Probe for EPMA v. 9.4.1

User's Guide to Getting Started Xtreme Edition



By Daniel T. Kremser, Ph.D. for Advanced MicroBeam, Inc. Edited by David T. Adams and Karsten Goemann for Probe Software, Inc. © Copyright 1994-2013

Contents

ACKNOWLEDGEMENTS	1
DISCLAIMER	1
CONVENTIONS USED IN THIS GUIDE	1
CREATING THE DEFAULT STANDARD DATABASE FILE	3
CREATING STANDARD POSITION FILES	
BEAM AND DETECTOR STABILITY	44
QUANTITATIVE MEASUREMENT RUN	54
INTRODUCTION	
OPENING PROBE FOR EPMA	
CREATING A NEW RUN	59
PARAMETER INITIALIZATION	
Analytical Standard Selection	
Creating a New Sample	64
Setting Analytical Conditions	
Nominal Beam Current Measurement	69
Element, X-Ray Line and Spectrometer Parameters Selection	71
Editing Acquisition Options	
Modifying Standard Assignments	
Setting Count Times	
LOADING STANDARD POSITION FILES	
MANUAL PEAKING AND PHA USING THE ACQUIRE! WINDOW	
MANUAL COUNT ACQUISITION USING THE ACQUIRE! WINDOW	116
WAVESCAN ACQUISITIONS AND OFF-PEAK ADJUSTMENTS	
AUTOMATION ACTIONS	136
Confirm Standard Positions	136
Calibrate Peak Positions	139
Acquire Standard Samples	143
EVALUATE STANDARD COUNT DATA	146
ASSIGN MAN BACKGROUND CALIBRATIONS	
ANALYZE STANDARD SAMPLES	157
SPECTRAL INTERFERENCE ASSIGNMENTS	165
MANUAL UNKNOWN SAMPLE DATA COLLECTION AND ANALYSIS	
DIGITIZED SAMPLE DATA COLLECTION AND ANALYSIS	
PLOTTING ANALYSIS DATA	
OUTPUT OF ANALYZED DATA	194
CLOSING THE CURRENT RUN AND PROBE FOR EPMA	198

Acknowledgements

The author would like to thank John Donovan and Don Lesher for critical comments, technical assistance and their friendship over the years. Their expertise has made this manual better. Also, Brad Jolliff and Paul Carpenter at Washington University in St. Louis.

Disclaimer

IN NO EVENT SHALL DAN KREMSER, DAVID ADAMS, KARSTEN GOEMANN, ADVANCED MICROBEAM, OR PROBE SOFTWARE BE LIABLE TO ANY PARTY FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING LOST PROFITS, ARISING OUT OF THE USE OF THIS DOCUMENTATION, EVEN IF DAN KREMSER, ADVANCED MICROBEAM, OR PROBE SOFTWARE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

DAN KREMSER, DAVID ADAMS, KARSTEN GOEMANN, ADVANCED MICROBEAM, AND PROBE SOFTWARE SPECIFICALLY DISCLAIMS ANY WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THIS DOCUMENTATION PROVIDED HEREUNDER IS ON AN "AS IS" BASIS, AND DAN KREMSER, DAVID ADAMS, KARSTEN GOEMANN, ADVANCED MICROBEAM, AND PROBE SOFTWARE HAVE NO OBLIGATIONS TO PROVIDE MAINTENANCE, SUPPORT, UPDATES, ENHANCEMENTS, OR MODIFICATIONS.

Conventions Used in this Guide

The screenshots used in this guide are consistent with Probe For EPMA version 9.4.1, released April 2013. Some screenshots might display older version information, but the contents of these dialogs and windows have not been changed since then.

The following conventions are used in this document; **Menu Commands** and **Dialog Box** (**Windows**) **Names and buttons** are bold-faced whenever they occur in the text. *Dialog Box Options* are italicized and FILE NAMES are capitalized. Several tips for saving time/steps include:

Context sensitive HELP is available in any window by pressing the F1 key. Pressing $\langle \text{Enter} \rangle$ (or $\langle \text{Return} \rangle \langle \checkmark \rangle$ on international keyboards) on the keyboard is identical to clicking the **OK** button.

Pressing the <Esc> key on the keyboard is identical to clicking the **Cancel** command.

To select a range of items in *Multi-Select* list boxes, click on the first item, move to the last and hold the <Shift> key down while clicking on the last item.

To select individual items in *Multi-Select* list boxes, hold down the <Ctrl> key down while clicking on the item.

De-select items in *Multi-Select* list boxes by holding the <Ctrl> key down and clicking the item.

(this page intentionally left blank)

Creating the Default Standard Database File

PROBE FOR EPMA requires a database of microprobe standards for use in quantitative analysis. This standard database can store up to 32768 standards each with up to 72 elements per standard. All standard information is stored in a file designated STANDARD.MDB. MDB is an abbreviation for Microsoft DataBase and represents a Microsoft Access v. 3.5 database file. In addition to the default standard database, four other standard databases are supplied as ASCII files and as MDB files. These are:

DHZ.MDB	Deer, Howie and Zussman
ORE.MDB	Dana's Mineralogy (Sulfides)
SRM.MDB	NIST standard reference alloys and glasses
AMCSD.MDB	American Mineralogist Crystal Structures

The DHZ.MDB is a database of all of the analyses listed in the first edition of "Rock Forming Minerals" by Deer, Howie and Zussman.

The ORE.MDB is a database composed of sulfide minerals from Dana's Mineralogy entered in ideal formulas.

The SRM.MDB is a database of SRM (Standard Reference Materials) alloys and glasses from the NIST SRM catalog.

The AMCSD.MDB is the American Mineralogist Crystal Structure Database, which contains over 9500 compositions based on formula stoichiometries.

All of these database files can be used for reference and compositional matching purposes through the Standard menu.

The following procedure illustrates how to create a new default standard database and enter standard compositions into it.

Open the STANDARD application. If available, double click on the yellow Probe for EPMA software folder on the desktop. Then double click on the **Standard** icon:



Alternatively, select **Standard** from the Probe Software group in the Windows Start Menu, or locate and double click on the STANDARD application in the Probe for EPMA application directory, which is usually C:\Probe Software\Probe for EPMA under Windows Vista and Windows 7, or C:\Program Files\Probe Software\Probe for EPMA for older operating systems.

STANDARD can also be launched by selecting **Standard Database** in the **Standard** menu of Probe for EPMA:

👎 Probewin	(Probe for EPMA)	- 0 X				
File Edit	Standard Xray Analytical Window Run Output Help					
A	Standard Database (load default standard compositional database)					
Welcom	Evaluate Standards	ĺ				
Copyri	Select Standard Database (specify a different standard composition database as the default)				
This sof	Edit Standard Parameters (coating)					
Karsten Probe Sc	Add/Remove Standards To/From Run	Ctrl+S				
Press the F1 key in any window for context sensitive help. To get help on a menu item simply highlight with the mouse and hit the F1 key.						
Initialia	Initializing Demonstration Interface					
Demonstration Interface Initialized						
Click File	lew or Open to create or open a probe database. Click File User Wizard! forCancel	Pause 📈				

This action launches the STANDARD (Compositional Database) program and opens the **Open Old Standard Database File** dialog box.

Standard (Compositional Database)							
File Edit Standard Options Xray	Analytical Output Help						
See Open Old Standard Database File	and a second sec		×				
Computer + Local D	isk (C:) ▶ Probe Software ▶ Probe for EPMA	✓ Search I	Probe for EPMA 👂				
Organize 🔻 New folder			:= • 🔟 🔞				
☆ Favorites	Name	Date modified	Туре				
🧫 Desktop	amcsd.mdb	04/02/2012 08:35	MDB File				
📕 Downloads 🔤	boundary.mdb	18/11/2012 06:45	MDB File				
🗐 Recent Places	Dana.MDB	27/09/2002 08:43	MDB File				
	DHZ.MDB	04/02/2012 10:23	MDB File				
词 Libraries	jeolel.mdb	06/09/2009 08:24	MDB File				
	jeolox.mdb	06/09/2009 08:24	MDB File				
🔞 Homegroup	MANvsOFF-1.MDB	16/06/2008 08:27	MDB File				
	matrix.mdb	18/04/2013 11:35	MDB File				
🖳 Computer	Ore.MDB	04/02/2012 10:23	MDB File				
🚢 Local Disk (C:)	POSITION.MDB	23/04/2013 09:58	MDB File 🔻				
emxmdata (\\moselev) (M:)	III		•				
File name: standa	ard.mdb	▼ *.MDB (*.	MDB) 🔻				
Open 🔽 Cancel							
 			Cancel Pause 🛛				

To create a new standard database, click on the **Cancel** button to close the **Open Old Standard Database File** dialog box.

Select File from the menu bar and then click on New from the menu.

Standard (Compositional Database)				
New	Inform	ation		
Open				
Close				
Import ASCII File		_		
Export ASCII File	Total Calcu	Oxygen lated Oxugen		otal Weight % • Bar
Import ASCII File (single row format)	Exces	is Oxygen	At	tomic Weight
Export ASCII File (single row format)			,	
Import Standards From Cameca PeakSight (Sx.mdb) Import Standards From JEOL Text File (created from Perl script)				
File Information	Ctrl+F			
Print Log	Ctrl+P			
Print Setup				
Exit				
			Cancel	Pause

This opens the **Open New Standard Database File** dialog box.

Open New Standard	Datab	ase File	Transfer Westmitter			×
O O I I Con	nputer	► Local Disk (C:) ► Probe Softwa	re 🕨 Probe for EPMA 🛛 👻	Search Prob	e for EPMA	
Organize 🔻 New	folde	,				?
퉬 Downloads	*	Name	Date modified	Туре	Size	
📃 Recent Places		amcsd.mdb	04/02/2012 08:35	MDB File	1,560 KB	
P	=	boundary.mdb	18/11/2012 06:45	MDB File	111,564 KB	
Cibraries		Dana.MDB	27/09/2002 08:43	MDB File	116 KB	
		DHZ.MDB	04/02/2012 10:23	MDB File	168 KB	
Nomegroup		📄 jeolel.mdb	06/09/2009 08:24	MDB File	220 KB	
· Commuter		jeolox.mdb	06/09/2009 08:24	MDB File	232 KB	
Computer		MANvsOFF-1.MDB	16/06/2008 08:27	MDB File	692 KB	
emxmdata (\\m	nc 🛫	i matrix.mdb	18/04/2013 11:35 III	MDB File	21,996 KB	Þ
File name:	standa	ard.mdb				
Save as type: *	.MDB	(*.MDB)				Ĩ
Hide Folders				Save	Cancel	

Click the **Save** button to open a new default standard database (STANDARD.MDB).

The Confirm Save As window appears. Click Yes.



The default standard database supplied with the installation is J. Donovan's standard listing. The user has a different set of standards typically, so the choice is to overwrite the supplied database. Click the **Yes** button to confirm overwriting the existing default database. Note: the supplied demonstration files JEOLEL.MDB and JEOLOX.MDB will no longer be usable after this operation.

The File Information window opens.

File Information		
File Name	C:\Probe Software\Probe for EPMA\standard.mdb	
Version	9.41 Type STANDARD OK	
User	Standard	
Title	Default Standard Database	
Department		
Account #	Group	
Description	Standard Composition (Probe for EPMA)	*
Date Created	23/04/2013 10:34:03 Date Modified 23/04/2013 10:34:03	
Last Updated	23/04/2013 10:34:03	

Enter the relevant information into the *User*, *Title*, and other *Description* text boxes shown in the **File Information** dialog box displayed below. Use the <tab> key to move between text boxes.

File Name	C:\Probe Software\Probe for EPMA\standard.mdb
Version	9.41 Type STANDARD OK
User	Karsten Goemann
Title	Default Standard Database
Department	
Account #	Group
Description	Standard Composition (Probe for EPMA)
Date Created	23/04/2013 10:34:03 Date Modified 23/04/2013 10:34:03
	,

When finished, click the **OK** button.

The user now has an empty database ready to accept standard composition data.

Standard [C:\Probe Software\Probe for EPMA\standard.mdb]	
File Edit Standard Options Xray Analytical Output Help	
Standards (double-click to see composition data) Standard Information Total Oxygen Calculated Oxygen Excess Oxygen	Total Weight % Z - Bar Atomic Weight
P	

To enter standards into this database, select **Standard** from the menu bar and click on **New** from the menu.

ile Edit St	andard Options Xray Analytical Outp	ut Help		
Standard	New	Ctrl+N	ormation	
	Modify Duplicate	Ctrl+M		
	Delete Delete Selected			
List All Standard Names List All Standard Names and Average Z List Elemental Standard Names List Oxide Standard Names			otal Oxygen Total Weig alculated Oxygen Z - Bar xcess Oxygen Atomic We	;ht % eight
	List Selected Standards List All Standards List Elemental Standards			
	List Oxide Standards			

This action opens the **Standard Composition** dialog box. Type the appropriate *Sample Number*, *Standard Name*, and *Standard Description* into the text boxes. The software automatically loads the next available number by default. Choose standard numbers that will allow grouping of standards into various functional sets. Standard numbers may range from 1 to 32768, however to avoid conflict with the supplied NIST SRM, DHZ, and Dana ORE sample databases select numbers below 2000.

andard Com	position						
Sample Nu	imber, Name	and Descr	iption ———				OK.
1							UK
Standard I	Description					*	Cancel
							Density (am/cm3
							5.00000
						-	Calculate Density
Click Elem	ent Row to I	Edit Elemen	t Composition	and/or C	ations (click en	npty row t	o add)
Channel	Element	X-Ray	Cations	Oxygen:	s Elemental	Oxide	Atomic _
	_						
4							
· 🗆							r
Enter Com	position In-	Display	Composition	As	C	urrent Col	umn Totals
⊖ Oxide E	ercent		de Standard		Elemental	Oxi	de Atomic
					.000		.000
• Elemen	tal Percent	• Elei	mental Standa	rd .	Total Oxygen F	rom Catio	ns
					Total Oxygen fr	om Halog	ens
Ente	r Atom Form	ula Compos	ition	1	Halogen Correc	ted Oxyge	en 📃
				Unda	te Evcess Ent	er Excess C)xygen

Click the *Elemental Percent* and *Elemental Standard* buttons under *Enter Composition In* and *Display Composition As* respectively, as necessary. All standard compositions are saved in the standard database as elemental concentrations. If oxygen is present in the standard then the user must enter oxygen as an element and its concentration into the standard entry. See the silicate example in this manual for details.

The first example will illustrate the entry of an elemental metal standard. Click on any empty row in the spreadsheet. This opens the **Element Properties** dialog box. In the *Element* field either type in the first element in the standard or use the drop-down list box to select the element symbol. Continue by choosing the correct *X-Ray* line, *Cations*, and *Oxygens*. The *X-Ray* line is used for modeling purposes only. When entering properties and concentrations for elements in elemental mode, the program grays out the *Cations* and *Oxygens* text boxes, as no editing of these text boxes is necessary.

Standard Composition	
Sample Number, Name and Description 529 Copper Metal	OK
Pure metal standard Provided by JEOL	Cancel
	Density (gm/cm3 5.00000
	Calculate Density
Click Element Row to Edit Element Composition and/or Cations (click empty row the Channel Element Properties and Weight Percent For :	OK
Cu ka 2 1 Co on In Elemental ni Percent Crystal (default) Cu LIF 1	Clear
Enter Complas isplay Composition As Current Coll Se Coxide Standard Elemental Ox Coxide Percent Coxide Standard .000 Elemental Percent Elemental Standard Total Oxygen From Cation	lumn Totals ide Atomic .000 ns
Total Oxygen from Halog Enter Atom Formula Composition Update Excess Ox	iens

Enter the elemental weight percent for copper into the *Enter Composition In Elemental Weight Percent* text box. Finish by clicking the **OK** button of the **Element Properties** dialog box.

lement Properties	
Enter Element Properties and Weight Percent For :	OK
ElementX-Ray (default)CationsOxygenscuImage: kaImage: 2mmImage: 1mmImage: 2mm	Cancel
Enter Composition In Elemental Weight PercentCrystal (default)Charge100LIF1	Clear

The program returns to the **Standard Composition** dialog box.

andard Com	position						
Sample Nu	mber, Name	and Descr	iption				OK
529	Сор	per Metal				_	
Pure metal Provided b	l standard sy JEOL					*	Cancel
							Density (gm/cm3
							5.00000
						*	Calculate Density
Click Elem	ent Row to	Edit Elemen	t Composition	and/or Cati	ons (click en	npty row t	o add)
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic 🔺
1	cu	ka			100.000		100.000
•							4
Enter Com	position In-	Display	Composition /	\s	Cu	urrent Colu	umn Totals
O Oxide P	ercent	O Oxio	de Standard		Elemental	Oxi	de Atomic
Element	tal Percent	Eler	mental Standar	d To	tal Oxygen Fi	om Catior	18
				To	tal Oxygen fr	om Halogo	ens
Enter	r Atom Form	ula Composi	ition	Ha	logen Correc	ted Oxyge	n
				Update	Excess Ent	el Excess L	xygen

If there are more elements (compound standards) in the standard, click the next empty *Element* row and repeat the data entry process. When all elements are entered, click the **OK** button on the **Standard Composition** dialog box. This concludes the entry of a standard into the standard database and results in the following log window output.

Standard [C:\Probe Software\Probe for	EPMA\standar	rd.mdb]			×
File Edit Standard Options Xray	Analytical Ou	utput Help			
Standards (double-click to see comp	osition data)—	Standard Information			
529 Copper Metal		St 529 Copper Metal TO = 40, KeV = 15 Pure metal standard Provided by JEOL			
		.000 Total Oxygen .000 Calculated Oxygen .000 Excess Oxygen	100.000 29.000 63.546	Total Weight % Z - Bar Atomic Weight	
St 529 Copper Metal					-
St 529 Copper Metal					
TakeOff = 40.0 KiloVolt = 1	5.0 Densi	ity = 5.000			
Pure metal standard					
Elemental Composition					
Average Total Oxygen:	.000	Average Total Weight%:	100.000		
Average Calculated Oxygen:	.000	Average Atomic Number:	29.000		Ξ
Average Excess Oxygen:	.000	Average Atomic Weight:	63.546		
ELEM: Cu					
XRAY: ka					
ELWT: 100.000					
KFAC: 1.0000					
ZCOR: 1.0000					
AT% : 100.000					
					+
P			Cance	l Pause	

Many standards contain oxygen in their compositions. Since all standard compositions are saved to the standard database as elemental concentrations, it is necessary to enter the oxygen concentration if oxygen is present in the compound. This applies to all standards, even those that are entered and/or displayed as oxide concentrations. The following example illustrates a silicate (oxygen bearing) standard entry into the database.

From the main STANDARD log window, select **Standard** from the menu bar and click on **New** from the menu choices. This action opens the **Standard Composition** dialog box. Type the appropriate *Sample Number, Standard Name,* and *Standard Description* into the text boxes. Click the *Oxide Percent* and *Oxide Standard* buttons under the *Enter Composition In* and *Display Composition As* boxes.

tandard Com	position	_	-	-			
Sample Nu	imber, Name	e and Descri elia Albite n Amelia, VA	iption			4	OK Cancel Density (gm/cm3 5.00000 Calculate Density
Click Elem	Element	Edit Elemen X-Ray	Cations	and/or Cati	ons (click en	npty row t	Atomic
Enter Com Oxide F C Elemen Ente	position In - Percent tal Percent r Atom Form	Display © Oxio © Eler ula Composi	Composition de Standard nental Standa	As Ind Tot Tot Hai	Cu Elemental .000 al Oxygen Fr al Oxygen fr logen Correc Excess	urrent Colu Oxi .OO(rom Catior om Halogo ted Oxyge er Excess C	umn Totals de Atomic) .000 ns .000 ens .000 en .000

Click on any empty row in the spreadsheet.

This opens the **Element Properties** dialog box. In the *Element* field either type in the first element in the standard or use the drop-down list box to select the element symbol. Continue by choosing the correct *X-Ray* line, *Cations*, and *Oxygens*. Finally, enter the weight percent for SiO_2 into the *Enter Composition In Oxide Weight Percent* text box.

lement Properties	-
- Enter Element Properties and Weight Percent For :	OK
ElementX-Ray (default)CationsOxygensSi•ka•1•2•	Cancel
Enter Composition In Oxide Weight Percent Crystal (default) Charge	ci
68.71 TAP • 4	Clear

Finish by clicking the **OK** button of the **Element Properties** dialog box. This results in the following **Standard Composition** dialog box.

Sample Nu	umber, Name	e and Desci	ription				OK .
1	Am	elia Albite					UK
Natural sp	oecimen from	n Amelia, V/	A, USA			*	Cancel
							Density (gm/cm
							5.00000
						Ŧ	Calculate Density
1	Si	ka	1	2	32.117	68.710	100.000
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic 4
•							4
<	position In -	Display	y Composition .	As –	C.	urrent Colu	mn Totals
 ✓ ■ Enter Com Oxide I 	aposition In	Display © Oxi	y Composition . de Standard	As	Cu Elemental	urrent Colu Oxid	mn Totals e Atomic
 ✓ ■ Enter Com Oxide I ○ Element 	position In - Percent atal Percent	Display © Oxi © Ele	y Composition , de Standard mental Standa	As To	Cu Elemental 32.117 tal Ovuger St	urrent Colu Oxid 68.710	mn Totals le Atomic 100.000
 Enter Com Oxide I Element 	aposition In - Percent atal Percent	Display © Oxi O Ele	y Composition , de Standard mental Standa	As rd To	Cu Elemental 32.117 tal Oxygen Fr	urrent Colu Oxid 68.710 rom Cations	mn Totals le Atomic 100.000 s 36.593
 ✓ ■ Enter Com Oxide I Element 	position In - Percent atal Percent	Display © Oxi © Ele	y Composition . de Standard mental Standa	As rd To To	Cu Elemental 32.117 tal Oxygen fro tal Oxygen fro	urrent Colu Oxid 68.710 rom Cations om Haloge	mn Totals e Atomic 100.000 s 36.593 ns .000

Note: to facilitate the data entry for the oxygen concentration of standard compositions which are entered as oxide concentrations, the program will display a running total in the text box designated *Total Oxygen From Cations*.

Sample NI	umber, Name	and Descr	iption				
1	Ame	elia Albite					ОК
Natural sp	pecimen from	i Amelia, VA	A, USA			*	Cancel
							Density (gm/cn
							5.00000
						Ŧ	Calculate Densit
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic
1	Si	ka	1	2	32.117	68.710	60.006
2	AI	ka	2	3	10.320	19.500	20.071
3	Na	ka	2	1	8.680	11.700	19.811
4		Ka	2	1	.083	.100	
∢							4
<	position In-	Display	y Compositior		C	urrent Colu	▶ mn Totals
 ✓ □ Enter Com Oxide I 	position In -	Display	y Composition de Standard	As –	Co Elemental	urrent Colu Oxic	mn Totals Je Atomic
 Enter Com Oxide F 	position In - Percent	Display © Oxi	y Composition de Standard	As –	Co Elemental 51.200	urrent Colu Oxic 100.01	mn Totals de Atomic 0 100.000
 Enter Com Oxide F Element 	position In - Percent atal Percent	Display © Oxi © Eler	y Composition de Standard mental Stand	As ard To	Cu Elemental 51.200 tal Oxygen F	urrent Colu Oxic 100.01 rom Cation	Imn Totals de Atomic 0 100.000 s 48.810
 Enter Com Oxide F Element 	position In - Percent Ital Percent	Display © Oxid	y Composition de Standard mental Stand	ard To	Co Elemental 51.200 tal Oxygen F tal Oxygen fr	urrent Colu Oxic 100.01 rom Cation om Haloge	Imn Totals le Atomic 0 100.000 s 48.810 ens .000
 Enter Com Oxide F Element 	position In - Percent atal Percent	Display © Oxid O Election	y Composition de Standard mental Stand ition	ard To To Ha	Co Elemental 51.200 tal Oxygen Fr tal Oxygen fr logen Correc	urrent Colu Oxic 100.01 rom Cation om Haloge ted Oxyge	Imm Totals de Atomic 0 100.000 s 48.810 ens .000 n 48.810

Continue the data entry process for the remaining elements (as oxides).

To complete the standard entry into the standard database, enter oxygen as the last element in the standard. Click on any empty row in the spreadsheet. This opens the **Element Properties** dialog box. In the *Element* field type in the element symbol for oxygen. Check for the appropriate *X-Ray* line, *Cations*, and *Oxygens*. Finally, enter the running total from the *Total Oxygen From Cations* text box into the *Enter Composition in Oxide Weight Percent* text box.

1	Ame	elia Albite					OK
Natural sp	pecimen from	n Amelia, VA	A, USA			*	Cancel
							Density (gm/cr
							5.00000
						-	Calculate Densi
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic
1	Si	ka .	1	2	32.117	68.710	60.006
2		ka	2	3	10.320	19.500	20.071
<u> </u>	Na	ка		100	8 680	11 700	19811
4 El	ement Prope	erties					
4 El	ement Prope - Enter Elem Elemen 0	ent Propert at X-Ra v ka	ies and Weig y (default) v	ht Percent Fo Cations	r: Oxyge	ns	OK Cancel
4 El 	Enter Elemen Elemen O Enter Co We	enties ent Propert at X-Ra v ka mposition lu eight Perce	ies and Weig y (default) y Dxide nt C	ht Percent Fo Cations I Crystal (default	r: Oxyge] 0) Charg	ns I	OK Cancel
4 El Content Co Coxido	Enter Elemen Elemen O Enter Co We 48.81	enties nent Propert at X-Ra v ka mposition In eight Percen	ies and Weig y (default) y (default) n Oxide nt C	ht Percent Fo Cations I ₹ Crystal (default NiCrBN ₹	r : Oxyge] 0) Charg] -2	ns v	OK Cancel
4 El Center Co Celementorial	Enter Elemen Elemen O Enter Co We 48.81	ent Propert at X-Ra v ka mposition In eight Percen	ies and Weig y (default) n Oxide nt C I mentar stand	iht Percent Fo Cations I – Trystal (default NiCrBN – arg Tot	r : Oxyge] O Charg] -2 al Oxygen Fr	ns v le	OK Cancel
4 El C Dxide C Elemen	Enter Elemen D Enter Co Enter Co We 48.81	ent Propert at X-Ra v ka mposition li eight Perce	ies and Weig y (default) v (de	ht Percent Fo Cations I ▼ Grystal (default NiCrBN ▼ ara Tot	r : Oxyge] 0 :) Charg] -2 al Oxygen Fr al Oxygen fr	ns v ie com Cations om Halogen	OK Cancel Clear s 48.810 ns .000

Click the **OK** button of the **Element Properties** dialog box.

The following **Standard Composition** dialog box illustrates the completed five-element silicate standard, Albite.

ndard Com	position						
Sample Nu	umber, Name	and Descr	iption ———				_
1	Ame	elia Albite					OK
Natural sp	ecimen from	ı Amelia, VA	A, USA			*	Cancel
							Densitu (am/or
							5.00000
						-	Calculate Densi
Click Elem	ent Row to	Edit Elemer	nt Composition	n and/or Cati	ions (click en	npty row to	add)
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic
1	Si	ka	1	2	32.117	68.710	23.072
2	AI	ka	2	3	10.320	19.500	7.717
3	Na	ka	2	1	8.680	11.700	7.617
4	K	ka	2	1	.083	.100	.043
5	0	ka	1	0	48.810	.000	61.550
•							Þ
Enter Com	position In-	- Display	v Composition	As	Ci	urrent Colu	ımn Totals
~ ~					Elemental	Oxio	le Atomi
🖲 Nxide F	Percent	• Oxi	de Standard		100.010	100.01	0 100.000
o ondo i		C Ela	mental Stand	ard			40.010
C Elemen	tal Percent			To To	tal Oxygen Fi	rom Cation	\$ 48.810
C Elemen	tal Percent			To To	tal Oxygen Fi tal Oxygen fr	rom Cation om Haloge	ns .000
C Elemen	r Atom Form	ula Compos	ition	To To Ha	tal Oxygen Fi tal Oxygen fr logen Correc	rom Cation om Haloge ted Oxyge	ns .000 n 48.810

The compositional data of any standard entered into the standard database may be reviewed by simply double-clicking on the standard of interest from the scrollable *Standards* list box. The following window contains two standards with the compositional data of Albite displayed in the log window in oxide form.

Standard [C:\Probe Software\Probe for EPMA\standar	rd.mdb]
File Edit Standard Options Xray Analytical O	utput Help
Standards (double-click to see composition data) –	Standard Information
1 Amelia Albite	St. 1 Amelia Albite
529 Copper Metal	TO = 40, KeV = 15
	Natural specimen from Amelia, VA, USA
	48 810 Total Oxygen
	48.810 Calculated Oxygen 10.712 Z · Bar
	.000 Excess Oxygen 20.178 Atomic Weight
,	
	A
St 1 Amelia Albite	
St 1 Amelia Albite	
TakeOff = 40.0 KiloVolt = 15.0 Densi	ity = 5.000
Natural specimen from Amelia, VA, USA	
Oxide and Elemental Composition	
Average Total Oxygen: 48.810	Average Total Weight%: 100.010
Average Calculated Oxygen: 48.810	Average Atomic Number: 10.712
Average Excess Oxygen: .000	Average Atomic Weight: 20.178
ELEM: SiO2 Al2O3 Na2O K2O	
XKAY: KA KA KA KA KA	ка
CAW1: 00.710 19.500 11.700 .100	3 48 810
KFAC: .2532 .0790 .0499 0003	7 . 2550
ZCOR: 1.2685 1.3059 1.7377 1.1563	3 1.9142
AT% : 23.072 7.717 7.617 .043	3 61.550
24 0: 8.996 3.009 2.970 .017	7 24.000
<u> </u>	Cancel Pause

Some standards are simple end-member compounds or stoichiometric phases. These standards may be entered as a formula string.

Select **Standard** from the menu bar and click on **New** from the menu. This action opens the **Standard Composition** dialog box. Type the appropriate *Sample Number, Standard Name,* and *Standard Description* into the text boxes.

			ption				ОК
310	NiS						<u> </u>
Synthetic	- USGS					*	Cancel
							Density (gm/cm
							5.00000
						~	Calculate Density
Click Elow	ent Row to	Edit Element	Composition	and/or Cati	one foliok or	antu row t	(bbc.o
Lhannel	Element	X-Hay	Lations	Uxygens	Liemental	Uxide	Atomic
	_						
•							•
•							•
∢ Enter Com	position In –	Display	Composition A	2.	Cu	urrent Colu	umn Totals
✓ □Enter Com○ Oxide F	position In – Percent	Display C Oxid	Composition A e Standard	.5	Cu Elemental .000	urrent Colu Oxi	umn Totals de Atomic
 Enter Com Oxide F Element 	position In – Percent Ital Percent	Display O Oxid O Elem	Composition A le Standard nental Standard	s d Tot	Cu Elemental .000 al Oxygen Fr	urrent Colu Oxi	umn Totals de Atomic .000
 Enter Com Oxide F Element 	position In - Percent Ital Percent	Display O 0xid O Elen	Composition A le Standard nental Standard	a Tot	Cu Elemental .000 al Oxygen Fr al Oxygen fr	urrent Colo Oxi Oxi om Catior	umn Totals de Atomic .000
 ✓ ■ Enter Com ○ Oxide F ○ Element 	position In – Percent Ital Percent	Display O Oxid O Elen	Composition A le Standard mental Standard	d Tot	Cu Elemental .000 al Oxygen Fr al Oxygen fro	irrent Coli Oxi om Catior om Catior	umn Totals de Atomic .000 ns

Click the **Enter Atom Formula Composition** button and enter the formula string into the text box.

In this example NiS for nickel sulfide was entered.

Enter Formula String For : Standard Name
NiS For example : "fe2sio4", "h2o", "ch2ch3oh" or "ca2mg5si8o22(oh)2"
OK Cancel

Click the **OK** button. The stoichiometric phase NiS is entered into the **Standard Composition** window.

andard Com	position		D. Land				
Sample Nu	mber, Name NiS	and Descri	ption ———				OK
- Click Elem	ent Row to	Edit Elemen	t Composition	and/or Cati	ons (click en	npty row to	Density (gm/cm3 5.00000 Calculate Density
Channel	Element	X-Ray	Cations	Oxygens	Elemental	Oxide	Atomic 🔺
1	Ni	ka			64.677		50.000
Z	5	ka			33.323		
Enter Com	position In-	Display	Composition /	4s -	C	urrent Colu	umn Totals
O Oxide P	ercent	O Oxid	le Standard		Elemental	Uxi	de Atomic
Element	tal Percent	Elen	nental Standa	rd Tot	al Oxygen Fi	rom Cation	100.000
				Tot	al Oxygen fr	om Haloge	ens
Enter	Atom Form	ula Composi	tion	Hal	logen Correc	ted Oxyge er Excess O	n

Click the **OK** button closing the **Standard Composition** window and returning to the main STANDARD log window.

Standard [C:\Probe Software\Probe for	EPMA\standar	d.mdb]			x
File Edit Standard Options Xray	Analytical Ou	tput Help			
Standards (double-click to see compo	sition data) —	Standard Information			
1 Amelia Albite		St 310 NiS			-
310 NiS 529 Copper Metal		TO = 40, KeV = 15			
		Synthetic - USUS			
		.000 Total Oxygen .000 Calculated Oxygen	100.000 23.761	Total Weight % Z - Bar	
		.000 Excess Oxygen	45.387	Atomic Weight	
24 0: 8.996 3.009 2.97	70 .017	24.000			^
st 310 Nis					
St 310 NiS					
TakeOff = 40.0 KiloVolt = 15	5.0 Densi	ty = 5.000			
Elemental Composition					
hiemental composition					
Average Total Oxygen:	.000	Average Total Weight%:	100.000		
Average Calculated Oxygen:	.000	Average Atomic Number:	23.761		
Average Excess Oxygen:	.000	Average Atomic Weight:	45.387		
FUENC No. C					
VDAV. ka ka					
ELWT: 64.677 35.323					=
KFAC: .6158 .3096					
ZCOR: 1.0504 1.1407					
AT% : 50.000 50.000					
<u></u>					-
			Cancel	Pause	

To modify a particular standard, select the standard in the *Standards* list box. Click **Standard** from the menu bar and select **Modify** from the menu. Edit the appropriate fields in the **Standard Composition** window as described previously.

After entering all of the standard compositions in your standard collection, copy this important file (STANDARD.MDB) to another directory on the hard disk and likewise to another storage media for archival purposes.

Note: the takeoff, kilovolt, x-ray, and cation ratio parameters displayed here are used only for nominal calculations of the k-factors and ZAF corrections within the program STANDARD. The PROBE FOR EPMA quantitative analysis will calculate the quantitative standard k-factors based on the actual conditions.

Creating Standard Position Files

The program STAGE is used to digitize your standard mounts to create pre-digitized standard coordinate files. These files are necessary for automated acquisition and standardization. The standard coordinates are digitized in three dimensions (X, Y, and Z) as well as the W stage position (JEOL multi-position specimen stages only) and are typically referenced to three physical fiducial marks on the standard mount surface. These coordinate files should be digitized with the standard mount located in the position where it is typically found.

The following procedure illustrates how to create a new standard position file. In this example, four carbonate standards will be digitized. These standards must already be entered into the standard database, using program STANDARD.

When creating digitized standard files for standard mounts containing more than 64 standards, a slightly different procedure than outlined below must be followed. Concise instructions on how to bypass the current 64 standard limit in the STAGE digitize feature are outlined in the reference documentation. To find these instructions, open the PROBEWIN.HLP program from the Probe for EPMA folder. Click the **Index** button and type in digitize in the text box. Highlight the topic entitled *Digitizing Standard Mounts with More than 64 Standards* and click the **Display** button.

Open the STAGE application (Stage Control and Automation), if available by double clicking on the **Stage** icon in the Probe for EPMA Software group.



Alternatively, select **Stage** from the Probe Software group in the Windows Start Menu, or locate and double click on the STAGE application in the Probe for EPMA application directory, which is usually C:\Probe Software\Probe for EPMA under Windows Vista and 7, or C:\Program Files\Probe Software\Probe for EPMA for older operating systems.

This starts the STAGE program and opens its main log window. If no POSITION.MDB is detected, the **PositionOpenNewFile** dialog opens.

Stage (Stage Control and Automation)		
File Edit Standard Window Output Help		
Welcome to Stage, Probe for EPMA (Xtreme Edi	tion)	<u>v.</u>
9.4.1 Convright (c) 1995-2013 John J Donovan		
This sc PositionOpenNewFile	x	
Probe S		
Creating a new Position database: C:\Probe Software\Probe	for	
on a me		get help key.
	_	-
Initial Demonst	ж	
Ca	ncel F	Dause 🛛 🎢

Clicking the **OK** button creates a new Position database.

If the POSITION.MDB exists then STAGE opens the **Stage Map!** window and the **Digitize!** dialog as seen below.



Older microprobes with Advanced MicroBeam automation systems will first see the **Confirm Motor and Crystal Positions** dialog box when STAGE is first opened. Confirm that all of the motors (stage and spectrometer positions) and crystal designations are correctly calibrated. If there is disagreement between the mechanical positions (actual) and the software values, adjust the software values. Use the <tab> key to move between the various *Stage* and *Spectrometer Positions* boxes.



Click the **OK** button to close the **Confirm Motor and Crystal Positions** dialog box when done.

The **PositionOpenNewFile** dialog opens if no POSITION.MDB exists and a new POSITION.MDB is created upon clicking the **OK** button.

Two additional windows then open; the **Stage Map!** window and the **Digitize!** dialog as described on the previous page.

The following display illustrates the STAGE log window.

_ 🗆 🗙 Stage (Stage Control and Automation) File Edit Standard Window Output Help SP2 SP3 SP4 SP5 z SP1 х Y 52549.3 41971.3 59907.8 26937.1 44980.6 -12449. 38768.0 310.518 Welcome to Stage, Probe for EPMA (Xtreme Edition) v. 9.4.1 Copyright (c) 1995-2013 John J. Donovan This software is registered to : Karsten Goemann Probe Software Press the F1 key in any window for context sensitive help. To get help on a menu item simply highlight with the mouse and hit the F1 key. Initializing Demonstration Interface Demonstration Interface Initialized Cancel Pause

Select **Standard** from the menu bar and click on **Add/Remove Standards To/From Run** from the menu choices.

🎦 Stage (S	tage Control and Automation)			_ 🗆 🗙	
File Edit	Standard Window Output Help				
SP1	Standard Database	x	Y	Z	
52549.3	Add/Remove Standards To/From Run	449. 38	768.0 31	0.518	
Welcom	e to Stage, Probe for EPMA (X	treme	Editio	n) v.	1
Copyri	ght (c) 1995-2013 John J. Don	ovan			
This sof Karsten Probe So	tware is registered to : Goemann ftware				
Press th on a men	e F1 key in any window for context s a item simply highlight with the mou	ensitiv se and i	e help. hit the	To get hel F1 key.	lp
Initializing Demonstration Interface Demonstration Interface Initialized					
			Cancel	Pause	1.

This action opens the **Add Standards to Run** dialog box. Click on the name of each of the standards in the standard block to be digitized from the *Available Standards in Database* list box.

Add Standards to Run			
Available Standards in Databas	e (multi-select)	Current Star	ndards in Run
113 Muscovite (U.C. #15463) 116 Biotite (GHC 305)			
135 Calcite (analyzed) 138 Calcite (Harvard #97189)			
139 Magnesite (Harvard #10509 140 Rhodocrosite (Harvard #897	0) 794)		
141 Dolomite (Harvard #105064) 143 Kutnahorite (Harvard #8567	0		
145 Siderite (Harvard #96217)	-,		
160 NBS K-412 mineral glass			
177 Corning 1737 Glass			
180 Anuu feldspar glass			
Enter Standard To Find:	Add Standard To	Run >>	ОК
	<< Remove Standa	rd from Run	Cancel

Click the **Add Standard to Run** >> button to move these standards into the current run. Standards may be added one at a time or the user may multi-select standards by holding down the <Ctrl> button on the keyboard as standards are selected. Double clicking each entry will also send the standard to the other column in the dialog window.

Add Standards to Run			_
Available Standards in Databas 113 Muscovite (U.C. #15463) 116 Biotite (GHC 305) 135 Calcite (analyzed) 138 Calcite (Harvard #97189) 139 Magnesite (Harvard #10506 140 Rhodocrosite (Harvard #105064 141 Dolomite (Harvard #105064 143 Kutnahorite (Harvard #856) 145 Siderite (Harvard #96217) 147 Celestine (U.C. #4593) 160 NBS K-412 mineral glass 162 NBS K-411 mineral glass 162 NBS K-411 mineral glass	se (multi-select)	Current Stan 135 Calcite (analyzed) 140 Rhodocrosite (Harv 141 Dolomite (Harvard ‡ 145 Siderite (Harvard ‡	dards in Run ard #89794) t105064) 96217)
180 An00 feldspar glass	•		
Enter Standard To Find:	Add Standard	d To Run >>	ок
,	<< Remove Sta	ndard from Run	Cancel

Click the OK button of the Add Standards to Run dialog box when finished.

The previously opened **Digitize!** dialog box should be brought forward.

Digitize	el				
Position	n List (mu	lti-select) (d	louble-click to :	see data) —	Move
⊙ Star	ndards				Digitize
C Way	nowns vescans				Fiducials
O All S	Samples				Plot
-	- 💌				Conditions
Selec	t Stds				File Setups
Sele	ct All				
G	ìo				
Auto	Focus	I			Use Beam Deflection
Upo	date				
Dele		1			Auto Focus New Sample
Delete	Selected	l Samples	Import from	ASCII File	C Every Point
Delete	Selected	Positions	Export Select	ed Samples	
			Elipoit coloci	cu sumpica	
Row	×	Y	Z	W	Grain # Focus
Row	X	Y	Z	W	Grain # Focus
Row	×	Y	Z	W	Grain # Focus
Row	×	Y	Z	W	Grain # Focus
Row	X	Y	Z	W	Grain # Focus
Row	X	Y	Z	W	Grain # Focus
Row	×	Y	Z	W	Grain # Focus
Row	X	Y	Z	W	Grain # Focus
Row	×	Y	Z	W	Grain # Focus
Row	X	Y	Z	W	Grain # Focus
Row	×	Y	Z	W	Grain # Focus
Row	×	Y	Z	W	Grain # Focus
Row		Y	Z	W	Grain # Focus

Click the **Fiducials** button.

This opens the **Select Fiducial Set** window.



Click the **New** button. This opens the **Modify Fiducial Positions** window. The current stage coordinates are loaded by default.

Modify Fidu	cial Positions				_	
Enter Ap	oproximate Fid	lucial Positions	For Fiducial S	iet 1		ОК
Fiducial	Description	New Fiducial	Coordinate Se	et		Cancel
Point#	×	Y	Z	w		
1	-12448.71	38768.04	310.5177	0	Update	
2	-12448.71	38768.04	310.5177	0	Update	Move
3	-12448.71	38768.04	310.5177	0	Update	Stage

Type in a *Fiducial Description*. Enter the nominal coordinates or move to each of the three fiducial marks on the standard mount, determining their approximate coordinates, and enter those values into the appropriate fields. On JEOL 733 microprobes, the W stage position needs to be recorded as well. The following window will result.

Modify Fidu	cial Positions	_			_	
Enter Ap	proximate Fid	ucial Positions	For Fiducial S	Get 1		ОК
Fiducial	Description	Carbonate St	andards			Cancel
Point#	х	Y	Z	W		
1	-12448.71	38768.04	310.5177	0	Update	
2	-12448.71	38768.04	310.5177	0	Update	Move
3	-12448.71	38768.04	310.5177	0	Update	Stage
-						

Click the **OK** button when done. This creates a new entry in the **Select Fiducial Set** list box as shown below.



Select (highlight) the new fiducial set and click the **Confirm** button to initiate a precise centering of the three fiducial marks.

The **Modify Fiducial Positions** window opens displaying the originally entered fiducial coordinates. Click the **OK** button to initiate the centering process.

N	Modify Fiducial Positions						
	-Enter Ap	proximate Fid	ucial Positions	For Fiducial 9	Get 1		ОК
	Fiducial	Description	Carbonate St	andards			Cancel
	Point#	×	Y	Z	w		
	1	-12448.71	38768.04	310.5177	0	Update	
	2	-12448.71	38768.04	310.5177	0	Update	Move
	3	-12448.71	38768.04	310.5177	0	Update	<mark>Stage</mark>

The computer then drives the stage to each fiducial mark and displays the **FiducialVerifyFiducial** window. Adjust the stage position to center the fiducial mark and click the **OK** button.

FiducialVer	rifyFiducial
i	Please adjust the stage position for fiducial #1 to the exact center of the alignment mark. Click OK or <enter> when ready or click Cancel or <esc> to quit.</esc></enter>
	OK Cancel

After centering the third fiducial mark and clicking the **OK** button, the **FiducialVerifyFiducials** window opens to display the specimen tilt in radians and degrees. A warning will be given if the sample is tilted at more than 0.5 degrees.

FiducialVer	ifyFiducials
1	Specimen tilt in radians: ThetaX = 1.804077E-03 ThetaY= 2.85416E-04 Theta= 1.826514E-03 Specimen tilt in degrees: ThetaX = .103366 ThetaY= 1.635313E-02 Theta= .1046516
	ОК

Click this **OK** button.

Closing the FiducialVerifyFiducials window returns to the Select Fiducial Set dialog box.



Finally, click the **OK** button on the **Select Fiducial Set** dialog box. This opens the **FiducialSaveSelect** window to confirm the currently selected fiducial set.

FiducialSaveSelect	
1	Subsequent manual and digitized sample positions will not be referenced to a fiducial set
	OK

Click the **OK** button of the **FiducialSaveSelect** window.
The fiducial coordinate positions are recorded to disk and the **Digitize!** dialog box returns.

🥵 Digitize	el	-	-		
Position	n List (<mark>mu</mark> l	lti- <mark>select)</mark> (d	louble-click to s	ee data) —	Move
⊙ Stan	ndards		Digitize		
O Way	rowns /escans			Fiducials	
	amples				Plot
					Conditions Sample Setups
Selec	t Stds				File Setups
Sele	ct All				Confirm Positions
G	io				
Auto	Focus				Use Beam Deflection
Dele	date te All				
		1			 New Sample
Delete	Selected	Samples	Import from ASCII File		Every Point Digitized
					DIGICIECO
Delete	Selected	Positions	Export Selecte	ed Samples	C Interval 5
Delete Ro w	Selected	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete Ro w	Selected	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete Ro w	Selected X	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete Row	Selected	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete Row	Selected X	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete Row	Selected X	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete Row	Selected X	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete Row	Selected	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete Row	Selected	Positions Y	Export Selecto	ed Samples	C Interval 5 Grain # Focus
Delete Row	Selected	Positions Y	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete	Selected	Positions	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete	Selected	Positions	Export Selecto	ed Samples W	C Interval 5 Grain # Focus
Delete	Selected	Positions	Export Selecto	ed Samples	C Interval 5 Grain # Focus

The position of each of the standards in this standard mount must now be digitized. Move to the first standard; either by turning the motor controls manually or, if possible with your instrument, by using the joystick via the JOYWIN (Joystick Control for Stage and Spectrometers) program, or by using the **Move** button in the **Digitize!** window. Clicking the **Move** button opens the **Move Motors and Change Crystals** dialog box.

Type in the appropriate target coordinates in the *Stage Target Positions* boxes for the first standard. Use the <tab> key to move between entries.

Stage Target F	Change Crystal		1	1		-		
×	Y		Remove Fa	araday	All	Spectros		
X T -12449. 38768.0 Z 310.518			Z Axis Adjust Increment		Position	ns Stage		
		Increment			Au	to Focus		
Jog Sta	age				Excha	Exchange Sample		
🔲 Use Stage Ba	oklash	D L CL	Update Positions Filamer					
,		Park Stage	Update Po Free/Cl	sitions ear	Filam	ent Standby Close		
Spectrometer 1 SP1	Farget Position	SP3	SP4	sitions ear SP	Filam	ent Standby Close		
Spectrometer 1 SP1 TAP	Target Position SP2 LLLIF _▼	SP3	SP4	sitions ear SP	Filam	ent Standby Close		
Spectrometer 1 SP1 TAP V 52549.3	Farget Position SP2 LLLIF ▼ 41971.3	SP3	SP4 TAP 26937.1	sitions ear SP LLIF 44980	Filam 25 	ent Standby Close		
Spectrometer 1 SP1 TAP V 52549.3	Target Position SP2 LLIF ▼ 41971.3 2 C	SP3 LPET 59907.8 3	SP4 TAP 26937.1 4	sitions ear SP LLIF 44980 5	Filam 25 ▼ .6	ent Standby Close		
Spectrometer 1 SP1 TAP • 52549.3 1 0	arget Position SP2 LLIF ▼ 41971.3 2 C	Park Stage SP3 LPET ▼ 59907.8 3 ↓	SP4 TAP 26937.1 4 C	sitions ear SP LLIF 44980 5	Filam 25 .6 ↓	ent Standby Close		

Click **Go All.** This will drive the stage to the target positions. Check the position and optical focus.

Click the **Digitize** button of the **Digitize!** dialog box. This activates the **Digitize Sample Positions** dialog box. The *Standard Position Samples* list box contains the standards already added to the run.

Digitize!		E Digitize Sample Positions	
Position List (multi-select) (double-click to see data) C Standards C Unknowns Wavescans C All Samples	Move Digitize Fiducials Plot	Sample Type Standard C Unknown C Wavescan To create a new u Unknown Sample Typ and click the Create button. To create a Standard Sample Typ from th	inknown position, click the be option, enter a sample name New Unknown or Wavescan ww standard position, click the e option and select a standard e Standard List.
Select Stds	Conditions Sample Setups File Setups		
	Confirm Positions	Positions PictureSnap	Stage
Go Auto Focus Update Delete All	Use Beam Deflection Confirm All Positions Auto Focus	Unknown or Wavescan Position Samp	les (Name/Description)
Delete Selected Samples Import from ASCIL File	 New Sample Every Point 		-
Delete Selected Samples Export Selected Samples	O Digitized	Add Standards To Bun Then Select	
Row X Y Z W	Grain # Focus	Standard from List Below	Auto Digitize
		Standard Compositions Added To Run 135 Calcite (analyzed) 140 Rhodocrosite (Harvard #89794) 141 Dolomite (Harvard #105064) 145 Siderite (Harvard #36217) Add/Remove Standards Increment Grain	I (select to create new) I (select to create n

Select (highlight) the first standard to digitize from the *Standard Position Samples* list box. The standard will be added automatically to the **Digitize!** *Position List*. If a BMP electron image file exists for the standard, then it too will be displayed. This can be used to check whether you are on the correct standard. Further, the image could be annotated to suggest places or grains to avoid during the standard digitization or acquisition process.



To digitize a random point on this standard, click the **Single Point(s)** button of the **Digitize Sample Positions** dialog box to record the current coordinates (X, Y, Z, and W) for this grain. The coordinates of this standard in the **Digitize!** dialog box are seen below.

Digitize!	
Position List (multi-select) (double-click to see data)	Move
Standards St 135 Fid 1 Calcite (analyzed)	Digitize
C Wavescans	Fiducials
C All Samples	Plot
	Conditions
Select Stds	File Setups
Select All	
Go	Confirm Positions
Auto Focus	Use Beam Deflection
Update	Confirm All Positions
Delete All	Auto Focus
Delete Selected Samples Import from ASCII File	O Every Point
Delete Selected Positions Export Selected Samples	O Digitized
	Grain # Foous
1 -12448.71 38768.04 310.5177 0	1 0
KeV = 15 Curr = 20 Size = 0 Mag = 2533 Mode = Analog Sj MagAnal = 2533 MagImag = 2533 ImgShift = -2, 3	oot Sample Setup (row) Number = 0
File Setup = NONE	
Multiple Setups = NONE	Replicates = 1

Note, that although only one position per standard need be digitized, if additional points are digitized, PROBE FOR EPMA will automatically utilize them. Otherwise, PROBE FOR EPMA will simply increment the stage X position for each additional acquisition required.

Move the stage to the next standard, select the standard from the list box in the **Digitize Sample Position** window and click the **Single Point(s)** button again. The standard position will be digitized. Continue until all of the remaining standards in the standard block are digitized. In this example the **Digitize!** and **Digitize Sample Positions** dialog boxes would appear as follows.

🔚 Digitize!		🔚 Digitize Sample Positions 📃 🗖 🔜 💌
Position List (multi-select) (double-click to see data) Image: Standards Image: Standards <t< th=""><th>Move Digitize Fiducials Plot Conditions Sample Setups Eile Setupe</th><th>Sample Type To create a new unknown position, click the Unknown Sample Type option, enter a sample name and click the Create New Unknown of Wavescan C Unknown Create New Unknown of Wavescan Wavescan Standard Sample Type option and select a standard from the Standard List. Referenced To Fiducial Set: 1, Setup Number: 0 and File Setup: NONE and Multiple Setups: NONE</th></t<>	Move Digitize Fiducials Plot Conditions Sample Setups Eile Setupe	Sample Type To create a new unknown position, click the Unknown Sample Type option, enter a sample name and click the Create New Unknown of Wavescan C Unknown Create New Unknown of Wavescan Wavescan Standard Sample Type option and select a standard from the Standard List. Referenced To Fiducial Set: 1, Setup Number: 0 and File Setup: NONE and Multiple Setups: NONE
Select All		Positions PictureSnap Stage
Go	Confirm Positions	Unknown or Wavescan Position Samples (Name/Description)
Auto Focus	Use Beam Deflection Confirm All Positions	Siderite (Harvard #96217)
Delete All Delete Selected Samples Import from ASCII File Delete Selected Positions Export Selected Samples	Auto Focus © New Sample © Every Point © Digitized © Interval 5	Specimen from Harvard Mineralogical Museum (Carl Francis) Locality: St. Just, Cornwall, England
Row X Y Z W 1 -13511.38 37653.09 307.9990 0	Grain # Focus 1 0	Standard Compositions Added To Run (select to create new) 135 Calcite (analyzed) 140 Rhodocrosite (Harvard #89794) 141 Dolomite (Harvard #105064) 145 Sidente (Harvard #195217)
		Add/Remove Standards To/From Run
KeV = 15 Curr = 20 Size = 0 Mag = 2533 Mode = Analog Spot MagAnal = 2533 MagImag = 2533 ImgShift = -2, 3	Sample Setup (row) Number = 0	Improvement Grain Use Digitized AutoFocus Number Size Number Size Single Point(s) Shotgun Linear Traverse IIII
File Setup = NONE		
Multiple Setups = NONE	Replicates = 1	Digitize Cluster (of Random Points)

Close the **Digitize Sample Positions** dialog box by clicking the **Close** button in the upper right corner.

Finally, store the new pre-digitized standard coordinates to disk as an ASCII position file (.POS). Select all of the standards using the **Select Stds** button of the **Digitize!** dialog box.

Digitize!	
Position List (multi-select) (double-click to see data)	Move
Standards St 135 Fid 1 Calcite (analyzed) St 140 Fid 1 Bhodocrosite (Harvard #	Digitize
C Wavescans St 141 Fid 1 Dolomite (Harvard #105) St 145 Fid 1 Siderite (Harvard #105)	Fiducials
C All Samples	Plot
	Conditions
Select Stds	File Setups
Select All	
Go	Confirm Positions
Auto Focus	Use Beam Deflection
Update	Contirm All Positions
	 Auto Focus New Sample
Delete Selected Samples Import from ASCII File	C Every Point
Delete Selected Positions Export Selected Samples	C Digitized
	Grain # Focus
1 -13511.38 37653.09 307.9990 0	1 0
KeV = 15 Curr = 20 Size = 0 Mag = 2533 Mode = Analog Spot MagAnal = 2533 MagImag = 2533 ImgShift = -2, 3	: Sample Setup (row) Number = 0
File Setup = NONE Multiple Setups = NONE	Replicates = 1

Click the Export Selected Samples button.

This action opens the **Open File To Export Position Data To** window. The default *Save in:* location is specified by the StandardPOSFileDirectory keyword in the PROBEWIN.INI file.

Y Open File	To Export Position Data To	b			×
Save in: 🚺	StandardPOSData	•	🗢 🗈 💣 🗉	≣ ▼	
Name	*		Date modified		Туре
	No items ma	atch your se	arch.		
•	III				P.
File name:	untitled.pos			Sa	ive
Save as type:	ASCII Position Files (*.POS)		•	Car	ncel

Type in an appropriate *File name*:

🔛 Open File	To Export Position Data To			×
Save in: 🚺	StandardPOSData	•	(† 🖻 🖆	
Name	×		Date modified	Туре
	No items matcl	h your se	arch.	
•	III			+
File name:	Carbonate Standards.pos			Save
Save as type:	ASCII Position Files (*.POS)		•	Cancel

Click the Save button of the **Open File To Export Position Data To** window.

After the positions are written to disk, the **AutomateExportPositions** window appears.



Click the **OK** button to confirm the exported position coordinate data to disk in the **AutomateExportPositions** window. Next, close the **Digitize!** dialog box by clicking the **Close** button. Finally, close STAGE by clicking the **File** | **Exit** menu.

X* St	age (Stage Control and Automation)				x
File	Edit Standard Window Output Help				
	Import Positions from Cameca PeakSight (Sx.mdb)		Y	z	
	Re-load PROBEWIN.INI File	37	653.1 30	7.999	
	Print Log Ctrl+H	o le	Editic) v.	
	Print Setup				
	Exit				
Pro Pre on Ini Dem	be Software ss the F1 key in any window for context set a menu item simply highlight with the mouse tializing Demonstration Interface onstration Interface Initialized	nsitiv e and	re help. hit the	To get P F1 key.	help
			Cancel	Pause	

After digitizing all of the standards on the standard mounts and creating various *.POS files, copy these files to another directory and to a backup media.

Beam and Detector Stability

Testing beam (drift) stability is an important step prior to acquiring any quantitative data. The following step-by-step procedure illustrates how to monitor and plot beam current with time. On JEOL microprobes the FARADAY module may also be run for measurement of the beam (see the User's Guide and Reference documentation for further details).

From the Desktop, double click on the yellow Probe for EPMA Software folder, if available. Then, double click on the **Startwin** icon.



Alternatively, select **Startwin** in the Probe Software group of the Windows Start Menu, or locate and double click on STARTWIN in the Probe for EPMA application directory, which is usually C:\Probe Software\Probe for EPMA under Windows Vista and Windows 7, or C:\Program Files\Probe Software\Probe for EPMA for older operating systems.

This action launches the STARTWIN (Motion and Counter Control) program and opens three windows. The main STARTWIN log window, the **Count Acquisition** window and the first **Stage Map!** are displayed.



Older microprobes with Advanced MicroBeam automation systems will first see the **Confirm Motor and Crystal Positions** dialog box. Confirm that all of the motors (stage and spectrometer positions) and crystal designations are correctly calibrated. If there is disagreement between the mechanical positions (actual) and the software values, adjust the software values. Use the <tab> key to move between the various *Stage* and *Spectrometer Positions* boxes.

🗹 Startwin (Motion and Counter Control)	_ 🗆 ×								
File Edit Modes Xray Window Output Help									
Welcome to Startwin, Probe for EPMA (Enterprise Edition) with Written by John J. Donovan, Copyright (c) 1995-2010 John J	<u>v. 8.36</u> J. Donovan								
Inis software is registered to : Dan Kremser									
Confirm Motors and Crystal Positions									
Current Stage Positions	. To get help								
X Y	e ri key.								
Z Please enter the current stage, Cancel									
for instruments without absolute position references.									
Current Spectrometer Positions									
TAP V LIF V PET V V									
200.000 199.999 199.999									
p	Cancel Pause //								

Click the **OK** button to close the **Confirm Motor and Crystal Positions** dialog box when done.

This causes both the Count Acquisition window and the Stage Map! window to open.

From the STARTWIN log window, select **Modes** from the menu bar and click on **Cycle Counters** from the menu choices. The **Measure Faraday** menu should also be selected.

Startwin (Mot	tion and Counter Control)	
File Edit Mo	des Xray Window Output Help	
Welcom ✓	Cycle Counters	treme Edition) v. 9.4.1
Copyri	Do Not Set Analytical or Column Conditions	ı
This sof Karsten Probe Sc	Perform Auto Focus Move To Off Peaks Measure Off Peaks	
Press th 🗸 simply h	Measure Faraday Measure Absorbed	tive help. To get help on a menu item ey.
Initiali Demonstr	Use Stage Traverse Use Time Stamp	
		Cancel Pause //

Next, click the **Count Times** button in the **Count Acquisition** window.

X	🧧 Count Acqu	isition					1.00		×
	SP1	SP2	SP3	SP4	SP5	х	Y	Z	
	52548.6	41970.2	59910.5	26937.8	44980.9	-13511. 370	553.1 3	07.999	
	1	L	2	3	4	5		Fara	aday
	3.5	63	.56	3.56	3.36	3.56			.00
	30902	. 284	28.	9579.	6747.	32778.		.00	0000
	PH/	4	Co	unt Times	Sta	art Wavescan		Start Cour	nt
	Analytical Conditions Peak/Scan Options Sta					rt Peak Center	Trav	erse	love

This opens the **Count Times** dialog box. Choose an *On Peak* and *Cycle Time* count time. The *On Peak* time is the time the scalers will count and the *Cycle Time* is the interval of time between successive measurements. Thus, the sum of both numbers is the time between measurements of the beam. Finally, disable the beam drift correction; confirm that the *Use Beam Drift Correction* box is unchecked.



Click the **OK** button returning to the **Count Acquisition** window. Click the **Start Count** button to initiate a continuous cycle of beam current measurements. In this example, a ten second scaler count will be done, followed by a thirty-second countdown and then a Faraday current measurement. This process repeats until the user cancels the loop.

Count Acqu	isition	in land	First In	Court, Vill	in the loss			X
SP1	SP2	SP3	SP4	SP5	x	Y	Z	
52549.5	41972.9	59910.6	26936.3	44979.3	-13511.	37653.1	307.999	
1-TAE	2-LI	LIF 3-	LPET	4-TAP	5-lli	F	Abso	rbed
4.00	64	.06	4.27	4.06	4.0)6		.00
26343	. 86	72. (5081.	4463.	32729).	.00	00000
PH/	1	Cou	ınt Times	Sta	art Wavesc	an	Start Co	unt
Analytical C	onditions	Peak/S	ican Option	s Sta	rt Peak Cer	nter Tr	averse	Move

When the user has acquired a suitable number of beam current measurements, click the **Cancel** button in the **Automation Status** bar located at the bottom right side of the STARTWIN log window to stop the acquisition cycle. All log windows in any PROBE FOR EPMA program will have a **Cancel** and **Pause/Continue** buttons in the lower right portion of the window.

1 Startwin (Motion and Counter Control)
File Edit Modes Xray Window Output Help
This software is registered to :
Karsten Goemann
Probe Software
Press the F1 key in any window for context sensitive help. To get help on a menu item simply highlight with the mouse and hit the F1 key.
Initializing Demonstration Interface
10 0000 Cration Interface Initialized
10,000,0,000,0,000,0,0,0,0,0,0,0,0,0,0,
20.0120 9841 7 2830 5 3021 1 550 5 3240.0 000000
10 0F4 5489 £ 4183 7 9140 8 904 8 375 £ 000000
20.0197 7264 9 7266 4 9145 2 8969 8 9446 3 000000
20.0137 1204.3 1200.4 3143.2 0303.0 3440.3 .000000
1 Wait On Count, 2 Wait On Count, 3 Wait On Count, 4 Wait On Count, 5 Wait On Count, 🛛 Cancel 🚺 Pause 📝

The STARTWIN log window will contain the beam current data acquired so far (in this example, reported in nanoamps). The other five columns represent counts in counts per second acquired by each spectrometer, which is in this case randomly generated by the demonstration mode of the software:

🚹 Startwin (Motion and Counter Control)						
File Edit Modes Xray Window Output Help						
Welcome to Startwin, Probe for EPMA (Xtreme Edition) v. 9.4.1						
Copyright (c) 1995-2013 John J. Donovan						
This software is registered to :						
Karsten Goemann						
Probe Software						
Press the F1 key in any window for context sensitive help. To get help on a menu item						
simply highlight with the mouse and hit the F1 key.						
Initializing Demonstration Interlace						
Demonstration Interlace Initialized						
10,000,000,000,000,000,000,000,000,000,						
19, 9009 0309,0 0399,9 2420,7 3040,3 9240,0 .000000						
20.0122 0001.7 2030.5 3021.1 339.5 3000.0 .000000						
10,1007 7264 0 7266 0 1405.7 0140.0 0504.0 575.0 000000						
10 0810 5500 7 3454 8 0273 3 3132 4 8087 2 000000						
20.0125 6148.0 27361 4590 7 7115 6 7504 3 000000						
20.0136 3835.8 7925.8 9208.1 3390.6 2307.7 .000000						
19,9879 5536 9 4590 3 5844 5 4007.0 5973.2 000000						
20.0128 4266.0 6685.1 3374.9 6811.1 7208.0 .000000						
20.0126 6454.5 620.3 7092.8 8563.0 1420.2 .000000						
20.0044 6384.1 4093.8 5986.6 2222.0 1858.1 .000000						
19.9918 8392.4 3265.4 9345.6 6772.1 5519.7 .000000						
19.9866 1577.7 6867.6 7223.2 2074.2 7489.0 .000000						
19.9944 8945.0 936.4 5355.2 8422.9 8397.4 .000000						
19.9830 5744.4 2542.6 8415.8 6445.5 7529.9 .000000						
19.9787 7989.6 3302.4 2872.2 4941.6 6334.0 .000000						
Cancel Pause A						

Evaluating the trend between beam current and time may best be viewed in graphical format rather than looking at a long series of numbers. Use the mouse to select the data set to plot. Then, select **Output** from the menu bar and click **Plot Count Data (Selected in Log Window)** from the drop-down menu choices.

💴 Startwin (Motion and Counter Control)						
File Edit Modes Xray Window	Output Help					
Welcome to Startwin, Copyright (c) 1995-20	Log Window Font Debug Mode	v. 9.4.1				
This software is registere Karsten Goemann Probe Software	Extended Format Verbose Mode Save To Disk Lon					
Press the F1 key in any wi simply highlight with the	View Disk Log Plot Count Data (Selected in Log Window)	help on a menu item				
Initializing Demonstration Demonstration Interface In 19.9989 6484.7 2134.8	List Spectrometer Setup					
19.9809 8589.6 8596.9 20.0122 8861.7 2830.5 19.9864 5488.6 4183.7	Close Link To Excel 8140.8 8904.8 375.6 .000000					
20.0197 7264.9 7266.4 19.9819 5529.7 3454. 20.0125 6148.0 2736.1	9145.2 8969.8 9446.3 .000000 8 9273.3 3132.4 8987.2 .000000 4590.7 7115.6 7504.3 .000000					
20.0036 3835.8 7925.8 19.9879 5536.9 4590.3 20.0128 4266.0 6685.1	9208.1 3390.6 2307.7 .000000 5844.5 4007.0 5973.2 .000000 3374.9 6811.1 7208.0 .000000					
20.0126 6454.5 620.3 20.0044 6384.1 4093.8 19.9918 8392.4 3265.4	7092.8 8563.0 1420.2 .000000 5986.6 2222.0 1858.1 .000000 9345.6 6772.1 5519.7 .000000 7003.0 0074.0 7400 0					
19.9866 1577.7 6867.6 19.9944 8945.0 936.4 19.9830 5744.4 2542.6 19.9787 7989.6 3302.4	7223.2 2074.2 7489.0 .000000 5355.2 8422.9 8397.4 .000000 8415.8 6445.5 7529.9 .000000 2872.2 4941.6 6334.0 .000000					
		Cancel Pause //				

This opens the **Display Data** window.



While all data columns were selected by the mouse operation previously, the user may plot a single column of data by clicking the column label of the desired data and then clicking the **Graph Selected** button.

Below, *Beam Counts* versus *Measurement Number* (time) are graphed and the overall beam stability with time may be judged. Here, the beam measurements fluctuate slightly around a value of 20 nA.



The numeric value of any point on the graph may be read by placing the mouse cursor over the data point and viewing its value in the two windows directly above the **Close** button (bottom right).

Click the **Close** button to return to the STARTWIN log window.

(this page intentionally left blank)

Quantitative Measurement Run

Introduction

This chapter illustrates step by step how to set up a new PROBE FOR EPMA quantitative run and how to analyze ten elements in an unknown pyroxene, which is a type of silicate mineral. This documentation was produced using a five spectrometer Cameca SX100 electron microprobe and on a computer running in demo mode. Your particular run may look very different depending on the specific configuration of your microprobe. This document should be used in conjunction with the User's Guide and Reference documentation, on-line help, Probe for EPMA Quick Start Guide and the PROBEUSERWIZARD program.

This run will demonstrate some of the basic and more advanced features of the PROBE FOR EPMA program. These include the use of manual and automated spectrometer peaking, manual and automated standard count and unknown sample acquisition, mean atomic number (MAN) background corrections, and automated spectral interference corrections. The use of predigitized standard positions, the unique wavescan option, off-peak adjustment capabilities and data output methods will be illustrated.

Opening Probe for EPMA

From the Desktop, double-click on the yellow Probe for EPMA Software folder, if available. Double click on the **Probe for EPMA** icon.



Alternatively, select Probe For EPMA from the Probe Software Group in the Windows Start Menu, or locate and double click on PROBEWIN in the Probe for EPMA application directory, which is usually C:\Probe Software\Probe for EPMA under Windows Vista and Windows 7, or C:\Program Files\Probe Software\Probe for EPMA for older operating systems. Upon launching PROBEWIN (Probe For EPMA), the main log window appears along with the **RealTimeInitInterface** window as illustrated below. To collect real time data click the **Yes** button. The program can also be run off-line without the microprobe interface to re-process previously acquired data or on another computer.

Probewin (Probe for EPMA)							
File Edit Standard Xray Analytical Window Run Output Help							
Acquire!	Analyze!	Automate!	Plot!				
Welcome to Probe fo	r EPMA (Xtreme Editio	on) v. 9.4.1	·				
Copyright (c) 1995-	2013 John J. Donovan						
This software is registe	red to :						
Probe Software							
Press the F1 key in any	window for context sensiti	ve help. To get help on a	a menu item simply				
inigninght with the mouse	and fift the fi key.						
	RealTimeInitInterface	×					
	Do you want to interface t	to the microprobe hardware?					
		Yes No					
			Cancel Pause //				

Note if this is the first time running PROBEWIN, several database files are created; SETUP.MDB, SETUP2.MDB, and SETUP3.MDB via the **SetupOpenNewFile** window. Click **Yes** to create these database files if prompted. Older microprobes with Advanced MicroBeam automation systems will next see the **Confirm Motor and Crystal Positions** dialog box. Confirm that all of the motors (stage and spectrometer positions) and crystal designations are correctly calibrated. If there is disagreement between the mechanical positions (actual) and the software values, adjust the software values. Use the <tab> key to move between the various *Stage* and *Spectrometer Positions* boxes.

Click the **OK** button after you have finished to close the **Confirm Motor and Crystal Positions** dialog box.

Probewin (Probe for EPMA)								
File Edit Standard Xray Analytica	Window Run Output Help							
Acquire!	Analyze!	Automate!		Plot!				
Welcome to Probewin,	, Probe for EPMA (En	<u>terprise Editi</u>	<u>on) v. 8.3</u>	<u>36</u>				
Written by John J. I)onovan, Copyright (c) 1995-2010 J	ohn J. Dong	ovan				
This software is regis Dan Kremser Probe for EPNA	This software is registered to : Dan Kremser Probe for EPNA							
Press the F1 key in an simply highlight with	y window for context s the mouse and hit the	sensitive help. F1 key.	To get help	on a menu	item			
Initializing AM (MCAP) DCX initialization sta DCX Driver v	[] Interface irted							
DCX DLL vers	s and Crystal Positions							
AM (MCAPI) I	ge Positions		OK					
61.4725	19.6016 Please enter the	current stage,	Cancel					
Z	spectrometer and for instruments w	crystal positions thout absolute						
11.1987	position refe	erences.						
Current Spe	ectrometer Positions							
1	2 3							
TAP								
199.996	199.999 199.999							
J				Cancel P	ause //			

The main PROBE FOR EPMA log window is now visible as seen below.

Probewin (Probe for EPMA)					
File Edit Standard Xray Analytical Window Run Output Help					
Acquire! Analyze! Automate!	Plot!				
Welcome to Probe for EPMA (Xtreme Edition) v. 9.4.1					
Copyright (c) 1995-2013 John J. Donovan					
This software is registered to :					
Karsten Goemann Probe Software					
Tibb Soloward					
Press the F1 key in any window for context sensitive help. To get	t help on a menu				
item simply highlight with the mouse and hit the ri key.					
Initializing Demonstration Interface					
Demonstration Interface Initialized					
Ciel File I New or Owner to constant an energy of costs databased. Ciel File I Have Viceoull (cost	Canada Davia				
LIICK FILE New or Upen to create or open a probe database. Llick File User Wizard! for a	ic Lancei Pause 📈				

Creating a New Run

To create a new sample run, select File from the menu bar and click New from the menu.



The Open New Probe Database File dialog box opens.

👎 Open New Probe Database	File				×
Computer	→ Local Disk (C:) → UserData →	•••••••	Search User	Data	Q
Organize 🔻 New folder	r				0
☆ Favorites	Name	Date modified	Туре	Size	
Nesktop	J011	23/04/2013 08:53	File folder		
퉬 Downloads 🛛 🗉	J012	22/04/2013 15:37	File folder		
🖳 Recent Places	J013	23/04/2013 08:53	File folder		
	퉬 CalcZAFDATData	22/04/2013 14:11	File folder		=
🥃 Libraries	퉬 ColumnPCCData	29/07/2011 20:06	File folder		
	퉬 DemoImages	22/04/2013 14:11	File folder		
🔞 Homegroup	퉬 Doe	22/04/2013 16:05	File folder		
	퉬 Penepma08	29/07/2011 19:55	File folder		
👰 Computer	퉬 Penepma12	25/10/2012 16:08	File folder		
🚢 Local Disk (C:) 💡	퉬 PFW Position Files	23/04/2013 12:03	File folder		-
File name:					-
Save as type: *.MDB	(*.MDB)				•
) Hide Folders			Save	Canc	el

Change the directory if desired and type an appropriate run name into the File name: text box.

The initial *Save in:* location is specified by the UserDataDirectory keyword in the PROBEWIN.INI file.

In this example, a new file designated SILICATES01.MDB will be created in the Doe directory. Any existing old runs may be re-opened to acquire additional data or used as a "setup" file for starting a new run. This will be the first .MDB file in this folder.

Y Open New Probe D	atabase File	Advanter 1	100	-	×
	omputer → Local Disk (C:) → UserData → [Doe	Search Doe	1000	٩
Organize 🔻 Ne	w folder				(?)
📃 Desktop	Name	Date modified	Туре	Size	
Downloads 🖳 Recent Places	=	No items match your searc	h.		
詞 Libraries					
🍓 Homegroup					
Computer					
🚢 Local Disk (C:)	1				
🔙 emxmdata (\\	mc				
😡 probedata (\\o	cas' 🔻				
File name:	silicates01.MDB				-
Save as type:	*.MDB (*.MDB)				-
Hide Folders			Save	Cance	el

Close the **Open New Probe Database File** window by clicking the **Save** button. First time users will see the creation of a new User database as shown below.

	UserOpen N	lewFile
•	i	Creating a new User database: C:\Probe Software\Probe for EPMA\USER.MDB
		ОК

Clicking the **OK** button opens the **File Information** dialog box.

Enter the relevant information for the new run into the *User*, *Title*, and other *Description* text boxes. Use the <tab> key to move between text boxes. When finished, click the **OK** button.

File Name	C:\UserData\Doe\silicates01.MDB
Version	9.41 Type PROBE OK
User	Karsten Goemann
Title	Quantitative run demo
Department	Probe Software
Account #	Group
Description	Quantitative run demonstration
Date Created	23/04/2013 13:34:56 Date Modified 23/04/2013 13:34:55

This returns the program to the main PROBE FOR EPMA log window. Now the four main Probe buttons **Acquire!**, **Analyze!**, **Automate!**, and **Plot!** become active.

Probe for EPMA [C:\UserData\	Doe\silicates01.MDB]				
File Edit Standard Xray Analytical Window Run Output Help					
Acquire!	Analyze!	Automate!	Plot!		
Welcome to Probe f	or EPMA (Xtreme Ed	ition) v. 9.4.1			
Copyright (c) 1995	-2013 John J. Dono	van			
This software is regist	tered to :				
Karsten Goemann					
Probe Software					
Press the F1 key in any	v window for context se	nsitive help. To get he	lp on a menu item		
simply highlight with	the mouse and hit the F	1 key.			
Initializing Demonstration	tion Intonface				
Demonstration Interface	e Initialized				
New: Ready			Cancel Pause 📈		

It is assumed that the user has previously chosen the elements to be analyzed, decided on initial standard assignments and has worked through the assignment of spectrometers for each element to be collected. Of course, additional elements and standards may be added or deleted at any time.

Parameter Initialization

Analytical Standard Selection

Select the analytical standards to be used in the new probe run. From the main PROBE FOR EPMA log window, click **Standard** from the menu bar and select **Add/Remove Standards To/From Run** from the menu.

👎 Probe for EPN	//A [C:\UserData\Doe\silicates01.MDB]		
File Edit Star	ndard Xray Analytical Window Run Output Help		
	Standard Database (load default standard compositional database)		
Welcom	Evaluate Standards		
Copyri	Select Standard Database (specify a different standard composition database as the default	t)	
This sof	Edit Standard Parameters (coating)		
Probe Sc	Add/Remove Standards To/From Run	Ctrl+S	
Press the F simply high Initializin Demonstrati	1 key in any window for context sensitive help. To get help o light with the mouse and hit the F1 key. g Demonstration Interface on Interface Initialized	on a menu	item
New: Ready		Cancel	Pause 🛛 🏾

This opens the Add Standards to Run dialog box.

Add Standards to Run				
Available Standards in Database	(multi-select)	Curre	ent Standards in R	un
1 Schott Cover Slip Glass (D 26 2 Soda-Lime Glass 3 Soda Glass (Microscope slide) 4 Shultenite, HPbAsO4 5 Rathite, (PbS)3 (As2S3)2 6 Baumhauerite, (PbS)4 (As2S3) 7 Sartorite, PbS As2S3 8 Jordanite, (PbS)4 As2S3 9 NaCF3SO3 10 BRI Polymer 11 Si0 12 MgO synthetic 13 Al2O3 synthetic 14 SiO2 synthetic	3)			
Enter Standard To Find:	Add Standard	To Run >>		OK
	<< Remove Star	dard from Run		Cancel

All previously entered standards in the default standard database are accessible. Scroll through the *Available Standards in Database* list box to find the standards to be used in this run. Select primary analytical standards, secondary standards for method validation, and the MAN background standards. The latter are used for background calculation and must not contain the element they are used for, so for example a few silicon free standards should be selected for Si background calculation. Standards may serve more than one purpose, e.g. pure silica could be used as Si primary standard and MAN standard for all other elements. Select each and click the **Add Standard To Run** >> button to add each to the *Current Standards in Run* list box.

Add Standards to Run			
Available Standards in Databas	e (multi-select)	Curre	ent Standards in Run
453 Augite, Kakanui USNM 122 455 Chromite USNM 117075 457 Diopside, NY USNM 11733 458 Fayalite Rockport, MA USI 460 Garnet USNM 87375 461 Garnet USNM 110752 462 Obsidian USNM 110752 463 Glass, basaltic USNM 11343 464 Obsidian USNM 113716 465 Obsidian USNM 72854 466 Glass, synthetic tektite USN 467 Hornblende (Kakanui) USNM 468 Hornblende (Kakanui) USNM	142 * VM 85276 VG-2 38 IM 2213 111356 4 143965 NM #746	12 MgO synthe 13 Al2O3 synthe 14 SiO2 synthe 22 TiO2 synthe 23 V2O3 synthe 24 Cr2O3 (synthe 25 MnO synthe 26 Fe2O3 synthe 303 Albite, Ame 453 Augite, Kak 469 Hypersthen	tic etic tic etic etic hetic] tic netic hematite ic ia anui USNM 122142 e, johnstown USNM #746
Enter Standard To Find:	Add Standard	d To Run >>	ОК
1	<< Remove Sta	ndard from Run	Cancel

Click the **OK** button of the **Add Standards to Run** window when finished selecting standards. This returns the program to the main log window.

Creating a New Sample

Click the **Acquire!** button in the main PROBE FOR EPMA log window. This action opens the **Acquire!** dialog box. Note, not all buttons are active.

The first task is to create an initial sample as a template that can be populated with the elements the user wishes to analyze.

👎 Acquire!								- 🗆 X
SP1 SP 52549.4 41970.	2 SP	3 SP4 5 26937.9	SP5	X -13511. 376	Y 53.1 30	Z 7.999	Spectro	Progress
1-TAP 2-	LLIF 3	B-LPET	4-TAP	5-LLIF .00		Faraday .00		
· ·						.000000		Þ
Current Sample: Start Standard or Unknown Ac					own Acquisition	-13511.	37653.1	
				St	art Waves	can	um .000000 0 x 0	.000000 0
New Sample		PHA		Imaging	Pea	king Options	Magnification Beam Mode	2533
Elements/Cations	Peak	/Scan Option	s Acqu	uisition Options	St	art Peaking	Kilouolta	Analog Spot
Analytical Condition	is C	ount Times	Sp	ecial Options		Move	Beam Current	20
Combined Conditions		Locate		Rate Meter		Stage	Dodini Size	

Click the **New Sample** button of the **Acquire!** dialog box.

This opens the **New Sample** dialog box.



Select *Unknown* from the *New Sample Type* buttons. Type an appropriate sample name and description into the *New Sample Name* and *New Sample Description* text boxes. This first sample will be used as a "template", only to establish the analysis parameters.

New Sample	-					
New Sample Type	ОК	Cancel				
Unknown	Load Eleme	ent Setups				
O Wavescan	Load Samp	ole Setup				
	Load File	e Setup				
Add/Remove Standards	Load Multip	ple Setup				
default on the last unknow analyzed elements in a rur buttons above or first crea make any necessary Load Wavesca	default on the last unknown sample in the run. To change the analyzed elements in a run, either click one of the Load Setup buttons above or first create a new unknown sample and then make any necessary changes to the element setup. Load Wavescan From Another Probe Run					
New Sample Name						
template for pyroxene	e elements					
New Sample Descripti	ion	Add <cr></cr>				
		*				
		~				
To add standards to the s then click the Standard A th	tandard list below, ca add Standards to Ru e main menu.	ancel this dialog, In menu item from				
12 MgO synthetic 13 Al2O3 synthetic 14 SiO2 synthetic 22 TiO2 synthetic 23 V2O3 synthetic 24 Cr2O3 (synthetic 25 MnO synthetic	;]	× III				

Click the **OK** button of the **New Sample** dialog box.

The program returns to the **Acquire!** window. Notice that the first sample designated $Un \ 1 * template for pyroxene elements is now listed in the$ *Current Sample*text box. The * symbol indicates that no data has been collected for this sample yet. Note, all of the buttons in**Acquire!**are now available.

👎 Acquire!								- 🗆 X
SP1 SP 52549.4 41970.	2 SP3 4 59909.5	SP4 26937.9	<mark>SP5</mark> 44979.8	X -13511. 376	¥ 53.1 30	Z 7.999	Spectro	Progress
1-TAP 2-	LLIF 3-	-LPET .00	4-TAP .00	5-LLIF .00		Faraday .00		
Current Sample: Un 1 * template for pyroxene Normal Acquisition Unknown Acquisition						-13511.	, 37653.1	
Data Rows: 0	Data Rows: 0 Good Data Rows: 0			Start Wavescan		um .000000 px 0	.000000 0	
New Sample		PHA		Imaging	Pea	aking Options	Magnification	2533
Elements/Cations	Peak/	Scan Options	Acqu	uisition Options	St	art Peaking	Kilovolts	Analog Spot
Analytical Condition	s Co	unt Times	Sp	ecial Options		Move	Beam Current Beam Size	20
Combined Conditions		Locate		Rate Meter		Stage	Doam Size	

Setting Analytical Conditions

Click the **Analytical Conditions** button to open the **Analytical Conditions** dialog box. Enter the appropriate numbers into the *Kilovolts, Beam Current*, and *Beam Size* text boxes for the currently *Selected Sample*. The *Kilovolts, Beam Current*, and *Beam Size* will need to be manually adjusted if a column digital interface is not present. If a hardware interface is supported, the user may specify a column condition string to indicate the desired analytical conditions of the instrument. Clicking the **Read Conditions** button will cause PROBE FOR EPMA to check the current analytical conditions and reload them if the conditions have changed.

Analytical Conditions	tanta Sugar
Selected Samples	OK Cancel
Un 1 * template for pyroxene elements	
- Enter Analytical Conditions For IIn 1 * template for	 Select Beam Mode and Magnification Analog Spot Analog Scan Select the analytical conditions beam mode for a sample acquisitions. Use "spot" mode for a defocussed beam and "scan" mode for a scanning heam
Take Off Kilovolts (ke¥)	© Digital Spot Magnification
40 15 Read Beam Current	Read Beam/Mag
(nA) Beam Size (um)	Magnification Magnification (analytical) (imaging)
	2533
Default Aperture 1 JEOL only	150.0197 um 150.0197 um 6ơ
Nominal Beam (nA) 1.00000	Image Shift X _2 Image Shift Y 3
 Use Analytical Conditions (TKCS) Use Column Condition String 	
	Calibrate Set Beam Current
Select Column Condition String For Un 1 * template	for pyroxene elements Note: When using a column condition string for the analytical
Force Column Condition Save Condition Browse Condition	setup, be sure that the analytical conditions (Kilovolts, Beam Current and Beam Size) are specified correctly. Note that SX50/51 or Jeol 8900 Pre and Post Acquire Strings only apply to Analytical Conditions (not Column Conditions)
, JEOL 8900 Pre Acquire String (e.g., PB OFF)	JEOL 8900 Post Acquire String (e.g., PB ON)

Click the **OK** button when done. The **Analytical Conditions** dialog box closes, returning to the **Acquire!** window.

Nominal Beam Current Measurement

The nominal beam current is not the actual measured beam current but a close approximation that is used to calibrate the magnitude of the beam drift correction. If the nominal beam current is close to the actual measured beam current then the correction is close to 1.0. The beam drift corrected counts displayed in the main log window will be close in magnitude to the counts displayed on the screen scalers. The nominal beam can be adjusted in several ways. Click the **Count Times** button of the **Acquire!** dialog box.

👎 Acquire!	10-17485 (1-11-0-1748)	-	n. weigh			. 🗆 🗙
SP1 SP2	SP3 SP4 59909.5 26937.9	SP5	X -13511. 3765	Y Z 3.1 307.999	Spectro F	Progress
1-TAP 2-I	LIF 3-LPET .00 .00	4-TAP .00	5-LLIF .00	Faraday .00	7 0 0 8	
Current Sample: Un 1 * template for pyroxene Normal Acquisition Unknown Data Rows: 0 Good Data Rows: 0			Start Standard Sta	<mark>or Unknown Acquisitio</mark> it Wavescan	n -13511. um .000000 px 0	37653.1 .000000 0
New Sample	РНА		Imaging	Peaking Options	Magnification	2533
				r caking options	Poor Modo	
Elements/Cations	Peak/Scan Options	: Acqu	uisition Options	Start Peaking	Beam Mode Kilovolts	Analog Spot
Elements/Cations	Peak/Scan Options	: Acqu	uisition Options	Start Peaking Move	Beam Mode Kilovolts Beam Current Beam Size	Analog Spot

This opens the **Count Times** dialog box.



Any value desired may be directly entered into the *Nominal Beam* text box (1 nA value is stored in the PROBEWIN.INI file) or the user may measure the present beam current by clicking the **Measure Nominal Beam** button. The **AcquireCheckNormal** dialog box appears, choose the **Yes** button to measure the present beam current for use in the beam drift correction.

?	The nominal beam current is just a drift correction. A value of one will cps/nA. Choose Yes to measure the Cancel to just use the default beam	non-zero display the present b current fr	value used e x-ray inter eam currer om the PR(for the b nsities in nt, No to DBEWIN.	eam skip or INI file.
	Yes		No		Cancel

The current value of the faraday beam is measured and reported to both the **Acquire!** window and the *Nominal Beam* text box in the **Count Times** window as seen below.

Count Times				- 1	Specific Program	
Click Element Row to Edit Count Time	25					
Channel Element Spectro Crystal	On-Peak Hi-Peak	Lo-Peak	MaxCoun Factor	Wave	Peak Quick	
•					4	
Beam Averages 1.	1	23	45		ОК	
Nominal Beam (nA) (39.9943)	U secs					
Change the Nominal Beam to modity the normalization constant used for the x-ray	Calculated				Cancel	
intensity display. For example, enter 1 (nA) for cps/nA intensity display.	Spectrometer Motion and					
Return To On-Peak Time 0 secs	Acquisition Time					
Crystal Flip Time 0 secs					Measure Nominal	
Set Column (TKCS) Time 0 secs	0 secs				Beam	

Close the **Count Times** window by clicking the **OK** button.
Element, X-Ray Line and Spectrometer Parameters Selection

Next, the user specifies the elements to be analyzed. Click the **Elements/Cations** button of the **Acquire!** window.

🜱 Acquire!	- the Constant of	-	-				- C X
SP1 SP2 52549.4 41970.4	SP3 SP4	SP5	X -13511. 376	Y 53.1 307	Z 7.999	Spectro I	Progress
1-TAP 2-LL	IF 3-LPET	4-TAP	5-LLIF		Faraday		
.00 .	00 .00	.00	.00		.00		•
Current Sample: Un 1 Normal Acquisition Unkr	* template for pyroxen nown	e	Start Standard	l or Unkno	wn Acquisition	-13511.	37653.1
Data Rows: 0	Good Data Rows: 0		Sta	art Wavesc	an	um .000000 px 0	.000000 0
New Sample	PHA		Imaging	Peal	king Options	Magnification	2533
Elements/Cations	Peak/Scan Options	Acqu	uisition Options	Sta	art Peaking	Kilovolts	Analog Spot
Analytical Conditions	Count Times	Sp	ecial Options		Move	Beam Current	40
Combined Conditions	Locate		Rate Meter		Stage	Doam 5126	

This action opens the **Acquired and Specified Elements** dialog box. Click on the first empty row under the element column to enter the first element to analyze. The user may enter the analyzed elements in any order; however, the analysis output will follow the order in which the elements were entered here.

elected S	amples				OK		Cance	I
Jn I	template for p	yroxene elen	nents		Load E	lement 9	Setup	
					Load S	ample S	Setup	
					Add/Rem	iove Sta	andards	
				1	Reload Star	idard As	signme	nts
				Re	ad current se	tup from h	MOVE wi	ndo
						8 A	5	6
Click Elem	ent Row to E	dit Element/C	Cations Parame	ters (click em	pty row to a	add) —	Paak	
Click Elem Channel	ent Row to E	dit Element/C X-Ray	Cations Parame Acquired	ters (click em Spectro	pty row to a	add) — On	-Peak	
Click Elem Channel	ent Row to E	dit Element/C X-Ray	Cations Parame	ters (click em	pty row to a	add) On	-Peak	
Click Elem Channel	Element	dit Element/C X-Ray	Cations Parame Acquired	ters (click em	pty row to a	add) On	-Peak	
Click Elem Channel	Element	dit Element/C X-Ray	Cations Parame	ters (click em	pty row to a	add) On	-Peak	
Click Elem Channel	Element	dit Element/C X-Ray	Cations Parame	ters (click em	pty row to a	add) — On	-Peak	
Click Elem	Element	dit Element/C X-Ray	Cations Parame	ters (click em	pty row to a	add) — On	-Peak	
Click Elem	Element	dit Element/C X-Ray	Cations Parame	ters (click em Spectro	pty row to a	add) — On	-Peak	
Click Elem	Element	dit Element/C X-Ray	Cations Parame	ters (click em	pty row to a	add) — On	-Peak	

This opens the **Element Properties** dialog box. In the *Element* field type in the first element to analyze. Certain default values listed in this window are based on parameters entered into the previously established configuration files.

	manufact de la contra	A DESCRIPTION OF TAXABLE	State in Trees		
Enter Element P	roperties For:				ПК
Element	X-Ray Line	Bragg Order	Cations / Or	ygens	<u> </u>
Si 🗸	ka 🔻	1 -	1 🛛 2		Cancel
Leave the X	-ray Line Blank Jement (Specif	k to Indicate an fied, by Difference	Charg	e	Delete
On Andiyzed E	or Stoichiomet	try)	4		Disable Aco
					Disable Qua
Parameters (note	e that Backgrou	und Type can diffe	er for Standards	and Unknown	s) ————————————————————————————————————
-Background Ty	ре	Off-Peak Entry –		Hi Off-Peak Interf	erences
 Uff Peak MAN 		O Absolute Pos	ition L	ow Off-Peak Inte	rferences
O Multi-Point		 Helative Uffs 	et 🗌 🗆 Che	ck All Interfering I	Elements
<u> </u>	C	0- 0-		« D1 1-	- O" D - L
Spectrometer	Lrystal		ak High C	n n	W UIT-Peak
.00	.00	.00	• .	.00	
Calculate B	Empirical PHA	Slit Siz	e Slit Po	sition D	etector Mode
Calculate E	Empirical PHA	Slit Siz	e Slit Po	sition D	etector Mode
Calculate B	Empirical PHA Intial PHA Mode Intensity Scan Intensities	Slit Siz	e Slit Po	sition D	etector Mode
Calculate B Use Differen Integrated I Use Integrated Use Integrated Use Inverted I	Empirical PHA Intial PHA Mode Intensity Scan Intensities Intensity Steps	Slit Siz	e Slit Po Size Minimum .00000	sition D Step Size Sp 0 1.0	etector Mode control to the section of the section
Calculate B Use Differen Integrated I Use Integrated Use Inverted I Off Peak Correct	Empirical PHA Intial PHA Mode Intensity Scan I Intensities Intensity Steps Ition Type	Slit Siz	e Slit Po	sition D Step Size Sp 0 1.0	etector Mode
Calculate B Use Differen Integrated I Use Integrated Use Inverted I Off Peak Correct Linear	Empirical PHA Intensity Scan Intensities Intensity Steps Ition Type C Av	Slit Siz	e Slit Po Size Minimum .000000	sition D Step Size Sp 0 1.0	etector Mode cecified APF 00000 Low Only
Calculate E Calculate E Use Differen Use Integrated I Use Integrated Use Inverted I Off Peak Correc C Linear C Exponential	Empirical PHA Intial PHA Mode Intensity Scan Intensities Intensity Steps tion Type C Av	slit Siz	e Slit Po Size Minimum 000000 High Only Position1	sition D Step Size Sp 0 1.(Position2	etector Mode
Calculate E Calculate E Use Differen Use Integrated Use Integrated Off Peak Correc C Linear C Exponential Slope (Hi)	Empirical PHA Intial PHA Mode Intensity Scan I Intensities Intensity Steps tion Type C Av 1.0000	slit Siz	e Slit Po Size Minimum .00000 C High Only Position1 .000000	sition D Step Size Sp 0 1.0 Position2 .000000	etector Mode
Calculate E Calculate E Use Differen Use Integrated I Use Integrated Use Inverted I Off Peak Correc C Linear C Exponential C Slope (Hi) C Slope (Lo)	Empirical PHA Intial PHA Mode Intensity Scan Intensities Intensity Steps tion Type C Av 1.0000 1.0000	slit Siz	e Slit Po	sition D Step Size Sp 0 1.0 Position2 Coeff2 .000000	etector Mode
Calculate E Calculate E Use Differen Use Integrated I Use Inverted I Use Inverted I Off Peak Correc C Linear C Exponential C Slope (Hi) C Slope (Lo)	Empirical PHA Intial PHA Mode Intensity Scan Intensities Intensity Steps tion Type C Av 1.0000 1.0000	slit Siz Initial Step 000000	e Slit Po	sition D Step Size Sp 0 1.0 Position2 Coeff2 .000000	etector Mode
Calculate E Calculate Calculate E Calculate E Calculate Calculate E Calculate Calcul	Empirical PHA Intial PHA Mode Intensity Scan d Intensities Intensity Steps tion Type O Av 1.0000 1.0000 1.0000	slit Siz Initial Step 000000 Perage Polynomial 0 High Iterate	e Slit Po Size Minimum .00000 C High Only Position1 .000000 Coeff1 .000000 High Ac	sition D Step Size Sp 0 1.0 Position2 .000000 Coeff2 .000000	etector Mode
Calculate E Calculate E Use Differen Use Integrated I Use Integrated Use Inverted I Off Peak Correc C Linear C Exponential C Slope (Hi) C Slope (Lo) C Multi-Point Fit Type	Empirical PHA Intensity Scan d Intensities Intensity Steps tion Type C Av 1.0000 1.0000 Acquire 4	slit Siz	e Slit Po	sition D Step Size Sp 0 1.0 Position2 .000000 Coeff2 .000000 quire Low 4	etector Mode
Calculate E Calculate E Use Differen Use Integrated I Use Integrated Use Inverted I Off Peak Correc C Linear C Exponential C Slope (Hi) C Slope (Lo) C Multi-Point Fit Type Linear V	Empirical PHA Intial PHA Mode Intensity Scan d Intensities Intensity Steps tion Type C Av 1.0000 1.0000 Acquire 4 High	slit Siz Initial Step 000000 Polynomial 0 High Iterate 2 Multi-Point Positi	e Slit Po	sition D Step Size Sp 0 1.0 Position2 Coeff2 .000000 quire Low 4 Low Multi-Poi	etector Mode ecified APF D0000 Cow Only Position3 .000000 Iterate Low 2 nt Positions

Under the *Enter Element Properties For:* section (top of the **Element Properties** dialog box), choose the correct *X-Ray Line, Cations*, and *Oxygens* for the first element. Both alpha and beta lines are now supported as well as the ability to analyze the same element on all relevant spectrometers.

Continue by selecting the *Background Type*. Three background correction methods are available to the user; off-peak, MAN (mean atomic number), and the multi-point method (see the User's Guide and Reference documentation for a complete discussion of these three types).

Short Note on Background Types

The *off-peak* method entails measuring the background conventionally on each element in the sample of interest with the spectrometer adjusted to a position, typically on each side of the analytical peak. This method, while somewhat time-consuming, can accurately determine the background contribution for major, minor, and trace element concentrations. Sophisticated modeling routines are available for precisely fitting backgrounds around analytical peaks (see User's Guide and Reference documentation for details).

The *MAN* method relies on the fact that most of the background (continuum) production in the sample is directly proportional to the average atomic number of the sample. The MAN correction is an empirical calibration curve method involving the measurement of standards of known composition (hence average atomic number). If many samples are to be analyzed for their major and minor element concentrations then substantial time may be saved using the MAN method. However, if the user is required to measure high atomic number samples and/or trace concentrations, more accurate data may be obtained with off-peak background corrections.

Finally, a new third background method is now available for high accuracy trace element analysis, called the *multi-point* background method. PROBE FOR EPMA automatically acquires a number of off-peak intensities distributed on each side of the analytical peak (user specified) so that at least a few of the background measurements will not be affected by the unpredicted presence of various other elements in the sample.

In this exercise, we will use MAN for the major pyroxene elements Si, Fe, Mg, Ca, and off-peak for Ti, Al, Cr, V, Mn, Na, which might only be present at trace levels. Continue by selecting MAN for the Si *Background Type* in the *Parameters* section. This deactivates the *Off Peak Correction Type* buttons as well as the *High* and *Low Off-Peak* boxes.

Next, use the drop-down menu to select or click the text box under *Spectrometer* and enter the appropriate spectrometer number that will be used to analyze the first element. Choosing a spectrometer number loads various parameters from the configuration files. Each of these parameters in this window should be inspected and edited as needed (use the <tab> key to move between boxes).

The next screen shows the edited **Element Properties** dialog box for silicon.

Enter Element F	Properties Fo	r			
Element	V.P.a. Li	na Dr	aga Order Ca	tions / Ouugana	OK
Si 🗸	ka				Cancel
Leave the X Un-Analyzed E	K-ray Line BI Element (Spe or Stoichior	ank to Inc ecified, by metry)	dicate an y Difference 4	Charge	Delete
Parameters (no	te that Rack	wound Tu	upa can differ for 9	Standarde and Un	Disable Qua
Background T C Off Peak MAN C Multi-Point	ype	Off-F ○ A ⓒ R	Peak Entry bsolute Position delative Offset	Hi Off-Pea Low Off-Pe	ak Interferences
					4
	_		0 0 0 1	Liah Off Dask	Low Off-Peak
Spectrometer 4 BaseLine	Cryst TAP Wind	al ▼ 0₩	27738 Gain	1334.80 Bias	-1334.9 Deadtime (us)
A BaseLine 56 Calculate	Cryst TAP Winds 4.99 Empirical PHA ential PHA Ma	ow ow	Gain 2759.00	Bias 1334.80 Bias 1317. Slit Position	-1334.9 Deadtime (us) 3.00 Detector Mode
4 Spectrometer 4 Section 56 Calculate Use Differe Integrated Use Integrate Use Inverted	Cryst TAP Wind 4.99 Empirical PHA Empirical PHA Me Intensity Sca ad Intensities Intensity Steps	ow ow ode	Gain 27738 2759.00 Slit Size Initial Step Size 53.3945	High Oil+reak 1334.80 Bias 1317. Slit Position Minimum Step Size 13.3486	Cow on reak -1334.9 Deadtime (us) 3.00 Detector Mode Specified APF 1.00000
Spectrometer 4 BaseLine .56 Calculate Use Differe Integrated Use Integrate Use Inverted Dff Peak Correct	Cryst TAP Wind 4.99 Empirical PHA Empirical PHA Me Intensity Sca ad Intensities Intensity Steps	ow ode an	CIN-Peak 27738 Gain 2759.00 Slit Size Initial Step Size 53.3945	High Off-r eak 1334.80 Bias 1317. Slit Position ✓ Minimum Step Size 13.3486	Cow on r cak -1334.9 Deadtime (us) 3.00 Detector Mode Specified APF 1.00000
A BaseLine 56 Calculate Use Differe Integrated Use Integrated Use Inverted Diff Peak Correct Calculate	Cryst TAP Wind 4.99 Empirical PHA Empirical PHA Mu Intensity Sca ad Intensity Steps Ction Type —	al v ow ode an Average	C. Hi	High Only	C Low Only
Spectrometer BaseLine .56 Calculate Use Differe Integrated Use Integrated Use Integrated Use Integrated Use Integrated Calculate Integrated Linear Exponential	Cryst Vind Vind A.99 Empirical PHA Empirical PHA Intensity Sca ad Intensities Intensity Steps Ction Type — C	ow ode an Average	Gain 27738 2759.00 Slit Size Initial Step Size 53.3945 C Hi Po	High Only Bias I 1334.80 Bias I 1317. Slit Position ✓ Minimum Step Size I 13.3486	C Low Only
Spectrometer 4 BaseLine .56 Calculate Use Differe Integrated Use Integrated Use Inverted Off Peak Correct C Linear C Exponential O Slope (Hi)	Cryst TAP Wind 4.99 Empirical PHA ential PHA Me Intensity Sca ed Intensities Intensity Steps ction Type — C 1.0000 1.0000	an Average	Un-Peak 27738 Gain 2759.00 Slit Size Initial Step Size 53.3945 ○ Hi Polynomial	High Only-reak I 1334.80 Bias I 1317. Slit Position Minimum Step Size I 13.3486 igh Only position1 Positio Cooff1 Cooff1	C Low Only C Low Only C Low Only C C Low Only C C Low Only C C Corefficient APF
Spectrometer 4 BaseLine .56 Calculate Use Differe Integrated Use Inverted Off Peak Correct Clinear Clinear Clinear Slope (Hi) Slope (Lo)	Cryst Vind Vind (4.99 Empirical PHA Empirical PHA Me Intensity Sca d Intensity Steps Cition Type — C 1.0000 1.0000	Average	Un-Peak 27738 Gain 2759.00 Slit Size Initial Step Size 53.3945 C Hi Polynomial 0 0	High Only-reak Bias 1334.80 Bias 1317. Slit Position Minimum Step Size Inimum Step Size 13.3486 igh Only position1 Positio Coeff1 Coeff1 Coeff1 Coeff1	Conversion Convers
Spectrometer 4 BaseLine .56 Calculate Use Differe Integrated Use Inverted Off Peak Correct Linear C Exponential Slope (Hi) Slope (Lo) Multi-Point Fit Type	Cryst TAP Wind 4.99 Empirical PHA Intensity Sca ad Intensities Intensity Steps ction Type — C 1.0000 1.0000 Acqu 4	an Average	Cr738 Gain 27738 2759.00 Slit Size Slit Size Initial Step Size 53.3945 C Hi Polynomial C 0 Iterate High 2	High Only Bias 1334.80 Bias 1317. Slit Position Minimum Step Size 13.3486 igh Only position1 Positio Coeff1 Coeff1 Coeff1 Coeff1 Acquire Lo 4	-1334.9 Deadtime (us) 3.00 Detector Mode • Specified APF 1.00000 • Position3 00 .000000 f2 Coeff3 00 .000000 w Iterate Low 2
Spectrometer 4 BaseLine .56 Calculate Use Differe Integrated Use Inverted Off Peak Correct Calculate Integrated Use Inverted Off Peak Correct Calculate Integrated Use Inverted Off Peak Correct Calculate Integrated Use Inverted Off Peak Correct Calculate Use Inverted Off Peak Correct Calculate Off Peak Correct Calculate Off Peak Correct Calculate Off Peak Correct Calculate Calculate Off Peak Correct Calculate Calculate Off Peak Correct Calculate Calculate Off Peak Correct Calculate Calculate Off Peak Correct Calculate	Cryst Vind Vind 4.99 Empirical PHA ential PHA Me Intensity Scass Intensity Steps C 1.0000 1.0000 1.0000 Acqu 4 H	al ow ode an Average C ire High	Un-Peak 27738 Gain 2759.00 Slit Size Initial Step Size 53.3945 C Hi Polynomial C 0 Iterate High 2 Point Positions	Implify only Bias I334.80 Bias I317. Slit Position Minimum Step Size I3.3486 igh Only osition1 Positio Coeff1 Coeff1 Coeff1 Coeff1 Subord .00000 Acquire Lo 4 Low Mu	C Low Only C Low Only C Low Only C Low Only C Coeff3 D .000000 C Coeff3 D .0000000 C Iterate Low C 2

Click the **OK** button of the **Element Properties** dialog box to accept these element parameters for silicon.

The program returns to the **Acquired and Specified Elements** window with silicon now entered into the *Element/Cations Parameters* table.

Selected S	amples		nombo		OK			Cance	el
UN I	tempiate for p	iyioxerie elel	nents		Loa	d Elen	nent S	etup	
					Lo	ad San	nple S	etup	
					Add/	Remov	ve Sta	ndards	\$
				F	eload	Standa	ard As:	signme	ents
				Re	ad curre	nt setup	from M	10VE w	vindo
				1	2	3	4	5	6
Click Elem	ent Row to Ed	dit Element/(X-Bau	Cations Parame	ters (click em	pty row Crust	to add	i)	Peak	
<mark>Click Elem</mark> Channel 1	ent Row to Ed Element Si	dit Element/O X-Ray ka	Cations Parame Acquired Yes	ters (click em Spectro 4	pty row Cryst TAP	to add	i) On- 27	Peak 738.0	
<mark>Click Elem</mark> Channel 1	ent Row to Ed	dit Element/(X-Ray ka	Cations Parame Acquired Yes	ters (click em Spectro 4	pty row Cryst TAP	to add	i) On- 27	Peak 738.0	
Click Elem Channel 1	ent Row to Ed	dit Element/(X-Ray ka	Cations Parame Acquired Yes	ters (click em Spectro 4	pty row Cryst TAP	to add	i) 0n- 27	Peak 738.0	
Click Elem Channel 1	Element Si	dit Element/C X-Ray ka	Cations Parame Acquired Yes	ters (click em Spectro 4	pty row Cryst TAP	to add	i) On- 27	Peak 738.0	
Click Elem Channel 1	Element Si	dit Element/O X-Ray ka	Cations Parame Acquired Yes	ters (click em Spectro 4	pty row Cryst TAP	to add	i) 0n- 27	Peak 738.0	
Click Elem Channel 1	ent Row to Et	dit Element/O X-Ray ka	Cations Parame Acquired Yes	ters (click em Spectro 4	pty row Cryst TAP	to add	i) 0n- 27	Peak 738.0	
Click Elem Channel 1	ent Row to Et	dit Element/O X-Ray ka	Cations Parame Acquired Yes	ters (click em Spectro 4	pty row Cryst TAP	to add	i) 0n- 27	Peak 738.0	

Enter titanium as the next element in the run by clicking on the next empty row of the **Acquired and Specified Elements** window. This opens the **Element Properties** dialog box again. Enter the appropriate *Element, Spectrometer, and Crystal* and adjust all other text boxes and buttons. Choose *Background Type* off-peak this time. The software calculates default high and low off-peak positions as shown below. Leave these as they are for the moment. They can be changed later if required.

	A CONTRACTOR OF STREET				
Enter Element F	Properties For:				OK
Element	X-Ray Line	Bragg Ord	er Cati	ons / Oxygens	UK
Ti 💌	ka	• 1	• 1	▼ 2 ▼	Cancel
Leave the >	K-ray Line Blar Element (Spec	nk to Indicate a ified, by Differ	n ance —	Charge	Delete
On Analyzed L	or Stoichiome	etry)	4		Disable Aco
					Disable Quant
Parameters (not	te that Backgro	ound Type can	differ for S	tandards and Unk	nowns)
Background T	уре	Off-Peak En	try	Hi Off-Peal	
C MAN		C Absolute	Position	Low Off-Pea	ak Interferences
C Multi-Point		I nelauve	onset	🗌 🔲 Check All Inter	fering Elements
					*
					-
Spectrometer	Crystal	On	-Peak	High Off-Peak	Low Off-Peak
3		▼ 31430).0	937.699	-937.70
BaseLine	Window	• (iain 🔺	Bias	Deadtime (us)
J.36	Fmoirical PHA	1873.00	▼	1845.	3.00
Calculate	Emplificant HA	ci	ik Cine	Slit Position	Detector Mode
□ Use Differe	ential PHA Mod		. 5128		
Use Differe	ential PHA Mod	le	▼		
Use Differe	ential PHA Mod Intensity Scan ed Intensities	le Initial	Step Size	Minimum Step Size	Specified APF
Use Different Integrated Use Integrated	ential PHA Mod Intensity Scan ed Intensities Intensity Steps	le Initial	Step Size	Minimum Step Size	Specified APF
Use Different Integrated Use Integrate Use Inverted	ential PHA Mod Intensity Scan ed Intensities Intensity Steps stion Type	le Initial	Step Size	Minimum Step Size	Specified APF
Use Different Integrated Use Integrate Use Inverted	ential PHA Mod Intensity Scan ed Intensities Intensity Steps ction Type	le Initial	Step Size	Minimum Step Size 9.37719	Specified APF 1.00000
Use Different Integrated Use Integrate Use Inverted	ential PHA Mod Intensity Scan ed Intensities Intensity Steps etion Type C A	le Initial 37.50 verage	Step Size 88 C Hig Pos	Minimum Step Size 9.37719 h Only ition1 Position	C Low Only Position3
Use Differentiated	ential PHA Mod Intensity Scan ed Intensities Intensity Steps ction Type C A 1.0000	le Initial 37.50 verage	Step Size 88 Pos .0000	Minimum Step Size 9.37719 h Only ition1 Position 000 .000000	Specified APF 1.00000 Low Only n2 Position3 0 .000000
Use Different Integrated Use Integrate Use Inverted Off Peak Correct C Linear Exponential Slope (Hi)	ential PHA Mod Intensity Scan ed Intensities Intensity Steps Stion Type C A 1.0000 1.0000	verage	Step Size 88 Pos nial Co	Minimum Step Size 9.37719 h Only ition1 Position 00 0.00000 eff1 Coeff:	Specified APF 1.00000 Low Only n2 Position3 0 .000000 2 Coeff3
Use Different Integrated Use Integrate Use Inverted Off Peak Correct C Linear Exponential Slope (Hi) Slope (Lo)	ential PHA Mod Intensity Scan ed Intensities Intensity Steps etion Type A 1.0000 1.0000	le Initial 37.50 verage	Step Size 88 Pos nial Co	Minimum Step Size 9.37719 h Only ition1 Position 000 .000000 eff1 Coeff. 000 .000000	Specified APF 1.00000 C Low Only n2 0 .000000 2 Coeff3 0 .000000
Use Different Integrated Use Integrate Use Inverted Off Peak Correct C Linear Exponential Slope (Hi) Slope (Lo)	ential PHA Mod Intensity Scan ed Intensities Intensity Steps etion Type A 1.0000 1.0000 Acquire	verage	Step Size 88 Pos nial Co 1.0000 rate High	Minimum Step Size 9.37719 h Only ition1 Position 000 0.00000 eff1 Coeff: 000 0.00000 Acquire Lov	Specified APF 1.00000 Coeff3 C
Use Different Integrated Use Integrate Use Inverted Off Peak Correct Exponential Slope (Hi) Slope (Lo) Multi-Point Fit Type	ential PHA Mod Intensity Scan ed Intensities Intensity Steps ction Type (° A (1.0000 (1.0000 (1.0000 (1.0000 (1.0000) (1	verage	Step Size 88 Pos iial Co .0000 rate High 2	Minimum Step Size 9.37719 h Only ition1 Position 00 0.00000 eff1 Coeff: 000 0.00000 Acquire Lov 4	Specified APF 1.00000 Comparison 0 .000000 2 Coeff3 0 .000000 2 Coeff3 0 .000000 2 Coeff3 0 .0000000
Use Different Integrated Use Integrate Use Inverted Off Peak Correct C Linear Exponential Slope (Hi) Slope (Lo) C Multi-Point Fit Type Linear	ential PHA Mod Intensity Scan ed Intensities Intensity Steps etion Type () A (1.0000 (1.0000 (1.0000 (1.0000 (1.0000) (1	le Initial 37.50 verage C Polynon 0 e High Iter h Multi-Point P	Step Size 88 Pos ial Co Co Co Co Co Co Co Co Co Co	Minimum Step Size 9.37719 b Only ition1 Position 00 0.00000 eff1 Coeff: 00 0.00000 Acquire Low 4 Low Mul	Specified APF 1.00000 C Low Only n2 Position3 0 .000000 2 Coeff3 0 .000000 4 Iterate Low 2 ti-Point Positions
Use Different Integrated Use Integrate Use Inverted Off Peak Correct C Linear Exponential Slope (Hi) Slope (Lo) Multi-Point Fit Type Linear Set To Default	ential PHA Mod Intensity Scan ed Intensities Intensity Steps etion Type () A (1.0000 (1.0000 (1.0000 (1.0000 (1.0000) (1	verage High Iter High Iter h Multi-Point Point ()	Step Size Step Step Size S	Minimum Step Size 9.37719 h Only ition1 Position 000 .000000 eff1 Coeffi 000 .000000 Acquire Lov 4 1 -1328.4	C Low Only 1.00000 C Low Only 1.00000 Coeff3 C Low Coeff3 C Loeff3 C

Click the **OK** button of the **Element Properties** to enter titanium into the *Element/Cations Parameters* table of the **Acquired and Specified Elements** window.

11	ampies				OK	Cancel
on i	template for p	yroxene elen	nents		Load E	lement Setup
					Load S	Gample Setup
					Add/Ben	ove Standarde
				F	Reload Star	ndard Assignments
				He	ad current se	tup from MUVE windov
				1	2	3 4 5 6
1	Si	ka	Yes	4	TAP	27738.0
2	Ti	ka	Yes	3	LPET	31430.0
	_					
	_					

Continue adding the remaining elements in the desired order, choosing *Background Type* **MAN** or **off-peak** as indicated above. The remaining eight element entries are not shown here to save space. Finally, oxygen is added to the element list as a not analyzed element for subsequent formula calculations. This is done by entering O (for oxygen) in the *Element* text box and leaving the *X-Ray Line* text box empty (see User's Guide and Reference documentation for more details).

Un 1 * template for pyroxene elements Load Element Set Load Sample Set Add/Remove Stand Reload Standard Assig Read current setup from MOV 1 2 3 4 Click Element Row to Edit Element/Cations Parameters (click empty row to add) Channel Element X-Ray Acquired Spectro Crystal On-Pet Si ka Yes 4 TAP 2773 Load Standard Assig Load Standard Assig Read current setup from MOV 1 2 3 4 Load Standard Assig Read current setup from MOV 1 2 3 4 Load Standard Assig Read current setup from MOV 1 2 3 4 Load Standard Assig Read current setup from MOV 1 2 3 4 Click Element Row to Edit Element/Cations Parameters (click empty row to add) Channel Element X-Ray Acquired Spectro Crystal On-Pet 1 2 1 1 2 2 1	tup up lards jnments VE windor 5 6
Load Sample Set Add/Remove Stand Reload Standard Assig Read current setup from MOV 1 2 3 4 Click Element Row to Edit Element/Cations Parameters (click empty row to add) Channel Element X-Ray Acquired Spectro Crystal On-Pet 1 Si ka Yes 4 TAP 2773 2 Ti ka Yes 4 TAP 21743	lards gnments VE window 5 6
Add/Remove Stand Reload Standard Assigned Read current setup from MOV 1 2 3 4 Click Element Row to Edit Element/Cations Parameters (click empty row to add) Channel Element X-Ray Acquired Spectro Crystal On-Peter 1 Si ka Yes 4 TAP 2773 2 Ti ka Yes 4 TAP 21743	lards gnments VE windo 5 6
Reload Standard Assig Read current setup from MOV 1 2 3 4 Click Element Row to Edit Element/Cations Parameters (click empty row to add) Channel Element X-Ray Acquired Spectro Crystal On-Peter 1 Si ka Yes 4 TAP 2773 2 Ti ka Yee 3 LIPET 2143	ynments VE windo 5 6
Read current setup from MO ¹ 1 2 3 4 Click Element Row to Edit Element/Cations Parameters (click empty row to add) Channel Element X-Ray Acquired Spectro Crystal On-Per 1 Si ka Yes 4 TAP 2773 2 Ti ka Yes 2 LPET 2142	VE windo
Click Element Row to Edit Element/Cations Parameters (click empty row to add) Channel Element X-Ray Acquired Spectro Crystal On-Peter 21/2 1 Si ka Yes 4 TAP 2773 2 Ti ka Yes 2 LPET 21/2	5 6
1 2 3 4 Click Element Row to Edit Element/Cations Parameters (click empty row to add)	5 6
Click Element Row to Edit Element/Cations Parameters (click empty row to add) Channel Element X-Ray Acquired Spectro Crystal On-Peter 1 Si ka Yes 4 TAP 2773 2 Ti ka Yes 2 LPET 2142	
1 51 Ka 165 4 1A 1 2773	eak /
Z 11 KA 18X J 18E1 J19J	0.0
3 Al ka Yes 4 TAP 3246	5.9
4 V ka Yes 2 LLIF 6220	9.1
5 Cr ka Yes 2 LLIF 5689	8.5
6 Fe ka Yes 5 LLIF 4808	5.0
7 Mn ka Yes 5 LLIF 5220	2.0
8 Mg ka Yes 1 TAP 3849	9.2
9 Ca ka Yes 3 LPET 3838	7.0
10 Na ka Yes 1 TAP 4636	2.9
11 U No	

Click the **OK** button of the **Acquired and Specified Elements** window when done entering elements in the run.

The **GetElmLoadDefaultStds** window opens to inform the user that standard assignments have been made based on elemental concentrations. The user will edit these choices shortly.

GetElmLoa	adDefaultStds
Ì	Default standard assignments were loaded for the sample(s) based on the highest concentration of the element in the standards. It may be necessary to modify these default standard assignments for best results.
Ē	ОК

Click **OK** to return to the main **Acquire!** window.

Editing Acquisition Options

The user may change the element acquisition order of the spectrometers by clicking the **Acquisition Options** button in the **Acquire!** dialog box.

🚏 Acquire!	- Inter (. confident)	-					- - X
SP1 SP2 52549.4 41970.4	SP3 SP4 59909.5 26937.9	<mark>SP5</mark> 44979.8	X -13511. 376	Y 53.1 30	Z 7.999	Spectro I	Progress
1-TAP 2-LI	JIF 3-LPET	4-TAP	5-LLIF		Faraday		
					.000000	4	•
Current Sample: Un 1 Normal Acquisition Unk	* template for pyroxer nown	10	Start Standard	i or Unkno	own Acquisition	-13511.	37653.1 იიიიიი
Data Rows: 0	Good Data Rows: 0		Sta	art Waves	can	px 0	0
New Sample	РНА		Imaging	Pea	king Options	Magnification	2533
Elements/Cations	Peak/Scan Options	Acqu	uisition Options	St	art Peaking	Kilovolts	Analog Spot
Analytical Conditions	Count Times	Sp	ecial Options		Move	Beam Current Beam Size	40
Combined Conditions	Locate		Rate Meter		Stage	Dealin Jize	

This opens the Acquisition Options dialog box.

quisition Opt	ions	a t Bar	- 1 × 1					(i) = /1	
Click Eleme Channel 1 2 3 4 5 5 6 7 7 8 8 6 7 8	Element Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka	Acquisition Option Spectro 4 3 4 2 2 2 5 5 5 5 1 1	Crystal TAP LPET TAP LLIF LLIF LLIF LLIF LLIF LLIF	0rder 1 2 2 2 1 2 1 2 1 2 1 2	Std Bgd MAN Off Peak Off Peak Off Peak MAN Off Peak MAN Off Peak MAN	Unk Bgd MAN Off Peak Off Peak Off Peak Off Peak MAN Off Peak MAN	Peaking No No No No No No No	Nth Point No No No No No No No	Nth Inters
Acquisition © Channel C Ascendir © Descend © User Del EDS Acquise © Acquire © Acquire EDS Unk © Use Pro © Use Sp	Order Number ng Angstroms fined Order Nun sition No EDS Data EDS Spectrum I snown Count Fa eset Time (in El vecified Count T	nber Intensities ctor 1 DS application) ime 40	Misce V Re Do V Bl Mo V Mu Mi V Us Us Us Us Auto-1	Illaneous Opti eturn to On Pe o Not Set Com ank Beam Aft easure Absorb easure Beam (assure Beam (the Point Beam M easure Beam (the Automated e Automated ad Standard I b Not Display : re Last Unkno te Unknown C Focus Thresho	ons eaks After Acquisis ditions During Ac; er Move and Acquisis er Move and Acquisis Current On Waves leasurement g Spectrometer Mr PHA Control On And Off Peak Data From File See Standard Images win As Wavescan count Time For Int old (JEOL only)	tion quisition isitions cans 1 otion Acquire tup setup erf. Std .33	Spectrometer I Asynchronou Synchronou Automation Err E-mail Notif E-Mail Address To Stage/Spec BackLash Co BackLash Co BackLash Co BackLash Co	Motion Jus Jus or Reporting Cation of Errors Deport Errors Cathering C	Cancel Cancel
Quick Stand C Only Assig C Assigned d Automated I Acquire A C Before	dard Acquisition ined Elements or Major Elements : Image Acquisition Automated Imag Automated Imag (After	Modes 10 10 10 10 10 10 10 10 10 10	Auton s C nns C	ntamination Ti ee Only Digitiz natic Analysis ee Automatic A Export Weight F Export Raw K-R Export Counts/S Export Counts/S Export Raw Cou	me (in sec) ed Standard Posi and Output Mode Analysis After Acq Percents To Excel Link atios To Excel Link Sec To Excel Link unts (Pt) To Excel Link	0 0 tions s wisition k k	Nth Point Off-F Use Nth Po Use Nth Po Element Inte Percent Cha On Peak Ti	Peak Backgroun int Acquisition F int Monitor Elen nsity To Monitor nge Intensity me Fraction	od Options For Off-Peaks nent Intensity 5 1.00000

To change the order that the spectrometer measures an element, select the *User Defined Order Number* button under *Acquisition Order* and click the row of the element to edit.

This opens the **Acquisition Properties** dialog box, seen below. Here, the user will re-define sodium (Na) to be counted on the first spectrometer pass due to its susceptibility to being volatilized by long exposure to the electron beam. In samples containing volatile elements the user may wish to consider running the time dependent intensity calibration routine (see User's Guide and Reference documentation and/or Advanced Topics manual).

Acquisition Properties	-
Enter Acquisition Options For: Na ka	OK
Acquisition Order Number 1	Cancel
To change the acquisition order first set the order to User Defined in the previous dialog, then in this dialog enter the desired acquisition order for all elements on that spectrometer. Note that the acquisition order of "combined" samples are automatically sorted by the analytical conditions.	
Background Type for Standards	
Off Peak	
 MAN (mean atomic number) Multi-Point Off-Peak 	
Background Type for Unknowns	
Off Peak	
C MAN (mean atomic number) C Multi-Point Off-Peak	
Peaking on Acquisition	
Peak Element Before Acquisition	
Nth Point Off-Peak Acquisition Options	
🔲 Use Nth Point Off-Peak Acquisition	
Nth Point Acquisition Interval 10	

Edit the *Spectrometer Order Number* for all elements to change the acquisition order, e.g. change Na to 1 and Mg, which is measured on the same spectrometer, to 2. Further, to use the same background correction method for both standards and unknowns edit the *Background Type for Standards* to *MAN* for Si, Fe, Mg, and Ca. Click the **OK** button returning to the **Acquisition Options** window.

Click the **OK** button of the **Acquisition Options** window to return to the **Acquire!** window.

Modifying Standard Assignments

The standard assignments chosen by PROBE FOR EPMA may be inspected and edited by clicking the **Analyze!** button from the main log window.

👎 Probe fo	or EPMA [C:	\UserData\D	oe\silicates(1.MDB]				-		- 0	x
File Edit	Standard	Xray Ana	alytical Wi	ndow Run	Output	Help					
	Acquire!		(Analyze!		1	\utomate!			Plot!	
WINDOW	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	-
MODE :	0	0	0	0	0	0	0	0	0	0	
GAIN:	2759.	873.	2759.	393.	393.	375.	375.	2874.	873.	2874.	
BIAS:	1317.	1845.	1317.	1838.	1838.	1824.	1824.	1328.	1845.	1328.	
Last (Cu	irrent)	On and O	ff Peak	Count Tim	nes:						
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
BGD :	MAN	OFF	OFF	OFF	OFF	MAN	OFF	MAN	MAN	OFF	
BGDS:	MAN	LIN	LIN	LIN	LIN	MAN	LIN	MAN	MAN	LIN	
SPEC:	4	3	4	2	2	5	5	1	3	1	
CRYST:	TAP	LPET	TAP	LLIF	LLIF	LLIF	LLIF	TAP	LPET	TAP	
ORDER :	1	2	2	2	1	1	2	2	1	1	
ONTIM:	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
HITIM:		5.00	5.00	5.00	5.00		5.00			5.00	
LOTIM:		5.00	5.00	5.00	5.00		5.00			5.00	
Miscella	aneous S	ample Ac	quisitio	n/Calcula	ation Pa	rameters	:				
KILO:	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	
ENERGY	1.740	4.509	1.487	4.950	5.412	6.400	5.895	1.254	3.691	1.041	
EDGE :	1.839	4.967	1.560	5.466	5.990	7.112	6.539	1.305	4.039	1.073	
Eo/Ec:	8.16	3.02	9.62	2.74	2.50	2.11	2.29	11.49	3.71	13.98	Ξ
STDS:	14	22	13	23	24	26	25	12	2401	303	
											-
Acquire: R	eady								Cancel	Pause	1.

Note that the program automatically wraps element data output to eight elements per line. If the extended format menu is checked, (activated from the **Output** menu) the data is written out (in log window and to disk file, if enabled) as far as necessary to the right.

This opens the Analyze! dialog box.

Analyze!		
Sample List (multi-select) (double-click to see intensity data)	Analyze Data KRaws Combine Selected Samples >>Excel	Combine Analysis Lines From Selected Samples
Unknowns Wayescans	List Report Calculation Options	Combine Data Lines From Selected Samples
C All Samples Select All	Pause Between Samples Use All Matrix Corrections	Sort Stat and Data Grids In Geological or Atomic Number
Add To Setup	Delete Selected Sample(s) Undelete Selected Sample(s) Match	
Save Setups	Combined Conditions Count Times	
Specified Concentrations Standard Assignments Name/Descrip	tion Conditions Elements/Cations	Samples into a New Sample
Total 0; Calculat Excess	wgen Total Weight % ed Dxygen Z - Bar Dxygen Atomic Weight	Boundary Corrections Create Material File
Delete Selected Line(s) Undelete Selected Line(s)	Analyze Selected Line(s)	
		Cancel Next 📈

Click the **Standard Assignments** button.

The Standard and Interference Assignments dialog box opens.

pelected S	amples				ОК	Cancel
Un I ⁻ t	emplate for py	roxene eleme	ents		Save Elemer	nt Setup
					Save Sampl	e Setup
					Add/Remove S	Standards
				Rel	load Standard	Assignments
				[Remove TDI (Correction
				1	2 3	4 5 6
Click Eleme	ent Row to Ed	it Standard/Ir	nterference/Tim	e Dependent	Intensity (TDI)) Assignment
Click Eleme Channel	ent Row to Ed	it Standard/Ir X-Ray	nterference/Tim Analyzed Yes	e Dependent Standard	Intensity (TDI)	Assignment
Click Eleme Channel I	ent Row to Ed Element Si Ti	it Standard/Ir X-Ray ka ka	Analyzed Yes Yes	e Dependent Standard 14 22	Intensity (TDI)	Assignment: Interf-Std 0,0,0,0,0 0 0 0 0 0
Click Eleme Channel 1 2 3	ent Row to Ed Element Si Ti Al	it Standard/Ir X-Ray ka ka ka	Analyzed Yes Yes Yes	e Dependent Standard 14 22 13	Intensity (TDI) Interf-Ele	Assignment Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0
Click Elemo Channel 1 2 3 4	ent Row to Ed Element Si Ti Al V	it Standard/Ir X-Ray ka ka ka ka	Analyzed Yes Yes Yes Yes Yes	e Dependent Standard 14 22 13 23	Intensity (TDI)	Assignment Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Elema Channel 1 2 3 4 5	ent Row to Ed Element Si Ti Al V Cr	it Standard/Ir X-Ray ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 14 22 13 23 24	Intensity (TDI)	Assignment: Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Elema Channel 1 2 3 3 4 5 5	ent Row to Ed Element Si Ti Al V Cr Fe	it Standard/Ir X-Ray ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 22 13 23 24 26	Intensity (TDI) Interf-Ele	Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Elema Channel 1 2 3 4 5 5 5 7	ent Row to Ed Element Si Ti Al V Cr Fe Mn	it Standard/Ir X-Ray ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 14 22 13 23 24 26 25	Intensity (TDI) Interf-Ele	Assignments 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Elema Channel 1 2 3 4 5 5 5 7 8	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg	it Standard/Ir X-Ray ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 14 22 13 23 24 26 25 12	Intensity (TDI) Interf-Ele	Assignments 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Elemo Channel 1 2 3 4 5 5 5 5 5 7 8 9	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca	it Standard/Ir X-Ray ka ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 14 22 13 23 24 26 25 12 2401	Intensity (TDI) Interf-Ele	Assignments 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Click Elema Channel 1 2 3 3 4 5 5 5 5 5 5 5 7 8 9 9 10	ent Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca Na	it Standard/Ir X-Ray ka ka ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	e Dependent Standard 14 22 13 23 24 26 25 12 2401 303	Intensity (TDI) Interf-Ele	Assignments 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,

Click the row of an element to change the respective standard assignment, e.g. Si.

This opens the **Assignment Properties** dialog box. The default standard assignments are based on the highest concentration of the element in the standards currently in the run. In addition to standard assignments, the user may assign spectral interference corrections and time dependent intensity element calibrations from this window.

ssignmen	nt Properties				
Enter S	itandard Assign	nments fo	or: Si ka		ОК
Eleme	ent X-Ray		Assigned (Primar	y) Standard	
Si	v ka v	- 14	SiO2 synthetic		Cancel
🔲 Use '	Virtual Standard Fo	or Standar	d Intensity Calculation (see Ar	nalytical menu)	
- Interfer	rence Standard	Assian	pents for Interfered Flem	ent: Si ka	
I	Intf Elem Intf	Order	In	erference Standard	
1st	•	•		•	Remove
2nd	-	-		•	Remove
3rd	-	•		•	Remove
4th	-	•		•	Remove
5th	-	•		•	Remove
					A
Time D TDI C C C C C Us C Us C Us C Us	ependent Inten: Correction Type No TDI Calibra Use TDI "Self" Use TDI "Assig	nsity (TD) ne (Self o ation Corr " Calibra gned" Ca gned" Ca gned" Ca ca second controls (hyper	I) Calibration Assignment r Assigned) rection tion Correction alibration Correction ial) Fit -exponential) Fit	(select unknown sample for assigned TDI c Both "assigned" and "self" calibration Time Depe element samples can be acquired. See the Spec the Acquire window. Both "assigned" and "self" Time Dependent Inte calibrations can be assigned or unassigned her Dependent Intensity (TDI) corrections are assig acquired with the "assigned" flag in Special Op Dependent Intensity (TDI) corrections are assig Time Dependent Intensity (TDI) element "self automatically assigned to themselves at the tim Display TDI Fit	alibration) Indent Intensity (TDI) ial Options dialog in Insity (TDI) element e. Assigned Time gned to samples tions. "Self" Time ied to themselves. 'calibrations are ne of acquisition. Error Bars
-Blank (Correction Samp	ple Assig	inment	Assign a sample to be used for a "blank" trace	

Click the *Assigned Standard* menu box. A scrollable list of all standards added to the current run is displayed. Select a new standard for element Si.

ssignment Properties		
-Enter Standard Assignments for: Si ka		or
Element X-Ray Assigned (Prima	ry) Standard	UK
Si v ka v 14 SiO2 synthetic	<u> </u>	Cancel
Use Virtual Standard For S 25 MnO synthetic 26 Fe2O3 synthetic hematil 28 NiO synthetic	ite	
-Interference Standard As 303 Albite, Amelia 453 Augite, Kakanui USNM	122142	
1st 469 Hypersthene, johnstown 2401 Wollastonite (Willsbord	n USNM #746 p, NY)	Remove
2nd 💌 💌		Remove
3rd 🗨 💌		Remove
4th 🔽 🔽	•	Remove
5th 🗸 🗸	•	Remove
		Ŧ
Time Dependent Intensity (TDI) Calibration Assignmen TDI Correction Type (Self or Assigned) No TDI Calibration Correction Use TDI "Self" Calibration Correction Use TDI "Assigned" Calibration Correction 	it (select unknown sample for assigned TDI calif Both "assigned" and "self" calibration Time Depender element samples can be acquired. See the Special the Acquire window. Both "assigned" and "self" Time Dependent Intensity Corrections are assigned acquired with the "assigned" flag in Special Optior Dependent Intensity (TDI) corrections are assigned Time Dependent Intensity (TDI) element "self" ca automatically assigned to themselves at the time in Display TDI Fit	pration) ent Intensity (TDI) Options dialog in ty (TDI) element Assigned Time dt to samples is: "Self" Time to themselves. librations are of acquisition. T Error Bars
© Use Log-Linear (exponential) Fit © Use Log-Quadratic (hyper-exponential) Fit		
-Blank Correction Sample Assignment	Assign a sample to be used for a "blank" trace eler The blank sample should be a similar matrix to the u and should have a zero or known trace of the ele	nent correction. Inknown sample ement present.

Click the **OK** button returning to the **Standard and Interference Assignments** dialog box. Repeat these editing steps until all necessary element standard assignments have been modified. In this example, the standard assignments for Si and Mg are edited, resulting in the following window.

	molate for nu	roxene eleme	ents		OK	Cancel
					Save Elemer	nt Setup
					Save Sample	e Setup
					Add/Remove S	Standards
				Rel	load Standard	Assignments
					Remove TDI (Correction
				-	2 2	4 5 0
	Element			e Dependent	incensity (101)	Assignments
Channel	Liement	A-⊓_ay	Analyzed	Standard	Interf-Ele	Interf-Std
Channel	Si	ka	Analyzed Yes	Standard 453	Interf-Ele	Interf-Std 0,0,0,0,0
Channel 2	Si	ka ka	Analyzed Yes Yes	Standard 453 22	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0
Channel 2 3	Si Ti Al	ka ka ka	Analyzed Yes Yes Yes	Standard 453 22 13	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0
Channel 2 3 4	Si Ti Al V	ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes	Standard 453 22 13 23	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel 1 2 2 3 1 1	Si Ti Al V Cr	ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes	Standard 453 22 13 23 24	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel 2 	Si Ti Al V Cr Fe	ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes	Standard 453 22 13 23 24 26	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel	Si Ti Al V Cr Fe Mn	ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	Standard 453 22 13 23 24 26 25	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel	Si Ti Al V Cr Fe Mn Mg	ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	Standard 453 22 13 23 24 26 25 473	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel	Si Ti Al V Cr Fe Mn Mg Ca	ka ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Standard 453 22 13 23 24 26 25 473 2401	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Channel	Si Ti Al V Cr Fe Mn Mg Ca Na	ka ka ka ka ka ka ka ka ka ka ka ka	Analyzed Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Standard 453 22 13 23 24 26 25 473 2401 303	Interf-Ele	Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,

Click the **OK** button of the **Standard and Interference Assignments** dialog box returning to the **Analyze!** window.

Setting Count Times

Click the **Count Times** button of the **Acquire!** window.

👎 Acquire!	- Inter (- 40 K				- - X
SP1 SP2 52549.4 41970.4	SP3 SP4	SP5	X -13511. 376	Y 53.1 30	Z 7.999	Spectro	Progress
1-TAP 2-LI	LIF 3-LPET	4-TAP .00	5-LLIF .00		Faraday .00		
Current Sample: Un 1	· · · · · · · · · · · · · · · · · · ·	e.	Start Standard	l or linkne	. 000000	. €	Þ
Normal Acquisition Unk Data Rows: 0	nown Good Data Rows: 0		Sta	art Waves	can	-13511. um .000000 px 0	37653.1 .000000 0
New Sample	РНА		Imaging Peaking Options		king Options	Magnification	2533
Elements/Cations	Peak/Scan Options	Acqu	uisition Options	St	art Peaking	Kilovolts	Analog Spot
Analytical Conditions	Count Times	Sp	ecial Options	1	Move	Beam Current	40
Combined Conditions	Locate		Rate Meter		Stage	beam size	

This opens the **Count Times** dialog box. Here various parameters relating to counting times can be adjusted. Initially *On-Peak* count time is set for 10 seconds and both *Hi-Peak* and *Lo-Peak* times are set for 5 seconds based on the configuration file defaults. For elements measured with Background Type MAN only the *On-Peak* setting is relevant. Note: Real time spectrometer motion and acquisition time is graphically displayed.

unt Times Click Eler	nent Row	to Edit Co	ount Time					-	(perio)	lugate .
Channel	Flement	Spectro	Crustal	On-Peak	Hi-Peak	l o-Peak	MaxCoun Factor	Wave	Peak	Quick
1	Sika	4	TAP	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
2	Tika	3	LPET	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
3	Al ka	4	TAP	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
4	V ka	2	LLIF	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
5	Cr ka	2	LLIF	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
6	Fe ka	5	LLIF	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
7	Mn ka	5	LLIF	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
3	Mg ka	1	TAP	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
9	Ca ka	3	LPET	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
0	Na ka	1	TAP	10.00	5.00	5.00	1000000(1.00	5.00	8.00	2.00
∢ eam Aver ominal Be	ages am (nA)	1.	3	62 se 1 m	1 TAP	23 LLIF LPET	4 5 TAP LLIF			OK
Vominal Beam (nA) 39.9943 1 min V Image: Calculated Spectrometer for cps/nA intensity display. Calculated Spectrometer Motion and Acquisition Mg Ti Al Mn										
ystal Flip et Columr	Time (TKCS) 1	0∶ ime 1∶	ecs	0 se	cs	Ca	Si Fe			Nominal Beam

To edit the count times for any element click that row in the spreadsheet. This opens the **Count Time Properties** dialog box.

Enter Count Time I	Properties For: Si ka-		OK					
On-Peak Time	On-Peak Time Hi Off Peak Time Lo Off Peak Time							
10.00	5.00	5.00	Cancel					
Wave Scan Time	Note that the							
5.00	8.00	2.00	Peaking Time i divided by A fo					
Enter the on and o samples (see below to standards). Enter wav	ff-peak count times for sta specify longer count times escan time for wavescan s	ndard and unknown for unknowns relative to samples, quickscan time	ROM peaking and Pre-Scan					
for quick wavesca	ns and peaking time for sp	ectrometer peaking.	Off-Peak					
MultiPoint ba	ackground count times are	based on the	Statistics					
corresponding) Hi and Lo Off Peak Time	s divided by two						
Statistics Based Co Unknown Maximum Use the Unknown M fixed count time. If t	Dunting For Predefined Count : · · · · · · · · · · · · · · · · · ·	d Precision Levels 100000000 desired statistical significa xceeds the Unknown Max	nce instead of a imum Count the					
Statistics Based Co Unknown Maximum Use the Unknown M fixed count time. If t Background counting off-peak counting time	aximum Count to specify a he total counts acquired et acquisition will be con time will be automatically o to the specified on-peak o counting	d Precision Levels 100000000 desired statistical significa xceeds the Unknown Max isidered complete. salculated based on the rat counting time and the actu- time.	ince instead of a imum Count the io of the specified al elapsed on-peal					
Statistics Based Co Unknown Maximum Use the Unknown M fixed count time. If t Background counting off-peak counting time Unknown/Standar	aximum Count to specify a aximum Count to specify a he total counts acquired ex acquisition will be con time will be automatically of to the specified on-peak of counting d Count Time Ratio ar	d Precision Levels 100000000 desired statistical significa xceeds the Unknown Max sidered complete. acculated based on the rat ounting time and the actu- time.	ince instead of a imum Count the io of the specified al elapsed on-pea l Peaks					
Statistics Based Co Unknown Maximum Use the Unknown M fixed count time. If t Background counting off-peak counting time Unknown/Standard Unknown Count Ti	Count : aximum Count to specify a he total counts acquired er acquisition will be con time will be automatically o to the specified on-peak o counting d Count Time Ratio ar me Factor :	Precision Levels 100000000 desired statistical significa xceeds the Unknown Max sidered complete. alculated based on the rat counting time and the actu time. d Alternating On/Off I 1.00	ince instead of a imum Count the io of the specified al elapsed on-peal Peaks					
Statistics Based Co Unknown Maximum Use the Unknown M fixed count time. If the Background counting off-peak counting time Unknown/Standar Unknown Count Ti Use the Unknown Cou Io count times for unk 10 and the Unknown	Count : A Count : Count : A Count : A count counts acquired exacquisition will be conting to the specified on-peak or counting Count Time Ratio are me Factor : Count Time Ratio are for the specified on-peak or counting Count Time Ratio are more Factor to automate nown samples relative to s Count Factor is 2, then the not the unknowns will court	Precision Levels IO0000000 desired statistical significa xceeds the Unknown Max sidered complete. alculated based on the rat counting time and the actu time. d Alternating On/Off I 1.00 ically change the counting tandards. For example, if t e standards will count 10 s t1 20 seconds on-peak.	ince instead of a imum Count the io of the specified al elapsed on-peal Peaks time for on, hi and he on-peak time is seconds on-peak					

Edit the *Count Time* text boxes with new times. To adjust the count times on unknowns, change the *Unknown Count Time Factor*. This is the multiplicity factor for acquiring unknown sample elements relative to the count times specified for the standards.

The *Unknown Maximum Count* text box is used to specify a statistics based count time. This is most useful if the user wishes to count for 30 seconds or 40000 counts, whichever comes first. For samples with high count rate elements, the actual analysis time would be shorter.

Click the **OK** button of the **Count Time Properties** window. Finally, click the **OK** button of the **Count Times** dialog box to accept any modified count times and return to the **Acquire!** window.

Loading Standard Position Files

Running standards using automation requires PROBE FOR EPMA to know the physical location of all the standards for this run. Click the **Automate!** button from the main PROBE FOR EPMA log window.

👎 Probe fo	or EPMA [C:	\UserData\D	oe\silicates	1.MDB]						- 0	x
File Edit	Standard	Xray Ana	alytical Wi	ndow Run	Output	Help					
	Acquire!			Analyze!		C	Automate!			Plot!	
WINDOW	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	-
MODE :	0	0	0	0	0	0	0	0	0	0	
GAIN:	2759.	873.	2759.	393.	393.	375.	375.	2874.	873.	2874.	
BIAS:	1317.	1845.	1317.	1838.	1838.	1824.	1824.	1328.	1845.	1328.	
Last (Cu	irrent)	On and O	ff Peak	Count Tim	es:						
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
BGD :	MAN	OFF	OFF	OFF	OFF	MAN	OFF	MAN	MAN	OFF	
BGDS :	MAN	LIN	LIN	LIN	LIN	MAN	LIN	MAN	MAN	LIN	
SPEC:	4	3	4	2	2	5	5	1	3	1	
CRYST:	TAP	LPET	TAP	LLIF	LLIF	LLIF	LLIF	TAP	LPET	TAP	
ORDER :	1	2	2	2	1	1	2	2	1	1	
ONTIM:	10.00	10.00	10.00	10.00	10.00	20.00	20.00	10.00	10.00	10.00	
HITIM:		5.00	5.00	5.00	5.00		5.00			5.00	
LOTIM:		5.00	5.00	5.00	5.00		5.00			5.00	
Miegella	meone S		mieitio	n/Calonla	tion Pa	rameter					
RTIO:	15 00	15 00	15 00	15 00	15 00	15 00	15 00	15 00	15 00	15 00	
ENERGY	1 740	4 509	1 487	4 950	5 412	6 400	5 895	1 254	3 691	1 041	
EDGE -	1 839	4 967	1 560	5 466	5 990	7 112	6 539	1 305	4 039	1 073	
EO/EC:	8 16	3 02	9 62	2 74	2 50	2 11	2 29	11 49	3 71	13 98	
STDS:	453	22	13	2.74	2.50	2.11	2.25	473	2401	303	E
5105.	400	~~~	15	25	24	20	25	475	2401	505	
											-
Acquire: R	eady								Cancel	Pause	

This opens the **Automate!** dialog box shown below.

👎 Automate!		
Position List (multi-select) (double-click to see data) Image: Standards St 135 Fid 1 Calcite (analyzed) Image: Click to unknowns St 140 Fid 1 Rhodocrosite (Harvard #8979- St 140 Fid 1 Rhodocrosi	Move Stage	Automation Actions Confirm Standard Positions Confirm Unknown Positions
C Wavescans St 141 Fid L Dolomite (Harvard #105064) C All Samples	Digitize	Confirm Wavescan Positions Peak Spectrometers Peaking
	Plot	Acquire Standard Samples
Select Stds	Fiducials	 Acquire Unknown Samples Acquire Wavescan Samples
- Sect All	Replicates	Acquire Standard Samples (again)
Auto Focus	Conditions	Automation Options
Update	Sample Setups	✓ Peak on Assigned Standards ☐ Use "Quick" Standards
Delete All Re-Load	File Setups Multiple Setups	 Use Filament Standby Afterwards Use Confirm During Acquisition
Delete Selected Samples		Use Beam Deflection For Position Suppress ROM Based Backlash
Delete Selected Positions Export Selected Sa	mples (to *.POS)	Confirm All Positions In Sample
Row X Y Z W Gra 1 -13511.38 37653.09 307.9990 0 1 1 -13511.38 37653.09 307.9990 0 1 KeV = 15 Curr = 20 Size = 0 Mag = 400 Mode = Analog Spot Samp MagAnal = 2533 MagImag = 400 ImgShift = -2, 3 Samp	in # Focus 0 de Setup (row) Number = 0	Use ROM Auto Focus New Sample Every Point Digitized Interval 5 Standard Points To Acquire 1 Automate Confirm Delay (sec) Standard X Increment (um) 4 Re-Standard Y Increment (um) 6 Re-Standard Interval (hrs) 6 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups
File Setup = NONE		 Use Digitized File Setups Use Digitized Multiple Setups
Multiple Setups = NONE	Replicates = 1	Run Selected Samples

The last set of digitized standards used is visible in the *Position List* list box of the **Automate!** window. Currently, the carbonate standards digitized previously are listed. These will be deleted and replaced by the appropriate standard position file(s).

Click the **Delete All** button. This opens the **AutomateDeleteAll** window. Click the **Yes** button of the **AutomateDeleteAll** window to clear the *Position List* list box of all displayed position samples.

👎 Automate!		
Position List (multi-select) (double-click to see data) © Standards St 135 Fid 1 Calcite (analyzed) © Unknowns St 140 Fid 1 Bhodocrosite (Harvard #8979)	Move Stage	Automation Actions Confirm Standard Positions Confirm Unknown Positions
C Wavescans C All Samples	Digitize	Confirm Wavescan Positions Peak Spectrometers Peaking
Select Stds	Fiducials	Acquire Standard Samples Acquire Unknown Samples
Select All	Replicates	 Acquire Wavescan Samples Acquire Standard Samples (again)
Auto Focus	Conditions Sample Setups	Automation Options
Delete All AutomateDeleteAll	- ampie o stape	y Afterwards
Delete Selected Posit Row X Y 1 -13511.38 376	Ye	s No Is Every Point
		Automate Confirm Delay (sec) Standard X Increment (um)
		Re-Standard Y Increment (um) 6 Re-Standard Interval (hrs) 6
KeV = 15 Curr = 20 Size = 0 Mag = 400 Mode = Analog Spot MagAnal = 2533 MagImag = 400 ImgShift = -2, 3 Samp File Setup = NONE	ole Setup (row) Number = 0	 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
Multiple Setups = NONE	Replicates = 1	Run Selected Samples

The **FiducialDeleteUnreferenced** window opens. Click the **Yes** button to clear the fiducial coordinate set from the position database.

FiducialDel	leteUnreferenced
?	Fiducial set 1 is not referenced by any position samples in the position database. Do you want to delete this fiducial set?
	Yes No Cancel

Click the **Import from ASCII File (*.POS File)** button of the **Automate!** dialog box to import position samples from a previously saved ASCII file.

🛃 Automate!		
Position List (multi-select) (double-click to	lata)	Automation Actions
Standards	Move Stage	Confirm Standard Positions
C Unknowns C Wayescans	Digitize	Confirm Unknown Positions
C All Samples		Peak Spectrometers Peaking
	Plot	Acquire Standard Samples
Select Stds	Fiducials	Acquire Unknown Samples
	Replicates	Acquire Standard Samples (again)
Auto Focus	Conditions	Automation Options
Update	Sample Setups	Peak on Assigned Standards
Delete All	File Setups	Use Filament Standards
Re-Load	Multiple Setups	Use Confirm During Acquisition
Delete Selected Samples	mport from ASCII (*.POS File)	Suppress ROM Based Backlash
Delete Selected Positions	ort Selected Samples (to *.POS)	Confirm All Positions In Sample
Row X Y Z	W Grain # Focus	
		New Sample C Every Point
		C Digitized C Interval 5
		Standard Points To Acquire
		Automate Confirm Delay (sec)
		Standard X Increment (um) 4
		Re-Standard Y Increment (um) 6
		Re-Standard Interval (hrs) 6
		 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
		Run Selected Samples

This action opens the **Open File To Import Position Data From** window. The user previously digitized all standard blocks and created a variety of *.POS files. Two *.POS files will be loaded for the pyroxene run documented here: SynthStds_pos1.pos, which contains a range of synthetic simple oxides and silicates, and Smithsonian_pos2.pos, which contains a selection of Smithsonian microbeam standards.

The default location for *.POS files is at C:\Probe Software\Probe for EPMA\PFW Position Files, but this can be changed in the PROBEWIN.INI file.

Select the file in the list and click the **Open** button.

👎 Open File	To Import Position Data From
Look in: 🚺	PFW Position Files 💌 🗲 🗈 📸 🕶
Smithsor	ian_pos2.pos s_pos1.pos
	Type: POS File Size: 764 bytes Date modified: 23/04/2013 17:19
File name: Files of type:	SynthStds_pos1.pos Open ASCII Position Files (*.POS) Cancel

This action opens the **FiducialLoad** window. Click the **Yes** button to do a fiducial transformation on this pre-digitized standard block to obtain an accurate set of standard positions.

FiducialLoa	ad	×
?	Do you want to transform the sample positions using sample for position matrix transformation?	e fiducials
	Yes No	Cancel

The **Modify Fiducial Positions** window opens. Normally the user would simply accept the defaults or edit the position text boxes for each point, including the appropriate stage location number (JEOL 733 use appropriate W stage position). When done, click the **OK** button.

lodify Fidu	odify Fiducial Positions							
- Enter Ap	OK							
Fiducial	Description	:\UserData\P	F₩ Position	Files\SynthStd	ls_pos1.pos	Cancel		
Point#	×	Y	Z	w		Cancer		
1	-7060	7219	77	0	Update			
2	-20970	540	50	0	Update	Move		
3	-11085	-9390	65	0	Update	Stage		
			_					

This action causes the stage motors to drive to the first fiducial coordinate in its lookup table.

The **FiducialVerifyFiducial** window appears. Adjust the stage motors to center the first fiducial mark, click the **OK** button.

FiducialVer	ifyFiducial
j	Please adjust the stage position for fiducial #1 to the exact center of the alignment mark. Click OK or <enter> when ready or click Cancel or <esc> to quit.</esc></enter>
	OK Cancel

The computer will drive to each of the three fiducial marks for centering. Clicking the **OK** button after the third fiducial mark opens the **FiducialsVerifyFiducials** window. Click this **OK** button.



The program then imports and updates the position coordinates of all of the standards in the predigitized standard position file. The **AutomateImportPositions** window opens.



Click the **OK** button returning to the **Automate!** window.

The **Automate!** window would appear as below. The currently transformed standard position file is listed in the *Position List* list box.

🚏 Automate!	
✓ Automate! Position List (multi-select) (double-click to see data) ✓ Standards St 13 Fid 1 ✓ Unknowns St St 14 Fid 1 St 15 Fid 1 ✓ Wavescans St C All Samples St ✓ Y St ✓ Select Stds St Select All St Go St Auto Focus St Update St St 26 Fid 1 Fid MO2 Select Stds St St 27 Fid 1 Select Mil St St 28 Fid 1 St 21 Fid 1 St 25 Fid 1 Molo synthetic Sample Setups <th>Automation Actions Confirm Standard Positions Confirm Unknown Positions Confirm Wavescan Positions Peak Spectrometers Peaking Acquire Unknown Samples Acquire Unknown Samples Acquire Standard Samples Acquire Standard Samples Acquire Standard Samples Acquire Standard Samples Comparison Options Peak on Assigned Standards Use "Durck" Standards</th>	Automation Actions Confirm Standard Positions Confirm Unknown Positions Confirm Wavescan Positions Peak Spectrometers Peaking Acquire Unknown Samples Acquire Unknown Samples Acquire Standard Samples Acquire Standard Samples Acquire Standard Samples Acquire Standard Samples Comparison Options Peak on Assigned Standards Use "Durck" Standards
Delete All File Setups Re-Load Multiple Setups	Use Filament Standby Afterwards
Delete Selected Samples Import from ASCII (*.POS File) Delete Selected Positions Export Selected Samples (to *.POS) Row Y Z W 1 -3532.066 65.00127 0 1 0	Suppress ROM Based Backlash Confirm All Positions In Sample Combine Multiple Sample Setups Vise ROM Auto Focus New Sample Stendard Points To Acquire Automate Confirm Delay (sec) Standard X Increment (um) Re-Standard Increment (um) Re-Standard Interval (hrs)
KeV = 15 Curr = 40 Size = 10 Mag = 2533 Mode = Analog Spot Sample Setup (row) Number MagAnal = 2533 MagImag = 2533 ImgShift = -2, 3 = 0 File Setup = NONE	 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
Multiple Setups = NONE Replicates = 1	Run Selected Samples

Repeat the same loading procedure for the other standard position files required for use in the automation. After clicking the **Import from ASCII File** button, the **AutomateImportFile** window opens.

AutomateIn	mportFile	122	-	×
?	The Automate list alre delete all positions in	eady contains po the Automate lis	sition samples. I st first?	Do you want to
		Yes	No	Cancel

Typically, when using more than one standard mount, the user would not delete all positions in the *Position List*, instead appending the additional position files to the first file. Select **No** and import additional standards.

All of the standards loaded are listed in the *Position List* list box of the **Automate!** window. These may now be accessed by the program during any automation action. For instance, it is now possible to drive to any standard located on the imported blocks by double clicking on the standard in the list first and then double clicking on the coordinate row.

🚏 Automate!	-	
Position List (multi-select) (double-click to see data) — © Standards St 462 Fid 2 Obsidian USNM 11124	0/52 A Move Stage	Automation Actions
C Unknowns C Wavescans C All Samples St 463 Fid 2 Glass, basaltic USNM St 464 Fid 2 Obsidian USNM 11371 St 465 Fid 2 Obsidian USNM 72854 St 465 Fid 2 Obsidian USNM 72854	1134 6 Digitize	Confirm Unknown Positions
St 466 Fid 2 Glass, synthetic tektite St 467 Fid 2 Hornblende (Arenal) US St 468 Fid 2 Hornblende (Kakanui)	SNM Plot	Peak Spectrometers Peaking Acquire Standard Samples
St 469 Fid 2 Hypersthene, johnstow St 470 Fid 2 Ilmenite USNM 96189 Select All St 471 Fid 2 Magnetite (minas gerai	n U: Fiducials s) U:	Acquire Unknown Samples
Go St 473 Fid 2 Olivine (Fo90) USNM 1 Go St 474 Fid 2 Olivine USNM 2566 (Fo St 475 Fid 2 Olivine USNM 1100	113 Replicates	Acquire Standard Samples (again)
Auto Focus St 477 Fid 2 Plagioclase [Lake Cou Update St 478 Fid 2 Garnet USNM 143968	nty) Conditions Sample Setups	Peak on Assigned Standards
Delete All	File Setups	Use "Quick" Standards
Delete Selected Samples	Multiple Setups	Use Beam Deflection For Position
Delete Selected Positions Export Sel	ected Samples (to *.POS)	Confirm All Positions In Sample
Row X Y Z W 1 -17049.70 -7077.103 65.00159 0	Grain # Focus 1 0	Use ROM Auto Focus New Sample Cevery Point Digitized CInterval 5
		Standard Points To Acquire
		Automate Confirm Delay (sec) Standard X Increment (um)
		Re-Standard Y Increment (um) 6
		Re-Standard Interval (hrs) 6
KeV = 15 Curr = 40 Size = 10 Mag = 2533 Mode = Analog S MagAnal = 2533 MagImag = 2533 ImgShift = -2, 3 File Setup = NONE	Spot Sample Setup (row) Number = 0	 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
Multiple Setups = NONE	Replicates = 1	Run Selected Samples

This concludes the initial parameter setup portion of PROBE FOR EPMA.

Manual Peaking and PHA using the Acquire! Window

The user may now manually determine the peak positions from the Acquire! window.

Move to the silicon standard either by double clicking in the **Automate!** window as described on the previous page, or by clicking the **Move** button found in many windows. This opens the **Move Motors and Change Crystals!** dialog box. Enter the coordinates of the standard into the *Stage Target Positions* text boxes. Click the **Go All** button.



The stage motors will move the stage to the expected position of the standard. Inspect the final X, Y location, adjust if necessary and check the focus.

Inspect the spectrometer crystal type and position text boxes, edit if required. The user may also select the element and x-ray line from the Periodic Table function. Click on the **Periodic Table** () button for spectrometer 4, where silicon is measured in this method.

Stage Target X	Positions Y		Remove Fa	raday	Go All	Go Spectros
-17050. Z	-7077.3	Increment	Z Axis Adjus	ement	Positio Au	ns Stage Ito Focus
Jog S Use Stage Ba	tage	Park Stage	Update Pos	itions	Exch Filan	ange Sample nent Standby
Spectrometer	Target Positions	s (Load Element	Setups From Ac	ar quire Ele	ements/C	Close Cations Butto
Spectrometer SP1 TAP 52549.4	Target Positions SP2 LLIF 41970.4	s (Load Element SP3 LPET V 59909.5	Free/Cla Setups From Ac SP4 TAP 26937.9	ar squire Ele SP LLIF 44979.	sments/C	Close Cations Butto
Spectrometer SP1 TAP V 52549.4	SP2 LLIF 41970.4 2 C	s (Load Element SP3 LPET 59909.5 3 3	Setups From Ac SP4 TAP V 26937.9	ar squire Ele SP LLIF 44979. 5	ements/C 5 8 [0	Close Cations Butto

The **Select Element and Xray for Spectrometer** window opens, click on Si in the periodic table.

Se	elect Element and Xray for Spectrometer 4 Crystal TAP																		
	н		Ka Kb La Lb Ma Mb OK										He						
	Li	Be	Si ka at 27740.57 (1.73984 keV) Ang= 7.12624, Ec= 1.83900 Cancel B C N O F											Ne					
	Na	Mg	Eo	/Ес ((@15	keV]) = 8.	1566	1				AI	Si	Р	S	CI	Ar	
	к	Ca	Sc	Ti	v	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
	RЬ	Sr	Y	Zr	NЬ	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
	Cs	Ba		Hf	Ta	w	Re	0s	lr.	Pt	Au	Hg	TI	Рb	Bi	Ро	At	Rn	
	Fr	Ra																	
			La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	ть	Dy	Ho	Er	Tm	YЬ	Lu		
			Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm					

Click the **OK** button to return to the **Move Motors and Change Crystals!** window.



The Move Motors and Change Crystals! window appears as below.

Send the spectrometer directly to the theoretical position by clicking the Go Spectros button.

The user could peak spectrometers as well as adjust the PHA parameters (baseline, window, gain, and bias) from the **Move Motors and Change Crystals!** window by clicking on the respective Peaking (2) and PHA (2) buttons next to the Periodic Table buttons, but in this exercise the peaking functionality of the **Acquire!** window will be used for this purpose.

Click the **Peaking Options** button of the **Acquire!** window.

👎 Acquire!	- Carlos (- Constant)	-	an and the			
SP1 SP2 52549.4 41970.4	SP3 SP4	SP5	X -13511. 376	Y Z 53.1 307.999	Spectro	Progress
1-TAP 2-LL .00	JIF 3-LPET 00 .00	4-TAP .00	5-LLIF .00	Faraday .00		
Current Sample: Un 1 Normal Acquisition Unkr	* template for pyroxen nown	ie	Start Standard	or Unknown Acquisition	-13511.	37653.1
Data Rows: 0	Good Data Rows: 0		Sta	rt Wavescan	um .000000	.000000 0
New Sample	РНА		Imaging	Peaking Options	Magnification	2533
Elements/Cations	Peak/Scan Options	Acq	uisition Options	Start Peaking	Kilovolts	Analog Spot
Analytical Conditions	Count Times	Sp	oecial Options	Move	Beam Current	40
Combined Conditions	Locate		Rate Meter	Stage	DCGIII 3/26	

This opens the **Peaking Options** dialog box.



From the *Peak Center Method* group, choose *Interval Halving* (see User's Guide and Reference documentation for discussion of various Peak Center methods) and click *Display Spectrometer Pre-Scan for Confirmation* from the *Peak Center Options* choices. Finally, select the *Si ka Spec* 4 TAP (27738.0) selection under the *Elements to Peak* list box.

The **Peak Center** window should appear as follows. An example of the more commonly used ROM based peaking will be displayed as well.



Click the **OK** button to close the **Peaking Options** dialog box.

👎 Acquire!	- I'm I continue	-					. 🗆 🗙
SP1 SP2 52549.4 41970.4	SP3 SP4 SP5 59909.5 26937.9 44979.8		X -13511. 376	¥ 53.1 307.9	Y Z 3.1 307.999		Progress
1-TAP 2-LI .00	LIF 3-LPET 4-TAP		5-LLIF Farada .00 .00		araday .00 000000		
Current Sample: Un 1 * template for pyroxene Normal Acquisition Unknown Start Standard or Unknown Acquisition -13511. 370 um .000000 .000						37653.1 .000000	
New Sample	New Sample PHA		Imaging	Peaking	Peaking Options		0 2533 Analog Spot
Elements/Cations Analytical Conditions	Count Times	s Acq Sp	uisition Uptions becial Options		Move		15 40 10
Combined Conditions	Locate		Rate Meter	Sta	Stage		

Click the **Start Peaking** button in the **Acquire!** window.

This action opens the **Prescan/Postscan Acquisition** window. The software then performs a peak pre-scan (40 step, user defined parameter) on spectrometer 4 in the Si K α region.



Click on a graph to toggle the display between graphs for all spectrometers and a single spectrometer.



Upon completion of the spectrometer pre-scan the **Peak Center Start Position Selection** window opens. Slide the scroll bar to move the vertical (maroon) peak line to match the actual x-ray maximum position. This selects a starting peak center position for the peaking routine.



Click the **OK** button when manually centered. This initiates a peak center routine to locate the precise peak center. The **Peak/ROM/PHA Scan Acquisition** window opens and real time peaking can be viewed.



The results appear in the main log window, displayed below.

Probe for EPMA [C:\UserData\Doe\silicates01.MDB]							x				
File Edit	Standard Xray	Analytical Wi	ndow Run	Output	Help						
	Acquire!		Analyze!			Automate!			Plot!		
KILO:	15.00 15.	00 15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	-	
ENERGY	1.740 4.5	09 1.487	4.950	5.412	6.400	5.895	1.254	3.691	1.041		
EDGE :	1.839 4.9	67 1.560	5.466	5.990	7.112	6.539	1.305	4.039	1.073		
Eo/Ec:	8.16 3.	02 9.62	2.74	2.50	2.11	2.29	11.49	3.71	13.98		
STDS:	453	22 13	23	24	26	25	473	2401	303		
Starting	spectrometer	r peaking p	rocedure	for Si	ka on sp	pectro 4	•				
Si ka Sp	ectro 4, Sto	pPk: 2773	8.7, Sto	pI:	873.9						
L											
Interval	Peak Center	Results:						_			
Element	Spectr Pe	aked Star	tPk S	topPk	Offset	StartI	Stop1	I			
S1 ka	4 TAP	Yes 277	38.0 2	7738.7	1.83	911.4	873	.9			
Ti ka	I 3 LPET I	NO .UU	0000 .	000000	.016	.0		.0			
AI ka	4 TAP	NO .UU	0000 .	000000	.025	.0		. 0			
Vka	2 LLIF	No .00	0000 .	000000	.031	.0		.0			
Crka	2 LLIF	No .00	0000 .	000000	.016	.0		.0			
Fe ka	5 LLIF	No .00	0000 .	000000	30.4	.0		.0			
Mn ka	5 LLIF	No .00	0000 .	000000	30.9	.0		.0			
Mg ka	1 TAP 1	No .00	0000 .	000000	05	.0		.0			
Ca ka	3 LPET 1	No .00	0000 .	000000	12.6	.0		.0			
Na ka	1 TAP	No .00	0000 .	000000	05	.0		.0		_	
L										=	
1											
<u> </u>										T	
Motion: Re	ady							Cancel	Pause		

While *Interval Halving* is the most accurate peaking method, it is also the slowest. Many microprobes support *ROM Based* peak center scans. An illustration is provided below. Select the *ROM Based* method and highlight the appropriate elements in the *Elements to Peak* list. Click the **OK** button.

Peaking Options						
Elements to Peak (multi-select) Si ka Spec 4 TAP (27738.7) Ti ka Spec 3 LPET (31430.0) Al ka Spec 4 TAP (32465.9) V ka Spec 2 LLIF (62209.1) Cr ka Spec 2 LLIF (56898.5) Fe ka Spec 5 LLIF (48085.0) Mn ka Spec 5 LLIF (52202.0) Mg ka Spec 1 TAP (38499.2) Ca ka Spec 3 LPET (38387.0) Na ka Spec 1 TAP (46362.9)	Peak Center Method OK O Interval Halving OK O Parabolic Fit Cancel O Manual (Pre/Post Scan Only) Cancel ROM Peaking Type O Internal O Parabolic © Maxima O Gaussian					
	Threshold .33 .33 .33 .33 C Dual Maxima/Parabolic C Dual Maxima/Gaussian C Highest Intensity Peak Center Options					
Double-click element to move to spectrometer peak position	 Acquire Automated PHA Scan Prior To Peaking Acquire Automated PHA Scan After Peaking Acquire PHA Baseline/Window Scan Acquire PHA Bias Scan (detector voltage) Acquire PHA Gain Scan (detector gain) 					
Move Selected Elements To On-Peak Positions Plot Selected Peak Center	 Display PHA Dialog Prior To Peaking (manual) Display PHA Dialog After Peaking (manual) Display Spectrometer Pre-Scan for Confirmation Display Spectrometer Post-Scan for Confirmation 					
Return To On Peak (start analysis) Positions	 Use ROM Based Scanning for Pre/Post Scan Skip P/B Check Before Peaking Spectrometer 					

Start the peak process by clicking the **Start Peaking** button in the **Acquire!** window.
Real time peaking may be observed (in the **Peak/ROM/PHA Scan Acquisition** window) as the ROM scan progresses. After completion, the **Peak/ROM/PHA Scan Acquisition** window opens again and the peak is displayed.



All spectrometer peaking and PHA scans are automatically saved to the probe run. These can be reviewed by selecting the **Run** | **Display, Fit and Export Spectrometer Peaking and PHA Scans** menu in the main Probe for EPMA log window.

Probe for EPMA [C:\UserData\Doe\silicates01.MDB]]			x
File Edit Standard Xray Analytical Window	Run	Output Help		
Acquire! A		List Run Summary	Ctrl+R	
		List Sample Rows, Names, Conditions	Ctrl+N	
Miscellaneous Sample Acquisition/Cal		List Anomalous Intensity Data for Standards or Unknowns		
ENERGY 1.740 4.509 1.487 4.5		List Sample Calculation Options	Ctrl+O	
EDGE: 1.839 4.967 1.560 5.4		List Standard Counts (Intensities)	Ctrl+I	
Eo/Ec: 8.16 3.02 9.62 2.		List Standard Compositions		
STDS: 453 22 13		List Fiducial Coordinate Sets		
Starting spectrometer peaking proceed Si ka Spectro 4, StopPk: 27738.7,		List Current MACs		
Interval Peak Center Results:		List Current Alpha Factors		
Element Spectr Peaked StartPk				
Ti ka 3 LPET No .000000		Display, Fit and Export Spectrometer Peaking and PHA Scans		
Al ka 4 TAP No .000000		Display, Annotate and Export Analog Signal Images		
V ka 2 LLIF No .000000				
Fe ka 5 LLIF No .000000		Display Time Dependent (TDI) and Alternating (on/off) Intensities		
Mn ka 5 LLIF No .000000		Display Integrated Intensities		=
Mg ka 1 TAP No .000000		Display Calibration Curve Intensities (multi-standard)		
Naka 1 TAP No .000000		Display MultiPoint Background Intensities		
				-
Motion: Ready		Display PictureSnap		:e //



The Display PHA, Peaking and Peak Scan Data window opens.

The user has the option to check the fitting (change radio buttons in list) and view the threshold values (set in the PROBEWIN.INI file as well as edited in the **Peaking Options** window). As well as Export capabilities.

Click the **Close** button to exit this dialog.

Next, the PHA properties for each element need to be checked. Each spectrometer has a single channel analyzer that selects pulses of interest (the amplitude of the pulse from the detector is proportional to the energy of the incident x-ray photon) and then outputs this pulse to the counting electronics. PROBE FOR EPMA allows adjustment of the baseline, window, whether the SCA is run in integral or differential mode, and the gain and/or bias voltage of the counter.

Most microprobe automation systems have gain and bias hardware interfaces. However, JEOL instruments typically run a fixed gain setting and allow bias scans on a per element basis. The object is to place the pulse height peak near 4 volts by adjusting the bias. Each element may have a slightly different bias value. On Cameca instruments both bias and gain scans can be performed and the gain value can be adjusted to change the position of the pulse height maximum, typically to a value around 2-2.5 volts.

Click the **PHA** button in the **Acquire!** window.

Acquire!								X
SP1 SP2	SP3 SP4	SP5	x	Y	Z		Spectro F	roaress
52549.4 41970.4	59909.5 26937.9	44979.8	-13511. 37	653.1 30	07.999			
1-TAP 2-LI	IF 3-LPET	4-TAP	5-LLIF		Faraday			
.00 .	.00 .00	.00	.00		.00			
L .					.000000		0	
Current Sample: Un 1	* template for pyroxe	ne						
Normal Acquisition Unkr		-13511.	37653.1					
Data Rows: 0	Good Data Rows: 0		S	um	.000000 N	.000000 0		
New Sample	РНА		Imaging	Pea	aking Options	Magnific Beam M	cation	2533
Elements/Cations	Peak/Scan Option:	s Acqu	uisition Options	S	tart Peaking	Kilovolts	, ,	Analog Spot
Analytical Conditions	Count Times	Sn	ecial Ontions		Move	Beam C	urrent	40
Children Conditions	COURT TIMES		-	_		Beam S	ize	10
Combined Conditions	Locate		Hate Meter		Stage			

The Pulse Height Analysis (PHA) window opens.

	Element	Spectro	Crystal	Baseline	Window	Inte/Diff	Gain	Bias	Deadtime	Slit Size	Slit Pos.	Det.
9	Si ka	4	TAP	.56	4.99	INTE	2100.00	1300.	3.00			
1	Tika	3	LPET	.56	4.99	INTE	873.00	1845.	3.00			
1	Alka	4	TAP	.56	4.99	INTE	2759.00	1317.	3.00			
1	V ka	2	LLIF	.56	4.99	INTE	393.00	1837.	3.00			
(Crka	2	LLIF	.56	4.99	INTE	393.00	1838.	3.00			
F	Fe ka	5	LLIF	.56	4.99	INTE	375.00	1824.	3.00			
	Mn ka	5	LLIF	.56	4.99	INTE	375.00	1824.	3.00			
1	Mg ka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			
(Ca ka	3	LPET	.56	4.99	INTE	873.00	1845.	3.00			
1	Na ka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			
1	Ca ka Na ka	3 1	LPET TAP	.56 .56	4.99 4.99	INTE INTE	873.00 2874.00	1845. 1328.	3.00 3.00			

To select the first element to evaluate (Si), click its element row.

The **PHA Properties** window appears. Run a Bias scan for Si by clicking on the **Acquire and Graph Bias Scan Distribution** button.

PHA Properties	
Enter PHA Properties For Spec: 4 Si ka	OK
Baseline Window	Cancel
Gain Bias	Set PHA
2100.00	Get PHA
Calculate Empirical PHA Deadtime (software) 3.00	Move On Peak
Use Differential PHA Mode	Adjust PHA
 Do Not Move Spectrometer On-Peak Before Scan Do Not Set Analytical or Column Conditions Before Perform a PHA scan to check the proper baseline or window of the detector pulse height analyzer. Perform a bias or gain scan to Count Time 	Scan Distribution Intervals 30
determine the proper bias or gain for a given gain or bias setting. Bias/Gain Scan Window	d Graph PHA ribution
Scan BaseL Scan Wind 2.1 Scan Bias of	or Gain
Bias and Gain Scan Ranges Count Time Bias Low Bias High 1200 1450	d Graph Bias
Gain Low Gain High 500. 3200. Count Time Acquire an Scan D	a Intervals 30 Ind Graph Gain distribution
Enter Detector Parameters For Spec: 4 Si ka Slit Size Slit Position D	etector Mode

At the completion of the bias scan the **PHA Bias Distribution Plot for spectrometer 4** window will be visible. Read the bias value for the maximum Si count rate from the plot and click the **Close** button.



Edit the *Bias* text field in the **PHA Properties** window with the appropriate value, here 1317. On Cameca instruments only, run a gain scan by clicking on the **Acquire and Graph Bias Scan Distribution** button.

PHA Properties	
Enter PHA Properties For Spec: 4 Si ka	пк
Baseline Window	Cancel
.56	
Gain Bias	Set PHA
2100.00	Get PHA
Calculate Empirical PHA 3.00	Move On Peak
🗌 Use Differential PHA Mode	Adjust PHA
 Do Not Move Spectrometer On-Peak Before Scan Do Not Set Analytical or Column Conditions Before Scan Perform a PHA scan to check the proper baseline or window of the detector pulse height analyzer. Perform a bias or gain scan to determine the proper bias or gain for a given gain or bias setting. 	Scan Sistribution Intervals 30 d Graph PHA
Bias/Gain Scan Window Dist	ribution
Scan BaseL Scan Wind 2.1 Scan Bias o	r Gain
Bias and Gain Scan Ranges Count Time Bias Low Bias High 1200 1450	30 d Graph Bias istribution
Gain Low 500. 3200. Count Time Count Time Count Time Count Time Count Time Count Time Count Scan D	Intervals 30 d Graph Gain istribution
- Enter Detector Parameters For Spec: 4 Si ka-	
Slit Size Slit Position D	etector Mode

At the completion of the gain scan the **PHA Gain Distribution Plot for spectrometer 4** window will be visible. Read the gain value for the maximum Si count rate from the plot and click the **Close** button.



Edit the Gain text field in the PHA Properties window with the appropriate value, here 1940.

Next, run a PHA scan to evaluate the appropriate baseline and window (if in differential mode operation) settings as well as gain and bias settings for the element of interest. Click the **Acquire and Graph PHA Distribution** button in the **PHA Properties** window.



The **PHA Distribution Plot** window will display at the completion of the scan.

Click the **Close** button to return to the **PHA Properties** window. Click the **OK** button to close the **PHA Properties** window. Note the new *Bias* and *Gain* values for Si in the **Pulse Height Analysis (PHA)** window.

hannel	Element	Spectro	Crystal	Baseline	Window	Inte/Diff	Gain	Bias	Deadtime	Slit Size	Slit Pos.	Det.
	Si ka	4	TAP	.56	4.99	INTE	1940.00	1317.	3.00			
	Tika	3	LPET	.56	4.99	INTE	873.00	1845.	3.00			
	Al ka	4	TAP	.56	4.99	INTE	2759.00	1317.	3.00			
	V ka	2	LLIF	.56	4.99	INTE	393.00	1837.	3.00			
	Cr ka	2	LLIF	.56	4.99	INTE	393.00	1838.	3.00			
	Fe ka	5	LLIF	.56	4.99	INTE	375.00	1824.	3.00			
	Mn ka	5	LLIF	.56	4.99	INTE	375.00	1824.	3.00			
	Mg ka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			
	Ca ka	3	LPET	.56	4.99	INTE	873.00	1845.	3.00			
0	Naka	1	TAP	.56	4.99	INTE	2874.00	1328.	3.00			
					1.33		2014.00	1320.	5.00			

Click the **OK** button to close the **Pulse Height Analysis (PHA)** window returning to the **Acquire!** window.

Manual Count Acquisition using the Acquire! Window

To acquire a single point of x-ray count data for a standard proceed as follows. From the **Acquire!** dialog box click the **New Sample** button.



This opens the **New Sample** window. Click on *Standard* from the *New Sample Type* buttons. This allows the user to specify a standard from the list now active at the bottom of the *New Sample* dialog box. Click *12 MgO synthetic*, its name now appears under *New Sample Name*. Click the **OK** button when done.

			-						
New Sample Type	OK	Canc	el						
C Unknown	Load Eleme	nt Setup	s						
O Wavescan	Load Samp	ole Setup	•						
	Load File	Setup							
Add/Remove Standards	Load Multip	ole Setup							
make any necessary changes to the element setup. Load Wavescan From Another Probe Run									
MgU synthetic									
MgU synthetic New Sample Descript	ion	Add <	cr>						
MgU synthetic New Sample Descript 1. UCB # M3567, 99. 0.2%	ion 8%, EPMA (UCB)	Add < : Ca ~	cr>						
MgU synthetic New Sample Descript 1. UCB # M3567, 99. 0.2% 2. C. M. Taylor, 99.9	ion 8%, EPMA (UCB) 8%, EPMA (UCB)	Add < : Ca ~ Ca ~	 						
MgU synthetic New Sample Descript 1. UCB # M3567, 99. 0.2% 2. C. M. Taylor, 99.9 To add standards to the s then click the Standard ! th	ion 8%, EPMA (UCB) 8%, EPMA (UCB) tandard list below, c Add Standards to Ru re main menu.	Add < Ca ~ Ca ~ ancel this (n menu ite	cr> tialog, m fron						
MgU synthetic New Sample Descript 1. UCB # M3567, 99. 0.2% 2. C. M. Taylor, 99.9 To add standards to the s then click the Standard I/ th 12 MgU synthetic	ion 8%, EPMA (UCB) 8%, EPMA (UCB) 8%, EPMA (UCB) tandard list below, c. Vadd Standards to Ru te main menu.	Add < Ca ~ Ca ~ ancel this o n menu ite	dialog, m fron						

Check the optical focus on the standard and click the **Start Standard or Unknown Acquisition** button of the **Acquire!** window to initiate the data acquisition.

🜱 Acquire!	to the Annal And	and and and				
SP1 SP2 52549.4 41970.4	SP3 SP4	SP5 2 44979.8 -13511	<mark>к у</mark> . 37653.1 3	Z 307.999	Spectro P	rogress
1-TAP 2-L	LIF 3-LPET .00 .00	4-TAP 5-LL .00	00	Faraday .00 .000000		
Current Sample: Un Normal Acquisition Un Data Rows: 0	nown Acquisition	-13511. um .000000	37653.1 .000000 0			
New Sample	РНА	Imaging	P	eaking Options	Magnification	2533
Elements/Cations	Peak/Scan Options	s Acquisition Op	otions	Start Peaking	Kilovolts	Analog Spot
Analytical Conditions	Count Times	Special Opti	ions	Move	Beam Current	40
Combined Conditions	Locate	Rate Mete	:f	Stage	Deam 5128	10

The progress of all data acquisition may be viewed in the **Acquire!** window. The current sample is displayed in the **Acquire!** window and the spectrometers move to their respective peak positions for the first elements and count on peak and off peak for times specified earlier in the **Count Times** window. Off peak measurements are not performed for Si, Fe, Mg, and Ca as the MAN background type was selected earlier. The Faraday cup is also measured.

🜱 Acquire!							_ 🗆 🗙
SP1 SP2 38499.9 62721.0	SP3 SP 30491.1 31231.	4 SP5	X	¥ 77.3 65.	Z 0021	Spectro TAP LLIF	Progress LPET TAP LLIF
Mg-TAP V 10.00 3 46912.	-Hi Ti-Lo .47 5.00 88. 182.	Al-Lo 5.00 63.	<u>Mn-Lo</u> 5.00 114.		Absorbed .00	Mg Na Cr	Ti Al Mn
Current Sample: St 12 Normal Acquisition Star Data Rows: 0	wn Acquisition an	-17050. um .000000 px 0	Ca Si Fe -7077.3 .000000 0				
New Sample	PHA		Imaging	Peak	king Options	Magnification	2533
Elements/Cations	Peak/Scan Opti	ions Acqu	uisition Options	Sta	rt Peaking	Kilovolts	Analog Spot
Analytical Conditions	Analytical Conditions Count Times Sp		ecial Options		Move	Beam Current	40
Combined Conditions	Locate		Rate Meter		Stage	Deam 3128	

After completion of acquisition, the results are written to the log window.

👎 Probe f	or EPMA [C	:\UserData\I	Doe\silicates	01.MDB]							x
File Edit	Standard	Xray Ar	nalytical W	indow Rur	n Output	Help					
	Acquire!			Analyze!			Automate	!		Plot!	
St	12 Set	t 11	MgO sy	ntheti	c						-
St 12 TakeOff	Set 1	KiloVol	t = 15	Beam ('urrent =	= 40 0 1	Ream Size	a = 10			
(Magnif	ication	(analvti	ical) =	2533),	Jurromo	Beam Mode	e = Analo	or Spot			
(Magnif	ication	(default	t) =	2533, Ma	gnificat	tion (ima	aging) =	2533)			
Image S	hift (X,	(Y):	-		-	-	-2.00), 3.00			
1 100	# M2567	00.04	EDMA (III		0.04						
2. C. M	# MSS67, . Tavlor	, 99.0 0 , c. 99.989	EPMA (UC	(UCB) Ca^	~ 0.2 % ~ 0.02%						
		.,	.,	(002) 04	0.020						
On and	Off Peak	C Positio	ons:								
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
ONPEAK	27738.0	31430.0	32465.9	62209.1	56898.5	48085.0	52202.0	38499.2	38387.0	46362.9	
UFFSET	2.56641	.015625	.025391	.031250	.015625	30.3867	30.9023	04688	12.5859	05078	
LOPRAK		30/02 3	31030 0	61694 5	56360 /		51640 4			4/402.1	
HT-OFF		937 699	1233 90	514 598	538 102		561 602			1039 20	
LO-OFF		-937.70	-1233.9	-514.60	-538.10		-561.60			-1039.3	
		501110	120010	011100	000110		001100			100010	
PHA Par	ameters:										
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
DEAD :	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
BASE:	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	
WINDOW	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	4.99	
MODE :	0	0	0	0	0	0	0	0	0	0	
GAIN:	2759.	873.	2759.	393.	393.	375.	375.	2874.	873.	2874.	
BIAS:	1317.	1845.	1317.	1838.	1838.	1824.	1824.	1328.	1845.	1328.	
Last (C	urrent)	On and (Off Peak	Count Ti	imes:						
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	
BGD:	MAN	OFF	OFF	OFF	OFF	MAN	OFF	MAN	MAN	OFF	
BGDS :	MAN	LIN	LIN	LIN	LIN	MAN	LIN	MAN	MAN	LIN	
SPEC:	4	3	4	2	2	5	5	1	3	1	
CRYST:	TAP	LPET	TAP	LLIF	LLIF	LLIF	LLIF	TAP	LPET	TAP	
ORDER :	1	2	2	2	1	1	2	2	1	1	
ONTIM:	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
HITIM:		5.00	5.00	5.00	5.00		5.00			5.00	
LOTIM:		5.00	5.00	5.00	5.00		5.00			5.00	
Miscell	aneous 9	Sample Ad	quisitio	on/Calcul	Lation Pa	arameters	8:				
KILO:	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	
ENERGY	1.740	4.509	1.487	4.950	5.412	6.400	5.895	1.254	3.691	1.041	
EDGE :	1.839	4.967	1.560	5.466	5.990	7.112	6.539	1.305	4.039	1.073	
Eo/Ec:	8.16	3.02	9.62	2.74	2.50	2.11	2.29	11.49	3.71	13.98	=
STDS:	453	22	13	23	24	26	25	473	2401	303	
OFF D	k Corres	tod or 1	ANI On D	ank V mer	. Compt-	(ma /20	00406-11				
RIEM.	si ka	Tika	ALV ON-Pe	sak X-ray V ka	Crka	(Cps/39) Fe ka	.99426nA) Mn k∍	: Morka	Ca ka	Na ka	
SLOPI:	JIKd	11 Kd	AI Kd	v Kd	UT Kd	re kd	rai Kd	ng Kd	Ca Kd	na Kd	*
Motion: R	eady								Car	ncel Pau	use 🛛 🥂

Repeated clicking of the **Start Standard or Unknown Acquisition** button acquires additional intensity data. The following log window illustrates the acquisition of three data points on the MgO standard.

File Edit Standard Xray Analytical Window Run Output Help Acquirel Analyzel Automatel Plot Last (Current) On and Off Peak Count Times: ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BGD: MAN OFF OFF OFF OFF OFF MAN OFF MAN MAN OFF BGDS: MAN LIN LIN LIN LIN LIN MAN LIN MAN MAN DFF ORDER: 4 3 4 2 2 5 5 1 3 1 CRYST: TAP LEET TAP LLIF LLIF LLIF LLIF TAP LEET TAP ONTIM: 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 HITIM: 5.00 5.00 5.00 5.00 5.00 5.00 LOTIM: 5.00 5.00 5.00 5.00 5.00 5.00 Miscellaneous Sample Acquisition/Calculation Parameters: RILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.995 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 2 - 1 - 1 -1.9 22.9 .6 4756.2 45.94 40.010 2G 13.0 2.57 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.58 39.976 AVER: 13.1 -2.32 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.9990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 6 .8 0.018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 .9.4 .4 .5 FRSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	👎 Probe f	or EPMA [C	:\UserData\Do	e\silicates0	01.MDB]			-	1. A.				x
Acquire! Analyze! Automate! Plot! Last (Current) On and Off Peak Count Times: ELEM: Si ka Ti ka Al ka V ka Cr ka Pe ka Mn ka Mg ka Ca ka Na ka BGD: MAN OFF OFF OFF OFF MAN OFF MAN MAN OFF MAN MAN OFF BGDS: MAN LIN LIN LIN LIN LIN MAN LIN MAN MAN MAN OFF MAN MAN OFF 3 1 CRYST: TAP LPET TAP LLIF LLIF LLIF LLIF TAP LPET TAP 1 2 2 2 1 1 2 2 1 1 ORDER: 1 2 2 2 2 1 1 2 2 2 1 1 0.00 10.00 10.00 10.00 10.00 10.00 ONTTM: 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 ONTTM: 5.00 5.00 5.00 5.00 5.00 5.00 5.00 5.00 LOTTM: 5.00 5.00 5.00 5.00 5.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 Miscellaneous Sample Acquisition/Calculation Parameters: KILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERCY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 EO/Es: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mi ka Mg ka Ca ka	File Edit	Standard	Xray Analy	ytical Wi	ndow Run	Output	Help						
Last (Current) On and Off Peak Count Times: ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BGD: MAN OFF OFF OFF OFF MAN OFF MAN MAN OFF BGDS: MAN LIN LIN LIN LIN LIN MAN LIN MAN MAN LIN SFEC: 4 3 4 2 2 5 5 1 3 1 CRYST: TAP LPET TAP LLIF LLIF LLIF LLIF TAP LPET TAP ORDER: 1 2 2 2 1 1 2 2 1 1 ONTIM: 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 HITIM: 5.00 5.00 5.00 5.00 5.00 5.00 LOTIM: 5.00 5.00 5.00 5.00 5.00 5.00 Miscellaneous Sample Acquisition/Calculation Parameters: RILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.467 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Rc: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .21 -1.9 22.9 .6 4756.2 45.94 40.010 2G 13.0 2.57 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.58 39.976 AVER: 13.1 -2.32 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 HISD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61		Acquire	ļ		Analyz	e!		Aut	omate!			Plot!	
Last (Current) On and Off Peak Count Times: ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BGD: MAN OFF OFF OFF OFF MAN OFF MAN MAN OFF BGDS: MAN LIN LIN LIN LIN LIN MAN LIN MAN MAN LIN SPEC: 4 3 4 2 2 5 5 1 3 1 CRYST: TAP LPET TAP LLIF LLIF LLIF LLIF TAP LPET TAP ORDER: 1 2 2 2 1 1 2 2 1 1 ONTIM: 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 10.00 HITIM: 5.00 5.00 5.00 5.00 5.00 5.00 LOTIM: 5.00 5.00 5.00 5.00 5.00 5.00 Miscellaneous Sample Acquisition/Calculation Parameters: KILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426A): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .21 -1.9 22.9 .6 4735.2 45.94 40.010 2G 13.0 2.57 2.1 -2.3 24.6 2.6 4731.2 46.5 -1.0 39.993 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 -1.0 39.990 SDEV: .1 4.44 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 FRR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 FRR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 FRR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5													
BLEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Naka BGD: MAN OFF OFF OFF OFF MAN OFF MAN MAN OFF BGDS: MAN LIN LIN LIN MAN LIN MAN <	Last (C	urrent)	On and Of	f Peak	Count Tim	nes:							
BGD: MAN OFF OFF OFF MAN OFF MAN LIN LIN LIN LIN LIN LIN LIN LIF LLIF LIF LIF LIS	ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe k	a Mnka	Mg ka	Ca ka	Na ka		
BCDS: MAN LIN LIN LIN LIN MAN LIN MAN LIN MAN LIN SPEC: 4 3 4 2 2 5 5 1 3 1 CRYST: TAP LPET TAP LLIF LLIF LLIF LLIF TAP LPET TAP ORDER: 1 2 2 1 1 2 2 1 1 ONTIM: 10.00	BGD:	MAN	OFF	OFF	OFF	OFF	MA	N OFF	MAN	MAN	OFF		
SPEC: 4 3 4 2 2 5 5 1 3 1 CRYST: TAP LPET TAP LLIF LLIF LLIF LLIF LLIF TAP LPET TAP ORDER: 1 2 2 1 1 2 2 1 1 ONTIM: 10.00 <td>BGDS:</td> <td>MAN</td> <td>LIN</td> <td>LIN</td> <td>LIN</td> <td>LIN</td> <td>MA</td> <td>N LIN</td> <td>MAN</td> <td>MAN</td> <td>LIN</td> <td></td> <td></td>	BGDS:	MAN	LIN	LIN	LIN	LIN	MA	N LIN	MAN	MAN	LIN		
CRYST: TAP LPET TAP LLIF LLIF LLIF LLIF TAP LPET TAP ORDER: 1 2 2 1 1 2 2 1 1 ORDER: 1 0.00 10.00 10.00 10.00 10.00 10.00 10.00 ONTIM: 5.00 5.00 5.00 5.00 5.00 LOTIM: 5.00 5.00 5.00 5.00 15.00 15.00 15.00 15.00 Miscellaneous Sample Acquisition/Calculation Parameters: KILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.633 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 So/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.9 1.49	SPEC:	4	3	4	2	2		5 5	1	3	1		
ORDER: 1 2 2 1 1 2 2 1 1 ONTIM: 10.00 10.01 10.01	CRYST:	TAP	LPET	TAP	LLIF	LLIF	LLI	F LLIF	TAP	LPET	TAP		
ONTIM: 10.00 <t< td=""><td>ORDER:</td><td>1</td><td>2</td><td>2</td><td>2</td><td>1</td><td></td><td>1 2</td><td>2</td><td>1</td><td>1</td><td></td><td></td></t<>	ORDER:	1	2	2	2	1		1 2	2	1	1		
HITIM: 5.00 5.00 5.00 5.00 5.00 LOTIM: 5.00 5.00 5.00 5.00 5.00 5.00 Miscellaneous Sample Acquisition/Calculation Parameters: KIL0: 15.00 1.03	ONTIM:	10.00	10.00	10.00	10.00	10.00	10.0	0 10.00	10.00	10.00	10.00		
LOTIM: 5.00 5.00 5.00 5.00 5.00 5.00 5.00 Miscellaneous Sample Acquisition/Calculation Parameters: KILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .21 -1.9 22.9 .6 4756.2 45.94 40.010 2G 13.0 2.57 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.58 39.976 AVER: 13.1 -2.32 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 .9.4 .4 .5 *RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	HITIM:		5.00	5.00	5.00	5.00		- 5.00			5.00		
Miscellaneous Sample Acquisition/Calculation Parameters: KILO: 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 15.00 ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426A): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .21 -1.9 22.9 .6 4756.2 45.94 40.010 2G 13.0 2.57 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.58 39.976 AVER: 13.1 -2.32 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 *RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	LOTIM:		5.00	5.00	5.00	5.00		- 5.00			5.00		
KILO: 15.00 <td< td=""><td>Miscell</td><td>aneous S</td><td>Sample Acq</td><td>uisitio</td><td>n/Calcula</td><td>ation Pa</td><td>aramete</td><td>rs:</td><td></td><td></td><td></td><td></td><td></td></td<>	Miscell	aneous S	Sample Acq	uisitio	n/Calcula	ation Pa	aramete	rs:					
ENERGY 1.740 4.509 1.487 4.950 5.412 6.400 5.895 1.254 3.691 1.041 EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): E ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.2 1.3 16.3 .	KILO:	15.00	15.00	15.00	15.00	15.00	15.0	0 15.00	15.00	15.00	15.00		
EDGE: 1.839 4.967 1.560 5.466 5.990 7.112 6.539 1.305 4.039 1.073 Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): E ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 6 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.	ENERGY	1.740	4.509	1.487	4.950	5.412	6.40	0 5.895	1.254	3.691	1.041		
Eo/Ec: 8.16 3.02 9.62 2.74 2.50 2.11 2.29 11.49 3.71 13.98 STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 <td< td=""><td>EDGE :</td><td>1.839</td><td>4.967</td><td>1.560</td><td>5.466</td><td>5.990</td><td>7.11</td><td>2 6.539</td><td>1.305</td><td>4.039</td><td>1.073</td><td></td><td></td></td<>	EDGE :	1.839	4.967	1.560	5.466	5.990	7.11	2 6.539	1.305	4.039	1.073		
STDS: 453 22 13 23 24 26 25 473 2401 303 Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 6 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2	Eo/Ec:	8.16	3.02	9.62	2.74	2.50	2.1	1 2.29	11.49	3.71	13.98		
Off-Peak Corrected or MAN On-Peak X-ray Counts (cps/39.99426nA): ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4	STDS:	453	22	13	23	24	2	6 25	473	2401	303		
ELEM: Si ka Ti ka Al ka V ka Cr ka Fe ka Mn ka Mg ka Ca ka Na ka BEAM 1G 13.1 -3.2 .2 1 -1.9 22.9 .6 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 %RSD: .64 <t< td=""><td>Off-Pea</td><td>k Correc</td><td>ted or MA</td><td>N On-Pe</td><td>ak X-ray</td><td>Counts</td><td>(cps/3</td><td>9.99426nA)</td><td>:</td><td></td><td></td><td></td><td></td></t<>	Off-Pea	k Correc	ted or MA	N On-Pe	ak X-ray	Counts	(cps/3	9.99426nA)	:				
1G 13.1 -3.2 $.2$ 1 -1.9 22.9 $.6$ 4756.2 45.9 4 40.010 2G 13.0 2.5 7 2.1 -2.3 25.2 $.3$ 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 $.1$ 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.996 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: $.1$ 4.4 $.5$ 1.6 $.2$ 1.2 1.3 16.3 $.6$ $.8$ $.018$ ISIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: $.0$ 2.6 $.3$ $.9$ $.1$ $.7$ $.7$ 9.4 $.4$ $.5$ $*RSD:$ $.64$ -190.90 -315.01 94.50 -9.03 4.80 111.92 $.34$ 1.34 -78.61	ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe k	.a Mnka	Mg ka	Ca ka	Na ka	BEAM	
2G 13.0 2.5 7 2.1 -2.3 25.2 .3 4725.7 47.1 -1.9 39.983 3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 ISIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 *RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	1G	13.1	-3.2	.2	1	-1.9	22.	9.6	4756.2	45.9	4	40.010	
3G 13.0 -6.2 .1 3.0 -2.3 24.6 2.6 4731.2 46.5 8 39.976 AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 %RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	2G	13.0	2.5	7	2.1	-2.3	25.	2.3	4725.7	47.1	-1.9	39.983	
AVER: 13.1 -2.3 2 1.7 -2.2 24.2 1.2 4737.7 46.5 -1.0 39.990 SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 %RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	3G	13.0	-6.2	.1	3.0	-2.3	24.	6 2.6	4731.2	46.5	8	39.976	
SDEV: .1 4.4 .5 1.6 .2 1.2 1.3 16.3 .6 .8 .018 1SIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 *RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	AVER:	13.1	-2.3	2	1.7	-2.2	24.	2 1.2	4737.7	46.5	-1.0	39.990	
1SIG: 1.1 1.8 1.1 1.6 1.6 1.5 21.6 2.2 1.2 SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 %RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	SDEV:	.1	4.4	.5	1.6	.2	1.	2 1.3	16.3	. 6	.8	.018	
SERR: .0 2.6 .3 .9 .1 .7 .7 9.4 .4 .5 %RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	1SIG:	1.1	1.8	1.1	1.6	1.6	1.	6 1.5	21.6	2.2	1.2		
*RSD: .64 -190.90 -315.01 94.50 -9.03 4.80 111.92 .34 1.34 -78.61	SERR:	.0	2.6	.3	. 9	.1		7.7	9.4	. 4	.5		
1	%RSD:	.64	-190.90 -	315.01	94.50	-9.03	4.8	0 111.92	.34	1.34	-78.61		=
													-
Motion: Ready Cancel Pause	Motion: R	eady									Cance	el Pause	

Similarly, x-ray counts can be acquired on the other standards. Move to the next standard position via the **Move** button and inspect the location and focus. Click the **New Sample** button, select the next standard from the standard list, and click the **OK** button when done.

Wavescan Acquisitions and Off-Peak Adjustments

Wavescans can be performed for example to check for spectral interferences, presence of minor elements, or to check and adjust off-peak positions.

Move to standard 453 (Augite, Kakanui USNM 122142), which is a pyroxene expected to be similar in composition to the unknowns, using the **Move Motors and Change Crystals!** or the **Automate!** window as explained before.

Click the **New Sample** button. Select *Wavescan* under *New Sample Type*, edit the *New Sample Name* and *New Sample Description* text boxes, as desired.



Click **OK** when done.

👎 Acquire!							
SP1 SP2 46364.8 56901.3	SP3 SP 38385.2 27737	24 SP5	X -20599.50	¥ 7.994 50	Z .0049	Spectro I	Progress
<u>1-тар 2-</u> L 10.00 5 46629. 1	LIF 3-LPET .00 5.00 .33. 186.	4-TAP 5.00 51.	5-LLIF 5.00 105.		Faraday 1.00 39.9761	4	•
Current Sample: Wa Normal Wavescan: Ste Data Rows: 0	1 * 453 Augite, Kal p/Count Scan Good Data Rows:	anui 122142 0	Start Standar	d or Unkno tart Waves	own Acquisition	-17050. um .000000	-7077.3 .000000
New Sample	РНА		Imaging	Pea	aking Options	Magnification Ream Mode	2533
Elements/Cations	Peak/Scan Opt	ions Acq	uisition Options	St	art Peaking	Kilovolts	15
Analytical Conditions	Count Times	s Sp	ecial Options		Move	Beam Current	40
Combined Conditions	Locate		Rate Meter		Stage	Dedili Diže	

Click the **Start Wavescan** button of the **Acquire!** window.

This action opens the **Wavescan Acquisition** window and automatically initiates a 100 step (user defined) wavelength scan for all of the elements entered into the current sample.

Graphical output of the completed scan via the **Wavescan Acquisition** window can be seen below for the second set of elements on the respective spectrometers, Mg, V, Ti, Al, and Mn. The Augite Kakanui standards contains Mg and Al as major elements, Ti and Mn as minor elements, and may contain a trace amount of V. Additional peaks are present which will be discussed later.



The wavescan labels appear in the main PROBE FOR EPMA log window.

Probe for EPMA [C:\UserData\D							
File Edit Standard Xray Ana	lytical Window Run Output	Help					
Acquire!	Analyze!	Automate!	Plot!				
Wa 1 453 Augit	e, Kakanui 122142	2	*				
Wa 1 453 Augite, Kakanui 122142 TakeOff = 40.0 KiloVolt = 15.0 Beam Current = 40.0 Beam Size = 10 (Magnification (analytical) = 2533), Beam Mode = Analog Spot (Magnification (default) = 2533, Magnification (imaging) = 2533) Image Shift (X,Y): -2.00, 3.00							
Normal Wavescan: Step/Co Number of Data Lines: 10 First/Last Date-Time: 04 Stage position of first	ount Scan 00 Number o 4/24/2013 11:00:26 AM to data point:	f 'Good' Data Lines: 100 o 04/24/2013 11:11:06 AM					
ELEM: Angstro Si ka A SPEC: 4	Angstro Ti ka Angstro 3	Al ka Angstro V ka 4 2	BEAM				
CRYST: TAP CRY2D: 25.7450 CRVZ: 002180	LPET 8.7500	TAP LLIF 25.7450 4.0267 002180 000058					
ORDER: 1 WVTIM: 5.00	2 5.00	2 2 5.00 5.00					
ONPEAK 27738.0 WAVHI: 30218.6	31430.0 33305.4	32465.9 62209.1 34779.5 63238.3					
WAVLO: 25212.6 HI-OFF 2480.55	29554.6 1875.44	30152.3 61179.9 2313.57 1029.22 2312.6 1000.0					
U-OFF -2525.4 WAVEPT 100	-1875.4 100	-2313.6 -1029.2 100 100	-				
Open: Ready			Cancel Pause 📈				

The wavescan positions and counts may be displayed in the main log window by clicking the **Analyze!** button opening the **Analyze!** window.

Select the *Wavescans* radio button, highlight the *Wa 1 453 Augite, Kakanui 122142* sample and finally click the **Data** button to write the data to the main log window.

👎 Analyze!											_ 🗆 🗾	٢
Sample Li	Sample List (multi-select) (double-click to see intensity data)						Data	KRaws	Combine Analysis Selected S	s Lines From amples		
· Waves	scans	1001100				_ist Report	Calculation (Options	Combine Data Selected S	Lines From amples		
C All Sal Select	All					Pause Between Use All Matrix Co	Samples prrections	Report	Sort Stat and D Geological or Ato Orde	ata Grids In omic Number r		
Add To Save Se	tups					Undelete Selected	d Sample(s)	Match	Do Not Output	To Log		
Specified	Concentratio	ons Standa	ard Assignmen	ts Name/	Description	Conditions	Elements	nt Times /Cations	Combine the Samples into a N	Selected Iew Sample		
Wa 1 453 TO = 40, Ke	Augite, Kakan V = 15, Beam	ui 122142 n = 40, Size = 1	0	.000	Total Oxyger Calculated O	n .0 xygen .0	00 Total We 00 Z · Bar	ight %	Boundary Co	rrections		
X-ray Counts	(cps/39.9943r	nA)		.000	Excess Oxyg	en .0	00 Atomic W	/eight _	Ureate Mate	erial File		
Сору	Si ka	Tika	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	Beam	
Average:	33.6	138.4	81.8	84.0	93.4	98.0	109.5	56.5	99.8	37.8	39.979	
Std Dev:	43.2	287.7	195.3	112.3	143.7	211.6	250.4	127.9	161.2	79.8	.000	
OneSigma:	2.6	5.3	4.0	4.1	4.3	4.4	4.7	3.4	4.5	2.7		
Std Err:	4.3	28.8	19.5	11.2	14.4	21.2	25.0	12.8	16.1	8.0		
%Rel SD:	128.61	207.88	238.71	133.68	153.91	215.84	228.78	226.50	161.62	211.30		
Minimum:	16.8	47.5	15.8	46.1	45.3	30.5	30.4	12.7	47.1	10.1	39.979	
Maximum:	225.8	1490.3	933.8	620.4	779.6	1084.3	1303.6	626.3	864.4	397.0	39.979	
•												F.
Delet	e Selected	Line(s)	Undele	te Selected	Line(s)	Analy	ze Selected Line	(\$)				
Сору	Si ka	Tika	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mgka	Ca ka	Na ka	Beam	
4 G	17.8	49.6	19.2	50.5	53.7	33.4	38.7	13.6	51.4	14.4	39.979	1
56	22.3	53.6	19.6	48.0	46.2	36.6	34.5	14.5	49.0	14.3	39.979	
6 G	18.5	49.2	20.1	54.3	49.0	38.8	38.1	17.8	50.0	11.2	39.979	
76	22.2	48.9	16.4	49.9	48.3	32.6	32.9	14.5	51.4	12.6	39.979	
8 G	19.9	49.1	19.5	50.6	50.4	35.4	35.9	13.6	55.6	10.9	39.979	
96	20.1	54.3	16.3	50.8	53.3	37.0	33.8	13.0	47.4	14 0	39 979	Ŧ
٠ 📄											+	
										Cancel	Next	1.

The output of the first lines of the wavescan data is shown below. Graphical display of these wavescans may be accomplished using the **Plot!** window, where they can also be used to check and adjust off-peak background positions. Click the **Plot!** button

File Edit Standard Xray Analytical Window Run Output Help						
File Edit Standard Xray Analytical Window Run Output Help						
Acquire! Analyze! Automate! Plot!						
Wa 1 453 Augite, Kakanui 122142						
Wa 1 453 Augite, Kakanul 122142						
[Aacoli = 40.0 kilovolt = 15.0 beam current = 40.0 beam Size = 10						
(Magnification (defailt) = 2533, Magnification (imaging) = 2533)						
Image Shift (X,Y) : -2.00, 3.00						
Normal Wavescan: Step/Count Scan						
Number of Data Lines: 100 Number of 'Good' Data Lines: 100						
First/Last Date-Time: 04/24/2013 11:00:26 AM to 04/24/2013 11:11:06 AM						
Stage position of first data point:						
4G -20599. 507.994 50.0049						
PLEM, American Gille American Mille American All he American Mille DRAM						
ELEM: Angstro Si ka Angstro II ka Angstro Ai ka Angstro V ka BEAM						
CRY2D: 25.7450 8.7500 25.7450 4.0267						
CRYK : .002180 .000144 .002180 .000058						
ORDER: 1 2 2 2						
WVTIM: 5.00 5.00 5.00						
ONPEAK 27738.0 31430.0 32465.9 62209.1						
WAVHI: 30218.6 33305.4 34779.5 63238.3						
WAVLO: 25212.6 29554.6 30152.3 61179.9						
HI-OFF 2480.55 1875.44 2313.57 1029.22						
LO-OFF -2525.4 -1875.4 -2313.6 -1029.2						
WAVEPT 100 100 100 100						
Caliburated branchana and Grantes						
Califorated Angstroms and Counts:						
56 6 49101 17.0 2.30537 43.6 7.75812 19.6 2 46435 48 0 39.979						
66 6.50331 18.5 2.59235 49.2 7.76982 20.1 2.46516 54.3 39.979						
7G 6.51633 22.2 2.59551 48.9 7.78191 16.4 2.46592 49.9 39.979						
8G 6.52920 19.9 2.59885 49.1 7.79418 19.5 2.46666 50.6 39.979						
9G 6.54258 20.1 2.60226 54.3 7.80597 16.3 2.46758 50.8 39.979						
10G 6.55532 20.2 2.60563 52.4 7.81817 19.4 2.46831 50.9 39.979						
11G 6.56816 21.8 2.60874 49.5 7.82965 17.5 2.46922 54.5 39.979						
12G 6.58114 17.8 2.61219 54.8 7.84161 19.1 2.47017 47.1 39.979						
13G 6.59458 21.5 2.61541 56.1 7.85403 20.2 2.47083 48.5 39.979						
14G 6.60759 19.7 2.61890 54.4 7.86609 19.2 2.47172 48.8 39.979						
15G 6.62033 19.1 2.62200 48.8 7.87807 19.7 2.47260 51.4 39.979						
166 6.63341 21.9 2.62539 51.7 7.89025 15.9 2.47335 48.9 39.979	-					
Anen: Beadu Cancel P	ause					

The **Plot!** window opens. Click the *Wavescans* radio button under *Sample List*. Click to highlight the *Wa 1 453 Augite, Kakanui 122142* wavescan sample.

Click on *Si ka* (4) *Spectrometer* from the *X*-Axis list and *Si ka* (4) *Wavescan Counts* from the *Y*-Axis list selections. The number following the element label (4, in this case) designates which spectrometer collected the data. The same element may be run on multiple spectrometers (see User's Guide and Reference documentation for additional details). Choose a *Graph Type*, click the *Line* button and an *Output Target* of *Send Data to Plot Window*. Finally, click the **Output** button to view the graph.

Plot!			- C X
Sample List (multi-select)	E U. Manuel Selection	Output Target	
C Standards	1 453 Augite, Kakapui 122142	Send Data to Plot Window	
C Helenene	T 435 Augice, Kakaliul T22142	C Send Data to ASCII File 0	
G Attaurant		C Cond Data To Brinter (con	
• wavescans		Send Data To Printer (sep	arate samplesj
		Include Deleted Points	🔲 Run Information
E transford Only		Data Point Labels	Sample Names
M Acquirea Uniy		ASCII File Column Labels	SURFER .BAS Fi
Select All		Force Black and White Print	Off Peak Labels
Select Analuzel		Normalize Samples (Y Sets)	Normalize Y Sets
		,	
X-Axis		Y-Axis (multi-select)	- Graph Type
Line Numbers	Line Numbers	Line Numbers	
Line Numbers (relative)	Line Numbers (relative)	Line Numbers (relative)	C Scatter
Dn Beam Current	On Beam Current	On Beam Current	C C Line
Ab Beam Current	Ab Beam Current	Ab Beam Current	C Linear-Log
DateTime	DateTime	_ DateTime _	C 3-D (three axes)
Elapsed Hours	Elapsed Hours	Elapsed Hours	
X Stage Coordinates	X Stage Coordinates	X Stage Coordinates	Average Oplu
Y Stage Coordinates	Y Stage Coordinates	Y Stage Coordinates	C Average only
2 Stage Loordinates	Z Stage Loordinates	_ Z Stage Loordinates	Minimum Total
W Stage Loordinates	W Stage Loordinates	W Stage Loordinates	Sum > Loo
Helative Microns Si ka (4) Waxaaan Caunta	Fieldtive Microns	Si ka (4) Managana County	
51 Ka (4) wavescan Counts Ti ka (2) Wavescan Counts	Ti ka (2) Wayeecan Counts	Si ka (4) wavescan counts	Later De Care Ree
Al ka (4) Wayescan Counts	Al ka (4) Wayescan Counts	Al ka (4) Wayescan Counts	Intensity Error Bars
V ka (2) Wavescan Counts	V ka (2) Wayescan Counts	V ka (2) Wayescan Counts	Plot Error Bars
Cr ka (2) Wayescan Counts	Cr ka (2) Wayescan Counts	Cr ka (2) Wayescan Counts	n Signa
Fe ka (5) Wavescan Count	Fe ka (5) Wayescan Count:	Fe ka (5) Wayescan Count	
Mn ka (5) Wavescan Count	Mn ka (5) Wavescan Count	Mn ka (5) Wavescan Count	n Spacing 1
Mg ka (1) Wavescan Count	Mg ka (1) Wavescan Count	Mg ka (1) Wavescan Count	
Ca ka (3) Wavescan Count	Ca ka (3) Wavescan Count	Ca ka (3) Wavescan Count	
Na ka (1) watesean Count	Na ka (1) Wavescan Count	Na ka (1) Wavescan Count	Output
Si ka (4) Spectrometer	Si ka (4) Spectrometer	Si ka (4) Spectrometer	
TI No (c) C Comotor	11 ka [3] Spectrometer	1 ka (3) Spectrometer	
Al ka (4) Spectrometer	Al ka [4] Spectrometer	Al ka (4) Spectrometer	Close
Ka (2) Spectrometer	J¥ Ka (2) Spectrometer	IN Ka (2) Spectrometer	0.000
			Canaal Mout



The program then loads the selected data into the **Plot Graph Data** window.

The **Plot Graph Data** module allows a more robust treatment of the wavescan data. The graph of *Si ka (4) Spectrometer* position versus *Si (4) Wavescan Counts* (labeled as *TAP cps*) is plotted as well as the locations of the on-peak (red vertical line) and both off-peaks (green vertical lines).

Various options are available for evaluation of the data. Besides click and drag *Zoom* capabilities, a large selection of *KLM Markers* options may be enabled to plot theoretical x-ray line positions. Further, a model background option is available (see User's Guide and Reference documentation for a complete discussion of this feature).

With the **Zoom** button active, click and drag the mouse over the region the user wishes to magnify. The *Analyzed Elements* button of the *KLM Markers* may be selected, plotting the various x-ray line positions for all analyzed elements in the current spectrum region.



The default choices for both silicon background positions (green vertical lines) appear sound as no analyzed element lies nearby and the background counts near these peaks are low. Click the **OK** button of the **Plot Graph Data** window to return to the **Plot!** dialog box.

Next, the user evaluates the same data set for manganese. From the **Plot!** dialog box, select *Mn ka* (5) *Spectrometer* from the *X*-*Axis* list and *Mn ka* (5) *Wavescan Counts* from the *Y*-*Axis* list selections. Click the **Output** button.

🚏 Plot!	And the second s		
Sample List (multi-select)	Use Manual Selection 453 Augite, Kakanui 122142	Output Target Send Data to Plot Window Send Data to ASCIL File (X)	Y (7)
 Wavescans Digitized 		Send Data To Printer (sep Include Deleted Points	arate samples)
🔽 Acquired Only		Data Point Labels ASCII File Column Labels	Sample Names SURFER .BAS File
Select All		Force Black and White Print	Dff Peak Labels
Select Analyze!		Normalize Samples (Y Sets)	Normalize Y Sets
X-Axis		Y-Axis (multi-select)	Graph Type
W Stage Coordinates Relative Microns Si ka (4) Wavescan Counts Ti ka (3) Wavescan Counts Al ka (4) Wavescan Counts V ka (2) Wavescan Counts Fe ka (5) Wavescan Counts Fe ka (5) Wavescan Count Mn ka (5) Wavescan Count Mg ka (1) Wavescan Count Ca ka (3) Wavescan Count Na ka (1) Wavescan Count Si ka (4) Spectrometer Ti ka (3) Spectrometer Al ka (4) Spectrometer V ka (2) Spectrometer V ka (2) Spectrometer	Line Numbers Line Numbers (relative) On Beam Current Ab Beam Current DateTime Elapsed Hours X Stage Coordinates Y Stage Coordinates Y Stage Coordinates W Stage Coordinates Relative Microns Si ka (4) Wavescan Counts Ti ka (3) Wavescan Counts Al ka (4) Wavescan Counts V ka (2) Wavescan Counts Cr ka (2) Wavescan Counts	Line Numbers Line Numbers (relative) On Beam Current Ab Beam Current DateTime Elapsed Hours X Stage Coordinates Y Stage Coordinates Y Stage Coordinates W Stage Coordinates Relative Microns Si ka (4) Wavescan Counts Ti ka (3) Wavescan Counts Al ka (4) Wavescan Counts V ka (2) Wavescan Counts Cr ka (2) Wavescan Counts	 C Scatter C Line at Line C Linear-Log C 3-D (three axes) Average Only Minimum Total Sum > 98 Intensity Error Bars Plot Error Bars n Sigma 1 ▼
Fe ka (5) Spectrometer Mn ka (5) Spectrometer Mg ka (1) Spectrometer Ca ka (3) Spectrometer Na ka (1) Spectrometer Si ka (4) Angstroms Ti ka (3) Angstroms Al ka (4) Angstroms	Mn ka (5) Wavescan Count Mg ka (1) Wavescan Count Ca ka (3) Wavescan Count Na ka (1) Wavescan Count Si ka (4) Spectrometer Ti ka (3) Spectrometer Al ka (4) Spectrometer V ka (2) Spectrometer	Mn ka (5) Wavescan Couni Mg ka (1) Wavescan Couni Ca ka (3) Wavescan Count Na ka (1) Wavescan Count Si ka (4) Spectrometer Ti ka (3) Spectrometer Al ka (4) Spectrometer V ka (2) Spectrometer	n Spacing 1 💽 Output
, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	, , , , , , , , , , , , , , , , , , , ,	, , , , , , , , , , , , , , , , , , , ,	Cancel Next

The **Plot Graph Data** window for the manganese data set is shown below. Two peaks are visible and the user observes that the low background position lies close to the second unknown peak, which is identified as $Cr K\beta_{1,2}$.



As both Mn and Cr are only present as minor elements in the Augite Kakanui standards, the count rates are low. To better assess the situation, additional wavescans need to be collected in the same way on standards high in chromium and manganese, respectively.

Click **OK** to return to the **Plot!** window.

Additional wavescans are collected using the same procedure, which is not shown again to save space. The Plot! window is now shown below with additional wavescans acquired on standards, including Bustamite for Mn and Chromite for Cr. Hold the $\langle ctrl \rangle$ key and click on the Augite, Bustamite, and Chromite standards to multi-select all three. Again, select *Mn ka* (5) *Spectrometer* from the *X*-Axis list and *Mn ka* (5) *Wavescan Counts* from the *Y*-Axis list selections. Click the **Output** button.

Plot!		· Andrews		
Sample List (multi-select)	Use Manual Selection	Output Target		
C Standards Wa 1 C Unknowns Wa 2 Wavescans Wa 3 C Digitized Wa 4	453 Augite, Kakanui 122142 22 TiO2 synthetic 26 Fe2O3 synthetic hematite 509 Bustamite	 Send Data to Plot Window Send Data to ASCII File (X, Y, (Z)) Send Data To Printer (separate samples) 		
Acquired Only Select All Select Analyze!	455 Chromite 177075	 Include Deleted Points Data Point Labels ASCII File Column Labels Force Black and White Print Normalize Samples (Y Sets) 	Run Information Sample Names SURFER .BAS File Off Peak Labels Normalize Y Sets	
X-Axis Si ka (4) Wavescan Counts Ti ka (3) Wavescan Counts	Line Numbers Line Numbers (relative)	Y-Axis (multi-select) Line Numbers Line Numbers (relative)	Graph Type	
Al ka (4) Wavescan Counts V ka (2) Wavescan Counts Cr ka (2) Wavescan Counts Fe ka (5) Wavescan Count	On Beam Current Ab Beam Current DateTime Elapsed Hours	On Beam Current Ab Beam Current DateTime Elapsed Hours	 ✓ Line ✓ Linear-Log ✓ 3-D (three axes) 	
Mn ka (5) Wavescan Counl Mg ka (1) Wavescan Counl Ca ka (3) Wavescan Count Na ka (1) Wavescan Count Si ka (1) Spectrameter	X Stage Coordinates Y Stage Coordinates Z Stage Coordinates W Stage Coordinates Relative Miscone	X Stage Coordinates Y Stage Coordinates Z Stage Coordinates W Stage Coordinates	Average Only Minimum Total Sum > 99	
Ti ka (3) Spectrometer Al ka (4) Spectrometer V ka (2) Spectrometer Cr ka (2) Spectrometer	Si ka (4) Wavescan Counts Ti ka (3) Wavescan Counts Al ka (4) Wavescan Counts V ka (2) Wavescan Counts	Si ka (4) Wavescan Counts Ti ka (3) Wavescan Counts Al ka (4) Wavescan Counts V ka (2) Wavescan Counts	Intensity Error Bars	
Fe ka (5) Spectrometer Mn ka (5) Spectrometer Mg ka (1) Spectrometer Ca ka (3) Spectrometer	Cr ka (2) Wavescan Counts Fe ka (5) Wavescan Count Mn ka (5) Wavescan Count Mg ka (1) Wavescan Count	Cr ka (2) Wavescan Counts Fe ka (5) Wavescan Counts Mn ka (5) Wavescan Count Mg ka (1) Wavescan Count Mg ka (1) Wavescan Count	n Sigma 1 💌 n Spacing 1 💌	
Na ka (1) Spectrometer Si ka (4) Angstroms Ti ka (3) Angstroms Al ka (4) Angstroms V ka (2) Angstrome	La ka (3) Wavescan Count Na ka (1) Wavescan Count Si ka (4) Spectrometer Ti ka (3) Spectrometer	La ka (3) Wavescan Count Na ka (1) Wavescan Count Si ka (4) Spectrometer Ti ka (3) Spectrometer	Output	
Cr ka (2) Angstroms	V ka (2) Spectrometer	V ka (2) Spectrometer	Close Cancel Next	

The **Plot Graph Data** window for the manganese data set is shown below. Due to the better counting statistics, the Mn and Cr peak shapes can now be much better assessed for off-peak positioning. To make a more detailed selection for the KLM Markers to be displayed, click the *User Selected Lines* radio button. Then click the **Choose Selected Lines** button below.



The **Xray Database** window opens containing the NIST x-ray line catalog. The user may select or multi-select any x-ray line to plot in the **Plot Graph Data** window simply by highlighting (a) line(s) and clicking the **Graph Selected** button. To select all lines for certain elements, click the **Periodic Table** button.

ay Databas	e						
NIST Xra	y Lines	[multi-select]					Graph Selected
Xray Li	ne	Angstroms	Energy	Intensity F	leference		
Hg LB3	11	2.06763	11.9930	5.17500	JD		Close
Cr K		2.07025	5.98890	.000000 #	ABS ES		
BaLI		2.07039	5.98850	.000000 /	ABS ES		
TILB4	11	2.07872	11.9290	4.33500	JD		🚽 🗆 Highlight Element
Pr LIII		2.07890	5.96400	.000000 /	ABS ES		
Br KA1	11	2.07994	11.9220	80.0000	JD		
Pm LB1		2.08026	5.96010	43.0800	ES		
Hg LB2	11	2.08029	11.9200	17.7680	JD		Decision and
Au LB5	11	2.08134	11.9140	3.50400	JD		Periodic
Pm LB4		2.08207	5.95490	7.79900	ES		Table
Fr LA2	11	2.08502	11.8930	9.09600	JD		
Cr KB1		2.08519	5.94600	11.6800	ES		
Cr KB3		2.08519	5.94600	6.51000	ES		Specify Hange —
Ho LI		2.08656	5.94210	4.75900	ES	=	
Br KA2	Ш	2.08800	11.8760	41,4560	JD		· · ·
NoLI	II.	2.08941	11.8680	5,60000	JD		
Pu MI		2 08987	5 93270	000000	ABS ES		Bragg Order
Hal B1	п	2 09771	11 8210	31 6030			
Mn KA1		2 10216	5 89800	100.000	ES		· · ·
Lall		2 10487	5 89040	000000	ARS ES		
Mn KA2		2 10609	5 88700	50,9700	ES		Load New Paper
Bn I A1	Ш	2 11489	11 7250	80 0000	dl.		Luau New hange
As KB1	ü	2 11507	11 7240	11 6710	Ű.		
As KB3	ü	2 11615	11 7180	00000 8	Ű.		Absorption Edge
Pr I R2		2 11977	5 84900	19 5190	FS		
Ful A1		2 12119	5 84510	100 000	FS		Maximum Urder
Bel G1	п	2 12249	11 6830	7 09100	10		· · · · ·
W 163	ï	2 12449	11 6720	2 89600	JD		
Nd I B3		2 12737	5 82810	12 8690	FS		Minimum Intensity
Ful 42		2 13176	5 81610	11 3500	FS		Minimum Intensity
	н	2 13474	11 6160	5 52000	10	-	2
0 21		2.10111	11.0100	0.02000	00		Start Angstroms
Note tha	t angstro	m values in the	above list v	with Bragg rei	flection orders hi	gher	2.062835
than	one (Ro	man Numeral "I	") are NOT	corrected for	r refraction index		Chan America
correction	is. Howe	ver, KLM marke	ers displayed	d in the Grap	h Data wavesca	n plot	Stop Angstroms
	dialog ar	e corrected usin	g the equa	tion A' = A * (1 • (K / N 2))		2.143405
	Copy to	Clipboard		Copy Sele	cted to Clipboard	H I	KeV
							15

This opens the Select KLM Elements window. Click to highlight Cr and Mn.



Click **OK** to return to the **Xray Database** window when finished. Click the **Graph Selected button** again in the **Xray Database** window to plot the new selection, then click the **Close** button to return to the **Plot Graph Data** window.



The low off-peak position for Mn appears to be slightly on the slope of the Cr K β peak. To adjust the low off-peak position further away from this peak, click the **Low** button, creating a crosshair on the graph window. Move the crosshair to a new low background position and click the mouse. The color of the initial off-peak position changes to pink and a new vertical green line appears, indicating the new off-peak position.



If high Cr samples are analyzed, the user should not move the off-peak position close or past the Cr K edge depicted by the purple Cr K ABS marker. It might become necessary to measure the Mn background using a high off-peak only with a slope factor (see User's Guide and Reference manual for details). The Cr K β peak also interferes slightly with the Mn K α on-peak position, potentially requiring an interference correction, which will be discussed further below.

Click the **OK** button to update this background position in the run and close the **Graph Data** window. The **GetPeakSave** window appears and the user is notified that new parameters (off-peak position) will take effect on the next new sample.



Click this **OK** button, returning to the **Plot!** window. Finally, click the **Close** button to exit the **Plot!** window returning to the main PROBE FOR EPMA log window.

Automation Actions

Confirm Standard Positions

All of the basic position confirmation, peak centering and x-ray count acquisition procedures may be automated. This is accomplished via the **Automate!** window.

Click the **Select Stds** button of the **Automate!** dialog box. All standards that have been added to the current run will be highlighted in the *Position List* list box.

👎 Automate!	the Spectrum Print	the Spectrum of	
Position List (multi-select) (double-click	to see data)	Move Stage	Automation Actions
C Unknowns St 13 Fid 1 Al2U3 s C Wavescans St 14 Fid 1 SiO2 sy C All Samples St 15 Fid 1 UO2	(Therite)	Digitize	Confirm Unknown Positions
St 17 Fid 1 PbC03 St 18 Fid 1 Th02 St 18 Fid 1 Th02		Plot	Peak Spectrometers Peaking Acquire Standard Samples
Select Stds Select Air Select Air St 19 Fid 1 Histor St 20 Fid 1 ThSiO4 St 21 Fid 1 USiO4 ((Harnon) (Huttonite) Coffinite)	Fiducials	Acquire Unknown Samples Acquire Wavescan Samples Acquire Standard Samples (again)
Go St 22 Fid 1 1102 sy Gt 23 Fid 1 V203 sy St 24 Fid 1 Cr203 (nthetic inthetic synthetic)	Conditions	Automation Options
Update St 25 Fid 1 MinU sy St 26 Fid 1 Fe2O3 sy St 27 Fid 1 CoO syr	nthetic synthetic hematite sthetic	Sample Setups	✓ Peak on Assigned Standards ✓ Use "Quick" Standards
Delete All St 12 Mg Re-Load Current	D synthetic Row = 1	File Setups Multiple Setups	Use Filament Standby Afterwards Use Confirm During Acquisition
Delete Selected Samples	Import from ASC	II (*.POS File)	Suppress ROM Based Backlash
Delete Selected Positions Row X Y Z	Export Selected Sa	amples (to *.POS)	Combine Multiple Sample Setups
1 -17049.70 -7077.103 6	5.00159 0 1	0	Ose ROM Auto Pocus New Sample C Every Point Digitized C Interval 5
			Standard Points To Acquire
			Standard X Increment (um)
			Re-Standard Y Increment (um) 6 Re-Standard Interval (hrs) 6
	N. J. A. J. C	1.0	© Use Last Unknown Sample
Nev = 15 Curr = 40 Size = 10 Mag = 2533 MagAnal = 2533 MagImag = 2533 File Se	mode = Analog Spot Sam mgShift = -2, 3 up = NONE	pie setup (row) Number = 0	 Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
Multiple Setups = NONE		Replicates = 1	Run Selected Samples

The user might start by checking the location and focus of each standard selected for the automated analysis. Click the box for *Confirm Standard Positions* under *Automation Actions*.



Click the **Run Selected Samples** button in the bottom right corner of the window.

The **AutomateConfirmSelected** window opens informing the user how many standards were chosen and asks if the user wants to run these automated samples. Click **Yes**.

AutomateC	ConfirmSelected: Using Last Unknown Sample
?	Number of Standard Position Samples: 12 Number of Unknown Position Samples: 0 Number of Wavescan Position Samples: 0
	Are you sure you want to run these automated position samples?
	Yes No

The program then sends the stage motors to the fiducial transformed coordinates for the first selected standard and opens the **Confirm Positions** window. Clicking the two-way **Pause/Continue** button suspends the 10 second countdown (user defined in the PROBEWIN.INI file). Adjust the stage motors (X, Y, and Z) to a new, clean analysis position. Click the **OK** button of the **Confirm Positions** window when done, sending the stage to the next standard to confirm its position. Again, the **Confirm Positions** window opens, allowing the user to pause the countdown and adjust the sample position.

If more than one position is digitized, the software moves to the first position and updates all positions for that sample by the same X, Y, and Z offset.

Confirm Positions		1000	-	-	
St 12 MgO	synthetic				
Please adjust the click OK when rea click th	sample stage pos ady. If you need n e Pause button.	iition and nore time			Time remaining 3.70
Refl Tran On Off	Remove Faraday	Jog Cancel	Auto Focus	Pause	ОК

After the final standard is confirmed, the **AcquireStop** window appears. Click this **OK** button to return to the **Automate!** dialog box.

AcquireStop	The state of the spect the state	
•	Automation Completed	
	ОК	

Calibrate Peak Positions

X-ray peaking may be automated from the **Automate!** window as follows. Under *Automation Actions* click only the *Peak Spectrometers* box. Under *Automation Options* click the *Peak on Assigned Standards* box. This option causes the program to attempt a peak center on a standard position sample if the standard is assigned as the primary standard for that element. If the element has no assigned standard, then the program will attempt to assign one automatically based on the highest concentration of the elements present among the standards in the run.

Next, click the **Peaking** button to open the **Peaking Options** dialog box.

👎 Automate!			
Position List (multi-select) (double-click	to see data)	Move Stage	Automation Actions
C Unknowns C Wavescans C All Samples C All Samples	ynthetic nthetic	Digitize	Confirm Unknown Positions
St 16 Fid 1 ThSi04 St 17 Fid 1 PbC03 St 18 Fid 1 Th02	(i horite)	Plot	Peak Spectrometers Peaking Acquire standard Samples
Select Stds St 20 Fid 1 H/SiO4	(Hafnon) (Huttonite) Coffinite)	Fiducials	 Acquire Unknown Samples Acquire Wavescan Samples
Go St 22 Fid 1 TiO2 sy Go St 23 Fid 1 V2O3 s	nthetic Inthetic	Replicates	Acquire Standard Samples (again)
Auto Focus St 24 Fld 1 Cr203 St 25 Fid 1 MnD sy St 26 Fid 1 Fe203	synthetic) nthetic synthetic hematite	Conditions Sample Setups	Automation Unitions ↓ Peak on Assigned Standards
Delete All St 2401 Wollastor	nthetic 🔹 🔻	File Setups	Use Filament Standby Afterwards
Re-Load Current R	ow = 1 of 1	Multiple Setups	Use Confirm During Acquisition Use Beam Deflection For Position Suppress ROM Read Realizab
Delete Selected Samples Delete Selected Positions	Export Selected Sa	amples (to *.POS)	Confirm All Positions In Sample Combine Multiple Sample Sature
Row X Y Z 1 -13644.14 -1092.094 6 1 -13644.14 -1092.094 6 KeV = 15 Curr = 40 Size = 0 Mag = 2533 MagAnal = 2533 MagImag = 2533 File Se	W Gi 5.00002 0 1 5.00002 0 1 Mode = Analog Spot San mgShift = -2, 3 1 tup = NONE 1	ain # Focus 0 ple Setup (row) Number = 0	Use ROM Auto Focus New Sample Every Point Digitized Interval Standard Points To Acquire Automate Confirm Delay (sec) 10 Standard X Increment (um) 4 Re-Standard Y Increment (um) 6 Re-Standard Interval (hrs) 6 © Use Last Unknown Sample Use Digitized Conditions © Use Digitized File Setups Use Digitized File Setups © Use Digitized Multiple Setups 0
Multiple Setups = NONE		Replicates = 1	Run Selected Samples

In the **Peaking Options** dialog box, highlight (select) all of the elements in the *Elements to Peak* list box, and click on a *Peak Center Method*. A spectrometer pre-scan is useful if that element has not been run recently or if maintenance has occurred on the spectrometer.

Peaking Options	Augus Statemen Louis						
Elements to Peak (multi-select) - Si ka Spec 4 TAP (27738.0) Ti ka Spec 3 LPET (31430.0) Al ka Spec 4 TAP (32465.9) V ka Spec 2 LLIF (62209.1) Cr ka Spec 2 LLIF (56898.5) Fe ka Spec 5 LLIF (48085.0)	Peak Center Method OK O Interval Halving OK O Parabolic Fit Cancel C ROM Based (see options below) Cancel Manual (Pre/Post Scan Only) OK						
Mn ka Spec 5 LLIF (52202.0) Mg ka Spec 1 TAP (38499.2) Ca ka Spec 3 LPET (38387.0) Na ka Spec 1 TAP (46362.9)	ROM Peaking Type C Internal C Parabolic Image: Maxima C Gaussian Threshold .33 .33						
	 Dual Maxima/Parabolic Dual Maxima/Gaussian Highest Intensity Peak Center Options Acquire Automated PHA Scan Prior To Peaking Acquire Automated PHA Scan After Peaking 						
Double-click element to move to spectrometer peak position	 Acquire PHA Baseline/Window Scan Acquire PHA Bias Scan (detector voltage) Acquire PHA Gain Scan (detector gain) 						
Move Selected Elements To On-Peak Positions	Display PHA Dialog Prior To Peaking (manual) Display PHA Dialog After Peaking (manual)						
Plot Selected Peak Center Display Spectrometer Pre-Scan for Confirmat Display Spectrometer Post-Scan for Confirmat Display Spectrometer Post-Scan for Confirmat							
Return To On Peak (start analysis) Positions	 Use ROM Based Scanning for Pre/Post Scan Skip P/B Check Before Peaking Spectrometer 						

Click the **OK** button of the **Peaking Options** window. Click the **Run Selected Samples** button from the **Automate!** window. This opens the **AutomateConfirmSelected** window. To run these automated samples, click **Yes**.



The steps of the automated procedure are similar to the manual peaking procedure described in the section "Manual Peaking and PHA using the Acquire! Window".

The stage motors move to the position coordinates of the first standard in the *Position List* list box. If the *Use Confirm During Acquisition* box under *Automation Options* is checked then the computer automation will pause at each standard (**Confirm Positions** window will open) for some user defined amount of time (usually 10 seconds) to allow the operator to adjust the stage position and focus. The **Peak/ROM/PHA Scan Acquisition** window opens and the spectrometers go through the peaking routine to peak center the spectrometer position to the intensity maximum for all the elements assigned to that standard. After finding a new peak position and reporting the results to the graph window and the main log window, the stage motors move on to the coordinates of the next standard highlighted in the *Position List* list box. Once situated on this standard, the spectrometers peak center those elements assigned to it. This procedure continues until all standards are done. When all automation action is complete, the **AcquireStop** window appears and requests the user to click the **OK** button.

An example for the graph displayed in the **Peak/ROM/PHA Scan Acquisition** window for Al Ka on TAP for Al2O3, using the ROM based peak center method and maxima fitting, is given below.



The following summary of the peak automation for two standards is found in the main log window.

Probe for EPMA [C:\UserData\Doe\silicates01.MDB]											- 🗆 🗙	
File	Edit	Standard)	(ray Analyti	cal Window	Run Output	Help						
	Acquire!			Analyze!			Automate!			Plot!		
Starting spectrometer peaking procedure for Mg ka on spectro 1 (TAP)												
ROM Scan completed on spectro 1 with 50 total points												
Mg k	a spe	ectro 1,	StopPK:	30400.0,	stop1:	109.	2					
ROM Brent's Maxima Peak Center Results:												
Ele	ment	Spectr	Peaked	StartPk	StopPk	Std	Offset	StartI	StopI			
5	i ka	4 TAE	Yes	27738.0	27550.2	453	190.	708.7	723.4			
1	'i ka	3 LPET	Yes	31430.0	31268.3	22	162.	409.6	427.1			
A	l ka	4 TAE	Yes	32465.9	32472.4	13	-6.5	1175.5	1195.3			
	V ka	2 LLIE	Yes	62209.1	62319.8	23	-111.	514.1	509.1			
0	'r ka	2 LLIE	Yes	56898.5	56742.6	24	156.	1276.5	1299.6			
F	'e ka	5 LLIE	Yes	48085.0	48261.8	26	-146.	1400.6	1351.0			
L I	ín ka	5 LLIE	Yes	52202.0	52244.0	25	-11.	59.3	48.8			
L I	lg ka	1 TAE	Yes	38499.2	38408.0	473	91.2	118.5	109.2			
C	la ka	3 LPET	Yes	38387.0	38419.4	2401	-20.	370.5	352.8			
N	la ka	1 TAE	Yes	46362.9	46153.9	303	209.	385.3	368.4			
Calibrate Peak Positions Automation Action is Completed												
											-	1
Acquire: Ready										Cancel	Pause	//
Acquire Standard Samples

The next step is to automate the acquisition of x-ray counts on all primary and MAN background standards as calibration for the unknown samples. Again, click the **Select Stds** button in the **Automate!** dialog box to select all current standards in the run, highlighting them in the *Position List* list box. Next, under *Automation Actions*, click only on the *Acquire Standard Samples* box. From the *Automation Options* choices select the number of *Standard Points To Acquire* and whether to *Use Confirm During Acquisition*.

In this example, only one XYZ(W) position was digitized for each standard, but four standard points are chosen along with a *Standard X Increment* of 15 μ m. This means that the first measurement will be performed in the digitized position, and for each consecutive measurement the X position will be shifted by +15 μ m. This value should be sufficiently larger than the beam diameter (here 10 μ m) to prevent overlapping measurements. The user has to ensure that sufficient space is available in the X direction on the standard grains for this operation. Alternatively, additional measurement positions could be digitized for each standard.



Finally, click the **Run Selected Samples** button. The **AutomateConfirmSelected** window opens again, stating how many standards are chosen and how long the run is expected to take and asking if these automated position samples should be run. Click **Yes**.

Automate	ConfirmSelected: Using Last Unknown Sample
2	Number of Standard Position Samples: 14 Number of Unknown Position Samples: 0 Number of Wavescan Position Samples: 0 Elapsed Time for Last Standard Acquisition: 49 seconds Projected Time for All Standard Acquisitions: 1.1 hours Total Projected Time for All Acquisitions: 1.1 hours Are you sure you want to run these automated position samples?
	Yes No

The stage moves to the coordinates of the first standard in the *Position List* list box. If *Use Confirm During Acquisition* was chosen, the **Confirm Positions** window opens, allowing a readjustment of the stage position and optical focus. X-rays are counted on peak and off peak positions for all elements as specified earlier. Progress can be monitored in the **Acquire!** window.

Acquire!	and the second			A real	in the second second		
SP1 SP2 46152.2 56744.0	SP3 SP4 38421.1 27549.5 4	SP5	X -16199.643	Y 4.41 67.	Z .9986	Spectro TAP LLIF I	Progress LPET TAP LLIF
Na-TAP Cr-LL 7.00 7. 74. 4415	IF Ca-LPET S: 00 7.00 56. 374.	i-TAP 7.00 146.	Fe-LLIF 6.98 238.		Absorbed .00 .000000	Mg Na Cr	Ti Al Mn
Current Sample: St 24 Normal Acquisition Stan Data Rows: 0	Set 1 * Cr2O3 (synthe dard Good Data Rows: 0	tic)	Start Standard	<mark>d or Unkno</mark> g art Wavesc	wn Acquisition an	-16199. um .000000 px 0	Ca Si Fe 6434.41 .000000 0
New Sample	PHA		Imaging	Peal	king Options	Magnification Beam Mode	2533
Elements/Cations	Peak/Scan Options	Acq	uisition Options	Sta	nt Peaking	Kilovolts	
Analytical Conditions	Count Times	Sp	ecial Options		Move	Beam Current	40
Combined Conditions	Locate		Rate Meter		Stage	Deam 3/26	

Finally, the Faraday cup is measured. The stage moves $15 \,\mu\text{m}$ in the X direction and the procedure is repeated for the remaining three points as specified in the *Automation Options* section of the **Automate!** dialog box. After completing data collection on the first standard, the stage travels to the next standard in the list and acquires four complete analyses on that standard. After finishing the automation schedule the familiar **AcquireStop** window opens and requires the user to click the **OK** button, thereby returning to the **Automate!** window.

The log window result for the x-ray count acquisition for the Augite Kakanui standard is seen below.

Probe f	or EPMA [C:	\UserData\D	oe\silica	tes01.MDB]			S					
File Edit	Standard	Xray Ana	alytical	Window Rur	n Output	Help	1			1		
	Acquir	e!			Analyze!			Autom	ate!			Plot!
LEM:	.000											
n-Peak	(off-pe	ak corre	cted)	or MAN On-	-Peak X-1	ray Counts	s (cps/3	9.99426n	A) (and	Faraday	Current)	
ELEM:	Si ka	Ti ka	Al k	a Vka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka	BEAM	
BGD:	MAN	OFF	OF	F OFF	OFF	MAN	OFF	MAN	MAN	OFF		
SPEC:	4 77 A D	1027	·	4 2 D IITE	2	5	5 עדוו	1	3 1 DRT	1 77 A D		
ORDER:	1	2	17	2 2	1	1	2	2	1	1		
162G	1865.4	43.3	317.	0 1.2	7.7	432.4	10.0	686.5	1083.1	53.9	39.984	
163G	1852.0	41.8	326.	5 1.5	8.1	445.0	8.1	699.2	1088.0	54.3	40.000	
164G	1871.3	48.6	315.	2 -3.3	7.2	446.0	12.0	701.6	1078.1	52.8	40.025	
165G	1865.1	41.7	321.	89	6.8	442.8	10.9	699.8	1087.2	50.6	39.971	
AVED .	1863 4	43.8	320	1 - 4	75	441 6	10.2	696 8	1084 1	52 9	30 005	
SDEV:	8.1	3.2	5.	1 2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	
1SIG:	13.6	2.8	5.	8 1.7	2.0	6.6	1.8	8.3	10.4	2.5		
SIGR:	. 60	1.15	. 8	8 1.27	. 27	.94	. 90	.83	.44	.66		
SERR:	4.1	1.6	2.	6 1.1	.3	3.1	.8	3.5	2.3	. 8		
*RSD:	.44	7.41	1.5	9 -618.45	7.15	1.41	16.16	1.00	. 42	3.15		
Off_Pea	k (aslan	lated) V		onnte (ane	/30 00/	(m)						
ELEM:	si ka	Ti ka		a Vka	Cr ka	Fe ka	Mn ka	Mor ka	Ca ka	Na ka		
TYPE :	NONE	LINEAR	LINEA	R LINEAR	LINEAR	NONE	LINEAR	NONE	NONE	LINEAR		
162G		36.1	18.	3 30.5	30.6		24.7			11.1		
163G		37.1	18.	3 29.6	30.3		23.5			12.5		
164G		33.9	17.	9 32.1	32.5		23.6			10.8		
165G		37.0	19.	7 30.9	30.0		22.3			11.9		
AVER		36.0	18	5 30.8	30.9		23.5			11.6		
SDEV:		1.5	10.	8 1.0	1.1		1.0			.8		
Raw Hi-	Peak X-r	ay Count	s (cps	/39.99426r	1A):							
ELEM:	Si ka	Ti ka	Al k	a Vka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka		
162G		34.2	16.	6 29.8	32.2		25.3			10.9		
164G		34.3	15	6 30.8	29.0		24.3			10.0		
165G		39.8	19.	2 28.0	30.4		22.7			11.4		
_		_										
AVER:		37.1	17.	0 30.2	31.5		24.2			11.0		
SDEV:		3.2	1.	5 1.8	1.7		1.1			.3		
1SIG:		2.7	1.	8 2.5	2.5		2.2			1.5		
SIGR:		1.18	. 8	.73	.66		.50			.21		
Raw Lo-	Peak X-r	ay Count	s (cps	/39.99426r	1A):							
ELEM:	Si ka	Ti ka	Al k	a Vka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka		
162G		37.9	20.	0 31.1	29.1		24.2			11.3		
163G		34.2	19.	9 27.0	30.9		22.7			14.3		
164G		33.5	20.	1 33.4	31.6		22.5			11.0		
165G		34.3	20.	2 33.7	29.7		21.9			12.3		
AVER:		35.0	20.	0 31.3	30.3		22.8			12.2		
SDEV:		2.0		1 3.1	1.2		1.0			1.5		
ISIG:		2.6	2.	0 2.5	2.5		2.1			1.6		
SIGR:		.76	. 0	1.24	. 47		.46			. 95		
cquire: F	Ready										Can	cel Pause

Off-peak counts were not collected for Si, Fe, Mg, and Ca, where MAN background correction was specified. In addition to the four individual lines of count data, the *AVER*, *SDEV*, *1SIG*, *SERR*, and *%RSD* are calculated. *AVER* is the average intensity reading of each element column. *SDEV* is the standard deviation of these results, *1SIG* (one sigma) is the predicted standard deviation, and *SERR* (standard error) is essentially the precision of the average. *%RSD* (percent relative standard deviation) is the *SDEV* divided by the *AVER* times 100. See the User's Guide and Reference documentation for exact equations. The output of the raw data counts for the remaining standards is not shown here to save space.

Evaluate Standard Count Data

After standard data is acquired it is useful to check the data for agreement among standards and for possible interferences. Click the **Analyze!** button in the main PROBE FOR EPMA log window.

Probe for EPMA [C:\UserData\Doe\silicates01.MDB]												
File Edit	Standard	Xray Ana	ytical Win	dow Run	Output	Help						
	Acquire!			Analyze			Automa	ate!		Ple	ot!	
AVER:		36.0	18.5	30.8	30.9		23.5			11.6		
SDEV:		1.5	. 8	1.0	1.1		1.0			. 8		
Raw Hi-	Peak X-ra	v Counts	(cps/39	99426nA	o :							
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka		
162G		34.2	16.6	29.8	32.2		25.3			10.9		
163G		40.0	16.7	32.3	29.8		24.3			10.8		
164G		34.3	15.6	30.8	33.5		24.7			10.7		
165G		39.8	19.2	28.0	30.4		22.7			11.4		
AVER:		37.1	17.0	30.2	31.5		24.2			11.0		
SDEV:		3.2	1.5	1.8	1.7		1.1			.3		
1SIG:		2.7	1.8	2.5	2.5		2.2			1.5		
SIGR:		1.18	.84	.73	.66		.50			.21		
Raw Lo-	reak X-ra	iy Counts	(cps/39	.99426nA	():	Re he	Max Is a	Mer. her	Co. ho	No. ko		
160C	SI Ka	27 0	AL Ka	V Kd.	00 1	re ka		му ка	Cd Kd	Nd Kd		
1620		34.9	10.0	27.0	29.1		24.2			14.3		
164G		33.5	20 1	33.4	31 6		22.7			11 0		
165G		34.3	20.2	33.7	29.7		21.9			12.3		
AVER:		35.0	20.0	31.3	30.3		22.8			12.2		
SDEV:		2.0	.1	3.1	1.2		1.0			1.5		
1SIG:		2.6	2.0	2.5	2.5		2.1			1.6		Ξ
SIGR:		.76	.05	1.24	. 47		.46			.95		
L												<u> </u>
Open: Rea	ady									Cancel	Pause	14

This opens the **Analyze!** dialog box. The *Sample List* list box contains the list of the standards that on which data has been acquired. To examine the raw count data acquired on any standard run under automation, first select the standard of interest and click the **Data** button.

Hanalyze!	Product Name	Course into				
Sample List (multi-sel	ect) (double-c	lick to see intens	sity data)	Analyze Combine Select	Data KRaws	Combine Analysis Lines From Selected Samples
C Unknowns St C Wayescans St	25 Set 2 Mn 26 Set 2 Fe	0 synthetic 203 synthetic he	matite	List Report	Calculation Options	Combine Data Lines From Selected Samples
All Samples St Select All St	28 Set 2 Ni0 2401 Set 2 ₩ 303 Set 2 All) synthetic 'ollastonite (Wills bite, Amelia	boro, NY)	│ Pause Betweer │ Use All Matrix C	Samples Corrections	Sort Stat and Data Grids In Geological or Atomic Number
Add To Setup St St	469 Set 2 Hy 473 Set 2 Hy	persthene, johns vpersthene, johns ivine (Fo90) USN	stown USN = IM 111312	Delete Selecter Undelete Selecter	d Sample(s) Match	Order Order Do Not Output To Log
Save Setups Un	3 - template	e ror pyroxene ei	Name (Deservi	Combined Condition	ions Count Times	Combine the Selected
Specified Concentration			Total O	xygen	Total Weight %	Boundary Corrections
		*	Excess	ted Oxygen	Z - Bar Atomic Weight	Create Material File
Copy						
•						•
Delete Selected	Line(s)	Undelete S	elected Line(s)	Analy	ze Selected Line(s)	
Сору						
						Cancel Next

The raw count data for the four automated measurements of the Augite Kakanui standard are shown below. Each individual line (162 G to 165 G) is illustrated along with the *Average*, *Std Dev, OneSigma, Std Err, %Rel SD*, and *Minimum* and *Maximum* of the acquired points. This count data is also printed to the log window.

Malyze!		-	distant in	e laspe	-							x
Sample Li	st (multi-selea ards St 2	ct) (double-c 14 Set - 2 Cc	lick to see int 203 (sunthetic	ensity data		Analyze Combine Selected	Data Samples		mbine Analysis I Selected San	Lines From nples		
C Unknow C Waves	wns St 2 cans St 2	5 Set 2 Mr 6 Set 2 Fe 8 Set 2 Ni	0 synthetic 203 synthetic 3 synthetic	, hematite	Li	st Report (Calculation O	ptions C	iombine Data Lines From Selected Samples			
All San Select /	All St 24	01 Set 2 W 03 Set 2 Al 03 Set 2 Al	/ollastonite (¥ bite, Amelia igite, Kakanu	/illsboro, N [*] USNM 122		Pause Between Samples Use All Matrix Corrections Delete Selected Sample(s) Order						
Add To S Save Set	etup St 40 St 40 Un	73 Set 2 Ol 3 * templat	ivine (Fo90) L e for pyroxene	ISNM 1113 e elements		ndelete Selected : ombined Condition	Sample(s)	Match) o Not Output T	o Log		
Specified Concentrations Standard Assignments Name/Description Conditions Elements/Cations Combine the Selected												
St 453 Set 2 Augite, Kakanui USNM 122142 .000 Total Oxygen .000 Total Weight % T0 = 40, KeV = 15, Beam = 40, Size = 10 .000 Calculated Oxygen .000 Z · Bar Create Material File .000 Excess Oxygen .000 Atomic Weight Create Material File												
	Sika MAN	n Tika Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Ma ka MAN	Ca ka MAN	Na ka Off	Beam	
Average:	1863.4	43.8	320 1	- 4	7.5	441.6	10.2	696.8	1084 1	52.9	39,995	_
Std Dev:	8.1	3.2	5.1	2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	
OneSigma:	13.6	2.8	5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
Std Frr	41	1.6	2.6	11	3	31	8	3.5	23	8		_
%Bel SD	44	7 41	1.59	-618 45	7 15	1 41	16 16	1.00	42	3 15		
Minimum:	1852.0	41.7	315.2	-3.3	6.8	432.4	81	686 5	1078 1	50.6	39 971	
Maximum:	1871.3	48.6	326.5	1.5	81	446.0	12.0	701.6	1088.0	54.3	40 025	
<					0.1							•
Delete	e Selected Li	ne(s)	Undelet	e Selected	Line(s)	Analyze	Selected Line(s	:)				
Сору	Si ka MAN	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Mg ka MAN	Ca ka MAN	Na ka Off	Beam	
162 G	1865.4	43.3	317.0	1.2	7.7	432.4	10.0	686.5	1083.1	53.9	39.984	
163 G	1852.0	41.8	326.5	1.5	8.1	445.0	8.1	699.2	1088.0	54.3	40.000	
164 G	1871.3	48.6	315.2	-3.3	7.2	446.0	12.0	701.6	1078.1	52.8	40.025	
165 G	1865.1	41.7	321.8	9	6.8	442.8	10.9	699.8	1087.2	50.6	39.971	
	1											
											1	P
										Cancel	Next	///

Examine the raw count data for each standard. If more than one sample/standard is selected for assessment, select the *Pause Between Samples* check box.

Malyze!	- test ing	heatited	Manhor A	er linger	-						- 0	x
Sample Li	st (multi-sele	ct) (double-c	lick to see in	tensity data		Analyze	Data	KRaws Co	mbine Analysis I Selected San	Lines From nples		
C Unkno	wns St scans St	23 Set 2 V2 24 Set 2 Cri 25 Set 2 Mr 26 Set 2 Fe	203 synthetic 203 (synthetic 203 synthetic 203 synthetic	c) Shematite		t Report	Calculation O	ptions C	ombine Data Li Selected Sar	nes From mples		
(All Samples Select All St. 28 Set. 2 NiO synthetic St. 2401 Set. 2 Wollastonic [Willsboro, NY] Pause Between Samples I ose Altividam Conections Report Add To Saw St. 453 Set. 2 August, Kakanui USNM 1221 ■ Delete Selected Sample(s) Match												
Add To Setup St 453 Set 2 Augite, Kakanui USNM 1221 Delete Selected Sample(s) Match Save Setups St 473 Set 2 Olivine (Fo90) USNM 111312 Combined Conditions Coupt Times												
Specified	Concentratio	ns <mark>Standa</mark>	rd Assignmen	ts Name/	Description	Conditions	Elements/	Cations Sa	Combine the Se mples into a Ne	elected w Sample		
St 453 Set TO = 40, Ke	2 Augite, Kaka V = 15, Beam :	nui USNM 122 = 40, Size = 11	142	.000	Total Oxygen Calculated Oxy	.000 gen .000	Total Weig Z - Bar	ght %	Boundary Corre	ections		
X-ray Counts	(cps/39.99426r	nA)	ALL - 06	.000	Excess Oxyger	.000	Atomic We	eight	Create Materi	al File	Daam	
Lopy	SI KA MAN	TI Ka Um	AlkaUfr	v ka Un	Lr ka Urr	Fe Ka MAN	Minika Urr	Mg Ka MAN	La Ka MAN	Nakaun	Beam	
Average:	1863.4	43.8	320.1	4	7.5	441.6	10.2	696.8 1084.1		52.9	39.995	
Std Dev:	8.1	3.2	5.1	2.2	.5	6.2 1.7 6.9 4.5				1.7	.023	
OneSigma:	13.6	2.8	5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
Std Err:	4.1	1.6	2.6	1.1	.3	3.1	.8	3.5	2.3	.8		
%Rel SD:	.44	7.41	1.59	-618.45	7.15	1.41	16.16	1.00	.42	3.15		
Minimum:	1852.0	41.7	315.2	-3.3	6.8	432.4	8.1	686.5	1078.1	50.6	39.971	
Maximum:	1871.3	48.6	326.5	1.5	8.1	446.0	12.0	701.6	1088.0	54.3	40.025	
I												•
Delet	e Selected L	ine(s)	Undelet	e Selected	Line(s)	Analyze	Selected Line(s	:)				
Сору	Si ka MAN	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Mg ka MAN	Ca ka MAN	Na ka Off	Beam	
162 G	1865.4	43.3	317.0	1.2	7.7	432.4	10.0	686.5	1083.1	53.9	39,984	
163 G	1852.0	41.8	326.5	1.5	8.1	445.0	8.1	699.2	1088.0	54.3	40.000	
164 G	1871.3	48.6	315.2	-3.3	7.2	446.0	12.0	701.6	1078.1	52.8	40.025	
165 G	1865.1	41.7	321.8	9	6.8	442.8	10.9	699.8	1087.2	50.6	39.971	
												-
<												•
										Cancel	Next	1.

When this box is checked, the program will automatically pause after displaying each analysis until the user clicks the **Cancel** or **Next (red flashing)** buttons on that are located at the bottom of the log window.

Malyze!	- not inter	Anapters	distant in	e freed	-						_ 🗆 🗙	
C Standa	st (multi-seled ards St 2	ct) (double-cl 3 Set 2 V2	lick to see in D3 synthetic	tensity data)		Analyze ombine Selected	Data Samples >	KRaws Cor	nbine Analysis I Selected San	ines From		
C Unkno	wns St 2 scans St 2				Lis	t Report C	Calculation O	ptions C	ombine Data Lii Selected Sar	nes From Inples		
All Sar Select.	St 2 nples St 2 All St 24 St 30 St 30					ause Between Sa se All Matrix Corr elete Selected Sa	amples ections ample(s)	Report So	ort Stat and Dat ological or Atom Order	a Grids In ic Number		
Add To Setup St 453 Set 2 Augute, Kakanu USNM 1221 Save Setups St 453 Set 2 Augute, Kakanu USNM 1131 Save Setups St 473 Set 2 Olivine (Foeg) USNM 11131 Delete Selected Sample(s) Match												
Specified	Concentration	ns <mark>Standar</mark>	d Assignmen	s Name/I	escription	Conditions	Elements/	Cations Sa	Combine the Se mples into a Ne	elected w Sample		
St 12 Set 3 MgO synthetic .000 Total 0xygen .000 Total Weight % T0 = 40, KeV = 15, Beam = 40, Size = 10 .000 Calculated 0xygen .000 Z · Bar Boundary Corrections X-ray Dounts (cns/39.99426n4) .000 Excess 0xygen .000 Atomic Weight Create Material File												
Сору	Si ka MAN	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Mg ka MAN	Ca ka MAN	Na ka Off	Beam	
Average:	15.8	-1.2	.2	6	.5	24.2	4	4739.9	45.7	.7	39.986	
Std Dev:	.5	1.9	1.8	1.9	2.9	.7	.6	9.3	2.0	.8	.027	
OneSigma:	1.3	1.8	1.1	1.6	1.6	1.6	1.5	21.6	2.1	1.2		
Std Err:	.2	.9	.9	.9	1.4	.3	.3	4.7	1.0	.4		
%Rel SD:	3.00	-150.93	807.73	-293.12	565.84	2.72	-155.28	.20	4.36	120.33		
Minimum:	15.1	-3.9	-2.1	-3.1	-2.4	23.3	9	4728.7	43.2	4	39.972	
Maximum:	16.2	.3	2.0	1.2	3.8	24.8	.5	4750.1	47.9	1.4	40.026	
Image: A labeled and the second se											F	
Delet	e Selected Li	ine(s)	Undelet	e Selected I	.ine(s)	Analyze	Selected Line(:	:]				
Сору	Si ka MAN	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Mg ka MAN	Ca ka MAN	Na ka Off	Beam 🔺	
118 G	15.9	-1.1	1.0	-3.1	-1.3	24.8	5	4750.1	47.9	4	40.026	
119 G	15.1	3	2.0	-1.0	1.9	24.0	7	4728.7	46.4	1.3	39.972	
120 G	16.0	-3.9	1	1.2	3.8	23.3	9	4744.2	45.1	1.4	39.973	
121 G	16.2	.3	-2.1	.3	-2.4	24.5	.5	4736.5	43.2	.5	39.973	
•	1											
Click Next b	Click Next button when ready											

If there are any bad data points, use the **Delete Selected Line(s)** button to flag a line of data as bad. In the Augite Kakanui standard, seen below, line 163 G (good) shows the lowest Si and highest Al counts which could indicate contribution of a small inclusion to the analysis. To delete, click on the line number in the first column, highlighting the line. Next click the **Delete Selected Line(s)** button.

Malyze!	- test	designed.	distant 1	an langue	-			_				x
C Standa	st (multi-selea	ct) (double-c 24 Set - 2 Cc	lick to see in 203 (syntheti	tensity data) cl		Analyze ombine Selected	Data Samples 2	KRaws Co	mbine Analysis I Selected Sar	Lines From nples		
C Unkno C Waves	wns St 2 scans St 2				Lis	t Report (Calculation O	ptions C	ombine Data Li Selected Sar	nes From nples		
All San Select /	All St 3					ause Between S se All Matrix Corr elete Selected S	amples ections ample(s)	Report Si	ort Stat and Dat ological or Atom Order	a Grids In ic Number		
Add To Setup Stars Setup Stars Setup Match Save Setups Un 3 * template for pyroxene elements Combined Conditions Count Times												
Specified (Concentration	ns Standa	rd Assignmen	ts Name/	Description	Conditions	Elements/	Cations Sa	Combine the So mples into a Ne	elected w Sample		
St 453 Set TO = 40, Ke' X-ray Counts	St 453 Set 2 Augite, Kakanui USNM 122142 .000 Total Oxygen .000 Total Weight % Boundary Corrections T0 = 40, KeV = 15, Beam = 40, Size = 10 .000 Total Oxygen .000 Z · Bar Calculated Oxygen .000 Z · Bar X-ray Counts (cps/33.93426nA) .000 Excess Oxygen .000 Atomic Weight Create Material File											
Сору	Si ka MAN	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Mg ka MAN	Ca ka MAN	Na ka Off	Beam	
Average:	1863.4	43.8	320.1	4	7.5	441.6	10.2	696.8	1084.1	52.9	39.995	
Std Dev:	8.1	3.2	5.1	2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	
OneSigma:	13.6	2.8	5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
Std Err:	4.1	1.6	2.6	1.1	.3	3.1	.8	3.5	2.3	.8		
%Rel SD:	.44	7.41	1.59	-618.45	7.15	1.41	16.16	1.00	.42	3.15		
Minimum:	1852.0	41.7	315.2	-3.3	6.8	432.4	8.1	686.5	1078.1	50.6	39.971	
Maximum:	1871.3	48.6	326.5	1.5	8.1	446.0	12.0	701.6	1088.0	54.3	40.025	
< □												- F
Delet	e Selected Li	ine(s)	Undele	te Selected	Line(s)	Analyze	Selected Line(s]				
Сору	Si ka MAN	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Mg ka MAN	Ca ka MAN	Na ka Off	Beam	
162.6	1865.4	43.3	317.0	1.2	7.7	432.4	10.0	686.5	1083.1	53.9	39.984	
163 6	1852.0	41.8	326.5	1.5	8.1	445.0	8.1	699.2	1088.0	54.3	40.000	
104 0	1871.3	48.6	315.2	-3.3	7.2	446.0	12.0	701.6	1078.1	52.8	40.025	
165 G	1865.1	41.7	321.8	9	6.8	442.8	10.9	699.8	1087.2	50.6	39.971	
	1										-	-
I I I I I I I I I I I I I I I I I I I												Þ.
Click Next b	utton when r	eady								Cancel	Next	t //.
												_

This opens the **SampleDeleteLines** window.

SampleDeleteLines	-	X
Delete line(s) 163, in sample St 453 122142?	Set 2 Augite, Ka	kanui USNM
	Yes	No

Click the **Yes** button.

The computer will flag this line with a B (bad) and ignore this data for any subsequent calculations, but the raw point data is still kept in the SILICATES01.MDB data file. Note that data lines can always be undeleted later with the **Undelete Selected Line(s)** button.

Analyze!	- in the	designed of	distant in	an inspec								×
Sample Li	st (multi-seled	ct) (double-c	lick to see in	tensity data)		Analyze	Data Samples	KRaws Co	ombine Analysis I Selected San	Lines From nples		
C Unknow	wns St 2 cans St 2	4 Set 2 Cr 5 Set 2 Mr	203 (synthetic 10 synthetic	D)		t Report	Calculation O	ptions (Combine Data Li Selected Sar	nes From nples		
G All San Select /	All St 24	16 Set 2 Fe. 18 Set 2 Nit 01 Set 2 W 03 Set 2 Al 53 Set 2 Al	203 synthetic D synthetic /ollastonite (V bite, Amelia wite, Kakapu	; hematite Villsboro, NY i USNM 1221		Pause Between S Jse All Matrix Corr Delete Selected S	amples ections ample(s)	Report S	ort Stat and Dat eological or Atom Order	a Grids In ic Number		
Add To S Save Set	etup ups St 4	69 Set 2 Hy 73 Set 2 O	persthene, ja ivine (Fo90) L	hnstown US JSNM 11131		Undelete Selected Sample(s) Match						
Save setups Start 473 set 2 Onlying (root) Osten (ro												
St 453 Set TO = 40, Ke ^s X-ray Counts (2 Augite, Kakar V = 15, Beam = cps/39.99426r	ght %	Boundary Corre Create Materi	ections al File								
Сору	Si ka MAN	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Mg ka MAN	Ca ka MAN	Na ka Off	Beam	
Average:	1863.4	43.8	320.1	4	7.5	441.6	10.2	696.8	1084.1	52.9	39.995	
Std Dev:	8.1	3.2	5.1	2.2	.5	6.2	1.7	6.9	4.5	1.7	.023	
OneSigma:	13.6	2.8	5.8	1.7	2.0	6.6	1.8	8.3	10.4	2.5		
Std Err:	4.1	1.6	2.6	1.1	.3	3.1	.8	3.5	2.3	.8		
%Rel SD:	.44	7.41	1.59	-618.45	7.15	1.41	16.16	1.00	.42	3.15		
Minimum:	1852.0	41.7	315.2	-3.3	6.8	432.4	8.1	686.5	1078.1	50.6	39.971	
Maximum:	1871.3	48.6	326.5	1.5	8.1	446.0	12.0	701.6	1088.0	54.3	40.025	
•												- >
Delete	e Selected Li	ne(s)	Undelet	e Selected L	ine(s)	Analyze	Selected Line(s)				
Сору	Si ka MAN	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka MAN	Mn ka Off	Mg ka MAN	Ca ka MAN	Na ka Off	Beam	-
162.6	1865.4	43.3	317.0	1.2	7.7	432.4	10.0	686.5	1083.1	53.9	39.984	
(163 B)	1852.0	41.8	326.5	1.5	8.1	445.0	8.1	699.2	1088.0	54.3	40.000	
104 0	1871.3	48.6	315.2	-3.3	7.2	446.0	12.0	701.6	1078.1	52.8	40.025	
165 G	1865.1	41.7	321.8	9	6.8	442.8	10.9	699.8	1087.2	50.6	39.971	
•												
Click Next b	utton when r	eady								Cancel	Next	

At this point, the user has collected all standardization data and is ready to make MAN background assignments for the elements Si, Fe, Mg, and Ca.

Assign MAN Background Calibrations

From the main PROBE FOR EPMA log window, select **Analytical** from the menu bar and click **Assign MAN Fits** from the menu choices.

👎 Probe fo	or EPMA [C:\l	UserData	a\Doe\silicates0	LMDB]							. • ×	
File Edit	Standard	Xray 7	Analytical Win	dow Run	Output H	Help						
	Acquire!		Analysis O	otions								
AVER:		36	Assign MA	N Fits								
SDEV:		10	Clear All M	AN Assignm	ents (use de	fault)						
Raw Hi-	Peak X-ra	y Co	Use Off Pea	k Elements I	For MAN Fit	(Use on-pea	k intensities	from eleme	ents acquire	d using off-p	eak background	s)
ELEM:	Si ka	Ti	Use MAN (orrection Fo	or Off Peak E	lements (Cal	culate MAN	background	ds for eleme	ents acquired	using off-peak b	ackgrounds)
162G 163G		40						-				
164G		34	Empirical N	IACs								
165G		39	Empirical A	PFs								
AVER:		37	ZAF, Phi-R	no-Z, Alpha	Factor and C	alibration C	urve Selectio	ons				
SDEV:		3	Create Virt	al Standard	Intensity							
1SIG:		2		17: C								
SIGR:		1.	Update Dea	id Time Con	stants							
Raw Lo-1	Peak X-ra	y Co	Student's "	" Table								
ELEM:	Si ka	Ti	CalcZAF Ca	lculations								
162G		37.	20.0	01.1	23.1		2712			11.0		
163G		34.	2 19.9	27.0	30.9		22.7			14.3		
1650		34	3 20.1	33.4	29.7		22.0			12.3		
1050			5 20.2	55.7	25.7		21.9			12.5		
AVER:		35.	0 20.0	31.3	30.3		22.8			12.2		
SDEV:		2.	0.1	3.1	1.2		1.0			1.5		
1SIG:		2.	6 2.0	2.5	2.5		2.1			1.6		
SIGR:		.7	6.05	1.24	. 47		.46			.95		
											*	
Open: Rea	ady									Cancel	Pause //	

This opens the **MANLoadNewElements** window. Default standards have now been assigned for the background correction of each element based on the standard database.

👎 Probe for	FEPMA [C:\	UserData\Do	e\silicates(01.MDB]						Ŀ	. 🗆	x
File Edit	Standard	Xray Analy	/tical Wi	ndow Run	Output I	Help						
	Acquire!			Analyze	I		Automa	atel		PI	ot!	
ELEM:	Si ka	Ti ka	Al ka	V ka	Cr ka	Fe ka	Mn ka	Mg ka	Ca ka	Na ka		-
162G		37.9	20.0	31.1	29.1		24.2			11.3		
163G		34.2	19.9	27.0	30.9		22.7			14.3		
164G		33.5	20.1	33.4	31.6		22.5			11.0		
165G		34.3	20.2	33.7	29.7		21.9			12.3		
			N	/ANLoadNew	/Elements					Σ	(ا	
AVER:		35.0	20.0								_	
SDEV:		2.0	. 1	_								
1SIG:		2.6	2.0		efault MAN	background	assignment	s were loade	d. Check ea	ich		
SIGR:		.76	.05	el el	ement MAN	fit and mod	lify if necess	ary by holdi	ng down th	e < cntrl>		
Calculat	ing All	Standard	K-fac	ke	y while click	king the mol	use to select	or deselect	standards in	the		
Standard	12 MgC) synthet	ic	St	andards list. andards	Click the Up	pdate Fit but	ton to re-fit	the selected	1		
Standard	13 A12	203 synth	etic	su	anuarus.							
Standard	14 S10	2 synthe	tic									
Standard	22 T10	2 synthe	tic						_		_	
Standard	23 V20	3 synthe	tic							OK		
Standard	24 CF2	203 (Synt	hetic)								-	
Standard	25 Find	03 synthet	etic he	matite							°	
Standard	20 FC2) synthet	ic ne	matice								
Standard	2401 1	Vollaston	ite (Wi	lishoro	NV)							
Standard	303 A1	bite. Am	elia	1132010,	,							
Standard	453 Au	ngite. Ka	kanui U	SNM 12214	2							
Standard	469 Hy	persthen	e, john	stown USN	 M #746							
Standard	473 01	ivine (F	090) US	NM 111312	2/444							
Standard	K-facto	ors Calcu	lated									_
												Ŧ
Open: Read	ły									Cancel	Pause	

Click the **OK** button.



This opens the **MAN** Assignment and Fit dialog box. The second element in the list, iron (Fe), is shown below.

From this dialog box, the user may display and modify the MAN background assignments and fits used for the background correction of all elements in the current run. The advantage of this method is that it requires only a simple calibration of the analyzing channel over a range of atomic number. Substantial time may be saved when many samples are to be analyzed. However, if measuring high atomic number samples and/or trace concentrations, the off-peak background correction technique is usually superior.

To review the MAN assignments, select the row for each element in the *Click Channel Row to Plot MAN Fit* section. The measured background counts are plotted as a function of the mean atomic number (MAN or Z-bar). Select standards from the *Standards* list box that do not contain the element itself. Use the shift key and the control key together with the left mouse button to select a range or additional individual standards, respectively. Choose at least five standards per element and click the **Update Fit** button to update the graph. Choose between a second-order polynomial or force a straight line fit. For further details and suggestions, see the User's Guide and Reference documentation.

Standards 22 (TiO2 synthetic) and 25 (MnO synthetic) plot slightly above the fit curve for magnesium. This could indicate a spectral interference or, more likely in this case, a minor amount of Mg in these standards which was so far not documented in the standards database.



Use <ctrl>-click to deselect these two standards in the *Standards* list and click the **Update Fit** button to update the graph. This change only applies to the MAN assignments for the current element, in this case Mg.



When done adjusting individual elements, click the **OK** button to store the updated MAN background corrections.

Analyze Standard Samples

The user will now analyze all of the raw standard data to calculate quantitative compositions. The results of the standards provide a valuable check on the quality of the analysis.

Click the **Analyze** button in the main PROBE FOR EPMA log window to re-open or bring forward the **Analyze!** window. Under *Sample List* select the *Standards* button. Click the **Select All** button to highlight all standards. Click the **Calculation Options** button.

🚏 Analyze!	
Sample List (multi-select) (double-click to see intensity data)	Analyze Data KRaws Combine Selected Samples
C Unknowne St 23 Set 2 Y02 synthetic Wavescans St 24 Set 2 Cr203 (synthetic) St 25 Set 2 Mn0 synthetic	List Report Calculation Options Combine Data Lines From Selected Samples
St 26 Set 2 Fe2O3 synthetic hematite St 28 Set 2 NiO synthetic St 2401 Set 2 Wollastonite (Willsboro, NY)	Pause Between Samples Use All Matrix Corrections Report Sort Stat and Data Grids In Geological or Atomic Number Urder
Add To Setup St 303 Set 2 Albite, Amelia Save Setups St 453 Set 2 Augite, Kakanui USNM 1221 Save Setups St 469 Set 2 Hypersthene, johnstown USN T	Undelete Selected Sample(s) Match Combined Conditions Count Times
Specified Concentrations Standard Assignments Name/Descrip	tion Conditions Elements/Cations Samples into a New Sample
Total O Calcula Excess	xygen Total Weight % Boundary Corrections ted Oxygen Z - Bar Oxygen Atomic Weight Create Material File
Copy	
Compared Line(a)	Anakara Selected Line(a)
Copy	
	Cancel Next

This action opens the **Calculation Options** dialog box. As all standards and unknowns are oxide compounds and oxygen is not measured in this method, click the tick box *Display Results As Oxides* and the radio button *Calculate with Stoichiometric Oxygen* under *Calculations Options*. Elemental results are always calculated and written to the log window.

Selected Samples	OK Canc	el:
St12 Set1 MgO syntheticSt12 Set2 MgO syntheticSt13 Set1 Al2O3 syntheticSt14 Set1 SiO2 syntheticSt22 Set1 TiO2 syntheticSt23 Set1 V2O3 syntheticSt24 Set1 Cr2O3 (synthetic)St25 Set1 MnO syntheticSt26 Set1 Fe2O3 synthetic hematiteSt26 Set1 NiO syntheticSt2401 Set1 Wollastonite (Willsboro, NY)St303 Set1 Albite, AmeliaSt453 Set1 Augite, Kakapui USNM 122142	EDS Calculation Data O Not Use EDS Element Data O Use EDS Spectrum Element Data Assign EDS Spectral Elements Integrated Intensity Data Options	ata
Sample Conductive Coating (need to explicitly tur Element Density Thickness (A) c 2.1 200	n on in Analytical Analysis Options) Use Standard menu to specify standard coating V Use Conductive Coating] S
Calculations Options	Calculate with Stoichiometric Oxygen	>
✓ Display Results As Oxides Calculate Atomic Percents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients	Calculate with Stoichiometric Oxygen Carculate at Elemental Use Particle/Film Calculations	>
 ✓ Display Results As Oxides Calculate Atomic Percents ✓ Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : 	Calculate with Stoichiometric Oxygen Carculate on Elemental Use Particle/Film Calculations	>
 Calculations Options Display Results As Oxides Calculate Atomic Porcents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: 	 Calculate with Stoichiometric Oxygen Carculate or Elemental Use Particle/Film Calculations Atoms Of To 1 Oxyg 	Þ
 Calculations Options Display Results As Oxides Calculate Atomic Porcents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: 	 Calculate with Stoichiometric Oxygen Carculate or Elemental Use Particle/Film Calculations Atoms Of To To To) Ien
 Calculations Options Display Results As Oxides Calculate Attance Percents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen 	 Calculate with Stoichiometric Oxygen Carculate or Elemental Use Particle/Film Calculations Atoms Of To 1 Oxyg Atoms Of To To H:O Ratio .00 OH = 1, H2O = 	en
Calculations Options Display Results As Oxides Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula): Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen Formula and Mineral Calculations	 Calculate with Stoichiometric Oxygen Carculate - Elemental Use Particle/Film Calculations Atoms Of To 1 Oxyg Atoms Of To To H:O Ratio .00 OH = 1, H2O = 	en
Calculations Options Display Results As Oxides Calculate Atomic Percents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula): Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen Formula and Mineral Calculations Calculate Formula Based On	 Calculate with Stoichiometric Oxygen Carculate or Elemental Use Particle/Film Calculations Atoms Of To To Atoms Of To To H:O Ratio OO OH = 1, H2O = Atoms Of Atoms Of Sum < Add specified oxygen 	Jen 2 ger
Calculations Options Display Results As Oxides Calculate Attanic Percents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen Formula and Mineral Calculations Calculate Formula Based On No Mineral End-Member Calculation	 Calculate with Stoichiometric Oxygen Carculate or Elemental Use Particle/Film Calculations Atoms Of To 1 0 xyg Atoms Of To To H:0 Ratio .00 OH = 1, H20 = Atoms Of Sum Add specified oxygetc. from the Elements/Cation button 	Jen 2 ger
Calculations Options Display Results As Oxides Calculate Atomic Percents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula): Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen Formula and Mineral Calculations Calculate Formula Based On C No Mineral End-Member Calculation C Olivine C Feldspar C Pyroxene C 0	 Calculate with Stoichiometric Oxygen Carculate or Elemental Use Particle/Film Calculations Atoms Of To To Atoms Of To To H:O Ratio .00 OH = 1, H2O = Atoms Of Sum Add specified oxygets, from the Elements/Cation button Garnet (Ca,Mg,Fe,Mn) 	Jen 2 ger ns "Cr

Click the **OK** button to output data in oxide form.

Analyzing all of the data on the standards will create a large amount of output, possibly overflowing the log window buffer, depending on the value specified in the LogWindowBufferSize parameter in the PROBEWIN.INI file. The size of the log window buffer is limited only by the amount of memory available. Setting this parameter to 512000 bytes is roughly equivalent to 300 pages of average density text. In some cases saving all log window output to a user specified text file for viewing with a text editor or printing to a printer may be best.

Select Output from the menu bar in the main log window and click Save to Disk Log.

Probe for EPMA [C:\UserData\Doe\silicates01.MDB]		
File Edit Standard Xray Analytical Window Run	Out	put Help
Acquire! Analyze	el	Log Window Font (Change log window font)
Standard 24 Cr2O3 (synthetic)	1	Debug Mode (Debug output to log window)
Standard 25 MnO synthetic		Extended Format (Output all elements on a single line to log window)
Standard 26 Fe2O3 synthetic hematite		Kiosk Display Mode
Standard 2401 Wollastonite (Willsboro.		
Standard 303 Albite, Amelia		Verbose Mode (Verbose output to log window)
Standard 453 Augite, Kakanui USNM 1221	4	Time Stamp Mode (Time stamp output to log window)
Standard 469 Hypersthene, johnstown US	N	Driver Logging Mode (Driver logging output to .log file)
Standard 475 Olivine (roso) USNM 11131 Standard K-factors Calculated	1—	Save To Disk Log (Save all output to log window to disk file)
Calculating All Standard K-factors		View Dick Log (once in denia to regime) volus me)
Standard 12 MgO synthetic		The of the Log (opening me in text called)
Standard 13 A1203 Synthetic		Open rile viewer (Open text earlor with empty life)
Standard 22 TiO2 synthetic		Load Custom Position Format #1 (C.G.S.), (Import .LEP stage coordinate files)
Standard 23 V203 synthetic		Save Custom Analysis Format #1 (C.G.S.) (Fived length fields: Output hased on file seture)
Standard 24 Cr203 (synthetic)		Surge Custom Analysis is format = 2 (CLT). (Clevelated and custom tead, output based on recently a custom tead, output based on recently a custom tead of the custom tead of tead
Standard 26 Fe203 synthetic hematite		Save Custom Analysis Format #2 (First), (Calculated and raw data, output based on sample names)
Standard 28 NiO synthetic		Save Custom Analysis Format #3 (J.H.), (Calculated, raw and statistical results. Output to single file)
Standard 2401 Wollastonite (Willsboro,		Save Custom Analysis Format #4 (J.J.D.), (Averages, standard deviations, statistics. Output to single file)
Standard 303 Albite, Amelia Standard 453 Augite Vakanni USNM 1221		Save Custom Analysis Format #5 (J.J.D2), (Calculated, raw and statistical results, Output based on sample names)
Standard 469 Hypersthene, johnstown US	N	Save Custom Analysis Format #6 (H.W.), (Calculated and statistical results with sample description fields. Output to single file)
Standard 473 Olivine (Fo90) USNM 11131	2	Save Custom Analysis Format #7 (NIST), (Raw uncorrected and unnormalized data. Output to single file)
Standard K-factors Calculated		Save Custom Analysis Format #8 (MAN), (Average atomic numbers and on-peak intensities of standards. Output to single file)
		Save Custom Analysis Format #9 (P.C.), (Calculated and statistical results with formulas and mineral end-members. Output to single file)
Open: Ready		Save Custom Analysis Format #10 (Wavescan samples), (Output based on sample names)
		Save Custom Analysis Format #11 (Wavescan centroids), (Output based on sample names)
		Save Custom Analysis Format #12 (Time Dependent Intensities- TDI). (Output based on sample names)
		Save Custom Analysis Format #13 (Hanchar-Montel Geochron). (Output to single file)
		Save Custom Analysis Format #14 (Trace Flement Average Statistics) (Output to single file)
		Surg Custom Analysis Format #15 (The Data Calculations) (Output to single the)
		Save Custom Analysis Format =13 (0, 1n, Pb Age Calculations), (Output to single file)
		Save Custom Analysis Format #10 (Homogeneity Calculations), (Output to single file)
		Save Images to BMP Files (Output all images via clipboard to save current drawing objects)
		Save User Specified Format Output (Output only the data types specified by the user)
		Save Multi-Point Position and Intensity Data (Output multi-point background intensity data and related parameters)
		Save All EDS Spectra To EMSA (Output all EDS spectra to EMSA format files)
		Output Wavescan Spectrum Image (Output a wavescan spectrum image in Lispix format from multiple wavescan samples)
		Save CalcZAF Format (Output standard or unknown samples. Process using CalcZAF.exe)
		Save CalcZAF "Standard" Format (Output standard samples. Process using CalcZAF.exe)
		Save StrataGem Format (Output k-ratios and thin film models. Process using StrataGem)
		Save Cluster Classification Format (for CalcImage)
		Save Cluster Classification Format (for CalcImage) Open Link To Excel (Allow data and results to go to Excel)

This opens the **Open File To Output Probe Data To** dialog box. The *Save in:* location will be the directory specified for the original file name (SILICATES01.MDB). All subsequent files created by the user will use this location. Edit the *File name* if desired. The default output file has the extension .OUT. Note that the raw data is always saved in the .MDB run file for future re-calculation and/or output. Click **Save** when finished.

👎 Open File 1	To Output Probe Data To		x
Save in: 📗	Doe	▼ = 🗈 💣 🖬 -	
Name	*	Date modified	Ту
	No items match yo	ur search.	
•	III		Þ
File name:	silicates01.out	Save	
Save as type:	Probe Output Files (*.OUT)	✓ Cancel	

Select the **Analyze!** button in the main PROBE FOR EPMA log window to bring forward the **Analyze!** dialog box. Click the **Select All** button highlighting all standards again. Then click the **Analyze** button. This will analyze all selected standard data into the specified text file. If the *Pause Between Samples* tick box is selected, the program will pause after each standard to allow the user to view the results directly in the **Analyze!** window.

Malyze!			- • X
Sample List (multi-select) (double-click to see intensity data)	Data KRaws Samples >>Excel	Combine Analysis Lines From Selected Samples	
C Unknowns St 24 Set 2 Cr203 (synthetic) C Wavescans St 25 Set 2 Mn0 synthetic	alculation Options	Combine Data Lines From Selected Samples	
C All Samples St. 22 Set 2. Ni0 synthetic hematte Select All St. 2401 Set 2. Violiastonite (Willsboro, NY) St. 303 Set 2. Albite, Amelia St. 435 Set 2. Auguite, Kakanui USNM 1221 ≡ Delete Selected Si	ections	Sort Stat and Data Grids In Geological or Atomic Number Order	
Add To Setup Save Setups St 459 Set 2 Hypersthene, johnstown USK Save Setups St 473 Set 2 Olivine (Fo90) USNM 111312 * Combined Condition	Sample(s)	Do Not Output To Log	
Specified Concentrations Standard Assignments Name/Description Conditions	Elements/Cations	Combine the Selected Samples into a New Sample	
Total Dxygen Calculated Oxygen Excess Oxygen	Total Weight % Z - Bar Atomic Weight	Boundary Corrections Create Material File	
Copy			
			4
Delete Selected Line(s) Undelete Selected Line(s) Analyze	Selected Line(s)		
Copy			A
			-
			•
		Lance	Next

To view this data in full, return to the main PROBE FOR EPMA log window and select **Output** from the menu bar again and click **View Disk Log** from the menu.

👎 Pro	be for EPMA [C	:\UserData\[Doe\silicate:	01.MDB]		
File	Edit Standard	Xray An	alytical W	indow Run	Out	put Help
	Acquir	el		Ana		Log Window Font (Change log window font)
PKBG	75.62	1.00	1.07	1.00	1	Debug Mode (Debug output to log window)
						Extended Format (Output all elements on a single line to log window)
st	473 Set	2 01	ivine	(Fo90) U		Kiosk Display Mode
GDDG		NH O				
TYPE	CALC	SPEC				Verbose Mode (Verbose output to log window)
		0120				Time Stamp Mode (Time stamp output to log window)
AVER	002	.370				Driver Logging Mode (Driver logging output to .log file)
SDEV	.000	.000				Save To Disk Log (Save all output to log window to disk file)
ELEM	SiO2	TiO2	A1203	V203		View Disk Log (Open log file in text editor)
11	70 40.254	.000	.004	.000		Open File Viewer (Open text editor with empty file)
11	1 40.963 72 40.673	.007	.021	.000		
17	40.467	.000	.090	.000		Load Custom Position Format #1 (C.G.S.), (Import .LEP stage coordinate files)
ATTED	40 590	010	029	019		Save Custom Analysis Format #1 (C.G.S.), (Fixed length fields, Output based on file setups)
SDEV		.012	.042	.036		Save Custom Analysis Format #2 (H.T.), (Calculated and raw data, Output based on sample names)
SERR	.151	.009	.021	.018		Save Custom Analysis Format #3 (J.H.), (Calculated, raw and statistical results. Output to single file)
%RSD	.74	161.83	145.21	200.00		Save Custom Analysis Format #4 (J.J.D.), (Averages, standard deviations, statistics. Output to single file)
PUBL	40.810	n.a.	n.a.	n.a.		Save Custom Analysis Format #5 (J.J.D2). (Calculated, raw and statistical results. Output based on sample names)
*VAR	54					Save Custom Analysis Format #6 (H.W.) (Calculated and statistical results with sample description fields. Output to single file)
DIFF	221					Save Custom Analysis Format #7 (NIST) (Raw uncorrected and unnormalized data Output to single file)
STDS	453	22	13	23		Save Custom Anshris Format #7 (MAN) (Average atomic gundhers and on pack interacting of standards Output to single file)
						Save Custom Analysis format =0 (wkm), (Average atomic numbers and on-peak intensities of statuards, output to single me)
						Save Custom Analysis Format +9 (P.C.), (Calculated and statistical results with formulas and mineral end-members. Output to single me)
Open:	Ready					Save Custom Analysis Format #10 (Wavescan samples), (Output based on sample names)
👎 Ana	lyze!					Save Custom Analysis Format #11 (Wavescan centroids), (Output based on sample names)
Sam	ple List (multi-	select) (dou	ble-click to	see intensity		Save Custom Analysis Format #12 (Time Dependent Intensities- TDI), (Output based on sample names)
6.5	itandards	t 23 Set	2 V203 su	nthetic		Save Custom Analysis Format #13 (Hanchar-Montel Geochron), (Output to single file)
01	Inknowns	t 24 Set	2 Cr2O3 (s	ynthetic)		Save Custom Analysis Format #14 (Trace Element Average Statistics), (Output to single file)
0 V	¥avescans	it 25 Set it 26 Set	2 MnU syr 2 Fe203 s	ithetic vnthetic hem		Save Custom Analysis Format #15 (U, Th, Pb Age Calculations), (Output to single file)
	All Samples	t 28 Set	2 NiO synt	hetic onite (Willshi		Save Custom Analysis Format #16 (Homogeneity Calculations), (Output to single file)
		t 303 Set	2 Albite, A	Amelia Kakanui USN		Save Images to BMP Files (Output all images via clipboard to save current drawing objects)
Ado	I To Setup	t 469 Set	2 Hyperst	hene, johnsto		Save User Specified Format Output (Output only the data types specified by the user)
Sa	ave Setups 📘 📘	t 473 Set	2 Ulivine	(Fo9U) USNM		Save Multi-Doint Doction and Intersity Data (Output multi-point background intensity data and related parameters)
Snec	ified Concentr	ations	andard Ass	ignments I		Save All EDS Spectra To EMSA (Output all EDS spectra to EMSA format files)
			andara mo	-grillonte		Output Wavescan Spectrum Image (Output a wavescan spectrum image in Lispix format from multiple wavescan samples)
St 47:	3 Set 2 Olivine (40 KeV = 15 B	Fo90) USNM 1 aam = 40, Siz	111312/444	A 43		
10-	40, NOV - 10, DA	Dann - 40, 512	0 - 10	- 43		Save CalcZAF Format (Output standard or unknown samples. Process using CalcZAF.exe)
Copy	Sin Uxide weight	Ti0?	0120	13 V20		Save CalcZAF "Standard" Format (Output standard samples. Process using CalcZAF.exe)
Averag	je: 40.589	.012	2 .(029 .(1	Save StrataGem Format (Output k-ratios and thin film models. Process using StrataGem)
Std De	¥: .302	.01	9.0	.042	1	Save Cluster Classification Format (for Calcimage)
ZAF Co	orr: 1.3969	1.168	81 1.6 n 4	5843 1.1		sore closer closered or romat (or continue)
%Bel S	151 D: .74	161.9	5. 33. 14	5.21 .U		Open Link To Excel (Allow data and results to go to Excel)
Minimu	m: 40.254	.00	0.0	. 000	✓	Close Link To Excel

This opens the file editor. This example utilizes the editor **Notepad++**, seen below. A number of text file viewers may be used. To utilize a specific editor such as Notepad, Textpad or Word, edit the FileViewer keyword in the PROBEWIN.INI file.

2 *C:\U	serData\Doe	e\silicates01.	out - Notepa	d++		_				_			_ 0 <mark>_ X</mark>
File Ed	it Search	View Enc	oding Lan	guage Set	tings Mac	ro Run Plu	ugins Wir	ndow ?					х
🛛 🕞		s 🕞 🖨	4 🗅 🗈	9 C	111 b	3 3 12	🔤 🔤	چ 🗐 ۱			🗟 🎸		
🗎 silicat	es01.out												
992													<u>^</u>
993	St 453	Set 2	Augite,	Kakanui	USNM 12	2142							
994													
995	St 453	Set 2	Augite,	Kakanui	USNM 12	2142							
996	TakeOff	= 40.0	KiloVol	t = 15.0	Beam C	urrent =	40.0 B	eam Size	= 10				
997	(Magnif	ication	(analyti (dofoult	cal) =	2533), 2522 Ma	Be	am Mode	= Analo	2522V				
999	Tmage 9	hift (X	(ueraurc V) •	, –	2555, Ha	gnificaci	on (ina	-2 00	2000				
1000	Indge D	(A)	-/.					2.00	, 0.00				
1001	Analysi	s (wet c	hemistry) by Gen	e Jarose	wich (mod	ifed)						
1002	Origina	analys	is: A120	3=7.86%,	Fe203=3	.69%, FeO	=3.45%						
1003	Number	of Data	Lines:	4	N	umber of	'Good' I	Data Lin	.es: 3				
1004	First/L	ast Date	-Time: 0	4/24/201	3 01:39:	48 PM to	04/24/2	013 01:4	2:48 PM				
1005	WARNING	- Forcin	g negati	ve k-rat	ios to z	ero							
1006													
1007	Average	Total O	xygen:	44.	240 .	Average T	otal We	ight%:	100.805				
1008	Average	Evenes	ted Oxyg	en: 44.	302	Average A Average A	tomic N	umber:	21 772				
1010	Average	7AF Tte	ration:		00 .	Average A Average O	want It	ergnt:	3 00				
1011	Average	. DAL 100	racion.		.00	Average ¥	auno 10	crace.	0.00				
1012	Oxygen	Calculat	ed by Ca	tion Sto	ichiomet	ry and In	cluded :	in the M	latrix Co	orrection			
1013													
1014	St 453	Set 2	Augite,	Kakanui	USNM 12	2142, Res	ults in	Element	al Weigł	nt Percent	s		
1015													
1016	SPEC:	0											
1017	TYPE:	CALC											
1010	AVED.	44 240											
1020	SDEV:	.151											
1021													
1022	ELEM:	Si	Ti	Al	v	Cr	Fe	Mn	Mg	Ca	Na		
1023	BGDS:	MAN	LIN	LIN	LIN	LIN	MAN	LIN	MAN	MAN	LIN		
1024	TIME:	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00		
1025	BEAM:	39.99	39.99	39.99	39.99	39.99	39.99	39.99	39.99	39.99	39.99		
1026						-	_						
1027	ELEM:	22 605	T1	A1	V 014	Cr	1 9 2 9	Mn	Mg	Ca 11 202	1 051	5UM	
1020	164	23.005	.518	4.532	.000	.090	4.998	.145	10.282	11.302	1.030	101.109	
1030	165	23.698	.496	4.624	.000	.080	4.960	.132	10.245	11.426	.986	100.936	
1031													
1032	AVER:	23.719	.530	4.569	.005	.085	4.932	.133	10.192	11.377	1.022	100.805	
1033	SDEV:	.047	.043	.049	.008	.005	.084	.012	.124	.051	.033	.387	
1034	SERR:	.027	.025	.028	.005	.003	.048	.007	.072	.029	.019		
1035	%RSD:	.20	8.06	1.06	173.20	5.96	1.70	8.84	1.22	.45	3.22		-
Normal te	ext file		length :	58832 lines	:: 1243	Ln : 992	Col:2 S	el : 0		Dos\Window	/s Al	NSI	INS

The user may now scroll through the analyzed standards using the text editor or may direct the file data to a printer by selecting **File** from the **Notepad**++ menu bar and clicking on **Print** in the drop-down menu.

Since all elements were acquired on all standards, examination of the results will serve as quality control for the calibration. Several of the standard compositions will be displayed in the **Analyze!** window. The first example is the Augite Kakanui standard displayed below, which is currently assigned as primary standard for silicon. To be able to directly compare the results with the published values, the tick box *Display Results As Oxides* in the **Calculation Options** window is deselected and elemental wt% are displayed. An excellent agreement between measured and published values is observed. No composition is calculated for line 163 B, which was disabled before by the user.

Sample List (multi-select) (double-click to see intensity data) Analyze Data KRaws Combine Analysis Lines From Selected Samples Size 25 Set 2 X003 synthetic Unknownes Size 25 Set 2 X003 synthetic Size 20 Set	👎 Analyze!	1.00	- 10.00				-			-			_ 0	3
Current Step 22 Set 2 V203 symbolic Current Step	Sample L	.ist (multi-sele	ect) (double-	click to see int	ensity data) —		Analyze	Data	KRaws	Combine Analysi: Selected Sa	s Lines From amples			
Litt Report Calculation Options Calculation options Calculation options Calculation options Calculation options Calculation options	• Stand	lards St	23 Set 2 V. 24 Set 2 D	203 synthetic 203 (supthetic	1	^ <u> </u>	ombine Selecter	d Samples	>>Excel					
All Samples St 26 Set 2 NG synthetic St 280 Set 2 NG synthetic St 2401 Set 2 NG synthetic St 403 Set 2 Augite, Kakemi USMH 1221 St 473 Set 2 Divine (Fo30) USMH 111312* Pause Between Samples Delete Selected Sample(s) Contined Conditions Sort Stat and Data Brite In Geological or Atomic Number Order Specified Concentrations Standard Assignments Name/Description Conditions Count Times Combine the Selected Samples into 8 New Sample St 453 Set 2 Augite, Kakemi USM 122142 TO = 40, KeV = 15, Beam = 40, Size = 10 44.240 44.240 Total Oxygen Total Oxygen Total Weight X Create Material File Boundary Corrections Create Material File St 453 Set 2 Augite, Kakemi USM 122142 TO = 40, KeV = 15, Beam = 40, Size = 10 44.240 44.240 Total Oxygen Total Weight X Create Material File Boundary Corrections Create Material File St 450 Set 2 N0		scans St	25 Set 2 M	nO synthetic	,	Li	t Report	Calculation	Options	Selected S	Lines From			
Add To Setup Save Setups St. 453 Set. 2 Augite, Kakamu USMM 1221 St. 473 Set. 2 Olivine (Fo90) USNM 111312 * Delete Selected Sample(s) Undelete Selected Sample(s) Match Iuddelete Selected Sample(s) Match Iuddelete Selected Sample(s) Do Not Dutput To Log Specified Concentrations Standard Assignments Name/Description Conditions Conditions Conditions Conditions Conditions Samples into a New Sample St 453 Set. 2 Augite, Kakamu USNM 122142 To a 40, KeV = 15, Beam = 40, Size = 10 44.240 Total Oxygen Total Oxygen Total Oxygen Total Weight ? Boundary Corrections Results in Elemental Weight Percent 302 Excess Dxygen 100.805 133 10.119 11.372 44.240 100.805 Std Dev: .047 .043 .049 .005 .084 .012 .124 .051 .033 .151 .387 Std Dev: .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 .387 Std Dev: .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 .387 <t< th=""><th>O All Sa Select</th><th>Imples St tAll St 2 St 3</th><th>26 Set 2 Fo 28 Set 2 N 401 Set 2 N 303 Set 2 A</th><th>e2O3 synthetic iO synthetic ∦ollastonite (₩ .lbite, Amelia</th><th>hematite /illsboro, NY)</th><th></th><th>Pause Between S Jse All Matrix Co</th><th>Gamples rrections</th><th>Report</th><th>Sort Stat and D Geological or Ato</th><th>ata Grids In omic Number</th><th></th><th></th><th></th></t<>	O All Sa Select	Imples St tAll St 2 St 3	26 Set 2 Fo 28 Set 2 N 401 Set 2 N 303 Set 2 A	e2O3 synthetic iO synthetic ∦ollastonite (₩ .lbite, Amelia	hematite /illsboro, NY)		Pause Between S Jse All Matrix Co	Gamples rrections	Report	Sort Stat and D Geological or Ato	ata Grids In omic Number			
Specified Concentrations Standard Assignments Name/Description Conditions Elements/Cations Scombine the Selected Samples into a New Sample St 453 Set: 2 Augite, Kakanui USNM 122142 44.240 Total Daygen 100.805 Total Weight % Boundary Corrections Results in Elemental Weight Percent	Add To Save S	Setup St 4	<mark>153 Set 2 A</mark> 169 Set 2 H 173 Set 2 O	lugite, Kakanui Iypersthene, jol Ilivine (Fo90) U	USNM 1221 hnstown USN- SNM 111312		ndelete Selected	Sample(s)	Match	Do Not Output	To Log			
St. 453 Set: 2 Augite, Kakanui USNM 122142 Total Dxygen Calculated Dxygen Sit. Ti Boundary Corrections Total Dxygen Calculated Dxygen Sit. Ti Al. V Cr Boundary Corrections Create Material File Optimized Total Dxygen Calculated Dxygen Sit. Ti Al. V Cr Fe Mn Mg Ca Na O Total Dxygen Create Material File Copy Si Total Dxygen Calculated Dxygen Z1.772 Atomic Weight % Create Material File Copy Si Total Mag O Total Meight % Create Material File Copy Si Total Meight % Copy Copy Si Total Meight % Ca Na O Total Meight % Create Material File Copy Si Total Meight % Ca O Total Meight % Ca O Total Meight % Ca Ca Na O Cotspa= Ca	Specified	Concentratio	ons <mark>Standa</mark>	ard Assignment	s Name/De	scription	mbined Conditio	ns Co Elements	unt Times s/Cations	Combine the Samples into a N	Selected Iew Sample			
Results in Elemental Weight Percent 302 Excess 0.xygen 21.772 Atomic Weight Create Material File Copy Si Ti AI V Cr Fe Mn Mg Ca Na 0 Total Average: 23.719 530 4.569 .005 .085 4.932 .133 10.192 11.377 1.022 44.240 100.055 Std Dev: .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 .387 Published: 23.714 .432 .6620 n.a. .089 4.928 .108 10.125 11.392 .994 44.198 100.660 Std Err: .027 .025 .028 .000 .008 4.838 .122 10.051 11.325 .986 44.071 100.369 Minimum: 23.774 .578 4.624 .014 .090 4.838 .122 10.051 11.426 1.051	St 453 Set TO = 40, K	2 Augite, Kaka eV = 15, Beam	anui USNM 122 = 40, Size = 1	2142	44.240 To 44.542 Ca	tal Oxygen alculated Oxy	gen 12.4	305 Total W 19 Z · Bar	eight %	Boundary Co	rrections			
Copy Si Ti AI V Cr Fe Mn Mg Ca Na 0 Total Average: 23.719 .530 4.569 .005 .085 4.932 .133 10.192 11.377 1.022 44.240 100.005 Std Dev: .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 .387 Published: 23.714 .432 .4620 n.a. .089 4.928 .108 101.125 11.392 .994 44.198 100.660 Std Err: .027 .025 .028 .005 .003 .048 .007 .072 .029 .019 .087 .223 Zale Sb: .20 8.06 1.06 173.20 5.96 1.70 8.84 1.22 .45 3.22 .34 .38 Minimum: 23.685 .496 4.624 .014 .998 .145 10.282<	Results in El	emental Weight	Percent		302 E>	cess Oxyger	21.7	72 Atomic	√eight	Lifeate Mate	rial File			
Average: 23.719 .530 4.569 .005 .085 4.932 .133 10.192 11.377 1.022 44.240 100.805 Std Dev: .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 .387 Published: 23.714 .492 .4620 na. .069 .4928 .108 10.125 .11.392 .994 .44.188 100.660 Std Err: .027 .025 .028 .005 .003 .048 .007 .072 .029 .019 .087 .223 ZRel 5D: .20 8.06 1.06 .173.20 5.96 1.70 8.84 1.22 .45 3.22 .34 .38 Minimum: 23.685 .496 4.532 .000 .080 4.838 .122 10.051 11.325 .986 44.071 100.369 Maximum: 23.772 .578 4.624 .014 .990 4.838 .122 10.051 11.325 1.051 44.071 100.369 <th>Сору</th> <th>Si</th> <th>Ti</th> <th>AI</th> <th>V</th> <th>Cr</th> <th>Fe</th> <th>Mn</th> <th>Mg</th> <th>Ca</th> <th>Na</th> <th>0</th> <th>Total</th> <th></th>	Сору	Si	Ti	AI	V	Cr	Fe	Mn	Mg	Ca	Na	0	Total	
Std Dev: .047 .043 .049 .008 .005 .084 .012 .124 .051 .033 .151 .387 Published: 23.714 .492 4.620 n.a. .089 4.928 .108 10.125 11.392 .994 44.198 100.660 Std Err: .027 .025 .028 .005 .003 .048 .007 .072 .029 .019 .087 .223 ZRel SD: .20 8.06 1.06 .173.20 5.96 1.70 8.84 1.22 .45 3.22 .34 .38 Minimum: 23.685 .496 4.624 .014 .090 4.998 .145 10.282 11.426 1.051 44.362 101.109 Maximum: 23.772 .578 4.624 .014 .090 4.838 .122 10.051 11.325 .986 44.071 100.369 Maximum: 23.665 .516 4.624 .014 .090 4.838 .122 10.051 11.382 .001 10.109 10.369	Average:	23.719	.530	4.569	.005	.085	4.932	.133	10.192	2 11.377	1.022	44.240	100.805	
Published: 23,714 .492 4.620 n.a. .089 4.928 .108 10.125 11.392 .994 44.198 100.660 Std Err. .027 .025 .028 .005 .003 .048 .007 .072 .029 .019 .087 .223 Std Err. .027 .025 .028 .005 .003 .048 .007 .072 .029 .019 .087 .223 Std Err. .20 8.06 1.06 173.20 5.96 1.70 8.84 1.22 10.051 11.325 .986 44.071 100.369 Maximum: 23.672 .578 4.624 .014 .090 4.998 .145 10.282 11.426 1.051 44.362 101.109 V Cr Fe Mn Mg Ca Na 0 Total V Cr Fe Mn Mg Ca Na 0 Total 100.369 Id2 G 23.685 .516 4.550 .014 .090 <t< td=""><td>Std Dev:</td><td>.047</td><td>.043</td><td>.049</td><td>.008</td><td>.005</td><td>.084</td><td>.012</td><td>.124</td><td>.051</td><td>.033</td><td>.151</td><td>.387</td><td></td></t<>	Std Dev:	.047	.043	.049	.008	.005	.084	.012	.124	.051	.033	.151	.387	
Std Err. 0.027 0.025 0.028 0.005 0.003 0.048 0.007 0.072 0.029 0.119 0.087 2.23 XRel SD: .20 8.06 1.06 173.20 5.96 1.70 8.84 1.22 .45 3.22 .34 .38 Minimum: 23.685 .496 4.532 .000 .090 4.938 1.22 10.051 11.325 .986 44.071 100.369 Maximum: 23.772 .578 4.624 .014 .090 4.998 .145 10.282 11.426 1.051 44.362 101.109 Copy Si Ti Al V Cr Fe Mn Mg Ca Na O Total I62 G 23.695 .516 4.550 .014 .090 4.838 .122 10.051 11.325 1.986 44.071 100.369 I63 B .516 4.550 .014 .090 4.838 .122 10.051 11.325 1.030 44.362 101.109 44.362 101.109 <th< td=""><td>Published:</td><td>23.714</td><td>.492</td><td>4.620</td><td>n.a.</td><td>.089</td><td>4.928</td><td>.108</td><td>10.12</td><td>5 11.392</td><td>.994</td><td>44.198</td><td>100.660</td><td></td></th<>	Published:	23.714	.492	4.620	n.a.	.089	4.928	.108	10.12	5 11.392	.994	44.198	100.660	
28ael SD: .20 8.06 1.06 173.20 5.96 1.70 8.84 1.22 .45 3.22 .34 .38 Minimum: 23.685 .496 4.532 .000 .080 4.838 .122 10.051 11.325 .986 44.071 100.369 Maximum: 23.772 .578 4.624 .014 .090 4.998 .145 10.282 11.426 1.051 44.362 101.109 Maximum: 23.772 .578 4.624 .014 .090 4.998 .145 10.282 11.426 1.051 44.362 101.109 Copy Si Ti Al V Cr Fe Mn Mg Ca Na O Total 162 G 23.695 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 163 B .516 4.550 .014 .090 4.838 .122 10.051 11.325 1.030 44.362 101.109 165 G	Std Err:	.027	.025	.028	.005	.003	.048	.007	.072	.029	.019	.087	.223	
Minimum: 23.685 .496 4.532 .000 .080 4.838 .122 10.051 11.325 .986 44.071 100.369 Maximum: 23.772 .578 4.624 .014 .090 4.998 .145 10.262 11.426 1.051 44.362 101.109 V Delete Selected Line(s) Undelete Selected Line(s) Analyze Selected Line(s) Total Copy Si Ti AI V Cr Fe Mn Mg Ca Na O Total I62 G 23.695 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 I64 G 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 101.109 I65 G 23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936 I65 G 23.698 .496	%Rel SD:	.20	8.06	1.06	173.20	5.96	1.70	8.84	1.22	.45	3.22	.34	.38	
Maximum: 23.772 .578 4.624 .014 .090 4.998 .145 10.282 11.426 1.051 44.362 101.109 Delete Selected Line(s) Undelete Selected Line(s) Analyze Selected Line(s) Analyze Selected Line(s) Intervention Na 0 Total Na Copy Si Ti AI V Cr Fe Mn Mg Ca Na 0 Total Na 162 G 23.685 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 165 G 23.698 .496 4.624 .000 .080 4.998 .145 10.282 11.325 1.030 44.362 101.109 44.288 100.369 165 G 23.698 .496 .132 10.245 11.426 .986 44.288 100.936 100.936 100.936 100.936 100.936 100.936 100.936 100.936 100.936 100.936 100.936 100.936 100.936 100.936 100.936	Minimum:	23.685	.496	4.532	.000	.080	4.838	.122	10.051	11.325	.986	44.071	100.369	
Si Ti Al V Cr Fe Mn Mg Ca Na O Total Al 162 6 23.695 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 163.8 164.6 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 101.109 165 6 23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936 V	Maximum:	23.772	.578	4.624	.014	.090	4.998	.145	10.282	2 11.426	1.051	44.362	101.109	
Copy Si Ti AI V Cr Fe Mn Mg Ca Na O Total 162 G 23.695 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 164 G 164 G 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 101.109 165 G 23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936 .	Dele	te Selected I	_ine(s)	Undelete	e Selected Lin	ie(s)	Analyz	e Selected Lin	e(s)					+
162 G 23.695 .516 4.550 .014 .090 4.838 .122 10.051 11.382 1.051 44.071 100.369 163 B .578 4.532 .000 .085 4.998 .145 10.262 11.325 1.030 44.362 101.109 165 G 23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936 .4.284 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936	Сору	Si	Ti	AI	v	Cr	Fe	Mn	Mg	Ca	Na	0	Total	
163 B 164 G 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 101.109 165 G 23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936 Cancel	162 G	23.685	.516	4.550	.014	.090	4.838	.122	10.051	11.382	1.051	44.071	100.369	
164 G 23.772 .578 4.532 .000 .085 4.998 .145 10.282 11.325 1.030 44.362 101.109 165 G 23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936 <td>163 B</td> <td></td>	163 B													
165 G 23.698 .496 4.624 .000 .080 4.960 .132 10.245 11.426 .986 44.288 100.936	164 G	23.772	.578	4.532	.000	.085	4.998	.145	10.282	2 11.325	1.030	44.362	101.109	
Cancel Nevt	165 G	23.698	.496	4.624	.000	.080	4.960	.132	10.24	5 11.426	.986	44.288	100.936	-
	•	1											•	
												Cancel	Next	

The analysis of the TiO_2 standard reveals apart from titanium 0.5 wt% iron which is a known contamination, and 0.6 wt% vanadium. This sample has no vanadium; here the user sees the notorious Ti-V spectral interference. This will be corrected for (shortly) using the automatic interference correction routine.

Hanalyze!		a 100.0					08.0						×
Sample Li	ist (multi-sele	e <mark>ct) (double</mark> - 401 Set 1 \	click to see inte ∀ollastonite f₩	ensity data) (illsboro, NY) 🔺	Co	Analyze mbine Selecte	Data d Samples	KRaws	Combine Analysi Selected S	s Lines From amples			
C Unkno C Waves	wns St 3 scans St 4	03 Set 1 A 53 Set 1 A	lbite, Amelia ugite, Kakanui	USNM 1221	List	Report	Calculation	Options	Combine Data Selected S	Lines From amples			
C All Sar Select	nples St 4 All St 5 St 4	69 Set 1 H 73 Set 1 0 12 Set 3 M 13 Set 2 A	lypersthene, joi Ilivine (Fo90) U gO synthetic 1203 synthetic	SNM 111312	□ Pa □ Us	use Between : e All Matrix Co	Samples rrections	Report	Sort Stat and D Geological or Ato Orde	ata Grids In mic Number			
Add To Save Se	tups St	14 Set 2 Si 22 Set 2 Ti 23 Set 2 Vi	iO2 synthetic i <mark>O2 synthetic</mark> 2O3 synthetic			lelete Selected	d Sample(s)	Match	Do Not Output	To Log			
Specified	Concentratio	ns Standa	ard Assignment	s Name/Desc	ription	Conditions	Elements	/Cations	Combine the Samples into a N	Selected Iew Sample			
St 22 Set 1 TO = 40, Ke	2 TiO2 syntheti V = 15, Beam	c = 40, Size = 1	10	.000 Tota .000 Calc	I Oxygen ulated Oxyg	en 16.4	135 Total We	eight %	Boundary Co	rrections			
Results in Ele	mental Weight	Percent		000 Exce	ess Uxygen	26.7	13 Atomic V	Veight	Create Mate	anai riie			
Сору	Si	Ti	AI	V C	r	Fe	Mn	Mg	Ca	Na	0	Total	
Average:	.008	59.102	.014	.604	.023	.486	.001	.000	.002	.035	39.860	100.135	
Std Dev:	.009	.096	.004	.028	.018	.028	.003	.000	.003	.042	.000	.153	
Published:	n.a.	59.100	n.a.	n.a.	n.a.	.660	n.a.	n.a.	n.a.	n.a.	39.860	100.000	
Std Err:	.005	.048	.002	014	.009	.014	.001	.000	.002	.021	.000	.077	
%Rel SD:	117.49	.16	30.39	4.58	81.24	5.75	200.00	141.44	200.00	120.91	.00	.15	
Minimum:	.000	59.022	.008	.579	.001	.464	.000	.000	.000	.000	39.860	99.995	
Maximum:	.021	59.229	.017	.636	.045	.527	.005	.001	.006	.085	39.860	100.349	
•													- F
Delet	e Selected L	ine(s)	Undelete	e Selected Line	[5]	Analyz	e Selected Line	e(s)					
Сору	Si	Ti	AI	V C	r	Fe	Mn	Mg	Ca	Na	0	Total	
284 G	.000	59.032	.014	.636	.045	.480	.000	.000	.000	.000	39.860	100.066	-
285 G	.002	59.022	.017	.618	.001	.475	.000	.000	.000	.000	39.860	99.995	
286 G	.009	59.125	.008	.579	.029	.464	.000	.000	.000	.054	39.860	100.128	
287 G	.021	59.229	.015	.582	.017	.527	.005	.001	.006	.085	39.860	100.349	
	1												- L
	1												
-												1	-
											Cancel	Nevt	1 1

All of the data lines gathered on the standards are examined in the same way and appear close to their standard database values. To save space they will not be reproduced here.

Spectral Interference Assignments

PROBE FOR EPMA allows the user to select a fully quantitative correction for spectral interferences. The program can only correct for interferences if both the interfered and interfering elements are measured. Further, data for an interference calibration standard must be acquired that contains a major concentration of the interfering element and none of the interfered element or any other elements that interfere with the interfered element.

The review of the analysis results for the standards in the previous section has identified interferences between various transition metals which require correction. Many transition metal K α x-ray lines are interfered by the element to the left in the periodic table of elements, e.g. Ti interferes with V, V with Cr, and so forth.

Select the *Standards* button in the *Sample List* and click the **Select All** button in the **Analyze!** window. Next, click the **Standard Assignments** button.

👎 Analyze!							-					_ D _ X
Sample L	ist (multi-sele	ect) (double-	click to see in	tensity data)-		Analyze	Data	KRaws	Combine Analysis Selected Sa	Lines From		
Stand	ards St wns St	23 Set 2 V 24 Set 2 C 25 Set 2 M	203 synthetic 203 (synthetic n() synthetic	c)	^	Combine Selected	Samples	>>Excel	Combine Data I	Lines From		
C Wave: C All Sar Select	All St	26 Set 2 Fe 28 Set 2 N 401 Set 2 N 803 Set 2 A	203 synthetic i0 synthetic ¥ollastonite (\ Ibite, Amelia	: hematite ¥illsboro, NY)	Ē	Pause Between 9 Use All Matrix Co	amples rections	Report	Sort Stat and Da Geological or Ato	ampies ata Grids In mic Number		
Add To S	Setup St 4	153 Set 2 A 169 Set 2 H 173 Set 2 0	ugite, Kakanu ypersthene, jo livine (En90)	i USNM 1221 hnstown USN ISNM 111312	- <u>-</u>	Delete Selected S Indelete Selected	Sample(s) Sample(s)	Match	Do Not Output	To Log		
Specified	Concentratio	ns Standa	ard Assignmen	ts) Name/De	escription	ombined Conditio	ns Cou Elements	unt Times	Combine the S Samples into a N	Selected lew Sample		
St 453 Set TO = 40, Ke Results in Ele	2 Augite, Kaka V = 15, Beam emental Weight	anui USNM 122 = 40, Size = 1 Percent	2142	44.240 T 44.542 C 302 E	otal Oxygen alculated Ox xcess Oxyge	ygen 12.4 n 21.7	105 Total W 19 Z · Bar 72 Atomic \	eight % √eight	Boundary Co Create Mate	rrections rial File		
Сору	Si	Ti	AI	V	Cr	Fe	Mn	Mg	Ca	Na	0	Total
Average:	23.719	.530	4.569	.005	.085	4.932	.133	10.192	11.377	1.022	44.240	100.805
Std Dev:	.047	.043	.049	.008	.005	.084	.012	.124	.051	.033	.151	.387
Published:	23.714	.492	4.620	n.a.	.089	4.928	.108	10.125	11.392	.994	44.198	100.660
Std Err:	.027	.025	.028	.005	.003	.048	.007	.072	.029	.019	.087	.223
%Rel SD:	.20	8.06	1.06	173.20	5.96	1.70	8.84	1.22	.45	3.22	.34	.38
Minimum:	23.685	.496	4.532	.000	.080	4.838	.122	10.051	11.325	.986	44.071	100.369
Maximum:	23.772	.578	4.624	.014	.090	4.998	.145	10.282	11.426	1.051	44.362	101.109
Image: A labeled and the second se												E.
Delet	e Selected L	.ine(s)	Undele	te Selected Li	ne(s)	Analyze	e Selected Lin	e(s)				
Сору	Si	Ti	AI	v	Cr	Fe	Mn	Ma	Ca	Na	0	Total 🔺
162 G	23.685	.516	4.550	.014	.090	4.838	.122	10.051	11.382	1.051	44.071	100.369
163 B												
164 G	23.772	.578	4.532	.000	.085	4.998	.145	10.282	11.325	1.030	44.362	101.109
165 G	23.698	.496	4.624	.000	.080	4.960	.132	10.245	11.426	.986	44.288	100.936
	1											· · · ·
												P
											Cancel	Next 📈

Clicking this button opens the **Standard and Interference Assignments** dialog box.

1 12 Set 2 MgO synthetic 1 13 Set 1 Al2O3 synthetic 1 14 Set 1 SiO2 synthetic 1 2 Set 1 TiO2 synthetic 1 2 Set 1 V2O3 synthetic 1 2 Set 1 MO synthetic 1 2 Set 1 Fe2O3 synthetic hematite 1 2 Set 1 NiO synthetic 1 2 Set 1 Albite, Amelia 1 4 53 Set 1 Albite, Amelia 1 4 53 Set 1 Augite, Kakanui USNM 122142 1 2 3 4 5 6 ick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) Assignments ick Element X-Ray Analyzed Standard Interf-Ele interf-Std Si ka Si ka Yes Si ka Yes Si ka Yes Si ka <		1 Mail sun	hetic			UK	Lancel
t 13 Set 1 Al2U3 synthetic t 14 Set 1 SiO2 synthetic t 22 Set 1 TiO2 synthetic t 23 Set 1 V2O3 synthetic t 24 Set 1 Cr2O3 (synthetic) t 25 Set 1 MnO synthetic t 26 Set 1 Fe2O3 synthetic hematite t 28 Set 1 NiO synthetic t 2401 Set 1 Wollastonite (Willsboro, NY) t 303 Set 1 Albite, Amelia t 453 Set 1 Augite, Kakanui USNM 122142 Remove TDI Correction 1 2 3 4 5 6 ick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) Assignments nannel Element X-Ray Analyzed Standard Interf-Ele Interf-Std Si ka Yes 453 nannel Element X-Ray Analyzed Standard Interf-Ele Interf-Std Si ka Yes 13 numel Ka Yes 22 numel 0,0,0,0,0 numel Ka Yes 23 numel 0,0,0,0,0 numel Ka Yes 23 numel 0,0,0,0,0 numel Ka Yes 23 numel 0,0,0,0,0,0 numel Ka Yes 24 numel 0,0,0,0,0,0	St 12 Set	2 MgO synt	hetic		ń –	Save Elemen	nt Setun
t 12 Set 1 TiO2 synthetic Save Sample Setup t 22 Set 1 V203 synthetic Add/Remove Standards t 25 Set 1 Mn0 synthetic Reload Standard Assignments t 24 Set 1 Fe203 synthetic tematite Remove TDI Correction t 2401 Set 1 Wollastonite (Willsboro, NY) 1 2 3 4 5 6 t 453 Set 1 Augite, Kakanui USNM 122142 1 2 3 4 5 6 ick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) Assignments vannel Element Si ka Yes 13 Xi Yes 13 0,0,0,0,0 V ka Yes 23 0,0,0,0,0 V ka Yes 23 Ka Yes 24 0,0,0,0,0	St 13/Set SF 17/SeF	1 AIZU 3 Syl 1 SiO 2 supl	nthetic		-		
1 23 Set 1 V2O3 synthetic 1 24 Set 1 Set 1 <td>St 22 Set</td> <td>1 TiO2 syn</td> <td>thetic</td> <td></td> <td>-</td> <td>Save Sample</td> <td>e Setup</td>	St 22 Set	1 TiO2 syn	thetic		-	Save Sample	e Setup
t 24 Set 1 Cr2O3 (synthetic) t 25 Set 1 MnO synthetic t 26 Set 1 Fe2O3 synthetic hematite t 28 Set 1 NiO synthetic t 2401 Set 1 Wollastonite (Willsboro, NY) t 303 Set 1 Albite, Amelia t 453 Set 1 Augite, Kakanui USNM 122142 Remove TDI Correction 1 2 3 4 5 6 Remove TDI Correction 1 2 3 4 5 0 1 2 0,0,0,0,0,0 1 2 3 4 5 0 1 2 0,0,0,0,0 1 2 0,0,0,0 1 2 0,0,0,0 1 2 0,0,0,0,0 1 2 0,0,0,0,0 1 2 0,0,0,0,0 1 2 0,0,0,0,0 1 2 0,0,0,0,0 1 2 0,0,0,0,0 1 2 0,0,0,0 1 2 0,0,0 1 2 0,0,0,0 1 2 0,0,0 1 2 0,0,0,0	St 23 Set	1 V203 syr	thetic				
t 25 Set 1 MnU synthetic t 26 Set 1 Fe2D3 synthetic hematite Reload Standard Assignments t 28 Set 1 NiD synthetic Remove TDI Correction t 303 Set 1 Albite, Amelia 1 2 3 4 5 6 ick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) Assignments 1 2 3 4 5 6 nannel Element X-Ray Analyzed Standard Interf-Ele Interf-Std Si ka Yes 13 0,0,0,0,0 Ti ka Yes 13 0,0,0,0,0 V ka Yes 23 0,0,0,0,0 V ka Yes 23 0,0,0,0,0	St 24 Set	1 Cr2O3 (s)	nthetic)			Add/Remove S	Standards
t 26 Set 1 Pe2OS synthetic hematite t 28 Set 1 Ni0 synthetic t 2401 Set 1 Wollastonite (Willsboro, NY) t 303 Set 1 Albite, Amelia t 453 Set 1 Augite, Kakanui USNM 122142 ick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) Assignments hannel Element X-Ray Analyzed Standard Interf-Ele Interf-Std Si ka Yes 13 V ka Yes 23 V ka Yes 23 Yes 24	St 25 Set	1 MnU synt	thetic Inthatia hamal	lika	Rel	oad Standard	Assignments
Z401 Set 1 Wollastonite (Willsboro, NY) 1 303 Set 1 Albite, Amelia 1 453 Set 1 Augite, Kakanui USNM 122142 1 2 3 4 5 6 ick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) Assignments nannel Element X-Ray Analyzed Si ka Yes 22 Ti ka Yes 13 0,0,0,0,0 V ka V ka Yes 23 23 0,0,0,0,0 Cr ka	St 28 Set	1 Nift sunt	ntrieuc riema netic	ute			
t 303 Set 1 Albite, Amelia t 453 Set 1 Augite, Kakanui USNM 122142 tick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) Assignments nannel Element X-Ray Analyzed Standard Interf-Ele Interf-Std Si ka Yes 453 0,0,0,0,0 Ti ka Yes 22 0,0,0,0,0 Al ka Yes 13 0,0,0,0,0 V ka Yes 23 0,0,0,0,0	St 2401 Se	t 1 Wollasto	onite (Willsbo	ro, NY)	L	Remove TDI (Correction
t 453 Set 1 Augite, Kakanui USNM 122142123456ick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) AssignmentsnannelElementX-RayAnalyzedStandardInterf-EleInterf-StdSikaYes4530,0,0,0,0TikaYes130,0,0,0,0AlkaYes130,0,0,0,0VkaYes230,0,0,0,0CrkaYes240,0,0,0,0	CF 303 CoF	1 Albite, A	melia				
ick Element Row to Edit Standard/Interference/Time Dependent Intensity (TDI) AssignmentsnannelElementX-RayAnalyzedStandardInterf-EleInterf-StdSikaYes4530,0,0,0,0TikaYes220,0,0,0,0AlkaYes130,0,0,0,0VkaYes230,0,0,0,0CrkaYes240,0,0,0,0	JU JUJ JU			1 1001 10			
Ti ka Yes 22 0,0,0,0,0 Al ka Yes 13 0,0,0,0,0 V ka Yes 23 0,0,0,0,0 Cr ka Yes 24 0,0,0,0,0	St 453 Set Click Eleme Channel	1 Augite, K nt Row to Ed Element	it Standard/In	nterference/Tim	e Dependent Standard	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment
Al ka Yes 13 0,0,0,0,0 V ka Yes 23 0,0,0,0,0 Cr ka Yes 24 0,0,0,0,0	St 453 Set	1 Augite, K nt Row to Ed Element Si	it Standard/In X-Ray ka	nterference/Tim Analyzed Yes	e Dependent Standard 453	2 3 Intensity (TDI)	4 5 6 Assignment Interf-Std 0,0,0,0,0
V ka Yes 23 0,0,0,0,0 Cr ka Yes 24 0,0,0,0,0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti	iit Standard/II X-Ray ka ka	A 122142 Interference/Tim Analyzed Yes Yes	e Dependent Standard 453 22	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment Interf-Std 0,0,0,0,0 0,0,0,0,0
Cr ka Yes 24 , 0,0,0,0,0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al	lit Standard/In X-Ray ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes	e Dependent Standard 453 22 13	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0
	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V	lit Standard/In X-Ray ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes	e Dependent Standard 453 22 13 23	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Fe ka Yes 26	Click Eleme Channel	1 Augite, K nt Row to Ed Element Si Ti Al V Cr	it Standard/In X-Ray ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes	1 e Dependent Standard 453 22 13 23 24	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe	it Standard/In X-Ray ka ka ka ka ka ka ka ka	A 122142 Analyzed Yes	E Dependent Standard 453 22 13 23 24 26	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn	iit Standard/II X-Ray ka ka ka ka ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 23 24 26 25	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0 Mg ka Yes 473 0,0,0,0,0	Click Eleme Channel 2 3 4 5 5 7 3	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg	iit Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka ka ka	A 122142 Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 24 26 25 473	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0 Mg ka Yes 473 0,0,0,0,0 Ca ka Yes 2401 0,0,0,0,0	Click Eleme Channel Ch	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca	iit Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka ka ka	A 122142 Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 24 26 25 473 2401	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0 Mg ka Yes 473 0,0,0,0,0 Ca ka Yes 2401 0,0,0,0,0 Na ka Yes 303 0,0,0,0,0	Click Eleme Channel	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca Na	it Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka ka ka	A 122142 Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 24 26 25 473 2401 303	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
V ka Yes 23 0,0,0,0 Cr ka Yes 24 0,0,0,0	St 453 Set	1 Augite, K nt Row to Ed	lit Standard/I	4 122142 nterference/Tim	e Dependent	2 3 Intensity (TDI)	4 5 Assignm
	lick Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe	it Standard/In X-Ray ka ka ka ka ka ka ka ka	A 122142 Analyzed Yes	E Dependent Standard 453 22 13 23 24 26	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Wn ka Yes 25 0.0.0.0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Hp	it Standard/In X-Ray ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 24 26 25	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn	iit Standard/Ii X-Ray ka ka ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 23 24 26 25	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0 Mg ka Yes 473 0,0,0,0,0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg	iit Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka ka ka	A 122142 Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 24 26 25 473	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0 Mg ka Yes 473 0,0,0,0,0 Ca ka Yes 2401 0,0,0,0,0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca	it Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 24 26 25 473 2401	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0 Mg ka Yes 473 0,0,0,0,0 Ca ka Yes 2401 0,0,0,0,0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca N-	it Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka	A 122142 Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	E Dependent Standard 453 22 13 23 24 26 25 473 2401 202	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,
Mn ka Yes 25 0,0,0,0,0 Mg ka Yes 473 0,0,0,0,0 Ca ka Yes 2401 0,0,0,0,0 Na ka Yes 303 0,0,0,0,0	Click Eleme	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca Na O	iit Standard/I X-Ray ka ka ka ka ka ka ka ka ka ka ka ka ka	A 122142 Analyzed Yes	E Dependent Standard 453 22 13 23 24 26 25 473 2401 303 0	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignment 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0,

Click on the element row for vanadium to edit the Interference Assignments.

The **Assignment Properties** dialog box for vanadium opens. Select the first *interference element* for this element and the corresponding *standard* from the respective drop down menus. Select a standard that contains a known amount of the interfering element but none of the interfered element.

		n	IUI. Y KO	100		OK
lemen	t X-I	Hay 2	Assig 3 V203 surthe	ned (Primary	yj Standard	Canaal
			J + 20 J synthe			Lance
Use Vir	tual Stand	ard For Stand	ard Intensity Calc	ulation (see Ar	nalytical menu)	
terferer	nce Stan	dard Assigr	ments for Inte	rfered Eleme	ent: V ka	
	Elem	Intf Order		Int	erference Standard	
t (Ti		I -	22 TiO2 syr	nthetic	•	Remove
d	•	•			•	Remove
d	-	-			•	Remove
h 🗌	-	-			•	Remove
n	-	•			•	Remove
me Dep	pendent I	ntensity (T	D1) Calibration	Assignment	(select unknown sample for assigned TDI	calibration) —
me Dep TDICo	pendent I prrection	ntensity (TI Type (Self	DI) Calibration or Assigned) -	Assignment	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window	calibration) pendent Intensity ecial Options dial
me Dep ∙TDICo ⊙N CU	oendent I orrection o TDI Ca se TDI "	ntensity (TI Type (Self Ilibration Co Self" Calibr	DI) Calibration or Assigned) – prrection ation Correctio	Assignment	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window. Both "assigned" and "self" Time Dependent In	calibration) pendent Intensity ecial Options dial
me Dep TDI Co C U	orrection o TDI Ca se TDI " se TDI "	ntensity (T) Type (Self hibration Co Self" Calibr Assigned" (DI) Calibration or Assigned) – prrection ation Correction Calibration Cor	Assignment on rection	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window. Both "assigned" and "self" Time Dependent In calibrations can be assigned or unassigned H Dependent Intensity (TDI) corrections are as acquired with the "assigned" flag in Special (Dependent Intensity (TDI) corrections are as acquired the Intensity (TDI) element "sa automatically assigned to themselves at the	calibration) — pendent Intensity ecial Options dial mere. Assigned Tii ssigned to sample Options. "Self" Tii gned to themsely. If" calibrations ar time of acquisitio
me Dep TDI Co © N C U	pendent I prrection o TDI Ca se TDI " se TDI "	ntensity (T Type (Self libration Co Self" Calibr Assigned" (DI) Calibration or Assigned) – prrection ation Correctio Calibration Cor	Assignment	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window. Both "assigned" and "self" Time Dependent In calibrations can be assigned or unassigned f Dependent Intensity (TDI) corrections are as acquired with the "assigned" flag in Special Dependent Intensity (TDI) corrections are ass Time Dependent Intensity (TDI) element "se automatically assigned to themselves at the Display TDI Fit	calibration) — pendent Intensity ecial Options dial ntensity (TDI) eler ere. Assigned Ti ere. Assigned Ti gned to sample Options. "Self" Ti gned to themselv iff" calibrations ar time of acquisitio
me Dep TDI Co O U O U	orrection o TDI Ca se TDI " se TDI "	ntensity (T) Type (Self dibration Co Self" Calibr Assigned" (D1) Calibration or Assigned) – prrection ation Correction Calibration Cor	Assignment on rection	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window. Both "assigned" and "self" Time Dependent In calibrations can be assigned or unassigned H Dependent Intensity (TDI) corrections are as acquired with the "assigned" flag in Special (Dependent Intensity (TDI) corrections are as attomatically assigned to themselves at the Display TDI Fit	calibration) — pendent Intensity ecial Options dial mere. Assigned Tii ssigned to sample Options. "Self" Tii gned to themsely. If" calibrations ar time of acquisitio
me Dep TDI Co © N C U C U	bendent I orrection o TDI Ca se TDI " se TDI " se TDI "	ntensity (T) Type (Self libration Co Self" Calibr Assigned" (Assigned" (assigned: (here dratic (here	DI) Calibration or Assigned) - prrection ation Correction Calibration Corr Calibration Corr Calibration Fit	Assignment on rection	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window. Both "assigned" and "self" Time Dependent In calibrations can be assigned or unassigned f Dependent Intensity (TDI) corrections are as acquired with the "assigned" flag in Special Dependent Intensity (TDI) corrections are ass Time Dependent Intensity (TDI) element "se automatically assigned to themselves at the Display TDI Fit	calibration) pendent Intensity ecial Options dial ntensity (TDI) eler ere. Assigned Ti ssigned to sample pptions. "Self" Ti gned to themselv iff" calibrations ar time of acquisitio
me Dep TDI C O U O U	Dendent I prrection o TDI Ca se TDI " se TDI " se TDI " Log-Line Log-Qua	Intensity (T) Type (Self Dibration Co Self" Calibr Assigned" (Assigned" (Assigned (As	DI) Calibration or Assigned) - prrection ation Correction Calibration Corr calibration Corr calibration Fit er-exponential)	Assignment	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window. Both "assigned" and "self" Time Dependent In calibrations can be assigned or unassigned H Dependent Intensity (TDI) corrections are as acquired with the "assigned" flag in Special (Dependent Intensity (TDI) corrections are as automatically assigned to themselves at the Display TDI Fit	calibration) — pendent Intensity ecial Options dial ntensity (TDI) eler iere. Assigned Tir signed to sample Options. "Self" Ti gned to themsely lift" calibrations ar time of acquisitio
me Dep TDI Co O U O U O U O Use O Use ank Co	Dendent I orrection o TDI Ca se TDI " se TDI " se TDI " Log-Line Log-Qua	ntensity (T) Type (Self libration Co Self" Calibr Assigned" (Assigned" (dratic (hypo Sample Ass	DI) Calibration or Assigned) - prrection ation Correctio Calibration Cor Calibration Cor calibration Fit er-exponential)	Assignment	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window. Both "assigned" and "self" Time Dependent In calibrations can be assigned or unassigned f Dependent Intensity (TDI) corrections are as acquired with the "assigned" flag in Special Dependent Intensity (TDI) corrections are ass Time Dependent Intensity (TDI) element "se automatically assigned to themselves at the Display TDI Fit	calibration) pendent Intensity ecial Options dial itensity (TDI) eler ere. Assigned Ti issigned to sample potions. "Self" Ti gned to themselv iff" calibrations ar time of acquisitio Error Bars
me Dep TDI C O U O U	Dendent I prrection o TDI Ca se TDI " se TDI " se TDI " se TDI " se TDI " se TDI "	Intensity (T) Type (Self Self" Calibr Assigned" (Assigned" (Assigned" (Assigned (Ass	D1) Calibration or Assigned) - orrection ation Correctio Calibration Cor Calibration Cor initial) Fit er-exponential)	Assignment on rection	(select unknown sample for assigned TDI Both "assigned" and "self" calibration Time De element samples can be acquired. See the Sp the Acquire window. Both "assigned" and "self" Time Dependent In calibrations can be assigned or unassigned f Dependent Intensity (TDI) corrections are as acquired with the "assigned" flag in Special (Dependent Intensity (TDI) corrections are as Time Dependent Intensity (TDI) element "se automatically assigned to themselves at the Display TDI Fit Assign a sample to be used for a "blank" trac The blank sample should be a similar matrix to and should have a zero or known trace of	calibration) — pendent Intensity ecial Options dial intensity (TDI) eler ere. Assigned Tir signed to sample Options. "Self" Ti gned to themselv of acquisitio Error Bars Error Bars

Click the **OK** button when finished.

The Standard and Interference Assignments window will appear as below.

		signments		-		
Selected Sa	mples				OK	Cancel
St 12 Set	1 MgO synt	hetic				
St 12 Set	2 MgO synt	hetic				at Cotup
St 13 Set	1 Al2O3 syr	nthetic			adve ciellier	it setup
St 14 Set	1 SiO2 synt	hetic		=	Save Sample	e Setup
St 22 Set	1 TiO2 synt	hetic				
St 23 Set	1 ¥2U3 syn	thetic			Add/Domouo	Standarda
51 24 501 CF 25 Col		hatio			Aud/fielliote .	stanuarus
SF 26 Set		neuc nthetic hemal	tito	Rel	oad Standard	Assignments
St 28 Set	1 Nift sunth	netic	uic			
St 2401 Sel	t 1 Wollasto	nite fWillsbor	ro, NY)		Remove TDI (Correction
St 303 Set	1 Albite, Ar	melia	-,,			
St 453 Set	1 Augite, K nt Row to Ed	akanui USNN	vl 122142 nterference/Tim	e Dependent I	2 3	4 5 6 Assignments
St 453 Set Click Elemen	1 Augite, K	it Standard/Ir	N 122142	e Dependent	2 3	4 5 6 Assignments
St 453 Set Click Elemen Channel	1 Augite, K nt Row to Ed	it Standard/In	nterference/Tim	e Dependent Standard	2 3 Intensity (TDI)	4 5 6 Assignments
St 453 Set Click Elemen Channel	1 Augite, K nt Row to Ed Element Si	it Standard/Ir	N 122142	e Dependent Standard 453	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignments Interf-Std 0,0,0,0,0,0
St 453 Set Click Elemen Channel 1 2	1 Augite, K nt Row to Ed Element Si	it Standard/In X-Ray ka ka	I 122142	Dependent Standard 453 22	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0
St 453 Set Click Elemen Channel 1 2 3	1 Augite, K nt Row to Ed Element Si Ti Al	it Standard/In X-Ray ka ka ka	I 122142	e Dependent Standard 453 22 13	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0 0,0,0,0,0 0,0,0,0,0
St 453 Set Click Elemen Channel 1 2 3 4	1 Augite, K nt Row to Ed Element Si Ti Al V	it Standard/In X-Ray ka ka ka ka ka	I 122142	 E Dependent Standard 453 22 13 23 	2 3 Intensity (TDI) Interf-Ele Ti	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
St 453 Set Click Elemen Channel 1 2 3 4 5	1 Augite, K nt Row to Ed Element Si Ti Al V Cr	it Standard/In X-Ray ka ka ka ka ka ka	I 122142	E Dependent Standard 453 22 13 23 24	2 3 Intensity (TDI) Interf-Ele Ti	4 5 6 Assignments 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
St 453 Set Click Elemen Channel 1 2 3 4 5 6	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe	it Standard/In X-Ray ka ka ka ka ka ka ka ka	I 122142	 E Dependent Standard 453 22 13 23 24 26 	2 3	4 5 6 Assignments 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
St 453 Set Click Elemen Channel 1 2 3 4 5 5 6 7	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn	it Standard/In X-Ray ka ka ka ka ka ka ka ka	I 122142	 Tependent Standard 453 22 13 23 24 26 25 	2 3 Intensity (TDI) Interf-Ele Ti	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
St 453 Set Click Elemen Channel 1 2 3 4 5 5 6 7 8	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg	it Standard/In X-Ray ka ka ka ka ka ka ka ka ka ka ka	I 122142	 Tependent Standard 453 22 13 23 24 26 25 473 	2 3	4 5 6 Assignments 0,0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0
St 453 Set Click Elemen Channel 1 2 3 4 5 5 6 7 8 9	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca	it Standard/II X-Ray ka ka ka ka ka ka ka ka ka ka ka ka	I 122142	 E Dependent Standard 453 22 13 23 24 26 25 473 2401 	2 3 Intensity (TDI) Interf-Ele Ti	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 22,0,0,0,0
St 453 Set Click Elemen Channel 1 2 3 4 5 5 6 7 8 9 9 10	1 Augite, K nt Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca Na	it Standard/II X-Ray ka ka ka ka ka ka ka ka ka ka ka ka ka	A 122142	 E Dependent Standard 453 22 13 23 24 26 25 473 2401 303 	2 3 Intensity (TDI) Interf-Ele Ti	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 22,0,0,0,0

Repeat these editing steps for all of the other element interferences, resulting in the following **Standard and Interference Assignments** window.

St. 12 Set	1 Mail sunt	hetic			OK	Cancel			
St 12 Set	2 MgO synt	hetic		ń –	Save Elemen	nt Setup			
St 13 Set	1 AI2U3 syr 1 SiΩ2 supl	hetic		=	C C I	C			
St 22 Set	1 TiO2 synt	thetic			Save Sample Setup				
St 23 Set	1 V203 syn	thetic			Add/Domouo Standarde				
St 24 Set	1 Ur2U3 [s]	Inthetic J			Add/Remove Standards				
St 26 Set	1 Fe2O3 sv	nthetic hema	tite	Rel	oad Standard	Assignments			
St 28 Set	1 NiO synth	netic		· · · · · · · · · · · · · · · · · · ·		`orrection			
St 2401 Set	1 Wollasto	nite (Willsbo	ro, NY)	L		Junection			
	1 Albite A	melia							
St 303 Set	1 Augite, K	akanui USNN	4 122142	• <u>1</u>	2 3	4 5 6			
St 453 Set	1 Augite, K	it Standard/In	4 122142 nterference/Tim	e Dependent	2 3 Intensity (TDI)	4 5 6 Assignments			
St 453 Set Click Elemer	1 Augite, K at Row to Ed	it Standard/In X-Ray	4 122142 nterference/Tim Analyzed	Dependent Standard	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignments Interf-Std			
St 303 Set St 453 Set Click Elemer Channel	1 Augite, K at Row to Ed Element Si	it Standard/In X-Ray	4 122142 nterference/Tim Analyzed Yes	e Dependent Standard 453	2 3 Intensity (TDI)	4 5 6 Assignments Interf-Std 0,0,0,0,0			
St 303 Set St 453 Set Click Elemer Channel I	1 Augite, K at Row to Ed Element Si Ti	it Standard/In X-Ray ka ka	4 122142 nterference/Tim Analyzed Yes Yes	Dependent Standard 453 22	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0			
St 303 Set St 453 Set Click Elemer Channel 1 2 3	1 Augite, K at Row to Ed Element Si Ti Al	it Standard/In X-Ray ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes	Dependent Standard 453 22 13	2 3 Intensity (TDI) Interf-Ele	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0			
St 303 Set St 453 Set Click Elemer Channel 1 2 3 4	1 Augite, K at Row to Ed Element Si Ti Al V	it Standard/In X-Ray ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes	 Tependent Standard 453 22 13 23 	2 3 Intensity (TDI) Interf-Ele Ti	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0			
St 303 Set St 453 Set Click Elemer Channel I 2 3 4 5	1 Augite, K at Row to Ed Element Si Ti Al V Cr	it Standard/In X-Ray ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes	 Terminal products Standard 453 22 13 23 24 	2 3 Intensity (TDI) Interf-Ele Ti V	4 5 6 Assignments Interf-Std 0,0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 23,0,0,0,0			
St 303 Set St 453 Set Click Elemer Channel I 2 3 4 5 5 5	1 Augite, K at Row to Ed Element Si Ti Al V Cr Fe	it Standard/In X-Ray ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	T 1 e Dependent Standard 453 22 13 23 24 26	2 3 Intensity (TDI) Interf-Ele Ti V Mn	4 5 6 Assignments Interf-Std 0,0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 23,0,0,0,0 25,0,0,0,0			
St 303 Set St 453 Set Click Elemer Channel 1 2 3 4 5 5 5 5 7	1 Augite, K Augite, K Element Si Ti Al V Cr Fe Mn	it Standard/In X-Ray ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	 T Dependent Standard 453 22 13 23 24 26 25 	2 3 Intensity (TDI) Interf-Ele Ti V Mn Cr	4 5 6 Assignments Interf-Std 0,0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 23,0,0,0,0 25,0,0,0,0 24,0,0,0,0			
St 303 Set St 453 Set Click Elemer Channel 1 2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	1 Augite, K Augite, K Element Si Ti Al V Cr Fe Mn Mg	it Standard/In X-Ray ka ka ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	 Tependent Standard 453 22 13 23 24 26 25 473 	2 3 Intensity (TDI) Interf-Ele Ti V Mn 	4 5 6 Assignments Interf-Std 0,0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 23,0,0,0,0 25,0,0,0,0 24,0,0,0,0 0,0,0,0,0			
St 303 Set St 453 Set Click Elemer Channel 1 2 3 4 5 5 6 7 8 9	1 Augite, K at Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca	it Standard/In X-Ray ka ka ka ka ka ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	 Tependent Standard 453 22 13 23 24 26 25 473 2401 	2 3 Intensity (TDI) Interf-Ele Ti V Mn Ct 	4 5 6 Assignments Interf-Std 0,0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 23,0,0,0,0 25,0,0,0,0 24,0,0,0,0 0,0,0,0,0,0 0,0,0,0,0 0,0,0,0,			
St 303 Set St 453 Set Click Elemer Channel 1 2 3 4 5 5 6 7 8 9 10	1 Augite, K at Row to Ed Element Si Ti Al V Cr Fe Mn Mg Ca Na	it Standard/In X-Ray ka ka ka ka ka ka ka ka ka ka ka ka ka	A 122142 hterference/Tim Analyzed Yes Yes Yes Yes Yes Yes Yes Yes	T 1 E Dependent 453 2 13 2 13 2 24 2 25 473 2401 303	2 3 Intensity (TDI) Interf-Ele Ti V Mn Cr 	4 5 6 Assignments Interf-Std 0,0,0,0,0 0,0,0,0,0 22,0,0,0,0 23,0,0,0,0 25,0,0,0,0 24,0,0,0,0 0,0,0,0,0,0 0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0 0,0,0,0,0 0,0,0,0,0 0,0,0,0 0,0,0,0 0,0,0,0 0,0,0,0,0 0			

Click the **OK** button when finished returning to the **Analyze!** window.

Next, check the analysis options that are currently assigned. From the main PROBE FOR EPMA log window, select **Analytical** from the menu bar and click **Analysis Options** from the menu choices.

👎 Probe	for EPMA [C:	\UserData\	Doe\silicates	01.MDB]										
File Edit	t Standard	Xray A	nalytical Wi	indow Run	Output	Help								
	Acquire	el	Analysis C	Options										
BEAM:	39.99	39.	Assign M	AN Fits										
ELEM:	Si		Clear All N	MAN Assign	ments (use d	lefault)								
162	23.685	. 5	Use Off D	eak Elemente	Eor MANE	it (llee on-ne	ak intensitie	r from elem	ente acquire	d using off-	neak backou	ounds)		
164	23.772	.5	USE OIL FO			it (ose on-pe	ak intensitie	is nom elem	ents acquire	u using on-	peak backy	ounus		
165	23.698	. 4	Use MAN	Correction F	or Off Peak	Elements (C	alculate MA	N backgrour	nds for elem	ents acquire	d using off-	peak backgr	ounds))
			Empirical	MACe										
AVER:	23.719	. 5	Empirical	MACS										
SDEV:	.047	. 0	Empirical	APFs										
SERR:	.027	. 0	745 01:1			e. 11								
%RSD:	.20	8.	ZAF, Phi-i	kno-z, Alpha	a Factor and	Calibration	Curve Select	ions						
			Create Vir	tual Standar	d Intensity									
PUBL:	23.714	. 4	create vii	cuar stariaan	amenisity									
%VAR:	(.02)	7.	Update De	ead Time Co	nstants									
DIFF:	(.00)	. 0	Churchandle	"A" Tabla										
STDS:	453		Student s	t Table										
C'IIITE .	1040		CalcZAF (Calculations										
STRE:	1946 0	5540 0	4250.0	6202.0	6406 9	6540 1	7221 1	2074 5	2009 4	495 0				
SICI.	1040.9	5540.9	4332.2	0323.9	0400.0	0349.1	/331.1	2074.5	3200.4	403.2				
UNKE :	.1843	.0045	.0318	.0000	.0007	.0415	.0011	.0684	.1048	.0053				
UNCT :	1847.1	44.5	318.0	-1.0	7.3	415.1	11.0	680.7	1046.2	52.5				
UNBG:	20.1	35.7	18.6	31.1	31.1	25.4	23.5	15.2	36.6	11.3				
ZCOR:	1.2870	1.1902	1.4364	1.2032	1.1732	1.1885	1.2093	1.4891	1.0856	1.9389				
KRAW:	1.0001	.0080	.0731	0002	.0011	.0634	.0015	.3281	.3261	.1081				
PKBG:	92.78	2.25	18.10	. 97	1.23	17.37	1.47	45.70	29.55	5.66				
													Ŧ	
Open: Re	eady										Cancel	Pause		

This opens the **Analysis Calculation Options** window. Check that the tick boxes for *Use Assigned Interference Corrections on Standards* and *Unknowns and Force Negative Interference Intensities To Zero in Corrections* are marked.



A range of other options can be switched on an off in this window which affect the calculation and output of the quantitative data. See the PROBE FOR EPMA User's Guide and Reference manual for details.

Click the **OK** button returning to the main log window.

The user then reanalyzes the standards (**Analyze** button in the **Analyze!** window), utilizing the spectral interference correction routine. The results for the TiO_2 standard are dramatic; the apparent 0.6 wt% vanadium concentration has been replaced with an average 0.01 wt% content (which is below the detection limit).

👎 Analyze!						100. V	08.0					- 🗆 <mark>- X</mark>
Sample Li	ist (multi-sele	ct) (double-	click to see in	ntensity data) —		Analyze	Data	KRaws	Combine Analysi Selected S	s Lines From amples		
C Unkno	wns St 3 scans St 4	03 Set 1 A 53 Set 1 A	lbite, Amelia ugite, Kakan	ui USNM 1221	Lis	t Report	Calculation	Options	Combine Data Selected S	Lines From amples		
C All Sar Select.	nples St 4 All St 1 St 1	69 Set 1 H 73 Set 1 O 12 Set 3 M 13 Set 2 Al	ypersthene, livine (Fo90) g0 synthetic 203 syntheti	USNM 111312		'ause Between : Ise All Matrix Co	Samples rrections Sample(s)	Report	Sort Stat and D Geological or Ato Orde	ata Grids In omic Number r		
Add To Save Se	tups St 1	14 Set 2 Si 2 <mark>2 Set 2 Ti</mark> 23 Set 2 V2	02 synthetic <mark>02 synthetic</mark> 203 synthetic	; -	Ur	idelete Selected	d Sample(s)	Match	Do Not Output	To Log		
Specified	Concentratio	ns <mark>Standa</mark>	ard Assignme	nts Name/Desc	ription	Conditions	Elements	Int Times	Combine the Samples into a N	Selected New Sample		
St 22 Set 3 TO = 40, Ke	2 TiO2 synthetic V = 15, Beam = mental Weight	= 40, Size = 1	0	.000 Tota .000 Calco .000 Exce	I Oxygen ulated Oxygen xss Oxygen	gen 99.8 26.6	196 Total W 107 Z · Bar 135 Atomic V	eight % Veight	Boundary Co Create Mate	rrections erial File		
Сори	Si	Ti	۵١		r	Fe	Mn	Ma	Ca	Na	n	Total
Average:	.008	59.305	.014	.012	.023	.487	.001	.000	.002	.035	40.010	99.896
Std Dev:	.009	.096	.004	.016	.019	.028	.003	.000	.003	.042	.000	.162
Published:	n.a.	59.291	n.a.	n.a.	n.a.	.660	n.a.	n.a.	n.a.	n.a.	40.010	99.962
Std Err:	.005	.048	.002	.008	.009	.014	.001	.000	.002	.021	.000	.081
%Rel SD:	117.49	.16	30.39	130.09	81.24	5.75	200.00	141.4	4 200.00	120.91	.00	.16
Minimum:	.000	59.225	.008	.000	.001	.464	.000	.000	.000	.000	40.010	99.745
Maximum:	.021	59.431	.017	.033	.045	.527	.005	.001	.006	.085	40.010	100.119
Image: A labeled and the second se												, ۴
Delet	e Selected L	ine(s)	Undele	te Selected Line	s)	Analyz	e Selected Line	e(s)				
Сору	Si	Ti	AI	V Ci	r	Fe	Mn	Mg	Ca	Na	0	Total 🔺
284 G	.000	59.235	.014	.033	.045	.480	.000	.000	.000	.000	40.010	99.816
285 G	.002	59.225	.017	.015	.001	.475	.000	.000	.000	.000	40.010	99.745
286 G	.009	59.327	.008	.000	.029	.464	.000	.000	.000	.054	40.010	99.902
287 G	.021	59.431	.015	.000	.017	.527	.005	.001	.006	.085	40.010	100.119
	1											
	4											•
											Canaal	Nout
					_						Lancel	Next //

The user is ready to move on to unknown samples.

Manual Unknown Sample Data Collection and Analysis

To collect x-ray data on an unknown sample, bring forward the **Acquire!** dialog box and click the **Move** button. Enter the stage coordinates of the first unknown sample and click **Go All**, or use the cursor buttons in the *Stage Target Positions* section, or use the joystick to drive the stage, if available. Adjust the Z focus.

Move Motors and	Change Crystals	Local and and				
x	Y		Remove Fa	raday	All	Spectros
-13600.	-1074.1		Z Axis Adjus	st —	Positions	Stage
Z 64.9978		Increment		ement 1.00	Auto	Focus
Jog St.	age				Exchan	ge Sample
Use Stage Ba	icklash	Park Stage	Update Pos Free/Cle	ar	Filamer Cl	nt Standby
Spectrometer 1	Target Position:	s (Load Element	Setups From Ac	quire Ele	ements/Cat	ions Button)
SP1	SP2	SP3	SP4	SP	5	
TAP 💌	LLIF 💌	LPET 💌	TAP 💌	LLIF	-	-
46152.1	56743.3	38417.8	27550.7	48262.	2	
1 0	2 0	Ca ka ု 🔿	4 0	Fe ka	0	6 C
💻 🌺 🔼	💓 🚵 🔣	💻 🌺 🔼	📐 🌊 🔚)		: 🏠 📖
Use Spectrom	neter Backlash	Jog Spec	ctrometers	P	ark Spectron	neters

Click the New Sample button in the Acquire! window to activate the New Sample dialog box.

Check the *Unknown* button under *New Sample Type*. Enter an appropriate sample name and description into the *New Sample Name* and *New Sample Description* text boxes.

lew Sample								
- New Sample Type -	OK	Cancel						
Unknown Load Element Setups								
C Wavescan Load Sample Setup								
Load File Setup								
Add/Remove Standards	Load Multi	ple Setup						
make any necessary	n From Another Pro	ment setup.						
New Sample Name pyroxene 1								
New Sample Descripti	ion	Add <cr></cr>						
To add standards to the standard list below, cancel this dialog, then click the Standard Add Standards to Run menu item from								
, To add standards to the st then click the Standard A	tandard list below, c dd Standards to Ru	ancel this dialog, un menu item from						
To add standards to the st then click the Standard A th 12 MoO sunthetic	tandard list below, c add Standards to Ru e main menu.	ancel this dialog, un menu item from						
To add standards to the st then click the Standard A th 12 MgO synthetic 13 Al2O3 synthetic	tandard list below, c add Standards to Rι e main menu.	ancel this dialog, un menu item from						
, To add standards to the st then click the Standard A th 12 MgO synthetic 13 Al2O3 synthetic 14 SiO2 synthetic 22 TiO2 synthetic	tandard list below, c udd Standards to Ru e main menu.	ancel this dialog, un menu item from						
To add standards to the st then click the Standard A th 12 MgO synthetic 13 Al2O3 synthetic 14 SiO2 synthetic 22 TiO2 synthetic 23 V2O3 synthetic 24 Cr2O3 (cmrthetic	tandard list below, c udd Standards to Ru e main menu.	ancel this dialog, un menu item from						

Click the **OK** button.

By default, all settings from the last measurement before will be loaded, in this case the standards acquisition using the pyroxene setup. Before starting the acquisition, any measurement conditions which don't require the acquisition of new standards can be changed, such as beam current and size in the **Analytical Conditions** window or count times, which can be increased to improve precision and detection limits for minor and trace elements.

Click on the **Count Times** button in the **Acquire!** window to launch the **Count Times** window. In this example, the *Unknown Count Time Factor (Factor)* in the **Count Times** window will be modified. This factor is a simple multiplication of the default count times (peak and backgrounds) on the standards. Currently this value, which is shown in the Factor column, is set to 1, leading to an estimated acquisition time of 77 seconds per point.

ount Times		-	- 199	1.08	1.088	-	1.00 8	-		
Click Ele	ment Row	to Edit Co	unt Time	s						
Channel	Element	Spectro	Crystal	On-Peak	Hi-Peak	Lo-Peak	MaxCour Factor	Wave	Peak	Quick
1	Si ka	4	TAP	10.00	5.00	5.00	100000 (1.00	5.00	3.00	2.00
2	Tika	3	LPET	10.00	5.00	5.00	10000000(1.00	5.00	3.00	2.00
3	Al ka	4	TAP	10.00	5.00	5.00	10000 0(1.00	5.00	3.00	2.00
4	V ka	2	LLIF	10.00	5.00	5.00	10000000(1.00	5.00	3.00	2.00
5	Cr ka	2	LLIF	10.00	5.00	5.00	10000000(1.00	5.00	3.00	2.00
6	Fe ka	5	LLIF	10.00	5.00	5.00	1000000(1.00	5.00	3.00	2.00
7	Mn ka	5	LLIF	10.00	5.00	5.00	100000000000000000000000000000000000000	5.00	3.00	2.00
8	Mg ka	1	TAP	10.00	5.00	5.00	10000000 1.00	5.00	3.00	2.00
9	Ca ka	3	LPET	10.00	5.00	5.00	100000 1.00	5.00	3.00	2.00
10	Na ka	1	TAP	10.00	5.00	5.00	10000001.00	5.00	3.00	2.00
•										Þ
eam Aver ominal Be	ages am (nA)	1.	2	77 se	1 TAP	2 3 LLIF LPET	4 5 TAP LLIF			OK
Change the normalizatio ntensity disp for c	e Nominal Bo on constant play. For exa ps/nA inten	am to modi used for the ample, enter sity display.	y the x-ray 1 (nA)	Calculated Spectromete Motion and Acquisition	er Mg	V	Al Mn			Cancel
eturn To rystal Flip	On-Peak Time	Time 2 s	ecs	Time	Na	Cr	Si Fe			Measure Nominal Beam
et Columr	n (TKCS) 1	ime 3 ≴	ecs	Use	cs				_	beam

Left-click and drag the mouse across the rows in the table to select all elements. This opens the **Count Time Properties** window. In there, change the *Unknown Count Time Factor* from 1 to 3.

						C	ount Time Properties	-		
ount Times		-		1.00			-Enter Count Time P	operties For Selecte	d Elements	OK
			-			1	On-Peak Time	Hi Off Peak Time	Lo Off Peak Time	
- Click Eler	nent Row	to Edit Co	unt Time	\$		1	10.00	5.00	5.00	Cancel
Channel	Element	Spectro	Crystal	On-Pea	K Hi-Pea	l	Wave Scan Time	Peaking Time	Quick Scan Time	Note that the
1	Sika	4	TAP	10.00	5.00		5.00	3.00	2.00	Peaking Time is
2	lika	3	LPET	10.00	5.00		Falsalla an and all		dead and and and an	divided by 4 for
3	Alka	4		10.00	5.00		Enter the on and orr	peak count times for star pecify longer count times	for unknowns relative to	and Pre-Scans
4	V ka	2		10.00	5.00		standards). Enter wave	scan time for wavescan s	amples, quickscan time	and the ocaris.
5	Crka	2		10.00	5.00		for quick wavescan	s and peaking time for sp	ectrometer peaking.	Off-Peak
6	Feka	5		10.00	5.00		Multimeter Land	the second second devices and	have a second second second	Statistics
/	Minka	5		10.00	5.00		MultiPoint bac	kground count times are Hi and Lo Off Peak Time	based on the s divided by two	
8	Mgka	1		10.00	5.00		conceponding	in and 20 off in date filles	s annaca by thro	
9	Laka	3		10.00	5.00					
	Na Ka	1		10.00	0.00		- Statistics Based Co	unting For Predefined	Precision Levels	
							University Manimum	Count.		
							Unknown Maximum		0000000	
}eam Aver Nominal Be	ages am (nA) Nominal Re	1. 39.994	3	77 se 1 i	ecs min		Use the Unknown Ma fixed count time. If the Background counting ti	ximum Count to specify a e total counts acquired ex acquisition will be con me will be automatically c	desired statistical significa ceeds the Unknown Max sidered complete. alculated based on the rat	nce instead of a imum Count the io of the specified
normalizatio intensity disp for cj	n constant Iay. For exa os/nA inten	used for the imple, enter sity display.	y me x-ray 1 (nA)	Calculate Spectrome Motion an	d ter d		off-peak counting time to	o the specified on-peak o counting	ounting time and the actu- time.	al elapsed on-peak
Return To	Dn-Peak i	ſime 2₃	ecs	Acquisitio Time	n Mg		Unknown/Standard	Count Time Batio an	d Alternating On/Off	Peaks
Crustal Flin	Time	0.0			1		Unknown Count Tim	e Factor : (
Set Column	(TKCS) 1	ime 3 s	ecs	0 se	ecs		Use the Onknown Sour lo count times for unkno 10 and the Unknown (t Time Factor to automat own samples relative to s Count Factor is 2, then th d the unknowns will cour	cally change the counting tandards. For example, if the standards will count 10 s t 20 seconds on-neak	time for on, hi and ne on-peak time is seconds on-peak
							The Unknown Count Ti feature (see the Acq positions are alternate)	me Factor is also used fo uisition Options dialog). V y acquired for a number o Time Fa	r the Alternating On and O /ith this feature the on-pea if repetitions based on the ctor.	ff Peak Acquisition ak and off-peak Unknown Count

Click **OK** to return to the **Count Times** window.

The **Count Times** window now shows a new estimate of 142 seconds for a measurement of unknown.

				1.08	1.000	100.00	1.00			
Click Ele	ment Row	to Edit Co	unt Time:	s						
				- 					.	
Channel	Llement	Spectro	Crystal	Un-Peak	HI-Peak	Lo-Peak	MaxCourfFactor	Wave	Peak	Quick
1	Sika	4	TAP	10.00	5.00	5.00	100000 (3.00	5.00	3.00	2.00
2	Tika	3	LPET	10.00	5.00	5.00	1000000(3.00	5.00	3.00	2.00
3	Alka	4	TAP	10.00	5.00	5.00	10000 0(3.00	5.00	3.00	2.00
4	V ka	2	LLIF	10.00	5.00	5.00	10000 00 3.00	5.00	3.00	2.00
5	Crka	2	LLIF	10.00	5.00	5.00	10000 00 3.00	5.00	3.00	2.00
6	Fe ka	5	LLIF	10.00	5.00	5.00	10000 0(3.00	5.00	3.00	2.00
7	Mn ka	5	LLIF	10.00	5.00	5.00	1000000(3.00	5.00	3.00	2.00
8	Mg ka	1	TAP	10.00	5.00	5.00	1000001(3.00	5.00	3.00	2.00
9	Ca ka	3	LPET	10.00	5.00	5.00	1000001(3.00	5.00	3.00	2.00
10	Na ka	1	TAP	10.00	5.00	5.00	1000000 3.00	5.00	3.00	2.00
1							-			
•										
eam Aver	ages eam (nå)	1	2	142 sec		2 3 LLIF LPET	4 5 TAP LLIF			OK
eam Aver Iominal Be Change the normalizatio ntensity disp for c	rages eam (nA) e Nominal Be on constant olay. For exa ps/nA inten	1 39.994 eam to modi used for the ample, enter sity display.	i 3 iy the x-ray 1 (nA)	Calculated Spectromete Motion and Acquisition	an Mg	2 LUF LPET V Ti	4 5 TAP LLIF			OK Cancel

Further, the graphical spectrometer motion bars next to the time estimate indicate how efficient the usage of the spectrometers is. Spectrometer 2 needs more time compared to the other four spectrometers as off-peak backgrounds are acquired for both Cr and V. It would therefore be more efficient to either reduce counting times for Cr and/or V, or, as both are expected to be present only at minor to trace level in the unknown samples, extend counting times on the other spectrometers.

Adjust all count times as desired and click **OK** to return to the **Acquire!** window.

Click the **Start Standard or Unknown Acquisition** button in the **Acquire!** window to start the acquisition of the unknown.

👎 Acquire!								
SP1 S 46154.5 56745	2 .3 3841	SP3 SP4 9.6 27551.3	SP5 48262.8	x -136015	¥ 74.05	Z 64.9978	Spectro	Progress
1-TAP 2-	-LLIF .00	3-lpet	4-TAP .00	5-LLIF .00		Faraday .00	Mg	Ti Al Mn
Current Sample: Un	4*ру	roxene 1		Start Standa	rd or Un	. 000000	Na Cr	Ca Si Fe
Normal Acquisition I Data Rows: 0	Jnknown Goo	d Data Rows: 0		s	tart Wa	vescan	-13601. um .000000 px 0	-574.05 .000000 0
New Sample		PHA		Imaging		Peaking Options	Magnification Beam Mode	2533
Elements/Cations	e Pe	ak/Scan Option	s Acqu	uisition Options		Start Peaking	Kilovolts	Analog Spot
Analytical Conditio	ns	Count Times	Sp	ecial Options		Move	Beam Current Beam Size	40
Combined Condition	s	Locate		Rate Meter		Stage		

Again, progress can be monitored in the **Acquire!** window. After completion of the measurement, move the stage to a different position and click the **Start Standard or Unknown Acquisition** button again to start another measurement. Repeat this procedure a third time so that three random spots are acquired on the same pyroxene sample.
Next, reopen or bring forward the **Analyze!** window. Click the *Unknowns* button under the *Sample List* buttons and highlight (select) *Un 2 pyroxene 1*.

Malyze!	Automater		-			
- Sample List (multi-select)	(double-click to see intens	sity data)	Analyze	Data KRaws	Combine Analysis Lines From Selected Samples	
Unknowns Un 2	pyroxene 1		List Report	Calculation Options	Combine Data Lines From Selected Samples	
C All Samples Select All			Pause Betweer Use All Matrix C	Samples Corrections	Sort Stat and Data Grids In Geological or Atomic Number Order	
Add To Setup			Delete Selecte Undelete Selecte	d Sample(s) Match	Do Not Output To Log	
Specified Concentrations	Standard Assignments	Name/Descript	Combined Conditions	ions Count Times Elements/Cations	Combine the Selected Samples into a New Sample	
		Total Oxy Calculate Excess 0	ygen ed Oxygen)xygen	Total Weight % Z - Bar Atomic Weight	Boundary Corrections Create Material File	
Сору						
•			1		4	
Delete Selected Line	s) Undelete S	elected Line(s)	Analy	ize Selected Line(s)		
Copy					^	
					Cancel Next //	

Click the **Analyze** button to calculate the results for these three points. The values are viewed below.

🚏 Analyze!	poli -		Automated			-			12.22	11/200		_ 0 <mark>_ X</mark>
Sample L	List (multi-sele	ect) (double-	click to see in	tensity data)		Analyze	Data	KRaws	Combine Analysi Selected S	s Lines From amples		
⊖ Stand ⊙ Unkno ⊖ Wave	owns Un owns Un escans Un	1 * templa 2 pyroxena 3 pyroxena	te for pyroxen e 1 e traverse	e elements		st Report	Calculation	Options	Combine Data Selected S	Lines From amples		
O All Sa Select	amples t All					Pause Between Samples Use All Matrix Corrections			Sort Stat and Data Grids In Geological or Atomic Number			
Add To	<mark>Setup</mark>					Delete Selected ndelete Selecte	Sample(s) d Sample(s)	Match	Orde	Tolog		
Save Se	Save Setups Do Not Dutput To Log Combined Conditions Count Times Combine the Selected											
Un 2 pyro	xene 1	standa	ard Assignmen	43.583	Total Oxygen	Conditions 99.5	Elements	s/Cations	Boundary Co	rrections		
TO = 40, Ke Results in El	ieV = 15, Beam Iemental Weight	= 40, Size = 1 Percent	•	43.583 .000	Calculated Oxy Excess Oxyger	vgen 12.4 n 21.8	193 Z - Bar 377 Atomic \	Weight	Create Mate	erial File		
Сору	Si	Ti	Al	V	Cr	Fe	Mn	Mg	Ca	Na	0	Total
Average:	23.829	.322	2.810	.025	.474	3.107	.066	9.628	3 15.015	.707	43.583	99.567
Std Dev:	.104	.002	.040	.011	.019	.025	.011	.013	.043	.077	.104	.150
ZAF Corr:	1.2648	1.1995	1.4264	1.2136	1.1844	1.1921	1.2131	1.485	5 1.0854	1.9415		
Std Err:	.060	.001	.023	.007	.011	.014	.007	.008	.025	.045	.060	.087
%Rel SD:	.44	.73	1.43	45.36	4.10	.80	17.05	.14	.29	10.95	.24	.15
Minimum:	23.725	.320	2.782	.018	.453	3.080	.057	9.618	3 14.977	.636	43.468	99.401
Maximum:	23.933	.324	2.857	.038	.492	3.129	.079	9.643	3 15.062	.789	43.673	99.693
												*
Dele	te Selected I	.ine(s)	Undele	te Selected I	.ine(s)	Analyz	e Selected Lin	e(s)				
Сору	Si	Ti	AI	V	Cr	Fe	Mn	Mg	Ca	Na	0	Total 🔺
382 G	23.933	.320	2.792	.038	.478	3.080	.057	9.623	3 15.062	.636	43.673	99.693
383 G	23.830	.320	2.857	.019	.492	3.129	.063	9.618	3 14.977	.694	43.608	99.607
384 G	23.725	.324	2.782	.018	.453	3.112	.079	9.643	3 15.007	.789	43.468	99.401
												-
•												4
											Cancel	Next

To set the software up to perform additional calculations, click the **Calculation Options** button.

This opens the **Calculation Options** dialog box. Make the following changes: under *Calculations Options* check the *Display Results as Oxides* and *Calculate Detection Limits and Sensitivity* boxes. Under *Formula and Mineral Calculations* check the *Calculate Formula Based On* box. Select *Pyroxene*, enter *6 Atoms of* in the text box, and select O (oxygen) from the drop down menu.

Selected Samples	OK Cancel
Un 2 pyroxene 1	- EDS Calculation Data
	Do Not Use EDS Element Data
	C Use EDS Spectrum Element Data
	Assign EDS Spectral Elements
	Integrated Intensity Data Options —
	C Do Not Use Integrated Intensities C Use Integrated Intensities
Element Density Thickness (A)	Use Standard menu to specify standard coatings
	Use conductive coating
Calculations Options	Calculate with Stoichiometric Oxygen
Calculations Options Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients	Calculate with Stoichiometric Oxygen Calculate as Elemental Use Particle/Film Calculations
Calculations Options Display Results As Oxides Calculate Atomic Tercents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula):	Calculate with Stoichiometric Oxygen Calculate as Elemental Use Particle/Film Calculations
 Calculations Options Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: 	Calculate with Stoichiometric Oxygen Calculate as Elemental Use Particle/Film Calculations Atoms Of To 1 Oxyger
Calculations Options Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element:	Calculate with Stoichiometric Oxygen Calculate as Elemental Use Particle/Film Calculations Atoms Of To 1 Oxyger Atoms Of To To To
 Display Results As Oxides Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen 	Calculate with Stoichiometric Oxygen Calculate as Elemental Use Particle/Film Calculations Atoms Of To Atoms Of To H:O Ratio
 Display Results As Oxides Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Detection Limits and Sensitivity Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen 	Calculate with Stoichiometric Oxygen Calculate as Elemental Use Particle/Film Calculations Atoms Of To Atoms Of To H:O Ratio .00 OH = 1, H20 = 2
Calculations Options Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen Formula and Mineral Calculations Calculate Formula Based On	Calculate with Stoichiometric Oxygen Calculate as Elemental Use Particle/Film Calculations Atoms Of To Atoms Of To H:O Ratio .00 OH = 1, H2O = 2
Calculations Options Display Results As Oxides Calculate Atomic Fercents Calculate Detection Limits and Sensitivity Calculate Projected Detection Limits Calculate Homogeneity Ranges Calculate Alternate Homogeneity Ranges Calculate Pearson's Linear Correlation Coefficients Element By Difference (as oxide formula) : Stoichiometry To Calculated Oxygen: Stoichiometry To Another Element: Hydrogen Stoichiometry To Excess Oxygen Formula and Mineral Calculations Calculate Formula Based On Modimeral End-Member Calculation	Calculate with Stoichiometric Oxygen Calculate as Elemental Use Particle/Film Calculations Atoms Of To Atoms Of To H:O Ratio .00 OH = 1, H2O = 2

Click the **OK** button to return to the **Analyze!** window. Click the **Analyze** button again.

The table in the Analyze! window now shows the formula units for the pyroxene formula calculation as below.

👎 Analyze	l i	-								-		- • • ×
Sample I	List (multi-sel	ect) (double-	click to see in	tensity data)		Analyze	Data	KRaws	Combine Analysi Selected S	s Lines From amples		
C Wave	dards Un Iowns <mark>Un</mark> escans Un	1 * templa 2 pyroxena 3 pyroxena	te for pyroxen e 1 e traverse	e elements		t Report	d Samples Calculation	Options	Combine Data Selected S	Lines From amples		
C All Sa Selec	amples et All					'ause Between Ise All Matrix Co	Samples prrections	Report	Sort Stat and D Geological or Ato	ata Grids In omic Number		
Add To Setup Delete Selected Sample(s) Undelete Selected Sample(s) Match Do Not Output To Log												
Save S	ietups	one Chand	and Assignment	Name/D		mbined Conditio	ons Co	unt Times	Combine the	Selected		
Un 2 pyro	xene 1			43.583	Total Oxygen	99.5	567 Total W	eight %	Boundary Co	rrections		
Results Bas	ev = 15, Beam	n = 40, 5ize = 1 of 0		43.583	Laiculated Uxy; Excess Oxygen	gen 12.4 21.8	193 ∠ · Bar 377 Atomic \	Weight	Create Mate	erial File		
Сору	Si	Ti	AI	V	Cr	Fe	Mn	Mg	Ca	Na	0	Total
Average:	1.869	.015	.229	.001	.020	.123	.003	.873	.825	.068	6.000	10.025
Std Dev:	.004	.000	.003	.000	.001	.001	.000	.003	.002	.008	.000	.008
ZAF Corr:	1.2648	1.1995	1.4264	1.2136	1.1844	1.1921	1.2131	1.485	5 1.0854	1.9415		
Std Err:	.002	.000	.002	.000	.000	.001	.000	.002	.001	.004	.000	.005
%Rel SD:	.21	.96	1.37	45.15	3.92	.93	17.30	.37	.28	11.19	.00	.08
Minimum:	1.866	.015	.227	.001	.019	.121	.002	.870	.823	.061	6.000	10.018
Maximum:	1.873	.015	.233	.002	.021	.123	.003	.876	.827	.076	6.000	10.034
•												+
Dele	ete Selected	Line(s)	Undele	te Selected L	ine(s)	Analyz	e Selected Lin	e(s)				
Сору	Si	Ti	AI	٧	Cr	Fe	Mn	Mg	Ca	Na	0	Total 🔺
382 G	1.873	.015	.227	.002	.020	.121	.002	.870	.826	.061	6.000	10.018
383 G	1.868	.015	.233	.001	.021	.123	.003	.871	.823	.066	6.000	10.023
384 G	1.866	.015	.228	.001	.019	.123	.003	.876	.827	.076	6.000	10.034
Calculating		n esmolo lln	2 риконоро	1							Canool	Mout
Carculating	y Arcidyes u	n sample ou	z pyroxene	1							cancer	next /

Additional data is written to the log window, which can be stored to a text file and viewed as described before, or simply be highlighted with the mouse and copied to the system clipboard with the key combination <Crtl>+C. The contents of the log window are shown on the following pages.

The user may obtain a large amount of information besides elemental and oxide weight percent data. These expanded capabilities include formula and mineral end member calculations, an extended set of detection limit and statistics including homogeneity and analytical sensitivity. See the User's Guide and Reference documentation for calculation details.

Un 2 TakeOff (Magnif (Magnif Image S Number First/L Average	pyroxer = 40.0 ication ication hift (X, of Data ast Date Total C	he 1 KiloVol (analyti (default Y): Lines: e-Time: 0 Dxygen:	t = 15.0 cal) = ;) = 3)4/25/201 43.) Beam C 2533), 2533, Ma .3 02:11: 583	Current = B Ignificat Number of 23 PM to Average	40.0 B eam Mode ion (ima 'Good' 04/25/2 Total We	eam Size = Analo ging) = 50 Data Lin 013 02:2 ight%:	e = 10 g Spot 2533) , .00 .es: 3 0:08 PM 99.567			
Average Average Average	Calcula Excess ZAF Ite	ated Oxyg Oxygen: eration:	gen: 43. 3	583 000 3.00	Average Average Average	Atomic N Atomic W Quant It	Number: Weight: Werate:	12.493 21.877 3.00			
Oxygen	Calculat	ed by Ca	ation Sto	ichiomet	ry and I	ncluded	in the M	latrix Co	rrection	L	
Un 2	pyroxer	ne 1, Res	sults in	Elementa	l Weight	Percent	.S				
SPEC: TYPE:	0 CALC										
AVER: SDEV:	43.583 .104										
ELEM:	Si	Ti	Al	V	Cr	Fe	Mn	Mg	Ca	Na	
BGDS:	MAN	LIN	LIN	LIN 20 00	LIN	MAN	LIN	MAN	MAN	LIN	
BEAM:	40.11	30.00 40.11	30.00 40.11	30.00 40.11	40.11	40.11	40.11	40.11	40.11	30.00 40.11	
	C +	m.;			Gre	Πa	Mar	Mar	G -	Na	CUM
ЕLEM: 382	23 933	320	AI 2 792	V 038	478	3 080	Mn 057	Mg 9.623	15 062	Na 636	99 693
383	23.830	.320	2.857	.019	.492	3.129	.063	9.618	14.977	.694	99.607
384	23.725	.324	2.782	.018	.453	3.112	.079	9.643	15.007	.789	99.401
AVER:	23.829	.322	2.810	.025	.474	3.107	.066	9.628	15.015	.707	99.567
SDEV:	.104	.002	.040	.011	.019	.025	.011	.013	.043	.077	.150
SERR:	.060	.001	.023	.007	.011	.014	.007	.008	.025	.045	
STDS:	.44 602	.73 539	1.43 609	45.30	4.10 631	.80 524	17.05 509	.14 607	. 29 602	651	
STKF:	.1884	.5489	.1277	1.0000	.3856	.6539	.1612	.2085	.1386	.0392	
STCT:	387.65	1658.01	272.03	358.23	169.81	460.67	107.33	336.16	336.12	43.93	
UNKF:	.1884	.0027	.0197	.0002	.0040	.0261	.0005	.0648	.1383	.0036	
UNCT:	387.70	8.10	41.98	.07	1.76	18.36	.36	104.50	335.38	4.08	
UNBG:	1.92	3.15	1.08	.30	.42	.86	.64	1.12	2.39	.47	
ZCOR:	1.2648	1.1995	1.4264	1.2136	1.1844	1.1921	1.2131	1.4855	1.0854	1.9415	
KRAW:	1.0001	.0049	.1543	.0002	.0104	.0399	.0034	.3108	.9978	.0928	
PKBG:	202.96	3.57	39.87	1.25 -6.53	5.21	22.36	1.57 _1 31	94.93	141.17	9.63	
INT 0			ulta in	Orido No	ight Dom	aonta	1.31				
011 2	pyroxer	le I, Kes	Suits III	OXIGE WE	ignic Per	Cents					
SPEC: TYPE:	0 CALC										
AVER: SDEV:	.000										
ELEM:	sio2	TiO2	A1203	V203	Cr203	FeO	Mn∩	MαO	CaO	Na20	SUM
382	51.201	.534	5.276	.056	.699	3.963	.073	15.958	21.075	.857	99.693
383	50.980	.534	5.398	.028	.719	4.026	.081	15.949	20.956	.936	99.607
384	50.756	.541	5.257	.026	.663	4.003	.102	15.992	20.998	1.064	99.401
AVER:	50.979	.536	5.310	.037	.693	3.997	.085	15.966	21.009	.953	99.567
SDEV:	.222	.004	.076	.017	.028	.032	.015	.022	.060	.104	.150
SERR:	.128	.002	.044	.010	.016	.018	.008	.013	.035	.060	
∛KSD: STDS.	.44	.73	⊥.43 600	45.36 ⊑01	4.10 621	.80 504	17.05 500	.14	.29	LU.95 6E1	
. 201.	002	229	009	504	031	524	509	007	002	0.01	

Un 2 pyroxene 1, Results Based on 6 Atoms of 0

SPEC: TYPE:	0 CALC										
AVER: SDEV:	6.000 .000										
ELEM:	Si	Ti	Al	V	Cr	Fe	Mn	Mg	Ca	Na	SUM
382	1.873	.015	.227	.002	.020	.121	.002	.870	.826	.061	10.018
383	1.868	.015	.233	.001	.021	.123	.003	.871	.823	.066	10.023
384	1.866	.015	.228	.001	.019	.123	.003	.876	.827	.076	10.034
AVER:	1.869	.015	.229	.001	.020	.123	.003	.873	.825	.068	10.025
SDEV:	.004	.000	.003	.000	.001	.001	.000	.003	.002	.008	.008
SERR:	.002	.000	.002	.000	.000	.001	.000	.002	.001	.004	
%RSD:	.21	.96	1.37	45.15	3.92	.93	17.30	.37	.28	11.19	
Pyroxene	e Mineral	End-Merr	ber Calo	culations							
	Wo	En	Fs								
382	45.4	47.9	6.7								
383	45.3	47.9	6.8								
384	45.3	48.0	6.7								
AVER:	45.3	47.9	6.7								
SDEV:	.1	.1	.1								
Detectio	on limit	at 99 %	Confider	nce in El	emental	Weight H	Percent (Single L	ine):		
ELEM:	Si	Ti	Al	V	Cr	Fe	Mn	Mg	Ca	Na	
382	.009	.008	.007	.019	.018	.017	.016	.010	.007	.013	
383	.009	.007	.008	.021	.019	.017	.015	.010	.007	.012	
384	.009	.007	.007	.019	.018	.017	.015	.011	.007	.013	
AVER:	.009	.007	.007	.020	.018	.017	.015	.010	.007	.013	
SDEV:	.000	.000	.000	.001	.000	.000	.000	.000	.000	.001	
SERR:	.000	.000	.000	.001	.000	.000	.000	.000	.000	.000	
Percent	Analytic	al Relat	ive Erro	or (One S	igma, Si	ngle Lir	ne):				
ELEM:	Si	Ti	Al	V	Cr	Fe	Mn	Mg	Ca	Na	
382	.2	1.7	.6	25.9	3.2	.9	14.6	.3	.2	2.1	
383	.2	1.7	.6	53.1	3.2	.9	12.9	.3	.2	1.9	
384	.2	1.6	.6	52.6	3.3	.9	10.7	.3	.2	1.8	
AVER:	.2	1.7	.6	43.9	3.2	.9	12.7	.3	.2	1.9	
SDEV:	.0	.0	.0	15.6	.1	.0	2.0	.0	.0	.1	
SERR:	.0	.0	.0	9.0	.0	.0	1.1	.0	.0	.1	
Detectio	on Limit	(t-test)	in Eler	mental We	ight Per	cent (Av	verage of	Sample)	:		
ELEM:	Si	Ti	Al	V	Cr	Fe	Mn	Mg	Ca	Na	
60ci		.001		.008	.016		.009			.062	
80ci		.002		.014	.028		.015			.111	
90ci		.004		.022	.044		.024			.171	
95ci		.005		.033	.065		.035			.252	
99ci		.012		.076	.149		.080			.582	
Analytic	cal Sensi	tivity (t-test)	in Eleme	ntal Wei	ght Perc	cent (Ave	rage of	Sample)	:	
ELEM:	Si	Ti	Al	v	Cr	Fe	Mn	Mg	Ca	Na	
60ci	.099	.001	.037	.002	.014	.022	.003	.010	.038	.061	
80ci	.177	.002	.065	.003	.025	.038	.006	.018	.068	.109	
90ci	.274	.003	.101	.005	.039	.059	.009	.028	.105	.169	
95ci	.403	.004	.149	.008	.058	.088	.013	.042	.155	.249	
99ci	.931	.010	.343	.018	.133	.202	.030	.096	.357	.575	

Digitized Sample Data Collection and Analysis

Acquisition of data on unknown samples can also be automated. As an example the user will perform a digitized traverse across an unknown pyroxene grain. The user can digitize standards, unknowns or wavescan positions based on random points, linear traverse or rectangular or polygon gridded areas. Check that the *Unknowns* button is clicked in the **Automate!** window.

🚏 Automate!		
Position List (multi-select) (double-click to see data)	Move Stage	Automation Actions
C Standards C Unknowns C Wayescans	Digitize	Confirm Standard Positions
All Samples	Plat	Peak Spectrometers Peaking
	Fiducials	 Acquire Standard Samples Acquire Unknown Samples
Select All	Replicates	 Acquire Wavescan Samples Acquire Standard Samples (again)
Auto Focus	Conditions	Automation Options
Update	Sample Setups	 Peak on Assigned Standards Use "Quick" Standards
Delete All Re-Load	Hile Setups Multiple Setups	 Use Filament Standby Afterwards Use Confirm During Acquisition
Delete Selected Samples Import from	ASCII (*.POS File)	Use Beam Deflection For Position Suppress ROM Based Backlash
Delete Selected Positions Export Selected	ed Samples (to *.POS)	Confirm All Positions In Sample
Row X Y Z W	Grain # Focus	Use ROM Auto Focus New Sample C Every Point Digitized C Interval 5
		Standard Points To Acquire 3
		Standard X Increment (um)
		Re-Standard Y Increment (um)
		Re-Standard Interval (hrs) 6
		 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
		Run Selected Samples

Click the **Digitize** button in the **Automate!** window.

This opens the **Digitize Sample Positions** dialog box.

To create an unknown digitized sample, click *Unknown* under *Sample Type* and enter a sample name in the *Unknown or Wavescan Position Samples* text box. Next, click the **Create New Unknown or Wavescan** button. The unknown sample will now appear in the *Position List* list box of the **Automate!** window. Finally, click the **Linear Traverse** button to create a traverse of digitized points.

👎 Digitize Sample Po	sitions	
Sample Type Ctandord Unknown wavescan	To create a new unkn Unknown Sample Type op and click the Create New button. To create a new s Standard Sample Type op from the St ucial Set: 0, Setup Num	own position, click the otion, enter a sample name v Unknown or Wavescan tandard position, click the tion and select a standard andard List. ber: 0 and File Setup:
NO	NE and Multiple Setups	NONE
Positions	PictureSnap	Stage
Unknown or Wave	scan Position Samples	(Name/Description)
pyroxene traverse		
		^
		v
Add New Unkno	tions Added To Bun (se	Auto Increment
12 Mail anathali	aons Added To Hun (se	
13 Al2O3 synthe	c tic	<u>^</u>
14 SiO2 syntheti 22 TiO2 syntheti	ic ic	
23 V203 synthe	tic	T
Add/I	Remove Standards To/I	From Run
1 Increm	nent Grain 📃 🗆 Use [Digitized AutoFocus
		Number Size
Single Po	int(s)	hotgun 12 40
Linear Tra	verse	Rectangular Grid
Digitize I	mage 🕷	Polygon Grid
Di	igitize Cluster (of Rando	om Points)
	-	

Note: Other available digitization options include rectangular and polygon grids as well as clusters of random points. The user can also digitize positions from an image acquired on the microprobe, or load a previously scanned image file for stage position calibration and then digitize samples on that image via the **PictureSnap!** menu.

The **Linear Traverse Parameters** dialog box opens. Move to the start position of the linear traverse, and click the **Update Start** button. Move to the stop position and click the **Update Stop** button. The *Total Distance* is displayed.

Enter Stage Coordi	nates For Trave	erse End Points		OK
X Start Position	-14958	X Stop Position	-14886	
Y Start Position	-29166	Y Stop Position	-29354	Cancel
Z Start Position	101	Z Stop Position	101	
Update Start	Move To	Update Stop	Move To	Stage
Total Distance	201.316	Distance in Microns	201.316	Auto Focus
Use Number Of	Points Per Trav	verse Step	Use this con stage in spec	trol to move the cified increments
C Use Step Size I	In Micronis I er a			
C Use Step Size In Number Of Points		10		
C Use Step Size I Number Of Points Step Size in Micron	15	10 22.3684		↓ ►
C Use Step Size I Number Of Points Step Size in Micron Fractional Steps Re	is emaining	10 22.3684 .00000		

Select *Use Number of Points Per Traverse* or and type 10 into the *Number of Points* text box. The *Step Size in Microns* is calculated.

Enter Stage Coordi	nates For Trav	erse End Points		ОК
X Start Position	-14958	X Stop Position	-14886	
Y Start Position	-29166	Y Stop Position	-29354	Cancel
Z Start Position	101	Z Stop Position	101	
Update Start	Move To	Update Stop	Move To	Stage
Total Distance	201.316	Distance in Microns	201.316	Auto Focus
Total Distance Traverse Interpolat Use Number Of Use Step Size In Number Of Points Step Size in Micron	201.316 e Position Opti Points Per Tra n Microns Per S	Distance in Microns ions verse Step	201.316	Auto Focus age Introl to move the cified increments
Total Distance Traverse Interpolat Use Number Of Use Step Size In Number Of Points Step Size in Micron Fractional Steps Re	201.316 e Position Opti Points Per Tra n Microns Per 3 is emaining	Distance in Microns ions verse Step	201.316	Auto Focus age ntrol to move the cified increments

Click the **OK** button to add the 10-point traverse to the position list and return to the **Automate!** window.

Now all of the calculated analysis positions have been digitized and listed. Under Automation Actions click the Acquire Unknown Samples button.

👎 Automate!					_		
Position Li	st (multi-sele	ct) (double-c	lick to see o	data) ———	_	1	Automation Actions
C Standa	rds <mark>Un</mark>	1 Fid 0 pyro	xene travers	se	Mov	e Stage	Confirm Standard Positions
C Waves	cans					Digitize	Confirm Wavescan Positions
	•					Plot	Peak Spectrometers Peaking Acquire Standard Samples
Select S	tds				F	iducials	Acquire Unknown Samples
Select #					F	Replicates	Acquire Standard Samples (again)
Auto Foc	us				C	onditions	Automation Options
Update	e				San	nple Setups	Use "Quick" Standards
Delete A					F	ïle Setups	Use Filament Standby Afterwards
Re-Loa	d 🔤				Mult	iple Setups	Use Confirm During Acquisition
		C 1	1			0.51.2	Use Beam Deflection For Position Suppress BOM Based Backlash
Del	ete Selected	Samples		mport from	ASCII (*.PU	S Filej	
Del	ete Selected	Positions	Exp	oort Selecte	d Samples (to *.POS)	Combine Multiple Sample Setups
Row	X	Y	Z	w	Grain #	Focus	
1	-14958.00	-29166.00	101.0000	0	1	0	New Sample C Every Point
2	-14950.00	-29186.89	101.0000	0	1	0	C Digitized C Interval 5
3	-14942.00	-29207.78	101.0000	0	1	0	
4	-14934.00	-29228.67	101.0000	0	1	0	Standard Points To Acquire
5	-14926.00	-29249.55	101.0000	0	1	0	
6	-14918.00	-29270.44	101.0000	0	1	0	Automate Confirm Delay [sec] 10
7	-14910.00	-29291.33	101.0000	0	1	0	Standard X Increment (um) 15
8	-14902.00	-29312.22	101.0000	0	1	U	Po Standard V Ingrammat (um)
9	14000.00	-29333.11	101.0000	0	1	0	ne-standard i increment (um) 6
10	-14000.00	-23334.00	101.0000	U	1	U	Re-Standard Interval (hrs) 6
KeV = 15 Cu Mag	ırr = 40 Size = Anal = 2533 ↑	= 10 Mag = 2 MagImag = 253 File	533 Mode = / 33 ImgShift = • Setup = NON	Analog Spot -2, 3 IE	Sample Setu; =	p (row) Number = 0	 Use Last Unknown Sample Use Digitized Conditions Use Digitized Sample Setups Use Digitized File Setups Use Digitized Multiple Setups
	Multip	ble Setups = NC	ONE		Replic	ates = 1	Run Selected Samples

Click **Run Selected Samples** button to initiate the traverse.

The AutomateConfirmSelected window opens. Click Yes.



When the traverse is completed the familiar **AcquireStop** window appears.

AcquireStop	Canon Inn -	
i	Automation Completed	
	ОК	

Click the **OK** button returning the user to the **Automate!** dialog box.

To analyze the data obtained from the traverse, again open the **Analyze!** window, select the *Un 3 pyroxene traverse* sample in the *Sample List*, and process the data in a similar way as before.

- Sample L	ist (multi-selo	ect) (double-	click to see into	ensity data	<u>) </u>	Analyze	Data	KRaws	Combine Analysi Selected S	is Lines From amples		
⊖ Stand	ards Un Juns Un	1 * templa 2 pyroxen	ite for pyroxene e 1	elements		Combine Sele	cted Samples	>>Excel	Combine Data Lines From			
C Wave	scans Un	3 pyroxen	e traverse			st Heport	Calculation	Uptions	Selected S	amples		
C All Samples Select All					Pause Betwe Use All Matrix Delete Seleci	en Samples Corrections ted Sample(s)	Report	Sort Stat and D Geological or Ato Orde	ata Grids In omic Number er			
Add To S	Setup				U	ndelete Sele	cted Sample(s)	Match	Do Not Outou	t To Log		
Save Se	etups				C	ombined Con	ditions Co	ount Times		1		
Specified	Concentratio	ons Standa	ard Assignments	Name/	Description	Conditio	ns Element	s/Cations	Combine the Samples into a f	Selected New Sample		
Un 3 pyro»	kene traverse	40.0:	10	43.603	Total Oxygen	9	9.535 Total W	/eight %	Boundary Co	prrections		
 Results in Ele	ev = 15, beam emental Weight	t Percent	•	43.603	Excess Oxyge	n 2	2.489 2 · Bar 1.872 Atomic	Weight	Create Mati	erial File		
Сору	Si	Ti	AI	V	Cr	Fe	Mn	Mg	Ca	Na	0	Total
verage:	23.898	.324	2.816	.029	.454	3.093	.063	9.56	7 15.001	.687	43.603	99.535
td Dev:	.041	.005	.023	.010	.015	.022	.011	.036	6 .033	.044	.084	.212
AF Corr:	1.2642	1.1996	1.4253	1.2137	1.1846	1.192	2 1.2132	1.485	50 1.0855	1.9413		
td Err:	.013	.002	.007	.003	.005	.007	.003	.011	.010	.014	.026	.067
Rel SD:	.17	1.52	.82	34.84	3.33	.70	17.14	.37	.22	6.33	.19	.21
linimum:	23.837	.318	2.774	.012	.437	3.040	.048	9.50	8 14.947	.635	43.476	99.169
laximum:	23.966	.336	2.842	.044	.481	3.115	.079	9.63	1 15.050	.766	43.708	99.792
Dele	te Selected I	Line(s)	Undelete	Selected	Line(s)	An	alyze Selected Lir	ne(s)				
Conv	Si	Ti	AI	v	Cr.	Fe	Mn	Ma	Ca	Na	n	Total
388 G	23.890	.320	2.785	.024	.457	3.073	.051	9.50	8 14.947	.638	43.476	99.169
389 G	23.869	.322	2.774	.042	.441	3.098	.057	9.52	6 14.962	.746	43.509	99.347
390 G	23.966	.324	2.797	.012	.481	3.115	.062	9.59	3 15.037	.697	43.708	99.792
391 G	23.886	.336	2.825	.021	.446	3.105	.054	9.57	4 15.050	.635	43.605	99.538
392 G	23.915	.322	2.815	.024	.457	3.104	.079	9.56	7 15.020	.674	43.630	99.609
393 G	23.886	.318	2.834	.027	.437	3.106	.074	9.63	1 15.010	.766	43.672	99.761
394 G	23.857	.326	2.832	.024	.437	3.093	.061	9.53	9 14.994	.654	43.528	99.345
395 G	23.837	.327	2.842	.034	.449	3.096	.048	9.56	5 14.977	.676	43.541	99.393
396 G	23.923	.321	2.834	.038	.476	3.104	.075	9.59	6 14.991	.676	43.677	99.711
207 C	23.955	.323	2.821	.044	.456	3.040	.070	9.56	8 15.019	.713	43.683	99.691
557 G												

The next two sections will illustrate more powerful options to plot and export analysis data.

Plotting Analysis Data

The user may wish to examine the traverse data in a graphical presentation. Click the **Plot!** button in the main PROBE FOR EPMA log window. This reopens the **Plot!** dialog box that was already used for plotting wavescans.

First, choose the pyroxene traverse from the *Sample List* list box. Select *Relative Microns* for the *X-Axis*. To plot for example the data for all minor elements in the pyroxene sample, ctrl-click to multi-select *TiO2*, *V2O3*, *Cr2O3*, *MnO*, and *Na2O* oxide percents in the *Y-Axis* list. Select a *Graph Type* and the button *Send Data to Plot Window*. Finally, click the **Output** button.

🚏 Plot!	(Realized	Subsection of					
Sample List (multi-select)	Use Manual Selection	Output Target					
O Standards Un 1 * ⊙ Unknowns Un 2 p	template for pyroxene element pyroxene 1	Send Data to Plot Window Send Data to ASCII File (X, Y, (Z),)					
O Wavescans Un 3 p	pyroxene traverse	O Send Data To Printer (sep	arate samples)				
		Include Deleted Points Data Point Labels	Run Information Sample Names				
Acquired Only		ASCII File Column Labels	SURFER .BAS File				
Select All		Force Black and White Print	🔲 Off Peak Labels				
Select Analyze!		Normalize Samples (Y Sets)	🔲 Normalize Y Sets				
X-Axis		Y-Axis (multi-select)	Graph Type				
Atomic Totals Formula Totals Line Numbers Line Numbers (relative) On Beam Current Ab Beam Current DateTime Elapsed Hours X Stage Coordinates Y Stage Coordinates X Stage Coordinates W Stage Coordinates W Stage Coordinates Helative Microns Si Detection Limits Ti Detection Limits Al Detection Limits Cr Detection Limits Fe Detection Limits Mn Detection Limits Mn Detection Limits Mg Detection Limits Ca Detection Limits Na Detection Limits Na Detection Limits Na Detection Limits	Si Elemental Percents Ti Elemental Percents Al Elemental Percents V Elemental Percents Fe Elemental Percents Mn Elemental Percents Ma Elemental Percents Ca Elemental Percents Na Elemental Percents SiO2 Oxide Percents Al2O3 Oxide Percents V2O3 Oxide Percents FeO Oxide Percents MnO Oxide Percents MnO Oxide Percents MacO Oxide Percents SiO2 Oxide Percents MnO Oxide Percents SiO2 Oxide Percents MnO Oxide Percents Si Oxide Percents Si Oxide Percents Si Atomic Percents Ti Atomic Percents Al Atomic Percents Al Atomic Percents	Si Elemental Percents Ti Elemental Percents Al Elemental Percents V Elemental Percents Fe Elemental Percents Mn Elemental Percents Ma Elemental Percents Ca Elemental Percents Na Elemental Percents SiO2 Oxide Percents Al2O3 Oxide Percents VO3 Oxide Percents FeO Oxide Percents MnD Oxide Percents MnD Oxide Percents MnD Oxide Percents SiO2 Oxide Percents MnD Oxide Percents Si Atomic Percents Ti Atomic Percents Al Atomic Percents Al Atomic Percents Al Atomic Percents Si Atomic Percents Al Atomic Percents Si Atomic Percents Al Atomic Percents Si Atomic Percen	C Scatter C Line C Linear-Log C 3-D (three axes) Average Only Minimum Total Sum > 98 Intensity Error Bars Plot Error Bars n Sigma 1 n Spacing 1 Output				
Ti Percent Errors	Cr Atomic Percents	Cr Atomic Percents	Close				
			Cancel Next				

This opens the **Plot Graph Data** window with the graph of the selected data. Clicking the **Zoom** button toggles its function with the **Hot Hit** mode, in which the weight percent concentration may be read directly by clicking on a point and reading the corresponding values in the box below the **Hot Hit** button. Any graph may be directly output using the **Print** button.





Output of Analyzed Data

In addition to saving and viewing the log window output, which has already been discussed, a wide variety of other output options are available to the user and can be accessed through the **Output** menu of the main window of PROBE FOR EPMA. These include customized analysis output, saving to an ASCII file and sending data to Excel directly. Note that all raw data is always automatically saved in the .MDB run file for future re-calculation and /or output.

👎 Probe fo	or EPMA [C:\	\UserData\D	oe\silicates	01.MDB]	
File Edit	Standard	Xray Ana	alytical Wi	ndow Run	Output Help
	Acquire	ł		Ana	Log Window Font (Change log window font)
					Debug Mode (Debug output to log window)
Miscella	aneous Sa	ample Ac	quisitic	n/Calcula	Extended Format (Output all elements on a single line to log window)
KILO:	15.00	15.00			Kiosk Display Mode
ENERGY	3.691	1.041			· · · · · · · · · · · · · · · · · · ·
Eo/Ec:	3.71	13.98			Verbose Mode (Verbose output to log window)
STDS:	2401	303			Time Stamp Mode (Time stamp output to log window)
Off-Peal	Correct	ted or M	AN On-Pe	ak Y-ray	Driver Logging Mode (Driver logging output to .log file)
ELEM:	Si ka	Ti ka	Al ka	V ka	Save To Dick Log (Save all output to log window to dick file)
176G	871.1	503.5	1271.9	176.6	Joint To Ball Les (Care les faits enter entere)
177G	862.2	512.9	1281.0	173.3	View bisk Log (open log ine in text eartor)
178G	872.3	507.8	1283.3	177.9	Open File Viewer (Open text eartor with empty file)
180G	871.4	507.4	1281.6	175.4	Load Custom Position Format #1 (C.G.S.), (Import .LEP stage coordinate files)
181G	865.0	501.5	1274.3	173.8	Save Custom Analysis Except #1 (C.G.S.) (Fixed length fields Output based on file seture)
182G	870.5	500.7	1272.8	173.3	ave Custom Analysis Format #1 (C.O.S.), (Fixed length fileds, Output based on file setups)
183G 184G	875.1	509.5	1287.2	173.2	Save Custom Analysis Format #2 (H.1.), (Calculated and raw data, Output based on sample names)
185G	862.6	501.8	1280.2	178.8	Save Custom Analysis Format #3 (J.H.), (Calculated, raw and statistical results. Output to single file)
					Save Custom Analysis Format #4 (J.J.D.), (Averages, standard deviations, statistics. Output to single file)
AVER:	868.6	506.4	1279.0	175.8	Save Custom Analysis Format #5 (J.J.D2), (Calculated, raw and statistical results, Output based on sample names)
ISIG:	4.3	4.4	5.2	2.4	Save Custom Analysis Format #6 (H.W.), (Calculated and statistical results with sample description fields. Output to single file)
SERR:	1.4	1.4	1.6	.8	Save Custom Analysis Format #7 (NIST), (Raw uncorrected and unnormalized data. Output to single file)
%RSD:	. 49	. 87	. 41	1.36	Save Custom Analysis Format #8 (MAN), (Average atomic numbers and on-peak intensities of standards. Output to single file)
ELEM:	Ca ka	Na ka	BEAM		Save Custom Analysis Format #9 (P.C.), (Calculated and statistical results with formulas and mineral end-members. Output to single file)
176G	425.2	1067.9	40.031		Save Custom Analysis Format #10 (Wavescan samples). (Output based on sample names)
177G	432.1	1077.9	39.996		Save Custom Analyzic Format #11 (Wavescan centrolic) (Output based on cample name)
179G	430.6	1068.5	39.991		
180G	430.6	1066.2	39.992		Save Custom Analysis Format #12 (Time Dependent Intensities- TDI), (Output based on sample names)
181G	426.7	1067.4	39.999		Save Custom Analysis Format #13 (Hanchar-Montel Geochron), (Output to single file)
182G	428.1	1066.5	39.991		Save Custom Analysis Format #14 (Trace Element Average Statistics), (Output to single file)
184G	431.2	1075.2	39.987		Save Custom Analysis Format #15 (U, Th, Pb Age Calculations), (Output to single file)
185G	427.4	1067.5	40.022		Save Custom Analysis Format #16 (Homogeneity Calculations), (Output to single file)
AVER:	429.9	1070.3	39.998		Save Images to BMP Files (Output all images via clipboard to save current drawing objects)
SDEV:	3.0	4.4	.016		Save User Specified Format Output (Output only the data types specified by the user)
SEBR:	3.8	6.0 1.4			Save Multi-Point Position and Intensity Data (Output multi-point background intensity data and related parameters)
%RSD:	. 69	.41			Save All EDS Spectra To EMSA (Output all EDS spectra to EMSA format files)
					Output Wavescan Spectrum Trage (Output a wavescan spectrum image in Lionix format from multiple wavescan samples)
Acquire	Unknown	samples	Automat	ion Actic	
Acquire: B	eadu				Save CalcZAF Format (Output standard or unknown samples. Process using CalcZAF.exe)
					Save CalcZAF "Standard" Format (Output standard samples. Process using CalcZAF.exe)
					Save StrataGem Format (Output k-ratios and thin film models. Process using StrataGem)
					Save Cluster Classification Format (for CalcImage)
					Open Link To Excel (Allow data and results to go to Excel)
					✓ Close Link To Excel

The most flexible output procedure is the *User Specified Format Output*, which is also accessible directly in the **Analyze!** window. Select the range of samples from the *Sample List* of the **Analyze!** window to be output to file. Then right click in the *Sample List* and choose *Export Selected Samples To User Specified Format Output*.

Sarphe List (multi-select) (double-click to see intensity data) Analyze Data Comits 2 <	Malyze!	· · · · ·		the Ast is	-								- D - X	
Expont Selected Samples To Custom Analysis Format #6 (H.W.). (Calculated and statistical results with sample description fields. Output to single file) Expont Selected Samples To Custom Analysis Format #9 (P.C.). (Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom Analysis Format #9 (P.C.). (Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom.MDB (for Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom.MDB (for Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom.MDB (for Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom.MDB (for Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom.MDB (for Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom.MDB (for Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom.MDB (for Calculated and statistical results with formulas and mineral end-members. Output to single file) Expont Selected Samples To Custom.MDB (for Calculated and statistical results with formulas and the second selected second select	C Stand C Stand C Unkno	ist (multi-sele ards Un owns Un	ct) (double-o 1 * templat 2 pyroxeno 3 pyroxeno	click to see inte te for pyroxene e 1 e traverse	ensity data elements) Co List	Analyze mbine Selecter Report	Data Samples > Calculation O	KRaws C >Excel ptions	ombine Analysis Selected Sa Combine Data L	Lines From mples ines From			
Specified Concentrations Standard Assignments Name/Description Conditions Element/Cations Samples into a New Sample In 1 template for procene elements To 4 = 40, Krs = 10 0.000 Total Weight & 0.000 Boundary Concetions Create Material File Xray Courts (cpr/1nk) 0.000 0.00 0.00 0.00 0.00 0.00 Std Dev: 0.00 0.00 0.00 0.00 0.00	C All San Select	mples All			Export Se Export Se Export Se	elected Samples elected Samples elected Samples elected Samples	To Custom A To Custom A To User Spec To Custom.N	nalysis Format nalysis Format ified Format O 1DB (for CalcIn	#6 (H.W.), (C #9 (P.C.), (Ca utput (Output	alculated and s Iculated and s only the data atch feature)	statistical resu satistical result types specifie	lts with sample is with formula d by the user)	description fields s and mineral end	. Output to single file) I-members. Output to single file)
Un 1 template for pycoxene elements 000 Cold Oxygen 000 Z · Bai Boundary Corrections Vera Courts (north rish) 000 000 000 000 000 000 000 Verage: 000 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Verage: 000 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Sti Ba Off Ti ka Off Al ka Off V ka Off Fe ka Off Mn ka Off Machaid Kaight X Verage: 000 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 Sti Ba Off Ti ka Off Veraget 0.00	Specified	Concentration	ns <mark>Standa</mark>	ard Assignments	Name/	Description	Conditions	Elements/	Cations S	Combine the S Samples into a N	elected ew Sample			
Copy Si ka Off Ti ka Off Al ka Off V Ka Off Cr ka Off Mn ka Off Mn ka Off Na ka Off	Un 1 temp TO = 40, Ke	late for pyroxene eV = 15, Beam = (cos/1p0)	e elements = 40, Size = 1	10	.000 .000 .000	Total Oxygen Calculated Oxyg Excess Oxygen	en .00	Total Weig Z - Bar Atomic Weig	ght %	Boundary Cor Create Mater	rections ial File			
Average: .00	Copy	Si ka Off	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Ma ka Off	Ca ka Off	Na ka Off	Beam		
Skid Dev: .00	Average:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.000		
OneSigna: .00	Std Dev:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.000		
Std Er:: .00	OneSigma:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			
2ħel SD: .00	Std Err:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			
Minimum: .00	%Rel SD:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00			
Maximum: .00 .0	Minimum:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.000		
Vertical Selected Line(s) Undelete Selected Line(s) Analyze Selected Line(s) Copy Si ka Off Ti ka Off Al ka Off Fe ka Off Mn ka Off Mg ka Off Ca ka Off Na ka Off Beam Image: Copy of the copy of	Maximum:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.000		
Copy Si ka Off Ti ka Off Al ka Off V ka Off Cr ka Off Fe ka Off Mn ka Off Mg ka Off Ca ka Off Na ka Off Beam Copy Si ka Off Ti ka Off Al ka Off V ka Off Cr ka Off Fe ka Off Mn ka Off Mg ka Off Ca ka Off Na ka Off Beam Copy Si ka Off Ti ka Off Al ka Off V ka Off Cr ka Off Fe ka Off Mn ka Off Mg ka Off Ca ka Off Na ka Off Beam Copy Si ka Off Ti ka Off Ti ka Off Al ka Off V ka Off Cr ka Off Fe ka Off Mn ka Off Mg ka Off Ca ka Off Na ka Off Beam Copy Si ka Off Ti ka Off Ti ka Off V ka Off Cr ka Off Fe ka Off Mn ka Off Mg ka Off Ca ka Off Na ka Off Beam Copy Si ka Off Ti ka Off Ti ka Off V ka Off Cr ka Off Fe ka Off Mn ka Off Mg ka Off Ca ka Off Na ka Off Beam Copy Si ka Off Ti ka Off Ti ka Off V ka Off Cr ka Off Fe ka Off Mn ka Off Mg ka Off Ca ka Off Na ka Off Beam Copy Si ka Off Ti ka O	Delet	te Selected L	ine(s)	Undelete	Selected	Line(s)	Analyz	e Selected Line(:	8)				1	
	Сору	Si ka Off	Ti ka Off	Al ka Off	V ka Off	Cr ka Off	Fe ka Off	Mn ka Off	Mg ka Off	Ca ka Off	Na ka Off	Beam	<u>^</u>	
												Cancel	Nout	

This opens the User Specified Custom Output window. Select the data types to export.

🜱 User Specified Custom Output	×
User Specified Output Data ✓ Output Sample Names Output Sample Numbers Output Sample Analytical Conditions Output Sample Line Numbers Output Sample Line Numbers Output Elemental Weight Percents Output Oxide Weight Percents Output Atomic Percents Output Atomic Percents Output Meight Percents	OK Cancel Note that these parameters can be defaulted in the [software] section of the PROBEWIN.INI file. User Specified Output Data
 Output Weight Percent Totals (WC, OX. & AC.) Output Formula Basis and Ratios Output Detection Limits in Weight Percents Output Analytical Errors in Relative Percents Output Stage X Coordinates in Stage Units Output Stage Y Coordinates in Stage Units Output Stage Z Coordinates in Stage Units Output Stage Relative Distance In Microns Output Measured Beam Current In nA Output High Off-Peak Count Times Output Low Off-Peak Count Times Output On-Peak Count Intensities Output Off-Peak Count Intensities Output Off-Peak Count Intensities 	 Output Calculated Percent Oxygen Output Excess Percent Oxygen Output Average Atomic Number (Zbar) Output Average Atomic Weight Output Oxygen Equivalent from Halogens Output Halogen Corrected Oxygen Output Total Charge Balance Output Fe Charge Balance Output Interference Correction Percents Output MAN Absorption Corrections (%) Output TDI (Volatile) Correction Percents Output TDI Correction Fit Deviations (%)
 Output Net Peak Count Intensities Output Date and Time (Excel Format) Output Raw K-Ratios (Ix/Istd) Output Elemental K-Ratios Output ZAF Correction Factors Output Compound MACs for Emitting Elements Output Primary Standard Assignments Output Elemental Percent Total Output Oxygen Percent Total 	User Specified Output Sample Averages Output Space Before Output Sample Average Output Sample Standard Deviation Output Sample Standard Error Output Sample Minimum Output Sample Maximum Output Space After

Click **OK**. This opens the **Open File To Save ASCII Data To** dialog box. Choose a file name and click **Save**.

👎 Open File To	o Save ASCII Data To				x
Save in: 🚺 🛙	Doe	•	← 🗈 (
Name	*		Date mo	dified	ту
	No items mate	h your search	h.		
•					•
File name:	silicates01.dat			Save	
Save as type:	ASCII Data Files (*.DAT)		•	Cancel	
			_		

The software will then reanalyze the selected samples and write the results to the specified file. On completion, the following message box is displayed.

OutputSaveCustomUserSpecified	×
Sample data was output to file C:\	UserData\Doe\silicates01.dat
	ОК

Click **OK**. Next, the following dialog box is displayed, asking the user if the data should be sent directly to Excel.

OutputSaveCustom2SendToExcel	1.000	×
Do you want to send the	custom output data t	files to Excel?
Yes	No	Cancel

If Excel is installed, click **Yes**. The data will then directly be opened in a new Excel spreadsheet for saving and/ or further processing.

Closing the Current Run and Probe for EPMA

To end the analysis session from the main PROBE FOR EPMA log window, select **File** from the menu bar and click **Close** from the menu selections.

File Edit Standard Xray Analytical Window Run Output Help New Open Automatel Plott Save As 32.3 Close 33.5 Find File 33.2 Find File 33.2 Print Log Ctrl+P 1.6 Print Log Ctrl+P 93 User Wizard! 93 Probe for EPMA Quick Start Guide 93 Probe for EPMA Prequently Asked Questions Exit .93 C.\UserData\Doe\silicates01_mavescans+Px.MDB C.\UserData\Doe\silicates01_wavescans+Px.MDB SIGR: .94	👎 Pi	robe for EPMA [C:\UserData\Doe\silicates01.MDB]						
New Automate! Plot! Open 32.3 Save As 33.5 Close 33.2 Find File 31.6 File Information Ctrl+F Compact Print Log Ctrl+P User Wizard! Probe for EPMA Quick Start Guide Probe for EPMA Quick Start Guide Distribution Ctrl+P Stift Stift Stift Stift: Stift:	File	Edit Standard Xray Analytical Window Run	Output	Help				
Open 32.3 32.3 Save As 33.5 31.6 Close 32.6 32.6 32.6 32.6 32.6 32.6 32.6 33.2 33.2 33.2 33.2		New			Automa	te!	Plot!	
Save As 33.5 Close 33.6 Find File 33.2 Find File 33.3 Print Log Ctrl+P 1.4 User Wizard! 93 Probe for EPMA Frequently Asked Questions Exit C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans.MDB		Open		-	 32.3			*
Close 31.6 Find File 32.6 File Information Ctrl+F 33.2 Compact 31.8 Print Log Ctrl+P 1.4 Print Setup User Wizard! .93 .93 User Wizard! Probe for EPMA Frequently Asked Questions .93 .93 Exit C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans.MDB .94		Save As		- 1	 33.5			
Find File 33.2 File Information Ctrl+F 31.8 Compact 1.4 Print Log Ctrl+P .93 User Wizard! Probe for EPMA Quick Start Guide .93 Probe for EPMA Frequently Asked Questions Exit C:\UserData\Doe\silicates01_wavescans+Px.MDB .93 SIGR: .94 .94		Close			 31.6			
File Information Ctrl+F Compact 31.8 Print Log Ctrl+P Print Setup 1.4 User Wizard! 93 Probe for EPMA Quick Start Guide 93 Probe for EPMA Frequently Asked Questions 93 Exit 93 C:\UserData\Doe\silicates01.MDB 94 STIGR: 94		First File		- 1	 33.2			
File Information Ctrl+F Compact 1.4 Print Log Ctrl+P Print Setup User Wizard! Probe for EPMA Quick Start Guide Probe for EPMA Frequently Asked Questions Exit C:\UserData\Doe\silicates01.MDB C:\UserData\Doe\silicates01_wavescans.HDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR:		rina rile						
Compact 1.4 Print Log Ctrl+P Print Setup		File Information	Ctrl+F	1.1	 31.8			
Print Log Ctrl+P Print Setup User Wizard! User Wizard! Probe for EPMA Quick Start Guide Probe for EPMA Frequently Asked Questions Exit Exit C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans.HDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR: .94 Tangel		Compact			 1.4			
Print Edg Ctri+P Print Setup User Wizard! Probe for EPMA Quick Start Guide Probe for EPMA Frequently Asked Questions Exit C:\UserData\Doe\silicates01.MDB C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR:94		Drink Law	Chilli D		 . 93			
Print Setup User Wizard! Probe for EPMA Quick Start Guide Probe for EPMA Frequently Asked Questions Exit C:\UserData\Doe\silicates01.MDB C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR: .94		Print Log	Ctrl+P					
User Wizard! Probe for EPMA Quick Start Guide Probe for EPMA Frequently Asked Questions Exit C:\UserData\Doe\silicates01.MDB C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR:94		Print Setup						
Probe for EPMA Quick Start Guide Probe for EPMA Frequently Asked Questions Exit C:\UserData\Doe\silicates01.MDB C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR:94		User Wizard!						
Probe for EPMA Frequently Asked Questions Exit C:\UserData\Doe\silicates01.MDB C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR: .94		Probe for EPMA Quick Start Guide						
Exit C:\UserData\Doe\silicates01.MDB C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR: .94		Probe for EPMA Frequently Asked Questions						
C:\UserData\Doe\silicates01.MDB C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR:94		Exit						
C:\UserData\Doe\silicates01_wavescans+Px.MDB C:\UserData\Doe\silicates01_wavescans.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR:94		C:\UserData\Doe\silicates01.MDB						
C:\UserData\Doe\silicates01_wavescans.MDB C:\UserData\Doe\silicates01_rutile_meas.MDB SIGR:94		C:\UserData\Doe\silicates01_wavescans+Px.MDB						
C:\UserData\Doe\silicates01_rutile_meas.MDB		C:\UserData\Doe\silicates01_wavescans.MDB						
SIGR:94		C:\UserData\Doe\silicates01_rutile_meas.MDB						
Tancel Pause	STG	R: 94		-				Ξ
Cancel Pause								
	<u> </u>				 		Cancel Pause	

This opens the ProbFormCloseFile window. Click Yes to close this file.

ProbForm	CloseFile	X
?	Are you sure you want to close the current Probe for E C:\UserData\Doe\silicates01.MDB?	PMA file
	Yes	No

Einally	alogo DDODE EOD	EDMA by coloctin	a Filo from the	monuborond	olioling Frit
гшану.	CIOSE PRODE FUR	EPIVIA DV SEIECUII		menu bai anu	CHCKING EXIL.
,			0		

Y P	robewi	n (Probe f	for EPM	A)							
File	Edit	Standar	d Xray	/ Ai	nalytical	Window	Run	Output	Help)	
	New									Automate!	Plot!
	Open										
	Save A	\s									
	Close										
	Find F	ile									
	File In	formatio	n					Ctrl+F			
	Comp	act									
	Print l	og						Ctrl+P			
	Print S	Setup									
	User V	Vizard!									
	Probe	for EPM/	A Quick	Start	Guide						
	Probe	for EPMA	A Freque	ently	Asked Q	uestions					
	Exit										
	C:\Us	erData\Do	e\silicat	tes01	.MDB						
	C:\Use	erData\Do	e\silicat	tes01	_wavesca	ans+Px.MD	В				
	C:\Us	erData\Do	e\silicat	tes01	_wavesca	ans.MDB					
	C:\Us	erData\Do	e\silicat	tes01	_rutile_m	neas.MDB					
-								_			
Click	File	New or (Open to) crea	ate or op	oen a probe	e data	base. Clic	k File	: User Wizard! for additional help	. Cancel Pause