030.0127.02.0







Innovation with Integrity

Handheld XRF



This page intentionally left blank.



Table of Contents

1	Introd	uction	5
	1.1	Installation	5
	1.2	Program Start	5
2	User lı	nterface	7
	2.1	Menu Structure	7
		2.1.1 File Menu	8
		2.1.2 Device Menu	8
		2.1.3 Measurement Menu	9
		2.1.4 Analyze Menu	9
		2.1.5 Spectrum Menu	. 10
		2.1.6 Project Menu	. 12
		2.1.7 Options Menu	. 13
		2.1.8 Export Menu	. 14
		2.1.9 User Menu	. 15
		2.1.10 Help Menu	. 15
	2.2	Toolbar Structure	.16
3	Worki	ng with Projects	18
	3.1	Opening a Project	.18
	3.2	Tabs	.19
	3.3	Creating a Project	.22
	3.4	Copying and Saving	.23
4	Worki	ng with Spectra	23
	4.1	Active Spectrum	.24
	4.2	Display Options	.25
	4.3	Manipulating a Spectrum	.29
	4.4	Status Bar	.30
5	Regior	ns of Interest (ROIs)	31
6	Spectr	a Parameters	35
7	Export	ing	36
8	Worki	ng with Methods	39
	8.1	Method Editor	.39
	8.2	Measurement Panel	.41
	8.3	Corrections Panel	.42
	8.4	Identification Panel	.43
	8.5	Deconvolution Panel	.44
	8.6	Qualification Panel	.44
	8.7	PDZ Options Panel	.44
9	Spectr	a Processing	45
	9.1	Adding and Subtracting Spectra	.45
	9.2	Scaling a Spectrum	.46
	9.3	Comparing Spectra	.47
10	Qualit	ative Analysis	49
	10.1	Display Options	.49
	10.2	Deconvolution	.51
App	endix A	: Registry Database	52



This page intentionally left blank.



1 Introduction

Description	 Artax is a program developed to work with S1 TITAN, TRACER 5, and CTX instruments to – Control system components. Acquire measurement data. Analyze measurement data.
Analyzing data	 Measured data can be analyzed by – Spectra correction (Escape, Shelf, Background). Qualitative analysis. Calculation of the spectral line intensities by deconvolution.
Contacting Bruker	Email: <u>support.hmp@bruker.com</u> Phone: +1 (509) 783-9850, Option 4 Web: <u>www.bruker.com/hhxrf</u> Address: 415 N. Quay Street
	Kennewick, WA 99336 USA

1.1 Installation

Hardware To use Artax, a PC with Windows 7, 8.1 or 10 operating system and a USB port is required. requirements

Instructions To install Artax –

Step	Action
1	Insert the USB flash drive.
2	Navigate to the USB drive (part number 160.0211).
3	Double-click Artax – 8-4xx.exe and follow the directions on the screen.

1.2 Program Start

Description This section describes how to start Artax and connect to an instrument.

Note: A default printer must be accessible or Artax may not start correctly.

Logging in **To log into Artax** –

Step	Action	Result
1	On the computer, start Artax by	The Password dialog box is displayed.
	double-clicking the icon.	
2	Enter a User name (test) and Password	The Artax window is displayed and OFF-LINE
	(test), and press Enter or click Ok .	is displayed in the status bar at the bottom.



Connecting to an instrument

To connect to an instrument –

C1	A	Decult
Step	Action	Result
1	Power on the PC and the instrument.	
2	Connect the instrument to the PC with a	
	USB cable (Bruker part number 160.0012)	
	or through Wi-Fi. To enable USB or set up	
	the Wi-Fi, see the Supervisor Manual,	
	Bruker document 030.0113.	
З	From the Artax window, click Device (left	The dropdown menu is displayed.
	side of menu bar).	
4	Click Connect .	The Connect dialog box is displayed.
5	Click the instrument name and Connect.	For the TRACER 5, the Information popup
		with instrument information is displayed.
6	For the TRACER 5, click OK .	Both dialog boxes are removed. Below the
		Artax toolbar, as data is retrieved from the
		instrument, a colored bar is displayed: first
		yellow, then orange, and finally green. ON-
		LINE is displayed in the status bar at the
		bottom.
		Artax logs into the instrument and the
		Ready to Test screen is displayed there.

Connect	2	<u></u>
Network Connection		
Active Network	Connection:	
Name	IP Address	
900F4351	192.168.137.139	
		Information
		Current Configuration: Application: Spectrometer Mode Mode: Air Manual Filter: (None) Spot: 8mm
	Connect Cancel	ОК

Failure to connect If Artax is unable to connect to the instrument, either **Error transmission to device** or **Time out** is displayed. Click **OK**.

Artax cannot connect with an instrument if -

- The instrument is not powered on and logged into.
- The USB connection cable between the computer and instrument is not plugged in.
- The computer hardware or the instrument has a malfunction.



2 User Interface

Description This section describes the organization of Artax options.

The Artax program window contains the -

Window structure

- Menu bar.
- Toolbar.
- Active panels.
- Status bar.



2.1 Menu Structure

Description

The Artax menu bar contains File, Device, Measurement, Analyze, Spectrum, Project, Options, Export, User, and Help. Their submenus are described below.



2.1.1 File Menu

Description

This section describes options found under **File** in the menu bar. Note that during a measurement these options are not available.

<u>F</u> ile	Device Measurement	<u>A</u> nalyze	<u>Spectrum</u>	<u>P</u> roject	<u>O</u> ptions	<u>E</u> xport	<u>U</u> ser <u>H</u> elp	
2	Open Project Open ROI			~ >	ا او	 ► =	Live Time:	10 s 韋
	Open Spectrum Ctrl+C							
	Reopen	+						
	Save Project As	· ·					•	
	Save ROI As							
	Save Spectrum As Ctrl+S	5						
	Exit	- I -						
_	- I ·							

Option	Description
Open Project,	Opens a dialog box through which a project, ROI (region of interest), or
Open ROI,	spectrum/spectra can be selected and opened. The most recent
Open Spectrum	directory and files are listed.
Reopen	Displays a list of the last modified spectra or project files. Click to open
	the file. The submenu option Clear deletes all listed items.
Save Project As,	Opens a dialog box through which a file can be saved. The most recent
Save ROI As,	directory and files are listed.
Save Spectrum As	
Exit	Closes Artax. If an assay is in process, the assay is stopped.
	The message Project was changed! Exit Program? is displayed if either
	of the following are unsaved –
	A modified open project.
	Measurement spectra in the Spectrum panel.

2.1.2 Device Menu

+%+ A	Artax - 8.0).0.443								
File	Device	Measurement	Analyze	Spectrum	Project	Options	Export	User	Help	
à	Co Dis	nnect sconnect			~ >	K lg Q	▶ =	Liv	e Time:	10 s 🛓
Spec	trum									

Description

This section describes options found under **Device** in the menu bar.

Option	Description
Connect	Once the PC is physically connected to an instrument via USB cable or Wi-Fi, displays the Connect dialog box through which Artax connects via software. See Program Start on page 5.
Disconnect	Disconnects Artax from an instrument.



2.1.3 <u>Measurement Menu</u>

<u>File Device Measurement Analyze Spectrum Project Options Export User Help</u>	
🛱 🔲 🕞 START F5 🛛 🖂 🗙 Io 😪 🕨 🔳 Live Time:	10 s ≜
STOP F7	
Spectrum 🗐 Method Ctrl+E	

Description This section describes options found under **Measurement** in the menu bar.

Option	Description			
Start	If the PC is connected to the instrument, starts a measurement.			
Stop	During a measurement, stops a measurement.			
Method	Opens the Method Editor dialog box through which methods can be selected,			
	added, replaced, and removed. See Working with Methods on page 39.			

2.1.4 Analyze Menu

Artax - 8.0.0.443		
<u>File</u> <u>Device</u> <u>M</u> easurement	<u>Analyze</u> <u>Spectrum</u> <u>Project</u>	<u>Options Export User H</u> elp
🗳 🔒 🗆	Accumulate Spectra Evaluate Results	lg 🔍 🕨 🔳 Live Time: 10 s 🛓
Spectrum	👗 Evaluation Ctrl+V	
Pulses	Match	
1000 - ·	Periodic Table Ctrl+T	
		*

Description

This section describes options found under Analyze in the menu bar.

Option	Description
Accumulate Spectra	Sums –
	• Channels using all spectra of one selected node within a project data file.
	Real and live measuring times.
	A new node, Accu_Points or Accu_Spectra, is added to the project.
Evaluate Results	Calculates the net intensities via deconvolution for all spectra within
	one selected node of a project file.
Evaluation	Calculates net intensities using selected deconvolution method.
Match	Opens the Match dialog box through which a spectrum can be
	compared with saved spectra. See Comparing Spectra on page 47.
Periodic Table	If a spectrum is open, displays the Periodic Table of the Elements
	dialog box. See Qualitative Analysis on page 49.



2.1.5 <u>Spectrum Menu</u>

Artax - 8.	0.0.443								
<u>F</u> ile <u>D</u> evice	<u>M</u> easurement <u>A</u> na	lyze <u>S</u> pe	ctrum	<u>P</u> roject	<u>O</u> ptions	<u>E</u> xpoi	t <u>U</u> ser	<u>H</u> elp	
🖻 🖬 🗆			C = A C = A	+ B - B			E Liv	ve Time:	10 s 💂
Spectrum			A = F	* B					
Pulses			Norm	alize					
1000 -		•	Smoo	th					
-			Count	ts					
			Degra	de					
	•		Degra	de All Refe	rence			•	·
-			Close	Spectrum	Ctrl+Del				
800 -		×	Close	All Spectra	Shift+Del				
			Delete	ROI					
-			Delete	All ROI					
			Chang	ge Paramet	ter				

Description This section describes options found under **Spectrum** in the menu bar. The functions of the **Spectrum** menu, except **Delete All ROI**, are not available during measurements.

The *active spectrum* is the currently selected spectrum that can be analyzed. See **Working with Spectra** on page 23.

When measurements are taken, spectra are added, or spectra are subtracted, newly created files are given the temporary names of Measured_n, Add_n, and Sub_n, respectively.

Option	Description				
C = A + B	Displays Select Spectra dialog box to indicate two spectra to add. See				
	Adding and Subtracting Spectra on page 45.				
C = A - B	Displays Select Spectra dialog box to indicate a spectrum to subtract from				
	another. See Addition and Subtraction of Spectra on page 45.				
A = F * A	Displays Factor for multiplication dialog box to enter a multiplication				
	factor to scale the active spectrum. See Scaling a Spectrum on page 46.				
Normalize	Scales all displayed spectra to the active spectrum to the channel at the				
	cursor location.				
Smooth	Smooths the active spectrum via a polynomial filter of second order.				
	Smoothed values replace original data.				
Counts	Opens the Counts dialog box. The cursor can be moved one channel at a				
	time and the counts in a channel can be changed. It also displays the				
	energy and counts of the current channel.				
	Counts X				
	Channel: 1				
	Energy: 0.02 keV				
	C <u>o</u> unts: 12446				
	Increment: 50				



Description, cont.

Option	Description						
Degrade	Opens the FWHM Mn K Alpha dialog box to increases the full width at half maximum (FWHM) of each line of a spectrum.						
	FWHM Mn K Alpha X						
	FWHM Mn K Alpha [eV]						
	OK Cancel						
Degrade All	Opens the Degrade All Reference dialog box though which the source and						
Reference	destination folder can be entered. Specify resolution (FWHM). Degrades all						
	.spx spectra to the resolution specified and stores them in the destination						
	folder.						
	Degrade All Reference X						
	Source Directory:						
	Destination Directory:						
	FWHM Mn K Alpha: 0.0 eV						
	Ok Cancel						
Close Spectrum	Closes the active spectrum.						
Close All Spectra	Closes all open spectra.						
Delete ROI	Removes the selected ROI.						
Delete All ROI	Removes all ROIs.						
Change	Not currently supported and may give incorrect results.						
Parameter							

Change Parameter			23
Parameter in File		New Parar	neter
Energy absolute:	0.0000 keV	-0.6	keV 🔽
E <u>n</u> ergy linear:	0.019977 keV/ch	0.004883	keV/ch 📝
<u>F</u> WHM Mn-K:	149.68 eV	155.00	eV 🔽
F <u>a</u> no factor:	0.10	0.12	
	Ok I	Cancel	Help



2.1.6 Project Menu

File Device	Measurement	Analyze	Spectrum	Project	Options	Export	User	Help	
🖻 🖬 🛛				Ne Clo	w Project ose Project	-	Live	e Time:	10 s 🛓
Spectrum	,			Dis	play Spectr	a			
1000 -				Ad Ad	d Spectra d Picture			•	
				Ad	d Clipboard	ł			
				Ad Rer	d Node move Obje	ct			•

Description This section describes options found under **Project** in the menu bar when the project nodes panel on the left of the window is right clicked.

Option	Description
New Project	Creates a new project.
Close Project	Closes a project. <i>Note</i> : this option does not save changes.
Display Spectra	Displays all spectra of the selected node, unless Options -> Only one
	Spectrum is checked.
Add Spectra	Adds all displayed spectra to the project.
Add Picture	Not currently available.
Add Clipboard	Adds objects on the clipboard to the project.
Add Node	Adds to the project a node.
Remove Object	Removes the selected object from the project.



2.1.7 Options Menu

File Device Measurement Analyze S	pectr	rum Project	Optio	ns Export	User	Help	
		~ >		Filled Spectri Filled Backgr	um ound		10 s 🗄
Roman Map.rtx	×	Spectrum Pa		Counts per S	econd		
✓ .■tª Project	^	× 163 P		Only one Sp	ectrum		
V III Objects				Channel Sca	le		
a-0001@070616_160245				Acustic sign	al when	finished	-
a-0002@070616_160245		15 -	lg	Logarithmic	Scale		1
a-0004@070616_160245				Automatic S	cale		1
- <u></u> ь-0001@070616_160245				Corrected da	ta curv	e	
b-0002@070616_160245				Background	data cu	irve	
				- Difference cu	irve		L
- Contraction -				Short Result	List		1
b-0007@070616_160245				Dicolay Prop	ertier		
b-0008@070616_160245		-		Penort Decia	ner		
► b-0009@070616_160245				Penert Orti-	net		
		10 -		Report Optic	/IS		1

Description

This section describes options found under **Options** in the menu bar and when the Spectrum panel is right clicked.

-	
Option	Description when checked
Filled Spectrum	Displays a colored area under the line plot.
Filled Background	Displays a colored area under the background radiation curve. Do
	not set both the spectrum and background to Filled . The area plot of
	the filled spectrum would occlude the area plot of the background.
Counts per Second	Displays the Y-axis scale's units in counts per second.
Only one Spectrum	Displays only one spectrum. If a new measurement is started or if a
	new spectrum data file is opened, the Spectrum panel is cleared.
Channel Scale	Displays the X-axis scale's units in channels.
Acoustic signal when	Not currently available.
finished	
Logarithmic Scale	Displays Y-axis values as a logarithmic scale.
Automatic Scale	During a measurement, adjusts the scale to the maximum amplitude
	in the active spectrum, excluding the zero peak.
Corrected data curve	Displays a data curve corrected for escape peaks and sum peaks.
	Corrects only a data curve placed within a project.
Background data curve	Displays the background data curve.
Difference curve	Displays the difference between the original spectrum and the
	deconvoluted spectrum.
Short Result List	Displays the shortened intensity list of deconvolution results to the
	right of the spectrum.
Display Properties	Opens the Display Properties dialog box which defines how spectra
	are displayed. See Display Options on page 25.
Report Designer	Not currently available.
Report Options	Not currently available.



2.1.8 Export Menu

💥 Artax	- 8.0.0.	443								
File Dev	vice N	leasurement	Analyze	Spectrum	Project	Options	Export	User	Help	
🖻 🖬					~ >	< lg 🔍	Sp Al	ectrum I Spectr	i a	5 🜩
Spectrum							Re	sult		
Pu	lzez						AI	l Result	s	
1000 -							Re	sults to	Excel	
-							AI	l Pictur	e	
							O	ptions		
							Co	opy Gra	phic Ctrl+C	
-							Co	opy Res	ult Ctrl+D	
800 -							Co	opy ROI		
							Co	opy Pict	ture	

Description

This section describes options found under **Export** in the menu bar.

Option		Description					
Spectrum	Exports spectrum data as a text file (.txt).						
All Spectra	Exports all spectra containe	Exports all spectra contained in a node as a text file.					
Result	Exports deconvolution resul	lts as a text file.					
All Results	Exports all results contained	l in a node as a text file.					
Results to Excel	For each analyzed element,	exports the results of a line-scan or mapping to					
	an .xlsx file that can be oper	ned by Microsoft Excel.					
All Picture	Not currently available.						
Options	Opens the Export Options d	lialog box which controls what is included in the					
	text file created from Expor	t options Spectrum through Results to Excel.					
Copy Graphic							
	Active Tab	Exports to the Windows Clipboard					
	Spectrum	Spectra displayed in the Spectrum panel.					
	Mapping Results	Not currently available.					
Copy Result	Copy results in table format						
	Active Tab	Exports to the Windows Clipboard					
	Spectrum	Summary of the deconvolution results.					
	Results	Short result list.					
	Mapping Results	Not currently available.					
	Match Results Results table.						
Copy ROI	Exports the ROI calculation	results to the Windows clipboard.					
Copy Picture	Not currently available.						



2.1.9 <u>User Menu</u>

Artax - 8.0.	0.443								
File Device	Measurement	Analyze	Spectrum	Project	Options	Export	User	Help	
				~ >	< lg 🔍			Login Logout	10 s 🌩
Spectrum							_		*

Description Options under **User** are not currently applicable.

2.1.10 Help Menu

全然 7775	Artax - 8.0	.0.443									
File	Device	Measurement	Analyze	Spectrum	Project	Options	Export	User	Help		
È					~ >	< lg Q		Live		Help About	4
Spe	ectrum								_		

Description This section describes options found under **Help** in the menu bar.

Option	Description
Help	Currently, this Artax User Manual contains the most updated material. Do not use
	the Help option.
About	Displays Artax version and copyright information. To remove it, press Esc on the
	keyboard or click the message.



2.2 <u>Toolbar Structure</u>

Description The toolbar displays icons to easily access commonly used options.

Icons

Note that icons, except for the stop icon, are not available during a measurement.

lcon		Descr	iption					
à	Opens selecte	the Open Project dialog bo d and opened. The most re	x through which a project can be cent directory and files are listed.					
	Opens saved.	the Save Project dialog box The most recent directory a	through which a project can be and files are listed.					
a-0001@070616_160245	Display spectru caret a its nam	s the name of the active sp Im from currently open spe nd click a spectrum name. T Ie is displayed in the field.	ectrum. To activate a different ctra, click the down pointing Fhat spectrum is now active and					
×	Removes all spectra from the Spectrum panel.							
lg	Switches the Y-axis between linear and logarithmic scale.							
٩	Activates zoom mode. <i>To zoom in on part of a spectrum</i> –							
	Step	Action	Result					
	1	Click the zoom icon and move the mouse cursor to the Spectrum panel.	The mouse cursor displays as a magnifying glass.					
	2	Left click, drag to define a rectangle, and release.	The area within the rectangle is enlarged to fill the Spectrum panel and the mouse cursor reverts to an arrow.					
	If the P	C is connected to the instru	iment, starts a measurement.					
	Stops a	measurement.						
Live Time: 10 s	Determ duratio	nines the length in seconds n, click the up pointing or c	of a measurement. To change the Jown pointing triangles.					
	Opens be sele Metho	the Method Editor dialog b cted, added, replaced, or re ds on page 39.	ox through which methods can emoved. See Working with					
Standard 🗸	Lists av	ailable methods. A method	name may be typed in the field.					



Icons, cont.

lcon	Description
<mark>d</mark> ala	Displays the Periodic Table of the Elements dialog box. See Qualitative Analysis on page 49.
*	Deconvolutes the active spectrum and calculates element intensities.

Radiation icons

During a measurement, two radiation warning icons are displayed in the toolbar -





3 Working with Projects

Description

Spectra and analysis results are saved in project files and are automatically created when a measurement is performed through Artax. A project file can contain –

- Several spectra.
- Images.
- Analysis result sets.
- Results of deconvolution images.
- Comments.

3.1 **Opening a Project**

Description An existing project can be opened and analyzed. A project can contain spectra, ROI (region of interest), and calculation results.

Opening a To open a project –

project

Step	Action	Result
1	Click File.	A dropdown list is displayed.
2	Click Open Project.	The Open Project dialog box is displayed.
	<i>Note</i> : if a project is already open, clicking Open Project will close it without saving changes.	

Look in:	Artax Project from Lee Drake	- 🕝 🤌 📂 🖽 -			
Name	*	Date modified	Туре	Size	
퉬 Obsidia 🔰 Regina I	n Cal Data Raul	4/5/2018 12:49 PM 4/2/2018 3:39 PM	File folder File folder		
Obsidia	n Cal.rbx	4/5/2018 12:57 PM	RTX File	457 KB	

3	Click the down pointing triangle of	A dropdown list of folders is displayed.
	the Look in field.	
4	Navigate the list and click a folder.	The node is displayed in the Name column.
5	Double-click the project name.	The project nodes panel is opened on the left with nodes listed in a tree. Available tabs are displayed above the main panel. The display in the main panel depends on which tab is active
		For information on tabs, see Tabs on page 19.





Displaying a **To display a spectrum**, click its name in the node tree and click the **Spectrum** tab. spectrum

Editing a nodeTo edit a node name, click it once to select it, then slowly click it again. The name changes to an
editable field. Note that the names "Project" and "Objects" cannot be changed.

3.2 <u>Tabs</u>

Description Various tabs, visible under the toolbar and to the right of the project nodes panel, display specific panels.





Tabs

Tab	Displays	When Visible	Reference
Spectrum	Spectra, a shortened results table of	Always.	Working with
	the Bayes deconvolution, and an ROI		Spectra, page 23.
	table, depending on options		
	selected under Options.		
Parameter	Parameters of an individual	After starting a	Spectra
	spectrum.	measurement or after	Parameters,
		displaying a spectrum.	page 35.
Results	Complete Bayes-deconvolution table	After executing a	Deconvolution,
	of results.	deconvolution or after	page 51.
		displaying a spectrum	
		containing results.	
Project	User - Name of the user under	After loading a project	Creating a
	whose login the project was created.	file.	Project, page 22.
	Comment - Provides the ability to		
	enter text. To save changes, save the		
	project.		



Spectrum panel



😂 🔚 📕 Measured_2		X lg Q	•	Live	e Time:	10 s 🚔	St
Spectrum Parameter Results							
Spectrum	Method						
Date/Time: 1/26/2018 1:33:35 I	t Name:	Standard					
Channel count: 2048	Corrections	Escape:	Yes				
Energy linear: 19.994858 eV/c		Shelf:	No				
Fano factor: 0.10		Background:	Yes	Cycles:	9		
Counts Per Sec: 91718.54 cps				Start:	1.0 keV		
				End:	40.0 keV		
Excitation	Identification	Method:	Line n	narkers			
Anode: Rh	Deconvolution	Method:	Bayes	i i			
Filter: Ti/Al		Max. cycles:					
		Step width:					
Atmosphere: Air	Quantification	Calculate:	No				
Descure 1000 mbs		Cal. file:					
Temp: 26 C							
1 emp. 20 C							
Measurement							
Input counts/sec: 91718.54 cps							
Output counts/sec: 73453.71 cps							
Dead time: 19.91 %							
X-ray Generator							
Voltage: 40 kV							
Current: 9 µA							

Parameter panel

😂 🔚 📕 Archibarca35@050418_125627		•× le	9	Live T	ime:	10 s 📥	🗊 Standar	d	📼 dala 🔺		1	
bsidian Cal.rtx	< Speci	trum Paran	neter Re	sults Project						8		
A - T Project	No	Floment	Line	Energy/kel/	Cuel	Net	Backar	Signa	Chi	Conc	Signal	ILD
🔺 🛅 Objects	NO.	Liement	Line	Lineigyvicev	Cyci.	Net	backyi.	Jigina	Crit	Conc.	Sigiliac	
Points	1	K	K12	3.314	9	1534	3993	98	0.80	0.000	0.000	0.000
Archibarca35@050418_12562	2	Ca	K12	3.692	9	1030	2878	82	0.56	0.000	0.000	0.000
Basaltic_Plateau20@050418_1	3	Cr	K12	5.415	9	237	1037	48	1.87	0.000	0.000	0.000
Big_Southern_Butte06@05041	4	Mn	K12	5.900	9	1129	1066	57	1.68	0.000	0.000	0.000
- Blue_Mountain04@050418_12	5	Fe	K12	6.405	9	24559	1056	163	4.89	0.000	0.000	0.000
- Burns_Green15@050418_1256	6	Cu	K12	8.046	9	1316	828	55	1.44	0.000	0.000	0.000
- Cannonball1_22@050418_125	7	Zn	K12	8.637	9	863	943	52	0.84	0.000	0.000	0.000
Casa_Diablo10@050418_1256	8	Ga	K12	9.251	9	375	912	47	1.00	0.000	0.000	0.000
- Cerro_del_Medio28@050418_	9	Ga	L1	1.098	9	-1	6745	116	2.11	0.000	0.000	0.000
	10	As	K12	10.543	9	545	891	48	0.85	0.000	0.000	0.000
Cougar_Mountain29@050418_	11	As	L1	1.282	9	1	6260	112	0.68	0.000	0.000	0.000
Davis_Creek27@050418_1256	12	Kr	K12	12.648	9	599	1251	56	2.91	0.000	0.000	0.000
East_Medicine_lake12@05041	13	Kr	11	1 585	9	40	6000	110	2.24	0.000	0.000	0.000
ELParaiso24@050418_12562;	14	Bb	K12	13 396	9	7708	1610	105	215	0.000	0.000	0.000
EI_Peceno40@050418_12562	15	Bb	11	1 692	9	169	5930	110	2.00	0.000	0.000	0.000
Glass_ButtesU3@050418_125t	16	Sr	K12	14 165	q	24653	1600	167	6.94	0.000	0.000	0.000
Grasshopper_Flat13@U5U418_	17	51 Cr	11	1 906	9	24033	6229	112	0.12	0.000	0.000	0.000
Gregory_Creek.38@050418_12	10	V	K12	14.050	0	2121	1772	75	1.00	0.000	0.000	0.000
Guadalupe_VictoriaU2@05041;	10	0	11	14.330	3	2121	0212	110	0.00	0.000	0.000	0.000
Inman_Lreek14@050418_125	19	1	LI	1.924	9	79	6213	112	0.89	0.000	0.000	0.000
KES_276_18@050418_12562	20	Hn Di	NIZ	20.216	9	6087	16188	196	2.78	0.000	0.000	0.000
KES_362_17@050418_12562	21	Rh	LI	2.697	9	45	5051	101	1.18	0.000	0.000	0.000
	22	Ра	K12	21.177	9	54600	22040	314	26.93	0.000	0.000	0.000
McDaniel_Tank21@050418_1	23	Pd	L1	2.838	9	616	4779	101	0.98	0.000	0.000	0.000
Meydan_Tepe36@050418_12:	24	Sn	K12	25.271	9	6041	47655	318	1.73	0.000	0.000	0.000
	25	Sn	L1	3.444	9	0	3595	85	0.96	0.000	0.000	0.000
Mule_Lreek13@050418_1256.	26	Ba	K12	32.194	9	5576	51130	328	1.51	0.000	0.000	0.000
	27	Ba	L1	4.466	9	510	1473	59	4.67	0.000	0.000	0.000
Pachuca30@050418_125627												
maredon34@050418_125627												

Results panel



File Device Measurement Analyze Spec	um Pr	oject	t Options 🗙 lg ९	Export	User Help		10 s 🛓 🗐
Obsidian Cal.rtx	< Spec	rum	Parameter	Results	Project		
Project Objects Objects Archibarca35@050418_12562' Basaltic_Plateau20@050418_1 Big_Southern_Butte06@05041 Blue_Mountain04@050418_125 Cansonball_22@050418_1255 Cans_Diablo10@050418_1255 Cetro_del_Medio28@050418_1255 Chickahominy26@050418_1255 Cougar_Mountain29@050418_1255 Davis_Creek27@050418_1255 Davis_Creek27@050418_1255 Davis_Creek27@050418_1255 Davis_Creek27@050418_1255	Proje User Com	ect Ir	formation test :				*
ELParaiso24@050418_12562;	•					*	

Project panel

3.3 <u>Creating a Project</u>

Description A project is a collection of measurement spectra. A project can be created before taking measurements and after.

Step	Action	Result
1	Open spectra or take measurements	
	to be included in the new project.	
2	Click Project.	A dropdown list is displayed.
3	Click New Project.	The project nodes panel is labeled New project .
4	In the project nodes panel, click to	
	highlight Objects .	
5	Click Project from the menu bar and	The Node dialog box is displayed.
	Add Node.	
6	Enter a node name and click OK .	The dialog box is removed and the new node is
		listed under Objects node of the nodes panel.
7	Double click Objects and click a node	The name is highlighted.
	name.	
8	Click Project from the menu bar and	All open spectra are added to the new project.
	Add Spectra.	

measurements

After

Node		
Input new node name:	Node	
		OK Cancel
		OK Cano

BeforeTo create a project before taking measurements, follow the steps in the preceding table exceptmeasurementsmove step 1 to right after step 3, then resume with step 4.



3.4 Copying and Saving

Copying **To copy a node to a different object or under another node**, click the node to be copied, drag, and drop it on top of the name of the object or node under which it will go.

Saving To save spectra within projects, click **File** -> **Save Project As**.

Note: using the **Open Project** or **Exit** option under **File** will not save changes. There is also no message to confirm closing a file without saving.

4 Working with Spectra

Description This section describes types of spectra, and how to display and manipulate them in the Spectrum panel. *To display the Spectrum panel*, select the **Spectrum** tab. Each displayed spectrum has an assigned color.

Note that when a large number of spectra are displayed, the general view worsens and performance slows.

For a description of tabs and their panels, see **Tabs** on page 19.

Spectra types For every measured or imported spectrum displayed, four spectra are managed within Artax –

Spectrum Type	Description
Original data	Data from a measurement of a sample.
Corrected spectrum	The spectrum with the background subtracted.
Calculated background count rate	The background data curve.
Recalculated spectrum from the	See Deconvolution on page 51.
deconvolution procedure.	

Assay resultIf assay results are saved with the spectrum, then the lines of the analyzed elements arelinesdisplayed on the Spectrum panel. See Qualitative Analysis on page 49.



4.1 Active Spectrum

Active spectrum

The active spectrum is the currently selected spectrum that can be analyzed.

- It is brought to the top of all other displayed spectra.
- Its name is displayed in the toolbar field.
- Its color is indicated in a box to the left of the name in the toolbar field.
- Its name in the project nodes panel is highlighted.



Selecting a spectrum

To make a spectrum active –

Step	Action	Result
1	Click the down pointing triangle on the left	A dropdown list is displayed.
	field in the toolbar.	
2	Click a spectrum name.	The selected spectrum is active.

OR click the spectrum name in the project nodes panel.



4.2 Display Options

Description What is displayed in the Spectrum panel depends on options selected under **Options -> Display Properties**.

Spectra frame Options in the **Spectra** frame affect how spectra are displayed.

Display Properties Spectra Sequence of colors:		×
Interpolate Type <u>N</u> one Linear	Background: Reconstructed spectr	um:
Chart Color: Axes Font Marker Font Abscissa (low): 1.0 keV Abscissa (high): 10.0 keV Ordinate (high): 1000 Series line width: 1 ~	R0I ☐ Eoreground Ø Background Color: Grid O None ↓ Long ticks Ø Short ticks Style: Points ✓	Cursor ↓ Vertical ● Both ○ Non <u>e</u> ● Follo <u>w</u> ○ Fjee Color:
	Ok Can	cel <u>H</u> elp

Option	Description
Sequence of	As each spectrum opens it is assigned a color according to the sequence
colors	defined here. To change a color box, click it. The Color dialog box is
	displayed. Click a color and OK . The selected color box reflects the choice.
	To change the order of colors, hold the Alt key, click and drag a color box to
	a new location, and release. The two boxes are exchanged.
Interpolate Type	None – Displays the spectrum with constant count rate across the width of
	the channel.
	Linear – The spectrum curve is linearly interpolated between channels.
Background box	Color of the background curve.
Reconstructed	Color of the reconstructed spectrum after deconvolution.
spectrum box	



Customizing colors

The Color dialog box provides the option to create custom colors. To create a custom color -

Step	Action	Result
1	From the Display Properties dialog	The Color dialog box is displayed.
	box, click a color box.	
2	Click Define Custom Colors.	The dialog box expands.
3	Select a color by clicking in the color	The Color box and numeric fields reflect the
	gradient or editing the values in the	color choice.
	numeric fields.	
4	On the right side of the dialog box,	The Color box and numeric fields reflect the
	slide the left pointing triangle up or	color choice.
	down as needed.	
5	Click Add to Custom Colors.	The custom color is displayed with the Custom
		colors on the lower left side of the dialog box.
6	Click the custom color to apply to	The Color dialog box is removed and the
	the previously-selected Display	previously-selected Display Properties option
	Properties option and click OK.	color box reflects the change.





Chart frame

Options in the **Chart** frame affect what is displayed in the Spectrum panel.

Display Properties		×
Spectra Sequence of colors:		
Interpolate Type ● <u>N</u> one ○ Linear	Background: Reconstructed spectr	um:
Chart Color: Axes Font Marker Font Abscissa (low): 1.0 keV Abscissa (high): 10.0 keV Ordinate (high): 1000 Series line width: 1 v	ROI ☐ Eoreground Ø Background Color: Grid O None ○ Long ticks ③ Short ticks Style: Points ✓	Cursor Vertical Both Nong Follo <u>w</u> Free Color:
	Ok Can	cel <u>H</u> elp

Option	Description		
Color box	Displays the Color dialog box. To change the chart background		
	<i>color</i> , click the color box, click a color on the displayed Color dialog		
	box and click OK, and click OK on the Display Properties dialog		
	box.		
Axes Font	Displays the Font dialog box. To alter the text format of axes		
	markers, click desired options and OK.		
Marker Font	See Axes Font above.		
Abscissa (low) This	Displays the field value as the <i>smallest</i> value of the <i>energy</i> scale.		
option, with the following	1. Open a spectrum.		
two, define spectrum	2. Open Display Properties and check the Abscissa (low) box.		
panel boundaries; how	3. Change the value and click OK .		
much of the spectrum is	4. Execute the change by double clicking the spectrum panel.		
displayed.			
Abscissa (high)	Displays the field value as the <i>highest</i> value of the <i>energy</i> scale.		
	See the steps for Abscissa (low).		
Ordinate (high)	Displays the field value as the <i>highest</i> value of the <i>impulse</i> scale.		
	See the steps for Abscissa (low).		
Series line width	Defines the line weight of all displayed spectra.		



Grid frame

Options in the **Grid** frame affect how the grid of the spectra is displayed.

Display Properties		×
Spectra Sequence of colors:		
Interpolate Type ● <u>N</u> one ○ L <u>i</u> near	Background: Reconstructed spectr	um:
Chart Color: Axes Font Marker Font	ROI Eoreground Background Color:	Cursor Vertical Both Non <u>e</u>
Abscissa (low): 1.0 keV Abscissa (high): 10.0 keV Ordinate (high): 1000 Series line width: 1 ~	Grid ONgne Long ticks Style: Points	Follow Free Color:
	Ok Can	cel <u>H</u> elp

Option	Description
None	No grid is visible.
Long ticks	Tick marks are visible where axes are labeled.
Short ticks	Tick marks are visible at axis marks.
Style	Displays a dropdown list of line style options: points, dot lines, horizontal dot
	lines, horizontal lines, lines, points, vertical dot lines, and vertical lines.
Color box	Displays the Color dialog box. <i>To change the grid color</i> , click a color and OK .



Cursor frame Options in the **Cursor** frame affect how the cursor is displayed.

Display Properties		×
Spectra Sequence of colors:		
Interpolate Type <u>N</u> one Linear	Background: Reconstructed spectrum:	
Chart Color: Axes Font Marker Font Abscissa (low): 1.0 keV Abscissa (ligh): 10.0 keV Ordinate (high): 1000 Series line width: 1 ~	R0I Cursor Eoreground ⊻ ettical Ø Background Ø Both Color: Nong Grid Color: None Free Long ticks Color: Ø Short ticks Color:	
	Style: Points ~	lp.

Option	Description
Vertical	Vertical bar cursor.
Both	Vertical bar and horizontal bar cursor.
None	No cursor.
Follow	When Both is selected and the cursor is moved, the horizontal bar follows the
	active spectrum curve.
Free	When Both is selected and the cursor is moved, the horizontal bar moves
	independently of the spectrum.
Color box	Displays the Color dialog box. <i>To change the cursor color</i> , click a color and OK .

4.3 Manipulating a Spectrum

Description To better view spectrum details, use the following commands.

Mouse and keyboard commands

Command	Mouse	Keyboard
Move cursor	Left button click or drag	Left/right arrow
Compress and stretch vertically	Ctrl + Left button OR	Page up/down or
	Left of the Y-axis, left button	arrow up/down
Compress and stretch horizontally	Ctrl + Left button	Ctrl + left/right arrow
Move horizontally	Below the X-axis, left button	Alt + left/right arrow
Move to the beginning		Home
Move to the end		End
Return to original display	Left button double-click	



Zooming

To zoom in on part of a spectrum -

Step	Action	Result
1	Click the zoom icon, , and move the mouse cursor to the Spectrum panel.	The mouse cursor displays as a magnifying glass.
2	Left click, drag to define a rectangle, and release.	The area within the rectangle is enlarged to fill the Spectrum panel and the mouse cursor reverts to an arrow.
3	<i>To restore the display</i> , double-click in the Spectrum panel.	The spectrum is restored to its original display.

Status Bar 4.4

Description The status bar at the bottom of the window displays the values for the point the cursor intersects an active spectrum.

Placing the To place the cursor on a specific point on a spectrum -

cursor

Position the mouse cursor and left click,	A vertical line intersecting the spectrum is
OR left click and drag the cursor,	displayed and data relevant to the intersection
OR use the left/right arrow keyboard keys.	point is reflected in the status bar. See below.

If **Options** -> **Channel Scale** is selected, the cursor can be placed only onto existing data points.

Status bar

The status bar displays the following conditional fields and information -

fields

Field	When Displayed	Description
E	Options -> Channel Scale is off.	Energy in keV.
Ch	Options -> Channel Scale is on.	Channel number (0-2048).
Cnts	Options -> Counts Per Second is <i>off</i> .	Count in the channel.
R	Options -> Counts Per Second is <i>on</i> .	Counts per second (rate).
User	Always.	Identification of logged in user.
READY	The PC is connected to an instrument.	The connection between the PC and
		the instrument is detected.
OFF-LINE	The PC is not connected to an instrument.	No connection between the PC and
		the instrument is detected.



Regions of Interest (ROIs) 5

Description

An ROI displays, in the ROI panel, the area under a curve between ROI boundaries. Multiple ROIs are defined in a single spectrum but apply to all spectra in the project. With ROIs, portions of the spectrum for the calculation of peak intensities can be defined.

Defining an ROI

Го	define	an	ROI -	
----	--------	----	-------	--

To a	lefine	an	ROI	-
------	--------	----	-----	---

Step	Action	Result
1	Position the mouse cursor at the left edge of the region to	
	be defined.	
2	a) Press and hold the Shift key,	During the operation, the
	b) left click and hold,	cursor displays as a short
	c) drag to the opposite edge of the region to be defined,	vertical line with ROI
	d) and release.	beneath.

Adjusting an ROI

To adjust left and right edges of an ROI -

-		
Step	Action	Result
1	Press and hold the Shift key and move	The ROI cursor gains left and right pointing
	the mouse cursor over an ROI edge.	arrows.
2	Continue to hold the Shift key, left click	The ROI edge moves accordingly.
	and hold the mouse, drag, and release.	





ROI display How an ROI is displayed depends on options selected under **Options** in the menu bar, **Display Properties**, **ROI** frame.

Display Properties		×
Spectra Sequence of colors:		
Interpolate Type <u>N</u> one Linear	Background: Reconstructed spect	rum:
Chart Color: Axes Font Marker Font Abscissa (low): 1.0 keV Abscissa (high): 10.0 keV Ordinate (high): 1000 Series line width: 1 ~	ROI ☐ Foreground Ø Background Color: Grid O None ○ Long ticks @ Short ticks Style: Points ✓	Cursor Vertical Boţh Nong Follo <u>w</u> Fiee Color:
	Ok Can	icel <u>H</u> elp

Option	Description	
Foreground	Not currently available.	
Background	ROIs are displayed as shaded areas, each labeled with a name. The shade color	
	is determined by the Color box.	
Color box	Displays the Color dialog box. To change the color for new ROIs, click a color	
	and OK . For details, see Display Options on page 25. This does not change the	
	color of existing ROIs.	

ROI panel At the bottom of the window, the ROI panel is displayed. It contains data for all ROIs in the active spectrum. When a different spectrum is made active, the ROIs stay the same, but the data in the ROI panel are recalculated.

Field	Description	
No.	Consecutive number based on creation order.	
Start/keV	Beginning of the ROI.	
End/keV	End of the ROI.	
Name	If labeled through the periodic table, a number or element line name.	
Gross	Calculated count rate.	
Net	Gross minus background count rate.	
Backgr.	Background count rate.	
Spectrum	Names of spectra containing ROIs.	

Copying To copy data from the ROI panel to the Windows clipboard –

From the menu bar, click **Export** -> **Copy ROI**.

OR

Right click in the ROI panel and left-click **Copy ROI**.



Naming ROIs are numbered consecutively, 1 to N. If elements are labeled on the spectrum, then the ROI is assigned a standard name of the element symbol and line type (e.g., Cu_K).

Renaming To rename an ROI –

Step	Action	Result
1	In the ROI panel, click an ROI.	The row is highlighted.
2	Click Name. The ROI Name dialog box is displayed.	
3	Enter a new name and press Enter	The dialog box is removed and the name in the
	or click OK .	ROI panel reflects the change.

Deleting

To delete a single ROI using the Spectrum panel –

Step	Action	Result
1	In the Spectrum panel, double-click inside an ROI. (If spectra are expanded, first double-click to resize the display.)	The ROI is bordered by dashed lines.
2	Press Delete on the keyboard.	The ROI is removed from the Spectrum panel and the ROI panel.

To delete a single ROI using the ROI panel -

Step	Action	Result
1	In the ROI panel, click an ROI.	The ROI is highlighted.
2	From the menu bar, click Spectrum . <i>OR</i>	A dropdown list is displayed.
	Right click the ROI in the ROI panel.	
3	Click Delete ROI.	The ROI is removed from the Spectrum
		panel and the ROI panel.

To delete all ROIs –

Step	Action	Result
1	From the menu bar, click Spectrum.	A dropdown list is displayed.
	OR	
	Right click in the ROI panel.	
2	Click Delete All ROI.	All ROIs are removed from the Spectrum
		panel and the ROI panel.



Saving To save an ROI –

Step	Action	Result
1	From the menu bar, click File.	A dropdown list is displayed.
2	Click Save ROI As.	The Save ROI List dialog box is displayed.
3	To select a folder, click in the Save	A dropdown list is displayed.
	in field.	
4	Click the desired folder.	Folders and files contained in the selected folder
		are displayed.
5	Enter a name in the File name field	The ROIs are saved in a file and the dialog box is
	and click Save or press Enter.	removed.

Opening To open a saved ROI file -

Step	Action	Result
1	From the menu bar, click File.	A dropdown list is displayed.
2	Click Open ROI .	The Open ROI List dialog box is displayed.
3	In the Look in field, click the down pointing	The desired file is listed in the Name
	triangle to navigate to the desired folder.	field.
4	Double-click the file name.	ROIs from the file are added to the
	OR	Spectrum panel and the ROI panel.
	Click the file name and click Open or press	
	the Enter key.	



6 Spectra Parameters

Description

The Parameter panel, visible when the **Parameter** tab is selected, displays measurement parameters for the active spectrum.

Spectrum parameters

Field	Description
Date/Time	Date and time the measurement started. Format depends on operating
	system settings.
Channel count	Number of channels in the spectrum.
Energy linear	The linear parameter A of the Energy-to-channel equation (E=A*x+B).
Fano factor	Describes the fluctuation of the primary ionization at the detector.
Counts Per Sec	Counts per second over the entire spectrum.

Excitation	Field	Description
parameters	Anode	Anode material of the X-ray tube.
	Filter	Filter material.
	Atmosphere	Milieu of the measuring chamber: air, He, or vacuum.
	Pressure	Pressure in the measuring chamber in mbar.
	Temp	Temperature in Celsius of the measuring chamber.

Measurement	Field	Description
parameters	Input counts/sec	All counts, including valid, double, escape, and more.
	Output counts/sec	Only valid counts.
	Dead time	Percent of time counting rejected invalid counts.

X-ray	Field	Description
Generator	Voltage	High voltage of X-ray tube.
parameters	Current	X-ray tube current.

Method These values are set in the **Method Editor**. See **Working with Methods** on page 39. parameters



7 Exporting

Description Measurement data can be exported for further analysis to standard programs (e.g., Microsoft Excel) and other evaluation software.

Settings **To define what data is exported**, check settings in the **Export Options** dialog box, under **Export -> Options**.

Export Options	×
Spectra	Ok
Only counts Channels and counts	Cancel
○ Energy and counts	<u>H</u> elp
Number per line 1 🚺	
With <u>h</u> eader	
Results Net <u>a</u> rea Concentration	

Spectra frame

Option	Description		
Only counts	Only recorded pulse counts.		
Channels and counts	Channel numbers and recorded pulse counts.		
Energy and counts	Energy values and recorded pulse counts.		
Number per Line	Number of measurements per line of text.		
With header	Measurements are preceded by the eV/channel and zero offset.		
	Exported spectra files (.txt files) can be reimported, if With Header was checked when they were exported. <i>To import</i> , use File -> Open Spectrum		

Results frame

Option	Description
Net area	Calculated net intensities.
Concentration	Not currently available.

Active

To export original measurements of the active spectrum –

spectrum data

Step	Action	Result
1	From the menu bar, click Export	The Save Spectrum as ANSI File dialog box is
	-> Spectrum.	displayed.
2	Navigate the Save in field to	The folder name is displayed in the Save in field.
	locate the folder to export to.	
3	Provide a name in the File name	Spectrum data, as specified in Export Options
	field and click Save .	dialog box, are saved in a file in the selected folder.

data



All spectra To export all spectra from a project node as text files –

Step	Action	Result	
1	Select a spectrum or node from the	Spectra are displayed.	
	project nodes panel.		
2	Click Export -> All Spectra.	The Save Spectra from Node as ANSI File	
		dialog box is displayed.	
3	Navigate the Save in field to locate the	The folder name is displayed in the Save in	
	folder to export to. The original file	field.	
	path is recommended.		
4	Provide a name in the File name field	Each spectrum's data are saved in an	
	and click Save . That name is used as a	individual file in the selected folder.	
	prefix for each created file. The		
	original file name with extension .txt is		
	recommended.		

Current results To export results of the deconvolution and intensities (counts) of the active spectrum –

Step	Action	Result	
1	Click Export -> Result.	The Save Results as ANSI File dialog box is	
		displayed.	
2	Navigate the Save in field to locate the	The folder name is displayed in the Save in	
	folder to export to.	field.	
3	Provide a name in the File name field	Data, as specified in Export Options dialog	
	and click Save .	box, are saved in a file in the selected folder.	

All results

To export all results from a project file node to a text file in .csv format –

Step	Action	Result
1	Select a spectrum or node from the project nodes panel.	Spectra are displayed.
2	Click Export -> All Results.	The Save Results from Node as ANSI File dialog box is displayed.
3	Navigate the Save in field to locate the folder to export to. The original file path is recommended.	The folder name is displayed in the Save in field.
4	Provide a name in the File name field. The original file name with extension .csv is recommended.	Data, as specified in Export Options dialog box, are saved in a file in the selected folder.



To Excel

To export all results from a project file node to an Excel file –

Step	Action	Result
1	Select a spectrum or node from the project	Spectra are displayed.
	nodes panel.	
2	Identify element lines in the spectra using Auto	Element peaks are identified.
	Ident in the Periodic Table of the Elements.	
	See Qualitative Analysis on page 49.	
3	Click Analyze -> Evaluate Results. The more	The intensities of the selected lines
	spectra to analyze, the longer the analysis.	for all spectra are determined and
		stored in memory. A progress bar
		may be displayed.
4	Click Export -> Results to Excel.	The Save As dialog box is displayed.
5	Provide a file name with an .xlsx extension and	The dialog box is removed and the
	click Save .	results are saved as an Excel file.



Working with Methods 8

Description Parameters for measuring and evaluating spectra data are specified within one method. An unrestricted number of methods, classified by name, can be saved.

To select a different method -

Selecting a method

Step	Action	Result		
1	Click the down pointing triangle to the	A dropdown list of method names is displayed.		
	right of the Edit methods icon ([[[]]).			
2	Click a method name.	The list is removed, the selected method		
		name is displayed in the field, and relevant		
		parameters are updated.		
File D	evice Measurement Analyze Spectrum Project Options Export	User Help		
🖻 🚔 🔚	dataMeasured_2	Live Time: 10 s 💭 📺 Use 25-15 🔽 📊 🔺		
Spectru	m Parameter	Use 25-15		
Spectr	um	Spectrum Information		
Date/T	Time: 4/2/2018 10:19:35 AM	User: test		
Chann	el count: 2048	Serial number: Alpha1		

8.1 Method Editor

Description

The Method Editor is a dialog box for creating new methods and editing existing ones.

To display the Method Editor, click the Edit methods icon (menu bar, click **Measurement** -> **Method**. *To access different panels*, click the appropriate tab.

omment:	<u>N</u> ame:	Standard			
		Standard Use 25-15			Add
					Replace
					Remove
Automatic e /29/2015 3:2	evaluation 3:30 PM				
Measuremen	t Corrections	Identification	Deconvolution	Quantification	PDZ Options
Current: 6. Eilter: T Stop condit Tjme: 10	20 🕵 µA i 25um:Al 300ui ion I 🎉 s	Max. Currer	nt	FA FA So Va So Va Lim Va So So Va So Va Va Va Va Va Va Va Va Va Va Va Va Va	19 50 Friz 7 16 Low Zlagy 6 17 5 Low Zlagy 6 18 10 VitZ 6 19 0 HiZ 6 19 0 HiZ 6 19 0 HiZ 6 19 0 HiZ 7 10 0 HiZ 7 10 0 HiZ 7 10 0 HiZ 10 10 0 HiZ 10
Excitation Atmos Collimat Manual Filt	sphere Air © Flus or: 3 👻 n er: Blank	h ⊚ Vaccum m	Shine	Alk Va Ob Mu Va Mu Va LA Ex Va	Ag Alloy Low-Z c AlMg Alloy Low-Z sidian udRock Maj15 c MudRock Maj15 c MudRock Trace40 c MudRock Trace40 s6 ploration_50 c Fundration_50
V Auto-save	e PDZ file(s) in I	ocation:			
<u>F</u> older:	C:\Users\frits	vosman\Docume	ents\bruker\Arta	x\data	(
<u>F</u> ile Name:	Measured			0	
					Ok Cancel Help



General fields

Option	Description
Comment	Comments entered for the currently selected method.
	When the method name is displayed in the toolbar method box and the mouse cursor hovers over the name, text previously entered in this Comment field is displayed.
Name	Currently selected method.
Add	<i>To add a new method</i> , enter a unique name in the Name field and click Add . The new name is displayed in the list box.
Replace	<i>To change parameters of the selected method</i> , click the method name, edit field values, and click Replace .
Remove	Deletes the selected method.
Automatic evaluation	When a measurement completes, deconvolution (blue curve on the Spectrum panel) and intensities (data displayed on the Results panel) are calculated. Detected elements are labeled and saved with the spectrum. The Bayesian deconvolution curve automatically changes when a new element is added or subtracted via the periodic table. See Qualitative Analysis on page 49.
	This option is available if the following are selected –
	• Under the Deconvolution tab, Bayes <i>OR</i> Profile bayes (normal Fit) <i>AND</i>
	• Under the Identification tab, Line markers OR Automatic.
	Note: Intensities results are displayed in the Results panel only if the spectrum is in a project.
Data and time	The date and time of the last method modification.
Ok	Stores all changes in the database.



8.2 Measurement Panel

Description

reasuremen	Corrections	Identification	Deconvolution	Quantification	PDZ Uptions	
Generator Voltage:	25 🔀 kV 5.00 🕅 IIA	May Curr	ant	Sele Rot FAC Bot	ct Illunination: Std Alloy Hi-Z HS 50 Hi-Z C Low Alloy HS Low-Z	*
<u>F</u> ilter:	tion	Ind. Com		▼ Vac Soil Vac Soil Vac	FAC Low Alloy HiZ Soil Hi-Z 50 Hi-Z Soil 50 Hi-Z soil 50 Hi-Z	11
Tjme: 1	D 🔀 S			Vac Std Min Vac Vac	estone 15 Alloy Low-Z ing-Soil Low-Z Std Alloy Low-Z Mining-Soil Low-Z Allon H-Z	
Excitation Atmo	sphere) Air 🔘 Flus	h 🔘 Vaccur	n	Vac AlM Vac Obs Mur Vac	s Std Alloy Hi-Z Ig Alloy Low-Z : AllMg Alloy Low-Z sidian dRock Maj15 : MudRock Maj15	
Collima Manual Fil	tor: 3 👻 m ter: Blank	m	×	Mui Vac LAS Exp Vac	dRock Trace40 5 MudRock Trace40 56 Ioration_50 5 Evploration_50	•
🗸 Auto-sav	e PDZ file(s) in lo	ocation:				
<u>F</u> older:	C:\Users\frits.	vosman\Docur	nents\bruker\Arta	x\data		
<u>F</u> ile Name	Measured				Oh	Hale

Option	Description		
Voltage	X-ray tube voltage.		
Current	X-ray tube current.		
Max. Current	When clicked, displays in the Current field the maximum current		
	possible at the voltage setting.		
Filter	A dropdown list of possible material filters.		
Time	Duration of a measurement.		
Select Illumination	From the list of available illuminations, select one as a starting point.		
Auto-save PDZ file(s)	When this box is checked, saves the .pdz file in the folder or file		
in location	specified in the boxes below.		
Folder	Folder in which the PDZ file is saved.		
File Name	PDZ file name with _n.pdz automatically appended, where n is a		
	unique number. The default name is Measured.		

TRACER 5 options

When connected to a TRACER 5, the following additional options are available.

Option	Description	
Atmosphere	Atmospheric measurement environments:	
	Air – Ambient atmosphere.	
	Vacuum – setting for use with a vacuum pump to eliminate air	
	between the sample and detector.	
	Flush – setting for use with a Helium, or other gas, flush to replace air	
	between the sample and detector.	
Collimator	Collimators that can be manually installed.	
Manual filter	Filters that can be manually installed.	



8.3 <u>Corrections Panel</u>

Measurement	Corrections	Identification	Deconvolution	Quantification	PDZ Options
 ✓ Escape Shelf ✓ Backgroun ✓ Pileup 	nd Cycles:	9 🌠	Start: 1.0 ke\	/ End: 40.0	keV

Option	Description
Escape	Corrects the spectrum for escape peaks.
Shelf	Corrects the spectrum for background signals in the lower energy range (Shelf).
Background	Corrects the background.
Pileup	Ignores sum peaks.
Cycles	For background, tunes background calculations.
Start	For background, lowest energy boundary for correction.
End	For background, highest energy boundary for correction.



8.4 Identification Panel

Method Name	Description
Line markers	Measured elements within the spectrum must be identified via the Periodic
	Table of the Elements dialog box, via the toolbar icon (
	Measurement Corrections Identification Deconvolut Line markers Preset list Automatic
Preset list	 This option is recommended when the collected spectra are known to contain certain elements. <i>To select required elements</i>, click element buttons on the periodic table. <i>To add elements to the periodic table from the active spectrum</i>, if the elements there are labeled, click Get Elements.
	Measurement Corrections Identification Deconvolution Quantification PDZ Options Line markers Elements for identification Get elements Preset list H He Automatic H He Line markers B C N Automatic H He Li Be B C Na Mg Ai Si P K Ca Sc Ti V Cr Na Mg Ai Si P S Ci Ba Li He Ai Si P Fr Ra C Pr Nd Nd Nd Fr Ra Ce Pr Nd Nd Nd Fr Ra Ce Pr Nd P Dy He Nd Nd Nd Nd Nd Nd
Automatic	Identifies elements within the spectrum. <i>To exclude elements known to not be present</i> , click element buttons on the periodic table.
	To exclude elements impossible to measure or rare, click Standard.



8.5 Deconvolution Panel

Option	Description		
Bayes	Performs Bayesian deconvolution of spectrum.		
	Measurement Corrections Identification Deconvolution Quantification PDZ Options		
	Bayes Profile bayes (normal fit) Max. stripping cycles: 1 Profile bayes (optimized fit) Stepwidth: 1		
Profile bayes (normal fit)	Not currently available.		
Profile bayes (optimized fit)	Not currently available.		

8.6 **Qualification Panel**

Not currently available.

	Corrections	Identification	Deconvolution	Quantification	PDZ Options
Calculate d	concentration				
Calibration file	10				
Cush ide d alex				•	
E <u>x</u> cludea elen	nents:				

8.7 PDZ Options Panel

Measurement	Corrections	Identification	Deconvolution	Quantification	PDZ Options
File Out	out / Saving				
PDZ ve	rsion: 25 🖣	•			

The PDZ version can be 24 or 25.



9 Spectra Processing

Description Spectra can be added, subtracted, scaled, compared, and saved.

Saving New spectra can be saved as part of a project or as an individual spectrum. Be sure to use a new file name so another file is not overwritten.

To add a new spectrum to the current project, click Project -> Add Spectra.

To save a new spectrum as an individual spectrum rather than part of a project, click **File** -> **Save Spectrum As**.

9.1 Adding and Subtracting Spectra

Description Two spectra can be added, or one spectrum subtracted from another.

Adding or

To add two spectra or subtract one spectrum from another –

subtracting

Step	Action	Result
1	Open two or more spectra.	
2	From the menu bar, click	The Select Spectra dialog box is
	Spectrum -> C = A + B OR C = A - B .	displayed.
3	Under Spectrum A, click the down pointing caret	The list is removed and the selected
	to display a list of open spectra and click a	spectrum name is displayed in the box.
	spectrum name. Parameter values from	
	spectrum A will apply to the new spectrum.	
4	Under Spectrum A , select the appropriate option	
	to be added or subtracted.	
	Original values – The original spectrum.	
	Corrected values – After the background is	
	subtracted.	
	Background – Just the background.	
	Fitted values – The deconvoluted spectrum.	
5	Under Spectrum B , click the down pointing caret	The list is removed and the selected
	to display a list of open spectra and click a	spectrum name is displayed in the box.
	spectrum name.	
6	Under Spectrum B, select an appropriate option	The dialog box is removed; the
	and click Ok .	Spectrum panel displays the new
		spectrum, Add_n or Sub_n (n being a
		consecutive number); and the toolbar
		indicates that it is the active spectrum.

Select Spectra: C=A+B	×	Select Spectra C=A-B	×
Spectrum A	Spectrum B	Spectrum A	Spectrum B
a-0001@070616_160245 🛛 🗸	a-0001@070616_160245 🛛 🗸	a-0001@070616_160245 🛛 🗸	a-0001@070616_160245 🛛 🗸
 Driginal values Corrected values Background Fitted values 	 Original values Corrected values Background Fitted values 	Driginal values <u>C</u> orrected values <u>B</u> ackground <u>F</u> itted values	Original <u>values</u> Corrected values B <u>a</u> ckground Fitte <u>d</u> values
Ok	Cancel <u>H</u> elp	Ok	Cancel <u>H</u> elp



9.2 Scaling a Spectrum

Description Scaling is multiplying the pulse counts, which affects the vertical scale.

Scaling

To scale the active spectrum –

Step	Action	Result
1	Click Spectrum -> A = F * A.	The Factor for multiplication dialog box is displayed.
2	Type a scaling factor and click	All pulse counts and measurement times of the active
	OK.	spectrum are multiplied by the entered factor.

Factor for multiplication		×
Factor (0 < Factor <= 394685) 1.0		
	ОК	Cancel

Normalizing

This type of scaling –

- At the spectrum cursor location, gives all open spectra the same value as the active spectrum.
- Recalculates all open spectra by the scaling factor determined by the relation of the pulse counts at the spectrum cursor.

To normalize all spectra in the Spectrum panel to the active spectrum, place the spectrum cursor at the desired location and click **Spectrum** -> **Normalize**. Open spectra are scaled accordingly.



9.3 Comparing Spectra

Description

An unknown spectrum can be identified by making it the active spectrum and comparing it to known spectra in project files. The comparison calculates matches in percent.

To search for matches with the active spectrum -

Searching for matches

Step	Action	Result
1	From the menu bar, click Analyze -> Match .	The Match dialog box is displayed.
2	To select a directory in which to search for	The Browse For Folder dialog box is
	matching spectra, click the folder icon to	displayed.
	the right of the Search in field.	
3	Navigate and select the desired folder, then	The directory name is displayed in the
	click OK .	Search in field.
4	In the Start energy field, specify the lower	The field reflects the change.
	boundary of the energy range in which to	
	compare the spectra.	
5	In the End Energy field, specify the upper	The field reflects the change.
	boundary of the energy range in which to	
	compare the spectra.	
6	In the Min. correlation field, specify the	The field reflects the change.
	minimum percent of matching	
	concentrations for spectra to be a match.	
7	In the Number of hits field, specify the	The field reflects the change.
	maximum number of matches displayed.	
8	Click Start .	The status bar of the dialog box displays
		the number of files found, the number
		spectra being compared, and the count
		of matches found so far. When the
		comparisons end, the dialog box is
		removed. If matches were found, the
		Match Results panel is displayed.

							23
D:\Obsi	dian D	ata					
1.0	keV	End energy:	17.0	keV			
98	%	<u>N</u> umber of hits:	100				
				(Start	Cancel	Help
	D:\Obsi 1.0 98	D:\Obsidian D 1.0 keV 98 %	D:\Obsidian Data 1.0 keV <u>E</u> nd energy: 98 % <u>N</u> umber of hits:	D:\Obsidian Data 1.0 keV End energy: 17.0 98 % Mumber of hits: 100	D:\Obsidian Data 1.0 keV End energy: 17.0 keV 38 % Number of hits: 100	D:\Obsidian Data 1.0 keV End energy: 17.0 keV 98 % Number of hits: 100 Start	D:\Obsidian Data 1.0 keV End energy: 17.0 keV 98 % Number of hits: 100 Start Cancel



😂 🛃 📕 Burns_Green15@050418_125627	• >	د او م	▶ ■ L	ive Time: 10 s 卖	Standard	💌 il ili 🔺	
Obsidian Cal.rtx	×	Spectrum	Parameter F	Results Match Results F	Project		
 Points Archibarca35@050418_125627 Basabic_Plateau20@050418_125627 Big_Southern_Butte06@050418_125627 Blue_Mountain04@050418_125627 Burns_Green15@050418_125627 	•	Spectrum Search in Start ener Min. corre	: Burns_Gi : D:\Obsid gy: 1 elation: 98	reen15@050418_125627 lian Data keV End energy: % Number of hits:	17 keV 100		
Casa_Diablo10@050418_125627			Correlation/%	Spectrum	Date	Filename	
Cerro_del_Medio28@050418_125627		1	100.00	Burns_Green15@050418	7/20/2012 11:10:16 AM	D:\Obsidian Data\Obsidian Cal.rtx	
Coucar Mountain29(@050418_125627		2	99.68	La_Joya16@050418_125	7/20/2012 11:15:40 AM	D:\Obsidian Data\Obsidian Cal.rtx	
Davis_Creek27@050418_125627		3	99.27	Witham_Creek23@05041	7/20/2012 12:38:26 PM	D:\Obsidian Data\Obsidian Cal.rtx	
East_Medicine_lake12@050418_125627		4	99.23	San_Leonel32@050418_	7/20/2012 1:43:08 PM	D:\Obsidian Data\Obsidian Cal.rtx	
EL_Paraiso24@050418_125627 EL_Paceno40@050418_125627 Glass_Buttes03@050418_125627 Grasshopper_Flat13@050418_125627		5	98.59	Cannonball1_22@050418	7/20/2012 12:33:15 PM	D:\Obsidian Data\Obsidian Cal.rtx	

Match Results panel	The Match Result	s panel displays the following columns –				
	Column Name	Description				
	Correlation/%	Closeness of match in percent.				
	Spectrum	Spectrum name.				
	Date	Date Date and time the spectrum was recorded.				
	Filename	Directory and filename of the project file or of the individual spectrum file.				
Active match	<i>To select a spectrum match to be active</i> , double click its row in the Match Results panel. The Spectrum panel is displayed and the selected spectrum is active.					
Removing the panel	The Match Results panel remains available until – A comparison is executed that results in zero hits. OR Artax is exited.					



10 Qualitative Analysis

Description

Elements to be charted in the Spectrum panel can be specified from the **Periodic Table of the Elements**, which is a dialog box accessible by clicking –

The toolbar icon (

OR

The menu bar option **Analyze** -> **Periodic Table**.

Periodic Table of the Elements							
H K series lines Lines			H	e <u>W</u> indo	w: 0.05 k	eV	
Li Be L series lines I text	B C	N O	F N	e oz	Element	Line	E/keV
K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn	Ga Ge	As Se	Br K	Gr			
Rb ST Y ZI Nb Mo To Ru Rh Pd Ag Cd	In Sn	Sb Te	ΙX	e			
Cs Ba La Hf Ta W Re Os Ir Pt Au Hg	TI Pb	Bi Po	At R	in			
	y Ho Er	Tm Yb Mai Na	Lu				
			<u>, - </u>	-			
New element: Pb	All	<u>H</u> elp	1				

10.1 Display Options

Element name Element buttons are displayed in periodic table format. *To display an element button's element* and number *name and atomic number,* hover the mouse cursor over it.

Element **To display details of a specific element**, right click the element button. The **Atomic Data** box is displayed, which contains atomic mass, density, line series energies, and more.

At	tomic Da	ta					×
Atom: Cu Atomic					number: 29		<u>C</u> lose
Atomic weight: 63.55 Density: 8.96 g/cm³							
	K series	L se	ries	M series	Absorption ec	lge	Fluorescence
	Line		Transition		Energy / keV	Int	ensity
	K-Alpha	1	K-L	3	8.0463	0.5	5771
	K-Alpha	2	K-L2		8.0267	0.2	943
	K-Beta 1		К-МЗ		8.9039	0.0	840
	K-Beta 2	2	K-N	12,3			
	K-Beta 3)	K-M2		8.9017	0.0	1435
	K-Beta 4	ļ.	K-N	14			
	K-Beta 5	i	K-N	14	8.9740	0.0	1008

Spectrum display options Depending on boxes checked on the Periodic Table, the Spectrum display can include -

- Lines indicating K, L, and/or M series points.
- Flags, with the element symbol and color corresponding to the color of the element button, indicating K, L, and/or M series points.



Option		Description					
K series lines	Displays the	spectrum K, L, and/or M series lines and/or text for each element					
L series lines	highlighted	on the Periodic Table , if the Lines box and/or Text box are checked.					
M series lines							
Lines	Displays, wit	h vertical lines, the K, L, and/or M points for each element highlighted					
	on the Perio	dic Table, if the respective series line boxes are checked.					
Text	Displays, wit	h colored flags indicating the element, the K, L, and/or M points for					
	each elemer	nt highlighted on the Periodic Table , if the respective series line boxes					
	are checked						
Color	Changes the	color of the –					
	 Eler 	nent button in the Periodic Table .					
	 Eler 	nent flag and element line on the Spectrum panel.					
	To change t	he color –					
	• Left	click and drag a color box from the dialog box and drop it over an					
	eler	nent button.					
	OR						
	Sele	ct an element button and press Enter twice repeatedly to scroll					
	thro	bugh color options.					
	New color a	ssignments remain while the program runs. They cannot he saved					
New element	To activate	a new element –					
new clement	Type the ele	ment symbol in this field and press Enter					
	OR click the	up arrow or down arrow to scroll through the elements					
	OR left click	an element button					
New element	Incremental	ly selects elements up or down from the selected element button.					
arrows		norementary selects elements up or down norm the selected element bullon.					
Auto Ident	Depending of	on checked box options, automatically identifies –					
	• In ti	ne Periodic Table , elements of the active spectrum.					
	● Intl	ne Spectrum panel, element series lines.					
	• In t	ne Spectrum panel, elements symbols associated with series lines.					
	Careful verif	ication of automatic results is recommended.					
		······································					
	To select ele	ments individually, click an element button. To unselect, click again.					
Clear All	Removes fro	om the –					
	• Spe	ctrum panel all element labeling.					
1 A.C. 1	• Per	lodic Table all activated element buttons.					
Window	Lists possible	e elements according to data at the spectrum cursor location.					
	Field	Description					
	keV	Adjustable bandwidth for recognizing a line along the X-axis.					
		The default is 0.05 keV.					
	OZ	Atomic number.					
	Element	Symbol of the elements detected at that point.					
	Line	Emission line series type.					
	E/keV	Energy in keV.					
	If Profile have	res is chosen as the deconvolution method, the list of possible					
	elements is	further restricted based on the included profile files. Flement symbols					
	with no corr	esponding reference data are underlined					
L		espension Directore data di e differimenti					



10.2 Deconvolution

Description From an existing spectrum, deconvolution creates a model spectrum defined by only elements selected on the Periodic Table of the Elements dialog box.

The deconvolution process depends on -

- The method selected in the **Method Editor** dialog box, under the **Identification** tab. ٠
- ٠ Availability of other spectra results.

Corrected raw To determine corrected raw counts of the active spectrum via deconvolution -

counts

Step	Action	Result
1	Display element labels and series lines	
	on the active spectrum.	
2	Click () on the toolbar or Analyze -> Evaluation on the menu bar.	The deconvolution curve (default blue) is displayed in the Spectrum panel and the method data and results are temporarily stored in memory.
3	To permanently save changes, use File -> Save Spectrum As or add the spectrum to a project file and use File - > Save Project As.	

Differences

To display the difference between original values and deconvolution values, from the menu bar click Options -> Difference curve. Results are displayed in a panel below the Spectrum panel.





Appendix A: Registry Database

Available methods

Description	Artax uses the registry database of the windows and dialog boxes and their di HKEY_CURRENT_USER/Software/ Bruk	operating system intensively to store the pos splay parameters. The information is in the re- er/ARTAX.	ition of all gistration key
Individual's data	If several users are registered within the the registry. This data is not automatic registration of new users.	ne operating system, an individual's data is als ally available after installation of the software	o stored in or
System parameters and methods	Instrument system parameters and av C:\Program Files (x86)\Bruker\Artax\	ailable methods are store in the directory settings\Spectra with the following naming co	onvention:
	Data Type	Storage File Name	
	Instrument system parameters	program name.ini	

program name.mth