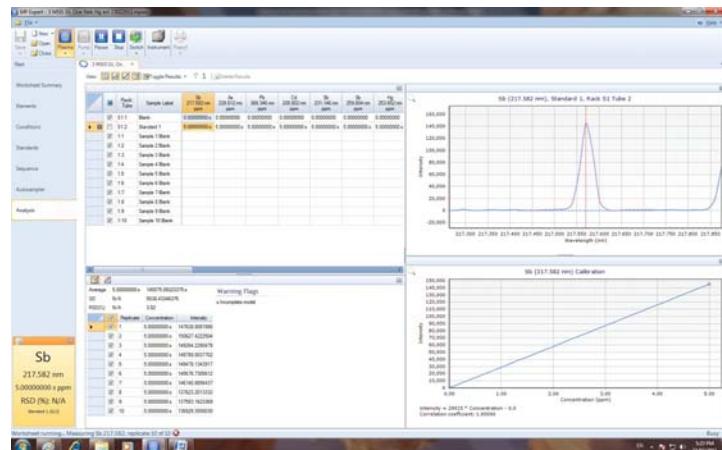


Agilent MP Expert Software

Technical Overview



Introduction

Today, busy laboratories are expected to be centers of analytical excellence, as well as profitable. The Agilent 4100 MP-AES provides a low-cost, multi-element analysis technique based on a microwave-generated plasma that runs using only nitrogen as opposed to flammable gases such as acetylene. This improves laboratory safety, while reducing the difficulties associated with sourcing and replacing flame AA gases — especially in remote areas. With excellent long-term stability, improved linear dynamic range, superior detection limits, and faster measurement compared with flame AA, the Agilent 4100 MP-AES is the perfect analysis tool for achieving your productivity and profitability goals, with the lowest cost of analysis. Part of what makes the Agilent 4100 MP-AES such an easy system to work with is the Agilent MP Expert software that controls the instrument. With a familiar worksheet interface, automated method development, and software applets that automatically load pre-set method templates, the Agilent MP Expert software dramatically simplifies analysis.



Agilent Technologies

Easy to use

Agilent MP Expert software uses application-specific software applets that ensure users of all skill levels can be confident running the Agilent 4100 MP-AES. The administrator can choose which application methods are available to the novice user, who can then simply walk up and click the applet icon (Figure 1, top). The software applet automatically loads the method so you can immediately start analysis by igniting the plasma and clicking the 'Run' button (Figure 1, bottom). Prompts are displayed to guide you to introduce the standards in the correct order, and then present the appropriate sample for measurement. This ensures that even novice users can take accurate and reproducible measurements without method development or alignment, and with minimal training. Applets can easily be imported and exchanged with other users by using the Applet Management tool.



Figure 1. Application-specific software applets enable novice users to start analysis immediately using a pre-set method, without method development or alignment

During analysis, you can easily track the progress and monitor results on a sample-by-sample basis using the summary panel display. When running an automated multi-element analysis, progress can easily be tracked even across a busy laboratory, by maximizing the summary panel.

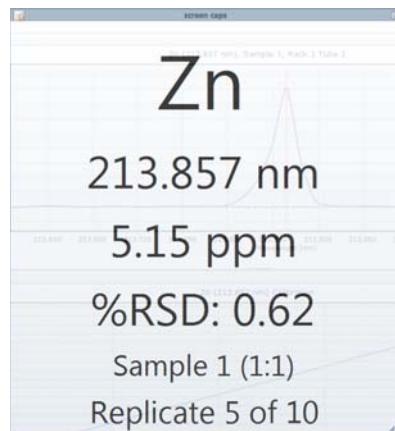


Figure 2. Easily track analysis progress, even at a distance, by viewing the result summary for the current solution

The administrator can use the Options dialog box (Figure 3) to choose the software components that are displayed for users of different levels. For example, a user performing routine analysis of samples might only need access to the software applets; whereas an experienced user might require access to method development and optimization tools.

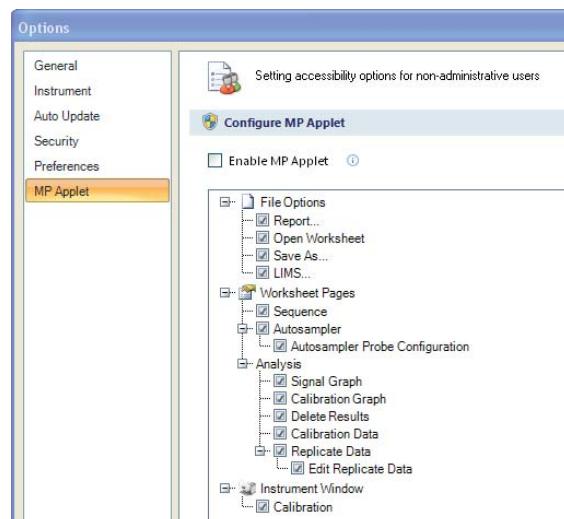


Figure 3. The administrator can tailor the Agilent MP Expert software interface so that each user sees only those features they need

Rapid method development with automated optimization

The Agilent MP Expert software makes method development simple, so you can spend less time setting up methods, and more time running samples.

When you select the element to be determined, the software displays the selection of emission lines ranked in order of preference. The available wavelength selections give you complete versatility, ensuring you can avoid spectral interferences and cover the required concentration range for your sample types.

When you select a wavelength from the list, the potential interferences are graphically displayed, with the other elements that have been selected for analysis highlighted in red. This enables you to visually assess the potential for interferences from the other analytes. If there are lines that are very close together, you can zoom in to view details.

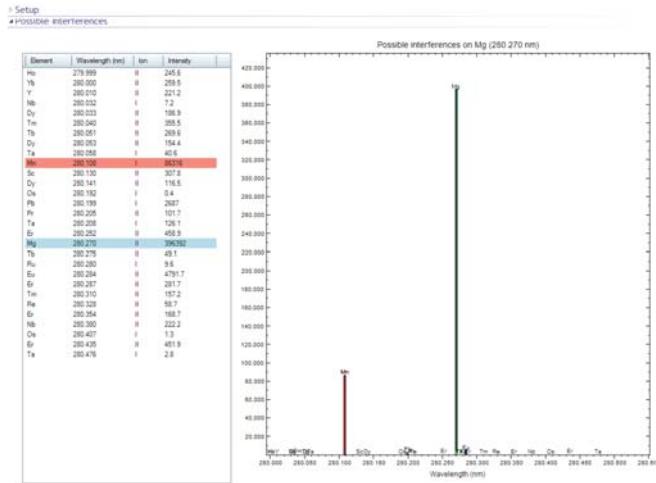


Figure 4. View potential interferences at a glance during method development. Interferences are both color-coded and displayed graphically.

Determining the optimum conditions for a suite of elements can be a daunting task for any user — even an experienced user. The optimum conditions for one element and its associated emission lines do not necessarily suit those of another. Even the optimum conditions for different emission lines of the same element can significantly vary.

In the Agilent MP Expert software, each line has its own default nebulizer pressure that will be adequate for many applications. For optimum performance, you can optimize the method settings by simply clicking the Optimize button, eliminating time-consuming manual method development. The optimization routine provides fast, automated optimization of the nebulizer pressure and the viewing position. Once optimization is completed, the optimum parameters are automatically updated in the method conditions. This routine is ideally suited to the MP-AES technique, where the optimum parameters for multiple elements need to be determined quickly and efficiently.

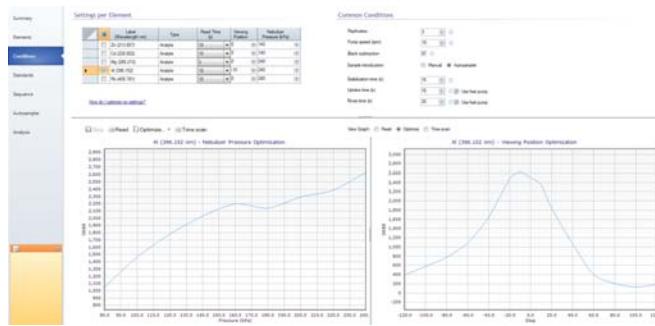


Figure 5. With auto-optimization, you don't need to be an expert to achieve fast and accurate optimization of instrument parameters

Logical workflow

The intuitive interface of the Agilent MP Expert software is logically organized for easy navigation and use, and comprehensive video help is included — so you can get the assistance you need on demand. The video help shows you how to change and use accessories for different applications, through to how to complete routine maintenance tasks.

The software features a clear, logical workflow procedure that helps to simplify analyses, even for experienced users. To set up and perform an analysis, you simply follow the sequence of pages in the displayed order. The current page is highlighted to provide full visibility of your progress in the workflow.

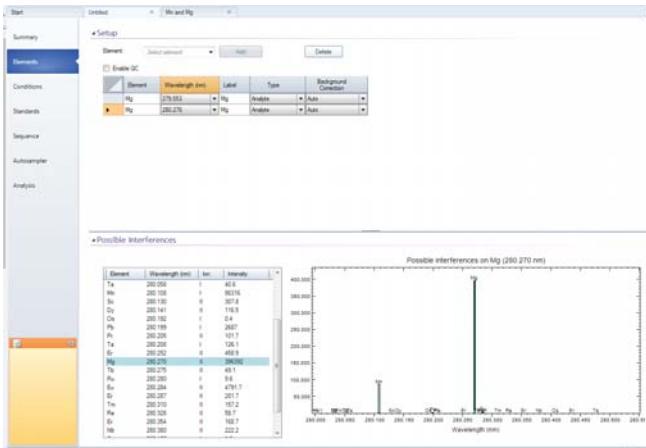


Figure 6. The Agilent MP Expert software provides a clear workflow to guide you through method development and analysis

Versatile correction options

The Agilent MP Expert software provides a choice of correction options to enable efficient and accurate correction for background or spectral interferences.

For simple, exceptional correction capability, choose Agilent's 'Auto' correction. Auto correction automatically develops models of the blank and the analyte, and applies these models during sample measurement to provide fast and accurate correction for both simple and more complex background. Using auto correction, there is no need to specify the correction points to use. In addition, by providing better correction for the background contribution, auto correction can help you achieve better detection limits.

Off-peak correction is available if you prefer to use this traditional correction technique. Achieving accurate correction with off-peak correction requires manual selection of the correction points — choose from left, right or both sides of the analytical peak.

For dealing with analytical interferences, you can rely on Agilent's Fast Linear Interference Correction (FLIC). It can be used when multiple, partly overlapping spectral components are present in the spectral window (and it is not possible for you to select an alternate wavelength that is free of the interferences), or if there is only a single component present. FLIC also provides you with the flexibility to correct for complex

structured backgrounds. To apply correction using FLIC, models are constructed using pure solutions for the blank, analyte and the expected interferences in the sample. The Agilent MP Expert software estimates the amount of each model required to minimize the sum of squared differences between the unknown spectrum and the scaled sum of the models for the blank, analyte and expected interferences. The algorithms used compensate for any wavelength drift in the instrument, which means that a correction model developed previously will continue to work without loss of accuracy.

FLIC improves analytical accuracy by solving your spectral interference problems in challenging samples. Best of all, if you suspect an unknown spectral interference in your analysis, you can retrospectively apply FLIC after your analysis is complete.

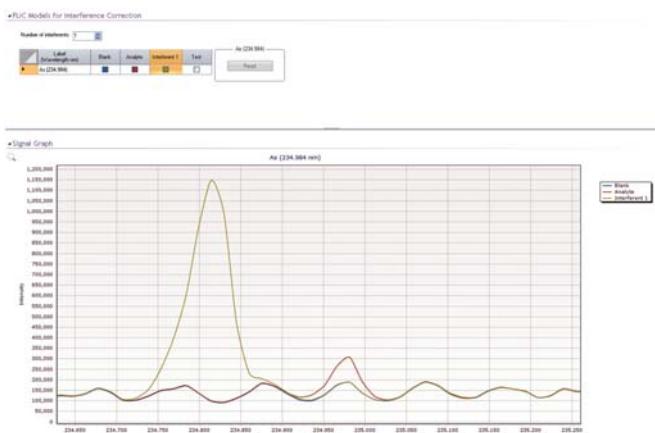


Figure 7. Agilent's unique FLIC correction provides real time spectral interference correction, without any time penalties. In this example, FLIC is correcting for the interference from Fe at the As 234.984 nm wavelength.

Extended dynamic range

The MultiCal feature of the MP Expert software provides the versatility to take advantage of the wavelength coverage of the MP-AES. If you use just one calibration for your analysis, you may limit the range over which you can accurately determine the amount of an element present. Elements generally have more than one wavelength at which they can be measured. These wavelengths have different sensitivities. By using a combination of wavelengths of different sensitivity, you can extend the dynamic range of your determination.

This means selecting the most sensitive line to give the best detection limits and accurate determinations of low-level analytes; and in the same determination, selecting lines that are not as sensitive so that you can measure the higher analyte concentrations. Only a few standards are required to define the calibration range for each wavelength. MultiCal enables you to use more than one calibration graph for the same element in your analysis, so that you can accurately measure analytes over a wider concentration range. Based on the measured signal intensity, MultiCal automatically reports the result based on the calibration for that wavelength. This enables you to extend the dynamic range of your determination from parts per billion to percentage levels. If desired, you can overlap the concentration ranges, giving you a simple way to verify your sample results. Using this approach, MultiCal provides automatic online results confirmation throughout the analysis. MultiCal provides an extra level of data quality control, giving you confidence in the accuracy of your results and confirmation of freedom from interferences.

Solution Label	Rack:Tube	Fe (238.204 nm)	Fe (259.940 nm)	Fe (248.327 nm)
		ppm	ppm	ppm
Blank	S1:1	0.00	0.00	0.00
Standard 1	S1:2	50.00	50.00	
Standard 2	S1:3	250.00	250.00	250.00
Standard 3	S1:4		500.00	500.00
Standard 4	S1:5			1000.00

Figure 8. Use MultiCal to extend dynamic range and achieve accurate results from a single sample measurement. In this example, Fe is being measured over the range to 250 ppm using the 238.204 nm line, the 259.940 nm line covers the range to 500 ppm, and the 248.327 nm line covers higher concentrations up to 1000 ppm.

Reporting versatility

The Agilent MP Expert software provides you with all the reporting versatility you need.

The Report Designer enables you to configure reports to include only the required data, and to customize report layout with your company logo. Once designed, reports can also be saved as templates, so setup need only be done once.

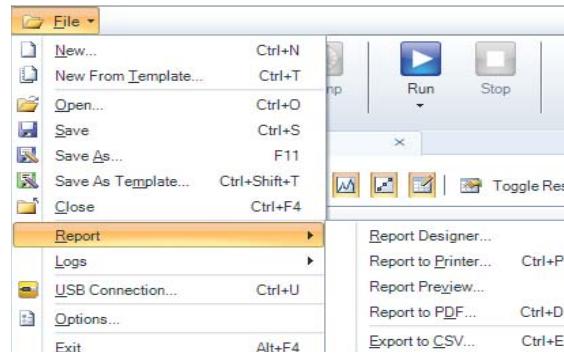
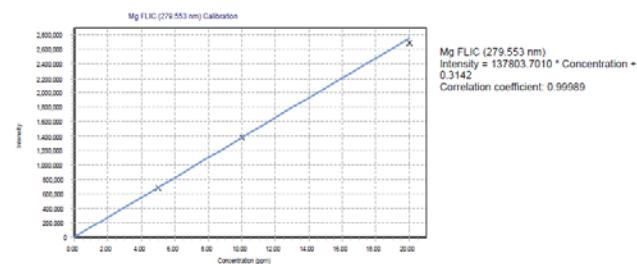


Figure 9. Agilent MP Expert contains a variety of options to meet all your reporting needs

Sample 8	21/03/2011 14:58:29	Mg FLIC (279.553 nm)	0.0008	ppm	43.6356	40.79
Sample 8	21/03/2011 14:58:29	Mg (279.553 nm)	0.0019	ppm	84.5904	31.73
Sample 9	21/06/2011 11:38:03	Mg FLIC (280.270 nm)	0.0029	ppm	0.0000	0.00
Sample 9	21/06/2011 11:38:03	Mg (280.270 nm)	0.1310 u	ppm	74.8286	80.27
Sample 9	21/06/2011 11:38:03	Mg FLIC (279.553 nm)		ppm	N/A	N/A
Sample 9	21/06/2011 11:38:03	Mg (279.553 nm)		ppm	N/A	N/A

Calibration Curves:



Standards	Intensity	Method Concentration	Actual Concentration	% Error
Blank	0.0734	0.0000	0.0000	N/A
Standard 1	692479.9695	5.0000	5.0251	0.50
Standard 2	1380330.0552	10.0000	10.0166	0.17
Standard 3	2609514.5716	20.0000	19.5170	2.42

Figure 10. Example of the report format that can be created using the Agilent MP Expert Report Designer

Data transfer and export

Easily transfer results to a LIMS or other application using the versatile data exporting options. Upload data to a LIMS, or export data into CSV format for direct transfer to a spreadsheet program for data manipulation, trend analysis, or process monitoring. Take advantage of the multi-tasking capabilities of the MP Expert software by reviewing, processing and generating reports on analyses that have just been completed, while simultaneously using the Agilent 4100 MP-AES to collect data for the current batch of samples.

Easy troubleshooting

If you ever need to check the instrument status or troubleshoot the system in the unlikely event of an instrument problem, the virtual LEDs displayed on the Instrument Status page provide an immediate overview of the current status of the system. For more detailed guidance on the instrument status, access to diagnostics and causes of possible errors, check the interactive diagram of the Agilent 4100 MP-AES system. The current status is automatically updated when the system changes.



Figure 11. View the interactive Instrument Status page to check the current status of the instrument and identify causes of problems

GLP/GMP compliance

Agilent MP Expert software provides an easy-to-use interface that is adaptable from novice to power users, all the while assisting you to meet the requirements within your lab for GLP/GMP compliance. The Agilent MP Expert software provides user level control and password protection within the software, simplifying analysis, and restricting access to more advanced capabilities, such as method development. The software applets also allow the administrator to determine which methods the novice user can access.

To enable periodic performance testing of the instrument, you can select a suite of tests that are automatically run to verify instrument performance. At the completion of the test cycle, a report is automatically generated in PDF format.

Report Summary

Instrument Serial Number	Demo
Software Version	1.0.0.42228
Firmware Version	1.000
Tested By	Lorin
Test Completed On	13/09/2011 3:04:33 PM

Result Summary

Detector Read Noise Test	Pass
Dark Current Calibration Test	Pass
Wavelength Accuracy Test	Pass
Stray Light Test	Pass
Short Term Noise Test	Pass
Detection Limit Test	Pass

Figure 12. Periodically run instrument tests to confirm the instrument is working to specification. A report in PDF format is automatically generated.

Summary

With features such as application-specific software applets, an intuitive interface, and simple method development with automated optimization, the Agilent MP Expert software greatly enhances workflow in busy laboratories.

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