Executive Overview

Agilent
Trusted Answers

This is How You ICP-MS: Mastering the Art of Cone Performance

A guide to maintenance of ICP-MS instruments to help you achieve the best analytical performance

Introduction

Focusing in on the interface region, where the cones sit, analyte ions are produced within the plasma, which is at very high temperatures and atmospheric pressure. These ions must be transmitted into a mass spectrometer, which needs to operate at very low pressures. First, these analyte ions are sampled through the first cone (the sampling cone) before they enter a low-pressure interface region where the ions expand and are extracted by a combination of a second cone (the skimmer cone) and extraction lenses.

Figure 1 is a schematic of the interface region. The purpose of the extraction lenses and sampling cones is to get the analyte ions through to the reaction cell, then into the quadrupole in the mass spectrometer. As well as transitioning from atmospheric pressure to very low pressure, it is important to exclude any photons or neutral species that would contribute to background signal, and only transmit positively charged analyte ions through to the mass spectrometer. Agilent provides several software tools to optimize this ion transmission.

Startup procedure

This automatically takes you through optimizing the plasma parameters within the ICP, such as setting the axis of the torch, the nebulizer gas flow, and tracking the performance of the instrument under standard conditions. This provides a performance report, which is valuable information that can be tracked over the lifetime of your ICP-MS to provide a history, and to easily identify when things start going off-track.

Auto tune for lens and extraction parameters

This removes operator variations and ensures consistent performance from day to day, so the ion lens extraction provides best performance for your ICP. Agilent typically recommends that you select to run all of these startup procedures. Pulse/analog factors are usually set within your individual methods, because they need to be updated for the elements within that method. Then, tune both globally for the instrument and within each batch – so within each method that you are going to run.

Interface cones

Look more closely at the interface cones. These are key to the performance of the ICP-MS, and so should be inspected regularly, focusing particularly on the orifice. Agilent offers a handy magnifier tool for this purpose. This magnifier is illuminated, and provides 10x magnification, together with a measuring scale. You need to check that the orifice is clear, that it is still circular, and that the dimensions remain correct. The sampler cone should be one millimeter in diameter. If it is clogged, it should be cleaned, and if it is enlarged, it has come to the end of its useful life and should be replaced.

Some common interface cone issues can occur from mishandling or poor use. The cones themselves are very fragile, particularly the tip on the skimmer cone, which comes to a very fine point, so poor handling will cause problems. The tip should not be placed in contact with any surface during cleaning, removal, and reinstallation into the instrument.

The correct skimmer base for the skimmer cone must be used – the key thing to remember is the material that you are using. Nickel skimmer cones need to use a stainless steel skimmer base, and this is the default for an x-lens

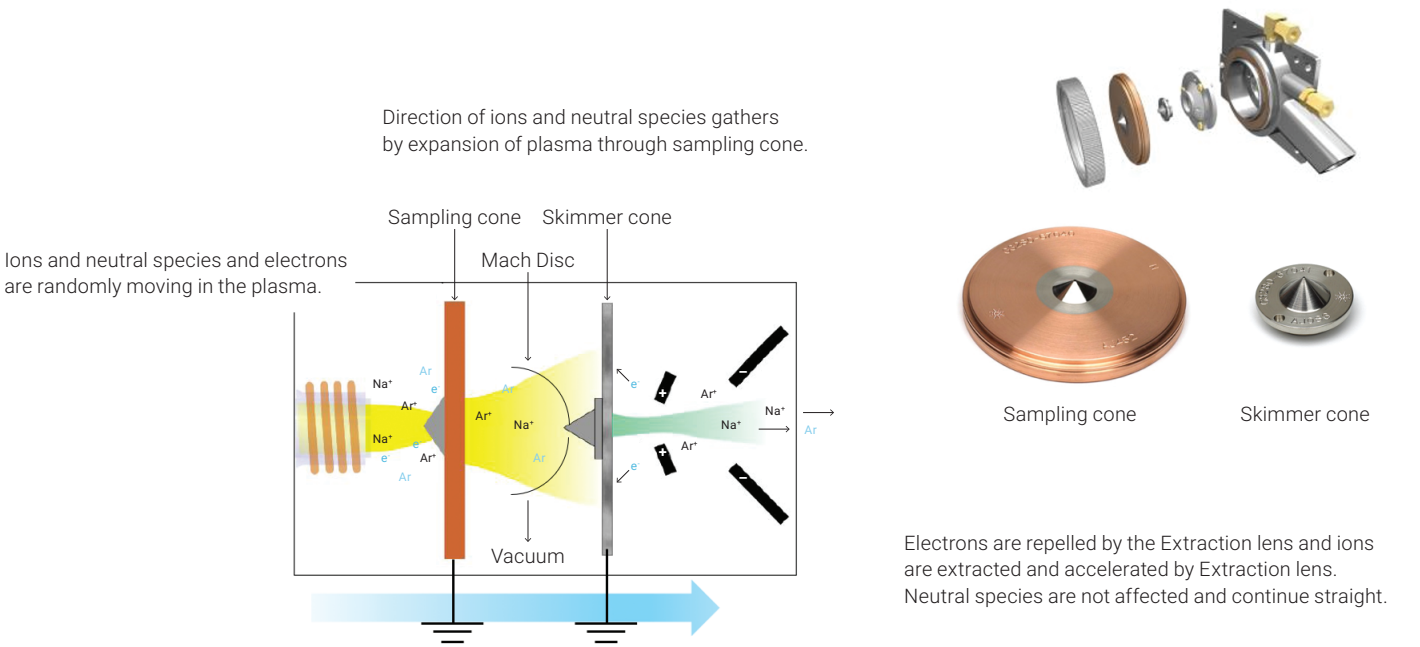

Figure 1. Schematic of the plasma/vacuum interface for the ICP-MS instrument, which extracts ions from the plasma and focuses them into the mass spectrometer and detector.

system. If you are using platinum cones, you need a brass skimmer base. This is Agilent's default for the semiconductor configuration instruments. It allows control of the tip temperature to prevent overheating, and ensures that the matrix deposits in a uniform manner on the tip.

There is a balance to be struck here as the cones should be maintained to ensure their performance, but they should not be cleaned any more than necessary. This is because any cleaning of the cones will reduce their lifetime. You must focus on the tip of the cone, especially the condition of the orifice – there is no need to clean and polish the face of the cone back to its original condition. The appearance of the cone face is essentially unimportant, but you need to ensure that the orifice is the correct dimension, is clear, and is the correct shape (Figure 2).

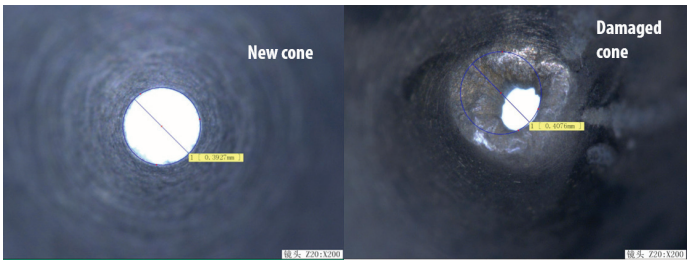

Figure 2. The overall condition, size, and shape of the orifice in the interface cones is critical to instrument performance.

Once new cones have been installed, or existing ones cleaned, they then need to be conditioned. This is recommended as it will reduce drift due to initial deposition of the sample matrix onto the clean cone surface. You are looking for an equilibrium with the matrix on the surface of the cone – a thin layer can lead to improved sensitivity because it lowers the background level, particularly with nickel and copper.

Agilent's default conditioning recommendation is to aspirate a 50 ppm calcium solution. This can be made up in 1% nitric acid, then aspirated for approximately 10 minutes. You should then follow with a rinse solution, for example with 1% nitric acid, for a further 10 minutes, and that will sufficiently condition the cone.

Practically, if you are running the same kind of sample matrix each day, you will be able to aspirate the typical matrix for your sample, for approximately 15 minutes, which can be performed as part of the instrument warmup. Ignite the plasma, aspirate a sample rather than just rinse, then follow this after the initial warmup with a blank or rinse solution for 10 minutes – this will condition your cone specifically for your analysis.

A third option is for environmental laboratories, where you can aspirate an interference-check solution (6020 Interference Check Solution A part no. 5188-6526). This should be diluted 10x by volume with ultrapure water, then aspirated for up to 30 minutes. The recommendation is to use general purpose plasma condition with auto tuning and no gas mode. Follow this with a 5% nitric acid rinse for 10 minutes.

As mentioned, make use of the instrument warm-up time, so you are not adding additional delay into your analysis. Figure 3 shows some nicely conditioned cones – this is the condition they should be in at the start of your analysis.

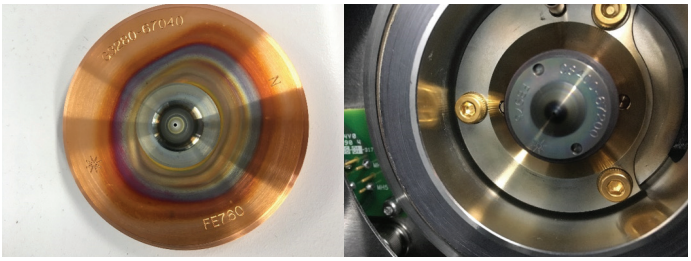

Figure 3. Cones should be conditioned prior to use to reduce drift during analysis. A properly conditioned cone should have a uniform coating on the surface.

So why and when do you need to clean the cones? It has been mentioned already that you should not over-clean the cones as this will reduce their effective life. When you see a reduction in sensitivity, poor long-term precision, or any elevated background due to your matrix, or nickel, or copper from the cone, that is typically the time to do some maintenance.

You may also notice changes to the interface vacuum. Typically, if the cones start getting clogged, or the orifice becomes blocked, the interface vacuum may change from its normal level, again indicating some maintenance is required. If the cones appear as shown in Figure 4 (compare with Figure 3), this indicates there is too much matrix deposited, particularly around the orifice, and this needs to be cleared.

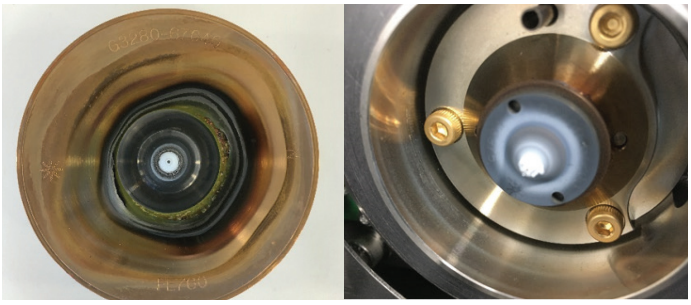

Figure 4. Excessive build-up of sample matrix on the cone is an indicator that the cones should be cleaned.

Remember, when you are cleaning cones, the aim is not to get them back to "as-new" condition – you are aiming for cones as shown in Figure 3, with a uniform deposit of matrix on the surface.

Agilent recommends a step-by-step procedure for cleaning the interface cones. Routinely, often all that is required is to ultrasonicate the cone in pure water. Agilent offers cotton swabs, which have a fine tip at the end, to allow cleaning of the back side of the cone and to make sure that the orifice is clear. You simply use these cotton swabs with water, then ultrasonicate the cones in pure water for at least five minutes (20 minutes is typical), then repeat as required. A good rule is to check that the water remains clean after sonication.

Next, and only if your application requires it, you can clean with a 2% Citranox solution. We recommend you sonicate for only 2 to 3 minutes, rinse the cone with pure water, then ultrasonicate in pure water for approximately five minutes to make sure all the Citranox residue is removed. For additional information visit www.agilent.com/en/product/atomic-spectroscopy/inductively-coupled-plasma-mass-spectrometry-icp-ms/icp-ms-resource-hub.

At that stage, most cones should be clean and back in use. For more severe contamination, after reinstalling the cone and checking sensitivity and performance for your analysis, Agilent recommends a more aggressive cleaning with 2% nitric acid. Do not ultrasonicate or soak the cones in acid because you can pit the surface of the cone from acid attack. Instead, dip a cotton swab in 2% nitric acid and use it to clean both sides of the cone. Then, rinse the cone in pure water, ultrasonicate it for a few minutes in pure water, then repeat that procedure to ensure any remaining acid residue is removed. Once the cones are clean and before reinstalling them, check the condition of the graphite gasket that sits behind the sampler cone – if it is deformed or torn, replace it.

Use the skimmer cone removal tool to install and tighten the skimmer cone – then refit the sampling cone with the retaining ring, which should only be hand-tight. The best way to make sure the installation is correct is to check that when you ignite the plasma it transfers happily to analysis mode. Also, understand the typical interface pressure on your system, and check this to confirm that the interface is running correctly.

Agilent has undertaken an in-depth study on the performance of its genuine Agilent cones for the Agilent 7900 ICP-MS using the x-lens configuration (these being the nickel sampler and the nickel skimmer cones), and to benchmark and compare with other cone manufacturers. The full article is here, but some of the main findings are highlighted below.

Figure 5 shows a comparison of the sampler and skimmer cone weights. You can see the Agilent cones on the left side, in comparison with cones from other manufacturers. The main takeaway is that the cones are all different, and they can be grouped by manufacturer. These differences may or may not create issues with performance, but it certainly indicates different manufacturing methods for the cones, and that they are not within Agilent specifications.

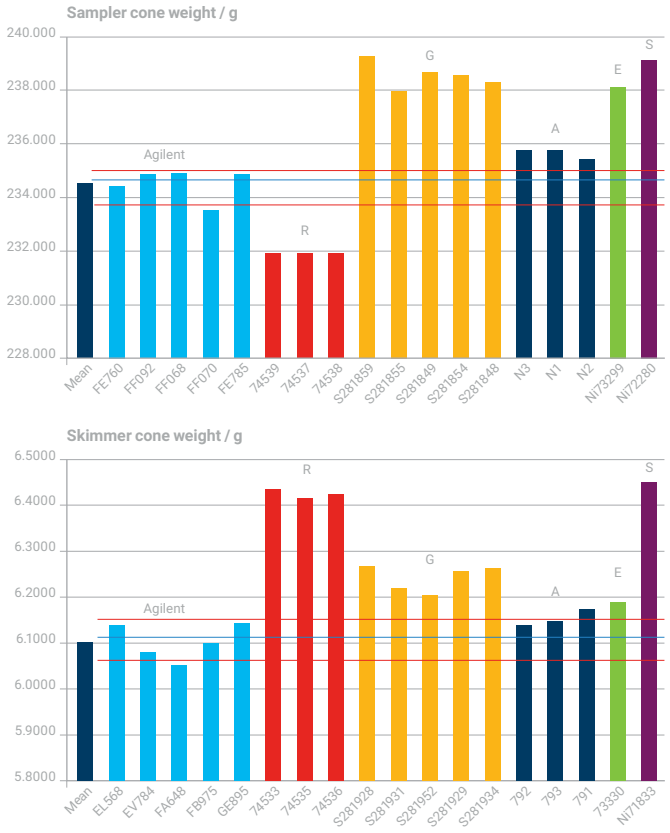

Figure 5. Comparison of weights for sampler and skimmer cones, as received from different manufacturers.

Figure 6 shows a sensitivity comparison with automated startup procedures and auto tuning for low-matrix conditions. Brand new cones out of the box are shown in the top plot, and it can seen that the Agilent cones (in blue) outperform third-party cones. The bottom plot in Figure 6 shows results after the conditioning procedure described earlier for environmental labs using the ICS standard. Agilent cones are really designed for these procedures, and provide the best sensitivity.

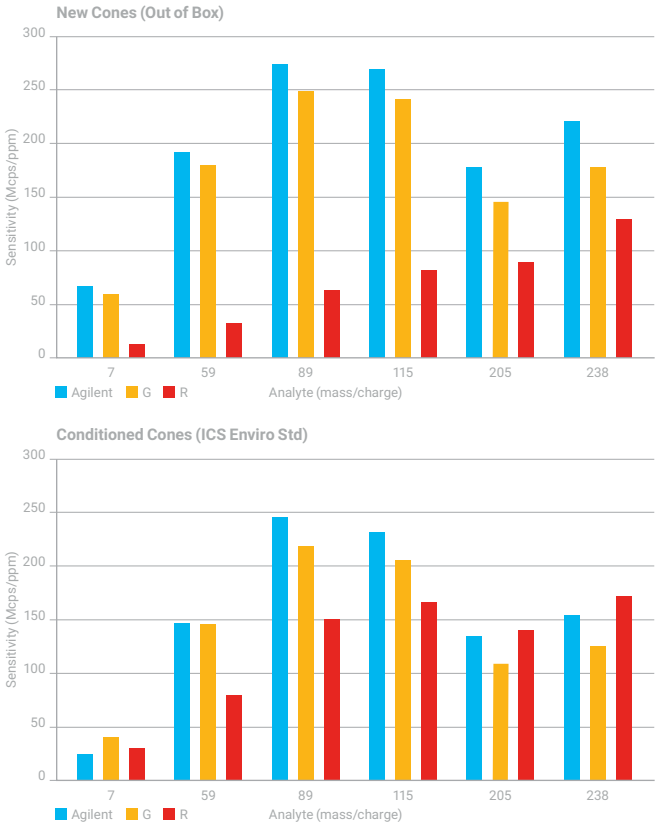

Figure 6. Comparative sensitivity of the 7900 ICP-MS for conditioned cones from each manufacturer.

We also investigated background. The background is very important, together with sensitivity, for Background Equivalent Concentration (BEC) levels. Figure 7 shows a comparison between a genuine Agilent cone for a full-mass scan versus the test sample for third-party cones. The blue lines indicate the levels that would be considered natural variation, and values above the upper level indicate an increased background at specific masses for the test cone. This was an example in no-gas mode, and it clearly shows that there is a number of masses that give a higher background with third-party cones.

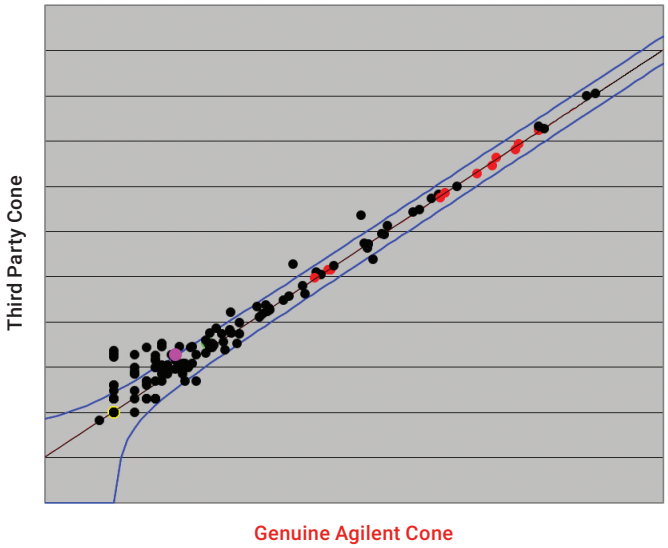

Figure 7. This scatter plot compares BEC levels for a third party cone with the Agilent cone. The values outside the blue lines signify increased background at those specific masses.

Similar results are seen in helium mode and using aerosol dilution, where for different manufacturers there is an elevation of background across the mass range, and between different manufacturers the same masses being an issue across those third-party cones – this affects the BECs you will find for your analysis.

Next, we looked at stability, both short-term (20 minutes), and long-term. All of the Agilent test cones generally meet the required specifications; one exception being for long-term stability with lithium, which is the most difficult element. Many of the third-party manufacturers suffer with lithium first, but there are a lot of failures across the board in terms of stability. Figure 8 highlights the worst-case scenario – the left side shows a typical two-hour stability trace expanded to show any variation, with the values plotted in percent RSD. We typically expect less than 3% RSD over this time period. On the right side, you can see significant instrument drift from a third-party cone. All cones were treated in exactly the same way, and conditioned with our recommended procedure for environmental labs, highlighting that you need to take more care when using a third-party cone.

Moving back to the selection of the right type of cone for your application (Table 1), Agilent offers several different materials to suit your particular needs. The default material is nickel in sampler and skimmer cones, for the x-lens systems, which are suitable for most common applications. Nickel gives good thermal and chemical resistance, and provides the most economical operation.

The sampler cone itself has a copper base, and Agilent recommend customers move to the nickel-plated copper base if they are routinely analyzing high-chloride matrices or using the aerosol dilution with HMI-plasma modes, which produces a hotter plasma. This gives you extra resistance to these conditions, and will give you a better lifetime for your sampling cones.

Agilent also offers platinum sampler and skimmer cones. These are default for the s-lens systems and semiconductor instruments. These are required for the analysis of aggressive acids, especially hydrofluoric acid, and Agilent also recommends this for organics analysis when you are using Oxygen-option gas to burn off the carbon load on the plasma.

Also available is a high-end platinum cone with a large insert, an 18 mm insert compared with the 12 mm standard insert, which is recommended for very aggressive acids such as sulfuric and phosphoric, due to the extra resistance. Typically, Agilent offers the copper base as the standard configuration, but also offers a platinum skimmer with a nickel base for organics analysis.

Recently introduced are three cone care packages. These are designed to provide everything required for maintaining the cones, including two sampler cones – you can choose from the standard nickel cones, which have a copper base, nickel-plated cones, or platinum cones. The kit includes a magnifier tool to help with cone maintenance and inspection, a pack of the cotton swabs, and gaskets for the sampler cones. More details can be found at www.agilent.com/cs/library/flyers/public/5991-8673_icpms_conecarekit_flyer.pdf

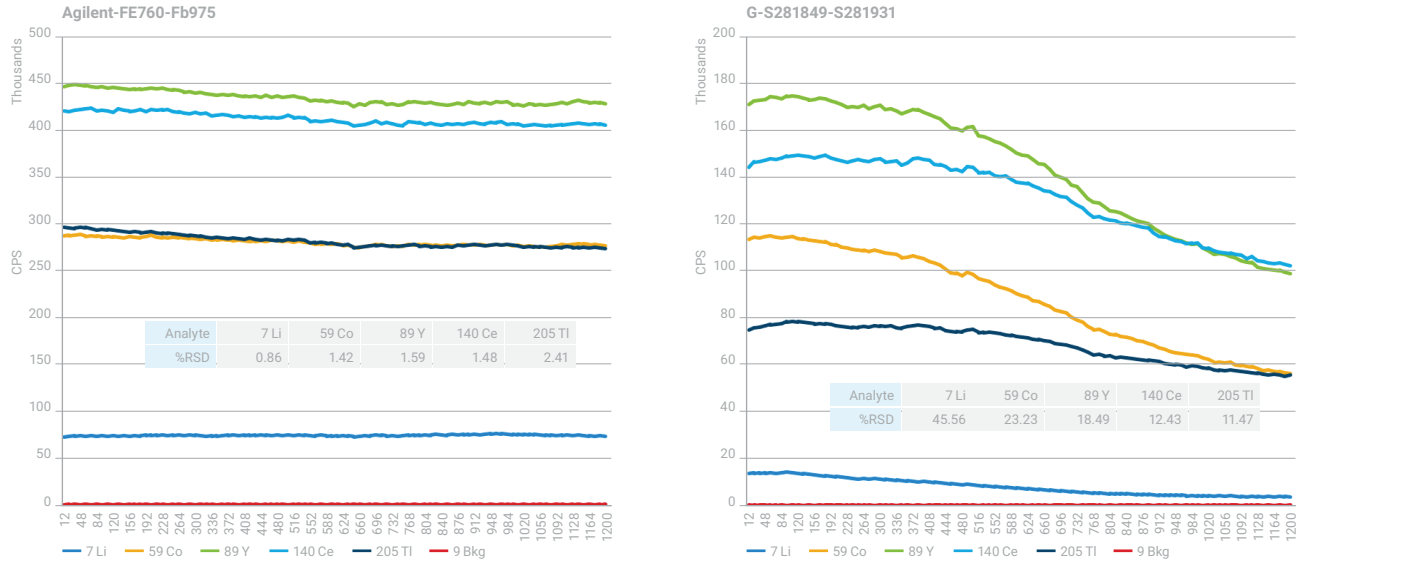

Figure 8. Long-term stability traces (over two hours after preconditioning) show that significant drift can occur with a third-party cone (right) compared to that for the Agilent cone (left).

Table 1. Select the right cone for your application.

Type of Cone	For which Model ICP-MS?	Skimmer Base Required	Recommended Applications
Nickel Sample/Skimmer Cones	Standard on 7500a/i/c/ce/cx, 7700x/e, 7800/7900 and 8800/8900 with x-lens	Stainless Steel	Suitable for most common applications. Good thermal and chemical resistance. Provides most economical operation. Typically use 3 to 5/year (based on ~350 samples/day)
Nickel Plated Sampling Cone	Optional for all 77/78/7900 and 88/8900 models	–	For samples containing > 0.5 % HCl, or for routine operation with (U)HMI with maximum aerosol dilution ratio
Platinum Sample/Skimmer Cones	Standard on 7500/cs, 7700s, 7900 with s-lens, and 8800/8900 semicon configuration. Optional for all other models.	Brass	Required for analysis of aggressive acids (esp. HF) and when O_2/Ar option gas is used for analysis of organic solvents. Use sample cone with larger 18mm insert for high viscosity and high boiling point acids e.g. H_2SO_4 or H_3PO_4
Platinum Skimmer with Copper base	Standard on 7700s, 7900, 8800/8900 semicon configuration and 8900c	Brass	Recommended for the lowest LODs and for higher matrix samples. Typically use 1 to 2/year (based on ~350 samples/day)
Platinum Skimmer with Nickel base	Standard on 8900m	Brass	Recommended for organics analysis

Skimmer cone, Nickel

Skimmer base, Stainless Steel

Skimmer cone, Platinum

Skimmer base, Brass

Agilent offers a recycling program for our platinum cones. This not only includes both cones, but also the torch shield, so you can return any used platinum cones to Agilent for a credit against future purchases of cones and torch shields. You can find more details at www.agilent.com/chem/Ptcone

Tips and resources

Finally, following are some tips, tricks, and resources to help you with your maintenance procedures, and for getting the best performance out of the ICP-MS.

Recommended end-of-day procedure

Follow these steps:

1. Aspirate acid rinse solution for a few minutes before shutting off the plasma. This helps to prevent sample deposition inside the nebulizer after the run.
2. Extinguish the plasma and switch off the chiller.
3. Remove the sample capillary from the rinse, start the pump again, and pump any remaining rinse solution from the spray chamber.
4. Release the pressure bars on the pump tubing and remove the bridges from the securing slot. Ensure that the tubes are no longer stretched over the pump rollers.
5. Empty the waste vessel.
6. Close the current worksheet – leave MassHunter S/W running.
7. Leave the main power on. This keeps the instrument in stand-by mode (ensures fastest start-up).

Maintenance schedule

The maintenance schedule is a daily check on the pressure on the gas lines, you will get alerts in the software if they fall below specified levels, but make sure you have a good control on your gas supply; check the peristaltic pump tubing, roll it between your fingers, make sure it is not flattened and is still elastic; visually check the glassware and all the connections within the sample introduction system, and have a look at the exterior of your sample cone, which you can see by opening the cover of the instrument, to make sure it has a good appearance, and there is not a high level of matrix deposited on the tip. As frequently as required, you need to replace peristaltic pump tubing (typically every week). Check the torch, check the recirculator, which can often be forgotten, and also check the rotary oil pump for the interface vacuum; check the oil level and the condition of the oil in terms of its color, and maintain it as required.

Early maintenance feedback

Agilent has software prompts to help with maintenance – early maintenance feedback (EMF). The EMF window shows usage of various components and predicts when to perform maintenance. This is typically used for the foreline pump, for which we recommend an oil change every six months, but this is fully customizable, so you can set limits once you have gotten used to your system (Figure 9).

You can also make use of the user log which, if you have multiple users, can be a convenient tool where you input what maintenance was done, and it automatically logs time and date, and that goes into the instrument history.

Key consumables for ICP-MS

To ensure you avoid any downtime make sure you have replacements for any glassware, e.g. torch, spray chamber, nebulizer (because they can be broken during replacement), tubing connectors, and interface cones. Do not forget anything associated with the autosampler (sample tubes, racks, probes and transfer tubing), or if you are using the switching valve system (ISIS system), keep the tubing and connectors for this as well.

To simplify your ordering and make sure you have these essential supplies to hand, Agilent produces customizable and basic kits for the typical components needed for 12 months of operation of your ICP-MS. There are kits for different models, and you can choose supplies to suit the configuration of your ICP-MS as well, including what type of cones you require. You can find more information at www.agilent.com/cs/library/brochures/ICP-MS_Suppplies_Kit_5991-5006EN_Brochure.pdf

Prepare accurate standards

ICP-MS provides ultra-trace detection across a wide mass range, ideal for environmental analysis, clinical testing, semiconductor QC, and pharmaceutical compliance. Its extreme detection capability, down to parts per trillion (ppt), means that even minor errors in calibration standards can severely impact data accuracy. Matrix mismatches, standard contamination, or trace impurity interference can lead to false positives, poor recoveries, or ion suppression. In high-throughput or regulated labs, this can lead to poor recoveries, invalid data, or costly sample reruns.

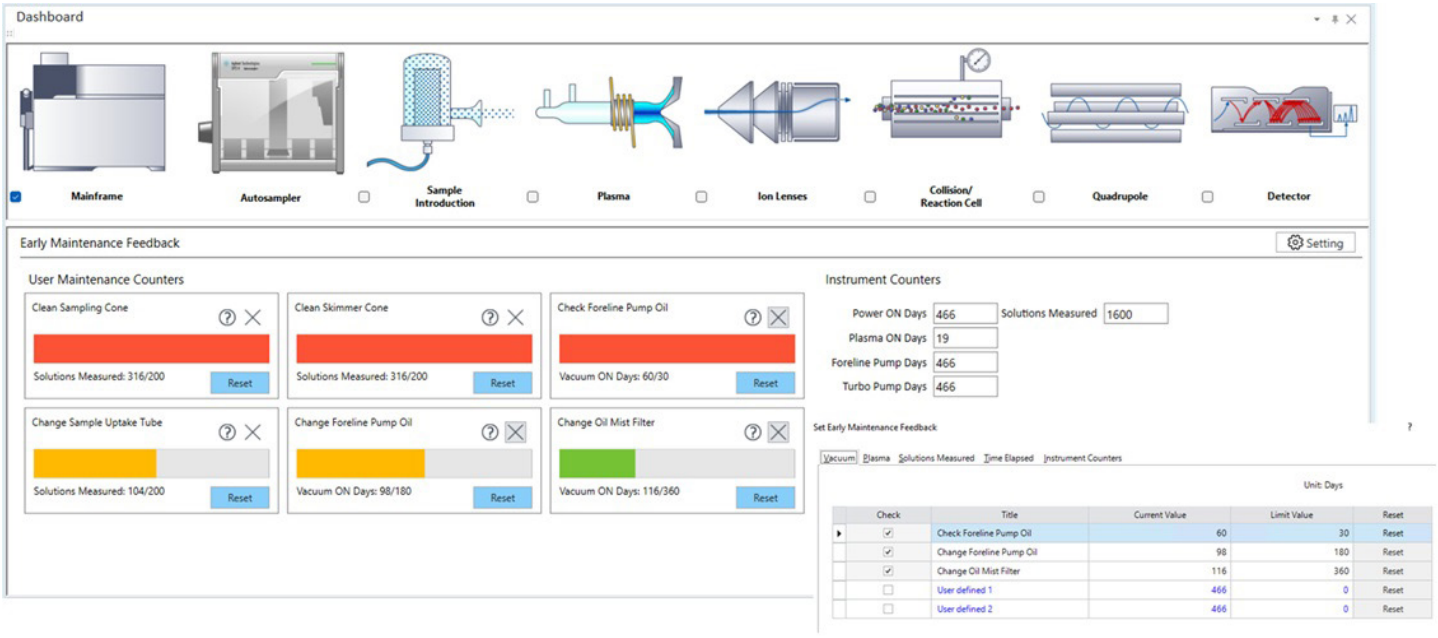

Figure 9. The Early Maintenance Feedback (EMF) function of Agilent ICP-MS instruments uses a range of sensors and counters to highlight when maintenance tasks are required.

What are the different quality standards (RM versus CRM)?

In atomic spectroscopy workflows, both Reference Materials (RMs) and Certified Reference Materials (CRMs) are valuable, depending on the precision required. When choosing a standard, it is important to understand the distinction between RMs and CRMs.

Both RMs and CRMs are tested using high-performance instrumentation and come with a Certificate of Analysis. One major difference is that CRMs are subjected to additional quality control steps, including testing for homogeneity and long-term stability (typically over 2 to 3 years). CRMs are then certified for homogeneity and long-term stability, making them essential for high-precision applications and or for regulated methods where full traceability and defined measurement uncertainty are required.

RMs are manufactured in the same ISO 17025 and 17034 accredited facilities as CRMs, ensuring they are traceable, tested, and a cost-effective alternative for routine analysis, method development, or internal quality control checks where enhanced homogeneity or stability testing past their shelf life is not critical. Choosing the right level of certification depends on whether your lab needs ISO/IEC 17025 traceability and regulatory compliance or simply reliable, consistent performance.

Agilent standards manufacturing process

Agilent CRM and RM standards are formulated and manufactured using rigorous quality controls to ensure exceptional purity, accuracy, and full traceability. All standards are gravimetrically prepared using ultra-pure raw materials and typically validated for trace-level impurities using Agilent ICP-MS systems. Production occurs in ISO-9001 certified facilities, with testing performed in ISO/IEC 17025-accredited laboratories. Certification complies with ISO 17034 guidelines, ensuring traceability to the NIST SRM 3100 series elemental standards. The final products are packaged in acid-leached, pre-cleaned HDPE bottles and sealed in protective bags to guard against contamination during shipping and storage. All RMs and CRMs are backed by stability studies demonstrating a shelf life of one year or more. RMs and CRMs are both supplied with a comprehensive Certificate of Analysis (CoA) with certified concentrations. The CoA for the CRMs provides expanded data, including measurement uncertainty and trace impurity levels for up to 68 elements.

Tips for preparing standards for your workflow

Proper preparation of calibration standards is critical to ensuring accurate, reproducible, and traceable results with your analyses. Even small mistakes with dilution, storage, or matrix matching can introduce significant errors, especially when working at trace concentrations or with complex sample matrices.

Follow these essential lab practices when using or preparing standards to help improve the accuracy and reliability of your calibration standards:

- **Use in-date standards:** Always check and use standards within their expiration date (especially important for low-concentration or organic-based solutions). Expired standards may have low concentrations due to degradation or precipitation.
- **Calibrate pipettes and glassware:** Regularly calibrate and verify your pipettes and glassware. Regular verification ensures accurate volume delivery and minimizes dilution errors.
- **Perform serial dilutions:** Avoid large single-step dilutions to reduce errors. Use intermediate dilution steps to improve accuracy and reproducibility
- **Stabilize working standards:** Acidify your prepared standards using the appropriate acid, based on the analyte, to stabilize metal ions and extend shelf life. Follow supplier guidance on acid type (e.g. HNO_3, HCl, HF, or mixed acids), concentration and compatibility.
- **Matrix match:** Prepared calibration standards should closely match the acid matrix in which your samples are prepared to avoid ionization or other enhancement/suppression effects in the atomizer.
- **Storage:** Store your prepared standards in pre-cleaned, high-purity HDPE or PFA containers. Avoid glass containers to prevent contamination and adsorption losses.
- **Reduce contamination risks:** Use only natural (uncolored) pipette tips to avoid trace metal contamination (especially for elements such as zinc, cadmium, and iron).
- **Prepare fresh standards as needed:** Prepare fresh standards frequently (daily for ultra-trace work). This is particularly important for volatile or unstable elements, or when working at trace concentrations (< 1 ppm).
- **QC Checks:** Include reagent blanks with each batch to check for potential background contamination. Use spike recoveries and matrix spikes to confirm method performance and identify matrix effects.

Reducing potential contamination

Contamination can distort sensitivity and skew calibration curves. It can occur at any point in the workflow: storage, handling, digestion, dilution, or measurement. Common sources include working with poor quality (impure) reagents, improperly maintained water systems, colored pipette tips, or leachable elements from solutions stored in glassware. Cross-contamination between high and low concentration standards can also occur.

Follow these essential lab practices when using or preparing standards to help minimize contamination:

- **Review the CoA:** Always check the CoA for every reagent and consumable used during sample preparation for potential contaminants. Even between different batches of the same product, impurity levels can vary significantly.
- **Use ultra-pure 18.2 MΩ·cm deionized water.**
- **Use natural (uncolored) pipette tips:** While colored tips may add interest in the lab, use only natural (uncolored) pipette tips to avoid trace metal contamination (especially for elements like zinc, cadmium, and iron).
- **Validate digestion workflows:** Choose your digestion method (microwave, hot-block, acid) based on sample matrix and target analytes. Verify accuracy by running a CRM through the full digestion and analysis workflow to verify recovery and accuracy.
- **Use QC checks in each batch:** Include reagent blanks with each batch to check for potential background contamination. Use spike recoveries and matrix spikes to confirm method performance and identify matrix effects.

Why select Agilent standards?

Agilent standards are trusted worldwide for their exceptional purity, traceability, and performance. Offering both single- and multi-element RMs and CRMs, Agilent supports a wide range of applications, including heavy metals in wastewater, nutritional elements in food, and wear metals in petroleum products. Agilent also offers specialty metallo-organic, biodiesel, and solvent-based standards, along with tuning and wavelength calibration solutions to verify instrument performance.

In addition, Agilent can offer custom inorganic standards allowing you to order the exact elements required in the concentrations needed, together with the matrix that you want those standards in, with assured fast delivery. Custom standards are manufactured to your specific requirements, then are qualified and certified by our team of expert chemists in our ISO 9001, 17025, and Guide 34 accredited facility.

Sourcing your standards from a trusted provider like Agilent is essential. Backed by detailed impurity profiles, NIST traceability, and rigorous quality control, Agilent delivers consistent, reliable standards to ensure confidence in your analytical results.

Agilent ICP-MS Online Resource Library

The focus of this overview is education, to ensure you get the best out of your instrument and do not suffer from problems. As part of this educational effort Agilent has developed a dedicated web page – ICP-MS Online Resource Library – where you will find links to videos which guide you through maintenance procedures, plus tips and tricks, and other literature to assist you with making sure that your ICP-MS runs trouble-free.

The Agilent Atomic Spectroscopy Lineup

Figure 10 highlights Agilent's atomic spectroscopy instrumentation lineup. Driven by insights from customers from around the world, Agilent has created an innovative atomic spectroscopy portfolio – spanning instruments, consumables, standards, services, software, and more – to bring that confidence to your lab. Agilent offers a comprehensive range of instrumentation ranging from flame AA systems all the way through to high-end ICP-QQQ ICP-MS that provides MS/MS capability to enable unique control of interference removal in reaction mode. Regardless of the technique that you are working with, regardless of the type of analyses that you are doing, you can be confident that Agilent will have the products that you need for your particular application.

Figure 10 . Agilent's atomic spectroscopy instrumentation lineup.

Summary

Most of the failures with an instrument occur in the sample introduction area, so ensure you pay attention to your interface cones, pump tubing, drain, torch, spray chamber, and nebulizer, to achieve good day-to-day instrument performance. Below is a list of resources to help you navigate your ICP-MS work most effectively:

- Agilent Atomic Spectroscopy YouTube Channel
- ICP-MS parts and supplies
- Agilent ICP-MS application notes
- Essential ICP-MS Instrument Supplies (lists most common consumable items)
- Agilent Spectroscopy consumables catalog
- Agilent high quality Inorganic and Metallo-Organic standards for Atomic Spectroscopy
- Agilent recorded webinars for atomic spectroscopy

Agilent also produces the quarterly Agilent ICP-MS Journal (www.agilent.com/en-us/newsletters/icpmsjournal), which has real-world applications, updates, and it is a useful source of information for ICP-MS users. You can subscribe by clicking the blue link above.

Finally, know that Agilent expert staff are on hand if you need any assistance, specific advice about your application, or details on your instrument. There is also the Agilent University (www.agilent.com/en/technology/agilent-university), particularly for training new staff, or new users in this technology. On offer is preventative maintenance on all Agilent instruments to make sure they are in the best operating conditions, and Agilent can offer method and application consulting specific to your needs.

Agilent CrossLab

From Insight to Outcome

Agilent CrossLab: Real insight, real outcomes

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