Guidelines for Trouble Shooting and Maintenance of ICP-MS Systems

Presented by Dr. Gareth Pearson
ICP-MS Supplies Product Manager
The Agilent Atomic Spectroscopy Lineup
An Instrument for Any Customer Application!

55B Flame AA
240FS/280FS Flame AA
240Z/280Z Furnace AA
4210 MP-AES

5110 ICP-OES
7800 ICP-MS
7900 ICP-MS
NEW! 8900 ICP-QQQ

Leading the way in atomic spectroscopy innovation
www.agilent.com/chem/atomic
Agilent ICP-MS at a Glance

**Quadrupole ICP-MS (ICP-QMS) Agilent 7800 and Agilent 7900**
- High matrix tolerance with HMI/UHMI
- He mode removes common polyatomics
- Wide dynamic range
- Applications from routine to research

**Triple Quadrupole ICP-MS (ICP-QQQ) Agilent 8900**
- MS/MS for controlled reaction chemistry
- Unmatched interference removal
- High sensitivity and low backgrounds
- Superior Abundance Sensitivity

Agilent 7800 and 7900 ICP-MS

Agilent 8900 ICP-QQQ
Top 5 Tips for Flawless ICP-MS Performance

1. Prevent nebulizer blockage
2. Pay attention to the interface cones
3. Keep it clean
4. Set high standards
5. Don’t neglect the pump tubing
1. How to Prevent Nebulizer Blockage?

Micro-flow nebulizers
- Zero tolerance to undissolved solids
- Plugging of annulus and/or capillary

Rinse at least 10 minutes with a reagent blank before extinguishing plasma

Filter/Centrifuge/gravitational settling
Use only lint less wipes
Autosampler enclosures
Autosampler probe height

Think “PREVENTION”
Improve Efficiency of Sample Filtering

Most users should filter samples prior to analysis
  • Reduces maintenance and downtime from blockages in the sample introduction system

Agilent Captiva syringe filters provide an efficient solution
  • Captiva filters provide the industry’s highest flow rates and loading capacities
  • Available in a variety of membrane types and pore sizes, to suit your application
  • Recommended for spectroscopy applications:
    – Captiva Premium, 100/pk
    • PTFE, 0.45um Pore, 15mm dia. (5190-5085) or 25mm dia. (5190-5087)
    – Captiva Econofilters, 1000/pk
    • PTFE, 0.45um Pore, 13mm dia. (5190-5266) or 25mm dia. (5190-5268)

Instructions for use – Captiva Syringe Filters

Follow these steps to realize the full benefits of filtration

Before filling with sample, draw approximately 1 mL of air into the syringe. This will minimize fluid retention.

Draw your sample into the syringe, then draw in about 1 mL of air. Invert the syringe and wipe residue off tip.

Connect the syringe to the syringe filter using a luer connection. Twist gently to ensure a secure seal.

Filter syringe contents into a vial. Afterwards, remove the syringe filter, draw air into the syringe, re-attach the syringe filter, and press the plunger to filter the residual sample. This will maximize sample recovery.

**Warning:** Use caution with syringes smaller than 10 mL. They can easily generate enough pressure to burst the syringe filter. Agilent syringe filters are for laboratory use only. Pre-wetting the filter, while not mandatory, can be performed as an extra step.

Improve Efficiency from Digestion to Filtration to Analysis

The FilterMate™ Filtration System provides a convenient, economical method for digestion, filtration and analysis, improving sample preparation efficiency by eliminating transfers.

- Weigh sample directly into the vessel and use the graduations to accurately add reagents
- Digest in the Hot Block, Dilute to volume, Filter directly and place on the autosampler rack for analysis

190048000 FilterMate™ 2 micron PTFE, 100/pk
190048100 FilterMate™ 0.45 micron PTFE, 100/pk
190047900 Digestion Tubes, Polypropylene for 36- and 54-well hot block, 500/pk

Cleaning the Nebulizer

Never sonicate or attempt to clean with wire!

For normal cleaning:
• Soak in 5% nitric acid for ~10 mins.

To remove a nebulizer blockage:
• Use a dedicated nebulizer cleaning tool to force methanol solution through the tip; OR
• Reverse pump the nebulizer with the tip in solvent; OR
• Apply suction from the wide end of the capillary using a vacuum aspirator; OR
• Apply high pressure clean air via a tubing snugly fitted over the nebulizer tip (use with caution)

For salt deposits:
• Soak the nebulizer overnight in a beaker of 25% alkaline lab detergent. Rinse with pure water

For “stubborn” deposits:
• Soak the nebulizer overnight in conc. nitric acid. Use a pipette to ensure there are no air bubbles in capillary. Rinse with pure water


Pay attention to the Interface Cones

• Visually inspect the cones
  - Agilent’s LED measuring magnifier (pn 5190-9614) is a tool to help user’s achieve optimum ICP-MS instrument performance and maximum cone life

• ICP-MS users can use the magnifier to:
  - Visually inspect a cone to evaluate its condition (e.g. check for excess matrix build-up at the tip)
  - Check if a cone has a damaged orifice and needs to be replaced (e.g. enlarged or damaged orifice)
  - Confirm if maintenance procedures and cleaning have been successful
Why and When to Clean Your Interface Cones?

The necessity to clean the cones depends on your (in)tolerance limits for:

- Sensitivity
- Long term precision
- Elevated background (cps)
- Interface vacuum changing

Other reasons to clean the cones?

- If there is an excessive build up of deposits on the orifice (should be circular and free of deposits)
- If the orifice of the cone is blocked / non-circular / unusually discolored

If analyzing the same type of samples, clean to remove only superficial deposits. Ultrapure water clean may be all that is required.

A conditioned cone has a uniform coating that leads to long term stability.

If analyzing different sample types where a major element in the first sample type is a trace element in the second, more than one cleaning step is required.
What’s the Right Way to Clean Interface Cones?

Routine Cleaning:
Simple clean with pure water
• Dip a cotton swab (pn 9300-2574) in pure water and clean both sides of the cone
• Rinse with pure water
• Ultrasonicate the cones in pure water for >5 mins (typ. 20 mins)
• Repeat as required (aim for water to stay clean)

Only if performance is still not satisfactory, clean with a 2% Citranox solution (pn 5188-5359) (NOT MORE THAN 2%)
• Ultrasonicate in a 2% Citranox solution for max. 2-3 mins
• Rinse with pure water
• Ultrasonicate in pure water for >5 mins

What’s the Right Way to Clean Interface Cones?

ONLY For more severe contamination:

Clean with a 2% nitric acid solution
• Dip a cotton swab in 2% HNO₃ and clean both sides of the cone (DO NOT SOAK IN ACID)
• Rinse with pure water
• Ultrasonicate in pure water for 2 - 3 mins
• Rinse with pure water
• Ultrasonicate again in pure water for an additional 2 - 3 mins

Re-installing the Cleaned Cones

• Check the condition of the graphite gasket and replace if necessary
• Refit the skimmer cone using the removal tool
• Refit the sample cone and tighten by hand
• Check the vacuum levels to confirm correct installation
  – Interface pressure: 500 Pa (~4 torr, 0.005 atm)
  – Analyzer pressure: 0.002 Pa (~1.5 x10⁻⁵ torr, 2 x10⁻⁸ atm)
Common Interface Cone Issues

Cones are fragile (esp. skimmer cone) – Handle with care!
  • Poor handling, harsh cleaning or physical abuse can irreversibly damage cones
  • Never place tip down on any surface or during cleaning
  • Don’t try to clean back to original condition

Check that you’re using the right skimmer base
  • Increases deposition on the cone
  • Using the wrong skimmer base can overheat and damage the cone
    – Ni cones – use the stainless steel base
    – Pt cones – use the brass skimmer base

Condition new or cleaned cones prior to use
  • Reduces drift due to initial deposition of sample matrix on the clean cone surface
  • Aspirate your highest matrix sample for >30mins and then your blank / rinse solution for 10 mins.
  • Alternatively aspirate 6020 Interference Check solution A (pn 5188-6526) diluted 10 times in General Purpose mode for 30 mins.; follow with a 5% HNO₃ solution for 10 mins.
Choose from three Cone Care Kits—each includes our LED measuring magnifier

Nickel Cone Care Kit (Part No. 5057-0254)

Nickel-plated Cone Care Kit (Part No. 5057-0255)

Platinum Cone Care Kit (Part No. 5057-0256)

Each kit contains:

- 2 sampler cones
- 1 LED measuring magnifier
- 1 package of sampling cone graphite gaskets (3/pk)
- 1 package of cotton swabs for cleaning (100/pk)

Order now
Order now
Order now

Remember...
You can save 25% on all skimmer cones ordered with any Cone Care Kit

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<th>Type of Cone</th>
<th>For which Model ICP-MS?</th>
<th>Skimmer Base Required</th>
<th>Recommended Applications</th>
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<td>Nickel sample / skimmer cones</td>
<td>Standard on 7500a/i/c/ce/cx, 7700x/e, 7800/7900 and 8800/8900 with x-lens</td>
<td>Stainless steel</td>
<td>Suitable for most common applications. Good thermal and chemical resistance. Typically use 3-5/year (based on ~350 samples/day)</td>
</tr>
<tr>
<td>Nickel plated sampling cone</td>
<td>Optional for all 77/78/7900 and 88/8900 models</td>
<td>-</td>
<td>For samples containing &gt; 0.5% HCl, or for routine operation with (U)HMI with max. aerosol dilution ratio</td>
</tr>
<tr>
<td>Platinum sample / skimmer cones</td>
<td>Standard on 7500s/cs, 7700s, 7900 with s-lens, and 8800/8900 semicon configuration.</td>
<td>Brass</td>
<td>Required for analysis of aggressive acids (esp. HF) and when O₂/Ar option gas is used for analysis of organic solvents</td>
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<tr>
<td></td>
<td>Optional for all other models</td>
<td></td>
<td>Use sample cone with larger 18mm insert for high viscosity &amp; high boiling point acids e.g. H₂SO₄ or H₃PO₄</td>
</tr>
<tr>
<td>Platinum skimmer with Copper base</td>
<td>Standard on 7700s, 7900, 8800/8900 semicon configuration and 8900c</td>
<td>Brass</td>
<td>Recommended for the lowest LODs and for higher matrix samples. Typically use 1-2/year (based on ~350 samples/day)</td>
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<tr>
<td>Platinum skimmer with Nickel base</td>
<td>Standard on 8900m</td>
<td>Brass</td>
<td>Recommended for organics analysis</td>
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SAVE MONEY AND REDUCE YOUR ENVIRONMENTAL IMPACT WITH THE AGILENT PLATINUM CONE TRADE-IN PROGRAM

Agilent ICP-MS Platinum Cones – cut costs & go green by returning your used cones

- ICP-MS interface cones are expensive and need regular replacement
- User’s purchasing new Agilent platinum cones can return their used cones
- You can receive a trade-in credit on your order
- The value of the credit is based on the reclaim value of the platinum
- This program lowers the net cost of purchasing a new cone, and enables recycling of the precious Pt metal in the cone

http://www.agilent.com/chem/Ptcone
Keep it clean
Sample Introduction System

Spray chamber

Routine cleaning:
• Soak the end cap and spray chamber in 5% nitric acid or Citranox for >30 mins
• Rinse, dry and refit

If you see precision problems or droplet formation on the walls of the spray chamber (beading):
• Soak overnight in a 25% detergent solution
  – Best to leave it soaking for 24 hours
  – Use any laboratory detergent e.g. Fluka RBS25, Triton X-100, Decon 90 etc.
Cleaning the Torch

Visually check the torch, bonnet and shield when removing the torch
• Replace if deformed or chipped

Do not sonicate!

For routine cleaning:
• Soak in >5% nitric acid for ~30 mins

For more stubborn stains:
• Soak in bleach (e.g. Chlorox ©) overnight
• Soak in aqua regia (1:3 HNO₃:HCl)

For salt deposits:
• Rinse with water to remove deposits
• Soak the torch overnight in a beaker of 25% Fluka RBS-25 detergent

Rinse and allow to dry

Caution! Reinstall only when dry

Torch damage due to incomplete drying
Re-installing the Torch

Refit the torch shield & torch bonnet

Replace the torch into the torch holder

Ensure the torch projection fits into the slot on the torch holder

Can check the alignment of the RF coil when re-installing the torch

Reconnect gas fittings and transfer tube from spray chamber

Check torch alignment – esp. sampling depth (z position)

Test plasma ignites and instrument switches to “analysis” mode

• If plasma fails to ignite, check all connections for possible air leaks
Set high standards
Prepare accurate standards using Certified Reference Materials

Most atomic spectroscopy techniques need a standard of “known” composition to calibrate the instruments; then you can determine the “unknown” in your sample.

The result of your analysis is largely dependent on the accuracy of your “known” standard.

Errors during preparation or contamination of your “known” standard leads to:
- Inaccurate results
- Lost time through trouble shooting
- Instrument downtime
- Preparation of new standards and re-analysis of samples
- Premature replacement of instrument supplies
- Failed audits & potential loss of ISO accreditation

What's in my sample?

How can I be sure these results are accurate?

I don’t have the extra time or money to redo this work...
I can't risk my results by using inaccurate standards!
# The Value of Agilent’s Certified Reference Materials

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<th>Highest ISO Accreditation!</th>
<th>• Manufactured in an ISO 9001, ISO Guide 34 facility and certified in an ISO 17025 testing laboratory</th>
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<tr>
<td>High purity</td>
<td>• Manufactured from high purity raw materials and solvents which are tested for impurities</td>
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<tr>
<td>NIST traceable</td>
<td>• Certified using the NIST high performance ICP-OES test protocols</td>
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<td>• Directly traceable to the NIST 3100 Series of SRMs</td>
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<td>Contamination free</td>
<td>• Packaged in pre-cleaned, high purity HDPE bottles</td>
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<td>• Shipped in poly sealed bags</td>
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<td>Long shelf life</td>
<td>• Most offer a shelf life of 18 months</td>
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<td>• Supported by short and long term stability studies</td>
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<tr>
<td>Thorough confirmation</td>
<td>• Trace impurities assayed using Agilent ICP-MS</td>
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<td>• Actual concentration reported on CoA for up to 68 trace impurities</td>
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**Agilent Certified Reference Materials**

**HIGH QUALITY INORGANIC AND METALLO-ORGANIC STANDARDS FOR ATOMIC SPECTROSCOPY**

The Measure of Confidence
Custom Inorganic Standards for ICP-MS, ICP-OES, AA, and MP-AES

Design your own standard for your unique sample and Agilent experts will guide you through stability and compatibility while maintaining the highest quality for precise, accurate calibration data.

All custom standards are of the highest quality - manufactured in an ISO Guide 34 facility and certified in an ISO/IEC 17025 testing laboratory. Each standard will be accompanied with Certificate of Analysis (CoA) highlighting ISO conformity, actual concentration, measurement uncertainty, and NIST traceability.

All Agilent’s Certified Reference Materials can be used with Agilent, or any other brand (PerkinElmer, and Thermo) instruments.

To Submit a Custom request (For US/Canada Only):

1. Complete the order form for a quote. Please complete all fields in the form.
2. Submit form by using “E-mail this form” button in the order form. This button compiles an e-mail message, which can be sent immediately

Tips to Improve Standard Preparation

How are they prepared?
- Ensure purchased standards are still within “Use By” date
- Avoid all use of glassware for ICP-MS
- Perform dilutions by weight using a 4-decimal place balance
- Use calibrated pipettes and class ‘A’ volumetric flasks for dilutions
  - Calibrate and Periodically, check accuracy & reproducibility of your pipettes
- Use de-ionized water (Type I - conductivity > 18 MΩ/cm³)
  - Lower grades may have contamination
- Use serial dilutions for preparing low concentrations from 1,000 ppm stock
  - Please don’t do large dilutions (> 1:10,000) in 1 step

What concentration are they?
- Low concentration standards have a finite life
  - Prepare ppb and sub ppb (µg/L) concentration standards daily from high conc. stock
  - Prepare low ppm (mg/L) concentration standards weekly

How are they stored?
- Plastic vessels ensure better stability (PFA or FEP)
- Stabilize with acid – low pH ensures better stability
Tips to Improve Accuracy of Results

Sample preparation

• Is the most appropriate digestion being used?
• Are all of the analytes being quantitatively (and reproducibly) extracted and dissolved?
  – Many digestions are only partial extracts – efficiency will vary with the sample matrix
  – Some volatile analytes may be “lost” during digestion
    • Confirm by taking a solid certified reference material through your preparation and analysis procedure

• Is the digest stable – or are you seeing any precipitates or a suspension?
• Do you see any potential contamination from either reagents or the digestion equipment? e.g. especially with Si, B or Ca
  • Include a “Reagent Blank” with every sample batch to monitor
Tips to Reduce Contamination

Contamination can come from anything that comes into contact with your sample during storage, digestion (dilution) and analysis

- **Check reagent purity**
  - Always buy the best reagents – use high purity or ICP-MS grade
  - Always check the certificate of analysis for elevated levels
  - Caution if buying in large quantities
    - Worst case – can use contaminated acid for cleaning
    - Ensure still within “use by” date
    - Reseal immediately after use

- **Other common contamination sources**
  - Reagent water
  - FEP containers preferred
    - Borosilicate glass can contribute Boron contamination
  - Airborne dust in the lab.
  - Pipette tips
    - Don’t insert pipette tips into your acids
    - Use natural tips – colored tips may increase contamination (esp. with Cu, Fe, Zn, Cd)
  - Powdered gloves (esp. for Zn)
Don’t neglect the pump tubing

Tubing diameters
• Waste to be larger ID than sample ID

Chemical compatibility
• Ensure tubing is resistant to the solvent being used

Replace frequently
• Pre-clean new tubing to remove potential contamination
• Using “old” tubing can lead to problems with precision and stability
  – Can also contribute to nebulizer blockage (if inside lining breaks down)
• Typical lifetime is ~5 days based on normal 8 hour working day
  – Detach from tube holder after use – allows tube to “relax”

Maintaining tubes – What to check?
• Check 2 key things on pump tubing
  – Roundness of tube – should not be any “flat” spots
  – Tubing should still be elastic – replace if obviously stretched
• Don’t over tighten – just need smooth and even sample flow

Remember to check other tubing for wear, leaks and crimps
Peri Pump Tubing Tips

Symptoms:
Peri pump tubing that looks/feel worn or has a strange colour

IF IN DOUBT, CHANGE IT

Erratic liquid flow
  • Check tension from clamps

Bubbles in the liquid stream
  • Check all gas fittings, tubing and connectors – deposits, burrs, damage

Spurting Nebuliser or disconnecting tubing segments
  • Plugging in the transfer line. Requires cleaning or replacement.

Bad recovery or carryover on “indicator” elements that tend to become unstable first when the pump tubing has got an “active” coating.
  • Ag and PGE (Platinum group elements. Ru, Rh, Pd, Os, Ir, Pt)
ICP-MS – Potential Autosampler Issues

More customers use autosamplers for automation

Issues to consider:

• Longer transfer tube between sampler and ICP-MS
  – May need to program a longer sample uptake delay
  – May exacerbate problems with memory effects

• Ensure probe diameter is appropriate for sample matrix
  – Use wider bore for high % TDS or viscous samples

• Sample stability - potential for sample changes while uncovered in racks – impacts accuracy
  – Dust ingress can introduce contamination
  – Sample evaporation may occur during long unattended runs
  – Sediment in the sample may settle out, esp. with wear metals or suspensions

• Ensure transfer line to ICP-MS is in good condition
  – Kinks in the line may cause poor uptake, or pulsing in the sample
  – Impacts on precision and accuracy
Recommended Procedures at End of the Day

1. Aspirate acid rinse solution for a few minutes before shutting off the plasma
   – 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 the tubes are no longer stretched over the pump rollers
5. Empty waste vessel
6. Close the current worksheet – leave Mass Hunter S/W running
7. Leave mains power and argon on
   – Keeps instrument in stand-by mode (ensures fastest start-up)
ICP-MS – Recommended Maintenance Schedule

Daily:
- Argon and cell gas (He, H₂, …) pressures
- Check peristaltic pump tubing for damage/deterioration
- Visual check of glassware
  (connections OK, no filling of spray chamber or connector)
- Visual inspection of sample cone exterior (orifice shape & deposition)

Frequently, as needed - perform these operations:
- Empty the drain reservoirs
- Thorough visual inspection of interface cones
- Check nebulization
- Replace peristaltic pump tubing
- Clean/replace torch
- Check recirculation water level

Frequency and extent of maintenance depends on the usage of the instrument:
this overview assumes daily use, 8 hours/day.
For systems run 24/7, more frequent maintenance is required.
EMF (Early Maintenance Feedback)

EMF window shows usage of various components and predicts when to perform maintenance.

All gauges and limit values are user definable.
ICP-MS System Tips – User Log

• Use the “Maintenance Log” to record routine and non routine maintenance activities

• Maintenance log can track:
  - When the maintenance activity was completed
  - Operator who completed the maintenance
  - Type of maintenance activity
  - Any operator comments
ICP-MS System Optimization

Startup provides a simple, user-configured schedule of system optimization and performance checks

- Automatically generate a Performance Report
- Provides a continuing record of system performance

One-click expert AutoTune for simple optimization

- Ensures consistent performance from day to day
- Independent of operator experience
Key Consumables for ICP-MS

Sample preparation/presentation:
- Peristaltic pump tubing
- Transfer and drain tubing
- ICP-MS standard solutions
- Internal Standard solutions
- Torches
- Spray chambers
- Nebulizers

Ion Extraction:
- Sampler and skimmer cones

Autosampling:
- Sample tubes, racks, probes and transfer tubing

ISIS:
- Peristaltic pump tubing, ferrules & fittings
Agilent ICP-MS Consumable Kits

Agilent offers configurable kits for all current Agilent ICP-MS systems, that allow you to select which key components are supplied in the kit e.g. type and quantity of interface cones

- G1131A for 7900 ICP-MS fitted with x- or s- lens
- M5141A for 7800 ICP-MS fitted with x-lens
- G1091A for 8900 ICP-MS fitted with x- or s- lens
- G3690A for 7700x/e and 8800 ICP-MS fitted with x- lens

Ask your Agilent representative for more information
If you need more help – count on the experts

Agilent University

Preventive Maintenance

Method and Application Consulting
Agilent Preventative Maintenance Services

Studies show that 60% of instrument failures can be traced to a single cause – lack of preventive maintenance*. These studies also show that failure rates decrease by up to 25% for all mechanical systems when a laboratory implements a preventive maintenance program.

This service includes:

- **Inspection**: Perform general inspection of the complete system.
- **System Cleaning**: Remove covers and clean dust from fans and vent covers.
- **Pump Maintenance**: Replace oil mist filter, drain and replace mechanical pump oil. Verify proper pump operation.
- **Lens Cleaning**: Remove and clean surfaces of the ion lens. Sonicate ion lens parts.
- **Vacuum System Maintenance**: Inspect vacuum hoses and exhaust tubes for possible problems. Check pump for evidence of leakage.
- **Verification**: Check quadropole matching. Replace octopole and perform octopole matching. Perform system auto-tune.
- **Documentation**: Record maintenance in instrument service logs.

*Studies show that 60% of instrument failures can be traced to a single cause – lack of preventive maintenance*. These studies also show that failure rates decrease by up to 25% for all mechanical systems when a laboratory implements a preventive maintenance program.
Top 5 tips for flawless ICP-MS performance

1. Set high standards
   Ensure precise, accurate calibration data by preparing standards fresh from certified reference materials with known uncertainty. Only use high-purity reagents and de-ionized water to reduce contamination. Learn more

2. Ensure system reliability
   Regularly check system performance and replace worn parts to maintain optimal operation. Use factory-monitored systems for peace of mind.

3. Manage consumables
   Replace all critical consumables regularly. Use only genuine Agilent parts for optimal performance and extended system life.

4. Maintain optical alignment
   Regularly inspect and readjust optical alignment to minimize drift and maintain spectral precision. Use alignment tools provided by Agilent.

5. Troubleshoot quickly
   Use the Agilent ICP-MS Online Resource Library to easily access troubleshooting videos, maintenance tips, and other resources to quickly resolve common issues.

Agilent supplies for Agilent instruments

Agilent Technologies is committed to optimizing your laboratory’s productivity, so we have produced this list of the most commonly ordered supplies and parts for the 7800/7900 ICP-MS and 8900 Triplet Quadrupole ICP-MS. Keep this list handy so you can quickly find the supplies you need and minimize inventory downtime.

Are you a subscriber to the Agilent ICP-MS journal?

- An ICP-MS specific journal produced 4 times/year
- Includes applications, techniques, “real” user stories, news updates and other product information

To register, use this link to the registration form on the Agilent website (or ask your Agilent representative):

Summary – To Achieve Quality Data

Most “instrument” failures occur in the sample introduction area:
• Interface cones
• Peristaltic pump tubing
• Drain Assembly
• Torch
• Spray chamber
• Nebulizer

Improper maintenance of this area can result in poor data quality

Frequently even experienced analysts can fail to recognize problems resulting in productivity losses

Establishing good routine maintenance procedures can prevent problems

https://www.youtube.com/user/agilent
Thank you for your attention. Question & Answer session.

1. Prevent nebulizer blockage
2. Pay attention to the interface cones
3. Keep it clean

4. Set high standards
5. Don't neglect the pump tubing