

# ICP/MS Performance Monitoring and Maintenance

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# ICP/MS Performance Monitoring and Maintenance

## 1 INTRODUCTION

This document addresses the performance monitoring and maintenance of the Inductively Coupled Plasma/Mass Spectrometer (ICP/MS). The ICP/MS system is comprised of an Inductively Coupled Plasma/Mass Spectrometer with a collision cell. A peristaltic pump and autosampler are used for liquid sampling. Definitions and guidelines are outlined in IOSS-701.

## 2 SCOPE

This document applies to personnel using the associated instrument(s)/equipment in the Toxicology discipline.

## 3 EQUIPMENT

- Instrumentation
  - Thermo Electron ICAP Q with collision cell, peristaltic pump, and Qtegra software (or equivalent)
  - Cetac ASX-260 peristaltic autosampler (or equivalent)
- Materials
  - Argon, 99.996% (ARC3 or equivalent)
  - Helium, 99.9999% (ARC3 or equivalent)
  - Thermo Tune-B solution or equivalent (Thermo or equivalent)
  - Thermo Setup solution or equivalent (Thermo or equivalent)
  - 50 mL polypropylene test tubes
  - General laboratory supplies

## 4 STANDARDS AND CONTROLS

### 4.1 Tuning Solution

The Thermo Setup solution is used for tuning the mass spectrometer.

### 4.2 Performance Verification Standard

The Thermo Tune-B solution is analyzed daily to assess operating performance, mass assignment, and continued integrity of the system. The Thermo Tune-B solution will be evaluated prior to the analysis of evidence. This solution will also be used to tune the source of the ICP/MS.

## 5 PROCEDURE

### 5.1 Daily Checks

The following steps will be performed when the instrument will be in use. Enter the appropriate information in the log to indicate completion.

- A. Record the remaining disk space on the hard drive. Verify that the hard disk has at least 100 MB of free disk space. Do not use if less than 100 MB remain.

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- B. Verify that the argon line pressure is 80 p.s.i. or above.
- C. Check the torch to see if there is any visible residue or discoloration present. Clean the torch if it is dirty.
- D. Check the sampler cone for dirt/residue build up. Clean the cones if they are dirty.
- E. Check the sample pump tubing to verify that it is in good working condition (i.e., no flat spots or blockages present). Change the pump tubing as needed.
- F. Check the level and color of the oil in the rough pump.
- G. Perform an analysis of the Performance Verification Standard using Thermo Tune-B solution. Open the appropriate instrument protocol and start the analysis. The report from the daily performance check will appear on the screen. Print and evaluate the results based on the 'Acceptance Criteria' section.
- H. If all requirements are within specification, prepare the documentation as outlined in IOSS-701. If any requirements fail, check the condition of the peristaltic pump tubing, the condition of the cones, and the torch and injector position/cleanliness. Most performance problems arise from the condition of the sample introduction system, torch, or cones. Significant changes in mass intensities, oxide ratios, doubly charged ion ratios, or increases in background may indicate the need to initiate further optimization procedures or maintenance procedures by contacting the appropriate instrument support personnel.

## 5.2 Yearly Scheduled Maintenance/Checks

The following steps will be performed once in a calendar year. Enter the information in the appropriate instrument log to indicate completion. Refer to IOSS-701 for more information on instrument maintenance and documentation.

### 5.2.1 ICP/MS

- A. Inspect the tubing, gas lines, and spray chamber. Replace if needed.
- B. Check level and color of rough pump oil. Top off or change oil as needed.
- C. Perform a check of the system using the Thermo Tune-B solution. If needed, calibrate the system using the Thermo Setup solution.

### 5.2.2 Cetac Autosampler

- A. Inspect the tubing. Replace if needed.
- B. Inspect the sample probe. Replace if needed.
- C. Inspect belts. Replaced if needed.

## 5.3 As Needed Maintenance/Checks

### 5.3.1 ICP/MS

- A. Clean or replace the cones.
- B. Clean or replace the torch and injector.
- C. Clean or replace the spray chamber.

## 6 INSTRUMENTAL CONDITIONS

Conditions are preset in the system based on the tune.

## 7 ACCEPTANCE CRITERIA

### 7.1 Performance Verification Standard

Verify the results of the daily performance verification standard:

Background:	< 1 cps @ mass 4.5
Background:	< 3 cps @ mass 220
Li Sensitivity:	> 25,000 cps
Co Sensitivity:	> 50,000 cps
In Sensitivity:	> 110,000 cps
U Sensitivity:	> 150,000 cps
CeO/Ce:	0.03
Ba <sup>2+</sup> /Ba <sup>+</sup> :	0.03
Li, Co, In, and U Stability:	3%

### 7.2 Performance Verification Kinetic Energy Discrimination (KED)

Verify the results of the daily performance verification KED:

Background:	< 1 cps @ mass 4.5
Background:	< 3 cps @ mass 220
Co Sensitivity:	> 15,000 cps
In Sensitivity:	> 15,000 cps
U Sensitivity:	> 40,000 cps
Co/CIO:	> 18
Ba <sup>2+</sup> /Ba <sup>+</sup> :	0.02
Co, In, and U Stability:	3%

## 8 LIMITATIONS

Only properly trained personnel will perform duties involved in the operation, maintenance, or troubleshooting of this instrument.

## 9 SAFETY

The instrument contains safety interlocks to prevent the torch box from being opened while the plasma is ignited. Do not attempt to defeat the interlock.

## 10 REVISION HISTORY

Revision	Issued	Changes
01	10/04/2018	Section 1- Updated scope to include applicable disciplines/categories of testing. Section 6- Added 'appropriate instrument support personnel'. Section 7- Added statement regarding instrument conditions. Section 13- Updated to 'Instrument Operation and Systems Support'.
02	09/30/2022	Revised to match new format requirements. Section 2- Updated the scope. Section 5- Added yearly maintenance and expanded as needed maintenance.