

- 1) Clinical and Laboratory Standards Institute (CLSI). *Liquid Chromatography-Mass Spectrometry Methods*; 2nd ed. CLSI document C62. Clinical and Laboratory Standards Institute, Wayne, PA; 2022.

INDUCTIVELY COUPLED PLASMA – MASS SPECTROMETRY (ICP/MS)

Inspector Instructions:

 READ	<ul style="list-style-type: none"> Sampling of ICP/MS policies and procedures Sampling of calibration records
 ASK	<ul style="list-style-type: none"> How does your laboratory verify assay performance each day of use?

CHM.20400 Tuning Solution

Phase II



An appropriate tuning solution or autotune is used to verify assay performance each day of use.

NOTE: Tuning solutions may contain a single element or multiple elements. Use of such solutions and/or autotuning verifies general system performance, control for potential interferences and mass resolution, optimization of ion lens voltages and check signal stability. Failure to use a tuning solution or autotune may affect ICP/MS sensitivity and selectivity.

Evidence of Compliance:

- ✓ Records of instrument tuning at defined frequency

CHM.20500 Peak Width

Phase I



The peak width is optimized.

NOTE: ICP/MS peak width must be optimized. In quadrupole ICP/MS experiments, there is generally mass unit resolution. If a mass spectral peak is too broad, a false positive finding may occur, since it may overlap with another analyte. If a mass spectral peak is too narrow, sensitivity is sacrificed. Most manufacturers of ICP/MS instrumentation designate an acceptable peak width range. The peak width range is generally determined using a tuning solution. Some software packages automatically check and alter peak width range. Peak width optimization is generally verified daily. There may be times when it may be desirable to go outside the manufacturer's specified peak width range. For example, brass is an alloy of copper and zinc. In ICP/MS, copper peaks surround that of zinc. Therefore, the copper peaks may interfere with the ability to detect zinc. Hence, by narrowing the zinc peak width, the possible interference due to copper may be mitigated or eliminated. With high resolution ICP/MS, it may be acceptable to have designated acceptable peak width range levels for different analytes.

Evidence of Compliance:

- ✓ Records of verification of peak width optimization

CHM.20600 Common Interferences Minimized

Phase II



When appropriate, oxides and doubly-charged species are minimized.

NOTE: Oxides and doubly-charged species are common interferences in ICP/MS. Oxides of various elements may have overlapping signals with elements of the same mass, thus leading to false-positive findings. Special techniques such as high resolution ICP/MS, dynamic-reaction cell and collision-reaction cell processes may eliminate the concern for oxide interference. Elements with a second ionization potential greater than or equal to 15.8 eV (the ionization potential of argon) may be doubly-charged. Such doubly-charged species may suggest the presence of an element that is not truly present. For example, gadolinium has an isotope at m/e 154. It has a doubly-charged species at m/e 77, which is also the same mass as an isotope of selenium.

CHM.20700 Dual Detector Mode Phase II

If the dual detector mode is applied, the calibration is verified.

NOTE: In ICP/MS, calibration can be performed in two modes – pulse counting for lower concentrations and analog for higher concentrations. If a range is necessary that overlaps with both modes, then the laboratory should employ a cross-calibration. This is generally accomplished by use of a tuning solution whereby a full calibration is performed in both modes followed by software adjustment for a smooth transition. If a concentration range is needed that only encompasses one mode or the other, then a cross-calibration is unnecessary as long as the appropriate mode is employed.

Evidence of Compliance:

- ✓ Records of calibration verification and cross-calibration, if needed

CHM.20800 Reaction/Collision Cell Phase I

If a reaction/collision cell is utilized, the reaction/collision gases are optimized.

NOTE: Optimization of reaction/collision gases will allow for maximization of sensitivity and minimization of background counts. Such optimization is generally accomplished through use of a separate tuning solution and is controlled by a separate part of most software packages than that used for autotuning.

Evidence of Compliance:

- ✓ Records of optimization of reaction/collision gases

CHM.20900 Calibration Curve Phase II

An adequate and appropriate calibration curve is established for quantitative testing.

CHM.21000 Instrument Drift Phase II

Performance criteria are defined to detect drift in ICP/MS equipment.

NOTE: Procedures for ICP/MS equipment must include criteria for performance and procedures to detect drift, which can occur rapidly. One way in which instrument drift can be detected is by evaluating control materials at defined intervals during a run.

CHM.21100 Isotope/Standard Criteria Phase II

Appropriate criteria are defined for selection of both the isotope(s) and the associated internal standard(s) related to each quantified element.