



Equipment Checks and Calibrations

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This Session

1. Calibration: What is it?
2. A process of comparison
3. What about adjustment?
4. What is a check?
5. In-house calibrations
6. The equipment table/s

Calibration: What is it?

An operation that, under specified conditions,

1. Establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties, and
2. Uses this information to establish a relation for obtaining a measurement result from an indication

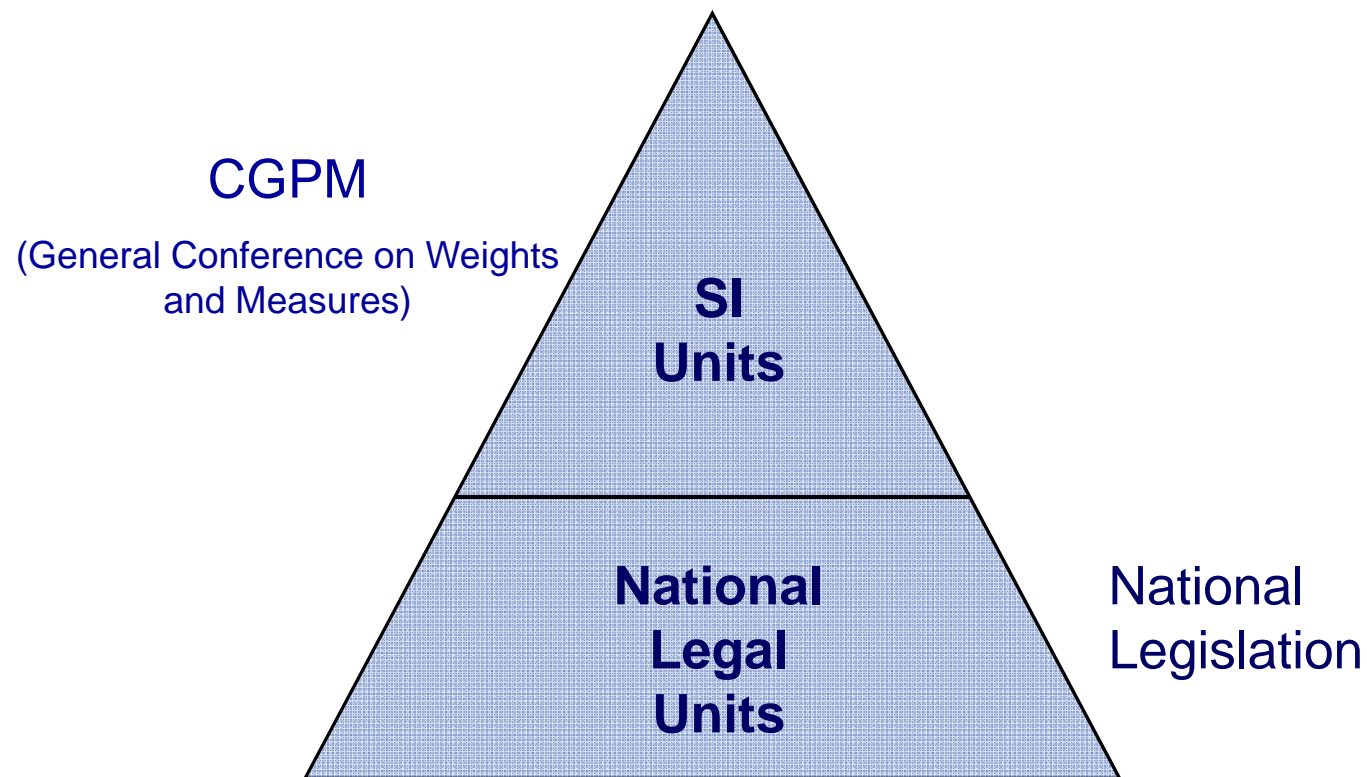
(Refer to ISO/IEC Guide 99 (VIM), definition 2.39)

A process of comparison

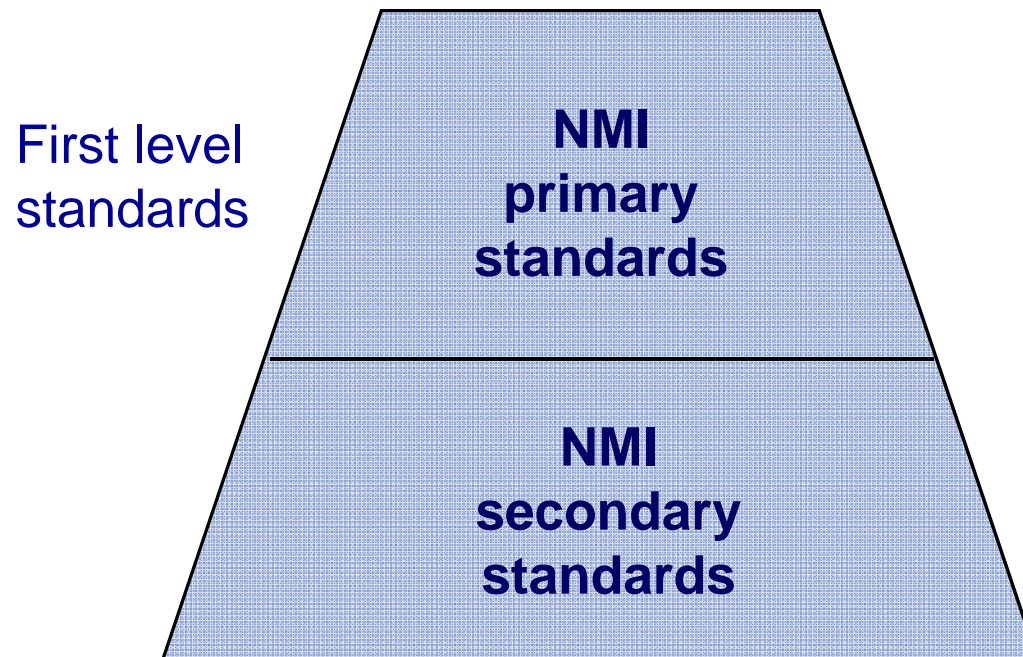
Metrological Traceability: property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.

(Refer to ISO/IEC Guide 99 (VIM), definition 2.39)

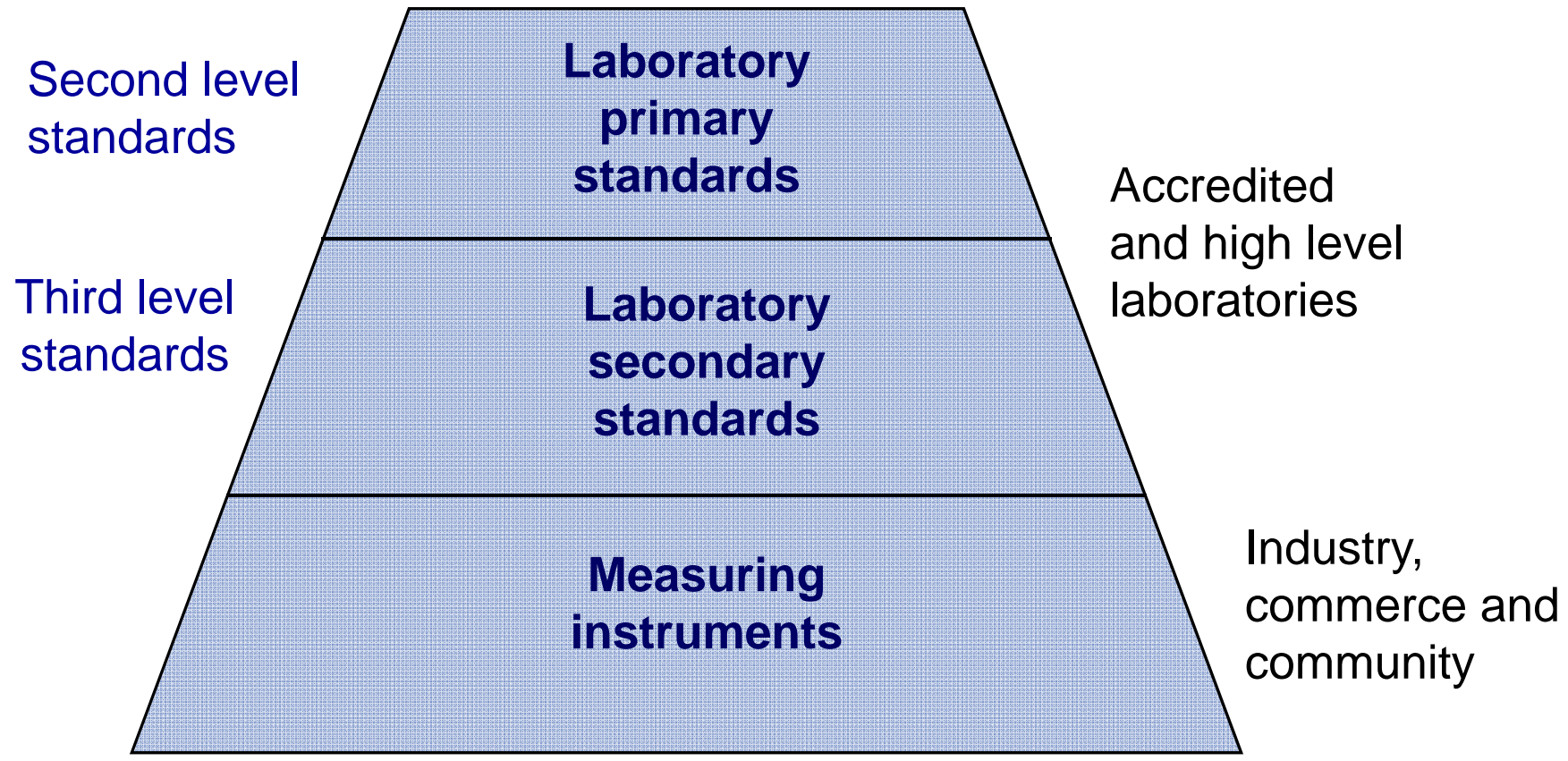
Standards Hierarchy



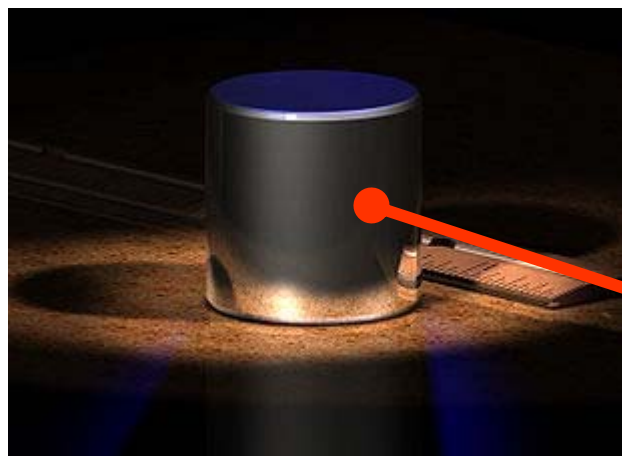
Standards Hierarchy



Standards Hierarchy

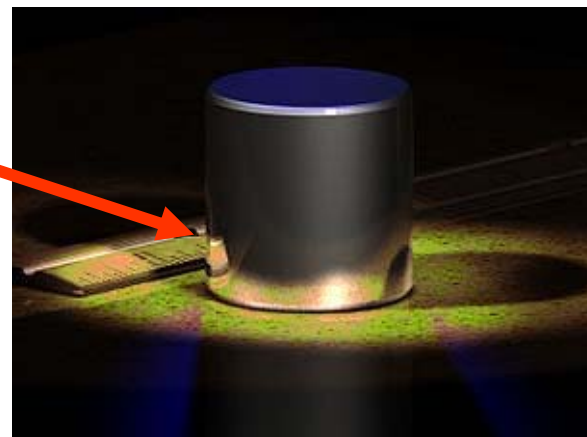


National standards – copies of IPK



The International Prototype Kilogram (IPK), kept at BIPM

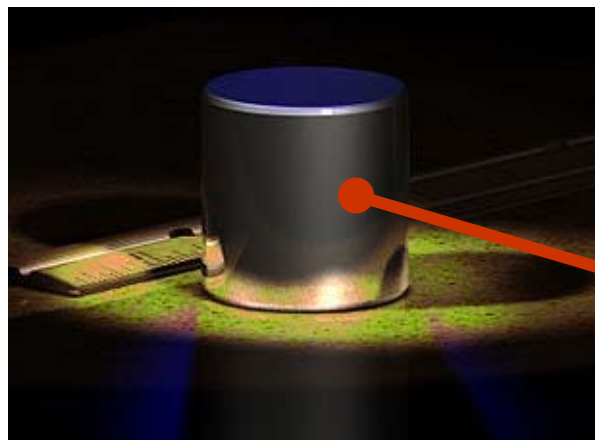
(International Bureau of Weights and Measures, des Poids et Mesures)



The National kilogram (NMI), a copy compared to IPK periodically

Working standards

Calibrated from the National kilogram



The National kilogram (NMI)



An NMI secondary standard

Working standards

Calibrated from the National kilogram



The NMI secondary standard



Laboratory primary calibration standard

Working standards

Calibrated from the National kilogram



Laboratory primary calibration standard



Laboratory secondary standards

Working standards

Calibrated from the National kilogram



Laboratory secondary standards



Precision balances



Working mass sets

Working standards

Calibrated from the National kilogram



Working mass sets

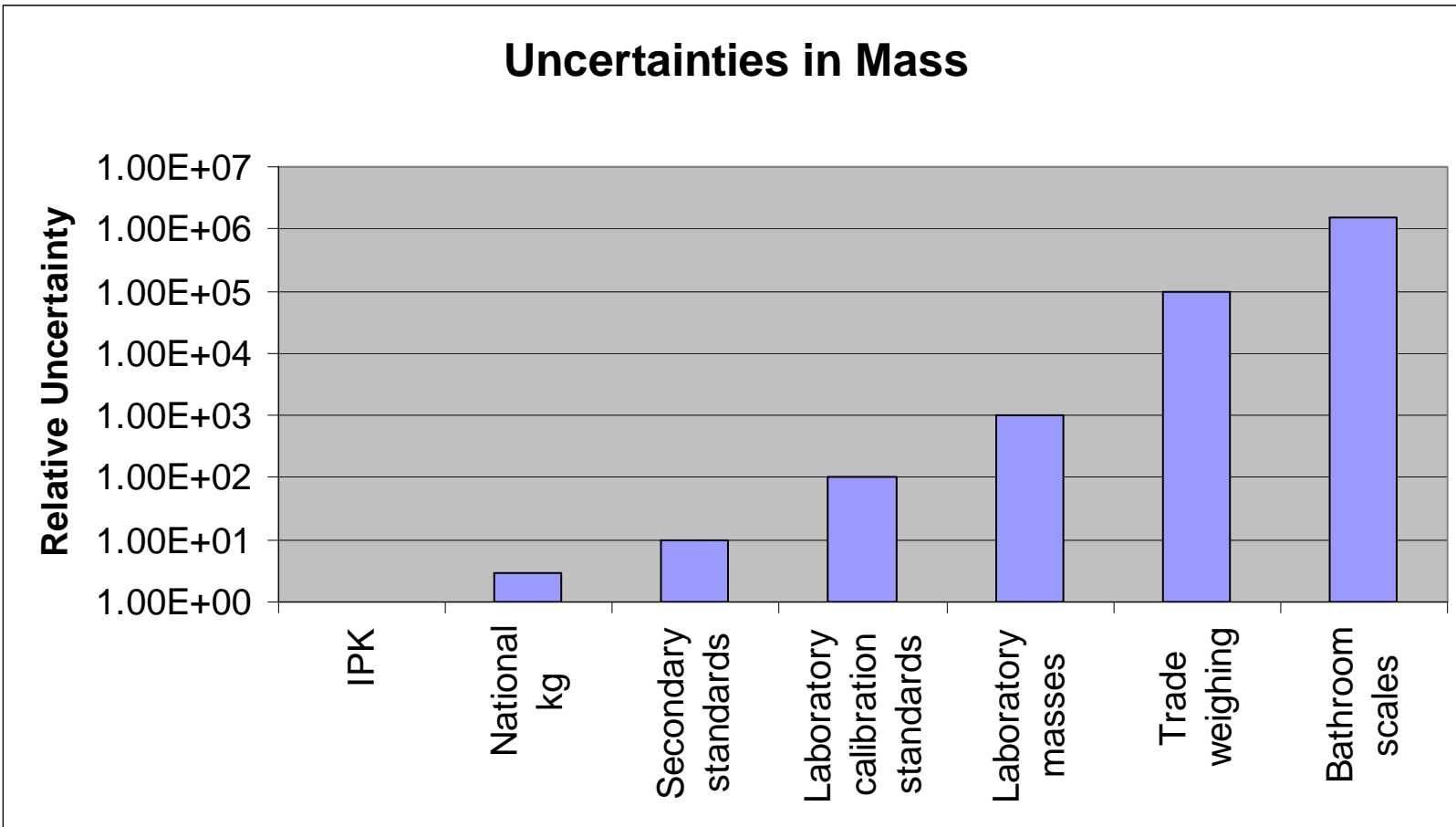


Trade and Industry weighing systems





Increasing Uncertainty



Calibration

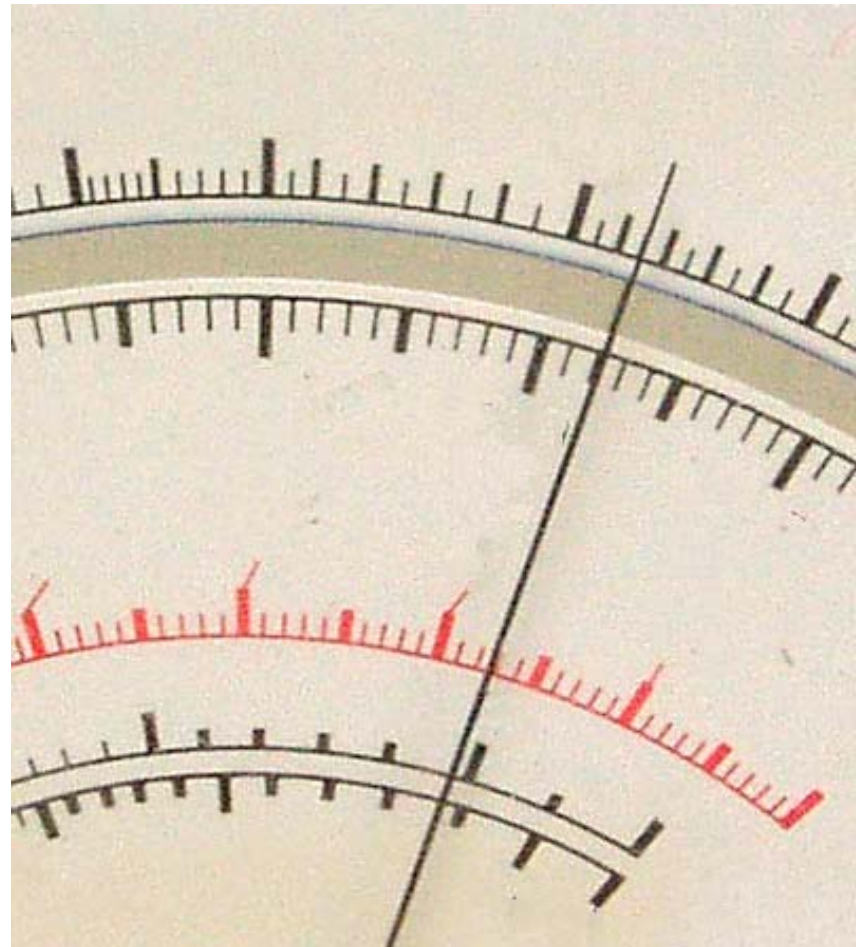
- Is a series of measures made against known reference/s
- Across a predetermined range (extrapolation is not allowed)
- With a measurement uncertainty calculated for each measurement

Calibrations may be made on equipment, instruments, artefacts & reference standards

A calibration record is evidence of measurement traceability

Calibration

A measurement made on an uncalibrated instrument is not reliable.



What about Adjustment?

An *adjustment* is to change the sensitivity of the test equipment against a known reference.

It is not part of the formal definition of calibration.

- An adjustment is often seen to be equivalent to a repair
- For many instruments, after an adjustment is made, a calibration must be repeated (pressure gauge)
- While other instruments are designed to perform an adjustment before measurement (balances) or before use (sound level meters)

What is a check?

1. A measurement of at least one point in a range of a measuring instrument or system or material against a known value to confirm that it has not deviated significantly from its original calibrated value.
2. It is also an examination of the condition of an artefact to determine that it has not been adversely affected by constant use.

What is a check?

A *check* is a measure or inspection used to determine continuing stability of an item.

- Does not necessarily require traceability
- No measurement uncertainty is necessarily calculated
- Suitability of the check method must be evaluated
- Documented history of the check is preferable

A check does not provide evidence of traceability

In-house calibrations

Policy Circular 12, *NATA requirements for the performance of calibrations in-house*, ensures all calibrations are carried out to the same standard.

- The policy applies to:
 - internal use within a facility
 - a central calibration facility carrying out calibrations for other accredited sections within their own organisation
- Notes a criteria level at which a critical parameter requires evidence of traceability (*1/5th*) of the largest single uncertainty component
- Provides guidance on how to assess in-house calibrations
- Notes that appropriate proficiency testing must be undertaken for the in-house calibrations
- Provides guidance on how in-house calibrations are to be reported

The Equipment Table/s

- Are part of NATA's guidance documents
- Restate the definitions of Traceability, Calibration, Checks
- Reference NATA Policy Circulars 11 & 12
- Provide excellent guidance for Laboratories to establish their own (fit for purpose) Equipment Assurance Program (LEAP) with consideration to be given to
 - History of stability (of item)
 - Frequency of use
 - Accuracy required
 - Requirement for traceability of measurement
 - Ability of staff to perform in-house checks
 - Successful participation in proficiency testing programs (for accredited testing)

The Equipment Table/s

- Equipment Assurance Programs are to cover:
 - Commissioning of new equipment (if traceability is required the item must be calibrated before being used)
 - Operational checking (checking during use with reference items)
 - Periodic checking
 - Scheduled maintenance
 - Recalibrations
- Intervals between calibrations may be extended if the facility is able to justify (with supporting records) an extension
- The Reference Equipment Table is only for use by Calibration providers (this includes in-house calibrations)

The Equipment Table/s

- Where an Equipment Assurance Program is **not** established by a facility, then the minimum intervals for calibrations and checks are as detailed in the table/s, noting:
 - It not a complete listing of laboratory equipment (just because an item is not listed, does not mean it does not require calibration)
 - Are based on typical use and required accuracy
 - The equipment is of good quality
 - The facility has both the equipment capability and staff expertise to perform the requisite in house checks
 - All of the subsidiary checks indicate satisfactory operation
- Otherwise shorter intervals between calibrations should be considered....

Summary

- ✓ **Calibration:** an activity that provides suitable traceability (usually involves a set of measurements together with a calculation of measurement uncertainty). Is technically assessed as a calibration activity (ILAC P14 requirements in NATA criteria).
- ✓ **Check:** An activity that demonstrates ongoing stability of an item. Suitability of the method must be demonstrated. Activity must be available for auditing.
- ✓ Accreditation is task specific and calibration activities are uniquely identified as such in scopes of accreditation
- ✓ In-house calibrations are covered by Policy Circular 12
- ✓ The policy on measurement traceability for calibrations applies to in-house calibrations.
- ✓ Equipment Table/s - the preferred option is for each facility to establish their own equipment assurance program.

Questions?

