



**19<sup>th</sup> meeting of the CCM**  
**Written report covering the period 2021 – 2022**  
**Mass and Related Quantities Laboratory**  
**Laboratorio Tecnológico del Uruguay – LATU**

➤ *Related activities*

- **November 2022 - reception of peer reviewers:**

- Mass
- Density
- Pressure
- Fluid flow

In all the reviews it was concluded that the laboratory is able to support its claimed CMC.

- **Participation in project:**

- **“Strengthening National Metrology Institutes in the Hemisphere, in support of emerging technologies”**

- **Sub-Proyect: “Calibration of weighing instruments Microbalances”**

Propose:

1. - Validation of an alternative method for the calibration of instruments for non-automatic operation with resolution less than or equal to 1 µg (microbalances or ultra-microbalances).
2. Generate experience in micro - weights calibration for microbalance calibration at values less than 1 mg.

Status:

1. The first draft of the SIM Guide for Microbalance Calibration with general harmonized criteria for application was completed. The document will be sent for review to the technical experts of the SIM MWG7 mass sub-group. It will be published on the SIM's official website for consultation and English translation is under way.
2. Article “STUDY OF THE STABILITY OF THE ALTERNATIVE METHOD IN CALIBRATION OF WEIGHING INSTRUMENTS NON-AUTOMATIC OPERATION WITH LOWER RESOLUTION A 0.010 mg – MICROBALANCES” published and presented at the CENAM 2022 metrology symposium.
3. The results were presented at a Mass Sub-committee meeting EURAMET TC-M. September 2022.



- **“Maintaining and disseminating the new SI unit kilogram via spheres of natural silicon- In the cleaning process”**

Status:

- 1 The measurements were completed, and the results were presented - August 2022
- 2 sphere is sent to PTB for final measurements.

- **“SIM kilogram dissemination project: Protocol for mass drift studies”**

Status: The weight was sent to the NRC and returned to LATU. The measures continue.

- **DEVELOPMENT OF BASIC METROLOGY INFRASTRUCTURE TO SUPPORT MEDICAL EQUIPMENT TESTING (VENTILATORS AS A PRIORITY) IN THE AMERICAS**
- **Software development for optical recognition of digital displays**

➤ *Participation in relevant comparisons*

- **SIM Comparison in mass standards (SIM.M.M-K6)**, a cylindrical shaped mass with nominal value 50 kg made in stainless steel.  
Status: Report in progress. Draft B. LATU obtains consistent values with greater uncertainty than the CMC, the CMC is modified in the KCDB to be consistent.
- **SIM Comparison High-accuracy hydrometers (SIM.M.D-S6)**, Density from 600 kg/m<sup>3</sup> to 1300 kg/m<sup>3</sup>.  
Status: Approved. Some results obtained by LATU were not consistent with the other participants within the interval of stated uncertainty. For this comparison, LATU used a reference liquid (tridecane internally calibrated) which usually is not used as a reference liquid for hydrometer calibrations services. The study of the results obtained with water is carried out by the usual laboratory method and the results are consistent, a study carried out during the peer review.
- **SIM Calibration of glassware and volume devices (SIM.M.FF-K4.1)**. Volume of liquid at 20 L (contained). Volume of liquid at 100 mL (contained).  
Status: In progress.
- **Comparison of Liquid density using a hydrostatic weighing method. (SIM.M.D-S7)**  
Status: Measurements in progress.
- **SIM Comparison in a mass standard (SIM.M.M-K4.1)**.  
Status: Measurements completed.



➤ *Acquired new equipment*

- Automatic Mass Comparator, Sartorius, for calibration weights 1 kg to 10 kg, with resolution of 0,1 mg, it was acquired. This equipment will with better uncertainties.
- Ambient Condition Meter, Vaisala INDIGO 520, appreciation 0.01 °C, 0.01 %HR y 0.1 Pa, which allows to reduce the uncertainty in the calculation of the air buoyancy.
- Automatic differential pressure gauge. Furness Control Brand, Model FCO 560 Interval 2000 Pa.
- Force transducer, 2 kN.

➤ *Papers and Publications*

1. **“Comparative study of the density of water and its application in the uncertainty budget for the volume determination”** Sica A., Preste S., Almeida G., Esteves R. In INNOTEC 21 (2021).
2. **“STUDY OF THE STABILITY OF THE ALTERNATIVE METHOD IN LALIBRATION OF WEIGHING INSTRUMENTS NON-AUTOMATIC OPERATION WITH LOWER RESOLUTION A 0.010 mg – MICROBALANCES”** published and presented at the CENAM 2022 metrology symposium. Sheila Preste, Daniel Gonzalez, Gabriel Almeida, Fernando Garcia, Juan Garcia, Rubén Quille, Javier Barbagrigia, Luz Cori, Donny Taipe, Luis Peña, Luis Becerra, Sandra Ramírez, Jhon Escobar, Alvaro Bermudez, Marcela Prendas, Olman Ramos, Jorge Sanchez.
3. **“Digitization of the pH measurement process by the Baucke cell method”**. M.V. Gelabert, P. Constantino. In SIM WG M4DT 2021 (virtual).
4. **“Software for optical recognition of digital displays - Development and validation”**. Constantino P. In: 4th CABUREK M4DT Workshop (may 2023).