

# Challenges in Mass and Related Quantities

## 2014 TC-M Report to the General Assembly

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CEM, Spain



# Contributions to EMRP

## JRPs to be finished in 2014

Number	Short Name	Full Name
IND 03	HIGHpress	High Pressure Metrology for Industrial Applications
IND 09	Dynamic	Traceable Dynamic Measurement of Mechanical Quantities
IND 12	Vacuum	Vacuum metrology for production environments

# High Pressure Metrology for Industrial Applications

**SCOPE:** Pressures up to 1.5 GPa are used in high-pressure technologies in general engineering, automotive, petrochemical, pharmaceutical and food industries.

**GOAL:** Traceability up to 1.6 GPa with a relative expanded uncertainty as low as 0.05 %.

**PARTNERS:** PTB, CMI, EJPD, LNE, SMU, TUC.

Workshop on High Pressure Metrology for Industry  
(September 2014)



# Traceable Dynamic Measurement of Mechanical Quantities

**SCOPE:** Many applications of the measurement of force, torque and pressure are dynamic (strong variation over time). Transducers are calibrated by static procedures but mechanical sensors exhibit distinctive dynamic behaviour.

**GOAL:** Traceability for force, torque and pressure for measurements under dynamic conditions.

**PARTNERS:** CEM, CMI, INRIM, LNE, MIKES, NPL, PTB, SP, UME.



# Vacuum metrology for production environments



**SCOPE:** Traditional measurements are based on the pressures of pure gases in stable conditions. In industry it is the opposite: gas mixtures and pressures changing with time.

**GOAL:** Establish traceability for partial pressures, outgassing rates and leak rate measurement in industry.

**PARTNERS:** PTB, CEM, CMI, IMT, INRIM, LNE, UME, DANFOSS, INFICON, LAZZERO, VACOM.

## JRPs to be finished in 2015

Number	Short Name	Full Name
SIB03	KNOW	Realisation of the awaited definition of the kilogram - resolving the discrepancies
SIB05	NewKILO	Developing a practical means of disseminating the new kilogram



# Realisation of the awaited definition of the kilogram - resolving the discrepancies

**SCOPE:** A significant international effort is under way to establish a new definition of the kilogram based on the Planck constant  $h$ . These experiments have been completed (watt-balance and Si-sphere Avogadro), but the results show discrepancies.

**GOAL:** Resolving the existing discrepancies with relative standard uncertainties not larger than  $5 \times 10^{-8}$

**PARTNERS:** PTB, INRIM, NPL, CNAM, NIST, NCR, EJPd.



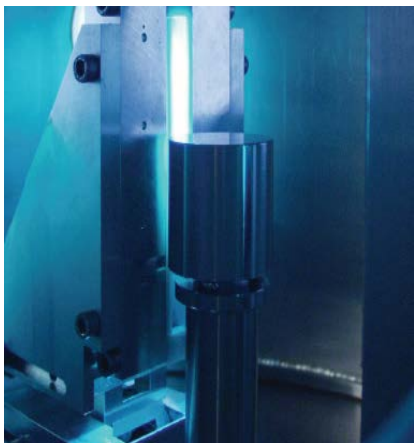
# Developing a practical means of disseminating the new kilogram

**SCOPE:** Practical experiments for the new definition of the kilogram cannot be performed as frequently as desired.

In the new definition the kilogram will have an uncertainty, the traceability chain has to be improved to avoid affecting uncertainties provided to the user.

**GOAL:** Dissemination of new realisations of the kilogram at the level of the NMIs

**PARTNERS:** NPL, CMI, DFM, EJPD, LNE, PTB, MIKES, CNAM, MHEST, UME, INRIM, NCR





Number	Short Name	Full Name
SIB63	Force	Force traceability within the meganewton range

# Force traceability within the meganewton range



## SCOPE:

In mechanical engineering, aerospace industry, power production, building industry, safety engineering and testing, forces with nominal values in excess of 15 MN are measured. The application conditions are different from calibration conditions.



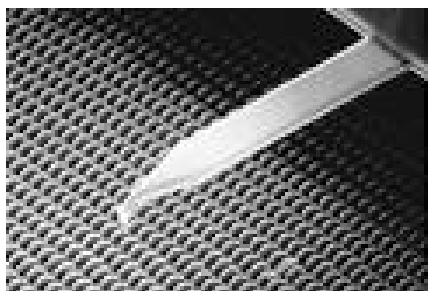
**GOAL:** Ensuring traceability up to 50 MN and investigating influencing factors in industry

**PARTNERS:** PTB, BAM, CEM, CMI, INRIM, LNE, METAS, MIKES, MG, UME, NPL

## Diversification of measurements in EURAMET TC MASS



- Magnetic properties of masses
- Micromasses
- Negative pressures
- Microforces (bending stiffness)
- Surface tension of liquids



## EURAMET Calibration Guides

cg 17: Guidelines on the Calibration of Electromechanical Manometers

*Goal : to be published in 2014!!!*

cg 18: Guidelines on the Calibration of Non-Automatic Weighing Instruments

It has being adopted also by other RMOs and broadly used by accreditation bodies as mandatory

It is the most visited issue in the EURAMET website!!

First review with a direct collaboration of manufacturers

*Goal : to be published in 2014!!!*

## Last meeting



Brno, Czech Republic, 11 April 2014.

External contributions:

- BIPM (Redefinition of the kilogram)
- EURAMET (EMPIR)
- GULFMET





# The End

## Thank you for your attention

