Consultative Committee for Amount of Substance – Metrology in Chemistry (CCQM)
President W May, Executive Secretary R Wielgosz

Meets every year **Last meeting** - April 2012 **Members/Observers** 27/11	**Working groups**: Organic Analysis (OAWG); Gas Analysis (GAWG); Inorganic Analysis (IAWG); Electrochemical Analysis (EAWG); Bioanalysis (BAWG); Surface Analysis (SAWG); Key Comparison and CMC (KCWG); Strategic Planning (SPWG); **ad hoc** Steering Committee on Microbiological Measurements (MBSG), ad hoc WG on the Mole; and ad hoc WG on KCRV	
Comparison activity	**Completed/In progress**	**Planned**
CCQM KCs (& CC Supplementary)	113 + (0)	125 +(0)
RMO KCs (& SCs)	14 + (10)	-
BIPM comparisons (all on-going)	1	1
CC Pilot studies (stand-alone)	115	66
CMC	5360 CMCs in 67 service categories	

Pointers to the future, stakeholder needs and technological developments

The scope of this CC is very diverse and complex and should provide for evolving and expanding measurement service needs. Specific examples of important issues and trends in various sectors that are likely to drive the development of NMI services are given below. Future CCQM comparisons would then be selected to establish the international equivalence of these measurement standards and services:

- **Healthcare; r**eference measurement systems for diagnostics, traceability of quantitative measurements of nucleic acids, proteins, polysaccharides and cells to the SI including high accuracy purity assessment; systems biology support (e.g. combined 'omic' approaches covering lipids/cells/genes/proteins…) including interactions in immune systems; measurements to support bio/pharmaceutical identity, quality, safety and efficacy.
- **Food safety and nutrition:** Residue and contaminant quantification, microbial identification and quantification, nutrient quantification, food constituent labelling, food provenance.
- **Environment:** reference measurement systems for: Long-term global, direct and remote monitoring of greenhouse gases; development of emission controls on toxic and reactive gases from industrial activities to atmosphere and workplace; particulates and nanoparticles semi-volatile organic compounds and in indoor and urban air including real time analysis of composition; Isotope ratio measurements for sensitive environmental studies; Water quality.
- **Energy:** diversification in the supply of energy gases (e.g. biogas, coal mine methane, shale gas); dissolved gas in water (e.g. methane and methane hydrates); emerging hydrogen economy (e.g. measurements of impurities in hydrogen); usable energy from bio waste; Industrial biotechnology (harnessing sustainable microbial energy); Chemico-physical properties of biofuels; State of health and of charge of energy storage systems (e.g. batteries in the automotive sector); injection of non-conventional gases into existing gas grids; alternative technologies in photovoltaic systems.
- **Advanced materials:** Development of metrologically underpinned characterization tools and protocols for analysis of nano-structured surfaces, nano-particles. Research towards traceability of toxicity measurements will on focus on chemical and biological characterization of nano-particles; development of new materials with functional surfaces including, biomaterials, meta materials, and hybrid materials; electrochemical sensors to monitor and feedback on the performance of smart materials; embedded chemical sensors in intelligent buildings
- **New technological requirements**: The range and complexity of analytes covered by the CCQM is expected to expand. This will require technological developments including the development of primary calibrators and reference measurement systems for new and more complex analytes and the development of an international metrological infrastructure for biological measurements

Workload Trend & Workload Management

- CCQM WGs have developed a 'core capability' approach to the organization of Key Comparisons in order to maintain the total number of key comparisons and pilot studies constant whilst increasing their scope and impact.
- Resources vary significantly by group particularly for preparation of study samples (from a minimum of 0.5 pm to a maximum of 24 pm). Coordination is typically a minimum of 3 to 6 months and a maximum of around 12 months. Participation minimums are around 1 pm and maximums around 12 pm.

BIPM – references to laboratory activity at the BIPM

- The BIPM Chemistry Department coordinates key comparisons and pilot studies prioritized by the CCQM in response to NMI needs (5 key comparisons and 7 stand-alone pilot studies (2000-2012), with 263 NMI participations in these comparisons), for:
- a) greenhouse and air quality gases, for which the uncertainty of standards is critical, to ensure the long term accurate global monitoring of these species, including BIPM.QM-K1 for surface ozone;
- b) the purity assessment of pure organic calibrators (source of traceability for measurements of the amount of organic species in a wide range of clinical, environmental, food, forensic and drugs in sport applications). Coordination of an on-going series of 4 comparisons covering all small organic molecule based CMCs, with an extended model of comparisons for large organic molecules.