

Report to the CCT by Working Group 6 on Humidity Measurements
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The Working Group on Humidity Measurements has focused its effort to date on the first of its tasks. Thus an international comparison of humidity standard generators is well underway. A revised technical protocol for K6, Key Comparison of Humidity Standards in dew/frost-point temperature -50 °C to 20 °C, has been approved by all participants and sent to CCT WG7 for approval. There are ten participants: Centre for Metrology and Accreditation (MIKES) Finland, DI Mendeleev Institute of Metrology (VNIIM) Russia, Instituto Nacional de Technica Aeroespacial (CEM/INTA) Spain, Istituto di Metrologia "G. Colonnetti" (IMGC) Italy, National Institute for Standards and technology (NIST) USA, National Metrology Centre (SPRING) Singapore, National Metrology Institute of Japan (NMIJ) Japan, National Physical Laboratory (NPL) UK, National Research Centre For Certified Reference Materials (NRCCRM) China, and Nederlands Meetinstituut - Van Swinden Laboratorium (Nmi-VSL) the Netherlands. NPL is the pilot and NMIJ is the assistant pilot.

As chairman of the CCT Working Group on Humidity Measurements, Peter Huang held a meeting to discuss issues related to the uncertainty analysis for the upcoming Key Comparison on humidity standards. The meeting was held in conjunction with the 4th International Symposium on Humidity & Moisture (ISHM), September 16 - 19, 2002, Taipei, Taiwan. It was decided that members should study the uncertainty associated with the weighted-mean and statistical methods of determining Key Comparison Reference Value. Members of the working group representing NMIJ/Japan, NPL/UK, PTB/Germany, CETIAT/France, IMGC/Italy, NMC/Singapore, MSL/New Zealand, KRISS/Korea, UME/Turkey and NMi/Netherlands attended the meeting.

All the Working Group members contributed to the organization and technical program of ISHM 2002. It attracted approximately 270 participants from twenty countries. A total of 112 papers were presented in four parallel sessions. Topics covered national standards, measurement uncertainty, calibration methods, new sensors and techniques, recent developments in hygrometry, humidification and drying, trace moisture in semiconductor gases, microwave aquametry, moisture measurement in liquids, and moisture measurement in solids. An exhibit was also run concurrently for the display and demonstration of the latest instrumentation. State-of-the-art instrumentation systems, such as an automated moisture sorption analyzer and hygrometers based on hyper-thin-film of aluminum oxide, were displayed.

Recently, an APMP Comparison of Humidity Measurement using a dew-point meter as a transfer standard, has been completed and the report of Draft B has been sent to CCT WG7 for approval as a regional key comparison. There are eight participants: NMIJ Japan, NMC Singapore, SIRIM Malaysia, NRCCRM China, Korea Research Institute of Standards and Science (KRISS) Republic of Korea, Center for Measurement Standards (CMS) Taiwan, Standards and Calibration Laboratory (SCL) Hong Kong, and National Measurement Laboratory (NML) Australia. NMC is the pilot.

The aim of the comparison is to compare the dew point temperatures realized by each participating laboratory. For doing so, a chilled mirror dew point meter was used as transfer standard. The stability of the transfer standard was checked by NIST before the start of comparison in 1998 and later re-checked in 2000. The results of the comparison are based on the data on the difference of the transfer standard and the laboratory standard dew-point generator for a given nominal dew/frost-point temperature. The nominal values used are from -60 °C to 20 °C in 5 °C increments. For each nominal dew/frost-point, an arithmetic mean of the differences obtained from participants is calculated without weighting. This mean value and the standard deviation from the mean value (s) is used to check outliers. Results show that all the participants' data are within $\pm 2s$ limits, except the NML data at 0 °C dew-point are outside the limits. This departure was found to be caused by a different cooler temperature used. Bilateral equivalence in terms of pair difference and its associated uncertainty with 95% level of confidence was given for each pair laboratories at each nominal dew/frost point. A single parameter pair equivalence, Quantified Demonstrated Equivalence, $QDE_{0.95}$, is also demonstrated both in data and graphically.

Regional comparisons in SIM and EUROMET will be followed by one in which the RMOs are fully linked to a CIPM/CCT key comparison. In SIM, a bilateral comparison between INMETRO Brazil and NIST USA is being organized by NIST. In EUROMET, a Key Comparison is being organized with 22 participants and is expected to start in November 2003. Its protocol, based on the protocol for K6, has been circulated and comments received. In addition, a project of inter-comparison for the dew-point range above 20 °C to 85 °C has been proposed with 15 participants.