

23. International Comparisons of Temperature Standards and Scale Realizations

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Objective: Serve as coordinator for, and/or participate in, comparisons of national realizations of the ITS-90 and of some transportable cells of the defining fixed points of the scale.

Problem: Although there have been some bilateral as well as some multi-national comparisons of fixed-point cells, there have been no global comparisons of realizations of the ITS-90 at the highest levels of accuracy. Results of such comparisons are needed in order to support the claimed degree of equivalence of thermometry calibrations from various national metrology institutes, as documented in the BIPM/CIPM Mutual Recognition Arrangement (MRA). The MRA is vital for international trade purposes, and the Key Comparisons (KCs) organized under the auspices of the Consultative Committee for Temperature (CCT) are vital in providing the technical foundation of the MRA.

Approach: We are participating in four Key Comparisons of realizations of the ITS-90 organized by the CCT, and in a comparison of transportable cryogenic triple-point cells organized by PTB for EUROMET. NIST coordinated KC 3 [83.8 K to 933.5 K], with 14 national laboratories plus BIPM participating. NML (Australia) and PTB (Germany) served as our sub-coordinators for some of the laboratories. Also, NIST served as sub-coordinator for KC 4 [933.5 K to 1234.9 K]. Both sets of comparisons involved circulating some fixed-point cells and one or more SPRTs. We are participating also in KC 1 (0.65 K to 24.6 K) involving rhodium-iron thermometers, and KC 2 (13.8 K to 273.16 K) involving capsule SPRTs.

Results and Future Plans: In FY00, the data analysis for CCT KC 3 was completed, and the measurements and analysis were documented in a comprehensive report that underwent several cycles of participant review. This work involved an unexpectedly large amount of

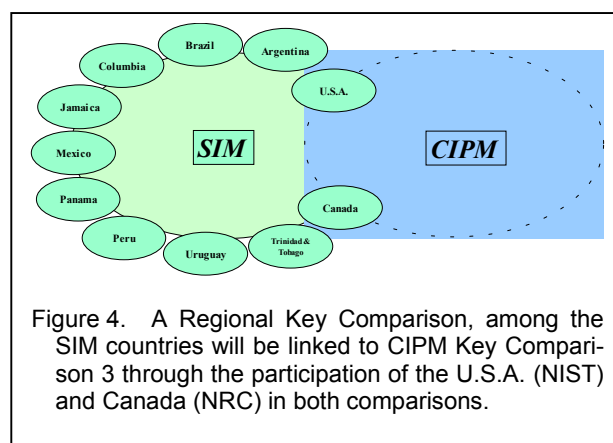


Figure 4. A Regional Key Comparison, among the SIM countries will be linked to CIPM Key Comparison 3 through the participation of the U.S.A. (NIST) and Canada (NRC) in both comparisons.

data analysis, uncertainty analysis, statistical investigation, and correspondence among the participants. Submission of the report on KC 3 to the CCT Working Group on KCs is anticipated in early FY01.

For the other Key Comparisons, NIST has completed all measurements, and the non-NIST pilot laboratories are in the process of drafting the reports. Additionally, NIST was the host of a meeting of pilot laboratories and CCT Working Group 3 members called in January 2000 to discuss issues of all of the ongoing KCs.

In FY00, a neon cell was sent to PTB for inclusion in the transportable-cell comparison. A number of additional hydrogen cells have been constructed, and IMGC is in the process of filling several cells with deuterium, for delivery to NIST in FY01.

A major activity for FY01 is the extension of KC 3 to the countries within SIM. A preliminary study that will evaluate the suitability of various transfer standard thermometers and test the proposed protocol is planned to start early in FY01.