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Progress Report for the International Star Intercomparison of Low-Temperature Fixed Points Using Sealed Triple-Point Cells

B. Fellmuth

Physikalisch-Technische Bundesanstalt, Abbestrasse 2-12, 10587 Berlin, Germany

The comparison measurements are still running essentially in accordance with the original description and scheduling: The organisation and the measurement program of the star intercomparison are described in detail in the documents CCT/99-06 and CCT/99-07. A first progress report is given in document CCT/2000-18. An amended, even more detailed protocol for the investigation of sealed triple-point cells is presented in the Project Report "Protocol for the investigation of the thermal properties of multicells" (European RTD Project MULTICELLS, Contract N° G6RD-CT-1999-00114) prepared by Fellmuth and Wolber in July 2000.

Up to now, cells have been measured from BNM-INM (multi-compartment cell), Cryogenic Laboratory (H_2), IMGC (H_2, Ne, O_2), INTiBS (H_2, Ne, O_2, Ar), MSL (H_2, Ne, O_2, Ar), NIM (Ne), NIST (H_2, O_2, Ar), NPL (H_2, Ne, O_2), NRC (H_2, Ne, O_2, Ar), PTB (H_2, Ne, O_2, Ar), and VNIIFTRI (multi-compartment cell). Further cells are already at PTB or their delivery in near future is agreed: IMGC (Ar), NIST (Ne), and NPL (Ar). Thus, most of the measurements within the original scope of the star intercomparison were finished until the end of 2000. Furthermore, it seems to be possible to include also cells from the AIST-NMIJ, Japan until the end of this year, 2001.

An extension of the scope has been caused by the inclusion of state-of-the-art multi-compartment cells developed within the framework of the EU project "Improvement of European traceability in temperature measurements below 0 ºC using permanently-sealed transportable multicell standards (MULTICELLS)" (Contract No. G6RD-CT-1999-00114), running from January 1, 2000 to December 31, 2002. The investigation of new multi-compartment cells within the framework of the star intercomparison will last until the end of 2001. It is planned to prepare a survey report of the star intercomparison in early 2002 so that it can be discussed during the Temperature Symposium to be held in Chicago, USA in October 2002.

Partly connected with the star intercomparison, two special problems have been investigated in detail that appear when realising the triple point of equilibrium hydrogen as a temperature fixed point due to the influences of the deuterium content and the catalyst. The activities of five metrological institutes (IMGC, INTiBS, NIST, NPL, PTB) have been joined. Preliminary results will be published in the Proceedings of TEMPMEKO 2001: Fellmuth et al., "Special problems when realising the triple point of hydrogen as a defining fixed point of the ITS-90". The influence of the deuterium content on the triple-point temperature requires re-defining the triple point of equilibrium hydrogen as defining fixed point of the ITS-90 in order to remove this source of ambiguity. Possible ways in which the hydrogen fixed points could be re-defined are discussed in another paper to be published in the Proceedings of TEMPMEKO 2001: Pavese et al., "Archival and theoretical considerations for isotopic dependence in the *e*-H_2 fixed points". During the first tests of the new multi-compartment cells it became evident that special thermal problems have to be considered if different fixed-point materials are thermally coupled. For instance, the time periods being necessary for attaining thermal

equilibrium after temperature changes are relatively long. Several reports of the MULTICELLS Project deal with this topic in detail.