

**Report of CCT-WG2: Secondary fixed points and techniques of approximation to the ITS-90**

Chair: Alan Steele, NRC Canada  
Members: Frank Edler, PTB Germany  
Rod White, NML New Zealand  
Yoshiro Yamada, NMIJ Japan  
Duan Yuning, NIM China  
Peter Bloembergen, The Netherlands (co-opted)  
Masahiko Gotoh, Tamagawa University Japan (co-opted)

The Working Group was charged with revising the BIPM publication “Techniques for Approximating the International Temperature Scale of 1990” (the “blue book”) at the meeting of the CCT held in April 2000.

A meeting was held on Wednesday June 20, 2001 during the Tempmeko 2001 conference in Berlin to discuss strategy and identify and prioritize items for the revision. At that time, Mr. Bloembergen was invited to participate in CCT-WG2, for the duration of his visit to NMIJ.

It was decided that a first step in the update would be to perform an extensive literature search covering the period from the current blue book (1990). Four broad subject areas were identified as targets for this: low temperature scale realizations, thermocouples, optical and high temperature techniques, and uncertainty and scale interpolation techniques.

Since the blue book is aimed primarily at industrial clients, it was also decided that the focus of the first efforts would be industrial applications. There is an identified need for fixed point cells suitable for use with industrial (or at least non-standard) platinum resistance thermometers, as well as a need for fixed points covering a wider temperature range (such as the use of fixed point black body sources for calibrating radiation thermometers). The Working Group will attempt to compile a comprehensive list of commercially available resistance thermometers and fixed points. A preliminary literature search on industrial use of PRTs performed by Mr. Edler is appended to this report.

In August 2001, Masahiko Gotoh visited NRC, and expressed interest in promoting the use of noble metal thermocouples in industry. He has been working as one of the members for IEC sub-committee 65B Working group 5 (IEC/SC65B/WG5). The technical committee 65 takes charge of Industrial-process Measurement and Control; sub-committee B is dedicated to Devices; WG5 takes charge of Sensors. Given his research activities in PtPd and PtAu thermocouples, his industrial contacts in Japan, and his IEC membership, Mr. Gotoh was a natural candidate for membership on CCT-WG2, and he graciously accepted the invitation of the Chair.

## Some Recent Literature on Use of Industrial PRTs

E. Méndez-Lango, R. Ramirez-Bazán; Calibration of Industrial Grade Platinum Resistance Thermometers by ITS-90 Fixed Points; TEMPMEKO'2001, Proceedings

P. Marcarino, P.P.M. Steur, G. Bongiovanni, B. Cavigioli; ITS-90 Approximation by Means of Non-Standard Platinum Resistance Thermometers, TEMPMEKO'2001, Proceedings

N.E. Kaiser; Accurate Temperature Measurements Using Pt 100 Resistance Thermometer; TEMPMEKO'99, Proceedings, 365-370

J.F. Dubbeldam, M.J. de Groot; Interpolation Equations and Uncertainties of Industrial PRT's; EUROMET Workshop Temperature, Paris, March 1998

M.V Chattle, J. Buttler; Calibration Characteristics of Industrial Resistance Platinum Thermometers in the Range 600 °C to 850 °C; TEMPMEKO'93, Proceedings, 17-23

J.J. Connolly; Interpolation equations for industrial platinum resistance thermometers, Temperature: Its Measurement and Control in Science and Industry, Vol. 6, New York, AIP, 1992, 419-422

H.M. Hashemian, K.M. Petersen; Achievable accuracy and stability of industrial RTDs; Temperature: Its Measurement and Control in Science and Industry, Vol. 6, New York, AIP, 1992, 427-432

Z. Jipie, F. Kai, W. Shuyuan, Y. Quanfa; Investigation on the R-T relationship above 0°C and the stability of industrial platinum resistance thermometers; Temperature: Its Measurement and Control in Science and Industry, Vol. 6, New York, AIP, 1992, 433-438

L. Crovini, A. Actis, G. Coggiola, A. Mangano; Precision calibration of Industrial Platinum Resistance Thermometers; Temperature: Its Measurement and Control in Science and Industry, Vol. 6, New York, AIP, 1992, 1077-1082

H. Sakurai, Y. Mizuma, T. Hamada, Y. Suyama; Reference Functions for JPt100 Thermometers based on the ITS-90; Transaction of the Society of Instrument and Control Engineers, Vol. 32, No. 8, 1139/1144, 1996

M. de Groot, G. Engler, D. van der Waal, J. Heimeriks; EAL Interlaboratory Comparison on Temperature TH-6; (Final Report); 1997