

Star Inter-Laboratory Comparison of NMI Infrared Spectral Emittance Scales

Leonard Hanssen^{C, S} and Boris Wilthan

National Institute of Standards and Technology, Gaithersburg, MD, U.S.A.

Christian Monte and Jörg Hollandt

Physikalisch-Technische Bundesanstalt, AG 7.31 Temperaturstrahlung, Berlin, Germany

Jacques Hameury

Division Thermique et Optique, Laboratoire National de Métrologie et d'Essais, Trappes, France

Jean-Rémy Filtz

Division Thermique et Optique, Laboratoire National de Métrologie et d'Essais, Paris, France

Ferruccio Girard and Mauro Battuello

Thermodynamics Division, Thermal Metrology, Istituto Nazionale di Ricerca Metrologica, Torino, Italy

Juntaro Ishii

Radiation Thermometry Section, Temperature and Humidity Division, National Metrology Institute of Japan (NMIJ)/AIST, Tsukuba, Ibaraki, Japan

Five National Measurement Institutes (NMIs), NIST, PTB, LNE, INRIM and NMIJ, have joined in an inter-laboratory comparison of their infrared spectral emittance scales. This action is part of a series of pilot inter-laboratory comparisons (including thermal conductivity and thermal diffusivity) sponsored by the Bureau International des Poids et Mesures - Consultative Committee on Temperature – Working Group 9: Thermophysical Properties. The objective of this collaborative work is to strengthen the robustness of major operative NMI Infrared spectral emittance scales and consequently coherency of radiative properties measurements carried out worldwide. The comparison has been performed over a spectral range of 1 μm to 12 μm , and a temperature range from 23 °C to 800 °C. Samples included in the comparison are potential standards: oxidized inconel, boron nitride, and silicon carbide. The measurement instrumentation and techniques used for emittance scales are unique for each NMI, including the temperature ranges covered as well as the sample sizes required. As a result of the difference in temperature ranges, not all NMI scales are compared at all temperatures. However, the overlap of temperature ranges enables at least an indirect comparison between all NMIs. Due to the difference in sample size requirements for each NMI, the emittance inter-laboratory comparison was conducted in a “star” format, in which the pilot laboratory (NIST) distributed separate sample sets to each participant. NIST measured each sample at 23 °C (only) prior to and subsequent to the participant’s measurements. The NIST 23 °C results are used to correct for sample to sample variation, as well as to monitor any change due to the measurement processes. Final complete results of the comparison will be presented and discussed.