Declaration of CCT WG-NCTh concerning the realisation of thermodynamic temperature by primary radiometry

Draft: 10 October 2016

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As part of the implementing the new kelvin project [1], trials of the realisation and dissemination of high temperatures by primary radiometry, using relative and absolute primary thermometry, were undertaken. As a result, best practice recommendations were developed for the realisation and dissemination of thermodynamic temperatures above the Cu (Ag) freezing point [2]. These have been slightly modified and are restated here for the benefit of the wider thermometry community. In addition, during the course of that trial, a number of areas of future research were identified. These are stated as part of the recommendations.

Best practice recommendations for the realisation and dissemination of high temperatures:

1) High-Temperature Fixed Points (HTFPs) can be used, using relative primary thermometry[1], to disseminate either the ITS-90 scale or thermodynamic temperature from NMIs to users with uncertainties comparable with current approaches. However:
    a. There are still some ill-understood effects due to the interplay of the furnace and HTFP cell, namely thermal inertia and furnace uniformity, and it is clear that if lower dissemination uncertainties are to be obtained these effects need robust quantification.
2) Filter radiometers and radiation thermometers, using absolute primary thermometry[1] (i.e., directly traceable to the watt), can be used to disseminate thermodynamic temperature to users. However:
    a. Unknown radiometer drift will remain a problem if this approach of dissemination is adopted, so either a HTFP should be used to periodically to assess the stability of the transfer radiometer, or at least two radiometers should be used as the basis of the dissemination and periodic cross comparisons should be performed to confirm stability.
    b. A detailed study should be performed to reliably quantify the corrections and uncertainties for the non-uniformity of high-temperature furnaces when they are used as radiance sources to transfer the calibration of a reference filter radiometer to a radiation thermometer.

References

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2. Sadli, M., Machin, G., Anhalt, K., Bourson, F., Briaudeau, S., del Campo, D., Diril, A., Lowe, D., Mantilla Amor, J. M., Martin, J. M., McEvoy, H., Ojanen, M., Pehlivan, O., Rougié, B., Salim S. G. R., "Realisation and dissemination of thermodynamic temperatures above the silver point", *Phil. Trans R. Soc. A.* **374:** 20150043 (2016) http://dx.doi.org/10.1098/rsta.2015.0043

[1] From *MeP*-K taxonomy of terms.