Key NPL thermometry research activities in thermometry, humidity and moisture metrology 2017 - 2020

- Sub-ppm uncertainty determination of the Boltzmann constant for the kelvin redefinition
- Ultra-low uncertainty determination of $T-T_{90}$ to $\sim$300 K using acoustic thermometry
- Lead EMPIR project to complete the “Implementing the new kelvin” ahead of the redefinition in May 2019 (including contributions to MeP-K-19 and new $T-T_{2000}$ measurements)
- Development of quantitative thermal imaging capability for use in a variety of applications, for e.g. space, diabetes and nuclear decommissioning
- Development of traceable phosphor-based thermometry to facilitate low uncertainty reliable surface temperature and fibre-optic based measurement
- Initiated research activity on photonic thermometry based on ring resonators
- Coordinate EMPIR project Realising the redefined kelvin (EMPIR SIB02)
- Development of miniature phase-change (fixed point) cells for in situ calibration of Pt100 thermometers used for determining temperature of calibration blackbodies on board spacecraft
- Development of self-validating thermocouples
- Development of optimal Pt-Rh thermocouples for temperatures above 1100 °C
- Investigation of effects (calibration drift, insulation resistance breakdown) arising from contamination of insulation in mineral insulated, metal sheathed thermocouples
- Collaboration with Metrosol on development of a practical Johnson noise thermometer
- Investigation of SPRT non-uniqueness, immersion, self-heating effects
- Lead CCT-K10, participation in CCT-K9, CCT-K8 (Protocol), EURAMET.T-K8 (Draft A), CCT K6.1 (draft A), local pilot in EURAMET.T-K9, participation in EURAMET.T-S3
- Developments in definitions and concepts of relative humidity in the SI (with BIPM/IAPWS workshop)
- Study of air thermometer radiance errors with diameter, for air temperature measurements in precision metrology and in meteorology
- Upwards extension of dew point range
- Incremental developments of multi-gas, multi-pressure humidity calibration and testing capability
- Development of calibration and testing of hygrometers in hydrogen for vehicles (EMPIR MetroHyVE)
- Development of simplified expression of uncertainty for meteorological observations of mixed quality from wide sources (EMPIR SIP 17SIP02 SimpleMeteoU)
- Development and application of soil moisture measurements and calibrations

Key publications 2017-2020:


• Liquidus Slopes for Impurities in ITS-90 Fixed Points, J.V. Pearce, J.A. Gisby, P.P.M. Steur, Metrologia 53 1101-1114 (2016)


• An improved non-contact thermometer and hygrometer with rapid response R Underwood, T Gardiner, A Finlayson, S Bell, M de Podesta. Metrologia 54 (1), S9 (2017)


• Air temperature sensors: dependence of radiative errors on sensor diameter in precision metrology and meteorology M de Podesta, S Bell, R Underwood. Metrologia 55 (2), 229 (2018)