

CCT member and observer Activity Report

Period: January to December 2021

Institute: NPL

State economy: UK

Number of persons involved in thermometry of the institute:

23

Short summary of research and development:

Coordination of large international projects:

- Completed EMPIR project EMPRESS2 focused on improving industrial based thermometry. NPL's key activities were in reliable phosphor thermometry and thermocouples.
- Mid-way through EMPIR Realising the redefined kelvin project (scheduled completion Mar 23). NPL's main activities are in extending the life of ITS-90 and various activities related to HTFPs especially for disseminating T by indirect primary radiometry.

We are continuing our activity on using acoustic resonators for $T-T_{90}$ and developing capability for calibrating thermometers for T dissemination.

We are developing practical methods for *in situ* traceable measurements including 1) Johnson noise thermometry in collaboration with a specialist in instrumentation development, 2) self-validating thermocouples, 3) miniature embedded ITS-90 phase-change cells.

We have expanded our activity in clinical thermometry and also characterisation of thermal imagers.

We are active in developing our metrology capability – particularly phosphor thermometry and thermal imaging to provide reliable temperature metrology for nuclear decommissioning.

We have completed EMPIR SIP SimpleMeteoU, proposing approaches to simplified uncertainty evaluation in meteorology, illustrated for the air temperature case.

We have incrementally developed capability for humidity in varied gases and conditions, introducing new provision of sensor response time testing, and trialling a capability for generating reference humidities at sub-atmospheric pressures

Short summary of recent comparison activity:

NPL realises and disseminates accredited temperature capability from the Argon point to the highest temperatures. We also have capability to perform calibrations to liquid He temperatures. We have taken part in K9 as a sub-pilot and have piloted K10. Both these comparisons are coming to a conclusion. We are currently taking part in K7.2021 water triple point comparison and, through the TG for Body

Temperature Measurement overall responsible for a KC of body temperature calibrators – coordinated by NIM China.

Short summary of other activities:

1. NPL led refresh of CCT Strategy on behalf of the CCT President.
2. NPL chairs two CCT WG Non-contact thermometry and Humidity, and TG on Body temperature measurement. NPL is also member of a number of other CCT WGs including Strategy and Environment. NPL also leads the production of thermometry guides on behalf of CCT.
3. Staff have given a number of keynote addresses at metrology meetings in the past year: Jon Pearce: “New perspectives on applied thermometry” EUSPEN, Graham Machin: 1&2. “The redefined kelvin”, Sensor and Measurement Science International and the same talk at the EMPIR EMPRESS2 stakeholder workshop 3. “The challenges of reliable body temperature measurement”, Saudi Arabia Standards Organization, World Metrology Day seminar and the same talk at 4. Danish Metrology Day, World Metrology Day celebration seminar.

Link to bibliography or list of bibliography (last 5 years):

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