Welcome to the third edition of DireK-T newsletter

Dear colleagues and partners,

Over the past ten months, our team has taken important steps toward building a solid foundation for the dissemination of thermodynamic temperature across the 4 K to approximately 300 K range.

Participants at the Symposium *'Contemporary Issues in Primary Thermometry'* held at the Universidad Internacional Menéndez Pelayo, Santander, Spain

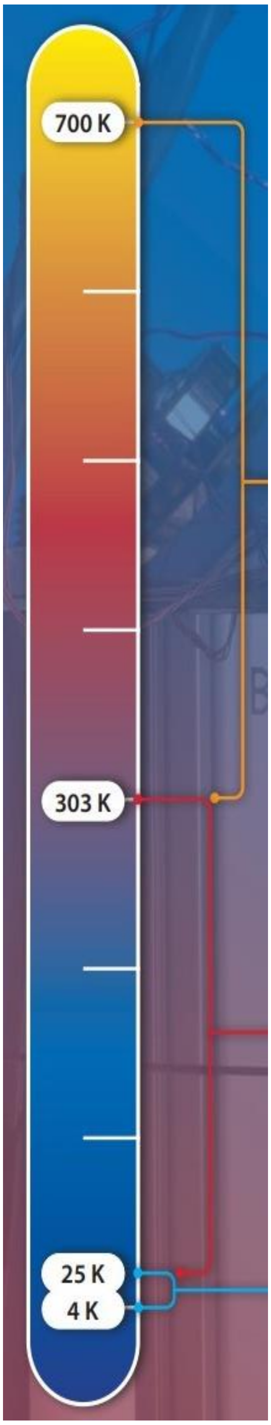
In this issue, we provide an overview of the progress made during the second phase of the project, spanning between March 2025 and April 2026. I would like to share a few highlights from the DireK-T symposium on Contemporary Issues in Primary Thermometry, which took place in Santander from 13–15 May 2026. Over three inspiring days, participants coming from 14 countries explored key developments in temperature metrology, exchanged ideas with experts, and enjoyed rich discussions in a very engaging and collaborative atmosphere.

Thank you for your continued dedication and support. I hope you may find the content of this newsletter interesting and inspiring, as we continue our journey towards the advancement and innovation of primary thermometry.

Roberto Maria Gavioso,

DireK-T Project Coordinator

Introduction



The European Metrology Partnership research project ‘Dissemination of the redefined kelvin’ (DireK-T), started in September 2023 with a duration of three years, brings together a critical mass of several leading primary thermometry experts worldwide. The main aim of the project is to take advantage of the kelvin redefinition to demonstrate the validity of primary thermometry approaches for the direct dissemination of thermodynamic temperature.

The kelvin redefinition in May 2019 initiated a comprehensive research phase for the realisation and dissemination of thermodynamic temperature to replace the ITS-90/PLTS-2000 scales currently in use. This research work utilises the experience gained over the past EMPIR project ‘Realising the redefined kelvin’ (Real-K) https://real-k.aalto.fi, which began the transition away from defined scales by establishing the capabilities to disseminate thermodynamic temperature at high temperatures >1235 K and low temperatures, particularly <5 K.

DireK – T (direk-t.org) addresses the high-level metrology needs stated by CCT recommendation T1 (2021) that NMIs establish capability to determine the difference (T-T_{90}) between the thermodynamic temperature T and its approximation, the defined scale ITS-90 (T90), above 400 K and, in so doing, establish the background capacity for dissemination of thermodynamic temperatures approaching 700 K, ensuring that thermodynamic temperature can be realised and disseminated to room temperature and beyond.

This project will demonstrate dissemination of the kelvin from 4 K to 300 K with defined scale level uncertainties, will develop a robust framework for establishing traceability by primary thermometry and will work towards the next generation primary thermometry to 700 K.

The realisation and dissemination of thermodynamic temperature, as opposed to defined scales, is a long-term objective. The project’s outcomes will mark a significant advance towards that objective by using multiple practical primary thermometry approaches to disseminate thermodynamic temperatures. The ultimate goal is to establish an integrated European temperature metrology infrastructure and facilitate the take up of the developed technology and measurement infrastructure by the measurement supply chain (accredited laboratories, instrument manufacturers), CIPM Consultative Committee for Thermometry (CCT), EURAMET and other RMO TC-Ts and relevant end users (industry and academia such as CERN, quantum computing, fundamental materials science communities, etc.).

Research highlights

Demonstrating dissemination of thermodynamic temperature from 4 K to 25 K

Because of the inherent difficulties, below 25 K the ITS-90 temperature scale is not routinely realized according to its definition. As an alternative, the DireK-T project aims at demonstrating that low-uncertainty realization and dissemination of thermodynamic temperature is achievable without the need to rely on a defined scale.

To provide supporting evidence to the proposed alternative, an international comparison of thermodynamic calibration capabilities using primary gas thermometry methods, namely acoustic gas thermometry (AGT), dielectric gas thermometry (DCGT), and refractive index gas thermometry (RIGT), was set up as a main objective of the DireK-T project.

As the first preparatory stage, completed by spring 2025 (see DireK-T Newsletter 1), the calibration of a set of 16 capsule-type thermometers of various kinds (Pt, RhFe, PtCo), previously selected for stability by different partners, was completed by INTiBS, in the range 4 K to 25 K, by comparison with other reference thermometers previously calibrated on ITS-90.

In the second stage, four project partners, namely PTB, TIPC-CAS, INRIM and LNE-CNAM, have used their previously developed primary gas thermometers (see DireK-T Newsletter 2) to obtain a direct thermodynamic calibration of the capsules under test in various overlapping subranges in the interval between 4 K and 25 K.

Particularly, PTB has used its DCGT apparatus (see Fig. 1) for the calibration of one PtCo and one RhFe capsule at six temperatures between 4 K and the TPNe (24.56 K), and two capsule standard Pt resistance thermometers (cSPRTs) between the TPe-H_2 (13.8 K) and TPNe; TIPC-CAS has used a RIGT apparatus to calibrate one PtCo and one RhFe capsule at about 40 calibration points between 4 K and 25 K, and one cSPRT at 13 calibration points between the TPe-H_2 and the TPNe; INRiM has calibrated one cSPRT, two PtCo and one RhFe capsule at four temperatures between TPe-H_2 and the TPNe using the primary method of single-state absolute AGT; finally, LNE-CNAM calibrated one cSPRT, two PtCo and one RhFe at 40 thermodynamic calibration points between 6 K and the TPNe using fast AGT, and along 7 isotherms spanning the pressure range between 20 kPa and 70 kPa.

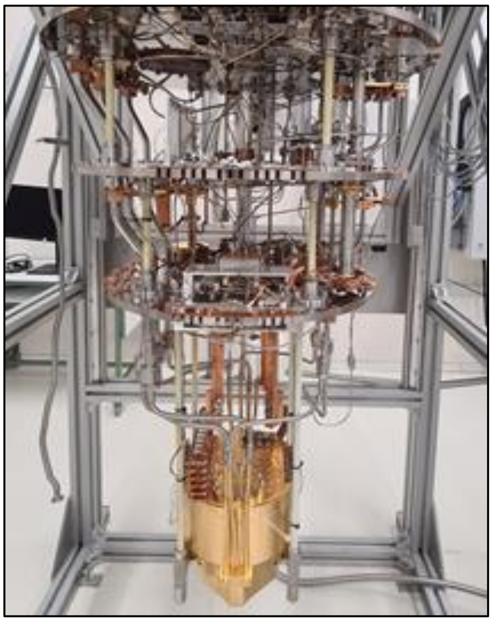
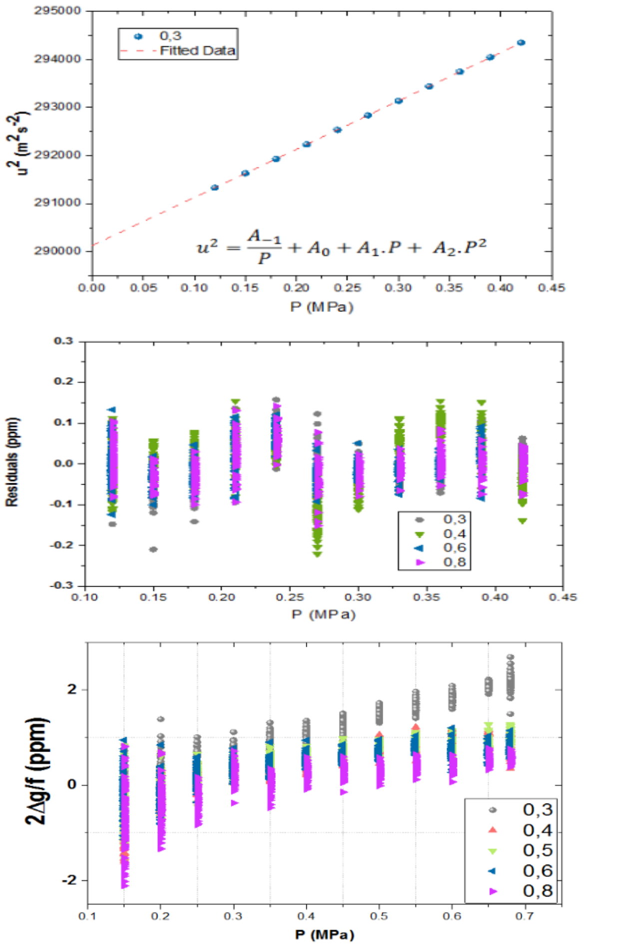


Figure 1. DCGT gas thermometer used at PTB for the thermodynamic calibrations between 4 K and the TPNe.

The results of all these thermodynamic calibrations are currently under evaluation, expected to be complete, and communicated to CEM, who acts as the pilot of the comparison, with a preliminary uncertainty evaluation in early 2026. In the meanwhile, all the thermometers have been returned to INTiBS who will be responsible for running their final direct comparison in 2026.

Demonstrating dissemination of thermodynamic temperature from 25 K to 300 K

Above 25 K, ITS-90 is easier to realize but has two major drawbacks: it displays large ($T-T_{90}$) deviations from thermodynamic temperature, relatively up to −55 ppm (−7.6 mK) near 140 K, and it suffers from non-uniqueness uncertainty contributions due to the possible cSPRT calibration at different fixed points. Because thermodynamic calibration of thermometers could in principle remove these issues, the objectives of DireK-T include extension of the



temperature range of interest up from the TPNe up to the MPGa (303 K).

Figure 2. AGT results obtained at LNE-CNAM. (Upper plot) squared speed of sound data measured in He near the TPAr (83.8 K) and. (Middle plot) corresponding residuals of four radial modes from a corresponding acoustic virial fitting function. (Lower plot) relative double excess halfwidths of five radial acoustic modes near the MPGa (303 K).

For this range, the initial ITS-90 calibration of twelve cSPRTs was collectively obtained at INTiBS, CEM, INRIM, SMD, LNE-CNAM and UL by the end of 2024. The thermometers were then delivered, with a distribution scheme designed not to disclose the initial calibration to the partners responsible for successive thermodynamic experiments, namely INRiM, NPL, PTB, LNE-CNAM.

Additionally, TIPC-CAS, NRC and KRISS prepared to run their own thermodynamic measurements for cSPRTs whose previous ITS-90 calibrations obtained *in-house*.

Figure 3. AGT apparatus based on a stainless steel microwave/acoustic resonator set up at CMI for thermodynamic temperature determinations in the range between the TPHg and the MPGa.

By summer 2025, seven experiments were running to collect thermodynamic calibration data over partially overlapping temperature ranges between the TPNe and the MPGa. At PTB, INRiM and TIPC-CAS the primary gas thermometry apparatus, respectively based on DCGT, AGT and RIGT, were the same used to cover the range below 25 K. Acoustic thermodynamic calibrations were obtained by INRiM, for one cSPRT, at nine intermediate temperatures between the TPNe and the TPXe (161 K), including the TPO_2 (54.3 K) and the TPAr (83.8 K). At PTB and TIPC-CAS, thermodynamic calibrations of cSPRTs were upper limited at the TPAr. At NPL, three cSPRTs were installed on an AGT apparatus measuring along seven isotherms between the TPHg (234 K) and the MPGa. At LNE-CNAM, four cSPRTs were installed in an AGT system, comprising a large-volume (3 liters) copper resonator, for thermodynamic calibrations along 7 isotherms, up to 675 kPa, spanning between the TPAr and the MPGa. Figure 2 exemplifies the remarkable precision and accuracy of some LNE-CNAM acoustic measurements.

Project collaborators NRC and KRISS also completed AGT calibrations before the end of 2025. Particularly, NRC completed thermodynamic calibration of two cSPRTs, providing a large set of results, based on repeated isotherm measurements, at 13 different temperatures in the range between the TPNe and the MPGa, while at KRISS calibration of a single cSPRT covered the range between 185 K and the MPGa.

All the cSPRTs thermodynamically calibrated by the consortium were later transferred to UL or INTiBS for the final stage of comparisons, currently ongoing.

Over the restricted temperature range between the TPHg and the MPGa, TUBITAK and CMI have used the AGT apparatus previously developed to perform acoustic and microwave measurements at the TPHg, TPW (273.16 K) and the MPGa. Their results will be analyzed in 2026 to provide additional (T−T_{90}) determinations.

Testing the equivalence of T and T_{90} dissemination

The multiple calibration and comparison activities scheduled within the DireK-T project are providing a substantial amount of primary thermometry results. Over the full temperature range between 4 K and 25 K, these data fall in two main categories of comparison, namely differences (T_i – T_{90j}) between realizations of thermodynamic temperature and the ITS-90 scale, and tests of the consistency (T_i – T_j) = 0, of different realizations of thermodynamic temperatures, where the different subscripts *i, j* refer to work carried out in different NMI laboratories.

The outcome of both types of comparisons are particularly interesting, and have not been tried before. In fact for the great majority, if not the totality, of the (T−T_{90}) determinations reported over the last 35 years, both T and T_{90} were obtained locally, i.e. in laboratories belonging to the same metrological institution. As for the direct comparison of T realizations from different laboratories, without involving the intermediacy of an ITS-90 reference, it also represents a novel challenging quest.

Beside novelty, these activities are of interest for thermometry because they will provide a realistic assessment of the metrological quality of a possible dissemination of T, instead of T_{90}, as well as a test of the level of equivalence of these alternative approaches over a wide temperature range, by providing estimates of their respective uncertainties. In this regard, a uncertainty source which affects any dissemination scheme is represented by the limited stability of the thermometers used as transfer standards. Importantly, the mole of redundant calibration data collected within the project, for three different kinds (Pt, RhFe, PtCo) of capsule thermometers will provide useful information about their robustness, stability, sensitivity, and about the required number of calibration points and the best suited calibration functions.

To be meaningful, the comparisons of T and T_{90} realizations require well-defined procedures which were established in a protocol prepared and agreed in the initial phase of the project. The protocol also defines the statistical and analytical methodologies to be used for the evaluation of the consistency of results across laboratories.

At the time of writing, all thermodynamic calibration activities have been completed with results currently being analyzed by the project partners. Communication of the results with a preliminary estimate of their uncertainty are expected within spring of 2026.

The final comparison runs to test their consistency are currently ongoing at INTiBS and UL and will continue until the end of the project, which is set by the end of August 2026. These final runs will also provide a second redundant set of ITS-90 auxiliary calibrations.

All results and data will be submitted and analyzed by CEM, the pilot of the comparison. Publication of their analysis is expected before the end of 2026.

Establishment of capabilities for dissemination of thermodynamic temperature between 300 K and 700 K

The realization of gas-based methods for thermodynamic temperature measurements significantly above 300 K is an area of primary thermometry still underexplored, with a limited number of determinations of (T–T_{90}) having been reported in this range.

The application of AGT thermometry in this range looks particularly promising, with no expected limitations as a matter of principle, but for a number of significant technological challenges mainly related to maintaining useful precision from acoustic and microwave signal transmission using waveguides instead of conventional transducers and cable connections, and achieving the capability to preserve gas purity.

Four different experiments have continuously been refined during the DireK-T project to meet these challenges and gradually expand AGT capabilities in this temperature range.

Most notably, the research group of NIM has recently reported relevant progress, including precise acoustic and microwave measurements up to 1300 K with anticipated preliminary (T–T_{90}) determinations. The AGT results obtained at NIM were obtained using two apparatus respectively based on a bolted cylindrical resonator for use up to 823 K, and a welded cylindrical cavity extending the range up to 1300 K. Both systems employ heat-pipes to increase thermal uniformity and are designed to accommodate a primary radiometric thermometer.

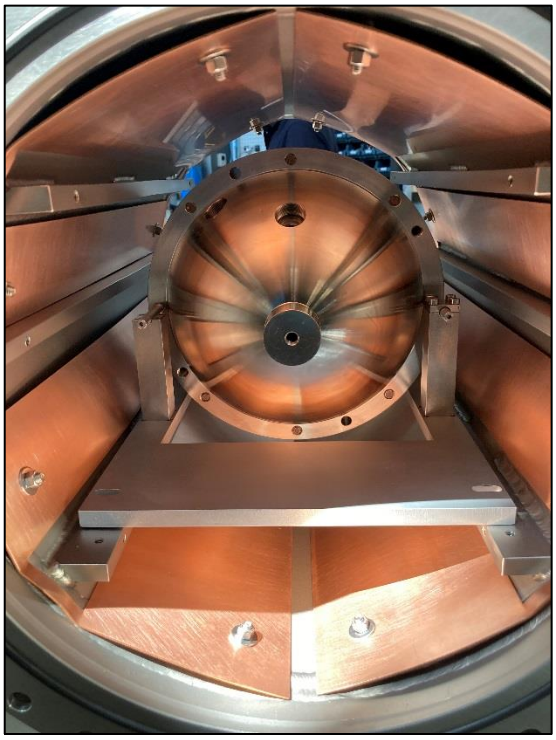


Figure 4. Assembly test of INRIM high temperature AGT apparatus. Detail of spherical stainless steel resonant cavity within vacuum- and pressure tight surrounding vessel.

At INRiM, mechanical processing has continued to complete constriction details and accessories of an AGT system based on a spherical stainless steel resonator, a custom designed pressure vessel rated for pressures up to 1.5 MPa at 800 K (see Fig. 4), and a vacuum furnace heated by IR lamps. Completion of the entire apparatus is expected within the life-time of the project in summer 2026.

ITRI and NPL cooperation reported tests of the performance of an AGT measurement using a cylindrical resonator system designed for temperatures up to 573 K. The apparatus was tested at ambient temperature for thermal uniformity and an evaluation of outgassing effects.

Dissemination and communication activities

Achieving and sharing "true thermodynamic temperatures" rather than relying on defined scales like ITS-90 is a long-term goal, representing full implementation of the redefined kelvin.

This transition marks a major milestone: it replaces over a century of temperature dissemination based on defined scales with a direct, scale-independent approach. To ensure alignment and transparency, key international stakeholders, such as the BIPM and the RMOs' technical committees on thermometry, are kept informed of DireK-T's progress through annual reports.

Several key events provided opportunities to highlight the progress and impact of the DireK-T project. **The EURAMET TC-T Technical Workshop on "Disseminating the Redefined Kelvin (DireK-T)"**, held on 14 April 2026, brought together experts from national metrology institutes to discuss recent advances in thermodynamic temperature measurement and dissemination. The workshop provided an overview of the DireK-T project, presented progress in primary thermometry methods including acoustic, dielectric-constant and refractive-index gas thermometry and reviewed comparison and dissemination activities across Europe. The programme also featured updates on new acoustic gas thermometry capabilities, the CCT strategy, and the future implementation and dissemination of the redefined kelvin.

The consortium organised the **Summer School "Contemporary Issues in Primary Thermometry"**, which took place from 13–15 May 2026 at UIMP Las Llamas, Santander. This three-day course provided early-career metrologists and researchers with advanced knowledge on the realization and dissemination of thermodynamic temperature. Participants gained insights into gas-based and other primary thermometry techniques and explored how these approaches relate to traditional temperature scales such as ITS-90. The course was scheduled immediately before the biannual Consultative Committee for Thermometry (CCT) meeting in Paris, offering an excellent opportunity for international participants to combine both events.

At the subsequent 32nd meeting of the CCT, held at the BIPM in Sèvres, future challenges and opportunities for temperature metrology were further discussed during the "**Celebratory Seminar of 100 Years of Temperature Scales**." The seminar reviewed the historical development of temperature scales, the redefinition of the kelvin, and the impact of evolving temperature standards. Particular attention was given to the future of temperature traceability beyond ITS-90, with discussions focusing on the increasing role of primary thermometry and the long-term evolution of thermodynamic temperature dissemination under the redefined kelvin.

Dissemination of project results

Explore the DireK-T Project Online

Want to learn more about the latest advances in thermodynamic temperature dissemination? Visit the official website of the DireK-T project – Dissemination of the redefined kelvin – to access news, publications, event updates, and technical insights from Europe's leading metrology institutes.

🔗 **www.direk-t.org**
Stay informed and follow the journey toward next-generation primary thermometry!

Access Direk-T Project Publications and Data

The scientific outputs from the Direk-T project, including papers, presentations, and datasets related to the dissemination of thermodynamic temperature, are openly available on **Zenodo**. This dedicated repository, part of the EU Open Research platform, ensures long-term access to research funded under Horizon Europe. Interested readers can explore the **Kelvin community on Zenodo**, where all relevant materials from the project are published and regularly updated.

Visit the repository here: Zenodo Kelvin Community

Published papers

- Gao, B., Zhang, H., Kong, X., et al. (2026). Primary thermometry below 25 K: a decade of low-uncertainty measurements linked to the new kelvin. *Phil. Trans. R. Soc. A* **384**: 20240451. https://doi.org/10.1098/rsta.2024.0451
- Gavioso, R. M., Steur, P. P. M., Lopardo, G., Imbraguglio, D. (2026). Dissemination of thermodynamic temperature by gas thermometry below 300 K. *Phil. Trans. R. Soc. A* **384**: 20240450. https://doi.org/10.1098/rsta.2024.0450
- Imbraguglio, D., Steur, P. P. M., & Gavioso, R. M. (2026). Direct calibration of resistance thermometers between 10 K and 25 K by absolute acoustic gas thermometry. *Phil. Trans. R. Soc. A* **384**: 20250043. https://doi.org/10.1098/rsta.2025.0043
- Liu, S., Song, Y., Zhang, H., et al. (2025). Active phase and amplitude temperature control method for cryostat: Active phase and amplitude temperature control method for cryostat: A case in the thermodynamic temperature international comparison system. *Appl. Therm. Eng.*, **258** 124562. https://doi.org/10.1016/j.applthermaleng.2024.124562
- Song, Y., Zhang, H., Gao, B., et al. (2025). Ultra-stable cryogenic international temperature comparator with microkelvin instability. *Metrologia*, **62** (2025) 065007 https://doi.org/10.1088/1681-7575/ae1f1d
- Song, Y., Zhang, H., Liu, S., et al. (2026). Stability and Calibration Performance of Standard Platinum-Cobalt Resistance Thermometers for Cryogenic Applications. *Metrologia,* **63** 015002. https://doi.org/10.1088/1681-7575/ae2687
- Zhang, H., Kong, X., Song, Y., et al. (2025). State-of-the-art comparisons of *ab initio* calculations of density virial coefficients for helium-4 with measurements. *Metrologia*, **62** 055008. https://doi.org/10.1088/1681-7575/ae012f

- Machin, G., Gavioso, R. M., Underwood, R. J., Gaiser, C., Dobre, M., & Martin Hernandez, J. M. (2025). European partnership in metrology project: Dissemination of the redefined kelvin (DireK-T). *Meas: Sens.,* **38** 101620 https://doi.org/10.1016/j.measen.2024.101620
- Zhang, H., Song, Y., Kong, X., Gao, B., Plimmer, M., Pitre, L. (2025). Repeatability of a primary thermometer and calibration of resistance thermometers between 5 K and 25 K. In *Metrologia,* **62** 015005 https://doi.org/10.1088/1681-7575/ad87f5
- Liu, S., Yaonan, S., Gao, B., Zhang, H., & Han, Z. (2025). Achieving High Stability in Cryostat: A Study on Optimal Thermal Link Parameters. *Int. J. Refriger.* **167** 13-22. https://doi.org/10.1016/j.ijrefrig.2024.07.026
- Szklarz, G., Nikonkov, R., Kowal, A. (2026) Analytical framework for high-precision cryogenic thermometry: Characterization of RhFe and PtCo sensors below 25 K. *Measurement,* **276** 121409. https://doi.org/10.1016/j.measurement.2026.121409
- Xu, L., Feng, X., Zhang, J. et al. Progress of acoustic gas thermometry using a cylindrical resonator at temperatures up to 809 K. *Phil. Trans. R. Soc. A* **384**: 20240454. https://doi.org/10.1098/rsta.2024.0454

Conference presentations

Results from the DireK-T project were presented at the **TEMPMEKO–ISHM 2025 Conference** held in Reims, France, from 20 to 24 October 2025 (https://www.tempmeko-ishm2025.com/inscriptions/en/scientific-program/detailed-program/).
Project partners contributed to the sessions **OP-01 – Thermodynamic Temperature Determinations; in Memory of Mike Moldover**, **OP-13 – Thermodynamic Temperature Determinations**, and **OP-25 – Dissemination of the Redefined Kelvin (DireK-T Project)**. These presentations showcased recent developments in primary thermometry, thermodynamic temperature determination, and strategies for the dissemination of the redefined kelvin, demonstrating the significant scientific progress achieved through the DireK-T project.

- Žužek, V., Kropej, R., Janežič, A., & Bojkovski, J. (2025). Establishing Traceability of Capsule Type Thermometers in Scope of DireK-T Project at MIRS/UL-FE/LMK. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Shivagan, D. D., Babita, Pant, U., Meena, H., Gupta, G., & Bapna, K. (2025). Thermal Optimizations for Development of Acoustic Gas Thermometry at CSIR-NPL, India. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025
- Gavioso, R. M., Steur, P. P. M., Lopardo, G., Rinolfi, S., Santoro, F., & Imbraguglio, D. (2025). Thermodynamic Temperature Measurements by Acoustic Gas Thermometry Between 10 K and 160 K. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Zhang, H. Y., Song, Y. N., Kong, X. J., Gao, B., & Pitre, L. (2025). Relative Refractive-Index Gas Thermometry and Thermodynamic Temperature Wire Scale from 5 K to 25 K. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Kong, X., Liu, S., Song, Y., Zhang, H., Guo, W., Gao, B., & Pitre, L. (2025). Towards Direct Realisation of the ITS-90 in a Primary Gas Thermometer Between 2 K and 5 K. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.

- Gavioso, R. M., Gaiser, C., Martin, M. J., Dobre, M., Underwood, R., & Machin, G. (2025). The DireK-T Project for Dissemination of Thermodynamic Temperature. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Voldán, M., Gavioso, R. M., & Mahovský, D. (2025). Implementing Acoustic Gas Thermometry at CMI in the Temperature Range 233 K to 303 K. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Gaiser, C., & Fellmuth, B. (2025). Experiment and Theory Hand in Hand – A Re-evaluation of DCGT Data with ^{3}He at 2.5 K and 3.2 K. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Yang, I. (2025). Thermodynamic Temperature Measurement Using Acoustic Gas Thermometry at KRISS. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Pitre, L., Tauzin, C., & Sparasci, F. (2025). Evaluating Different Methods in Acoustic Frequency Measurement: Advancing Towards a Practical AGT. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Tsai, S. F., & Underwood, R. (2025). Acoustic Gas Thermometry with a Cylindrical Resonator Near Room Temperature. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Rourke, P. M. C., Levesque, M. B., & Todd, A. D. W. (2025). NRC AGT+RIGT System: Vacuum Measurements and Auxiliary Isotherm Results. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Xu, L., Feng, X.-J., Lu, X.-F., & Zhang, J.-T. (2025). Progress on the Determination of T−T90 by Cylindrical Acoustic Gas Thermometry up to 1000 K. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Pant, U., Sparasci, F., Plimmer, M. D., & Pitre, L. (2025). Progress on Measurement of the T−T90 Using Acoustic Gas Thermometry of Helium-4 with a Large-Volume Quasi-Spherical Resonator. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Gao, B., Zhang, H. Y., Guo, W. X., Kong, X. J., Song, Y. N., Liu, S. Q., Luo, E. C., & Pitre, L. (2025). Implementing New Kelvin at Temperatures Below 25 K. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.Kowal, A., Nikonkov, R., Szklarz, G., et al. Advancements in Thermodynamic Temperature Dissemination: Progress in the DireK-T Project. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Underwood, R. (2025). The Gas-Shell Interaction in Acoustic Resonators and Implications for Practical Primary Thermometry. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- Dobre, M., Voldán, M., & Mahovský, D. (2025). Overcoming Challenges in Using ITS-90 Fixed Point Cells for CSPRT Calibration: Lessons Learned. Presentation at TEMPMEKO–ISHM 2025, Reims, France, 20–24 October 2025.
- C. Gaiser, The challenges of primary thermometry from 300 K to 1235 K, presentation at The Royal Society - Theo Murphy Meeting - The redefined kelvin: progress and prospects, 24 – 25 February 2025

- R. Gavioso, Dissemination of thermodynamic temperature below 300 K, presentation at The Royal Society - Theo Murphy Meeting - The redefined kelvin: progress and prospects, 24 – 25 February 2025
- B. Gao, Ultra-low uncertainty primary thermometry below 25 K, presentation at The Royal Society - Theo Murphy Meeting - The redefined kelvin: progress and prospects, 24 – 25 February 2025
- X. Feng, Progress on future temperature dissemination using high temperature acoustic gas thermometry, presentation at The Royal Society - Theo Murphy Meeting - The redefined kelvin: progress and prospects, 24 – 25 February 2025
- G. Machin, M. Dobre, R. Gavioso, C. Gaiser, M-J. Martin, R. Underwood, "Dissemination of the redefined kelvin", poster presented at 26th IIR International Congress of Refrigeration: Paris , France, August 21-25, 2023.
- R. Gavioso, M. Dobre, C. Gaiser, R. Underwood and G. Machin, "Dissemination of the redefined kelvin", poster presented at 22nd Symposium on Thermophysical Properties, Boulder, CO, USA, June 23–28, 2024
- G. Machin, R. Gavioso, M. Dobre, C. Gaiser, M-J. Martin, R. Underwood, "European Partnership in metrology project: Dissemination of the redefined kelvin (DireK-T)", paper accepted for presentation at XXIV IMEKO World Congress "Think Metrology" August 26 - 29, 2024, Hamburg, Germany

Consortium and contact information

The consortium consisting of national metrology, research institutes and universities brings together a critical mass of recognised world leaders in the field.

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To register as a project stakeholder, contact Miruna Dobre (miruna.dobre@economie.fgov.be). An updated edition of this newsletter will be distributed every nine months until the project conclusion in August 2026.

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