# NMISA Temperature Laboratory – Activity Report to the

**Consultative Committee for Thermometry (CCT)**
**Reporting Period:** May 2024 – May 2026
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## 1. Introduction

This report presents an overview of the key activities, developments, research contributions, calibration services, and international engagements undertaken by the NMISA Temperature and Humidity Laboratory during the reporting period.
These activities support NMISA's mandate to maintain, realize, and disseminate national temperature standards, enhance national and regional measurement capability, and contribute to the international thermometry community, particularly through participation in CCT working groups, key and supplementary comparisons, and regional metrology organization (RMO) initiatives.

## 2. Maintenance and Development of National Temperature Standards

During the reporting period, the laboratory maintained and verified its ITS-90 temperature realization, covering fixed-point cells from the Argon point to the Aluminium point.
Verification and assurance of equivalence were supported through:

- Participation in relevant CCT and RMO key comparisons
- Ongoing monitoring of fixed-point cell performance
- Support of NMISA calibration and measurement capabilities (CMCs)

These activities ensure continued traceability to the SI and alignment with international best practice.

## 3. Calibration and Dissemination Services

The laboratory delivered high-accuracy thermometer calibration services for a wide range of temperature measurement devices, including:

- Standard Platinum Resistance Thermometers (SPRTs)
- Industrial Platinum Resistance Thermometers (IPRTs)
- Digital thermometers
- Thermistors
- Thermocouples
- Infrared thermometers
- Blackbody radiation sources

The laboratory serves South African and African industries and calibration laboratories, including:

- Pharmaceutical manufacturing
- Power generation
- Environmental monitoring
- Medical device manufacturing
- African National Metrology Institutes (NMIs)
- Commercial calibration laboratories

These services support traceability chains across critical sectors within South Africa and the broader African region.

## 4. Research, Development, and Innovation

The NMISA Temperature and Humidity Laboratory is actively engaged in applied research and development, including:

- Ongoing R&D on the simultaneous evaluation of emissivity and temperature determination using signals obtained from a multi-wavelength infrared thermometer
- Ongoing R&D on the design of cut-off interference filters for infrared thermometer applications
- Completed research on *Investigating Design Considerations and Offsets in Body Infrared Thermometer Accuracy*, published in the Journal of Thermophysics
- Engagement in the APMP Thermal Imager project, including experimental investigations of thermal imager testing principles.
- Annual technical contributions at the Test & Measurement Conference organized by the National Laboratory Association (NLA), South Africa
- Modernization and automation upgrade of the thermocouple measurement system
- Ongoing R&D on Traceability of Thermal Imagers: A Comparative Study of different Approaches
- Ongoing R&D on Traceable Infrared Thermometry in Humid Environments: Modelling, Measurement, and Uncertainty Evaluation

These activities support both metrological advancement and improved customer service efficiency.

## 5. International Comparisons and CCT / AFRIMETS / APMP Engagement

### 5.1 Comparisons

The NMISA Temperature and Humidity Laboratory participated in several key and supplementary comparisons, including:

- Completion of the final measurement and analysis phase of CCT-K9.3
- Piloting and coordination of AFRIMETS supplementary comparisons:
  - AFRIMETS TS3
  - AFRIMETS TS7
- Provision of reference temperature points for SADCMET comparisons
- Completion and publication of APMP K4.2 key comparison
- Completion and publication APMP TS-16 supplementary comparison
- APMP TS-17 supplementary comparison: Draft A report circulated

### 5.2 CCT and RMO Working Group Participation

The laboratory actively participates in some CCT Working Groups and Task Groups namely WG-ENV, TG-AIR, WG-CMC, WG-SP

Additional regional and international engagement includes:

- Chair of AFRIMETS TC-T, providing coordination and leadership across the region
- Technical assistance to AFRIMETS and SADCMET temperature laboratories
- Participation as an associate member of APMP TC-T, contributing to technical projects, TC meetings, and intercomparisons

## 6. Quality System Activities

The laboratory operates under a fully implemented quality management system, with:

- Regular internal audits
- Periodic external assessments
- Ongoing compliance with accreditation requirements

The laboratory is accredited by the South African Accreditation System (SANAS) for temperature calibration services.

The laboratory is actively engaged with SANAS, Southern African Development Community Accreditation Services (SADCAS), and AFRIMETS, contributing to regional and international quality infrastructure through the provision of qualified technical assessors and peer reviewers.

## 7. Capacity Building and Stakeholder Engagement

In support of regional metrology development, the laboratory provides technical capacity building and consultancy, including:

- In-house and on-site practical training delivered to African NMIs, including Uganda, Kenya, Tanzania and Namibia

The laboratory also continues to support South Africa's national quality infrastructure initiatives.
International engagement under government-to-government frameworks includes:

- Establishment of a collaborative relationship with Fujian Metrology Institute (China) via Fujian Province, exploring future technical cooperation opportunities

## 8. Challenges and Future Plans

### 8.1 Challenges

The laboratory continues to face challenges, including:

- Increasing calibration demand relative to available equipment throughput
- Resource constraints limiting participation in multiple international comparisons and conferences

### 8.2 Future Plans

To address these challenges and strengthen capacity, the laboratory plans to:

- Expand cross-disciplinary research collaboration within NMISA (temperature and humidity domains)
- Increase participation in CCT and APMP comparisons, particularly:
  - Silver and Aluminium point SPRT calibrations to support new and expanded CMCs
- Expand research collaborations with universities and international NMIs

## 9. Conclusion

The NMISA Temperature and Humidity Laboratory continues to strengthen South Africa's national temperature standards, expand high-quality calibration services, and contribute meaningfully to the global thermometry community through the CCT and RMOs.
Continued investment in infrastructure, human capacity, and international collaboration will further enhance NMISA's alignment with the SI and the international metrology system.