

## **Recent SADC MET activities**

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### **Abstract**

The Southern African Development Community is one of the most recently established trading blocks in the world. Due to the nature of the region, it has to deal with several unique challenges. Despite this, developments are rapidly taking place within the block.

It was realised early on that technical barriers to trade was probably the greatest stumbling block preventing economic cooperation and growth within the region. As such a regional quality infrastructure was put in place with the express goal to eliminate these barriers through the establishment of common standards. As part of this process, the Southern African Development Community Cooperation in Measurement Traceability was formed to coordinate and promote the science of measurement within the region.

The history of the region and the recent past, current and planned future activities within the measurement cooperation will be highlighted in the paper.

### **1. Introduction**

The Southern African Development Community (SADC) was formed in 1992, although a loose alliance of nine members existed since 1980. As part of the quality infrastructure, the Southern African Development Community Cooperation in Measurement Traceability (SADC MET) was formed at the same time. The formation of this cooperation coincided with the formation of several other regional bodies within SADC MET, specifically the technical committee and working group structure.

Due to the nature of business in the region, and the history of Southern Africa, the typical metrology services currently focus on trade measurements, such as mass, volume and length. A number of laboratories in the region are in the process of applying for accreditation for these services.

As part of the technical program of SADC MET projects are identified at regional meetings. Several intercomparisons and pilot studies were completed in the last few years. Current focus areas include Reference Materials for Food Analysis, and a Regional Time Network.

Funding for the activities of the region is sourced from various organisations, such as the Physikalisch-Technische Bundesanstalt (PTB) of Germany, the South African Department of Trade and Industry (**the dti**), and the European Union (EU).

## 2. The Southern African Development Community

SADC was formalized in 1992 at a meeting in Windhoek, Namibia. It currently has fourteen member states, which are: Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe. The objectives of SADC include [1] achieving active development and economic growth; alleviating poverty; enhancing the standard and quality of life of the people of Southern Africa; amongst others. A map of the member states of SADC is shown in figure 1.

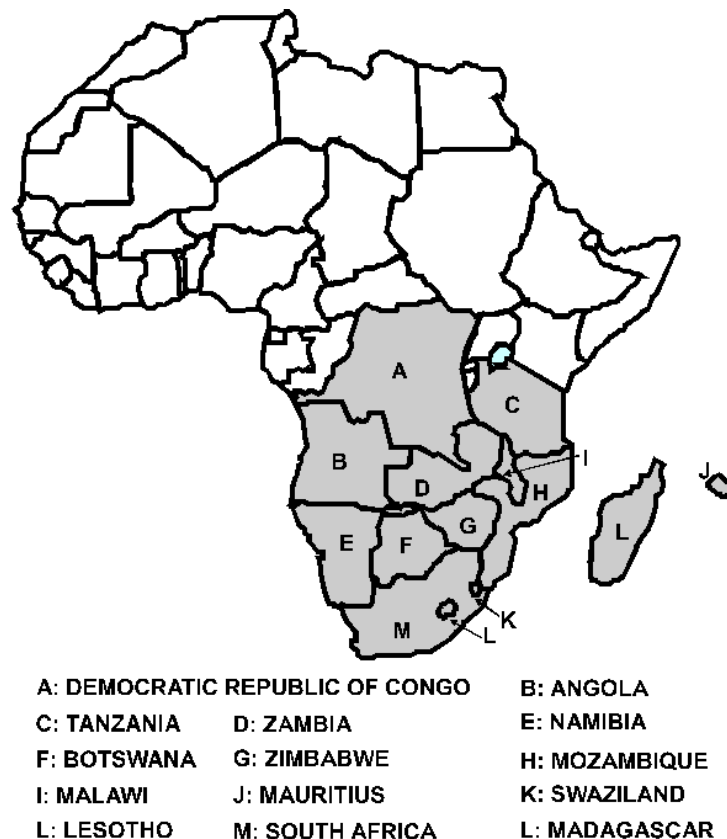


Figure 1. A map showing the member states of SADC

The SADC Standards, Quality Assurance, Accreditation and Metrology (SQAM) program was established to progressively eliminate Technical Barriers to Trade (TBT) in the region, and between SADC and other regions in the world. This program is overseen by the SADC Directorate Trade, Finance, Industry and Investment. The SADC quality infrastructure includes several formal entities, established to perform specific functions of the SQAM program, of which SADC MET is one. The others are the SADC Cooperation in Legal Metrology

(SADCMEL), the SADC Cooperation in Accreditation (SADCA), and the SADC Standardization Cooperation (SADCSTAN).

### **3. The SADC Cooperation in Measurement Traceability**

The operations of SADCMET [2] are overseen by a chairperson, and the daily running of its affairs is handled by a secretariat, currently run by the CSIR National Metrology Laboratory (CSIR NML) of South Africa. The technical work of the cooperation is performed by a technical committee structure. The secretariat consists of a regional coordinator, a projects coordinator and a secretary.

There are five technical committees within the cooperation. These are Technical Committee (TC) 1, dealing with Joint Committee on Joint Committee of Regional Metrology Organisations and the BIPM (JCRB) matters; TC-2 dealing with Education; TC-3 dealing with National Metrology Institute (NMI) development, TC-4 dealing with Harmonised national Measurement Standard (NMS) legislation; and TC-5 dealing with Metrology support for Small and Medium Enterprises (SMEs).

TC-1 working groups, mirroring the Consultative Committees have been formed in all major metrology areas. There are working groups for Acoustics, ultrasound and vibration, Electricity and magnetism, Length, Mass and related quantities, Photometry and radiometry, Amount of substance, Ionising radiations, Thermometry, Time and frequency, NMI quality systems, and a newly formed working group to quality control entries to the Calibration and Measurement Capabilities (CMC) database.

The stated aims of SADCMET are to:

1. Promote closer collaboration amongst its Members in their work on measurement standards within the present decentralised regional metrology structure;
2. Improve existing national measurement standards and facilities and make them accessible to all Members;
3. Ensure that new national measurement standards and facilities developed in the context of SADCMET collaborations are accessible to all Members;
4. contribute to the formulation of and participate in intra- and inter-regional systems to maintain the continued traceability of the National Measurement Standards of the Member States to the SI units of measurement; and
5. Encourage the harmonisation of legislation relating to National Measurement Standards.

These aims are pursued through the coordination of SADC projects on measurement standards; and by providing a forum for cooperation with regard to major investments in national metrology facilities in the region. It also operates a database containing details on regional metrology facilities, the personnel and services at those facilities and the results of proficiency testing schemes and comparisons (not yet at the level where it can be submitted to the BIPM databases) performed in the region. It is also the official liaison with the Joint Committee of Regional metrology organisations and the BIPM (JCRB) and other regional and international organisations concerned with measurement traceability.

SADCMET is also responsible for organizing of and promoting the participation in both intra- and inter-regional laboratory comparisons, in both testing and calibration. It also promotes the creation of an environment within which Mutual Recognition Agreements (MRAs) among qualifying institutions of member states within the framework and consistent with the global MRA can be concluded.

In addition to the current member states of SADC, a number of organisations hold associate membership of SADCMET. These are the Kenya Bureau of Standards, the National Institute of Standards (Egypt), the Quality and Standards Authority of Ethiopia, and the Uganda National Bureau of Standards.

#### **4. Metrology in the SADC region**

Since the formation of SADCMET, a number of the members have established NMIs. Of these the oldest is by far the CSIR NML of South Africa, established in 1947. It is the reference laboratory for the region as a signatory of the Mutual Recognition Arrangement between NMIs. Its experts serve on almost all the CIPM Consultative Committees.

Of the other countries in the region, Lesotho is the only one that has no metrology facilities. Angola, the Democratic Republic of Congo, Mozambique, Namibia, Swaziland, Botswana and Malawi have rudimentary facilities, such as some metrology facilities and some elements of SQAM legislation. Tanzania, Zambia and Zimbabwe have established Trade Metrology systems, some traceable national measurement standards. The system in Mauritius is almost recognised, in the sense that it is engaged in the accreditation process, and participates in regional or international intercomparisons. Two associate members, Uganda and Egypt, also fall within this category. Another associate member, the Kenya Bureau of Standards, has an internationally accredited measurement system and comprehensive SQAM legislation in place.

The CSIR NML [3] is the most prominent NMI in the region. It has 18 laboratories performing measurements in all the physical parameters, such as length, time, pressure, volume, mass; electrical quantities, such as voltage, resistance and current, optical radiation, ionising radiation, temperature, and many more. Chemical metrology is also well established at the CSIR NML, with laboratories for gas metrology, surface analysis, inorganic analysis, and most recently, organic analysis. Bio analysis is addressed through a partnership with the Biosciences unit of the CSIR.

Within the region, a number of laboratory intercomparisons has been organised in the past few years. These include a mass intercomparison, sponsored by the PTB in the late 1990s, a resistance intercomparison was carried out during November 1997 between South Africa, India and Mauritius, which was extended to include several other countries later on, a temperature intercomparison, using a liquid-in-glass thermometer as the intercomparison artefact, a further mass intercomparison in 2003, and a bilateral intercomparison in force measurements between the Kenya Bureau of standards and the CSIR NML.

A proficiency test study for the laboratories of the Research reactor centres in Africa was performed during 2003. The CSIR NML in collaboration with the International Atomic Energy Agency (IAEA) and the South African Nuclear Energy Corporation (NECSA) organised a proficiency test study, called CMIP-AFRA-P1 “Trace and minor elements in geological materials” for the laboratories of the Research Reactor Centres in Africa in order to evaluate their technical capabilities as well as promote concepts of traceability and measurement uncertainty.

Eleven laboratories from five countries (Egypt, Algeria, Ghana, Nigeria and South Africa), took part in the study for the determination of sixteen trace and minor elements in rock type geological material using primarily neutron activation analysis (NAA) and X-ray fluorescence spectrometry (XRF). The participants were encouraged to follow the internationally accepted ISO and EURACHEM/CITAC guides on quantifying uncertainty in measurements.

The laboratory performance on the determination of each measurand was evaluated and expressed as a percent difference from the certified reference value and  $E_n$ -score, taking into account the uncertainty of the reported and certified values. The participant’s results and the performance statistics data were compiled and presented individually for each laboratory to provide a quick reference on their performance.

Of particular interest was the recent Proficiency Testing Scheme for Water Laboratories. The scheme, jointly sponsored by the PTB and the CSIR NML, and supported by the German Ministry of Economic Cooperation and Development, focussed on testing drinking water and ground water. The protocol for this scheme was developed during 2004, with inputs from all the participating laboratories, and a pilot study was launched late in the same year.

As part of the activities of SADC MET, several development projects are planned. One of the most exciting projects is the establishment of a time network within the region [4]. This network will place an atomic clock in each of the SADC countries, and will provide a link to a monitor and control station that will most likely be set up at the CSIR NML in South Africa. The time network will provide a national time scale for each of the member states, and will provide time services to the respective countries, traceable to the SI second.

A number of further intercomparisons are planned, such as a voltage intercomparison at the 10V level. The artefact to be used will be a zener voltage standard, but due to uncertainties in the travel time of the standard from one laboratory to another; the unit will be shipped cold, and without a battery pack. (It has happened that standards were delayed for weeks in customs in previous intercomparisons, even though careful precautions were taken to avoid the situation.)

The unit that will be used for the intercomparison is currently being evaluated for its retrace – how well does it return to its previous steady state value, after being turned off for several days. It is also planned to ship this unit to several local laboratories to test the robustness of the measuring scheme, and the travelling behaviour of the intercomparison artefact.

As one of the stated objectives of SADC MET is the eventual accreditation of all measurement services provided by its members, a number of countries are in the process of obtaining

accreditation for their services. At present Tanzania is the furthest along of the newly established NMIs, with both Kenya and Egypt (associate members) and South Africa having accreditation for most of their services.

## **5. Acknowledgements**

Funding received from the PTB, **the dti** and the EU for SADC MET activities and projects are grateful acknowledged.

## **References**

1. The Southern African Development website, see: <http://www.sadc.int/>
2. The SADC Cooperation in Measurement Traceability website, see: <http://www.sacmet.org/>
3. The CSIR National Metrology Laboratory website, see: <http://www.nml.csir.co.za/>
4. E.L. Marais, "The Establishment of a SADC Time Network", Proceedings of the 2004 IEEE International Ultrasonics, Ferroelectrics, and Frequency Control Joint 50th Anniversary Conference, pp 524-526