

Report to the 18th meeting of the CCRI (I), May 2007

Recent activities in radiation dosimetry at the National Metrology Institute of South Africa (NMISA)

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Introduction

The National Metrology Institute of South Africa (NMISA) has recently been established through an act of Parliament and has only been officially in operation since 1st of May 2007. The NMISA took over and continues the work of CSIR-National Metrology Laboratory (CSIR NML) that ceased to exist at the end of April 2007.

The Ionising Radiation Laboratory of the NMISA maintains national measuring standards in the field of radiation dosimetry. Through these standards, the laboratory supports radiation therapy and radiation protection in South Africa and the Southern African region.

Currently all standards maintained by the Ionising Radiation Laboratory of the NMISA are secondary standards with traceability to primary standards at the BIPM (air kerma and absorbed dose to water) and the PTB (absorbed dose to tissue for $^{90}\text{Sr}/^{90}\text{Y}$ and ^{85}Kr beta radiation).

Absorbed dose to water in ^{60}Co gamma radiation

A NE 2611 chamber calibrated in terms of absorbed dose to water is used to maintain the standard for absorbed dose to water in ^{60}Co gamma radiation. The chamber was calibrated at the BIPM in 2005. The laboratory uses the IAEA TRS398 protocol as the basis for the maintenance and dissemination of traceability for absorbed dose to water.

Air kerma in ^{60}Co gamma radiation and medium energy X-rays

The same NE 2611 chamber is calibrated in terms of air kerma in ^{60}Co and medium energy X-rays (50 kV– 250 kV) and is used to maintain the standard for air kerma. The chamber was calibrated at the BIPM in 2005.

Absorbed dose to tissue in $^{90}\text{Sr}/^{90}\text{Y}$ and ^{85}Kr beta radiation

Two beta sources used with beam flattening filters in a beta irradiation rig are used to maintain the standard for absorbed dose to tissue in $^{90}\text{Sr}/^{90}\text{Y}$ and ^{85}Kr beta radiation. The two sources were calibrated at the PTB in 2003 and is scheduled for calibration again in 2008. The development of an extrapolation chamber based measurement system for beta radiation sources has been started with the aim of eventually becoming independent of external calibration services for the beta radiation standards.

Air kerma standards for ^{60}Co , ^{137}Cs and ^{241}Am (protection level)

A NE 2530 ionization chamber is used to maintain standards for air kerma in ^{60}Co , ^{137}Cs and ^{241}Am at protection level rates. Calibration factors for ^{60}Co and ^{137}Cs have been obtained through calibration at the BIPM in 2005. A factor for ^{241}Am is obtained through calibration against the therapy air kerma standard in medium energy X-rays and ^{60}Co and then interpolating for the relevant energy.

The NE 2530 chamber is currently being calibrated in ^{60}Co and ^{137}Cs at the IAEA. It is planned to also in future send a larger volume chamber (1000cc PTW 32002) to the IAEA for calibration for use as a reference chamber for protection dose rates.

Intercomparisons

APMP.RI(I)-K1 Measurement of air kerma for Cobalt 60, August 2005

Accreditation

The Ionising Radiation Laboratory was accredited in 2003 for parameters covering air kerma (therapy level ^{60}Co , medium energy x-rays and protection level ^{60}Co , ^{137}Cs and ^{241}Am), absorbed dose to water (therapy level ^{60}Co) and absorbed dose to tissue ($^{90}\text{Sr}/^{90}\text{Y}$ and ^{85}Kr beta radiation) by the South African National Accreditation Service (SANAS). The laboratory has since been assessed twice in routine follow-up assessments, the last of which was in January 2007 which included an international technical assessor. Continued accreditation was recommended after each assessment.

IAEA SSDL Activities

The CSIR-NML has been a member of the IAEA Secondary Standards Dosimetry Laboratory (SSDL) network since 2001. As a member of the SSDL network, the laboratory has been taking part in the annual TLD audits and has had the opportunity to send laboratory staff members for workshops and training fellowships organized by the IAEA.

The SSDL has been declared a regional designated centre in the field of dosimetry. From February to April 2007 the laboratory, in its capacity as regional designated centre, hosted its first IAEA fellow.

Development of measurement capabilities for low energy X-rays

The SSDL, supported by the IAEA under a technical cooperation project, is in the process of developing dosimetry standards applicable to diagnostic radiology levels. This project progressed significantly in the last six months with construction work on the laboratories having been completed and equipment such as the reference chambers, electrometers and X-ray units having been delivered.

Publications

Msimang ZLM, Mostert J, Simpson B, Activities at the CSIR NML SSDL, SSDL Newsletter No. 53, January 2007