

LABORATORY REPORT
Activity Standards Laboratory
Australian Nuclear Science and Technology Organisation
CCRI(II) Meeting, 13-16 May 2013

SECTION 1. General Status

ANSTO, via the Activity Standards Laboratory, is a member of the International Committee for Radionuclide Metrology (ICRM), the Consultative Committee for Ionising Radiation (CCRI) Part II Radionuclides, the Asian Pacific Metrology Programme (APMP) and the Technical Committee on Ionising Radiation (TCRI). The Group liaises regularly with the National Measurement Institute (NMI).

The group will continue to fulfill its obligations to the aforementioned committees by submitting reports, attending meetings and participating in international comparisons. Through this involvement, the group maintains links with other professional bodies, influences the national and international metrology regulations and contributes to the maintenance of the status and reputation of Australia.

a. Developments Specific to the Laboratory

- ANSTO was recently issued a renewed legal Authorisation to maintain and disseminate the Becquerel by the Australian NMI.
- The re-commissioned Activity Standards Laboratory was officially re-opened by the NMI Chief Metrologist on 3 May 2012. The re-commissioned laboratory provides substantially improved facilities and infrastructure to facilitate maintenance of national standards, the development of new standards and participation in regional and international inter-comparisons. Improved arrangements have also been implemented to satisfy regulatory compliance, safety and environmental standards and related obligations.
- The Activity Standards Laboratory is in the process of establishing a new national traceability service for Australian nuclear medicine departments. The service will be piloted with three participating nuclear medicine departments at the end of May 2013, with the intention for a larger-scale national rollout by the end of the year.
- A new radioactivity measurement technique has recently been validated, the ZoMBieS method, with peer reviewed acceptance of a journal article describing the technique.

b. Equipment Status and Capabilities

An internal capability review of the ASL has been completed. The review has identified a number of laboratory equipment and capability upgrades which will be implemented as part of the 5 year term of the ASL Capability Upgrade Plan.

Current capabilities of the laboratory include:

- An atmospheric pressure $4\pi\beta(\text{PC})-\gamma$ coincidence counting system used to maintain the Australian Primary Standard of Activity.
- Triple to Double Coincidence Ratio (TDCR) liquid scintillation system for determination of primary activity of beta and electron emitters.
- Liquid scintillation $4\pi\beta(\text{LS})-\gamma$ coincidence counting system with MAC3 and FASEA data acquisition systems.
- Digital $4\pi\beta-\gamma$ coincidence counting system.
- ZoMBieS liquid scintillation measurement system.
- Scintillation and HPGe gamma spectroscopy.
- Cooled Si(Li) Beta spectrometer.
- Geant4 cluster for Monte Carlo simulation.
- Pressurized TPA ionization chamber connected to Keithley 6517A electrometer.
- Vinten ionization chamber connected to Keithley 6517A electrometer.
- Source preparation facilities.

The recently upgraded facilities of ASL have seen the incorporation of a dedicated radioactive source store within a dedicated source preparation laboratory. Other modifications have seen the separation of wet chemistry processes involving unsealed sources from metrology measurement processes. A new ionization chamber station has also been engineered to better accommodate practical safety features together with functional metrology attributes.

Research opportunities have been expanded through the incorporation of the ASL into the Nuclear Science Technology Group at ANSTO.

c. Staff Structure and contact

In the past twelve months two new radionuclide metrologists, Tim and Bonnie, have joined the ASL team. The team currently comprises:

- Dr. Mark Reinhard, Acting leader
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- Dr. Lindsey Bignell, Physicist
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- Mr. Tim Jackson, Radionuclide Metrology Scientist
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- Ms. Alison Flynn, Physicist (P/T)
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- Mr Adam Sarbutt, Senior Technician
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SECTION 2. International Technical Cooperation

The ASL group continues to research novel detection techniques and detectors for improved radionuclide metrology measurements, reporting this research to the international metrology community through journal publications and forums such as the ICRM.

SECTION 3 For the Global MRA

d. Present Status for Signatory of the MRA

Australian NMI is the signatory of The Mutual Recognition Agreement (MRA).

e. International Comparison Activity

The group did not participate in any international comparisons in 2012 due to the re-commissioning work plan of the upgraded Activity Standards Laboratory facilities and infrastructure.

f. Status of Quality Systems

The ASL currently maintains certification to quality system ISO 9001:2000 and environmental management system ISO 14000. Compliance with ISO 9001:2000 was demonstrated with recertification in an external audit in March 2013.

g. Activities Concerning CMCs Submission

ANSTO did not submit additional entries to the CMC tables in 2012 due to the re-commissioning work plan of the upgraded Activity Standards Laboratory facilities and infrastructure.

SECTION 4 Activities with Other SRBs and APEC

h. Interactions / Connections with Other Parts of the National / Territorial Technical Infrastructure

- ANSTO has worked in conjunction with the Australian NMI in the preparation and implementation of new legal Authorisations issued by the Chief Metrologist under the powers of the National Measurement Act.
- The NMI Standards Authorisation Steering Committee Annual Meeting was held on 17 April 2013 at ANSTO involving ANSTO, ARPANSA and NMI.
- Through the Australian and New Zealand Society of Nuclear Medicine (ANZSNM) ANSTO is in discussion with New Zealand's nuclear medicine community on how the ASL can assist in meeting their metrology needs concerning the activity of radionuclides.
- ANSTO is in discussion with ARPANSA in Australia on the development of new measurement standards the brachytherapy.

SECTION 5 Future Plans

i. Future Training Needs

The ASL inducted a new radionuclide metrology scientist into the laboratory in 2012 and is currently inducting a second radionuclide metrology scientist into the laboratory following recruitment in April 2013.

j. Conferences / Seminars / Workshops.

An ASL staff member was present at the APMP meeting in November 2012 and the associated Technical Committee for Ionising Radiation (TCRI) workshop held in New Zealand. A staff member will attend the ICRM 2013 conference.

List of publications and conferences attended

- L. J. Bignell, ‘Liquid Scintillation Non-Linearity Measurements using the ZoMBieS method’. *ICRM 2013, proceedings to be published.*
- L. J. Bignell, E. Mume, T. Jackson, and G. P. Lee, ‘Plasmonic light yield enhancement of a Liquid Scintillator’. *Appl Phys Lett, accepted manuscript.*
- L. J. Bignell, L. Mo, T. Steele and S. R. Hashemi-Nezhad, ‘The Zero Model By using Coincidence Scintillation (ZoMBieS) Method of Absolute Radioactivity Measurement’. *IEEE Trans Nucl Sci, accepted manuscript.*
- B.E. Zimmerman, T. Altzitzoglou, A. Antohe, A. Arinc, E. Bakhshandear, D.E. Bergeron, L. Bignell, C. Bobin, M. Capogni, J.T. Cessna, M.L. Cozzella, C.J. da Silva, P. De Felice, M.S. Dias, T. Dziel, A. Fazio, R. Fitzgerald, A. Iwahara, F. Jaubert, L. Johansson, J. Keightley, M.F. Koskinas, K. Kossert, J. Lubbe, A. Luca, L. Mo, O. Nähle, O. Ott, J. Paepen, S. Pommé, M. Sahagia, B.R.S. Simpson, F.F.V. Silva, R. van Ammel, M.J. van Staden, W.M. van Wyngaardt, and I.M. Yamazaki, “Results of an international comparison for the activity measurement of ^{177}Lu ”. *Appl. Rad. Isotop.*, **70**(9), pp. 1825-1830 (2012).

Oral presentations:

- L Bignell, ‘Recent activities of the Activity Standards Laboratory, ANSTO’Asia Pacific Metrology Program meeting, 2012, Wellington.