Report to the BIPM - 2009

Ionizing Radiation Physics, Australian Nuclear Science & Technology Organization (ANSTO)

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1. Completed neutron flux analysis for the reactor core and irradiation facilities including facilities for neutron transmutation doping of silicon, bulk irradiation facilities for radiopharmaceuticals, NAA facilities and the low flux facilities.
2. Completed neutron flux analysis for the neutron beam lines and the reactor face.
3. Completed validation of TDCR system.
4. Monte Carlo simulation of liquid scintillation process using GEANT4 is on going.
5. Established efficiency curve for HPGe detectors for point source. Work for volume source geometry is on hold.
6. Continue the annual traceability program for ARI for I-131, Ga-67, Tl-201, Tc-99m and Y-90 activity measurements.
7. Implemented FPGA technology to the TDCR system. FPGA Acquisition System and Software Event Analysis (FASEA) have been developed.
8. Incorporated a gamma channel to TDCR system using FASEA technology.
9. Completed international intercomparison of 3H.
10. Intercomparison of I-131 and Lu177 is in progress.
11. Improved the conventional $4\pi\beta - \gamma$ coincidence counting system by adding an additional NaI detector to improve the gamma detection efficiency.

Presentation:

L. J. Bignell, L. Mo, M.L. Smith and D. Alexiev, "Quantitative Uncertainty Evaluation for Monte Carlo Simulations of ^{123}I decay in a Liquid Scintillation Vial". BIPM Workshop 2 on CCRI(II) Activity Uncertainties and Comparisons 2008, at the Bureau International de Poids et Measures, Paris.

Li Mo "Standardisation of I123 using TDCR method". ICRM – Liquid Scintillation and Life Science Working Group meeting, NPL 10-16 Nov.'08.

D. Alexiev, L. Mo, M. Smith, L. Bignell, T. Steele " Ionising Radiation Physics at the Australian Nuclear Science and Technology Organisation ". International Symposium RMO2008; Metrology, Testing and Accreditation – Breaking the Trading Barriers.

D.Alexiev " Report to the TC (IR) and the General Assembly of the APMP". 2nd- 8th Nov 2008. Jakarta, Indonesia.

Publications

L. J. Bignell, L. Mo, M. L. Smith, D. Alexiev and S. R. Hashemi-Nezhad, "Monte Carlo Simulation of a ^{198}Au Thin Foil: The Response of a $4\pi\beta$-γ Detector". *IEEE Trans. Nucl. Sci.*, Vol.55, NO 6, Dec. 2008.

L. Mo, M. Smith, L. Bignell, T. Steele, D. Alexiev " Ionising Radiation Physics at the Australian Nuclear Science and Technology Organisation "International Symposium RMO2008; Metrology,

Testing and Accreditation – Breaking the Trading Barriers.

L. J. Bignell, M. L. Smith, D. Alexiev and S. R. Hashemi-Nezhad, "Analysis of Adhesive Tape Activation During Reactor Flux Measurements". *Nucl. Eng. Tech*., **40**, pp. 93-98 (Feb, 2008).

L. J. Bignell and R. A. Lewis, "Reflectance Studies of Candidate THz Emitters". *J. Mater. Sci. Mater. Electron*., in press, publication available online, DOI: 10.1007/s10854-008-9608-2.

M. L. Smith, L. Bignell, D. Alexiev, L. Mo and J. Harrison, "Evaluation of Lead Shielding for a Gamma Spectroscopy System". *Nucl. Instr. Meth. A*, **589**, pp. 275-579 (2008).

R. Mendis, M. L. Smith, L. J. Bignell, R. E. M. Vickers and R. A. Lewis, "Strong THz Emission from (100) *p*-type InAs". *J. Appl. Phys.*, **98**, p. 126104 (2005).

S. Hargreaves, L. J. Bignell, R. A. Lewis, J. Sigmund and H. L. Hartnagel, "New Modes of THz Generation by Low-Temperature Grown GaAsSb". *Solid State Electronics*, in press (awaiting publication).

S. Hargreaves, L. J. Bignell, R. A. Lewis, D. Schoenherr, M. Saglam and H. L. Hartnagel, "Investigation of *p*-GaAsSb as a THz Emitter". *J. Electrochem. Soc.*, **155** (10), p. H734 (2008).

L. Mo, M. Smith, L. Bignell, D. Alexiev, "Characterising neutron flux for the hot commissioning of the OPAL reactor". Submitted to *Nucl. Eng. and Design*.

D. Alexiev, L. Mo, D. Prokopovich, M. Smith and M. Matuchovac. "Comparison of LaBr3:Ce and LaCl3:Ce with Nal(Tl) and cadmium Zinc telluride (CZT)." *IEEE Trans. on Nucl. Sci.* vol 55, issue 3, 2008, 1174-1177.

L. Mo, H.Y. Wu and C. Baldock. "Absolute activity determination of 198Au solid source using 4πβ-γ coincidence counting corrected by Monte-Carlo calculation." *IEEE Trans. Nucl. Sci.*, vol 54, No 3, June 2007.

L. Mo, P. Cassette, C. Baldock, "The influence of rejection of a fraction of the single photoelectron peak in liquid scintillation counting". *Nucl. Instr. Meth.A*, vol 558, 2006, p490-496.