ANSTO Report to the CCRI - 2007

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

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1. Perform neutron flux measurements for the OPAL reactor core, 6 NTD Si, 17 bulk irradiation facilities, 2 NAS facilities, 55 low flux facilities and 8 neutron beam lines for commissioning the reactor and neutron beam lines.
2. Establish TDCR measurement capability. We have completed construction of the system and data acquisition Labview program. Validation of the system is in progress.
3. Monte Carlo simulation of liquid scintillation process using GEANT4.
4. Establish efficiency curve for HPGe detectors for point source.
5. Continue the annual traceability program for ARI for I-131, Ga-67, Tl-201, Tc-99m and Y-90 activity measurements.
6. Undertake new scintillator study. Comparison of new scintillators, Lanthanum Bromide ($LaBr_3$:Ce), Lanthanum Chloride ($LaCl_3$:Ce), with Cadmium Zinc Telluride (CdZnTe or CZT) and Sodium Iodide (NaI(Tl).

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1. D. Alexiev, L. Mo and M. Smith. Comparison of $LaBr_3$:Ce, $LaCl_3$:Ce, CZT and Nal(Tl) for resolution of Nuclear Material spectra. Accepted for oral presentation in the IEEE-9th International Conference on Inorganic Scintillators and their Applications, Winston-Salem, NC USA, June 4-8, 2007.
2. L. Mo, H.Y. Wu and C. Baldock. Absolute activity determination of Au-198 solid source using $4\pi\beta-\gamma$ coincidenc counting corrected by Monte-Carlo calculation. Accepted for publication in the IEEE transaction on Nuclear Science.
3. Mo, L., Avci, B., James, D., Simpson, B., Van Wyngaardt, W.M., Cessna, J.T., Baldock, C., "Development of activity standard for ^{90}Y microspheres". *Applied Radiation and Isotopes*, vol 63, 2005, p193-199.
4. Mo, L., Cassette, P., Baldock, C., "The influence of rejection of a fraction of the single photoelectron peak in liquid scintillation counting". *Nuclear Instruments and Methods in Physics Research A*, vol 558, 2006, p490-496.
5. Mo, L., Reinhard, M.I., Davies, J.B., Alexiev, D., Baldock, C., "Calibration of the Capintec CRC-712M dose calibrator for ^{18}F". *Applied Radiation and Isotopes*, vol 64, 2006, p485-489.
6. Mo, L., Alexiev, D., Baldock, C., "Uncertainty evaluation

of thermal neutron flux determination over the energy range 0 – 0.625 eV". *Proceedings of the International Metrology Conference*, 3 – 7 April, 2006 Casablanca, Morocco.
7. Mo, L., Smith, M., Bignell, L., Qin, M.J., Alexiev, D., "Characterising neutron flux for the hot commissioning of the OPAL reactor". *ANSTO technical report*, ANSTO/S/TN/2007-3, 2007.
8. Davies, J. B., Mo, L., Alexiev, D., "Development of an Australian secondary standard for the reference air kerma rate measurement of 125I seeds". *Australasian Physical & Engineering Sciences in Medicine*, vol 28, 2005, p196-199.
9. Alexiev, D., Dytlewski, N., Reinhard, M. I., Mo, L., "Characterisation of single-crystal mercuric iodide". *Nuclear Instruments and Methods in Physics Research A*, vol 517, 2004, p226-229.
10. Alexiev, D., Prokopovich, D., Reinhard, M.I., Thomson, S., Mo, L., "Deep-level transient conductance spectroscopy of high resistivity semiconductors". *Physica status solidi (c).* vol 2, Issue 4, 2005, p1347-1354.
11. M.I. Reinhard and D. Alexiev and N. Dytlewski, "Investigation of different scenarios that can be used to mask the presence of nuclear materials with other gamma emitters, Part II Plutonium," Undertaken as part of the IAEA CRP entitled, "Improvement of Technical Measures to Detect and Respond to Illicit Trafficking of Nuclear and other Radioactive Materials" 2004.
12. M. Matuchova, K. Zdansky, J. Zavadil, J. Maixner, D. Alexiev and D. Prochazkova, "Study of lead iodide semiconductor crystals doped with silver", *Materials Science in Semiconductor Processing*, vol 9, Issues 1-3, Feb-Jun 2006, P394-398.