National Physical Laboratory

Review of Recent Work and Projects 2001-2

During the past two years, progress on scientific and technical issues was dominated by the effects of relocating the majority of the Radioactivity Group into new accommodation. This relocation was part of a Government-led, Private Finance Initiative which has the objective of relocating almost all scientific and administrative operations at NPL into a new, purpose-built laboratory on the NPL site. Although the planning for this process started several years before, the first moves for the Radioactivity Group only started in the early summer of 2001. The consequences were that all scientific work was gradually brought to a halt from the beginning of that year accompanied by an extensive benchmarking programme. UKAS accreditation of measurement, testing and calibration services was also suspended for this period. Following re-location and re-commissioning, the benchmarking measurements were repeated in order to demonstrate the continued integrity of systems and to re-institute UKAS accreditation. Although a small number of services still need to complete their re-commissioning or even be moved, the Group only became fully operational again in the middle of 2002.

Alongside these moves, there have also been some major changes in personnel and functions within the Group. The Radioactivity Group now comprises over 20 scientific staff and a summary is given at the end of this report. The measurement systems available are effectively the same as those reported in the previous progress report.

Despite these major disruptions, significant progress was made on the targets within the current three year programme (Oct 2001 to Sep 2004), which is funded by the UK Department of Trade and Industry and is designed to support the UK's National Measurement System.

In the area of Digital Coincidence Counting (DCC), the first production systems were successfully validated and approved under the TICKET system which is part of the ISO9000 software quality system operated at NPL. Further developments include the incorporation of out-of-channel events which extends the scope of the system and better accommodates the variable dead-times imposed by some gamma single channel analysers. The architect of this system, John Keightley, moved to IRMM on a three-year secondment at the beginning of 2003 and will continue to develop the DCC system.

A project aimed at improving the understanding of the fundamentals of the coincidence counting extrapolation technique and consequently to reduce the uncertainty on the efficiency extrapolation itself has been initiated. This is a joint undertaking between Liverpool University, NPL, Ionising Radiation Metrology Consultants Ltd and two other consultants and will employ Monte Carlo modelling techniques. An additional collaboration has also been established with BNM-LNHB whereby their Low-Energy X-ray scanning system will be used to characterize the solid distribution of real sources on VYNS as well as comparing the results from different modelling codes.

Studies have continued on the NPL implementation of the CIEMAT-NIST system. The PTB codes for electron capture decays have been introduced and a series of validation tests are underway.

NPL has participated in all of the CCRI(II) comparisons during this period as well as performing a number of absolute standardisations on other radionuclides, primarily aimed at reducing the uncertainties associated with the secondary standard systems that are routinely used at NPL to satisfy the requirements of the user community. This includes comparisons initiated by ICRM. The radionuclides concerned include: ^{18}F, ^{32}P, ^{65}Zn, ^{89}Sr, ^{90}Y, ^{192}Ir, ^{204}Tl and ^{241}Am.

The VERMI Memorandum of Understanding has now been ratified and NPL is leading the plans to develop a series of training programmes for young researchers in the field of radionuclide metrology. It is intended to conduct the first such course/workshop at the end of 2003 at BNM-LNHB and will concentrate on absolute and primary counting techniques.

Improvements to the quality of radionuclide calibrator measurements have been pursued through a series of projects. These include the investigation of the quality of calibration factors associated with several commercial calibrator systems, re-calibration of the NPL secondary standard radionuclide calibrator for Schott vials (the new Amersham radiopharmaceutical container) and the determination of calibration factors for a range of syringe types and formats. The radionuclides concerned are principally those of importance to the medical community.

Major projects are is now underway to provide reference materials required by the environmental measurement community. In particular, studies are being directed at reference materials of Organically Bound Tritium (OBT) and depleted uranium in Kaolin.

A significant effort was given to the IAEA Coordinated Research Project which was aimed at updating and extending the scope of the IAEA TECDOC-619, X-ray and Gamma-ray Decay Data Standards for Detector Calibration and Other Applications. In particular, NPL was tasked to evaluate gamma emission probabilities for 6 radionuclides and the half-lives of all (65) radionuclides in the expanded list.

NPL has continued to support the transfer of technology to the user community via a number of initiatives. User Groups have been established for several specific user areas and regular meetings are held with representatives from the whole of the UK. These areas include gamma spectrometry, alpha spectrometry, liquid scintillation counting, radionuclide calibrators, air monitoring and associated websites have also been introduced. Measurement Good Practice Guides also continue to be developed. Recent publications include the Calibration and Testing of Installed Radiation Protection Instruments, and Practical Radiation Monitoring. About to be published is a GPG on The Treatment of Uncertainty in Radiological Measurements and a new GPG has just been initiated on Air Monitoring.

Comparison exercises continue with the relevant users. A regular environmental comparison is nearing completion and two radionuclide calibrator comparisons are now being planned.

NPL has continued to contribute to the various international organizations and working groups including (a) the CCRI(II) Working Groups on Key Comparisons, Uncertainties, and the Extension of the SIR, (b) the various ICRM Working groups, (c) EUROMET. In particular, NPL is now providing the majority EUROMET input to the development and review of Radioactivity CMCs.

Mike Woods
28 February 2003

NPL, Centre for Acoustics and Ionising Radiation (CAIR)

Group Head/Team Manager
Steve Judge

Business Development & Support Services
Simon Jerome

Senior Research Scientist
Arvic Harms
Lena Johansson
Des MacMahon
Nigel Watkins
Denise Woods
Simon Woods

Higher Research Scientist
Michaela Baker
Julian Dean
Andy Pearce
Clare Scott
Dagmara Tyler
Andrea Woodman

Research Scientist
Arzu Arinc
Chris Gilligan

Assistant Research Scientist
Kalyani Chari
Sean Collins
Hilary Phillips
Michelle Sanderson
Andy Stroak
Jo Townley

Consultant
Mike Woods