National Physical Laboratory

Review of Recent Work and Projects 2000

During the past year, the final year of the 1998 – 2001 three-year programme was entered. This programme is funded by the UK Department of Trade and Industry and is designed to support the UK's National Measurement System. The work programme comprises individual projects across three main areas, namely, maintenance of existing facilities and services, research and development, and technology transfer. The maintenance programme includes both primary and secondary facilities such as coincidence counting equipment, ionization chambers, gamma spectrometers, etc. It also covers the quality assurance protocols for both ISO and UKAS quality accreditations. A new three-year programme is under formulation.

The Radioactivity Group now comprises 20 scientific staff with an additional two staff providing the necessary health physics and radiological protection support. The group has also hosted two IAEA Fellows during the period covered by this report.

The Group continues to maintain a variety of primary standardisation systems:

3 x atmospheric 4π(pc)-γ-coincidence systems,
1 x high pressure 4π(pc)-γ-coincidence system,
1 x liquid scintillation-γ-coincidence system,
1 x LS NIST-CIEMAT facility,
2 x gas counting equipment.

In addition, the secondary standard systems include

3 x HPGe spectrometers for medium to high level measurements including decay scheme studies,
4 x HPGe spectrometers for environmental level measurements (25% n-type Be end window, low energy photon spectrometer for X-rays, 70% p-type and a well Ge),
3 x TPA MkII/IG11 high pressure ionisation chambers (2 MPa argon),

2 x NPL secondary standard radionuclide calibrators (1 MPa nitrogen),

2 x well-type NaI detectors,

1 x high resolution alpha spectrometer,

24 x environmental level alpha spectrometers.

The ongoing quality assurance measurements entail the re-standardisation of a number of previously standardised radionuclides on each of the coincidence systems and comparison of the observed ionisation calibration figures with those obtained previously (^{18}F, ^{60}Co, ^{89}Sr, ^{131}I and ^{152}Eu). In addition, several radionuclides have been standardised for the first time. These include ^{11}C, ^{229}Th, ^{238}Pu, ^{239}Pu and ^{244}Cm .

In the area of Digital Coincidence Counting (DCC), further validation of the system, developed for high pressure proportional counting, has been completed by comparison against analogue $4\pi\beta$-γ coincidence systems and secondary standard re-entrant ionisation chambers for ^{11}C, ^{18}F and ^{152}Eu. Further development of the data analysis software is being undertaken to enable use with atmospheric proportional counters. In the other area of innovative development work, a prototype triple to double coincidence system (TDCR) has been established and preliminary tests have proved to be satisfactory.

The range of standards provided by NPL has been maintained and additions made, particularly at the environmental levels. Effort is now being concentrated on those nuclides required for yield tracer determinations, both for fission products and heavy elements, in particular Tc-95m. NPL has continued to provide a mixed radionuclide standard, in solution form, on a four-monthly basis. Alongside this, the 8th environmental radioactivity comparison was completed. The number of participants remains high as does the attendance at the follow-up workshops. This is seen as a major contributor to the technology transfer responsibilities for NPL.

Comparisons and workshops in the medical area are also included in the technology transfer activities. Comparisons of hospital radionuclide calibrators have been completed for solution sources of ^{123}I and ^{131}I. Currently, an exercise comparing solutions of ^{201}Tl is underway as are two further comparisons of brachytherapy wire sources of ^{192}Ir

.

The NPL secondary standard radionuclide calibrator continues to be manufactured and calibration figures are added to the calibration list as and when new, relevant primary standardisations are completed. Investigations are continuing to extend the calibration facilities to ^{125}I seeds used for the treatment of prostate cancer. In addition, a shield has been added to the options for the calibrator and new calibration figures are being supplied to hospital facilities. A full energy response curve, characterising the performance of the calibrator with the shield, is being developed.

Internationally, NPL continues to be involved in a range of projects. These include the BIPM CCRI(II) SIR and Equivalence Working groups, the key comparisons of ^{89}Sr, ^{152}Eu and ^{238}Pu, the EUROMET projects on ^{237}Np and ^{235}U, and the revision of the IAEA TECDOC-619 on nuclear data.

M J Woods
Centre for Ionising Radiation Metrology
National Physical Laboratory
Teddington
Middlesex TW11 0LW
United Kingdom

March 2001