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Competence and reliability of gamma analysis at the Department of Nuclear Science, University of Colombo

M D S Pushparani, P Mahawatte and R Hewamanna
Department of Nuclear Science, Faculty of Science, University of Colombo, Colombo 03

Department of Nuclear Science counts for more than three decades of experience in both qualitative and quantitative studies of gamma (γ) emitting radionuclides in natural and anthropogenic solid samples. The need for technical competence by a certified validation method became important for the credibility of testing and results generated. With the International Atomic Energy Agency Analytical Quality Control Service (IAEA-AQCS) providing member states the opportunity to participate in inter laboratory comparisons the Department became a participant in proficiency tests (PT) for natural (^{40}K, ^{226}Ra, ^{214}Bi, ^{214}Pb, ^{228}Ac, ^{212}Pb and ^{208}Tl) and anthropogenic γ emitting radionuclides (^{137}Cs, ^{134}Cs, ^{60}Co, ^{65}Zn and ^{54}Mn) in soil and vegetation. Samples containing natural radionuclides were sealed for 4 weeks in uniform plastic boxes so that a secular equilibrium between ^{238}U and ^{232}Th and their progeny could be reached. γ Spectra of the prepared samples were measured using a shielded High Performance Germanium Detector (Gem 13200; Ortec) with relative photo peak efficiency of 20.6% and energy resolution of 1.85 keV full width at half maximum for 1.33 MeV gamma line of ^{60}Co. Data acquisition and photo peak analysis were done using S100 and Genie-2000 software followed by energy and efficiency calibration. This study reports data for ten participated PTs during 2006- 2013. PT samples provide results in terms of satisfactory relative bias, precision and z scores at 95% confidence limit. IAEA evaluate reported results against the acceptance criteria for accuracy and precision and assign the status “acceptable” when it passes both criteria. In 2006 the final score for ^{54}Mn, ^{60}Co, ^{137}Cs and ^{65}Zn in soil of our analysis were “not acceptable”. In 2007 PT ^{60}Co, ^{137}Cs and ^{65}Zn results in soil were “acceptable” due to the improvement of data acquisition system (Genie supported multiport II), area correction with Origin software and testing of efficiency by PT 2006. Natural radionuclides other than ^{226}Ra in all matrices were “acceptable”. Participating in such PTs has provided a variety of samples that could be used as “secondary standards” for the laboratory and helped to identify the analytical errors which were corrected to claim competence and reliability of results generated in our research.

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suvendramaya@yahoo.com Tel: 0786352606