Low-level Gamma-Spectrometry by using Compton suppression – testing the performance of two systems at the ANSTO Low Level Radiochemistry Laboratory.

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The successful use of gamma-spectrometry to measure very low level radioactivity relies on several factors, including the actual system and shielding, as well as environmental factors. A low-level laboratory needs to be in a geographic location with low back ground radiation, built with low background materials. The laboratory should ideally be built underground to minimize the interference from cosmic radiation. Compton suppressed systems have been designed to reduce background caused by Compton scattering.
The background can be reduced by the use of Compton Suppression. This is achieved by introducing a second detection system. This second detection system, consisting of a large single crystal NaI annulus, detects the escaping energy from partial absorbed photons in the primary detector, the High purity Germanium detector.
As set of standards tests to check the performance of the Compton suppression systems has been devised by the Monaco Laboratory (J-F Commanducci, 2003). These tests have been carried out on both ANSTO systems and show a considerable improvement in Compton to peak ratios in the testing and an overall decrease in background due to the stripping of incomplete photon absorption in the primary detector.
The two systems allow small environmental samples to be analysed for isotopes such as Pb-210, Cs-137 and Be-7, without comprimising the detection limit too much.
J-F Commanducci, 2003: Construction du Laboratoire Souterrain et des Spectrometres a coincindences "faible bruit" destines a la surveillance de L'Environment Marin. IAEA-MEL Document. PP 69.