

Development of a Cosmic Veto Gamma-Spectrometer

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is supported by a network of certified laboratories that perform high-resolution gamma-spectrometry on global air filter samples for the identification of 85 radionuclides. At the UK CTBT Radionuclide Laboratory (GBL15), a novel cosmic veto gamma-spectrometer has been developed to improve the sensitivity of measurements for treaty compliance. The system consists of plastic scintillation plates operated in time-stamp mode to detect coincident cosmic-ray interactions within an HPGe gamma-spectrometer. This provides a mean background reduction of 75.2% with MDA improvements of 45.6%. The CTBT requirement for a ^{140}Ba MDA is achievable after 1.5 days counting compared to 5 – 7 days using conventional systems. The system does not require dedicated coincidence electronics, and remains easily configurable with dual acquisition of unsuppressed and suppressed spectra. Performance has been significantly improved by complete processing of the cosmic-ray spectrum (0 – 25 MeV) combined with the Canberra LynxTM multi-channel analyser. The improved sensitivity has been demonstrated for a CTBT air filter sample collected after the Fukushima incident.

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