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DEVELOPMENTS IN SUPPORT OF THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY - ULTRA SENSITIVE MEASUREMENTS OF AIRBORNE NUCLEAR DEBRIS

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The Comprehensive Nuclear Test-Ban Treaty (CTBT) International Monitoring System (IMS) provides a network of 80 Radionuclide detection systems, strategically positioned around the globe with the aim of detecting particulate radionuclide emissions from nuclear explosions. The authors have undertaken research, with the aim of increasing the overall sensitivity of the monitoring regime both within IMS laboratories and at IMS radionuclide stations.

Comparisons of HPGe based low-level γ -ray spectrometry systems at both an IMS laboratory and remotely located at the IMS station on St Helena are assessed, versus a prototype coincidence system based in Vienna. The coincidence systems are based on dual Broad Energy detectors using the Canberra Lynx MCA to collect data in time-stamped list mode with a 100 ns time resolution. Data is processed using an efficient, custom software chain (available from the authors). Processing of the data is largely automated, streamlining the analysis such that nuclide identification and quantification is a relatively simple task. Analysis is performed in summed singles, coincidence and anti-coincidence modes, maximising the sensitivity of the spectrometer and the robustness of the analysis.

The improvements in detection limits are discussed within the context of the IMS, alongside the additional advantages of coincidence counting in the identification of different treaty relevant radionuclides in a complex air sample.

Primary authors: Mr DAVIES, Ashley (CTBTO); Dr BRITTON, Richard (CTBTO)

Presenters: Mr DAVIES, Ashley (CTBTO); Dr BRITTON, Richard (CTBTO)

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