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Ultra-Low Background Measurements Of Decayed Aerosol Filters

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To experimentally evaluate the opportunity to apply ultra-low background measurement methods to samples collected, for instance, by the Comprehensive Test Ban Treaty International Monitoring System (IMS), aerosol samples collected on filter media were measured using HPGe spectrometers of varying low-background technology approaches. In this way, realistic estimates of the impact of low-background methodology can be assessed on the Minimum Detectable Activities obtained in systems such as the IMS. The current measurement requirement of stations in the IMS is 30 microBq per cubic meter of air for 140Ba, or about 106 fissions per daily sample. Importantly, this is for a fresh aerosol filter. Decay varying form 3 days to one week reduce the intrinsic background from radon daughters in the sample. Computational estimates of the improvement factor for these decayed filters for underground-based HPGe in clean shielding materials are orders of magnitude less, even when the decay of the isotopes of interest is included.