

Gamma spectrometry (for Np-237, Pa-233, Pa-231)

Neptunium-237 is determined both directly and indirectly (via its decay product Pa-233) by high-resolution gamma spectrometry. Determination of Np-237 via Pa-233 gives a more sensitive detection method, but assumes equilibrium is established between parent and daughter. Unless processing of the material has been undertaken within the last 270 days this is a reasonable assumption. Both radionuclides are quoted for this reason.

Pa-231 is determined directly by gamma spectrometry, although the limits of detection achievable by this technique are limited by the low gamma emission probability of this radionuclide.

High-resolution gamma spectrometry is undertaken using a number of high purity germanium detectors linked via signal processing electronics to a computerised multi-channel analyser. Industry standard software is used for peak search, radionuclide identification and determination. Spectrometry calibration is undertaken over an energy range from 60 keV to 2000 keV for a range of densities and geometries using a nationally traceable "mixed gamma" reference solution.