Polaris-H Imaging Spectrometer Design and Applications

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H3D's gamma-ray imaging spectrometer system named Polaris-H has been used at nuclear power plants and related environments worldwide.
Polaris-H was designed to perform gamma spectroscopy and imaging throughout nuclear power plants. It integrates a 3D-position-sensitive pixelated CZT detector (20 mm×20 mm×15 mm), associated readout electronics, an embedded computer, a battery with over 6-hour life, and an optical camera in a portable water-proof enclosure. Based on pixelated depth-sensing technology, spectroscopy is routinely better than 1.0% FWHM at 662 keV. The total mass is about 4 kg, and the system startup time is less than 2 minutes. Additionally, it can be connected via Wifi, Bluetooth, or USB to a tablet, which displays a gamma-ray spectrum and isotope-specific images of the gamma-ray distribution in all directions in real time. List-mode data is saved to an external USB memory stick. Measurements have been performed at nuclear power plants in contaminated environments, in high radiation fields, and in cramped quarters. The various applications for the technology include, but are not limited to: locating primary source terms, shielding design and optimization, finding discrete radioactive particles, locating and tracking crud in pipes and valves, tracking sources through time, and isotopic characterization and quantification.