

Previous model number: 3501

Plutonium Isotopic Spectrometer

G3501

Introduction

The ANTECH G3501 Plutonium Isotopic Ratio Spectrometer is a comprehensive measurement system for the determination of plutonium isotopic ratios. This information is required for both neutron and calorimetry measurements of plutonium, in order to determine the masses or activities of the individual plutonium isotopes. The G3501 may also be used for the isotopic ratio measurement of mixed oxide fuel material containing a mixture of both plutonium and uranium. In this role the G3501 is a cost effective and timely alternative to mass spectrometry. The G3501 also has potential application in general-purpose gamma ray spectroscopy, for radionuclide analysis with an appropriate gamma ray energy and efficiency calibration.

The G3501 system consists of a safeguards quality high purity Germanium (HPGe) detector with shield and collimator, shielded sample enclosure, sample can elevation and rotation mechanism, and gamma ray spectroscopy data acquisition and analysis electronics. In order to control the count-rate from high activity cans of plutonium the detector collimator is fitted with an automatic / manual motor driven variable aperture shutter mechanism.

In normal operation cans of plutonium are manually loaded onto the slide mounted sample rotation platform. The platform is moved into the rotation position. In this position the can is both rotated and raised and lowered by a lift mechanism which ensures that the envelope of the sample can moves uniformly through the solid angle view of the detector. The combination of the shutter with the combined rotation and vertical motion of the can ensures that optimum gamma ray counting of the can is achieved.

The G3501 system uses the PC/FRAM Plutonium Isotopic Analysis software code developed at the Los Alamos National Laboratory. Alternatively, the system can be configured for the MGA Plutonium Isotopic Analysis software code developed at the Lawrence Livermore National Laboratory. The system operating software controls the data acquisition, the motion of the sample can (rotation and vertical scanning) and the operation of the variable aperture. Once the spectral data has been obtained it is passed to the PC/FRAM code for analysis. The G3501 can be linked through a network to other related assay instruments such as passive neutron counters or calorimeters so that the plutonium mass result, by isotope, is directly available.



Features

- 20% efficient high resolution Safeguards Quality shielded HPGe detector
- PC/FRAM Plutonium Isotopic Analysis software developed at the Los Alamos National Laboratory or alternative MGA Plutonium Isotopic Analysis software developed at the Lawrence Livermore National Laboratory
- Automatic / manual motor driven variable aperture shutter to adjust count rate from high activity plutonium samples
- Gamma ray spectroscopy data acquisition and analysis electronics based on the ORTEC DSPEC Pro
- Shielded sample can measurement position
- Plutonium sample can is both rotated and raised and lowered by a lift mechanism to ensure optimum counting
- HPGe detector can employ electromechanical or liquid nitrogen (LN) cooling

Benefits

- Semi-automatic sample counting
- Pu sample can shielding reduces radiation background interference and reduces the radiation dose to operators
- High resolution Safeguards Quality HPGe detector ensures high measurement precision



Specification

External dimensions (H x W x D)	2100 mm x 800 mm x 800 mm
Sample Size	4", 8", 12" & 16" typical, although customisable
HPGe detector	Safeguards coaxial high resolution HPGe detector
HPGe detector type and efficiency	25% ORTEC Pop-Top SGD GEM-5050P4
Typical sample measurement time	15 minutes
Operating voltage	Typically 1600 V