Previous model number: 2108

N2098
Plutonium Scrap Multiplicity Counter

Introduction

The ANTECH Model N2098 Plutonium Scrap Multiplicity Counter is a high efficiency passive neutron counter for measuring the multiplicity of neutron emissions from the spontaneous fission and induced fission of plutonium bearing samples of scrap and residues.

The Model N2098 is based on technology developed by the Los Alamos National Laboratory for safeguards and inventory control purposes. Conventional passive neutron coincidence counting of scrap and residues give rise to significant biases since the plutonium present is often in lumped form and mixed with significant quantities of low-z number impurities. The high α-ratio causes a general increase in the apparent correlated response through induced fission reactions that can lead to significant biases.

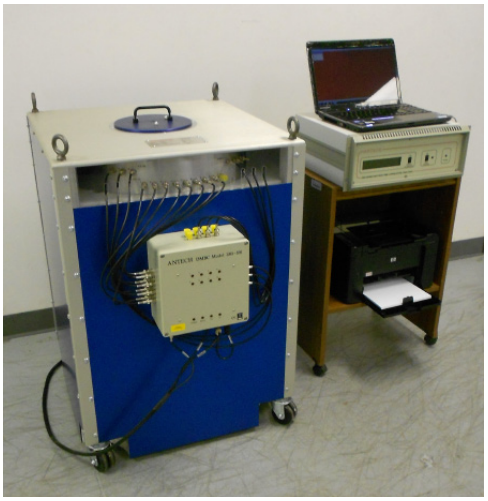
In multiplicity counting, the number of signal multiplets (the signal frequency distribution) is measured in the neutron pulse train. From the moment of the neutron probability distribution it is possible to determine the number of neutron totals, the number of correlated neutron pairs and the number of correlated neutron triples. When one of the variables is known (or can be inferred), the data analysis employs the Point Source model to perform a four parameter analysis based on the frequency distribution to solve for the spontaneous fission rate, Fs (and hence the $^{240}Pu_{effective}$ mass), the detection probability (ε), the (α,n) source term (Sα) or the neutron multiplication, as appropriate. The Point Source model of neutron multiplicity counting was developed by Dr W. Hage of JRC Ispra and forms the basis of all neutron multiplicity analysis.

The Model N2098 can be used with either a Multiplicity Shift Register or the ANTECH N1003 Neutron Time Correlation Analyser (TCA) for multiplicity distribution data collection.

The neutron detection system consists of 80 ^{3}He tubes arranged in four concentric rings. The unit is mounted on a robust, portable trolley. The castors can be locked for safety and stability.

Features

- Fast Amptek A-111 based amplifier/discriminator based junction box that reduces dead time effects for doubles and triples, especially at high count rates
- Annular ANTECH electrically screened Junction Box that ensures comprehensive electrical screening at the termination of the detector tubes
- Integrated ANTECH De-randomising Buffer Mixer Counter that provides a buffer so that pulses which arrive ‘simultaneously’ on different inputs are not lost
- Cylindrical HDPE moderator



Benefits

- Very high efficiency (>50%) for the detection of ^{240}Pu spontaneous fission neutrons
- Designed to have as flat a radial and axial detection efficiency profile as possible
- Can be used with a Multiplicity Shift Register or the N1003 Neutron Time Correlation Analyser for multiplicity distribution data collection

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Specification

External dimensions (H x W x D)	757 mm x 340 mm x 340 mm (29.8 in x 13.4 in x 13.4 in)
Internal cavity dimensions (H x diameter)	410 mm x 200 mm (16.14 in x 7.85 in)
Weight	392 kg (864 lb)
Detectors	80 ^{3}He tubes (Model RS-P4-0820-103) arranged in four rings
Detector dimensions	25.4 mm x 711 mm active detector length at 4 atm
HV Bias setting	~1680 V
Gate width setting	Typically 64 µs
Die-away time	50 µs with gate setting of 64 µs
Pre-delay	4 µs
Precision	~ISO reals/s/g $^{240}Pu_{effective}$ 0.42% (1 sigma) for 1 kg PuO_2 (20% ^{240}Pu)