

Passive Neutron Slab Counter & Curium Monitor

Introduction

The N2004 Passive Neutron Slab Counter & Curium Monitor is a simple, non-quantitative neutron slab counter for the detection of curium contamination in waste drums, boxes or crates. Measurements are taken before or after a more quantitative measurement of fissile/fertile content by some other non-destructive assay technique (such as tomographic or segmented gamma scanning).

The qualitative detection process relies on the fact that the spontaneous fission output (per gram) of curium isotopes (principally ^{244}Cm) is some ten thousand times greater than an equivalent mass of ^{240}Pu . On this basis, the presence of curium can be detected by comparing the expected neutron output (based upon the downstream quantitative measurement) with the efficiency corrected totals output from the curium monitor.

The unit is a single neutron slab counter module consisting of four ^3He detector tubes in a rectangular high-density polyethylene block. The moderator block is clad with a skin of aluminium sheet. Brackets are provided to attach the module to the wall of the room or laboratory. A junction box for the four tubes is housed at the top of the module and combines and amplifies the detector signals and distributes high voltage to the detector tubes. The output from the junction box on the detector module is connected to an Advanced Multiplicity Shift Register (AMSR) by a coaxial, a serial cable and a power cable. The shift register contains circuitry that provides and monitors the high voltage power supply for the ^3He tubes and the low voltage power supply to provide power to the head amplifier.

The ANTECH electrically screened junction box ensures comprehensive electrical screening at the termination of the detector tubes. It houses the fast charge sensitive amplifiers, which employ the AMPTEK A-111 based amplifier. The Junction Box is modular so that ^3He tubes can be replaced easily without disassembling unit.

Each ^3He tube is connected via an HN connector to the junction box and supplied with HV. Two SHV sockets are provided for HV In and HV Out. The LV compartment of the junction box contains the Amptek A-111 pre-amplifier board and the LV socket (BNC). The signal is fed out of a single BNC socket directly to the shift register

Features

- Four ^3He detector tubes (25 mm diameter x 1000 mm length, 4 atmospheres ^3He fill pressure with HN connectors) in a rectangular high-density polyethylene block
- Count rate produced by a ^{252}Cf source (with certified activity) positioned at one meter from the mid-height of the detector module is recorded
- The moderator block is clad with a skin of aluminium sheet for ease of decontamination
- A junction box for the four tubes is housed at the top of the module and combines and amplifies the detector signals and distributes high voltage to the detector tubes
- Provided with user manual and test documentation



Benefits

- Simple, non-quantitative, low cost system for detecting the presence of curium (principally ^{244}Cm) in waste drums, boxes and crates
- Small footprint floor mounted detection module or wall mounted with brackets for ease of use and economy of space
- Inspection and testing includes measurement of high voltage bias curve, discriminator and gain setting and thermal neutron die-away time
- Robust construction for operation in laboratory or plant
- Suitable for use with stand-alone counting electronics
- Provides a curium monitoring system when used with an Advanced Multiplicity Shift Register (AMSR)

Specification

Dimensions (H x W x D) (excluding brackets)		1100 mm x 200 mm x 80 mm (43.31 in x 7.87 in x 3.15 in)
Weight (approx.)		21 kg (46.3 lbs)
Detectors		4 x ^3He detector tubes with connectors in a rectangular high-density polyethylene block
Detector dimensions (L x diameter)		25.4 mm diameter x 1000 mm length at 4 atm pressure (1 in x 39.37 in)
Detection efficiency		~1% *
Operating voltage		~1650 volts
Electrical connections	High voltage	SHV
	5 V supply for head amplifiers	BNC
	Signal output	BNC

(* not warranted)