MIRION TECHNOLOGIES

WM3500

Curved Slab Passive Neutron Counter

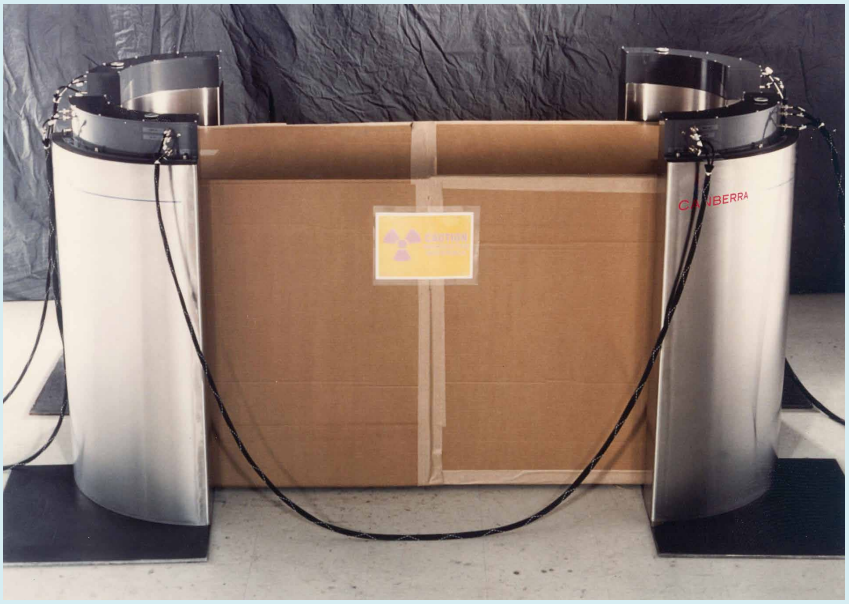
KEY FEATURES

- Designed for quantitative passive neutron analysis
- Suitable for go/no-go measurement of plutonium
- Flexibility geometry for assay of pails, drums or large objects
- Expandable – additional slabs can be connected to improve performance with large samples
- Fast Amptek electronics
- High efficiency >19%
- Sensitivity – detection levels of <50 mg W.G. Pu
- All HDPE moderator enclosed in stainless steel skins
- Transportable
- Free standing detector assemblies
- Operated using JSR-12™ or JSR-14™ shift registers
- Available with NDA 2000™ software

DESCRIPTION

The curved slab neutron coincidence slab counter measures the plutonium content of the sample by detecting coincidence neutrons from the spontaneous fission of the even numbered isotopes of plutonium. The counter is designed to make either quantitative or go/no-go measurements. A JSR-12 or JSR-14 Neutron Coincidence Analyzer is required for coincidence counting (ordered separately).

The counter is comprised of four separate slab counters. These counters are curved through 90° and may be fitted together to form a passive well counter. Each section of the counter contains eight 91 cm (35.8 in.) ^{3}He proportional tubes forming a single detector bank. The output from each of these detector banks is daisy chained, providing a single TTL signal out to the shift register. When configured in its smallest sample geometry (i.e. the four slabs are in contact) the WM3500 counter provides an overall efficiency of 19.4%. As the sections are positioned further apart, the efficiency decreases. The full counter has a height of 114 cm (44.9 in.) and forms a circle with inner diameter of 54 cm (21.3 in.) and has an outer diameter of approximately 86 cm (33.9 in.). For the most accurate results the sample should be placed on a pedestal to center it vertically within the counter. Since this counter does not have end plugs, the axial response will fall quickly as the source is moved near the ends of the counter.



The WM3500 system can be used with larger objects by separating the pillars.

SPECIFICATIONS

DETECTOR ASSEMBLY

- The detector assembly consists of a curved high-density polyethylene (HDPE) moderator with embedded ^{3}He proportional tubes.
- ^{3}He detectors are threaded into a conductive junction box containing a JAB-01 pre-amplifier/amplifier/discriminator board to provide low noise signal processing.
- Inputs/outputs from each slab are daisy chained together to provide a single output.
- The assembly is by a 0.81 mm (0.032 in.) cadmium liner to eliminate thermal neutron background.
- Each slab is free-standing.

SHIELDING

- Primary Shield: 5 cm (2 in.) HDPE – Detector slab is fixed in a minimum within the shield surrounding the entire detector except for the active front/face.
- Peripheral Shield: 5 cm (2 in.) HDPE – Counter and primary shield fit into the peripheral shield for added shielding (total of four inches).

CAVITY DIMENSIONS

- Inner diameter (smallest configuration) – 54.0 cm.
- Outer diameter (smallest configuration) – 86.0 cm.
- Height to top of junction box – 114.0 cm.

NEUTRON DETECTION

- Eight (8) ^{3}He proportional tubes per slab.
- Active length 91.0 cm (36 in.).
- Outer diameter 2.5 cm (1 in.).
- ^{3}He partial pressure – 4 atm.

DETECTION EFFICIENCY

- 19% in smallest configuration.
- Die-away time – 75 µs.

COINCIDENCE COUNTING DETECTION LEVELS

<3 mg ^{240}Pu effective (<50 mg weapons grade plutonium) under the following conditions:

- 20 minute acquisition time.
- Source located at the center of the detector cavity in smallest configuration (all slabs touching).
- Operation at sea-level.
- Neutron background – natural sources only.

INPUTS

- +5 V LVPS (BNC connector).
- +1700 V HVPS bias supply (SHV connector).
- TTL out from adjacent slab (BNC connector).

OUTPUTS

- TTL pulse (BNC connector).
- +5 V LVPS to adjacent slab (BNC connector).
- +1700 V HVPS bias supply to adjacent slab (SHV connector).

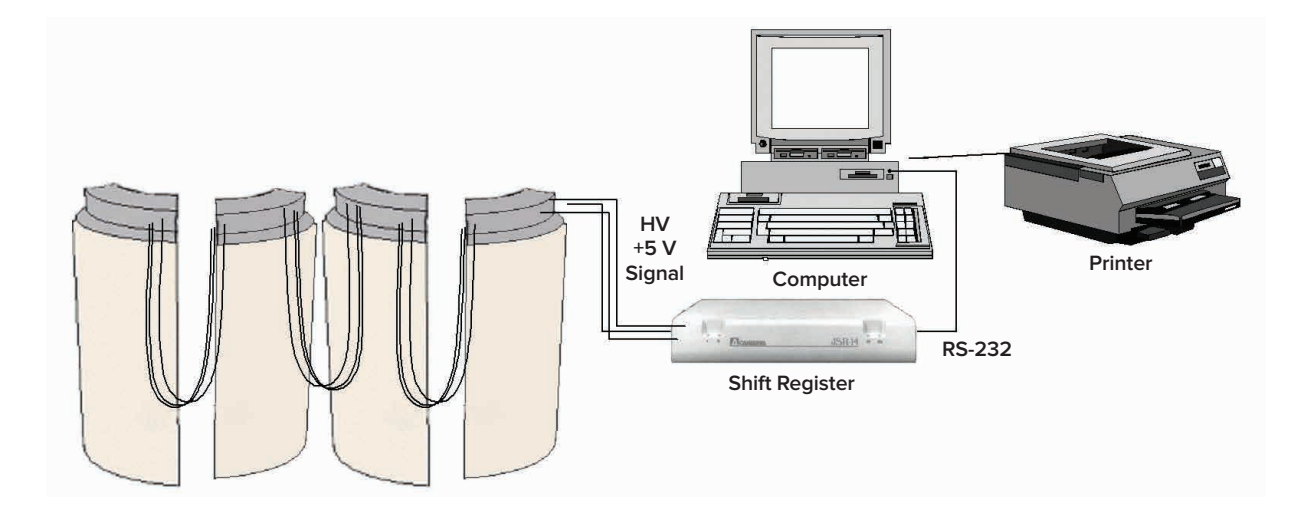


Figure 3. Illustration of the set-up of the WM3500 slabs, shift register and computer.

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