



JCC-12™

Inventory Sample Neutron Coincidence Counter INVS



KEY FEATURES

- Authorized for routine inspection use by the International Atomic Energy Agency (IAEA) as the INVS, the Inventory Sample Coincidence Counter
- Designed for passive neutron coincidence assay of plutonium
- High counting efficiency – 35%
- Variable sample cavity size
- Fast Amptek Electronics
- Sixteen ^3He detectors
- Portable
- Optional transport container

DESCRIPTION

The JCC-12 counter is based on a design developed at Los Alamos National Laboratories (LANL) in the United States under the United States Department of Energy development programs. The JCC-12 unit has also been authorized by the International Atomic Energy Agency (IAEA) in Vienna, Austria, for routine inspection use of nuclear material at facilities placed under international safeguards under agreements established by the Non-Proliferation Treaty and Information Circular (INFCIRC) 153 (Revised). The JCC-12 counter was specifically developed to meet IAEA safeguards requirements for the INVS, the Inventory Sample Coincidence Counter by LANL.

The JCC-12 counter assays plutonium inventory samples by counting coincidence neutrons from the spontaneous fission of the even numbered isotopes of plutonium. The cylindrical-shaped sample holder accommodates various samples including liquids, powders and pellets. The sample cavity can be enlarged to 8.8 cm in diameter by removing the polyethylene sleeve around the aluminum sample carrier. However, enlarging the sample cavity decreases counter efficiency. The counter is intended to operate in the 0.1 to 500 g Pu mass range.

A cadmium sleeve lines the central region of the sample cavity to flatten the response profile along the length of the ^3He tubes. Surrounding the sample cavity is a ring of high-density polyethylene with a total of sixteen ^3He proportional detectors embedded in the polyethylene. The tubes are arranged in two concentric rings to maximize detector efficiency. The tubes are divided into four groups of four, each group is wired together and connected to one JAB-01 Preamplifier/Amplifier/Discriminator circuit board. The four JAB-01s are mounted inside a sealed junction box. LED indicator lights are mounted externally on the junction box to indicate proper operation of each JAB-01 channel. Electrical connections between the JCC-12 counter and the JSR-12™ Neutron Coincidence Analyzer include +5 V and HV. The combination of signals will be combined into a logical OR.

The detector is highly portable and fits into an optional carrying case for transport.

A JSR-12 Neutron Coincidence Analyzer, a computer and analysis software are required for coincidence counting but are not included as part of the JCC-12 counter.

SPECIFICATIONS

PERFORMANCE

- HV SETTING – 1760 V.
- GATE SETTING – 64 μ s.
- DIE-AWAY TIME – 45 μ s.
- DETECTOR EFFICIENCY – 35% with smallest sample configuration; 29% with polyethylene sleeve removed.
- SENSITIVITY RANGE – 0.1 to 500 g Pu.

PHYSICAL

- SIZE – 46.2 \times 27.9 cm (18.2 \times 11 in.) H \times Dia.
- WEIGHT – 20.4 kg (45 lb).
- SAMPLE CAVITY SIZE – 14 \times 5 cm (5.5 \times 2 in.) H \times Dia.
- ^3He TUBES – 16.
- ^3He RINGS – 2.
- ^3He ACTIVE LENGTH – 30.5 \times 2.5 cm (12 \times 1 in.) L \times Dia.
- CLADDING – Aluminum.
- GAS PRESSURE – 600 kPa (6 atm.) ^3He .

OPTIONS

- Transport carrying case.
- One ^{252}Cf neutron source with source strength of 5×10^4 neutrons/second for making routine normalization measurements. An aluminum source rod that reproduces the position of the source is included with the counter.
- Change cladding on ^3He tubes from aluminum to stainless steel to reduce (γ, n) background for ultra-low level counting applications.

REFERENCE

1. Menlove, H.O., Holbrooks, O.R. and Ramalho, A. (1982). *Inventory Sample Coincidence Counter Manual*. Report LA-9544-M. Los Alamos, New Mexico: Los Alamos National Laboratory.



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