



# JCC-12™

## Inventory Sample Neutron Coincidence Counter INVS



**The JCC-12 counter is a field-proven, IAEA-authorized neutron coincidence counter designed for accurate, non-destructive assay of plutonium inventory samples. Developed under U.S. Department of Energy programs and validated by international safeguards authorities, the JCC-12 delivers reliable performance in a compact, transportable form factor – ideal for routine inspections and facility-level nuclear material verification.**

The JCC-12 is a neutron coincidence counter designed for accurate, non-destructive assay of plutonium inventory samples. It assays plutonium inventory samples by counting coincidence neutrons from the spontaneous fission of the even numbered isotopes of plutonium.

### Trusted for Safeguards and Inventory Verification

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.

### FEATURES

- ✓ IAEA-Authorized for Safeguards Use: Developed by LANL and approved by the IAEA for routine inspections under INFCIRC/153 agreements
- ✓ Designed for passive neutron coincidence assay of plutonium
- ✓ High Counting Efficiency: 35%
- ✓ Variable Sample Cavity Size for Versatile Sample Handling: Accommodates liquids, powders and pellets; removable polyethylene sleeve allows for larger sample diameters (up to 8.8 cm)
- ✓ Fast pre-amp electronics with greater performance
- ✓ Sixteen  $^3\text{He}$  detectors
- ✓ Highly portable, with optional transport container, for easier equipment management and flexibility

## JCC-12 INVENTORY SAMPLE NEUTRON COINCIDENCE COUNTER INVS

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.

### System Components and Performance

The cylindrical-shaped sample holder of the JCC-12 counter 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  $^3\text{He}$  tubes. Surrounding the sample cavity is a ring of high-density polyethylene with a total of sixteen  $^3\text{He}$  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 Preamplifier/Amplifier/Discriminator circuit board. The four pre-amps are mounted inside a sealed junction box. LED indicator lights are mounted externally on the junction box to indicate proper operation of each pre-amp channel. Electrical connections between the JCC-12 counter and the JSR-15™ 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-15 Neutron Analysis Shift register, a computer and analysis software are required for coincidence counting but are sold separately.

## SPECIFICATIONS

### Performance:

- HV Setting: 1760 V
- Gate Setting: 64  $\mu\text{s}$
- Die-Away Time: 45  $\mu\text{s}$
- Detector Efficiency: 35% with smallest sample configuration; 29% with polyethylene sleeve removed
- Sensitivity Range: 0.1 to 500 g Pu

### Physical:

- Size: 46.2 × 27.9 cm (18.2 × 11 in) H × Dia
- Weight: 20.4 kg (45 lb)
- Sample Cavity Size: 14 × 5 cm (5.5 × 2 in) H × Dia
- $^3\text{He}$  Tubes: 16
- $^3\text{He}$  Rings: 2
- $^3\text{He}$  Active Length: 30.5 × 2.5 cm (12 × 1 in) L × Dia
- Cladding: Aluminum
- Gas Pressure: 600 kPa (6 atm.)  $^3\text{He}$

### Options:

- Transport carrying case
- One  $^{252}\text{Cf}$  neutron source with source strength of  $5 \times 10^4$  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  $^3\text{He}$  tubes from aluminum to stainless steel to reduce ( $\alpha, n$ ) 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.

