



# Model JCC-31

## High Level Neutron Coincidence Counter



Nuclear



Healthcare



Homeland  
Security  
& Defense



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Education



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Manufacturing

### KEY FEATURES

- Designed for passive neutron coincidence assay of plutonium
- Eighteen  $^3\text{He}$  detectors
- Fast Amptek<sup>®</sup> electronics
- Transportable for inspections at multiple sites
- Optional transport container

### DESCRIPTION

The JCC-31, which is based on a technology transfer from Los Alamos National Laboratory, measures the  $^{240}\text{Pu}$ -effective mass in a sample by detecting coincidence neutrons from the spontaneous fission of plutonium. The effective mass of  $^{240}\text{Pu}$  is the mass of  $^{240}\text{Pu}$  which would emit the same number of spontaneous fission neutrons per second as the combined  $^{238}\text{Pu}$ ,  $^{240}\text{Pu}$  and  $^{242}\text{Pu}$  in the sample.

The detector can measure up to several kilograms of plutonium.

The JCC-31 has a cylindrical-shaped sample cavity 41 cm high by 17 cm in diameter. It is intended to assay plutonium samples including  $\text{PuO}_2$ , mixed oxides ( $\text{PuO}_2\text{-UO}_2$ ), metal carbides, fuel rods, fast critical assemblies, solution, scrap, and waste. A cadmium sleeve surrounds the sample cavity to prevent the re-entry of thermalized neutrons into the sample, which could induce fission in the sample and adversely affect the results. Outside the cadmium sleeve is a ring of high-density polyethylene with eighteen  $^3\text{He}$  tubes placed in the polyethylene.

The tubes are arranged in a single ring around the sample with optimum spacing between the tubes for maximum counter efficiency for a transportable counter. The tubes are divided into six groups of three with each group wired together and connected to one JAB-01 Amplifier/Discriminator circuit board. The six JAB-01s are mounted inside a sealed junction box. LED indicator lights are placed externally on the junction box to indicate proper operation of each JAB-01 channel. Electrical connections between the JCC-31 and the JSR-12 include +5 V and HV. The combination of signals will be combined into a logical OR.

A cadmium sleeve wrapped around the outside of the JCC-31 provides radiation protection for personnel as well as background reduction.

A JSR-12 Neutron Coincidence Analyzer, a computer and analysis software are required for coincidence counting but are not included with the JCC-31.

## SPECIFICATIONS

### PERFORMANCE

- HV SETTING – 1680 V.
- GATE SETTING – 64  $\mu$ s.
- DIE-AWAY TIME – 42  $\mu$ s.
- NOMINAL DETECTOR EFFICIENCY – 17.8%.

### PHYSICAL

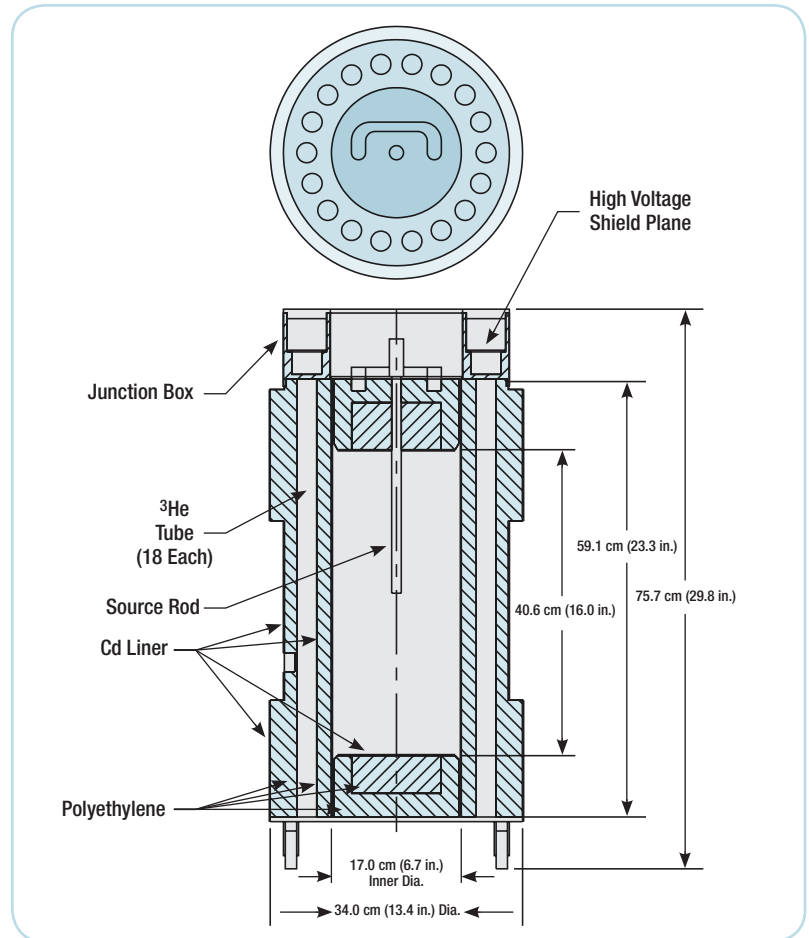
- SIZE – 73.7 x 34 cm (29.7 x 13.4 in.) H (including wheels) x Dia.
- WEIGHT – 55 kg (121 lb).
- SAMPLE CAVITY SIZE – 40.6 x 17.0 cm (16.0 x 6.7 in.) H x Dia.
- $^3\text{He}$  TUBES – 18.
- $^3\text{He}$  RINGS – 1.
- $^3\text{He}$  ACTIVE LENGTH – 50.8 x 2.54 cm (20 x 1 in.) L x Dia.
- CLADDING – Aluminum.

### OPTIONS

- Transport container.
- 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.

### REFERENCE

1. Menlove, H.O. and Krick, M. (1979). *The High-Level Neutron Coincidence Counter (HLNCC): User's Manual*. Report LA-7779-M. Los Alamos, New Mexico: Los Alamos National Laboratory.



Model JCC-31 – High Level Neutron Coincidence Counter III



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