JCC-31™
High Level Neutron Coincidence Counter

KEY FEATURES
- Designed for passive neutron coincidence assay of plutonium
- Eighteen $^3$He detectors
- Fast Amptek electronics
- Transportable for inspections at multiple sites
- Optional transport container

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

The detector can measure up to several kilograms of plutonium. The JCC-31 counter has a cylindrical-shaped sample cavity 41 cm high by 17 cm in diameter. It is intended to assay plutonium samples including PuO$_2$, mixed oxides (PuO$_2$-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 $^3$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 counter and the JSR-12™ unit 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 counter 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 counter.
SPECIFICATIONS

PERFORMANCE
- HV SETTING − 1680 V.
- GATE SETTING − 64 μs.
- DIE-AWAY TIME − 42 μs.
- 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