

# Active-Passive Well Coincidence Counter

## Introduction

The ANTECH Model N2442 Active Well Coincidence Counter (AWCC) is a transportable high efficiency neutron counter for the measurement of plutonium and uranium. The AWCC was originally developed by the Los Alamos National Laboratory (LANL) in the United States. ANTECH has added performance enhancing features including:

- De-randomising buffer mixer circuit to reduce count losses
- Built-in totals counter associated with each amplifier channel
- Robust mechanical design including lifting fixtures

## Active mode

For uranium measurements the N2442 is used in Active Mode. Two americium-lithium sources are inserted (one in the base and one in the plug unit) and the system is operated in random driver mode. Uncorrelated neutrons produced by the Am-Li sources induce fission in  $^{235}\text{U}$  samples in the measurement chamber. The coincidence counter electronics of the ANTECH N1003 Neutron Time Correlation Analyser (TCA) can be used to determine the coincidence count rate, which is attributable to the induced fission in the  $^{235}\text{U}$ . Using this method the mass of uranium is readily determined. Two action modes are available depending on the size of the  $^{235}\text{U}$  sample:

1. **Thermal Active Mode** is employed to measure low-enriched uranium materials. In this mode the sleeve and end plug cadmium coverings are removed. The detection level of this mode is approximately 1 gm of  $^{235}\text{U}$ .
2. **Fast Active Mode** is employed to measure highly enriched material such as uranium metal, uranium thorium fuel and LWR fuel pellets. In this mode the cadmium plates and sleeve are inserted and the detection limit is approximately 23 gm of  $^{235}\text{U}$ .

## Passive mode

In Passive Mode the americium-lithium sources are removed and the N2442 can function either as a neutron coincidence counter or a neutron multiplicity counter, using the appropriate features of most commercially available neutron coincidence and multiplicity counters. The detector measurement chamber can be enlarged by removing the two internal polyethylene disks and the nickel reflector. It can also be operated in the horizontal position with the end plugs removed and with a material test reactor (MTR) holder in position for the measurement of uranium in MTR measurements.

## Features

- Adjustable size measurement chamber
- Two americium-lithium sources for the measurement of uranium
- Advanced electronics with de-randomising mixer buffer circuitry to reduce count losses
- Built in totals counter that can be read out independently
- Robust construction

## Benefits

- Serves as both active neutron detector for measuring uranium and passive neutron multiplicity detector for measuring plutonium
- Provides complete passive and active assay system when used with most commercially available neutron coincidence or multiplicity counters
- Reproduces the physics and measurement characteristics of the original LANL Active Well Coincidence Counter design



## Specification

<b>External dimensions (H x W x D) [including handle and frame]</b>		1040 mm x 635 mm x 711 mm (40.94 in x 25 in x 27.99 in)
<b>Measurement chamber dimensions (H x diameter)</b>		206 mm x 229 mm (8.11 in x 11.77 in) Measurement chamber is adjustable
<b>Weight (approx.)</b>		130 kg (286.6 lb)
<b>Am-Li sources</b>		4.8 x 10000 n/sec (2 off)
<b>Detectors</b>		42 <sup>3</sup> He detectors at 4 atm pressure 6 Amptek charge sensitive amplifiers
<b>Detection efficiency</b>		26 - 31 %
<b>Electrical connections</b>	<b>High voltage</b>	SHV
	<b>5 V supply for head amplifiers</b>	BNC
	<b>Signal output</b>	BNC
	<b>Mixer RS-232 output</b>	9 W male 'D'