

Li-Foil Multiwire Proportional Counter Neutron Detector Backpack



Backpack Radiation Detection Applications

Backpack Radiation Detectors (BRD) applications include those for homeland security, military personnel, and law enforcement. Li-Foil Multi-wire Proportional Counter (MWPC) Neutron Detectors provide an affordable large-area alternative to the ^3He -based detectors, maintaining a high thermal-neutron detection efficiency, at a comparable volume, mass, voltage, and power required. The Li-Foil MWPC are being integrated into existing electronics technology prepared originally for ^3He -based detectors. One of these areas is the BRD.

Li-Foil MWPC Backpack

There is a strong demand for light-weight, large-area, and high efficiency neutron detectors to be integrated into systems as a direct ^3He replacement. Li-Foil offers a light weight solution while maintaining high neutron detection sensitivity and ruggedness that is known of ^3He -based detectors. The Li-Foil MWPC technology has the flexibility to easily adjust available detection area to customer specifications with a 20% to 70% thermal neutron detection efficiency.

Li-Foil Technology

The detector utilizes proportional counter technology with a ^6Li -Foil conversion material to yield high thermal neutron detection efficiencies – up to 70% with ten ^6Li foils. HDPE moderator can be incorporated into the design for increased fast-neutron sensitivity.

Electronics & Interfacing

The onboard readout electronics provided by Quaesta Instruments, Inc. includes pulse processing components (i.e preamp, amp, etc) along with a multichannel analyzer, temperature sensor, and TTL output to interface with the customer's GUI system.

Specifications

- Backpack Total Neutron Detector Area: 760 cm²
- Weight: 19.9 lbs (gamma-ray component)
- Cf-252 Sensitivity: 0.45 cps/ng (*ThermoFisher PackEye* – 0.37 cps/ng)

γ -reject: $1:10^{-8}$

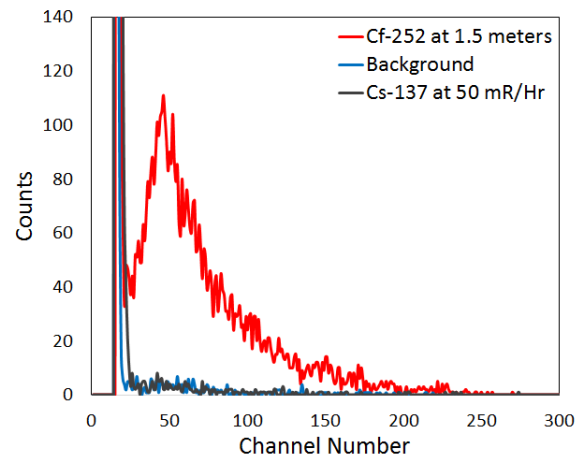
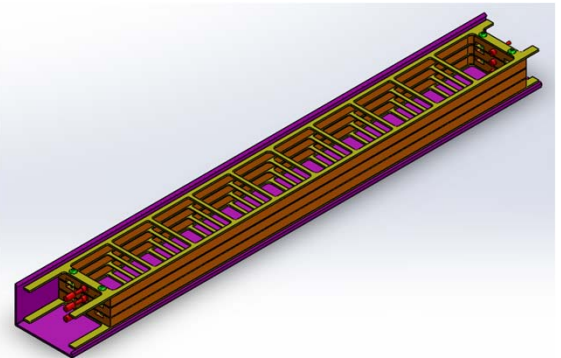
E_{thermal} : 35(± 1)%

V_{output} : TTL

Power: 30-60 mW

V_{input} : 600-800 V

Temp. Range: -40°C to 100°C



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Li-Foil MWPC Neutron Detector Gen3



Quaesta 3000E

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Electronic Specifications

The electronics package is provided by Quaesta Instruments, a leader in lightweight, rugged, and compact multichannel analyzer/TTL output electronics. The low-power package can operate with two 9V batteries for approximately 9 hours.

Options

- Scintillation Detector*: The BRD can include either a 3 x 3 PVT, 2 x 2 CsI, 2 x 2 NaI or 3 x 3 NaI gamma-ray counter.
- Reach-back Capabilities*: Electronics are equipped with GPS and/or Bluetooth reach-back capabilities
- HDPE moderator*: The backpack can be lined with a thin coating of HDPE to increase the neutron sensitivity
 - $\frac{1}{4}$ " HDPE \rightarrow 0.56 cps/ng Cf-252 (backpack weight – 21.6 lbs)
 - $\frac{1}{8}$ " HDPE \rightarrow 0.53 cps/ng Cf-252 (backpack weight – 20.9 lbs)

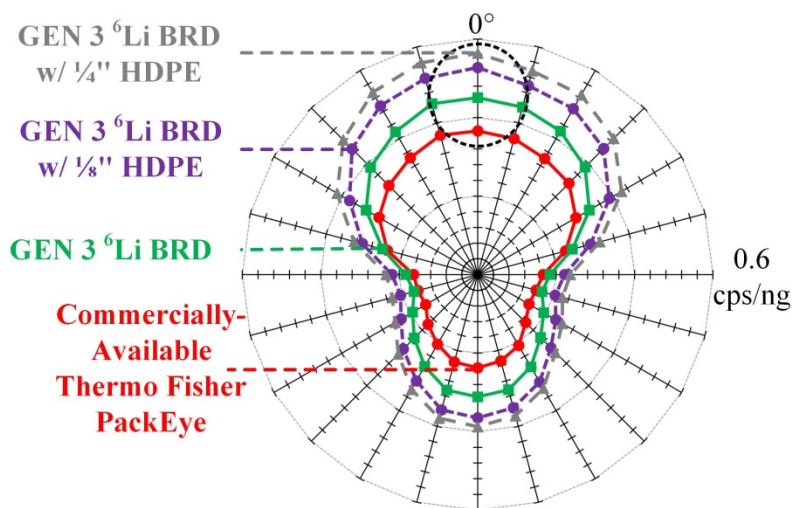


Figure Above: The response to unmoderated Cf-252 at 1.5 meters in the horizontal source plane.



Figure Above: Li-Foil MWPC Backpack V1.0 (w/o the gamma-ray component) calibrated on an acrylic phantom.