

GE Energy

# Boron-10 Neutron Detection Module

Reuter Stokes Radiation Measurement Solutions



imagination at work

## World-class research and development

Beginning with the first Reuter Stokes gas-filled neutron detectors in 1956, GE has been a leader in the research, design and manufacture of radiation sensors for harsh environments. Whether you're experimenting with neutron scattering or developing a homeland security radiation detection solution, GE Energy can custom-design and deliver the right solution for your needs. With more than 100,000 detectors in service around the world, no one understands your radiation measurement needs better than GE Energy.

Our experienced Technology staff makes extensive use of GE's network of Global Research Centers to develop cutting edge products. We also have the unique advantage of leveraging insight and experience gained from radiation detection in other applications we serve, such as nuclear power power generation and oil & gas exploration.

## Why Boron-10?

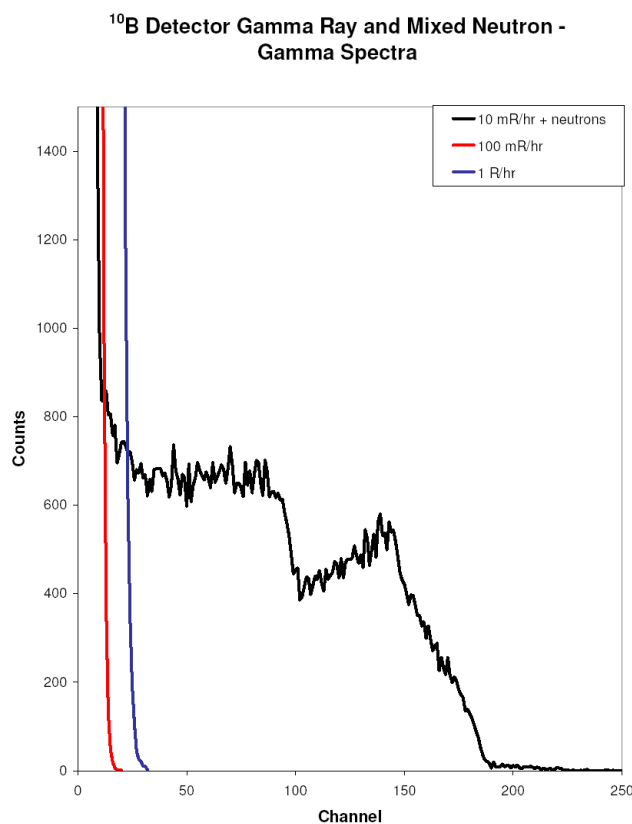
The Reuter Stokes legacy dates back to the early years of the nuclear industry. During its long history, GE has designed and manufactured an assortment Helium-3, Boron-10 lined, BF<sub>3</sub> and scintillating neutron detectors. Upon learning of the impending Helium-3 shortage, our team set to work developing a replacement technology for Radiation Portal Monitors (RPM).

GE has decades of experience in designing and manufacturing Boron-10 lined detectors. Many have been used in nuclear reactors where our detectors accurately measure neutron levels under the extreme radiation conditions prevalent to the reactor. Our Boron-10 Neutron detection module leverages many of the attributes of the proven, highly reliable Helim-3 detectors deployed today. The result—A neutron detection module that is accurate and reliable, even under the harshest operating conditions.

# Neutron Detection Module

## Features

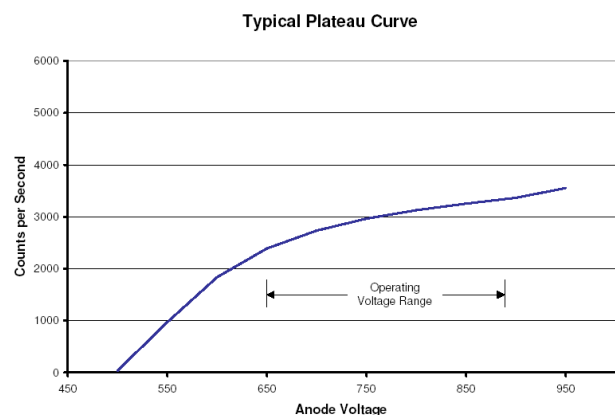
- **Drop-in Replacement** – integrated moderator, detector, and electronics designed to fit within existing Helium-3 neutron detector moderator envelope.
- **High Neutron Sensitivity** – exceeds neutron sensitivity specification ANSI N42.35-2006 (2.5 cps/ng) in many existing Radiation Portal Monitor designs.
- **Excellent Gamma Discrimination** – meets intrinsic efficiency and GARRn specification when exposed to gamma radiation up to 100 mR/h.
- **Integrated Electronics** – environmentally sealed, analog or digital output. A USB port is available to monitor operating voltage, current consumption, temperature, and to set discriminator.
- **Built-in Quality** – incorporates many of the design features of today's helium-3 detectors
- **Product Configurations** – available in a variety of sizes and lengths up to 2.2 meters. Module is also available with HN or specified electrical connectors in lieu of electronics.



Typical pulse height spectrum for a <sup>10</sup>B module. Spectrum was acquired using an unmoderated PuBe source in various gamma fields produced by a <sup>60</sup>Co source.

## Specifications

- Moderator Module
  - High Density Polyethylene (HDPE)
  - Overall length: up to 2.2 meters
  - Width: various, 30 cm (typical)
  - Depth: various, 12.7 cm (typical)
- Boron 10 Lined Detectors
  - Inner wall lined with enriched Boron 10
  - Fill gas: Argon mixture
  - Pressure; less than 1 atmosphere (typical)
- Integrated Electronics - Two separate independent systems
  - Includes HV power supply, preamplifiers, and shaping and summing amplifiers
  - Operating voltage controlled either externally or internally.
  - Environmentally protected
  - Power requirements: +5VDC (<500mA)
  - Analog or digital output
  - USB port to set operating voltage (0 – 800VDC), discriminator and to monitor and troubleshoot module.
- Ratings
  - Temperature: -40°C to +55°C
  - Relative humidity: 93%
- Configurations
  - Mechanical: drop-in designs available
  - Moderator-Detector only (option)
    - Connectors: HN (2) or as specified
    - Operating voltage: 600 – 1,100 volts
    - Capacitance: ~200 pF





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