Boron-lined neutron detectors for mobile soil moisture measurements

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Innovative Neutron Detection

- Radiation type & background discrimination
- Low cost & low power consumption
- Lightweight and modular

Concept

Demands in environmental neutron detection
- High spatial resolution
- High signal-to-noise ratio
- High temporal resolution
- Efficient discrimination of radiation types
- Minimization of background signals
- Precise soil moisture monitoring
- Long-term use

Detection Method

Neutron conversion by boron-10

Charge amplification in CCy, by gas

Electronics

Read-out unit (Pulse Analyzer)

High voltage

Power Supply

Communication and Data Units

Slow Control & Data Processing

Detector Units

Summary/Advantages

- Modular detection system of boron-lined proportional chambers
- Simple, robust and temperature-stable electronics (based on open hardware)
- High count rates:
  1. Large effective area
  2. Overall high efficiency
- Modulare system allows for easy upgrading/downgrading
- Modular system allows for easy upgrading/downgrading
- Lightweight and modular
- Advanced discrimination of background radiation
- Shrinkage against thermal neutron leakage
- AirCO2 counting gas: cheap and hazard-free

A ³He alternative for environmental applications

The nuclei of solid borons are emission converters that limit the efficiency of single proportional counters to roughly 1.2%. This is why we provide a modular detector system composed of a multitude of boron-lined counting tubes. Each tube can work as an individual neutron conversion detector. The system offers a high signal-to-noise ratio, precise soil moisture monitoring and long-term use.

The walls of the counting tubes are composed of 200 µm thick aluminium sheets making them very light and most suitable for airborne applications. Moreover, the system features all important measurement devices for the application in soil moisture. Furthermore, all individual boron-lined counting tubes can be easily replaced in case of aging or wear.

Additional Information

Examples from biomass and agriculture using the boron-lined detector system.