

LIQUID SCINTILLATOR BASED, FAST NEUTRON DETECTOR FOR FRESH FUEL

VeryFuel

MAIN FEATURES

- Fits the profile of the fuel assemblies for PWR and WWER1000 reactors.
- Detector assembly and DAQ system with modular digital electronics, embedded PC and data processing software included
- 12 cells of EJ-309 liquid scintillator arranged on three detection panels
- biased by individual HV channels and read out by individual flash ADC
- Collects neutron coincidences from induced nuclear reactions at much higher rate compared to presently available systems detecting thermal neutrons
- Statistical uncertainty on the ^{235}U enrichment in 17×17 PWR lower than 1% with 15 min acquisition time
- Immune to burnable poisons
- Easy set-up of the instrument in-field with minimal cabling and connection complexity
- Collect, transfer and store raw data comprising waveforms, cell number/address and time stamps to allow data integrity evaluation and give the possibility for an independent re-processing of stored data on site or at the Head Quarters.
- Provide an easy configuration mode for in-field use comprising a real-time data analysis, with display of the main result in the form of ^{235}U linear mass and related uncertainty for item verification.

DESCRIPTION

The **VeryFuel** is a Non Destructive Assay (NDA) tool for verification of modern fresh fuel assemblies. The **VeryFuel** has the capability to measure the ^{235}U content with unprecedented speed and much lower systematic uncertainty in presence of burnable poisons. The **VeryFuel** is a liquid scintillator-based instrument detecting fast neutrons from induced nuclear fissions. The standard geometric configuration fits the profile of the fuel assemblies for PWR and WWER1000 reactors.



CAEN developed the **VeryFuel** for the International Atomic Energy Agency (IAEA) and its user requirements have been defined in the safeguards operational divisions.

The **VeryFuel** comprises a detector assembly and a DAQ system with modular digital electronics, embedded PC and data processing software.

The detector assembly is composed by 12 cells of EJ-309 liquid scintillator, arranged on three detection panels. The fourth panel of the assembly, composed by high density polyethylene, has the housings for two Americium-Lithium sources (AmLi). Each liquid scintillator cell is biased by individual High Voltage channels and read out by individual flash Analog-to-Digital Converters. The detectors and data analysis was developed by the IAEA and Member States Support Programs.

The software allows the user to configure the data acquisition through an intuitive graphical user interface and shows the result of the real time data processing. When the data acquisition is started, the events are read from the digitizer modules, encoded in binary files, analysed and filtered by a series of configurable selection criteria.

