

PERALS SPECTROMETER



DESCRIPTION

The Photon-Electron Rejecting Alpha Liquid Scintillation (PERALS®) Spectrometer is an electronic module optimized for efficient, rapid, and accurate counting and spectrometry of alpha particles from alpha-emitting nuclides in appropriate extractive scintillators. The Model 8100AB is packaged in a triple-width Nuclear Instrument Module (NIM) and contains the following functional circuits and sub-systems:

- Integrated Photo Multiplier Tube (PMT) detector and sample-chamber
 - Preamplifier
 - High-voltage filter and bias interlock circuit
 - Shaping amplifiers
 - Time-to-pulse-height converter
 - Pulse-shape discriminator and coincidence gate
- Pulse-shape discriminator level marker
 - Pulse pile-up rejection

With these circuits, the Perals Spectrometer contains all functions necessary for alpha scintillation spectrometry with 99.7% counting efficiency, 99.95% rejection capability of unwanted pulses from electrons and photons, 300 keV resolution at 6 MeV, and excellent linearity.

SPECIFICATIONS

- INPUTS:** BIN POWER: Rear panel NIM Bin connector; ± 12 V @ 450 mA, ± 24 V @ 240 mA.
INPUT: Rear panel SHV connector; accepts +500 V @ 1 mA input current to provide power to the photomultiplier tube (PMT). (Note: Not required if internal high voltage module option is installed.)
- OUTPUTS:** PULSE HEIGHT: Front panel BNC connector; provides unipolar, positive pulses, 0 to 10 V amplitude; linear with alpha energy (6 MeV alpha energy = 6 V output at GAIN = 10); 1.5 μ s dwell time, 100 S output impedance; <300 keV (fwhm) resolution at 6 MeV alpha energy; output internally gated by Pulse-Shape Discriminator (PSD) setting.
GATE: Front panel BNC connector; provides unipolar, positive pulses, 3.5 V amplitude, 3 μ s dwell time, 100 S output impedance; time coincident with all Pulse Height outputs having amplitudes between the PSD and Pile-Up set points.
PULSE SHAPE: Front panel BNC connector; provides unipolar, positive pulses, 0 to 10 V amplitude (approx. 0.5 V/ns); 1.5 μ s dwell time, 100 S output impedance; 10 ns (fwhm) resolution. For samples having beta/gamma and alpha activity, the multichannel analyzer display of the pulse shape spectrum shows two peaks separated by approx. 35 ns.

PERALS SPECTROMETER

SPECTIFICATIONS (cont)

DISABLE: Rear panel BNC connector; provides short to ground to disable bias and prevent damage to PMT when sample chamber is opened. (Note: Not required if internal high voltage option is installed.)

CONTROLS: **GAIN:** Front panel, 10-turn potentiometer; 0.4 X - 1.4 X range. Allows calibrating the energy scale from 2.4 V to 8.4 V for 6 MeV alpha energy. **PSD SET:** Front panel, 10-turn potentiometer, 0 to 10 V range. Sets the lower level discriminator of the Pulse Shape pulses to eliminate beta/gamma background.

DISPLAY: Front panel, two position, momentary contact switch; allows superposition of the PSD lower level discriminator setting and the Pile-up upper level discriminator setting on the Pulse Shape output spectrum.

PILE-UP: Front panel, multi-turn trimpot, 0 to 10 V range. Sets upper level discriminator for rejection of pulses with longer decay times than alpha particles of interest.

LLD: Rear panel, multi-turn trimpot, factory set lower-level discriminator for the Pulse Height output spectrum.

EXP: Rear panel, multi-turn trimpot, factory set gain for the Pulse Shape output spectrum.

SHIFT: Rear panel, multi-turn trimpot, factory set offset for the Pulse Shape output spectrum.

DIMENSIONS: 3 NIM wide module, 10.2 cm wide, 22.1 cm high, and 24.6 cm long.

WEIGHT: (shipping) 5 kg (Net) 2.5 kg

