ORDELA INC.
OAK RIDGE DETECTOR LABORATORY

ORDELA MODEL 2410N

POSITION-SENSITIVE PROPORTIONAL COUNTER (PSPC)

DESCRIPTION

The ORDELA Model 2410N is a PSPC designed and manufactured by ORDELA, Inc. for applications in neutron scattering and diffraction research. It applies the multi-anode/multi-cathode and preamplifier-per-cathode design for excellent angular resolution and count-rate capability. The counting volume has an active area of 40.6 cm x 40.6 cm and is 2.5 cm deep. The counting gas is ^{3}He plus additives at <350 kPa absolute pressure for high neutron detection efficiency and reduced gamma-radiation cross-section. The anode/cathode wire pitch (and thus the spatial resolution) is ≈3 mm. The PSPC operates at low gas multiplication (<25); that is, the anode avalanche generates 100 fC charge per detected neutron to greatly extend the anode life time.

The PSPC pressure vessel and electronics enclosure are constructed of Aluminum 6061-T6 and are designed for operation inside a vacuum flight path. Mostly metal and ceramic components are used inside the counting volume for improved gas purity over extended time periods.

The Model 2410N position-encoding electronics consist of one low-noise, wide-band preamplifier /discriminator per cathode wire for independent amplification and discrimination of each of the 256 outputs (128 each for the x- and y-coordinates). All cathode wire signals are grouped into sixteen sets of modular preamplifier card, discriminator card, and front-end-processing card, sixteen wires per set. Multiple Event Discrimination (MED) between adjacent wires is implemented with Programmable Gate Array (PGA) circuits by over-sampling discriminator outputs of each wire. This technique also eliminates spurious noise pulses from being processed. All 256 cathode outputs are connected to the on-board processor for coincidence analysis between the x- and y- coordinates. A Fast Digital Interface (FDI) latches valid X-Y coincident events. A handshake signal with the host computer or data logger will update the one-event latch with a new event. Coincident X-Y events from the detector cathode wires can be processed and latched on the FDI for readout at a sustained cycle time of 100ns. Standard features of the Model 2410N electronics include an anode preamplifier to process outputs from the anode wire plane for pulse-height analysis. An on-board processor allows for remote control of the discriminator settings for each wire and the high voltage power supply setting via an RS-485 differential serial bus. The data output flow is controlled via the Fast Digital Interface. The position encoding electronics are modular for simple maintenance and replacement. All the PSPC position encoding electronics are contained in a sealed enclosure located on the PSPC back plane. This enclosure is vented to atmosphere to allow operation of the electronics at atmospheric pressure when the PSPC is located in a vacuum flight path.

SPECIFICATIONS

ACTIVE AREA:	40.6 cm x 40.6 cm
SPATIAL RESOLUTION:	128 x 128 picture elements (pixels)
PIXEL SIZE:	0.32 cm x 0.32 cm
SPATIAL UNCERTAINTY:	0.2 cm (fwhm) for an avalanche charge of 100 fC per neutron (i.e., GMF = 25)
COUNT-RATE CAPABILITY:	2×10^{5} neutrons per second overall with <10% coincidence losses

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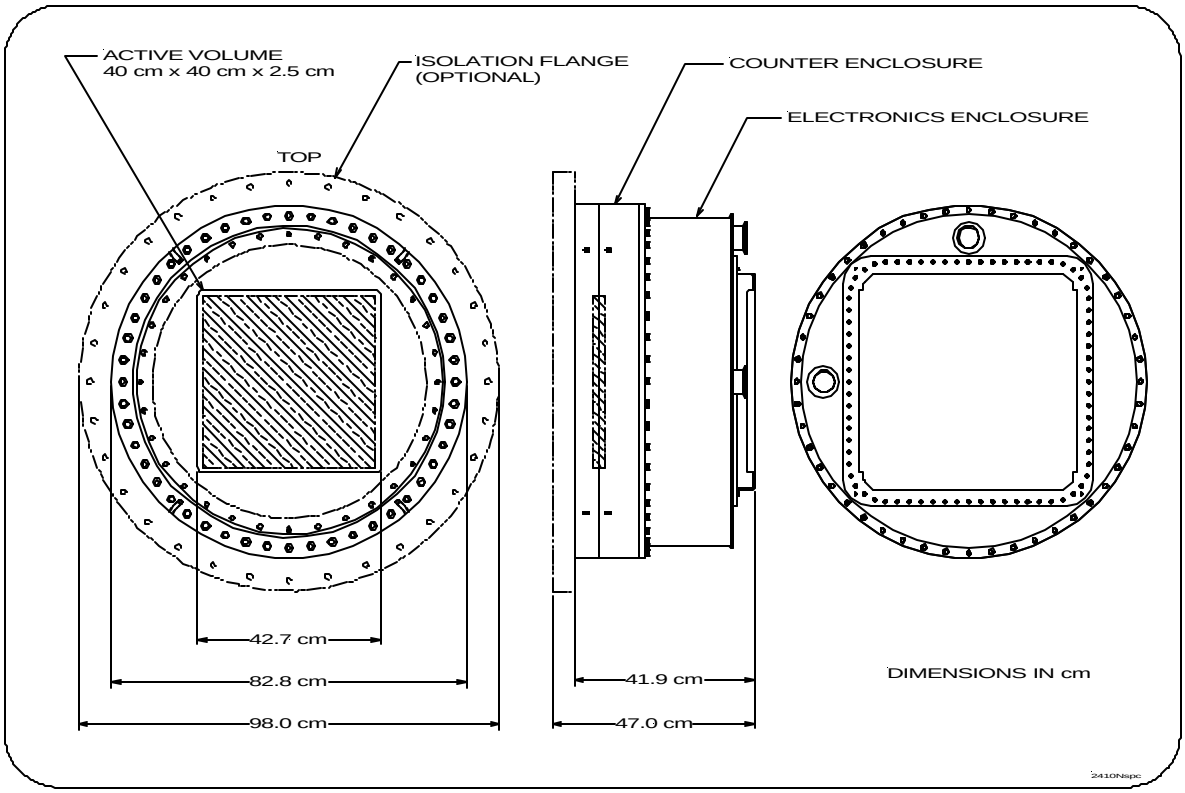
SPATIAL UNIFORMITY:	±2% integral, ±10% differential
BIAS VOLTAGE:	<3500 V (exact bias voltage preset at factory)
ELECTRONICS POWER:	±5 V and ±12 V (from internal power supply)
EXTERNAL POWER:	110 V, 50/60 Hz Clean Power

COUNTER CONSTRUCTION

BODY AND WINDOW:	Aluminum 6061-T6
TEST PRESSURE	Counter chamber @ 400kPa relative pressure, electronics chamber @ 150kPa relative pressure (i. e., 50% overpressure for all chambers)
WINDOW THICKNESS	1.0 cm
OVERALL DIMENSIONS	82.8cm diameter, 42.0cm height
SHIPPING WEIGHT	~800kg



ORDELA Model 2410N System, outline and dimensions of the position-sensitive proportional counter and the electronics enclosure.

WARRANTY

ORDELA, Inc. warrants its products to be free from defects in materials and workmanship for 12 months after shipment. No other warranty is included. Specifically, no warranty of merchantability or fitness for a particular purpose is implied. ORDELA's liability under this warranty is limited to repairing or replacing the product at ORDELA's option. This warranty is void if the product is operated improperly, disassembled, or modified other than in the ORDELA laboratory.