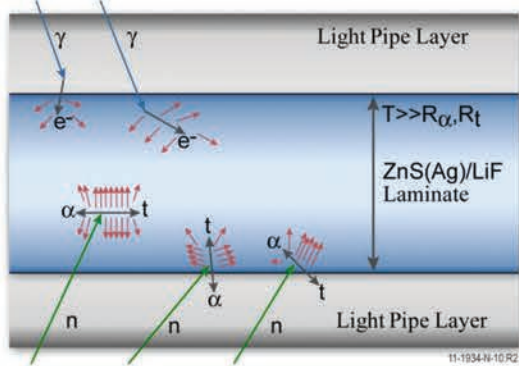


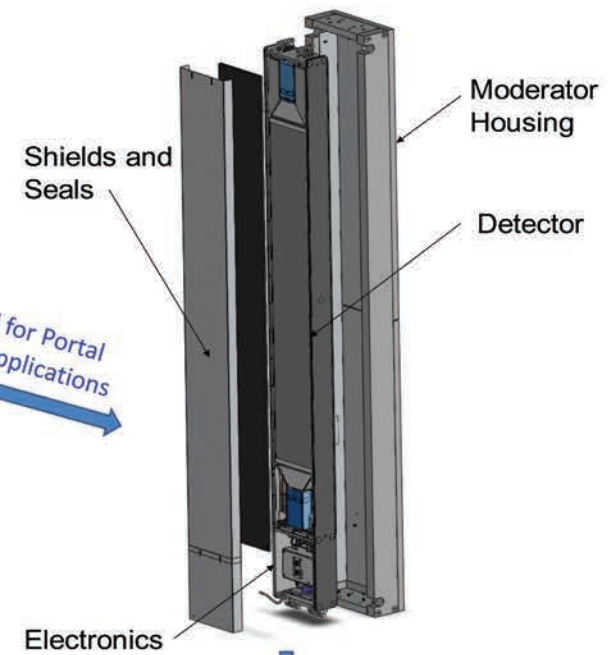
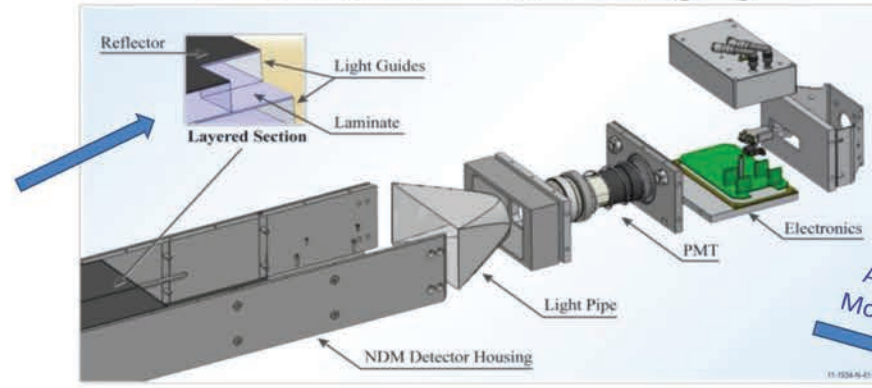
# NeuSand®: A Large-Area Neutron Detector Based on a Sandwiched Neutron Scintillator/Moderator-Light Guide Structure - Replacing He-3 in Portal Monitors

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## NeuSand Neutron Detection



## NeuSand Detector Packaging



### NeuSand Technology:

- Neutrons moderated by hydrogenous light guides (and moderator housing)
- Thermal neutrons absorbed and converted to scintillation light by ZnS(Ag)/<sup>6</sup>LiF scintillator laminate
- Light guides pipe light to either end of detector through light pipes
- Photomultiplier tubes convert light
- Analog signals from PMTs summed
- Pulse height discrimination eliminates gamma-ray pulses
- Attributes:
  - Low-power, robust, minimal complexity
  - Readily integrated w/ different RPMs (i.e., flexible interface)
  - Scalable
  - Economical solution
  - No gas, no fragile tubes, no toxic materials

### NeuSand NDM 2.5 (single <sup>3</sup>He tube equivalent):

- Meets or exceeds neutron efficiency and gamma discrimination requirements – see table below
- Nearly identical response to moderated and unmoderated <sup>252</sup>Cf neutrons
- Tested: EMI, ESD, temperature, shock, humidity, blowing/freezing rain per ANSI N42.38-2000
- UL 508, 61010-1, and FCC Part 15 Class B compliant
- Successfully completed Phase I of DNDO Neutron Detector Replacement Program

### Drop-In <sup>3</sup>He Replacement for SAIC RPMs:

- Form factor: 5" x 12" x 84.5"
- High voltage: < 1200 V, < 1 mA
- DC power: < 25 mA @ ±3.7 V
- Pulse processing: preamp output to be sent to external shaper and discriminator

### NeuSand NDM 4.0 (two <sup>3</sup>He tube equivalent):

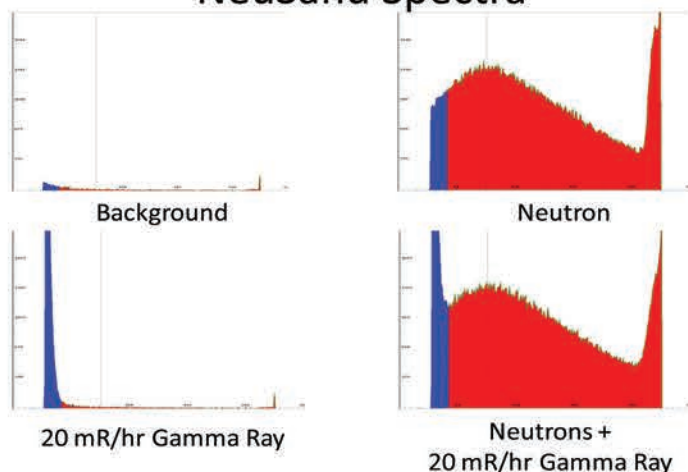
- > 4 counts/second per ng of <sup>252</sup>Cf, similar gamma-ray discrimination performance
- Same form factor, power requirements, and pulse output as Model 2.5

NeuSand NDM 2.5 Truck Lanes

NeuSand NDM 4.0 POV Lanes



## NeuSand Spectra



\*Red area = counted neutrons Blue area = rejected gammas



	NeuSand NDM 2.5 Performance	DNDO NDRP Requirement
Neutron Efficiency: $\epsilon_{abs,n}$ (cps/ng <sup>252</sup> Cf)	3.26	> 2.75
Gamma Discrimination: $\epsilon_{int,\gamma n}$ (20 mR/hr)	$3.05 \times 10^{-8}$	< $10^{-7}$
GARRn	1.019	$0.9 < GARRn < 1.1$