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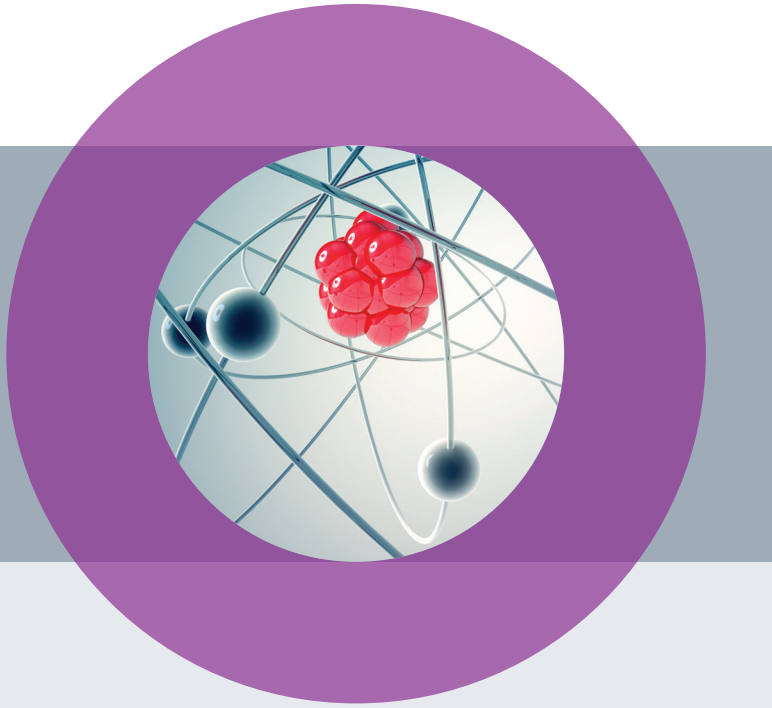
THE CENTRE OF SCINTILLATION

Neutron Screens

Lithium-6 based screens for detection and imaging of thermal neutrons

Our specialist neutron screens offer excellent gamma discrimination and sensitivity for high performance in both neutron detection and imaging applications.



product range

Neutron screens are available in three formulations:

1. the standard ND is a blue emitting screen with unique low sensitivity to background gamma;
2. the green emitting NDg is ideal for CCD imaging
3. while the NDFast has been specifically designed for high rate applications.

Neutron efficiency is determined by the ZnS:6LiF mass ratio and by the thickness of the screens.

Typically a higher thickness and a lower ZnS:6LiF ratio will provide a greater capture efficiency but a lower light output. This however will depend on incoming neutron flux and on the detector setup. The detection of thermal neutrons is based on the nuclear reaction:

$$^{6}Li + n \; g^{3}H + \acute{a} + 4.78 \text{ MeV}$$

specification

Physical Properties of NDFast, ND and NDg Screens

Screen Type	NDFast	ND	NDg
Formulation	^{6}LiF ZnO:Zn	^{6}LiF ZnS:Ag	^{6}LiF ZnS:Cu, Al
Phosphor Type	Particulate blend	Particulate blend	Particulate blend
Emission Colour	Green	Blue	Green
Peak Emission	505nm	450nm	540nm
Decay to 10%	3.5µs	80µs	85µs
Afterglow	Ultra low	Low level	Low level
X-ray Absorption	Very low	Very low	Low
UV Absorption	<390nm (Broad band)	Broad band	>220nm into visible

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ZnS:^{6}LiF mass ratio

Available mass ratios: 4:1 for maximum light output; 2:1 for maximum ^{6}Li density and detection efficiency.

dimensions

Screens are readily available up to 500mm x 500mm but larger sizes can be manufactured to special order.

substrates

Available either on a 250 um white polyester substrate or free standing (i.e. without any substrate). Additional substrates available on demand.

shapes

Screens can be manufactured in a range of shapes from flat sheets to more complex designs such as ridged/ grooved tiles and conformed cylindrical surfaces. Most types of screens are heat formable.

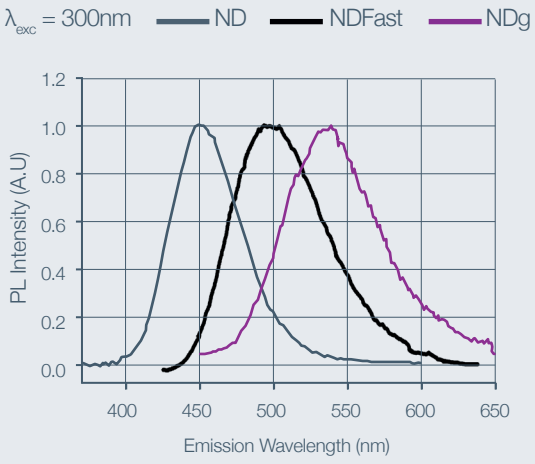
construction

A wide range of mountings and support materials are available, such as aluminium plates. Wall thickness tolerances can be agreed on demand.

performance

Performance achieved with ND Screen in a detector for the replacement of He-3 tubes		DNDO NDRP Requirement
Neutron Efficiency: $e_{abs,n}$ (cps/ng ^{252}Cf)*	3.26	> 2.75
Gamma Discrimination: $e_{int,gn}$ (20 mR/hr)	3.05×10^{-8}	$< 10^{-7}$
GARRn	1.019	0.9<GARRn<1.1

* For 2:1 ZnS:Ag / ^{6}Li ratio, 300µm thickness



applications

- Fissile material detection in radiation portal monitors
- Thermal neutron detection in high energy physics
- Neutron radiography in non-destructive testing
- Cancer treatment
- Crystallography
- Hand-held devices

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