BC-702
Thermal Neutron Detector

BC-702 is a highly efficient scintillation detector of thermal neutrons, and provides excellent discrimination against gamma background. The detector is a disc 0.25″ (6.35mm) thick available in several diameters which can be mounted directly to photomultiplier tubes or light guides and surrounded by an appropriate moderator.

The detector incorporates a matrix of a lithium compound enriched to 95% ^{6}Li dispersed in a fine ZnS(Ag) phosphor powder. The detection process employs the nuclear reaction ^{6}Li (n, α) ^{3}H in which the resulting alpha particle and triton produce scintillations upon interacting with the ZnS(Ag). The BC-702 is an improved version of that developed by Stedman[1] with the scintillating portion of the detector being convoluted to maximize light output.

Scintillation Properties	
Light Output	Pulses up to a maximum of ZnS(Ag) [comparable to NaI(Tl)]
Decay Time, µs	0.2
Wavelength of Max. Emission, nm	450
General Technical Data	
Lithium Content	11mg/cm^2

Standard Sizes				
Overall Diameter	1.5” (38.1mm)	2” (50.8mm)	3” (76.2mm)	5” (127mm)
Sensitive Area (diameter)	34.9mm	47.6mm	73.0mm	123.8mm
Sensitive Area (cm^2)	9.5	17.8	41.8	120.4

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Performance Characteristics –

The neutron detection efficiency varies with neutron energy as the following approximate values indicate.

Neutron Energy	Efficiency
0.01 eV	60%
0.025 eV	55%
0.1 eV	30%
1 eV	10%

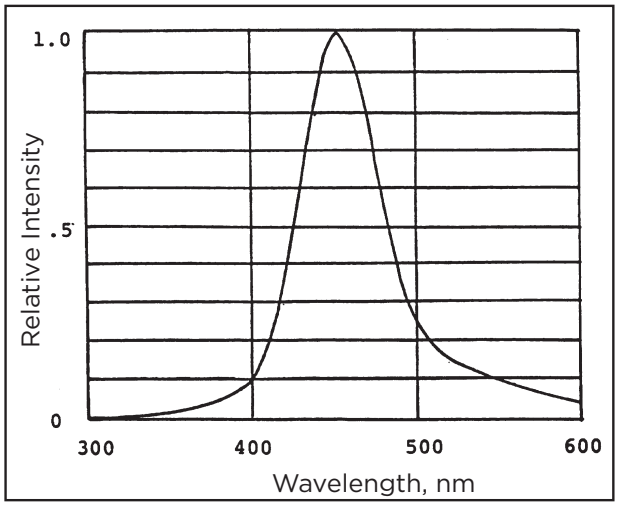
In most applications, the BC-702 will give counting efficiencies up to twice those possible with similar detectors based on ^{10}B. The neutron detection efficiency attainable in a specific application will depend on the level of the gamma ray background.

Gamma discrimination can be achieved to enable efficient detection of thermal neutron fluxes in gamma fields as high as 10R/hr (10^7 gamma rays per neutron). In lower gamma fields (<100mR/hr) discrimination is easily achieved by setting a lower threshold. In fields above 1R/hr, several gamma interactions occurring within the resolving time of the detector could produce a composite pulse as large as that from a neutron. In this case, pulse shape discrimination may be effectively used.

Reference –

I. R. Stedman, *Rev. Sci. Instru.*, 31,1156(1956)

Emission Spectrum –



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