

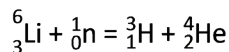
# THERMAL NEUTRON DETECTOR

## EJ-420

The EJ-420 detector is an efficient detector of thermal neutrons in the presence of gamma radiation. The detector employs a lithium compound, whose Li content is enriched to 95%  ${}^6\text{Li}$  dispersed in a ZnS:(Ag) matrix. Efficient measurements of thermal neutron fluxes may be performed in the presence of gamma radiation as high as  $10^7$  gamma rays per neutron.

In most applications, EJ-420 will give counting efficiencies up to 100% greater than those attainable with similar detectors based on  ${}^{10}\text{B}$ . The efficiency is dependent on the neutron energy and is approximately 30% for 0.1 eV neutrons and 60% for neutrons of energy 0.01 eV or less. The detection efficiency for thermal neutrons of about 0.025 eV is approximately 55%. The attainable detection efficiency in a particular application will, of course, also depend on the competing gamma ray background.

The detection process in EJ-420 depends on the nuclear reaction  ${}^6\text{Li} (n, \alpha) {}^3\text{H}$ :



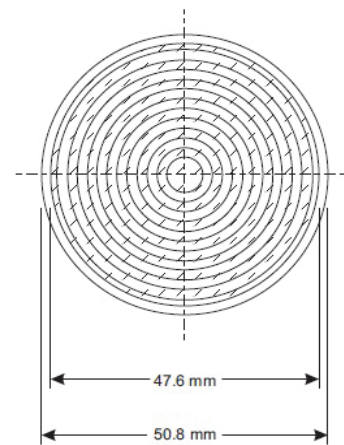
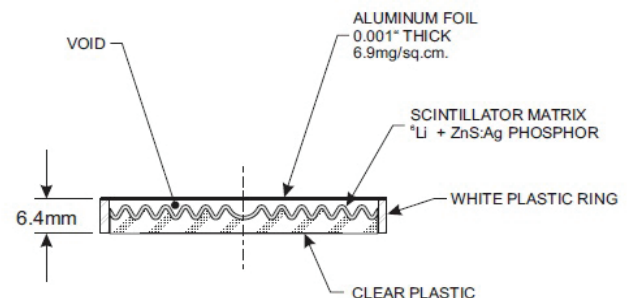
with a cross section of 941 barns for 0.025 eV neutrons. The resulting triton and alpha particle are efficiently detected in a ZnS:(Ag) phosphor especially selected for short decay time characteristics.

For typical applications EJ-420 is optically bonded to a photomultiplier tube with clear silicone grease or fluid. It may be surrounded by an appropriate quantity of hydrogenous material for neutron thermalization. The neutron flux is determined above a desired rejection

ratio of gamma radiation or photomultiplier noise by setting the pulse height analyzer or discriminator of the associated electrical equipment to an appropriate level. This is adequate for most applications, but if the flux of gamma rays is very high, pulse shape discrimination may be effectively used.



50mm DISC



PROPERTIES	EJ-420
${}^6\text{Li}$ Content (mg/cm <sup>2</sup> )	9
Pulse Height (% NaI(Tl))	120
Wavelength of Maximum Emission (nm)	450
Decay Time, Short Component (μs)	0.2

STANDARD SIZES	
Thickness (mm)	6.5
Diameter (mm)	25, 38, 50, 76, 127

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