

Scintillation Cerium-doped Silicate Yttrium Lutetium Crystal(Ce:LYSO)

Description

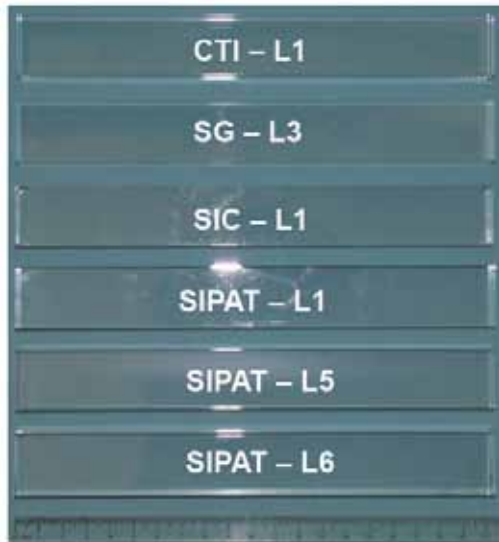
Scintillation Cerium-doped Silicate Yttrium Lutetium Crystal (Ce:LYSO) is a new inorganic scintillation crystal of excellent performances. It has the advantages of high light output, fast decay time, good radiation hardness, high density, a high effective atomic number, high detection efficiency of γ rays, non-hygroscopicity and stable physical and chemical properties. Therefore it is considered as an inorganic scintillation crystal material of the best overall performance. It has many applications in nuclear physics, nuclear medicine, high-energy physics and geophysical exploration.



Specifications

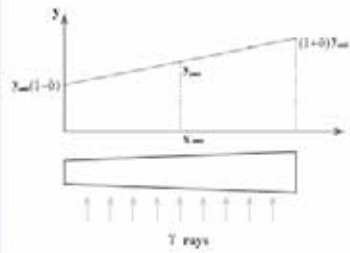
Crystal system	Monoclinic
Density(g/cm ³)	7.15
Hardness(Mohs)	5.8
Refractive index	1.82
Light output(Relative to NaI)(%)	65~75
Decay time (ns)	≤47
Peak wavelength (nm)	410
Anti-radiation (rad)	> 1×10 ⁸
Diameter(mm)	φ50~φ80
Length(mm)	≤200

Light Response Uniformity



25 x 25 x 200 mm samples measured for their L.R.U. and fit to a linear function

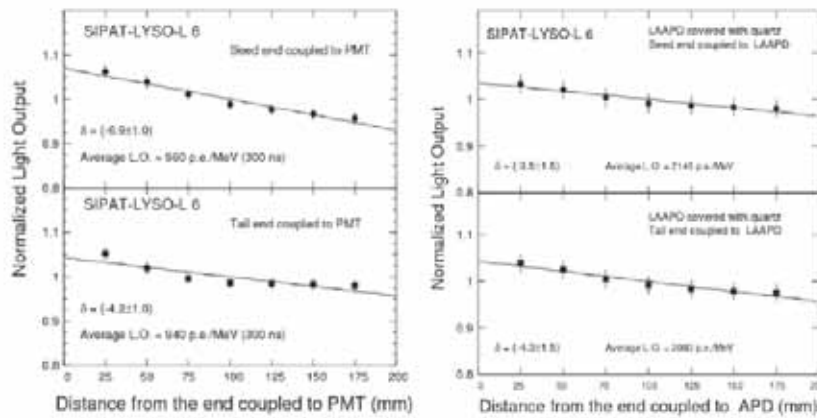
$$Y = Y_{mid} [1 + \delta(x/x_{mid} - 1)]$$



References: CMS ECAL SLHC Workshop at Fermilab, Ren-yuan Zhu, Caltech at October 29, 2009

Progress In 2009 (I)

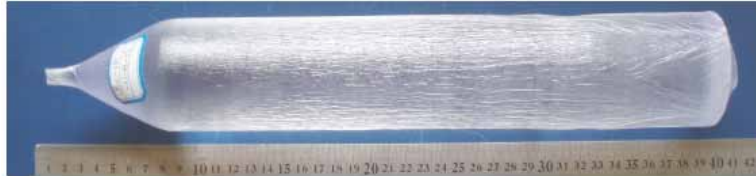
SIPAT-LYSO-L6: Consistent slopes for PMT and APD readout. They may be compensated by the optical focusing effect.



References: CMS ECAL SLHC Workshop at Fermilab, Ren-yuan Zhu, Caltech at October 29, 2009

Progress In 2009 (II)

The 1st ϕ 61×310mm LYSO ingot was successfully grown recently at SIPAT, which may be cut into two 28cm(25X₀) crystals.



The Caltech crystal laboratory is looking forward to test the 1st 2.5×2.5×28cm sample.

References: CMS ECAL SLHC Workshop at Fermilab, Ren-yuan Zhu, Caltech at October 29, 2009

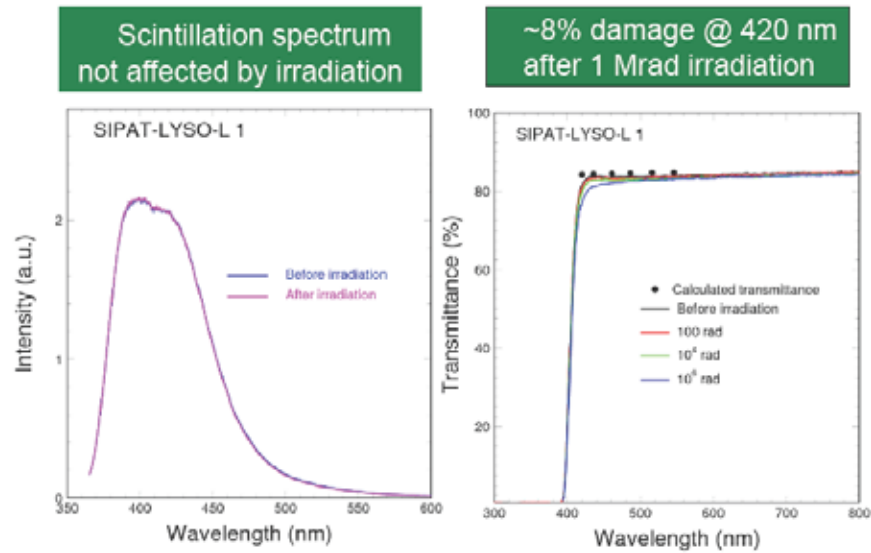
CETC-SIPAT Czochralski Furnaces



Ø60 x 250 mm LYSO Ingots



Similar g-Ray Damage in CETC-SIPAT LYSO



References: CMS ECAL SLHC Workshop at Fermilab, Ren-yuan Zhu, Caltech at October 29, 2009

L.R.U. by PMT & LAAPD: CETC-SIPAT-LYSO-L5

Issue: Ce doping was optimized for the uniformities measured by PMT with two end-couplings, but a large difference observed between the PMT & APD readouts.

