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# A BSO Crystal and Two Glass Samples for Beam Test

**Liyuan Zhang and Ren-Yuan Zhu**

California Institute of Technology

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# SIC BSO-1309 (20×20×200 mm<sup>3</sup>)

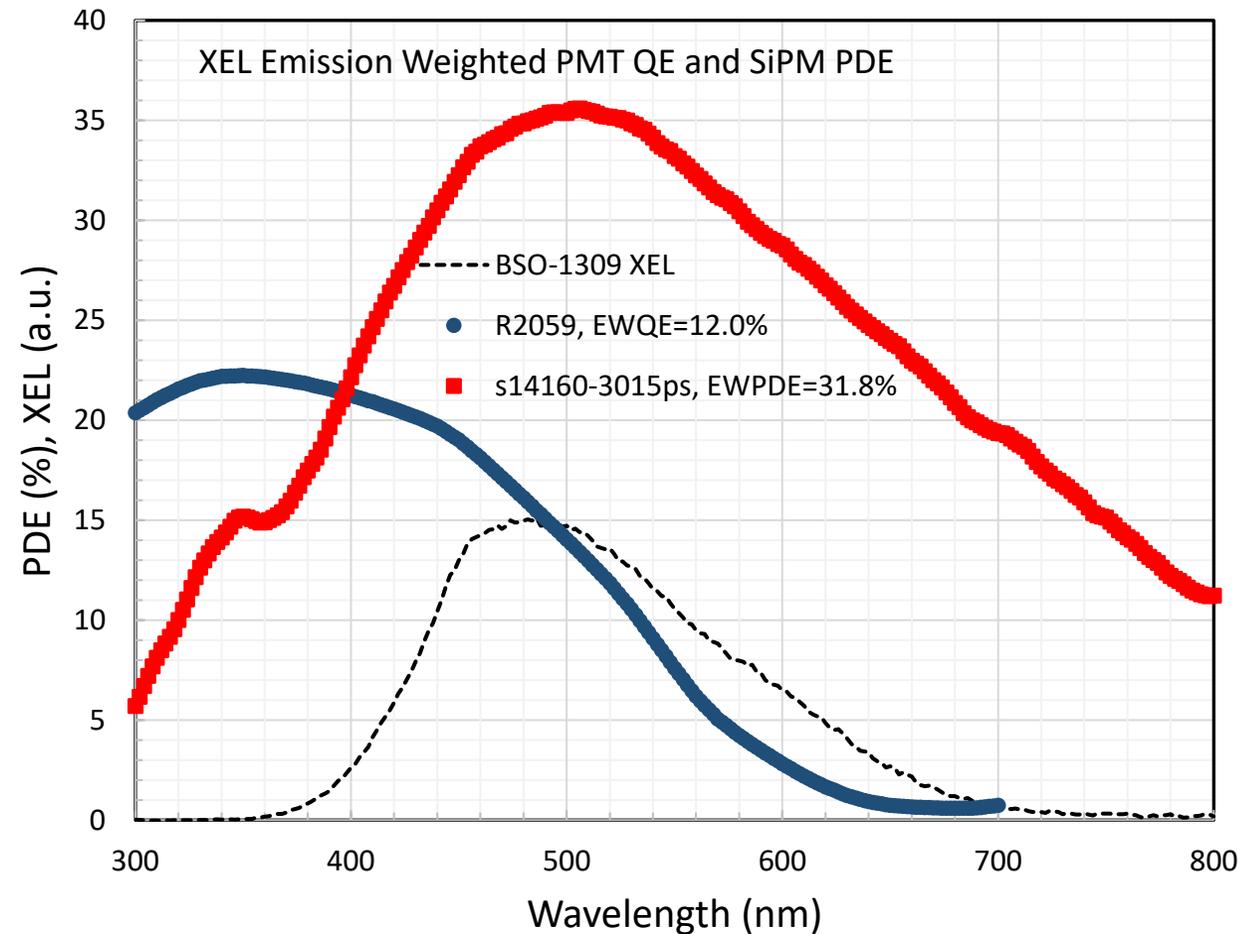
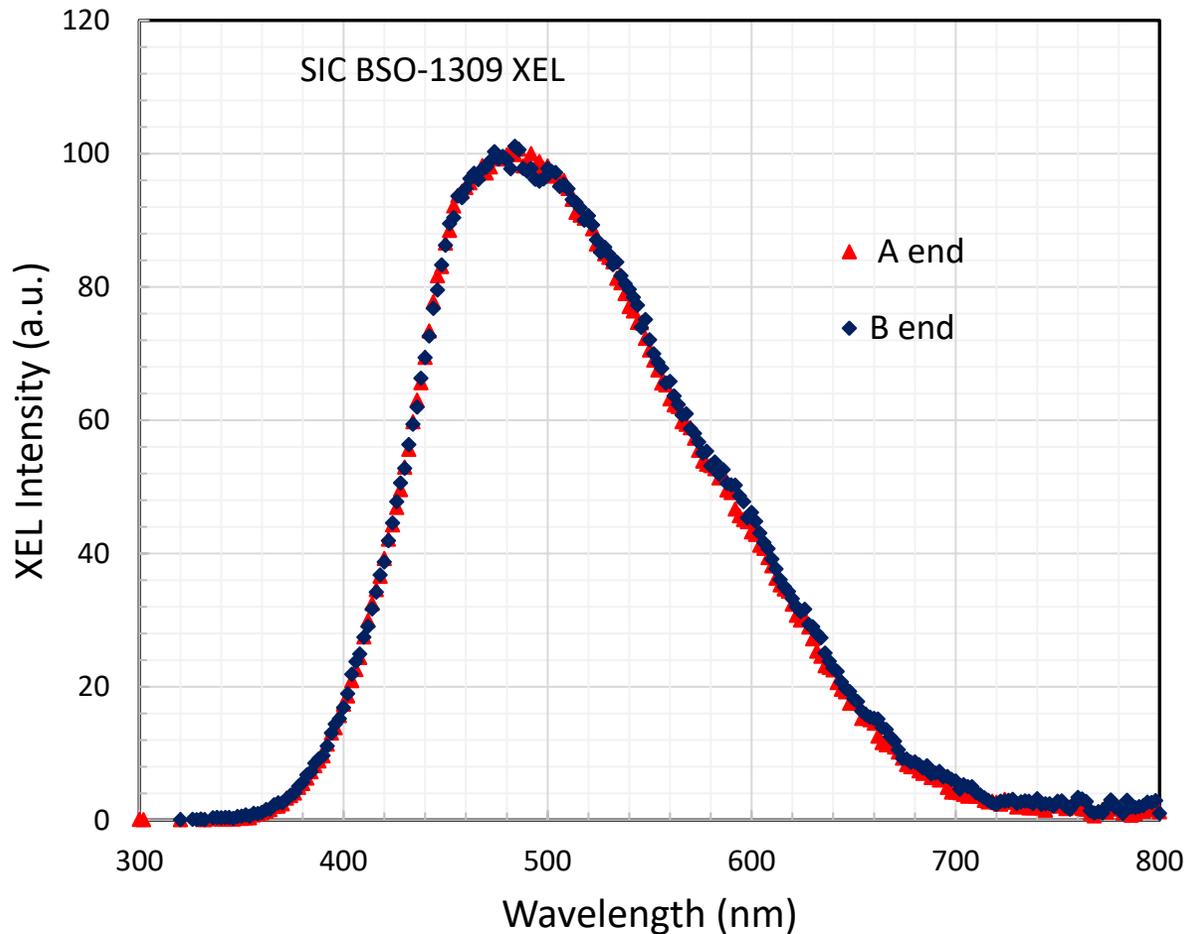
SIC BSO-1309 is fully recovered after the gamma irradiation under 30 rad/h [1]. Measurements at room temperature: X-ray excited luminescence (XEL), emission weighted QE/PDE, transverse and longitudinal transmittance, light attenuation length (LAL), Pulse Height Spectra (PHS), Light Output (LO) vs. integration time, decay time ( $\tau$ ) and light response uniformity (LRU).

[1] [https://www.its.caltech.edu/~rzhu/papers/14\\_calor\\_BSO.pdf](https://www.its.caltech.edu/~rzhu/papers/14_calor_BSO.pdf)



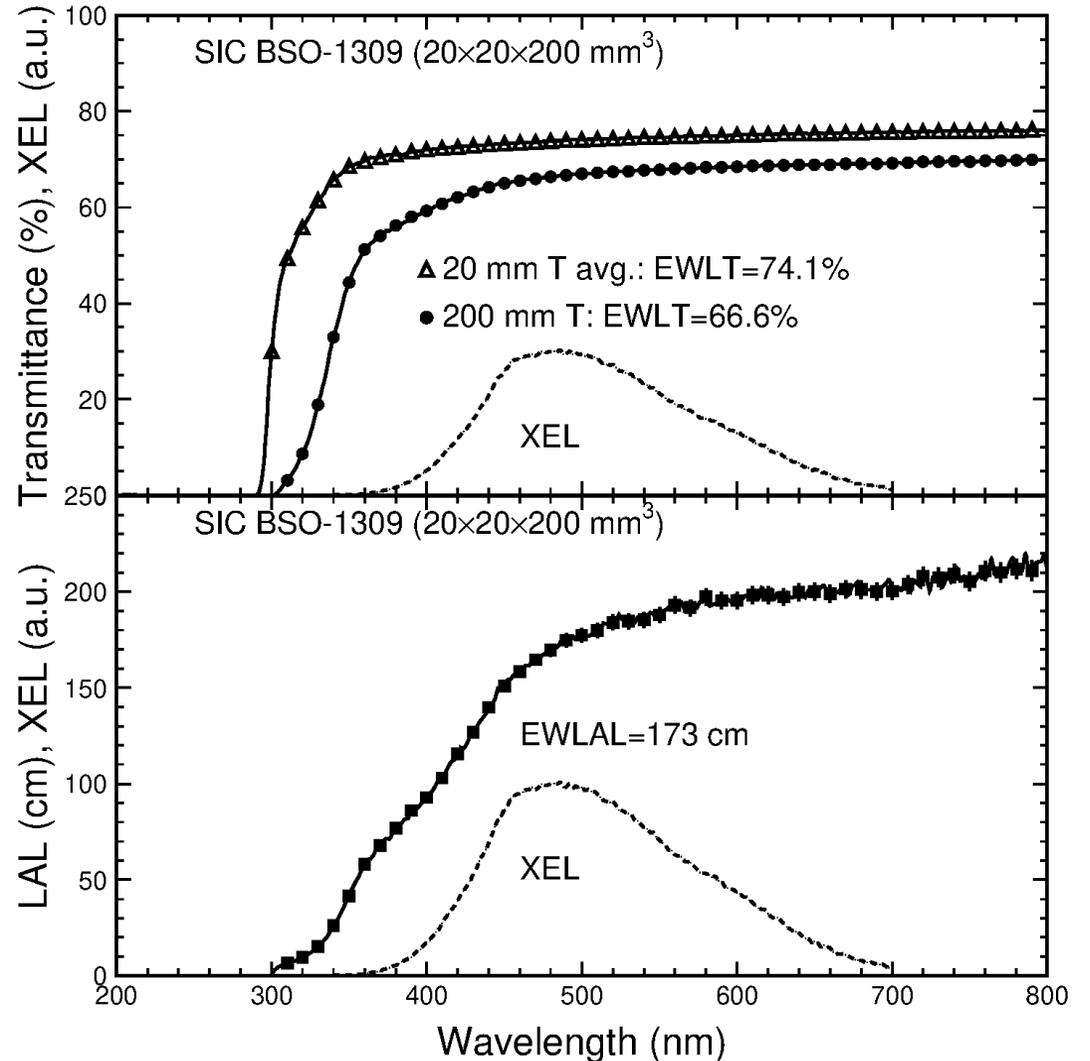
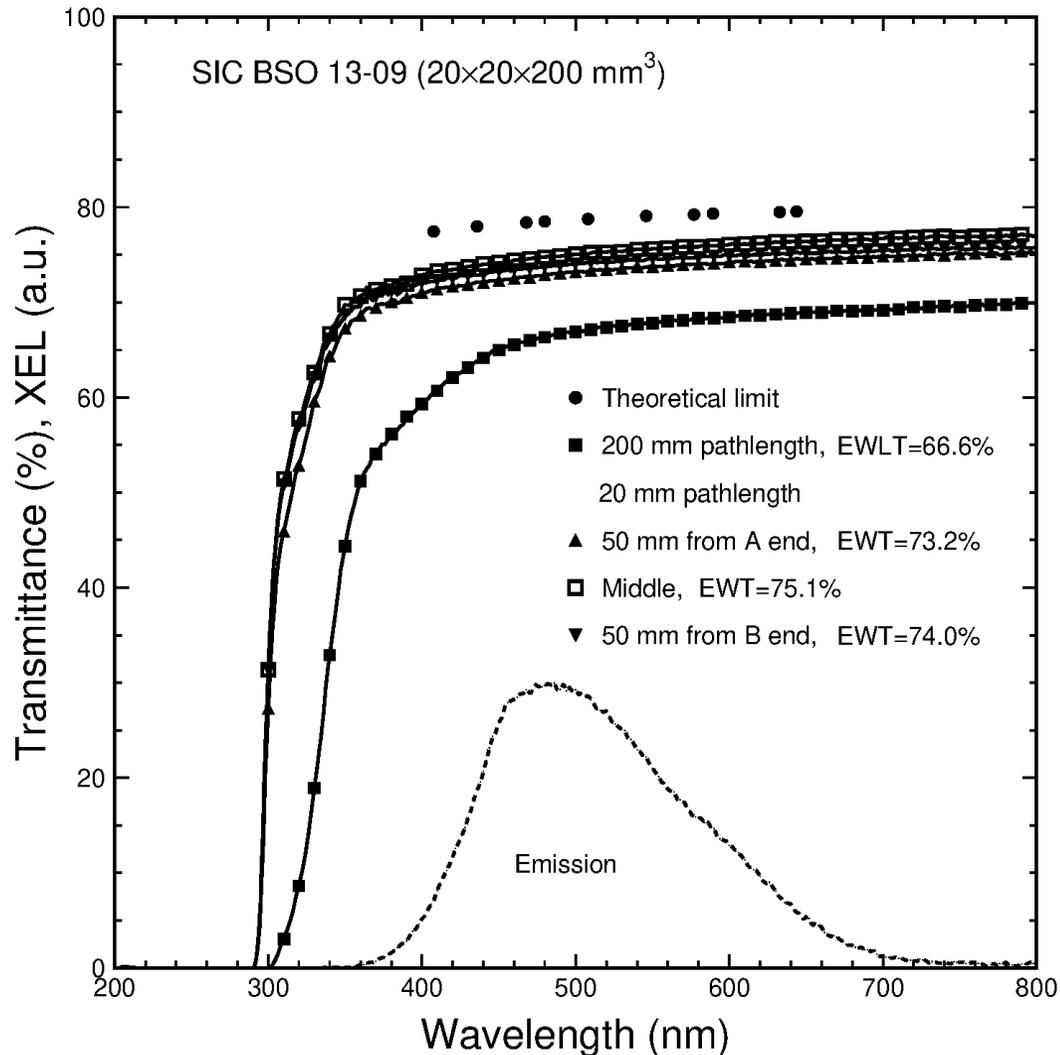
# XEL, EWQE and EWPDE

Consistent emission from two ends of the BSO sample  
EWQE/EWPDE: 12%/32% for Hamamatsu R2059/s14160-3015ps



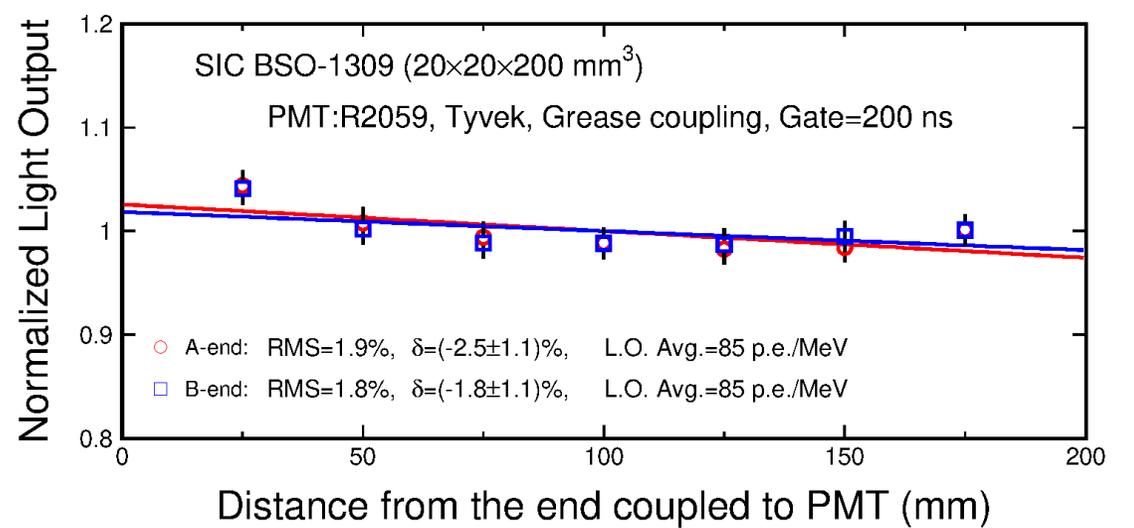
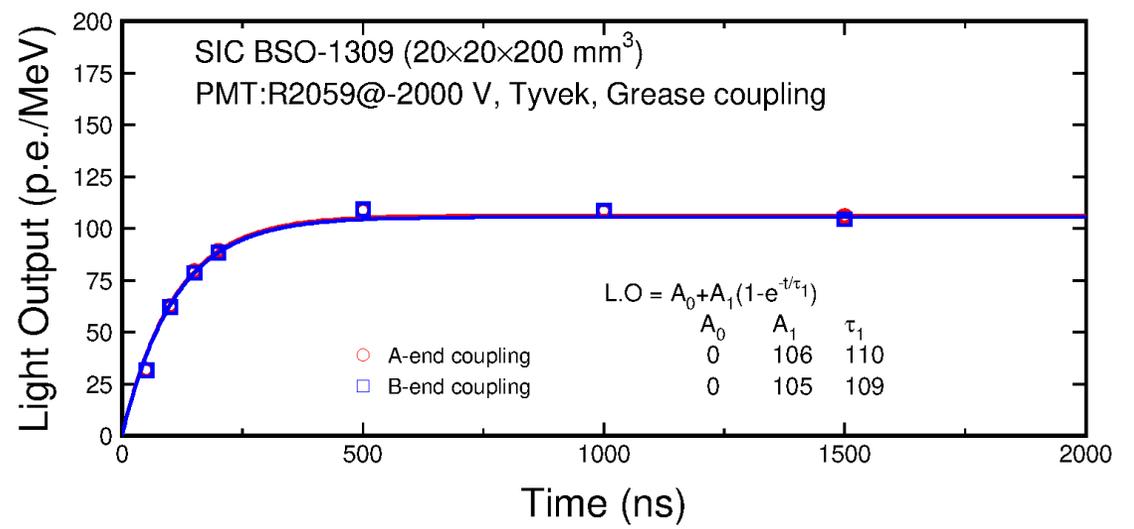
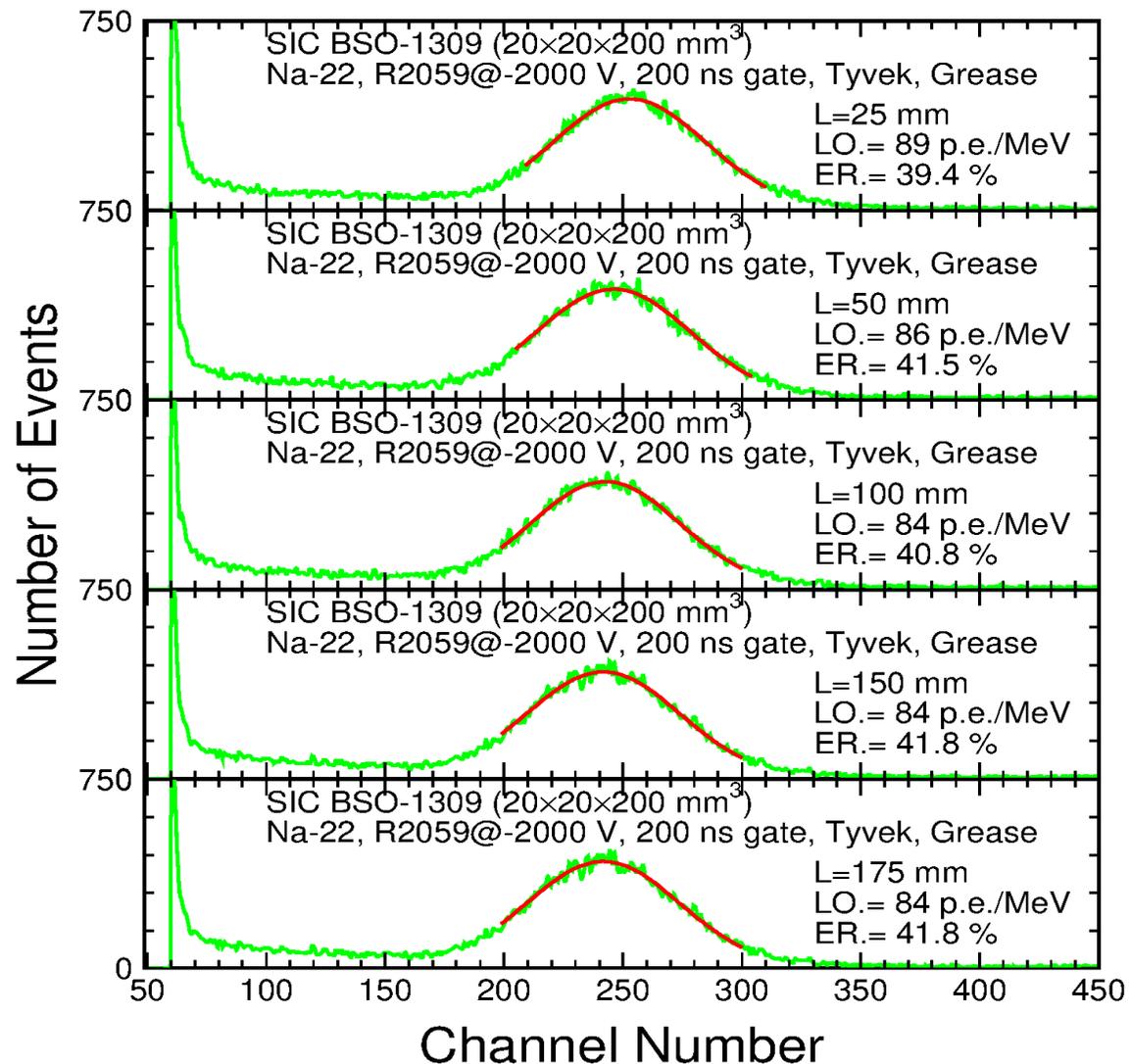
# Transmittance, EWLT, LAL and EWLAL

EWLT = 67%/74% for 200/20 mm path, EWLAL = 173 cm



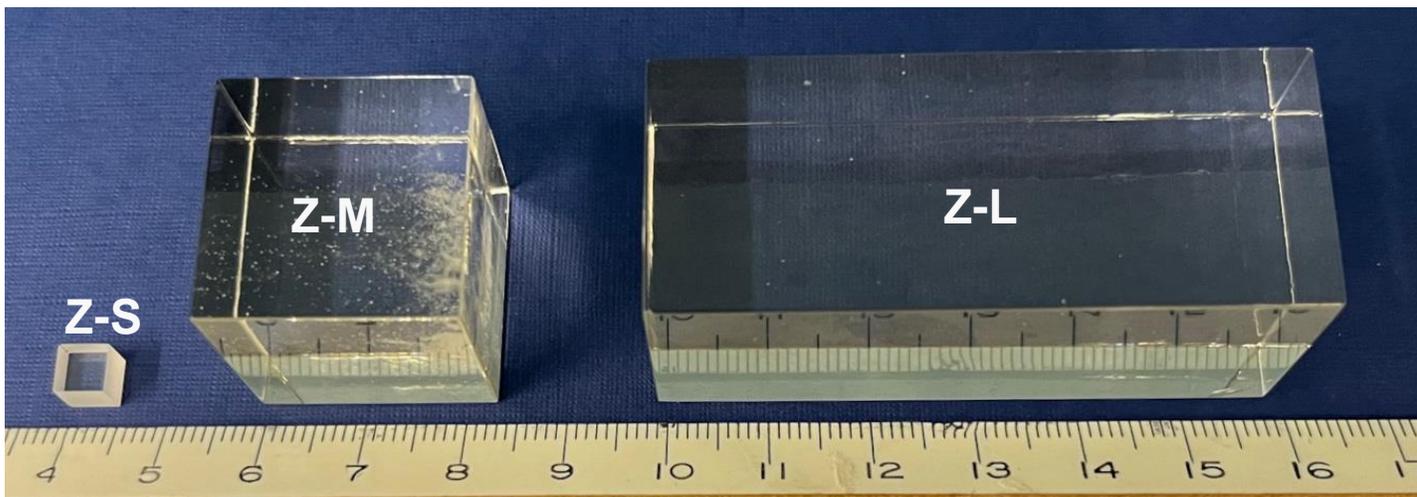
# PHS, LO, Decay and LRU

LO = 85 p.e./MeV in 200 ns,  $\tau$ : 110 ns, rms of LRU: 2%



# ABS and DSB Glass Samples

[https://www.its.caltech.edu/~rzhu/talks/4Calvision\\_240118\\_ABS\\_DSB\\_glass.pdf](https://www.its.caltech.edu/~rzhu/talks/4Calvision_240118_ABS_DSB_glass.pdf)

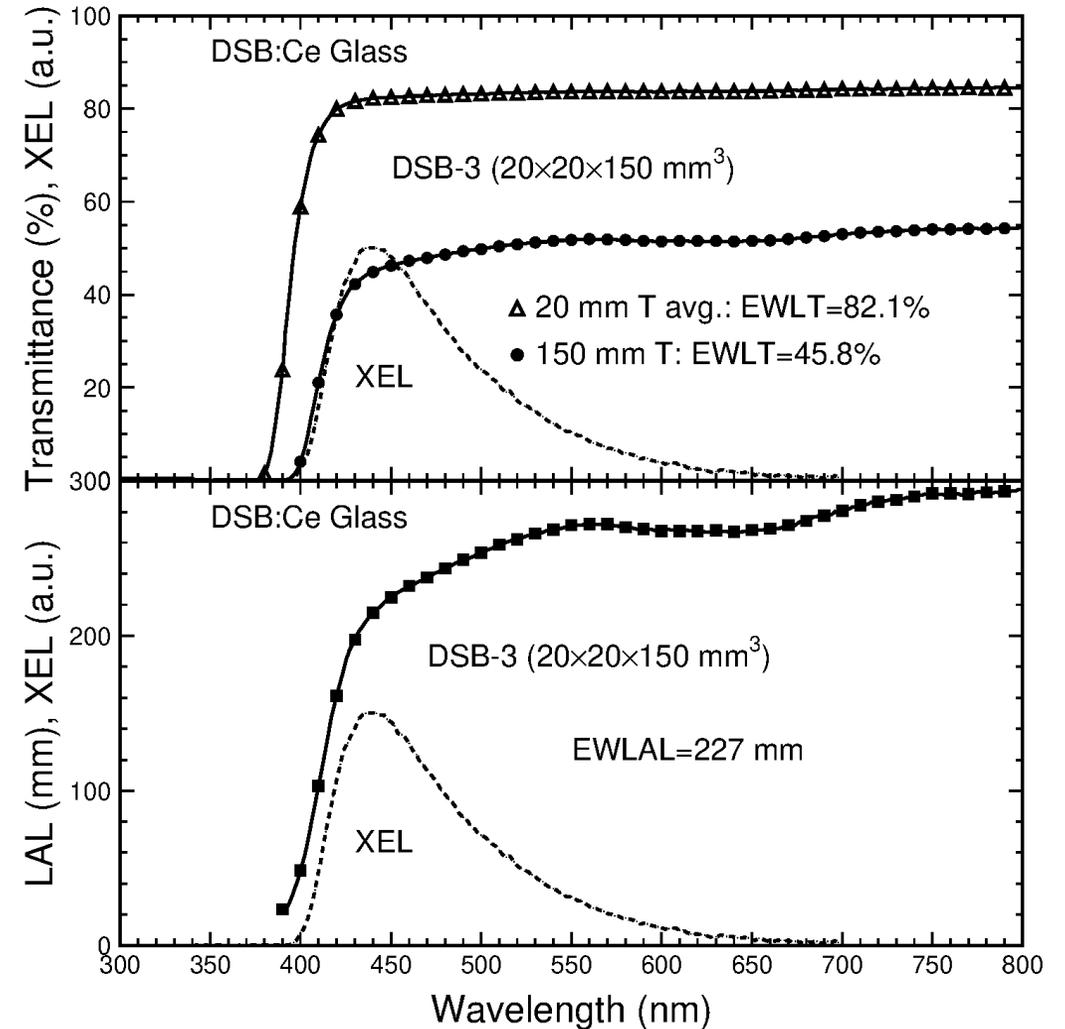
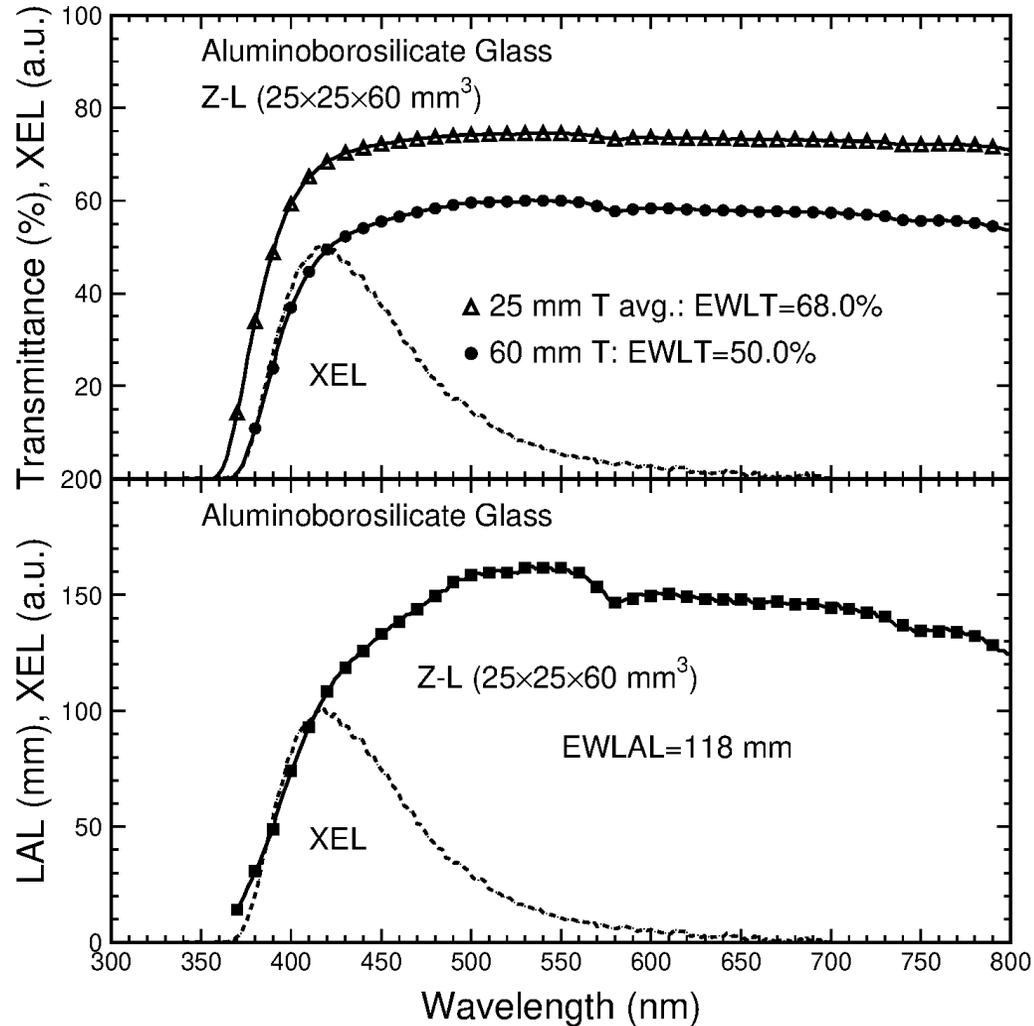


No.	ID	Doping	Dimension (mm <sup>3</sup> )	Lot info.
1	ABS Z-L	Ce <sup>3+</sup>	25x25x60	Gd-Loaded
2	DSB-3	Ce <sup>3+</sup>	20x20x150	Gd-Loaded

Optical property of these glass samples is not as good as crystal samples but may also be used in the beam test.

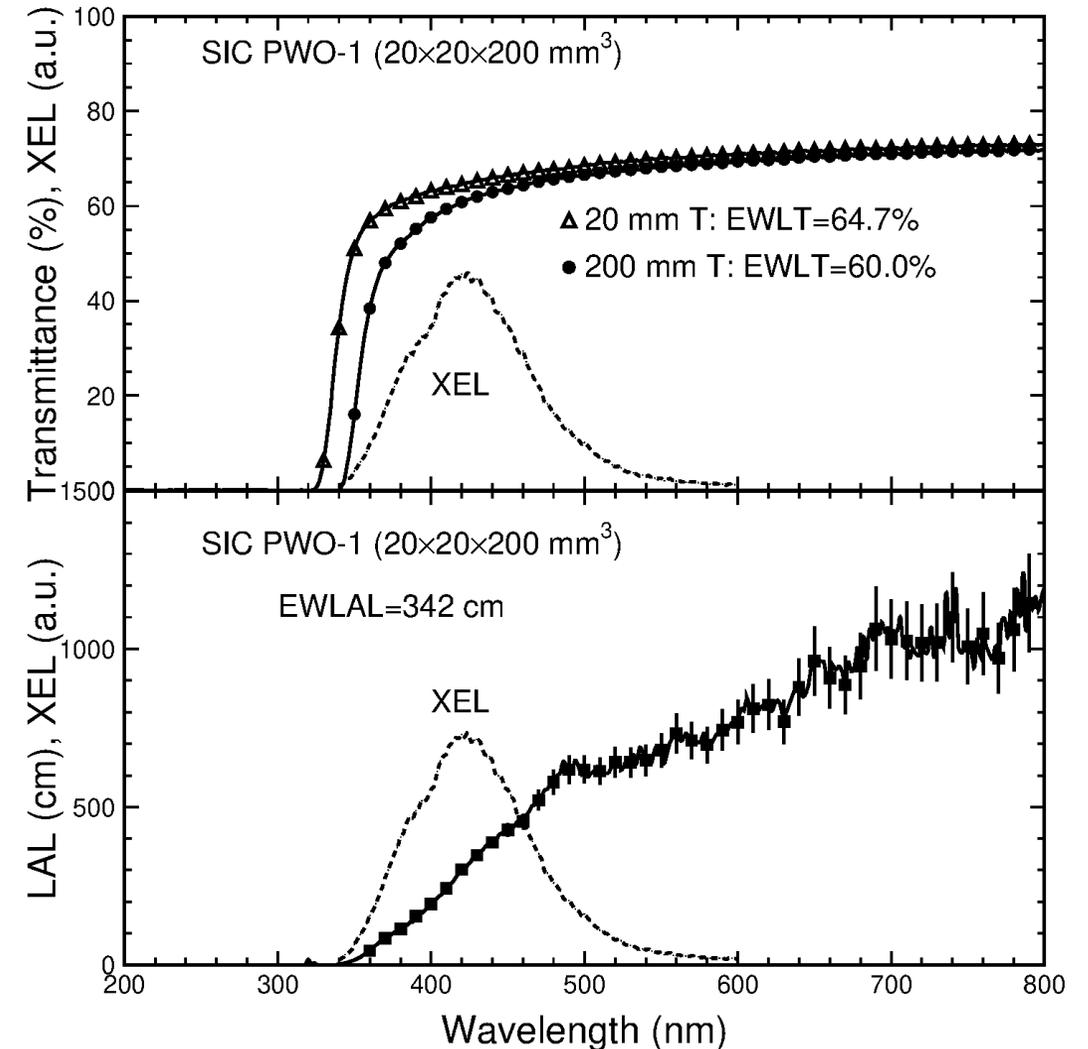
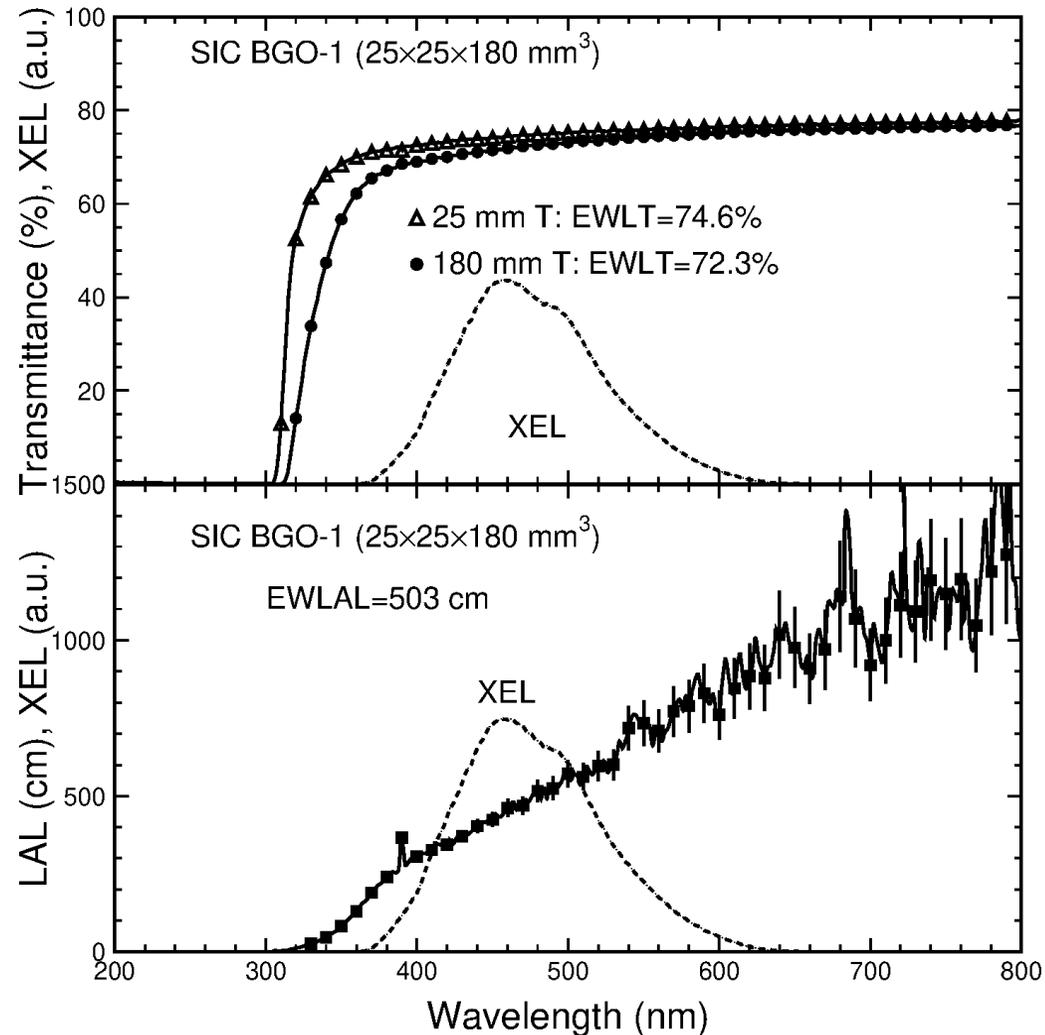
# EWLAL of ABS and DSB Glass Samples

Ignoring scattering LAL is calculated by using the ratio of transverse and longitudinal transmittance  
EWLAL: 118 mm for the 6 cm long ABS glass Z-L and 227 mm for the 15 cm long glass DSB-3



# EWLAL of BGO and PWO Crystal Samples

EWLAL: 503 cm for the 18 cm long BGO and 342 cm for the 20 cm long PWO samples



# Summary

A BSO crystal sample of  $20 \times 20 \times 200 \text{ mm}^3$  was characterized. With decay time of 100 ns it provides an additional option. The EWLAL of BGO, BSO and PWO is 503, 173 and 342 cm.

Two glass samples: an ABS Z-L of  $25 \times 25 \times 60 \text{ mm}^3$  and a DSB-3 of  $20 \times 20 \times 150 \text{ mm}^3$  with EWLAL of 11.8 and 22.7 cm also available for beam test. While optical quality needs to be improved they may provide a cost-effective solution for HHCAL.

Plan to characterize glass samples developed under DOE SBIR program at RMD.

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