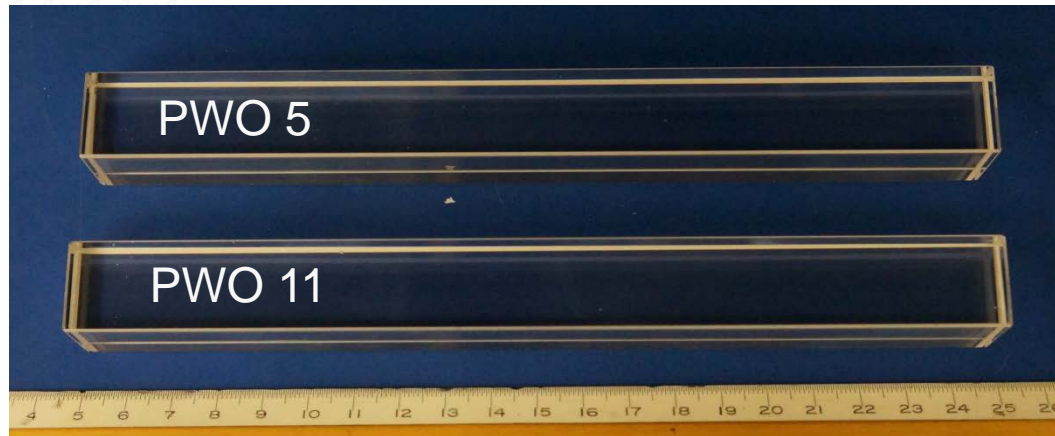


# Report on Two PWO Crystals from Jlab

14x14x1.5



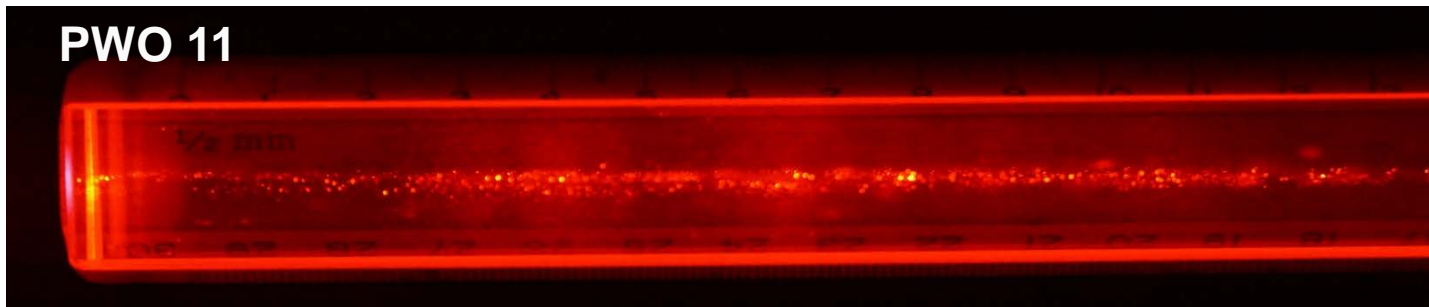
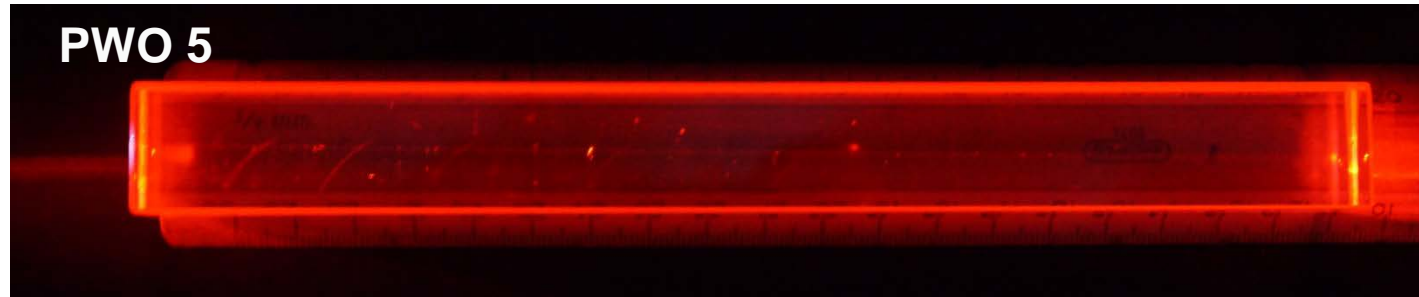
ID	Dimension (mm <sup>3</sup> )	Polishing
PWO 5	20x20x200	All faces
PWO 11	20x20x200	All faces

## Experiments

- Two crystals were annealed at 200°C for 240 minutes before measurements.
- Properties measured: LT, PHS, LRU, LO & Decay Kinetics

# Scattering Centers Observed

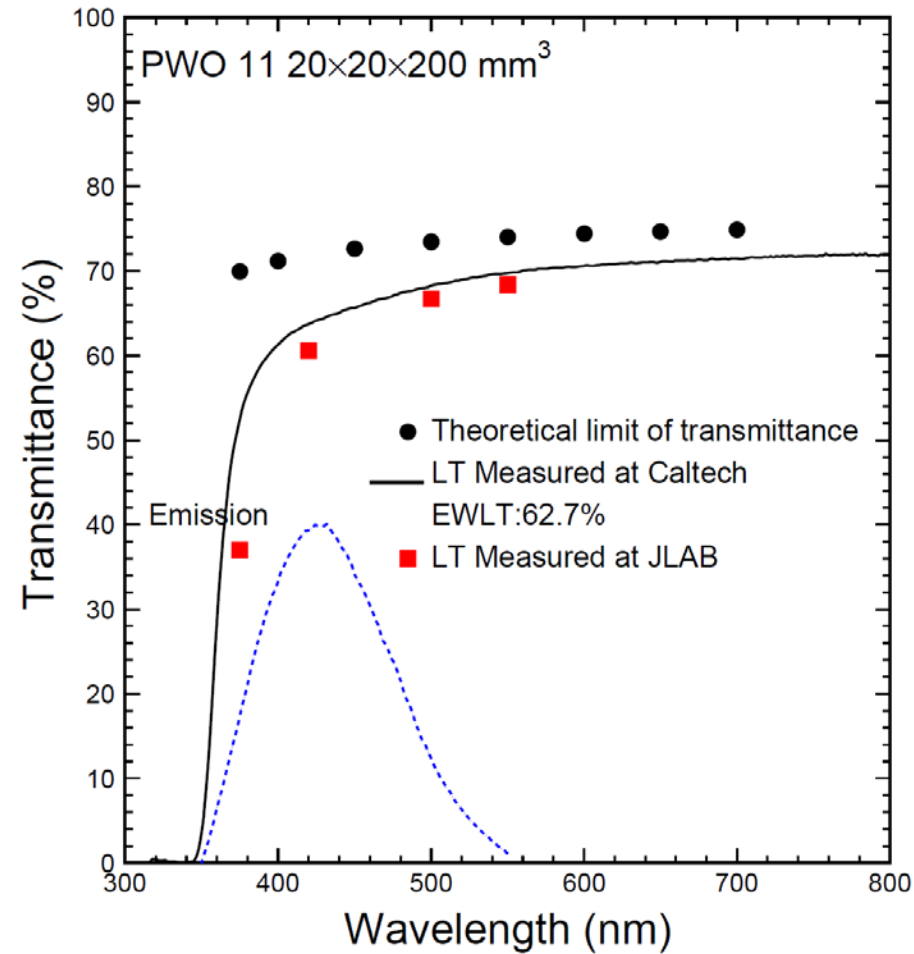
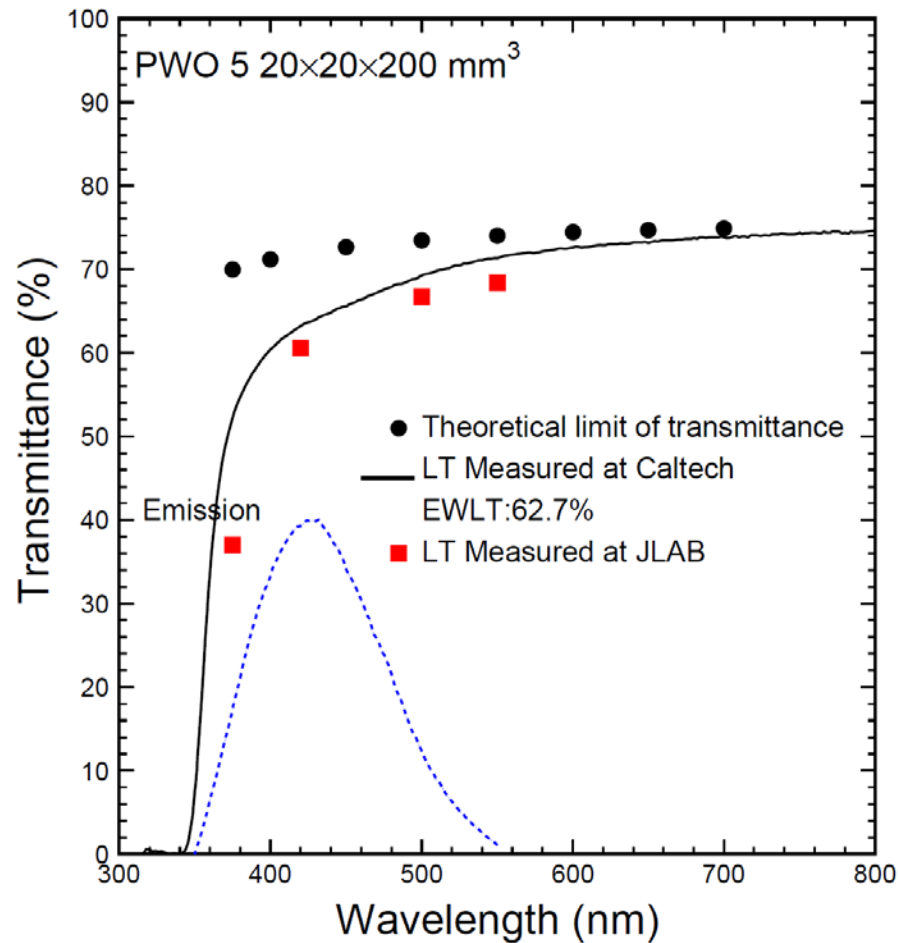
Laser beam goes through crystals, showing scattering centers



Sample 11 has significant scattering centers in the bulk

# Longitudinal Transmittance

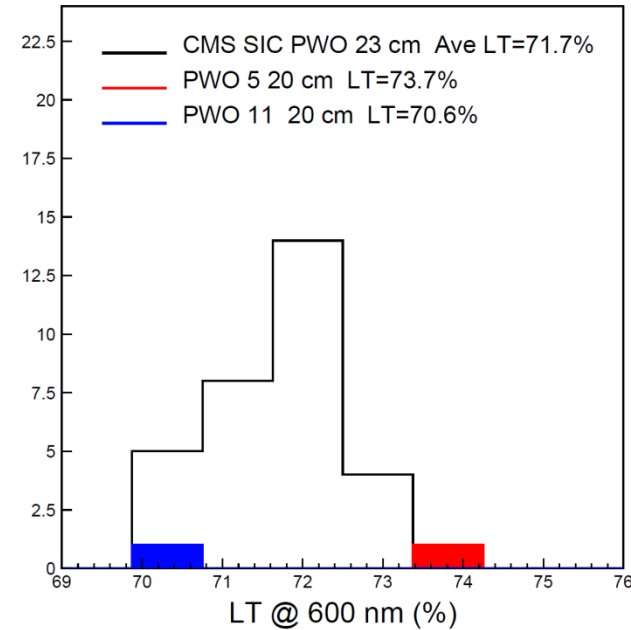
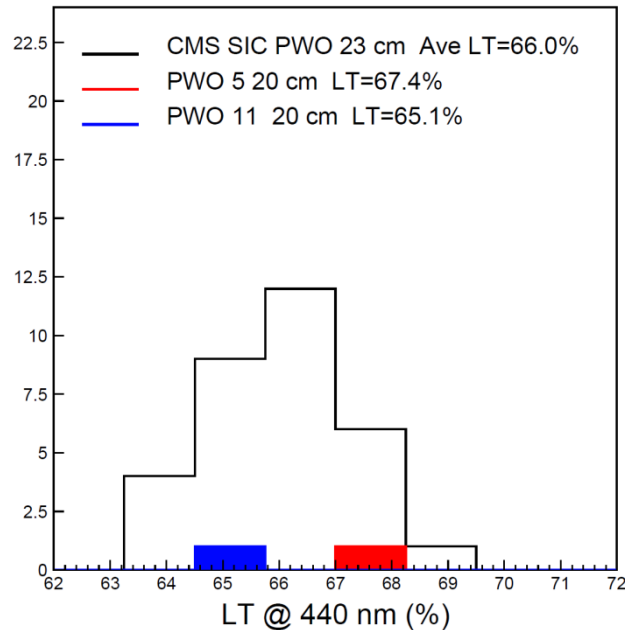
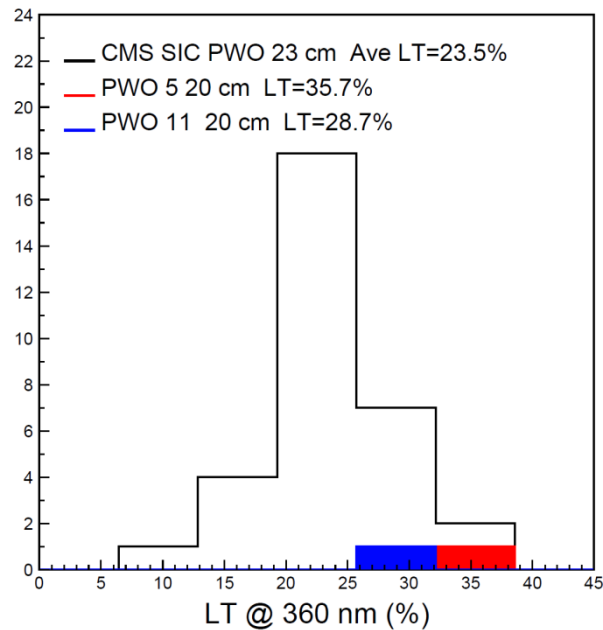
Measured with a Perkin Elmer Lambda 950 spectrophotometer  
with one end at 1 cm to the integrating sphere



Sample 5 shows better LT than sample 11 because of less scattering centers

# A Comparison of LT with CMS SIC PWO Crystals

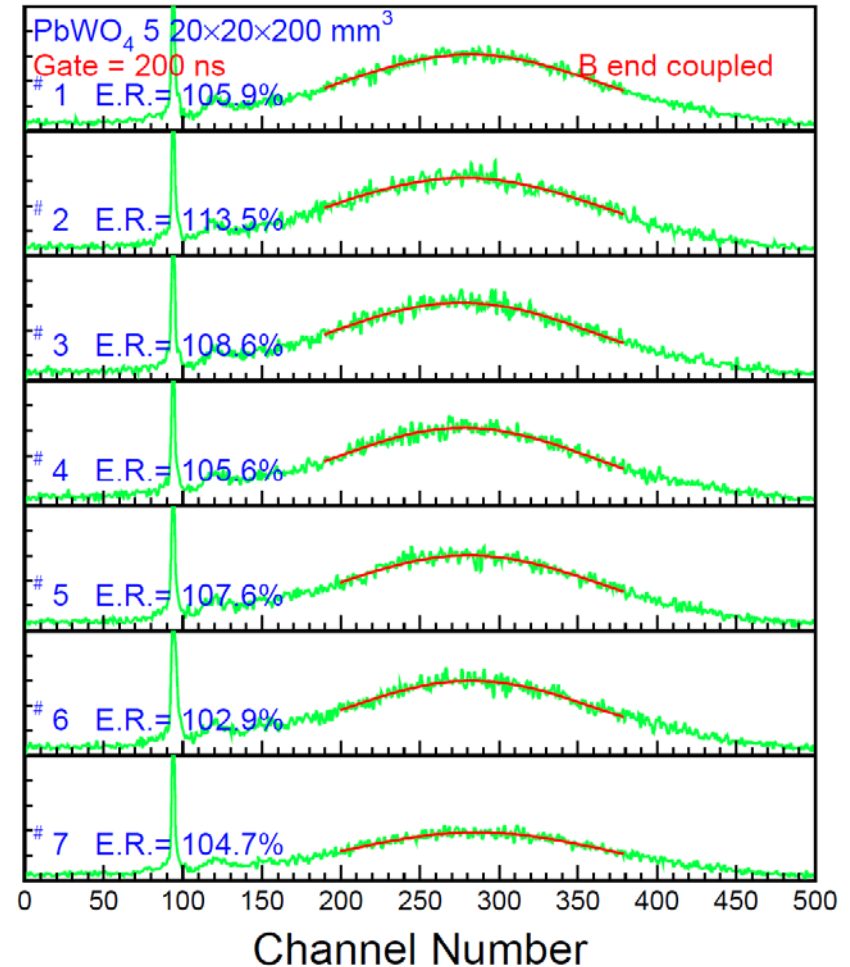
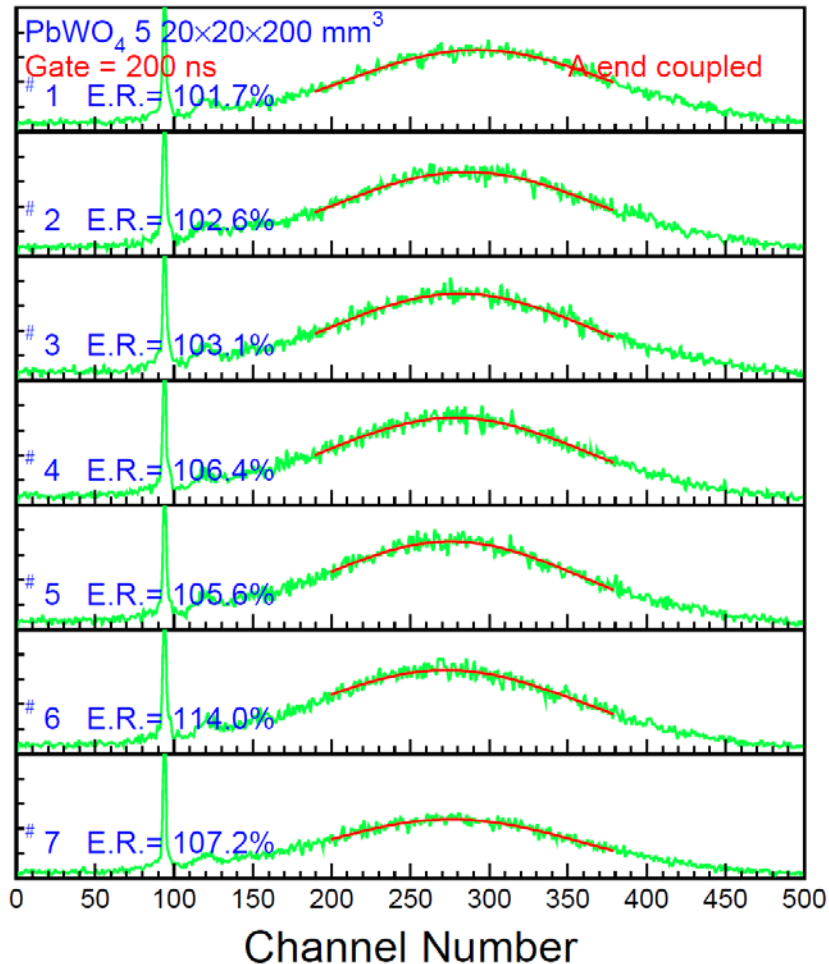
Longitudinal transmittance of sample 5/11 is better/worth that the average of CMS crystals as published in IEEE Trans. Nucl. Sci. NS-51 1777



Sample 5 shows better LT than sample 11 because of less scattering centers

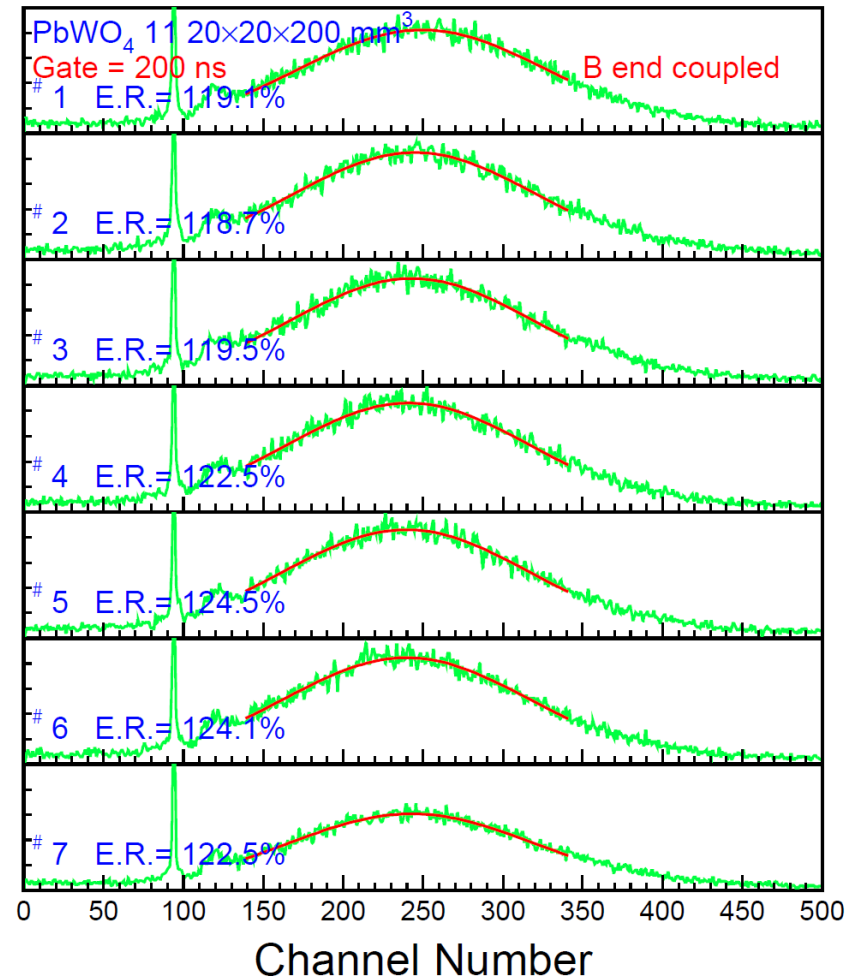
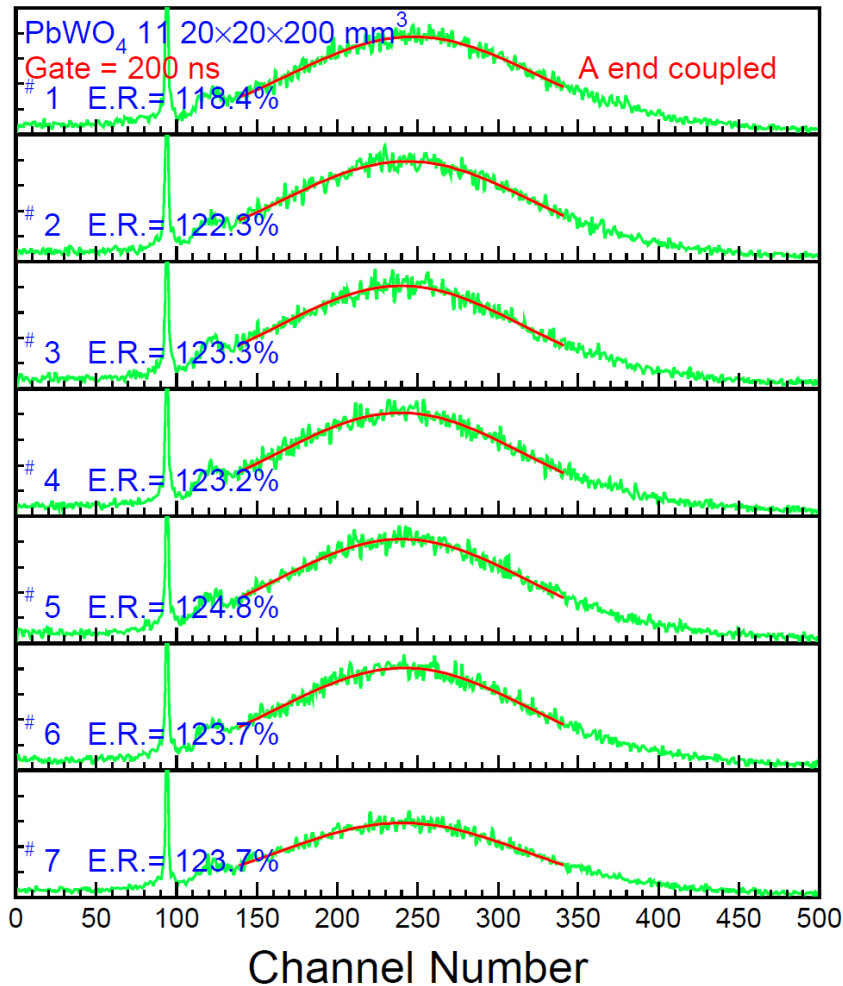
# Pulse Height Spectra of PWO 5

Measured with Cs-137 source and Hamamatsu R2059 PMT with grease coupling



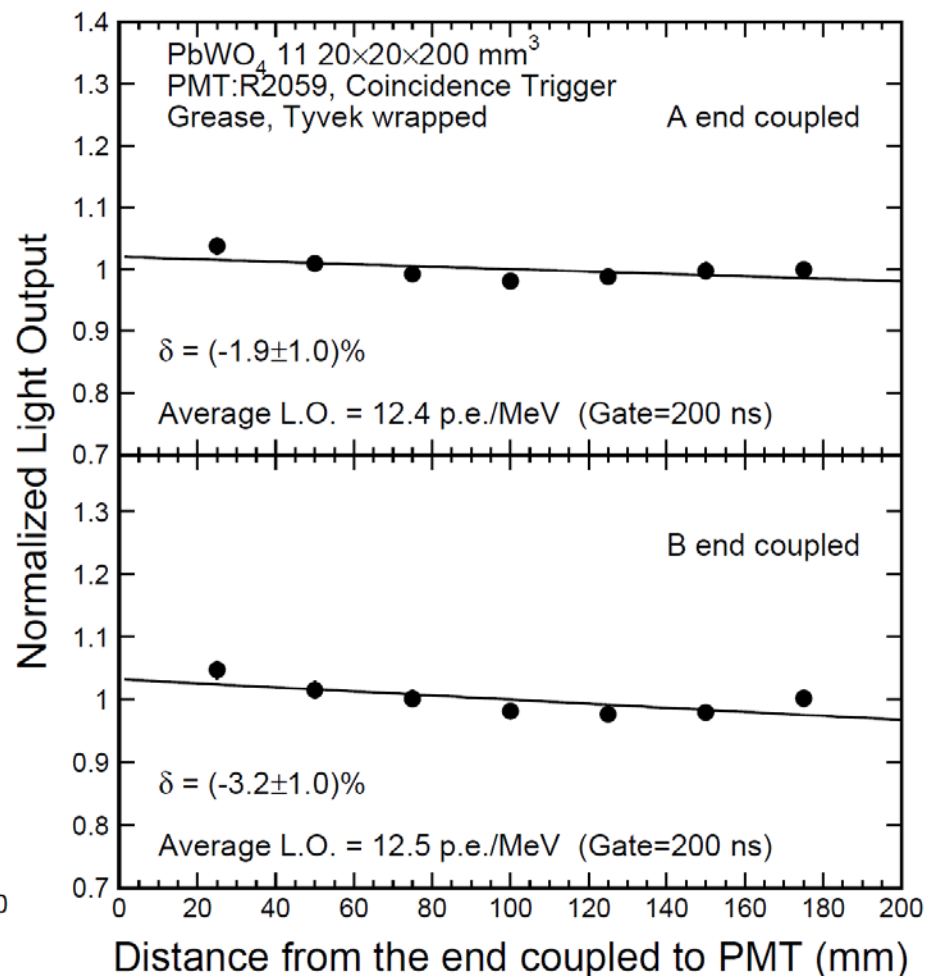
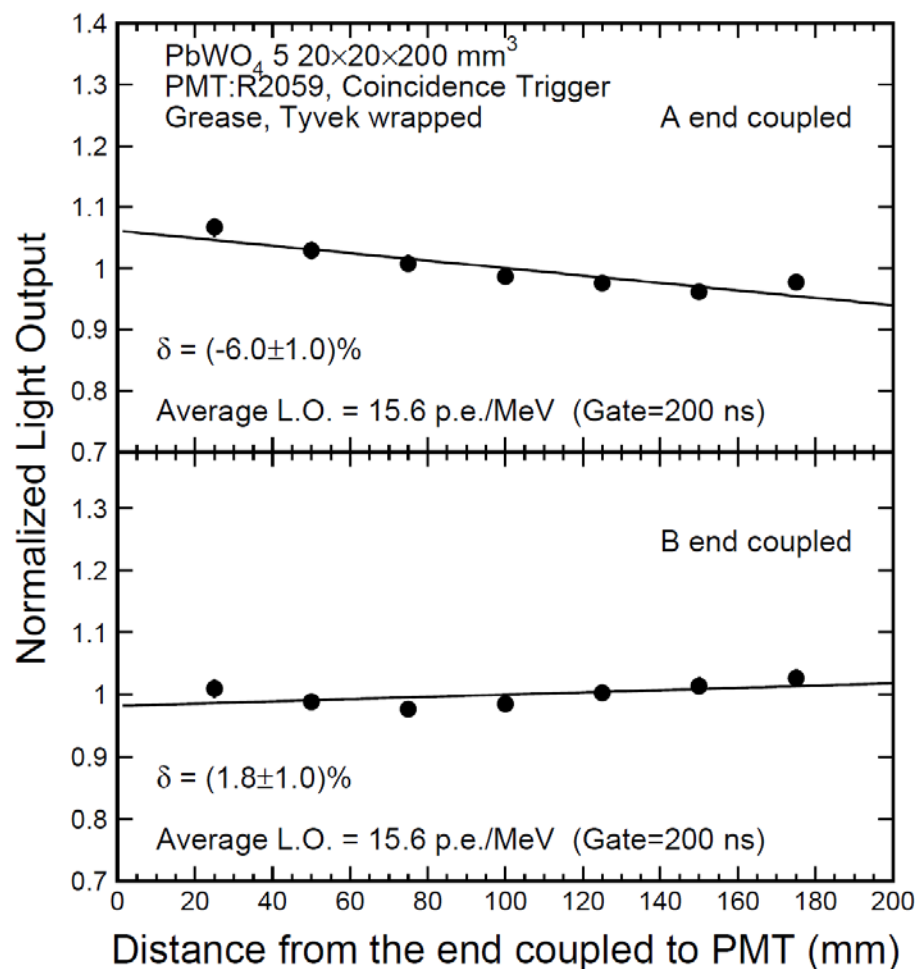
# Pulse Height Spectra of PWO 11

Measured with Cs-137 source and Hamamatsu R2059 PMT with grease coupling

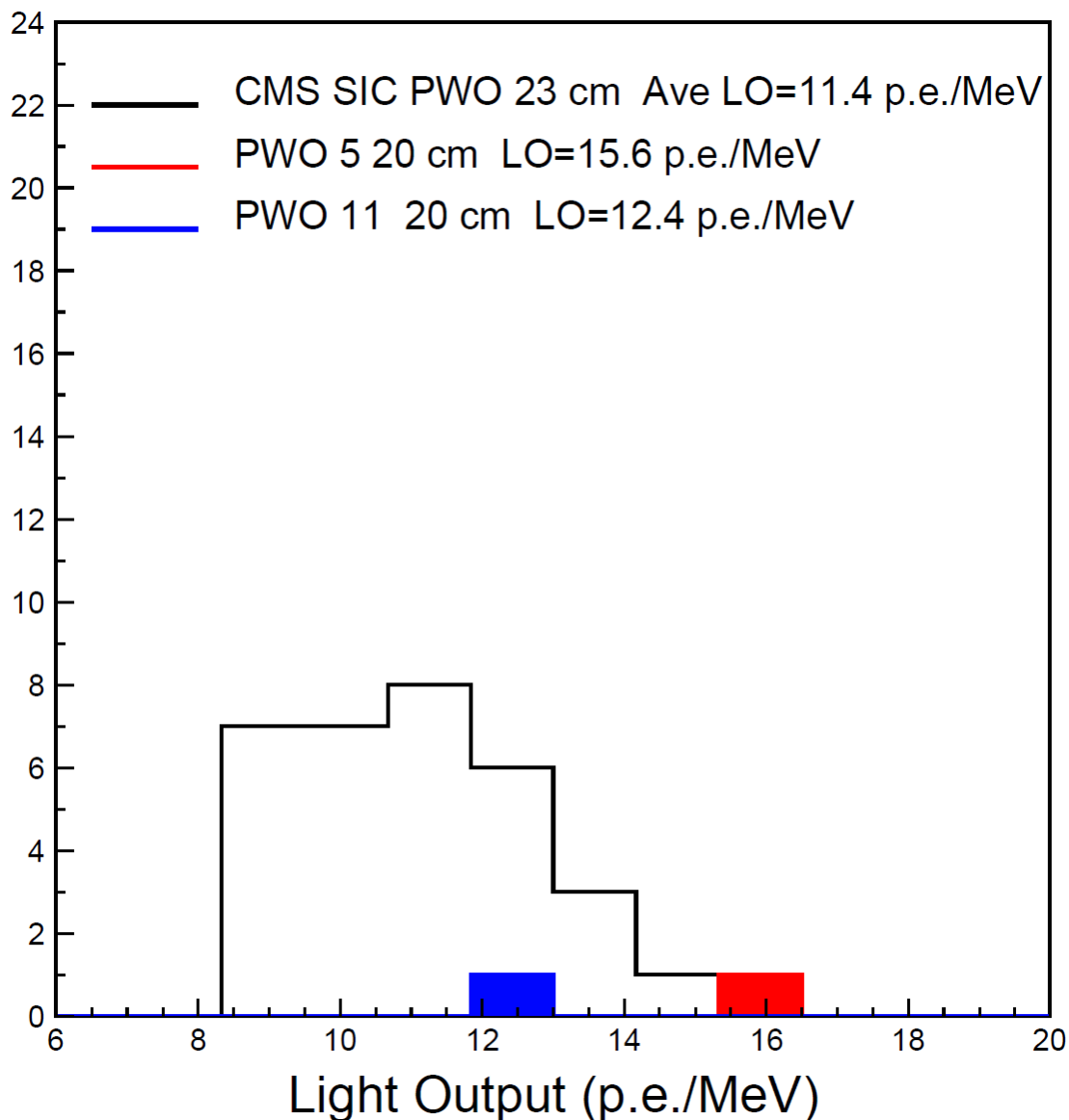


# Light Response Uniformity and Light Output

Sample 5/11 with B/A end coupling to PMT provide good LRU



# A Comparison of LO with CMS SIC PWO Crystals

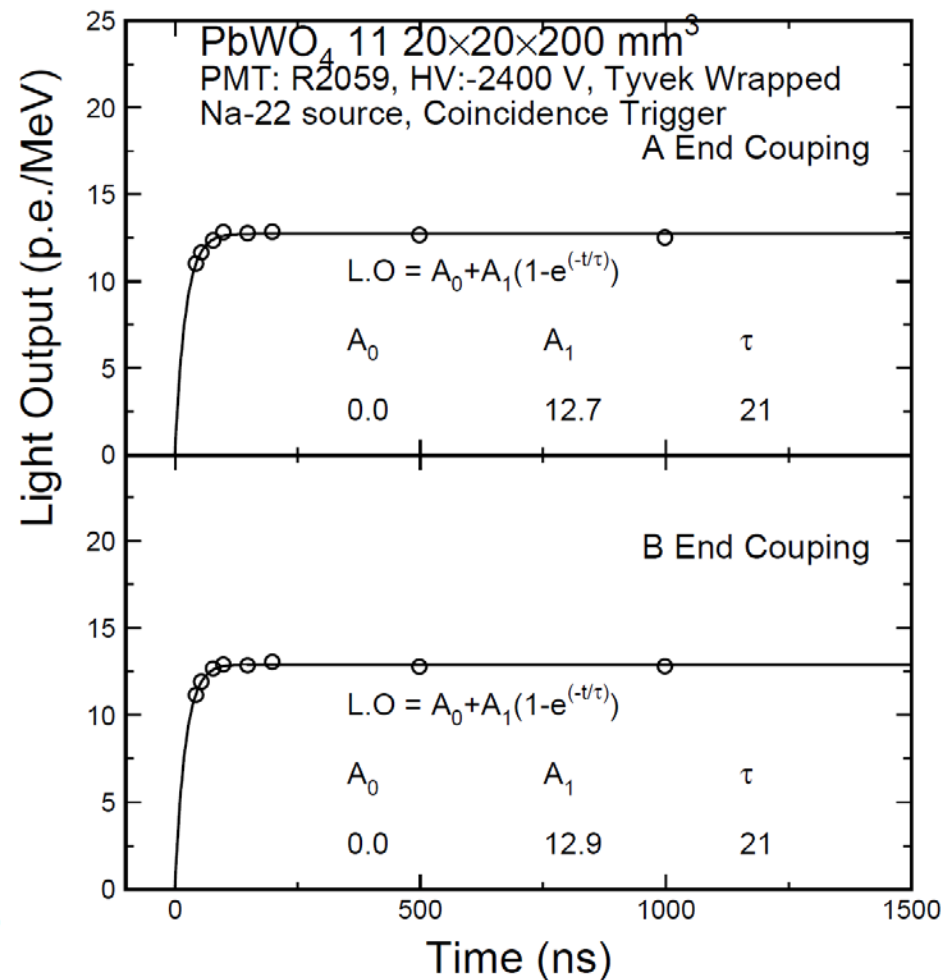
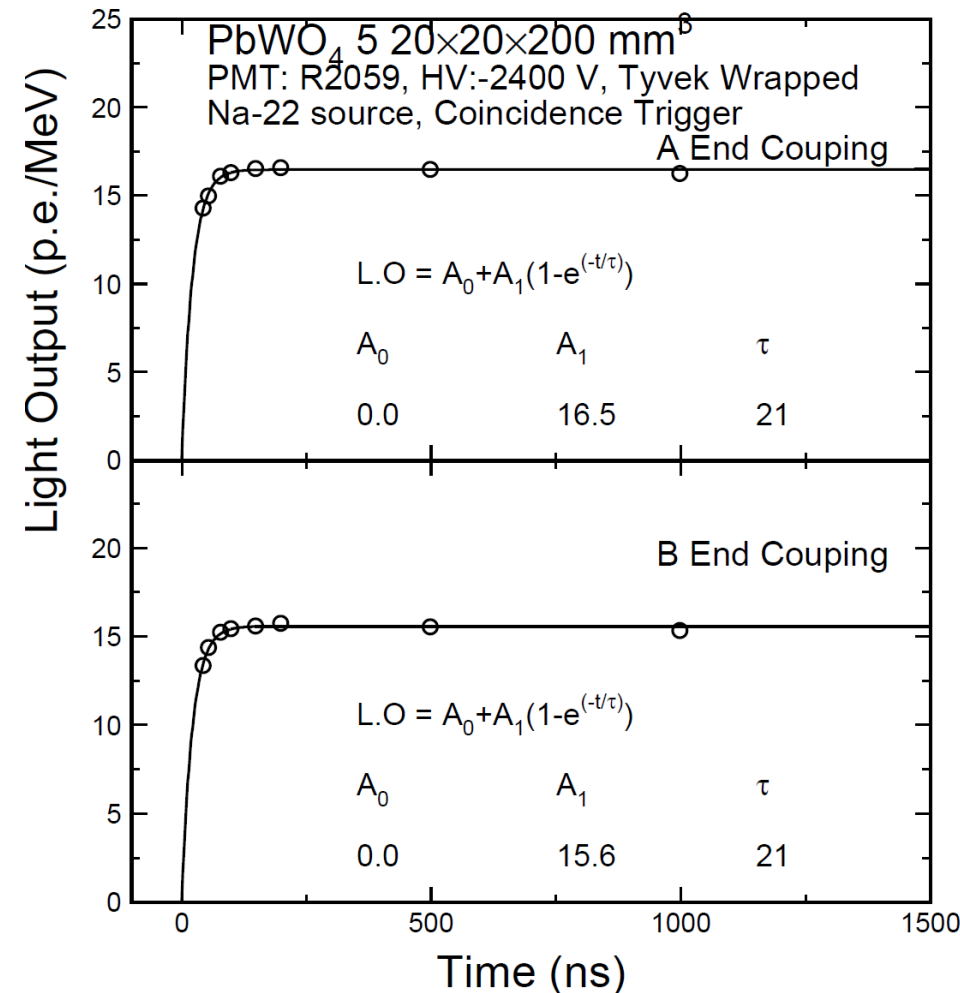


Light output of both samples are larger than the average of CMS PWO crystals as published in IEEE Trans. Nucl. Sci. NS-51 1777.



# Decay Kinetics

Fraction of LO in 50/100 ns is 91/99%, which is larger than 84/96% for CMS PWO crystals as published in IEEE Trans. Nucl. Sci. NS-51 1777



Both samples are faster than CMS PWO crystals

# Summary

- Two PWO crystal samples of 2 x 2 x 20 cm grown at SIC were received from Jlab, and characterized at the Caltech HEP crystal laboratory.
- Initial measurements show that their longitudinal transmittance, light output and decay time are respectively compatible, higher than and shorter than PWO crystals grown at SIC for CMS. Significant scattering centers are observed in one sample.
- A comparison with the Jlab data shows that transmittance measured at Caltech with integrating sphere is higher than Jlab, which seems caused by the scattering centers.
- Investigations on radiation hardness are on-going. It is important to understand the expected EIC radiation environment, such as the ionization dose rate etc.