Light Output measurement of BSO scintillator

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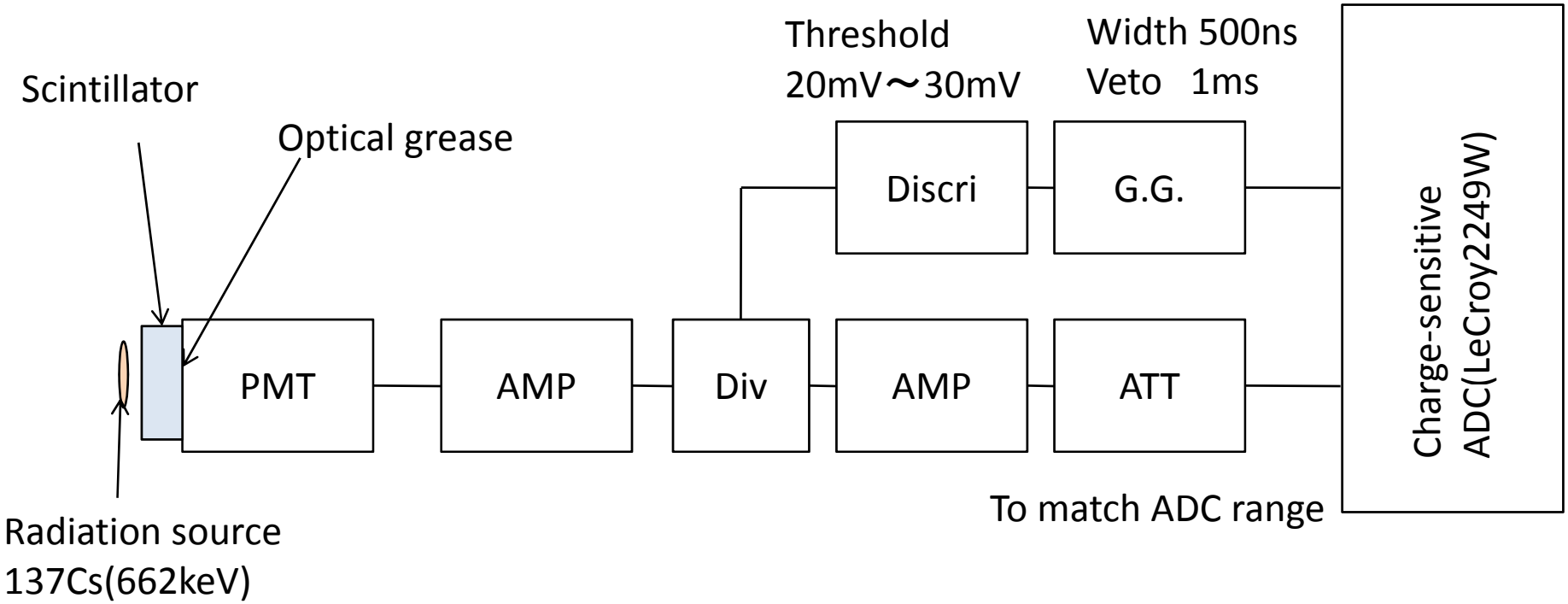
Outline

- Motivation
  - BSO is an alternative option;
  - Heavier and longer wavelength(~480nm).
  - Checked Light Output of small samples quickly.
- Set up
- ADC distribution
  - PureCsI
  - BSO
- Compared with PureCsI
- Summary and plans

Set up



- PMT : H3167(19mmϕ)
  Borosilicate glass window
  Bialkali photocathode

HV → 1650V

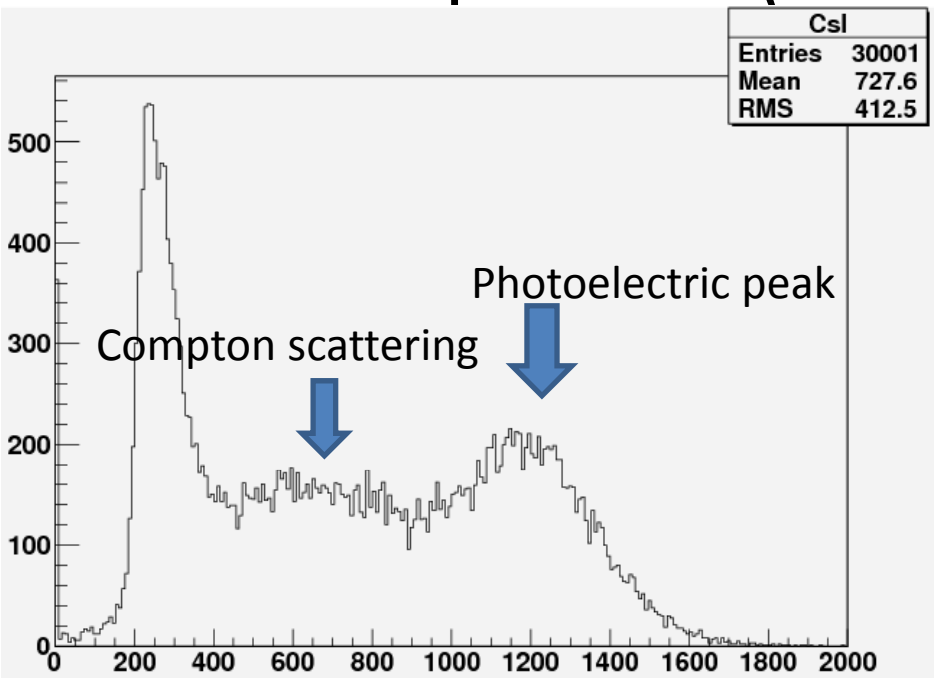
Samples

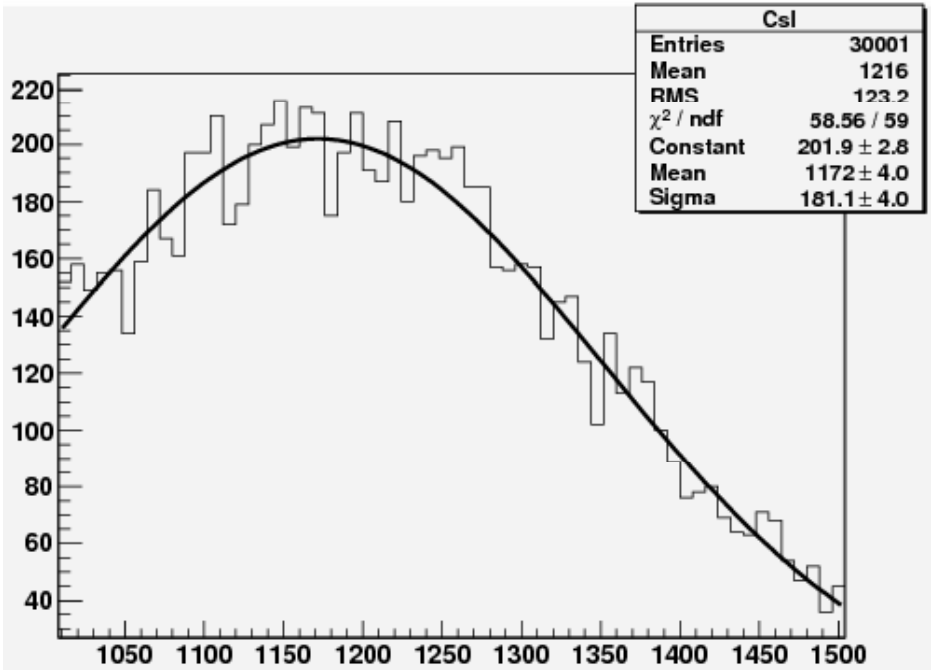
•PureCsI
1ϕ × 2cm

•BSO
1*1*2cm^3 BSO both ends mirror polish, 4 side surfaces are frosted.
Wrapped by white Gore-TeX film.

ADC distributionof PureCsI

- Size : 1ϕ × 2cm. (λ=330nm)



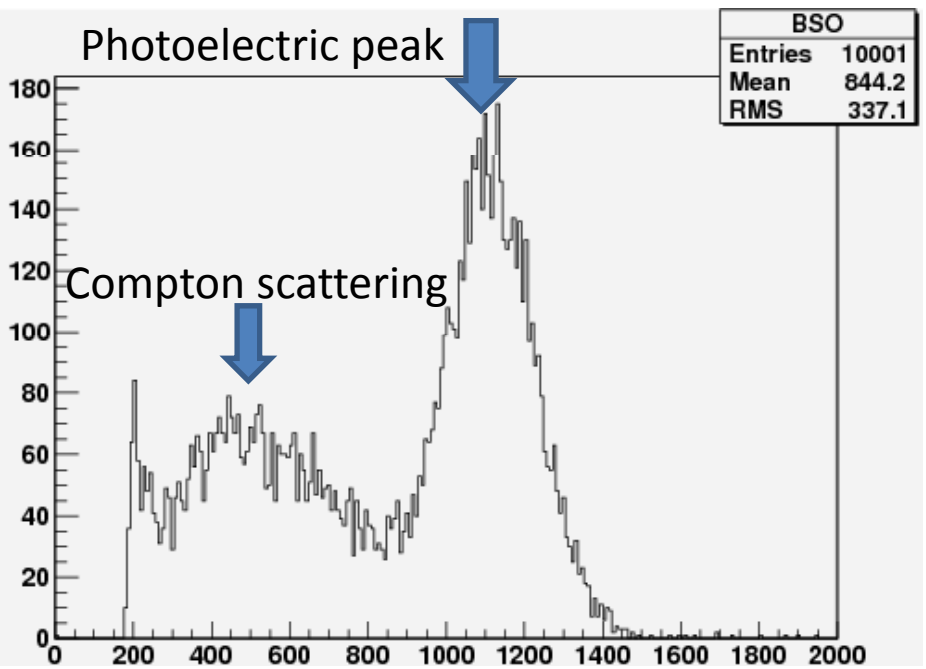


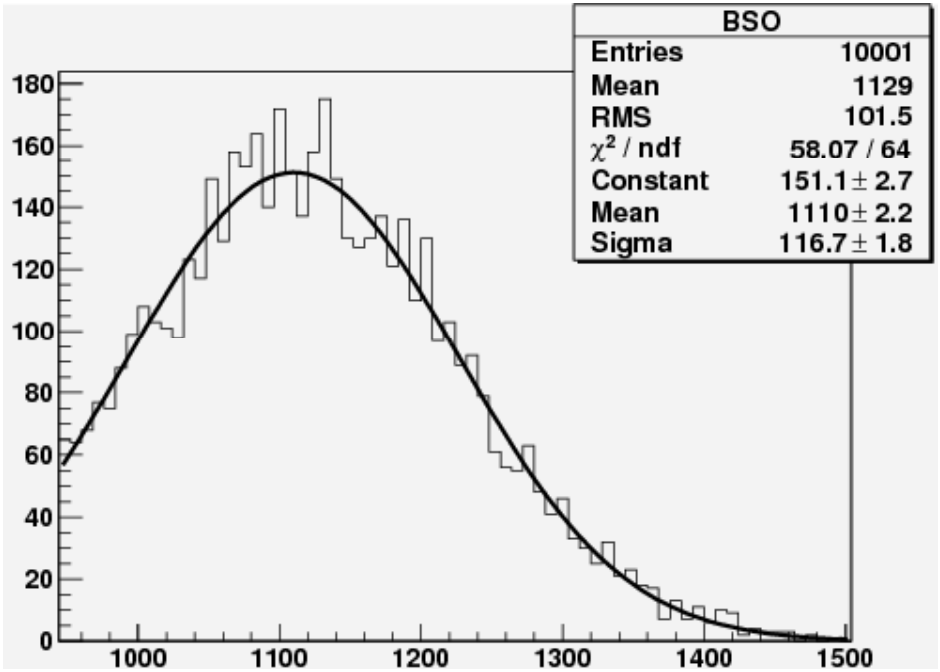
Around photoelectric peak is magnified as right figure, together with fitted line by Gaussian.

ADC distribution of BSO

- Size : 1cm × 1cm × 2cm.
  (Purity 99.9999%, λ=480nm)

ATT 6dB : To adjust ADC range.

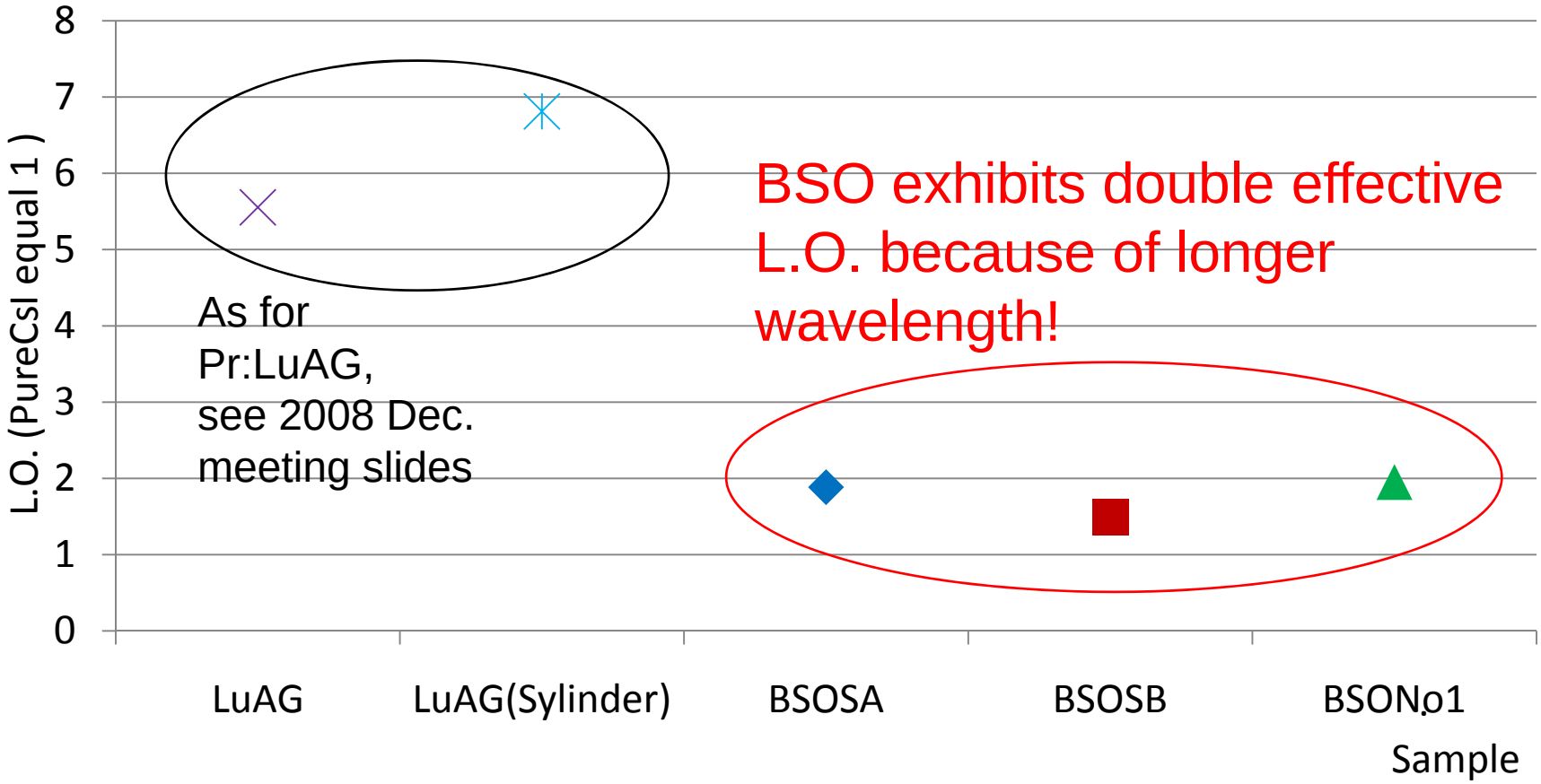




Right figure is magnification around photoelectric peak.

To compare with PureCsI

BSO SA, SB and No.1 are different samples; all purity 99.9999%.



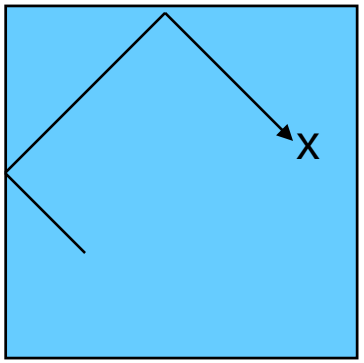
L.O. of BSO is two times as PureCsI.

Comments on sample dimension and surface finishing.

- Light collections for PureCsI(cylindrical)=BSO(1X1X2cm^3) assumed.
- In order to make sure, PureCsI (1X1X2cm^3) ordered, delivered in 3 weeks.
- Then answer becomes clearer.

Actually we experienced;

- L.O. of 2x2x2cm^3 BSO(all 6 surfaces mirror polished) exhibits ~ half of 1x1x2cm^3(only both end surfaces are mirror polished) sample.
  - Though they are taken from the exactly same block.
- Thought to because of photon's total reflection at its polished surfaces ~45 deg.
- Significant amount of photons are absorbed during travel inside crystal…



Common phenomena in crystal with n>sqrt(2).

Summary and plans

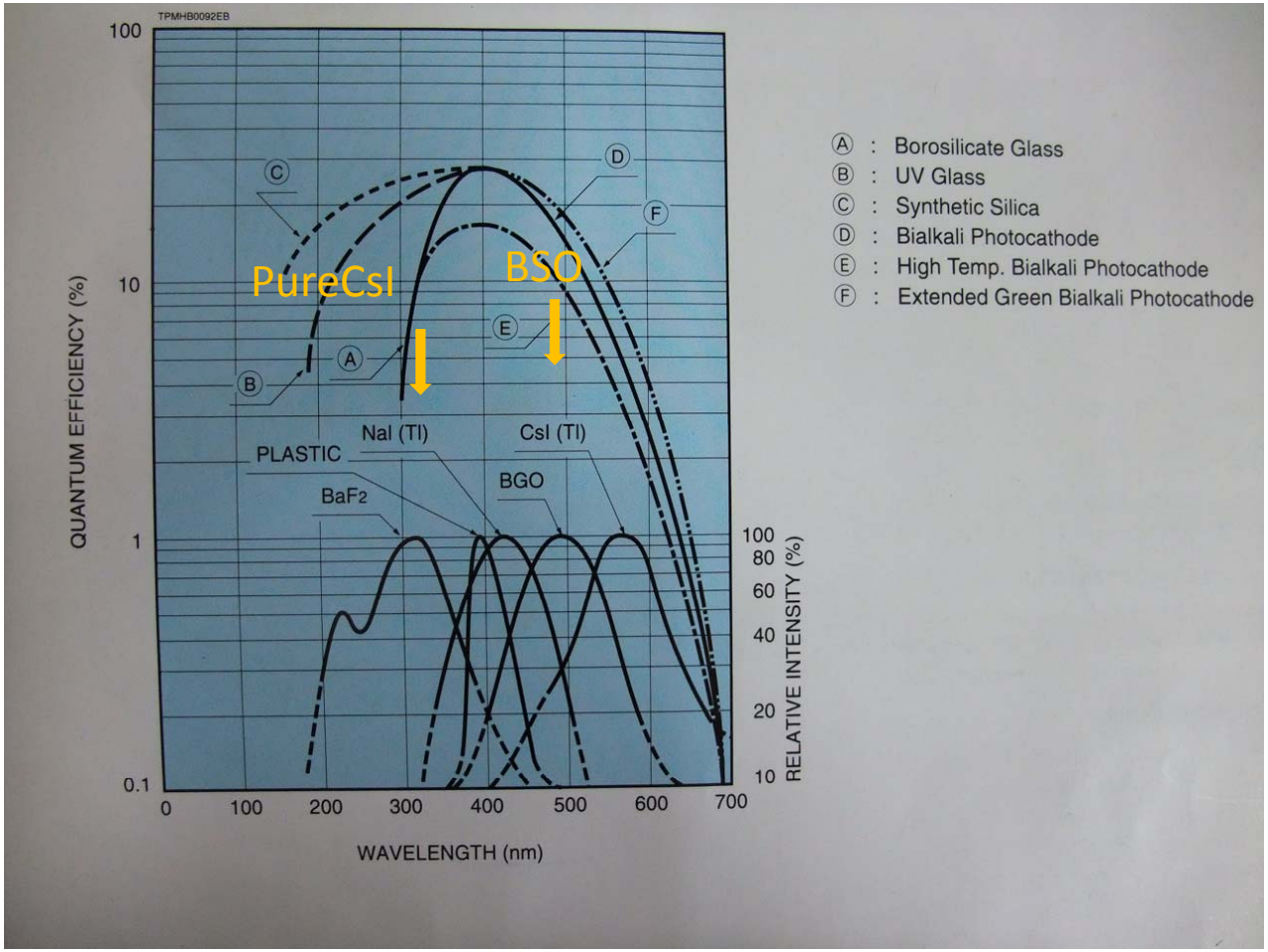
- Effective L.O. of BSO is 2 times as high as PureCsI because of longer wavelength.

- 1*1*2cm^3 PureCsI (Both ends mirror polish, 4 side surfaces are frosted) will be gotten soon.
  - To remove possible light collection difference .

- Radiation hardness test of BSO(and Pr:LuAG) small samples.

Back up

Typical Photocathode Spectral Response and Emission Spectrum of Scintillators



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