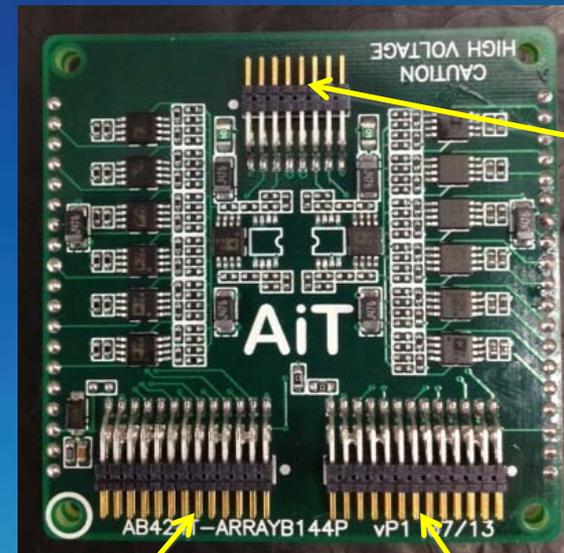
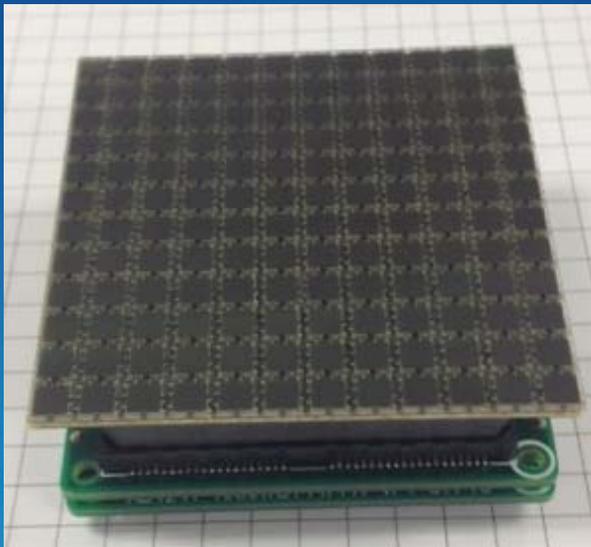


Studies with the ArrayM-30035-144P-PCB



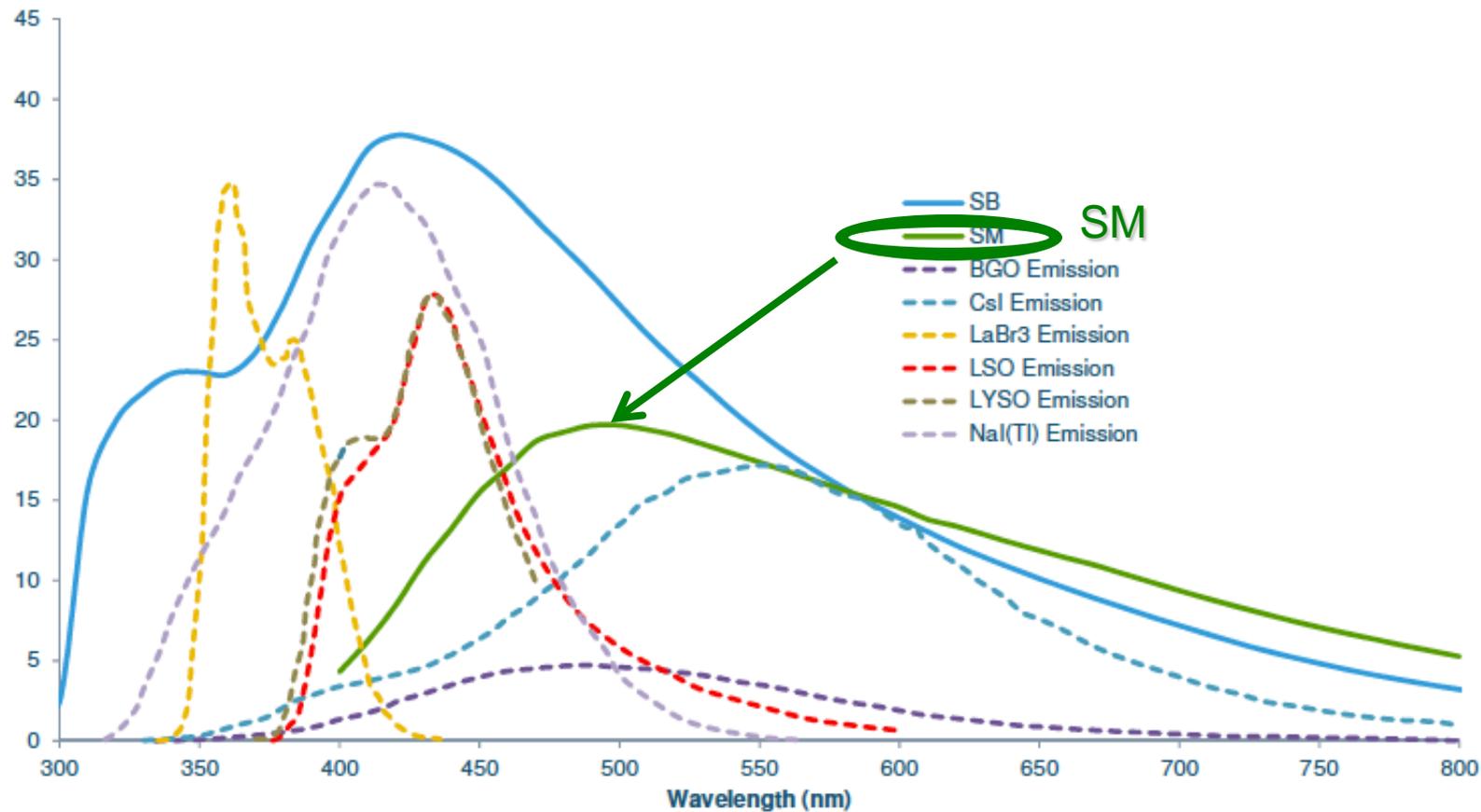
4ch
readout

12ch columns

12ch rows

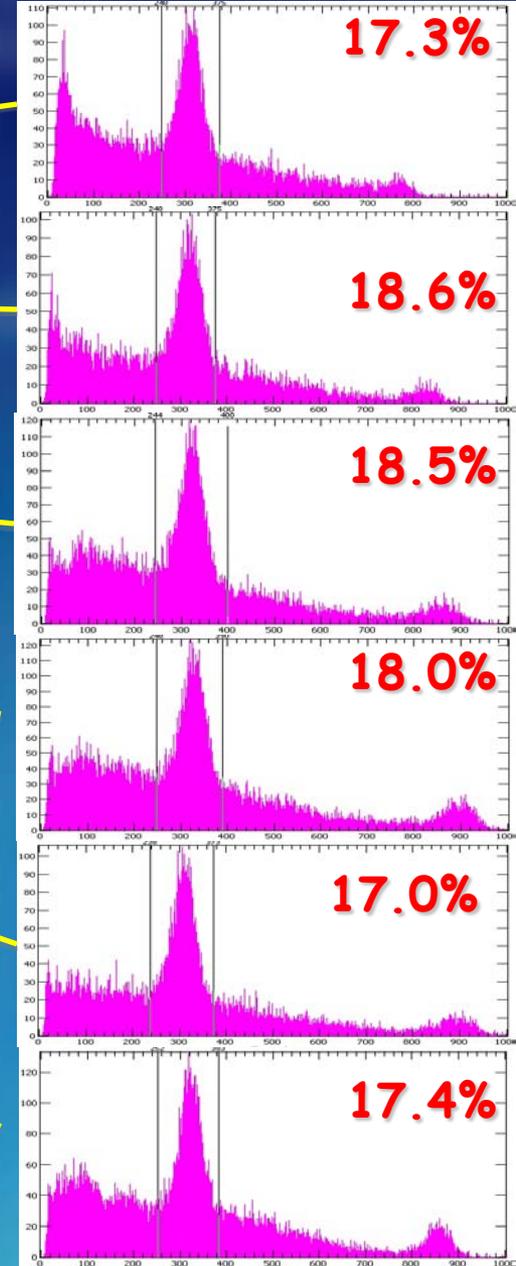
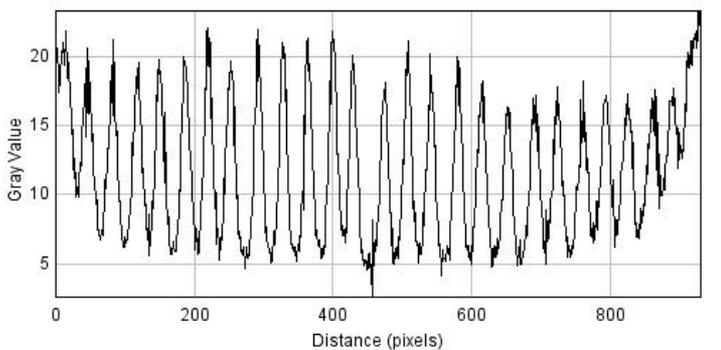
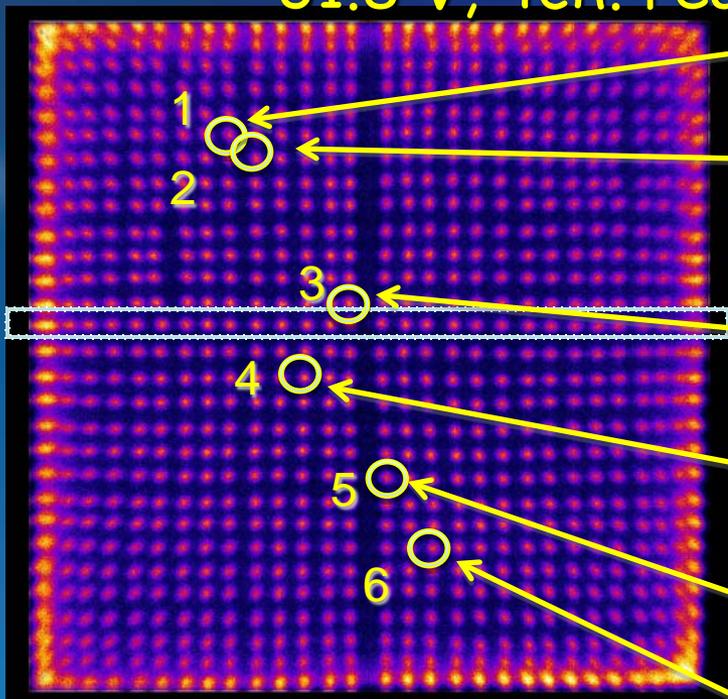
Hybrid readout board from AiT Instruments with the row-and-column readout (bottom connectors) and 4ch readout (top connector).

Common Scintillators & SensL SiPMs





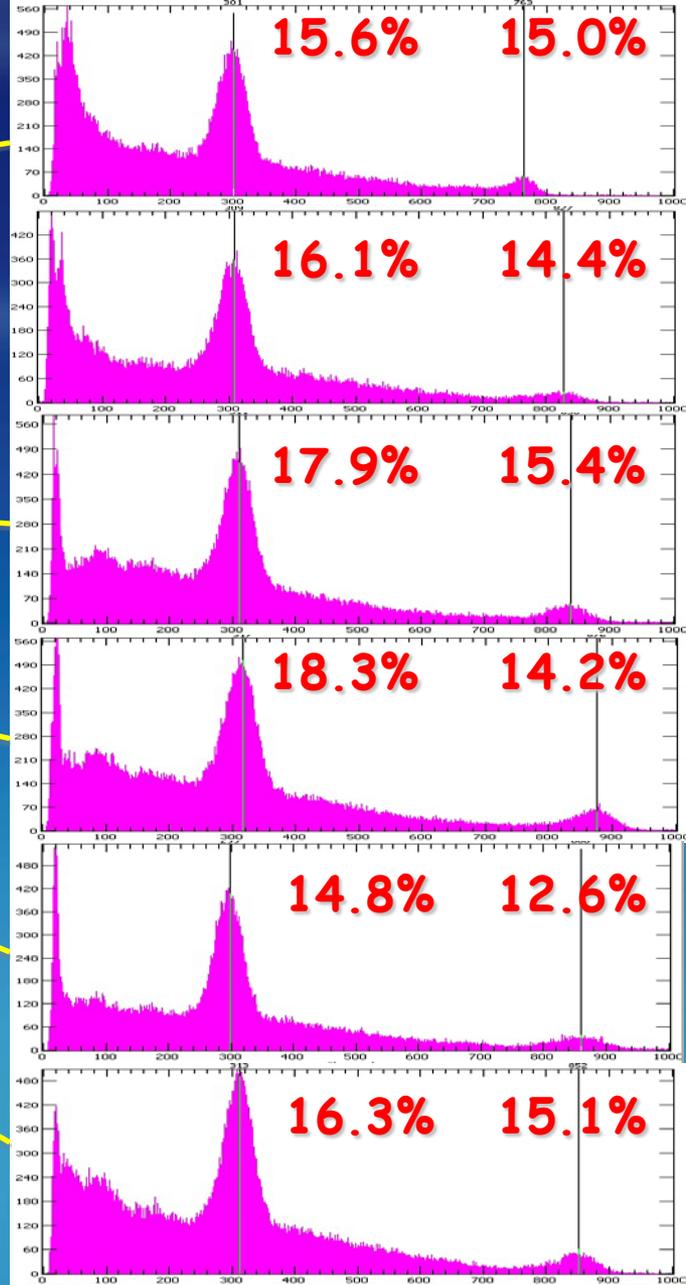
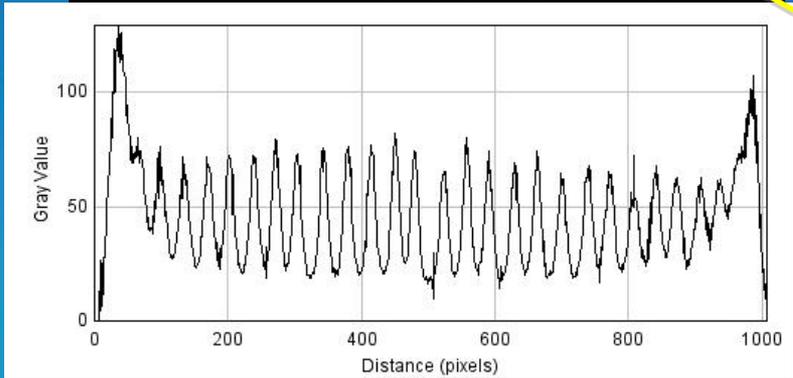
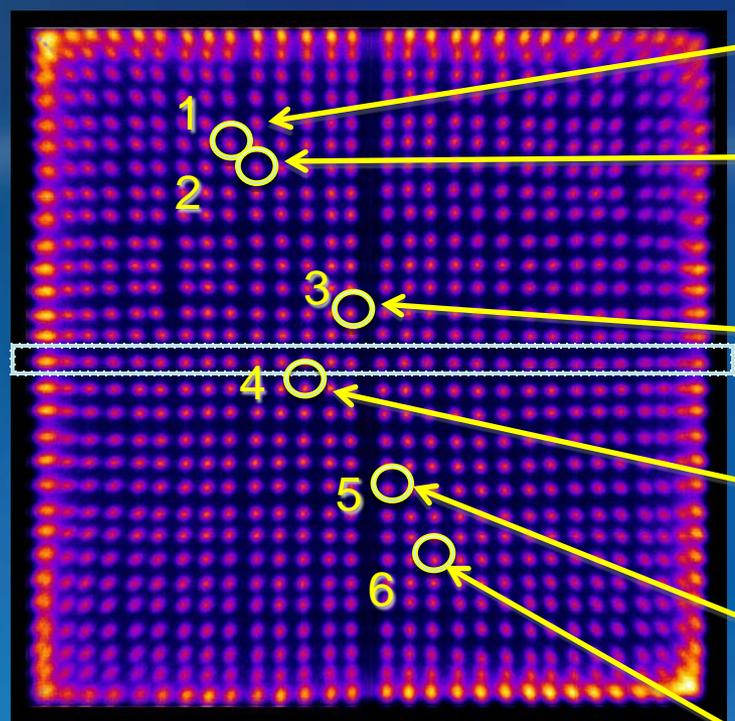
1.57mm LYSO array, 21.5 deg. C, 31.8 V, 4ch. readout



Raw image, profile, and six energy pixel spectra for the 1.57mm pitch 10mm thick LYSO array from Proteus with as-cut pixel sides finish. Bias voltage on the SiPM array ~ 31.8 V. 350 nsec ADC integration time. FWHM values for the 511 keV photopeak not corrected for the zero energy shift due to the diode readout.



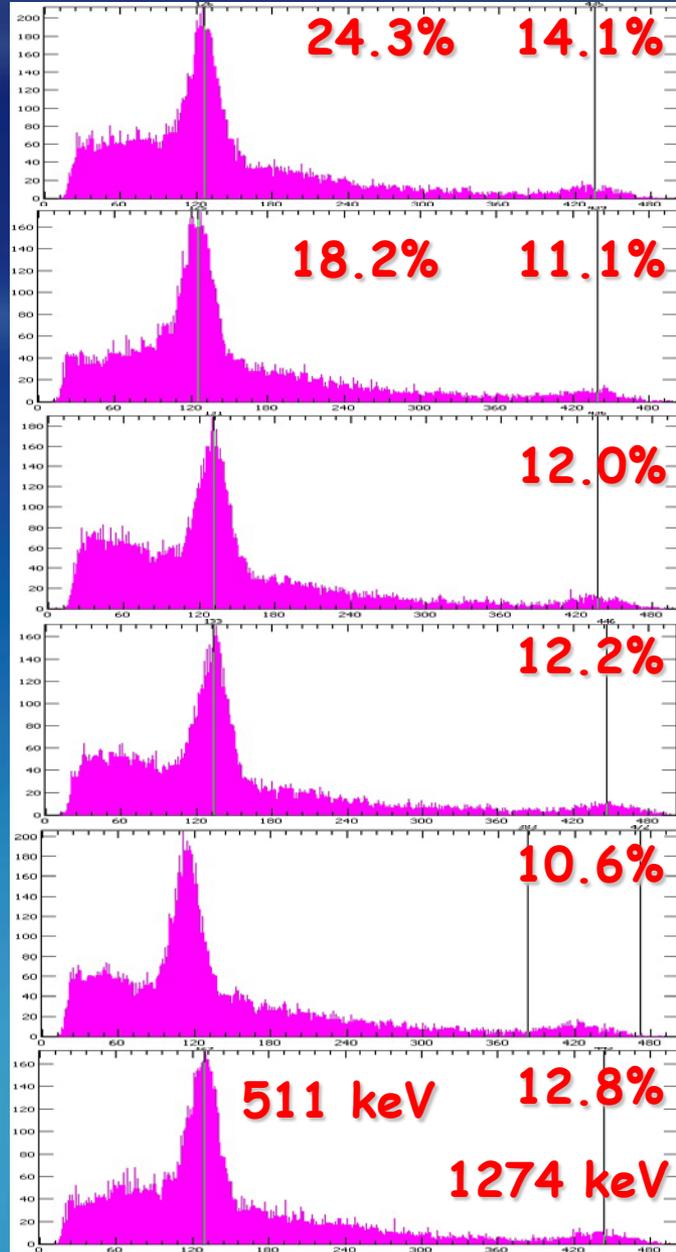
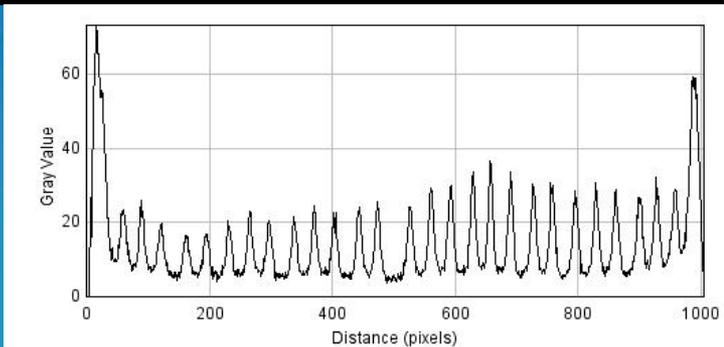
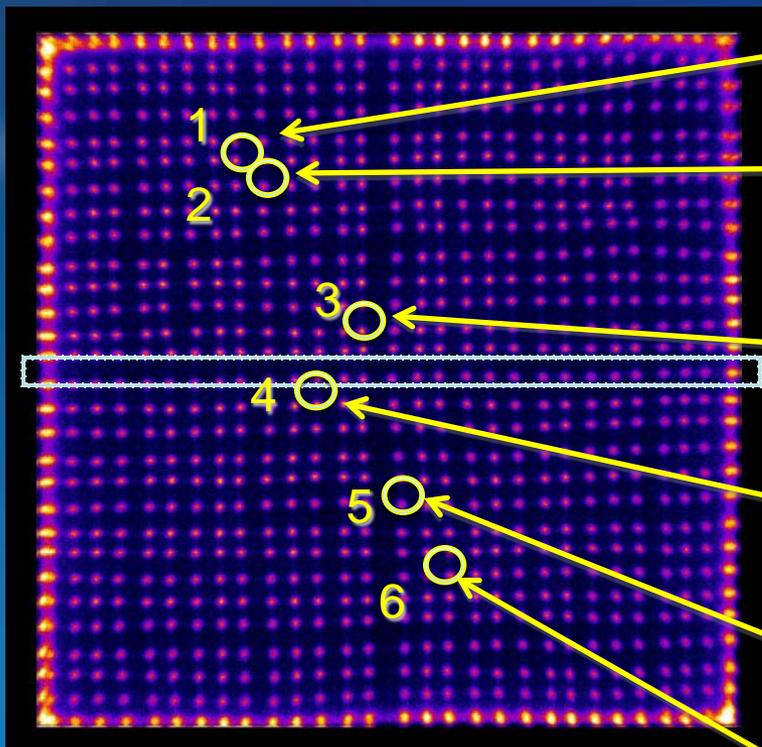
1.57mm LYSO array, 21.5 deg. C, 31.8 V, 4ch. readout



As before, but for high statistics run. Two sets of FWHM numbers, before and after zero energy correction of each spectrum.



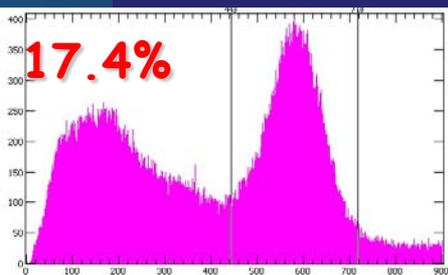
1.57mm LYSO array, 7.6 deg. C, 30.3V, 4ch readout



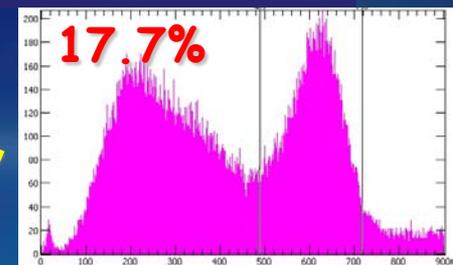
Raw image, profile, and six energy pixel spectra for the 1.57mm pitch 10mm thick LYSO array from Proteus with as-cut pixel sides finish. Bias voltage on the SiPM array ~ 30.3V. 350 nsec ADC integration time. FWHM values for the 511 keV photopeak not corrected and corrected for the zero energy shift.



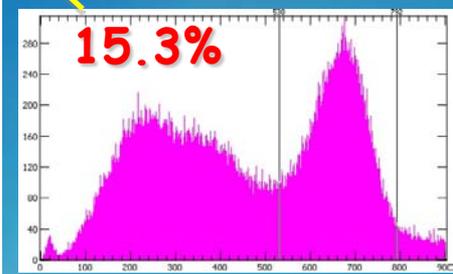
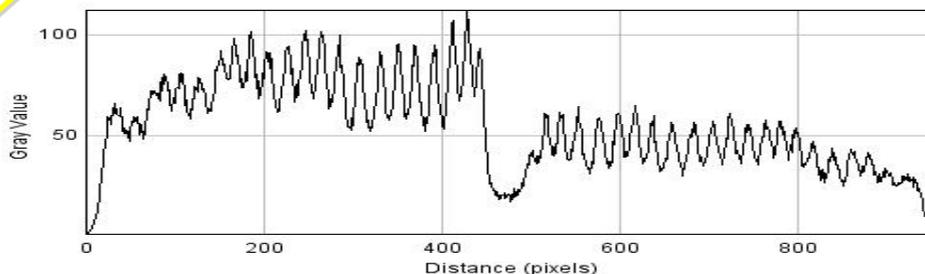
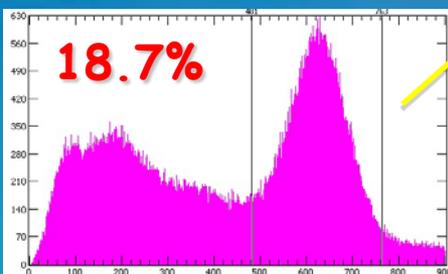
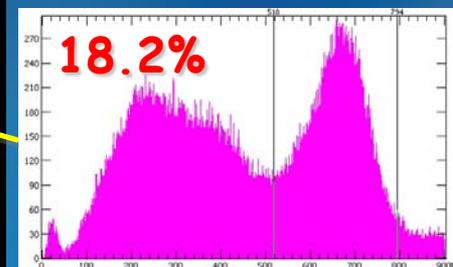
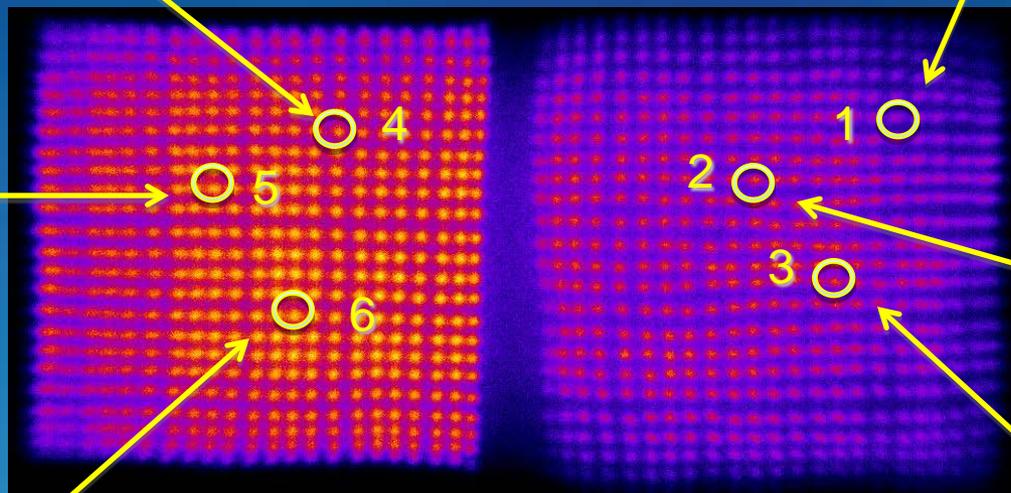
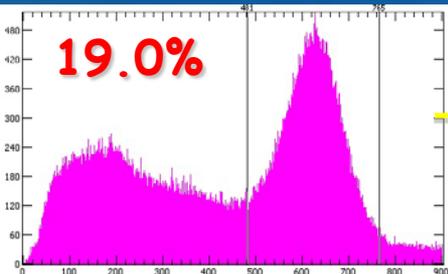
1 mm LYSO and GAGG arrays, 21.5 deg. C, 31.9V SiPM bias, 4ch readout, 150 ns gate



LYSO 511 keV



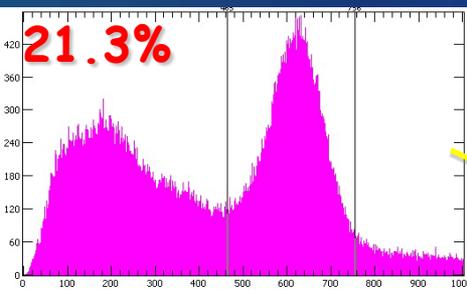
GAGG 511 keV



Raw image, profile, and six energy pixel spectra for two ~1mm pitch and 10mm thick LYSO (Proteus) and GAGG (Furukawa) arrays. Bias voltage on the SiPM array ~ 31.9V. 150 nsec ADC integration time. FWHM values for the 511 keV photopeak not corrected for the zero energy shift.

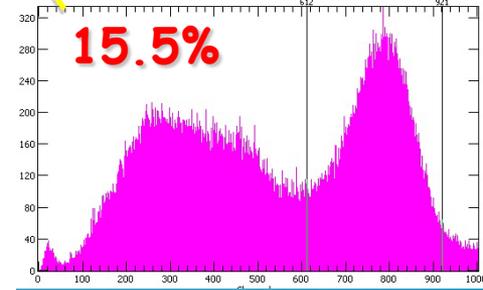
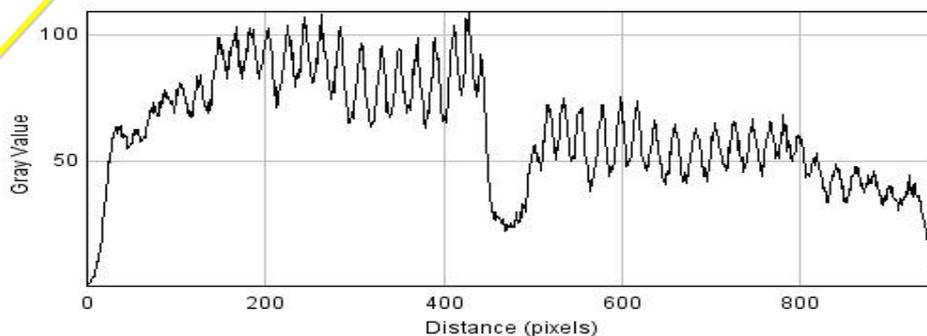
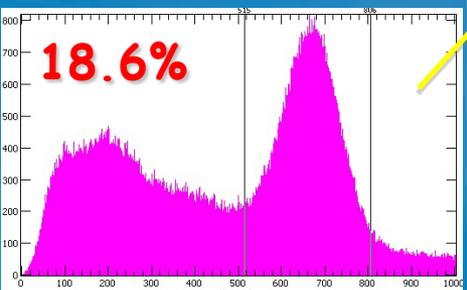
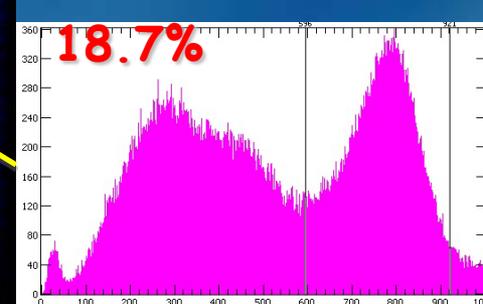
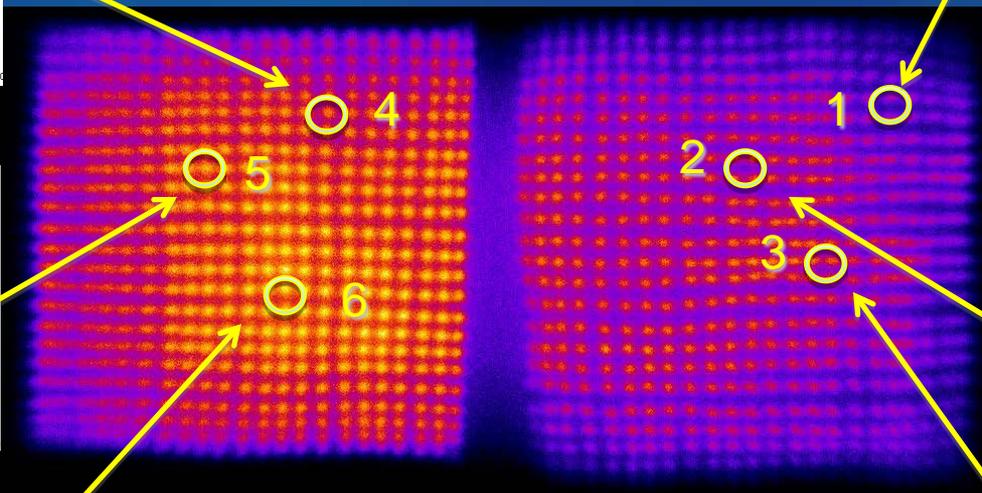
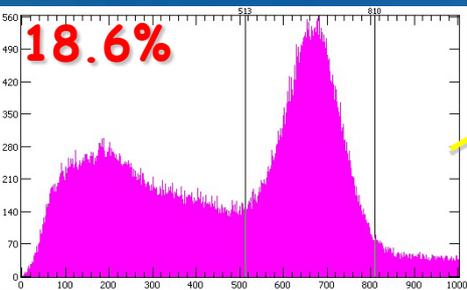
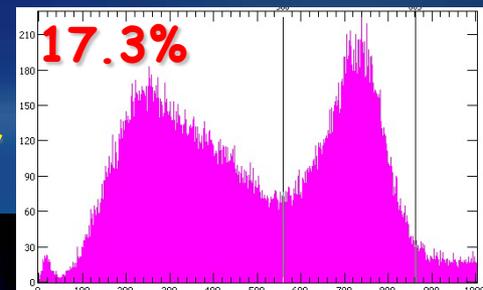


1 mm LYSO and GAGG arrays, 21.5 deg. C, 31.9V SiPM bias, 4ch readout, 350 ns gate



LYSO 511 keV

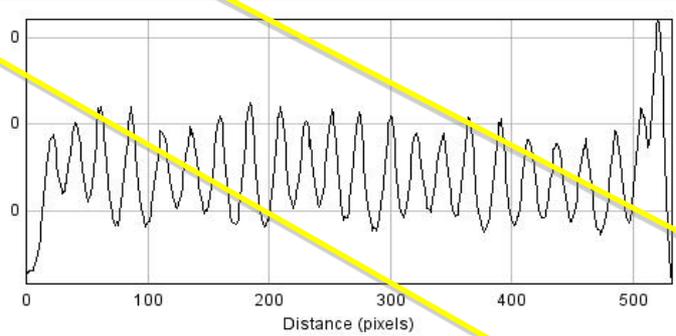
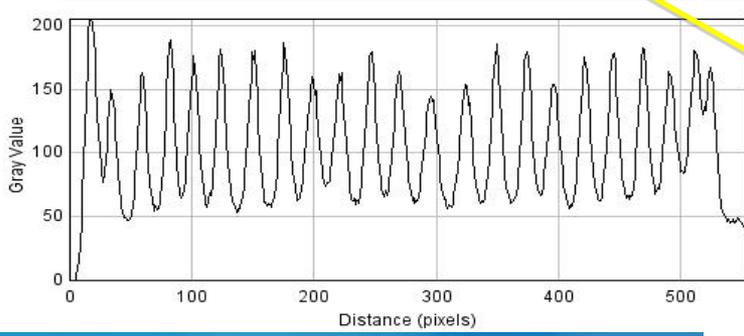
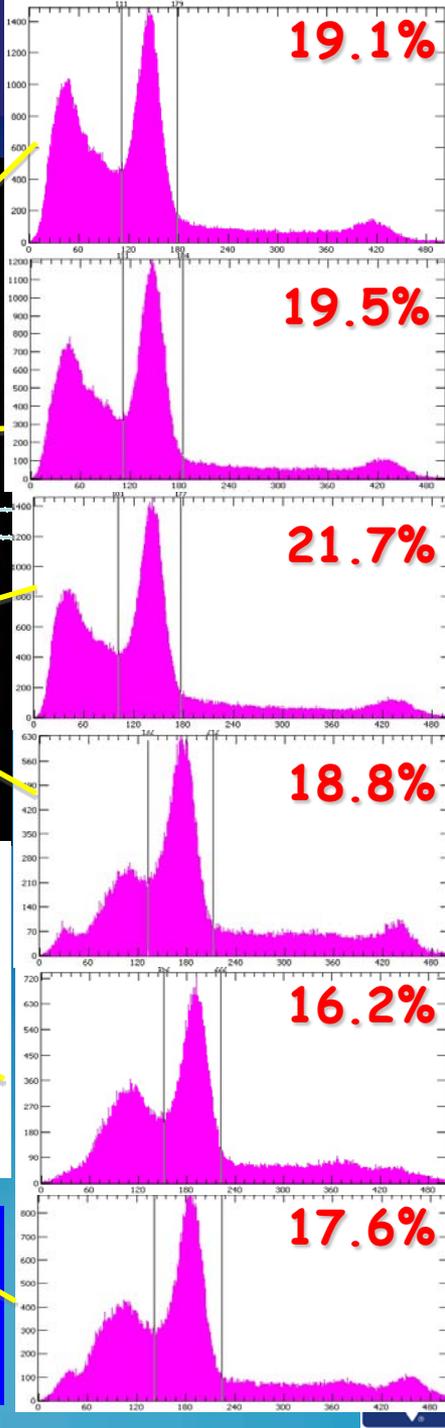
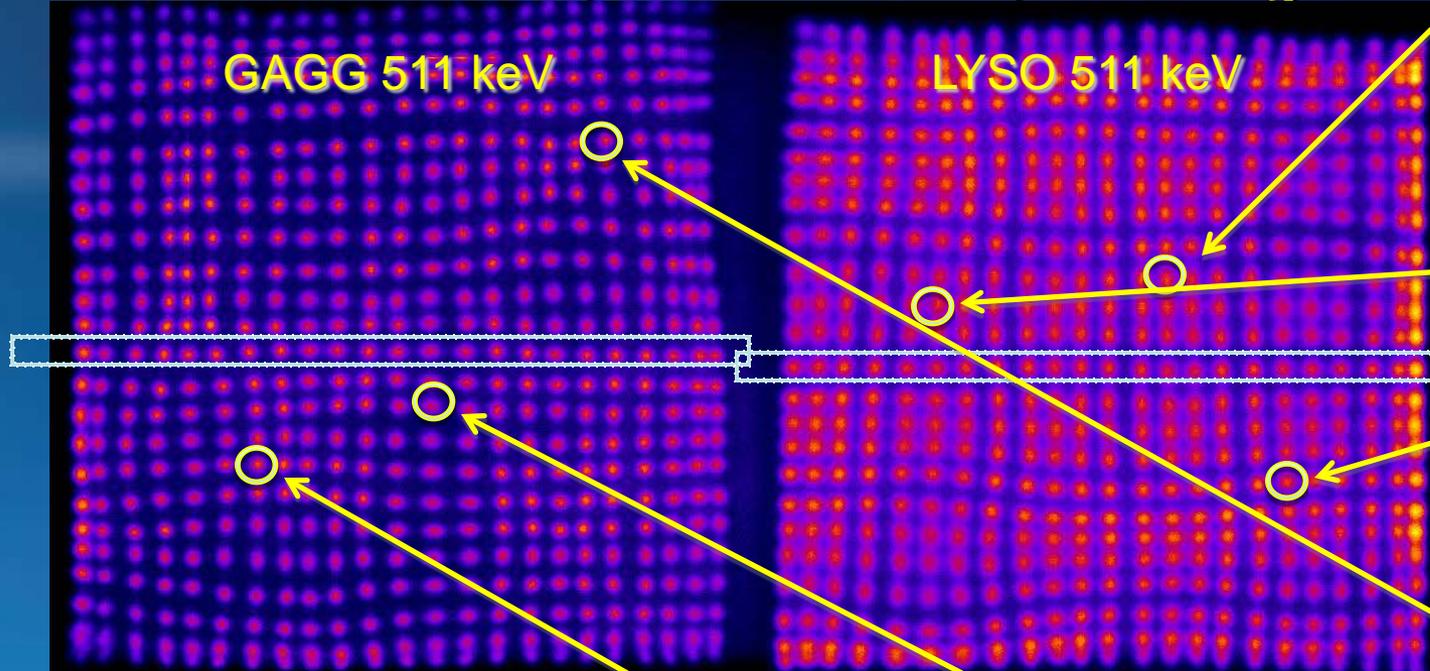
GAGG 511 keV



Raw image, profile, and six energy pixel spectra for two ~1mm pitch and 10mm thick LYSO (Proteus) and GAGG (Furukawa) arrays. Bias voltage on the SiPM array ~ 31.9V. 350 nsec ADC integration time. FWHM values for the 511 keV photopeak not corrected for the zero energy shift.



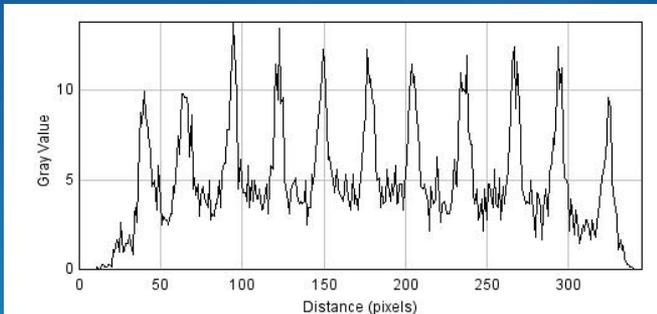
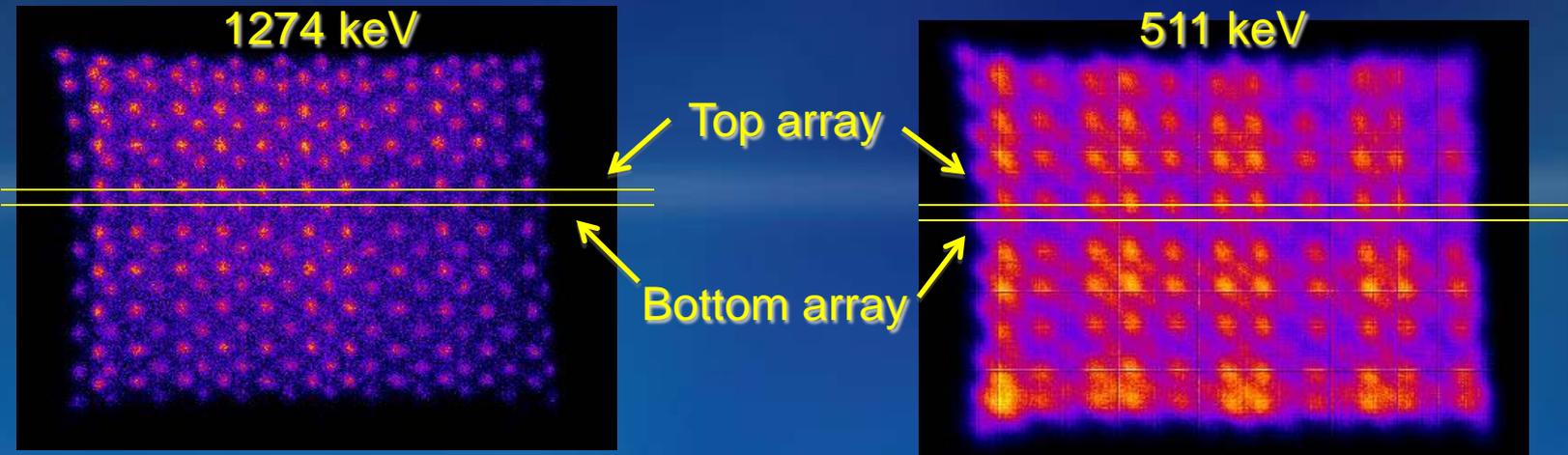
1 mm LYSO and GAGG arrays, 21.5 deg. C, 31.9V SiPM bias, 12ch readout, 350 ns gate



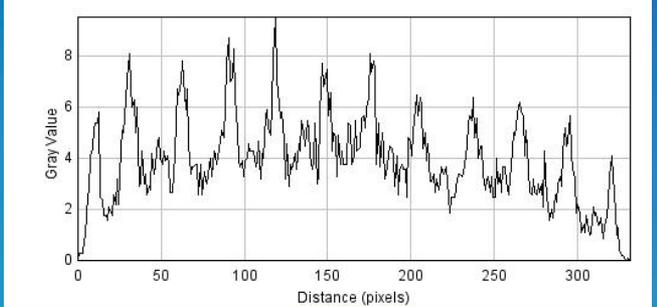
Raw image, profile, and six energy pixel spectra for two ~1mm pitch and 10mm thick LYSO (Proteus) and GAGG (Furukawa) arrays. Bias voltage on the SiPM array ~ 31.9V. 350 nsec ADC integration time. FWHM values for the 511 keV photopeak not corrected for the zero energy shift.



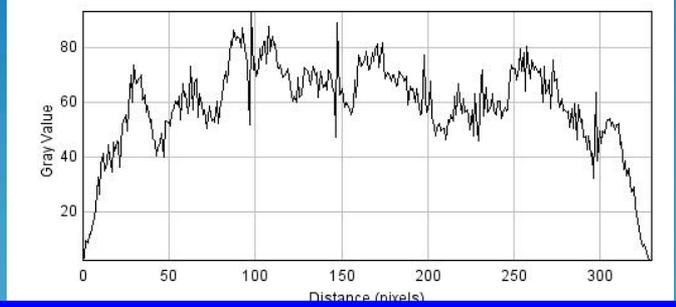
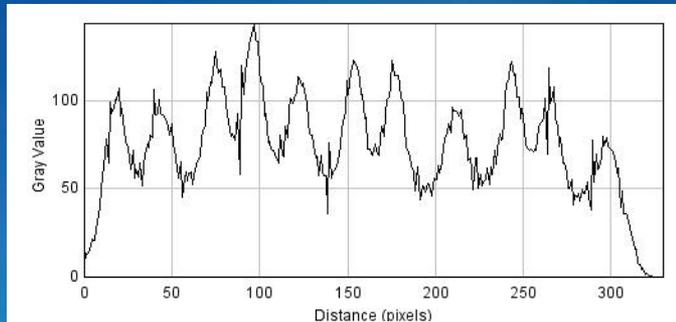
1.5mm stacked array, 8.2 deg. C, 30.3V, 4ch readout



Top array



Bottom array



Raw images at 1274 keV and 511 keV for the stacked 1.5mm LYSO array using two 10mm thick Proteus arrays relatively shifted by half a pitch in both planar coordinates. All sides of the pixels were polished. Top profiles are through the pixels at the top array (from the gamma beam side) and the bottom are for the bottom array, close to SiPM.



ArrayM-30035-144P-PCB test results summary

- Despite spectral response not optimal for LYSO, good performance obtained
- Limit of operation of the 4ch readout is at about 1.0mm resolution for simple pixellated arrays
- Higher bias (beyond standard recommended value) and lower operational temperature improve energy resolution
- 12x12 row-and-column readout spatial resolution is under 1mm
- 4ch diode circuitry readout produces zero energy shift (by cutting low signals below threshold) that need to be corrected for energy resolution measurements on the channel by channel basis
- 150 ns signal integration gate is sufficient to optimize energy resolution

