

Scintillation Readout From THGEMs operating in xenon

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2nd RD51 collaboration meeting

13-15 Oct. 2008, Paris

Recent Relevant Applications of Optical TPCs

Double Beta decay Experiments

NEXT – Neutrino Xenon TPC

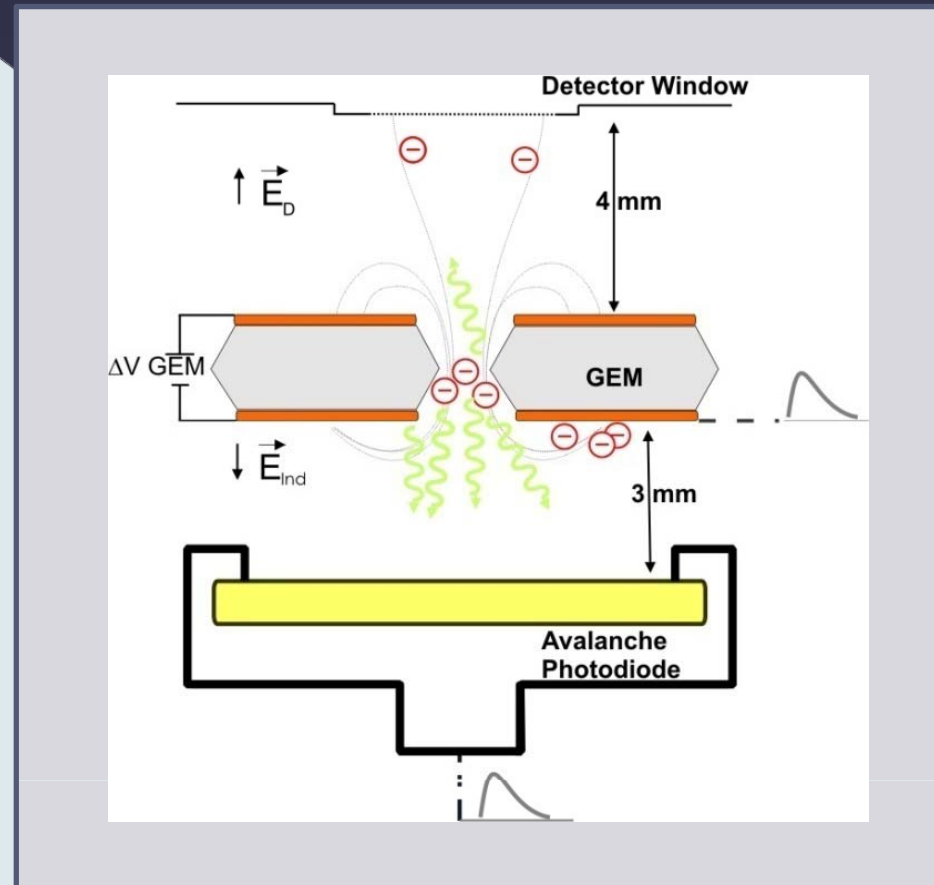
Dark Matter search

XENON, LUX, ZEPELIN, WARP experiments

- Secondary scintillation amplification, for higher sensitivity, with PMT/LAAPD readout
 - Double mesh, uniform field scintillation gap
e.g. secondary scintillation yield of **466 photons/e⁻/cm @ 4.1 kV/cm/bar**
(C.M.B. Monteiro et al., J. Inst. 2 P05001)
 - Scintillation in hole-type microstructures, e.g. THGEMs



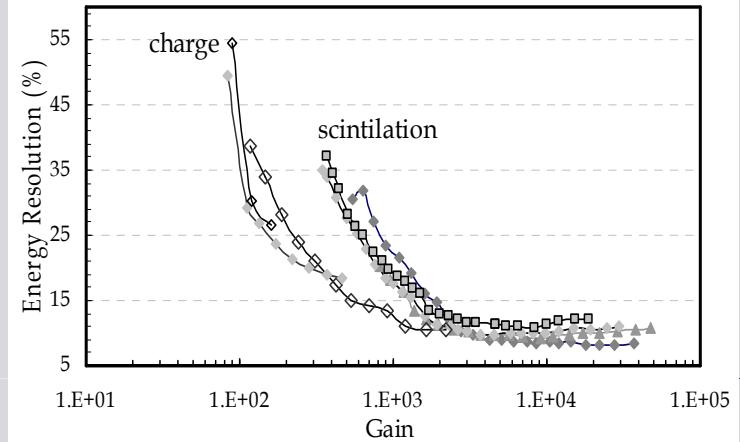
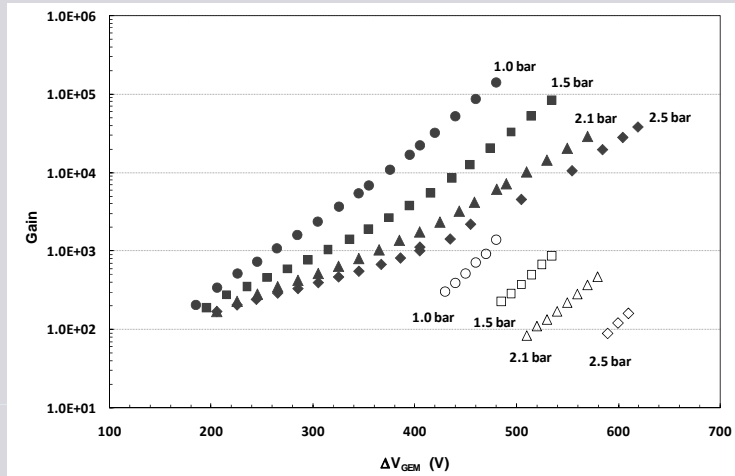
MPGD scintillation vs. charge readout



A.S. Conceição, et al., J. Inst. 2 P09010



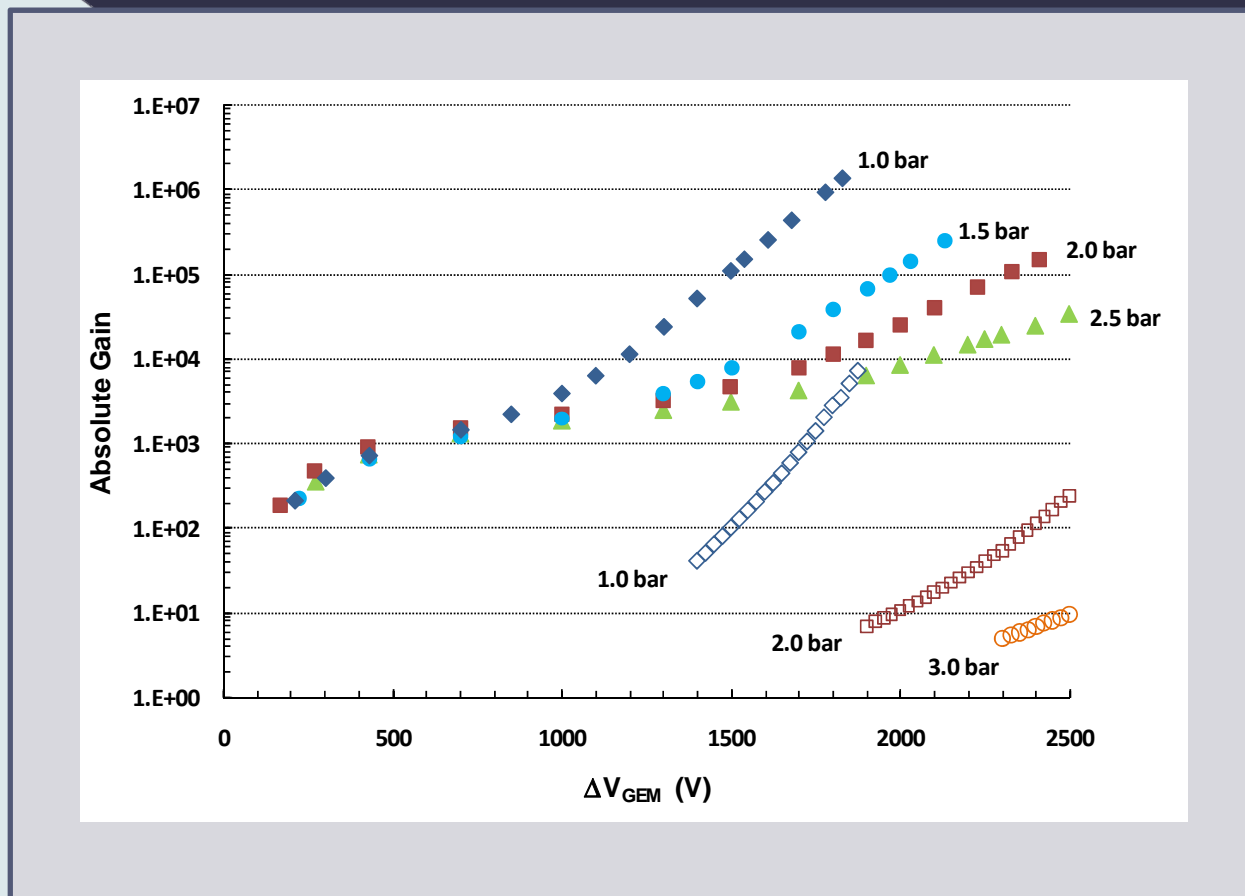
GEM scintillation vs. charge readout



LAAPD gain ~130 - 150



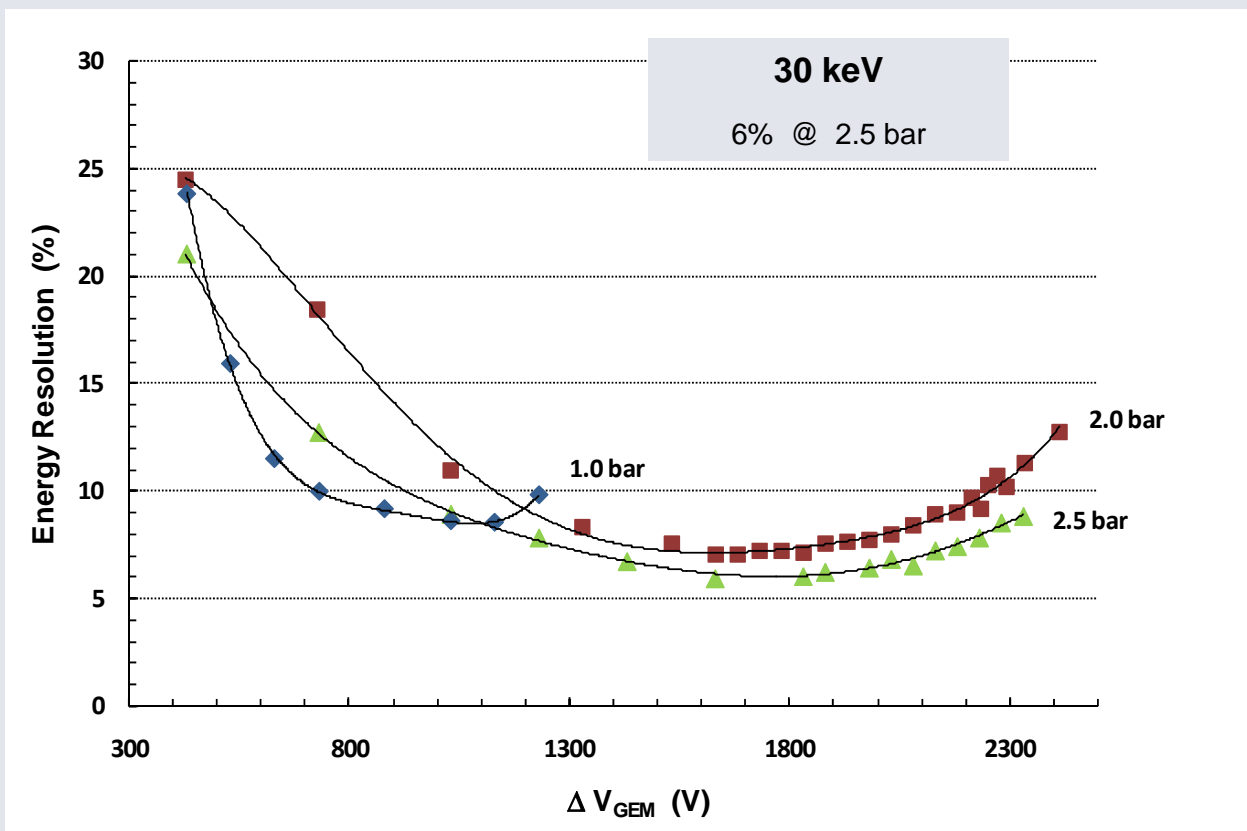
THGEM scintillation vs. charge readout



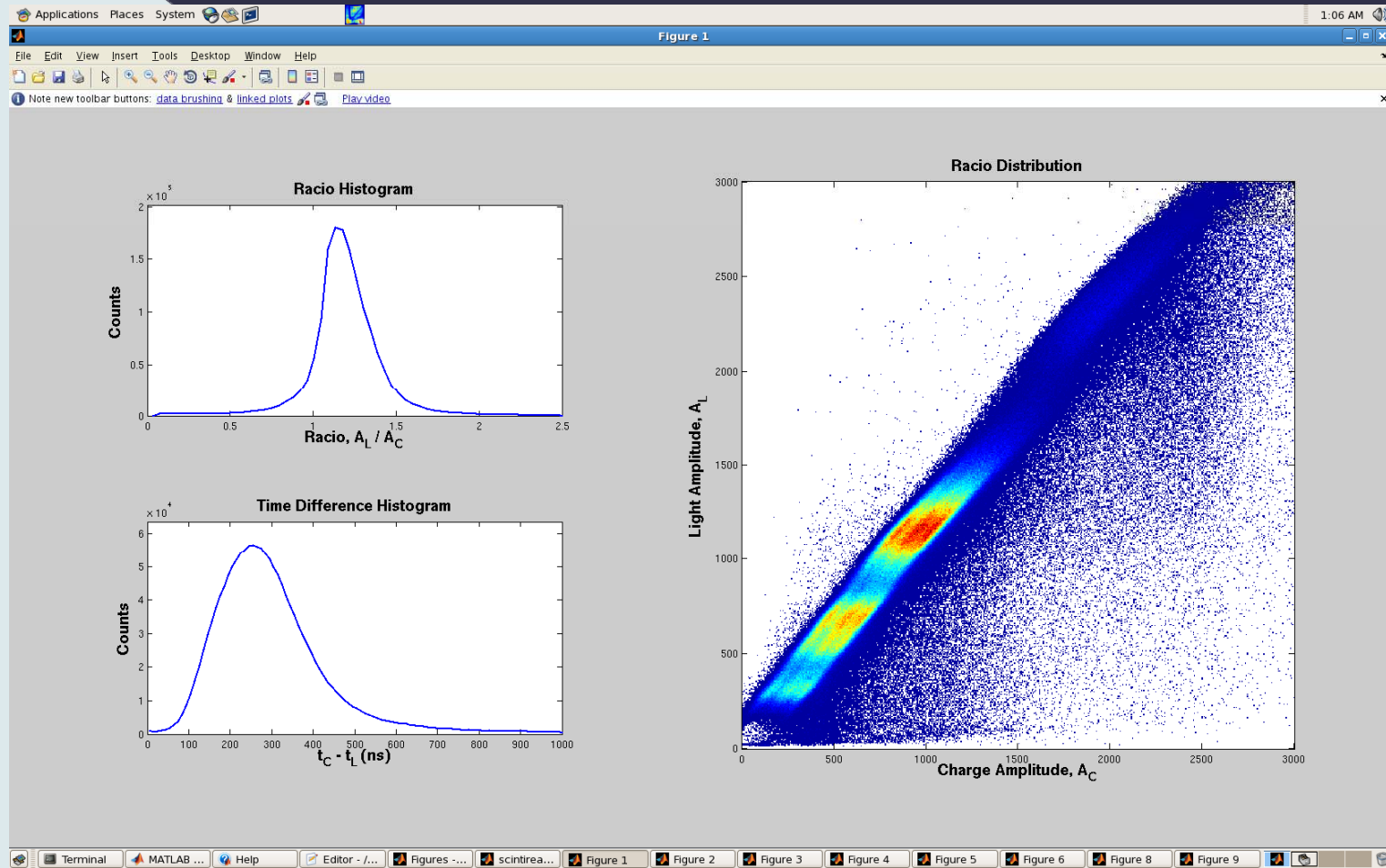
LAAPD gain ~130 - 150



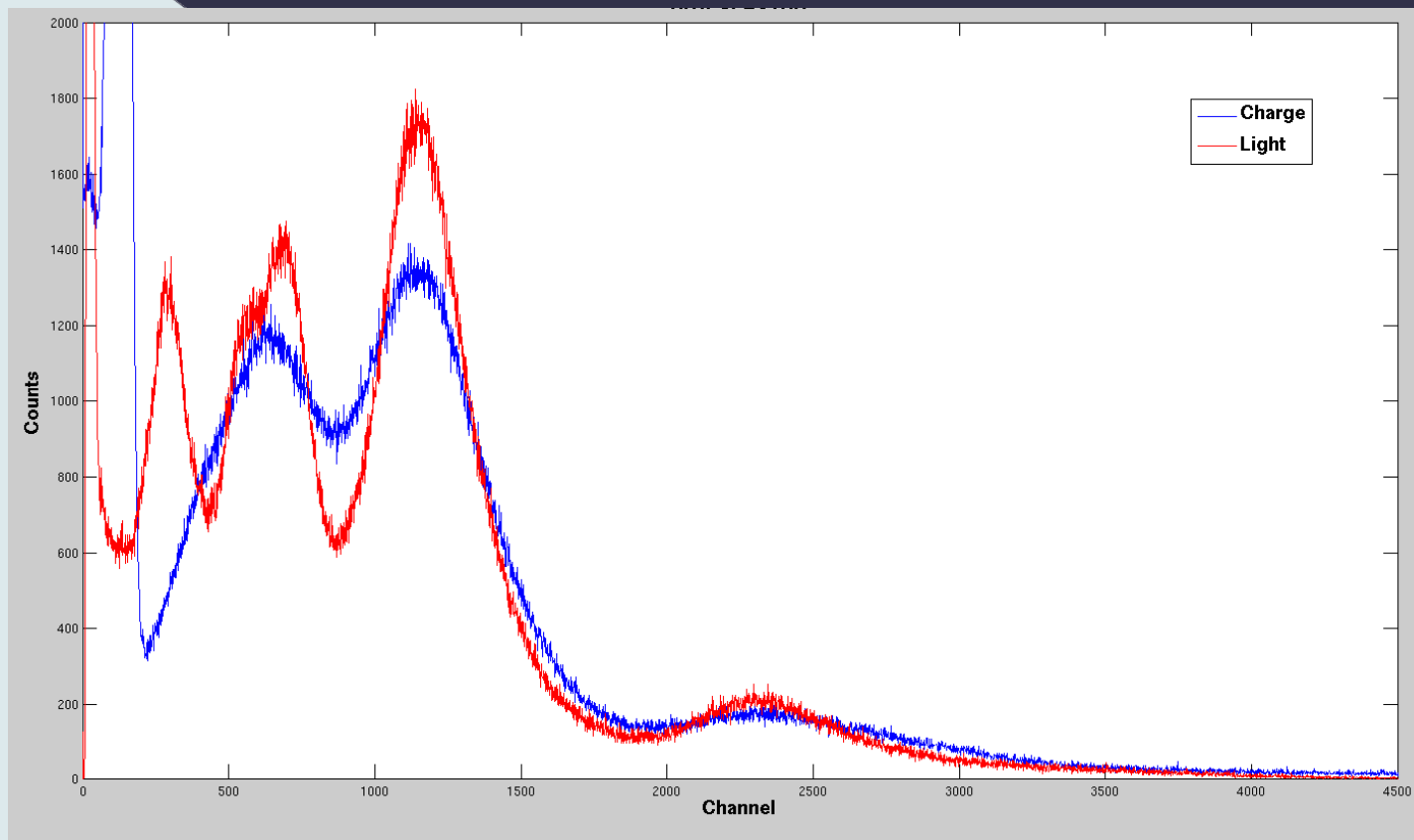
THGEM scintillation – Energy Resolution



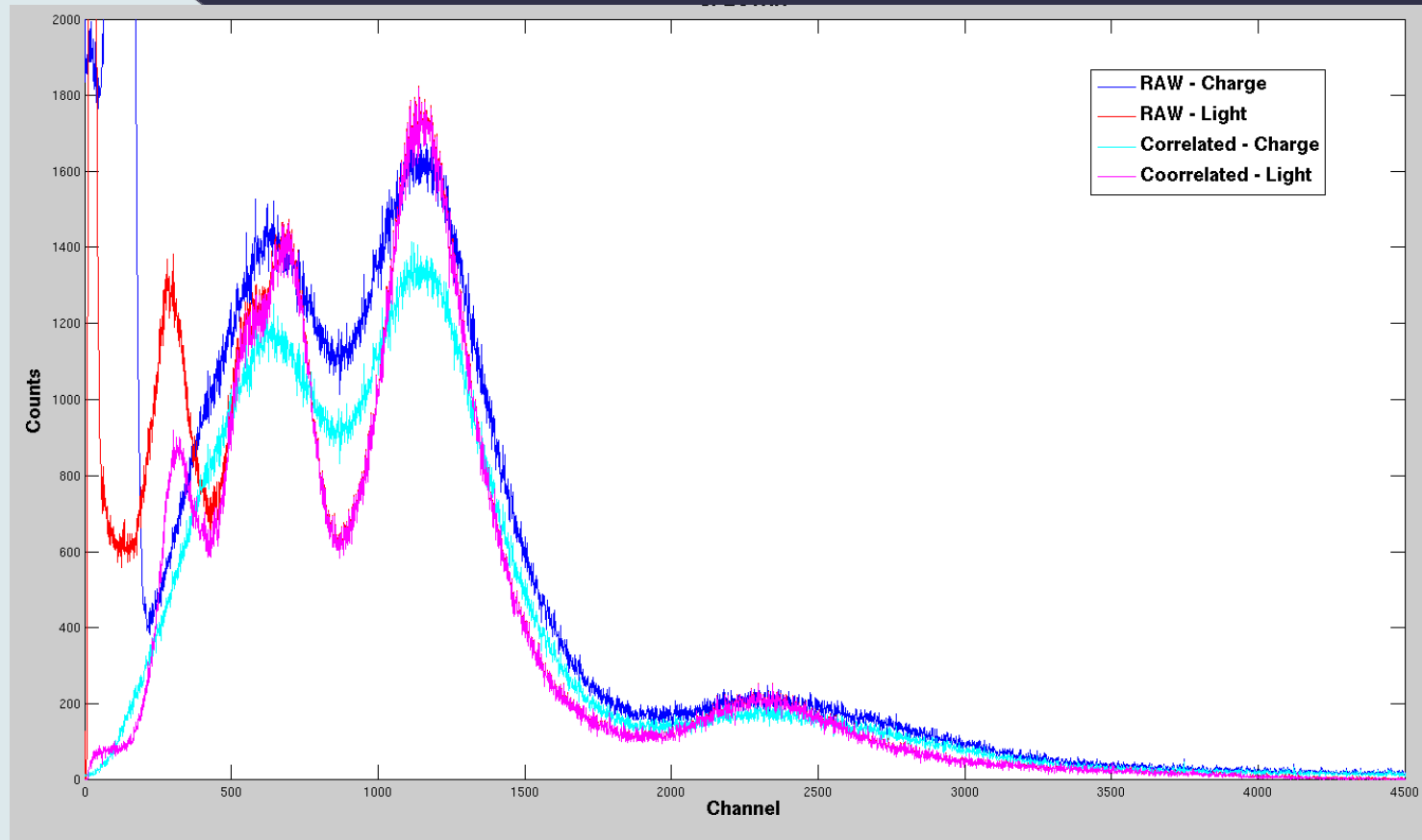
Scintillation and charge pulses correlation



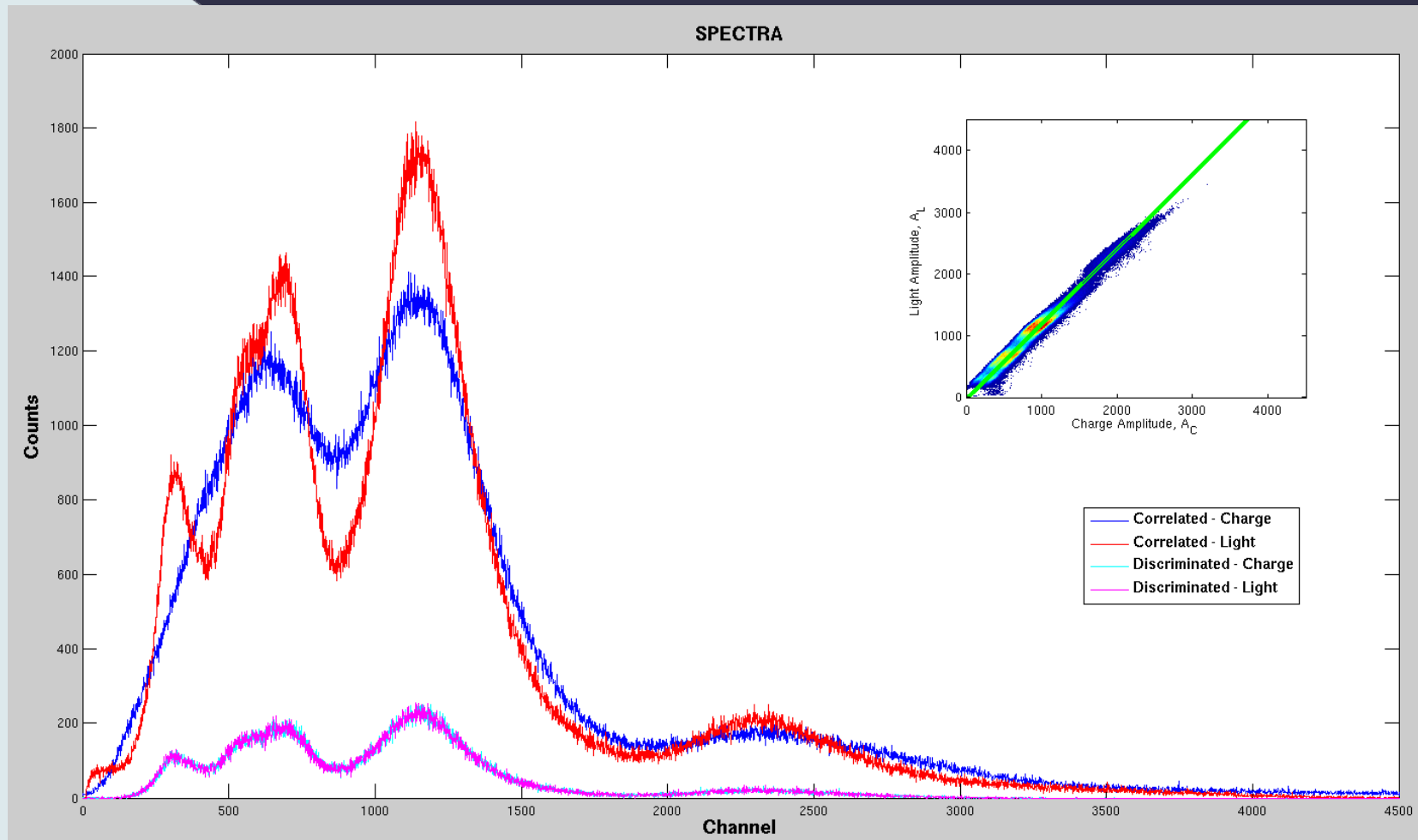
Scintillation and charge raw spectra



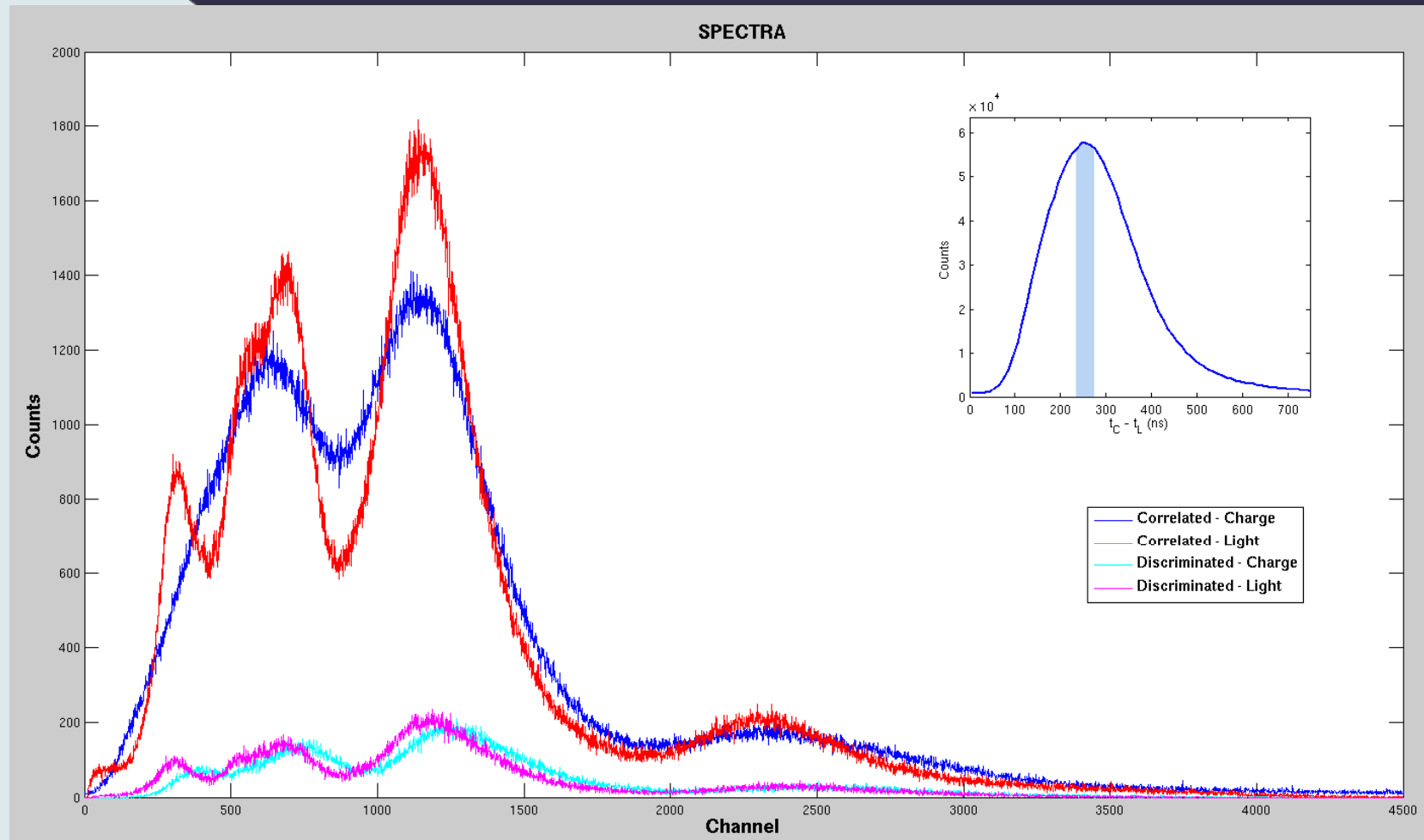
Scintillation and charge correlated spectra



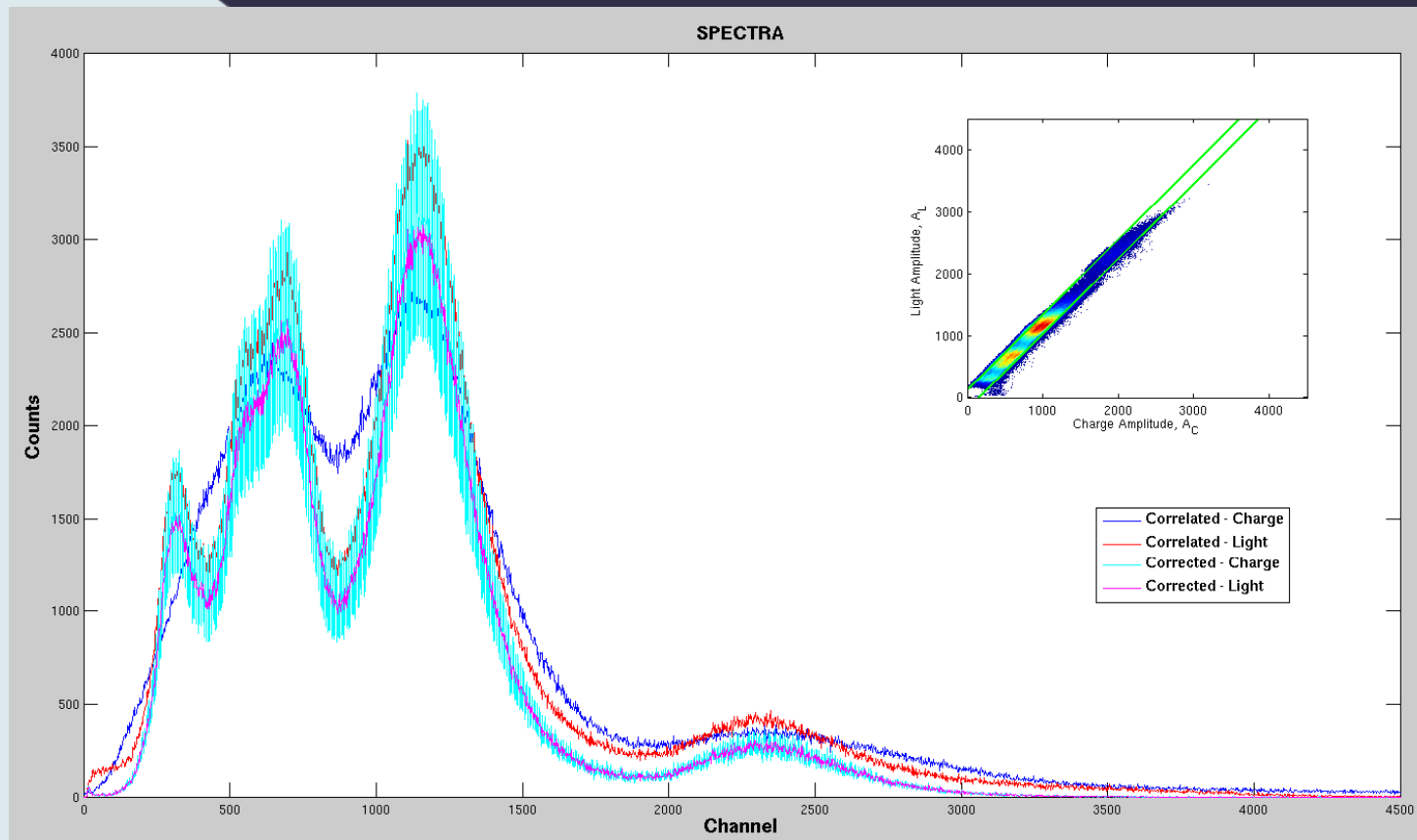
Scintillation and charge correlated spectra



Scintillation and charge correlated spectra



Scintillation and charge corrected spectra



Summary

Secondary scintillation for signal readout

high gains + good energy resolution at low voltages



Stable operation without discharges

⇒ $\text{Max Gain}_{\text{scint}} > 100 \times \text{Max Gain}_{\text{charge}}$

THGEM-APD scintillation readout

Good alternative to double stainless steel mesh-PMT readout

⇒ THGEM scintillation yield higher than for uniform field

THGEM-APD gains $> 10^5$ ⇒ single electron detection with high efficiency

Scintillation and charge pulse correlation

⇒ not better than scintillation pulse spectra

