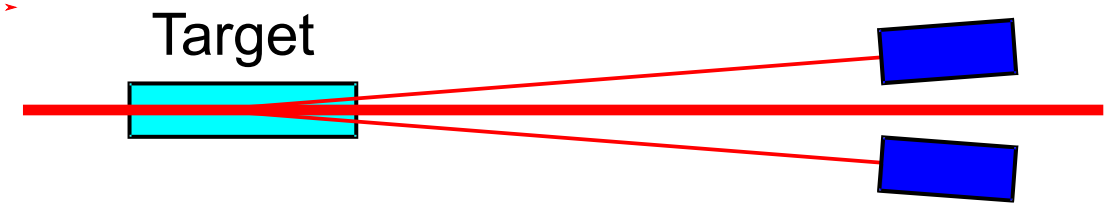
Symmetric Moller detector, readout, and MC studies

Monte Carlo studies

Status of readout

Symm. Moller lumi setup

Count symmetric Moller electrons (under 1.2°) to monitor luminosity



Lumis
(3 m from target center)

DORIS:
- 10 bunches
- bunch length 7.5 mm (25 ps)
- bunch spacing 100 ns (10 MHz repetition rate)

Two 3x3 PbF_2 clusters (fast Cherenkov calorimeters)
with fast histogramming readout

Monte Carlo simulation

What I did in December:

GEANT4 simulation with 2.3 GeV beam energy

energy deposition only – no photon / p.e. statistics

no pile-up (anyway <2% even at 2 MHz)

Yue Ma working on “clean” code, reproducing these results

Monte Carlo simulation

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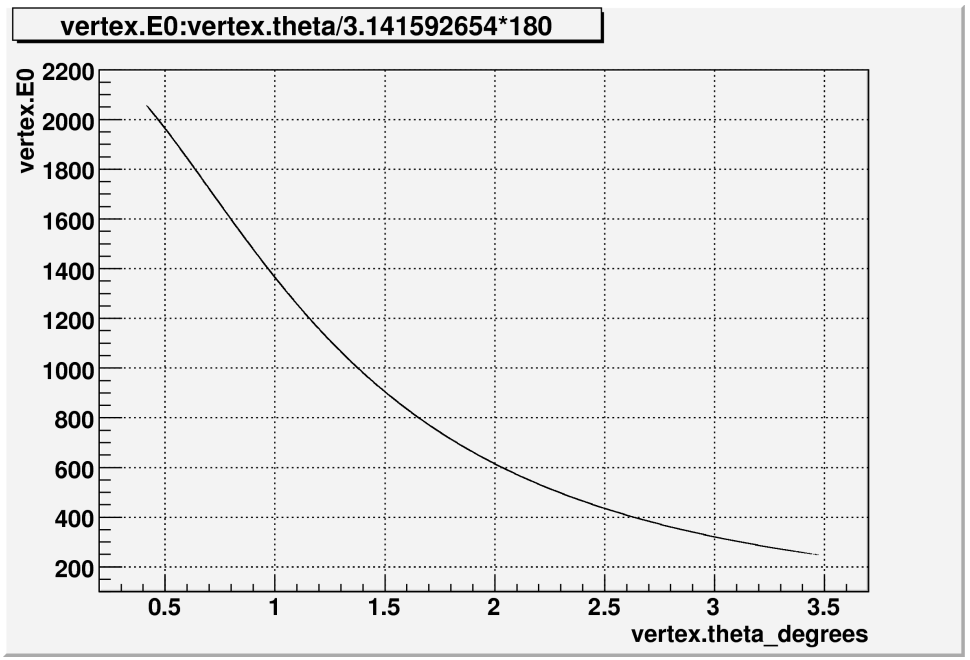
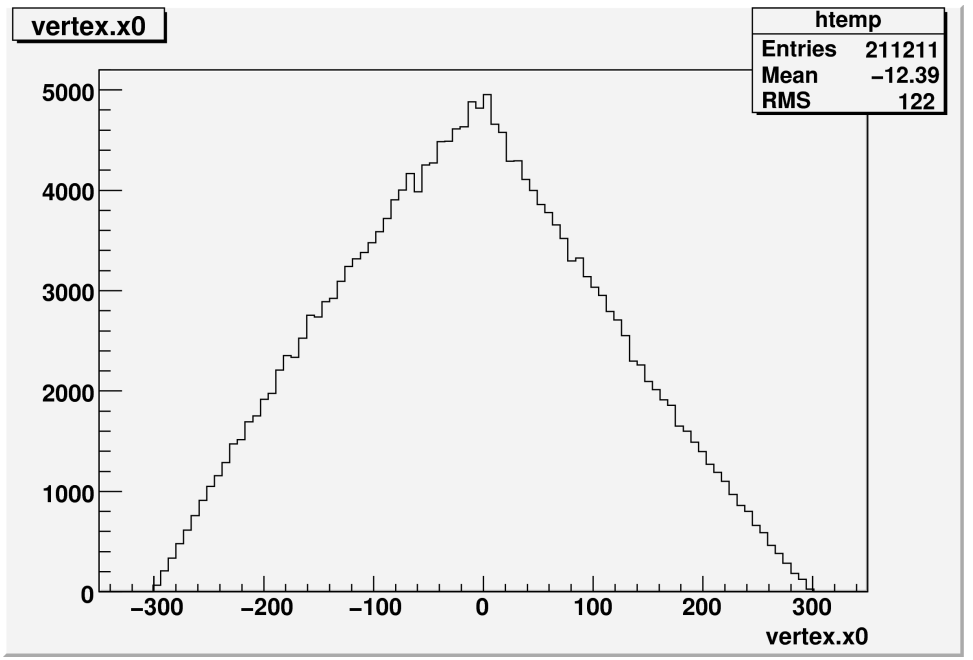
include Luigi's Cherenkov parametrization (interface?!)

Monte Carlo simulation

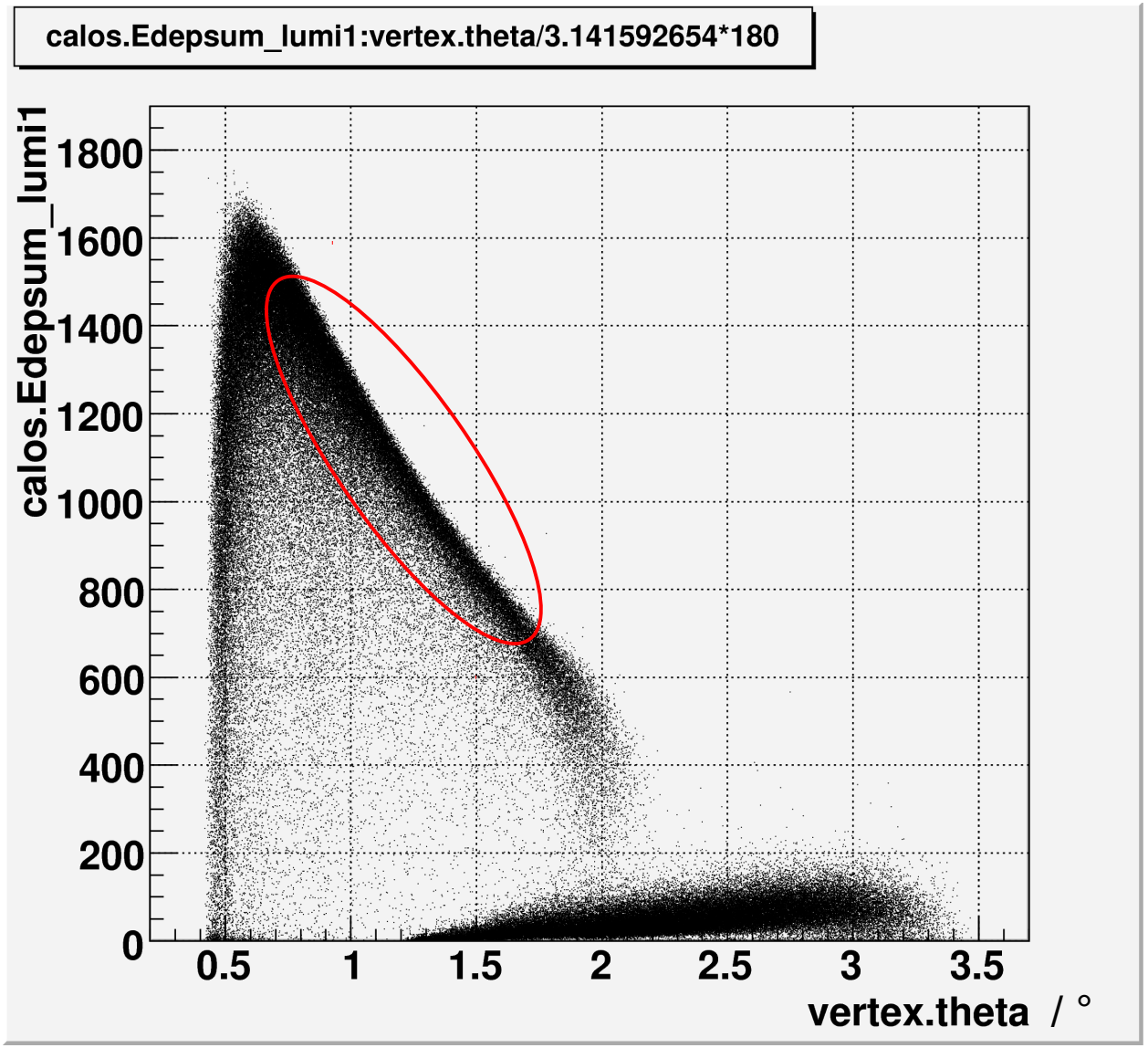


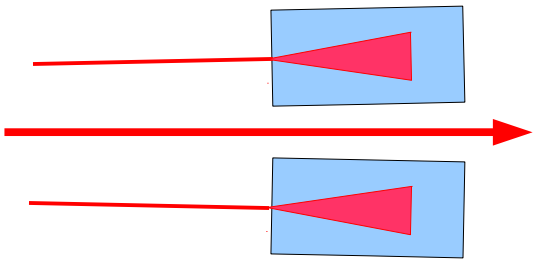
Energy (MeV) vs. lab angle for “primary” particle



Triangular target density distribution

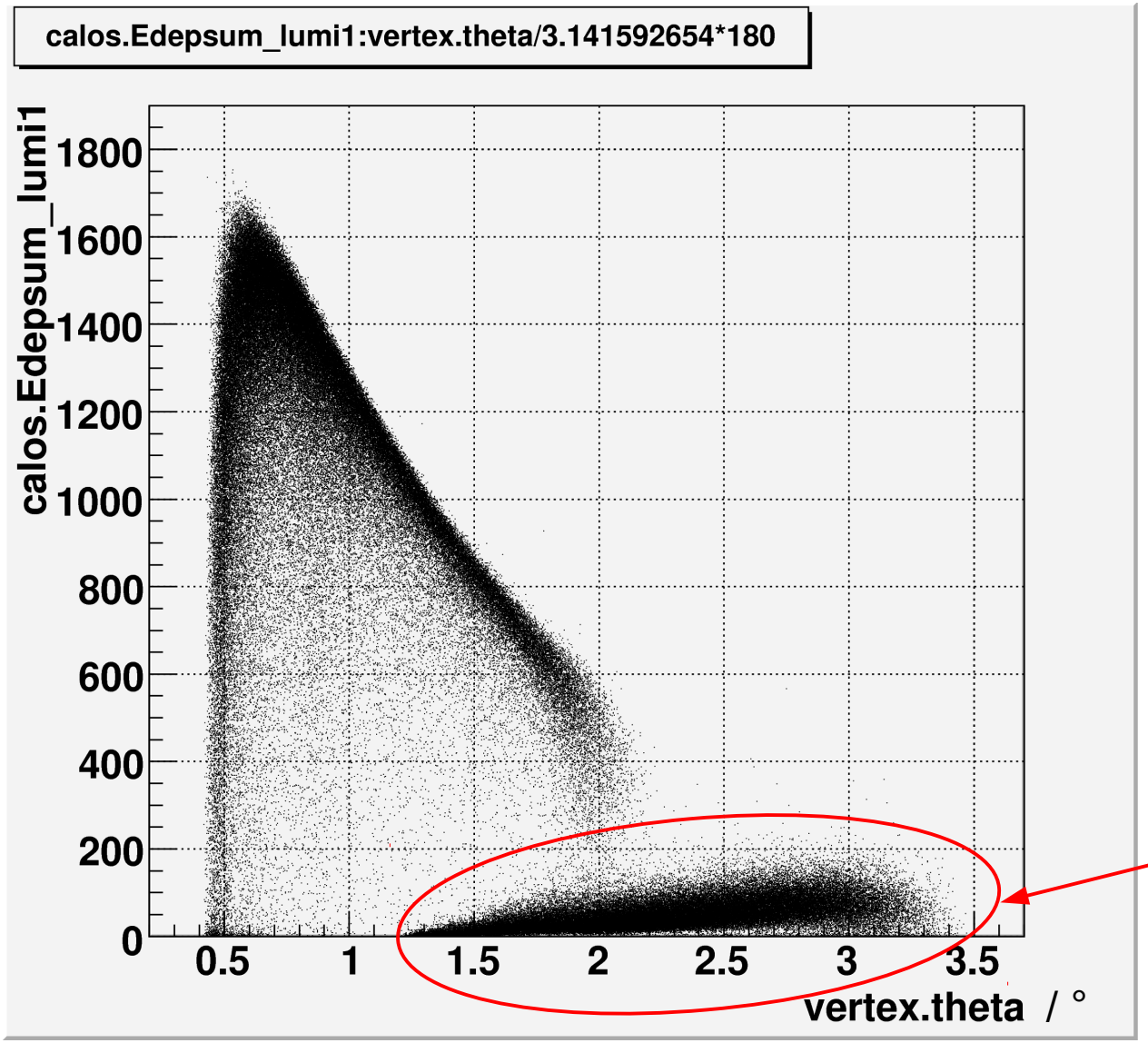
Moller events as seen by detectors

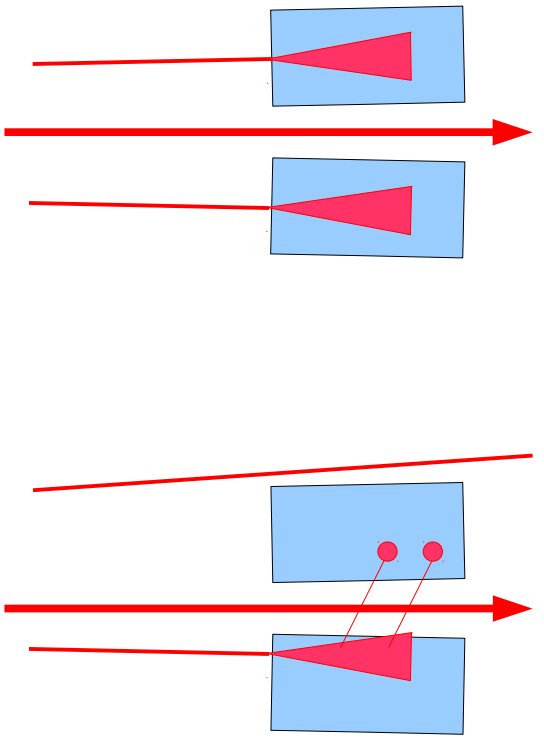




Edep in lumi 1 vs. scattering angle of particle 1

Moller events as seen by detectors

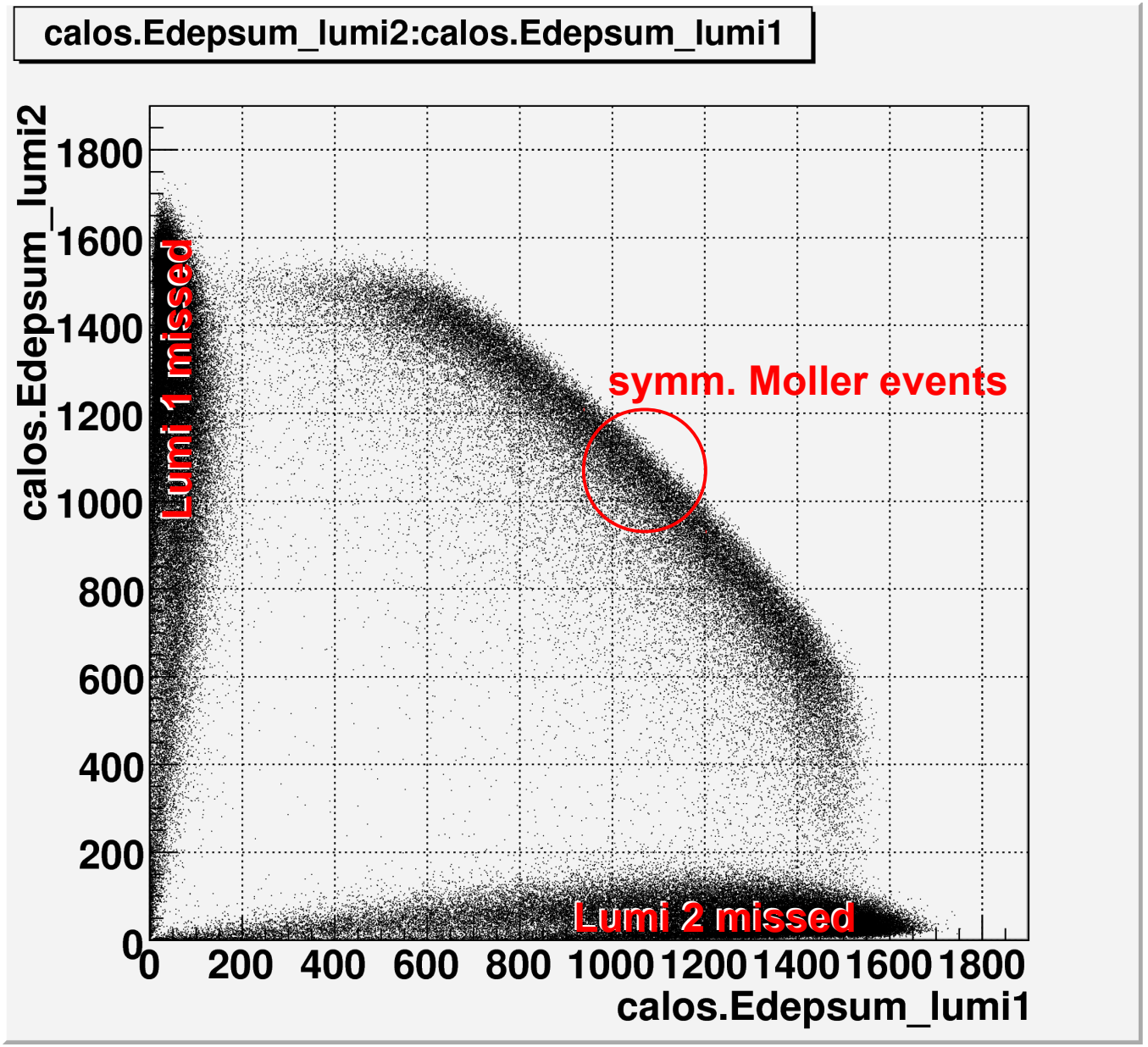




Shower leakage from lumi 2

Edep in lumi 1 vs. scattering angle of particle 1

Moller events as seen by detectors



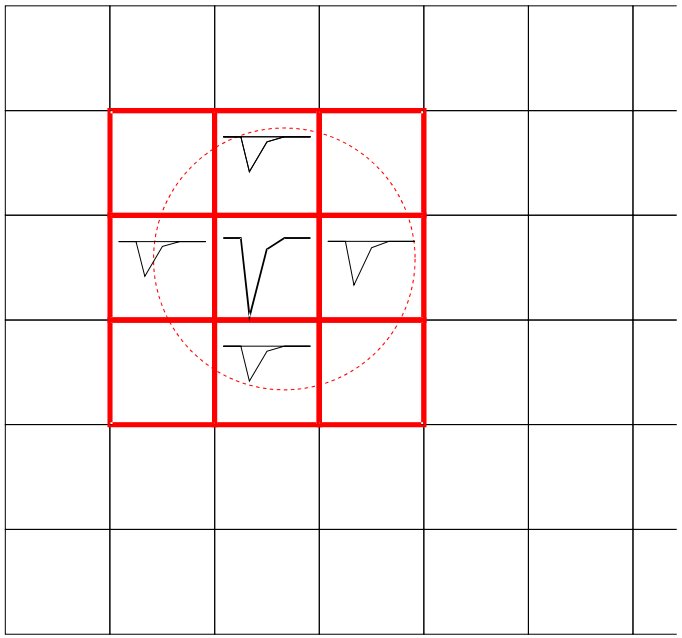
Local maximum trigger

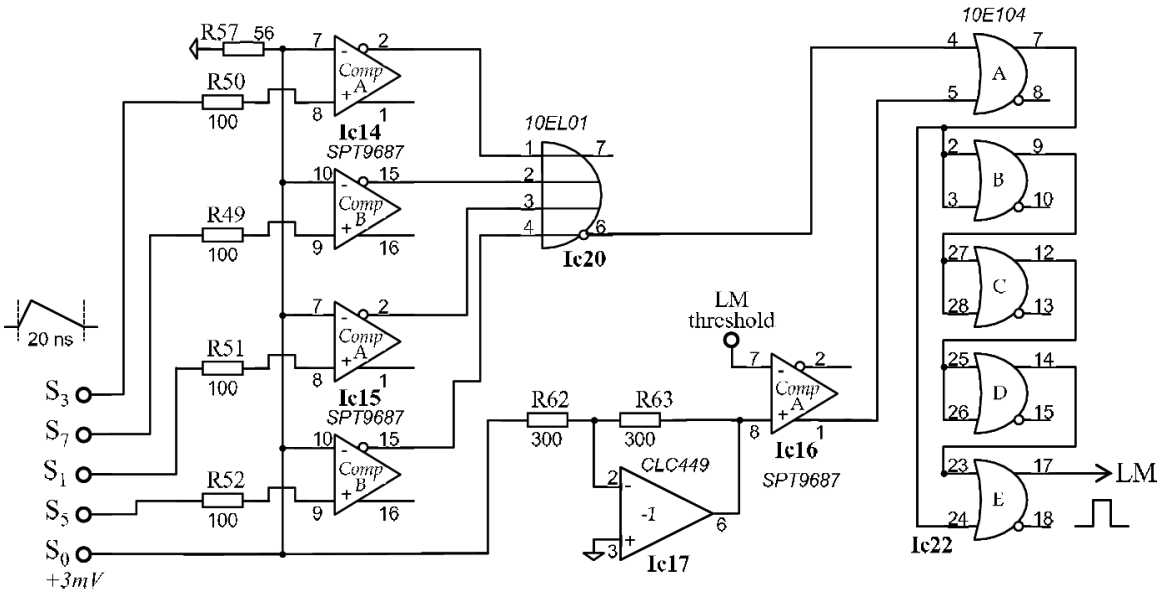
Select symmetric Moller events with

- local maximum (LM)

  and / or

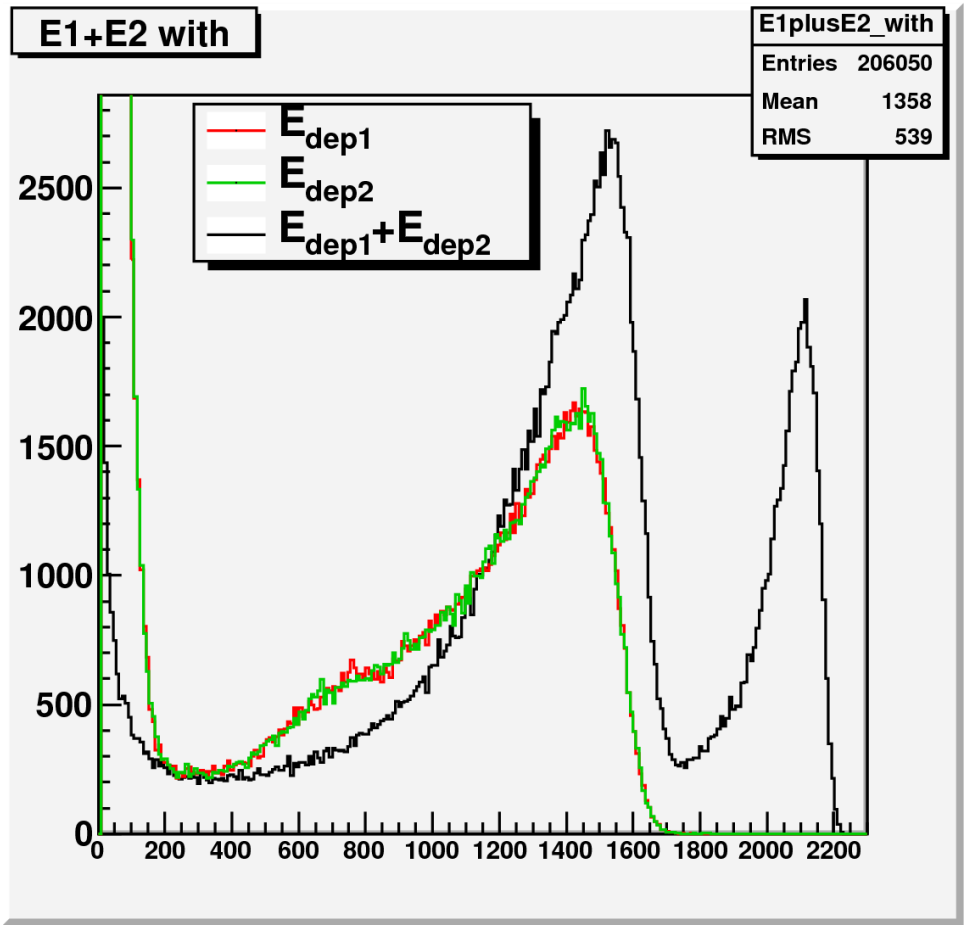
- collimator (s. David's talk)

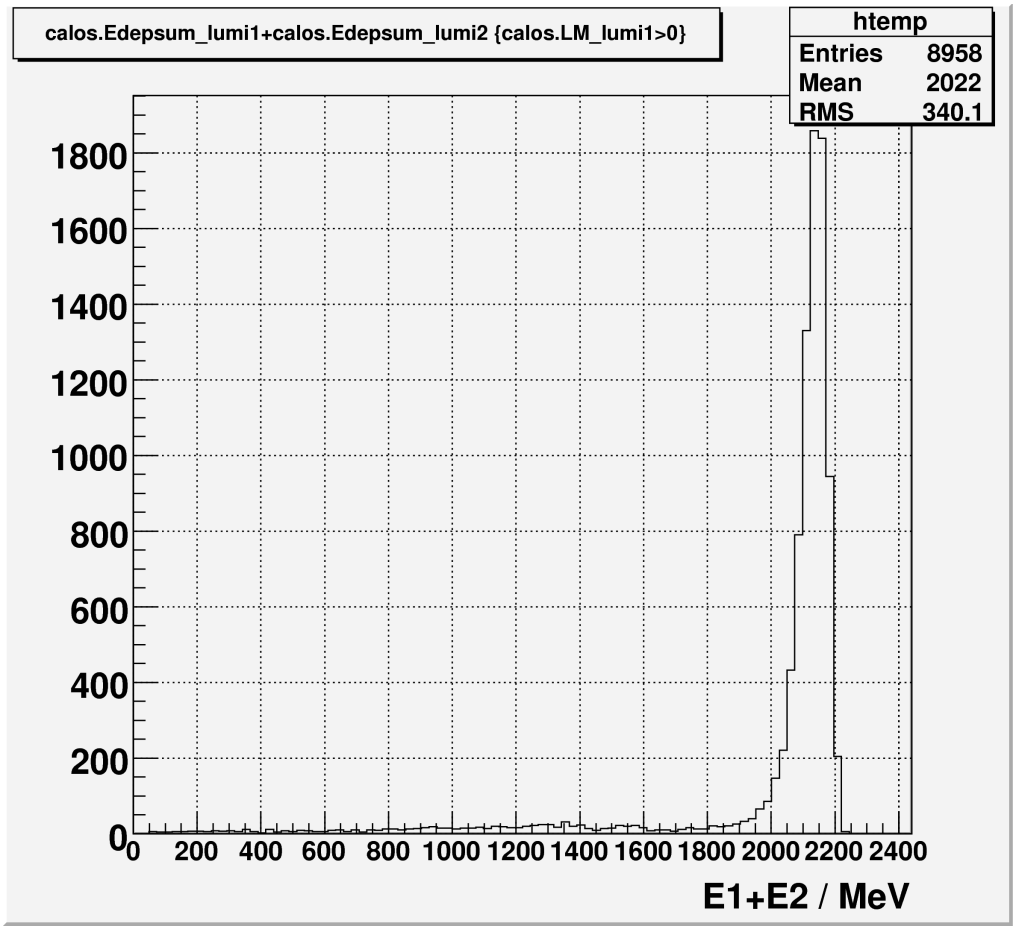




Local maximum to select symm. Moellers

Sum of deposited energy lumi 1 plus lumi 2 should give Ebeam





many events with *E1+E2<Ebeam*
(one particle missing the detector)

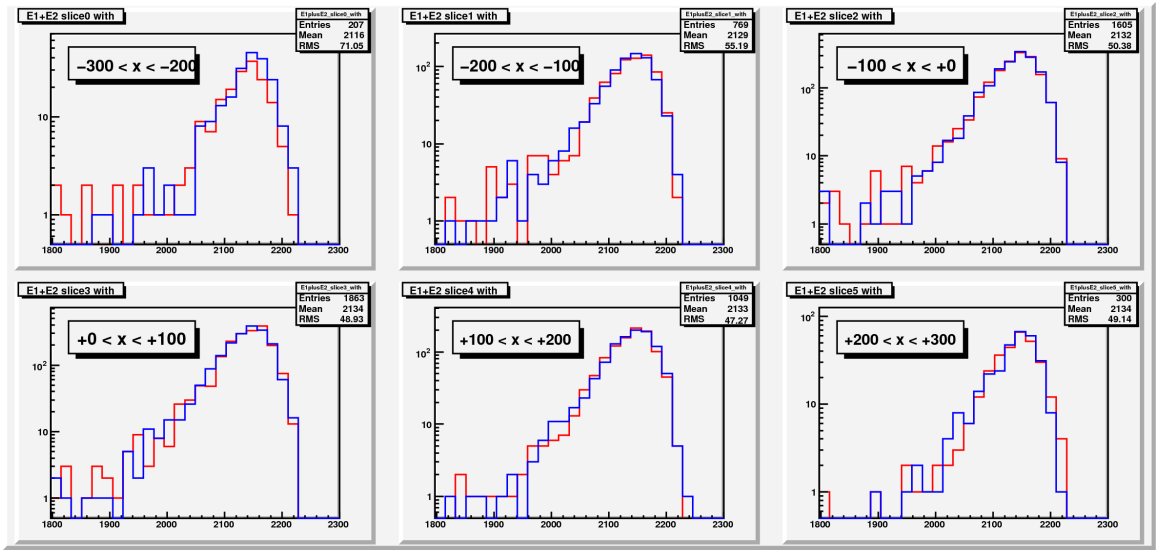
"local maximum" (LM)
condition fulfilled

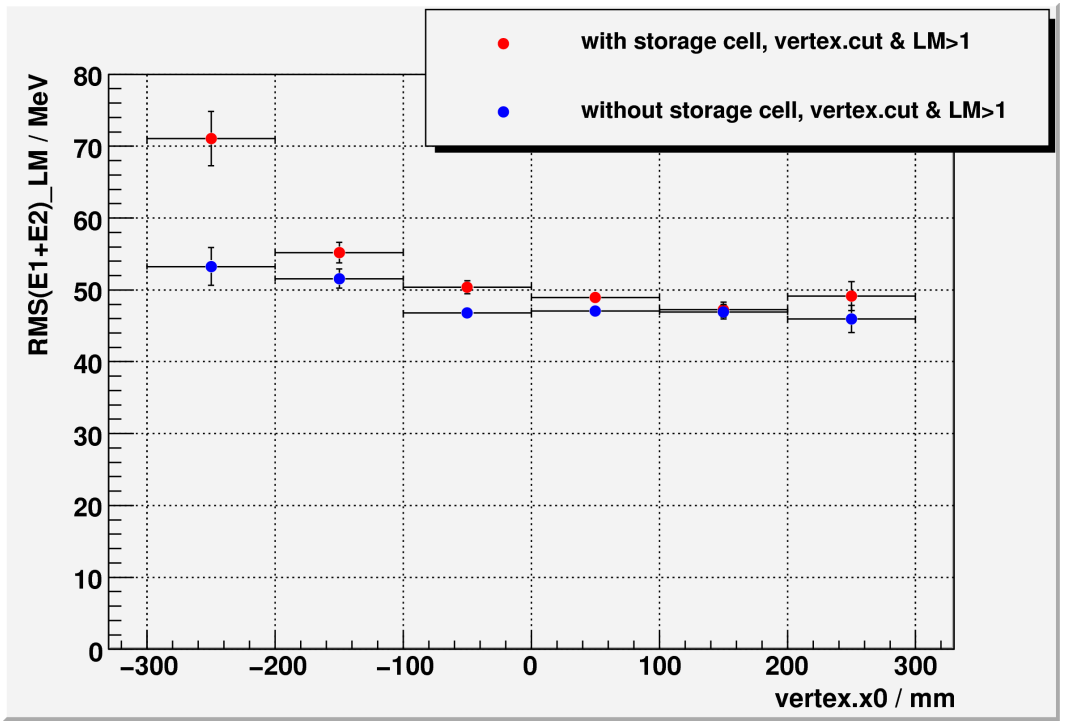
Storage cell scattering

Cuts on vertex position along target cell:

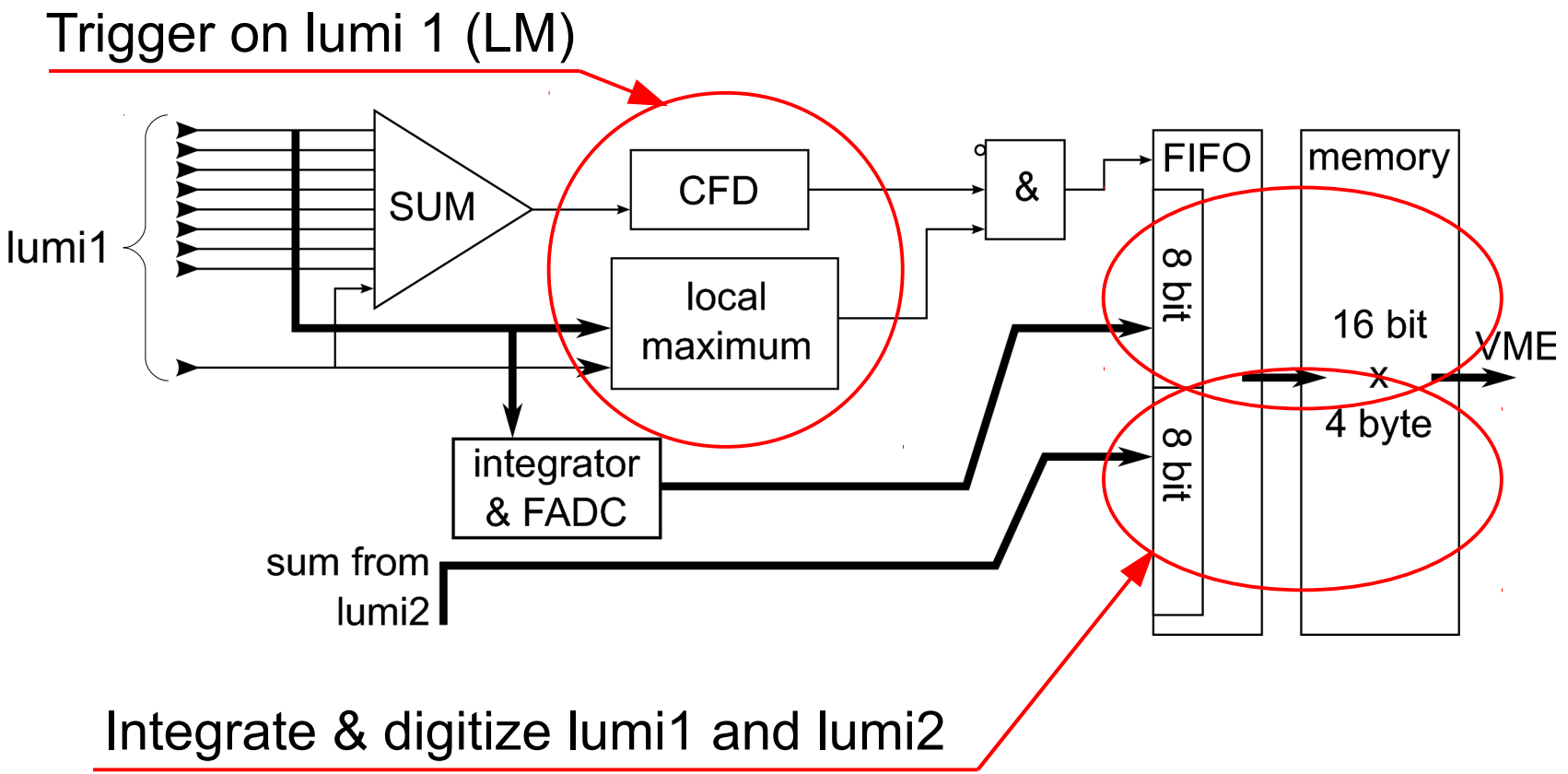
Moller electrons from upstream events need to pass through target storage cell

no serious effect





Readout electronics

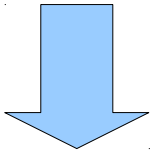


AND: Trigger on lumi 2 (LM), integrate & digitize lumi1 and lumi2

Need 2x2 “PVA4” analog cards
plus one histo card
plus 18 channels of five-fold fanouts

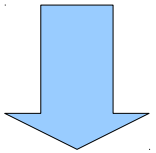
Test of readout electronics

- ANALOG: at least 2 frames, 7 analog cards per frame
- HISTOGRAMMING: at least one histogramming module (7 channels)



Basic tests successful:

- setting of thresholds
- histogramming
- memory readout



To do:

- rewrite documentation (for readout software)
- connect two cards for combined readout of two lumis
- test beamtime at MAMI (?)