Studies of the Monolithic Crystals

Youcef Hadjarab[1], Kevin Li[1], P. Murat[2]

[2]Fermilab

May 1, 2013

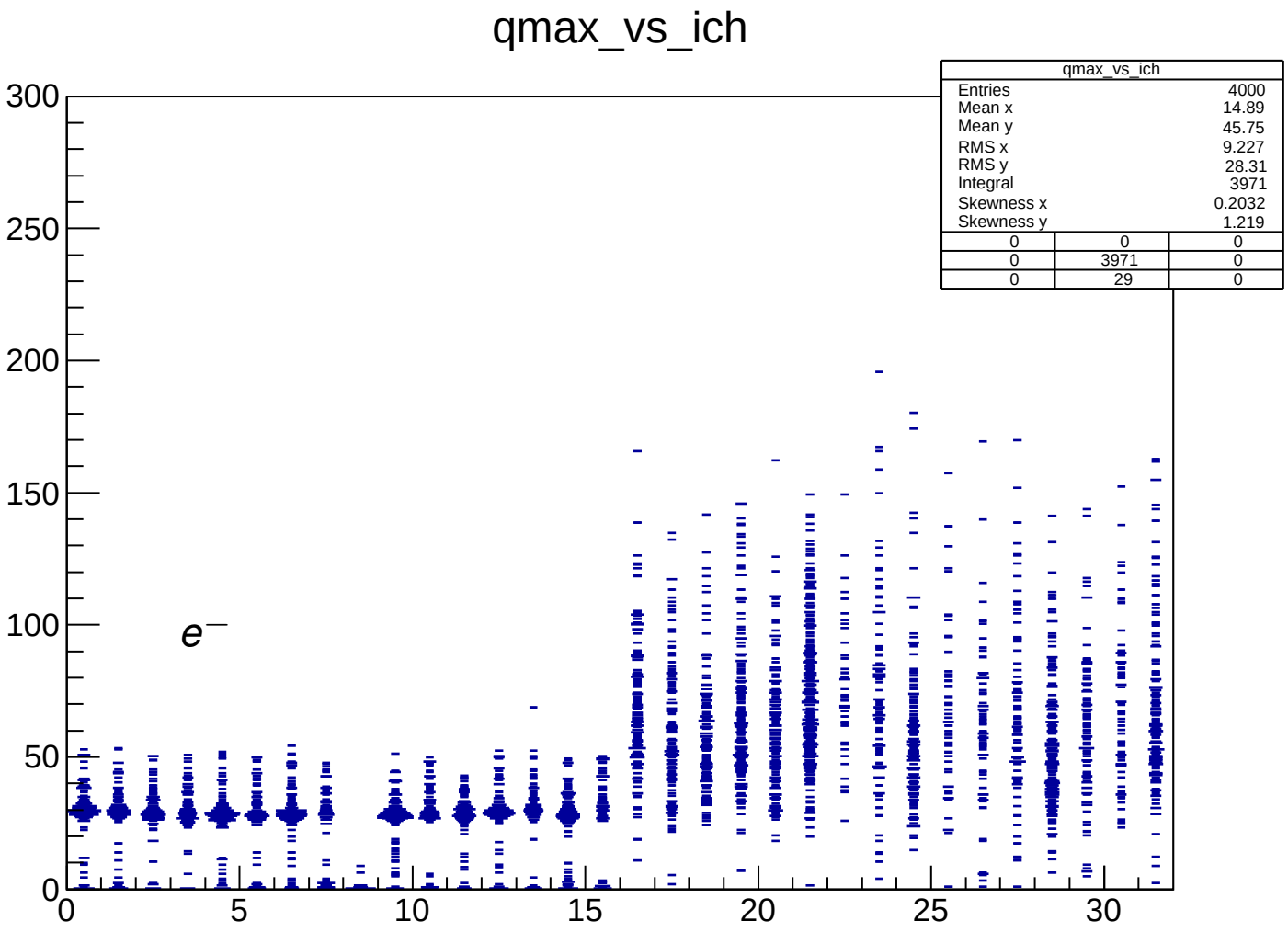
Introduction

- monolithic crystals are interesting

The beam spot size

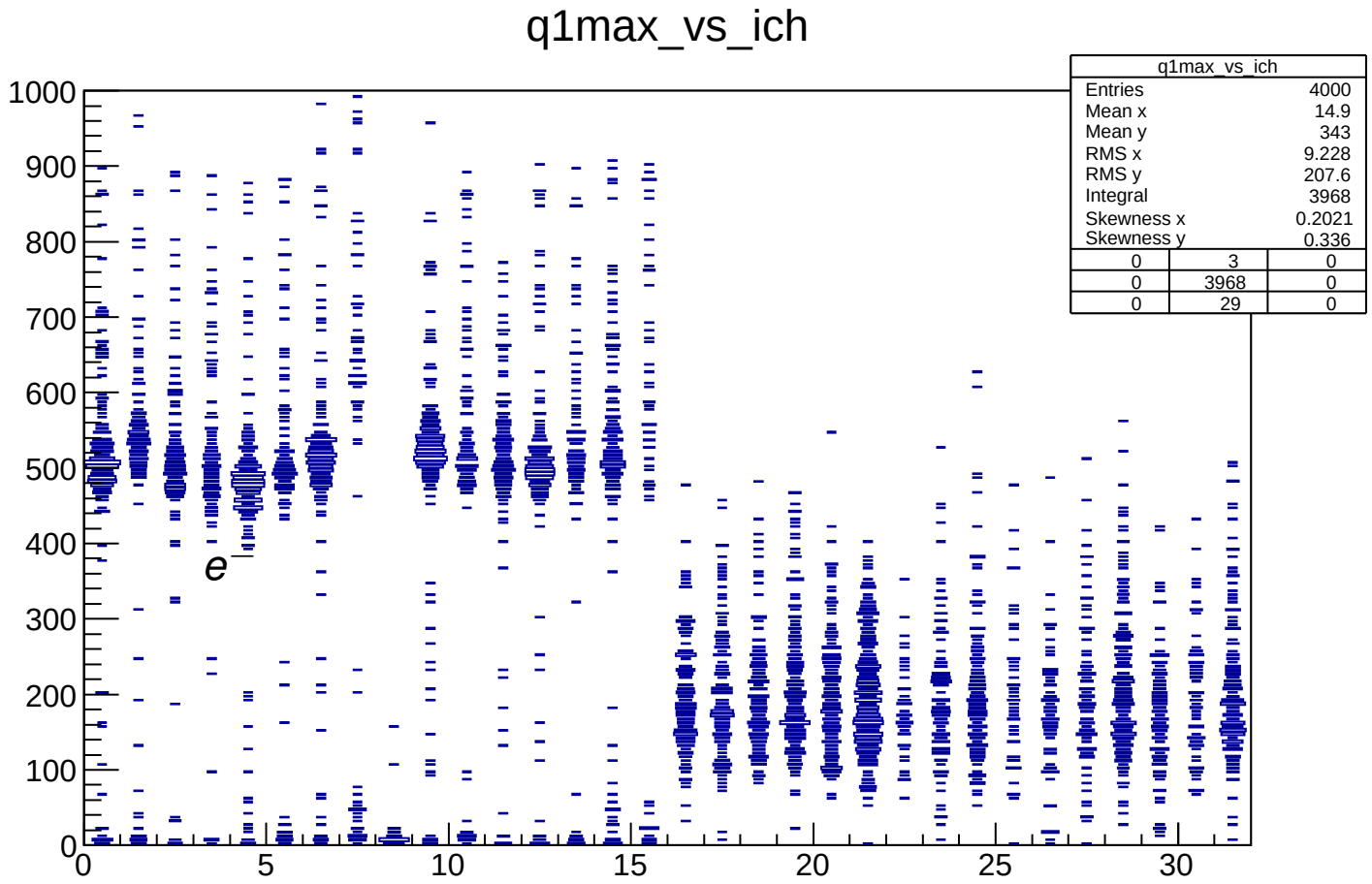
- needs to be measured
- then subtract in quadrature from the measured widths of the residual distributions
- use LYSO 4x4 $\approx$ 18x16x15 mm matrix on one side, and a 20x20x10 single crystal on another
- use two-stage amplification for the monolithic crystal , second stage adds x10

Calibration - QMAX



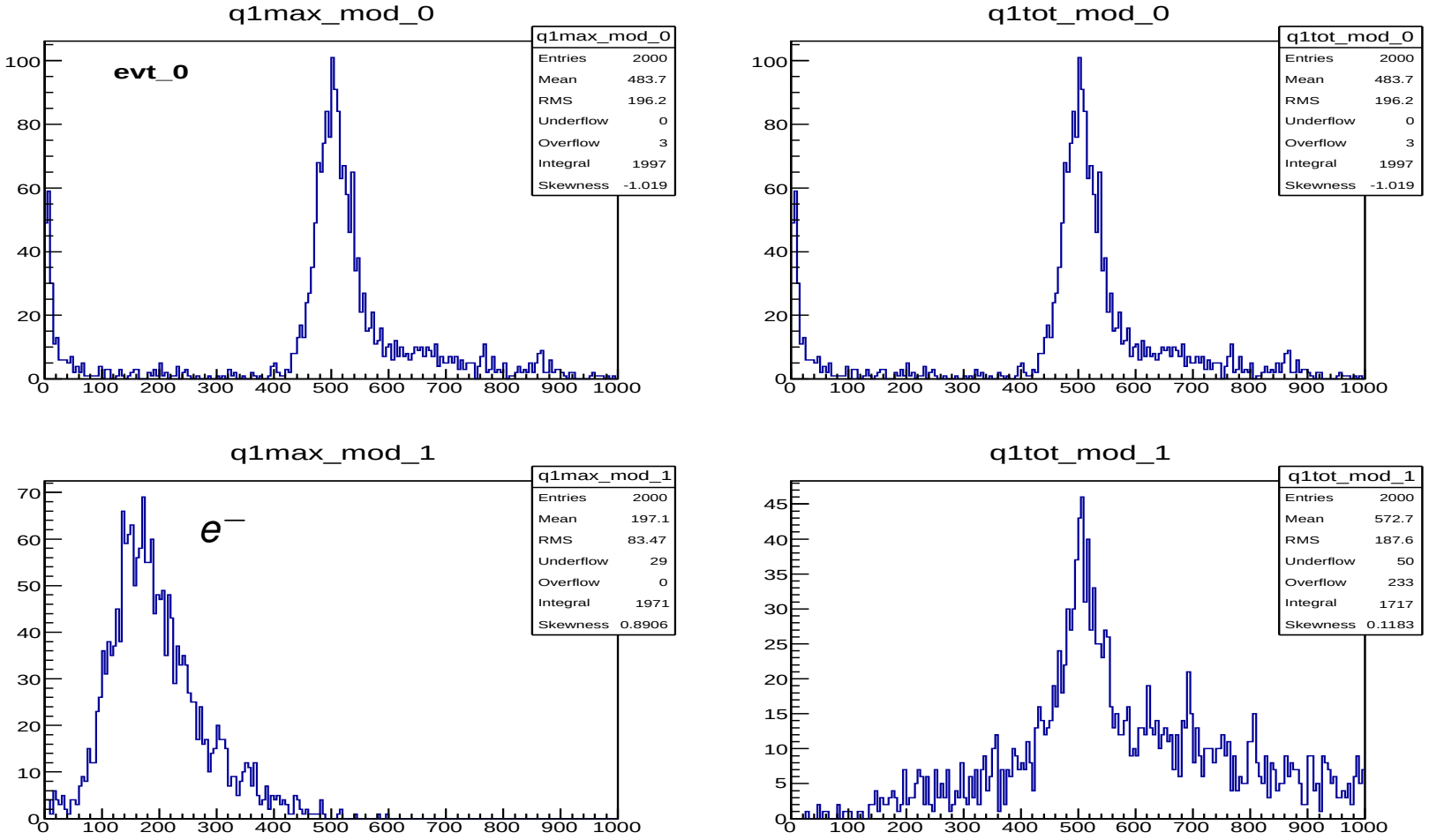
- new page

Calibration - Q1MAX



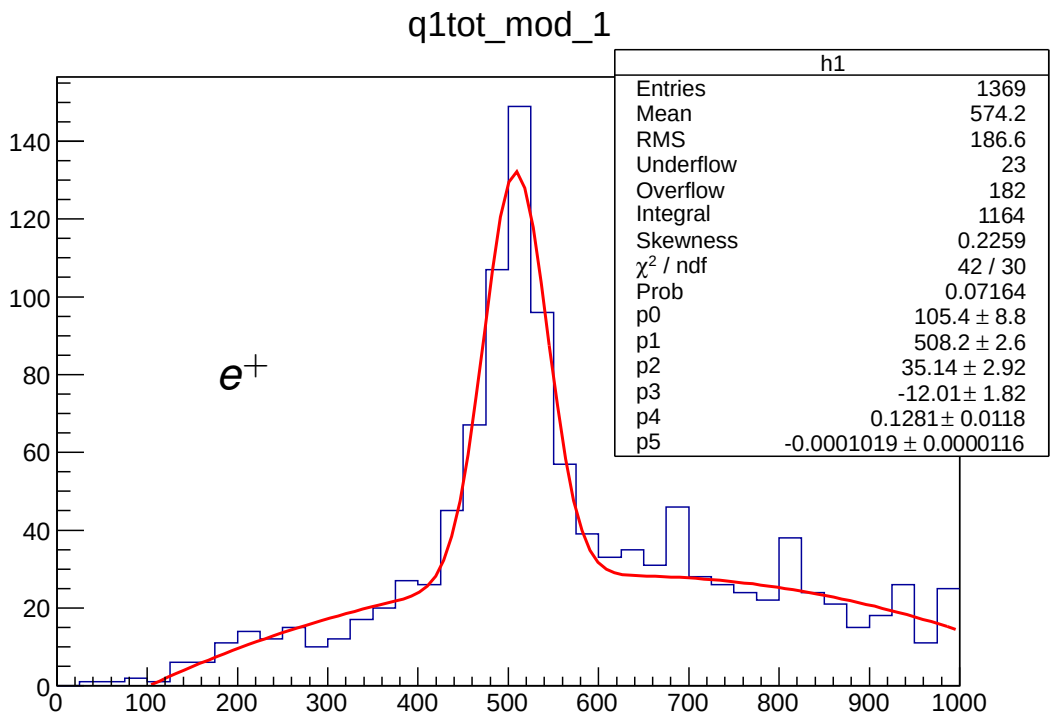
- the matrix calibration can be tuned a little bit
- can try to “align” channels reading the monolithic crystal - DONE.

Normalized Energy depositions - max channel and total



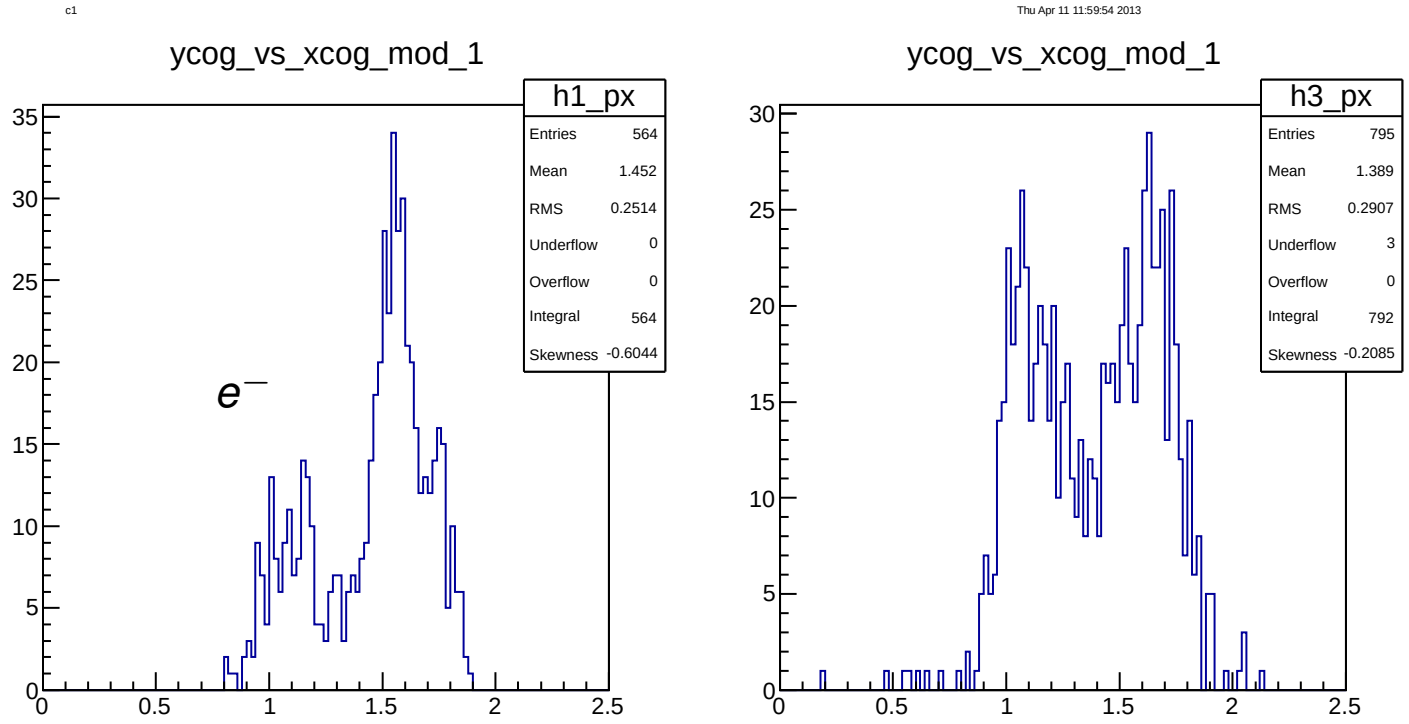
- what is the tail on the matrix side?
- low Q entries on the matrix side?

First steps



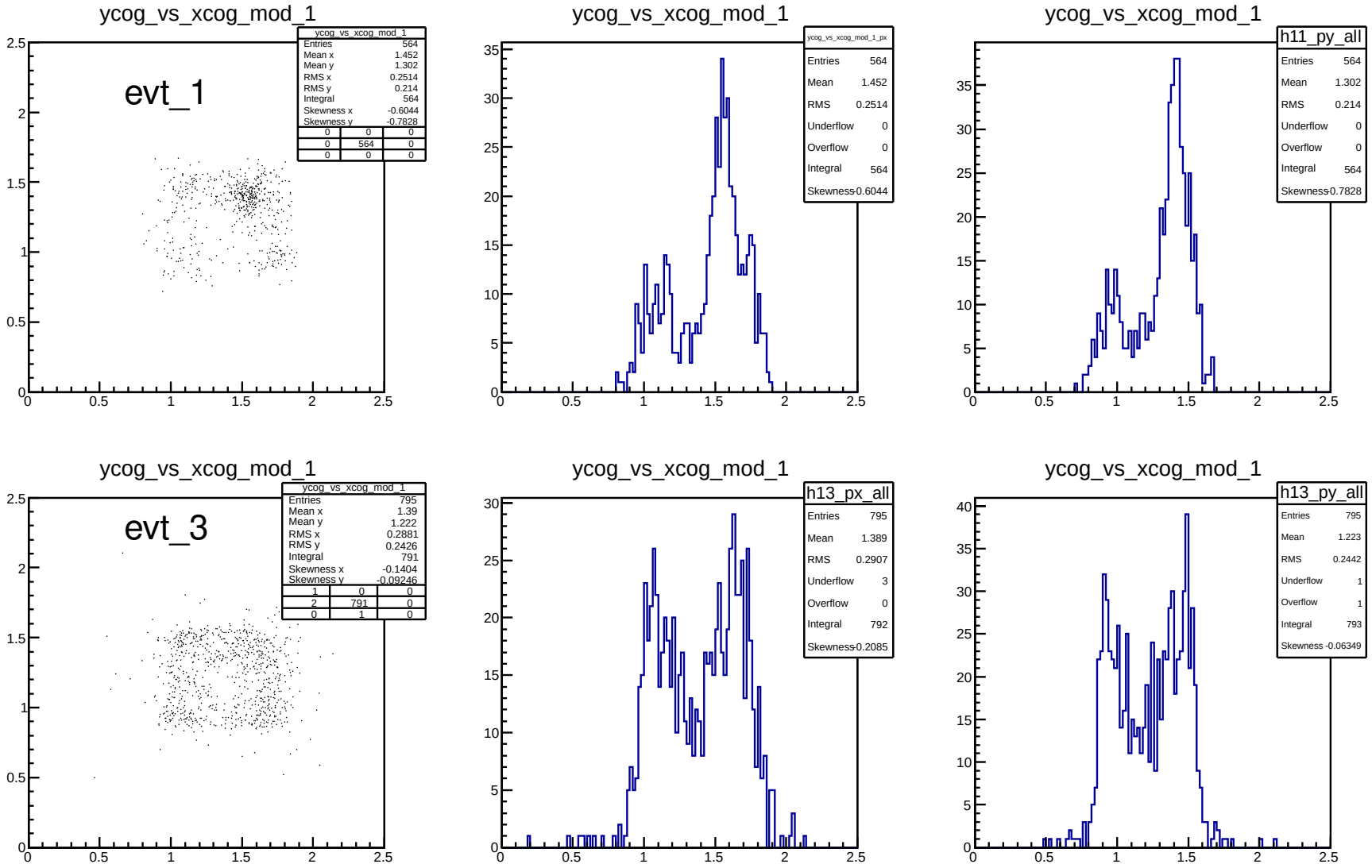
- signal on the monolithic crystal side - resolution of about 16% FWHM

Background subtraction - X-projections



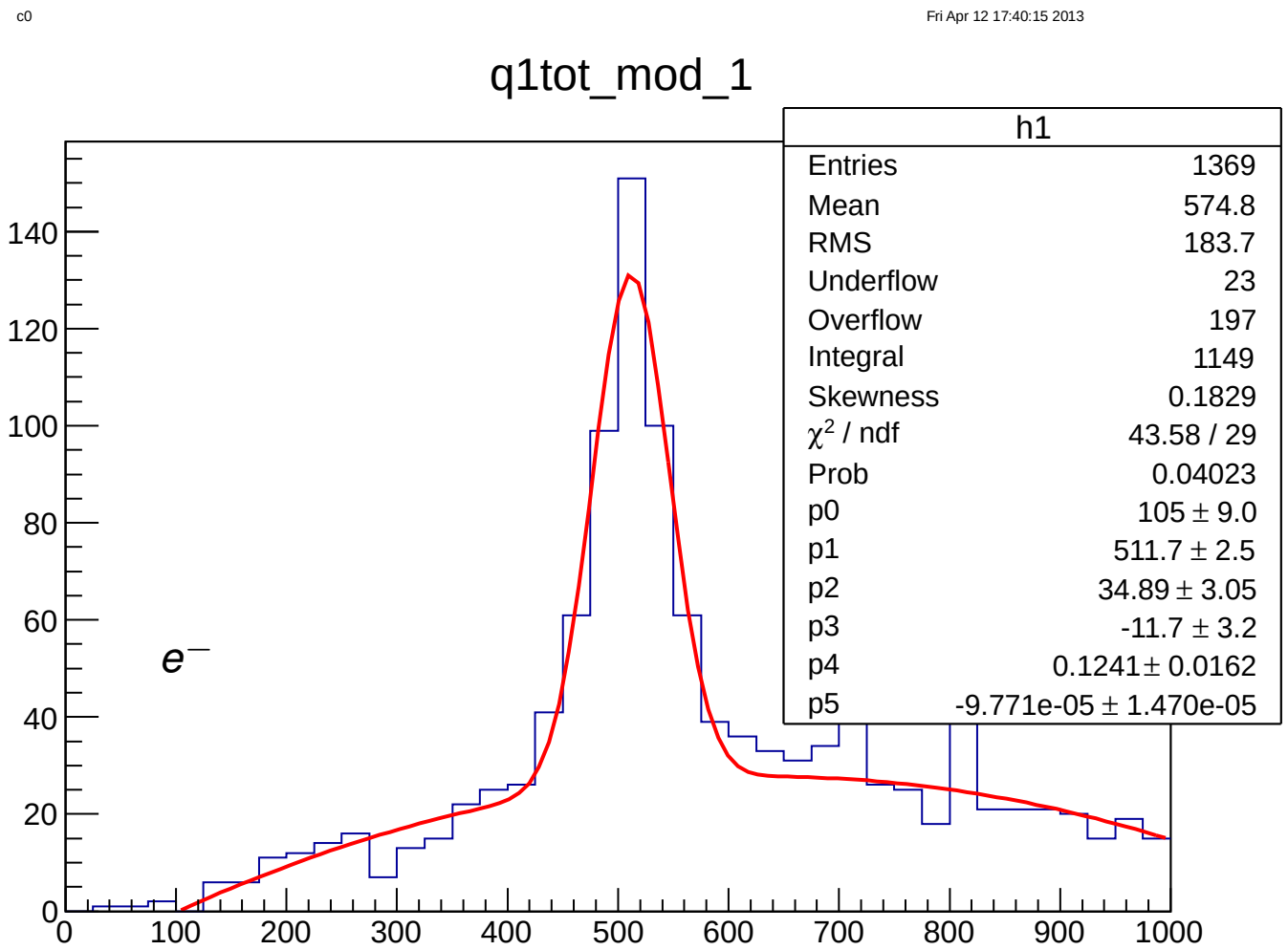
- left: X projection of the Y:X distribution on the monolithic crystal side, photopeak
- right: same, but monolithic crystal side outside the photopeak

Y_{COG} vs X_{COG}



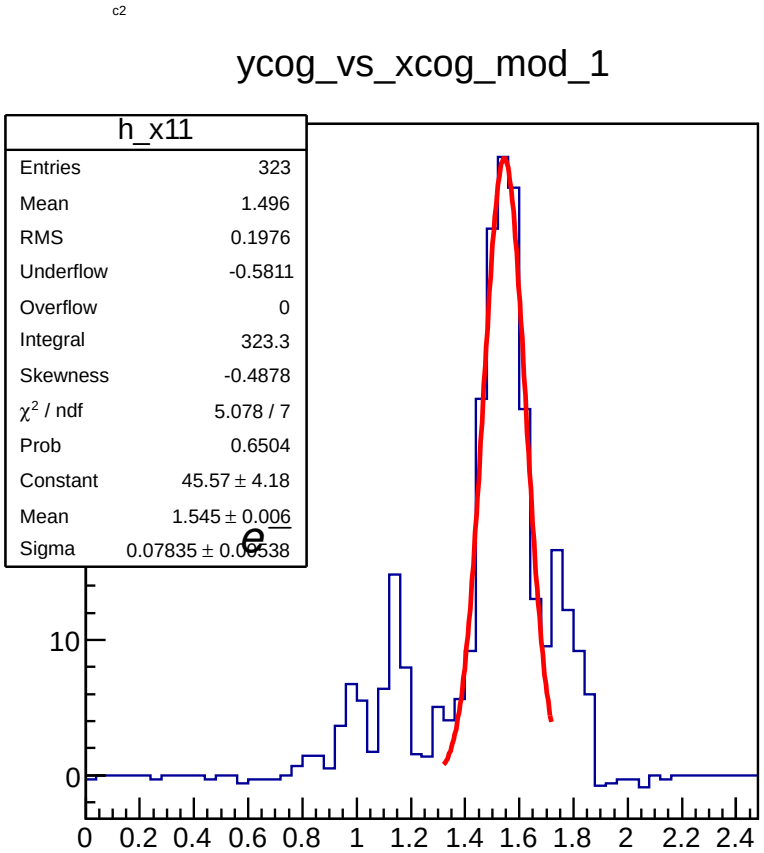
- origin of the background not quite clear
- however, it can be subtracted

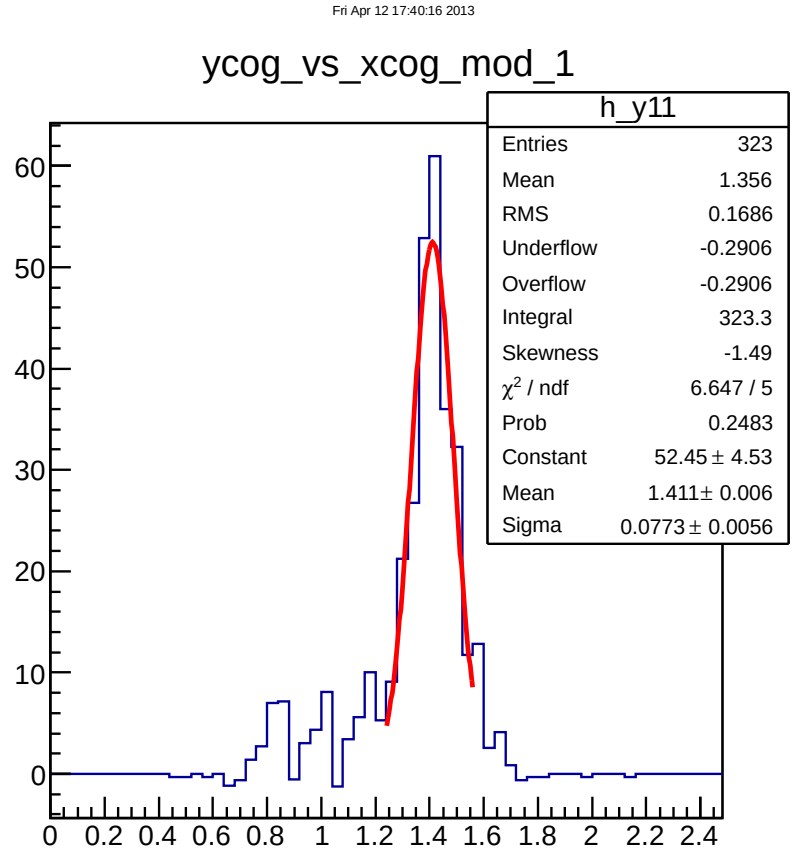
Fit evt_2 distribution in Q1TOT



- resolution in the photopeak - 16% FWHM
- Q: what is the long tail above the photopeak?

Resolutions





- widths after background subtraction: $\sigma \approx 0.8 \pm 0.1$ mm in both X and in Y
- uncertainty - guesstimate
- background not fully subtracted on the X side, need more statistics
- origin of the background? - noise?

Summary

- residual distributions have widths σ 0.8mm in both X and Y directions
- collimator beam size $\sigma \approx 0.55\mathrm{mm}$
- expect the coordinate resolution to improve