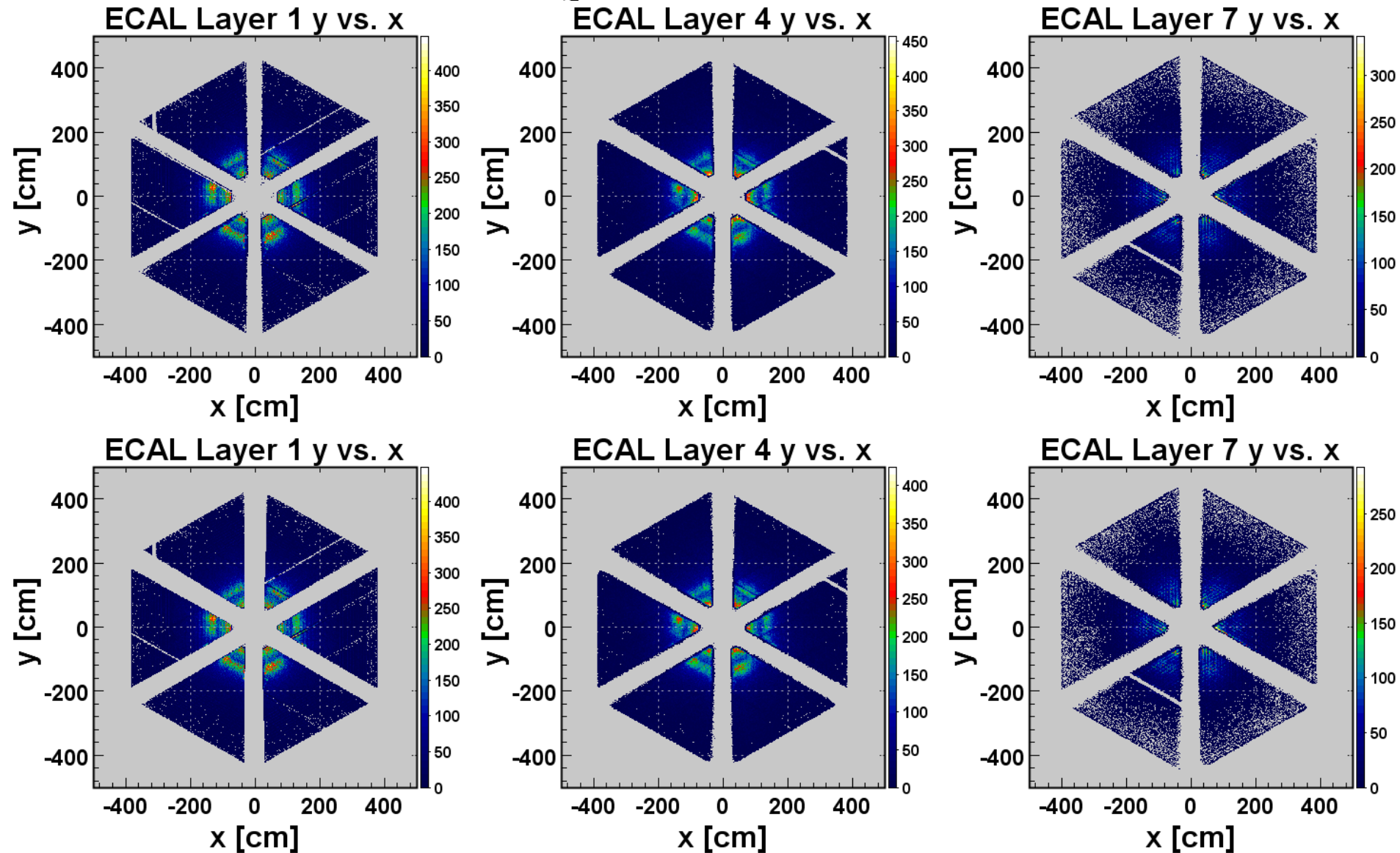# Fiducial Cuts for DVCS Photons RG-K 6.5 GeV and 7.5 GeV DVCS Wagon

Joshua Artem Tan

08 June 2022
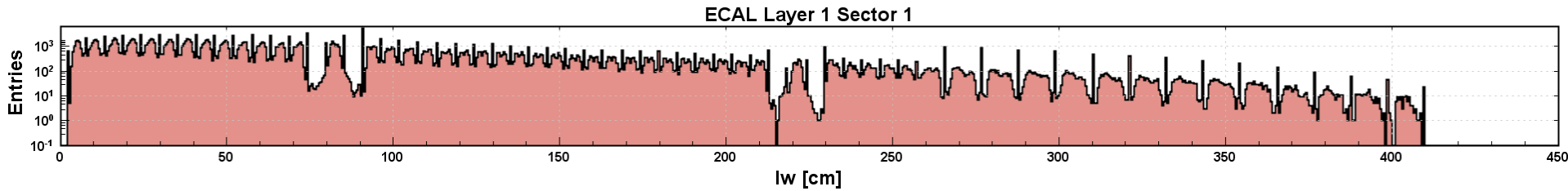
ECAL Fiducial Cuts:
RG-K 6.5 GeV and 7.5 GeV DVCS Wagon
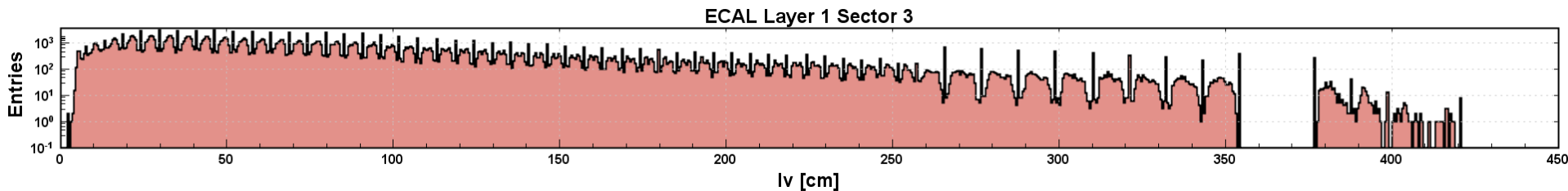
ECAL Boundary Fiducial Cuts

ECAL surface hit map of γ before (top) and after (bottom) implementing boundary fiducial cuts based on sampling fraction (SF).
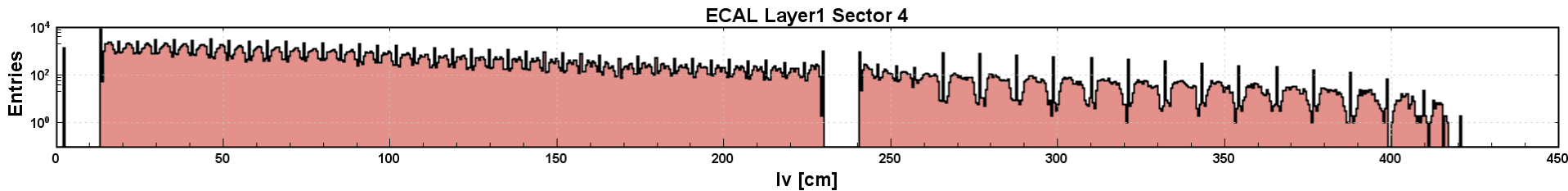
Faulty ECAL Channels

ECAL Layer 1 Sector 1

Faulty channel positions {(74.5,79.5), (85.5,90.5), (213,218), (224.5,229.5)} cm: cable swapped channels

ECAL Layer 1 Sector 3

Faulty channel position (354.5,376.5) cm: dead channel

ECAL Layer1 Sector 4

Faulty channel position 13) cm: (practically) dead channel

ECAL Faulty Channels: Sector 1

Sector	Layer	Orientation	Position [cm]
1	1	lu	-
		lv	-
		lw	(74.5,79.5), (85.5,90.5), (213,218), (224.5,229.5), (410
	4	lu	-
		lv	(70, 93)
		lw	-
	7	lu	(410.5
		lv	24), (36.5,60), (411
		lw	21.5)

$(a$ means $> a$
$b)$ means $< b$
(a, b) means $> a$ and $< b$

ECAL Faulty Channels: Sector 2

Sector	Layer	Orientation	Position [cm]
2	1	lu	-
		lv	(102, 113)
		lw	-
	4	lu	(396
		lv	-
		lw	(363
	7	lu	12)
		lv	-
		lw	10.5), (376

ECAL Faulty Channels: Sector 3

Sector	Layer	Orientation	Position [cm]
3	1	lu	-
		lv	(354.5,376.5)
		lw	-
	4	lu	23)
		lv	-
		lw	10), (363
	7	lu	-
		lv	-
		lw	(387

ECAL Faulty Channels: Sector 4

Sector	Layer	Orientation	Position [cm]
4	1	lu	-
		lv	13), (230,240.5)
		lw	(410
	4	lu	-
		lv	-
		lw	20.5)
	7	lu	-
		lv	-
		lw	32.5)

ECAL Faulty Channels: Sector 5

Sector	Layer	Orientation	Position [cm]
5	1	lu	-
		lv	-
		lw	-
	4	lu	-
		lv	23)
		lw	10)
	7	lu	(193.5, 217)
		lv	24)
		lw	-

ECAL Faulty Channels: Sector 6

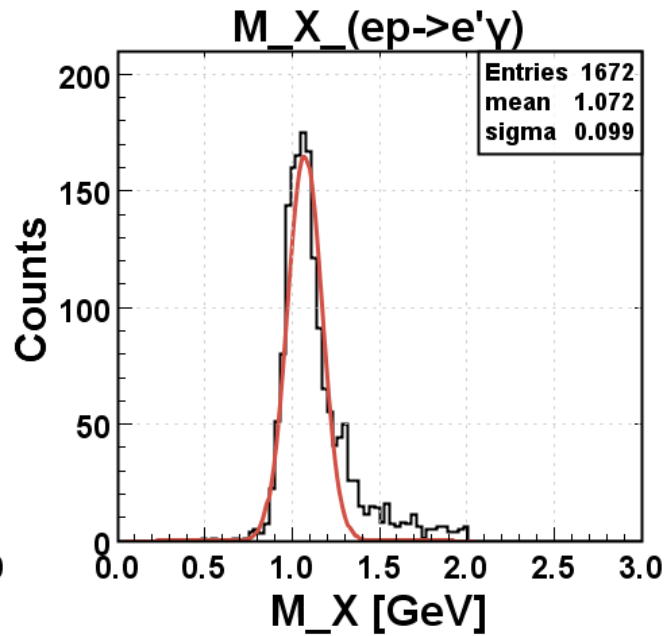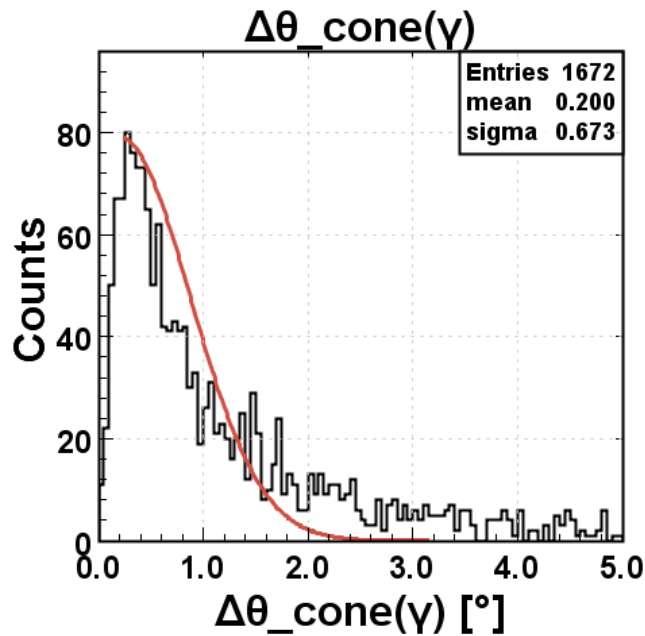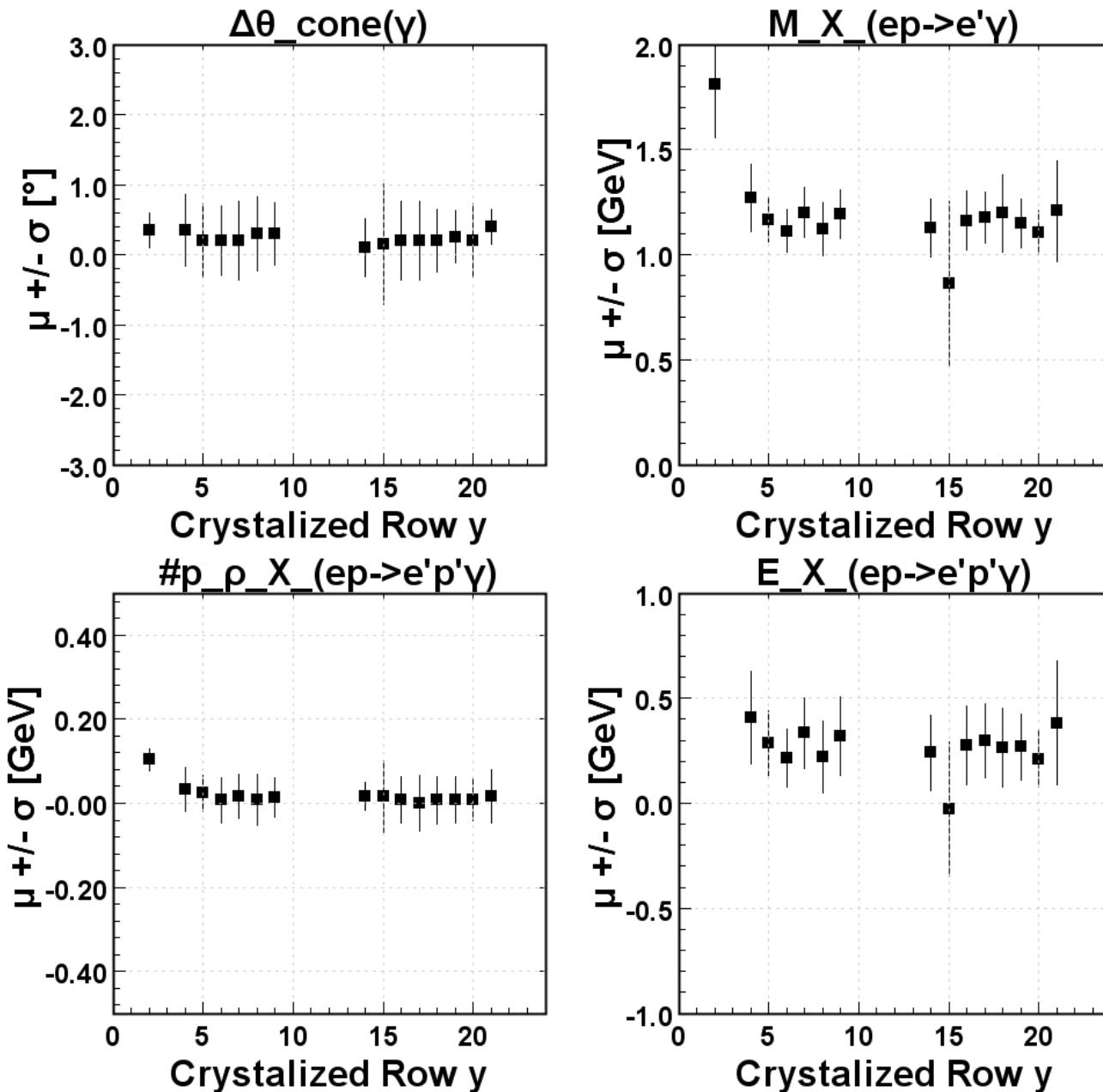| Sector	Layer	Orientation	Position [cm]
6	1	lu	-
		lv	-
		lw	(174.5,179.5), (185.5, 190.5)
	4	lu	-
		lv	11.5)
		lw	20.5)
	7	lu	-
		lv	12), (423
		lw	32.5)

FTCAL Fiducial Cuts:
RG-K 7.5 GeV DVCS Wagon
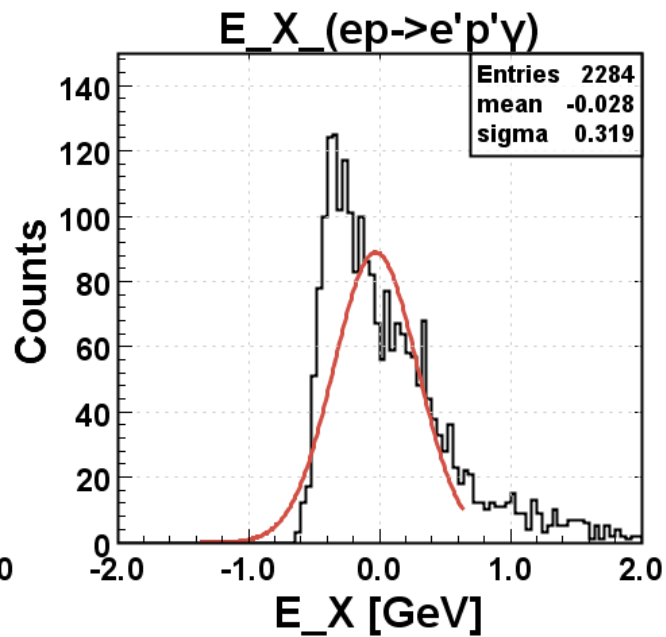
FTCAL: DVCS Wagon
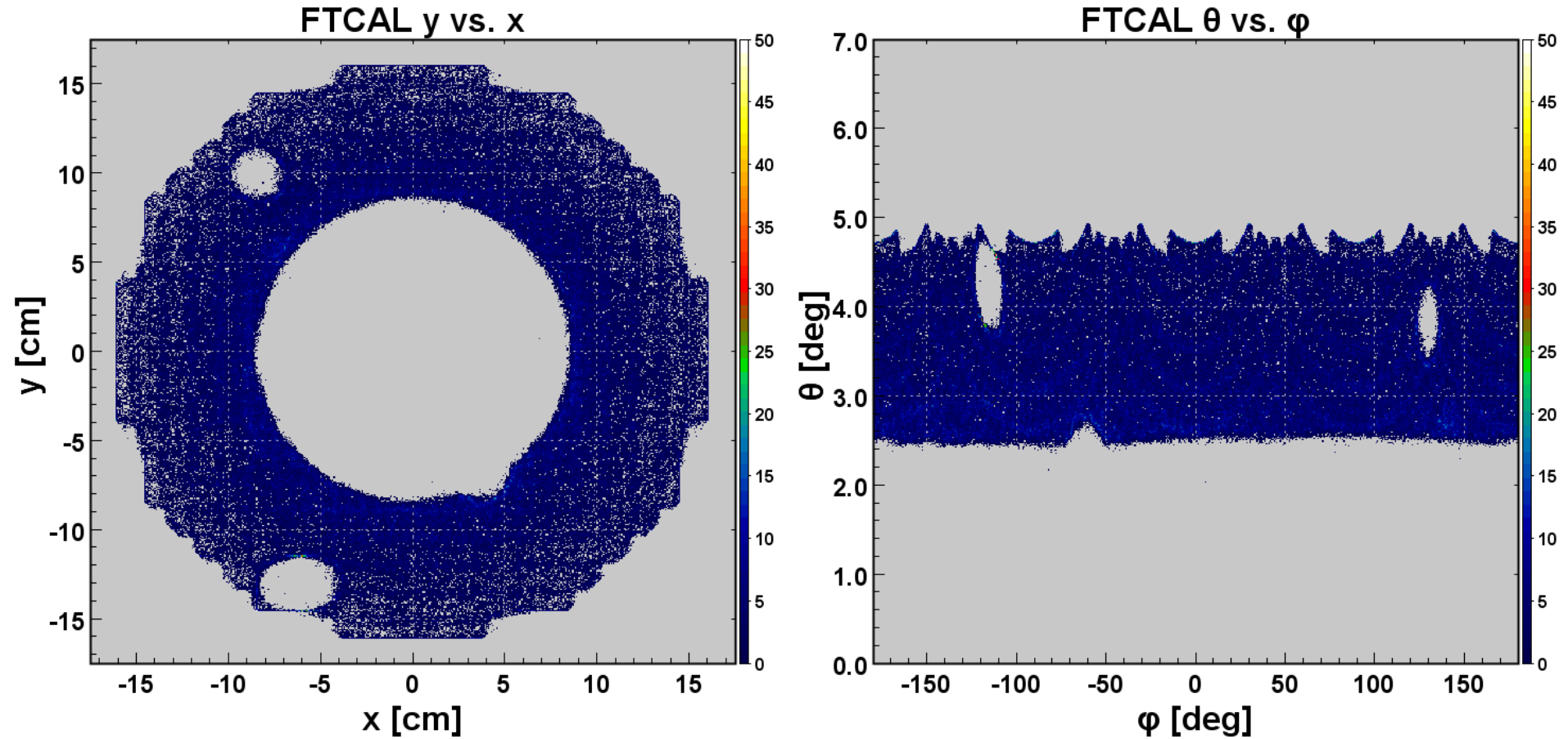
FTCAL: Crystal(ized) (x, y)
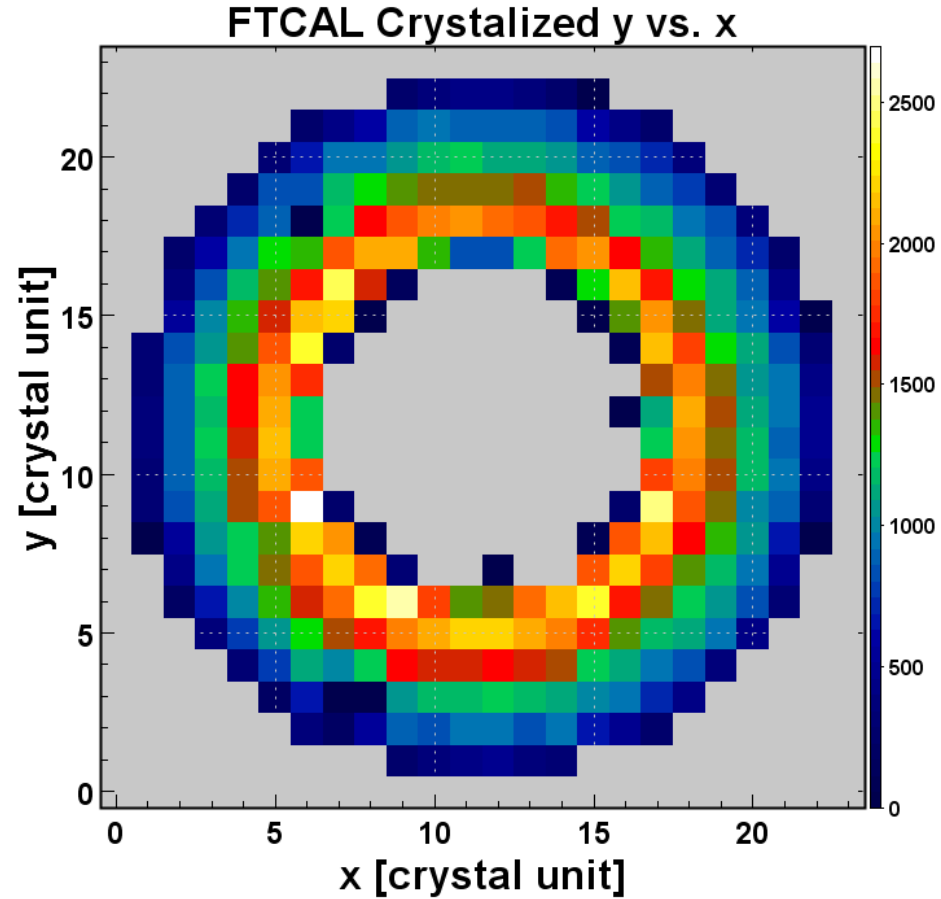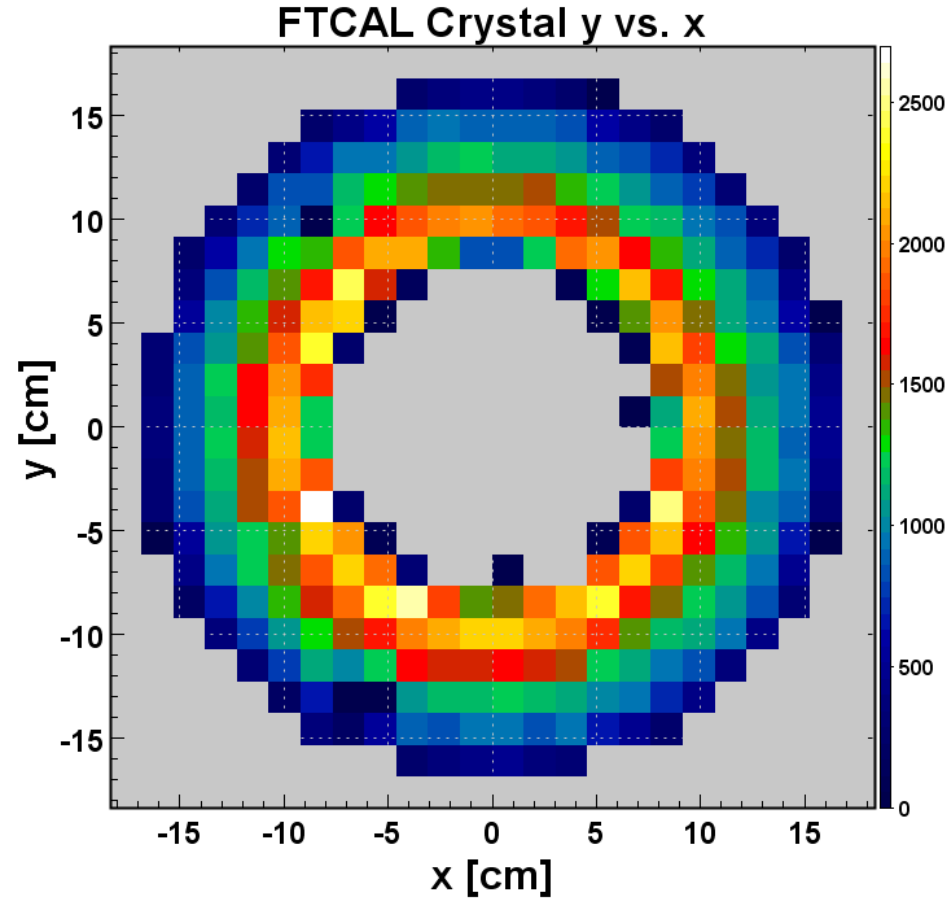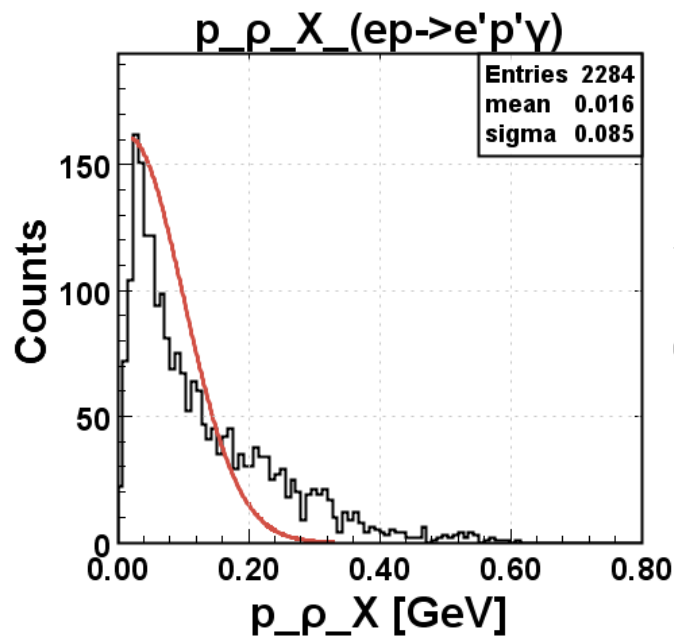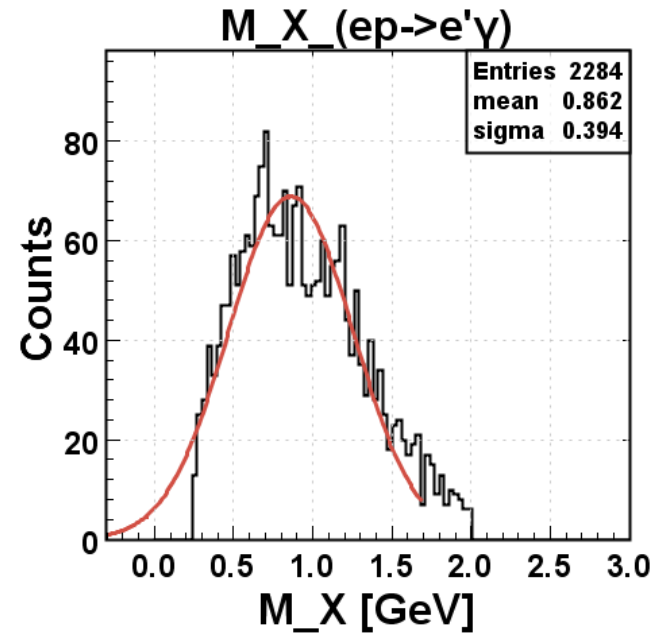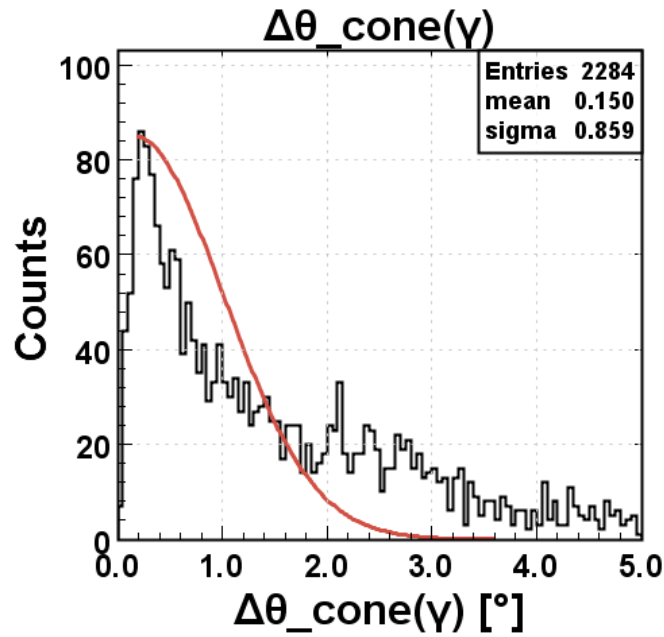
DVCS: Crystal Bin (4,12)
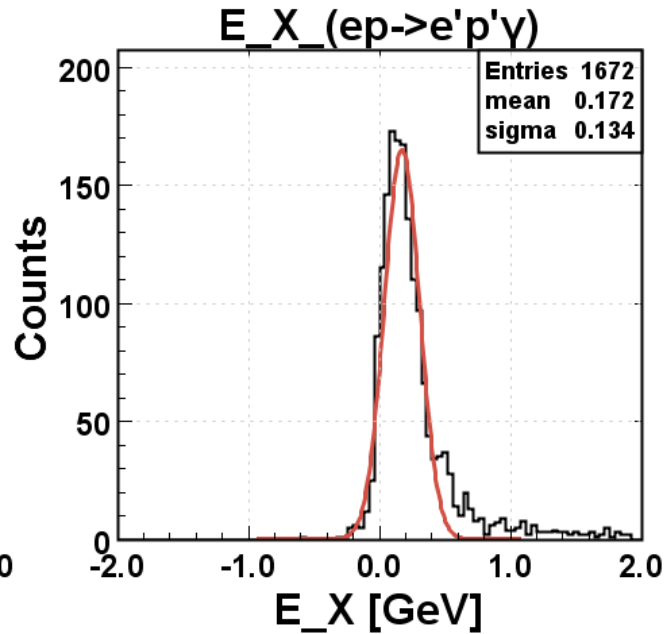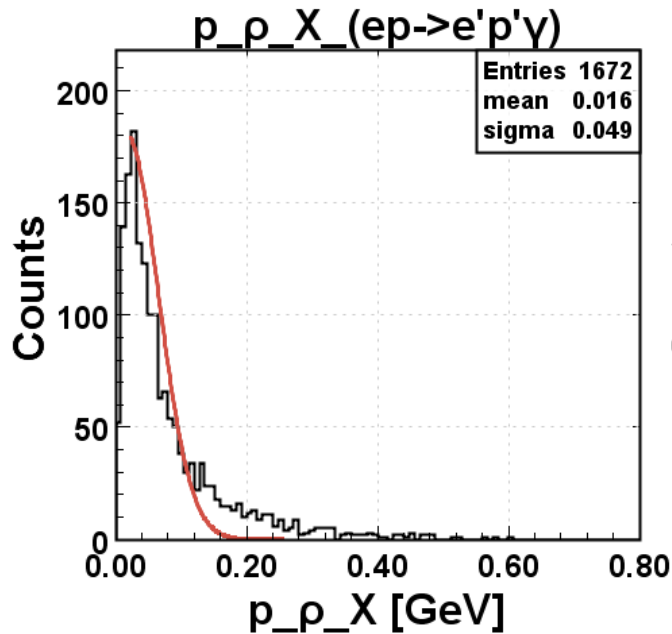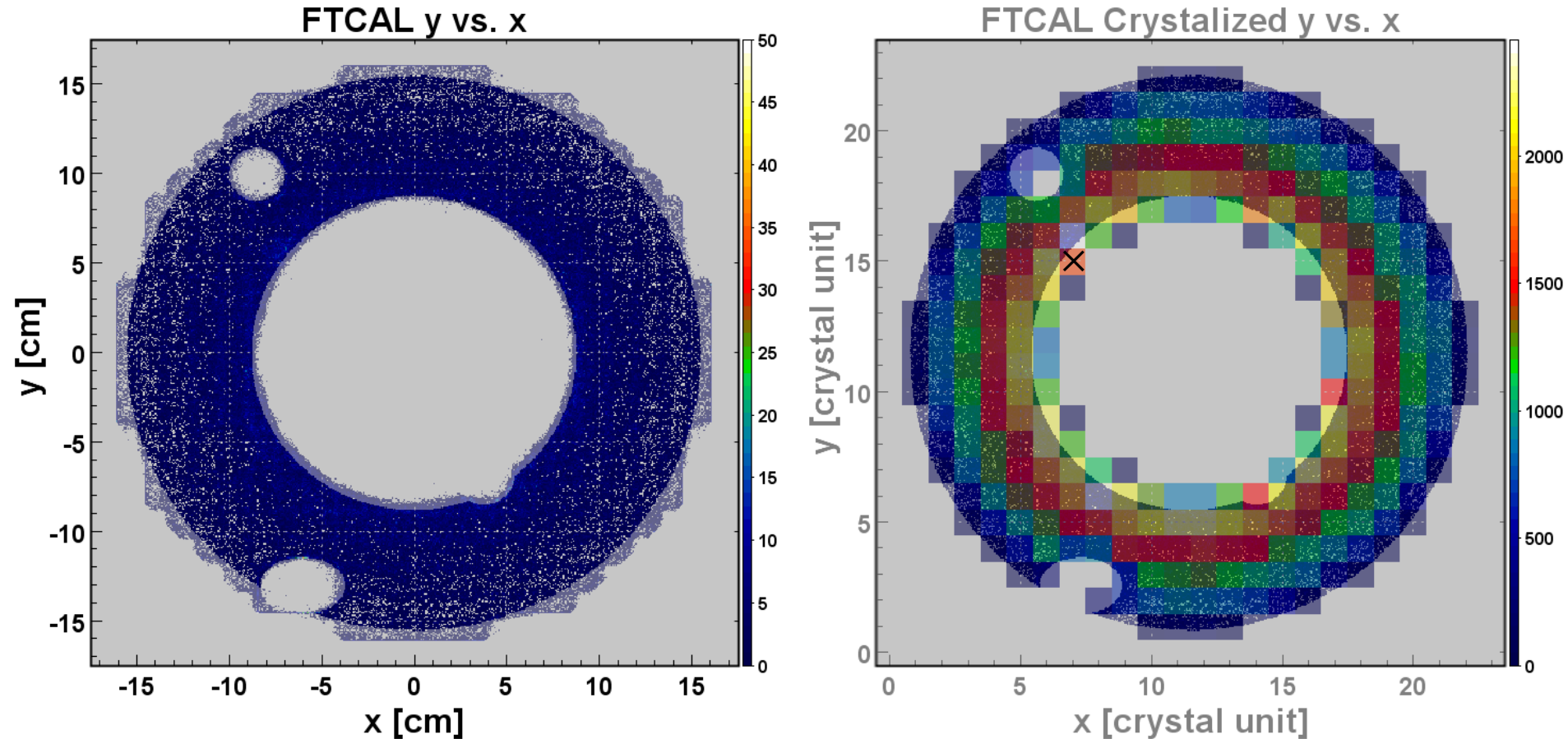
DVCS: Crystal Bin Strip x = 7

DVCS: Crystal Bin (7,2)
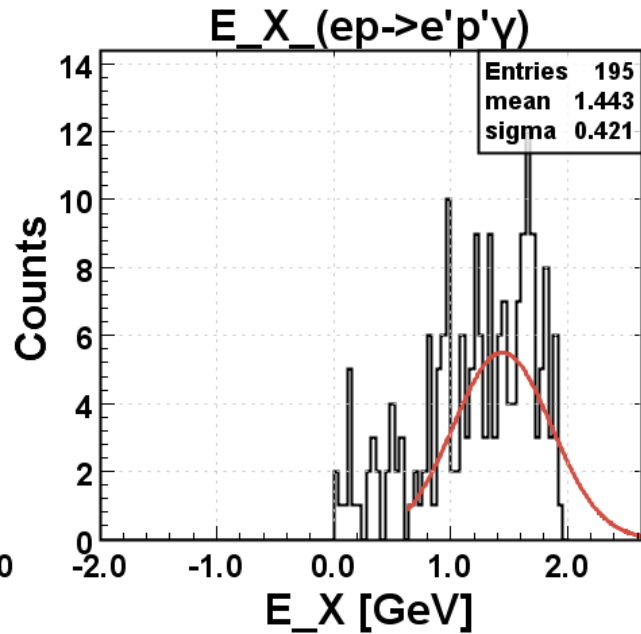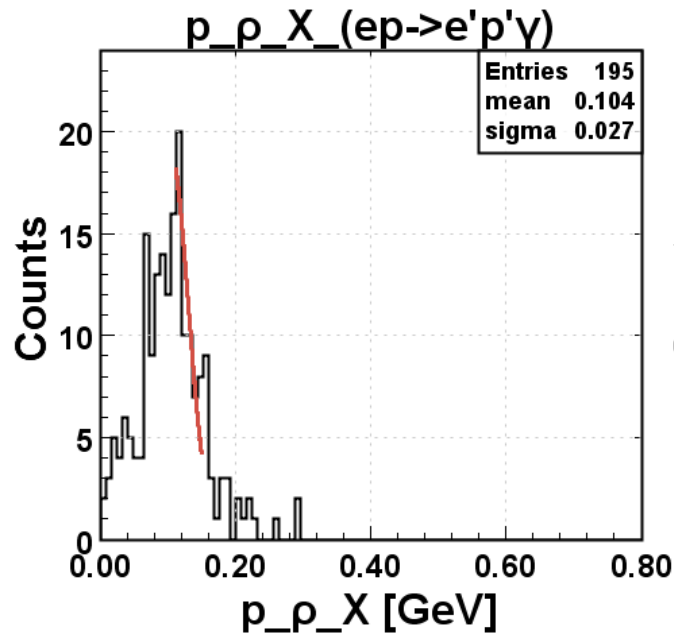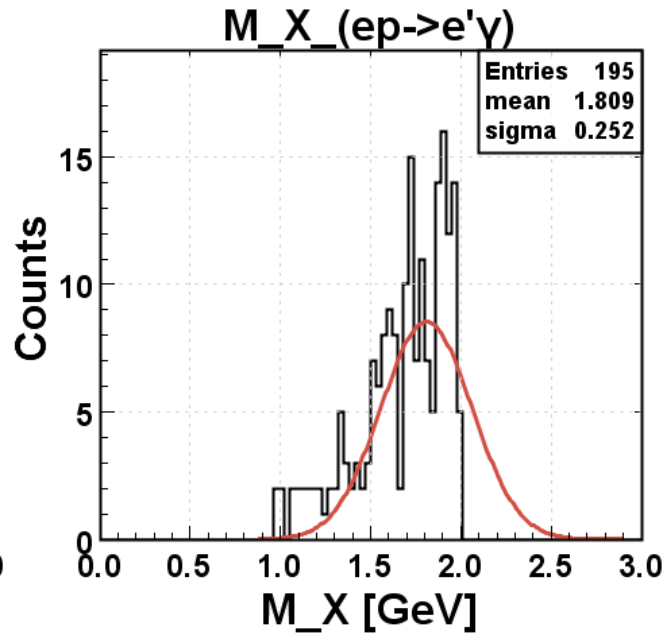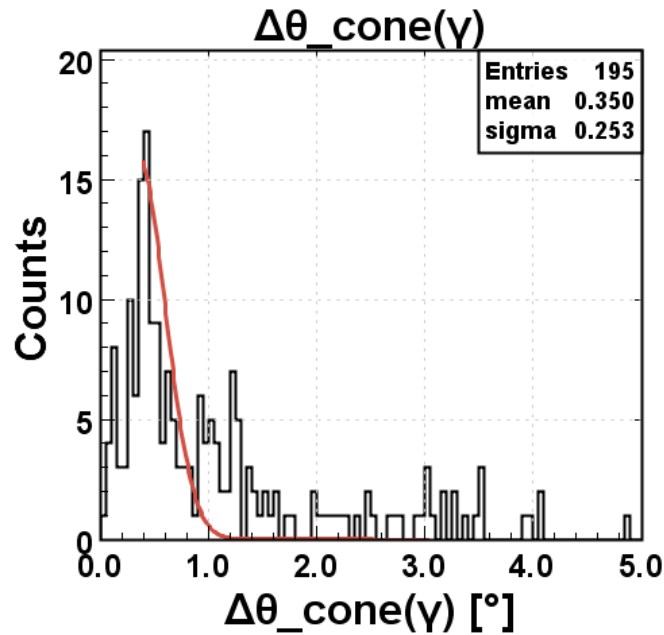
DVCS: Crystal Bin (7,15)

FTCAL Boundary Fiducial Cuts

Elliptical boundaries are used to define the fiducial cuts (as shown as transluscent 2D hit maps) and are selected to smoothen the rough edges of the detector and the holes.

FTCAL Fiducial Cuts

   Given the REC::ForwardTagger bank entries x and y satisfying the conditions:
- detector == 1, *and*
- layer == 1

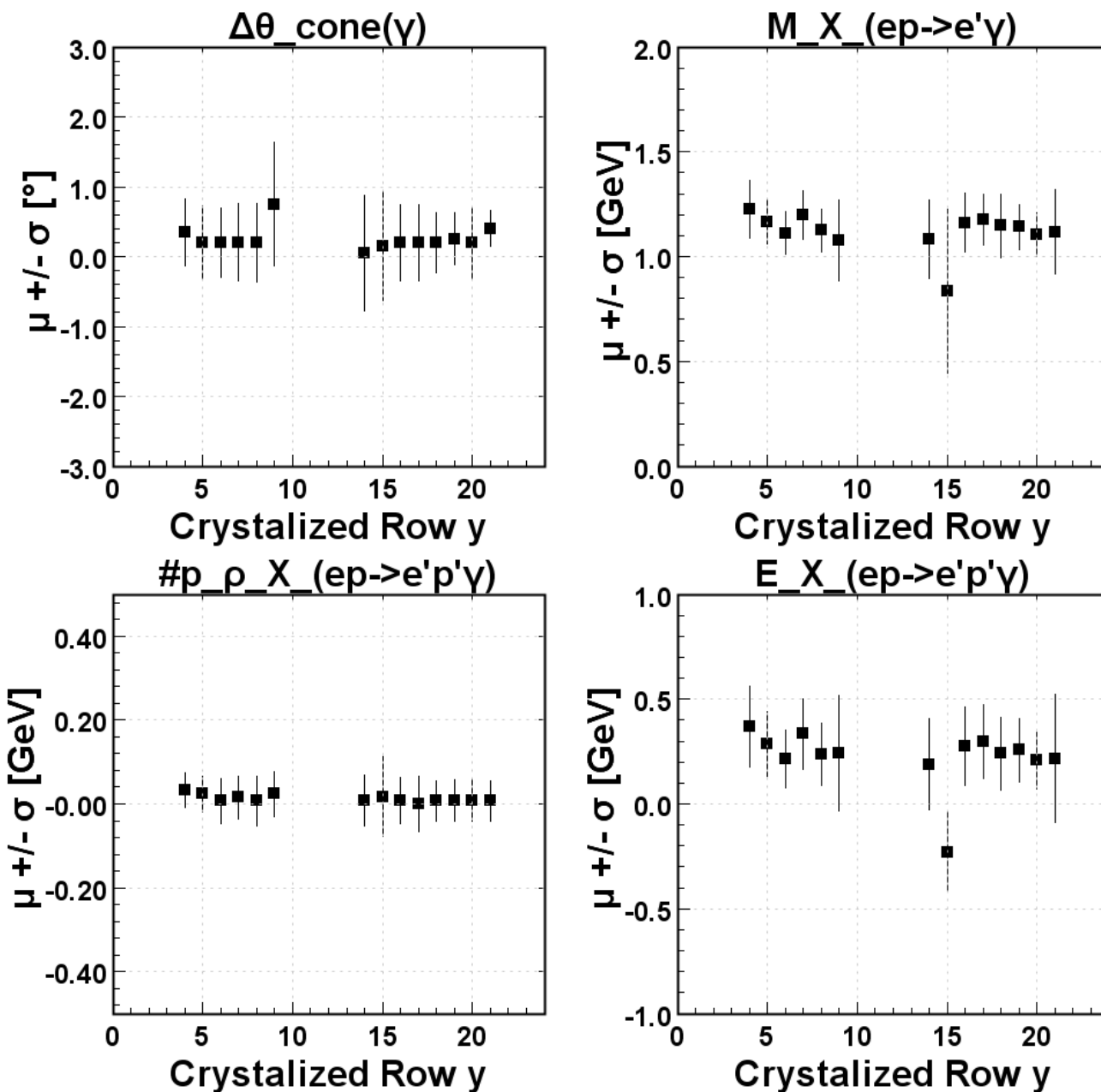, the acceptance (fid) can be defined with the parameters P_n:

$$\left(\frac{x-x_0}{a}\right)^2 + \left(\frac{y-y_0}{b}\right)^2 > 1 \ [cm],$$

IF (P_1) AND NOT(P_2) AND (P_3) AND (P_4) AND $(P_5) \rightarrow$ (fid) = TRUE

Parameter	x_0 [cm]	y_0 [cm]	a [cm]	b [cm]
P_1	0	0	8.8	8.8
P_2	0	0	15.5	15.5
P_3	-8.5	10.0	1.5	1.5
P_4	-6.0	-13.0	2.3	1.6
P_5	3.8	-6.8	1.7	1.7

DVCS: Bin Strip $x = 7$ after Cuts

DVCS: Crystal Bin (7,15)
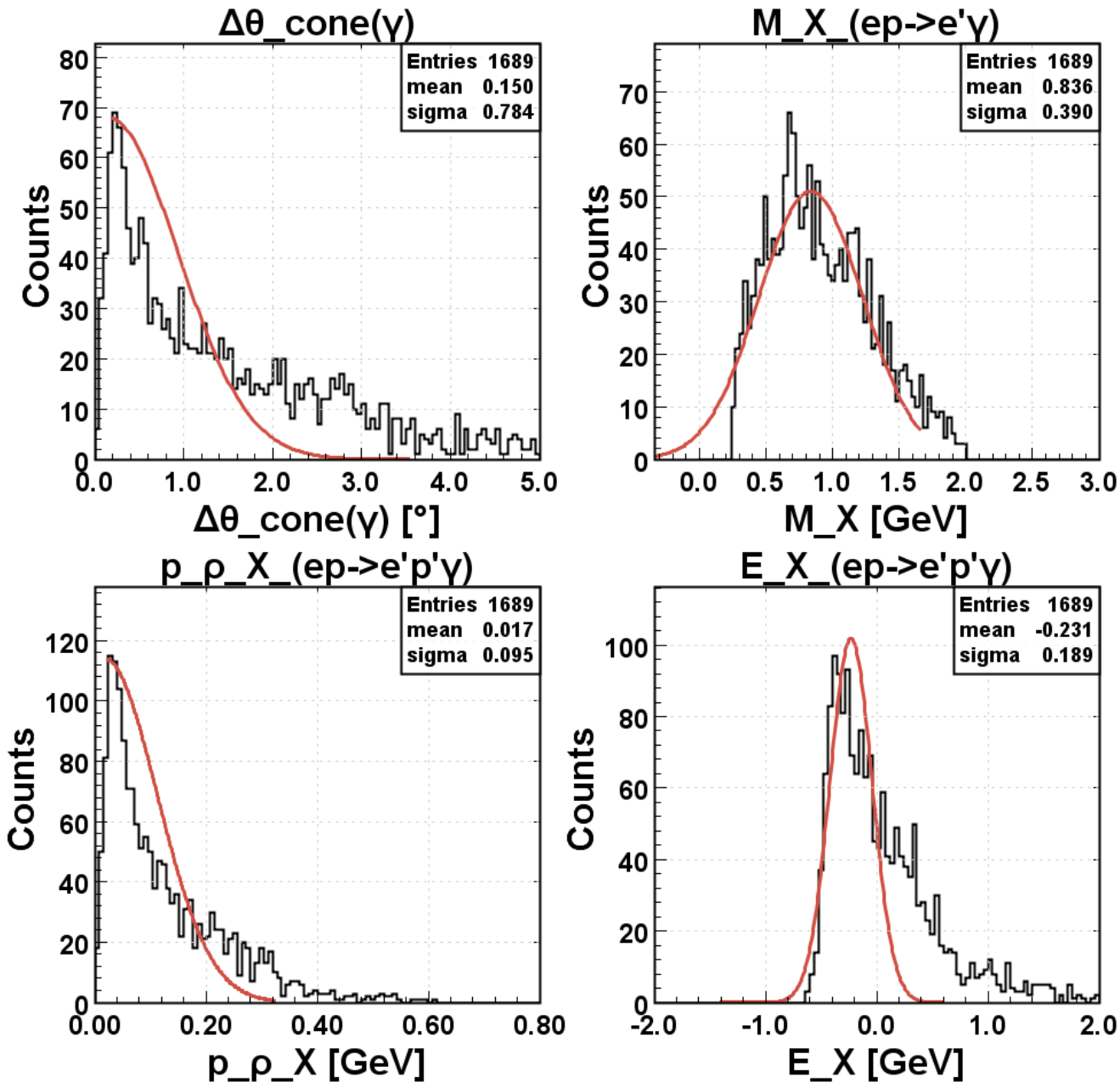
Summary

- Photons from RG-K 6.5 GeV and 7.5 GeV DVCS wagon are used to map ECAL detector hits.
- Faulty channel positions are identified as:
    1. Corresponding to dead channels, *or*
    2. Corresponding to channels with their cables swapped.
- Empty hit position on the edges are evaluated as faulty if:
    1. There are no hits adjacent to the scintillator spike on the empty side, *and*
    2. The edge starts farther or ends closer compared to its corresponding edges from other sectors.
- Elliptical boundaries which carve out the rough edges of the detector are evaluated with DVCS exclusivity variables.

Thank You!!!