EMCal Analysis Update

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analysis idea

- select electrons via Cherenkov
- select position via the hodoscope
  - measure the energy resolution and linearity
- data selection shown here:
  - long energy scan with the EMCal in the upstream position (https://wiki.bnl.gov/sPHENIX/index.php/T-1044/EMCal_good_run_note#Energy_Scan_.28UIUC_centered.2C_Tower_21.2C_350k_Events.29)
  - high statistics with beam in 3 positions

beam centering

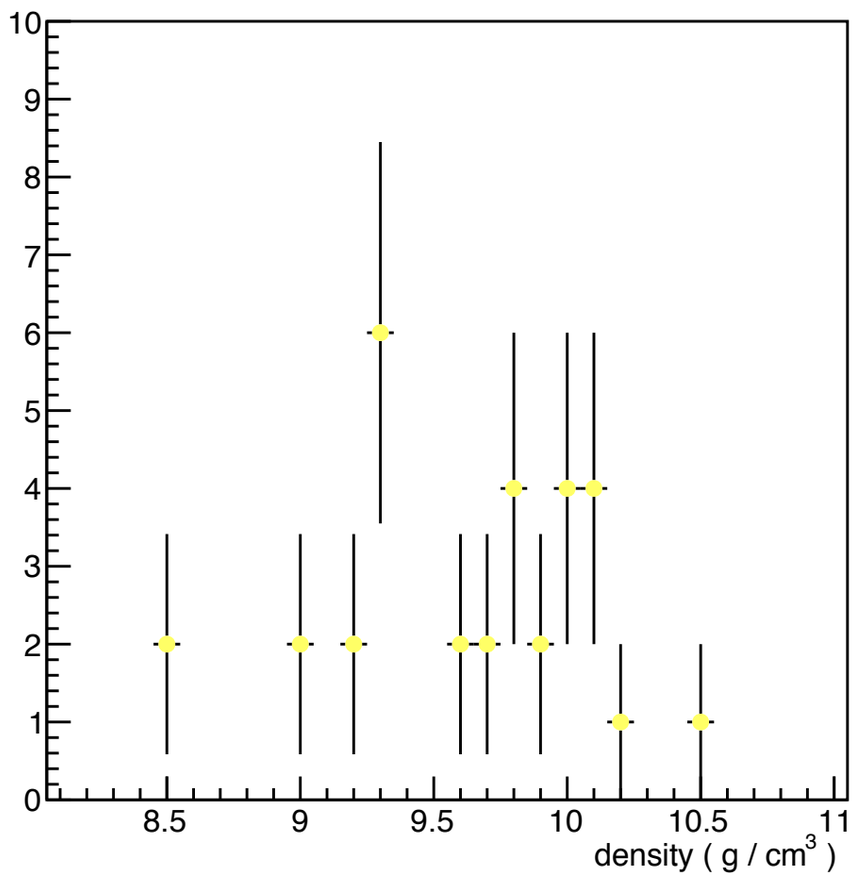
THP 10.2	THP 10.5	THP 8.5	THP 8.5	THP 9.0	THP 9.0	THP 9.8	THP 9.8
THP 9.7	THP 9.7	THP 10.0	THP 10.0	THP 10.0	THP 10.0	THP 9.9	THP 9.9
THP 9.2	THP 9.2	THP 9.8	THP 9.8	THP 9.3	THP X 9.3	THP 10.1	THP 10.1
UIUC 9.6	UIUC 9.6	UIUC 9.4	UIUC 9.4	THP 10.1	THP 10.1	THP 9.6	THP 9.6
UIUC 9.5	UIUC 9.5	UIUC 9.5	UIUC 9.5	THP 9.3	THP 9.3	THP 9.3	THP 9.3
UIUC 9.4	UIUC 9.4	UIUC X 9.4	UIUC 9.4	UIUC 9.4	UIUC X 9.4	UIUC 9.6	UIUC 9.6
UIUC 9.2	UIUC 9.2	UIUC 9.6	UIUC 9.6	UIUC 9.3	UIUC 9.3	UIUC 9.3	UIUC 9.3
UIUC 9.5	UIUC 9.5	UIUC 9.6	UIUC 9.6	UIUC 9.3	UIUC 9.3	UIUC 9.2	UIUC 9.2

module variations

THP modules

$\langle\rho\rangle = 9.6\ g/cm^3$

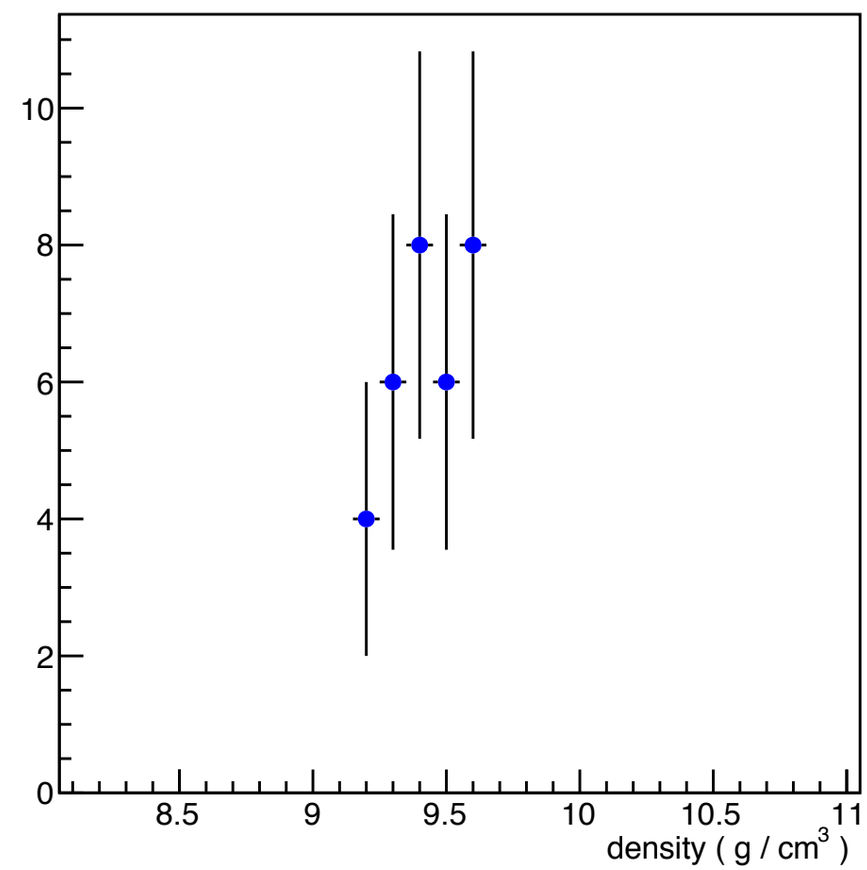
$RMS = 0.47\ g/cm^3$



Illinois modules

$\langle\rho\rangle = 9.4\ g/cm^3$

$RMS = 0.13\ g/cm^3$



- THP modules: 2% higher $\langle\rho\rangle$, 3x wider distribution than Illinois modules

ntuple making

- code: https://github.com/sPHENIX-Collaboration/analysis/tree/master/Prototype2/EMCal/EMCalCalib_TestBeam
- DST files: /gpfs/mnt/gpfs02/sphenix/data/data01/t1044-2016a/production/Production_0428_MIP_set2_Cosmic

run list

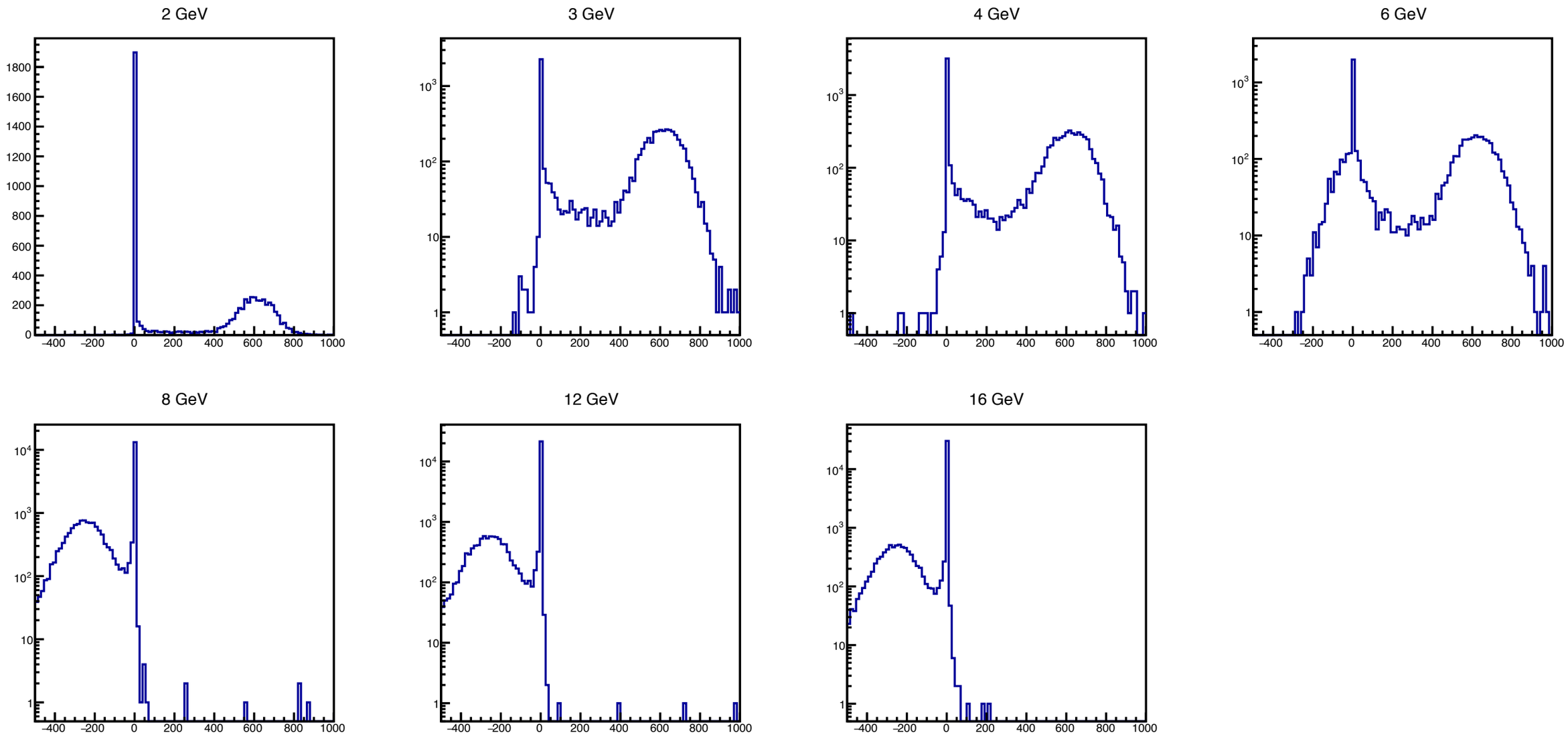
Tower 21 Centered

Energy	Scan Number
1 GeV	2298
2 GeV	2268
3 GeV	2260
4 GeV	2256
6 GeV	2247
8 GeV	2295
12 GeV	2276
16 GeV	2280

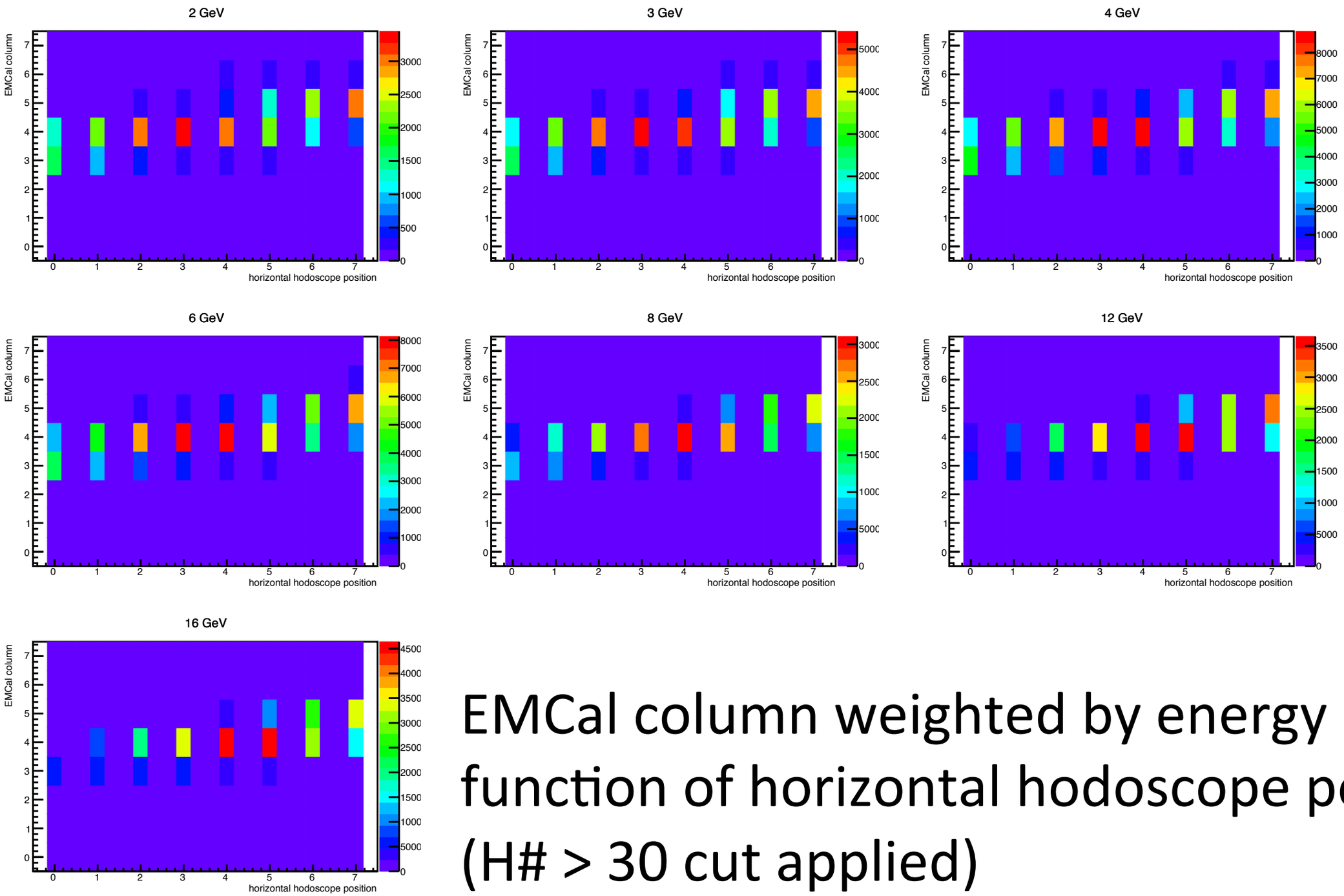
Tower 42 Centered

Energy	Run Number
2 GeV	2269
3 GeV	2264
4 GeV	2257
6 GeV	2249
8 GeV	2288
12 GeV	2278
16 GeV	2284

Cherenkov distributions; Tower 42 runs

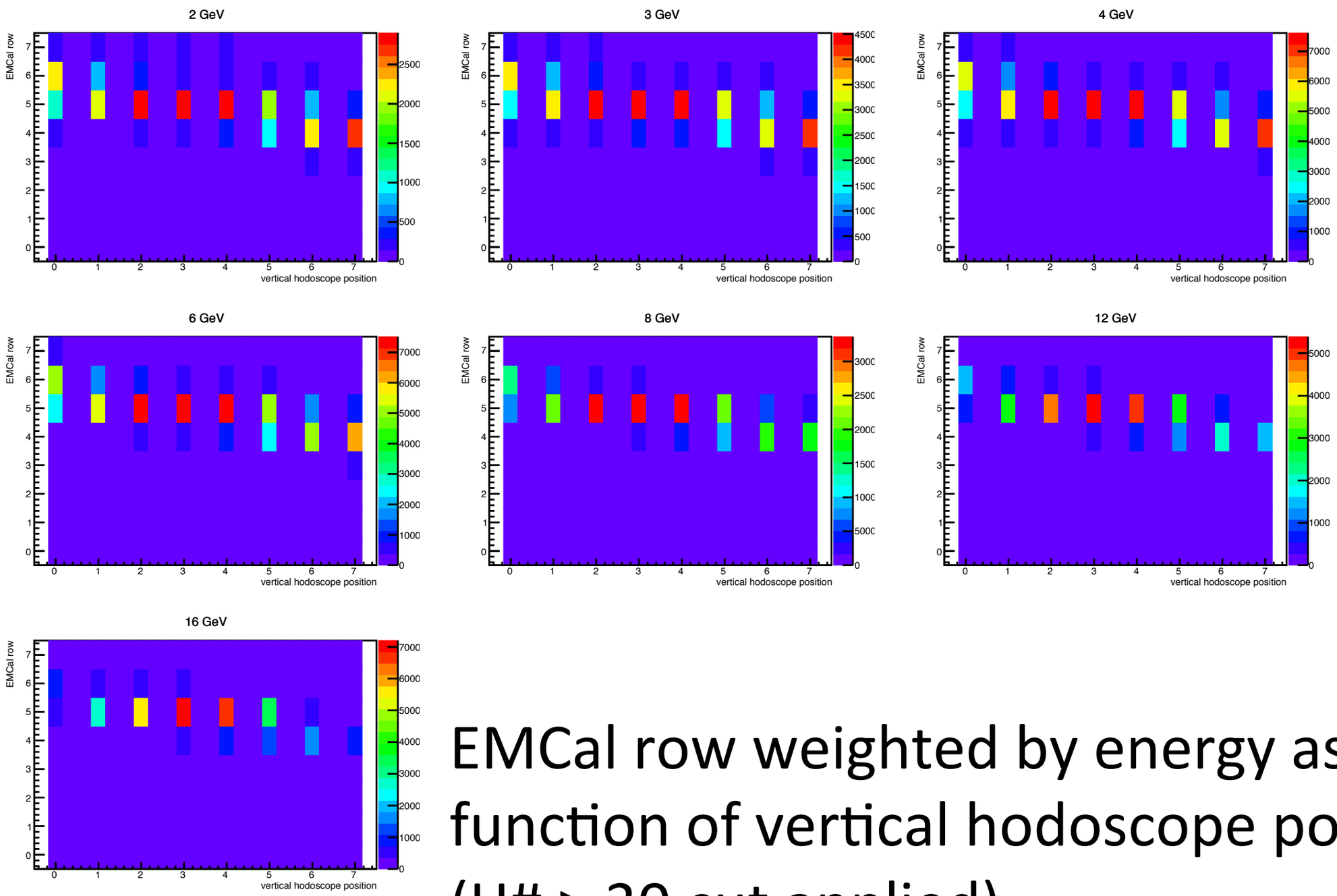


horizontal hodoscope



EMCal column weighted by energy as a function of horizontal hodoscope position (H# > 30 cut applied)

vertical hodoscope

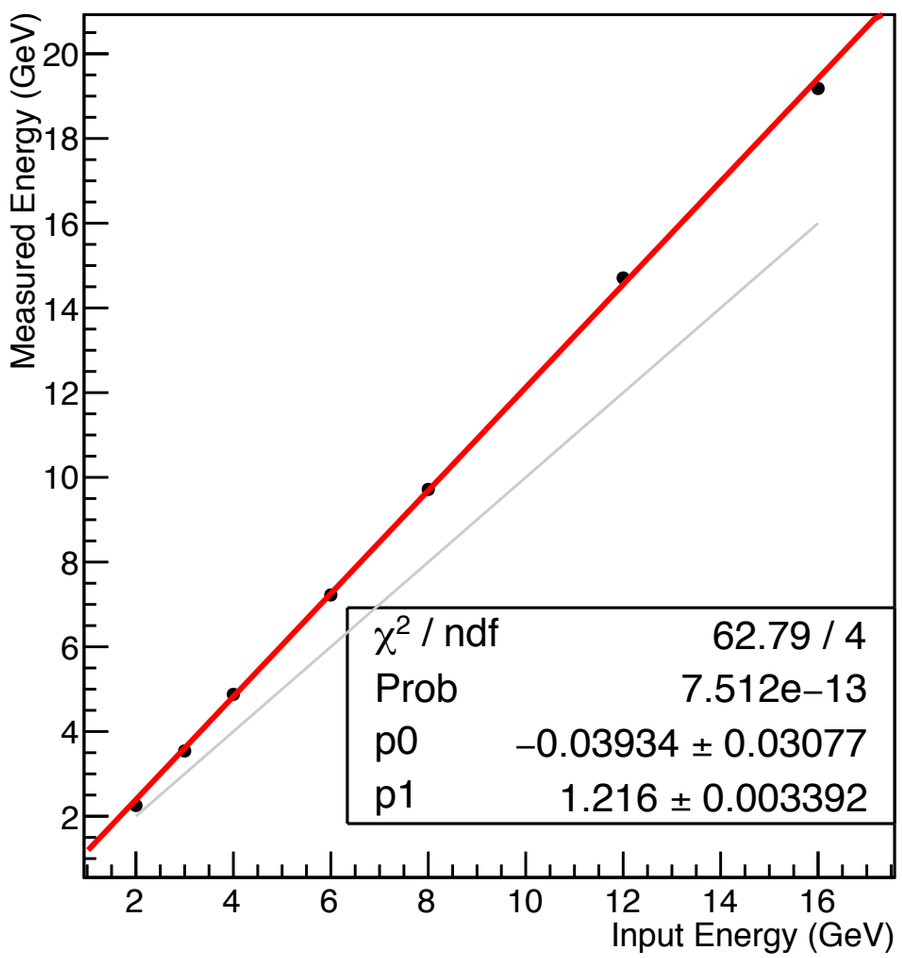


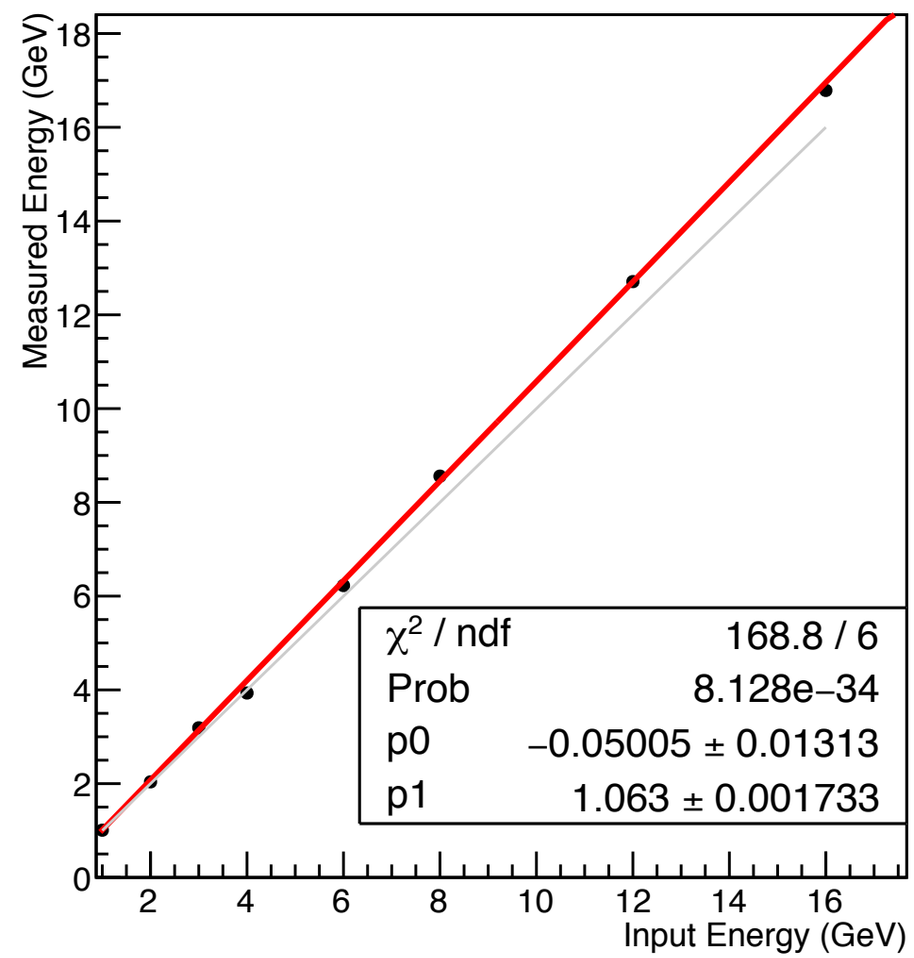
EMCal row weighted by energy as a function of vertical hodoscope position (H# > 30 cut applied)

cuts

- all veto counters less than 15
- C2_inner + C2_outer > 100
- hodoscope:
  - Illinois tower 21: V 2|| 3; H 5
  - THP tower 42: V 4; H 3||4

linearity

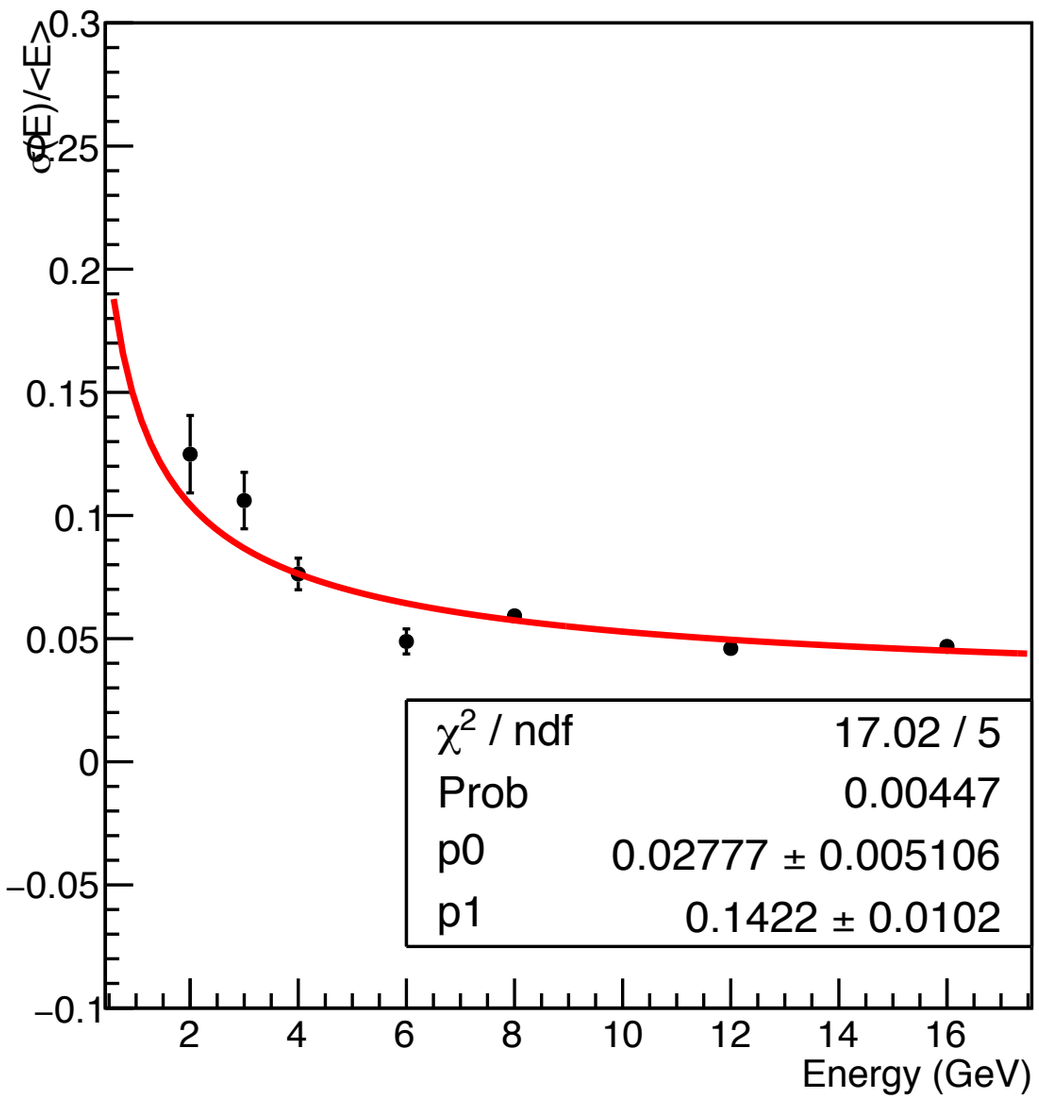




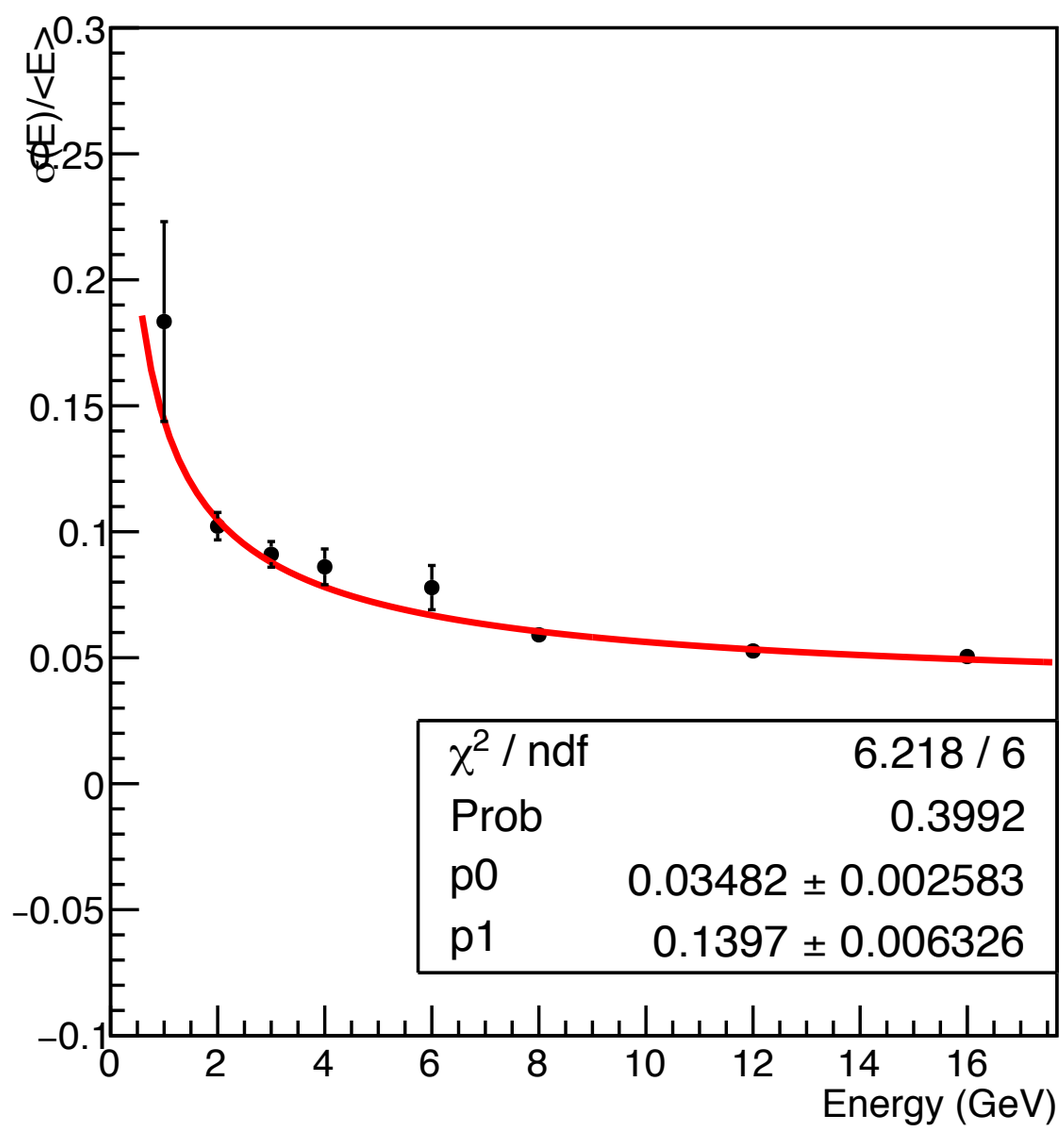
THP

UIUC Tower 21

energy resolution



THP



UIUC Tower 21

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THP 9.7	THP 9.7	THP 10.0	THP 10.0	THP 10.0	THP 10.0	THP 9.9	THP 9.9
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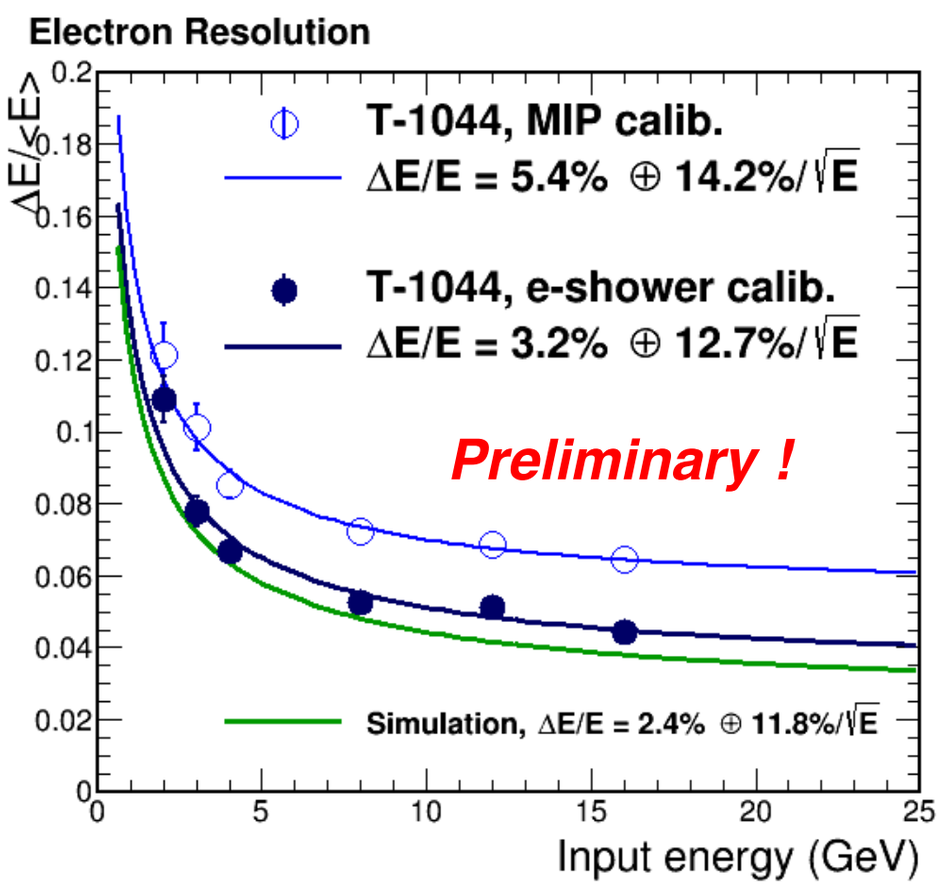
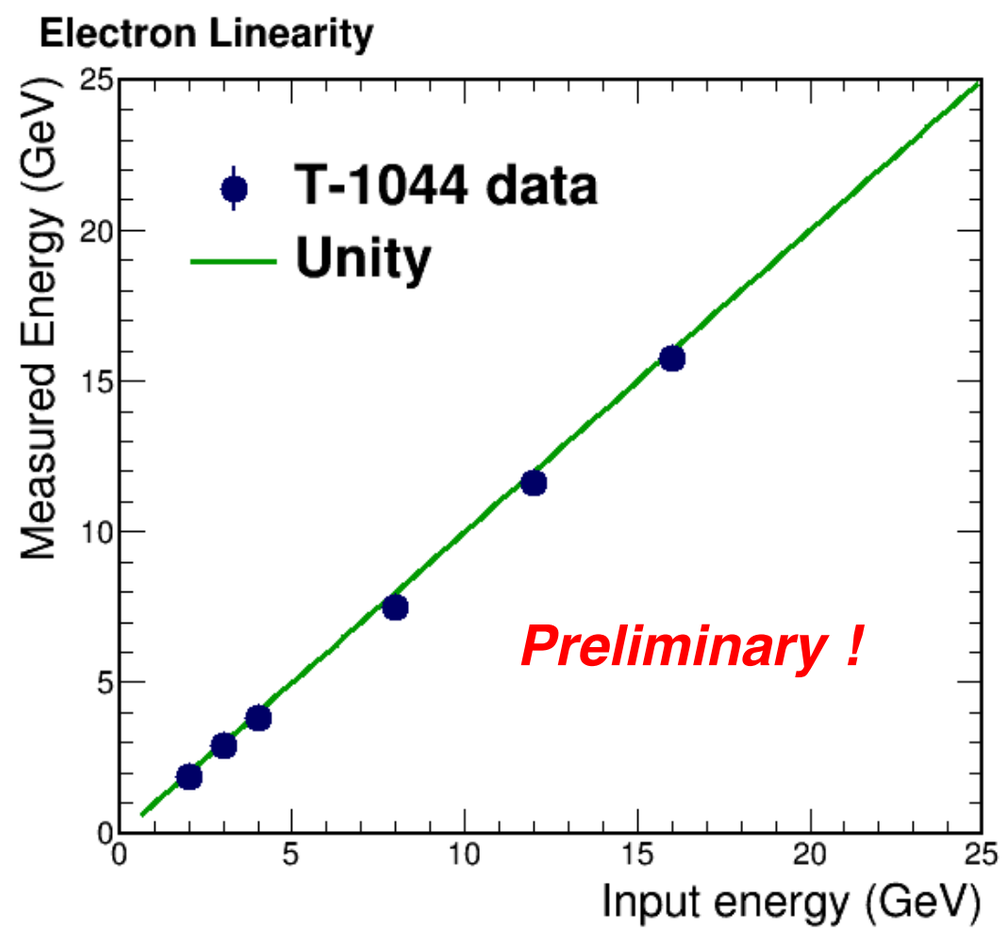
UIUC 9.4	UIUC 9.4	UIUC 9.4	UIUC 9.4	UIUC 9.4	UIUC 9.4	UIUC 9.6	UIUC 9.6
UIUC 9.2	UIUC 9.2	UIUC 9.6	UIUC 9.6	UIUC 9.3	UIUC 9.3	UIUC 9.3	UIUC 9.3
UIUC 9.5	UIUC 9.5	UIUC 9.6	UIUC 9.6	UIUC 9.3	UIUC 9.3	UIUC 9.2	UIUC 9.2

data @ 4 & 8 GeV

preliminary plot

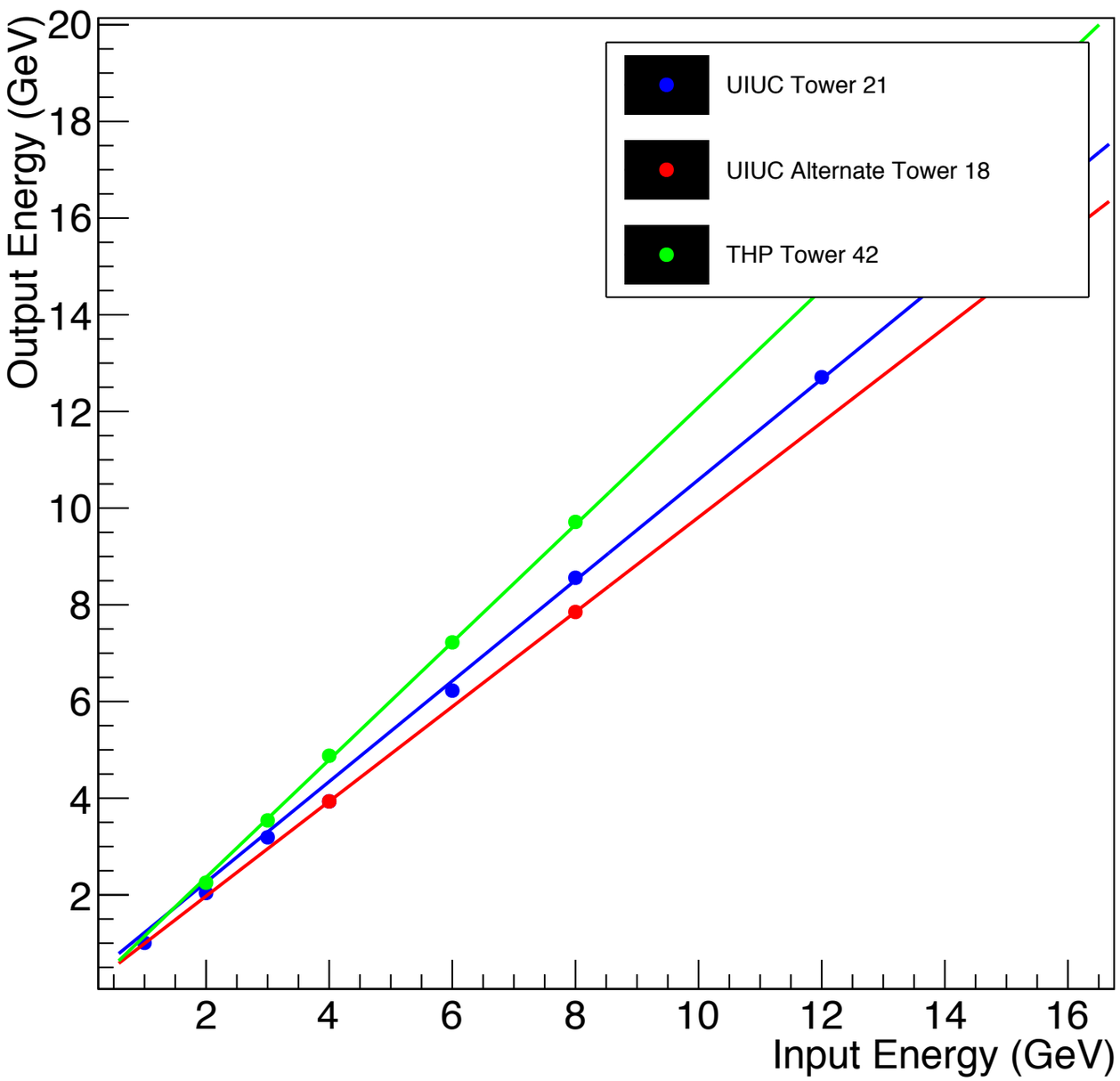
Beam momentum spread of ~ 2% ***not*** unfolded



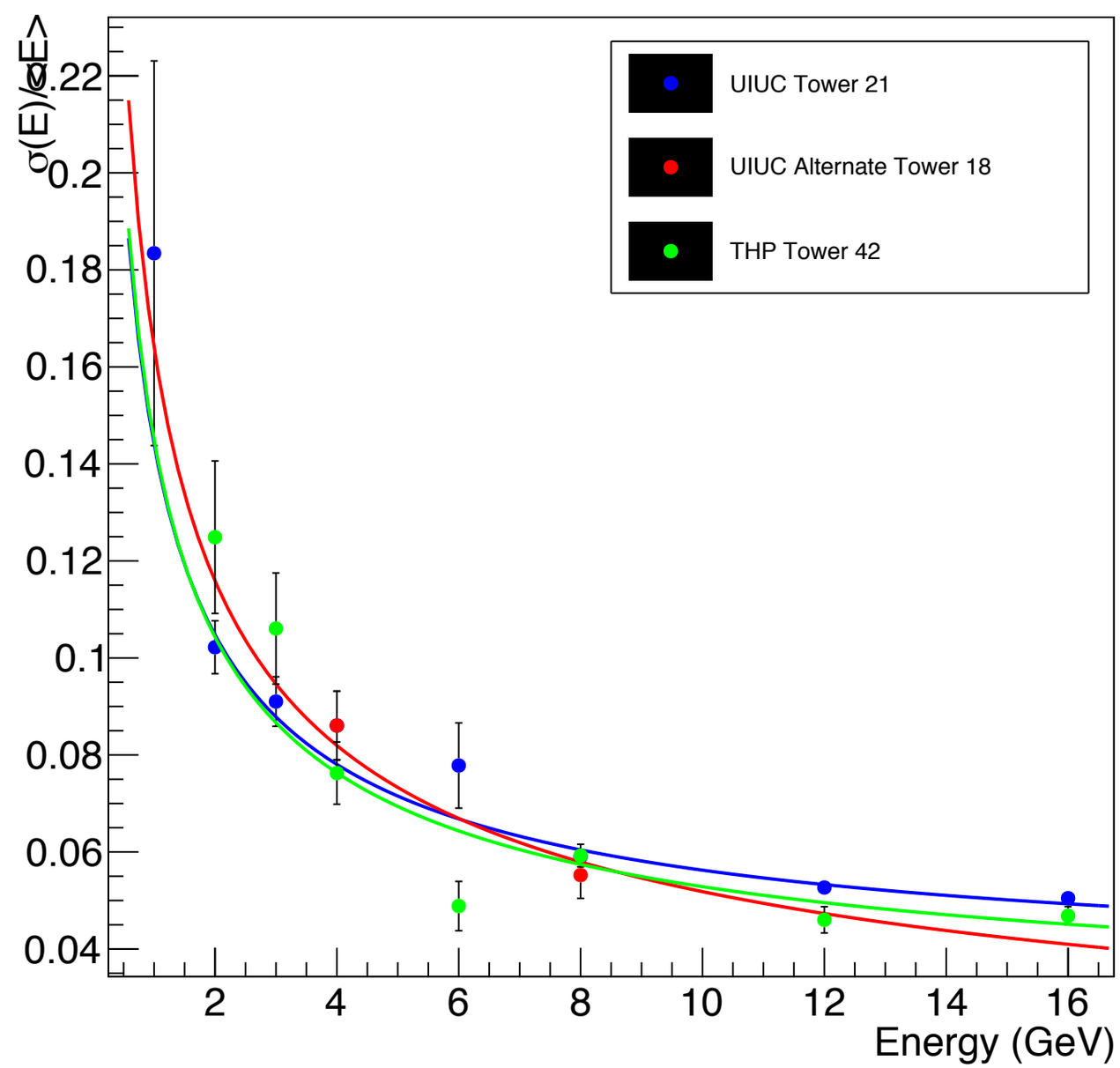


position comparison

Linearity



Resolution



my thoughts

- I'd like to see how the resolution changes as we change the version of the MIP calibration
- change the hodoscope cuts to see variation across the tower—Jin has been looking at this
- why is the resolution so similar in all the block locations?
- no inclusion of temperature compensation