HCal Analysis Status

Megan Connors
Abhisek Sen

Test Beam Workfest

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Georgia State University

RBRC
RIKEN BNL Research Center

HCal Configurations

- Hcal Run Lists:
  - https://wiki.bnl.gov/sPHENIX/index.php/T-1044/HCAL_good_run_note
- Joint Run lists:
  - https://wiki.bnl.gov/sPHENIX/index.php/T-1044/joint_data_good_run_note

Good Run List

HCal IN + HCal OUT

The list of good runs from the HCAL are found: https://wiki.bnl.gov/sPHENIX/index.php/File:T1044-2016a-goodruns.pdf

The list of good runs from the HCAL are found: https://wiki.bnl.gov/sPHENIX/index.php/File:EMCAL_HCAL_runs.pdf

Run(s)	Beam	Event	Comment
2380, 2381	-12	62k, 91K	HCAL only C1 = 0.7 psia
2382, 2383	-16	54k, 151k	HCAL only C1 = 0.7 psia
2385	-20	168k	HCAL only C1 = 0.7 psia
2386, 2387, 2388	-24	16k, 72k, 77k	HCAL only C1 = 0.7 psia
2389, 2390	-32	77k, 77k	HCAL only C1 = 0.7 psia
2391, 2392, 2393	-8	12k, 75k, 108k	HCAL only C1 = 0.7 psia
2394, 2395, 2396	+40	63k, 23k, 63k	HCAL only C1 = 0.7 psia
2397, 2398	+50	125k, 30k	HCAL only C1 = 0.7 psia
2401, 2402	+60	95k, 58k	HCAL only C1 = 0.7 psia
2403, 2404	+66	62k, 47k	HCAL only C1 = 0.7 psia
2439, 2440, 2441, 2442, 2444, 2445	-4	37k, 95k, 150k, 70k, 90k, 88k	HCAL only C1 = 0.7 psia
2446, 2447, 2448, 2449, 2450, 2451, 2452	-8	8k, 65k, 69k, 51k, 51k, 64k, 108k	HCAL only C1 = 0.7 psia
2453, 2454, 2455, 2456 2457	-2	7k, 100k, 92k, 185k, 39k	HCAL only C1 = 0.7 psia
2458, 2459, 2460, 2461, 2462	-6	102k, 58k, 108k, 132k, 44k	HCAL only C1 = 0.7 psia

HCal OUT

EMCal and inner HCal was moved out of the beam at the last day of beam. Cryostat is in the beam.

Run(s)	Beam	Event	Comment
2920	-12	99622	EMCal normal bias C1 = 1.3 psia, C2 = 1.5 psia
2919	-16	101518	EMCal normal bias C1 = 1.3 psia, C2 = 1.5 psia
2921, 2922, 2923	-24	10431+40846+51985	EMCal normal bias C1 = 0.4 psia, C2 = 0.5 psia
2924, 2925, 2926	-28	5770+35316+65573	EMCal normal bias C1 = 0.4 psia, C2 = 0.5 psia

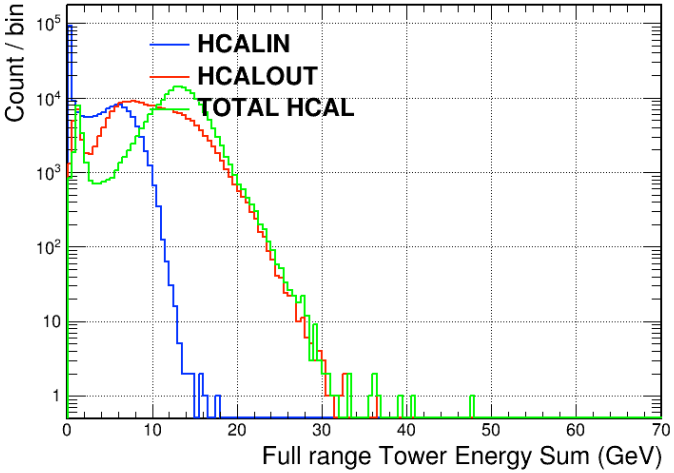
Run(s)/sPHENIX Calo	Run(s)/PbGl, 1200V	Run(s)/PbGl, 1100V	Beam	Event	Comment
2692	2693		-2	>100K	EMCal normal bias. C1 = 12.0 psia, C2 = 12.5 psia
2695			-4	>200K	EMCal normal bias C1 = 12.0 psia, C2 = 12.5 psia
2696	2697		+4	>200K	EMCal normal bias C1 = 12.0 psia, C2 = 12.5 psia
2698 2700 2701	2702		-6	57205	EMCal normal bias C1 = 12.0 psia, C2 = 12.5 psia
2703,2704,2705,2706,2707,2708,2709,2710			-8	>200K	EMCal normal bias C1 = 5 psia, C2 = 6
2711,2712,2713,2714,2715	2716	2717, 2718	+8	>200K	EMCal normal bias C1 = 5 psia, C2 = 6
2719,2720,2721		2726	-12	>100K	EMCal normal bias C1 = 1.3 psia, C2 = 1.5 psia
2722			-16	50K	EMCal normal bias C1 = 1.3 psia, C2 = 1.5 psia
2723, 2724		2725	-16	50K	EMCal lower bias @ gain of 1.15E5. C1 = 1.3 psia, C2 = 1.5 psia
2727		2728, 2729	-24	>100K	EMCal lower bias @ gain of 1.15E5 C1 = 0.4 psia, C2 = 0.5 psia,
2730		2733, 2735, 2736, 2737	-28	>100K	EMCal lower bias @ gain of 1.15E5 C1 = 0.4 psia, C2 = 0.5 psia,

Code

- Abhisek:
  - Runs on output of DST Reader
  - /gpfs/mnt/gpfs02/sphenix/sim/sim01/sPHENIX/sunywrk/abhisek/scan/DrawPrototype2HCAL.C
  - Results: https://wiki.bnl.gov/sPHENIX/index.php/T-1044/HCAL_good_run_note

- Megan:
  - Runs on DST: Fun4All macro in macros/ under:
  - /gpfs/mnt/gpfs02/sphenix/sim/sim01/sPHENIX/sunywrk/mjuszkie/sphenix/analysis/HCalTB/
  - Outputs histos and ntuple

- Should add these to GIT?

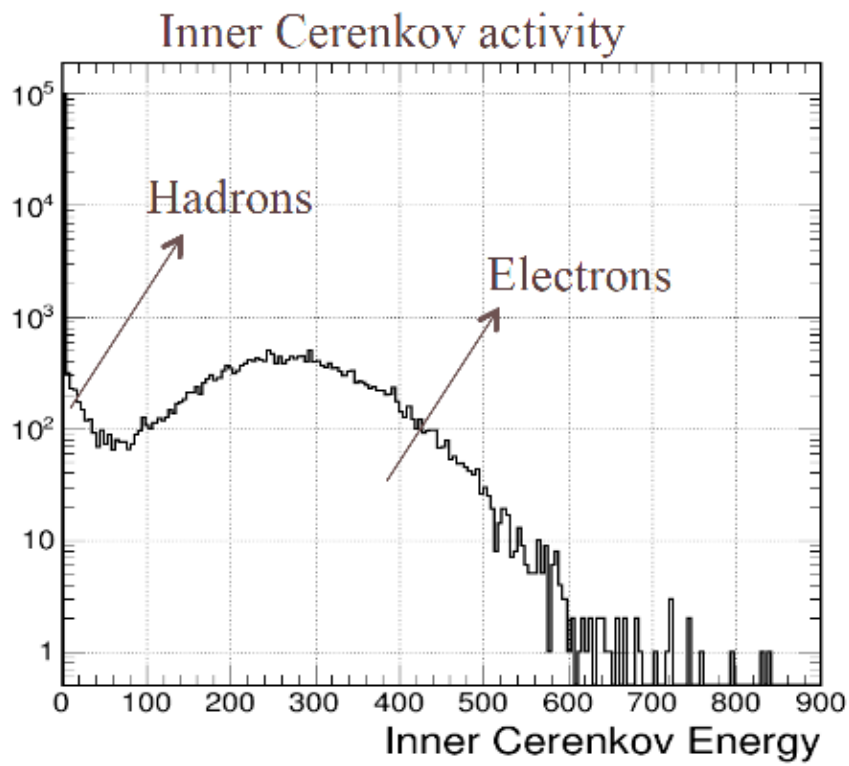


What do we want to get

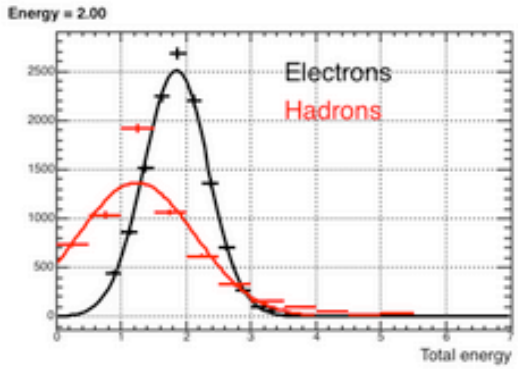
- Tile scan results – Status?
- HCAL (cosmic) calibration – Previous talk by A. Sen
- Electron and hadron resolution and linearity for HCAL
- HCAL e/pi
- Timing lineshape of electrons and hadrons
- Position dependent shower response and corrections
- Simulation plot for Resolution, linearity and lineshape – X. He talk this afternoon
- Joint resolution
- Joint e/pi separation

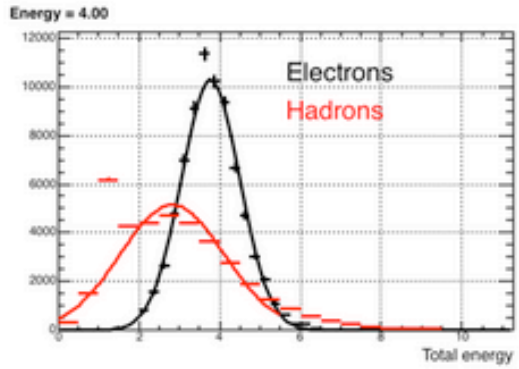
What do we have: Electrons and Hadrons

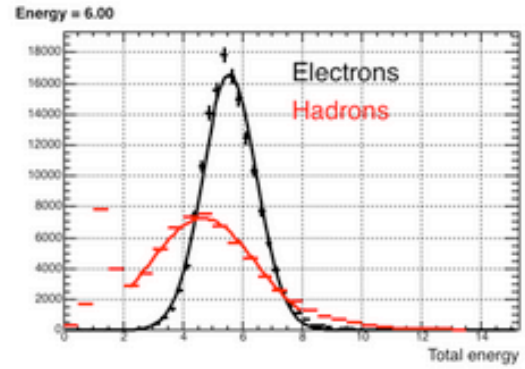
- Want to select on hadrons and electrons (when no emcal in front)
- Cerenkov cuts:
  - Hadrons <10
  - Electrons >100

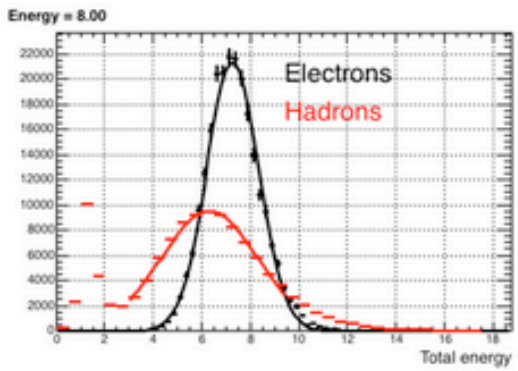


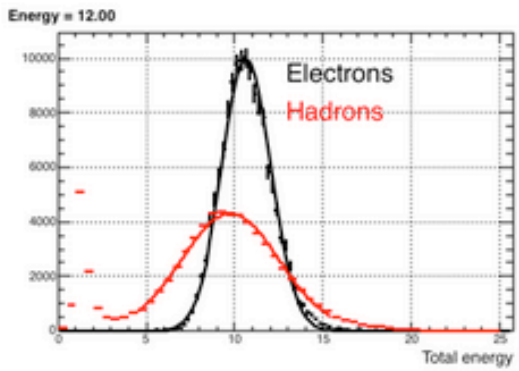
Electrons and Hadrons

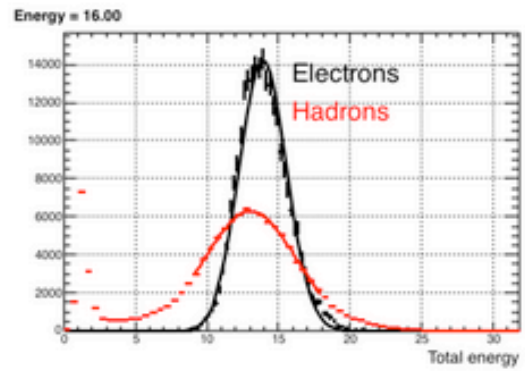


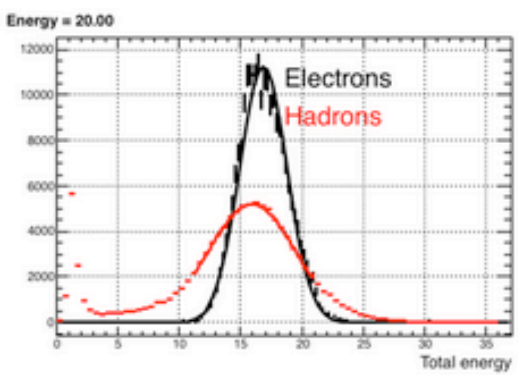








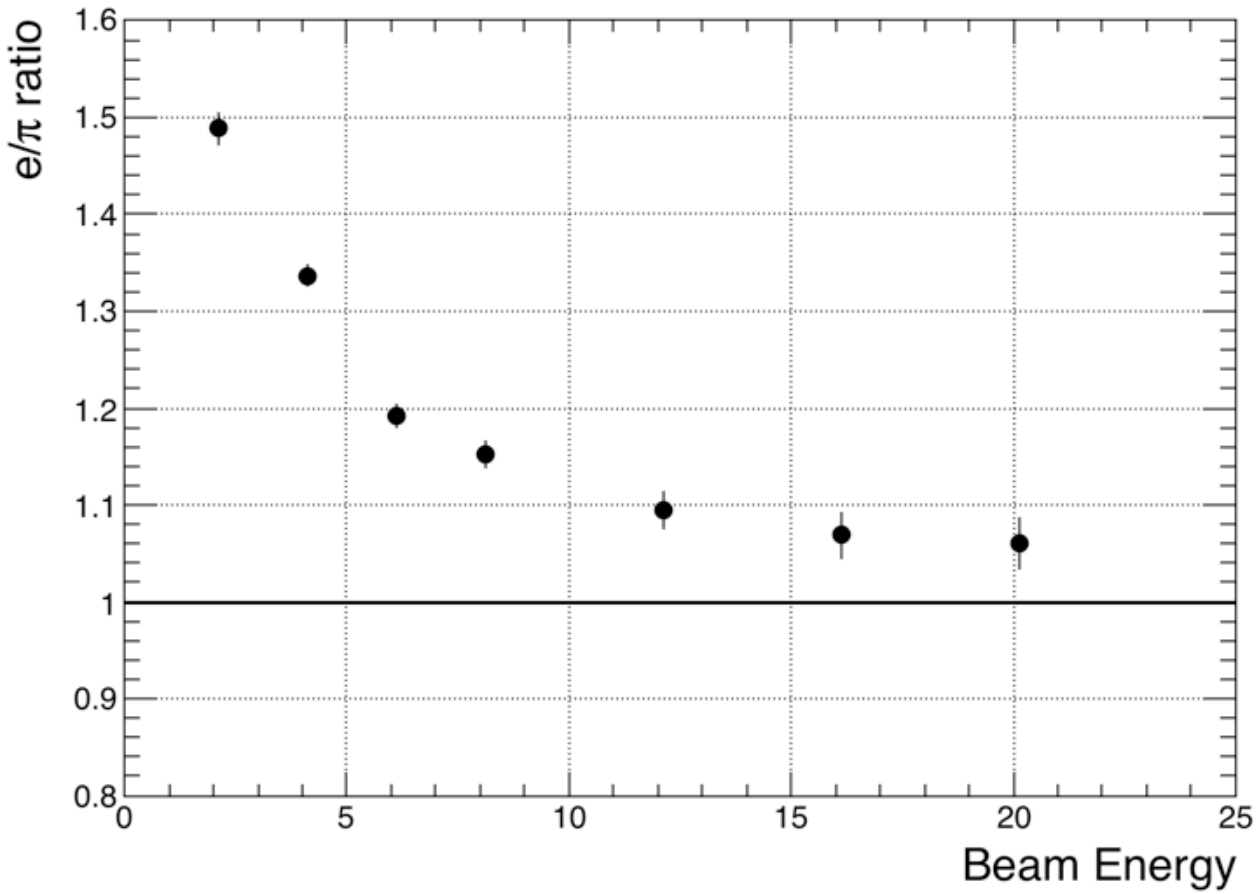




- Electron vs hadron response

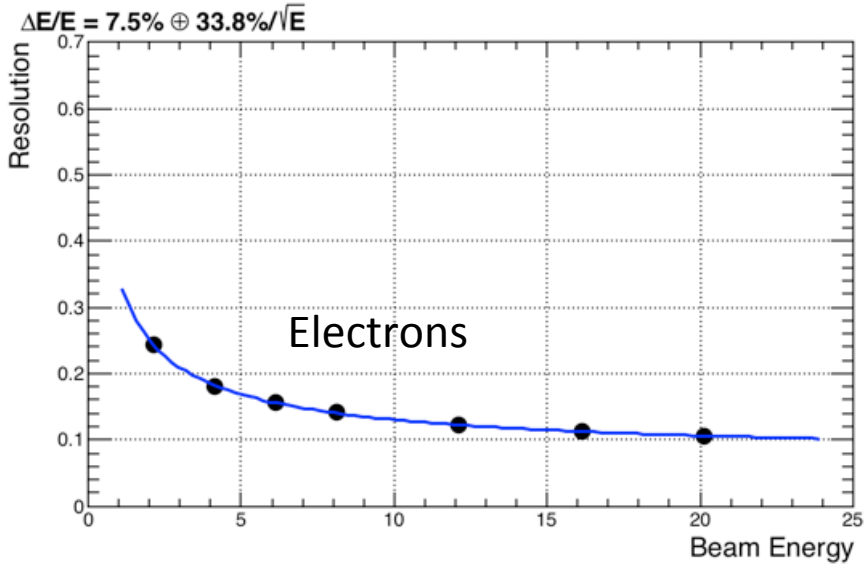
What do we have: e/pi

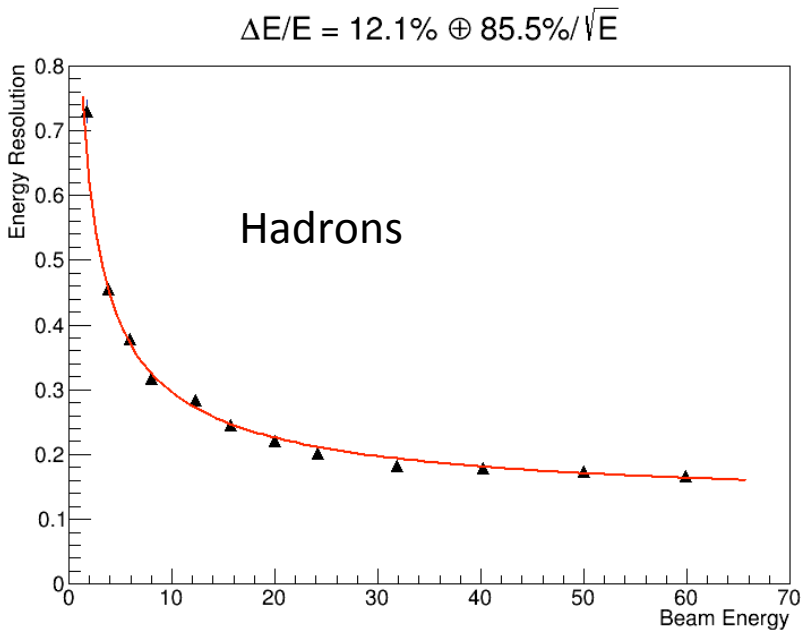
- For Hcal

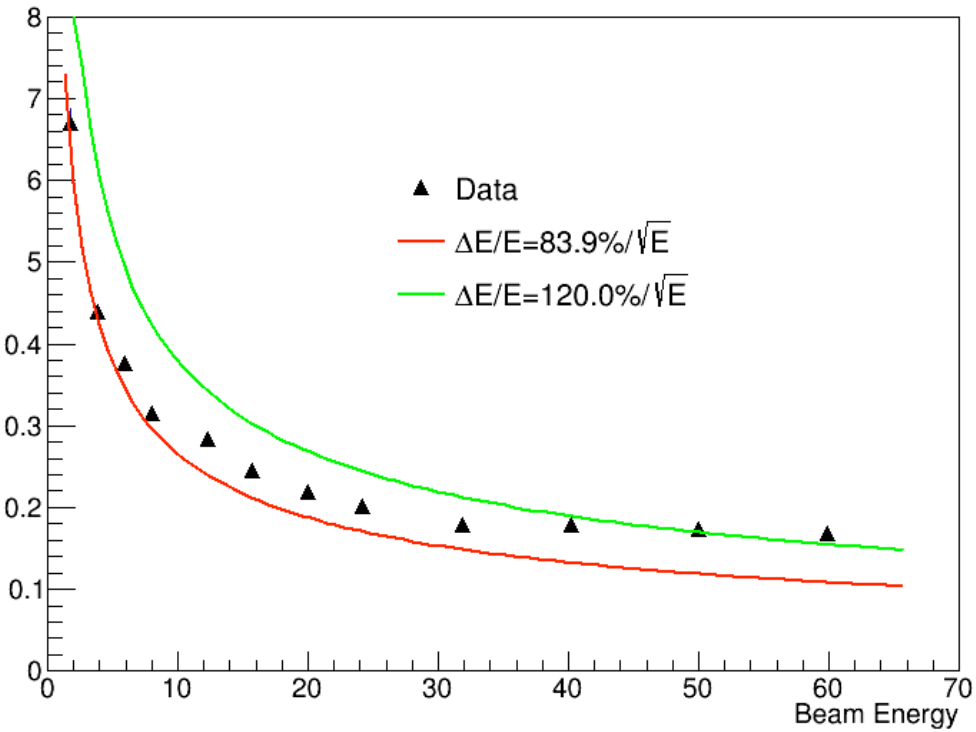


What do we have: Energy Resolution

- Hcal Stand alone

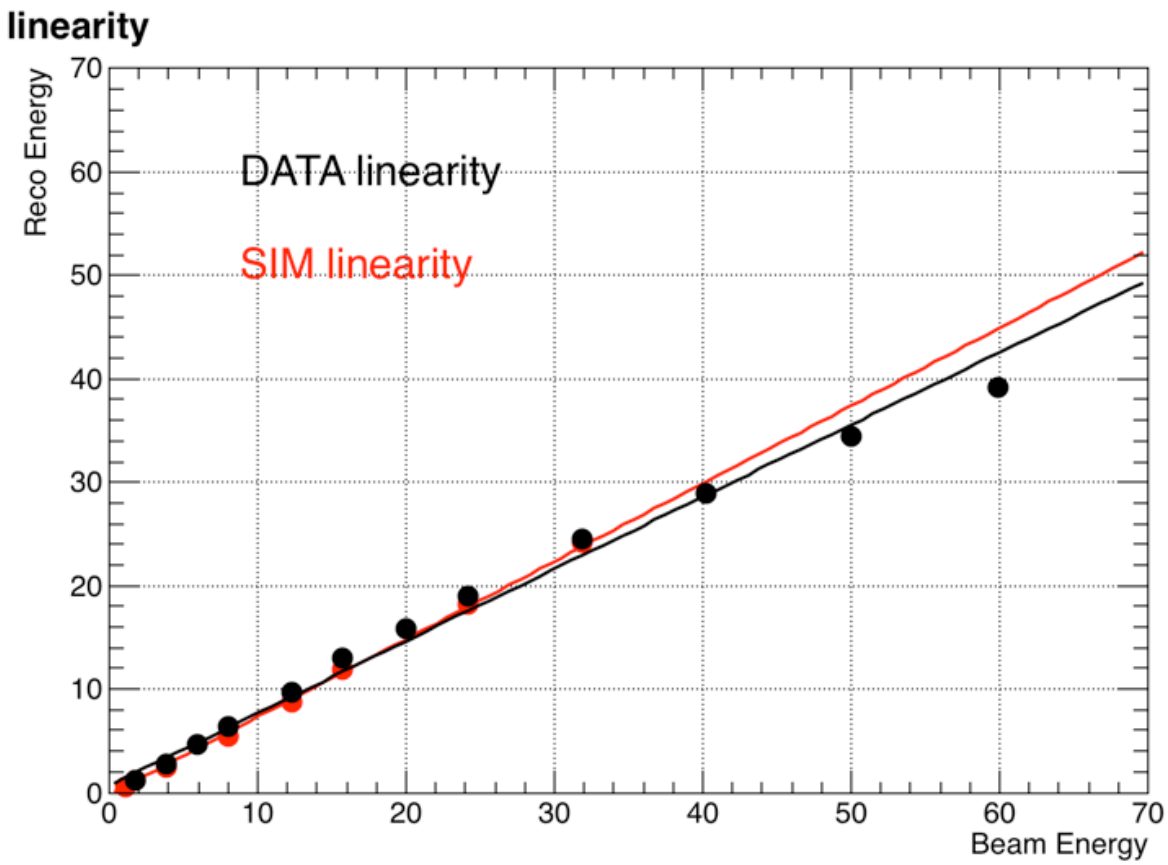




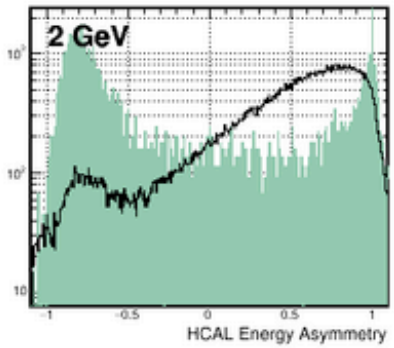


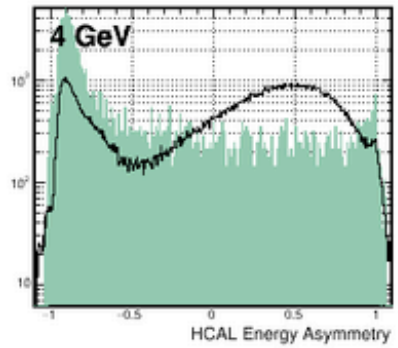
What do we have: Linearity

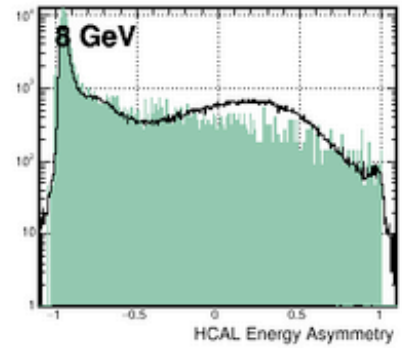
- Linearity from data and simulation
- Data not so linear?



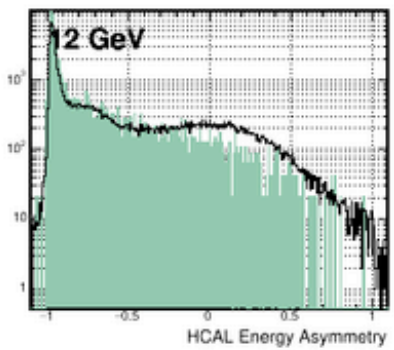
What we have: Asymmetry

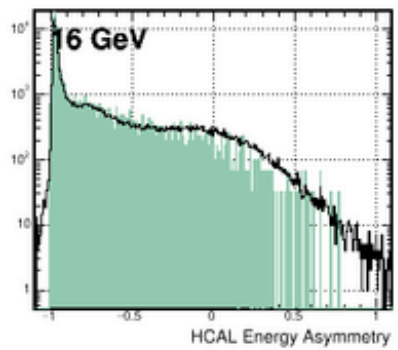


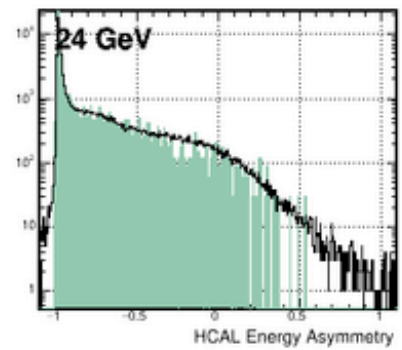


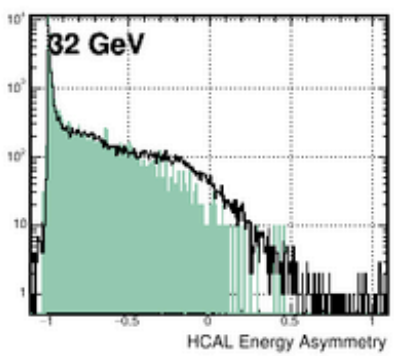


Data
Simulation



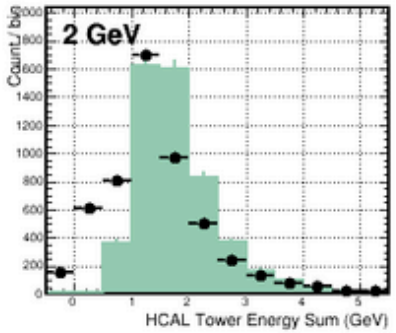


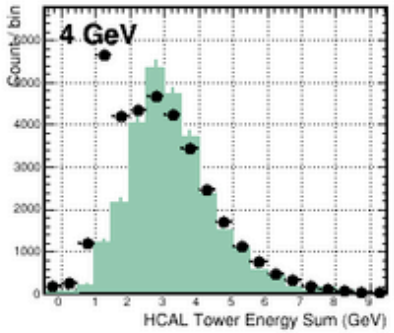


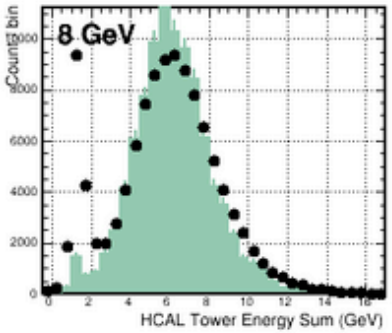


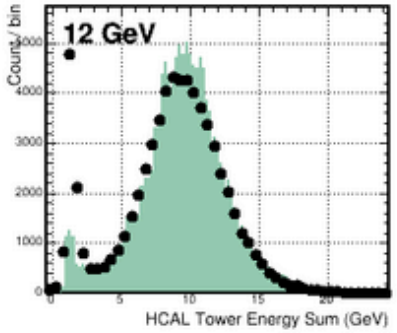
- This data still has electrons which causes mismatch with simulation
- Improved cuts: Cerenkov (C2 inner<10) and hcal asymmetry ((inner-outer)/(inner+outer)) >-1 asymmetry<-0.5

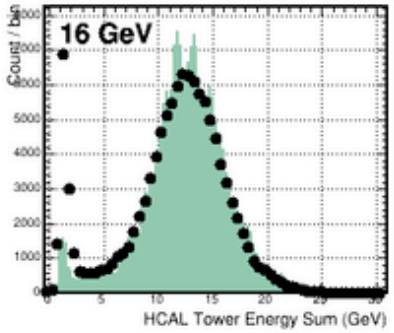
What do we have: Comparison to Simulation

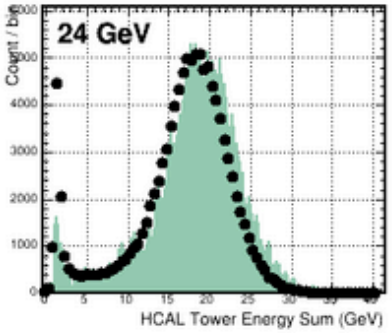


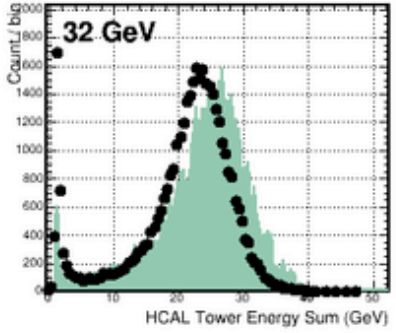








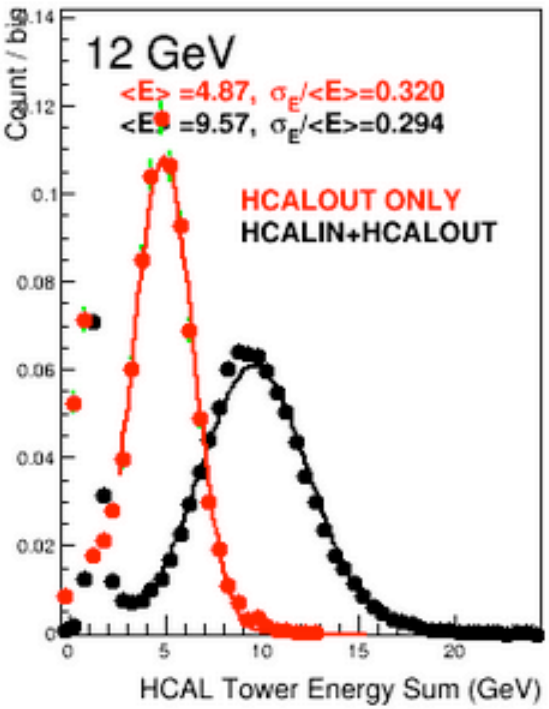


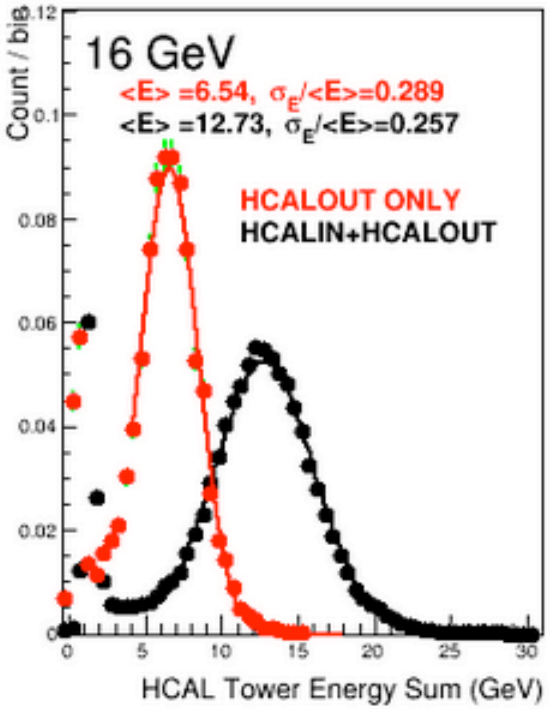


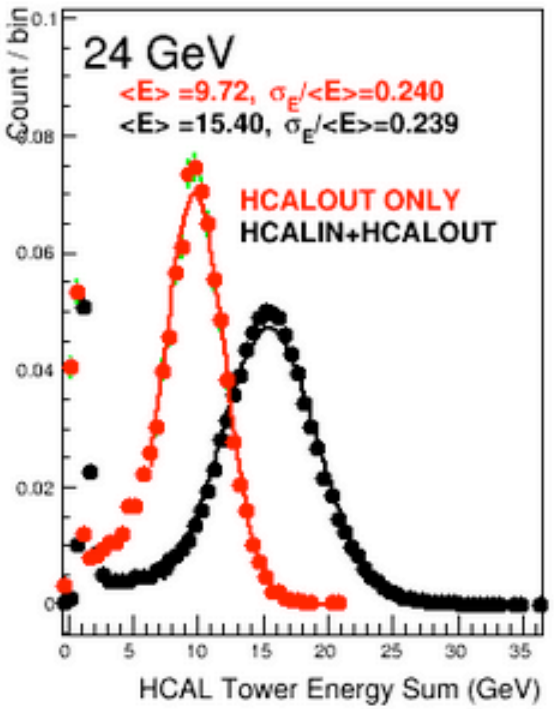
- Compared to Jin simulation
- Comparison looks very good
- Spike at low energy mismatch

Outer Hcal alone

- Interesting to look at but is this for the paper?
- This is not what sPHENIX would be like without an inner Hcal (no emcal here either)







Where do we go?

- Finalize Calibrations
- Finalize Cuts and corrections
- Machinery to make final plots
- Tile Mapper
- Tilt studies?