Resolutions and material budget

Elisa

Samples

- Code version: release-00-05-02/
- 50k events for each config and for each energy
- single photons generated with particle gun
- Energy: 100 MeV, 500 MeV
- FWD ECL acceptance (as in simulation config files): 'thetaParams': [12.398°, 31.62°] with uniform distribution

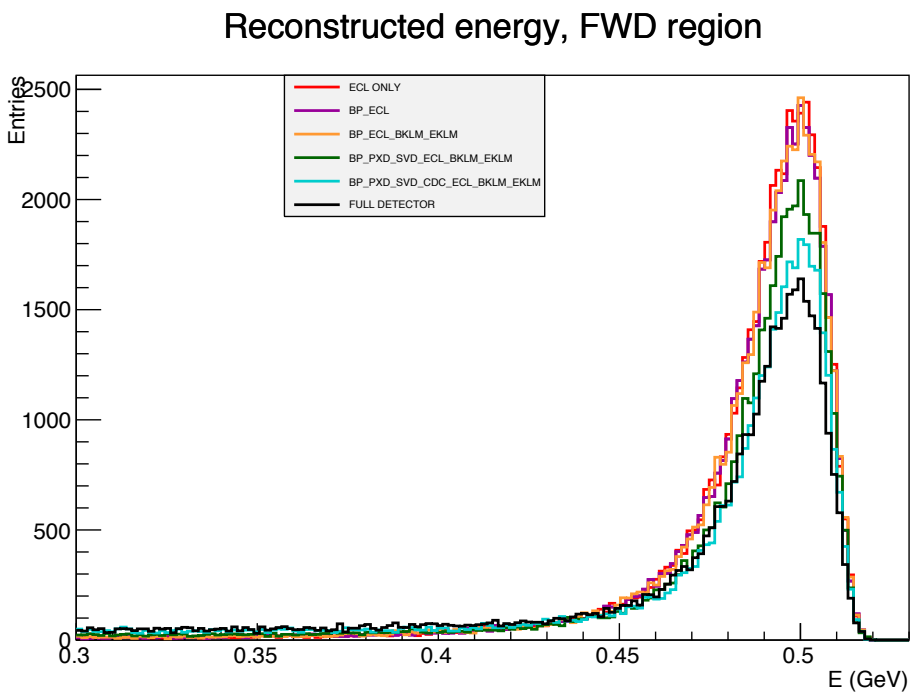
Configs

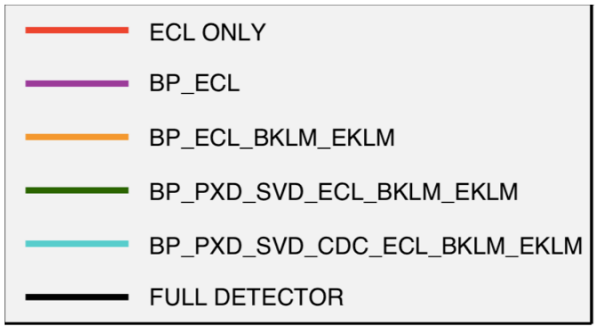
1. ECL ONLY
2. Beam Pipe + ECL (1 vs 2: beam pipe effect)
3. BP + ECL + BKLM + EKLM (2 vs 3: back-scattering effect)
4. BP + PXD + SVD + ECL + BKLM + EKLM (3 vs 4: vertex detectors effects)
5. BP + PXD + SVD + CDC+ ECL + BKLM + EKLM (4 vs 5: CDC effect)
6. FULL DETECTOR (5 vs 6: PID device effects)

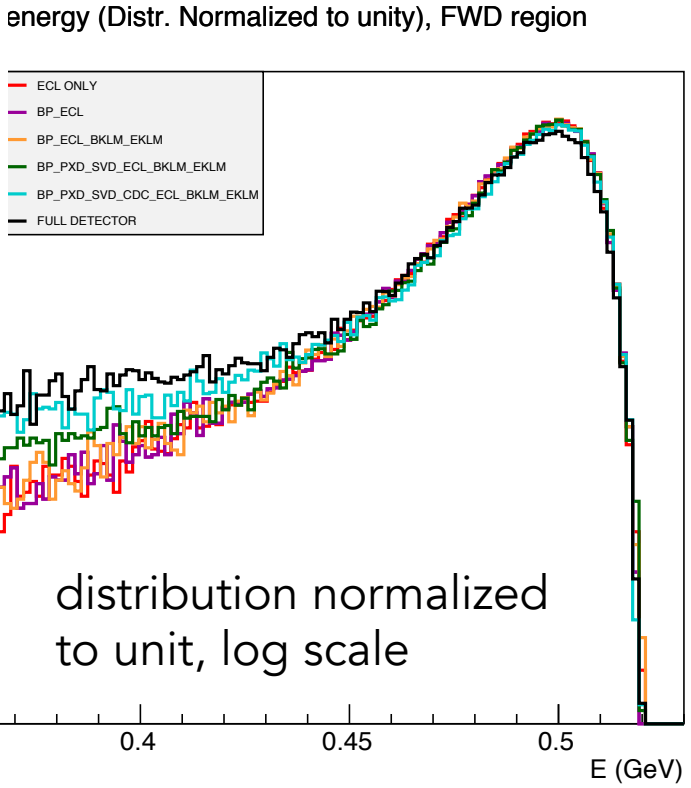
- [magnetic field always ON]

500 MeV

Reco'd energy distribution

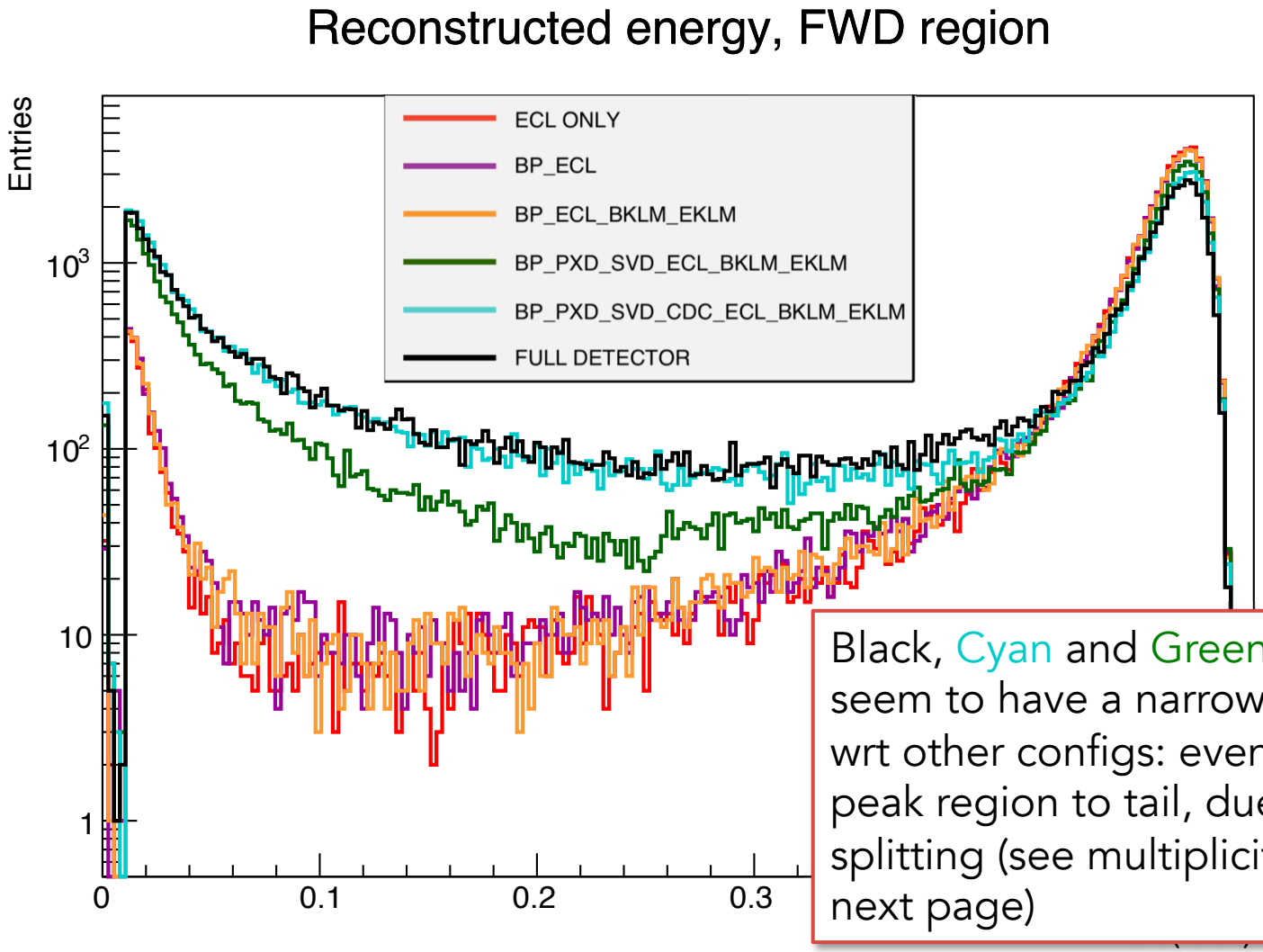






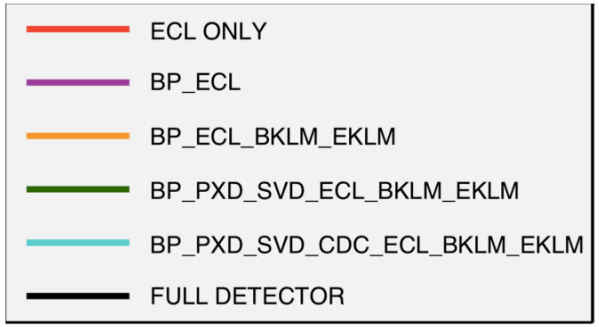
Largest effects when adding SVD+PXD and CDC

Reco'd energy distribution (II)

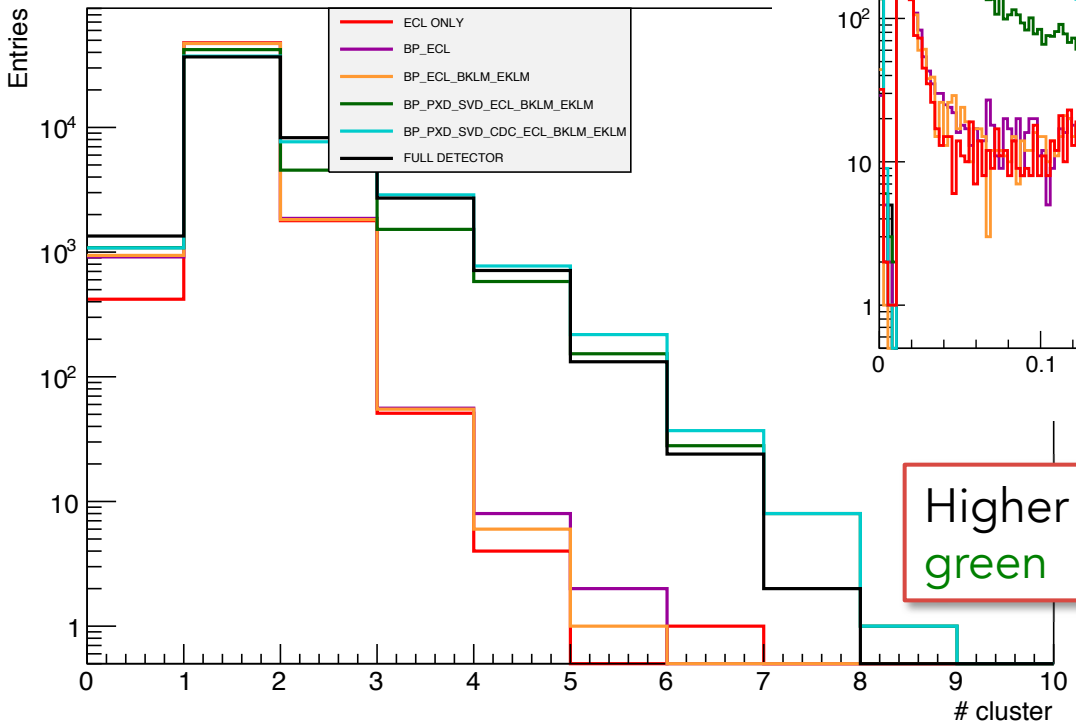


Black, Cyan and Green configs seem to have a narrower peak wrt other configs: events from peak region to tail, due to cluster splitting (see multiplicity plot in next page)

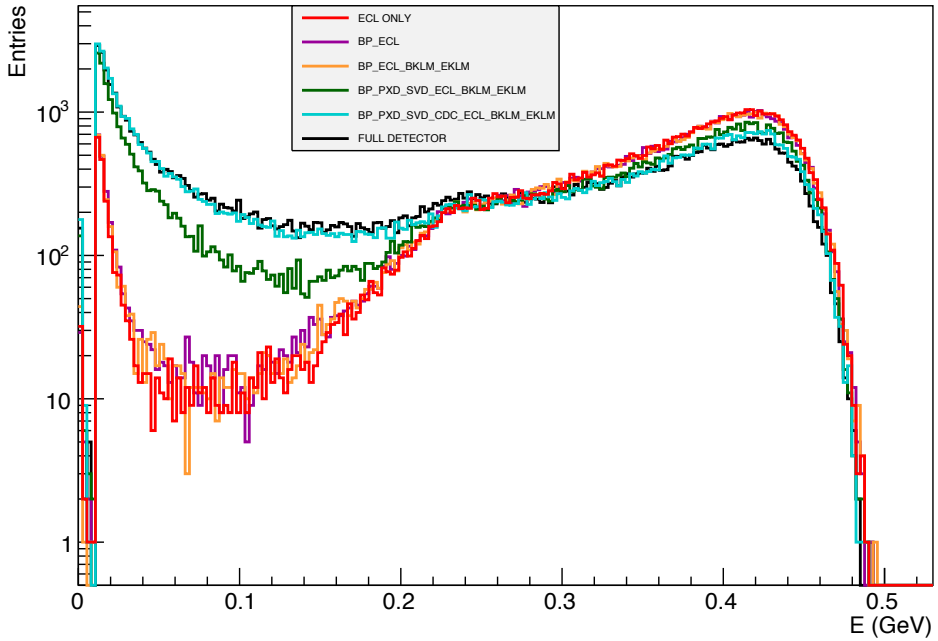
Multiplicity and Max energy deposit



Multiplicity, FWD regior



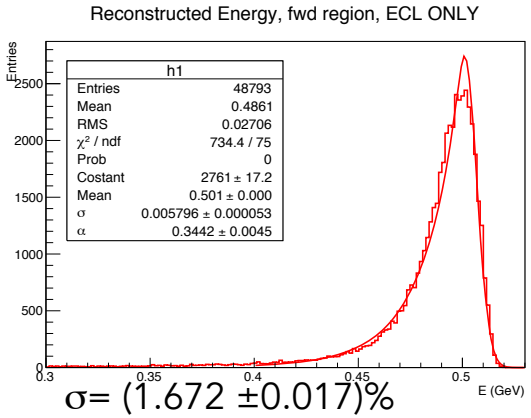
Highest energy deposit, FWD region



Higher multip for black, cyan and green

CB fits

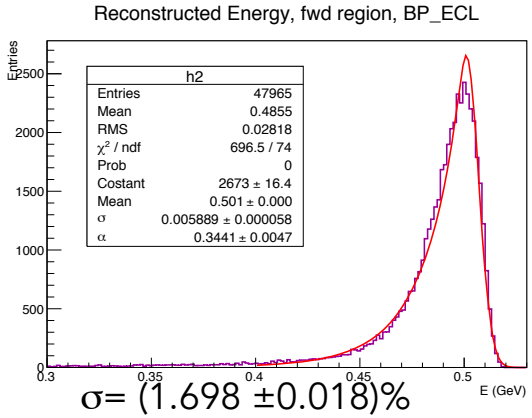
ECL ONLY



σ= (1.672 ±0.017)%

σ_{gauss} = (1.157 ±0.011)%

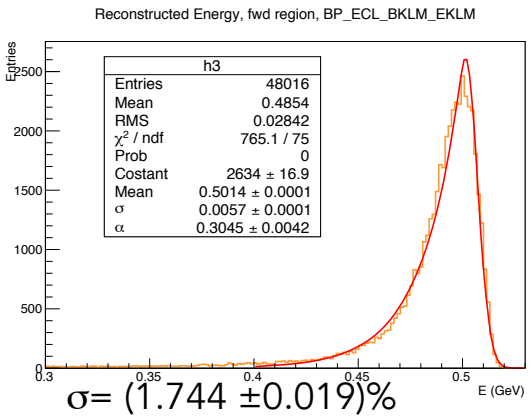
BP_ECL



σ= (1.698 ±0.018)%

σ_{gauss} = (1.175 ±0.011)%

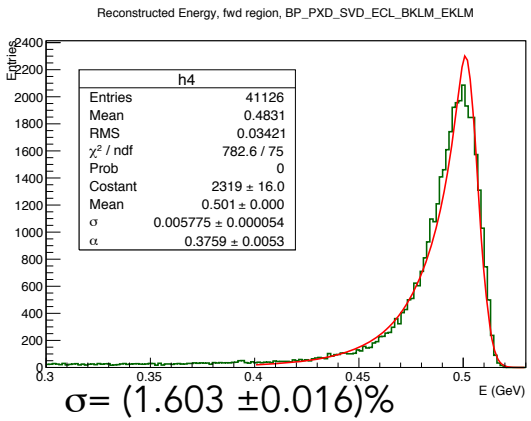
BP_ECL_BKLM_EKLM



σ= (1.744 ±0.019)%

σ_{gauss} = (1.137 ±0.011)%

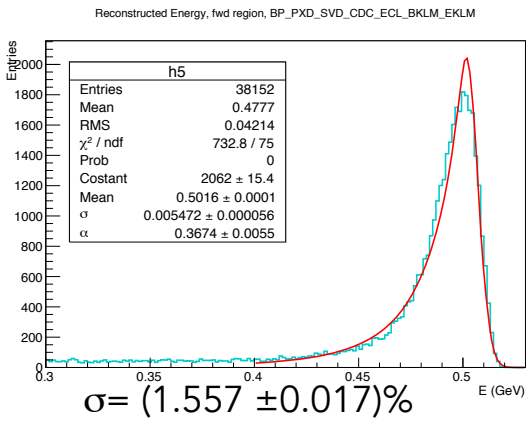
BP_PXD_SVD_ECL _BKLM_EKLM



σ= (1.603 ±0.016)%

σ_{gauss} = (1.152 ±0.011)%

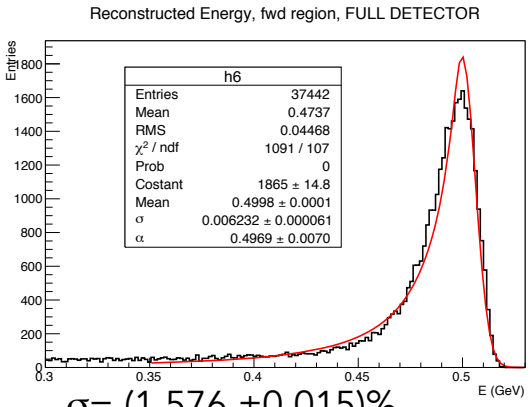
BP_PXD_SVD_CDC _ECL_BKLM_EKLM



σ= (1.557 ±0.017)%

σ_{gauss} = (1.091 ±0.011)%

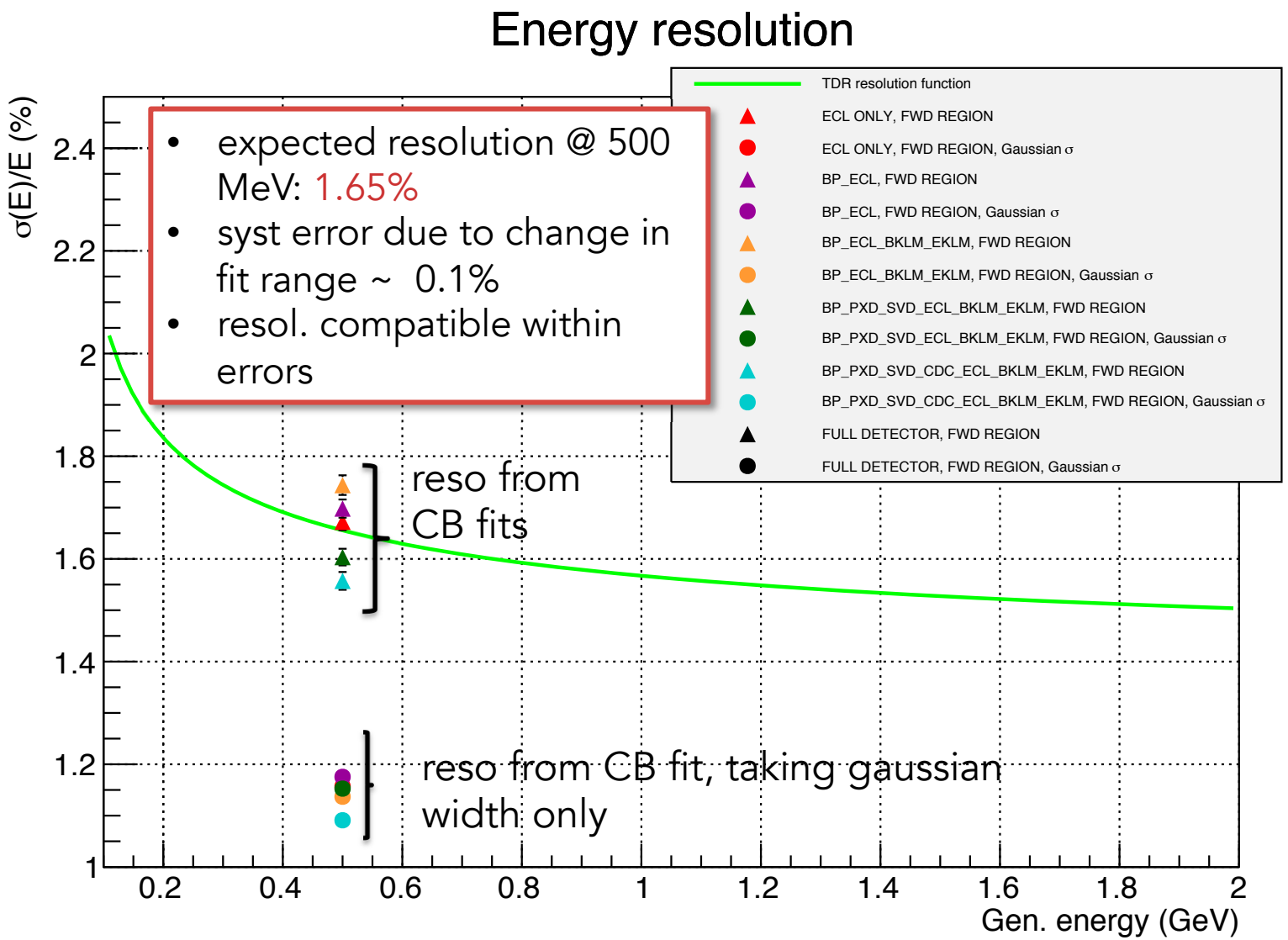
FULL_DETECTOR



σ= (1.576 ±0.015)%

σ_{gauss} = (1.247 ±0.012)%

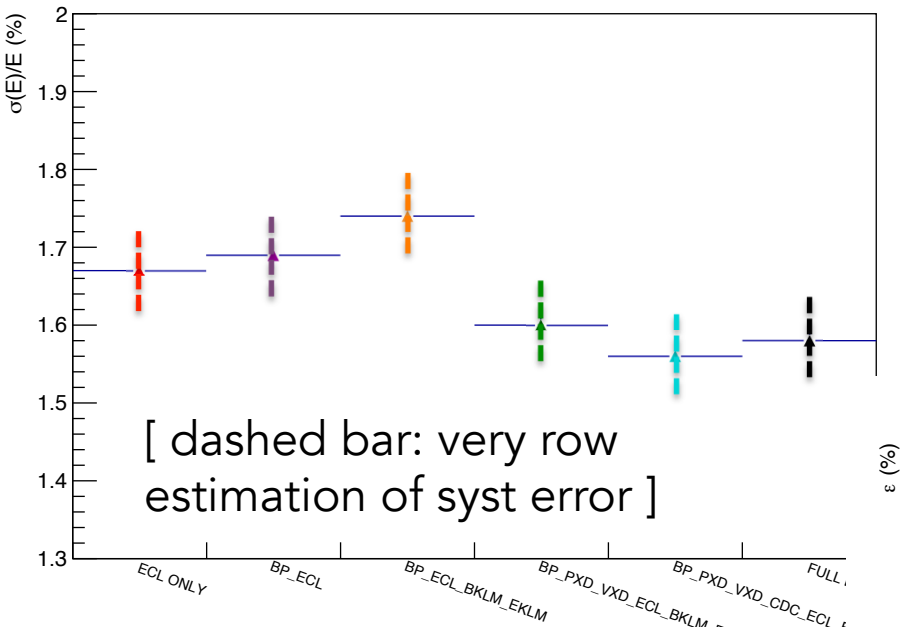
Resolutions



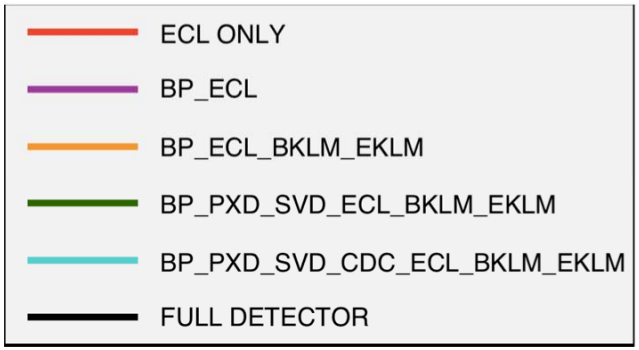
- expected resolution @ 500 MeV: 1.65%
- syst error due to change in fit range ~ 0.1%
- resol. compatible within errors

Resolution and efficieny summary

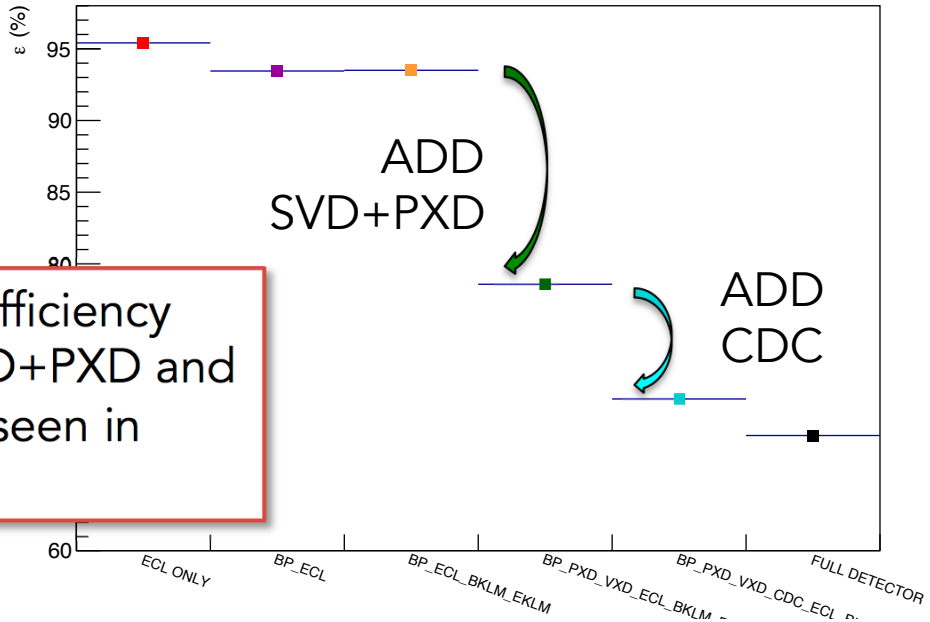
Resolution from CB fit



[dashed bar: very row estimation of syst error]

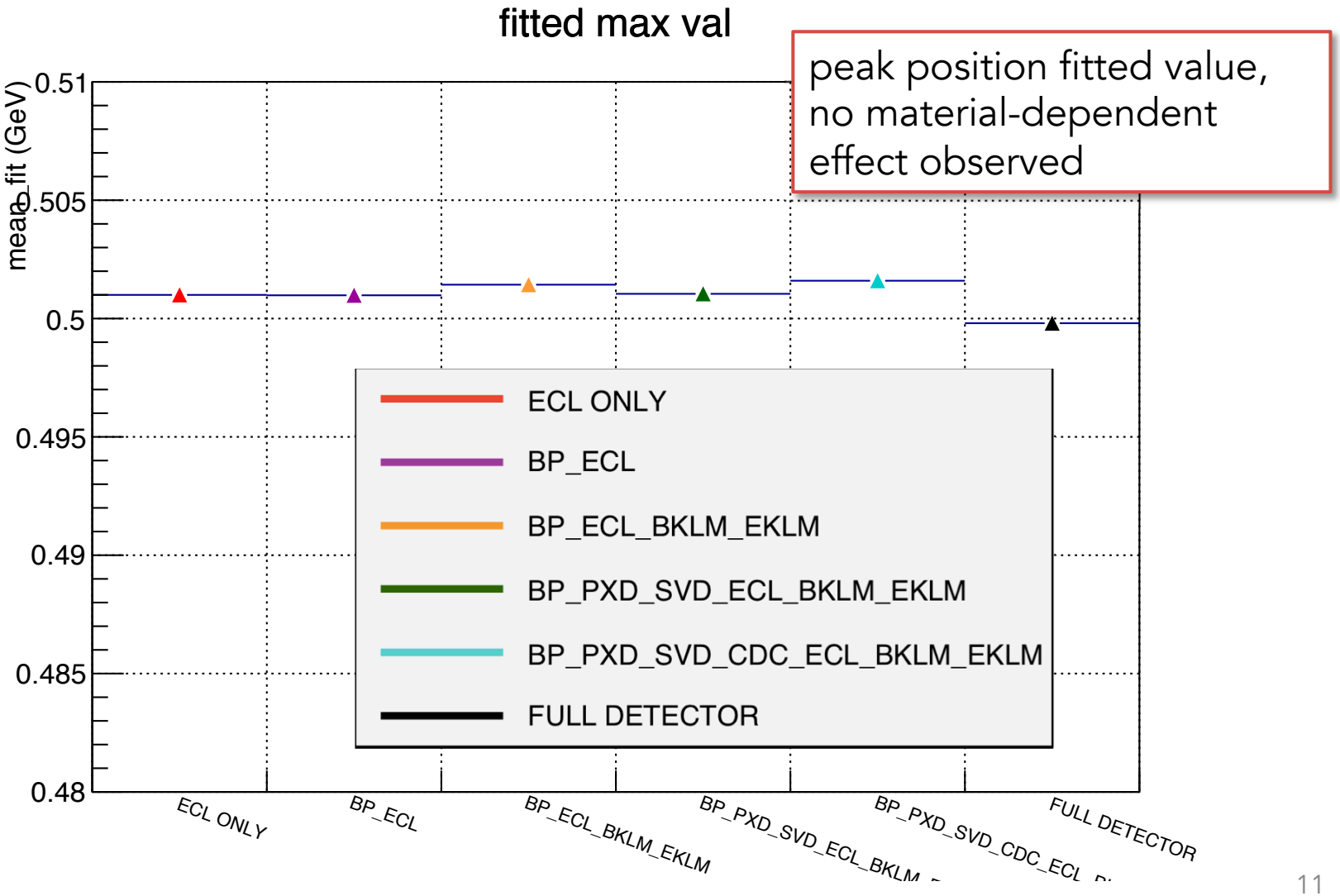


Efficiency (0.4-0.53 MeV range)



larger effect on efficiency when adding SVD+PXD and CDC (as already seen in previous studies)

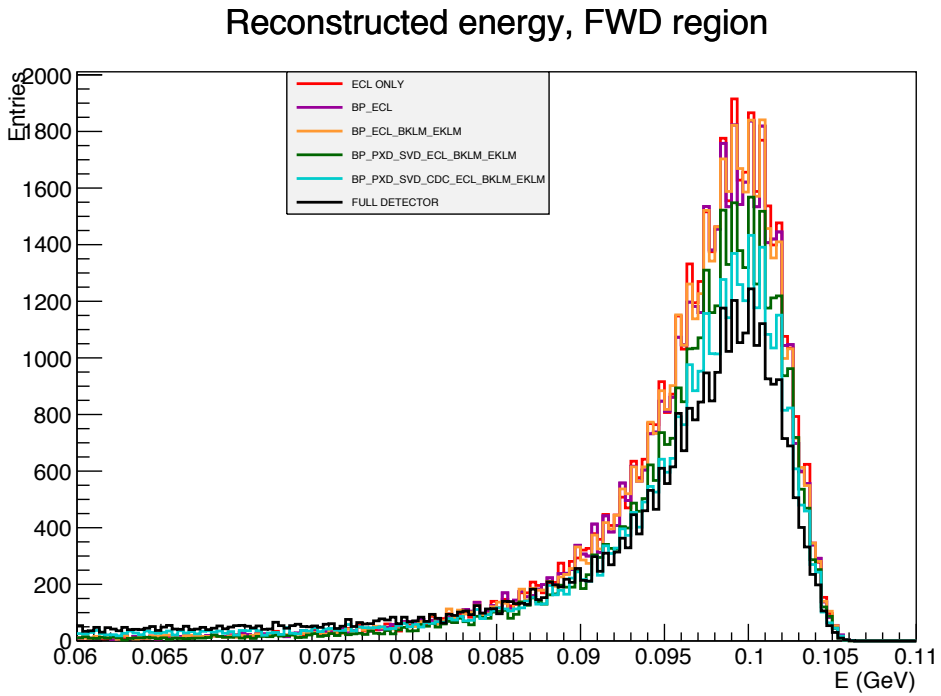
Linearity

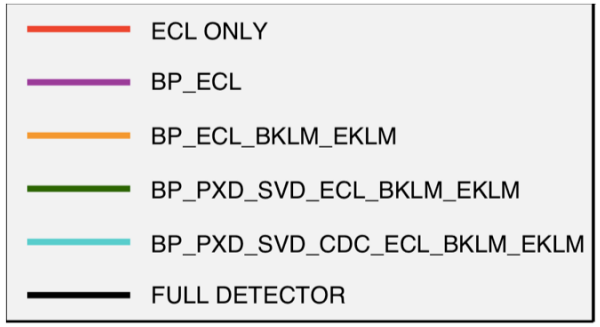


peak position fitted value, no material-dependent effect observed

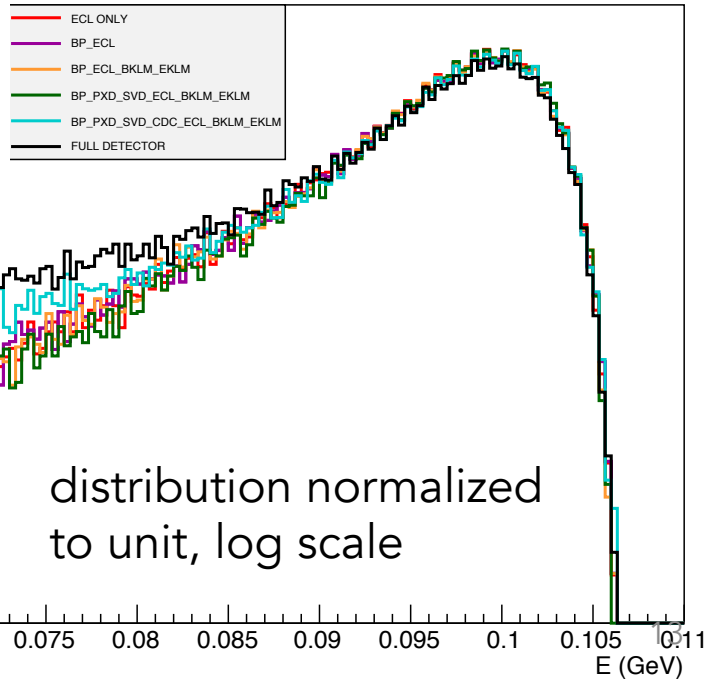
100 MEV

Reco'd energy distribution





ed energy (Distr. Normalized to unity), FWD region

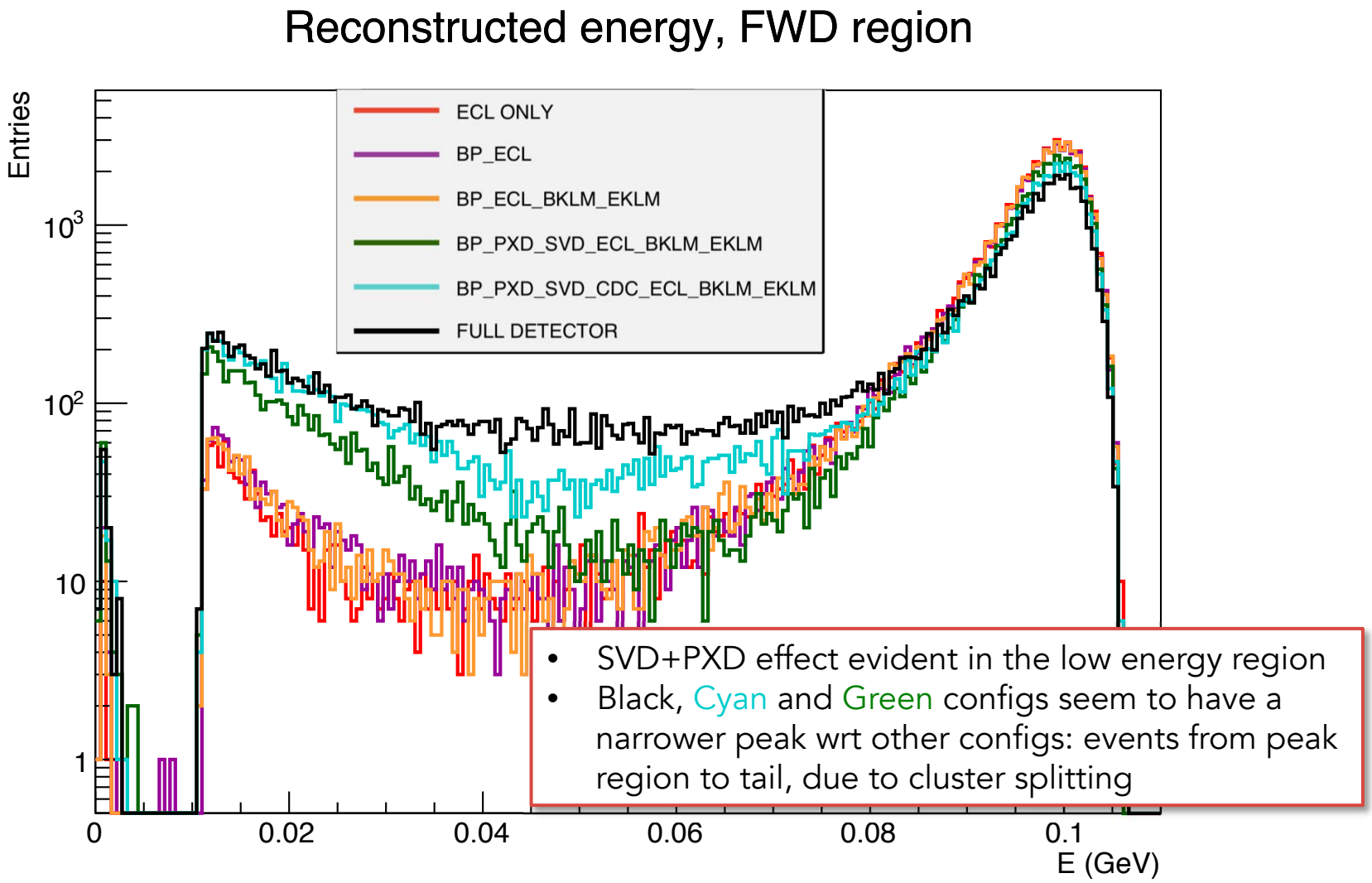


ADD CDC

distribution normalized to unit, log scale

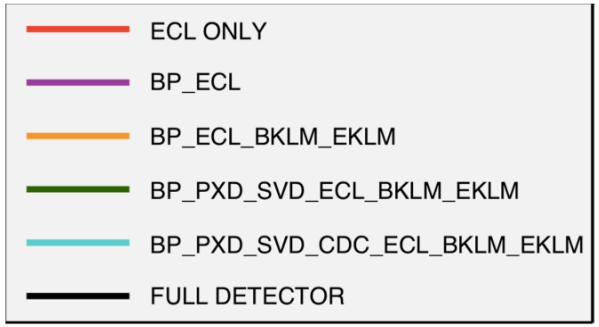
In the fit region, largest effects when adding CDC, SVD+PXD doesn't seem to have a big effect here

Reco'd energy distribution (II)

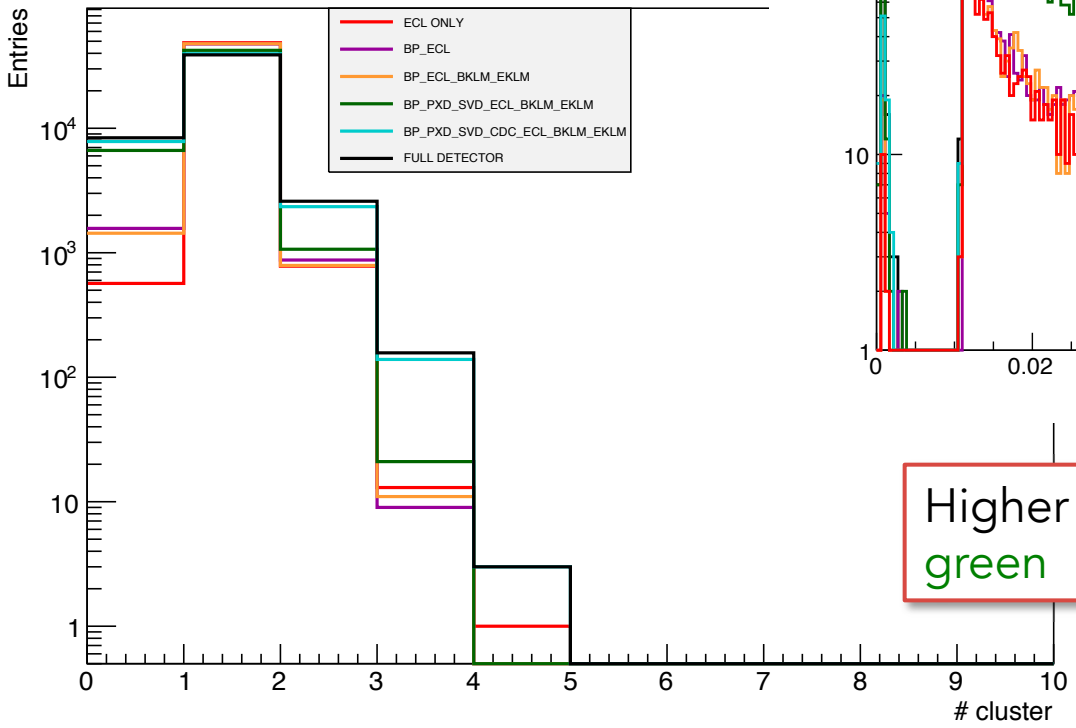


- SVD+PXD effect evident in the low energy region
- Black, Cyan and Green configs seem to have a narrower peak wrt other configs: events from peak region to tail, due to cluster splitting

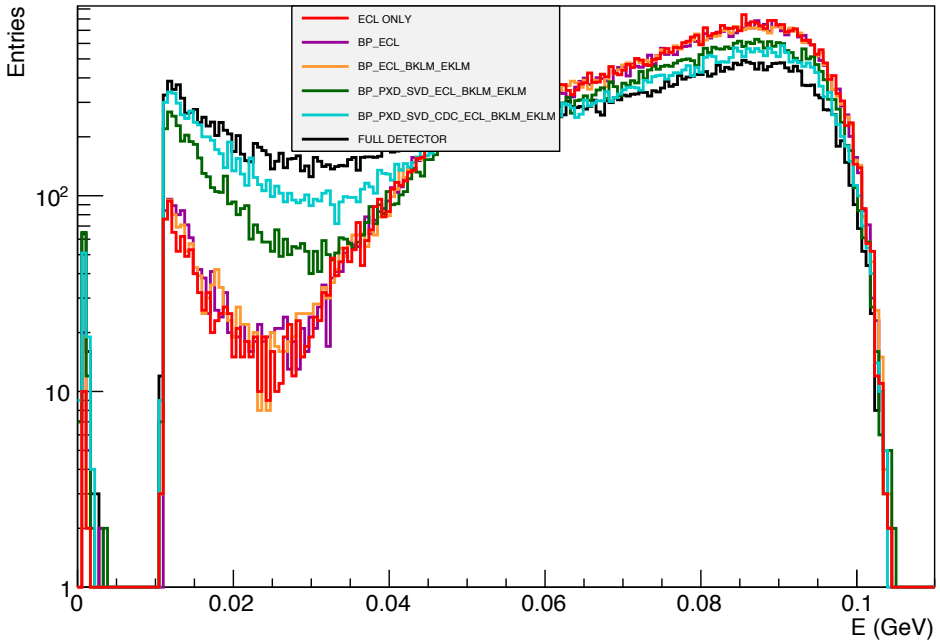
Multiplicity and Max energy deposit



Multiplicity, FWD regior



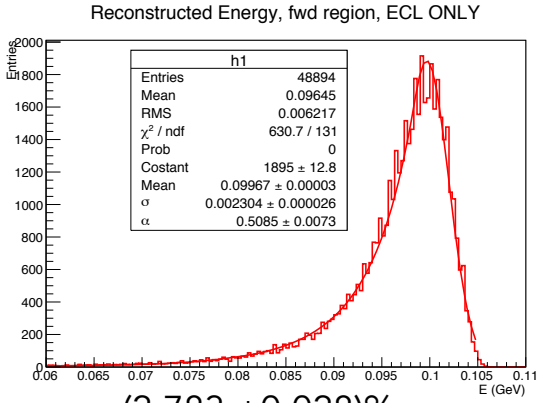
Highest energy deposit, FWD region



Higher multip for black, cyan and green

CB fits

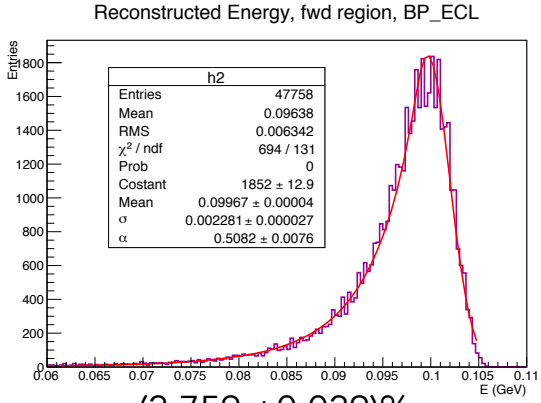
ECL ONLY



σ= (2.783 ±0.028)%

σ_{gauss} = (2.311 ±0.026)%

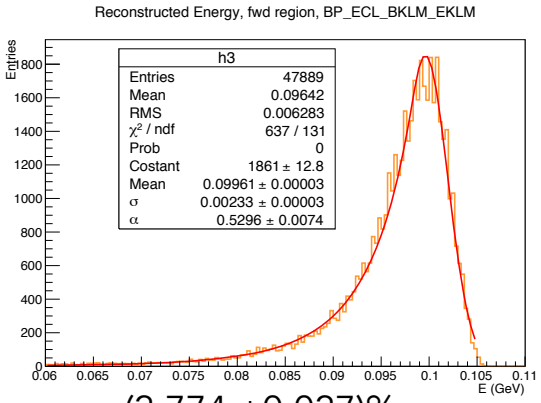
BP_ECL



σ= (2.759 ±0.029)%

σ_{gauss} = (2.288 ±0.027)%

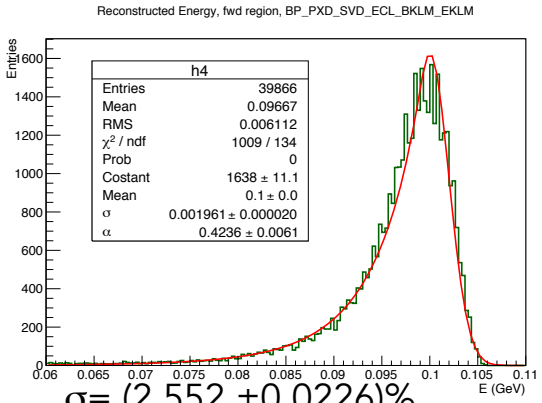
BP_ECL_BKLM_EKLM



σ= (2.774 ±0.027)%

σ_{gauss} = (2.339 ±0.026)%

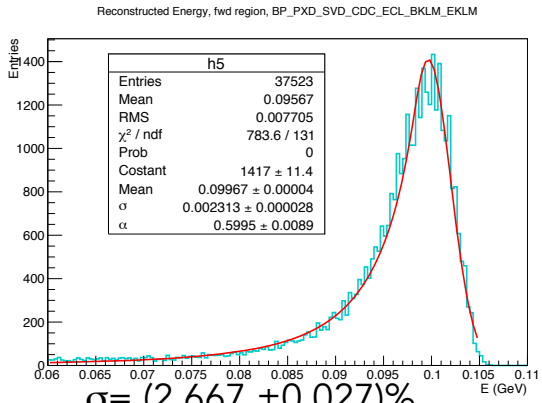
BP_PXD_SVD_ECL _BKLM_EKLM



σ= (2.552 ±0.0226)%

σ_{gauss} = (1.961 ±0.020)%

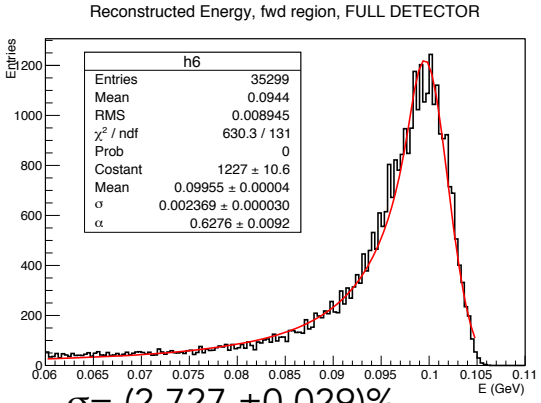
BP_PXD_SVD_CDC _ECL_BKLM_EKLM



σ= (2.667 ±0.027)%

σ_{gauss} = (2.321 ±0.028)%

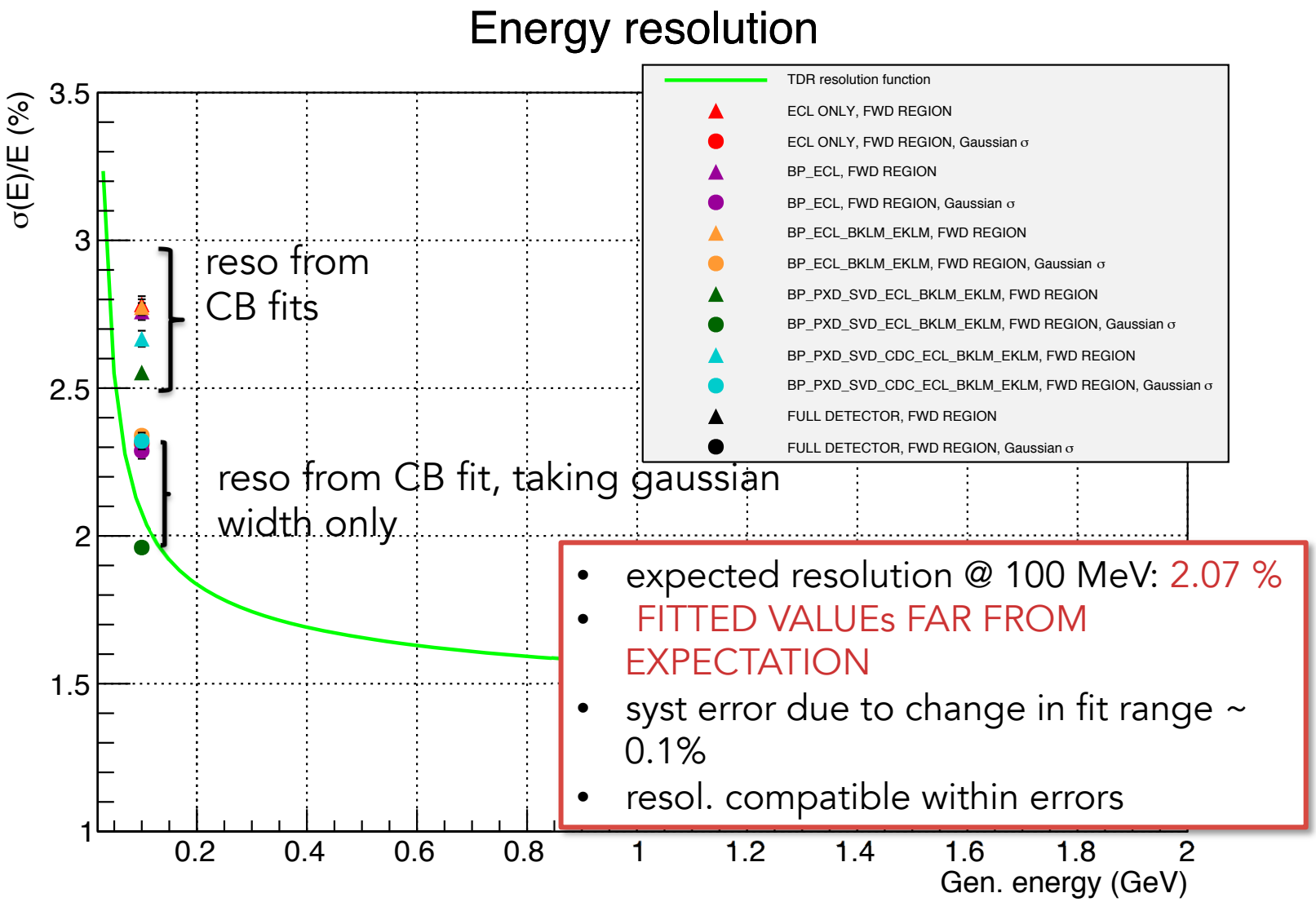
FULL_DETECTOR



σ= (2.727 ±0.029)%

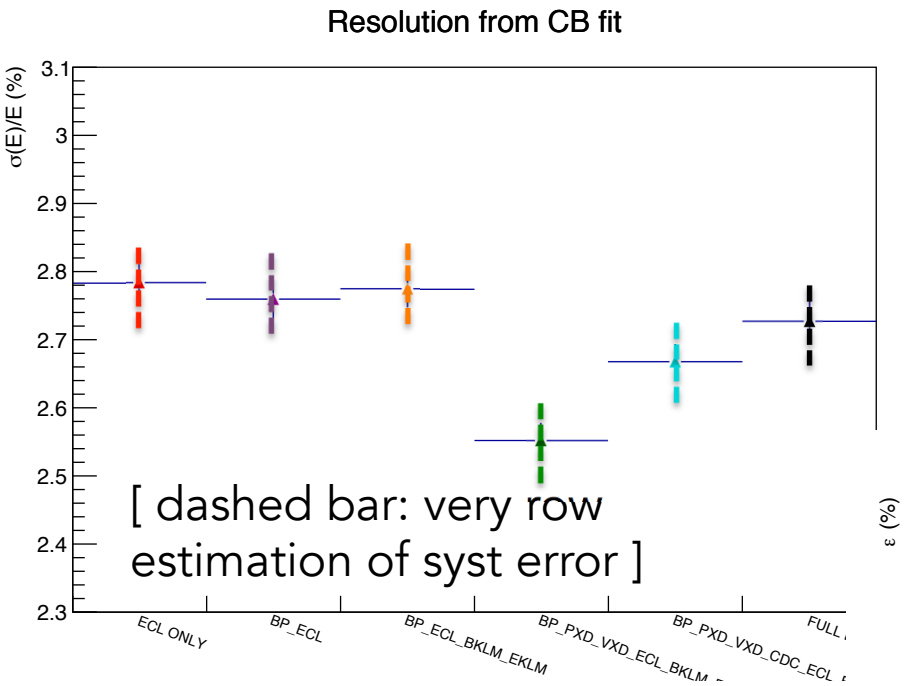
σ_{gauss} = (2.379 ±0.031)%

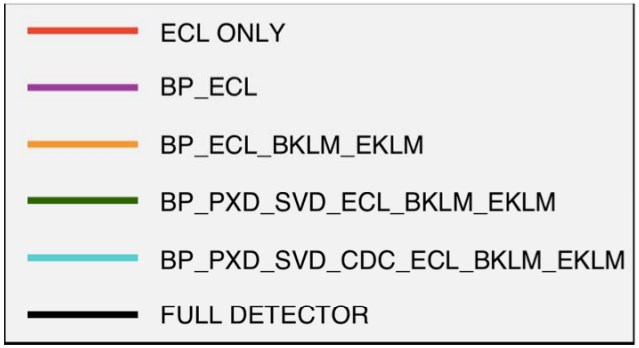
Resolutions

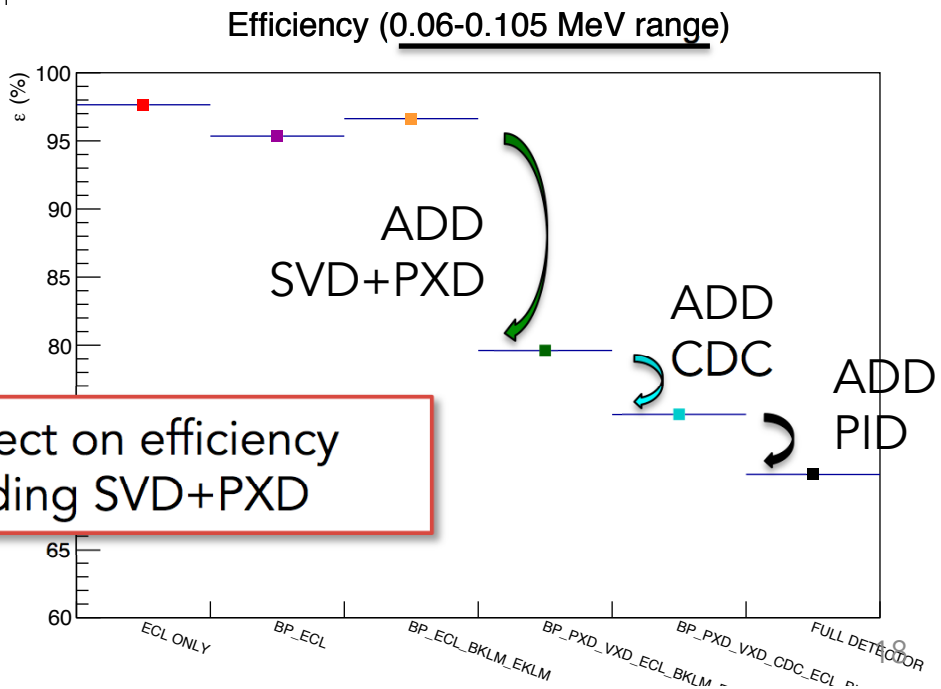


- expected resolution @ 100 MeV: 2.07 %
- FITTED VALUEs FAR FROM EXPECTATION
- syst error due to change in fit range ~ 0.1%
- resol. compatible within errors

Resolution and efficiency summary

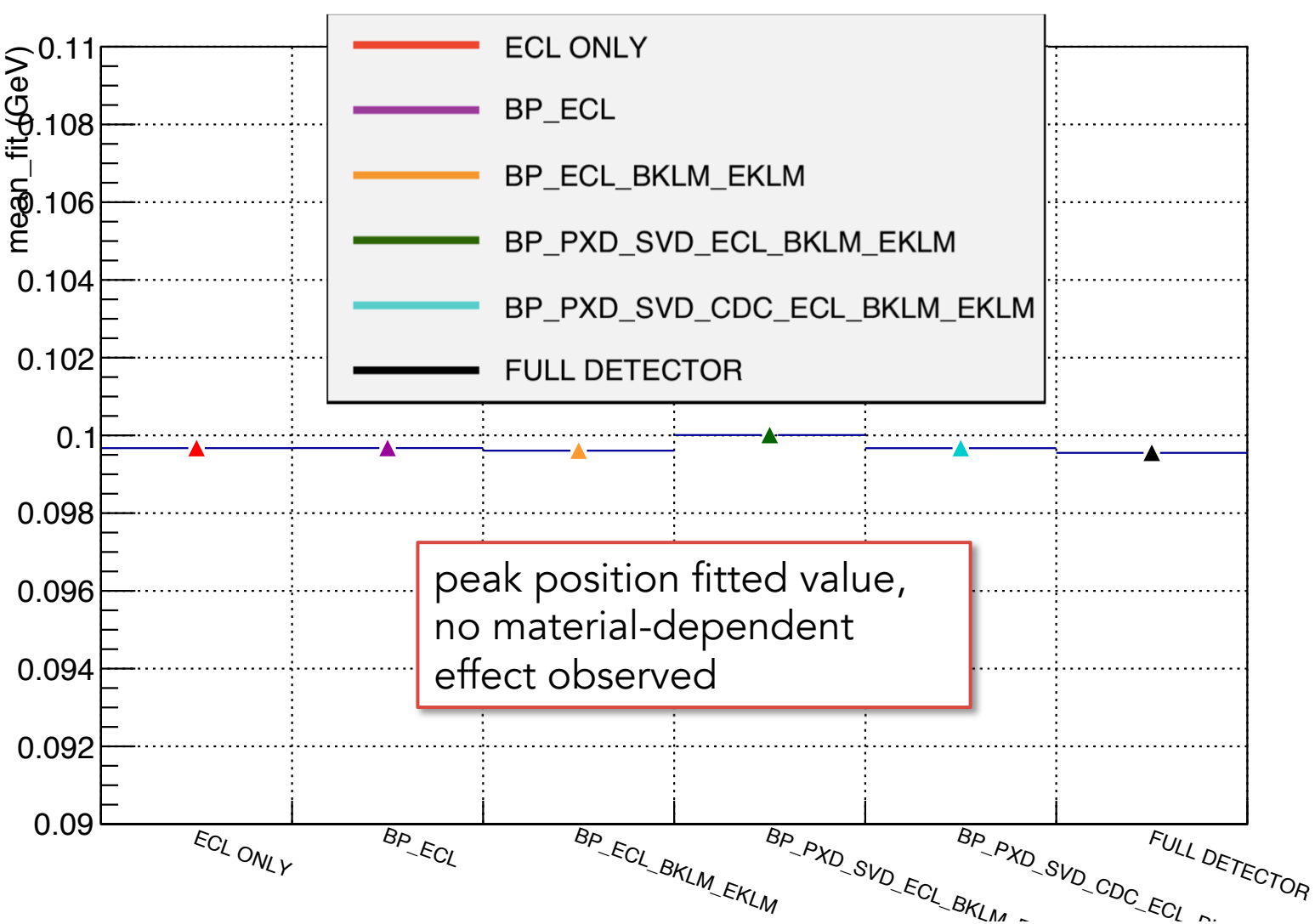






larger effect on efficiency when adding SVD+PXD

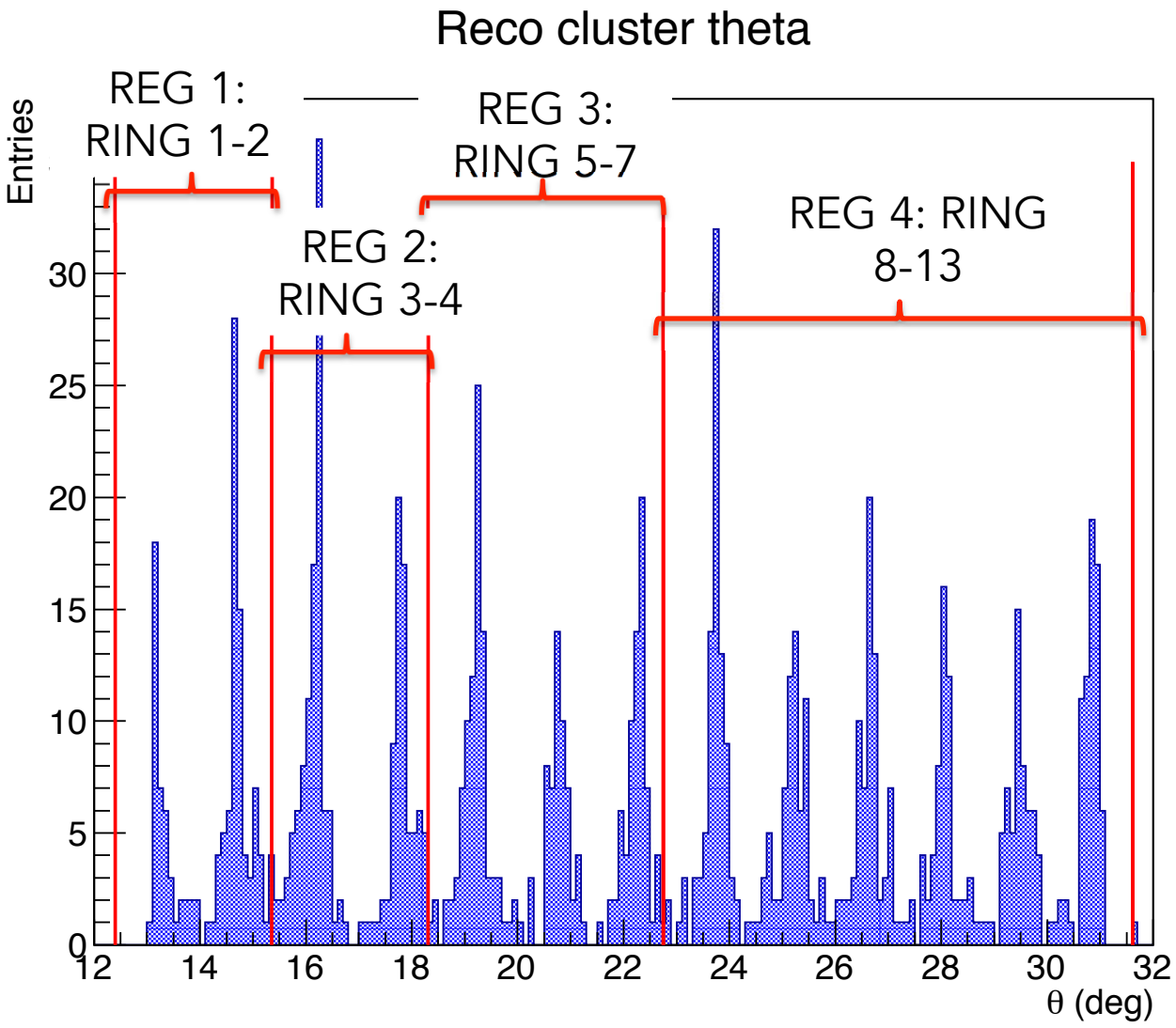
Linearity



peak position fitted value, no material-dependent effect observed

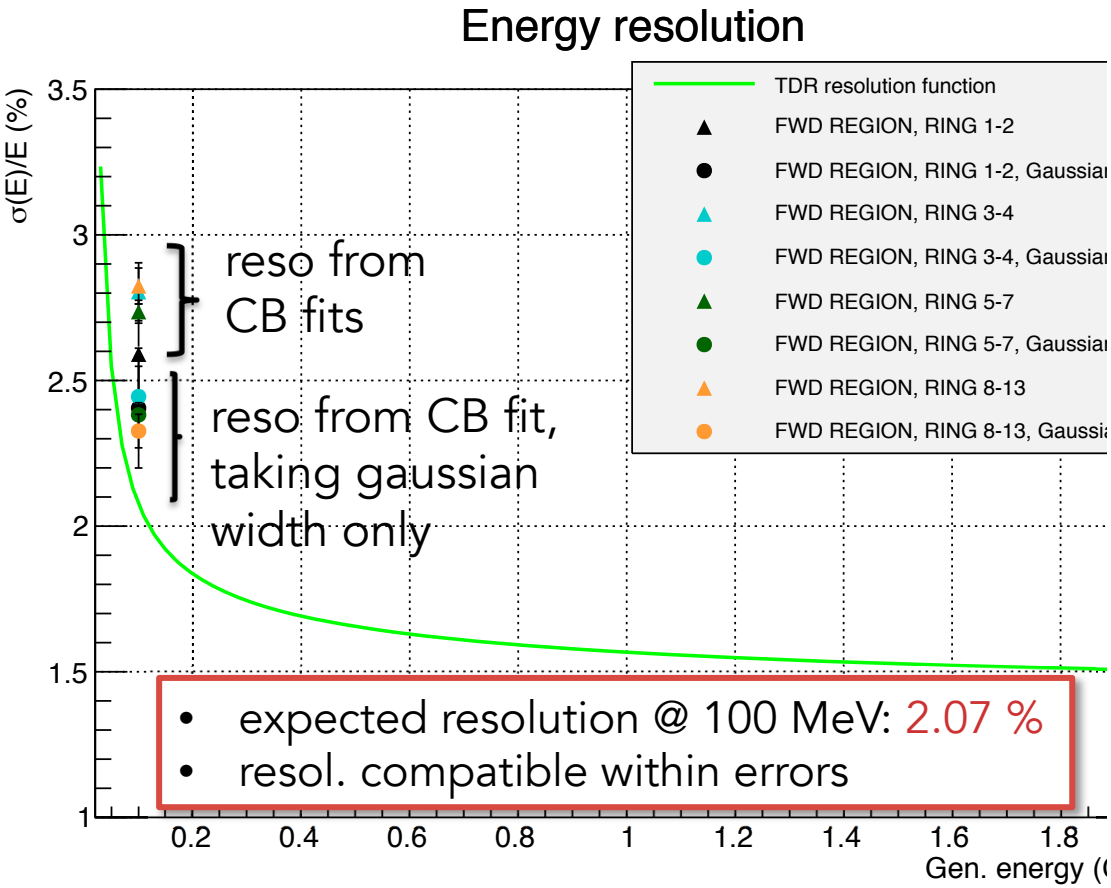
DIVIDING FWD ECL IN SLICES

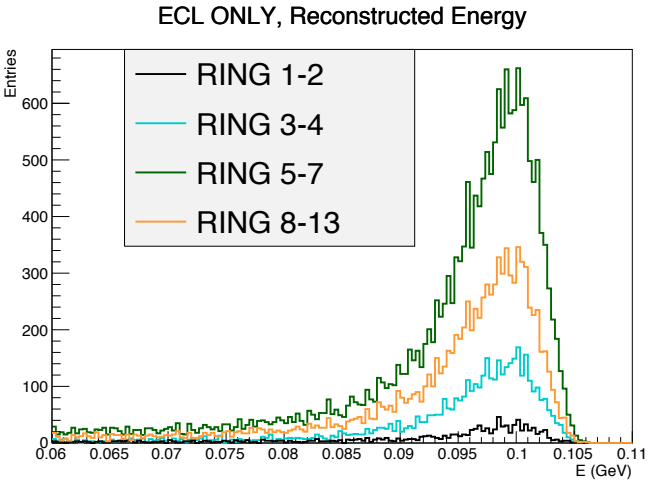
SELECTED SUB-REGIONS

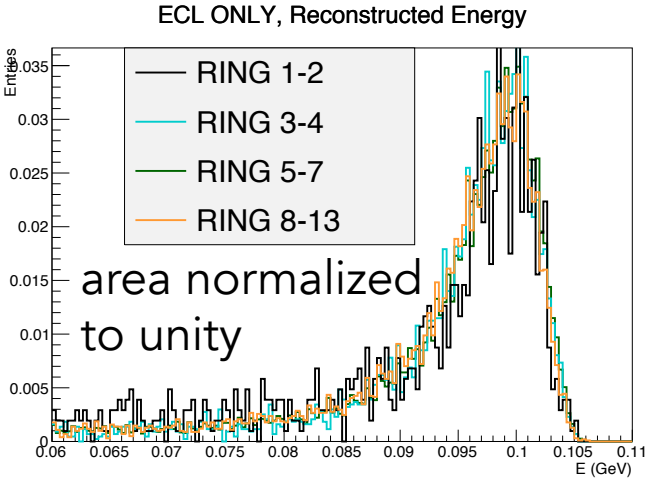


- events generated with 'thetaParams': [12.398°, 31.62°] with uniform distribution

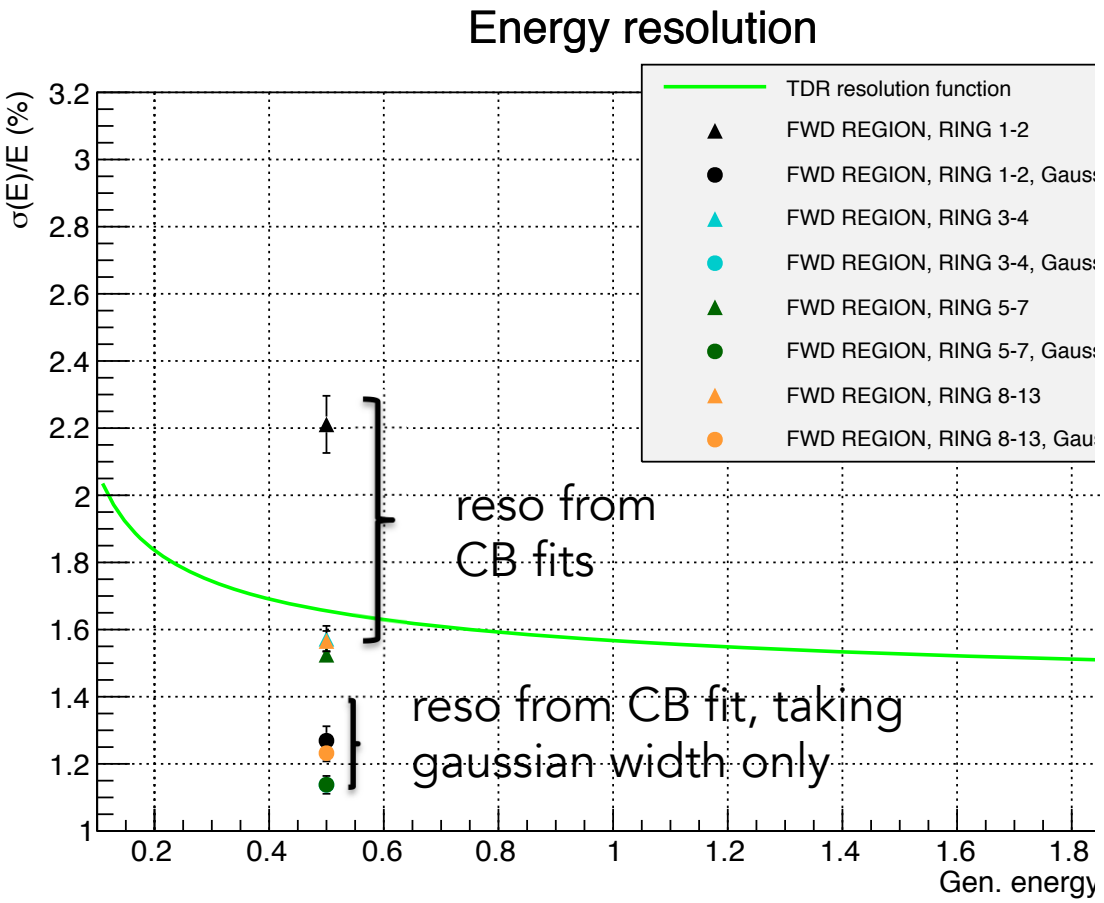
100 MeV, FULL DETECTOR

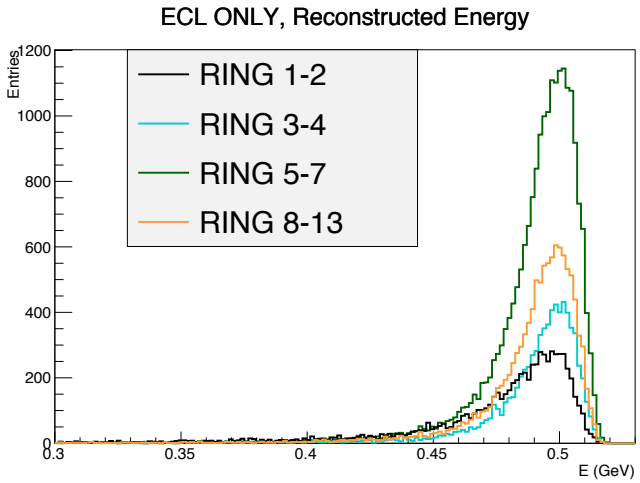


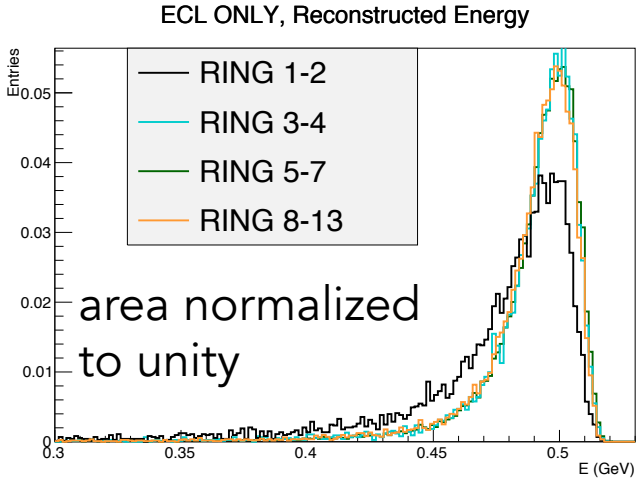




500 MeV, ECL ONLY

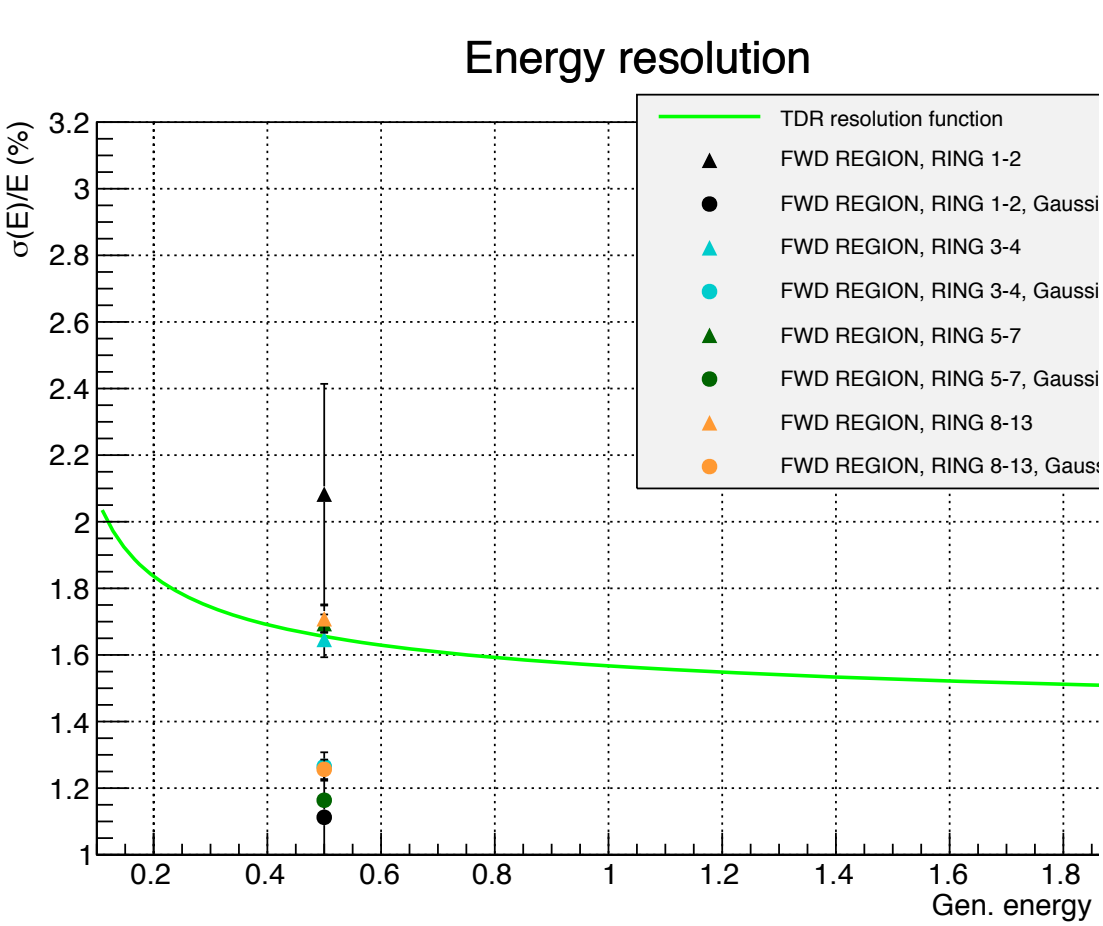


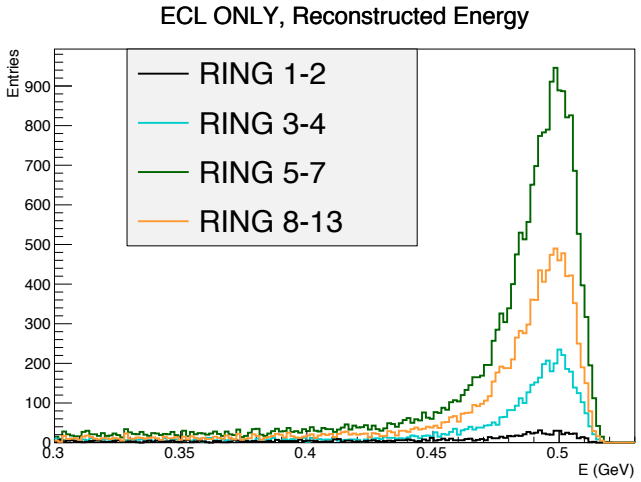


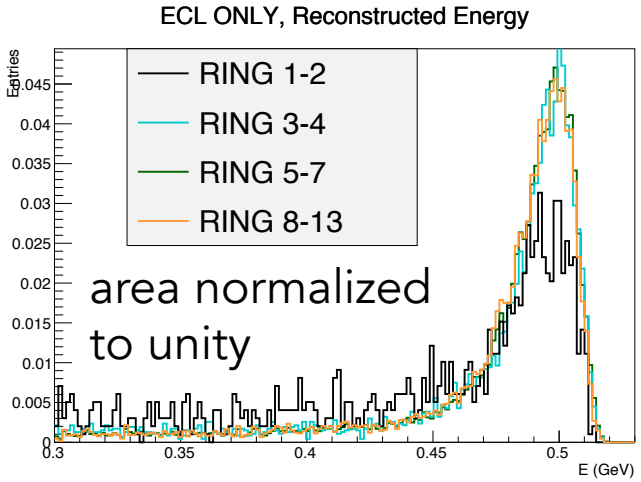


- expected resolution @ 100 MeV: 2.07 %
- larger tails and resolution in RING 1-2

500 MeV, FULL DETECTOR







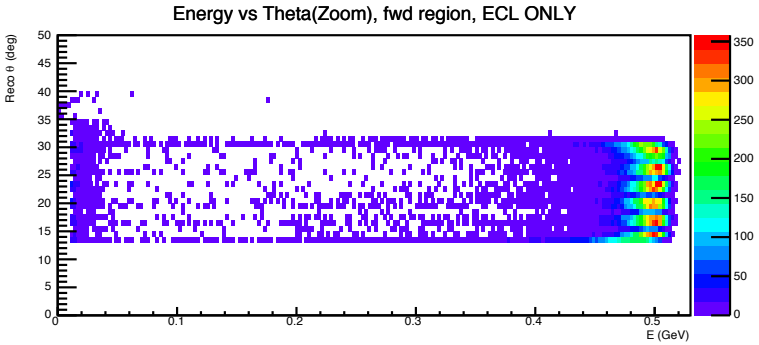
Conclusions

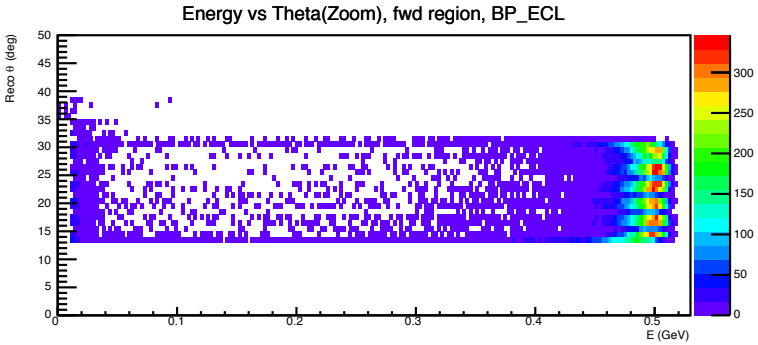
- Negligible material budget effect on resolution
  - adding SVD+PXD, CDC and PID cause cluster splitting
  - narrower energy distribution, lower efficiency in fit region
  - major effect in efficiency due to SCV+CDC
  - @ 500 MeV: fitted resol. compatible with expected
  - @ 100 MeV: fitted resol. FAR with expected

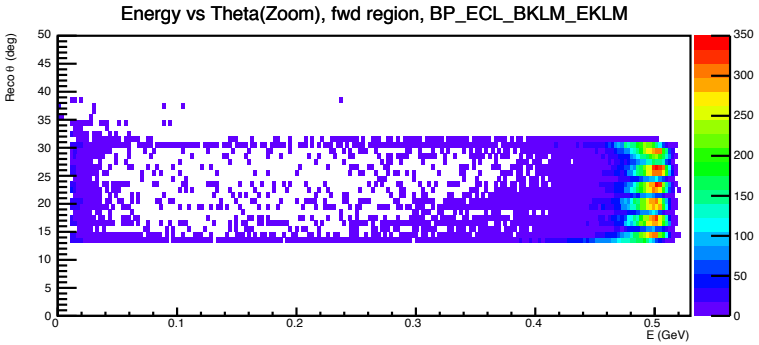
- Dividing FWD in slices:
  - @ 100 MeV: no difference between FWD ECL regions in terms on resolution (much lower efficiency in RING1-2)
  - @ 500 MeV: much worst resolution in RING1-2, also in ECL_ONLY config (much lower efficiency in RING1-2)

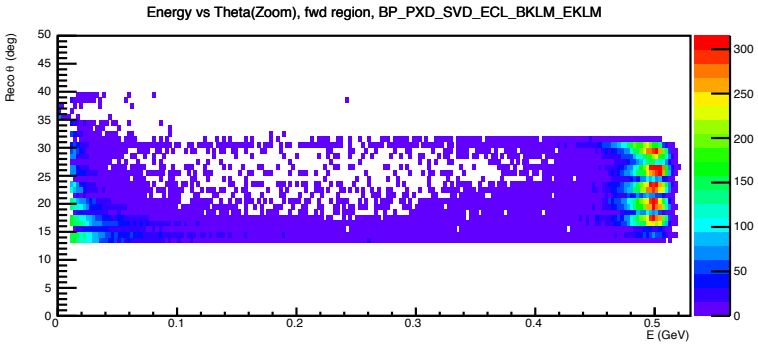
EXTRA-SLIDES

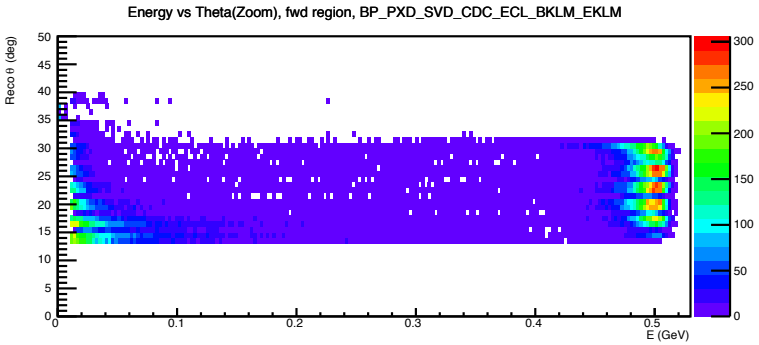
500 MeV: reco'd energy vs reco'd theta

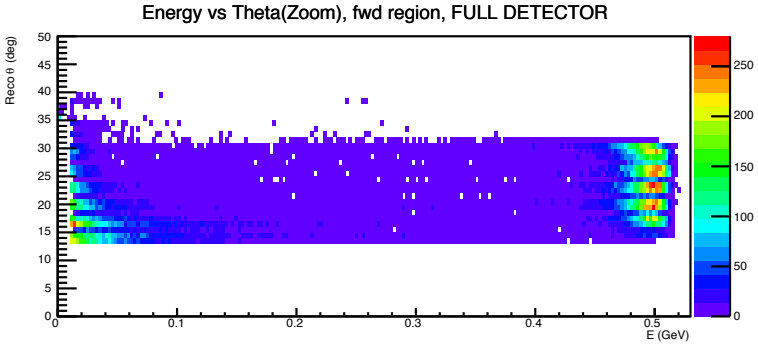












100 MeV: reco'd energy vs reco'd theta