Validation of 10.5.ref08 with geant-val

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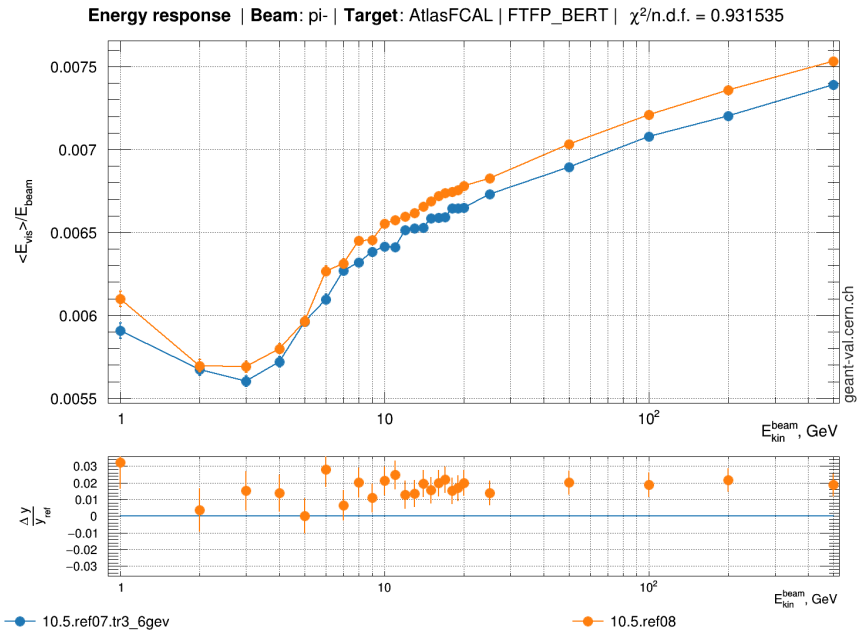
Reminder

Validation results presented at the previous Geant4 CERN group meeting (https://indico.cern.ch/event/803482/):

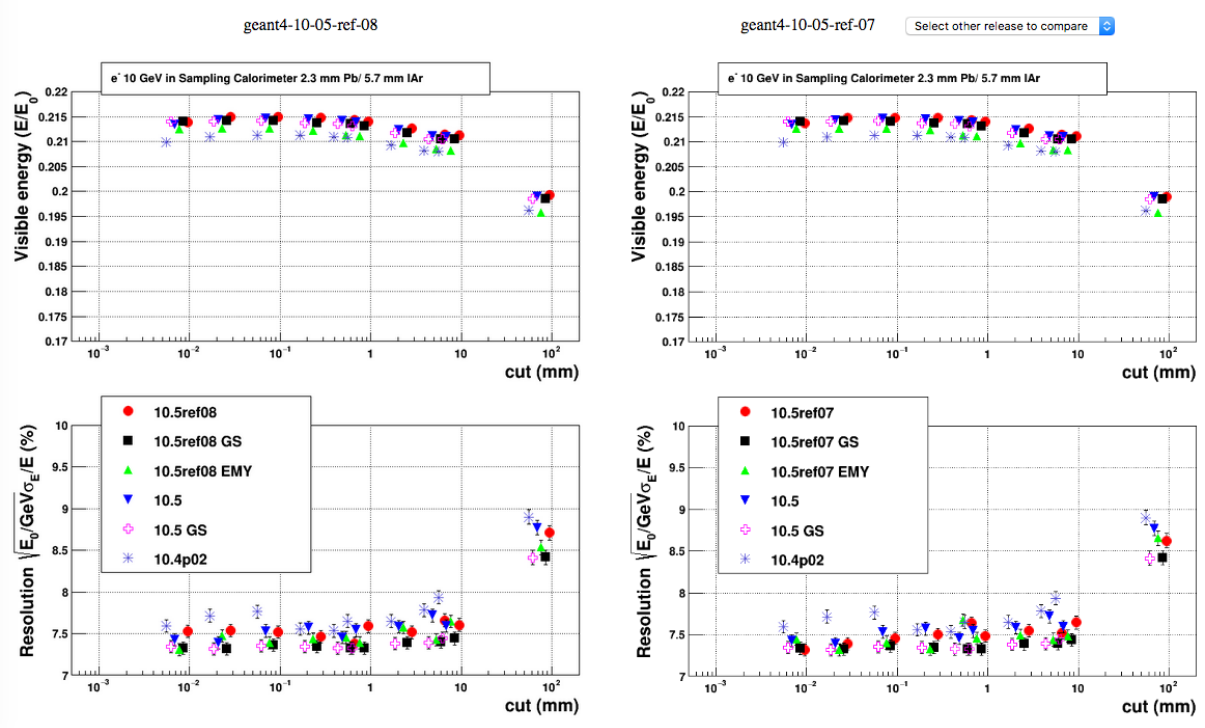
- Alberto R.: **"Simplified Calorimeter"** test with **pi-** and **hadronic calorimeters**.
- One small difference is observed and reported: + 2% shift in energy response of tungsten calorimeter. **Not understood**



Geant4 10.5.ref08 and 10.5.ref07 with new transition regions

Reminder

- Vladimir I.: **"EM Testing Suite"**

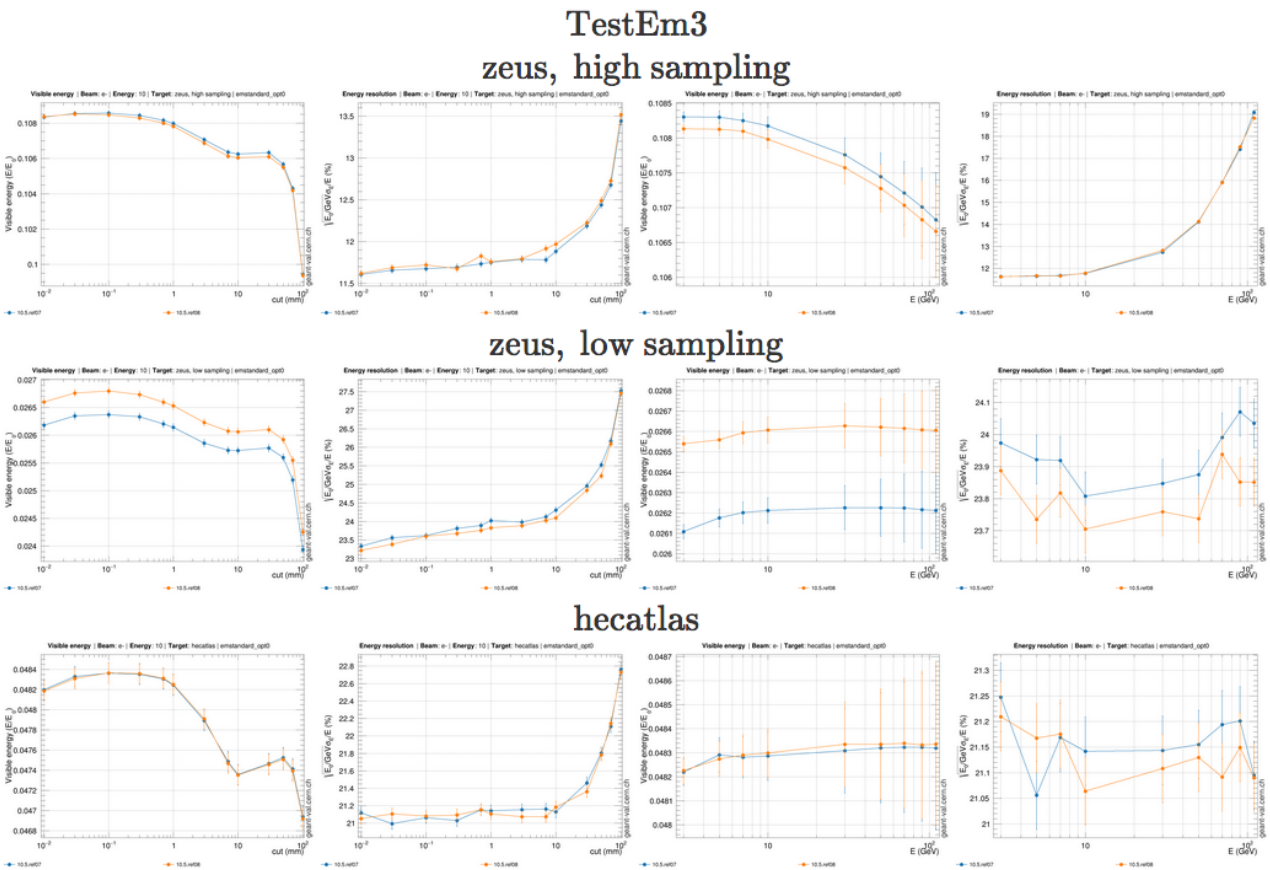


Geant4 10.5.ref08 and 10.5.ref07

- No difference between 10.5.ref08 and 10.5.ref09 is observed. For more plots see: https://test-geant4-tools.web.cern.ch/test-geant4-tools/emtesting/

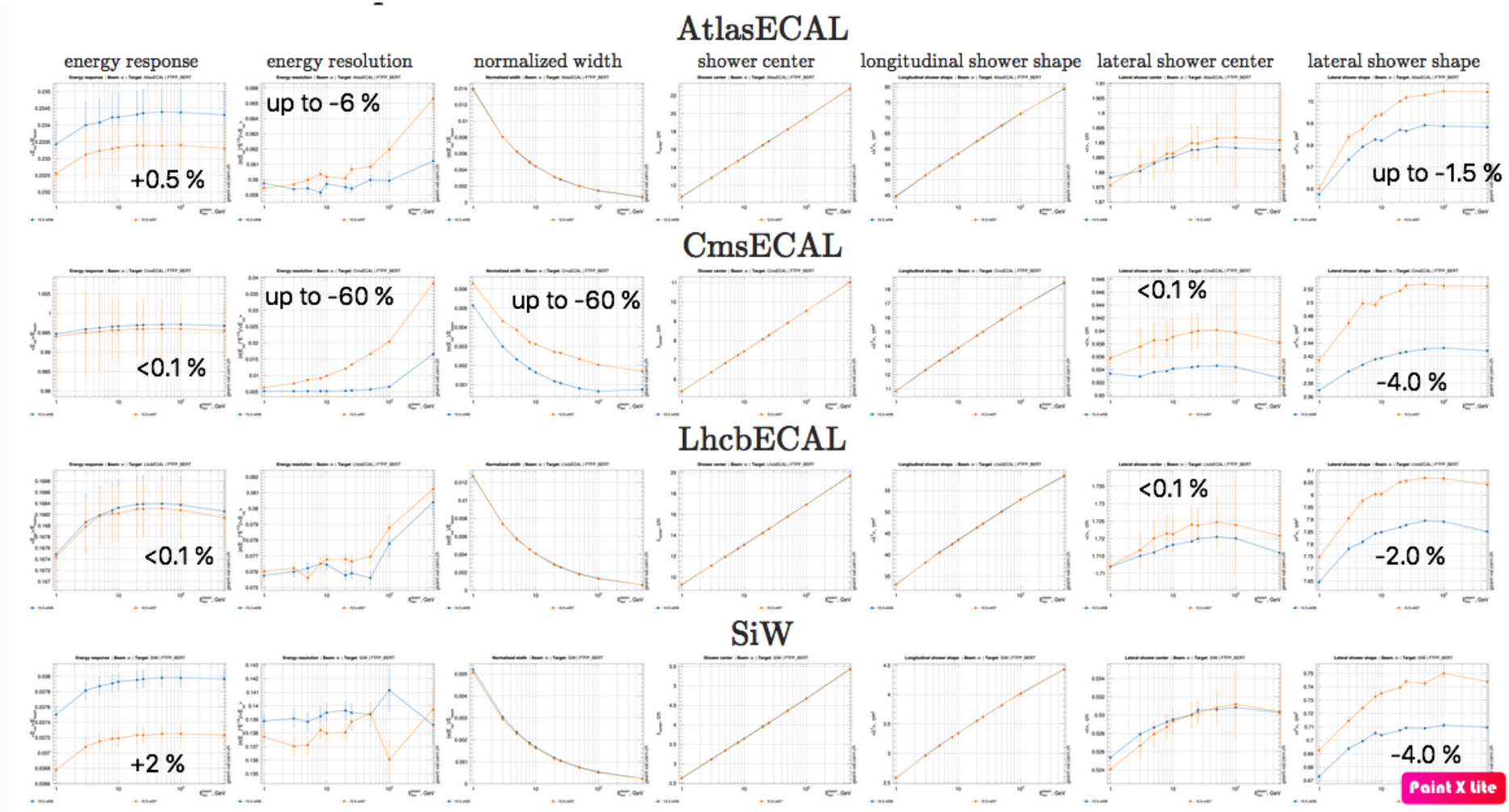
TestEm3

- "Same TestEm3 as in EM testing suite but with much higher statistics"



New test: EM "Simplified calorimeter"

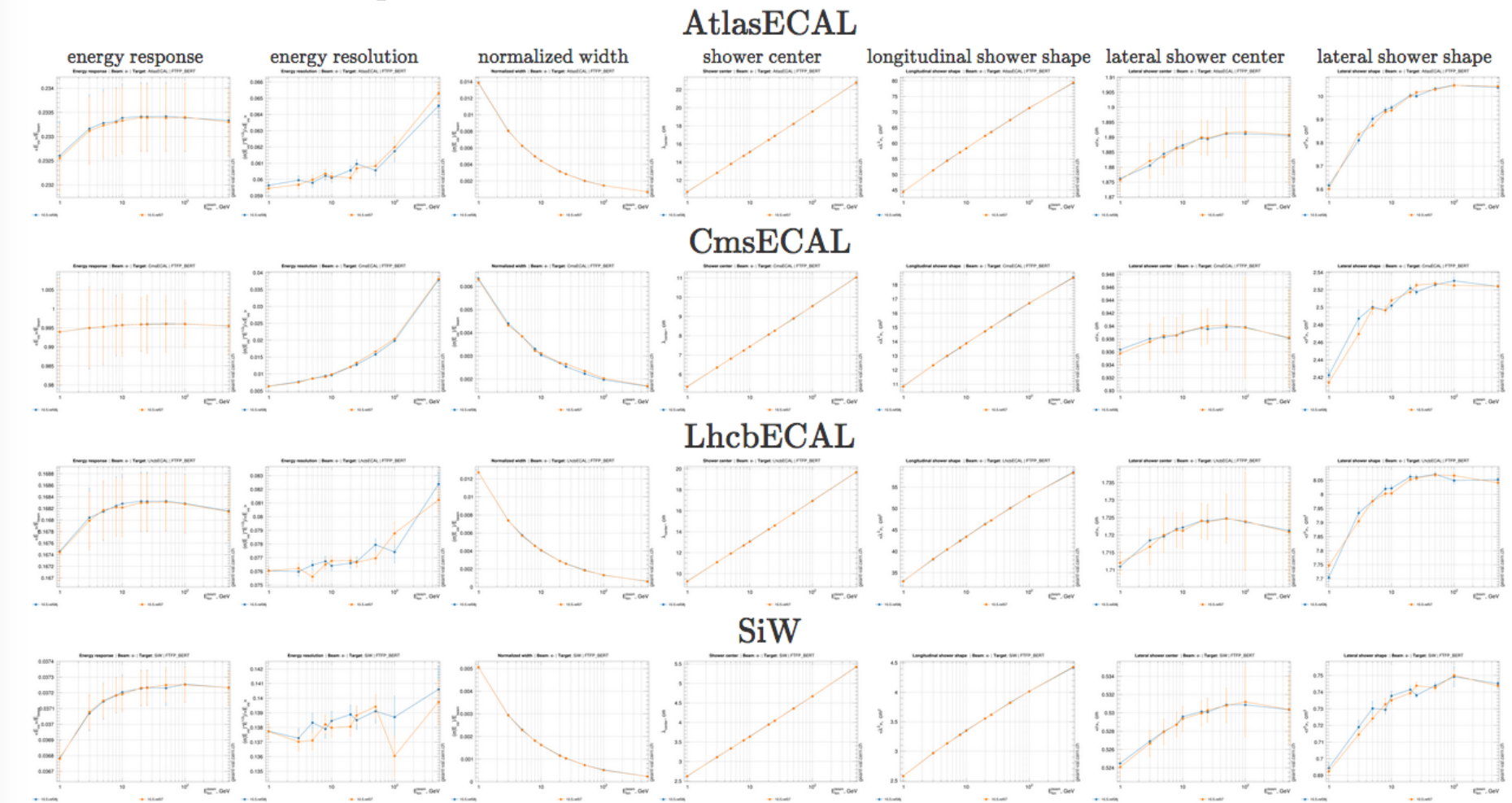
- "Simplified calorimeter" with em calorimeters and electrons.
- Usual "SC"updated by Alberto



Geant4 10.5.ref08 and 10.5.ref07

10.5.ref08h

10.5.ref08h - 10.5.ref08 + no general gamma process

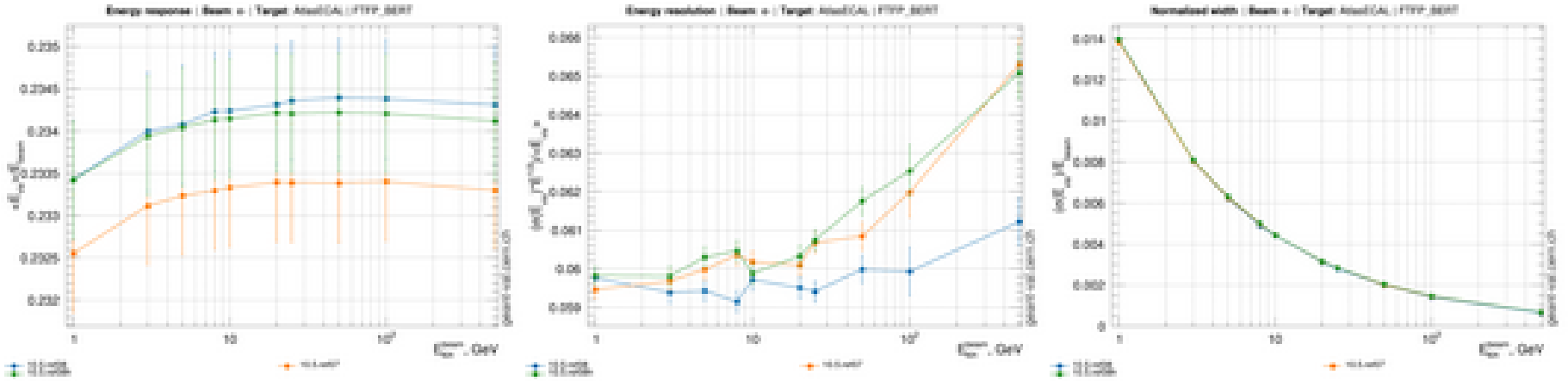


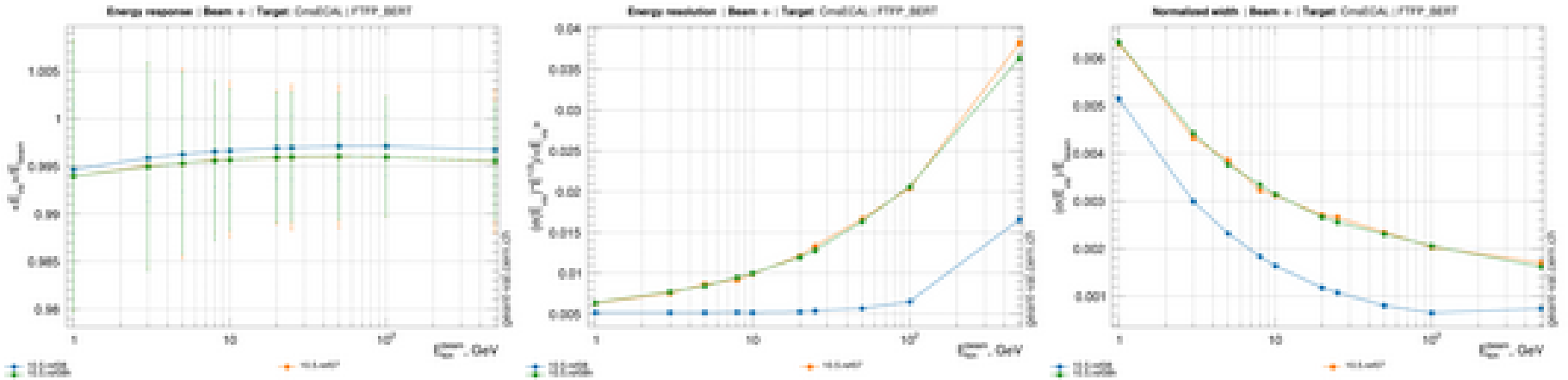
SC for ECALs for Geant4 10.5.ref08h and 10.5.ref07 are identical

10.5.ref08h: response, resolution, width

10.5.ref08h - 10.5.ref08 + no general gamma process

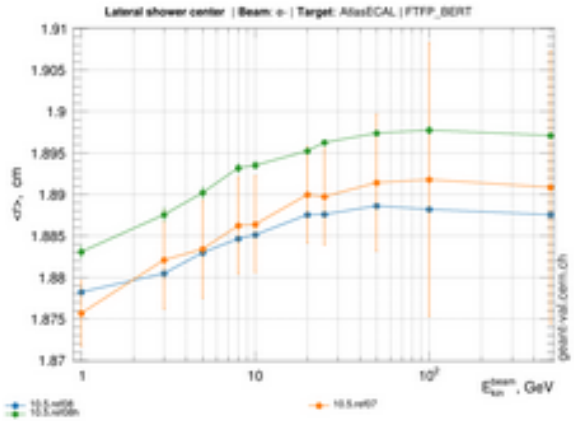
energy response | energy resolution | normalized width

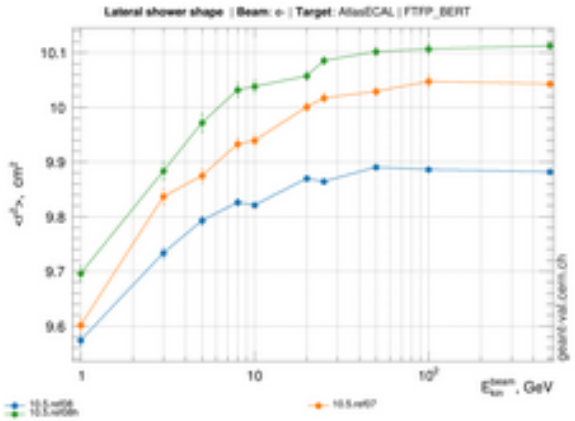


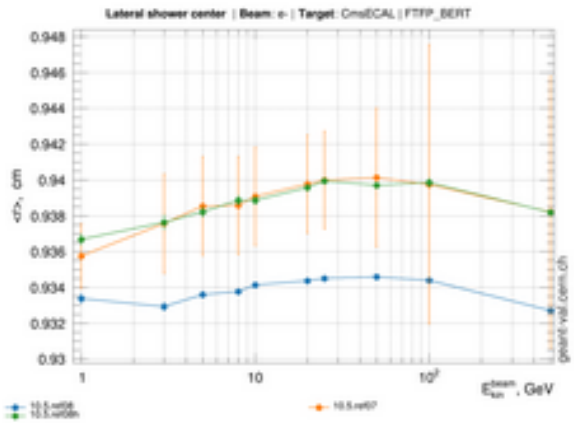


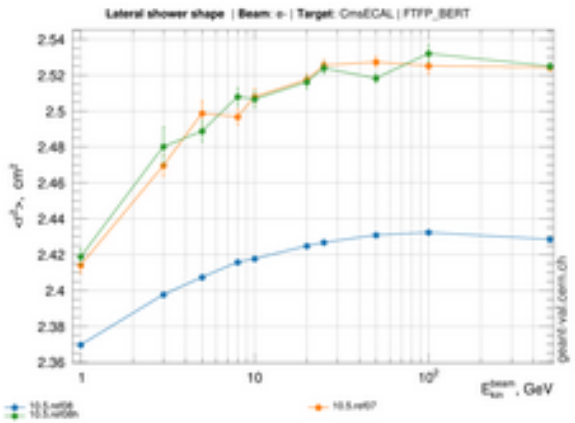
10.5.ref08h: lateral center, lateral shape

lateral shower centerlateral shower shape







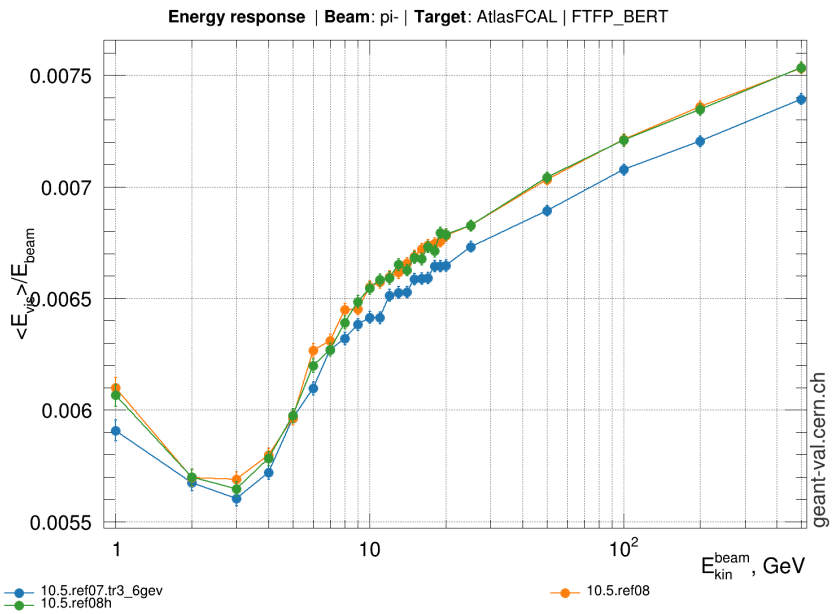


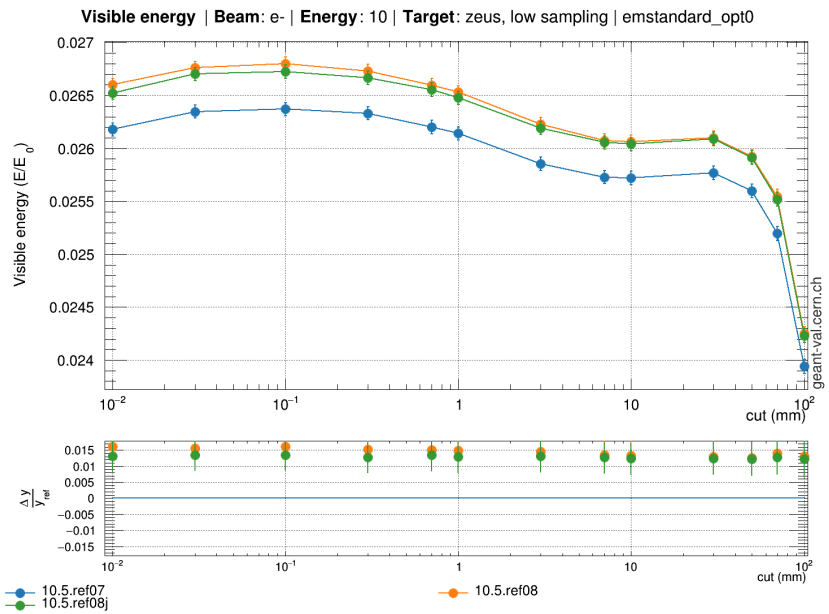
10.5.ref08,

10.5.ref07, 10.5.ref08h

10.5.ref08h

But "gamma general"did not bring back all new "features"observed in ref08:





- Shift in energy response in W-LAr (AtlasFCAL) hadronic calorimeter.
- Shift in visible energy in zeus low sampling em calorimeter(TestEm3).

Many hours of git bisecting in the background mode and ....

emstand-V10-05-16 explains shift in energy response in W-LAr (AtlasFCAL) hadronic calorimeter.

- *change in parameters of Urban multiple scattering*

materials-V10-05-06 explains shift in visible energy in zeus low sampling em calorimeter(TestEm3).

- *slightly new way in which density effect parameters are set: if in a composite material one element dominates (>80%) then density effect parameters for that elements are used and scaled.*

Conclusion

- All major differences between 10.5.ref07 and 10.5.ref08 are explained:
  - **[emstand-V10-05-16]** shift in energy response in W-LAr (AtlasFCAL).
  - **[materials-V10-05-06]** shift in visible energy in zeus low sampling (TestEm3)
  - **[switching general gamma process on by default]** change in electron lateral shower shapes