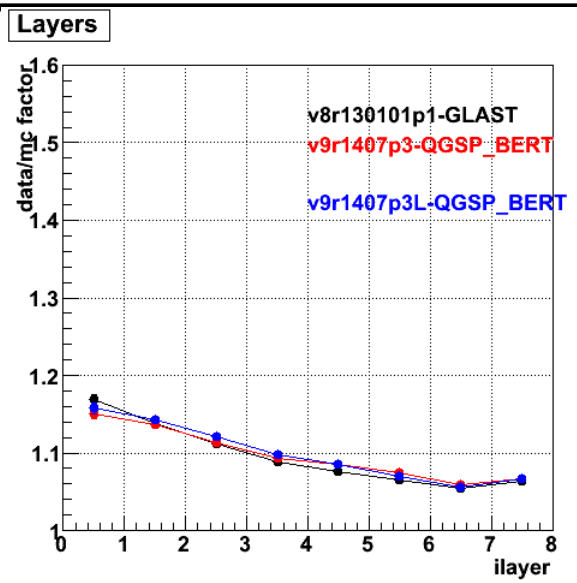
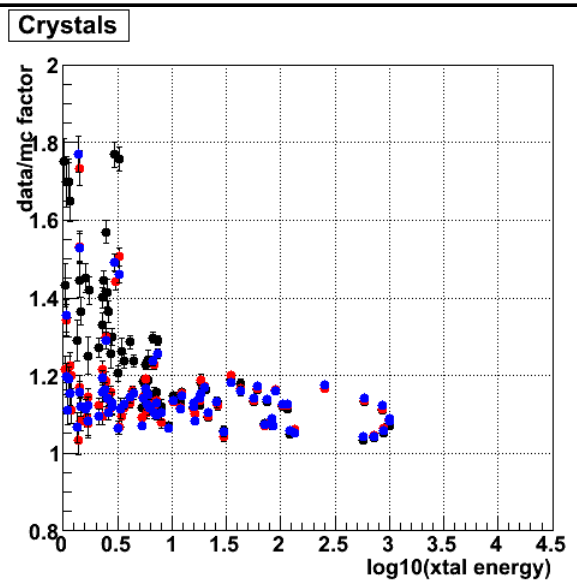
Data/MC comparison for old/no/new LPM

- Last data reprocessing :
  - -recon-v2r71215p1
- Simulation
  - v8r130101p1-GLAST : old LPM
  - v9r1407p3-QGSP_BERT : no LPM
  - v9r1407p3L-QGSP_BERT : new LPM
  - 10, 20,50, 100, 196 and 282 GeV on-axis
- Many thanks to Francesco and Johan !

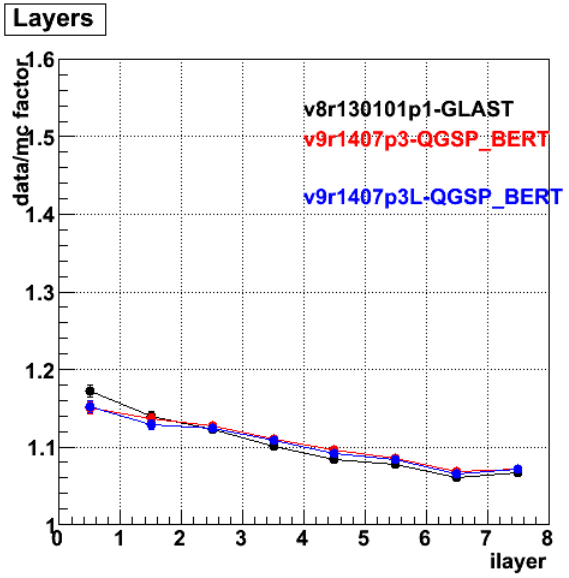
Old (black) no (red) new LPM (blue)

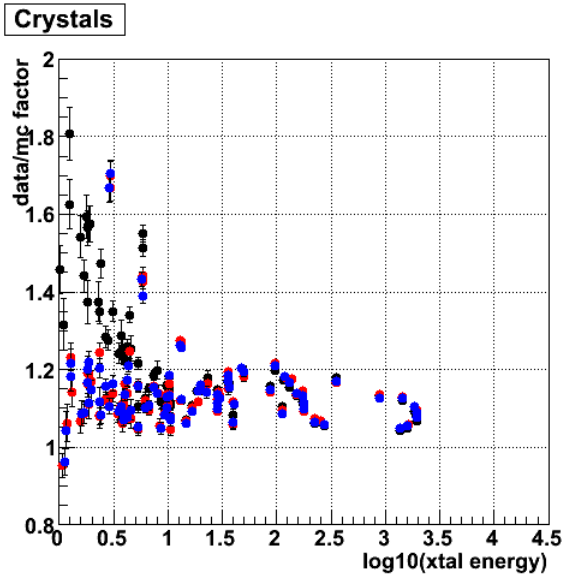
10 GeV





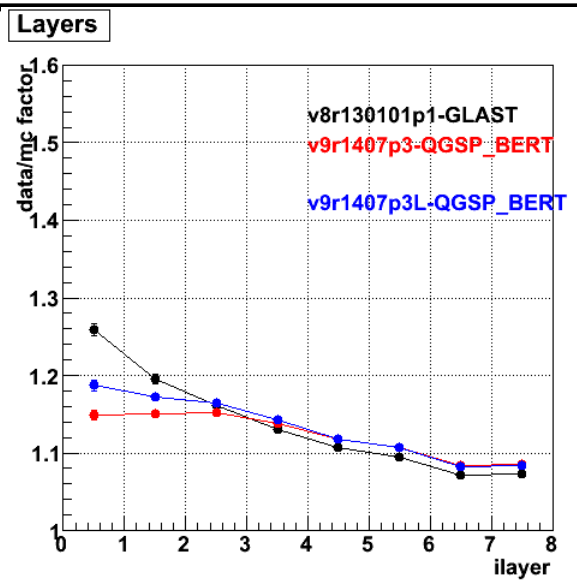
20 GeV

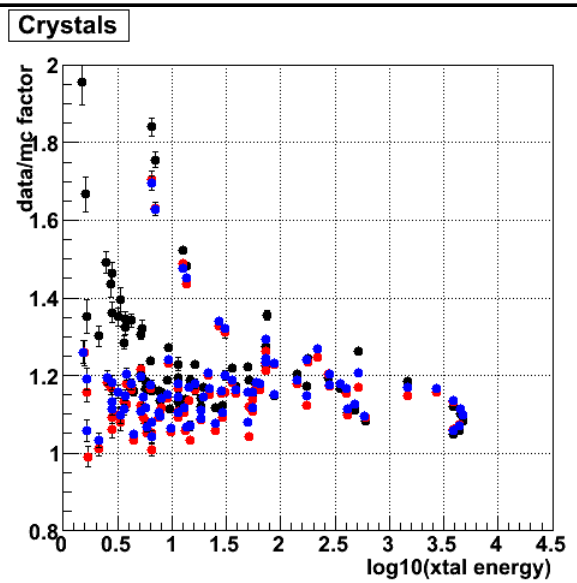




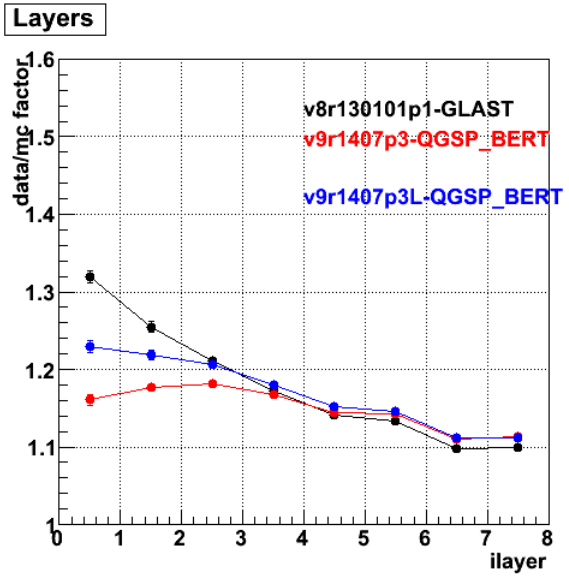
Old (black) no (red) new LPM (blue)

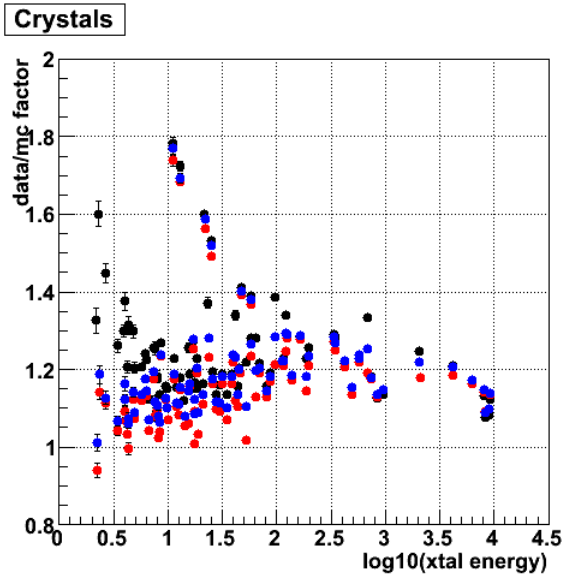
50 GeV





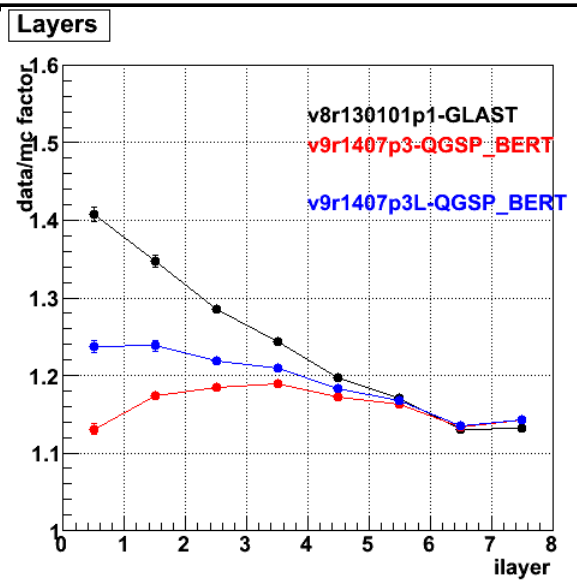
100 GeV

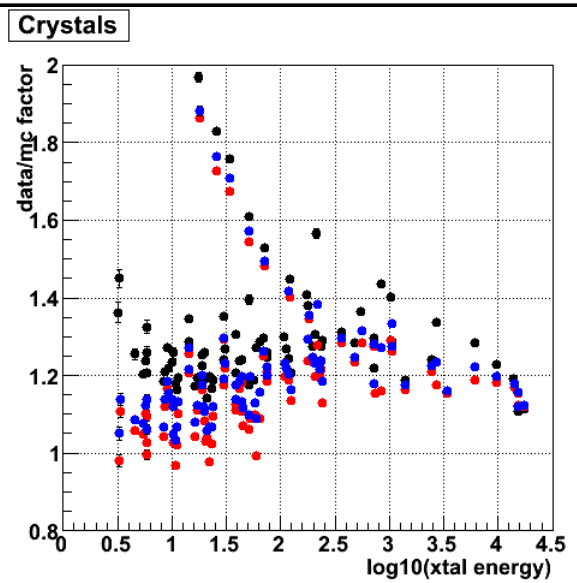




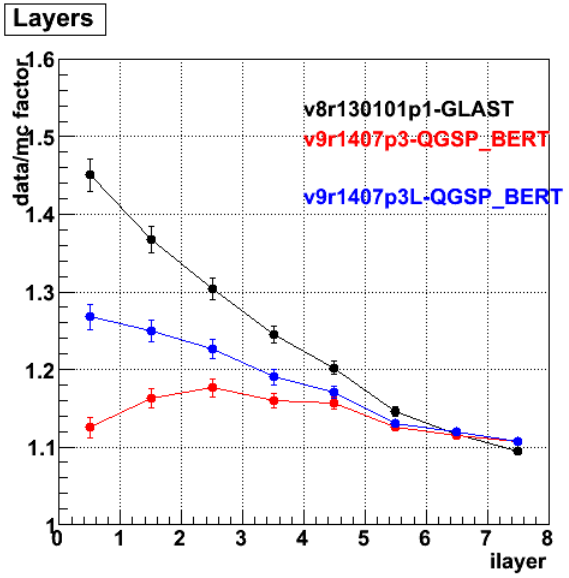
Old (black) no (red) new LPM (blue)

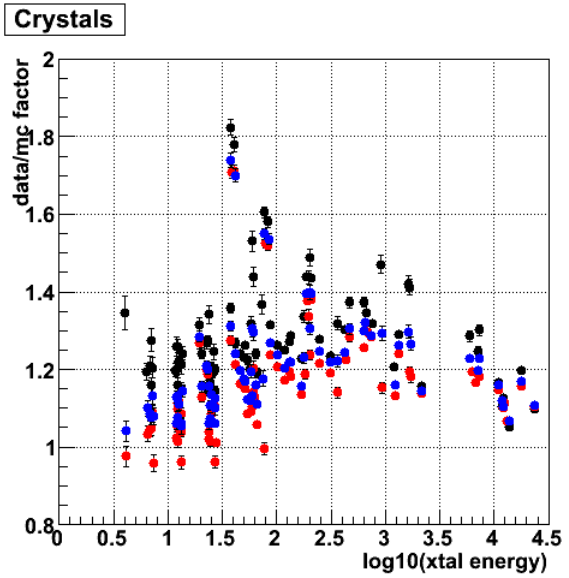
196 GeV





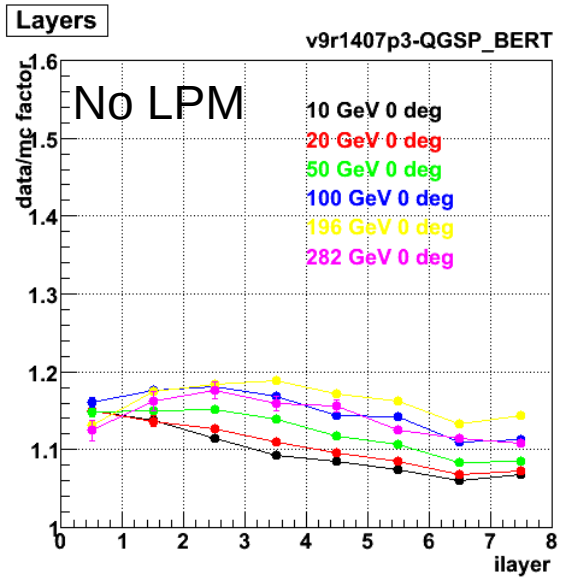
282 GeV

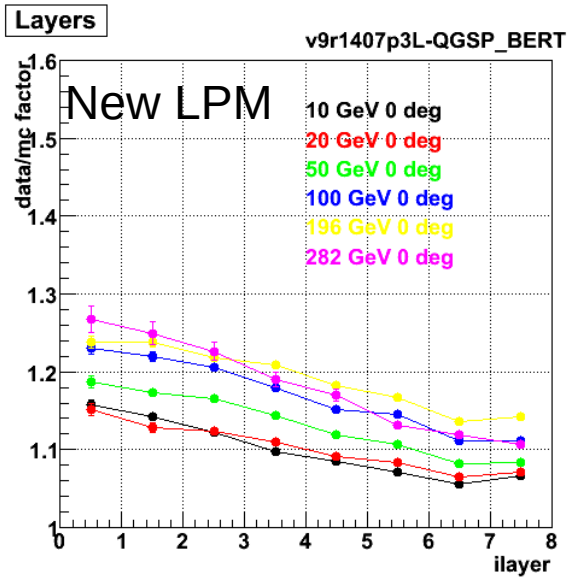


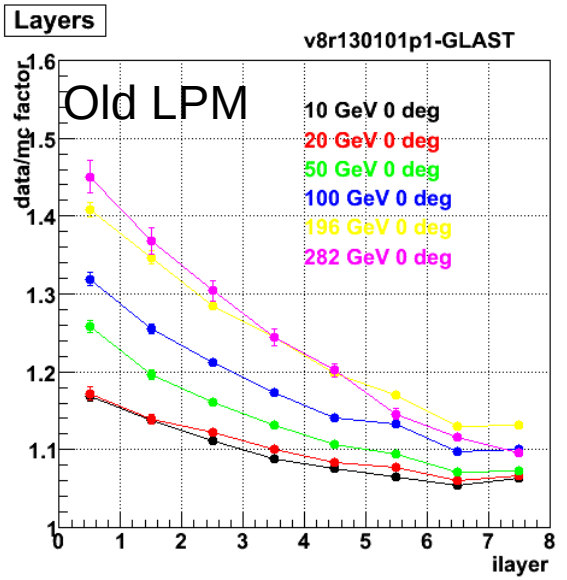


Conclusions (1)

- What we see is what we expect :
  - No difference between old/no/new LPM at 10 and 20 GeV
  - The difference starts to be visible at 50 GeV
  - The new LPM lies in between no LPM and old LPM
- The new LPM behaves better than the others :

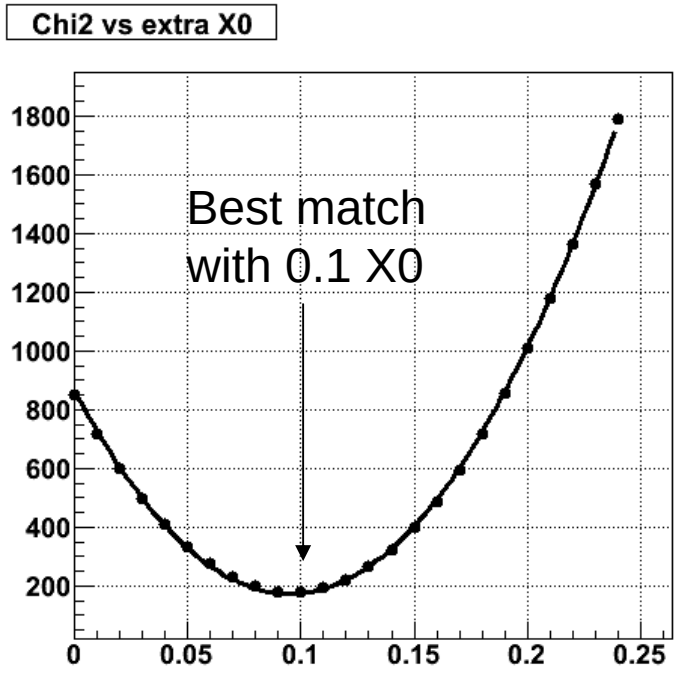


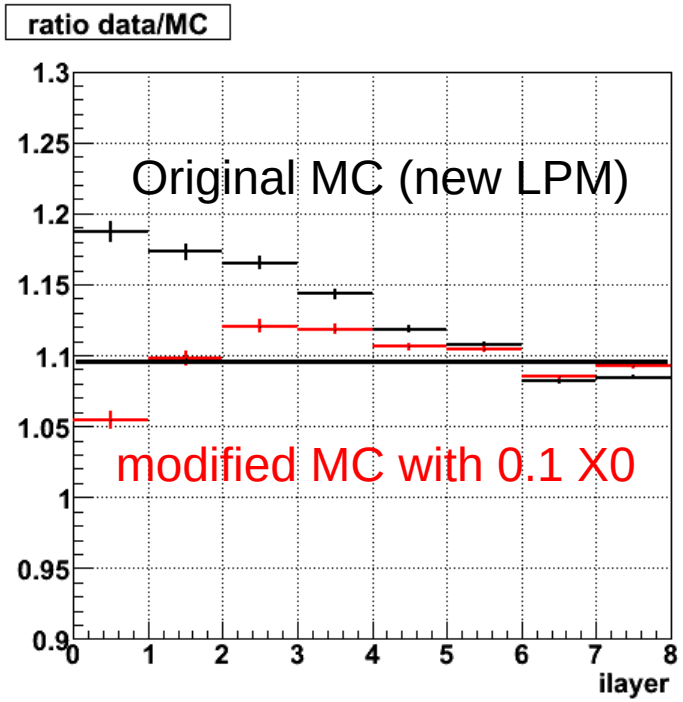




Next step : looking for extra X0

- For each energy : looking for the extra X0 allowing the best data/MC agreement = the same data/MC ratio for all layers
- To do that, I've performed a simple analysis (without full simulation with extra-material along the beam line) :
  - Fit the MC layer energies to get the shower profile function
  - Use this function to evaluate the modified layer energies with some extra X0

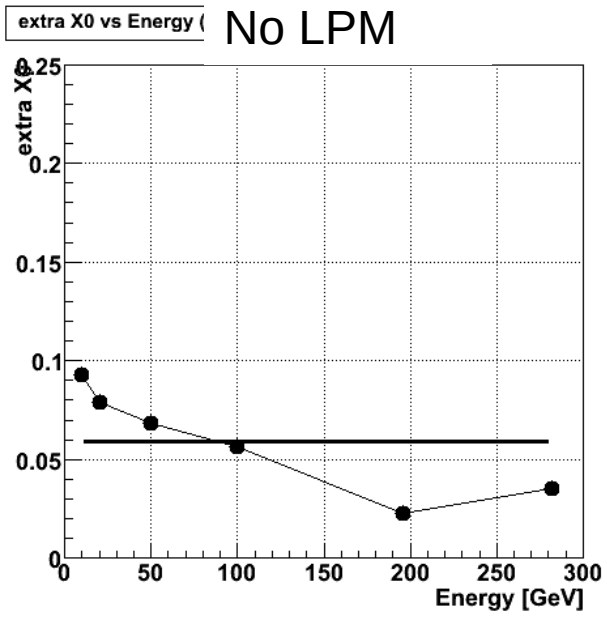




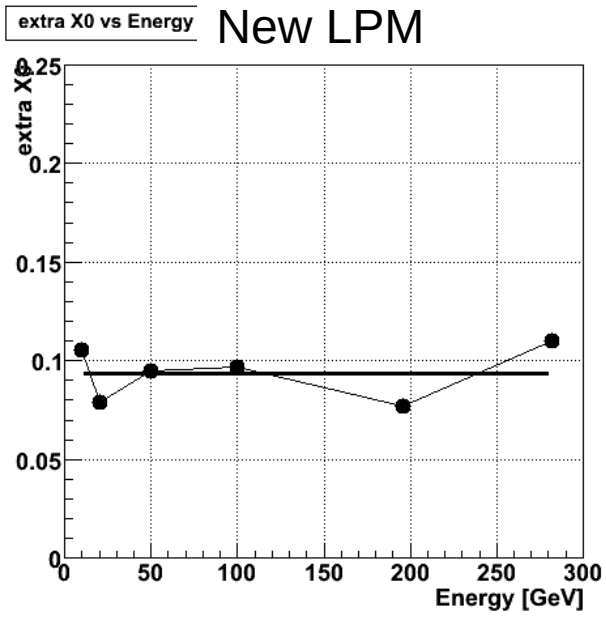
Looking for a common extra X0

- The new LPM behaves much better : all on-axis runs seem to require the same extra material along the beam line (which is not the case for no LPM or the old LPM)

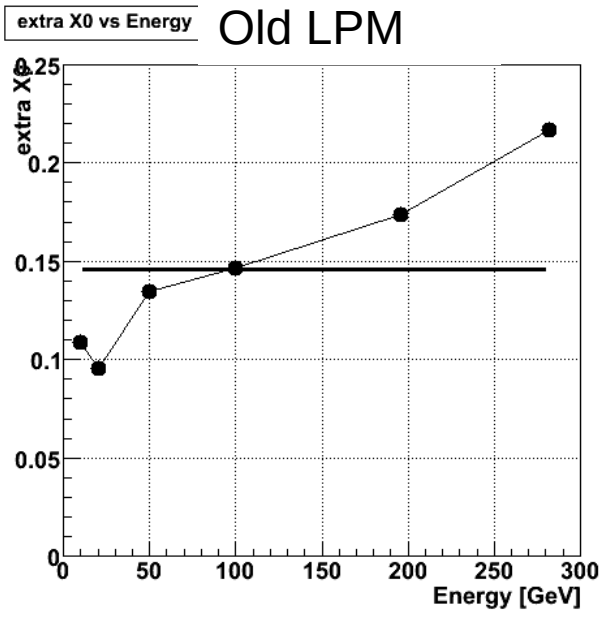
No LPM



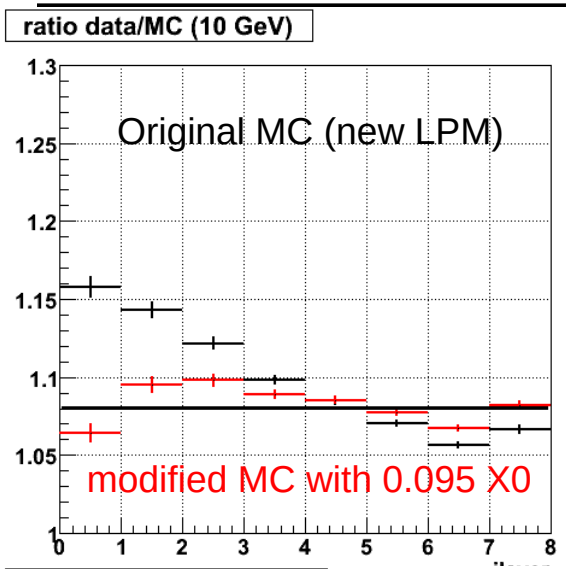
New LPM

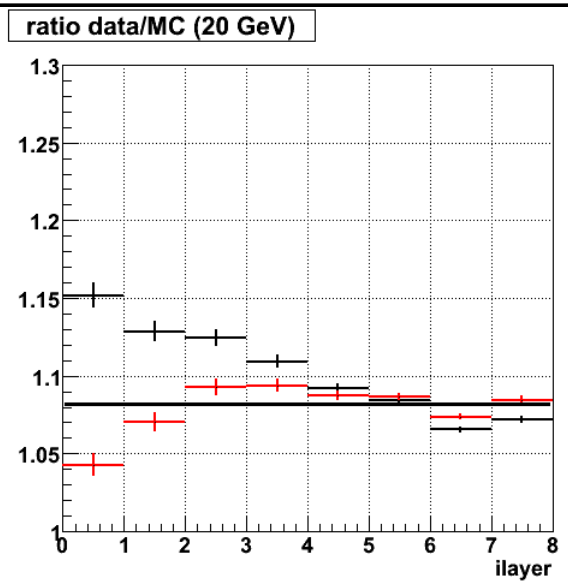


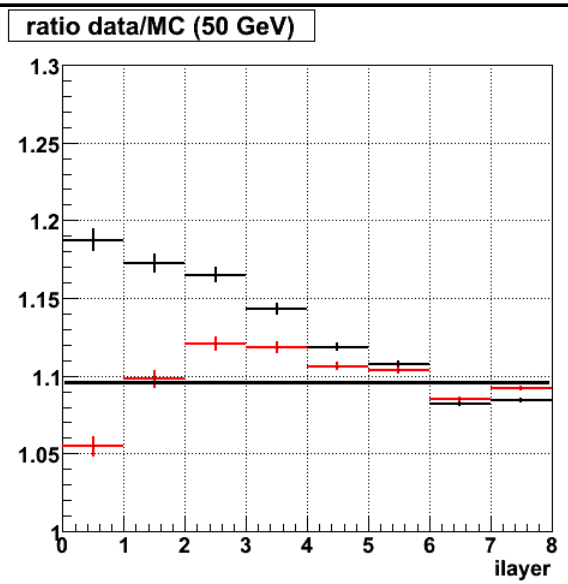
Old LPM

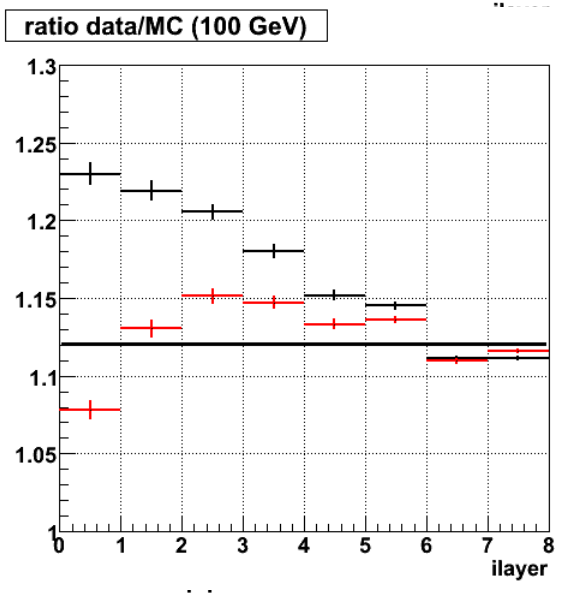


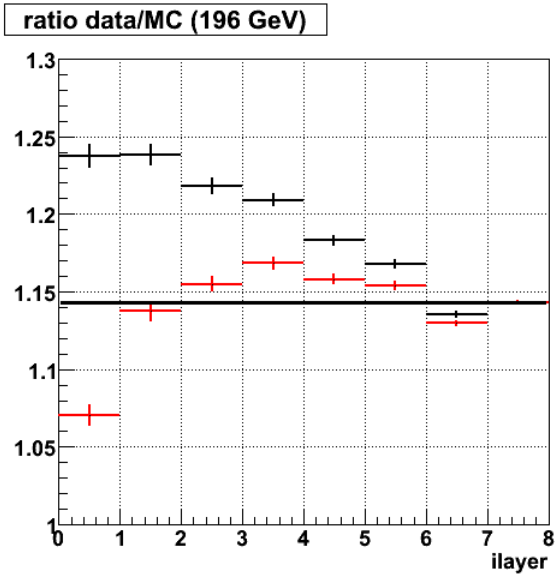
Layer data/MC comparison with extra X0 ~ 0.095

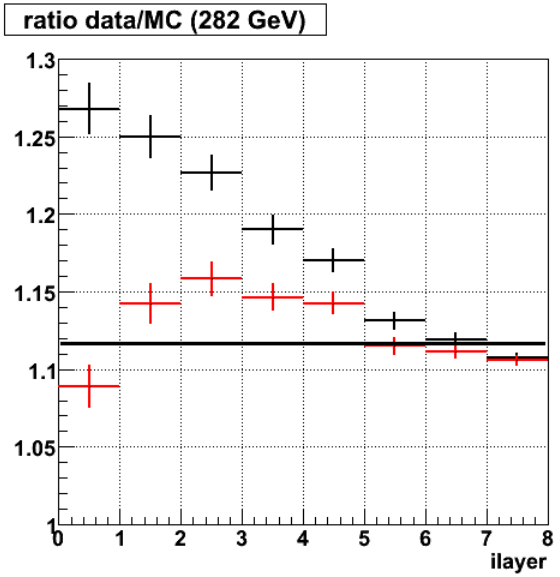






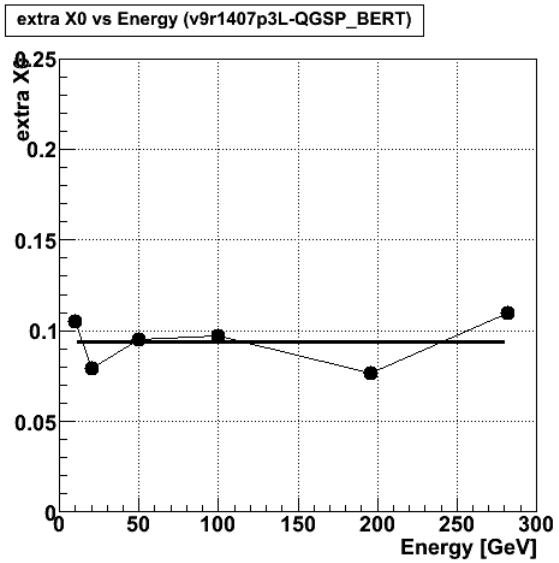


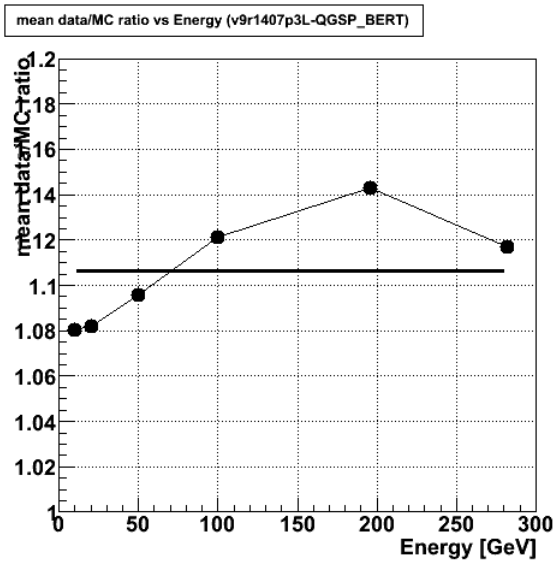


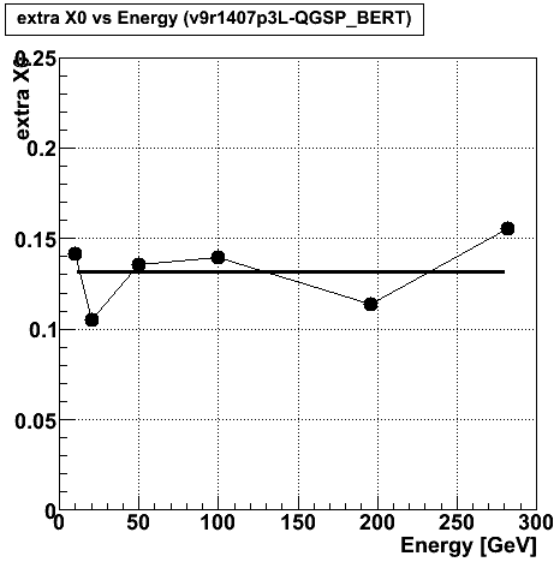


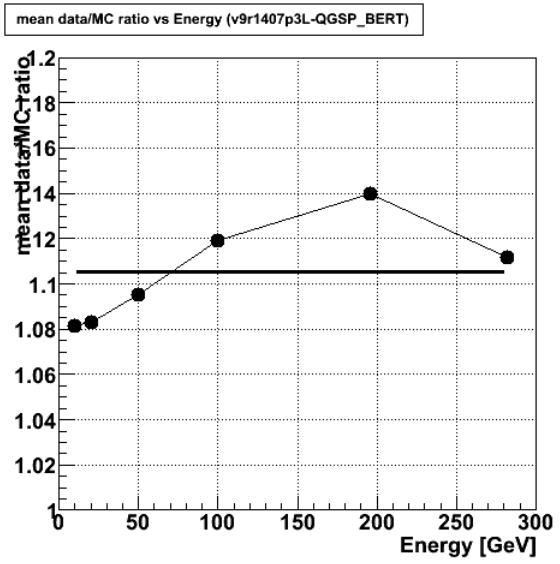
Global scaling factor ?

- Top : taking into account all layers (as in previous slides)
  - Extra X0 ~ 0.095
  - Mean data/MC ~ +11%
- Bottom : not taking into account the first layer (since the gamma function is known not to be perfect at the start of the shower…)
  - Extra X0 ~ 0.13
  - Mean data/MC ~ +11%
- The scaling factor doesn't seem to be constant with energy (but remember that this analysis doesn't use full simulation with extra X0)









Conclusions (2)

- The new LPM greatly helps to reach data/MC agreement for on-axis runs
- Preliminary analysis gives :
  - Extra X0 ~ 0.1
  - Mean data/MC ratio ~ +11%
- It has to be confirmed with full simulation of extra X0
- And especially with runs at 10, 20 and 30 deg !