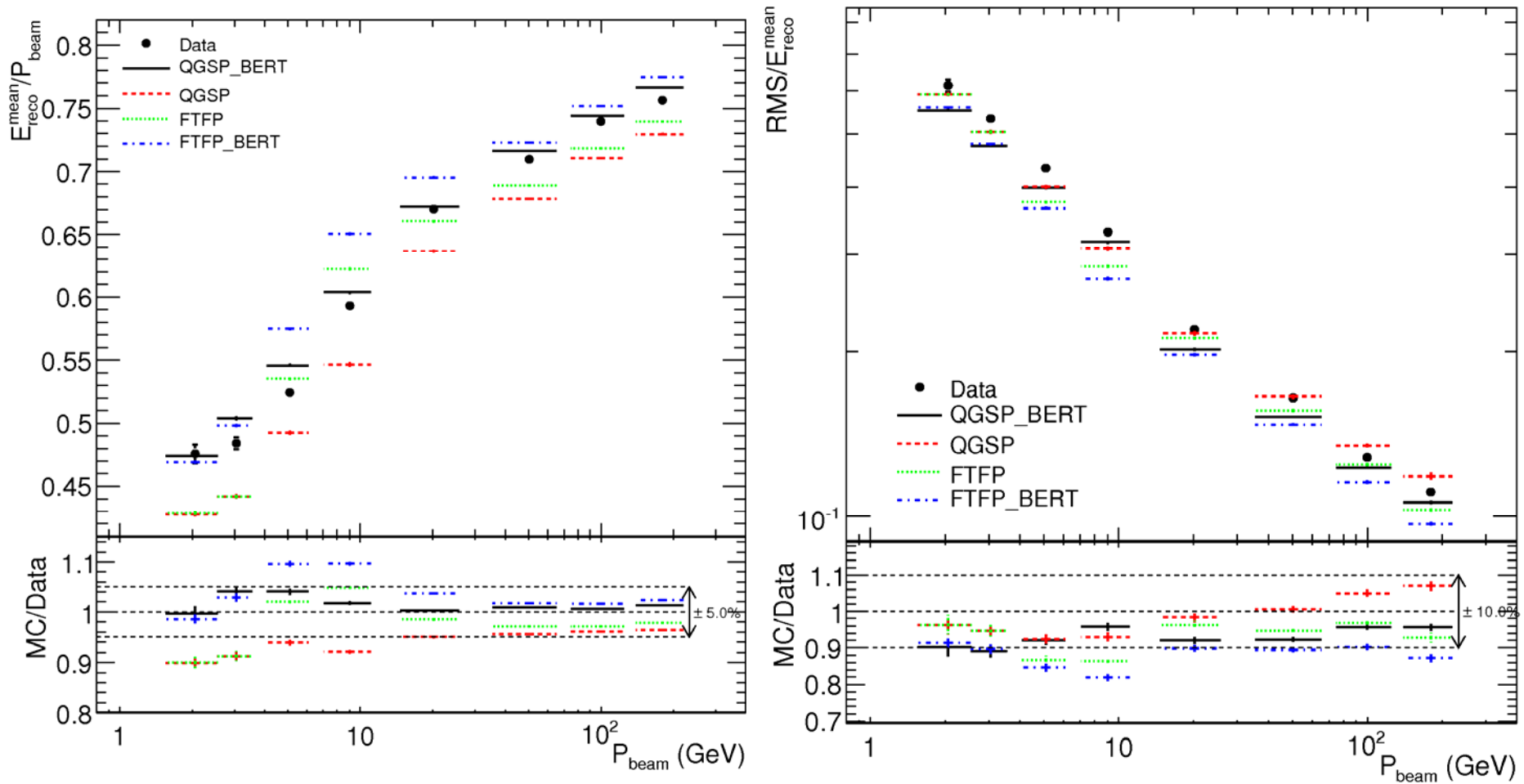


Summary of the Combined Test-beam Data to Monte Carlo Comparisons of the ATLAS Barrel Calorimeter

- Atlas Barrel Detector (Pixel, SCT, TRT, Lar, Tile) pions from 2-180 GeV (protons mixed in according to fraction measured by TRT)
- Models considered: QGSP (old default), QGSP_BERT (new default)
FTFP FTFP_BERT (alternative)
- Linearity and Resolution
- Longitudinal shower development
- Radial shower development

All results from: ATL-COM-CAL-2009-001

Pion Response and Linearity

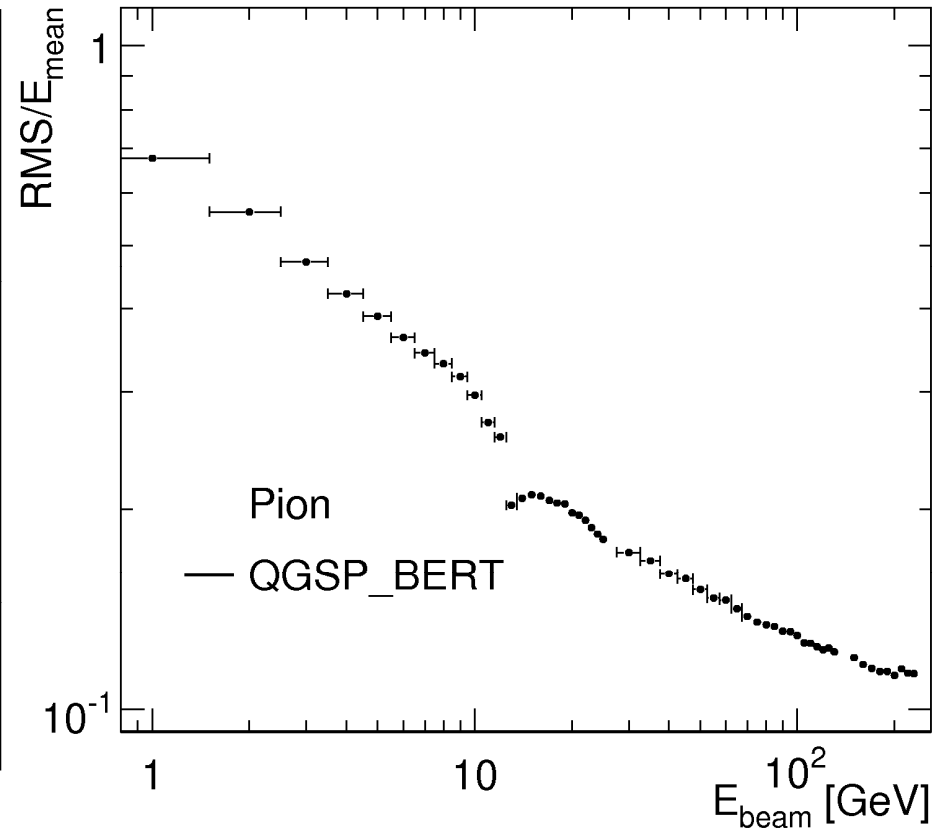
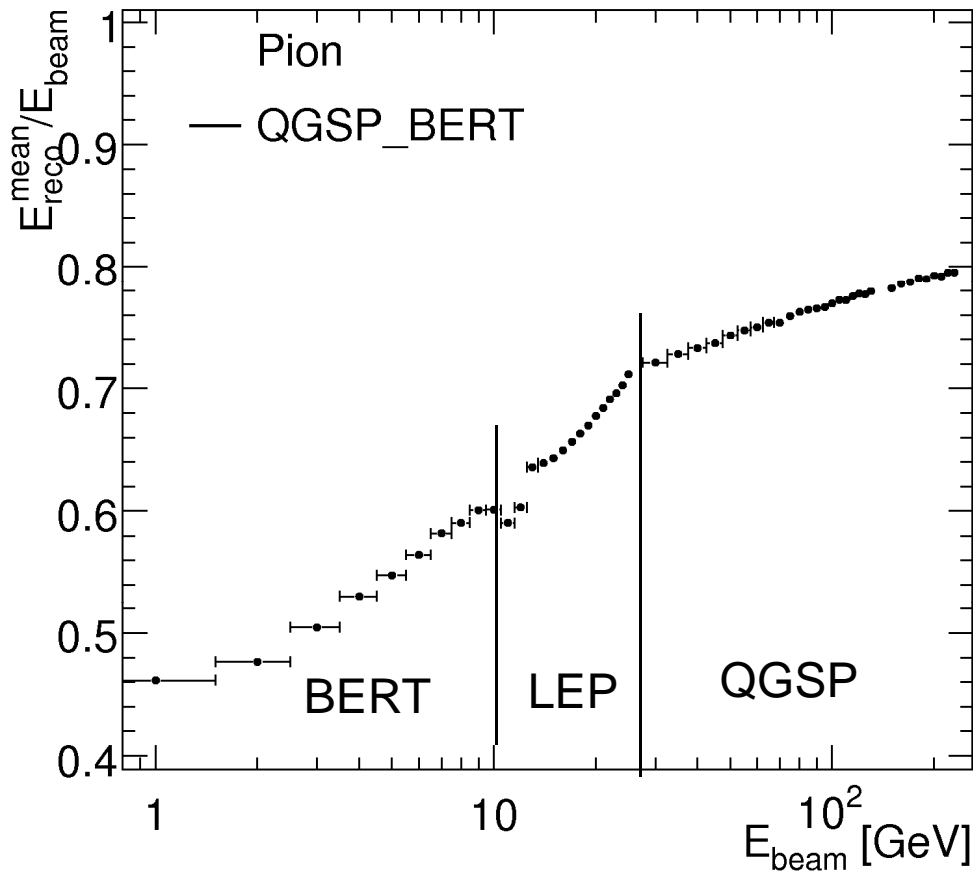


QGSP_BERT: response within 3% $E < 10$ GeV, 1% $E > 10$ GeV
 resolution too low (-10% $E < 10$ GeV, -5% $E > 10$ GeV)

FTFP_BERT: response higher

Quite good performance ! ... but ...

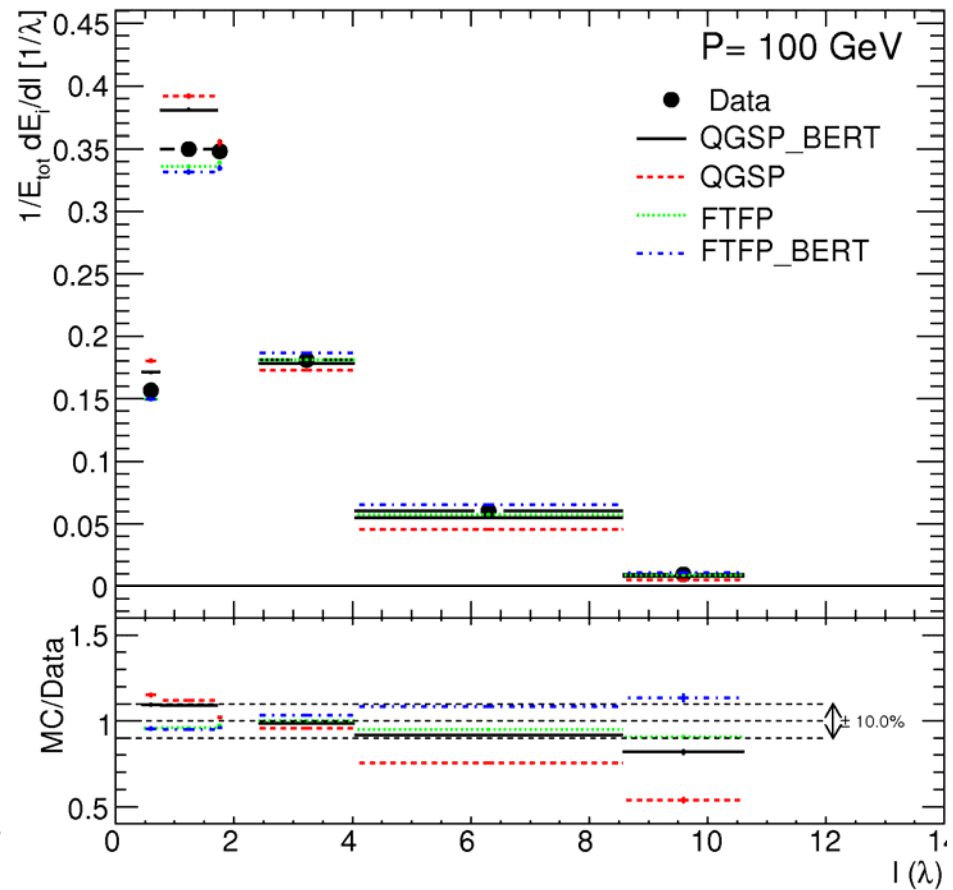
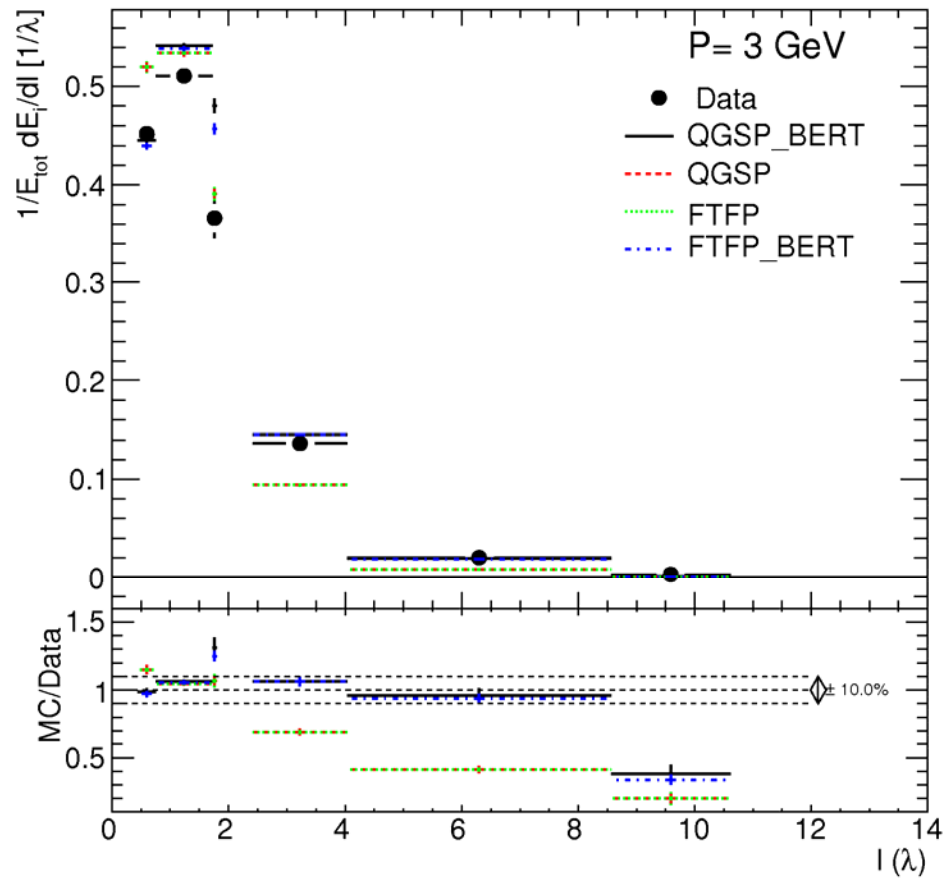
Pion Response and Linearity



Discontinuities at boundaries where models get mixed
→ Systematic uncertainties for Atlas analysis
G4 developers looking into possible solutions

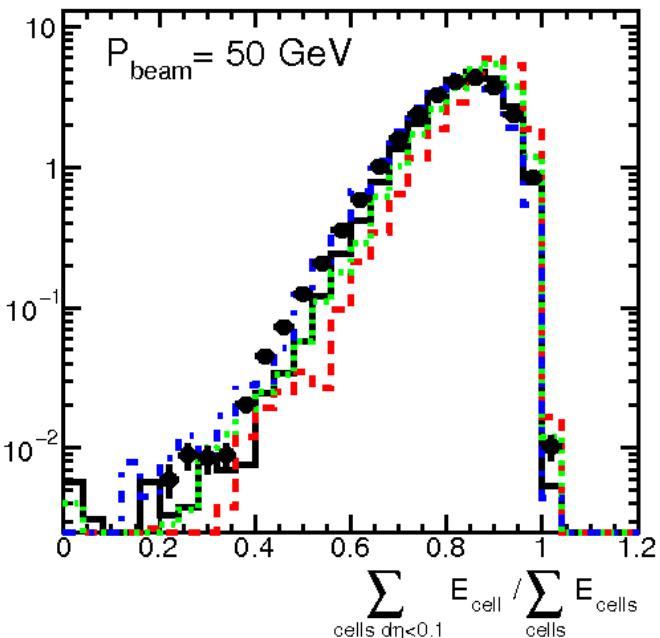
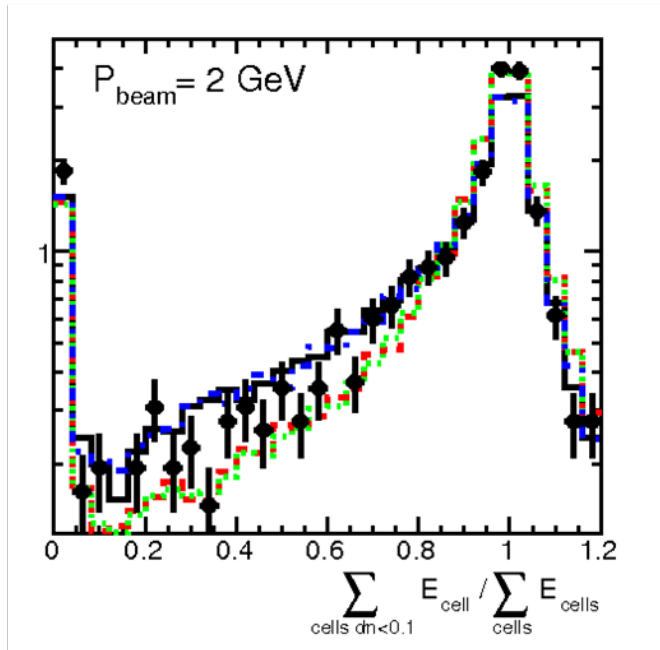
Similar problems
seen in shower shapes
3

Longitudinal Shower Development

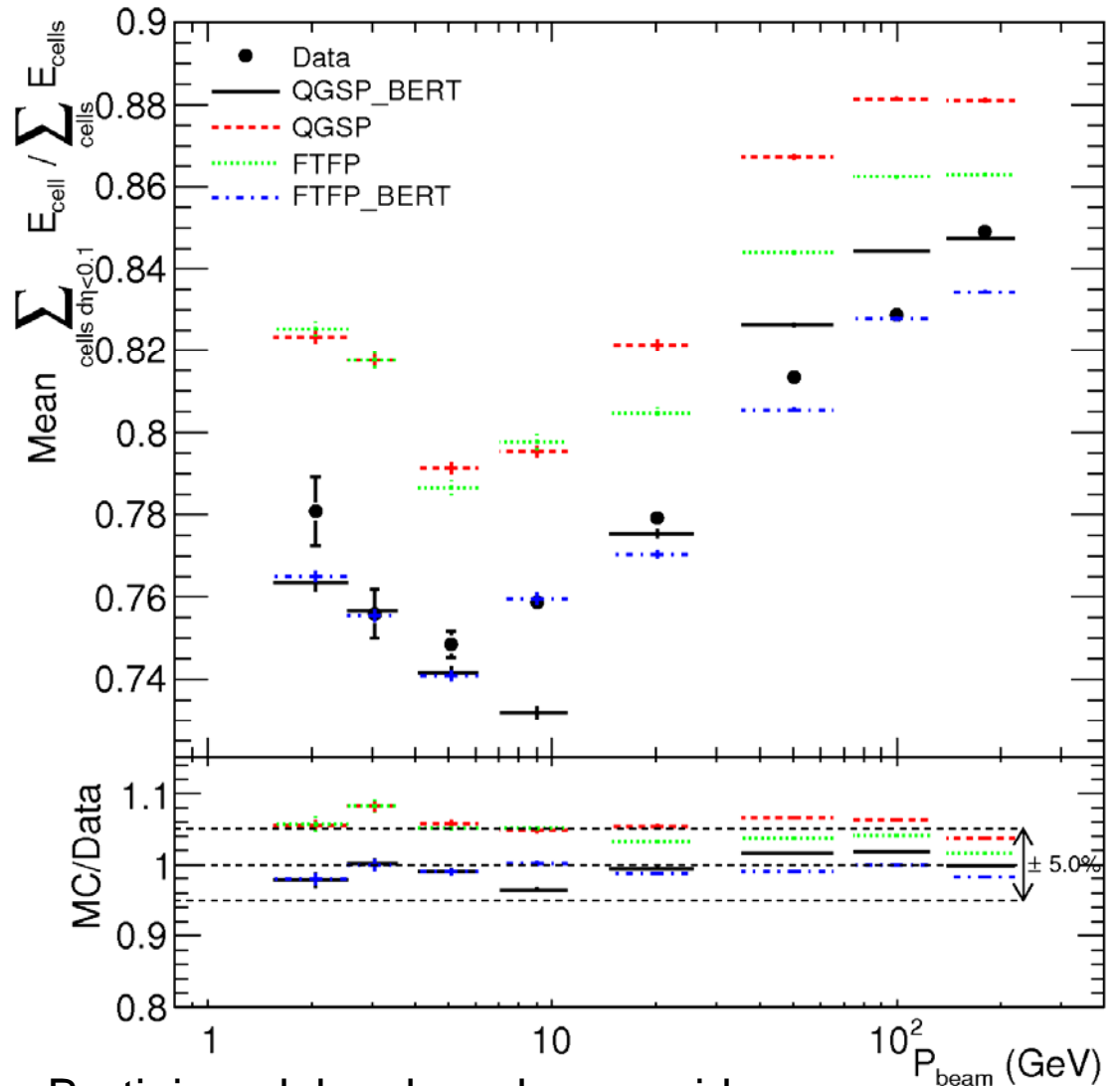


Adding Bertini makes shower longer, but not long enough in case of QGSP
 ...and a bit too long for FTFP

Transverse Shower Development



Study energy in cone of 0.1/Total energy



Bertini model makes shower wider
in better agreement with data

Summary

physics list	response	resolution	longitudinal	radial
QGSP	low	ok	too short	too narrow
QGSP_BERT	ok	low	short	narrow
QGSP_BERT_HP	ok	low	short	narrow
QGSP_BERT_NQE	ok	low	too short	narrow
QGSP_BERT_TRV	ok	low	short	narrow
QGSP_BIC	low	low	too short	too narrow
QGS_BIC	low	low	too short	too narrow
FTFP	ok	low	too short	too narrow
FTFP_BERT	high	low	long	narrow
FTFP_BIC	high	low	long	narrow