



for GEANT4

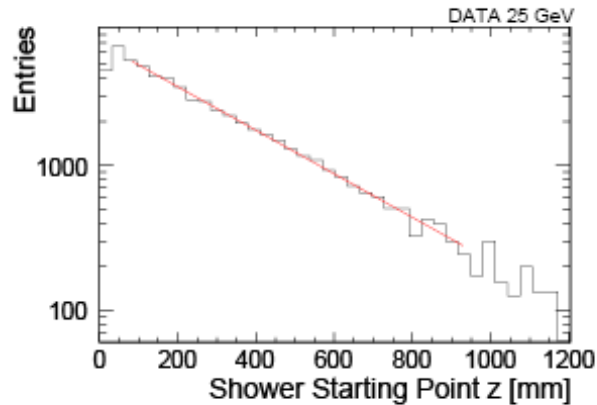
Erika Garutti (DESY)

Background to this presentation/discussion:

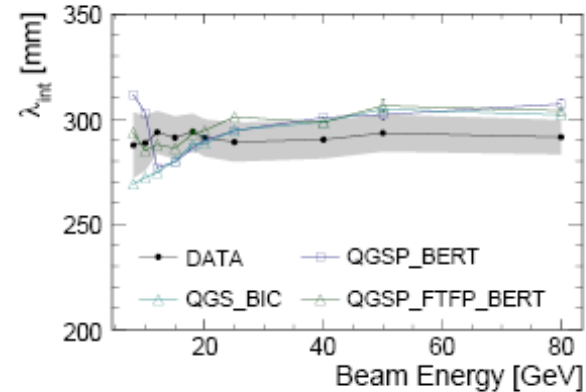
- 1) GEANT4 hadronic group is meeting next week at SLAC
 - CALICE was asked for inputs & wish list

- 2) Several analysis (PhD thesis) already exist on pion shower analysis
 - Finalize analysis results into a paper
 - Largely based of the EUDET report written in collaboration with G4

Check of cross-section

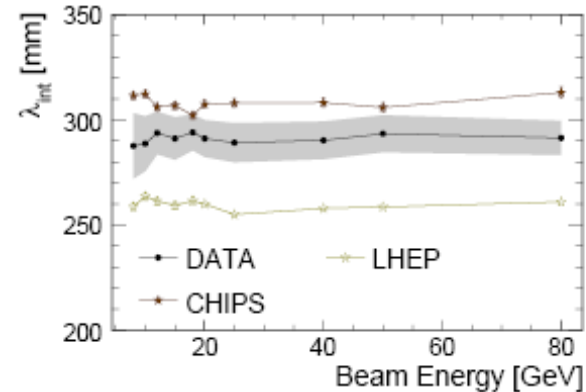
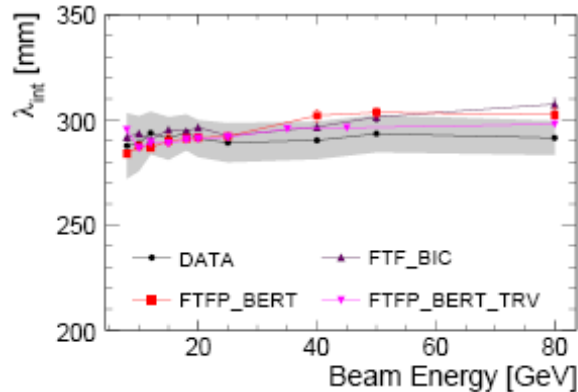


(a)



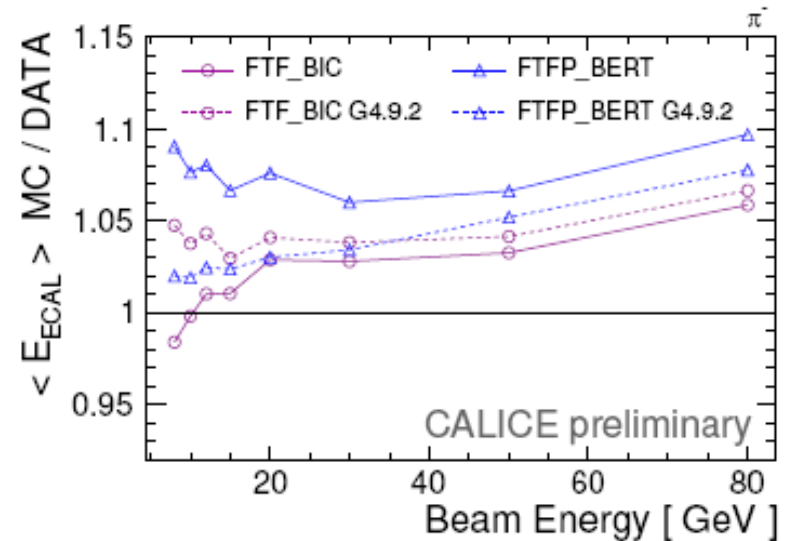
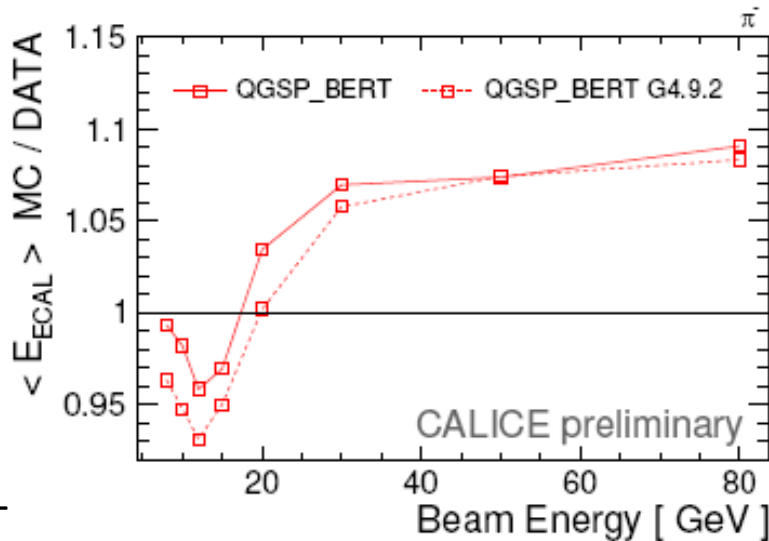
(b)

A. Kaplan
PhD thesis



- Cross section from most phys. lists agrees with data
- Still to be checked/clarified: CHIPS (G4.9.3)

G4 improvements: visible energy

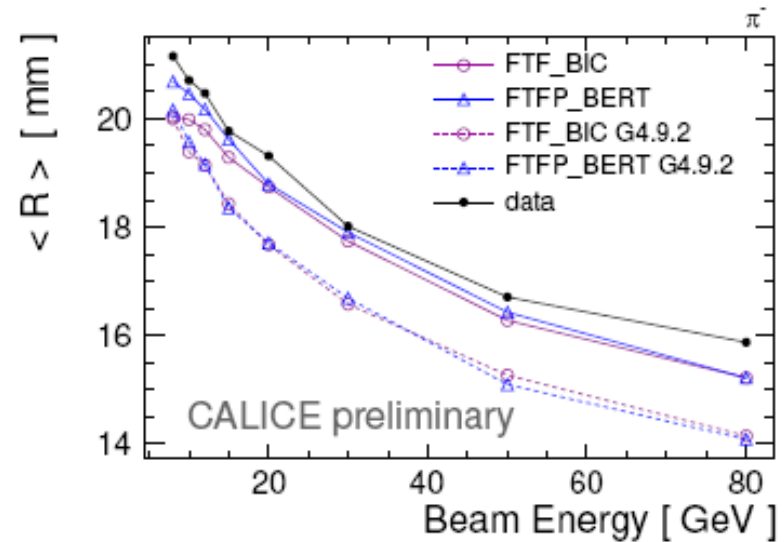
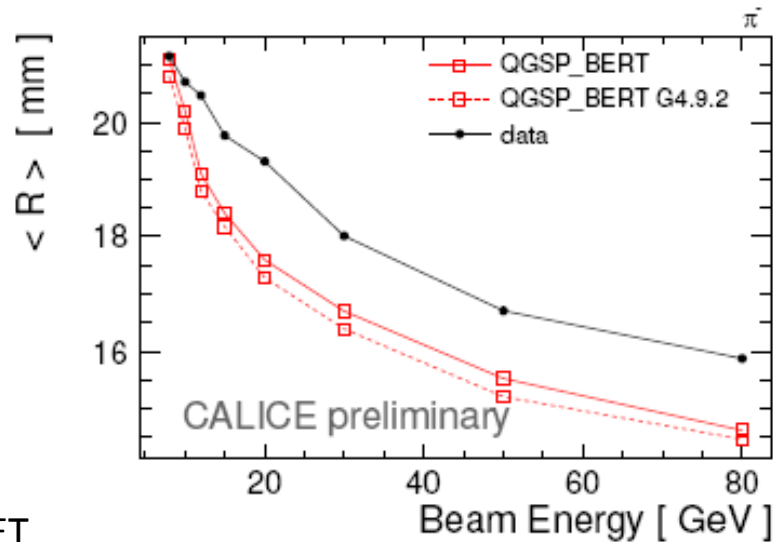


EUDET
Memo-2010-15

Figure 19: Comparison of Geant4 version 9.3 (solid lines) and version 9.2 (dashed lines) for the total visible energy in ECAL as a function of beam energy, on the left for the QGS-based physics lists and on the right for the FTF-based physics lists.

- ➔ Improvements in the energy dependence of FTF_BERT, while significant E-dependence in FTF_BIC
- ➔ The absolute scale is strongly dependent on calibration and digi procedure.

G4 improvements: shower shape



EUDET
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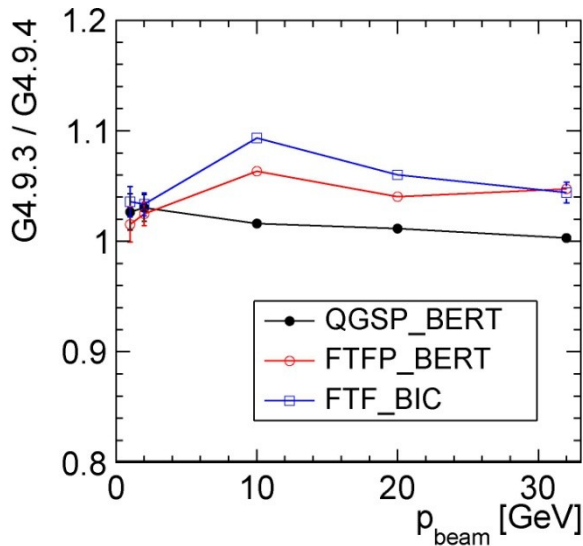
Figure 20: Comparison of Geant4 version 9.3 (solid lines) and version 9.2 (dashed lines) for the first moment of the radial shower profile in ECAL as a function of beam energy, on the left for the QGS-based physics lists and on the right for the FTF-based physics lists.

- ➔ Significant improvement of the FTF models
- ➔ Urgent need to repeat this analysis with G4.9.4 (➔Nils)
- ➔ changes in phys. lists could be also monitored by G4 group with basic CALICE geo.

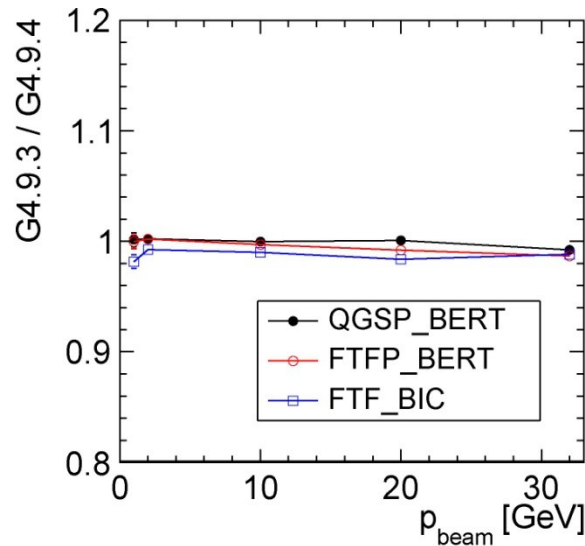
G4 improvements: the latest release

➔ Latest G4 release: 9.4 currently used only in the low energy pion analysis (FNAL data)

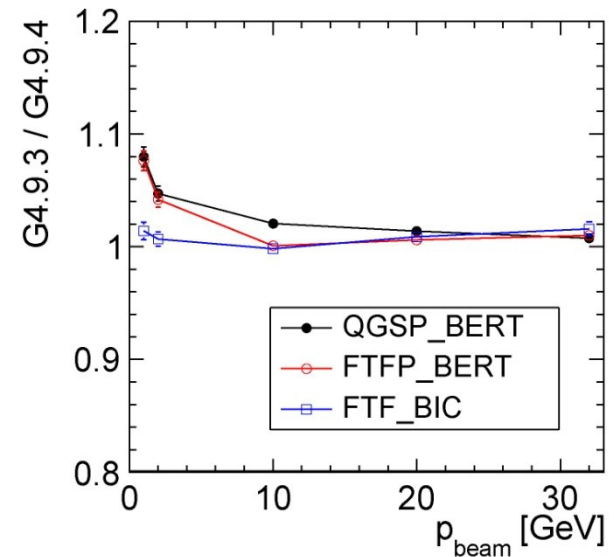
Visible energy



Longitudinal mean



Lateral mean

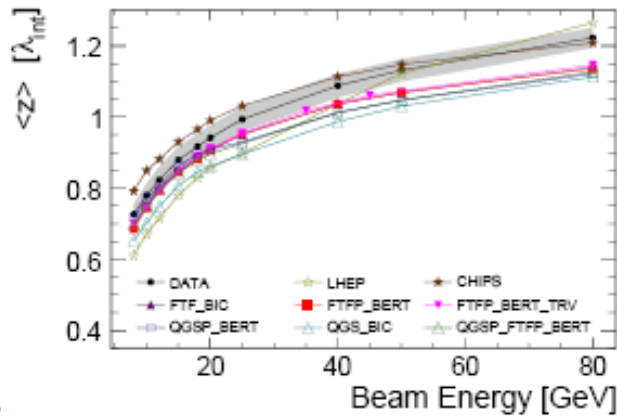


FTF: decrease in visible energy by 5-8%

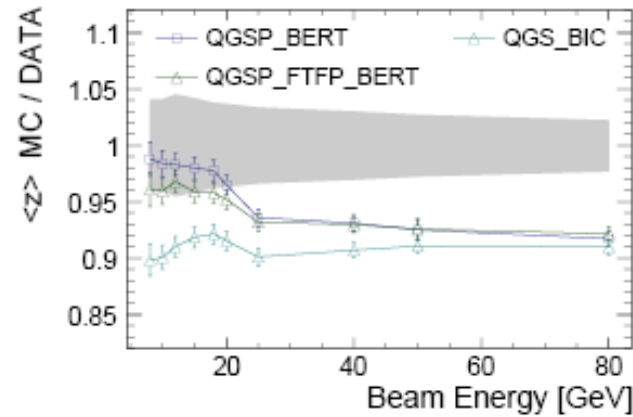
BERT: decrease of shower radius (effects low energies)

Longitudinal shower mean is unchanged

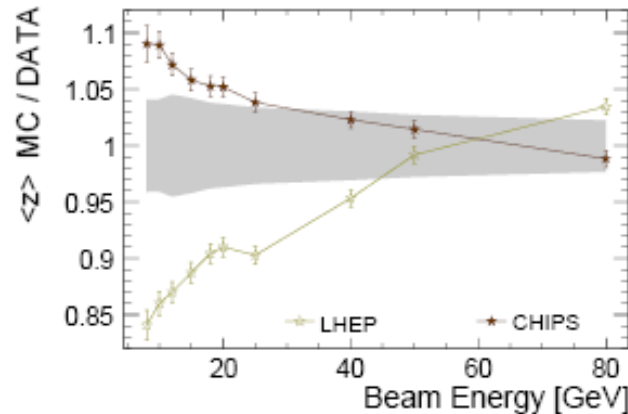
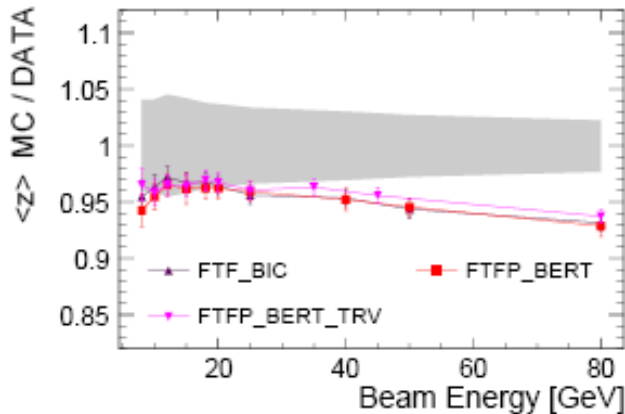
Release of calibrated CALICE data



(a)



(b)

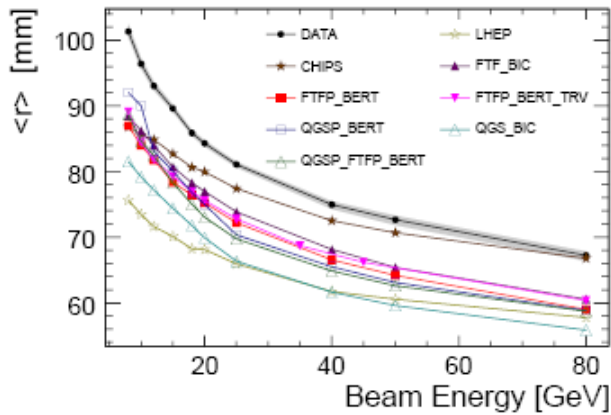


What can we release?

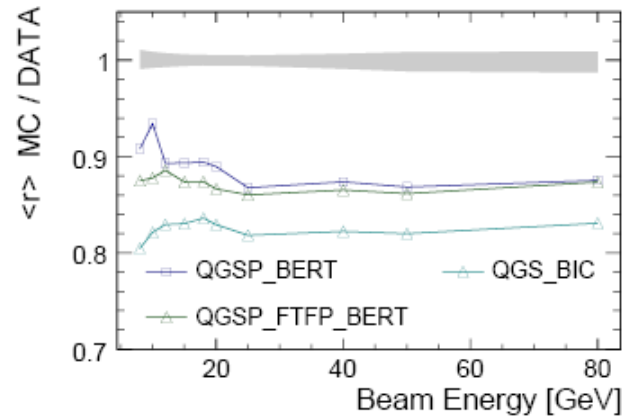
A. Kaplan
PhD thesis
cross-checked
with
B. Lutz
PhD thesis

- The mean of longitudinal shower profile from first hard interaction in units of lambda does not depend too strongly on calibration ✓
- But this variable depends on the position of the first hard interaction !!!

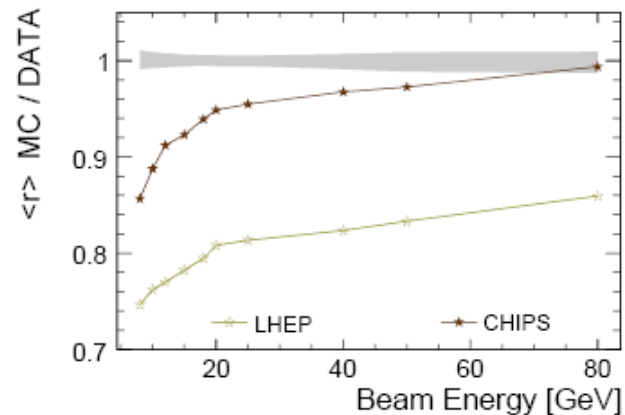
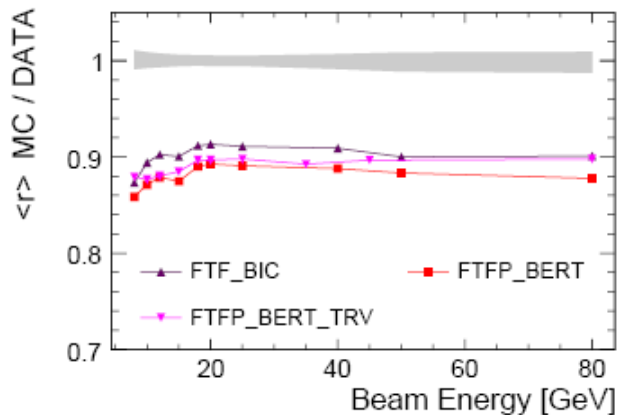
Release of calibrated CALICE data



(a)



(b)



A. Kaplan
PhD thesis
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What can
we release?

- The mean of lateral shower profile is more dependent on digitization !!!
- Still off by 10% w.r.t. all phys. Lists, but reasonably flat E dependence (except CHIPS)

CALICE wish list for G4

- Implement CALICE-like geometry in the check plots for new releases
- Prepare for the comparison Fe .vs. W
 - what are the G4 expectations?
 - does pure G4 agree with our simulation?
(remember CALICE MC = Mokka + G4 + energy threshold + digi)
- Continue to improve CHIPS (fix cross section, lower visible energy too long showers)
- Radial shower shape → indications from CALICE: too narrow in all lists
- CALICE favors HP (at least for W), comments? How about FTF+HP?

wish list for CALICE

- Release a calibrated set of data for reference comparison to new MCs
- Work on a combined message on hadronic shower model validation
 - explain differences Fe/W