Update on 2003 Forward Calorimeter Beam Test Analysis / Simulation

Submitted to the Lisbon Hadronic
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FCal Group

**These slides are for pion results only. Backup slides contain:**

- Electron results (data / MC)

- Description of Testbeam Setup and Datasets

- Details of simulation

- Comments on data / MC agreement

- To do list

FCal Pion Energy Resolution

Energy reconstruction with 1 weight / module: $E_\pi = g_1 E_1^{EM} + g_2 E_2^{EM} + g_3 E_3^{EM}$

$E_i^{EM} =$ EM-scale energy reconstruction within 16cm of beam impact point (from tracking)

Weights derived from data by minimizing resolution for 200 GeV pions. Weights from data also used for reconstruction of Monte Carlo data.
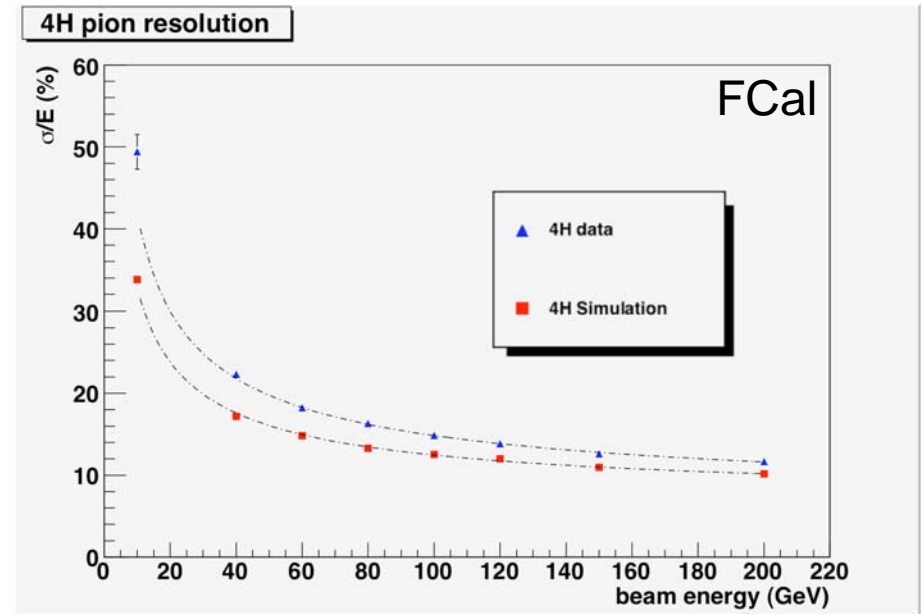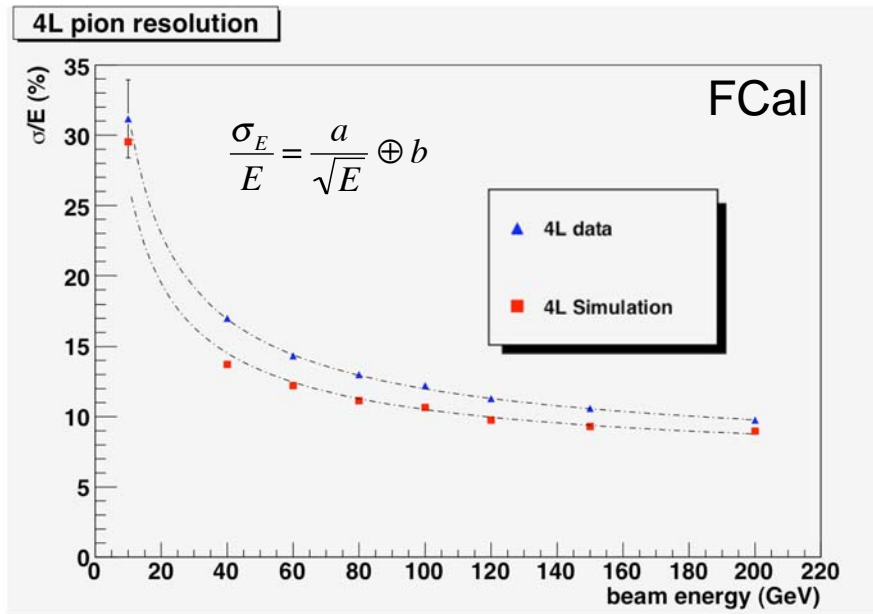
Athena 14.5.0, QGSP_BERT, G4.9.1.patch01.atlas03, Birk's Law ON

$a = 98.0\% \quad b = 6.9\% \quad$ [data]

$a = 82.0\% \quad b = 6.6\% \quad$ [MC]

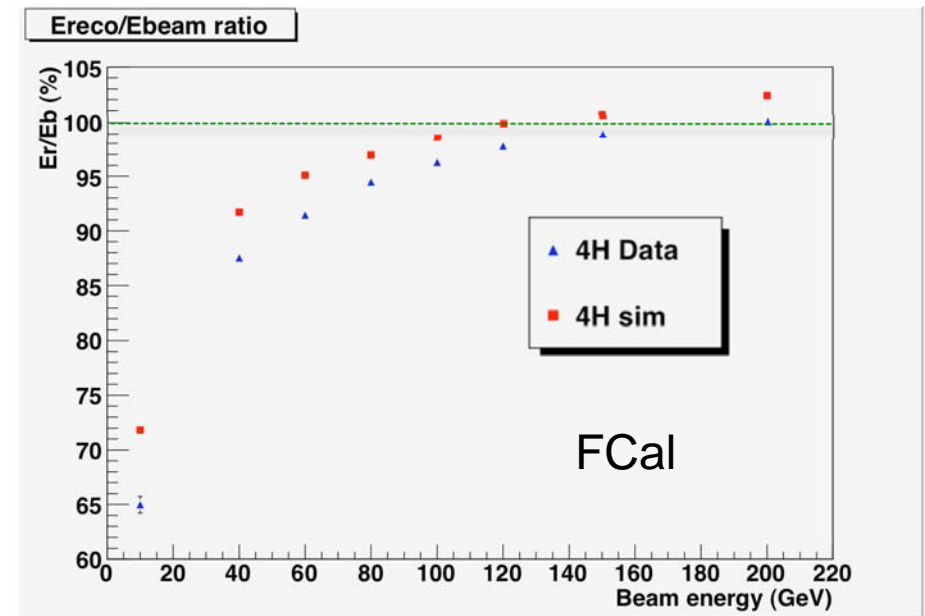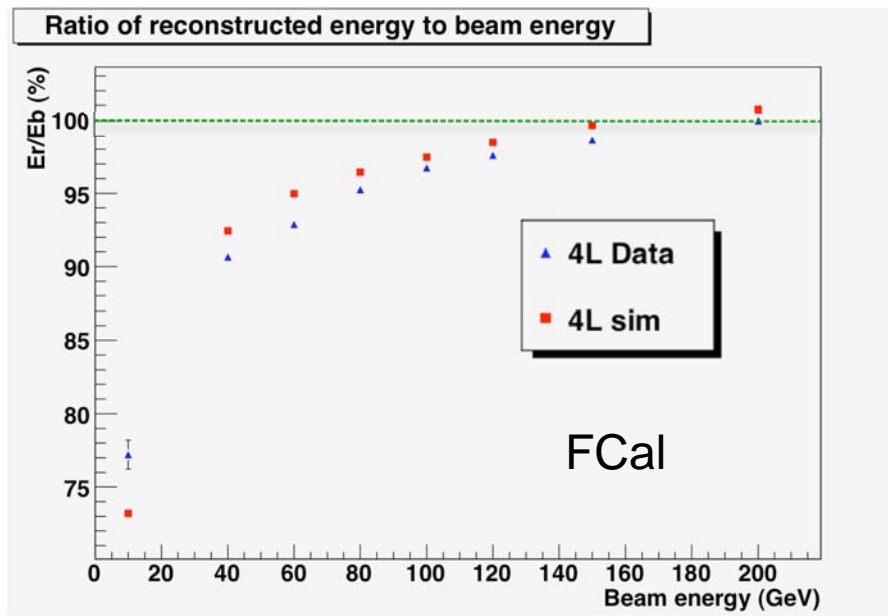$a = 130\% \quad b = 7.1\% \quad$ [data]

$a = 101\% \quad b = 7.2\% \quad$ [MC]

[4H data taken with upstream material modeled]

FCal Reconstructed Pion Energy

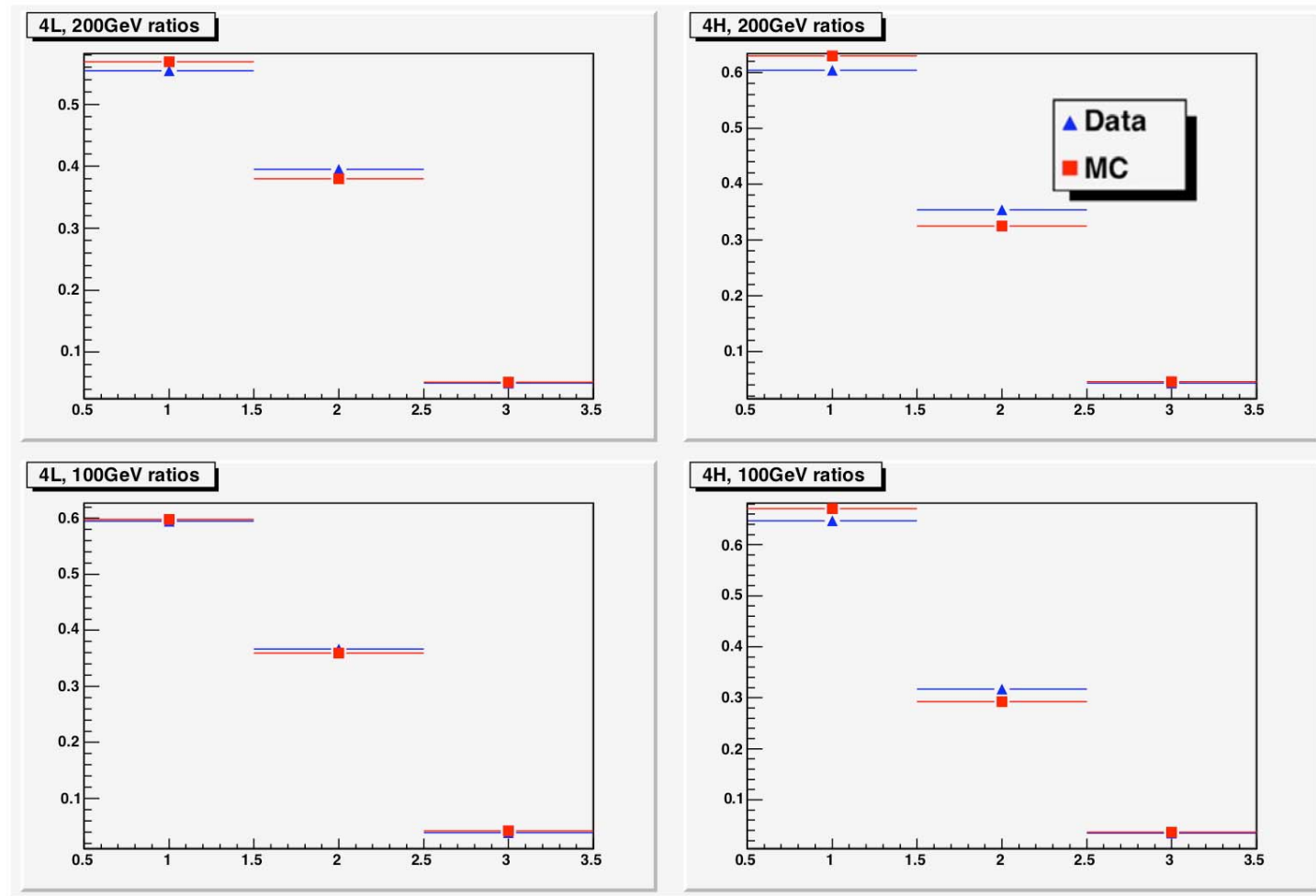Weights derived from 200 GeV pion data, so for data E_{reco}/E_{beam} = 100% at 200 GeV.

At highest energies MC E_{reco}/E_{beam} > 100% (EM scale energies too high in Monte Carlo).

Athena 14.5.0, QGSP_BERT, G4.9.1.patch03.atlas01, Birk's Law ON

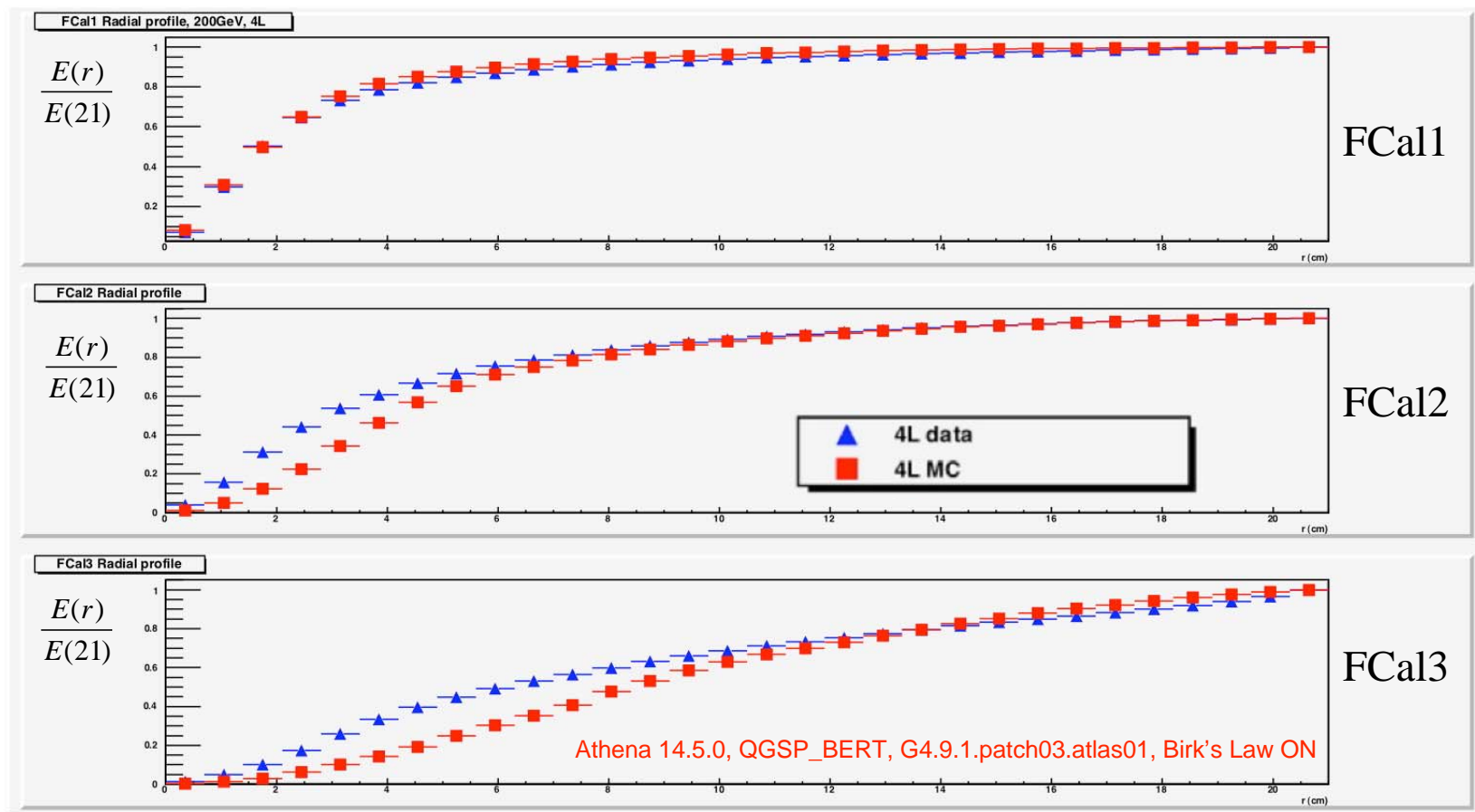# FCal: Longitudinal Energy Deposition for Pions

Three longitudinal layers: FCal1,2,3.

Athena 14.5.0, QGSP_BERT, G4.9.1.patch03.atlas01, Birk's Law ON

Relative energy deposits in ~OK agreement. However, overall Monte Carlo yields EM energy deposits that are larger than in data (see also slides from L.Heelan).

FCal Pion Energy Deposition - Radial Profiles

$E(r)$ is the energy within a cylinder of radius r, centred on the beam impact point: 21cm is the limit before reaching the FCal edge (from the 4L or 4H positions).

In FCal2/3 showers wider in Monte Carlo than in data. These plots are for 200 GeV π^- at 4L, but 4H results are similar, as are results for 100 GeV π^-. Examine this as function FCal matrix density?