LumiCal test beam simulations

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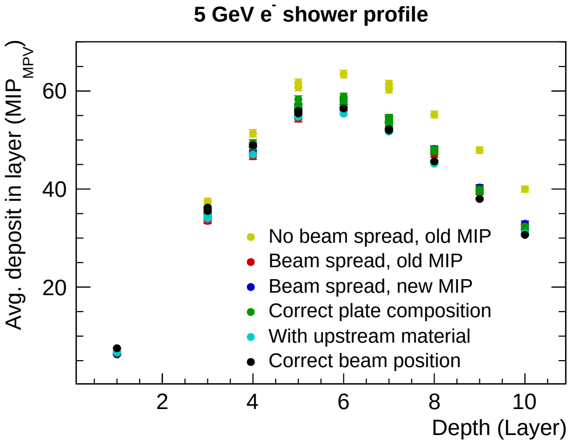
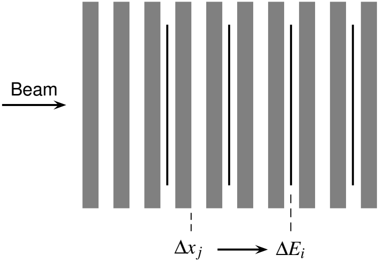
1. Lessons from the TB 2014 simulation
2. Monte-Carlo vs. reality
3. Test Beam 2015 simulation
4. Conclusions

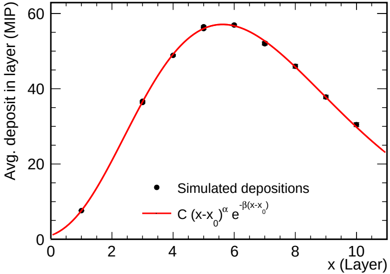
Development of the TB simulation (Early 2015 – early 2016)



- Many details fixed over time. Impact often small, but sometimes very large. Attention to detail important

Systematic uncertainties





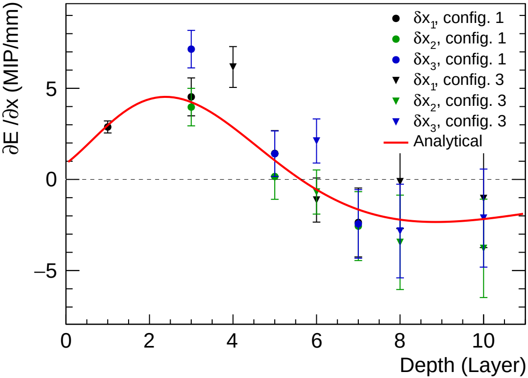
Method 1:

- Run simulations for a limited number of Δx_j.
- Simulate Δx_j several times higher than measured plate uncertainties and extract $\partial E_i/\partial x$.

Method 2:

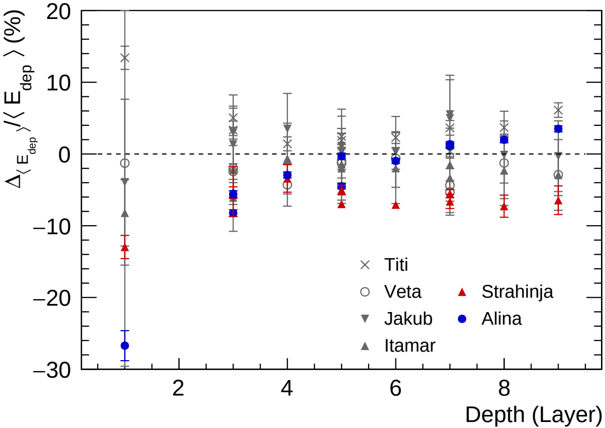
- Extract $\partial E_i/\partial x$ analytically from the fit of the Longo&Sestili function to the beam profile.

Systematic uncertainties



- Simulated $\Delta x_j = \pm 0.1\ \mathrm{mm}$, 20 000 events per point.
- Reasonable agreement between $\partial E_i / \partial x$ estimated from simulation and analytically.

Comparison with the measured data

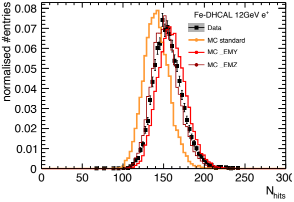


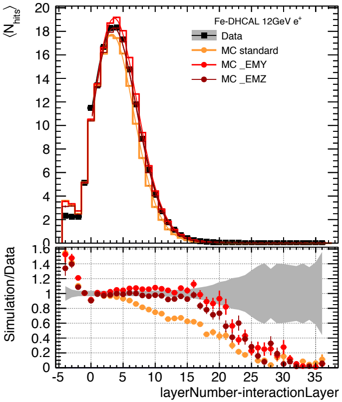
- Relative deviations from average deposit in the 4 data analyses
- Agreement within uncertainties, but uncertainties are large
- 2D comparison might reveal more (see next talk by Itamar)

Experience of CALICE DHCAL

Positron shower analysis

- Longitudinal profile
  - Fitted with Gamma Distribution
- Strong differences between EM physics lists
- Impact of longitudinal description on N_{hits}





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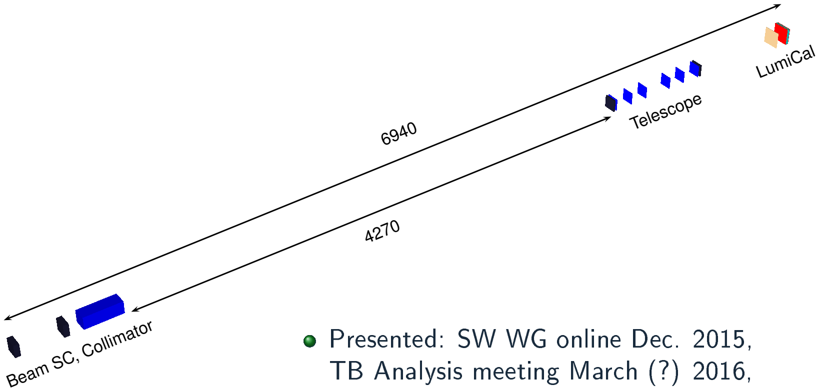
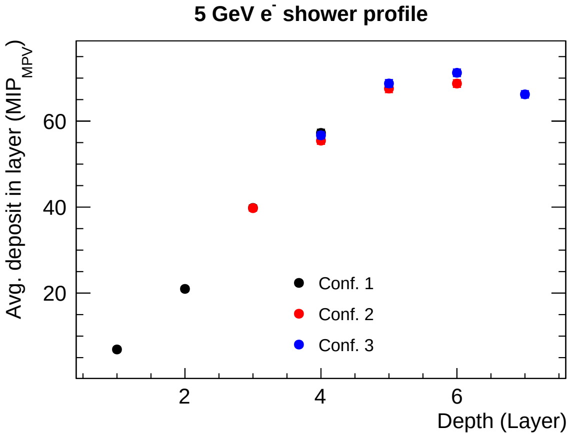
- Monte Carlo meets reality. Feedback to Geant4 developers.

TB 2015 – Geometry



- Presented: SW WG online Dec. 2015, TB Analysis meeting March (?) 2016, FCAL WS March 2016, Dubna
- Sources: Logbook, Telescope online manual , FCAL Talk LCWS 2015 by Yan, Corrections at SW meeting on 16 Dec. 2015

TB 2015 – Shower



- Beam profile rectangular 2×1 cm
- Beam center 18 mm below top of sensor – *ad hoc* position – to be adjusted to analysed measurement position(s) when available)

Conclusions

- TB 2014 simulation has been refined over time.
- Our understanding of the LumiCal shower development has improved.
- Choice of physics list affects results significantly.
- Disagreement with the data should eventually lead to an improvement of the simulation. Is this the future goal of FCAL?
- TB 2015 simulation is ready to run as soon as a set of measured data is selected for comparison.