GLAST CERN 2006 Beamtest

**BTR v8r130101p1
LPM effect bug
Simulation status**
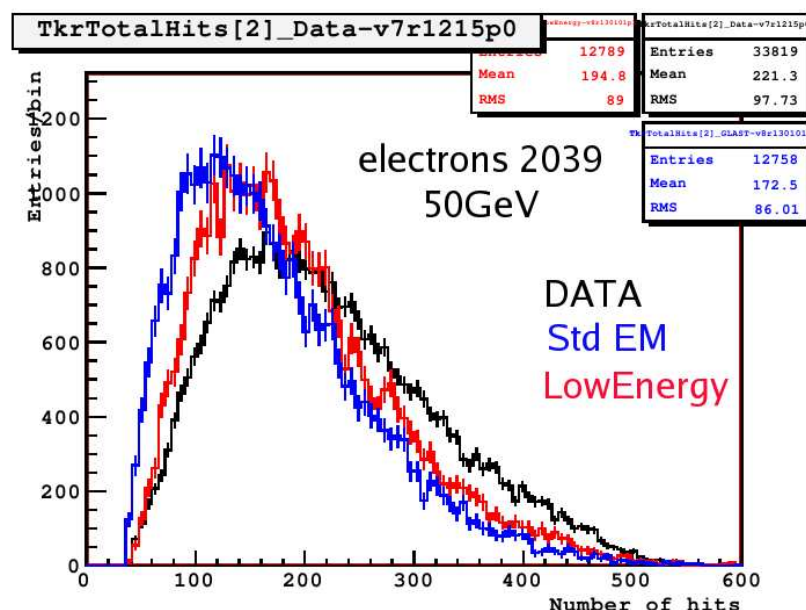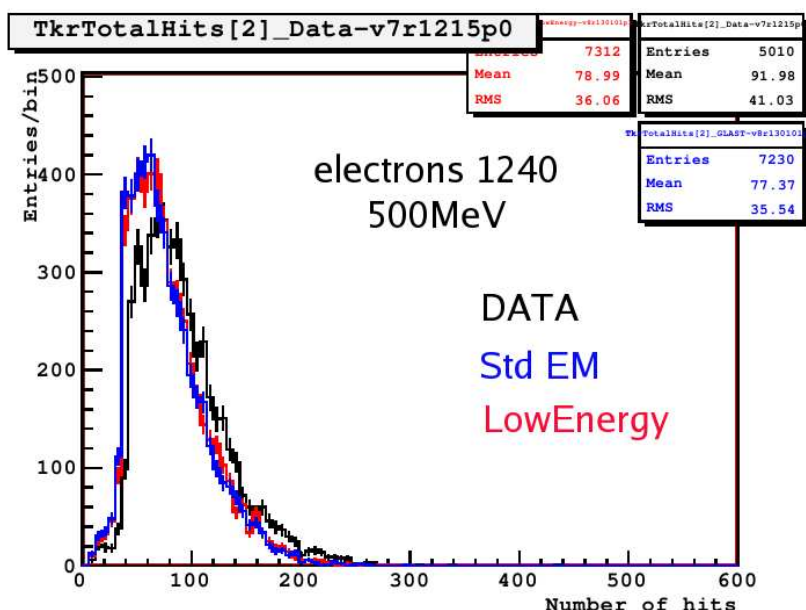
Johan Bregeon

Beamtest Analysis - April 23rd, 2008

Low Energy vs GLAST (reminder)

- Low Energy physics produces different hit distributions in the tracker (only) for high energy electrons runs !?

- Vladimir Ivantchenko suggests 2 tests :
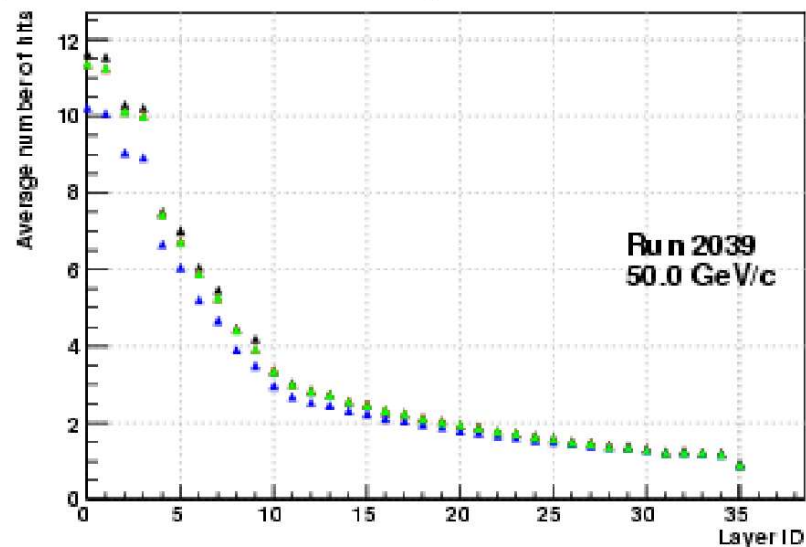 - Add G4LowEnergyRayleigh to Std. EM photon processes (No significant change)

LPM flag test

- LowEnergy physics does not simulate the LPM effect
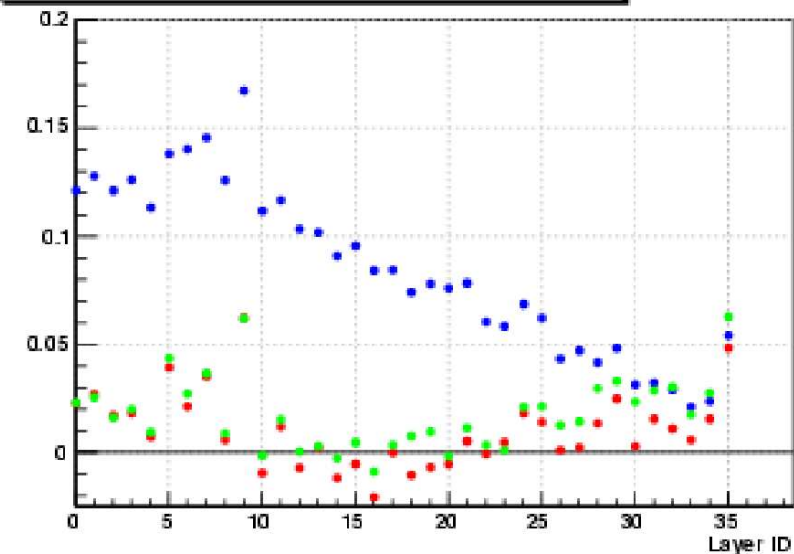- Turning off the LPM effect simulation in run 2039 for Std. EM physics
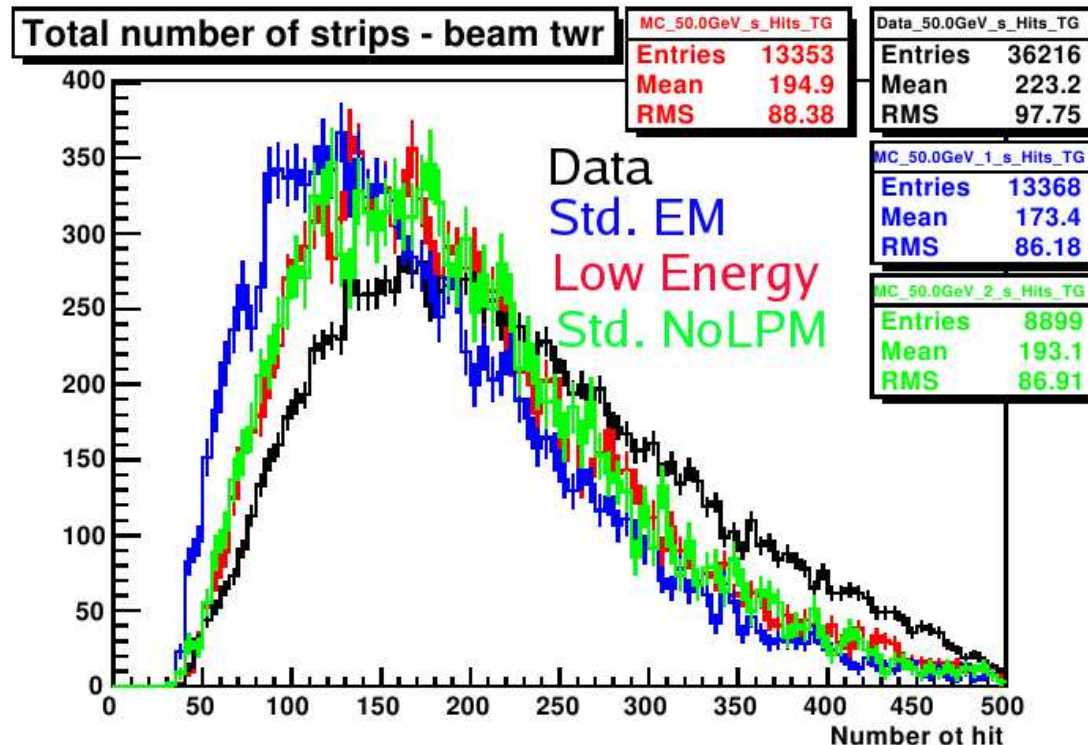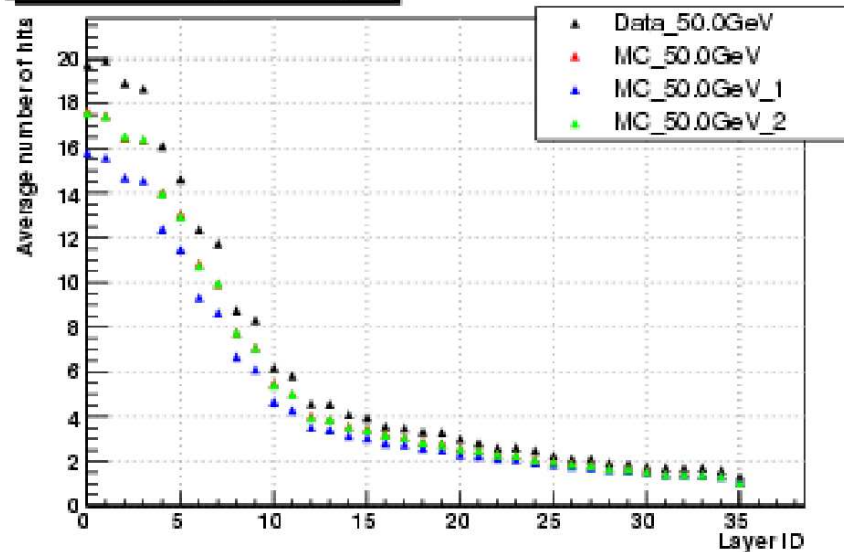
LPM flag test (2)

The LPM effect (1)

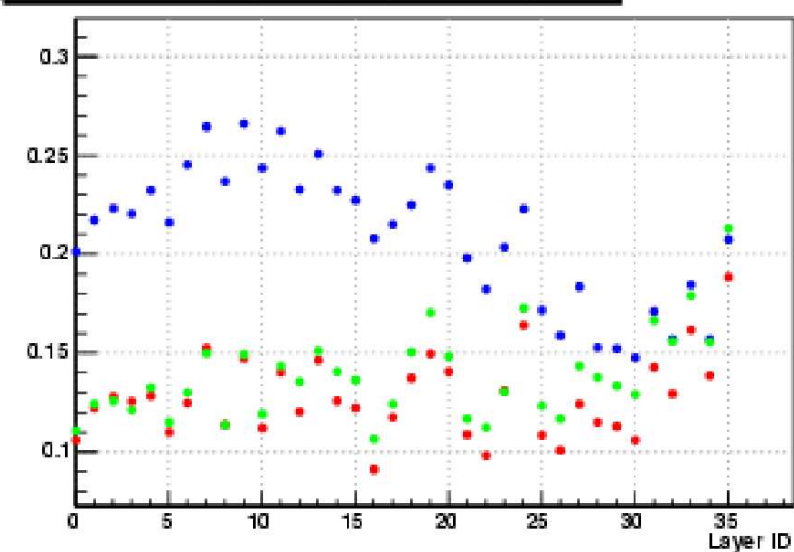- few words from the `PDG - 27.4.5`

  - Landau-Pomeranchuk-Migdal effect ($E \sim TeV$)

  - quantum mechanical interference between amplitudes from different scattering centers

  - the distance over which the electron and photon split apart gets longer

$\rightarrow$ elongation of the EM shower

$\rightarrow$ Bremsstrahlung is suppressed if the photon energy k is less than E^2/E_{LPM}, where :

$$E_{LPM} = \frac{(m_e c^2)^2 \alpha \rho X_0}{4\pi \hbar c} = (7.7 TeV/cm) \times \rho X_0$$

The LPM effect (2)

- what about its implementation in `GEANT4`
  - v8.01p01 (the one we use) has a bug, the LPM constant is wrong by a factor of 2
  - the bug was corrected in v8.3
  - however, correcting the bug, i.e. multiplying by 2 the LPM constant would mean to have the LPM effect twice as strong... even more suppression of Brehmsstrahlung
  - $\rightarrow$ our data demonstrate that the current implementation of the LPM effect in `GEANT4` is not good enough.
  - $\rightarrow$ V. Ivantchenko is looking into it but advised us to turn it off for now

BTR Future - MC

- Turn LPM off

- Calorimeter geometry

  - It had been updated according to CAL material audit since last november

  - but CsI density was updated to wrong value of $4.53 gr/cm^3$: CsI density must be corrected

- Lower LACs $\sim 1 MeV$

- Improved Calorimeter analysis : new variables implemented by Philippe

- pass6 or pass7 ?

BTR Future - Data

- CAL calibration
  - temperature variation : pedestals, light yield
  - status of calibration from scratch at SLAC ?
- Improved Calorimeter analysis : new variables implemented by Philippe
- pass6 or pass7 ?
- Reconstruction
  - Tk1Type in TkrRecon
  - CalLkHdEnergy issue