Status of MAPS simulation studies

CALICE-UK MAPS ECAL Meeting

at Rutherford Appleton Laboratory

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Correction for 17/05/07 MAPS meeting slides and for discussion just before LCWS07

1. Non-linearity only in default energy resolution

-> Decoding layer number from CellID0 was not correct.

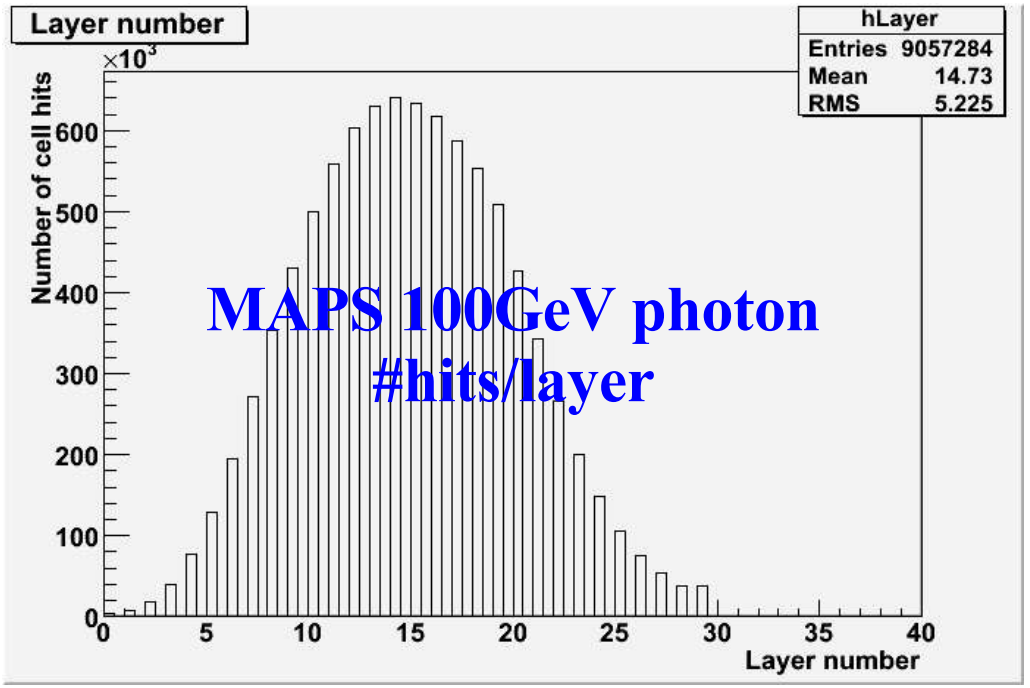
-> As a result, weighting by factor 2 for different W thickness were not working correctly.

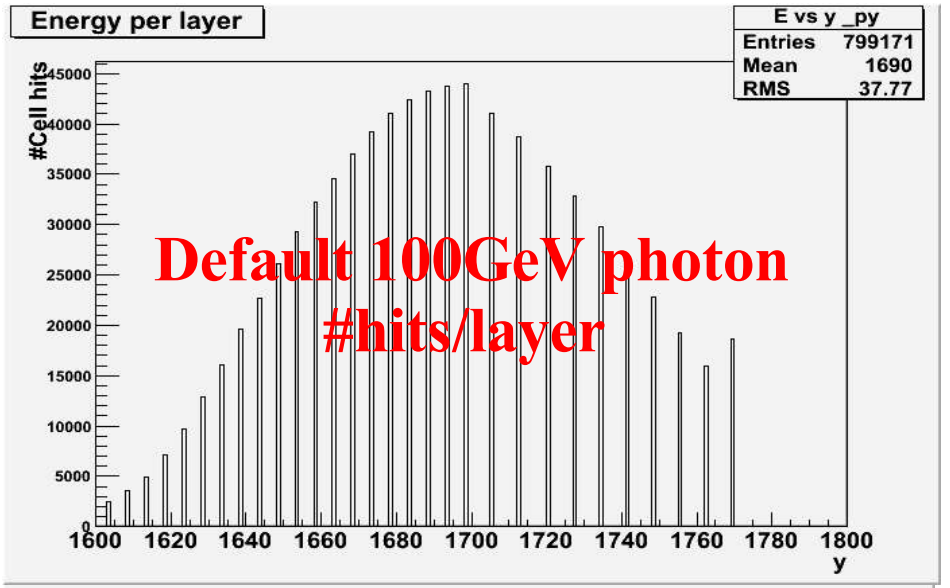
2. Longitudinal shower shape problem between MAPS v.s. default

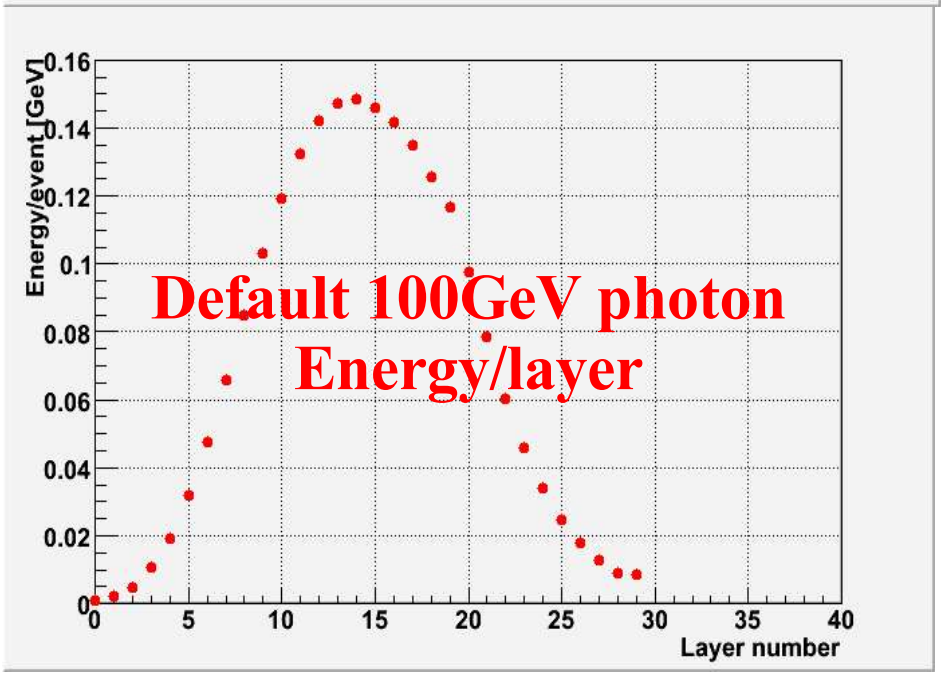
-> Weighting by energy wasn't working correctly as I expect.

-> Was comparing just #hit/layer as a result.

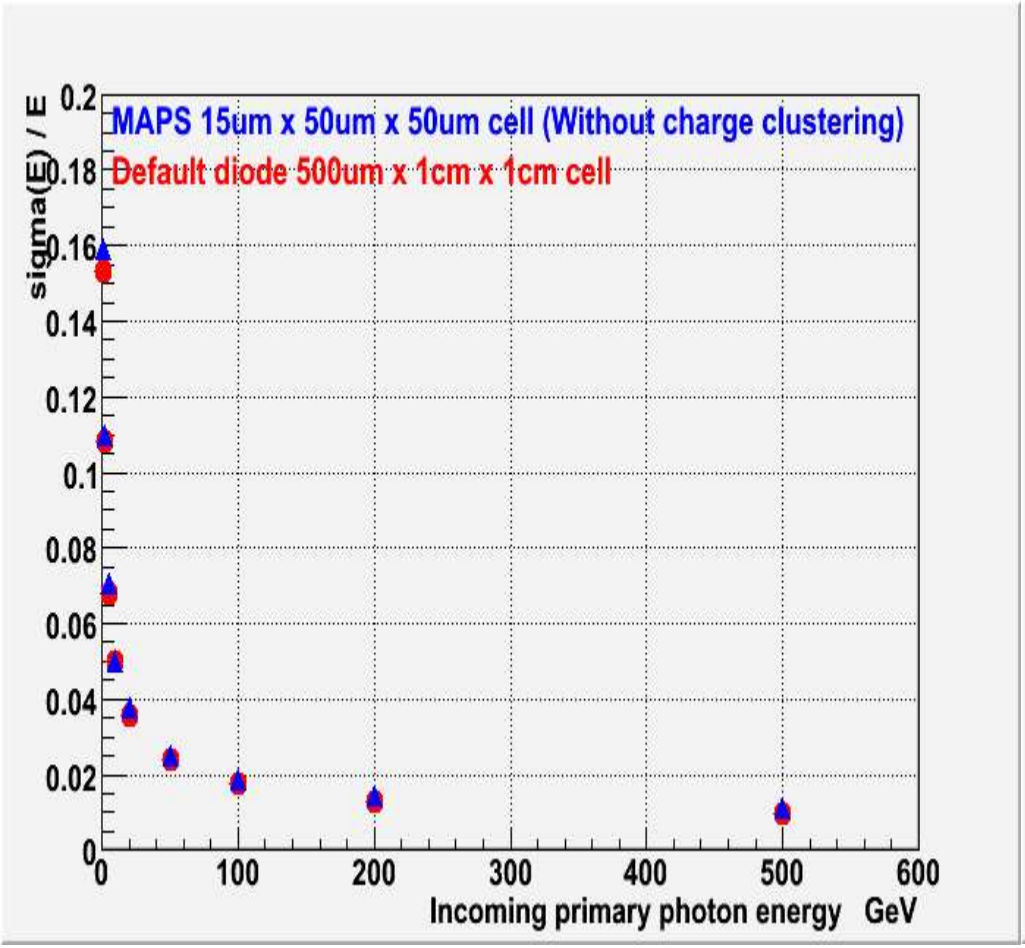
Longitudinal shower shape (Layer) comparison

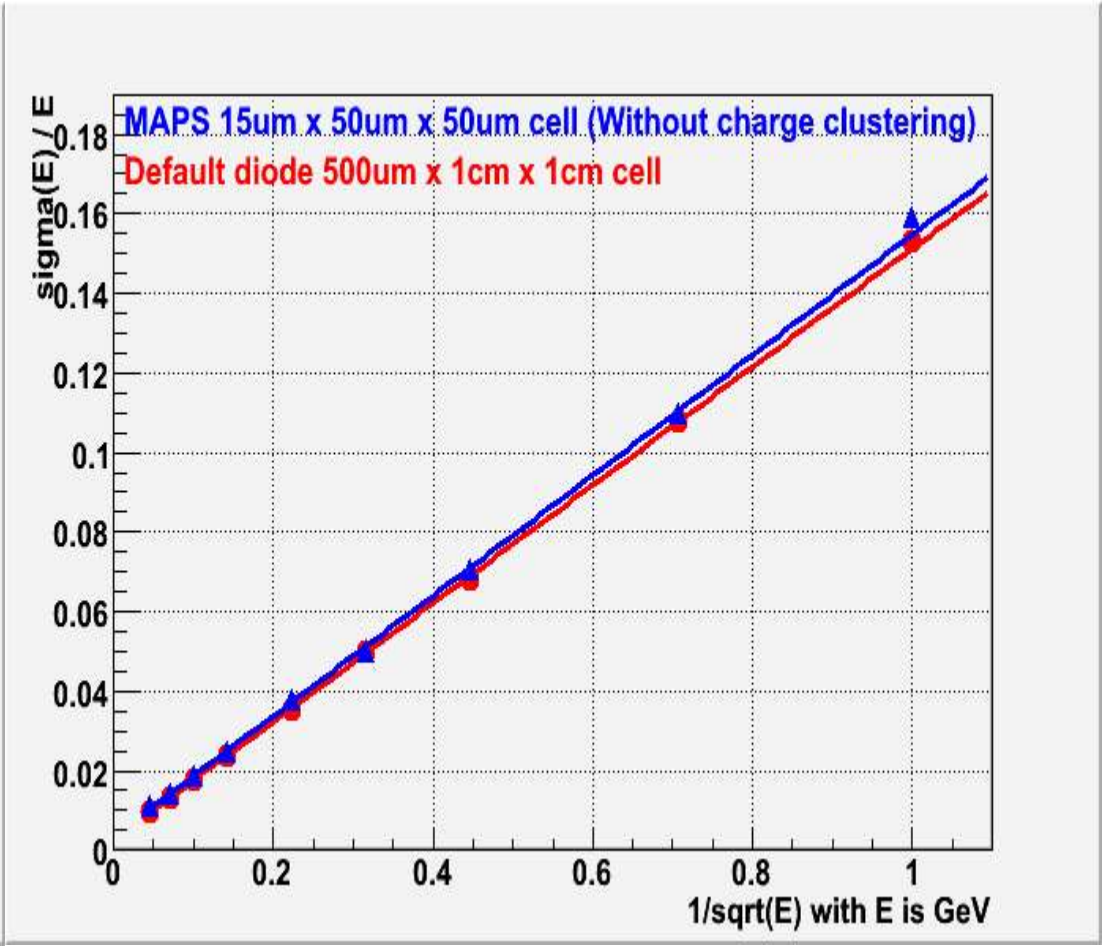






Energy resolution
MAPS v.s. default





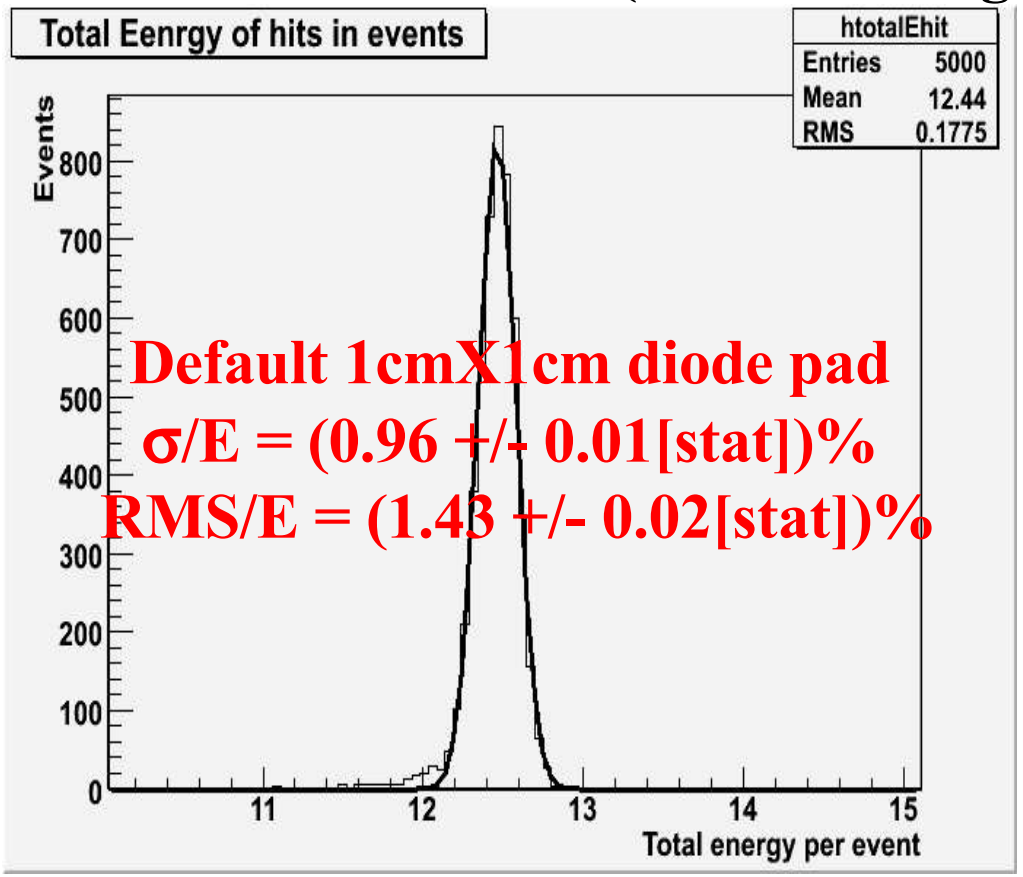
MAPS (without charge clustering): $\sigma(E)/E = (15.1\pm0.1^{stat})\%/\sqrt{E} + (0.36\pm0.02^{stat})\%$

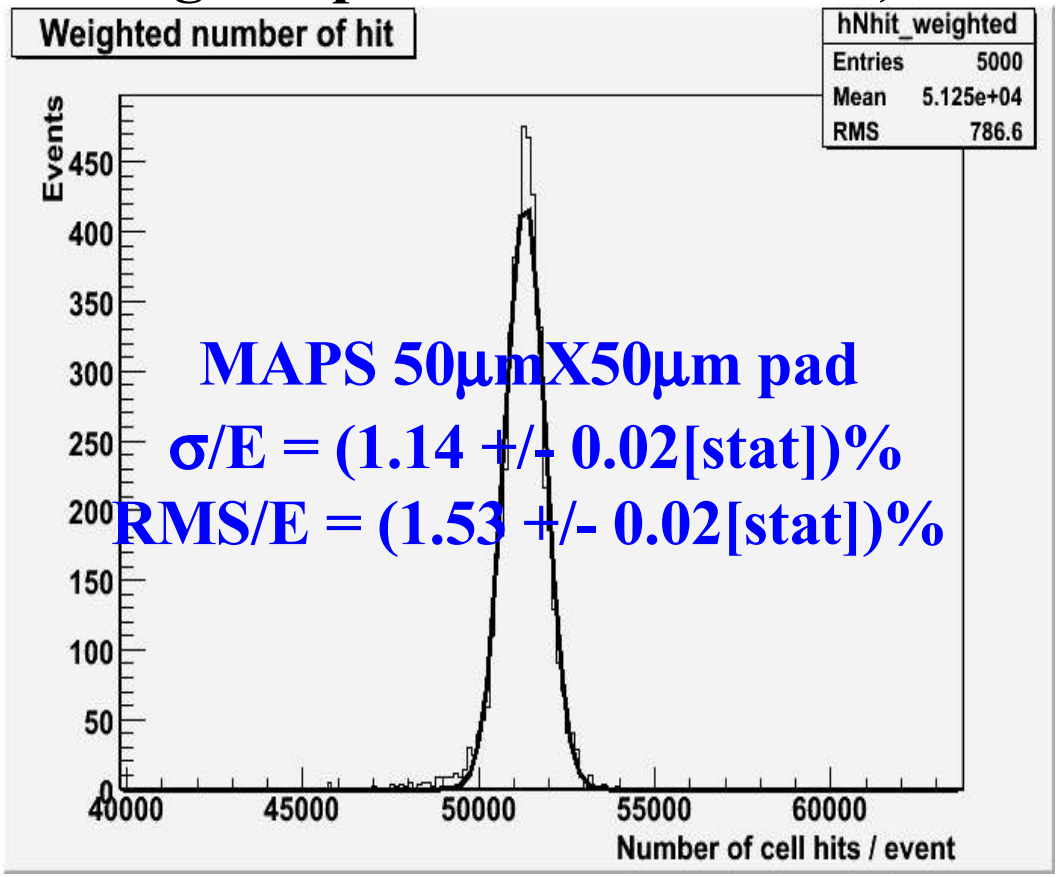
Default (1cmX1cm cell) : $\sigma(E)/E = (14.9\pm0.1^{stat})\%/\sqrt{E} + (0.27\pm0.02^{stat})\%$

Constant term is slightly worse in MAPS without charge clustering.

Energy resolution at 500 GeV
MAPS v.s Default

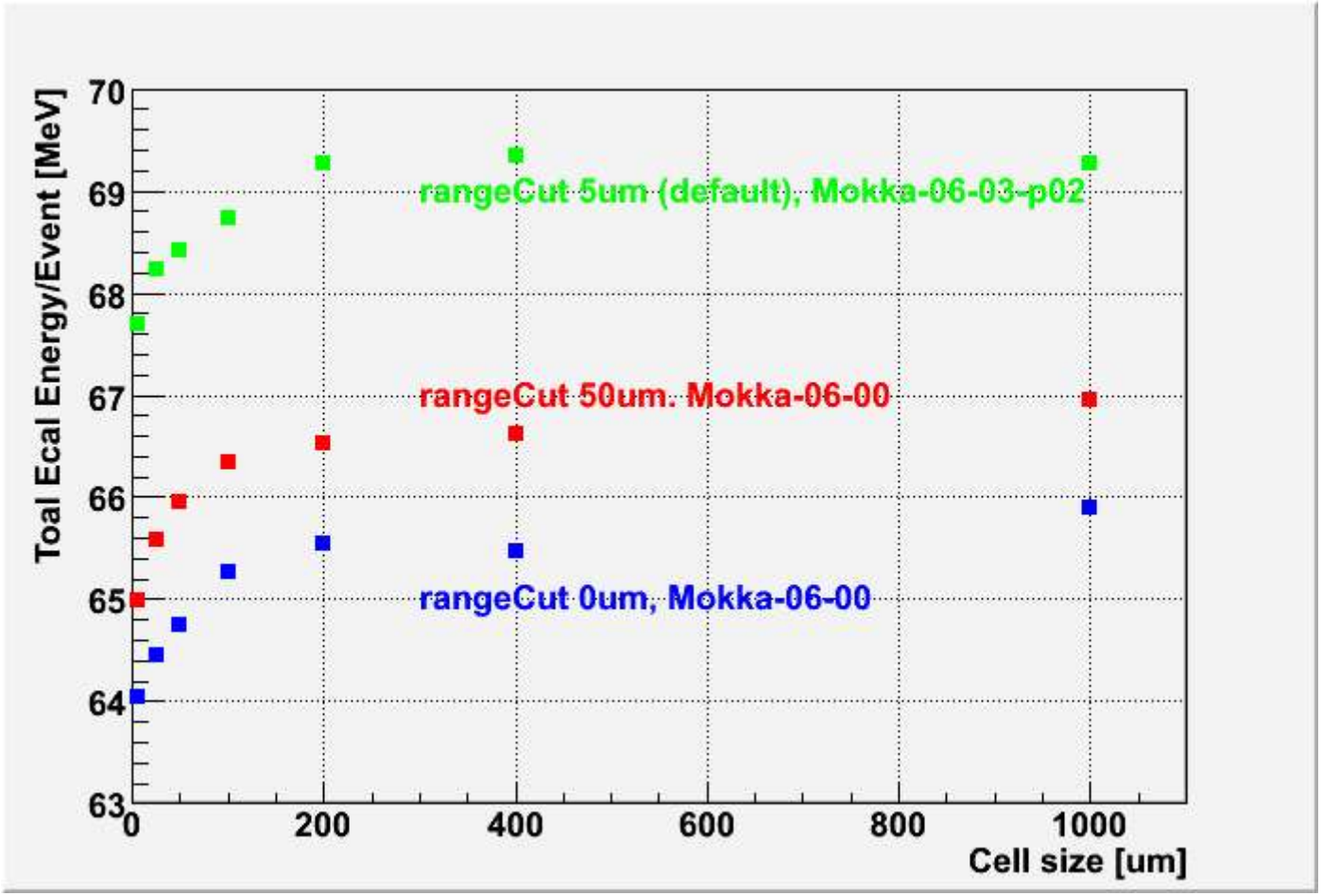
- 500 GeV photon
- Mokka-06-03-p02
- Geant4 (without charge sharing compensation for MAPS)





Although MAPS is slightly worse if it is without compensation of charge sharing, it may be a comparable energy resolution after Anne-Marie's compensation. (If its 10~15% better resolution is valid at 500 GeV as well.)

Study for problem of small cell energy loss in software



It was not due to neither rangeCut nor Mokka version.
(Not yet understood)

Next steps

- **Linearity comparison with MAPS charge sharing step by step (Anne-Marie's digitization)**
  - **Charge diffusion without threshold**
  - **Charge diffusion with threshold**
  - **Adding Noise**
  - **Adding dead area**
  - **Adding charge clustering**
  - **(Adding secondary particle angle effect)**