

First Look at W/Si Dynamic Range Requirement

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- Want to measure MIPs (400 keV/mm in Si) *and* dense EM showers due to 250 (500) GeV Bhabha e^\pm
- EM showers in W are dense:
W only: $R_m = X_0(21.2\text{MeV}/E_c) = 9.1 \text{ mm}$
- But is modified significantly by sampling layers:
W/Si: $R_m \approx 9.1\text{mm} [1 + (\text{Si gap})/(\Delta z_W)]$
- for SD, $\Delta z_W = 2.5 \text{ mm}$; can trade off $R_m \leftrightarrow \sigma_E$

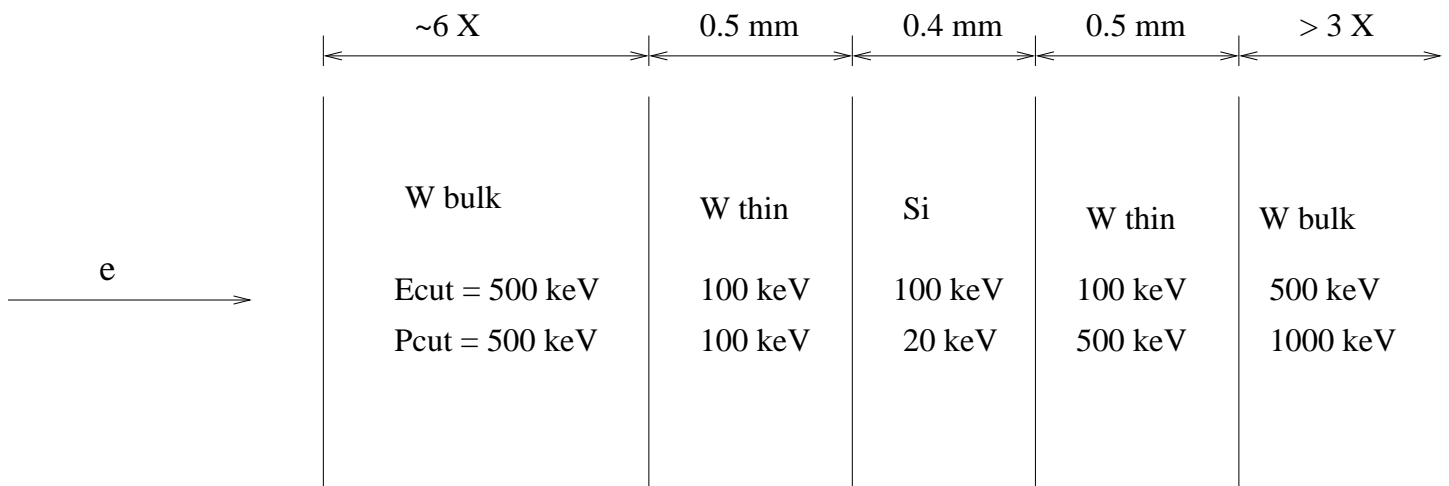
1. EGS setup

2. Results

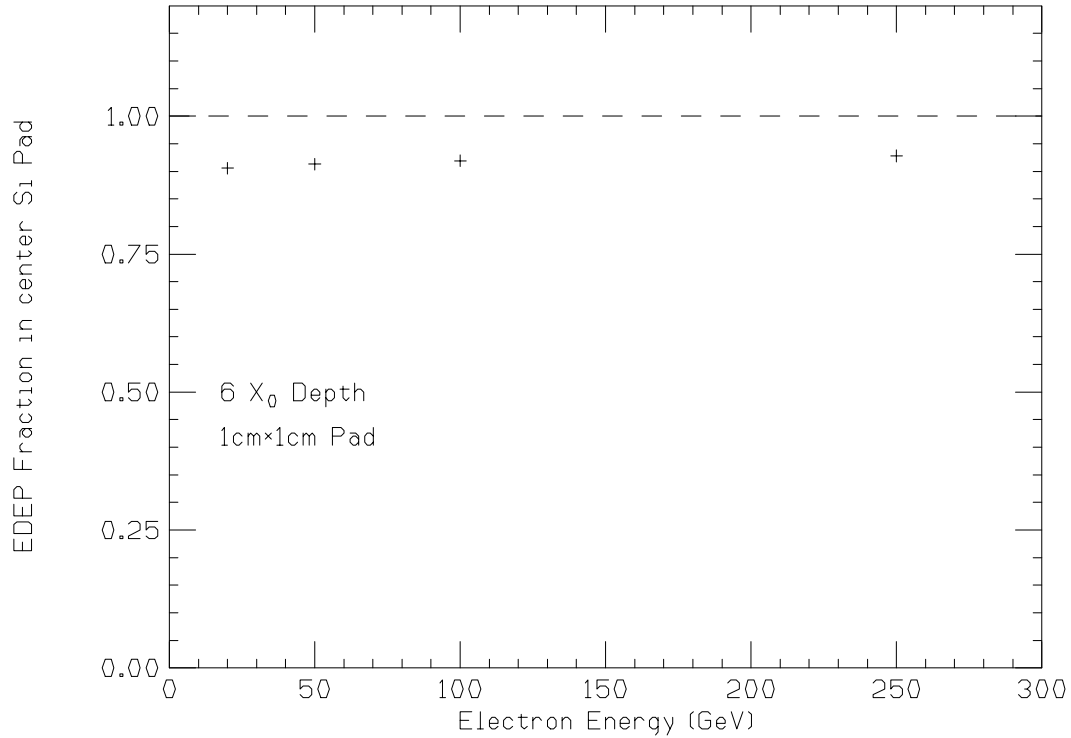
3. Conclusions

EGS Setup

- Use the G. Lindstrom recommendations for E_{cut} in thin sampling layers. (Good accuracy with finite CPU time.)
- Reduced E_{cut} , P_{cut} in thin regions near the Si
- Step size small (0.3%) everywhere



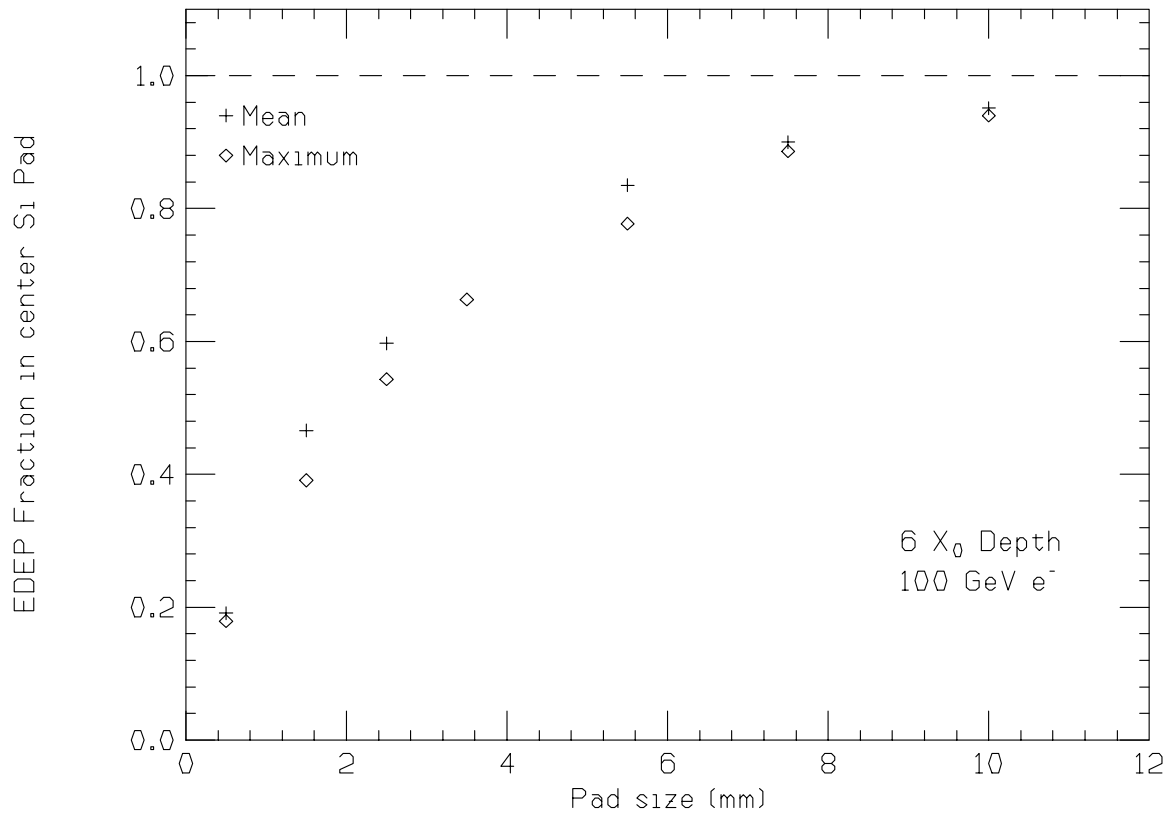
- Fraction of total EDEP in $1\text{cm} \times 1\text{cm}$:
($E_e = 100\text{ GeV}$)



1. Broad shower max in depth $\sim 6.5 \pm 1 X_0$
2. Fraction of energy in central $1\text{cm} \times 1\text{cm}$ is
 \sim independent of E_e

\Rightarrow Results not sensitive to these

- EDEP fraction in center pixel as function of pixel size (mm):



⇒ need big pixel size reduction to change dynamic range requirement significantly

- For this config. and 1cm×1 cm Si:
250 GeV Bhabha / MIP = (340MeV)/(0.16MeV) = 2.1×10^3
 - decrease in pixel area by 100 gives only 2-3 bits reduction
 - result scales for max. energy → 500 GeV
- Current thinking is 3 linear 12-bit ranges (driven by resolution)
See M. Breidenbach talk
- Now have code to model full ECal stack
→ interesting to compare with GEANT4 and GISMO