Backsplash Angular Distribution Studies

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Data runs

- 200GeV e^- data, center of tower 2:
  - Run#700001885, 0deg beam angle
  - Run#700001892, 10deg beam angle
  - Run#700001896, 20deg beam angle
  - Run#700001902, 30deg beam angle
  - Run#700001906, 45deg beam angle
  - Run#700001909, 60deg beam angle

- Used MCs of same runs
  - NewMC with improved beam geometry
  - MIN and MAX light collection efficiency
  - ftp://ftp-glast.slac.stanford.edu/glast.u33/lreyes/beamtest_data/output
  - Also use the above link for the svac tuples of the above runs with Acd10Ids turned on

Cuts

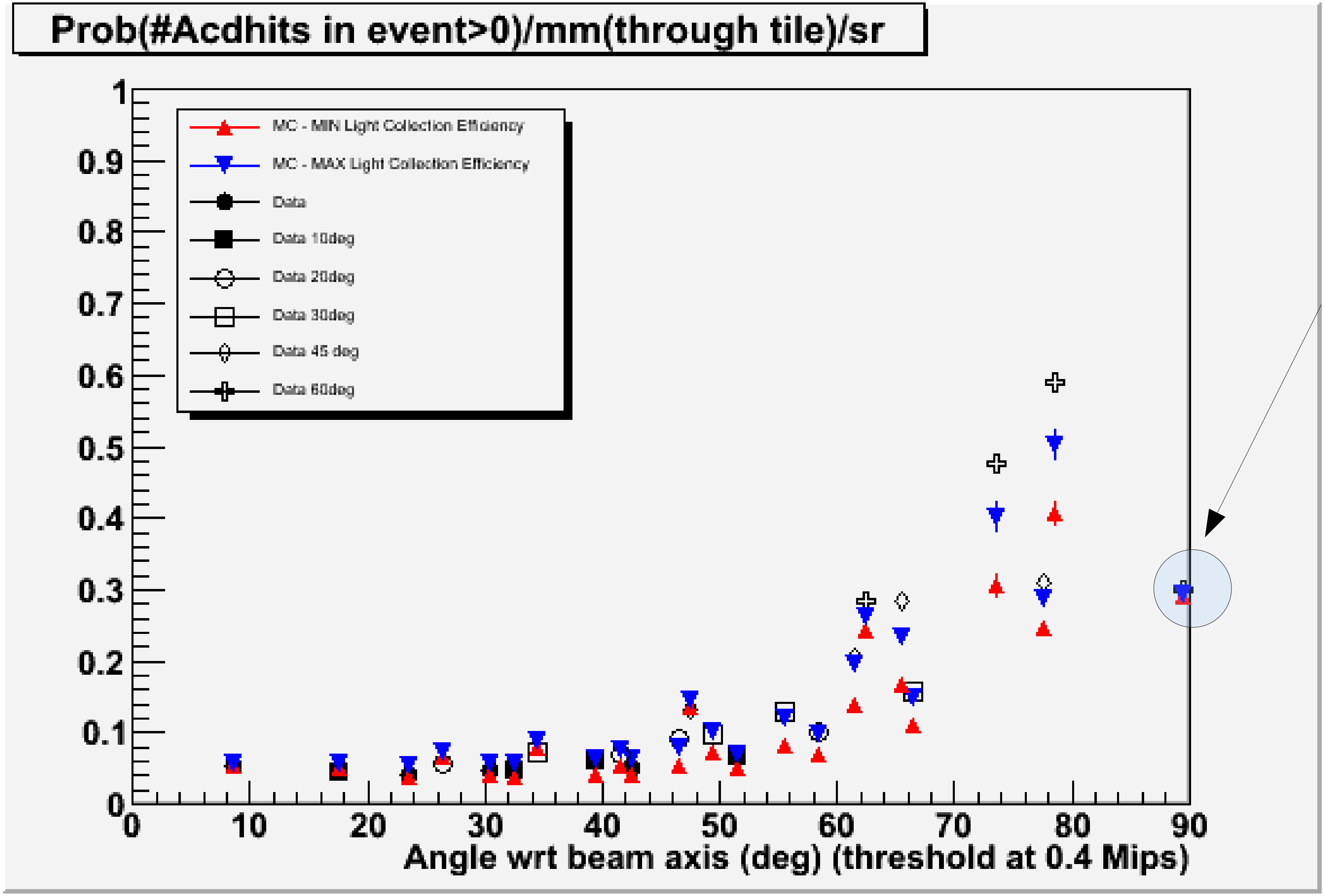
- For data and MC
  - TkrNumTracks>0
  - log10(CalEnergyRaw)>3
  - Tkr1ZDir cut for each beam angle, looked at distributions
    - 0deg, Tkr1ZDir<-0.9998
    - 10deg,-0.99<Tkr1ZDir<-0.98
    - 20deg,-0.955<Tkr1ZDir<-0.925
    - 30deg,-0.88<Tkr1ZDir<-0.85
    - 45deg,-0.72<Tkr1ZDir<-0.69
    - 60deg,-0.51<Tkr1ZDir<-0.485
- For data only
  - GemCondArrivalTimeTkr<30
  - GemCondArrivalTimeCalLe<30

Strategy

- Assume all backsplash photons originate from mean showermax position.
- Count the number of events with >0 hits above a given threshold in a tile and divide by the total number of events.
- Longer pathlength through tile means greater likelihood for backsplash photon to interact.
- Different tiles will appear to be different sizes.
- Calculate backsplash probability/mm through tile/sr as a function of angle.
- If backsplash is isotropic, should be flat.
- Assume no error in tile coordinates
  - Error from mean shower max rms and statistics, propagated

Results

- Example, 0.4Mips threshold (onboard veto)



- Probability saturates, dividing by pathlength and solidangle makes this (incorrectly) too small.

Additional plots at end of presentation

Results

- Probability is roughly isotropic up to ~45^o, then rises quickly for greater angles.
- Angles are to center of tile from mean showermax.
  - Can't tell exactly where the photon hit.
- Data and MC have same behavior.
- Data does seems to rise more quickly than the MC as the beam angle increases.
  - See extra plots.

Conclusions

- The data is generally between the MAX and MIN efficiencies.
- Isotropic for low angles (<~40^{o}) but probability rises quickly for higher angles.
- At higher angles, data above MAX efficiency MC
  - MC can't reproduce as well or beam not well described for nonzero incidence angle?

- Things to do:
  - Understand the geometry of the radiating region
  - Verify cuts for high beam angle
  - Investigate the systematic effect for onboard effective area at high energy
  - Suggestions?

Extra Slides

- Plots from Alex's paper
  - Beam is 200 GeV e⁻
- Different geometry and calorimeter
  - Can't directly compare

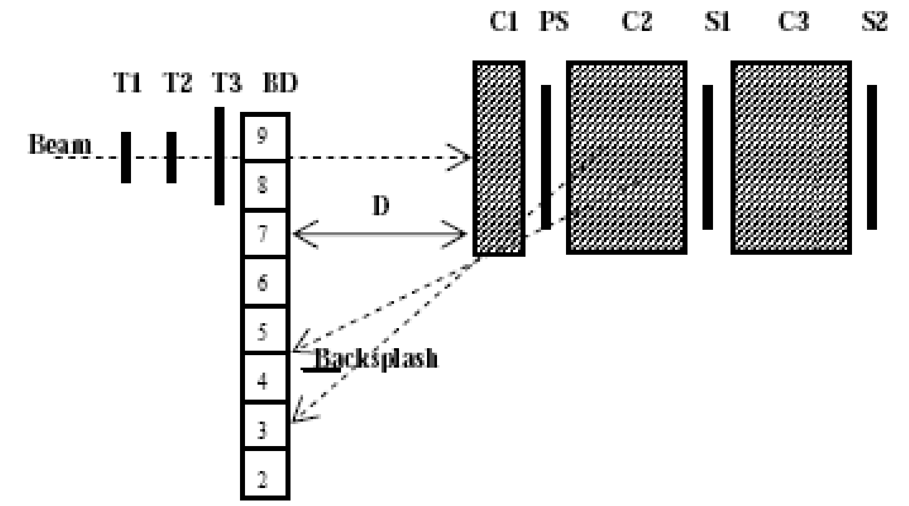


Figure 2. Experimental setup. T1, T2, and T3 – triggering scintillators; BD – tile hodoscope; PS, S1, and S2 – shower detectors; C1, C2, and C3 – calorimeter sections

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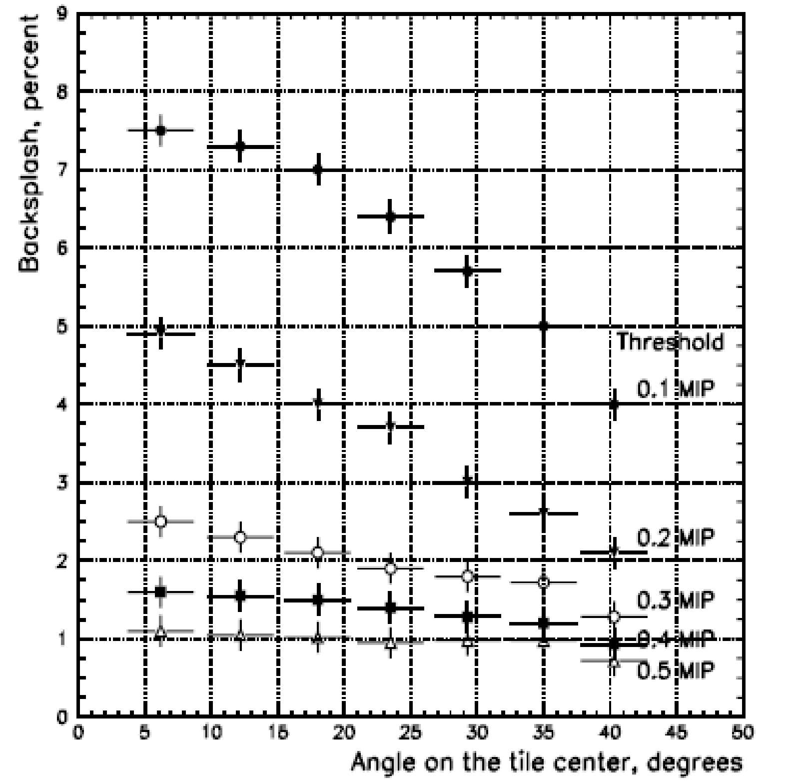
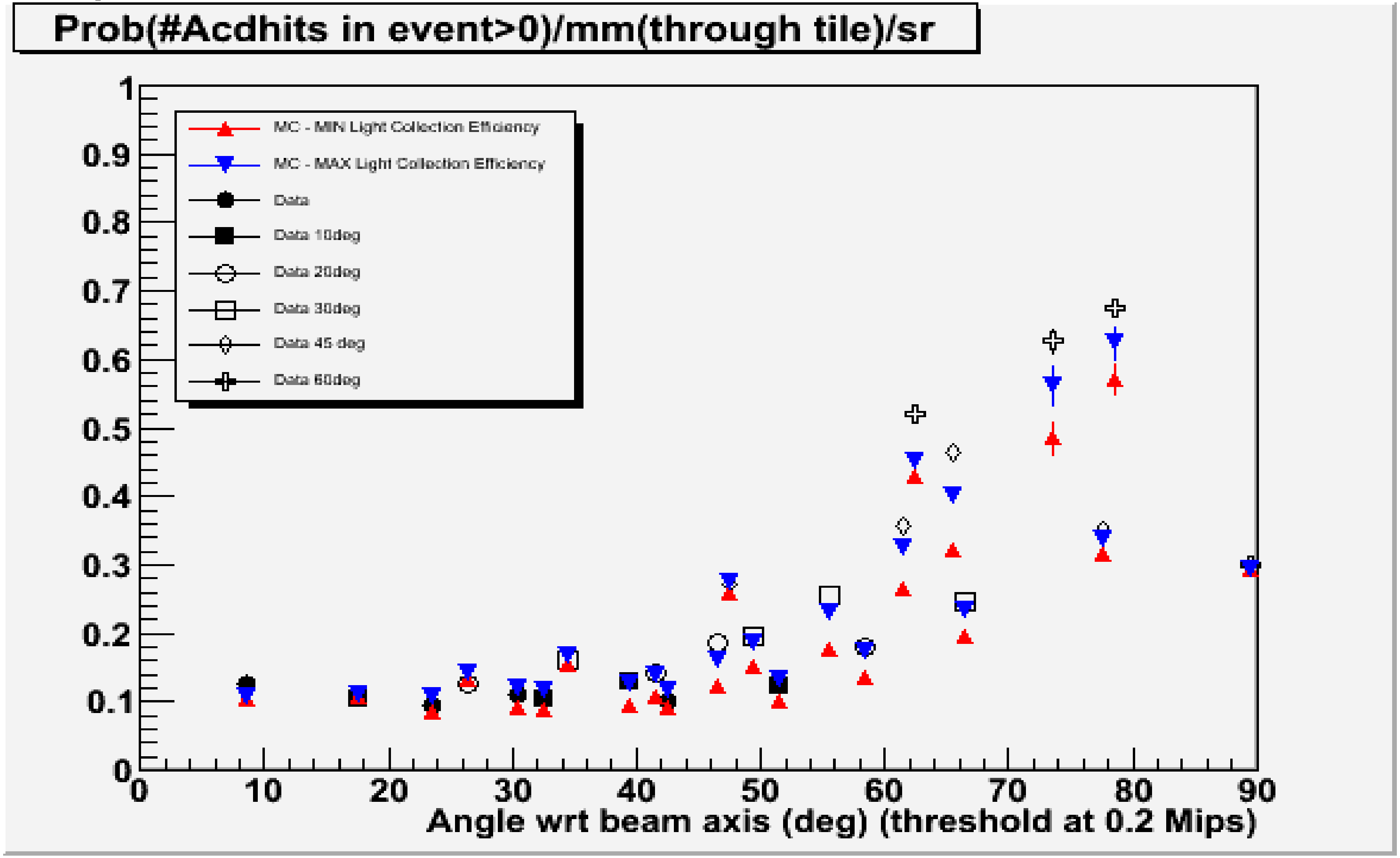


Figure 5. Angular distribution of backsplash for different thresholds. Data are for 200 GeV beam with the tin calorimeter placed at 45cm from BD

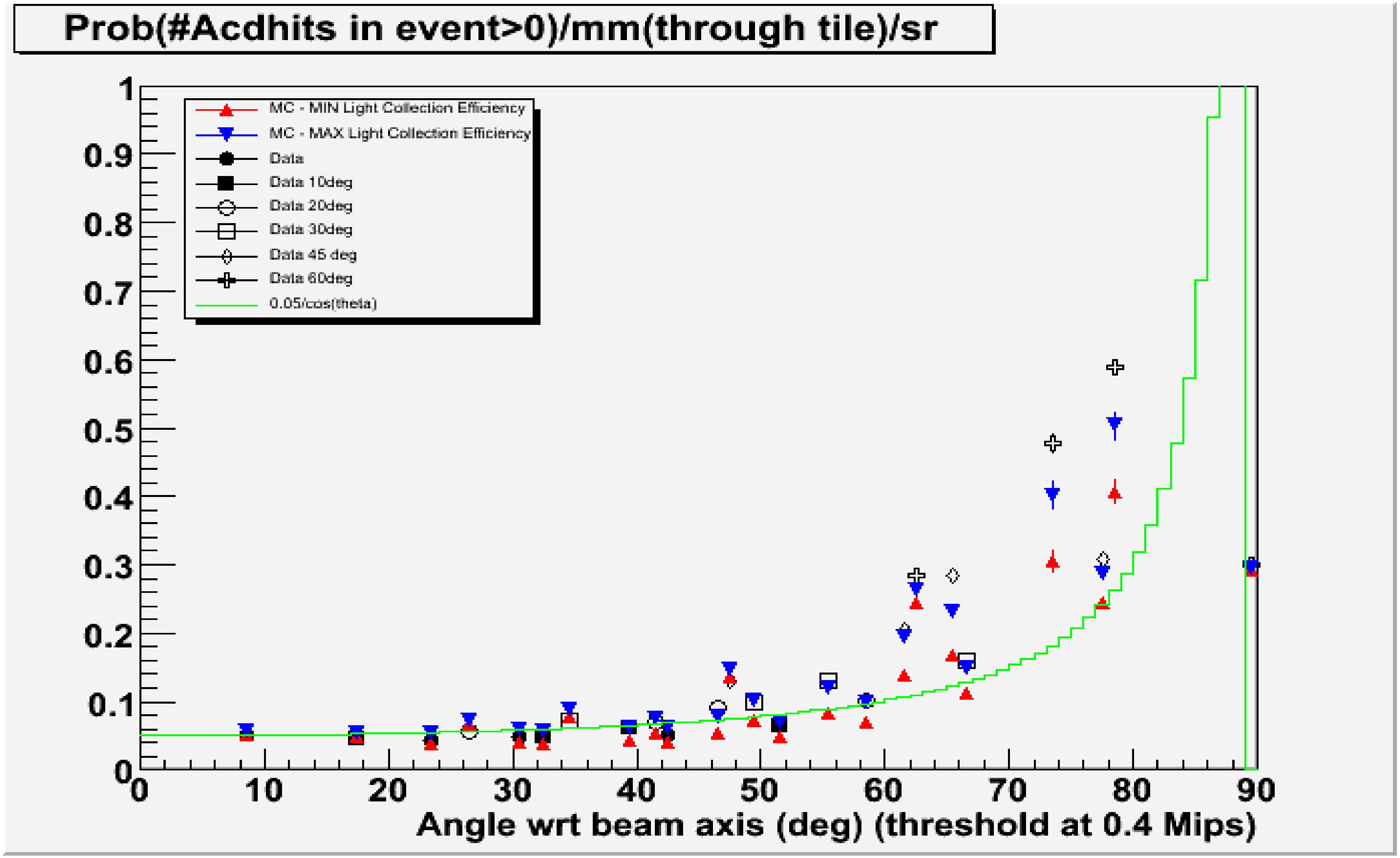
Extra Slides

- 0.2Mips threshold.



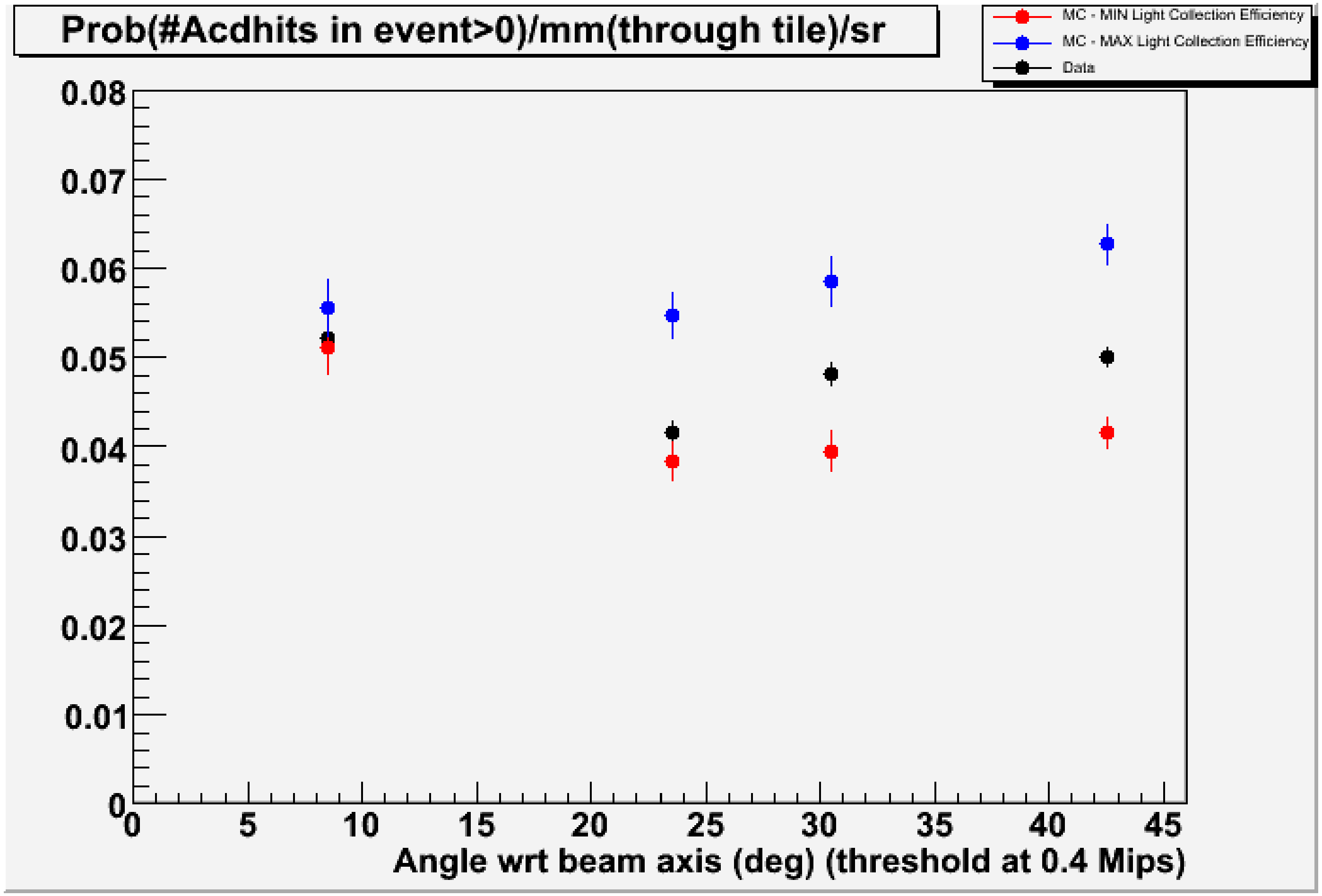
Extra Slides

- 0.05/cos(θ), not a fit, just what looked “good”.



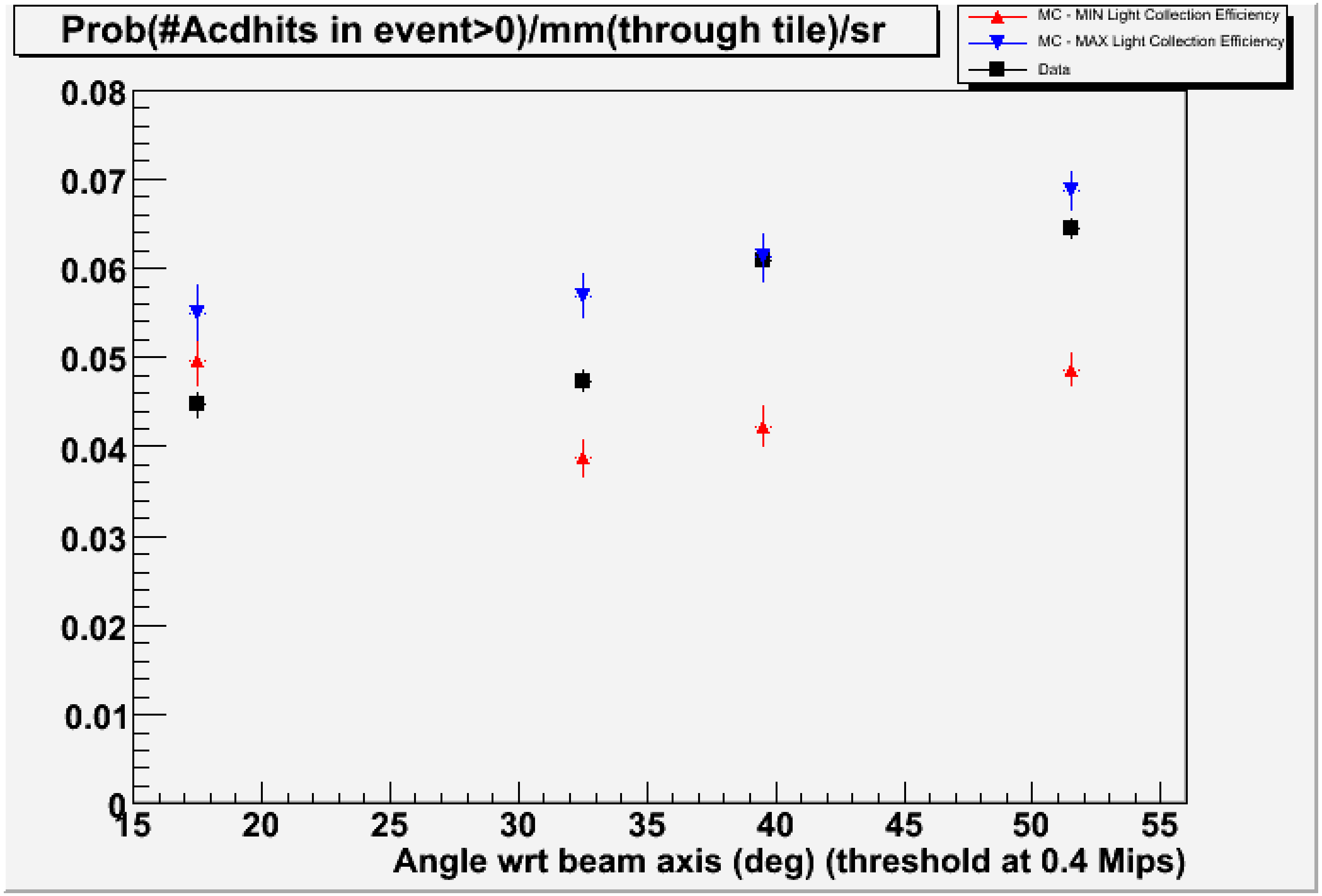
Extra Slides

- 0° beam angle
- 0.4Mips threshold



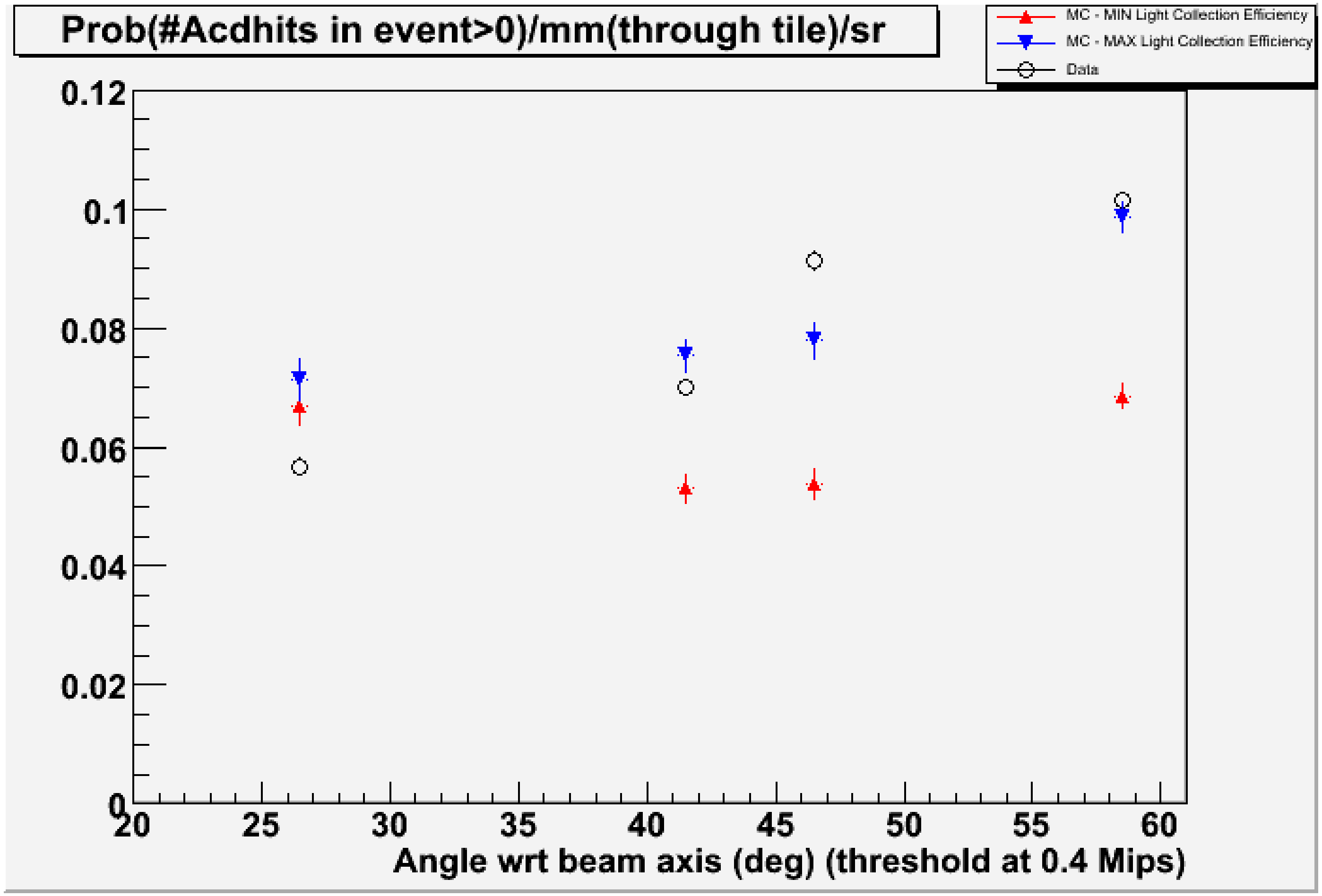
Extra Slides

- 10^o beam angle
- 0.4Mips threshold



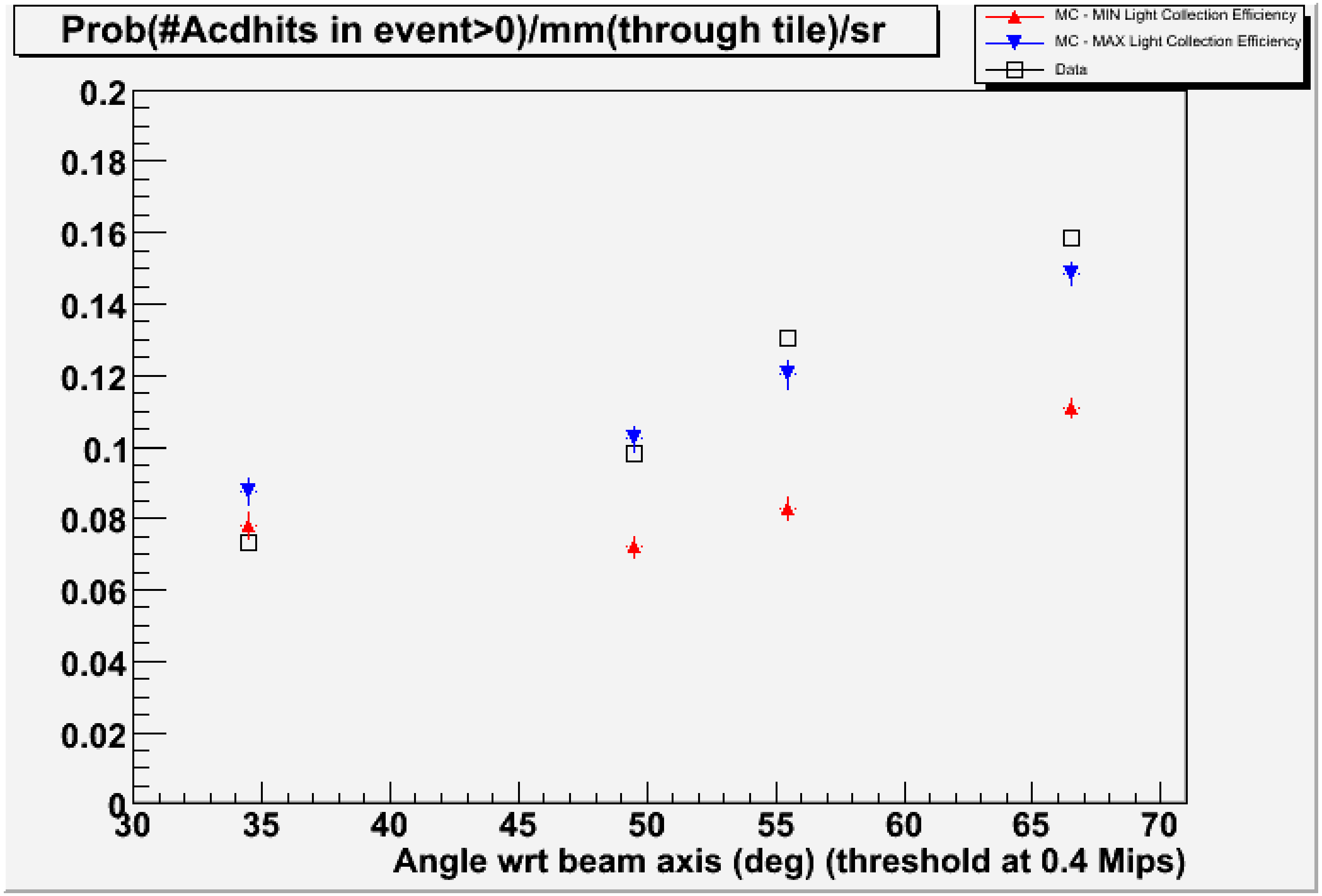
Extra Slides

- 20^{o} beam angle
- 0.4Mips threshold



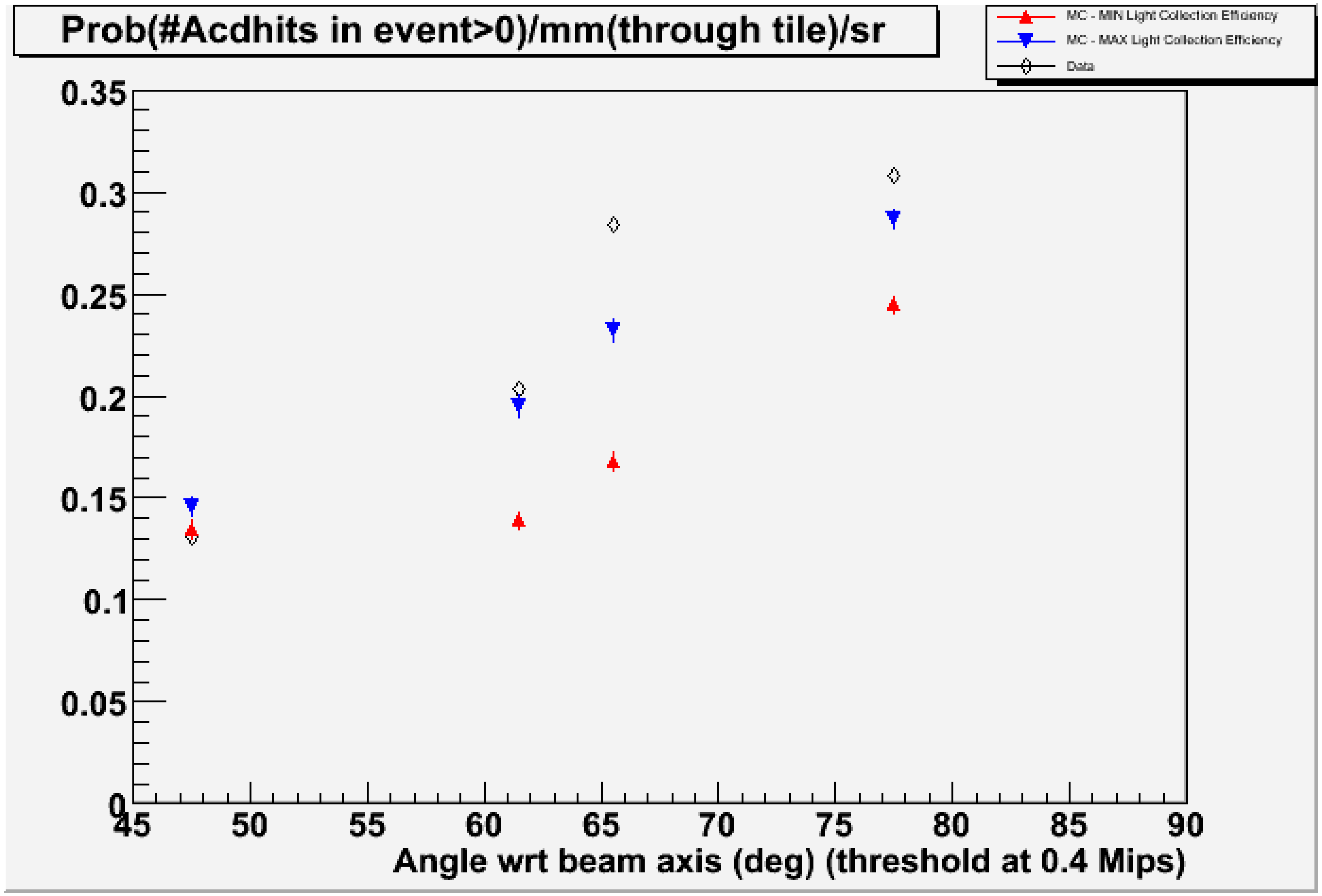
Extra Slides

- 30^o beam angle
- 0.4Mips threshold



Extra Slides

- 45° beam angle
- 0.4Mips threshold



Extra Slides

- 60° beam angle
- 0.4Mips threshold