Data Analysis Suggestions

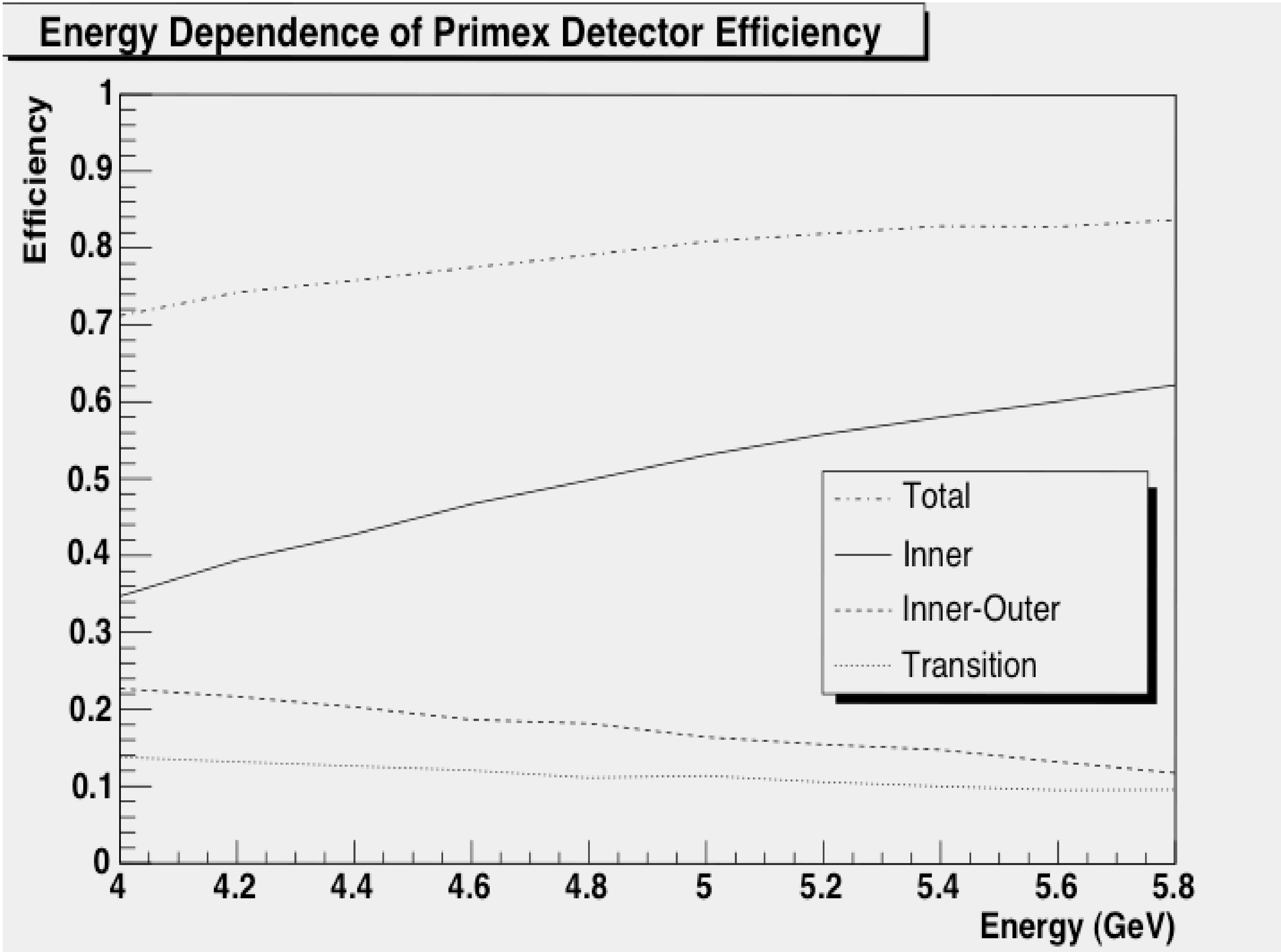
A.M. Bernstein

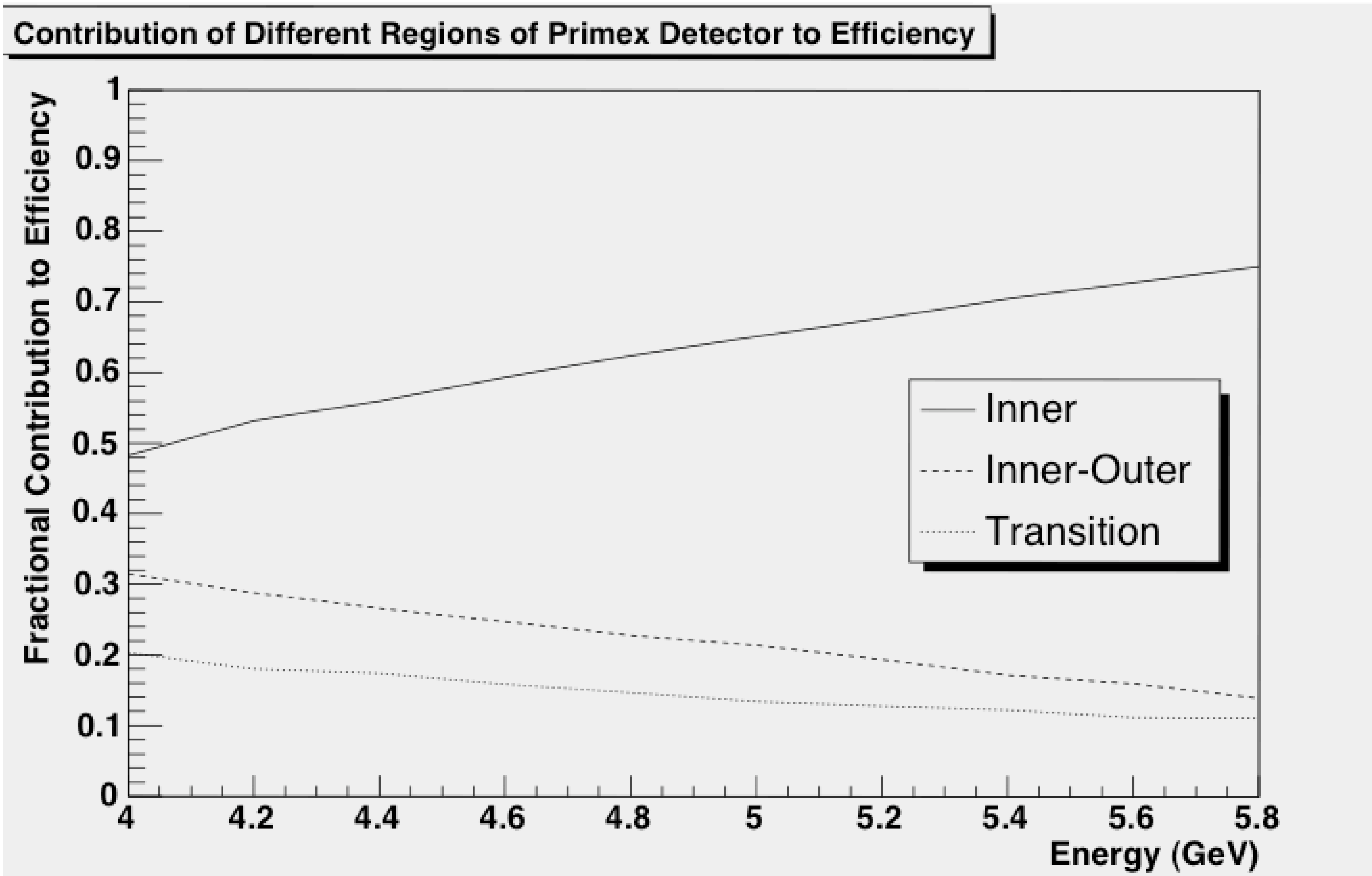
Collaboration Meeting July30, 2005

- **Goal-speed up analysis**
- Cycle through analysis to see where the limitations,errors, are
- Fix major algorithms- position, energy reconstruction, timing
- Apply present analysis of flux
- Use veto counter(see if background is reduced)
- Use snake calibrations to determine gains
- Use LMS variations as option
- Drop transition region
- Use low count rate data to understand backgrounds
- Develop Monte Carlo codes
- Perform simple estimates or educated guesses for error budget
- Use both integral and differential π^0 cross sections

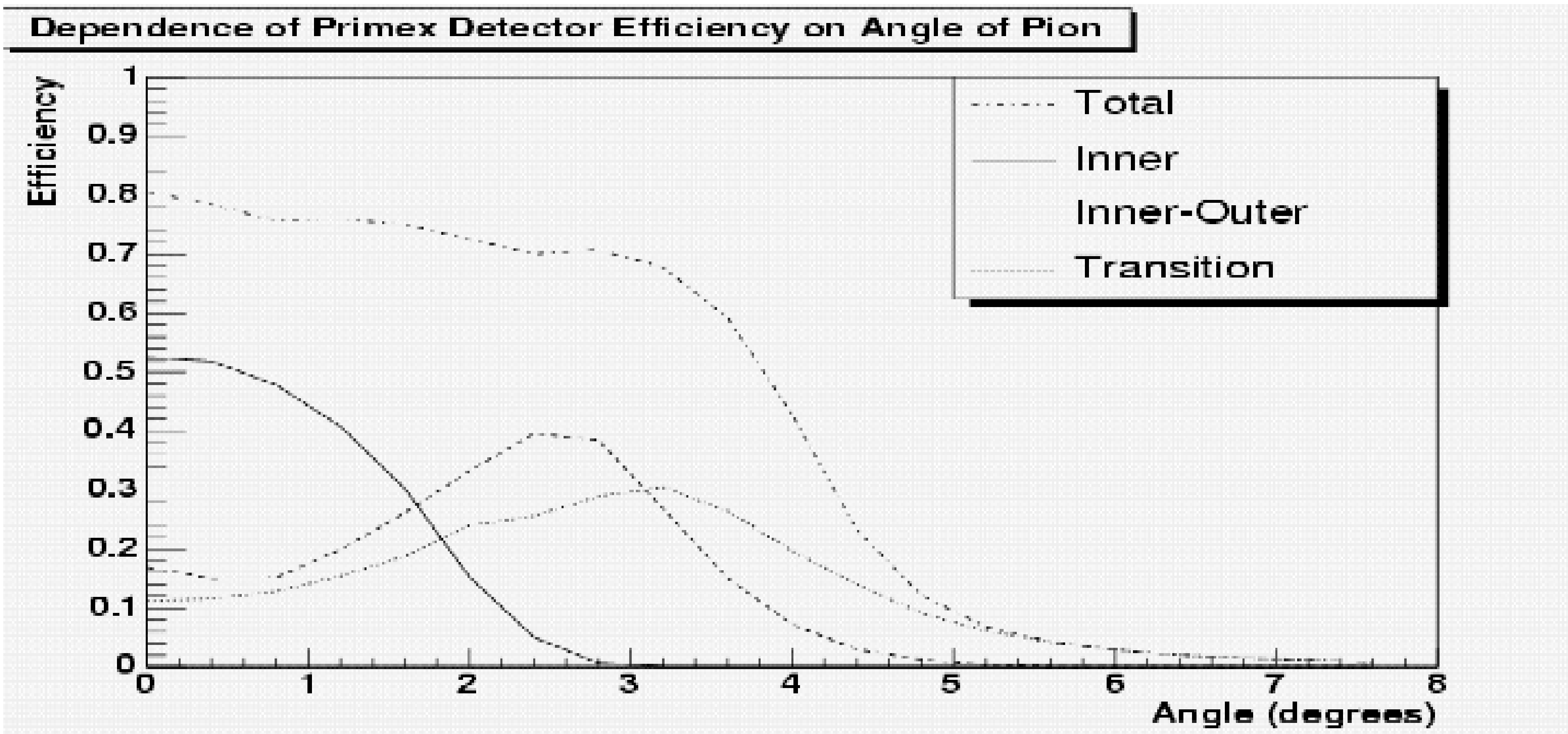
Monte Carlo

- Geant: pisim- can calculate backgrounds, detector shower development and effeciencies,….
- Geometrical: Use C++ codes to rapidly generate large numbers of events, treat apparatus as black box with energy and position resolutions as input
- We can use either the first or both. The major thing is to get going on this quickly.

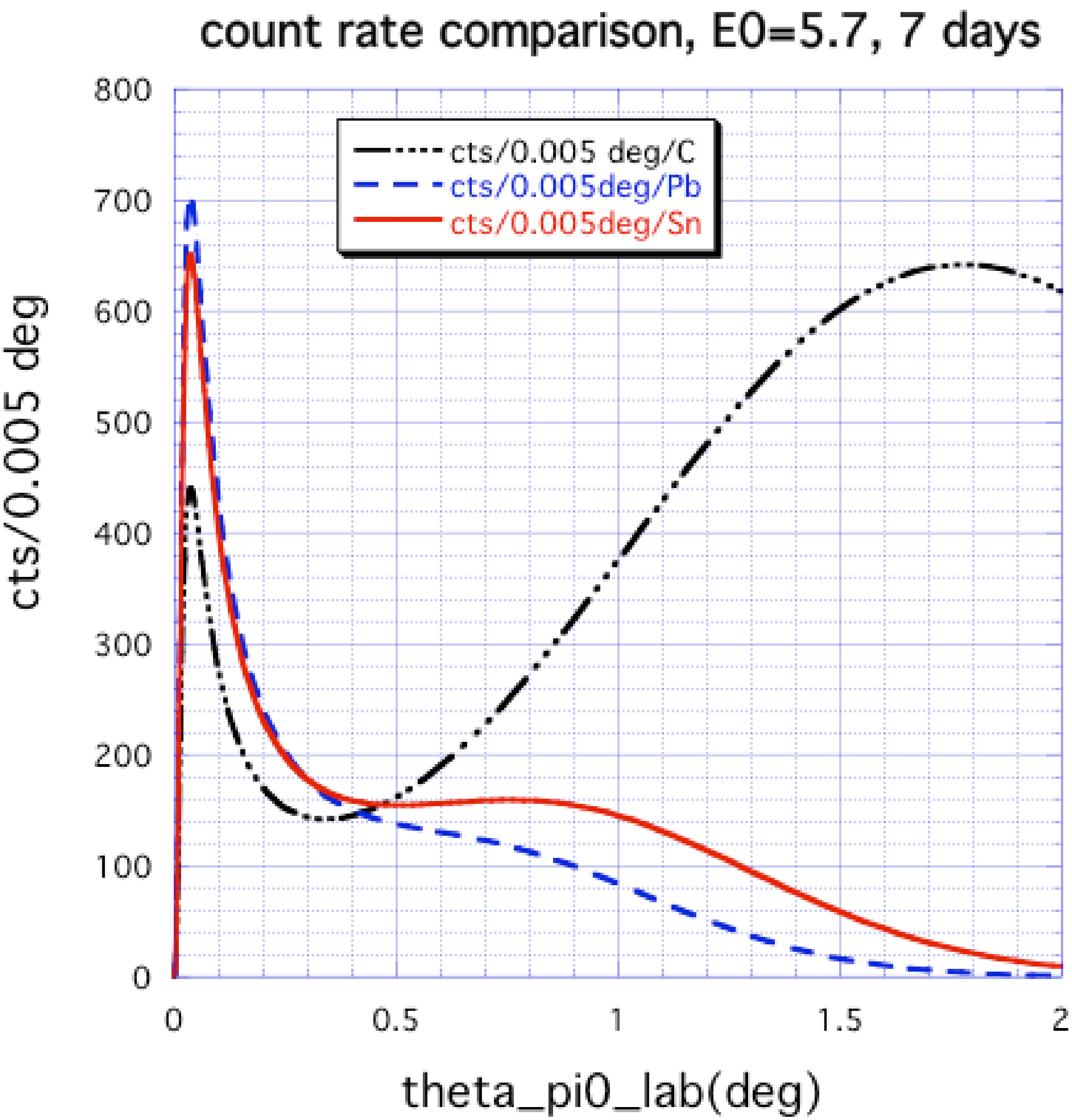

Energy Dependence of Primex Detector Efficiency
Efficiency
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5.6
5.8
Energy (GeV)
Total
Inner
Inner-Outer
Transition



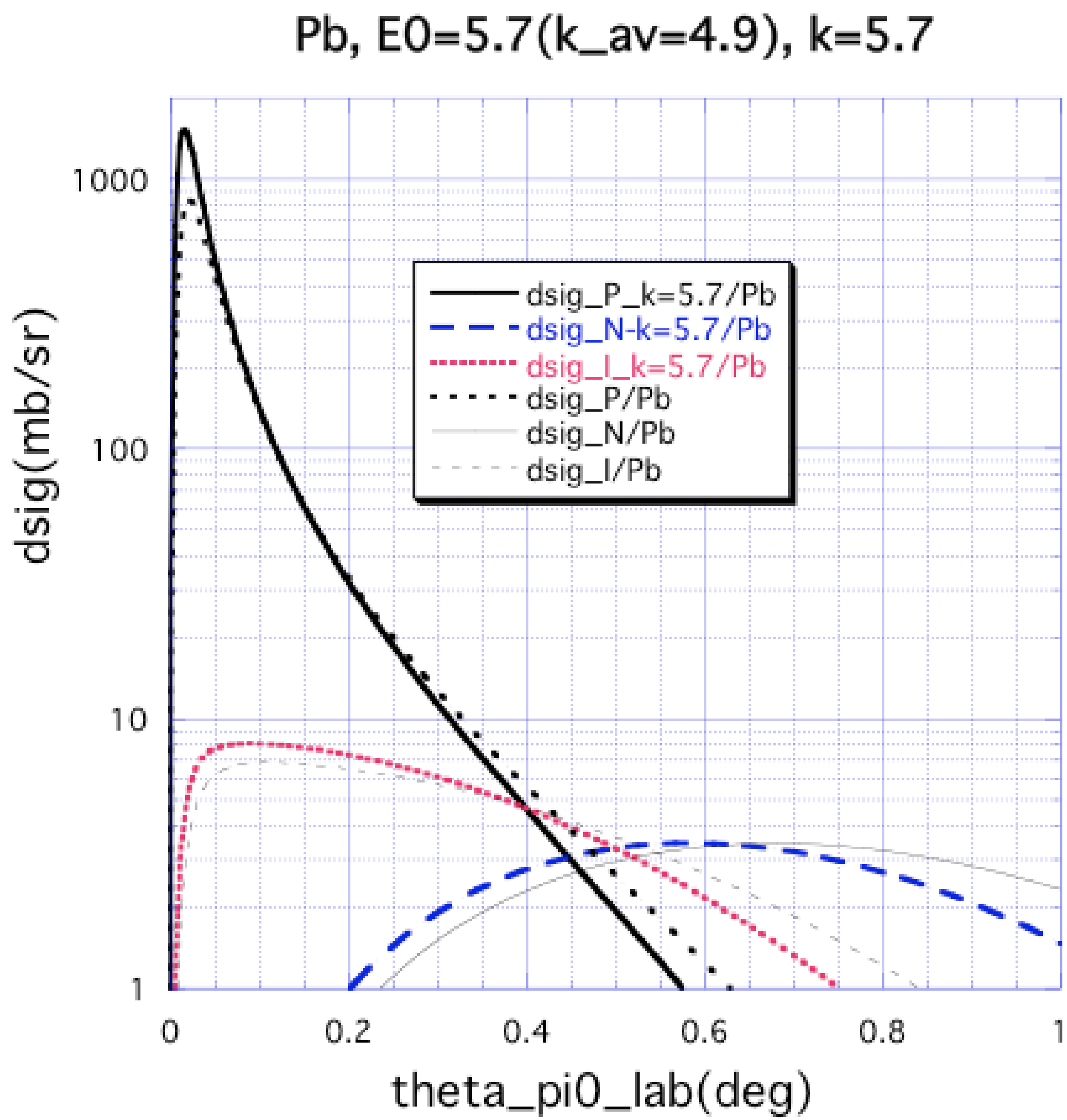
Contribution of Different Regions of Primex Detector to Efficiency
Fractional Contribution to Efficiency
Energy (GeV)
Inner
Inner-Outer
Transition
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5.6
5.8



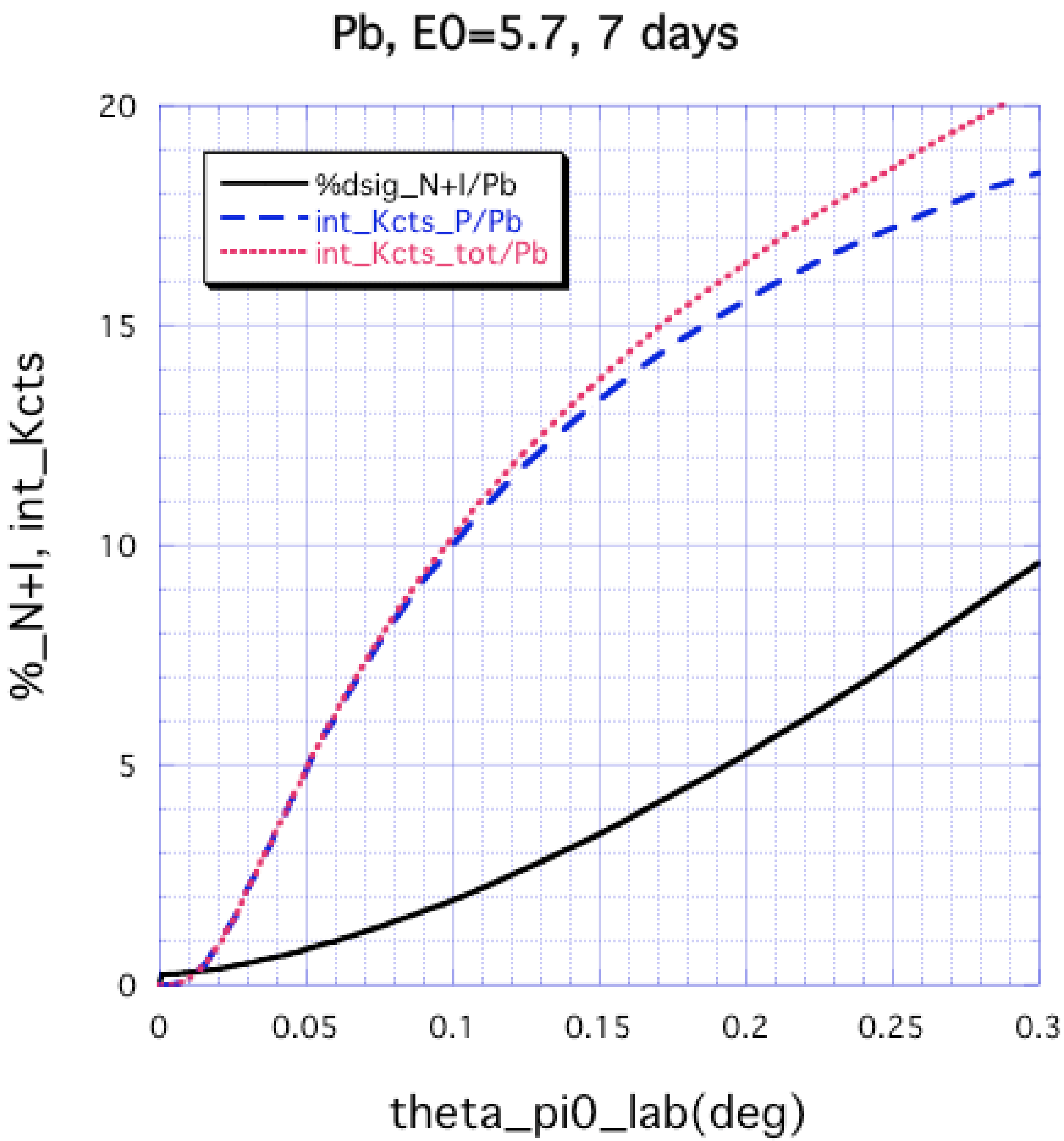
Dependence of Primex Detector Efficiency on Angle of Pion
Efficiency
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Total
Inner
Inner-Outer
Transition
0
1
2
3
4
5
6
7
8
Angle (degrees)



count rate comparison, E0=5.7, 7 days
cts/0.005 deg/C
cts/0.005deg/Pb
cts/0.005deg/Sn
cts/0.005 deg
theta_pi0_lab(deg)
0
100
200
300
400
500
600
700
800
0
0.5
1
1.5
2



Pb, E0=5.7(k_av=4.9), k=5.7
dsig(mb/sr)
theta_pi0_lab(deg)
1000
100
10
1
0
0.2
0.4
0.6
0.8
1
dsig_P_k=5.7/Pb
dsig_N-k=5.7/Pb
dsig_I_k=5.7/Pb
dsig_P/Pb
dsig_N/Pb
dsig_I/Pb



Pb, E0=5.7, 7 days
%dsig_N+I/Pb
int_Kcts_P/Pb
int_Kcts_tot/Pb
%_N+I, int_Kcts
theta_pi0_lab(deg)
0
5
10
15
20
0
0.05
0.1
0.15
0.2
0.25
0.3

Primakoff Angular Integration Range

$$\sigma(\theta) = \sigma_P(\theta) + \sigma_N(\theta) + \sigma_I(\theta)$$

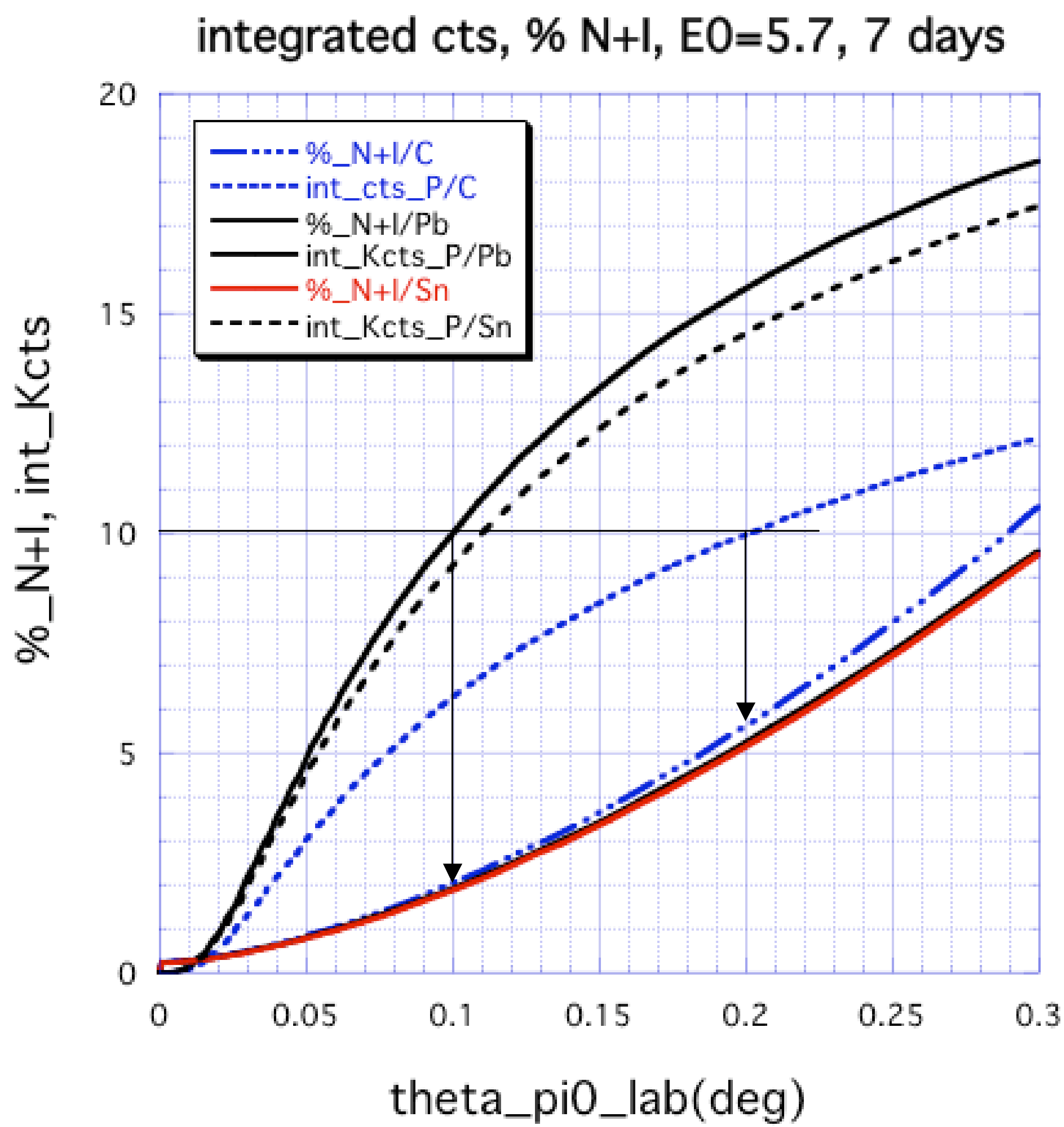
$$\sigma_{int}(\theta_c) = \int_0^{\theta_c} d\Omega \sigma(\theta)$$

$$f_{N+I}(\theta_c) \equiv \frac{\sigma_{I,int}(\theta_c) + \sigma_{N,int}(\theta_c)}{\sigma_{int}(\theta_c)}$$

We need to pick θ_c such that $f_{N+I}(\theta_c)$ is sufficiently large to get good statistics, but small enough to accurately correct for this background.This can be achieved with:

$$2\% \leq f_{N+I}(\theta_c) \leq 5\%$$

Then a 10% error in $f_{N+I}(\theta_c)$ will cause a systematic error in the Primakoff cross section between 0.2% and 0.5%.


integrated cts, % N+I, E0=5.7, 7 days
%_N+I/C
int_cts_P/C
%_N+I/Pb
int_Kcts_P/Pb
%_N+I/Sn
int_Kcts_P/Sn
%_N+I, int_Kcts
theta_pi0_lab(deg)
0
5
10
15
20
0.05
0.1
0.15
0.2
0.25
0.3

•Conclusions

•Cycle through analysis to see where the limitations,errors, are
•Fix major algorithms- position, energy reconstruction, timing
•Apply present analysis of flux
•Use veto counter(see if background is reduced)
•Use snake calibrations to determine gains
•Use LMS variations as option
•Drop transition region
•Use low count rate data to understand backgrounds
•Develop Monte Carlo codes
•Perform simple estimates or educated guesses for error budget
•Use both integral and differential π^0 cross sections

Integration Regions

	counts	Θ_c (deg)	f_{N+I}(%)
Pb	10K	0.10	2.0
Pb	15K	0.19	5.0
C	10K	0.20	5.5