Upstream Polarimeter Scaled Field Scenarios

Jan. 8, 2008

Oleg Eyser
DESY

Deepa Angal-Kalinin (Dec. 1, 2007):

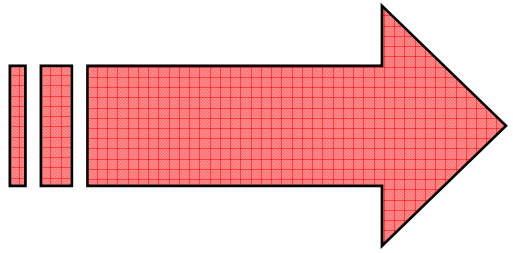
Consider a version of design with scaled field and three fixed dispersion ranges, with a fixed dispersion depending on the range.

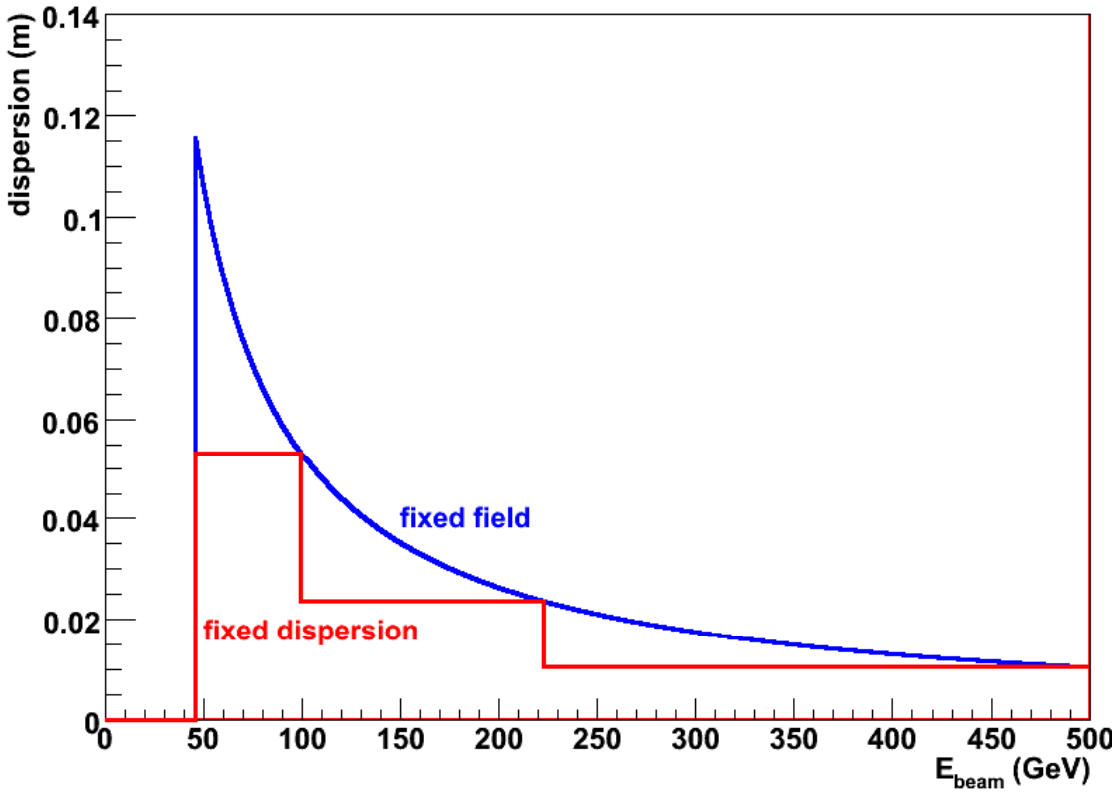
Let's say

20 mm in the baseline par. range of 100-250 GeV / beam

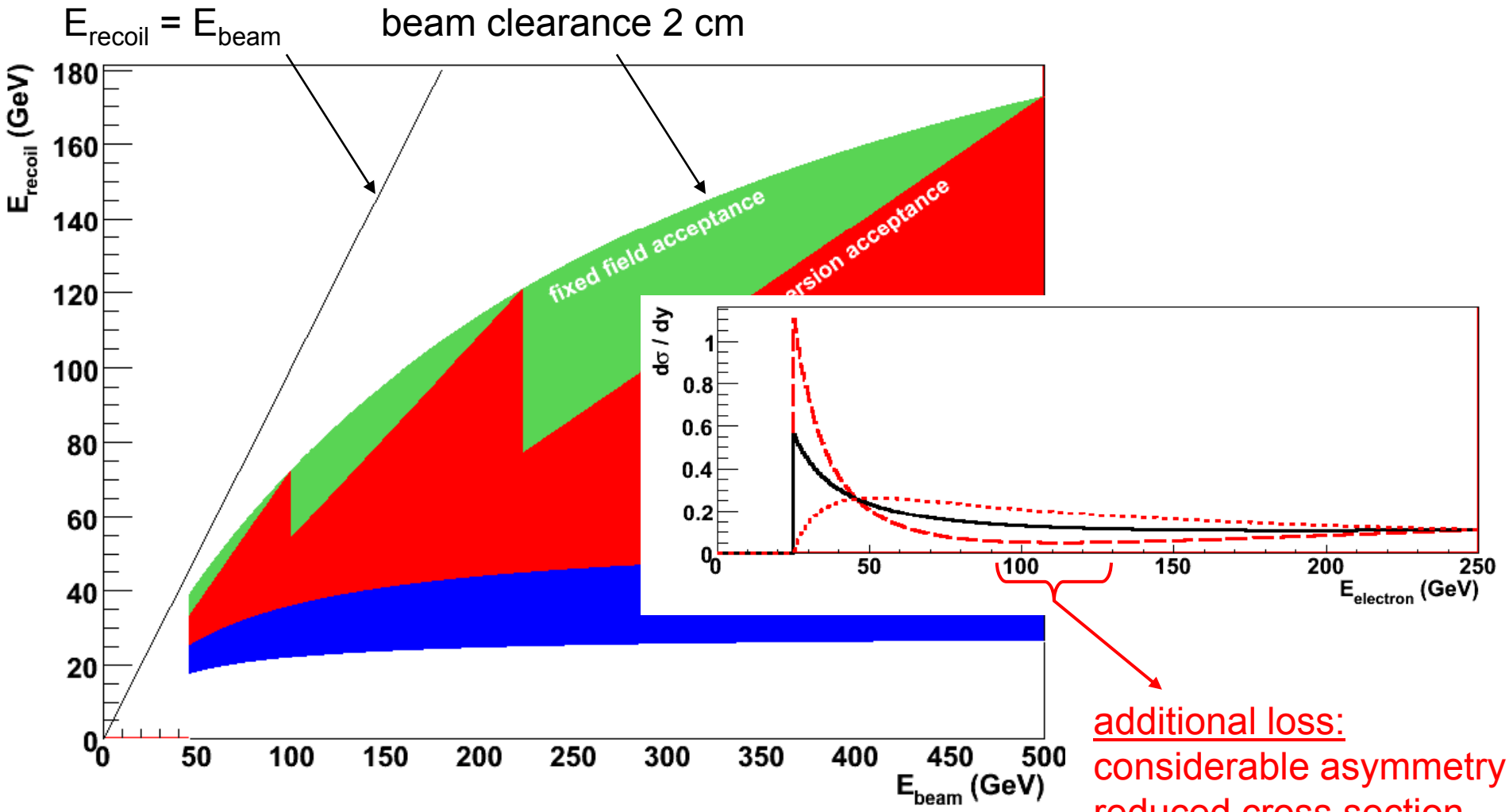
15 mm in 250 – 500 GeV / beam

50 mm in 45 – 100 GeV / beam



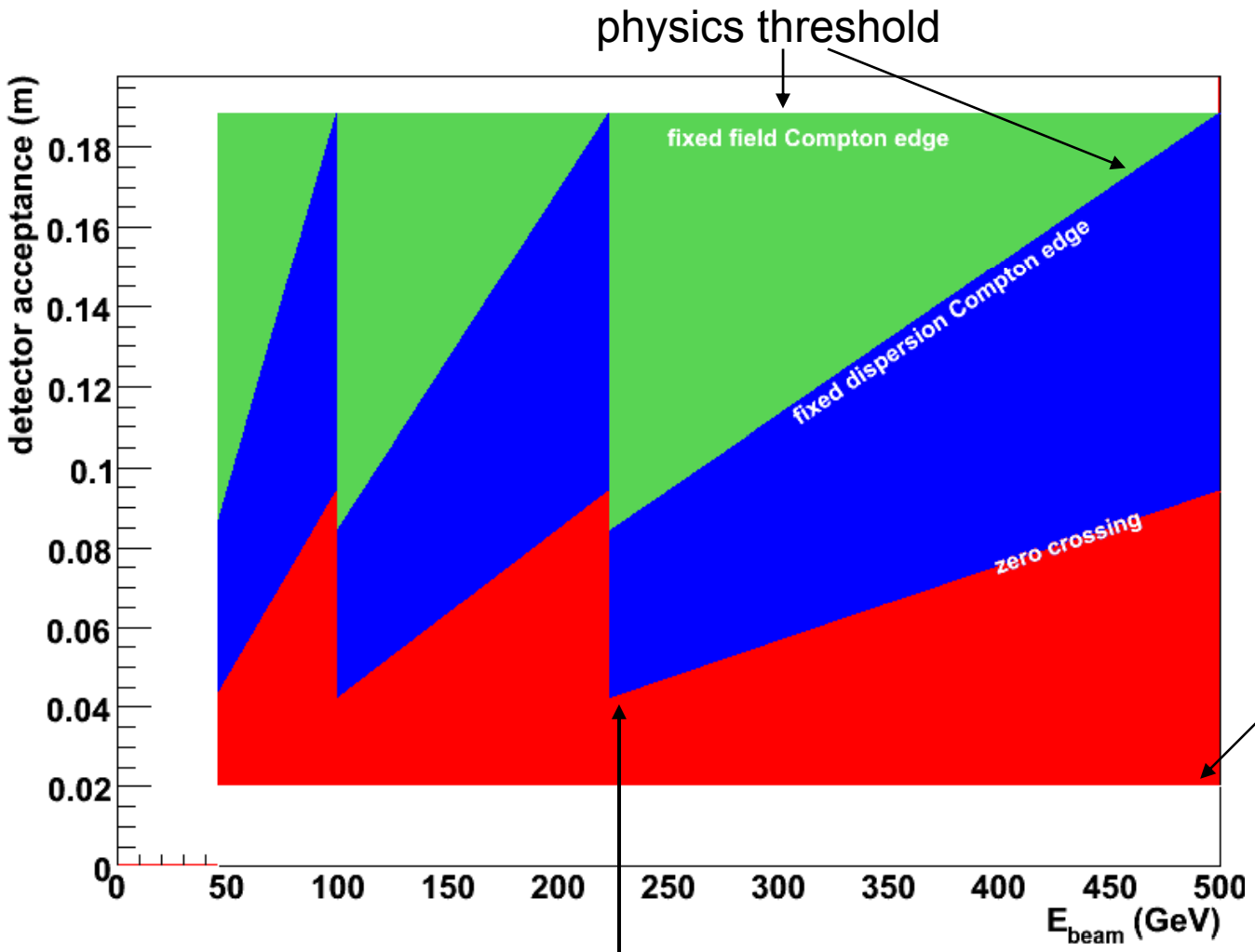


Energy Acceptance



additional loss:
considerable asymmetry
reduced cross section

Detector Acceptance

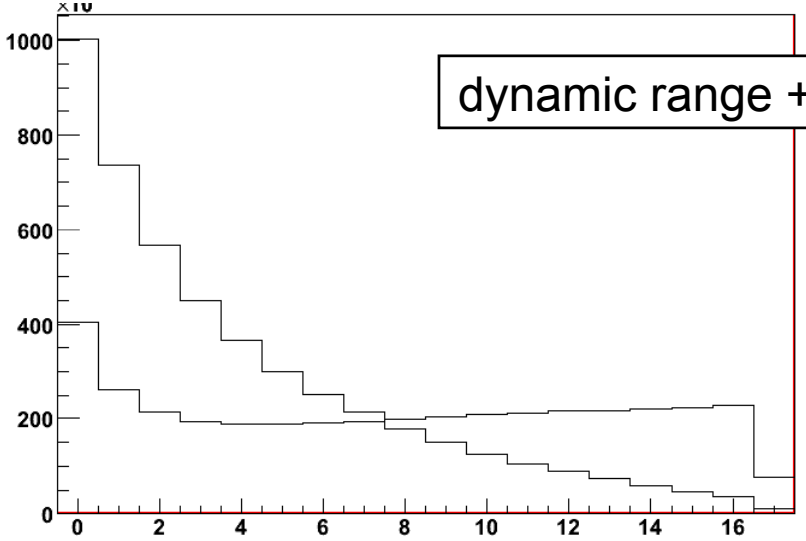


beam clearance 2 cm

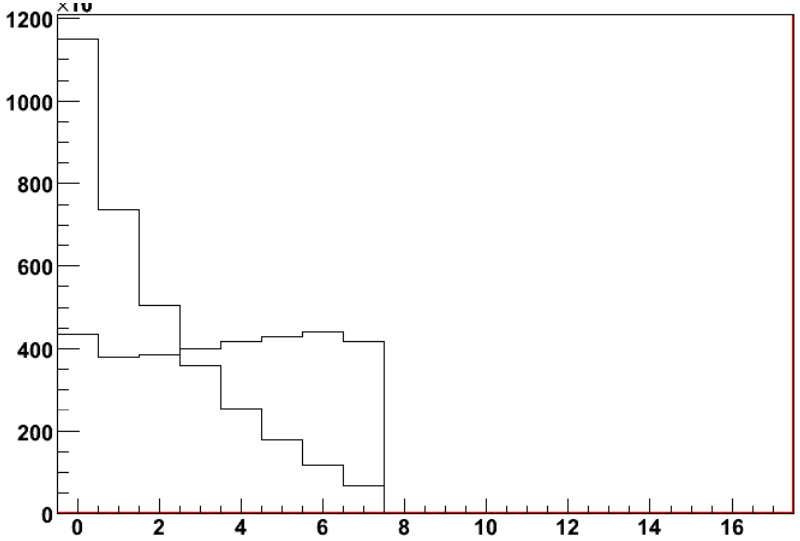
negative asymmetry covers more than 2 channels

Signal Compression

@ 250 GeV with a 11 mm dispersion (approx. 50% dipole strength)

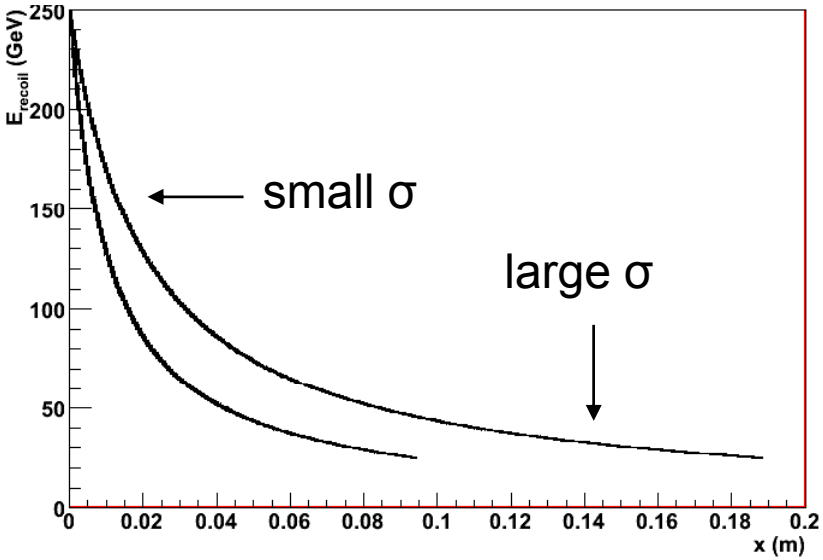


dynamic range +15%

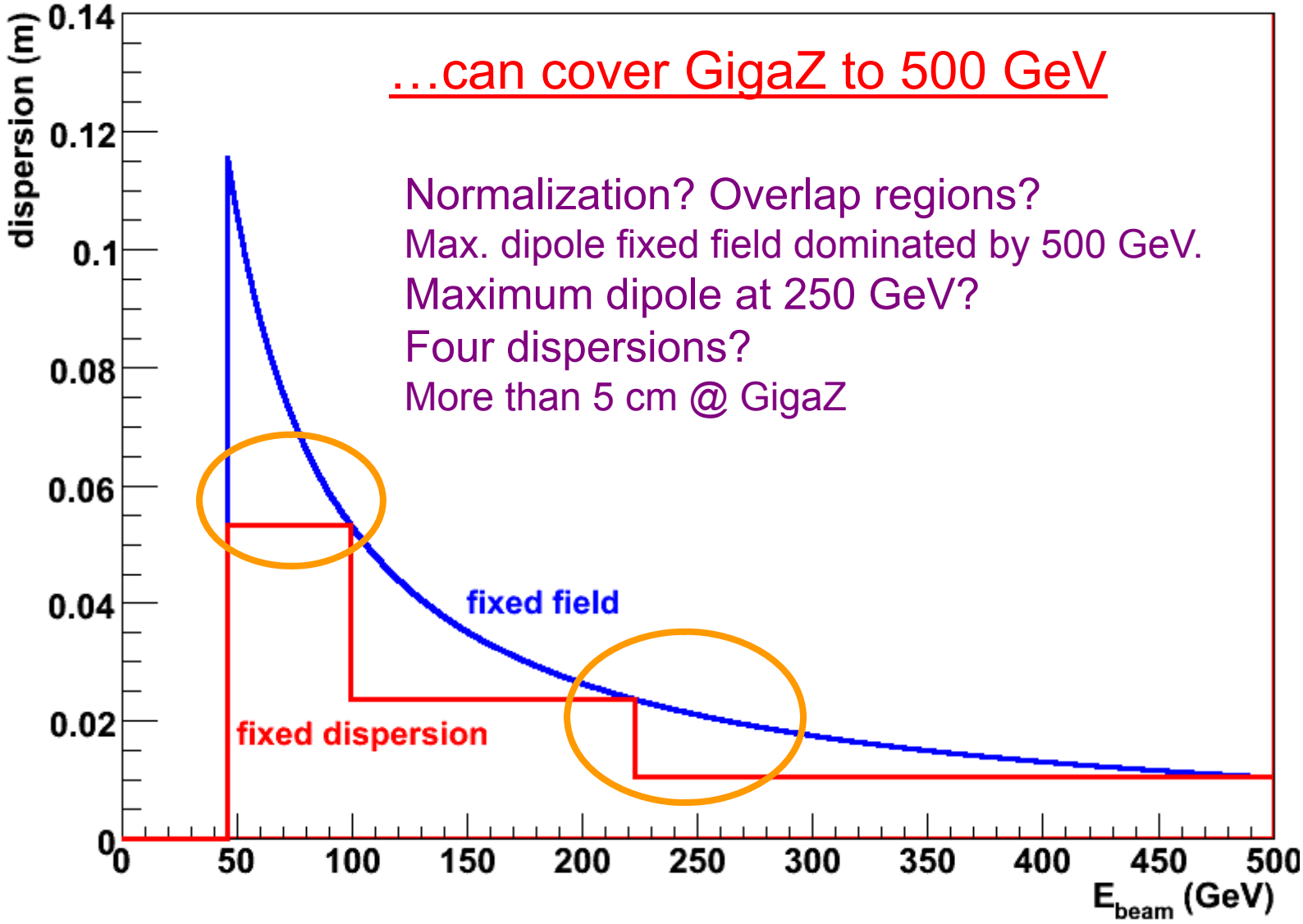


ch #

beam clearance 20 mm
1 cm wide channels

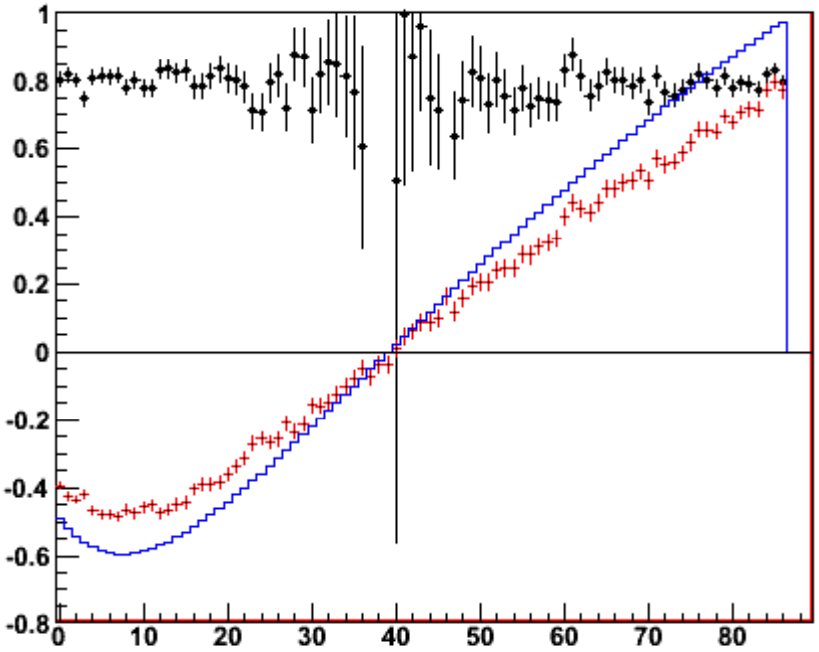


three fixed dispersions…

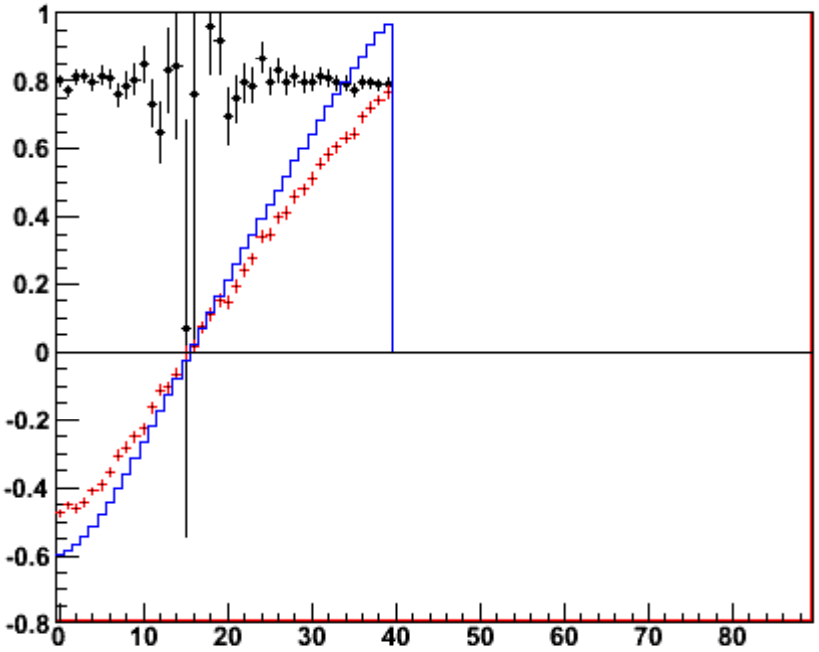


Normalization

fixed field



fixed dispersion



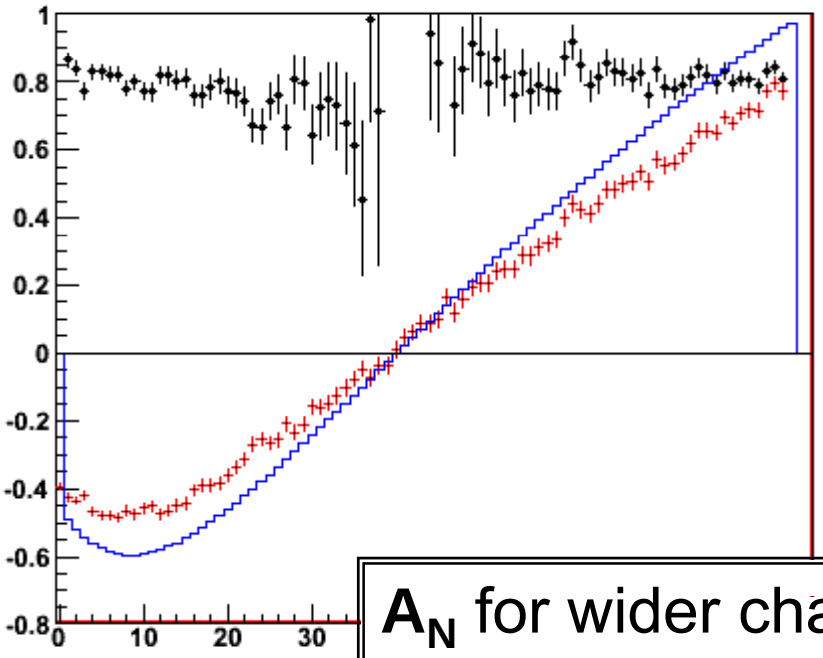
90 channel detector

so far: assumes perfect knowledge of Compton edge → $\mathbf{A_N}$

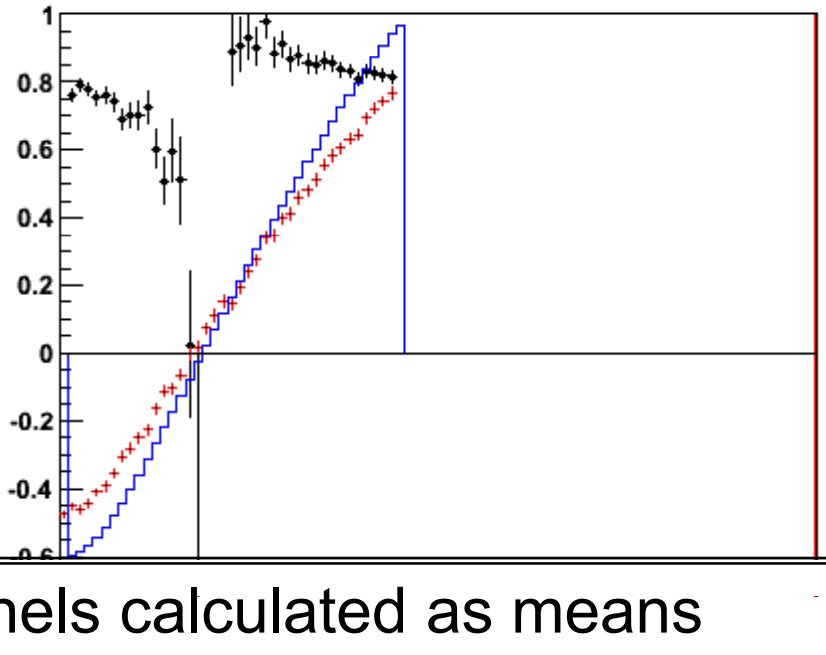
P=(79.79±0.36)% P=(79.58±0.41)%

A_N misalignment

fixed field



fixed dispersion

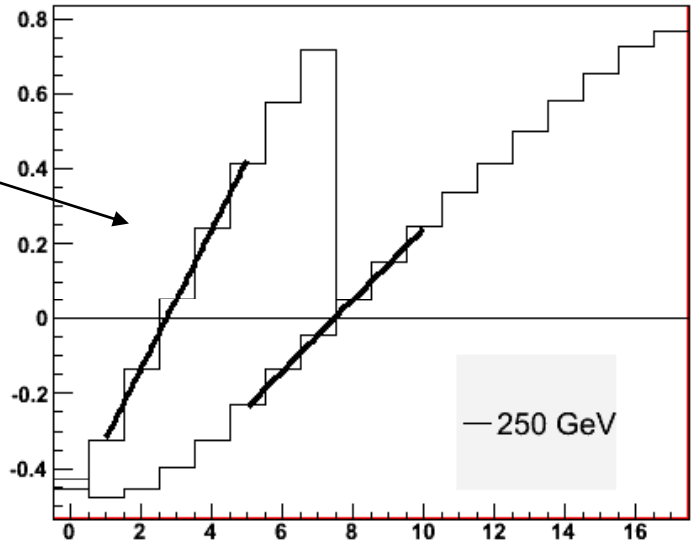


A_N for wider channels calculated as means effect on polarization should be of the same size

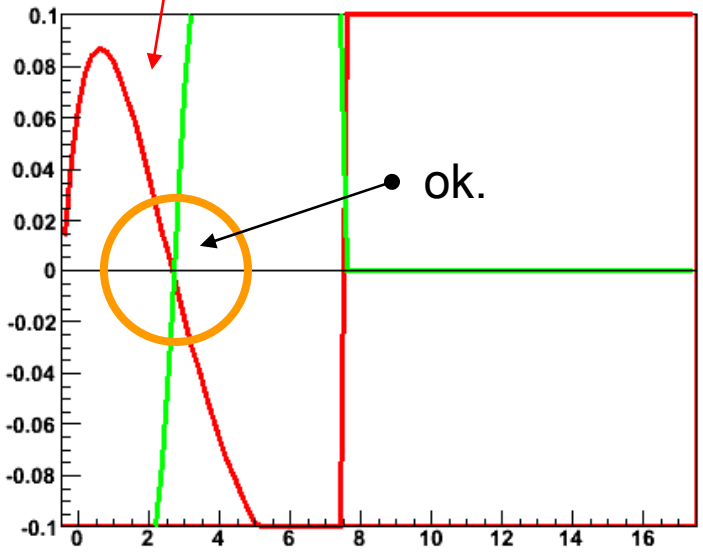
detector		
-1 mm	P=(78.83±0.36)%	P=(78.42±0.42)%
exact	P=(79.79±0.36)%	P=(79.58±0.41)%
+1 mm	P=(80.69±0.37)%	P=(80.56±0.44)%

A_N alignment from data

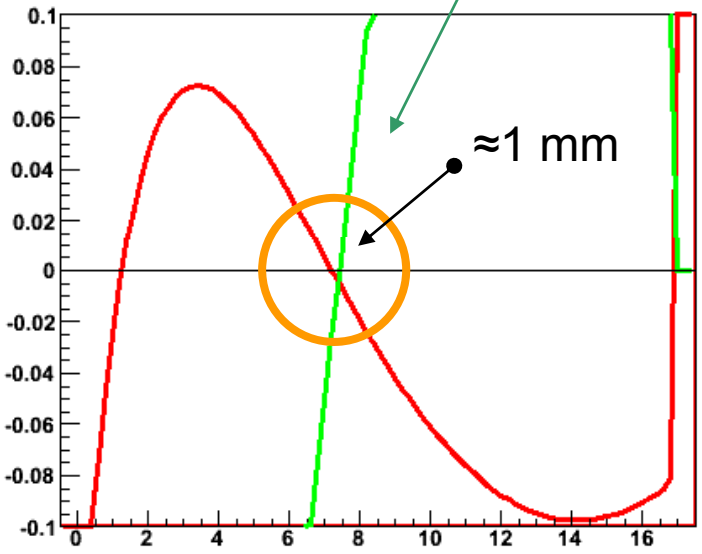
asymmetry
fit pol0



sutract real A_N
from fit ($A_N \cdot P$)



compare real A_N



Conclusions

Three fixed dispersions might be ok.

signal compression > signal loss outside acceptance

≈ worst case at 250 GeV

Four would be better.

Normalization? Overlap?

Max. dipole strength?

A_N alignment needs further careful studies.

Extraction from data