Spoiled B-Field MC study

April 6, 2009

David Lawrence - JLab

Spoiling as a function of Z

Nominal TOSCA generated field spoiled by:

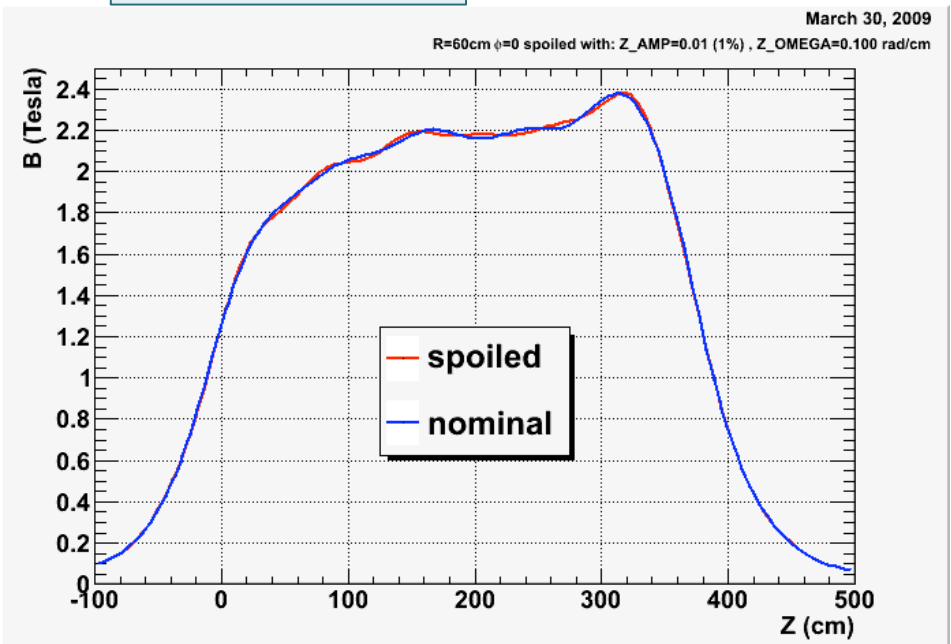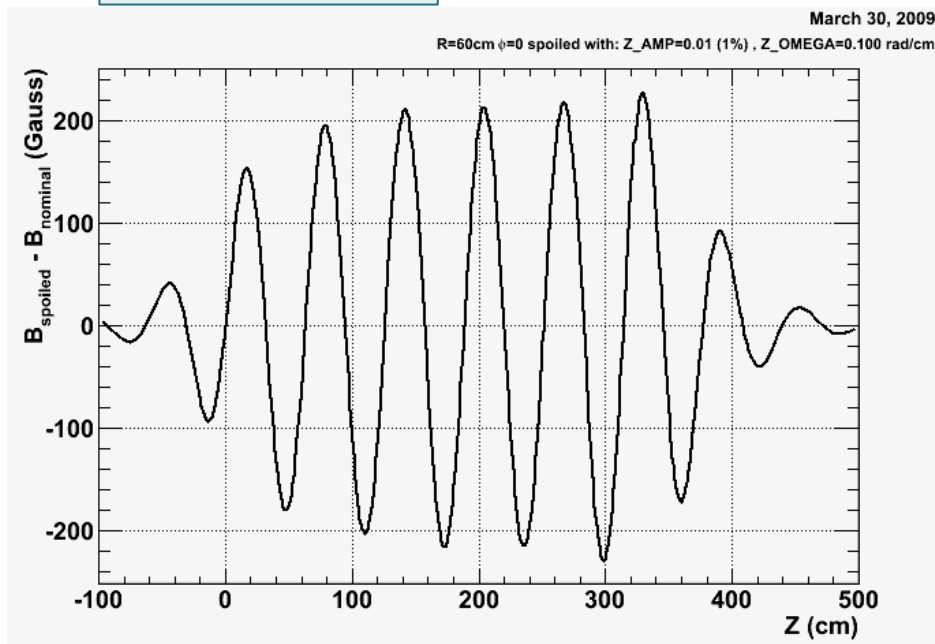$$B' = B*[1 + A \sin(\omega z)]$$

A = 0.01 (1%)
ω = 0.100 rad/cm

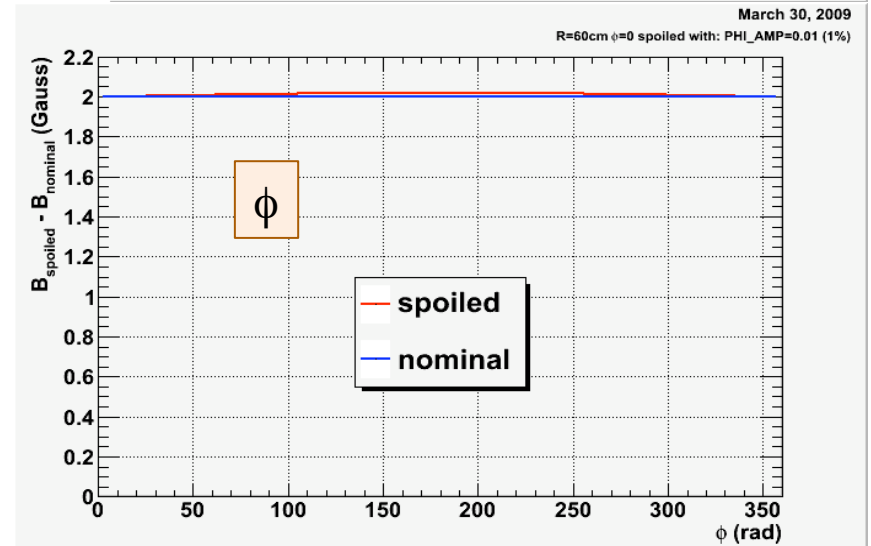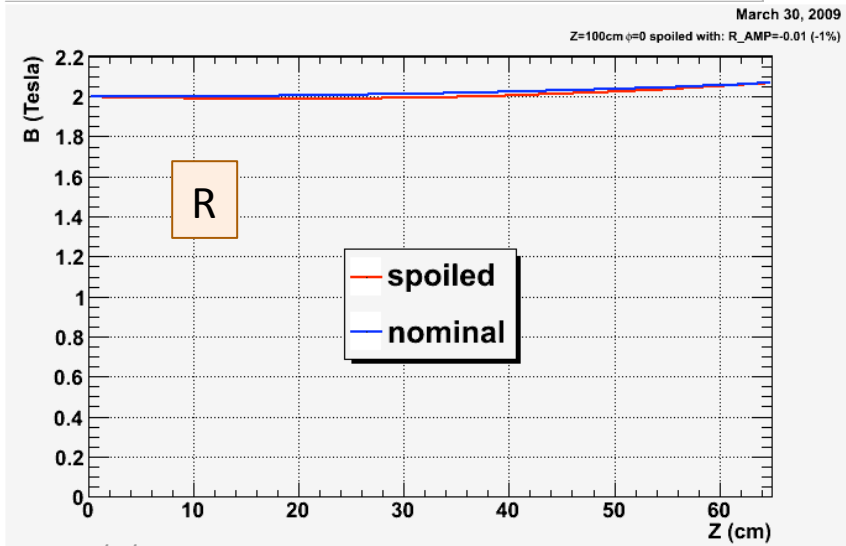(angle not changed, just magnitude of field)

Field difference

Field Magnitude

Spoiling as a function of R and φ
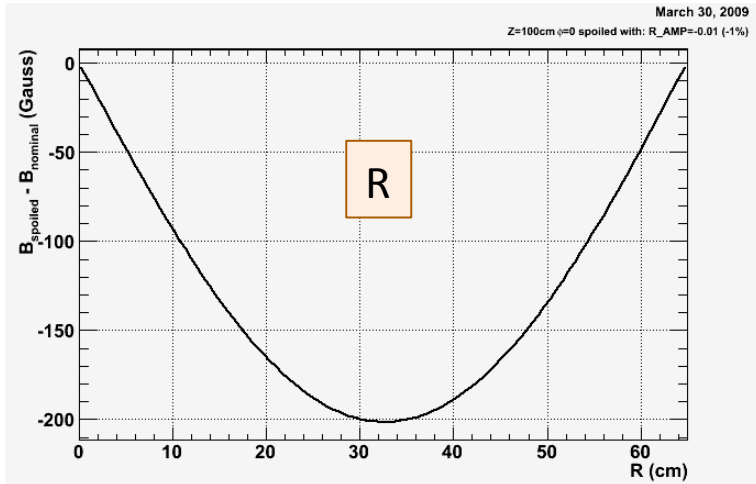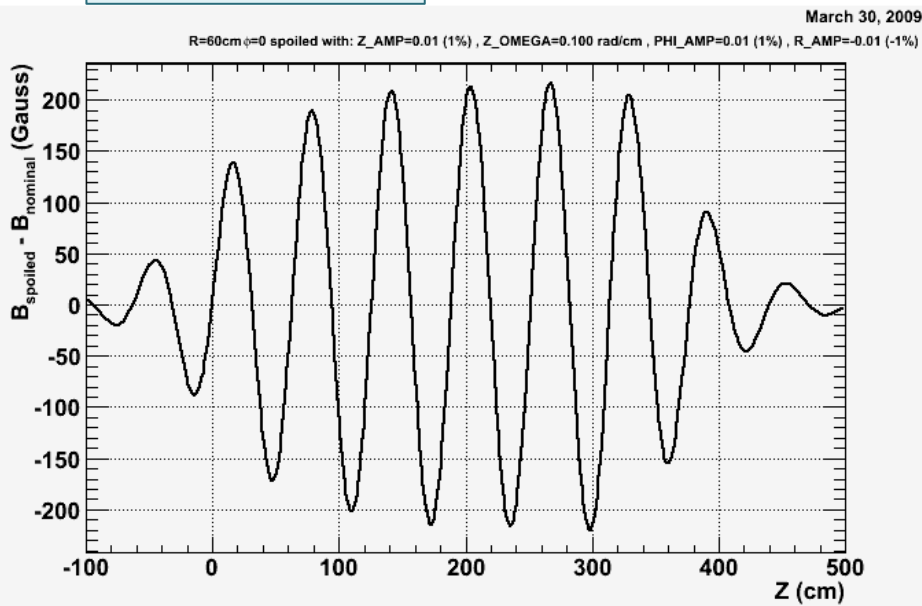
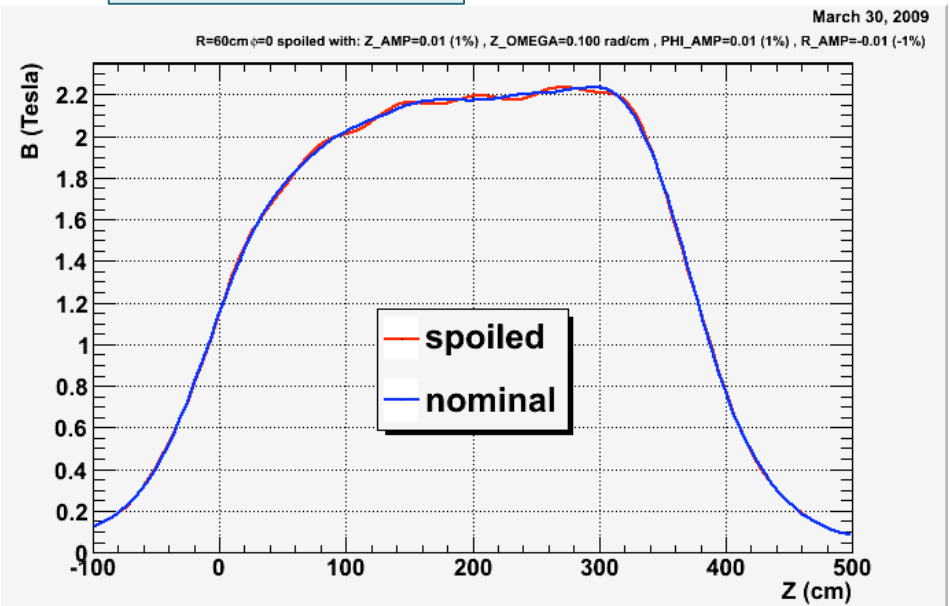$$B' = B*[1 + A \sin(\omega z)]$$

A = +/-0.01 (1%)
ω = 0.100 rad/cm
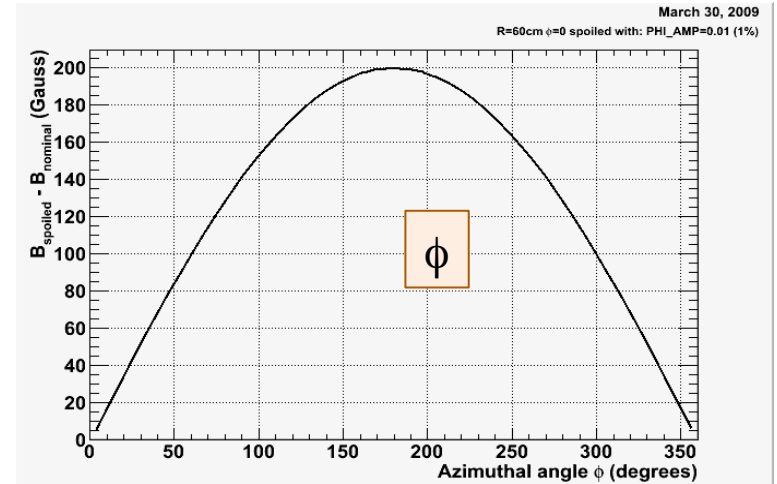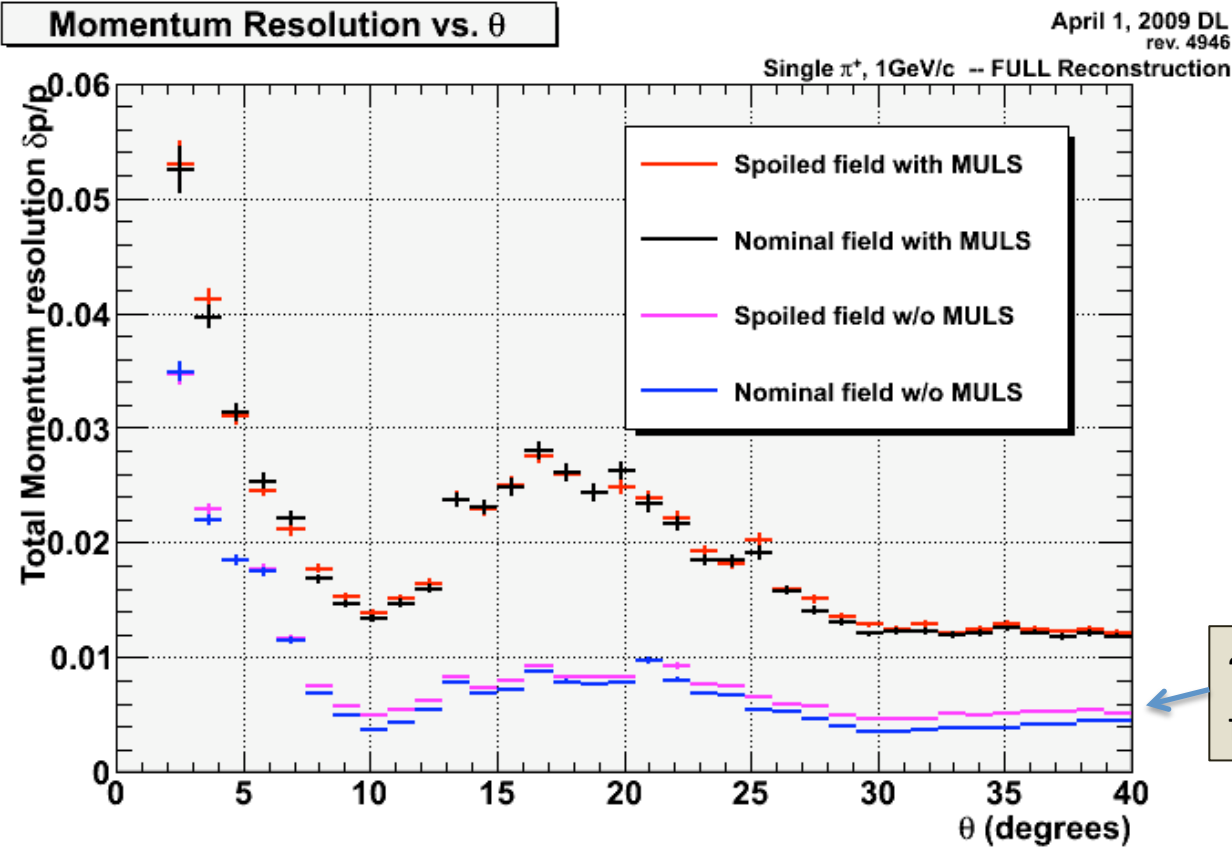
Spoiled in r, ϕ, and z simultaneously

Field difference

Field Magnitude

4/6/09

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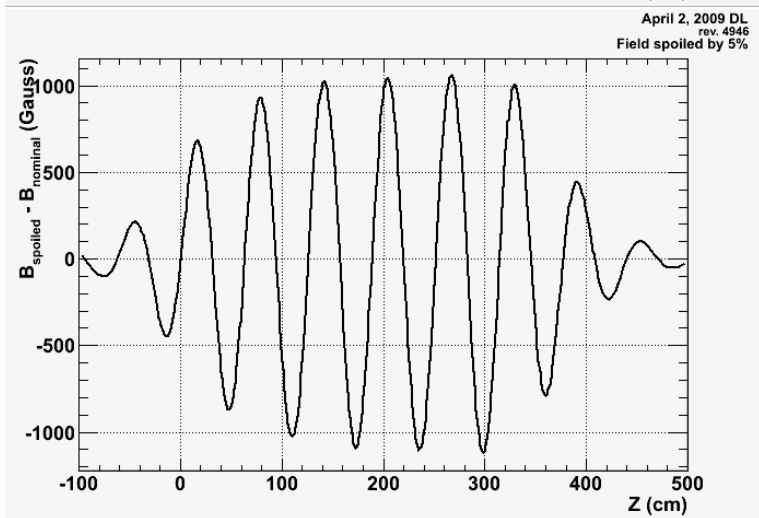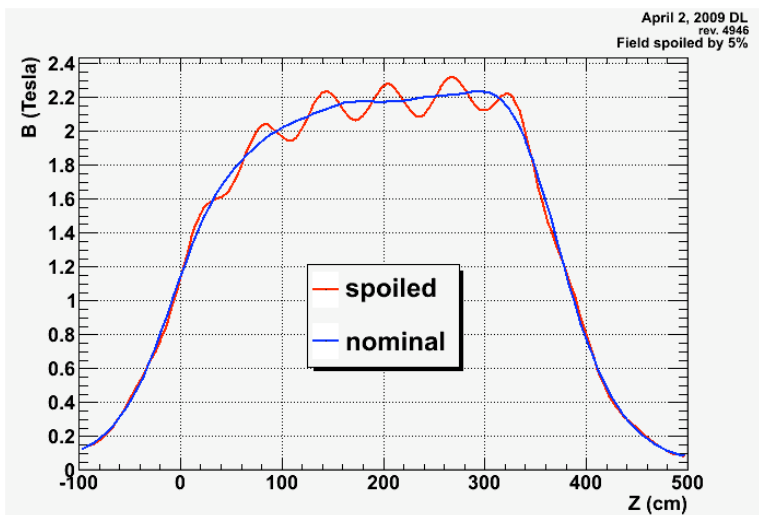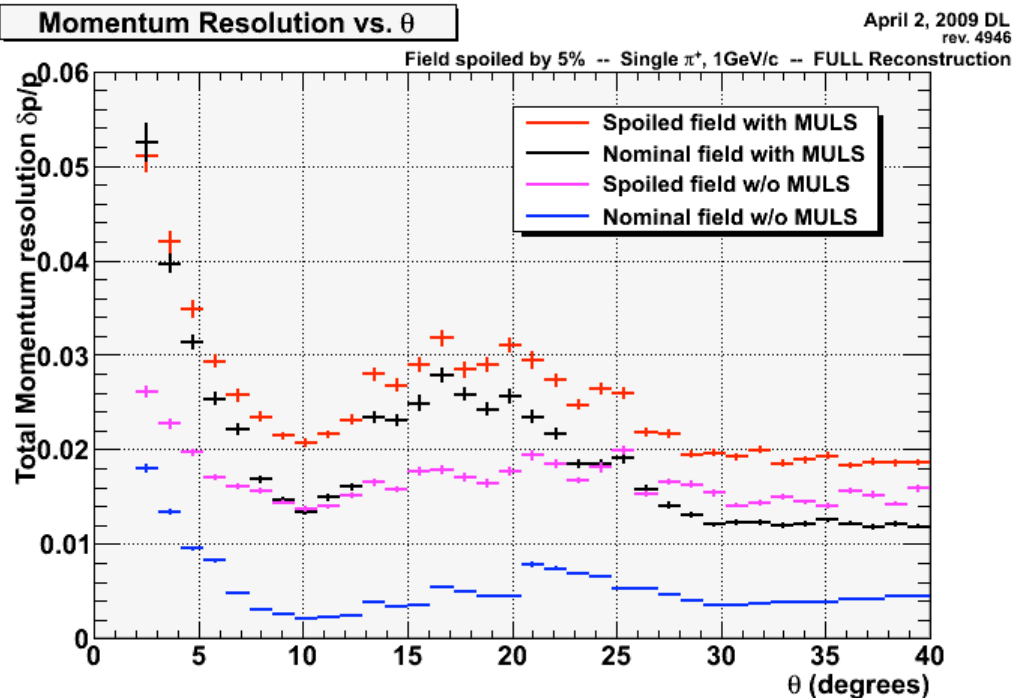# Momentum Resolution with and without Spoiling the Field

200 μm position resolution for FDC

150 μm position resolution for CDC

~0.2% change in resolution for 1% change in B-field

Momentum Resolution with a field Spoiled by 5% (magnitude only)
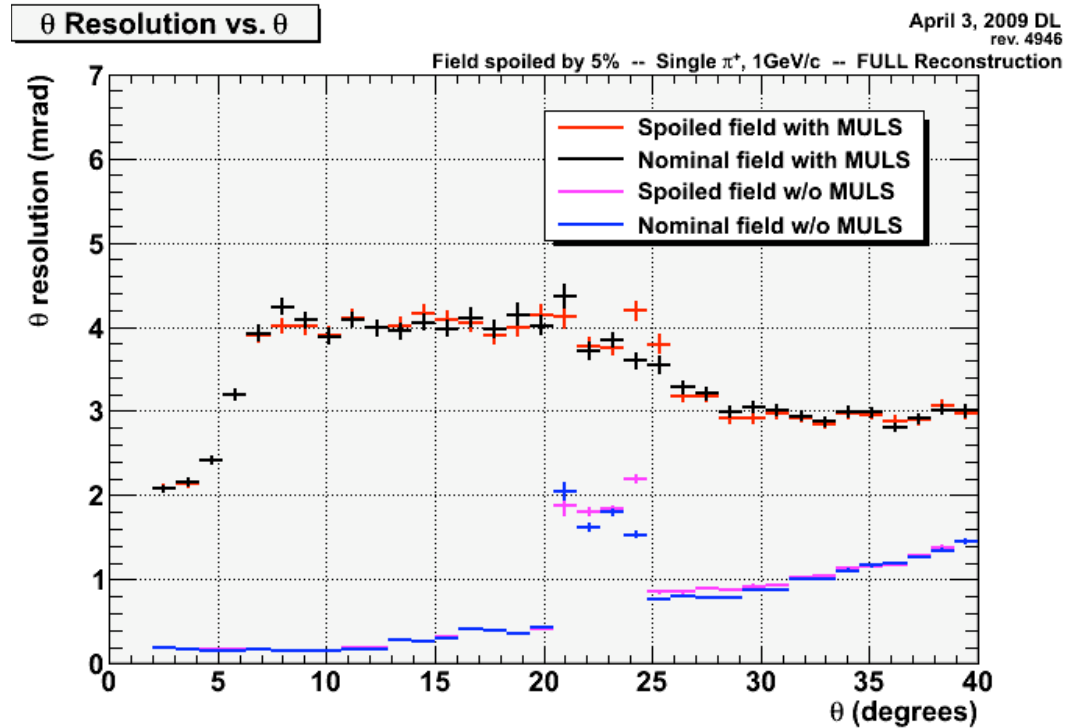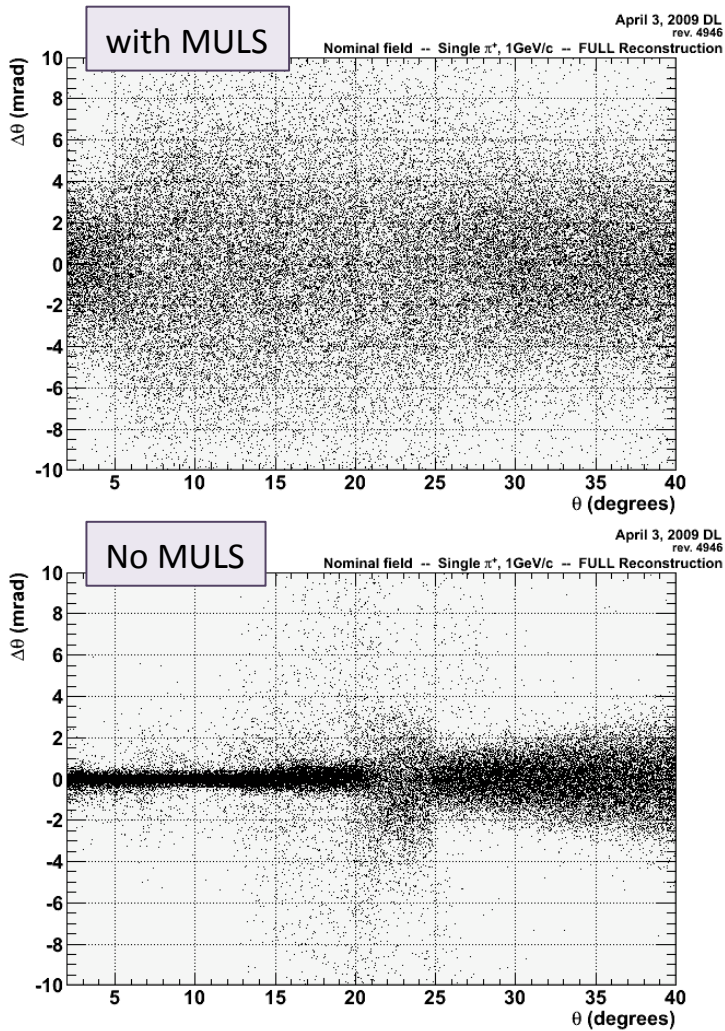
~1% change in resolution for 5% change in B-field

θ angular resolution

No change in resolution for
5% change in B-field

φ angular resolution

with MULS

April 3, 2009 DL
rev. 4946
Nominal field -- Single π⁺, 1GeV/c -- FULL Reconstruction

No MULS

April 3, 2009 DL
rev. 4946
Nominal field -- Single π⁺, 1GeV/c -- FULL Reconstruction

φ Resolution vs. θ

April 3, 2009 DL
rev. 4946
Field spoiled by 5% -- Single π⁺, 1GeV/c -- FULL Reconstruction

Spoiled field with MULS
Nominal field with MULS
Spoiled field w/o MULS
Nominal field w/o MULS
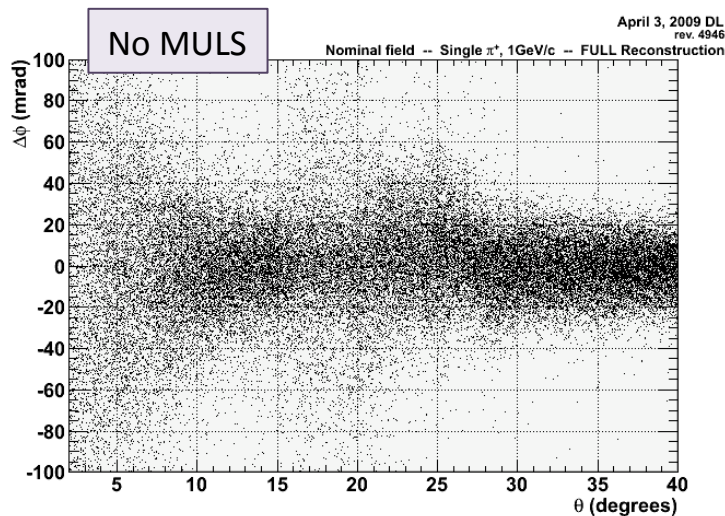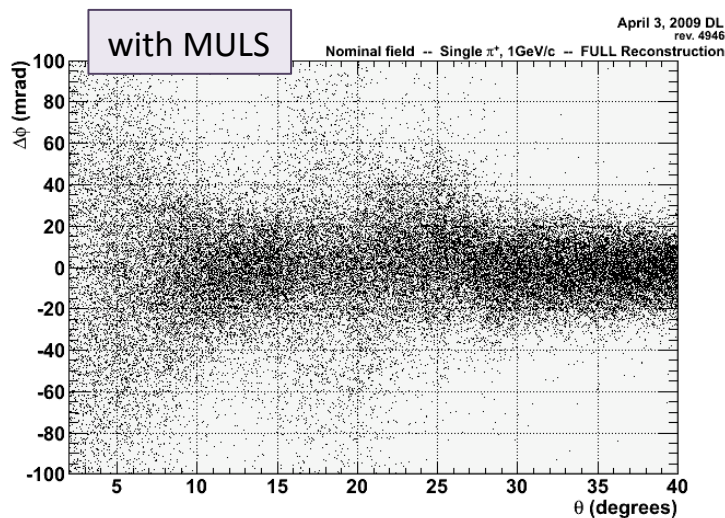
No change in resolution for 5% change in B-field

Momentum Resolution for CDC
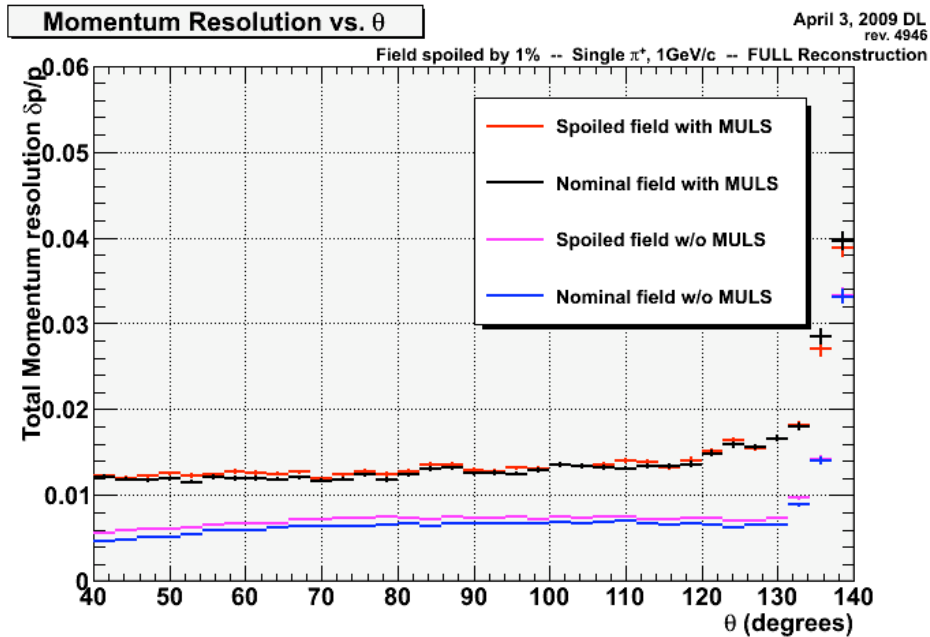
No change in resolution for 1% change in B-field

~1% change in resolution for 5% change in B-field

Tracking Efficiency for field spoiled by 5%
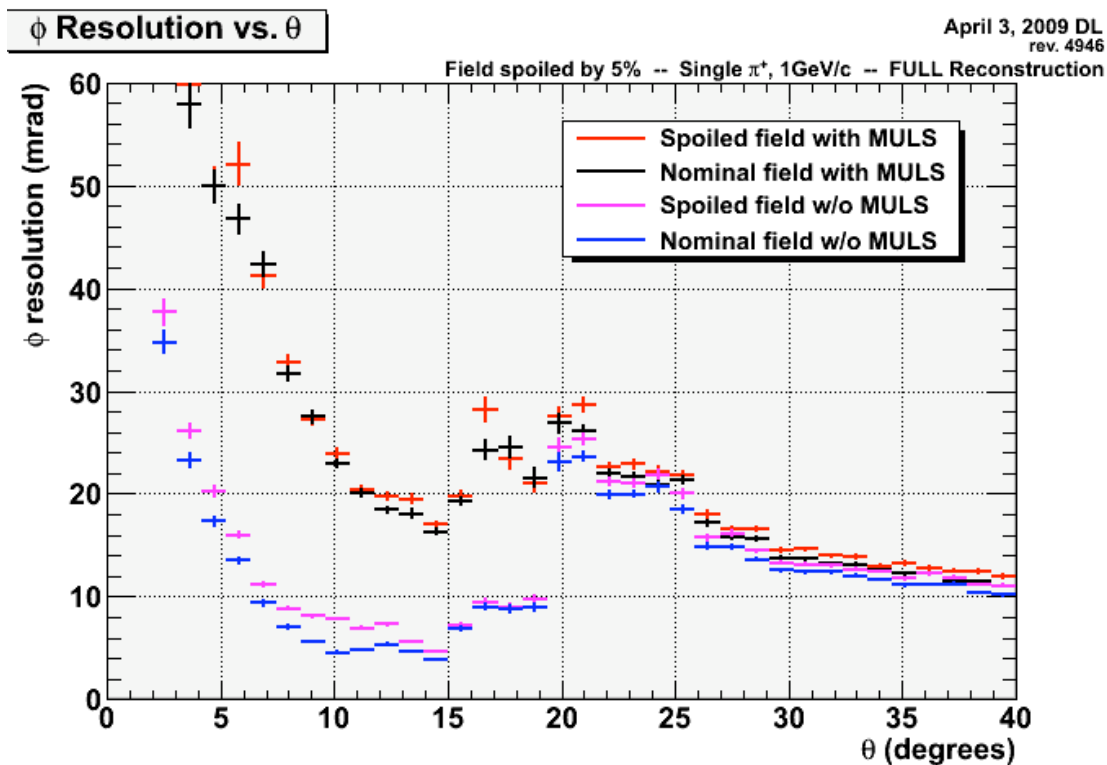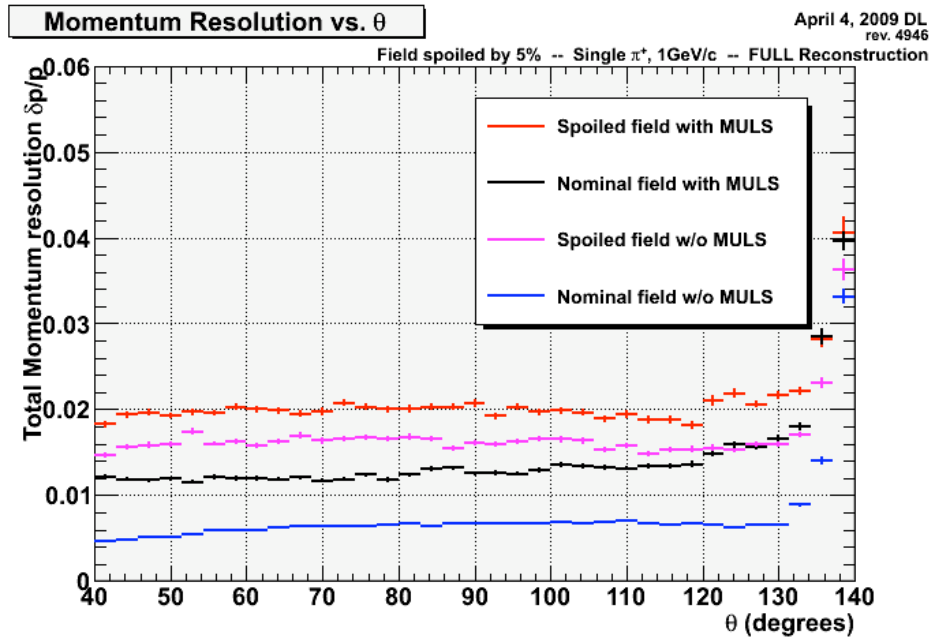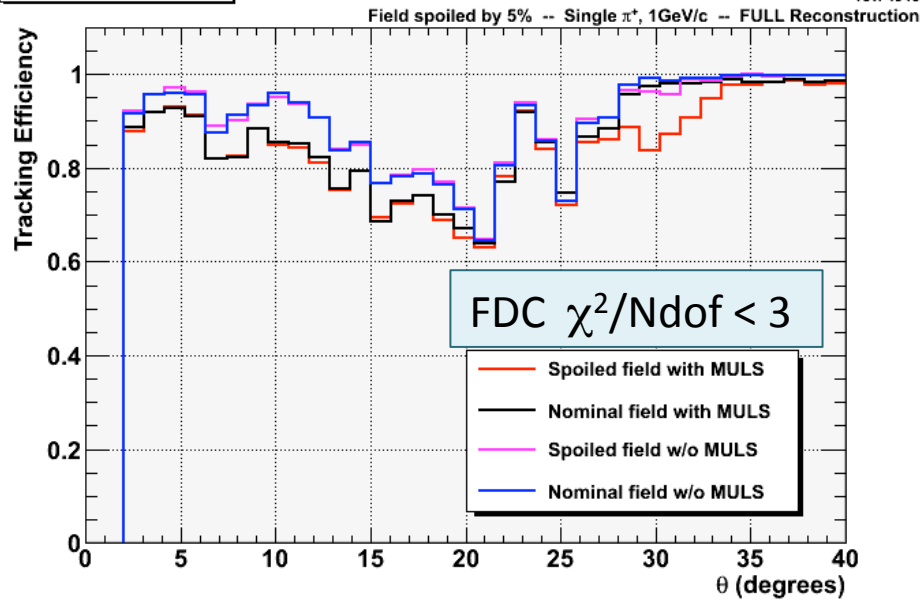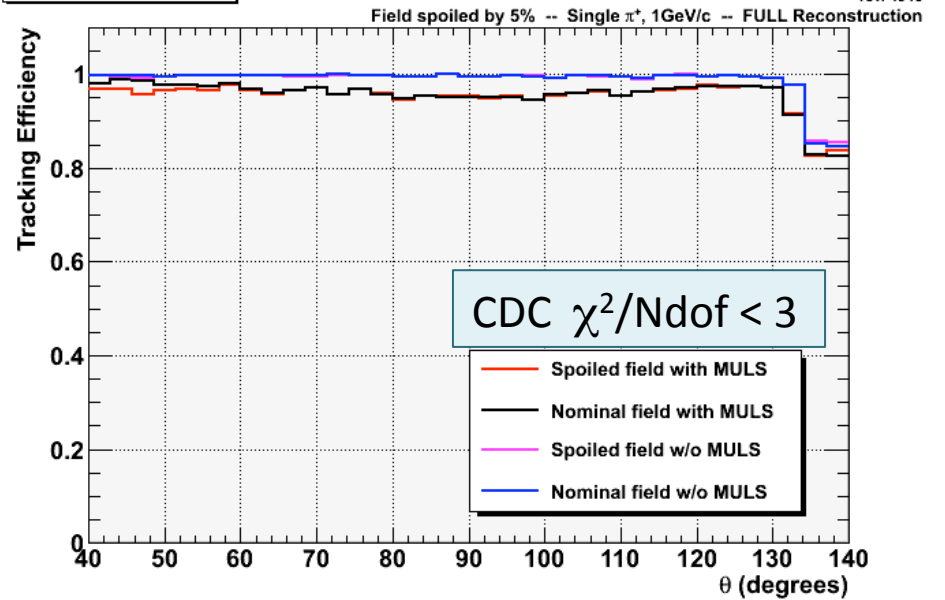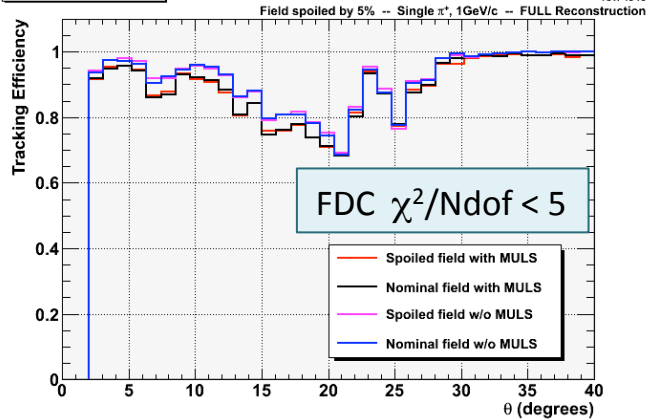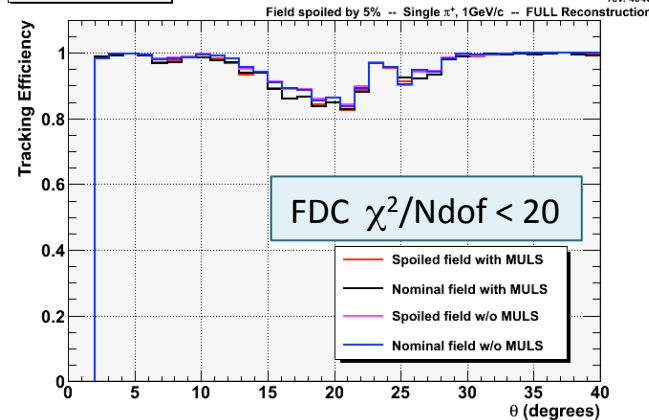
See next talk for more …

Momentum Resolution for 0.5 GeV/c π^+

Momentum Resolution vs. θ

April 5, 2009 DL
rev. 4946

Field spoiled by 1% -- Single π^+, 0.5GeV/c -- FULL Reconstruction

- Spoiled field with MULS
- Nominal field with MULS
- Spoiled field w/o MULS
- Nominal field w/o MULS

Spoiled by 1%

Momentum Resolution vs. θ

April 5, 2009 DL
rev. 4946

Field spoiled by 5% -- Single π^+, 1GeV/c -- FULL Reconstruction

- Spoiled field with MULS
- Nominal field with MULS
- Spoiled field w/o MULS
- Nominal field w/o MULS

Spoiled by 5%
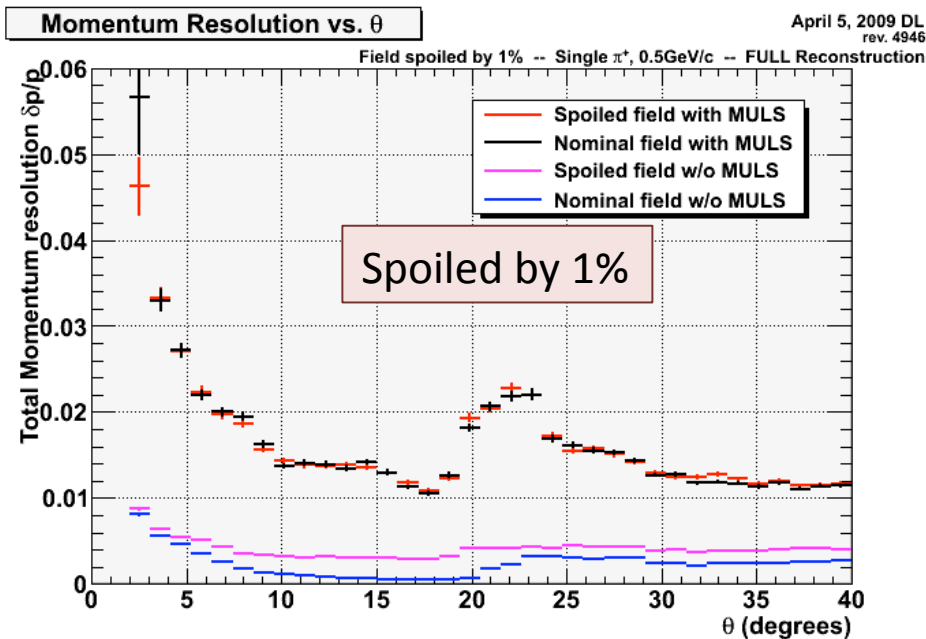
~0.2% change in resolution for 1% change in B-field
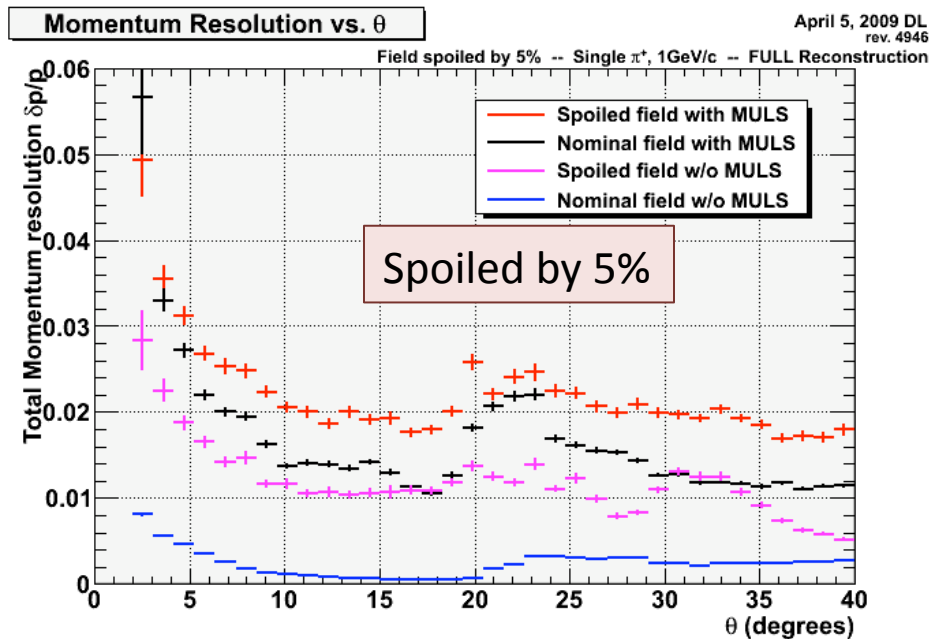
~1% change in resolution for 5% change in B-field

consistent with 1 GeV/c case

Summary

- For both 1GeV/c and 0.5GeV/c π^+ tracks, the total momentum resolution is made worse by about 0.2% (added in quadrature) for every 1% deviation of B-field map

- No noticeable change was observed in the angular resolutions with a 5% spoiled field

- Little or no change in tracking efficiency for a 5% spoiled field