

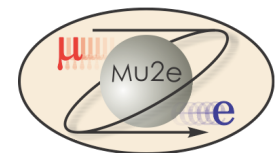


U.S. DEPARTMENT OF
ENERGY Office of
Science

Mu2e CD-2 – answer to B-Field question

D. Glenzinski

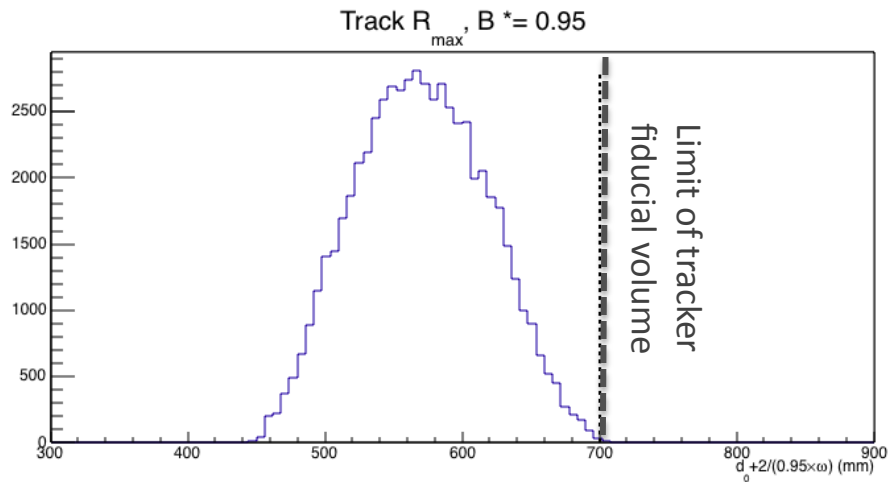
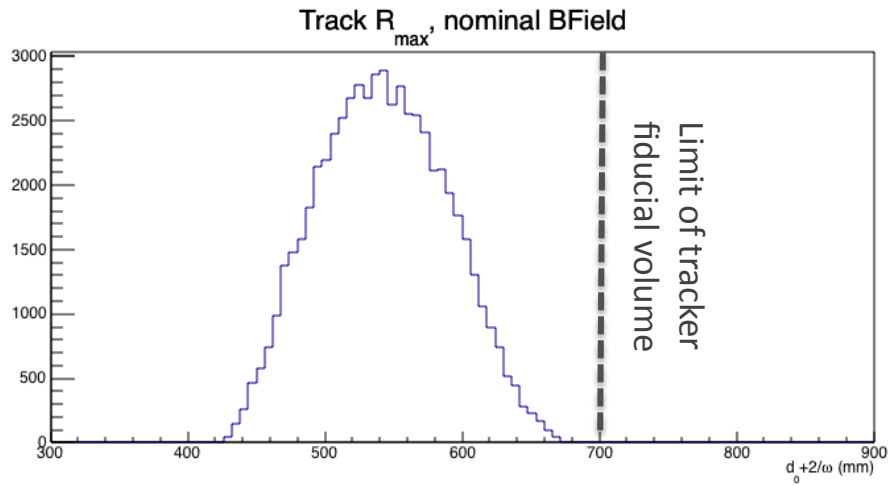
7/9/2014



For the B-Fields, how good is good enough?

- Studies have been performed scaling the PS, TS fields
 - Mu2e-docdb-652
 - Stopped-muon yield scales roughly linearly with peak PS field
 - More an issue of run-time than success/failure of experiment
- DS field is more complicated because 1T field
 - Affects tracker rates from accidental occupancy arising from , muon-capture and muon-decay products, beam flash
 - Affects signal acceptance since 105 MeV/c electrons can spiral out of tracker fiducial volume if field is too low
- We mitigate these risks by
 - Designing in significant margin to conductor, especially DS
 - Employing a rigorous Quality management plan for the solenoid procurements
 - Performing simulation studies including the effect of fabrication tolerances

Effect of degraded DS field in spectrometer

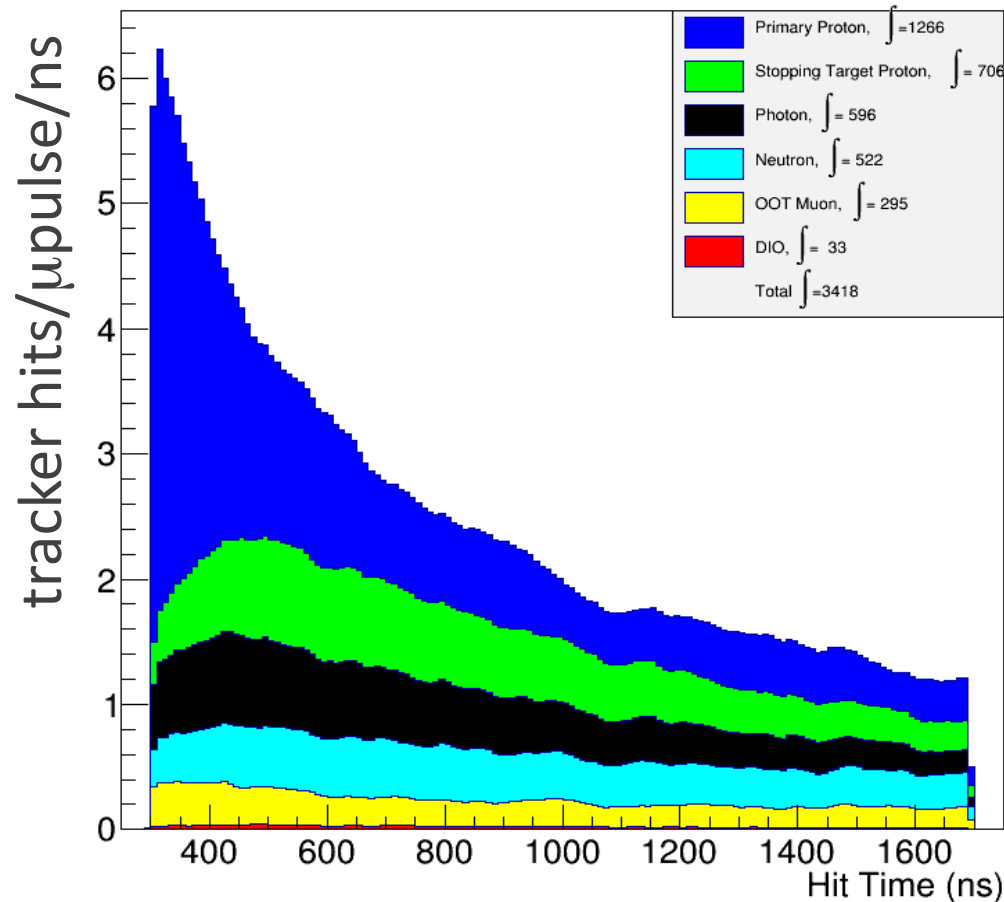


- Signal acceptance negligibly affected even for 5% field reduction

(thanks to D. Brown)

Effect of degraded DS field in spectrometer

Hits in tracker per ns normalized
to one micro-pulse

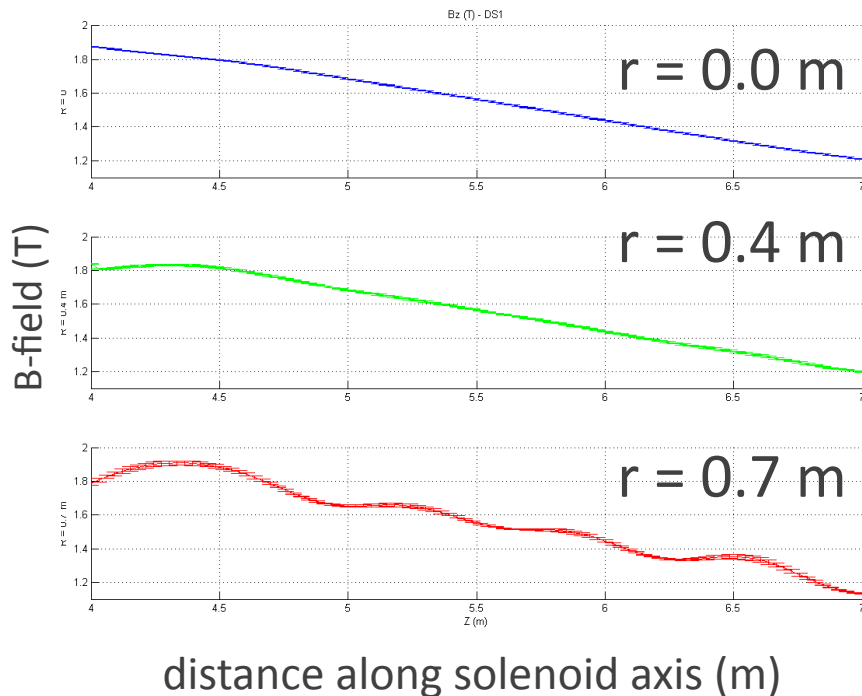


- Only DIO rate will vary significantly with changes in B-field
- Will mostly occupy small radii, which are not used in pattern recognition

Tolerance studies

- Described in mu2e-docdb-2870, 2156, 2403, 652
- What we did:
 - Introduce variations of the coil positioning and conductor positioning
 - Recalculate the B-field
 - Compare to specifications
 - Identify outliers
 - Produce background and signal simulations using the outliers
 - Both random and systematic uncertainties were considered
- **These results informed the fabrication tolerances and QC plan for the conductor and solenoids**

DS tolerance studies



- Variations of coil radial positions, longitudinal positions, pitch
- Variations of conductor placement assuming linear or quadratic divergence from nominal and lower or higher density relative to nominal
- Variations of conductor width

- Even worst-case scenarios achieve Mu2e physics goals
- **We are confident that conductor and magnets built to spec will allow Mu2e to accomplish its physics goals**