RFOFO Status in GEANT

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- **GEANT Simulation**
  - **Geometry and Material**
  - **Constant Magnetic Fields**
  - **GRID Magnetic Fields**
- **New Magnetic Fields**
- **Re-visit GEANT with New Fields**
- **Summary**

Emittance Exchange Workshop
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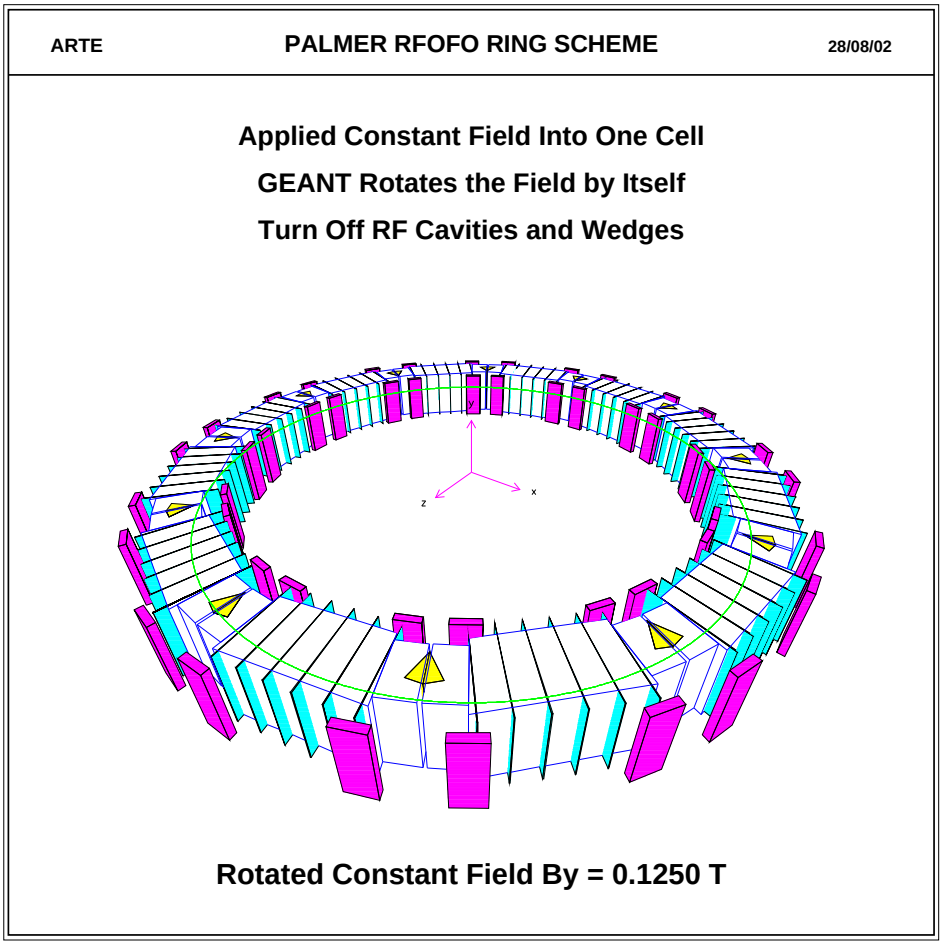
Fermilab

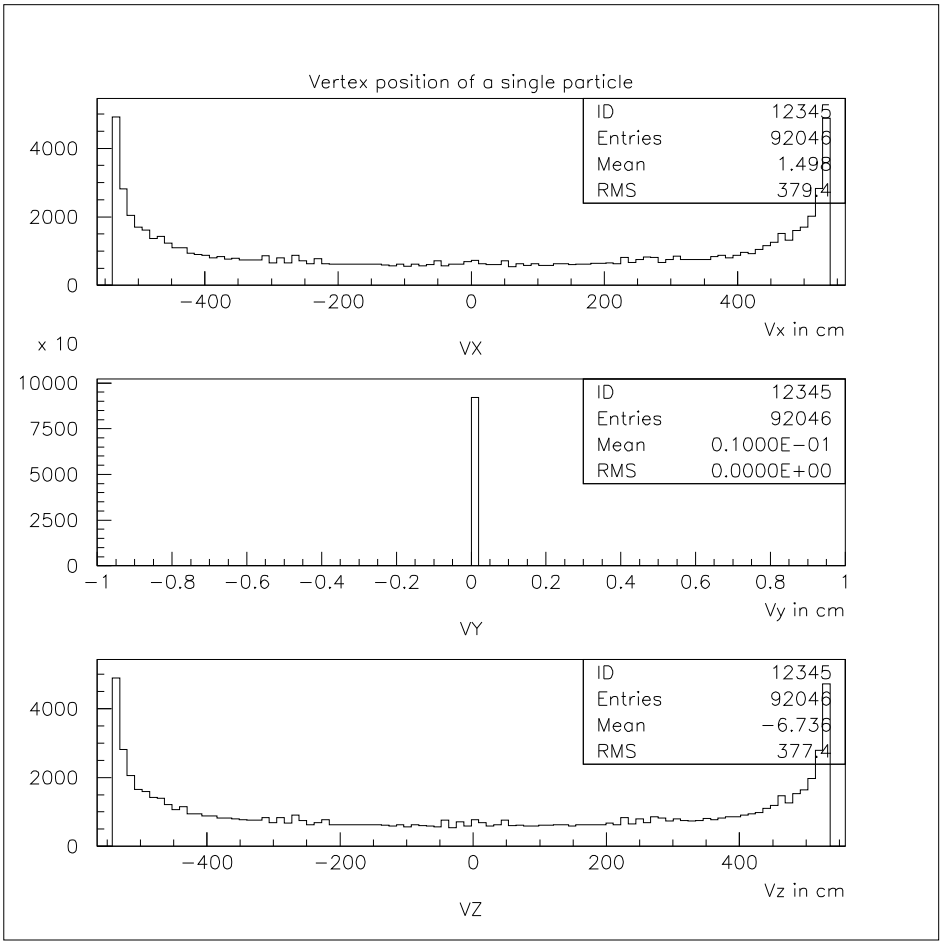
Geometry and Material

- **Geometry and material in GEANT = ICOOL**



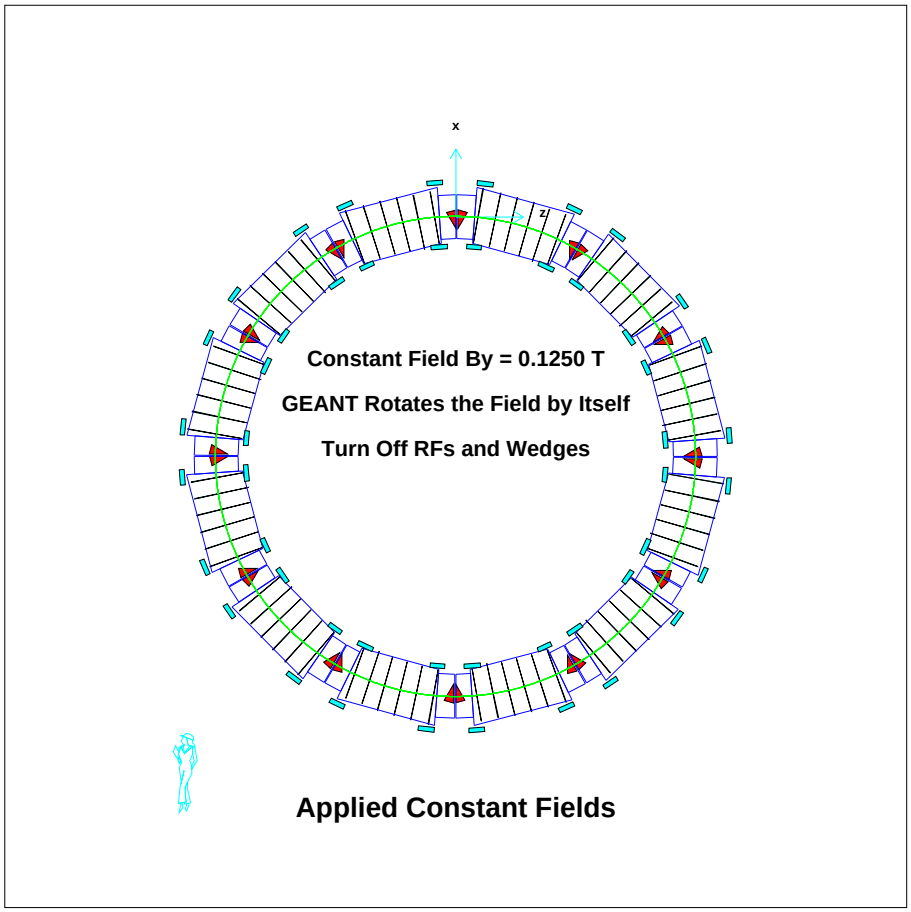
Vertex Position of Single Particle

- **Applied Constant Fields :**



Constant Fields Rotation in GEANT

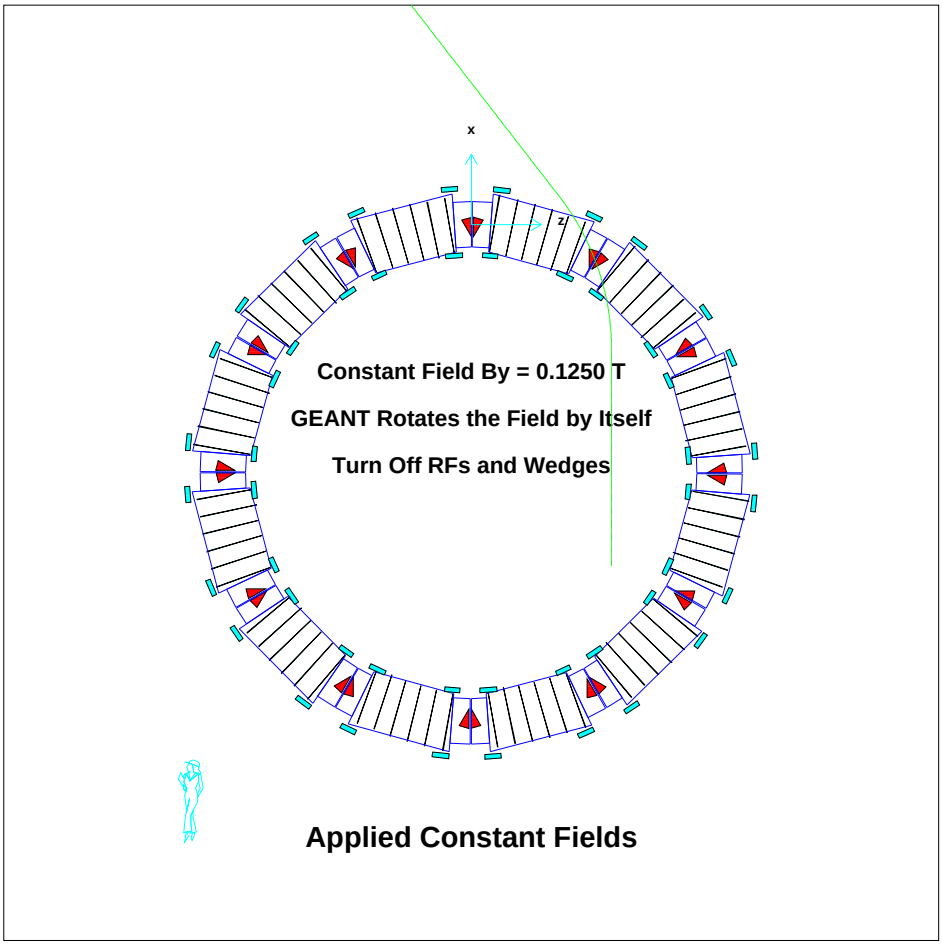
- **Can GEANT rotate the fields by itself ?**
  - **Applied constant fields (0.125 Tesla) into one cell**
  - **Let GEANT rotates the fields by itself**
  - **Locate μ^+ (200 MeV/c) at z=531 cm**



$\Longrightarrow$ **The μ^+ still follow a closed orbit !**

Does GEANT Rotate the Fields Correctly ?

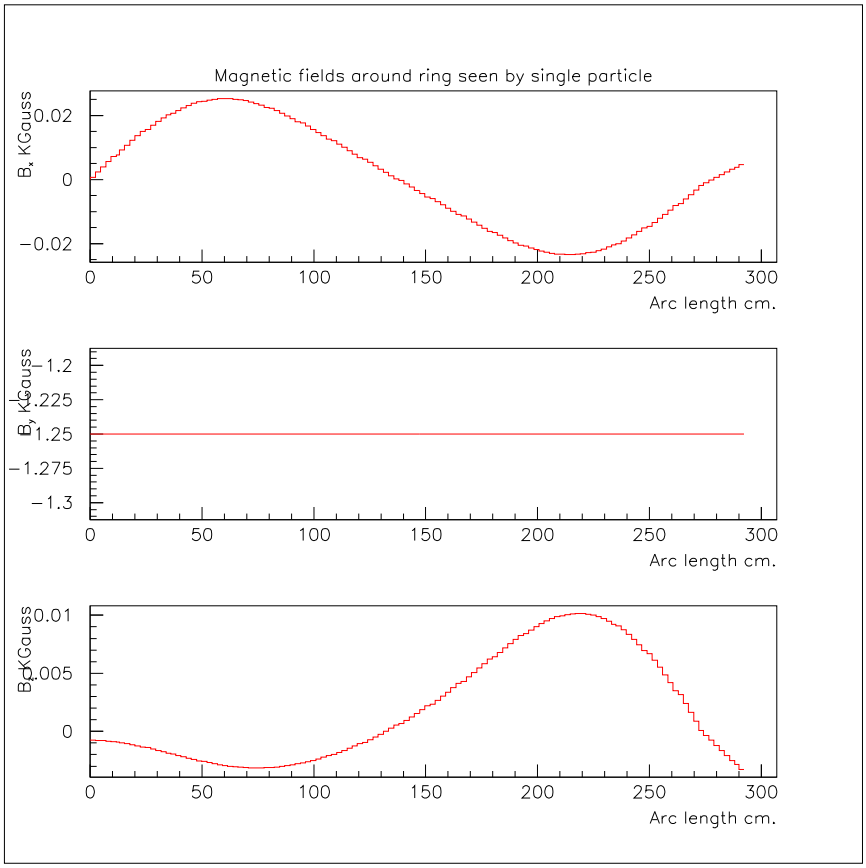
- **Locate μ^+ at z=300 cm and x=-200 cm**



$\Longrightarrow$ **Indeed μ^+ does not follow a closed orbit !**

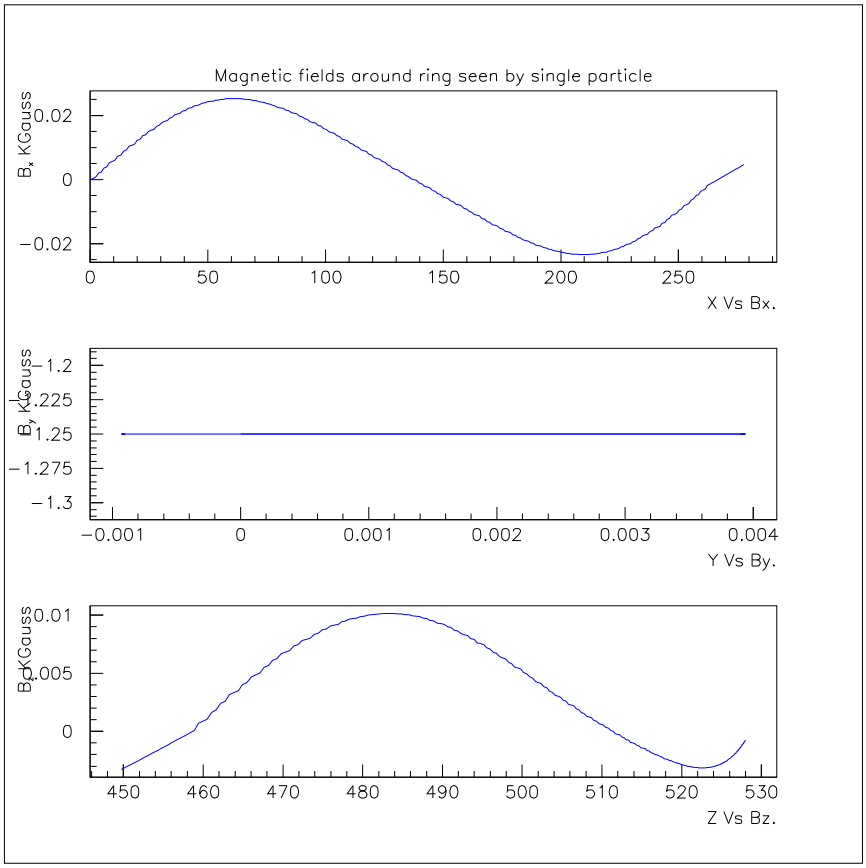
GRID Magnetic Fields

- **We implemented GRID map into GEANT then do interpolation $\Longrightarrow$ GRID Fields Map**
- **GRID fields map along the arc length :**



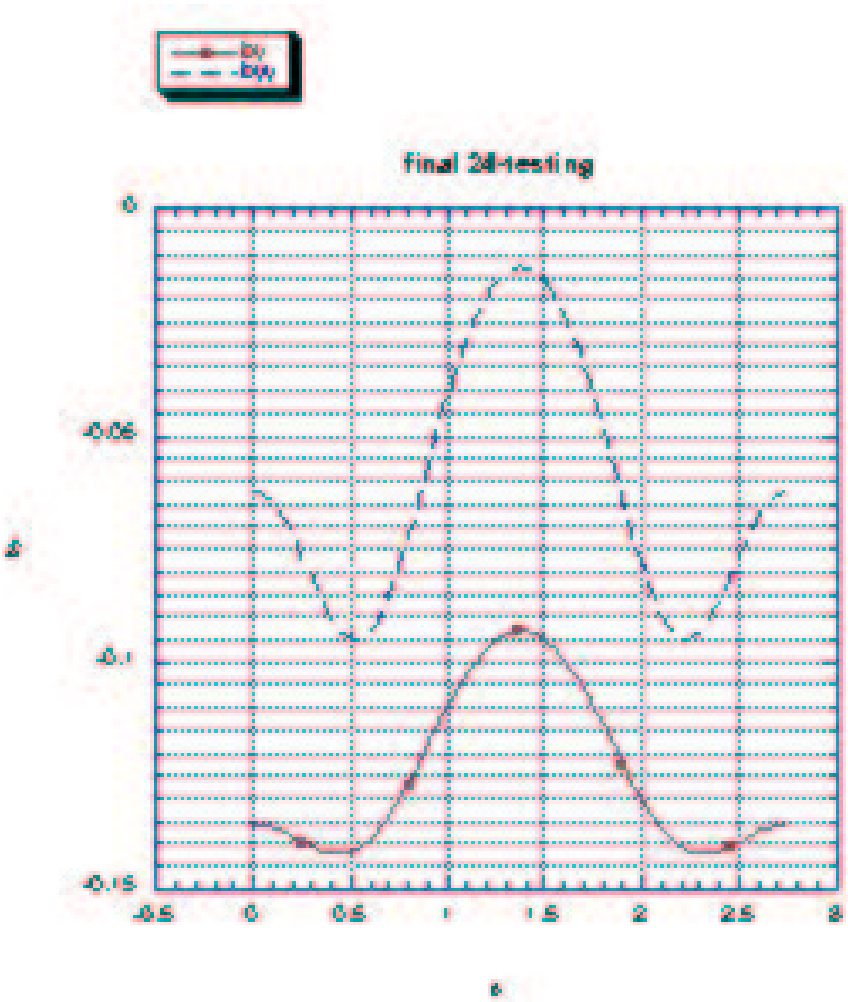
GRID Magnetic Fields

- **Fields map output from GEANT is very well match with BIOT fields $\Longrightarrow$ a cross check**
- **GRID fields map along axis :**



By Fields Comparison of BSHEET-BIOT

- **There is still a large discrepancy of By that need to understand $\Longrightarrow$ resolved ?**



Current Magnetic Fields Study

- **In addition to Lucien, Don, Rick and Juan Steve Bracker is on board now!**

- **Steve generated his own fields to check the discrepancy between BSHEET and Biot-Savart**

- **He checks the fundamental of Maxwell's eqn i.e: Divergence and Curl of BIOT-Savart Fields $\Longrightarrow$ Div and Curl of B are very close to 0** (see plot)

- **The current tilt angle is 53 mradians and the Divergence and Curl with tilt is shown here** (see plot)

Current Magnetic Fields Study...

- **Bx in Cartesian Coordinate** (see plot)
  Bx in Cylindrical Coordinate (see plot)

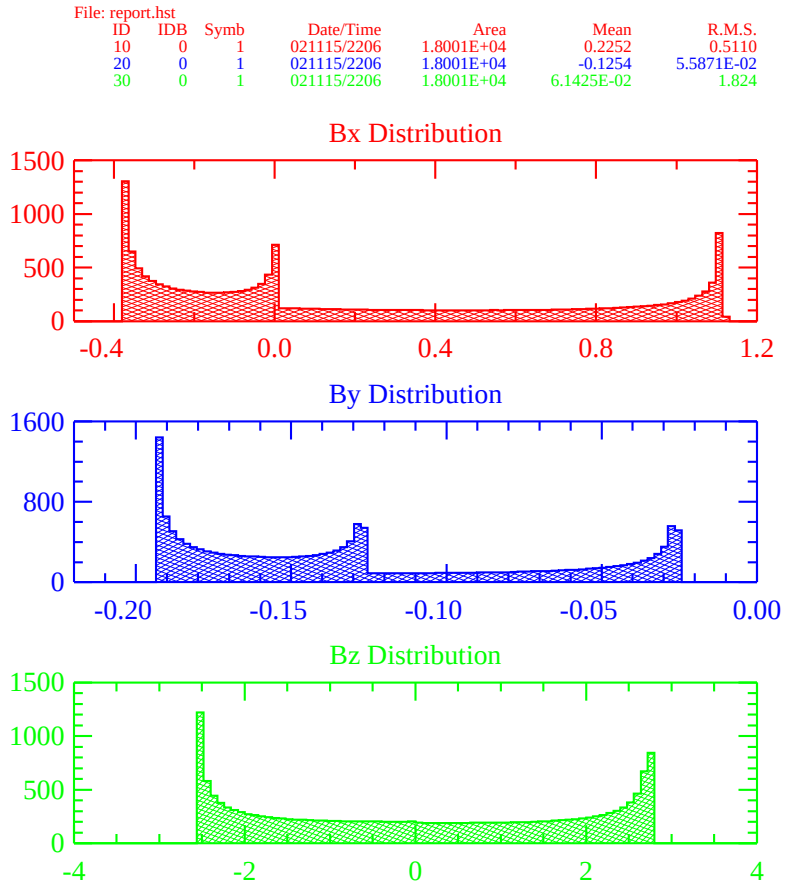
- **Bz in Cartesian Coordinate** (see plot)
  Bs in Cylindrical Coordinate (see plot)

- **By is unchanged in both systems** (see plot)

- **Probably Rick or Juan could say something about the current BSHEET fields study**

Re-visit GEANT with New Fields

- **I tested Steve's code in standalone linux**
  It works fine as we expected



Summary and Plans

- We have new fields map where Bx, By and Bz are consistent on both BSHEET and Biot
- The CERN interpolation routine was used (FINT) that has been tested
- Many things need to do in GEANT in order to implement the new code/map fields since the new code is using a different orientation, and unit compared to what GEANT expected
- I am implementing the new fields and code into GEANT....in progressing