RFOFO Ring Status in GEANT

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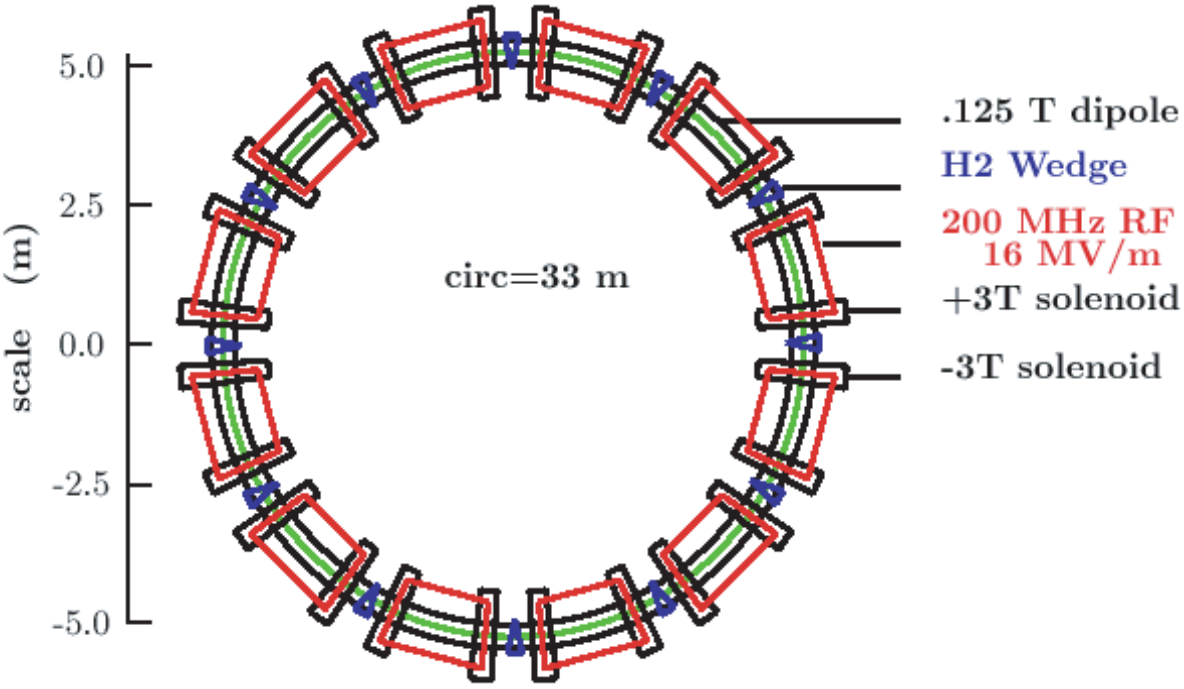
RFOFO Ring Overview

- We simulate the RFOFO ring based on ICOOL version 2.40 with useful information from Bob Palmer and Rick Fernow

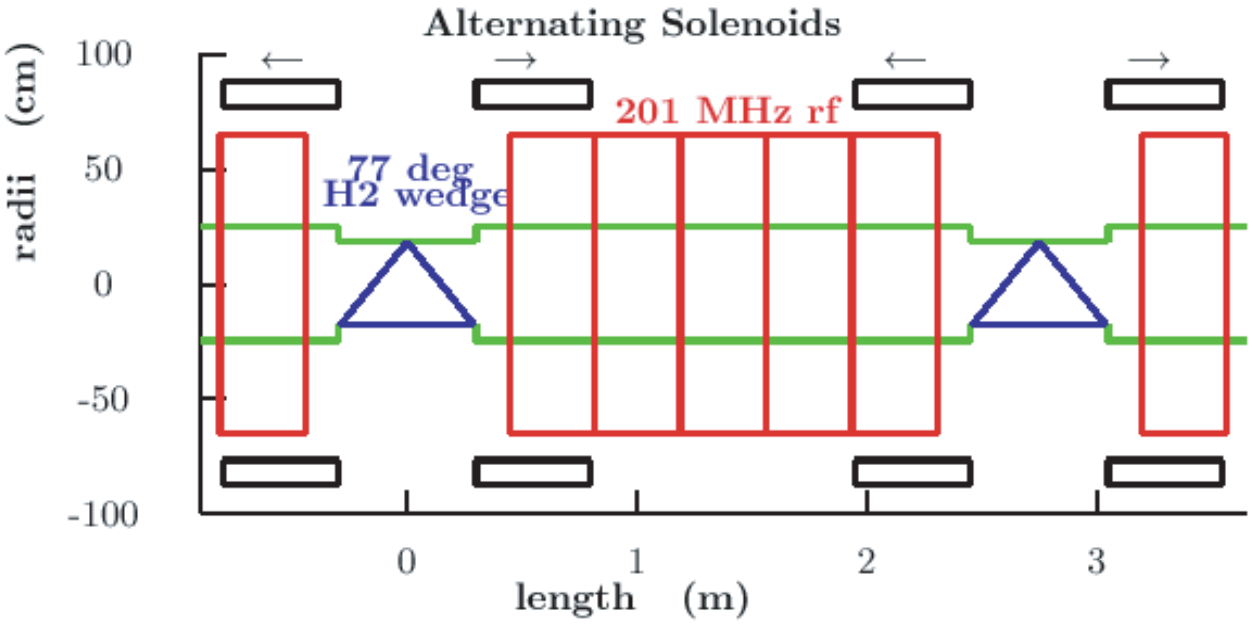


- The ring is about 33 m in circumference
  It has 12 cells and each cell is 2.75 m long

- The overall dipole field for bending is 0.125 T

RFOFO Ring Overview

- 1 cell = half wedge + 6 RFs + half wedge
  The alternating solenoid coils are located outside pillbox RF cavities



- RF freq.= 201.25 MeV; Gradient = 16 MV/m
- The wedge is made of liquid hydrogen with a full angle $\alpha = 77^\circ$ at the vertex

Motivations

- ICOOL works in different ways as GEANT
  In a straight channel ICOOL models
  the solenoid as a current sheet without any
  direct rotation as in GEANT

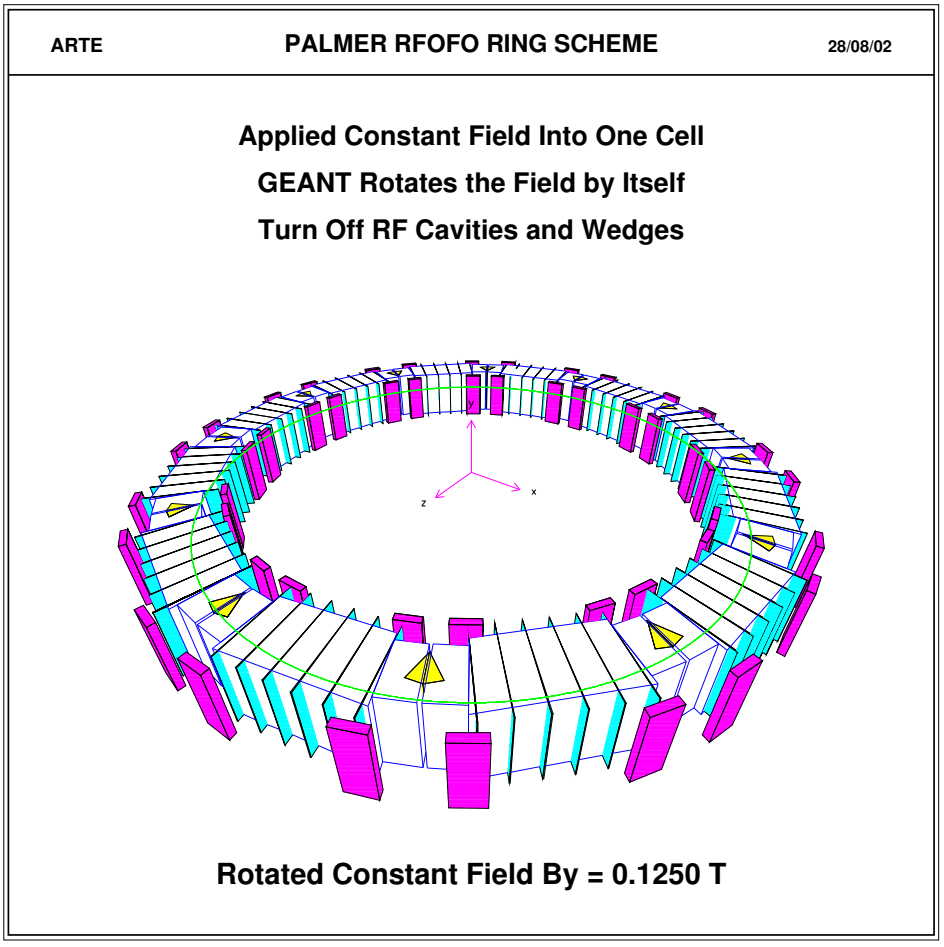
- GEANT is able to rotate the field for a ring
  then do a linear GRID map interpolation
  I will show it later

- GEANT should tell us the exact coil angle
  and tilts that generate the required fields

- It always good to have a redundant simulation
  for a crucial part of an experiment

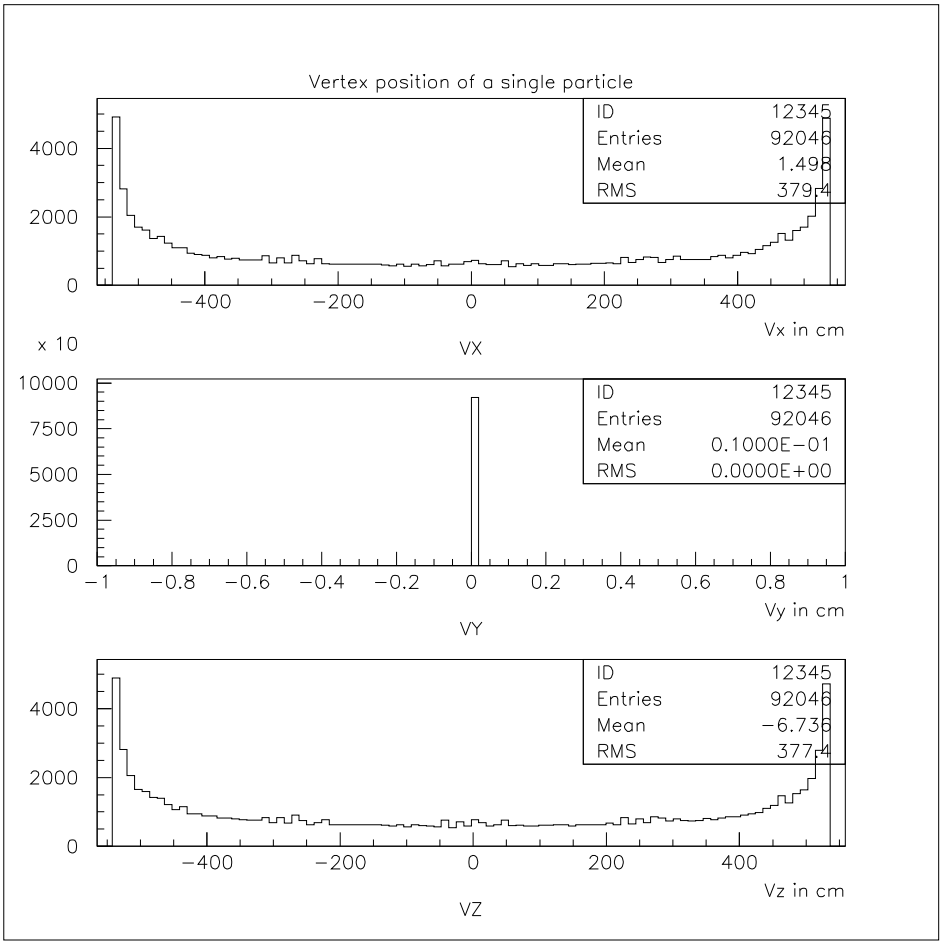
Geometry and Material

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



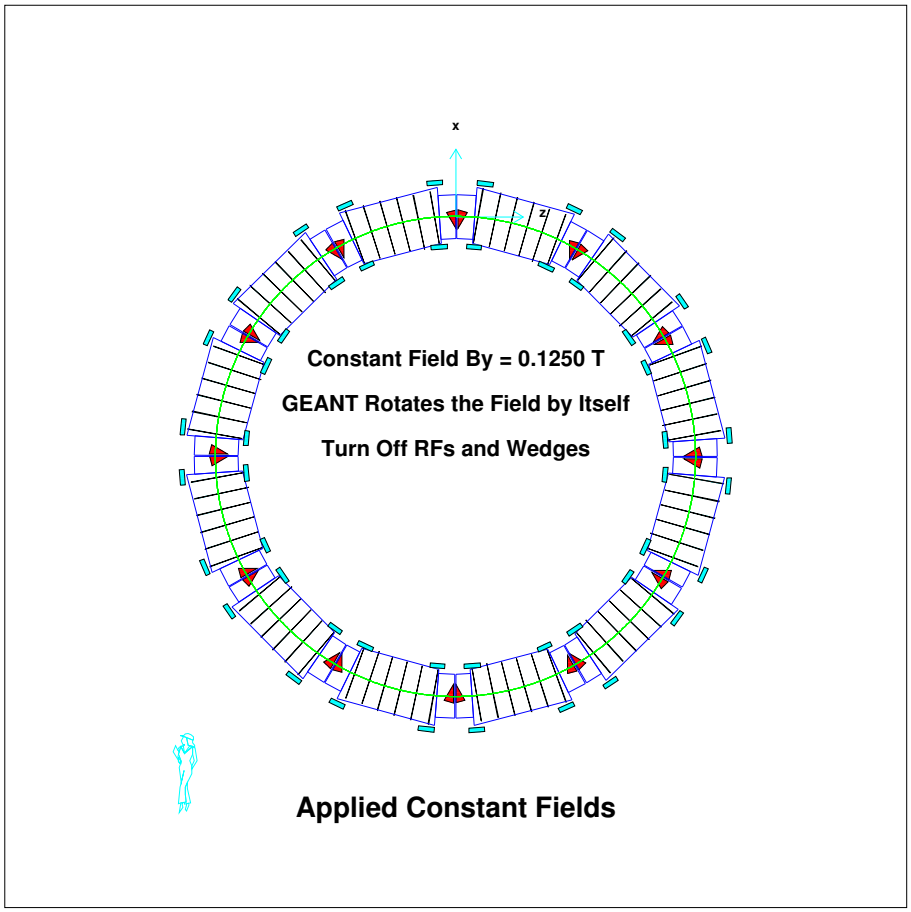
Vertex Position of Single Particle

- **Applied Constant Fields :**



Constant Fields Rotation in GEANT

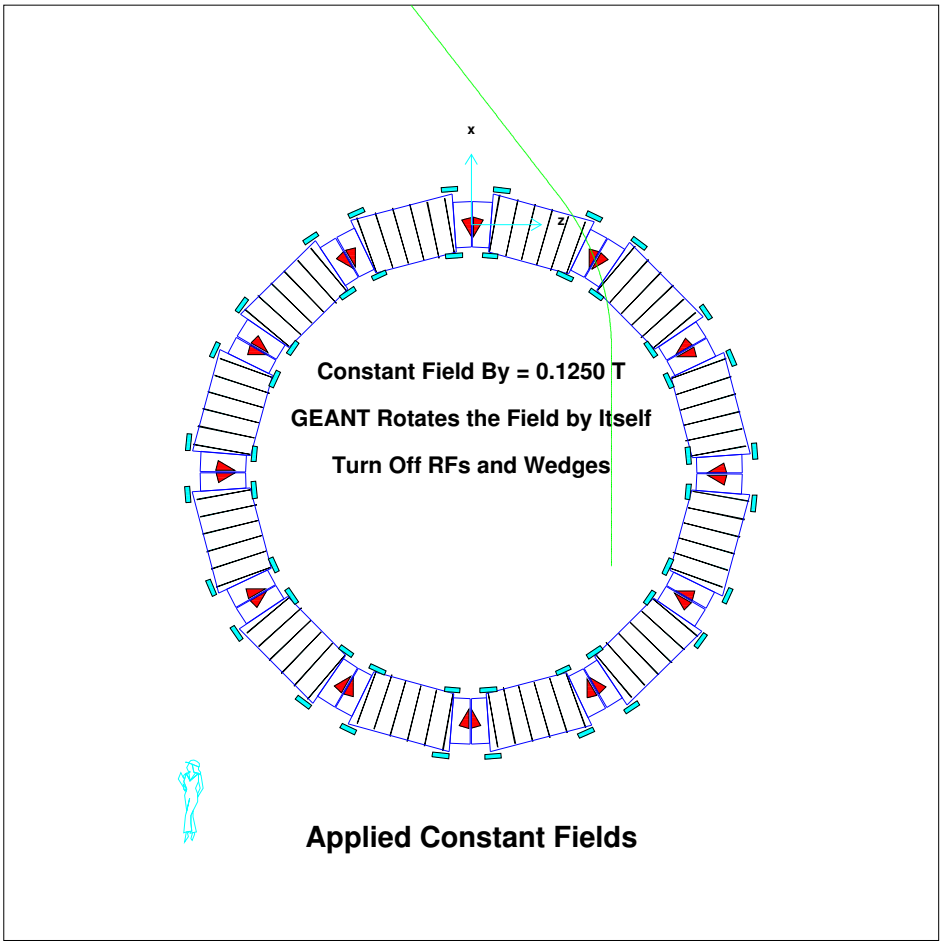
- **Can GEANT rotate the fields by itself ?**
  - **Applied constant fields (0.125 Tesla) into one cell**
  - **Let GEANT rotates the fields by itself**
  - **Locate μ^+ ($200\ MeV/c$) at z=531 cm**



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

Did GEANT Rotate the Fields Correctly ?

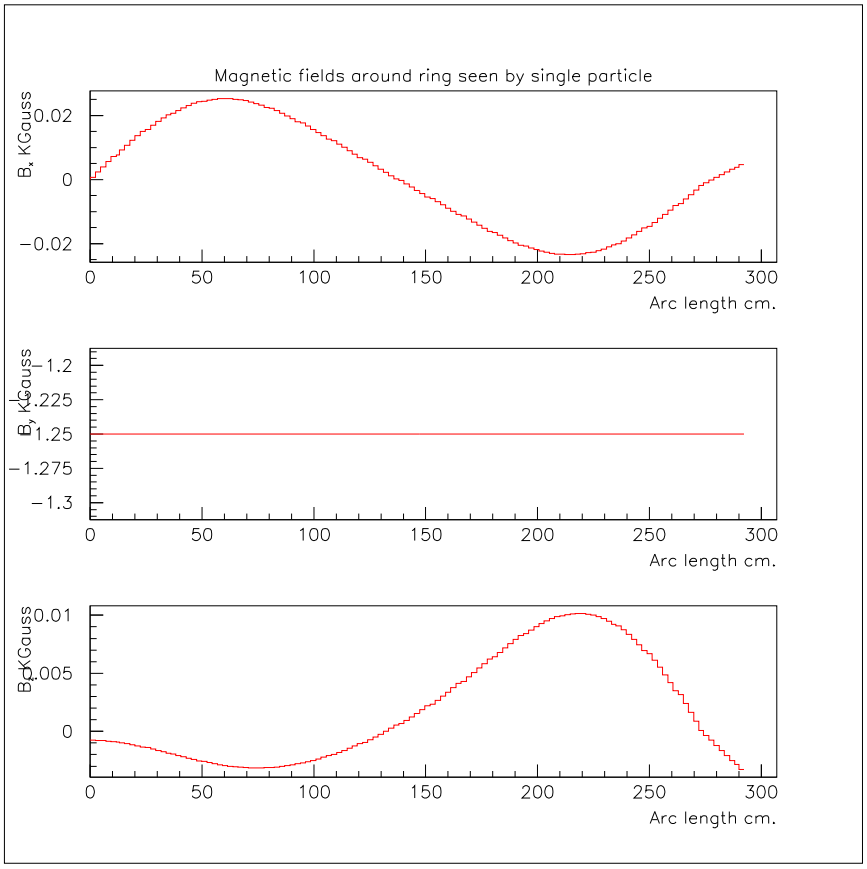
- Locate μ^+ at z=300 cm and x=200 cm



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

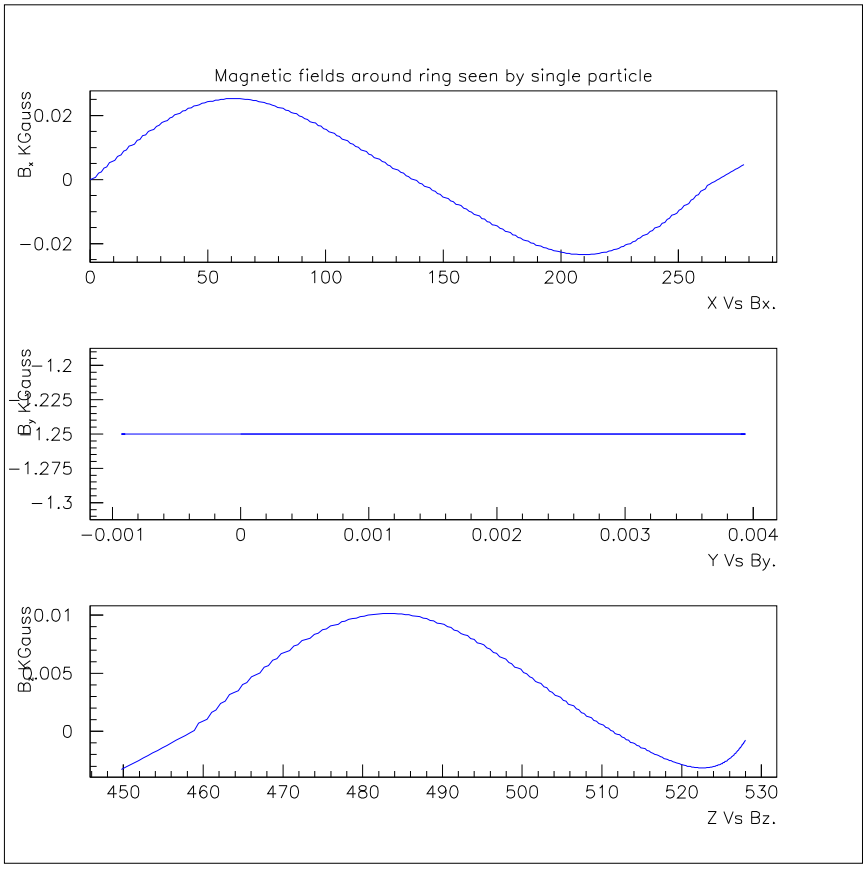
GRID Magnetic Fields

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



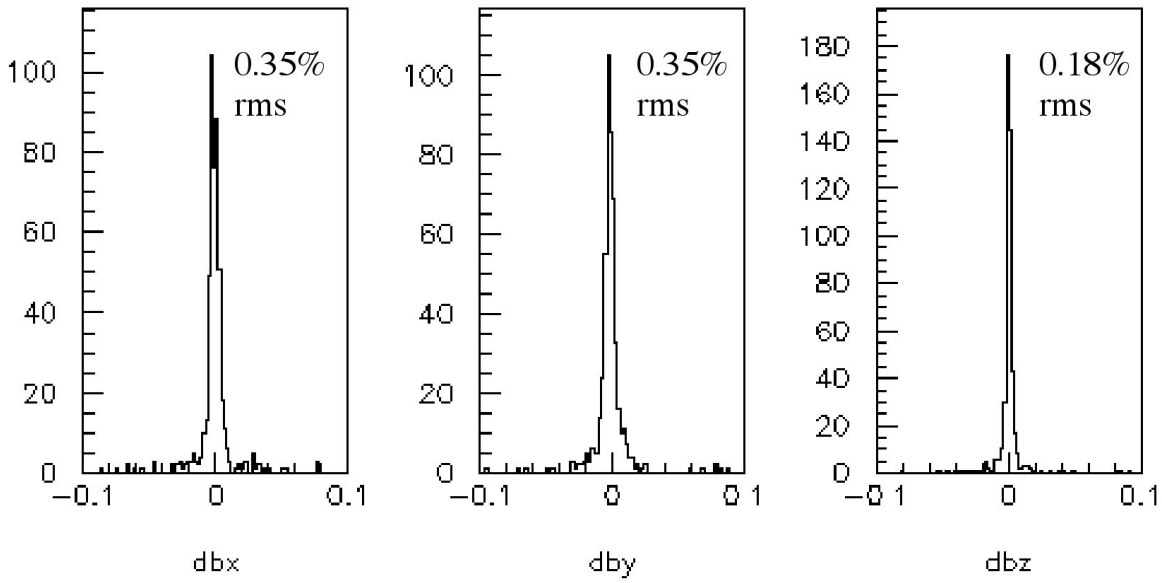
GRID Magnetic Fields

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



Interpolation Method

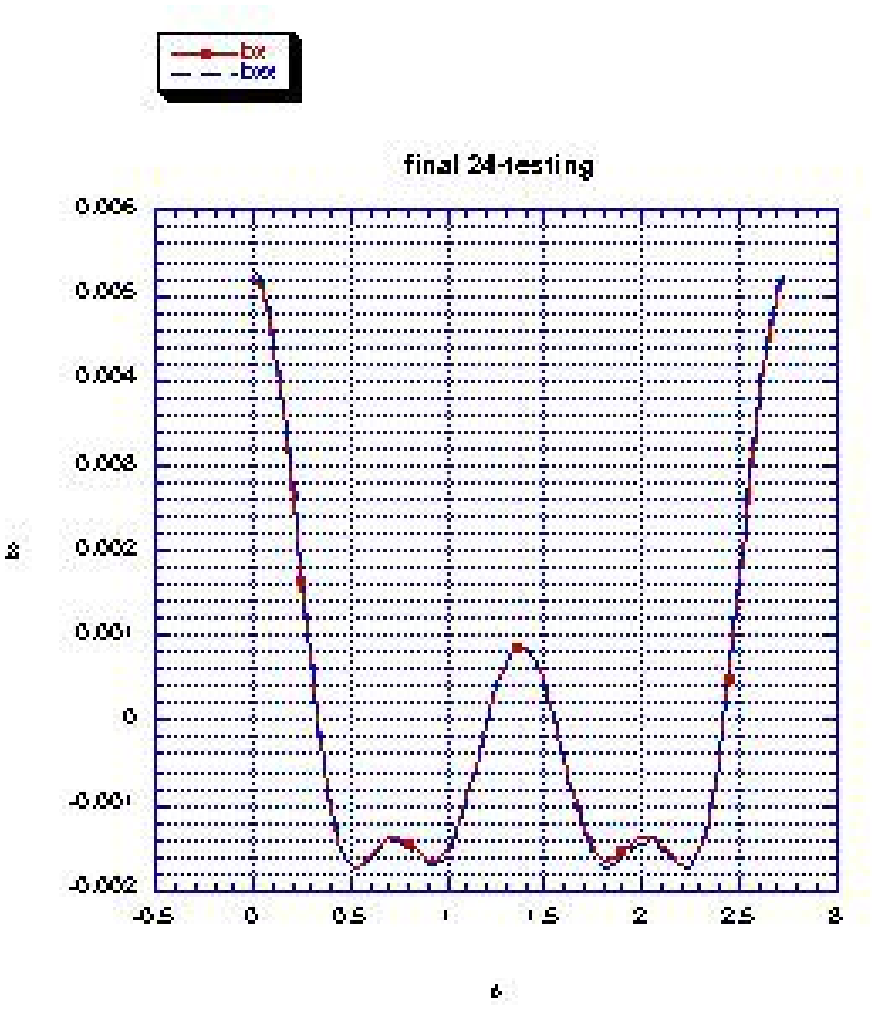
- **We do check the interpolation method when GEANT read the GRID map $\Longrightarrow$ Fields map**
- **Fractional difference of True - GRID Fields**



- **dbx=(BX-bx)/BX; dby=(BY-by)/BY; dbz=(BZ-bz)/BZ**

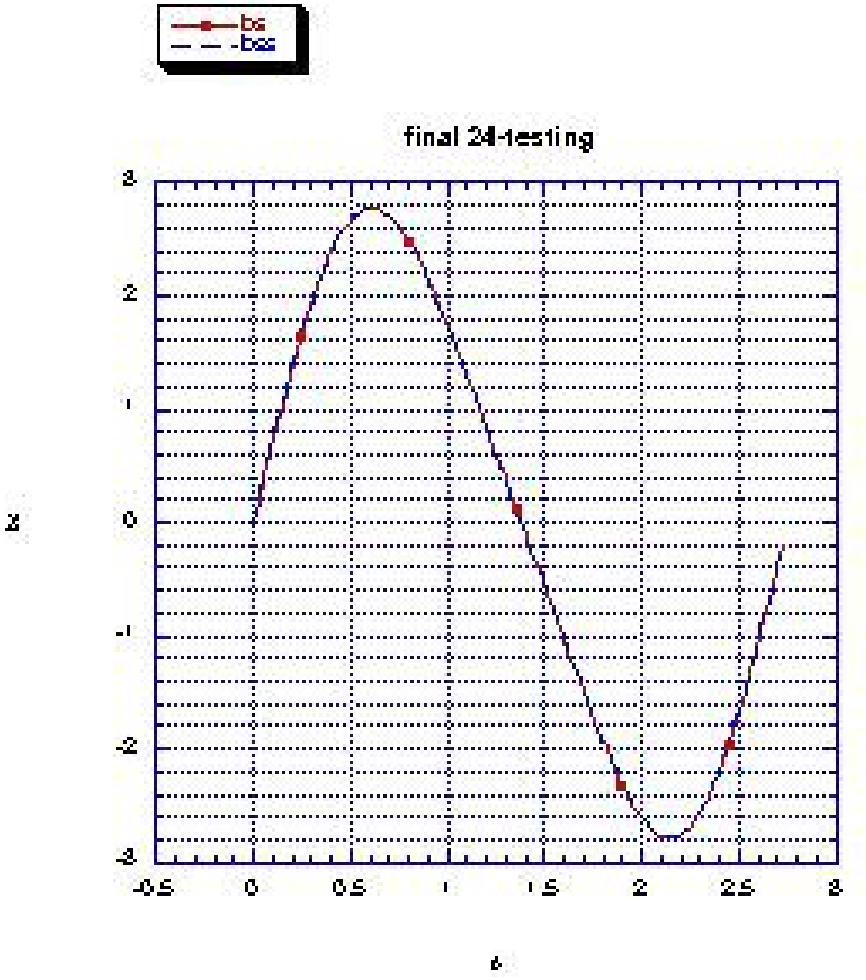
Magnetic Fields Study

- **BIOT-Savart fields is done by Lucien and Don**
  BSHEET (ICOOL) is done by Rick and Juan
- **Bx fields comparison between BSHEET and BIOT (Integral Method) $\Longrightarrow$ GEANT**



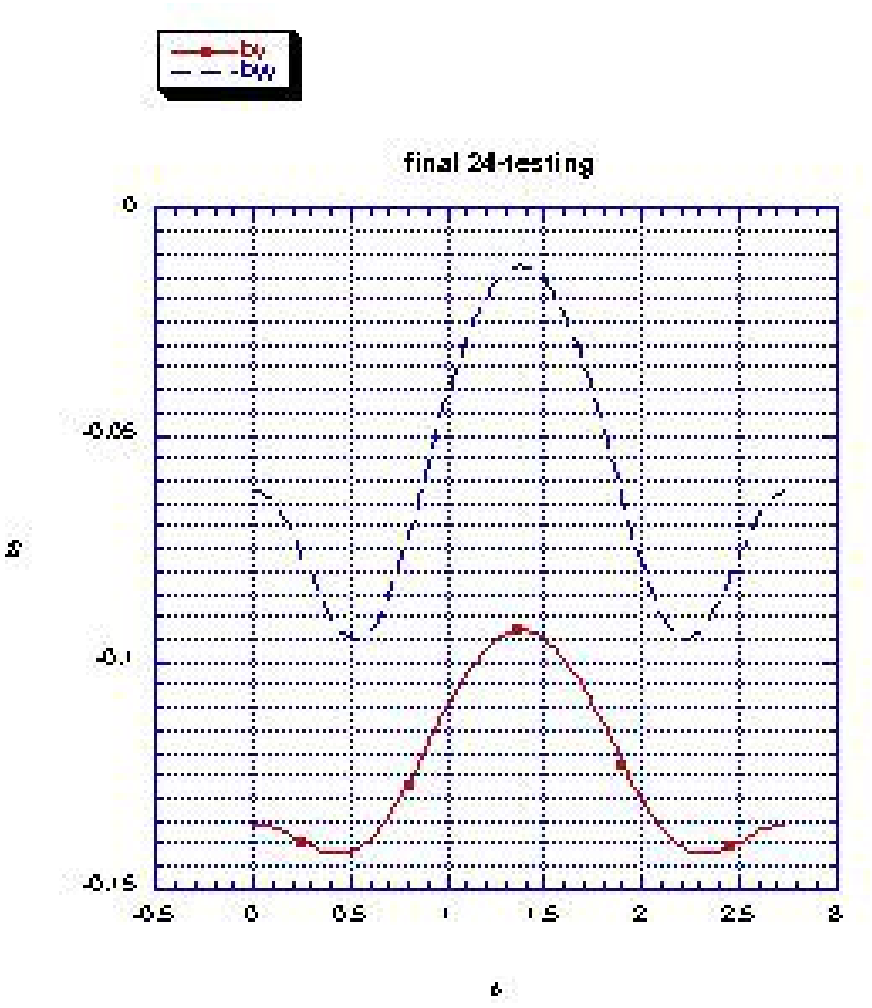
Bs Fields Comparison of BSHEET-BIOT

- **BSHEET-BIOT Bs fields match very well**



By Fields comparison of BSHEET-BIOT

- There is still a large discrepancy of By that need to understand $\Longrightarrow$ in progress



Conclusions

- GEANT rotates the fields map correctly
  It is very good feature from GEANT
- GEANT produces consistent fields map output
  by doing a correct interpolation routine
- The CODE has installed into CVS repository
  in Fermilab, thanks to Raja for his help
- The discrepancy between BIOT-BSHEET
  in By fields is under studying
- We are studying the RFOFO RF tunning