Simulations of the Box Cavity MTA Experiment

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Outline

• Review of MTA Box Cavity Experiment
• Concept of Magnetic Insulation
• Simulation Details and Results
• Discussion
• Conclusion and Outlook
See talks of Moretti NFMCC Meeting in LBNL (2009) but also NFMCC Phone Meeting (02/13/09).
Magnetic Insulation Concept

- $B_E$ and $E_{RF}$ are at 90 degrees (good insulation)

- $B_E$ and $E_{RF}$ are at $< 90$ degrees (poor insulation)
$E_x = E_y = 0$

$E_z = E_0 \cos \left( \frac{\pi x}{a} \right) \cos \left( \frac{\pi y}{b} \right) \cos(\omega t)$

$B_x = -\frac{\pi E_0}{b \omega} \cos \left( \frac{\pi x}{a} \right) \sin \left( \frac{\pi y}{b} \right) \sin(\omega t)$

$B_y = \frac{\pi E_0}{a \omega} \sin \left( \frac{\pi x}{a} \right) \cos \left( \frac{\pi y}{b} \right) \sin(\omega t)$

$B_z = 0$

$\alpha = 250 \text{ mm}$
$b = 276.497 \text{ mm}$
$d = 123.825 \text{ mm}$

$\omega_{110} = \pi c \sqrt{\left( \frac{1}{a} \right)^2 + \left( \frac{1}{b} \right)^2}$
 Particle Trajectories

- Particle tracking with CAVEL v. 1.23

\[
\theta = 0^0
\]

\[
\theta = 7^0
\]

\[
\theta = 14^0
\]

\[
\theta = 90^0
\]

\[B_E \perp E_{RF}\]

0.003 MeV

0.05 MeV

0.1 MeV

1 MeV

\[B_E \parallel E_{RF}\]

$\theta$ is the departure angle from the $B \perp E$ condition
Energies at Impact Point

- $\theta$ is the departure angle from the $B \perp E$ condition
- So higher $\theta$ means worse insulation
Returning Particles

- I assume that $\theta = 14^0$
- Returning particles may cause also damage
- Still however the impact energy is less than 1 MeV
Summary/ Outlook

• Simulated the square cavity experiment
• A rotation of 10-14 may be fine to test the concept
• It will be interesting to look at the secondary electrons
• It will be also Interesting to input the actual field map from the MTA solenoid into the code.
• Use "real asperities" as initial distribution.