

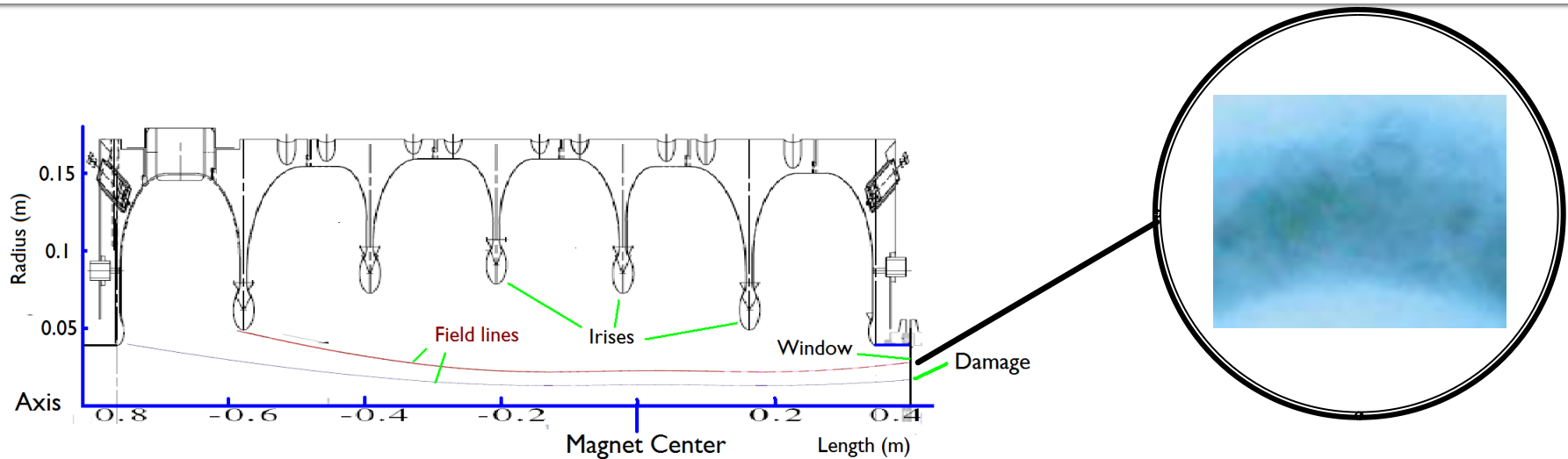
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RF cavities in magnetic fields: Previous work and future plans

Outline

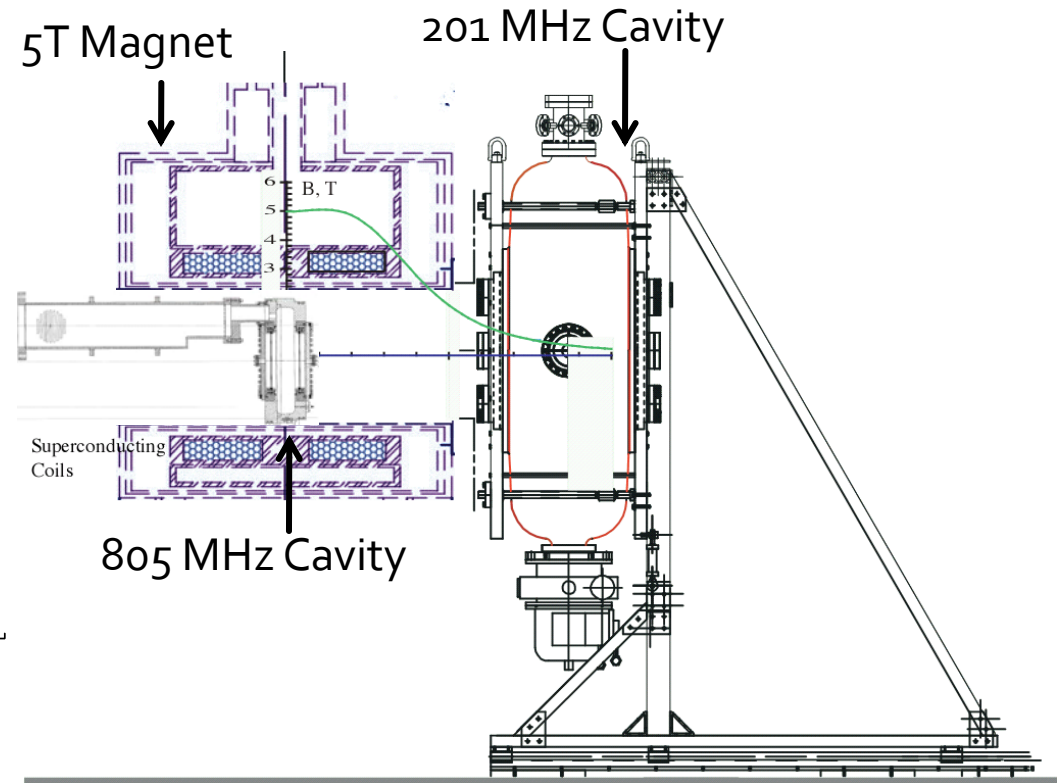
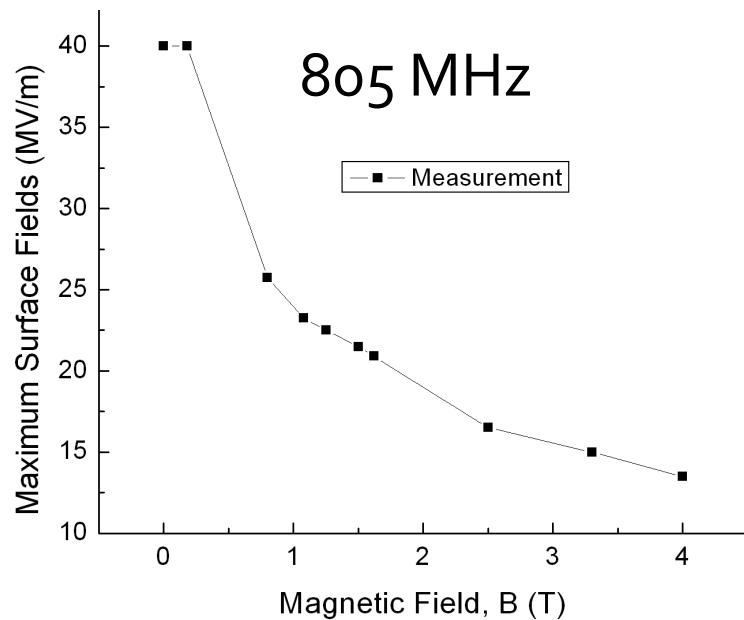
- Briefly report on previous experiments with rf cavities in B-fields
 - Multi-cell 805 MHz cavity
 - Pill-box 805 MHz cavity
- Discuss planned experiments to test the operation of cavities in magnetic fields
 - Box Cavity Experiment
 - Magnetic Insulation Experiment
 - Button Test Experiment
 - Be cavity experiment
- Quick overview of simulation studies at BNL

Multi-Cell Cavity in B-Field



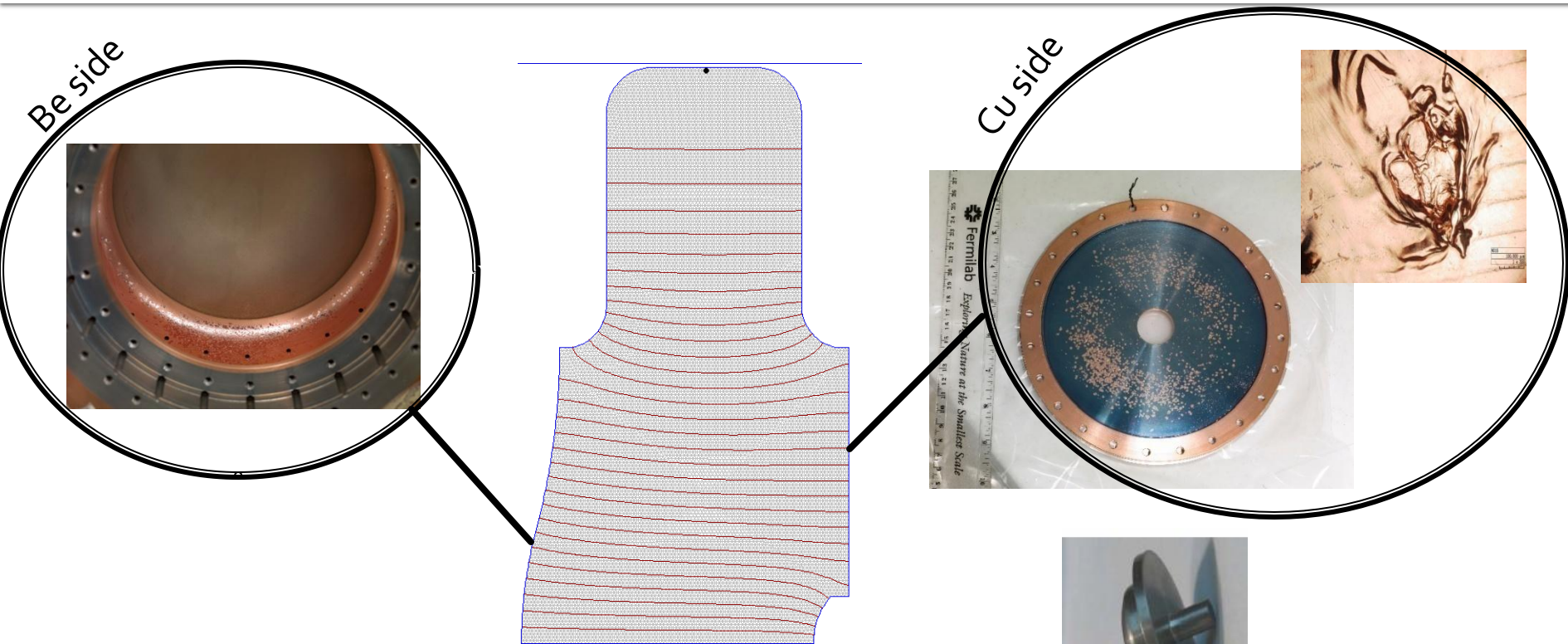
- Dark currents were observed in a multi-cell 805 MHz cavity.
- They arise most likely from local field enhanced regions on the cavity iris. They follow the B-field lines.

Pillbox Cavity in B-Field



- Maximum gradients were found to depend strongly on the external B-field.

Button Experiment



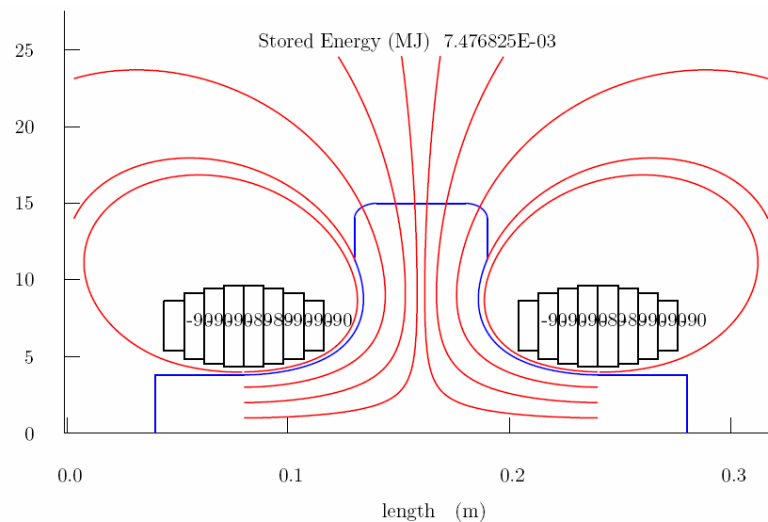
- Copper Side: Damage
- Beryllium side: No (visible) damage



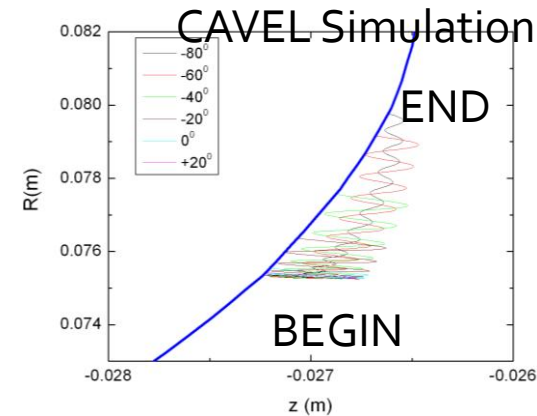
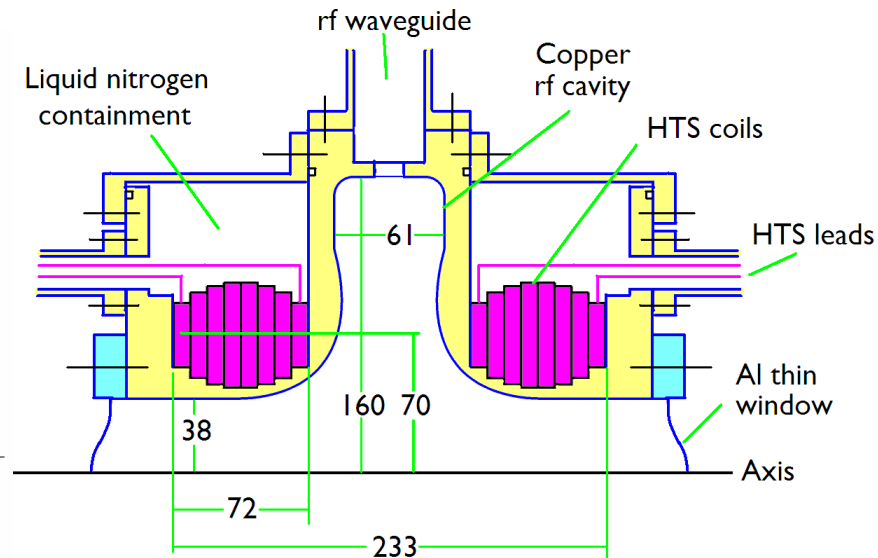
Magnetic Insulation Experiment

- Design a 805 MHz cavity where its surface is parallel to the B-field lines

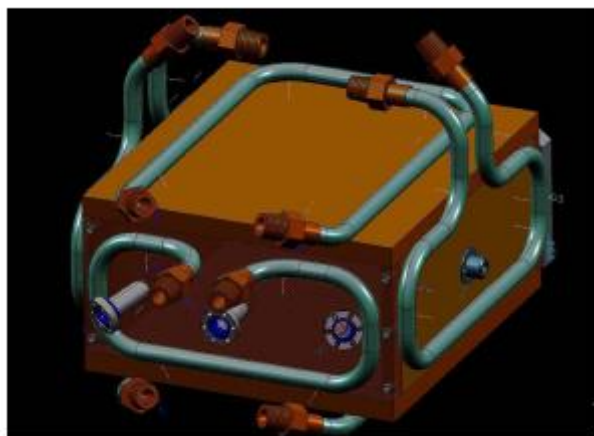
Simplified Configuration



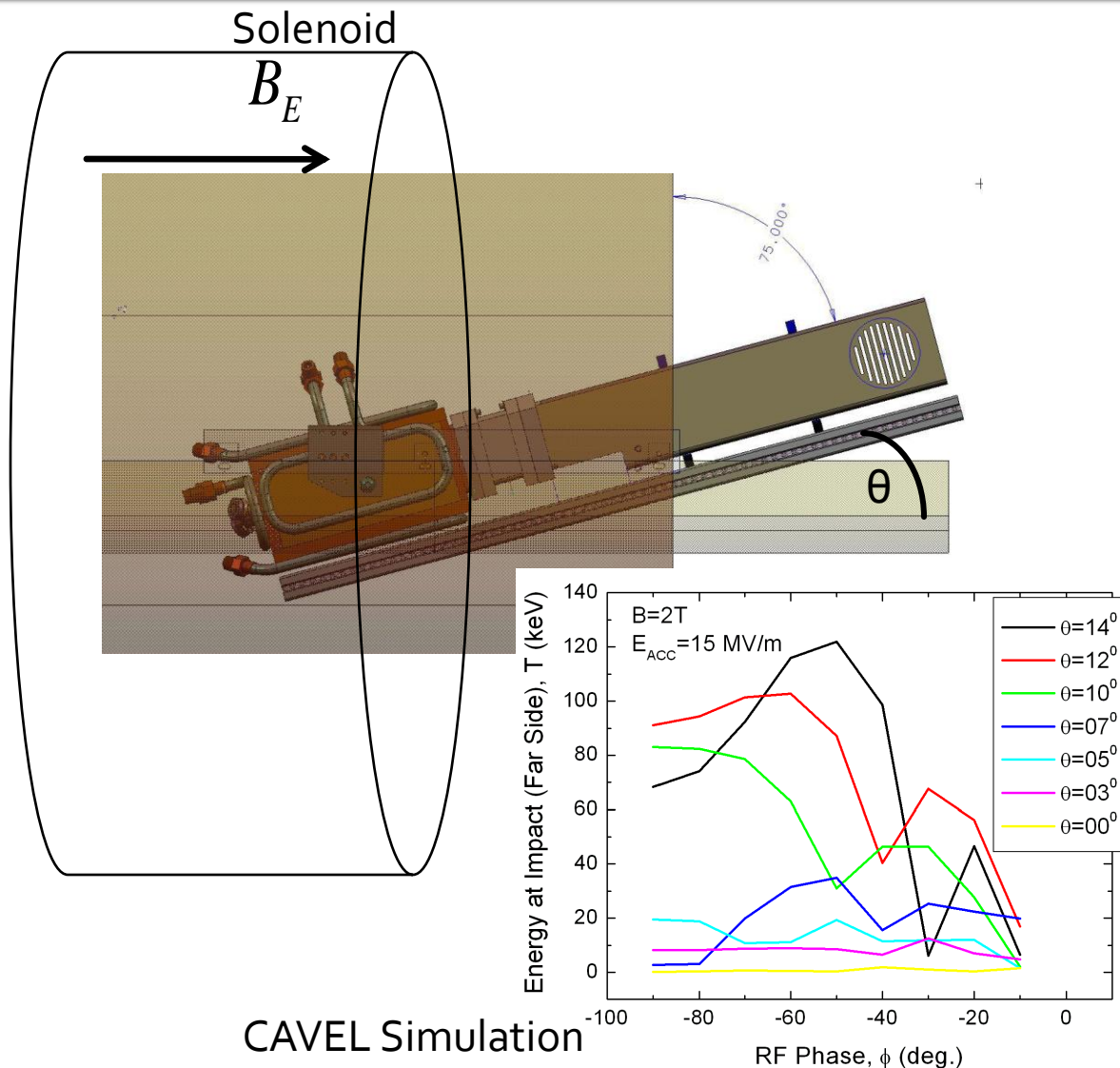
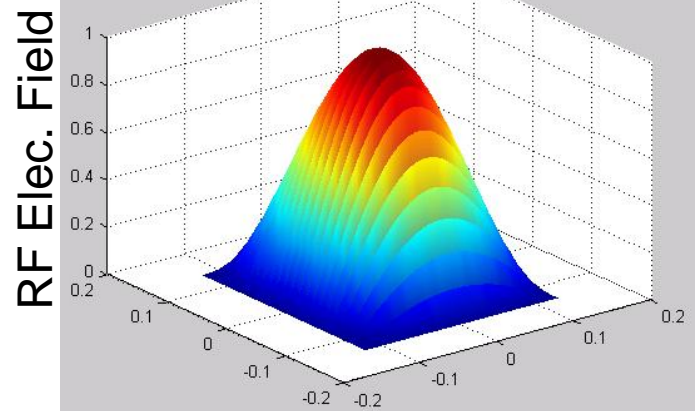
Experimental Configuration



Box-Cavity Experiment



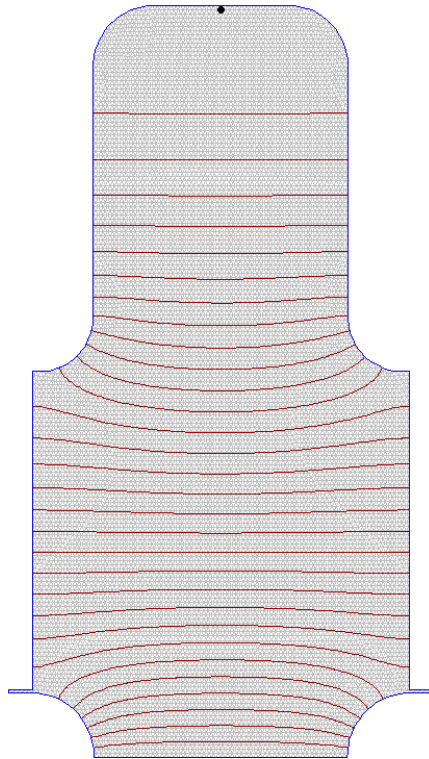
Credit: A. Moretti



Proposed Button Experiment

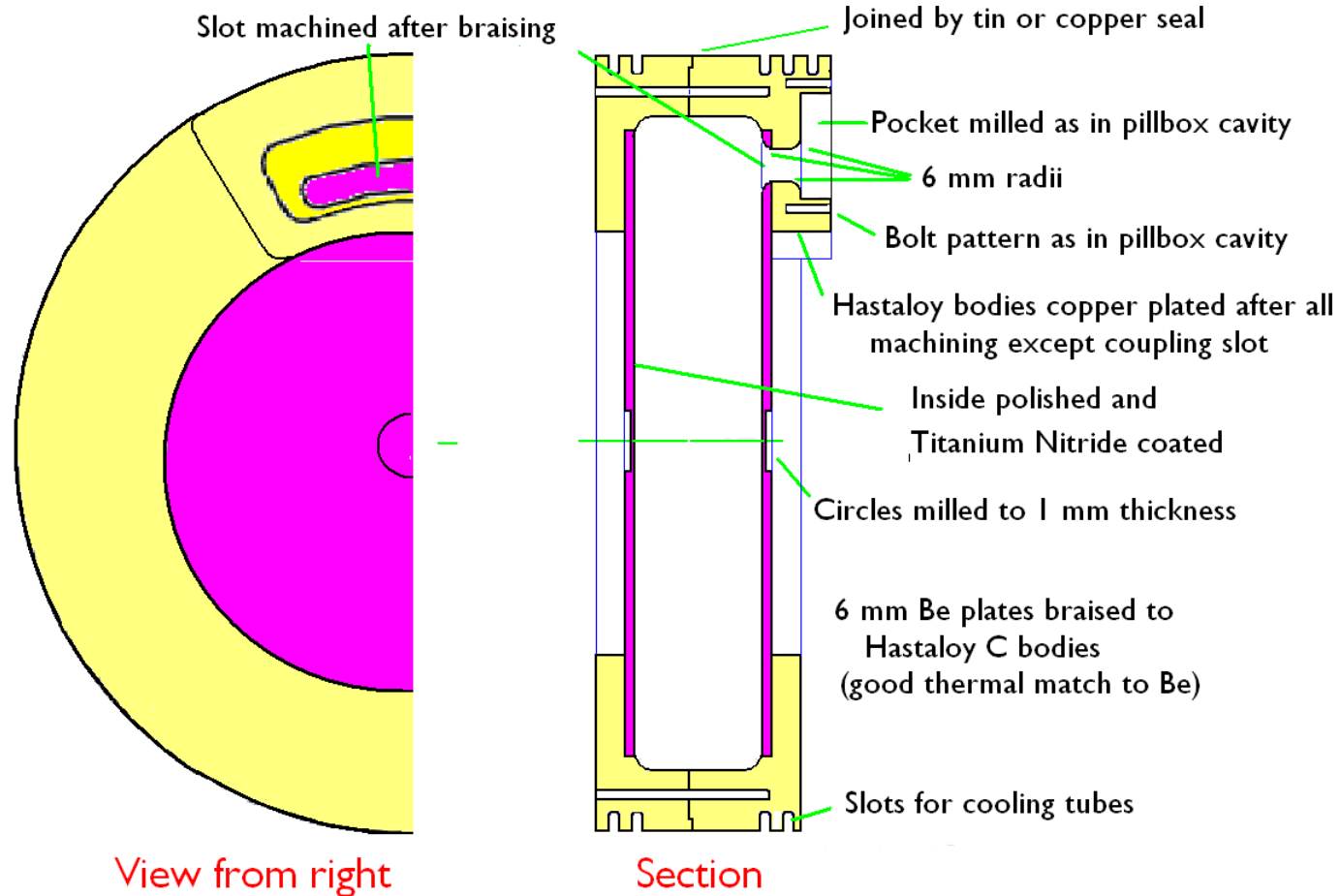


Credit: D. Huang



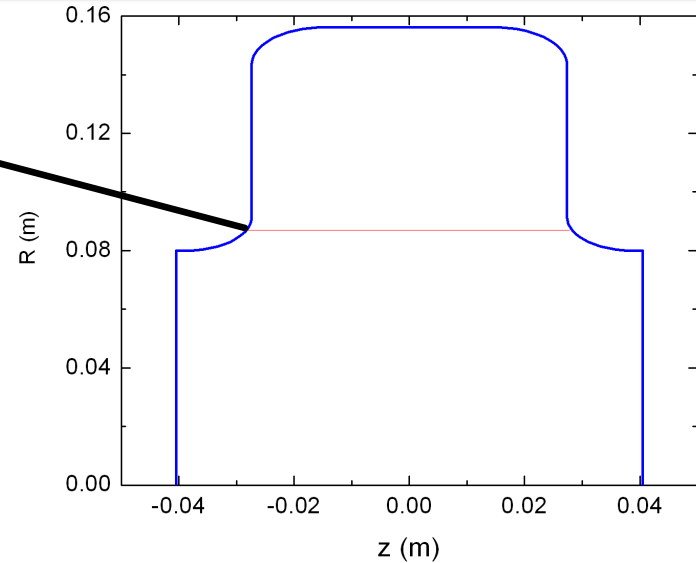
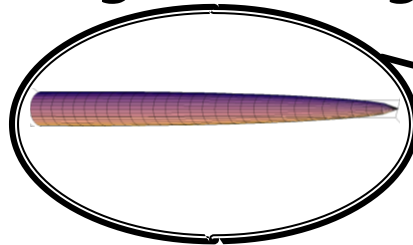
- Construction of two button pairs: one Cu-pair and one Be-pair
- Designed to achieve 3 times higher E-field than the iris
- Simulations predict that Be can sustain higher gradients than Cu (Palmer)

Be Cavity Experiment

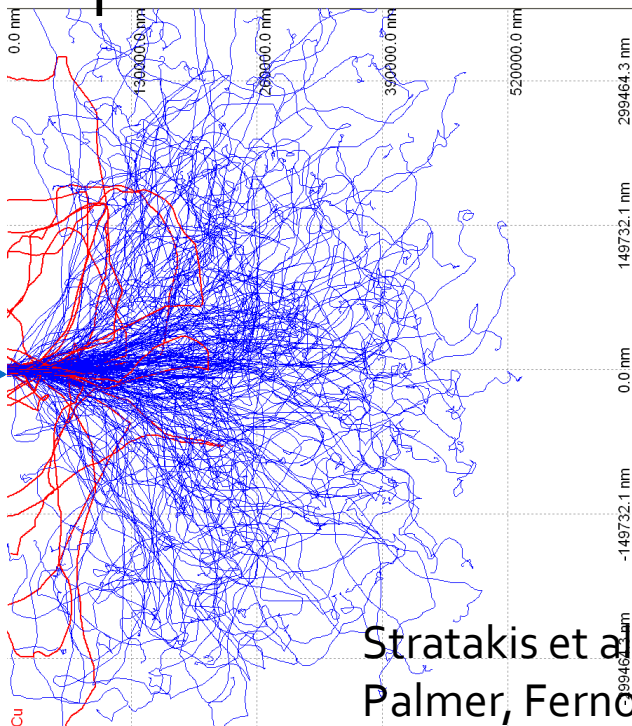


Simulation Studies for RF in B-fields at BNL

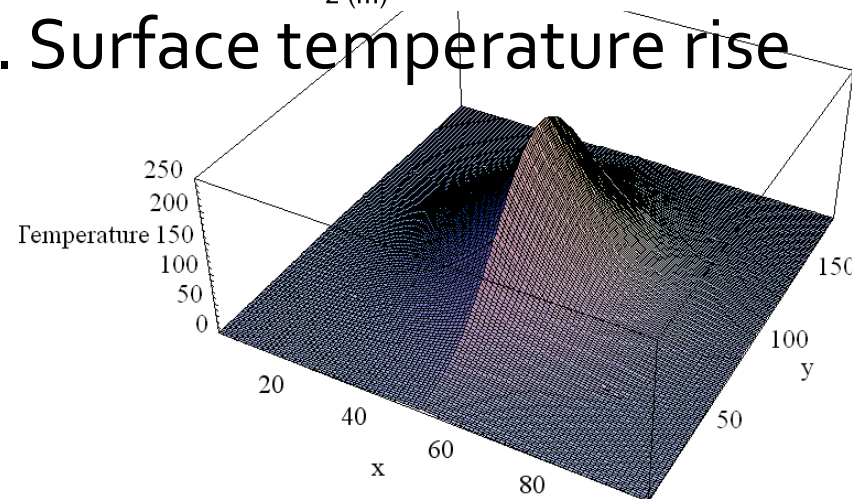
1. Emitter modeling-Tracking



2. e penetration in metals



3. Surface temperature rise



Stratakis et al. PAC 2009

Palmer, Fernow, Gallardo, Stratakis, Li, PRST-AB 031002 12 (2009)

Summary

- Experiments with RF showed serious operational problems in the presence of B-fields.
- This suggests the need of both experiment and theory to understand the effect on B-fields on RF cavities.
- Here experiments were outlined that will address this problem.