



# 805 MHz RF test plan: v1.0

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# Outline

- **Goals**
- **Pillbox cavity plan**
- **Rectangular cavity plan**
- **Discussions**



# Goals

- **Pillbox cavity:**

- Sustainable accelerating gradient w/ buttons: to find out the best material able to withstand the highest accelerating gradient w/ & w/o external magnetic field
- Sustainable accelerating gradient w/o buttons, w/ & w/o magnetic field (time and Helium are enough & button data look good)
  - **Regular configuration with both Be windows facing in same direction**
  - **Symmetric configuration with both Be window facing inward (to make field symmetric and concentrate on axis, in such a way to obtain results comparable to button test)**

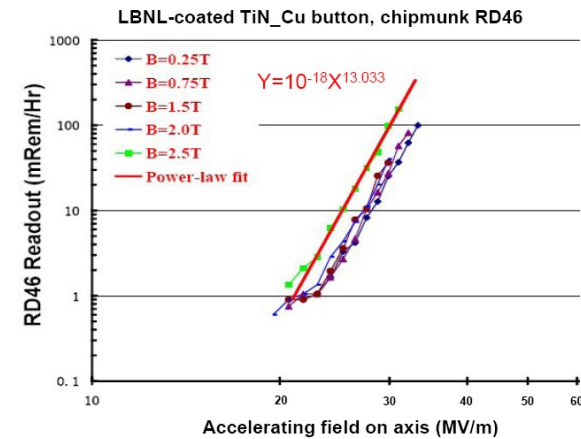
- **Rectangular (box) cavity**

- $E \times B$  test, breakdown gradient vs. angle between E & B field. Test of magnetic insulation theory



## Goals (cont.)

- **X-ray background**
  - Discover the strength and distribution of field emitters as a function of accelerating gradient and magnetic field for both the pillbox and rectangular cavities
    - **Doses & counts at various directions/locations**
    - **Energy spectrum by crystal detector**
  - **Safety: people and instruments**



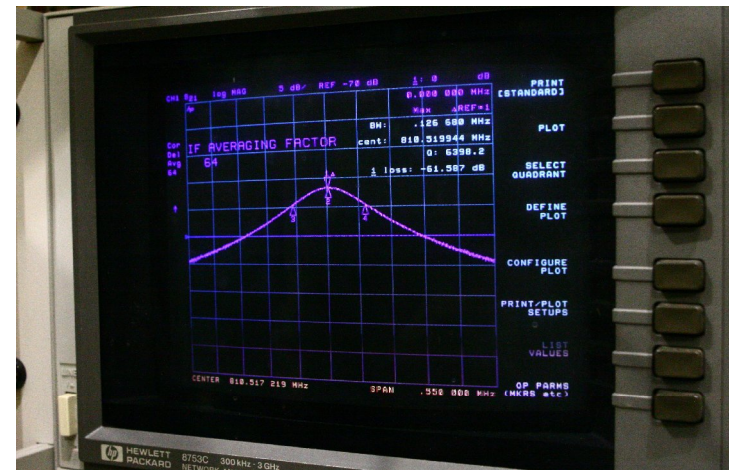
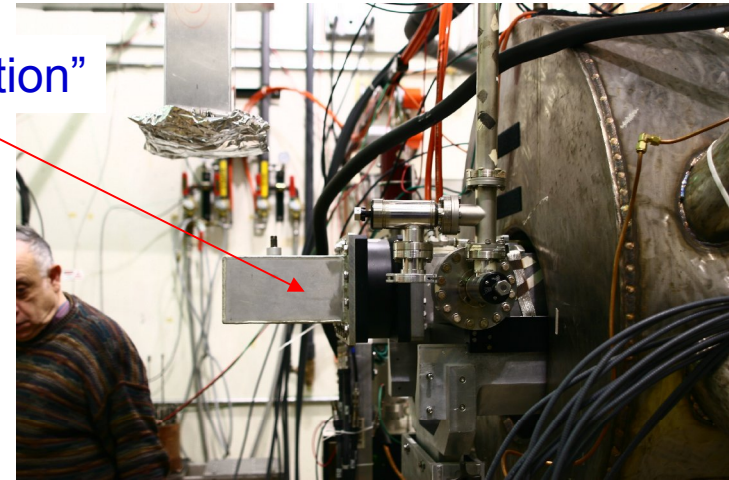
X-ray data last year

# Pillbox cavity plan

- **Low-level RF tests**

- Prerequisite: cavity remanufacture done
- Connect the cavity with Network Analyzer through the “transition” waveguide.
- Measure the s-matrix elements to obtain quality factor  $Q_0$ , matched resonant frequency  $f_0$ , reflection and transmission (coupling)
- Cable calibration

“transition”



## Pillbox cavity plan (cont.)

- **High-power tests**

- Prerequisites:

- MTA is ready, klystron is ready, refrigerator room is ready, etc.
- Transport RF power into MTA hall to a dummy load (done on 6/30/09)
- All X-ray detectors in position and wired, including “chipmunks” and scintillation counters, particularly the small scintillator paddle and crystal detector
- DAQ system checked and tested
- Cavity conditioned: **will condition cavity from high B to low B to save time & reduce damage**

- Button material tests

- Mo, Cu with TiN, W, etc.
- Test the maximal sustainable gradient and X-ray background at various magnetic field

- Be windows tests (time and Helium are enough & button data look good)

- Face in same and opposite direction
- Test the maximal sustainable gradient and X-ray background at various magnetic field



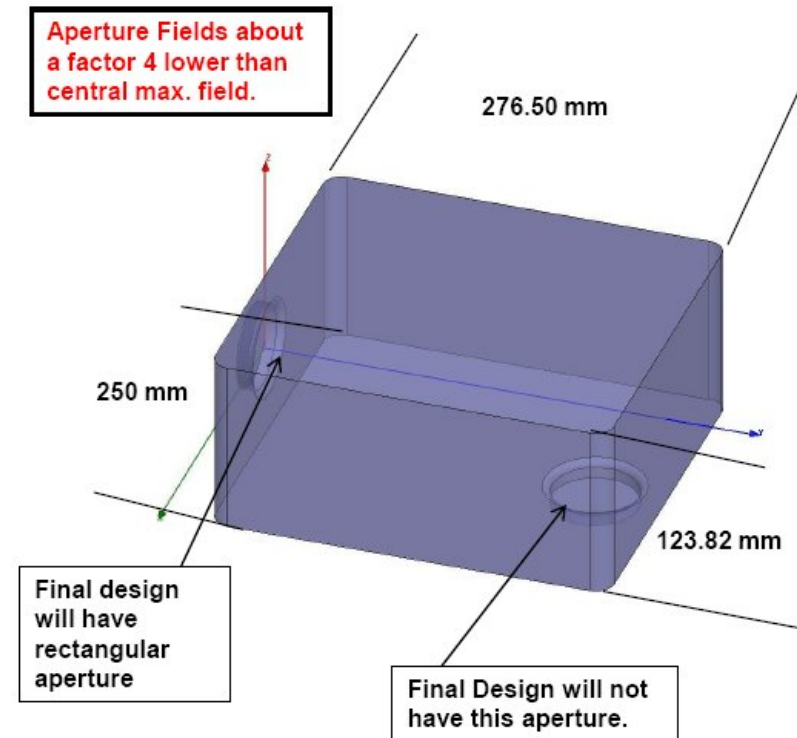
# Rectangular (box) cavity plan

- **Low-level RF tests**

- Prerequisite:

- Cavity is ready, parts machined, polished (see Al Moretti's NFMCC Friday meeting talk on 5/29/09)

- Same as the pillbox cavity, connect to the "transition", measure  $f_0$ ,  $Q_0$ , reflection and transmission

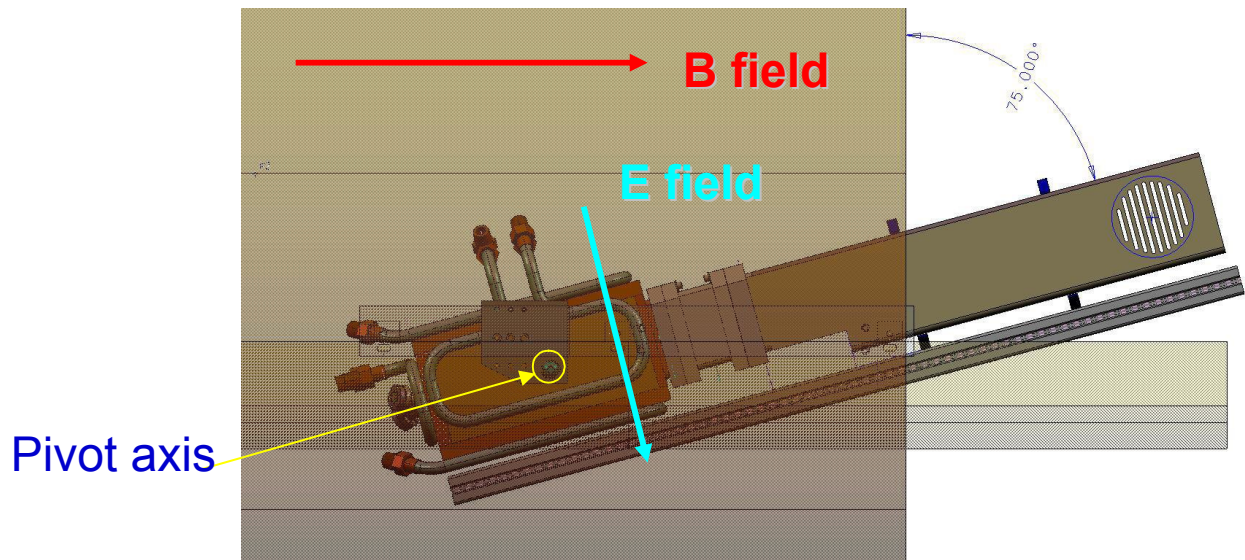


from AM's presentation on 05/29/09

## Rectangular cavity plan (cont.)

- **High-power RF tests**

- Prerequisites: same as the pillbox cavity high-power tests
- Measure the maximal sustainable accelerating gradient at various angles and magnetic field, rotatable from  $78^\circ$  to  $102^\circ$ , start at  $90^\circ$  (can reach  $\pm 15^\circ$  if moving the pivot axis 1 inch down)







## Discussions

- **Rectangular cavity will be ready in 6 weeks after 07/13/09, according to schedule**
- **Probably start rectangular cavity tests first**
- **Start pillbox cavity tests when it is totally ready**
- **More...**



## **P. S.: refrigerator updates from T. Cross**

**On 07/06/09:**

- **Two new helium and nitrogen distribution boxes. One is on the refrigeration room and one in the hall.**
- **A 4" helium gas return line from the hall distribution box that goes to the compressor suction line.**
- **A 3/4" helium gas return line that comes off of the magnet. This line has a vaporizer and 3.5kw heater in it.**
- **The solenoids for the lead flows are routed up stairs.**

**The 4" gas return line and lead flows are complete from the hall to the penetration in the refrigeration room. They still need to be tied into the suction line of the compressor.**

**The 3/4" in magnet return line is partially done. In the hall it needs to be tied to the magnet and vaporizer. In the refrigeration room it needs to be tied to the suction line of the compressor.**