Status of the 201-MHz Prototype Cavity

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The 201-MHz Cavity Parameters

The cavity design parameters

- Frequency: 201.25 MHz
- ß = 0.87
- Shunt impedance (V_T^2/P): ~ 22 M? /m
- Quality factor (Q_0): ~ 53,000
- Curved Be window with radius and thickness: 21-cm and 0.38-mm

Nominal parameters for cooling channels in a neutrino factory

- Up to ~16 MV/m peak accelerating gradient
- Peak input RF power ~ 4.6 MW per cavity (assuming 85% of Q_0 and 3 times filling time)
- Average power dissipation per cavity ~ 8.4 kW
- Average power dissipation per Be window ~ 100 watts

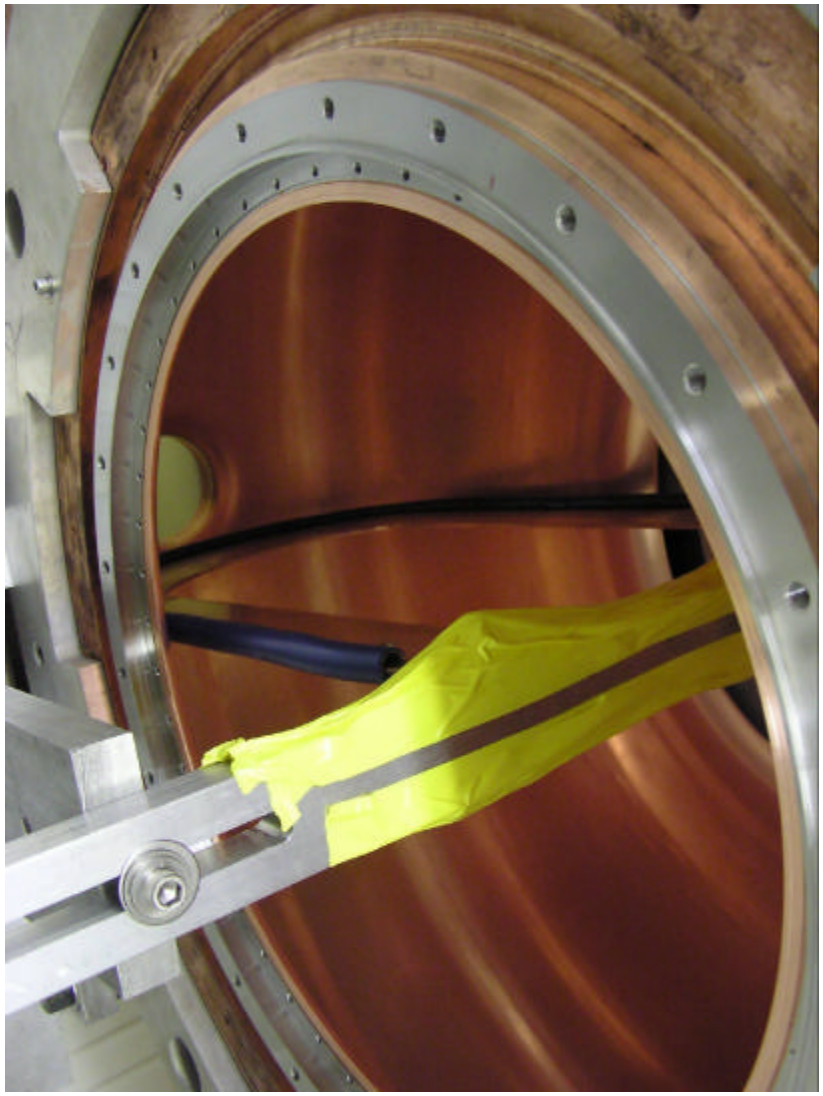
The 201 MHz Prototype Cavity

The Cavity status: still at Jlab

- **Cavity Body**
  - — **Done with mechanical buffing (cleaning)**
  - — **Waiting for EP**
    - **Already assembled and ready for filling water (leak check)**
    - **Electrode is in place and ready to go**
    - **Materials (acid and butanol) are ready**
    - **Set up (rotation mechanism) is ready**
    - **Waiting for safety review**
    - **Should start either today or early next week depending on the safety review (signatures)**

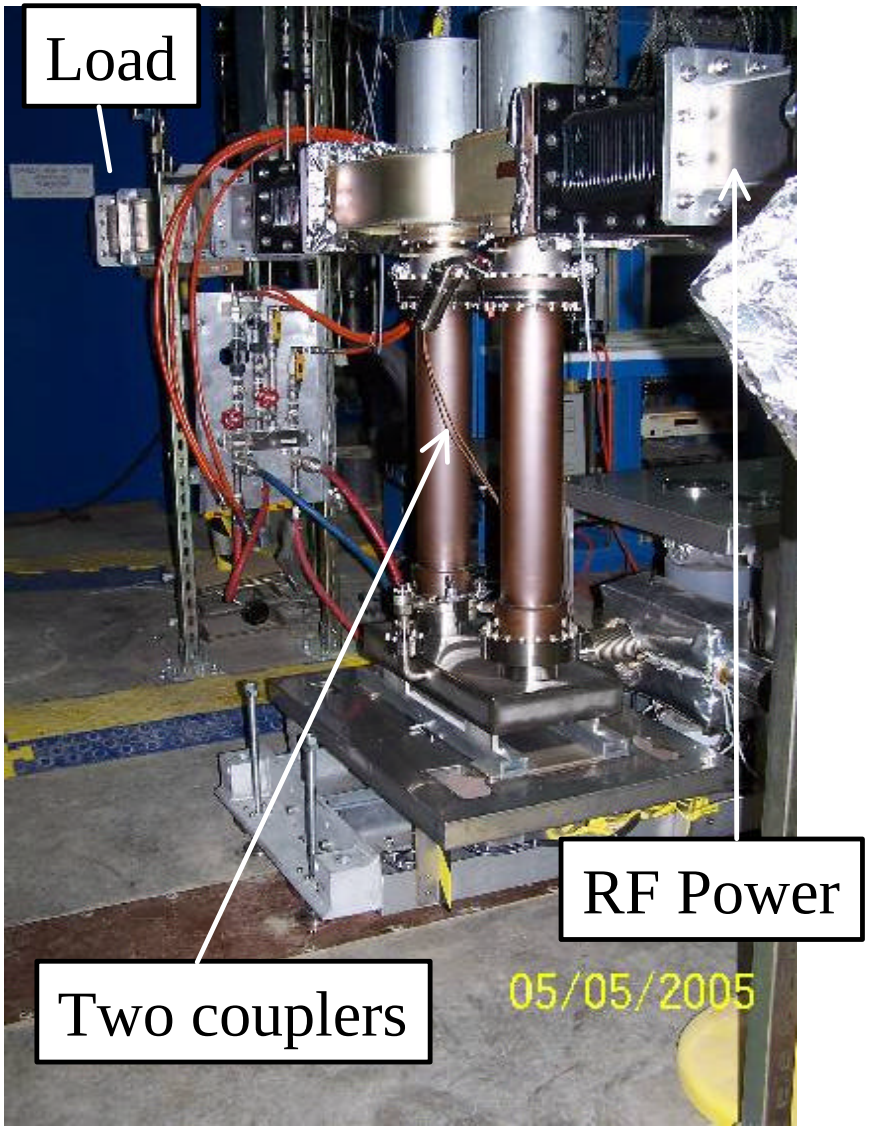
EP Set Up at JLab

The Electrode (U-Shape)



The U-Shape electrode for EP at JLab

The Prototype Cavity (cont'd)



Couplers

- Conditioning started during PAC-05 week at SNS
- Good vacuum ~ low 10^{-8} T
- Achieved 600 kW in TW mode (matched load)
- Achieved 10 kW average power (~ 9 kW for nominal NF parameters)
- Achieved 2.4 MW peak power in SW mode (at variable short positions)
- Ceramic windows work fine in nearly two weeks of the RF conditioning

Curved Be Windows for the Cavity (old)

- Succeeded in two curved Be windows for the 805-MHz cavity
- Placed purchase order of three Be windows for 201-MHz cavity:

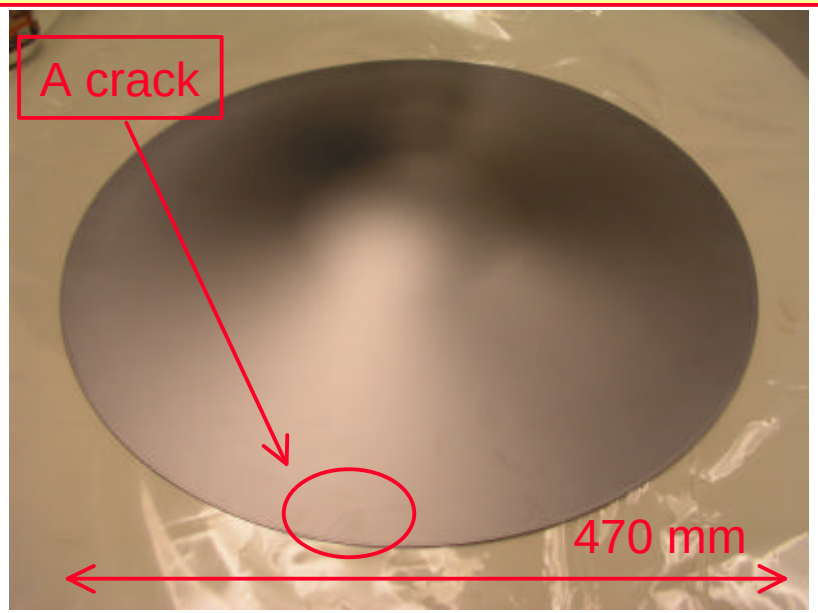
  0.38 mm thick, 420 mm diameter

  at Brush-Wellman (~100 watts per window with ? T~ 55 degrees at nominal Study-II parameters)
- Window is formed by applying a die at elevated temperature
- Copper frame is brazed to Be window
- Be windows will be Ti-N coated

Brush-Wellman attempted twice so far:

- warping (1st one)
- cracking (2nd one) on edge, but still can be used
- Very confident for future ones

– Present a perfect conducting BC for RF.
– Min. scattering and mechanically strong



~ 470 mm diameter curved Be window for the 201 MHz cavity formed

at Brush-Wellman.

This window has a crack on the edge, but still can be used (brazed under Cu frame).

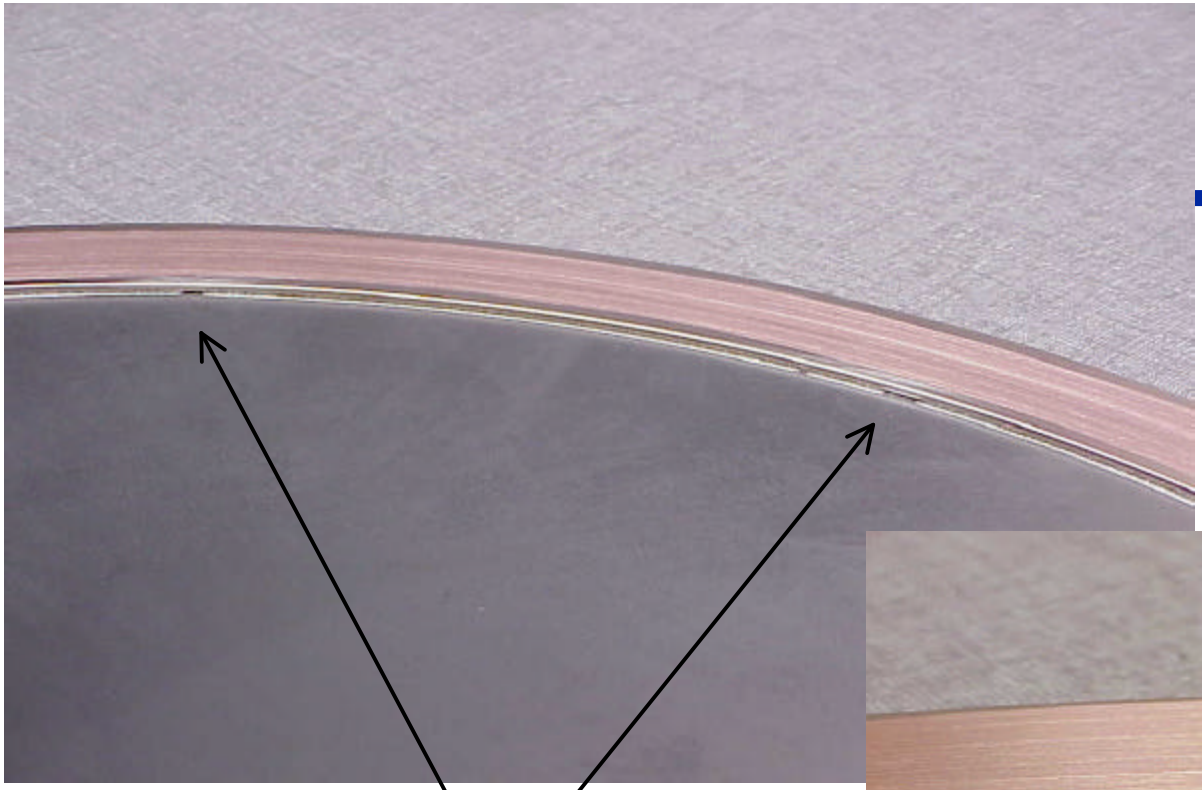
Curved Be Windows

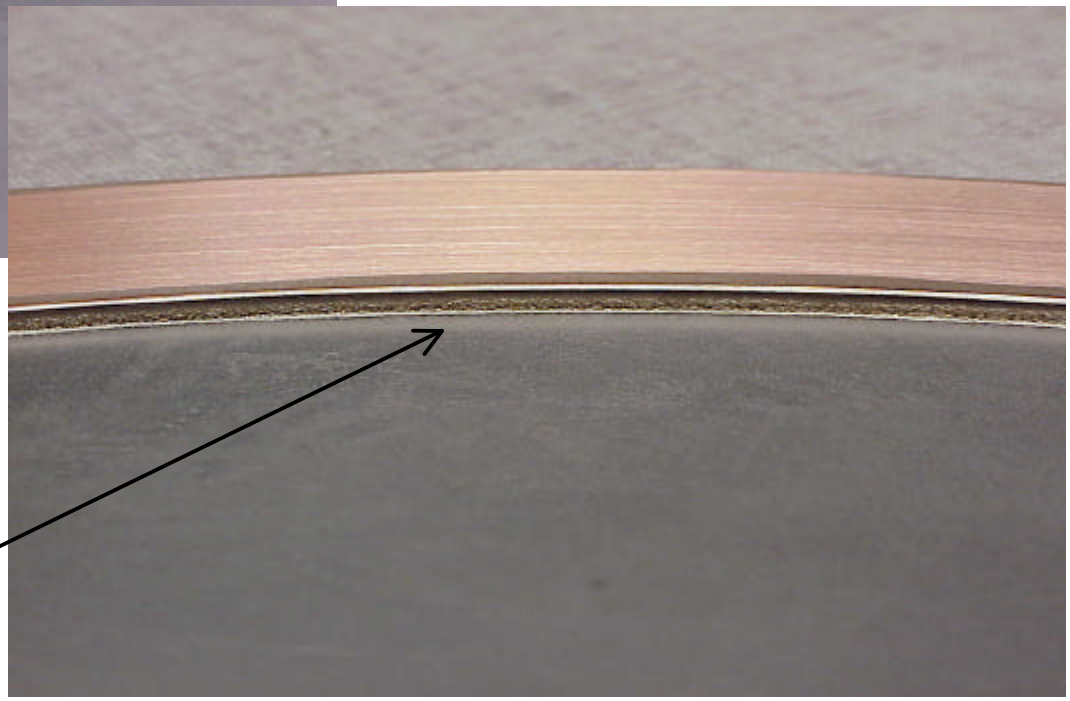
- Visited Brush Wellman recently
  - — Concerns: forming and braze
- CMM measurement of the first curved Be window
  - — 420-mm diameter and 0.38-mm thick
  - — Successful forming
  - — Good braze on one (curved in) side
- Visual inspection of the second curved window
  - — ”Good” braze both sides (better control)
  - — Again, very successful forming
  - — A few small gaps between Cu frame and Be (max ~ 4-mm), do not expect to be a problem

Curved Be Windows (cont'd)

The second curved Be window

Close-Up View of the Window





Small gaps, max ~ 4-mm

Braze between Cu frames and the beryllium foil

Summary

- Cavity is nearly complete except waiting for the EP at Jlab
- Couplers are conditioned, ready to go
- Curved Be windows:
  - Two are usable, will be Ti-N coated in next two to three weeks
  - One is under way
- Expect to ship the cavity to MTA as soon as the EP is finished