Preparation Procedures for Testing the LANL/AAA Spoke Cavities

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LANL

Workshop on the Advanced Design of Spoke Resonators

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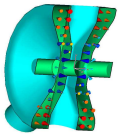
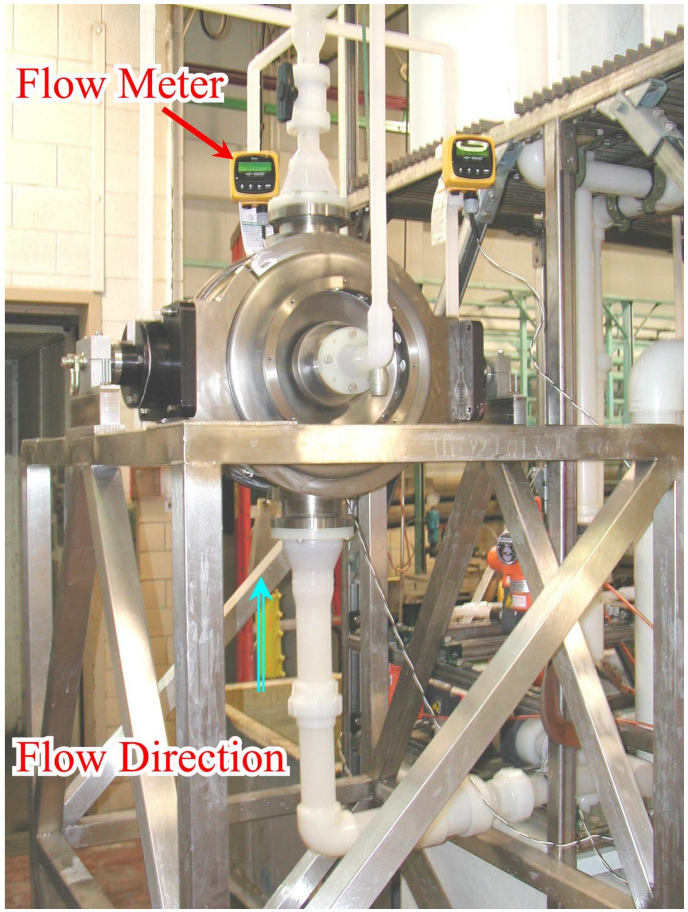


Buffered Chemical Polishing (BCP)

$HF:HNO_3:H_3PO_4$=1:1:2 by volume at < 15 ºC

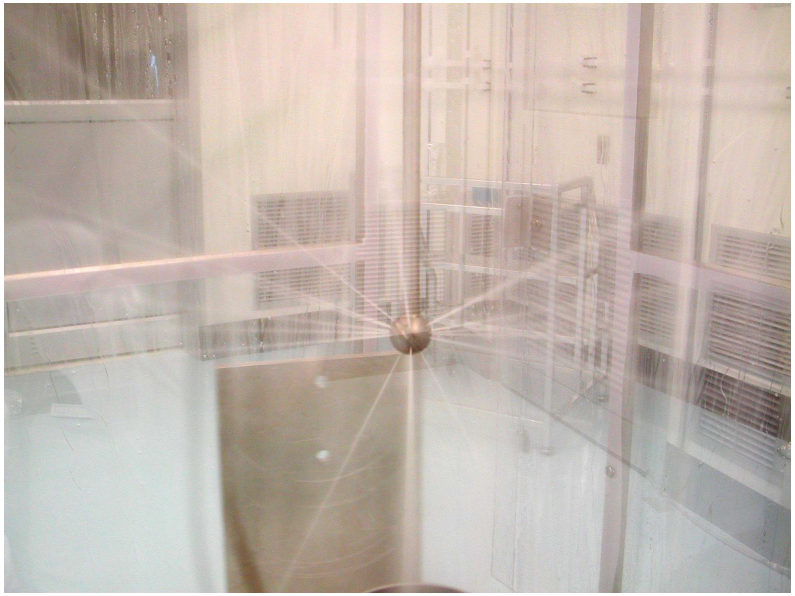
EZ02

EZ01



High Pressure Rinsing (HPR)

- Ultra-pure water
- Pressure 1000-1200 psi (69 – 83 bar), ~10 L/min.
- At 4 positions
  - beam port 1 (10 min.)
  - radial port 1 (10 min.)
  - beam port 2 (10 min.)
  - radial port 2 (20 min.)
- Sweep speed
  - Up ~ 4 mm/s
  - Down ~ 7.5 mm/s
- Table rotation ~ 23 rpm



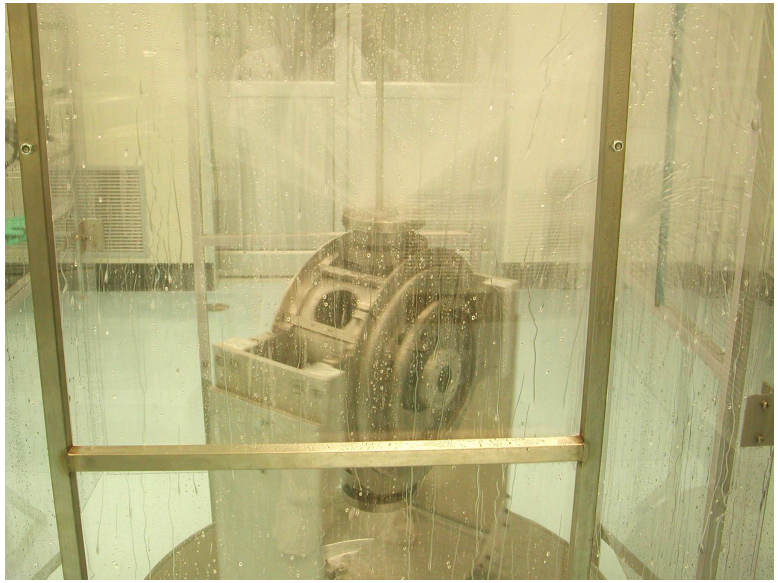
Nozzle

Outer diameter: 31.75 mm

Holes: 457 μm-diam., 3.81 mm long

No. of holes: 21

11 different angles to cover all the surfaces

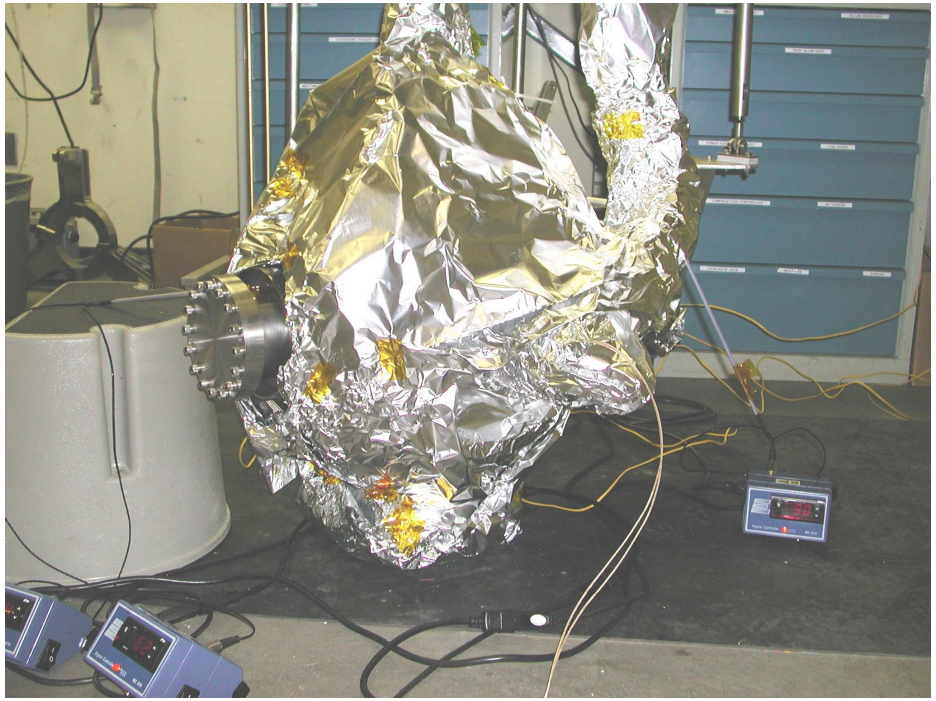


Assembly in the Clean Room

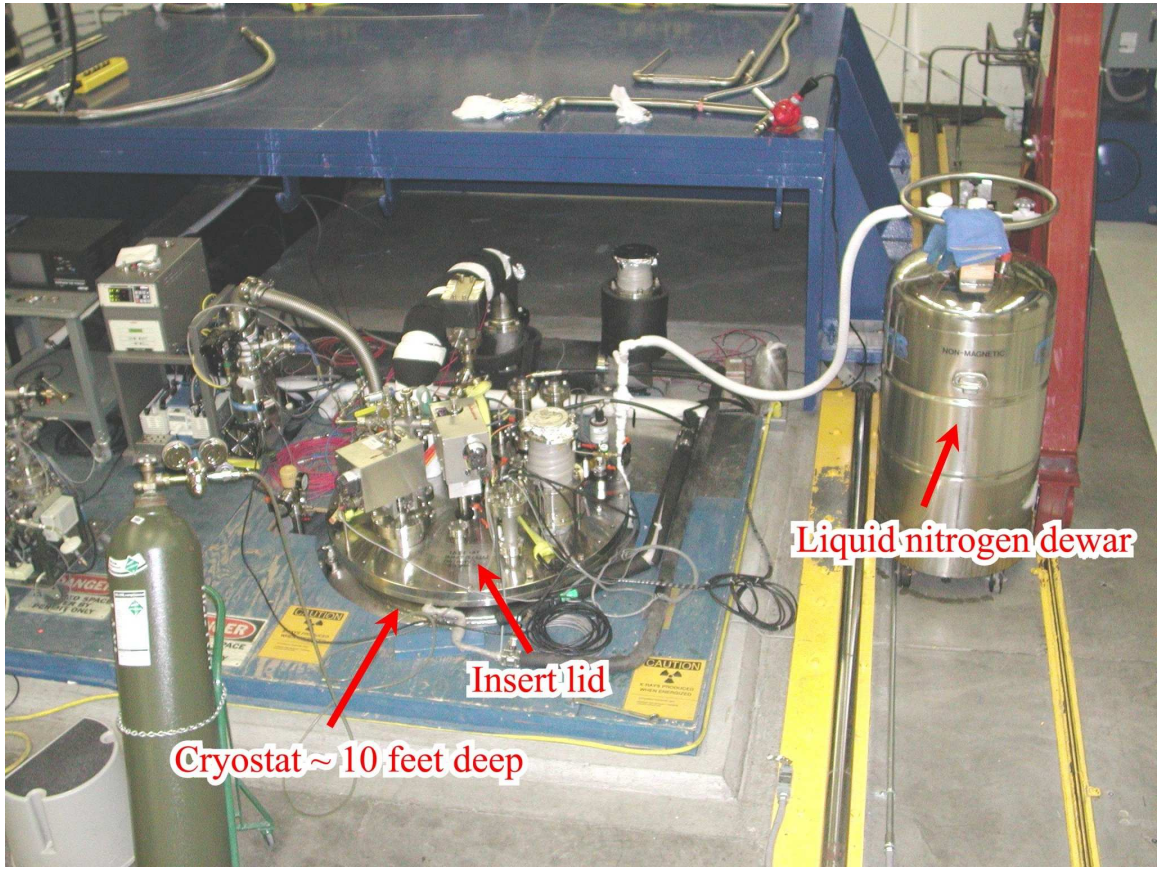
- Clean room class 100
- For tapped holes, anti-seize grease is used
- For through holes, SS bolts and silicon-bronze nuts are used.
- Nominally, all the flanges are Conflat, but indium seals were used to attach Nb blank flanges on the large radial ports for the vertical tests.
- Special polyethylene cover was made to attach indium on the flat surface inside of Conflat knife edge.

Set Up on the Insert and Baking

Baking at ~ 110 ºC for ~ 2 days
Indium < 80 ºC

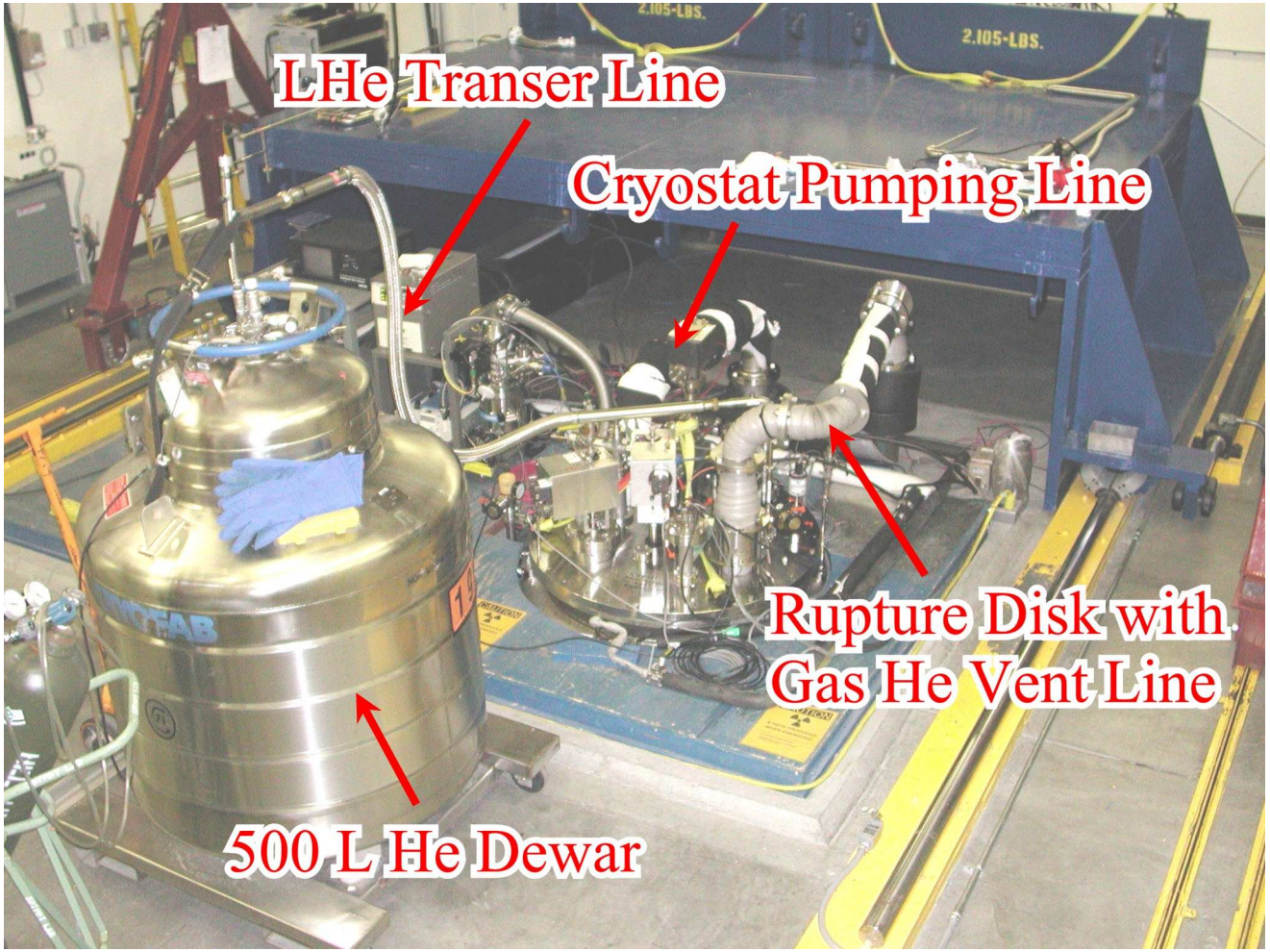


Indirect Pre-Cooling with LN



- Fill the vacuum-insulated layer between inner and outer vessel with LN
- This operation is carried out one day before LHe transfer
- When LHe transfer starts, the cavity temperature is ~ 250 K

Helium Transfer and Testing



RF Tests and Helium Processing

- LavView6.1 software has been used for automated data acquisition. Web broadcasting or monitoring of background data has been very useful.
- Helium injection to the cavity has been automated so that we can control the amount of injection, but it has been unable to control the amount precisely yet.

Summary and Issues for Improvement

- BCP, HPR, clean assembly, setting on the insert, baking and testing at 4 K and 2 K were described.
- Issues we are planning to improve in the future
  - Better BCP flow control and may try EP in the future
  - Face shield during assembly to avoid contamination with particles from human face
  - Better anti-seize coating for bolts
  - Better control of He injection during helium processing