ANL CRAB CAVITY FABRICATION @ JEFFERSON LAB

LHC-CC08 WORKSHOP @ BROOKHAVEN

FEBRUARY 25, 2008

LARRY TURLINGTON

ANL CRAB CAVITY

ANL CRAB CAVITY FABRICATION

- When I saw the drawing for the Crab Cavity I wanted to have a part in the fabrication. After building numerous elliptical, round Cavities I saw a challenge in fabricating this Cavity.
- I'm a member of the Special Project group within the SRF Division.
- Personnel used in the fabrication of the Crab Cavity:

Myself, Senior Engineering Associate

Bob Rimmer, Director of SRF Institute

Peter Kneisel, Senior SRF Physicist

ANL CRAB CAVITY FABRICATION

Haipeng Wang, Accelerator Engineer-RF Structures

Gary Slack, Machinist

Steve Manning, Electron Beam Welder

Bill Clemens, Electron Beam Welder

Jim Henry, Senior Designer

- You can see we had a lean efficient project.
- Jefferson Lab has all the facilities and personnel for rapid prototyping and testing.

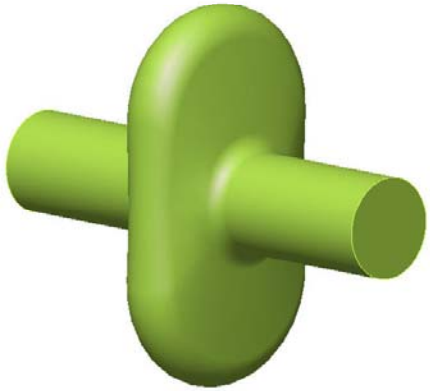
ANL CRAB CAVITY FABRICATION TIMELINE

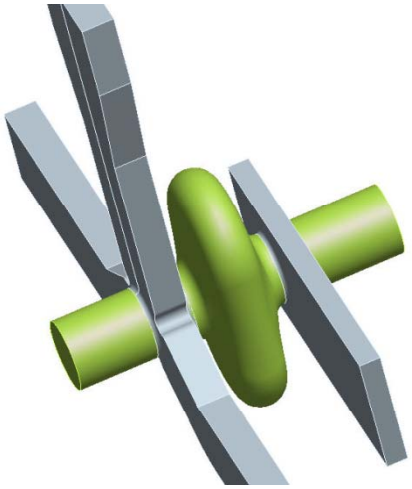
- Received initial design late June 2007
- Cost estimate early July 2007
- Die and fixture drawings finished late August 2007
- Project approved early September 2007
- Dimensions and models finalized early October 2007
- Drawings revised early October 2007
- Die and fixture contract awarded mid October 2007
- Nylon male and female Die CNC test pieces received late October 2007

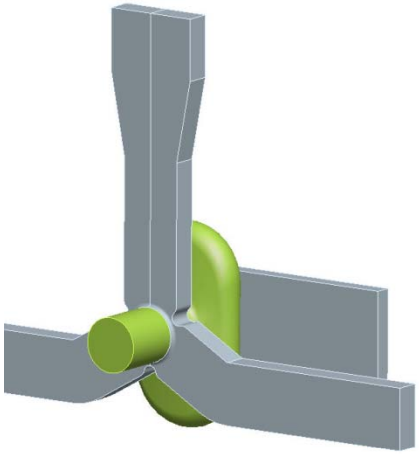
ANL CRAB CAVITY FABRICATION TIMELINE

- Fabrication dies and fixtures received early November 2007
- Parts deep drawn and machined late November 2007
- EBW complete early December 2007
- Cavity complete December 12, 2007
- First Cryostat test Mid December, 2007
- Total time for fabrication was a little over three months which included three weeks of modeling time
- Jefferson Lab's management provided the necessary support to complete this project in a timely manner

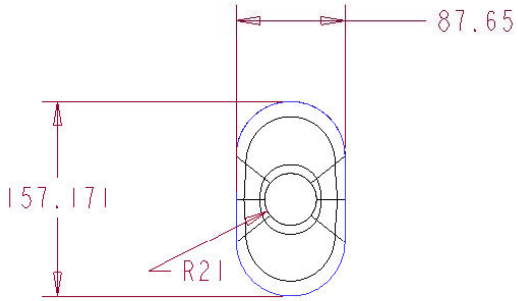
ANL CRAB CAVITY MODELS
Received from ANL

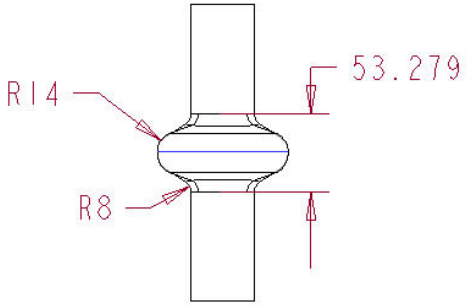


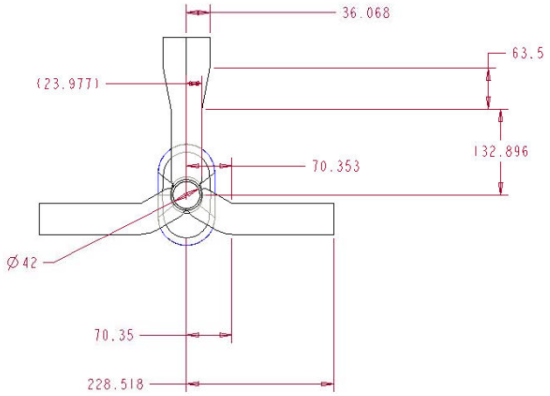


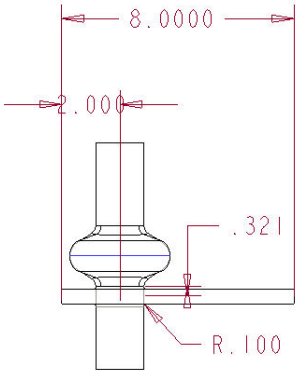


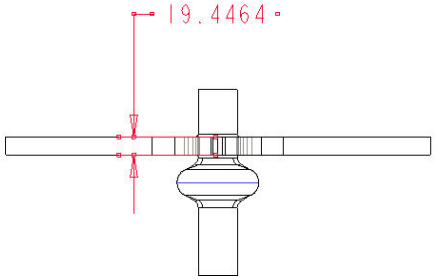
ANL CRAB CAVITY DRAWINGS
Received from ANL

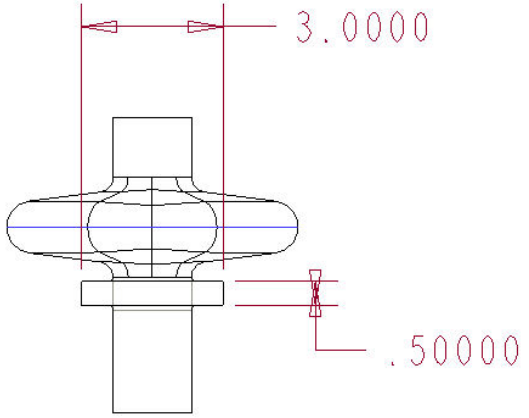






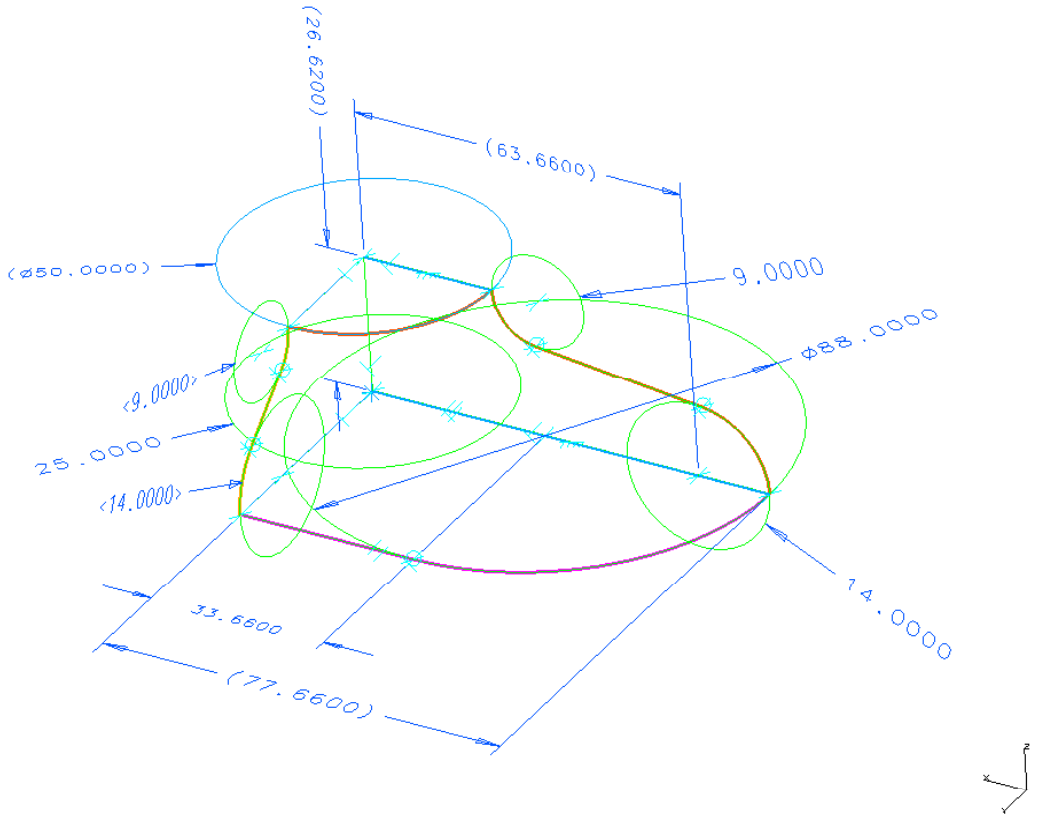




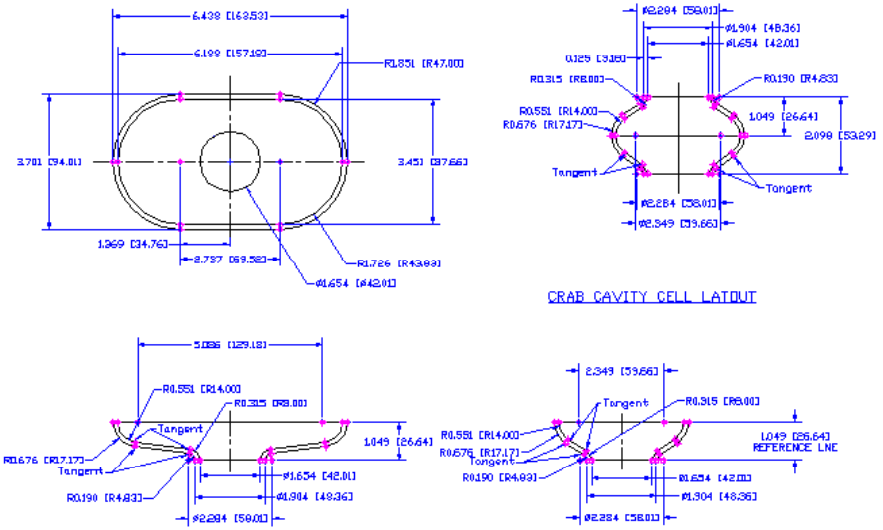


Jefferson Lab

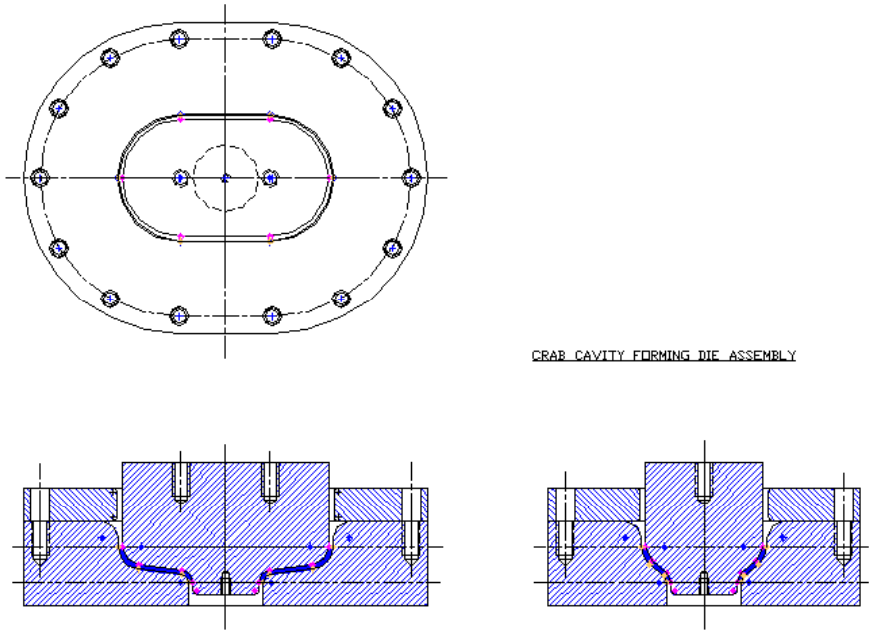
ANL CRAB CAVITY 3-D MODEL
Provided to Machine Shop



ANL CRAB CAVITY 2-D LAYOUTS

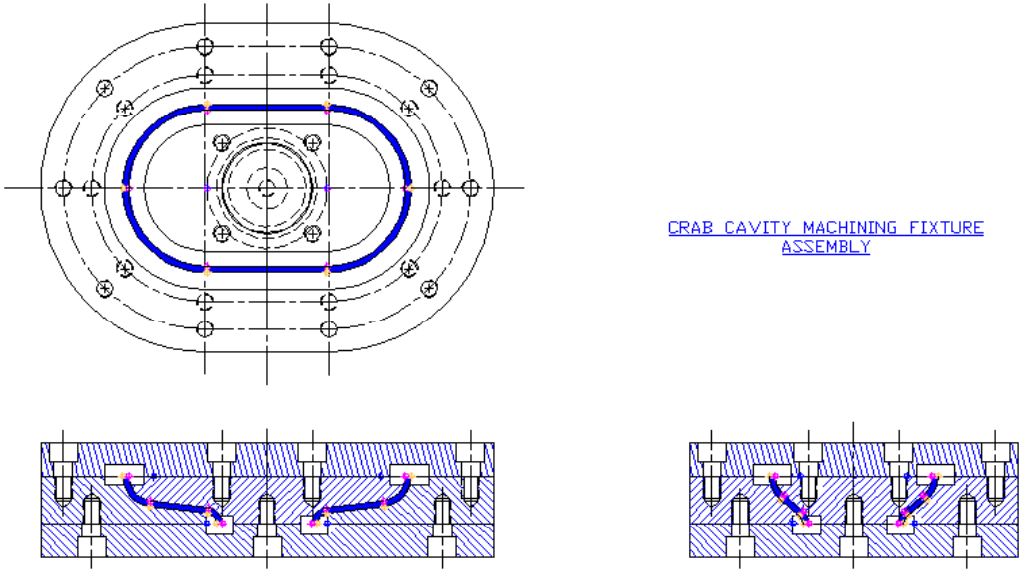


ANL CAVITY FORMING DIE



ANL CRAB CAVITY FORMING DIE

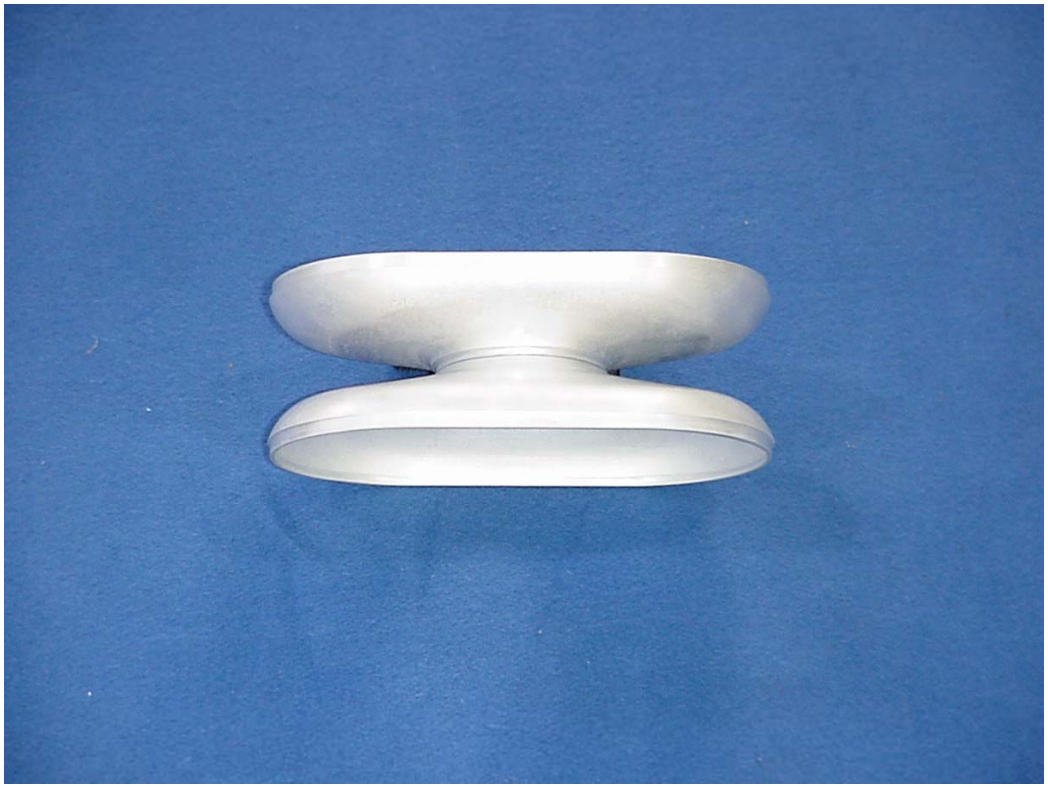
ANL CAVITY MACHINING FIXTURE



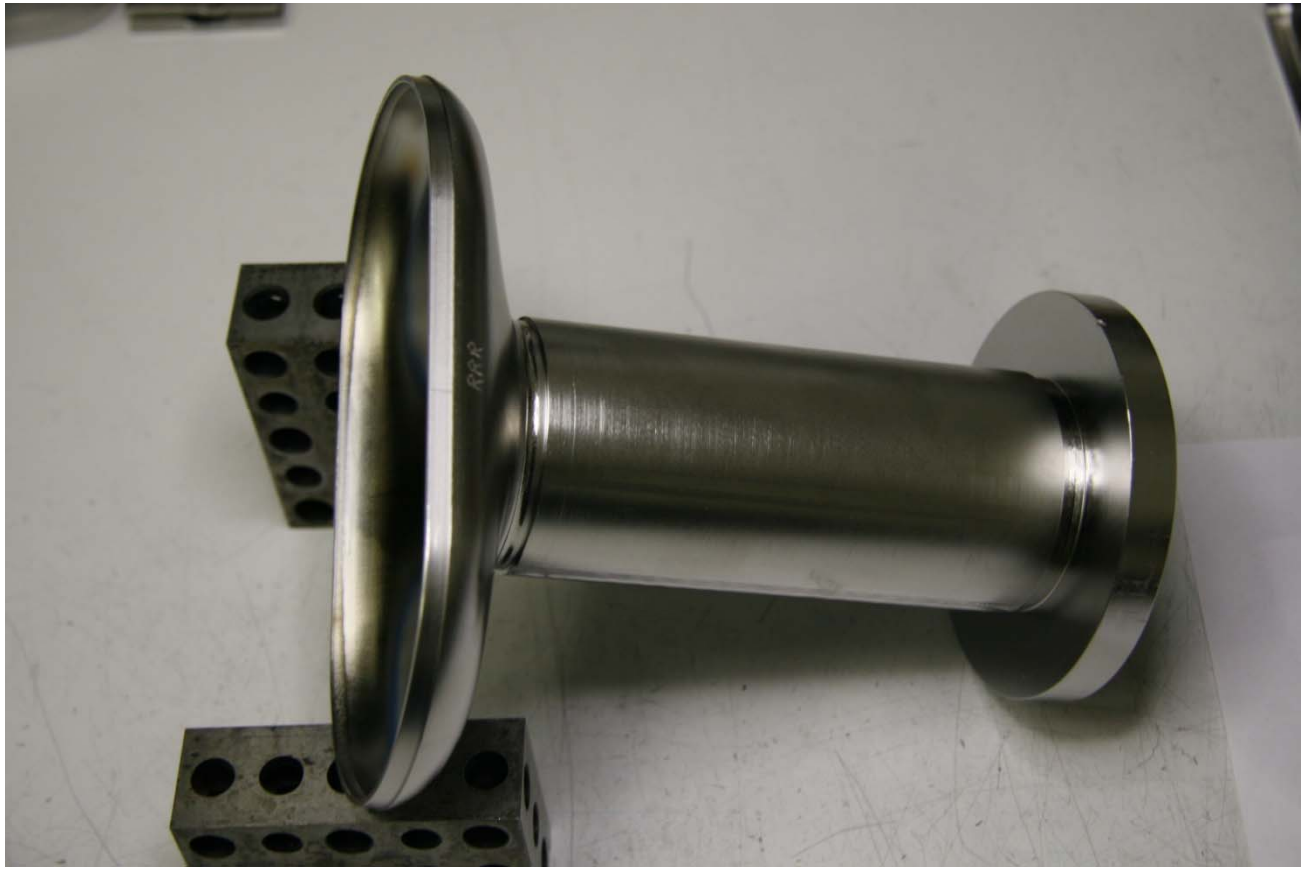
ANL CRAB CAVITY MACHINING FIXTURE

ANL CRAB CAVITY HALF CELLS AND CELL BLANK

ANL CRAB CAVITY ALUMINUM DUMB BELL For RF Measurements

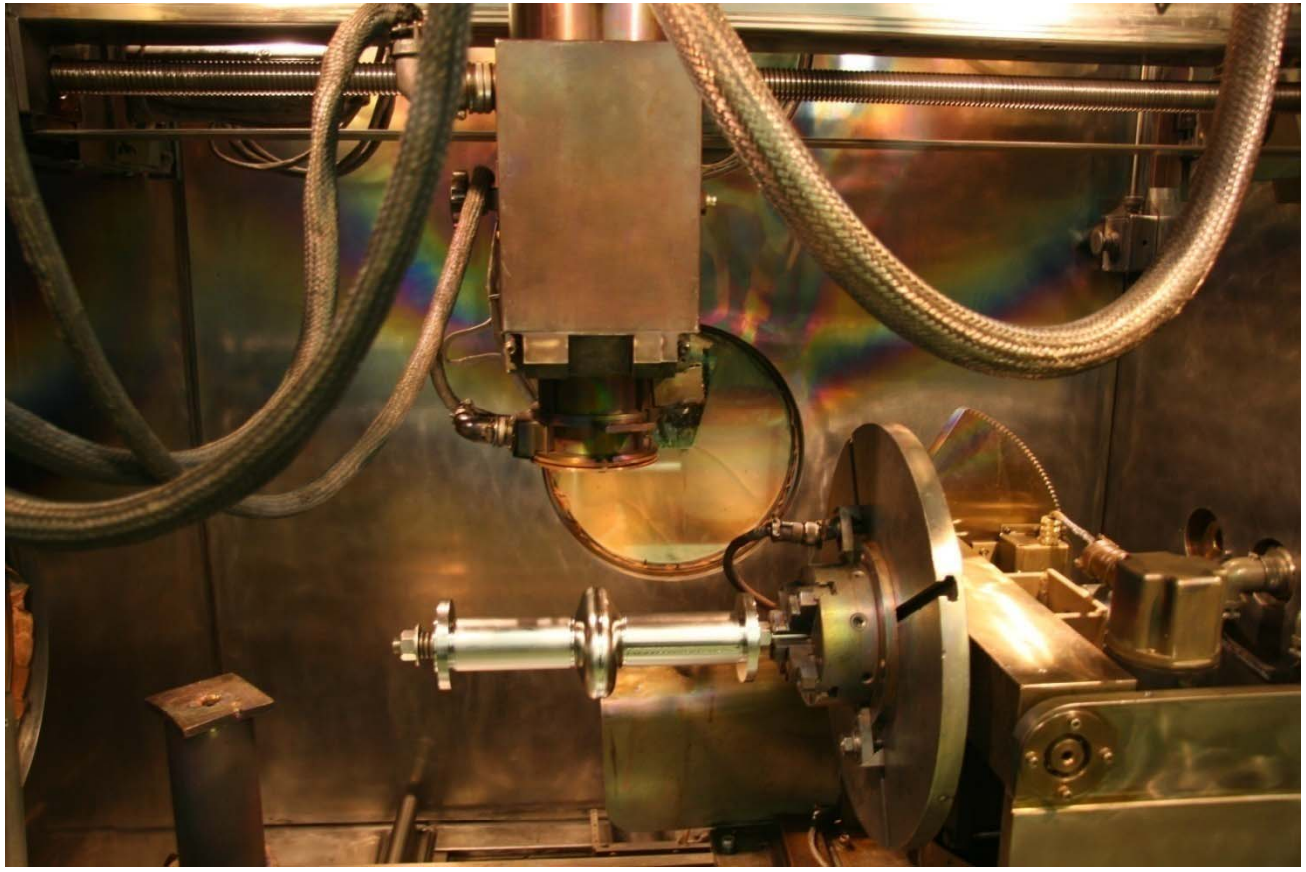


ANL CRAB CAVITY HALF CELL + BEAM TUBE AND FLANGE

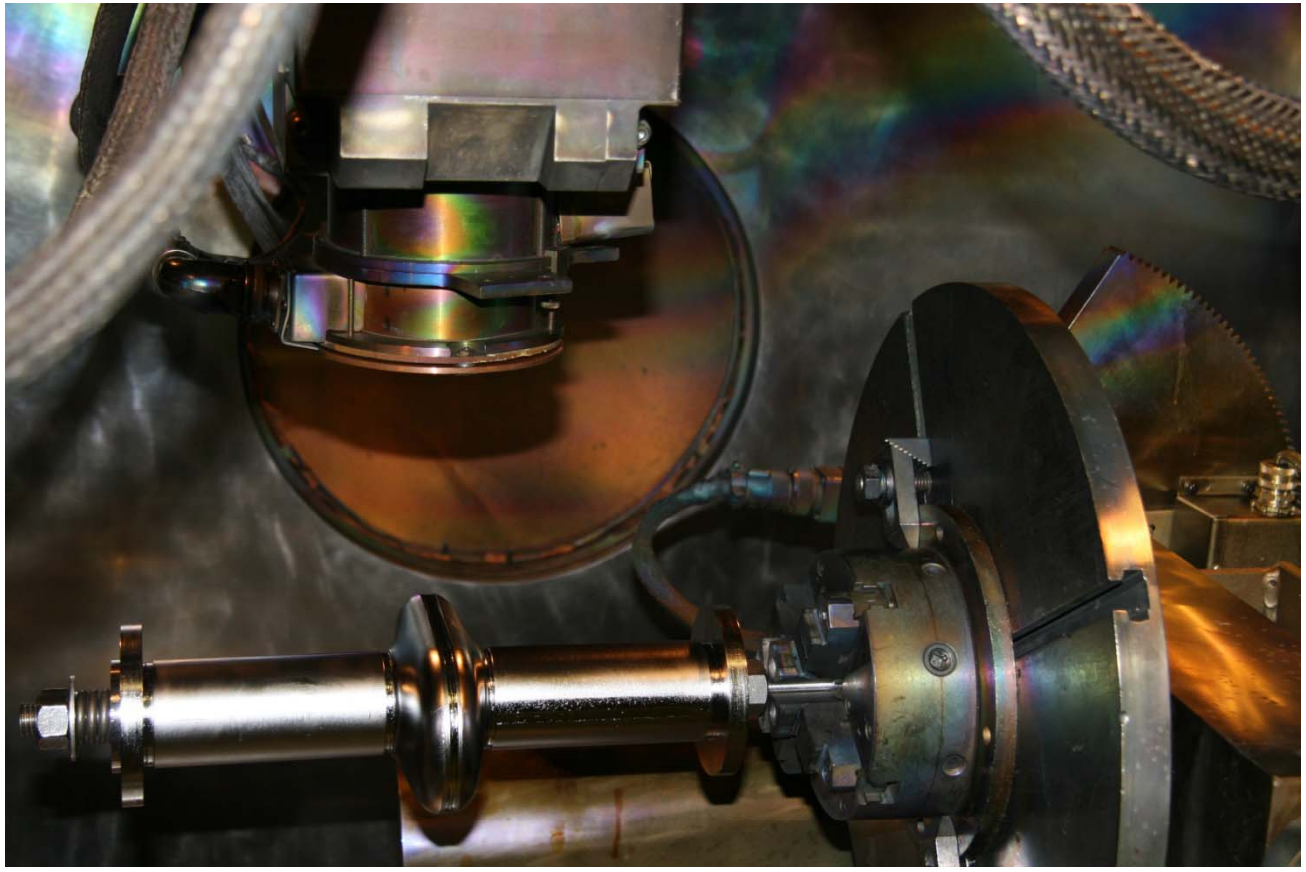


ANL CRAB CAVITY HALF CELL + BEAM TUBE AND FLANGE

ANL CRAB CAVITY EBW



ANL CRAB CAVITY EBW

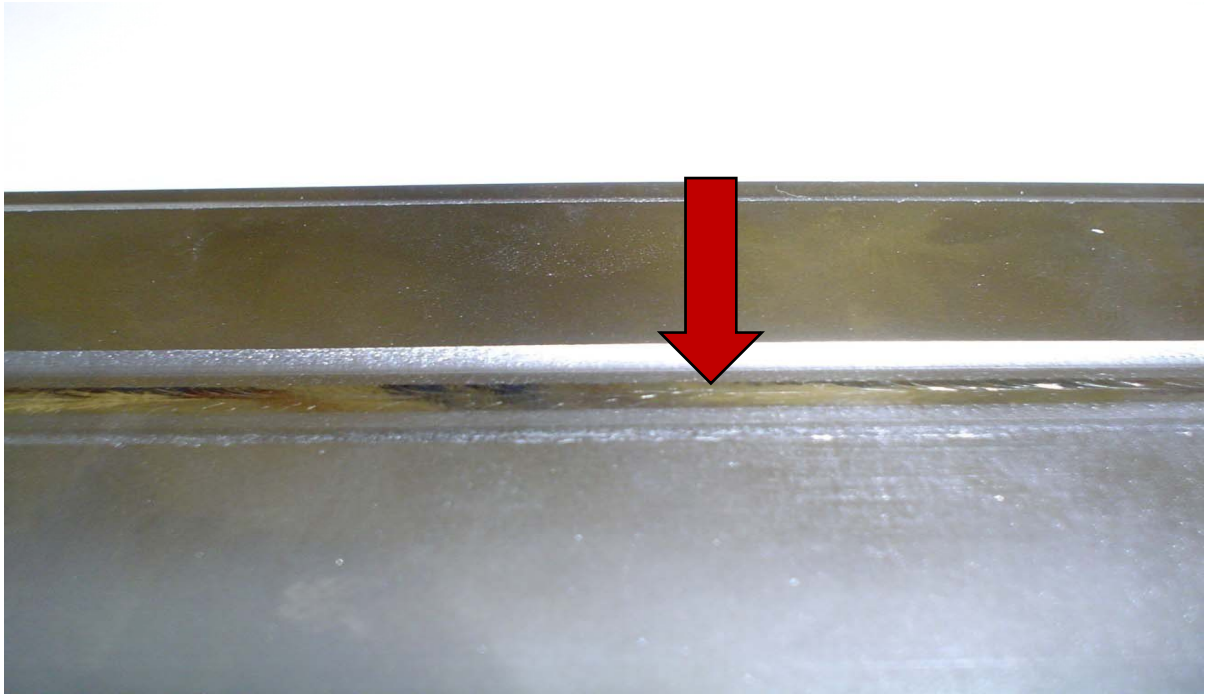


ANL CRAB CAVITY EBW

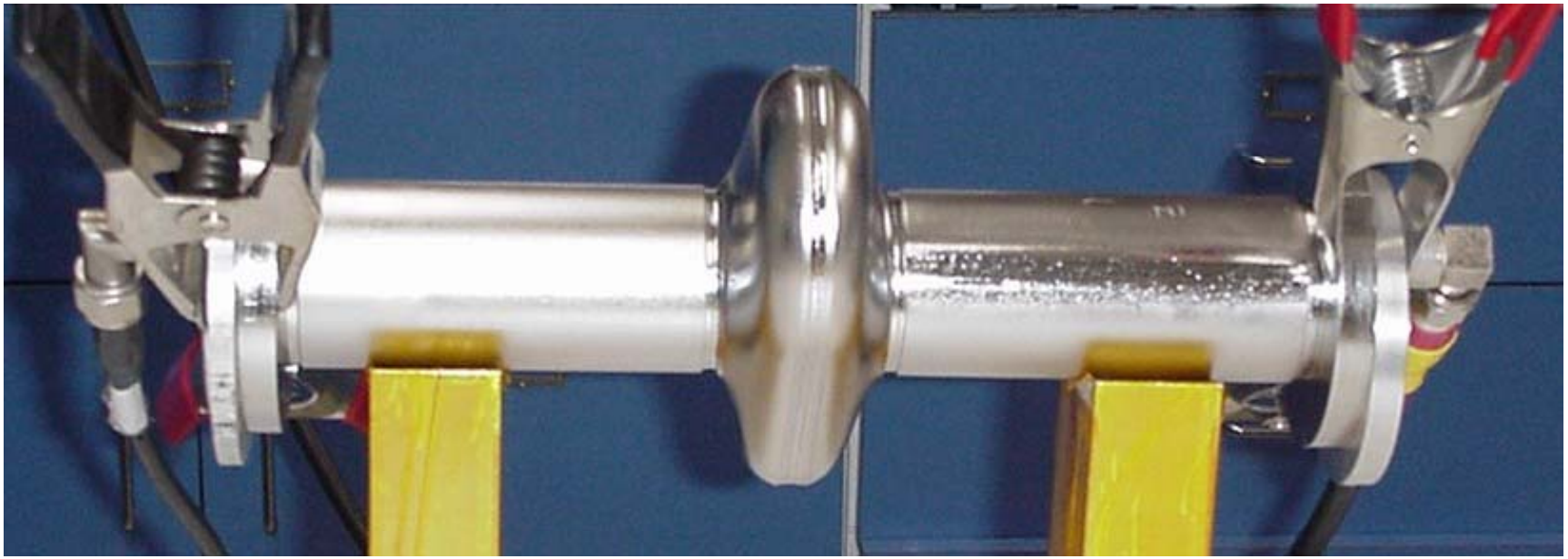
ANL CRAB CAVITY AFTER EBW

ANL CRAB CAVITY AFTER EBW

ANL CRAB CAVITY EBW SAMPLE SMOOTH UNDER BEAD PRODUCED @ 50KV, 42 MILIAMPS @ 18”/Minute



ANL CRAB CAVITY SETUP FOR BEAD PULL



ANL CRAB CAVITY FUTURE PLANS & SUMMARY

- Multi Cell Copper Cavity with End Groups when End Group models are complete.
- End Groups are planned to be machined from copper plate to reduce fabrication cost associated in developing Dies and Fixtures.
- Adding stiffeners.
- This Cavity presented few problems in fabrication and went as planned. We thought the biggest problem would be the 3-D EBW which proved to be no problem at all.

THANK YOU