
Further progress on fabrication of Improved 1.3 GHz Single Cell Cavities & End Group for 1.3 GHz Multi Cell Cavity.

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I wish you and your family a
Happy & progressive New Year
2011

- **1.3 GHz Improved single cell cavity .**
- **1.3 GHz 5-cell cavity with simple beam pipe.**
 - **Dumbbell development (5 cell & 9 cell cavity)**
- **End Group Development (for 9-cell cavity)**
- **650 MHz single cell cavity**

Two nos 1.3 GHz prototype single cell cavities have been manufactured (RRCAT + IUAC), processed (FNAL+ ANL) and tested at 2 K (FNAL)

The cavities have shown E_{acce} of 21 ~ 23 MV/m at $Q > 1.5 E+10$

Based on the feedback from the inspection & testing, we are working now to make two nos improved single cell cavities.

- We have incorporated following Key Steps in fabrication of improved single cell cavity.
 - A. 20 μm Bulk BCP at RRCAT in addition to 3 μm pre-weld etch at IUAC, Delhi.
 - B. Beam Oscillation in welding and weld parameter optimisation for critical equator weld.
 - C. Careful handling of Niobium components during Manufacturing Process.



Fixture with half cells



BCP etching bath



DI water rinsing

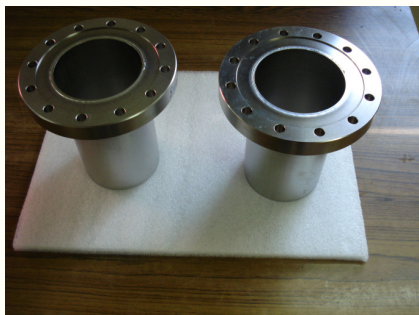
Ultrasonic cleaning in Soap water for 30 min

BCP Solution used :HF(40%)+HNO₃(70%)+H₃PO₄= 1:1:2

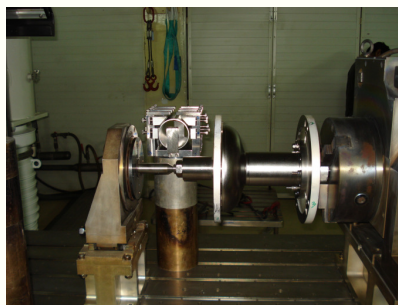
Acid Temperature <15 °c

- **Components storage & Transportation to IUAC in polybags filled with N₂ to prevent contaminations.**

Welding Progress at IUAC



Beam Pipe- Flange
Assembly



Outside welding at
Iris

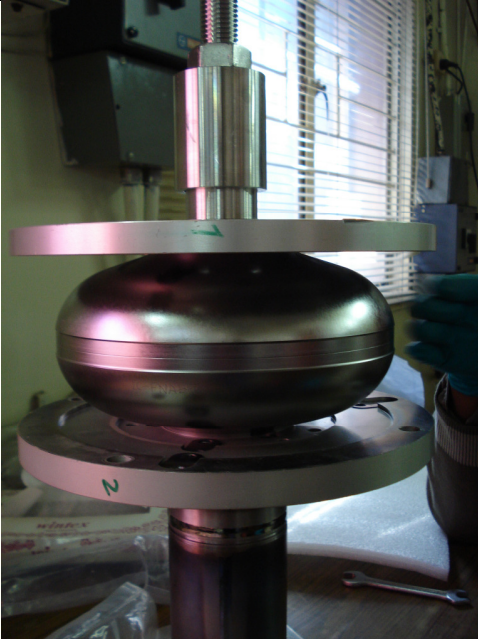


inside welding at Iris



Two half cell Assembly have been
completed.

Weld parameter optimisation using dummy equator (Trial)



Setting in Fixture



Welded Dummy Equator

Upper bead is good and smooth

The inner bead is observed (possible to see due to absence of beam pie) directly.

It is noticed that though the inner bead has improved considerably wrt to earlier two prototypes , some undulation have been observed in the 90- 270 deg region.

Next plan : We decided to make one more set of dummy equator to further fine tune the parameters.

End Group Development for 1.3 GHz Multi cell Cavity (Aluminum)

As part of our Multicell cavity we are also working on 1.3 GHz standard End group.

We plan to make prototype (01 Aluminum) and 03 in Nb.

We have initiated the welding activities for Aluminum end group.

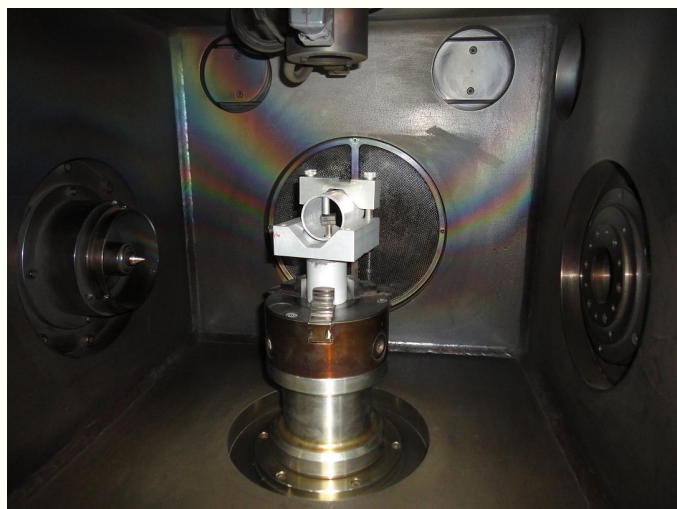
This will help us for qualification of fixture & tooling & development of process.



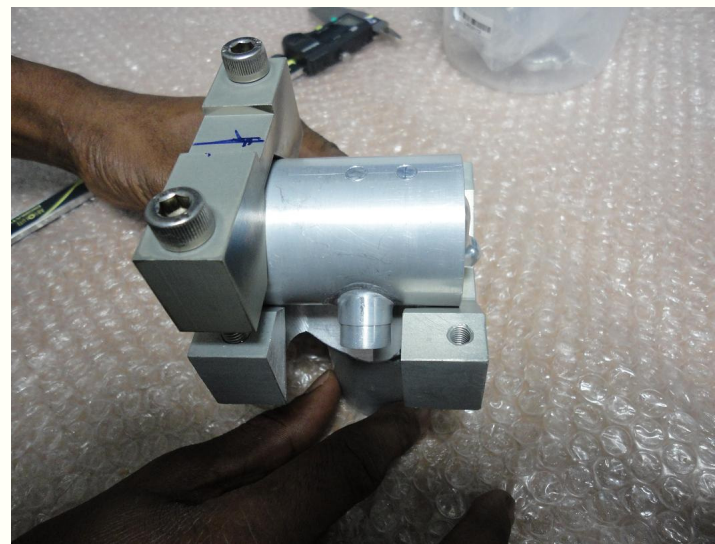
HOM trial

HOM Spool Piece welded to HOM Housing body, this joined requires a variable focus beam due the 3-d Geometry of joining surface.

Stages of end group welding

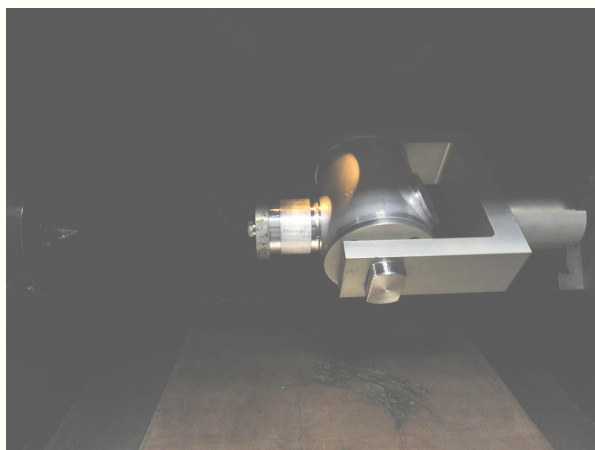


Dummy trial on f-part

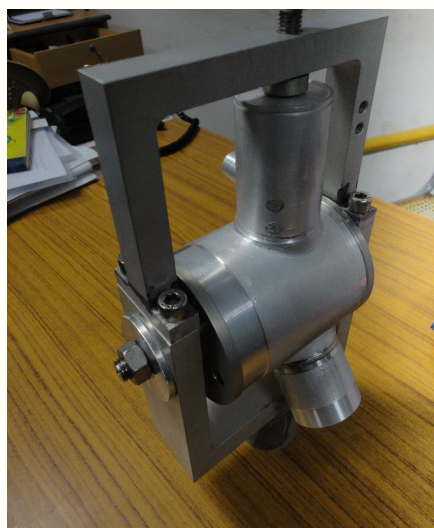


Form-tail welding

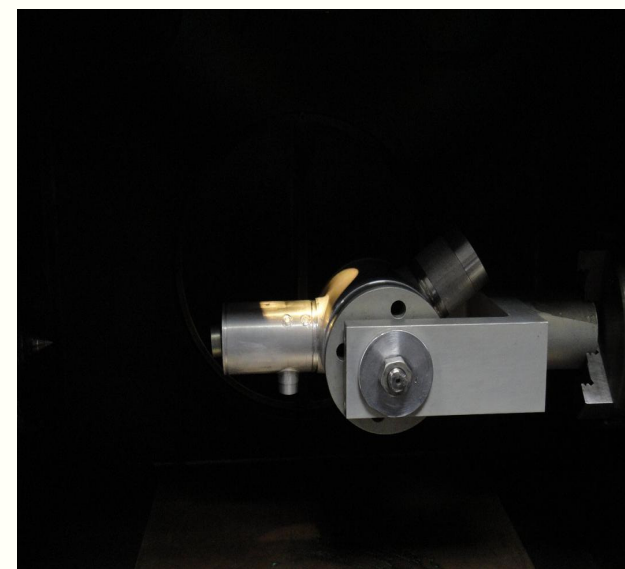
Stages of end group welding



Coupler Spool piece is welded to Short End tube



Setting in the fixture for welding

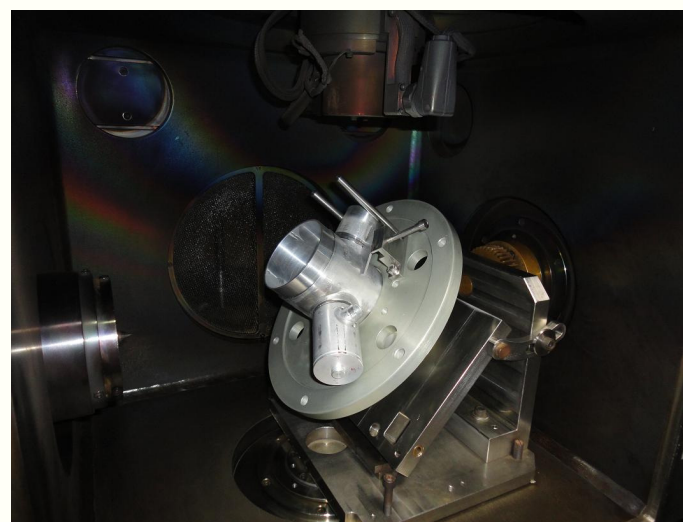


HOM housing body welded to End tube

Stages of end group welding



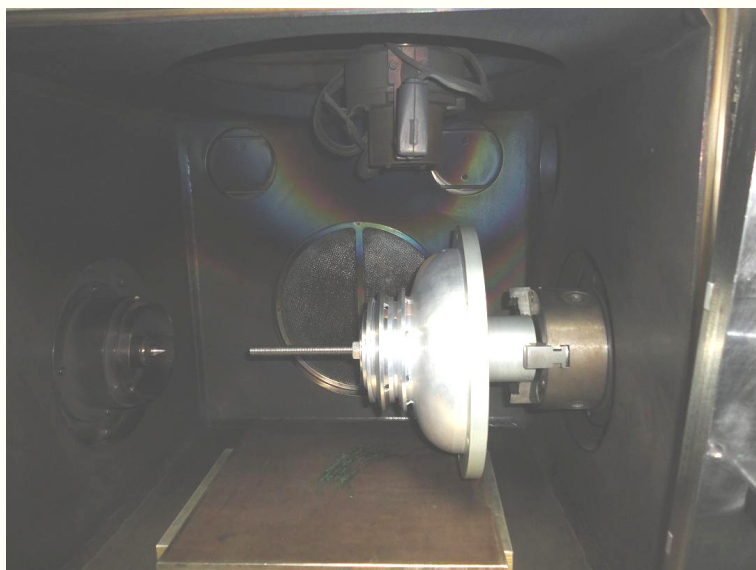
Setting in Fixtures for ribs welding



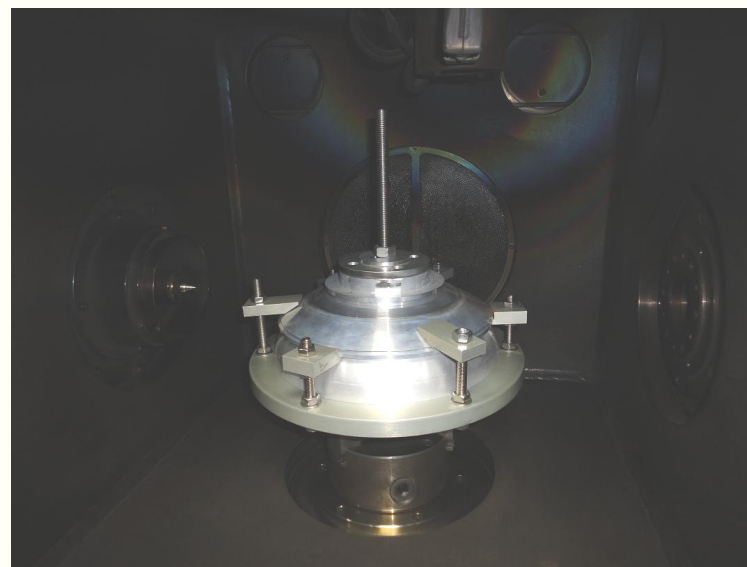
Actual Welding of stiffening ribs

Ribs are welded to Short End tube & Coupler spool piece

First half cell is welded to tube spool Piece from inside and outside



End disk Flange is welded to tube spool Piece & End Half Cell



End Cap Disk is welded to Disk Flange

Further Plans for 1.3 GHz Multicell Cavity

- **Aluminum End –Group :**
 - Dimensional measurements & feedback for next cycle
 - **2 months** (Depends on availability of welding machine slot at Industry).
- **Niobium End- Group:**
 - PO for Machining of Niobium components in under progress.
- **Five cell cavity**
 - Half cell forming planned in coming two weeks.
 - To be followed by machining
 - Welding activities at IUAC, March-April-2011(plan)

650 MHz Single cell cavity

- **Half cell Machining fixture has been designed.**
- **Fabrication of machining fixture is under progress at ACDFS, RRCAT.**
- **Design for various welding fixture is under progress.**

Thank You