PIP-II Technical Workshop
Cavity Manufacturing working group

Topic-4 : Cavity integration

Cavity Dressing Learning & Challenges

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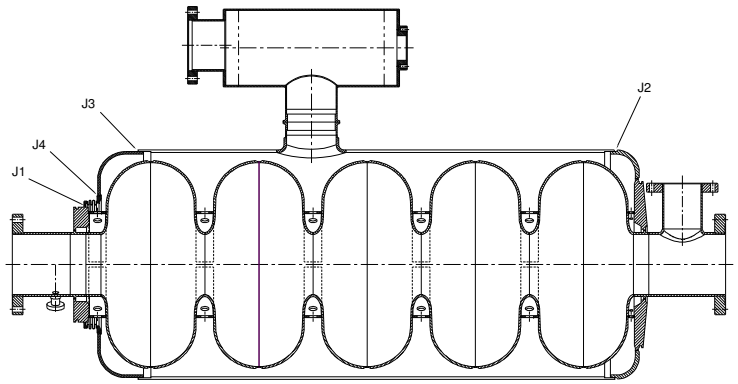
Dressing of first ever β=0.92 650 MHz cavity at RRCAT



Joints of dressed cavity

Dressing sequence

GB Operation #1

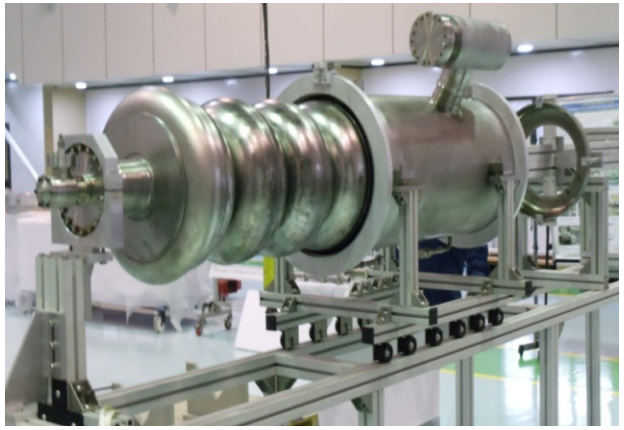
Joint -1 Bare cavity to bellow

GB Operation #2

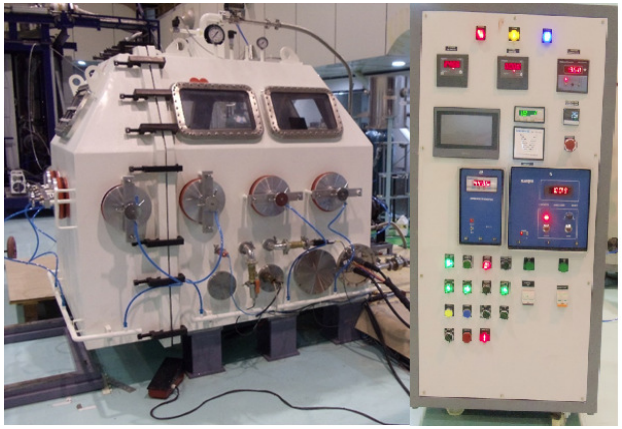
Joint -2 Helium vessel to MC transition spool

Joint -3 Helium vessel to FP End Cap

Joint -4 FP End Cap to Bellow

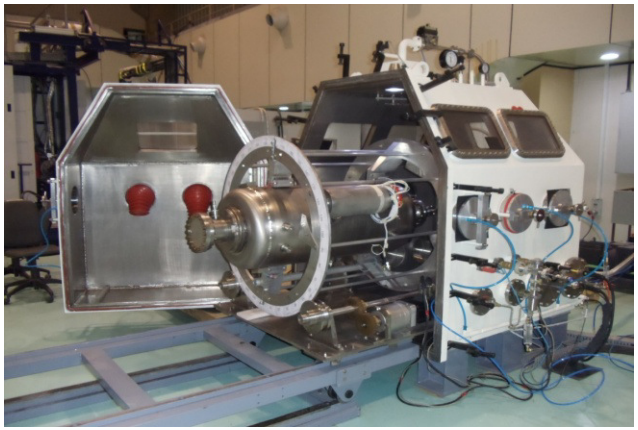


Cavity Assembly on Insertion Bench



Controlled environment Glove Box

Cavity Weld inspection from windows



Dressed cavity coming out of GB

Cavity frequency monitoring during dressing

Cavity frequency and FF drift

GB Operation #1

➔ Cavity tuning for FF

(FF 98.2% reduced to 95%)

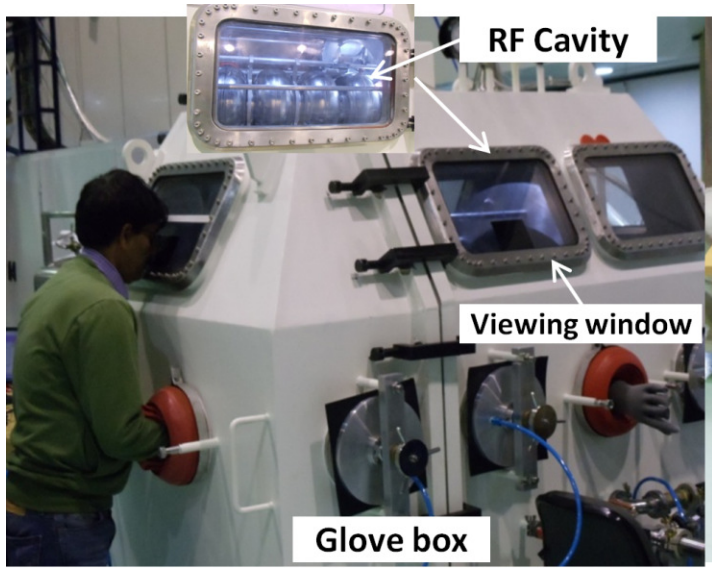
Tuned to >98%

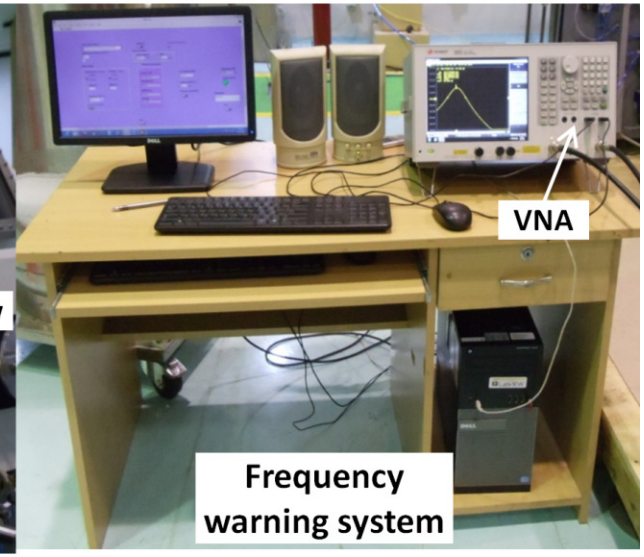
GB Operation #12

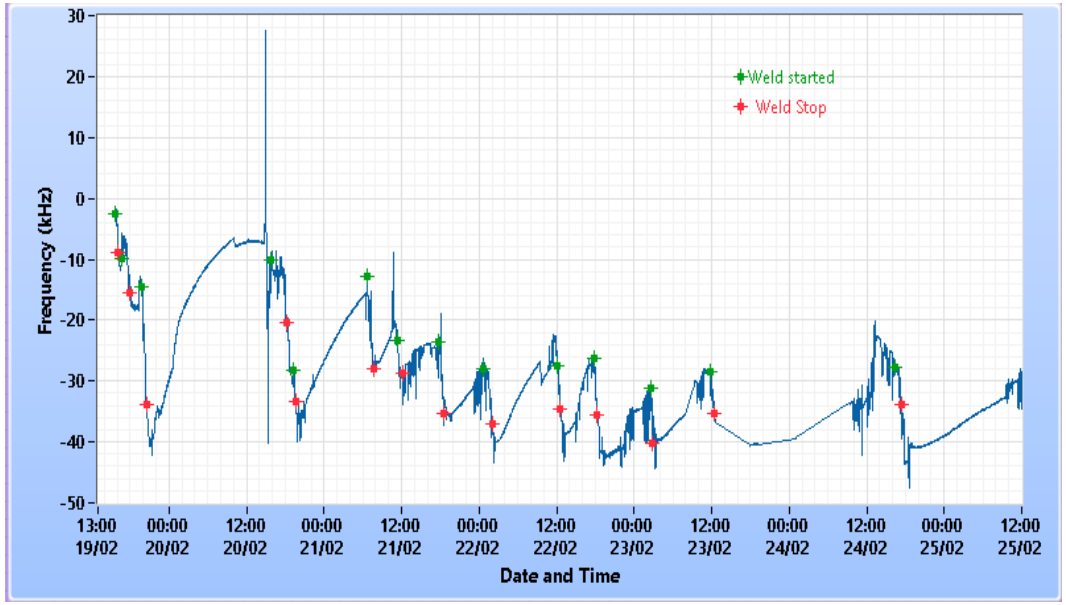
FF changed from >98% to 92.1%

And change in cavity frequency

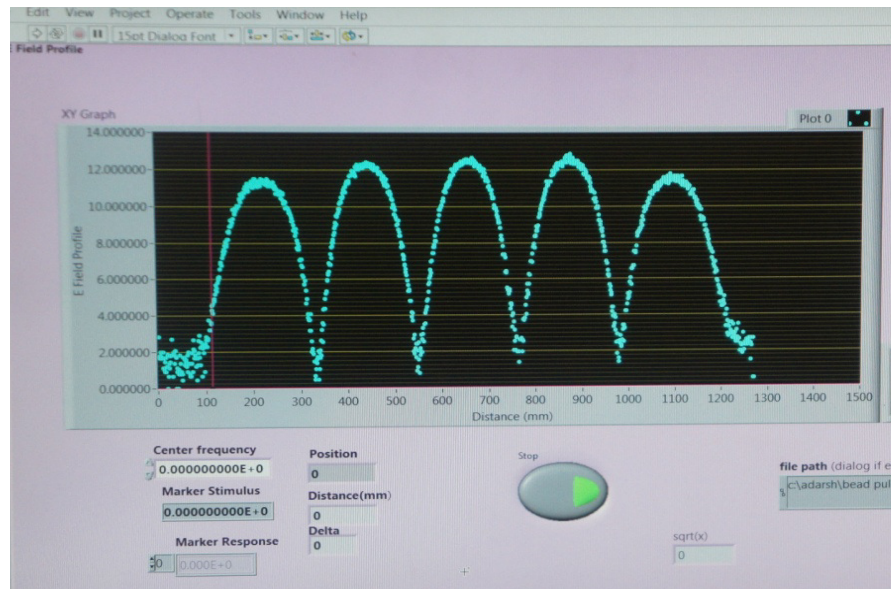
-86 kHz







Frequency drift during Joint -2 and partial Joint-3 welding



Cavity Field Flatness after Dressing ~92%

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Learning for dressing

- The permanent frequency drift of -86 kHz has been recorded, which is within tuner range, however drift should have been reduced.
- This drift is on the account of intense heating during welding even it is small and intermittent weld stages and weld shrinkage of more than initial estimation, which might have compressed the cavity axially by ~ 0.3 mm.
- A design improvement for relaxing the weld shrinkage is one of the finding from this dressing.
- With some more data generated on weld shrinkages and correcting the initial position of bellow the issue of frequency shift can be addressed.
- (For j4 joint) As the cavity was filled and sealed with high purity Argon to protect it from contaminations during welding, the inertial hot mass was not allowing it to cool faster, there could be local plastic deformation of end cells of the cavity as it is underneath the welding joints.
- Another proposal is to close the two-phase pipe to force the high Purity Argon through the remaining openings for partial weld joints for effective cooling.

Questions

How to keep FF degradation a minimum value?

What is the allowed frequency drift?

Can we use different enhanced cooling schemes including flow of high purity Argon through the cavity inside?

Can we use of sub cooled Argon gas?

What are the experiences of β=0.9 cavity?