SRF Welding Process at Fermilab

1.3GHz RF Nb Cavity to Ti Helium Vessel Welding

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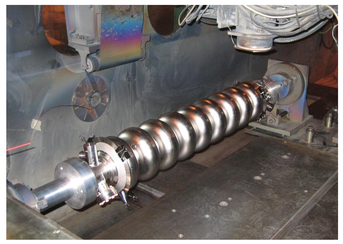
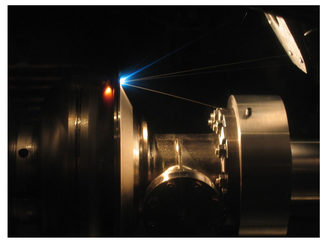
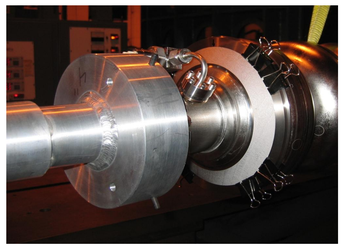
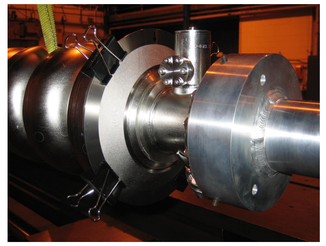
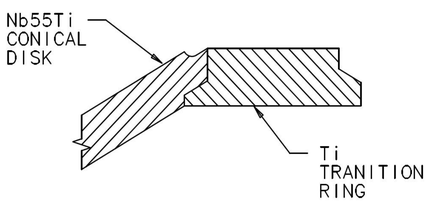
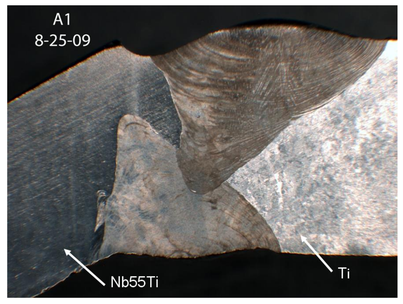
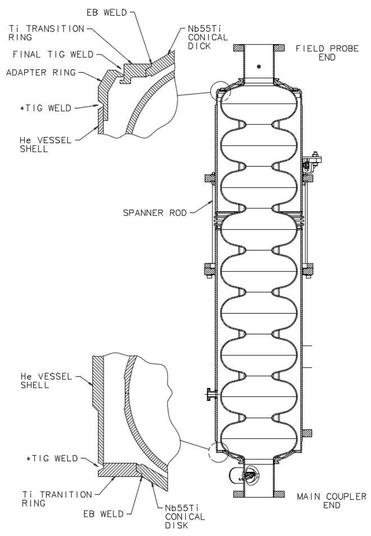
Electron-Beam Welding Titanium Transition Rings

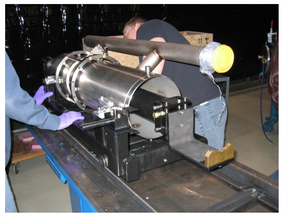
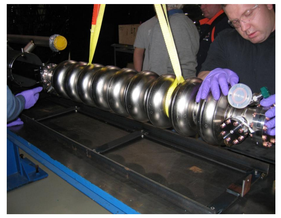
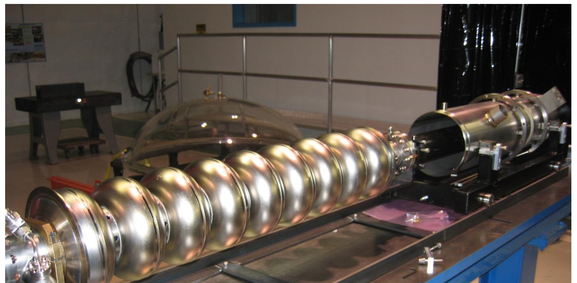
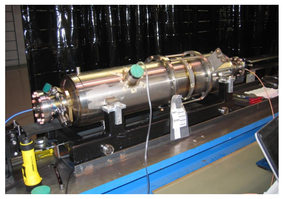
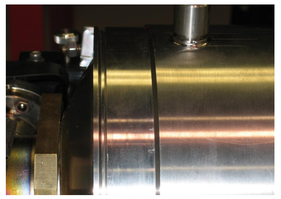
Titanium transition rings are electron-beam welded to the niobium/titanium conical end disks. They are welded from both sides to fully consume the joint for compliance to ASME Boiler & Pressure Vessel Code. Shown below is the joint configuration before and after welding.



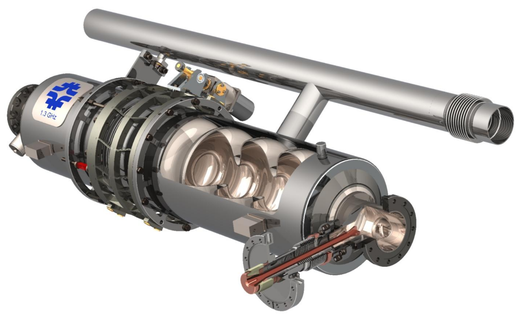




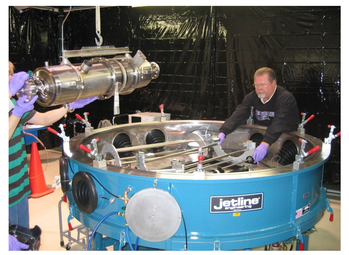
Cavity To Helium Vessel Alignment & Tack Welds

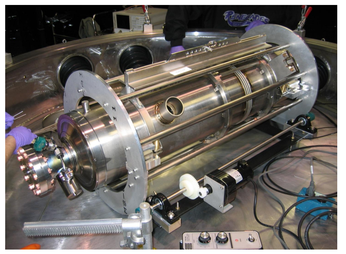
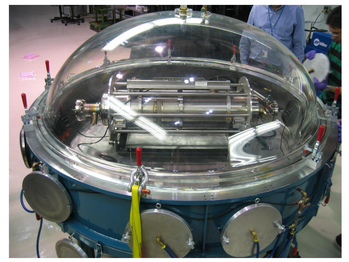






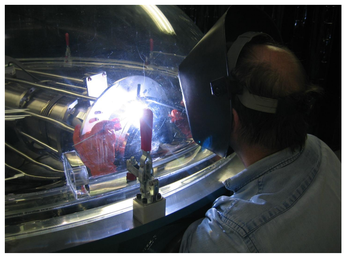
The main coupler is aligned in the horizontal position and parallel to the moving cart using a bracket that engages the coupler flange. The helium vessel is mounted to the cart supported by the bearing lugs and travels along a rail track with bearing rollers. This fixture enables us to adjust and achieve the cavity coupler flange to the helium vessel lugs perpendicularity requirement.



Glovebox TIG Welding

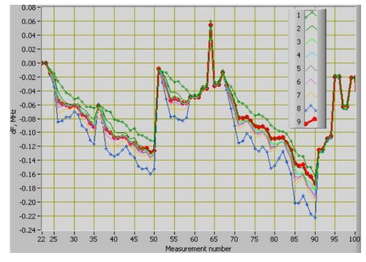


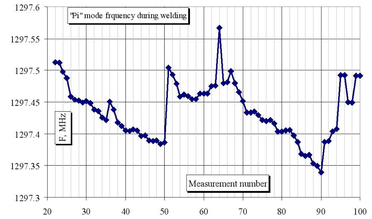



The TIG welding done inside the glove box is operating on three separate argon purge lines. One line is dedicated for the dome purge; a second line has a purge flow inside the helium vessel and the third line is for torch purge and torch cooling. The cables for monitoring the frequency spectrum of the cavity are also attached and connect to feedthrough ports inside the glove box. Once the oxygen level is below 20ppm and humidity levels below 15% are achieved, welding can begin.

Final Frequency Spectrum Recorded During Welding





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