B10 D19 Diode Repair

March 29, 2016

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Opening the interconnect

Multi-step process

Over 2.5 days of preparation prior to opening the interconnect

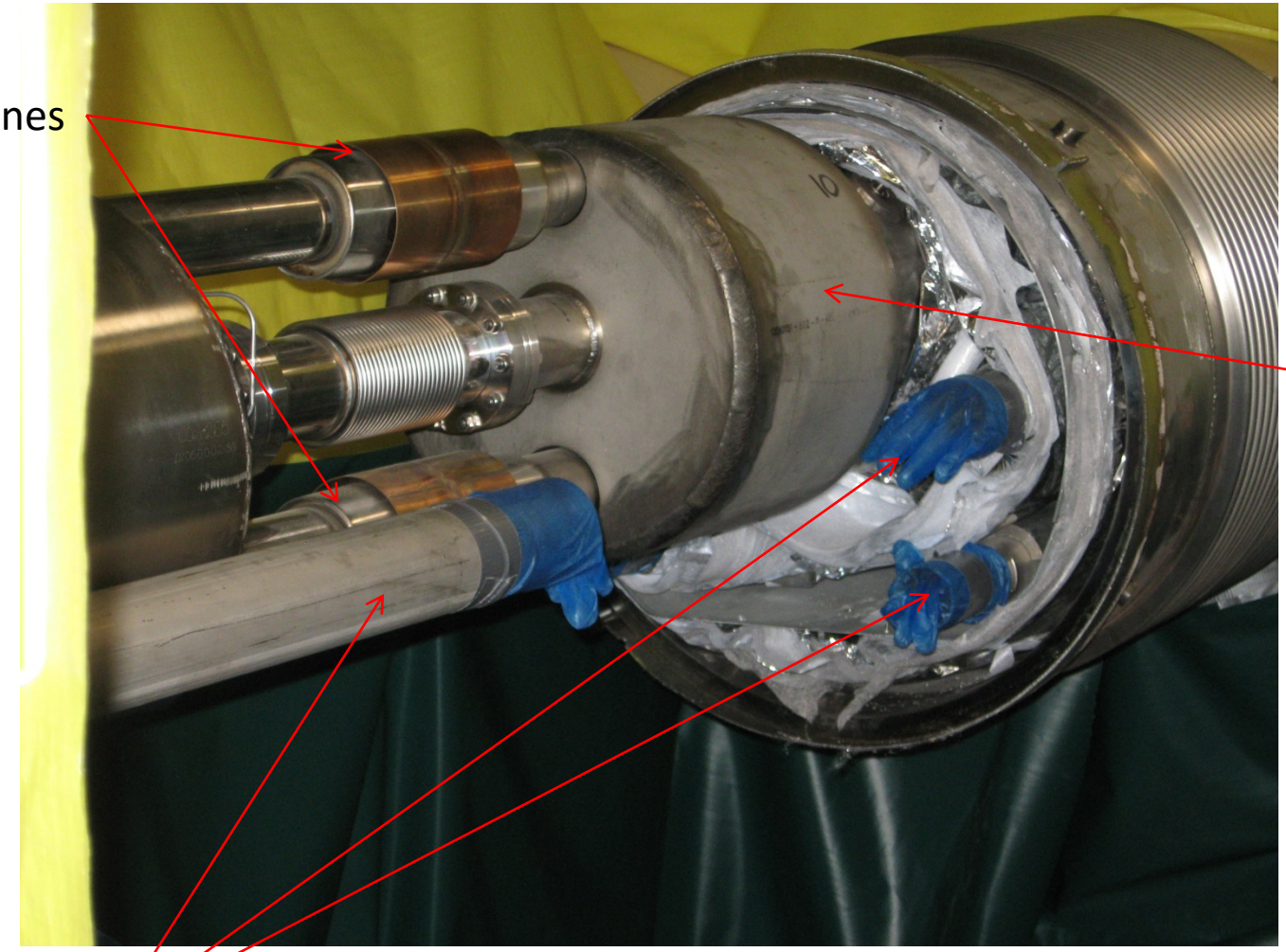
- Writing permits
- Arranging support from Weld Shop & HP
- Constructing a viable schedule
- Coordinating with other CAD groups in support of repair
  - Cryogenics Group
  - Magnet Electric Power Supply Group
  - Vacuum Group
  - Beam Instrumentation Group
  - Access Controls Systems Group

Tremendous support was provided by all groups!

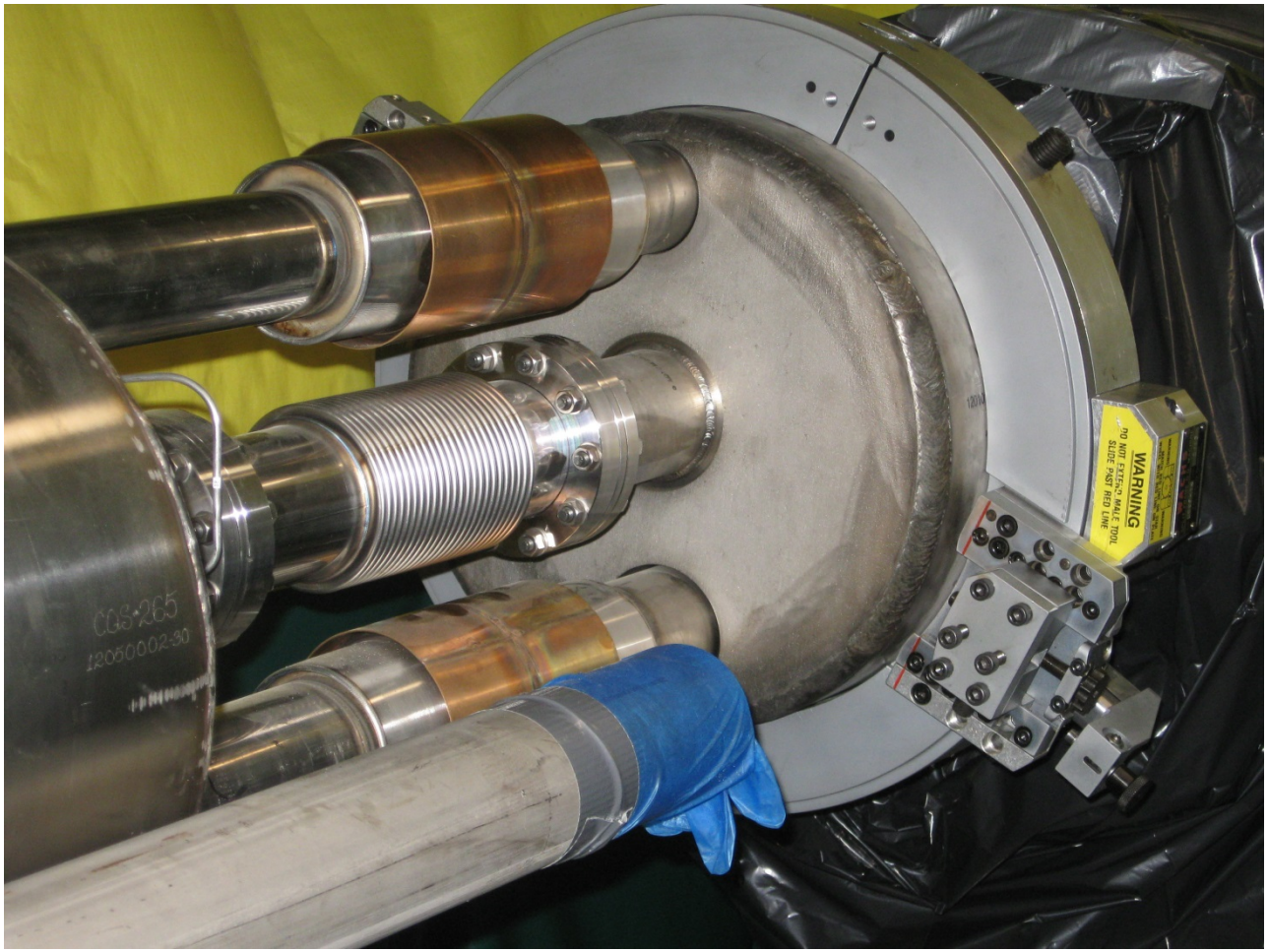
Injured Party Blue Dipole Sector 10, S/N DRG592

Once permits are in place outer shell in removed. Due to HP assay jigsaw was used to instead of grinding wheel.

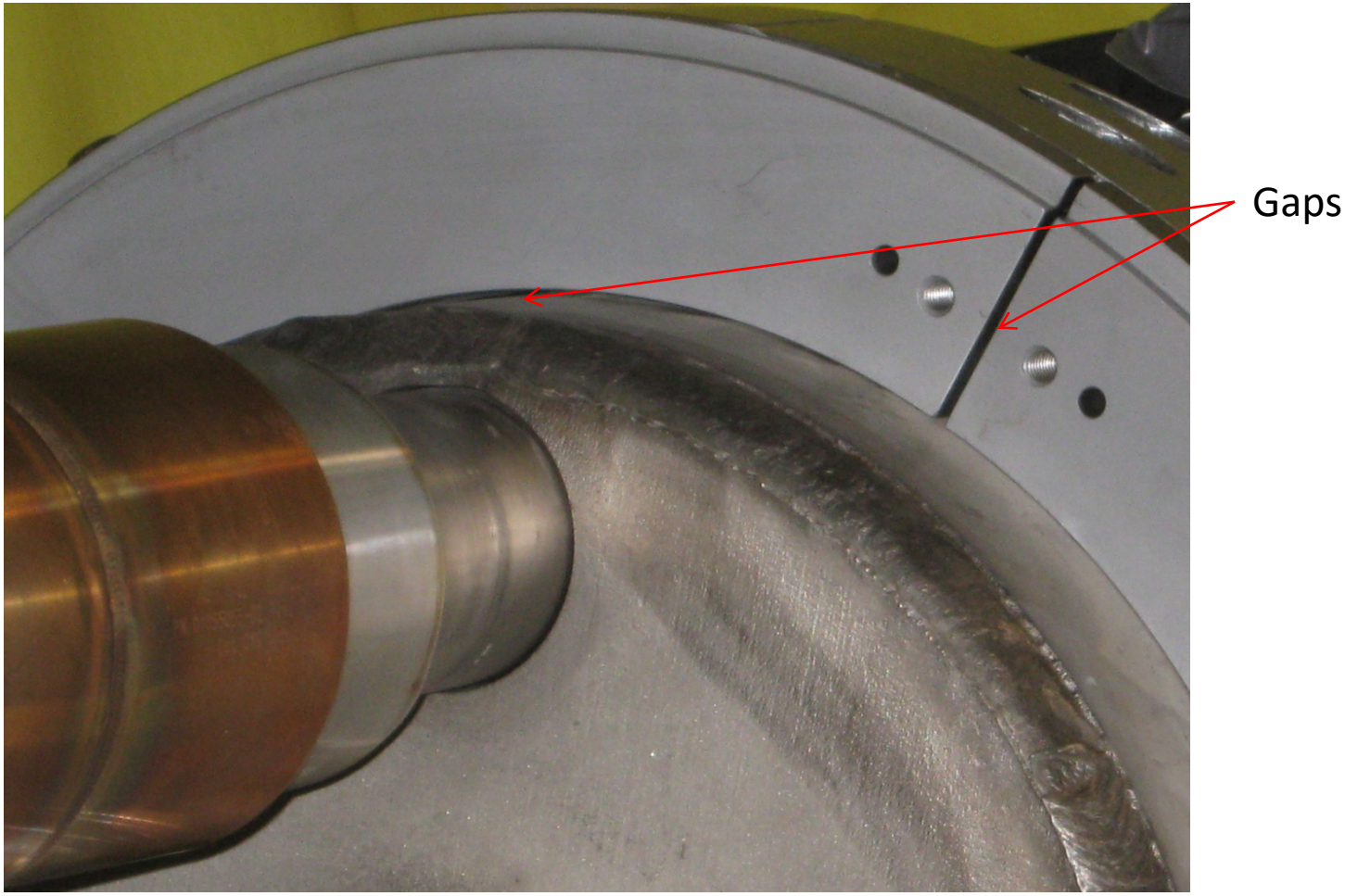
End volume exposed after the outer shell (vacuum vessel) is cut , the MLI blankets & heatshield removed and the end cage blanket cage taken out.
HP survey/assay & protocol required at Outer Shell, H/Shield and at End Volume



A split ring (Wach's) cutter is used to turn away the old weld. Thursday (1:45AM) it was discovered cutter did not fit due to slight "egg" shape of the EV. Required reworking of the cutter.

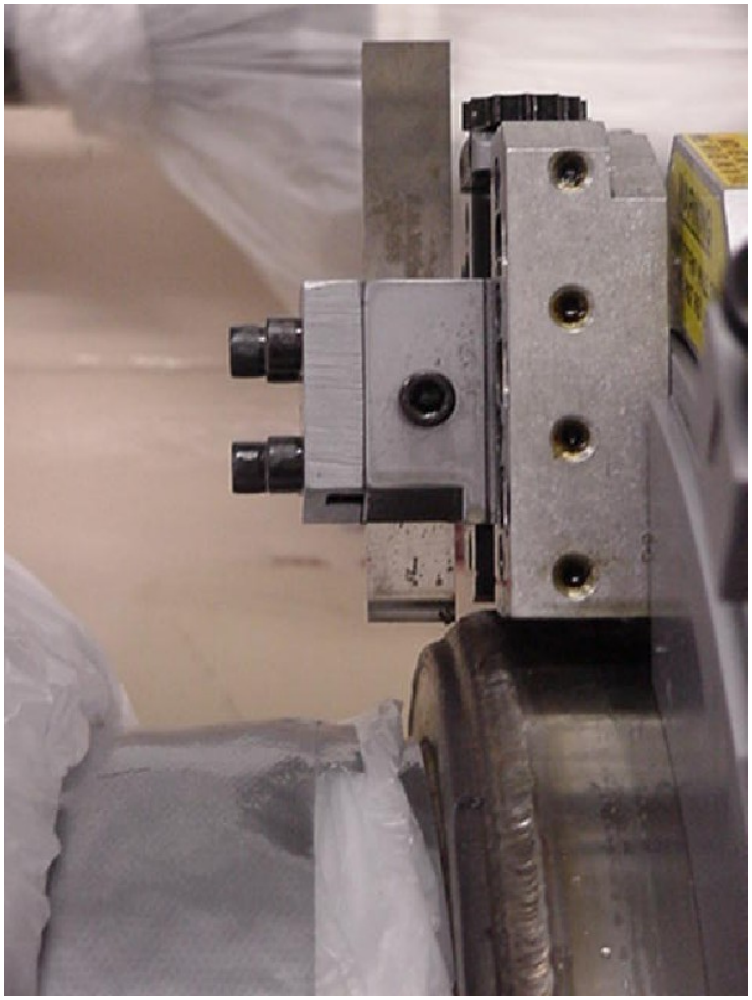


Note gaps between cutter and EV. The EV shape would not allow proper sitting of the cutter.

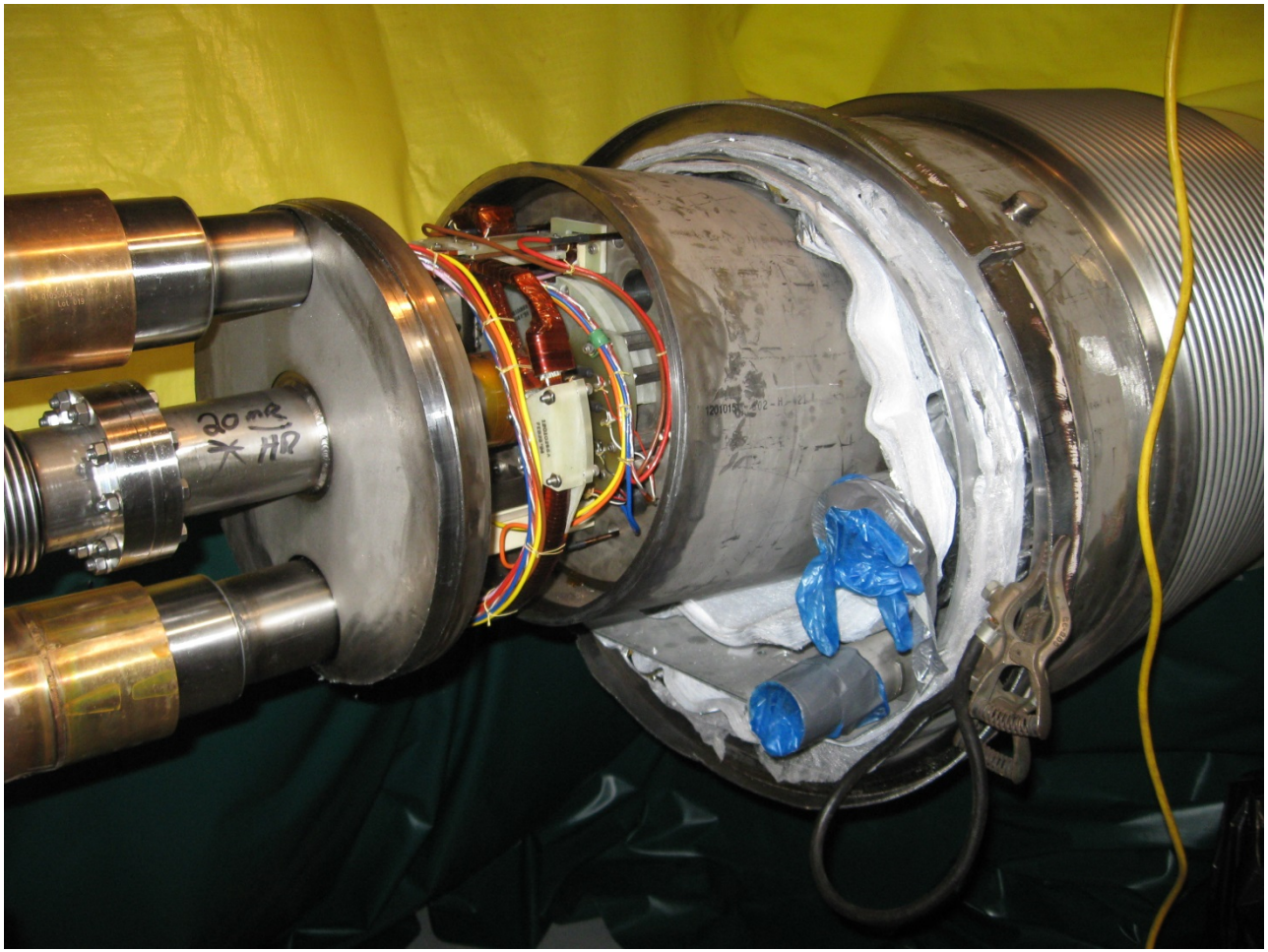


Reworked Wach's cutter in action

Close-up of cutting tool – after first step of weld removal



End volume cut free – ample persuasion required

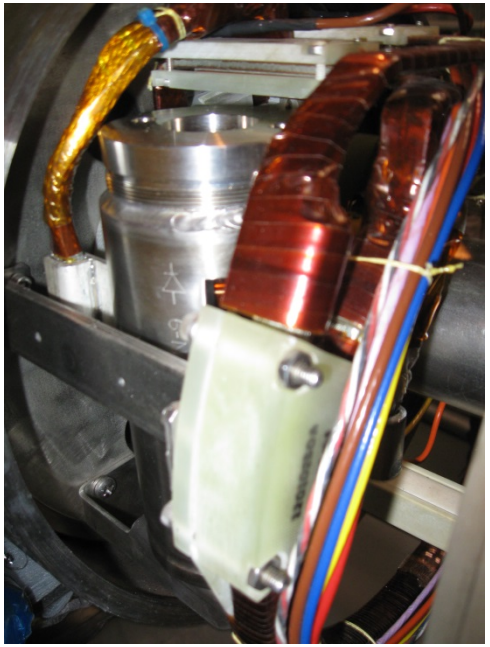


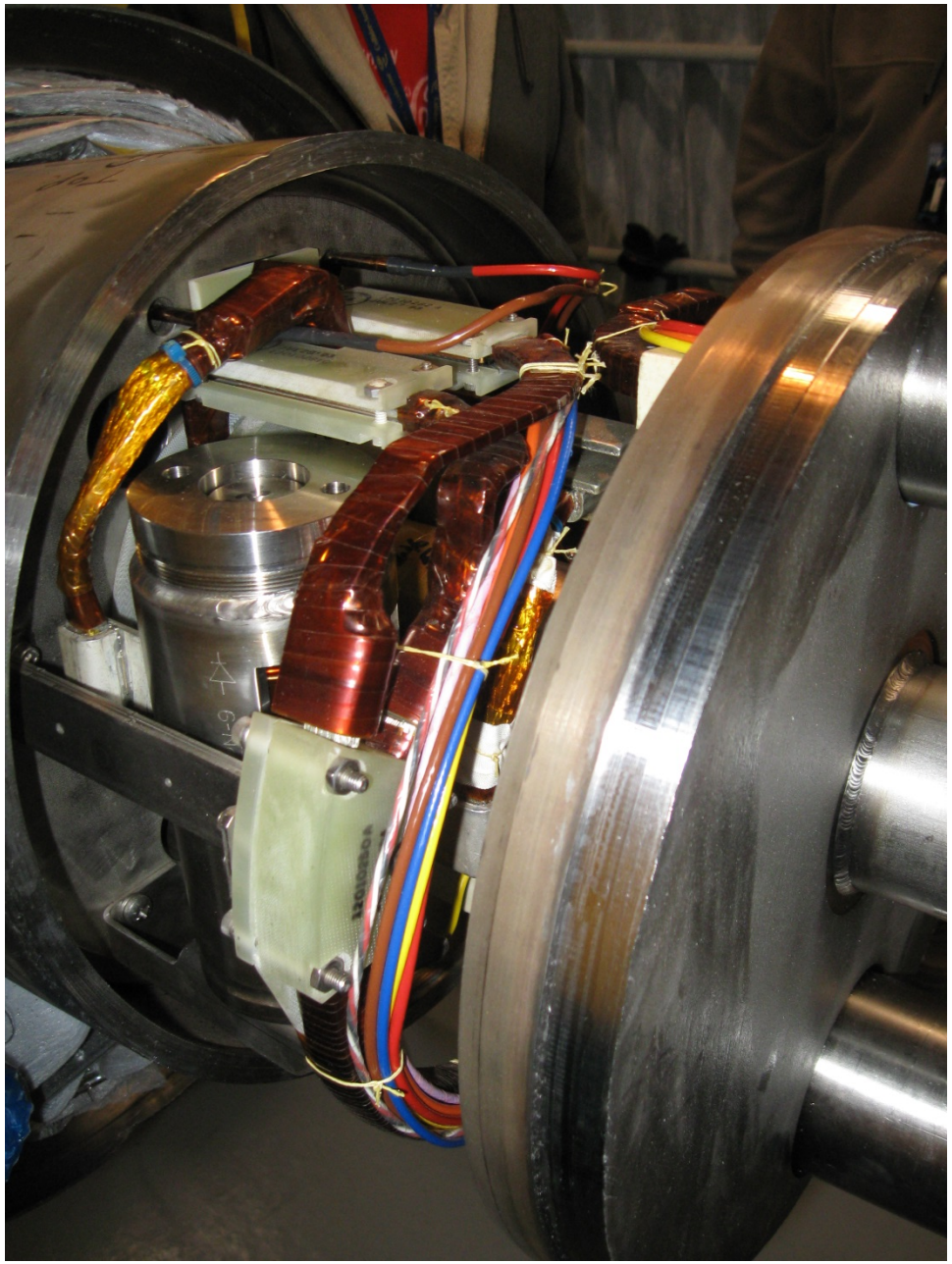
All process lines must be removed to allow rotation of the cutter head

Damaged Diode

This type is held in place by 10-32 machine screws connected to metal braid.

Close-up

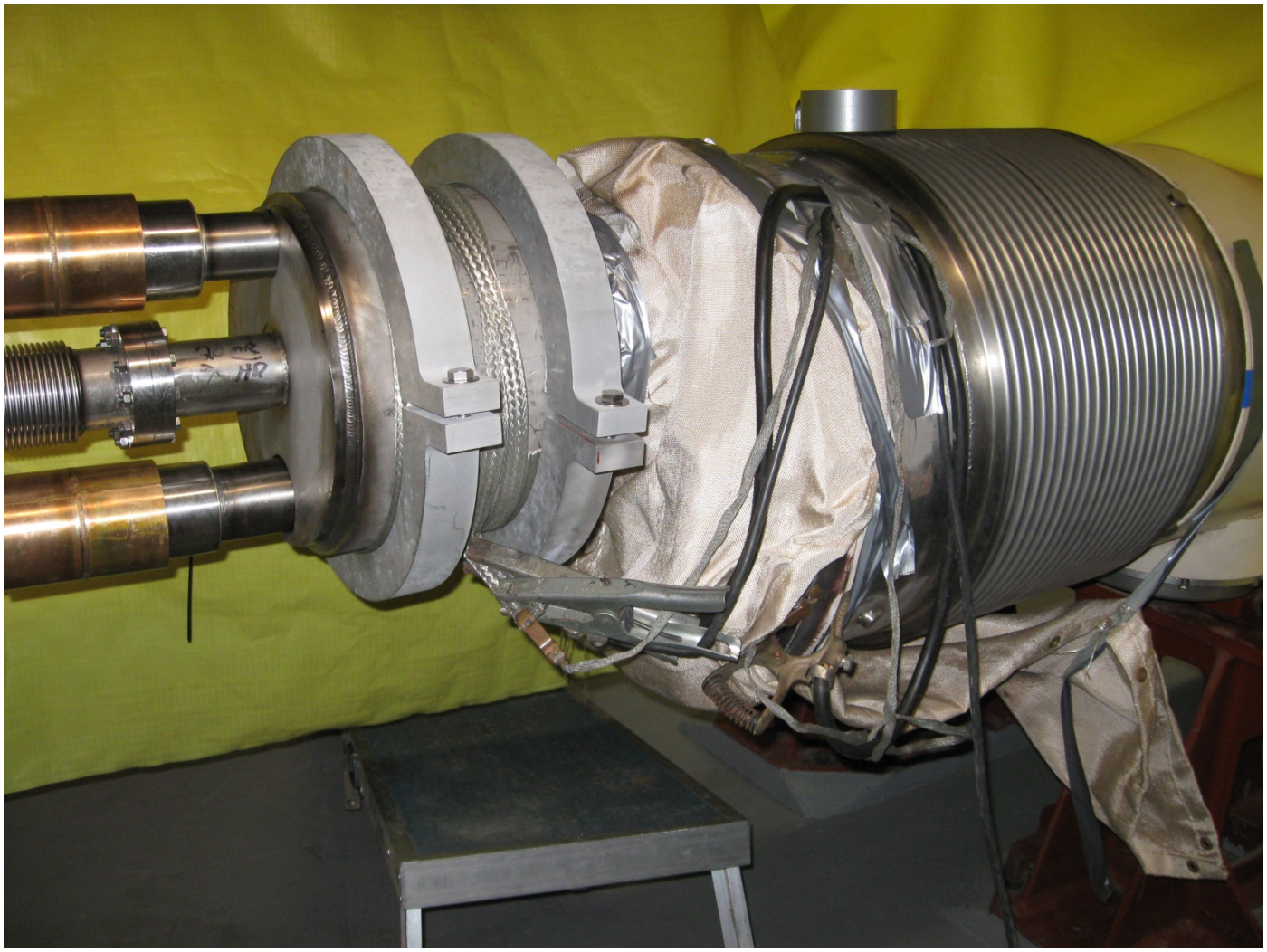




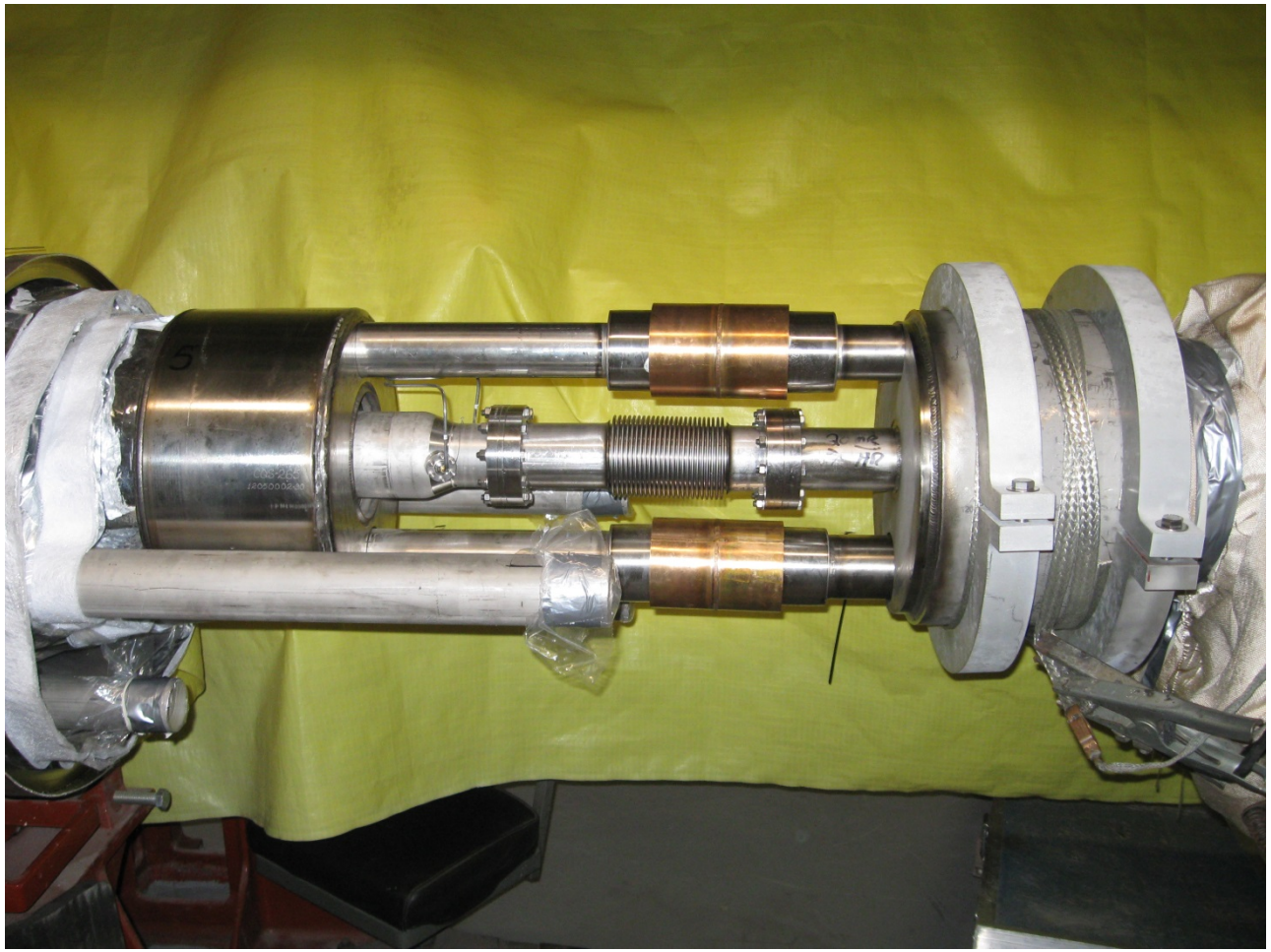
Removed diode
on tunnel floor.

4 mR at contact

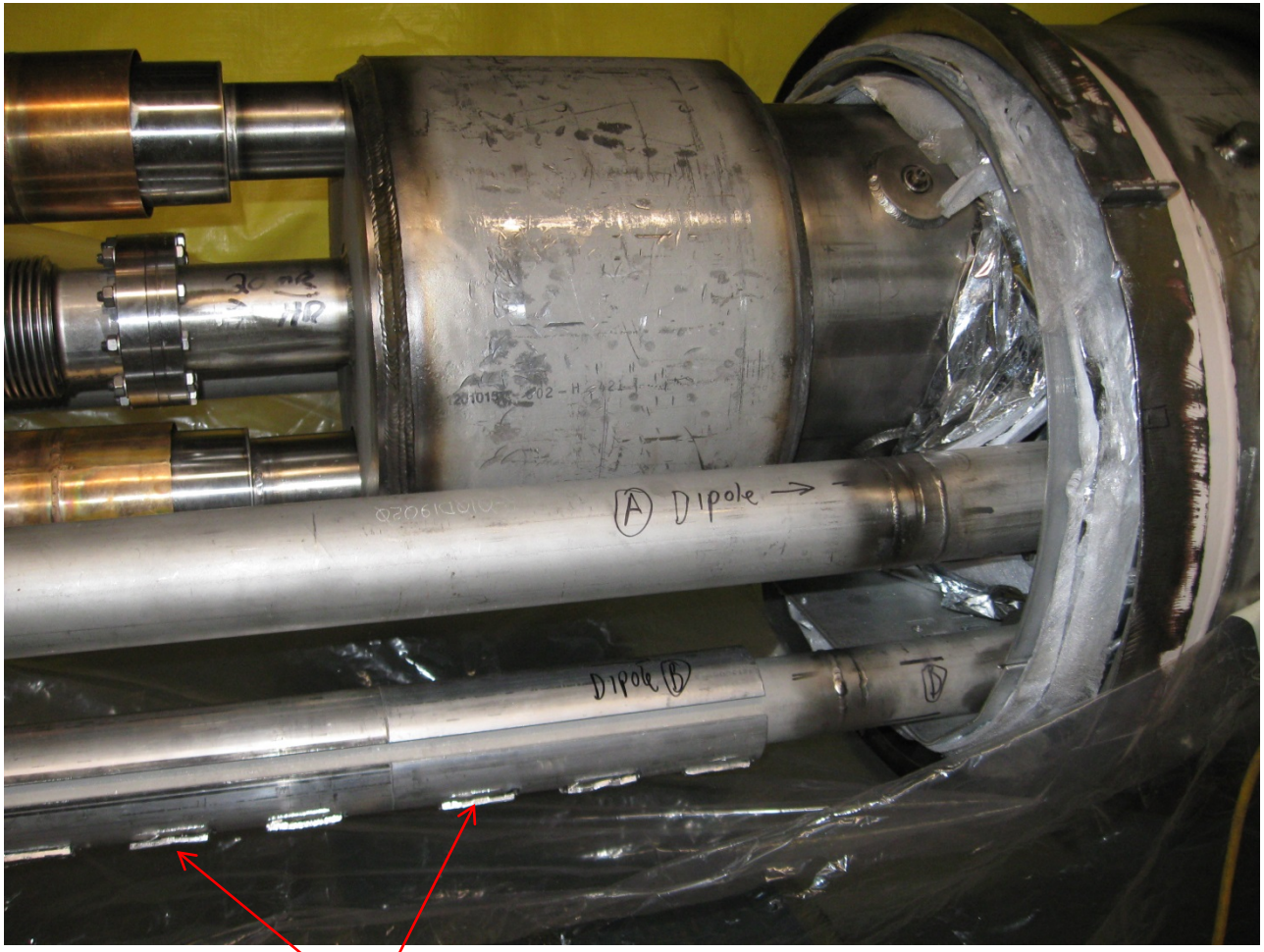
New diode install and welding process begins.
Magnet covered with welding blanket to protect insulation.



Multi-pass welds are required but temperature must be controlled to avoid damage to diode and Omega joint.
Aluminum “cooling rings” used to speed temperature drop.

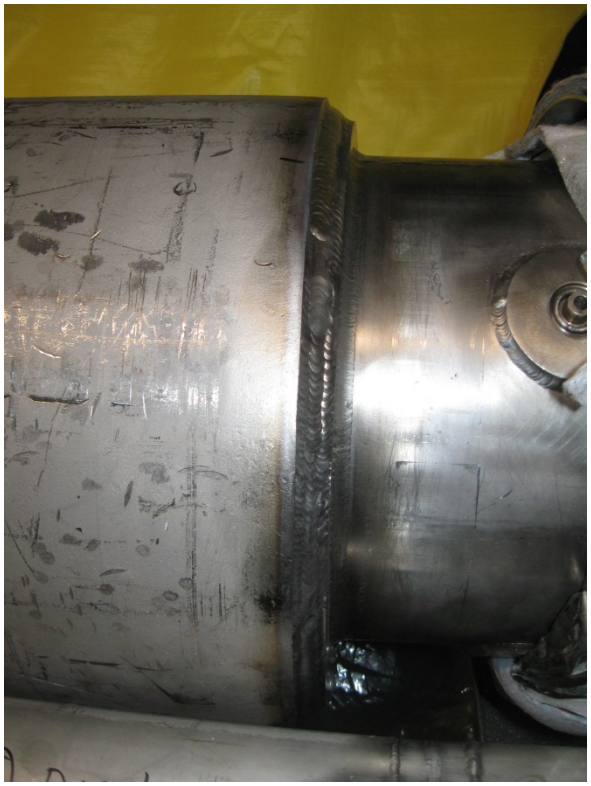


EV and process (RUSH) lines re-assembled



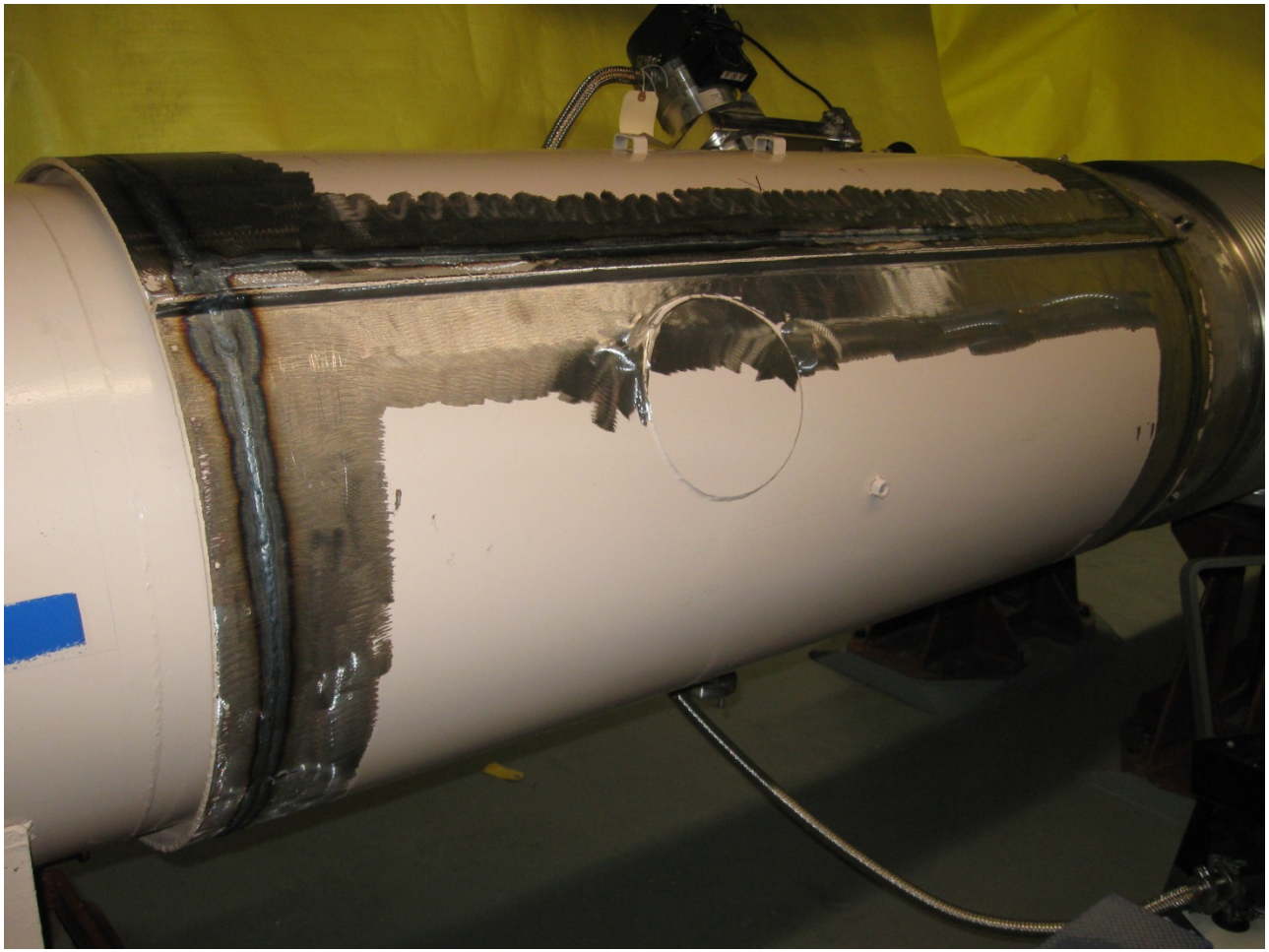
Heatshield welded to these rectangles

Completed EV welds – 7-9 passes

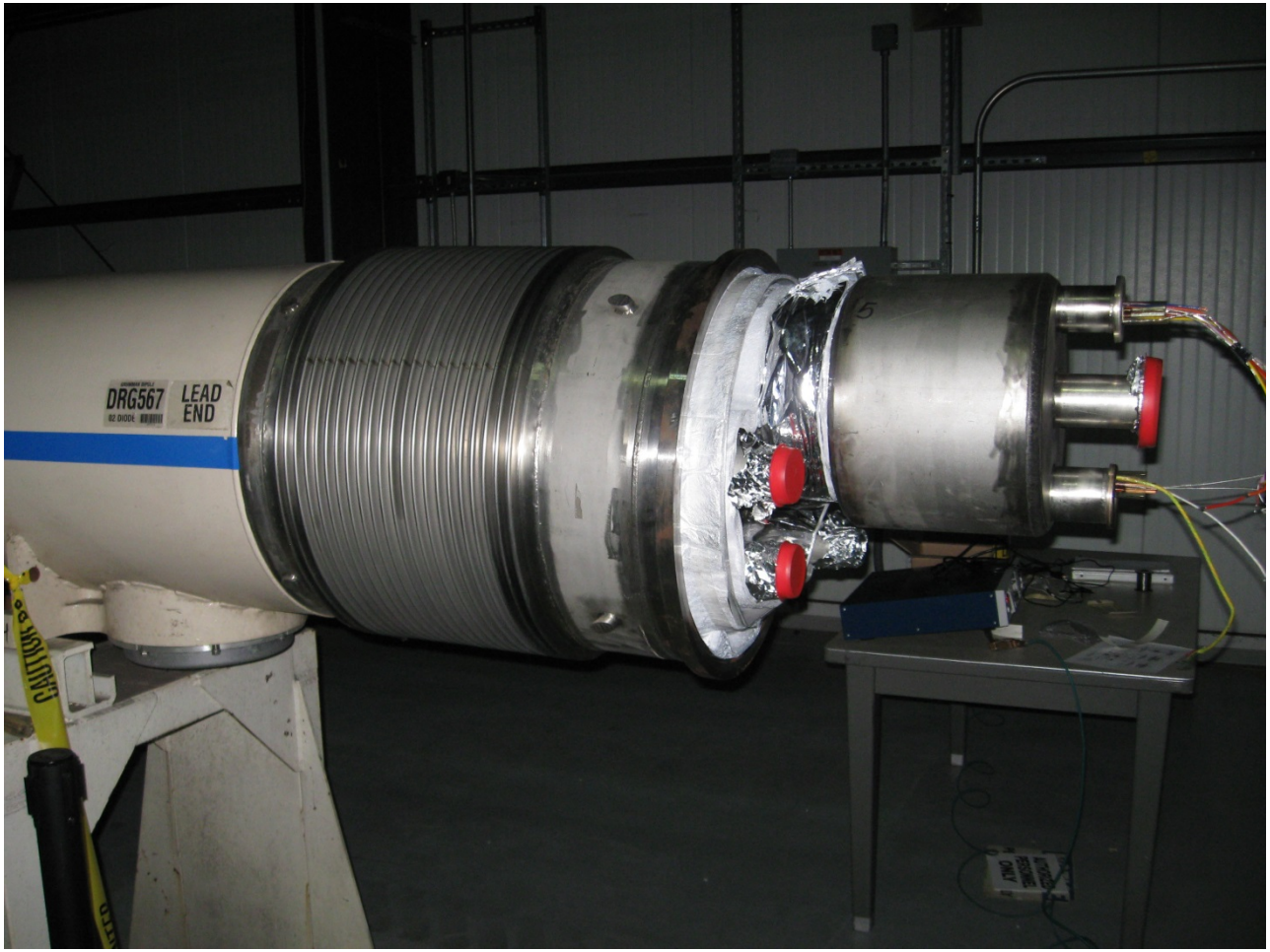


Interconnect piping complete.
Next steps MLI blankets and heatshield replaced.

Outer shells welded back in placed



SC Magnet Division prepared spare dipole in case it was needed.



Exception effort put forth by everyone involved.
Excellent coordination and support from all group called into service.

all hours of the day and night

CMS and weld team worked 12 hour shifts 24 /7
Put on shift with minimal heads –up

Repair completed, from opening of interconnect through closed and pumping down 6.5 days