Some SuperB IR Details

M. Sullivan

For

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Outline

- Some extra topics
  - Solenoid compensation
  - HOMs
  - Assembly and Removal
  - Vibrations
  - ?
- Summary

Simplified detector solenoid model in the IR

Assumptions and simplifications based on proposed scheme by K. Bertsche and M. Sullivan:

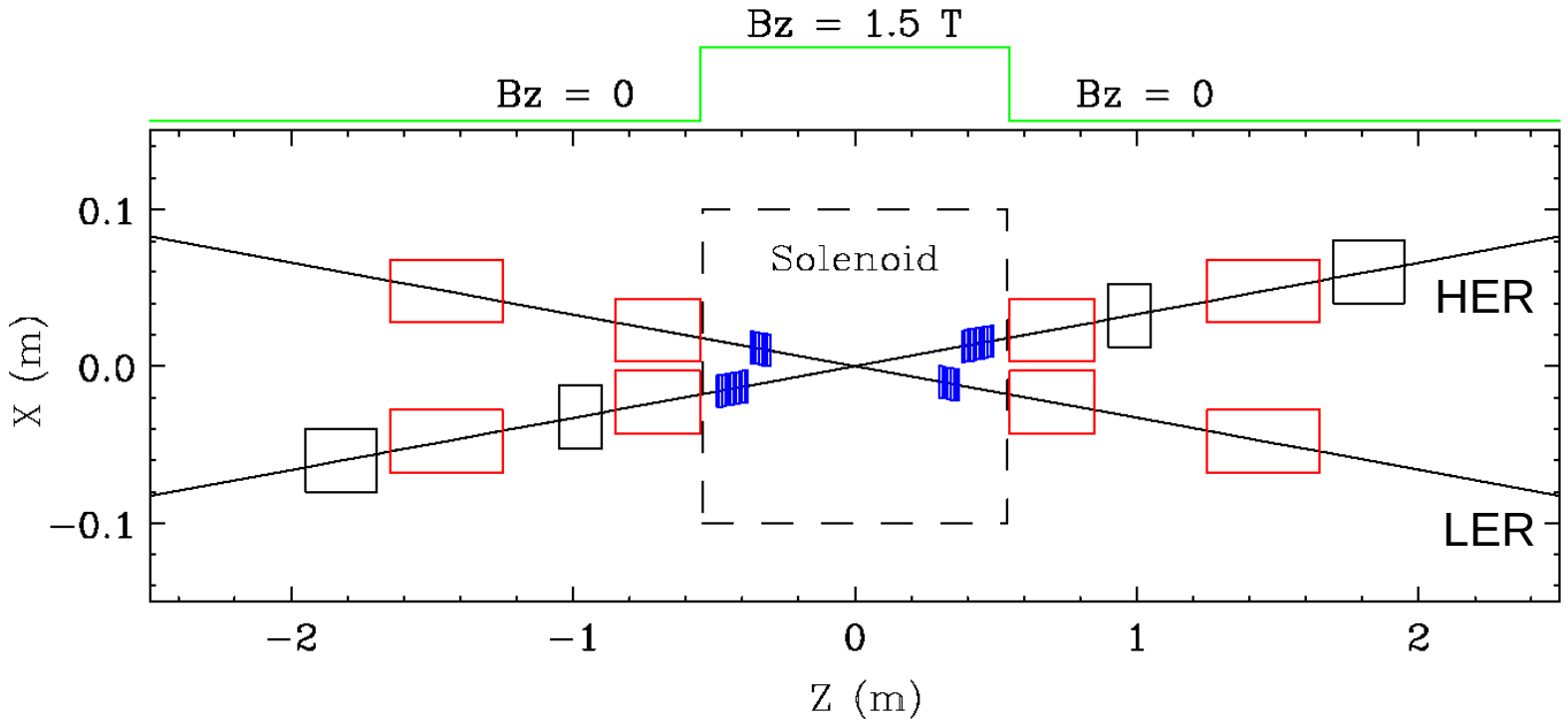
• Detector solenoid field is 1.5 T in the ±55 cm region near IP (between left and right SC cryostats) and cancelled outside of this region by means of compensating solenoids.

MAD model:

• Hard edge solenoid is tilted with respect to beams by ±33 mrad (for v.12 crossing angle).

• Overlap of permanent quads and the solenoid is modeled using thin lens quads with thick solenoid slices between them.

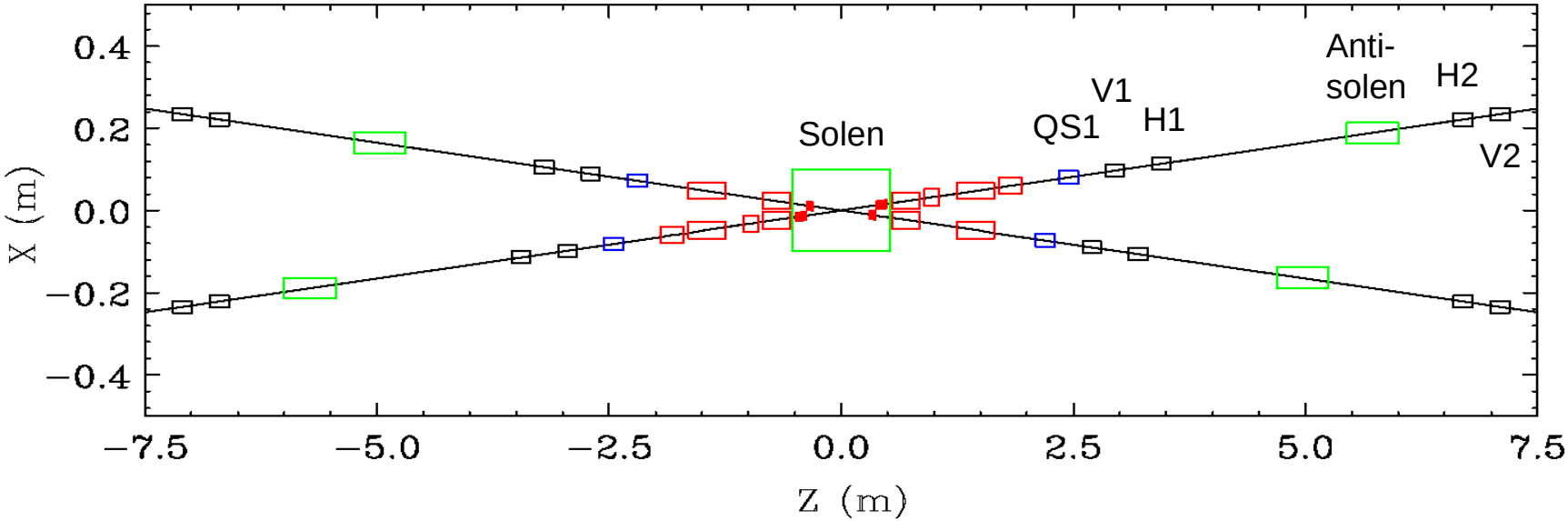
Note: Constant solenoid field profile can be easily replaced by a more realistic Z-dependent profile using many slices with gradually changing field.



Correction system

The designed correction system compensates each half-IR independently and contains on each side of IP:

- Rotated permanent quads.
- Skew winding on SC quads to simulate rotation.
- SC anti-solenoid of strength 1.5T x 0.55 m aligned with the beam axis.
- 2 vertical and 2 horizontal dipole correctors for orbit correction.
- 4 skew quads at non-dispersive locations for coupling correction.
- 2 skew quads at dispersive locations for correction of vertical dispersion and slope.
- The nominal FF quads are used to rematch the Twiss functions and horizontal dispersion.

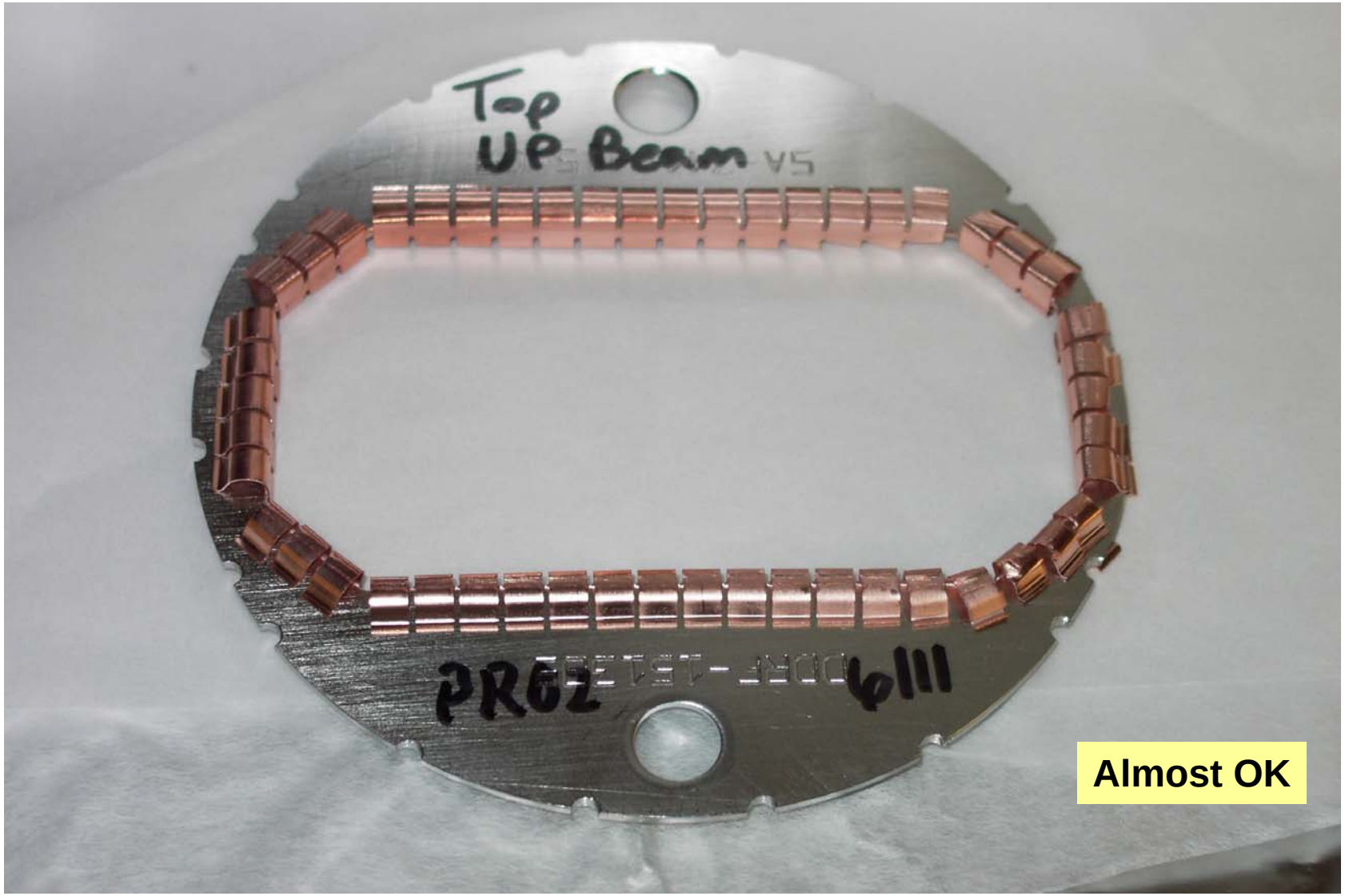


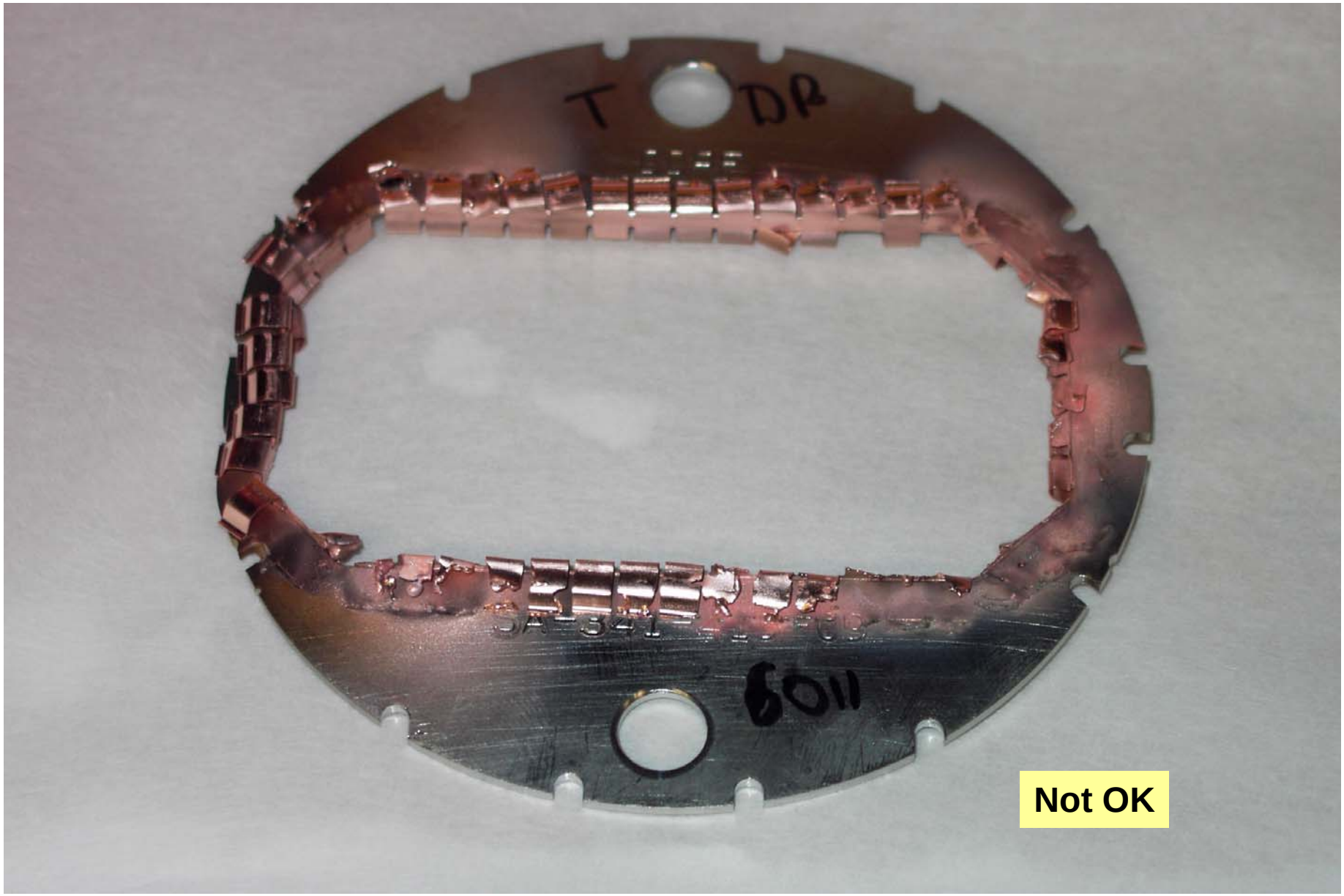
Other correctors are outside of this region

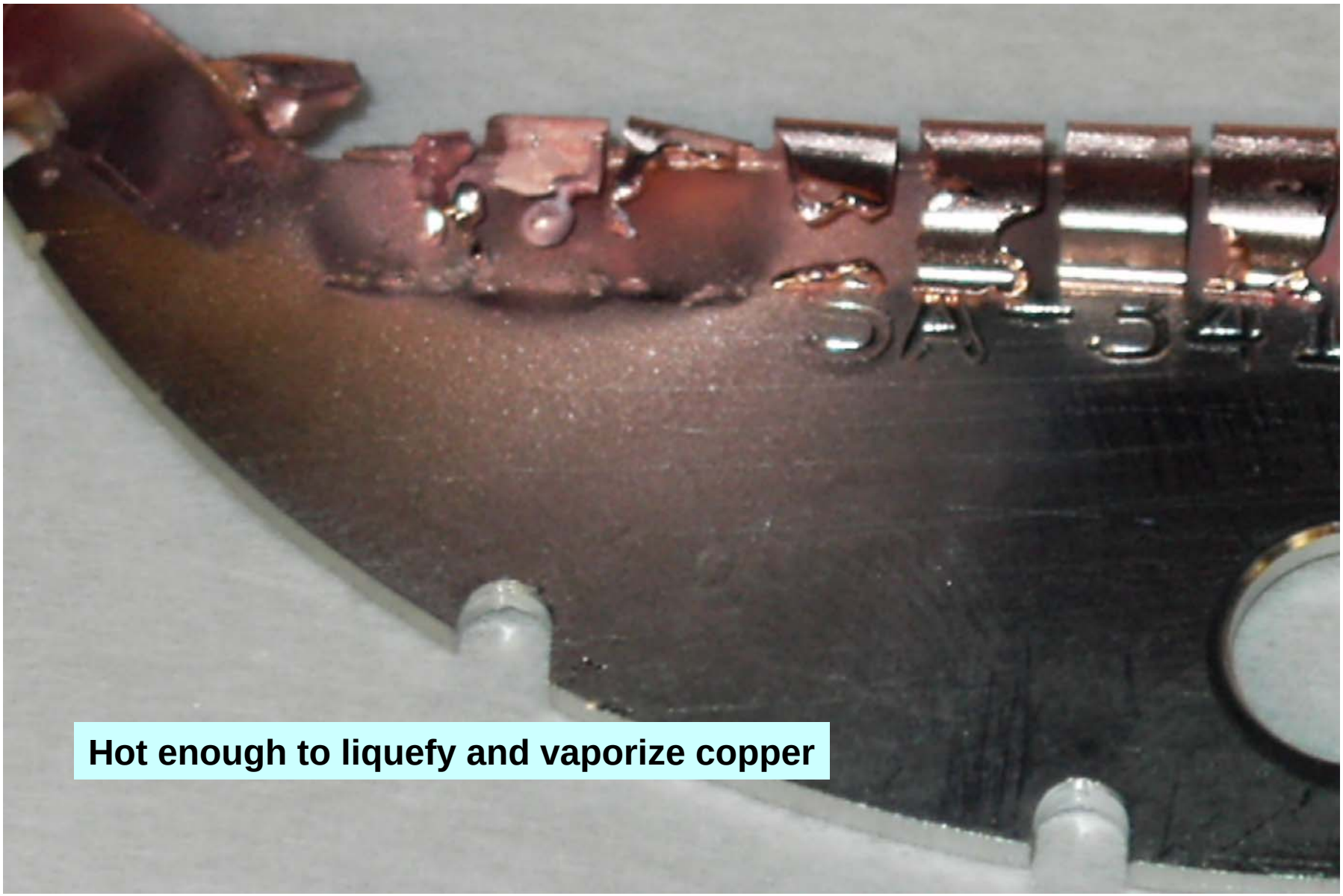
HOMs

- Analysis not complete until an engineered beam pipe is designed
- The devil is in the details
  - A HOM analysis needs to be done as soon as possible so that unexpected “hot spots” (places where HOM power is being absorbed that is not properly cooled) can be addressed

Vacuum components destroyed by a few Watts of RF



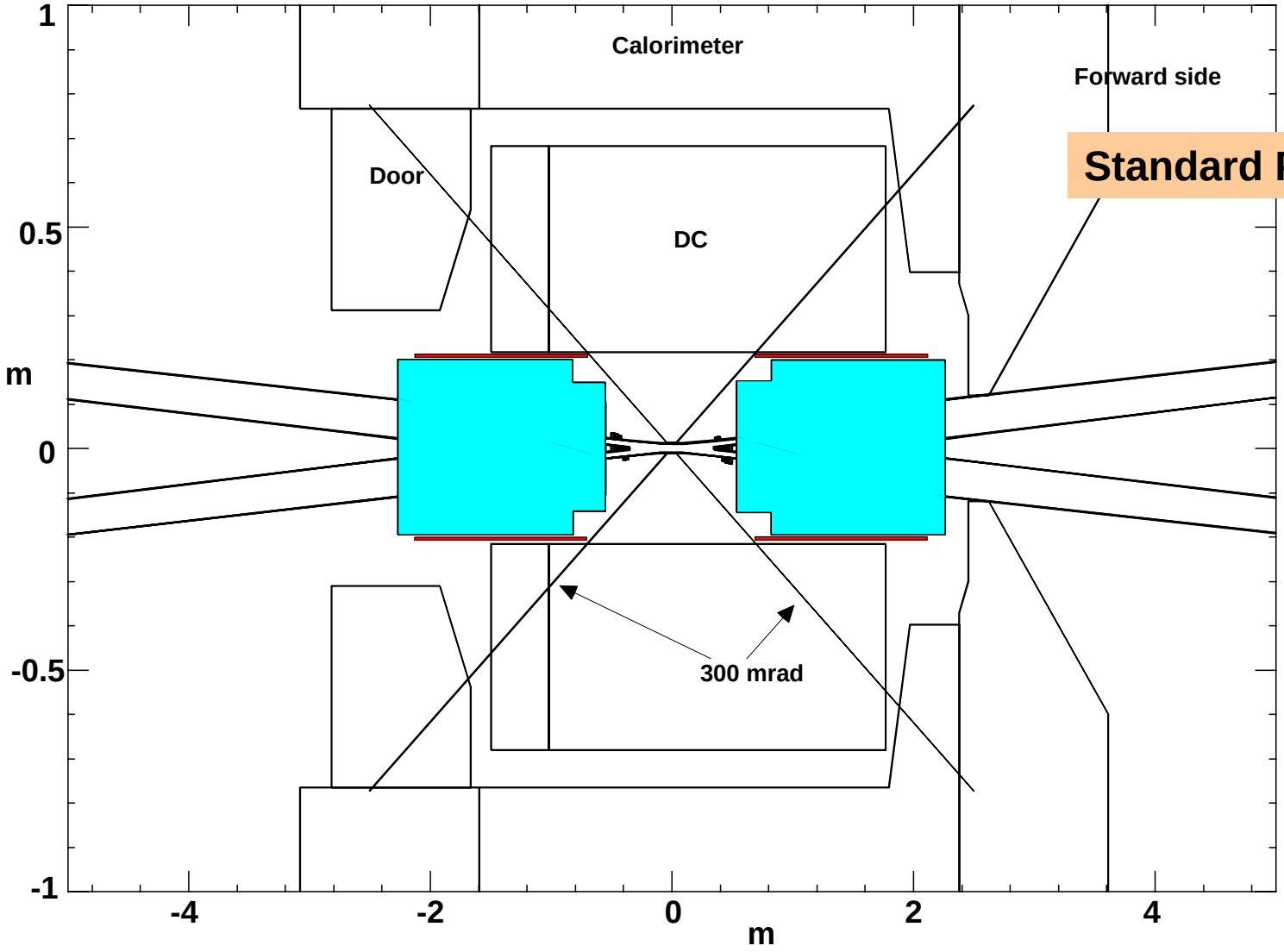

T
DR
Not OK


Hot enough to liquefy and vaporize copper

Access to the central region

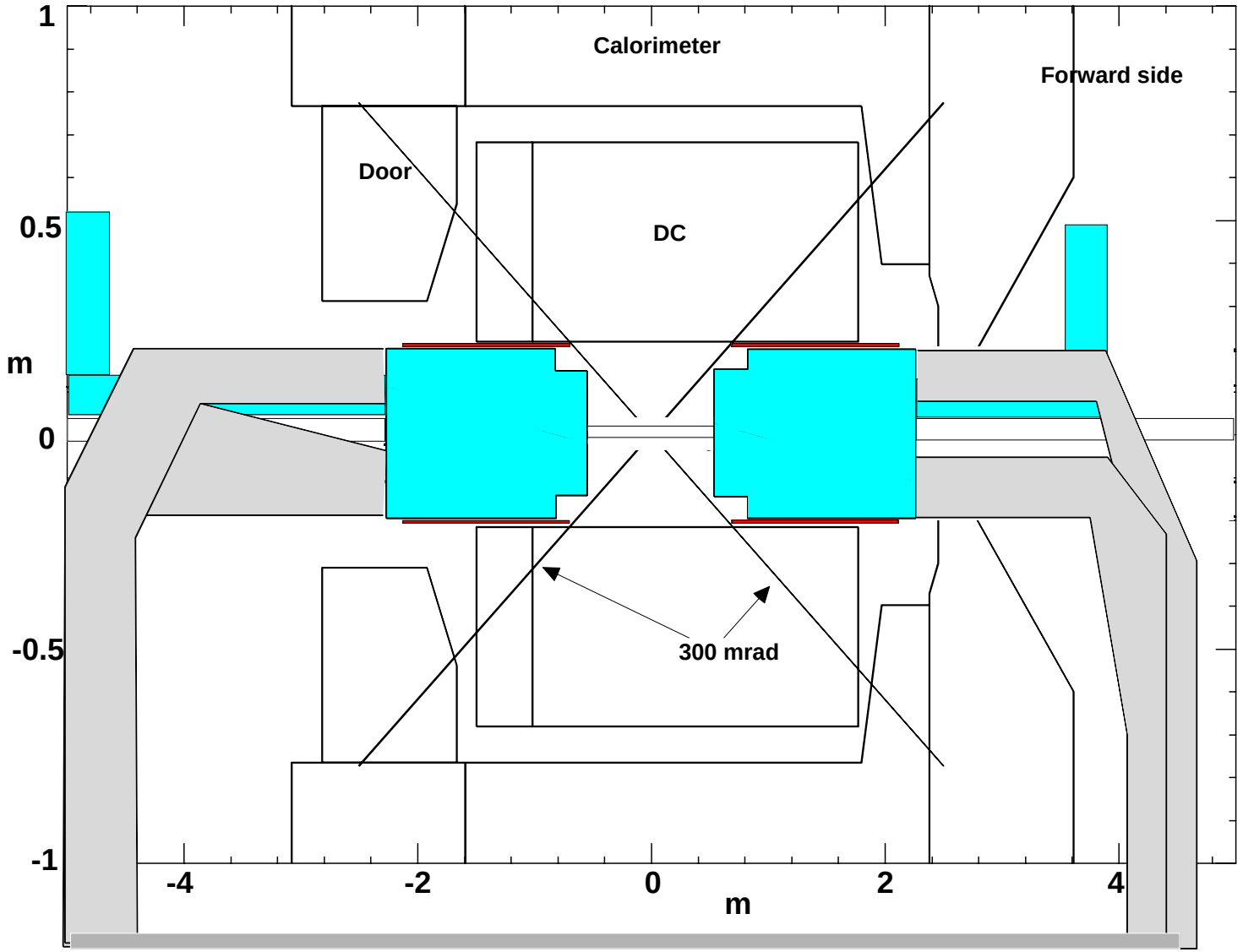
- Rapid access to the central region
- SuperB presently does not have an *in situ* way of disconnecting the central chambers
- We have to connect the two cryostats to a common structure – probably under the detector

Rapid Access Scenario

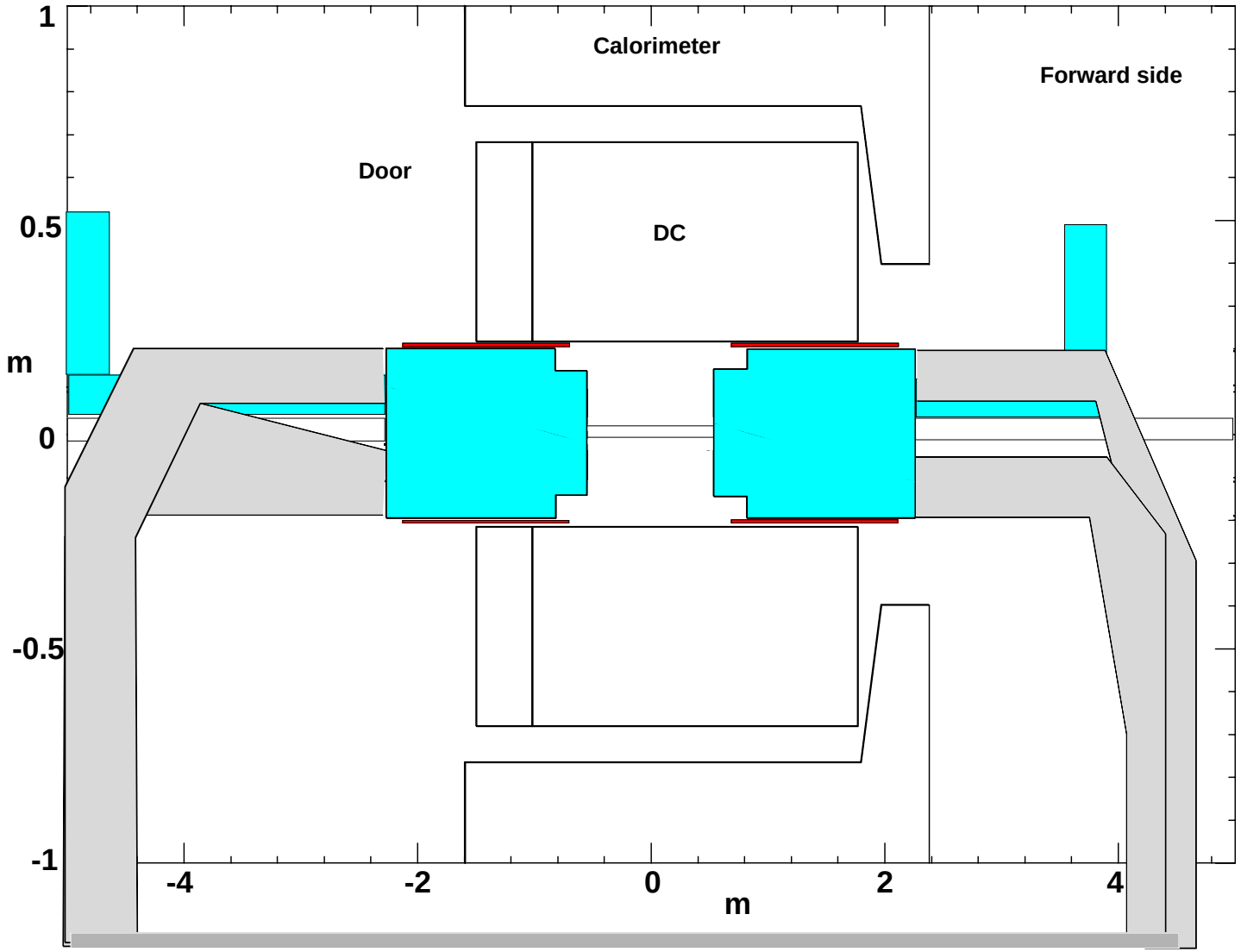


Standard Plan View

Side view

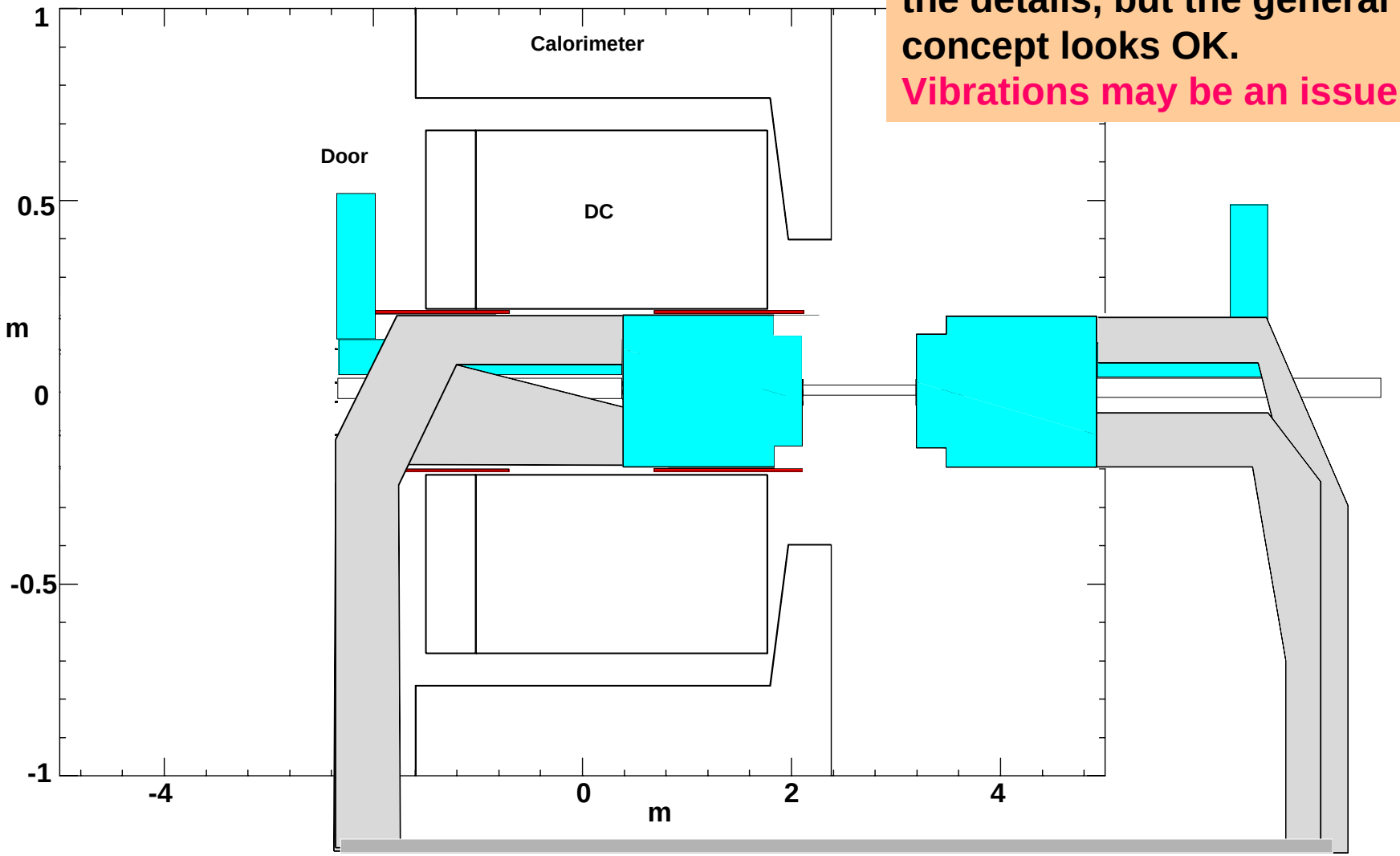


Doors opened



Cryostats and SVT slid out of the detector

More work is needed to study the details, but the general concept looks OK.
Vibrations may be an issue



Vibrations

- Certainly vibration control at some level is needed for the final focus elements
- For the machine, the only point of interest is to keep the beams in collision
  - We think we can do this by correcting the orbit of one beam wrt the other beam
  - This means we don't care if the IP moves around in the beam pipe
  - At least at some level. Too much motion and the orbits will not be stable enough. Few microns at the IP ok???

Vibrations (2)

- Giuliana Rizzo brought up an interesting point at coffee yesterday
  - What about relative motion between L0 and the rest of the SVT?
  - For that matter, what about relative motion between the SVT and the DCH?
  - This is an issue for both detectors
- The motion could be large (microns)
  - Did BaBar do anything about the found motion of the support tube?

Vibrations (3)

- Capacitive readout between L0 and the SVT?
- Laser interferometry between SVT and DCH or the rest of the detector?
- Should be thought about at least
  - Motion that is too fast to be corrected by track reconstruction will blur the vertex resolution
  - Even just measuring the motion to make sure it is small enough to ignore should be considered

Summary

- There are still many things that need further study for both designs
  - I don't see the design teams running out of things to check and study more carefully
- The SuperB TDR should at least list these topics as well as study as many as possible