Open Cavities Experiments

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LEMC

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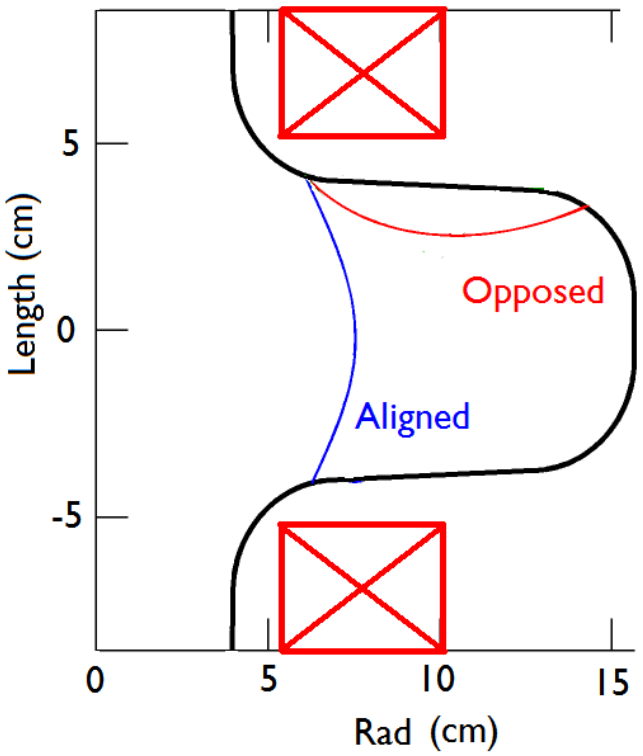
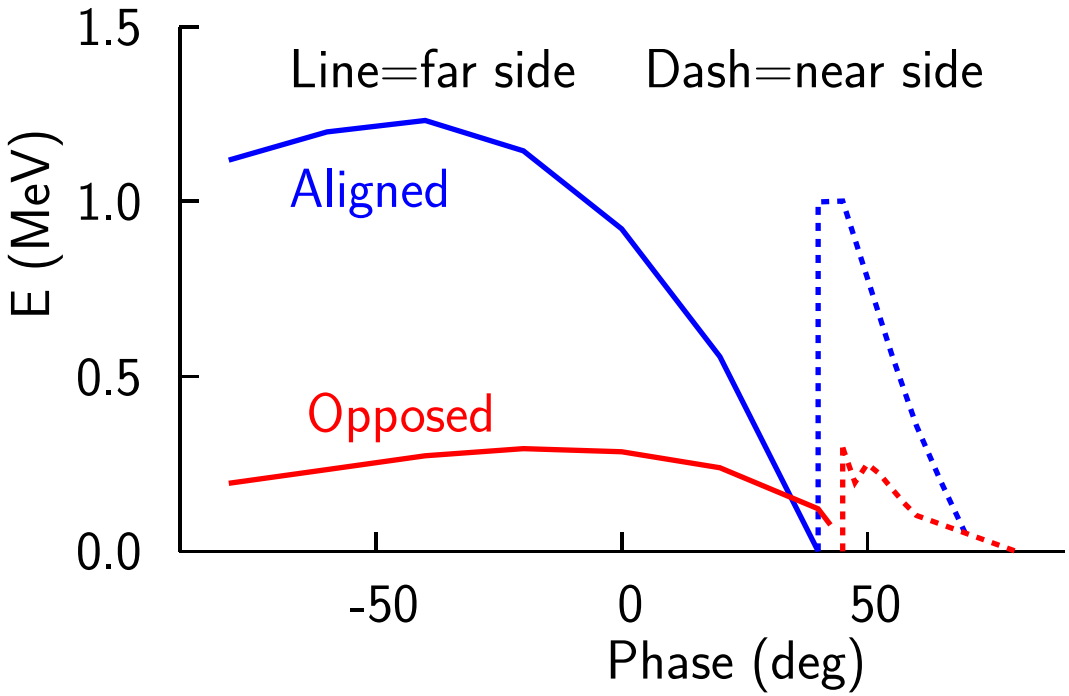
- Introduction
- Conclusion

Fix # 1: Open 805 MHz cavity with coils in the irises

(Palmer, Fernow, Gallardo)

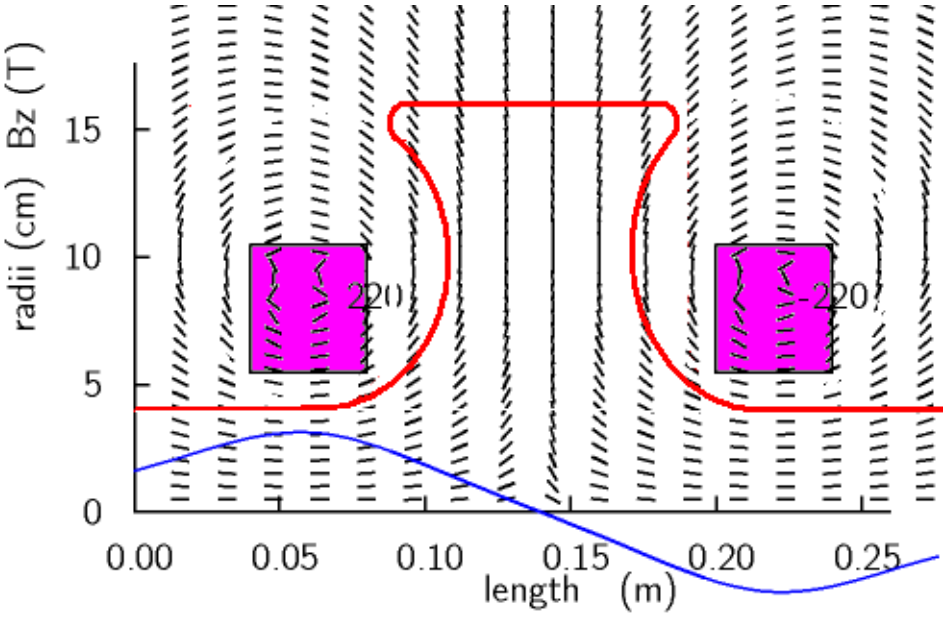


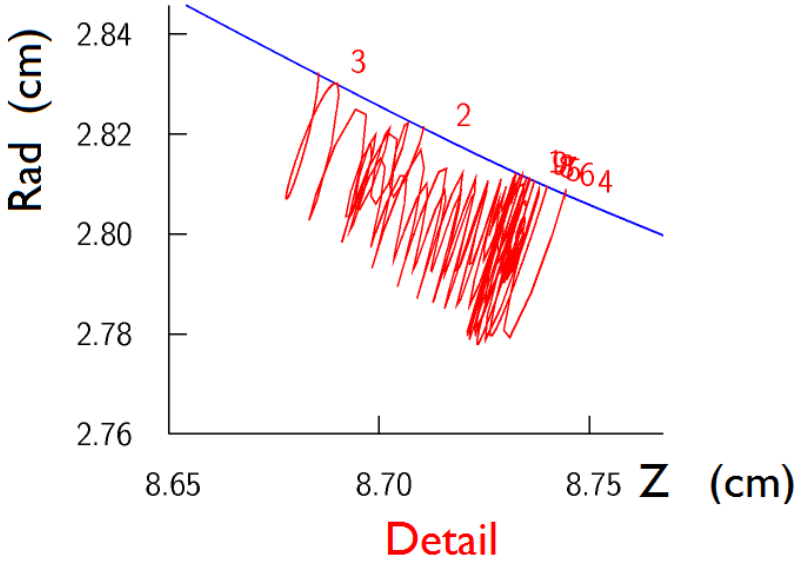


- For opposed coil currents
  - Electrons end in low field region, or
  - Return, but with low energy
  - This may, or may not, fix the problem
- Does not work for coils with same signs

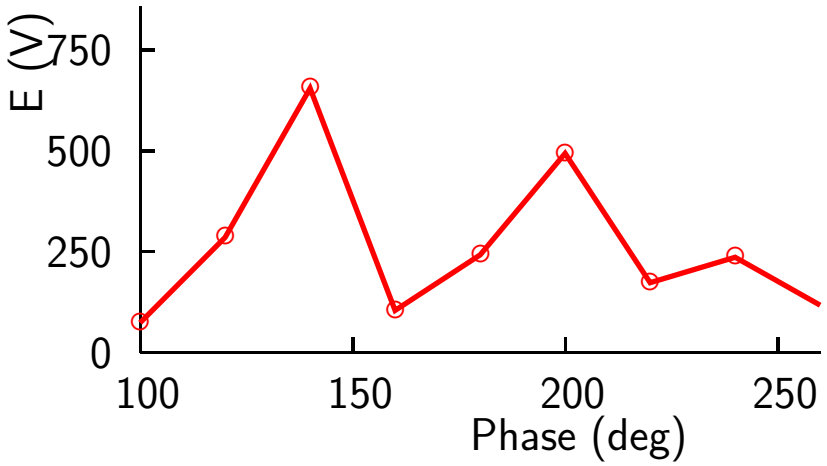
Fix #2 Magnetitically Insulated rf

Form cavity surface to follow magnetic field lines





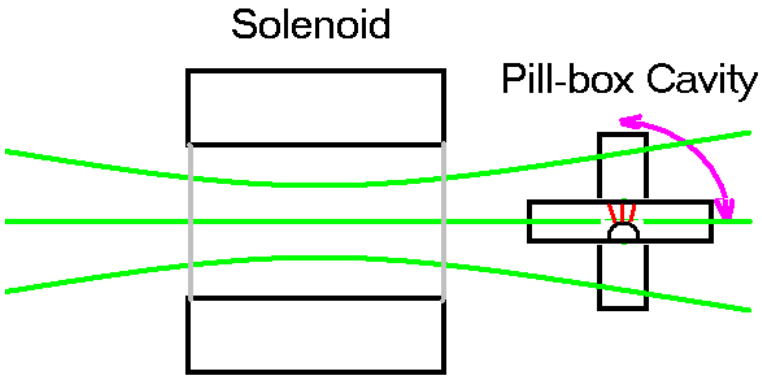
- All tracks return to the surface
- Energies are very low
- No dark current, No X-Rays !
- No danger of melting surfaces
- But secondary emission could lead to magnetron instability

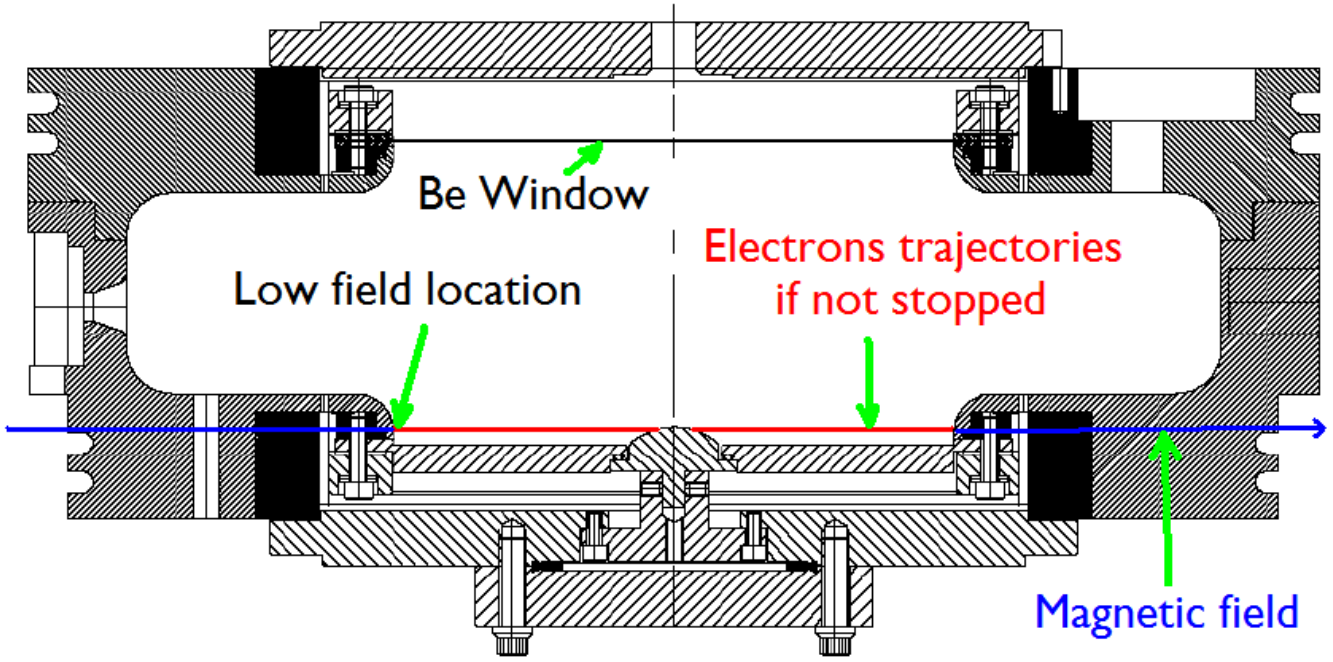


First Test in MTA

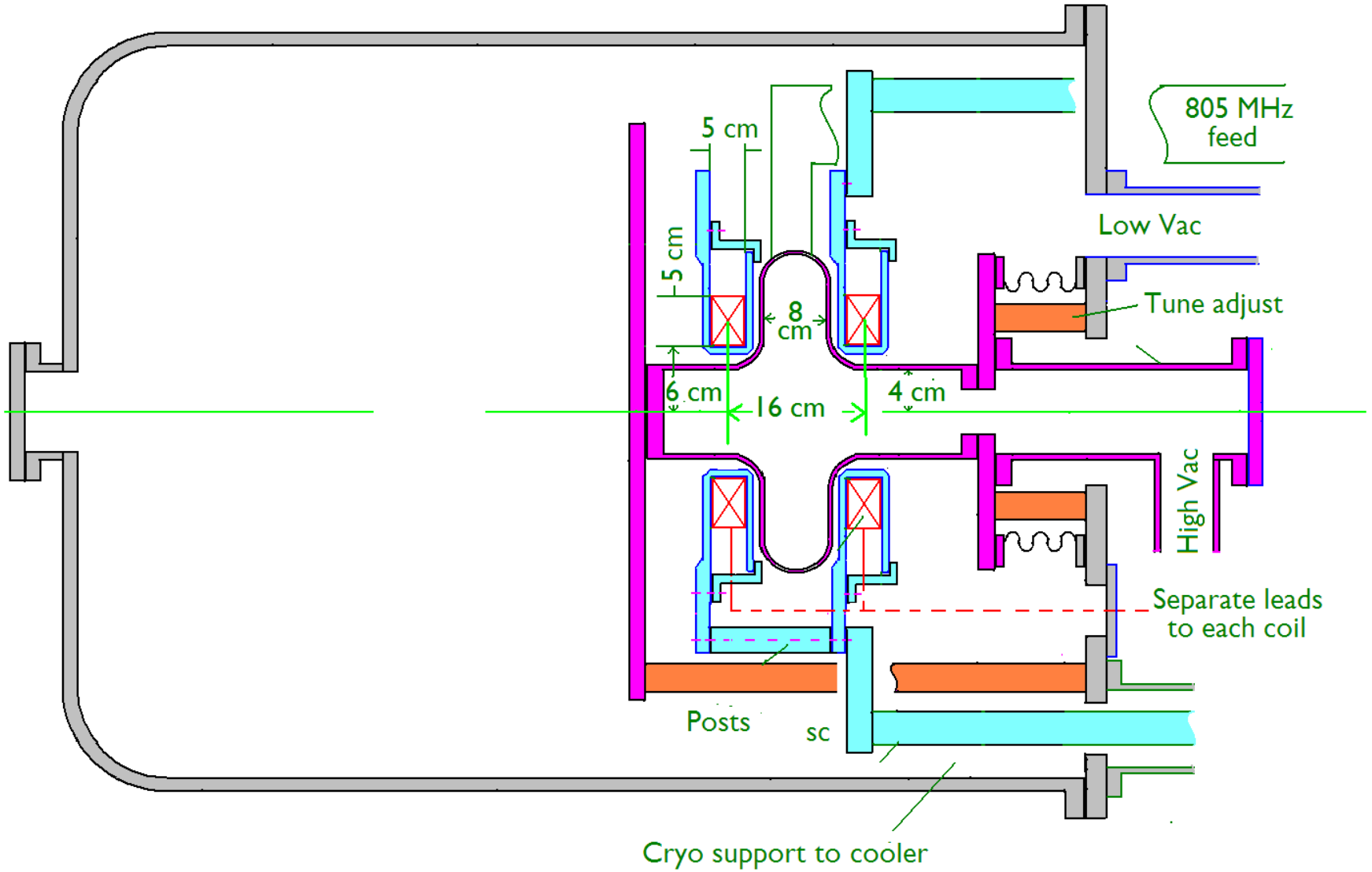
First using lab G Magnet and existing cavity at two angles

In next few weeks



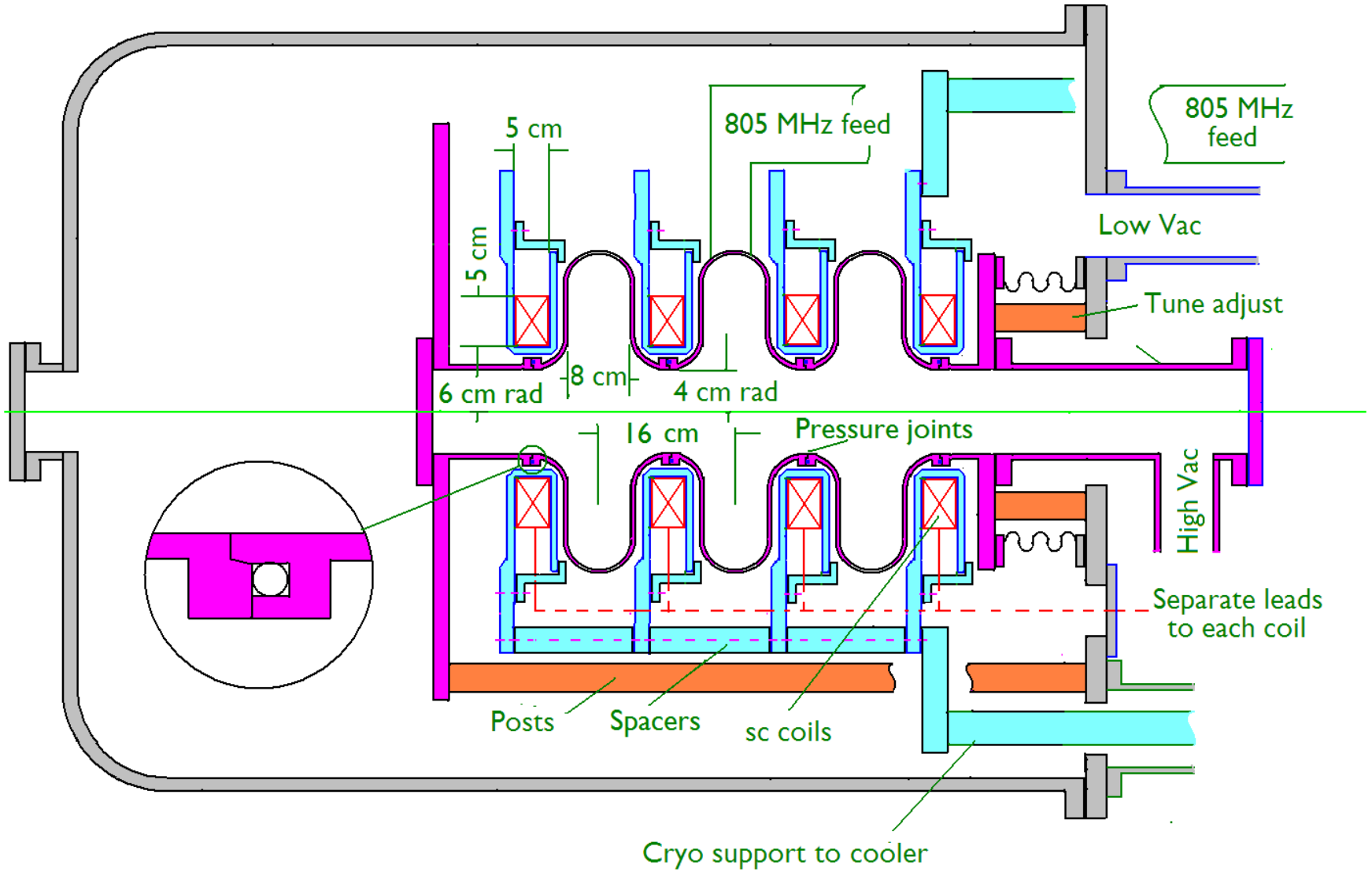


Sketch of Phase 1 Test 1 of Experiment



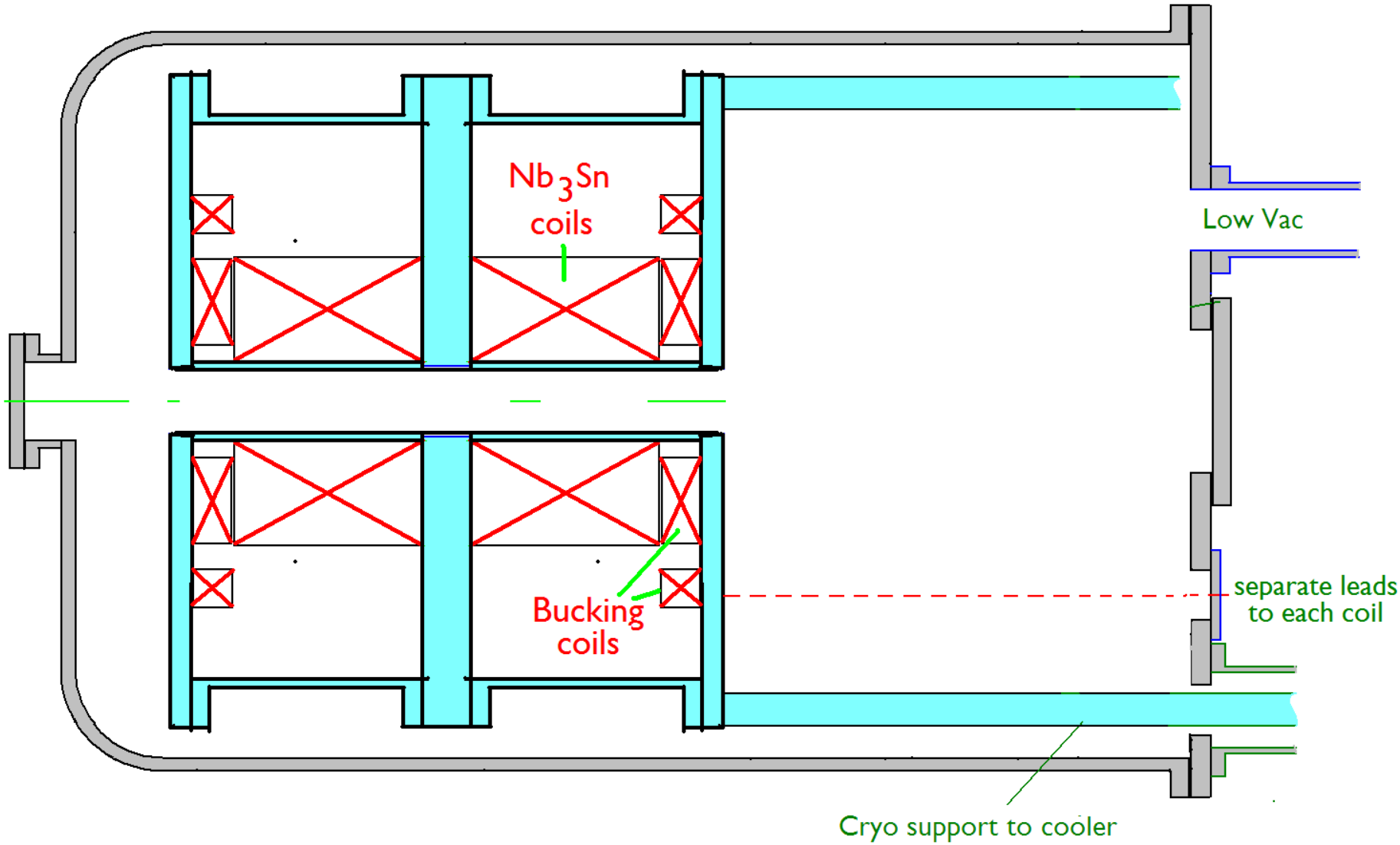
- Single cavity without joints
- Two coils
- Qualitative results, but not real fields: rf or magnetic

Sketch of possible of Phase 1 Test 2



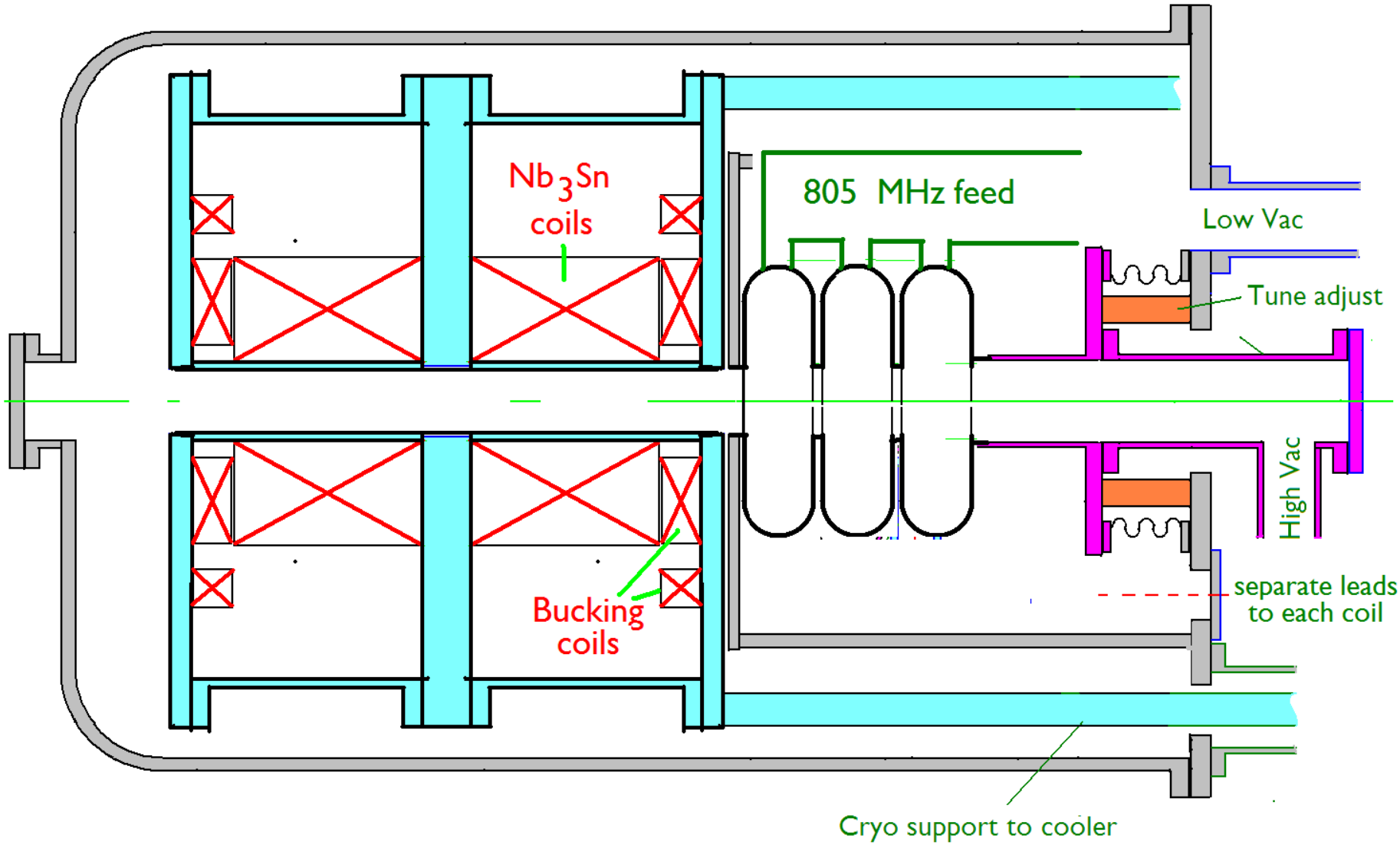
- More realistic E and B fields
- Test concept of pressure flanges for cavity joints
- But end fields not exact

Sketch of Phase 2, Test 1



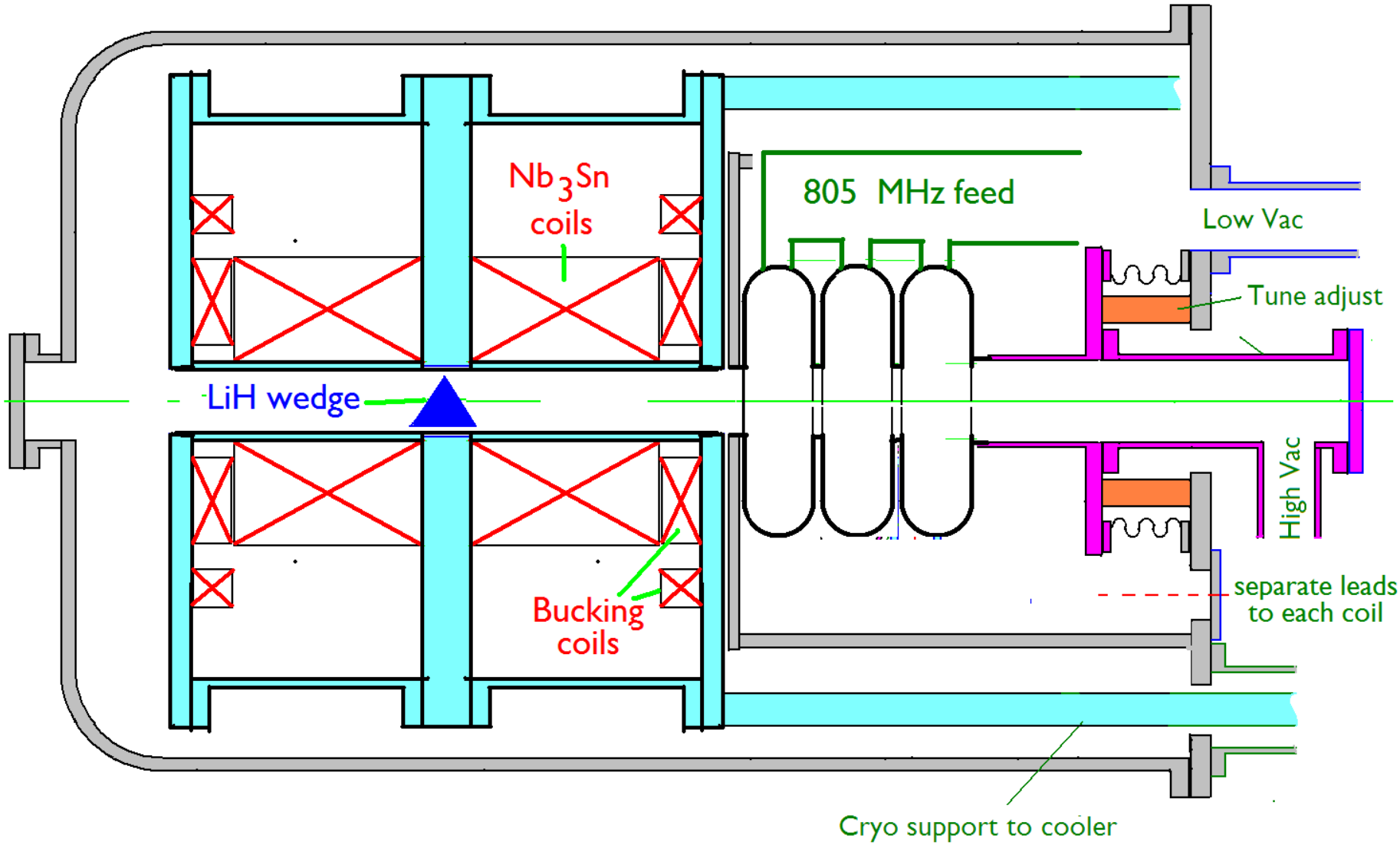
- Tests of 10 T Nb_3Sn coil with bucking coils
- Not to scale

Sketch of Phase 2, Test 2



- Add 805 MHz pill box cavities and feed
- Again: not to scale

Sketch of Phase 2, Test 3



- Add LiH wedge, with cooling and saftey considerations
- This will need a lot of engineering
- But we will have to face it to know if we are realistic

Phase 3

Put the above assembly in a muon beam and observe cooling down to emittances of the order of

$$\epsilon_o \approx 400 \ \ (\pi \text{ mm mrad})$$

Questions:

- Can the MICE detectors measure an emittance of $400 \ \ (\pi \text{ mm mrad})$?
- What modifications might be needed ?
- Can it measure the momentum of such a beam ?
  probably need to enter solenoids off axis to get significant helix radius
- What would the detector look like if we start from scratch at FNAL ?