

# Discussion on FRS Document

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# Page by Page discussion (Pg5)

- We were wondering if we could use this “FRS document writing exercise”
  - into an opportunity wherein boundary conditions for this design effort are decided
  - The unresolved issues are directed to the concerned groups

(But This is Tom’s decision we will leave it to him)

- Hope that we will not be working on internal magnetic shield here.

# Page by Page discussion (Pg6)

- Alignment fiducials on the vacuum shell with reference to cavity positions. —  
Do you think that we need to involve alignment experts at this stage in our design

As many changes have been made as compared to Tesla type IV.

During assembly of CM1 the alignment group had acquired valuable experience. The problems that they faced could be accommodated in our design.

- Should we mention Relief valves also?
- The baseline cryomodule structure includes short enough warm to cold transitions such that cavity to cavity spacing from one cryomodule to the next is acceptable with allowance for warm Magnet(s), instrumentation between cryomodules, and access for their installation
  - Can we specify a minimum distance or say that it should be as per the lattice configuration.
- Is the total isolation of cryomodule required?
  - Can we think of warming up of concerned cryomodule without warming adjacent cryomodules in a segment ?

## Page by Page discussion (Pg7)

- ❖ We were wondering about 20 number of thermal cycles for CM? is it dependant on the warm ups in life time?
- ❖ Can we have some idea of the envelope space required by the (expecting blade tuner) tuner on helium vessel from the group working on it (Serena)?
- ❖ Cooling requirement of the tuner motor ?
  - Do we have to mention the enhanced cooling which may be required for a new tuner? The tuner motor may be different.

## Page by Page discussion (Pg8)

- ❖ Probably it has been decided that end groups will now have HOM couplers.
  - So can we remove “if any” in section 3.3 under the heading thermal shield and intercepts.
- ❖ Aim for highest possible mechanical frequencies for mechanical vibration. [NEED A DESIGN GOAL. For example 50 Hz for lowest mechanical mode of a cavity on its support structure.]
  - The statement is fine. As we are designing the cavity support system, we would like to know how can the design efforts get integrated with the shipment group (Mike Mc Gee’s group)

# Some General Issues

- Are all bellows to be designed for 10,000 cycles?
- We are in the process of designing the thermal shield. So we have been looking at the Tesla cryomodule papers on cool down . Should we put a value that the cryomodule should get cooled down in so much time . We may try to keep the value closer to Tesla Cool down time so that cooling scheme experimentation is minimized.
- As in earlier presentation and this document 300 mm pipe taken as ideal support in a CM with 650 MHz cavity. Can we reduce this pipe diameter to 200 mm (with appropriate stiffness) and modifying the assembly tooling of CM?
- In addition, required size of 2K 2-phase pipe(at 30 or 16 mbar pressure) is about 6" (from emergency venting point of view) which is connected to a vent pipe from one end only. Can we accommodate second connection from this 2-phase to vent at other end also? This may reduce required size of 2-phase pipe (for helium emergency venting in a scenario of accidental loss of vacuum). This will not only allow us to have chimney of smaller diameter but create extra space side ways. This will be more useful if we consider flexible chimney(bellow) for 2 K liquid supply .

# Some General Issues

- Considering 2-phase flow instability issues in addition to requirement liquid level control and other related extra instrumentation etc. Should we consider your proposal of supercritical helium flow for 5K thermal intercept as final.
- Is Fermi's parallel plate relief valve (as mentioned in HTS) can be taken as reference for spring loaded safety valve for insulating vacuum vessel as Fermi's std. bayonet design and J Lab's big sub-atmospheric bayonet design taken as reference for bayonet connection to transfer line.