Impedance Guidelines for the SPS

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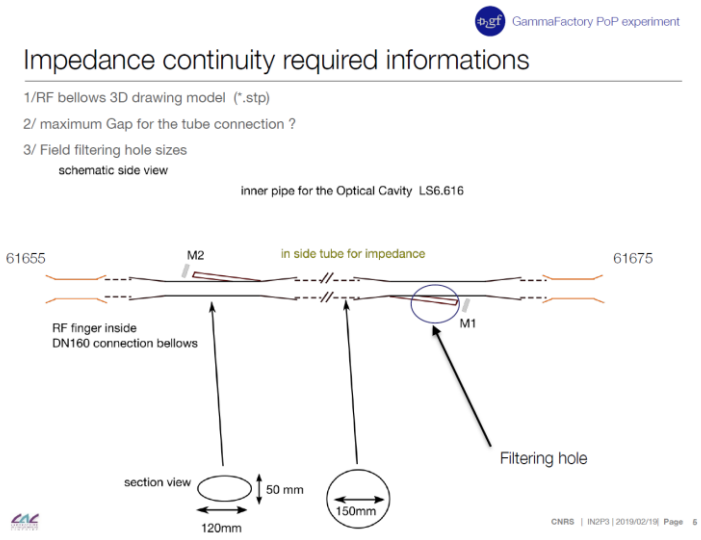
Outline

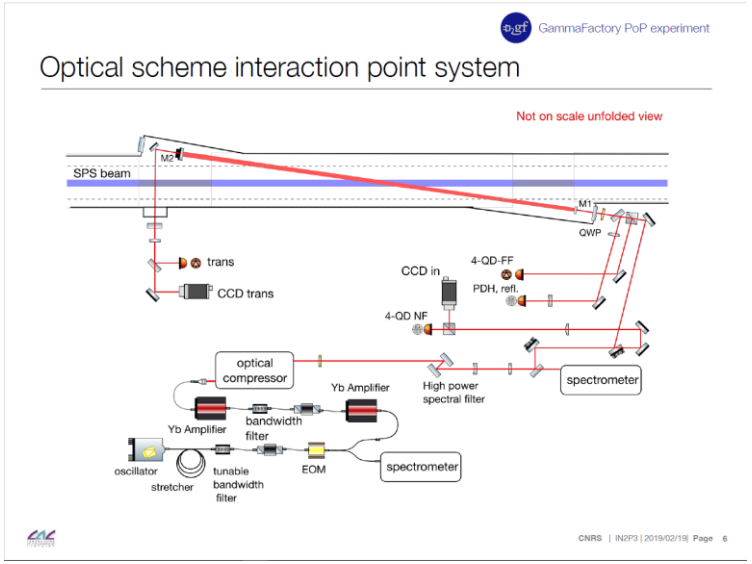
- The location of the proposed test stand
- The impact on existing equipment
- The impact of additional equipment including the test stand
- Possible modifications to the first stage proposal

Note: The information in the presentation was compiled under the assumption of the 6.257 m experiment which is now reduced.

Proof of concept in the SPS

- Installation of a Fabry-Perot cavity in LSS6 of the SPS
- Requires an optical cavity with a small angle to the beam on the order of a few degrees (Long cavity) s=6285.155 m to s=6291.412 m is proposed
- This will lead to several possible impedance issues





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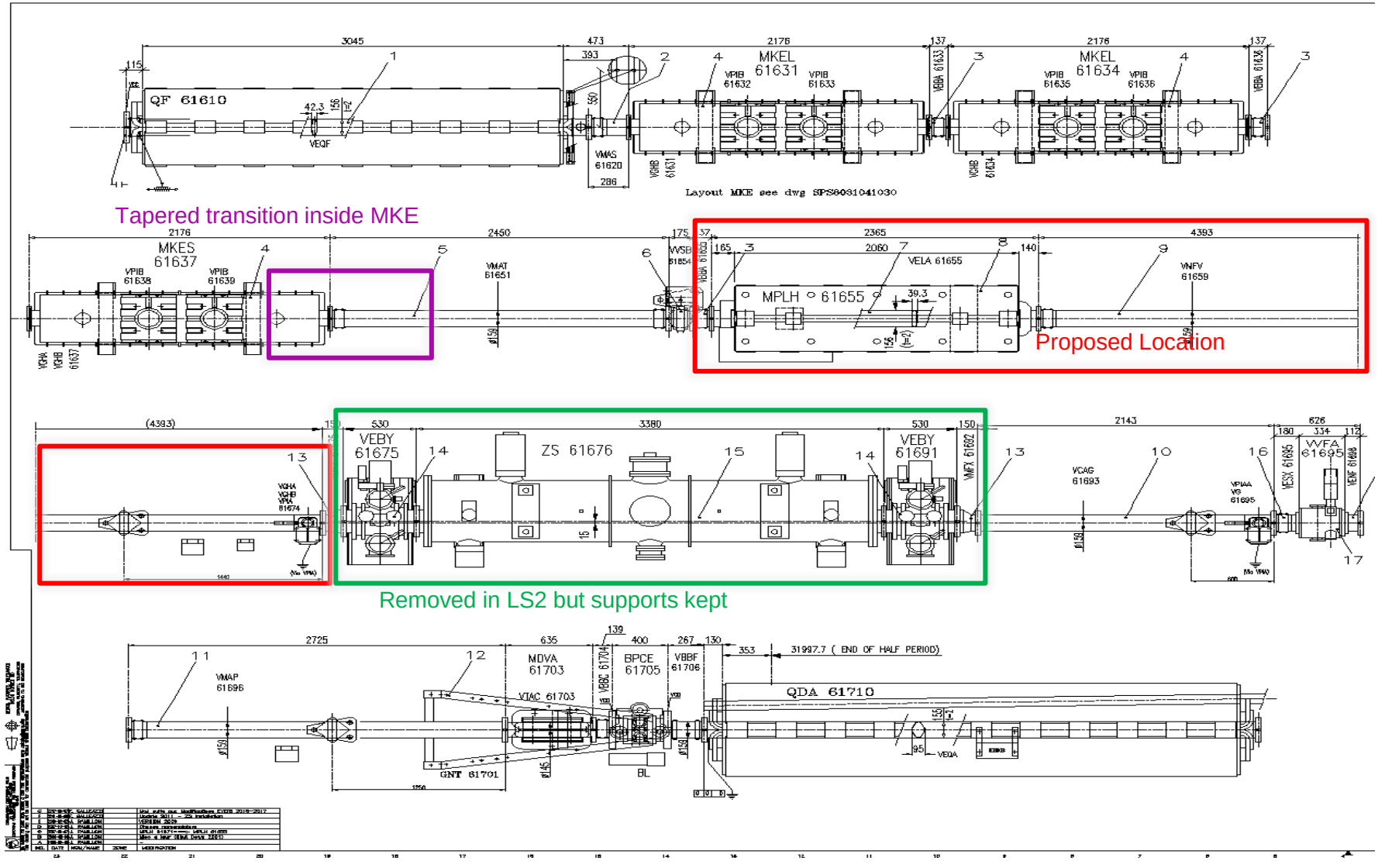
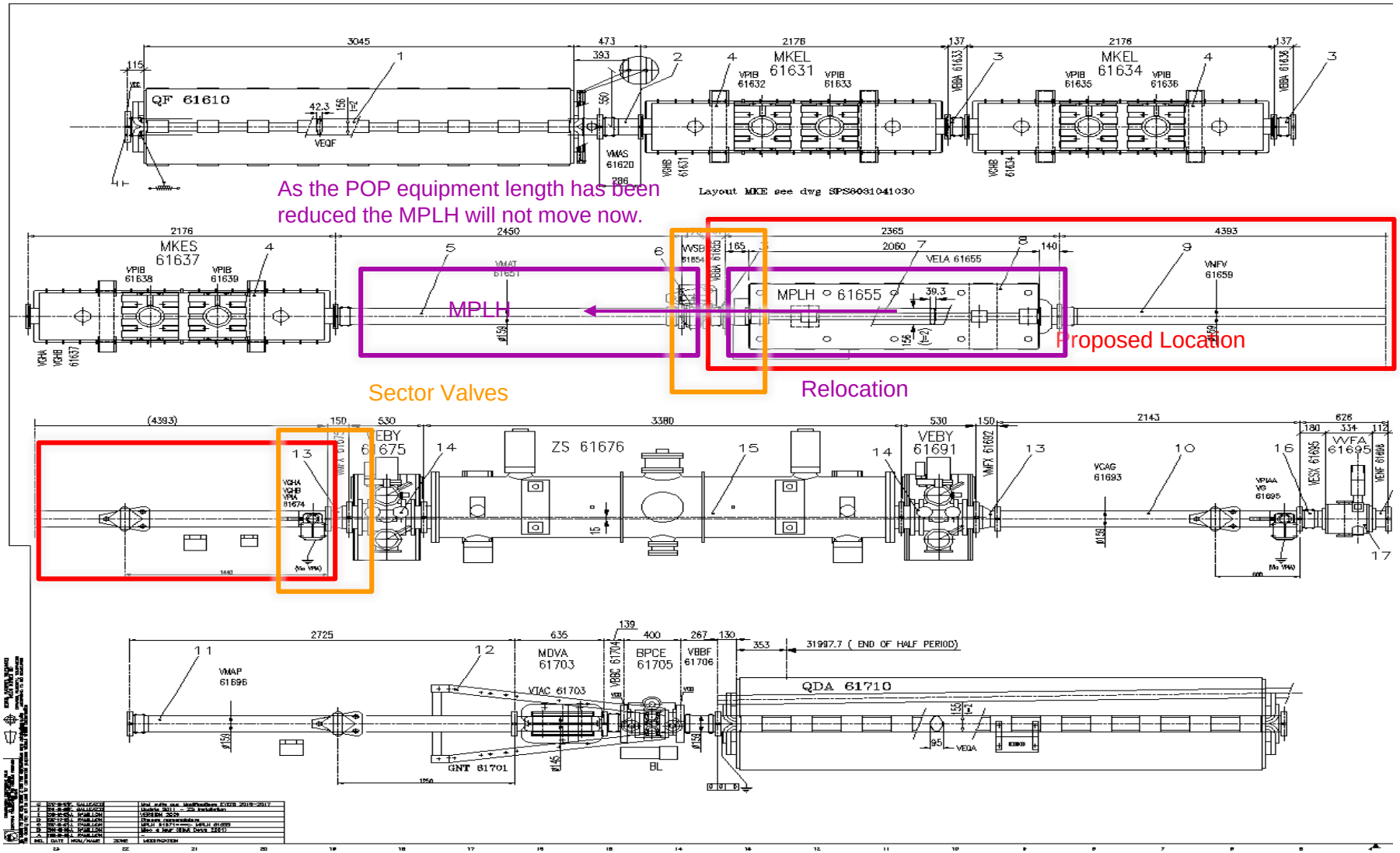
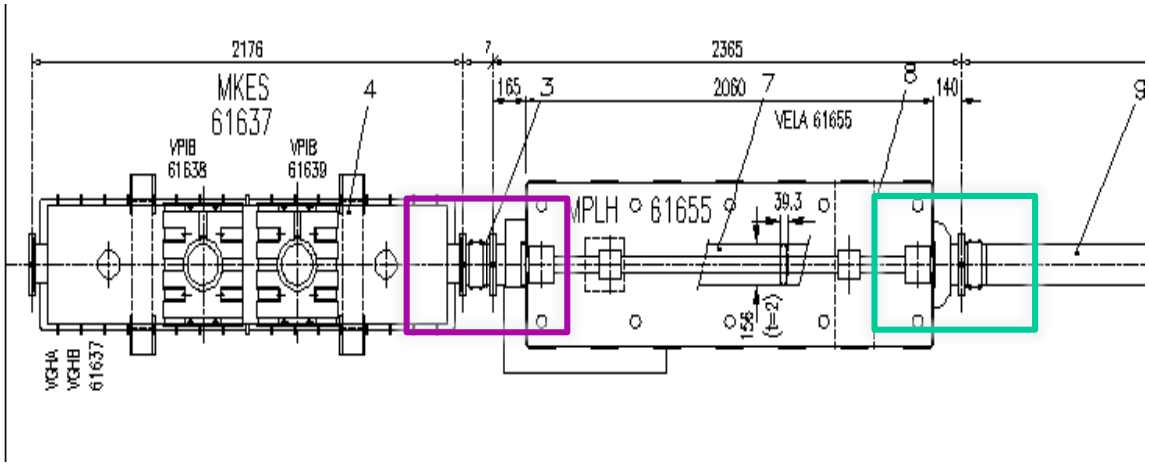
Current Layout



Changes to the Layout



Impedance Consequences

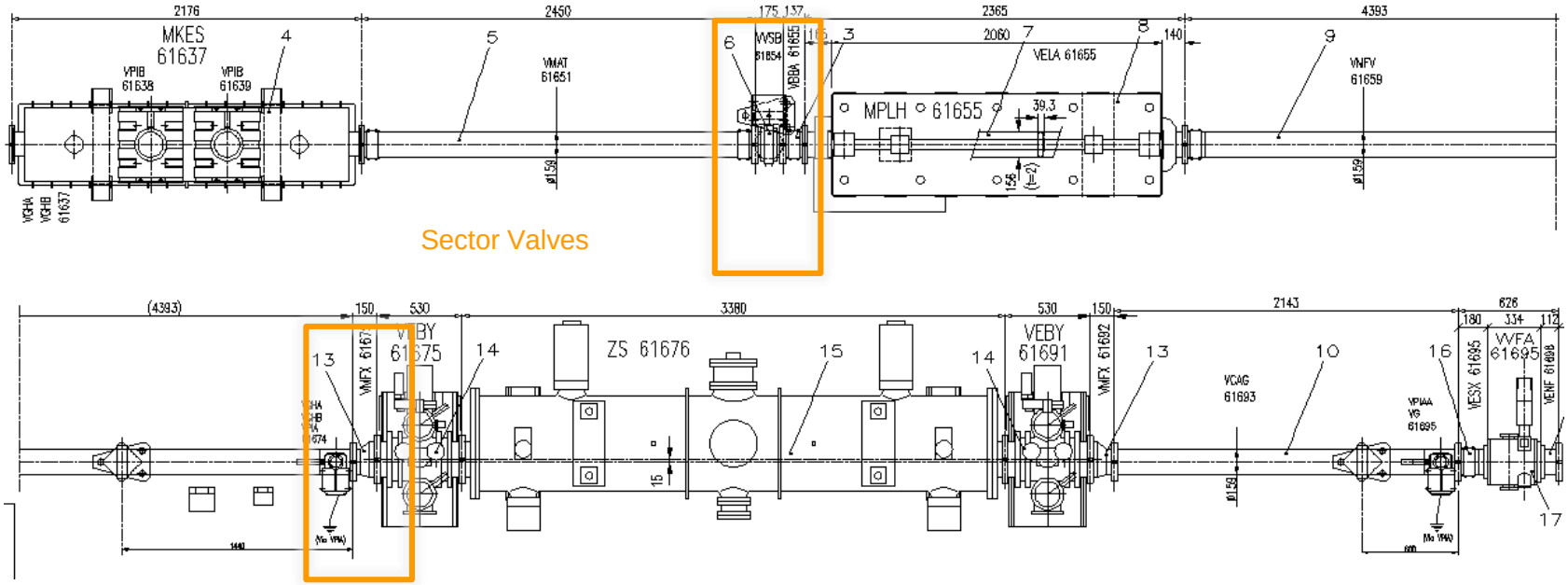


As the POP equipment length has been reduced the MPLH will not move now.

- Relocation of the MPLH which has a flat beam pipe poses issues
- Between the MKES and the MPLH a cavity is created which will give an impedance contribution

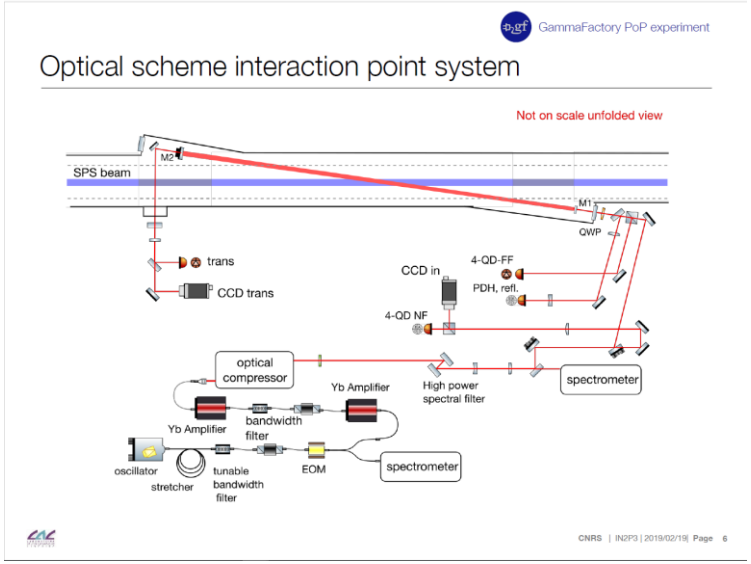
- This side would require the installation of a dedicated shield between the MKES and the MPLH which in all likely hood will also encompass a bellows between them
- In addition this creates an electrical connection from the MKES which needs investigation
- The step out is also not ideal and should be tapered on the down stream end

Impedance Consequences



- Sector valves are a known impedance contributor in the SPS
- They have a significant impact on the beam stability
- In order to have these valves transparent to the beam they require shielding.

The Fabry-Perot Cavity Itself



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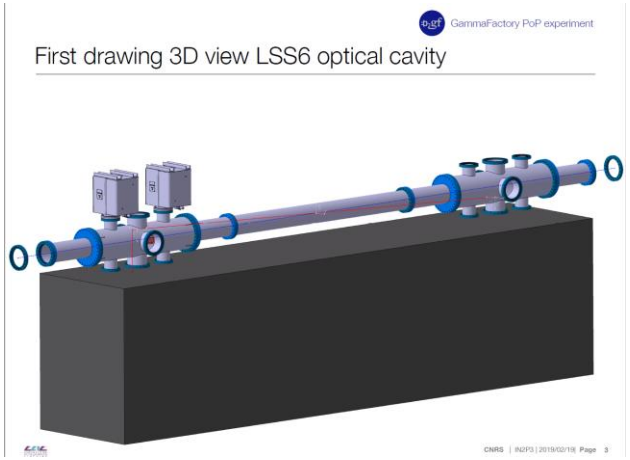
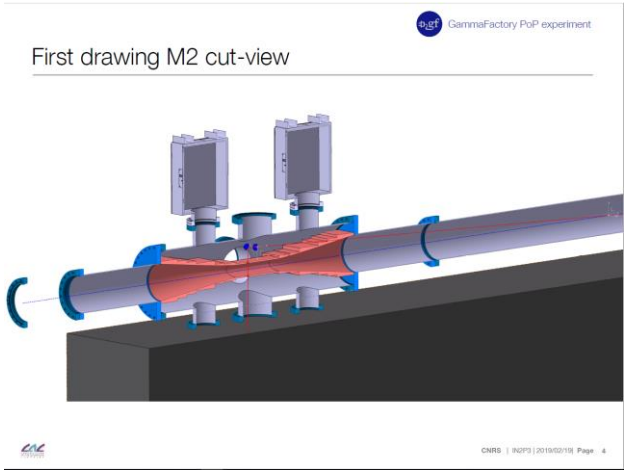
- Ideally any device which is not a requirement for the LHC or FT beams should be transparent
- In this location that would mean the ideal case would be to maintain the current 156 mm internal diameter if possible
- Detailed guidance can only be given once the design is in a more advanced state

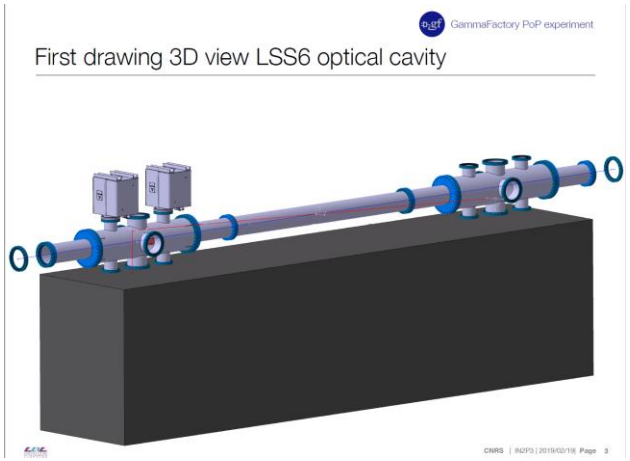
Proposed Design

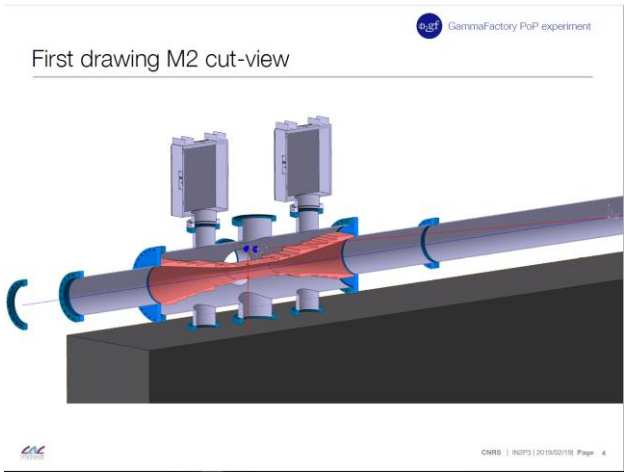




- Introduction of tapers with an angle less than 15 degrees is helpful for impedance
- Shields will require holes for pumping (Check with TE/VSC)
- The current layout will create a long and hopefully inefficient cavity between the two tanks (to be confirmed)
- Additional bellows for alignment may also be required at each connection point (TE/VSC to advise)

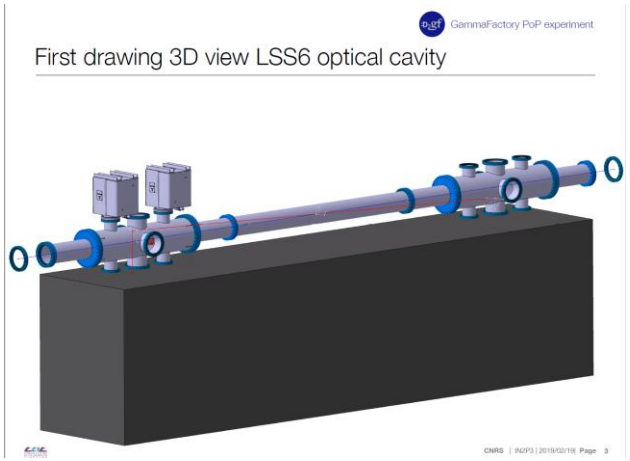
Alternative (1/2)

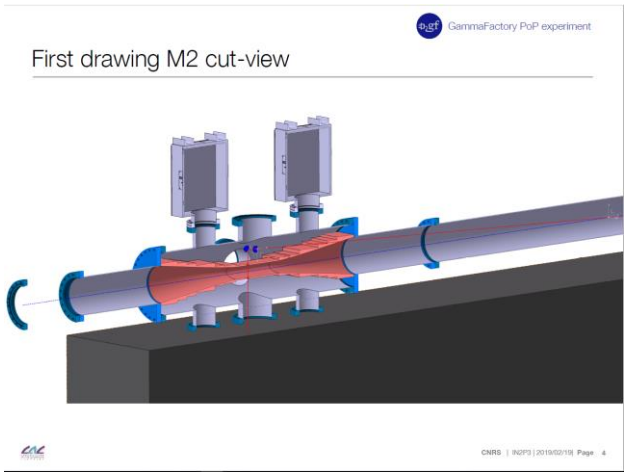




- Maintain the 156 mm round aperture
- Have tank with the additional volume for the primary mirrors attached to the 156 mm pipe with only the openings for the laser and for pumping - All of this inside primary vacuum
- The laser input and output can all be outside of the vacuum with an optical array and window used to allow it to reach the primary mirrors

Alternative (2/2)





- Maintain the 156 mm round aperture
- Rather than have a tapered shield use a 156 mm internal diameter cylindrical shield
- Increase the diameter of the main tank to make space for the optical setup
- This is expected to give the smallest possible impedance contribution

Thank You for Your Attention