Pending requests for (or related to) HL-LHC

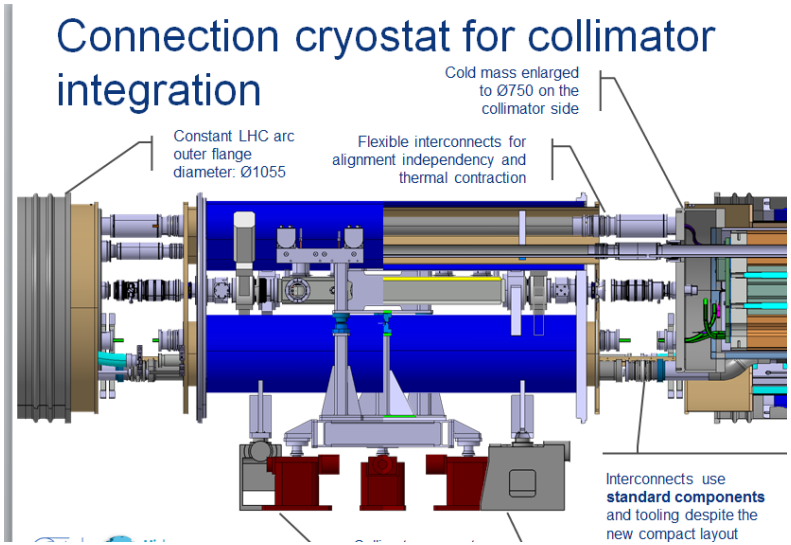
Benoit, Nicolo Elias and all collaborators
for the impedance team

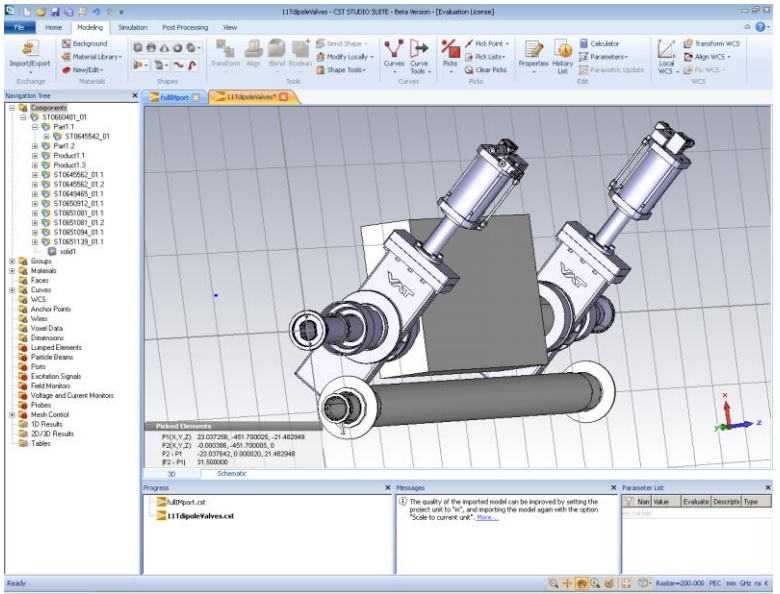
Actions from WP2 task leader meeting

- D11 T dipole: question if RF shielding of sector valves is really needed.
- Update on Triplet BPMs
- Update on new octogonal beam screen
- New backup solution for RF fingers planned in the triplets???

Actions from WP2 task leader meeting

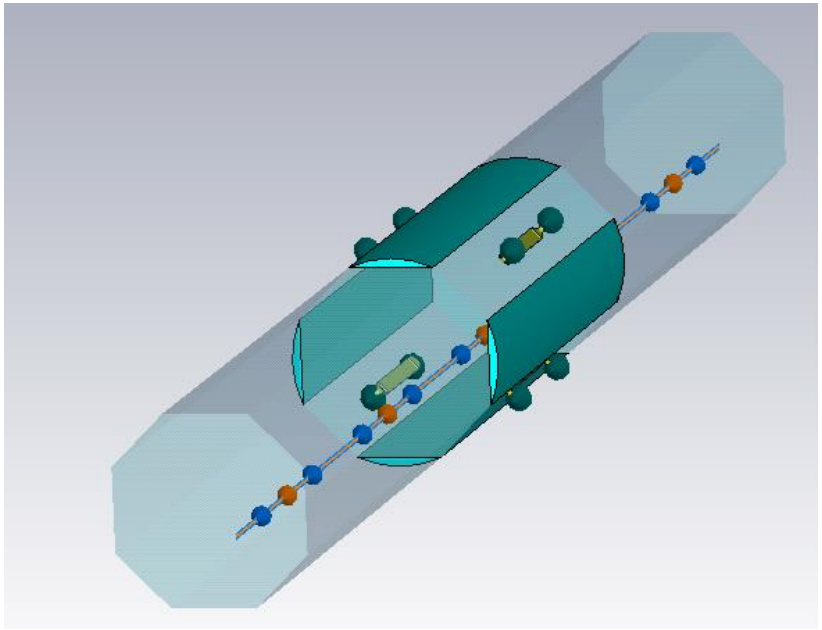
- D11 T dipole: question if RF shielding of sector valves is really needed.
  - Answer needed by May
  - 3D model of D11T available, but the inside of the VAT sector valve is missing
  - From work from Jose Varela for SPS sector valves, it is likely that the RF fingers are needed





Actions from WP2 task leader meeting

- Update on Triplet BPMs
  - Trials for striplines design for BI, but Thibaut informed that design has anyway changed (no tungsten anymore)

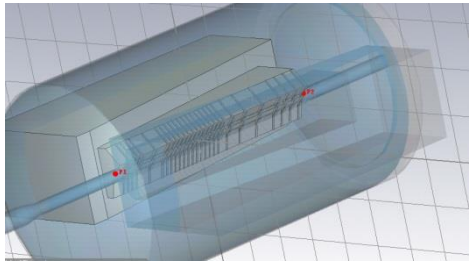


Actions from WP2 task leader meeting

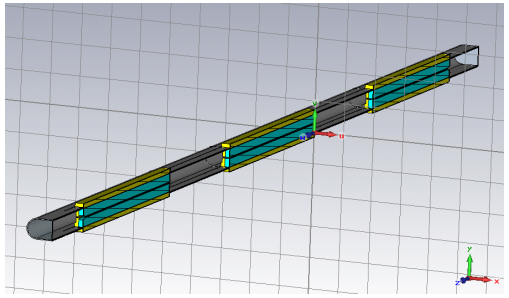
- Update on new octogonal beam screen for triplets
  - Waiting for proposals of design from TE-VSC after the meeting in January:
    - two welds instead of one
    - carbon coating (presentation by Carlo at TE-VSC meeting) → impact of aC coating seen on both imaginary impedances

Other ongoing work

- Crab cavity → no change, no news from list of modes
- LHCb VELO → longitudinal impedance Im(Z/n) ~ 5% of full LHC (instead of 1% now). Impact on transverse smaller thanks to low beta*.



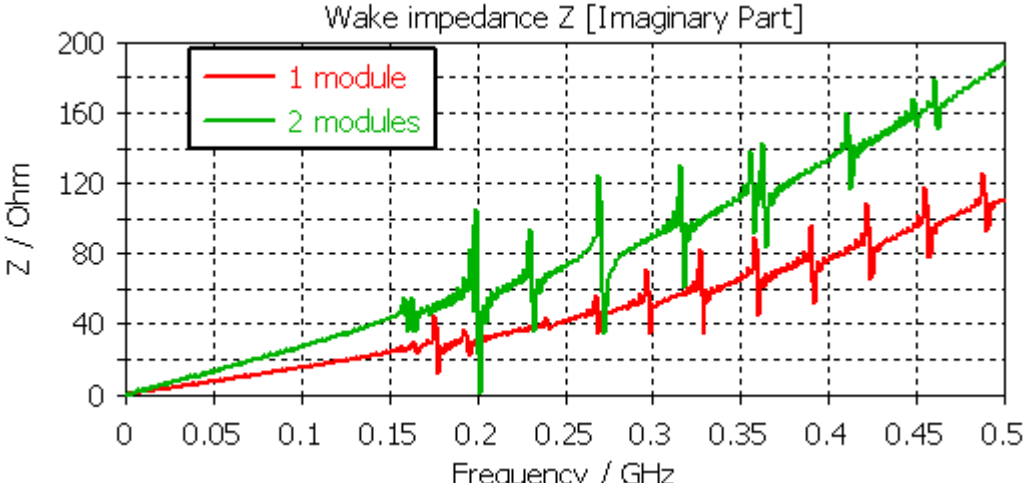
- Stochastic cooling → new design by Lars Thorndal.
- Impact of radiation on conductivity of materials (can we give a tolerance limit?)
- Hollow electron lens (waiting for first design)
- New TDI (waiting for first design) → proposal to split the jaw in 3

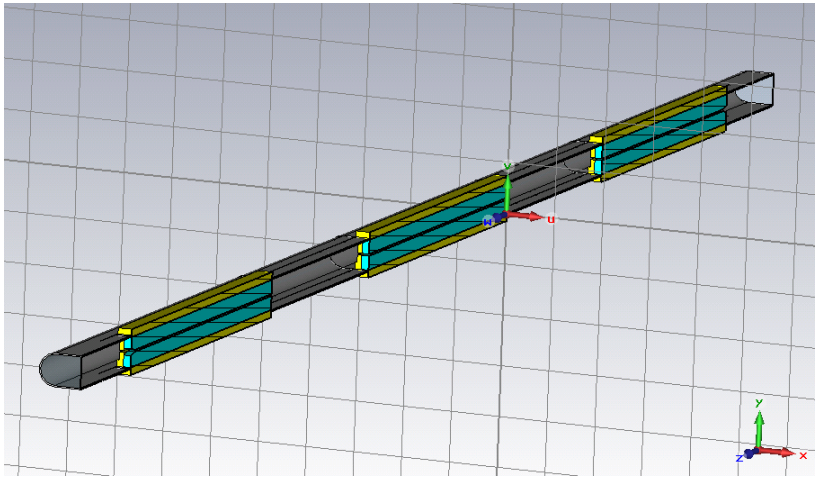


Impedance studies for the new TDI

- TDI was critical from several points of view before LS1: impedance became critical due to beam induced heating that caused damage and outgassing . This issue should be of course tackled with priority in the new design.

- Many constraints for the new design:
  - Not a collimator but a dump with two beams inside → very optimized design of the current secondary collimators can not be used *(large volume around needed for second beam, large clearance in stable beam requested by nearby experiments, not possible to use RF fingers to taper from the entrance and exit pipes to the jaw, large excursion of the jaw between injection and preramp)*
  - Request to split the jaw in 3 separate jaws for mechanical reasons → clearly not favourable for impedance since it ads transitions that is expected to only increase the impedance contribution of the TDI.





Impedance studies for the new TDI

Priorities for the new design:

(1) significantly improve the cooling system and make sure it is cooling what it should and where it should

(2) As for the spares installed during run 2, use a very good conductor for the surface of the jaws facing the beam (e.g. copper bulk or coating with sufficient thickness)

(3) ensure that the gap is closed between the jaw and the beam screen

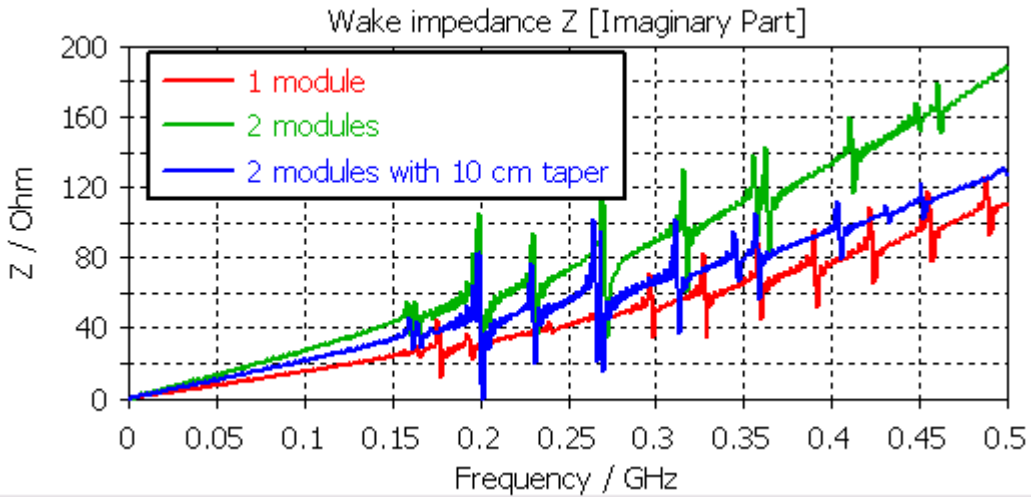
(4) check that all impedance contributions of the interconnections with the incoming pipes and between the tanks are optimized in inserted and retracted configurations (if they cannot be optimized, then the 3 tank design may have to be reconsidered later):

- Longitudinal and transverse effective impedance for beam stability
- Longitudinal and transverse resonant modes for beam stability
- Longitudinal real impedance for beam induced heating

→ For this optimization, many parameters can be optimized: taper length, taper height, transition length, transition height (if it is not possible to keep the same height all along), non-linearity of the tapers, jaw material, beam screen material, presence of coating.

→ First simulations (helped by O. Frasciello and M. Zobov from INFN) to probe the wide parameter phase space showed a significant impact of the new transitions but also potential for mitigation.

→ A first iteration of a feasible design will be analyzed in detail when it is available.



Stochastic cooling

- Voici les calculs du système à 10 GHz avec les terminaisons.

	1 system at 10 GHz	10 systemes à 10 GHz	LHC total impedance at injection	Ratio to total impedance for 1 system	ratio to total impedance for 10 systems
Z/n eff (Ohm)	0.00045	0.004498	0.09	0.004998	0.049978
Ztrans (Ohm/m)	8400	84000	2.00E+06	0.0042	4.20E-02

- Extrapolating with 10 systems (even though the geometry should differ and could be worse for lower frequencies), we obtain about 5% of the total impedance over the whole frequency range of the LHC beam spectrum which is clearly not negligible. A goal would be to reduce this contribution below 1%.