



Diode stack status and integration validation

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- Conclusion

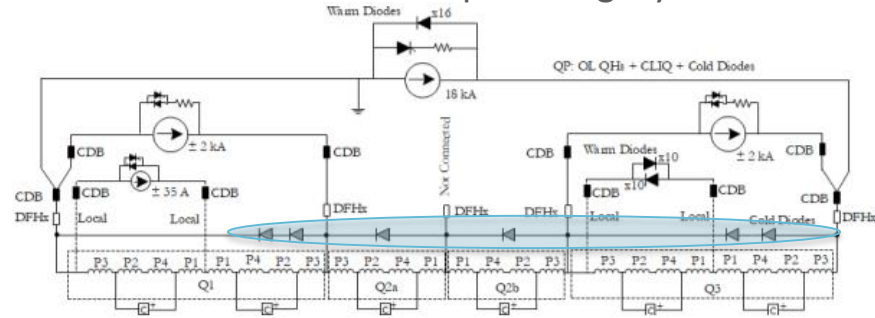


G. D'Angelo, with inputs from WP3

12th HL-LHC Collaboration Meeting, Uppsala, 19-22 September 2022

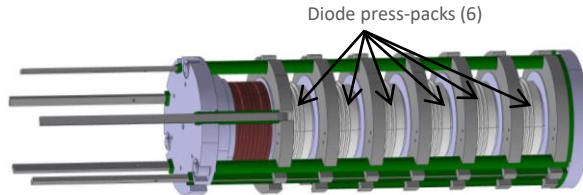
Introduction

- Cold diodes are in the baseline of the powering layout of the main Inner Triplet.

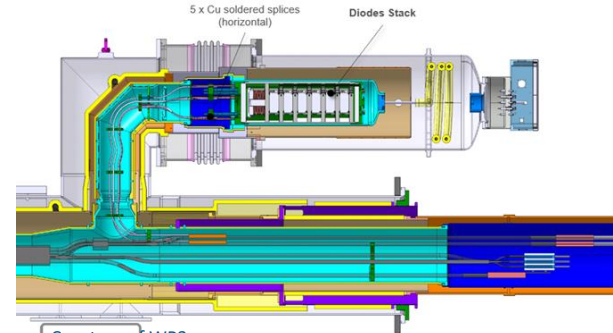


Main Inner Triplet Circuit layout

- The cold diodes are installed on the HL-LHC diode stack which is part of the D1-DFX connection module, called DCM.



Prototype HL-LHC diode stack



Courtesy of WP3

HL-LHC diodes

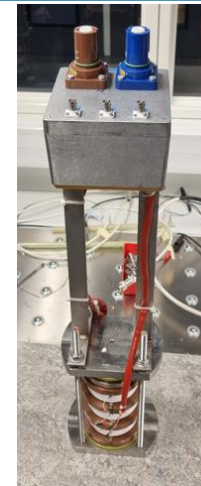
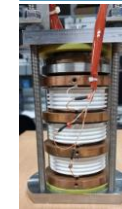
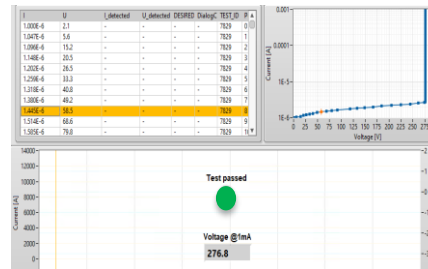
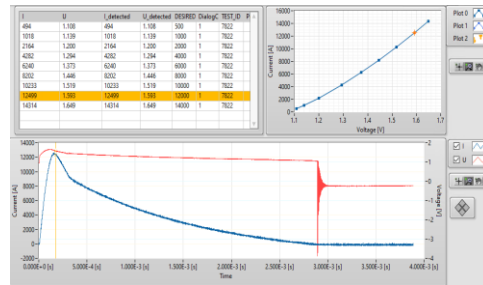
- Specific diodes have been produced by Dynex, based on the qualified diodes tested in CHARM (irradiation test) in 2018.
- The entire production for HL-LHC: 60 diodes, including spares, has been received at CERN and submitted to electrical tests at 300K and 80K (LN2).
- Their electrical performance is in line with the prototype production and fulfill design criteria.
- HL-LHC diodes are stored in MPE diode lab.



60/60 HL-LHC diodes produced, delivered and tested at 300K and 80K (LN2)

- 24 HL-LHC diodes needed for HL-LHC operation (4 HL-LHC diode stacks).
- Remaining diodes (36) as spares.

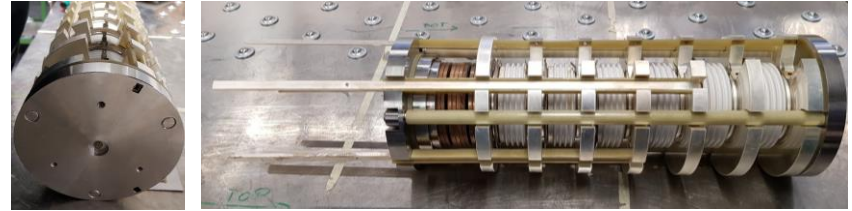
HL_LHC diodes: electrical tests at 300K and LN2



HL-LHC diode stack

- Following the review of the DCM (April 2021), some modifications were applied to the first HL-LHC diode stack:

- Fixing plate at the base
- Bus bar connection
- Increasing of venting channel to avoid overpressure
- Details regarding instrumentation of the diode stack.

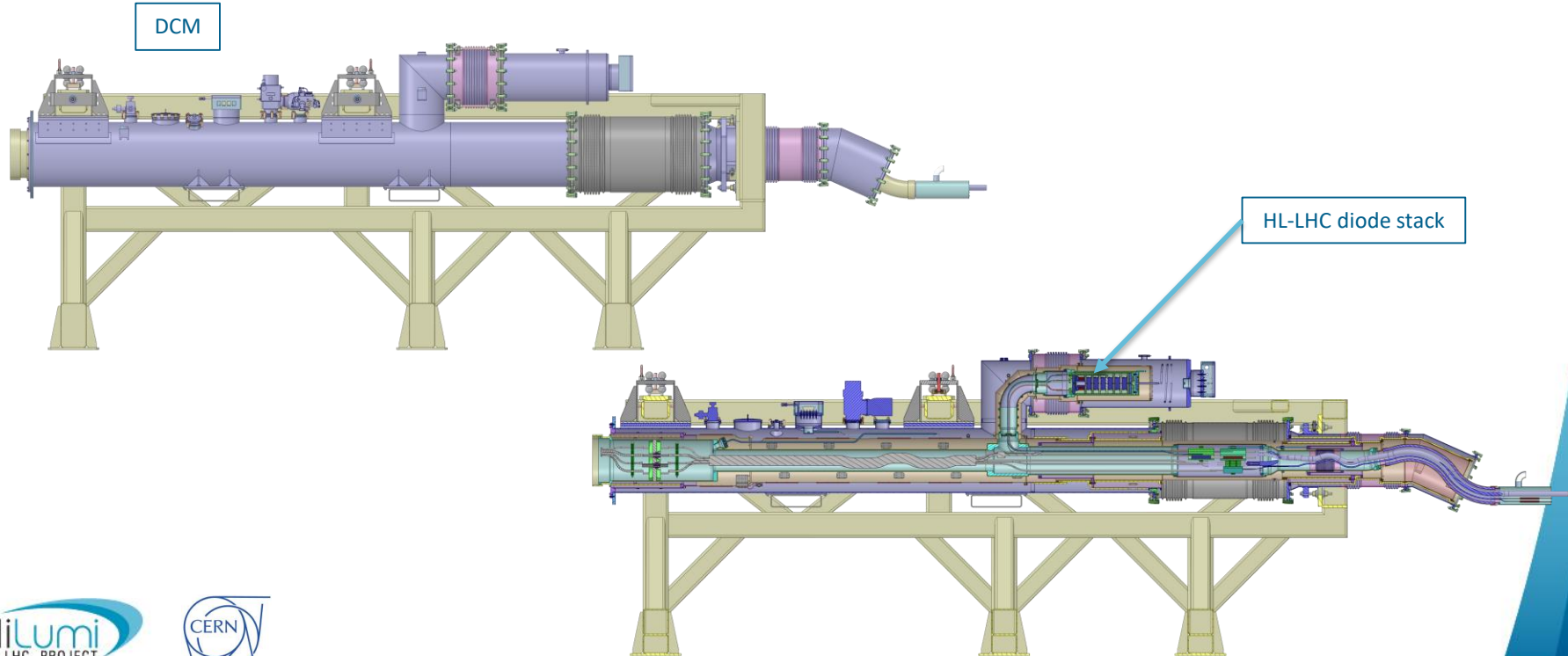


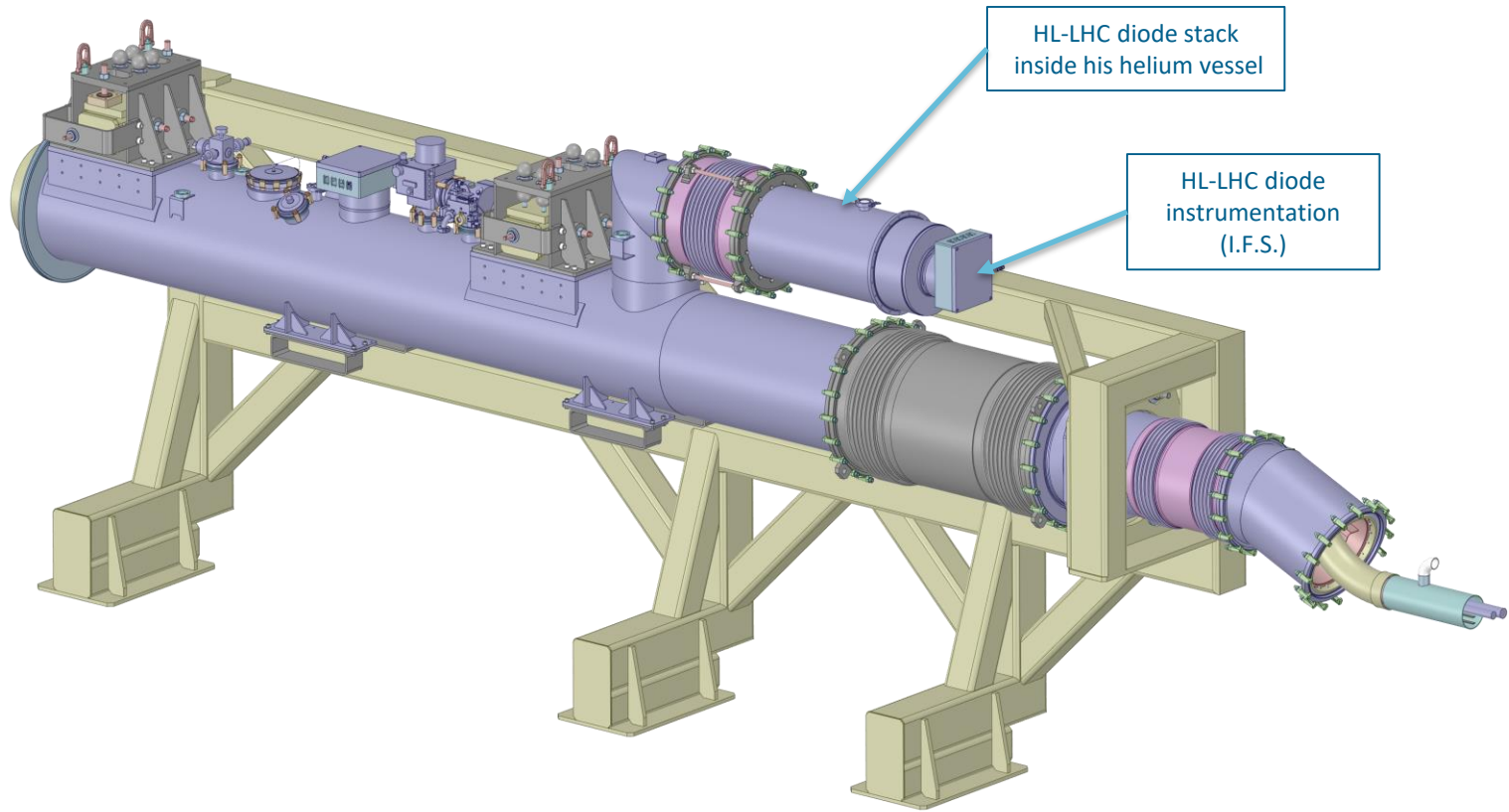
- The prototype stack was disassembled, modified and then re-assembled, using LHC standard diodes. The instrumentations of the diode stack has been prepared as for the final configuration.
- Full set of electrical tests: contact resistances and diodes characteristics (U_{Fwd} , U_{Rev}) has been performed on the diode stack, at 300 K and LN2.
 - All results are very satisfactory: $R_{contact} < 1e-6$ Ohm, diode characteristics within criteria.
 - After thermal contraction still very good contact resistance between diodes and heat sinks.



HL-LHC diode stack integration

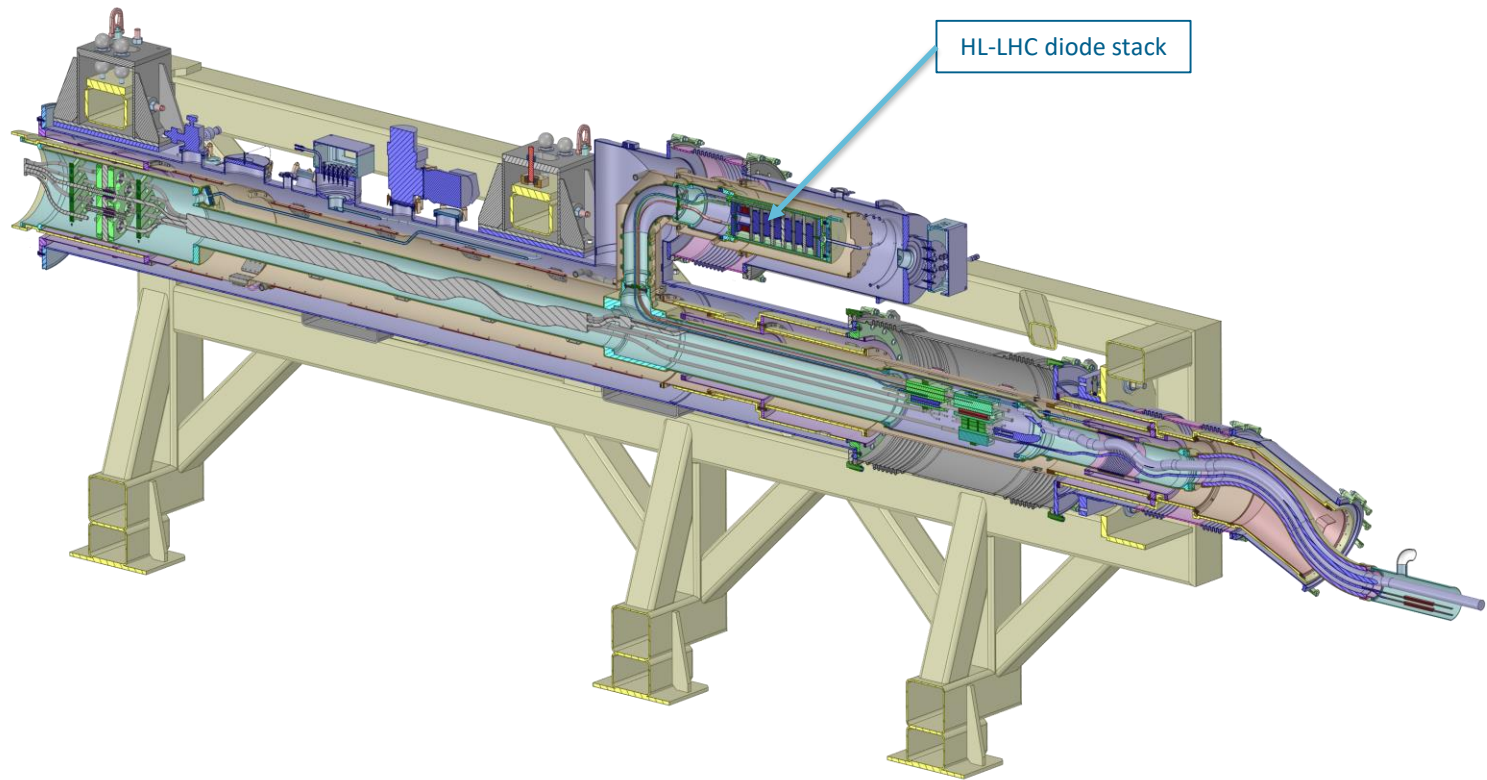
- The integration of the diode stack in the DCM has been studied carefully by WP3 (3D model) in agreement with WP7.



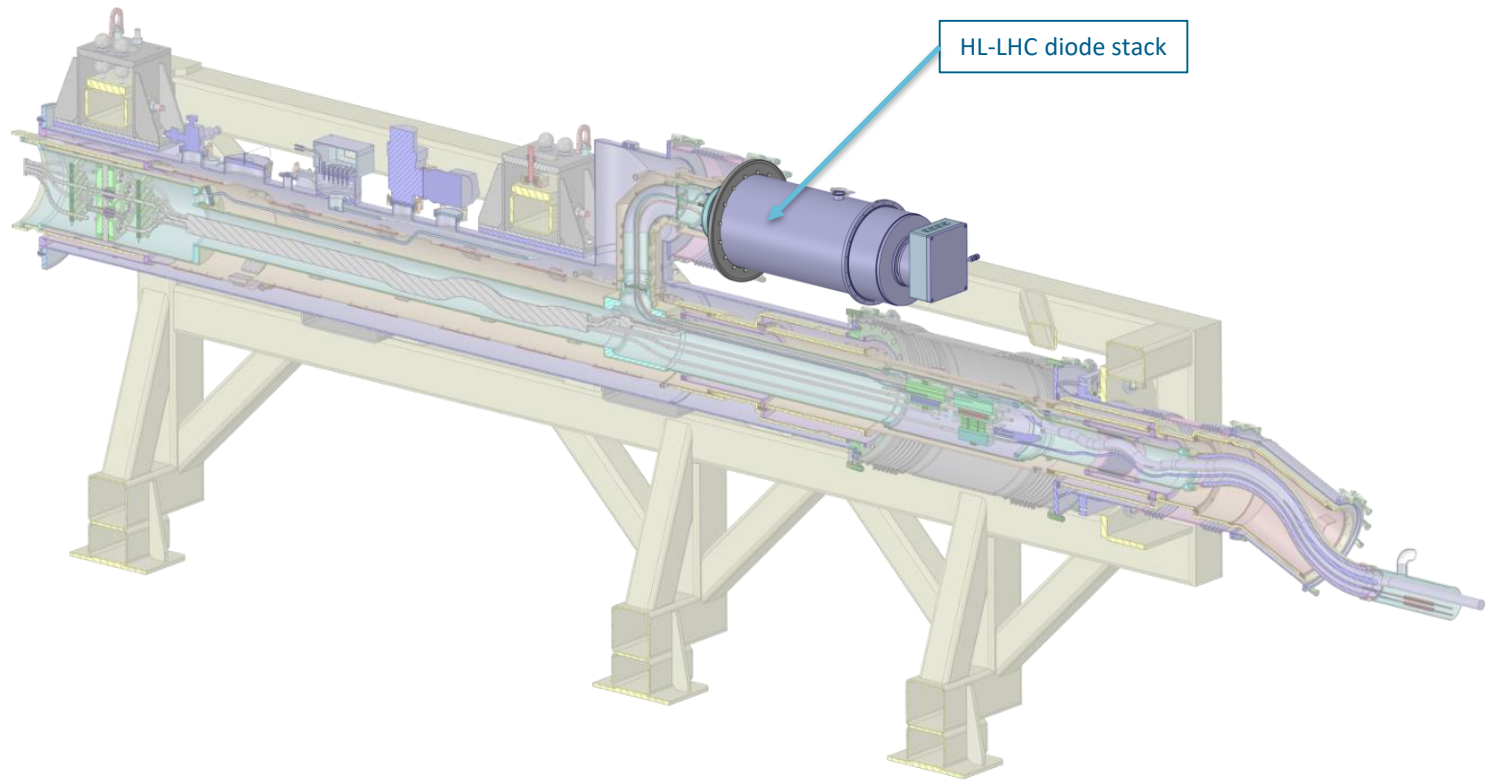


HL-LHC diode stack
inside his helium vessel

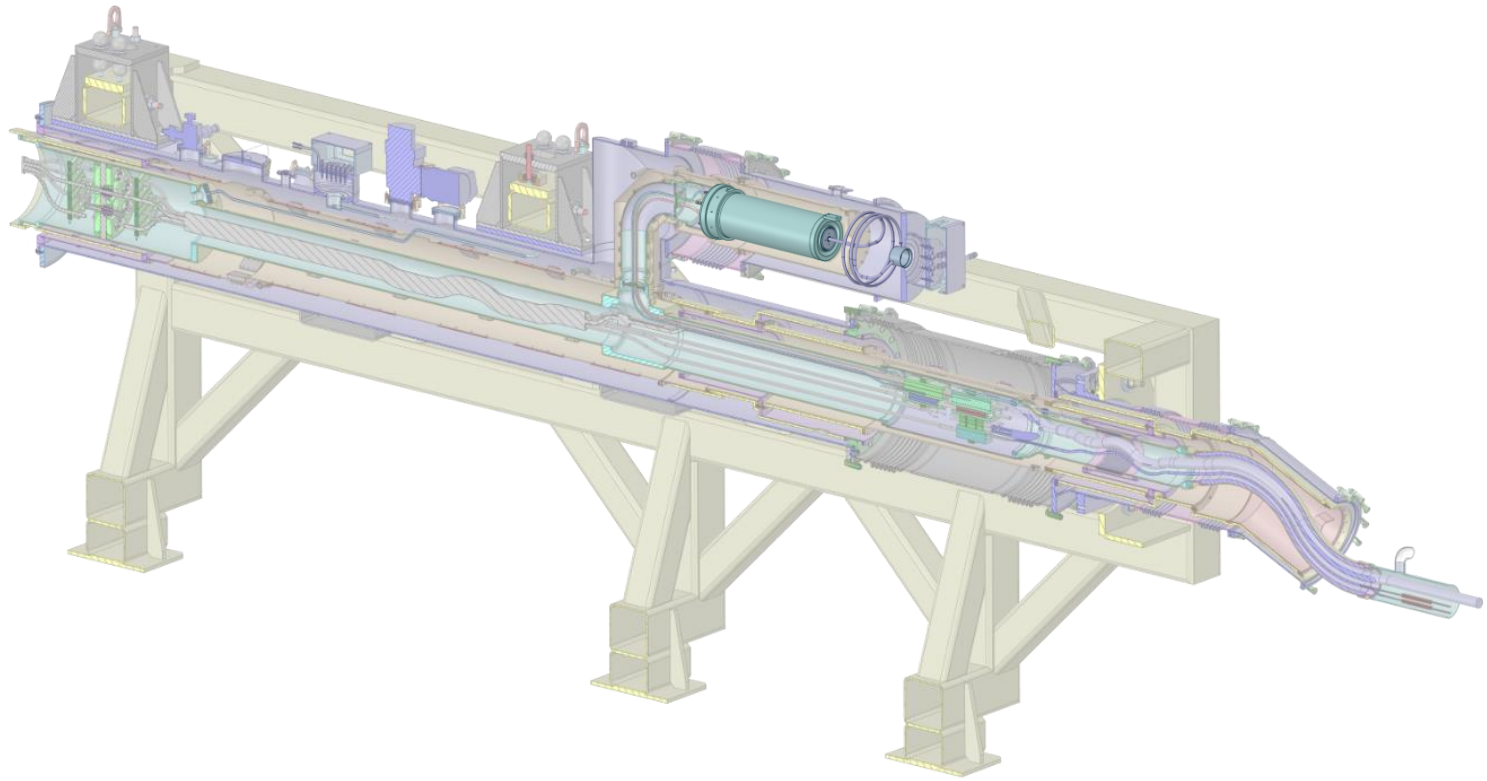
HL-LHC diode
instrumentation
(I.F.S.)

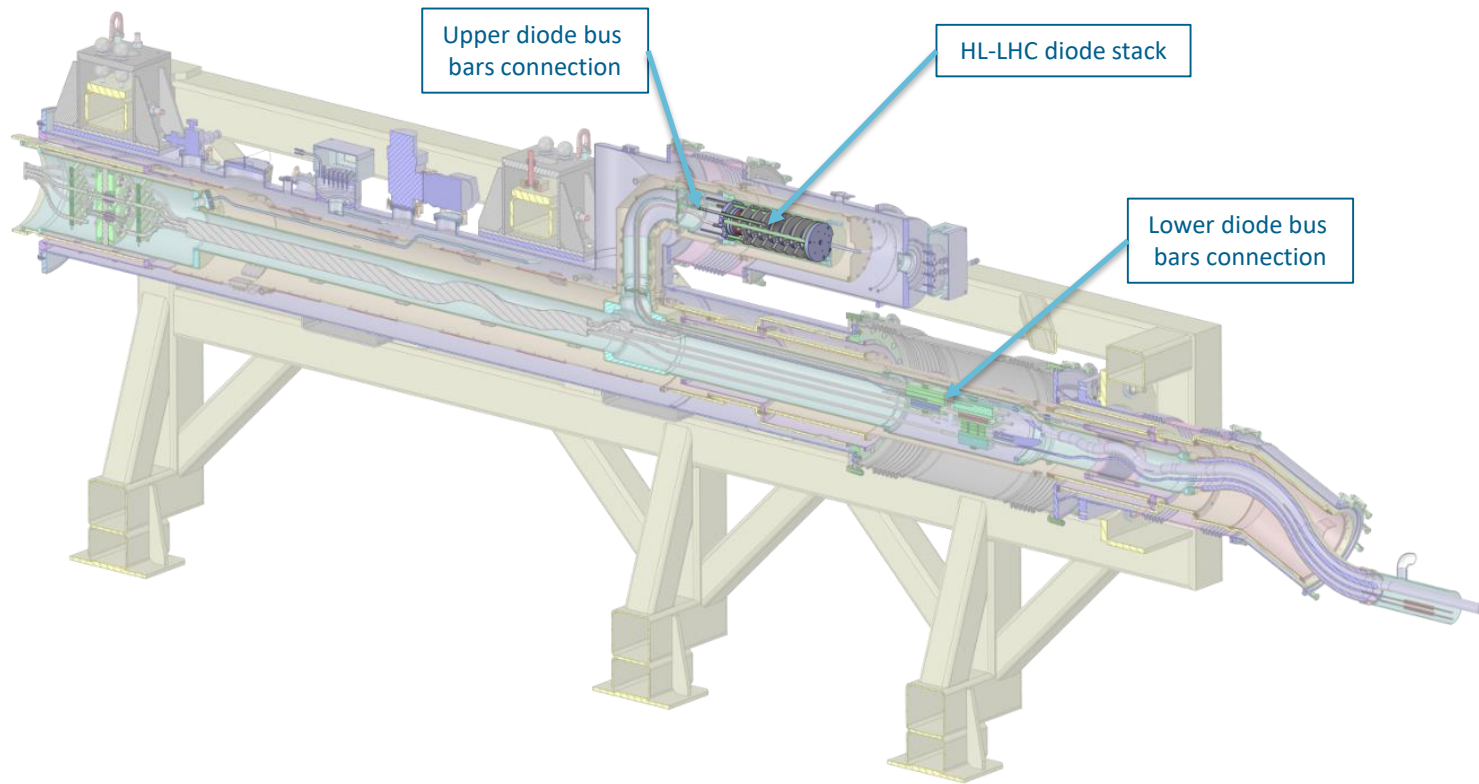


HL-LHC diode stack



HL-LHC diode stack





Upper diode bus bars connection

HL-LHC diode stack

Lower diode bus bars connection

Conclusions

- The entire production of HL-LHC specific diodes (60 pcs) have been received, tested at 300K and LN2, and are stored in MPE diode lab, ready to be assembled in the HL-LHC series diode stack.
- The prototype HL-LHC diode stack, equipped with LHC standard diodes (same dimensions and similar electrical performances), with series instrumentation, has been modified, then reassembled and tested at 300K and LN2. The electrical performance shows that the diode stack is mechanically sound.
- Integration studies are finalized by W.P.3 (3D model). As soon as the DCM components connecting to the HL-LHC diode stack will be delivered, a real integration test of the HL-LHC diode stack will be performed, before end of 2022.
- Validation at liquid He temperature should be organized: test in SM18.
- Manufacturing of second prototype HL-LHC diode stack will be launched after validation of first prototype integration.
- The first HL-LHC prototype diode stack could be used in the “STRING” test facility.

Thank you for your attention !