Plan for MQXFB prototype cold mass

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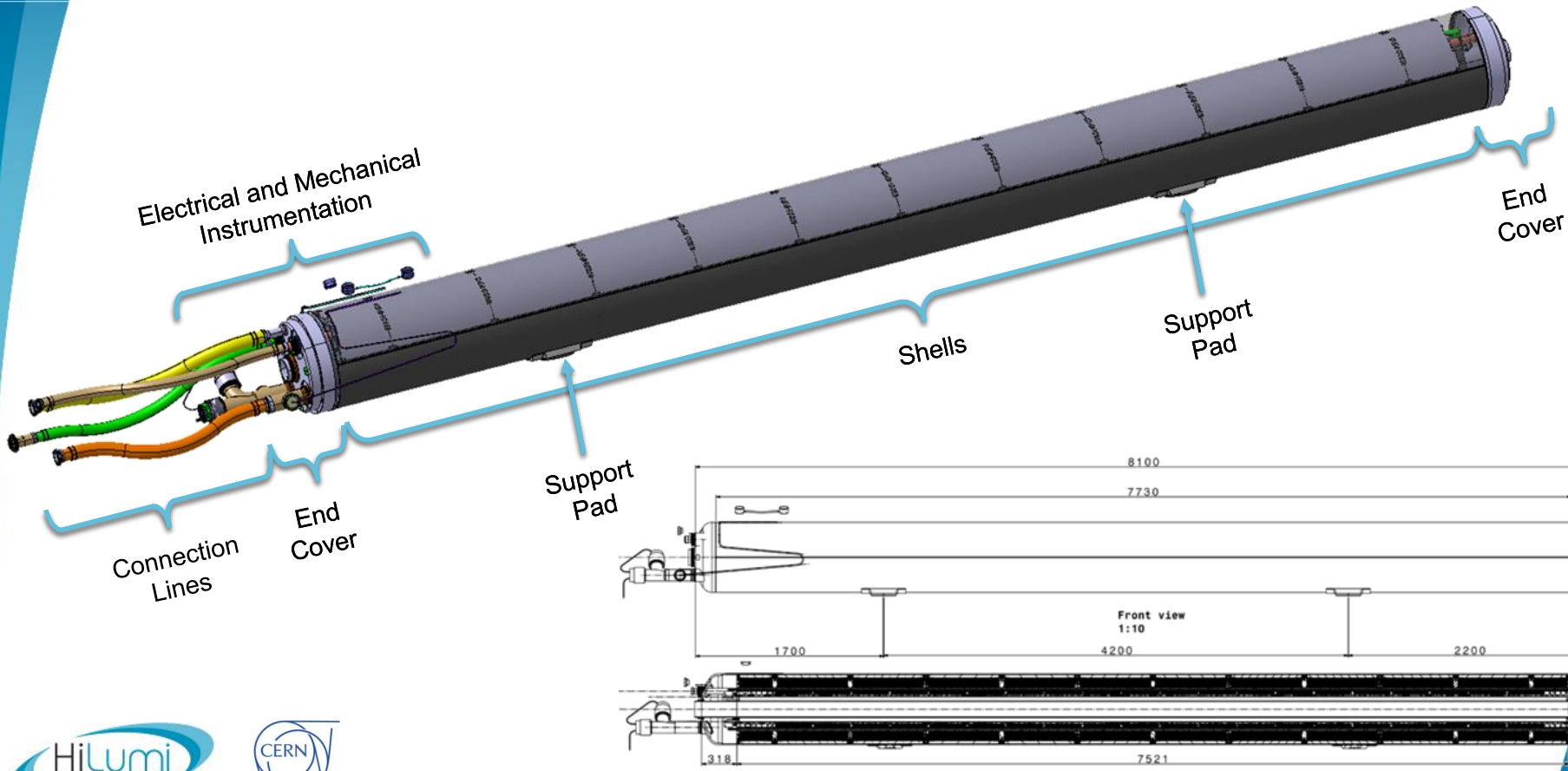
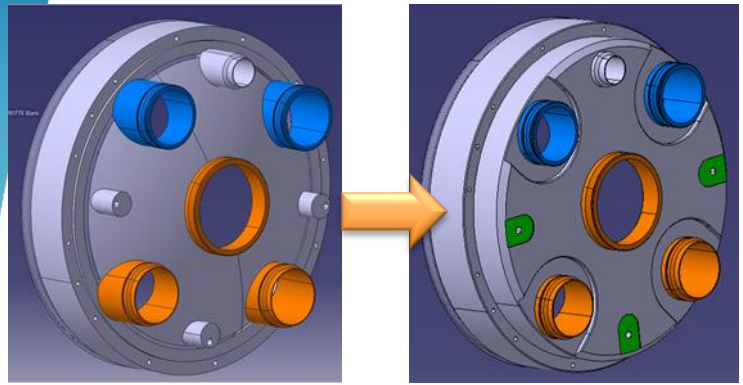
Scope of the project

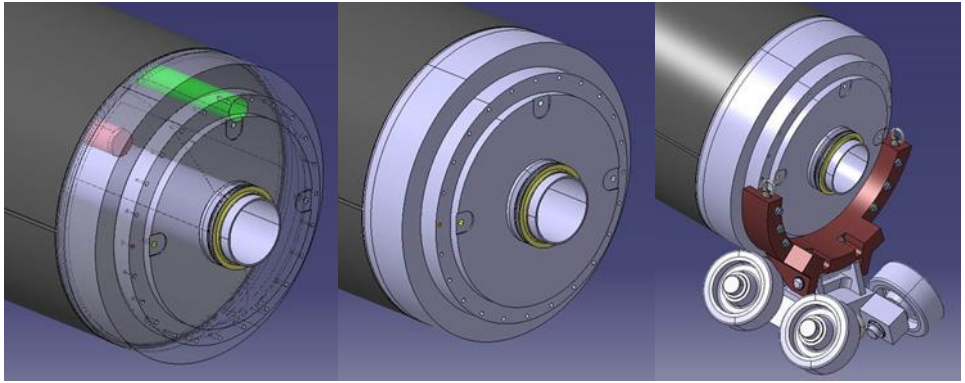
- Providing a leak tight envelope surrounding the MQXFB prototype magnet to perform **cold test horizontally**,
- Providing **mechanical inertia**, rigidity and alignment in between aluminium shells,
- Fitting and integrating inside the **existing spare vacuum vessel** for the Q9
  (see F. Micolon's talk)
- Connecting to the **existing test bench in SM18**: CFB on the connection side, MRB on the one,
- Enabling **magnetic measurements** at cold, eventually with the **beam screen** inserted,
- Housing **electrical protection and mechanical instrumentation** and provide interfaces to route the signals from 1.9K to RT,

Cold Mass Envelope Layout

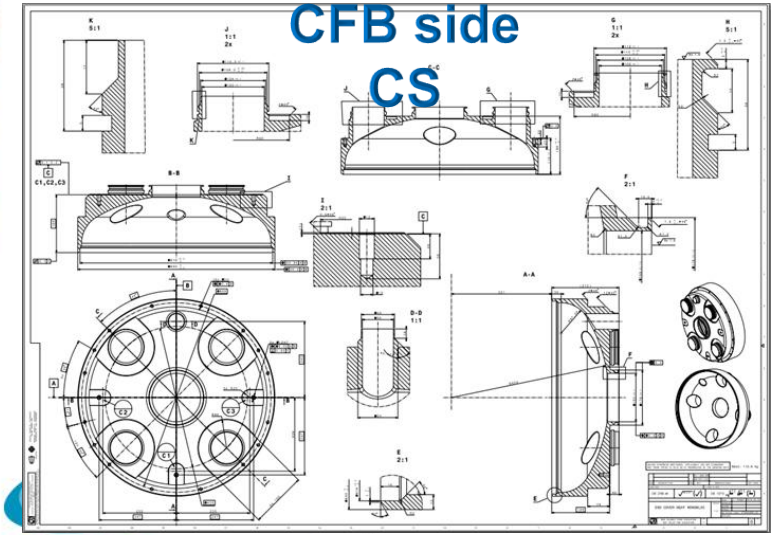


End covers

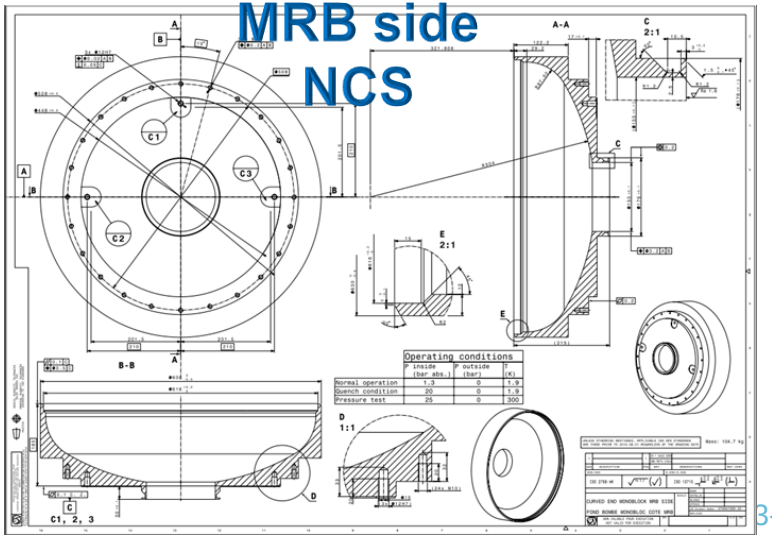




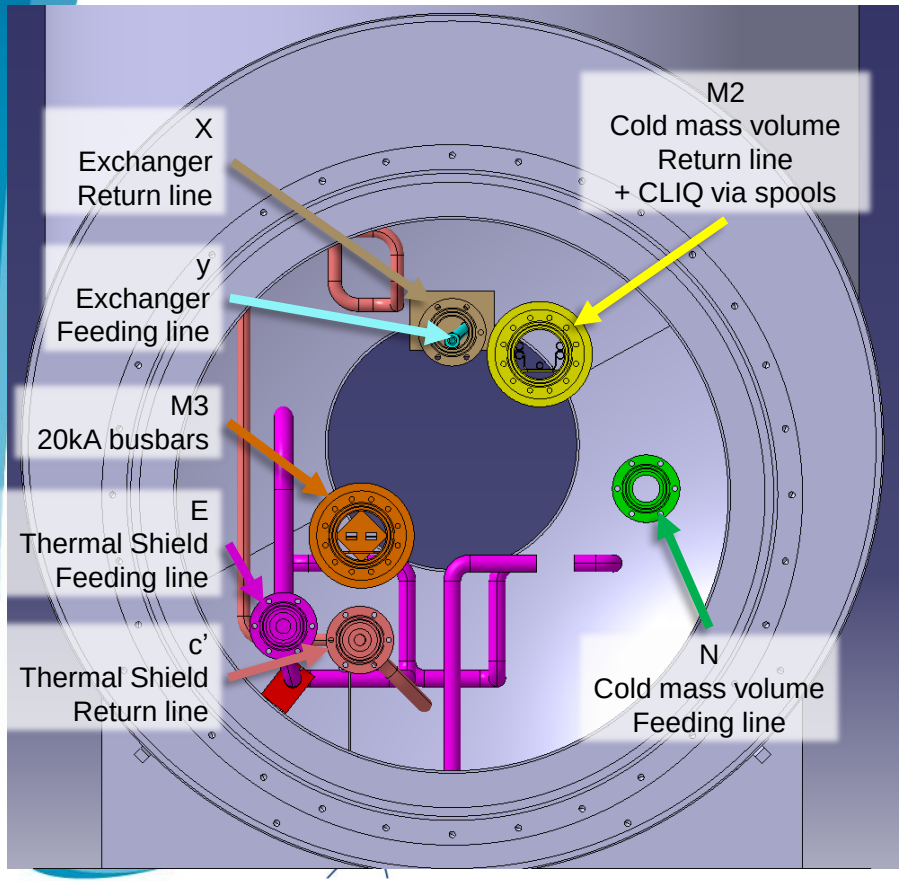
CFB side
CS

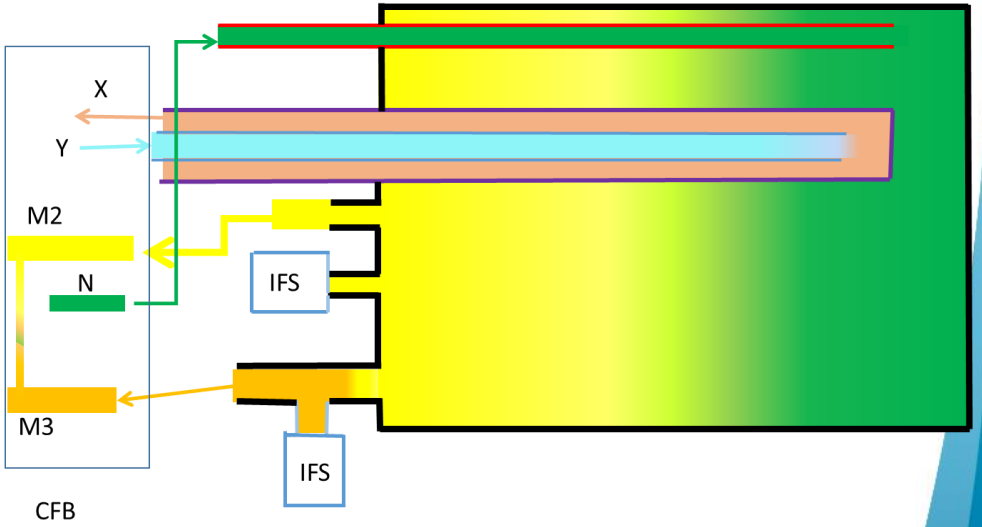


MRB side
NCS

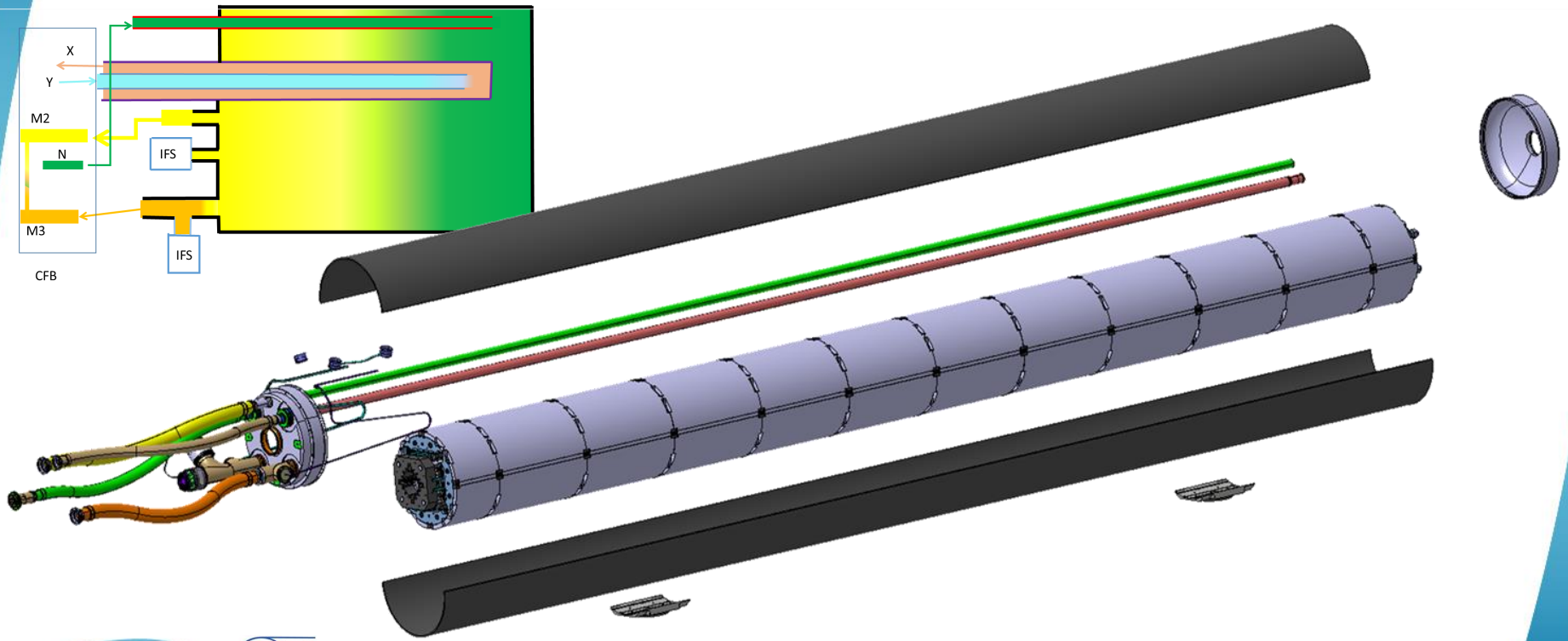


CFB Interfaces and Conceptual Cryo-Scheme

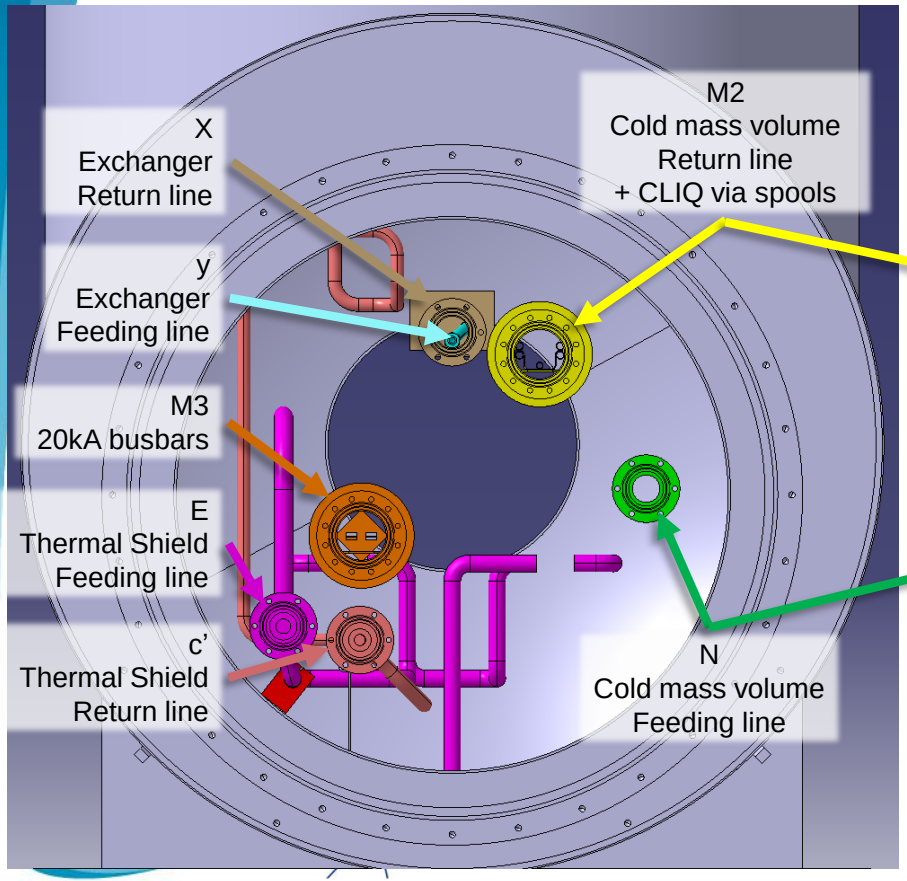


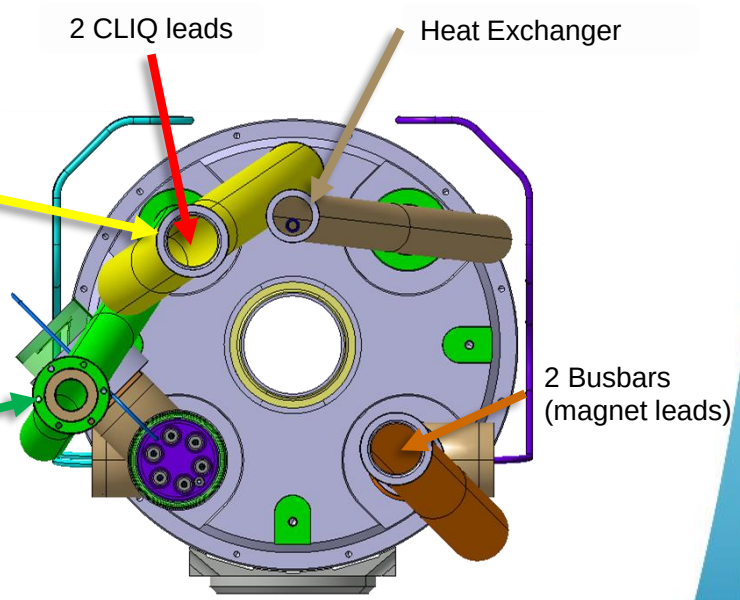


Cold Mass Interfaces



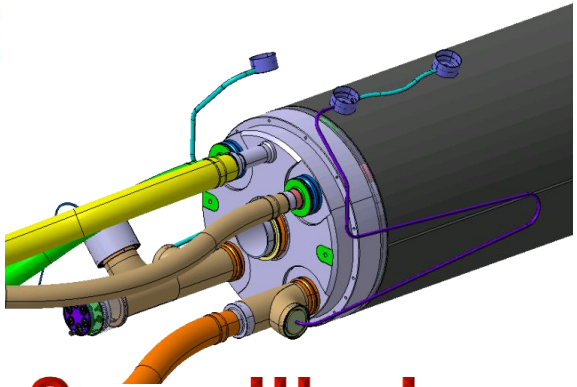
Cold Mass Connection to the CFB





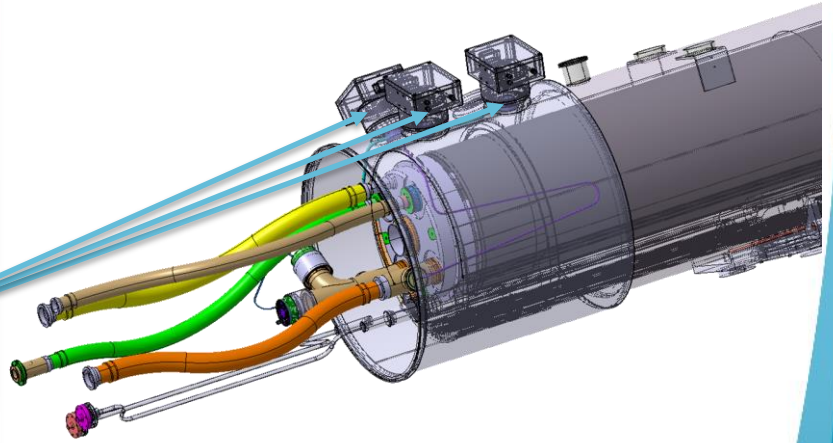
Electrical Instrumentation

	Wires qtty & type
• 16 V-Taps per coil	64 AWG26
• 12 QH cables per coil	48 AWG16
Total	112



2 capillaries

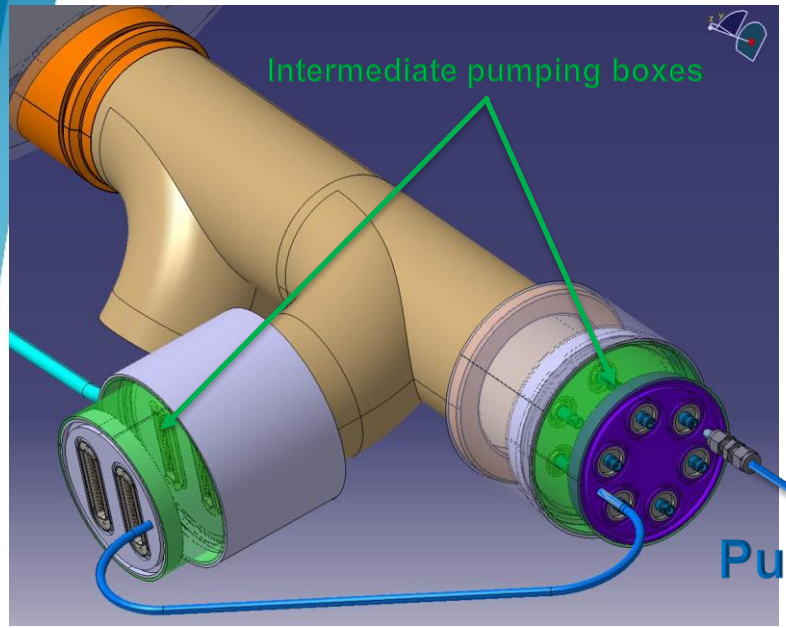
40 feedthrough per IFS box



3 IFS boxes

+ 2 CLIQ leads routed to M2 through the yellow line

Mechanical Instrumentation inside the cold mass

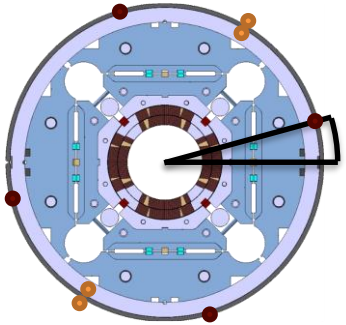


		wires
Inside the cold mass volume	• Cryo thermometer	4
	• 4 gauges for the rods (6 wires per gauge)	24
	• 6 gauges (3 sections - 4 wires)	24 (V plane)
		52
	• 1 fibre cable using 2 connectors measuring 6 locations per coil	8 connectors
Inside insulation vacuum	• 6 gauges (3 sections – 4 wires)	24 (V plane)
	• 12 gauges (3 sections – 4 wires)	64
		88

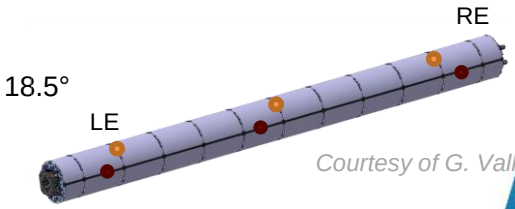
Sub-B connector weldable

Optical fibre feedthrough, weldable

SG Position Cross-Section

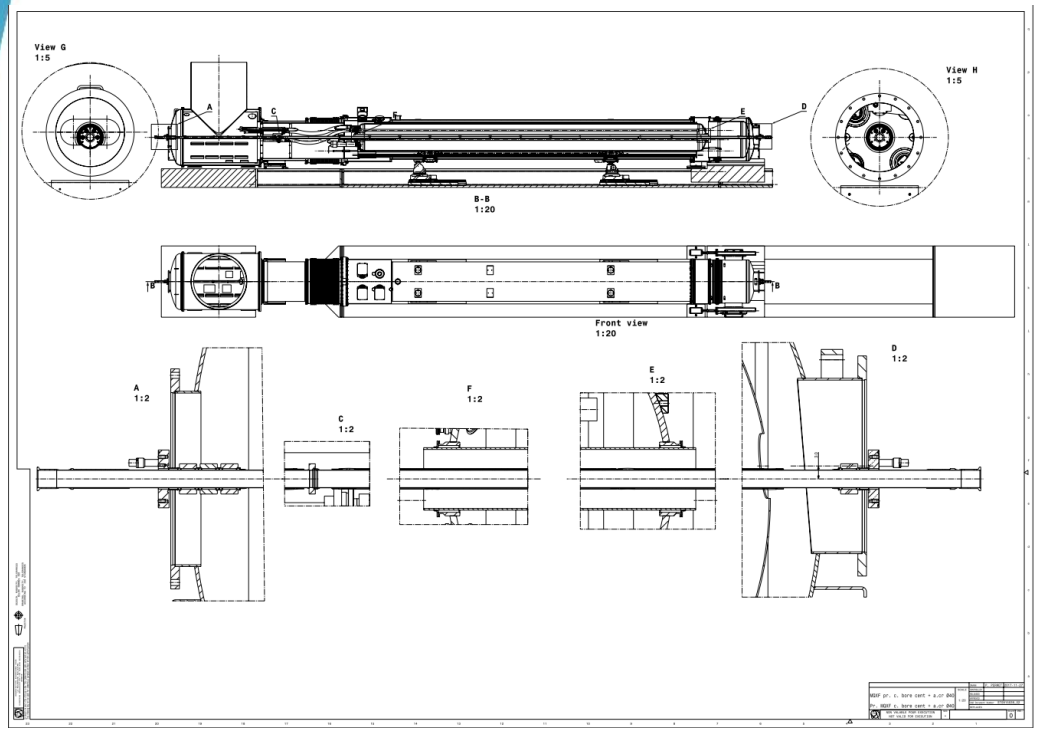


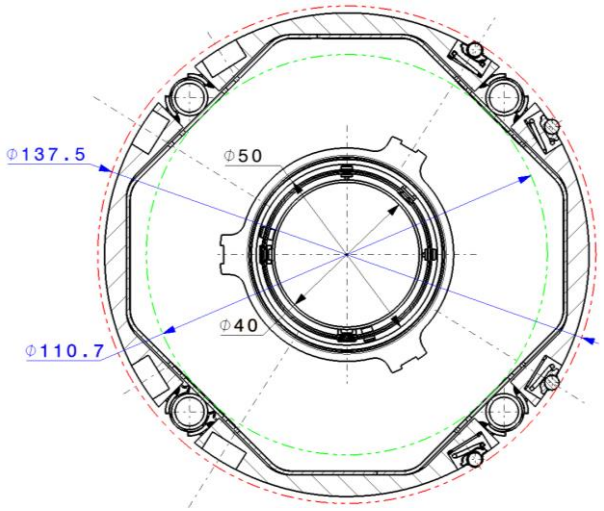
SG Position Longitudinal



Courtesy of G. Vallone

Anticryostat Ø40mm





Possibility to reuse an existing anti-cryostat for Fam. 2 (Ø50mm)
LHCMMQD_0002 inner bore Ø40mm
A centering device must be developed

Drawings Structure and Procurement

- LHCLMQXFBT: Cold Mass Assembly with MQXFB Prototype - Test of Prototype
- LHCLMQXFBTS: Cold Mass Assembly Components for MQXFB Prototype -Test of Prototype

Drawings completed		Procurement status
✔ LHCLMQXFBTS0001	MQXFB PROTO COLD MASS ASSY - MQXFB_SHELL TEST ENSEMBLE MASSE FROIDE PROTO MQXFB	*Shaped and machined,* *Supposed to be delivered at CERN*
✔ LHCLMQXFBTS0002	MQXFB PROTO COLD MASS ASSY - END COVER LMQXFT MRB ASSY ENSEMBLE MASSE FROIDE PROTO MQXFB - FOND BOMBE EQUIPE LMQXFT MRB	*Delivery planned in Sept 2018*
✔ LHCLMQXFBTS0003	MQXFB PROTO COLD MASS ASSY - EQUIPED END COVER CS ENSEMBLE MASSE FROIDE PROTO MQXFB - FOND BOMBE EQUIPE CS	*Delivery planned in Sept 2018*
✔ LHCLMQXFBTS0004	MQXFB PROTO COLD MASS ASSY - RESERVED ENSEMBLE MASSE FROIDE PROTO MQXFB - RESERVE	
✔ LHCLMQXFBTS0005	MQXFB PROTO COLD MASS ASSY - RESERVED ENSEMBLE MASSE FROIDE PROTO MQXFB - RESERVE	
✔ LHCLMQXFBTS0006	MQXFB PROTO COLD MASS ASSY - RESERVED ENSEMBLE MASSE FROIDE PROTO MQXFB - RESERVE	
✔ LHCLMQXFBTS0007	MQXFB PROTO COLD MASS ASSY - COLDMASS SUPPORT FOR TEST ENSEMBLE MASSE FROIDE PROTO MQXFB - SUPPORT POUR MASSE FROIDE DE TEST	*Delivery planned in Summer 2018*
✔ LHCLMQXFBTS0008	MQXFB PROTO COLD MASS ASSY - HELIUM HEAT EXCHANGER TUBE TEST ENSEMBLE MASSE FROIDE PROTO MQXFB - TUBE ECHANGEUR THERMIQUE TEST	*Delivery planned before Summer 2018*
✔ LHCLMQXFBTS0009	COLD BORE TUBE ASSY ENSEMBLE TUBE FROID	*Pipe already available from VSC* *Insulation process to be developed*

Drawings to be completed (design is done)

- IFS capillaries
- Instrumentation pumping boxes (validation on-going on the fiber feedthrough at cold)
- Flexibles junction to the CFB
- Centering supports for filling and heat exchanger pipes

- Anti cryostat centering system if any

Summary

- All topics listed in the scope of the project are covered.
- Solutions have been found to route all the 252 instrumentation and protection wires (electrical and mechanical), CLIQ lead, as well as the fiber connectors.
- Components design is finished, drawings are almost completed, major parts are ordered or being ordered
- Tooling (lifting beam, welding cradles, rotation rollers…) is designed and under procurement. The geomagnetic mole still needs to be developed for large aperture.
- Anti-cryostat supporting and centering system has to be designed if reuse existing pieces. Not part of the cold mass design.
- This assembly will be used to prepare and validate the series cold mass assembly procedures.

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Thank you for your attention

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