



Introduction to the Cold Powering Project for HL-LHC

A. Ballarino

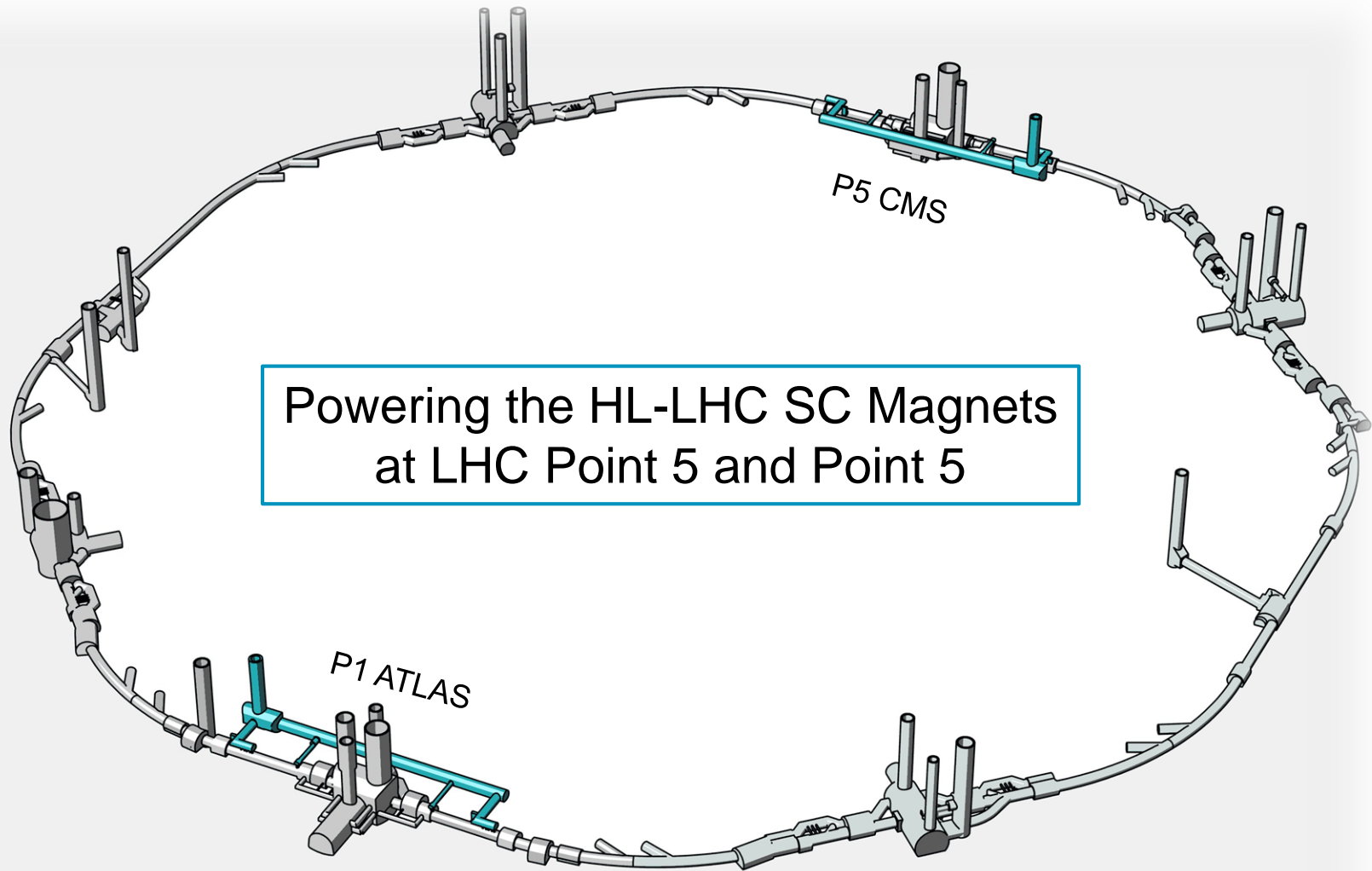
Leader of WP6a (Cold Powering)

CERN, 20/06/2018



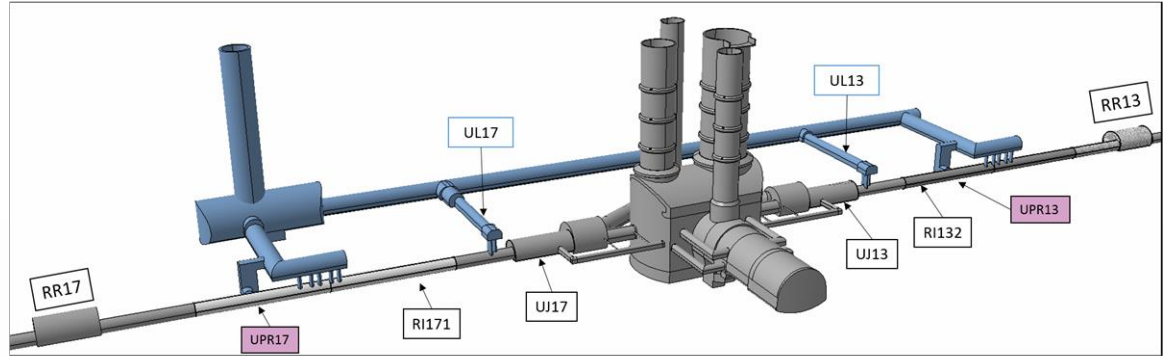
UU-CERN-RFR Meeting for the DFH Collaboration Protect

The project



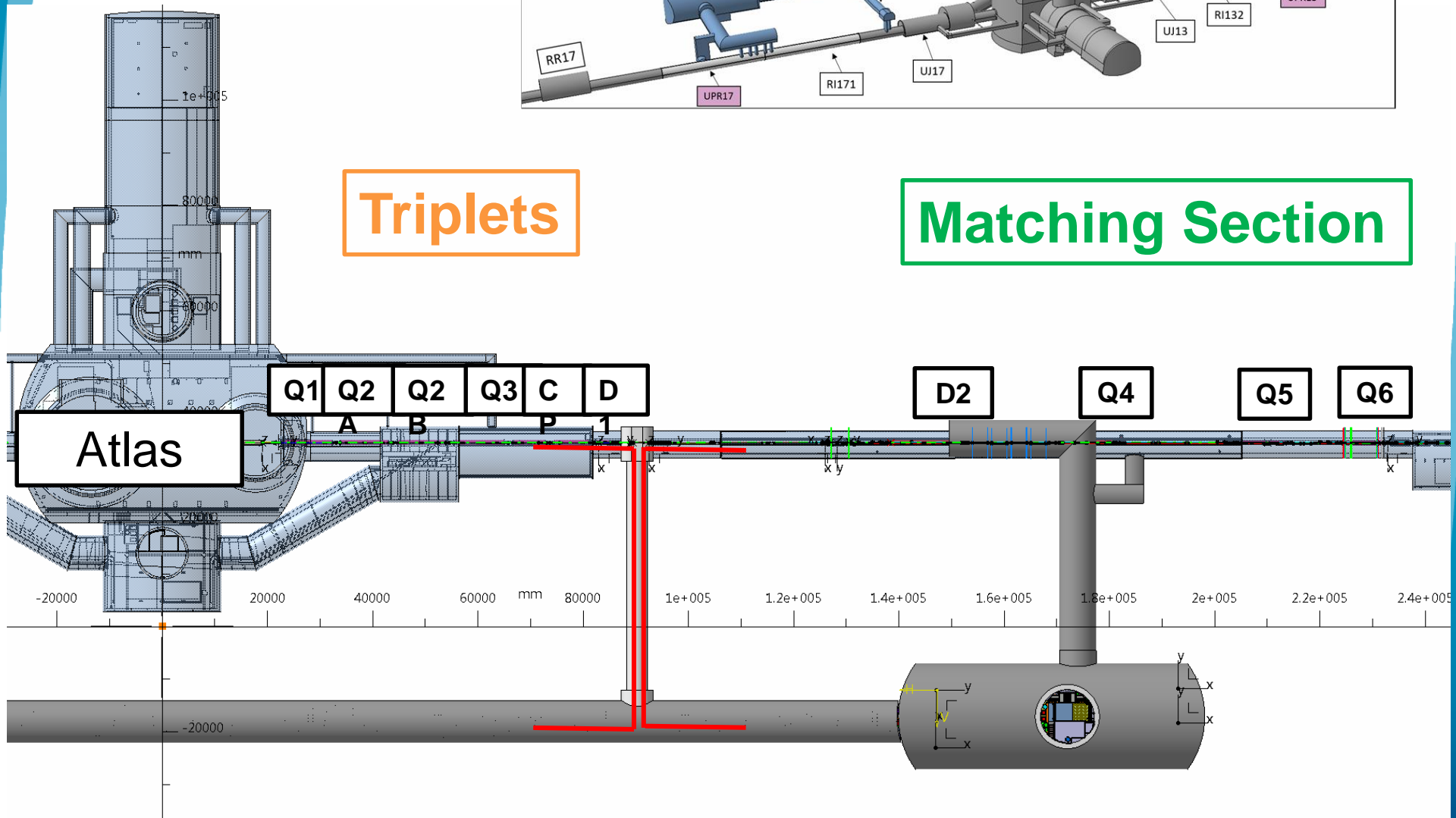
Powering the HL-LHC SC Magnets
at LHC Point 5 and Point 5

The HL-LHC Tunnel

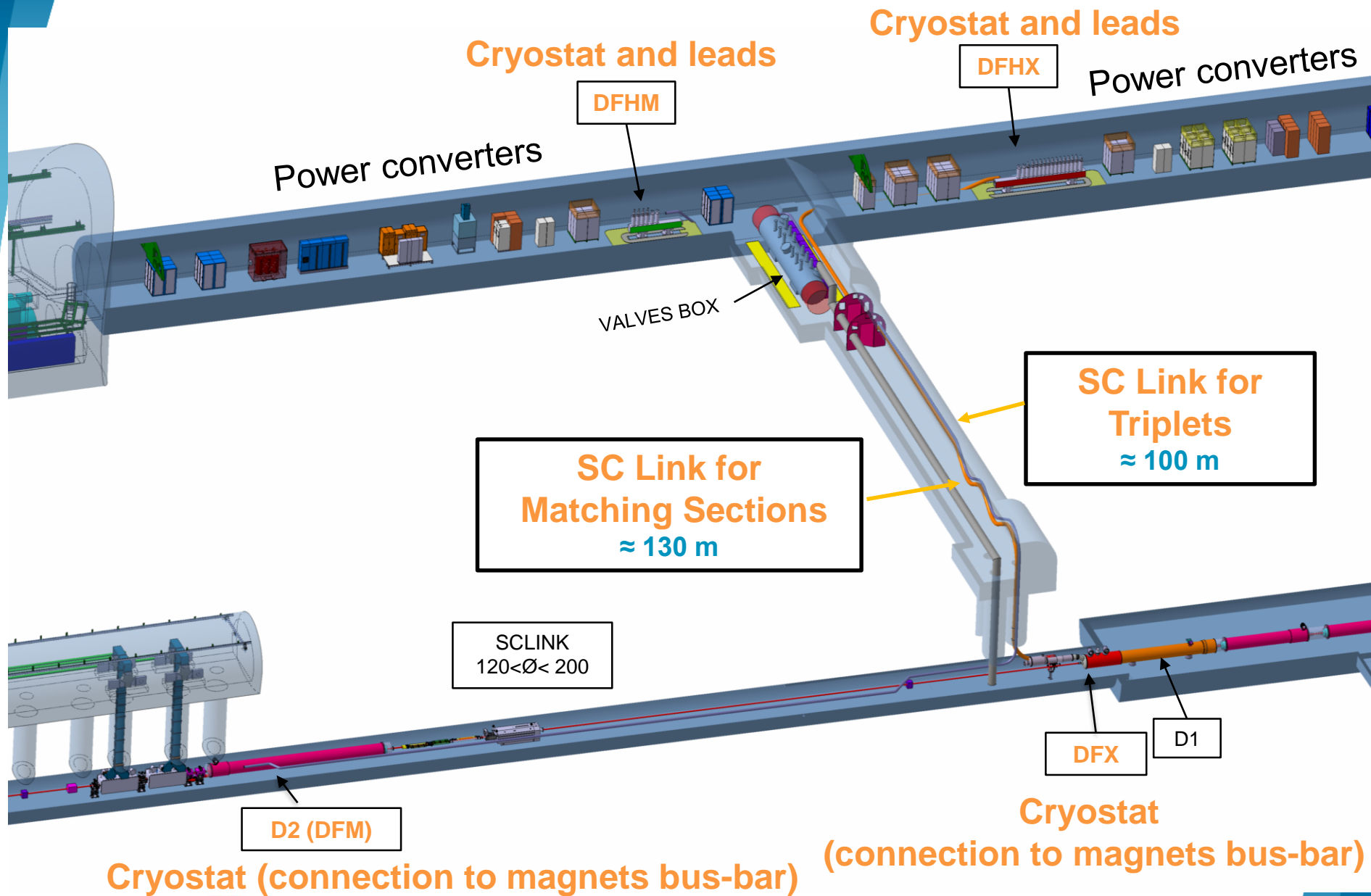


Triplets

Matching Section



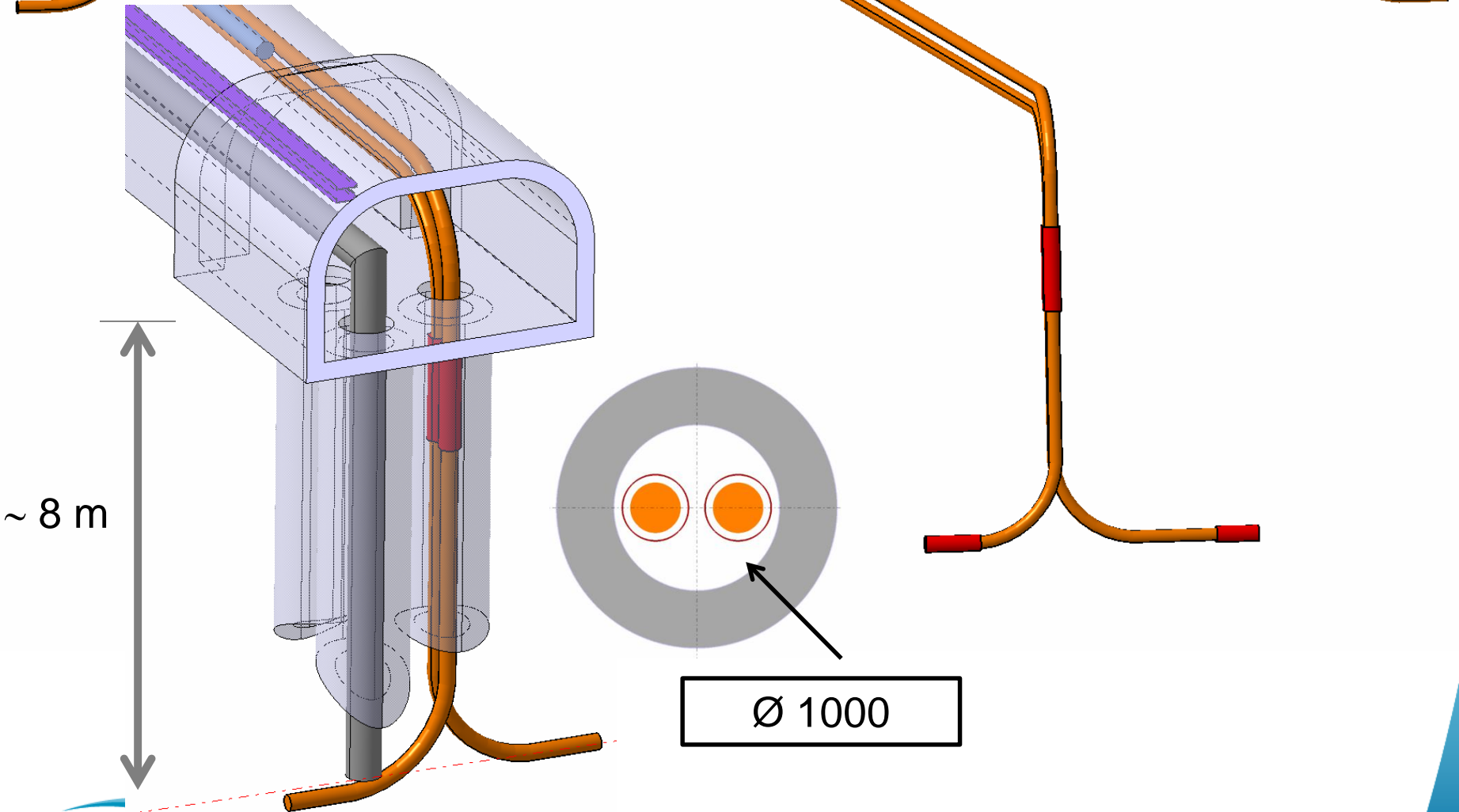
LHC Tunnel and equipment



LHC Tunnel Configuration

L ~ 100 m

L ~ 130 m

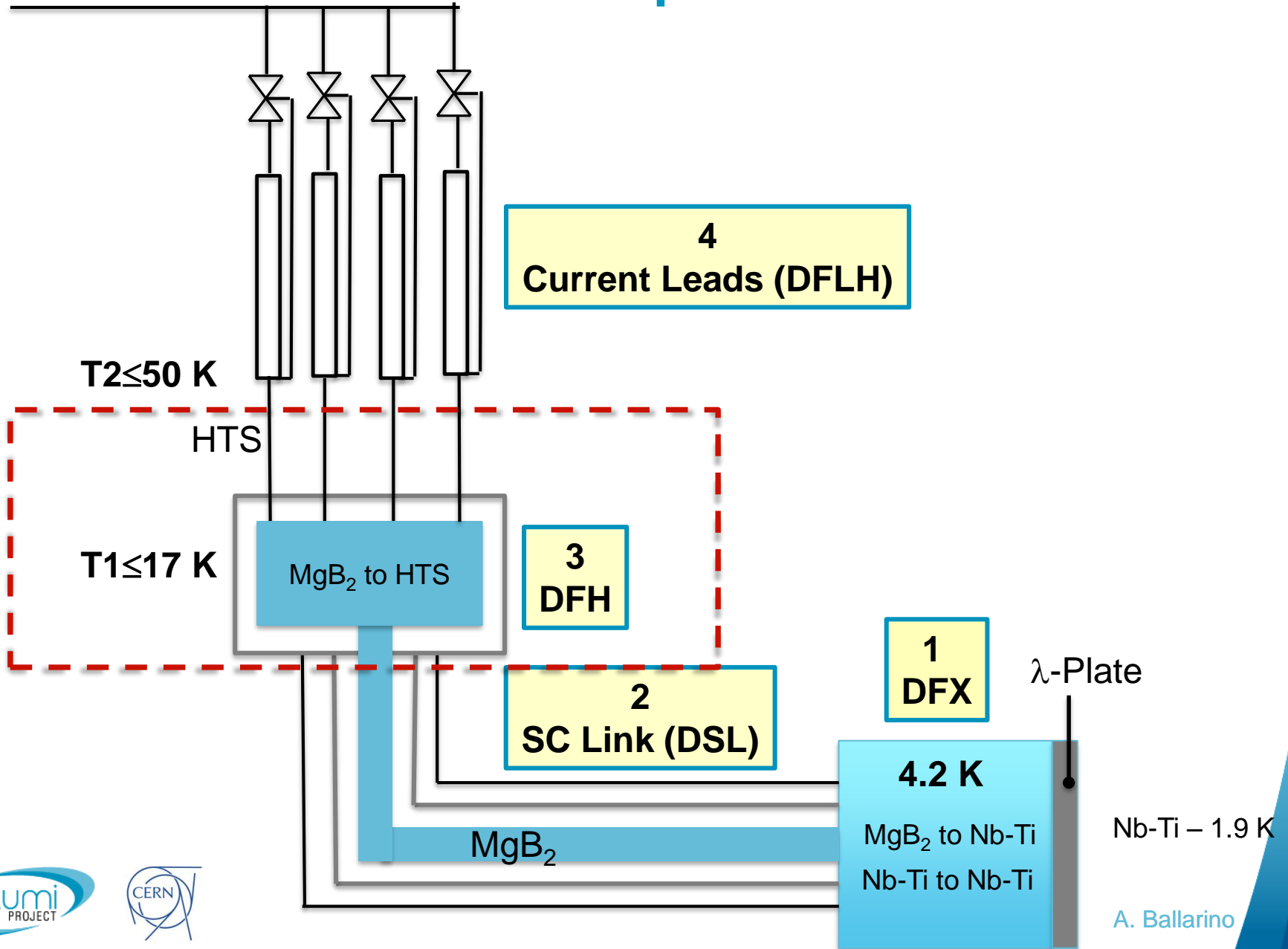


~ 8 m

Ø 1000

Cold Powering System (WP6a)

Schematic representation



Requirements for the powering of the Triplets

Trim Q1a (35 A) → Local powering

EDMS N. 1821907

	Magnet	Cold Powering			
		I_{ult} (kA)	I_{peak} (kA)	I_{lead} (kA)	I_{cable} (kA)
MQXF	17.82	-	18	18	2
Trim Q1	2	2.4	2*	7	1
Q2a/Q2b	Protec.	5.6	2*	7	1
Trim Q3	2	6.8	2*	7	1
MCBXFB	1.73	-	2	2	2+2
MCBXFB	1.59	-	2	2	2+2
MCBXFA	1.73	-	2	2	2
MCBXFA	1.59	-	2	2	2
MQSXF	0.2	-	0.2	0.2	2
MCSXF/MCSSXF	0.12	-	0.12	0.12	2+2
MCOXF/MCOSXF	0.12	-	0.12	0.12	2+2
MCDXF/MCDSXF	0.12	-	0.12	0.12	2+2
MCTXF/MCTSXF	0.12	-	0.12	0.12	2+2
D1	12.96	-	18	18	2

* Able to cope with over-currents without excessive over-heating

Requirements for the powering of the Triplets

Number and type of components per system

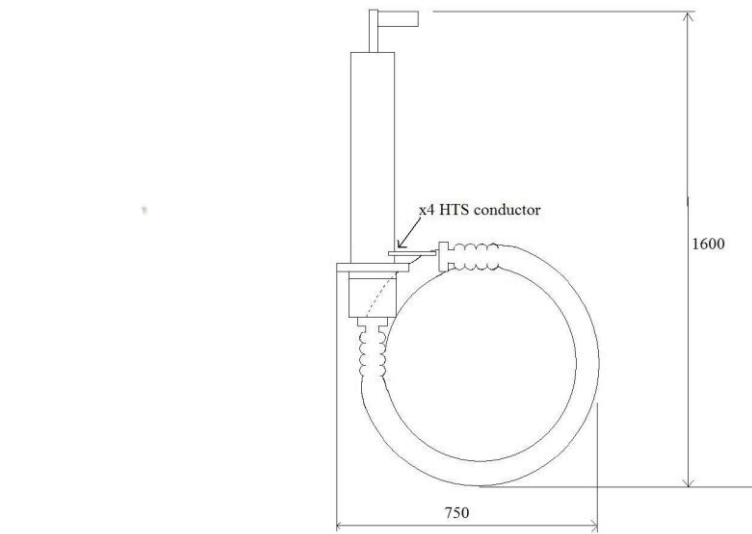
Rating (kA)	N_{leads}	N_{Cables}
18	4	4
7	-	3
2	12+3*	12
0.2	2	2
0.12	16	16
Total	37	37

Leads rated at 0.12 kA and 0.2 kA (18 in total) proposed for local powering (as in the LHC)

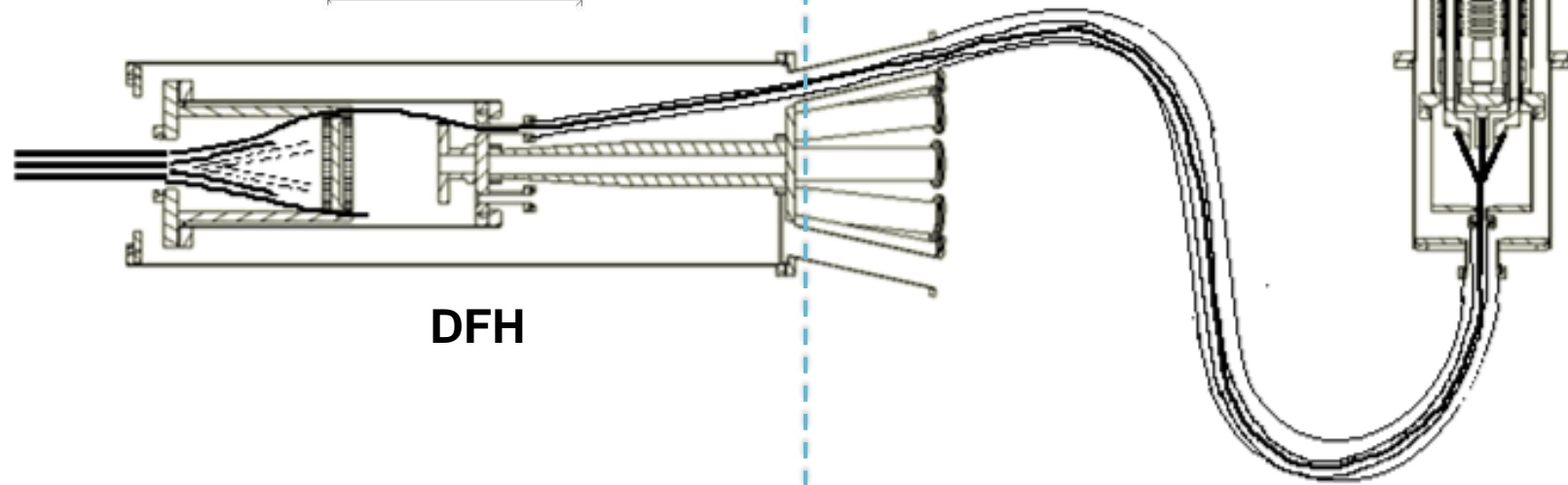
Updated in order to take into account recent changes on the magnets circuits (HL-LHC Magnets Circuits Internal Review, EDMS N. 1807471, May 2017)

EDMS N. 1821907

DFH - Concept



CERN supply



DFH

Development activity at CERN

Test station operational from 2014 until end 2016 – now being upgraded

L test station = 20 m / 60 m



GHe
5 K - 70 K
 ± 1 K

H ~ 4 m



Industrial procurement of long cryostats

SC Link cryostats @ CERN



R&D Development

- **SC Link**

- MgB₂ wire: developed with industry. Being procured
- MgB₂ cable: prototyping on-going in industry

- **HTS Current leads**

- Prototypes at CERN (internal design/construction)

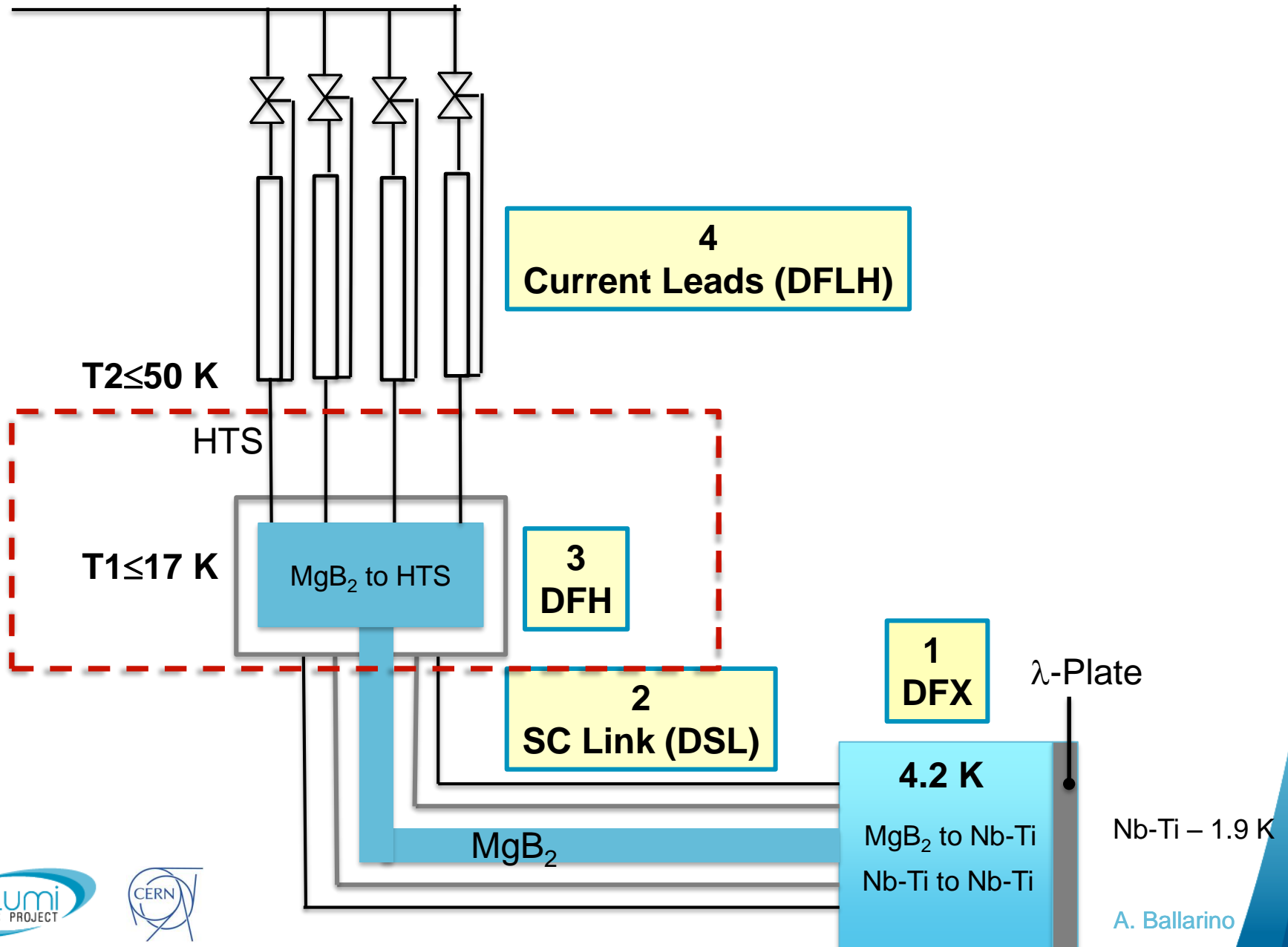
- **DFX**

- Small scale demonstrator being constructed

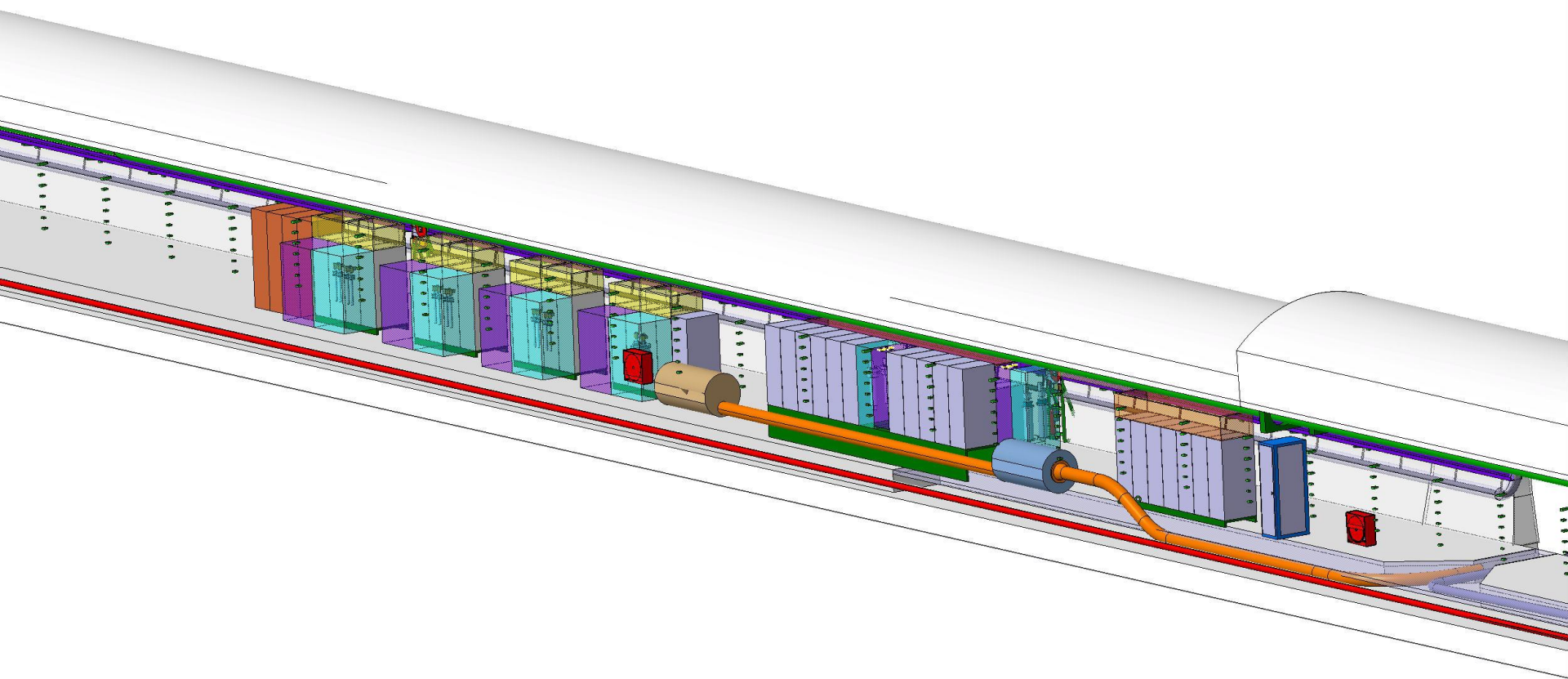
- **DFH**

- Clear baseline – changed in 2018 for simplifying cooling

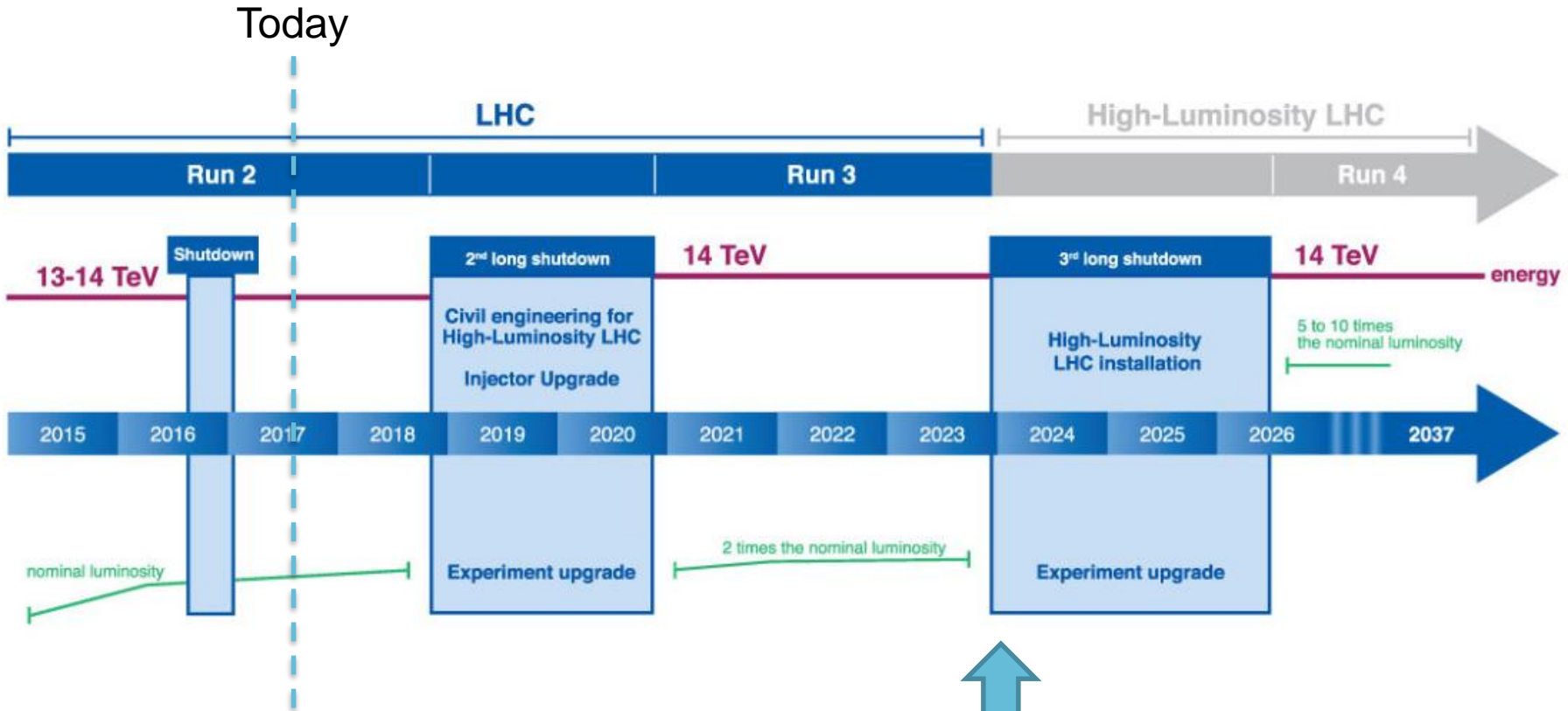
DFH Functionalities



DFH Integration in the tunnel



HL-LHC Timeline



Integration in LHC Tunnel in 2024

All large procurements of WP6a components
launched in 2018 and 2019

Looking forward to starting the collaboration

Questions ?