



TCC Meeting 02/11/2017

Local integration of the low-current leads for the HL-LHC Inner Triplet

A. Ballarino

With contributions from/discussions with R. Betemps, H. Prin, D. Ramos, S. Maridor, P. Fessia



Presented at the WP6a Meeting on 24/10/2017

Circuits fed via the Superconducting Link

| | Magnet | Cold Powering | | | |
|--------------|----------------|-----------------|-----------------|------------------|------------------------|
| | I_{ult} (kA) | I_{peak} (kA) | I_{lead} (kA) | I_{cable} (kA) | N_{leads}/N_{cables} |
| 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 |

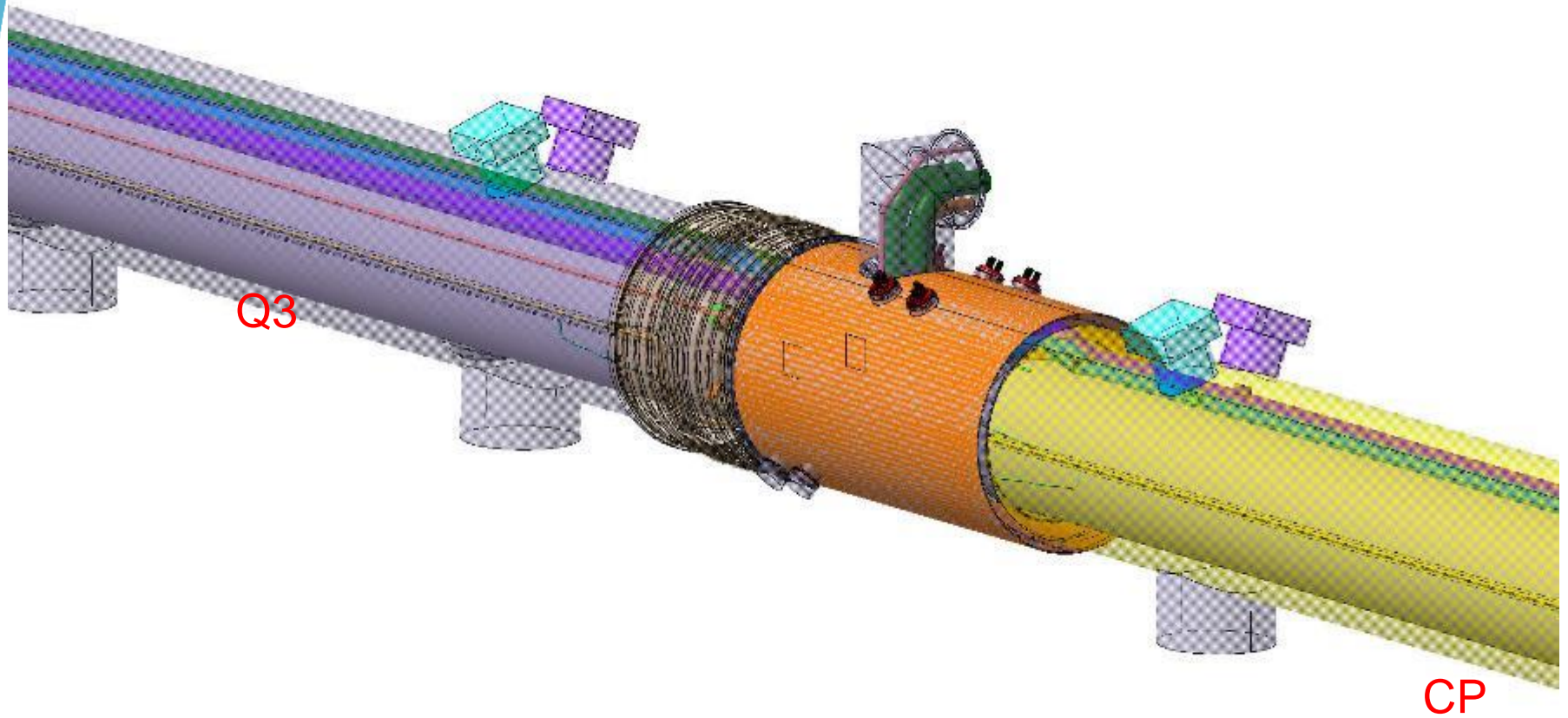
Proposed for local powering

EDMS 1821907, June 2017

Local powering of corrector circuits

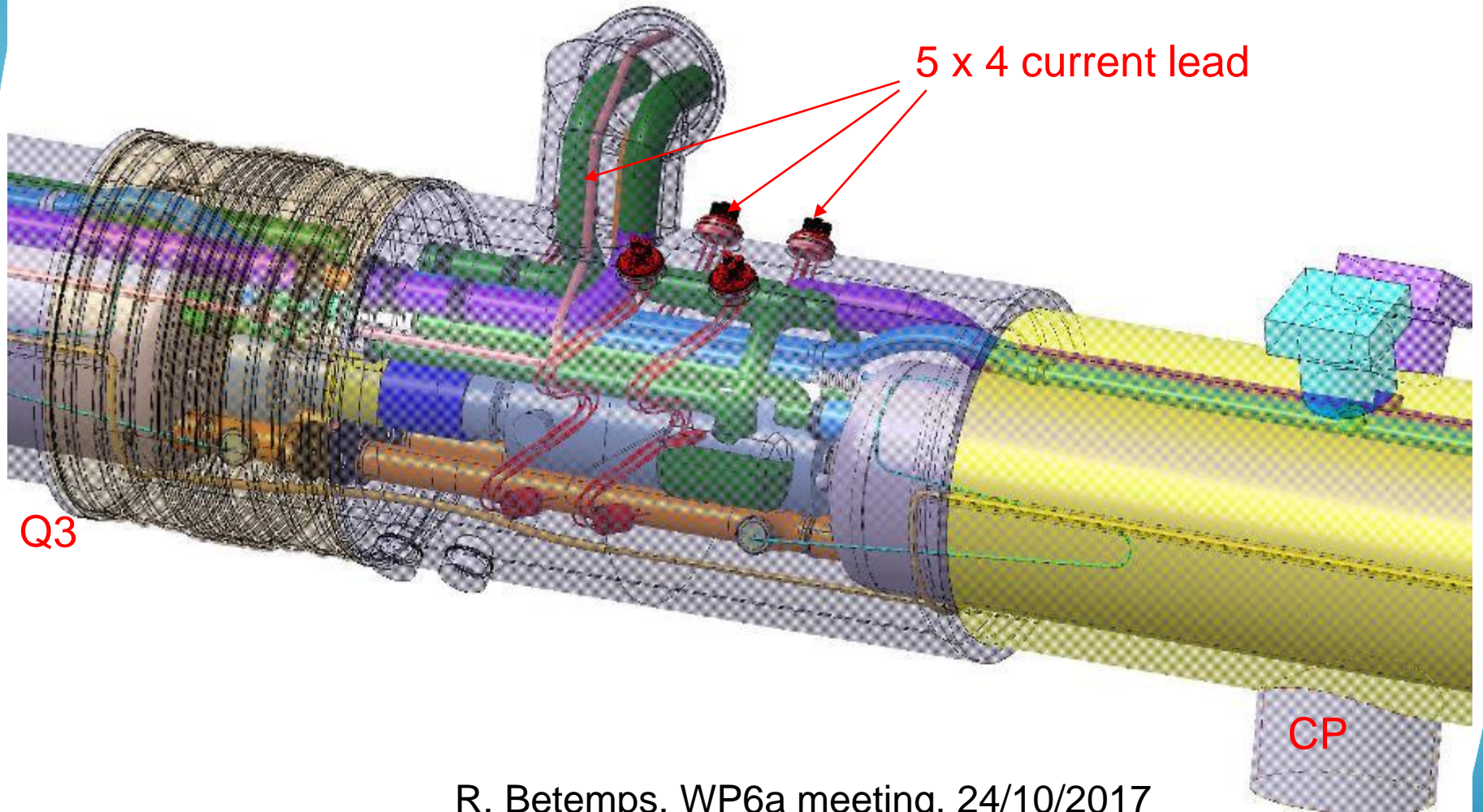
- Main advantages:
 - Simplified cabling of SC Link
 - Simplified plugs between DFX and magnet cold mass (18 cables “less”)
 - Simplified (reduced size) of DFH
 - Elimination of electrical connection (splices) in the DFX and in the DFH (2×18)
 - No need of developing gas-cooled 120 A leads to be located in the UR (and no need for cryo-control, piping and and valves)

Preliminary integration studies



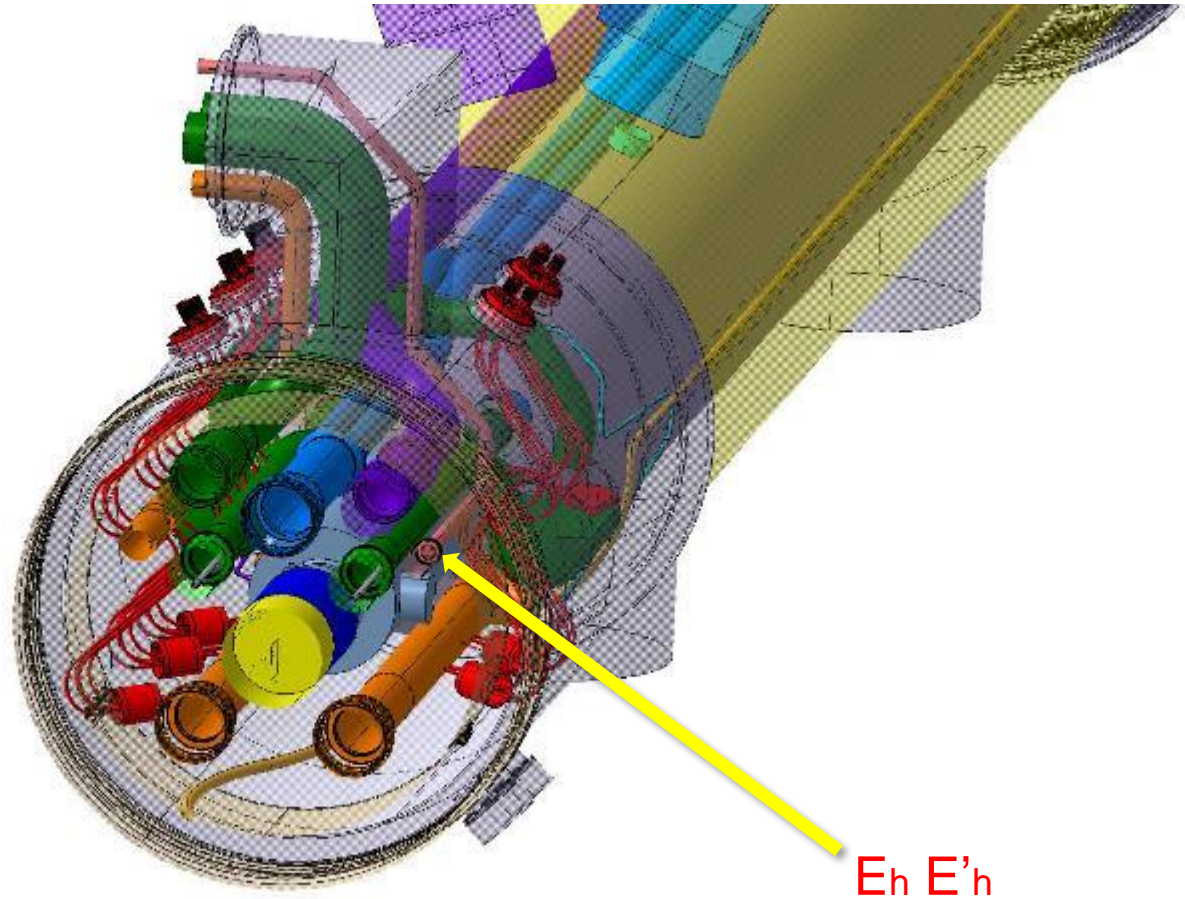
R. Betemps, WP6a meeting, 24/10/2017

Preliminary integration studies



R. Betemps, WP6a meeting, 24/10/2017

Preliminary integration studies



Used for “thermalisation” of the current leads

R. Betemps, WP6a meeting, 24/10/2017

To be studied

- Possibility of routing RT cables
- Alternatives for integrations – present preliminary proposal implies integration of the current leads before cryostat vacuum envelope
- One thermalization at ~ 50 K (and none at 5 K-20 K) as in the LHC. Design of conduction-cooled LHC current leads to be adapted – not considered to be an issue (just not identical to LHC)
- **Concluding:** no evident showstoppers, but verifications to be done before confirmation of change of baseline
- Trim of Q1: today “considered” part of the CLIQ system