TCC Meeting 02/11/2017
Powering of 11 T Trim

A. Ballarino

With contributions from/discussions with R. Betemps, Ph. Denis, H. Prin, D. Ramos, M. Gonzalez, S. Yammine, J. P. Burnet

Presented at the WP6a Meeting on 24/10/2017

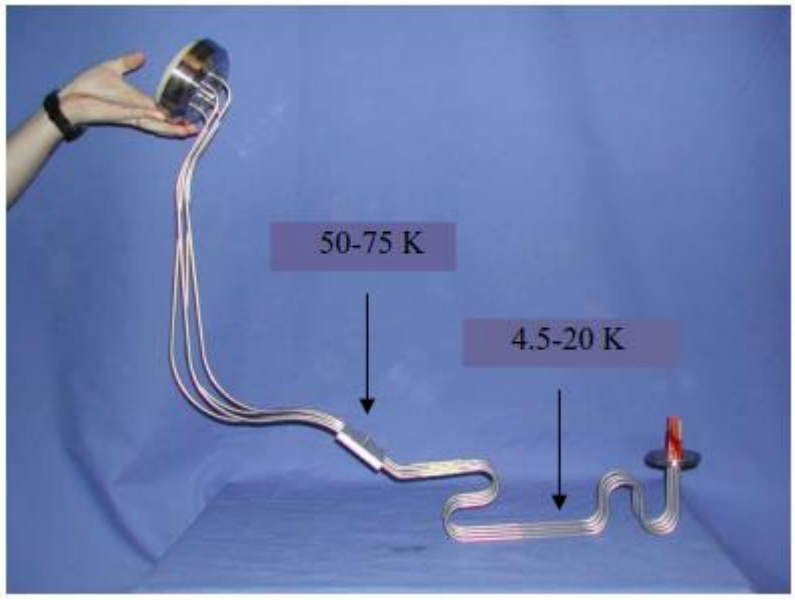
Introduction

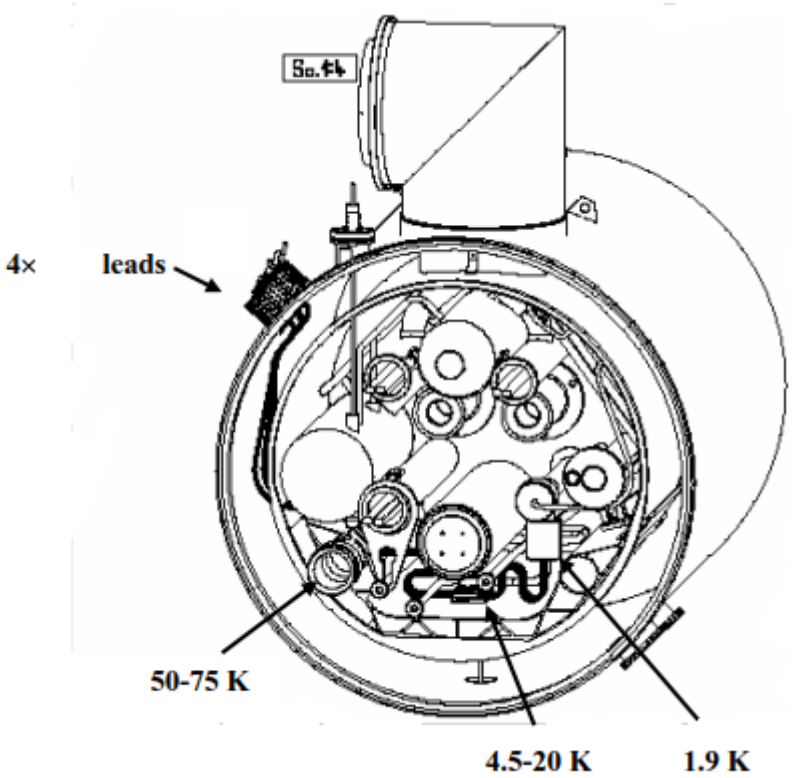
- Following **recommendation from circuits review** (March 2017): use trim circuit to compensate difference in transfer function between the 11 T and the main LHC dipoles

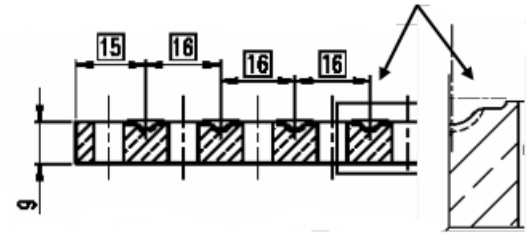
- Design of leads with **CMI**. Conceptual study of **gas-cooled leads** able to meet the HV insulation requirements (3.1 kV to ground in cryogenic conditions - trim on MB dipole circuit, EDMS 90327) and **preliminary integration study** of conduction-cooled leads

- In October 2017: decision to use conduction-cooled leads LHC-type under the responsibility of SCD

LHC 120 A Conduction-cooled leads







Work performed to date (since Oct 2017)

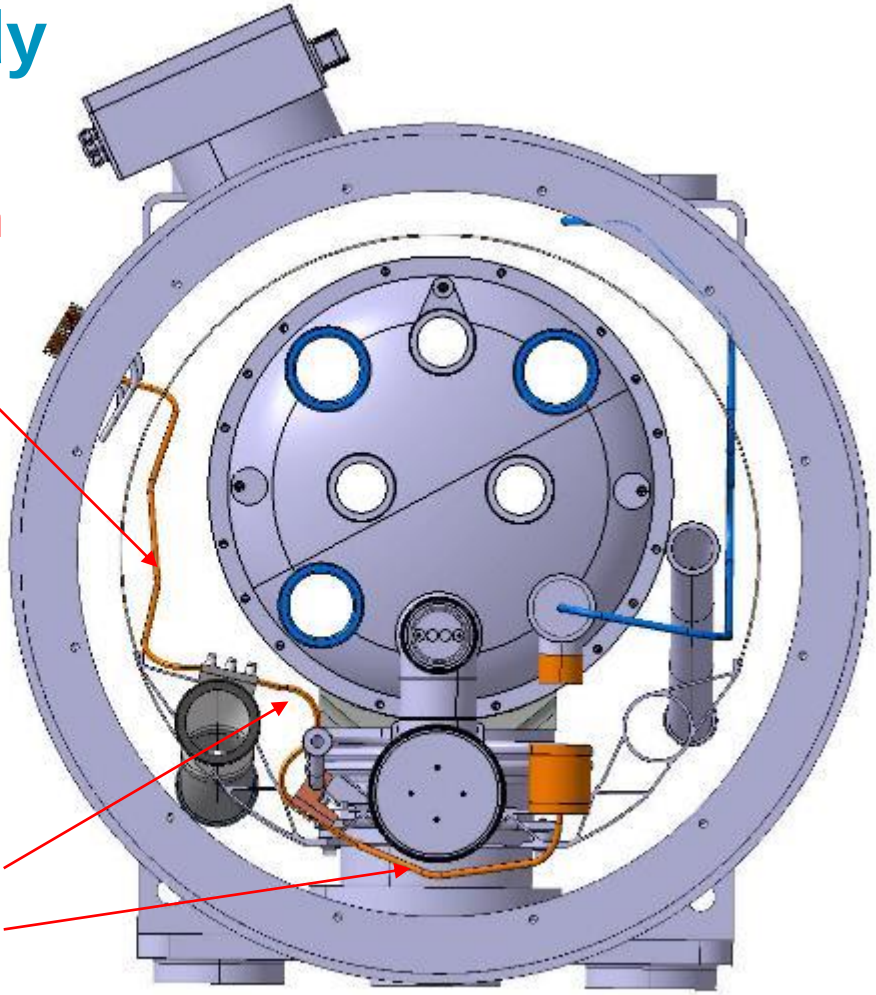
- Reviewed integration study (for enabling use of LHC design and associated technologies)
- Performed electrical insulation tests on LHC conduction-cooled 120 A leads (Vins > 5 kV in He gas, RT, atmospheric pressure)
- Proposed the use of two current leads per polarity (one assembly of four leads per circuit)
- Discussed with EPC:

  Protection of the leads (voltage signal to power converter) – slow power abort (~10 s) when voltage across individual lead exceeds ~ 100 mV;

  Detection of un-equal (ΔI > 10 A) current distribution between conductors

Conduction-cooled current leads for 11 T Trim Integration study

Lg1 : 740mm # 635 mm



- Lg2: (100)+204 mm
- Lg3: (88) + 385 mm

Integration preserves LHC lengths: **same design** and **same components/parts** as for LHC. **Same integration** as for LHC (by adding a slit on the thermal shield). **Different shape** of current leads.

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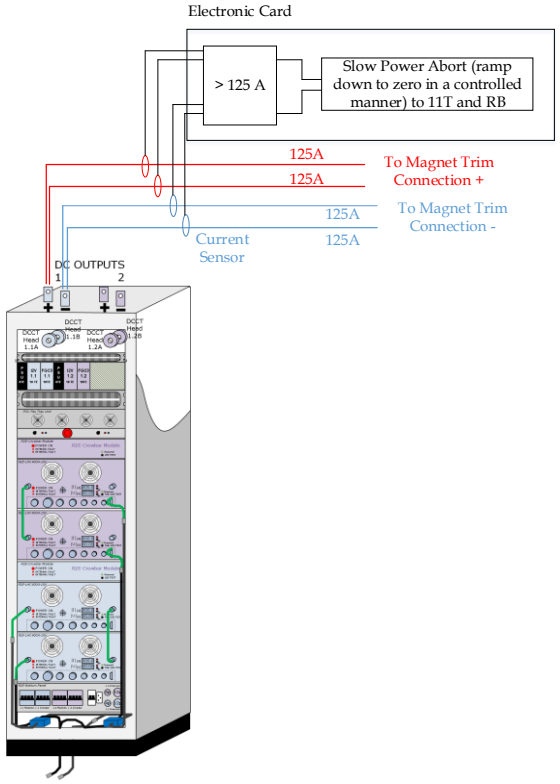
Protection



- **2x70mm² DC cables** (identical) per polarity. The resistance of the cables will naturally balance the current in both leads.
- **Current sensors on the DC cables** to be added to be able to protect from overcurrent (>125 A).
- A **new R2E card** (logic to be determined) should be developed to generate an abort signal when the limit current in surpassed.
- WP6b was asked to follow up this subject, and to report back to the MCF.

S. Yammine, TE-EPC

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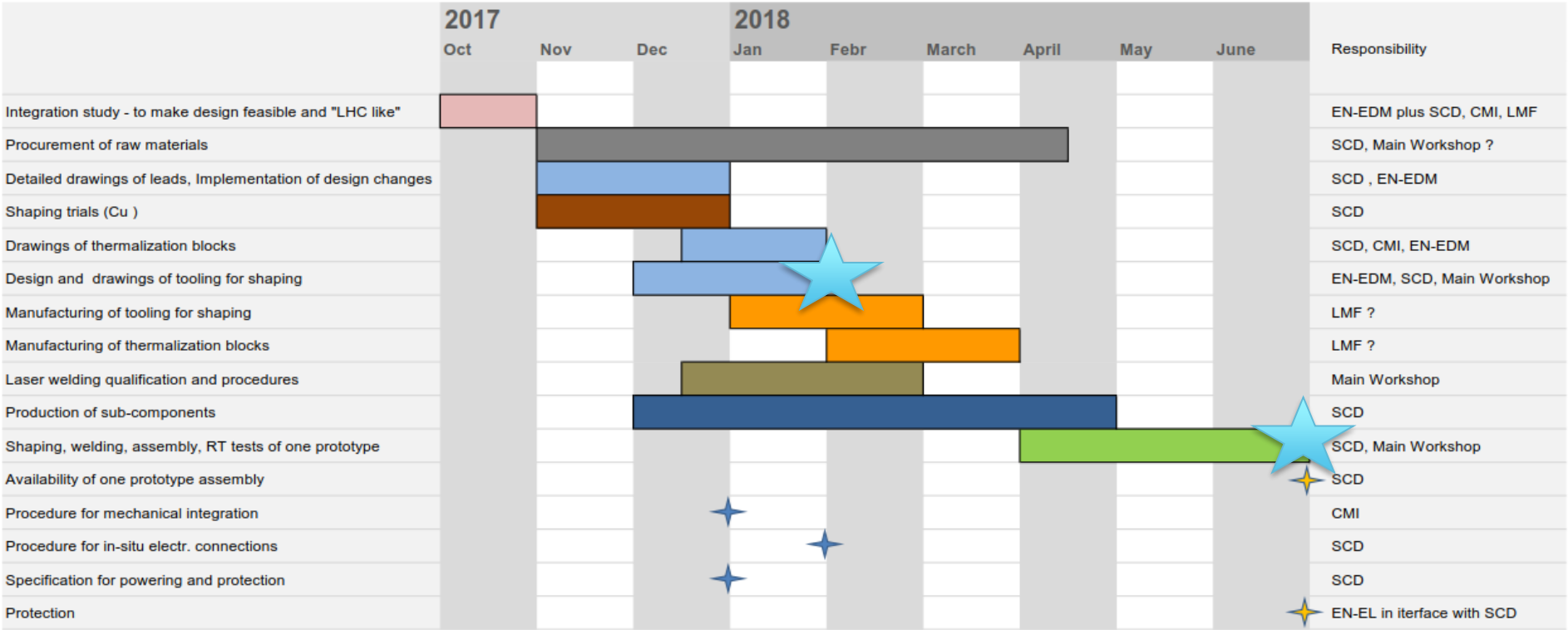
- To be verified: routing of RT cables (four instead of two - not considered to be a challenge)

Tentative schedule

Nine months project timeline

Start Date: 02/10/2017

Desired end date: 30/06/2017



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