TE-MPE LS1 review
Vision from EN-EL(CF)

Daniel RICCI
Section Leader EN-EL-CF

Acknowledgments to:

Georgi GEORGIEV (Cabling)
Consuelo GONCALVES PEREZ (Cabling)
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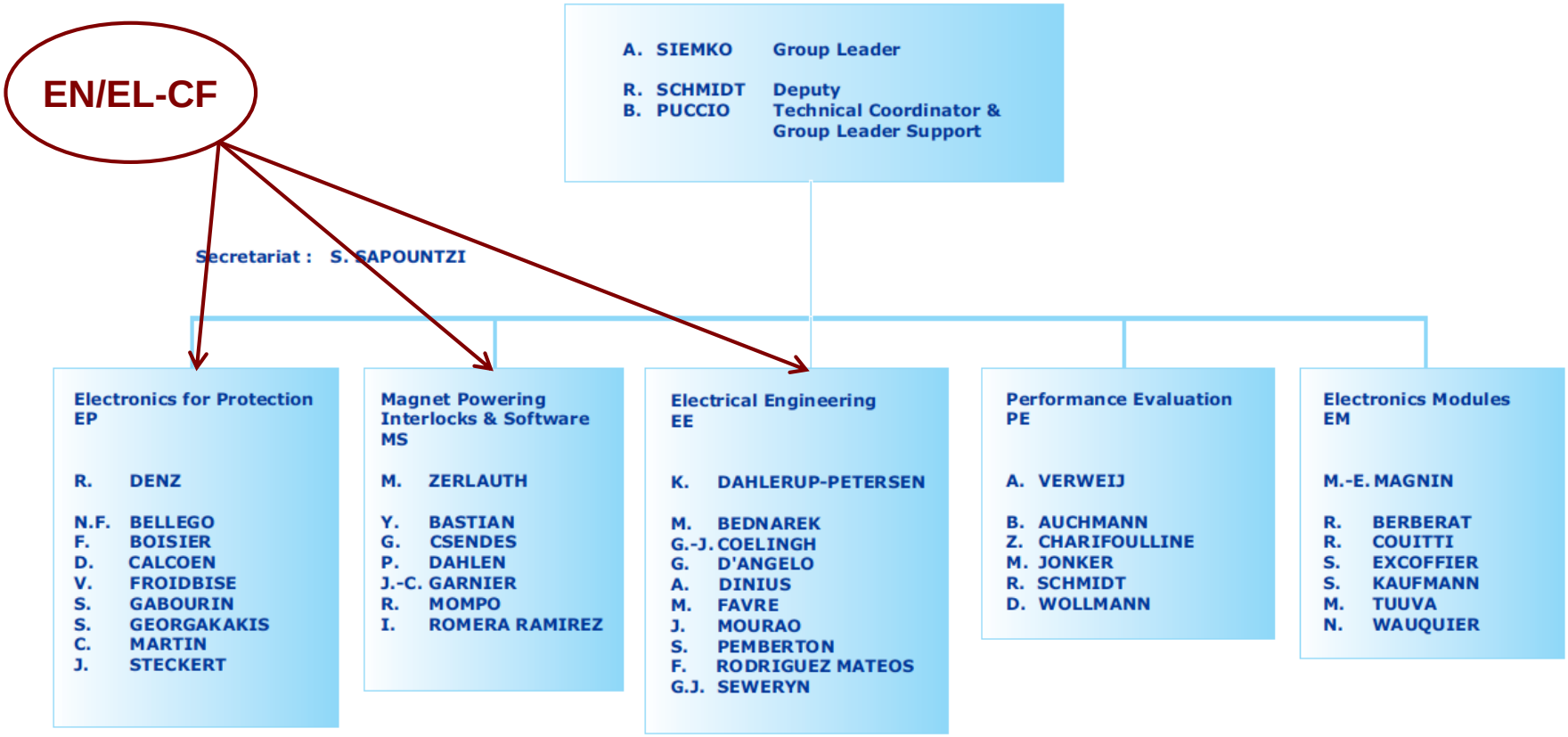
Collaboration between TE/MPE and EN/EL(CF)

- **Power cabling** (Direct Current)
  - Including Water Cooled Cables (WCC)
- **Signal cabling**
  - Copper
  - Optical fibres (through a multi-user infrastructure)

Mainly for machine interlocks

Machine Protection & Electrical Integrity
Staff Members



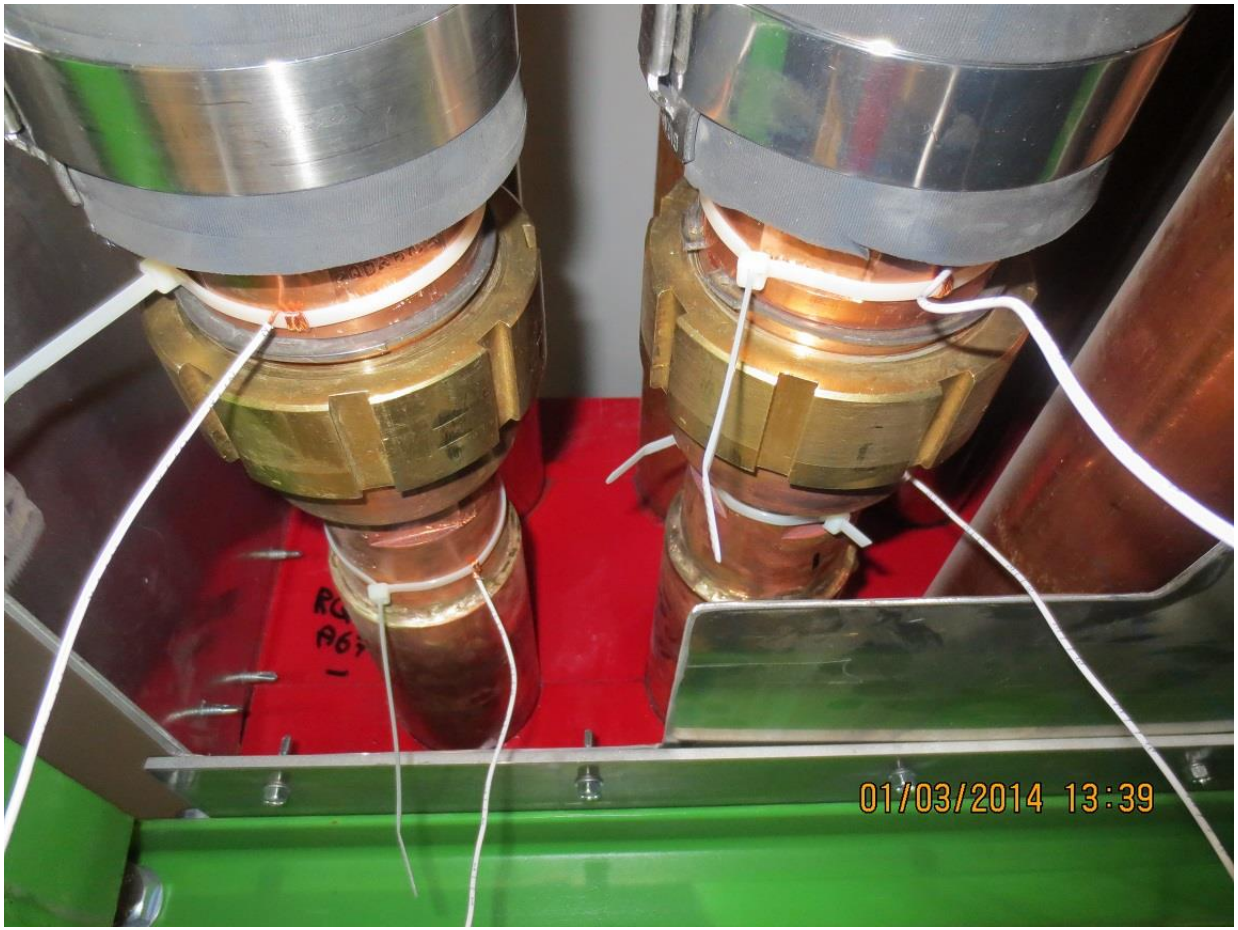
MARCH 2015

Power cabling

Main works requested on **Water Cooled Cables**

- **LHC commissioning** (during LS1)
  - Preparation for SCT (Short Circuit Test) at LHC Pt. 6 and Pt. 8 - Conical connection resistance test
    - 2000 mm^2, 13 kA cables and tubes part of the RB, RQF, RQD circuits
- **Additional SCT at LHC Pt. 2**, including:
  - Preparation (eg.: short circuit blocks mounting/dismantling, orientation)
  - Resistance test, incl. WCC conical connections tightening
    - 2000 mm^2, 13 kA cables and tubes part of the RB, RQF, RQD circuits
- **Meyrin – Building 377** (Test area)
  - Removal, procurement and re-installation of 2 x 2000 mm^2 cross-section WCC
    - Hose replacement, orientation and pressure test

Conical connections LHC-P6L (UA63)



- Preparation for the voltage taps test

Feedback

Well appreciated

- Good understanding/flexibility of TE/MPE in scheduling the works requested
- Working teams cohabitation : efficiency between two services during commissioning tests
- Availability of teams in case of additional test requested by EN-EL
- Very good flexibility of TE/MPE team in adapting the switch to 2 WCC polarity inversion (Pt. 3L)

To improve

- Additional action for new SCT in pt 2 → aim at more anticipation from TE-MPE
- WCC converters side: the manipulation by TE/MPE team during TE/MPE commissioning – to prevent water leakage
- Improve the protection against water projections of very sensitive equipment (to study)

We agree in general with the remarks presented by TE/MPE during the Cabling review (cfr. B. Puccio on 17 Feb 2015)

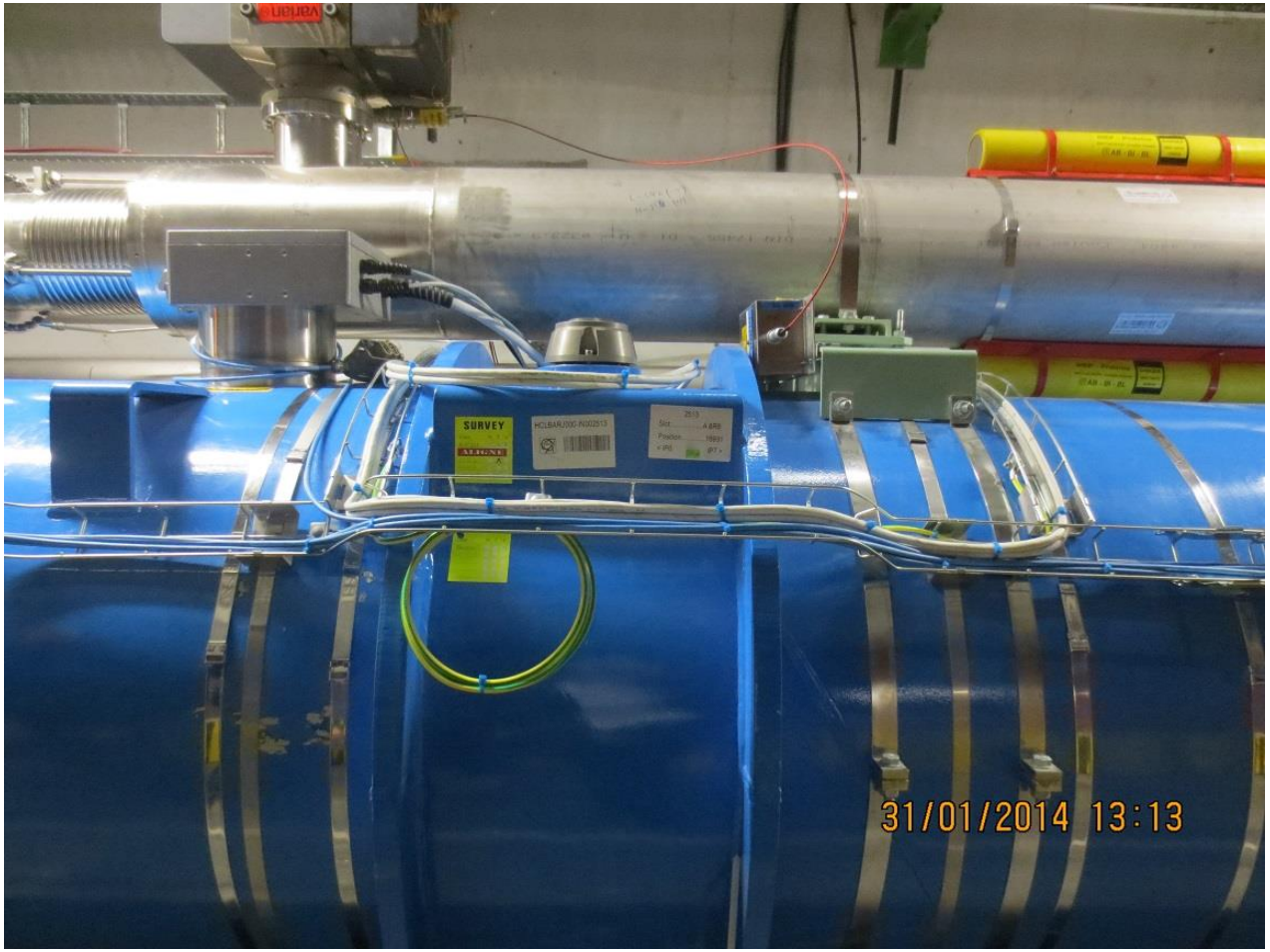
Signal cabling (copper)

Main requests during LS1:

Machines	Projects	Nb of cables	Total length (km)
SPS	New Interlock Ringline	109	18
PSB	Cabling and installation of 80 Interlock boxes	114	2.3
HIE-Isolde	New Interlock cables	160	5
Linac4	New Interlock cables and BIC	10	0.7
AD	Modification of Interlock cables	112	8.2
LHC	Modification of cables VTAP IPQ (8,9,10)	35	3.7
	Modification of QPS cables	151	3.8
	New cables for BIS	8	1.5
	New cables WorldFip QPS	41	15
	R2E Project	59	3.2
Total		799	61.4

Works organised by EN/EL in **multi-user**, CERN-wide, **cabling campaigns**

Signal cabling for IPQ (UJ67)



- Installation campaign LHC6D-LS12 during LS1

Feedback

Well appreciated

- Information (DIC, etc…) were very clear and given in time for EN/EL preparation
- Very good understanding of our cabling constraints (organization, cable deliveries, workload, etc…)
- Availability of the TE-MPE team in case of additional questions

To improve

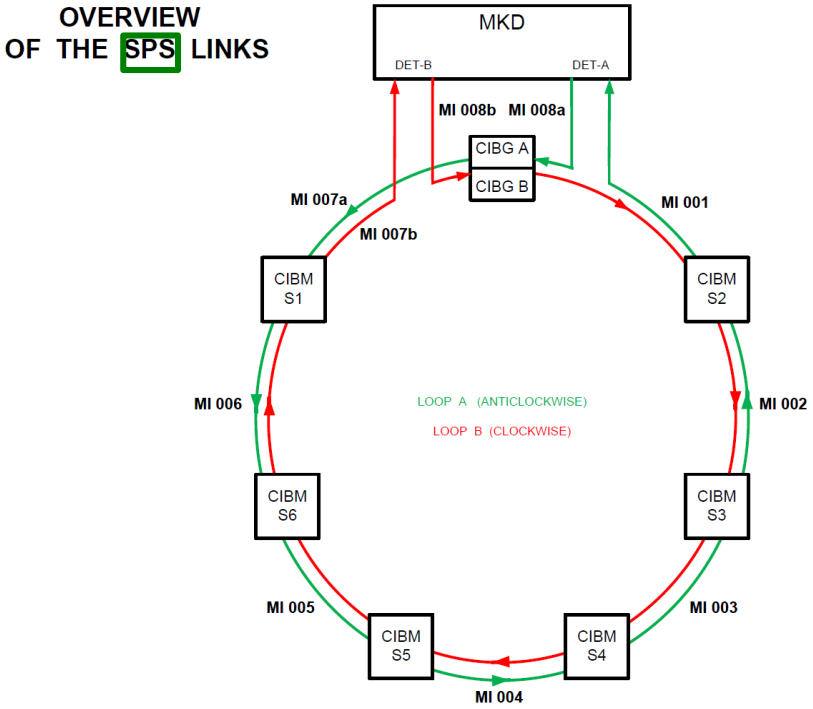
- Some problem (solved) of responsibilities of interlock cables between TE-MPE and TE-MSC on AD site.

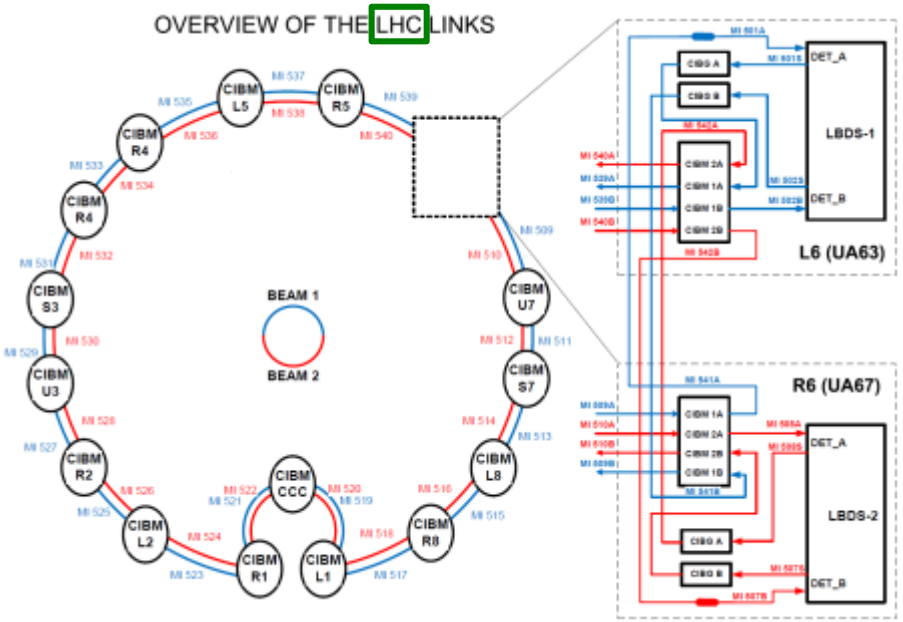
We agree in general with the remarks presented by TE/MPE during the Cabling review (cfr. B. Puccio on 17 Feb 2015)

Optical fibres for TE/MPE systems

- EN/EL-CF provides and maintains the optical fibre infrastructure for the systems managed by TE-MPE-EP (**BIS** and **SMP**)

Optical fibre links for BIS system





Optical fibres for TE/MPE systems

Main activities/collaborations **during LS1:**

- **LHC Radiation sensitive optical fibres replacement campaign**
  - BIS system: 3 LHC underground optical fibre trunks were replaced (18 links affected)
    - **Good organization** with TE/MPE-EP for previous measurements campaigns and final replacement of the fibres
    - TE/MPE-EP tested and put in service again all the links
- **R2E project**
  - BIS system - R2E P5: relocation of fibres in USC55 → consolidated during LS1
    Good anticipation with respect to the expected workload during LS1

Optical fibres for TE/MPE systems

- **Study of implementation of BIS system for Project SBLNF**
  - Good collaboration with TE/MPE-EP for establishment of a budget envelop for this project for the system BIS. **Information received timely**

- **Optical fibre installations in SPS**
  - BIS system: Installation of spare fibre links between each BA
  - SMP system : Fibre installation for SMP SPS between BA1 and CCR
  - Nothing to report beside good collaboration and **understanding the scheduling constraints** during LS1

- **Troubleshooting requested by TE/MPE**
  - BIS system: repair of damaged fibre in BB4
  - BIS system: troubleshooting on one optical fibre link with a problem in the re-connection campaign UJ33
  - SMP system: troubleshooting on 2 optical fibre links in SX4 and TZ76. Both were ok, **probably just a cleaning issue**

Feedback

Well appreciated

- Good that TE/MPE is equipped to do a **first evaluation test of the optical fibre links in service** → this common procedure allows optimising the EN-EL interventions for large fibres systems;
- To be maintained that **EN-EL-CF is contacted to intervene systematically over the infrastructure** if a malfunctioning is found by TE/MPE

To improve

- EN/EL and TE/MPE shall work together to **centralize the documentation** of the optical fibre links for BIS and SMP and to keep it **available** and **up-to-date**.
  - EN-EL-CF needs **to register in a database (fibrotheque)** all the optical fibre links related to BIS, SMP systems. A collaboration will be needed for LS2
- EN-EL-CF would like to be kept involved in the definition of the **fibre requirements** for **future development or upgrade projects.**

Conclusions

- The collaboration between TE/MPE and EN/EL(CF) is **very much satisfactory**
  - Very good **mutual dialogue and understanding** between the teams → essential to maintain for LS2
    - We greatly appreciated the understanding of the constraints on EN/EL side
  - The job comprises **3 very different technologies** (power, signal cabling and optical fibres) each one presenting **specific challenges**
    - For 13 kA conical joints we agree with TE/MPE suggestions at the Cabling review to setup dedicated training for the teams involved

- All requested works/troubleshooting during LS1 were achieved with global **very good quality**
  - Some unplanned works during LS1 could be absorbed also thank to the **good flexibility of TE/MPE teams** → an asset to be maintained for LS2
  - TE dep. (HDO, ABT, VSC) also contributed with resources (people) to help → **a very positive experience** on both sides to be definitely repeated in the future (cfr. Conclusion Cabling review)

- We identified **specific points to improve**, which are detailed in the slides

- **EN-EL(CF) would already be very happy if we manage together to maintain the same way of working for LS2!**

Thank you

Ref. TE-MPE revue in Indico: https://indico.cern.ch/event/396125/

Ref. EN-EL-CF cabling revue in Indico: https://indico.cern.ch/event/348896/