
CERN

Agreement KE4082/TE : ADDENDUM No. 2
to
FRAMEWORK COLLABORATION AGREEMENT KN3369
between
THE EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH (CERN)
and
THE WROCLAW UNIVERSITY OF SCIENCE AND TECHNOLOGY (WUST)
concerning

**Collaboration between CERN and WUST in the matter of the consolidation of the LHC Dipole Diodes during LS2**

# The DISMAC Project

# Wecome (back) presentation

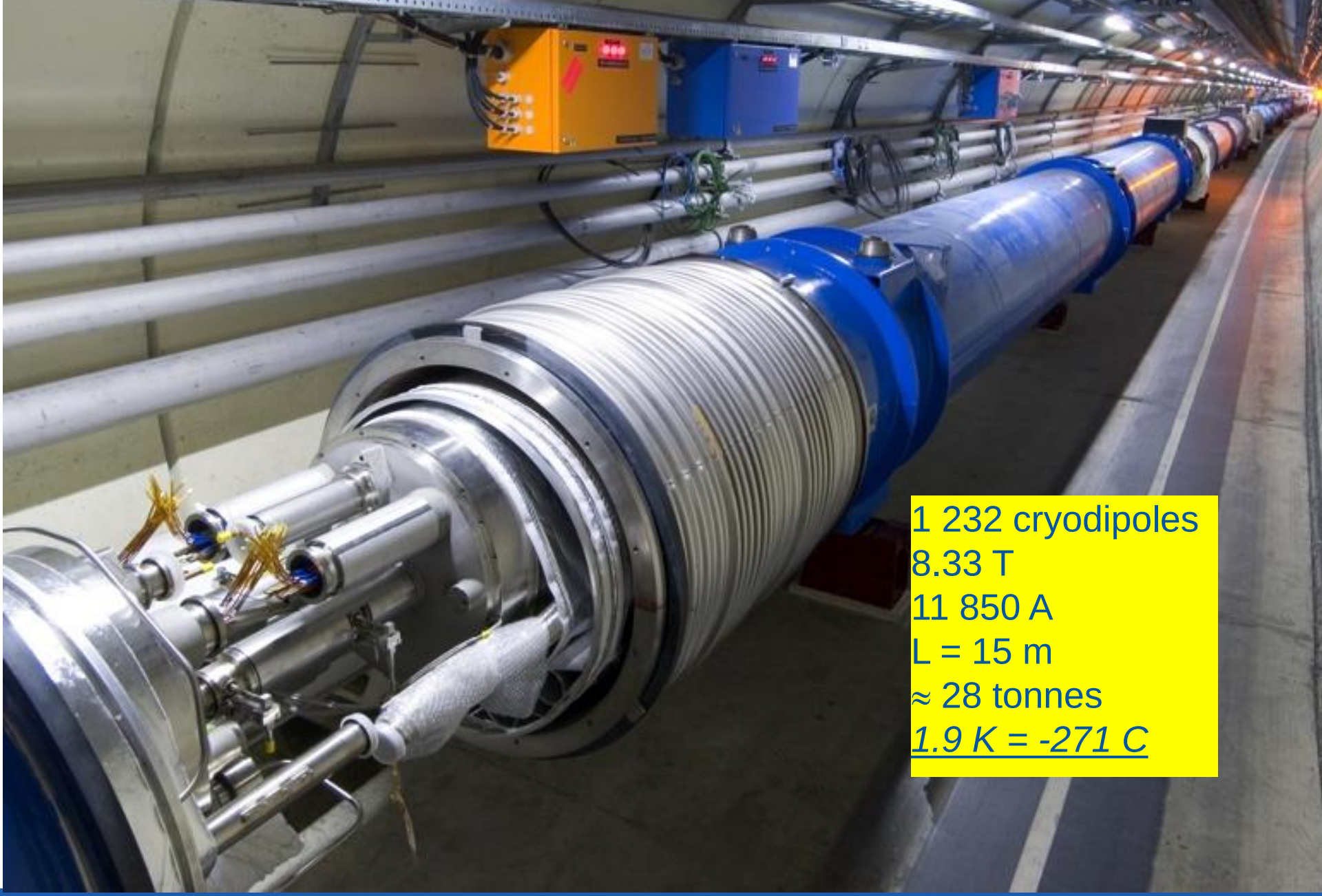
J.Ph. Tock (TE-MSC)

- Introduction
- DISMAC :

  Diodes Insulation & Superconducting MAgnets Consolidation
  - Scope
  - Organization chart
  - ***Your contribution***
  - Mock-ups / Training
  - Schedule
- Conclusions

# CERN : The European Organization for Nuclear Research

## Like a small town


1 232 cryodipoles
8.33 T
11 850 A
L = 15 m
≈ 28 tonnes
1.9 K = -271 C

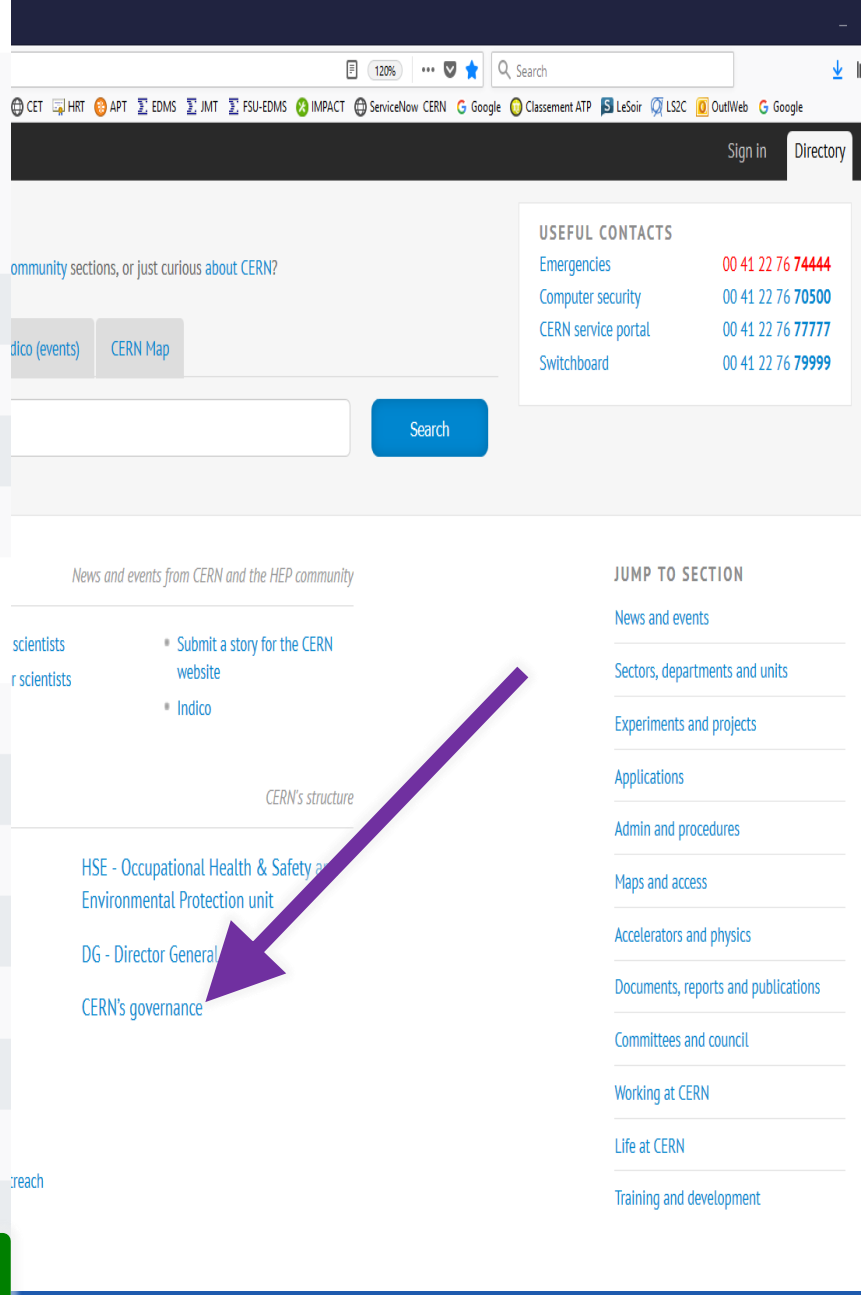
## Directorate

| | |
|---|---|
| Director-General | |
| Appointed by Council, usually for five years, **the Director-General manages CERN**. A directorate assists the Director-General, who proposes its members to Council. The Director-General reports directly to the Council, and can also propose any adjustment deemed necessary to meet the evolving needs of the research programme. | Fabiola Gianotti |
| Director for Accelerators and Technology | Frédérick Bordry |
| Director for Research and Computing | Eckhard Elsen |
| Director for Finance and Human Resources | Martin Steinacher |
| Director for International Relations | Charlotte Warakaulle |

*The biographies are available on this page.*

## Heads of departments

| | |
|---|---|
| Beams | Paul Collier |
| Engineering | Roberto Losito |
| Experimental Physics | Manfred Krammer |
| Finance and Administrative Processes | Florian Sonnemann |
| Human Resources | James Purvis |
| Industry, Procurement and Knowledge Transfer | Thierry Lagrange |
| Information Technology | Frédéric Hemmer |
| Site Management and Buildings | Lluis Miralles |
| Technology | José Miguel Jiménez |
| Theoretical Physics | Gian Francesco Giudice |



# TECHNOLOGY DEPARTMENT

Also LS2 coordinator (CERN-wide)

José Miguel JIMÉNEZ — Head of Department

Thomas Otto — Departmental Safety Officer

Also DISMAC Safety officer

**ABT**
Accelerator Beam Transfer
Brennan GODDARD GL
Malika MEDDAHI DGL

**EPC**
Electrical Power Converters
Jean-Paul BURNET GL
Valérie MONTABONNET DGL

**MSC**
Magnets, Superconductors & Cryostats
Luca BOTTURA GL
Arnaud Devred DGL

**PPR**
Projects, Planning & Resources
Mar CAPEANS GL
Lisette Van Den Boogaard DGL

**CRG**
Cryogenics
Dimitri DELIKARIS GL
Serge CLAUDET DGL

**MPE**
Machine Protection & Electrical Integrity
Andrzej SIEMKO GL
Markus ZERLAUTH DGL

**VSC**
Vacuum, Surfaces & Coatings
Paolo CHIGGIATO GL
PAUL CRUIKSHANK DGL

MARCH 2019

TE-MSC

# Magnets, Superconductors & Cryostats

## Staff Members

**Group Leader** L. BOTTURA

**Deputy Group Leader** A. DEVRED

**Group Leader Office:**
L. BOTTURA
G. DE RIJK
A. DEVRED
J.Ph. TOCK
E. TODESCO
D. TOMMASINI

**Secretariat:**
C. HERVET
M. GONZALEZ TORRES

**Quality Assurance**

Coordinator A. DEVRED
Deputy Coordinator R. PRINCIPE

Correspondent:

MM T. ZICKLER
LMF R. PRINCIPE
MDT A. MUSSO
MNC R. LOPEZ
CMI M. STRUIK
TF O. DITSCH
SCD S. HOPKINS

**Cryostats & Machine Integration CMI**

V. PARMA

A. BASTARD
D. DUARTE RAMOS
S. LE NAOUR
Y. LECLERCQ
M. SOUCHET
M. STRUIK
J.Ph. TOCK
A. VANDE CRAEN
L. WILLIAMS

**Large SC Magnet Facility LMF**

A. MILANESE

J. AXENSALVA
T. BAMPTON
M. BRUYAS
D. ETIEMBRE
R. FAES
L. FAVIER
A. FOUSSAT
L. GRAND-CLEMENT
J.M. HUBERT
F. LACKNER
C. LOPEZ
S. LUZIEUX
M. POZZOBON
H. PRIN
R. PRINCIPE
F. SAVARY
C. SCHEUERLEIN
S. TRIQUET

**SC Magnet Design & Technology MDT**

G. DE RIJK

N. BOURCEY
S. CLEMENT
D. COTE
C. FERNANDES
P. FERRACIN
R. GAUTHIER
S. IZQUIERDO BERMUDEZ
G. KIRBY
G. MAURY
J. MAZET
A. MUSSO
J. PEREZ
F. PINCOT
P. RIZZO
D. SCHOERLING
S. SEQUEIRA LOPES
E. TODESCO

**Magnetic Measurements MM**

S. RUSSENSCHUCK

R. BELTRON MERCADILLO
M. BUZIO
R. CHRITIN
G. DEFERNE
O. DUNKEL
L. FISCARELLI
J. GARCIA PEREZ
D. GILOTEAUX
C. PETRONE
T. ZICKLER

**Magnets Normal Conducting MNC**

D. TOMMASINI

J. BAUCHE
D. BODART
P. CATHERINE
A. CRETIN
O. CRETTIEZ
M. DUMAS
D. GERARD
R. LOPEZ
A. NEWBOROUGH
G. PERRIN-BONNET
A. RUSSO
P. SCHWARZ
P. THONET

**Superconductors & Devices SCD**

A. BALLARINO

C. BARTH
A. BONASIA
B. BORDINI
A. CARLON ZURITA
P. DENIS
J. FLEITER
A. GHARIB
S. HOPKINS

A. JACQUEMOD
M. MALABAILA
G. PEIRO
P. RETZ
D. RICHTER

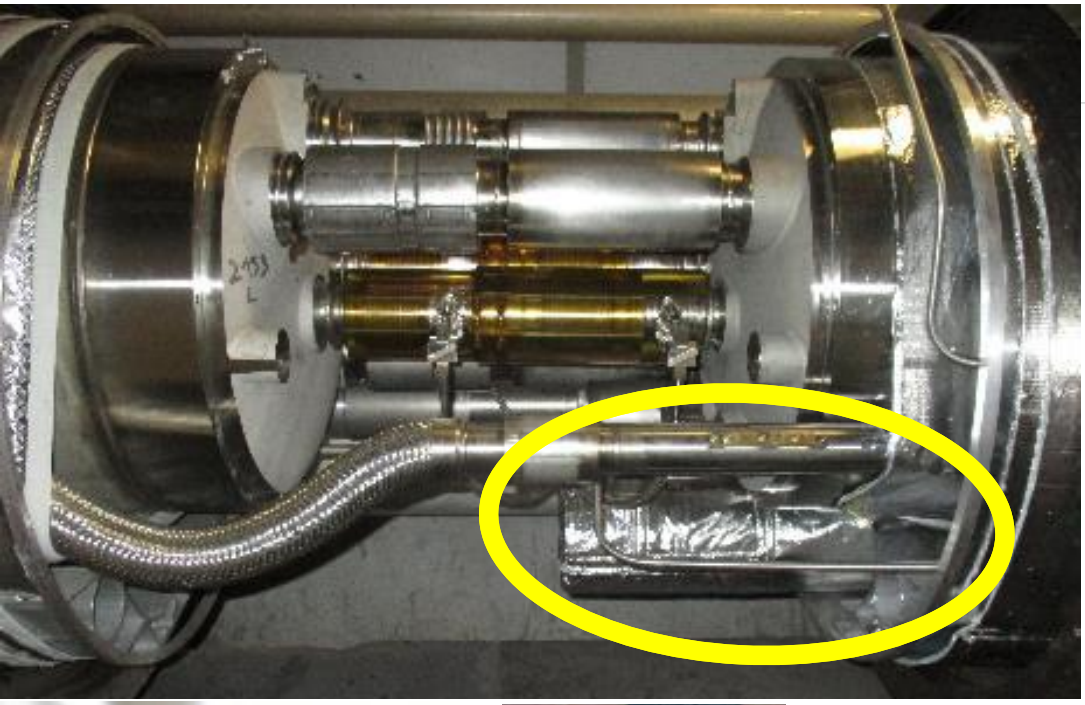
**Superconducting Magnet Test Facilities TF**

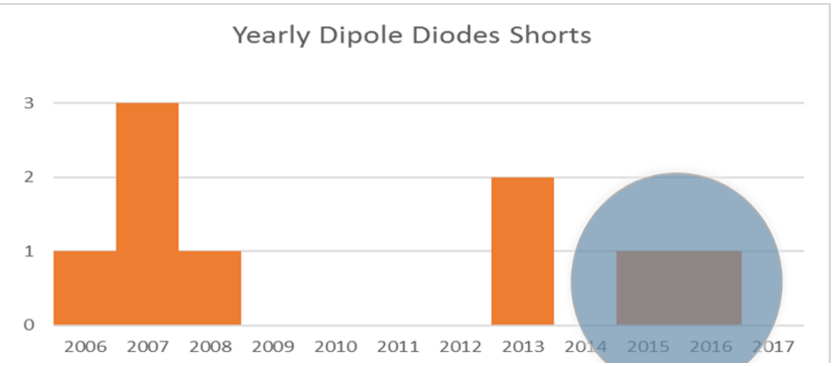
M. BAJKO

H. BAJAS
M. CHARRONDIERE
V. DESBIOLLES
O. DITSCH
J. FEUVRIER
C. GILOUX
G. NINET
P. VIRET
G. WILLERING

Also DISMAC Training Manager

# DISMAC : The scope





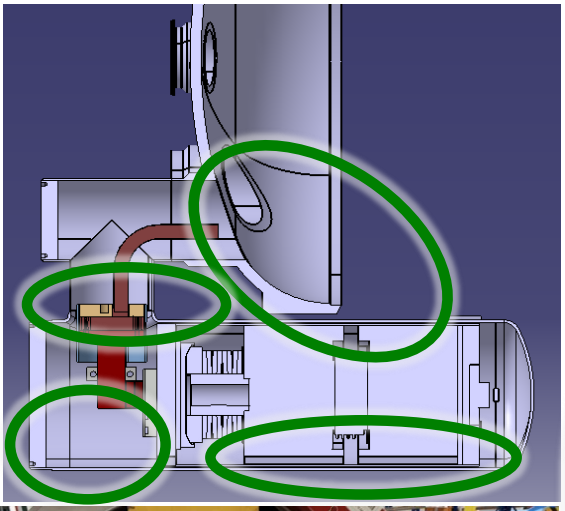

The goal after LS2 is to reach **14 TeV**

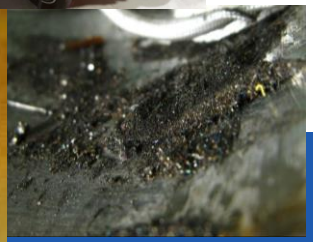
This requires powering / training the magnets

This is too risky without having consolidated the diodes insulation hence the DISMAC project

# TECHNICAL SOLUTION : 3 main actions

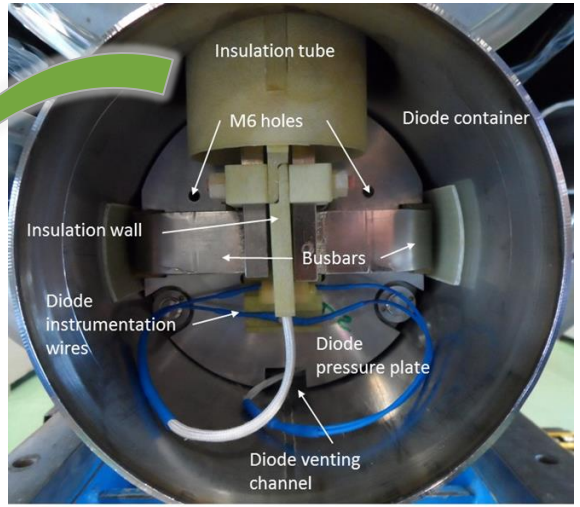
## 1 Removal of accessible (metal) debris





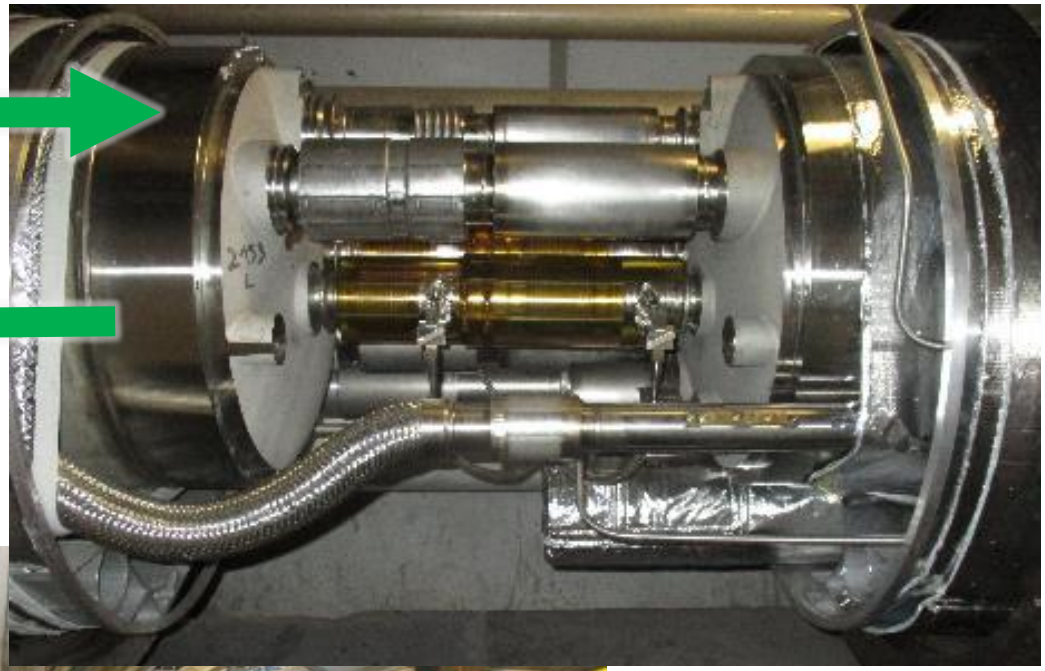
## 2 Installation of *optimised* half-moon insulation pieces

## 3 Insulation of diodes bare busbars



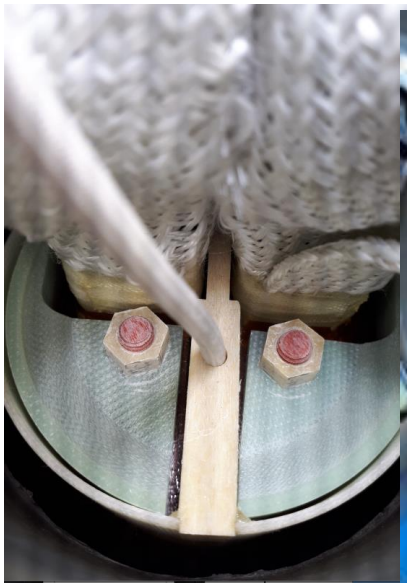

# WUST contribution to DISMAC

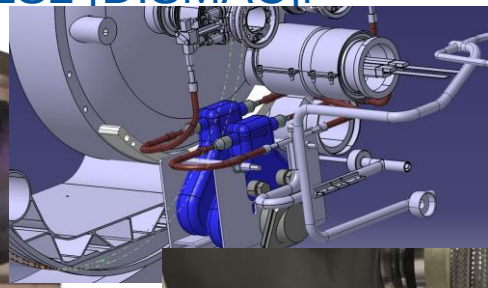
## Opening and reclosure of >1300 interconnections



# Not only diodes …

All the consolidation of the LHC superconducting magnets during LS2 [DISMAC].

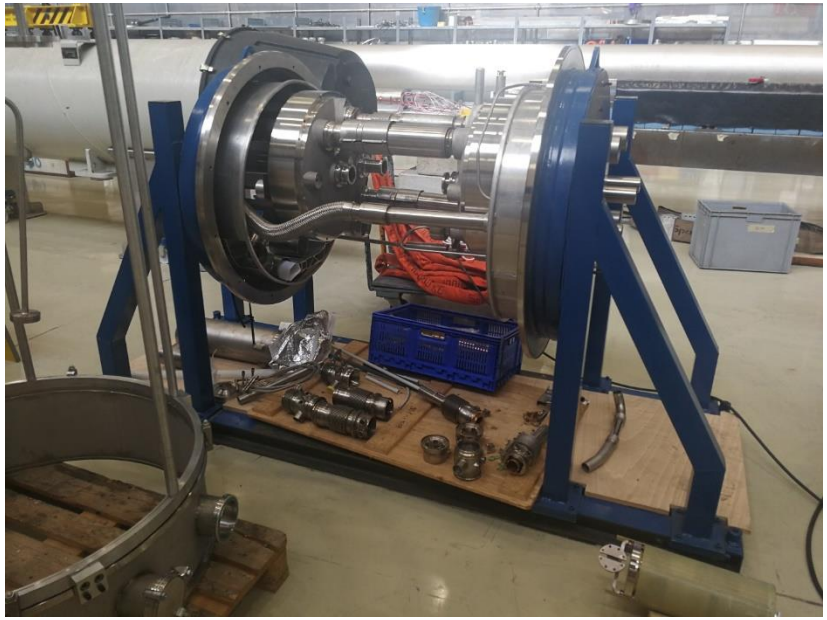


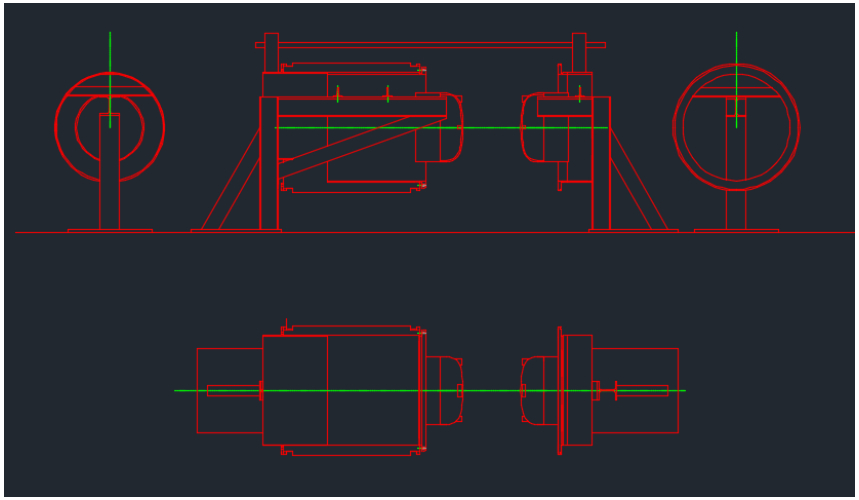


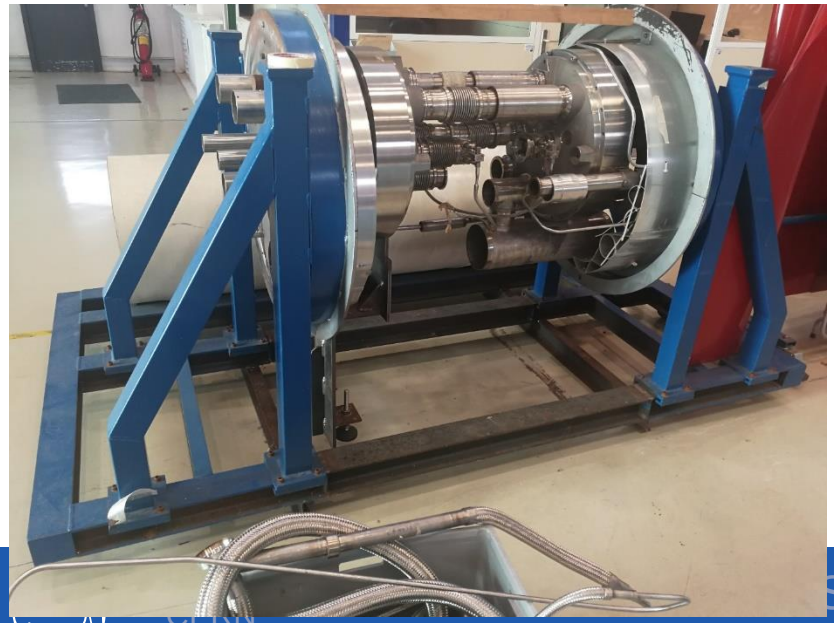

Non conformities

?

# Mock-ups / Training

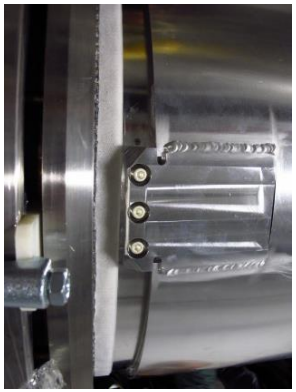


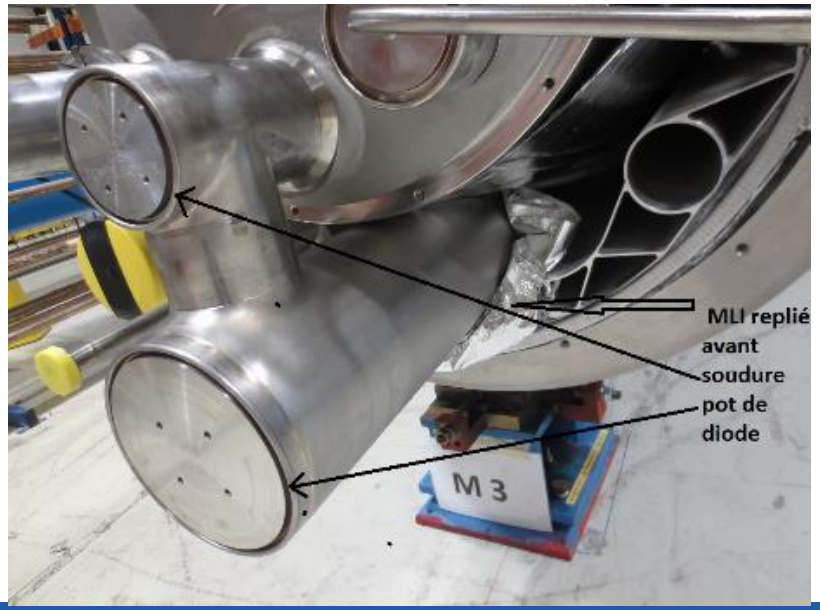




# Mock-ups / Training

Training and **CERTIFICATION** on mock-ups before intervening in the tunnel is mandatory and of utmost importance






Most of you are experienced ☺

Beware there are differences

# DISMAC: J.Ph. TOCK

Project Office : Logistics, Planning, Safety, Radioprotection, Budget
*C Adorisio, M. Bednarek, M Bernardini, R Faes, M Gonzalez Torres, S Le Naour, M Pojer, T Otto [DISMAC PSO], Y Pira, L Van Den Boogaard, E Vergara*

Technical Advisor
D Tommasini

Work Site Coordination
M Pojer(*)

(*) : Deputy

Budget Officer
L VD Boogaard

Quality Assurance Manager
**A Devred**
**T Zickler**

BLM
**C Zamantzas**

SIT
**S Le Naour**
**N Bourcey**

CLEM
**Ph Denis**

DISCOQC
**D Schoerling**

CWICQC
**G Arnau**

OPCLIC
**L Ponce**
**A Bastard**
**A Jacquemod**

SPQC
**C.Scheuerlein**

**ICIT**
**C Duclos**
**M Strychalski**

Audits
**S. Russenschuck**

CRIM
**N Vauthier**

LTIC
**J Perez Espinos**

ElQA
**G D'Angelo**

CWIC
**G Favre**
**P Freijedo Menendez**

DISCO
**M Pojer**
**L Grand Clement**

IC : InterConnection
BLM : Beam Loss Monitors
CRIM : CRyogenics InstruMentation
DISCO : Diode InSulation Consolidation
ICIT : InterConnection Inspection Team
OPCLIC : OPen & CLose Ics
SIT : Special Interventions Team

QC :Quality Control
CLEM : Current LEads Maintenance
CWIC : Cutting and Welding ICs
ElQA : Electrical Quality Assurance
LTIC : Leak Tests on ICs
SPQC : SPlices QC

**A Name :** Work Package / QC Leader

**A Nothername :** Work Package / QC Deputy

15.03.2019

# LHC-LS2: DISMAC


- Consolidation of 10 diodes per working day (5/7)

**But higher rate for OPCLIC**

**Dimensioned for:**

**9 openings per day (WUST only)**

**6+ reclosures per day (WUST only)**

- 6 efficient working hours per day (LS1 exp)

**Morning shift : start at the top of the pit usually at 7 am, ready to go**

- Starting at P8, clockwise
- Advanced openings are on-going
  Two first ones completed on 01.03.2019
- Series openings for diodes consolidation to start 2nd of May-19

# NEXT STEPS (1/2)

Feb-2019

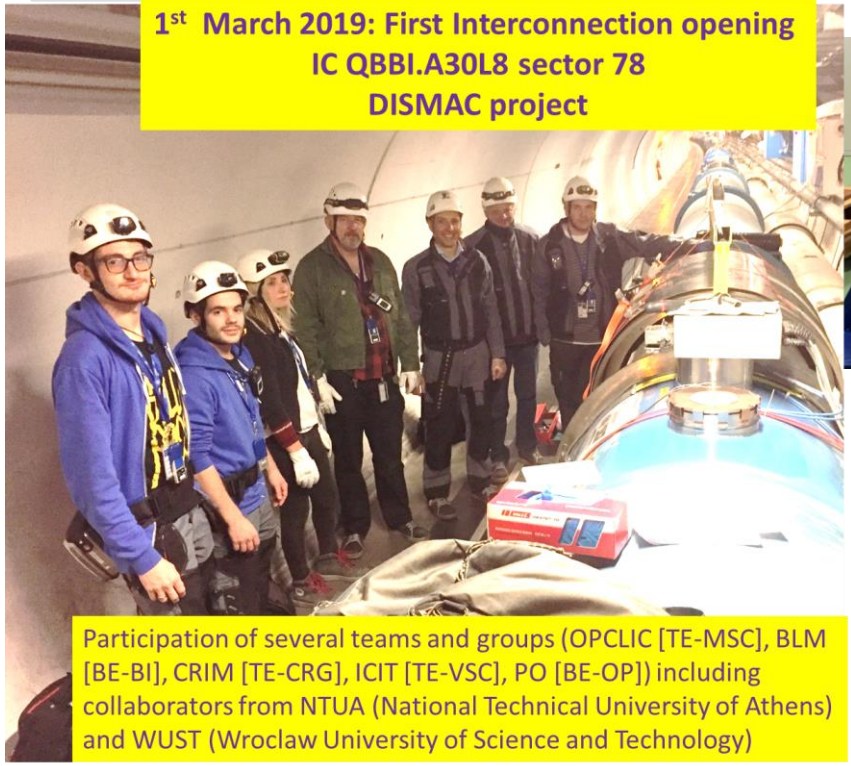
Mar-2019

Apr-2019

May-2019

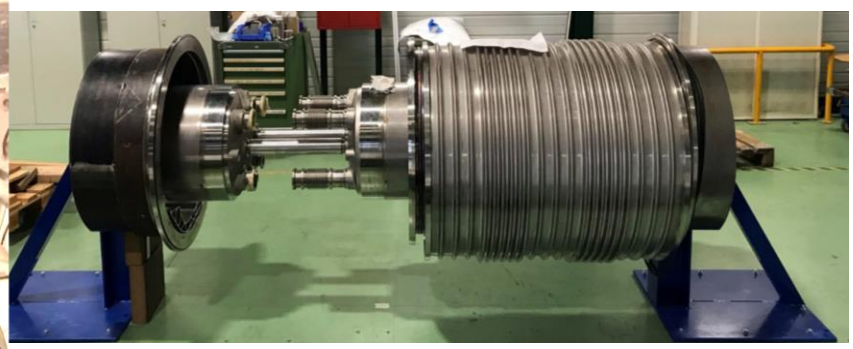
Advanced openings for special interventions

Training and certification
Final rehearsals



**1st March 2019: First Interconnection opening**
**IC QBBI.A30L8 sector 78**
**DISMAC project**

Participation of several teams and groups (OPCLIC [TE-MSC], BLM [BE-BI], CRIM [TE-CRG], ICIT [TE-VSC], PO [BE-OP]) including collaborators from NTUA (National Technical University of Athens) and WUST (Wroclaw University of Science and Technology)



- Opening of 1st interconnection for diode consolidation

# NEXT STEPS (2/2)

May-2019

- Opening of 1st interconnection for diode consolidation

5

4

6

Opening of 1st IC in sector 81: Beg May-19
Closing of last IC in sector 78: Summer-20
Working day starts at the top of the lift
Temporary building at every point containing:
canteen, cloakroom, meeting rooms, toilets
Early start (sometimes at 6 am, usually around 7 am) to ensure a complete working day (6 am to 3 pm)
9 hours including a one-hour lunch break

3

7

2

8

1

Sum 2019

- Quality Assurance Review
- Reclosure of 1st interconnection


End-2019

- Completion of the 1st sector

Sum 2020

- Reclosure of the last interconnection

# The "Dream" WUST team

| | | |
|---|---|---|
| Jacek | Muszynski | Team Leader |
| Pawel | Czubaszek | Deputy Team Leader |
| Jan | Garbowski | |
| Maciej | Nowak | |
| Pawel | Czarnecki | |
| Pawel | Herda | |
| Jakub | Osieleniec | |
| Konrad | Branowski | |
| Wieslaw | Panfil | |
| Wladyslaw | Krupa | |
| Wojciech | Tuduj | |

# Your favourite contacts

## DISMAC

**L Ponce**

**A Bastard**

**A Jacquemod**

## AOB

**J Muszynski**

MSC secretariat

# CONCLUSIONS

- **DISMAC and especially your contribution are necessary :**
  **to increase safely the LHC energy and**
  **to open doors towards discoveries**

- **We are happy to welcome you in this endeavour**

- **We are confident that success is at the end of the tunnel**

**Safety > Quality > Schedule**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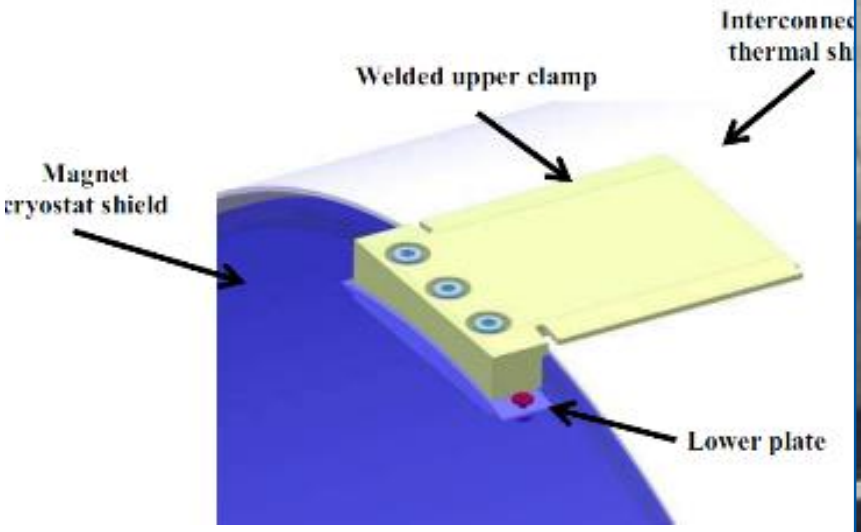
# Experience from SMACC LS1




New thermal shield design, removing the necessity of grinding

# CMAC Recommendation

Why ?

- **Perform a quantitative risk analysis of the impact of potential problems caused by magnet training *[and operation]* and develop a mitigation plan.**
  **Study the possibility to (remove debris in all magnets, to clean and) better insulate the diode boxes and establish the necessary time and resources required to do it**

Beam energy : **Run 2 @ 13 TeV c.m.**

NO change of beam energy in 2017 and 2018

*Goal is to prepare the LHC to run at 14 TeV during Run 3.*

***Preference to make the change in energy in a single step.***

Study how to reinforce the insulation (and to clean) during LS2 the electrical part connecting the dipole bypass diode.
Powering tests before and during LS2 should be defined

Working group was set up after Chamonix'17 workshop:
How ?, How long ?, How much ?