

DT contribution to **ALICE**

EP-DT Group meeting
CERN, June 22, 2017

Corrado Gargiulo-CERN, EP-DT-EO





DT in ALICE

LS2 Upgrade

Tech-Coordination
ITS Upgrade

M&O

Tech-Coordination
Magnet
Gas Systems



2016-2017

DT ALICE team

A number of DT resources are permanently allocated to the ALICE CERN Team for a full or a large fraction of their time.



- Yannick DT-CO
- Samuel DT-FS
- Pieter DT-CO
- Philippe DT-CO
- Jaap DT-CO
- Gregory DT-CO
- Didier DT-CO
- Bernard DT-EF
- Paolo DT-TP
- Petra DT-DD
- Corrado DT-EO

DT ALICE services

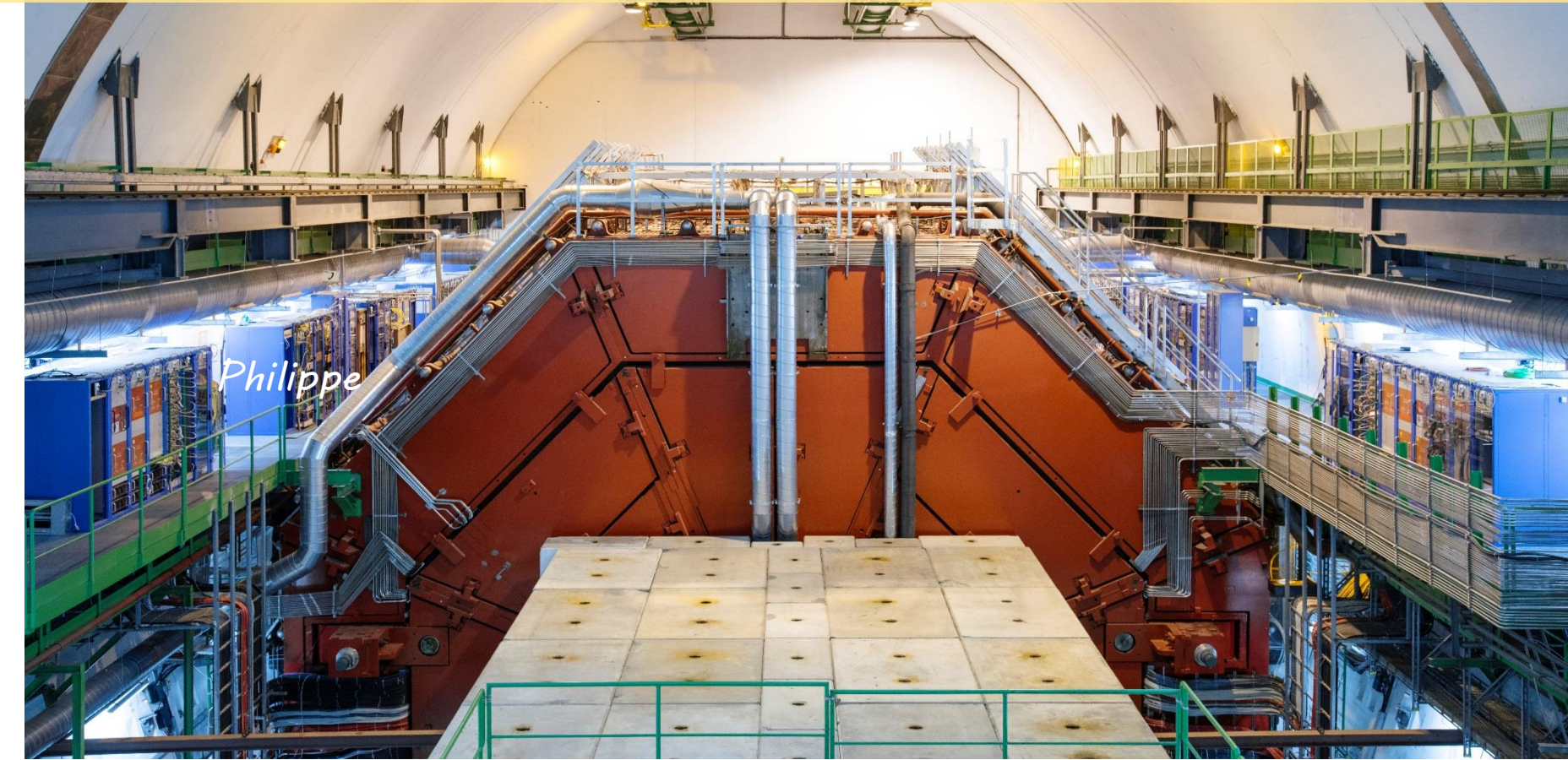
The DT group supports the ALICE CERN Team via several services.



- DSF Bond Lab
- Composite Lab
- Micropattern lab
- Workshop 162
- Magnet M&O
- GasSystem M&O
- Irrad. Facilities

DT & ALICE Detectors and Services Maintenance

- Several maintenance activities have been carried out by DT on the ALICE detectors during the different technical stops
- Large intervention on the Detector Electronics Racks
- Replacement of several malfunctioning electronic boards of the Time-Of-Flight (TOF)



*Detector Electronics Racks - replacement of cooling fittings cause of leaks
- implementation of an improved filtering system*



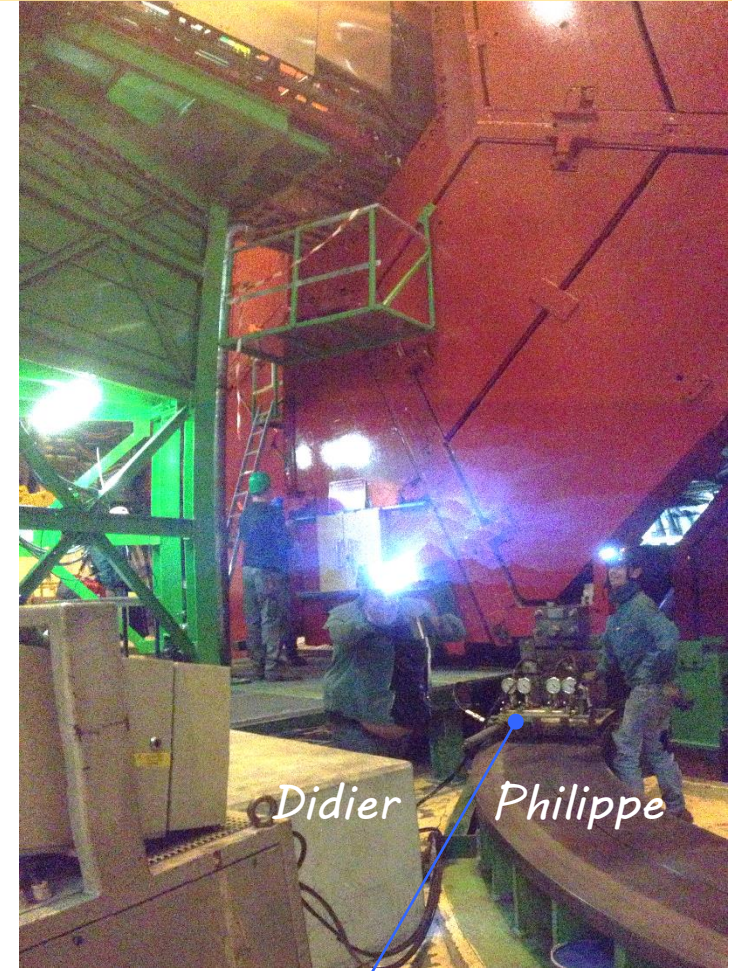
*TOF el-boards replacement,
required detector
supermodules displacement*

DT & ALICE Detectors and Services Maintenance

- Routine maintenance of the different L3 magnet subsystems
- Special intervention on the pneumatic system devoted to the door opening



L3 magnet control and cooling systems maintenance



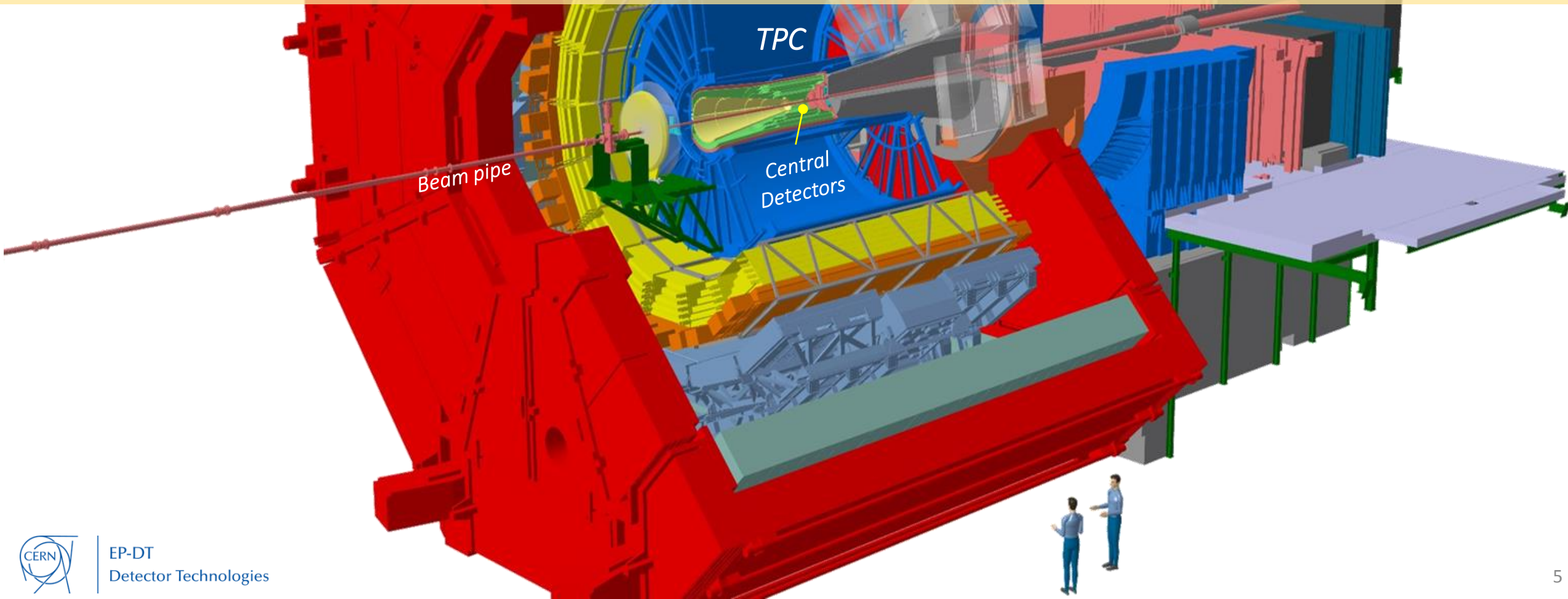
L3 door opening system upgrade

ALICE LS2 Upgrade preparation

The planned upgrade includes

- *New Beam Pipe and Central Detectors (ITS, MFT, FIT)*
- *Upgrade of the Time Projection Chamber (TPC)*
- ...

2016-2017 Production Readiness Reviews phase and Production start for the Upgrade Programs





*TPC GEM foil
production at DT-EF Micro-pattern Lab
tested at DT-DD-GDD Lab*



DT & TPC Upgrade @LS2

- The high collision rate after LS2 will require the TPC to use Micro-pattern detectors
- All existing chambers will be replaced with the new GEM chambers. This requires TPC on Surface

*DT team working at the
preparation of TPC lifting jig, frames, and Clean room at P2*

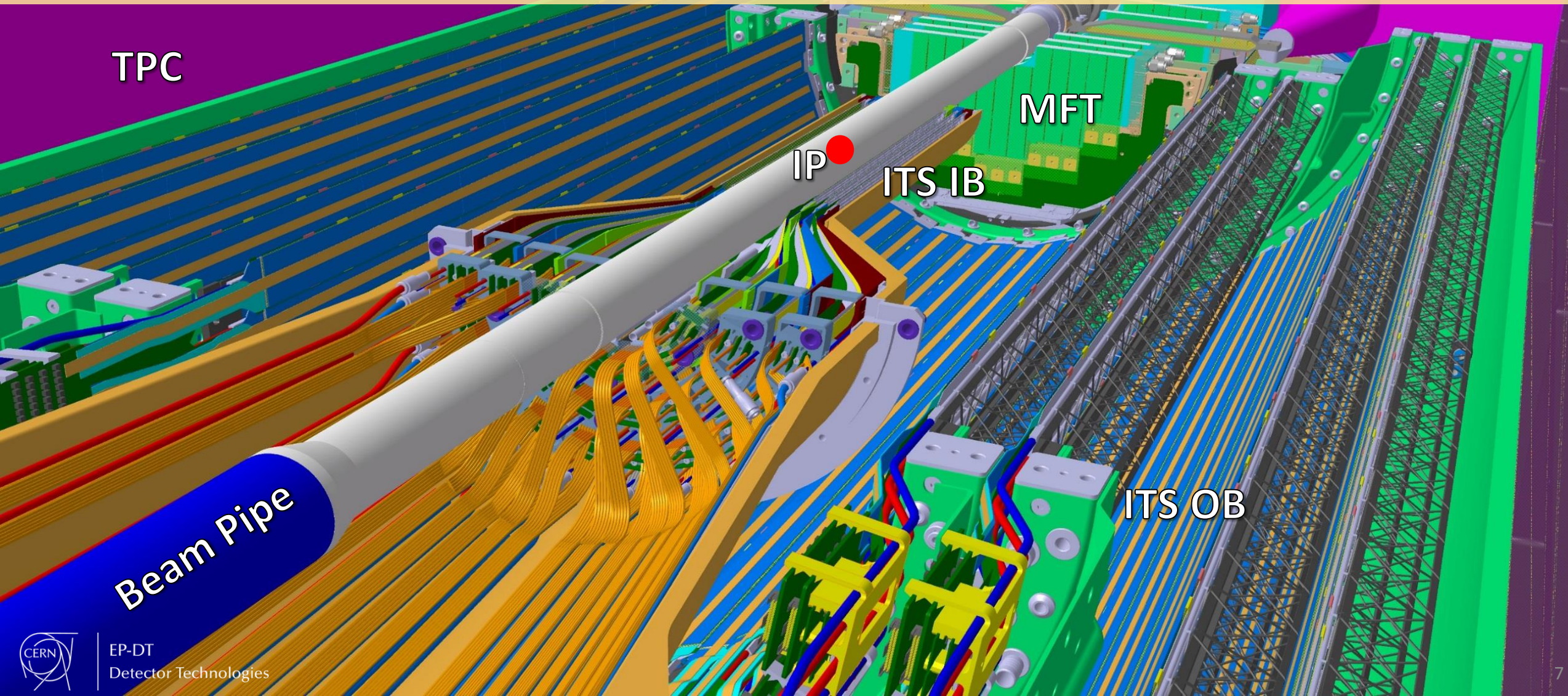


*2019 TPC
will be brought to
surface*

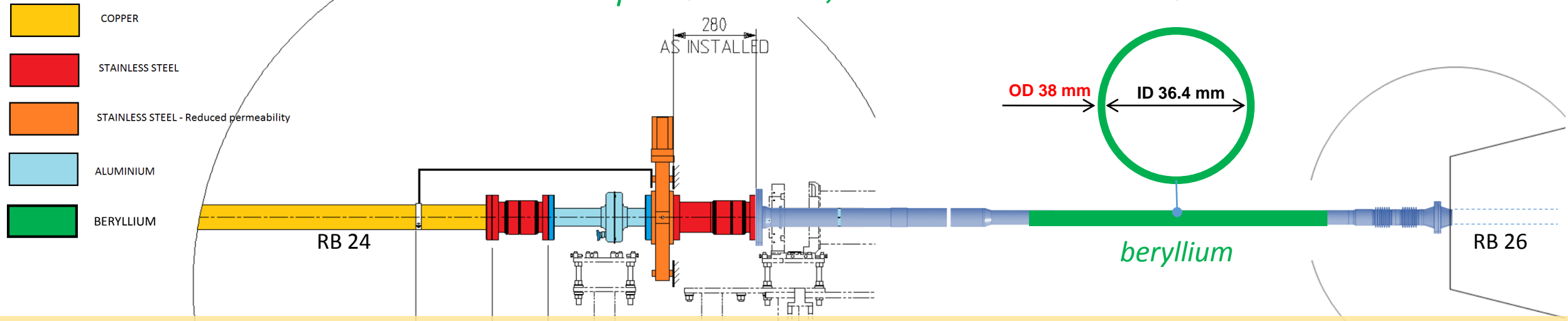


DT & ALICE New Central Detectors and Beam Pipe @LS2

The planned upgrade includes a new Beam Pipe, a new Inner Tracking System (ITS), a vertex Tracker for Forward Muons (MFT), and Fast Interaction Trigger (FIT)
Fully integrated design coordinated by DT-EO has been developed up to the services detail



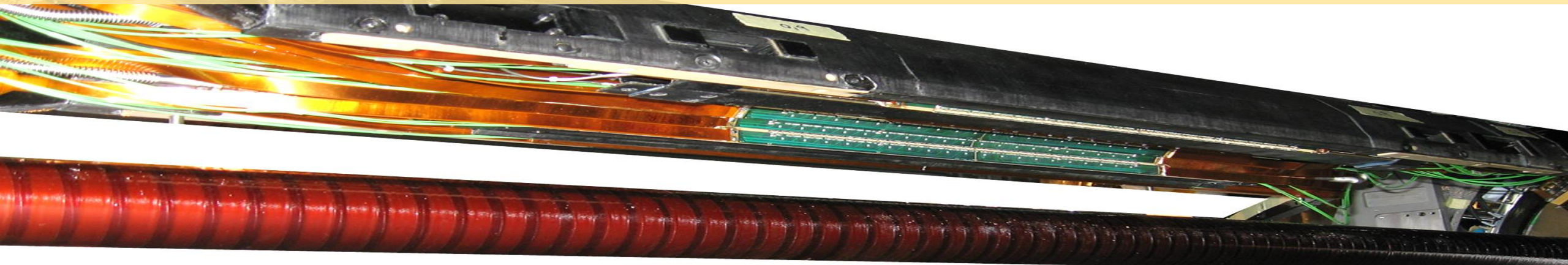
New Beam Pipe after LS2, Diameter reduction from 60mm to 38 mm

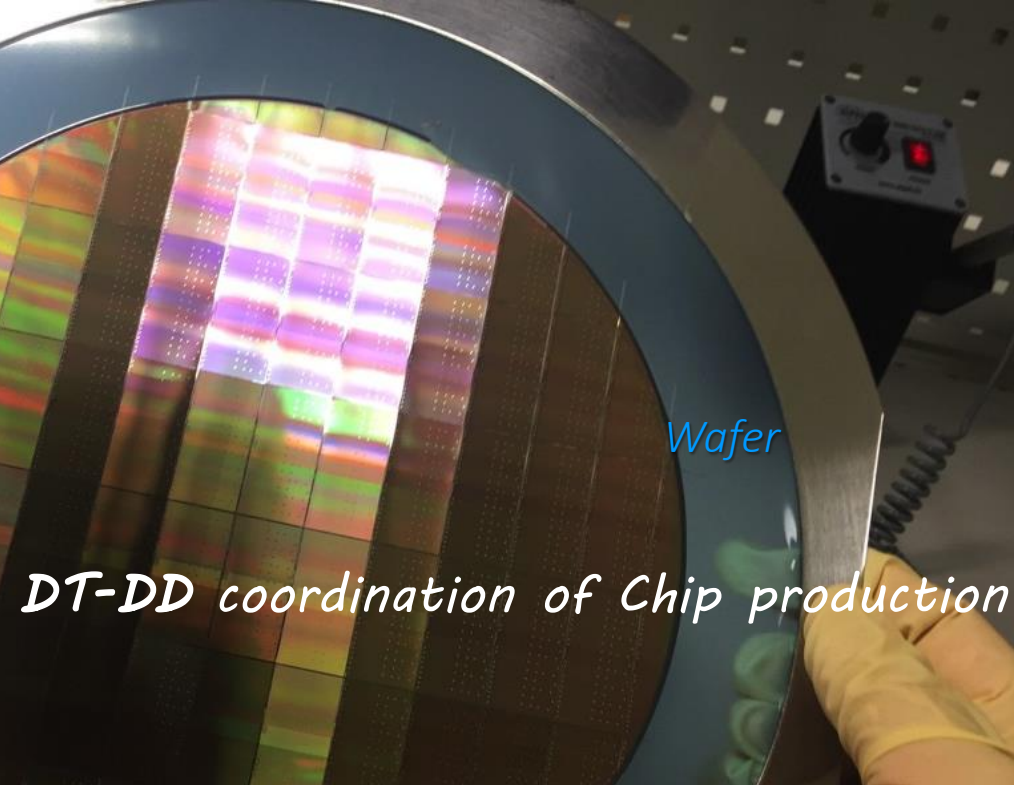


DT & ALICE New Beam Pipe @ LS2

The new Beam Pipe is under production at Materion Electrofusion in Fremont, California, that has provided already several of the beryllium beam pipes currently installed in the LHC experiments.

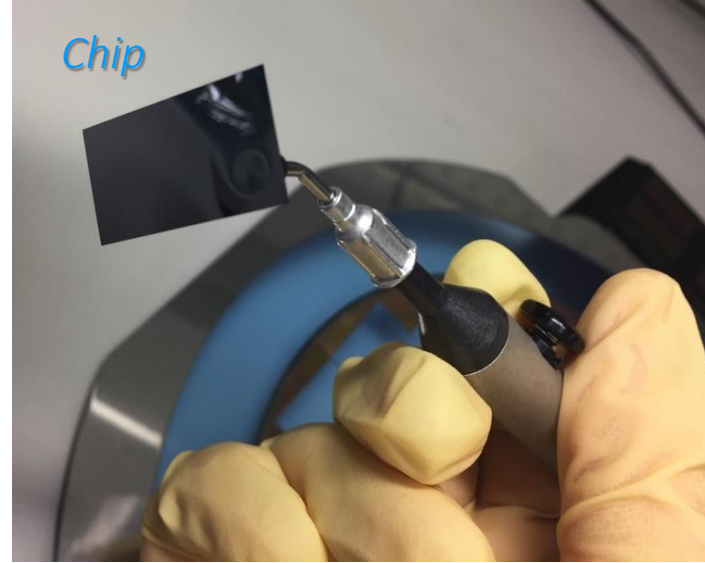
BP design, close collaboration between the ALICE DT-EO engineering and the CERN Vacuum Group



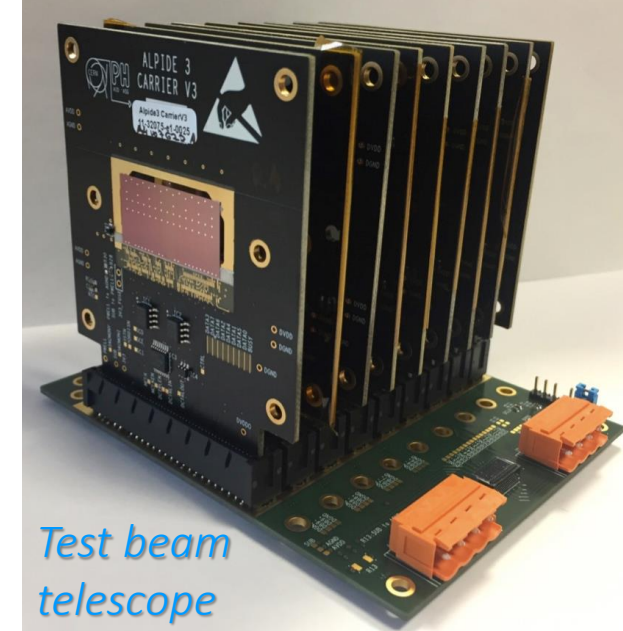


Wafer

DT-DD coordination of Chip production and post-processing



Chip

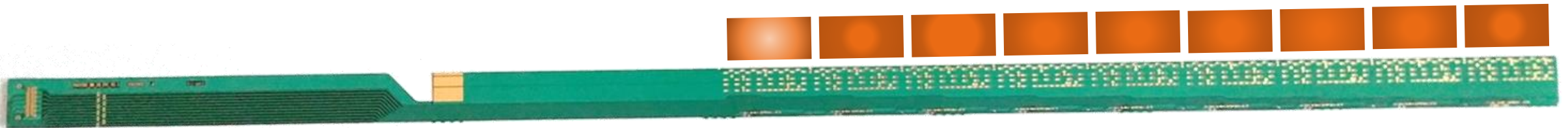


Test beam telescope

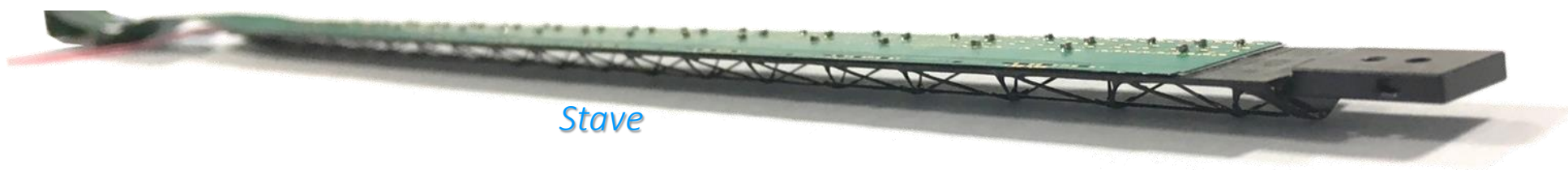
DT-TP coordination of ALPIDE Chip test beam activity

DT & ITS Chips and Flex Printed Circuit production for LS2 Upgrade

- Successfully designed and operated a 7-plane beam telescope fully consisting of ALPIDE Monolithic Pixel Chips Sensors
- In the first half of 2017 production of several hundred of wafers with ALPIDE Chips
- The wafers are shipped for thinning and dicing to an external supplier before being tested and assembled into HICs



*DT Micro-pattern Lab production of ITS Inner Barrel aluminum Flex Printed Circuit for chips connection
DT-DD Irradiation facility support, HIC (chips+ FPC) characterization*



Stave

DT & ITS Stave assembly for LS2 Upgrade

- The ALICE DT technical team has supported the design of the extremely accurate jigs and the optimization of the assembly phases
- The DT Silicon Facility (DSF) has provided a fundamental support in the development of the wire bonding interconnection between the chips and the FPC, as well a full characterization of the assembled staves through an aging test campaign

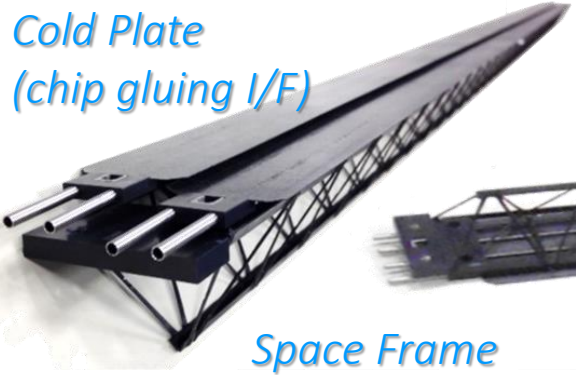


Jaap

DT-DD DSF area for IB stave construction and assembly

DT-DD Bond lab support, hosting of the ALICE bonding machine and technician

Cold Plate
(chip gluing I/F)



Space Frame

~1.5 m stave, (1 space frame + 2 cold plates) 80 gr



~0.3 m stave, 1.7 gr



DT & ITS Stave Mechanics, serial production at CERN for LS2 Upgrade

-At the beginning of 2016, the stave ultralight carbon structures, Spaceframe and Cold Plate, have entered the serial production phase, based at CERN in the ALICE Composite laboratory under DT responsibility

-Several hundred units have been produced and production has arrived almost to completion



Pieter



ITS Inner
Detector Barrel



Bernard



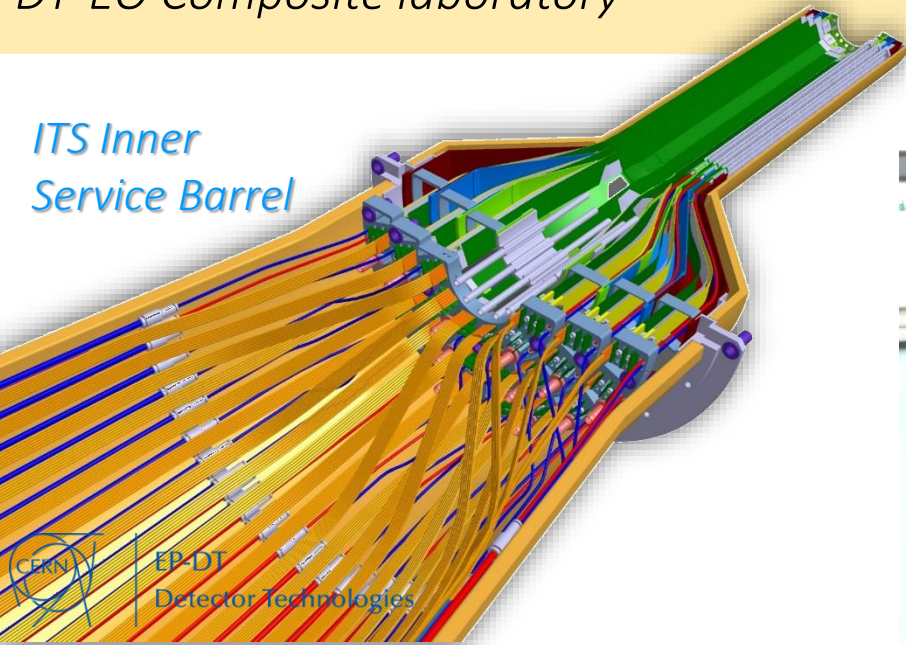
Samuel



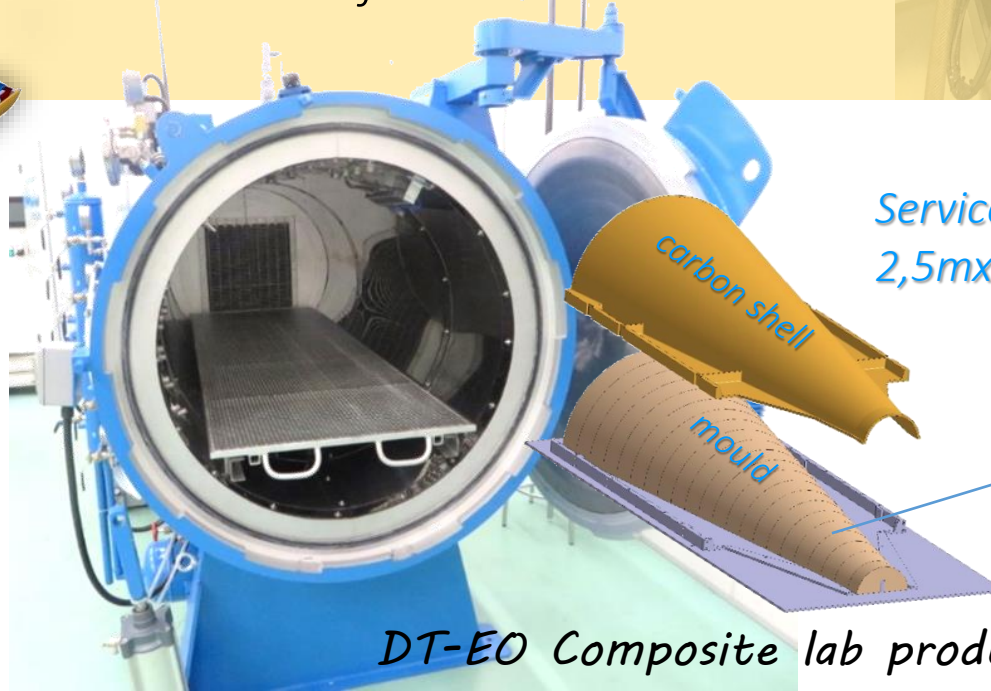
Gregory

DT & ITS Barrels Mechanics

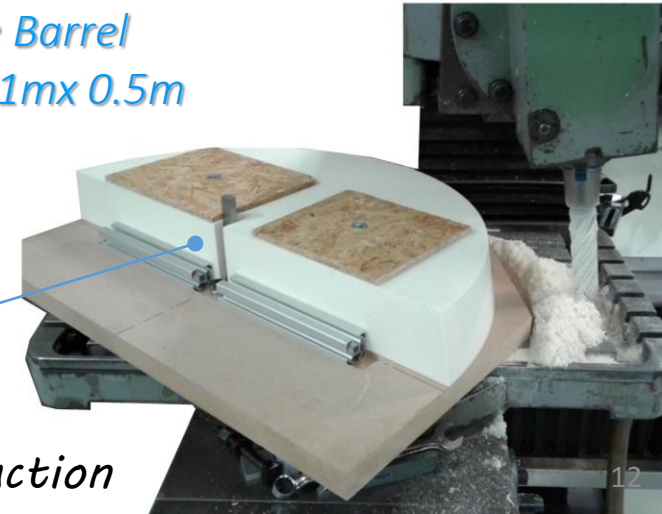
The Detector Barrels mechanics, that supports in position the staves and the detector services, has entered the production phase. The mechanics of the Service Barrel for the ITS innermost three layers, will be produced in the DT-EO Composite laboratory



ITS Inner
Service Barrel

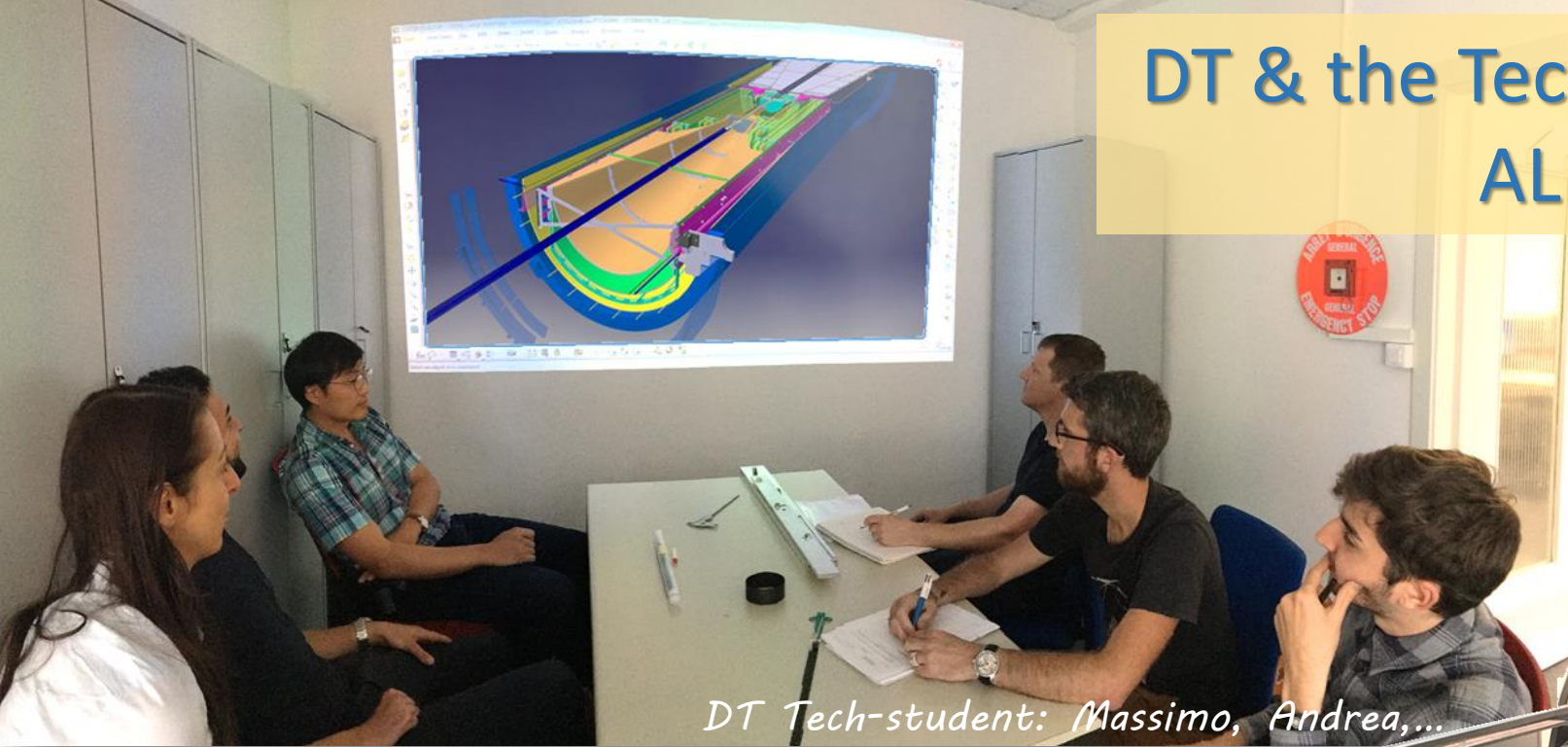


Service Barrel
2,5mx 1mx 0.5m



DT-EO Composite lab production

DT & the Technical Coordination of the ALICE LS2 Program



DT Tech-student: Massimo, Andrea,...

ALICE DT Team working at LS2 installation preparation (mock-up)

DT-EO responsible of the Coordination of the ALICE Engineering team for LS2

The ALICE DT team is working with the ALICE Technical Coordination, at the preparation of the entire LS2 program through the development and verification of step by step procedures and through a large refurbishing activity of jigs and infrastructures



Yannick

DT support to ALICE is fundamental, especially in this period when a final “push” is needed for all the LS2 Upgrade activities

