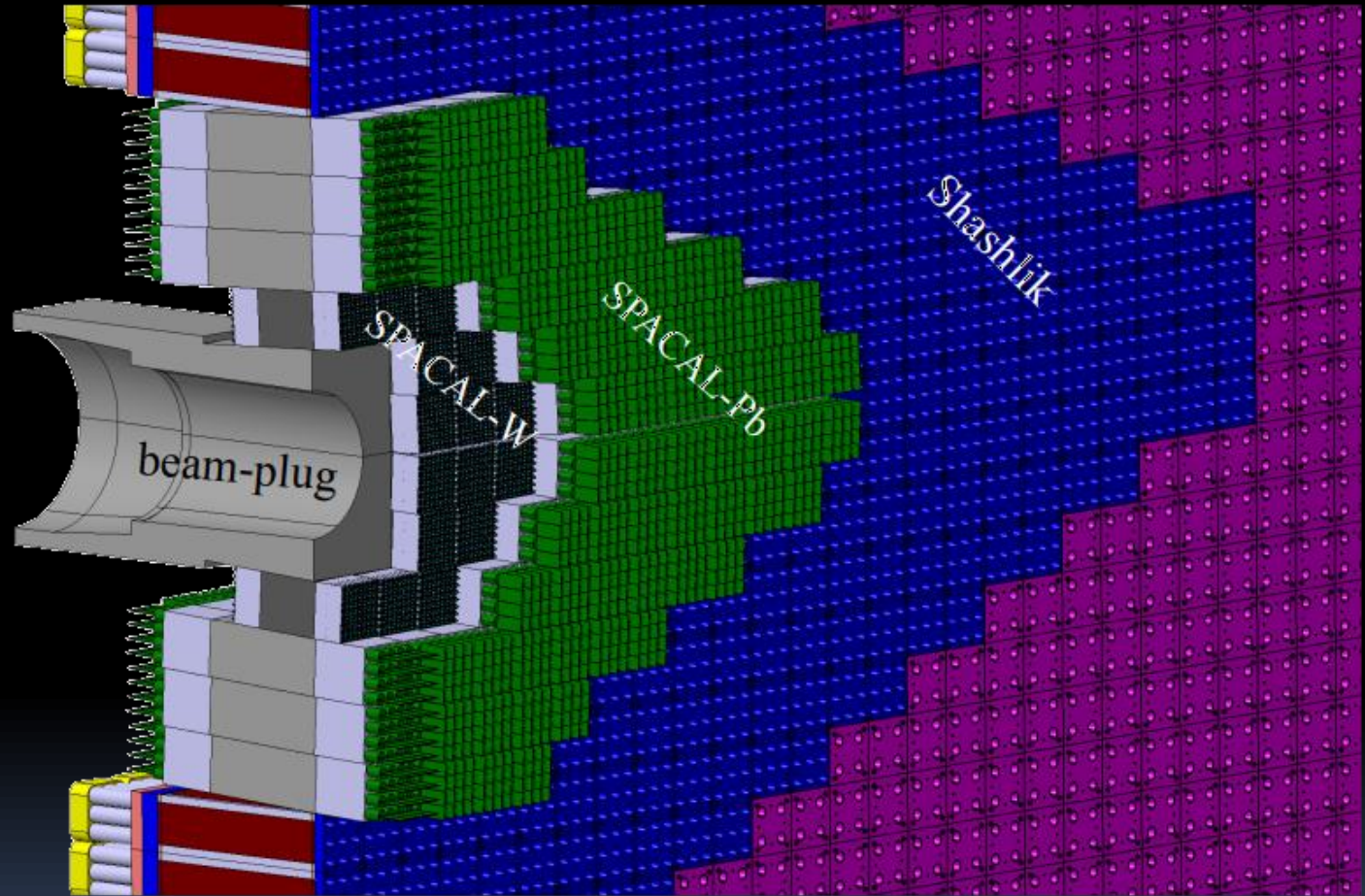
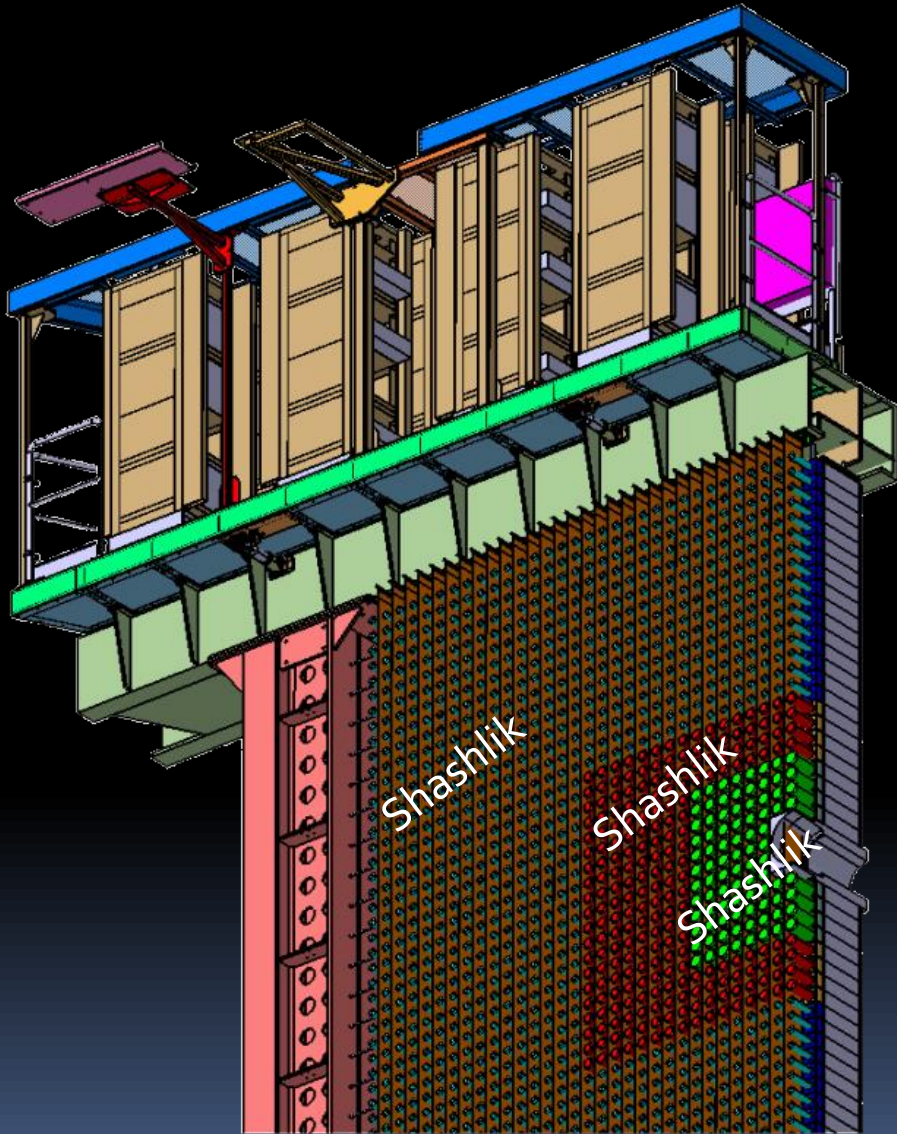


ECAL engineering design and support infrastructure

Mainly based on material from
Frederic Dall'Omo
Bruno Lieunard



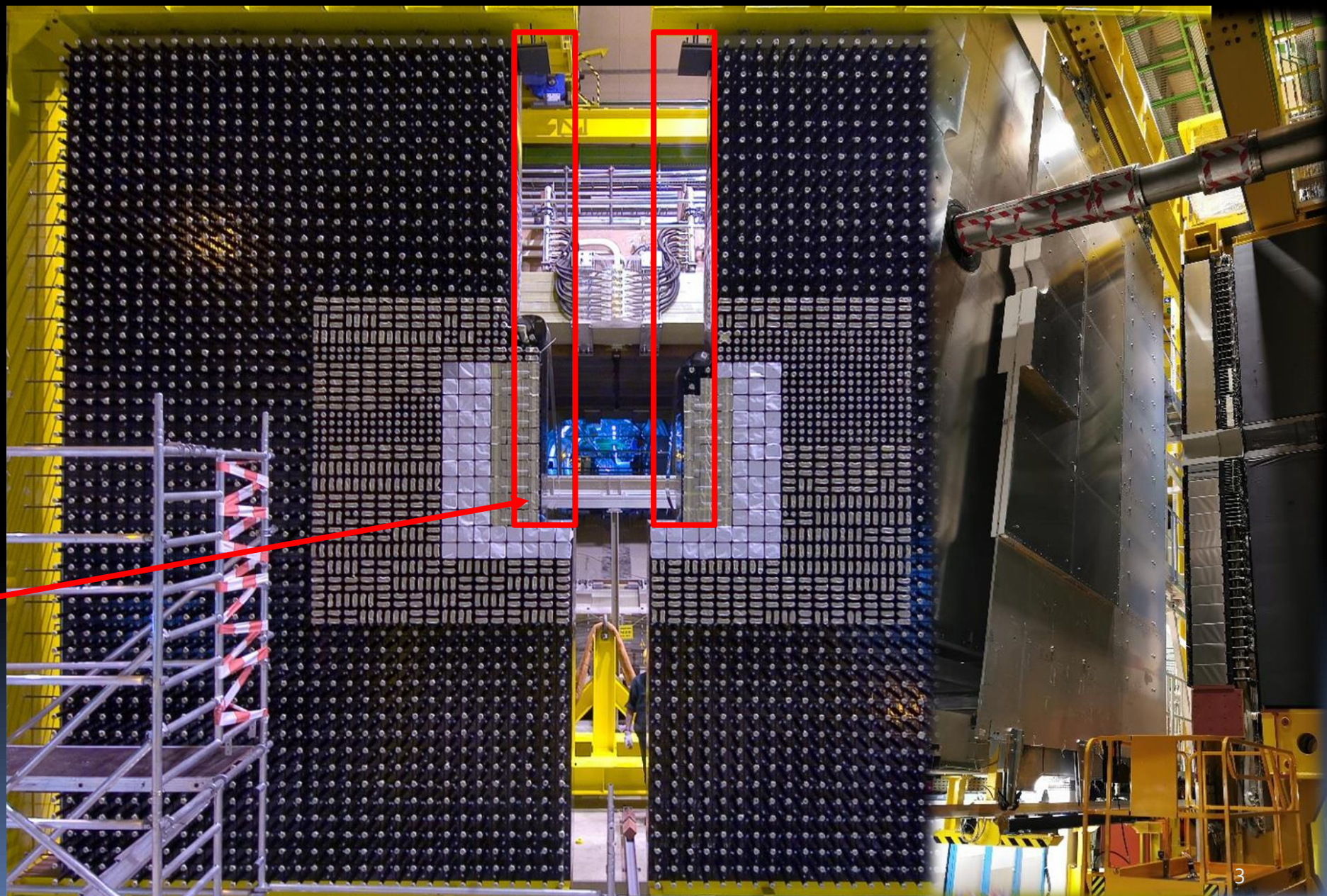
From Shashlik to New SpaCal technology for inner region of ECAL

- LS₃:W absorber for innermost modules equipped with scintillating plastic fibres

Modification for LS3

32 SPACAL-W & 144
 SPACAL-Pb modules
 require a complete
 dismantling of the ECAL
 system

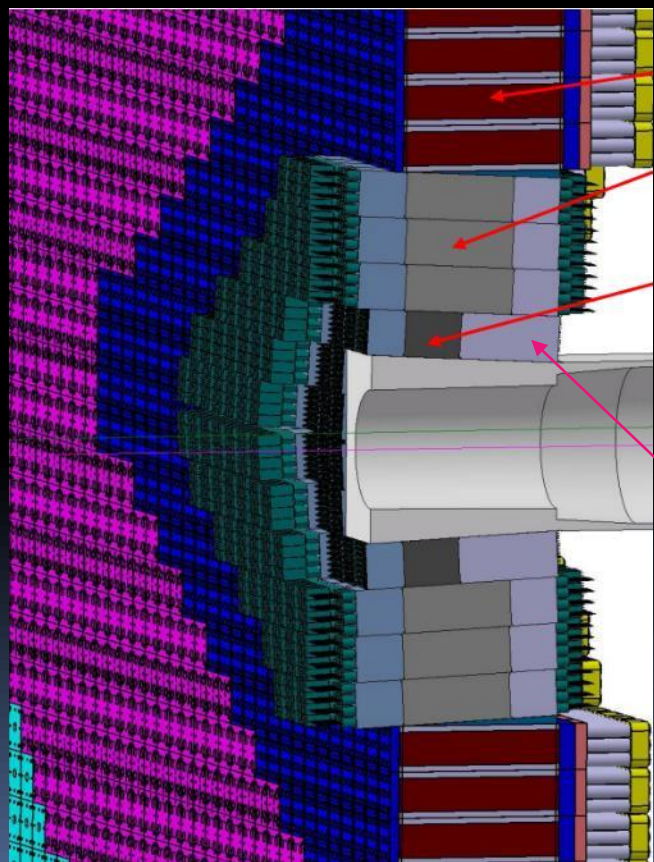
Only the very inner part
 could have been
 exchanged without
 major dismantling of
 the structure.



Modification for LS₃

SPACAL modules will be installed under an angle (probably 3°, 3°)

- adapt a new beam pipe to ease the piling up of modules
- remains the transition from SPACAL to SHASHLIK modules
 - Shimming? Material? Fixation?



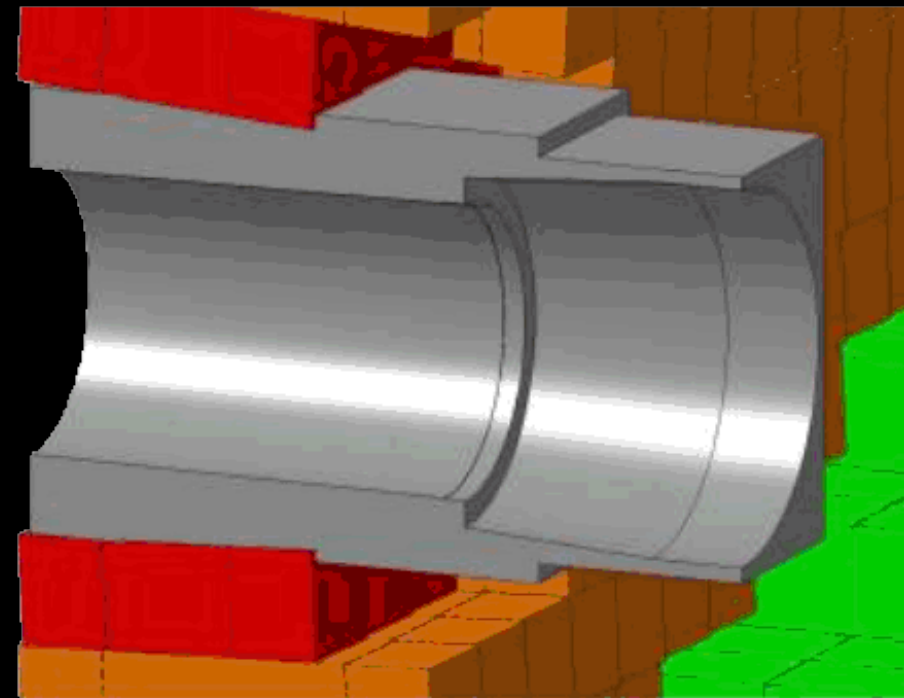
SHASHLIK

SPACAL Pb

SPACAL W

SPACAL modules are shorter than SHASHLIK modules

- Stability of 'ECAL wall' is considerably affected
- Extension of SPACAL modules to the length of the SHASHLIK modules

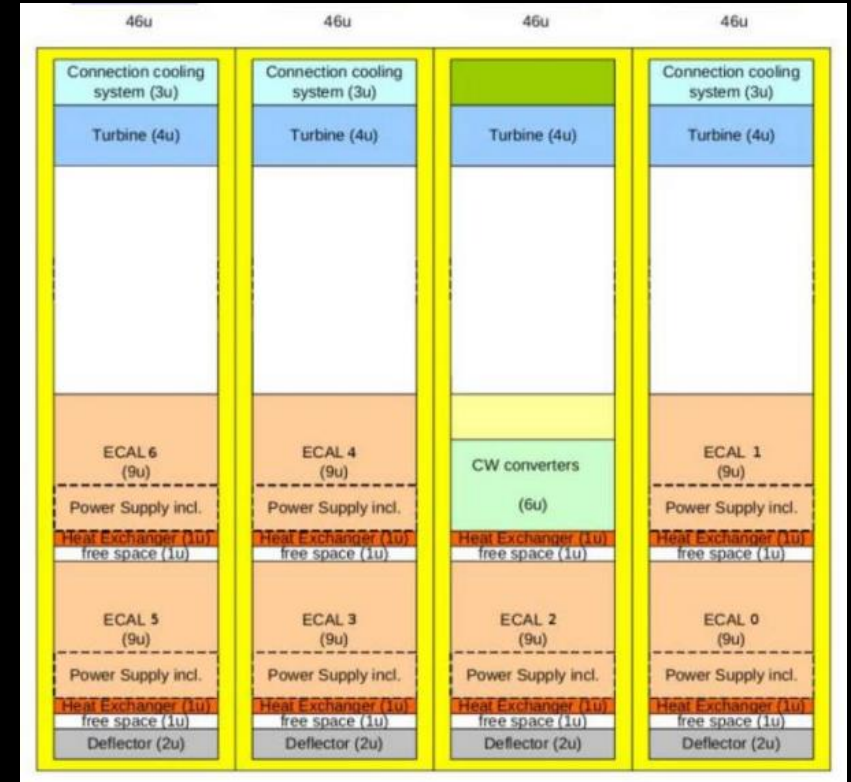
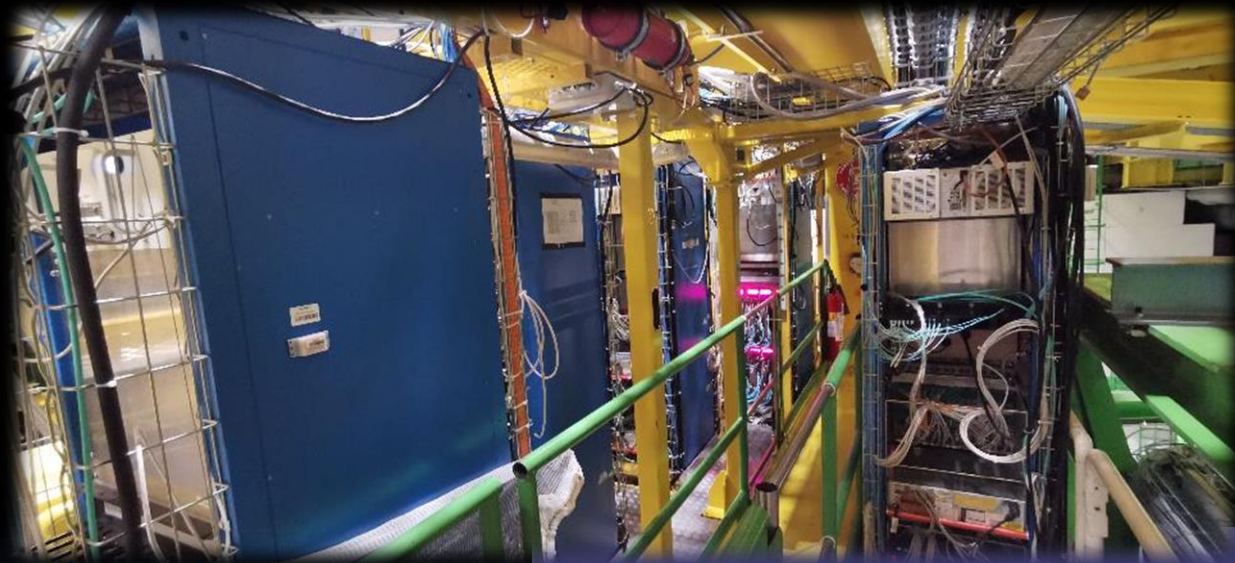


**How to connect/fix SpaCal modules?
 Shashlik modules will be fixed as before?**

Modification for LS₃

If keeping the number of crates per rack:

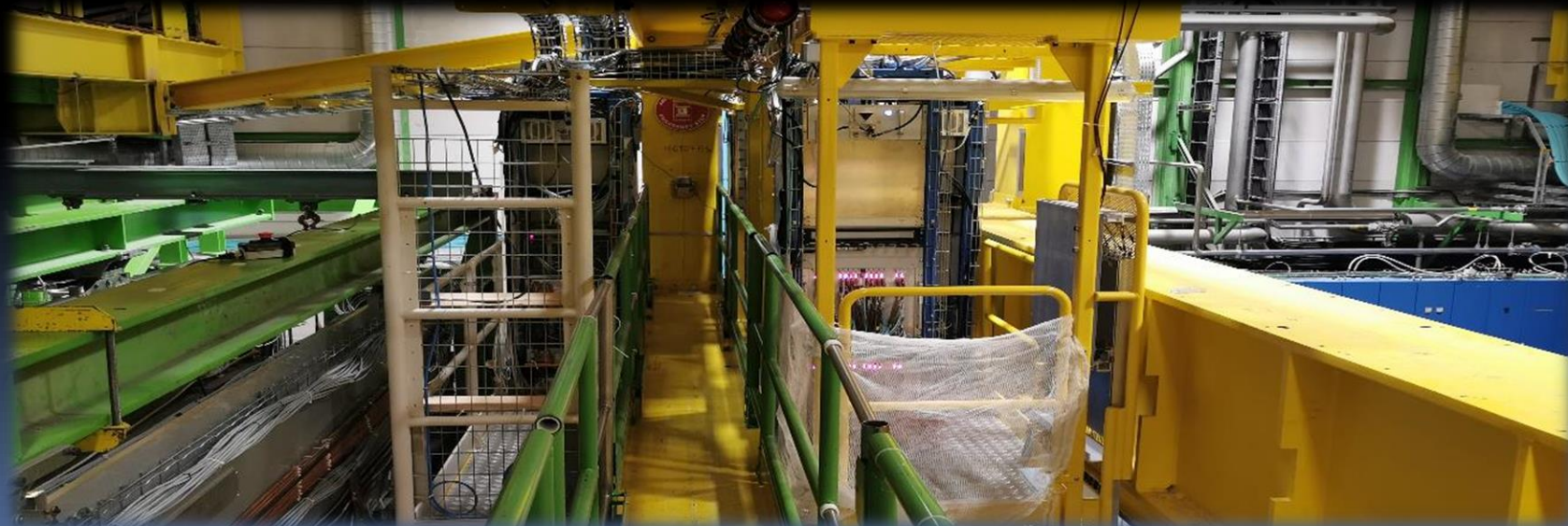
- 4 racks on each ECAL platform with 12 crates by side are possible.



Modification for LS₃

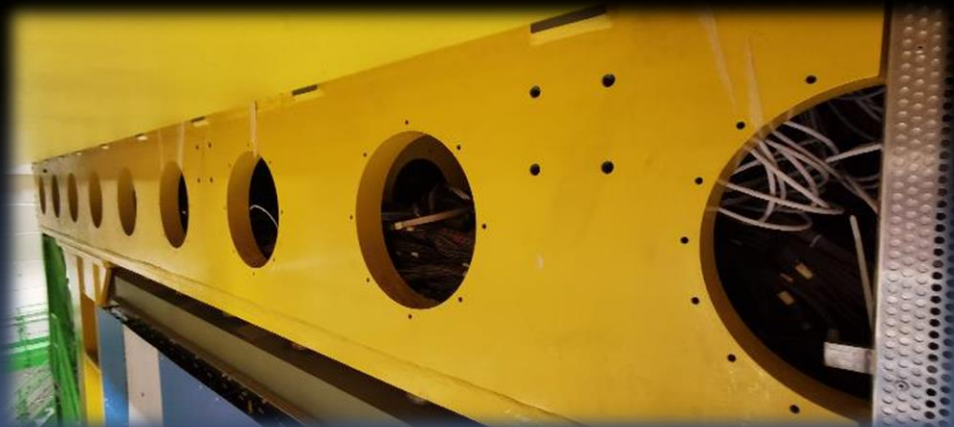
With more channels > more electronics (up to 5 times in LS₄, number of electronics will increase considerably

- Surface of the platform on top of the ECAL is probably not sufficient for required number of racks/crates
 - New structure to be designed/constructed/installed ?
- How many crates do we need, and how many crates per rack are possible
- **Number of racks, cables and services to be defined in due time**
- Extension of platform is very limited (upstream confined by the RICH 2, TORCH?, downstream possibly by HCAL)



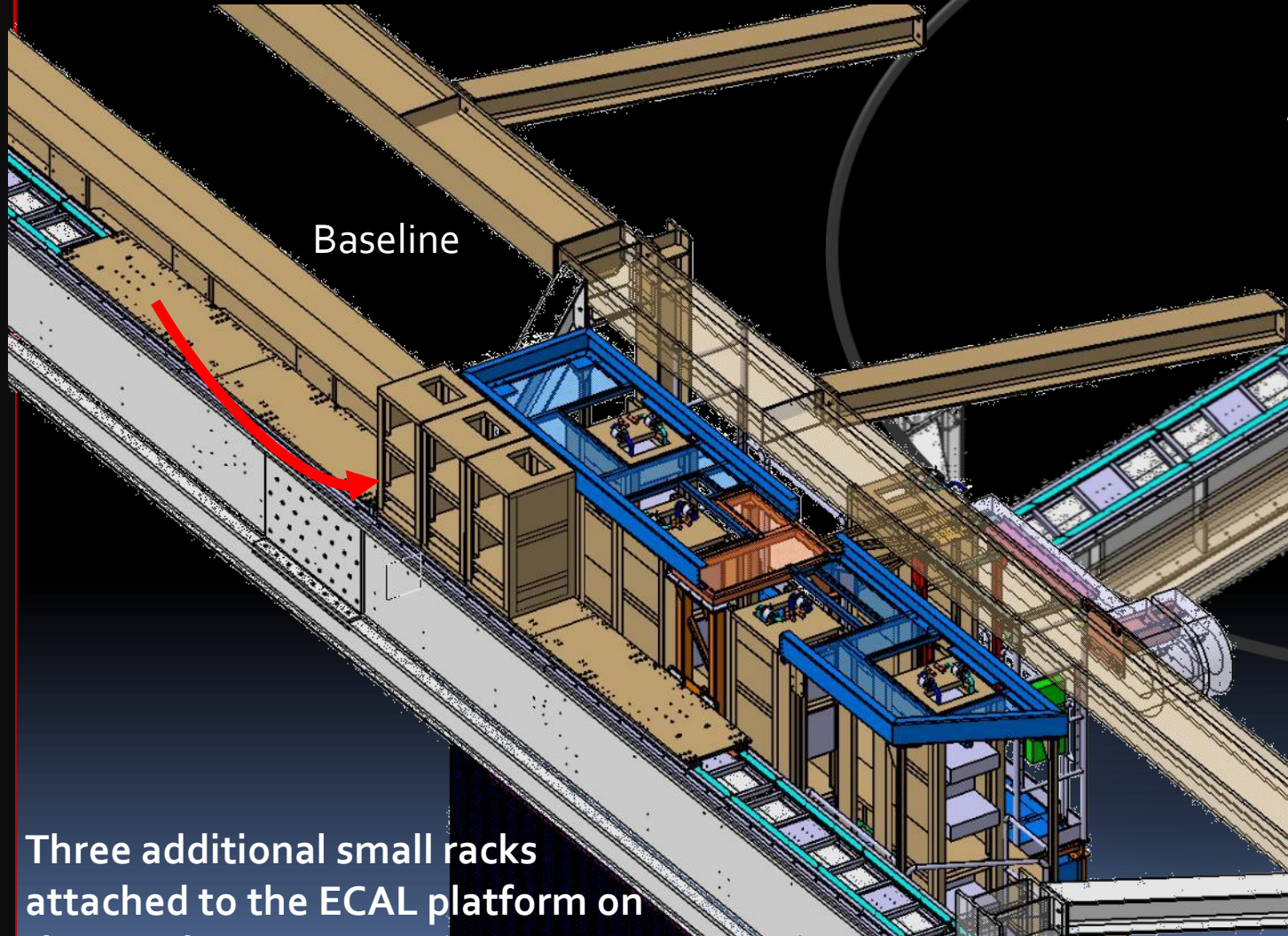
Modification for LS₃

- Cable management will be more challenging
 - Do we need storage space for cables
 - Same cable length not required anymore?
 - In case this space is not required , ECAL platform could be lowered for taller racks



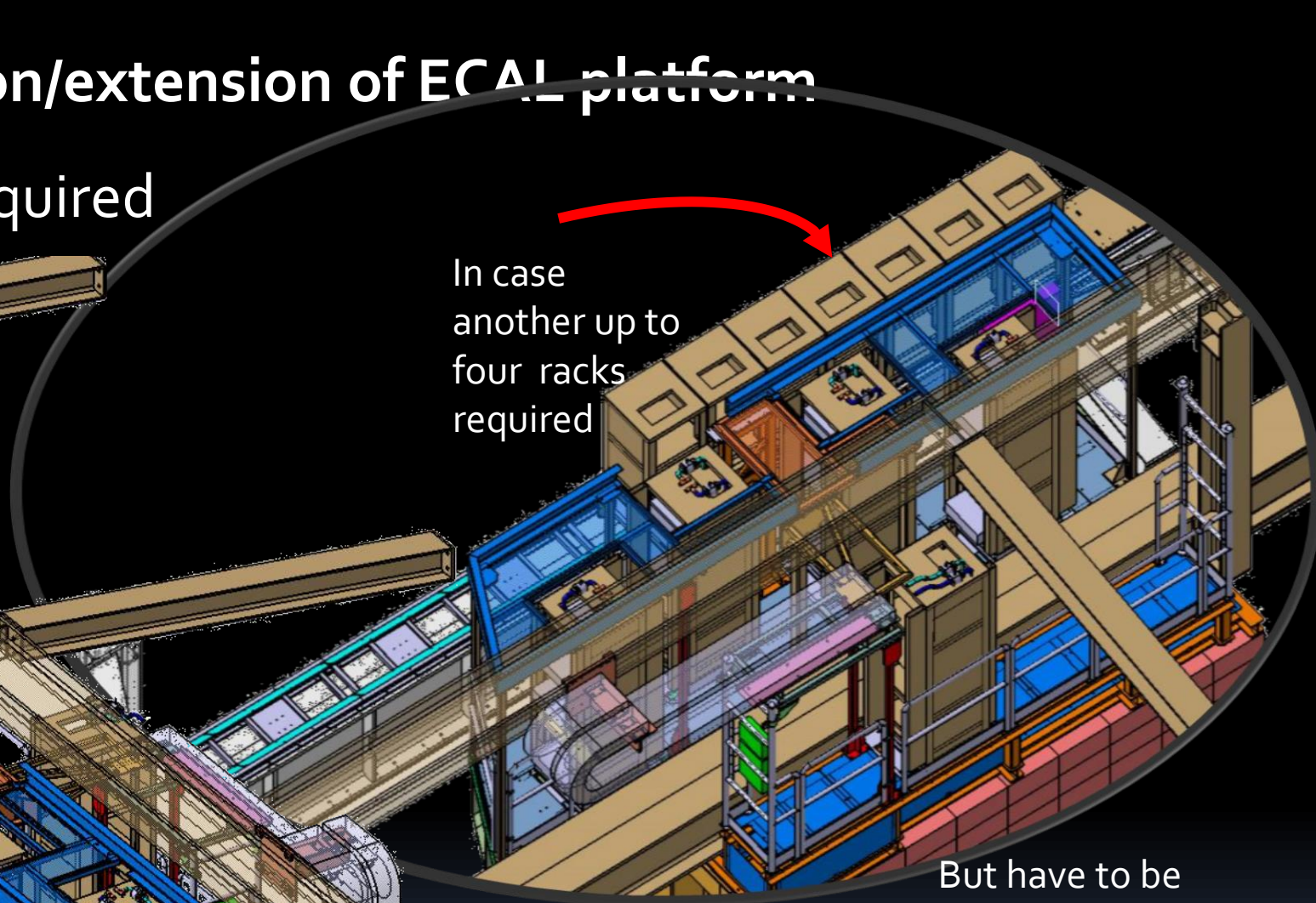
Possible modification/extension of ECAL platform

In case more rack space is required



Baseline

Three additional small racks attached to the ECAL platform on the 'M1' beam.



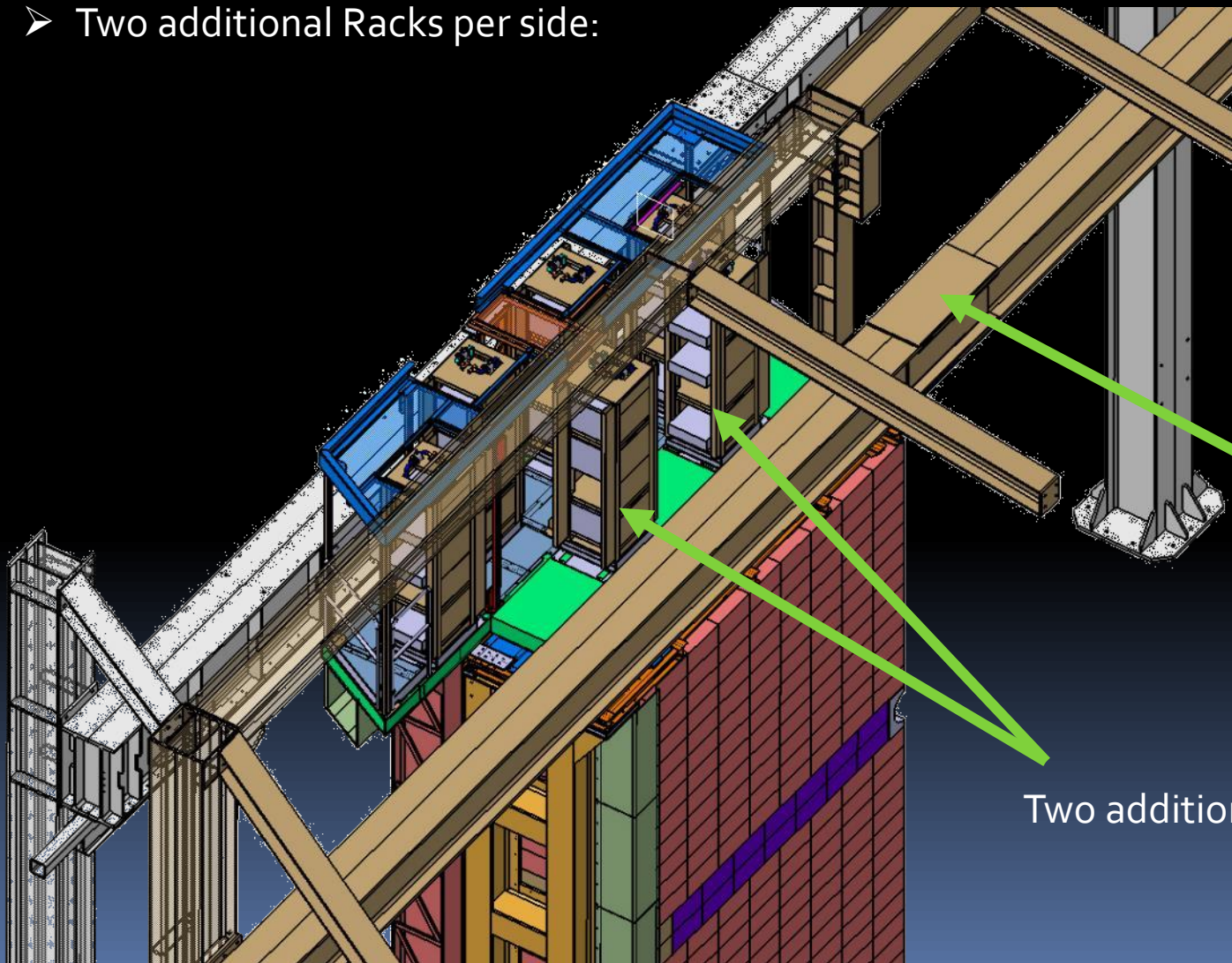
In case another up to four racks required

But have to be moved separately from ECAL for access

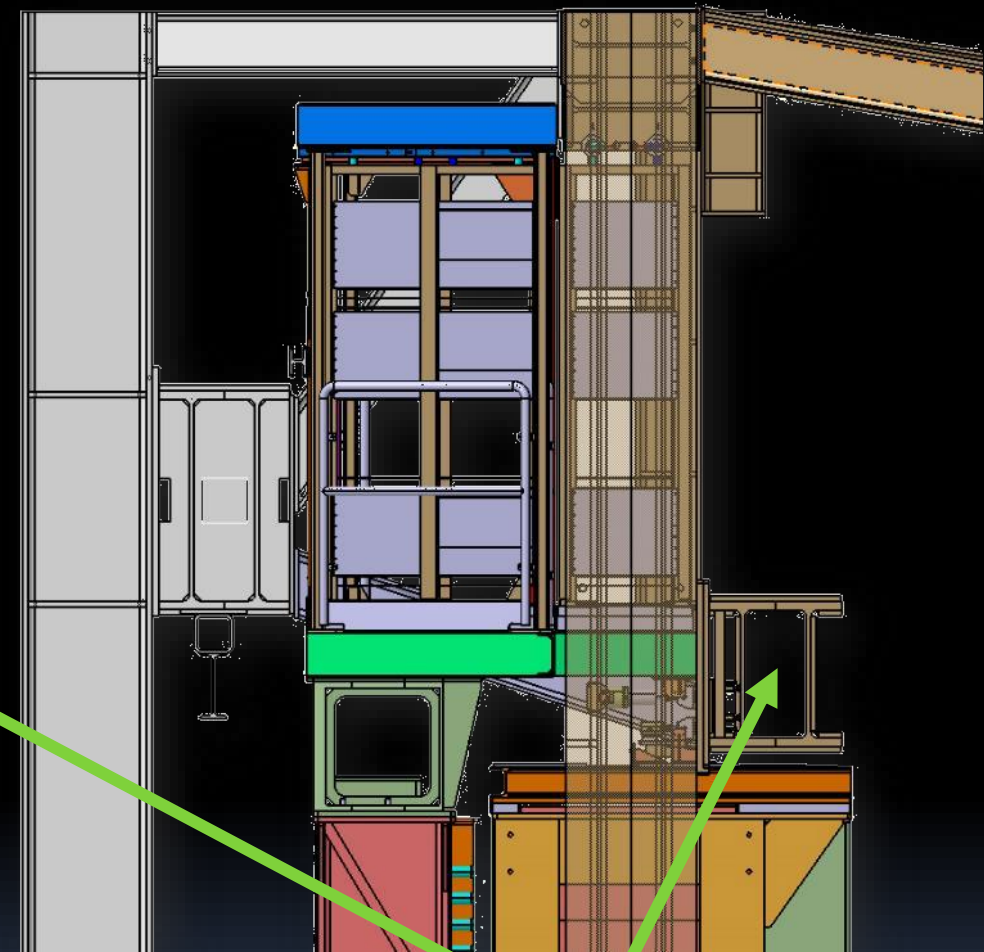
Possible modification/extension of ECAL platform

In case HCAL will be removed and no HCAL electronics needed

- Two additional Racks per side:



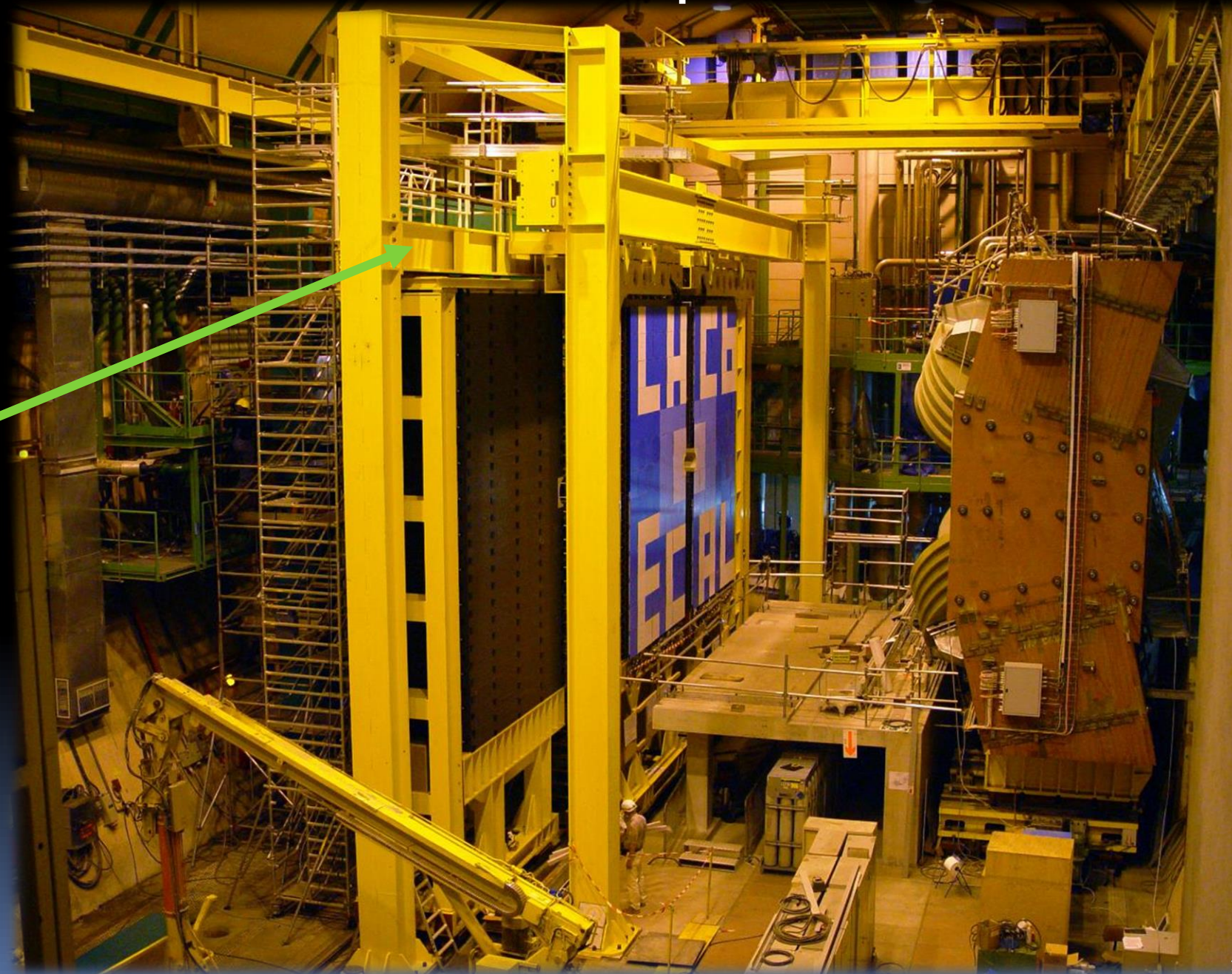
Two additional racks



New 'passerelle'

This would mean
a major
intervention:

Move the passerelle more
down stream



Modification for LS₄

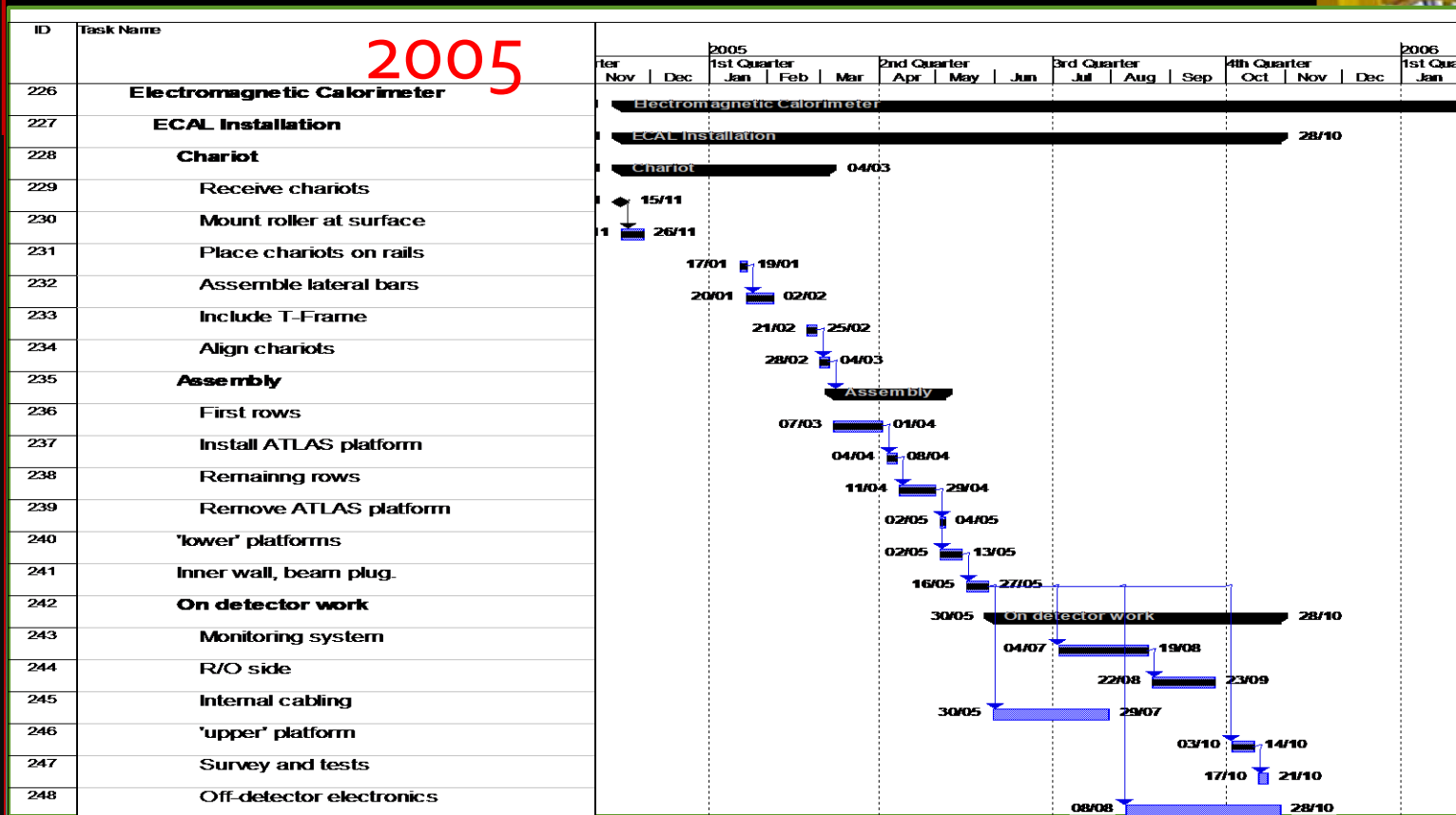
What will change from LS₃ to LS₄ ?

- Single to double section read out for SpaCal & Shashlik modules
- Improve timing of Shashlik modules
- Include timing information with double sided R/O to full ECAL
 - All modules to be removed for modification/replacement
 - Modification of modules at point 8?
- Has this any further impact on the metallic structure and access?
 - **Plan possible modification of general support for LS₃!!!**

Dismantling and Installation

The installation of present ECAL modules was easy compared to the Upgrade II condition.

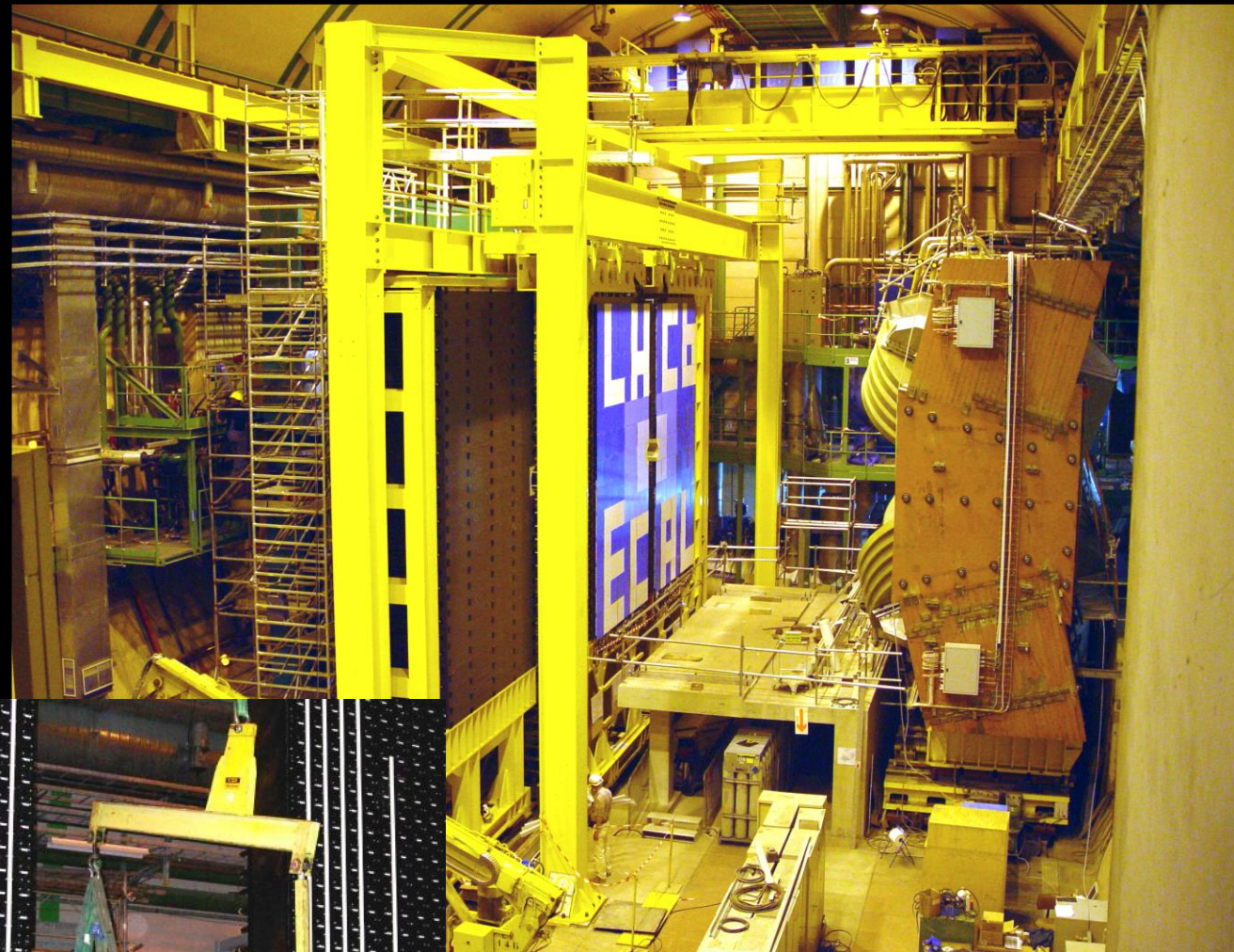
- No RICH 2 in front
- Space for a huge 'flying carpet' from ATLAS



Dismantling and Installation

To be studied:

- Dismantling of platforms
- Dismantling of SHASHLIK modules
- Modification of support structures
- Design of required tooling
- Cable routing and installation
- Installing/Connecting modules
- Confining modules
- Beam plug installation
- Installing platforms and racks on top



Beam plug installation

What can be expected from the Technical coordination Team?

Following slides: courtesy of Eric

What can be expected from the Technical coordination Team?

Following slides: courtesy of Eric

- Safety
- Infrastructure
- Coordinate with CERN support groups



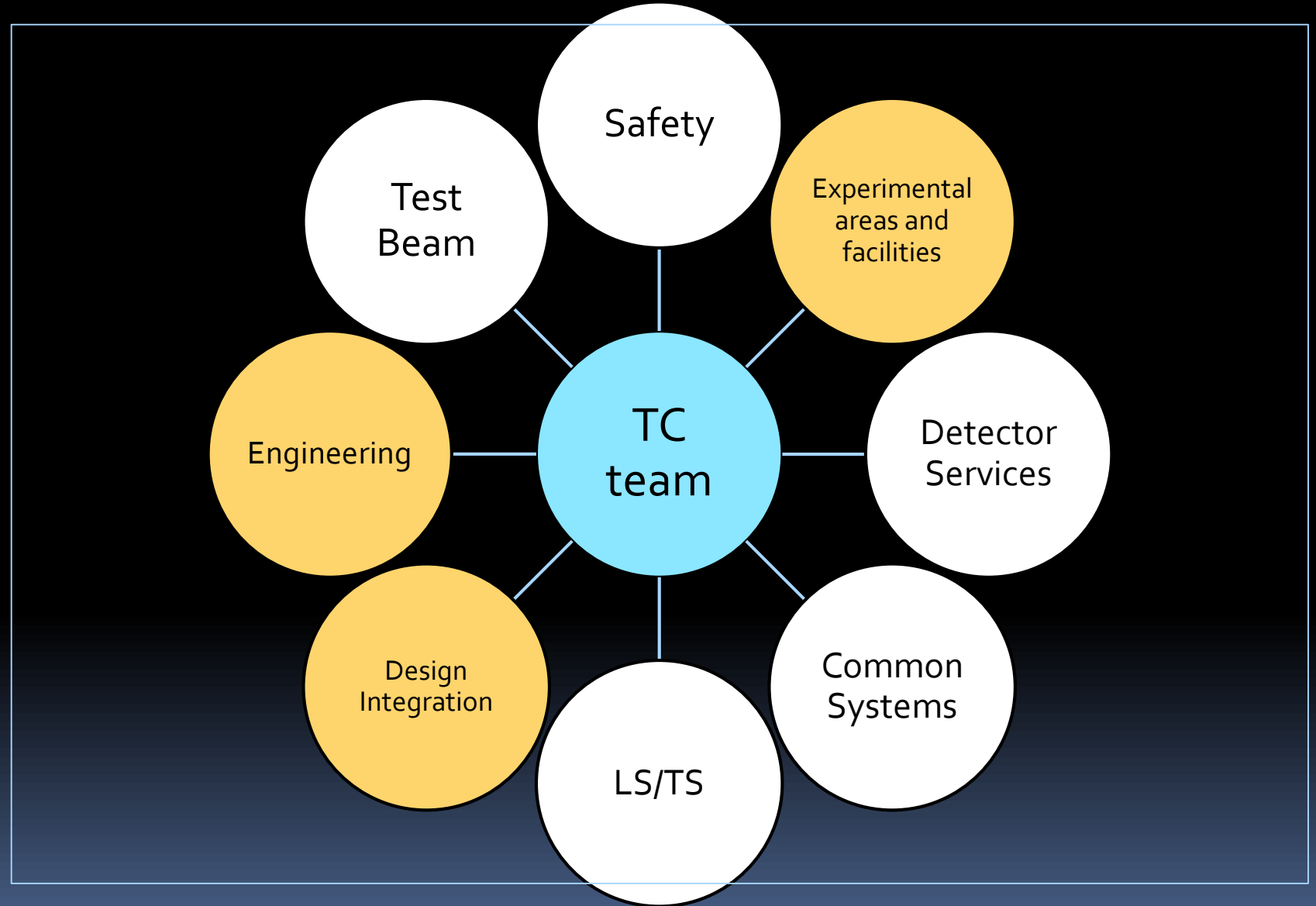
Host Lab duties

- Detector services
- Engineering support
- Detector Integration & CAD model
- Shielding
- Planning
- LHCb operation during Shutdown and TS



Support to the
Collaboration

Which support can be expected from the Technical coordination Team?



TC: Experimental area and facilities



- Provide experimental Area / facilities

- UX85
- SG8
- Workshop *
- Assembly Hall SXL8 * SX8
- Storage Tent (3889) *, Cable (3887) *, Electronics (3895) *
- Data Centre *
- Control room*

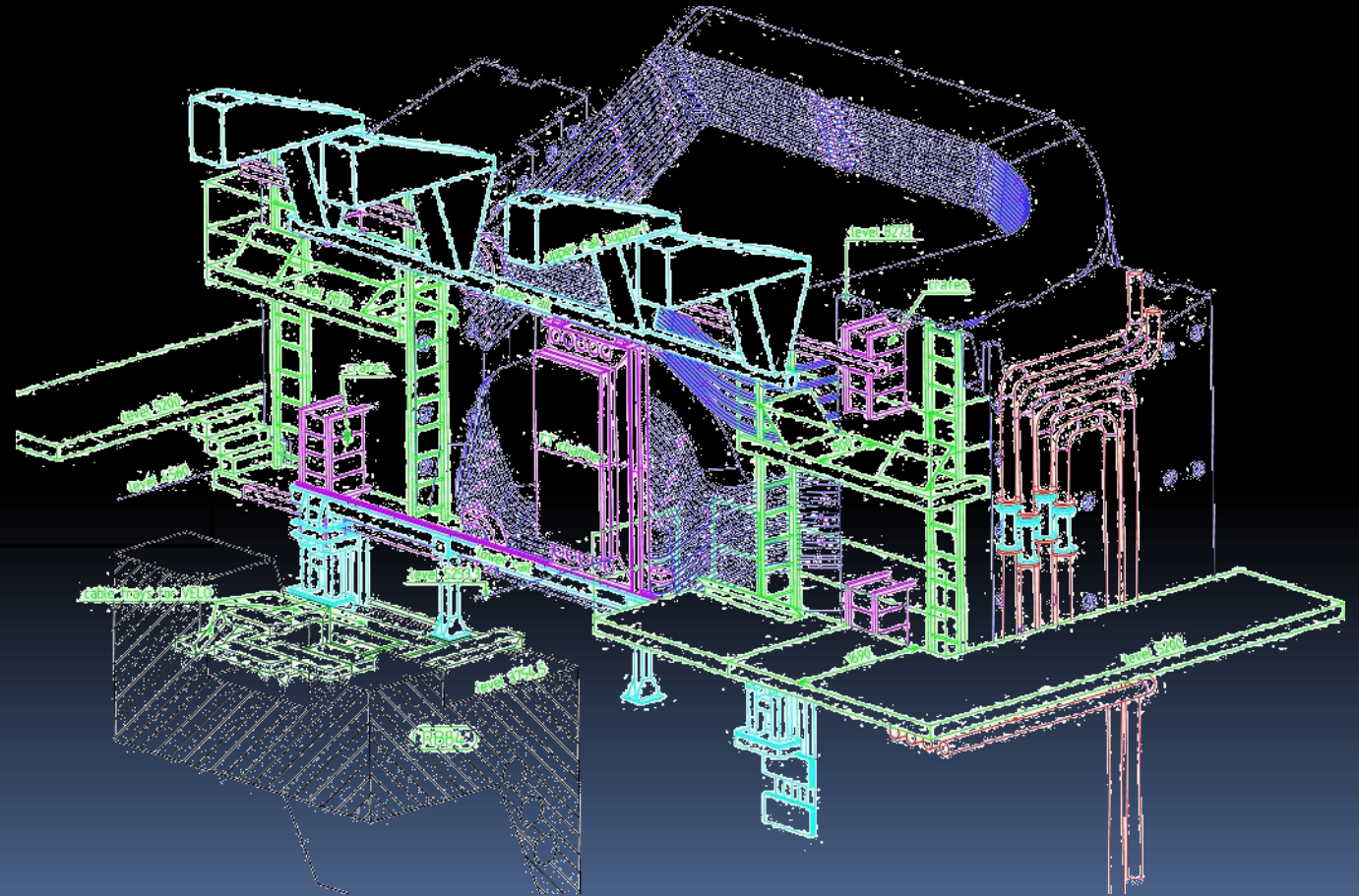
* New since 2010

- Follow-up inspections
- Operation and maintenance

Request for Electromagnetic Calorimeter U11

Activity/Process	Start Date and duration	LxLxh (m ³)	Specs (Crane, clean room, RP, Gas, Colling, HVAC ...)
Storage of 3000 modules and minor modification Module size 0.8x0.13x0.13 m ³	LS3 2026	45m ³ could be stored in racks. 5m x 5m x 2m or similar + Working place: 8m x 8m x 3m	Radiated modules, room temperature, no crane
Support structure modification and storage	LS3 2026	10m x 15m x 8m	Crane, 10t
SPACAL final assembly	LS3 2026	10m x 5m x 3m	Working places, no crane, not radiated. Compressed air
Shashlik module modification , 3000 modules	LS4 20xx	45m ³ could be stored in racks. 5m x 5m x 2m or similar + Working place: 8m x 8m x 3m	Radiated, no crane required, working tables and some tooling

- Provide, maintain, upgrade CAD model for LHCb and its environment
- Integration of detectors and services
- Engineering & design support for
 - Detectors
 - Installation
 - Dismantling
 - Tooling

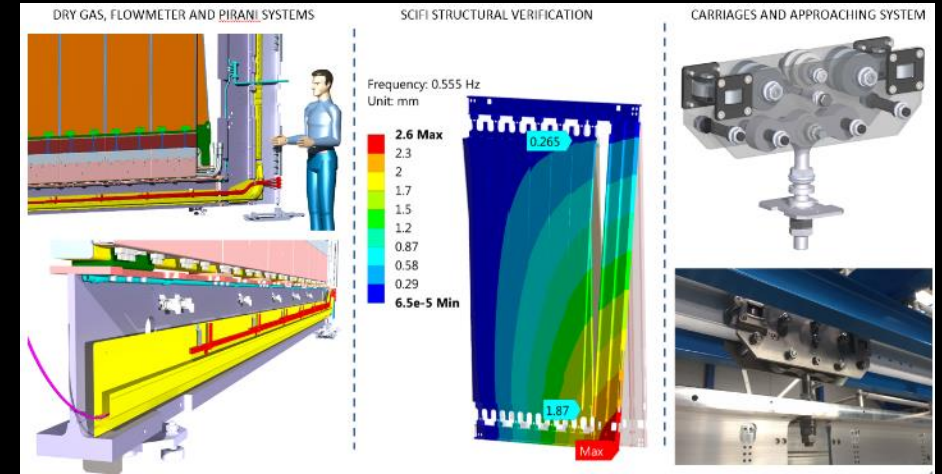


Can provide expertise and support to sub-detector

- Mechanical design and integration
- Mechanical conformity assessment
- Structural and Finite Element Analysis
- Assembly and Handling tools

Support for host lab duties

- Mechanical Safety
- Support and access structures
- Shielding wall



Conclusion

- More questions than answers for now
 - Number, size and length of cables?
 - Modification of platform accordingly -> not much time left!!!
 - What space is left in front of ECAL – Torch, Neutron shielding?
 - What happens to the HCAL? Decision is urgently needed!
 - **Only then a serious study can start to design a new ECAL platform**
 - Connection between SpaCal modules and SpaCal and Shashlik modules?
 - A schedule is urgently needed - start of LS₃ is 2026 (3 years left)
 - Time consuming activities such as a modification of platform can not be performed during LS₄
 -



New photos can be accessed:
<https://cernbox.cern.ch/s/qOUVtbWhqfhsSuz>

