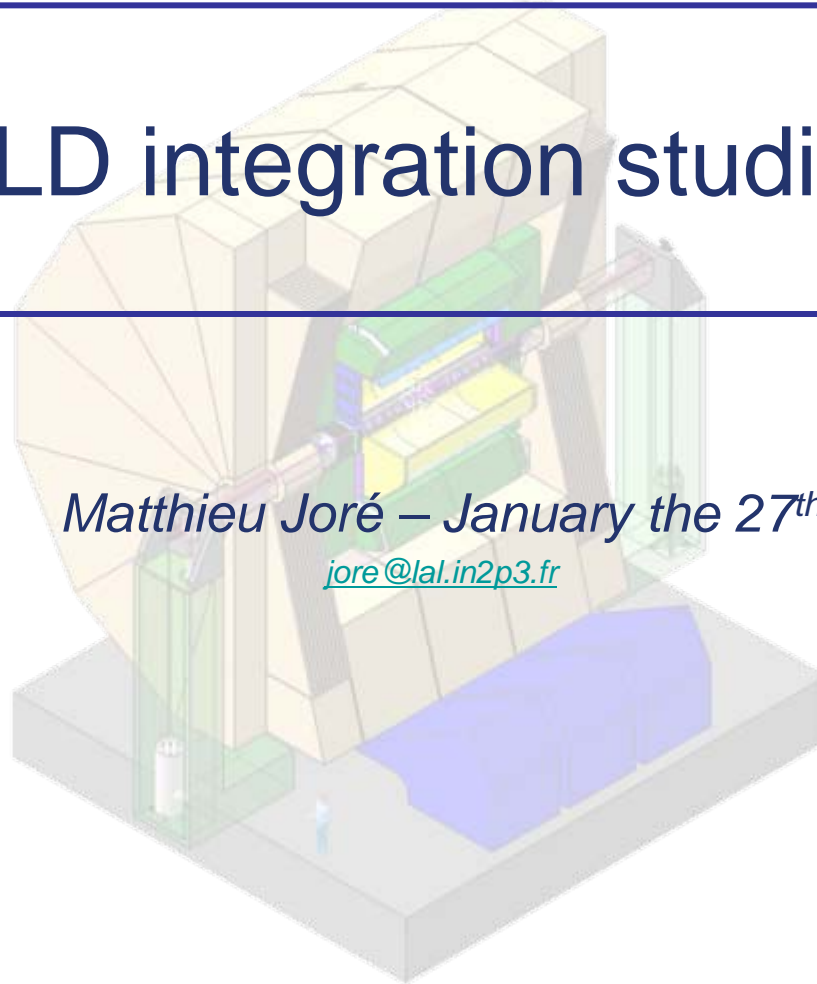


# ILD integration studies

*Matthieu Joré – January the 27<sup>th</sup>*

[jore@lal.in2p3.fr](mailto:jore@lal.in2p3.fr)

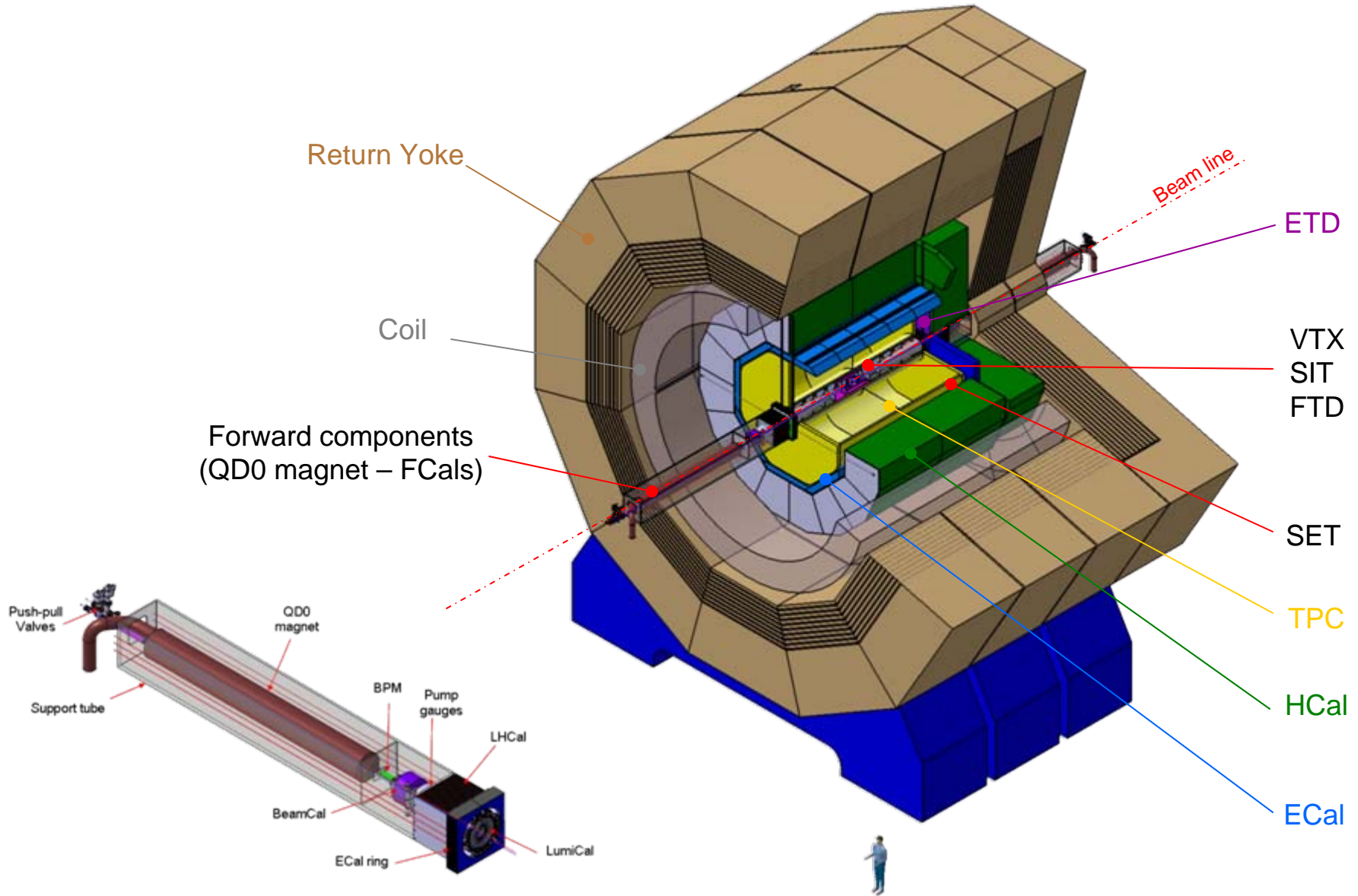




- Detector integration Studies
  - **Brief reminder of the detector integration baseline**
  - **Recent updates**
    - Forward calorimeters
    - QD0 support
  - **Main issues for 2012 (concerns only the detector)**
    - Design interfaces (TPC, inner silicon disks, ...)
    - Services (cabling/cooling)
- Detector integration organisation (proposal)
  - **Integration rules**
  - **Needed inputs from sub detectors**
  - **CAD**



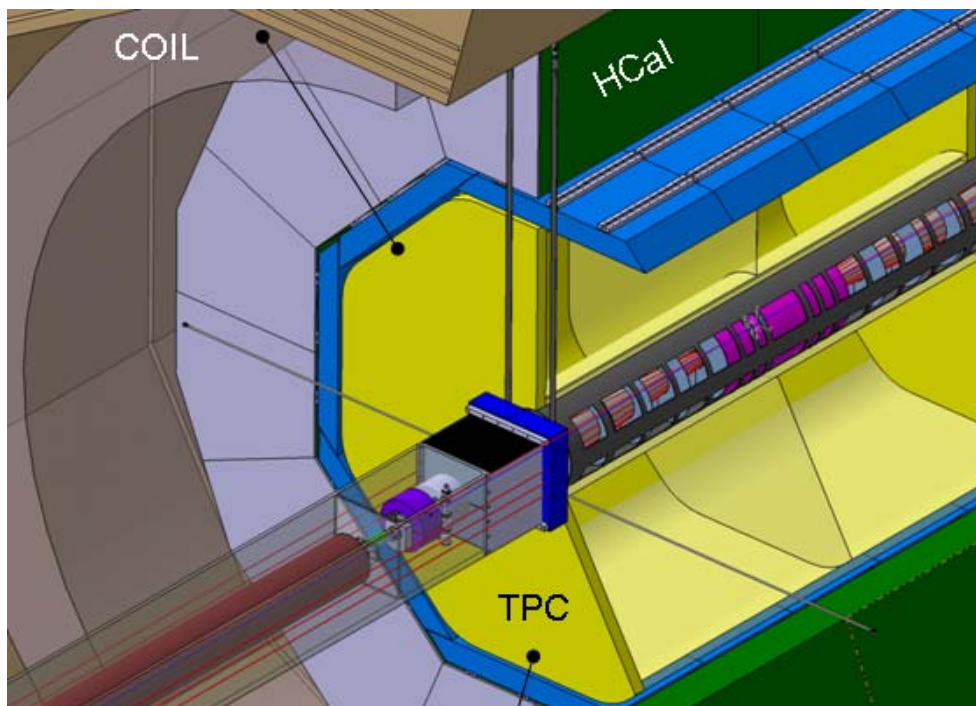
# ILD overview







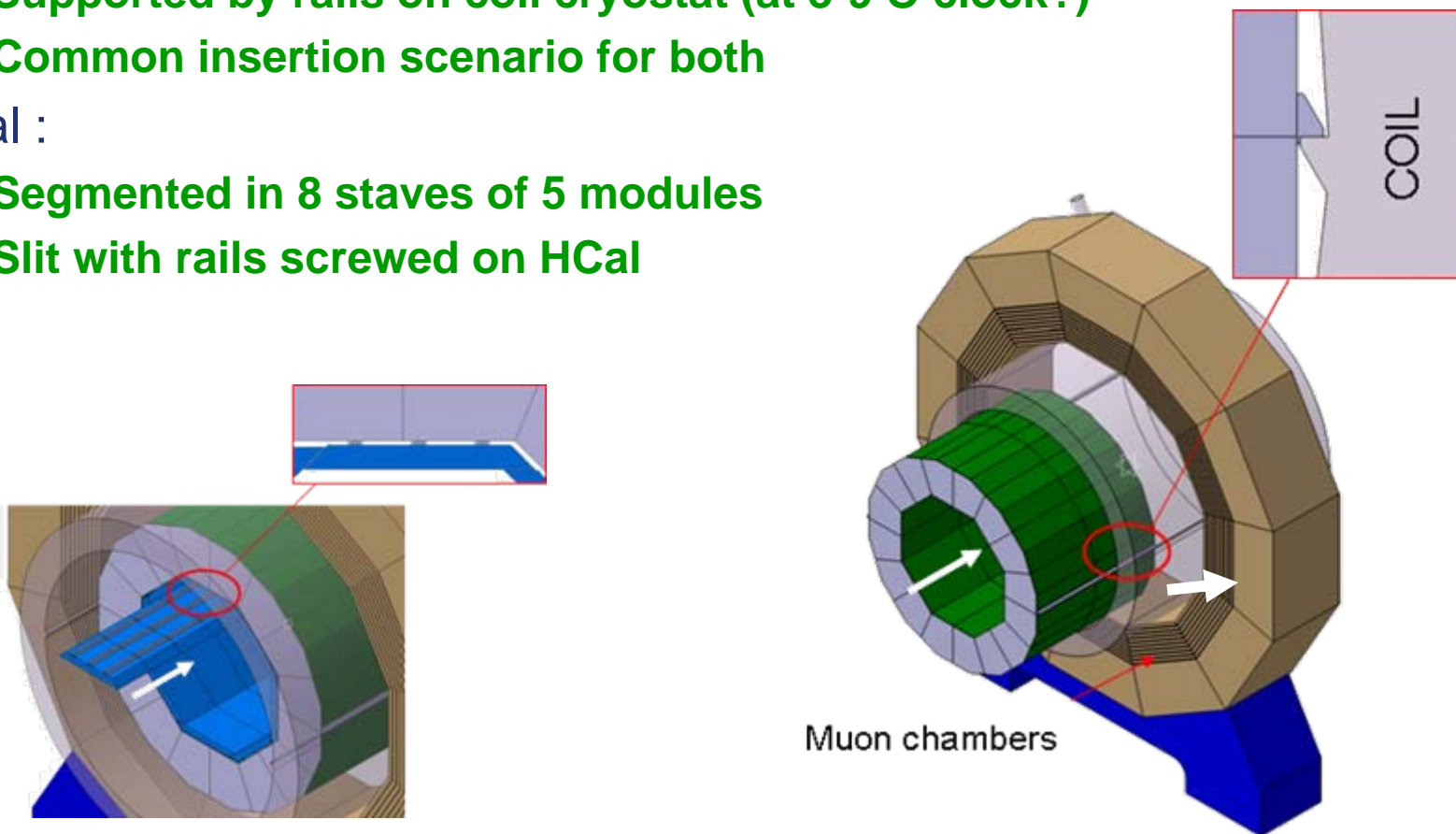
- TPC hanged from coil or barrel HCal
  - **Need to be designed in 10cm gap (isostatic system mandatory)**
  - **Adjustments needed**
  - **Better stability with fixing on HCal (= smaller rods)**





# Barrel calorimeters

- HCal :
  - Split in 2 rings for AHCAL – in 5 for SDHCAL
  - Supported by rails on coil cryostat (at 3-9 O'clock?)
  - Common insertion scenario for both
- ECal :
  - Segmented in 8 staves of 5 modules
  - Slit with rails screwed on HCal

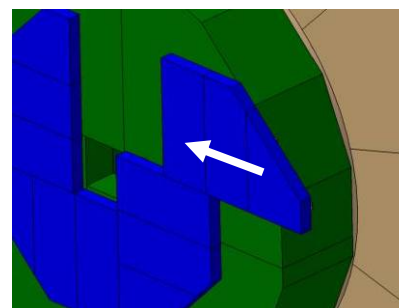
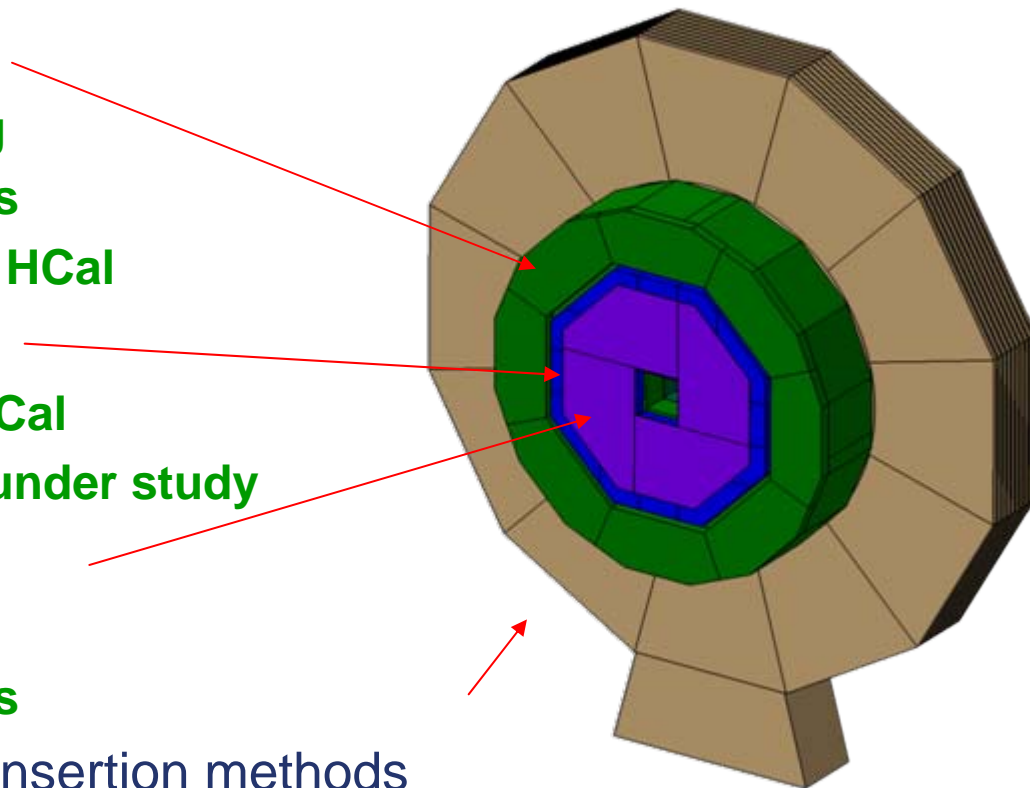






# EndCap Calorimeters

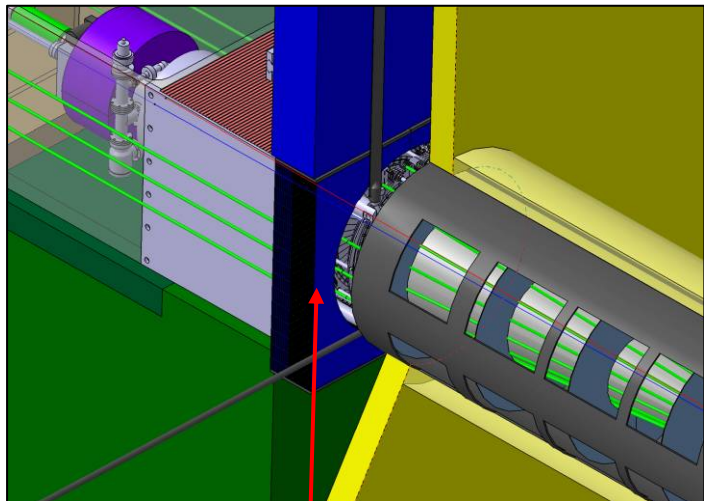
- HCal
  - attached to FSP via ring
  - segmented in 4 modules
  - HCal Rings screwed on HCal
- ECal
  - supported via rails to HCal
  - several configurations under study
- ETD
  - screwed on ECal
  - segmented in 4 modules
- Different muon chambers insertion methods
  - Horizontally
  - Radially



*ECal insertion*



# Cabling scheme

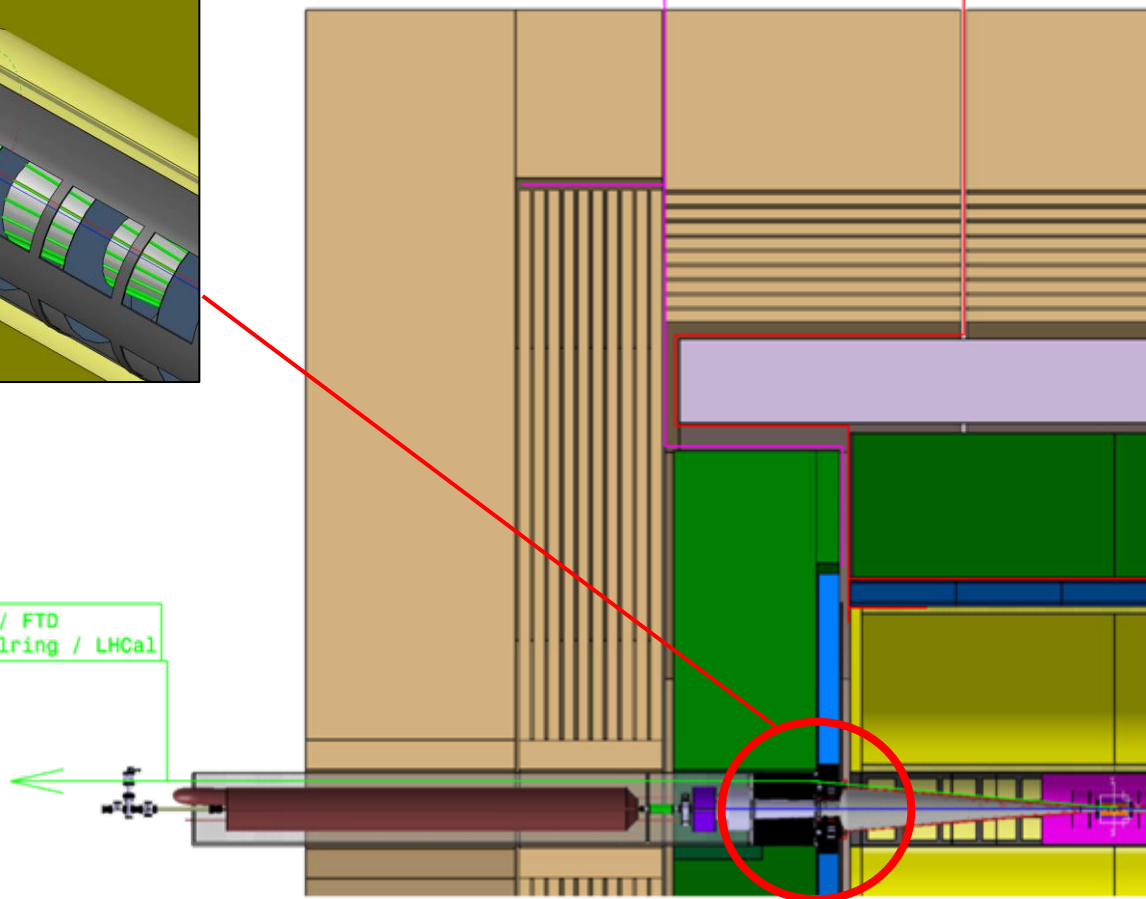


Inner cables/supplies  
behind the ECal ring

Vertex / SIT / FTD  
LumiCal / ECalring / LHCAL

EndCap Calorimeters  
ETD  
EndCap muon chambers

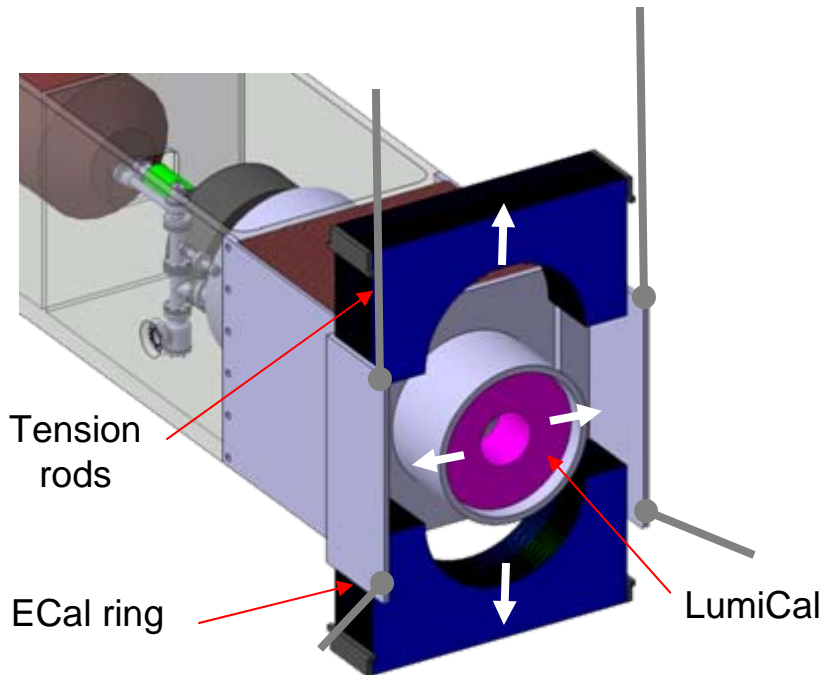
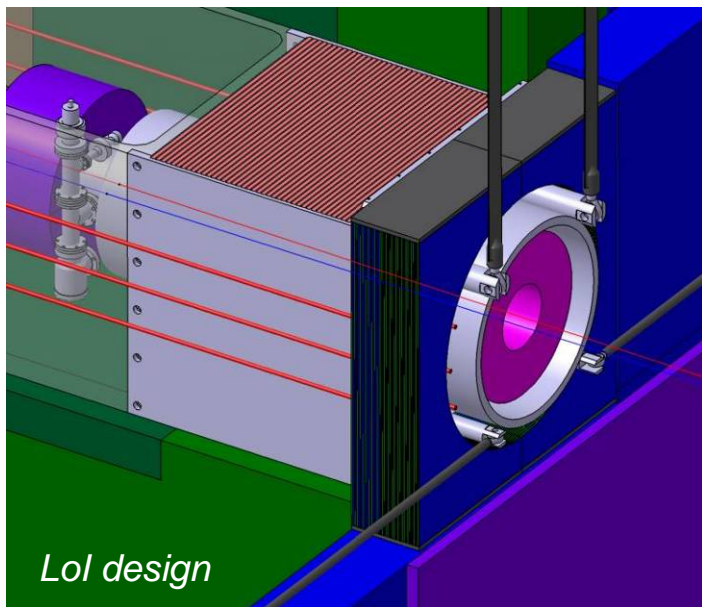
TPC  
Barrel calorimeters  
Central ring muon chambers  
SET



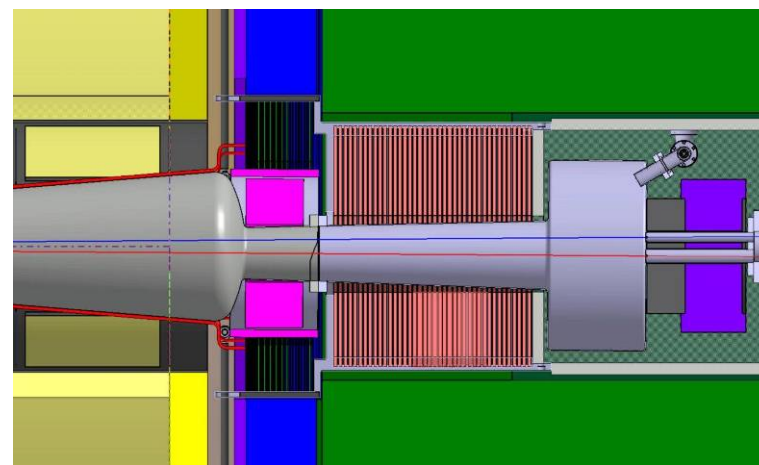




# Recent updates on FCals



- Less dead material
- Lower gap
- Better cables paths
- Stiffer support for tension rods
- Vibration behaviour TBC
- Opening of LumiCal and ECalring without disconnecting services





# Updates on QD0 support

- Yamaoka san's calculations have shown we need to decouple QD0 support from FCals one

## **Better vibration behaviour resulting from :**

- less weight
- no coupling with tension rods and coil
- less cantilever effect (shorter beam)

- The solution could be 2 square tubes :

### **– QD0 one**

- Fastened to machine tunnel
- Better coherency with machine vibrations
- Supports also Kicker and BPM

### **– FCals one**

- supported from pillar and tension rods :
- Alignment possible and kept between garage and beam position





# Main integration issues for 2012

From ILD work plan till 2010 (EB meeting) :

- *“Complete basic mechanical integration of the baseline design accounting for insensitive zones such as the beam holes, support structure, cables, gaps or inner detector material”*  
⇒ **Detector Integration studies**
- *“Develop a realistic concept of integration with the accelerator including the IR design”*  
⇒ **MDI and IR design**
- *“Develop a realistic simulation model of the baseline design, including the identified faults and limitations”*  
⇒ **Inputs from detector integration studies**
- *“Develop a push-pull mechanism, working out the movement procedure, time scale, alignment and calibration schemes in cooperation with relevant groups”*  
⇒ **Push-Pull studies**

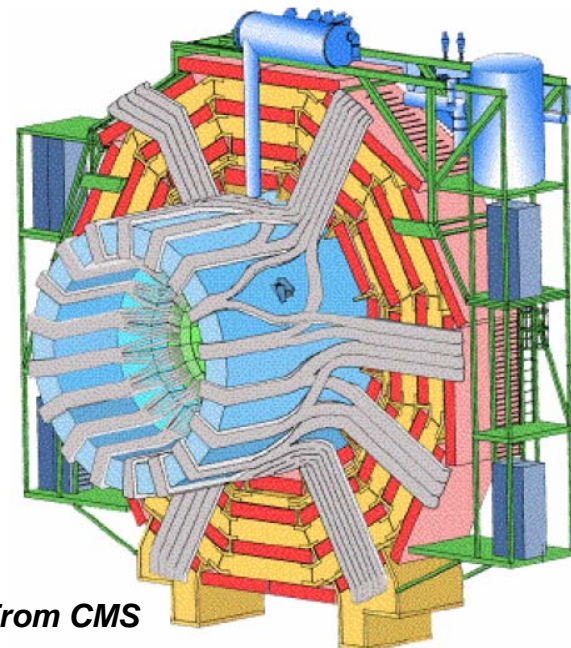


# Detector integration studies for 2012

- Evaluation of support structure and dead material needed for optimising the simulation model
- New design studies to be performed (in close collaboration with relevant groups) :
  - **TPC support**
  - **Inner detectors integration (VTX+silicon disks) including beam pipe**
  - **Integration of MONALISA (QD0 position monitor)**
  - **Tooling for assembly**
  - ...
- Some improvements are also possible on :
  - **FCals support (tube dimension, tension rods, etc...)**
  - **Beam line components (vacuum studies on going, nber of valves)**
  - **HCal/ECal interface : present design seems too statically underdetermined**
    - Isostatic design would be preferred



- Integration of services is also mandatory to help us to evaluate gaps and dead material
- Integration of services in the detector :
  - **Patrick Cornebise (LAL) will help us to design cable paths (from first studies done by Uwe)**
    - Not designing each cables but reserve space including their screening, support structure, etc...
  - **Same strategy foreseen for cooling BUT :**
    - No one identified at the moment
    - Any one candidate?
  - **The cabling and cooling services must be as common as possible for the different sub systems**



*From CMS*



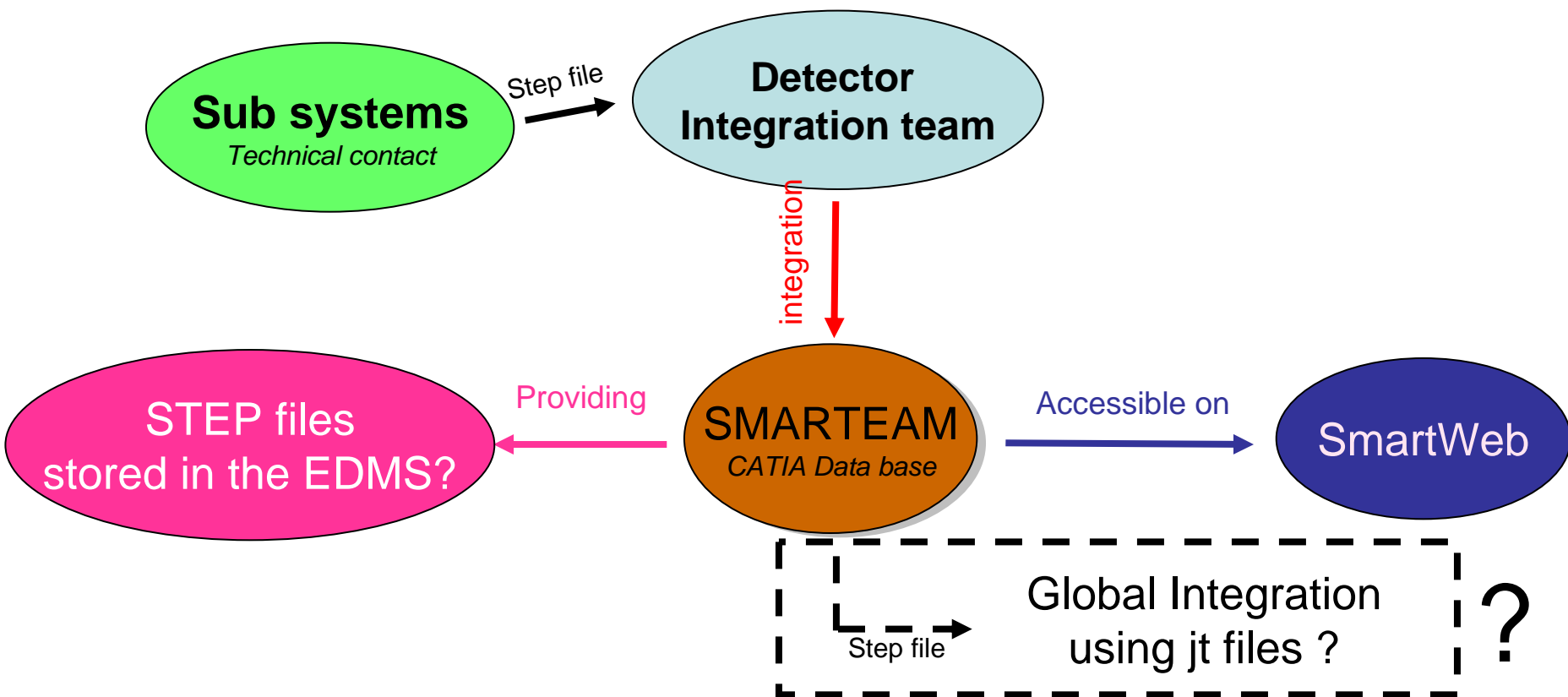


- Identify **technical** contact for **each sub systems**
- Need inputs from groups :
  - **CAD model (in step file)**
  - **Information about their sub detectors (see Catherine's draft document) :**
    - Dimensions
    - Cables/cooling needed
    - Alignment procedure
    - Stability requirements
    - Etc...
- Need to define integration rules (non exhaustive list):
  - **For 3D model (coordinates system, name, level of details, ....)**
  - **Placeholders , no go boxes, etc..**
  - **Adiabatic detectors : the heat you create, the power you have to evacuate**
  - **Etc...**



# CAD management proposal

- Slight changes from the previous CAD organisation :
  - **adding a technical contact for each sub system**
  - **How work with the EDMS?** *Seems not easy, time consuming but very usefull*
  - **What are the interactions with the global integration ?**





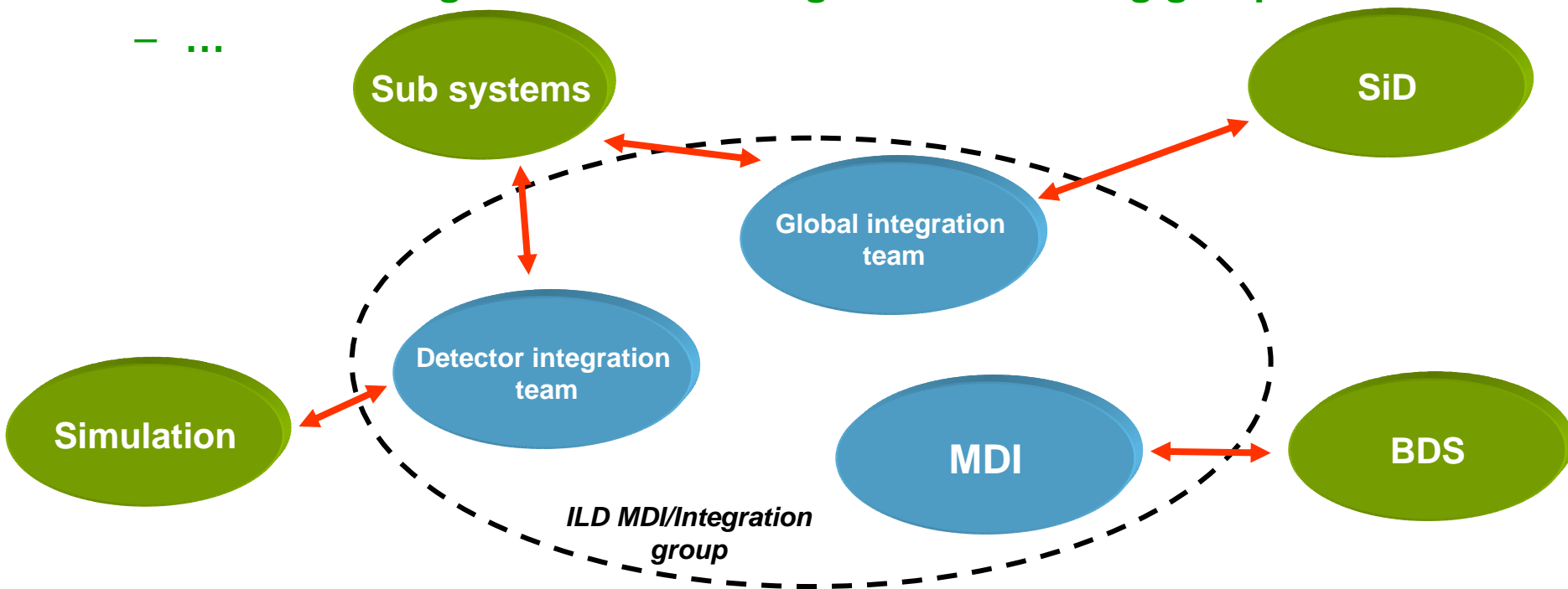
# Conclusions

- We have reached a good knowledge of the detector for the Lol
- BUT now some integration studies are needed for 2012 :
  - **Sub detectors Interfaces (TPC, Inner silicon disks, etc..)**
  - **Detector services' design (cables, cooling)**
  - **Optimisation of present design**
- Detector integration organisation proposal :
  - **A technical contact must be named for each sub systems**
  - **Interface document would be filled by each sub systems**
  - **Integration rules must be established**
  - **CAD management will mainly follow the previous concept**
    - How we could perform this differently?
    - How will be performed the global integration?



# MDI/Integration organisation chart proposal

- Open questions for discussion on the MDI/Integration group :
  - **How we organise with the other groups?**
    - Software / Sub detectors / BDS people / SiD/... ?
  - **Who will be in charge of the global integration with machine, the push pull mechanism, the hall design including services, etc... ?**
  - **What about decision making?**
  - **Should we organise the MDI/Integration in working groups?**
  - ...

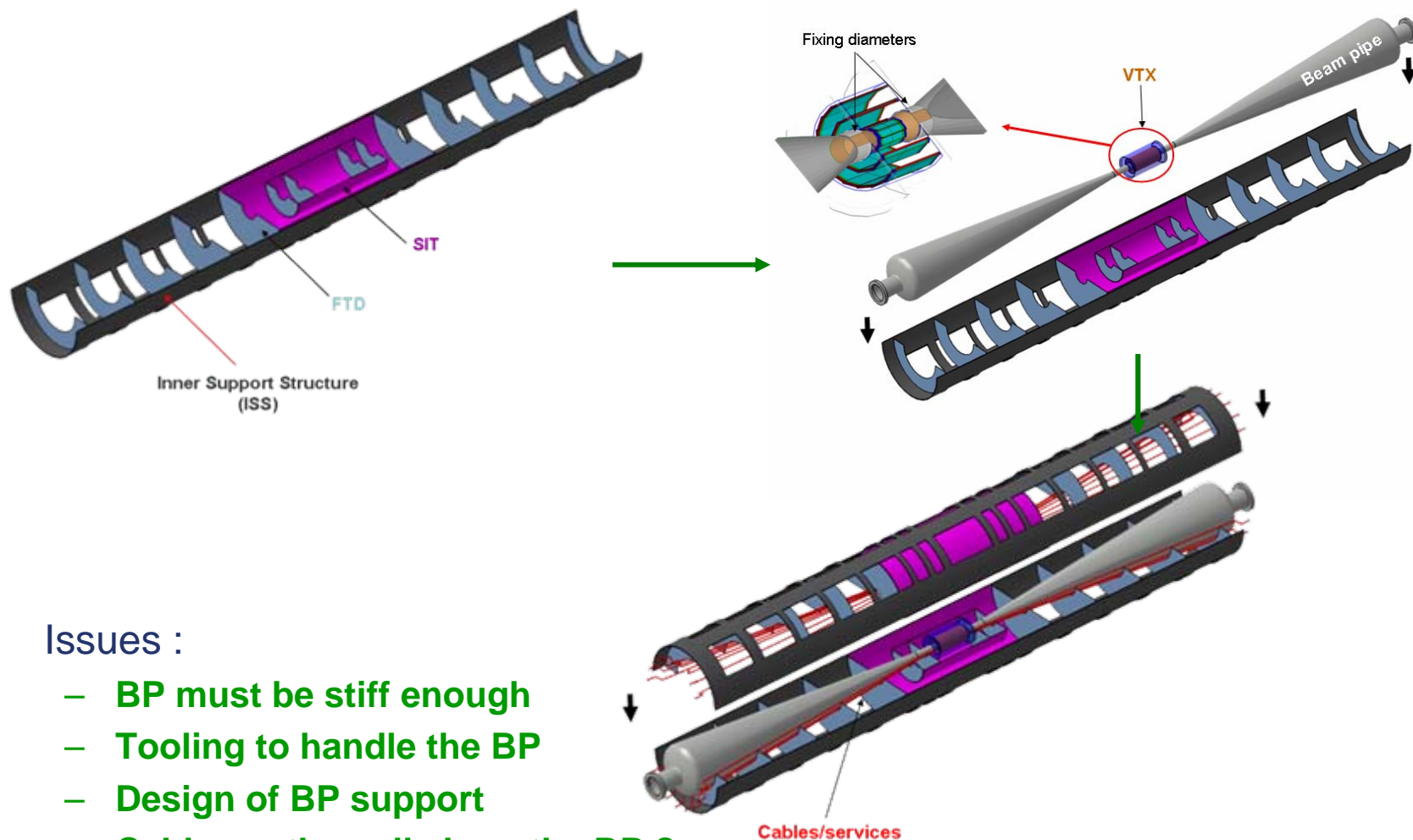




# Back up slides



# Inner region assembly



- **Issues :**

- **BP must be stiff enough**
- **Tooling to handle the BP**
- **Design of BP support**
- **Cables paths : all along the BP ?**
- **Maintenance of VTX?**



- Support tube which supports all these components
  - **Forward Calos : LumiCal, ECal ring, LHCal, BeamCal**
  - **Vacuum components and beam diagnostics**
  - **Final focus magnet (big challenge!)**

