



# High Luminosity LHC

## Crab cavities cryomodule – discussions for SPS

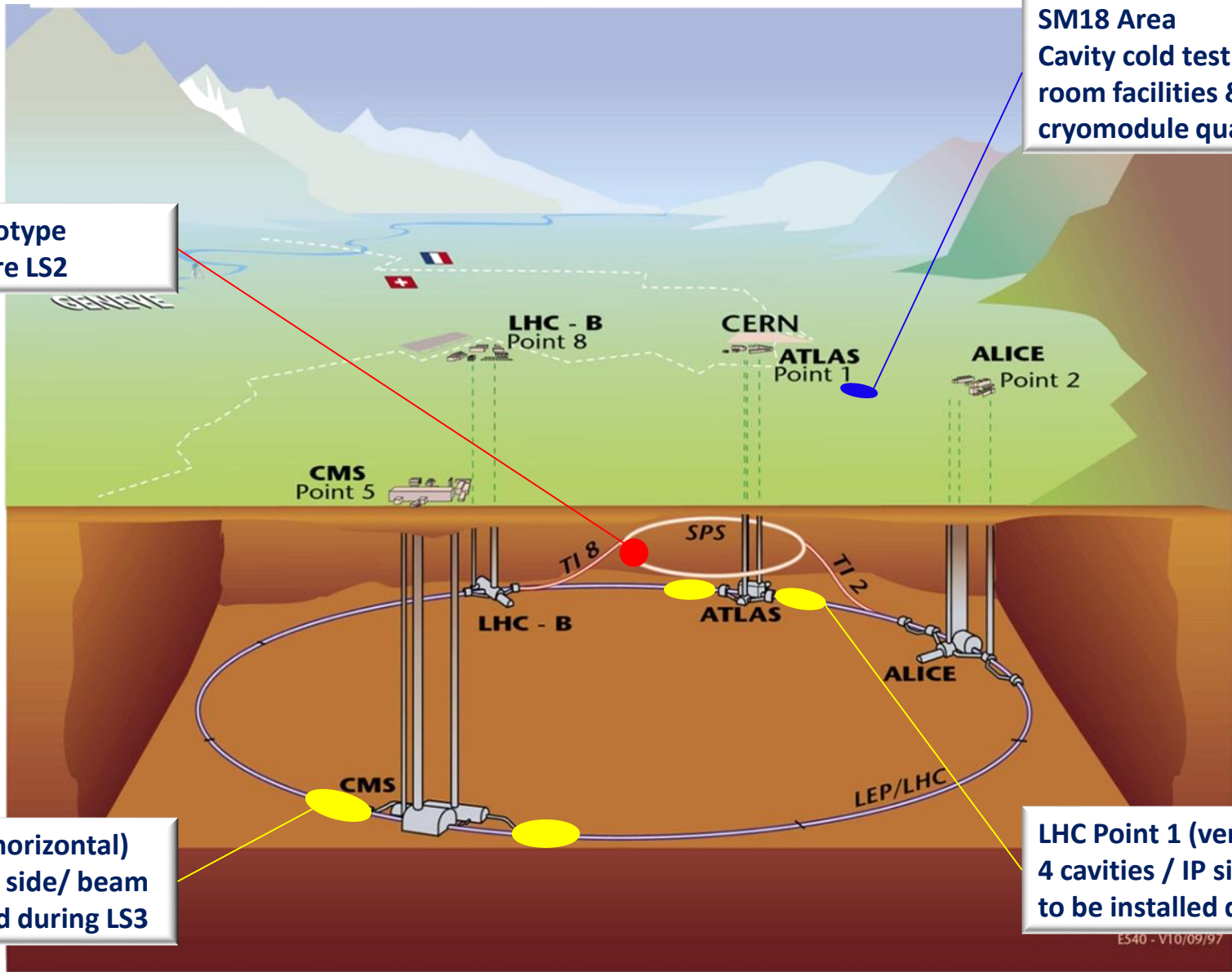
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On behalf of cryomodule development team



The HiLumi LHC Design Study is included in the High Luminosity LHC project and is partly funded by the European Commission within the Framework Programme 7 Capacities Specific Programme, Grant Agreement 284404.





**SM18 Area**  
 Cavity cold testing, clean room facilities & cryomodule qualification

**SPS Test Prototype Module before LS2**

**LHC Point 5 (horizontal)**  
 4 cavities / IP side/ beam to be installed during LS3

**LHC Point 1 (vertical)**  
 4 cavities / IP side/ beam to be installed during LS3

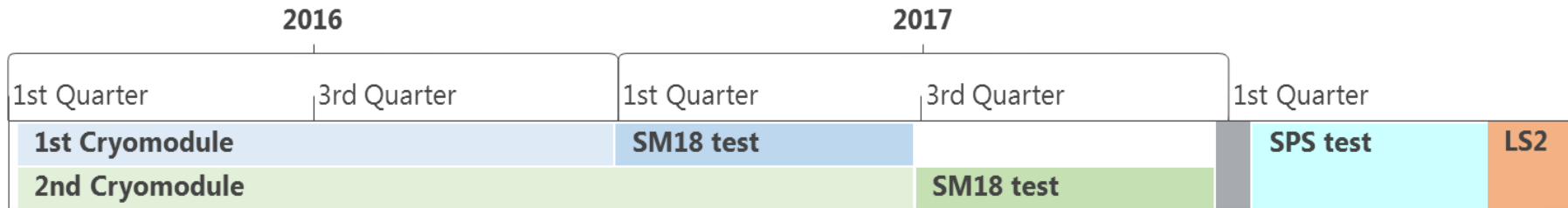
E540 - V10/09/97

# Plans for SPS

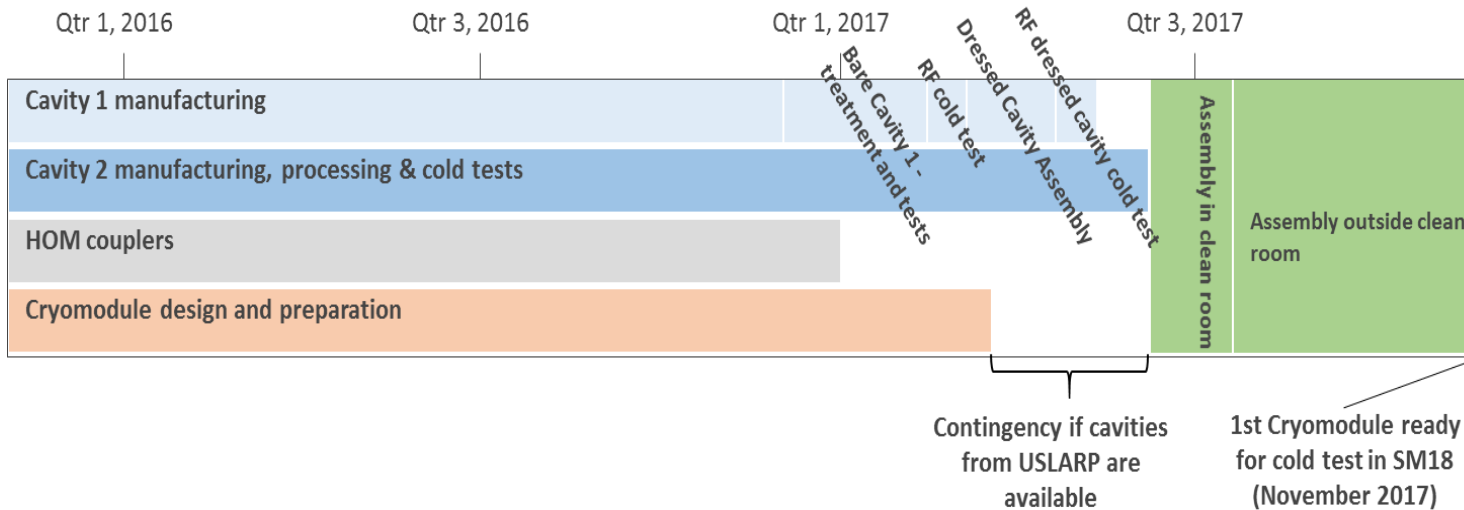
- Updated plans for SPS tests (beginning 2015):
  - Dressed cavities
    - USLARP to provide bare cavities and helium vessels;
    - UK to provide cold magnetic shielding
    - CERN to provide HOMs and tuning systems
    - USLARP to provide assembly of dressed cavities, processing and cold tests
  - Cryomodule
    - Design by CERN & UK; Manufacturing, assembly and test by CERN
- Due to lack of details, non-conformities and transparency of the fabrication process of bare cavities we have updated the plans for the SPS tests (October 2015)
  - The US production of cavities is likely to accumulate additional delays
  - CERN is accelerating the parallel production line for one type of cavities and the respective helium vessel
    - This includes as baseline cavities processing (BCP, heat treatment) and cold tests at CERN

# Plans for SPS

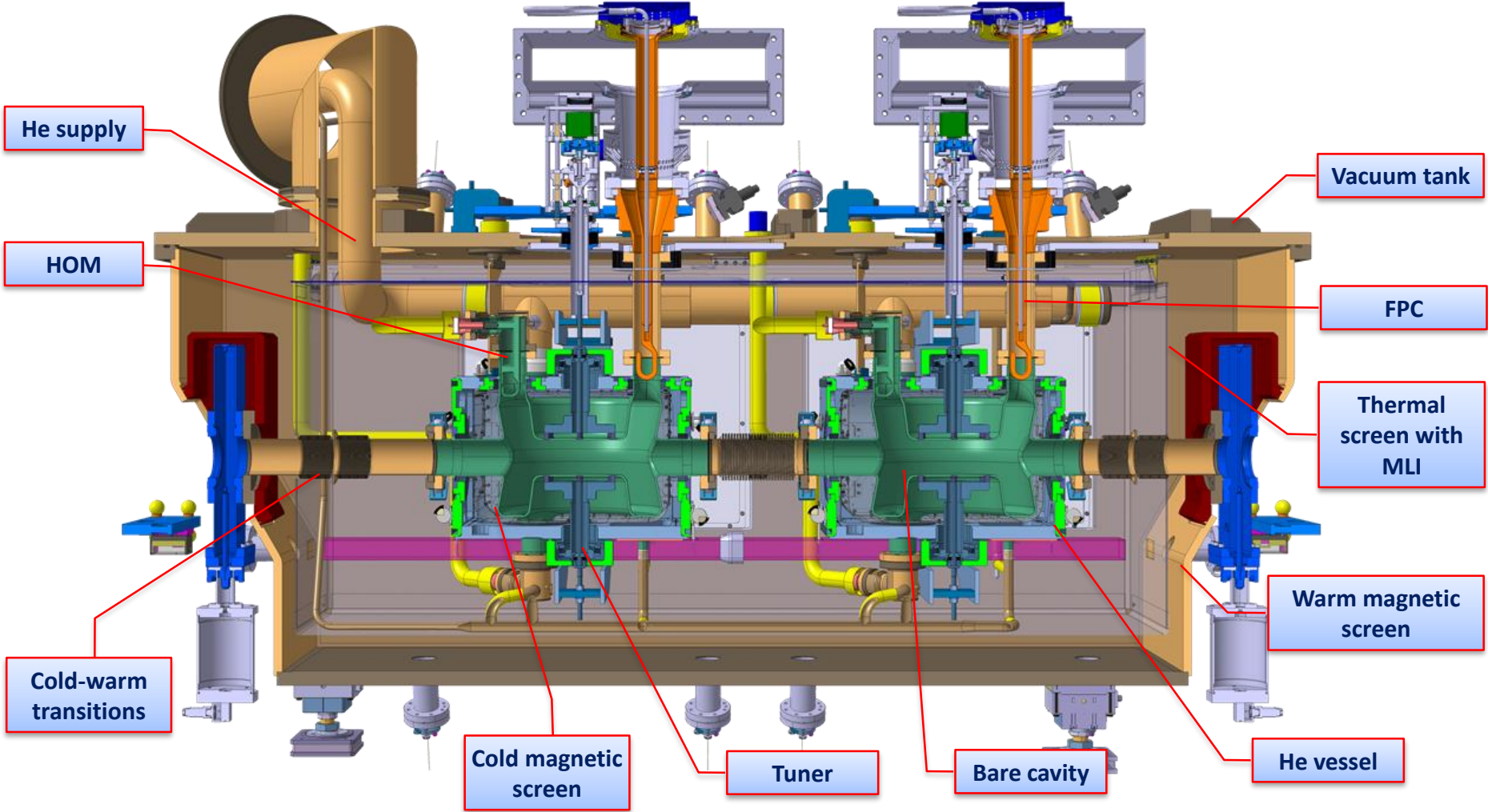
- Plans from C&S review for SPS cryomodules



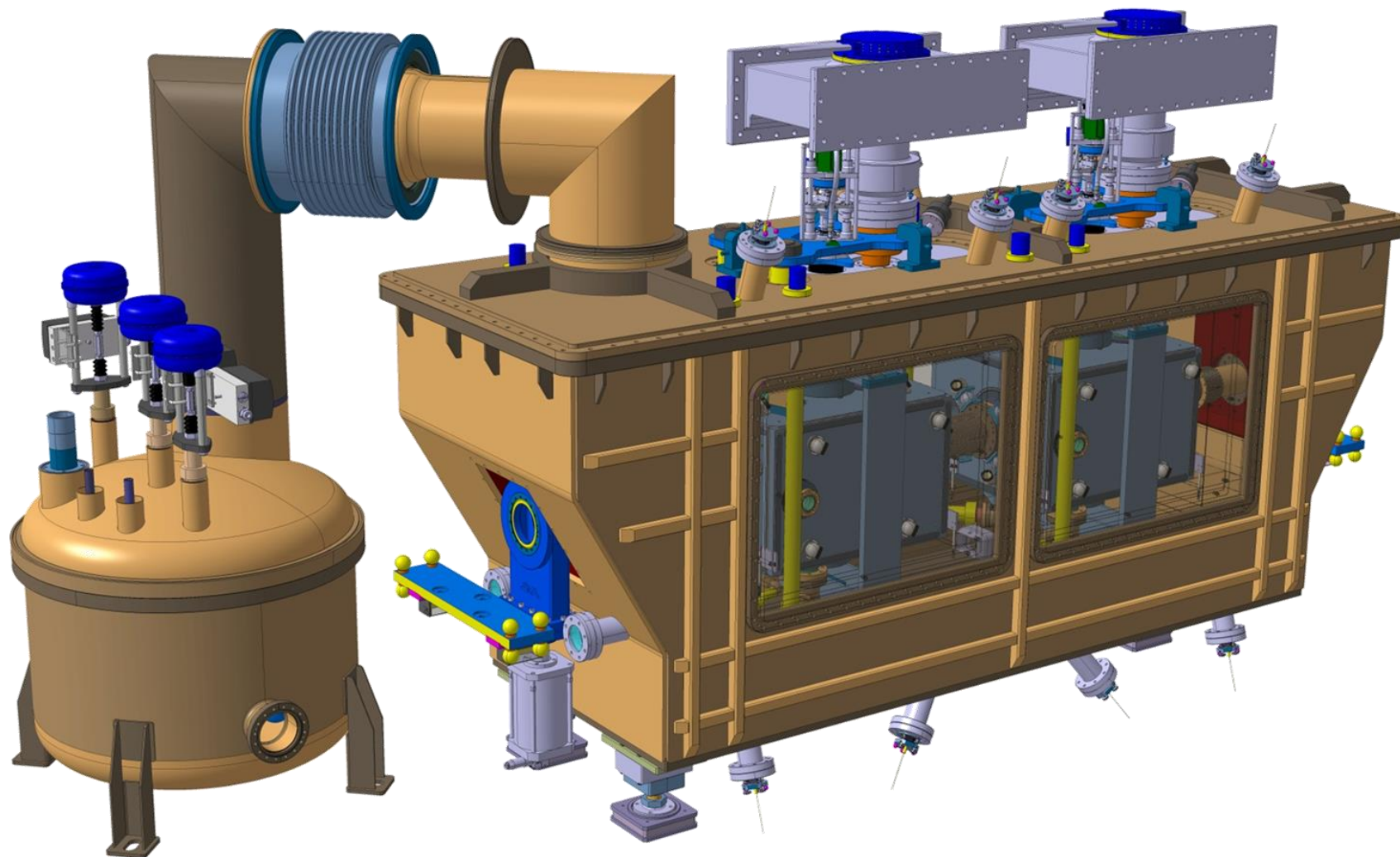
- Recently updated plans (October 2015)



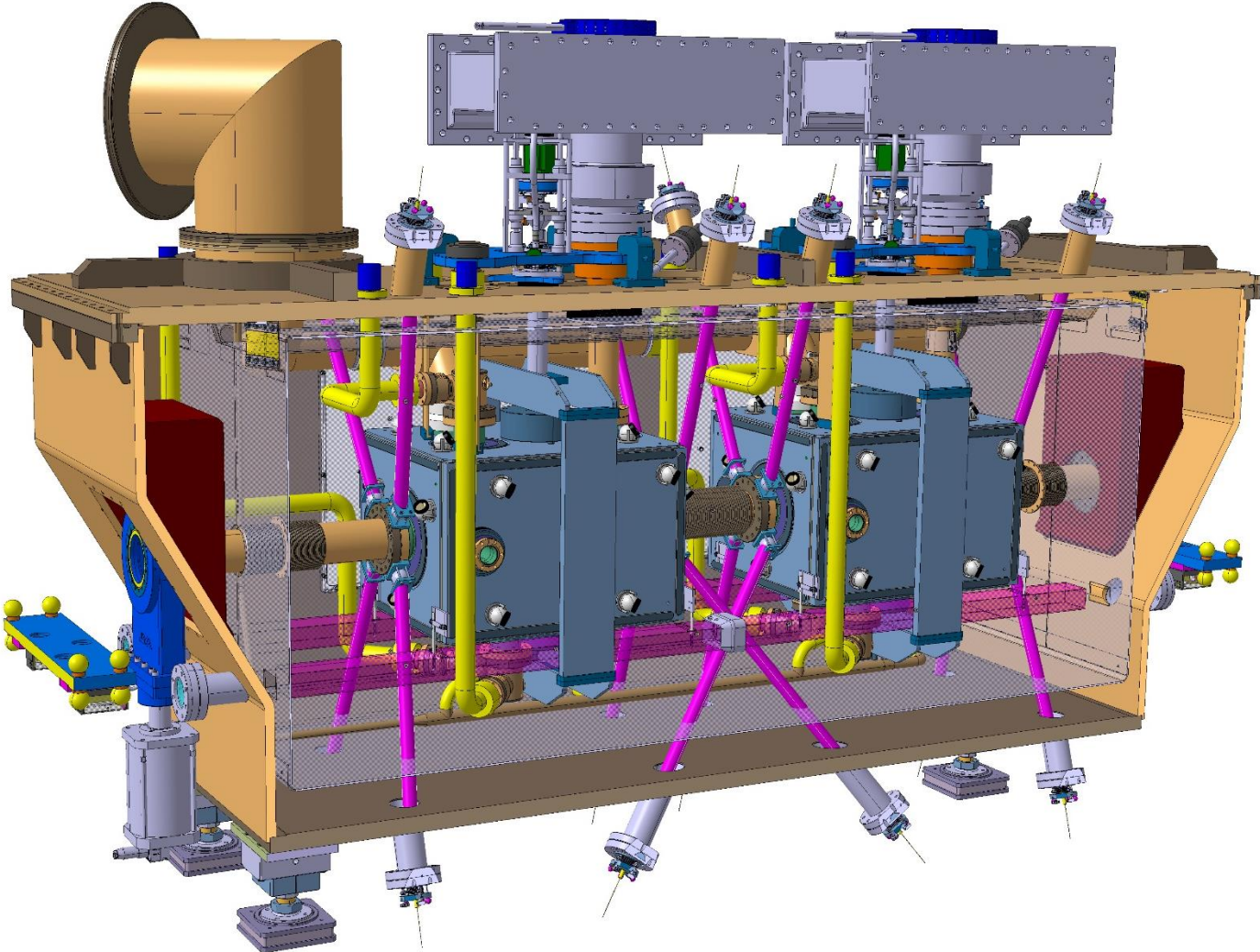
# Cryomodule



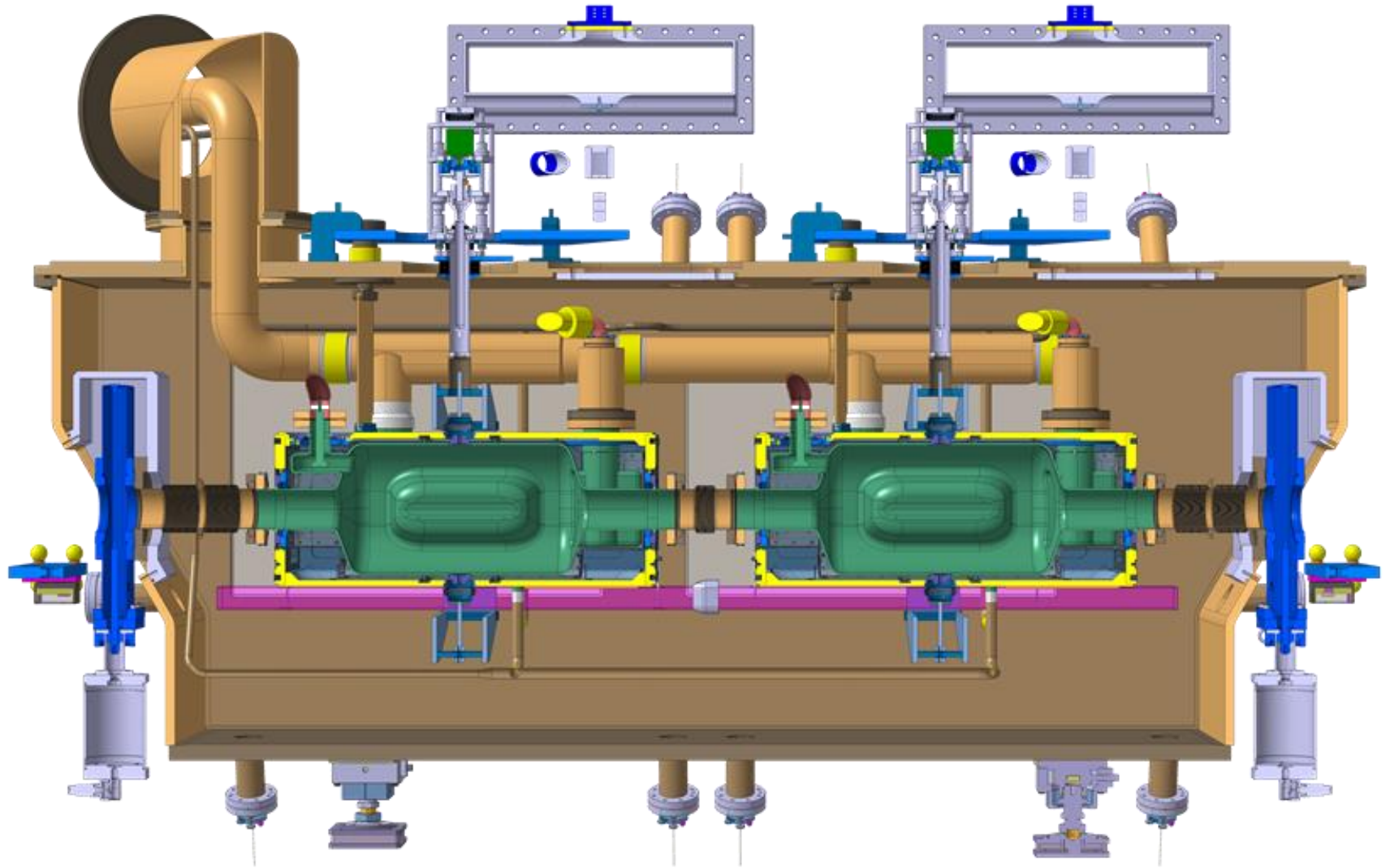
# Cryomodule



# Cryomodule



# Cryomodule





# Vacuum

- Beam vacuum
  - Valves for cavity protection after clean room outside the cryomodule
  - Will include vacuum gauges at the valves
  - Second beam pipe not fully installed, space reserved
- Insulation vacuum
  - Common insulation vacuum with service module
  - Will foresee pumping ports on both sides, cryomodule and service module (DN150 on cryomodule)
  - Will include vacuum gauges on the vacuum tank
  - Will include pressure relief device (port + cover) on the vacuum vessel DN100 TBC

# Cryogenics

- 2K
  - Cryogenic lines 2K defined with TE/CRG (Krzysztof) : routing + volumes:
    - Cooldown bypass placed below the cavities
    - Two-phase pipe above for operation – filled from one extremity point controlling helium level
- 50K
  - 50K - 80K circuit (thermal shield) under definition with TE/CRG + UK colleagues
- Cryogenic instrumentation fully defined with TE/CRG

# Integration

- Integration in SM18 test zone (bunker) ?
- Integration in SPS ?