

HIE-ISOLDE Project Status Report

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ISOLDE Annual Workshop
CERN, 25-27 November 2013

- Technical Advances
- Procurement
- Installation works
- Schedule
- Conclusions

Technical Advances

● SC Linac

- Cavity series production started
- RF coupler and **tuner** systems are being validated
- LLRF prototype successfully tested => series production underway
- SC solenoid design approved=> fabrication starting
- Cryomodule design finalized => procurement underway for Ir

● High-Energy Beam Transfer lines

- Layout frozen => tracing on the floor
- Dipole and quadrupole Magnets +
- H/V corrector magnets by
- vacuum chambers
- Diagnostic

● Installation work

● Design

- Upgrade well underway
- End (FE8 and 9)
- separator test bench
- VAC + Cooling => nuclearization
- **Charge Breeder => assembly of electron gun, test at BNL (US)**

HIE-ISOLDE Technical Workshop
Nov. 28 & 29 2013, Globe of Science and Innovation

Surface quality of the inner conductor tip → source of field emission



Central electrode: 20 mm diameter, at earth potential



No central electrode

Adhesion on the lower edge (RF contact) was improved using a longer cathode

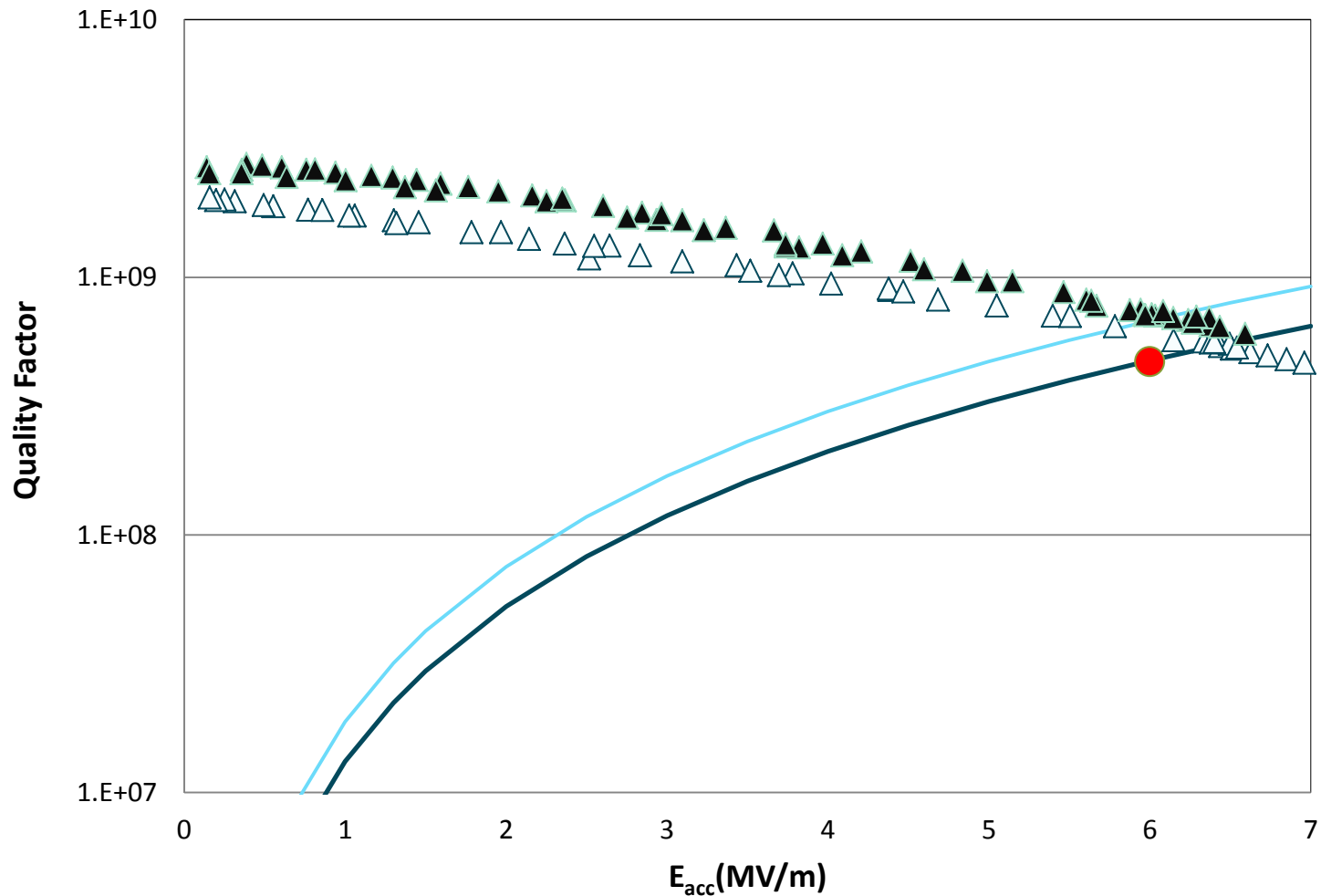


with 840 mm cathode



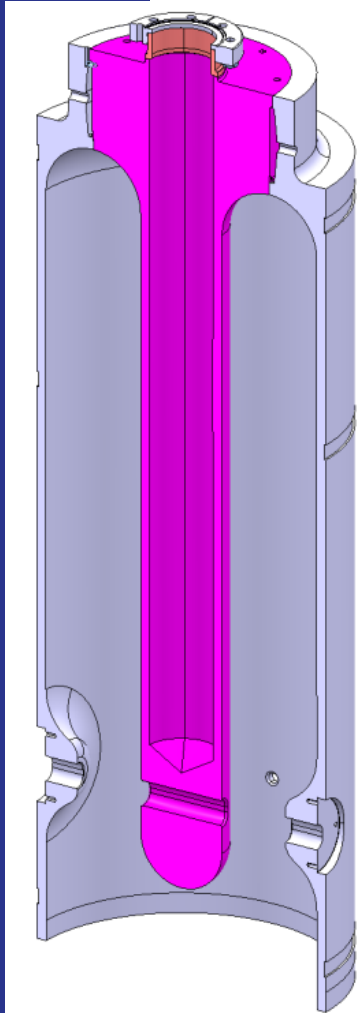
length increased to 870 mm

Ready to start series cavity production



High beta cavity procurement

Version 2



Two series cavities (QP2 and QP3)
ready at CERN to start series coating

Contract attributed to industry for
production

Kick-off meeting to finalize few
welding issues: parameters of the
welding machine set in collaboration
with CERN

Expected delivery of first pre-series
unit by the end of the year

Low Level RF status



First prototype LLRF controller
commissioned in SM18

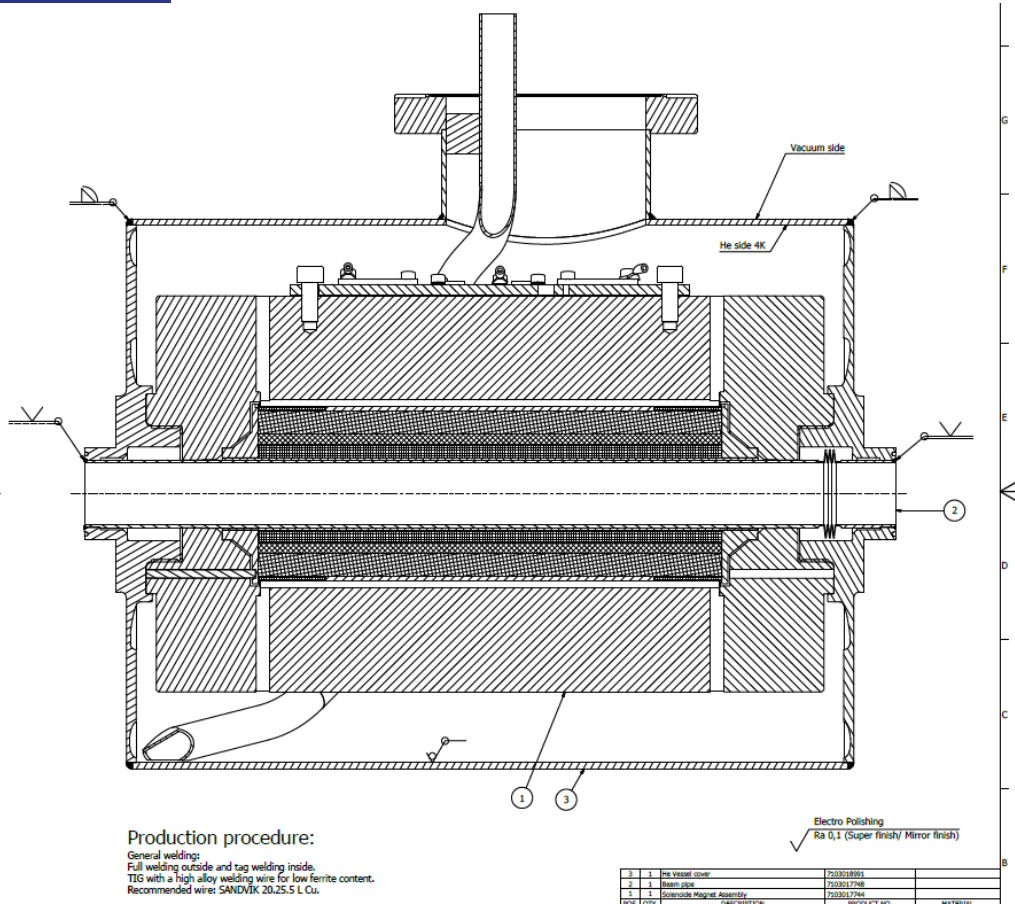
Monitoring of RF signals, locking in Self
Excited Loop mode, control of Coupling
and Tuning

FESA class operational, high level
software to be developed

Manufacturing on-going of 3 LLRF
controllers for SM18 cryomodule test

Components for 10 controllers already
in house, will start assembly early 2014

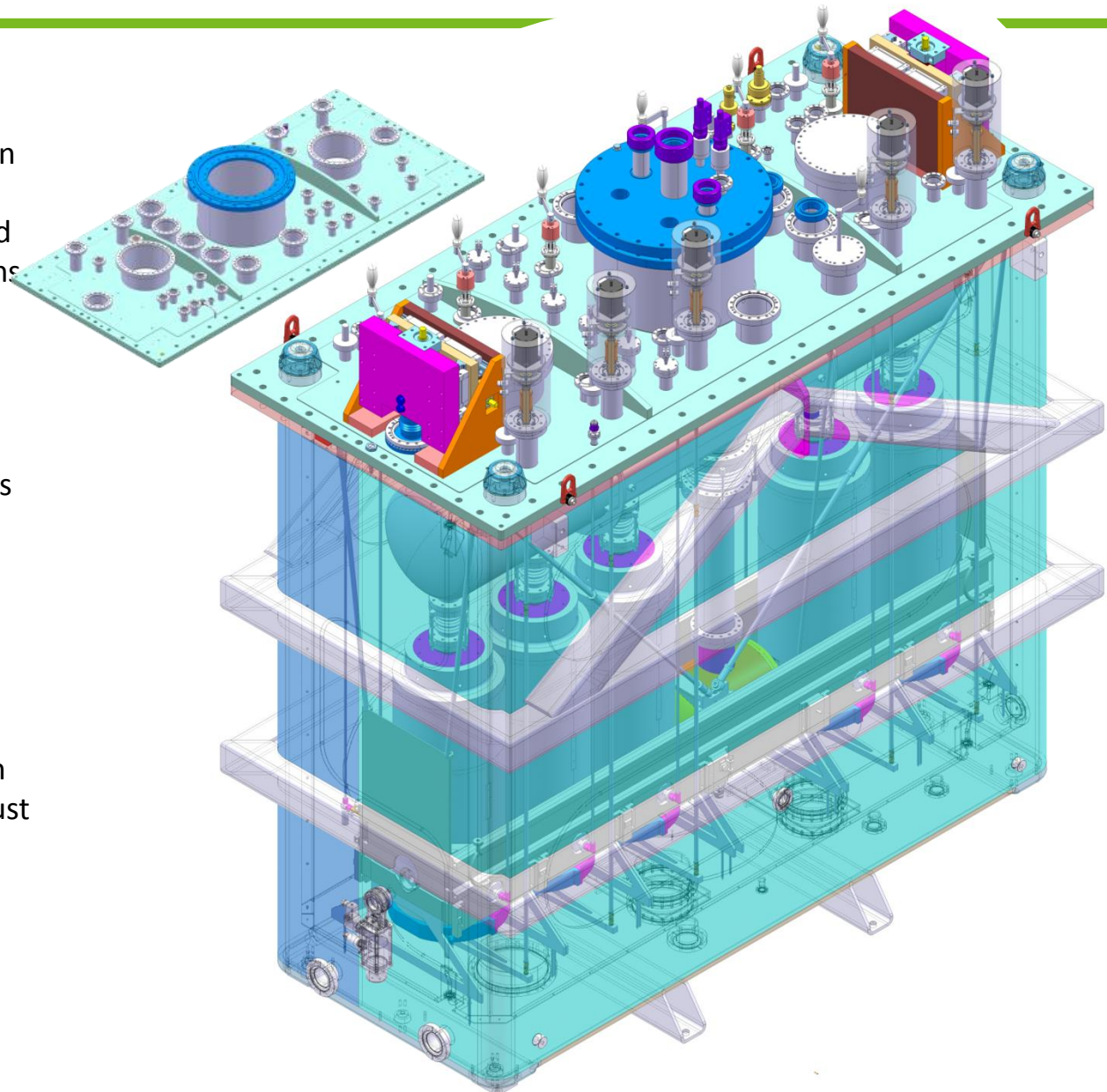
Superconducting Solenoid



- Design was revised in June to cope with differential thermal contractions during cool down transients
- Final Design Report
- Company working on manufacturing drawings and tooling (mandrel, etc.)
- Winding started in November
- First solenoid delivery foreseen end February 2014
- Second end March 2014

Cryomodule assembly

- Vacuum vessel (leading item): tendering process is complete. On 21/10/2013 visiting the (lowest bidder) company. Contract placed on Nov.6th ; delivery: T₀+ 6 months (end May 2014)
- Helium vessel: same stage as vacuum vessel, longer manufacturing times
- Thermal shield: detailed drawings being checked → price inquiry by end November
- Suspension system: design completed and reviewed 6 November. Detailed design and specification by the end of year; price inquiry. Present plan to sign contract in February 2014 for a just in time delivery in May
- Support adjusters: two systems passed acceptance tests, will be delivered at CERN next month.



SM18 infrastructure: clean room

- Status of clean room:
 - Rail installed and precisely positioned
 - Ground prepared
 - Clean room mounting almost finalized



Cryomodule assembly in clean room

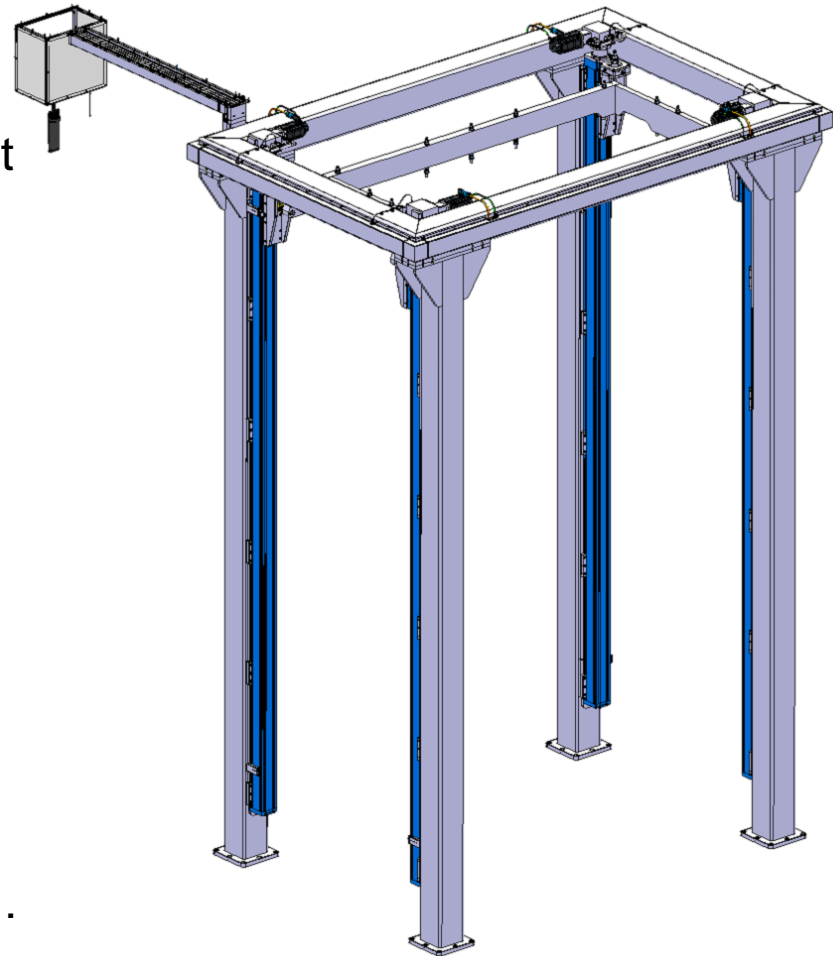
Assembly **procedures** being worked out in weekly meetings TE-MSC/ BE-RF

Tooling being designed, main items:

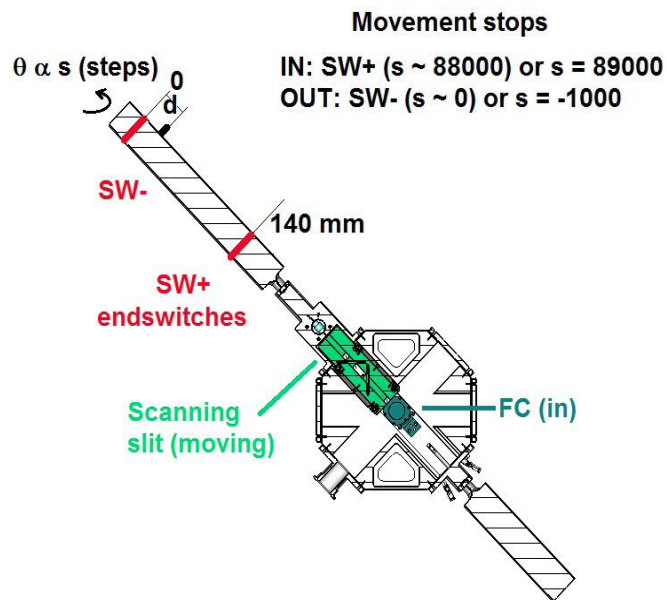
- Class 100 lifting device: starting fabrication
- Insertion table: at conceptual design stage
- More tools needed

Urgent issue with **manpower** for the clean room work proper.

Acknowledged by CERN management...



Failure of the prototype short DB



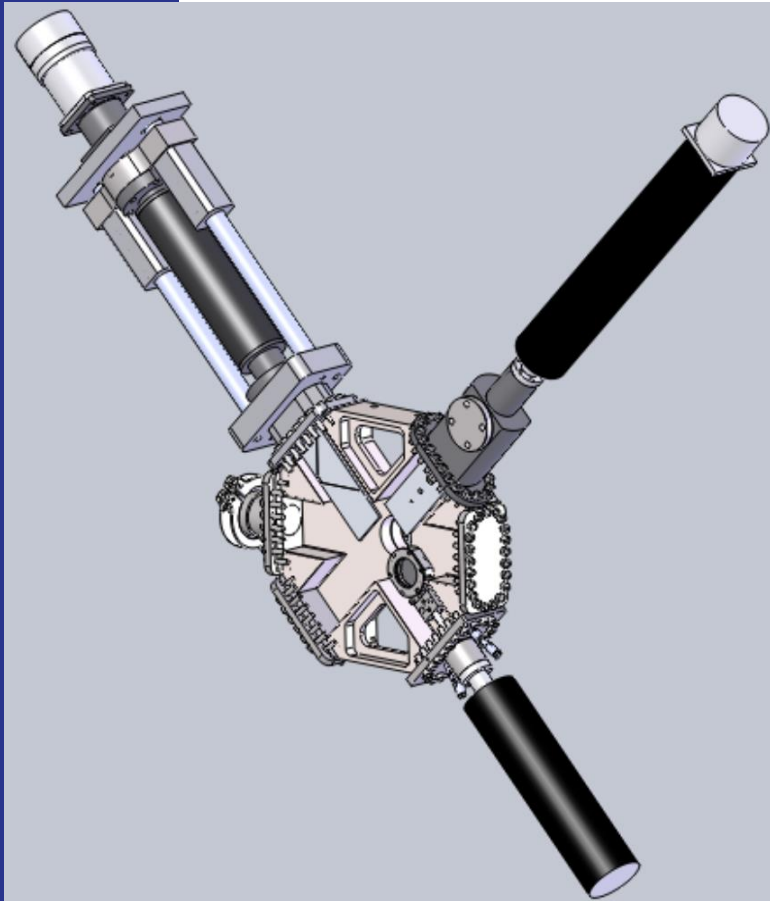
History log of the experimental test done with the HIE DB:

- 20 August 2012: Installation of HIE DB in REX-ISOLDE Hall
 - From 20 August 2012 to 5 February 2013: Experimental measurements with stable beams ($A/q = 4$ and $A/q = 3.5$); mainly Faraday cup test but also beam profile measurement including movement of the scanning slit (during this period, about 100 IN-OUT scans of the scanning slit were performed).
 - 8-9 April 2013: Tests of the scanning slit software, approx. 350 IN-OUT cycles.
 - 10-15 April 2013: Stress test of the scanning slit mechanism (run of 1340)
- Total number of IN-OUT cycles of the scanning slit mechanism: approx. 1800.

HIE-BDB-TN-0001 (edms# 1284254)



Beam Instrumentation



New design with external actuators

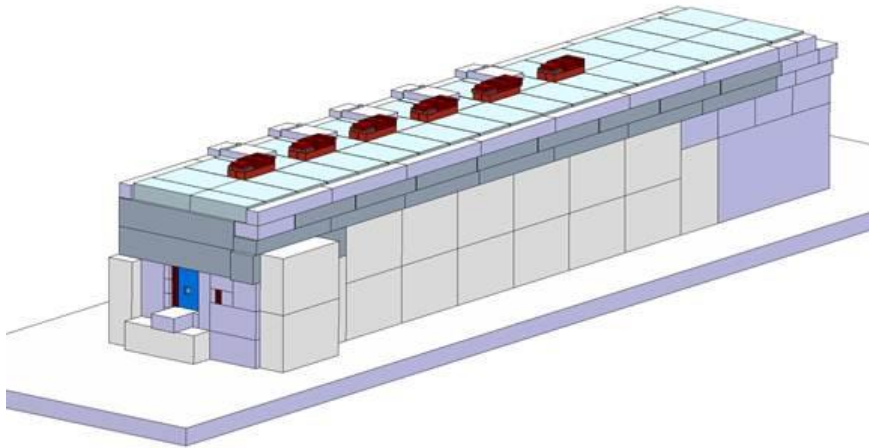
The concept of an external actuator was tested successfully at CERN

Contract with AVS has been signed for Short Diagnostic Boxes → 6 SDB boxes by August 2014

Supply T0=contract date. T1=Slit prototype acceptance	Latest Delivery dates
Revised manufacturing drawings	8 November 2013
Test of the scanning slit linear motion at AVS	T0+9 weeks (15 January 2014)
Batch of prototype short diagnostic box	T1+7 weeks (5 March 2014)
Batch of three series short diagnostic boxes	T1+31 weeks (6 August 2014)
Batch of two optional series short diagnostic boxes, if option taken up by CERN	T1+31 weeks (6 August 2014)
Batch of two optional spare short diagnostic boxes, if option taken up by CERN	To be advised

Tendering for Long boxes (LDB) needed in the transfer lines will start by end of this year

- ✓ Shielding Study Achieved thanks to **S.Giron** – Installation on going
 - Design Objective **1 $\mu\text{Sv/h}$** outside tunnel (80 cm on side – 40 cm on top)
 - Conservative approach used (900 KeV and all cavities conditioned in parallel)
 - Radioprotection Monitors around tunnel defined



TO BE DONE

- Design report of the Shielding – On going
- Minor points to be confirmed (doors, tranches loses , up-beam part of the shielding) - Ongoing

✓ Two items were labelled as very important and therefore require the necessary attention:

- the insulation vacuum rupture disc that has no exhaust to the outside of the LINAC tunnel
- the dose rates for loss of different beams and/or the use of the diagnostic boxes that in some cases can lead to dose rates that are an order of magnitude higher than the present classification of the zones allows for.

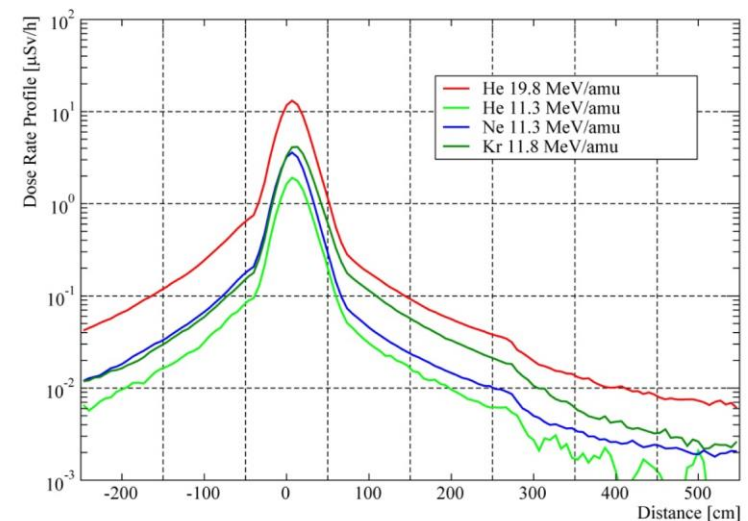
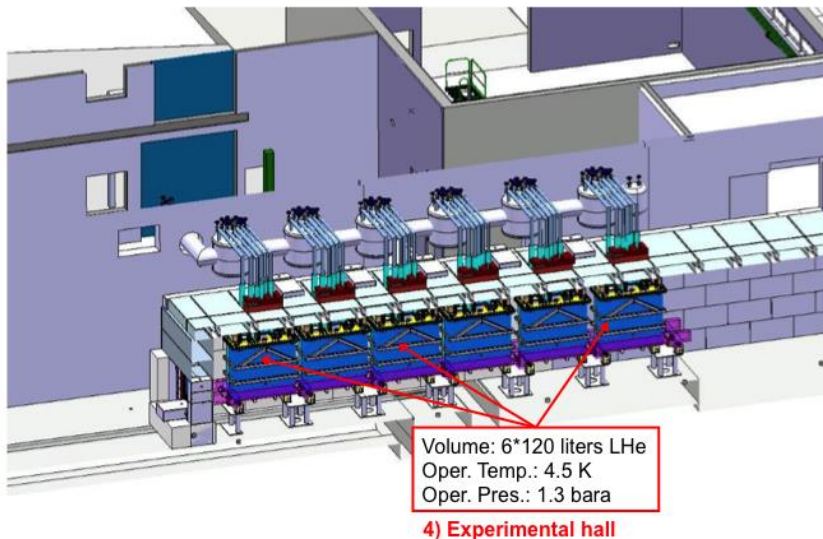


Figure 1: The dose rates for a 1 ppA loss in a dipole.

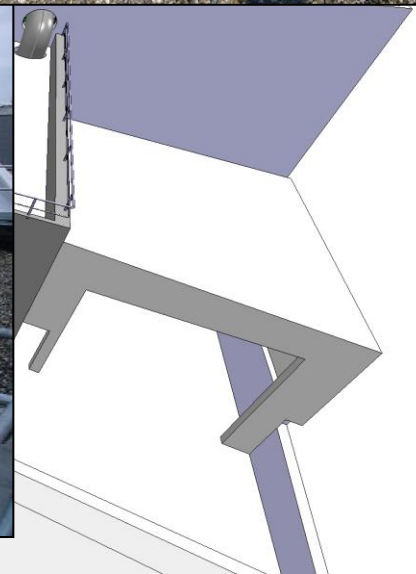
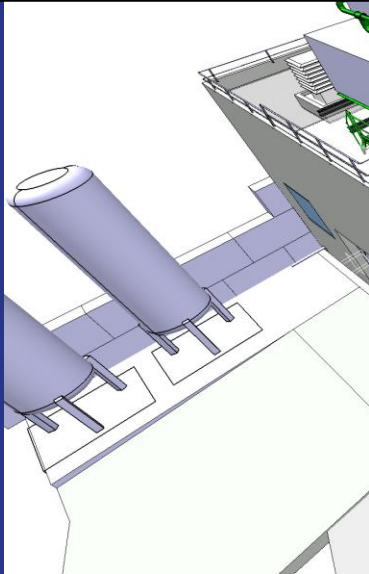
TO BE DONE

- Re-evaluate, as first priority, all means to guide the exhaust from the insulation vacuum rupture disc to the outside of the tunnel – On going
- Draw up a clear table of operational modes and ions species with intensities and energies required and evaluate the resulting dose rates. – Ongoing

HIE ISOLDE installation works



Outdoor progress



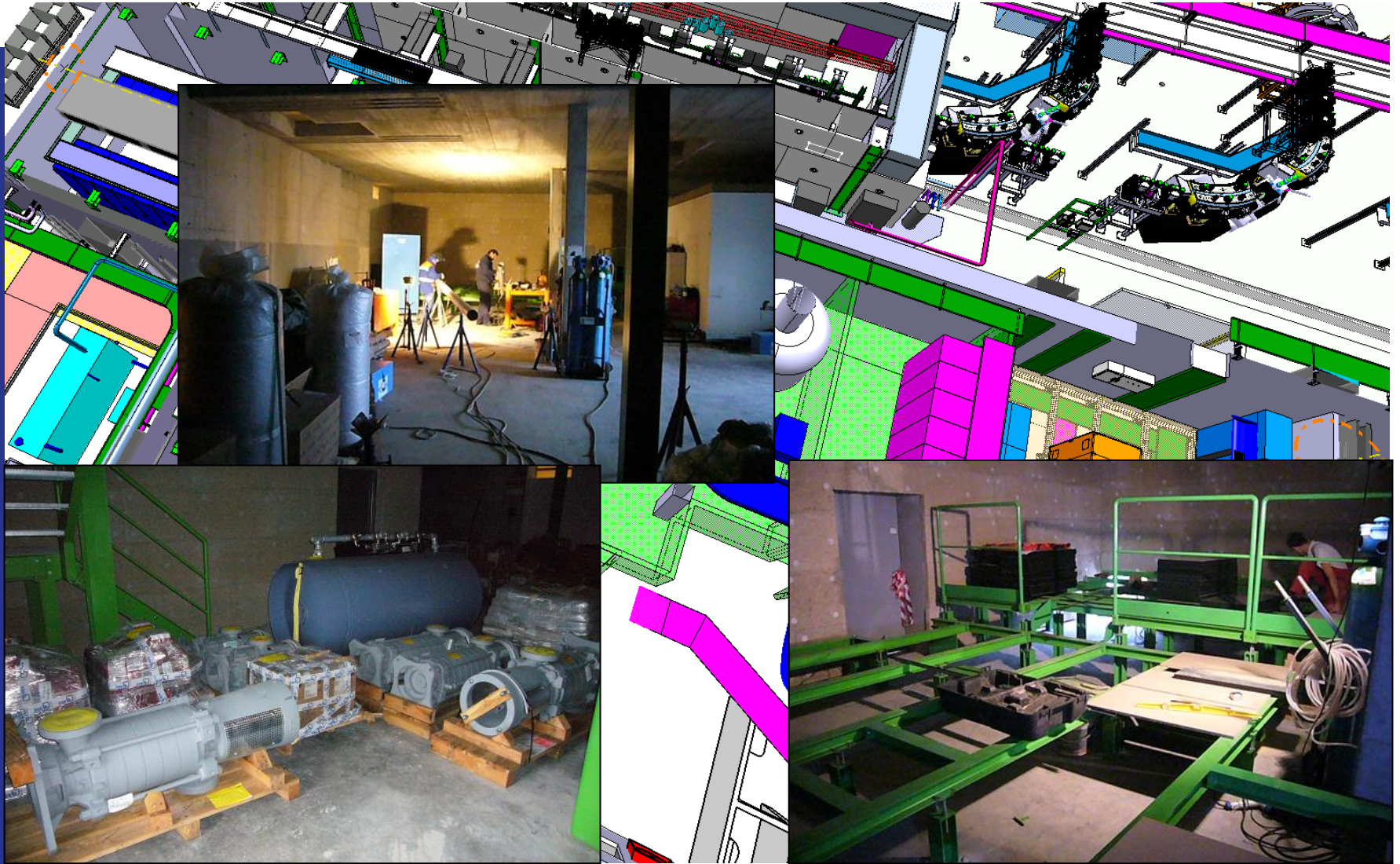
Cooling & ventilation:
Cooling towers, Chillers and a large part of the tubing is in place

Compressor building 198



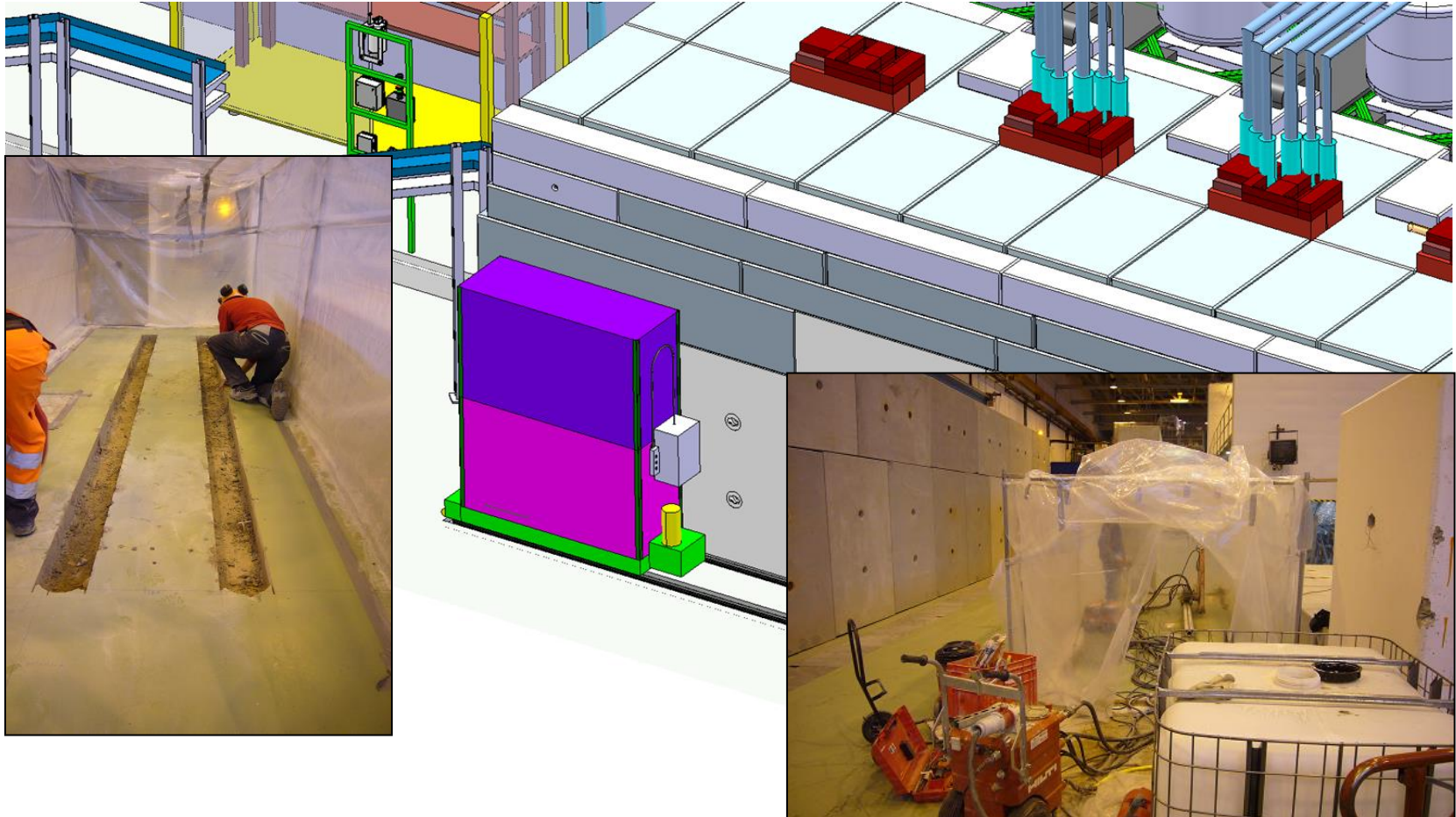
Cooling & ventilation and EL systems:
Steel structures, Ventilation Unit, Electrical cabinets, Pumps and Piping
in place as well as large parts of the ducts and cable trays

Cold Box building 199

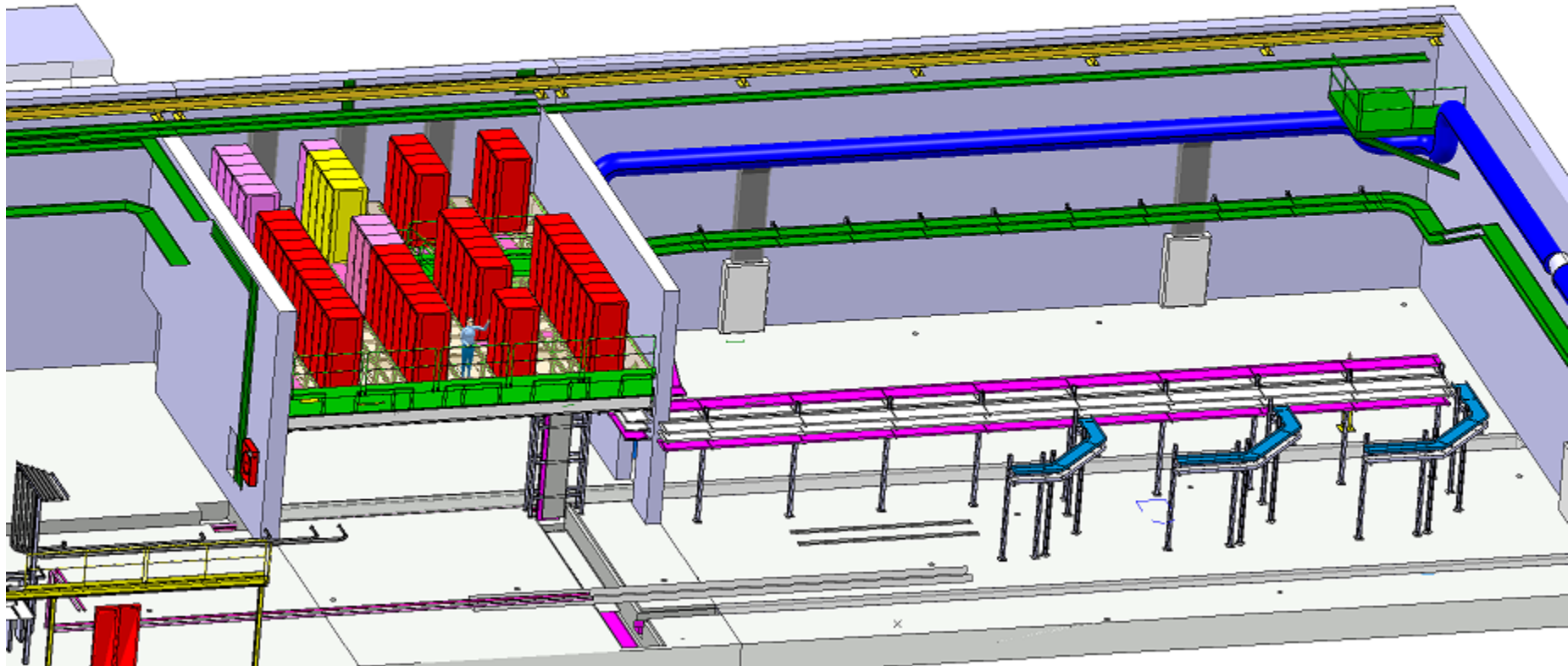


EL systems ground floor:

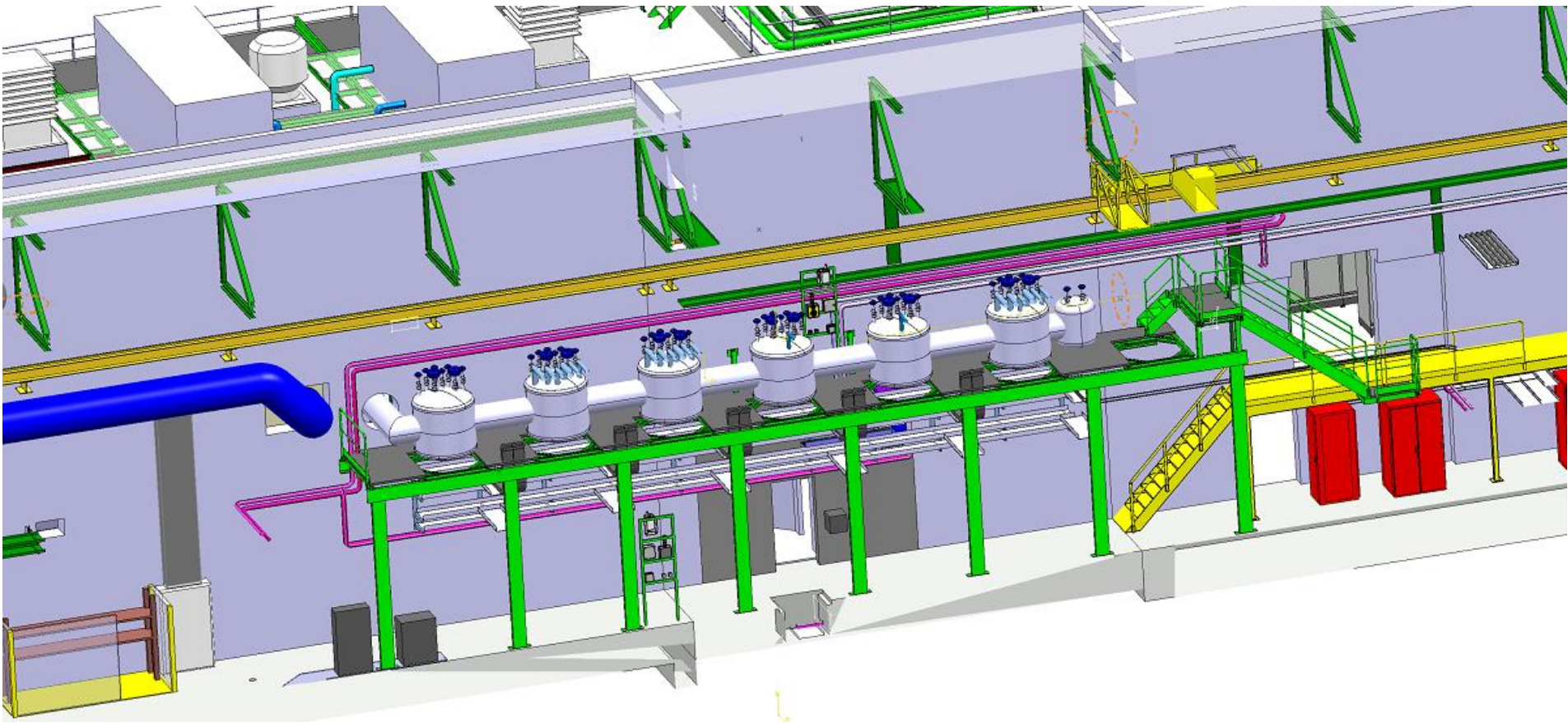
False floor structure in place for the 3.3kV (Compressors power)



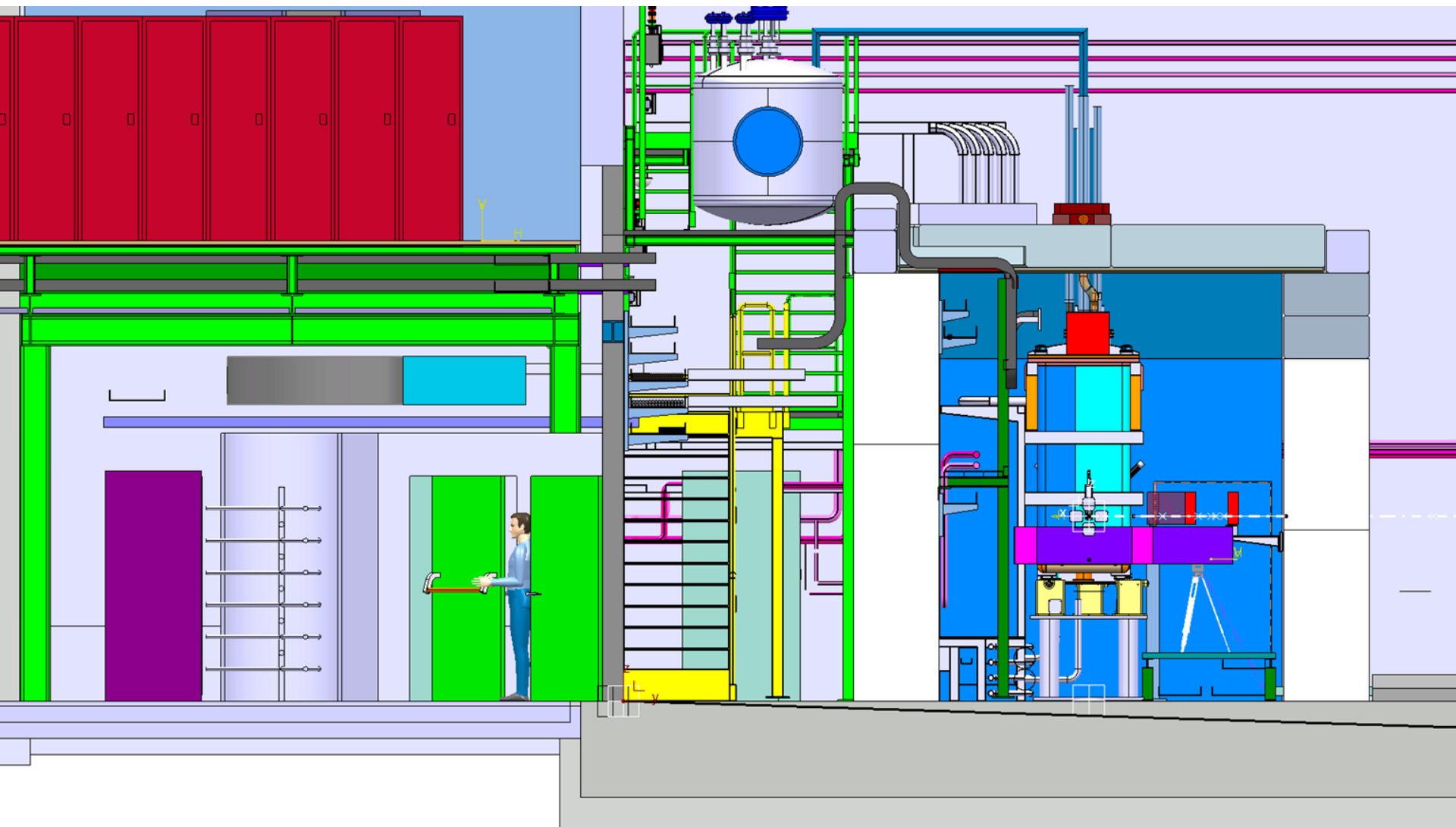
ISOLDE hall 170: Civil engineering
Installation of the shielding door rails



Cable trays buildings, tunnel and HEBT: Nov 2013 – March 2014



Platforms Cryo Jumper Boxes: To be in place early 2014



Tunnel structure and infrastructure installation to start early 2014

Conclusions (1/2)

- Technical Activities: progress is tangible on most of the machine parts => however one has to carefully monitor the following items:
 - ✓ Series cavity production
 - ✓ Tuning system procurement
 - ✓ Procurement of CM parts and instrumentation
 - ✓ Tooling for clean room assembly
 - ✓ Cryogenics for SM18 test
 - ✓ Transport solutions
 - ✓ Reliability issues
 - ✓ Safety
- Installation Works: High activity in the hall and service buildings; Despite delays we are still in line with the overall schedule which aims for low energy physics during 2014 and HIE physics as of Oct 2015. Critical paths for some activities are being addressed (cryogenics & cryomodule assembly)

Conclusions (2/2)



Safety:

- ✓ Shielding study finished – Report under preparation
- ✓ Beam losses and dump study to be finished
- ✓ CFD simulations of He leaks done by EN/CV have helped to discuss the access to the tunnel during steady state
- ✓ Safety folder => Demonstrative part to be finished
- ✓ Safety review carried out on November 6th 2013



Budget & Planning: consolidation ongoing

Acknowledgement

- BE/OP : E.SIESLING and D. VOULOT
- BE/RF : W. VENTURINI DELSOLARO
- EN/STI : A.-P. BERNARDES and R.CATHERALL
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