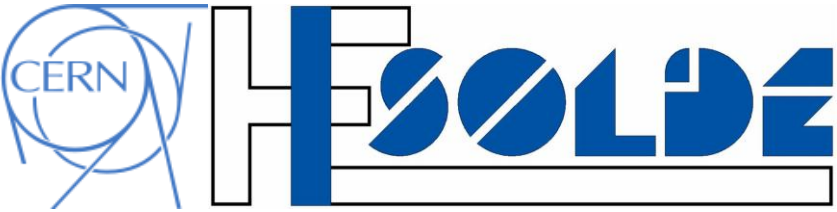


HIE-ISOLDE Status Report

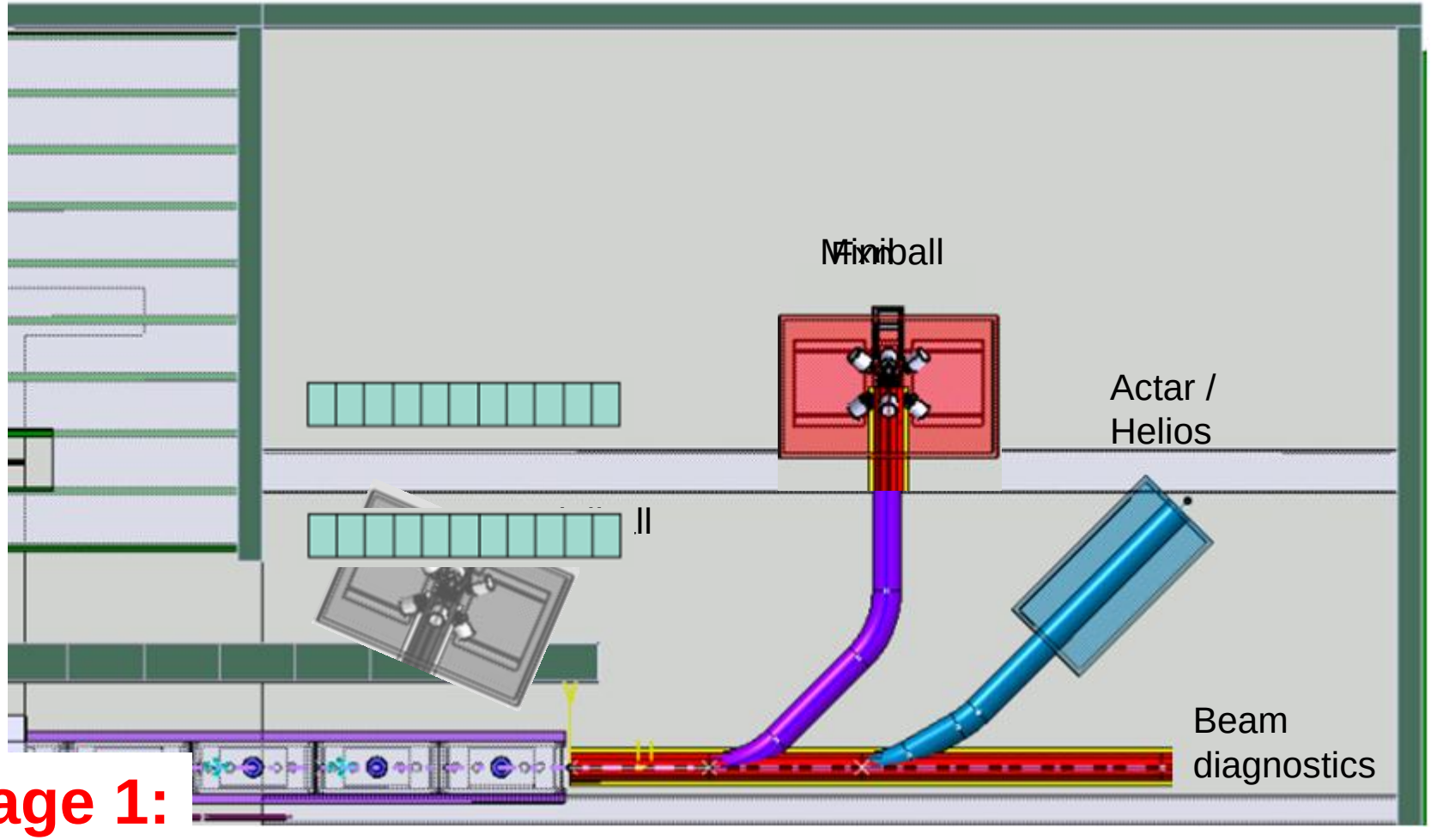
Yacine Kadi on behalf of HIE-ISOLDE project team

ISOLDE Annual Workshop, 5 December 2011

Outline

- **Main Highlights & R&D Activities**
- Project Schedule
- Budget Review + Resources
- Int. Collaboration
- Outlook

Stage Installation

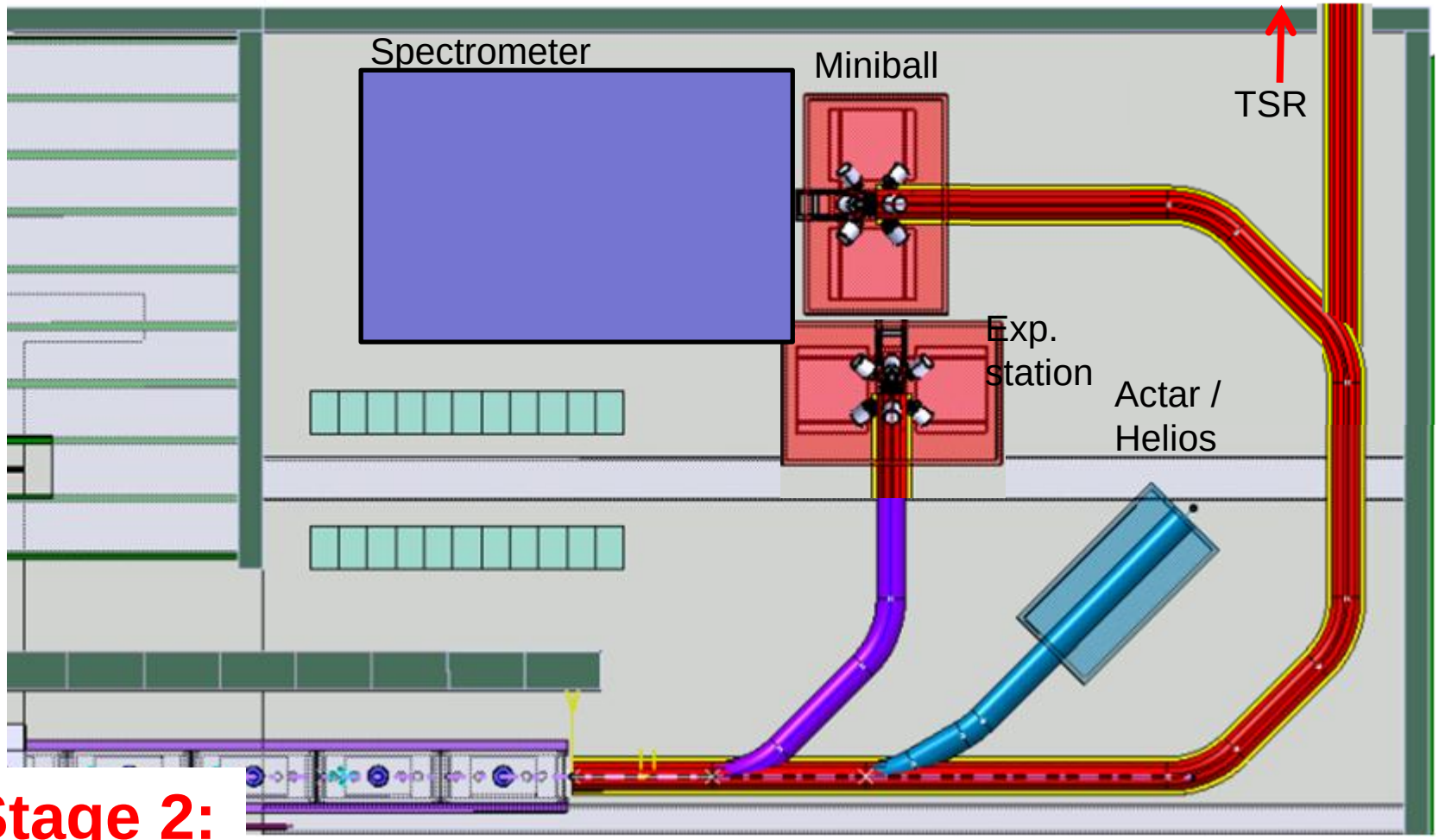


Stage 1:

Straight line with 2 branches – Oct 2013 - Sept 2014

Miniball move: Oct 2013 – April 2014

Staged Installation



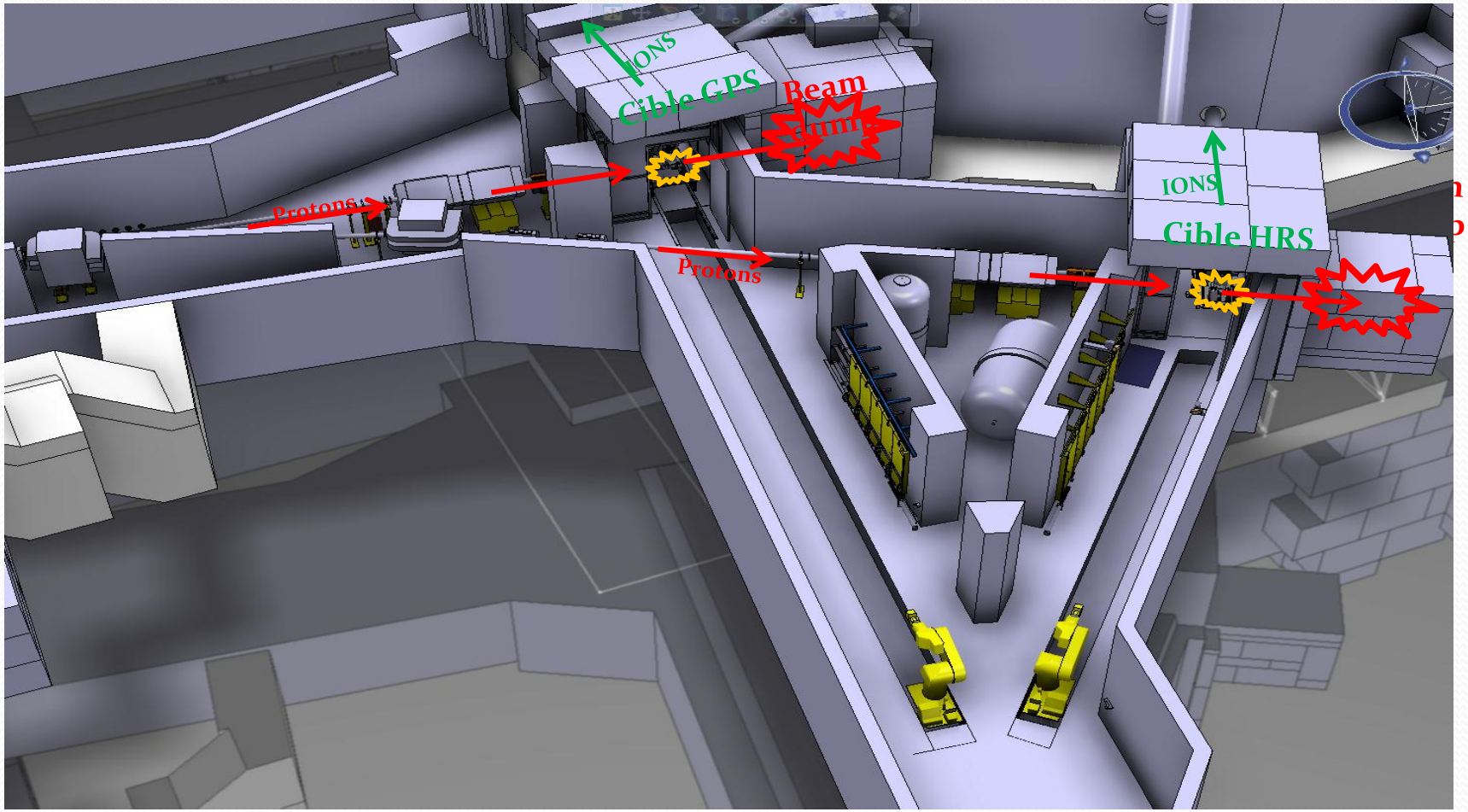
Stage 2:

Stage 3:

TSR and beyond..

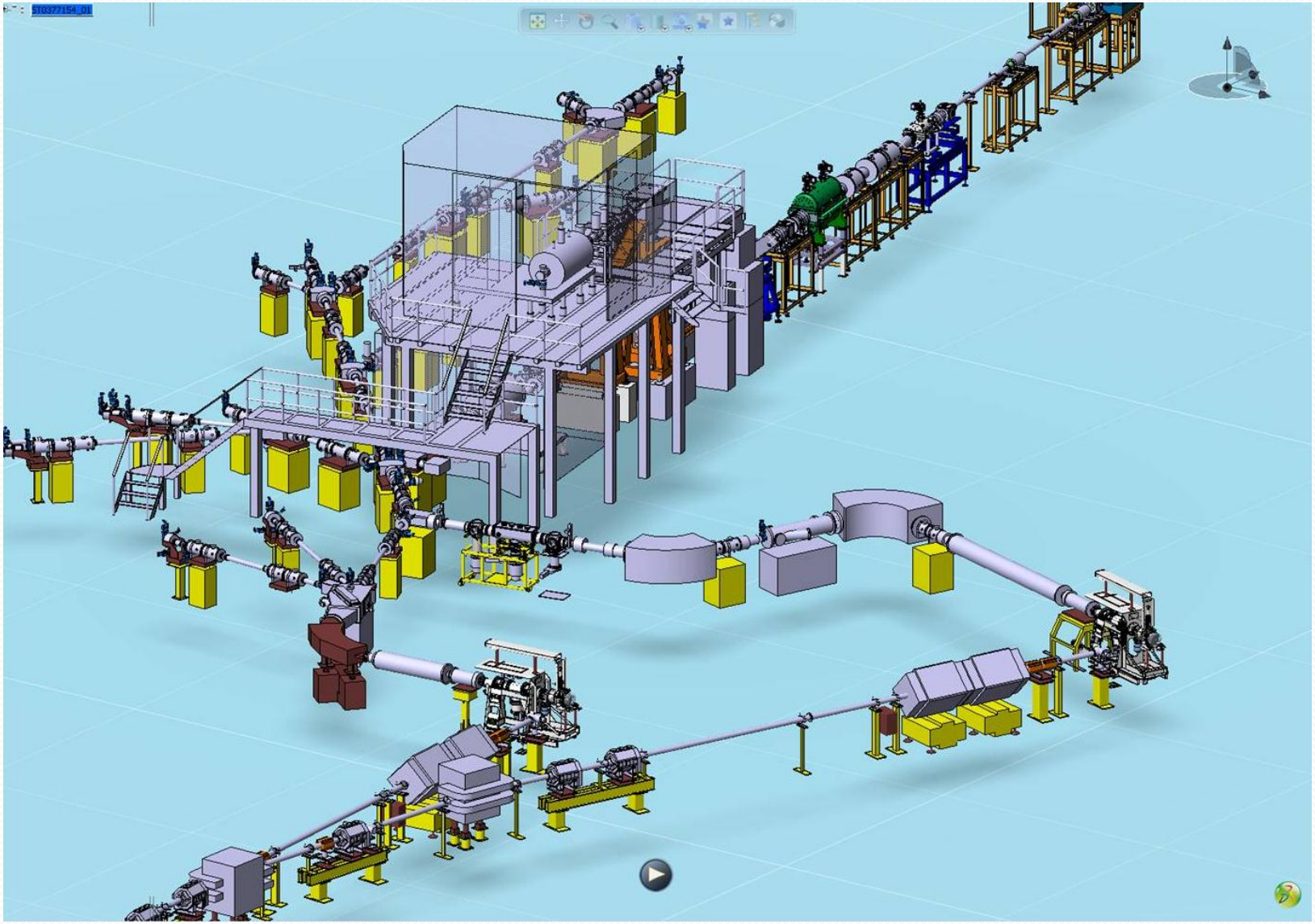
I Spectrometer installation

Intensity Upgrade



2 GeV & 5.3uA RCS no longer applicable

Beam quality



Main Highlights

- Dismantling and relocation of "hangar à camion" over => start of civil engineering work at ISOLDE
- Invitation for Tenders are being launched
  - Cryogenic Plant
  - HVAC System
- Market surveys are being launched
  - Cooling System
  - Cryomodule vessel and support
  - Cavity adjustment mechanism
  - Cavity substrate
  - SC solenoids
  - Clean room at SM18

R&D Activities

- **Pre-series High-Beta Cavity**
- High-Beta Cryomodule Design
- RF Measurements & Sputtering Developments

⇒ Detailed presentations at 7th HIE-ISOLDE Steering Committee meeting:

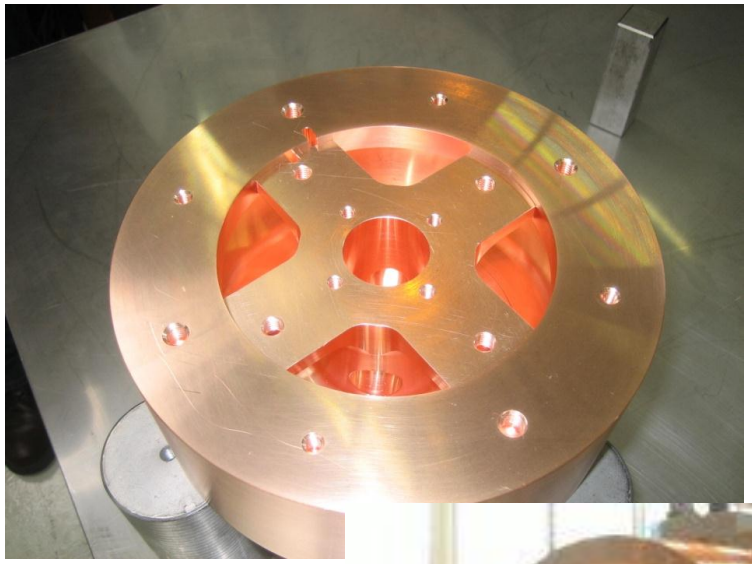
https://indico.cern.ch/conferenceDisplay.py?confId=159608

Superconducting RF cavity (by O. Capatina EN/MME)

- Design high- beta cavities – NEW VERSION
  - Material: Cu-OFE 3D forged
  - Manufacturing technique for serial production: 3D machning, EB welding
    - Reduces considerably the number of critical welds
    - No annealing
    - Repetitive precision of beam ports
  - By design
    - Reduce sensibility to pressure fluctuation
    - Increase final precision with no need of plastic deformation
    - The same external envelope as the old design

Superconducting RF cavity (by O. Capatina EN/MME)

- Manufacturing high- beta cavities – NEW VERSION
  - One prototype of the “new version” manufacturing ongoing
    - Concept validation by calculations and tests



R&D Activities

- Pre-series High-Beta Cavity
- **High-Beta Cryomodule Design**
- RF Measurements & Sputtering Developments

⇒ Detailed presentations at 7th HIE-ISOLDE Steering Committee meeting:

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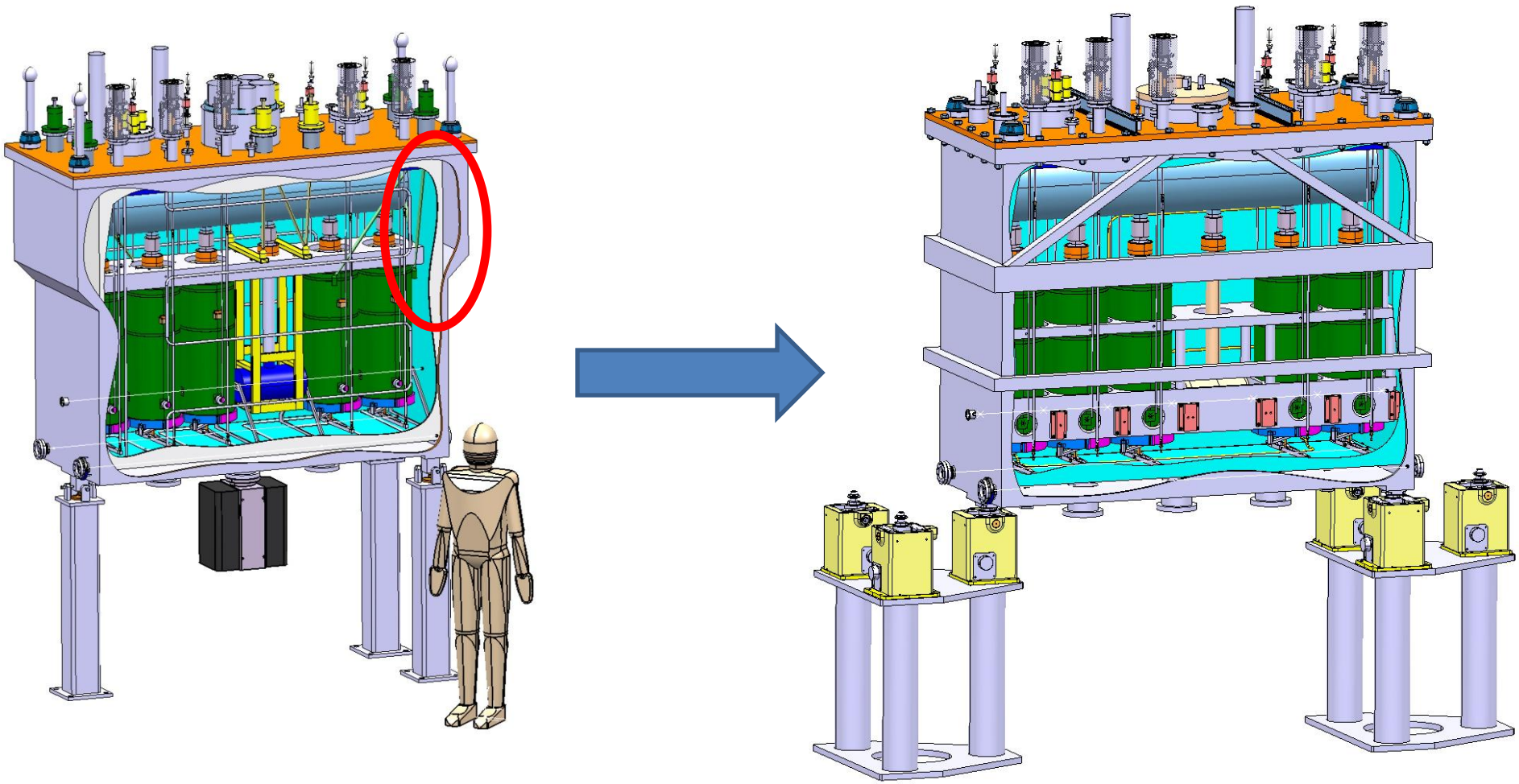
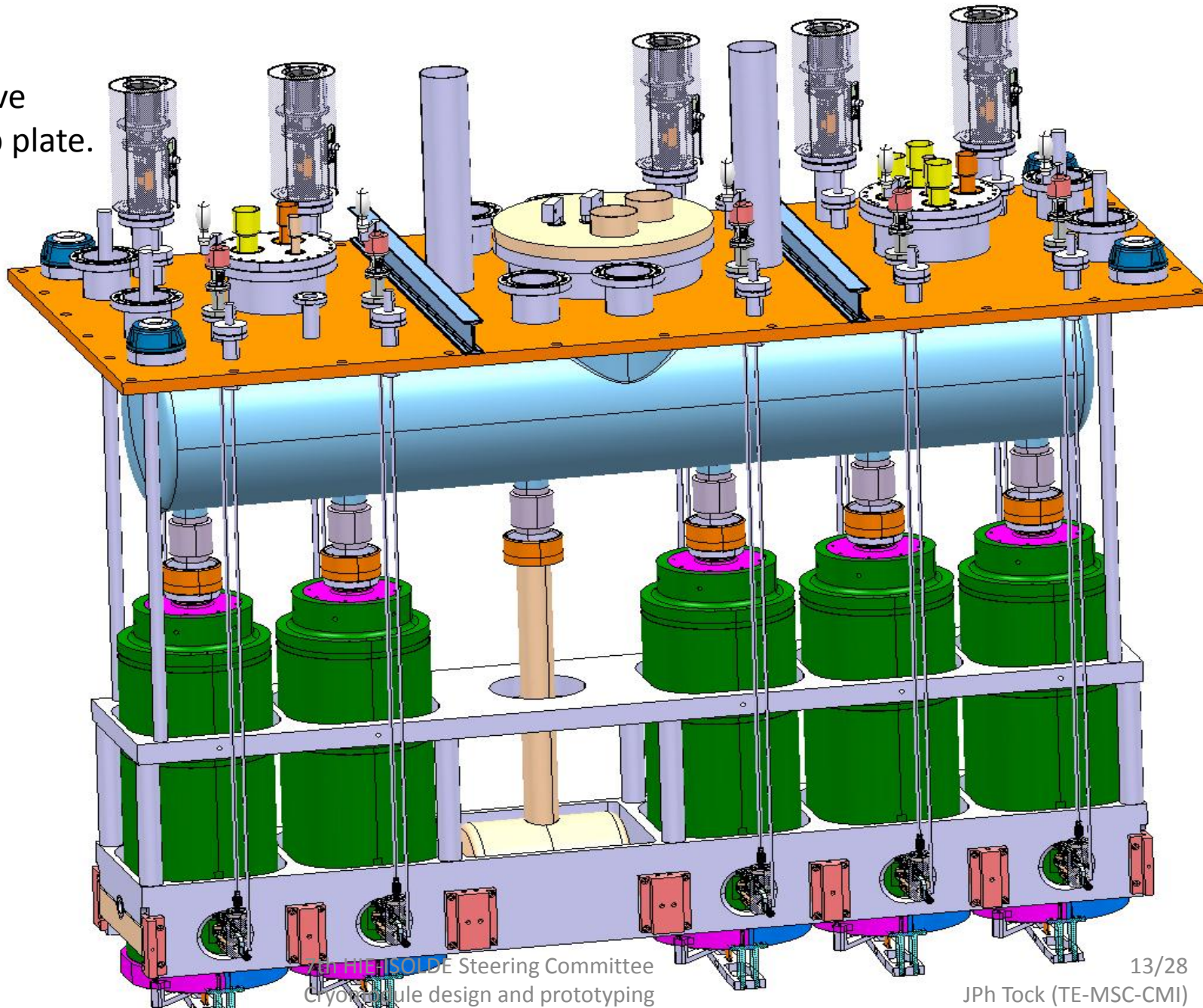
The HIE-ISOLDE cryomodule: the vacuum vessel (2/3)

Shape simplified thanks to optimisation of the inner components

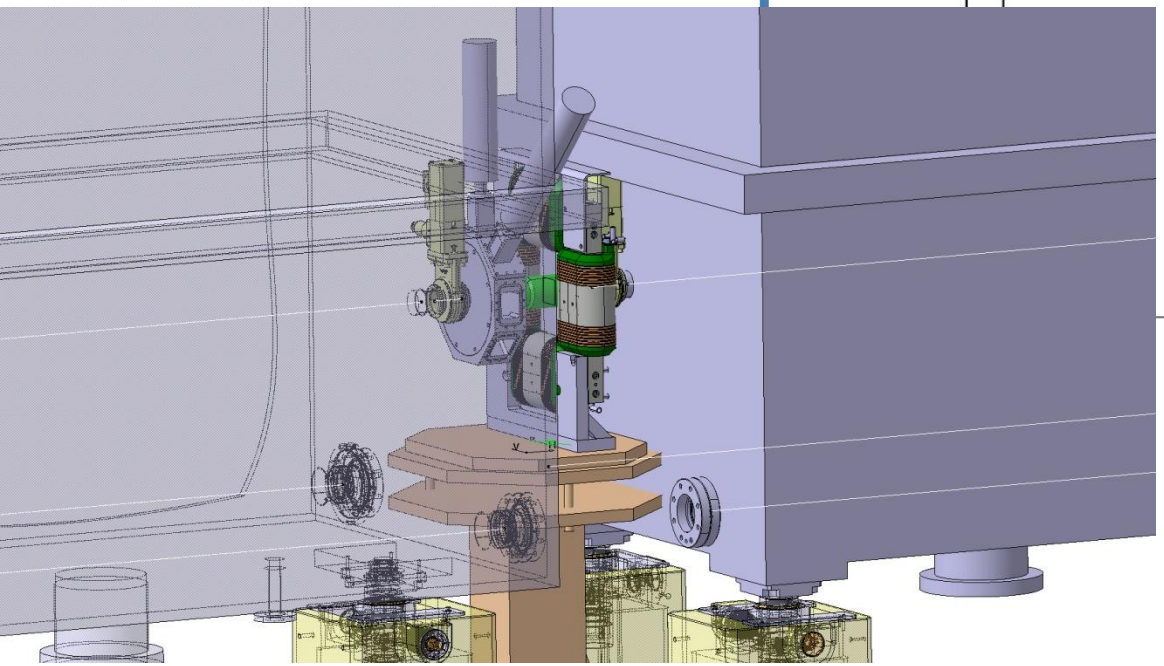


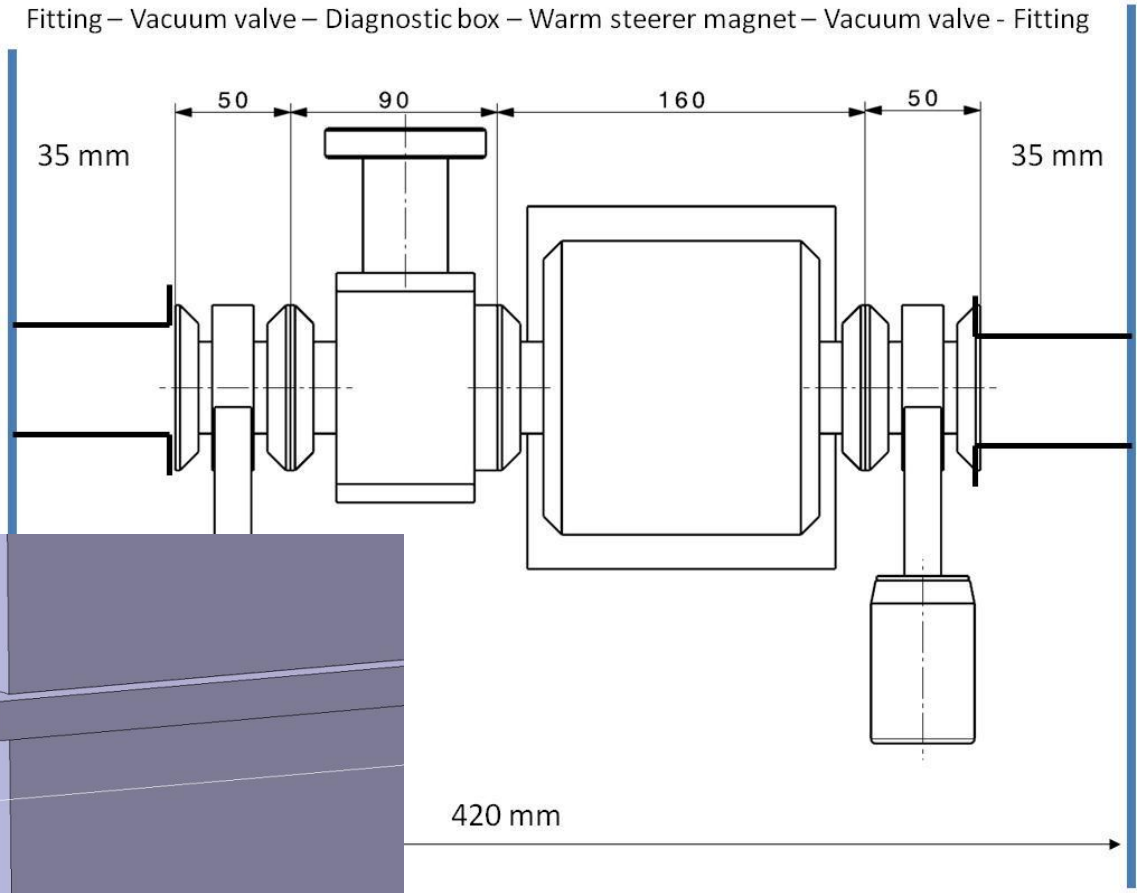
The HIE-ISOLDE cryomodule: Top plate

All services arrive through the top plate.



The HIE-ISOLDE cryomodule: Interconnection module





The HIE-ISOLDE cryomodule: Cleanroom (O Brunner BE/Rf)

Specification available

Cryomodule assembly procedure definition started

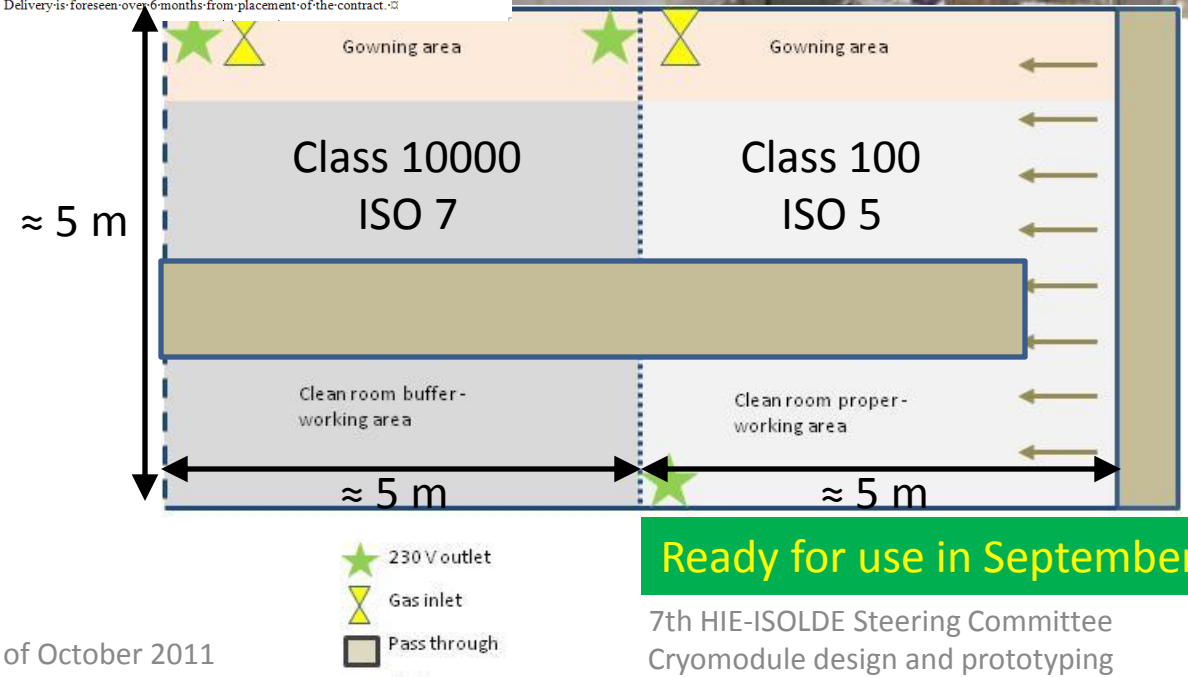
The·HIE·ISOLDE·Project¤ Original:·English

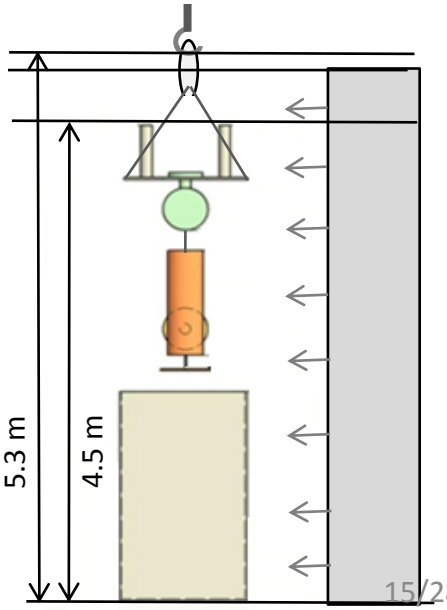
Invitation·to·Tender¶

Technical·Specification·for·the·Supply·of·a·Clean·Room·Facility·for·the·assembly·of·the·HIE·Isolde·Cryomodules¤

Abstract¶

This·technical·specification·concerns·the·supply,·delivery·and·installation·of·a·Clean·Room·Facility,·consisting·of·the·Clean·Room·Proper·and·a·Clean·Room·Buffer,·for·the·assembly·of·the·HIE·ISOLDE·cryomodules·in·SM18.¶ Delivery·is·foreseen·over·6·months·from·placement·of·the·contract.·¤

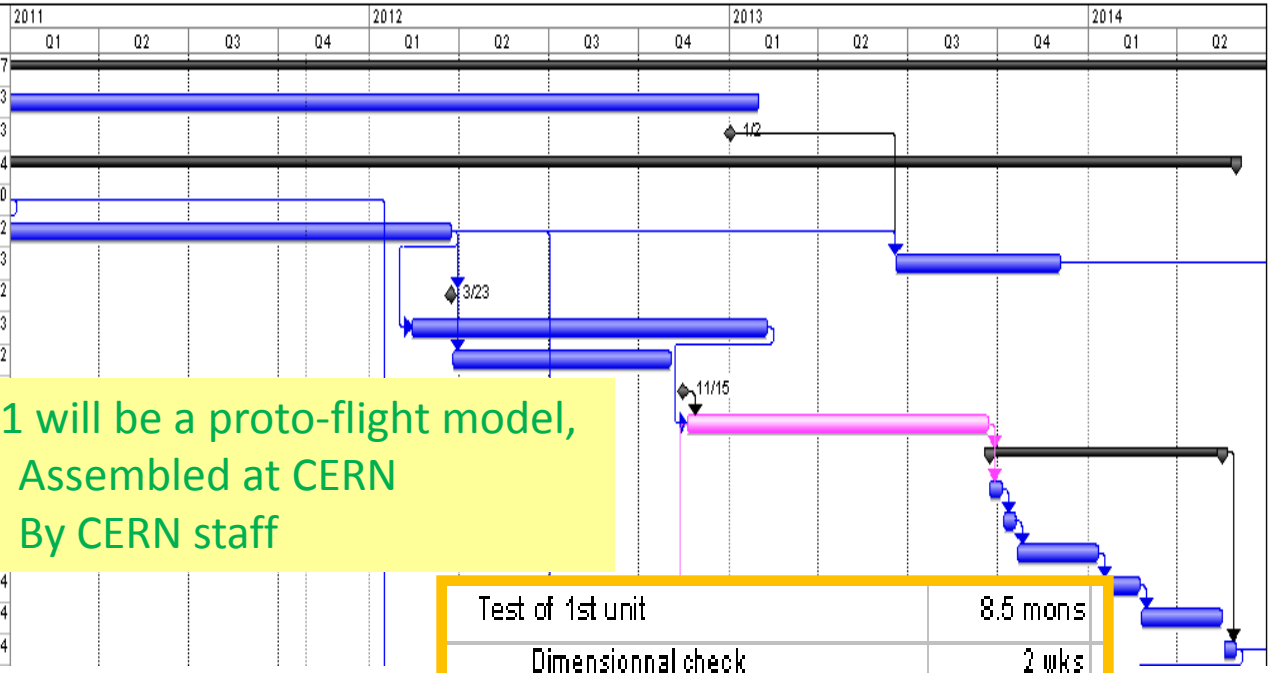




Ready for use in September 2012

Planning: Details of cryomodule 1 (proto)

ID	Task Name	Duration	Start	Finish
1	Cryomodule	96 mons	3/1/10	7/7/17
2	Fellowship	653 days	8/2/10	1/30/13
3	OK for low B	0 mons	1/2/13	1/2/13
4	First unit (Proto)	55.5 mons	3/1/10	5/30/14
5	Finalise concept	11 mons	3/1/10	12/31/10
6	Cryomodule detailed design	19 mons	10/11/10	3/23/12
7	Low B design update	6 mons	6/19/13	12/3/13
8	Cryomodule design review	0 mons	3/23/12	3/23/12
9	Procurement for 1st unit	260 days	2/13/12	2/8/13
10	Tooling development	8 mons	3/26/12	11/2/12
11	Cleanroom commissioned	0 mons	11/	
12	Assembly of 1st unit (proto)	11 mons	11/	
13	Test of 1st unit	8.5 mons	9/	
14	Dimensionnal check	2 wks	9/	
15	LeakTest	2 wks	10	
16	Thermal test	3 mons	10/	
17	RF test	6 wks	1/13/14	2/21/14
18	Correction	3 mons	2/24/14	5/16/14
19	Proto Accepted	2 wks	5/19/14	5/30/14



CM 1 will be a proto-flight model,
Assembled at CERN
By CERN staff

Test of 1st unit	8.5 mons
Dimensionnal check	2 wks
LeakTest	2 wks
Thermal test	3 mons
RF test	6 wks
Correction	3 mons

<u>Vacuum vessel (long lead item) including top plate</u>

Dec 2011: Design completed

Jan 2012: MS sent out / 1unit + 1 in option

March 2012: Cryomodule detailed design review

Nov 2012: Start of assembly in cleanroom / All components available

Sep 2013: Cryomodule 1 assembled

May 2014: CM available for installation including 3 months allocated for corrective actions

`

! Cryo shutdown in SM18 not taken into account !

Back-up: thermal test with thermal models

R&D Activities

- Pre-series High-Beta Cavity
- High-Beta Cryomodule Design
- **RF Measurements & Sputtering Developments**

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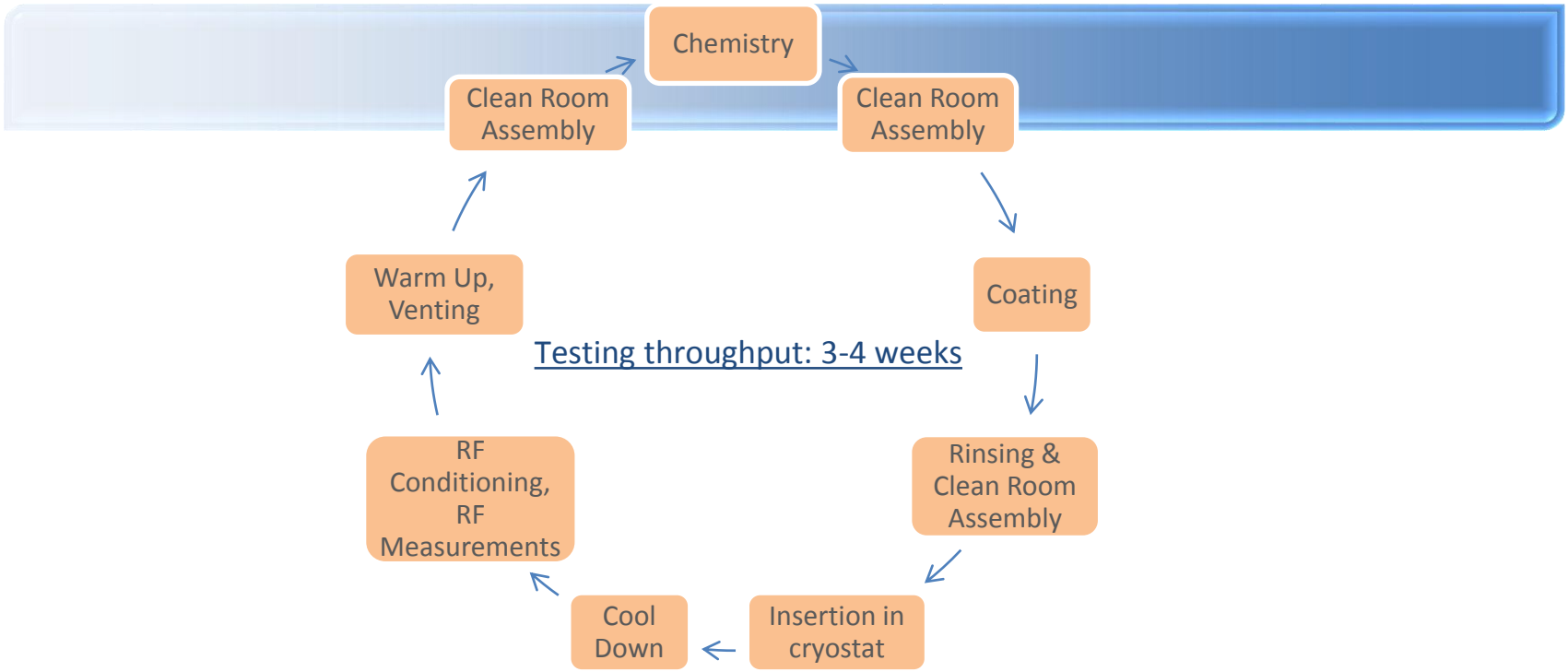
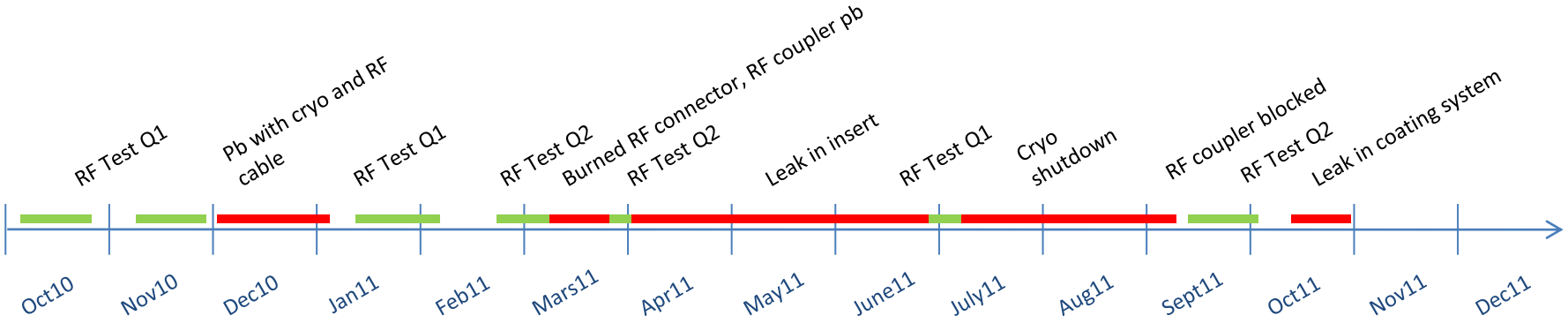
"A long and winding circle..." (O. Brunner BE/RF)

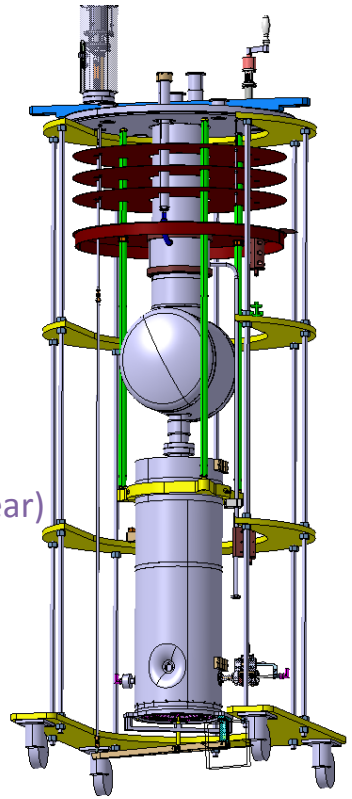




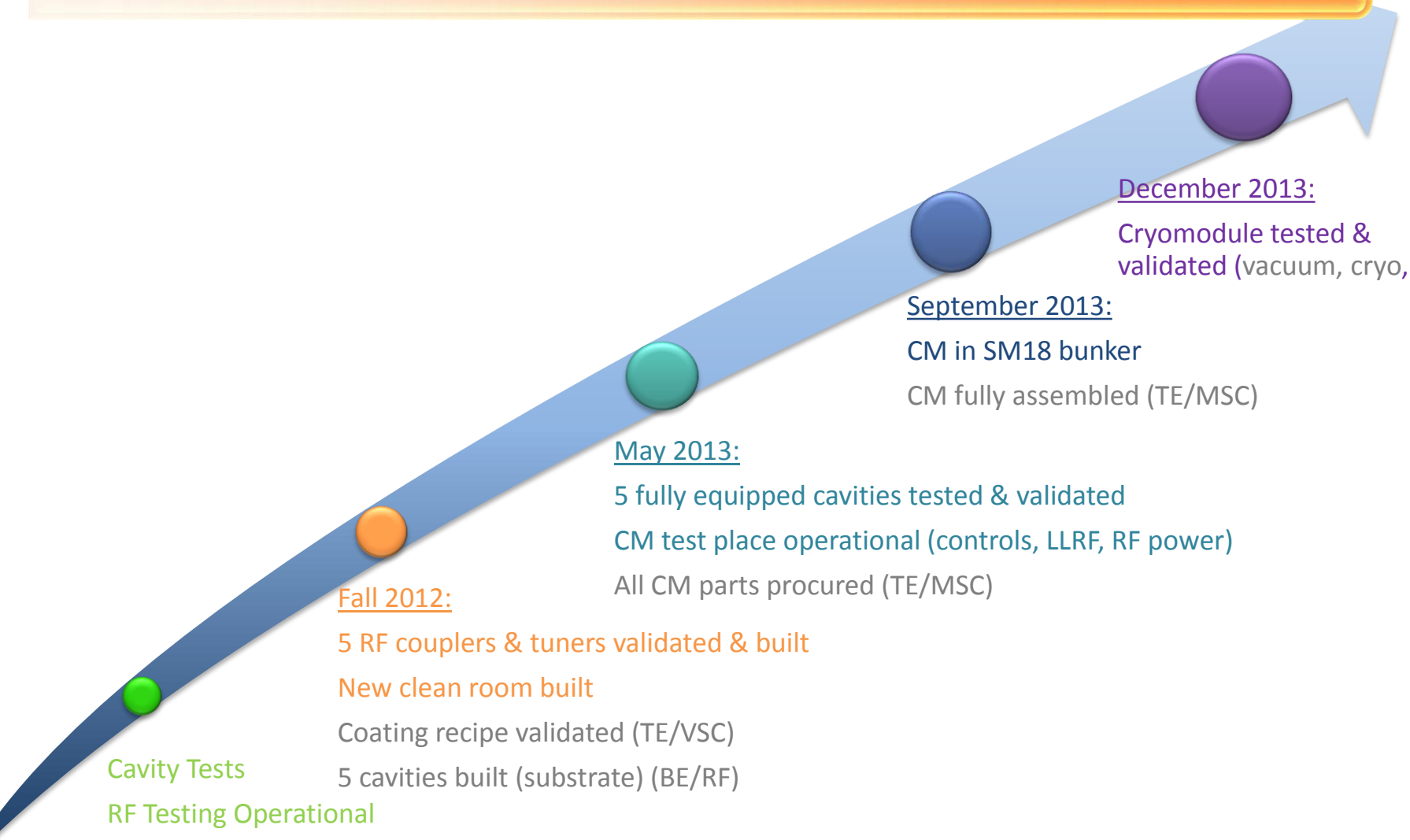
Clean room assembly & RF testing (2)

- Cryostat and vertical RF test stand
  - Cavity insert
  - Actively
- Operatio
  - Improve
    - Wa
    - Col
  - Large ef
    pressure
    - Act
    - Try
  - Cavity h
  - **Problem**
    - Dev
    - Lea

year)



Milestones



Cavity Tests

RF Testing Operational

Clean room & RF Test Protocol Established

Coating tests in progress (VSC)

Fall 2012:

5 RF couplers & tuners validated & built

New clean room built

Coating recipe validated (TE/VSC)

5 cavities built (substrate) (BE/RF)

May 2013:

5 fully equipped cavities tested & validated

CM test place operational (controls, LLRF, RF power)

All CM parts procured (TE/MSC)

September 2013:

CM in SM18 bunker

CM fully assembled (TE/MSC)

December 2013:

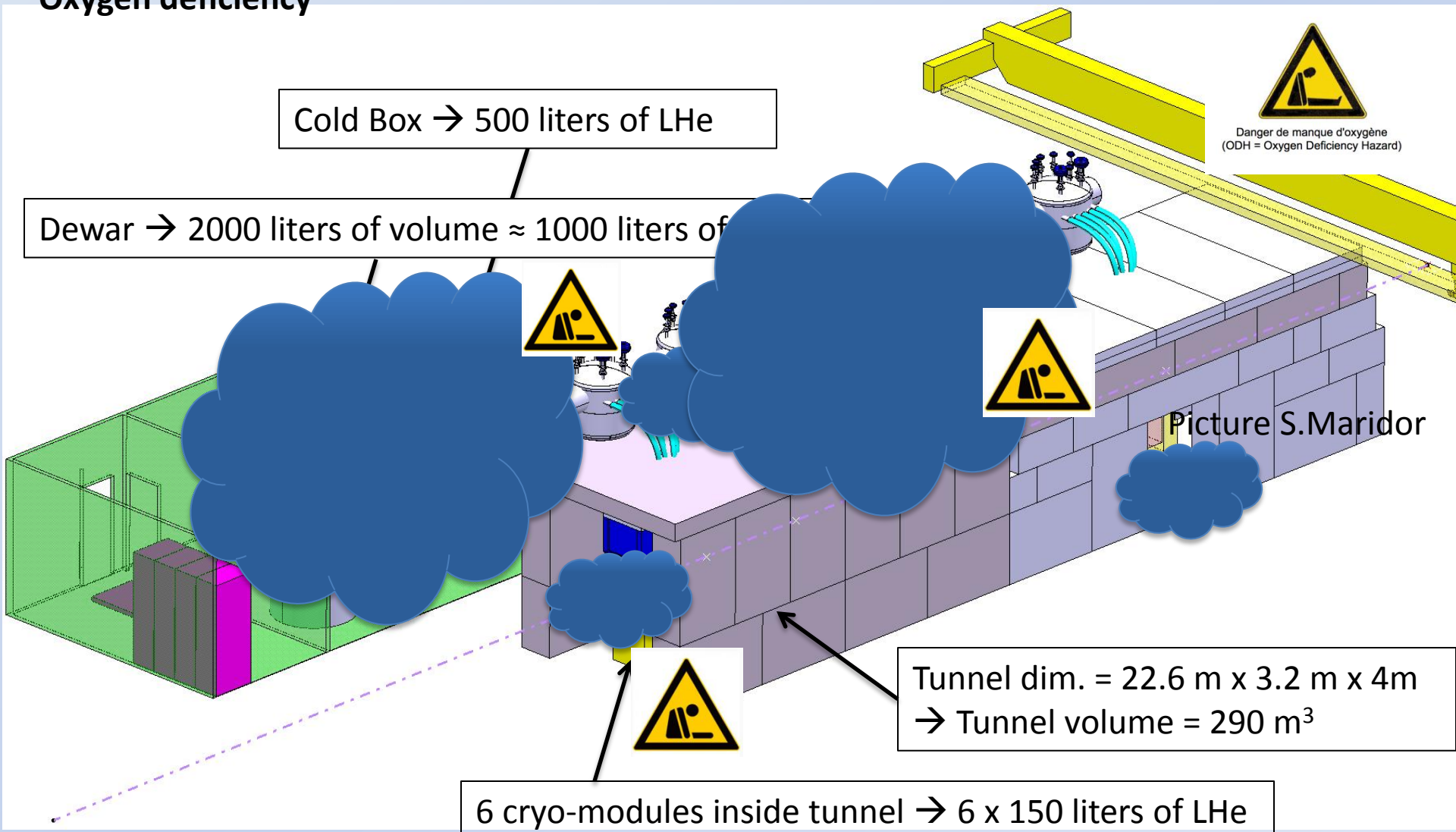
Cryomodule tested & validated (vacuum, cryo, RF)

What's next .....

- Kick-Start of the Design Study for the Intensity Upgrade
- Validation of the Beam Transfer Line Optics (TE/ABT)
  - Magnet design
  - Estimation of power converters
  - Beam diagnostics
  - CV, Vacuum, etc…
- Chopper Line Design => ECR in preparation
- IAP => 9-10 January 2012
- Cryomodule Design Review => March/April 2012
- Radiation Protection & General Safety Issues

General Safety (A.-P. Bernardes)

Oxygen deficiency



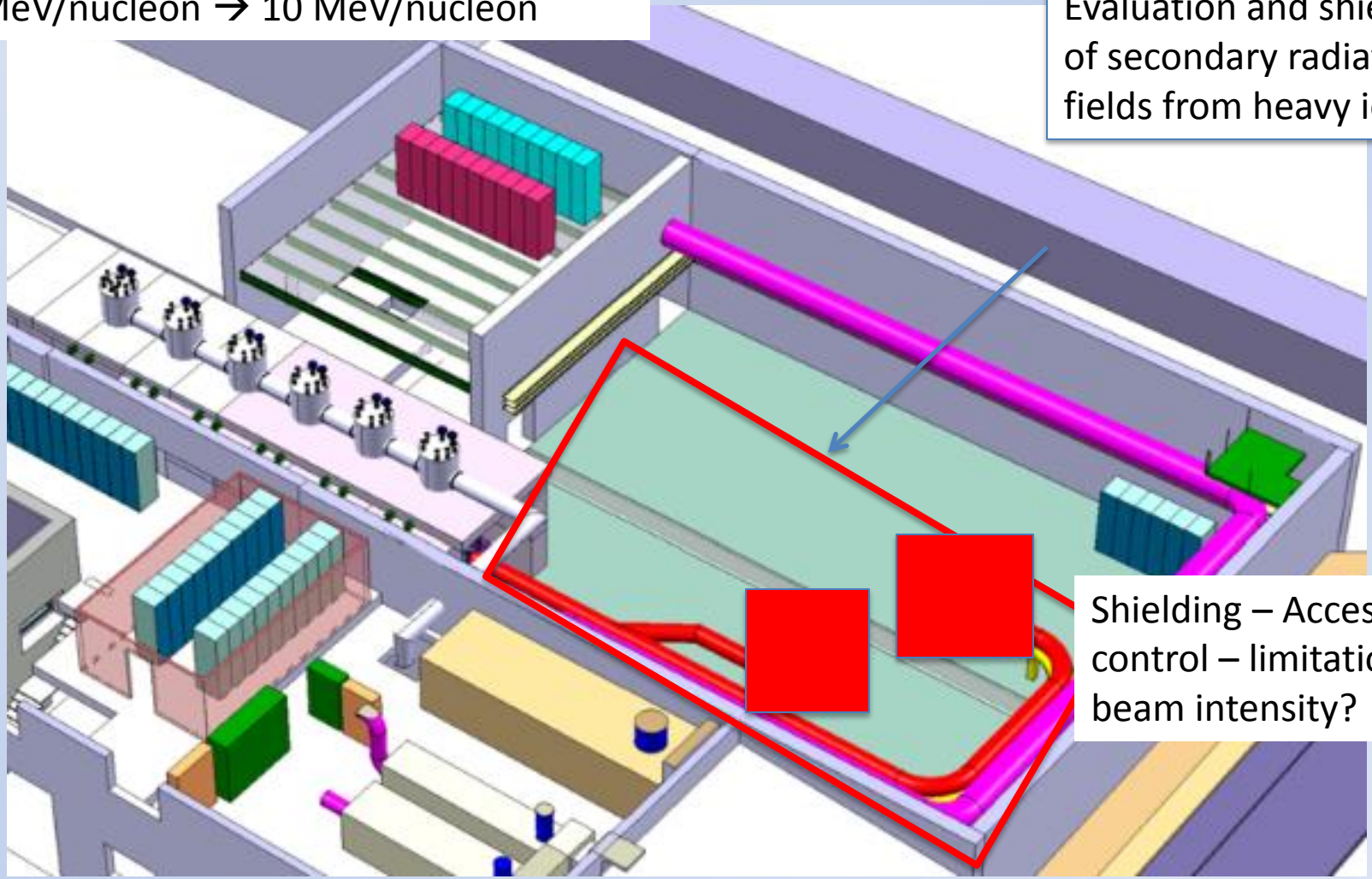
In collaboration with N.Delruelle (TE/CRG)

Radioprotection

TO BE DONE In collaboration with A.Dorsival and J.Vollaire DGS/RP

3MeV/nucleon → 10 MeV/nucleon

Evaluation and shielding of secondary radiation fields from heavy ions



Shielding – Access control – limitation of beam intensity?

Outline

- Project Organization
- Main Highlights & R&D Activities
- **Project Schedule**
- Budget Review + Resources
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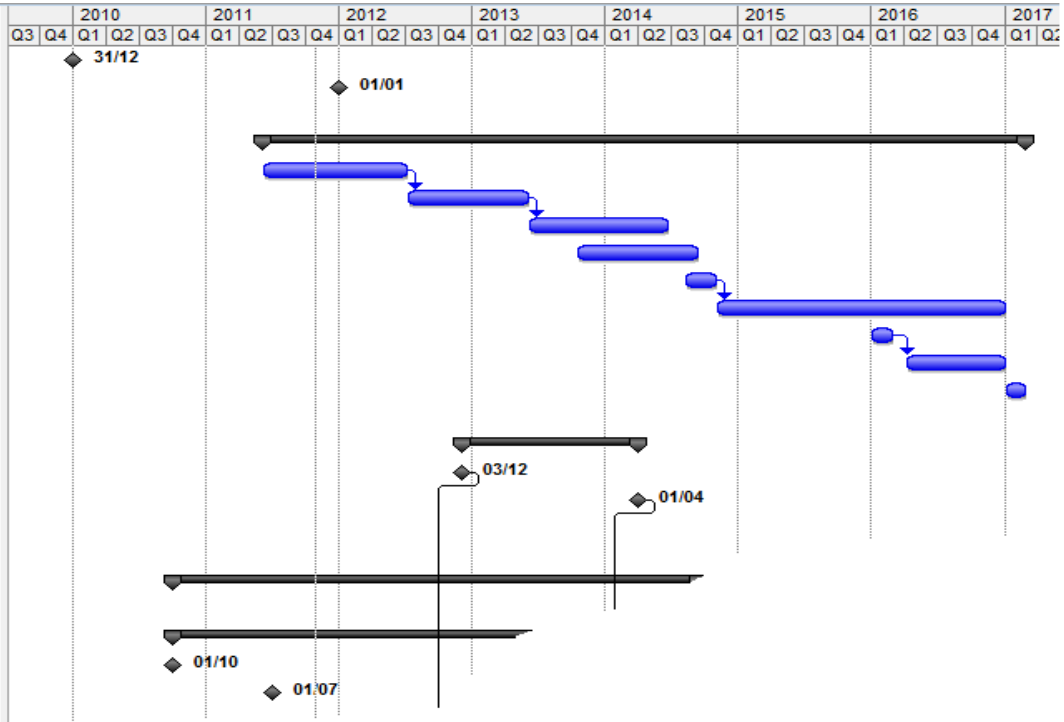
HIE-ISOLDE Planning

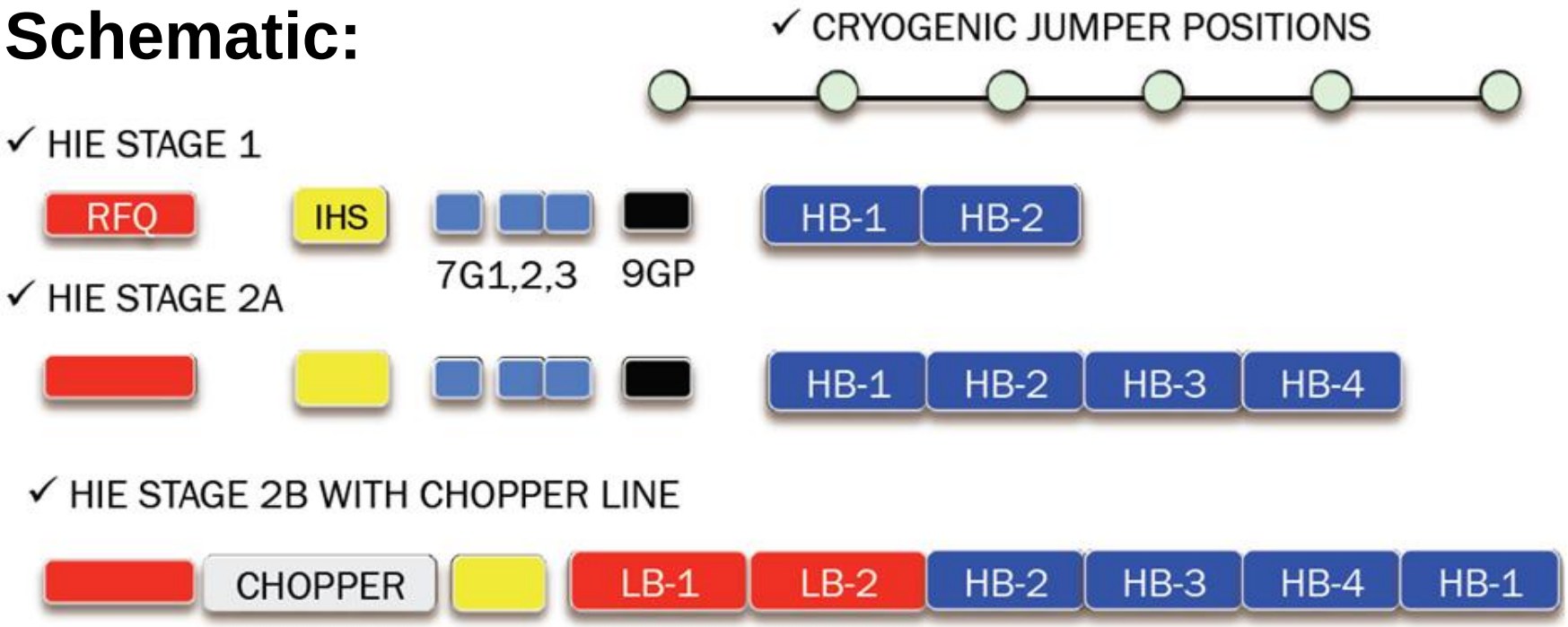
Task Name	Duration	Start	Finish	Pr
Official Approval Project	0 hrs	Thu 31/12/09	Thu 31/12/09	
Technical Design Report	0 hrs	Sun 01/01/12	Sun 01/01/12	
Hie Isolde key-dates:	**1495 days**	**Mon 06/06/11**	**Fri 24/02/17**	
Civil Engineering Q3 2011 - Q3 2012	281 days	Mon 06/06/11	Mon 02/07/12	
Main Services Q3 2012 - Q2 2013 (C	239 days	Tue 03/07/12	Fri 31/05/13	5
Cryo Q2 2013 - Q3 2014	275 days	Mon 03/06/13	Fri 20/06/14	6
Beam Transfer Line Q4 2013 - Q3 20	236 days	Tue 15/10/13	Tue 09/09/14	
Cryo Module 1 & 2 Q3 2014 - Q4 201	60 days	Fri 08/08/14	Thu 30/10/14	
5.5MeV/u physics as of Q4 2014	568 days	Fri 31/10/14	Tue 03/01/17	9
Cryo Module 3 & 4 Q1 2016 - Q2 201	40 days	Fri 01/01/16	Thu 25/02/16	
10MeV/u physics as of Q2 2016	195 days	Tue 05/04/16	Mon 02/01/17	1
Cryo Module 5 & 6 Q1 2017 - Q2 201	40 days	Mon 02/01/17	Fri 24/02/17	
Long Shutdown LS1	**346 days**	**Mon 03/12/12**	**Tue 01/04/14**	
ISOLDE Shutdown start	0 days	Mon 03/12/12	Mon 03/12/12	
ISOLDE Shutdown end	0 days	Tue 01/04/14	Tue 01/04/14	
Infrasctructure & Integration	**)28 days?**	**Fri 01/10/10**	**Tue 09/09/14**	
Civil Engineering	**782 days**	**Fri 01/10/10**	**Mon 30/09/13**	
Layout & Specifications	0 hrs	Fri 01/10/10	Fri 01/10/10	
Start Construction	0 hrs	Fri 01/07/11	Fri 01/07/11	
Linac Tunnel installation	21 days	Mon 02/09/13	Mon 30/09/13	
Buildings ready	**22 days**	**Thu 31/05/12**	**Sun 01/07/12**	
Compressor building 198 read	0 hrs	Sun 01/07/12	Sun 01/07/12	
Cold Box buidling 199 ready	0 days	Thu 31/05/12	Thu 31/0	
Cooling & Ventilation	**316 days?**	**Mon 14/0**		
Preparatory work (buildings	**316 days?**	**Mo**		
ISOLDE Shutdown start				
ISOLDE Shutdown end				



Hie-Isolde installation planning in EDMS: Projects – Accelerators - Hie-Isolde – Infrastructure & Integration - Planning
https://edms.cern.ch/nav/P:CERN-0000072786:V0/P:CERN-0000090679:V0/TAB3

Modular installation

Schematic:



Courtesy: Matteo Pasini, Matthew Fraser

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Budget Review

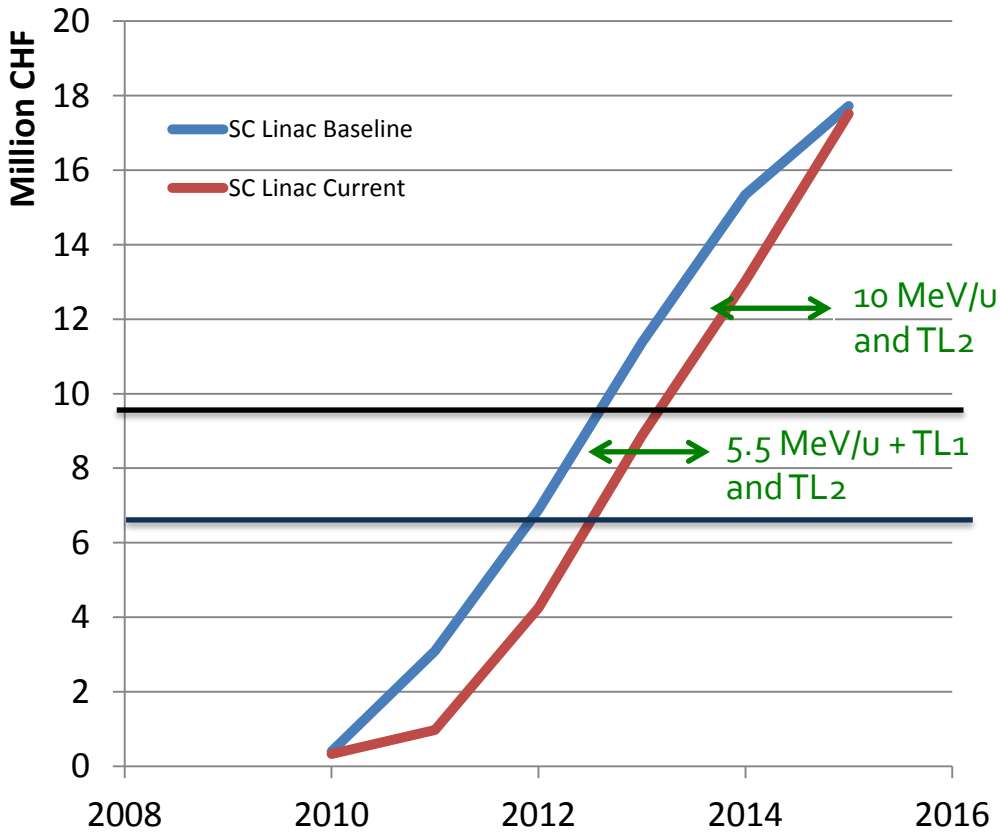
As defined in MTP 2010

(175 FTE)

Total budget of 35.8 MCHF (2010 – 2015) with two funding sources:

- External funding (incl. Isolde Coll.)
  - LINAC (17.5 MCHF)
    - **5.5 AMeV + beam line stage1 ~ 8.5 MCHF (6.3 MCHF secured)**
- CERN
  - Management (0.2 MCHF)
  - Infrastructure (15.2 MCHF) => +15% (consolidation of testing infrastructure)
  - Design studies for intensity upgrade (2.0 MCHF)
  - Safety (0.9 MCHF) => +25%

SC Linac Expenditures



Income Secured + Applied

Income Secured

Human Resources

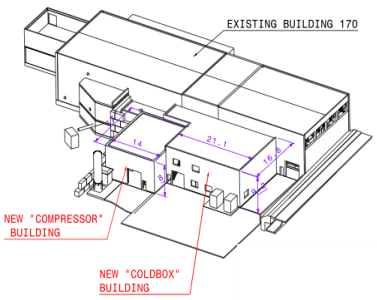
- CERN Staff
  - ✓ Resources defined by group leaders (98 FTE over 5 years) => included in APT
- Fellows (77 FTE)
  - ✓ 8 FTE paid on departmental budget
  - ✓ 13 FTE paid by Isolde Collaboration
  - ✓ 56 FTE paid by ITN3 Marie Curie Contract (20 fellows)

Status of HIE-ISOLDE Collaborations

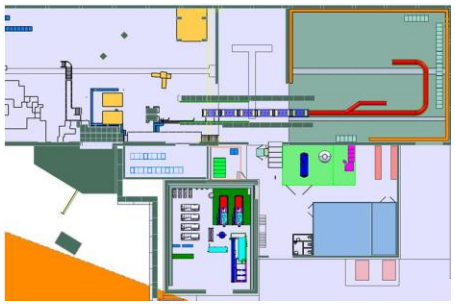
- IPN-Orsay
  - Discussions concerning special contribution (LLRF, cavity ancillaries, …)
  - Availability of test cryostat for HIE-ISOLDE cavity RF tests
  - MoU in preparation
- Korean MEST to allocate 200 kUSD/year for joining ISOLDE Collaboration => under approval
- BARC (India)
  - Discussion concerning in kind contribution (production of copper cavity substrates and cryostats)
  - Discussion with DAE (funding agency) for joining ISOLDE Collaboration
- Application to Wallenberg Foundation on priority list

Outlook

- SC Cavity prototype cold tests @ SM18
- Cryomodule Design
- Procurement of Cooling & Ventilation Plant
- Procurement of the Cryogenics Plant
- Procurement of SC solenoids
- Start of the civil engineering works
- Kick-start of Design Study for intensity upgrade



Thank you very much for your attention



HIE-ISOLDE web site -> http://hie-isolde.web.cern.ch/hie-isolde/

CATHI-ITN web site -> https://espace.cern.ch/Marie-Curie-CATHI/default.aspx