HIE-ISOLDE Project Status Report

Y. Kadi for the HIE-ISOLDE Project Team

72nd ISCC Meeting
CERN, 13 February 2015

OUTLINE

- Outcome of CSR 27-10-2014
- Status of the technical systems
- Schedule
- Budget
- Conclusions

Outcome 2nd CSR 27-10-2014

- Project monitoring tools found adequate
- Financial situation under control
- Schedule risk for physics deadline in 2015 highlighted
- Cryomodule assembly time is the schedule driver
- Re-assessment and mitigation plan requested by Dec.2014
- Phase II: go-ahead with procurement of remaining components
- Spare parts policy to be evaluated (for funding)
- Phase III: not for now, focus on high beta section (4 cryomodules)

Mitigation options and Actions

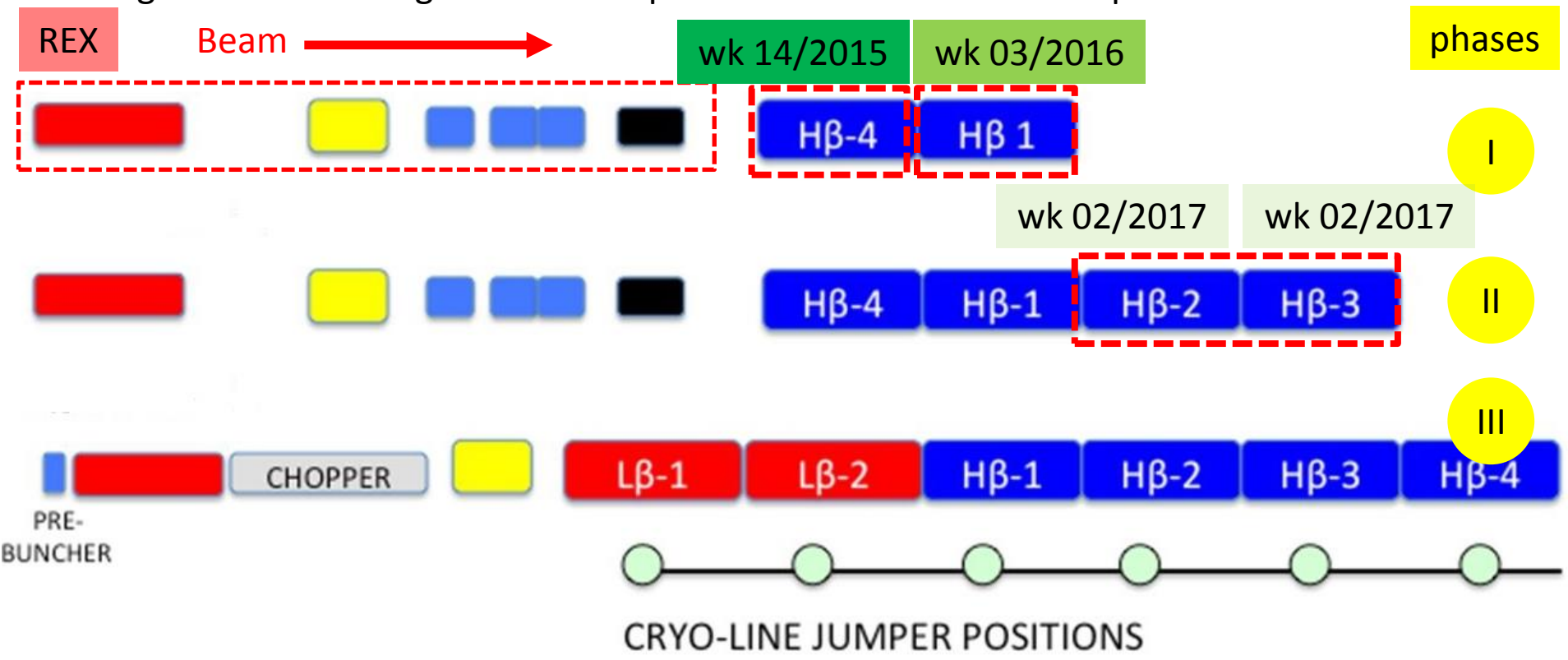
Endorsed by the Acc.-Tech. Sector Management on 16Dec14

- Test CM1 directly in the linac, skipping SM18 test
- Adapt installation and test planning (dry runs, check-out) and coordinate it tightly; anticipate resources during summer period
- REX re-commissioning: WG coordinated by R. Catherall
- Expedite 9-gap amplifier solution => backup solution with L4
- eventual extension of the proton run in 2015

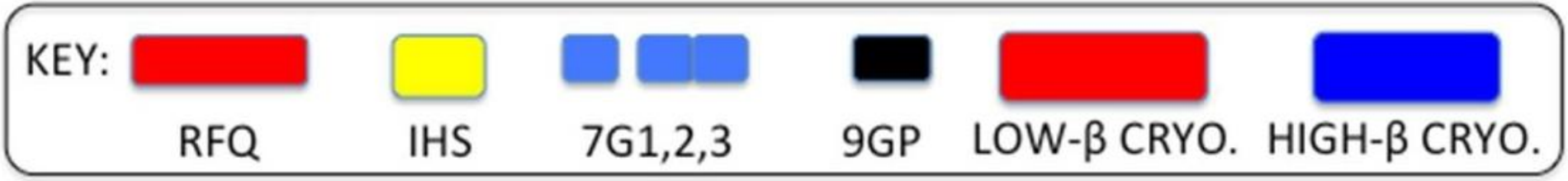
Next review by ATS-MB mid-March 2015

Project Phases

Green light from A&T mngt to continue procurement for HIE-ISOLDE phase II.



Legend:



Existing REX-structures:

RFQ, IHS: 20-gap IH-structure, 7GX: 7-gap split-ring cavities, 9GP: 9-gap IH-structure

Present Status of Phase „I a“ (CM1)

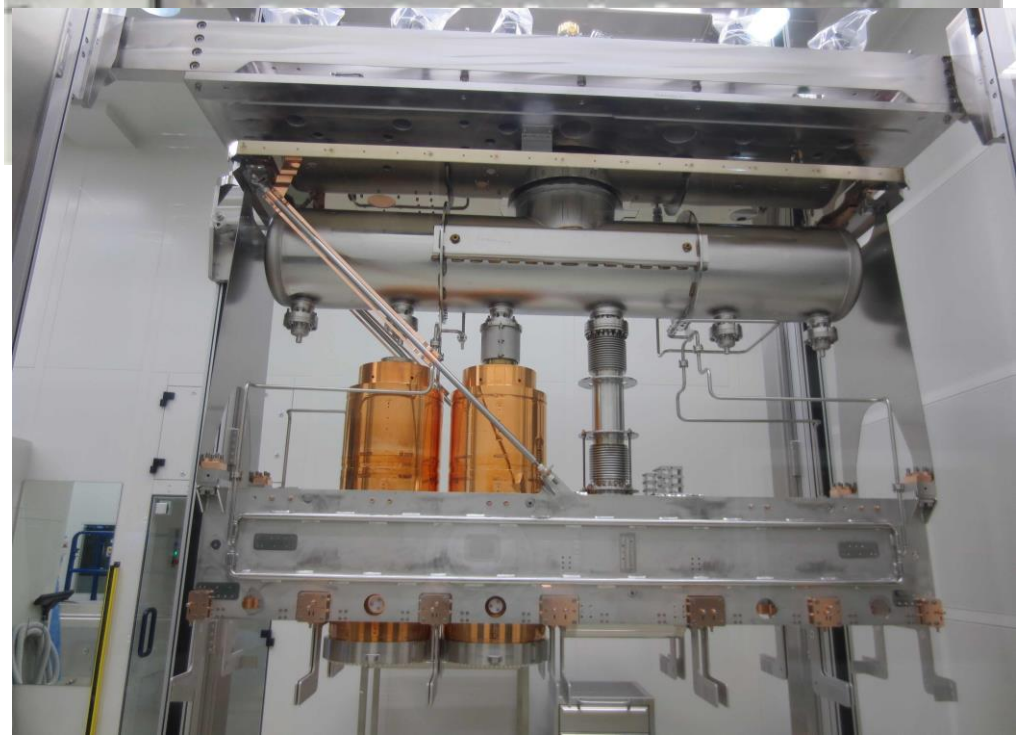
CM1 assembly status

Assembled:

- Vacuum vessel with thermal shield
- Top plate with helium vessel and circuits, top thermal shield and supporting frame
- SC solenoid (tested at warm)

The SMA18-SM18 assembly teams:
M.Therasse, JA. Bousquet, G.Barlow, JB. Deschamps, L.Fabre, F. Vial, Ph.Canard, S.Caille, F.Oddo, S.Benvenuti, M.Bouhammou, P.Demarest, A.Harrison, J.Dequaire, M.Gourragne, S.Bizzaglia, L.Williams, A.Chrul, M.Struik.

CM1 assembly status



Assembled:

- Blank cavity mounting
- Instrumentation setup

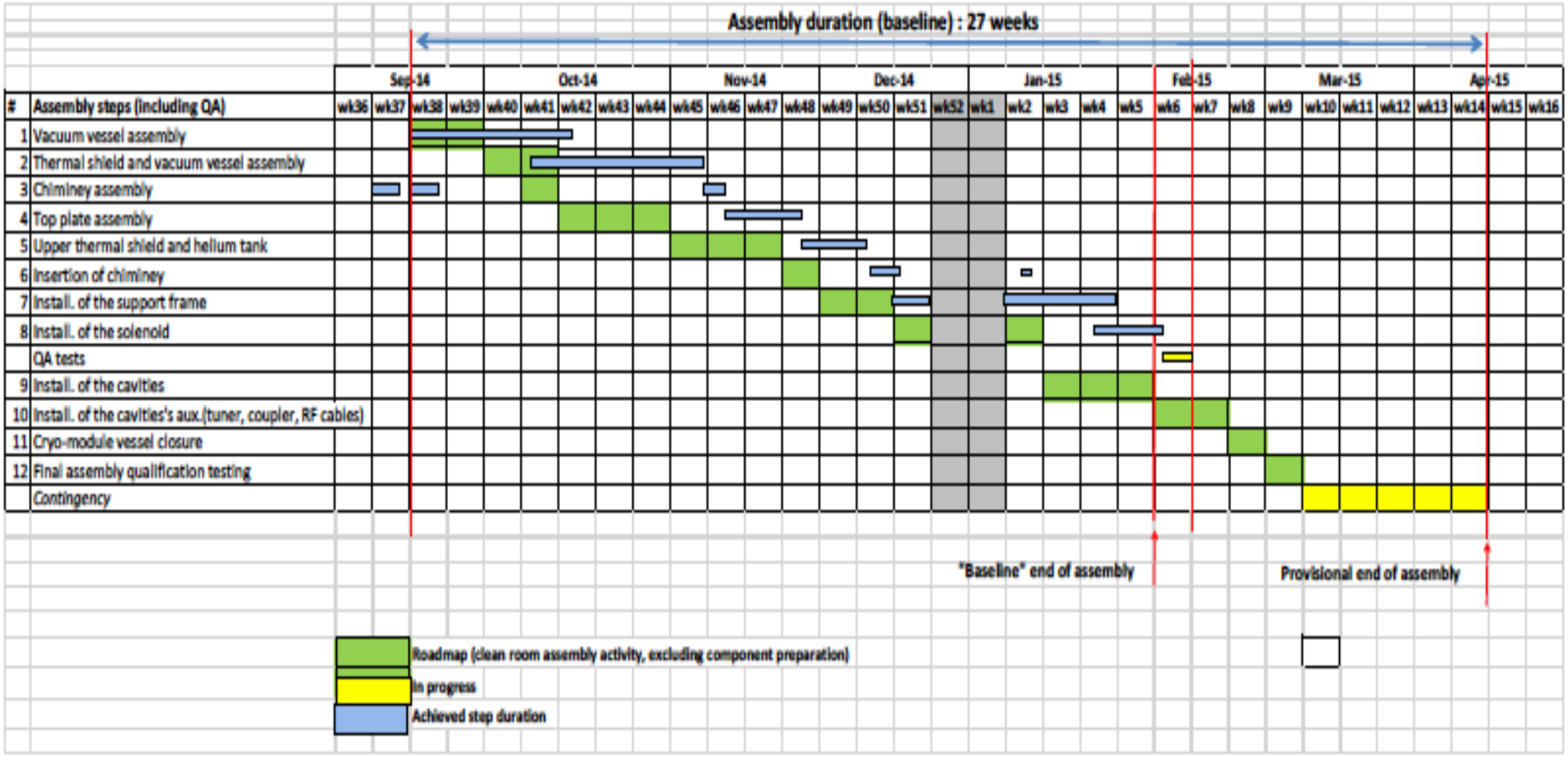
Cavity final rinsing and dressing going on (3/5 done).

Next:

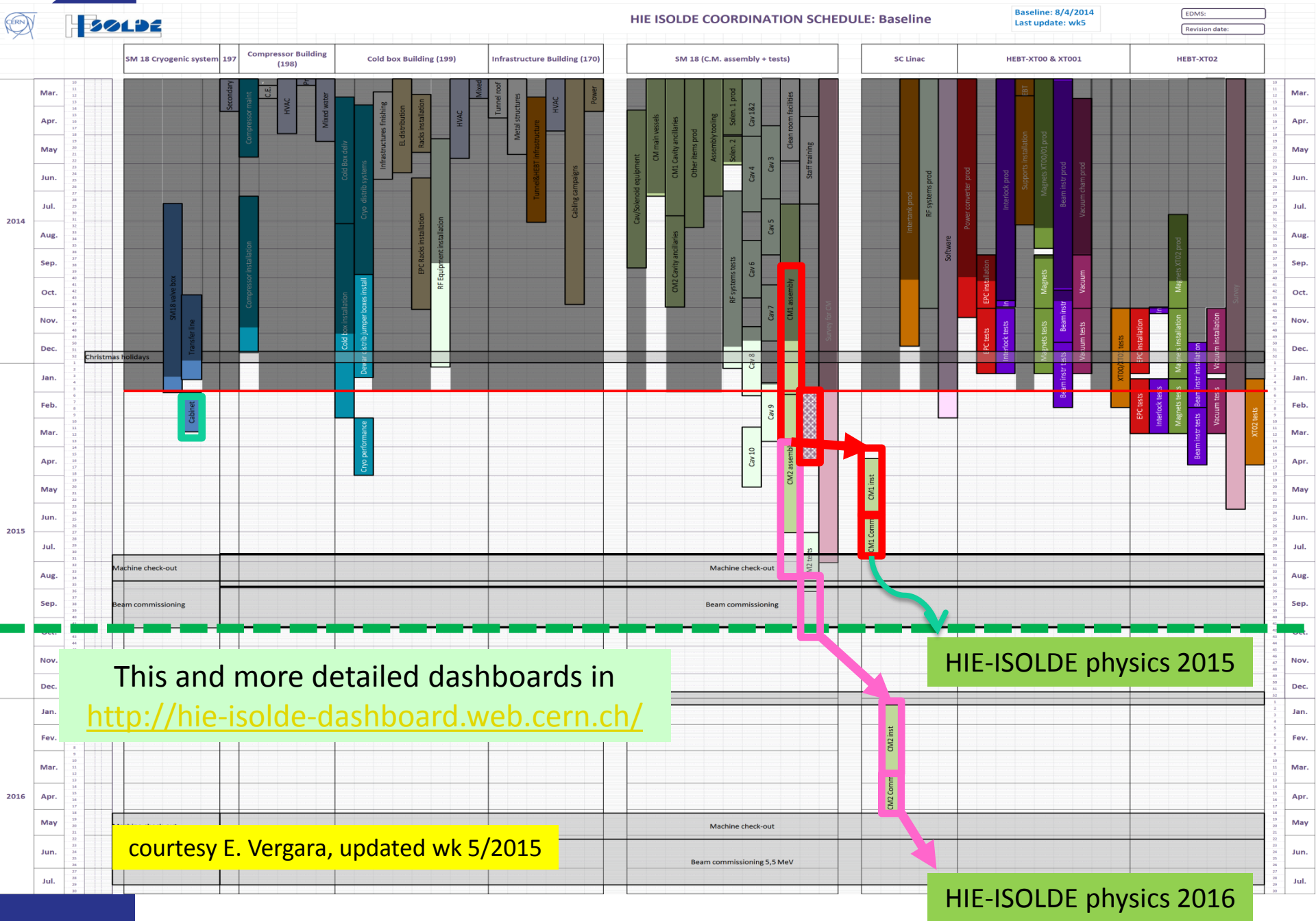
- Global leak test with He circuits pressurized
- Cavity and ancillaries assembly
- Insertion in vacuum vessel
- Final leak test

CM1 expected to be ready for transport wk 12/2015.

General Road Map



Baseline planning adopted in April 2014, with status



Components, planning and manpower for CM2

Components:

- Cavities – assembled so far 7 from RI, 7 sputtered (5/7 RI + 2 CERN) – 5 ready to use in CM1; 1 stripped (being recoated) => plan to have next batch of 5 ready in June.
- Solenoid – new coil has been impregnated wk 6 => passed tests successfully => delivery planned wk 12.
- Vacuum vessel – dimensional checks to be completed; to arrive here wk 7.
- He vessel – ok, to arrive here wk 7.
- Thermal shield – all Ni plated panels arrived at CERN; now with MME to repair the damaged pipes (bent by Corima); found a solution to straigthen them, need pressure test to validate .

Planning:

- Announced assembly time for CM2 21 wks (CM1 foreseeably = 25-27 wks).
- Assembly start ca. wk 14 (end March)
- Assembly finish ca. wk 34-35 (2nd half of August)
- Cold test in SM18 ca. wks 36-43 (until end October)
- Installation in SC Linac SD 2015/2016, then HW commissioning (services to be available)
- Beam to ISOLDE start ca. April 2016 (?), beam commissioning 5-7 weeks, physics at 5.5. MeV/c could start ca. mid/end May 2016

Manpower:

- TE-MSC confirms deployment of same staff for CM2 as for CM1;
- As of end March gradual handing-over of the activities to BE-RF, while responsibility for assembly remains with TE-MSC.
- EN-MME: Principle agreement to support the CM2 components manufacturing

Phase II (CM3 + CM4)

Components for CM3 + CM4

Components (except cavities and solenoids):
Parts list prepared and circulated ATS-MB for approval.
Cost estimate 1.37 MCHF, w/o manpower (~0.8 MCHF).
Discussed with Procurement Service => Agreed to launch negotiations with companies / workshop.
Results to be compiled for management decision by mid-March.

Cavities:
15 Originally ordered from industry.
Additional 2 made at CERN (actually 3 but QP1 no usable).
Stolen (raw material for 3 inner conductors and 1 outer cylinder; remaining parts unusable).
To be re-ordered for CM3 + CM4, strictly speaking 3 (if 0 spares)
Recommended to have 5 spares => re-order 8 more cavities (20 installed + 5 spares at the end of phase II).

Solenoids:
New solenoids for CM3 and 4 could be available around wk 23.

Planning and manpower for CM3 + CM4

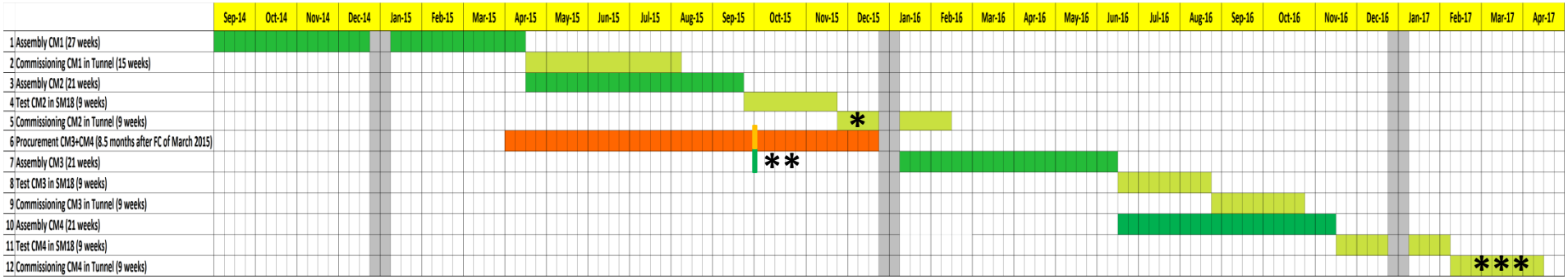
Planning:

CM3 assembly in principle starting right after CM2 (provided parts have arrived by then).

CM3 + CM4 to be finished towards end 2016 and installed in SD 2016/2017 („LS1.5“).

Planning only realistic if

- procurement is launched very soon and remains EN-MME supported,
- full complement of assembly and logistics team remains in place,
- support teams continue to be flexible and highly committed.



NOTA:

* CM2 installation could start mid November 2015 (if no run extension, otherwise January 2016)

** CM3 assembly could start October 2015 if procurement of early components OK in 6 months
(in this case CM3 could serve as spare during the 2016 run with CM1 + CM2)

*** If delayed start of CM3 assembly CM4 commissioning will last until mid-April 2017
(just in time for beam to HIE-ISOLDE, with zero margin)

Manpower:

Responsibility for assembly with BE-RF.

Financial Situation (EDMS 1422826)

“Funding and Cash Flow for the Machine Part

Based on the income secured so far by the collaboration, the CERN loan granted and special contribution from CERN, the cash balance of the machine part of the HIE-ISOLDE project shows that:

the Phase 1 is funded,
0.7 MCHF are missing for the Phase 2
and **5.6 MCHF are missing for the Phase 3.” => component wise !**

Cash flow shortage for Phase 2 (transient effect due to collaboration rate of contribution) does not seem to be a showstopper

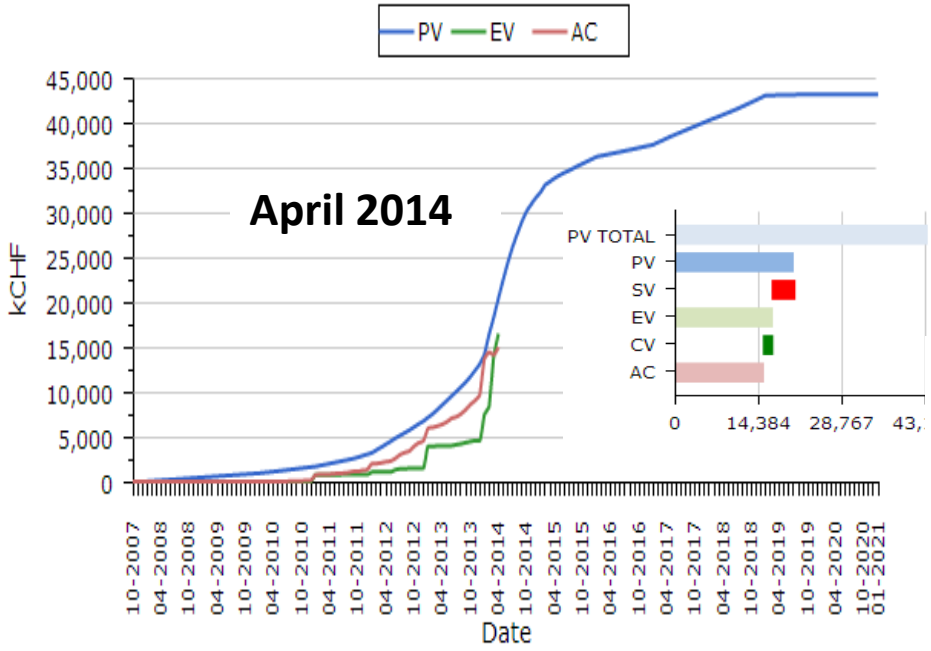
To be considered in MTP2015:

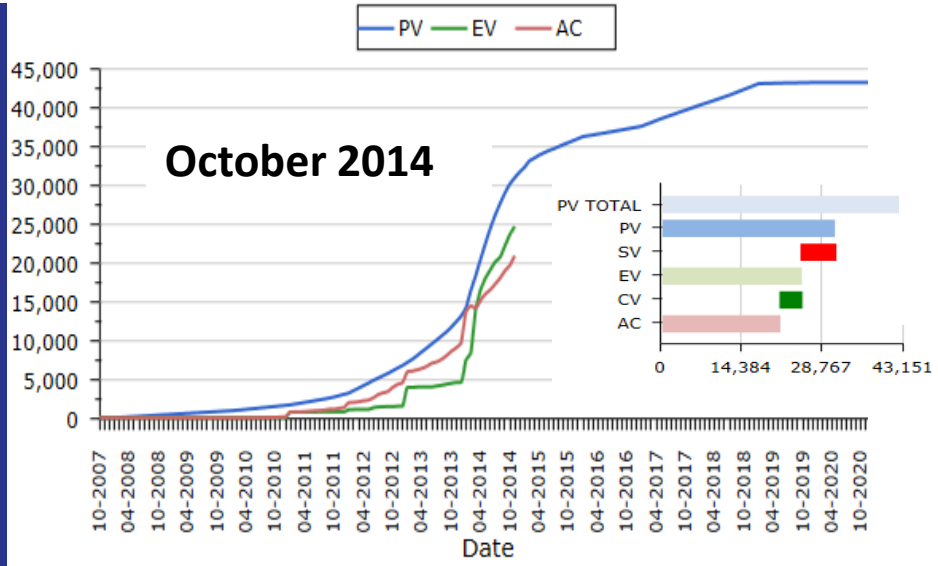
- **0.8 MCHF for manpower**
- **0.5 MCHF for spares**

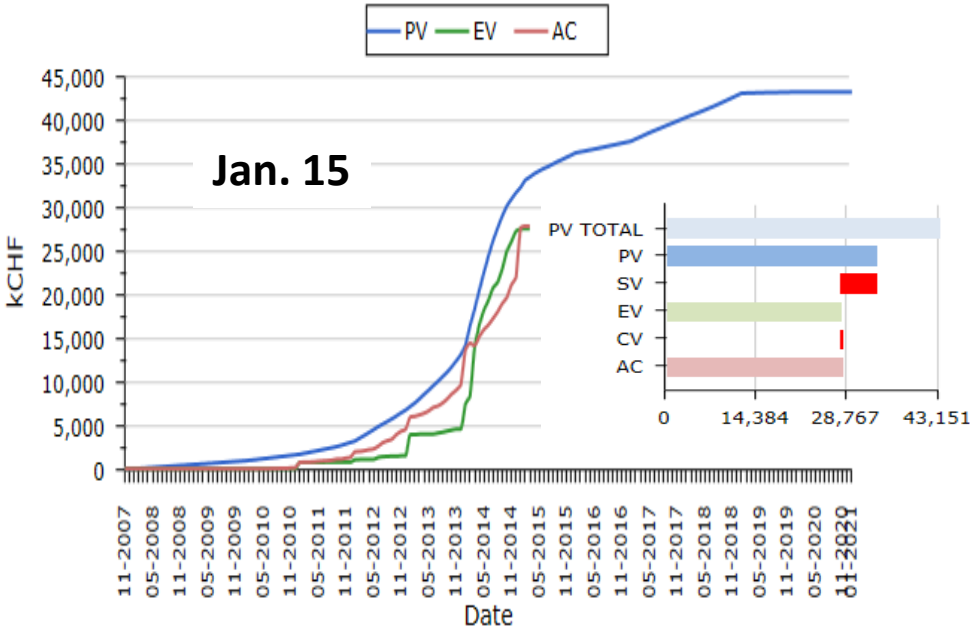
SPARE PARTS at the end of PHASE 2 (EDMS 1466161)

Item	Installed	Spares Needed	Spares Available	Action*	Cost (kCHF)
Cavities	20	5	2	Order 3 (RI)	180
Tuning systems	20	5	0	Order 5	60
Coupling systems	**20**	**10**	**0**	Order 10 (CERN)	120
Power amplifiers	**20**	**6**	**4**	Order 2	25
LLRF controllers	20	10	10	None*	0
SC solenoids	4	1	0	Activate option for 1	80
Other CM parts	NA	Assembly spares	NA	Order	65
MB	4	Spare coils	yes	None	0
MQ	22	2	2	None	0
MC	11	2	2	None	0
SCS PC	**4**	**1**	**0**	Order 1	10
MB PC	**4**	**1**	**1**	None	0
MQ PC	**22**	**4**	**4**	None	0
MC PC	22	4	4	None	0
SDB	5	1	1	None	0
LDB	8	1	1	None	0
TOTAL	**NA**	**NA**	**NA**	**NA**	**540**

EVM evolution (Apr14 – Jan15)







EVM Analysis (Apr14 – Jan15)

April 2014

	From Project Start To Date					Total	
	Cost Variance	Schedule Variance	Planned Value	Earned Value	Actual Cost	Planned Value	% Progress
TE	446'848	-1'922'583	5'321'226	**3'398'643**	2'951'360	**18'301'500**	**19%**
Total	1'538'801	-3'446'916	19'918'900	**16'471'983**	14'932'745	**43'150'641**	**39%**

Oct 2014

	From Project Start To Date					Total	
	Cost Variance	Schedule Variance	Planned Value	Earned Value	Actual Cost	Planned Value	% Progress
TE	1'573'603	-3'071'423	11'160'361	**8'088'938**	6'515'335	**18'301'500**	**44%**
Total	3'749'380	-6'028'822	30'651'424	**24'622'602**	20'873'222	**43'150'641**	**57%**

Jan 2015

	From Project Start To Date					Total	
	Cost Variance	Schedule Variance	Planned Value	Earned Value	Actual Cost	Planned Value	% Progress
TE	-1'217'901	-2'888'751	12'501'483	**9'612'733**	10'830'634	**18'301'500**	**52%**
Total	-280'355	-5'572'438	33'076'372	**27'503'935**	27'784'289	**43'150'641**	**64%**

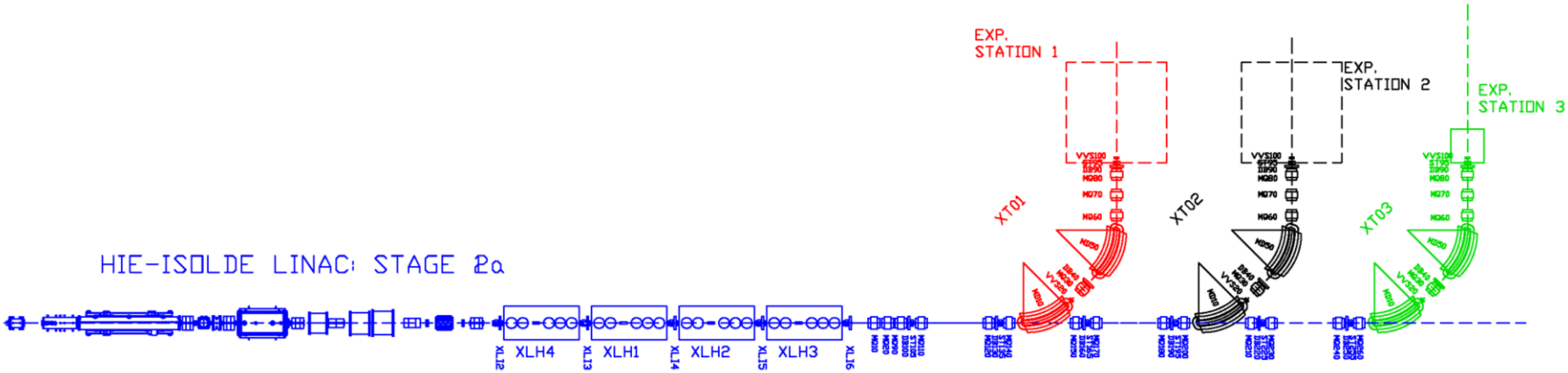
Summary

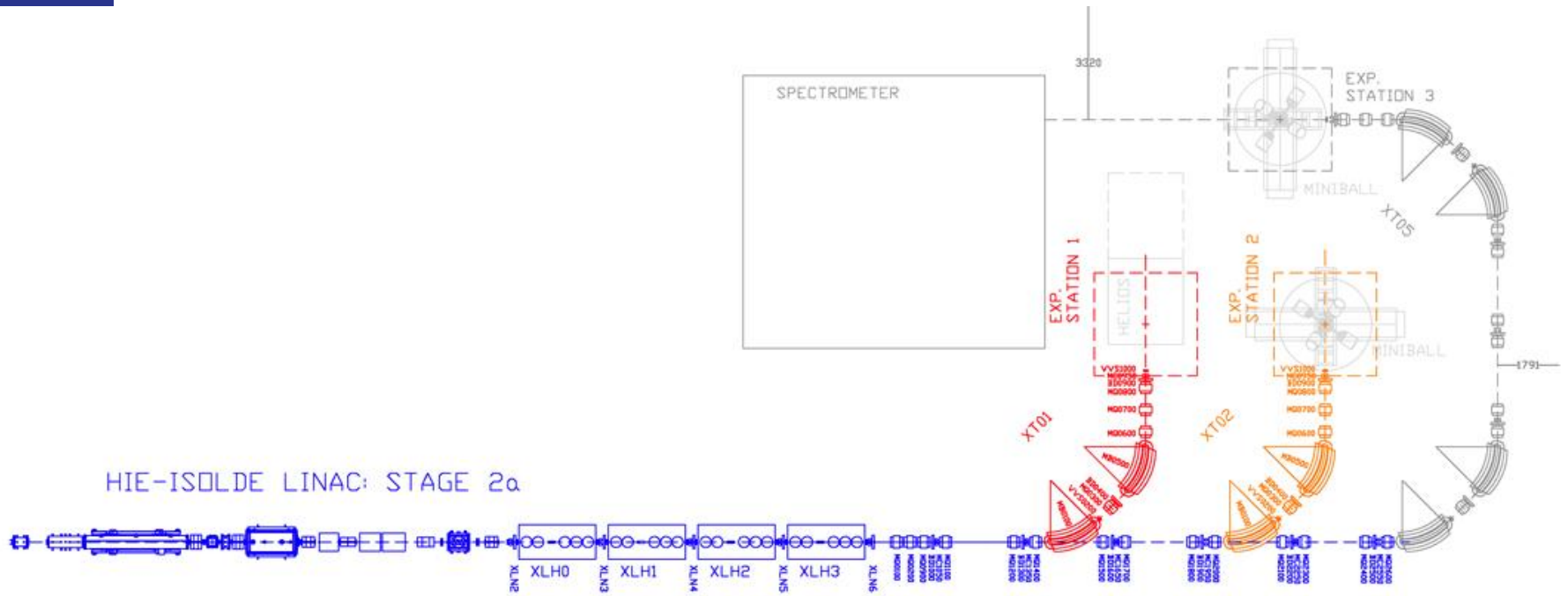
- Looks like **phase 1 a** will be getting there in time => provided no major technical issues turn up – transport incident, major vacuum leak, pollution, RF performance, ... Present ready-for-installation date of CM1 = wk 12/2015.
- **Phase I b** (CM2) shall normally also get ready well in time as per baseline planning adopted in April 2014. CM2 will first be cold tested in SM18. Present CM2 assembly finished date = wk 34/2015, ready for installation as of wk 43/2015 => wait until „winter SD“.
- Procurement for **phase II** (CM 3 + 4) is being prepared and shall be launched – subject to management approval – in March 2015.
- Construction for **phase II** (CM 3 + 4) planned for 2016, allowing physics with 4 high-beta CMs as of 2017.
- Spare policy defined (EDMS 1466161), to be submitted to management for approval
- New budget under preparation, to be submitted to management for approval and inclusion in MTP2015

Thank you

Phase II (XT03 + potential U-turn)

Layout XT03 + potential U-turn





Physics motivation

Two proposals for HIE-ISOLDE beam line extensions have been suggested for the future (i.e. sometime after the initial installation of XT01 and XT02).

1. XT03 => to accommodate a small travelling detector 1 x 1 m (included in CtC Phase-3);
2. U-turn => to accommodate MINIBALL + Large Angle Spectrometer setup (enables in parallel to connect to the TSR) => not in CtC;
   - Out of the 37 HIE-ISOLDE Letters of Intents, 15 say they would profit from a spectrometer or separator. The proposed reaction types includes Coulomb excitation, direct reactions with light targets, and transfer induced fission;
   - The beams of interest covers the full range of isotopes available at HIE-ISOLDE (Li to Ra);
   - The characteristics of transfer reactions with light targets: energy 5.5 - 10 MeV/u; intensities > 1e5/s;
   - The unique problem is the instantaneous beam intensity which requires improvements to the EBIS charge breeder.

2'. U-turn => to accommodate HELIOS (not in CtC);
   - This is not compatible with proposal#2 => not possible to fit Spectrometer;
   - Beam microstructure required: repetition rate of 1/ 100 ns => needs "Chopper Line" (not in CtC);
   - Compact version of HELIOS could fit in XT01 or XT02 but stray fields from solenoid should be cancelled in order not to perturb nearby experiments and SC cavities.

Components required

- ✓ Both proposals will be technically feasible, from the point of view of optics and performance, with the addition of standard periods of 2.62m and standard bend configurations into the lattice;

- ✓ Equipment and infrastructure costs will be about **0.7 MCHF** and **2.5 MCHF**, respectively, for:
  - **XT03**: This would involve the addition of 2 dipoles, 8 quadrupoles, 4 long DB and 3 steerer magnets, plus associated vacuum chambers;
  - **U-turn**: This would involve the addition of 4 dipoles, 15 quadrupoles, 8 long DB and 6 steerer magnets, plus associated vacuum chambers, cabling, power convertors, interlocks, cooling and supports;
  - **Chopper Line**: additional **0.5 MCHF**

- ✓ Before any implementation can be decided, studies will be needed to define or check:
  - Cooling and Ventilation capacity;
  - Rack space;
  - Cabling layouts;
  - Integration;
  - Interlocking;
  - Vacuum sectorisation;
  - Stray fields;
  - Beam dynamics confirmation.