

Activities of the LIU project planned up to end of LS2

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In collaboration with the EN-MEF Facility Coordinators and the LIU project team:

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LS2 DAYS

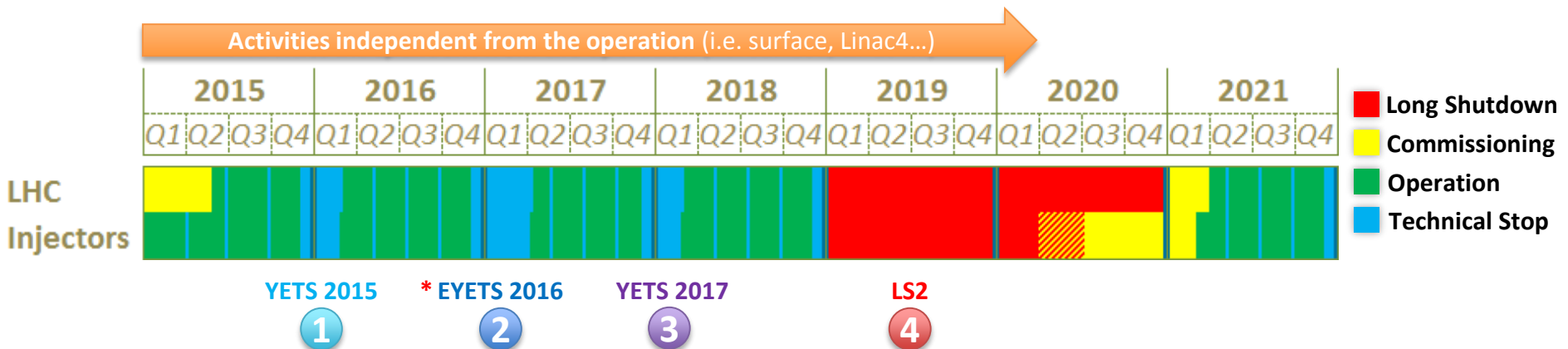
29-30 SEPTEMBER 2015

<http://indico.cern.ch/event/436424/>

Content

- **Master Schedule of the LIU Project**
- **LIU project activities**
 - Activities in the Linac4
 - Activities in the interface Linac2-3-4 in the PS switch Yard
 - Activities in the Linac3
 - Activities in the PSB
 - Activities in the PS and TT2
 - Activities on surface of the PS complex
 - Activities in the SPS
 - Activities in the SPS to LHC transfer lines TI2 and TI8
- **Conclusions**

Master schedule of the LIU Project



3 periods are available for works before the Long Shutdown 2 (LS2):

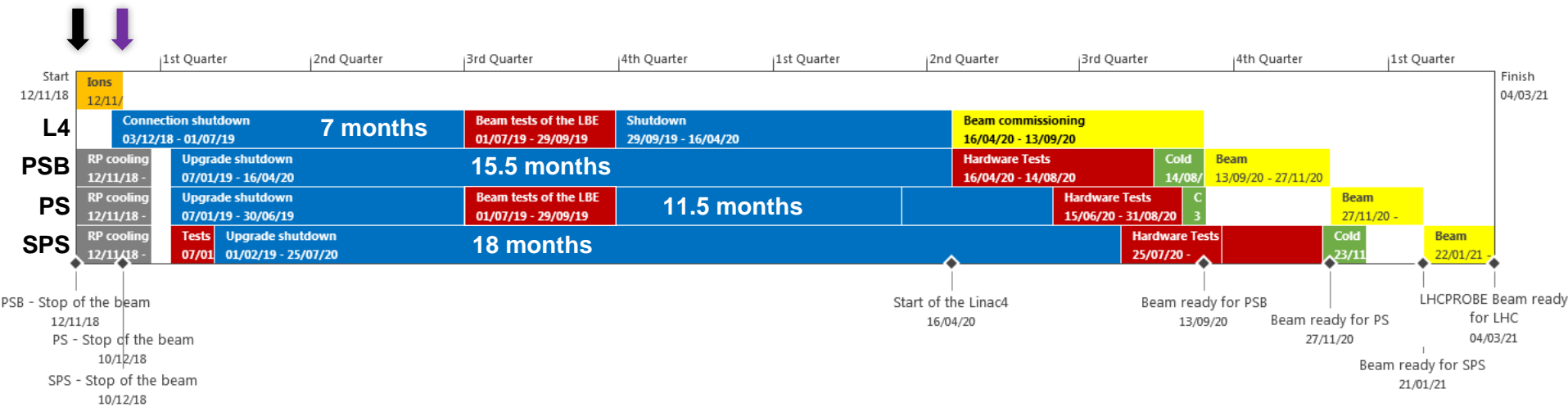
- Some activities will be anticipated wrt the availability of the equipment involved and machines operation
- Decabling campaign will start for the obsolete systems (ref. EN-EL talk)

***: The connection of the Linac4 to the PS Booster is foreseen for the LS2 but all equipment need to be ready by the end of 2016 in case of an early full connection.**

Machines	Opening of the machine (weeks) not including the xmas break of 2 weeks		
	YETS 2015	EYETS 2016	YETS 2017
PSB	10	13	8
PS	8	13	8
SPS	8	11 (BA1) - 13	7 (BA1) - 8

EDMS 1470895: Length of the YETS 2015-2016 / EYETS 2016-2017 / YETS 2017-2018

Master schedule of the LIU Project



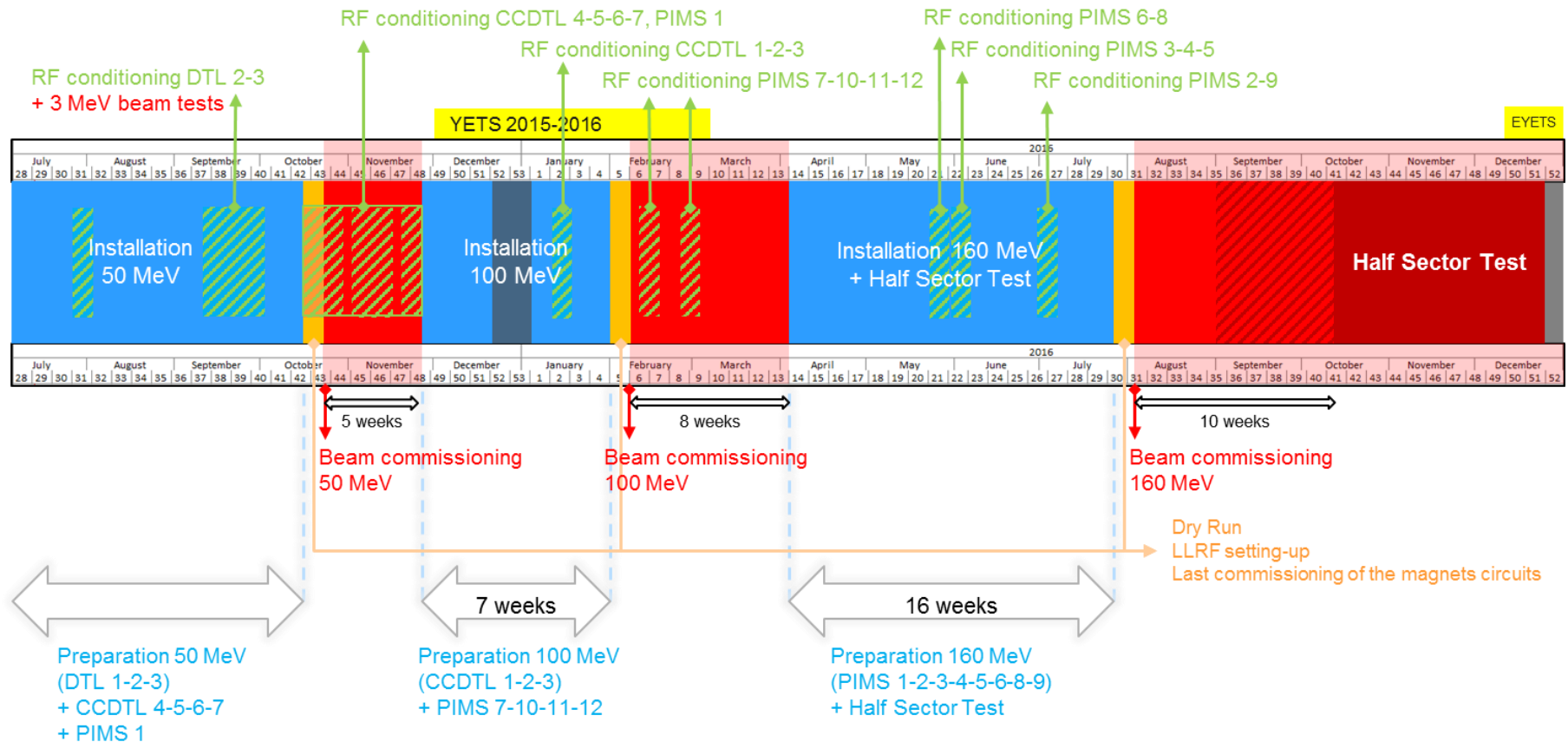
The machine schedules are defined individually and need to be combined in order to level the resources.

Start of LS2 for the injectors:

- Surface activities for Linac2, Linac4 and PSB machines will start in **November 2018**, during tunnel RP cooling.
- All other surface activities for PS and SPS will start at the end of the ion run, in **December 2015**.

LIU project activities

Linac4: Installation and beam commissioning



Dry Run
LLRF setting-up
Last commissioning of the magnets circuits

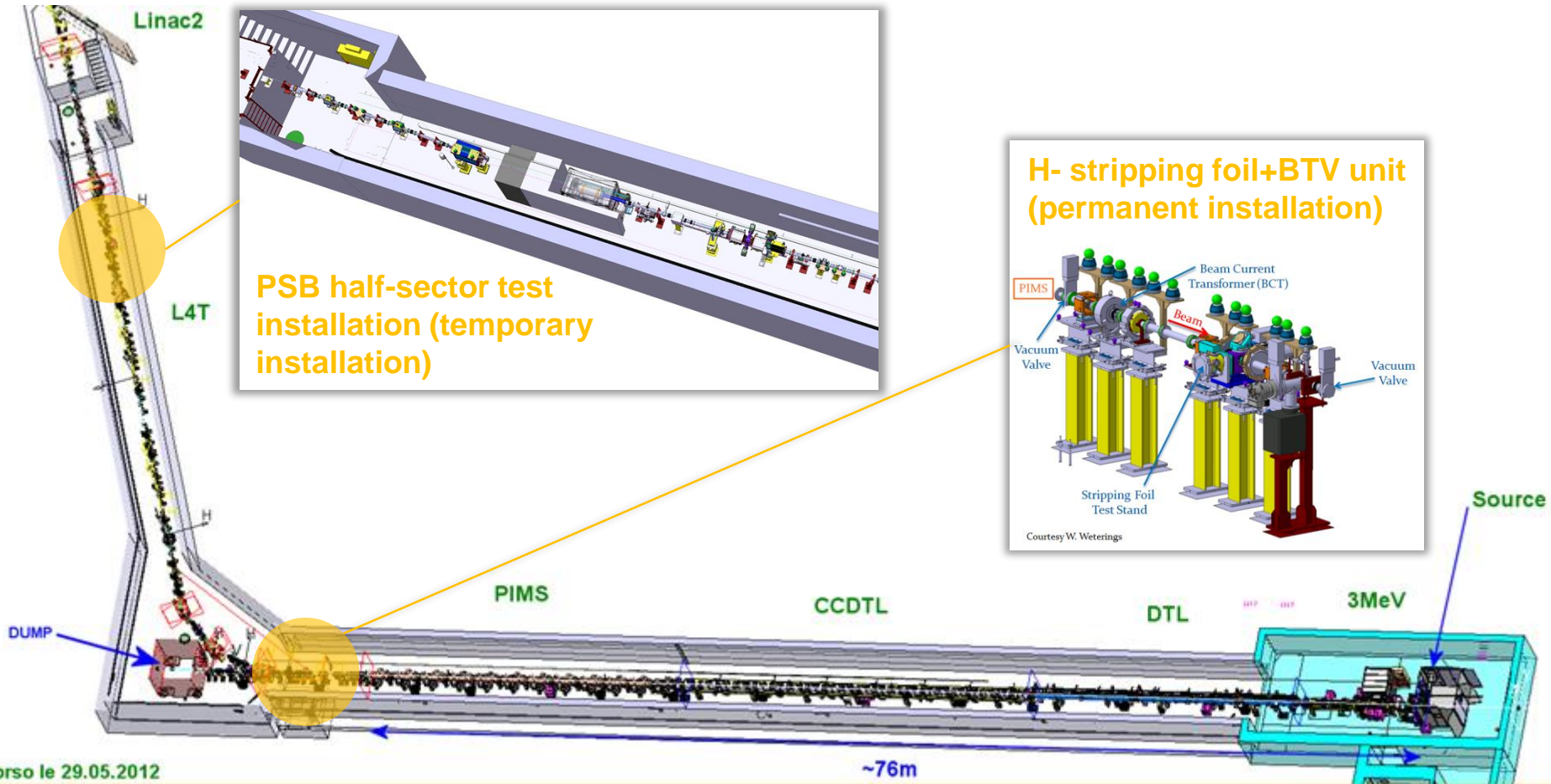
2017												2018												2019												2020											
1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
spare for HST	HST out, DB in											interventions, repairs							beam recommissioning					connection works								beam tests LBE				shut-down								Beam start-up			Beam to PSB

Courtesy: Maurizio Vretenar

LIU project activities

Linac4: Half Sector Test

- independent
- 1 YETS 2015
- 2 EYETS 2016 *
- 3 YETS 2017
- 4 LS2



Courtesy: Jean-Pierre Corso, Bettina Mikulec, Benoit Riffaud

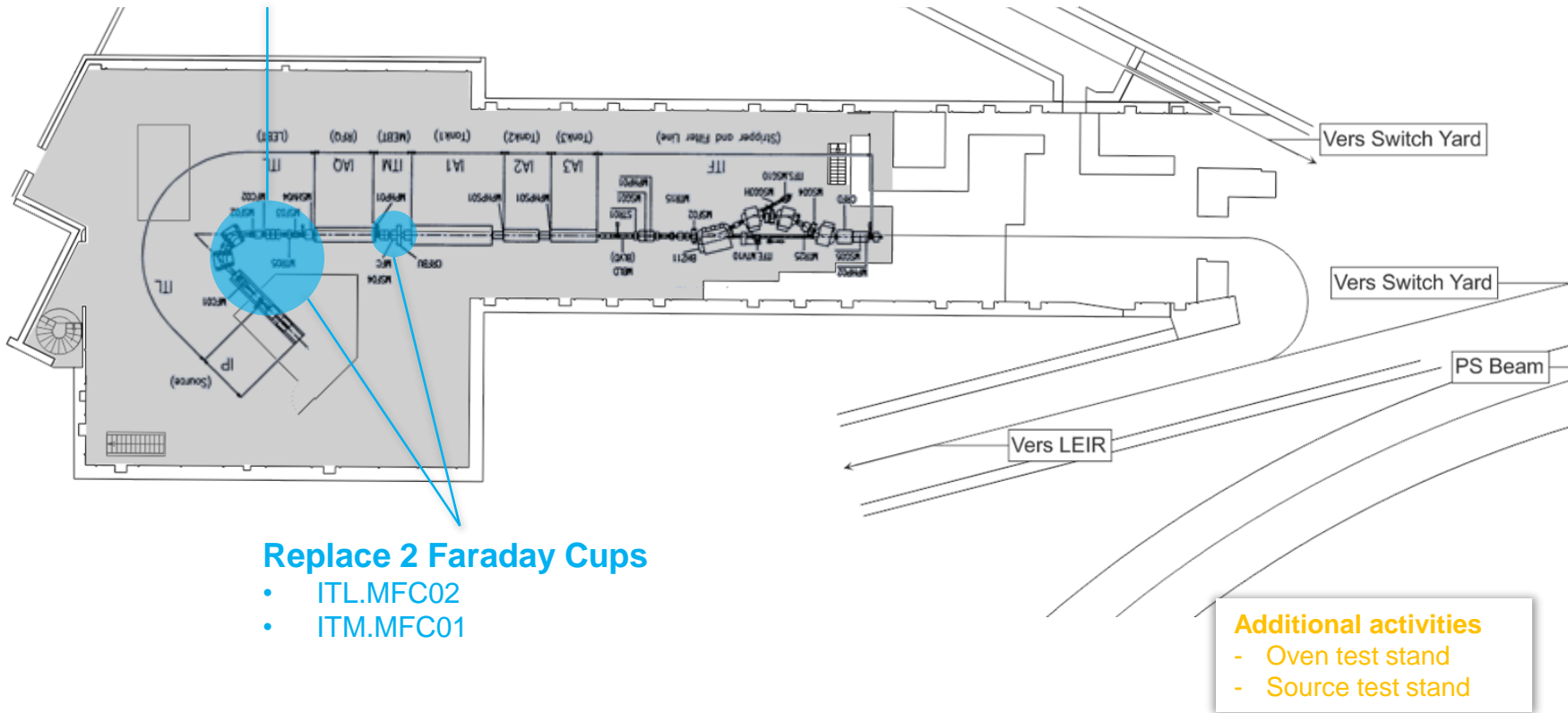
LIU project activities

Linac3: ions upgrade

- independent
- 1 YETS 2015
- 2 EYETS 2016 *
- 3 YETS 2017
- 4 LS2

Rematch optics in low energy beam transport between the Source and the RFQ:

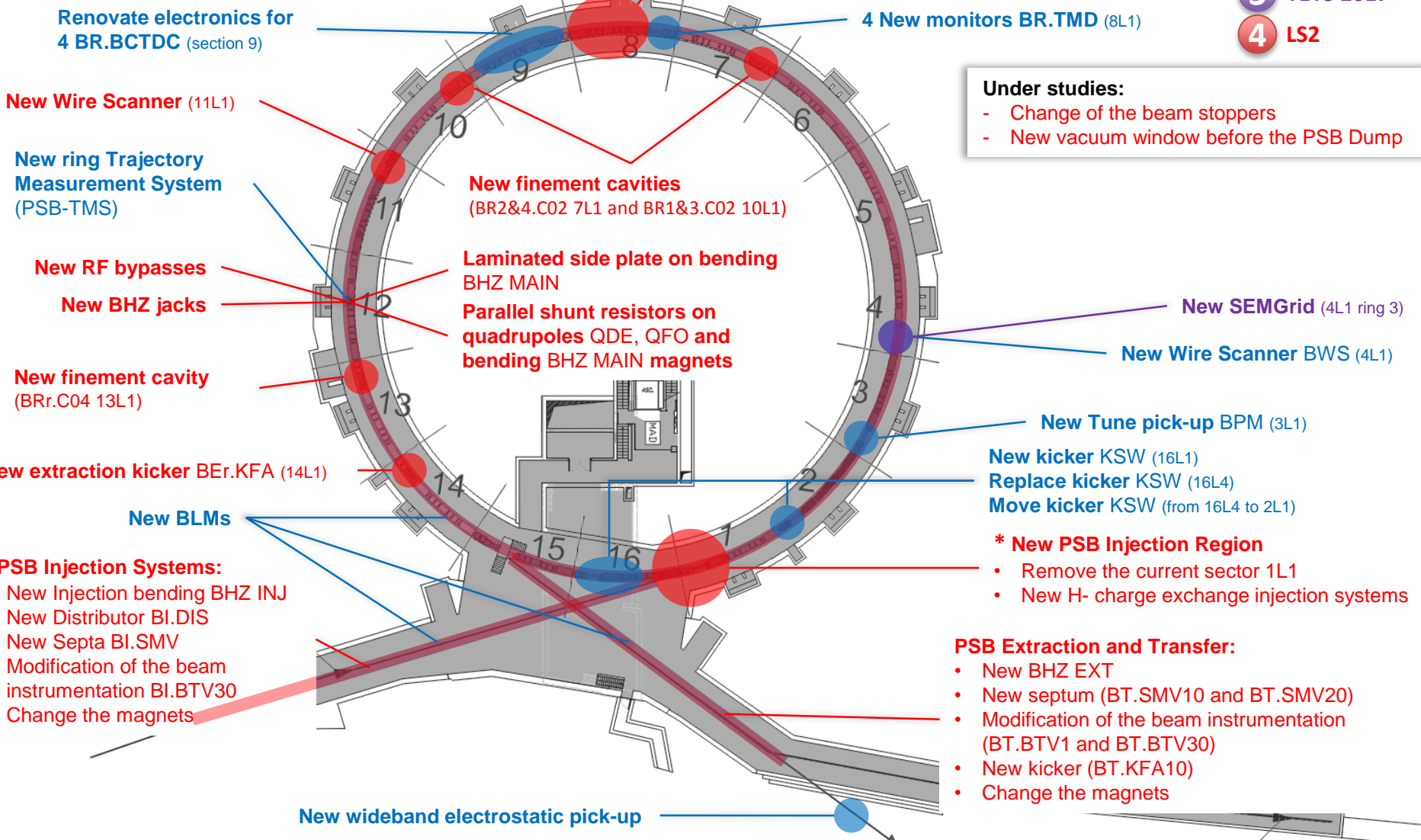
- New beam pipe with increased bore size through the first beam line solenoid
- New pumping chamber
- New focusing element in the extraction system (Einzel-lens)



LIU project activities

PS Booster

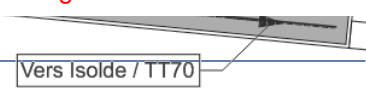
- independent
- ① YETS 2015
- ② EYETS 2016 *
- ③ YETS 2017
- ④ LS2



Under studies:

- Change of the beam stoppers
- New vacuum window before the PSB Dump

- * PSB Injection Systems:**
- New Injection bending BHZ INJ
 - New Distributor BI.DIS
 - New Septa BI.SMV
 - Modification of the beam instrumentation BI.BTV30
 - Change the magnets



LIU project activities

PS machine and TT2

Under studies:

- Position of the second new ionization profile monitor (BGI)
- Position of the new insertion quadrupole magnets (SS33-49 or SS33-65) depends on the installation of the injection extra kicker KFA53

- independent
- ① YETS 2015
- ② EYETS 2016 *
- ③ YETS 2017
- ④ LS2

Renovation of the TT2 power converters

- Replace 2 magnets

New vacuum chambers (MU41, MU42)

New vacuum chambers (SS41)

New bumpers (40, 43, 44)

New slow BLMs (Ionization)

New skew quadrupoles

- (03,07,19,23,29,33,37,41,43,47,53,57,69,73,79,83,87,91,93,97)

New vertical correctors

- (02,04,08,12,20,22,24,30,34,38,44,54,64,70,76,80,88,94,98)

New fast BLMs (Diamond)

- (SS14,15,17,18,40,41,42,43,44,45,46,49,71,75,79,83)

10 MHz system:

- Renovation of the feedback amplifiers
- Modification of the water cooling circuit (SS11, SS36, SS46, SS51, SS56, SS66, SS76, SS81, SS86, SS91, SS96)

New injection septum + bumper SMH42 (SS42):

- New BTV (MU41)
- New SEMGrid (MU42)
- New bumper (SS41)

Replace injection extra kicker KFA45

Renovation of the BWS (SS54, SS64, SS65, SS68, SS85)

New beam dumps (SS47 or SS48)

- Remove dump in SS12 and SS47 or 48

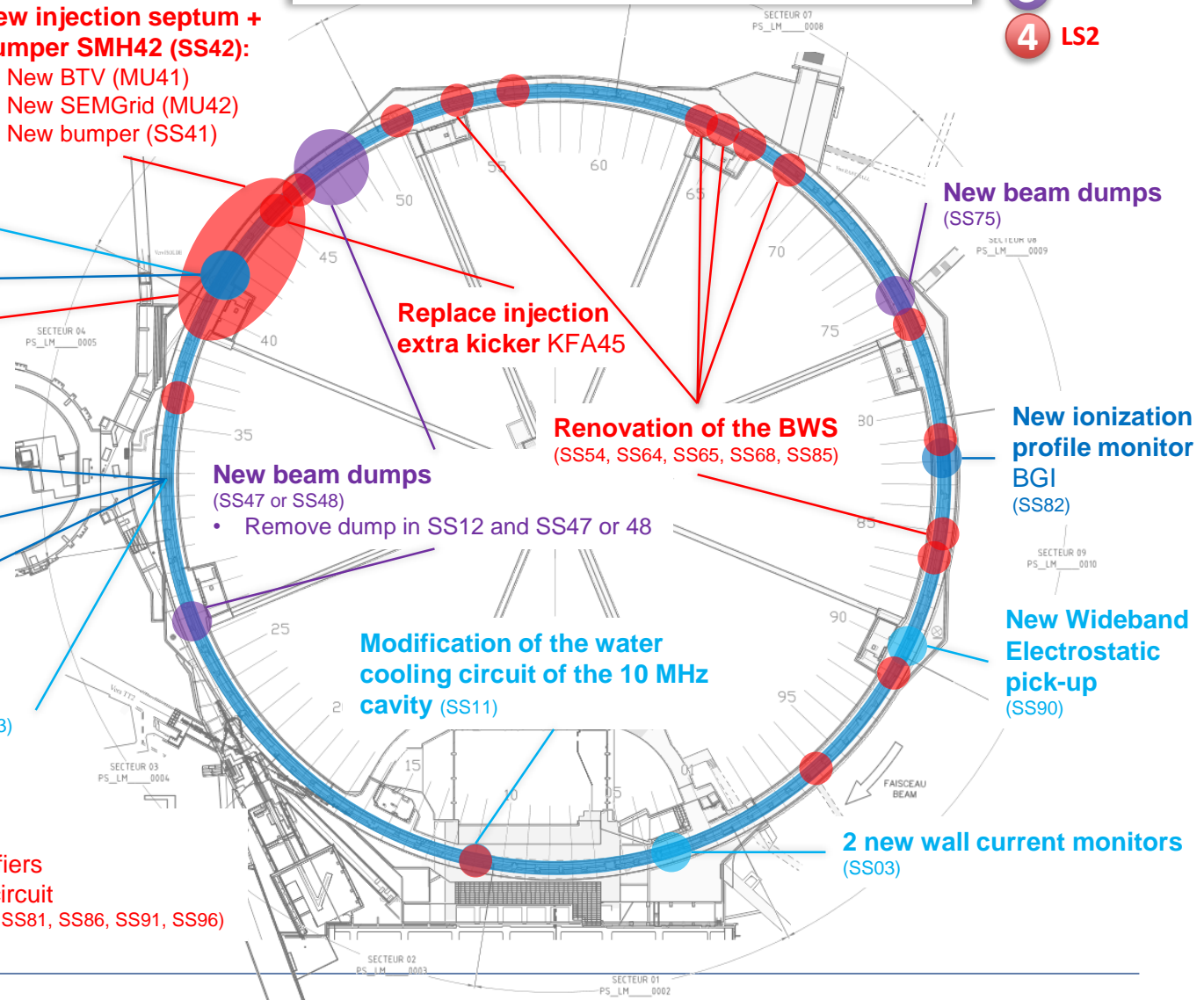
Modification of the water cooling circuit of the 10 MHz cavity (SS11)

New beam dumps (SS75)

New ionization profile monitor BGI (SS82)

New Wideband Electrostatic pick-up (SS90)

2 new wall current monitors (SS03)



LIU project activities

Surface of the PS complex: power converters & RF

- independent
- 1 YETS 2015
- 2 EYETS 2016 *
- 3 YETS 2017
- 4 LS2

PS

Injection low beta quadrupoles
Injection bumpers

PS

Replace high energy dipole

PSB

Finemet cavities (BRF1)

TT2

Complete renovation

Linac3

* LBS bending magnet

Linac transfer line (LT, LTB, BI)

* Bendings

Linac4

* LBE magnets

PS injection septum + bumper
(PI.SMH42)

PSB

Correction dipoles (BCER)
Injection stripping foil chicane (BRF2)
Injection Qstrip (BCER, BAT)
Injection correctors (BCER)
Dipoles (BCER)

* Injection stripping foil chicane (BRF2)
* Kickers KSW
* Distributor BI.DIS (BCER, BAT)
* Injection BI.BVT (BHP)
* Injection quadrupoles (BCER)
* Injection correctors (BCER)
* Injection septa (BRF2)
Transfer bending (BHP)
Quadrupoles (BHP)

PS

Low energy dipoles (DHZ)

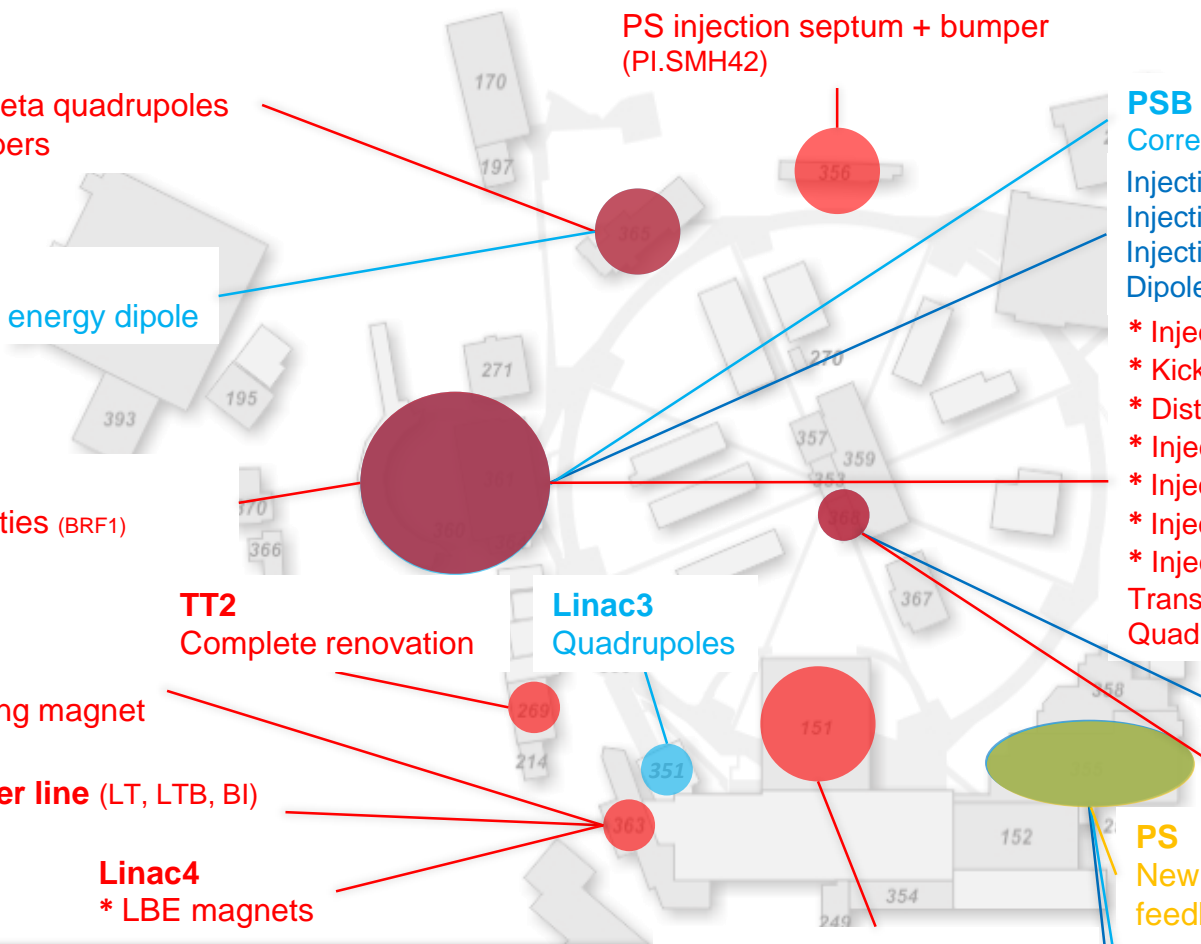
IPM magnets

PS

New power amplifiers for transverse feedback

Low energy focusing quadrupoles
Chromaticity sextupoles

Low energy dipole (DVT)
Low energy skew quadrupoles



Under studies:

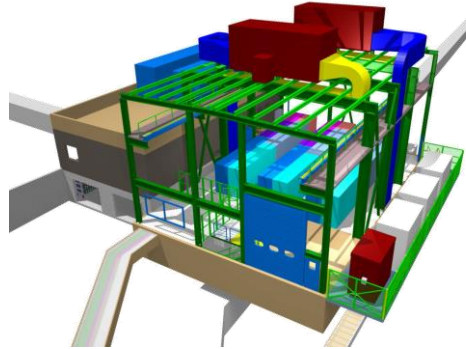
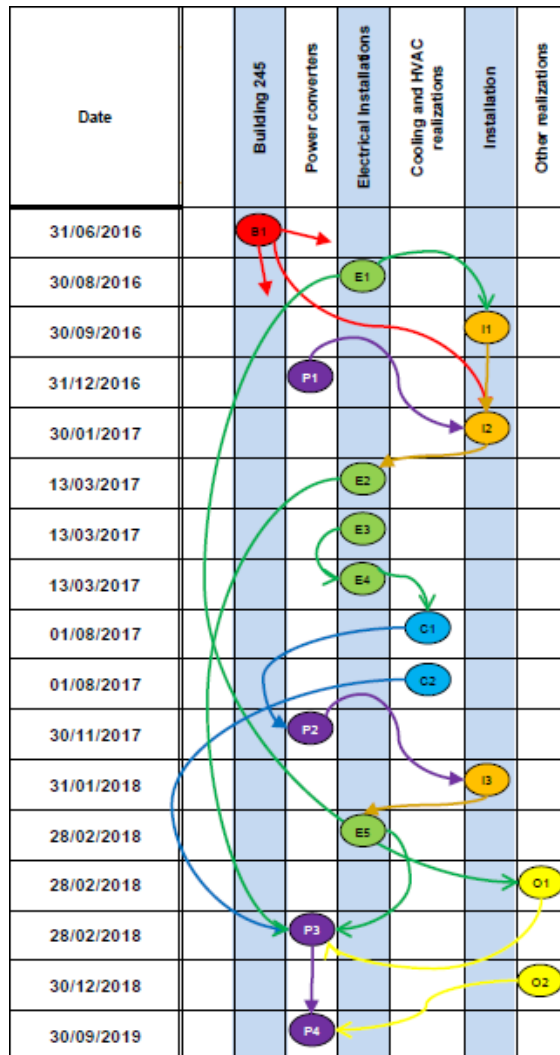
- Position for the PS septa PI.SMH42, bumper PI.BSM41,42,43,44
- Position for the PS low beta quadrupole
- Change of the 80MHz cavities tuners (SS08,88,89)

PS

New 1-turn delay feedbacks
(40MHz/80MHz cavities)

LIU project activities

Surface of the PS complex: new MPS building (245)



- 3 weeks preliminary testing on PSB magnets during the RP cool-down at the beginning of LS2
- 8 weeks for commissioning of the power converters on the PSB magnets at the end of the LS2

Courtesy: Fulvio Boattini

LIU project activities

SPS machine

- independent
- 1 YETS 2015
- 2 EYETS 2016 *
- 3 YETS 2017
- 4 LS2

Under studies:

- Position of the BRST
- Position of the fast BLMs (diamond)
- Identification of the critical location for new slow BLMs (ionization)
- Position of the new wide band transverse damper
- LIU-IONS, injection of ions with 100 ns rise time

ZS improvement (LSS2)

Vacuum sectorisation (Arcs)
Vacuum sectorisation (Arcs)

Optical fibres for the orbit systems (Sextants 1,2,3,4,5,6)
Replacement MOPOS electronics (Sextants 1,2,3,4,5,6)

Replace 1 High Bandwidth damper kicker

200 MHz RF power upgrade:

- 2 additional 1.4 MW power plants (new BAF3)
- 2 extra cavities (LSS3)

LLRF upgrade (LSS3)

LLRF upgrade (faraday cage in BA3)

Reconfiguration of LSS1 (LSS1, BA1)

- Removal of the dumps
- Removal of the kickers
- Removal of the monitors
- Replacement of quadrupole magnets
- Modification of the vacuum sectorization

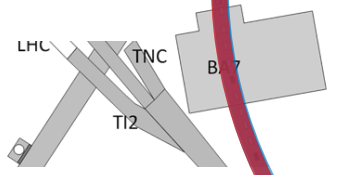
2 New fast BLMs (Diamond)

aC coating + impedance reduction:
 1 arc for QF+SSS
 MBB aC coating for limited cells

Full deployment of QF+SSS aC coating and impedance reduction
Pilot (1 arc?) MBB coating, to debug full-scale logistics and quality control
Full deployment of standard coated 156 mm drift chambers

Fast BCT (LSS3, LSS5)

Reduction of numbers of MKEs (LSS4, ECA4)



New beam dump in LSS5:

- Removal of the WCC (ECX5/LSS5)
- Civil engineering (ECA5)
- Modification of the shielding (ECA5/ECX5)
- New beam dump

Extraction protection devices:

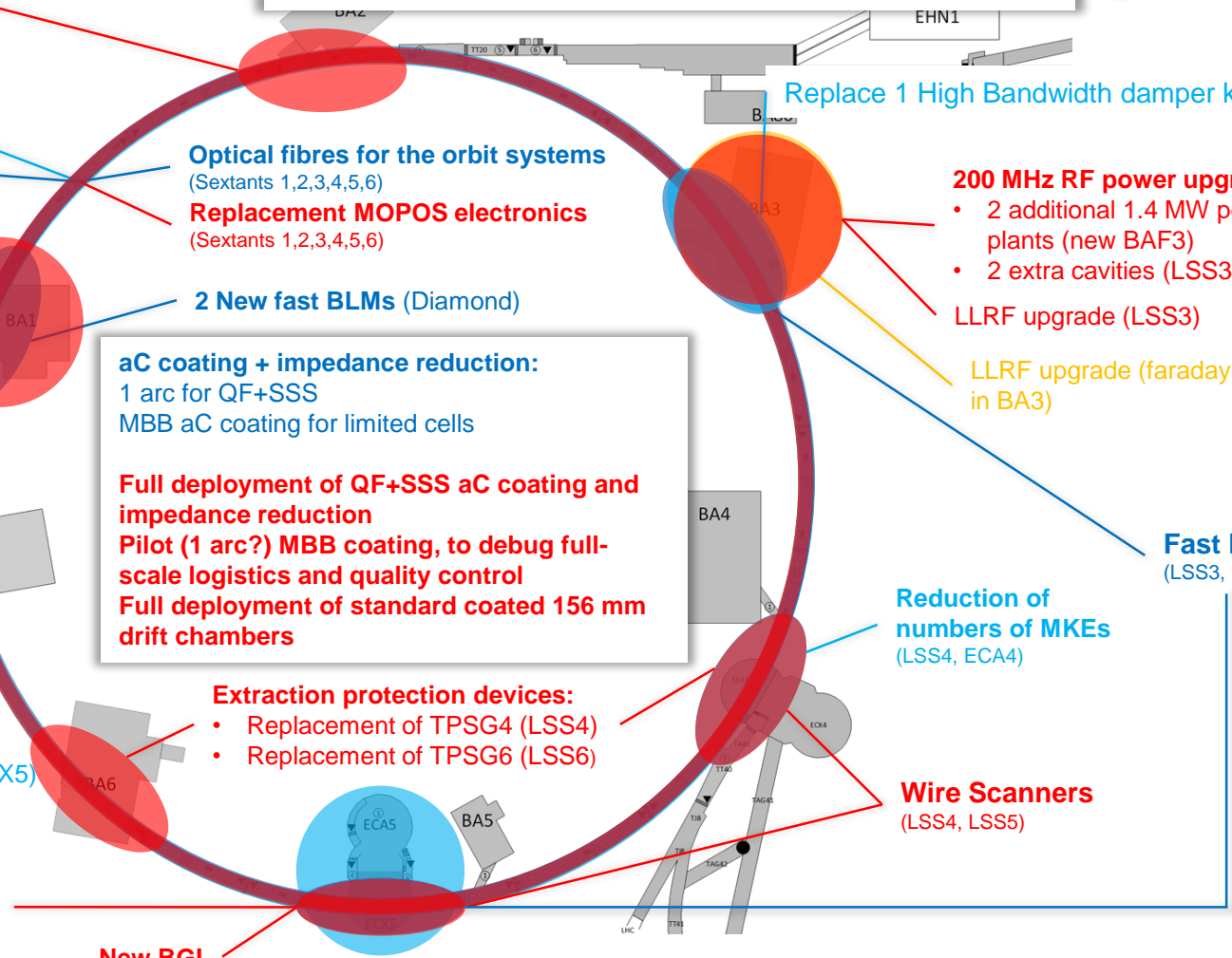
- Replacement of TPSP4 (LSS4)
- Replacement of TPSP6 (LSS6)

Wire Scanners (LSS4, LSS5)

Reconfiguration of LSS5

- UA9
- eCloud
- Beam instrumentation

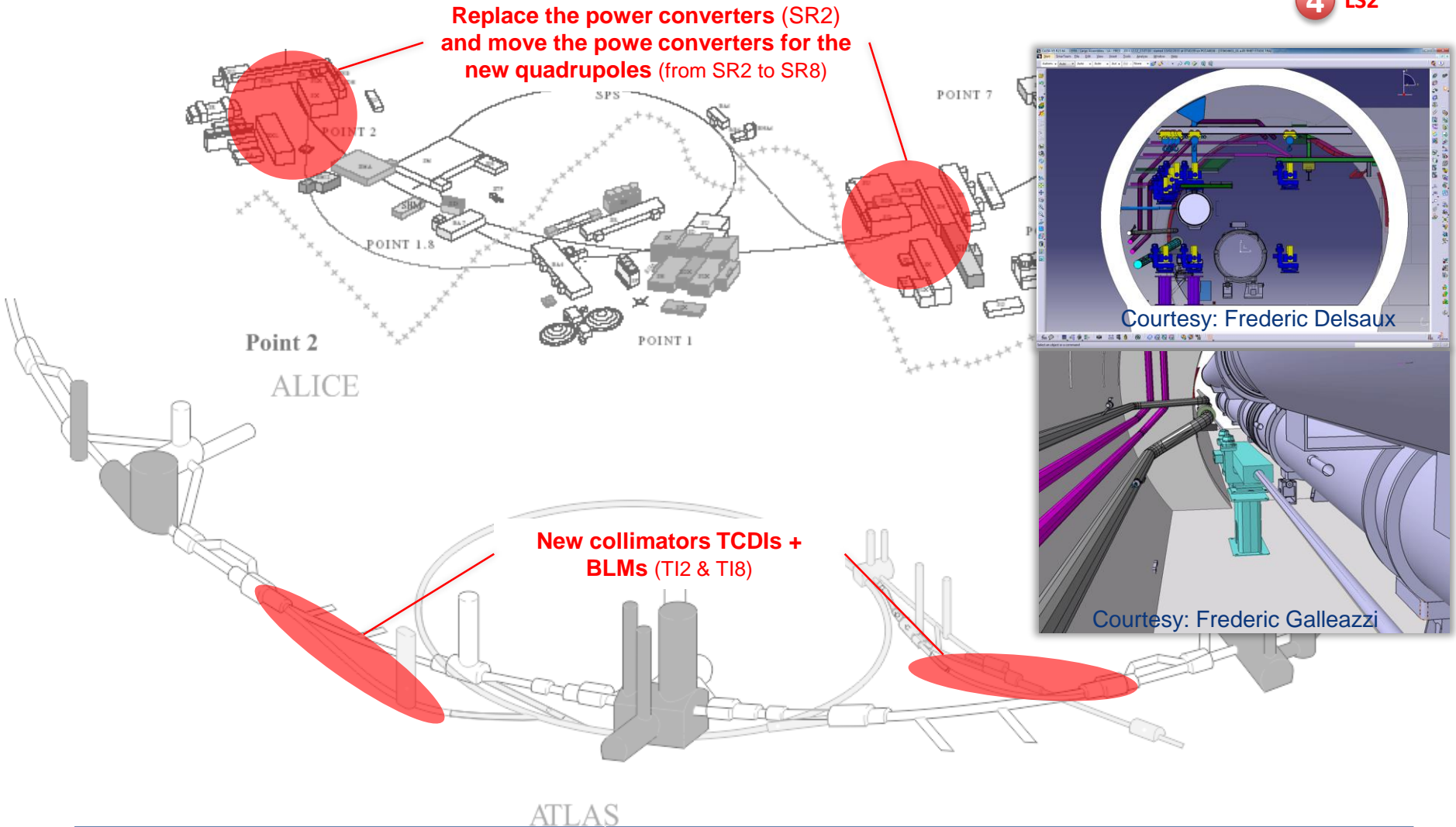
New BGI



LIU project activities

SPS to LHC Transfer Lines TI 2 and TI 8

-  independent
-  1 YETS 2015
-  2 EYETS 2016 *
-  3 YETS 2017
-  4 LS2



Conclusions

- Some equipment installation has been anticipated to (E)YETS and will require the general services and infrastructure to be performed in the same timeline (EN-CV, EN-EL, EN-HE, EN-MEF, GS-SE, etc...).

 - The groups have to make the corresponding adequate requests, well ahead of time.

- All equipment group will be committed to the approved injectors master schedule.

 - The preparation phase need to fit with the installation forecast

- The **LIU schedule** needs to integrate work from all projects, upgrade and maintenance activities and be presented as the **Injectors schedule**.
- All LIU activities need to be entered into PLAN and will be cross-checked with our LIU schedule.



LS2 DAYS

29-30 SEPTEMBER 2015

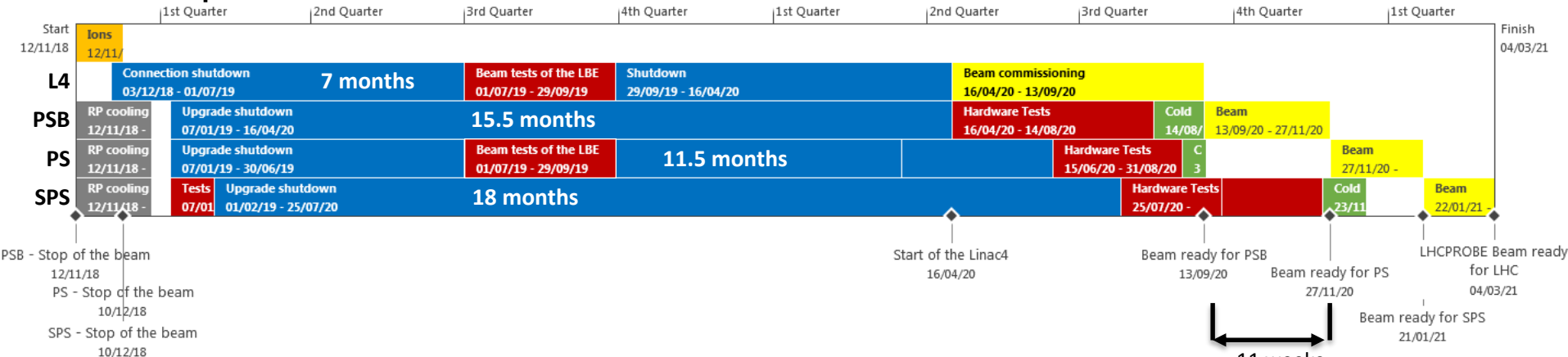
THANKS FOR YOUR ATTENTION



LIU Project

LS2 schedule

LS2 – update time estimation



Linac4 :

- **7 months** for the connection + **3 months** for beam tests in the LBE line + **6.5 months** of shutdown (=no work) + **5 months** of beam commissioning = **21.5 months**

PSB :

- **1.5 months** of RP cooling + **15.5 months** of work in the machine + **5 months** of hardware tests and cold check out = **22 months**
- **+ 2.5 months** of beam commissioning (LHC PROBE)

PS :

- **1.5 months** of RP cooling + **11.5 months** of work in the machine (+ **3 months** of machine closed because of the Linac4 beam test in the LBE line) + **3 months** of extra-time + **3 months** of hardware tests (11 weeks) and cold check out (2 weeks) = **22 months**
- **+ 1.5 months** (6 weeks) of beam commissioning (LHC PROBE)

SPS :

- **1.5 months** of RP cooling + **4 weeks** of magnets tests + **18 months** of work in the machine + **5 months** of hardware tests (2 months + 2 months of extra-time) and cold check out (4 weeks) = **28.5 months**
- **+ 1.5 months** (6 weeks) of beam commissioning (LHC PROBE)

!/! DSO tests for the SPS = +1 week

