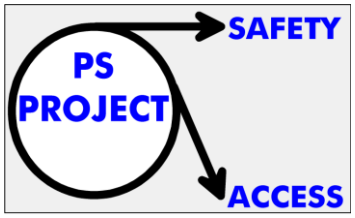


Installation and Commissioning of the PS Personnel Safety System PS PSS

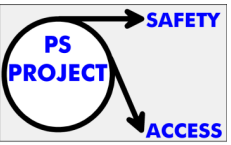
Eva Sanchez-Corral GS-ASE

On behalf of the PS Access Team

Boris Morand, Christophe Delamare, Didier Chapuis, Eva Sanchez-Corral, Fabrice Chapuis, Francesco Valentini, Frederic Havart , Gregory Smith, Jean-Francois Juget , Jose-Luis Duran-Lopez, Louis Hammouti ,Miriam Munoz, Pierre Ninin; Rende Steerenberg, Rui Nunes, Serge Di Luca, Timo Hakulinen, Tomasz Ladzinski

EDMS 1203121

IEFC Workshop
9 March 2012



Overview

- Scope of the Project
  - Main features
  - Implementation strategy
- Project Status
  - System design and test platform
  - Work progress
  - Sectorisation and integration studies
- Installation & Commissioning
  - Requirements and constraints
  - Milestones and general planning
  - Organisation
  - Access conditions during installation works
- Open Issues
- Action Plan and Conclusions

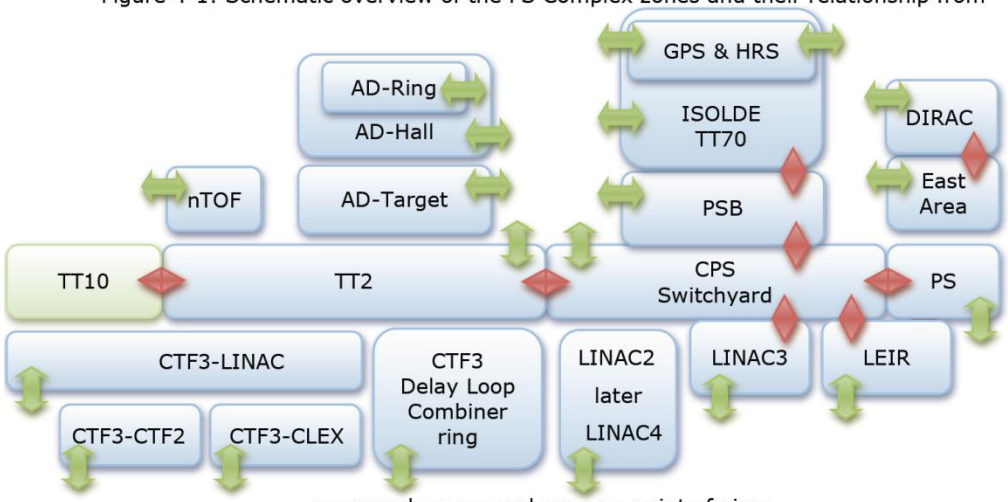
PS PSS Scope

- The new PS PSS aims at replacing the current access and safety system of the PS Complex & CTF3 Primary beam areas by a new system:
  - Providing the same functions for operation and personnel protection as the one of the LHC
  - Harmonising the personnel safety systems of CERN accelerators
  - Designed to be compliant with the Tri-partite agreement and Nuclear Regulatory Bodies

- LHC <-> PS Complex: different layout of the machines concerned
  - LHC has 5 chains & 12 EIS-beam/machine/external, 9 access sites
  - PS has 17 chains & ~135 EIS-b/m/e, 18 access zones

	LHC	CPS & CTF3
Access Points	36	28
Doors	265	~ 100
Patrol Boxes	330	~ 110
EIS-b/m/ext	12	~ 135
Interlock "Chains"	5	17

Figure 4-1: Schematic overview of the PS Complex zones and their relationship from



personnel access and passage point of view.

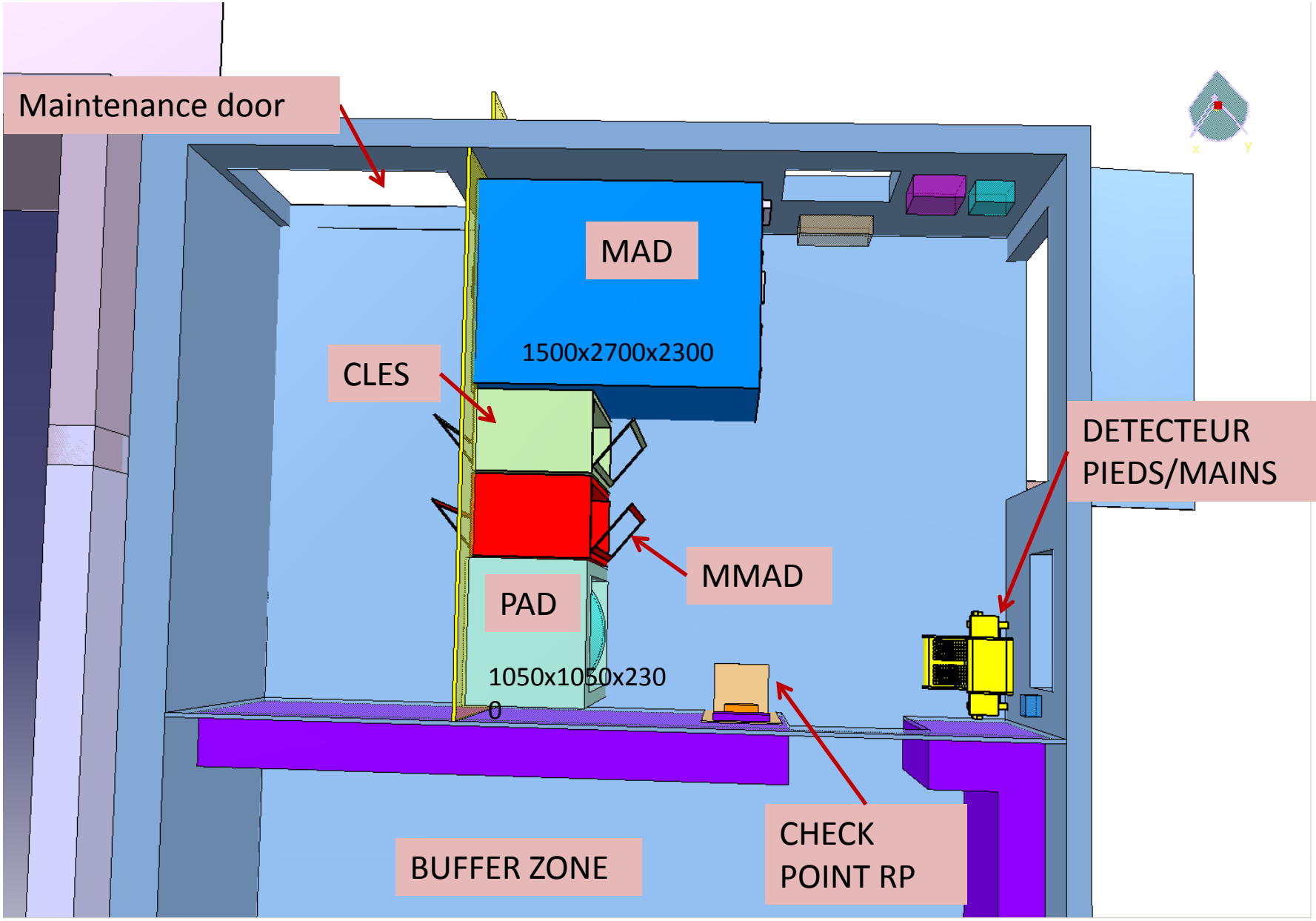
from Functional Specification for PACS (901505)

PS PSS Main Features

- Personnel protection against radiological risks
- Other risks considered:
  - Electrical, laser
  - External interlocks with ventilation
- New Operation Modes
    - *Special permit* mode - Magnet testing for specialists only
    - *Test EIS-b* mode - Testing of all EIS–beam of a Zone by interlocking the upstream chain
- Safety system based on 2 redundant systems of different technology (as required by French IRSN): fail-safe PLCs and relay logic
- Access Point composed of:
  - PAD (unicity & biometry checks)
  - MAD (trespassing detection)
  - *Mini-MAD* "drawer" in Access Points for small material
  - Key distributors (mechanical keys & independent processes for key-taking and PAD entry/exist cycles)
  - Maintenance door and emergency exit door
- Public Address

- Enlarge the scope of PSS project to include the RP buffer zone, check point and hand-feet monitor in the access point (EDMS 1166528, 1166535)

Access Point Concept



PS PROJECT SAFETY ACCESS

Current PSS

New PSS

PS0 Test Platform installed in B271

PS PSS Implementation Strategy

From 2009

- CERN
  - Users' requirements and technical specification (IT)
  - Sectorisation and integration studies
  - Civil engineering design and works
  - Technical infrastructure (copper & FO cables, power supply and computing network)
  - Grids, locksmith and mechanical works
  - System functional specification, design review, verification & validation

From Oct-10

- Contract B1303
  - Part1: Design and Test Platform
    - Validation of the technology and integration on a large scale test platform
    - Use of proven technology

From May-12

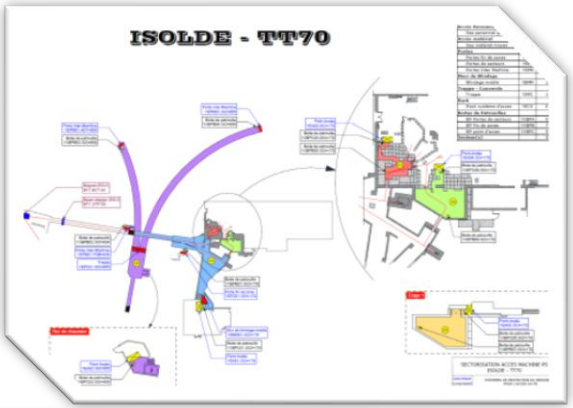
  - Part 2 : System Construction & Deployment
    - Old and new system will run in parallel
    - Flexible deployment strategy to cope with CERN accelerators schedule

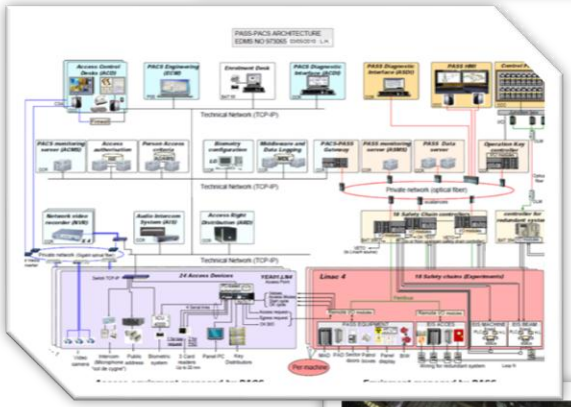
From June 2014

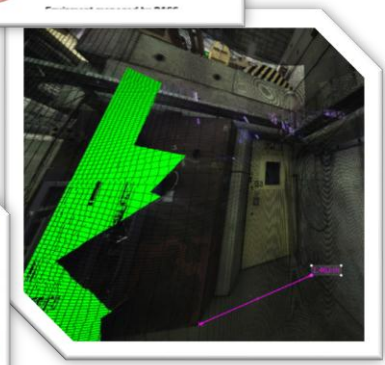
  - Part 3 : Maintenance
    - Maintenance during the installation period, after options for 2 * 5 years

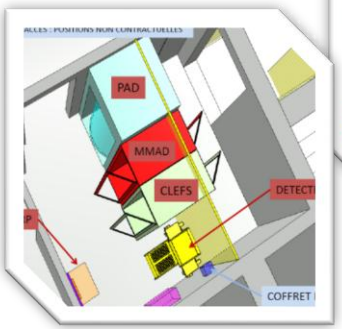
PS PSS System Design Status

- Functional Specification & Sectorisation
  - Sectorisation documents under final approval
- Risk analysis
  - Safety functions defined
- Technical Specification done
- System design completed
  - Architecture defined
  - Equipment selected & validated
- Test platform installed
  - In building 271 (refurbished)
  - Factory Acceptance tests completed 2011 Q3
  - System validation on CERN platform 2012 Q1
- Integration studies for access points on-going
  - Zones 3D scans (TruView, Catia) done (due to lack of drawings)
  - Include RP Buffer Zones
    - Optimize both studies and installation works
    - Difficulties due to lack of space and obsolescence of the technical infrastructure
  - Studies done by the EN-MEF design office
  - In collaboration with RP and the technical services groups

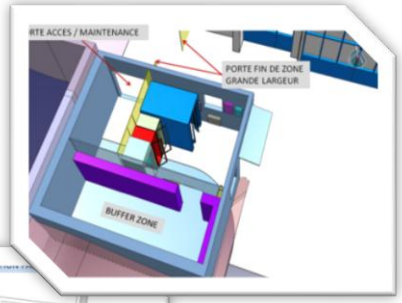


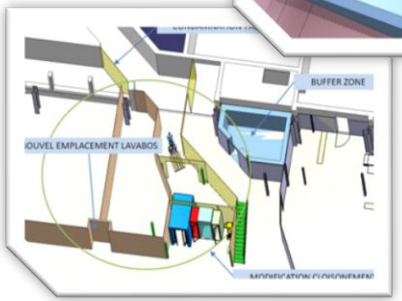






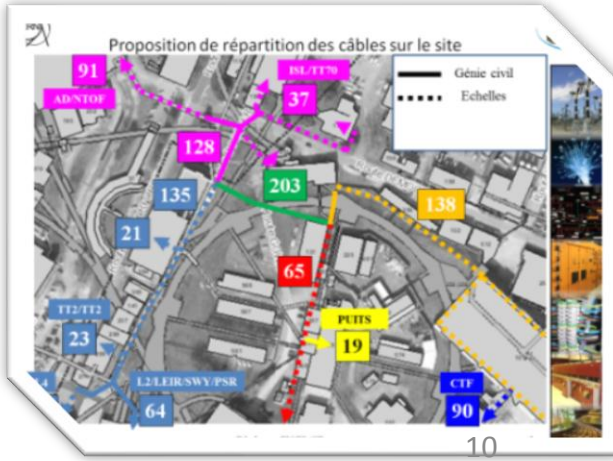
PS PSS Work Progress



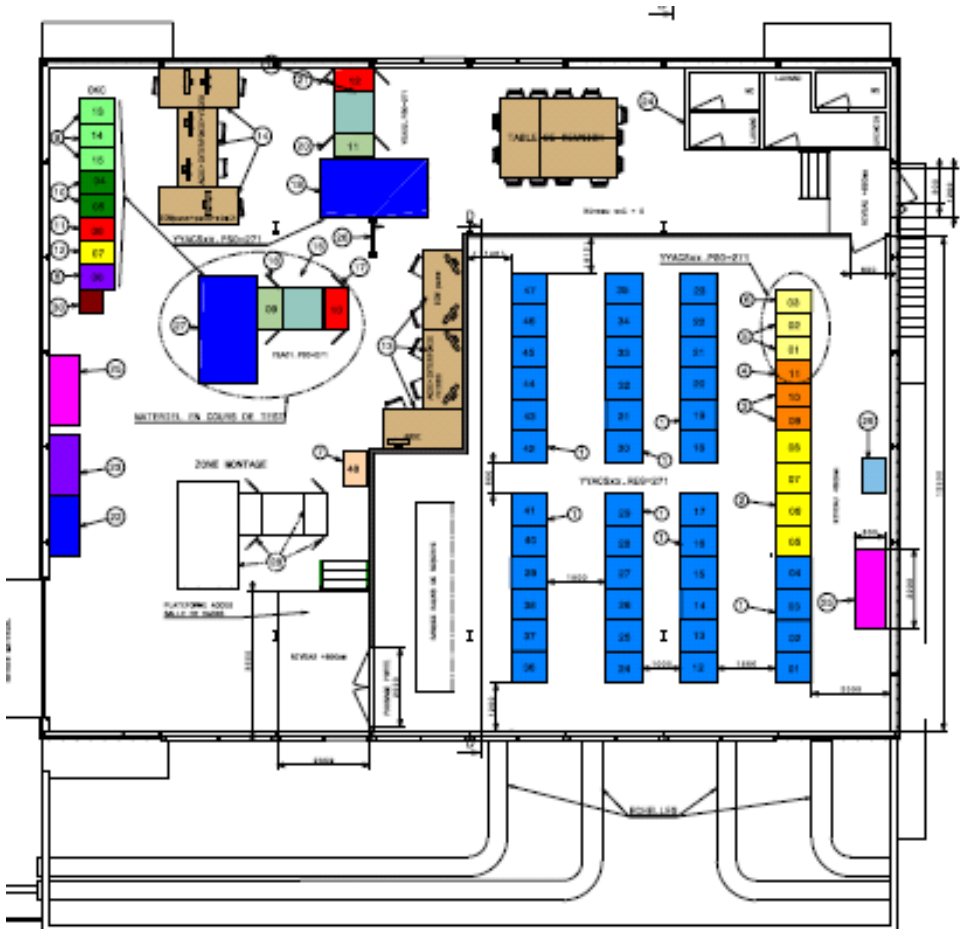


- Refurbishing of building 271- 1st floor
  - In order to host:
    - test platform, racks control room and AP mounting area
- Technical infrastructure preparation
  - Support from EN-EL, IT-CS, EN-CV
  - Optical fiber network
  - Cabling for controls and power supply
  - Heating and ventilation at access points
- Civil engineering work preparation
  - Access points
- Cabling
  - Cable tray extensions or new galleries to be made

With the support of EN-EL and GS-SE

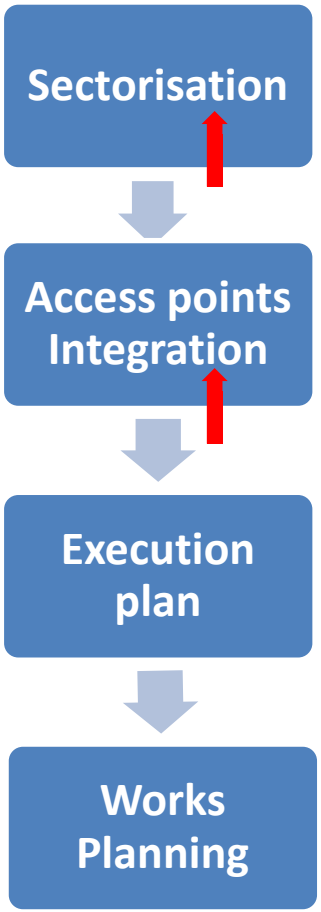


Test Platform and Racks Control Room in B271



- PS0 test platform
  - Final validation of equipment
  - Functional tests for system validation
  - Hosts up to 4 zones (i.e. Pilot: SWY&PS, TT2, NTOF)
  - Easily configurable to change the zone to be tested
    - SIEMENS simulation tools (SIMIT IHM & SIMBA box for I/O) allows to build test scenarios and simulate inputs for zone PLCs
    - Supervision with PASS consoles
    - Real access point equipment directly connected
  - Replica of the CCC PS control panel and operation consoles
  - During deployment phase: access point mounted -> connected to PS0 for testing -> installation on site
- Consoles allowing system supervision and maintenance
- Racks Control Room
  - One safety PLC per zone
  - Central location for cabling optimisation

PS PSS Sectorisation & Integration



- **ZONES (18) Sectorisation** still to be approved for LN2, LN4, LEIR, ISOLDE, AD, CTF3
  -> Bill of quantities specification for contractor (Part2)

- **Access points (25) integration studies**
  - Started in 2010, sites visits & studies on-going
  - Including 18 RP buffer zones & AP check points & HFM
  - In collaboration with EN-MEF, RP, GS-SE and services groups

Approved	Under study	To do
8	7	10

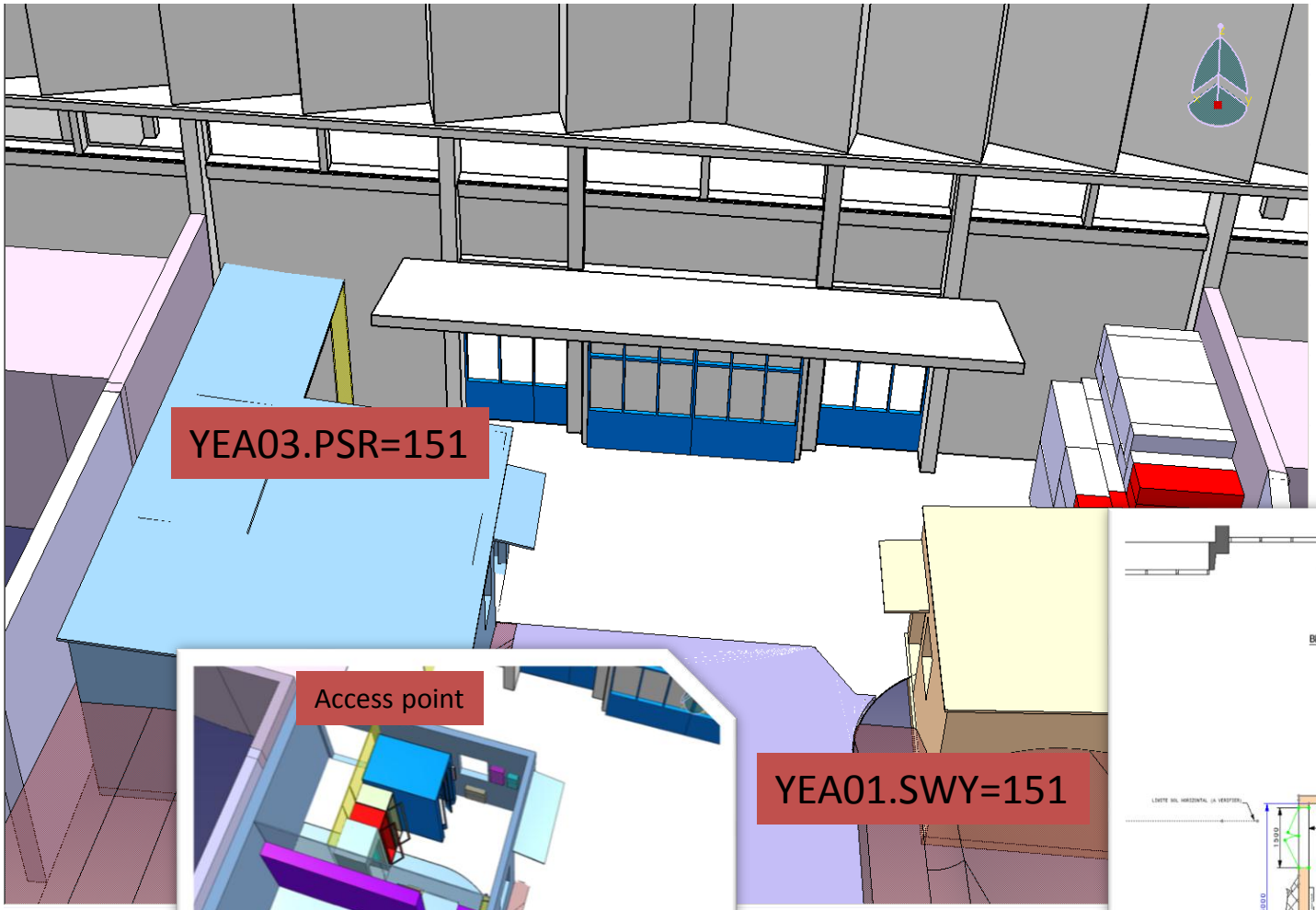
- **Types of civil engineering work identified:**

New building extension	Minor/Major works t.b.d.	RP Shielding
9 PS, SWY, TT2, CTF3	16	3 LN2, SWY, ADR, LEIR, others t.b.d.

- **Execution plans** under preparation by GS/SE
  - Preparation of tender for 9 building extensions
  - Works to start in September 2012

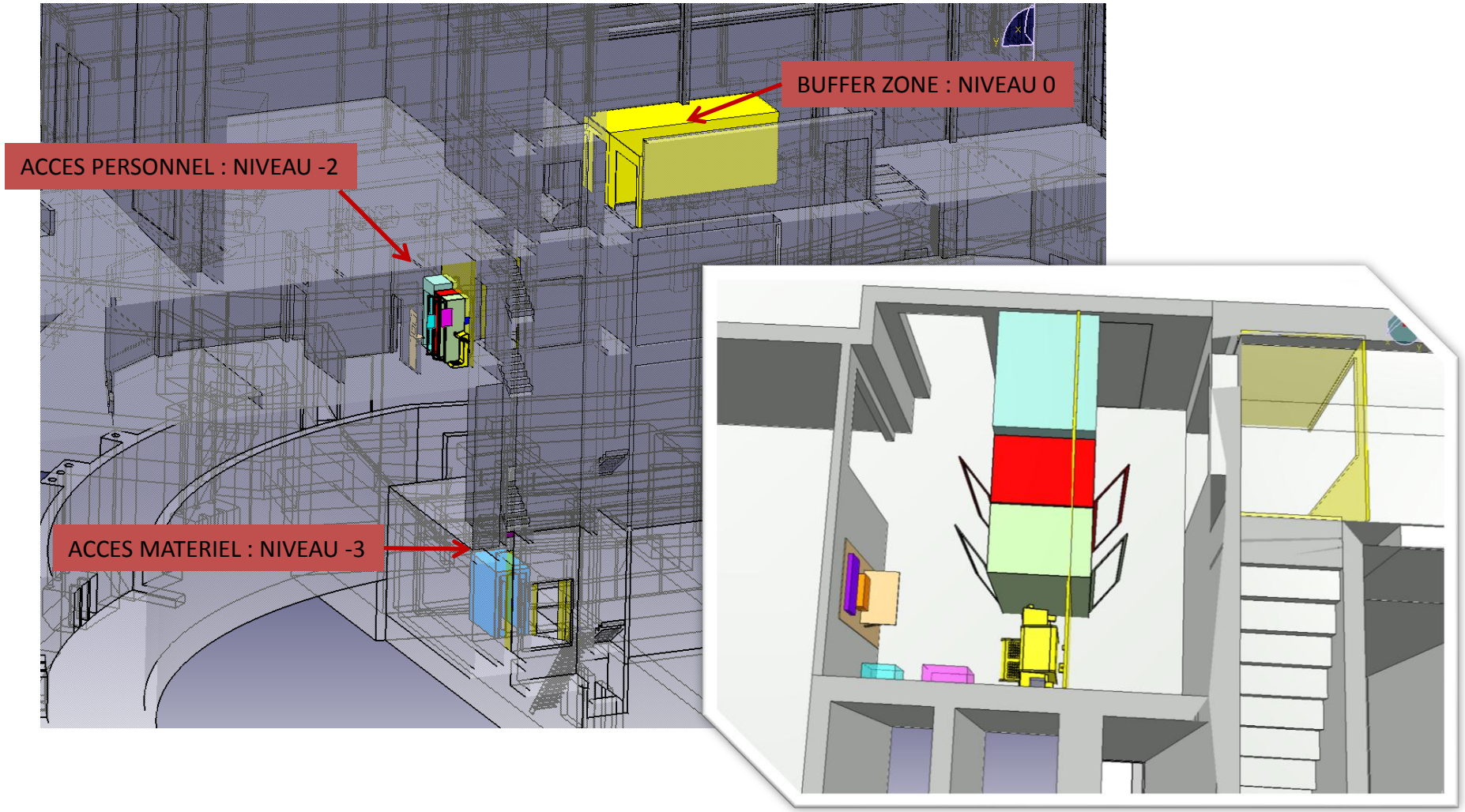
http://ps-proj-access-public.web.cern.ch/ps-proj-access-public/
Credits S. Di Luca

Integration of PS & SYW access points in new extensions of Building 151 - YEA03.PSR=151, YEA01.SWY=151

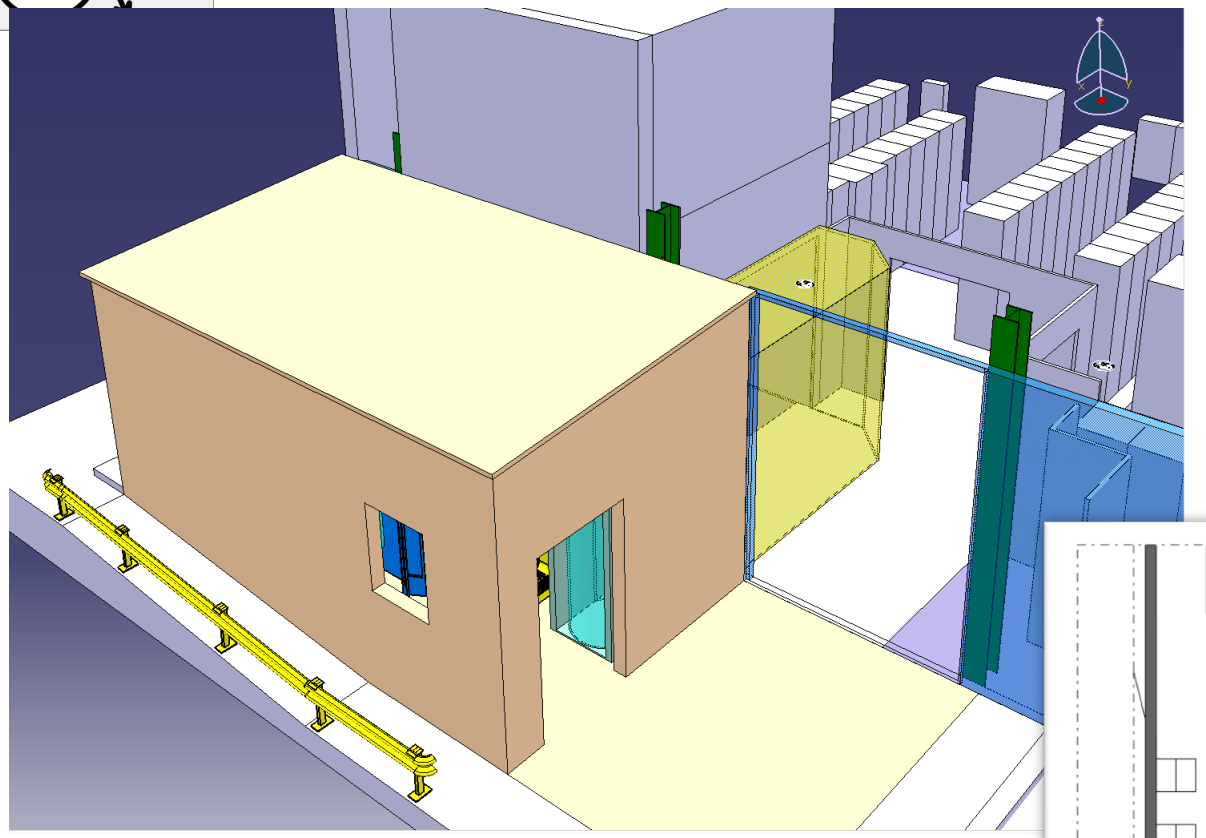


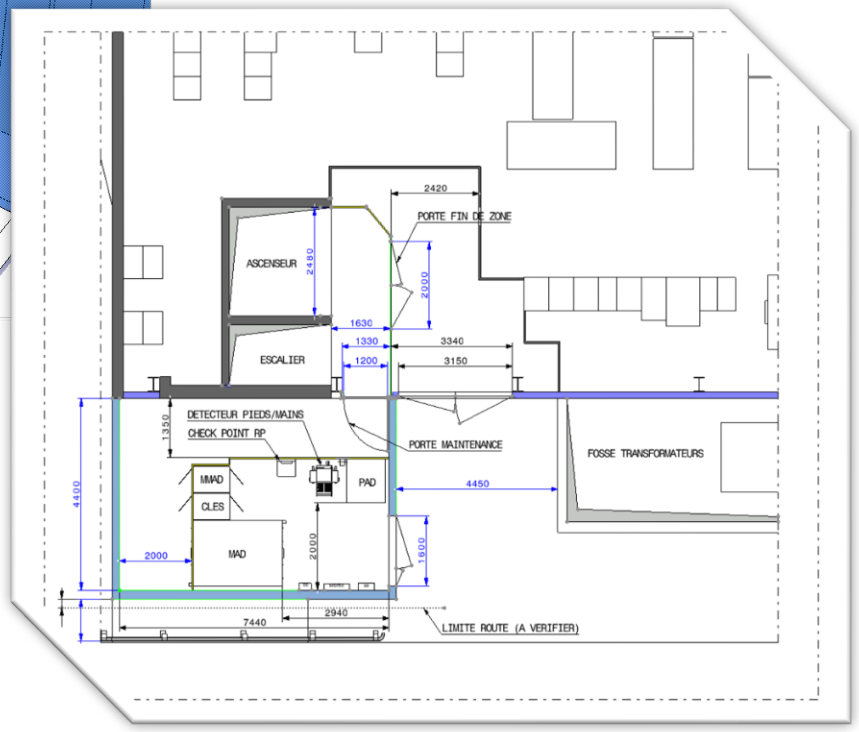
Credits C. Magnier EN-MEF

Integration of BOOSTER access point in building 361 - YEA01.PSB=361



Integration of TT2 access point in new extension of building 269 - YEA01.TT2=269



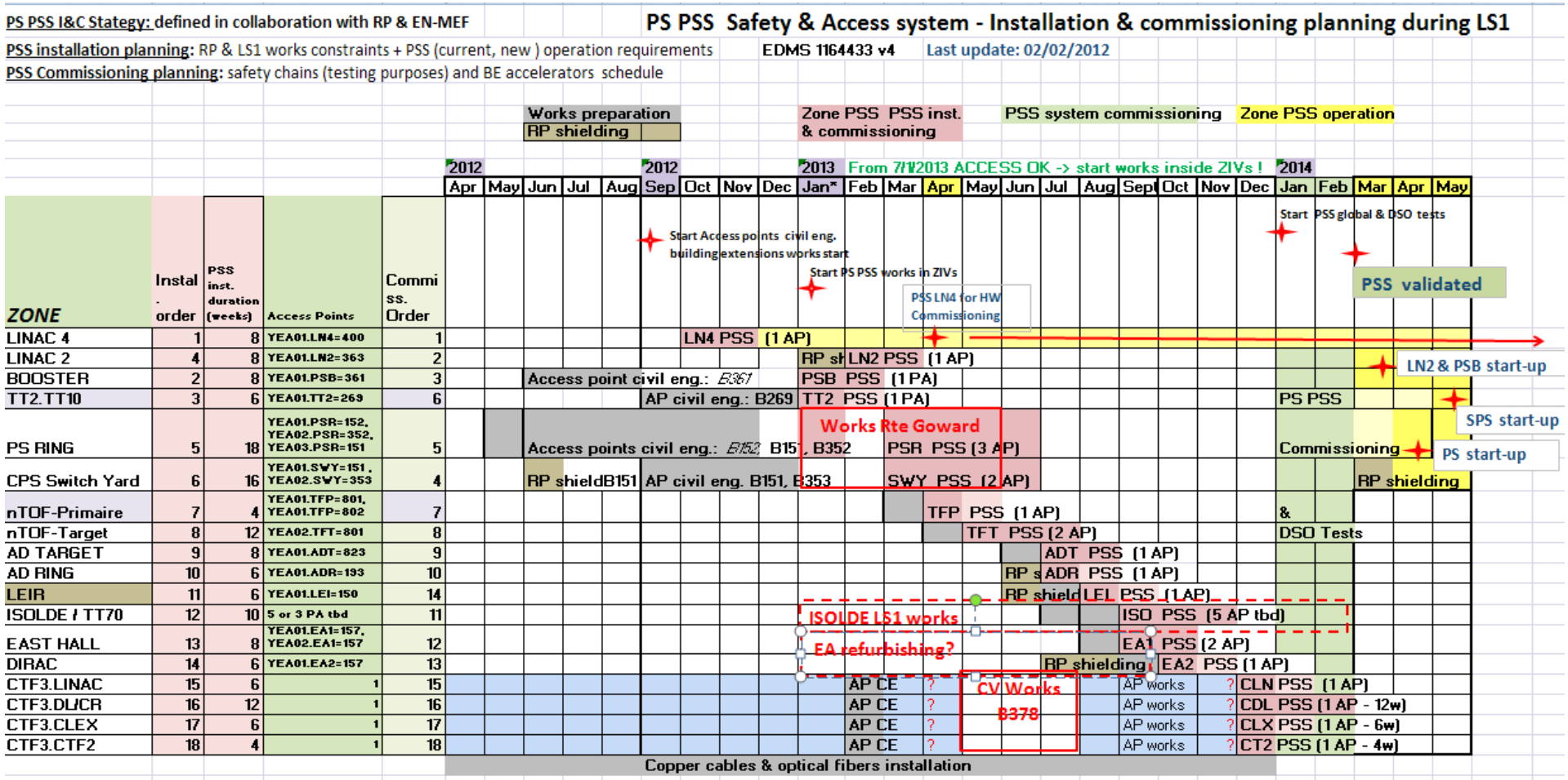


PS PSS Installation planning

- **Constraints** for installation planning during LS1
  - Requirements for Machine run
    - CTF3 -> Operation dates to be confirmed
    - Current system must be kept fully operational including interlocks
    - **-> installation of the new system to be planned outside the machine RUN periods**
  - Requirements for Access control
    - Current system must provide full access control functionality (but not interlock)
    - Case by case, according to radioligical risk in the zone (RP)
  - RP Constraints
    - Decay time for some areas before access is possible
    - ALARA working conditions
    - DIMR Procedure
  - Coactivity Management
    - Coordinated via EN-MEF (route Goward shielding, HIE Isolde works)
    - **-> PSS project planning to be integrated in the LS1 official planning**
- **Objective**
  - Installations **starting** in 2012 Q4
    - Linac4: access control in general and closed mode with “IMPACT” from end Nov 2012
  - **Install all zones during LS1**
    - priority given to zones in the LHC injector chain
    - 2-4 months per zone - 3 zones installed in paralel
  - **System Commissioning & Testing** (BE DSO & OP) – 2 months – **Jan&Feb 2014**
    - LHC injectors operational by April 2014
    - Linac4 : PSS must be ready for HwC in 2013 Q1 (May-2013?)

PS PSS Installation & Commissioning Planning

Defined in collaboration with EN-MEF-INJ and RP



ZONE	Instal. order	PSS inst. duration (weeks)	Access Points	Commiss. Order
LINAC 4	1	8	YEA01.LN4=400	1
LINAC 2	4	8	YEA01.LN2=363	2
BOOSTER	2	8	YEA01.PSB=361	3
TT2.TT10	3	6	YEA01.TT2=269	6
PS RING	5	18	YEA01.PSR=152, YEA02.PSR=352, YEA03.PSR=151	5
CPS Switch Yard	6	16	YEA01.SWY=151, YEA02.SWY=353	4
nTOF-Primaire	7	4	YEA01.TFP=801, YEA01.TFP=802	7
nTOF-Target	8	12	YEA02.TFT=801	8
AD TARGET	9	8	YEA01.ADT=823	9
AD RING	10	6	YEA01.ADR=193	10
LEIR	11	6	YEA01.LEI=150	14
ISOLDE / TT70	12	10	5 or 3 PA tbd	11
EAST HALL	13	8	YEA01.EA1=157, YEA02.EA1=157	12
DIRAC	14	6	YEA01.EA2=157	13
CTF3.LINAC	15	6	1	15
CTF3.DL/CR	16	12	1	16
CTF3.CLEX	17	6	1	17
CTF3.CTF2	18	4	1	18

PS PSS Installation Organisation (1)

- **Work definition and detail planning**
  - Resources and work teams defined with contractor
    - 2 teams per domain of activity : PAD&MAD, locksmith, cabling, mechanical, automation, control & supervision
  - On-going definition of installation & commissioning tasks

    (sequence, task duration, requirements, dependencies, constraints, services concerned, possible installation date, commissioning tests, operation date required*)*

-> To be integrated by EN-MEF into the LS1 CPS planning

PS PSS Installation Organisation (2)

- **Work preparation**
  - Advance as much as possible in 2012
  - Copper cabling, FO and power supply needs have been specified and requested to EN-EL
  - Civil engineering works required to host new access points & RP buffer zones being specified with GS-SE
- **Work coordination**
  - Site co-activity management
    - Coordinated by EN-MEF

Access conditions during deployment

- ***The aim is*** *to deploy the new system zone by zone and disconnect progressively the current system without disturbing the required access & safety functions (of both current and new system)*
- **Access strategy applicable to all the zones NOT in RUN during LS1**
  - Current system must provide full access control functionality (but no interlocks)
  - New access point not in the same location as the current control door
    - Only short interruptions of the current access control system shall be required when putting in service the new AP
  - New access point located in the same place as the current control door (few cases)
    - Not possible to keep the current access control system operational during installation of the new access point as it will have to be dismantled -> Compensatory measures to apply
  - Access control in GENERAL and CLOSED mode with "IMPACT" (for both current and new system)
  - Operation & supervision from CSA
- **Specific cases for Machines in RUN during LS1**
  - Current system must be kept fully operational including interlocks
  - Access with key
  - Operation & supervision from CCC
- **Compensatory measures**
  - Forbid passage through the replaced access control door and propose an alternative one
  - Deploy temporary access control card readers (SUSI) with dosimeter at access control 'points'
  - Guards

New PS PSSS Main Installation Activities

Description	Location	Group
Copper and optical fibers cabling	All AP and doors	EN-EL
Electrical distribution installation	B271 , all AP, some zones	EN-EL
Civil engineering works at the Access Point & RP buffer zone	At all AP	GS-SE
Cooling ventilation	B271 , at some AP	EN-CV
PAD & MAD testing (B271) – AP installation	B271 , at all AP	PSS Contractor
Transport	Everywhere	EN-HE
RP shielding	At some AP	EN-HE
Dismantling of old doors	At all AP	EN-HE
Locksmith work	At all doors	t.b.d
Mechanical work, painting	At all doors	GS-SE, EN-HE
Grids work	At all AP, some doors	EN-HE
Video cameras installation	At all AP	PSS Contractor
Junction box connection, local cabling	All AP and doors	PSS Contractor
Public Address installation	At all AP + specific location	t.b.d
Safety and Control computing infrastructure installation	B271	PSS Contractor
HMI installation in CCC	CCC & CCR	PSS Contractor
Connection and electrical tests of the PASS racks	B271	PSS Contractor
Zone software testing	B271 + zones	PSS Contractor, GS/ASE

Open issues

- **LINAC 4 HW commissioning**
  - Define requirements for new PSS during the different Linac 4 commissioning phases (HW, Beam)
    - Nov-2012 to March-2013: Access control (General & Closed modes with "IMPACT")

    -> Operation from CSA
    - From May-2013 : PSS fully operational (access with key, interlocks)

    -> Operation & supervision from Linac4 control room in building 400 (and not the CCC!) until end of LN4 commissioning *(request being studied)*
  - PSS system availability requirements to be defined

- **CTF3 operation during LS1**
  - RUN during whole LS1 has been requested by CTF3 -> Dates to be confirmed

    -> Operation from CCC with current PSS ?
  - PSS Installation & commissioning planning to be defined outside RUN periods
    - But as new access points will be located outside the experimental area buildings

    -> AP works will be possible during RUN operation period(s)
    - However, need to reserve at least 2-3 weeks per zone without RUN in order to complete the PSS system deployment

Open issues (2)

- **East Area & Dirac re-furbishing during LS1 –** to be confirmed?
  - Integration studies to be done for new East Hall layout (not yet approved)
  - PSS I&C planning to be defined

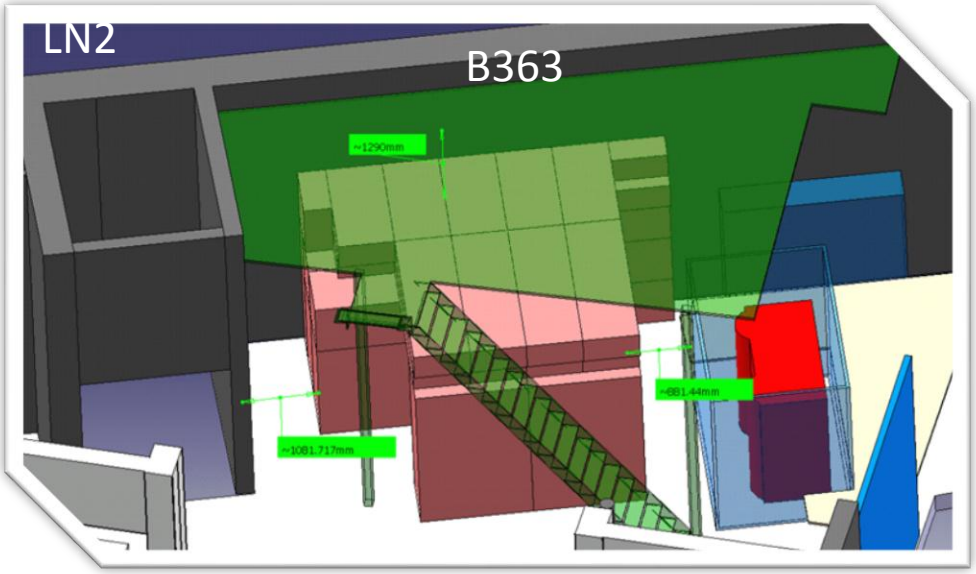
  -> PSS installation possible only after East area refurbished

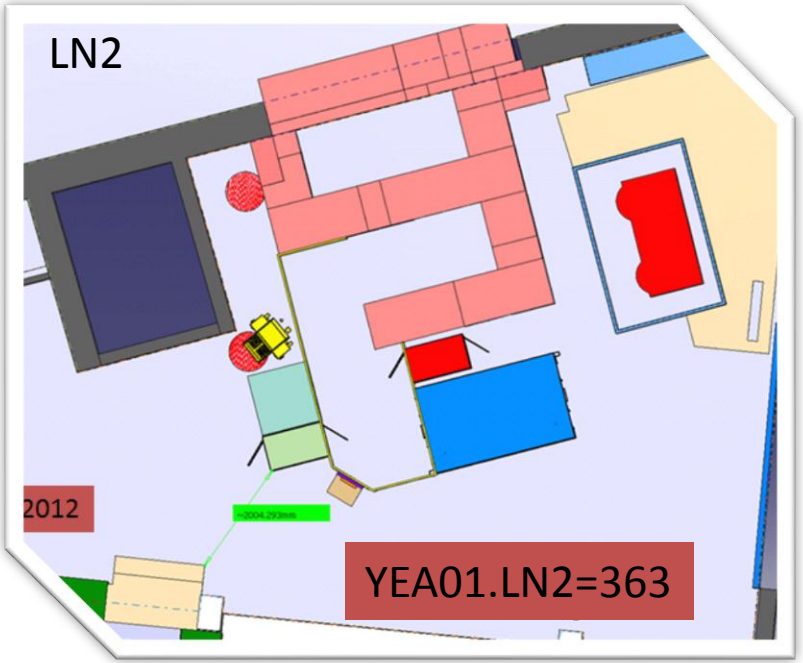
- **ISOLDE access points integration difficulties**
  - Lack of space, revise number of access points and update sectorisation
    - Proposal: No access point in HRS and HT zones but instead, install an end zone door (requires blind access procedure to access to these areas)
  - Co-activity with different ISOLDE works to be managed
  - PSS installation work will be inside the zone and have impact in the current PSS system as future access points and doors will be located in the same place as today

  -> Define access conditions and when/how to dismantle the current system

Open issues (3)

- **LINAC2 access point integration difficulty**
  - Implementation solution to be optimised as requires important work (RP chicane, re-furbishing of metalic plateform in level1, ...)
  - Temporary implementation as Linac2 only foreseen till connection of Linac4
    - Access point could be used later for Linac4 inside the tunnel



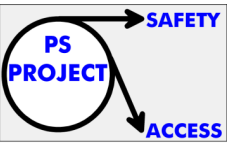


Open issues (4)

- **LINAC3 removed from scope of the new PSS**
  - To validate the proposal to deploy only access control with dosimeter card reader (SUSI) at the LN3 entry door

- **Co-existance of current and new system**
  - Human machine interfaces in the CCC and cabling
  - Testing and progressive integration of the zones to the new PSS

- **Impact on other systems**
  - Interfaces with interlocked equipment to be provided following defined installation planning to allow zone system tests
    - Beam stoppers, power converters
  - New Beam Imminent Warning deployment
  - Emergency stop refurbishing
  - Install a SIP (Safety Information Panel) at every access point as in LHC ?



Action Plan

- Validation of all the sectorisation specification documents
  1) -> Specification of bill of quantities for our contractor in order to order the Deployment of the PSS in all the CPS & CTF3 zones
  2) -> Preparation of installation & commissioning planning of zones (deployment order)

  -> deadline April 2012

- Definition of installation procedures, DIMR preparation
  -> detail PSS I&C planning to be integrated by EN-MEF in the LS1 official planning

- Launch civil engineering works
- Launch technical infrastructure services deployment

- Study co-existance of current and new system

- Validate with RP and BE the access conditions during LS1 to the different zones

PS PSS project contract Part 2:

System Construction & Deployment

(1) Zone superintendant & equipment groups required

(2) DSO/RSO required

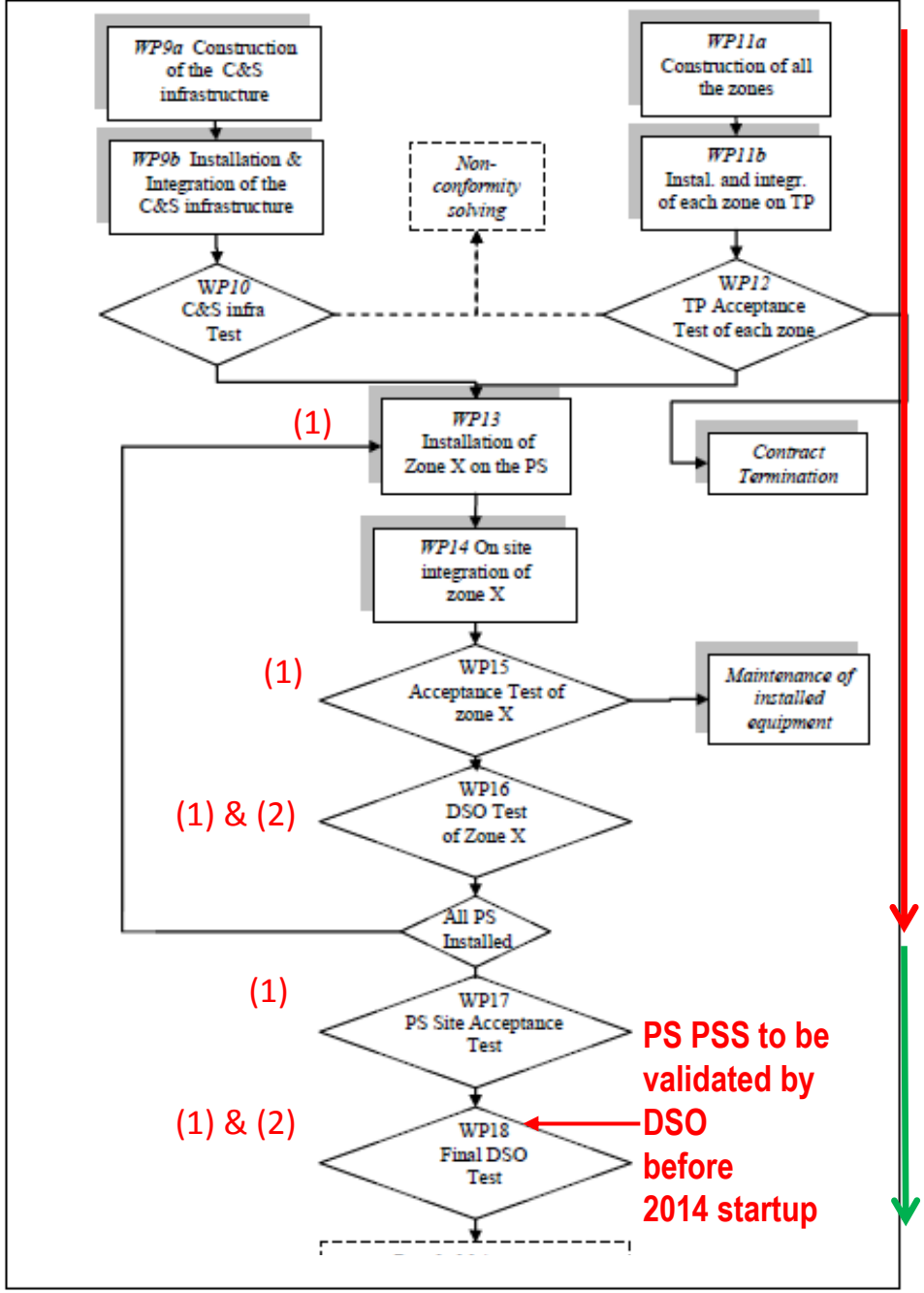
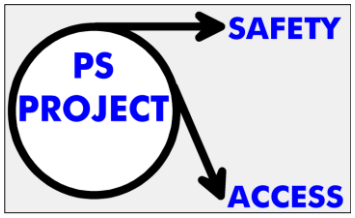


Figure 9: Part 2 – System Construction and Deployment

Conclusions

- Planning is tight but feasible
  - Approval of all sectorisation and integration documents NOW !
  - RP support to complete the shielding studies and validation of work organisation
  - Major coordination effort by project team
  - Contractor will allocate the necessary resources
  - Support of EN-MEF for the works coordination and planning
  - Operation of current and new system during LS1 to be defined

- 2012:
  - GS-ASE: Produce PSS system
  - Assistance from service groups (EN-EL, EN-CV, GS-SE) to timely fulfil the PSS requests
- 2013:
  - PSS Installation
- 2014:
  - PSS Commissioning



Thanks for your attention

and special aknowledgments to our collaborators of BE-OP, DGS-RP, EN-MEF, EN-MME, GS-SE, EN-EL, EN-CV, EN-HE and IT-CS

Questions ?