



LHC-LS2 2018/21

HL-LHC – WP11

05th June, 2018

Installation Planning proposal v0.1

Sebastien Bustamante



Summary

- Presentation of 11T and CC main installation sequences
- Presentation of planning constraints and planning integration in LHC general planning
- Conclusion

https://indico.cern.ch/event/680374/contributions/2787337/attachments/1570745/2477819/ICL_Meeting_-

11T + TCLD and CC+ TCLD installation planning based on:







- Integration studies presented @ ICL 6/12/2017
- Technical visit performed during TS2 2017
- Readiness dates provided by TE-MS
- LHC-Main general planning constraints



Courtesy of M. Gonzalez de la Aleja

A more detailed planning + formal review of all the activities must be ready by October for LS2 readiness review

11T/CC Main installation sequences

Main installation sequences	
Old Dipole Removal	
	Preparatory works prior Dipole Removal
	Dipole Disconnection and removal through PMI2
	IC Works
New 11T/CC installation	
	11T/CC Installation Preparatory works
	11T/CC Installation
	Target Collimator Long Dispersion Suppressor (TCLD) installation/commissioning

Main activities for 11T in P7 and CC in P2 installation in LHC Tunnel

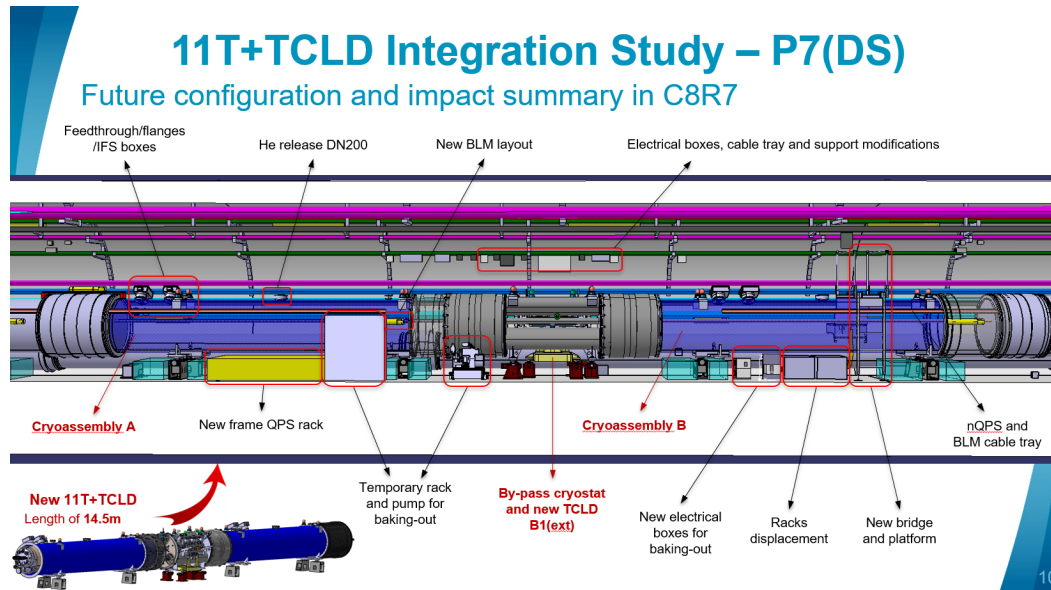
Due to 11T uncertainty on availability during LS2, works planned are divided in two categories:

- Activities that will be performed during LS2 even if 11T is not available
- Activities that can be performed only after 11T availability confirmation (= ready to install date)

Old Dipole Removal

: Activity to be performed sequentially

Task Name		Duration
Old Dipole Removal		-
Preparatory works prior Dipole Removal		-
→ DYPB Removal	Planning TBD during WP11 review	-
→ Electrical box disconnection and displacement	Planning TBD during WP11 review	3 days
→ BLM disconnection and cable-au fil removal	Planning TBD during WP11 review	3 days
→ Dipole/CC Disconnection	For CC: During Magnet exchange campaign in P2 = in the shadow of DISMAC	5 days
→ Dipole/CC Removal through PMI2		4 days
→ IC Works		2 days



11T/CC Installation preparatory works

: Activity to be performed sequentially

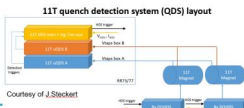
11T/CC Installation Preparatory works		-
Powering Racks installation – only for 11T and TCLD		Performed during EPC racks installation campaign
QPS Racks installation – only for 11T		
Cabling Campaign		Performed during LHC P2 and P7 cabling campaign
Floor levelling (= removal of semelles en beton)	Planning TBD during WP11 review	2 days
Floor Tracing and drilling	Planning TBD during WP11 review	4 days
BLM Cabling re-routing	Planning TBD during WP11 review	1 day

11T+TCLD Integration Study – P7(DS)

Impact on other items

- New 11T equipment needed at RR and Service Galleries. Cabling.

- 11T Power Connectors.
- 11T QDS (quench detection system): 2 QDS crates (per IPside)
 - Location: RR73 and RR77
 - Existing QPS racks: DYPG01
 TEMPE is evaluating the option to use a part of the adjacent rack shared between interlocks and QPS.



New 11T PC (LHC60)



11T+TCLD Integration Study – P7(DS)

Impact on other items

- TCLD racks needed at Service Galleries. Cabling.

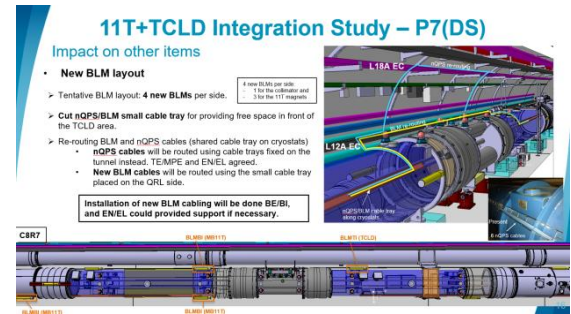
- Beam Position Monitor in TCLD
 - Location: UJ76
 - Back: SPORIS acquisition system BY03
 - Cabling: 6 cables → 4 coaxial cables and 2 control per TCLD
 - CR17 to UJ76 BY03
 - CR07 to UJ76 BY03
- Motorization control system in TCLD
 - Location: T276
 - Back: control system TYCHL05
 - Cabling: from TCLD to TYCHL05
 - 5 multiconductor cables → 4xNE48 + 1xNG28 per TCLD



11T+TCLD Integration Study – P7(DS)

Impact on other items

- New BLM layout
 - Tentative BLM layout: 4 new BLMs per side.
 - Cut nQPS/BLM small cable tray for providing free space in front of the TCLD area.
 - Re-routing BLM and nQPS cables (shared cable tray on cryostats)
 - nQPS cables will be routed using cable trays fixed on the tunnel instead. TEMPE and ENEL agreed.
 - New BLM cables will be routed using the small cable tray placed on the CRL side.
- Installation of new BLM cabling will be done BE/BI, and ENEL could provide support if necessary.





Cryo Assembly Installation

11T/CC Installation		-
11T/CC Cryo Assembly A Installation		-
→	Transport in tunnel (From P4 or P6 for 11T – PMI2 for CC)	2 days
→	Alignment	2 days
→	Reconnection	14 wks
LEN bypass cryostat Installation		-
→	Transport in tunnel (From P4 or P6 for 11T – PMI2 for CC)	2 days
→	Alignment	2 days
→	Reconnection	14 wks
11T/CC Cryo Assembly B Installation		-
→	Transport in tunnel (From P4 or P6 for 11T – PMI2 for CC)	2 days
→	Alignment	2 days
→	Reconnection	14 wks

14 weeks of reconnection takes into account

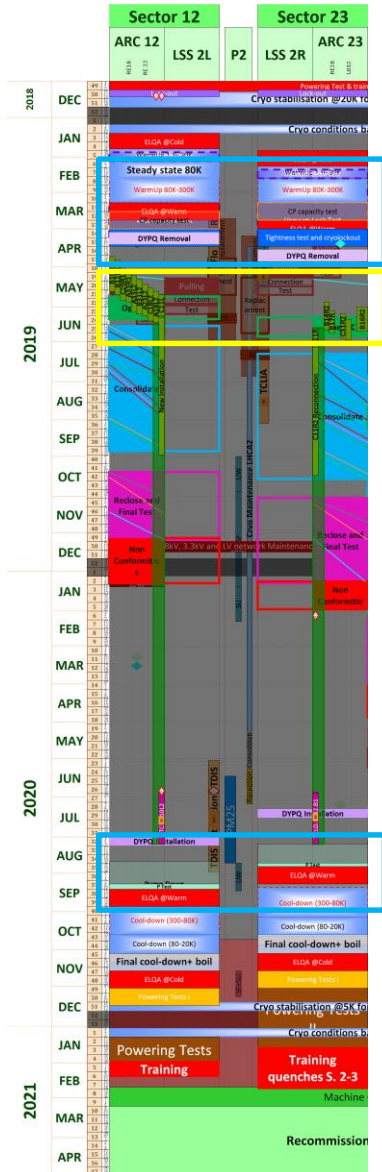
- ELQA + quality tests
- Vacuum pumping (11 weeks)
- Leak tests – TCLD replaced by a vacuum chamber
- Beam instrumentation re-installation and connection



TCLD Installation

Task Name	Duration
Target Collimator Long Dispersion Suppressor (TCLD) installation/commissioning	1.5 mons

Installation details to be checked during WP5 WPA



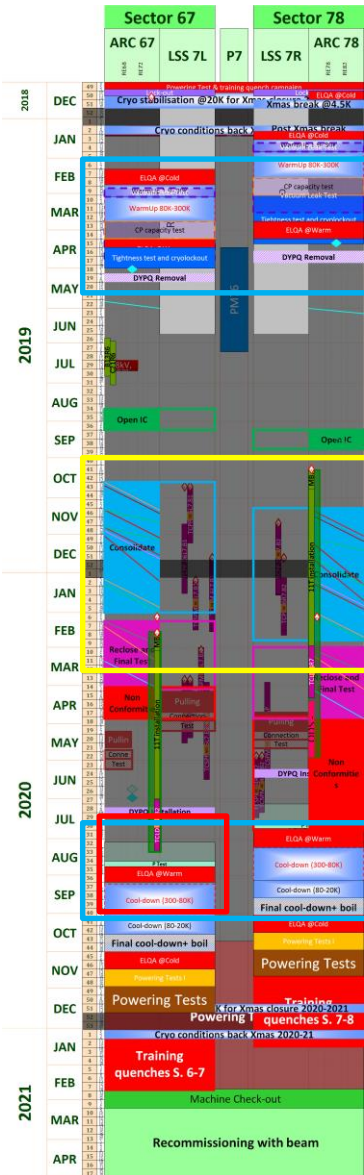
Planning Constraints:

- Access in LSS2 only after warm-up and DYPQ Removal
- Works shall be ended before LHC Pumping down prior ELQA tests and machine cool-down

Milestones Cryostat connection	Date
Ready to install of LEP connection	14/12/18
Ready to install of LEN bypass cryostat	14/12/18
Ready to install of TCLA	26/06/20

- Old CC removal during magnet removal campaign
- Installation planning proposal is in line with DISMAC activities - **OK**

11T Installation in P7: Planning constraints and integration LHC main planning



Planning Constraints:

- Access in LSS7 only after warm-up and DYPQ Removal
- Works shall be ended before LHC Pumping down prior ELQA tests and machine cool-down

Milestones 11T B8R7	Dates
Ready to install of LEN bypass cryostat	14/12/18
Ready to install of 11T	09/10/19
Ready to install of TCLD.8R7.B1	05/02/20

Milestones 11T B8L7	Dates
Ready to install of LEN bypass cryostat	14/12/18
Ready to install of 11T	17/02/20
Ready to install of TCLD.8L7.B2	05/02/20

- Old Dipôle Removal only after 11T readiness date (= not during Magnet exchange campaign)
- Installation planning proposal is not line with DISMAC activities – **NOK**

Readiness of 11T LSS7L is on the LS2 critical path

- **11T in B8L7 is on the critical path**
- **A more detailed installation planning is under optimization**
 - Installation open points shall be assessed during 11T review
 - Complete Reconnection sequence shall be better defined and optimized with the help of TE-MS/DSMAC
 - Readiness to install date 09/10/19 and 17/02/2020 confirmed? Planning risks?
- **TCLD readiness dates + installation sequences to be refined during WP5 WPA**
- **It is urgent to submit the ECR !!!**

Activities on the critical path for HL during LS2

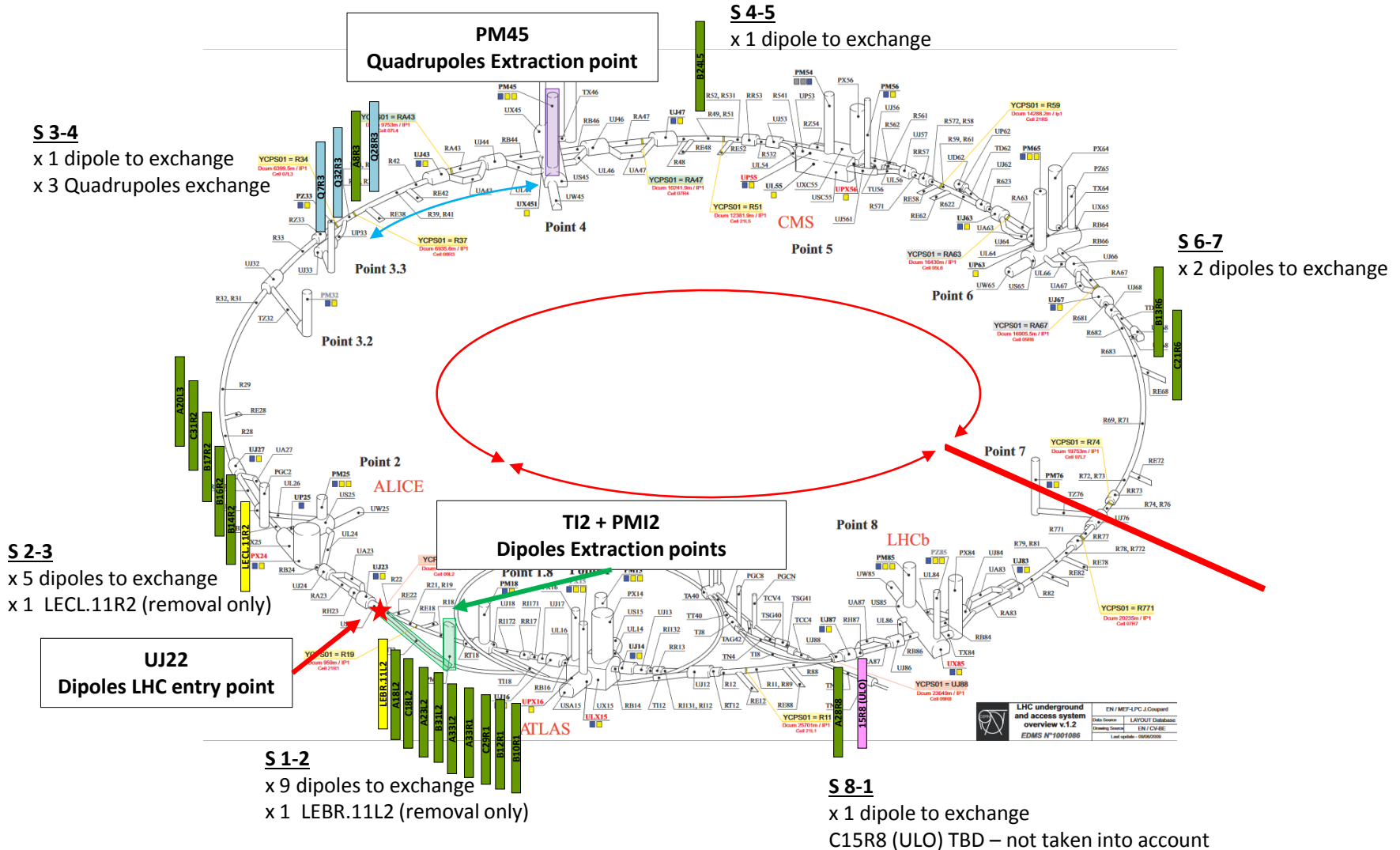
- 2 activities have been identified on the critical path
- **HL-LHC: 11T magnet in B8L7**
→ Any additional delay in the 11T B8L7 readiness (February 2020) could impact the start of cool down of S. 6-7 and the related LS2 end date
- **HL-LHC: civil engineering activities**, in particular related to UPR 53
→ Mitigation: in case of delay, the activity related to the UPR opening & finishing, can be postponed to the YETS 2021-2022
- **Warning: HL- LHC → Injection Dumps TDIS**
→ The equipment are expected to be ready in June 2020 (last equipment ready to be installed during LS2), reduced margin exists for contingencies

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Back-Up slides

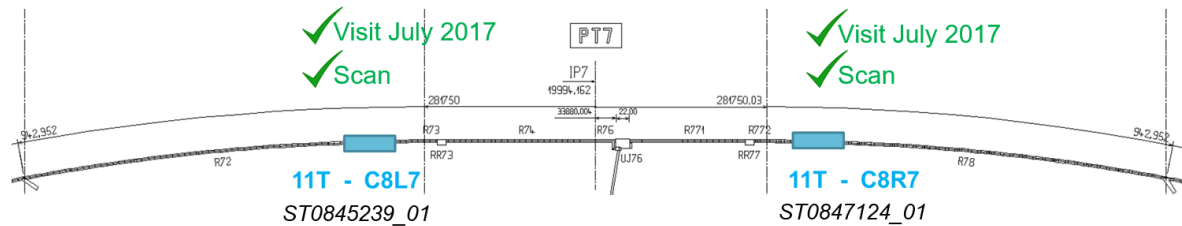
Magnet location and transport constraints



11T Tunnel Activities

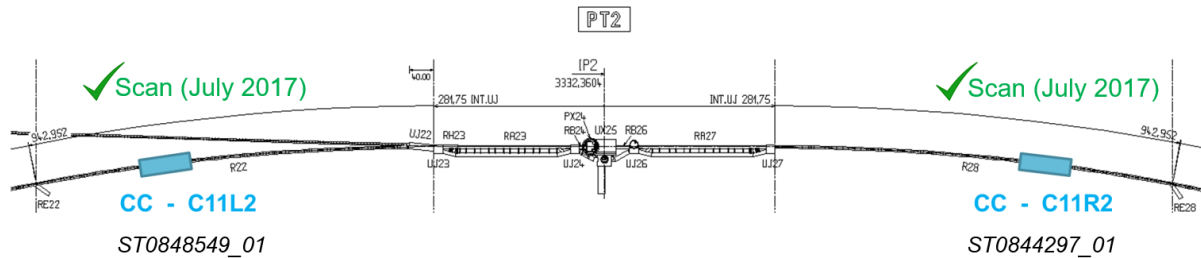
11T+TCLD Integration Study – P7(DS)

Location of changes and 3D models of area under study



CC+TCLD Integration Study – P2 (DS)

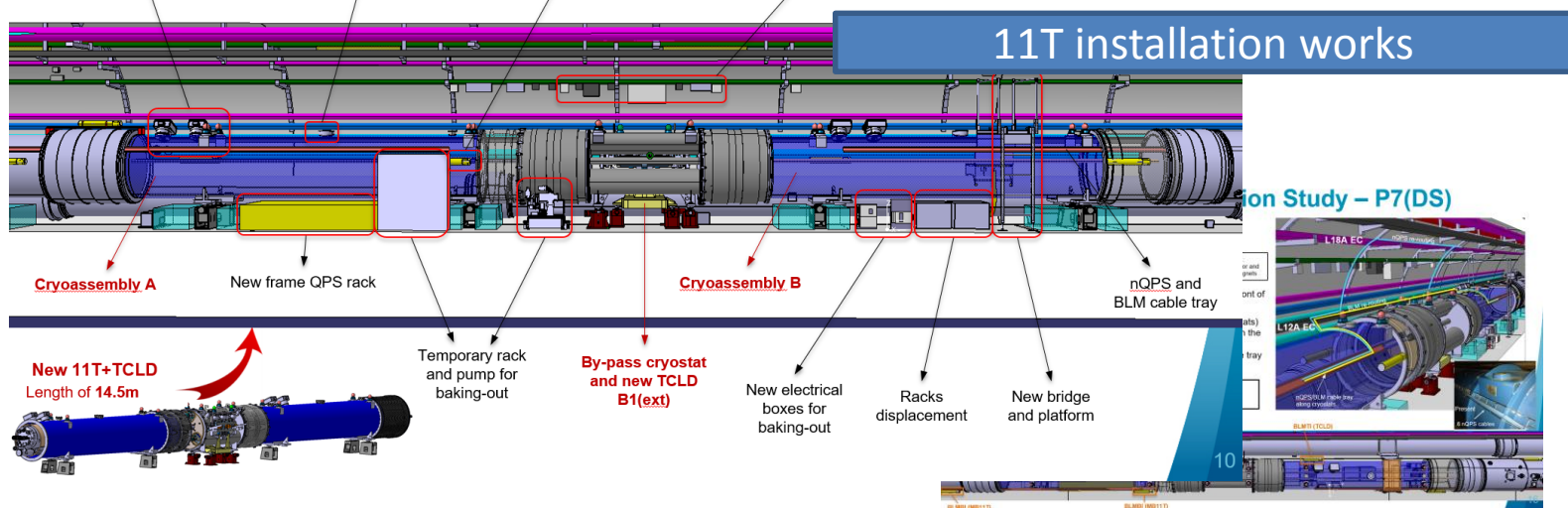
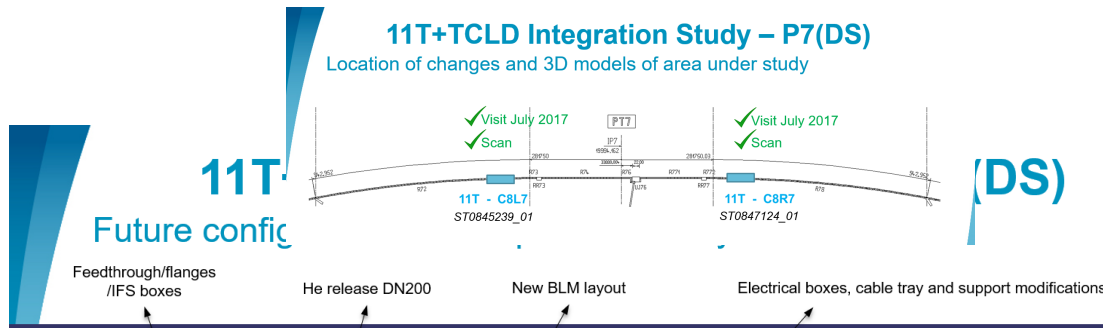
Location of changes and 3D models of area under study



11T Tunnel Activities

11T+TCLD Integration Study – P7(DS)

Location of changes and 3D models of area under study



11T+TCLD Integration Study – P7(DS)

Impact on other items

- 11T equipment needed at RR and service galleries. Cabling.

- 11T Power Converters: 1 PC (per IPside)
 - Location: RR73 and RR77
 - New name: RYABA01 (4x6000-100)
 - Water connection for PC cooling.
- TE/EPC has given mandate to do

Cabling Campaigns



11T+TCLD Integration Study – P7(DS)

Impact on other items

- TCLD Collimator Installation

- Position of collimators
- There is no need of OQL bellow protections during

Installation of TCLD

(General as taken in charge in WPS WPA)

400mm ladder by 300mm ladder above the handling area.

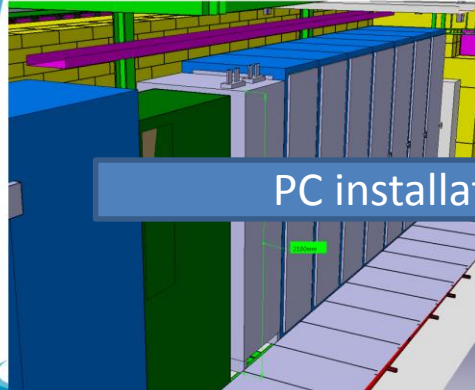
Responsibility of these actions is on EN/STI side, but work will be performed by EN/EL.



11T Racks and PC installation in RR and TZ

New 11T PC (LHC600A-10V) at RR77 and RR73

RR77



RR73



PC installation in RR

23

11T+TCLD Integration Study – P7(DS)

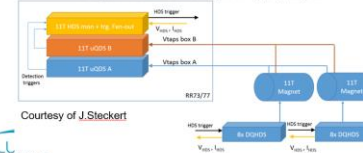
Impact on other items

- New 11T equipment needed at RR and Service Galleries. Cabling.

- > 11T Power Converters.
- > 11T QDS (quench detection system): 2 QDS crates (per IPside)
 - Location: RR73 and RR77
 - Existing QPS racks: DYPG01

TE/MPE is evaluating the option to use a part of the adjacent rack shared between interlocks and QPS.

11T quench detection system (QDS) layout



Courtesy of J.Steckert



Courtesy of S.Mandor



RR73 → L7

Existing DYPG01

26

11T+TCLD Integration Study – P7(DS)

Impact on other items

- TCLD racks needed at Service Galleries. Cabling.

- > Beam Position Monitor in TCLD
 - Location: UJ76
 - Rack: DOROS acquisition system BY03
 - Cabling: 6 cables → 4 coaxial cables and 2 control per TCLD
 - C8L7 to UJ76 BY03
 - C8R7 to UJ76 BY03
- > Motorization control system in TCLD
 - Location: TZ76
 - Rack: control system TYCHL05
 - Cabling: from TCLD to TYCHL05
 - 5 multiconductor cables → 4xNE48 + 1xNG28 per TCLD



New location for BY03 (at A9 area)

TYCHL05

