LHC Injectors Upgrade

Dry Runs for PS

Denis Cotte, BE-OP-PS

Many thanks to all PS-BCWG participants.

Dry Runs

- **Dry Run** (or a practice run) is a testing process where the effects of a possible failure are intentionally mitigated. -> “Test a Blanc”
  - Done in collaboration with equipment groups, BE-CO and OP from CCC.
  - In most of our cases, it’s a (sub) system functionality test in operational conditions.

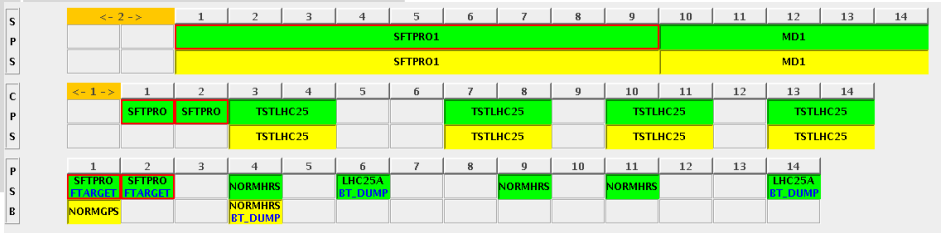
- **The aim** : **validate** (sub) system and **identify** problems (or blocking points) as soon as possible in order to generate **reports** (JIRA issue) and **work** on fixes.

- **Planning** : Dry Run can be performed anytime (LS2, ISTs, HW tests or cold check-out periods)
  - Depends on the availability of the system to be tested
  - So far, we can say that 2 dry runs have already been done in PS :
    - Validate functionality of LKTIM Trees with virtual LTIMs (September 2019)
    - Control validation of the new DFA242 5-steps in TT2 (August 2019)

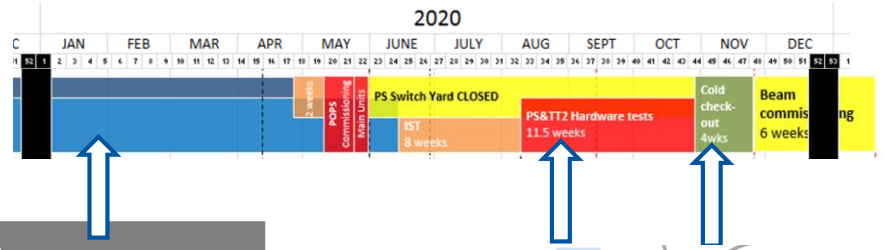
Dry Runs CO + OP

System	Tests	Requirements	Dates
Timing - CO **24 to 32 users**	• Check machine behavior after migration from 24 -> 32 timing users in CPS complex • Check the presence of 8 new timing users in CBCM application & CCM • Check PLS number of user ZERO=first position • Check the possibility to map/unmap cycle. • Check Wset update with 8 new users. • Check PPM behavior on operational devices	• MTG (Central timing) updated • CBCM (application)	• Beginning of 2020 end of January
New destination **EAST_T9** **SEM_PS**	• Check new destination in CBCM • Check inhibit by destination in CCC • Check inhibit sequence change	• MTG (Central timing) updated • CBCM (application)	• Beginning of 2020 end of January
Sequence manager with **automatic** SuperCycle **filling**	• Work with entire complex	• CBCM (application) • Sandy's algorithm + integration	• To be defined
SIS	• Test all tasks	• SIS application • CO infrastructure	• HW test, following device readiness

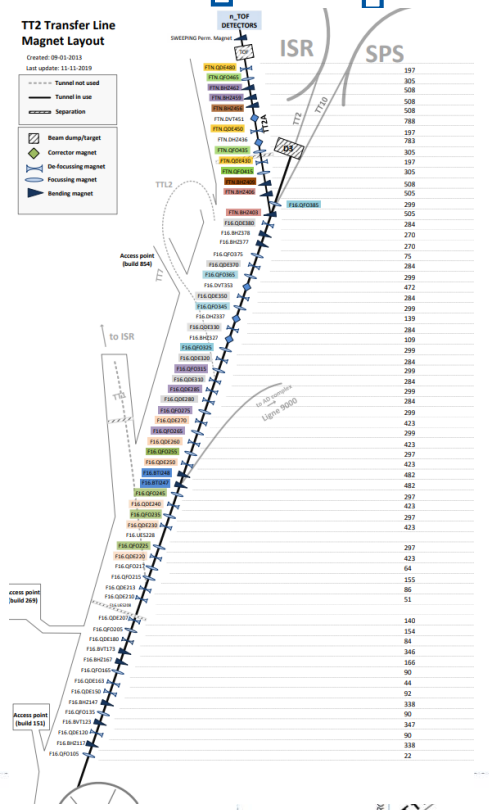
Vistars	• Check vistar displays
	  • PS
	  • BLM
	  • EAST AREA
	  • BGI
		• CO infrastructure
		• Vistar readiness	

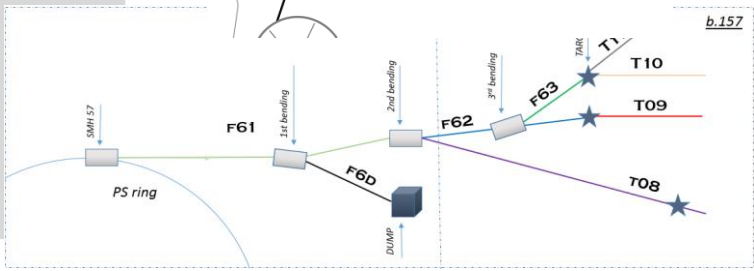


Dry Runs EPC + OP + (support CO)

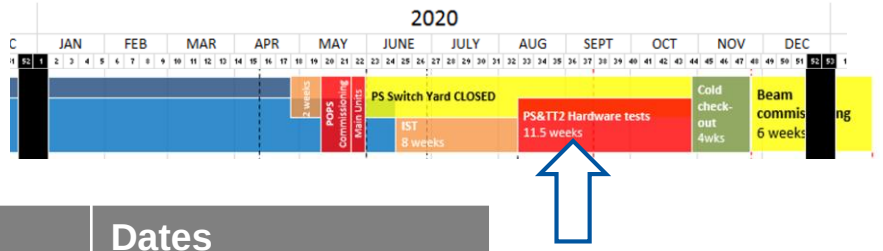


System	Tests	Requirements	Dates
TT2 Power supply	• **Validation of Economic mode by Destination on test bench.** • **Find super cycle composition restrictions** • Validate Configuration, State, Control, Cycling mode(Eco + up-min-max), software External Condition, Acquisition + OASIS (Sampler)	• MTG (Central timing) updated • CBCM • FGC63 • OASIS datasource + Sampler	• Beginning of 2020 • HW test period
F16.BHZ377 F16.BHZ378 (EIS)	• Validate Configuration, State, Control, Cycling mode, software External Condition, Acquisition + OASIS + (EIS deconsignation) • Validate the fast abort process with SPS BIC.	• MTG (Central timing) updated • CBCM • FGC63 • OASIS datasource + Sampler	• HW test period August/September 2020
F6x Power supply	• Validate Configuration, State, Control, Cycling mode(up-min-max), software External Condition, Acquisition + OASIS (Sampler) • Copy MakeRule for device with multiple PC for one magnet. • **Find super cycle composition restrictions**	• MTG (Central timing) updated • CBCM (application) • OASIS datasource + Sampler	• PS Cold Check-out November 2020

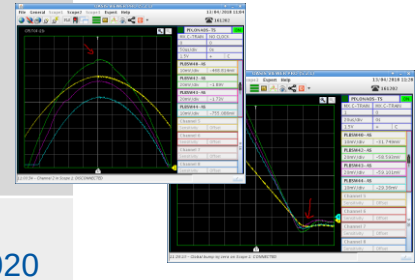


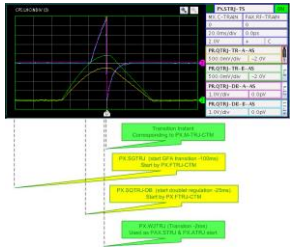


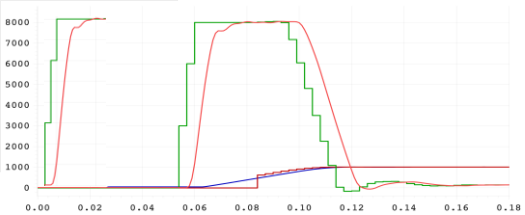
Dry Runs EPC + OP + (support CO)



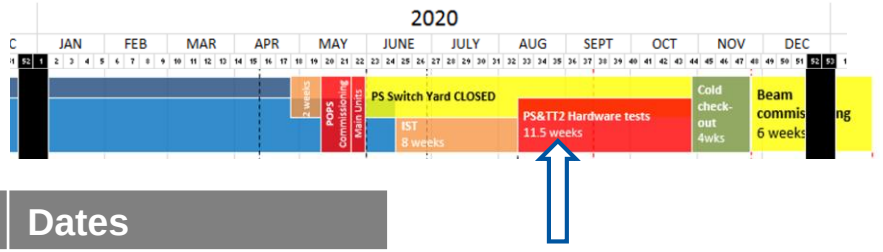
System	Tests	Requirements	Dates
Injection process Bumper (x5) SMH42 QLB	• Specification validation (**synchronization**, **shape, ripple**…) • Validate Configuration, State, Control, Acquisition + OASIS	• MTG (Central timing) • Wset/Knobs • OASIS datasource • FGC62	• HW test period August 2020
Transition process Doublets QTRJ-DB Triplets QTRJ-TR	• Specification validation (synchronization, shape, ripple…) • Validate Configuration, State, Control, Acquisition + OASIS. • Copy MakeRule.	• MTG (Central timing) • Wset/Knobs • OASIS datasource • FGC63	• HW test period August/September 2020
Ejection process Bumper (x4) SMH16 QKE16	• Specification validation (**synchronization, shape, ripple…)** • Validate Configuration, State, Control, External Condition, Acquisition + OASIS (Sampler)	• MTG (Central timing) • Wset/Knobs • OASIS (datasource for FGC62)	• HW test period September 2020
POPS	• **Early ramp-up** test and validation to save time in order to reach 2 GeV injection B field.	• MTG (Central timing) • Btrain ready • Application update • FGC53	After TE-EPC POPS test



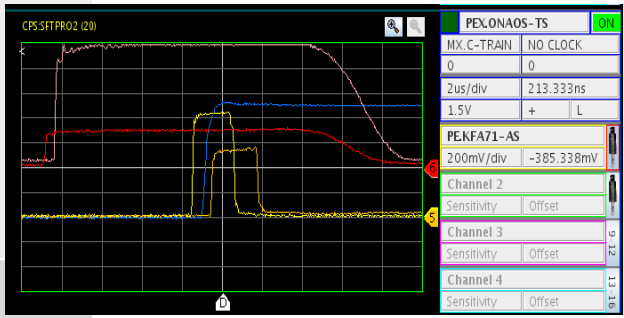




Dry Runs ABT + OP + (support CO)



System	Tests	Requirements	Dates
Injection kicker PI.KFA45	• Specification validation (charge, discharge, operation mode…) • Validate Configuration, State, Control, External Condition, Acquisition + OASIS signal per module • Simulate operation modes (EDMS : 1967855)	• MTG (Central timing) • Wset/Knobs • OASIS	• HW test period August 2020
Ejection kicker PE.KFA71 MTE kickers	• Validate Configuration, State, Control, External Condition, Acquisition + OASIS signal per module • PPM interlock	• MTG (Central timing) • Wset/Knobs • OASIS	• HW test period August 2020
DFA/BFA BFA9P (PS Ring) DFA242 (TT2) DFA254 (TT2)	• Validate Configuration, State, Control, software Acquisition + OASIS (Sampler) • Test with moulinette	• MTG (Central timing) • Wset/Knobs • OASIS + Sampler	• HW test period August 2020
Septa movement + TPS15	Validate Configuration, State, Control of the new FESA Class	• MTG (Central timing) • Wset/Knobs • FESA class readiness	• HW test period or before To be defined



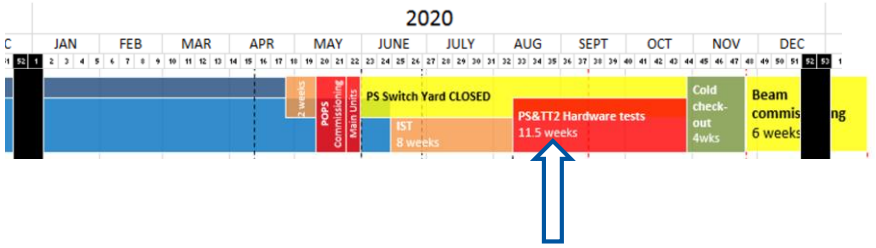
Dry Runs OP + (support ALL)

System	Tests	Requirements	Dates
Christmas Dry-Run	• **Switch OFF – Switch ON the full machine** • Identify equipment that requires piquet service to restart. • **Find or test a sequence** to restart the machine. • Can be cancelled in case of electrical glitch. ;-)	Machine with all equipment ON.	• Start of Cold check-out period End of October 2020

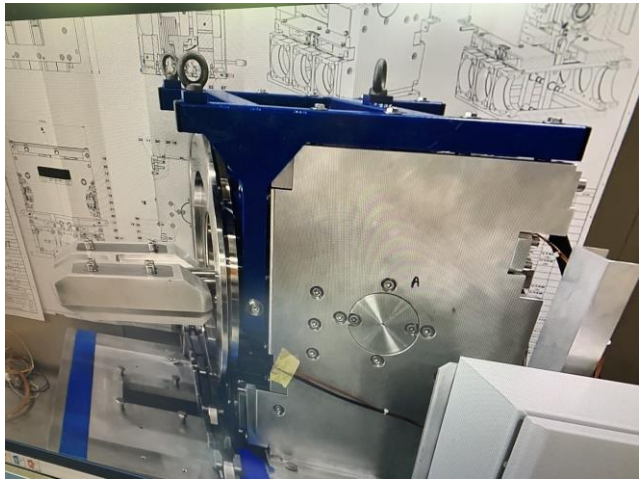
YASP	• Check the following configuration :
	  • Injection Oscillation (ions, p+)
	  • Low energy orbit correction (optics, correctors, BPM)
	  • High energy orbit correction (optics, correctors, BPM)
	  • Transition ? (optics, correctors, BPM)
	• Validate/Simulate **a realignment** process of PS magnet(s) (optics, check optics : simulated correctors MU)
	
	• Simulate a bump creation.
		• Simulated orbit	• HW test period
			October 2020

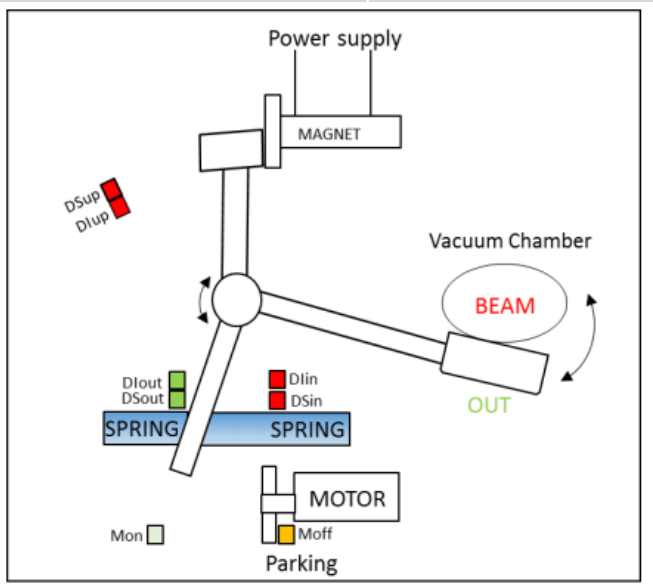
Working Point Bumpers	• Check high level parameters • PFWs function generation • MakeRules for change of Qh, QV, Xih, Xiv • Check high level parameters • MakeRules	• LSA • LSA tools • Calibration curves	As soon as possible

Dry Runs STI + OP + (support BI,CO)

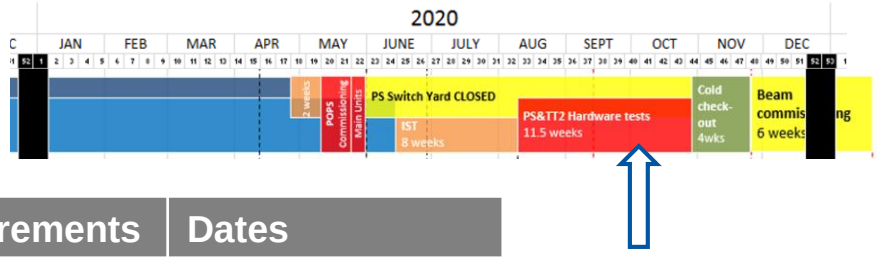


System	Tests	Requirements	Dates
Internal Dump PR.TDI47-48	• Specification validation (Time to dump, interlock with Booster BIC, operation mode…) • Simulate operation modes (EDMS : 11582110 and 1977845) • Beam dumped event triggering test • Communication with TRDC FESA class.	• MTG (Central timing) • Wset/Knobs • BI Trafo	• HW test period August 2020

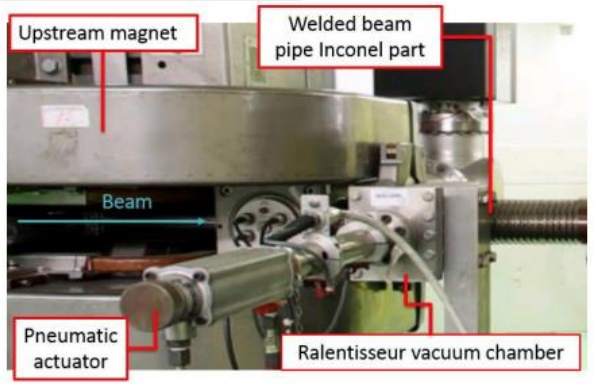




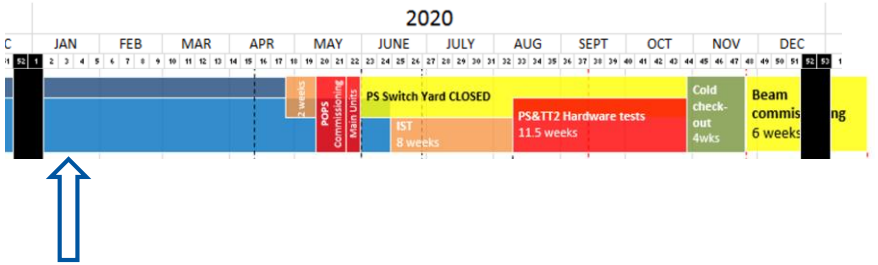
Dry Runs BI + (support CO)



System	Tests	Requirements	Dates
BE-BI	• Most of the equipment are already present in check list • Basic test to be performed : Beam IN / Beam OUT for **BTV** and **SEMGRID/SEMFIL** • Test **new FWS** with SPS new application, find limits, check data transfer with new FESA class, check Harmonics programming. Check optics from LSA. • **BLM** configuration in Wset, application check, interlock test		• HW test period October 2020
Ralentisseur	• Dedicated test to check **interlock** with injection SemGrid48/52/54 • Check that interlock can be **masked**.	• Wset/Knobs	• HW test period August 2020



Dry Runs RF + (support CO)

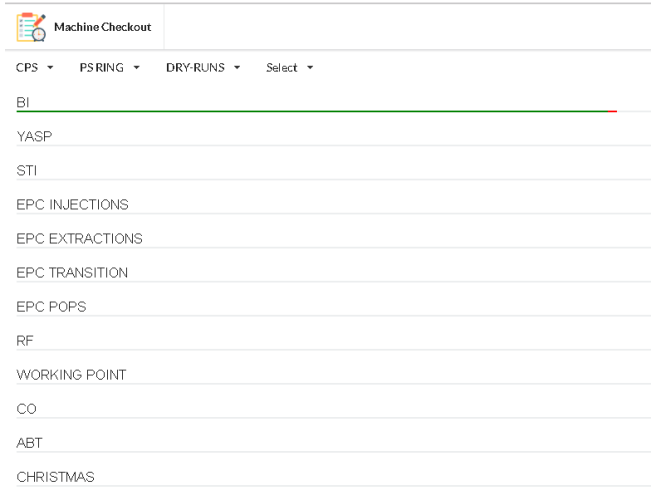


System	Tests	Requirements	Dates
RF (Low Level)	Check Cavity spare selection + C10 Matrix Check C200 Matrix Check C40 selection (1 or 2), including functions for new cavity controllers Check virtualization of CVORB and LTIM + Makerules Check VPROG (main harmonic) and harmonic number sequence + MakeRules Generation of stable phase program Generation of harmonic functions for different loops + MakeRules Check virtualization of function + MakeRules Generation of internal functions + MakeRules Generation and distribution of RF trains (CTUs) Control of 20/40/80 MHz cavity controller Control of digital radial position detection	• CO infrastructure • LSA • Specific applications	Starting in January 2020

Conclusion

- **This Dry Run list is focused on different items that will be :**
  - new,
  - renovated,
  - or modified during LS2.
  - other simple tests are already present in “Check List” and only need a small update.
- **Dry Run list has been added in check list tool thanks to Marc**
- **Planning:**
  - For the moment, dates are just a rough idea,

  we need a new iteration when IST & HW test planning will be frozen.



www.cern.ch