PSB Dry Runs

LIU Commissioning Coordination Committee

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PSB Upgrade Snapshot

Upgrade

- New injection and extraction energies
- New H^- injection schema: Stripping foil, transverse & longitudinal painting, beta-beating correction
- New RF system (Finemet) and LLRF control
- POPS-B control: beta-beating corrections, special trims, etc, etc
- B-Train
- Transverse Feedback
- New Extraction Kicker control

Instrumentation

- H^0/H^-
- TbT BPMs
- Diamond and IC BLMs
- Matching Monitors
- Wire scanners
- Tune/Quadrupolar PU

Operation

- Cycle generation and tune control
- Interlock: BIS, External Conditions, SIS
- Synchronisation adjustment of equipment (distribution, injection, extraction, recombination)
- Operational applications

Overview

- In previous years in the PSB we were used to refer to Dry Run as test with experts
- **The current definition of Dry run is: full (sub-)system functionality tests in operational conditions (from K. Li, SPS Dry Run).**
- Plan and schedule tests per equipment or system ideally **from highest level (application)** through LSA/INCA and FESA **down to hardware.**
- **The 'verticality' is the key aspect of the test.**
- **In these slides we present** the identified list of tests.
- The integration in the Hardware Commissioning planning will follow.

Beam Instrumentation

Dry Run	High Level Application	Tested Dependencies	Requirements
Injection/Extraction Trajectory	Injection/Extraction Trajectory application	• BPMs reading • Logging in DB • Timing (change of destination)	MTG BPM calibration signal NXCALS Optical/mechanical/electrical offsets in FESA
Injection/Extraction Trajectory **Ring Orbit**	YASP Optics uploader	• BPMs reading (time integrated for rings) • Logging in DB • Optics according to destination/beam type • Transitional FGC setting • Timing (destination) • Open Bump (position/angle at injection/extraction)	MTG BPM calibration signal NXCALS MADX Optics FGC for correctors Optical/mechanical/electrical offsets in FESA High Level Parameter Knobs
Multi-turn Ring Orbit	Turn-by-Turn application	• BPMs turn-by-turn reading • Gain setting • Test calibration procedure • Logging in DB	MTG BPM calibration signal RF NXCALS Optical/mechanical/electrical offsets in FESA
BCT	Watchdog BCTTRIC	• Watchdogs with new medium ring BCT • Wetting of BCT gates • Calibration signals • Logging in DB	BCT calibration signal OASIS NXCALS RF Timing
BTV	BTV application	• Screen movement • Acquisition for different settings • Alarms	Laser

Beam Instrumentation

Dry Run	High Level Application	Tested Dependencies	Requirements
BLM	BLM Surveillance Ring BLM Viewer	• BLM reading • Threshold management • OASIS signal for diamond BLMs • Logging in DB • Virtual parameter in knobs • Laser	BLM calibration signal OASIS NXCALS Laser
Transverse Profile Measurements	Wirescanner application: • "Old" WS • LIU WS	• Acquisition for different gain and speed • Automatic retrieval of the tune-dependent optics parameters • Test bunch-by-bunch in LIU WS • Logging in DB	FESA class with simulated data NXCALS MADX Optics
Matching Monitor	Matching Monitor application? ABT scripts	• Acquisition for different gain • In/Out movement • Interlock when inserting grids • Logging in DB	SEM calibration signal? OASIS, SIS, NXCALS External Condition Tested (slide 11) Detailed procedure for dedicated MD
H^0/H^- Monitor	H^0/H^- Monitor application	• Acquisition for different gain • Logging in DB • Alarms	OASIS NXCALS Laser
SEM GRIDs	SEM Grid application	• Check different optics settings • Wire reading • Logging in DB	SEM calibration signal? NXCALS

New PSB Injection

Dry Run	High Level Application	Tested Dependencies	Requirements
Distributor	Cruise Control	• Vary number of turns and verify the distributor response • Logging in DB • Synchronisation with Chopper	MTG OASIS Knobs (Virtual Devices) NXCALS
Kicker SloW	Cruise Control	• Load/read KSW functions • Vary number of injected turns and verify the KSW response • Logging in DB	OASIS Knobs (Virtual Devices) NXCALS
Bumper Slows	Cruise Control	• Vary number of injected turns and control the flat-top length • Asynchronous control of the flat-top length (for optics measurements, beam commissioning) • Logging in DB	OASIS Knobs/FGC NXCALS
QSTRIP Beta-beating compensation	ABP Scripts	• Tune-dependent generation of the beta-beating compensation • Load the compensation in HW and test expected response • Logging in DB	OASIS Knobs/FGC NXCALS Makerules
Stripping Foil	---	• Foil movement and no foil positioning • Snapshot of each foil before beam impact • BTV IN/OUT + Interlock	Knobs

Early Beam Extraction

- Early extraction after maximum 100 turns is critical to be able to commission the matching monitor and be able to study the Linac4 matching at the PSB injection and give the option to anticipate the commissioning of the extraction line at 160 MeV.

Dry Run	High Level Application	Tested Dependencies	Requirements
Extraction/Recombination Kickers	---	• Supercycle with only 1 beam type • Anticipate extraction time to C275.xxx with xxx < 100 and verify the response of the kicker. • **Reliability run** of extraction kicker at injection: Without beam, triggering on injection timing & acquire KFA14 current waveform on OASIS. Several hours needed to accumulate sufficient statistics. • Logging in DB.	MTG OASIS Knobs (Virtual Devices) NXCALS

Other OP Applications

Dry Run	High Level Application	Tested Dependencies	Requirements
Tune Setting	Tune Control Application	• Modify tune and verify the trims for main quadrupoles, qstrips • Logging in DB	OASIS FGC NXCALS Makerules MADX Optics
Cycle Generation	POPS-B Cycle generation	• Generate operational 1.4 GeV and 2.0 GeV, load and play in the supercycle • Test MD variations • Verify thresholds with FGC • Logging in DB	MTG OASIS FGC B-Train
Tune/Chromaticy Measurement	Q-meter	• Check that the new hardware is compatible with the old application (the interface should not have been changed)	OASIS Knobs

RF

Dry Run	High Level Application	Tested Dependencies	Requirements
Tomography	Tomoscope	• Check PU signal • Check timing/trigger behaviour with 2 connexion on each scope • Loading data from previous year to check reconstruction algorithm • Logging in DB	MTG BPM calibration signal OASIS (signal, trigger/timing, attenuators) NXCALS
Bunch Shape Monitor	BSM Application	• Check application and scope functionalities • Logging in DB	MTG OASIS NXCALS
Transverse Feedback (old analog system)	TFB Inspector panel	• Check control behaviour with FESA class.	MTG

Expert Dry Run (I)

Dry Run	High Level Application	Tested Dependencies	Requirements
LLRF (to be repeated for 4 rings)	---	VME & NIM Power supply checks Check RF synoptic can be used to control LL Working sets and knob checks Timing generation B Train reception by cable and fiber Check of local LL B train simulator, official simulated B Train and measured B Train RF train generation and distribution, FREV, TFB(old and new), Q-Meter, injection synchro, PSB extraction synchro RF Train reception from PS for synchro 10 MHz reception and distribution Frequency program generation Voltage program/frequency generation and distribution to cavity Cavity ready signals check Gap voltage reception check Cavity current reception check Check functions required to program system, voltage, blow-up etc. Visualization of all functions and signals on OASIS and samplers Phase pick-up power check. Synchro signal switching for destination and harmonic number Check of all signals distributed to OASIS, digital and analogue Check Tomoscope app. + programming & operation of HW	CO infrastructure Tomoscope application RF Synoptics OASIS Samplers NXCALS

Expert Dry Run (II)

Dry Run	High Level Application	Tested Dependencies	Requirements
Transverse Feedback (digital electronics)	---	• Power amplifier performance • Verify the cable length/connection • Perform pattern injection tests • Excitation signal generation • Logging in DB	Calibration signal OASIS Knobs NXCALS
B-Train	Inspector Panel	• Check electronics (calibration, WhiteRabbit transmission to TE-MSC-MM lab) in simulated mode • Check electronics in current regulation mode • Check electronics in field regulation mode with cavities • Logging to DB	POPS-B (current/field regulation test) RF (field regulation test) NXCALS OASIS
PSB Scraper	---	• Mask positioning • Reading of the temperature sensors	Scrapers Control

EPC

- Check of configuration, state, control, acquisition + OASIS for each power converter is a critical part of the HW Commissioning → validate shape, ripple, synchronization
- Several of the dry runs described before already include EPC system in the chain of tests

Dry Run	High Level Application	Tested Dependencies	Requirements
BT.BHZ10 switching magnet	---	• Multi-PPM, multi-destination control • Verify the interlock response Configure FEI • Logging to DB	MTG FGC OASIS Makerule NXCALS

Miscellanea

Dry Run	High Level Application	Tested Dependencies	Requirements
Interlock	BIS GUI BIS Monitor SIS FEI PSB WIC EC GUI	• Check all instances • Check settings and interlock acquisition for power converters • Verify that the correct interlock is displayed • Test all failure scenario • Laser alarms	MTG FGC Knobs OASIS External conditions Laser
Septa	---	• Blade alignment	Knobs
Timing: 24 to 32 users	Sequencer Manager	• Check machine behaviour after migration from 24 to 32 timing • Check the presence of 8 new timing users • Check PLS number of user ZERO=first position • map/unmap cyclses. • Check wset update with 8 new users. • Check PPM behaviour on operational device	MTG
Timing	Sequence Manager	• Check destination • Check inhibit by destination in CCC • Check inhibit sequence change	MTG
Special sequences	Sequencer Manager	• Test special sequences for dedicated measurement cycles	MTG


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