Critical Settings Management for Linac4 and PSB

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Critical Settings

- Critical settings: machine settings that could cause equipment damage and are therefore protected
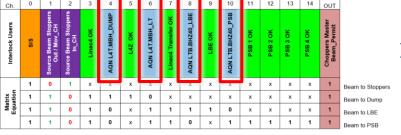
- 2 main categories:

Settings of Power Converters connected to BIS (HW or SW)

In LSA: MCS using RBAC framework

PCs and BIS – Settings for Linac4 EDMS 1016233

Figure 4 :   Truth table of the 'Source RF Master BIC'.

Figure 5 :   Truth table of the 'Choppers' Master BIC.

Figure 8 :   Truth table of the 'Linac4 Transfer' slave BIC.

- Settings for low-energy quadrupoles
  - good optics to dump beam fractions correctly on chopper dump
- Settings of main bending magnets (partly multi-ppm by destination)

- ➢ Settings for BIS implemented with FI (FGC Interlock) application
  - ➢ CCV, min/max, ON status etc.
  - ➢ +/- 10 A for quadrupoles (as used during LBE run; should be refined by ABP)
  - ➢ +/- 1 A for bendings
  - ➢ To be clarified: have FGC BIS interlock properties as MCS (role: MCS-LN4EXP)

MCS-LN4EXP: CPS shift leaders (egroup), Linac4 supervisors (egroup)

PCs and BIS – Settings for PSB

Ch.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	OUT	
Interlock Users	SIS	Destination PSB Dump	Destination ISOGPS	Destination ISOHRS	Destination PS	AQN BT.BHZ10 BDUMP/ISOLDE	AQN BT.BHZ10 PS	BTM.BHZ10 PSB Dump & ISO GPS & ISO HRS	AQN BTY.BVT101 ISOLDE	AQN BTY.BHZ301 GPS	AQN BTY.BHZ301 HRS	WIC BTM	WIC BTP	WIC BTY	PS Dump	PSB Extraction Master Beam_Permit	
Matrix Equation	1	1	0	0	0	1	0	1	0	x	x	1	x	x	x	1	Beam to Dump
	1	0	1	0	0	1	0	1	1	1	0	1	x	1	x	1	Beam to GPS
	1	0	0	1	0	1	0	1	1	0	1	1	x	1	x	1	Beam to HRS
	1	0	0	0	1	0	1	x	x	x	x	x	1	x	1	1	Beam to PS

Figure 16 :   Truth table of the 'PSB Extraction' master BIC.

- Settings of main bending magnets in PSB extraction transfer lines
- Settings for BIS implemented with FI application for FGC power converters (not for BTY.BHZ301)
  - CCV, min/max, ON status etc.
  - Expect to set tolerance to ~1 A
  - To be clarified: have FGC BIS interlock properties as MCS (role: MCS-PSBEXP)
- Settings for BTY.BHZ301 (PowM1553) through potentiometer
  - Not very precise (window of ~25% around set value; T-dependent)

MCS-PSBEXP: CPS shift leaders (egroup), PSB supervisors (egroup)

MCS for Linac4

MCS	Proposed Setting	Required Role
Linac4 operational mode (operational (mode 1) / low-intensity (mode 2) / MD (mode 3))	Depending on operational mode (usually 1)	MCS-LEBT
Solenoid settings? Propose to become MCS	Pre-defined settings for modes 1 and 2	(MCS-LEBT)
Low-energy watchdog (transmission through RFQ)	Depending on operational mode (~80%/50% transmission for modes 1 and 2; 3/1 bad shots)	MCS-LEBT
Linac4 dump watchdog	95% transmission, 3 bad shots	MCS-LN4OP
L4T watchdog	95% transmission, 3 bad shots	MCS-LN4OP
LBE watchdog	95% transmission, 3 bad shots	MCS-LN4OP
BLM thresholds (beam presence)	Minimise losses during setup → with application take average loss for ~50 cycles → set threshold with +20% margin (in ppm)	MCS-LN4OP

MCS-LEBT: Linac4 supervisors (egroup), R. Scrivens
MCS-LN4OP: Linac4 supervisors (egroup), CPS operators (egroup), G.P. Di Giovanni

MCS for PSB

MCS	Proposed Setting	Required Role
BI line watchdog	95% transmission, 3 bad shots	MCS-PSBOP
Booster injection watchdogs (1 per ring) → safety net for H0/H- dumps in case of foil breakage (together with BLMs and H0/H- monitor)	95% transmission, 1 bad shot	MCS-PSBEXP
H0/H- monitor thresholds (1 per ring) → protects H0/H- dumps in case of foil breakage	Not yet known; requires calibration during commissioning	MCS-PSB-Injection
BLM thresholds (beam presence for inj/extr, full cycle for ring BLMs)	Minimise losses during setup → with application take average loss for ~50 cycles → set threshold with +20% margin (in ppm)	MCS-PSBOP

MCS-PSB-Injection: C. Bracco, G.P. Di Giovanni, B. Mikulec, F. Roncarolo
MCS-PSBEXP: CPS shift leaders (egroup), PSB supervisors (egroup)
MCS-PSBOP: PSB supervisors (egroup), CPS operators (egroup), P. Skowronski

Sum-up Critical Settings

- Strategy is available for Linac4 and PSB

- MCS roles have been defined and assigned

- Creation of MCS done or under implementation

- Separate point in Beam Commissioning Checklist

    - During beam commissioning requires loose settings for PSB

    - Trim of MCS has to follow PSB commissioning steps

Appendix

Sequencer to move into Linac4 low-intensity mode

TECHNICAL SPECIFICATION

Sequencer Tasks to Reduce the Linac4 Intensity

ABSTRACT:

This procedure details the different tasks the sequencer has to execute in order to reduce the Linac4 intensity, and later return to the original situation.

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Status:
Will be sent for engineering check end of next week.

11 steps defined, some requiring MCS roles.

Procedure for Routine Linac4 Beam Meas.

PROCEDURE

Tasks to Perform Routine Beam Measurements in Linac4

ABSTRACT:

This procedure details the different tasks that have to be executed when beam measurement devices are inserted in the beam to perform routine beam measurements in Linac4.

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Reason:
Beam loss when inserting certain beam measurement devices into the Linac4 beam

Applies to SEM grid and BSM measurements; will be handled through applications

Status:
Will be sent for engineering check end of next week.