
CERN

MD12663: Wire compensation during the β*-leveling

G. Sterbini on behalf of the team

Special thanks to D. Mirarchi, Y. Dutheil, M. Hostettler, S. Redaelli, BE-OP, HL-WP2, Collimation team, SY-STI, SY-ABT, SY-RF for the input/feedback.

1. **Clarify the order** of loss maps, change of collimator settings, change of wire settings and scraping.
2. Loss maps to be done before. **When and approval of it?**
3. Why does the **PCinterlock of the wire** need to be masked at 30 cm only? Is this OK with that many bunches?
4. **Masking of interlocks** to be defined for each step.

rMPP MD3, August 9, 2024

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5. $\beta^* = 30$ cm + $\theta_c = 130$ μrad + **WIRES ON/OFF** + tight collimators + **scraping**

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- Then at β^*=30 cm, we will reduce the crossing up to 130 μrad with WIRES ON/OFF (**we propose to validate it with WIRES ON**).
- Then at β^*=30 cm and 130 μrad, we will get tight collimation settings (TCS/TCT/TCDQ) (**to be validated** with WIRES ON and OFF). For the WIRES ON configuration will perform the ASD.

Loss Maps Matrix summary

Validation test	Loss Maps Matrix						
	β* (cm)						
	41.5	38.5	35.5	32.5	30.0	30.0	30.0
	Xing (μrad)						
	160	160	160	160	130	130	130
	Collimator settings						
	Nominal	Nominal	Nominal	Nominal	Nominal	Tight	Tight
	BBLR						
	ON	ON	ON	ON	ON	ON	OFF
B1H	✗	✗	✗	✗	✗	✗	✗
B1V	✗	✗	✗	✗	✗	✗	✗
B2H	✗	✗	✗	✗	✗	✗	✗
B2V	✗	✗	✗	✗	✗	✗	✗
+dp/p	✗					✗	
-dp/p	✗					✗	
ASD						✗	

Courtesy of D. Mirarchi.

When do we do/approve the LMs?

- We requested 12 h: 4 h dedicated to a validation fill (LMs + ASD with pilots) and 8 h for the fills with trains.
- The validation (LMs+ASD) will be performed **during the assigned MD slot**.
- **Yann gave his availability** to check the ASD during the night the ASD. The collimation team did not confirm yet its availability (holiday period) but we are confident on their full support.

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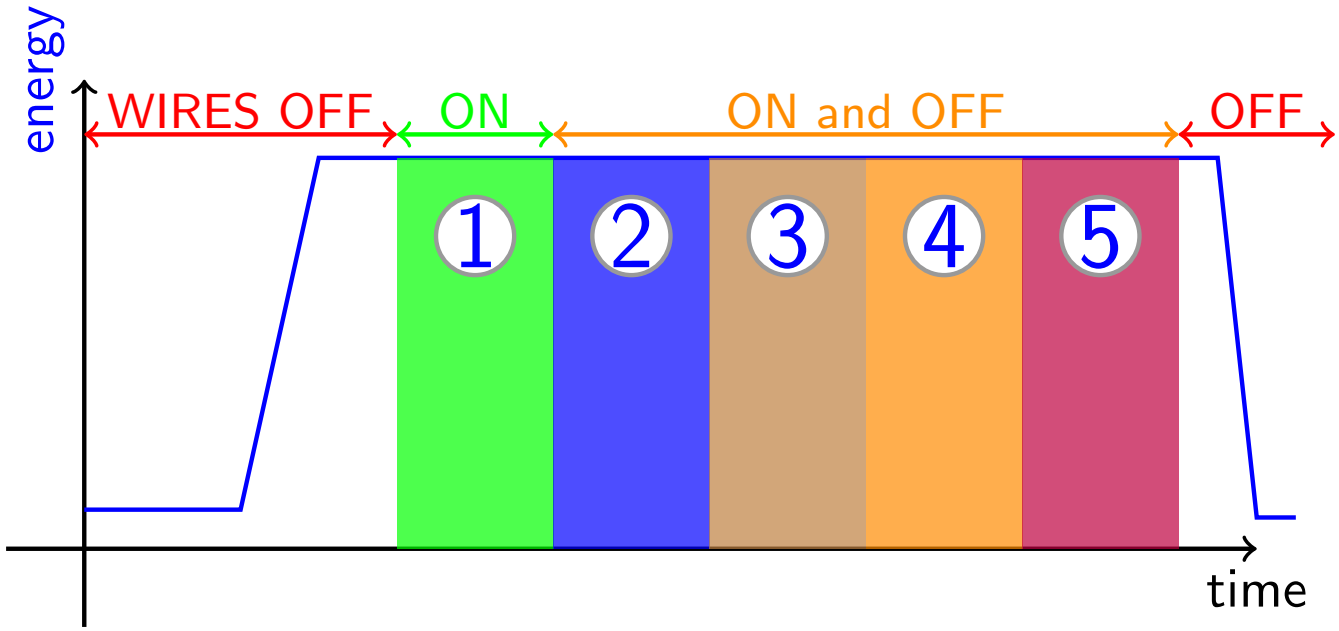
- **Yann gave his availability** to check the ASD during the night the ASD. The collimation team did not confirm yet its availability (holiday period) but we are confident on their full support.
- the MD plan is success oriented: in case of problem with the validation, the fill with trains will be modified by skipping the non validated part of the measurement program following the rMPP feedback (e.g. if the ASD test is not successful, the fill with trains will no cover the tight collimator settings).

Masking of the WIRES PC interlocks



- In the step 2-5 of the MD we would like to cover the [0-350] A range of the wires current to see the effect **w/** and **w/o** compensation at the different configurations (e.g. lower crossing angle and tighter collimators settings), and to have the possibility to explore intermediate values of the wire currents.
- **BUT** the PC interlock of the other PCs (namely the quadrupoles of the matching section used for the Q-feedforward) will **not be masked**.

Thank you for your attention.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MD12663: BBLR compensation and β*-leveling (I)

- Wire compensation in a full dynamics configuration
  - Wires compensators are used systematically in the operation at the end of the fills (end of $\mathcal{L}$-levelling). Despite the limited potential, excellent opportunity to integrate them in the machine cycle. When the wires are activated, the machine is almost static (β^*=30 cm, θ_c=150 μrad, TCT gap constant);
  - To prove their potential in the HL era, it is paramount to show that the wires can be ON during the full $\mathcal{L}$-levelling process, that is while $\beta*$, crossing angles, TCT gaps/positions are changing. The MD aims to test a full-fledged and realistic orchestration of all the previous parameters in the segment $\beta^* = 41.5 \rightarrow 30$ **cm**.
- **1 validation fill (≈4 h) + 1 fill with trains (≈8 h)**
  - Fill A: 1 INDIV + PILOTS per beam;
  - Fill B: 3(**?**)×36b trains + 2 INDIV per beam at **1.6e11 ppb**;

MD12663: BBLR compensation and β*-leveling (II)

- Play the standard cycle up to beam collision at top energy
  - $\mathcal{L}$-optimization at β^*=120 cm but skip ϵ scan;
  - go w/o $\mathcal{L}$-levelling to 41.5 cm and switch ON the wires (optimize tunes before and after);
  - continue with wires ON until 30 cm;
  - cycle the wires ON-OFF-ON (optimize the tunes);
  - close the crossing angle from 150 to 130 μrad and cycle the wires ON-OFF.
  - perform a diffusion measurement with wires OFF and ON (**if time allows**).

Link 1
Link 2