



217th HiLumi WP2 Meeting

Tuesday 29th August 2023, 09:30 – 11:00

Chairs: Rogelio Tomas

Speakers: Colas Droin, Yannis Angelis, Ezio Todesco, Nicolas Mounet.

Participants (18): Yannis Angelis, Hannes Bartosik, Roderik Bruce, Xavier Buffat, Riccardo De Maria, Colas Droin, Lorenzo Giacometti, Massimo Giovannozzi, Giovanni Iadarola, Lotta Mether, Nicolas Mounet, Dobrin Kaltchev, Konstantinos Paraschou, Thomas Pognat, Stefano Redaelli, Guido Sterbini, Rogelio Thomas, Ezio Todesco

AGENDA

Meeting actions	1
1. General Information (Rogelio Tomas)	1
2. Update on DA studies (Colas Droin, Yannis Angelis)	2
3. Update on D1 and D2 field quality (Ezio Todesco)	2
4. Review of open actions (Nicolas Mounet)	2
5. AoB	2

MEETING ACTIONS

Actions:

Xavier Add the test of 8b4e with $Q'=5$ units to the Run 3 MD list

Massimo Look at impact of unequal a_2 errors in the D2 and MCBRD apertures

(see [action list](#) on the WP2 webpage, for the complete list of current actions).

1. GENERAL INFORMATION (ROGELIO TOMAS)

Rogelio reported on the recent news:

- The injectors continued their progress with LIU beams: 4 batches of 8b4e with 2.15×10^{11} ppb was achieved.
- The FRAS software EDMS document needs to be commented on this week.
- The EDMS document on the D2 shift was just released for comments (LHC-LMBRD-EC-0002).
- The new schedule foresees beam start around July 2029 and possible margin for starting earlier seems small (few weeks).
- Ezio should present in WP2 the data available for sorting during the different cryostating phases.

Minutes of the last meeting were circulated, and they were approved.

2. UPDATE ON DA STUDIES (COLAS DROIN, YANNIS ANGELIS)

Yannis presented dynamic aperture studies with flat optics. The dispersion knobs are off as they are not yet optimised for all optics. The octupole current is not scaled for the corresponding teleindex, thus the DA is smaller for flat optics which feature a higher teleindex. **Rogelio** suggested to make sure that the round optics results are consistent with **Sofia's** simulations, at first sight it looks OK. At the start of levelling with flat optics, 8b4e and 2.2×10^{11} p/b there is good margin in tune space and octupole strength thanks to the fact that the chromaticity can be kept low with 8b4e. **Rogelio** suggested to scan the octupole strength for the nominal beam with 2.3×10^{11} p/b and a chromaticity of 15 units, which is the tightest configuration. **Rogelio** expressed doubts about the expressions used for the enhancement of the octupole's detuning with flat optics and suggested to check them with tracking. **Nicolas** mentioned that the chromaticity of 5 units during the ADJUST process was never demonstrated with 8b4e and could be tested in MDs (**Action:** Add MD for 8b4e with $Q'=5$ to the MD list).

Colas presented an octupole scan for 8b4e but with chroma 15, there is enough margin to power the octupoles at maximum strength with either polarity. **Guido** asked whether the two polarities of the spectrometer in IP2 should be considered. **Riccardo** answered that there should be no impact, a sanity check could still be done.

Colas confirmed that the tune scans presented last week with equal octupole current are not comparable due to the larger detuning caused by the telescopic optics.

DA simulations are computationally heavy, **Colas** is currently elaborating techniques to reduce the needs by avoiding long parts of the tracking where it is not needed. **Rogelio** suggested to discuss with **Massimo** who worked on such strategies. **Massimo** confirmed and mentioned that **Thomas** is working on the implementation of analytical models to predict long term DA based on short term tracking.

Nicolas mentioned that the DA with 8b4e are better than those obtained by **Sofia** for the standard beam. One reason for this is the fewer number of long-range interactions in 8b4e than in the standard. **Xavier**

mentioned that the larger emittance will decrease the head-on tune spread and probably cause this improvement. **Gianni** suggested a benchmark with standard beam to check the tools. **Colas** mentioned that he ran a few tests against **Sofia**'s results and they matched.

Nicolas mentioned that, up to now, the largest emittance was thought as pessimistic for DA. This approach should probably be reviewed, since these simulations suggest that the lowest emittance is the most pessimistic, as for instabilities.

Gianni mentioned that there is potential margin for improving DA jobs, as in sixtrack particles were not well spread within the jobs. **Colas** answered that this issue was already fixed.

Discussion:

- **Guido** suggested maintaining the 2.3 um emittance hypothesis for both 8b4e and standard beam, however the corresponding luminosity is lower. **Rogelio** said that the luminosity change is rather small. He added that one could start with 2.3 um and check 2.0 um later on. If the results are good enough with 2 um, we may stick to it, otherwise we can compromise since the baseline is 2.5 um in collision. He suggested to focus on the optics with 0.7/2.8. **Rogelio** suggested to scan the octupole strength with this optics and standard beam.

3. UPDATE ON D1 AND D2 FIELD QUALITY (EZIO TODESCO)

Ezio showed the measurement of b3 and b5 of the MBXF1, the reduction of b5 by 5.5 units and the increase of b3 by 4 units were confirmed. The results from KEK are biased by some iron structure in the measurement pit. The bias is corrected, but this should be confirmed by measuring the magnet at CERN. In October, the MBXFP1 will be measured at CERN such that the expected biases from the KEK measurement setup can be verified. Multipoles are found within specifications. The second series magnet MBXF5 was measured at room temperature and the first measurements show results comparable to the first of the series (MBXF1) thus showing good reproducibility.

A full length model of the D2 was already measured at CERN, showing b3 of 10-12 units and b5 of 9-10 units, which were corrected for the series production. The first series magnet was measured at room temperature showing the expected improvement (mention the expected value b3 and b5, versus acceptance). No further corrections are planned.

Cold measurements will be done towards July next year.

Discussion:

- **Rogelio** congratulated and thanked **Ezio** for the efforts made to improve the multipolar components of D1 and D2 to reach specs.
- **Massimo** mentioned that the b3 in the two apertures of D2 do not seem correlated. **Ezio** mentioned that 1-2 units difference between the apertures is expected and was already the case for LHC dipoles.
- **Massimo** mentioned that the magnet can be installed skewed to compensate for the a2 component if it is correlated in the two apertures. However the orbit correctors will be skewed as well. **Rogelio** added that the a2 in the IT corrector package could also be used. **Ezio** showed that differences between the a2 in the 2 apertures could reach 5 units. **Massimo** suggested to rather study a local

compensation using the Q4 magnets for the b2 errors and possibly both local and global compensation using the IT a2 correctors and the arc skew quadrupoles (**Action: Massimo** to look at the impact of unequal a2 errors in the two D2 apertures). **Ezio** reminded the final validation will arrive in autumn next year.

4. REVIEW OF OPEN ACTIONS (NICOLAS MOUNET)

Nicolas suggested to improve the management of the actions by grouping them according to WPs and tasks and using the new WP2 sharepoint webpoint being finalized by **Andreas**. He listed the status of the actions for WP3, WG on alignment, Task 2.1, 2.2 and Task 2.3.

Discussion:

- **Rogelio** is surprised by CC-TCT phase advance of 90 degree. **Riccardo** said that it is in fact 0 degrees and typo is to be corrected. **Rogelio** mentioned that it should probably be a range of acceptable phase advances.

5. AoB

Nicolas reported some news from the WP5 meeting: Due to the geometry of the tapers, their resistivity cannot be measured as the collimator blocks. Consequently, the quality of the coating cannot be assessed. **Nicolas** suggested to measure the thickness of the coating on a witness sample as simulations suggest that a thickness of 1 μ m is sufficient. **Rogelio** suggested to show and validate this strategy at the next meeting.

The next meeting will be announced in due time and could take place in a few weeks' time.

Reported by Xavier Buffat