

MD4224 High Brightness

Foteini Asvesta, Hannes Bartosik, Alex
Huschauer, Myrsini Kaitatzi, Haroon Rafique

CERN BE-ABP-HSI

January, 2019

Motivation

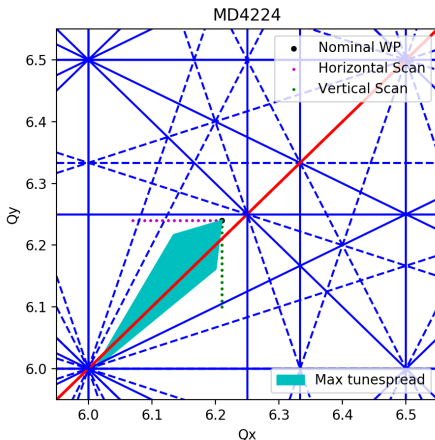
- **Motivation:** Investigate possible effects of space charge for injection setup in the PS.
- **MD4224:** Tune scan approaching the integer resonance in each plane separately.
- **Beam:** MD4224_LHC_BCMS25_2018_PSB_PN2
CPS.USER.MD7 MD4224_48b_BCMS
- **Tune Spread:** 0.2/0.24

Tune Scan

Operational WP (6.21, 6.24).

Horizontal scan (6.07-6.21, 6.24).

Vertical scan (6.21, 6.10-6.24).

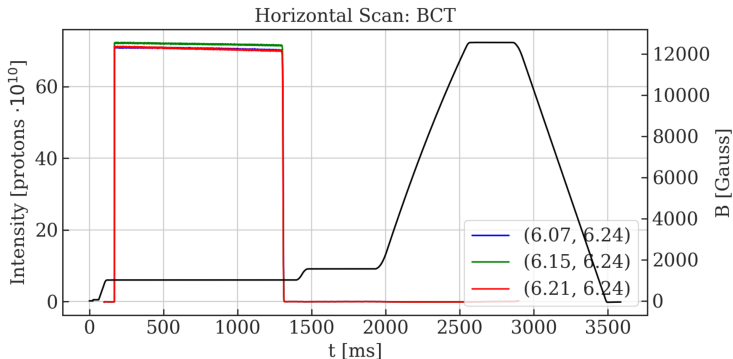


MD4224: High Brightness

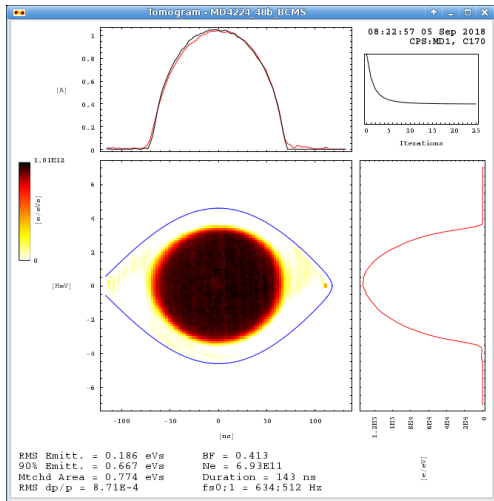
- Orbit corrected.
- Injection steering good enough for low tunes.
- Transverse feedback used (set to individual shot tune).
- RMS current on LEQs monitored (< 6 Amps).
- WS only available for same plane as scan.
- Low-chroma cycle.
- Tune measurement active at flat bottom for all measurements: gives losses at flat bottom and coupling resonance.

Cycle

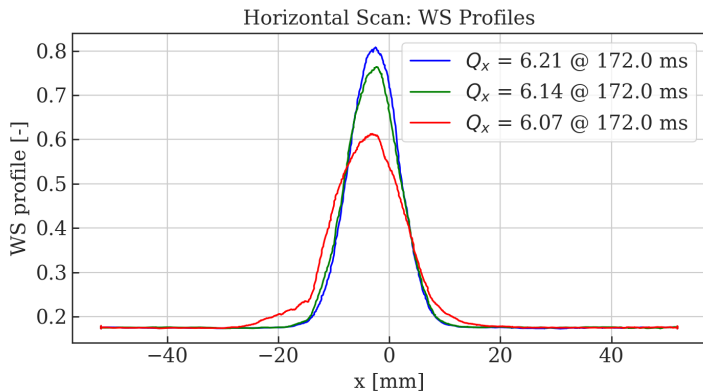
- Injection @ 170 ms.
- Internal dump @ 1300 ms.



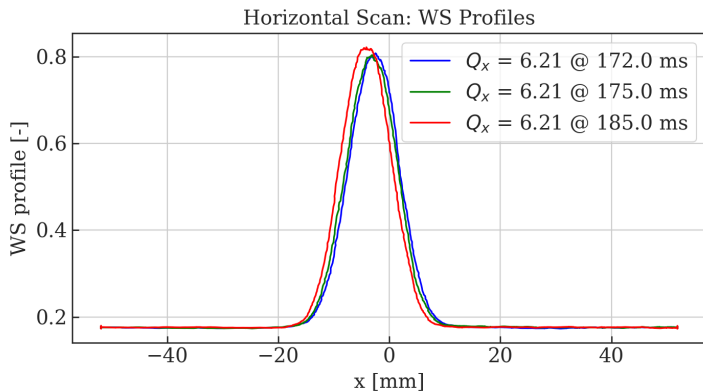
Tomo



Example Wire Scans (After Filtering)



Example Wire Scans (After Filtering)



Analysis

- Classical formula and single $\frac{dp}{p}$ value used for $\epsilon_{x,y}$ calculation
- ± 40 mm used for wire scanner $\epsilon_{x,y}$ calculation
- Losses calculated between 170 - 1285 ms

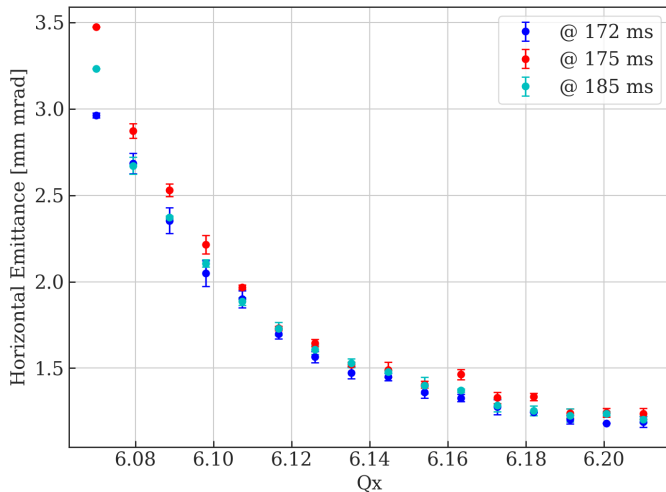
Optics for Analysis: Generated with MAD-X

Horizontal scan: WS 65.H $Q_y = 6.24$

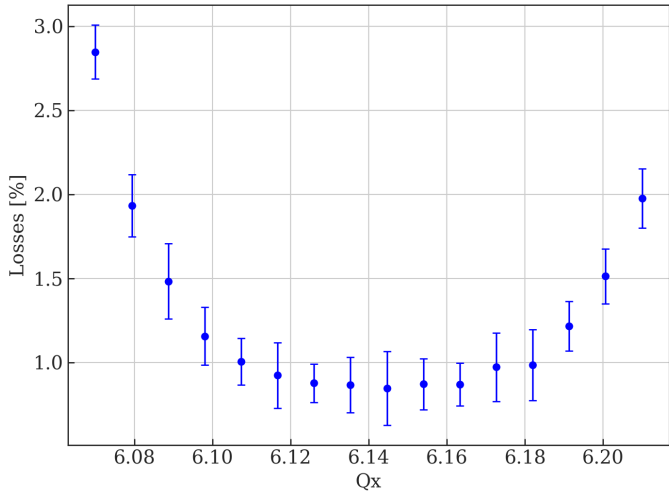
Vertical scan: WS 64.V $Q_x = 6.21$

Q_x	β_x [m]	β_x [m]	D_x [m]	Q_y	β_x [m]	β_x [m]	D_x [m]
6.07	18.25	12.32	4.34	6.10	11.66	25.14	2.63
6.08	18.86	12.29	4.17	6.11	11.70	24.63	2.62
6.09	19.35	12.27	4.02	6.12	11.74	24.22	2.61
6.10	19.75	12.24	3.90	6.13	11.79	23.89	2.59
6.11	20.09	12.21	3.80	6.14	11.83	23.61	2.58
6.12	20.39	12.18	3.71	6.15	11.87	23.38	2.57
6.13	20.64	12.15	3.64	6.16	11.91	23.19	2.55
6.14	20.86	12.12	3.59	6.17	11.95	23.02	2.30
6.15	21.05	12.09	3.51	6.18	11.99	22.88	2.53
6.16	21.22	12.07	3.45	6.19	12.03	22.76	2.51
6.17	21.37	12.04	3.40	6.20	12.07	22.65	2.50
6.18	21.51	12.01	3.35	6.21	12.12	22.55	2.49
6.19	21.64	11.98	3.31	6.22	12.17	22.47	2.47
6.20	21.75	11.96	3.27	6.23	12.20	22.39	2.46
6.21	21.86	11.93	3.23	6.24	12.24	22.32	2.45

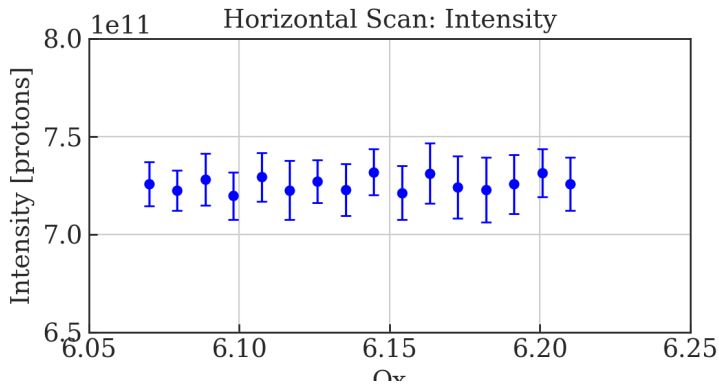
Horizontal Scan



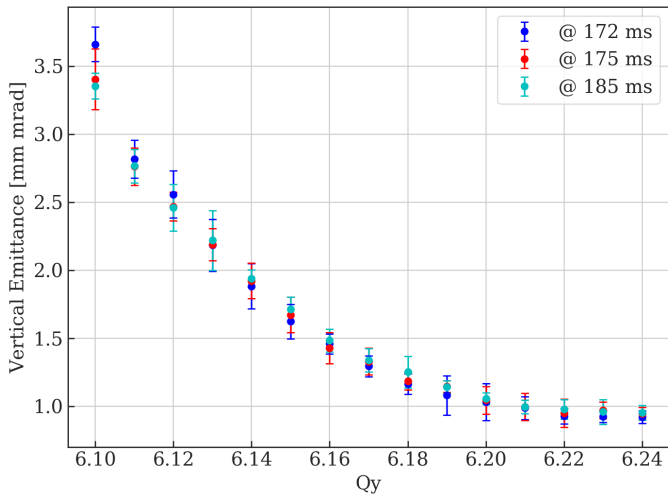
Horizontal Scan



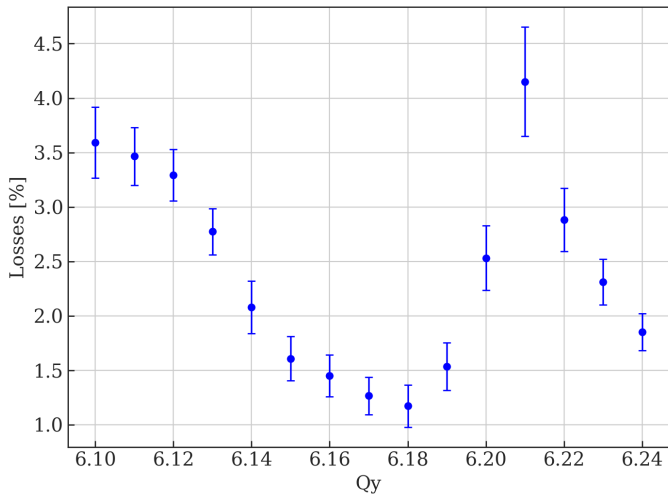
Horizontal Scan



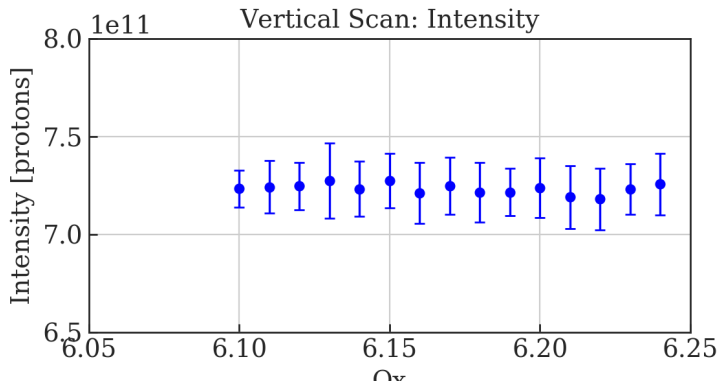
Vertical Scan



Vertical Scan



Vertical Scan



Conclusions

- Clear emittance blowup approaching the integer in both planes.
- Due to core crossing the integer, and corresponding tune spread reduction.
- No obvious dependency on WS measurement time - implies very fast blowup.

Simulations

- Use nominal WP bunch to observe emittance blow-up for each WP, clue to whether this is SC, transfer line, errors, something else?
- ...

MD4224: Logbook Entries

- 23.08.18 @ 14:58
- 31.08.18 @ 13:51
- 03.09.18 @ 10:21
- 04.09.18 @ 08:02
- 05.09.18 @ 08:21