

MD9325 – Beam halo scraping at the End of Squeeze (EoS)
2nd attempt

at rMPP meeting for MD block 5

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Previous attempt

Main goal: study the evolution of transverse beam halo during different stages of acceleration cycle. Check if halo is impacted by e-cloud effects.

MD9325 performed on 23.08.2024 with 260 bunches. Idea to scrape at Flat-Top and after hours of collisions.

Designed fill to study e-cloud effects on halo:

- ▶ standard 25 ns,
- ▶ nominal BCMS,
- ▶ low-tail BCMS,
- ▶ 8b4e
- ▶ standard 25ns with $q \simeq 1$ scraping in SPS

Encountered issues:

1. More time than expected needed for injection of different beam types (**3.5h**),
2. Scraping in SPS only to $q \simeq 1.2$,
3. Spent only **1h** in collisions.

Outcome

Main conclusions:

1. Observable difference between bunch-by-bunch halo of different beam types (BCSM, 25ns, 8b4e),
 2. Observable influence of the e-cloud in inner triplets on halo,
 3. **Quantitative comparison not possible** due to different times spent at injection,
 4. **Not enough time spent in collisions** to re-populate halo and be representative of physics fills.
- it is valuable to repeat the measurement and probe actual halo from e-cloud.

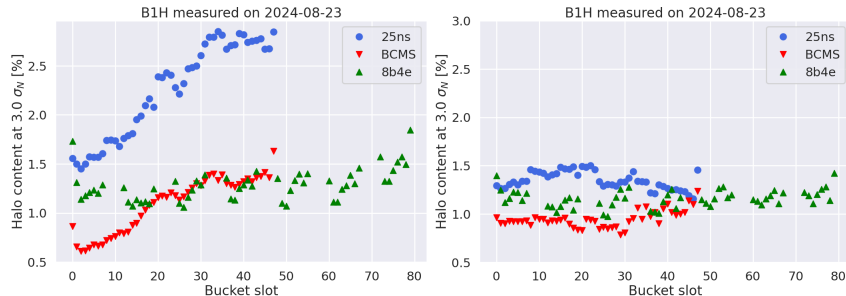


Figure: Bunch-by-bunch halo pattern at FT (left) and after collisions COLL (right) for different beam types, re-indexed to 0.

Changes for the 2nd attempt

- An altered filling scheme: use operational beams and reduce time spent at injection, all 1.6×10^{11} ppb,
- Order of injections:
 1. Pilot and 12b for machine injection protection,
 2. BCMS 36b and 8b4e 56b (scraped at LHC injection energy),
 3. BCMS 36b and 8b4e 56b,
 4. BCMS 36b (scraped in SPS to $q \simeq 1.0$).
- Additional scraping at LHC injection energy to understand how halo changes during ramp.

Procedure:

1. Injection (1.) and (2.),
2. **1st scraping, INJ:** open collimator TCP(.C and .D) inner limits, perform collimator beam-based alignment, scrape by moving in left jaw by $(10-50)\mu\text{m}$ approx. every 10s, until $3.0\sigma_N$ betatron cut is reached,
3. Injection (3.) and (4.),
4. Ramp up to 6.8 TeV reaching flat-top (FT),
5. **2nd scraping, FT:** same procedure as in 2., after scraping revert TCPs to initial position
6. Continue to SQUEEZE, bring beams in collisions and stay at least until $\beta^* = 30\text{cm}$ is reached, preferably for $\geq 2\text{h}$,
7. **3rd scraping, COLL:** same procedure as in 2.