MD 14343: Schottky-based diagnostics with ion beam

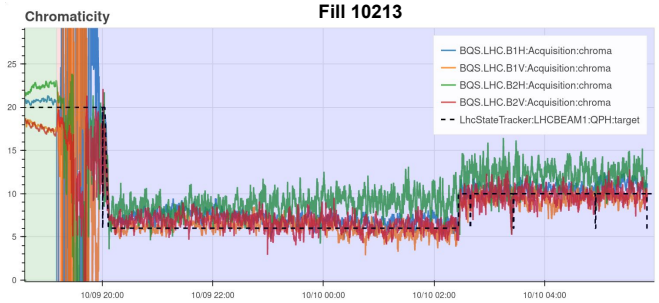
D. Alves, C. Lannoy, K. Lasocha, N. Mounet

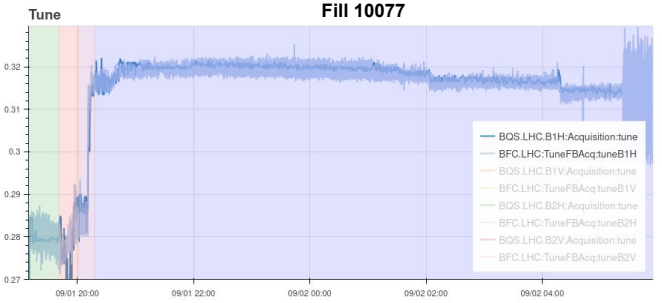
Motivation

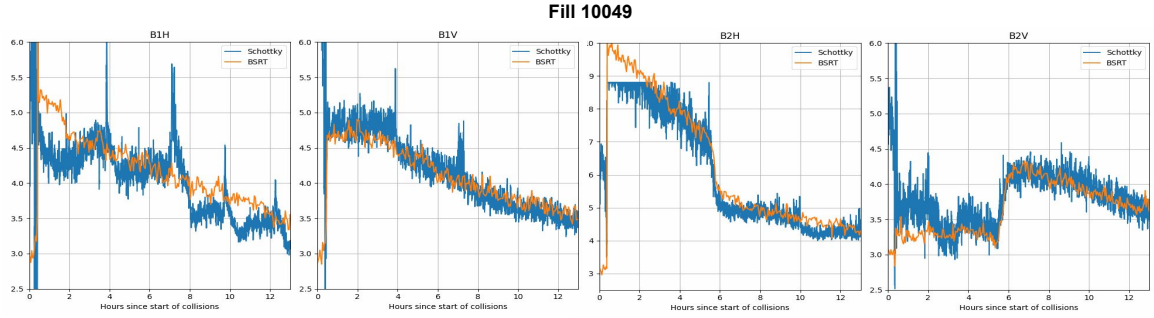
The data collected during the proton run showed the potential of Schottky-based estimate of:

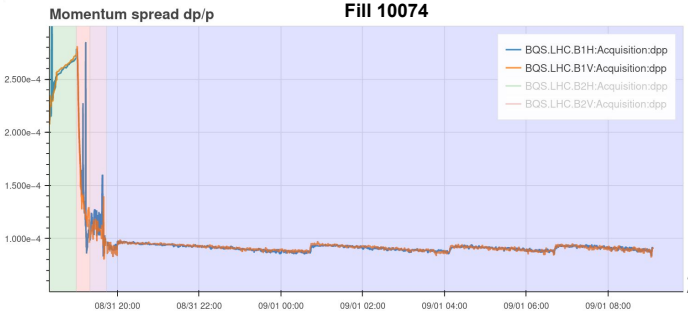
- Chromaticity
- Tune
- Dp/p
- Emittance

With nominal bunch intensity, at INJ energy and during collisions.





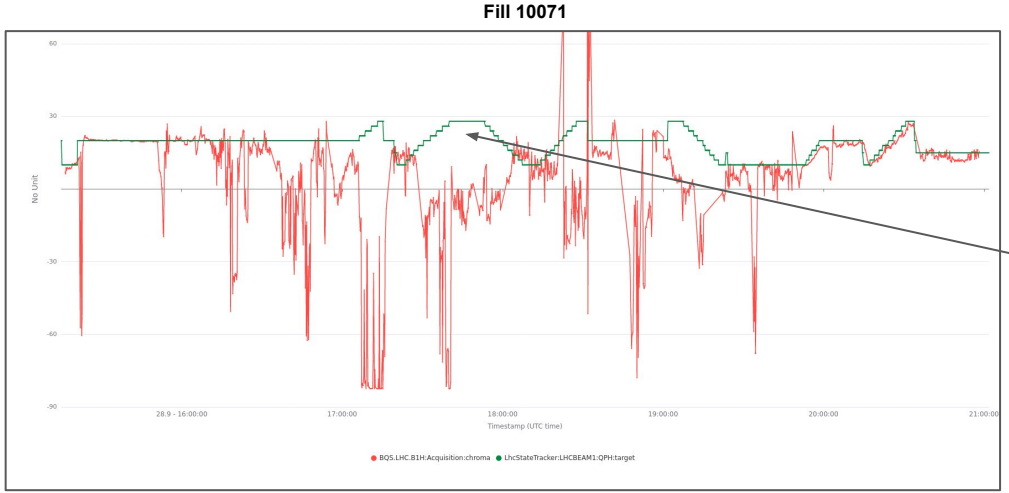


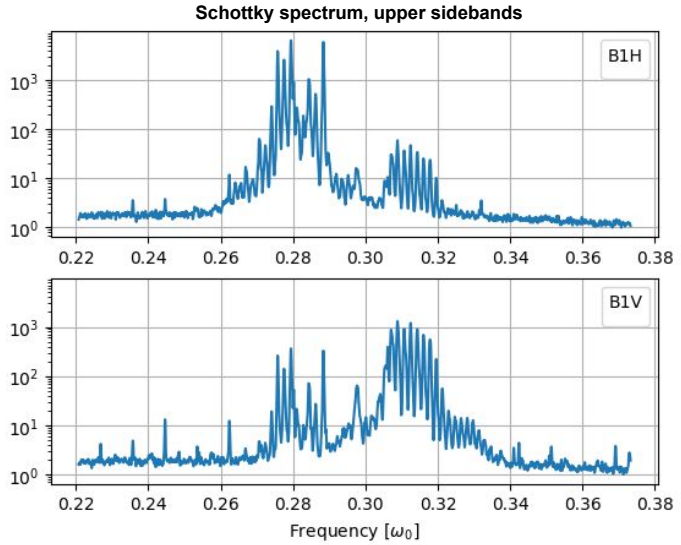


Motivation

On the other hand, the technique failed:

- During flattop-adjust phase (coupled components)
- For probe bunches (low SNR)

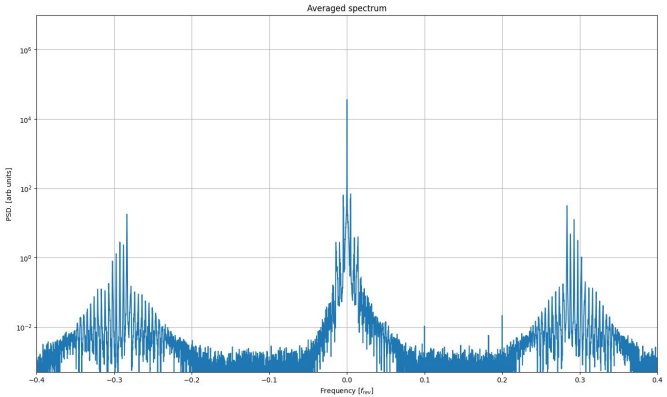


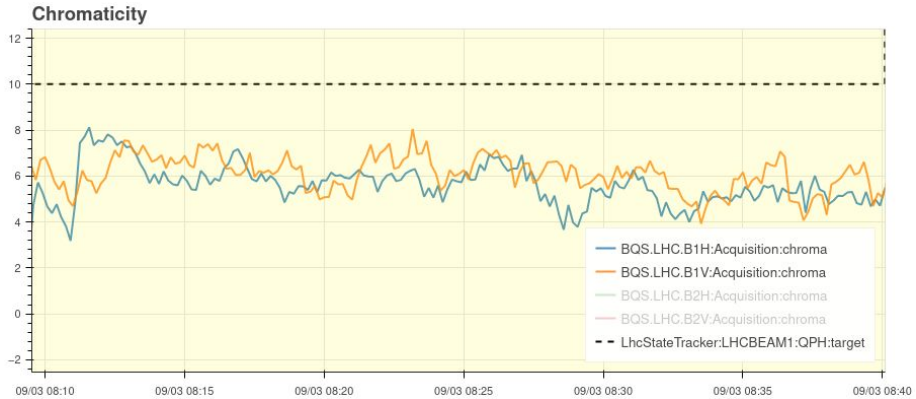


Motivation

On the other hand, the technique utterly failed:

- During flattop-adjust phase (coupled components)
- For probe bunches (low SNR)





MD Goals

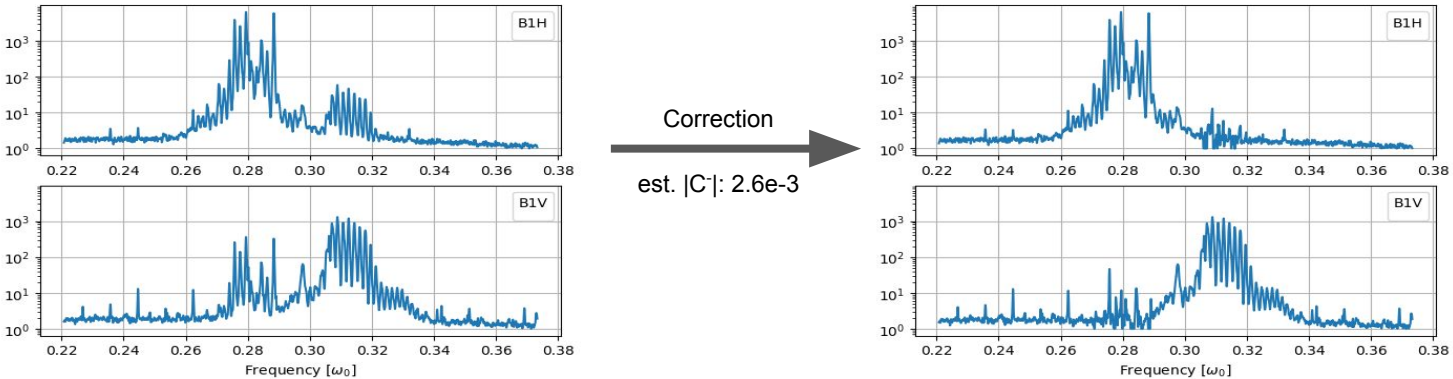
The goal of the MD is to study, in a controlled manner and with a clean ion signal:

- Bias in the Schottky-based estimate due to the signal strength
  - Confirmed to be present for proton probe bunches
  - Verify if bias could be present in a standard ion fill, due to the variations in bunch emittance and intensity
- Impact of the coupling on spectra
  - Find at what levels it becomes a problem for diagnostics
  - Test mitigation techniques and C^- estimate

MD Goals

The goal of the MD is to study, in a controlled manner and with a clean ion signal:

- Bias in the Schottky-based estimate due to the signal strength
  - Confirmed to be present for proton probes
  - Verify if bias could be present in a standard ion fill, due to the variations in bunch emittance and intensity
- Impact of the coupling on spectra
  - Find at what levels it becomes a problem for diagnostics
  - Test mitigation techniques and C^- estimate



MD Plan

- We would like to have 8 bunches in the machine
  - Of different intensities: E.g. ~ 6e9 and ~ 3e9
  - Of different horizontal and vertical emittances: E.g. ~ 1.5 um and ~3 um
  - We might reuse bunches after the MD 14363 (Off-Momentum Beam Loss Patterns) or inject new ones, depending on their parameters

- At INJ energy, at flattop before collisions and during collisions we will:
  - Perform two-value Q' scan (10 and 20 units) - only at flattop
  - Perform 3 value $|C^-|$ scan (~0, ¼, ½ of Δ_Q)
  - Sequentially observe all the bunches with the Schottky monitor

Scans will be supported with WS beam size, rf-modulation Q' and AC dipole C^- measurements

- Total beam intensity below 3e11

<u>The minimal time needed: 5 h</u>