Processing of the Schottky Signals at RHIC

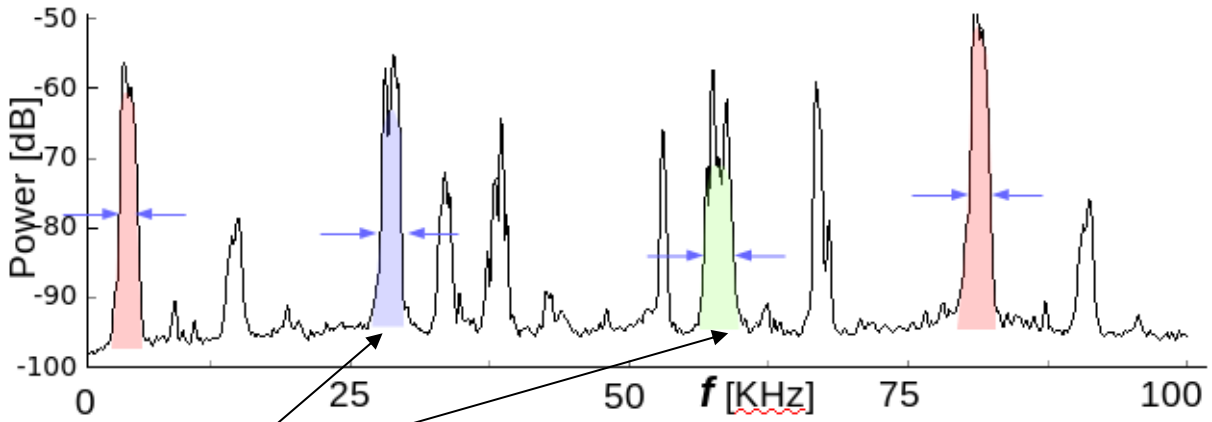
A. Sukhanov†, K. A. Brown, W. C. Dawson, J. P. Jamilkowski, A. Marusic, and J. Morris,
Brookhaven National Laboratory, Upton, USA

THMPA08

Project Goal

- Schottky monitors are used to determine important beam parameters in a non-destructive way.

The Schottky spectrum during injection and ramp could be very complex.



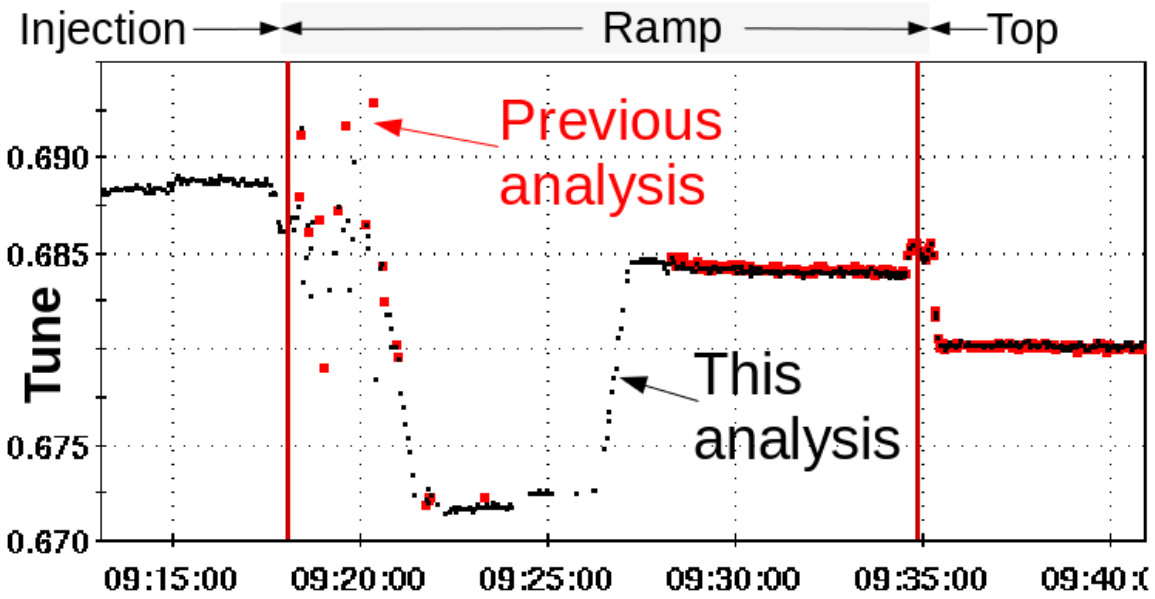
- Problem:
- Need to identify Revolution and Betatron peaks.
- Remove coherent spikes on top of the peaks.
- Find position, widths and peak areas.

- Complications:
- Noise is not gaussian.
- Peak shape changes.
- Curve fitting often fails.

Solution outline

- Measurements provided to Control Room:
- The tune during the ramp.
- Improved beam chromaticity.
- Improved beam size / emittance.

- <u>What's next:</u>
- Fix unexpected drift of the emittance



Conclusion

- The fast, robust Python algorithm using scipy and numpy modules.
- Spectrum Analyzer data are processed in linear scale; analysis is not sensitive to baseline fluctuations.
- The position of peaks is predicted based on externally supplied RF frequency.
- The peak parameters extracted from smoothed raw data after subtraction of the coherent spikes.
- Precision achieved:
  - Tune at top energy: 0.1%, during the ramp: 0.4%.
  - Chromaticity at injection: 2%.
  - Emittance at top energy: 2%.