ObsBox & Bunch by Bunch Tunes

LBOC, 08/04/16

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ObsBox – Current Status

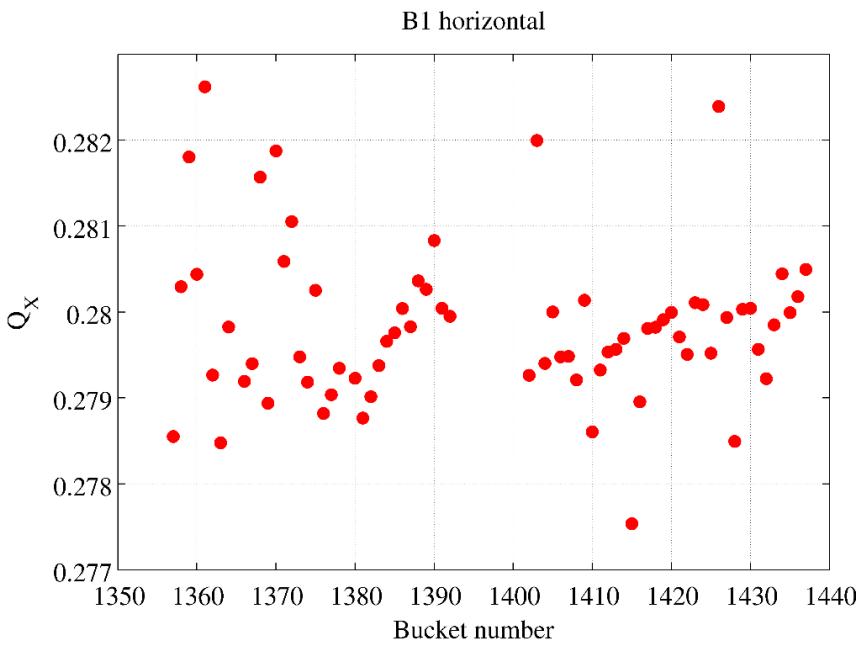
- Basic scripts have been written that subscribe to the relevant FESA classes.
- At present the scripts are stored in "/user/slops/data/LHC_DATA/OP_DATA/LHC_ADT_OBSBOX/", which is also where the data will be stored (for now).
- M. Sandonis has implemented (last night) new FESA classes for Injection Instabilities, as well as new functionality for retrieving only a specific range of buckets.
- I have written scripts (with the help of G. Trad) that can retrieve the buckets to be injected into from the sequencer.
- A few more organisational things to do (e.g. time stamps), but most things are in place to start dating some too.
- Gianni and I will be testing the old buffer immediately after this meeting.
- Time frame for first injected trains?

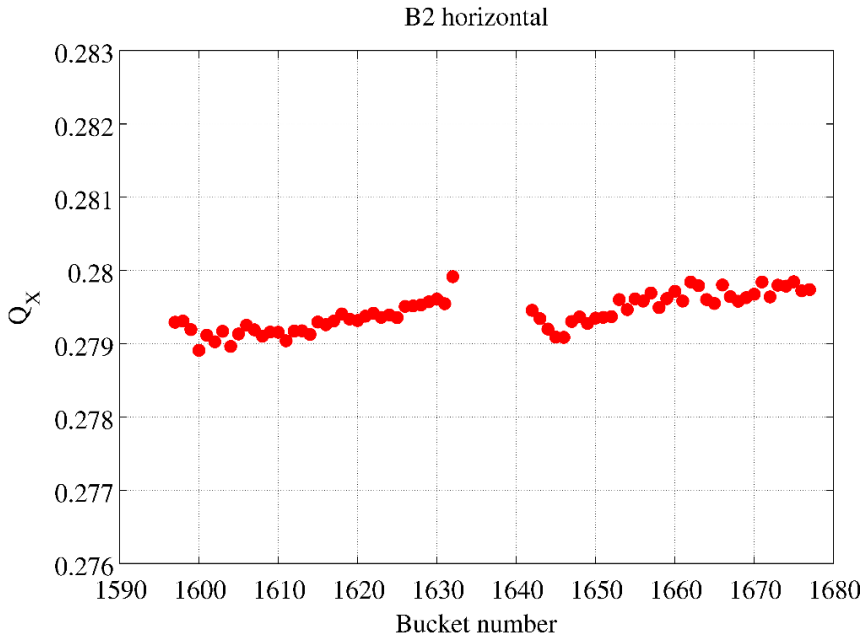
Bunch by Bunch Tunes

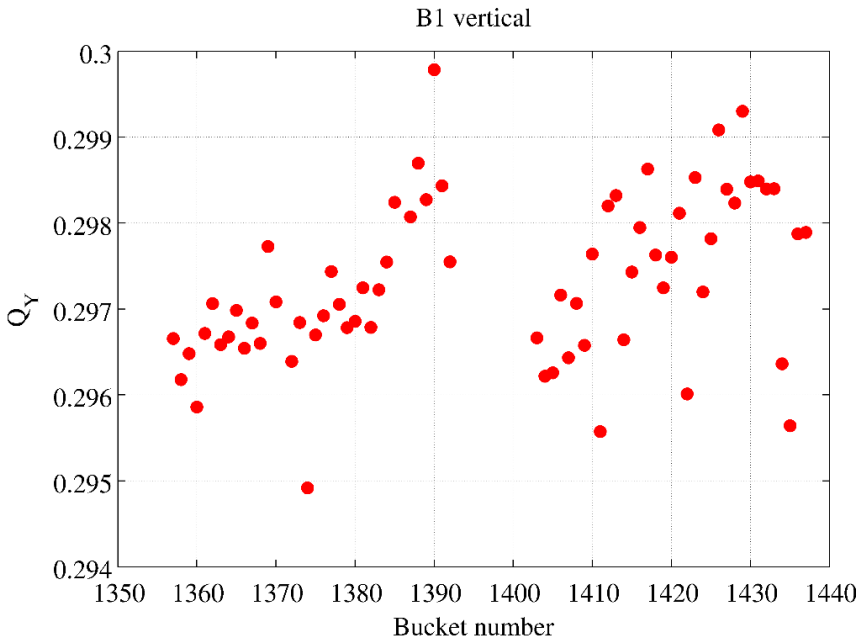
- During MD3, injection of 2x36b w/ 25ns spacing in fill 4754 and then 1x72b w/ 25ns spacing in fill 4757.
- ObsBox set to trigger at injection for ~2000 turns.
- By using NAFF (see 'Tune Evaluation in Simulations and Experiments – R. Bartolini et al'), the bunch by bunch tunes can be calculated from the ObsBox data.
- Currently some question marks over whether NAFF is appropriate to use for small number of turns. Could attempt to determine average phase advance. Bunch by bunch tunes can be determined through a variety of different methods.
- With refined technique, could be used as an additional measurement to estimate level of e-cloud conditioning/deconditioning at injection.
- With a chirp or a kick, could be also used at flat top?

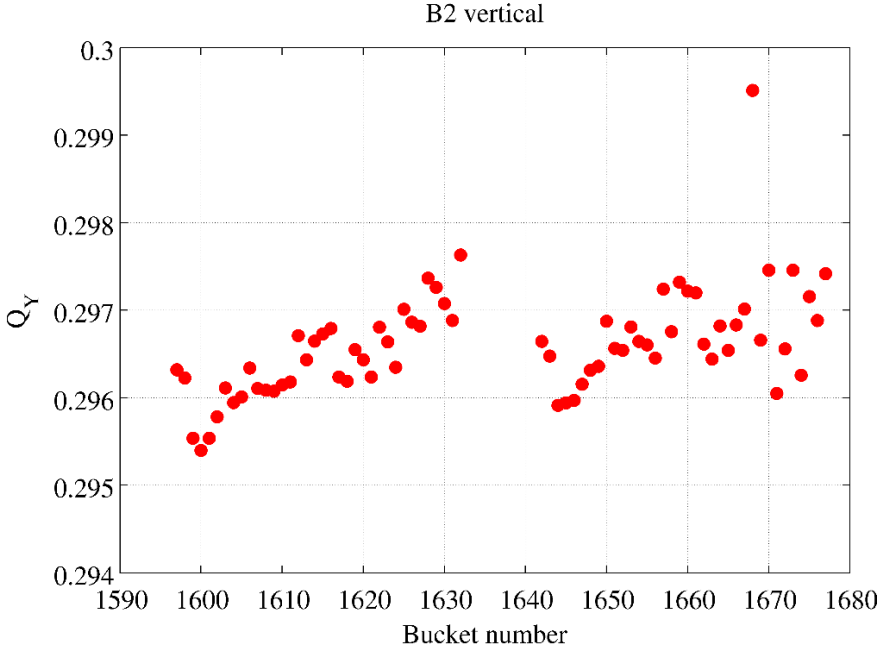
N.Biancacci, L.Carver, G.Rumolo

Bunch by Bunch Tunes: Fill 4574 – 2x36b w/ 25ns spacing









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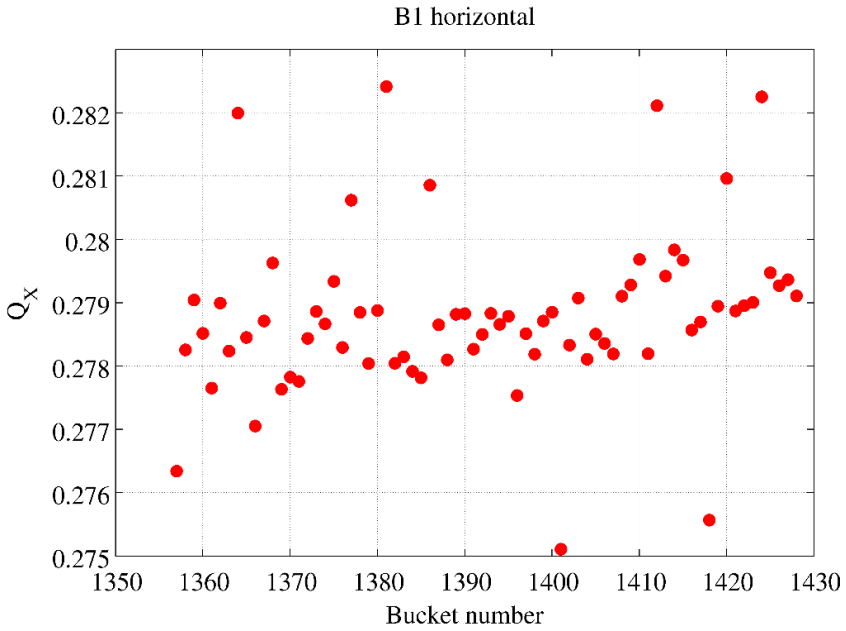
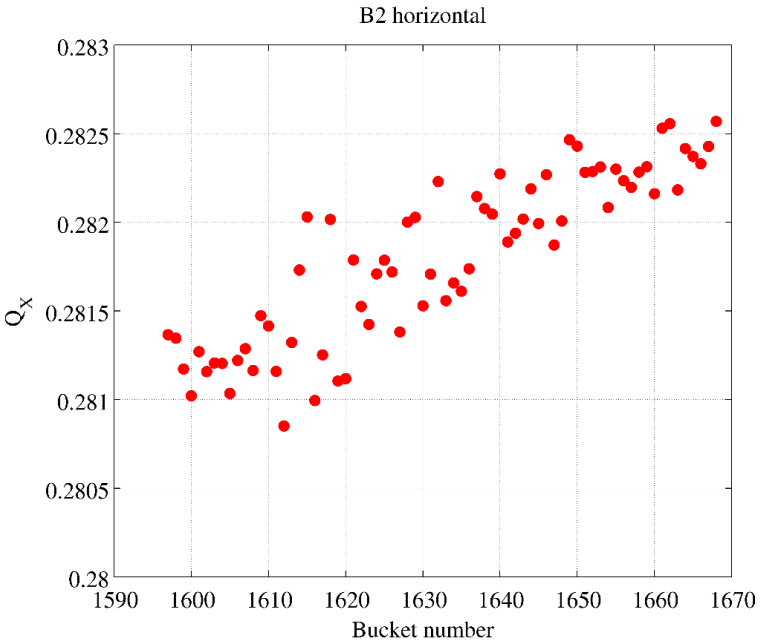
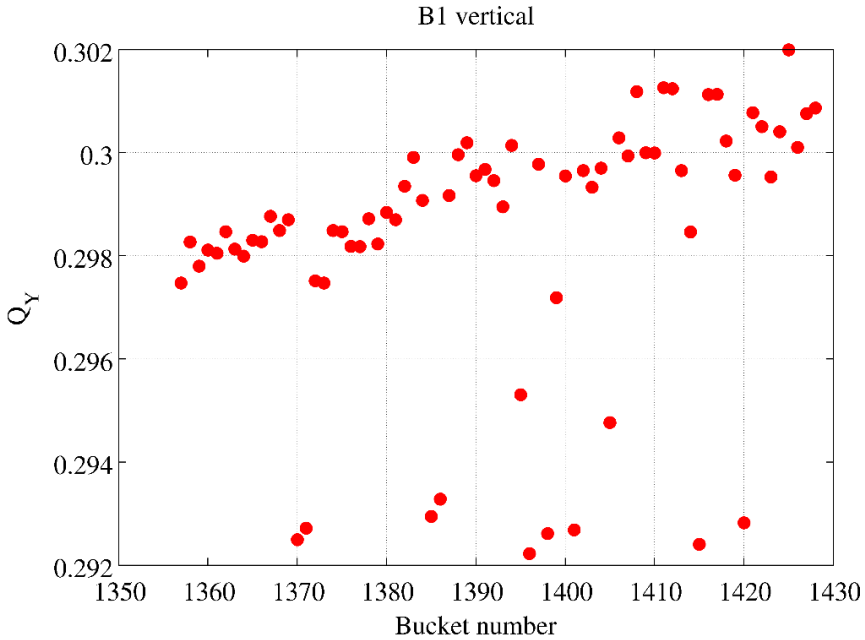
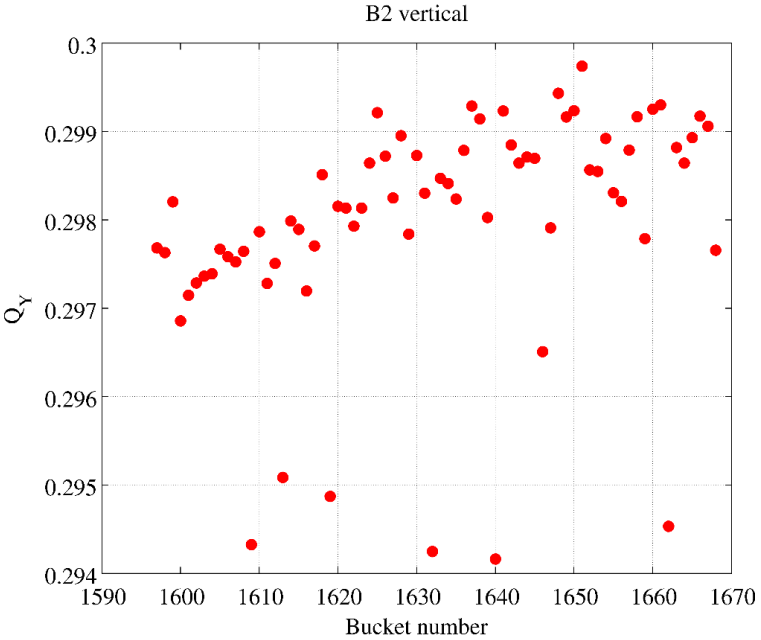
Bunch by Bunch Tunes: Fill 4577 – 1x72b w/ 25ns spacing









Tunes at injection

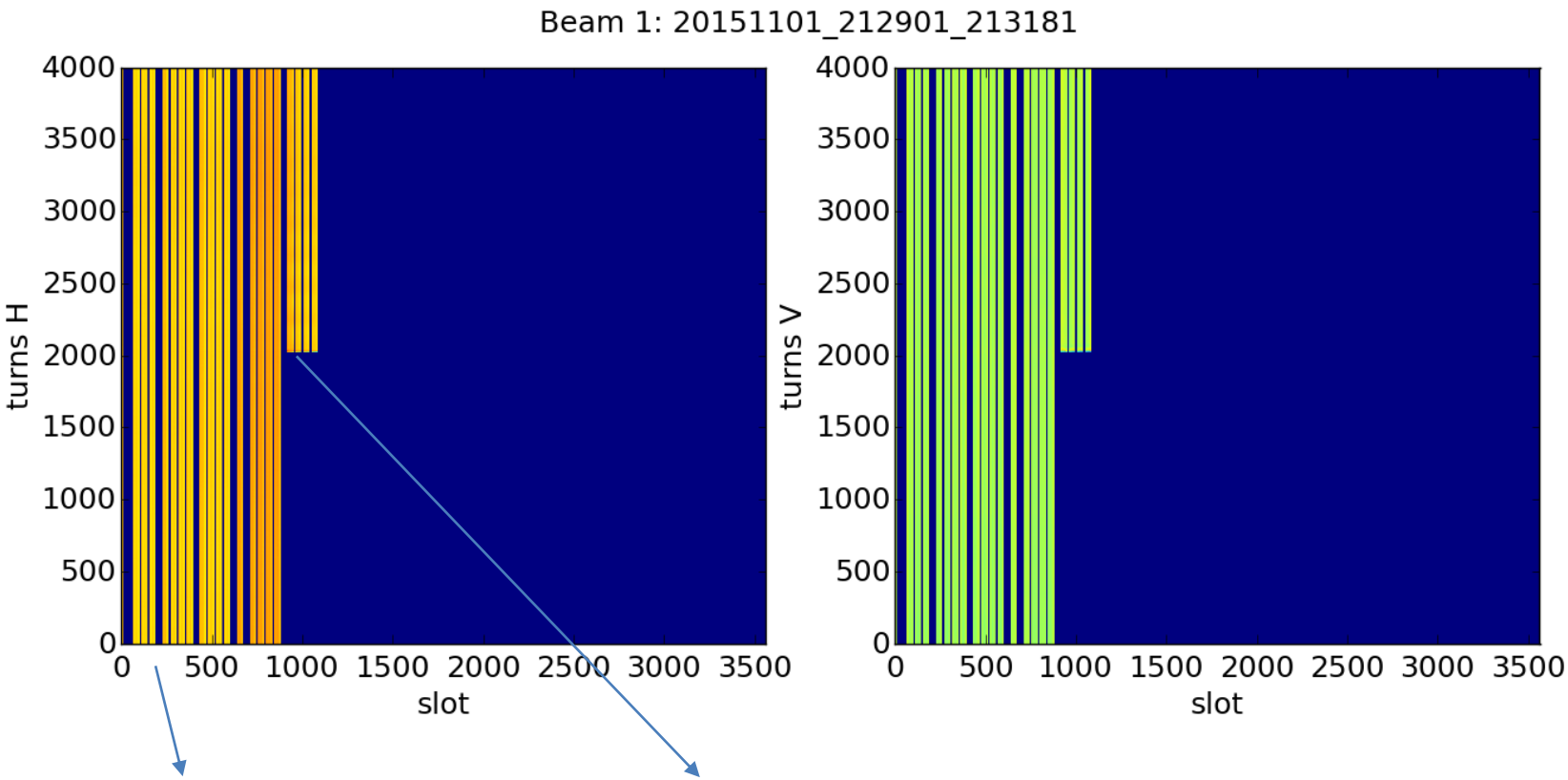
- ADT uses - within one turn - two regions with different gain (witness area with lower gain for the tune feedback). Damping times throughout the cycle are kept constant, i.e. the feedback gain scales with momentum (until saturation).

- Bunch movements lead to a feedback kick as soon as the oscillation amplitude exceeds the ADT detection limit, visible as a notch in the tune spectrum at the location of the tune.

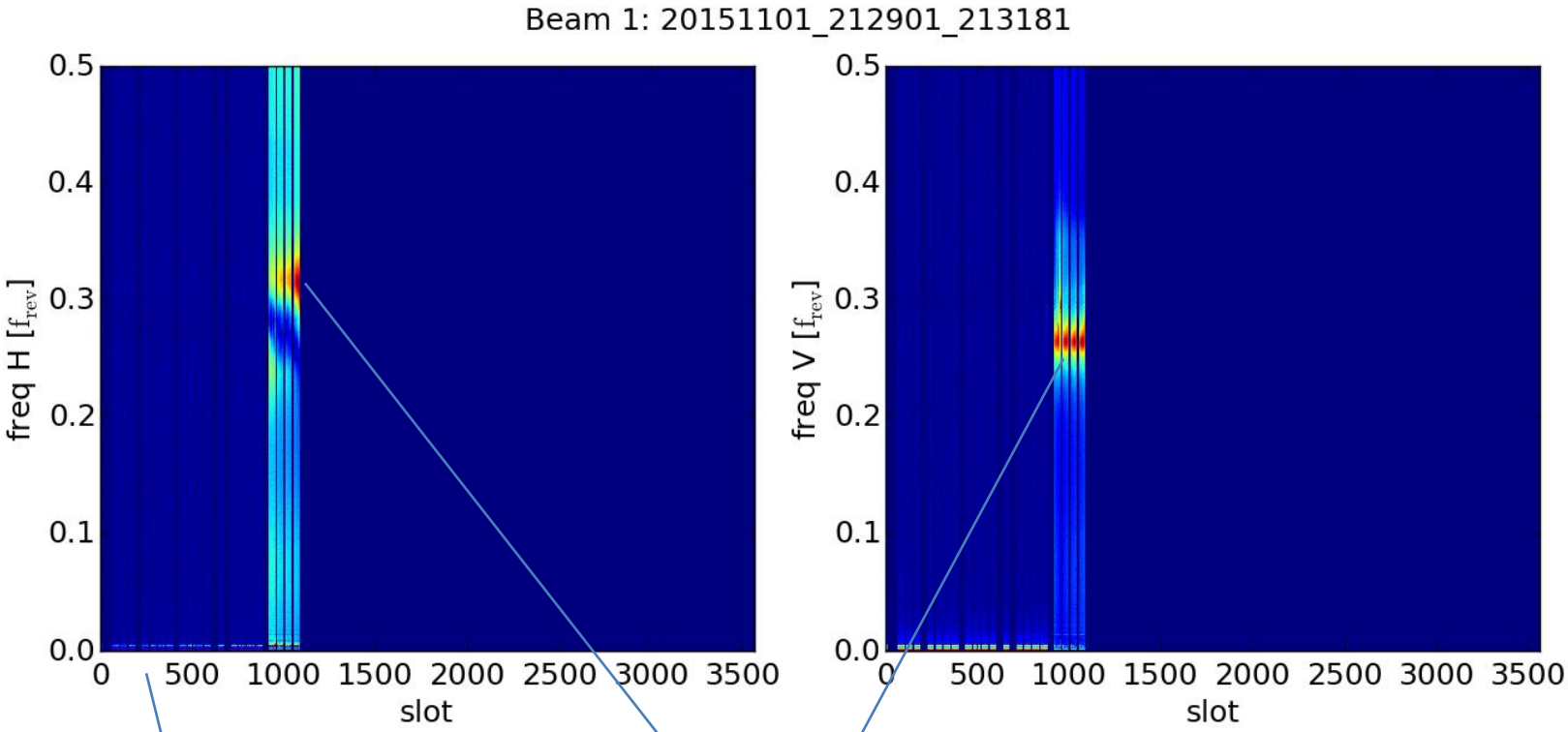
- G. Kotzian developed algorithms for in-situ measurements of parameters essential for ADT (per bunch damping times, per-bunch tunes, phase advances, feedback loop delay). Methods to be evaluated for use also with ObsBox data.

- R. DeMaria and M. Fjellstrom have been studying the tunes for each injection.

Tunes at injection – Raw Data



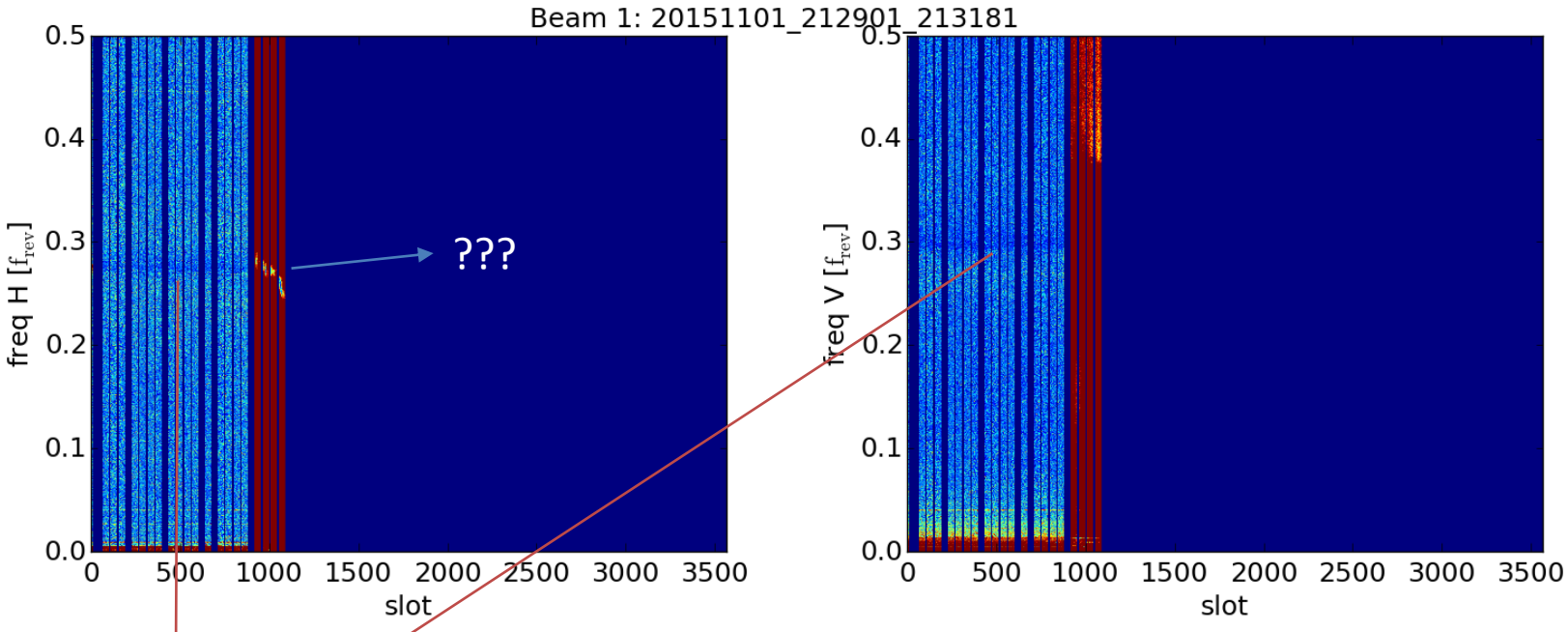
Tunes at injection – Injection Oscillation



Circulating bunches

Injected batch 144 bunches
Injected bunches do not oscillates at tune frequencies but likely at ADT some closed-loop poles
Different patterns H,V Beam 1 and Beam 2

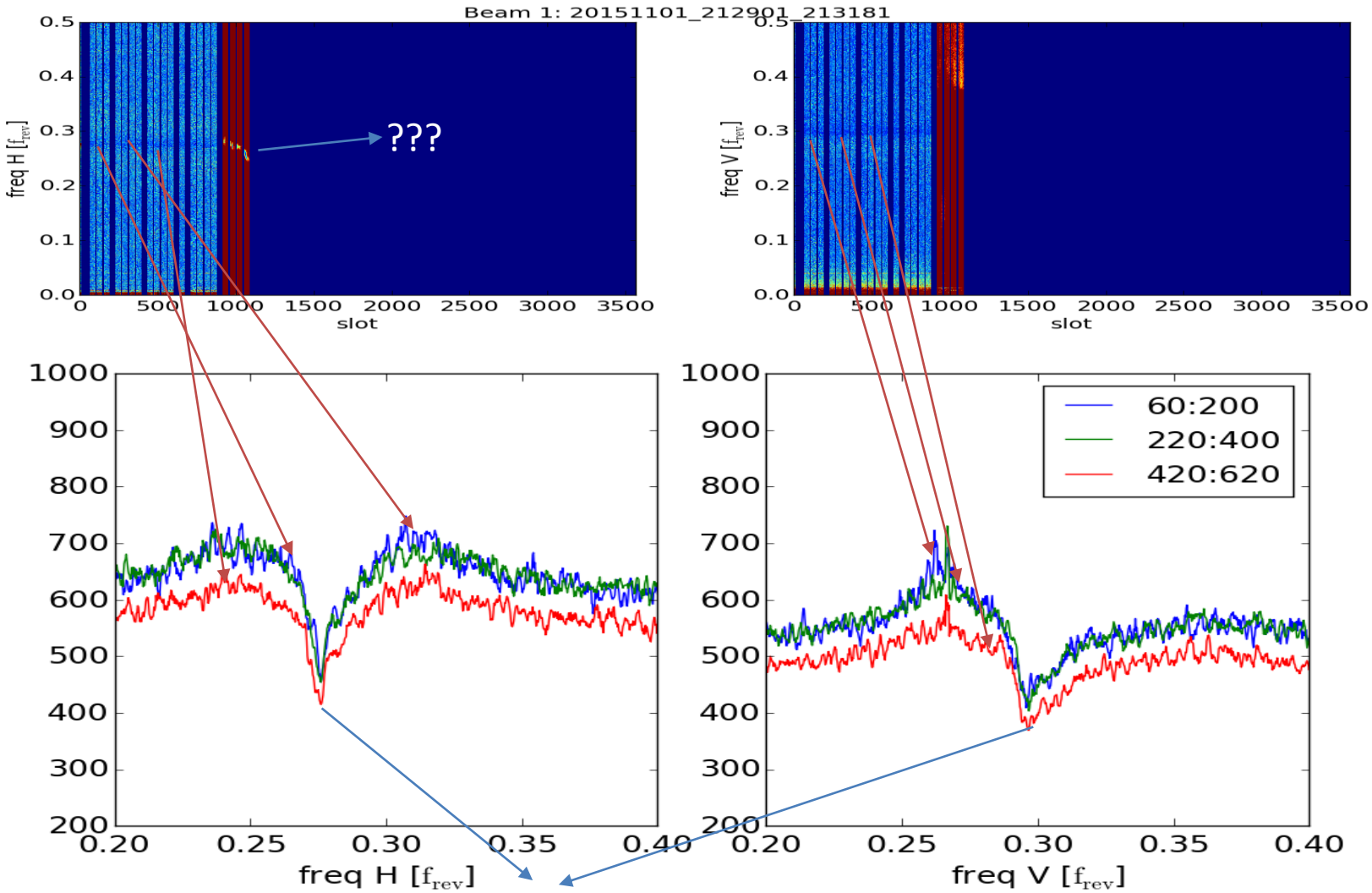
Tunes at injection – Injection Oscillation



Circulating bunches
Tune information in the noise

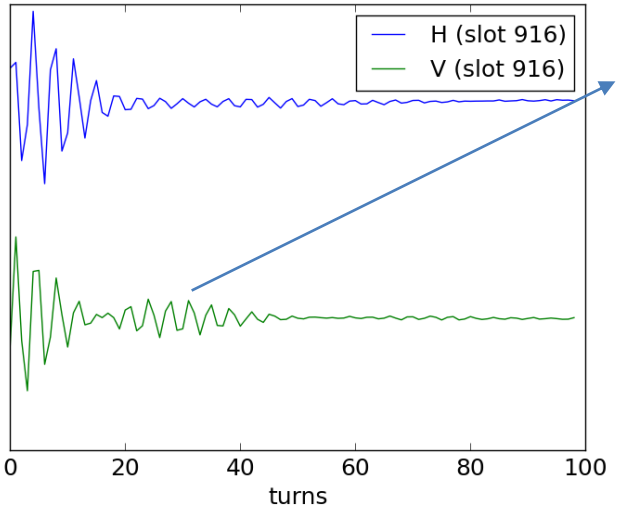
Injected batch 144 bunches
Injected bunches do not oscillates at tune frequencies but likely at closed loop poles
Different patterns H,V Beam 1 and Beam 2

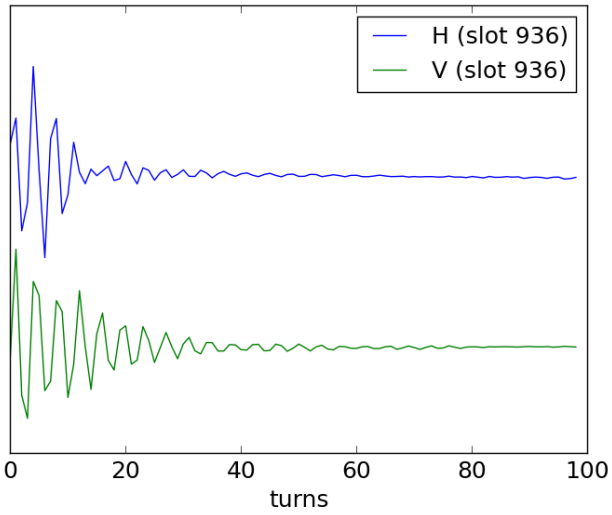
Tunes at injection – Injection Oscillation



Tunes (see W. Hofle at al. Chamonix 2012)

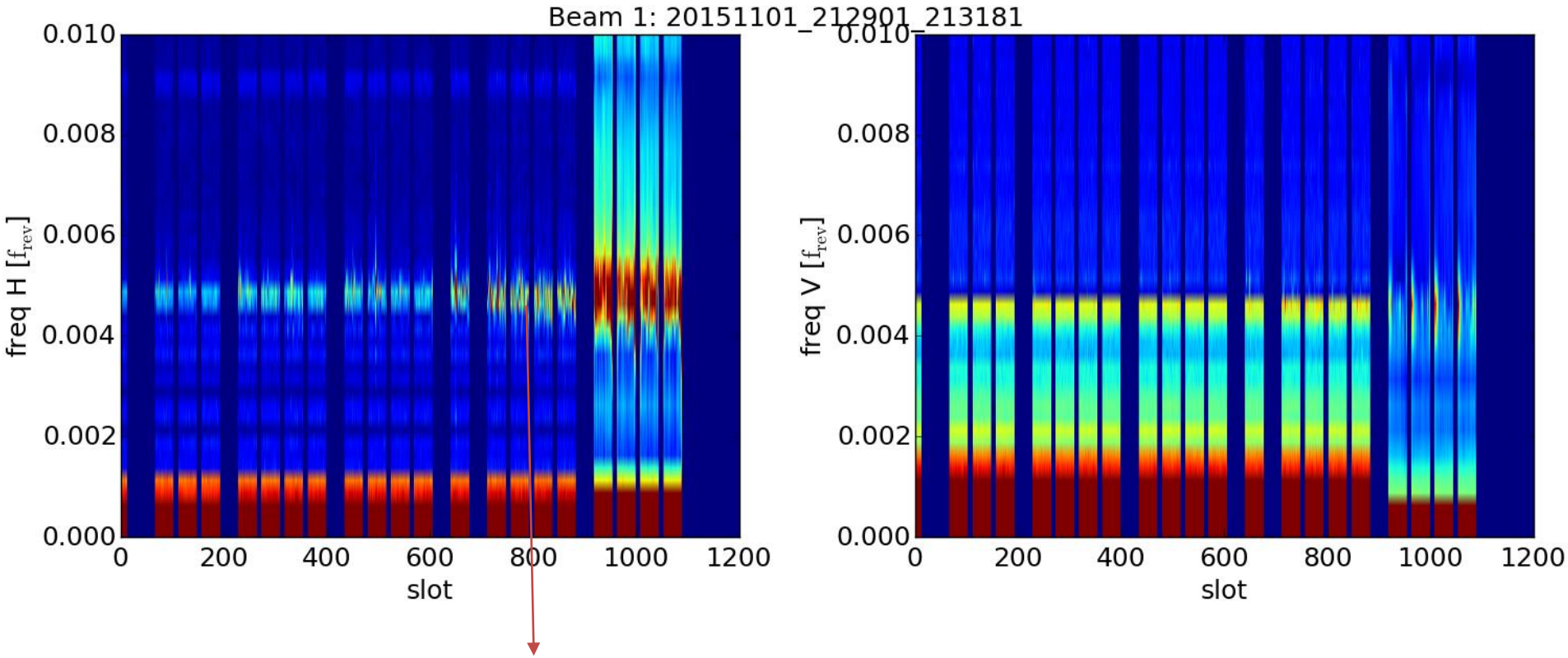
Tunes at injection – Re-coherence





Fast re-coherence observed for first bunch in the injected bunches but not in other in the train

Tunes at injection – Synchrotron Signal



Synchrotron signal visible in train close to the injected one.