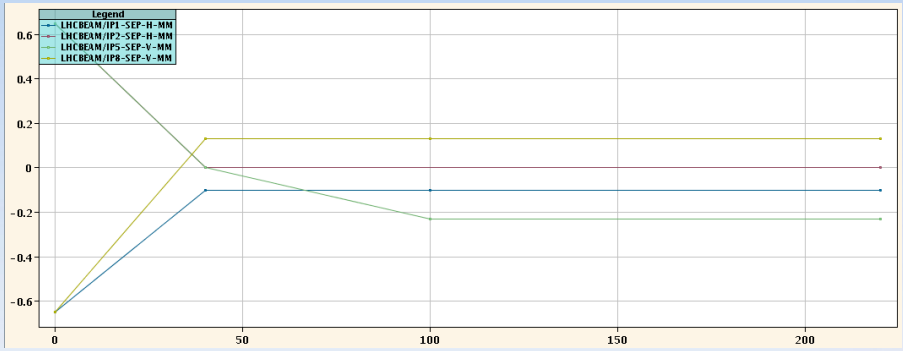
Observation of losses and instabilities during collision

X. Buffat on behalf of the BBWG and G. Arduini

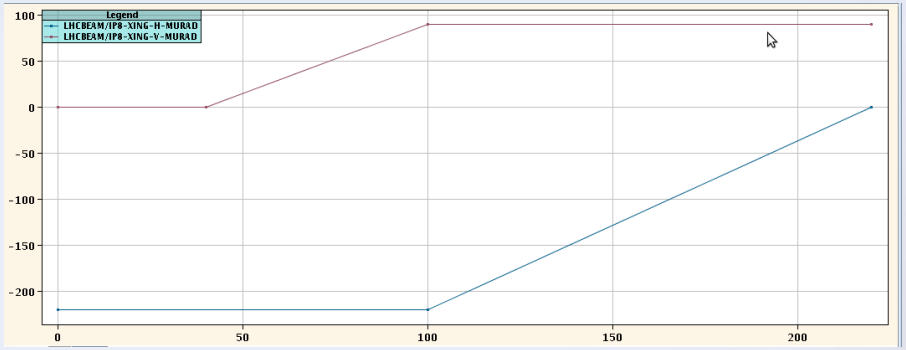
- Lifetime during PHYSICS beam process
  - Fill 2533 to 2536
- Instabilties during stable beam
  - Fill 2488, 2535

PHYSICS Beam Process

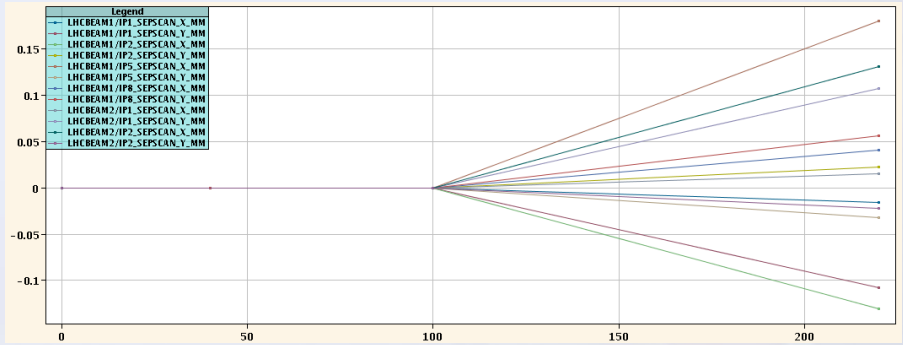
Separation



IP8 Xing



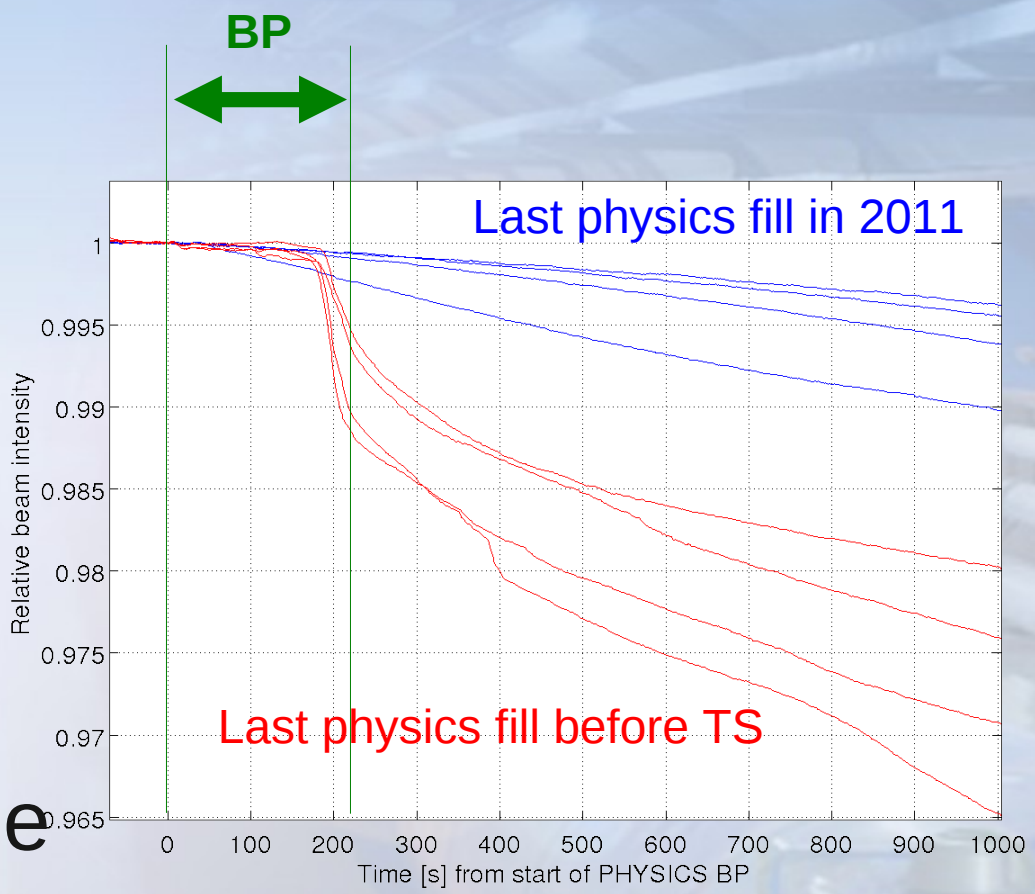
Lumiscan knobs



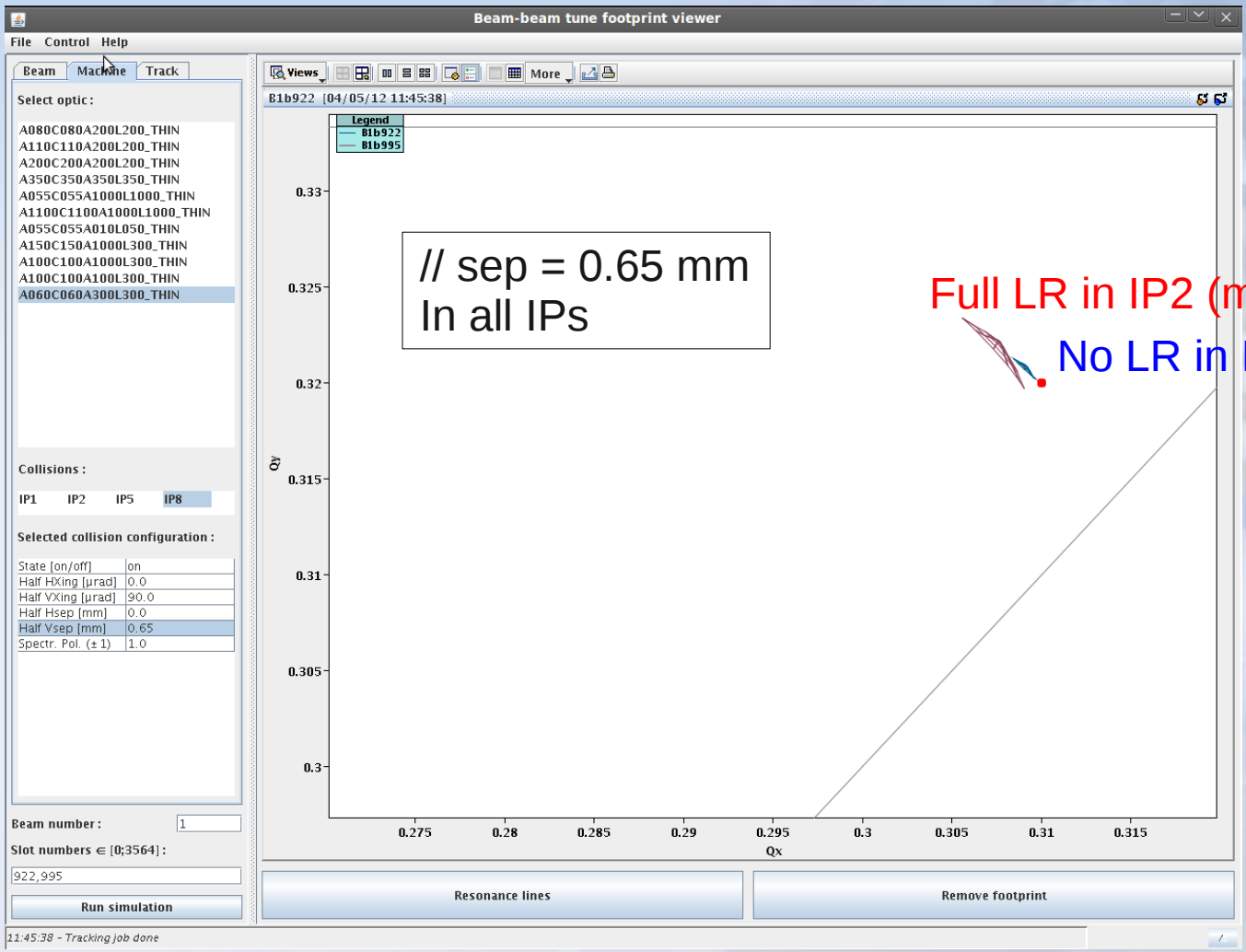
- Collapse separation bumps
- Increase VXing in IP8
- Simulatenously
  - Remove HXing in IP8
  - Go head on

Lifetime during PHYSICS BP

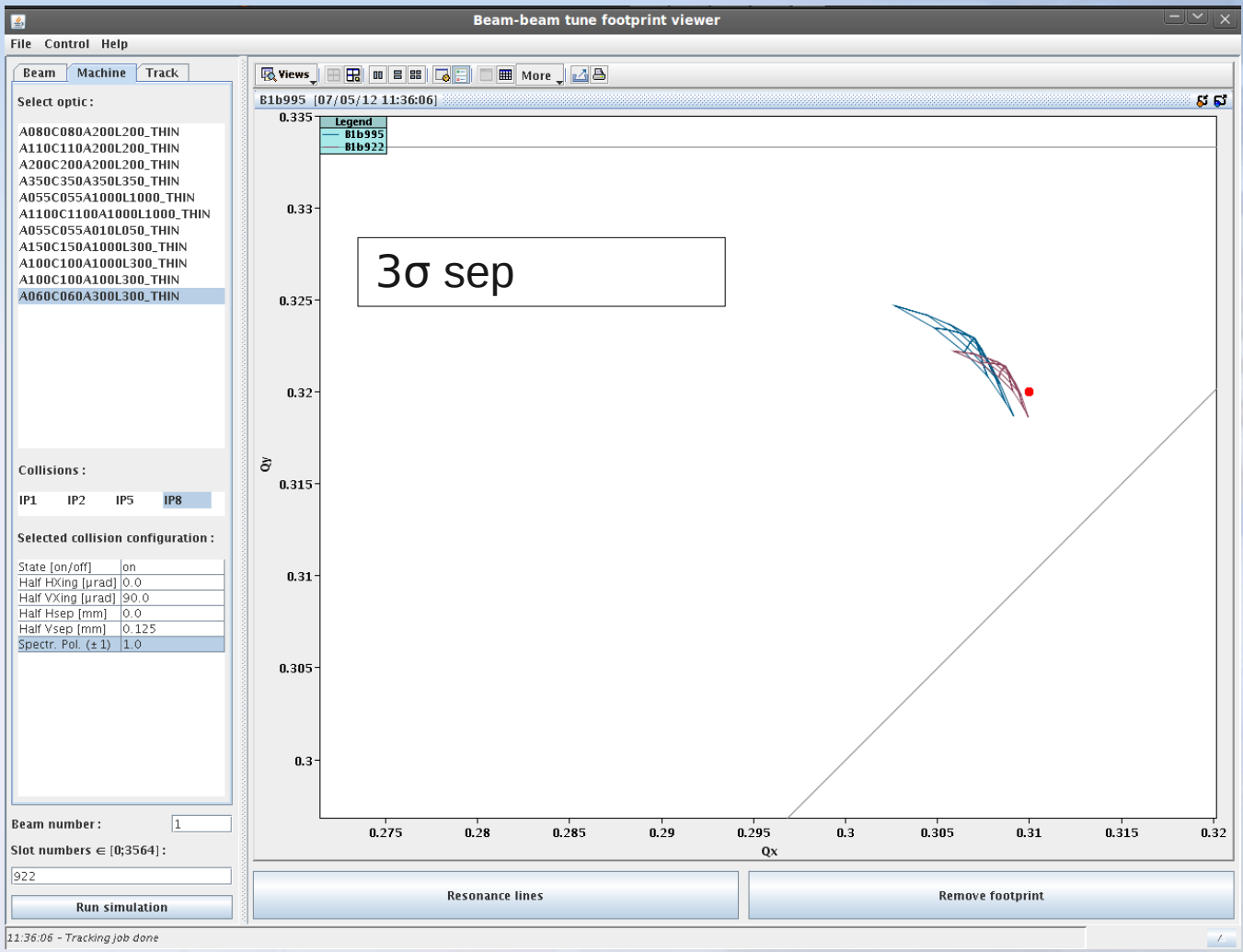
- Many things changed since last year
  - β* (IP1,5 and 2)
  - Xing
  - Collimator settings
  - Intensity
- Do they explain the very bad lifetime at the end of physics BP ?



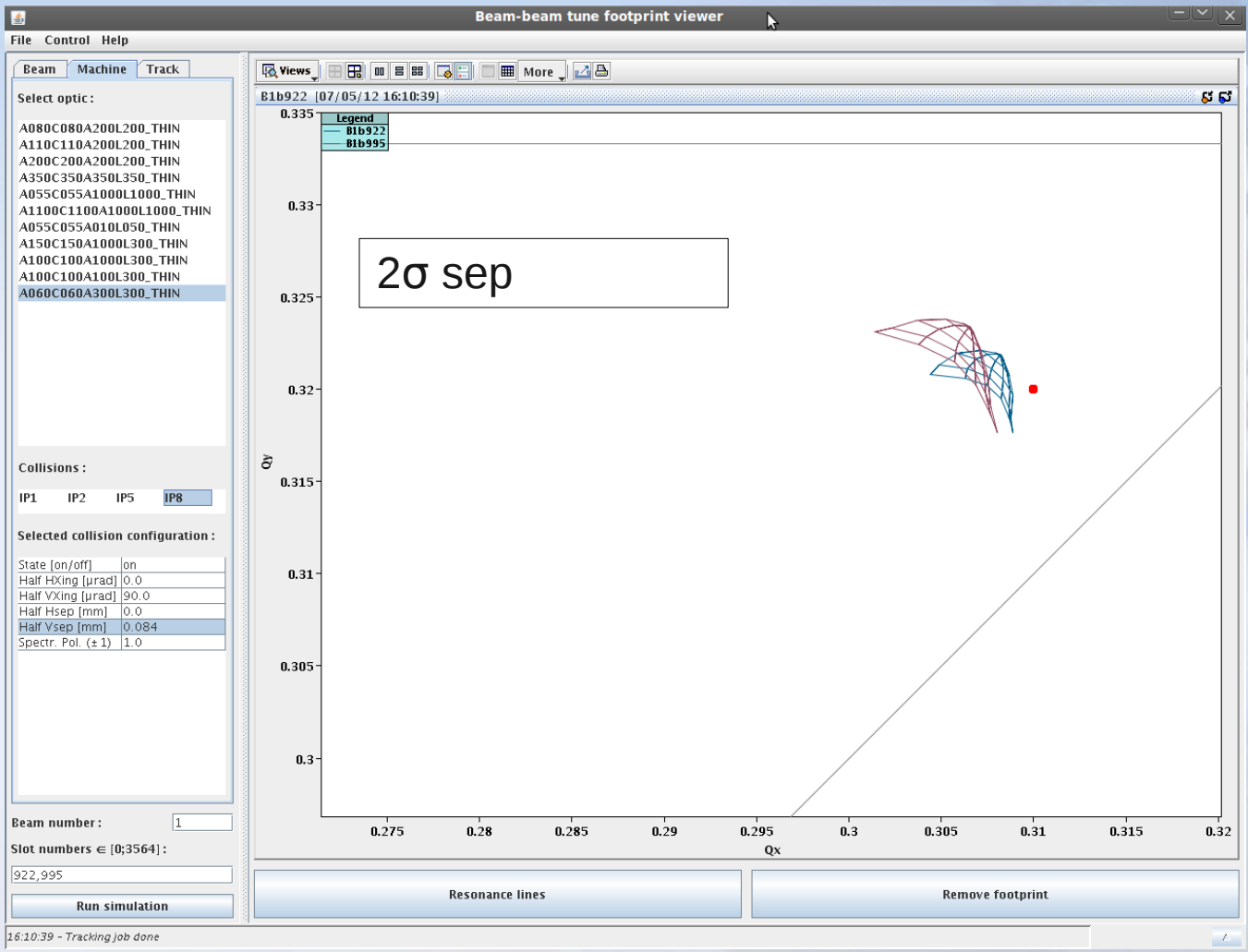
Footprint with full // separation



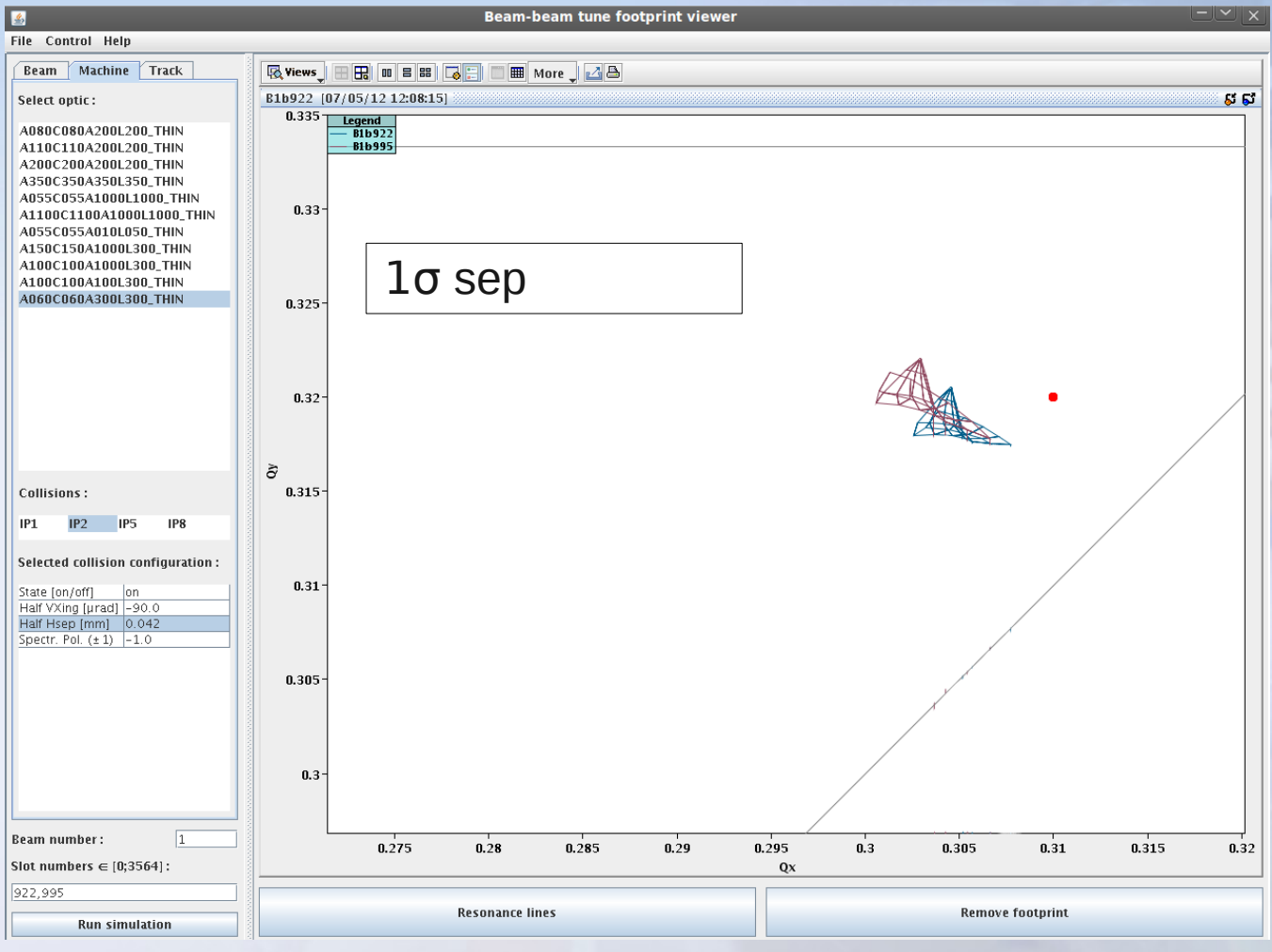
Footprint with intermediate // separation



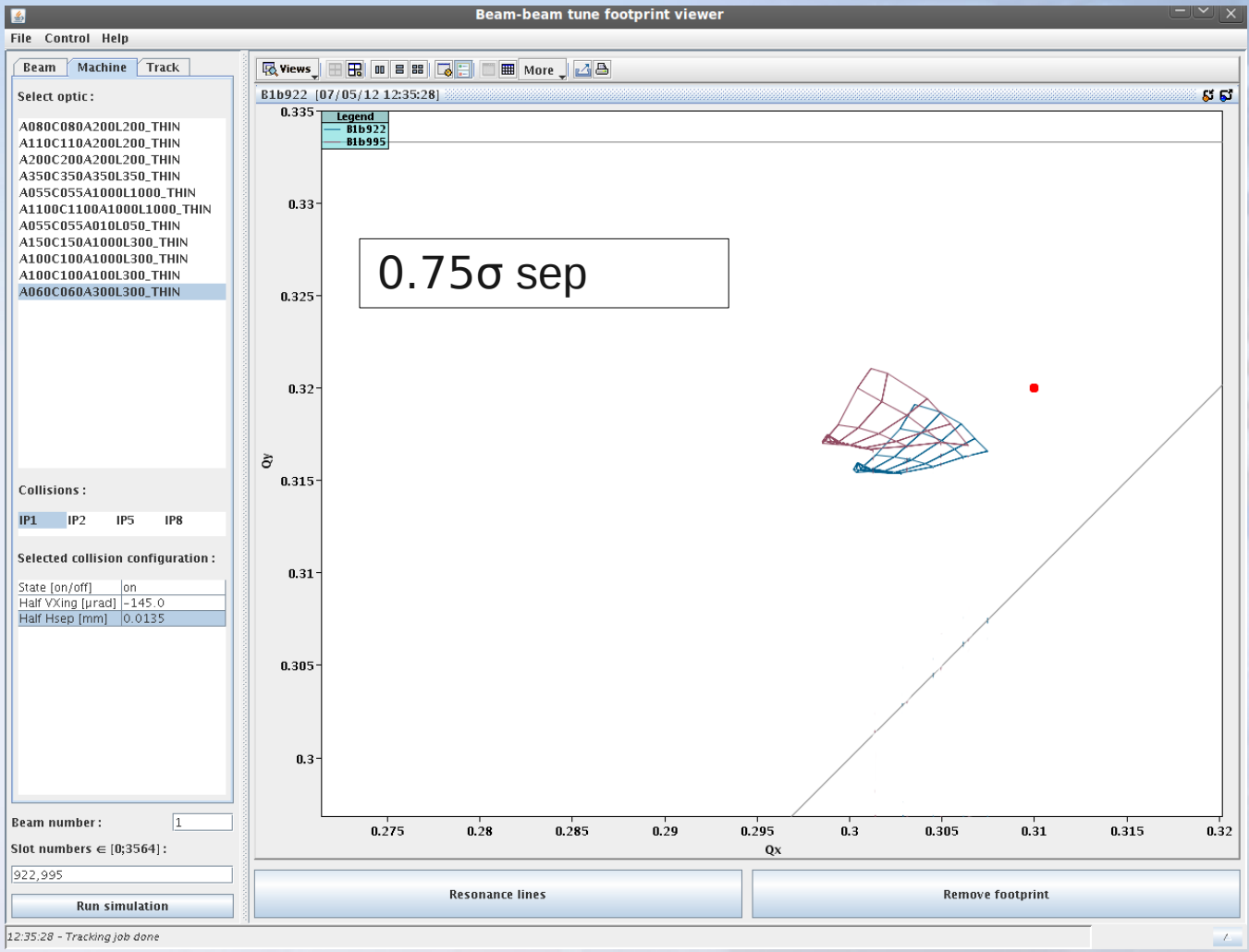
Footprint with intermediate // separation



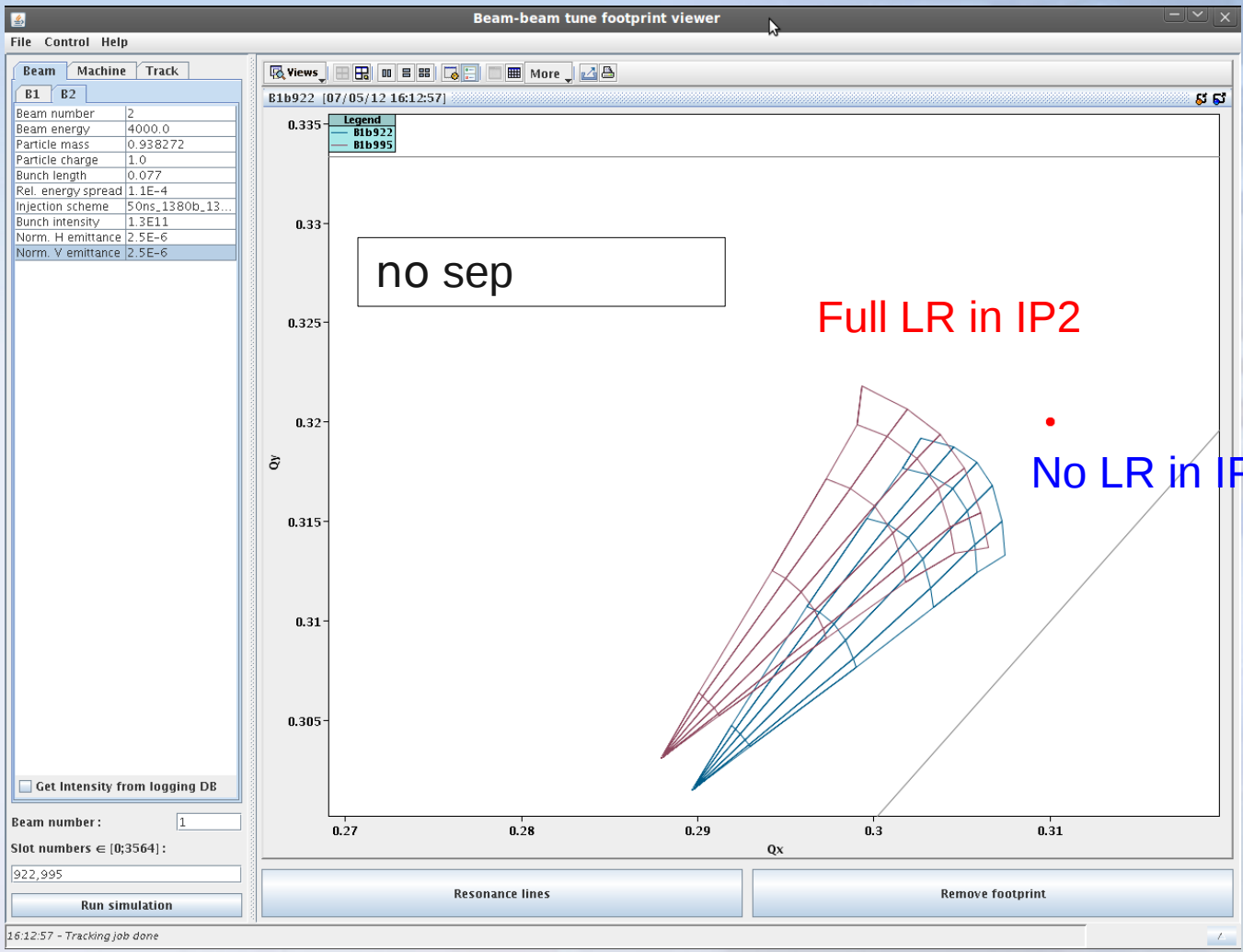
Footprint with intermediate // separation



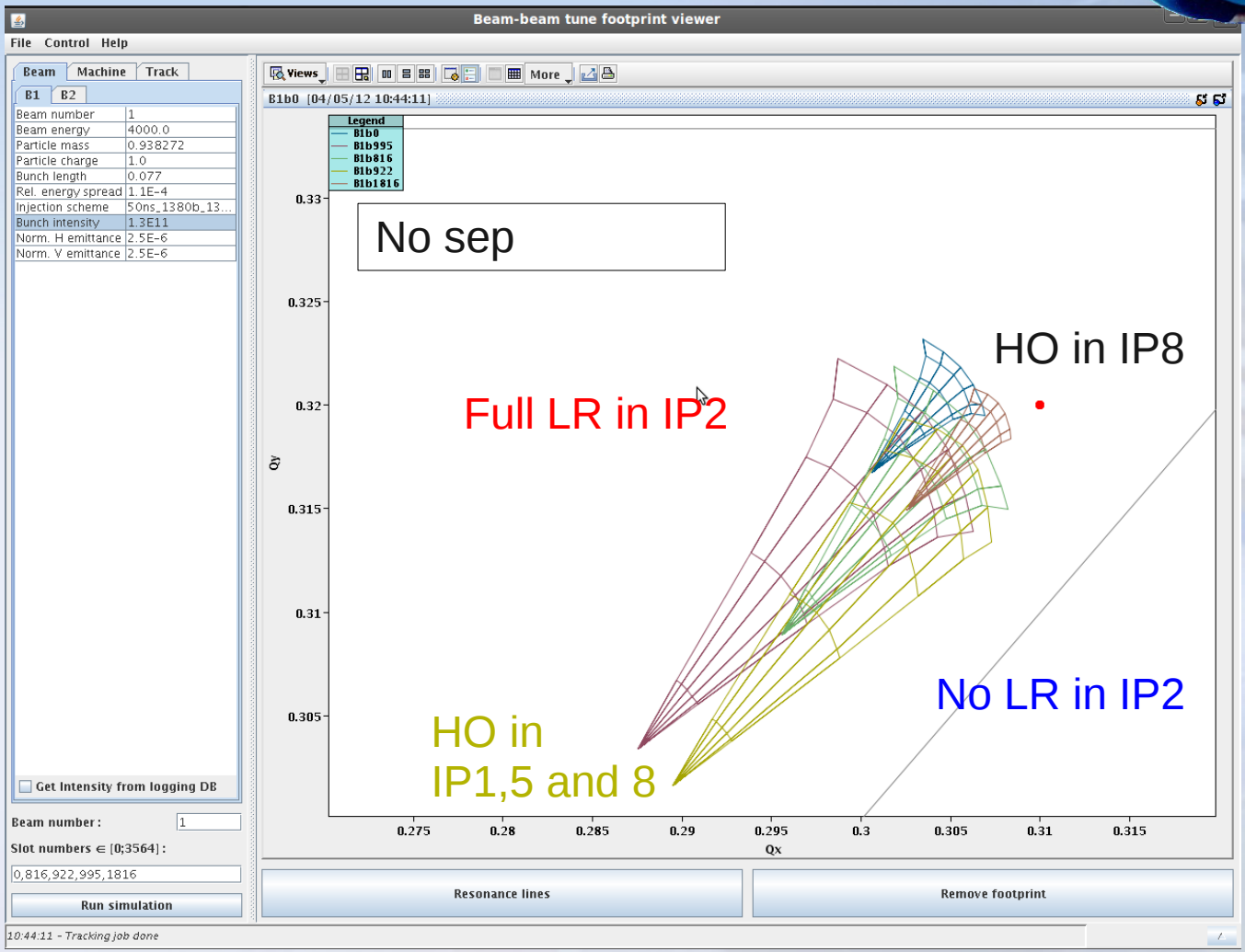
Footprint with intermediate // separation



Footprint with no separation



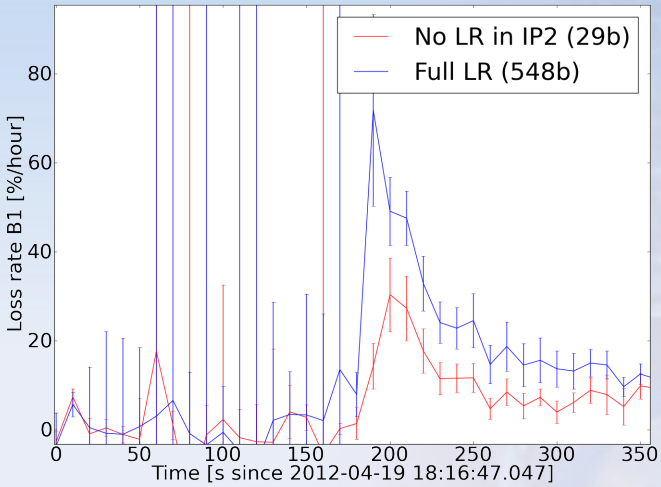
Footprint when HO

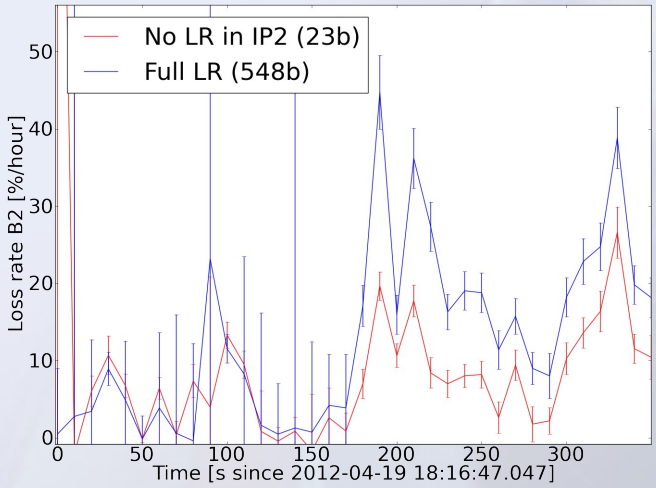


Loss rates

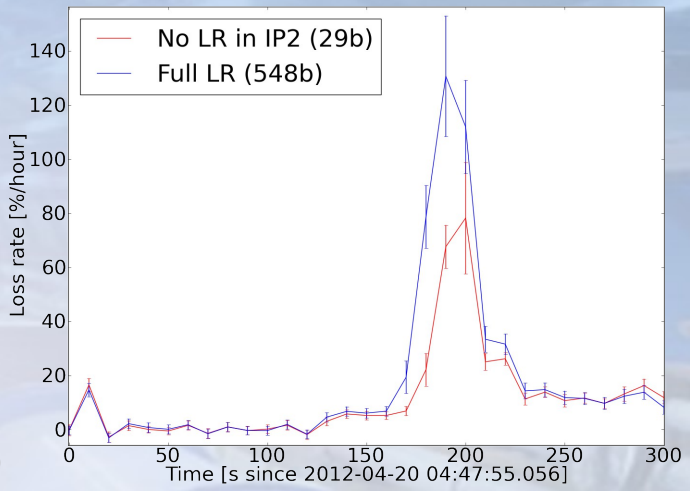
- Clearly the one colliding LR in IP2 suffer the most
- Most bunches have full LR in IP2

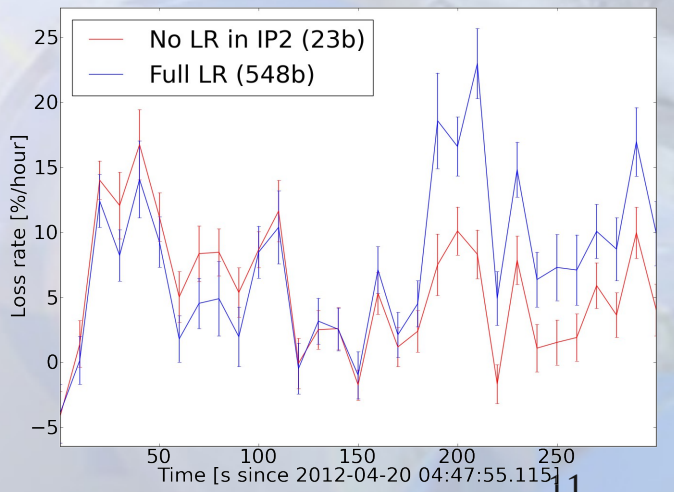
Fill 2535





Fill 2536





IP2

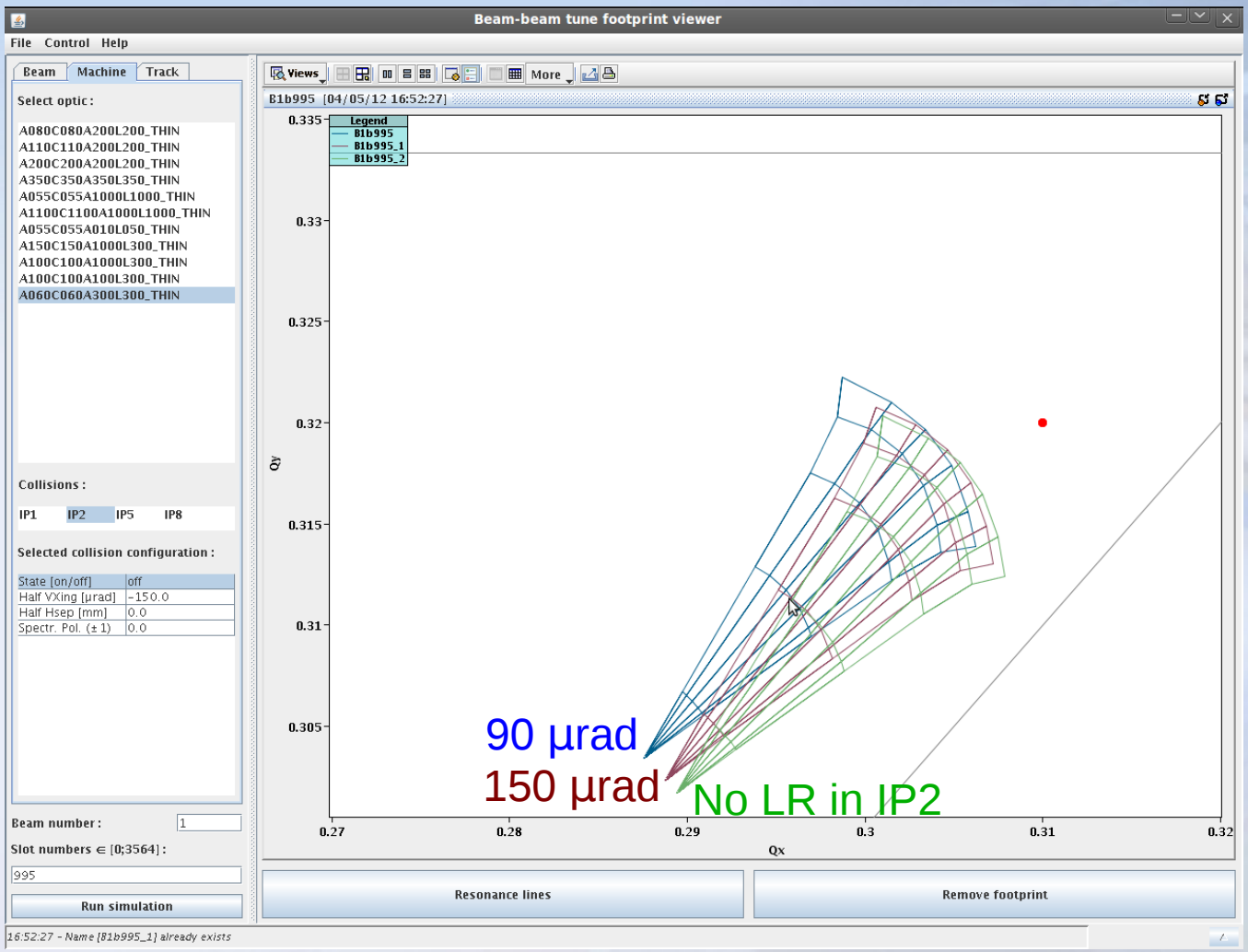
LR in IP2 are no longer negligible compared to IP1 and 5 (smaller β* and Xing)

→Most footprints are shifted up

- Increase of losses
- Effect very worse for selected bunches

- Can be cured by opening Xing in IP2
  - 150 µrad (ok with aperture, R. Bruce)
- An improvement is expected with optmimized tune, easy to test

IP2 Xing


Beam-beam tune footprint viewer
File Control Help
Beam Machine Track
Select optic :
A080C080A200L200_THIN
A110C110A200L200_THIN
A200C200A200L200_THIN
A350C350A350L350_THIN
A055C055A1000L1000_THIN
A1100C1100A1000L1000_THIN
A055C055A010L050_THIN
A150C150A1000L300_THIN
A100C100A1000L300_THIN
A100C100A100L300_THIN
A060C060A300L300_THIN
Collisions :
IP1 IP2 IP5 IP8
Selected collision configuration :
State [on/off] off
Half VXing [μrad] -150.0
Half Hsep [mm] 0.0
Spectr. Pol. (± 1) 0.0
Beam number : 1
Slot numbers ∈ [0;3564] :
995
Run simulation
Views
More
B1b995 [04/05/12 16:52:27]
Legend
B1b995
B1b995_1
B1b995_2
0.335
0.33
0.325
0.32
0.315
0.31
0.305
Qy
0.27
0.28
0.29
0.3
0.31
0.32
Qx
90 μrad
150 μrad
No LR in IP2
Resonance lines
Remove footprint
16:52:27 - Name [B1b995_1] already exists

Observation of losses and instabilities during collision

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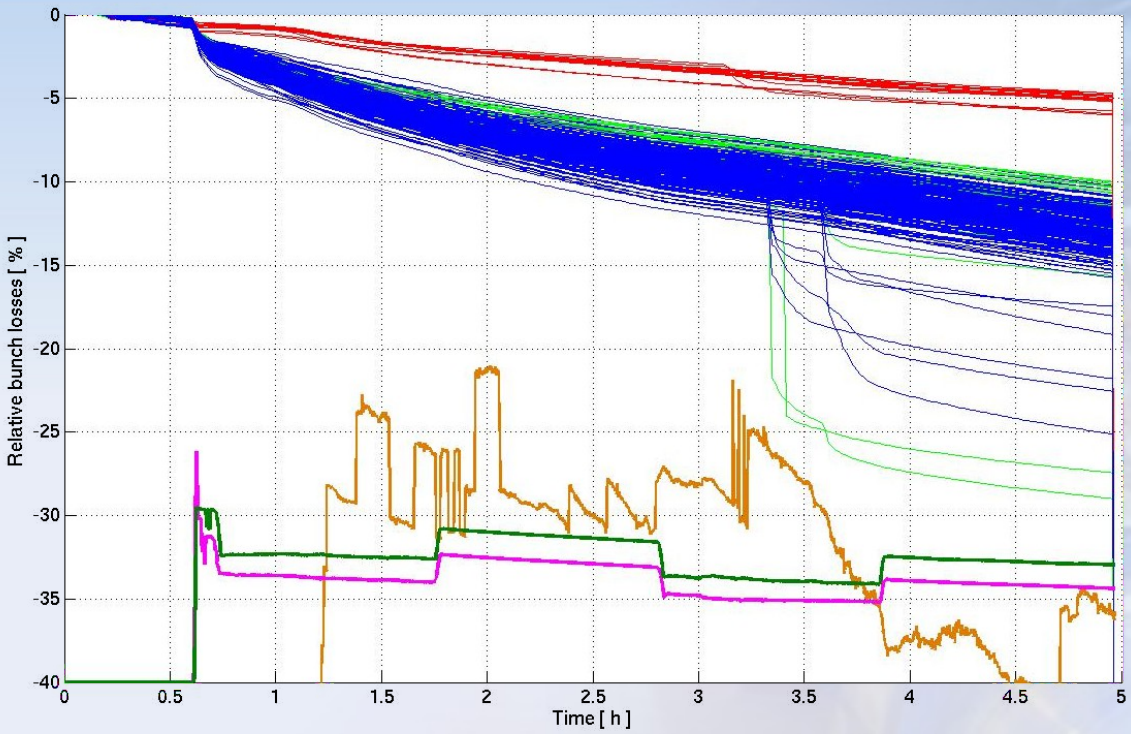
- ~~Lifetime during PHYSICS beam process~~
  - ~~Fill 2533 to 2536~~
- Instabilties during stable beam
  - Fill 2488, 2535

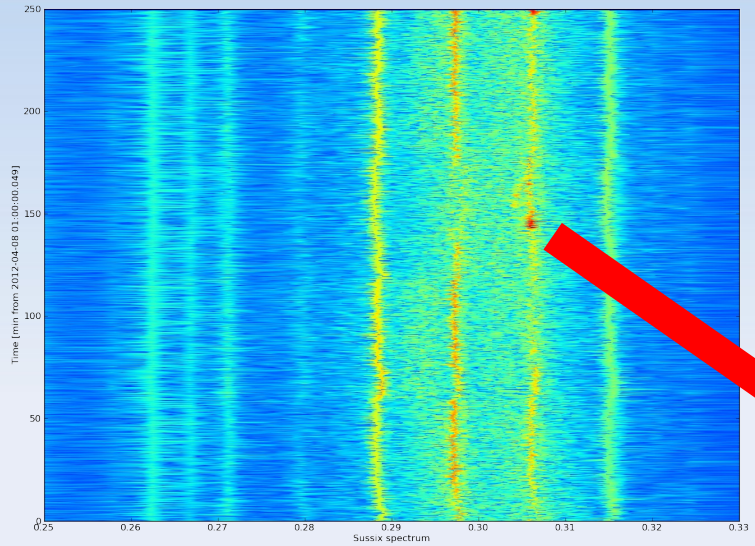
Levelling test (2488)



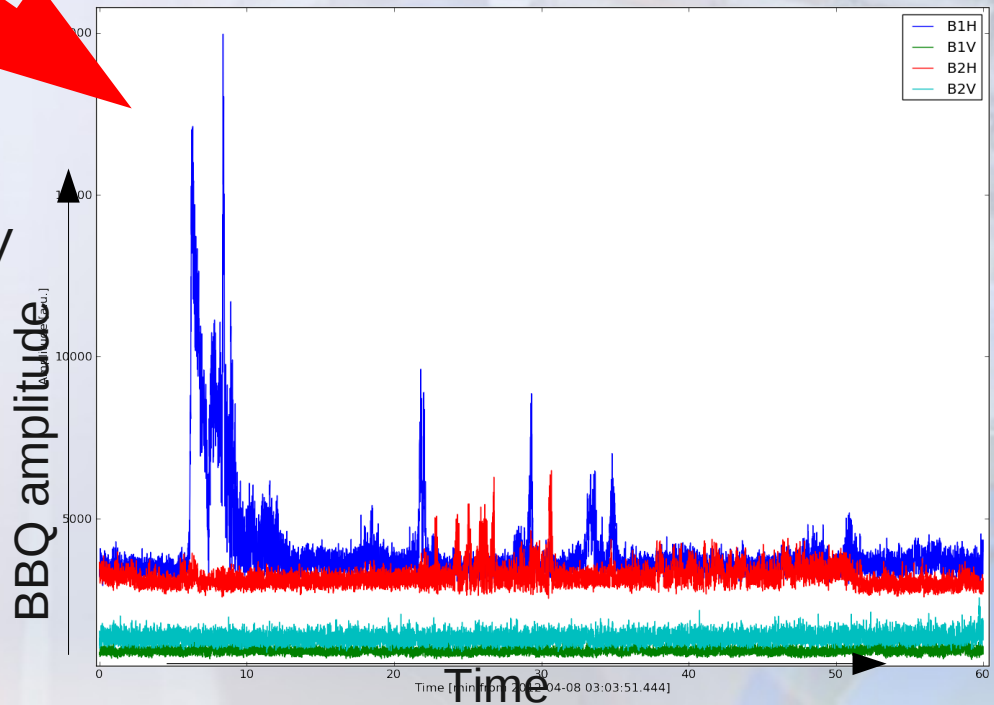
Leveling Test: Machine Experience Preliminary Results, T. Pieloni, LBOC 17.04.2012

- No optimization in IP8
- Not caused by an orbit change
- Cause is unknown

Levelling test (2488)

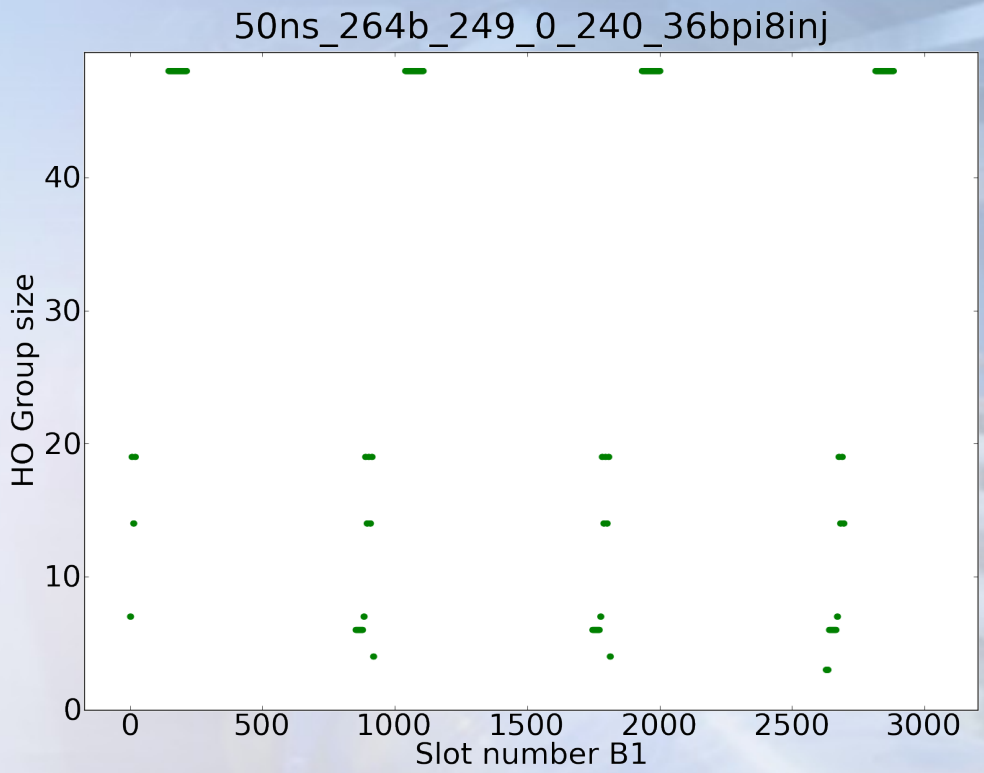


- A priori no relation with levelling
- Selected bunches are unstable



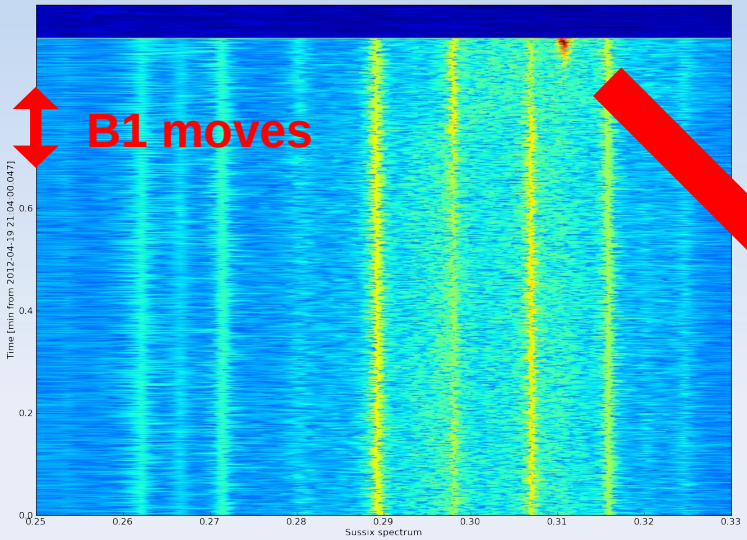
Collision group

- The collision pattern of some bunches are very simple
- These are the ones losing
- Beam-beam coherent motion are not excluded

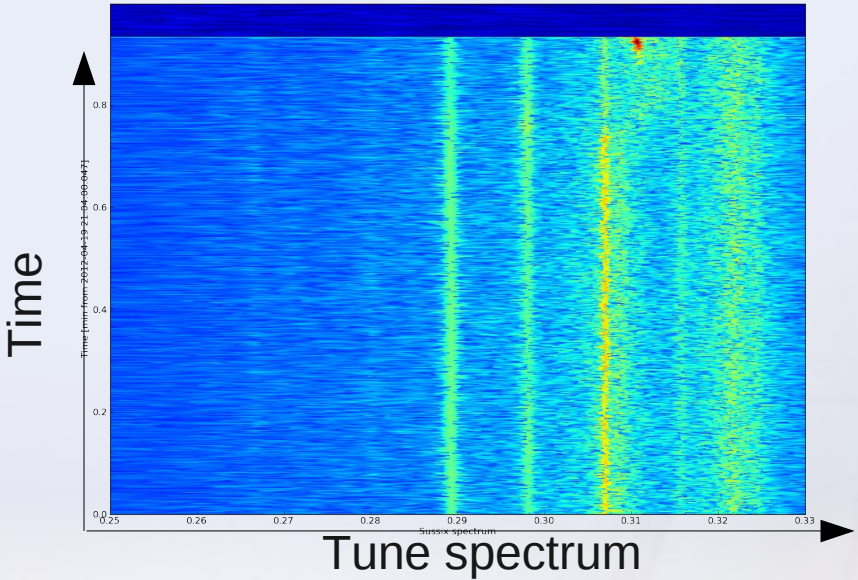


- The spectrum of individual bunches will be investigated using the damper pickups

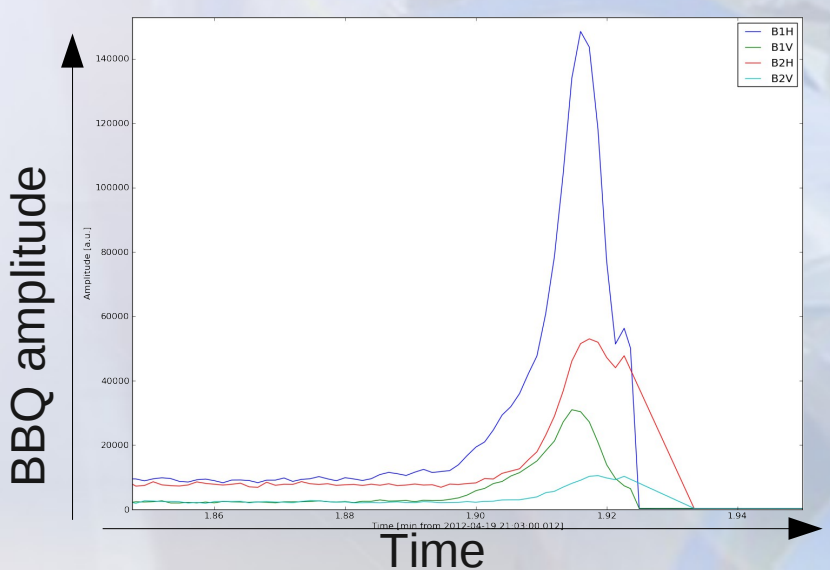
Length scale calibration (2535)



- Beams went unstable when moving IP1 to 2.5σ

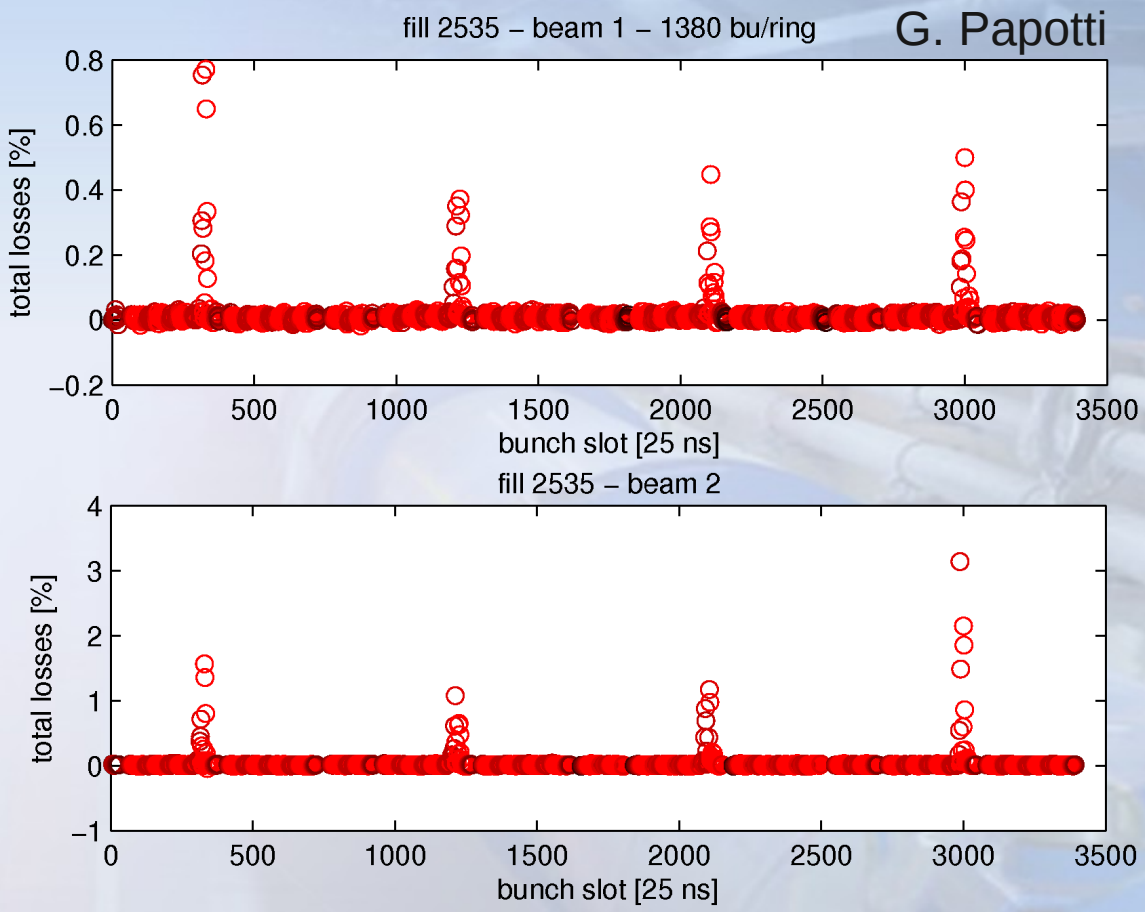


B1V



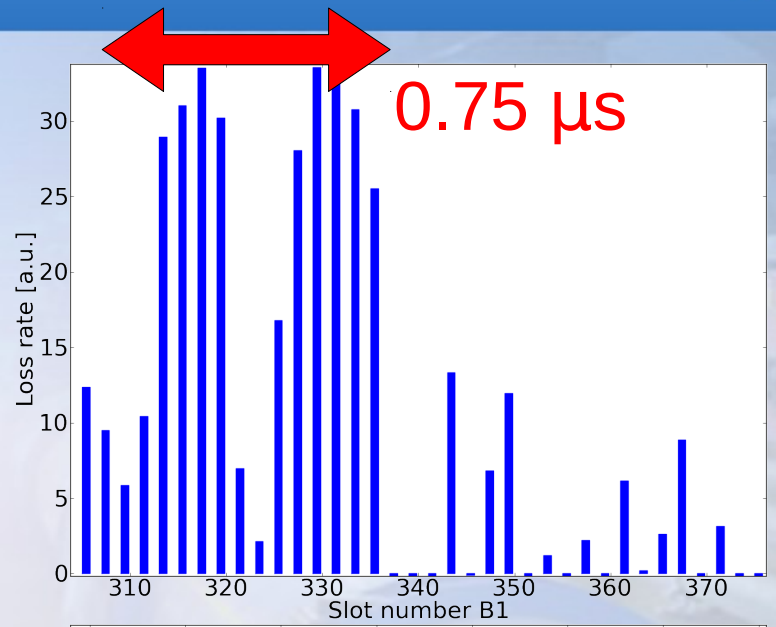
Loss pattern

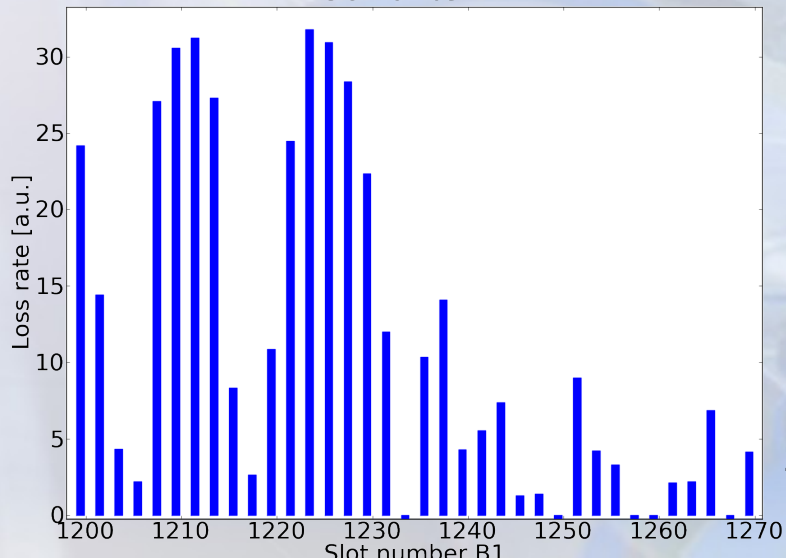
- Few bunches are unstable
- They collide together
- Nothing different from other stable bunches



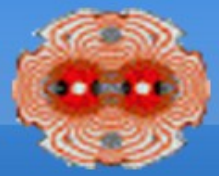
Loss pattern

- Repeating pattern suggest that two bunches may be unstable
  - The instability is transmitted to others via BB
- Any idea welcome





Avoid instabilities during stable beams



- By trying to cure the problem :
  - Open Xing in IP2
  - Optimize the working point
- By hiding the problem :
  - Increase damper gain

- Note : for a better unserstanding, we should avoid to do all at once...