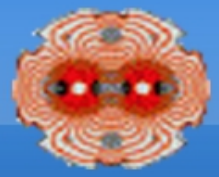
Transverse instabilities when bringing the beams into collision and during stable beam

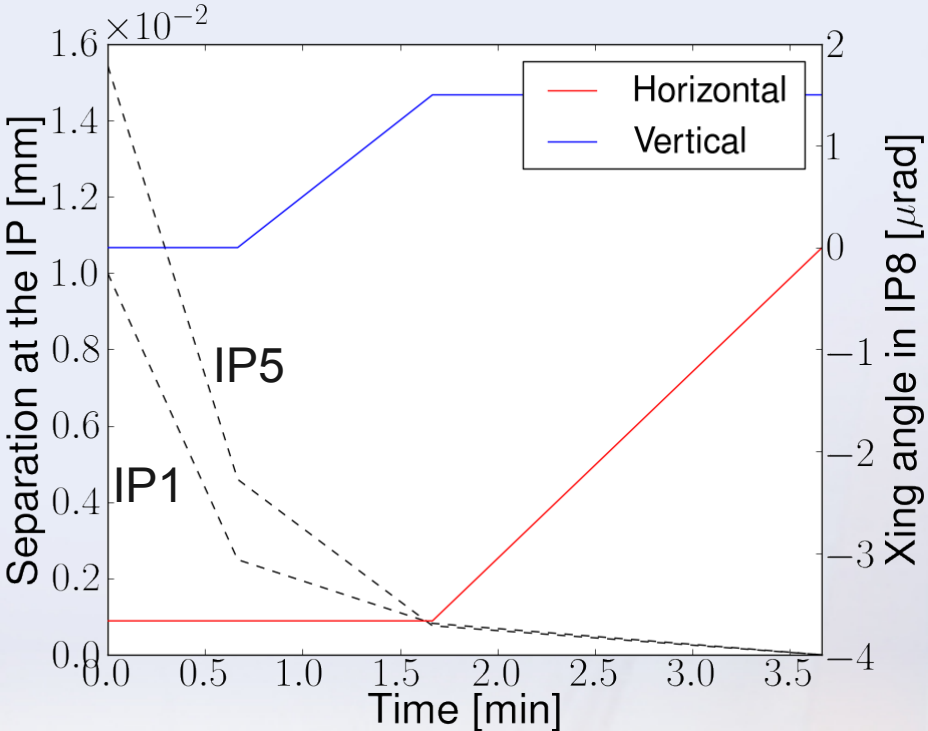


- Bringing the beams into collision
- Instabilities during stable beam
- Comparison with models
- Conclusion

PRELIMINARY

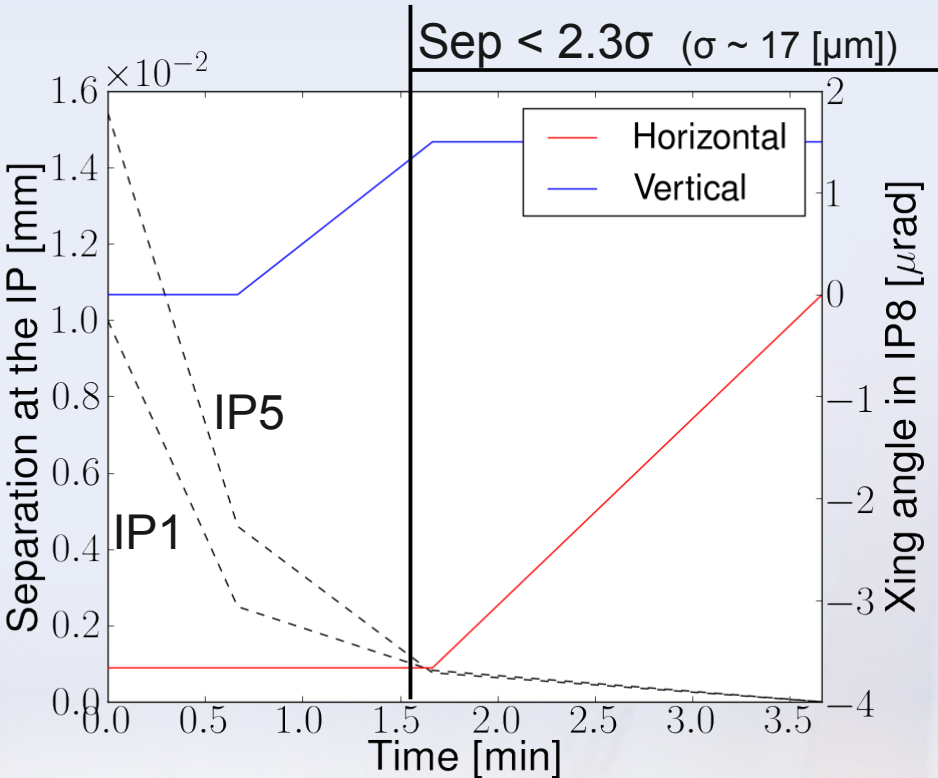
Collision beam process

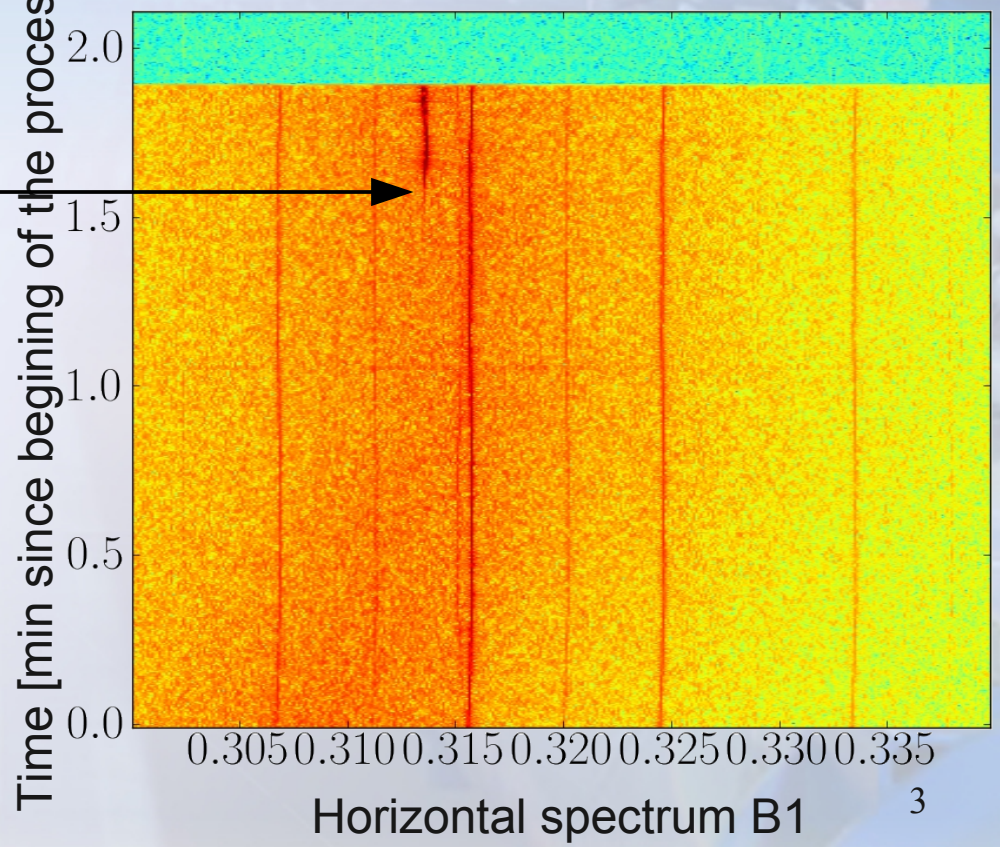
- In 2012, up to fill 3076 (24th sept.), the collision BP included
  - The collapse of the separation bumps in IP1 and 5
  - Tilting of Xing angle in IP8



Observation of instability

- Instabilities were observed at different time in the BP
- Example : fill 2808 (5th July)

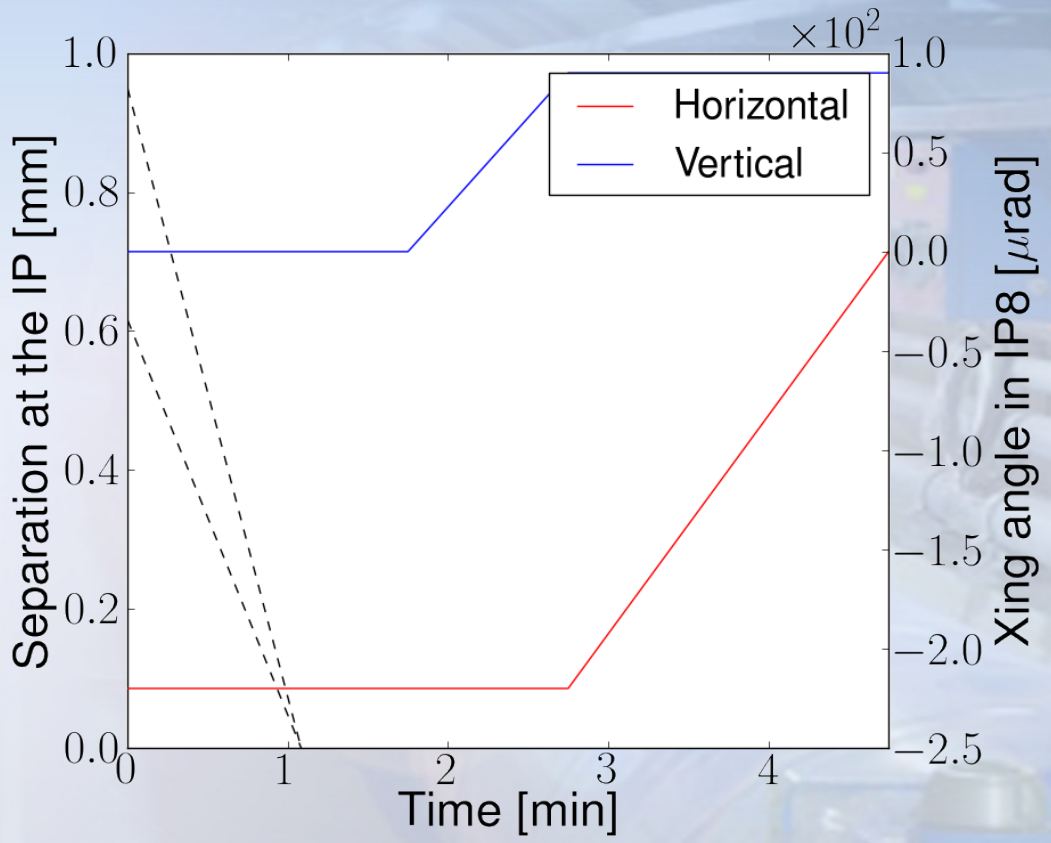




Collision beam process

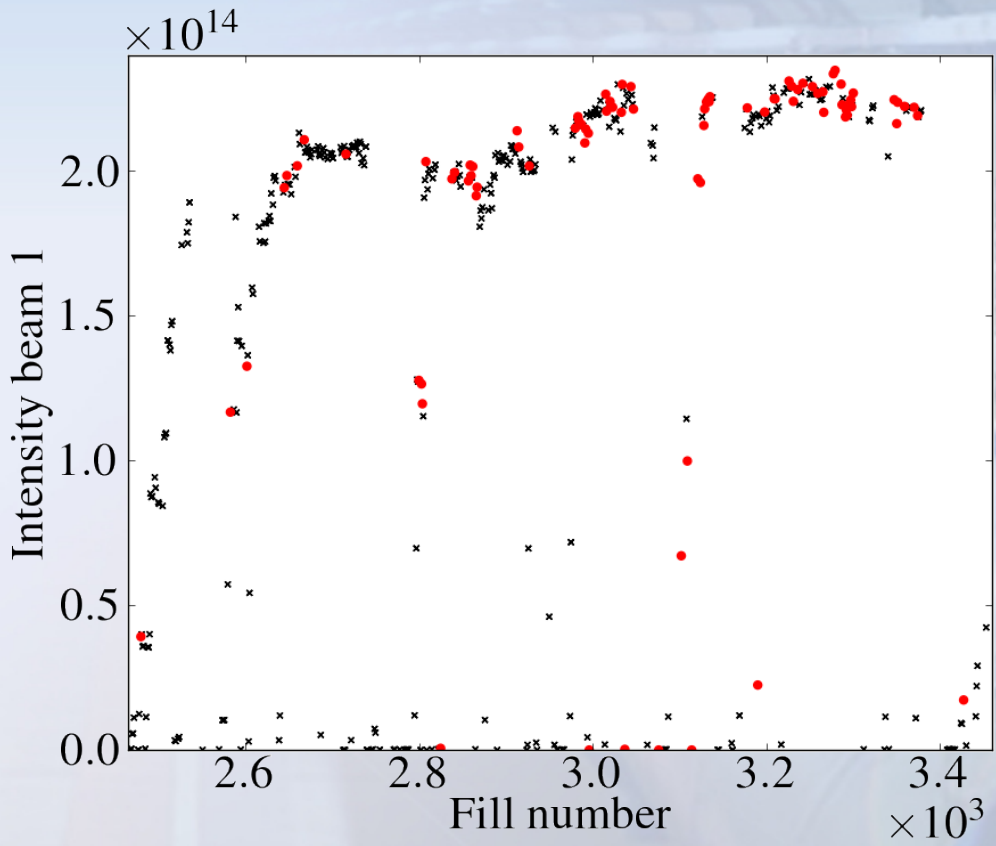
- From fill 3076 on, the collision BP was modified.

  → The collapse of the bumps in IP1 and 5 was done prior to the tilting of the Xing angle in IP8.



2012 run overview

- Criterion : BBQ activity during the collision BP

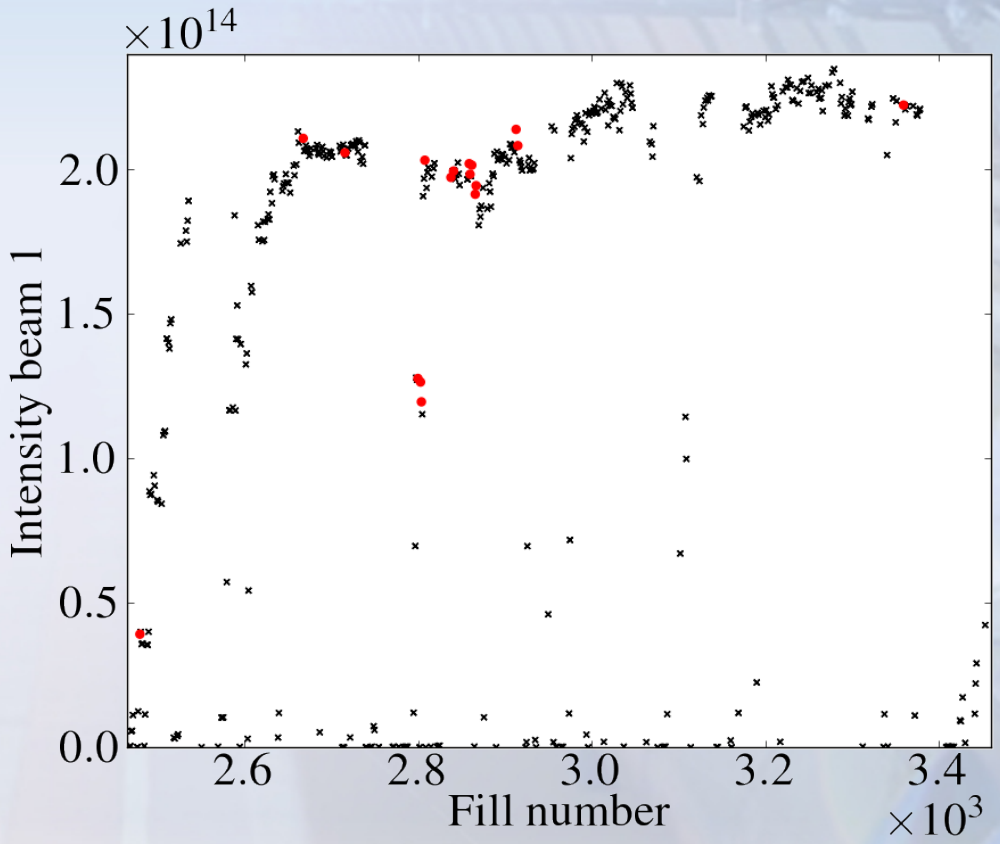


Note : Fills where BBQ data is not available / unclear are considered stable

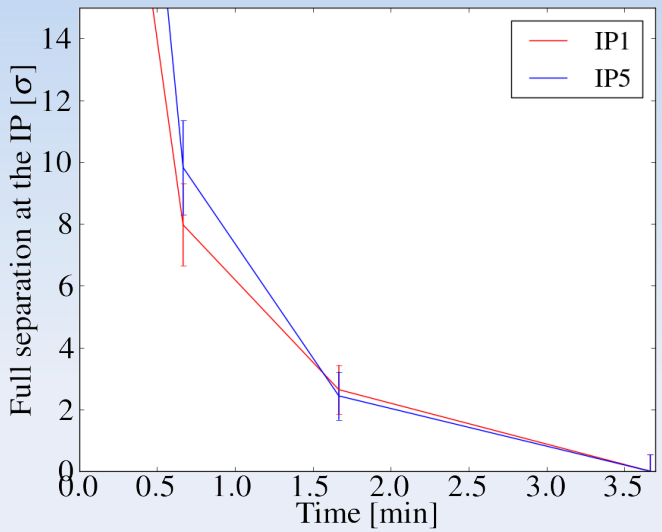
2012 run overview

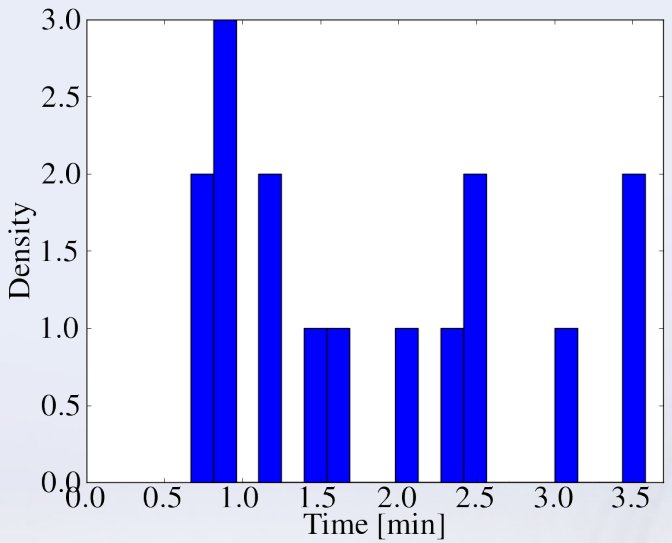
- Criterion : BBQ activity and dump during the collision BP
- Dumps only in first part of the year

  → Different type of instabilities for the two configurations

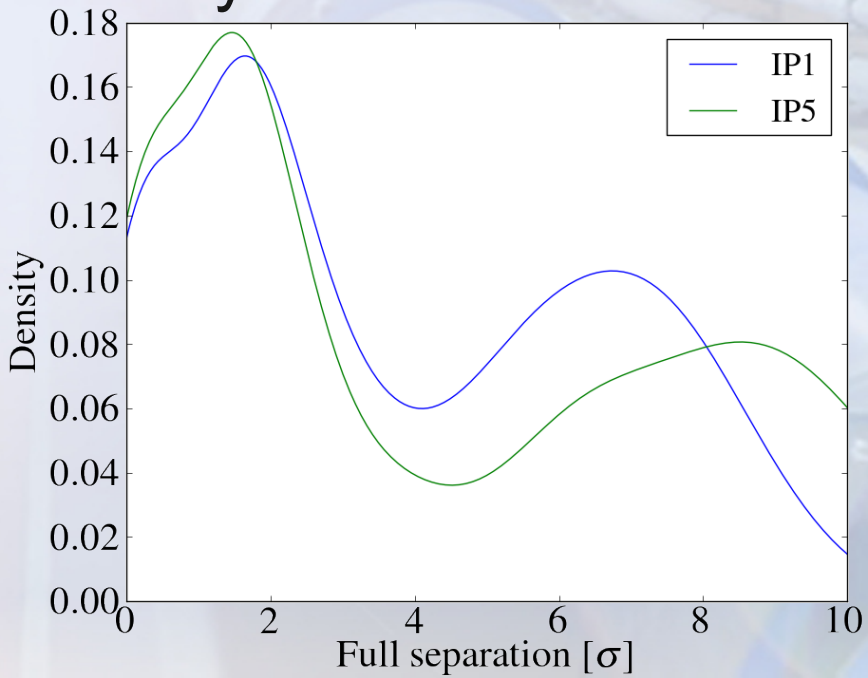


Low chromatcity negtive ocupole polarity





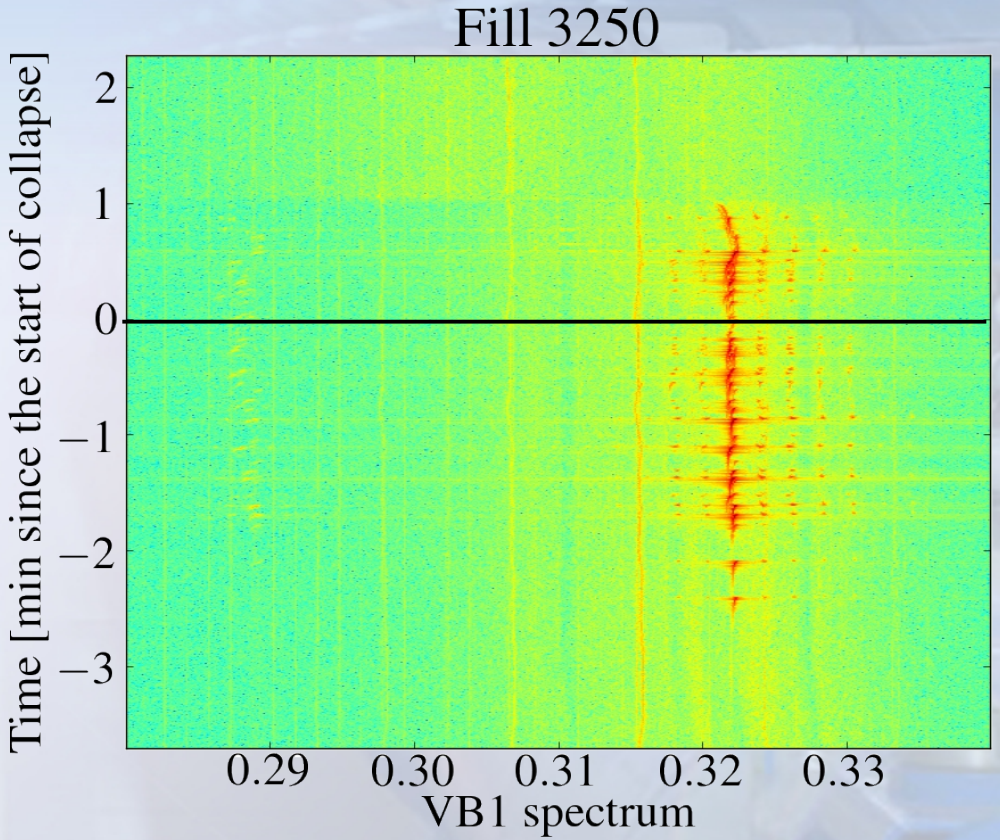
- Mostly horizontal beam 1 and beam 2
- Large uncertainty on the separation at which instability occur, mostly due to emittance variation / measurement
- Peak density around 1.6σ



High chromatcity positive ocupole polarity

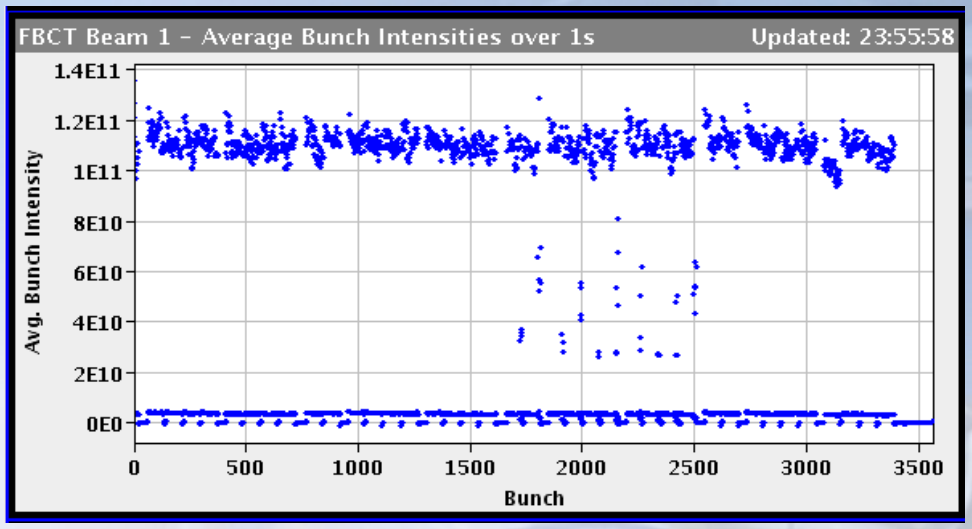
- Almost exclusively vertical beam 1
- Instabilities starts before the collapse of the separation

  → cannot say much on the instabilities in adjust due to the *end of squeeze instability*

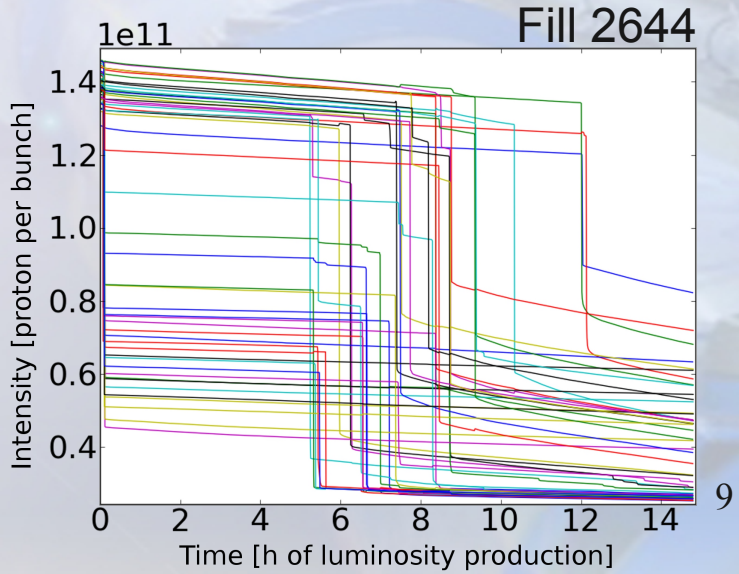


Stable beam

- Bunch intensities are falling like *snowflakes*



- Sudden drop of intensity of bunches colliding 'head on' only in IP8 (IP8 private bunches)

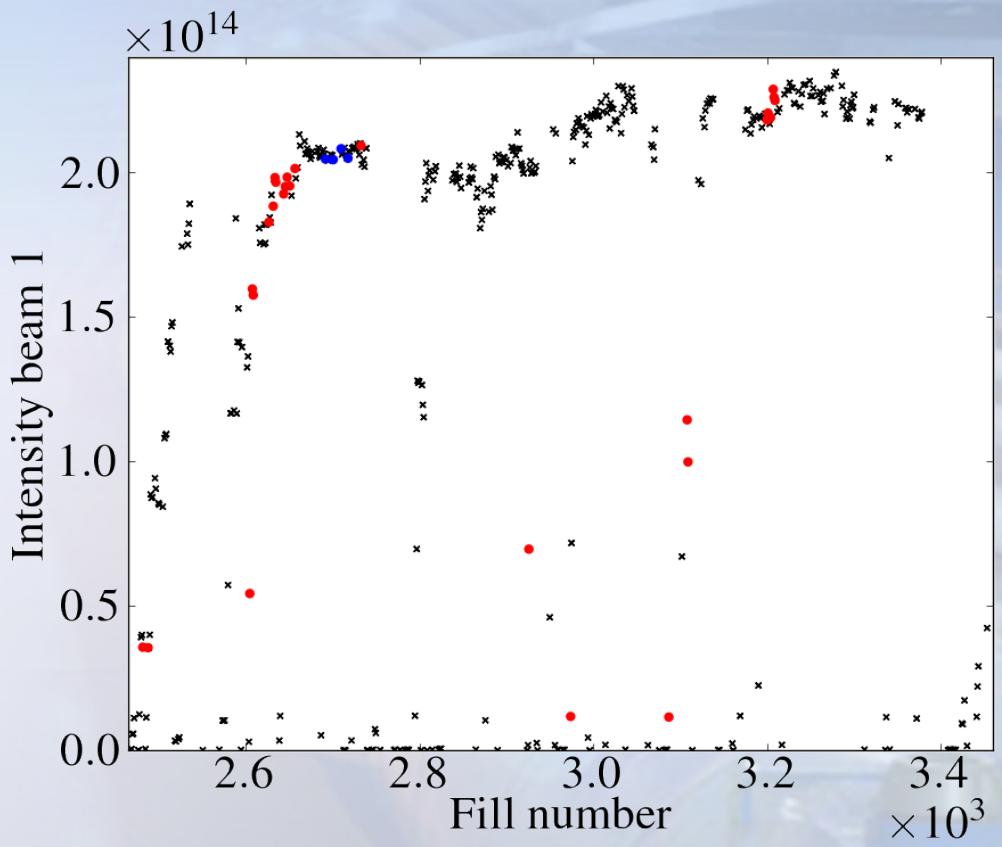


Snowflake statistics

Snowflakes were observed :

- With full physics beam
  - at the beginning of the run
  - Around fill 3200, during tests with the transverse damper

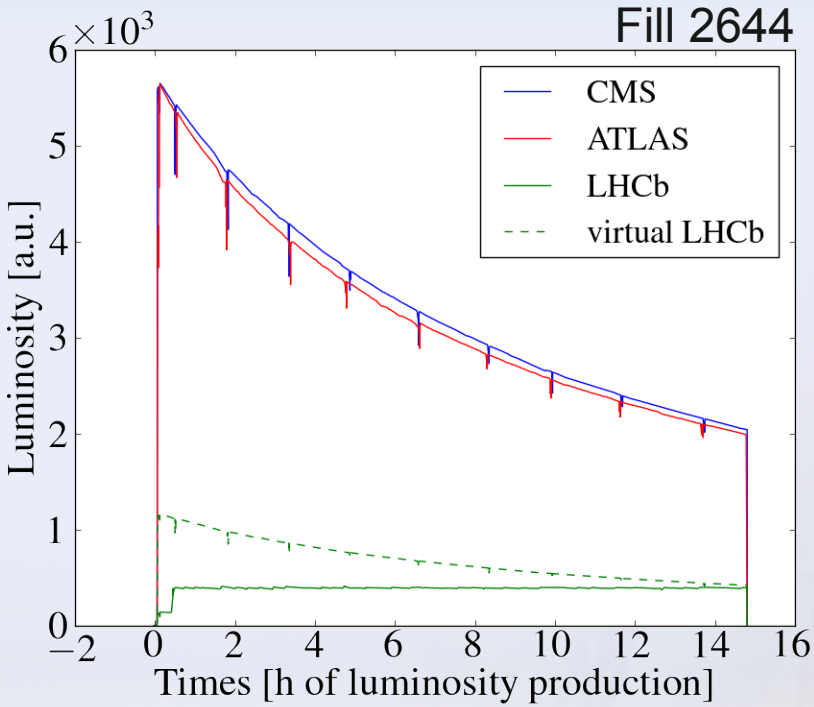
    → not considered in further analysis
- During intensity ramp up

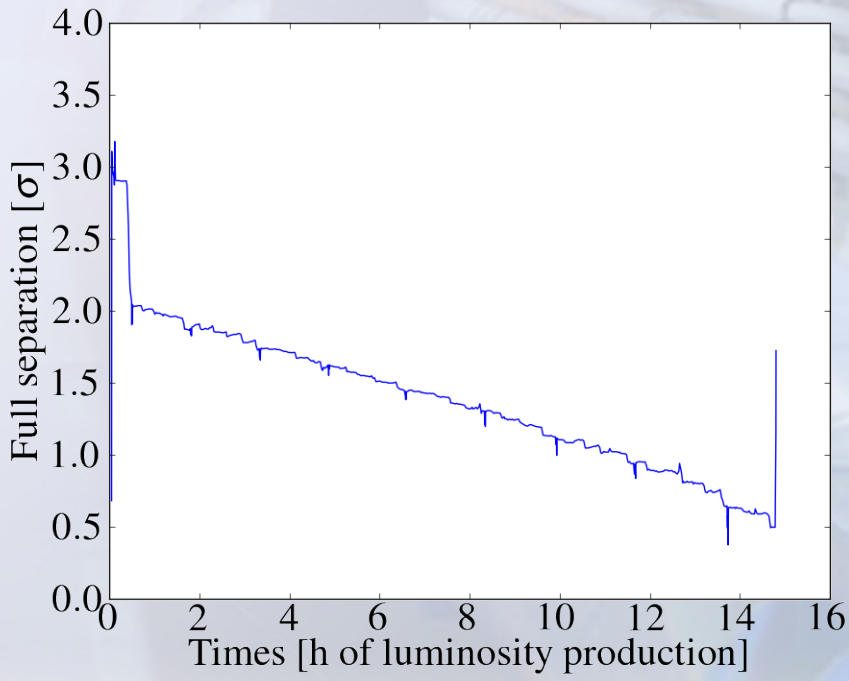


Estimation of the separation in IP8

- Separation estimated from luminosity reduction factor
- Usually leveling started around 2σ

$$Sep = \sqrt{-4 \cdot \log \frac{L}{L_0}}$$



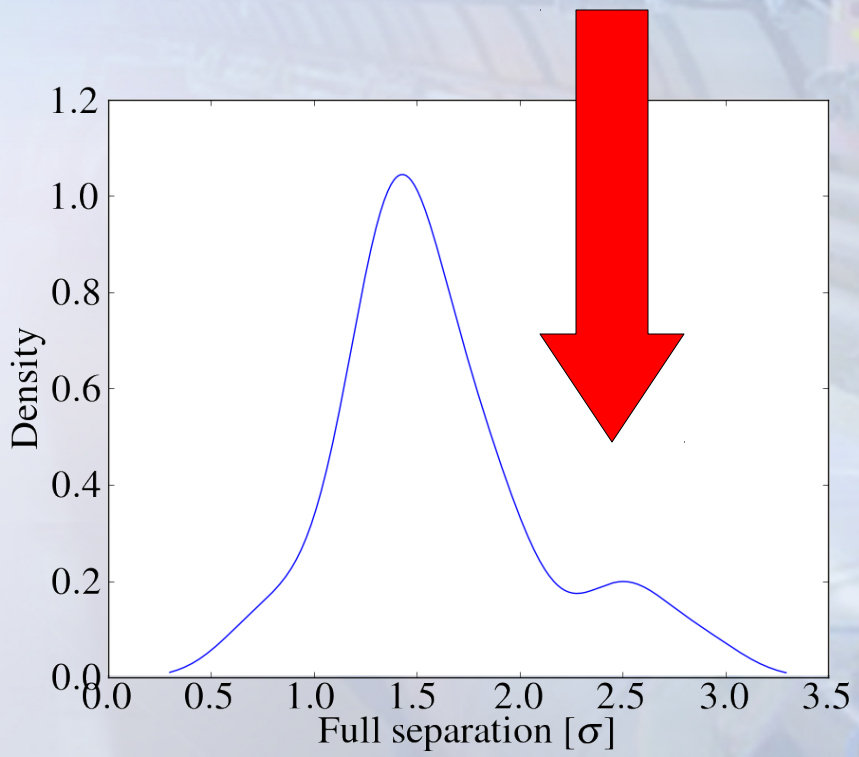


Separation statistics

- Peak density around 1.5 σ

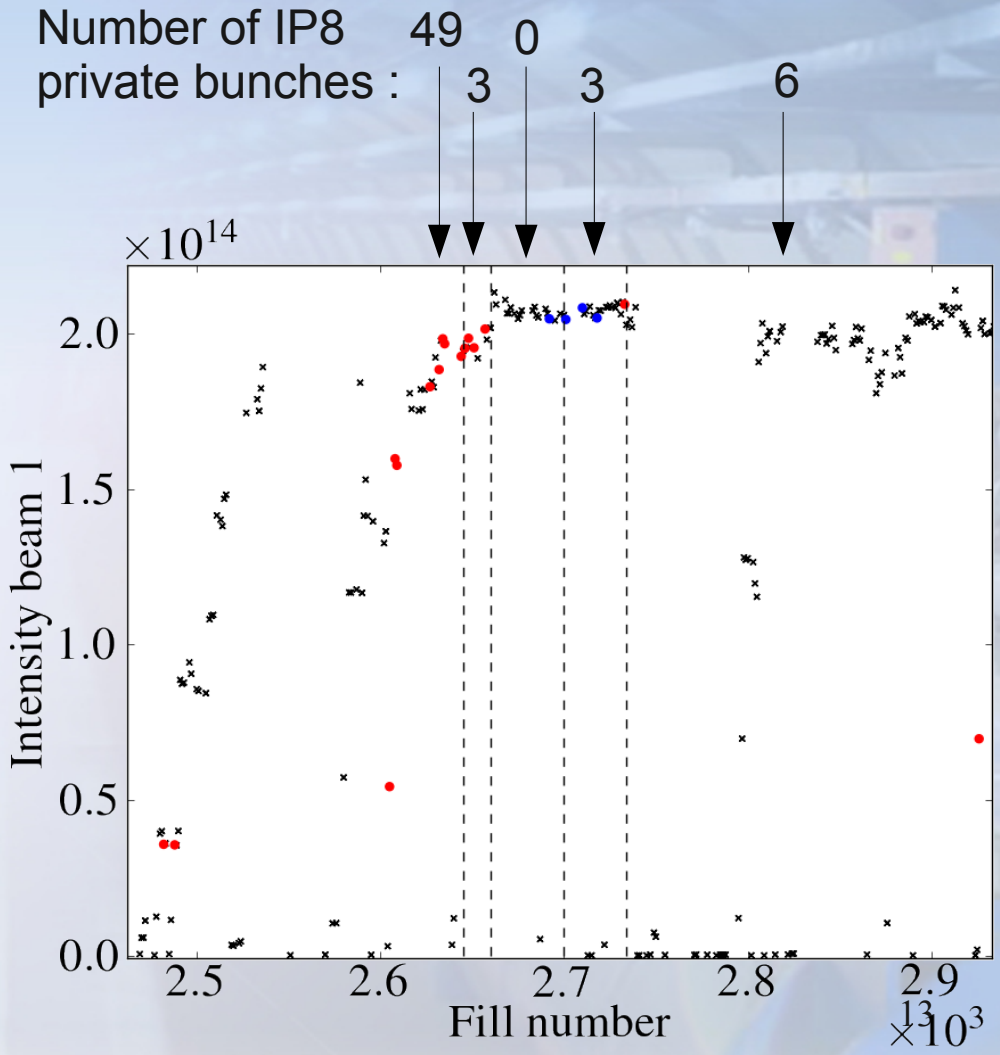
- Start of levelling

  → biased statistics



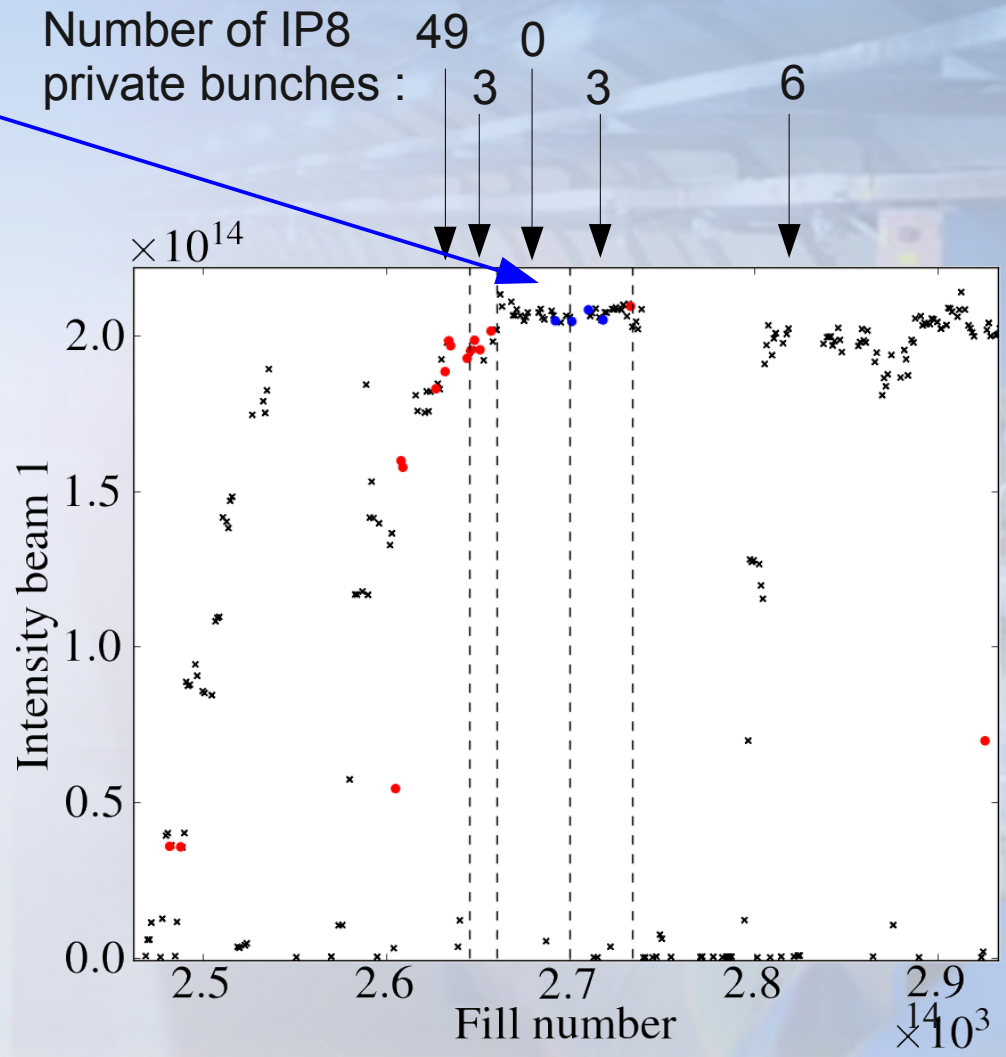
Snowflake statistics

- Snowflakes disapeared before the change to high chromaticity / positive octupole polarity
- No snowflake observed with filling scheme *50ns_1374_1368_0_1262_144b pi12inj* i.e. IP8 private bunches are in the first train of 6 → different parameters with respect to 144/72 bunch trains

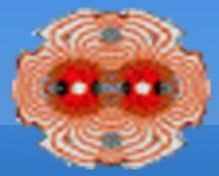


Snowflake statistics

- There are 3 party poopers, i.e. observations of unstable bunches colliding head-on in IP1 and IP5 (fill 2692,2701,2718)



To be done



- Explain party poopers
- Rise time measurement (when possible)
- Analysis of MDs (offset leveling, end of MD MD)
- Comparison with models:
  - Chromaticity variation due to offset collision
  - Stability diagrams
  - BBZ mode coupling
- ...

Backup

lumiscan statistics (Ack. J. Wenninger)