



## Update on PACMAN effects

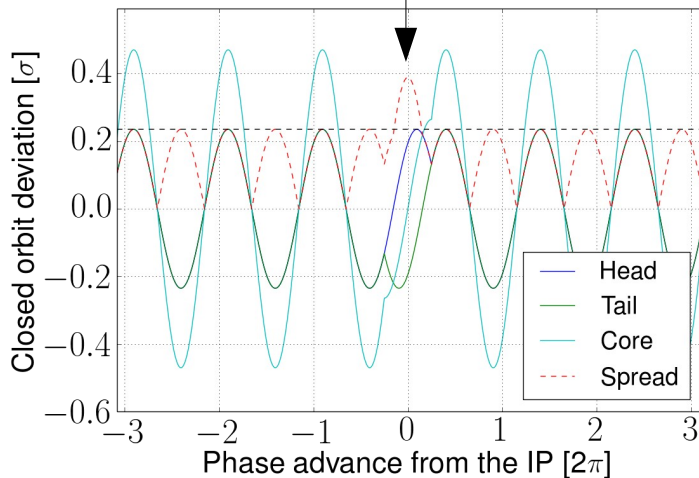
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WP2 meeting – 18.04.2017

## Orbit effects : Impact on luminosity

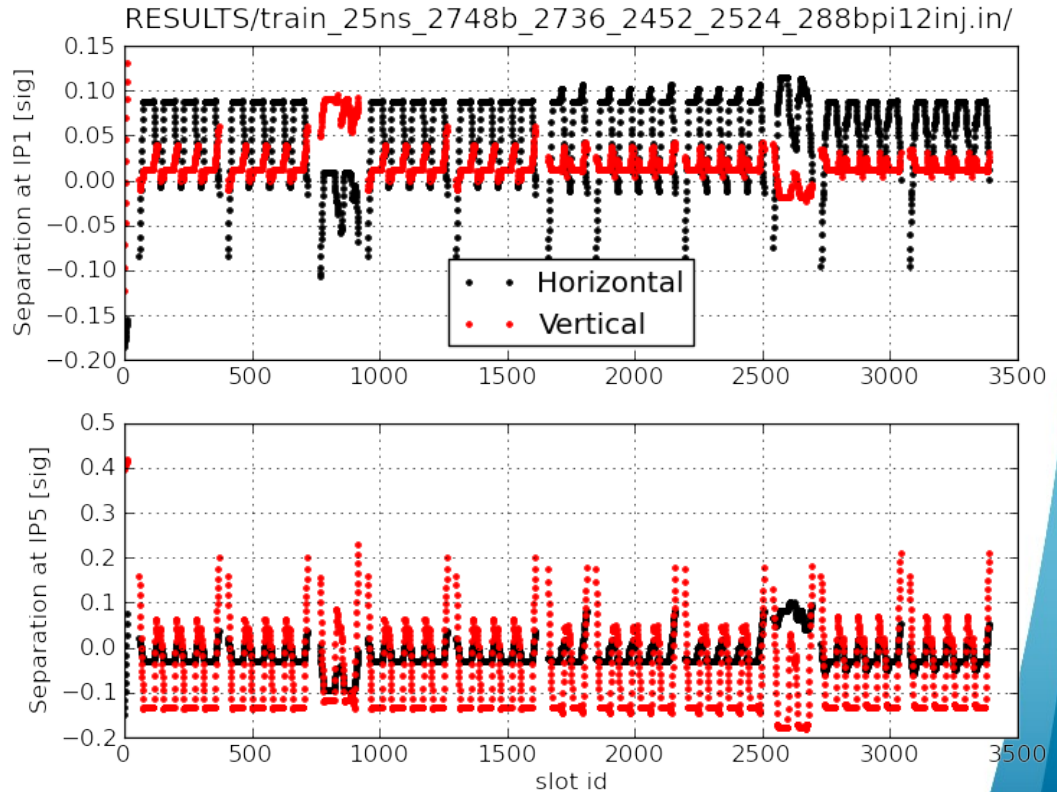
- Due to the symmetry between the two beams, the offset at the IP result in head-on collision, but the luminous region is displaced transversally with a bunch by bunch spread of  $0.4 \sigma$  ( $\rightarrow 3$  to  $5 \mu\text{m}$ )



- With the worst phase advances between IPs ( $\varphi_1=1/4+Q/2+n/2$ ,  $\varphi_2=\varphi_1+m/2$ ), this can lead to a full separation of  $0.4 \sigma$  between the beams in other IPs  $\rightarrow$  4 % reduction of the luminosity of PACMAN bunches  $\rightarrow$   $\sim 0.6$  % reduction of the total luminosity
- If needed it could be mitigated with equal phase advances between IPs in the two beams respectively
- The maximum orbit spread is proportional to  $1/d$ , with  $d$  the normalised separation at the LRs
  - 3m and 250  $\mu\text{rad}$  in IP8  $\rightarrow 0.10 \sigma$
  - 10m and 170  $\mu\text{rad}$  in IP2  $\rightarrow 0.08 \sigma$

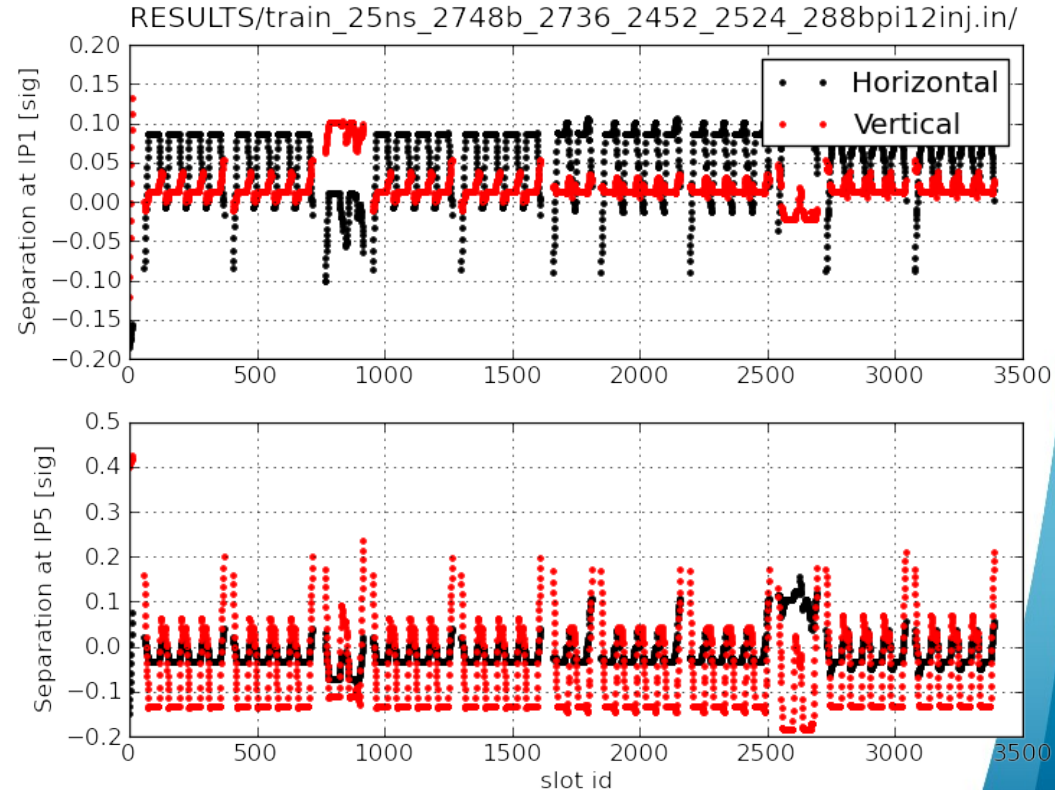
## Self-consistent computations, IPs 2 and 8

- Long-ranges in IP8 result in separations in the horizontal plane  $\sim 0.10 \sigma$   
→ Close to the worst phase advance wrt the main IPs
- Long-ranges in IP2 result in separations in the vertical planes well below  $0.08 \sigma$



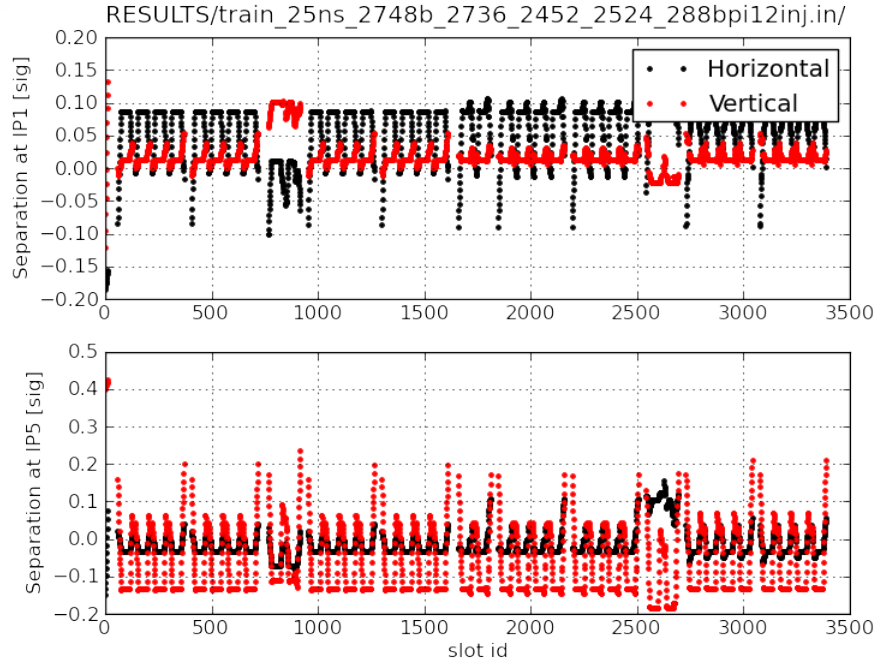
## Self-consistent computations, offset levelling in IPs 2 and 8

- The separation in IPs 1 and 5 due to the levelling with an offset in IPs 2 and 8 is negligible even at the maximum of the coherent kick, due to a favourable phase advance

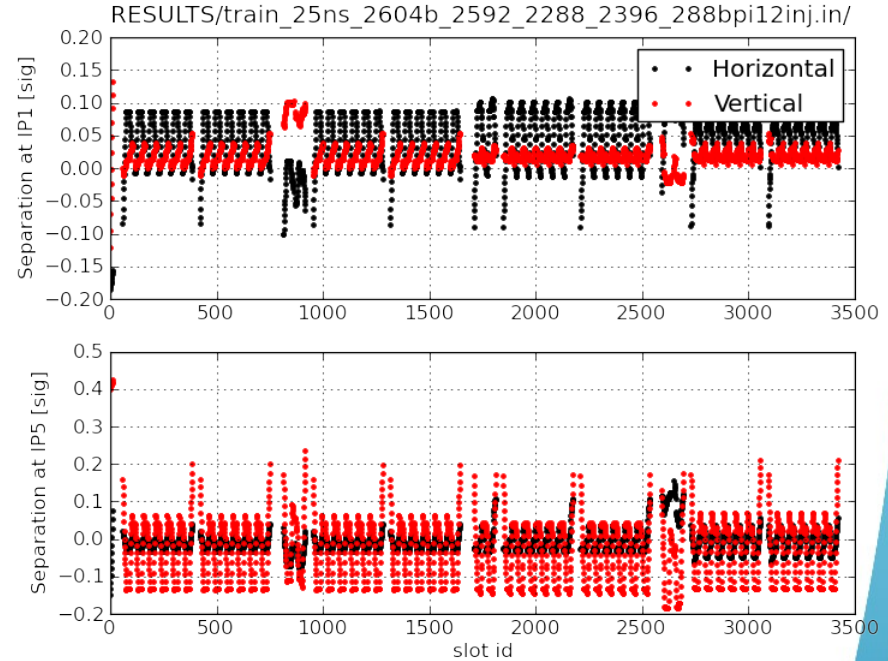


# Filling schemes - BCMS

## Nominal



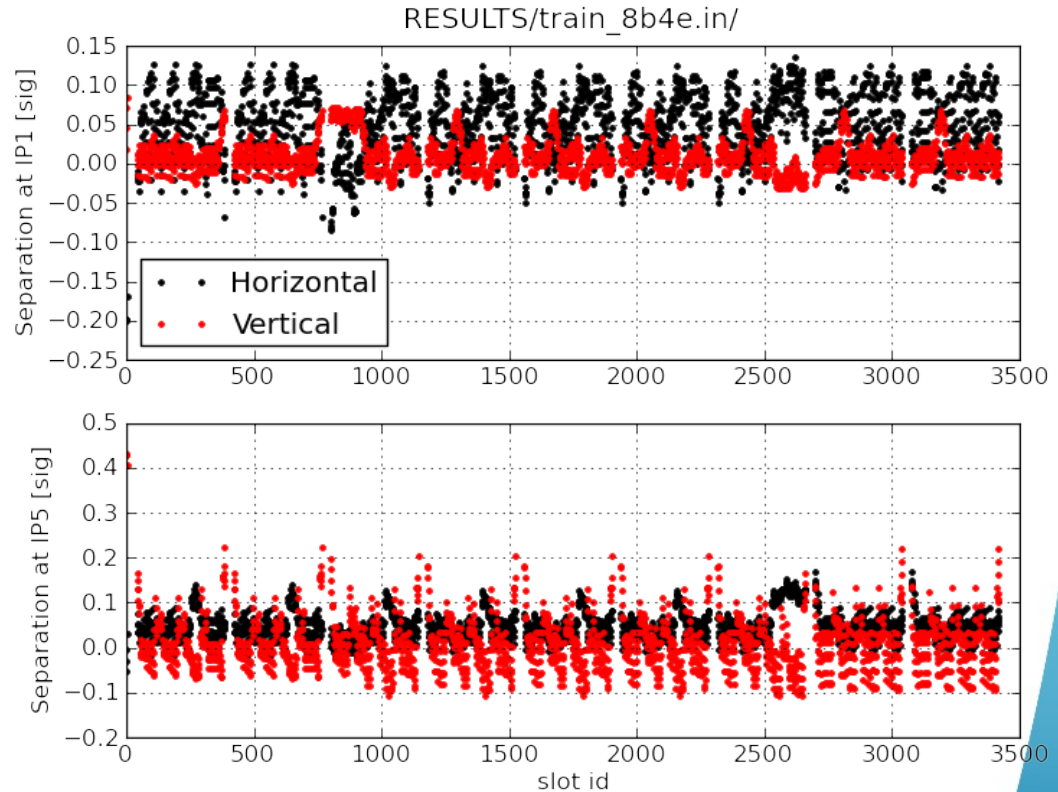
## BCMS



- Maximum orbit shifts are identical with the BCMS beams, but the number of PACMAN bunches is higher → slightly higher impact on luminosity

## Filling schemes - 8b4e

- All bunches are PACMAN bunches
  - Similar bunch by bunch spread due the higher intensity
  - Higher impact on luminosity
- Exact impact to be evaluated including the orbit optimisation, nevertheless the order of magnitude will remain  $\sim 1\%$



## Flat optics – 10/40cm

- The orbit effect is defined by the separation in the crossing plane → With a flat optics the effect is reduced by 14 % due to the larger normalised separation

