β* leveling MDs

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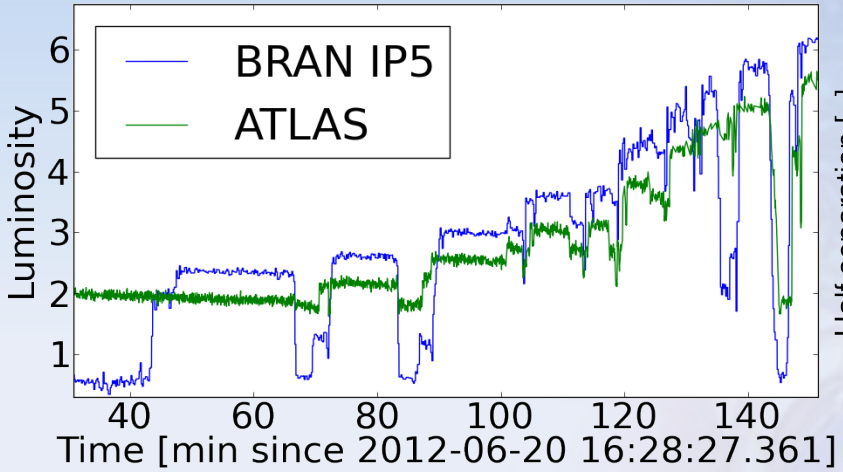
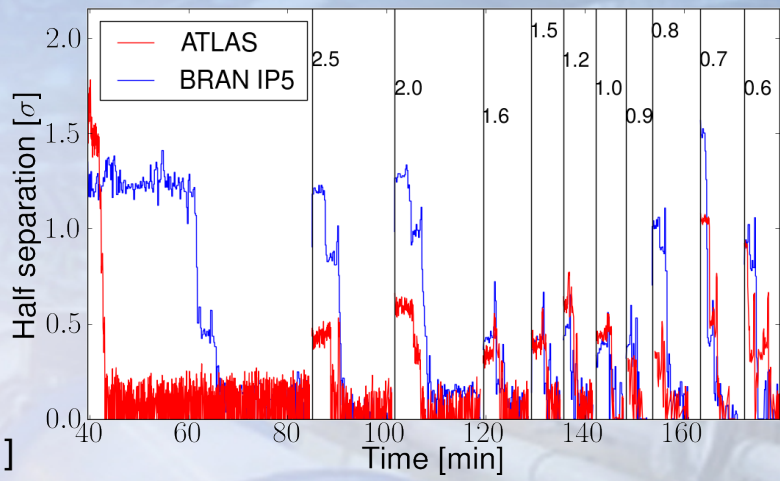
- Motivations :
  - Large pile up → Luminosity leveling
  - Octupole and transverse damper not sufficient to stabilize the beam → Profit from large tune spread from head-on beam-beam interaction
- Challenges :
  - The position of the beams at the IPs have to be controlled to ~1σ while changing the optics

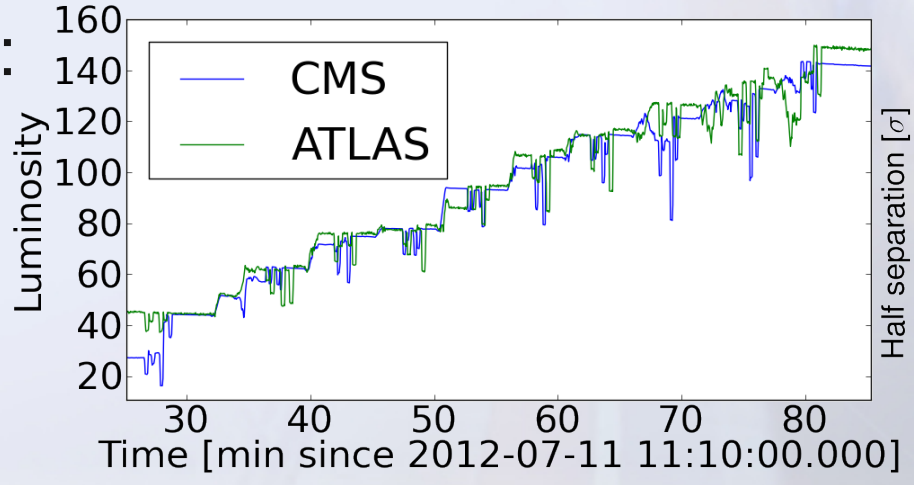
Results of MD2 and floating MD

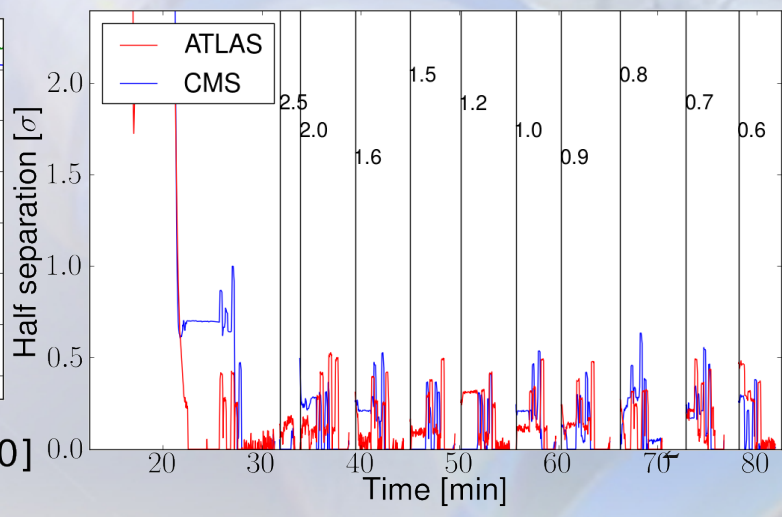
- First run :
  - One bunch
  - Lumi scan at each step
  - Feed forward correction





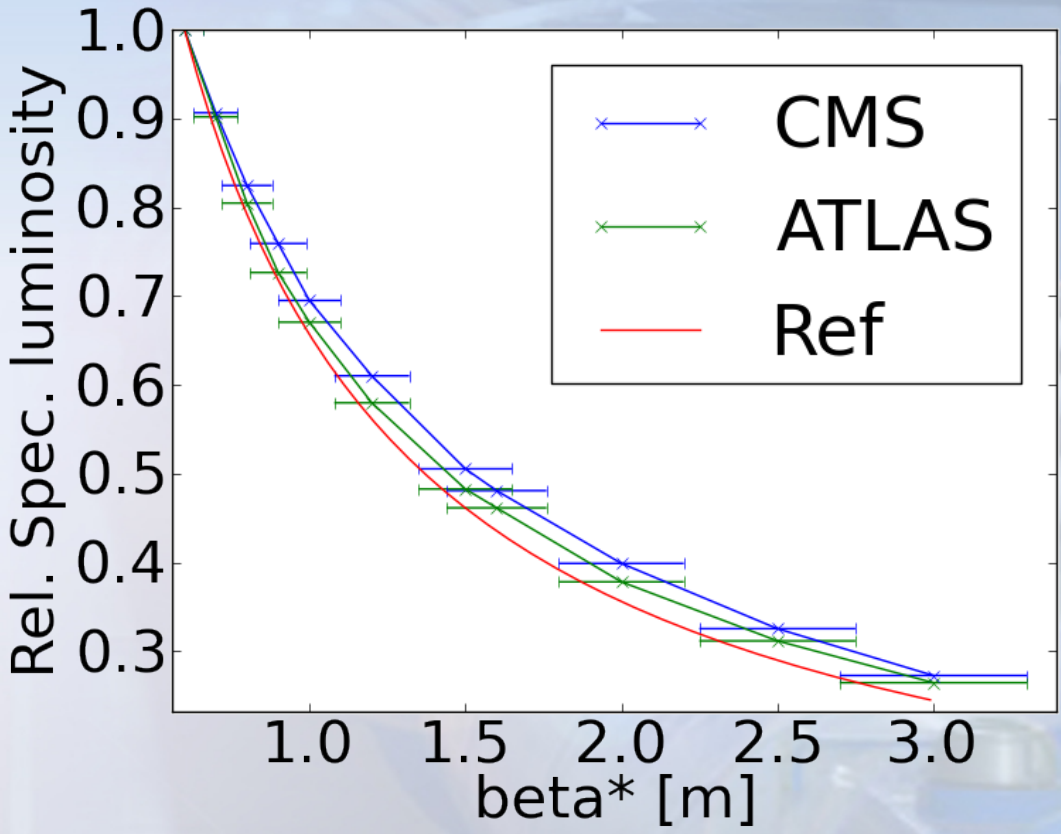
- Third run :
  - One train
  - Almost no correction required



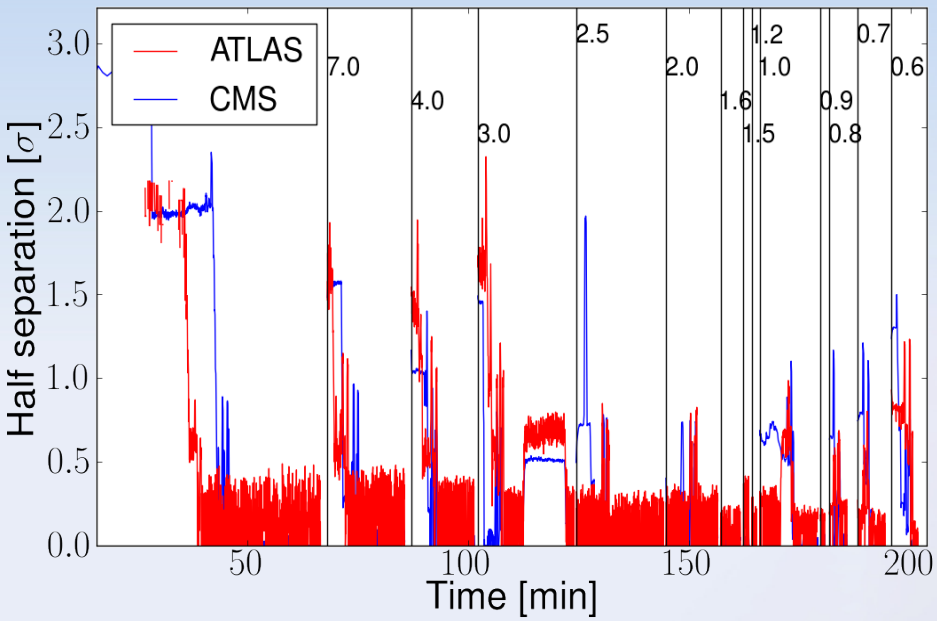


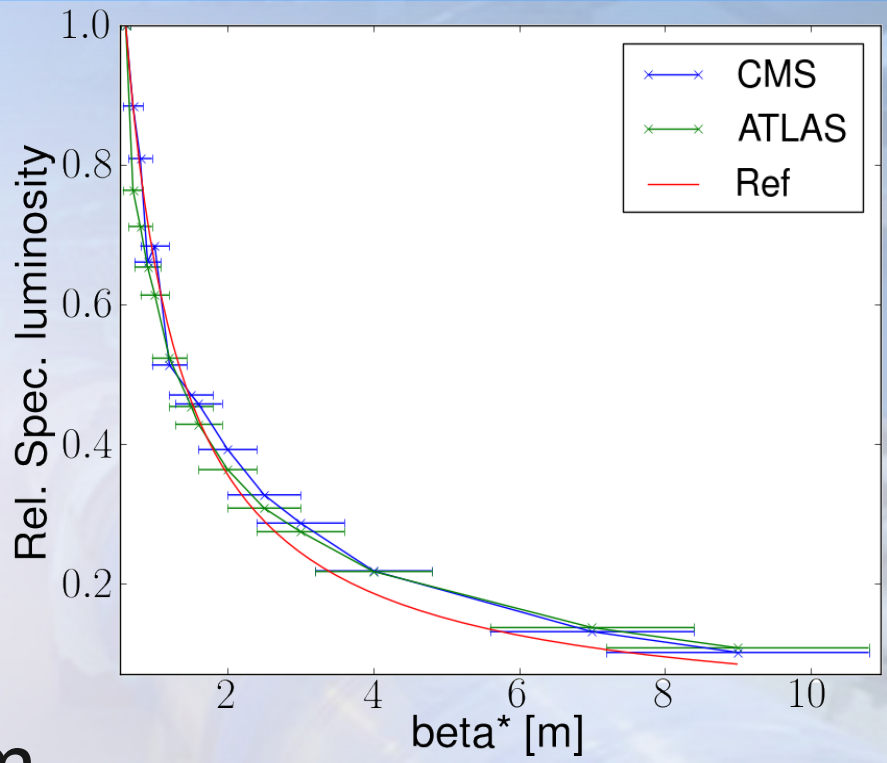
Results of MD2 and floating MD

- Luminosity reduction with β* follows expectation
  - 10% β beat assumed



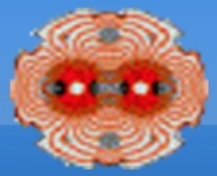
Results of MD3





- Start from 9m instead of 3m
  - Offset up to 2sigma at the IP
  - A bit worse than the very first MD, most likely due to longer squeeze step at the beginning of the squeeze

Conclusion



- No show stopper for β* leveling in the LHC
- Good control of the orbit required
  - Good correction of the global orbit during commissioning
  - Feed forward lumiscan knobs
- Operational details needs to be worked out
  - Orbit feedback
  - Beam modes (stable beam ?)
  - Flexibility (Different β* for the different IPs)