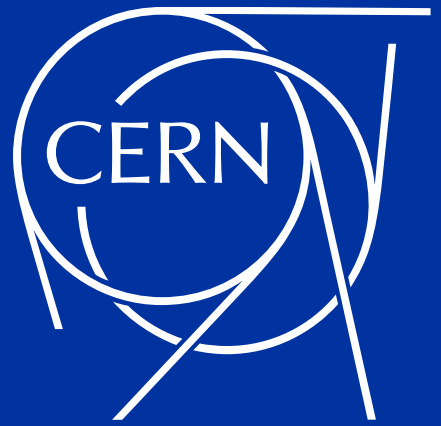


MD10703: Ions BB limit varying the crossing angles

G. Sterbini, R. Bruce, S. Kostoglou, M. Hostettler

https://indico.cern.ch/event/1335055/

MD10703: Ions BB limit varying the crossing angles→ 8 h (not including the validation time)

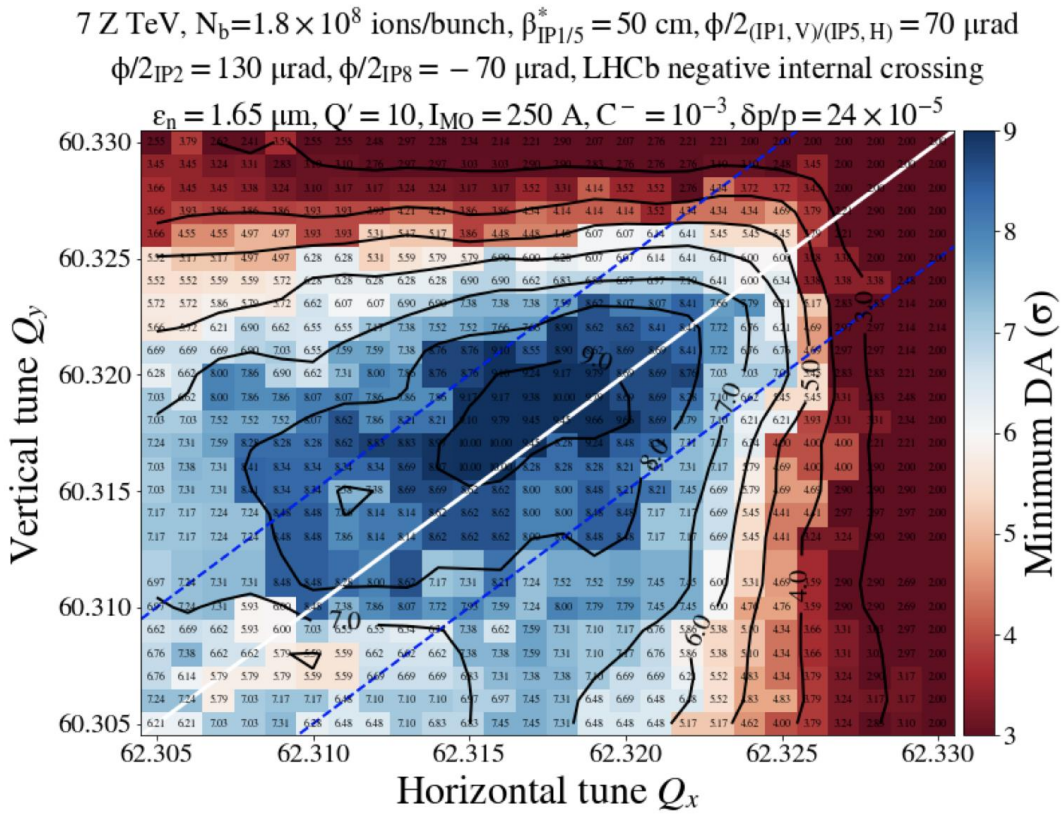
As for protons, there is an interest in reduce the crossing angle of the ions (in IP1/2/5/8). Simulations show significant margin if we adopt the proton metric (DA>6 sigma) but the DA/MD benchmarking with ions is limited. More on https://indico.cern.ch/event/1078695.

MD benefits:

1. Potential performance gain (θ_X and $\beta*$ reduction)
2. Simulation benchmarking for ions studies

We request a 8 h (+2 h for validation if needed) MD to make one θ_X-scan in IP1/2/5/8 with β*=50/50/50/150 cm

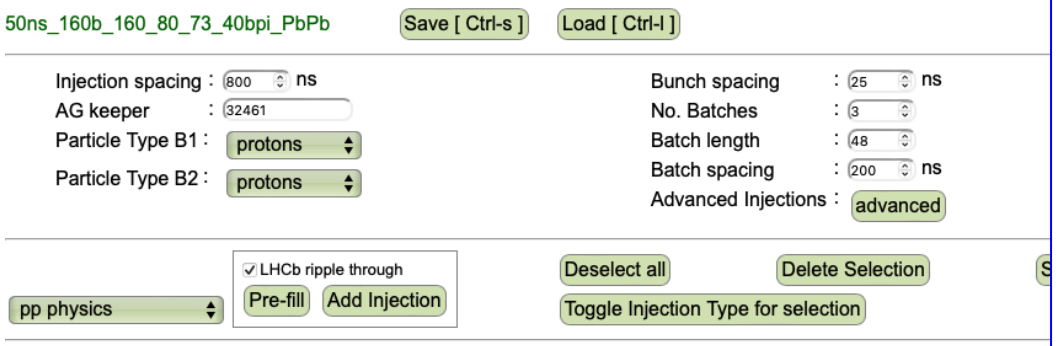
Ions DA simulations with reduced θ_X



Courtesy of S. Kostoglou

Filling scheme proposal

- **5 x 8b per batch, 4 batches per beam, 320b in total (detail here).**
- **Bunches with nominal parameters (emittance/intensity).**

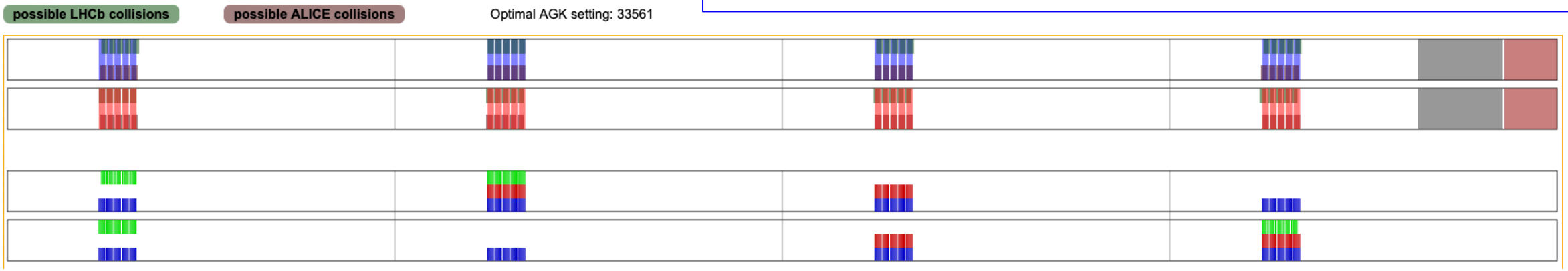


Beam Info	
Bunches B1/B2	160 / 160
Injections B1/B2	4 / 4

Collisions	
ATLAS/CMS	160
ALICE	80 (50.0%)
LHCb	73 (45.6%)
Non Colliding B1	0
Non Colliding B2	0

B1 classes : 0:0 1:47 2:0 3:40 4:0 5:33 6:0 7:40

B2 classes : 0:0 1:40 2:0 3:47 4:0 5:40 6:0 7:33



Courtesy of M. Rufolo

MD steps (I)

From LMC 471, machine nominal IP configurations is

	IP1	IP2	IP5	IP8
β^* (m)	0.5	0.5	0.5	1.5
crossing plane	V	V	H	H
spectrometer half crossing (μrad)	0	$\mp$72	0	-139
external half crossing (μrad)	170	$\pm$170	170	-135
net half crossing (μrad)	170	$\pm$ 98	170	-274
spectrometer polarity	-	pos/neg	-	pos

- STEP 1: Go to collisions with a fully nominal configuration.
- STEP 2: Once in collisions, optimized and in a stable situation, load (discrete) limits for the TCTs that are open to allow crossing angle reductions.
- STEP 3: We reduce with 5/10 urad steps the IP1/5, IP2 and IP8 crossing angles using the orchestration tools (tested during the night of 21-22 Sept, F9177). If losses occurs → optimize the tunes
  - The target is to explore down to 50-70 urad external crossing angle

This implies to potentially reaching down to ~200 urad in IP8 (could potentially go significantly lower), 70 urad in IP1/5 and even towards 0 in IP2. If we observe parasitic collisions before detrimental effects from beam-beam, it is also an important input.

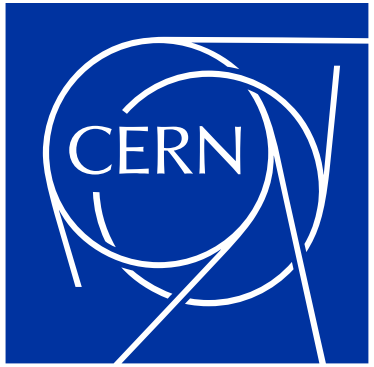
MD steps (II)

Step 3 will be iterated 5-7 times.

As main online observable we consider the bbb lifetime. Offline analysis will consider also effective cross-section (using bbb lumiinosity, FBCT or dBLM).
If very detrimental effects are observed on the beam, stop the scan.

- STEP 4: End the cycle with an emittance scan.
- STEP 5: Dump.

Thank you for your attention.



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