

ULTIMATE LHC BEAM

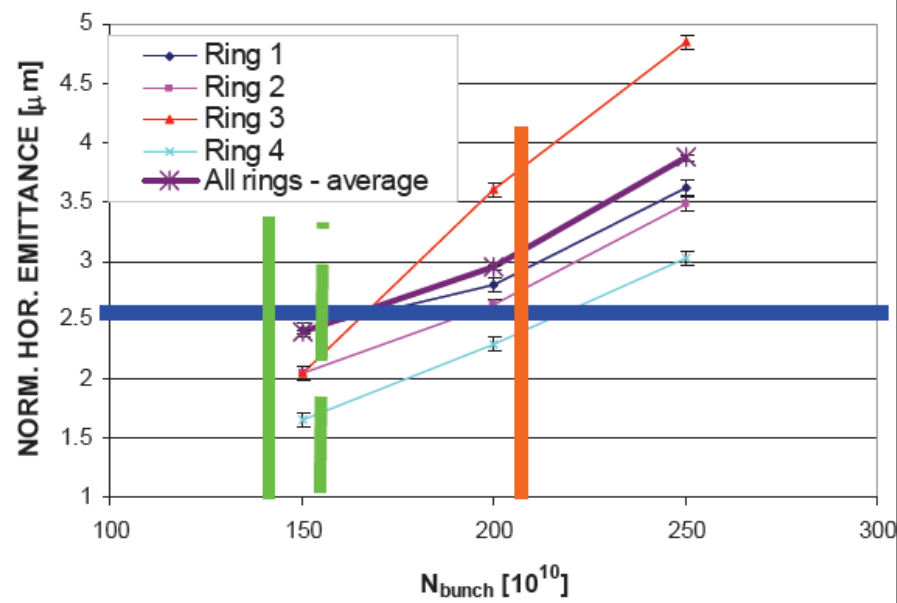
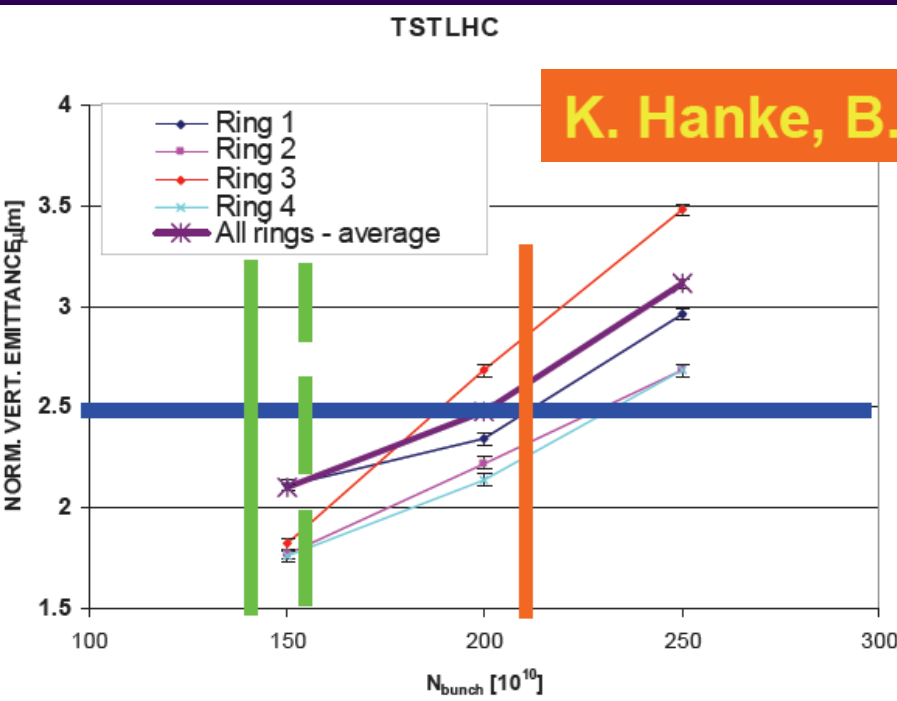
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⇒ **Follow-up of the BEAM'07 workshop:**

- ◆ **Is LINAC4 needed to produce the ultimate LHC beam?**
- ◆ **What is the best strategy for the transverse emittance control along the accelerators?**

PSB limitations (1/3)

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- ◆ 250×10^{10} p/b in the PSB $\Leftrightarrow \sim 2.1 \times 10^{11}$ p/b in the LHC if no beam losses
- ◆ 250×10^{10} p/b in the PSB $\Leftrightarrow 1.7 \times 10^{11}$ p/b (i.e. ultimate bunch) in the LHC if 20% of beam losses are assumed in the downstream accelerators
- ◆ 250×10^{10} p/b in the PSB $\Rightarrow \epsilon_x^* + \epsilon_y^* = 7 \mu\text{m}$ (which is the limit at SPS extraction)

PSB limitations (2/3)

◆ Sources of emittance blow-up?

- The (relative) emittance blow-up due to mis-steering and dispersion mismatch is inversely proportional to the initial emittance \Rightarrow Better if larger emittances
- For the space-charge induced losses on the PS injection flat-bottom \Rightarrow Better if larger emittances
- For the ecloud instability at SPS injection \Rightarrow Better if larger emittances (from simulations \Rightarrow To be verified experimentally)
- ...

PSB limitations (3/3)

- ◆ An advantage of LINAC4 should be to produce the same beam as now in the PS but in one batch from the PSB instead of two
- ◆ Using the 48 bunch scheme (instead of the 72)
 - Only 1 batch from the PSB instead of 2
 - Reduced LHC filling scheme
 - ...
 - 8% reduction of the (instantaneous) luminosity (for constant intensity / bunch)