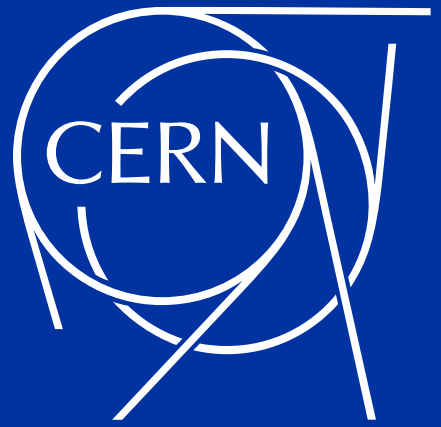


Beam-beam wire compensation (MD8043)

G. Sterbini with thanks to Michi and Daniele

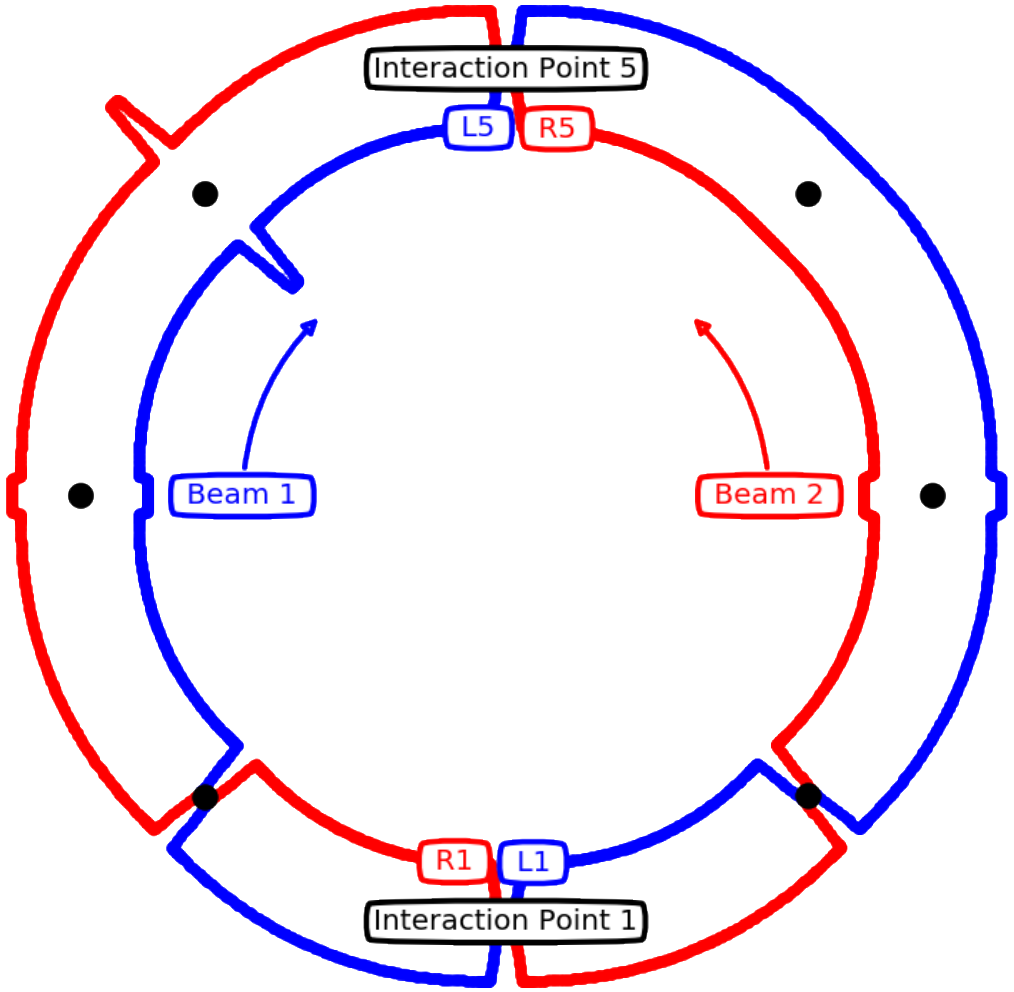
28 October 2022

Beam-beam wire compensation (MD#8043+MD#7983)

Participants (preliminary): M. Giovannozzi, G. Sterbini, P. D. Hermes, S. Kostoglou, A. Poyet, C. E. Montanari, P. Belanger

- 4 wire compensator demonstrators installed in LHC (2 per beams) BUT only B2 wires (R5 and R1) will be used in the MD .

- Since 2022 run (thanks to BI, collimation team, MPP, OP, STI, and many other colleagues) the beam-beam wire demonstrators are used during LHC standard operation at the end of the cycle for b*=30 cm and half crossing angle of 160 urad.



Description (**8 h slot,** UPS Noise MD)

First part (~5 h)

- The MD should be performed at 6.8 TeV with colliding beams in IP1/5 at beta*=30 cm with ~150 bunches/beam (1 INDIV + 12b + 3x48b per beam (1.4e11ppb on the 48b trains), trains colliding only in IP1/5).

- The MD will start with crossing angle of 160 urad and nominal settings (collimation, chroma, octupoles,...). A Q-optimization will be performed for both beams. In case of visible BB induced losses, the wires will be switched ON (using the operational knobs/applications) at maximum current (350 A).

- A Q-optimization with wires ON will be performed and will be followed by wire current scan, reducing the current from 350 A to 140 A in -20% steps (3 steps, all wires together). Two ON/OFF wire current cycle will be performed with the wire optimal current.

- The same wire current scan will be repeated at reduced crossing angle (e.g. 150, 140 and 130 urad). From OP side the orchestration of the crossing angle is ready.

- **After the 150 urad step perform the noise measurements.**

Description (**8 h slot requested**)

Second part (~3 h)

- During the second phase of the MD (reduce crossing angle and reduced bunch intensity), the main goal is to collect experimental data for establishing the diffusion rate at different transverse amplitudes and the beneficial effect of the wire compensation.
- Controlling the initial tails density of the beam transverse profiles is crucial, and to this aim, **transverse scraping (see PRAB 23 044802)** is needed before each scan (priority will be given on B1, both planes).
- The scraping target (up to 1.5 σ to be scraped) will be adjusted depending on the observed losses and the margin on the BLM threshold.
- Three ON/OFF scans will be performed. If time allows, octupole scans when the wire is ON will be performed. For each machine condition scan. (e.g. wire current trims, crossing angle reduction), a steady state of minimum 10 minutes is needed.
- Normalized losses signals, FBCT, bbb luminosity from ATLAS and CMS, BSRT measurements, calibrated loss signals are needed. Coronagraph measurements could be done in parallel during the second part, tail scraping (no BSRT measurement during coronagraph acquisition).

Bump information at TCT/TCL

The `tctp**v**.4l[r]**1**.b1[2]:1` center is moving from
y@160urad = -0.001587 m to y@130urad = -0.001289 m that is
y@130urad-y@160urad = 0.000298 m **≈ 300 um**.

The `tctp**h**.4l[r]**5**.b1[2]:1` center is moving from
x@160urad = -0.002096 m to x@130urad = -0.001703 m that is
x@130urad-x@160urad = 0.000393 m **≈ 393 um**

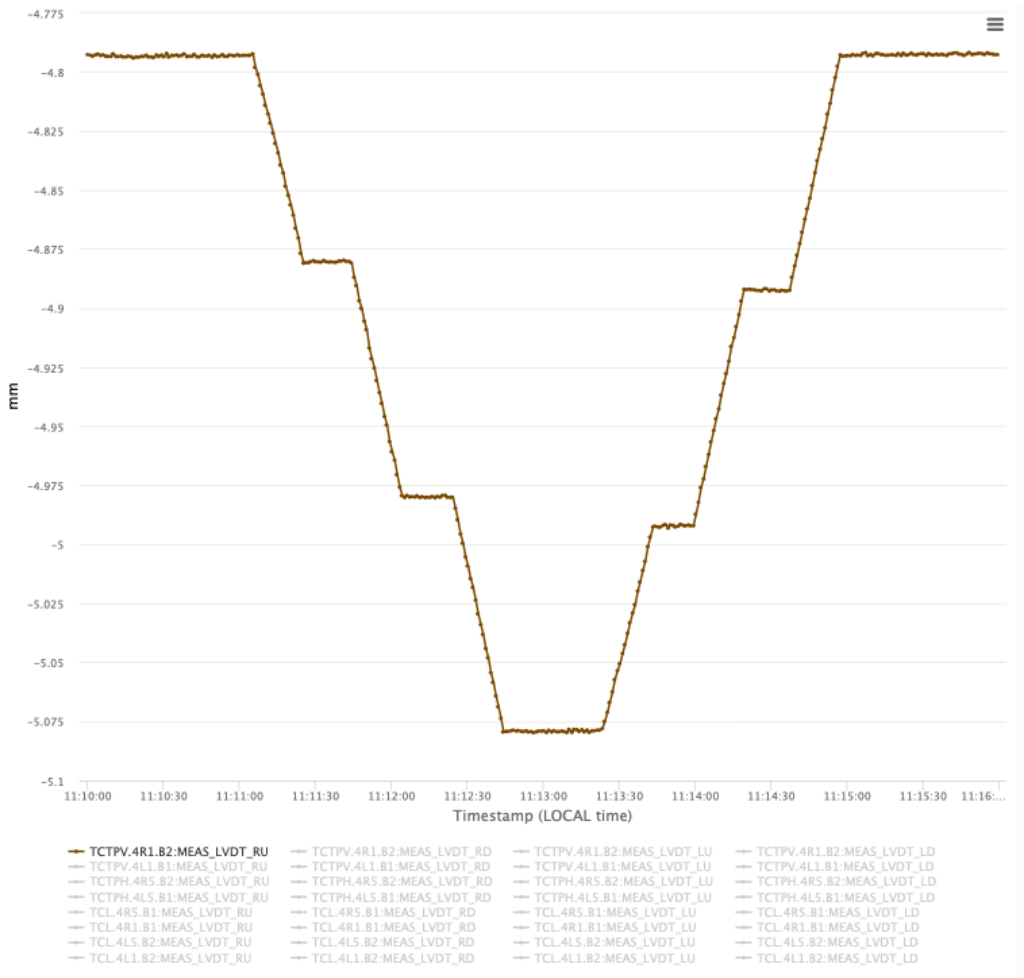
(The `tcl.4r[l]**1**.b1[2]:1` center is moving from
y@160urad = 0.002032 m to y@130urad = 0.001651 m that is
y@130urad-y@160urad = -0.000381 m **≈ -380 um**)

The `tcl.4r[l]**5**.b1[2]:1` center is moving from
x@160urad = 0.001341 m to x@130urad = 0.001089 m that is
x@130urad-x@160urad = -0.000252 m **≈ -250 um**

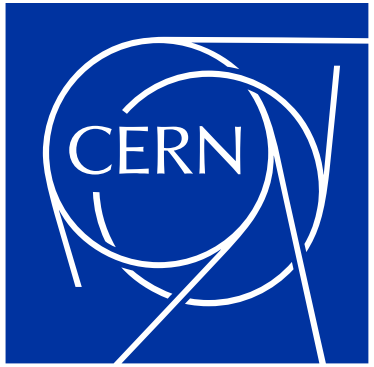
Test done by Michi w/o beam (morning 26 Oct)

https://timber.cern.ch/query?tab=Visualization&configuration=46084&autoLoad=true

Test done by Michi w/o beam (morning 26 Oct)



Test done by Michi w/o beam (morning 26 Oct)



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