

β^* levelling MD 40-30cm

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- In the past (2012 and 2015) β^* levelling was tried out on the standard squeeze.
 - Setup a standard squeeze with collisions all along.
 - Replay, stepping from one matched point to the other, hoping to maintain beams in collision with a mixture of good machine reproducibility and OFB tricks.
- A valuable outcome of those tests: our current flexible system to generate references orbits for the FB.
 - Based on base orbit + bumps, automatically generated from the settings.
- The current MD has two short term and one long term goal.
 - 1: try out for the first time β^* levelling with telescopic optics.
 - 2: prepare settings for an MD (~MD4) that will put in place a new revolutionary levelling technique (controls perspective).
 - 3: prepare for possible β^* levelling during routine operation in 2018.



- During a telescopic squeeze step, the nominal optics has no settings changes in IR1 and IR5.
 - On paper there is nothing to change in those IRs, only the betatron functions and phase change.
 - Levelling in IR1 and IR5 could be **much simpler** than for a classical squeeze.
- On the other hand the situation is much more delicate in IR2 and IR8 that are levelled by separation.
 - The IP tolerances on separation are $\sim 1 \mu\text{m}$ and we have no way to control it directly with that accuracy. We can only hope that the OFB does a reasonable job.
- Both MD3 and MD4 should provides answers on the feasibility and on issues with telescopic β^* levelling.



- First MD steps:
 - Run through the nominal cycle to collisions with 3 bunches per beam.
 - Step through the squeeze to 30 cm (37, 33, 30) trying to maintain the beams in collision. Re-optimize at each step. Incorporate all settings for replay.
 - Replay if time permits, possibly even testing new β^* levelling SW – tbc.
- Open points:
 - Ideally the squeeze 40-30cm should be prepared for standard operation (decision on 30cm at this week's LMC?).
 - If no I will foresee 1 non-colliding bunch / beam for tune and coupling measurements.
 - We have the optics corrections for 30cm, but they were never replayed. Situation of tunes and coupling 'unclear'.
 - We will keep the xing angle constant at 150 urad (no need to increase !):
 - The TCT center will not change (only lumi knobs changes expected to be small).
 - Gains some margin in aperture.
 - TCT settings are still open. Waiting for answer from collimation.
- On the side: new reconstruction test of β^* by SIS in tele mode.
 - Roll out during this MD. If OK, leave in place (→ also for ATS MD).