

## Beta\*-reach: IR7 collimation hierarchy limit and impedance

Since the aim of the MD is to test new collimator settings for pushed LHC performance in collision, the test has to be carried out at top energy (i.e. 6.5TeV), with collision optics. Loss maps should be produced for each beam, to qualify the tested configuration in terms of cleaning efficiency and respect of the correct collimation hierarchy. Tune measurements should be performed to estimate the impedance induced by the settings under test.

The main collimator settings to be tested foresee the TCPs with their operational settings (5.5 sigma) and:

- 1) a 2 sigma retraction between TCP and TCSG7 collimators (i.e. keeping the same sigma-retraction as the one of the tight settings used at 4TeV in 2012).
- 2) a 1 sigma retraction between TCP and TCSG7 collimators as in the LHC design report.

The MD could be divided into the following steps, which should be carried out for both settings 1-2:

1. starting from the 2015 operational settings of the LHC collimators, IR7 collimator jaws should be moved to the settings under test. While moving the jaws, BLM readouts can be recorded, to check that the collimator hierarchy is not broken during the transition phase;
2. once the new settings are reached, step back to the previous positions of all collimators in one step and then move back in again. Repeat this a few times and monitor the tune shift in order to estimate the impedance.
3. Perform betatron loss maps in both beams and planes through an ADT blowup. Use one pilot bunch per loss map.

At the beginning of the MD, a beam-based alignment of the collimators in IR7 should be performed, to ensure optimum centering around the orbit and verify the stability of the alignment with respect to the previous one. Moreover, in case of hierarchy breaking while reaching tighter settings, the concerned collimators can be re-aligned, to continue with the MD.

Since collimators of both beams should be tested, both LHC beams are needed. Due to the low beam intensity allowed for MDs at 6.5TeV, each beam could be made of a bunch of nominal intensity, followed by a number of pilot bunches until the limit of the relaxed setup beam flag is reached, e.g. 24. The bunch at nominal intensity is used for orbit correction and impedance measurements, and the train of pilot bunches for actually inducing the losses.