

## Multi-turn losses and cleaning

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In the LHC all multi-turn losses should occur at the collimators in the cleaning insertions. The cleaning inefficiency (leakage rate) is the figure of merit to describe the performance. In combination with the quench limit of the superconductive magnets and the instantaneous life time of the beam this defines the cleaning dependent beam intensity limit of the LHC. In addition, limits can arise from radiation-induced effects, like radiation damage and radiation to electronics. In this paper the used collimator settings, the required setup time, the reliability of collimation (all multi-turn losses at collimators), and the achieved proton/ion cleaning inefficiency are discussed. Observed and expected losses are compared. The performance change during the months of operation is reviewed. In addition, the peak losses during high intensity runs, losses caused by instabilities, and the resulting beam life times are discussed. Taking the observations into account the intensity reach with collimation at 3.5 TeV is reviewed.

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