



MD 11787: Longitudinal Halo Scraping

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Motivation

Power limitations at injection

- **Study proportion of uncaptured beam and flat-bottom losses**
- **Scaling of losses to benchmark simulations**
 - Estimate margins in voltage and consequently RF power
 - Predictions for HL-LHC

Remarks

- Similar studies have been performed with full machine at top energy in IR7
- If possible, explore bunch intensities of or above 1.8×10^{11} p/b (in a second MD)

<https://asm.cern.ch/md-planning/lhc-requests/11787/>

Preparation of the MD

- **Prepare acquisitions:**
 - Longitudinal beam profiles in the LHC and at SPS extraction
 - Injection power transients
 - Diamond detectors in IR7
 - Check instrumentation for collimators
- **Prepare special IR3 collimator threshold for outer limits at flat-bottom**
 - Making sure to only open limits to not move out primary collimators by accident

Establishing the Collimator Reference Position

- **Beam needed:**
 - 12 bunches
- **Procedure:**
 - Longitudinal blow-up of the beam to fill the bucket (1.5-1.6 ns)
 - Drive in collimators and obtain the reference position corresponding to bucket height

Measuring the Uncaptured Beam and Flat-bottom Losses

- **Beam needed:**
 - 12b and 144b batches 25ns spacing
 - Possible to do 12b plus one 144b-injection with frequent re-filling
 - Ideally 3-4 injections of 144b trains (500-600 bunches)
 - Highest possible intensity (for first MD operational intensity)
- **Procedure**
 - Inject and move in collimators to measure uncaptured beam
 - Move collimators out
 - After some time at flat bottom, move them in again to measure debunched beam
 - Change RF settings for each re-filling

Different RF/Beam Parameters

- **With and without beam-phase loop**
 - Study the capture of the first batch (phase loop on) and the last batch (phase loop off)
- **Different capture voltages**
 - Uncaptured beam and flat-bottom loss as a function of voltage
- **Varied injection errors**
 - Sensitivity to injection phase errors
- **Different times spent at flat-bottom**
 - Proportion of uncaptured beam and flat-bottom loss as a function of batch number
- **Turning on and off the ADT cleaning**
- **Ideally different bunch intensities**

After the MD

- **Restore nominal RF settings and close beam-phase loop**
- **Drive back collimators to nominal position**



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