RF MDs 2024

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Loss of Landau damping

Aim: scan the longitudinal threshold in intensity and bunch length. Probe the effective broad-band impedance and the cut-off frequency.

- **MD setup**
  - Single bunches with up to 2.4×10^{11} p/b (ADT limit)
    - Scan bunch length and intensity
  - Inject, filament, kick through beam control loops
  - Observe the oscillation amplitude
- **Aim for MD#1**

Beam losses at injection

Motivation: power limitations at injection.

Aim: determine the fraction of capture vs flat bottom losses.

- **MD setup**
  - Operational beam with available beam intensity (e.g. 1.6×10^{11} p/b)
  - Use collimator scraping down to the bucket
    - Right at injection to determine capture losses
    - After some time at flat bottom to determine flat bottom losses
  - Quantify the sharing between IR3 and IR7
  - Possibly a ramp at the end of the MD to check start-of-ramp losses
  - Might require several MDs
- **In collaboration with D. Mirarchi, S. Morales, S. Redaelli, B. Salvachua**

RF power transients

Aim: explore the high-intensity region.

- **MD setup**
  - Batched beam (1-2 batches of 48/72b) with up to 2.3x10^{11} p/b, if possible
  - Fine-tune RF capture
  - Measure beam losses
- **After injection, go to full detuning and explore the stability margin of the adaptive set point algorithm**
  - Requires batched beam of > 1.8x10^{11} p/b

Coupling local and global control loops

Aim: benchmark simulation models crucial to power transient studies, study injection transients in a controlled way.

- **MD setup**
  - Batched beam with available bunch intensity (e.g. 1.6×10^{11} p/b)
  - Inject several batches, each with a different phase error and look at the transients
  - Inject with beam phase loop on/off
  - If technically possible, try a gating of the beam phase loop
    - Explorations of a "longitudinal damper"

Controlled emittance blow-up

Aim: explore controlled emittance blow-up with the PPLP ramp to understand why it did not work in the past.

- **MD setup**
  - Ramping with single bunches (and batched beam?)
  - Modifications to the parameters of the controlled emittance blow-up
- **In collaboration with M. Solfaroli**

IBS mitigation for ion beam

Aim: reduce beam losses due to IBS for ions at injection/start of ramp.

Time: 8 h

- **MD setup**
  - Operational ion beam, MD at flat bottom, with possibility of one ramp at the end (to test start-of-ramp losses)
  - Try injections with different RF configurations
  - Modifications to capture voltage
    - Different capture voltages, steps between capture/flat bottom
  - Explorations of batch-by-batch blow-up or single sine-wave modulation (flattening)
  - …
- **MD#5**
- **In collaboration with R. Bruce, N. Triantafyllou**

Beam commissioning and operational items

Following items are foreseen for beam commissioning or operation, but might require MD time if the results are not conclusive or testing during those periods is not possible.

- **Foreseen during beam commissioning**
  - RF voltage and cavity QL calibration
  - Optimization of half-detuning phase with batched beam
- **Foreseen during proton operation**
  - Optimization of RF capture voltage and BLM thresholds at the start of the ramp

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