RF REQUEST FOR LHC MD#1 2023

MD#9523, MD9525

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MD#9523 Threshold of longitudinal loss of Landau damping

- Motivation:

  - Refine the loss of Landau damping threshold and LHC impedance model in the longitudinal plane

    - More accurate scan of parameter space

    - Gain a better understanding of some features of the impedance model (e.g. cutoff frequency)

- Procedure:

  - MD at flat bottom. Once injected, the bunches will be given a phase kick in the LLRF Set Point module and their oscillation will be observed with the beam phase loop open

- Special beam/HW request:

  - Check SPS-LHC energy matching beforehand

  - Single bunches of variable longitudinal emittances and bunch intensities: 0.1-0.3 eVs, 5×10^9–3×10^{11} p/b

- Are we ready:

  - Yes

MD#9523 Threshold of longitudinal loss of Landau damping

- **MP aspects:**

  - Confirm the maximum desired bunch intensity: 3×10^{11} p/b indeed

    - We have used up to 2.4×10^{11} p/b in the past (e.g. p.61 in https://cds.cern.ch/record/2196930/files/CERN-THESIS-2016-066.pdf)

    - We could reduce e.g. to 2.5×10^{11} p/b, if required from MP point of view

  - Check ADT bunch intensity limit and maximum bunch intensity that can be injected:

    - the dynamic range of the RF beam phase module can be adjusted to the desired range in the beginning of the MD

    - the ADT dynamic range should be similar, we will check with ADT colleagues

  - Clarify required RF interlocks and update procedure accordingly

    - We are not aware of any RF interlocks required

MD#9525 Injection power transients with different RF settings

- Motivation:

  - Study the correlation of different RF parameters with power transients at injection

    - Decrease power transients in the first ~100 turns by varying FB gain and delay settings etc.

- Procedure:

  - Optimize detuning and loaded Q and study the maximum voltage available

  - Study the effects of different LLRF settings and pre-detuning on power transients

  - Acquire turn-by-turn and bucket-by-bucket signals

- Special beam/HW request:

  - Check SPS-LHC energy matching beforehand

  - 25ns spaced (36-72b) and 8b4e batches, at maximum available intensity, at injection

- Are we ready:

  - Yes

MD#9525 Injection power transients with different RF settings

- **MP aspects:**

    - Requested 1000 bunches with bunch intensity of 2e11 (beyond operationally achieved values): Injection set-up? Max. number of bunches?

        - 1000 bunches is not absolutely necessary

        - We'd like to do a few injections of 72b at least, to test the effect of the beam phase loop