LHC MD Proposals for 2016

L.R. Carver, N. Biancacci, B. Salvant, E. Metral
Instability Threshold Studies

• Systematic study of instability threshold as function of Q’ performed in 2015. Good agreement for operational Q’, bad agreement for Q’<2.

• Measurements also performed for trains of bunches in various configurations. During MD2, large increase in instability threshold detected. This was not seen again due to scrubbing at FT from high intensity physics.

• Proposal 1: Continuation of measurements of the instability threshold with increasing number of bunches. Will we see a return of the fast instability with electron cloud for 144b? What about more bunches? (~8 hours)

• Proposal 2: A measurement of the stability threshold at FT in the absence of the transverse damper. ADT has some uncertainty on the damping time at FT. This measurement removes this uncertainty. (~4 hours)

• Proposal 3: Re-measure the instability threshold for a single bunch at Q’=0 to try and further understand the discrepancies we are observing.
\( \beta^* = 40\text{cm} \)

- MD755 had difficulties. H plane became unstable before V plane, despite having a higher emittance.
- Would like to repeat MD with TCSG=6.5\( \sigma \).
- Tune shift study can also be repeated, hopefully can use ObsBox to measure tune of single bunch, which should improve the measurement (need to check resolution of BBQ vs ADT pickup).

- **Proposal:** Single nominal bunch at flat top, move TCSG’s between 20 and 6.5\( \sigma \). Measure instability threshold at 6.5\( \sigma \). 1 dedicated ramp required.

---

**Impedance Localization with AC Dipole**

- MD349 was incomplete due to bug in turn by turn data acquisition. The data acquired during the MD was not able to be correlated.
- **Proposal:** MD needs to be repeated. Several nominal bunches at injection that are excited using the AC dipole. Multi-turn BPM acquisition needs to be checked beforehand. 4 hours at injection.
Coupling

• We observed many instabilities at injection in 2015, despite operating with $Q'=15$ $J_{oct}=-1.5$. We saw several cases where tunes were shifting due to Laslett tune shift. Blowup did not occur when this was corrected.

• Much work now being performed on the study of coupling and its role in stability.

• **Proposal 1 (Operational):** 1 single nominal bunch at injection. Set $|C-|=0$, move tunes closer together to see if bunch becomes unstable. Repeat measurement for range of $|C-|$, from 0 to $1e-3$.

• **Proposal 2 (Academic):** Instability threshold measurements for nominal bunches at flat top with coupling. MD parameters will need to be confirmed from simulations first.