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Assessment of the real part of the impedance of the LHC collimators with instability growth rate measurements

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The impedance of the Large Hadron Collider (LHC) is a source of instabilities and has to be monitored closely. It is usually assessed by measuring the tune-shift vs intensity, in particular at top energy where it is the most critical, as the collimators are the closest to the beam. However, to get information on the real part of the impedance, growth rate measurements are required. These are difficult to perform at flat-top because triggering the instability in a sharp and fast manner remains a challenge. Moreover, the length of the full cycle, including an energy ramp, prevents the measurement repetition. Instead, measuring growth rates at injection is more natural and allows rapid cycling, with the downside that the impedance at injection is not dominated by collimators but rather by fixed-gap devices. Here, we present measurements at injection energy, placing the collimators in tighter positions than the nominal ones, in an attempt to obtain a similar configuration as the flat top situation. The measurements are performed at several negative chromaticities to study the evolution of the growth rate of the rigid bunch mode instability. Results are finally compared to simulations.

Footnotes

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