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Longitudinal loss of Landau damping in the CERN super proton synchrotron at 200 GeV

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Landau damping plays a crucial role in preserving single-bunch stability. In view of delivering the beam to the High-luminosity LHC (HL-LHC), the Super Proton Synchrotron (SPS) must double the intensity per bunch. In this intensity range, the loss of Landau damping (LLD) in the longitudinal plane can pose an important performance limitation. Observation of the beam response to a rigid-bunch dipole perturbation is a common technique to study the LLD. This contribution presents measurements for a single bunch at 200 GeV in a double-harmonic RF system with a higher harmonic voltage at four times the fundamental RF frequency are presented, showing the impact on Landau damping. Beyond the analytical estimates, the observations are moreover compared to the results from novel stability criteria implemented in the semi-analytical code MELODY, as well as with macroparticle simulation in BLonD.

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Footnotes

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Yes

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