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Harmonics of 50 Hz on the beam spectrum of the Large Hadron Collider

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Studies of the beam spectrum of the Large Hadron Collider (LHC) have revealed the existence of harmonics of the mains frequency (50˜Hz), ranging from 50˜Hz to 8˜kHz, in the form of transverse dipolar excitations. The restart of the LHC operation in Run 3 was accompanied by substantial improvements in the beam instrumentation. In particular, the upgrade of the transverse damper's observation system (ADTObsBox), currently providing bunch-by-bunch and continuous position measurements, allows for the first time a systematic follow-up of the harmonics'evolution during the run. In this paper, we present parasitic observations collected during the LHC physics operation, as well as results from dedicated experiments with the aim of providing further insights into the source of the perturbation, especially concerning the 50˜Hz harmonics around 8˜kHz. These tests include modifications in the operation mode of systems such as some of the Uninterruptible Power Supplies, while observing potential changes in the spectrum of the beam position data.

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Footnotes

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