

Lessons Learned from the Civil Engineering Test Drilling and Earthquakes on LHC Vibration Tolerances

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20' + 5'

 During Run 1 and in 2015 LHC operation has not been perturbed by vibrations and higher frequency (>1 Hz) ground motion. The effects of some large earthquakes was observed on the beam orbits, but no beam was lost or spoiled by such events. In the coming years two new sources of perturbations could possibly impact LHC operation: civil engineering for HL-LHC in points 1 and 5 as well as enhanced seismic activity due to the development of a geothermal energy program Geothermie 2020 by the Canton of Geneva. The triplet area is particularly sensitive to vibrations due to large beta-functions and strength and resonances in the frequency range of 10-30 Hz. Depending on amplitude, frequency and coherence length vibrations may lead to loss of performance or in the worst cases to beam dumps. The current observations and measurements on LHC beam will be reviewed. Triplet vibrations and in situ transfer functions of vibrations will be presented. Mitigation measures in the form of fast orbit feedbacks and girder designs will be discussed.

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