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Influence of vibratory effects on the beam parameters of SuperKEKB

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SuperKEKB is an asymmetrical lepton collider with a circumference of 3 016 meters, which collides 7 GeV electrons with 4 GeV positrons. To optimize the luminosity, which recently reached a world record of $4.71 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$, all the undesirable effects on beam parameters must be analyzed in detail, especially close to the interaction point where the Belle II detector is operated. The presented study investigates the influence of mechanical vibration on the luminosity. For this purpose, four seismic sensors (Guralp 6T) were installed and collect data 24 hours a day, two on the ground and another two located on the supports of the two cantilevered cryostats, inside which the last focusing magnets on both sides of the interaction point (the most critical for vibrations) are mounted. The luminosity is measured thanks to the LumiBelle2 fast luminosity monitor, which is based on diamond detectors installed in both beam lines. Vibration-induced disturbances in the luminosity frequency spectrum are investigated for several types of perturbations, in particular the ones resulting from ground motion amplified by the dynamical behavior of the cryostat, as well as also from external vibrations sources.

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Footnotes

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