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First HE-LHC impedance model and aspects of single beam stability

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A first version of the HE-LHC impedance was derived from the LHC and HL-LHC impedance models. In these models, two main sources of impedance are considered: the beam screen and the collimation system. The proposed injection energies were evaluated with respect to impedance and transverse beam stability. Because of the tighter physical gaps in the collimators at top energy (13.5 TeV), the impedance budget is higher. Its impact on beam stability needs to be addressed as it could prevent reaching the nominal beam parameters.

Impedance simulations were performed for four different cases: for three different injection energies (450 GeV, 900 GeV and 1.3 TeV per beam) and for the top energy case (13.5 TeV per beam). These models were then used to estimate the single beam instability thresholds and the possible mitigation techniques. This first assessment of beam stability didn't show serious hindrance to reach the nominal beam parameters. However the impedance budget should be followed-up to keep a reasonable safety margin for the beam stability.

Author: AMORIM, David (CERN / Universite Grenoble-Alpes (FR))

Co-authors: ANTIPOV, Sergey (CERN); ARSENYEV, Sergey (CERN); BIANCACCI, Nicolo (CERN); BUFFAT, Xavier (CERN); OEFTIGER, Adrian (CERN); METRAL, Elias (CERN); SALVANT, Benoit (CERN); METHER, Lotta (EPFL - Ecole Polytechnique Federale Lausanne (CH)); PIELONI, Tatiana (EPF Lausanne); TAMBASCO, Claudia (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Presenter: AMORIM, David (CERN / Universite Grenoble-Alpes (FR))

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