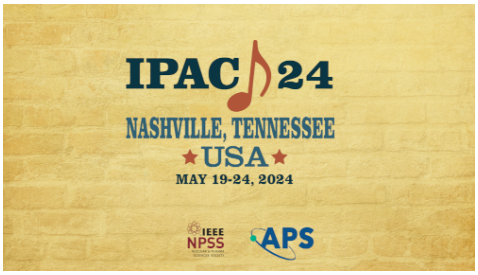

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The electron cloud and its impact on LHC and future colliders

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The secondary emission of electrons and their interaction with the electromagnetic fields of charged particle beams can lead to the build-up of electron clouds in accelerator beam chambers. The interaction of the electrons with both the beam and the chamber walls leads to detrimental effects, such as transverse instabilities and emittance growth, beam loss, pressure rise and heat load. Such effects are systematically observed in the Large Hadron Collider (LHC) during operation with proton beams with the nominal bunch spacing of 25 ns. Furthermore, the severity of electron cloud effects has increased after each long shutdown period of the machine, due to a degradation of the beam screen surfaces with air-exposure. Consequently, electron cloud is already limiting the total intensity in the collider and is one of the main concerns for the performance of the HL-LHC upgrade. In this contribution, the present understanding of electron cloud in hadron accelerators is reviewed. Measurements and observations at the LHC are presented, the impact on performance is evaluated and mitigation measures are discussed along with lessons for future machines.

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