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DYVACS (DYnamic VACuum Simulation) code: calculation of gas density profiles in presence of Electron Cloud

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The computation of residual gas density profiles in particle accelerators is an essential task to optimize beam pipes and vacuum system design. In a hadron collider such as the LHC, the beam induces dynamic effects due to ion, electron and photon-stimulated gas desorption. The well-known VASCO*code developed at CERN in 2004 is already used to estimate vacuum stability and density profiles in steady state conditions. Nevertheless, some phenomena are not taken into account such as the ionization of residual gas by the electron clouds and the evolution of the electronic density related to the electron cloud build up. Therefore, we propose an upgrade of this code by introducing electron cloud mapsto estimate the electron density and the ionization of gas by electrons leading to an increase of induced desorption. The pressure evolution computed with DYVACS reproduces with a good accuracy the experimental pressure recorded in the VPS beam pipes sector*** of the LHC from the proton beam injection to the stable beam period. Additionally, DYVACS can also be used as a predictive tool to compute the pressure evolution in the beam pipes for the Future Circular Colliders (FCC-hh or -ee).

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