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Dynamic Pressure in the LHC - Influence of Ions Induced by Ionization of Residual Gas by Both the Proton Beam and the Electron Cloud

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Ultra-High Vacuum is an essential requirement to reach design performances in high-energy particle colliders. For the future HL-LHC or FCC study, the understanding of the beam interactions with the vacuum chamber is fundamental to provide solutions to mitigate the pressure rises induced by electronic, photonic and ionic molecular desorption. Studies were performed on the ions, produced by molecular ionization generated by the proton beam and the electron cloud, and stimulating molecular desorption by the surface bombardment. In-situ measurements were carried out, on the LHC Vacuum Pilot Sector (VPS)* during the LHC RUN II, to monitor the dynamic pressure, and to collect the electrical signals due to the electron cloud and to the ions interacting with the vacuum chamber walls. In parallel, the ions behaviour in the VPS was simulated to determine the longitudinal and transversal velocity kicks, and the energy spectra. Computation of the dynamic pressure in the VPS was also performed.

*The LHC Vacuum Pilot-Sector Project

B. Henrist, V. Baglin, G. Bregliozzi, and P. Chiggiato - CERN
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Auteur principal: BILGEN, Suheyla

Co-auteurs: Dr BAGLIN, Vincent (CERN); BRUNI, Christelle (LAL); GAMELIN, Alexis (Laboratoire de l'Accélérateur Linéaire); MERCIER, Bruno (LAL); Dr SATTONNAY, Gaël (LAL)

Orateur: BILGEN, Suheyla

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