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Electron impact on the cryosorbed gas of selected accelerator materials.

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The vacuum chambers of the LHC's arcs operate in a temperature range between 1.9 K, i.e. the temperature of the superconducting magnets, and 20 K. At such low temperatures, most of the residual gas species are efficiently adsorbed on the cold surface.

LHC's beam emits synchrotron radiation inside its bending magnets and, consequently, electrons are extracted from the surrounding walls by photoelectric effect. The bunched proton beam accelerates the photoelectrons, building-up an "electron cloud"which generates gas desorption and heat load on the cryogenic vacuum system. This phenomenon might become a limiting factor for the operation of the High Luminosity LHC upgrade, where more intense beams will circulates.

In order to study the electron interaction with gas adsorbed at cryogenic temperature, a new facility has been designed and built at CERN. It reproduces in the laboratory the typical conditions of a cryogenic ultra-high vacuum surface, present in the accelerator. A sample representing the inner surface of the accelerator is mounted on a 4-axis manipulator able to regulate the temperature between 10K and 250K, in a fully conditioned vessel. Known quantities of gas are adsorbed on the sample surface that can be bombarded by an electron beam at different energies. In this paper, we present the results obtained with selected accelerator materials at different surface gas coverages.

Primary author: HENRIST, Bernard (CERN)

Co-authors: BAGLIN, Vincent (CERN); DUPUY, Remi (Centre National de la Recherche Scientifique (FR)); HAUBNER, Michal (Czech Technical University (CZ))

Presenter: HENRIST, Bernard (CERN)

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