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RF plasma conductivity in the CERN Linac4 H^- ion source, comparison of simulations and measurements STEFANO MATTEI, CERN, 1211 Geneva 23, Switzerland, SHINTARO MOCHIZUKI, KENJIRO NISHIDA, TAKANORI SHIBATA, Graduate school of Science and Technology, Keio University, 3-14-1 Hiyoshi, Kouhoku-ku, Yokohama 223-8522, Japan, JACQUES LETTRY, CERN, 1211 Geneva 23, Switzerland, AKIYOSHI HATAYAMA, Graduate school of Science and Technology, Keio University, 3-14-1 Hiyoshi, Kouhoku-ku, Yokohama 223-8522, Japan, MINH QUANG TRAN, Centre de Recherches en Physique des Plasmas, Ecole Polytechnique Federale de Lausanne, CH-1015 Lausanne, Switzerland — CERN Linac4 H^- ion source is a Radio Frequency Inductively Coupled Plasma (RF-ICP) ion source. A solenoid antenna of 4 to 6 turns heats the plasma at a frequency of 2 MHz, in pulses of 0.5 ms and with a repetition rate of 0.8 to 2 Hz. In order to investigate the underlying plasma physics we have developed a Particle-In-Cell Monte Carlo Collision (PIC-MCC) code with the long-term goal to optimize the ion source operational parameters and geometry. This paper presents the determination of the complex plasma conductivity based on the PIC-MCC simulations. The resistive and reactive components of the plasma conductivity are computed as the proportionality factor between the RF electric field and the resulting plasma current. We present a parametric investigation as a function of the antenna current, gas pressure and antenna geometry. The simulation results, corresponding to the Linac4 ion source, are compared to the time-resolved optical emission photometry measurements of the Balmer lines obtained on a dedicated ion source test stand.

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