Abstract Submitted
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Experimental and computational study of autoresonant injection of antiprotons into positron plasma in antihydrogen production CHUKMAN SO, University of California Berkeley, JONATHAN WURTELE, JOEL FAJANS, University of California Berkeley, Lawrence Berkeley National Laboratory, LAZAR FRIEDLAND, The Hebrew University, Israel, WILLIAM BERTSCHE, University of Manchester, United Kingdom, ALPHA COLLABORATION — The injection of antiprotons into positron plasma during antihydrogen synthesis in ALPHA is simulated numerically and compared with experimental measurements. The antiprotons and positrons are initially confined in adjacent axial potential wells in a nested Penning-Malmberg trap. The antiproton plasma is excited autoresonantly and partially injected into the adjacent positron plasma, creating antihydrogen. The excitation and injection process is modeled numerically with a hybrid code in which the antiproton plasma responds to the autoresonant drive fully dynamically, and the positrons respond quasi-statically. The strong axial magnetic field suppresses radial transport on the timescales of interest. The antiproton plasma is thus assumed to consist of concentric cylindrical tubes within which antiprotons move only in the axial direction, and the evolution of the phase space distributions in each tube obeys a one-dimensional Vlasov equation. The antiproton self-field is obtained by solving the Poisson equation in two-dimensions, thereby coupling the tubes. Alternative injection schemes and the effect of varying antiproton number and temperature are also examined.

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