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Combining the Strong Drive Regime with Evaporative Cooling to Control Plasma Parameters in the ALPHA Experiment[1] CELESTE CARRUTH, JOEL FAJANS, Univ of California - Berkeley, ALPHA COLLABORATION — To make antihydrogen at the ALPHA experiment at CERN, we need to produce antiproton and positron plasmas with consistent plasma parameters. We developed a technique that allows us to eliminate initial variations in the density and the number of particles by combining evaporative cooling and the strong drive regime. The strong drive regime is a non-neutral plasma regime driven by a rotating electric field, where the drive frequency synchronizes with the plasma rotation frequency; this controls the density.[2] Evaporative cooling is a space-charge dominated effect where a potential well is completely filled with the space charge of a plasma and one side is lowered, which sets the on-axis potential. For cold non-neutral plasmas, the density and on-axis potential give a unique solution to the plasma parameters, so we want to simultaneously combine these two techniques. Experimental results using electron plasmas show this combination of techniques does an excellent job at producing plasmas with the same number of particles and densities from a wide range of initial conditions.

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[2]J. R. Danielson and C. M. Surko, "Radial compression and torque-balanced steady states of single-component plasmas in Penning-Malmberg traps", Physics of Plasmas **13**, (2006), 055706

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