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Low-Frequency Rotating Wall Compression of Electron-Antiproton Plasmas ANDREY ZHMOGINOV, JOEL FAJANS, JONATHAN WURTELE, University of California, Berkeley, ANDREA GUTIERREZ, MAKOTO FUJIWARA, University of British Columbia, THOMAS O'NEIL, University of California, San Diego — Recent advances in antihydrogen production and trapping would be impossible without the means for compressing and mixing individual particle species [1]. Rotating wall technique based on applying harmonically-changing potentials to segmented electrodes of an electrostatic plasma trap is one of the methods widely used for compressing non-neutral plasmas. The frequency of the rotating wall perturbation used for compressing electrons in a laboratory is typically of order of several MHz. However, it has recently been observed in ALPHA (CERN) that an efficient compression of two-component electron-antiproton plasmas may occur at much lower frequencies. We show that the mechanism of such compression can be attributed to single particle resonances in contrast to excitation of collective plasma modes [2]. A model of resonant plasma compression based on kinetic theory is presented and shown to agree with experimental results in a strongly-collisional regime. Plasma evolution in the opposite weekly-collisional regime is also discussed. The most complicated intermediate case is analyzed using a 2D n-body code.

[1] G. B. Andersen, et al. (ALPHA Collaboration), Phys. Rev. Lett. 100, 203401 (2008)
[2] F. Anderegg, E. M. Hollmann, and C. F. Driscoll, Phys. Rev. Lett. 81, 48

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