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Characteristic coupling time between axial and transverse energy modes for antihydrogen in magnetostatic traps[1] MIKE ZHONG, JOEL FAJANS, Univ of California - Berkeley — For upcoming ALPHA collaboration laser spectroscopy and gravity experiments, the nature of the chaotic trajectories of individual antihydrogen atoms trapped in the octupole Ioffe magnetic trap is of importance [1]. Of particular interest for experimental design is the coupling time between the axial and transverse modes of energy for the antihydrogen atoms. Using Monte Carlo simulations of semiclassical dynamics of antihydrogen trajectories, we quantify this characteristic coupling time between axial and transverse modes of energy. There appear to be two classes of trajectories: for orbits whose axial energy is higher than 10% of the total energy, the axial energy varies chaotically on the order of 110 seconds, whereas for orbits whose axial energy is around 10% of the total energy, the axial energy remains nearly constant on the order of 1000 seconds or longer. Furthermore, we search through parameter space to find parameters of the magnetic trap that minimize and maximize this characteristic coupling time. [1] A I Zhmoginov, A E Charman, R Shalloo, J Fajans, J S Wurtele, Nonlinear dynamics of antihydrogen in magnetostatic traps: implications for gravitational measurements, Class. and Quantum Grav., 30 205014 2013,doi:10.1088/02649381/30/20/205014.

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