Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Optimized Photonic Crystal Accelerating Cavities CARL BAUER, GREGORY WERNER, Center for Integrated Plasma Studies, University of Colorado, Boulder, CO, JOHN CARY, Center for Integrated Plasma Studies, University of Colorado, Boulder, CO and Tech-X Corp., Boulder, CO — Photonic crystal (PhC) cavities may provide a useful replacement for metallic accelerating cavities used in linacs today. The main advantage of PhC cavities lies in their ability to suppress higher-order modes (HOMs). Because of the frequency bandgaps found in PhCs, certain disruptive HOMs can be made to propagate out of a PhC structure. One disadvantage with PhC cavities, however, is their size. For a PhC cavity, many layers of scattering elements are needed to attain Q-values comparable to metallic cavities, because of the radiative losses from the trapped mode. In response, we show how optimizing the positions and size of the individual scatterers can increase the maximum Q due to radiation losses by ~ 2 orders of magnitude for a specified number of scatterers, and thus decrease the physical extent required for cavities of this type. We present here examples of optimized PhC accelerating cavities and discuss their individual resonant mode spectra. We also show results from simulations of particle beams passing through these cavities without significant excitation of HOMs.

Carl Bauer
Center for Integrated Plasma Studies, University of Colorado at Boulder

Date submitted: 20 Jul 2007 Electronic form version 1.4