Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Modeling Alfven and Whistler Waves Generation by Rotating Magnetic Field Source X. SHAO, A. KARAVAVEV, A.S. SHARMA, K. PAPADOPOULOS, N. GUMEROV, G. JOYCE, Dept Phys. and Astronomy, Univ. Maryland, A. GIGLIOTTI, W. GEKELMAN, Dept. Phys., UCLA — Recent experiments by Gigliotti et al. 2008 and Karavaev et al. 2008 demonstrated excitation of Alfven and whistler waves, respectively, by Rotating Magnetic Fields (RMF) created by a phased orthogonal loop antenna. This paper presents a combination of computations along with experiments that emphasize the RMF properties for generating MHD and whistler waves. For RMF rotating frequencies in the whistler wave frequency range, the electrons quickly come to a co-rotation with the RMF, generating a differential azimuthal current. For rotating frequencies below the ion cyclotron frequency wave, the electron and ion motion decouple within the ion skin-depth near the antenna and co-rotates with the RMF outside the ion skin depth. In order to understand the RMF and plasma interaction and the resultant radiation in different frequency regimes, we developed a 3D code to simulate experimental configurations. The simulation help us understand the general characteristics of impedance matching, energy coupling and far field radiation pattern from an RMF antenna in plasmas. The dependence of the induced magnetic field on RMF frequency, and plasma parameters, as well as space applications of RMF antennas are discussed. This work was sponsored by ONR MURI Grant 5-28828.

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Date submitted: 22 Jul 2008 Electronic form version 1.4