EXPERIMENTAL VERIFICATION OF THE STATIONARY ALFVÉN WAVE AND ITS RELEVANCE TO AURORAL PLASMA PHYSICS

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Abstract

Alfvén waves are found in laboratory and space plasmas. In this talk, experimental investigations of Alfvén waves in laboratory plasmas and their relevance to space plasmas are discussed. A smaller-diameter, off-axis channel of electron current and depleted density was created in the larger-diameter plasma column of the Large Plasma Device Upgrade (LAPD) at UCLA using a heated, oxide-coated electrode at one end. The column rotates about its cylindrical axis due to a radial electric field imposed by a special termination electrode on the same end. Experimentation with plasma-rotation-inducing termination electrodes in the WVU Q Machine led to LAPD design. The radial profile of azimuthal velocity agrees with rigid-body rotation within a sufficiently large radius. We show that inertial Alfvén waves are concentrated in the off-axis channel and, when rotational flow across the current channel and current in the channel coexist, a dc spatial pattern consistent with a stationary, not standing, inertial Alfvén wave is observed. The stationary Alfvén wave provides a plausible mechanism for explaining observations of long-lasting (minutes) auroral-arc structures.

About the Speaker: **Dr. Mark Koepke is Professor of Physics at West Virginia Univ. He recently served as Acting Director of the Research Division in the Office of Fusion Energy Sciences at the Department of Energy, 2009-2011. Mark received his Ph.D. plasma physics from the Univ. of Maryland in 1984. His research at WVU covers waves and instabilities in space plasmas, manipulation of the electron energy distribution in industrial plasmas, plasma diagnostics, and nonlinear dynamics in externally driven, spontaneous oscillators. He is a Fellow of the APS, Institute of Physics, and Japanese Society for the Promotion of Science. Mark serves as Vice Chair of the APS Division of Plasma Physics and as Deputy Editor of *Plasma Physics and Controlled Fusion*.**