Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Theoretical foundations of MHD spectroscopy in Madison Plasma Dynamo Experiment ROBERT SILLER, IVAN KHALZOV, CARY FOREST, Univ of Wisconsin, Madison — We develop a theoretical basis of active MHD spectroscopy for Madison Plasma Dynamo Experiment (MPDX). This new diagnostic is based on an analysis of incompressible shear Alfven modes and compressible acoustic modes for spherical plasmas, and the influence of plasma flow on the corresponding eigen-spectrum. Alfven modes in plasma are assumed to be excited in the presence of an external axial magnetic field. The mode frequencies depend on the distribution of plasma parameters. Inverting this dependence for a given (experimentally measured) set of modes, we are able to infer the spatial structure of plasma characteristics. We demonstrate this inversion technique by determining the rigid plasma rotation from the splitting of the low-frequency resonance Alfven modes driven by a localized antenna. Compressible acoustic waves in plasma are assumed to be excited with and without the presence of an external magnetic field. For the acoustic waves we determine the velocity dependence of the normal mode spectrum and magnetic field structure. We consider the feasibility of using the developed diagnostic in MPDX.

Robert Siller
Univ of Wisconsin, Madison

Date submitted: 11 Jul 2014 Electronic form version 1.4