Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

TG waves in θ-asymmetric magnetized plasma column.[1] NICOLA PANZERI, University of Milan, KURT THOMPSON, ANDREY KABANTSEV, C. FRED DRISCOLL, University of California, San Diego — An unusual $m_\theta = 0$ TG wave amplitude modulation due to the interaction with a $m_\theta = 2$ diocotron wave is observed for the first time in a pure electron plasma column. Trivelpiece-Gould (TG) modes describe longitudinal electrostatic plasma oscillation, modified by the cylindrical boundary, on an axially magnetized plasma column [1]. Here we perform the first experiments on TG waves propagating in an azimuthally perturbed density (and potential) distribution in a pure electron plasma confined in a Penning-Malmberg trap. We apply a small $m_\theta = 2$ diocotron mode to an originally axisymmetric equilibrium density distribution $n_0(r)$, and we measure the amplitude modulation of regular $m_\theta = 0,\ k_z = 1,\ m_r = 1, 2, 3...$ TG modes: in the Fourier space, this appears as a wave triplets consisting of a central branch (continuation of the original mode) as well as of the upper and lower sideband shifted in frequency by Δf_{SB}. The splitting $\Delta f_{SB}/f_{TG}$ depends on the asymmetry strength q_2 (the quadrupole moment of the $n(r, \theta)$) approximately as $\sqrt{q_2}$. Diagnostics also show two triplets signals near the TG wave, with frequency $f_{TG} \pm f_{E\times B}$, each with Δf_{SB} also related to $\sqrt{q_2}$. These features in the interaction of two orthogonal waves (diocotron and TG) are not yet explained by nonlinear waves coupling theory.

[1]Supported by University of Milan, NSF grant PHY 18-05764, DOE grant DE-SC-18236

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Date submitted: 02 Jul 2019 Electronic form version 1.4