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**Probing Ion Mix via Nonlinear Interactions of Alfven Waves**[1] XIANGRONG FU, New Mexico Consortium, SETH DORFMAN, Space Science Institute, HUI LI, Los Alamos National Laboratory — Alfven waves are of fundamental importance in magnetized plasmas, such as the solar wind and Earth's magnetosphere. When the wave amplitude is large, nonlinear interactions among waves, such as three wave resonance, dominate the dynamics. These nonlinear process may be used as a diagnosis of the plasma composition; this is because the composition affects the dispersion relation of Alfven waves, especially when the wave frequency is close to ion cyclotron frequencies. We present results from recent experiments on the Large Plasma Device at UCLA aimed at investigating nonlinear interactions of two counter-propagating Alfven waves in a plasma with both hydrogen and helium ions. A third Alfven wave is excited through three wave resonance, with frequencies and wave numbers matching the resonance condition. The measured properties of these waves are then used to estimate relative density of helium ions. The results are also compared to estimates from other methods. The outcome of this study will have implications in developing new technology to measure cold ion populations in space plasmas, which is very challenging using traditional methods. This work was performed at the Basic Plasma Science Facility supported by DOE and NSF.

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