

Abstract Submitted  
for the DPP20 Meeting of  
The American Physical Society

**A Criterion for the Sign of Wave Energy**<sup>1</sup> THOMAS O'NEIL, University of California, San Diego — A plasma wave is said to have positive energy if energy must be added to the plasma when the wave is excited. Likewise, a wave is said to have negative energy if energy must be removed from the plasma when the wave is excited. Since energy is reference frame dependent, the sign of wave energy is reference frame dependent. This paper considers weakly damped, electrostatic waves that propagate on a stable non-neutral plasma, and establishes criterion that the waves have negative energy as viewed in the laboratory reference frame.<sup>1</sup> The criterion for the sign of wave energy is developed by using the symmetry properties of the plasma equilibrium and the fact that Vlasov dynamics is an incompressible flow in phase space, rather than the usual and more difficult procedure of calculating the value of the wave energy directly. [1] Thomas M. O'Neil, Phys. Plasmas 26, 102106 (2019)

<sup>1</sup>NSF grant PHY-1805764, DOE grant DE-SC0018236

Thomas O'Neil  
University of California, San Diego

Date submitted: 09 Jul 2020

Electronic form version 1.4