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Nonlinear development of absolute SRS in ignition-scale direct-drive coronal plasmas

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The nonlinear behavior of absolute stimulated Raman scattering (SRS) near the quarter-critical density is investigated using one-dimensional (1D) Vlasov simulations with parameters relevant to ignition-scale direct-drive coronal plasmas. Numerical Vlasov simulations show that a strong and stable Airy pattern is formed by the Raman light as it is generated near its cutoff density. This pattern self-consistently modulates the density profile below the quarter-critical density. The density modulation superimposed in the linear density profile results in a change in the nature of SRS in lower density region from spatial (convective) amplification to temporal (absolute) growth. In addition, strong Langmuir decay instability (LDI) cascades produce daughter Langmuir waves (LWs) that seed SRS below quarter-critical density. These effects act to broaden the spectrum of reflected light. More interestingly, collapse of the primary LWs is observed near their turning point, producing hot electrons. These observations provide a new explanation of hot electron generation and SRS scattered light spectra for ignition-scale experiments.

Authors: Dr WANG, Qing (University of Alberta); ROZMUS, W (University of Alberta); MYATT, Jason (University of Alberta)

Presenter: Dr WANG, Qing (University of Alberta)

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