Experimental Study of Nonlinear Energy Transfer in Frequency Domain

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Experiments aiming at identifying the direction of non-linear energy transfer between fluctuations with different frequencies have been carried out on the cylindrical CSDX (Controlled Shear Decorrelation Experiment, U. C. San Diego) magnetized helicon plasma device. The initial results show that an inverse energy transfer from drift wave turbulence to the azimuthally rotating mean flow exists in the region where a shear layer forms. The measured energy transfer terms (both the kinetic and internal) show a net transfer to low frequencies (corresponding to larger azimuthal scales) at the maximum shear location, and a net transfer to higher frequencies (corresponding to smaller azimuthal scales) on either side of the shear layer, indicating that the direction of non-linear energy transfer is closely related to the shear in plasma.