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Bispectral Analysis of Unstable Broadband Cyclotron Waves: Identity of the parent waves and fraction of power associated with three-wave coupling[1] M KOEPKE, R STAUBER[2], West Virginia Univ — The application of bispectral analysis to the study of nonlinear interactions was demonstrated by a comparison of computed quantities with results from model equations found in the literature: the amplitude and phase of coupling coefficients, the power transfer function, the fraction of power associated with nonlinear coupling, and the identification of waves involved in a quadratic coupling interaction. Two parent waves were distinguished from the daughter wave in this three-wave interaction. These results, as well as the values computed from a Monte-Carlo simulation of plasma turbulence were found to be consistent with expectations. Two experimental systems were investigated with the bispectrum. One was the periodically pulled time-series data of a driven van der Pol oscillator (unijunction transistor circuit) which contained significant bispectral features but no real evidence of quadratic coupling. The other was plasma fluctuation data from the WVU-Q Machine, where the (ion-cyclotron range, shear-driven) inhomogeneous energy-density driven mode exhibited a degree of coupling to various spectral components of the lower-frequency drift-wave oscillations that was absent in the case of the current-driven ion-cyclotron mode.

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