

When does acoustic turbulence begin?

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Any nonlinear wave distorts at moving in a medium, but this distortion as well as formation of multiple harmonics from "sine" wave doesn't need an interaction of high frequency mode *inter se*. One of the key questions in experimental investigation of acoustic turbulence is when interaction between waves in energy cascade really begins.

Experimental study of strong nonlinear second sound waves in superfluid helium in a high quality resonator demonstrates the interaction of derivative of the pumping signal harmonics (secondary multiple harmonics and subharmonics). The pumping of the system by two incommensurate resonance frequencies leads to format combination frequencies, which are ensued from interaction of secondary harmonics *inter se*. The similar combinational frequencies create at interaction subharmonics with multiple harmonics at formation of an inverse energy flux cascade. The probability density function of the high frequency multiple harmonics remains Gaussian-like due to stochastic interaction between the waves themselves. Experimental investigation indicated that the enchantment of the pumping excitation to a critical level ($q_c \sim 10 - 20 \text{ mW/cm}^2$) lead to a change in the behavior of the energy transmission across the frequency range. Therefore these experimental results imply the formation of a turbulent state of multiple harmonics of the standing one dimensional second sound waves.