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P5.4013 Spatiotemporal wave dynamics in the transition to defect-mediated dust acoustic turbulence wave

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Under increasing driving and through modulation instability, the transition from the ordered wave to the weakly disordered wave state occurs in various nonlinear waves. The emergence of fluctuating topological defects at the sites with null amplitude and undefined phase leads to the name of defect-mediated turbulence (DMT) for the weakly disordered state. The recent study in an acoustic-type travelling wave demonstrated that defect filaments winded by helical waveforms named as acoustic vortices (AVs), through pairwise generation and annihilation, are the singular objects for characterizing the dynamical behaviour of DMT. In this work, the spatiotemporal waveform dynamics in the transition from the plane wave to DMT is experimentally investigated in 3D traveling dust acoustic waves. It is found that with increasing effective driving, the transition onsets from the stable single AV state, through the unstable single AV state, to the multiple AVs state. The correlation of waveform undulation, AVs motion, and the broadening of power spectrum is also unravelled.

[1] Y. Y. Tsai and L. I, Phys. Rev. E 90, 013106 (2014)

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