

Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Experimental Evidence of Amplitude Death in Coupled Candle Flame Oscillators KRISHNA MANOJ, SAMADHAN A. PAWAR, R. I. SUJITH, Indian Institute of Technology Madras — Mutual coupling causes synchronization in coupled limit cycle oscillators by locking their phases to a common value. A pair of candle flame oscillators, each consisting of 3 or more candles and capable of exhibiting self-sustained oscillations, produce synchronized behaviour in their flame dynamics upon coupling. Previous studies on synchronization of candle flame oscillators report the existence of only two modes of oscillations, in-phase and anti-phase, as a consequence of variation in inter-flame distance between the oscillators. Here, we provide experimental evidence on the presence of an amplitude death (AD) state between the previously known states of in-phase and anti-phase oscillations. With increase in number of candles in an oscillator, we observe a considerable reduction in the AD zone. Eventually, we reach a point of phase-flip bifurcation, wherein the oscillators show sharp transition from a state of in-phase to anti-phase oscillations without showing an intermediate state of AD. We also report similar results in a pair of candle flame oscillators, where the number of candles in each oscillator is different. Based on our experimental results, we speculate on the major role of time delay coupling in inducing synchronization behaviour in candle flame oscillators.

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Date submitted: 20 Jul 2017

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