PhD GRANTS 2024

PhD project title: Temporal crystals in optical resonators

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PhD project summary (max. 20 lines):

Temporal crystals were theoretically introduced in 2012 by Frank Wilczek. Similar to classic crystals in condensed matter, the goal here is to create a temporal signal with discrete translational symmetry. The formation mechanisms involve a sophisticated balance of physical phenomena such as parametric resonance (Floquet driving) and localization in an N-body problem within dissipative systems out of equilibrium. It's not surprising that one of the first experimental realizations of temporal crystals was achieved by stabilizing a train of regularly spaced cavity solitons. The cavity soliton, a nonlinear and localized response of an optical Kerr resonator, can exhibit complex evolutions. Understanding the dynamics of these solitons, as well as the underlying mechanisms for stabilizing trains, is still relatively unknown and under-studied at this stage. This project aims to address this issue, using a fiber-optic-based Kerr cavity as the study area. The goal is to provide a precise understanding, both theoretically and experimentally, of the dynamics of temporal crystals in Kerr resonators, whose coherence properties are widely sought after in technological applications such as quantum computing or information processing.