Theoretical and Physical Chemistry Institute

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Vass. Constantinou 48, Athens

ONLINE LECTURE

"Classical and Quantum Dispersion-Free Coherent Propagation by Tailoring Multi-Modal Coupling"

Prof. Aikaterini Mandilara

Department of Physics,
Nazarbayev University,
Kazakhstan

Thursday, April 1, 2021, 12:00

Link to join the lecture:

https://zoom.us/j/99876732688?pwd=MmRsdGtVVTVVN3llbCtxVDZJdXZiUT09

Passcode: 913806

Classical and Quantum Dispersion-Free Coherent Propagation by Tailoring Multi-Modal Coupling

Aikaterini Mandilara

Department of Physics, Nazarbayev University, Kazakhstan

One of the major hindrances in information transmission at long distances via multimode optical fibers, is the spread in arrival times of packages due to the discrepancy in the group velocities for various modes. At the same time, the dispersion effects need to be compensated for each of the modes separately. In classical single-mode optical networks the most common solution is the dispersion compensating fibers. In the multi-modal scenario, the techniques are based on the inter-conversion of the signal between different modes or alternative elegant suggestions involving principal orthogonal modes and adaptive optical modulators.

In this talk I will elaborate on the topic of overcoming these snags by emulating a multimode waveguide with identical group velocities of different modes and no quadratic dispersion. In particular, I will show that breaking the translation invariance through weak scattering in waveguides/optical fibers, can compensate both for quadratic dispersion at any predetermined order k of Taylor expansion and cancel the discrepancy in group velocities. The proposed technique is based on previously developed ideas for implementing quantum control over compact semigroups but it also goes one step further, by incorporating and treating weak non-unitary effects (up to second order) arising in the non-ideal scenario. In practice, the method requires scatterers able to couple different modes and carefully designed dispersion laws giving a null average quadratic dispersion in the spectral vicinity of the operational frequency.

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