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Book of Abstracts

Editors
Suzana Petrović, Goran Gligorić and Milutin Stepić

Belgrade, 2015.

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On localized modes in nonlinear binary kagome ribbons

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One of the attractive two-dimensional [2D] lattice configurations is characterized by kagome geometry. The specific arrangement of its elements, i.e. waveguides, in the form of periodic hexagons renders completely flat the first energy band in linear case. As a consequence, the localized ring-like eigenmodes belonging to the lowest energy state propagate without diffraction through the system [1, 2]. Here we study kagome ribbon [3], which can be interpreted as one-dimensional counterpart of the standard 2D kagome lattice, and can be fabricated by dint of the direct femtosecond laser inscription [4, 5].

The existence, stability and dynamical properties of various localized modes in binary kagome ribbon with defocusing Kerr type of nonlinearity have been explored, both numerically and analytically. We derived the corresponding dispersion relation and the bandgap spectrum, confirmed the opening of mini-gaps in it and found several types of stable ring-like modes to exist: staggered, unstaggered and vortex. Beside these nonlinear mode configurations occurring in a semi-infinite gap, we investigated features of "hourglass" solutions, identified in [3] as interesting structures when kagome lattice dimensionality is reduced to 1D. In nonlinear binary kagome ribbon dynamically stable propagation of unstaggered rings, vortex modes with certain topological charge and hourglass solutions are observed, while the staggered ring solutions are destabilized. In addition, we examined possibility to generate stable propagating solitary modes inside the first mini-gap and found that these mode patterns localize within sites mutually coupled by smaller coupling constant. The last feature is opposite to the nonlinear localized solutions found in the semi-infinite gap.

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