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Stationary Nonlinear Schrödinger Equation on Simplest Graphs: Boundary conditions and exact solutions

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We treat the stationary (cubic) nonlinear Schr\"odinger equation (NSLE) on simplest graphs. Formulation of the problem and exact analytical solutions of NLSE are presented for star graphs consisting of three bonds. It is shown that the method can be extended for the case of arbitrary number of bonds of star graphs and for other simplest topologies such as tree and loop graphs. The case of repulsive and attractive nonlinearities are treated separately.

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