Saturable impurity in an optical array: Green function approach

Molina, Mario I.

 We examine a one-dimensional linear waveguide array containing a single saturable waveguide. By using the formalism of lattice Green functions, we compute in closed form the localized mode and the transmission across the impurity in closed form. For the single saturable impurity in the bulk, we find that an impurity state is always possible, independent of the impurity strength. For the surface saturable impurity case, a minimum nonlinearity strength is necessary to create a bound state. The transmission coefficient across the impurity shows a sublinear behavior with an absence of any resonance. The dynamical self-trapping at the bulk impurity site shows no self-trapping transition, and it resembles the behavior of a weak linear impurity. For the surface impurity, however, there is a self-trapping transition at a critical nonlinearity value. The asymptotic propagation of the optical power shows a ballistic character in both cases, with a speed that dec