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Light propagation and Anderson localization in superlattices containing metamaterials: effects of correlated disorder RAIMUNDO ROCHA DOS SANTOS, Universidade Federal do Rio de Janeiro, DMITRI MOGILEVTSEV, Institute of Physics, NASB, FELIPE PINHEIRO, Universidade Federal do Rio de Janeiro, SOLANGE CAVALCANTI, Universidade Federal de Alagoas, LUIZ OLIVEIRA, UNICAMP — We discuss the effect of correlated disorder on light propagation and Anderson localization in a one-dimensional superlattice made up of air (A) and a dispersive metamaterial (M). Disorder is incorporated by assuming the layer widths to be random variables; however, here we consider the cases of correlated (i.e., the A and M layers with the same width) and completely anticorrelated (the total width of the A and M layers is fixed). We use transfer matrix techniques to obtain the localization length, and compare with the uncorrelated case. We have found that the photonic gaps of the corresponding periodic structure are not completely destroyed in the presence of disorder, giving rise to minima in the localization length. Near a gap, the behavior the localization length depends crucially on the physical origin of the gap (Bragg or non-Bragg gaps). We have found that the asymptotic behavior for the localization length $\xi \propto \lambda^6$ for disordered metamaterials is not affected by correlations, and the Brewster anomalies, at which light is delocalized, are also present.

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