Nonlinear waves emitting resonant radiation: new scenarios

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Abstract:

Perturbed solitons are well-known to emit Cherenkov-like radiation owing to a mechanism of resonance with linear waves. Many recent experimental results have widened this area considerably, showing the possibility to extend radiative phenomena in several directions involving, e.g. new spectral regions (far in the normal dispersion regime but even involving the anomalous dispersion regime) in fibers [1], novel arrangements such as second-harmonic generation [2] or semiconductor photonic crystal waveguides [3], or new paradigms such as the negative-frequency resonant radiation [4]. Inspired by these results, we discuss what we found to be the most interesting aspects of the theory behind these new scenarios, showing in particular that the radiative emission does not require a soliton but only two coexisting mechanisms, namely a considerable spectral broadening and a definite velocity of the wave-packet. As such, resonant radiation can efficiently occurs also for dispersive shock waves [5] with a variety of possible interesting scenarios.

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