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Predicting superluminality using Einstein causality DAVID ROUNDY, Cornell University, ELEFTERIOS LIDORIKIS, MIHAI IBANESCU, JOHN D. JOANNOPOULOS, Massachusetts Institute of Technology — We will show that in any system having population inversion and a sufficiently small spontaneous decay rate there exists soliton solutions having superluminal velocities. The existence of these solitons can be proven using Einstein causality in any system where there is gain and a loss mechanism, provided spontaneous emission may be neglected. The shape of these solitons depends on the details of the electronic system, but their existence does not. Although coupling to this soliton by pulses outside the gain material does not appear to be possible, we propose that superluminal pulses may be observed by setting up a “seed field” in the system prior to introducing the population inversion.

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