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Coherent optical photons from shock waves in polarizable crystals
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We predict that coherent electromagnetic radiation can be generated in polarizable crystalline materials when subject to a shock wave or soliton-like propagating excitation. To our knowledge, this phenomenon represents a new source of coherent optical radiation source in the 1-100 THz frequency range that is distinct from lasers and free-electron lasers. The radiation is generated by the synchronized motion of large numbers of atoms when a shock wave propagates through a crystal. Analytical theory, finite-difference time-domain simulations of Maxwell's equations, and molecular dynamics simulations demonstrate coherence lengths on the order of mm (at 16 THz) and potentially greater.

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