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Quench-induced correlation waves, and quantum grenades JOHN CORSON, JOHN BOHN, JILA, NIST, and the University of Colorado — We investigate the wave packet dynamics of a pair of particles that undergoes a rapid change of scattering length. Such quenches have recently become experimentally feasible with fast magnetic-field ramps and optical switching in the vicinity of a Feshbach resonance. The short-range interactions are modelled in the zero-range limit, where the quench is accomplished by switching the boundary condition of the wave function at vanishing particle separation. This generates a correlation wave that propagates rapidly to nonzero particle separations. We have derived universal, analytic results for this process that lead to a simple phase-space picture of quench-induced scattering. Intuitively, the strength of the correlation wave relates to the initial contact of the system. A natural consequence is that the waves are significant when the quench dissociates, at least partially, a bound state. These waves can propagate with high energy from one lattice site to another, potentially triggering highly non-equilibrium dynamics.

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