

# Dark Matter and Stars: Multi-Messenger Probes of Dark Matter and Modified Gravity

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## Finding Exotic Particles in Fireballs

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Compact transients such as supernovae and binary neutron star mergers can produce enormous fluxes of exotic particles. One way to look for them is through fireballs, a dense expanding photon electron plasma formed when exotic particles escaping a compact source quickly decay to Standard Model particles. Fireballs produce a unique signal, allowing us to observe new parts of dark photon and axion parameter space. Fireball formation changes previously predicted signals from axions emitted by SN 1987a, and may generate new constraints on axions with masses between 1 MeV and 1 GeV based off of observations of the neutron star merger GW 170817.

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