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Finding Exotic Particles in Fireballs

Compact transients such as supernova 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 the standard model. Fireballs produce a unique signal, allowing us to observe new parts of dark photon and axion parameter space. Fireballs from the neutron star merger GW170817 can produce new constraints on axions with masses between 1 MeV and 1 GeV, while a fireball from SN1987a opens up previously ruled out parameter space.