

Dark U(1) sector with concrete gravitational wave signals

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U(1) dark sectors accommodating viable dark matter candidate(s) will be discussed, including the evolution of dark particles, interplay between multiple hidden sectors, possible extended neutrino sectors, and gravitational wave generations. When the additional U(1) symmetry undergoes spontaneous breaking, the dark sector often exhibits a characteristic phase transition pattern capable of producing detectable gravitational wave signals. A gauge-invariant formulation of the dark Higgs associated with the phase transition will be discussed in detail.

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