

Leptophilic dark matter from gauged lepton number: Phenomenology and gravitational wave signatures

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In this work, we consider a model in which the SM gauge group is extended by a lepton number $U(1)_L$. The arising gauge anomalies are canceled by adding two sets of SM vector-like leptons. We further add a scalar field that spontaneously breaks $U(1)_L$. An accidental global symmetry ensures the stability of the lightest additional lepton, thus providing a dark matter candidate. We investigate current and future constraints on the model from collider searches as well as dark matter experiments. We further study the EWSB and $U(1)_L$ breaking phase transitions, particularly focusing on the potential for generating gravitational wave signatures that are accessible to GW interferometry as a complementary way to probe the model.

Primary authors: Mr MADGE, Eric (Johannes Gutenberg University Mainz); SCHWALLER, Pedro Klaus (Mainz University)

Presenter: Mr MADGE, Eric (Johannes Gutenberg University Mainz)

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