

## Gauged Lepton Number and Cosmic-ray Boosted Dark Matter for the XENON1T Excess

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The recently reported excess in XENON1T is explained by two scenarios with and without a dark matter interaction with the gauged lepton number,  $U(1)_{L_e-L_i}$ ,  $i = \mu$  or  $\tau$ . In Scenario#1, the gauge boson provides non-standard interaction between solar neutrino and electron that enhances the number of electron recoil events in the XENON1T detector. In Scenario#2 with the gauge coupling to dark matter, dark matter can be boosted by cosmic electrons and generate electron recoil energy up to  $\mathcal{O}(keV)$  to explain the XENON1T result. The dark matter, aided by the new gauge interaction, could heat up a neutron star more than 1500 K as a neutron star captures the halo dark matter. Therefore, we propose to utilize the future infrared telescope to te

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