

# Conecting the Inverse Seesaw Mechanism to a Symmetry Breakdown with Axion Like Particles

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We present a model in which the breakdown of a global  $U(1)$  symmetry, leading to a axion like particle, trigger the inverse seesaw mechanism. The mass scale parameters required in such a mechanism are generated through gravity induced nonrenormalizable operators and the vacuum expectation value of a scalar field hosting the axion like particle, which may be behind physical phenomena like the Universe transparency to ultra-energetic photons, the soft  $\gamma$ -ray excess from the Coma cluster, and the 3.5 keV line. Strong gravitational effects that destabilize the axion like particle and the inverse seesaw mechanism are shown to be suppressed by anomaly free discrete symmetries.

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