

A 17 MeV pseudoscalar and the LSND, MiniBooNE and ATOMKI anomalies

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In the absence of any new physics signals at the Large Hadron Collider (LHC), anomalous results at low energy experiments have become the subject of increased attention and scrutiny. We focus on three such results from the LSND, MiniBooNE (MB), and ATOMKI experiments. A 17 MeV pseudoscalar mediator (a') can account for the excess events seen in ^8Be and ^4He pair creation transitions in ATOMKI. We incorporate this mediator in a gauge invariant extension of the Standard Model (SM) with a second Higgs doublet and three singlet (seesaw) neutrinos (N_i , $i = 1, 2, 3$). $N_{1,2}$ participate in an interaction in MB and LSND which, with a' as mediator, leads to the production of e^+e^- pairs. The N_i also lead to mass-squared differences for SM neutrinos in agreement with global oscillation data. We first show that such a model offers a clean and natural joint solution to the MB and LSND excesses. We then examine the possibility of a common solution to all three anomalies. Using the values of the couplings to the quarks and electrons which are required to explain pair creation nuclear transition data for ^8Be and ^4He in ATOMKI, we show that these values lead to excellent fits for MB and LSND data as well, allowing for a common solution.

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