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## Implications of X17 boson to \(D\) meson, Charmonium, and \(\phi\) meson decays

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The recent ATOMKI experiments provided evidence pointing towards the existence of an X17 boson in the anomalous nuclear transitions of Beryllium-8, Helium-4, and Carbon-12. The favored ranges for the couplings between the X17 boson and the first-generation quarks, denoted as  $\epsilon_u$  and  $\epsilon_d$ , are determined through fittings to the above nuclear transitions.

In this work, we consider X17 boson contributions to the previously measured D meson decays which include  $D_s^{*+} \to D_s^+ e^+ e^-$ ,  $D_s^{*+} \to D_s^+ \gamma$ ,  $D^{*0} \to D^0 e^+ e^-$ , and  $D^{*0} \to D^0 \gamma$ , as well as the measured decays of  $\psi(2S) \to \eta_c e^+ e^-$ ,  $\psi(2S) \to \eta_c \gamma$ ,  $\phi \to \eta e^+ e^-$ , and  $\phi \to \eta \gamma$ . In addition to the dependence on  $\epsilon_u$ , these decays also depend on X17 boson couplings to the second-generation quarks, denoted as  $\epsilon_c$  and  $\epsilon_s$ . Using the data of the above meson decays, we perform an independent fitting to the coupling parameters  $\epsilon_u$ ,  $\epsilon_c$ , and  $\epsilon_s$  while keeping the X17 boson mass at the best-fit value obtained by ATOMKI experiments. In this fitting, we take the scenario that X17 is a vector boson and treat the couplings  $\epsilon_u$  and  $\epsilon_c$  as independent from each other rather than assuming the generation universality  $\epsilon_u = \epsilon_c$ . It is found that the above fitting renders a huge magnitude for  $\epsilon_u$ , which is in serious tension with  $\epsilon_u$  determined from the ATOMKI measurements of Beryllium-8, Helium-4, and Carbon-12 nuclear transitions. Implications of our findings are discussed.

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