Interpretation of the 17 MeV anomaly in $^8\text{Be}^*$ decay as light, weakly coupled new physics\textsuperscript{1} SUSAN GARDNER, University of Kentucky, JONATHAN FENG, BARTOSZ FORNAL, IFTAH GALON, JORDAN SMOLINSKY, TIM TAIT, University of California, Irvine, PHILIP TANEDO, University of California, Riverside — Recently a 6.8σ anomaly has been reported in the opening angle and invariant mass distributions of $e^+e^−$ pairs produced in $^8\text{Be}$ nuclear transitions (Krasznahorkay et al., PRL 116 (2016) 042501). We find that the data can be explained by a 17 MeV vector gauge boson $X$ that is produced in the decay $^8\text{Be}^* \rightarrow ^8\text{Be}X$, with $X$ decaying through $X \rightarrow e^+e^-$. The $X$ boson mediates a new force with a characteristic range of 12 fm, and it has milli-charged couplings to up and down quarks and electrons, yielding a proton coupling that is suppressed relative to neutrons. We show that such a "protophobic" $X$ boson is compatible with all other experimental constraints in this mass range and discuss how such an object can emerge from fundamental physics. The $X$ boson may also alleviate the current 3.6σ discrepancy between the predicted and measured values of the muon’s anomalous magnetic moment.

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