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Light Scalars and the KOTO Anomaly SAMUEL HOMILLER, YITP, Stony Brook University, DANIEL EGANA-UGRINOVIC, Perimeter Institute for Theoretical Physics, PATRICK MEADE, YITP, Stony Brook University — The KOTO experiment recently presented an excess of events in their search for the rare Standard Model (SM) process $K_L \rightarrow \pi^0 \nu \bar{\nu}$, well above the combined SM signal and background prediction. In this talk, I will show how an excess of events may be explained by weakly-coupled scalar particles produced in Kaon decays that escape KOTO undetected. I will review two concrete realizations: the minimal Higgs portal and a hadrophilic scalar model. Both have regions of parameter space that can explain the observed events while satisfying bounds from other flavor and beam-dump experiments. Hadronic beam-dump experiments provide particularly interesting constraints on light scalar particles, and I will discuss in detail the often underestimated uncertainties associated with these bounds. The simplicity of the models which can explain the excess, and their possible connections to other well known theories of beyond the Standard Model physics, provides strong theoretical motivation for a new physics interpretation of the KOTO data.

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