

X17 discovery potential from $\gamma d \rightarrow e^+e^-pn$ with neutron tagging

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We propose a novel direct search experiment for X17 using the photon-deuteron reaction $\gamma d \rightarrow e^+e^-pn$. X17 is a hypothetical particle conjectured by the ATOMKI collaboration to explain anomalous signals around 17 MeV in excited ^8Be , ^4He and ^{12}C nuclear decays via internal pair creation. It has been subject to a global experimental and theoretical research program. The proposed direct search in $\gamma d \rightarrow e^+e^-pn$ can verify the existence of X17 through the production on a quasi-free neutron, and determine its quantum numbers separate from ongoing and planned nuclear-decay experiments. This is especially timely in view of the theoretical tension between results from the ^{12}C and ^8Be measurements. Using the plane-wave impulse approximation, we quantify the expected signal and background for pseudoscalar, vector and axial-vector X17 scenarios. We optimize the kinematics for the quasi-free neutron region with the upcoming MAGIX experiment at MESA in mind and show that for all three scenarios the X17 signal is clearly visible above the QED background.

Parallel Session

Poster Session

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