

Searching a dark photon with HADES

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Collaboration

HADES

Abstract content

The existence of a photon-like massive particle, the γ' or dark photon, is postulated in several extensions of the Standard Model. These models are often advocated to explain some recent puzzling astrophysical observations, as well as to solve the so far unexplained deviation between the measured and calculated values of the muon anomaly. The dark photon, unlike conventional photon, would have mass and would be detectable via its mixing with the latter. We present a search for the e^+e^- decay of such a hypothetical dark photon, also named U vector boson, in inclusive dielectron spectra measured by HADES in the p (3.5 GeV) $+p$, Nb reactions, as well as the Ar (1.756 GeV/u) $+KCl$ reaction. An upper limit on the kinetic mixing parameter squared ϵ^2 at 90% CL has been obtained for the mass range $M(U) = 0.02 - 0.55 \text{ GeV}/c^2$ and is compared with the present world data set. For masses $0.03 - 0.1 \text{ GeV}/c^2$, the limit has been lowered with respect to previous results, allowing to exclude a large part of the parameter region favored by the muon $g - 2$ anomaly. Furthermore, an improved upper limit of $2.3 \cdot 10^{-6}$ at 90 % CL on the branching ratio has been set on the branching ratio of the helicity-suppressed direct decay of the η meson, $\eta \rightarrow e^+e^-$.

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