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Search for a low mass dark photon decaying to an electron-positron pair with the Belle II detector

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During the past few decades, many astronomical and cosmological studies provided strong evidence for the existence of dark matter.

Though, to this day, we do not have any hint about what dark matter is, which motivates taking any opportunity to probe this question.

One possible solution is to extend the Standard Model with a new U(1) gauge group.

This introduces a new mediator: a light boson, usually associated with a dark photon A' , that couples to the Standard Model kinetically.

On top of that, the ATOMKI collaboration has recently observed an anomaly [Phys. Rev. Lett. 116, 052501 (2016)] that might be explained by a 17 MeV dark photon.

For these reasons, we search for a low mass dark photon decaying to an electron and positron using the 387 fb⁻¹ of 10.58 GeV centre-of-mass data collected with the Belle II detector at the SuperKEKB e^+e^- collider. We probe $e^+e^- \rightarrow \gamma_{ISR}[A' \rightarrow e^+e^-]$ visible decays in a mass range from 10 MeV up to 200 MeV.

We present new preliminary results that set a 90% CL upper limit on the kinetic coupling of the dark photon, and give the first results of a search in e^+e^- collisions in the region below 20 MeV, a region also sensitive to the ATOMKI anomaly.

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Keyword-2

High energy physics

Keyword-3

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