

DM search at Belle II

We propose a new “disappearing positron track” channel at Belle II to search for dark matter, in which a positron that is produced at the primary interaction vertex scatters with the electromagnetic calorimeter to produce dark matter particles. Such scatterings can occur via either annihilation with atomic electrons, or the bremsstrahlung process with target nuclei. The main backgrounds are due to photons and neutrons that are produced in the same scatterings and then escape detection. We require a large missing energy and further veto certain activities in the KLM detector to suppress such backgrounds. To illustrate the sensitivity of the new channel, we consider a new physics model where dark matter interacts with the standard model via a dark photon, which decays predominantly to dark matter; we find that our proposed channel can probe some currently unexplored parameter space, surpassing both the mono-photon channel at Belle II and the NA64 constraints.

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