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Dark photon searches with accelerators

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Abstract content

The cosmological standard model assumes that a large fraction of the universe is made of dark matter while only a small fraction of matter is made of ordinary baryonic matter. Up to now, the nature of dark matter is unknown, and this is certainly one of the most pressing puzzles of today's physics. Dark matter interacts in cosmology only via gravitation with ordinary matter. In particle physics, however, one assumes that for a possible particle candidate at least a very weak interaction with ordinary matter remains, calling such a candidate a "weakly interacting massive particle" (WIMP). A particle physics candidate would appear naturally e.g. if one demands R-parity in Super-symmetry. Most experiments therefor concentrate on the direct detection of the so called "lightest super-symmetric particle'" as the WIMP. A more general approach however was suggested by different authors (e.g. Arkani-Hamed et al.), explaining a series of puzzling phenomena like e.g. the DAMA/LIBRA modulation and the positron excess recently confirmed by the newest AMS results by a U(1) gauge boson of the dark matter sector which mixes with the photon. Besides Super-symmetry, nearly all well motivated extensions of the standard model, e.g. string theories, introduce an additional gauge boson, since large symmetries have to be broken and U(1) bosons provide the lowest-rank local symmetries. Such gauge bosons would have naturally a mass in the range of 1 GeV, making this accessible to existing accelerators, however with very small coupling. In this talk an overview of the existing and planed experimental searches for dark photons at accelerators will be presented.

Primary author(s) : MERKEL, Harald (University of Mainz)

Presenter(s) : MERKEL, Harald (University of Mainz)

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