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Search for the Dark Photon with the PADME experiment at LNF

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Massive photon-like particles are predicted in many extensions of the Standard Model with a hidden sector where dark matter is secluded. They are vector bosons mediating the interaction between dark matter particles and can be produced in scattering of ordinary particles through a faint mixing to the photon. Most of the present experimental constraints on this "dark photon"(A') rely on the hypothesis of dominant decays to lepton pairs. The PADME experiment will search for the e+e−→γA'process in a positron-on-target experiment, assuming a decay of the A'into invisible particles of the hidden sector. The positron beam of the DAΦNE Beam-Test Facility, at Laboratori Nazionali di Frascati of INFN, will be used. A fine-grained, high-resolution calorimeter will measure the momentum of the photon in events with no other activity in the detector, thus allowing to measure the A'mass as the missing mass in the final state.

In about one year of data taking, a sensitivity on the interaction strength (ε^2 parameter) down to 10^{-6} is achievable in the mass region $M_{A'}<23.7$ MeV.

The experiment is currently under construction and it is planned to take data in 2018. The status of PADME and its physics potential will be reviewed.

Summary

The PADME experiment, currently under construction, is planned to take data in 2018 and to search for the production of a Dark Photon, gauge boson of a U(1) symmetry of a hidden sector, using the positron beam of the BTF at the Laboratori Nazionali INFN of Frascati.
PADME for the first time will derive constraints on the parameters of the model in the almost unexplored scenario of invisible decays of the dark photon. The status and potential of the experiment will be reviewed.

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