Service de Physique Nucléaire

Séminaire

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CEA Saclay, Orme des Merisiers, Bât. 703, Salle 135

Search for the dark matter gauge boson with the Mainz Microtron

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The cosmological standard model (ΛCDM) assumes that a large fraction of the universe is made of dark matter while only a small fraction of matter is expected to consist 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 this candidate a "weakly interacting massive particle" (WIMP).
A particle physics candidate would appear natural if one demands R-parity in Supersymmetry. Most experiments therefore concentrate on the direct detection of the so called "lightest supersymmetric particle" as the WIMP. A more general approach however was suggested by Arkani-Hamed et al. [1], explaining a series of phenomena like e.g. the DAMA/Libra modulation and the positron excess detected by several cosmic ray experiments by a U(1) gauge boson of the dark matter sector, which mixes with the photon. Such a gauge boson 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 a test experiment for the search for this gauge boson at the Mainz Microtron (MAMI) will be presented, using the experimental methods developed by Bjorken et al. [2]. It will be shown, that the high luminosity of a high current continuous wave electron accelerator in combination with the high resolution of magnetic spectrometers provides a unique tool to extend possible exclusion limits for a dark matter gauge boson by several orders of magnitude.
[1] N. Arkani-Hamed, *et al.*, Phys. Rev. D 79 (2009) 015014
[2] J. D. Bjorken, *et al.*, Phys. Rev. D 80, 075018 (2009)

Le café sera servi 10 minutes avant

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