



Contribution ID: 39

Type: **not specified**

Spin-dependent WIMP-nucleus elastic scattering simplified

Wednesday 1 June 2011 16:30 (15 minutes)

Today a massive experimental effort is addressed towards the direct detection of weakly interacting massive particles (WIMP), that should form the dark matter halo of our galaxy, through elastic scattering with nuclei in underground detectors.

We discuss a suitably normalized form of the isospin momentum dependent structure functions entering in the spin-dependent elastic neutralino-nucleus cross section.

We compare these functions with the commonly used ones and discuss their advantages: in particular, these allow in the spin-dependent cross section to factorize the particle physics degrees of freedom from the momentum transfer dependent nuclear structure functions as it happens in the spin-independent cross section with the nuclear form factor.

As an application we propose a scheme that allows to analytically determine the three elementary cross sections and connect the solutions to the relative sign between the proton and the neutron spin scattering amplitudes once the measurements of total event rate from three appropriate targets become available.

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Session Classification: P11 –DARK MATTER