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KLOE/KLOE-2 results and perspectives on dark force search

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During the last years several Dark Sector Models have been proposed in order to address striking astrophysical observations which fail standard intepretations.
In the minimal case a new vector particle, the so called dark photon (U or A' boson), is introduced, with small coupling with Standard Model particles. Also, the existence of a dark Higgs boson h' is postulated, in analogy with the Standard Model, to give mass to the dark photon through the Spontaneous Symmetry Breaking mechanism.

The experiment KLOE, which collected 2.5 fb-1 of integrated luminosity at the Dafne e+e- collider in Frascati, searched for the existence of the dark photon in a quite complete way, investigating three different processes and six different final states:

- in dalitz decays of the Phi meson Phi-> eta U, with U->e+e- and eta-> pi+pi-pi0 and p0p0p0
- in e+e- -> U gamma events, with U decaying to electron, muon and pion pairs
- in the dark Higgsstrahlung process, e+e- -> Uh', U-> mu+mu-, h' invisible.

Tight limits on the model parameters have been set at 90%CL.

A new beam crossing scheme, allowing
for a reduced beam size and increased luminosity, is now operating at DAFNE.
The upgraded detector, named KLOE-2, has already collected 3.5 fb-1 in these
new operating conditions.

Further improvements are expected in terms of sensitivity and discovery potential with KLOE-2, both because of the larger available integrated luminosity and the presence of a new tracking detector in the interaction region, with better momentum and vertex position measurement resolutions.
A single photon trigger is now in operation and will allow the search of the dark photon through its invisible decays in light dark matter particles.

Experimental Collaboration

KLOE-2

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