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Search for Dark Forces with KLOE (15' + 5')

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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 interpretations.

In the minimal case a new vector particle, the so called dark photon or U-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 U-boson through the Spontaneous Symmetry Breaking mechanism.

KLOE searched for the existence of the U-boson in a quite complete way, investigating three different processes and six different final states:

- in dalitz decays of the Phi meson $\Phi \rightarrow \eta U$, with $U \rightarrow e^+e^-$ and $\eta \rightarrow \pi^+\pi^-\pi^0$ and $p^0p^0p^0$
- in $e^+e^- \rightarrow U$ gamma events, with U decaying to electron, muon and pion pairs
- in the dark Higgsstrahlung process, $e^+e^- \rightarrow Uh'$, $U \rightarrow \mu^+\mu^-$, h' invisible.

Tight limits on the model parameters have been set at 90%CL. Further improvements are expected in terms of sensitivity and discovery potential with the new KLOE2 detector working on the improved DAFNE e^+e^- collider.

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