

## Recent results from KLOE-2

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The KLOE experiment has collected  $2.5 \text{ fb}^{-1}$  at the  $e^+e^-$  collider DAPHNE. The upgraded detector KLOE-2 has already collected  $3.5 \text{ fb}^{-1}$  with a new beam crossing scheme, allowing for a reduced beam size and increased luminosity. Analysis of KLOE data is still in progress in different sectors.

Precision physics requires appropriate inclusion of higher order effects and the knowledge of very precise input parameters of the electroweak Standard Model. The running of the QED coupling constant  $\alpha$  in the time-like region in the energy range 0.6-0.975 GeV has been measured for the first time using the KLOE detector. The result shows a clear contribution of the  $\rho$ - $\omega$  resonances to the photon propagator with a significance of the hadronic contribution of more than 5 sigmas. For the first time the real and imaginary part of  $\Delta(\alpha(s))$  have been extracted.

A new, precise result on the isospin-violating decay  $\eta \rightarrow \pi^+\pi^-\pi^0$ , aiming to a better determination of the light-quark mass ratio has been published. The analysis determines with very good accuracy the parameters of the decay matrix element, providing an improvement of a factor of two on the statistical uncertainty of all parameters with respect to previous experiments. Smaller systematic uncertainties have been also achieved. The un-binned integrated left-right, quadrant and sextant charge asymmetries have also been measured, providing an accurate test of C parity conservation. The values extracted are consistent with zero at  $10^{-4}$  level, thus improving existent evaluations.

We also searched for the existence of the dark photon in a quite complete way, investigating three different processes and six different final states: (1) dalitz decays of the  $\phi$  meson,  $\phi \rightarrow \eta U$ , with  $U \rightarrow e^+e^-$  and  $\eta \rightarrow \pi^+\pi^-\pi^0$  and  $\pi^0\pi^0\pi^0$ , (2) in  $e^+e^- \rightarrow U\gamma$  events, with U decaying to electron, muon and pion pairs, (3) in the dark Higgsstrahlung process,  $e^+e^- \rightarrow U h'$ ,  $U \rightarrow \mu^+\mu^-$ ,  $h'$  invisible. Tight limits on the model parameters have been set at 90% CL.

Entangled neutral kaon pairs produced at DAPHNE are a unique tool to test discrete symmetries and quantum coherence at the utmost sensitivity, in particular strongly motivating the experimental searches of possible CPT violating effects, which would constitute an unambiguous signal of a New Physics framework. The status of the latest ongoing analyses on KLOE/KLOE-2 data using the most refined analyses tools will be presented and discussed: (i) measurement of the KS semileptonic charge asymmetry and tests of CP and CPT symmetry, (ii) test of Time reversal and CPT in transitions in  $\phi \rightarrow K_S K_L \rightarrow \pi\pi$  decays, (iii) search for the CP violating  $K_S \rightarrow 3\pi^0$  decay.

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