Recent Results from the NA48/2 and NA62 Experiments

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In 2003-2004, the NA48/2 experiment at the CERN SPS collected a large sample of simultaneously recorded K^+ and K^- decays. The main goal of this data taking was the search for direct CP violating charge asymmetries in decays to three pions in the final state. In addition, many other precise studies have been performed on this multipurpose data set, taking advantage of the highly symmetric experimental conditions. In my talk I will present recent results based on these data, including a new precision measurement of the form factors of the semileptonic decays $K^{\pm} \to \pi^0 l^{\pm} \nu$ (K_{l3}, with $l = e, \mu$) as well as form factor and branching ratio measurements in the charged ($K^{\pm} \to \pi^+\pi^- e^{\pm}\nu$) and neutral ($K^{\pm} \to \pi^0\pi^0 e^{\pm}\nu$) K_{e4} modes.

Using the beam line and detector of NA48 in the years 2007-2008, the successor kaon experiment NA62 performed a precison measurement of the ratio of the charged kaon leptonic decay rates $K^{\pm} \to e^{\pm}\nu$ (K_{e2}) and $K^{\pm} \to \mu^{\pm}\nu$ ($K_{\mu 2}$). With ∼150000 decays of the strongly helicity-suppressed electronic channel, the NA62 experiment has increased the corresponding world sample by an order of magnitude. The total uncertainty on this ratio is only 0.4 %, representing a precision test of $\mu - e$ lepton universality. The analysis strategy will be presented with a final result based on the whole data set.

In its next phase, the NA62 experiment aims to record ∼100 events of the ultra rare decay $K^+ \to \pi^+ \nu\overline{\nu}$, one of the golden channels in the kaon sector, and to measure its branching ratio with 10% precision with a signal to background ratio of 10:1. While this decay is largely suppressed in the SM due to a power-like GIM mechanism, it can be predicted very precisely by theory (branching ratio $(7.8 \pm 0.8) \times 10^{-11}$), leading to a uniquely high sensitivity to contributions from new physics. In addition, it provides a precise measurement of the CKM matrix element $|V_{td}|$. I will briefly discuss the demanding key elements of the experiment, e.g. the necessity for a hermetic photon veto, and a muon suppression of 10^{11}. A first pilot run is scheduled for the end of 2012, the main data taking will start in 2014 after the LHC shutdown.

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