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Study of the rare decay K+- –> pi+- gamma gamma and high precision measurement of the form factors of the semileptonic decays K+- to pi0 l+- nu

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A sample of about 300 K+- to pi+- gamma gamma rare decays with a background contamination below 10% has been collected by the NA48/2 and NA62 experiments at CERN during low intensity runs with minimum bias trigger configuration. The presented measurements of the decay spectrum and rate provide a crucial test of the Chiral Perturbation Theory (ChPT) describing weak low energy processes.
Semileptonic kaon decays offer the most precise determination of the CKM matrix element |Vus|. The experimental precision is however limited by the knowledge of the form factors of this decay, since these enter both the phase space integral and the detector acceptances.
The NA48/2 experiment presents new measurements of the form factors of the semileptonic decays of charged kaons, based on 4.3 million Ke3 and 3.5 million Kmu3 decays, both with negligible background. The result matches the precision of the current world average on the vector and scalar form factors and allows to significantly reduce the form factor uncertainty on |Vus|. In addition, the comparison of both channels sets tight constraints on lepton flavor violation and other possible new physics.

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