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KLOE measurement of form factor slopes for K_L to pi l nu decays.

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Semileptonic kaon decays offer possibly the cleanest way to obtain an accurate value of the Cabibbo angle, or better, V_{us}. At present, the largest uncertainty in calculating V_{us} from the decay rate, is due to the difficulties in computing the matrix element of the $K \to \pi$ transition. The matrix element of $K_L \to \pi\mu\nu$ decay is expressed in terms of kaon and pion four-momenta, P and p respectively, and using form factors $f_+(t)$ and $f_0(t)$, where $t = (P-p)^2$. It is customary to expand the scalar form factor $f_0(t)$ in powers of t as $f_0(t) = f_+(0)\left[1 + \lambda_0' t/m^2 + ..\right]$, where m is the mass of the carged pion, and only the linear term is retained. The form factor at zero momentum transfer, $f_+(0)$, is evaluated from theory, while the form factor slope, λ_0', has to be determined experimentally from $K_L \to \pi\mu\nu$ decay spectra.

The best sensitivity to λ_0' is achieved in KLOE by using the neutrino energy spectrum. Such a measurement is possible because of the tagging technique, consisting of identifying K_L decays through the selection of $K_S \to \pi^+\pi^-$ decay near the e^+e^- interaction point. This strategy allows to measure K_L momentum with good precision. We present the results of this analysis, based on 330 pb^{-1} of data acquired during years 2001 and 2002.

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