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Measuring KS and KL lifetimes at KLOE

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A phi-factory offers the possibility to select pure kaon beams: neutral kaons from $\phi \rightarrow K_S K_L$ are in fact produced in pairs and the detection of a K_S (K_L) tags the presence of a K_L (K_S). This allows to perform precise measurement of kaon properties. We are presently finalizing new determinations of the K_L and K_S lifetimes using the whole KLOE data set, consisting of more than 109 $\phi \rightarrow K_S K_L$ decays. Both determinations benefit from a precise knowledge of kaon momenta. The K_L lifetime, which has been already measured by KLOE with 0.6% accuracy using 20% of the total data sample (PLB 626, 2005, 15), will be extracted from the proper time distribution of $K_L \rightarrow 3\pi^0$ decays, tagged by a $K_S \rightarrow \pi^+\pi^-$ decay on the opposite hemisphere of the apparatus. A competitive measurement of the K_S lifetime is obtained from the proper time distribution of $K_S \rightarrow \pi^+\pi^-$ decays.

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