Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Search for the Rare Decay $K_L \to \pi^0\pi^0\mu^+\mu^-$ DAVID G. PHILLIPS II, University of Virginia, KTEV COLLABORATION — Using data collected by the KTeV Experiment at Fermi National Accelerator Laboratory in Batavia, Illinois, this study will be the first experimental analysis of $K_L \to \pi^0\pi^0\mu^+\mu^-$. Although this decay mode is possible within the Standard Model, it is limited to a very narrow band of phase space. The HyperCP Experiment has recently observed three $\Sigma^+ \to p\mu^+\mu^-$ events within a narrow dimuon mass range of 213.8 MeV/c^2 to 214.8 MeV/c^2. This suggests that the process could occur via a neutral intermediary particle, $\Sigma^+ \to pX^0 \to p\mu^+\mu^-$, with an X^0 mass of 214.3 MeV/$c^2$$\pm$0.5 MeV/$c^2$. Since the X^0 has a light mass and a low interaction probability, then it is most likely a new neutral boson that exists beyond the Standard Model. Recent theoretical predictions suggest that the decay mode $K_L \to \pi^0\pi^0\mu^+\mu^-$ can also occur via the aforementioned neutral boson: $K_L \to \pi^0\pi^0X^0 \to \pi^0\pi^0\mu^+\mu^-$. Therefore, in addition to a Standard Model measurement, the search for $K_L \to \pi^0\pi^0\mu^+\mu^-$ is also carried out in an effort to address the viability of X^0 in explaining the HyperCP phenomena.

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Date submitted: 06 Jan 2009 Electronic form version 1.4