

Abstract Submitted  
for the SES08 Meeting of  
The American Physical Society

Sorting Category: 6. (E)

**Search For the Rare Decay  $K_L \rightarrow \pi^0\pi^0\mu^+\mu^-$**  DAVID PHILLIPS, University of Virginia, KTeV COLLABORATION<sup>1</sup> — Using data collected by the KTeV Experiment at Fermi National Accelerator Laboratory in Batavia, Illinois, this study will be the first experimental analysis of  $K_L \rightarrow \pi^0\pi^0\mu^+\mu^-$ . 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  $\Sigma^+ \rightarrow p\mu^+\mu^-$  events within a narrow dimuon mass range of 213.8 MeV/ $c^2$  to 214.8 MeV/ $c^2$ . This suggests that the process occurs via a neutral intermediary particle,  $\Sigma^+ \rightarrow pX^0 \rightarrow p\mu^+\mu^-$ , 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 not feasible within the Standard Model. However, the  $X^0$  could be explained by a theory known as the “Next-to-Minimal Supersymmetric Standard Model” (NMSSM). In NMSSM, there are seven Higgs bosons and theorists believe that the  $X^0$  may be the lightest of this group. Recent theoretical predictions suggest that the decay mode  $K_L \rightarrow \pi^0\pi^0\mu^+\mu^-$  can also occur via the aforementioned neutral intermediary particle:  $K_L \rightarrow \pi^0\pi^0X^0 \rightarrow \pi^0\pi^0\mu^+\mu^-$ . Therefore, in addition to a Standard Model measurement, the search for  $K_L \rightarrow \pi^0\pi^0\mu^+\mu^-$  is also carried out in an effort to address the viability of  $X^0$  in explaining the HyperCP phenomena.

<sup>1</sup>for the KTeV Collaboration

Prefer Oral Session  
 Prefer Poster Session

David Phillips  
dgp6d@virginia.edu  
University of Virginia

Date submitted: 11 Aug 2008

Electronic form version 1.4