LOI 12-15-001: *Physics opportunities with a secondary* $\mathbf{K_L}$ *beam at JLab*

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This LOI outlines the implementation of a photo-produced K_L beam in Hall D, and its physics application for hyperon spectroscopy. The main physics motivation is to study $K_L N$ scattering, which in reactions such as $K_L N \to K^+ \Xi^{0(*)}$ would offer an entirely new opportunity at Jefferson Lab searching for the elusive excited Ξ baryons and possibly also excited Ω^- baryons. This project follows on the basic concepts of the charged Kaon production at SLAC some 30 years ago that ran experiments at LASS. The successful physics carried out with the charged K beam with the LASS spectrometer should bode well for this JLab initiative put forward in this LOI.

A very large increase in the K meson production yield with respect to the SLAC case is claimed to be possible. If so, there will be very interesting physics in this experiment. In addition, a small neutron contamination in the K_L beam for energies above 2.5 GeV would further enhance the capabilities of the experiment. With all this in place, the improvement over presently available results for the cross sections for $\Xi^{(*)}$ production would be very significantly improved. This is illustrated in Fig. 3. Hhowever it is not clear that other K^+ backgrounds have been fully considered, and this would need to be done in preparation for a full proposal. The possibility of using a polarized target gives an additional advantage over past experiments.

This LOI addresses an interesting experimental development at Jefferson Lab, which could open new opportunities for the study of strange hadrons. In particular, it could significantly impact on the present sparse knowledge of the doubly strange Ξ baryons. It is very likely that other applications of a K_L beam could be envisaged, and thus a detailed study of this development should be encouraged. A full fledged proposal would be the next natural step.