Abstract Submitted
for the SES12 Meeting of
The American Physical Society

Investigating Failed Supernovae and Black Hole-Neutron Star Mergers Using Neutron Signals HALSTON LIM, JASON LIANG, North Carolina School of Science and Mathematics, KATE SCHOLBERG, Duke University — Failed supernovae (fSN) and black hole-neutron star mergers (BHNSM) are unique high energy astrophysical events that can be studied in novel ways through their copious neutrino emissions. Using SNOwGLoBES, we were able to calculate the observed neutrino spectrum of fSN and BHNSM in various detectors, including Super-Kamiokande and LBNE. We analyzed the sensitivity of the observed neutrino spectrum to the source emission parameters and determined how flavor tagging influenced this sensitivity. Our results show that it is possible to discriminate between the average energies of electron and antielectron neutrinos from the observed neutrino signal, which sheds light on nucleosynthesis processes within fSN and BHNSM. We also found that in both the water Cherenkov detector Super-Kamiokande and the proposed liquid argon detector LBNE, the fSN neutronization burst produces a peak in the neutrino event rates after applying directional cuts (for water only) and event tagging, demonstrating the viability of using neutrinos to study the internal processes of fSN. Our assessment of tagging methods and determination of the promise for neutrino detectors for observing fSN and BHNSM will aid physicists in future neutrino astrophysics experiments.

Halston Lim
North Carolina School of Science and Mathematics

Date submitted: 28 Sep 2012 Electronic form version 1.4