# NEUTRINO-NUCLEUS REACTION CROSS SECTIONS FOR NEUTRINO DETECTION AND NUCLEOSYNTHESIS IN SUPERNOVA EXPLOSIONS

Toshio Suzuki[1,3], A. B. Balantekin[2], T. Kajino[3], S. Chiba[4], M. Honma[5]
[1]Department of Physics, College of Humanities and Sciences, Nihon University, Setagaya, Tokyo 156-8550, Japan
[2]Department of Physics, Univeristy of Wisconsin, Madison, Wisconsin 53706, USA
[3]National Astronomical Observatory of Japan, Mitaka, Tokyo 181-8588, Japan
[4]Reaearch Laboratory for Nuclear Reactors, Tokyo Institute of Technology, Meguro, Tokyo 152-8550, Japan
[5]Center for Mathematical Sciences, University of Aizu, Aizu-Wakamatsu, Fukushima 965-8580, Japan

Neutrino-nucleus cross sections relevant to detection of supernova and reactor neutrinos as well as synthesis of elements in supernova explosions are evaluated by shell-model calculations with new shell-model Hamiltonians, which can describe spin degree's of freedom in nuclei very well. The new Hamiltonians, SFO for p-shell, GXPF1J for pf-shell and VMU (monopole-based universal interaction), have proper tensor components in common, which lead to proper shell-evolutions. We can now reproduce experimental ν-induced cross sections available, that is, those of $^{12}$C and $^{56}$Fe, and evaluate the cross sections with sound reliability in various light and medium heavy nuclei. Updated ν-induced cross sections on $^{12}$C, $^{13}$C, $^{16}$O, $^{20}$Ne and $^{40}$Ar are presented. The cross sections on $^{12}$C are applied to study light element synthesis in supernova explosions and neutrino oscillation parameters. Coherent scattering cross sections on $^{12}$C and $^{13}$C are applied to study neutron distributions of the nuclei. The cross sections updated for $^{13}$C, $^{16}$O and $^{40}$Ar, which are powerful targets for neutrino detections, are compared to those obtained before. Cross sections folded over neutrino spectra with and without the oscillation effects are also compared to each other to see how they are sensitive to the oscillation effects.