様式 2 (Form 2)

（2015 年 1 月改定）

滞在型研究員報告書
Activity Report for the NAOJ Visiting Fellows Program

所　　属 (Institution)	Department of Physics, Soongsil University, 369, Sangdo-ro, Dongjak-gu, Seoul 156-743, Republic of Korea (South Korea)
氏　　名 (Name)	Ghil-Seok, Yang (吉錫，梁)
研究課題名 (Research subject)	Neutrino-processes in the Supernova explosion
滞在期間 (Period of stay)	2016 年 2 月 5 日～ 2016 年 2 月 19 日 YYYY MM DD YYYY MM DD
受入責任者氏名 (NAOJ host researcher)	Prof. Dr. Toshitaka Kajino

１．滞在型研究員として国立天文台滞在中に行った活動について簡単にお書きください。
(Summarize your activities during the stay using the NAOJ Visiting Fellows Program.)

We discussed several astrophysical and astronomical projects on the supernovae with Prof. Kajino and his collaborators. The first project is the ν -processes of light elements in SNe, leading to production of ^{7}Li and ^{11}B through ^{4}He$(\nu, \nu\,\mathrm{N})^{3}$H $\rightarrow^{3}$ H$(\alpha, \gamma)^{7}$Li $\rightarrow$ ^{7}Li$(\alpha, \gamma)^{11}$B or ^{4}He$(\nu, \nu\,\mathrm{N})^{3}$He $\rightarrow^{3}$He$(\alpha, \gamma)^{7}$Be$\rightarrow$ ^{7}Be$(\alpha, \gamma)^{11}$C. We discussed the possible roles of sterile neutrinos, too, within the neutrino-nucleus quasi-elastic scatterings comparing the experimental results of MiniBooNE and NOMAD. Also with these results, we discussed about Galactic chemical evolution and time variation of ν -processes light elements so that we improve our numerical code for the nucleosynthesis of heavy proton-rich nuclei on O-Ne-Mg layer of SNe. I made a seminar talk on “neutrino-nucleus quasi-elastic scattering of charged-current exchange processes in the context of MiniBooNE and NOMAD experiments”.

２．今回滞在型研究員として得られた成果について簡単にお書きください。
(Summarize your research products from the stay.)

During the stay, I discussed with Prof. Kajino, Prof. Aoki and Prof. Cheoun (NAOJ Visiting Professor) how to describe precisely the nuclear response function in high-energy neutrino experiments by using more delicate and realistic nuclear structure model than the Fermi gas model in QRPA (Quasi-Particle Random Phase Approximation). We found that realistic model can explain a long standing problem of discrepancy between theory and experiment at E<100-500MeV relevant for the application to supernova ν -process. We started to write a paper for submittal to Phys. Rev. Lett. I improved also the theoretical calculations of neutral-current quasi-elastic scatterings and tried to figure out how to involve the non-standard neutrino interactions as those like electron-muon conversion which violates lepton number conservation.

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３．この制度について何か御意見がありましたら、お書きください。 (Please provide any comments about this program.)
I found this exchange program to be very effective. I learned much about the collaboration that goes into completing a project and writing a paper. I deeply acknowledge Prof. Kajino for his insightful navigation and discussions in our project. I would like to appreciate all members of NAOJ Theory grioup to welcome me with deep kindness and warm hospitality. I thank NAOJ for providing me with this precious opportunity.