滞在型研究員報告書（様式２）　　2013年08月13日

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受け入れ　　氏名：　Prof. T. Kajino
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I. 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。(Your activity during this stay)：

I had the opportunity to work with Prof. Toshitaka Kajino and Dr. Jun Hidaka on the impact of sterile neutrinos on core-collapse supernovae. In addition, my thesis supervisor Professor Mathews is an NAOJ Visiting Professor during my stay and was able to work with us on this project. We have been working to include a matter-enhanced active-sterile neutrino oscillation in the Notre Dame-Lawrence Livermore supernova model code of numerical simulation. A first draft of our paper describing the results of this project was partially completed during my visit.

During my stay, we made progress on this project on several fronts. I was able to explain the current treatment of the neutrino transport calculations in the Notre Dame-Lawrence Livermore code to Prof. Kajino and Dr. Hidaka. This also is beneficial for our extensive collaboration on neutrino-process nucleosynthesis in core-collapse supernovae under way.

We discussed in depth how a sterile neutrino fits into the current treatment of the neutrino transport. It is important to ensure that we were handling the numerical calculation correctly. There are some subtle issues that arose in regards to the thermalization timescale of electron neutrino spectrum in comparison to the hydrodynamic timescale of the code. This led us to reconsider the numerical treatment of sterile neutrinos within the neutrino transport routines.

In addition, we discussed which limits on the mass and mixing angle of the sterile neutrino would be of interest for this project. There are orders of magnitude of parameter space available in mass and mixing angle for the sterile neutrino, with bounds set by recent anomalous reactor results, cosmology, and large-scale structure. We reviewed the results obtained with a sterile neutrinos in the keV mass range that are also dark matter

candidates in order to determine the parameter space of interest for this project.

II. 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。(Your research products from this stay)：

We have written a draft of a paper, entitled “Sterile neutrino oscillations in core-collapse supernova simulations,” which will present the active-sterile neutrino oscillation discussed above and will be submitted for publication once our results are finalized soon. We also plan to present this result in the international conferences, the 12th International Symposium on Origin of Matter and Evolution of Galaxies, Tsukuba in Japan, November 18 - 21 2013, and 27th Texas Symposium on Relativistic Astrophysics, Dallas, Texas in U.S.A., December 8 - 13.

III. この制度についてなにか御意見がありましたら、なんでも記入ください。(Any opinions on this exchange program)：

I found this exchange program to be very fruitful and educational. This was my first opportunity to participate in an international collaboration. I learned much about the collaboration that goes into completing a project and writing a paper. I would like to thank NAOJ for providing me with this precious opportunity. I also acknowledge Prof. Kajino deeply for his insightful navigation and discussions in our project. I really enjoyed discussions with several faculty members, dost docs and graduate students in his group and NAOJ. I hope that this program continues in the future.