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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) :

We worked on several interesting problems with Prof. Kajino together with Prof. Balantekin from Univ. of Wisconsin and Dr. Motohiko Kusakabe from Korea Aerospace University who were also visiting NAOJ at the same time. Below are the most important topics from our joint works:

(1) We discussed the interplay between the neutrino magnetic moment and the CP violation effects in a core collapse supernova where both effects potentially play important roles. We were able to show that CP violating phases can be effectively factored out of the problem by simply redefining the magnetic moments. This observation will considerably simplify the numerical and analytical treatment of neutrino propagation in supernova.

(2) We also discussed the possible effects of heavy sterile neutrino states in the Early Universe which decay to produce non-thermal energetic photons due to their magnetic moment. We showed that these photons affect the Big Bang Nucleosynthesis yields and allow us to significantly limit the parameter region of neutrino mass and magnetic moment from observations of primordial elemental abundances.

(3) We discussed whether collective neutrino flavor oscillations near the core of a core-collapse supernova can affect the neutrino-process nucleosynthesis which is believed to take place in the outer layers. Our conclusion was that collective oscillations must be studied together with the MSW resonances in the outer layers because these two effects will combine to transfer energy from other flavors to electron neutrinos and enhance neutrino-process nucleosynthesis.

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 prepared the initial draft of a paper together with Dr. Kusakabe, Prof Kajino and Prof. Balantekin entitled “A Big-Bang Nucleosynthesis Limit for the Neutrino Magnetic Moment” in which we present our results outlined in the activity topic (2) above. It will soon be submitted for publication. We also finished our calculations regarding the activity topic (1) outlined above and started writing the relevant paper titled “A Consistent Treatment of CP Violation Effects on Neutrino Propagation in Dense Matter.” Following the completion of above mentioned papers, we will proceed to write another paper concerning the activity topic (3).

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) :

We thank NAOJ for providing us the opportunity to come together with active researchers from different fields and discuss the most contemporary problems in Astronomy and Astrophysics in a stimulating atmosphere. In addition to those activities mentioned above, I also found a valuable opportunity to discuss with Prof. Myung-Ki Cheun from Soongsil University who was another short term visitor and we agreed on further collaboration with mutual visits.

In my opinion, the short term visitor program of NAOJ is very effective in promoting collaboration and fruitful discussions. I hope that the program is further expanded and enriched in the future.