

November 29, 2012

Letter of Recommendation for Suprabh PRAKASH

I am writing to you on behalf of Mr. Suprabh PRAKASH who has applied for a post-doctoral position in your group. Suprabh is a Master's-Doctoral dual degree candidate in our department. He did his Master's thesis with me four years ago and is about to complete his doctoral degree under my guidance. His work has been in the field of *Neutrino Physics*.

Below I list some highlights of Suprabh's work.

- During his Master's thesis, Suprabh showed that at very long baseline experiments, the hierarchy- δ_{CP} degeneracy of $P(\nu_\mu \rightarrow \nu_e)$ can easily be resolved because, for each baseline, there is an energy range where $P(\nu_\mu \rightarrow \nu_e)$ for IH is very small for all δ_{CP} .
- He constructed the migration matrices for the suppression of neutral current single π^0 background of $P(\nu_\mu \rightarrow \nu_e)$ using the generator NUANCE and simple kinematic considerations. With these, he could match his results with those obtained using Super-Kamiokande reconstruction software.
- He fully mastered the software GLoBES and used it to study the hierarchy determination capabilities of NO ν A, after the measurement of θ_{13} . He showed that for the favourable combinations (normal hierarchy and δ_{CP} in the lower half plane) and (inverted hierarchy and δ_{CP} in the upper half plane), NO ν A can determine the hierarchy by itself. He also discovered that, for unfavourable combinations, the addition of T2K data provides a fair hierarchy discrimination power.
- He redid the hierarchy discrimination capability of NO ν A when NO ν A collaboration did a reoptimization of their cuts in light of the large measured θ_{13} . He showed that the planned runs of NO ν A and T2K can give a 90% C.L. hint of hierarchy for all values of δ_{CP} . Presently, he is studying the θ_{23} octant discrimination capabilities of these two experiments.

P.T.O.

Suprabh has a keen sense of the various possibilities present in each problem he studies. When I asked him to rederive the expression for $P(\nu_\mu \rightarrow \nu_e)$ in three flavours with matter effect, he did so and then observed that the probability is small for all values of δ_{CP} over a range of energy for IH. Similarly, it was he who realised the importance of the migration matrices in suppressing the neutral current background in the search for $\nu_\mu \rightarrow \nu_e$ oscillations and developed a simple strategy to construct them. In the study of the hierarchy sensitivity of current and near future experiments, Suprabh noticed that T2K has a reasonable hierarchy discrimination capability in the regions unfavourable for NO ν A. After developing an expertise in the use of GLoBES, he is now modifying it to do atmospheric neutrino studies. In our present work on θ_{23} octant discrimination, Suprabh developed a very innovative presentation, which demonstrates the octant sensitivity of the experiments with great clarity. He also came up with a concise but effective way of presenting our results, which is truly remarkable. While working on any problem, Suprabh is constantly thinking of all the possibilities in it and, time and again, has come with a new point of view.

In conclusion, I can say that Suprabh is a very hard working man, devoted to physics. His ability to speak and write English are very good and he can express his ideas very clearly. In speech, he is soft-spoken but in discussions he makes his points with quiet conviction. His presentations are models of clarity. During the course of his research, he has collaborated with a diverse group of students and, with his pleasant demeanour, made all the collaborations successful. At the moment, he is training his junior students in the logic and the use of GLoBES. He will be a great asset to any research group. I strongly recommend him for a post-doctoral position in your group.

Yours Sincerely,

S. Uma Sankar
Professor,
Department of Physics,
I.I.T. Powai, Mumbai 400 076.
uma@phy.iitb.ac.in