

## Activity report

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I participated in the KITP Program “*Particlegenesis*” from June 9th 2014 to July 3rd 2014. The goals I set before coming to the workshop were:

- a) To learn about the latest developments in the fields of electroweak baryogenesis and baryogenesis via leptogenesis as well as developments in the application of the Kadanoff-Baym and density matrix equations to the analysis of the asymmetry generation in these scenarios.
- b) Present my own recent work on the application of Kadanoff-Baym formalism to thermal resonant leptogenesis and the derivation of the improved density matrix equations from first principles.
- c) Discuss the open problems and possible promising directions of the future research.
- d) Meet scientist doing similar research that I had not had the opportunity to meet in person before.
- e) Possibly start a collaboration.

The informal blackboard-style talks have been very helpful in getting the big picture of the actively developing topics in the scenarios of electroweak baryogenesis and baryogenesis via leptogenesis as well as their relation to the experiment.

I have also given a blackboard talk on the role of effective masses and widths in thermal resonant leptogenesis based on my recent work arXiv:1404.5309. The following discussion has helped me to find a more clear way of explaining the effects related to the thermal corrections to the masses and widths as well as the difference in the interpretation of the results related to the freedom of definition of these quantities. I have incorporated elements of this discussion into the text of arXiv:1404.5309 and the updated version of the paper has been accepted for publication in JHEP during my stay at the KITP. The role of the workshop in improving the paper will be acknowledged in the published and updated arXiv versions.

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The friendly atmosphere of the workshop facilitated discussions of the open problems and promising directions of the future research as well as exchange of ideas. In particular I have had interesting and helpful discussions with Vincenzo Cirigliano, Sean Tulin, Pedro Schwaller, Björn Garbrecht, Mikko Laine, Hai-Bo Yu and Eric Zhitnitsky.

Especially the discussions with Vincenzo Cirigliano and Sean Tulin have had an important impact on my current research work which is related to the derivation of improved density matrix equations from first principles as well as the application of the density matrix equations to neutrinos oscillations in supernovae. The details of their recent works that Vincenzo and Sean have kindly explained will likely be very helpful for the projects I am currently working on. The role of the workshop in boosting my research related to the density matrix equations will be acknowledged in the corresponding publications.

All in all, the participation in the KITP program “*Particlegenesis*” has been very interesting and helpful for my research work, as will be acknowledged in the forthcoming publications.