Closure Report

(97)

File Number : EMR/2015/001683

Project Title : Neutrino Mass Ordering, Leptonic CP Violation and Matter-Antimatter Asymmetry

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Total Sanctioned 6,17,100 (INR)

Total Released Amount 6,01,000 (INR)

Start Date of the 20 Jul, 2016

Date of completion: 19 Jul, 2019 (36 months)

Approved Objectives :

- CP violation in neutrino oscillations, neutrino mass hierarchy and the CP phase; Quasi-degenerate neutrino, O, Inverted hierarchy, Majorana neutrinos
- CP Violation, neutrino mass hierarchy and matter effects in the long baseline neutrino experiments
- Sterile neutrinos, CPT test and short baseline neutrino oscillations experiments
- Beyond neutrino oscillations: Non-standard neutrino interactions and Solar magnetic fields
- Connection between the leptogenesis phase and leptonic CP-violating phase
- Relate neutrinos with collider physics; Mass hierarchy and _13 at INO.
- Supersymmetric thermal leptogenesis, Resonant leptogenesis, Soft leptogenesis, Dirac leptogenesis, and Affleck-Dine baryogenesis

Deviation made from original objectives (If Any) :

NO

Ph.D. Produced/ Likely to be : 2

Technical Personnel Trained : 2

Total Expenditure : 6,17,100 (INR)

Concise Research Accomplishment :

Closure Details

Experimental/ Theoretical Investigation carried out

Theoretical works. We have investigated the Leptonic CP violation, neutrino mass ordering and matter-antimatter asymmetry and have completed it very successfully as specified in the outcome of the Project.

Detailed Analysis of result

At the time of the big bang, matter and anti-matter were produced in equal number. Today the present universe has a very tiny amount of anti-matter and mostly of matter only. Our project has helped in understanding better of this asymmetry through the study of neutrino physics.

Conclusions

My Research Team sincerely thanks from the bottom of our hearts to the SERB_DST Staff, in particular to Dr. Nilotpal Ghosh for sanctioning the project and helping us in different ways.

Scope of future work

We shall further study these topics: Neutrino Mass Ordering, Leptonic CP violation and matter-antimatter asymmetry and relate with the CP violation from the quarks sector and inflation and dark matter.

Equipment Details :

Equipment Name	Cost (INR)	Procured	Make & Model	Utilization %	Amount Spent	Date of Procurement
Printer + Other Accessories	36,000	Yes	LASER JET PRO M202 DW; HP DESKJET INK	25	0	02 Mar, 2021
Computer	1,95,000	Yes	DELL TWO PC	20	0	02 Mar, 2021

Plans for utilizing the equipment facilities in

The next batch of PhD students shall be using the PCs and Printers.

Title of the Paper	List of Authors	Journal Details	Month & Year	Volume	Status	DOI No	Impact Factor
3. Non-thermal leptogenesis in quasi-degenerate neutrinos	Ng. K. Francis	International Conference on Emerging Trends in Engineering Science and Management (ESM-17) held at Sphoorty Engineering College, Hyderabad (National)	Mar-2017	Vol. 6, Issue 3 (938-942)	Published		2.83
1. Resonant Leptogenesis in Froggatt-Neilsen Mechanism	Ng. K. Francis	International Journal of Advanced Technology in Engineering and Science (ijates) (National)	Dec-2016	No 04, Issue 12 (400-407)	Published		2.87
2. Relating CKM matric Parametrization and Unitary Triangle (TECHNOVA-2016) organised by Gauhati University & Krishi Sanskriti, New Delhi, India on 22-23, December 2016, pp. 1190-1193	Ng. K. Francis	TECHNOVA-2016) organised by Gauhati University & Krishi Sanskriti, New Delhi, India on 22-23, December 2016 (National)	Dec-2016	Volume 3, Issue 13 (1190-1193)	Published		
The Effects of Majorana Phases in Estimating the Masses of Neutrinos	XXXI International Workshop on High Energy Physics CRITICAL POINTS in the MODERN PARTICLE PHYSICS JULY 5-7, 2017, PROTVINO, RUSSIA	XXXI International Workshop on High Energy Physics CRITICAL POINTS in the MODERN PARTICLE PHYSICS JULY 5-7, 2017, PROTVINO, RUSSIA (National)	Jul-2017	4 (33-45)	Published		

List of Patents filed/ to be filed :

Patent Title	Authors	Patent Type	Country/Agency Name	Patent Status	Application/ Grant No
Not Available					

List of Publications (only from SCI indexed journals) :

Title of the Paper	List of Authors	Journal Details	Month & Year	Volume	Status	DOI No	Impact Factor
4. Validity of Neutrino Mass Models through thermal leptogenesis	Ng. K. Francis	International Journal of Advanced Technology in Engineering and Science (ijates) (National)	Dec-2016	04, Issue 12 (46-54)	Published		5.4
1. CP Violation in different neutrino experiments	Ng. K. Francis	International Journal of Innovative Research in Science, Engineering and Technology (National)	Jul-2017	6 Issue 7 (2501 2506)	Published		6.209
2. Study of Neutrino oscillations at DUNE and LBNO	Ng. K. Francis	International Journal of Innovative Research in Science, Engineering and Technology (National)	Jul-2017	Vol. 6 Issue 7 (1250712 514)	Published		6.209
The Effects of Majorana Phases in Estimating the Masses of Neutrinos Published in International Journal of Modern Physics: Conference Series Vol. 47 (2018) 1860100 (5 pages) Publisher World Scientific Publ. Co. Pte. Ltd DOI: 10.1142 /S201019451860100X	Ng. K. Francis and Ankur Nath	International Journal of Modern Physics: Conference Series (Others)	Jul-2018	Vol. 47 (5)	Published		2.7
3. Constraints of Leptogenesis on the Neutrino Mass Models	Ng. K. Francis International Journal of Innovative Research in Science, Engineering and Technology, ISSN 2347-6710, Vol. 6 Issue 7, July 2017 IF 6.209, pp 12517-12523	nternational Journal of Innovative Research in Science, Engineering and Technology (National)	Jul-2017	6 Issue 7 (1251712 523)	Published		6.209

List of Papers Published in Conference Proceedings, Popular