The Institute of Mathematical Sciences, Chennai

Quarterly Report

July - September 2021

Highlights: research and events

Algebra

A paper titled "Remarks on CCR and CAR flows over closed convex cones" authored by Anbu Arjunan, got accepted for publication in the journal Infinite Dimensional Analysis, Quantum Probability and Related Topics on August 19, 2021.

Algebraic Number Theory

K Srinivas, M Subramani and Usha K Sangale in a recent work showed that all imaginary biquadratic fields and cyclic quartic fields of class number 1 are Euclidean. This has appeared in the Journal Rendiconti del Circolo Matematico di Palermo Series 2 with the title Euclidean algorithm in Galois Quartic Fields.

Astrophysics and Cosmology

In one of his works, titled 'Primordial Standard Clock Models and CMB Residual Anomalies', Dhiraj Kumar Hazra has developed a model of the early Universe that provides a best fit to the latest Cosmic Microwave Background observation data from Planck.

He has released python notebooks in his Git repository named 'simple codes in Cosmology'. He has provided several numerical notebooks that cover broad topics in cosmology. These are helpful in learning Cosmology at the Masters level or in the initial couple of years of PhD. To his knowledge, this is the first effort that attempts to provide open-access resources in numerical cosmology and data analysis at the Masters' and PhD level.

Link: https://gitlab.com/dhirajhazra/simple-codes-in-cosmology

Foundations of Quantum Mechanics

A paper titled "Layers of classicality in the compatibility of measurements" authored by Arindam Mitra was published in Physical Review A on 13 August 2021.
DOI:https://doi.org/10.1103/PhysRevA.104.022206

A paper titled "Information leak and incompatibility of physical context: A modified approach" authored by Arindam Mitra, Gautam Sharma, and Sibasish Ghosh was published in Physical Review A on 29 September 2021. DOI:https://doi.org/10.1103/PhysRevA.104.032225

Non-Perturbative Quantum Field Theory

The paper titled "Bottomonium melting from screening correlators at high temperatures" authored by Sayantan Sharma along with his co-authors P. Petreczky and J.H. Weber was recently published in Physical Review D 104, 054511 on 24th September 2021.

Conferences Organised

Conference on applications of Macdonald polynomials July 19-23, 2021, IISc, Bangalore.

The theory of Macdonald polynomials has remained an active area of research since the 1980s, finding ever newer applications in disparate fields of mathematics and physics.

This conference is devoted to recent advances in this theory, with a focus on its applications to algebraic combinatorics, special functions, probability, representation theory, geometry, and mathematical physics.

Scientific committee:- Arun Ram & K. N. Raghavan.

Organizers :- R. Venkatesh & S. Viswanath

Venue:- Zoom (online)

Modular forms: an online conference in honour of Prof. B. Ramakrishnan's 60th birthday (17th to 19th September 2021)

Prof. Ramakrishnan has made significant contributions in the theory of integral and half-integral weight modular forms, Jacobi forms and Siegel modular forms. The conference highlighted his work in these areas on the occasion of his 60th birthday.

More Details in: https://sites.google.com/view/modularformsconference/home

NBHM - Selection procedures for the national level NBHM Scholarship Schemes (September 2021)

IMSc has been the nodal agency for several years now, responsible for conducting the written test and interviews for the national level NBHM Scholarship Schemes. The written test for the

Doctoral Scholarship Scheme which also doubles up as the screening test for Mathematics PhD / Integrated PhD admissions for various institutions including IMSc, was conducted on 18 August 2021 in about 50 centres across the length and breadth of the country. (This test is usually conducted in the month of January. This year, it was initially scheduled to be held in April, but it suffered an indefinite postponement due to the rise of the second wave of the pandemic.) Out of over 3000 candidates who had registered for the test, 1675 attended, and 88 were shortlisted for the interviews based on their test scores. The interviews were held during 13--15 September (online) by five panels of experts drawn from institutions across the country. The final selection results are awaited.

Conference Participation

Hazra, Dhiraj Kumar

Participated in a School-cum-Workshop on Data Analysis in Cosmology and Astroparticle Physics held at the Technology Innovation Hub, ISI Kolkata, West Bengal, during Aug 23 – Sep 4, 2021. 6 lectures were delivered, including hands-on tutorials, details of which can be found in https://www.isical.ac.in/sites/default/files/TIH.pdf

Mahajan, Meena B.

Speaker at an online Webinar on Aug 31, 2021. Vigyan Prasar, DST is organising a Webinar Series Each-for-Equal to promote women in STEMM. In this series, she gave a talk titled "The Fascinating World of Computational Complexity" on 31 Aug 2021.

Viswanath, Sankaran

Member of Local Organising Committee for the Conference on applications of Macdonald polynomials held at IISc Bangalore (online) during Jul 19 – Jul 23, 2021.

Sharma, Sayantan

Selected for a contributory oral presentation at the 38 th International Symposium on Lattice Field Theory (Lattice 2021) organized by the Massachusetts Institute of Technology, USA, in an online mode, during Jul 26 – Jul 30, 2021.

Honours and Awards

Prof. Saket Saurabh of IMSc was awarded the prestigious Shanti Swarup Bhatnagar Prize for Science and Technology (SSB) in 2021 for his contributions in Mathematical Sciences, by the Council of Scientific and Industrial Research, Government of India.
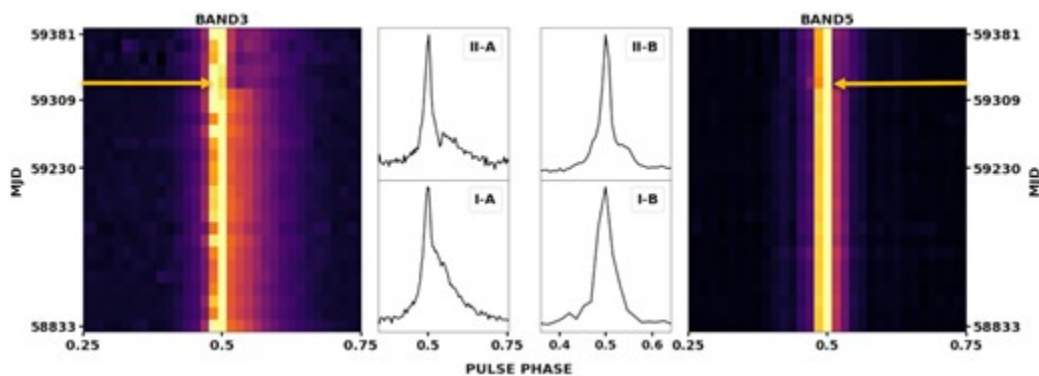
Threads on Twitter

Some of our events / research activities have received wide coverage among the public through our official twitter page. Few of them are listed below:

1. https://twitter.com/IMScChennai/status/1437292070134108161

   Recent observations by a team of astronomers from IMSc including Pratik Tarafdar, Manjari Bagchi, Dhruv Pathak and Arpita Choudhary received media coverage.

   The original article can be found at
   https://academic.oup.com/mnrasl/article/507/1/L57/6356572

2. https://twitter.com/IMScChennai/status/1435821828740567047

    Prof. Sitabhra Sinha (IMSc) spoke on "The Maths of Epidemics" : from the surprising beginning of epidemiological modeling by a British doctor in Indian colonial medical service to the present" in a webinar organised by the Science City, National Council of Science Museums, Ministry of Culture, Government of India.