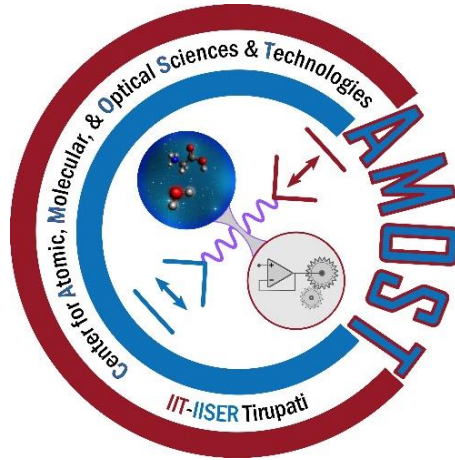


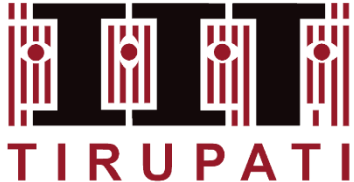
CAMOST Annual Report: 2022 - 2024

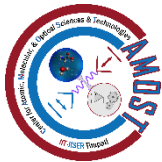


Center for Atomic, Molecular, & Optical Sciences & Technologies (CAMOST)

A JOINT INITIATIVE OF IIT TIRUPATI & IISER TIRUPATI

भारतीय प्रौद्योगिकी संस्थान तिरुपति





About CAMOST

AMO (Atomic, Molecular, and Optical) sciences encompass significant areas of human activities directly impacting life through applications in health, communication, navigation, metrology, space, internet, and quantum technologies. Advances in the field of quantum computing would lead to exciting possibilities in solving problems related to weather modeling, the evolution of our Universe, secure communication, etc.

Tirupati is the only town in India that is home to both an Indian Institute of Technology (IIT) and an Indian Institute of Science Education and Research (IISER). These two institutes started together at Tirupati in 2015 and have leveraged each other's unique strengths by sharing resources and have now come together to establish the Center for Atomic, Molecular, & Optical Sciences & Technologies (CAMOST) to address key challenges in frontier areas of AMO sciences and technologies. Researchers from institutions pan-India would collaborate with each other under the aegis of CAMOST.

CAMOST is India's first such center in a university environment where some of the country's best undergraduate and graduate students interact closely with post-doctoral researchers and distinguished faculty. Close cooperation between scientists and engineers from IIT Tirupati, IISER Tirupati, and also from several other premier institutes in India would come under CAMOST's initiatives. This partnership is already nucleated and the formal inauguration of CAMOST takes place at the hands of Dr. Arabinda Mitra (Scientific Secretary, Office of the Principal Scientific Advisor, Government of India) on August 14th, 2020, on the eve of the 73rd anniversary of India's INDEPENDENCE DAY.

Vision

Inspire tangible solutions to frontier problems in AMO Science and Technologies through innovative research initiatives in basic and applied science domains.

Mission

To advance the field of AMO Sciences and Technologies by:

- Developing innovative solutions to frontier problems of AMO Quantum Science and Technology
- Contributing to solving key problems in atmospheric, space, and biosciences
- Fostering human resources to meet 21st century challenges in AMO quantum Sciences & Technologies

Thrust Areas

- Ultrafast physics: Quantum dynamics on attosecond time scale
- Quantum communication and Quantum technology applications
- Quantum Computation and Quantum Information Theory
- Quantum photonics: Cold plasma applications
- Laboratory astrophysics, Astrochemistry, and Atmospheric Sciences
- Molecular Biophysics
- Quantum Chemistry
- Statistical Mechanics
- High Technology Devices

Administrative Council



K N Satyanarayana
Director, IIT Tirupati



Santanu Bhattacharya
Director, IISER Tirupati

Mentor & Convener



P C Deshmukh
Chair Professor, RV University

Scientific Advisory Council



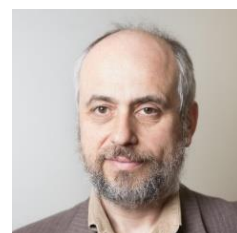
Dilip Angom
PRL, Ahmedabad



E Krishnakumar
RRI, Bangalore



C P Safvan
IUAC, New Delhi



Dmitry Budker
JGU Mainz & UCB



John Costello
Dublin City University



Bhanu Pratap Das
Tokyo Institute of
Technology



S T Manson
Georgia State University



G Ravindrakumar
TIFR, Mumbai



Roland Wester
University of Innsbruck



Jan Michael Rost
MPI for Complex Systems



Peter Bruggeman
University of Minnesota

Core Administrative Members



Arijit Sharma
Program Coordinator,
IIT Tirupati



Sunil Kumar S.
Program Coordinator,
IISER Tirupati



Reetesh Gangwar
HoD, Physics (2022-'24),
IIT Tirupati



Rudrasekhar Manna
HoD, Physics (2024-),
IIT Tirupati



Prasenjit Sen
Chair, Physics,
IISER Tirupati

Principal Investigators

IIT Tirupati



Arijit Sharma



Arun K. Manna



Debasish Mondal



N. N. Murthy



P. C. Deshmukh



Rajib Biswas



Reetesh Gangwar



Swapnil Bhuktare



Jaya Gurugubelli



Vinay Majety



Mamilla Ravi Sankar



Aravinda S.

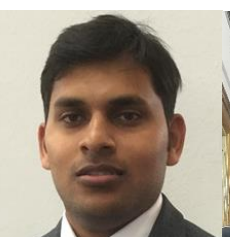
IISER Tirupati



Patmabati Mondal



Raghunath O. R.



Umith Mandal



Sunil Kumar S.



Sudipta Dutta



Tapan Adhyapak



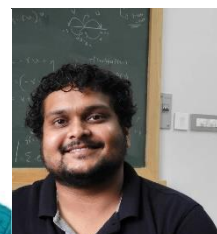
Rakesh Singh



Ravikumar Pujala



Nibedita Pal



Sambuddha Sanyal



Kanagasekaran T



Srabani Kar

Adjunct Members



Dhananjay Nandi
IISER Kolkata



G Aravind
IIT Madras



Koushik Saha
IIT Dharwad



R Hari Varma
IIT Mandi



Jobin Jose
IIT Patna



Rajesh K Kushawaha
PRL, Ahmedabad



S Sivakumar
KREA University



Sivarama Krishnan
IIT Madras



Ramachandra R Yalla
University of Hyderabad



Sankar De
SINP, Kolkata



Sasmita Mohakud
VIT Vellore

Events hosted by CAMOST (August 2022 – July 2024)

A comprehensive overview of CAMOST and its activities is available on the twin websites:

<https://iittp.ac.in/camost>

<http://www.iisertirupati.ac.in/camost>.

In addition to building up several collaborations among its members, CAMOST has organized several events such as seminars and plans to organize some additional events to commemorate its second year of operation.

Second Anniversary Colloquium Series:

To commemorate the nucleation of CAMOST, we conducted the CAMOST SECOND ANNIVERSARY COLLOQUIUM SERIES (10th September 2022 and 1st October 2022). Three eminent scientists working on fundamental atomic and molecular physics delivered lectures.

Speaker	Affiliation	Date	Title of the talk
Prof. Roland Wester	University of Innsbruck	10.09.2022	Controlled interactions of cold trapped negative ions
Prof. Aravind Gopalan	IIT Madras	10.09.2022	Intermolecular coulombic decay in molecules of astrophysical interest
Prof. Jan Michael Rost	MPI for the Physics of Complex Systems, Dresden	01.10.2022	Dynamics of delocalized electrons in strong laser fields

Talks organized:

CAMOST organized one online webinar during (August 2022 – July 2024).

- Dr. Oded Heber, Molecular Physics Lab, Weizmann Institute of Science, Israel, “Many-body interaction with trapped ions”, 15th February 2023

Third Anniversary Colloquium Series:

In observance of the CAMOST’s third anniversary, we curated a CAMOST-G20-S20 consortium seminar series on Disruptive Sciences and Technologies, supported by esteemed institutions such as the Indian National Science Academy (INSA), G20, and S20 groups. This series featured distinguished experts in quantum technology from both national and international academic circles. Hosted by IISER Tirupati and IIT Tirupati, the seminars were held from August 16 to October 27, 2023, incorporating both in-person and hybrid lecture formats. The Indian Association of Physics Teachers (IAPT) collaborated with us as our Outreach Partner. The event concluded with a comprehensive panel discussion on October 28, 2023.

Total No. of invited speakers: Nineteen

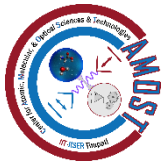
No. of online talks: Ten

No. of in-person talks at IIT Tirupati: Five

No. of in-person talks at IISER Tirupati: Four

Note: In-person talks were in hybrid mode.

The details are available at <https://www.iisertirupati.ac.in/camost/camostcs.php>.



S. No.	Name	Affiliation	Venue	Date/Time (IST)
1	Prof. Arun Pati	Head, Center for Quantum Science and Technology (CQST), IIIT Hyderabad	IIT Tirupati	Aug 16/15:00
2	Prof. Miles Padgett, OBE	Royal Society Research Professor and Kelvin Chair of Natural Philosophy, University of Glasgow	Online	Aug 17/12:00
3	Prof. S. R. Valluri	University of Western Ontario	IIT Tirupati	Aug 18/15:00
4	Prof. Saikat Guha	University of Arizona	Online	Aug 19/17:30
5	Prof. Anil Prabhakar	IIT Madras	IIT Tirupati	Aug 21/15:00
6	Prof. Michel Devoret	Yale University	Online	Aug 21/20:30
7	Prof. Ferdinand Schmidt-Kaler	Johannes Gutenberg-Universität Mainz	Online	Aug 22/15:30
8	Prof. Arul Lakshminarayan	IIT Madras	IISER Tirupati	Aug 24/15:00
9	Dr. Abhishek Chopra	Founder and CEO BosonQ Psi	Online	Aug 28/17:30
10	Dr. S. Aravinda	IIT Tirupati	IISER Tirupati	Aug 31/15:00
S. No.	Name	Affiliation	Venue	Date/Time (IST)
11	Dr. Ranjan Modak	IIT Tirupati	IISER Tirupati	Sep 04/15:00
12	Prof. Robin Santra	Center for Free-Electron Laser Science (CFEL)	Online	Sep 05/17:00
13	Prof. Tjaart Kruger	University of Pretoria	Online	Sep 06/17:30
14	Prof. J.C. Seamus Davis	Cornell University	Online	Sep 07/17:30
15	Dr. Shesha Raghunathan	IBM Quantum	IISER Tirupati	Sep 08/15:30
16	Prof. Klaus Bartschat	Drake University	Online	Sep 11/18:30
17	Prof. Victor Acosta	University of New Mexico	Online	Oct 13/20:30

18	Dr. Sudipta Dutta	IISER Tirupati	IIT Tirupati	Oct 26/15:00
19	Dr. Sambuddha Sanyal	IISER Tirupati	IIT Tirupati	Oct 27/15:00
20	Panel Discussion by distinguished leaders in Quantum Sciences and Technologies	Various institutes	IIT Tirupati	Oct 28/15:00

Panelists for panel discussion:

Professor Achanta Venugopal, Director, NPL, Delhi
 Professor Arvind, IISER Mohali & Vice Chancellor, Punjabi University
 Dr. Utpal Roy, IIT Patna
 Professor Umakant Rapol, IISER Pune
 Professor Urbasi Sinha, RRI, Bengaluru
 Professor R. Vijayaraghavan, TIFR, Mumbai

Publications

In the past two years (August 2022 – July 2024), CAMOST members have published more than 100 peer-reviewed journal articles in renowned international journals and filed one patent.

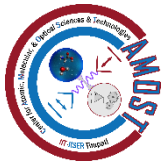
Journal Publications:

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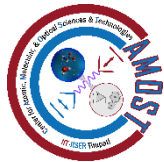
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Patents

1. Chemo-Photo-Plasma Hybrid Advanced Oxidation Process for Ultrafast Removal Of Environmental Pollution; Authors: S. M. Maliyekkal, R. K. Gangwar, S.M. Allabakshi, P. Srikar, A. Kumar, Indian patent, Application number: 202441030958 (IDF submitted).

Sponsored research grants

In the past year (August 2022 – July 2024), CAMOST members have secured several research grants from external funding agencies, amounting to nearly INR 10 crore.



Faculty Name	Project Title	Funding Agency	Project Amount (lakhs in INR)	Duration
Sunil Kumar S.	Photodissociation cross-section measurements of nucleotides to understand the photostability of DNA and RNA building blocks.	DST: Indo Austria (WTZ)	15	2023-2025
	UV photostability of molecular ions in the interstellar medium	ISRO-RESPOND	63	2024-2027
Padmabati Mondal	A Multiscale Study of Photoswitchable Drugs for Optimal Control of G-protein Coupled Receptor	SERB	33	2024-2027
	Unravelling mechanistic details of tryptophan hydroxylation via multiscale computational study	CSIR-EMRII-ASPIRE	27	2024-2027
Mamilla Ravi Sankar	Indigenous Development of Epoxy/Carbon Fiber (CF)/ Carbon Nano Tube (CNT) based Ternary Nano Composite Filament for Composite 3D Printing for Satellite Application	ISRO-RESPOND	30	2024-2026
	Development of UV sensor using CNTs for monitoring combustion in engines	DST	50	2023-2025
	Finishing of Additive manufactured Complex Internal Features	SERB (CRG)	32	2022-2024
	Material and process development for Additive Manufacturing and Post Processing of Tool (ModAMtool)	DST (IGSCT)	185	2022-2024
Raghunath O. Ramabhadran (CO-PI) PI - Dr. Balaraman E.	Divergent catalytic approach to sustainable and affordable synthesis of chiral amines and pharmaceuticals	STARS (DST)	35	2024-2027
Reetesh Gangwar	Development of an atomic processes database using calculation & measurement in Tokamak & Lab plasma	DAE-BRNS	30	2024-2027
Reetesh Gangwar	Development of a novel nonthermal atmospheric	SERB	75	2024-2027

	pressure plasma reactor for the prevention of aflatoxin in food and agriculture products			
Sambuddha Sanyal	Investigations on near and far from equilibrium dynamical properties in quantum matte	DST -SERB	36	2024-27
Jointly with Prof. Prasenjit Sen (IISER TPT)	Quantum computing and quantum materials	'Visvesvaraya PhD Scheme for Electronics and IT: Phase II' Digital India Corporation, MeitY	102	2024-2029
Soumit Sankar Mandal	Investigate the role of biomolecular condensates as protective reservoirs for the treatment of neurodegenerative diseases	DST-SERB	61	2024-2027
	Investigation of liquid-liquid phase separation associated with heat shock protein70 and their role in regulating neurodegenerative disease	DST SERB	46	2024-2027
Aravinda	Computational complexity of dual-unitary operators	DST SERB	13.5	
Ravi Kumar Pujala	Hierarchical Self-Assembly of Colloids: Control and Manipulation from Nano-Granular	DST INSPIRE	39.5	2017-2023
	Tailored microswimmers: tuning dynamics and non-equilibrium phase behavior	DST SERB	48.6	2021-2024
	Hydrodynamic simulations and experiments on dense suspensions and near-surface trapping of flagellated bacteria	DST SERB	42.6	2022-2025
	Cellulose Nanocrystals and Nanoclays: Preparation of Functional Nanocomposites	CNRS, France	20	2022-2024
Jobin Jose	Scattering of electron and positron by bare and engineered atoms: A benchmarking study of effects of relativity, correlation, and confinement	DST SERB	20	2023-2026

	Travel grant to attend 55th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics (DAMOP)	DST SERB	1.4	2024
Hari Varma	Photoionization dynamics of atomic metal clusters and their endofullerenes	DST-SERB	21	2023-2026
		Total	980	

Awards and Recognitions of CAMOST Members

Faculty Name	Award/Recognition
Sunil Kumar S.	Selected as an executive committee member of the Indian Society of Atomic and Molecular Physics (23 rd Feb 2023)
Mamilla Ravi Sankar	Selected as the Associate Editor for the Elsevier Journal "Journal of Manufacturing Processes" (April 2024)
Raghunath O. Ramabhadran	Invitations to American Chemical Society's first ever focused "Organometallic Astrochemistry" symposium (Aug 2022, Chicago), and the 10th year celebratory symposium of the sub-division of Astrochemistry to discuss progress and future prospects (Aug 2023, San Francisco)
Soumit S Mandal	JSPS invitational Fellowship to Gifu University (2024) Travel grant by Biophysical Society USA (2023) Sakura Science Exchange Fellowship by JST (2023)
Ravi Kumar Pujala	Soft Matter Emerging Investigator by RSC Visiting Professor at the University of Paris-Saclay by CNRS Topic Editor for a special issue, "Sustainable Soft Materials: Liquid Crystals" in Frontiers in Soft Matter.

Other Relevant Information

- 1.2 MeV proton cyclotron proposed to be built in India by Prof. P. C. Deshmukh is currently under development at the Inter-University Accelerator Center, New Delhi. The proposal was developed by CAMOST members plus affiliate members, including Prof. G. Aravind, Prof. C. Vijayan, and Prof. T. S. Natarajan. Students from IISER/IIT Tirupati can go to IUAC and do internships using this facility.