

CV
Dr. Deepak Garg

General

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Employment

April, 2021- Assistant Professor of physics in D.A.V college, Sector 10, Chandigarh. I am teaching fundamental physics courses to B.Sc (non-medical and comp. science) students.
2016- Assistant Professor (contractual) of physics in G.G.D.S.D.college, Chandigarh. I taught fundamental physics to B.Sc and M.Sc students.
2013-2015 Assistant Professor of Physics at Amity University, Noida(UP), India. I taught applied and fundamental Physics courses to B.Tech, M.Sc. students.
2012-2013 Worked as a Scientist (ad-hoc position) in the 'Quantum Phenomenon and Applications' Division at National Physical Laboratory (NPL), New Delhi (India).
2010-2012 Postdoctoral Research Associate in the Low Temperature group of the Physics Department at Lancaster University, supported initially by an EPSRC *PhD Plus Fellowship*.

Education

2006–2010 Ph.D., Lancaster University, UK. Thesis: *Experimental Investigation Of Quantised Vortices Using Grid and Quartz Tuning Forks in Superfluid Helium-4 in the Zero Temperature Limit*. PhD supervisor Prof. P.V.E. McClintock
2004–2006 M.Sc. in Physics, Indian Institute of Technology (IIT) Delhi, New Delhi, India. Grade: 8.2/10. Thesis: *Downloading of Energy Meter Reading Using GSM Technology*
2001–2004 B.Sc (Hons.) in Physics, Panjab University, Chandigarh, India.

Academic Awards and Achievements

July, 2024 Selected as **Team Leader** by **National Steering Committee** for **Science and Astronomy Olympiads** of Indian Delegation for 54th **International Physics Olympiad (IPhO)** held in Isfahan, Iran.
Aug, 2023 Awarded **EMP fellowship** by EU under the ageis of **Horizon-2020** to explore 2-D superfluidity in He-4 using carbon nanotubes at Lancaster EMP facility.
Aug, 2021 Awarded **EMP fellowship** by EU under the ageis of **Horizon-2020** to work on a novel oscillator design at Lancaster EMP facility.
2017 - present I am an active resource person for **Indian Physics Olympiad (InPhO)** programme run by HBCSE-TIFR, Mumbai, and Board Member of **NSEP-2024** organised by Indian Association of Physics Teachers (IAPT)
2012-2013 Work on Grid-Turbulence was selected in **SET for Britain-2012**, which was presented, as a poster, in UK Parliament (House of Commons).
2010–2011 Four-month EPSRC *PhD Plus Fellowship*, Lancaster University, UK.
2006–2007 India Award from Lancaster University, UK.
2006–2010 **EPSRC** PhD Project Studentship at Lancaster University, UK.
2005–2006 Qualified IELTS with Band score 6.5.
2005–2006 Qualified **CSIR-NET (Physics)** exam for *Lectureship* eligibility in Indian colleges/universities.
2004- Secured **All India Rank 71 in J.A.M (Physics)**. This test is conducted all over India by IITs (Indian Institute of Technology) for intake into M.Sc programmes in basic sciences.

Computer Skills

Software COMSOL, OriginLab, LabVIEW
Languages MATLAB, Python
Operating Systems WINDOWS

Principal Research Interests and skills

My research interests include experimental low-temperature physics to explore quantum fluids and solids. My current recent involves exploiting resonant properties of a low-frequency, high-amplitude electromechanical torsional oscillator to investigate quantum vortex pinning in purely convex flow of superfluid helium-4 in the zero-temperature limit (down to 10mK). Previously, I investigated quantised vortex lines, in particular quantum turbulence, in superfluid ⁴He by measuring drag on macroscopic circular mesh-grid oscillator and miniature

quartz tuning forks. As a PhD student, and later during Postdoc position, I acquired experimental skills to run state-of-the-art cryogenic equipment including a ^3He - ^4He dilution refrigerator, and to measure signals of extremely low signal-to-noise ratio. I also performed measurements in a glass helium cryostat (1.3–4.2 K). I analyzed my experimental data using the research-standard Origin software tool and MATLAB programming platform.

My research achievements include the development of a dippe-cryostat at NPL, Delhi. Previously, I developed three different experimental techniques for the accurate measurement of tuning fork tip-velocity and of the velocity profile along the fork prong. I also observed for the first time *mutual interactions* between a pair of forks, and between a fork and an oscillating grid, in superfluid helium-4 at mK temperatures. Another phenomenon I observed was that of *switching* in the grid oscillation amplitude, with corresponding frequency changes. Neither the interactions nor the switching are properly understood yet, but they are both assumed to involve in some way the dynamics of quantised vortex lines or rings.

Thesis Students

April, 2022 – Ms. kalpana Devi, registered in Panjab University, Chandigarh, working on the torsional oscillator experiment, recently submitted her Ph.D synopsis. Experimental work was carried by her at Lancaster Low temperature facility under EMP fellowship.

Scientific Publications

1. Anthony M. Guènault et al. "A low-frequency, high-amplitude, torsional oscillator for studies of quantum fluids and solids" *Phys.Fluids*. **35**, 045146 (2023);
2. Yachna Tyagi, Deepak Tripathi, Keshav Walia, and Deepak Garg "Ion acoustic wave assisted laser beat wave terahertz generation in a plasma channel" *Physics of Plasmas* **25**, 043118 (2018);
3. D. I. Bradley, M. Človečko, S. N. Fisher, D. Garg, A. M. Guènault, R. P. Haley, G. R. Pickett, M. Poole and V. Tsepelin, "Thermometry in normal liquid ^3He using a quartz tuning fork viscometer", *J. Low Temp. Phys.* **171**, 750-756 (2013).
4. Deepak Garg, V. B. Efimov, M. Giltrow, P. V. E. McClintock, L. Skrbek, and W. F. Vinen, "Behaviour of quartz forks oscillating in isotopically pure ^4He in the $T \rightarrow 0$ limit", *Phys. Rev. B* **85**, 144518 (2012) .
5. D. Garg, V. B. Efimov, M. Giltrow, P. V. E. McClintock and L. Skrbek, "Mutual interactions between objects oscillating in isotopically pure superfluid ^4He in the $T \rightarrow 0$ limit", *Low Temp. Phys.* **38**, 1026 (2012) .
6. D. I. Bradley, M. Človečko, S. N. Fisher, D. Garg, E. Guise, R. P. Haley, O. Kolosov, G. R. Pickett, D. Schmoranzner, V. Tsepelin and L. Skrbek, "Crossover from hydrodynamic to acoustic drag on quartz tuning forks in normal and superfluid ^4He ", *Phys. Rev. B* **85**, 014501 (2012).
7. D. I. Bradley, P. Crookston, M. J. Fear, S. N. Fisher, G. Foulds, D. Garg, A. M. Guènault, E. Guise, R. P. Haley, O. Kolosov, G. R. Pickett, R. Schanen, V. Tsepelin, "Measuring the prong velocity of quartz tuning forks used to probe quantum fluids", *J. Low Temp. Phys.* **161**, 536-547 (2010).
8. V. B. Efimov, Deepak Garg, O. Kolosov and P. V. E. McClintock, "Direct measurement of the critical velocity above which a tuning fork generates turbulence in superfluid helium", *J. Low Temp. Phys.* **158**, 456 (2010).
9. V. B. Efimov, Deepak Garg, M. Giltrow, P. V. E. McClintock, L. Skrbek, W. F. Vinen "Experiments on a high quality grid oscillating in superfluid ^4He at very low temperatures", *J. Low Temp. Phys.* **158**, 462 (2010).

Conferences

Parts of my work have also been presented at conferences:

1. "Participated in the International Online Conference on Quantum Fluids and Solids (QFS 2021) at IISC, Bangalore, 10th-19th August, 2021."
2. "Study of quantum turbulence using quartz tuning forks in the temperature limit $T \rightarrow 0$ " as a poster presentation, 25th International Conference on Low Temperature Physics, Amsterdam, 6–13 August, 2008.
3. "Experimental investigation of oscillating objects in mK superfluid ^4He " as a poster presentation, QFS2009: International Symposium on Quantum Fluids and Solids, Northwestern University, Evanston, Illinois, USA, 5–11 August, 2009.
4. "Vortex dynamics in superfluid helium-4 in the $T \rightarrow 0$ limit: Tuning forks as vortex generators and detectors", Symposium on superfluids under rotation: Vortices, Superfluid Dynamics, and Quantum Turbulence", Helsinki, Finland, 11–16 April, 2010.