RAMAN RESEARCH INSTITUTE

Announcement of two PhD-track Junior Research Fellowships in experimental quantum communication under India's National Quantum Mission

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Qualify in JEST, CSIR-UGC NET or GATE, and earn your place in the RRI PhD programme through your work in the laboratory, not your exam rank.

Raman Research Institute invites applications for two Junior Research Fellowships (JRF) in the Quantum Information and Computing (QuIC) laboratory of the Light and Matter Physics group, for students who intend to do a PhD in experimental quantum physics. These fellowships lead into the RRI PhD programme through RRI's Alternative Entry to PhD programme (AEP), which admits exceptional students funded through extra-mural grants. The route is open to candidates who have qualified in a national eligibility test. Entry does not depend on a rank cut-off. It depends on steady work and demonstrated progress in the laboratory.

How the route works: Alternative Entry to PhD programme (AEP)

1. **You join QuIC as a JRF** on the National Quantum Mission project and work on a defined experiment from your first week.
2. **Your progress is reviewed at six months** against the expectations set out below.
3. **Between six and twelve months after joining,** on the strength of your laboratory work and progress, the Principal Investigator, as your prospective supervisor, recommends you for admission through the AEP, and you are interviewed for the RRI PhD programme.
4. **A successful interview admits you to the RRI PhD programme through the AEP.** You continue the same research with the same supervisor towards a PhD degree, with your fellowship continuing from the project grant.
5. **If you are not recommended for, or not successful at, the PhD entrance interview within twelve months of joining,** the fellowship ends on completion of one year.

Details of the AEP are on the RRI PhD programme page: www.rri.res.in/careers/phd-programme.

What you will work on

QuIC leads QuEPRAN (Quantum Entanglement-based Photonic Repeater Advanced Network), the National Quantum Mission technology group building a multi-node quantum repeater network for entanglement-based quantum communication, with partners at HRI Prayagraj, IIT Tirupati, IIT Patna and IISER Mohali. Professor Urbasi Sinha is the Lead Principal Investigator. Thesis-scale problems at the first repeater node include:

- optical and spin properties of colour centres in diamond, including nitrogen-vacancy, silicon-vacancy and other vacancy centres;
- entangled-photon sources compatible with solid-state quantum memories;
- light–matter interfaces between single photons and solid-state quantum memories;
- Bell-state measurement and entanglement swapping between network links;
- photonic links in fibre and free space between network nodes.

QuIC demonstrated India's first quantum key distribution over a free-space atmospheric link and its first with a moving receiver. Its doctoral alumni now work at Xanadu, Universal Quantum, Chalmers University of Technology, IISc, NISER and FSU Jena.

What we expect

Experimental quantum physics needs clear thinking, careful attention to detail and a lot of patience. Most experiments do not work the first time, and many do not work the fifth time either. The people who do well here are the ones who enjoy finding out why.

By the six-month review, you will be expected to have:

- characterised the optical components and sources in your set-up, with quantified uncertainties;
- read the documentation of the instruments you use, and applied it;
- identified and explained any discrepancy between expected and measured behaviour;
- built and run an interference experiment from start to finish;
- presented your work at a group meeting.

Fellowship and tenure

- **Fellowship:** Rs. 37,000 per month plus HRA at the applicable rate (currently 30%) for the first two years, and Rs. 42,000 per month plus HRA from the third year for those inducted into the PhD programme.
- **Tenure:** one year in the first instance. On induction into the PhD programme, the fellowship continues subject to satisfactory progress in six-monthly reviews. If you are not inducted within twelve months of joining, the fellowship ends on completion of one year.

Eligibility

Essential

- A Master's degree in Physics, Engineering Physics, Optics or Photonics with at least 55% marks in aggregate or equivalent grade, with relaxation for reserved categories as per Institute norms. Students in their final semester may apply; the degree must be completed before joining.
- Qualification in JEST (Physics), CSIR-UGC NET (Physical Sciences; JRF or Lectureship/Assistant Professor) or GATE (Physics), valid on the closing date of this advertisement. Qualification is sufficient: no minimum score or rank is required.
- Age not more than 28 years on the closing date.

Desirable

- 75% or more marks in aggregate, or equivalent CGPA, in the qualifying degree.
- Coursework in quantum mechanics and optics.
- Hands-on experience in an optics laboratory.
- Programming for data analysis or instrument control (Python, MATLAB or LabVIEW).

Selection procedure

Applications will be shortlisted against the essential and desirable criteria. Letters of recommendation will then be requested from the referees of shortlisted candidates, and a final list of candidates will be called for interview in person at RRI, Bengaluru. The interview covers the fundamentals of quantum mechanics and optics, an experiment the candidate has carried out with their own hands, and their reasons for pursuing an experimental PhD.

How to apply

Email a single PDF to quic-job@rri.res.in with the subject line "PhD-track JRF Application", containing:

- a CV with marks or grades from Class 10 onwards;
- the scorecard or certificate showing your JEST, CSIR-UGC NET or GATE qualification, with the year;

- a one-page statement on why you want a PhD, why experimental physics, and one experiment you carried out with your own hands, including what went wrong and what you did about it;
- a short statement showing how you meet the essential and desirable criteria;
- names and email addresses of two academic referees. Letters will be requested only from the referees of shortlisted candidates.

Closing date for receiving applications: 31 December 2026. Applications received after the closing date will not be considered.

General information

- Those already working in Government, Semi-Government, PSU or Autonomous Bodies shall submit their applications through proper channel.
- The Institute reserves the right to restrict the number of candidates called for interview to a reasonable limit, on the basis of qualification and experience higher than the minimum prescribed. Mere fulfilment of the essential and desirable criteria does not entitle an applicant to be called for interview.
- Age relaxation will be applicable as per Government of India rules for candidates belonging to SC/ST/OBC categories and persons with disabilities.
- Second class train fare for attending the interview at RRI shall be reimbursed on production of the original tickets.
- This is a project-based position. Remuneration shall depend on availability of project funding.
- The Institute reserves the right to relax any of the above requirements in exceptional cases.
- The Institute reserves the right not to fill the positions advertised. Canvassing in any form shall disqualify the candidate.