Name: Prof. Ravindra Pratap Singh

Designation: Visiting Professor, CPQCT

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Area of Research: Light scattering, Structured light beams, Nonlinear Optics, Quantum Optics and Quantum Information

Highlights:

- Developed an experimental program at PRL dedicated to Quantum Science and Technology
- Working on DST project “Free space quantum communication: Road to satellite quantum communication”
- Working on Indo-Israel project in the area of Quantum technologies and applications
- Representing India for Quantum Technology in BRICS
- Alternate Chair for the “Committee on Satellite Based Quantum Communication” and “Committee on Quantum Radar” constituted by ISRO
- Serving as Apex Committee member of DYSL-QT (DRDO Young Scientist Lab in Quantum Technologies)
- Served as Chair of the Design Review Committee for QMAN – Quantum Communication for Metropolitan Cities – a project from Advanced NUmerical Research and Analysis Group (ANURAG), a laboratory of the Defence Research and Development Organisation (DRDO)
- Signed MoU for transfer of know-how in quantum communication to the Centre for Development of Telematics (C-DOT), Delhi
- Chairing the Project Review and Monitoring Committee (PRMC) of the project "Experimental Investigations to Characterize the Entangled States of Light in Presence of Background Noise" at IISc Bangalore, and also member of PRMC for the project “Development of Portable and High Precision Compact Gravimeter for Field Applications” funded by the office of Principal Scientific Advisor (PSA), Government of India
- Member of Project Review and Steering Group (PRSG) in respect of the two projects, "Metro Area Quantum Access Network (MAQAN)" being implemented by IIT Madras, SETS Chennai and C-DAC Bangalore and "Quantum communication using entangled photons" being implemented by SAMEER Mumbai; both the projects funded by Ministry of Electronics and Information Technology
- Subsequent to demonstration of free space quantum key distribution with weak coherent pulses and entangled photons for 200 meters in April 2021, Apex committee of QuEST (Quantum Enabled Science and Technology) program of DST has approved the second phase of funding for the ongoing project “Free space quantum communication: Road to satellite quantum communication”
- Got an MoU signed between Physical Research Laboratory and National University of Singapore for cooperation in quantum science and technology

- Contributed to standards for quantum key distribution and quantum cryptography as a member of the Inter-Ministerial Committee formed by Department of Telecommunication

- Invited to be a member of INSQT (International Network in Space Quantum Technologies)

- Supervised more than ten Ph.D. students and an almost equal number of post-docs

Complete list of research publications

1. (*) N Lal, S Mishra, A Rani, A Banerji, C Perumangatt**, R P Singh**, 2023, Polarization–orbital angular momentum duality assisted entanglement observation for indistinguishable photons, Quantum Information Processing **22 (1)**, 90.
2. (*) Sarika Mishra, Ayan Biswas, Satyajeet Patil, Pooja Chandravanshi, Vardaan Mongia, Tanya Sharma, Anju Rani, Shashi Prabhakar, S Ramachandran and **Ravindra P Singh**, 2022, BBM92 quantum key distribution over a free space dusty channel of 200 meters, Journal of Optics **24(7)**, 074002.
3. (*) A Biswas, A Banerji, N Lal, P Chandravanshi, R Kumar, and **R P Singh**, 2022, Quantum key distribution with multiphoton pulses: an advantage, Optics Continuum **1(1)**, 68-79.
4. V Raskatla, B P Singh, S Patil, V Kumar, **R P Singh**, 2022, Speckle-based deep learning approach for classification of orbital angular momentum modes, Journal of the Optical Society of America A **39**, 759-765.
5. HJ Pandit, V Kumar, **R P Singh**, 2022, Dynamical charge inversion of polarization correlation vortex in propagating vector speckle field, Journal of Optics **24 (6)**, 064005.
6. P Vanitha, B Manupati, I Muniraj, S Anamalamudi, GR Salla, **R P Singh**, 2022, Augmenting data security: physical unclonable functions for linear canonical transform-based cryptography, Applied Physics B **128 (10)**, 183.
7. (*) Ali Anwar, Shashi Prabhakar, and **R. P. Singh**, 2021, Size-invariant twisted optical modes for the efficient generation of higher-dimensional quantum states, Journal of Optical Society of America B **38**, 2976-2983. **(Selected as Editor's Pick)**
8. (*) Ayan Biswas, Anindya Banerji, Pooja Chandravanshi, Rupesh Kumar, **R. P. Singh**, 2021, Experimental Side Channel Analysis of BB84 QKD Source, IEEE Journal of Quantum Electronics **57**, 8000207.
9. (*) Ali Anwar, Nijil Lal, Shashi Prabhakar and **R P Singh**, 2020, Selective tuning of Hilbert spaces in states encoded with spatial modes of light, New Journal of Physics **22**, 113020.
10. Satchi Kumari, Vijay Kumar, Salla Gangi Reddy, **R. P. Singh**, 2020, Tunable ultraslow light propagation in ruby, Optics Communications **473,** 125913.
11. P Vanitha, N Lal, A Rani, B K Das, G Salla, **R P Singh**, 2021, Correlations in scattered perfect optical vortices, Journal of Optics **23**, 095601.
12. (*) Prashant Kumar, Swetapuspa Soumyashree, Nageswara Rao Epuru, Swaroop B. Banerjee, **R. P. Singh**, K. P. Subramanian, 2020, Determination of Stark Shifts and Widths Using Time Resolved Laser-Induced Breakdown Spectroscopy (LIBS) Measurements, Applied Spectroscopy **74**, 913–920.
13. A. Bekshaev, L. Mikhaylovskaya, S. Patil, V. Kumar, and **R. P. Singh**, 2020, Optical-vortex diagnostics via Fraunhofer slit diffraction with controllable wavefront curvature, Journal of Optical Society of America A **37**, 780-786.
14. (*) Nijil Lal, Anindya Banerji, Ayan Biswas, Ali Anwar, and **R. P. Singh**, 2020, Photon statistics of twisted heralded single photons, Journal of Modern Optics **67**, 126-132.
15. (*) Nijil Lal, Biveen Shajilal, Ali Anwar, Chithrabhanu Perumangatt, and **R. P. Singh**, 2019, Observing sub-Poissonian statistics of twisted single photons using oscilloscope, Review of Scientific Instruments **90**, 113104.
16. Varun Sharma, GK Samanta, S Chaitanya Kumar, **R P Singh**, and M Ebrahim-Zadeh, 2019, Tunable ultraviolet vortex source based on a continuous-wave optical parametric oscillator, Optics Letters **44**, 4694-4697.
17. S Kumari, A Kumar, V Kumar, **R P Singh**, 2019, "Transition from Two-photon Absorption to Saturable Absorption in Gold Patterned Ruby Thin Film", Optik 182, 186-193.
18. (**) A Kumar, **R P Singh**, T Mohanty, A Taneja, 2019, "Tunable optical nonlinearity of Au-TiO2 nanocomposites, Photonics and Nanostructures - Fundamentals and Applications 33, 1-9.
19. (*) Ali Anwar, Pravin Vaity, Chithrabhanu Perumangatt, and **R. P. Singh**, 2018, "Direct transfer of pump amplitude to parametric down-converted photons", Optics Letters 43, 1155-1158.
20. Srinivas, C. Perumangatt, Nijil Lal, **R. P. Singh**, and B. Srinivasan, 2018, "Investigation of propagation dynamics of truncated vector vortex beams", Optics Letters 43, 2579-2582.

21. (**) Vijay Kumar, Ali Anwar, **R. P. Singh**, 2018, “Structuring Stokes correlation functions using vector-vortex beam”, Journal of Optics 20, 015604.
22. (*) G. R. Salla, V. Kumar, Y. Miyamoto, **R. P. Singh**, 2017, “Scattering of Poincaré beams: polarization speckles”, Optics Express 25, 19886-19893.
23. (*) Chithrabhanu P, Nijil Lal, Ali Anwar, S. G. Reddy, **R. P. Singh**, 2017, “Quantum information with even and odd states of orbital angular momentum of light”, Physics Letters A 381, 1858-1865.
24. (**) Vijay Kumar, Bruno Piccirillo, S. G. Reddy, **R. P. Singh**, 2017, “Topological structures in vector speckle fields”, Optics Letters 42, 466-469.
25. Anindya Banerji, **R. P. Singh**, Dhruba Banerji, Abir Bandyopadhyay, 2016, “Generating a perfect quantum optical vortex”, Physical Review A 94, 053838-1-6. **(Result highlighted in Kaleidoscope of the Journal)**
26. (*) Ali Anwar, Chitrabhanu P., Salla Gangi Reddy, Nijil Lal, and **R. P. Singh**, 2017, “Selecting the pre-detection characteristics for fiber coupling of parametric down-converted biphoton modes”, Optics Communications 382, 219-224. **(Selected as Editor’s Choice)**
27. (*) P Chithrabhanu, S G Reddy, N Lal, A Anwar, A Aadhi, and **R P Singh**, 2016, “Pancharatnam phase in non-separable states of light”, Journal of Optical Society of America B 33, 2093-2098.
28. (*) A Aadhi, S G Reddy, S Prabhakar, and **R P Singh**, 2016, “Generating arbitrary cebits on the orbital angular momentum Poincaré sphere”, P Chithrabhanu, International Journal of Quantum Information 14, 1640032.
29. Anindya Banerji, **R. P. Singh**, Dhruba Banerjee, Abir Bandyopadhyay, 2016, “Entanglement propagation of a quantum optical vortex state”, Optics Communications 380, 492-498.
30. (*) A Aadhi, N A Chaitanya, M V Jabir, P Vaity, **R P Singh**, G K Samanta, 2016, “Airy beam optical parametric oscillator”, Scientific reports 6, 25245.
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32. (*) Reddy, Salla Gangi; Prabhakar, Shashi; Chithrabhanu, P.; **Singh, R. P**.; Simon, R., 2016, “Polarization state transformation using two quarter wave plates: application to Mueller polarimetry”, Applied Optics 55, B14-B19.
33. (*) Reddy, Salla Gangi; Permangatt, Chithrabhanu; Prabhakar, Shashi; Anwar, Ali; Banerji, J.; **Singh, R. P.**, 2015, “Divergence of optical vortex beams”, Applied Optics 54, 6690-6693.
34. (*) Reddy, Salla Gangi; Permangatt, Chithrabhanu; Vaity, P; Aadhi, A.; Prabhakar, Shashi; **Singh, R. P.**, 2016, “Non-diffracting speckles of a perfect vortexbeam”, Journal of Optics 18, 055602-1-7.
35. (*) S Prabhakar, S G Reddy, A Aadhi, C Perumangatt, GK Samanta, **R P Singh**, 2015, “Violation of Bell's inequality for phase-singular beams”, Physical Review A 92, 023822. **(Result highlighted in Kaleidoscope of the Journal)**
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40. (*) C Perumangatt, G R Salla, A Anwar, A Aadhi, S Prabhakar, **R P Singh**, 2015, “Scattering of non-separable states of light”, Optics Communications 355, 301-305.
41. (*) G R Salla, C Perumangattu, S Prabhakar, A Anwar, **R P Singh**, 2015, “Recovering the vorticity of a light beam after scattering”, Applied Physics Letters 107, 021104.
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43. A Chaitanya N, A Aadhi, **R P Singh**, G K Samanta, 2014, “Type-I frequency-doubling characteristics of high-power, ultrafast fiber laser in thick BIBO crystal”, Optics Letters 39, 5419-5422.
44. (*) Reddy, S. G., Prabhakar, S., Aadhi, A., Banerji, J. and **Singh, R. P.**, 2014, “Propagation of an arbitrary vortex pair through an astigmatic optical system and determination of its topological charge”, Journal of the Optical Society of America A 31, 1295-1302.
45. (*) Reddy, S. G., Prabhakar, S., Kumar, A., Banerji, J. and **Singh, R. P.**, 2014, “Higher order optical vortices and formation of speckles”, Optics Letters 39, 4364-4367.
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47. (*) S. Prabhakar, S. G. Reddy, A. Aadhi, Ashok Kumar, P. Chithrabhanu, G.K. Samanta, **R. P. Singh**, 2014, "Spatial distribution of spontaneous parametric down-converted photons for higher order optical vortices", Optics Communications 326, 64-69.
48. (*) S.G. Reddy, S. Prabhakar, A. Aadhi, A. Kumar, M. Shah, **R. P. Singh**, R. Simon, 2014, "Measuring Mueller matrix of an arbitrary optical element with a universal SU (2) polarization gadget", Journal of Optical Society of America A 31, 610-615.
49. (*) S. Prabhakar, **R. P. Singh**, S. Gautam, D. Angom, 2013, "Annihilation of vortex dipoles in an oblate Bose–Einstein condensate", Journal of Physics B: Atomic, Molecular and Optical Physics 46, 125302-1-8.
50. (*) S. G. Reddy, A. Kumar, S. Prabhakar, **R. P. Singh**, 2013, "Experimental generation of ring-shaped beams with random sources" Optics Letters 38, 4441-4444. **(Cover page of the issue)**
51. (*) Pravin Vaity, A. Aadhi, **R. P. Singh**, 2013, "Formation of optical vortices through superposition of two Gaussian beams", Applied Optics 52, 6652-6656.
52. A. Banerji, P. K. Panigrahi, **R. P. Singh**, S. Chowdhury, A. Bandyopadhyay, 2013, "Quadrature uncertainty and information entropy of quantum elliptical vortex states", Journal of Physics A: Mathematical and Theoretical 46, 225303-1-12.
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54. (*) Jitendra Bhatt, Ashok Kumar, **R. P. Singh**, S.N.A. Jaaffrey, 2015, "Optical trapping of fluorescent beads", Journal of Experimental Nanoscience 10, 290-298.
55. Dilip Kumar Giri, **R. P. Singh**, Abir Bandyopadhyay, 2014, "Displacement gain dependent fidelity in quantum teleportation using entangled two-mode squeezed light", Optical and Quantum Electronics 46, 1127- 1137.
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59. (*) Ashok Kumar, J. Banerji, and **R. P. Singh**, 2012, "Hanbury Brown–Twiss-type experiments with optical vortices and observation of modulated intensity correlation on scattering from rotating ground glass", Physical Review A 86, 013825.
60. (*) Pravin Vaity and **R. P. Singh**, 2012, "Topological charge dependent propagation of optical vortices under quadratic phase transformation", Optics Letters 37, 1301-1303.
61. (*) Pravin Vaity and **R. P. Singh**, 2012, "Generation of quadrupoles through instability of dark rings in photorefractive media", Journal of Optical Society of America B 29, 2099-2102.
62. (**) Sunita Kedia, Ashok Kumar, **R. P. Singh**, 2012, "Investigation of local structural properties of self-assembled photonic crystals by optical diffraction", Applied Physics B 108, 903-907.
63. (*) Shashi Prabhakar, Ashok Kumar, J. Banerji, and **R. P. Singh**, 2011, "Revealing the order of a vortex through its Intensity Record", Optics Letters 36, 4398-4400.
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65. (*) Ashok Kumar, Shashi Prabhakar, Pravin Vaity, **R. P. Singh**, 2011, "Information content of optical vortex fields", Optics Letters 36, 1161-1163.
66. (*) Ashok Kumar, Pravin Vaity, and **R. P. Singh**, 2011, "Crafting the core asymmetry to lift the degeneracy of optical vortices", Optics Express 19, 6182-6190.
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68. (*) Pravin Vaity and **R. P. Singh**, 2011, "Self-healing property of optical ring lattice", Optics Letters 36, 2994-2996.
69. A. Bandyopadhyay, **R. P. Singh**, 2011, "Wigner distribution of elliptical quantum optical vortex", Optics Communications 284, 256-261.
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71. (*) Ashok Kumar, J. Banerji, **R. P. Singh**, 2010, "Intensity correlation properties of high- order optical vortices passing through a rotating ground-glass plate", Optics Letters 35, 3841-3843.
72. (*) V. K. Jaiswal, **R. P. Singh**, and R. Simon, 2010, "Producing optical vortices through forked holographic grating: study of polarization", Journal of Modern Optics 57, 2031-2038.
73. (*) Ashok Kumar, Pravin Vaity, **R. P. Singh**, 2010, "Diffraction characteristics of optical vortex passing through an aperture–iris diaphragm", Optics Communications 283, 4141–4145.
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81. **R. P. Singh** and Sanjoy Roychowdhury, 2004, “Non-conservation of topological charge: experiment with optical vortex”, Journal of Modern Optics 51, 177-181.
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(*) Ph.D. student of R. P. Singh, (**) Post-doc of R.P. Singh

Complete list of books, monographs etc. published

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