

BABY KOMAL

Singular Optics Lab , IIT Delhi, Hauz Khas, New Delhi-110016, India
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AREAS OF INTEREST:

- **Structured light**
- **Orbital angular momentum of light**
- **Nonlinear interaction of structured light**
- **Optical designing**
- **Interested in all types of optics related problems.**

EDUCATIONAL BACKGROUND:

- **Ph.D. Physics** **2018-2023**
Indian Institute of Technology Delhi (IITD) **NEW DELHI**
Supervisor: Prof. P. Senthilkumaran and Prof. Sunil Kumar
CGPA (Course Work): 8.5/10
- **M.Sc. Physics** **2014-2016**
Indian institute of Technology Guwahati (IITG) **ASSAM**
Supervisor: Prof. Bibhas Ranjan Majhi
CGPA: 7.54/10
- **B.Sc. (Hons.) Physics** **2011-2014**
Banaras Hindu University (BHU) **UTTAR PRADESH**
CGPA: 8.1/10

NATIONAL LEVEL EXAMINATIONS AND SCHOLARSHIPS:

- **Senior Research Fellowship (July 2020 to present)** from UGC.
- **Junior Research Fellowship (July 2018 to July 2020)** from UGC.
- **Qualified Graduate Aptitude Test in Engineering (GATE)-2018 (AIR-364).**
- **Qualified for JUNIOR RESEARCH FELLOWSHIP (JRF) in the Joint CSIR-UGC test** held in December 2017 (AIR- 122).
- **Qualified Joint Admission Test for M.Sc. (JAM)-2014 (AIR- 622).**
- **Qualified Banaras Hindu University B.Sc. (Hons) Entrance Examination - 2011.**
- **Received CBSE Merit Scholarship CSSS-2011.**

ACHIEVEMENTS:

- **Received student travel support award** un ICOAM-2022.
- **Achieved SPIE Student Paper Award** in ICOL-2019.

- Achieved **Merit certificate in Science** by CBSE in 2009.
- Achieved First prize in Commissionary level Essay competition in 2008.

RESEARCH EXPERIENCE:

- **Rindler frame and Unruh effect in rainbow gravity** **2015-2016**
(M.Sc. Project)
The explicit expressions for the coordinate transformations from rainbow Minkowski spacetime to accelerated frame was found. This accelerated frame has several importances in revealing various properties of gravity.
- **Study of Potato starch and Magnesium salt based Biodegradable Polymer Electrolyte systems** **2016-2017**
(Junior Research Assistant in UP-CST Research Project)
An economical, easy to handle and environment friendly electrolyte suitable for electrochemical device fabrication was studied.
- **Helicity inversion, detection, generation, and self-healing of orthogonal degenerate states of polarization singularities** **2018 to present.**
(Ph.D. Research Work)
 - Simple and effective techniques for the index determination of polarization singularities through a tilted lens is proposed.
 - The index-preserved helicity inversion process in non-separable states of light is studied.
 - Self-healing of structured light beams is studied in detail which makes it an efficient candidate for optical communication.
 - The second harmonic generation of polarization singularities has been studied.
 - A detailed literature survey on nonlinear studies of phase singularities was performed.

JOURNAL PUBLICATIONS:

1. **Baby Komal**, R. Joshi, S. Kumar, and P. Senthilkumaran, Polarization singularity index determination using wedge plate lateral shear interferometry, *Optics and Lasers in Engineering*, <https://doi.org/10.1016/j.optlaseng.2024.108119>
2. **Baby Komal**, G. Arora, Sunil Kumar, and P. Senthilkumaran, “Role of symmetry in self-healing of singular beams,” *Appl. Phys. B* **129**, 29 (2023).
<https://doi.org/10.1007/s00340-023-07978-0>
3. **Baby Komal**, G. Arora, Sunil Kumar, and P. Senthilkumaran, “Self-healing of vector field singularities,” *Opt. Commun.* **524**, 128796 (2022). <https://doi.org/10.1016/j.optcom.2022.128796>
4. **Baby Komal**, S. Deepa, S. K. Pal, B. S. Bhargav Ram, Sunil Kumar, and P. Senthilkumaran, “Helicity inversion and generation of orthogonal, degenerate index states of generic C points,” *J. Opt.* **23** 114001 (2021). <https://doi.org/10.1088/2040-8986/ac26ce>

5. **Baby Komal**, S. Deepa, Sunil Kumar, and P. Senthilkumaran, "Polarization singularity index determination by using a tilted lens," *Appl. Opt.* 60, 3266-3271 (2021). <https://doi.org/10.1364/AO.420554>
6. **Baby Komal**, Madhavi Yadav, Manindra Kumar, Tuhina Tiwari and Neelam Srivastava. "Modifying potato starch by glutaraldehyde and MgCl₂ for developing an economical and environment-friendly electrolyte system" *e-Polymers*, vol. 19, no. 1, 2019, pp. 453-461. <https://doi.org/10.1515/epoly-2019-0047>
7. Gaurav Yadav, **Baby Komal**, and Bibhas Ranjan Majhi, 'Rainbow Rindler Metric and Unruh Effect', *International Journal of Modern Physics A*, 32.33 (2017), 1–13 <https://doi.org/10.1142/S0217751X17501962>

CONFERENCE PAPERS:

1. **Baby Komal**, G. Arora, S. Kumar, and P. Senthilkumaran, "Self-reconstruction of C-point beams," in *Frontiers in Optics + Laser Science 2022 (FIO, LS)*, Technical Digest Series (Optica Publishing Group, 2022), paper FM4E.4 <https://opg.optica.org/abstract.cfm?URI=FiO-2022-FM4E.4>
2. **Baby Komal**, S. Deepa, Sunil Kumar, P. Senthilkumaran, Vector singularity charge detection using tilted lens, JSAP Annual Meetings Extended Abstracts, 2020, Volume 2020.2, The 81st JSAP Autumn Meeting 2020, Session ID 9p-Z17-6, Pages 413, Released on J-STAGE April 22, 2022, Online ISSN 2436-7613, https://doi.org/10.11470/jsapmeeting.2020.2.0_413
3. **Baby Komal**, S. Deepa, S. K. Pal, Sunil Kumar, P. Senthilkumaran, "Ellipse field to vector field singularities through diffraction," Proc. SPIE 12126, Fifteenth International Conference on Correlation Optics, 12126J (20 December 2021) <https://doi.org/10.1117/12.2615493>
4. **Baby Komal**, P. Senthilkumaran, S. Kumar, (2021) Nonlinear Interaction of Polarization Singular Beams. In: Singh K., Gupta A.K., Khare S., Dixit N., Pant K. (eds) ICOL-2019. Springer Proceedings in Physics, vol 258. Springer, Singapore. https://doi.org/10.1007/978-981-15-9259-1_44

CONFERENCES:

- Presented a paper on "Self-healing of optical beams" in the Conference on Optics, Photonics & Quantum Optics (COPAQ)-2022 held at IIT Roorkee during 10-13th November 2022.
- Presented a paper on "Complete self-healing of V-point singularities" in the 6th International Conference on Optical Angular Momentum (ICOAM), 12–17 June 2022, Tampere University, Finland.
- Presented a paper on "Vector singularity charge detection using tilted lens" in the 81st JSAP Autumn Meeting held online during September 8-11, 2020.

- Participated in the “Student Conference on Photonics and Quantum Technology (SCPQT)2021” organized by the National Institute of Science Education and Research Bhubaneswar from 24th to 26th February 2021.
- Attended the 2020 Conference on Lasers and Electro–Optics (“CLEO”), presented in an all– virtual, web conference format, from 11 – 15 May 2020.
- Attended the Student Conference on Optics and Photonics 2020 (SCOP-2020) organised as a webinar during September 23-25, 2020, at Physics Research Laboratory, Ahmedabad. • Attended “Photonics – 2018” organised by Indian Institute of Technology, Delhi during December 12-15, 2018.

TECHNICAL SKILLS:

- C, C++ language
- MATLAB
- Mathematica
- HTML (Basics)
- Origin
- LATEX.
- COMSOL basics
- OSLO

TEACHING ASSISTANTSHIP:

- Teaching assistant for **M.Sc. Physics Lab** at IIT Delhi (2018-2020).
- Teaching assistant for “PYL-755 Basic **Optics and Optical instrumentation**” coursework at IIT Delhi (2020).

SCIENTIFIC MEMBERSHIP:

Optical Society of America (OSA) member

REFERENCES:

1. **Prof. P. Senthilkumaran (Email: P.Senthilkumaran@physics.iitd.ac.in)**
Professor
Department of Physics
Indian Institute of Technology Delhi, New Delhi-110016
2. **Prof. Sunil Kumar (Email: kumarsunil@physics.iitd.ac.in)**
Associate Professor
Department of Physics
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3. **Prof Kedar Bhalthandra Khare (Email: kedark@physics.iitd.ac.in)**
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