



## Gaurav Shukla

Ph. D.

Department of Physics, Institute of Science,  
Banaras Hindu University, Varanasi-221005, India

+91-7398027319

✉ gaurav00jnp@gmail.com

✉ gaurav.shukla18@bhu.ac.in

🔍 ResearchGate

🔍 Google Scholar

🔍 ORCID

### PERSONAL STATEMENT

I did my Ph. D. in Physics from Banaras Hindu University, specializing in quantum optics, quantum metrology, and non-linear optics. My research focused on enhancing the sensitivity of interferometric measurements using quantum states of light. I have collaborated with leading research groups at the Max Planck Institute for the Science of Light and the University of Hamburg, gaining expertise in theoretical quantum optics and a basic understanding of experimental aspects in the interferometric field. I aim to contribute to cutting-edge research in quantum technologies and mentor the next generation of scientists.

### EDUCATION

- **Ph. D. in Physics** 2019 to 2025  
Banaras Hindu University, Varanasi-221005, India
- **Master of Science (Physics)** Percentage: 78.85  
University of Allahabad, Prayagraj-211002, India 2018
- **Bachelor of Science (Physics, Mathematics)** Percentage: 64.72  
VBS Purvanchal University (TDPG College), Jaunpur-222003, India 2016

### KEY PUBLICATIONS

- **G. Shukla**, S. Panahian, D. K. Mishra, and F. Schlavin, “Enhancing Measurement Precision of Non-Degenerate Two-Photon Absorption”, [arXiv:2506.07384](#).
- D. Yadav, **G. Shukla**, P. Sharma, and D. K. Mishra, “Quantum-enhanced super-sensitivity of Mach-Zehnder interferometer using squeezed Kerr state”, [APL Quantum](#) **1** (1) 016104 (2024).
- **G. Shukla**, K. M. Mishra, A. K. Pandey, T. Kumar, H. Pandey and D. K. Mishra, “Improvement in phase-sensitivity of a Mach-Zehnder interferometer with the superposition of Schrödinger’s cat-like state with vacuum state as an input under parity measurement”, [Opt. Quant. Electron.](#) **55**, 460 (2023).
- **G. Shukla**, K. K. Mishra, D. Yadav, R. K. Pandey, and D. K. Mishra, “Quantum-enhanced super-sensitivity of a Mach-Zehnder interferometer with superposition of Schrödinger’s cat-like state and Fock state as inputs using a two-channel detection”, [J. Opt. Soc. Am. B](#) **39**, 59-68 (2022).
- **G. Shukla**, D. Salykina, G. Frascella, D. K. Mishra, M. V. Chekhova, and F. Ya. Khalili, “Broadening the high sensitivity range of squeezing-assisted interferometers by means of two-channel detection”, [Opt. Express](#) **29**, 95-104 (2021).

### PUBLICATIONS

- **G. Shukla**, S. Panahian, D. K. Mishra, and F. Schlavin, “Enhancing Measurement Precision of Non-Degenerate Two-Photon Absorption”, [arXiv:2506.07384](#).
- A. Kumar, **G. Shukla**, and D. K. Mishra, “Comparative study of squeezing-assisted Mach-Zehnder interferometer under homodyne, product detection and first-order correlation measurements”, [Quantum Inf Process](#) **24**, 142 (2025).
- T. Kumar, **G. Shukla**, and D. K. Mishra, “Enhancement in Sensitivity of Coherent Anti-Stokes Raman Spectroscopy via  $SU(1,1)$  Interferometry”, [Appl. Phys. B](#) **131**, 25 (2025).
- P. Sharma, A. K. Pandey, **G. Shukla**, and D. K. Mishra, “Enhancement in phase sensitivity of  $SU(1,1)$  interferometer with Kerr state seeding”, [Optics Communications](#), **573**, 131028 (2024).
- D. Yadav, **G. Shukla**, P. Sharma, and D. K. Mishra, “Quantum-enhanced super-sensitivity of Mach-Zehnder interferometer using squeezed Kerr state”, [APL Quantum](#) **1** (1) 016104 (2024).
- **G. Shukla**, D. Yadav, A. Kumar, and D. K. Mishra, “Quantum sub-phase sensitivity of a Mach-Zehnder interferometer with the superposition of Schrödinger’s cat-like state with vacuum state as an input under product detection measurement”, [Physics Open](#) **18**, 100200 (2024).

- **G. Shukla**, K. M. Mishra, A. K. Pandey, T. Kumar, H. Pandey and D. K. Mishra, “Improvement in phase-sensitivity of a Mach-Zehnder interferometer with the superposition of Schrödinger’s cat-like state with vacuum state as an input under parity measurement”, *Opt. Quant. Electron.* **55**, 460 (2023).
- **G. Shukla**, K. K. Mishra, D. Yadav, R. K. Pandey, and D. K. Mishra, “Quantum-enhanced super-sensitivity of a Mach-Zehnder interferometer with superposition of Schrödinger’s cat-like state and Fock state as inputs using a two-channel detection”, *J. Opt. Soc. Am. B* **39**, 59-68 (2022).
- **G. Shukla**, D. Salykina, G. Frascella, D. K. Mishra, M. V. Chekhova, and F. Ya. Khalili, “Broadening the high sensitivity range of squeezing-assisted interferometers by means of two-channel detection”, *Opt. Express* **29**, 95-104 (2021).
- D. Yadav, K. K. Mishra, **G. Shukla**, and D. K. Mishra, “Enhancement of amplitude-squared squeezing of light with the  $SU(3)$  multiport beam splitters”, *Opt. Quant. Electron.* **53**, 133 (2021).
- K. K. Mishra, D. Yadav, **G. Shukla**, and D. K. Mishra, “Non-classicalities exhibited by the superposition of Schrödinger’s cat state with the vacuum of the optical field”, *Physica Scripta* **96**, 045102 (2021).
- K. K. Mishra, **G. Shukla**, D. Yadav, and D. K. Mishra, “Generation of sum- and difference-squeezing by the beam splitter having third-order nonlinear material”, *Opt. Quant. Electron.* **52**, 186 (2020).

## RESEARCH EXPERIENCE

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|---|---|
| • <b>Max-Planck Institute for the Science of Light, Staudtstr. 2, D-91058</b><br><i>Visited as a Ph. D. student in the laboratory of Dr. Maria Chekhova</i> | <i>December 1<sup>st</sup> to 22<sup>nd</sup>, 2019</i><br>Erlangen, Germany            |
| • <b>Max-Planck Institute for the Science of Light, Staudtstr. 2, D-91058</b><br><i>Visited as a Ph. D. student in the laboratory of Dr. Maria Chekhova</i> | <i>January 7<sup>th</sup> to February 14<sup>th</sup>, 2022</i><br>Erlangen, Germany    |
| • <b>University of Hamburg, Luruper Chaussee 149, D-22761</b><br><i>Visited as a Ph. D. student in the Dr. Frank Schlawin’s group</i>                       | <i>August 1<sup>st</sup>, 2023 to January 31<sup>st</sup>, 2024</i><br>Hamburg, Germany |

## TECHNICAL SKILLS

**Programming Languages:** Python

**Software:** Mathematica, MATLAB, LaTeX

## ACHIEVEMENTS & AWARDS

- **GATE-19 (Graduate Aptitude Test in Engineering-19)** qualified in PHYSICS with GATE score 387 conducted by Indian Institute of Technology Madras, India in 2019.
- **Rs. 84000/- Incentive to the Research Scholars** (August 2022 and April 2024) for publishing research papers in Q1/Q2 journals. Initiated by the Institutes of Eminence (IoE) cell, Banaras Hindu University.
- **First prize** in the poster competition in “7th Institute Day Celebration” held at the Institute of Science, Banaras Hindu University, Varanasi on December 14, 2022.
- **International Visiting Student Program** (6 months fellowship amount \$1800/- (USD) per month). Initiated by the Institutes of Eminence (IoE) cell, Banaras Hindu University.

## REFERENCES

### 1. **Prof. Devendra Kumar Mishra** (Ph. D. supervisor)

Department of Physics, Institute of Science, Banaras Hindu University, Varanasi-221005, India

Phone: +91 9450578401

Email: kndmishra@gmail.com

### 2. **Dr. Frank Schlawin** (Collaborator)

Young Investigator Group Leader, Centre for Ultrafast Imaging, University of Hamburg, Germany

Tel: +49 40 8998-6673

Email: frank.schlawn@uni-hamburg.de

### 3. **Prof. Dr. Maria Chekhova** (Collaborator)

Group leader, Quantum Radiation, Max Planck Institute for the Science of Light, Erlangen, Germany

Phone: +49 (0)9131 7133-611

Email: maria.chekhova@mpl.mpg.de

### 4. **Prof. Farit Ya. Khalili** (Collaborator)

Russian Quantum Center, Skolkovo IC, Bolshoy Bulvar, Moscow, Russia

Email: farit.khalili@gmail.com