

Education

IISER KOLKATA

INTEGRATED PHD IN PHYSICS

📅 Since 2021 📍 Mohanpur

CGPA : 8.92

R.K.M. RESIDENTIAL COLLEGE,
NARENDRAPUR

BSC. IN PHYSICS

📅 2018-2021 📍 Narendrapur

CGPA : 8.60

Research Interests

Weak Measurements • Optical Beam Shift •
Non-Hermitian System • P-T Symmetry in
optical system • Spin-orbit interaction of
light

Skills

PROGRAMMING AND SIMULATION

Python • MATLAB

EXPERIMENTAL

Experience in handling CW laser systems,
CCD / EMCCD and other photodetectors,
Spectrometer, Microscopes,
Optoelectronic components such as SLM,
Optical and Optomechanical components

MISCELLANEOUS

LaTeX • Microsoft Office

Academic Achievements

HS EXAM (CLASS 12)

Top 1% in WBCHSE

NATIONAL GRADUATE PHYSICS
EXAM - 2020

National Top 1%

JAM PHYSICS

Qualified in 2021

INSPIRE - SHE

Recived 2018 - 2021

SVMCM SCHOLARSHIP

Recived 2016 - 2018

Other Achivements

Selected in top 15 best startups from the
nation.

('ideapool' - a competition of startups
organized by RISE Foundation - IISER
KOLKATA)

Research Experience

Making and study of conducting flexible thin film using PEDOT:PSS

R.K. MISSION RESIDENTIAL COLLEGE, NARENDRAPUR

📅 January 2021 - June 2021 📍 Narendrapur, WB

BSc. Project Under supervision of Dr. Sourav Chattopadhyay (R.K.M.R.C Narendrapur)

Connection between optical beam shift with P-T symmetry

IISER KOLKATA

📅 August 2022-December 2022 📍 Mohanpur, WB

IPhD. Project 1 under the supervision of Prof. Nirmalya Ghosh

Detection of Joint Weak Value using optical beam shift

IISER KOLKATA

📅 Since January 2023 📍 Mohanpur, WB

IPhD. Project 2 under the supervision of Prof. Nirmalya Ghosh

Patent

Weak value polarimeter for enhanced detection of small optical rotation

ATHIRA B S, ANKIT K SINGH, NILADRI MODAK, MINTU KARMAKAR, RITWIK
DHARA, DIBYENDU NANDY, AND NIRMALYA GHOSH

The quantum mechanical concept of weak value amplification can be formulated in the realm of classical optics as near destructive interference of slightly shifted pointers associated with the system eigenstates. We have experimentally realized this philosophy in standard McZhander path interference using polarization state as a pointer and small polarization anisotropy effect as the weak coupling between the path and polarization degrees of freedom of light. This has culminated into the development of a completely new type of polarimeter, namely, the weak value polarimeter. Drammatic enhancement in the sensitivity of measurement of small optical rotation as compared to the conventional Stokes polarimeter is demonstrated using the concept of weak value polarimeter.

• Indian patent application under processing.

Upcomming Publications

Inhomogeneous polarization resolves a fundamental issue in non-Hermitian transverse optical beam shifts

NILADRI MODAK, S. ASHUTOSH, SAYAN GHOSH, RITWIK DHARA, ALOKE
PAN, SOURIN DAS, NIRMALYA GHOSH

Optical beam shifts at dielectric interfaces show a striking resemblance with the physics of non-Hermitian systems exhibiting exceptional point and PT symmetry. In this study, the origin of such connection is unraveled by momentum (k) domain Jones matrix analysis of optical beams undergoing a shift in their k distribution following partial reflection. The emergence of exceptional point-like behavior at the onset of the Brewster's angle is uncovered and attributed to the inhomogeneous polarization effect of the k domain Jones matrix, which transforms from a general elliptical di-attenuating retarder to an elliptical diattenuator around the Brewster's angle. The predictions of the theoretical analysis are experimentally verified.

• The manuscript is under preparation.

Realization of joint weak values of Polarization observables through weak measurements on longitudinal and transverse optical beam shifts

RITWIK DHARA, NILADRI MODAK, S. ASHUTOSH, NIRMALYA GHOSH

It is usually challenging to measure joint observable terms using strong hamiltonian due to nonlinear effect. In this work, we have addressed this challenge by measuring joint weak values of longitudinal and transverse optical beam shifts.

• The manuscript is under preparation.