

DHEP Seminar

Title: Quantum Dots for Quantum Sensing and their applications

Speaker: Dr. Tribikram Choudhury, IISER Kolkata, INDIA

Abstract: Quantum sensors and quantum devices are transforming our world. Polymer based rare earth and perovskite quantum dots (QDs) are especially suitable materials for sensing and waveguiding in integrated optic devices, because of their high transparency above 400 nm, low propagation losses, and easy fabrication. The effective bandgap of QDs and hence their photoluminescence can be tuned by either modifying their radius or the composition in the visible and near-infrared spectra. With the high potential of direct-band-gap-engineered semiconductor nanostructures for the emission of prompt photons due to quantum confinement, the materials based on semiconductor QDs/quantum wells such as CdS, CdTe, CdSe, and/or PbS as scintillator or charged particle tracking for High Energy Physics detectors and medical application; X-ray imaging and cancerous tumour cells detection have been explored in collaboration with the Quantum Technology DRD5 collaboration with CERN, Geneva, Switzerland. For this, one of the focuses has also been in developing QD-based scintillators with a high photon density. The other focus is developing thin film-based QDs that has the potential to increase power transfer rates, could also be of use to spintronics which is a power generation method that exploits electron spins more than classical electronics can. Also, thin-film QDs can be promising for superconductivity experiments. This can also be used in case of Near infrared imaging, the wavelength range (700–1400 nm) that provides vital information in fields such as low-light/night vision, military, surveillance, sorting or biometrics, with content interpretation very similar to visible photography and imaging possible with no additional light source. These thin film based QDs can enable low-cost infrared cameras with promising resolution and pitch with high External Quantum Efficiency with application in Short-Wavelength Infrared imaging for identification of biomolecules, military, surveillance, agriculture, machine vision as well as in consumer devices industries. The potential impact of the thin film based QDs is broad and considerable and in the near future, with promising quantum technology applications.

Time: 14:30 hrs.

Date: January 20, 2025 (Monday)

Venue: AG-80

Zoom link: <https://cern.zoom.us/j/69596932530?pwd=wtg1AryONKqcnM174rbwxlM723pLAL.1>

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(Gagan B. Mohanty)
Seminar Coordinator