Report on Technical Seminar under HRD Program

Title: HORIBA Solutions for Quantum Materials and Devices
Date: 17th September 2025
Mode: Hybrid (IIT Delhi + Microsoft Teams)
Organizers: HORIBA India & QMD Foundation, IIT Delhi (initiative by DST under the National Quantum Mission)

Introduction

As part of the Human Resource Development (HRD) program under the **National Quantum Mission (NQM)**, a technical seminar (TechSEM) on **"HORIBA Solutions for Quantum Materials and Devices"** was successfully organized on **17th September 2025**. The seminar was conducted in **hybrid mode**—in-person at **IIT Delhi** and online via **Microsoft Teams**—to maximize reach and participation.

The session aimed to provide researchers, faculty members, and students with exposure to **state-of-the-art material characterization solutions** essential for advancing research in **quantum technologies and semiconductor devices**. There were 71 registration to this technical seminar.

Inaugural Session

The seminar commenced with a keynote address by **Prof. Rajendra Singh**, Project Director, QMD Foundation and Associate Dean (R&D), IIT Delhi. Prof. Singh emphasized the vision of the **National Quantum Mission**, underlining the importance of **building skilled manpower, advanced infrastructure, and fostering academia–industry collaboration**. He highlighted how such HRD initiatives will play a crucial role in preparing India for global leadership in the quantum era.

Technical Sessions

1. HORIBA Solutions for Quantum Materials & Devices

Speaker: Dr. Priyadarshini Ghosh, Head – Materials & Semiconductor Applications, HORIBA India

Dr. Ghosh introduced HORIBA's suite of **characterization tools**, including **Raman spectroscopy, photoluminescence, AFM-Raman, ellipsometry, and cathodoluminescence**. She explained how these solutions enable nanoscale material analysis, defect detection, and heterostructure characterization, addressing both academic and industrial R&D needs

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2. Raman & Hybrid Raman for Quantum Material Characterization

Speaker: Dr. Maruda Shanmugasundaram, Specialist (Raman & AFM-Raman), HORIBA India
This talk showcased how **Raman spectroscopy and hybrid Raman-SPM platforms** provide comprehensive insights into **graphene, 2D materials, and topological insulators**. Dr. Shanmugasundaram demonstrated how correlative techniques reveal **layer thickness, defects, doping levels, and stress/strain mapping**, which are critical for device fabrication and reliability.

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3. Fluorescence Spectroscopy for Quantum Dots

Speaker: Dr. Khokan Roy, Application Scientist – Fluorescence, HORIBA India
Dr. Roy discussed **quantum dots** and their applications in **display technology, solar cells, and sensors**. Using **steady-state and time-resolved photoluminescence (TRPL)**, he illustrated how HORIBA's modular systems probe optical properties, carrier lifetimes, and defect states. Real-world examples of **InGaAs/GaAs quantum dots** and **lanthanide-doped nanoparticles** highlighted their role in **optoelectronics and quantum photonics**.

Key Outcomes

- Enhanced awareness of **cutting-edge characterization tools** for quantum materials and devices.
- Practical demonstrations of **nanoscale analysis methods** bridging research and industrial needs.
- Strengthened **academia–industry partnerships** under the National Quantum Mission.
- Capacity building through **HRD initiatives** that prepare the next generation of scientists and engineers.

Conclusion

The seminar successfully connected researchers, faculty, and industry experts, reinforcing the importance of **advanced metrology tools** in the development of **quantum technologies**. The interactive discussions highlighted how HORIBA's solutions can accelerate innovation, while also contributing to **skill development and human resource training** under the HRD program.