

## **Seminar**

# **Quantum Many-Body Phenomena in 2D Chalcogenides Probed by Light-Matter Interactions**

**Ajay Soni**

**IIT, Mandi**

Light matter interactions provide profound insights into the quantum phenomena of materials, particularly in two-dimensional chalcogenides. A key quantum phenomenon is the charge density wave (CDW), characterised by a periodic modulation of electronic charge density that couples with lattice distortions, leading to electronic instabilities and pronounced anharmonicity. [1-3] These lattice reconstructions result in Brillouin zone folding, the emergence of collective modes, and enhanced many-body interactions.[4-6] In this talk, I will explore CDW phenomena in materials and present intriguing Raman mode behaviours observed in the thickness-dependent CDW of layered 2H-TaS<sub>2</sub>, as well as Multi-phonon interactions in 2H-NbSe<sub>2</sub> and 2H-TaS<sub>2</sub>. Additionally, I will discuss recent findings on multiple CDWs in GdTe<sub>3</sub>. [6]

### **References:**

1. D. Rawat, A. Thomas, Ajay P S Rana, C. Bera and A. Soni, Phys Rev B (2024).
2. D. Rawat, A. Singh, N. K. Singh and A. Soni, Phys Rev B 197, 155203 (2023).
3. J. Pandey and A. Soni, Phys Rev Res. 02, 033118 (2020).
4. D. Rawat, J. Pandey, S. Menon, U. V. Waghmare and A. Soni, arXiv:2311.02371 (2023).
5. P. Dutta, S. Chandra, I. Maria, K. Debnath, D. Rawat, A. Soni, U. V. Waghmare and K. Biswas, Adv. Funct. Mater. 2312663 (2023).
6. D. Rawat, P. Datta, D. Negi, I. Maria, S. Saha, K. Biswas and Ajay Soni, accepted in Phys Rev B (2024).

**Wednesday, Sep 4<sup>th</sup> 2024**

**11:30 Hrs (Tea / Coffee 11:15 Hrs)**

**Auditorium, TIFR-H**