

## **Internal Seminar**

# **Ferromagnet Proximity Induced effects in 2D materials and superconductors for Majorana**

**Dhavala Suri**

**Massachusetts Institute of Technology**

Interface between two materials can host completely novel states compared to the materials that make the interface. In this context, 2D materials, ferromagnets and superconductors have shown promising avenues so far. In hBN/Graphene/EuS layer system we observe phase transitions spanning various quantum Hall regimes from quantum spin Hall edge state to anti-ferromagnetic (AF) state via an intermediate canted anti ferromagnetic (CAF) state. This is first demonstration of quantum Hall ferromagnetic ground states driven by proximity coupling with a ferromagnetic insulator and achieved at a much lower applied magnetic field than any study in the past. This follows our previous demonstration of strong exchange coupling in graphene/EuS system [1,2]. The results clearly demonstrate opening of edge state corresponding to CAF gap, at a very high field we observe re-entrant insulating phase corresponding to the bulk gap as predicted by theory [3-5]. The talk shall present these investigations along with experiments on superconducting nanowires and ideas to implement superconducting interface on 2D material/ferromagnet interfaces.

### **Reference:**

1. P. Wei et. al., Nature Materials 15, 711 (2016)
2. F. Katmis et. al., Nature 533, 513 (2016)
3. Kharitonov, M. Phys. Rev. Lett. 109, 046803 (2012)
4. Kharitonov, M. Phys. Rev. B 85, 155439 (2012)
5. Kharitonov, M. Phys. Rev. B 86, 075450 (2012)

***Tuesday, Oct 29<sup>th</sup> 2019***

***9:30 AM (Tea/Coffee at 9:00 AM)***

***Seminar Hall, TIFR-H***