

## **Internal Webinar**

### **Possibility for Topological superconductivity in 3D topological insulator/S-wave superconductor bilayer**

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Topological quantum computing and coherent quantum information processing completely relies on the development of a superconducting qubit to realise a fault tolerant quantum computer. Development of a topological qubit in nanoscale can not only enhance the computing power exponentially but also plays a pivotal role in the development of modern artificial intelligence (AI) technology. Unprecedented discovery of topological insulator  $\text{Bi}_2\text{Se}_3$ , a decade ago, has opened up a gateway of possibilities to fabricate topological Quantum devices which are topologically protected under several symmetries. Using proximity effect as a convenient engineering tool, there can be a possibility to realise topological superconductivity in topological insulator/s-wave superconductor hybrids. So, in this talk, I will discuss how far we have progressed to realise topological superconductivity in  $\text{Bi}_2\text{Se}_3$ /Aluminium hybrid.

Addition to that majorana fermions which are predicted a long ago in high energy physics are believed to exist in a topological insulator/s-wave interface can be probed via robust zero-bias conductance peak (ZBCP) during differential conductance spectroscopy (DCS) measurement. There is an additional way to confine the majorana modes using a planar Josephson junction geometry, where phase can act as an additional knob to drive the system from topological to trivial phase. I will also discuss our progress to fabricate Squid geometries using conventional lithography techniques.

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***2:30 PM***