Contribution ID: **118** Type: **Invited**

What if we did the opposite? (remotely)

Thursday, 18 July 2024 11:50 (25 minutes)

What can we learn if we apply the guiding question 'What if we did the opposite?' to science and instrumentation scenarios?

Understanding magnetism at the interface of exotic thin film layers of topological material (e.g. BiTe) or altermagnets (e.g. MnTe) is a requirement for their adoptialtermagnetsle technology. The average magnetism in these films is small and often can be localized near an interface. Traditionally, this problem is solved by employing a multi-layer or superlattice structure to increase the sensitivity to interfaces by producing an intense Bragg peak to analyze. Can we do the opposite and measure the small moments in simple single layer and tri-layer films without "superlattice" amplification? We will present two examples, MnTe/InP(111) an alter magnet candidate and BiTe/FeSeTe/BiTe/Al2O3 to investigate the interface between a topological insulator and potential topological superconductor. In each case the film structure was kept simple and the expected magnetic is in the 10's of emu/cc.

Traditionally, neutron instruments are optimized to either take advantage of a single wavelength delivered continually or efficiently measure a spectrum of wavelengths delivered in pulses. This optimization choice is often dictated by the characteristics of the source. Reactor sources tend to favor monochromatic designs although there are a growing number of examples using chopper system to deliver a wavelength spectrum to the instrument or using wavelength analyzing detector system with a white continuous beam. Spallation instruments however have not seen a similar mixing of design elements or operating modes. Reflectivity instruments tend to minimize the overlap between a minimum number of instrument angle settings to efficiently collect data across a wide q-range.

In this presentation, we will cover the results of applying this question to time-of-flight reflectivity measurements, searching for magnetism in thin films of topological insulators, superconducting material and altermagnets, …. and cooking.

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Magnetic thin films and interfaces

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Session Classification: Magnetic thin films and interfaces