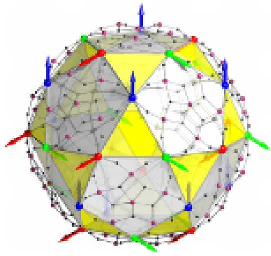

Contribution ID: **17**　　Type: **Talk**

Thermal Aspects in Quantum Materials –Phonon Lifetimes Investigated by Neutron Scattering

Wednesday, 5 June 2019 16:30 (30 minutes)

Thermal management is a key aspect for future information technologies since non-volatile data storage and information processing in quantum circuits strongly rely on minimizing thermal decoherence effects. Among the successful strategies to control the coherence are rapid cooling and thermal isolation of quantum states, emphasizing the importance to engineer materials with very high or very low thermal conductivity. Computational materials design based on first-principle calculations holds a huge potential for identifying novel compounds with superior heat transport properties, and state-of-the-art *ab initio* methods, albeit based on approximations, allow to calculate wavevector-dependent relaxation rates for every phonon mode in the Brillouin zone. Exploiting the high energy resolution of inelastic neutron scattering, we have measured phonon lifetimes in the quantum paraelectric SrTiO3 which allows to benchmark the predictive power of quantum theoretical calculations. We discuss recent results obtained by neutron triple-axis spectroscopy and neutron resonance spin-echo spectroscopy pin-pointing phonon lifetimes on an absolute energy scale. We further discuss Larmor diffraction measurements which deliver important information about phonon scattering at the domain walls. These experiments provide a thorough basis to resolve discrepancies between the calculated and measured lifetimes and to further develop theoretical models for lattice-mediated heat propagation.

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Session Classification: Dynamics of magnetic textures: domain walls, vortices and Skyrmions

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