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## Magnetic structure determination in heavy fermion CeVGe3

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Heavy electron materials manifest a broad spectrum of correlated-electron phenomena, including long-range antiferromagnetism, quantum criticality, and unconventional superconductivity. In these systems, the 4f electrons tend to be more localized, but interact weakly with itinerant conduction electrons via a Kondo interaction. This interaction can lead to long-range magnetic order via a Ruderman-Kittel-Kasuya-Yosida (RKKY) interaction between the 4f electron moments, or delocalization of the 4f electrons by hybridizing with the conduction electrons and formation of a narrow band with enhanced mass [1]. Many of these materials have tetragonal lattices, such as the prototypical CeRhIn5 family [2]. Less is known, however, about the behavior of systems with other crystal symmetries. CeVGe3 crystallizes in the hexagonal P63/mmc space group with two Ce atoms per unit cell, where the structure can be viewed sheets of Ce with AB-type stacking. The nearest neighbor Ce-Ce distance of 4.58 Å is similar to that in the CeRhIn5 materials, hence naively one might expect to find similar Kondo lattice physics. Indeed, CeVGe3 exhibits antiferromagnetism below  $T_N = 5.5$  K [3]. The heat capacity shows a large peak at  $T_N$ , while the entropy reaches only  $0.5R\ln 2$  at 7 K, suggesting that a significant Kondo interaction.

In order to better understand the nature of the long-range order in this material, we have conducted detailed neutron scattering studies on a single crystal of CeVGe3 using GPTAS (4G) triple axis thermal neutron spectrometer to determine the magnetic structure. The magnetic structure factors were utilized for a least-square refinement process. Fig. 1 (a) shows the calculated and observed magnetic structure factors. A scale factor was determined from the 110 nuclear reflection. The proposed in-plane

helical magnetic structure as shown in Fig. 1 (b) was confirmed through the refinement. As a heavy fermion compound that exhibits Kondo lattice coherence and helical antiferromagnetic order, CeVGe3 exhibits similarities to the archetypical heavy fermion system, CeRhIn5.

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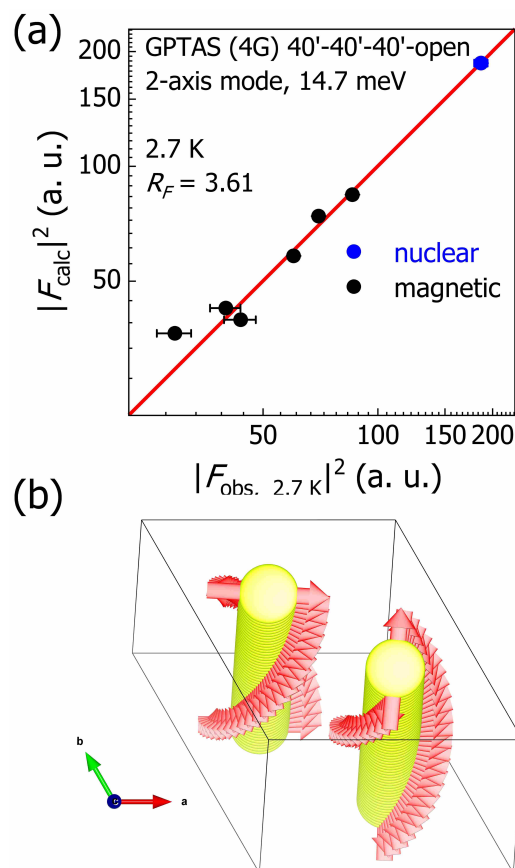


Fig. 1. (a) The calculated magnetic structure factor from the refinement versus the observed magnetic structure factor obtained at 2.7 K. (b) The proposed in-plane helical magnetic structure