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^{8}Li βNMR studies of Epitaxial Thin Films of the 3D topological Dirac semimetal Sr_3SnO

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The inverse perovskite Sr_3SnO is a 3D cubic Dirac semimetal with a very small energy gap, a so-called topological crystalline insulator[1]. The unusual electronic structure confers a variety of novel properties, such as chiral topological surface states, and very strong itinerant electron orbital magnetism. Remarkably, when doped it also becomes superconducting[2]. In the most insulating samples, the Fermi level lies close to the Dirac points, and orbital magnetism is maximal. We report the results of ion-implanted $^8Li^+$ βNMR in Au capped epitaxial thin films of Sr_3SnO as a function of carrier content which can be finely tuned by the growth conditions. In addition, we stop the ^{8}Li in the Au overlayer to seek proximal evidence of the chiral surface state.

In high magnetic field (6.55 T), we find remarkably little contrast in spin-lattice relaxation between low carrier density Sr_3SnO and the Au overlayer. In the insulator, $1/T_1 \sim 0.14$ s^{-1} is slightly faster than Au at 300 K, while, in the overlayer, there is a small but systematic enhancement in $1/T_1$. The resonance in the insulator is broad with a long tail towards negative shift without resolved quadrupolar splitting.

[1] A.W. Rost et al., APL Materials 7, 121114 (2019).
[2] M. Oudah et al., Nat. Comm. 7 (2016) 10.1038/ncomms13617.

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