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Study of magnetism in Cr doped $(Bi_{1-x}Sb_x)_2Te_3$ ANTHONY RICHARDELLA, ABHINAV KANDALA, SUSAN KEMPINGER, NITIN SAMARTH, Pennsylvania State Univ., University Park PA, ALEX GRUTTER, JULIE BORCHERS, NCNR, NIST Gaithersburg MD — The quantum anomalous Hall (QAH) effect was first observed in Cr doped films of the topological insulator (TI) $(Bi_{1-x}Sb_x)_2Te_3$. This ferromagnetic TI opens a gap at the Dirac point and, when the Fermi energy lies inside this gap, a quantized QAH conductance can be observed. The origin of ferromagnetism in this material is still not well understood with the mechanism typically attributed to either a high van-Vleck susceptibility or a carrier mediated RKKY like interaction. To elucidate this we have studied $Cr_y(Bi_{1-x}Sb_x)_{2-y}Te_3$ thin films grown by MBE on $SrTiO_3$ (STO) substrates using polarized neutron reflectivity (PNR) while in-situ backgating the film to change the position of the Fermi energy. The films are also characterized by XRD, AFM, TEM and low temperature transport measurements. PNR measurements provide a direct measure of the depth dependent magnetization of a sample. We use this to study how the magnetization changes as the Fermi energy is moved towards the Dirac point. Funded by DARPA and ARO-MURI.

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