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Magnetic structure and its role in the possible Weyl state in topological semimetal $Sr_{1-y}Mn_{1-z}Sb_2$ (0<y,z<0.1)[1] QIANG ZHANG, Louisiana State Univ - Baton Rouge, HUIBO CAO, Oak Ridge National Laboratory, JINYU LIU, Tulane University, ALAN TENNANT, Oak Ridge National Laboratory, JOHN DITUSA, Louisiana State Univ - Baton Rouge, ZHIQIANG MAO, Tulane University — Very recently, Liu et al (*arxiv.org/pdf/1507.07978, (2015)*) discovered the first magnetic topological semimetal $Sr_{1-y}Mn_{1-z}Sb_2$ (0<y,z<0.1), in which a possible Weyl state arising from time reversal symmetry breaking is expected. However, the origin of ferromagnetic (FM) behavior of this material has not been clarified. By employing the neutron diffraction at the four-circle diffractometer HB3A, HFIR, we found a long-range FM order with Mn moments along b-axis below T_C =565 K, followed by another magnetic transition to a canted C-type antiferromagnetic (AFM) order at T_{FM-AFM} = 304 K. In the canted C-type AFM state, the Mn moments are aligned with the a-axis along with a canting toward the b-axis, leading to a net FM moment lying along the$b-$axis. The Mn moments along the $a-$ and b-axes at 5 K are found to be 3.789(3) and 0.741(4) $_B$, respectively. The discovered FM order in $Sr_{1-y}Mn_{1-z}Sb_2$, either the FM ordering at 304<T<565 K or the FM component of the canted AFM order for T<304 K, is sufficient to break time-reversal symmetry likely creating a Weyl semimetal.

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