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**Magnetic structures of $Tm_2PdSi_3$ studied by neutron diffraction in zero and finite magnetic fields** FEI TANG, MATTHIAS FRONTZEK, TU Dresden, JENS-UWE HOFFMANN, Helmholtz-Zentrum Berlin, MICHAEL LOEWENHAUPT, TU Dresden — $R_2PdSi_3$ ($R$ = rare earth) compounds crystallize in hexagonal $AlB_2$ structure (P 6/mmm) with rare earth ions on Al positions and Pd/Si ions on B positions. A crystallographic superstructure caused by Pd and Si ordering is observed, which is closely related to a generic magnetic structure observed in finite magnetic fields from earlier studies. However, the mechanism leading to the generic magnetic structure is yet not clear although crystal electric field effects are supposed to play an essential role. Neutron diffraction measurements have been performed on a $Tm_2PdSi_3$ single crystal on the flat cone diffractometer E2 at HZB. In zero field at 0.4 K (well below $T_N = 2$ K) a magnetic structure with propagation vector $\tau = (1/8, 1/8, 1/16)$ was identified. In addition, extra magnetic satellites have been observed which can only be explained if starting from the (nuclear) superstructure reflections. Evolution of the magnetic structures in magnetic fields applied along 001 has been followed up to 4 T. The generic magnetic structure found in other $R_2PdSi_3$ ($R$ = Tb, Ho and Er) compounds was also observed in $Tm_2PdSi_3$ in finite magnetic fields. In this contribution we will present the neutron diffraction data and their interpretation and discuss the relation between the observed magnetic structures and the crystallographic superstructure.

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