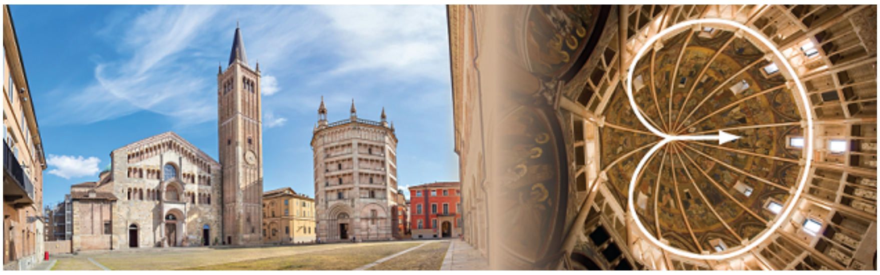

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Investigation of the magnetic topological insulator family ($MnBi_2Te_4$) (Bi_2Te_3)$_n$ by μSR and NMR

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[Fig. 1 ($MnBi_2Te_4$) (Bi_2Te_3)n Zero Field μSR asymmetries vs. time at different temperatures
Time-reversal symmetry breaking in a topological insulator (TI) opens a surface gap and distinguishes chiral quantum states that could eventually be exploited in electrically controlled spintronic devices. The new approach to this state in a TI is with the intrinsic magnetic proximity of a magnetic insulator that can be achieved with layered van der Waals materials.
($MnBi_2Te_4$) (Bi_2Te_3)n are one of the first such examples, where the increasing number n of TI layers controls the magnetic properties and dimensionality of the material. These compounds do display the quantum anomalous Hall effect, a hallmark of a magnetic TI, where spontaneous magnetization and spin-orbit coupling lead to a topologically non-trivial electronic structure. Magnetic order critical temperatures detected by macroscopic magnetization are T_N=25,13K for n=0,1 and T_C=12K for n=2 with a lower metamagnetic transition at T_M=6K for n=1[1,2,3].
Zero-field μSR (see Fig. 1) shows more than one internal field at the muon site with the majority one decreasing in value when n is increased. The muon spin precessions display very fast relaxations of static inhomogeneous nature, and the longitudinal asymmetry component displays critical slowing down of fluctuations at T_C. Remarkably the high field site disappears above T_M. NMR additionally shows the presence of a small anti-site component (likely Mn in the Bi site) in the n=1 sample. This local information is crucial to correctly interpret macroscopic magnetization data.

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[2] Raphael C. Vidal et.al, Physical Review X 9, 041065 (2019)
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