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Proximal Quantum Spin Liquid in One-Dimensional Spin-1/2 Metal Ti4MnBi2

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Electronic correlations lead to heavy quasiparticles in three-dimensional metals, and their collapse can destabilize magnetic moments. It is an open question whether there is an analogous instability in one-dimensional systems, unanswered due to the lack of metallic spin chains. Recently, using neutron scattering, we reported a metallic correlated frustrated spin-1/2 chain compound, Ti4MnBi2 [1,2]. Here, we present the positive muon spin rotation and relaxation (μSR), and magnetic susceptibility measurements study of Ti4MnBi2 single crystal. Zero-field μSR measurements revealed a dramatic slowing down of spin dynamics across 2 K, indicating a spin-freezing transition that aligns with the heat capacity and magnetic susceptibility data. In addition, we observed that less than 10% of spins became static. Interestingly, the other ~ 90% of spins in Ti4MnBi2 single crystal fluctuate in a wide frequency window, i.e., between Hz and THz range, mimicking the glassy relaxation. Our results provide a glimpse of how a metallic one-dimensional system tries to order, proving Ti4MnBi2 is very close to a quantum spin liquid.

REFERENCES
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[2] Pandey, A. *et al.* Correlations and incipient antiferromagnetic order within the linear Mn chains of metallic Ti4MnBi2. **Phys. Rev. B** 102, 014406 (2020).

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