**Supplemental Information**

**Quantum Disordered Ground State in the Heisenberg-Kitaev Candidate NaRuO2**

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**Supplemental Figure 1**: X-ray and neutron diffraction data collected at 5 K and 300 K and 1.5 K and 300 K respectively. Red lines show the output of the structural refinement model and blue lines denote the difference between the model and the data. Neutron data were collected on BT-1 at the NIST Center for Neutron Research and synchrotron x-ray data were collected at 11-BM at the Advanced Photon Source.



**Supplemental Table 1**: Crystallographic parameters for NaRuO2 using both neutron and synchrotron diffraction data. Occupancy values refine to within unity and were fixed for later analysis. For synchrotron data, the Beq for oxygen was constrained near that of the neutron data. Values in parenthesis are one standard deviation.



**Supplemental Figure 2**: Frequency dependence of the low-temperature cusp in the AC susceptibility of NaRuO2. The resulting Mydosh parameter $K=\frac{ΔT\_{f}}{T\_{f}log⁡(Δf)}=0.029$ is an unusual intermediate value. It is significantly smaller than that expected for a superparamagnet and significantly larger than that expected for a conventional spin glass.1,2,3 This weak freezing represents a small amount of entropy and marks a crossover into a state with persistent spin fluctuations as described in the main text of the manuscript.



**Supplemental Figure 3**: Fit parameters resulting from the model of the longitudinal field muon spin polarization data at 1.5 K where the polarization is parameterized by the form $ P(t)=GbG\left(Δ;R;t\right)e^{(-λ\_{GbG}t)^{β}}$ . The relaxation rate *GBG* (left axis) and stretched exponent  (right axis) are plotted as a function of the applied longitudinal magnetic field. Error bars represent one standard deviation.

**References:**

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