Supporting Information

$Ba_3Fe_{1.56}Ir_{1.44}O_9$: A Polar Semiconducting Triple Perovskite with Near Room Temperature Magnetic Ordering

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Figure S1. The natural logarithm of electrical resistance plotted against T^{-4} to test for three dimensional Mott variable range hopping. The significant deviation from a linear relationship between these values indicates that Mott variable range hopping is not the conduction mechanism.

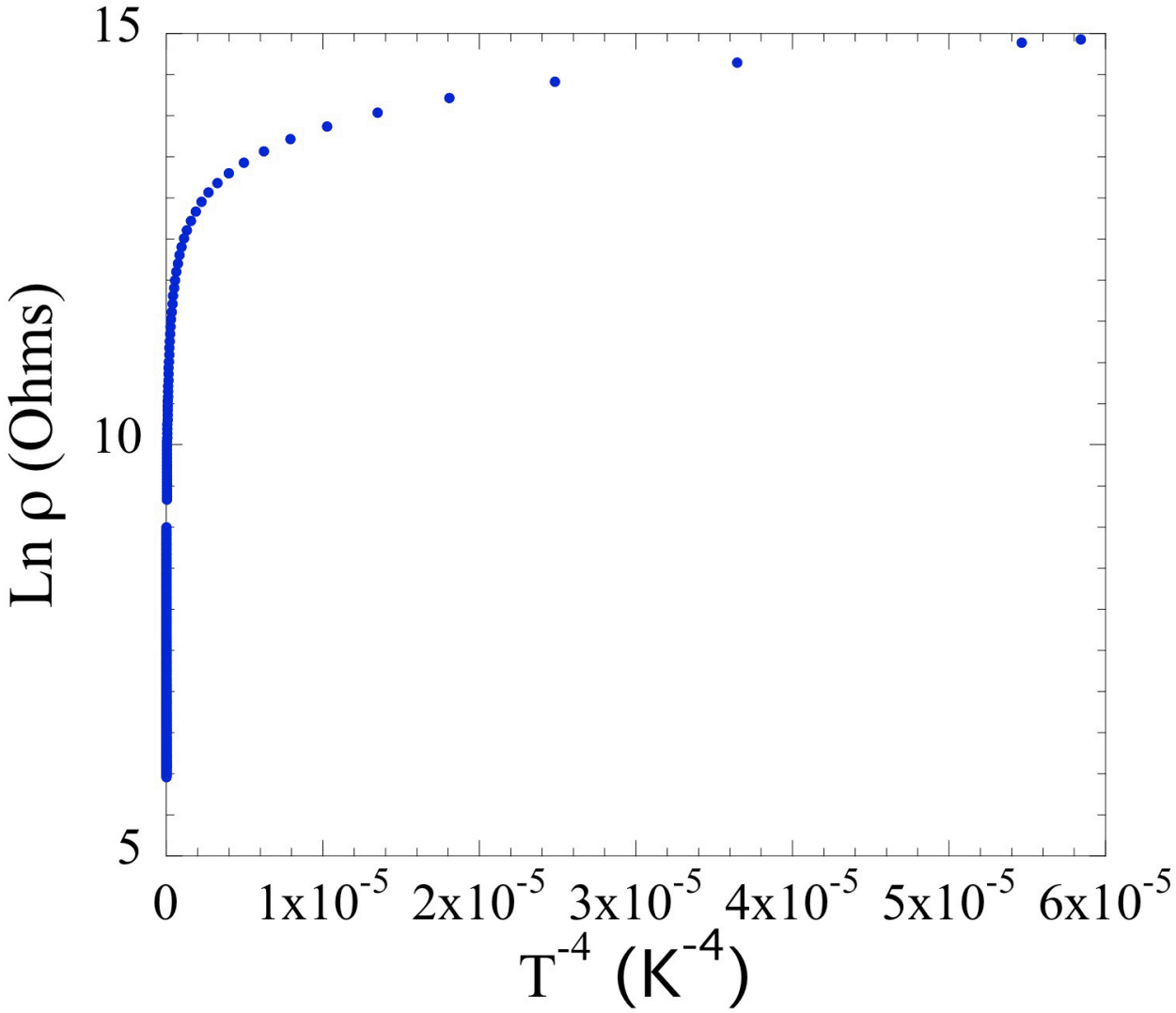

Figure S2. Powder X-ray diffraction of $Ba_3Fe_{1.56}Ir_{1.44}O_9$, shown in blue, overlaid with the simulated powder pattern based on CIF data, shown in green.

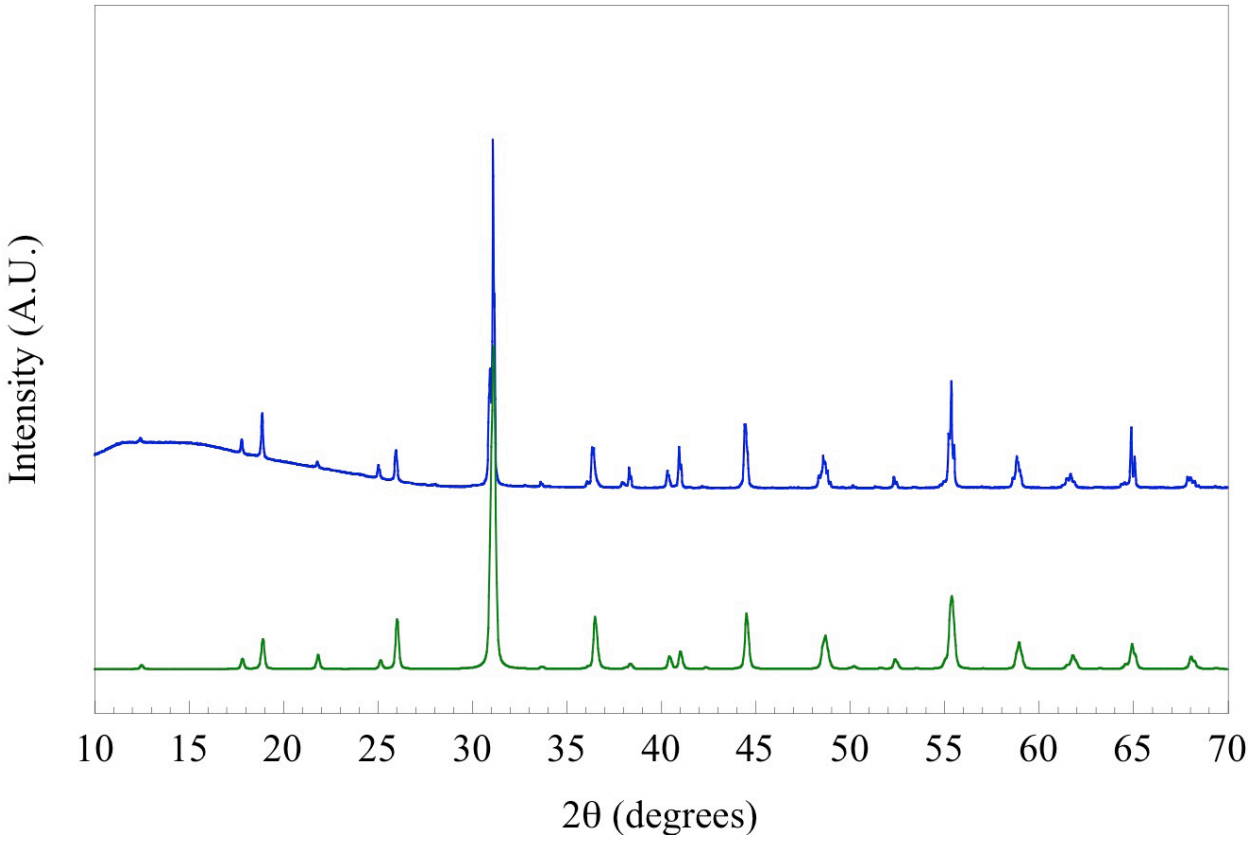

Figure S3. Inverse of the temperature dependence of the magnetic susceptibility of $Ba_3Fe_{1.56}Ir_{1.44}O_9$ at an applied field of 0.1 T fit in the Curie-Weiss regime to extract an effective moment and Weiss temperature.

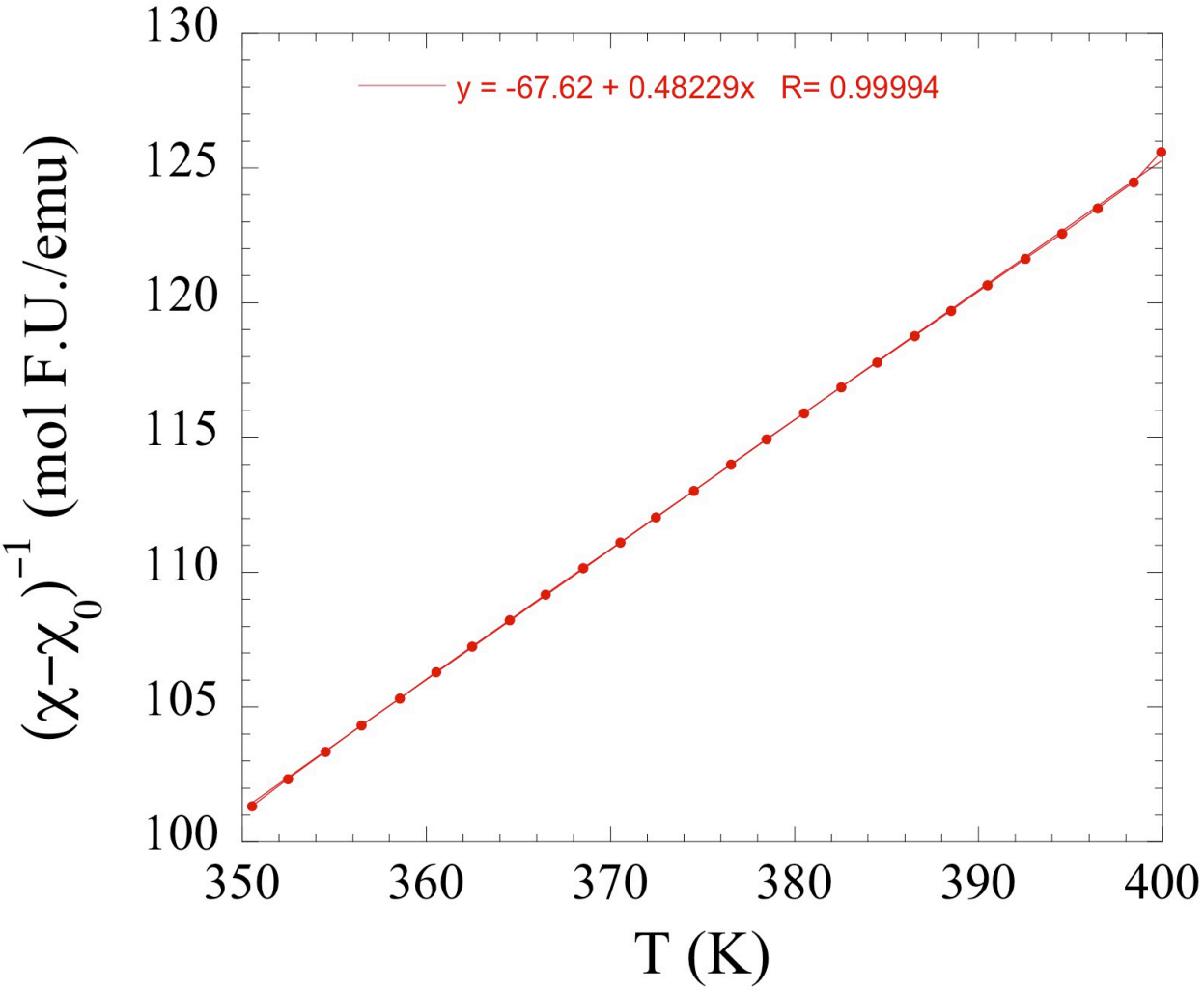

Figure S4. Temperature dependence of $\chi_m T$ for $Ba_3Fe_{1.56}Ir_{1.44}O_9$ under an applied field of 0.1 T. For purely antiferromagnetic interactions, a gradual decrease of magnetic susceptibility is expected for decreasing temperatures. This data is indicative of ferromagnetic-like interactions, with an observed magnetic moment of 5.20 μ_B at 400 K.

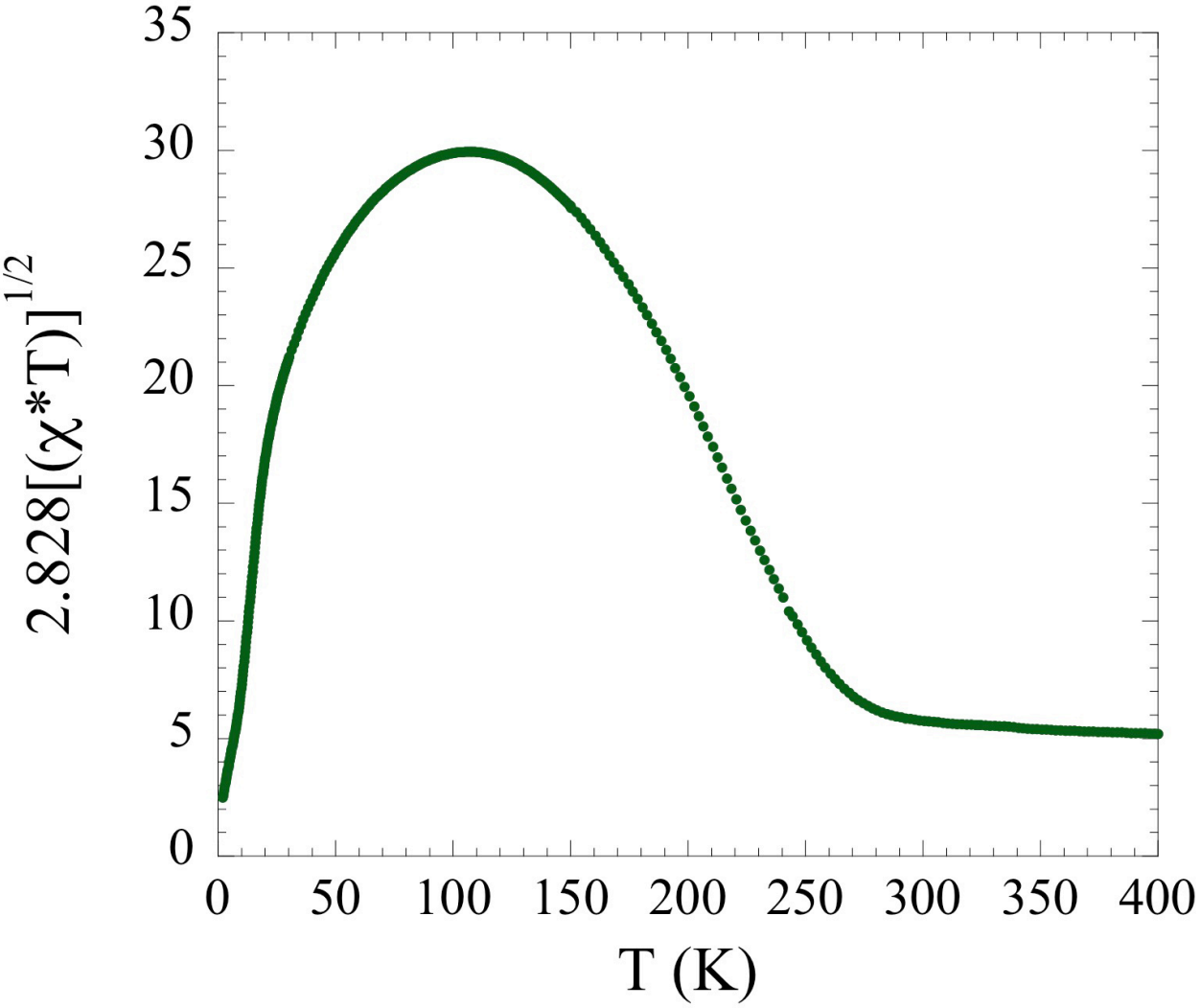

Figure S5. Temperature dependence of the magnetic susceptibility for $Ba_3Fe_{1.56}Ir_{1.44}O_9$ under an applied field of 1 T, with FC data shown in blue, ZFC data shown in green, and inverse susceptibility data shown in red.

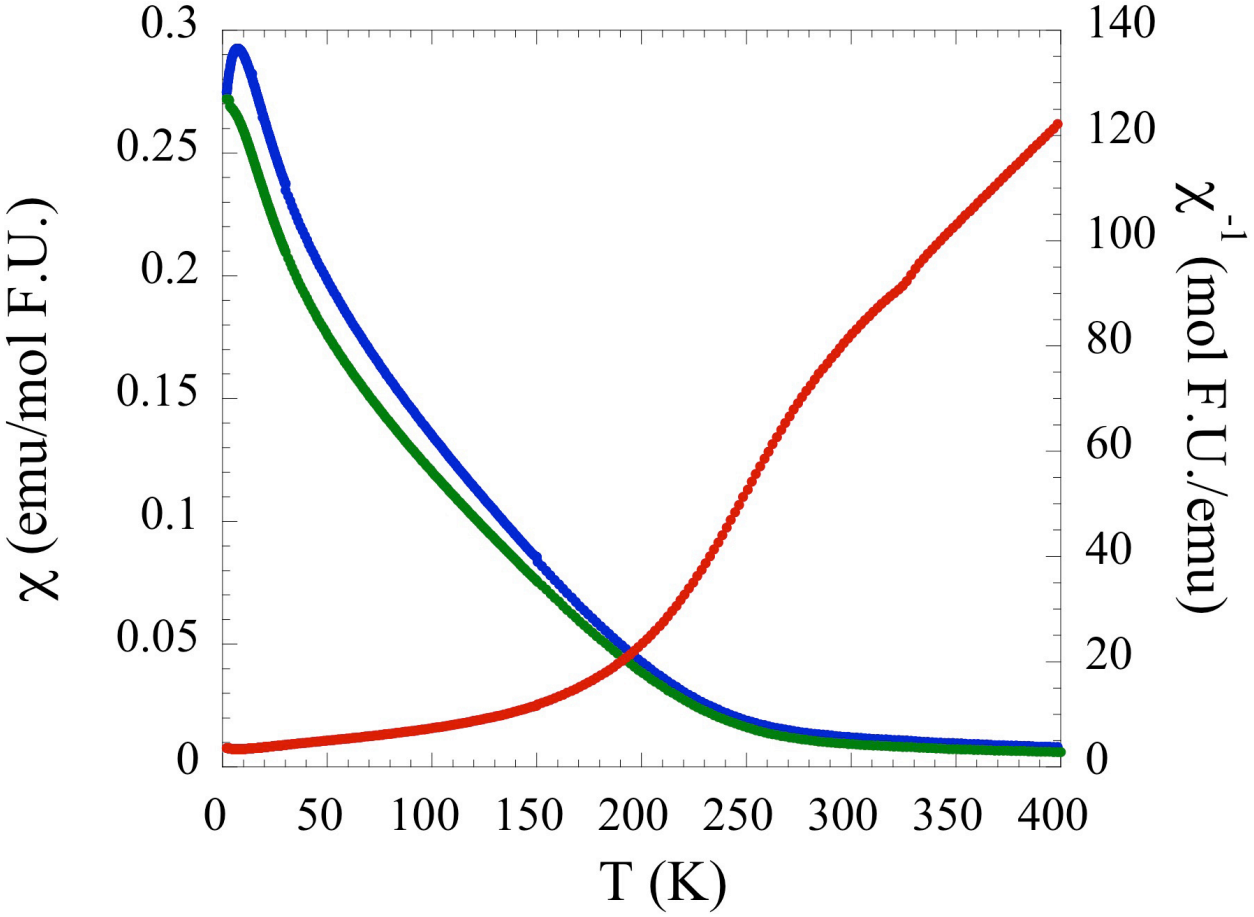

Figure S6. Magnetization (μ_B) versus magnetic field (T) for $Ba_3Fe_{1.56}Ir_{1.44}O_9$ ranging from 0 to 5 T at 2 K. A weak coercive force of 0.01 T can be observed in the hysteresis loop inset.

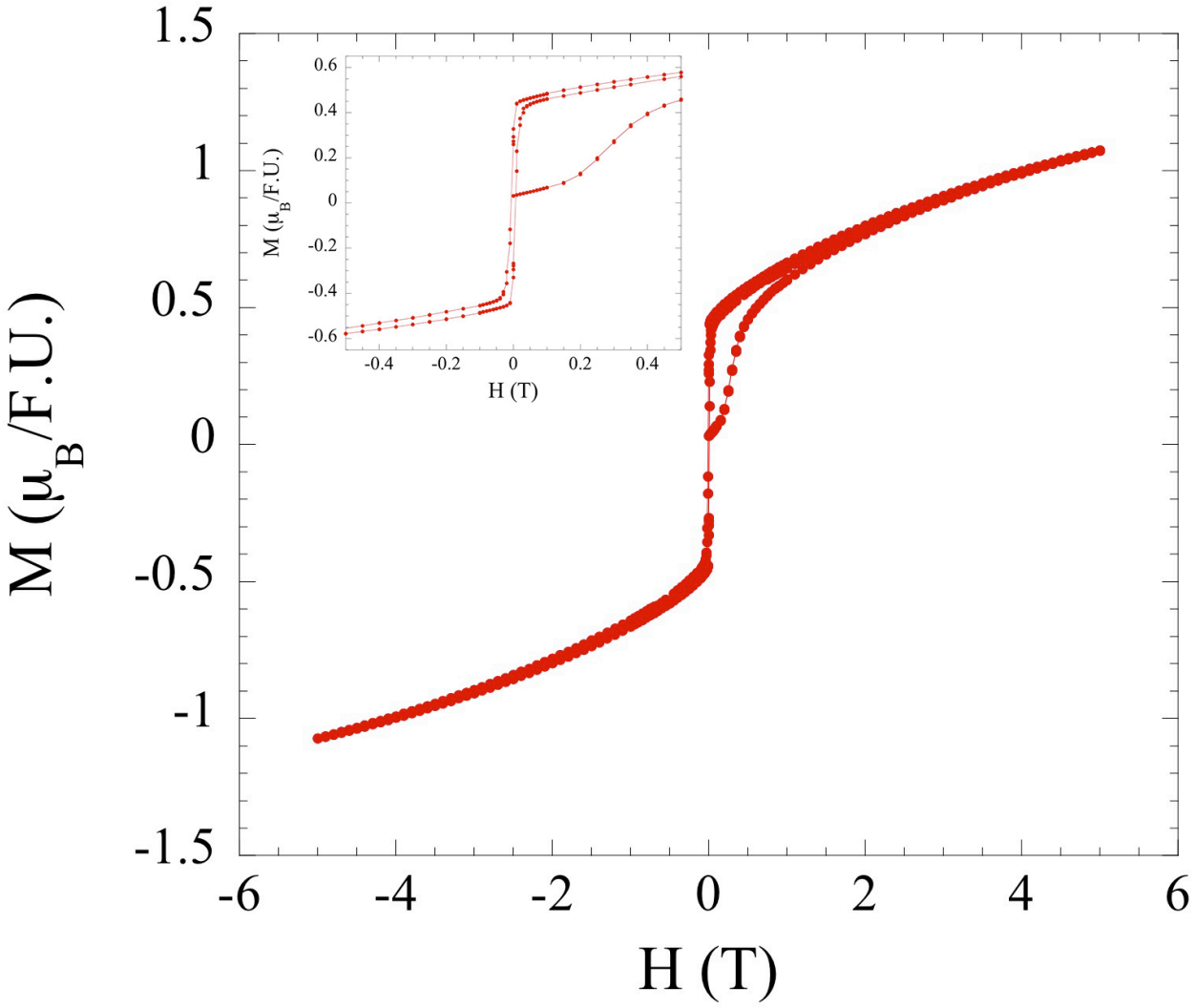

Figure S7. Magnetization (μ_B) versus magnetic field (T) for $Ba_3Fe_{1.56}Ir_{1.44}O_9$ ranging from 0 to 5 T at 45 K. A weak coercive force of 0.01 T can be observed in the hysteresis loop inset.