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^{17}O Single Crystal NMR Evidence for a Gapped Spin-liquid Ground State in the S=1/2 Kagome Lattice $ZnCu_3(OH)_6Cl_2$ MINGXUAN FU, Department of Physics and Astronomy, McMaster University, TAKASHI IMAI, Department of Physics and Astronomy, McMaster University and Canadian Institute for Advanced Research, TIANHENG HAN , Department of Physics, University of Chicago , YOUNG. S. LEE, Departments of Applied Physics and Photon Science, Stanford University and SLAC National Accelerator Lab — The two-dimensional S=1/2 Kagome lattice in Herbersmithite $ZnCu_3(OH)_6Cl_2$ is the best candidate for experimental realization of a quantum spin liquid ground state known to date. The recent discovery of a continuum of spinon excitations using inelastic neutron scattering[1] has drawn strong attention to its exotic magnetic properties. Understanding the nature of the paramagnetic ground state of $ZnCu_3(OH)_6Cl_2$, however, remains a challenge, due to excess magnetic Cu defects occupying the interlayer Zn sites. We conducted single crystal NMR measurements of the ^{17}O Knight shift, and succeeded in measuring the intrinsic spin susceptibility of the Kagome layer down to $T \sim 0.01J$($J \sim 17$meV) for the first time. We demonstrate that the intrinsic spin susceptibility decays exponentially at low temperatures, revealing the presence of a spin gap $\Delta \sim 0.1J$. Moreover, we show that application of a high magnetic field suppresses the gap. These results provide direct evidence for a gapped spin-liquid ground state realized in $ZnCu_3(OH)_6Cl_2$.[2]

[1]T. Han et al., Nature **492**(2012) 406
[2]M. Fu et al., preprint.

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