Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

3He-4He liquid mixtures investigated by neutron imaging technique at low temperatures[1] PATRICK GUMANN, University of Waterloo, JULIA SCHERSCHLIGT, DANIEL HUSSEY, DAVID JACOBSON, NIST Center for Neutron Research, DAVID CORY, IVAR TAMINIAU, University of Waterloo — Helium is a unique element which exhibits a variety of different phases and unusual behaviors. It can be found in nature in two stable isotopic forms: ^{3}He and ^{4}He. One of the most profound quantum mechanical effects, superfluidity, occurs below 2.17 K in liquid helium ^{4}He and 0.003 K in liquid ^{3}He. There are also interesting phenomena occurring in mixtures of the two isotopes. One demonstrative example is the finite solubility of liquid ^{3}He (a Fermi system) in superfluid ^{4}He (a Bose system) even at T = 0 K. This is the basic principle in the operation of a ^{3}He-^{4}He dilution refrigerator capable of continuously producing 2 mK. While much has been done in studies of the thermodynamical, quantum properties of liquid helium mixtures, there has not been any attempt to visualize the dynamics of ^{3}He in liquid ^{4}He. Presented results of neutron imaging experiments on 0.3 bar liquid ^{3}He-^{4}He mixtures, at 1.5 K have shown a clear diffusion of ^{3}He driven by the difference in chemical potential. The data were taken for over 12 hours using a high resolution CCD camera.

[1]Supported NIST Center for Neutron Research, U.S. Commerce Department

Patrick Gumann
University of Waterloo

Date submitted: 14 Nov 2011

Electronic form version 1.4