Abstract Submitted
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New quantum state of protons and electrons in nano-confined water[1] GEORGE REITER, University of Houston, ALEXANDER KOLESNIKOV, ORNL, STEPHEN PADDISON, University of Tennessee, Knoxville, JERRY MAYERS, ISIS, PHIL PLATZMAN, University of Houston — Neutron Compton Scattering provides a means of directly and accurately measuring the momentum distribution of protons in water, which is determined primarily by the protons ground state wavefunction. We find that in water confined on scales of $\sim$20Å, this wave function responds to the details of the confinement, corresponds to a strongly anharmonic local potential, shows evidence in some cases of coherent delocalization in double wells, and involves differences in zero point kinetic energy of the protons from that of bulk water at room temperature of -40 to +120 meV. This behavior is a generic feature of nanoscale confinement, and in particular, this state should be that which is present in water confined in biological cells. It is exhibited here in 16 Å inner diameter carbon nanotubes, two different hydrated proton exchange membranes (PEMs), Nafion 1120 and Dow 858, and has been seen earlier in xerogel and 14 Å diameter carbon nanotubes. The existence of this state is confirmed by xray Compton scattering measurements of the electron momentum distribution.

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