Structure of He-4 adsorbed on single-wall carbon nanotube bundles\textsuperscript{1} OSCAR VILCHES, U. of Washington, JONATHAN PEARCE, ILL, Grenoble, France, MARK ADAMS, ISIS, Didcot, UK, MARK JOHNSON, ILL, Grenoble, France, HENRY GLYDE, U. of Delaware — The structure and dynamics of $^4\text{He}$ adsorbed on single-wall carbon nanotubes (SWNT) has for a long time been the subject of intensive theoretical investigation. Here we present the first experimental measurements of the structure of $^4\text{He}$ adsorbed on SWNTs, obtained using neutron diffraction techniques. The structure of this highly quantum system has been measured as a function of the $^4\text{He}$ coverage, up to one monolayer, and appears to be qualitatively similar to that of more classical systems. By combining the current data with our existing measurements of the heat capacity and isosteric heat of adsorption, we are able to identify the contributions from the linear chains in the outer groove sites, and the two-dimensional patches on the curved outer walls. In conjunction with molecular dynamics simulations, we are able to draw some conclusions about the population mechanism of $^4\text{He}$ on SWNTs based on direct observations of the adsorbate structure.

\textsuperscript{1}Work supported by NSF DMR 0115663 and 0245423, and ILL

Oscar Vilches
U. of Washington

Date submitted: 29 Nov 2004