## X-ray Scattering Measurements of Liquid Water

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Despite decades of research using both x-rays and neutrons there still exist disagreements concerning the radial distribution function of liquid water at room temperature. These disagreements largely arise due to the challenges of extracting the elastic scattering from the significant inelastic background as well as debate about the correct independent scattering factor[1]. Recent research using spectroscopic techniques[2], in combination with modeling, suggest that liquid water contains significant numbers of broken hydrogen bonds and is better described as rings of strongly H-bonded chains rather than the tetrahedral structure observed in ice-Ih.

Using the increased brightness of the new SPEAR3 synchrotron source we have performed measurements of liquid water both at 23 C and at 5 C. These measurements take advantage of a second recent development, a variable-focus diffracted beam analyzer which provides energy dispersion of the scattered x-rays onto a position-sensitive detector[3]. We have also developed a horizontal water jet with a sub-millimeter diameter that eliminates scattering from a container and precludes radiation-induced bubble formation. The high brightness of the source has also allowed us to measure scattering from water out to 19.7 Å<sup>-1</sup>, which simplifies the normalization of the data and increases the r-space resolution.

 Head-Gordon T., Hura G., *Chem. Rev.*, 2002, **102**, 2651. [2] Wernet Ph., et al., *Science*, 2004, **304**, 995. [3] Ishii H., Johnson B., Brennan S., *AIP Proc.*, 2004, **CP708**, 969.

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