

Science with Photons

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BESSY-Hörsaal

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X-Rays Shines Light on the Water Mystery

Abstract:

Water is the key compound for our existence on this planet and it is involved in many important physical, chemical, biological and geological processes. Although water is the most common molecular substance it is also most unusual with many anomalies in its thermodynamic properties such as compressibility, density variation and heat capacity. The question of the structure of the hydrogen bonding network in water has been discussed intensively for over 100 years and has not yet been resolved. This talk will describe recent x-ray spectroscopy and scattering measurements showing that the liquid can be described as fluctuations between two types of local hydrogen bonded structures driven by incommensurate requirements for minimizing enthalpy and maximizing entropy. The connection of these results to low and high density water and the 2nd critical point model will be discussed. Ion solvation, hydrophobic interactions and bonding to metal surfaces will also be discussed.