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Observation of the slow, Debye-like relaxation in hydrogen-bonded liquids by dynamic light scattering YANGYANG WANG, PHILIP GRIFFIN, ADAM HOLT, FEI FAN, ALEXEI SOKOLOV, University of Tennessee, Knoxville — Water, monohydroxy alcohols, and several other hydrogen-bonded liquids, display a pronounced Debye-like low-frequency dielectric relaxation. Despite extensive studies of more than half a century, the molecular origin of this process still remains an open question. Curiously, the slow, Debye-like relaxation has largely remained a dielectric phenomenon and has thus far eluded observation by other experimental techniques. This has led many to believe that this process is a purely dielectric phenomenon. Here we present the first evidence of the slow, Debye-like relaxation from the depolarized light scattering experiments on a model hydrogen-bonded liquid, 2-ethyl-4-methylimidazole. We show that the relaxation times obtained for this process by dielectric spectroscopy and light scattering spectroscopy are in good agreement with each other and can be explained by the Debye model of rotational diffusion. This finding resolves a long-standing mystery about the slow Debye-like relaxation in hydrogen-bonded liquids and offers new insights into its nature.

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