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Density fluctuations and dielectric constant of water in low and high density liquid states ERIK LASCARIS, Boston University, CUI ZHANG, GIULIA A. GALLI, University of California, Davis, GIANCARLO FRANZESE, Universitat de Barcelona, H. EUGENE STANLEY, Boston University — The hypothesis of a liquid-liquid critical point (LLCP) in the phase diagram of water, though first published many years ago, still remains the subject of a heated debate. According to this hypothesis there exists a critical point near $T \approx 244$ K, and $P \approx 215$ MPa, located at the end of a coexistence line between a high density liquid (HDL) and a low density liquid state (LDL). The LLCP lies below the homogenous nucleation temperature of water and it has so far remained inaccessible to experiments. We study a model of water exhibiting a liquid-liquid phase transition (that is a liquid interacting through the ST2 potential) and investigate the properties of dipolar fluctuations as a function of density, in the HDL and LDL. We find an interesting correlation between the macroscopic dielectric constants and the densities of the two liquids in the vicinity of the critical point, and we discuss possible implications for measurements close to the region where the LLCP may be located.

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