Abstract Submitted
for the TSF12 Meeting of
The American Physical Society

Using a Microwave Resonant Cavity to Study Hydrogen Bonding at Phase Transition in H_2O and D_2O JIM ROBERTS, University of North Texas, JAI DAHIYA, S. GHOSH, Southeast Missouri State University, JAI DAHIYA, S. GHOSH TEAM — The resonant microwave cavity is a very sensitive device for detecting small changes in material properties as they are perturbed by temperature, electric and magnetic fields. In this laboratory all states of mater have studied with the resonant cavity, including the plasma state. In this paper we report on an experiment with water as it changes from liquid (disordered) to water ice (ordered) phase. In that hydrogen bonds are involved in this process, we are able to observe their behavior through the dielectric response of H_2O as it is cycled from solid to liquid. The transition through the densest state of water near 4°C indicates that the structure of the water molecules in the ice phase at 0° C is less compact than that experienced at the most dense temperature of water. If we associate this density with the interaction of the hydrogen bonds, it can be postulated that the distribution of the structure in snowflakes is a consequence of random processes in sharing the hydrogen bonds as the system cycles from the "disordered" state to the more ordered state. In this work phase transition from liquid to solid and solid to liquid was studied for H_2O and D_2O. It was assumed that the bonding of the two molecules behave the same during the transition from ordered to disordered states and in the reverse transition for disordered to ordered states. The apparatus employed in this investigation is discussed briefly.

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Date submitted: 24 Sep 2012 Electronic form version 1.4