PRESSURE BROADENING OF SEVERAL TERAHERTZ TRANSITIONS OF WATER FROM 20K TO 200K

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The pressure broadening of the 0_{00} to 1_{11}, 1_{11} to 2_{02}, 3_{03} to 3_{12}, 2_{21} to 3_{12} and 3_{12} to 3_{21} transitions of water by hydrogen and helium has been investigated using the collisional cooling technique. This technique has allowed the broadening to be examined over the temperature range of 20K to 200K, far below the freezing point of water. The results of the investigation show a general trend of two distinct regions of broadening for each rotational line. Above 50K, the temperature dependence of the broadening follows the expected power law behavior. Below 50K, the broadening decreases very rapidly with temperature. This behavior is similar to that observed in a recent study of the pressure broadening of the 556 GHz line of water completed in our lab. However, this behavior is in sharp contrast to that predicted by previous theoretical calculations.

We will present the results of our current investigation. This will include a discussion comparing the current study with the results of the previous experimental and theoretical work. The pressure broadening is a window into the collisional excitation and the implications of our results for the interpretation of water spectra in the interstellar medium will be discussed.