THE PERFORMANCE OF THE THIRD GENERATION OF CP-FTMW SPECTROMETERS ILLUSTRATED BY THE ANALYSIS OF THE WATER HEPTAMER STRUCTURE

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The current status of the ongoing construction of a CP-FTMW spectrometer operating in the 2-18 GHz is presented. This new design exploits advances in high-speed digital electronics to achieve unprecedented speed and sensitivity in molecular rotational spectroscopy. Such high-speed digitizers allow deep time-domain signal averaging, making possible to routinely acquire 10M free-induction-decays in a single experiment, decreasing the measurement time by a factor $\sim$10x. The spectrometer uses high directionality microwave antennas that permit a separation large enough to place five pulsed nozzles with no signal loss, increasing the signal by a factor of 5/3 and minimizing sample consumption with respect to previous designs. The minimal use of traditional microwave components included in this setup make it especially well-suited for remote internet control, which will provide access to the instrument to a broad range of chemical community. In order to cover a wide-range of molecular systems, liquid reservoir nozzles, pulsed laser ablation sources, and pulsed electric discharge sources are being successfully implemented. The spectrometer performance and sensitivity are demonstrated through the measurement and analysis of the rotational spectrum of the water heptamer.