

DIRECT DIGITAL SYNTHESIS CHIRPED PULSE MICROWAVE SPECTROMETERS FOR THE CLASSROOM AND RESEARCH

GEOFFREY BLAKE, BRANDON CARROLL, IAN A FINNERAN, *Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA, USA.*

By combining the rapid development in direct digital synthesis circuitry and Field Programmable Gate Arrays (FPGAs) coupled to fast A/D samplers, it is possible to construct high performance chirped pulse microwave spectrometers suitable for gas-phase rotational spectroscopy experiments in undergraduate physical chemistry labs as well as graduate level research. The technology is highly tailorable, and sufficiently robust that extensive experimentation is feasible in the teaching environment. The time domain nature of the experiment has strong ties to concepts in Nuclear Magnetic Resonance (NMR) widely discussed in undergraduate curricula, and the software environment for the instrument control and spectral assignment can be integrated with ab initio quantum chemistry predictions of molecular structure and dynamics.