

## A 6–18 GHz DIRECT DIGITAL SYNTHESIS TUNABLE SEGMENTED CHIRPED PULSE FOURIER TRANSFORM MICROWAVE SPECTROMETER

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Chirped pulse Fourier transform spectroscopy (CP-FTMW) has become a widely used technique for the detection of molecular rotational spectra owing to its broad frequency coverage. Traditional CP-FTMW set ups involve top-quality broadband arbitrary waveform generators (AWG), high-power amplifiers, and digitizers, which are expensive due to their specifications. One method to lower costs with only a mild sacrifice of efficiency is to divide the total bandwidth into smaller sections and step from section to section with a tunable local oscillator; these so-called “segmented” CP-FTMW spectrometers have much lower costs by decreasing the required amplifier power and digitizer bandwidth. Inspired by the work of Finneran et al. (*Rev. Sci. Inst.* 84, 2013, 083104), our group has designed a 6–18 GHz segmented CP-FTMW broadband spectrometer that also replaces the AWG with a direct digital synthesizer (DDS), further lowering the spectrometer cost. To our knowledge, this is the first instrument in which a DDS has been coupled with the segmented approach to achieve a tunable intermediate frequency (IF). Design, cost analysis, progress, and performance will be discussed in this talk.