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.