

DELIVERING MICROWAVE SPECTROSCOPY TO THE MASSES: A DESIGN OF A LOW-COST MICROWAVE SPECTROMETER OPERATING IN THE 18-26 GHz FREQUENCY RANGE

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Advances in chip-level microwave technology in the communications field have led to the possibilities of low cost alternatives for current Fourier transform microwave (FTMW) spectrometers. Many of the large, expensive microwave components in a traditional design can now be replaced by robust, mass market monolithic microwave integrated circuits (MMICs). "Spectrometer on a board" designs are now feasible that offer dramatic cost reduction for microwave spectroscopy. These chip-level components can be paired with miniature computers to produce compact instruments that are operable through USB. A FTMW spectrometer design using the key MMIC components that drive cost reduction will be presented. Two dual channel synthesizers (Valon Technology Model 5008), a digital pattern generator (Byte Paradigm Wav Gen Xpress), and a high-speed digitizer \ arbitrary waveform generator combination unit (Tie Pie HS-5 530 XM) form the key components of the spectrometer for operation in the 18-26.5 GHz range. The design performance is illustrated using a spectrometer that is being incorporated into a museum display for astrochemistry. For this instrument a user interface, developed in Python, has been developed and will be shown.