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High power, high resolution terahertz spectroscopy technologies and its applications[1] DONG HO WU, BENJAMIN GRABER, CHRISTOPHER KIM, Naval Research Laboratory — Since a large number of molecules' resonance frequencies lie within terahertz frequencies, terahertz spectroscopy is a highly useful tool for scientific investigation of various materials. At the same time one can use the same technology for the identification of hidden materials. Despite these potential applications presently terahertz spectroscopy is largely underutilized, and it is mostly being used in the laboratory environment. This is in part largely due to the fact that no portable, high power, high resolution spectrometer is currently available. So we have been developing a high power, wideband terahertz source. The terahertz source is capable to produce a relatively high power (>2 mW), wideband (0.1 – 3 THz) terahertz beam. In addition to the source we have optimized and calibrated an electro-optic (EO) detector, of which sensitivity is 10^{-13} W/(Hz)$^{1/2}$. Recently, by utilizing these terahertz source and detector, we have constructed a high power, high resolution terahertz spectrometer, and carried out various experiments to understand resonance spectra of water vapor, chemicals and ionized air. Also we constructed a modified terahertz spectrometer for a stand-off detection applications. In this presentation I will discuss our experimental achievements and progresses.

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