# UNI-TRAVELING CARRIER PHOTODIODE FOR GAS-PHASE SPECTROSCOPY AND STAND-OFF EXPLOSIVE DETECTION

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Molecular gases, such as vapor from explosives and chemical agents, have sharp spectral features in the millimeter-wave and THz regions of the electromagnetic spectrum. In addition, the large molecular structure of solid-state explosives can provide distinctive reflectance spectra between 300 GHz and 3 THz. A high-power, frequency-agile source, which is capable of resolving the unique spectral features, enables rapid spectroscopic detection, identification, and characterization of these target materials. Higher power sources reduce the integration time required to collect a spectrum, while high spectral resolution and increased spectral coverage can reduce false alarms by enabling unique discrimination of similar materials. Recently, the generation of spectrally pure, millimeter-wave signals between 100 GHz and 350 GHz was demonstrated using photodetection based on an ultra-high-speed Uni-Traveling Carrier Photodiode (UTC-PD). A development program is underway in which this photodiode will be evaluated for applications in spectroscopy operating from 100 GHz to 1100 GHz.