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**Terahertz spectroscopy of ionized air and explosive vapor** BENJAMIN GRABER, US. Naval Research Laboratory / Temple University, RONGJIA TAO, Temple University, DONG HO WU, US. Naval Research Laboratory — In the past it has been demonstrated that terahertz spectroscopy could identify various chemical agents and explosives in solid and liquid phases. However peaks and dips in the terahertz spectra obtained from solid and liquid phases are not sharp and often ambiguous or ill-defined, as the interferences among the molecules in the solid or liquid obscure the molecule's characteristic resonances. Hence there has been considerable interest in obtaining terahertz spectrum of gas phase. Recently we have increased terahertz output power of our terahertz spectrometer, and measured terahertz spectra of gases, including water vapor, and ionized air produced by various ionization sources as well as explosive vapors. Our experiments revealed: (1) our terahertz spectrum of water vapor was highly consistent with other published data, (2) the spectra of ionized air produced by corona discharge and nuclear isotopes including Am-241, Bi-207, Ba-133, Co-60, Na-22 and Cs-137 were all different, and the characteristic spectrum changes largely depending on the type of ionization source, and (3) terahertz spectra of explosive vapor taken from TNT, PETN and RDX which were dissolved in acetonitrile or water exhibit very sharp resonance peaks and dips. We will present details of our experimental results.

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