363. 标题: THz detection of small molecule vapors in the atmospheric transmission windows
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摘要: Using a low power beam of ultrashort THz pulses that propagate in the ambient laboratory environment we have measured the rotational signatures of small molecule vapors at frequencies within the atmospheric transmission windows. We investigate two types of apparatus. In the first type the THz beam propagates along a 6.7 meter round trip path that is external to the spectrometer, and which contains a long sample tube (5.4 meter round trip path) that holds the analyte vapor. The environment of the tube is controlled to simulate dry or humid conditions. In the second apparatus the THz beam propagates over a much longer 170 meter round trip path with analyte vapor contained in a relatively short 1.2 meter round trip path sample chamber. We describe the rotational signatures for each apparatus in the presence of the strong interference from water vapor absorption. For the shorter path long-tube apparatus we find that the peak detection sensitivity is sufficient to resolve a 1% absorption feature. For the more challenging 170 meter path apparatus we find that the peak detection sensitivity is sufficient to resolve a 3-5% absorption feature. The experiments presented here represent a first step towards using ultrashort THz pulses for coherent broad band detection of small molecule gases and vapors under ambient conditions.

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