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Label-free detection of DNA interactions by terahertz spectrometry ANIS RAHMAN, Applied Research and Photonics, Inc., BRUCE STANLEY, Penn State College of Medicine, AUNIK RAHMAN, Applied Research and Photonics, Inc., ARP TEAM — Terahertz (THz) spectrometry has the potential to analyze DNA and other molecular interactions without fluorescent labeling. THz spectrometry is conducted in time domain where the temporal signal is acquired on a sub-pico-second scale. The temporal signal converted to frequency domain via Fourier transform constitutes a signature of the interaction under study. An important advantage of this technique is that the delay time can be tuned from tens of femto-seconds to tens of pico-seconds. This gives a means of probing a molecular "event" (e.g., a vibrational state or bond position or bending, or a conformational state, etc.) in an appropriate time window. This is a powerful ability because different molecular events exhibit different time response based on their physical and chemical nature. For example, a molecular relaxation occurs over a longer time scale compared to a bond vibration. Similarly, compositional or conformational difference of a given molecule results in different signature with appropriate time response that can be accurately probed. The terahertz signature is unique and provides a means of identifying and/or characterizing many molecular interactions. Some exemplary results of biological system will be discussed.

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