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### Advances in terahertz spectroscopy nanoscanner and sub surface 3D imaging for biomaterial

Terahertz radiation (T-ray) is the band of energy with corresponding frequencies between 0.1 THz and 30 THz. The non ionizing nature of T-ray is especially suitable for probing human tissues in a non invasive and non contact fashion without any radiation damage. ARP has invented a new mechanism, the dendrimer dipole excitation (DDE) for continuous wave (CW) terahertz generation from a nanomaterial called electro optic dendrimer. The CW DDE source is different than the legacy photoconductive antenna in that it does not require a femtosecond pulsed laser for terahertz generation; yet it generates 10s of milliwatts of power. This source is tunable and produces wide band frequency spectrum. In this paper, we report important applications that are developed using terahertz time domain spectrometer, nanoscanner and 3D imager; all built from the DDE based CW terahertz generator. For example, permeation of nanoparticles through human stratum corneum that leads to bioavailability was measured by a direct method. The stratum corneum was also scanned by the terahertz nanoscanner for its thickness profile which allows quantification of the concentration distribution of the permeated nanoparticles. In addition, reconstructive imaging was conducted for inspecting both the surface and the sub surface. The images reveal that the nanoparticles form an array on the surface of the stratum corneum. The significance of these results will be discussed. Additional examples will be used to illustrate the technology.

### Biography

Anis Rahman is known for his work on dendrimer based photonics and terahertz technology. He has completed his MS and PhD from Marquette University (Milwaukee, WI) and Postdoctoral Research Position at Columbia University, USA. He has contributed more than 100 publications and conference presentations and has produced 12 patents. Currently, he is the President and Chief Technology Officer of Applied Research & Photonics (ARP), a Harrisburg, PA based company. He is also the Chair-elect of the division of small chemical businesses of the American Chemical Society.

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