

RUTGERS CDR SEMINAR

Anis Rahman

Applied Research & Photonics

April 27th, 2015

“Terahertz sub-surface imaging and spectroscopy for cellular level identification of skin abnormalities”

BIOGRAPHY:



Anis Rahman (formerly K. M. Anisur Rahman) is the founder and Chief Technology Officer of Applied Research and Photonics Inc. (ARP), located in Harrisburg, PA: <http://arphotonics.net>. Dr. Rahman is known for his work on Dendrimer based non-linear optics, photonics and terahertz technology. ARP was founded in 2003 to harness the unique capabilities of a nanomaterial called Dendrimer (a polymer with spherical molecular architecture). Coined the term “silicon for photonics”, Dr. Rahman’s approach makes it possible to fabricate chip based components for fiber-optic communication and high capacity optical node. Dr. Rahman has contributed more than 80 publications and conference presentations and has produced 8 patents. Dr. Rahman originated the concept of “natural index contrast” (NIC) that enables monolithic fabrication of photonic integrated circuits from Dendrimer.

Currently ARP is the leading company to produce turn-key terahertz instruments based on wideband terahertz generated from electro-optic dendrimer. ARP’s terahertz technology finds applications in a number of important areas in life sciences, pharmaceuticals, biomedical, semiconductor imaging, analytical and fine scale materials characterization. ARP has recently demonstrated early detection of skin cancer via terahertz thickness profiling and sub-surface imaging. Under Dr. Rahman’s leadership, ARP technology and products received prestigious awards including the NASA Nanotech Brief’s nano-50 award (2007 & 2008) and CLEO/Laser Focus World’s Innovation award (2011). Anis Rahman completed his graduate work (MS & PhD) at Marquette University (Milwaukee, WI) and a postdoctoral research position at Columbia University (NY). Anis Rahman is also the Chair-elect of the division of small chemical businesses of the American Chemical Society (www.acs-schb.org).

ABSTRACT:

Terahertz scanning reflectometry offers an opportunity to investigate both the surface and the sub-surface of biological tissues (e.g., skin) in a non-invasive fashion. The non-ionizing nature of T-ray eliminates radiation damage or perturbation of sensitive tissues while able to probe disease conditions in the deeper layers leading to an effective early diagnostic tool. For example, thickness profiling of benign and cancerous skins would show vast difference in their profile.

In this study, a terahertz technique comprised of terahertz scanning Reflectometry, terahertz time-domain spectroscopy and terahertz imaging (all instruments from Applied Research & Photonics, Harrisburg, PA 17111) have been utilized for detection of cancerous skin with basal cell carcinoma (BCC) in comparison to benign skin sample. Two groups of samples were studied; the first group samples are benign skin and the second group samples are biopsy from cancerous area. Thickness profile exhibits significant differences in profiles of the respective skin samples both in their layer structure and also in their reflected intensities; thus indicating presence and lack of cellular order for respective specimen. Similarly terahertz spectra acquired in transmission exhibit quantifiable differences for both group. More interestingly, terahertz image of the benign skin shows regular cell patterns while the image of a sample with BCC exhibit no clear cell demarcations. The lack of clear cell order in the skin, thus, may be used as an indication of cancerous area and this finding may be used as an early diagnosis tool. It is notable that this is the first of such a concerted observation of benign versus BCC skins from three different experiments. The results are consistent from individual experiments and collectively provide an accurate means of early detection of BCC.

- LOCATION:** Life Sciences Building Rutgers - The State University of New Jersey,
145 Bevier Road, Piscataway, New Jersey 08854, New Jersey Center for
Biomaterials Suite - Conference Room 102
- TIME:** 5:30 PM
- HOST:** Bozena B. Michniak-Kohn, Ph.D., M.R.Pharm.S. Director, Center for
Dermal Rsearch, Professor of Pharmaceutics, Ernest Mario School of
Pharmacy