Introduction of Terahertz and Nanotechnology in Bangladesh
Potential Impact on the Next Generation Science and Agro Industry

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In this first half of the 21st century when we talk about "introducing" a new technology, many become skeptic about the nature of the "new" because in most cases it is actually a modification of an existing art or a new application of something not being known for such application. So, naturally most new technologies around us involve incremental improvement of its previous version. For instance, the mobile phone system that find place in everyone's pocket today, is actually a modified (cellular) radio communication system in different wavelength band with different coding for transmission and receiving; the device itself being both receiver and transmitter simultaneously. For another instance, a fuel-cell car is actually an electric car where the electricity is generated by fuel-cells that recharge the battery which runs the motor.

In case of spectroscopy, Scientists, who use molecular spectroscopy as an investigative tool for the study of molecular signature and inter-molecular interactions, are increasingly confronted with the term "terahertz spectroscopy." This term is not commonly found in the standard spectroscopy textbooks, nor does it appear in the classical molecular spectroscopy literature [1]. Nevertheless, in the recent decade terahertz spectroscopy has experienced significant growth owing to its usefulness over other kind of spectroscopy. Terahertz spectroscopy, in fact, is a time-domain spectroscopy (THz- TDS) that is fundamentally different from all other kind of spectroscopy. There are research labs and universities mostly in countries such as the USA, European Union, and Japan, which are at the cutting edge of terahertz research. Scientists from all over the world are looking for better ways to generate and harness the potential of this special energy, "terahertz radiation" or T-ray. Regrettably though, a single breakthrough has not yet occurred, but the technology finds applications in multiple areas, mostly in a complementary fashion. Nonetheless, the proponents of terahertz technology continue to praise its great promise. This is the nature of a great majority of new technologies anyway. For instance, when lasers were in the research phase, scientists thought the end use of lasers could in hair removal of patient body or some therapeutic treatment. But later, lasers found their way to be essential in communications, entertainment, and many many other faucets of modern life.

So, what can a Harrisburg, PA, based startup company like ARP contribute to this field? In a nutshell, ARP has found a way to enhance the performance many times

compared to the current art with their proprietary nanotechnology while reducing the cost points. Simultaneously, ARP has opened critical applications of this powerful technique that are not available from anywhere else.

Now, is it possible to introduce this emerging technology in Bangladesh when only a handful of developed countries are at the stage of introducing it for themselves? Moreover, why Bangladesh (or any other desh for that matter) should be interested? Scientists from Bangladesh should have been at the forefront to find answer of question like this. In this connection it is worthwhile to note that recently Bangladesh economy is doing better as the country has demonstrated better performance, in some cases comparable with India and China [2]. Therefore, Bangladesh actually is a fertile ground for harnessing the advents of an emerging technology like terahertz and nanotechnology. So, what can Bangladesh offer? The following points and applications may be highlighted:

New science and technology. One way human mind works can be summarized as: when one learns something new, no one can predict what that person will think the next. For example, the notion of constant motion of an object that is not disturbed by an external force was first conceptualized by Al-Hazen (who is commonly known as the father of modern optics), which later become known as the Newton's first law of motion. So, once the activities are set in motion, many new ideas and applications will blossom.

Applied research in life sciences. Microbiology, chemistry, biochemistry, biotechnology, pharmaceuticals, etc.; all deal with interactions of one molecule with another. This also include, genetic research and therapy; personalized medicine; efficacy and suitability of a drug based on genetic makeup; new drug discovery; etc.

Medical diagnostics. A rapid diagnostic tool is very important for physicians to determine presence or absence certain pathogen; analysis of pathogen, germs, bacteria, etc. without lengthy centralized lab analysis.

Early detection of cancer and tissue health monitoring. Early detection is of paramount importance for successful treatment. Terahertz technology is able detect cancerous conditions at very early stage on a cellular level. Additionally, it can be used for monitoring the health condition of biological tisses.

Quality control. Routine applications may be developed for quality control in pharmaceutical, paper, paint, food, personal care, and other industries.

Applied research in agro sciences. Genetic recognition, gene polymorphism, gene backbone chemistry, etc. This has practical applications in crop engineering, crop or plant breeding, crop protection without using pesticide, crop yield, etc.

Analytical applications. Environment monitoring and detection of trace amount of unwanted chemicals, etc.

Semiconductor industry. There are applications in semiconductor and electronics industry for both research and manufacturing.

As the initial applications starts seeing success, more applications will spring off the base applications. Thus it will create a new sector of nanotechnology driven economy for making people's lives better. The key is to get started. And in this case, sooner is better.

Comments and questions are welcome.

[1] Austin J. Barnes, et al., Preface of the "Journal of Molecular Structure," Vol. 1006, 1, (2011).

[2] Amartya Sen, "Quality of Life: India vs. China," The New York Review of Books, MAY 12, 2011: http://www.nybooks.com/articles/2011/05/12/quality-life-india-vs-china/