Researchers mine the 'Terahertz gap'

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Research underway at the University of Leeds will provide a completely fresh insight into the workings of nano-scale systems, and enable advances in the development of nano-electronic devices for use in industry, medicine and biotechnology.

The Leeds team has secured a new grant of £2 million from the Engineering and Physical Sciences Research Council (EPSRC) to shed light on the changes in behaviour and properties of nano-scale systems within the least explored area of the electromagnetic spectrum, the terahertz region.

The combined expertise at Leeds will fuse two fundamental areas of science – nanoscience, which focuses on decreasing size, and high frequency science, which focuses on high speed electronics.

Project leader Dr John Cunningham of the School of Electronic and Electrical Engineering explains: “The dimensions of electronic devices have reduced so much that they can be literally a few atoms in size – but at this scale, they exhibit different properties than their larger scale counterparts. These properties can be directly revealed or even changed using radiation from the terahertz region of the spectrum. If we want to continue to provide ever-smaller electronic systems that work at ever-faster speeds, we must find new ways of enabling this development by understanding exactly how they work. It’s an exciting project for us because we’re bringing together two areas of fundamental science that have rarely been studied together.”

Technologies using the radiation from many regions of the electromagnetic spectrum are well developed: the use of radio waves, x-rays and microwaves are now second nature in modern life. But the terahertz region, often called the 'Terahertz gap' because of the lack of commercially available sources and detectors for this region, is considered to be the 'final frontier' in understanding the electromagnetic spectrum. The Leeds team believes that its unique properties could offer the gateway to the next generation of new nano-electronics.

Terahertz radiation is found in the electromagnetic spectrum between the microwave region (where satellite dishes and mobile phones work) and infra-red light, but ways to generate detect and analyse terahertz radiation are not as advanced as other imaging techniques.

The four-year project will develop new methods to examine and assess nanoscale electronic systems using terahertz radiation, Future applications may include the development of new nano-scale high-frequency electronic devices in areas such as sensing, imaging and spectroscopy, and ultimately in communications.

Source: University of Leeds

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