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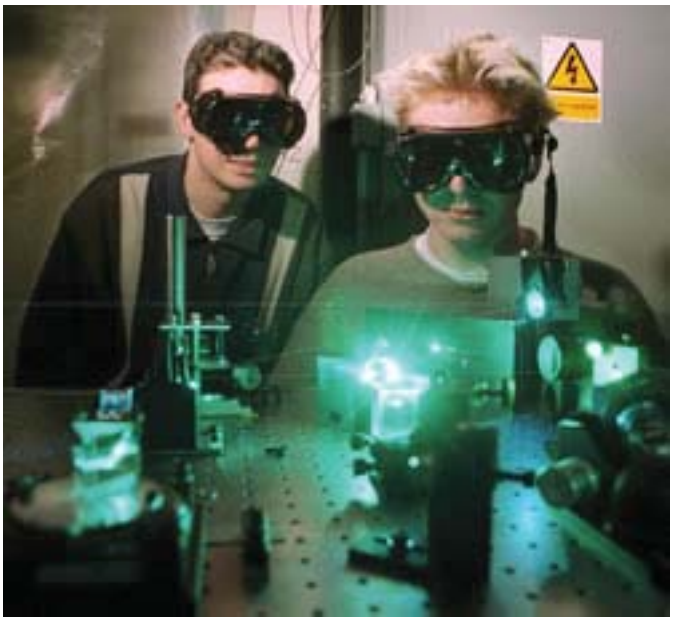
T-RAYS FOR TERRORISTS

Science is preparing to deploy powerful new weapons in the war on terrorists, drug smugglers and cancer, using TeraHertz rays - or T-rays.



New devices that see through clothing and packaging as never before and can identify explosives, guns, knives and even chemical and biological weapons with pinpoint precision are being developed in laboratories round the world.

Leading scientists from America, Europe, Asia and Australia will share the latest advances in T-ray technology at the international workshop on TeraHertz for Defence and Security, at Adelaide University from December 16-17 this week. The workshop is sponsored by Australia's Defence Science and Technology Organisation (DSTO).

Terahertz or T-rays are emissions between infra-red and microwaves. This enables scientists to analyse the composition and density of things the rays contact, as well as to image them.

"Most molecules vibrate in the terahertz frequency, so if you can detect them with T-rays, you can get a very good 'fingerprint'," explains conference organizer Professor Derek Abbott of Adelaide University.

"T-rays pass through things like food packaging, clothing, plastic and cardboard enabling us to analyse what's inside. This means they can be used to detect and identify weapons of metal or plastic, illicit drugs or biological hazards like anthrax, even if they were hermetically sealed," he says.

"You can find out much more about the substance than you would with optical, infra-red or x-ray imaging, and this helps to identify it precisely."

Because T-rays are low energy, they are also safe to use around people – unlike X-rays, Prof. Abbott explains.

“One of the most important recent discoveries is that T-rays can also be used to detect cancer. Australia is part of the big scientific race to find out why.”

Due to their low penetrating power of the human body, T-rays would probably be used to scan the outer skin or, on endoscopes, to scan the bowel and other organs for early signs of cancer, he predicts.

Prof Abbott says that the potential applications of T-rays are huge, from food safety and quality monitoring, to disease detection, airport security, postal scans for drugs, explosives or bio-weapons, military threat detection and medical diagnosis.

T-rays can also penetrate poor weather, dust and smoke far better than infrared or visible systems, says UK researcher Dr Roger Appleby. “Imaging in this band offers the opportunity to navigate and perform surveillance in poor visibility.”

T-rays will also provide forensic analysts with new tools in the fight against crime, says Dr Robert Miles of the University of Leeds. The ability of terahertz radiation to pass through different substances and differentiate between them on the basis of their composition will lead to much more precise identification of different types of glass, fabrics, lubricating oils and paper.

The ‘father’ of T-rays, Professor Xi-Cheng Zhang of Rensselaer Polytechnic Institute, New York, says T-rays offer the opportunity for transformational advances in defense and security.

“Recent work shows that T-rays have promise as a means identifying explosive compounds. Unique features in THz frequency have been obtained. Examples of such applications to identify terrorist threats include terahertz spectroscopy of biomaterial identification with fingerprint in terahertz range, and remote sensing and imaging of explosive targets.”

Prof. Zhang adds that T-rays also offer huge promise for the emerging science of nanotechnology.

“Although some people don’t realise it, you can actually analyse things which are smaller that the wavelength of T-rays itself. You can break the wavelength of light by passing it through a tiny pinhole,” Prof Abbott explains.

“This means we will soon be able to use T-rays to study human cells at below the cellular level.”

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