

Terahertz technology fights fashion fraud

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The UK fashion industry is famous all over the world and worth around £37 billion to the economy. However, it is estimated that counterfeit clothing and footwear costs designer brands and retailers around £3.5 billion each year. Recently, new powers were given to customs officers to seize and destroy fake goods but in order to act on these powers they need to be able to tell whether or not a particular item of clothing is the genuine article.

Scientists from the National Physical Laboratory (NPL) have published research in *Applied Optics* that demonstrates how a technique called terahertz time-domain spectroscopy could be used to help spot fakes and combat textile counterfeiting.

This technique requires the generation of a beam of terahertz radiation, which is a band of [electromagnetic radiation](#) that falls between [microwaves](#) and [infrared light](#). A sample of fabric is then placed within this beam and the properties of the terahertz waves are detected after passing through the fabric.

The composition and structure of the different types of fabric give rise to different rates of beam scattering and absorption. This means that each type of fabric has a distinct transmission profile associated with it, essentially giving it a signature. The detection of this signature could indicate whether or not the fabric in question is counterfeit.

This research examined fabrics made from wool, cotton, linen, silk and mixed fibres, all of which demonstrated distinct terahertz transmission

properties. The technique could clearly distinguish between fabrics that looked and felt similar but that had different compositions. It could, for example, tell the difference between plain wool and the more expensive merino wool, as well as between natural and [synthetic silk](#).

These results demonstrate the potential of terahertz spectroscopy to identify different textiles and help prevent fraud. The next stage will be to test batches of the same type of fabric from the same manufacturer in a potential collaboration. It is also necessary to create a database of the terahertz transmission properties of many different fabrics and to study further the relationship between these and the properties of the fabrics themselves.

John Molloy, who worked on the project at NPL, said:

"Counterfeit clothes can look and feel almost exactly like the real thing and so customs officials need technological assistance to spot them. Terahertz spectroscopy is a fast, safe and reliable test that could help safeguard one of the UK's most valuable industries."

The research was carried out in collaboration with the Institute of Monitoring of Climatic and Ecological Systems in Russia.

NPL is also working with Technitex, the premier research and knowledge transfer organisation for the UK's technical textiles and advanced materials sector, on terahertz spectroscopy to help with quality control and characterisation of non-fashion fabrics used in industry, sports, medical and other assorted applications.

Provided by National Physical Laboratory

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