TeraSense

Terahertz imaging systems

TERAHERTZ (THz) IMAGING SCANNER

NON-INVAISVE, NON-DESTRUCTIVE TECHNOLOGY

FOR INDUSTRIAL APPLICAITONS

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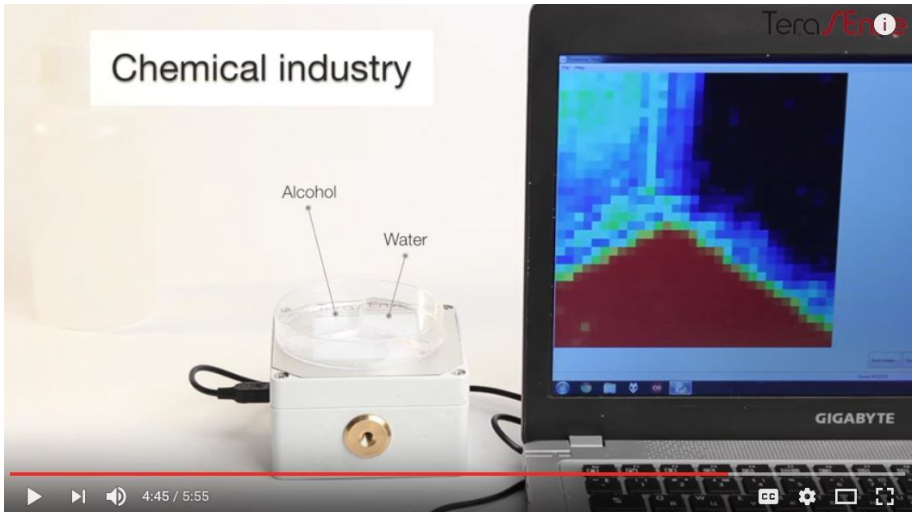
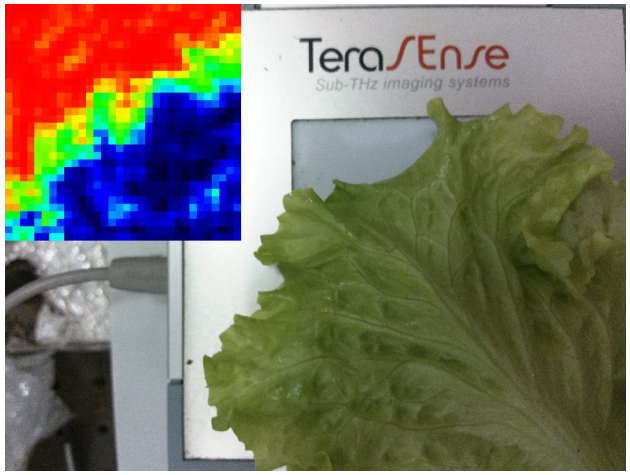
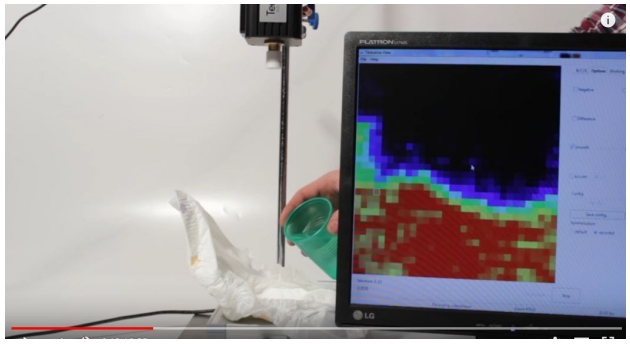
CAPABILITIES OF TERASENSE TECHNOLOGY

Our detectors / sensor arrays are not frequency-selective and our technology can differentiate substances based on *their absorption / transmission* data (rather than their spectroscopic data). Our THz imaging systems can distinguish *in-homogeneous* materials (i.e. different from surrounding substance in one or more critical parameter, i.e density, thickness, moisture content etc) and show the contrast in image. It is this property that enables detection of foreign bodies or internal anomalies that create contracts in THz image.







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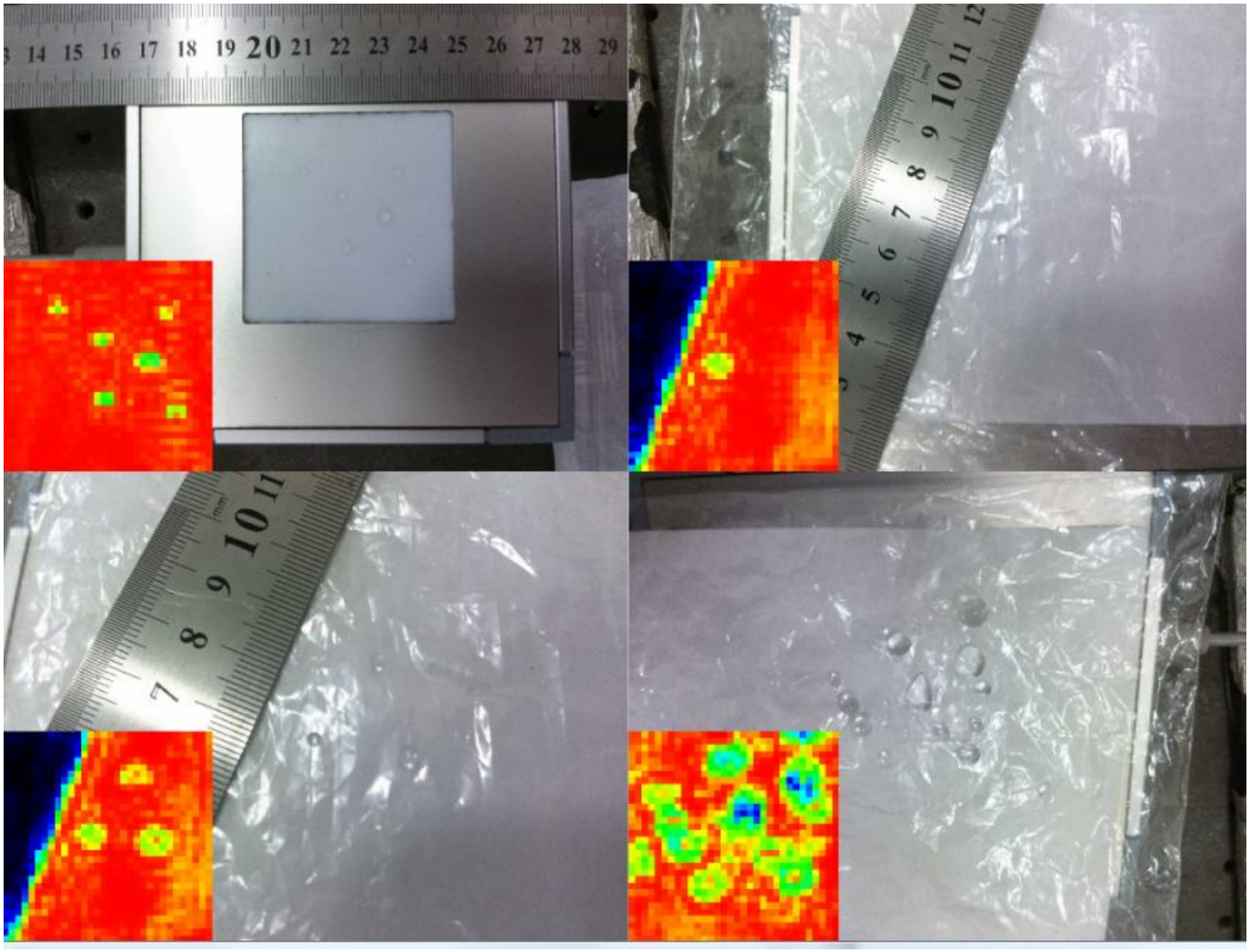
CAPABILITIES OF TERASENSE TECHNOLOGY

Detection of Water Drops through paper 0.5mm and PET film



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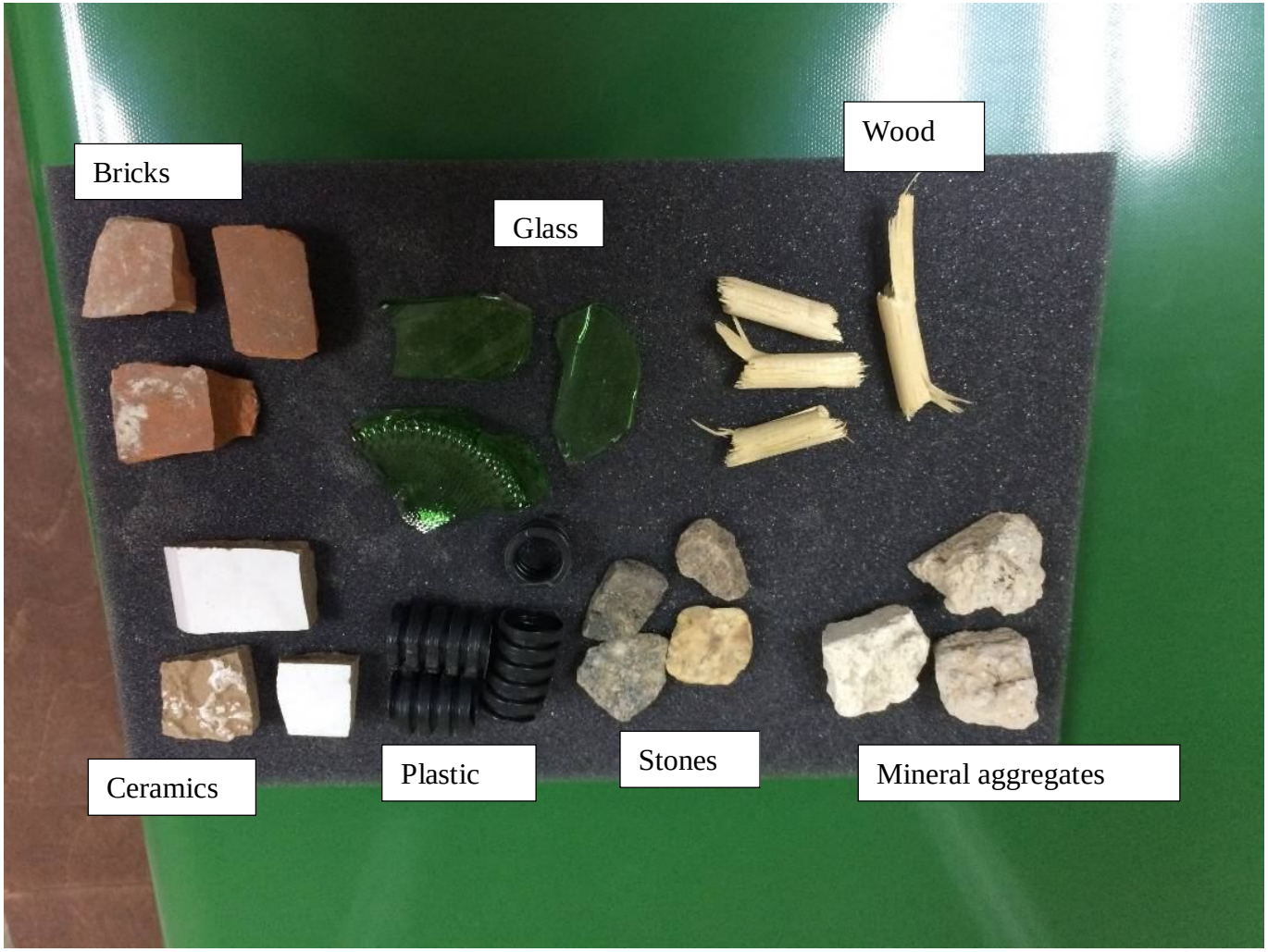
PERFORMANCE: peculiarities and limitations of THz technology

Differentiation capabilities of THz imaging technology: different types of debris



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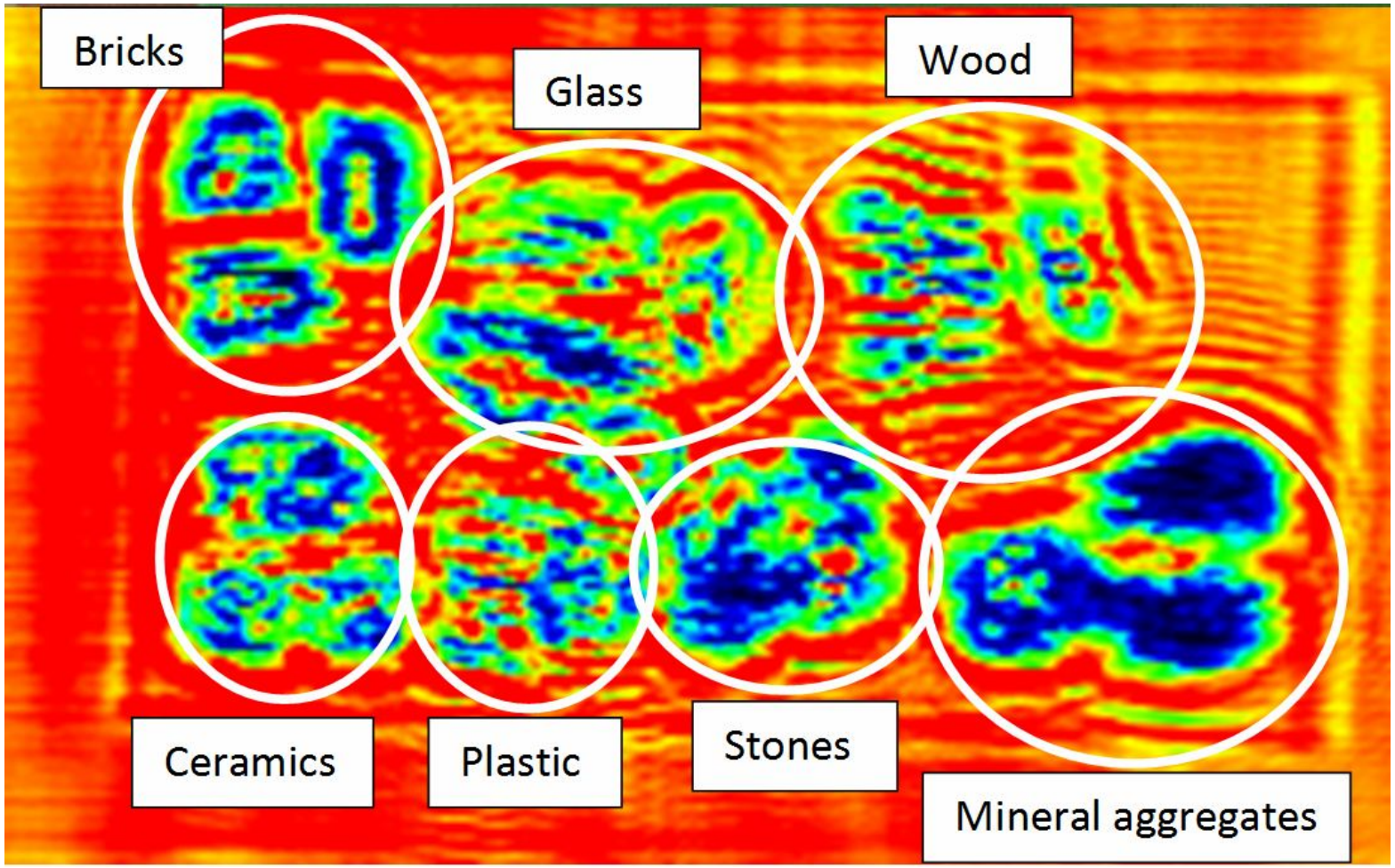
THz images of various types of foreign bodies



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APPLICATIONS

THz imaging systems can perfectly identify extraneous objects or internal defects in fairly dry materials (products). This is a necessary precondition, because moisture (and water) heavily attenuate THz light and may preclude detection of foreign bodies inside.

Each material (product) has its own *transmission* ratio and behaves differently in THz light (i.e. has its unique absorption index), therefore each material must be tested by THz imagers to check feasibility of application.

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LIMITATIONS / PECULIARITIES

Each material has its own *transmission* ratio and behaves differently in THz light (i.e. has its unique absorption index), therefore each material must be tested by THz imagers to check feasibility of application.

The general rule of thumb is like this:
Conductive materials are likely to be non-transparent in our THz spectrum (except for thin films). Water and water-containing materials are not transparent. High-carbon materials (like high-carbon plastics or composites) are usually not-transparent either. Metal and metal-containing materials heavily attenuate and absorb THz radiation and therefore are not transparent. With metal-containing material penetration index is very low (this is why we can perfectly detect metal knife hidden in a box due to the high contrast its creates in THz image.

Non-conductive materials, on the contrary, are likely to be fairly transparent. Many types of plastic and rubber, PVC, synthetic foam (polyfoam) some composite materials, wood have fairly low absorption and therefore are transparent in THz light. With some of these materials max thickness (or penetration depth) can reach 10-15 cm. Penetration depth in Teflon, PTFE, Silicon can be higher by an order of magnitude because of their extremely high transmission ratio

DIFFERENTIATION / DISTINGUISHING CAPACITY

Our detectors and sensor arrays are of ***broad-band*** type and, accordingly, are not *frequency-selective*. It follows that our technology does not allow obtaining spectroscopic data/images. That is why *we can only differentiate substances based on their absorption / transmission* data (rather than their spectroscopic data).
Our THz imaging systems can distinguish only ***inhomogeneous*** materials (i.e. different from surrounding substance in one or more critical parameter i.e. , i.e density, thickness, moisture content etc) and show the contrast in image.
As you see , there may be a number of factors that come to play in the matter, for instance density and thickness of target material; power output of THz generating source; presence of hollow parts inside materials etc .
For instance, if a powdered drug is placed next to a wheat flour, our camera is unlikely to distinguish one from the other, because both materials are ***homogeneous*** in nature (have the same absorption capacity and fraction size).

IMAGE RESOLUTION and DETECTING SMALL OBJECTS

Our technology can easily detect inhomogeneous areas -defects or foreign bodies –(that are different from surrounding substance in one or more aspect, i.e density, thickness, moisture content etc) in a number of materials transparent in THz spectrum). One of the key limitations of our technology is that the size of internal defects /objects to be detected should not be less than 2 mm – 3mm. In other words defects/objects should commensurate in size with the wavelength employed by our THz imagers (around 1mm – 3mm depending on frequency specs preferred). This limitation is imposed by the physical principle employed (wavelength), as well as the size of our pixel (1.5 x 1.5mm – for standard 2D cameras and 1.5 x 3mm – for high speed line scanner). Again, the primary objective of our THz technology is detecting concealed defects, rather than obtaining their sharp images.

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