

**Tera/Ense**  
Terahertz imaging systems



The World's First  
**HIGH SPEED TERAHERTZ  
IMAGING SYSTEMS**

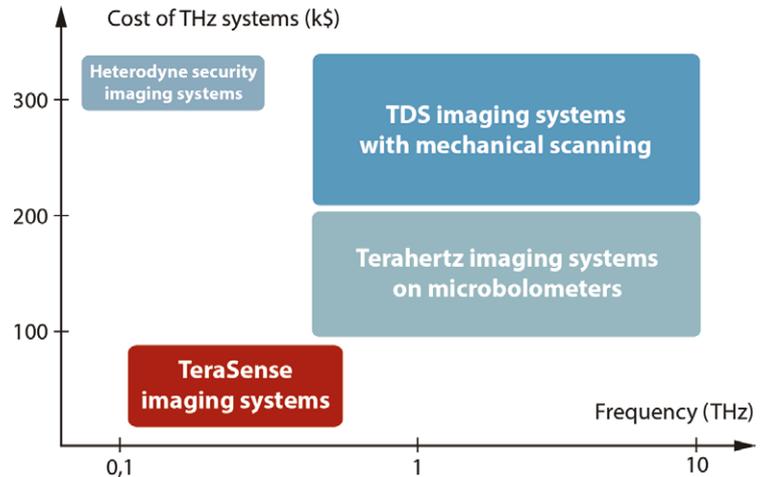


TeraSense has developed an original patent-protected technology for making a new generation of semiconductor detector arrays for terahertz imaging. The detectors developed by TeraSense have good sensitivity compared to other available detectors working in THz range (0.05 – 0.7 THz). TeraSense detectors have an advantage with their low cost and ease of fabrication in large quantities in the form of 2D arrays, thanks to compatibility of the TeraSense technology with mass-production lines of semiconductor industry. The detector arrays are scalable in the number of pixels.

With the use of TeraSense imaging chips, an extremely compact and sensitive THz camera can be produced. It is essential that spatial resolution of such a camera is around 1 mm and registration time is less than 1 second. That makes it possible to effectively use TeraSense imaging chips for medical diagnostics, nondestructive testing and many other terahertz applications.

For the terahertz generation purposes Terasense uses reliable IMPATT technology which makes it possible to produce low-cost and compact 100 – 300 GHz wave sources with output power up to 400 mW.

### Existing terahertz imaging systems



## Terasense products



## Terahertz imaging cameras

- Wide spectral range 50 GHz – 0.7 THz
- Noise Equivalent Power 1 nW/√Hz
- High speed image acquisition rate up to 5000 frames per second
- 1.5 mm pixel pitch
- Customized solutions and compact size
- Low cost

## Ultrafast line camera for conveyor applications

TeraSense has developed Terahertz camera optimized for high-speed conveyor industrial applications. The camera features 5 kHz (5000 frames per second) speed, custom pixel number and special software to stitch shots.

Number of pixels (scalable): 256 x 1  
Min detectable power/pixel:

- 100 nW (at 5000 fps)
- 45 nW (at 1000 fps)
- 14 nW (at 100 fps)





## Sub-terahertz sources

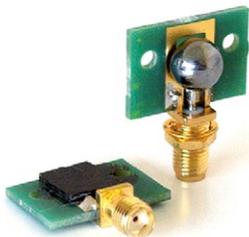
IMPATT diodes (IMPact ionization Avalanche Transit-Time)

Frequencies	100 GHz	140 GHz	200 GHz	300 GHz
Output power	80/180/400 mW	30/90 mW	10/50 mW	10/25 mW

- High power output
- Protective isolator for enhanced stability
- TTL modulation option with 1 μs rise/fall time
- High gain horn antenna or WR- type flange

## Terahertz security body scanner

Working distance:	3 - 6 m
Imaging area (at 3 m):	70 x 70 cm (at 3 m) 120 x 120 cm (at 6 m)
Resolution:	3 cm (at 3 m) 6 cm (at 6 m)
Operating frequency:	100 GHz
THz sensor array:	3 x 3 mm, 32 x 32 px
Number of sources:	6
Frame rate:	Live Stream



## Ultrafast terahertz detectors

	Ultrafast	Fast
Response time	150 ps	1 μs
Spectral range	50 GHz - 0.7 THz	50 GHz - 0.7 THz
Impedance	50 Ω	10 k Ω
Responsivity	0.5 V/W	10 V/W
Noise equivalent power	2 nW/√Hz	1 nW/√Hz
No power supply	✓	✓

## Optics for terahertz

TeraSense offers custom manufacturing of quasi-optical components for THz range: PTFE and TPX lenses, windows, prisms, attenuators, polarizers, beam splitters. Terahertz lenses are done with diameters 1 - 30 cm and focal lengths 50 - 300 mm.



TeraSense Imaging Cameras and IMPATT diodes have EC Certificate of Compliance (EC Certificate of Conformity) and are 100% environmentally friendly products that can be safely used with no detriment to human health/safety.

## Featured clients

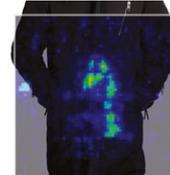
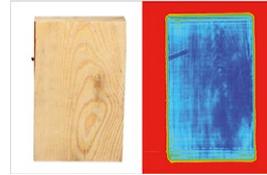


# Applications



## Terahertz quality control

Non-destructive analysis (NDT) of the internal structure of objects (quality control of products). THz cameras enable to visualize the contents of sealed packages or food products under various enclosures.



## Terahertz wireless communication

Building high-frequency wireless telecommunication systems of new generation (up to 100 Gbit/sec). This application holds high promise for high-speed information transmission between electronic devices; building wireless local area networks (WLAN) and wireless personal area networks (WPAN) of new generation, as well as creating entirely secured dedicated channels of wireless communication.



## Terahertz imaging security

Security systems for various applications: people screening, luggage scanning, as well as scanning postal parcels and envelopes in terms of prohibited items inside. Here the emphasis is primarily made on one feature that unlike X-ray, THz radiation is not detrimental to human body. THz scanners allow remote detection of metallic, plastic, ceramic and other object concealed under clothes — at a distance of a few meters.



## Terahertz imaging in medicine

THz tomography in medicine allows to conduct analysis of the upper layers of a human body — skin, vessels, joints and muscles. There are known successful applications of THz tomography for detecting skin and breast cancers at early stages. Capability of visualizing current conditions of wounds under gypsum/bandage layers also represents high interest.



## Terahertz science

Scientific applications of THz radiation include spectroscopy of long-wavelength lattice vibrations of crystals, bending vibrations of molecules. Frequencies of soft modes in ferroelectric materials and frequencies matching the energy of apertures in superconductors are also 'residing' within THz range. Terahertz frequency range is convenient for creation and study of meta-materials and plasmonic effects.

# About TeraSense



**Since 2008**

bringing innovations in THz imaging



**Over 500 happy clients**

in science and industry



**50+ distributors**

around the world



**2 headquarters** and  
**40 people team**

with half holding Ph.D. degree



Products used at

**5 continents** in over  
**50 countries** of the world



**100+ publications**  
and **5 patents**