THz near-field scanning system

TeraCube Scientific

new

The new standard for micron-scale resolution THz imaging on large areas

THE TeraCube Scientific is a fully automated THz near-field scanning system. The system provides a high-efficient source for the optical generation of broadband THz pulses which can be transmitted through planar samples. Spatially and temporally resolved detection of the transmitted pulses in the near-field of sample surfaces is enabled by Protemics TeraSpike microprobes integrated near-field detectors. The system enables measurements on arbitrary surface topographies through active control of the detector/surface distance. It can be driven by an existing or new fs-laser source with suitable specifications.

Application areas

- THz Metamaterial research and sensing application
- Semiconductor wafer inspection
- Sheet resistance imaging
- Graphene analysis
- THz device characterization
- Microstructure analysis
- Non-destructive testing

Key features

- High-speed continuous move scanning & data acquisition
- Optical sample topography detection for scanning at constant microprobe/surface-distance
- Synchronized motion-control and real-time position detection
- Linear polarized and rotatable THz emitter for polarization-dependent measurements
- High performance THz emitter/detector component
- High dynamic range Lock-in detection
- Integrated CCD camera module for monitoring of microprobe tip and sample position
- System control and measurement automation software on integrated PC unit
- Software-implemented alignment monitoring function and system health check electronics
- Software assisted microprobe-tip to sample surface approximation
- Time-domain signal preview mode for fast optical alignment
- Data-export as plain-text or Matlab-compatible format
- System housing for laser beam and dust protection
- Open extendable lab-type system platform

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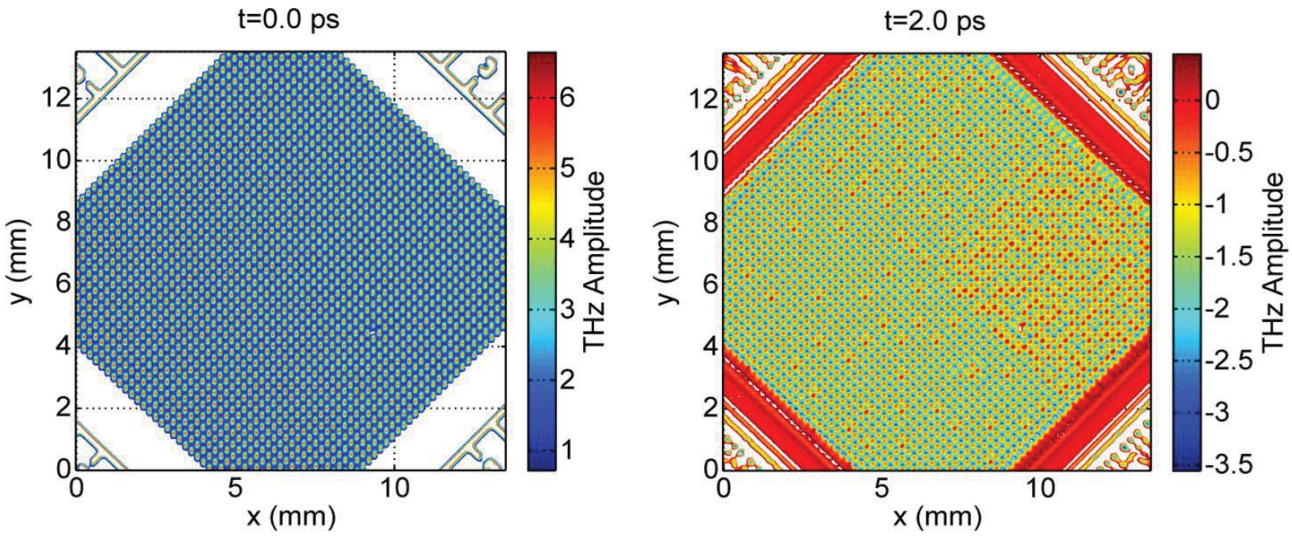
Technical data

new

Type	TeraCube Scientific	TeraCube M2
Optical system construction	Free-space beam	Fiber-coupled
Spectral range	0.05 – 3 THz	0.05 – 4 THz
Maximum sample size (x, y, z)	20 cm, 20 cm, 1 cm	
Maximum scanning speed (x, y)	Up to 100 mm/s	
Min. scanning time per pixel	10 ms / **Single TDU position**	10 ms / **Full TD Transient (5ps)**
Maximum scanning range (x, y, z)	18 cm, 18 cm, 3 mm	
Time-domain scanning range	1000 ps	5 .. 200 ps
Time-domain step resolution (dt)	6.6 fs	50 fs
Bi-directional repeatability (x, y, z)	+-0.1 µm, +-0.1 µm, +-0.15 µm	

Measurement example



Example plots of the THz near-field distribution measured at a metamaterial surface for sensing applications which is locally loaded with sample material. Left: Peak excitation state, right: 2 ps after excitation.

Installation requirements

- Vibration-damped optical table with 1.5m x 1m x 1.5m of space for system placement
- Laser laboratory specification of class 3b or higher