TERAVIL

PRODUCTS

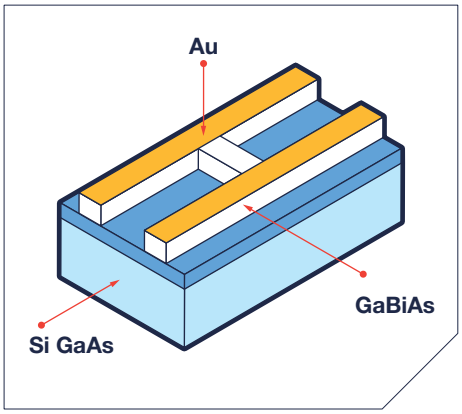
Terahertz Emitter

ABOUT

There are two types of THz emitters: based on epitaxial layer of **LT-GaAs** (for excitation with **800 nm** wavelenght lasers) and **GaBiAs** (for excitation with **1050 nm** wavelenght lasers). On its surface a coplanar Hertzian dipole type antenna structure is formed with a dipole width of **90 µm**, the width of the photosensitive gap is **50 µm**. In the case of **GaBiAs**, epitaxial active layer is mesa-etched in order to achieve high dark resistance and to simplify the laser beam alignment. High photosensitivity of the material allows to use for excitation very low average power generated by, e.g., femtosecond fiber lasers.

Emitter is mounted together with **12 mm** diameter **hyper-hemispherical lens** from **high-resistivity silicon** in an opto-mechanical holder with in-plane micro positioning capability and SMA connector.

PRINCIPLE OF OPERATION



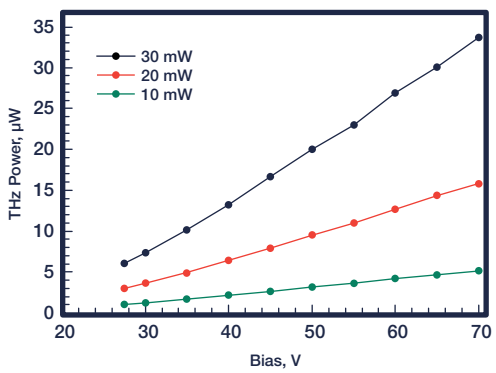
THz emitter consists of a micro strip antenna integrated with photoconductor and silicon lens mounted on the back side of photoconductive antenna.

Low temperature grown GaAs (LT-GaAs) or GaBiAs is used as photoconductor. Total GaAs or GaBiAs substrate thickness is about **600 microns**. Antenna is formed using AuGeNi metallization.

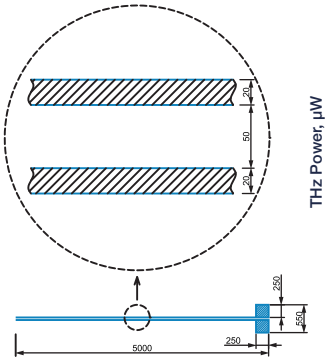
THz emitter is illuminated by laser beam from panel side. Laser beam must be focused between two AuGeNi strip lines. Si lens is used for THz radiation output. Adjustment screws are used for Si lens positioning in point of view of microstrip antenna center (or laser radiation focusing point).=SMA socket is used for connecting DC or AC bias to THz emitter. Any of three M6 holes can be used for THz emitter mounting on optical table.

SPECIFICATIONS

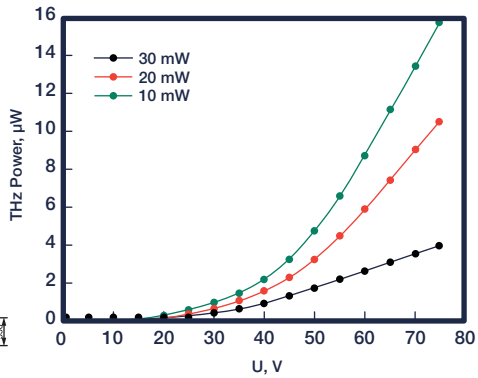
	THz Emitter for 800 nm wavelength lasers	THz Emitter for 1 µm wavelength lasers
	LTG-GaAs based photoconductive switch:	LTG-GaAs based photoconductive switch:
DIMENSIONS OF THE WAFER	5x1.5 mm typical	5x1.5 mm typical
EMITTED POWER	see Fig. below for average THz power	see Fig. below for average THz power
BIAS VOLTAGE	50 V max and 40 V typical	40 V max typical
PUMPING WAVELEGTH	800 ± 40 nm	1050 ± 40 nm
PUMPING POWER	50 mW max and 30 mW typical	20 mW max and <20 mW typical
DARK RESISTANCE	>200 Mohm	>30 Mohm
INTEGRATED FOCUSING LENS	Si	Si
X-Y ADJUSTABLE STAGE RANGE	± 3 mm	± 3 mm



TERAVIL THz emitter (for 800 nm wavelength lasers) radiated power dependance on bias voltage and laser excitation power. Measured using TYDEX Optoacustic detector GC-1P (Gollay Cell).



Microstrip antenna



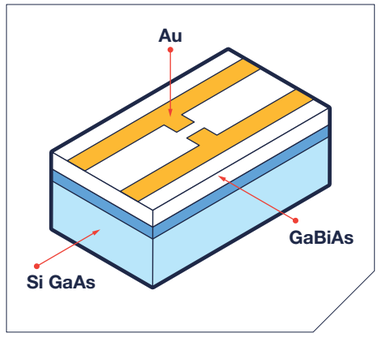
TERAVIL THz emitter (for 1050 nm wavelength lasers) radiated power dependance on bias voltage and laser excitation power. Measured using TYDEX Optoacustic detector GC-1P (Gollay Cell).

Terahertz Detector

ABOUT

LT-GaAs based THz detectors typically are activated using Ti:Safyr femtosecond lasers (**800 nm** wavelenght). THz detectors manufactured from newly developed **GaBiAs** epitaxial layers can be used in Time-Domain Spectroscopy systems activated by **1050 nm (±40 nm)** and shorter wavelength laser pulses.

Detector is mounted together with **12 mm** diameter **hyper-hemispherical lens** from **high-resistivity silicon** in an opto-mechanical holder with in-plane micro positioning capability and SMA connector.



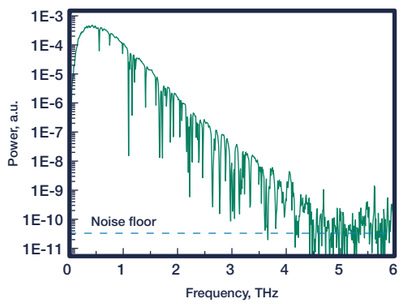
PRINCIPLE OF OPERATION

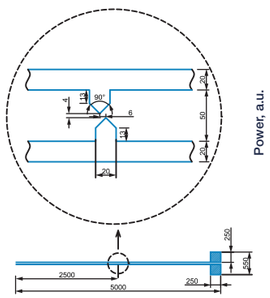
The photoconductive THz detector consists of a micro strip antenna integrated with photoconductor and silicon lens mounted on the back side of photoconductive antenna. Low temperature grown GaAs (LT-GaAs) or GaBiAs is used as photoconductor. Total GaAs or GaBiAs substrate thickness is about **400 microns**. Antenna is formed using AuGeNi metallization.

Thz detector is illuminated by laser beam from panel side. Laser beam must be focused into photoconductor antenna gap. Si lens is used for THz radiation input. Adjustment screws are used for Si lens positioning in point of view of microstrip antenna center (gap). SMA socket is used to connect lock-in amplifier or any other registering device. Any of three M6 holes) can be used for THz detector mounting on optical table.

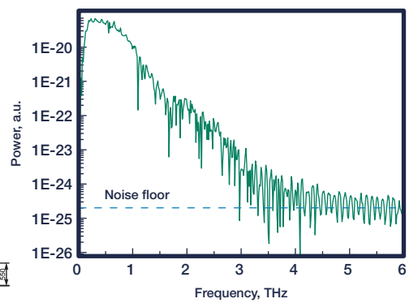
SPECIFICATIONS

	THz Detector for 800 nm wavelength lasers	THz Detector for 1 µm wavelength lasers
	LTG-GaAs based photoconductive switch:	LTG-GaAs based photoconductive switch:
DIMENSIONS OF THE WAFER	5x1.5 mm typical	5x1.5 mm typical
REGISTERED THz SIGNAL	see Fig. below for average THz power	see Fig. below for average THz power
PUMPING WAVELEGTH	800 ± 40 nm	1050 ± 40 nm
PUMPING POWER	50 mW max and 30 mW typical	< 25 mW
INTEGRATED FOCUSING LENS	Si	Si
X-Y ADJUSTABLE STAGE RANGE	± 3 mm	± 3 mm
DETECTED THz BANDWIDTH	4 THz	4 THz
MAXIMUM OF THE THz SPECTRUM	0.4 THz	0.4 THz
SIGNAL-TO-NOISE RATIO	>60 dB	>55 dB





Microstrip antenna drawing



THz Optics

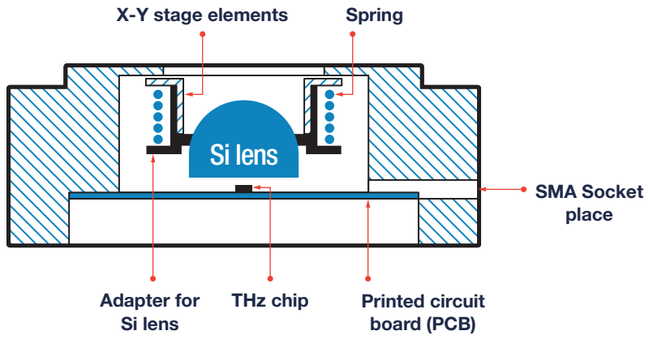
OVERVIEW

We also provide **hyperhemisferical** and **hemispherical lenses**, beam splitters and polarizers made from **high resistivity silicon** for THz radiation guidance. For more information please visit our website **www.teravil.lt**.

Emitter/Detector Mounts

OVERVIEW

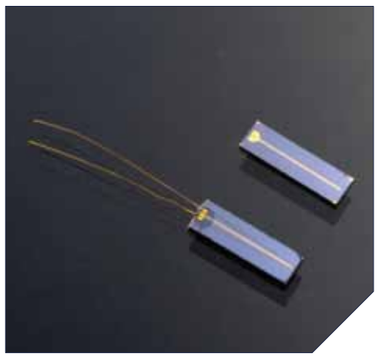
If you want to test **your own photoconductive antenna** we can provide the mounting. Detector/emitter mount consist of printed circuit board (PCB) used to attach detector/emitter, silicon lens and integrated XY stage for silicon lens adjustments.
Typical set consist of 1 PCB, 1 silicon lens, 1 integrated XY stage with micrometric screws for silicon lens adjustments,1 SMA socket.



Photoconductive emitter/detector antenna for 800 nm wavelength lasers

OVERVIEW

THz emitter/detector consists of a micro strip antenna integrated with photoconductor. Low temperature grown GaAs (**LT-GaAs)** is used as photoconductor. Total GaAs substrate thickness is about **600 µm**, dimensions of single antenna substrate is **1.5x5 mm**. Antenna is formed using AuGeNi metallization. Two types of antenna geometry are available.



Preamplifier

OVERVIEW

Preamplifier is used for amplification of weak terahertz signals. It helps to match output impedance of terahertz detector and input impedance of lock in amplifier and reduces influence of external noise sources allowing to achieve better signal to noise performance.

SPECIFICATIONS

Preamplifier

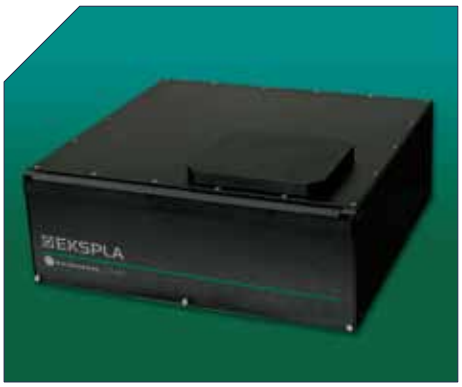
TYPE	current-to-voltage converter
CONVERSION COEFFICIENT	not less than 106
HEAD DIMENSIONS	60*12*15 mm

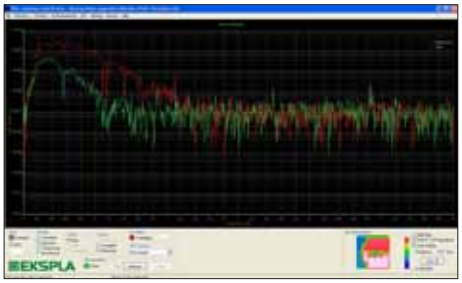
Power supply

OUTPUT VOLTAGE	+15 V, -15 V
LINE VOLTAGE	220 V or 110 V
DIMENSIONS	155*65*80 mm

*Preamplifier head is equipped with SMA connector that is matched with Teravil THz detector holder connector.

Real-time THz spectrometer





OVERVIEW

Together with our partner EKSPLA we offer real-time Terahertz spectrometer. It is a powerful tool for investigative applications of pulsed terahertz waves. With simple and robust design, it is easy-to-use and adaptable to individual requirements.The unique design of microstrip photoconductive antenna fabricated on low-temperature grown GaAs (LT-GaAs) substrate ensures broad-band spectral coverage and high dynamic range.The system is designed with two delay lines: fast and slow. Fast scan line allows real time data acquisition with **10 spectra/sec.** speed.

Average of collected spectra can increase signal to noise ratio to **106:1** at **0.4**. Additional slow delay line extends scan window from **110 ps** to **220 ps**; as a result system obtains excellent spectral resolution of **f <5 GHz**. The fast scan line is designed without bearings and uses a magnetically coupled drive which makes it extremely reliable and significantly extends the lifetime. Our T-SPEC series spectrometer is the perfect choice for broadband THz imaging. It allows scan of up to **25×25 mm** sample with spatial resolution of approx. **1 mm** Measurements contain information about the target, revealing both structural and spectroscopic information.

For more information about this product please visit **www.ekspla.com**.

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