

# CONTINUOUS WAVE TERAHERTZ DETECTOR MODULES



## AT A GLANCE

Ultra-broadband  
photomixing terahertz  
receivers for 1.5  $\mu\text{m}$  optical  
wavelength



### Features

- Up to 5.5 THz bandwidth
- >130 dB dynamic range at 120 GHz
- 0.1 fW/Hz NEP
- Robust housing and fiber coupling

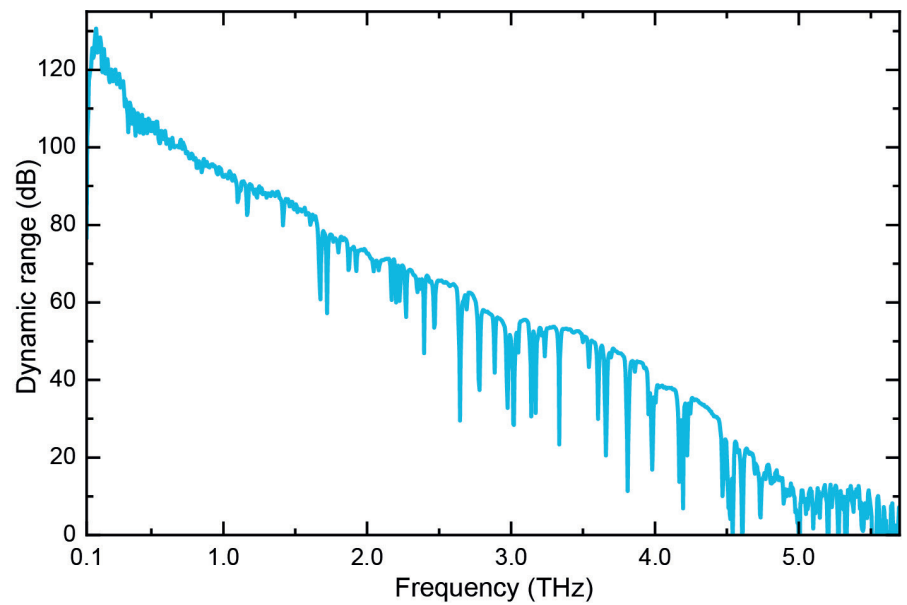
### Applications

- High-bandwidth terahertz spectroscopy
- Industrial process control
- Non-contact thickness measurement
- High-speed measurements

### Technical background

Our photoconductive continuous wave (cw) terahertz receivers detect an incoming THz signal by mixing it with an optical local oscillator signal given by the beating signal of two lasers. The frequency resolution of cw THz systems is only limited by the linewidth of the lasers. Frequency-domain THz systems are particularly suited for applications in high-resolution spectroscopy, such as precise monitoring of specific spectral lines, non-destructive testing as well as (sub-) THz communications.

HHI's THz modules leverage mature telecom technology, thereby facilitating the integration of THz technology into industrial applications and environments.



Performance of HHI's cw THz detector modules for operation conditions as given in the specifications [Deumer et al., *Opt. Express* 32 (2024)]. Absorption lines are due to water vapor absorption at ambient conditions.

### Specifications

- Optical wavelength: 1.5  $\mu\text{m}$
- Optical power: 30 mW
- Spectral range: 0.1 - 5.5 THz
- Dynamic range:
  - >130 dB @ 120 GHz
  - >90 dB @ 1 THz
  - >70 dB @ 2 THz
- Diameter of module: 25 mm



Dr. rer. nat. Robert Kohlhaas  
 Hybrid Integration and Sensing

Phone +49 30 31002-407  
 robert.kohlhaas@hhi.fraunhofer.de

Fraunhofer Heinrich Hertz Institute  
 Einsteinufer 37, 10587 Berlin  
 Germany

[www.hhi.fraunhofer.de/phs](http://www.hhi.fraunhofer.de/phs)

*M. Deumer, et al. "Continuous wave THz receivers with rhodium-doped InGaAs enabling 132 dB dynamic range," *Opt. Express* 32, 29855-29867 (2024).*