

TeraFlash smart

Ultrafast Time-Domain Terahertz Platform

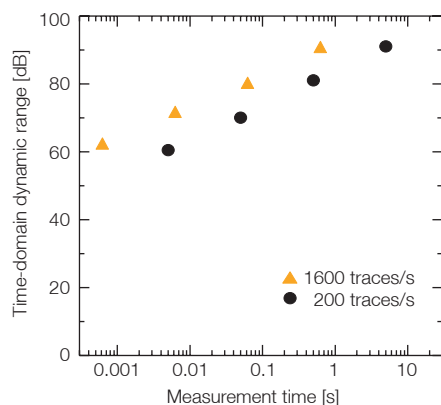


Key Features

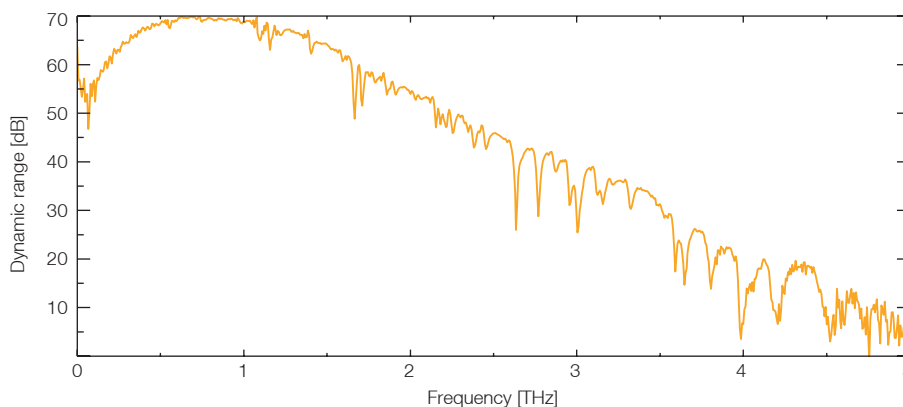
- Enables fastest terahertz-based thickness measurements to-date
- Proprietary ECOPS technology
- Robust design
- 1600 pulse traces/s @ 150 ps scan length

TeraFlash smart

TOPTICA's TeraFlash smart utilizes a proprietary laser modulation scheme dubbed ECOPS ("electronically controlled optical sampling"). The approach employs two femto-second lasers rather than one, eliminating the need for a mechanical delay. This results in extremely high measurement speeds: the TeraFlash smart acquires 1600 complete terahertz waveforms per second. In a "single-shot" measurement, the system achieves a time-domain dynamic range of > 50 dB and a spectral bandwidth of 3 THz. Within one second of averaging, the time-domain dynamic range increases to > 80 dB and the bandwidth reaches 4.5 THz. The system enables terahertz-based thickness gauging at unprecedented speed, and lends itself particularly to measurements on rapidly moving samples, e.g. conveyor belts, papermaking machines, or extrusion lines.



Time-domain dynamic vs. measurement time. Yellow and black symbols denote measurement speeds of 1600 traces/s and 200 traces/s, respectively.

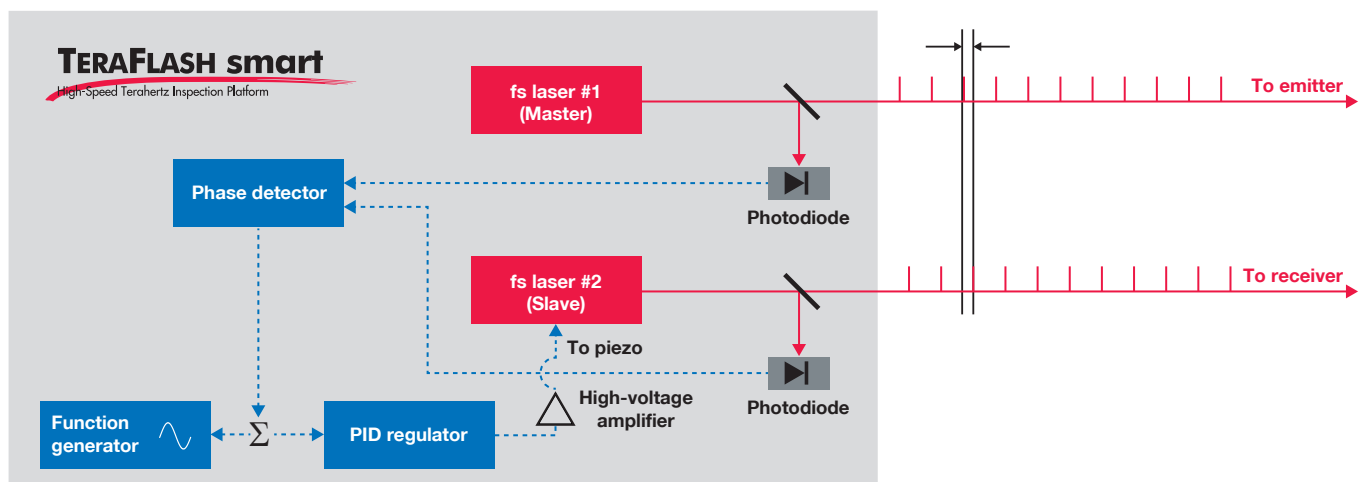


Terahertz spectrum of air with water vapor lines, obtained with the TeraFlash smart. With 1000 averages, the spectrum spans almost 5 THz – within a measurement time as short as 600 milliseconds.



Class 1 Laser Product EN 60825-1:2014.
Invisible laser radiation. Avoid direct exposure to beam.

Specifications TeraFlash smart	
Components	2 synchronized femtosecond lasers SM/PM fiber delivery Electronic delay 2 InGaAs photoconductive switches Electronics for data acquisition
Laser wavelength	1560 nm
Laser pulse width	typ. 80 fs
Laser repetition rate	80 MHz
External fiber length	10.8 m
Terahertz emitter	#EK-001123: InGaAs/InP photoconductive switch with 100 μm strip-line antenna, 0.3 m fiber pigtail
Terahertz receiver	#EK-001125: InGaAs/InP photoconductive switch with 25 μm dipole antenna, 10 μm gap, 0.3 m fiber pigtail, integrated preamplifier
Antenna package	Cylindrical, 25 mm, integrated Si lens and SM/PM fiber pigtail
Scan range	150 ps / 400 ps / 700 ps
Scan speed	1600 traces/s (150 ps) 800 traces/s (400 ps) 200 traces/s (700 ps)
Spectral range	0.1 – 4.5 THz, in < 1 s
Average terahertz power	typ. 30 μW
Time-domain dynamic range	typ. > 50 dB in < 1 ms 80 dB in 1 s
Spectral peak dynamic range	typ. 35 dB in < 1 ms > 60 dB in 1 sec
Useable terahertz path length	10 – 180 cm, adjustable via software (electronic phase shift)
Frequency resolution @ max. scan range	< 1.5 GHz
Computer interface	Ethernet and USB, Data streaming via USB
Computer software	LabView-based GUI, included
Size (H x W x D)	200 x 450 x 440 mm ³
System weight	20 kg
Operating voltage	24 V DC, power supply included
Accessories	Transmission optomechanics, Reflection head



Schematic diagram of the TeraFlash smart. Blue lines depict electric signals, red lines the optical signals. The black arrows depict the momentary difference in repetition rates.

Further reading:

M. Yahyapour et al., *Fastest thickness measurements with a terahertz time-domain system based on electronically controlled optical sampling*; Appl. Sci. **9** (2019) 1283.