



# Electronics

*Measurer*

## CORE COMPETANCE

We have an advantage in THz-wave technology which was developed by RIKEN Teraphotonics Research Team. We have considerable experience in solid-state and fiber lasers and their applications. By using this technology we can develop customized products within short deadlines.

## MISSION

To provide hardware of coherent wave instruments and software including knowledge and experience in these fields for our clients world wide to accelerate R&D and industrial activity.

## COMPANY NAME

PHLUXi, Inc.

## ADDRESS

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## ESTABLISHMENT

October, 2010

## CAPITAL

JPY 2,000,000 (as of June 2014)

## REPRESENTATIVE

Yoshiharu URATA, D. Eng

## DESCRIPTION OF BUSINESS

R&D, manufacture and sale of coherent sources in the region between UV and THz-wave.  
R&D, manufacture and sale of laser & THz related components, devices, and instruments.  
Consulting service for above mentioned matters.

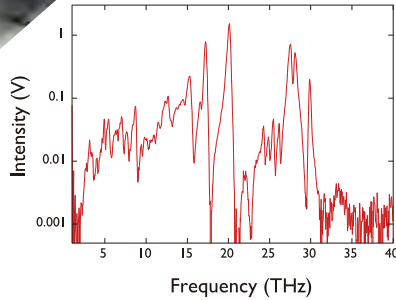
*THz*  
*Imaging*  
*Mechani*  
*Solid-state lase*

# THz / Laser Instruments

## Terahertz Generator using DAST-DFG



Tunable THz-wave can be generated using differential frequency generation (DFG) process in a DAST crystal in 3~30 THz. System includes an optical head, a laser/DFG controller, and a chiller. User can easily select/scan THz frequency through PC control.



Typical tuning curve of DAST-DFG system.

### Specifications (preliminary)

Frequency range	3~30 THz
Head dimensions	600 x 500 x 150 mm <sup>3</sup>
Power consumption	AC100 V, 5 A

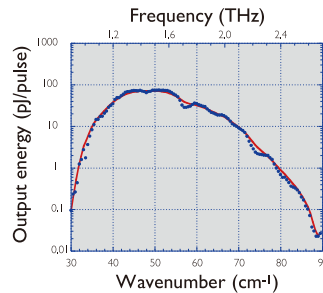
\*Pump laser required separately.  
\*\* Specifications depend on pump source.

## Terahertz Parametric Oscillator (TPO)

Another product in THz range source, TPO. It generates relatively low frequency with smooth and fast tuning from a unique ring resonator. This compact system can include a THz oscillator with a fast tuning mirror, a pump source, and a set of handling optics in an enclosure. All solid-state systems offer stable and reliable output.

### Specifications

Frequency range	0.8~2.2 THz
Head dimensions	540 x 400 x 150 mm <sup>3</sup>
Power consumption	AC100 V, 20 A



Typical tuning curve of ring TPO.

## Laser Engine for Pump Source (PE)

Our approach to generate THz-wave requires a pump source. Employing this laser engine is the best choice for high-power pulses both as an oscillator and amplifier. You can select the mode of operation, the diode power, and the laser rod diameter.

### Specifications

POD-3/300CS (standard)	
Diode wavelength	808 nm
Diode power	QCW 900 W peak
Laser rod	Nd:YAG, 3 mm-dia
Dimensions	80 x 81 x 86 mm <sup>3</sup>

### Requirements For Operation

Diode driver capacity	QCW 270 A / 6.6 V
Chiller capacity	200 W at RT

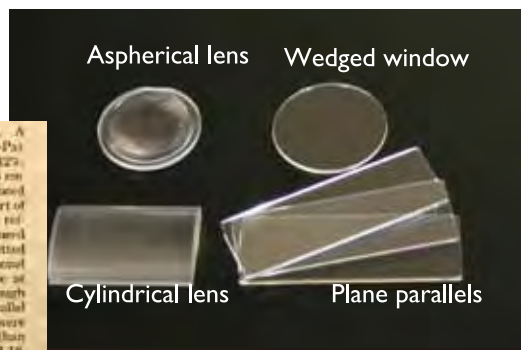
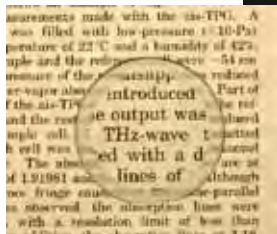
### Model Variation

Rod diameter	2.5~5.5 mm
Rod material	YAG, YAP, Vanadates..
Doping	Other activator and concentration
Operation mode	QCW / CW

# Passive components

## Tsurupica® Optics

Tsurupica® is one of the best transparent material for THz-wave applications. It has many advantages over existing materials such as Polyethylene and Silicon. Tsurupica shows high transmission and low loss on a surface not only for THz-wave but for visible light.

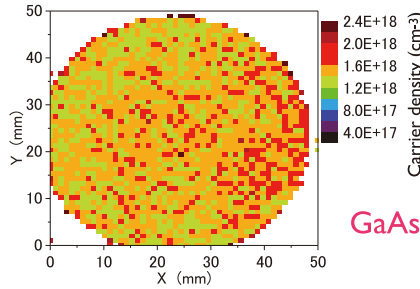
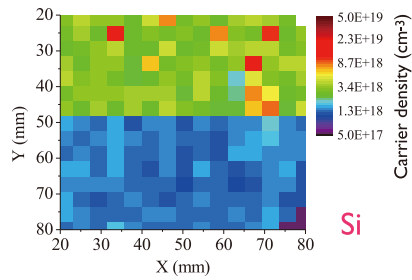


## HR-Silicon Optics

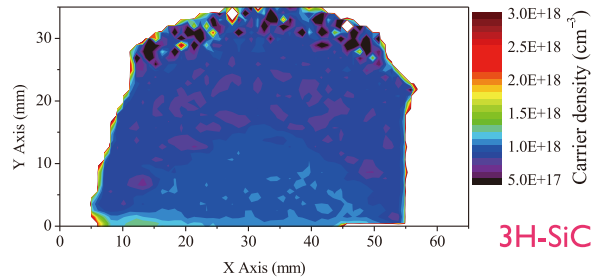
High resistivity Silicon (HR-Silicon) is a pure material without dopant and contaminants, which is grown using a special technique. It shows a considerably lower absorption than normal silicon, especially in the low THz frequency region and at resonance oxygen-related specific absorption peak at 1100 cm<sup>-1</sup>.

# Applications

## Semiconductor Inspection: Carrier Density Scanner



The narrow linewidth of DFG-baser THz-wave source and fast switching between on- and off-resonance frequencies enables the non-destructive, high-accuracy measurement of the carrier density of semiconductor with a high throughput. This technique is applicable to Si, Ge, GaAs, SiC, and GaN wafers at present. Measurement is done automatically with a built-in scanner and a unified controller. No vacuum environment is required.



An example of carrier density map of various semiconductor wafers using DAST-DFG source.

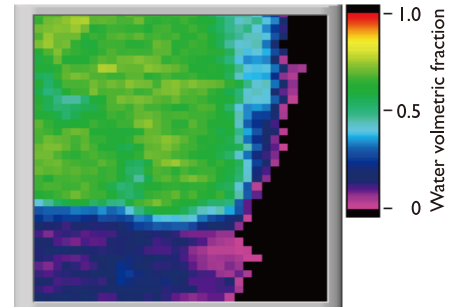
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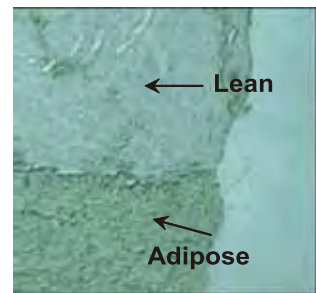
## Biological Monochromatic Imaging

THz-wave image is closely related to the water content variation. This makes the THz-wave a viable tool for water measurement.

Tunable THz source can adjust to the frequency to the optimal value for the most reliable analysis. Highly reliable, reproducible water mapping for tiny biological tissue can be achieved without large instruments at a high cost.



THz Image (water content)



CCD Image

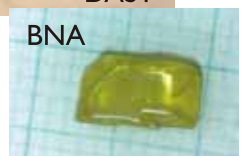


## Organic Nonlinear Crystals

High nonlinear optical coefficient of organic crystal enables high-efficiency conversion from lightwave to THz-wave. DAST is well-known as one of the best of THz generation materials as it is highly nonlinear coefficient. A new comer BNA is also exciting material because of its capability of pumping by 1 um source.



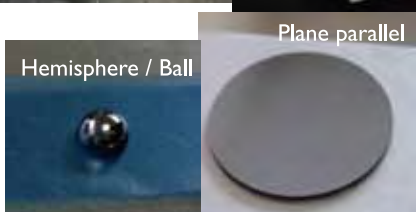
DAST



BNA



ATR module



Hemisphere / Ball

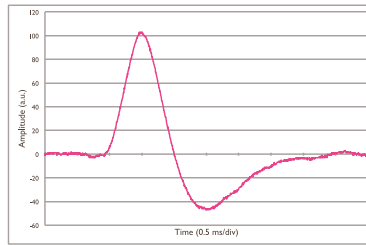
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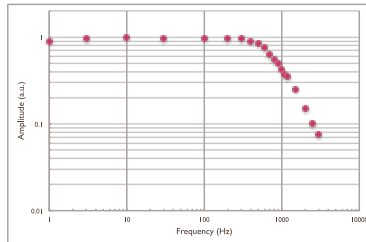
## Fast Pyroelectric Detector



Detector head with Tsurupica condenser



Temporal profile  
100 uJ, 100 ns, 1064 nm



Peak amplitude  
as a function of pulse repetition rate

### Specifications

PYD-1 (standard model)	
Wavelength region	350 nm ~ 300 um
Element surface size	1 mm-dia
Frequency response	300 Hz
Maximum pulsewidth	200 us
Response time	350 us
Sensitivity <sup>*1</sup>	12 V/uJ
Noise level <sup>*2</sup>	<1 nJ
Head dimensions <sup>*3</sup>	54 x 54 x 60 mm <sup>3</sup>

\*1 For 1064 nm, 100 us pulse

\*2 For 1064 nm pulse, battery drive

\*3 Without attachment option

### Model Variation

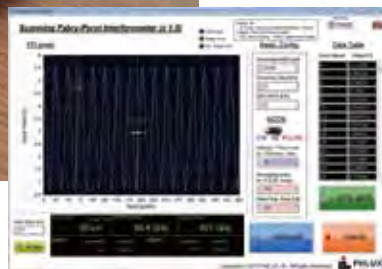
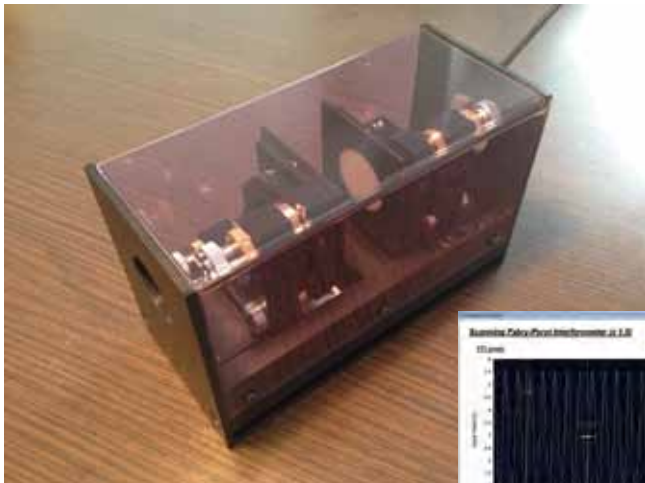
Detector element	low freq / high freq optimized
Amplifier	Battery / Stabilized DC power supply
Beam condenser	Tsurupica lens / Parabolic reflector

### Optional Attachments

Tsurupica lens	
Filters	HR-Si, Ge, Polyethylene, Diamond...
Other	Iris aperture, Shutter, Carrying case...

## Measuring Instruments

## THz Scanning Fabry-Perot Interferometer



Window of measurement software

### Specifications

TFPI-1 (standard model with 1 inch aperture)	
Measurable frequency*	0.3 ~ 3 THz
Free spectral range	0.03 ~ 0.6 THz
Resolution	20 GHz
Reflector gap distance	0~12 mm
Gap accuracy	+/- 5 um
Beam height	12 V/uJ
Clear aperture	20 mm
Head dimensions	156 x 97 x 71 mm <sup>3</sup>
Head weight	2 kg

System includes; Interferometer head, 1 pair of reflectors, stage controller, and measurement software.

\* User selects a pair of specified reflectors for placing order.

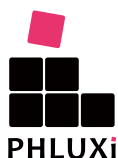
### Model Variation

Large aperture
Long stage stroke

### Option

Additional reflector pair
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See separated flyer for each item for detailed information



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