Boston Electronics

USA Distributors for INO Thz Cameras

Terahertz Imaging Camera System

- 384 x 288 THz FPA
- ~4 - 0.1 THz (70 -3200 um) waveband
- Lens options
- THz Illuminator module

INO

Boston Electronics
91 Boylston St., Brookline, MA 02445
thz@boselec.com
www.boselec.com
617-566-3821

INO

COMPLETE TERAHERTZ OFFER

MICROXCAM-384I-THZ

SOLUTION OVERVIEW

INO's MICROXCAM-384i THz camera is the core instrument at the forefront of concealed object or hidden defect detection. The broadband detection capabilities render our solution a versatile tool for fundamentals research in THz field. Offering unmatched penetration depth, our MICROXCAM-384i THz camera allow you to see through materials such as fabric, ceramics, plastic, leather, and cardboard.

- 384 x 288 pixels, uncooled microbolometer detector
- 35 µm pixel pitch
- 50 Hz, real time imaging
- Broadband sensitivity, 90 GHz to 20 THz

TYPICAL APPLICATIONS :

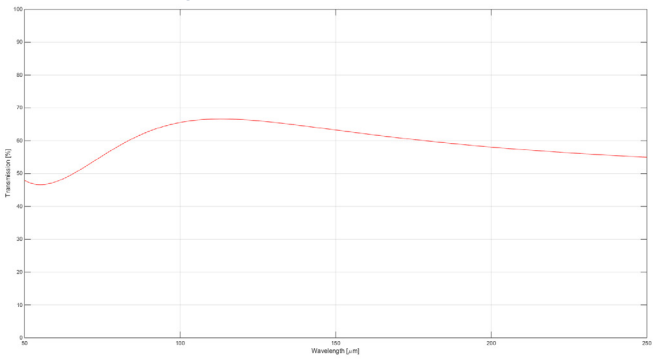
- Beam profiling and optical alignment
- Package inspection
- Manufacturing
- Security and surveillance
- Detection of hidden weapons
- Vision through camouflage
- Quality control, process management
- Spectroscopy
- Submillimeter astronomy
- Dental and medical imaging
- Food inspection

CAMERA OPTIONS

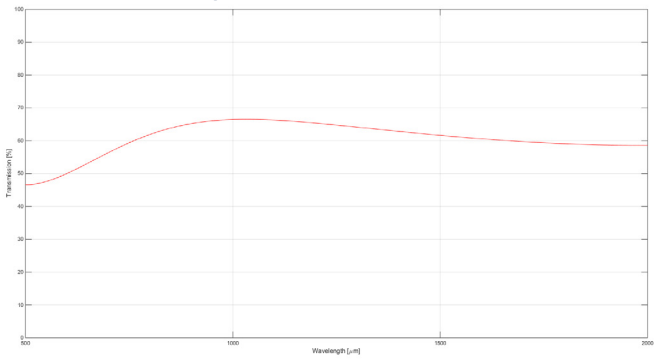
AR Coating :

- Is applied to the external detector window and optics
- Highly recommended to increase transmitted power to the detector
- Can achieve up to 67% transmission at specific wavelengths
- Reduces potential interference of the reflected beams with the transmitted signal beams

Detector window transmission optimized for 118 um



Detector window transmission optimized for 1000um



INO MICROXCAM-384i THz Typical AR coating curves

CAMERA OPTIONS (CONTINUED)

Microshutter:

- Facilitates the offset correction to compensate background fluctuations
- Recommended if you use the camera in an environment where the temperature could vary or if the camera is not readily accessible

IR Filters:

- Used to directly block IR signal that is within the field of view that would otherwise be picked up by the detector
- Long-pass filter; 30 µm cut-off

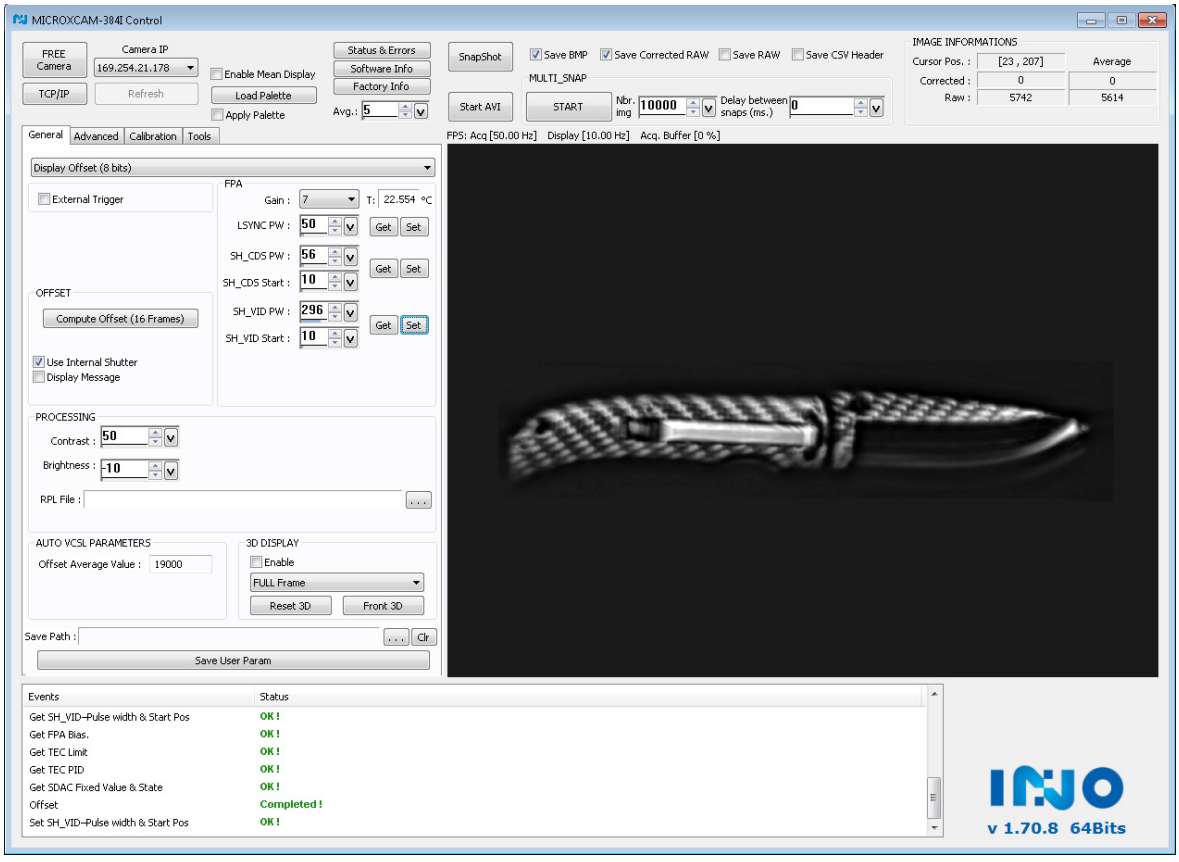
CAMERA FEATURES

Software:

- Microxcam Control Software is included with the camera
- The camera can communicate to the software via GigE

Allows users to:

- Set camera parameters
- Correct image data (gain and offset)
- Calibrate the camera (gain correction factor and bad pixel replacement)
- Save an image snapshot or multisnap to disk
- Record a video in AVI format (8 bits)



INO MICROXCAM-384i THz camera software

BEAM PROFILING

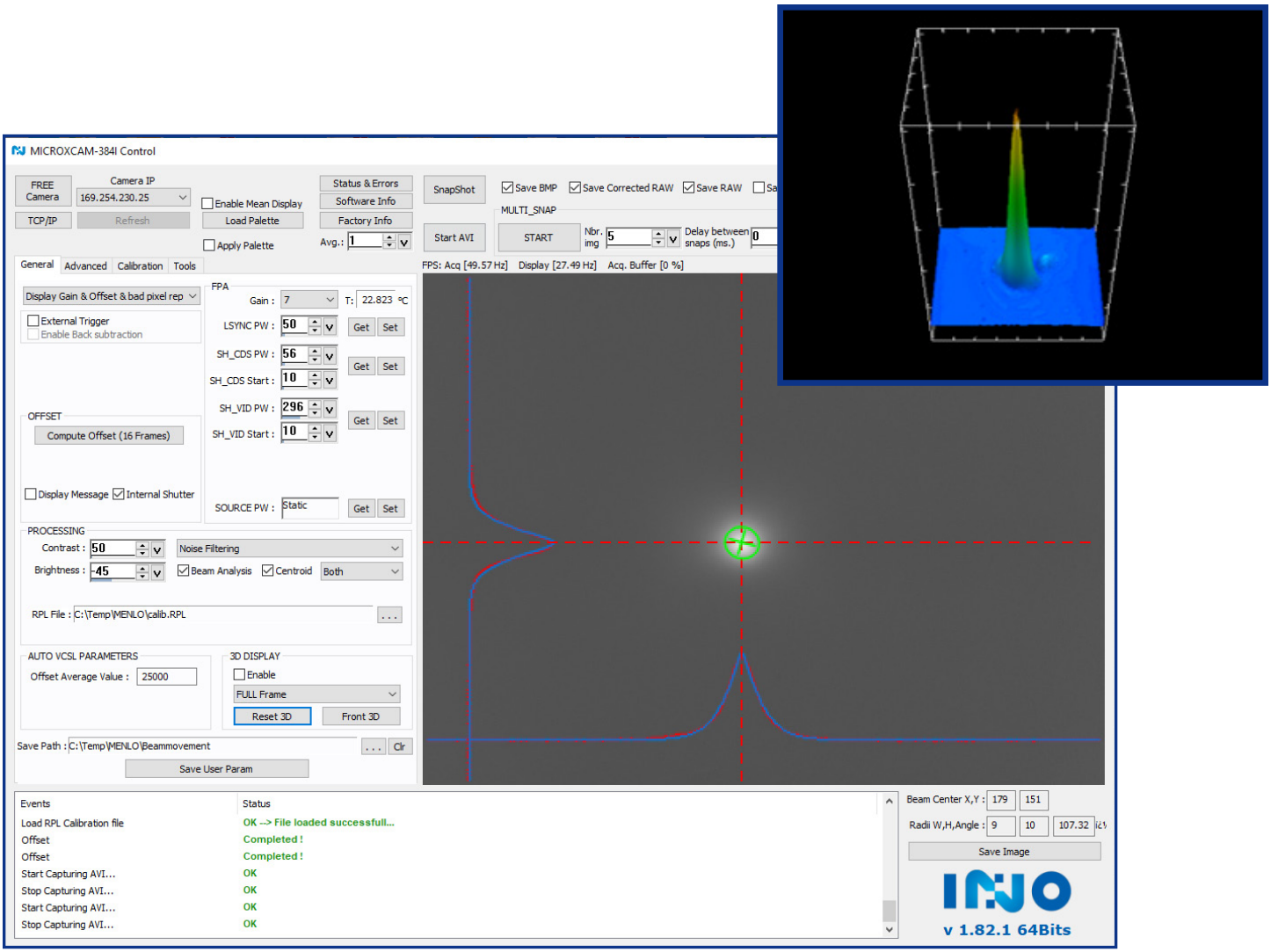
A set of features are available for beam profiling applications showing characteristics such as center position, radii, width, height, tilt angle. Furthermore, we can add a gaussian fit to the image.

Software Development Kit (SDK) :

- Included with the camera
- Create your own application
- Compatible to Labview programs

EXTERNAL TRIGGER

For customers wishing to initiate the capture of an image via an external periodic signal, has an SMA input gold-coated connector at the back of the unit.



INO MICROXCAM-384i THz camera bream profiling

NOISE EQUIVALENT POWER (NEP)

The NEP is a measure of the sensitivity of the uncooled microbolometer detector. The typical NEP for specific wavelengths is given below.

TECHNICAL SPECIFICATIONS[1], [2]

FREQUENCY (THZ)	MDP (pW)	NEP pw/sqrt(Hz)
4.25	11.2	0.11
2.52	19.9	0.18
1.89	19.1	0.18
0.762	13.3	0.12
0.693	13.9	0.12
0.397	34.6	0.31
0.198	34.0	0.32

[1]The values above are for a detector with an optimized AR coated window. For windows without the AR coating, NEP values are 10-20% higher.
[2]Marc Terroux, Pierre Talbot, Francis Généreux, Linda Marchese, El-Hassane Oulachgar, Alain Bergeron, "NEP characterization and analysis method for THz imaging devices," Proc. SPIE 11745, Passive and Active Millimeter-Wave Imaging XXIV, 117450L (12 April 2021)

SYSTEM REQUIREMENTS

- OS: Windows XP service pack 2 or more recent
- Display Monitor: Minimum resolution of 1280x1024 pixels is recommended to use the Software
- GigE Ethernet card

TWO MODES OF OPERATION

- Transmission: The object under test is placed between the THz illumination system and the camera
- Reflection: The THz illumination system is located on the same side as the camera with respect to the object under test

ILLUMINATION SOURCES

INO THz illumination systems make the perfect match for our camera and provide you with a bigger light surface ideal for a variety of applications.

SOLUTION OVERVIEW

- Two frequencies available: 0.28 or 0.5 THz
- Compact light surface: 3 x 4 inches, near flat-top illumination
- 0.28 THz ≈4 mW, 0.5 THz ≈1.25 mW, Custom
- Matches aspect ratio of the FPA
- Compatible with reflection & transmission modes
- Calibration procedure

LENS

F/ 0.7

- High Resistivity Float Zone Silicon (HRFZ-Si)
- Images objects from 60 cm to infinity
- 44 mm focal length
- Field of View:
- H-FOV: 17.36 degrees
- V-FOV: 13.06 degrees
- D-FOV: 21.61 degrees

MACRO

- Perfect polymer to increase resolution over a defined area
- Focal length: 48 mm
- Working distance: ~ 22mm
- Field of view of 10x13mm

1-866-657-7406
ino.ca

MICROXCAM-384i-THz

TERAHERTZ CAMERA

SOLUTION OVERVIEW

The MICROXCAM-384i-THz is a camera based on the sensitive INO 384 x 288-pixel uncooled microbolometer FPA optimized for the terahertz waveband. Due to its longer wavelength, THz band offers unmatched penetration depth for seeing through materials such as fabric, ceramic, plastic, leather, or cardboard. Thus, the camera shows unrivalled sensitivity over a wide spectral range, providing live video images. It features a very small footprint: 61 x 61 x 65 mm

The camera electronics handles raw data acquisition and data transfer over GigE, providing 16-bit raw image outputs at 50 Hz. The camera can be further equipped with ultra-fast 44 mm focal length refractive optics optimized for the THz region.

TYPICAL APPLICATIONS

- Beam Profiling
- Package inspection
- Manufacturing
- Security screening and surveillance
- Concealed weapons detection
- Vision through camouflage
- Quality control, process monitoring
- Spectroscopy
- Submillimeter astronomy
- Dental and medical imaging
- Food inspection

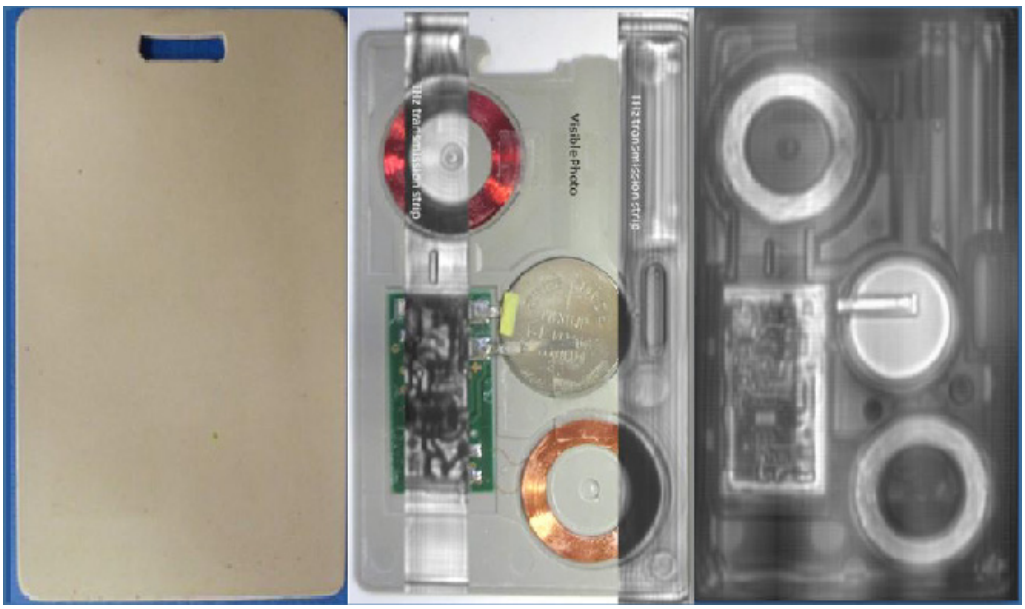
BENEFITS

- Wide band response
- High sensitivity
- 16-bit raw data
- High image quality
- Refractive optics available

Visible image Magnetic Card

Visible image of opened card with THz transmission strips

Mosaic of THz image strips taken of sealed card



CAMERA SEPCIFICATIONS[1]	
Waveband[2]	70 - 3189µm / 4.25 – 0.094 THz
Sensor[2]	• 384 x 288 pixels uncooled microbolometer FPA • 35µm pixel pitch • Silicon float zone window • AR coating optimized for specific THz wavelenghts
Frame rate	50 Hz
Video output	GigE Link • RJ-45 connector • 16-bit raw data
Supply	12 VDC Nominal (10VDC to 15VDC)
Power	< 3 W (excluding TEC power)
Dimensions	61 mm (H) x 61 mm (W) x 65 mm (L)2.4 in. (H) x 2.4 in. (W) x 2.6 in. (L)
Weight	360g / 0.8 lb (excluding optics)
Temperature	0 to 40 °C

CONTACT US

1 866 657-7406 | info@ino.ca

ino.ca

Québec (Head Office)
2740 Einstein Street
Québec (Québec) G1P 4S4
CANADA
418 657-7006

Hamilton
175 Longwood Road South, #316 A
Hamilton (Ontario) L8P 0A1
CANADA
905 529-7016

Montréal
405 Ogilvy ave, Suite 101
Montréal (Québec) H3N 1M3
CANADA
438 387-8957

THz Illumination

SOLUTION

INO offers a terahertz (THz) illumination source especially designed to build a complete THz imaging system when paired with INO's THz camera, the MICROXCAM-384i-THz.

The THz imaging system is used for see-through imaging. Its default configuration is for transmission imaging, where the object under test is placed between the THz source and the THz camera. The system may also be configured to operate in reflection mode.

APPLICATIONS

- Security screening and surveillance
- Manufacturing
- Laboratory experiments
- Concealed weapons detection
- Vision through camouflage
- Quality control, process monitoring
- Dental and medical imaging
- Food inspection

BENEFITS

- Can be used in both transmission and reflection modes
- Uniform illumination

ADDITIONAL COMPONENTS FOR COMPLETE THZ IMAGING SYSTEM

- THz components (camera, objective, computer) can be purchased to build a complete THz system

Source Specifications[1]	Standard 0.5 THz	Standard 0.28 THz	Compact 0.5 THz	Compact 0.28 THz
Source Center Frequency[2]	0.5 THz	0.28 THz	0.5 THz	0.28 THz
Illumination surface[2]	4.5 x 6 inches	4.5 x 6 inches	3 x 4 inches	3 x 4 inches
THz illumination optics	Optimized for beam uniformity at 0.5 THz	Optimized for beam uniformity at 0.28 THz	Optimized for beam uniformity at 0.5 THz	Optimized for beam uniformity at 0.28 THz
Output Power	1.25 mW typical	4 mW typical	1.25 mW typical	4 mW typical
Power Supply	110-240 V AC	110-240 V AC	110-240 V AC	110-240 V AC
Power Consumption	6 - 7 W	6 - 7 W	6 - 7 W	6 - 7 W
Operating Temperature	+20°C to +30°C	+20°C to +30°C	+20°C to +30°C	+20°C to +30°C
Overall Dimensions	25 cm (H) x 44 cm (W) x 40 cm (L)	25 cm (H) x 44 cm (W) x 40 cm (L)	22 cm (H) X 37 cm (W) X 40 cm (L)	22 cm (H) X 37 cm (W) X 40 cm (L)
Weight	12.7 Kg	12.7 Kg	9.9 Kg	9.9 Kg
Others	• Near-flat-top rectangular illumination • External housing • Form factor of beam matched to fit INO THz sensor • United States Patent			

1. Specifications subject to change
2. Specifications can be adaptedfor specific requirements

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1 866 657-7406 | info@ino.ca

ino.ca

Québec (Head Office)
2740 Einstein Street
Québec (Québec) G1P 4S4
CANADA
418 657-7006

Montréal
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Hamilton
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THz Imaging Kits

SOLUTION

The INO terahertz kit makes THz imaging easy, whatever your needs. The kit features our camera, which delivers high sensitivity across a wide spectral range, as well as a lens and a 282 GHz or 515 GHz light source with two modes of operation: transmission and reflection.

The user-friendly kit also comes with operating software that allows you to adjust camera settings, calibrate the camera, perform certain image corrections, and more.

APPLICATIONS

- Security screening and surveillance
- Manufacturing
- Laboratory experiments
- Concealed weapons detection
- Vision through camouflage
- Quality control, process monitoring
- Dental and medical imaging
- Food inspection
- Non Destructive Testing

BENEFITS

- Can be used in both transmission and reflection modes
- Includes everything for THz imaging (camera, optics, and a source)

Source Specifications[1]	Standard Kit 0.5 THz	Standard kit 0.28THz	Compact kit 0.5 THz	Compact kit 0.28 THz
Source Center Frequency[2]	0.5 THz	0.28 THz	0.5 THz	0.28 THz
Illumination surface[2]	4.5 x 6 inches	4.5 x 6 inches	3 x 4 inches	3 x 4 inches
Typical Output Power	1.25 mW	4 mW	1.25 mW	4 mW
Overall Dimensions	25 cm (H) x 44 cm (W) x 40 cm (L)	25 cm (H) x 44 cm (W) x 40 cm (L)	TBD	TBD
Weight	12.7 Kg	12.7 Kg	TBD	TBD
Others	• Near-flat-top rectangular illumination • External housing • Form factor of beam matched to fit INO THz sensor • United States Patent			

Camera Specifications[1]	
Waveband[2]	70 - 3189 µm / 4.25 0.094 THz
Sensor[2]	· 384 x 288 pixels uncooled microbolometer FPA · 35 µm pixel pitch · AR coating optimized for specific THz wavelenghts · Frame rate of 50 Hz
Dimensions	61 mm (H) x 61 mm (W) x 65 mm (L)
Weight	360g / 0.8 lb (excluding optics)
Temperature	0 to 40 °C

Optics Specifications[1]	
Specifications[2]	**Ultrafast Optics**
Type	Refractive
Focal length	44 mm
F number	0.7
Object distance	60 cm toinfinity
Lens material	HRFZ-Si
Dimensions	80 mm (ø) 66.5 mm (L)
Weight	350 g

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CANADA
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THz Objectives

SOLUTION OVERVIEW

INO offers a selection of THz objectives designed to provide the best image quality.

The F/0.7 ultrafast lens is our compact and lightweight lens facilitating manipulation when imaging. The lens is particularly adapted for smaller wavelength applications.

The F/0.6 lens is currently the lowest F/# lens in the THz market. It will allow you to have more signal reaching the camera and give you a better image contrast and superior image quality.

Combined with our Microxcam-384i-THz camera, the macro lens is the perfect tool when you want to increase the resolution of the image over a defined area.

TYPICAL APPLICATIONS

- Quality control
  - PCB Inspection
  - Food Inspection
  - Pharmaceutical
- Automotive Industry
- Agriculture
- Security
- Package Inspection
- Medical
- Research / Education

BENEFITS

- Lowest F/#, broadband
- Optimized for our Microxcam-THze

F/0.7 **Macro** **F/0.6**

SPECIFICATIONS			
	F/0.7	**Macro Optics**	**F/0.6**
Focal length	44 mm	48 mm	50 mm
F-number	0.7	0.7	0.61
Dimensions	80 mm (Ø), 66.5 mm (L)	141 x 141 x 171 mm (WxLxH)	146 x 171 x 171 mm (WxLxH)
Weight	350 g	3 Kg	3.5 Kg

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Hamilton (Ontario) L8P 0A1
CANADA
905 529-7016

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Montréal (Québec) H3N 1M3
CANADA
438 387-8957

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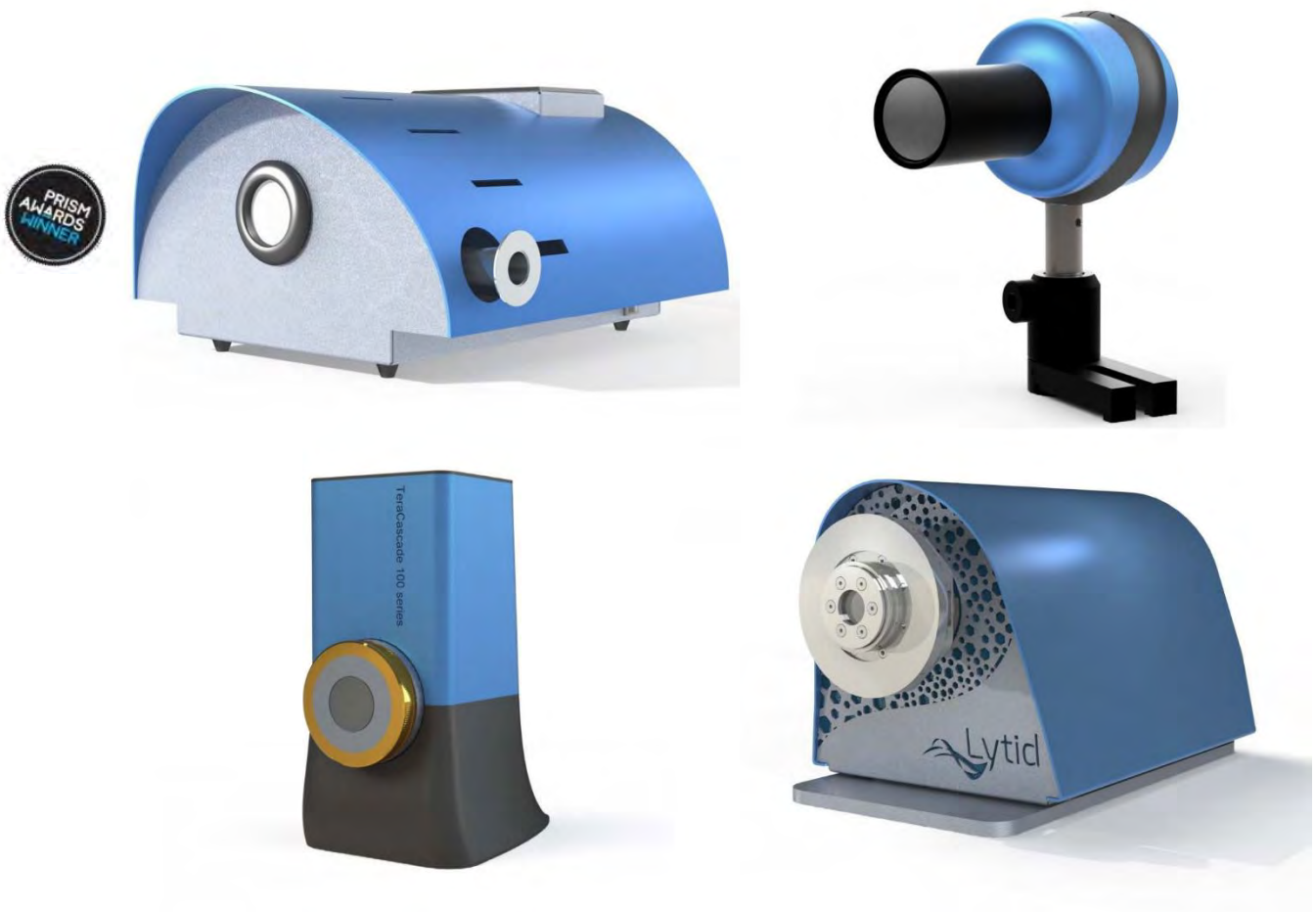

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- Security screening and surveillance
- Concealed weapons detection
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BENEFITS

- Wide band response
- High sensitivity
- 16-bit raw data
- High image quality
- Refractive optics available

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