TELEDYNE
PRINCETON INSTRUMENTS
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NIRvana: 640

The NIRvana: 640 from Teledyne Princeton Instruments is the world's first scientific grade, deep-cooled, large format InGaAs camera for low-light scientific SWIR imaging and spectroscopy applications. The camera uses a 640 x 512 InGaAs array with response from 0.9 µm to 1.7 µm. The detector is Peltier cooled to -85°C to minimize thermally generated noise and to improve signal-to-noise ratio for the most demanding SWIR applications. It offers 16-bit digitization and low read noise for outstanding dynamic range.

FEATURES	BENEFITS
640 x 512 InGaAs array	High resolution imaging in the SWIR region; Offers 4X more pixels over 320 x 256 sensor
20 µm x 20 µm pixels	High spatial resolution
Response from 0.9 µm to 1.7 µm with 85% (typical) peak quantum efficiency	Excellent SWIR sensitivity for demanding imaging applications
Thermo-electric (Peltier) cooling	Minimizes dark noise and allows extended integration times without the need for liquid nitrogen; Built-in air or liquid cooling option for vibration sensitive environments
Integrated cold-shield	Special "cold shield" limits the ambient thermal background
Electronic shutter	Provides integration times from 2 µs to many minutes
C-mount	Standard lens interface compatible with numerous lenses and microscopes (spectrometer adapters available)
Fused silica window	AR coated, fused silica window for high transmission in SWIR range
GigE interface	Industry standard for fast data transfer over long distances, up to 50 m
Optional: LightField® (for Windows 8/7, 64-bit) Or WinView/Spec (for Windows 8/7/XP, 32-bit)	Flexible software packages for data acquisition, display and analysis; LightField offers intuitive, cutting edge user interface, IntelliCal® and more
SITK® for LabVIEW™	Easy integration into complex experimental setup
PICAM (64-bit)/PVCAM (32-bit) software development kits (SDKs)	Compatible with Windows 8/7/XP, and Linux; Universal programming interfaces for easy custom programming.

NIRvana: 640 shown with lens, sold separately.

NOTE: Export of this camera outside of the United States is prohibited by law unless accompanied by a valid Export License as issued by the United States Department of Commerce.

Applications:

Nanotube fluorescence, emission, absorption,
non-destructive testing and singlet oxygen detection

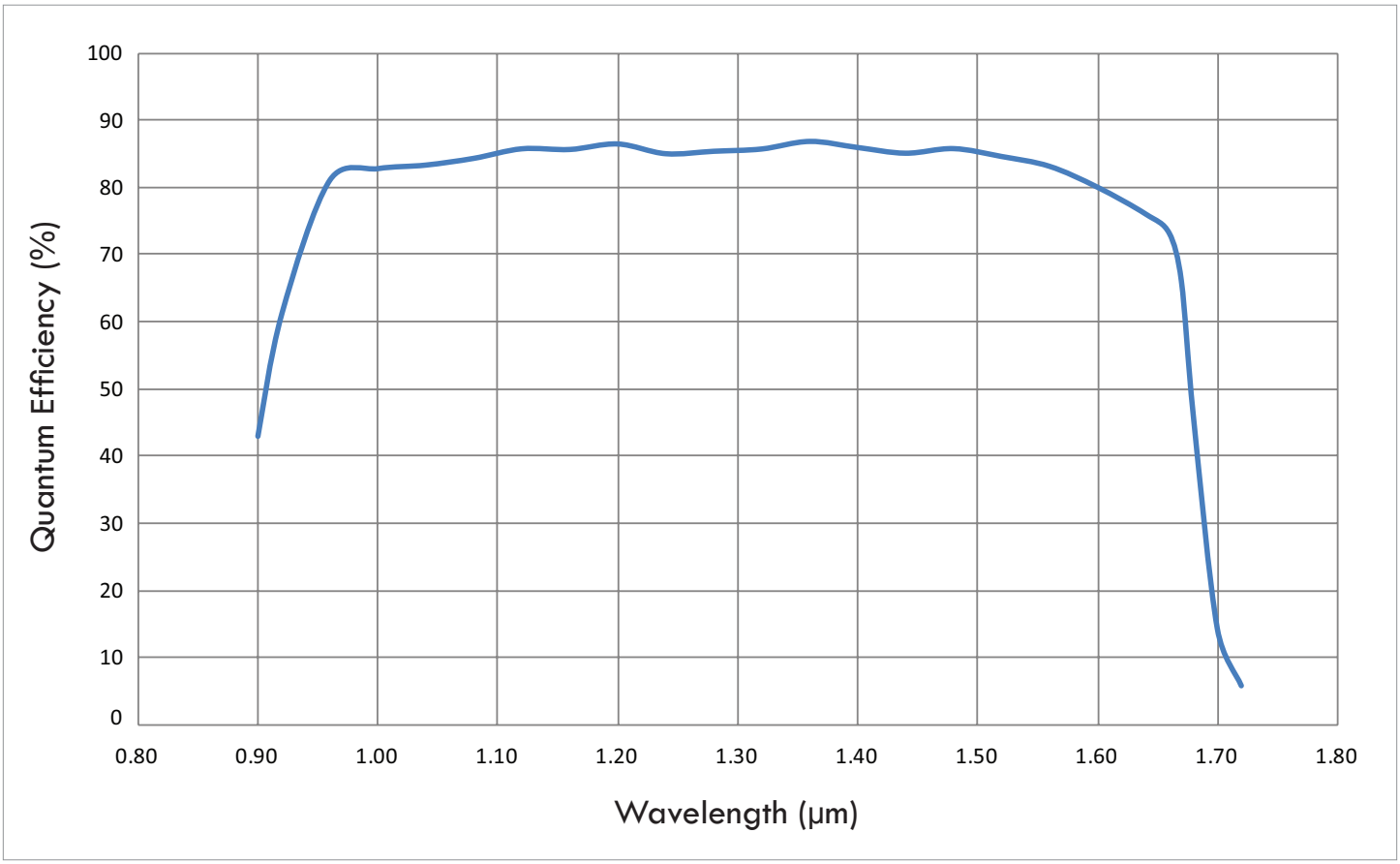
SPECIFICATIONS

	NIRvana: 640	
CCD image sensor	2D InGaAs focal plane array	
CCD format	640 x 512 imaging pixels	
CCD image area	12.8 mm x 10.24 mm	
Pixel size	20 µm x 20 µm	
Pixel well capacity (e^-)	***High Gain*** 45,000	***High Capacity*** 600,000
Nominal gain (e^-/count)	1.2	14
Typical system read noise (e^-)	80* (High Gain)	
Response nonlinearity: High gain	< 2** %	
Cooling temp. @ +20°C ambient	-80°C (guaranteed), -85°C (typical with Air +15°C liquid circulation)	
Cooling method	Air only, liquid only, or a combination of air and liquid	
Dark current (e^-/p/sec) @ -80°C	75***	
Blemish specification	Grade A: <2% defects For detailed blemish specifications, contact Princeton Instruments	
Digitization	16 bits	
Scan rate	2 MHz, 5 MHz, 10 MHz	
Frame rate	22 fps @ 2 MHz 55 fps @ 5 MHz 110 fps @ 10 MHz	
Binning and ROI	Software only	
Cold shield	f#/1.5	
Exposure time	< 2 µs to >10 min	
Window material	Fused Silica (AR coated)	
Thermostating precision	±0.05°C across entire temperature range	
Operating temperature	0°C to +30°C	
Certification	CE	
Weight / Dimensions (C-mount)	9.5 lbs (4.3 kg) / 7.40" x 5.8" x 5.8" (187.96 mm x 147.32 mm x 147.32 mm) (L x W x H)	
Weight / Dimensions (SP-mount)	9.5 lbs (4.3 kg) / 7.297" x 5.8" x 5.8" (185.34 mm x 147.32 mm x 147.32 mm) (L x W x H)	

All specifications are typical. Subject to change without notice.

* Measured with 1 µs exposure time
** Linearity for exposure > 20 ms
*** Measured with a cold target at -174°C (+99°K)

SENSOR QUANTUM EFFICIENCY CURVE



NOTE: Graph shows typical Quantum Efficiency (QE) data measured at + 25°C. Longer cut-off wavelength shifts towards blue by 8 nm per every 10°C of cooling.

APPLICATION IMAGES

SWIR Angiography

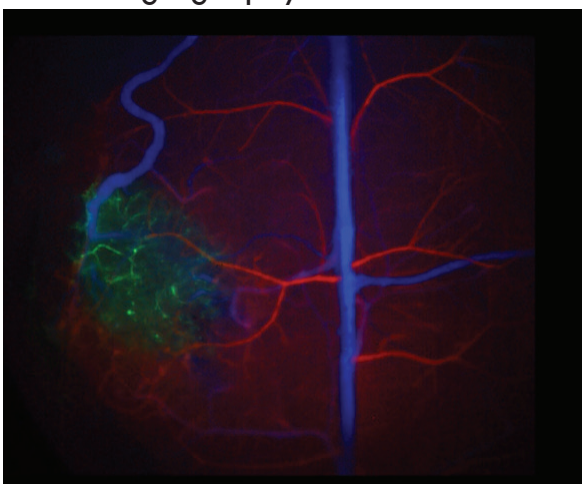


Image courtesy: Bawendi Lab, Massachusetts Institute of Technology, Cambridge, MA. From high-speed intravital imaging for angiography in a brain tumor model to high resolution and high-speed SWIR intravital imaging to generate flow maps of microvascular networks using QD composite particles.

Topographical rendering of energy-momentum-resolved spectroscopy

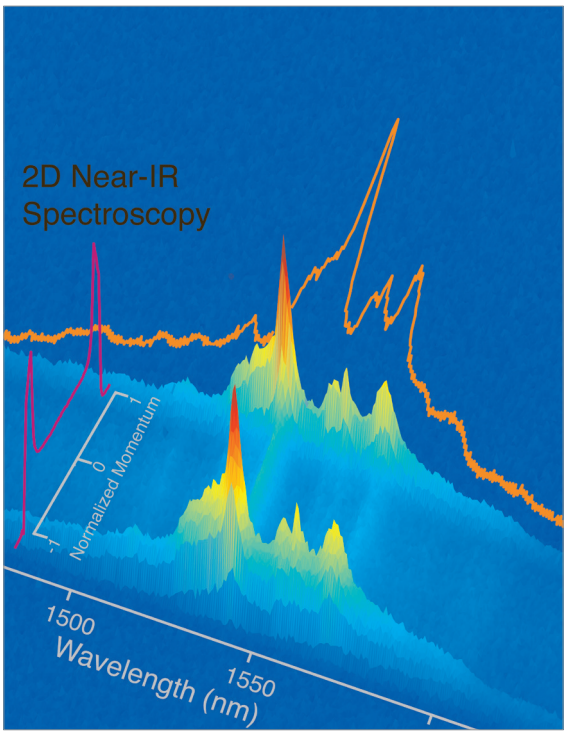
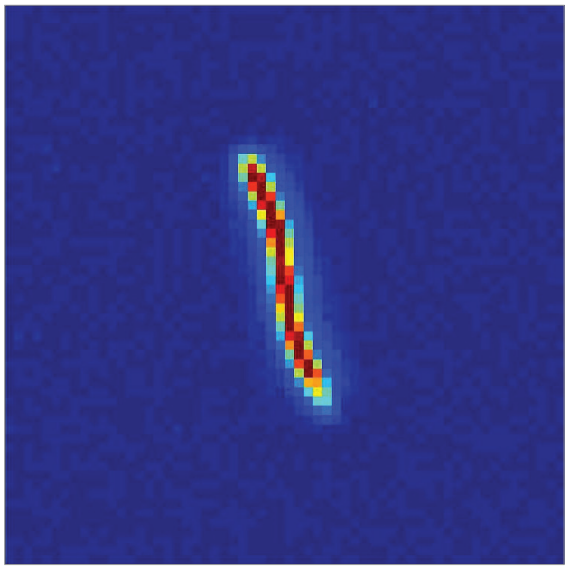
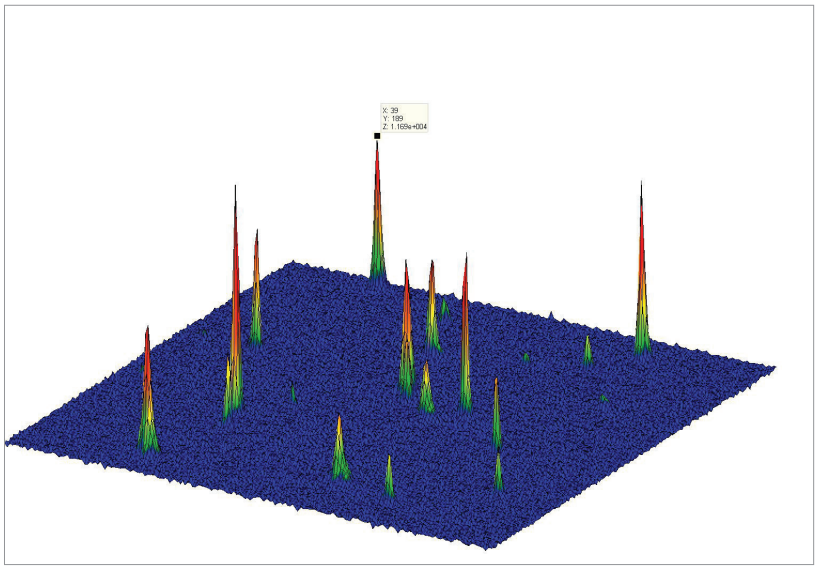


Image courtesy of Dr. Rashid Zia, Manning Assistant Professor, School of Engineering, Brown University, Providence, RI USA

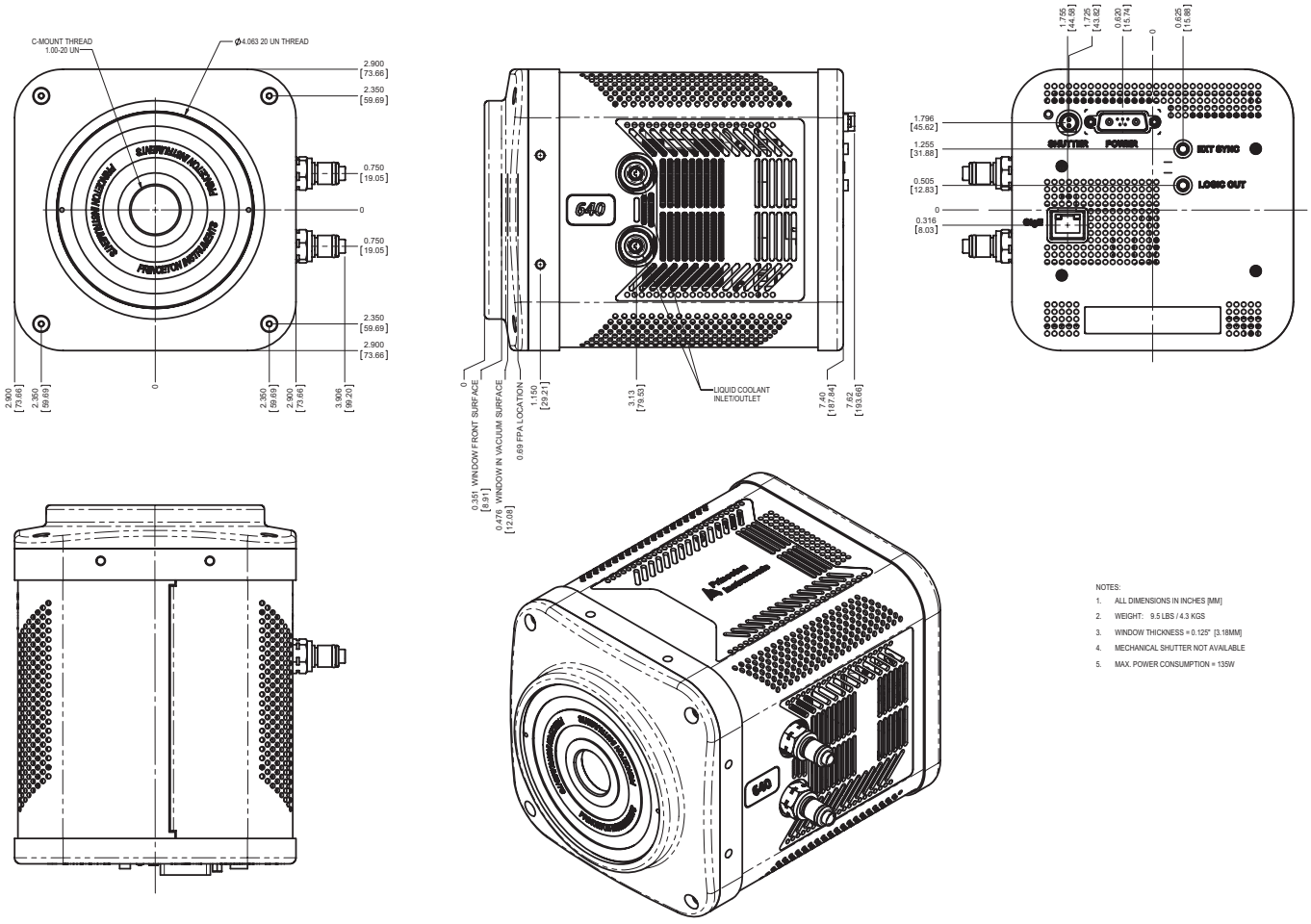
Single walled nanotube (SWNT)





Images courtesy of Dr. R. Bruce Weisman, Professor of Chemistry, The Richard E. Smalley Institute for Nanoscale Science and Technology, Rice University, Houston, TX USA

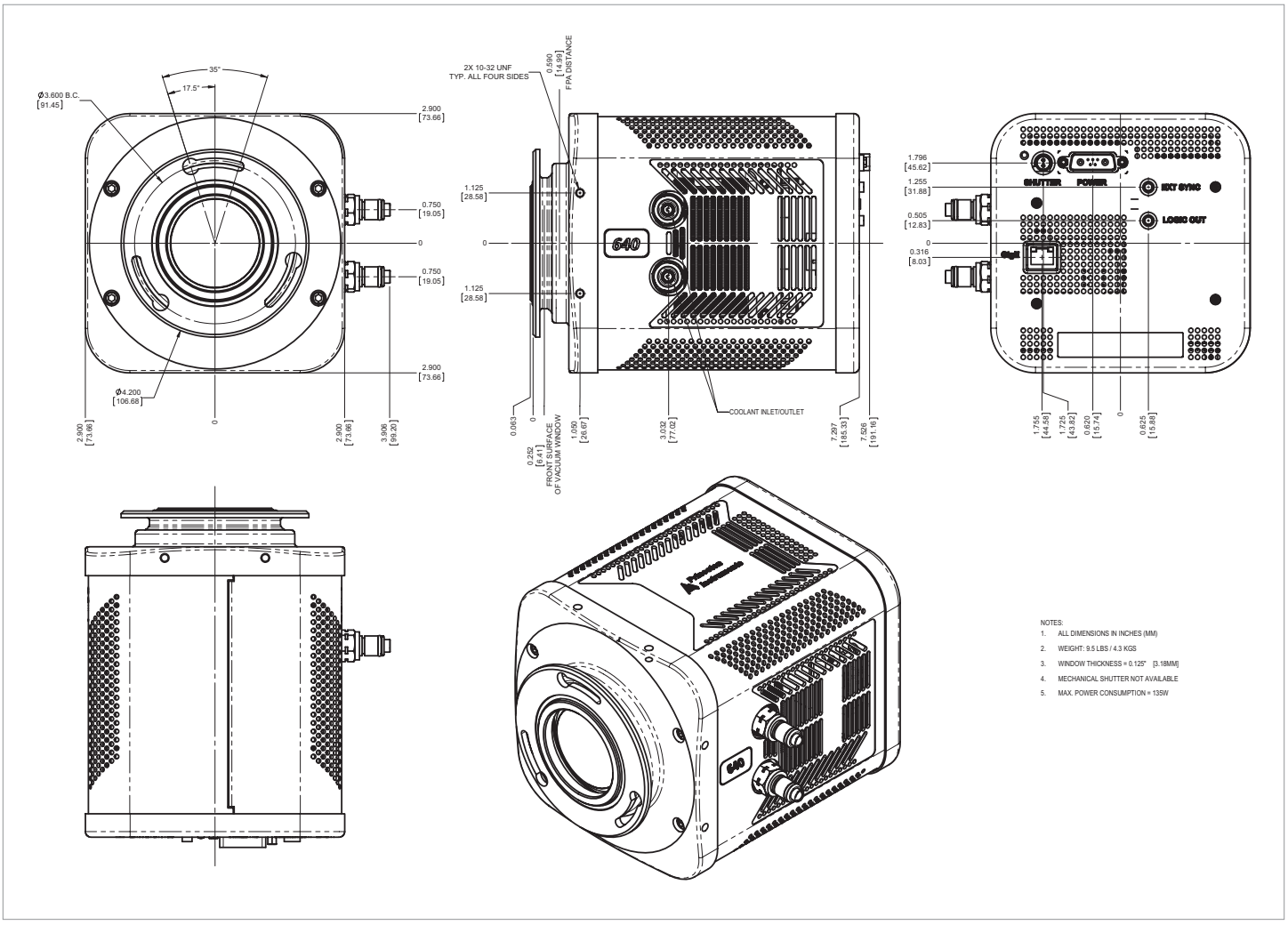
OUTLINE DRAWING
WITH C MOUNT



NOTES:
1. ALL DIMENSIONS IN INCHES [MM]
2. WEIGHT: 9.5 LBS / 4.3 KGS
3. WINDOW THICKNESS = 0.125" [3.18MM]
4. MECHANICAL SHUTTER NOT AVAILABLE
5. MAX. POWER CONSUMPTION = 135W

Spectrometer adapter is available upon request.

OUTLINE DRAWING WITH SPECTROMETER MOUNT



C-mount adapter is available upon request.