

SanjSCOPE™ NanoTherm-Series For Top-Side Thermal Imaging

The **SanjSCOPE™ Nanosecond Transient Thermal Imager** for topside thermal imaging is available as a single mode lock-in thermorefectance-based (TR only) system or as a **Dual Mode TR + IR** lock-in system. In TR mode, the system spectral range is 365 nm to 800 nm with a 50 ns transient response. The **Dual Mode** configuration combines an advanced digital IR lens to gain the increased thermal sensitivity of infrared emission thermography. The wide spectral range supports TR-based imaging for the thermal analysis of a wide range of advanced devices. The NUV coverage is especially important for the thermal analysis of GaN and other wide band-gap devices. With submicron spatial resolution, 50 ns transient resolution, and support for **TransientCAL™** and **HyperSpectral** calibration, the **NT-Series System** will meet the thermal imaging requirements of the most advanced electronic and optoelectronic devices. The dual mode functionality enables macro-analysis to detect very low power levels with the ability to zero in on a micro-scale for a more detailed analysis of detected hotspots or other thermal anomalies. The **NT-Series System** is available in a baseline system configuration suitable for integrating with your own probe or thermal stage and available as factory-configured turnkey system complete with a probe station and an auto-focus and positioning piezo x-y-z thermal stage for greater thermal resolution.

Figure 2: Lock-in technique ensures high S/N ratio for improved resolution & measurement accuracy

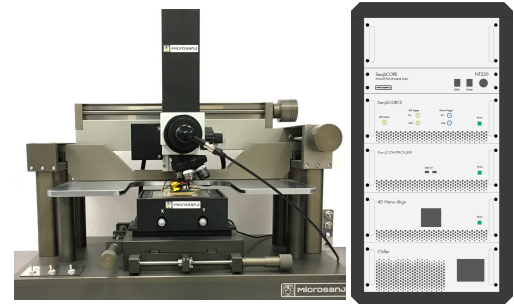
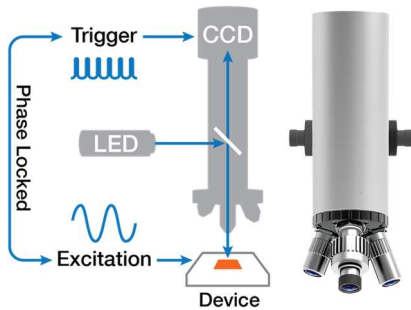


Figure 1: The SanjSCOPE™ NT-Series System is shown with optional gantry probe station, AFP-200 Calibration Tool, and Vibration Isolation Table.

The dual mode functionality enables macro-analysis to detect very low power levels with the ability to zero in on a micro-scale for a more detailed analysis of detected hotspots or other thermal anomalies. The **NT-Series System** is available in a baseline system configuration suitable for integrating with your own probe or thermal stage and available as factory-configured turnkey system complete with a probe station and an auto-focus and positioning piezo x-y-z thermal stage for greater thermal resolution.

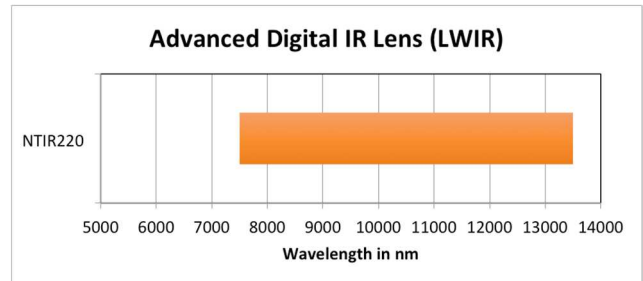
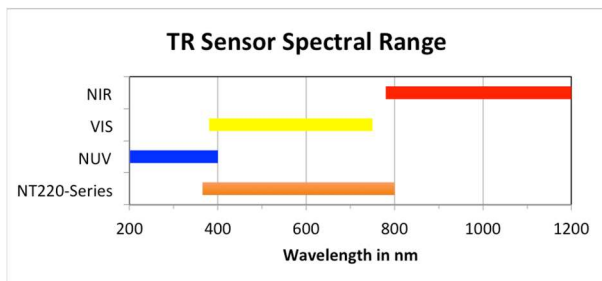


Figure 3: NT-Series spectral response for TR Mode (left) extends from NUV to NIR, while IR Mode (above) covers the range 7.5 μm to 13.5 μm.

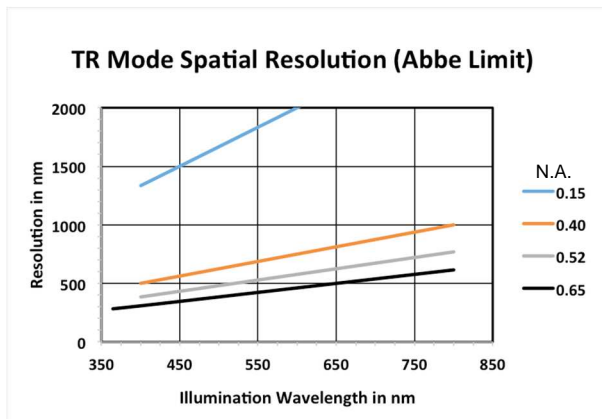


Figure 4: Diffraction limited spatial resolution is shown for the 3 objectives provided with the NT-Series System & an optional objective included with the NUV package.

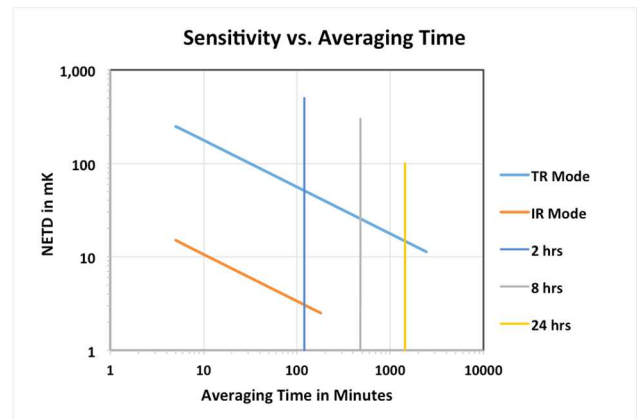


Figure 5: With the lock-in technique, the sensitivity is further enhanced with increased time averaging.



3287 Kifer Road
 Santa Clara, CA 95051 USA
www.microsanj.com

NT220C/NTIR220C Performance Specifications

	SanjSCOPE™ NT220C & SanjSCOPE™ NTIR220C in TR Mode	SanjSCOPE™ NTIR220C in IR Mode
DESCRIPTION		
Camera Sensor	CMOS	VO Micro-bolometer
Active Thermal Pixels	2048 x 2048 (4 MP)	640 x 512 (0.33 MP)
Detector Pitch	5.5 µm	12 µm
Spectral Range	(NUV) 365 nm to 800 nm	(LWIR) 7.5 µm to 13.5 µm
CCD Interface	USB 3.0 High Speed Acquisition	USB 2.0
LED Illumination Model LS-300 SanjSOURCE™	405 nm, 470 nm, 530 nm, & 780 nm	n/a
Objectives	5x, NA=0.15, WD=35.1 mm 20x, NA=0.40, WD=22 mm 100x, NA=0.52, WD=14.1 mm	0.5x, WD=32 mm
Field of View (FOV)	2.25 mm x 2.25 mm w/5x objective	15.4 mm x 12.3 mm @ 0.5x
Operating System	SanjCONTROLLER™ with embedded SW: SanjVIEW™ v6.0 for system management, image data collection, and data processing and analysis	
PERFORMANCE		
Spatial Resolution	Diffraction limited 389 nm (LED=405 nm, 100x, NA=0.52) <300 nm (LED=365 nm) with optional NUV Enhancement Upgrade	Nyquist limit: 48 µm with 0.5x objective 12 µm with optional 2x objective
Pixel Resolution	55 nm per pixel at 100x	24 µm/pixel at 0.5x objective 6 µm/pixel with optional 2x objective
NETD ¹	250 mK	15 mK
Transient	Resolution: 12.5 ns Delay 50 ns Pulse Duration (FWHM)	17 ms Pulse Duration (FWHM)
GENERAL		
Operating Temperature	10 °C to 35 °C (50 °F to 95 °F), < 60% relative humidity, non-condensing	
Power	1500 W: 120V/ 12.5 A (240V/6 A)	
Full Rack Size (L x W x H)	36" x 24" x 46" (91 cm x 61 cm x 117 cm)	
Full Rack Weight	260 lbs (120 kg)	

1. Temperature sensitivity typical after 5 min

OPTIONAL ACCESSORIES/UPGRADES AVAILABLE	
NUV Enhancement Upgrade	An important upgrade for thermal imaging of GaN & other wide band gap devices for enhanced sensitivity & spatial resolution <300 nm with 365 nm illumination wavelength. Inquire for details
NIR Enhancement Upgrade	For spectral range extension to 1050 nm for base-line back-side substrate imaging. Inquire for details
SPS-400: Probe Station	4 inch vacuum chuck, DC probe heads & vacuum pump
GPS-200: Probe Station	Gantry type with 6 inch vacuum chuck, DC probe heads
AFC-60 3D Nano Align: Auto-Focus Chip Level Calibration Tool	To achieve 5% absolute temperature accuracy with small size. Includes: 3-axis Piezo fixture stage and controller, Thermal chuck with 18 °C to 33 °C temperature range with 0.5 x 10 ⁻⁵ accuracy, 20 µm travel, x-y correction to <100 nm
AFP-200 4D Nano Align: Auto-Focus Package Level Calibration Tool	To achieve 5% absolute temperature with larger sample sizes. Includes: High performance 3-axis Piezo stage and controller, 500 W Thermal chuck with 125 mm x 125 mm work area with Temperature Range 20 °C to 150 °C with 0.10 °C accuracy. 3-axis 1 nm positioning resolution, 200 µm travel & ±2° tilt adjustment, x-y correction to <10 nm
SA-200: SanjANALYZER-PLUS™	For Advanced Post-processing of SanjVIEW™ data files. Support for HyperSpectral Analysis, TransientCAL™, Sub-Pixel Digital Alignment, Etc.
LS-200: Tunable Light Source	390 nm to 660 nm range with 5 nm resolution and 0.5 nm accuracy
Optional Objectives for TR Mode	Several available with varied NA, Working Distance, & Spectral Range
VT-100: Vibration Isolation Table	For sample stability in environments subject to vibration

For further information about the NT220C, NTIR220C, or other Microsanj products inquire at:

info@microsanj.com, Tel: +1 408 256 1255, Fax: +1 408 470 7539

Or contact your local sales representative: <https://www.microsanj.com/contact/locations>



SanjSCOPE™ NT220/NTIR220 Options & Accessories

INTRODUCTION

The *Microsanj SanjSCOPE™ NT220/NTIR220 Thermal Imagers* have been configured with a set of optics, illumination wavelengths and a set of features that will meet a wide range of customer thermal imaging applications. Recognizing the potential for unique application-specific requirements that may not be adequately addressed with a standard configuration we offer a range of options and accessories for enhanced performance or to more optimally configure an imaging solution to a specific application. Many of the system variations have to do with the selection of objectives, which are designed to cover specific spectral ranges, and illumination wavelengths required for specific materials, devices, or device configurations to be analyzed. While many of the options are straightforward and easily configurable by the customer after purchase of a standard SanjSCOPE™ system, some are best if configured and validated at the factory prior to shipment.

This is intended to be a guide as to the options that are available for the NT/NTIR220C-series.

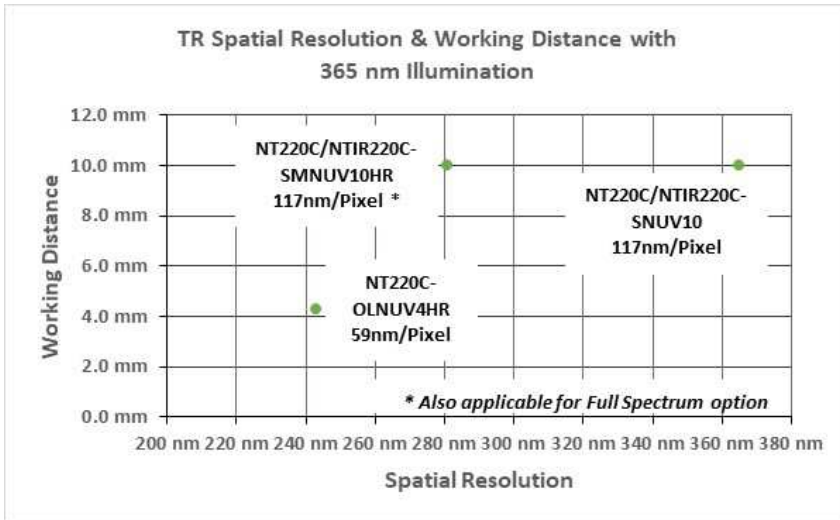
Notes for spectral coverage:

Light Guides:	LLGUVx	220 nm to 650 nm	Objectives:	NUV Band	355 nm to 620 nm
	LLGVISx	340 nm to 800 nm		VIS Band	400 nm to 800 nm
	LLGNIRx	420 nm to 2000 nm		NIR Band	480 nm to 1800 nm

NT220C/NTIR220C			
Specified Spectral Range for TR Mode	CMOS Detector	365 nm to 800 nm (extendable to 1050 nm)	
Standard LEDs	Model LS-300 SanjSOURCE-5	5 Auto-selectable wavelengths: (365nm)*, 405nm, 470nm, 530nm, 780nm <i>*365nm LED included but only usable with an added optional objective for the NUV band</i>	
Standard Objectives for TR Mode	Part # 5SVIS35 Part # 20SVIS22 Part # 100SVIS14	Mag=5x, WD=35.1mm, VIS Band Mag=20x, WD=22mm, VIS Band Mag=100x, WD=14.1mm, NA=0.52, VIS Band	
Standard IR Lens for NTIR220C IR Mode	Part # IR050FoV	Mag=0.5x, 48 micron spatial resolution	
Options			Price
Optional LEDs	SanjSOURCE-8 Model LS-400	8 Auto-selectable wavelengths: (365 nm)*, 405 nm, 470 nm, 530 nm, 625 nm, 780 nm, (940 nm, 1050 nm)* Also includes two 6 ft. light guides; LLGUV6 & LLGNIR6 <i>*365 nm, 940 nm, & 1050 nm LEDs only usable with an added optional objectives for the NUV band and/or NIR band</i>	On Request
Optional Objectives for TR Mode	Part # 2.5SVIS32	Mag=2.5x, WD=32mm, VIS Band For 2x greater FOV compared to included 5x magnification	On Request
	Part # 50SVIS18	Mag=50x, WD=18.3mm, VIS Band For higher magnification with reduced FOV when observing smaller features	On Request
	Part # 100MVIS6	Mag=100x, WD=6mm, NA=0.70, VIS Band Alternative 100x magnification with higher NA for better spatial resolution	On Request
	Part # 100MVIS1	Mag=100x, WD=1.3mm, NA=0.90, VIS Band Alternative 100x magnification with very high NA for best spatial resolution if small WD can be tolerated	On Request
	Part # 50SNUV10	Mag=50x, WD=10mm, NA=0.50, NUV Band Enables TR operation in NUV band with 365nm LED, supports spatial resolution of 365 nm with 365 nm illumination.	On Request
	Part # 100MNIR10	Mag=100x, WD=10mm, NA=0.70, NIR Band Enables TR operation in NIR band for illumination wavelengths up to 1050 nm.	On Request

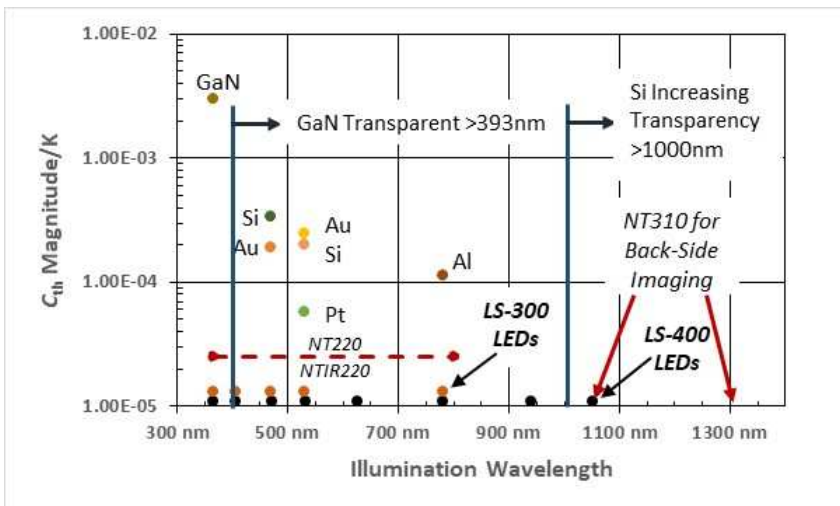


Optional Lens for IR Mode (For MTIR220C only)	Part # IR024FoV	1x Magnification For 24 micron Spatial resolution with 7.70mm x 6.15mm FOV	On Request
	Part # IR012FoV	2x Magnification For 12 micron spatial resolution with 3.85mm x 3.08mm FOV	On Request
Factory-Configured Options for NT220C & NTIR220C			List Price
Chip-Level Calibration Package	Product Model # followed by PKG-1	Adds the SPS-400 Probe Station and AFC-60 Chip-Level Calibration Tool to the NT220C, NTIR220C, or any of the following factory-configured options	On Request
Package-Level Calibration Package	Product Model # followed by PKG-2	Adds the GPS-200 Probe Station and AFP-200 Package-Level Calibration Tool to the NT220C, NTIR220C, or any of the following factory-configured options	On Request
NUV Enhancement Option Extend TR imaging down to 365 nm	NT220C-SNUV10 or NTIR220C-SNUV10 (365nm resolution, 110nm/pixel with 10mm WD)	Objectives included: Mag=5x, WD=35.1mm, VIS Band (5SVIS35) Mag=20x, WD=12mm, NUV Band (20SNUV12) Mag=50x, WD=10mm, NA=0.50, NUV Band (50SNUV10) Spatial Resolution=365nm (50x Mag, NA=0.50, LED=365nm), 110nm/pixel @50x	On Request
	NT220C-SMNUV10HR or NTIR220C-SMNUV10HR (281nm resolution, 110nm/pixel with 10mm WD)	Objectives included: Mag=5x, WD=35.1mm, VIS Band (5SVIS35) Mag=20x, WD=12mm, NUV Band (20SNUV12) Mag=50x, WD=10mm, NA=0.65, NUV Band (50MNUV10) Spatial Resolution=281nm (50x Mag, NA=0.65, LED=365nm), 110nm/pixel @50x	On Request
	NT220C-OLNUV4HR (243nm resolution, 55nm/pixel with 4.3mm WD)	Objectives included: Mag=5x, WD=20mm, VIS Band (5OVIS20) Mag=20x, WD=6.6mm, NUV Band (20ONUV6) Mag=100x, WD=4.3mm, NA=0.75, NUV Band (100LNUV4) Spatial Resolution=243nm (100x Mag, NA=0.75, LED=365nm), 55nm/pixel @100x	On Request
NIR Enhancement Option Extend TR imaging up to 1050 nm	NT220C-SMNIR10 or NTIR220C-SMNIR10	Model LS-400 SanjSOURCE-8 Auto-selectable wavelengths: (365nm)*, 405nm, 470nm, 530nm, 625nm, 780nm, 940nm, 1050nm. Also includes two 6 ft. light guides; LLGNUV6 & LLGNIR6 Objectives included: Mag=5x, WD=35.1mm, VIS Band (5SVIS35) Mag=20x, WD=20mm, NIR Band (20MNIR20) Mag=100x, WD=10mm, NA=0.70, NIR Band (100MNIR10) Spatial Resolution=750nm (100x Mag, NA=0.70, LED=1050nm), 55nm/pixel	On Request
Full Spectrum Option LEDs and Objectives to support TR imaging from 365 nm to 1050 nm	NT220C-SMFS10HR or NTIR220C-SMFS10HR	Model LS-400 SanjSOURCE-8 Auto-selectable wavelengths: (365nm)*, 405nm, 470nm, 530nm, 625nm, 780nm, 940nm, 1050nm. Also includes two 6 ft. light guides; LLGNUV6 & LLGNIR6 Objectives included: Mag=5x, WD=35.1mm, VIS Band (5SVIS35) Mag=20x, WD=12mm, NUV Band (20SNUV12) Mag=50x, WD=10mm, NA=0.65, NUV Band (50MNUV10) Mag=20x, WD=20mm, NIR Band (20MNIR20) Mag=100x, WD=10mm, NA=0.70, NIR Band (100MNIR10) Spatial Resolution=281nm (50x Mag, NA=0.65, LED=365nm), 110nm/pixel @50x Spatial Resolution=750nm (100x Mag, NA=0.70, LED=1050nm), 55nm/pixel	On Request



A 365 nm illumination wavelength is important for the thermal analysis of GaN devices which, in many cases have submicron features. The chart at the left shows the spatial resolution and working distance tradeoffs between the NUV enhancement options with a 365 nm illumination wavelength.

Note that the OLNUV4HR option is not available for the dual mode TR+IR NTIR220C.



Thermoreflectance coefficient (C_{th}) values are shown in the chart at the left for typical materials of interest. Note that GaN is opaque at 365 nm and virtually transparent above 393 nm. The high value of C_{th} ensures excellent thermal sensitivity at 365 nm illumination for thermal imaging of GaN devices. Also shown is the standard spectral range for the NT220-Series and the provided LEDs for the LS-300 and LS-400 respectively. The optional LS400 SanjSOURCE provides a 1050nm wavelength LED enabling backside imaging with a corresponding NIR objective.

A 1300nm LED which comes as standard with the NT310B is not available for the NT220-Series as it is outside the spectral

range of the CMOS detector.