



Tech Note: TN-001B

THERMOREFLECTANCE THERMAL IMAGING (TTI) & INFRARED MICROSCOPY (IR): A COMPARATIVE OVERVIEW

	IR	TTI
Minimum Power	~100 mW (<10 μ W with lock-in)	500 μ W (~25 μ W possible with longer integration time)
Full Frame Time Resolution	10's ms	< 50 ns (800 ps demonstrated)
Temperature Resolution	100 mK (10 μ K with lock-in)	0.1 – 0.5 $^{\circ}$ C (6 mK demonstrated)
Spatial Resolution	~2 to 5 μ m	245 nm (top-side) 0.8 μ m (thru-the-substrate)
Sample Temperature	>50 $^{\circ}$ C to 70 $^{\circ}$ C	-265 $^{\circ}$ C to 500 $^{\circ}$ C demonstrated
Relative Cost	\$\$ to \$\$\$	\$ to \$\$



Tech Note: TN-001B

Advantages and Disadvantages

INFRARED MICROSCOPY (IR)	
Advantages	Disadvantages
<ul style="list-style-type: none">• Very good emission temperature resolution with cryogenically-cooled InSb camera	<ul style="list-style-type: none">• Higher cost• Requires sample heating• Low emissivity for metals• Sometimes requires special sample preparation (less suitable for in situ testing)• Only fair spatial resolution and poor time resolution• Image 'blurring' unless lock-in technique is used
TRANSIENT THERMAL IMAGING (TTI)	
Advantages	Disadvantages
<ul style="list-style-type: none">• Lower cost• Very good time and spatial resolution• Imaging obtained over wide range of sample temperature (sample heating not required)• Possible to obtain simultaneous emission and thermal images with NIR illumination source• Simple sample preparation	<ul style="list-style-type: none">• Temperature resolution typically limits applications to samples with >500 μw power dissipation