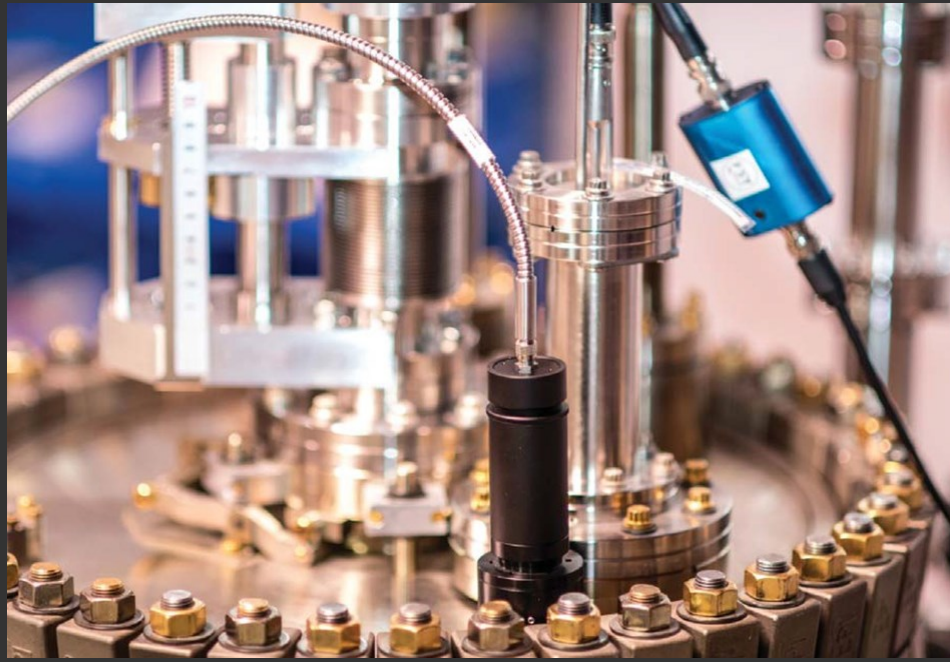# Absolute Temperature, Absolutely Easy

kSA SpectraTemp is an easy to use, non-contact, optically-based temperature measurement and calibration tool that measures absolute temperature. Using patented analysis of the spectral radiation profile, kSA SpectraTemp can determine absolute temperature without any prior temperature calibration or knowledge of the emissivity of the radiating material.

kSA SpectraTemp can be used to measure the temperature of semiconductor wafers, metals, ceramics, and much more. The kSA SpectraTemp can also be used to calibrate other temperature measurement devices, including standard infrared pyrometers. As part of this patented technology, SpectraTemp has the ability to determine whether the measured temperature is valid, so you can have utmost confidence in your measurement!

| Applications: |
| --- |
| MOCVD carrier temperature |
| Infrared pyrometer calibration |
| Semiconductor wafer temperature |
| Miscellaneous source temperature |

Materials:
Metals
Ceramics
Semiconductor materials (bandgap < 1.4 eV)

System Overview

The standard kSA SpectraTemp system comes with a spectrometer, optics head, fiber, USB cable, and control software. There are two options for the spectrometer used in the system: the standard NIR spectrometer (SPECTRA) , and the cooled NIR spectrometer for expanded temperature range measurement (SPECTRA-C). In addition to this hardware and software, a computer with a USB connection is required for tool operation.

Standard Package	
Component/Description	**Part Number/Option**
Spectrometer unit	SPECTRA - Extended range NIR 870-1670nm spectrometer
	SPECTRA-C - Extended range NIR 870-1670nm cooled spectrometer for enhanced low temperature measurement
Data Acquisition and Analysis Software	Standard
Fiber	Standard
Optics Head	Standard for a 1.33", 2.75", or 4.5" o.d. viewport. To be specified at time of order. Custom optical heads quoted separately.
Add on for kSA ICE	
Component/Description	**Part Number/Option**
Spectrometer calibration unit for use with kSA ICE-ECPR module.	ICE-SPECT
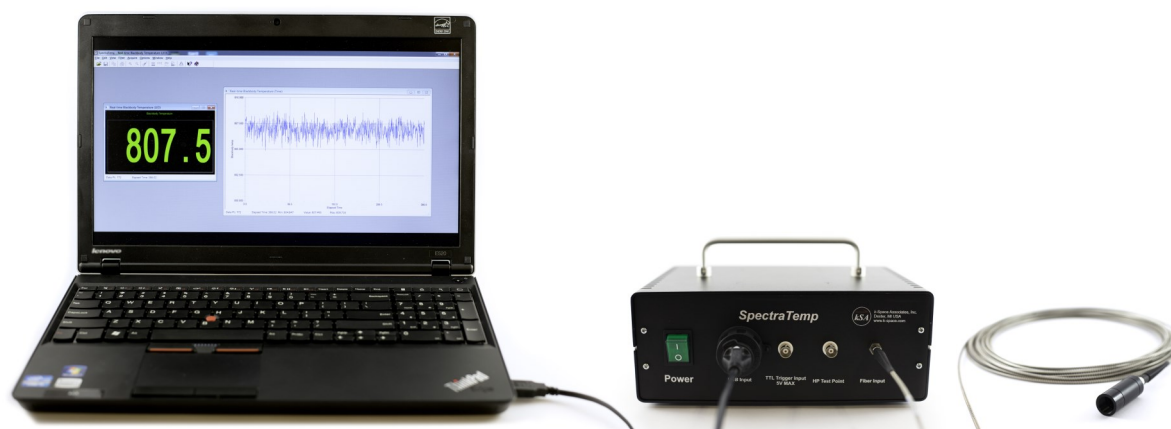
Shown: kNB-LLT and SPECTRA

Functional Specifications

Substrate Material Capabilities	All semi-absorbing semiconductor materials with a bandgap smaller than 1.4 eV, metals, ceramics, and more
Temperature Range	> 350°C (SPECTRA) > 180°C (SPECTRA-C)
Spot Size Diameter	3-5mm
Temperature Repeatability	± 0.5^{o}C
Temperature Resolution	0.2^{o}C > 400°C (uniform material sample)
Temperature Accuracy*	± 3°C, 350-500°C (SPECTRA) ± 3°C, 180-500°C (SPECTRA-C) ± 2°C, > 500°C (both SPECTRA and SPECTRA-C)
Data Acquisition	1μs - 3s (Rate depends on sample temperature and the intensity of the signal collected; software has the option to automatically adjust acquisition rate based on the real-
I/O Interface	USB 2.0
Module Size	10.03" x 7.25"x 4.225" (allow 3" for cables at front and back of 7.25" measurement direction). Please note that with the cooled spectrometer (SPECTRA-C) the unit will be larger.

*Accuracy is guaranteed when the goodness of fit measurement of the tool is ≤ 0.1: for goodness of fit measurement > 0.1 then the radiation detected is not in true blackbody form, and the temperature accuracy is lost.

Spectrometer Specifications

	Extended Range NIR Spectrometer (SPECTRA)	Extended Range Cooled NIR Spectrometer (SPECTRA-C)
Temperature Range	> 350°C (Standard spectrometer)	> 180°C (Cooled spectrometer)
Spectral Range	870-1670nm	870-1670nm
Application	All semi-absorbing semiconductor materials with a bandgap smaller than 1.4eV, metals, ceramics, and more	All semi-absorbing semiconductor materials with a bandgap smaller than 1.4eV, metals, ceramics, and more
Sensor Type	128 element temperature stabilized InGaAs Array	Peltier cooled 256 element InGaAs Array
Rotation Speed Range	0-1500rpm	0-1500rpm
Triggering	TTL trigger input, 5V max	TTL trigger input, 5V max
Power	120/240 VAC	120/240 VAC

Computer Specifications

A computer is required to run SpectraTemp. k-Space recommends purchasing a laptop (KNB-LLT) from k-Space for your convenience. All software is loaded and tested prior to shipping. If another computer is used it must meet the following minimum specifications:

• Processor: Dual Core or higher, minimum I3

• Speed: Minimum 2GHz

• Memory: Minimum 4GB

• Video: 1024 x 768, 16-bit depth

• Hard Disk: Minimum 500MB

• OS: Windows^{TM} 10

• Interface: Single USB 2.0 port
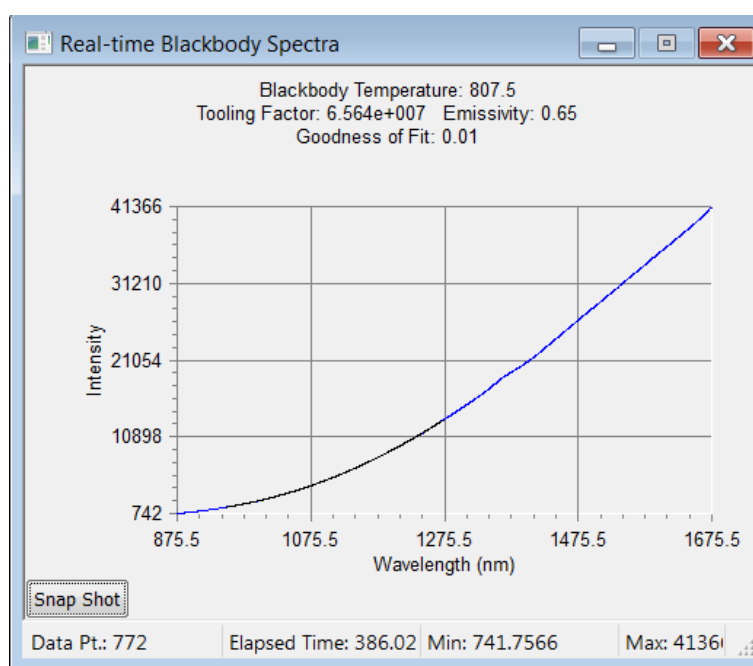
Above: Blackbody Curve Fit
Blackbody spectra is fit in real-time to give an absolute temperature with no need to know the sample emissivity.

Chamber Requirements

- Optical viewport at a non-glancing angle

- Minimum aperture size of ~2mm. Anything less than 5mm will potentially require an xy stage and custom mounting, quoted separately.
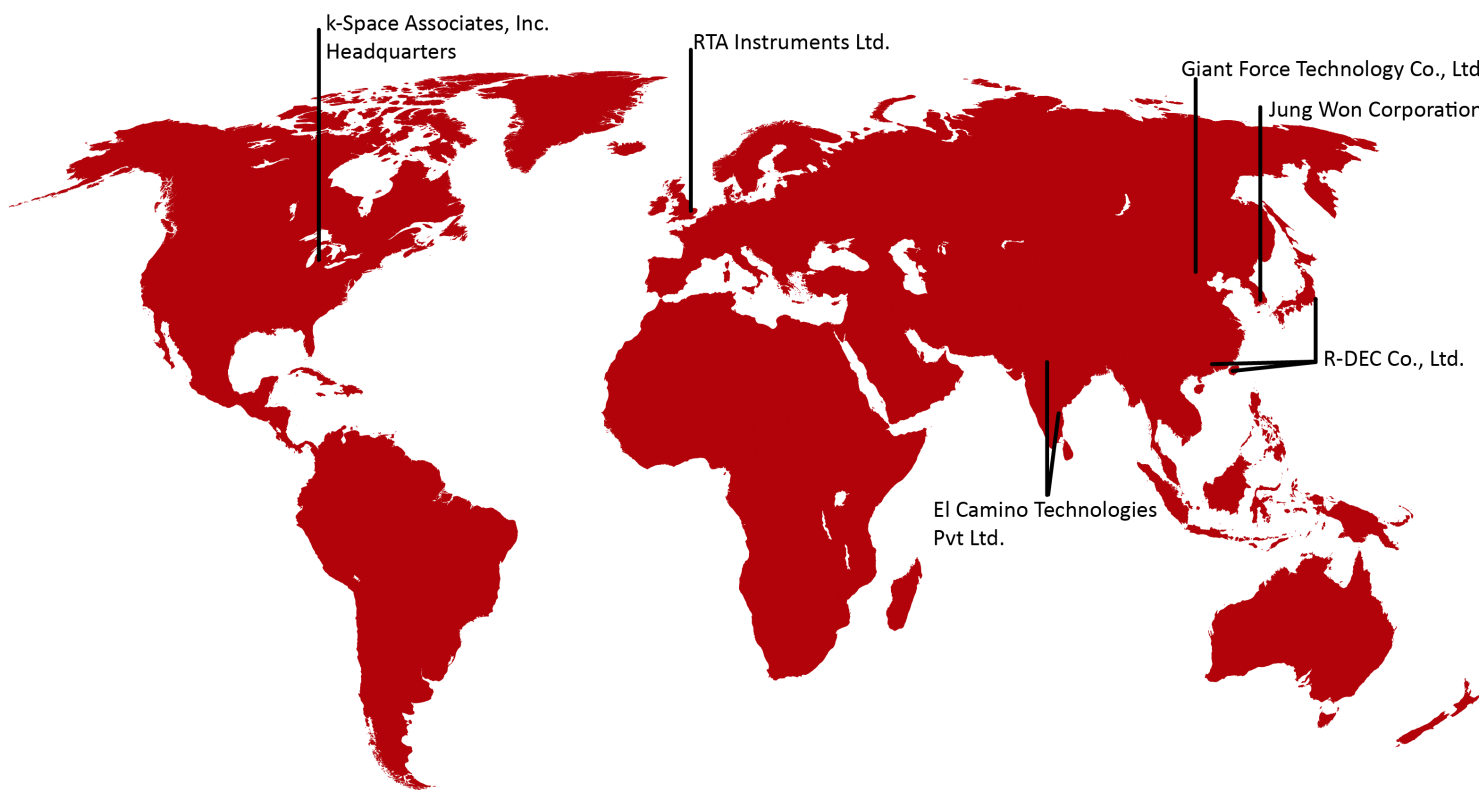
Example Screen
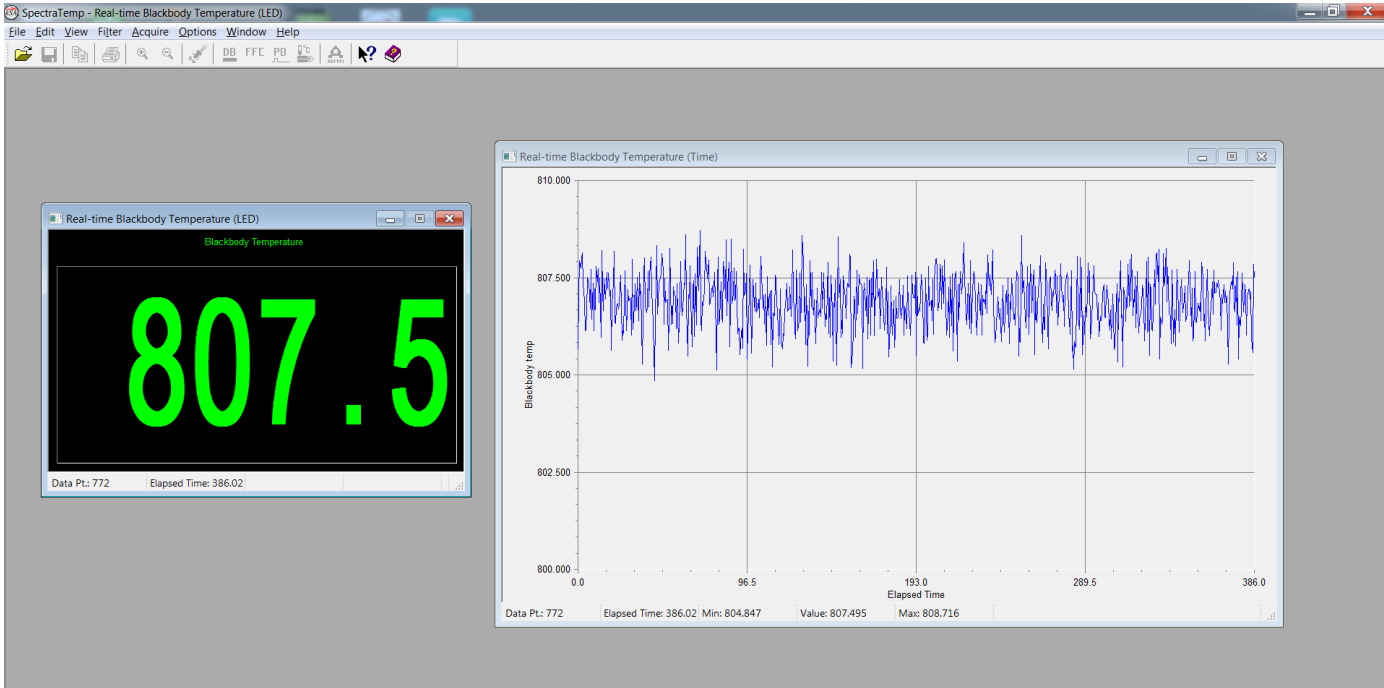
Above: Sample data collection screen showing temperature display as well as temperature vs. time. Configure the screen for the view you want. Other options include goodness of fit and real time blackbody spectra. All acquired data can be stored to a file or output to an analog output channel or via TCP/IP interface.

Left: Simply press the start button to acquire absolute temperature.

kSA SpectraTemp Notes:

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Specifications are subject to change without notice. While due caution has been exercised in the production of this document, possible errors and omissions may occur.

SpectraTemp Product Specs July 22, 2020

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