Tech Notes

Title: How can we measure above 89°C using technology that is limited to 8 – 14µm?
Created:
Last Revised:

Applies To: 4180 and 4181

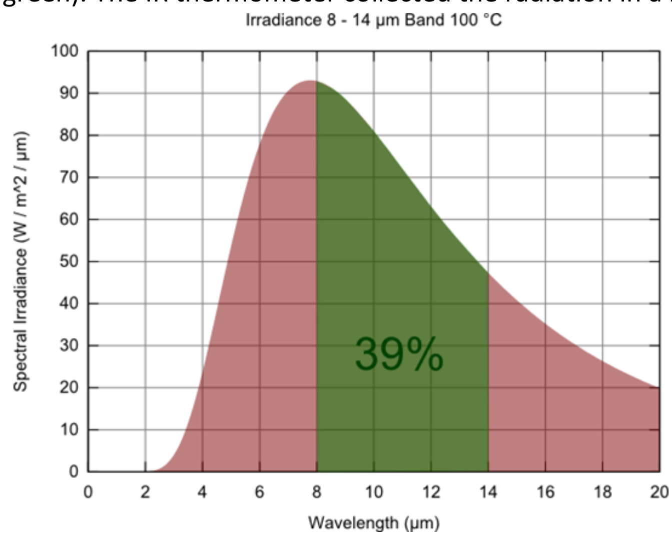
Problem Description: Wavelength and temperature association

Resolution/Work Around: In the Users Guide there is an example of wavelength. It states:

"An example of an object emitting energy at wavelengths we can see is the sun. The sun's surface temperature is about 5750K. According to Wien's Displacement Law, Equation 1 on next page, the peak wavelength for this temperature is about 500nm which happens to be in the visible light band. Thus the eye detects wavelengths corresponding to the temperature of the Sun. By the same respect, if we are measuring an object at room temperature, (23°C or about 296K), the peak wavelength is 9.8µm which is inside the 8 – 14µm band. In fact the temperature corresponding to a peak wavelength at 8 µm is 89°C and the temperature corresponding to a peak wavelength at 14 µm is −66°C. This is one of the reasons the 8 – 14 µm is widely used in handheld IR thermometers. IR thermometers take advantage of this peak wavelength phenomenon. They measure the amount of energy radiating from an object and calculate temperature based on this measured energy. In most handheld IR thermometers, the sensor and optical system measure IR energy in the 8-14µm band."

Please don't confuse peak wavelength as determined by Wien's Displacement Law and how the IR thermometer detects radiance.

An IR thermometer does not detect peak radiation for a given wavelength and assign a temperature. Instead, it collects all the radiation emitted within a given band (8 – 14 um). Based on the amount of optical power of the radiance collected (plus a few other factors), the IR thermometer assigns a temperature. The graph below may help. The object emits radiation in all wavelengths (red plus green). The IR thermometer collected the radiation in a band (green).



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