$$L(\lambda, T) = \frac{2hc^2}{\lambda^5(e^{hc/\lambda kT} - 1)}\, d\lambda$$

Merely producing radiance over a wide range is not sufficient for generating a high-fidelity scene. The radiance values must be generated with sufficient resolution to accurately depict any real contrast throughout the scene. For example, a nighttime scene may span only a few degrees in apparent temperature, and thus require a thermal resolution of 0.1C or less to accurately reproduce. Representing a very hot target (over 500K, for example) may not require such fine thermal resolution, however. The addition of the nonlinear variation of radiance with temperature can further complicate the specification of thermal (radiance) resolution.

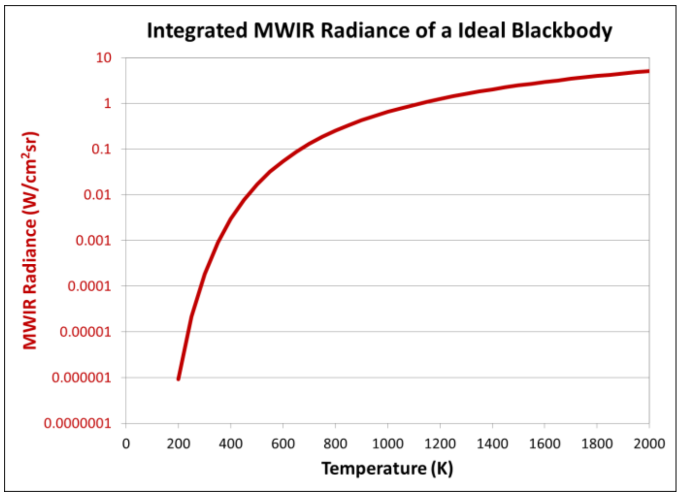

Figure 1. Integrated MWIR radiance as a function of temperature from 200-200K. The radiance covers almost 7 orders of magnitude. from 200-2000K.

IRSPs are rarely procured as an end-to-end system from a single provider. Various providers typically specialize in one area or another, such as emitter array technology, emitter drive electronics, system control electronics, or scene generation. As a result, such systems are often specified, developed and procured in a ‘piece-meal’ manner. This can unfortunately lead to subsystems that cannot support desired system requirements when interfaced with other subsystems. A key goal of this paper is to describe some of the pitfalls that can arise when specifying IRSP systems, and to provide some suggestions for properly defining thermal resolution requirements to enhance the likelihood of realizing the desired end-system performance.

2. SCENE PROJECTORS AND THERMAL RESOLUTION

As mentioned above, IRSPs are generally comprised of several subsystems. The minimum incremental step in radiance of an integrated IRSP system at a given output radiance is limited by the step sizes of its subsystems at that radiance. Each of these subsystems must be considered when determining system resolution. Figure 2 shows a block diagram of a typical IRSP system. A scene generator system outputs a digital data stream representation of the desired scene, which may consist of actual digitally-recorded IR scenes, synthetically-generated scenes and/or targets, or a combination of both. This scene data is then typically transferred to a set of electronics for digital preprocessing. These preprocessing electronics may format and perform some transformations to the data before transmission to the emitter array and its associated drive electronics. Each individual subsystem has its own ‘native’ response to a

Addressable MWIR LED Arrays Based on Type-II InAs/GaSbSuperlattices," *IEEE J. Quant. Electron*, vol. 49, 2013.

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