Abstract Submitted
for the NWS09 Meeting of
The American Physical Society

Black Body Detector Temperature from Gall and Planck Perspectives CLARENCE A. GALL, Postgrado de Ingenieria, Universidad del Zulia, Maracaibo, Venezuela — The laws of Gall (http://sites.google.com/site/purefieldphysics) and Planck are generally defined with zero intensity at 0 K. However actual measurements involve detectors above absolute zero. These detectors must also be treated as approximate black body radiators. The zero intensity reference point is thus defined by the radiated intensity at the detector temperature. Planck's law thus becomes $\left(I_P = \frac{c_1}{\lambda^5}\frac{1}{e^{\frac{c_2}{\lambda T}}-1} - \frac{c_1}{\lambda^5}\frac{1}{e^{\frac{c_2}{\lambda T_d}}-1}\right)$ where T_d is the detector temperature. Provided that $T > T_d$; $I_P\ is\ always > 0$. Thus from a Planck perspective, wavelength increase should not be a factor in defining detector temperature. The corresponding expression for Gall's law is $\left(I_G = \sigma\frac{T^6}{b^2}\lambda e^{-\frac{\lambda T}{b}} - \sigma\frac{T_d^6}{b^2}\lambda e^{-\frac{\lambda T_d}{b}}\right)$. Above the crossover wavelength (http://absimage.aps.org/image/MWS_MAR09-2008-000004.pdf), even though $T > T_d$; $I_G < 0$. From a Gall perspective, this sets a limit on the long wavelength range for a given detector temperature. Longer wavelength measurements require lower detector temperatures. For a 6000 K black body radiator, the long wavelength crossover limits for detectors at 300 K, 100 K and 4 K are 9.138, 12.066 and 21.206 microns respectively.

Clarence A. Gall
Universidad del Zulia, Maracaibo, Venezuela

Date submitted: 17 Apr 2009 Electronic form version 1.4