Abstract Submitted
for the NWS08 Meeting of
The American Physical Society

Unifying the Thermodynamic and Colour Temperature Scales with Gall's Black Body Radiation Law CLARENCE A. GALL, Postgrado de Ingeniería, Universidad del Zulia, Maracaibo, Venezuela — The determination of high temperatures (colour temperature) when it is not possible to apply Charles' Law (thermodynamic temperature) is a fundamental problem in scientific measurement. Wien's displacement law $\left(\frac{1}{\lambda_m} = \frac{T}{b}\right)$ has long suggested that the reciprocal wavelength at maximum emitted intensity is directly proportional to and hence is a measure of temperature. However Planck's and all previous distribution laws do not make direct use of the empirical constants (σ, b) in their formulation. It has not thus been possible to directly relate the wavelength at maximum emitted intensity and the given temperature with the proportionality constant b. Gall's distribution law $\left(I_G = \sigma \frac{T^6}{b^2} \lambda e^{-\frac{T}{b}\lambda}\right)$ (BAPS, March Meeting 2007, X21.4, Denver, CO) which treats emission as a decay process, employs these empirical constants directly in its formulation. It satisfies exactly the three empirical laws of black body radiation. It establishes a direct relationship between the wavelength at maximum emitted intensity and the given temperature with Wien's constant b. The distribution law can then be reformulated as $\left(I_G = \sigma_G G^6 \lambda e^{-G\lambda}\right)$ where $\left(G = \frac{T}{b} = \frac{1}{\lambda_m}\right)$ and $(\sigma_G = b^4\sigma)$. If the colour temperature is defined as $\frac{1}{\lambda_m}$, it becomes identical to the thermodynamic temperature over the entire temperature range.

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Date submitted: 25 Mar 2008 Electronic form version 1.4