Interpretation of black body radiation as a decay process

CLARENCE A. GALL, Division de Postgrado de Ingenieria, Universidad del Zulia, Apartado # 98, Maracaibo, Zulia, Venezuela — The treatment of black body radiation as a decay process with the wavelength ($\lambda$) as the time marker, leads to an apportioning function ($D_\lambda$) that distributes the total thermodynamic Stefan-Boltzmann emitted intensity ($I$) over the entire wavelength range (Clarence A Gall, BAPS, March Meeting 2007, Denver, CO). The resulting distribution function ($I_\lambda = ID_\lambda = \sigma T^4 \lambda e^{-\frac{T}{b\lambda}}$) gives the Stefan-Boltzmann law on integration over the same interval. Differentiation of $I_\lambda$ produces Wien’s displacement law as the condition for the wavelength at maximum emitted intensity ($\lambda_m$). Substitution of $\lambda_m$ in $I_\lambda$ yields the maximum emitted intensity ($I_{\lambda_m}$) as being proportional to $T^{-5}$. Hence $I_\lambda$ satisfies exactly the three known empirical laws of black body radiation and fulfils Einstein’s hope for a solution of the radiation problem without the use of light quanta. Finally the replacement of $\frac{T}{b}$ with a single constant $G$ simplifies the distribution function so that $I_\lambda = \sigma G G^6 \lambda e^{-G\lambda}$ where $\sigma G = b^4 \sigma$. Consequently $G$ defines a new temperature scale with units of reciprocal wavelength that unifies the thermodynamic and colour scales.

Clarence A. Gall
Division de Postgrado de Ingenieria, Universidad del Zulia
Apartado # 98, Maracaibo, Zulia, Venezuela

Date submitted: 12 Feb 2007

Electronic form version 1.4