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Kelvin Absolute Temperature Scale Identified as Length Scale and Related to de Broglie Thermal Wavelength. SIAVASH SOHRAB, Northwestern University — Thermodynamic equilibrium between matter and radiation leads to de Broglie wavelength $\lambda_{d\beta} = h/m_\beta v_{r\beta}$ and frequency $\nu_{d\beta} = k/m_\beta v_{r\beta}$ of matter waves and stochastic definitions of Planck $h = h_k = m_k < \lambda_{rk} > c$ and Boltzmann $k = k_k = m_k < \nu_{rk} > c$ constants, $\lambda_{rk}\nu_{rk} = c$, that respectively relate to spatial (λ) and temporal (ν) aspects of vacuum fluctuations. Photon mass$m_k = \sqrt{hk/c^3}$, $amu = \sqrt{hkc} = 1/N^o$, and universal gas constant $R^o = N^o k = \sqrt{k/hc}$ result in internal $U_k = Nh\nu_{rk} = Nm_k c^2 = 3Nm_k v_{mpk}^2 = 3NkT$and potential $pV = uN\hat{v}/3 = N\hat{u}/3 = NkT$ energy of photon gas in *Casimir vacuum* such that $H = TS = 4NkT$. Therefore, Kelvin absolute thermodynamic temperature scale [degree K] is identified as length scale [meter] and related to most probable wavelength and de Broglie thermal wavelength as $T_\beta = \lambda_{mp\beta} = \lambda_{d\beta}/3$. Parallel to Wien displacement law obtained from Planck distribution, the displacement law $\lambda_{wS}T = c_2/\sqrt{3}$ is obtained from Maxwell−Boltzmann distribution of speed of "photon clusters". The propagation speeds of sound waves in ideal gas versus light waves in photon gas are described in terms of $v_{r\beta}$ in harmony with perceptions of Huygens. Newton formula for speed of long waves in canals $\sqrt{p/\rho}$ is modified to $\sqrt{gh} = \sqrt{\gamma p/\rho}$ in accordance with adiabatic theory of Laplace.

Siavash Sohrab
Northwestern University

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