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Some Implications of Invariant Boltzmann Statistical Mechanics to Quantum Gravity and Noncommutative Geometry of Physical Space and its Fractal Spectral Dimension. SIAVASH SOHRAB, Northwestern University — According to invariant Boltzmann statistical mechanics [1], Kelvin absolute temperature T [K] is identified as Wien wavelength $\lambda_{\mathrm{w}\beta-1}$ [m] of thermal oscillations leading to *internal measures* of spacetime $(\lambda_{w\beta-1}, \tau_{w\beta-1})$ and *external measures* of space and time $(x_\beta = N_x \lambda_{w\beta-1}, t_\beta = N_t \tau_{w\beta-1})$. Therefore, temperature of space or Casimir vacuum fixes local measures of *spacetime* $(\lambda_{w\beta-1}, \tau_{w\beta-1})$that are not *independent* because $v_{ws} = \lambda_{ws}/\tau_{ws}$ must satisfy the vacuum temperature. Since Wien displacement law $\lambda_w T = 0.29$ cm-K $= 0.0029\,[\mathrm{m}^2]$ requires the change of units [m/cm] = 100, the classical temperature conversion formula becomes $T[m] =^o$ C[m] + 2.731 with 2.731 close to Penzias-Wilson [1965] cosmic microwave background radiation temperature $T_{CMB} \simeq 2.73\,[\mathrm{m}]$. The role of analytic functions, Cauchy-Riemann conditions, and possible imaginary nature of internal spacetime coordinates, due to connections to Riemann surfaces at lower scale $\beta \quad -1$, on path-independence of trajectories of quantum transitions and Heisenberg equation of motion are discussed. Finally, some implications of the hydrodynamic model to quantum gravity as a dissipative deterministic system [2] and fractal spectral dimension of noncommutative geometry of space [3] are examined. [1] Sohrab, S. H., *ASME J. Energy Resoures Technology* **138**, 1-12 (2016). [2] 't Hooft, G., *Quantum Grav.* **16**, 3263 (1999). [3] Connes, A., *Lett. Math. Phys.* **34**, 238 (1995).

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