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A New Physical Meaning of Sommerfeld Fine Structure Constant SIAVASH SOHRAB, Northwestern Univ — Identifying physical space or Casimir vacuum as a *compressible* tachyon fluid, Planck compressible ether, leads to stochastic definitions of Planck $h = m_k <\lambda_k> c$ and Boltzmann $k = m_k <\nu_k> c$ constants, finite photon mass $m_k = (hk/c^3)^{1/2}$, amu $= m_k c^2 = (hkc)^{1/2}$, and modified Avogadro-Loschmidt number $N_o = 1/(hkc)^{1/2} = 6.03766 \text{ x}10^{23}$ mole^{-1}. Thus, Lorentz-FitzGerald contractions now result from compressibility of physical space and become *causal* (Pauli) in accordance with Poincaré-Lorentz dynamic theory of relativity as opposed to Einstein kinematic theory of relativity. At thermodynamic equilibrium $h_e = m_e <\lambda_e> v_e = h_k = m_k <\lambda_k> c = h$, Compton wavelength can be expressed as $\lambda_c = h/m_e c = (v_e/c)h<\lambda_e>/(m_e<\lambda_e>v_e) = \alpha\lambda_e$. Hence, Sommerfeld fine structure constant α is identified as the ratio of electron to photon speeds $\alpha = e^2/(2\varepsilon_o hc) = v_e/c = 1/137.036$. The mean thermal speed of electron at equilibrium with photon gas is $v_e = 2.187640\text{x}10^6$ m/s and its de Broglie wavelength is $\lambda_e = 3.3250\text{x}10^{-10}$ m. Also, electron kinetic energy for oscillations in two directions <x+>and <x->or $\varepsilon_e = h\nu_e = m_e v_e^2 = kT_e$ results in electron temperature $T_e = 3.15690\text{x}10^5$ K.

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