The Energy Probability Distribution of Quantum Levels of a Particle Imprisoned in a Three-Dimensional Box, Contingent Upon a Fixed Energy Range

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Abstract. This work was trigered by the earlier achievements of Yarman et al, aiming to bridge thermodynamics and quantum mechanics, whence, Planck Constant came to replace Boltzmann Constant, and "average quantum level number" came to replace "temperature". This evoked that the classical Maxwell energy probability distribution *p(E)* with respect to energy *E,* of gas molecules, might be taken care of, by the *"energy probability distribution of the quantum levels"* of a particle imprisoned in a given volume, assuming that in the case we have many particles, following Pauli Exclusion Principle, no pair of particles, can sit at the same level. Thereby, the energy probability distribution of the quantum levels of a particle imprisoned in three dimensions in the manner of Schrödinger's common setup engenders; as contingent upon a fixed energy range, that we pick up beforehand, will be the subject of this essay. Such an outlook becomes interesting from several angles: i) It looks indeed very much like a classical Maxwellian distribution. ii) In the case we have as many free particles in the box as the number of levels depicted by the number of quantum levels in between the predetermined lower bound energy level and the upper bound energy level, all the while assuming that the Pauli Exclusion Principle holds, the distribution we disclose becomes the energy probability distribution of the ensemble of particles imprisoned in the given box. iii) It can even be guessed that, if elastic collisions between the free particles in question, were allowed, just like is the case for molecules in a room, and still assuming quantization and the Pauli Principle, the outcome we disclose should be about the same as that of the energy probability distribution, molecules in a room would display, in *equilibrium.* iv) The *quantized energy* being proportional to the sum of three squared integers associated with respectively, each of the spatial dimensions; the property we reveal certainly becomes remarkable from the point of view of mathematics of integer numbers – *all the more, we further disclose that, to the probability distribution outlook remains the same, be this qualitatively, for higher dimensions than 3, i.e. for the sum of, say, 4 squared integers.*