Review of: "Emergent Quantum Mechanics – How the Classical Laws Can Replicate the Quantum Harmonic Oscillator"

Alexander Lopez[1]

1 Escuela Superior Politécnica del Litoral

Potential competing interests: No potential competing interests to declare.

Dear editors of Qeios,

I have reviewed the work “Emergent Quantum Mechanics – How the Classical Laws Can Replicate the Quantum Harmonic Oscillator”. Some comments to the author are given to the author. These comments are meant to provide some constructive criticism that might contribute to a better understanding of the results presented in the work.

The structure of the review is I first reproduce the author’s statements and then add a comment or question. I hope these issues are considered by the author.

Best regards,

Alexander Lopez

Review:

The author states that:

“An interesting difference between the treatments by QM and by Em.QM must also be pointed out: to find the solution of Schrödinger’s equation for this simple configuration is unexpectedly complicated (see e.g. refs.1 or 2). From the point of view of mathematics, the harmonic oscillator is not an “easy piece” in QM...”

However, in the analysis presented in the current work, dealing with the harmonic oscillator, the calculations are lengthy, and it is not clear to me how the author’s approach could be extended to more complicated physical systems, like quantum tunneling (as presented in section 11.7 of the present work), or the description of multiparticle systems. Could the author please comment on these issues? In addition, could the author please comment if there are any other instances in which the value of Planck’s emerges from the parameters used to describe other physical systems?

The author states that:

“The interaction between two different elements of the droplet takes place through electromagnetic waves propagating with the speed of light c. This means that any element will “see” other elements at a slightly earlier time, and, therefore, with a slightly smaller speed than its own speed. This will disturb the balance of internal forces that existed when the

charge was at rest, with the effect that so-called self-forces arise."

These is an interesting statement. Yet, it might seem that all these self-forces could deem the model to require too many parameters to properly describe physical systems within the Em-QM approach. Moreover, this might lead to fine-tuned results. I would consider the interested readers would profit more from this work if the author could comment about this number of assumptions concerning the forces acting on the theoretical model presented.

The author states that:

"The physical explanation of a delay in the radiation resistance during transients is the following. The solution of Maxwell's equations allows both outgoing as well as incoming waves. This corresponds with the dissipation of the droplet's energy, respectively, energy absorption from the field. A superposition of both types of waves is mathematically allowable, the particular mix being determined by the physical boundary conditions. A well-known example of complete cancelling of radiation resistance is the oscillating charge inside an enclosure so that no radiation of energy to infinity can take place. The mathematical description entails the sum of outgoing and incoming waves of equal strength, resulting in a field of standing waves inside the enclosed space. In ref.3 it is shown that, in such a case, the radiation resistance indeed vanishes, without affecting the other self-forces."

Thus, it is to so clear to me what is the role of the radiation resistance term if, at the end, it seems to vanish. Could the author please comment on this point?

When the author states that:

"It must again be stressed that the quantisation of E is not the same as a quantisation of the total energy of the droplet. This total energy comprises contributions not only by the average velocity, but also by the potential energy in the elongation "spring", as well as by the pulsations and the velocity fluctuations. The total energy of the droplet need not even be quantised at all."

Could the author comment what would be the actual comparison of the results presented for the energy quantization of the system described in this work and the quantum mechanical energy quantization of the quantum harmonic oscillator for which, its total energy is the quantity that is quantized?