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Inviato: sabato 11 luglio 2015 13:31
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Oggetto: Your Submission PLA-D-15-01199

Ms. Ref. No.: PLA-D-15-01199
Title: Quantum states from Maxwell's theory of the free radiation field Physics Letters A

Dear Dr. Marrocco,

Reviewers' comments on your work have now been received. You will see that they are strongly advising against publication of your work. Therefore I reject it.

For your guidance, I append the reviewers' comments below.

Thank you for giving us the opportunity to consider your work.

Yours sincerely,

Alexander Eisfeld
Editor
Physics Letters A

Reviewers' comments:

Reviewer #1:

I re-iterate my objections to this "proof". The development is based on an expansion, essentially of a plane-wave as a solution of the free Helmholtz equation, of which eq.(16) is simply one term. Such an expansion gives integer values of n which is due to uniqueness of the spherical harmonics on the unit sphere. As such, since any function of vector r can be expanded in spherical harmonics, e.g. the amplitude of oscillations of the Earth, one cannot view this as representing quantization. The proof that <beta> is a constant is equally suspicious in that eqs.20 and 21 are n dependent and hence so is <beta>. However by considering the special cases "the limit of kR >> 1, which is reasonable because R is much larger than 1/ k for all the cases of practical interest " and taking a continuum limit as in eq.23, the author argues that <beta> becomes independent of n. If <beta> were indeed the universal Planck constant, it should be valid in all cases and not be restricted to these special conditions on the electromagnetic field.
The additional section, purporting to demonstrate that <beta> is equal to the Planck constant relies on arguments from statistical physics. However, it is well known that even classical statistical physics requires that the Planck constant be introduced to properly normalize classical phase space.
The author introduces the Planck constant from the statistics, so that again, the forcing of the classical expression for the cycle-averaged energy of a discrete

classical mode to agree with the quantum expression, automatically leads to a correspondence between <beta> and Planck's constant. But this correspondence cannot be seen as a route to quantization of the field.
To see the connection between quantization and classical modes of the electromagnetic field, the author may profitably consult the essay "Anti-photon" by W.E.Lamb Appl.Phys. B60, p.77 (1995).B 60, 77-84 (1995) Again I recommend that this paper not be published in Physics Letters.

Reviewer #2: The present paper is arguing that there is no need for the quantization of the radiation field since the energy of the radiation field already is in half integer multiples of some unit of energy. The author claims that this feature is a result of the orthogonality relations of the spherical harmonics, Eq. [18].

Obviously, the author does not distinguish between the mode function and the excitation of the mode function. The number of nodes of a mode function of course determines the energy through the frequency. However, each mode function can also display discrete excitations. This is the main confusion of the paper.

There are many arguments why the present paper cannot replace the quantum theory of radiation. The most important one is the fact that present paper predicts that a cavity with a single node would only have one excitation. However, the experiments by the group of S. Haroche in the context of cavity quantum electrodynamics clearly show that such a mode can have several discrete excitations, see for example M. Brune et al. Phys. Rev. Lett. 76, 1800 (1996).

In conclusion, the paper cannot be published since it is fundamentally wrong.