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Peer Review

Review of: "On the Gupta-Bleuler and Dirac-Fock Quantization Schemes Revisited"

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This interesting work reformulates Gupta–Bleuler quantization using the canonical Dirac-Fock approach and shows that the strong Lorenz condition provides a physically consistent quantization with positive photon energy. One of its strengths is that it formulates the discussion entirely within the canonical Hamiltonian framework, providing a coherent operator-based treatment from the Lagrangian level to the Fock-space construction. I also particularly appreciated the effort to revisit Bogolubov's historical ideas and connect them with a contemporary operator formulation. This historical perspective adds value to the manuscript and makes it particularly interesting for readers working on the mathematical foundations of quantum electrodynamics. There are some arguments that would benefit from further clarification and a more rigorous justification:

1. The construction of the strongly reduced Fock subspace is interesting. However, I would appreciate a more detailed justification of the equivalence between the imposed strong constraint and the stated decomposition into positive- and negative-frequency parts. At present, this equivalence appears to be assumed rather than demonstrated.
2. Since the manuscript challenges a well-established quantization scheme, I believe the discussion would be strengthened by comparing the proposed approach with modern gauge quantization frameworks, such as the BRST formulation and the Kugo–Ojima construction. Such a comparison would help readers better appreciate the conceptual differences and the scope of the present proposal.
3. I believe the manuscript would benefit from a brief discussion of the physical implications of the proposed quantization scheme. In particular, it would be interesting to clarify whether the new

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formulation modifies any physical predictions or whether it should be regarded as an alternative mathematical framework leading to the same observable physics.

Overall, I enjoyed reading this manuscript. It presents an interesting approach to a fundamental problem in quantum electrodynamics. I believe that the comments above will help further strengthen the manuscript.

Declarations

Potential competing interests: No potential competing interests to declare.