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## The Validity of the Semiclassical Approximation in 1+1 Electrodynamics: Numerical Solutions to the Linear Response Equation

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From previous work, *Phys. Rev. D* 103, 105003 (2021), the semiclassical backreaction equation (SBE) in 1+1 dimensions was solved and a criterion was implemented to assess the validity of the semiclassical approximation in this case. The criterion involves the behavior of solutions to the linear response equation (LRE) which describes perturbations about solutions to the SBE. The LRE involves a time integral over the current-current commutator for the quantum field. It is expected that significant growth in the current-current commutator (and therefore in quantum fluctuations) will result in significant growth in solutions to the LRE. It was found for early times that the difference of two nearby solutions to the SBE, with similar initial conditions, can act as an approximate solution to the LRE. A comparative analysis between the approximate solutions and numerical solutions to the LRE will be presented for the case of a massive, quantized spin  $\frac{1}{2}$  field. The objectives are (i) to determine how robust the approximation method is for representing solutions to the LRE, and (ii) to investigate in detail the relationship between quantum fluctuations and solutions to the LRE.

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