Abstract Submitted
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A space-time resolved approach for interacting quantum field theories[1] Q. SU, R. WAGNER, R. GROBE, Intense Laser Physics Theory Unit, Illinois State University — We present an alternative approach to the usual perturbative S-matrix evaluation of quantum field theories which is non-perturbative and provides full space-time resolution [1]. This method is used to study the dynamical development of the force between two fermion wave packets for a one-dimensional Yukawa system. The spatial distribution of the virtual bosons that act as mediators of the force can be analyzed along with the fermionic densities. The fermion-fermion interaction can be approximated by a potential function, which is used to develop classical and quantum models. It is shown that these models are good approximations to the exact field theoretical calculations when the Fock space is restricted to only one boson, but in the full quantum field theory the fermion-fermion force is enhanced by higher-order multi-boson processes. Furthermore, the normally attractive fermion-fermion Yukawa force can in principle be manipulated to even be repulsive if the momentum modes available to the virtual bosons are restricted.

[1] R.E. Wagner, M.R. Ware, B.T. Shields, Q. Su and R. Grobe, Phys. Rev. Lett. 106, 023601 (2011).

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