Abstract Submitted
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On the Feynman Problem[1] GIACOMO D'ARIANO, Università di Pavia — Foundations of Quantum Field Theory can be connected to foundations of Quantum Theory if we can derive the former in terms of the latter with two additional postulates of locality and topological homogeneity of interactions between quantum systems, in the hypothesis that a quantum field is ultimately made of a numerable set of quantum systems that are unitarily interacting. But, in order to do that we need to be able to simulate quantumm field by a quantum computer. In the paper "Simulating Physics with Computers" (Int. J. Th. Phys, 21 467 (1982)) Richard Feynman raised the problem whether it is possible to simulate Fermi fields by a quantum computer—in short if we can "qubit-ize" a Fermi field, keeping the field interaction local on qubits. In this talk I will show how this problem is solved for any space-dimension, upon introducing a new general Jordan-Wigner map between field and qubits, and by adding witnessing auxiliary qubits. I will also derive the unique vacuum for the Fermi fields and for the auxiliary fields. The solution of the Feynman problem allows us to simulate quantum fields by a quantum cellular automata, also providing a kind of Planck-scale version of quantum field theory. Computer simulations will be projected at the end of the talk

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