

Quantum algorithm for track reconstruction in the LHCb vertex locator

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Using the LHCb vertex locator as a use-case, I will present a new algorithm for particle track reconstruction based on the minimisation of an Ising-like Hamiltonian using a linear algebra approach. This new formulation of the problem is suitable to be solved using the Harrow-Hassadim-Lloyd (HHL) quantum algorithm: if the hypotheses for an efficient implementation are met, this approach can provide an exponential speedup as a function of the number of input hits over its classical counterpart. The algorithm has been validated using LHCb simulated events with a classical linear solver, showing good track reconstruction performances. The quantum implementation has been also tested, using smaller toy-generated events, showing very promising results.

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