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Spin transport and quasi 2D architectures for donor-based quantum computing AUSTIN FOWLER, Institute for Quantum Computing, University of Waterloo, Canada, LLOYD HOLLENBERG, ANDREW GREENTREE, CAMERON WELLARD, ARC Centre of Excellence for Quantum Computer Technology, University of Melbourne, Australia — The original Kane quantum computer architecture is based on a single line of ^{31}P atoms spaced a few tens of nm apart in an isotopically pure ^{28}Si lattice with electrodes above and between donor atoms. This architecture suffers from major technical issues including strong spatial oscillations in the nearest neighbour donor electron exchange coupling strengths at the scale of a single lattice site and an inability to limit the effect of a given electrode to its nearest donor or donor pair. Through the introduction of a new donor electron spin transport mechanism, a 2D donor electron spin quantum computer architecture is proposed. This new architecture addresses the exchange coupling and cross-talk issues, as well as a host of other physical barriers to implementation.

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