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**Josephson Circuits as Vector Quantum Spins** GABRIEL SAMACH,  
ANDREW J. KERMAN, MIT Lincoln Laboratory — While superconducting circuits based on Josephson junction technology can be engineered to represent spins in the quantum transverse-field Ising model, no circuit architecture to date has succeeded in emulating the vector quantum spin models of interest for next-generation quantum annealers and quantum simulators. Here, we present novel Josephson circuits which may provide these capabilities. We discuss our rigorous quantum-mechanical simulations of these circuits, as well as the larger architectures they may enable. This research was funded by the Office of the Director of National Intelligence (ODNI) and the Intelligence Advanced Research Projects Activity (IARPA) under Air Force Contract No. FA8721-05-C-0002. The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official policies or endorsements, either expressed or implied, of ODNI, IARPA, or the US Government.

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