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Tunable inter-qubit coupling as a resource for gate based quantum computing with superconducting circuits B. CHIARO, C. NEILL, Z. CHEN, A. DUNSWORTH, B. FOXEN, C. QUINTANA, J. WENNER, UC Santa Barbara, J. M. MARTINIS, UC Santa Barbara and Google, Santa Barbara, GOOGLE QUANTUM HARDWARE TEAM — Fast, high fidelity two qubit gates are an essential requirement of a quantum processor. In this talk, we discuss how the tunable coupling of the gmon architecture provides a pathway for an improved two qubit controlled-Z gate. The maximum inter-qubit coupling strength $g_{max} =$ 60 MHz is sufficient for fast adiabatic two qubit gates to be performed as quickly as single qubit gates, reducing dephasing errors. Additionally, the ability to turn the coupling off allows all qubits to idle at low magnetic flux sensitivity, further reducing susceptibility to noise. However, the flexibility that this platform offers comes at the expense of increased control complexity. We describe our strategy for addressing the control challenges of the gmon architecture and show experimental progress toward fast, high fidelity controlled-Z gates with gmon qubits.

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