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Optimizing JPC-based remote entanglement of transmon qubits via stochastic master equation simulations[1] E. ZALYS-GELLER, M. HATRIDGE, Department of Applied Physics, Yale University, M. SILVERI, Department of Physics, Yale University, A. NARLA, K.M. SLIWA, S. SHANKAR, Department of Applied Physics, Yale University, S.M. GIRVIN, Department of Physics, Yale University, M.H. DEVORET, Department of Applied Physics, Yale University — Remote entanglement of two superconducting qubits may be accomplished by first entangling them with flying coherent microwave pulses, and then erasing the which-path information of these pulses by using a non-degenerate parametric amplifier such as the Josephson Parametric Converter (JPC). Crucially, this process requires no direct interaction between the two qubits. The JPC, however, will fail to completely erase the which-path information if the flying microwave pulses encode any difference in dynamics of the two qubit-cavity systems. This which-path information can easily arise from mismatches in the cavity linewidths and the cavity dispersive shifts from their respective qubits. Through analysis of the Stochastic Master Equation for this system, we have found a strategy for shaping the measurement pulses to eliminate the effect of these mismatches on the entangling measurement. We have then confirmed the effectiveness of this strategy by numerical simulation.

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