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Continuously monitoring the parity of superconducting qubits in a 2D cQED architecture[1] MACHIEL BLOK, EMMANUEL FLURIN, WILLIAM LIVINGSTON, JAMES COLLESS, ALLISON DOVE, IRFAN SIDDIQI, Quantum Nanoelectronics Laboratory, Department of Physics, University of California, Berkeley CA 94720, USA — Continuous measurements of joint qubit properties such as their parity can reveal insight into the collapse dynamics of entangled states and are a prerequisite for implementing continuous quantum error correction. Here it is crucial that the measurement collects no information other than the parity to avoid measurement induced dephasing. In a cQED architecture, a full-parity measurement can be implemented by strongly coupling two transmon qubits to a single high-Q planar resonator ($\chi \gg \kappa$). We will discuss the experimental implementation of this on-chip technique and the prospects to extend it to more qubits. This will allow us to monitor, in real-time, the projection into multi-partite entangled states and continuously detect errors on a logical qubit encoded in an entangled subspace.

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