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Correlators in simultaneous measurement of non-commuting qubit observables JUAN ATALAYA, University of California, Riverside, SHAY HACOHEN-GOURGY, LEIGH S. MARTIN, IRFAN SIDDIQI, University of California, Berkeley, ALEXANDER N. KOROTKOV , University of California, Riverside — We consider simultaneous continuous measurement of non-commuting qubit observables and analyze multi-time correlators $\langle i_{\kappa_1}(t_1)\cdots i_{\kappa_N}(t_N)\rangle$ for output signals $i_\kappa(t)$ from the detectors. Both informational ("spooky") and phase backactions from cQED-type measurements with phase-sensitive amplifiers are taken into account. We find an excellent agreement between analytical results and experimental data for two-time correlators of the output signals from simultaneous measurement of qubit observables σ_x and $\sigma_\varphi = \sigma_x \cos\varphi + \sigma_y \sin\varphi$. The correlators can be used to extract small deviations of experimental parameters, e.g., phase backaction and residual Rabi frequency. The multi-time correlators are important in analysis of Bacon-Shor error correction/detection codes, operated with continuous measurements.

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