Continuous-variable quantum error correction II: the Gottesman-Kitaev-Preskill code KYUNGJOO NOH, Yale University, KASPER DUIVEN-VOORDEN, RWTH Aachen University, VICTOR V. ALBERT, R. T. BRIERLEY, PHILIP REINHOLD, LINSHU LI, CHAO SHEN, R. J. SCHOELKOPF, S. M. GIRVIN, Yale University, BARBARA M. TERHAL, RWTH Aachen University, LIANG JIANG, Yale University — Recently, various single mode bosonic quantum error-correcting codes (e.g., cat codes and binomial codes) have been developed to correct errors due to excitation loss of bosonic systems. Meanwhile, the Gottesman-Kitaev-Preskill (GKP) codes do not follow the simple design guidelines of cat and binomial codes, but nevertheless demonstrate excellent performance in correcting bosonic loss errors. To understand the underlying mechanism of the GKP codes, we represent them using a superposition of coherent states, investigate their performance as approximate error-correcting codes, and identify the dominant types of uncorrectable errors. This understanding will help us to develop more robust codes against bosonic loss errors, which will be useful for robust quantum information processing with bosonic systems.

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