Quantum Error Correction resilient against Atom Loss

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(Dated: January 3, 2026)

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I. INTRODUCTION

In recent years, neutral atom arrays have emerged as a promising platform for quantum computing due to their scalability, long coherence times, and the ability to manipulate individual atoms with high precision. These advantages position neutral atom arrays as strong contenders against other qubit architectures such as superconducting qubits and trapped ions. However, one of the significant challenges faced by neutral atom arrays is atom loss, which can severely impact the performance of quantum error correction (QEC) strategies. Atom loss in neutral atom arrays can occur due to various factors, including collisions with background gas particles, spontaneous emission, and technical imperfections in trapping mechanisms. This loss of atoms leads to errors in quantum computations, which QEC strategies aim to mitigate. Effective QEC strategies are essential for maintaining the integrity of quantum information and ensuring reliable quantum computations in the presence of atom loss. This literature review aims to conduct an exploratory analysis of QEC strategies that can effectively mitigate atom loss in neutral atom arrays. The key research questions to be addressed include:

- What are the key factors and challenges associated with atom loss in neutral atom arrays, and how do they impact QEC performance?
- What are the relevant error models for atom loss in neutral atom arrays?
- What QEC strategies have been proposed to mitigate atom loss in neutral atom arrays?
- What are the key factors to consider when assessing the effectiveness of QEC strategies for atom loss in neutral atom arrays?

II. METHODOLOGY

III. RESULTS & DISCUSSION

IV. CONCLUSION

REFERENCES