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(54) **GEOMETRY-BASED COMPRESSION FOR QUANTUM COMPUTING DEVICES**

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(57) **ABSTRACT**

A quantum computing device comprises a surface code lattice that includes/logical qubits, where/is a positive integer. The surface code lattice is partitioned into two or more regions based on lattice geometry. A compression engine is coupled to each logical qubit of the/logical qubits. Each compression engine is configured to compress syndrome data generated by the surface code lattice using a geometry-based compression scheme. A decompression engine is coupled to each compression engine. Each decompression engine is configured to receive compressed syndrome data, decompress the received compressed syndrome data, and route the decompressed syndrome data to a decoder block.