

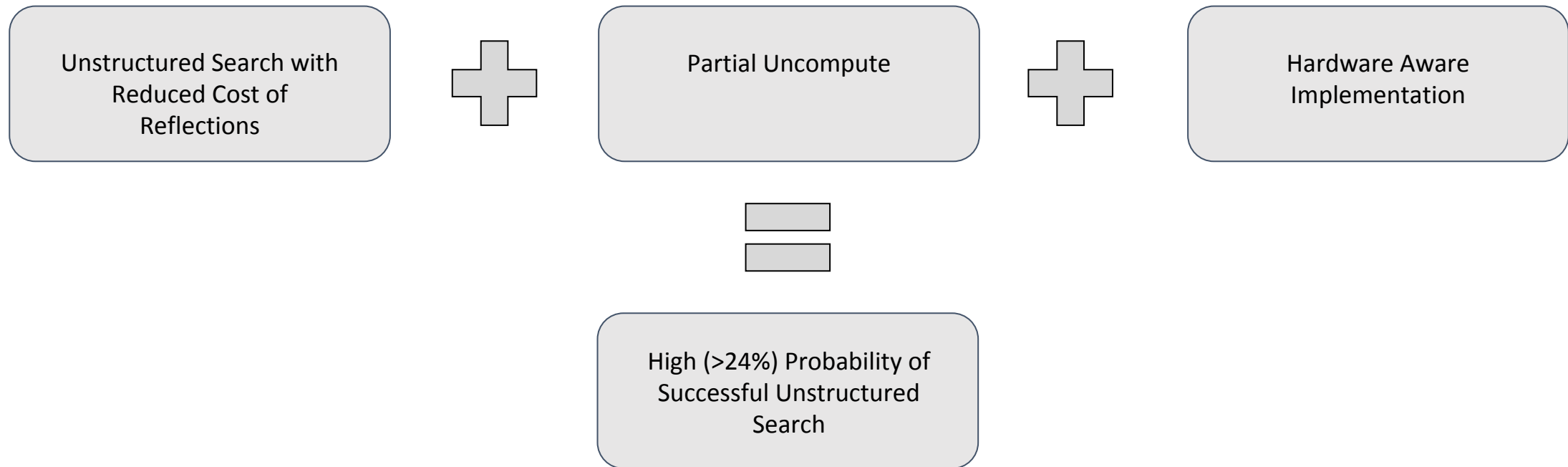
Benchmarking 16-element Quantum Search Algorithms on Superconducting Quantum Processors



Jan Gwinner, Marcin Briański, Wojciech Burkot, Łukasz Czerwiński, Vladyslav Hlembotskyi, Adam Szady

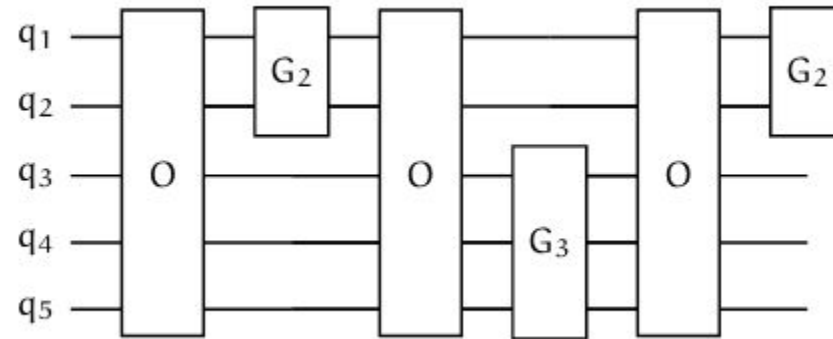
BEIT

jan.gwinner@beit.tech, marbri@beit.tech, voytek@beit.tech, lukasz@beit.tech, vlad@beit.tech, adsz@beit.tech



Reduce Cost of Reflections

Tree-like patterns of Grover reflection operators



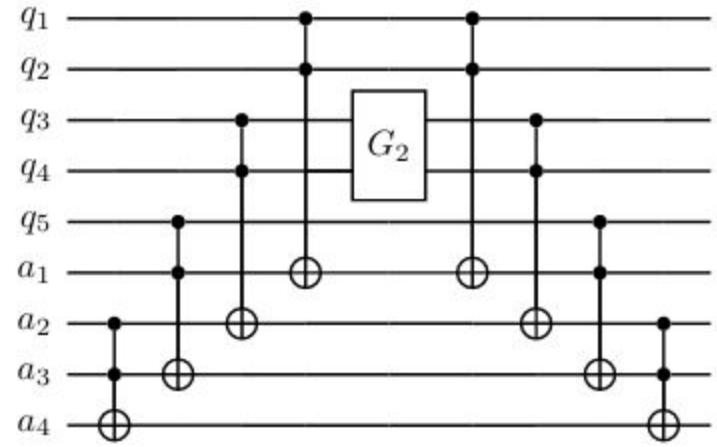
Solve unstructured search in near-optimal number of oracle queries

Additional gates scale asymptotically as \sqrt{N}

Plenty of other small-reflection patterns

Partial Uncompute

Ancilla qubits can be marked once for many oracles



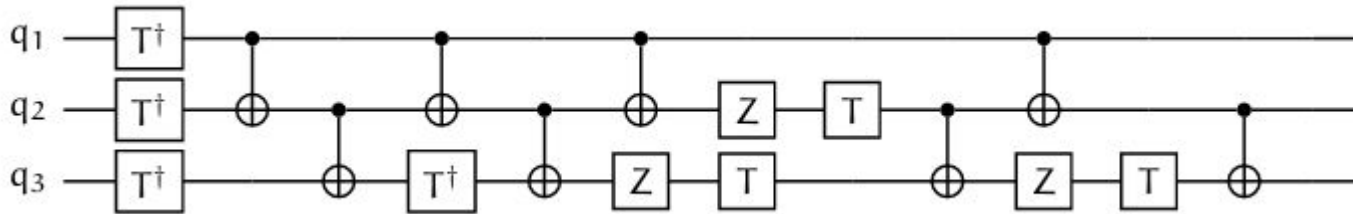
as many Toffoli gates cancel each other if subsequent oracles are intertwined with small reflections

Hardware Aware Implementation

Margolus gate to mark ancilla (3 CX gates instead of 6)

+

Toffoli gate for linear connectivity



as superconducting quantum processors do not allow for full connectivity

Results

