# Truncated Qubit Hamiltonian

| Operator Qubits | Terms in Full Operator | Terms in Truncated Operator | Ground State Relative Error | Excited State Relative Error |
|---|---|---|---|---|
| 2 | 10 | 10 | 0 | 0 |
| | | 9 | 3.4761 | 2.4725 |
| | | 8 | 6.6673 | 4.8905 |
| | | 7 | 2.6483 | 2.2819 |
| | | 6 | 0 | 2.6398 |
| | | 5 | 0.5931 | 2.8591 |
| | | 4 | 2.6929 | 2.1914 |
| | | 3 | 4.1349 | 1.1356 |
| | | 2 | 4.1953 | 1.196 |
| 3 | 28 | 28 | 0 | 0 |
| | | 14 | 0 | 4.1639 |
| 4 | 72 | 72 | 0 | 0 |
| | | 36 | 0 | 33.4191 |

COMMENT: By symmetry, truncating the matrix by half gives the correct ground state. This is true for matrices with more qubits. This significantly speeds up the calculation

COMMENT: By inspection, this truncation by half works if the resulting number of terms is even. This has to do with a fortuitous cancelation of terms/errors in the qubitized operator

COMMENT: It would be interesting if such a symmetry can be found for the first excited state as well

Slicing rule of thumb:

Terms in sliced operator = terms in full operator / 2^(N-1), where N is the number of qubits

NEXT STEPS: Jun 2, 2023

Analytically derive a relationship of each term in the qubit hamiltonian

Test different problems of the Schlogl problem, i.e., use matrices with different model parameters