An exercise in the previous lecture

We have a qubit Hamiltonian of the form

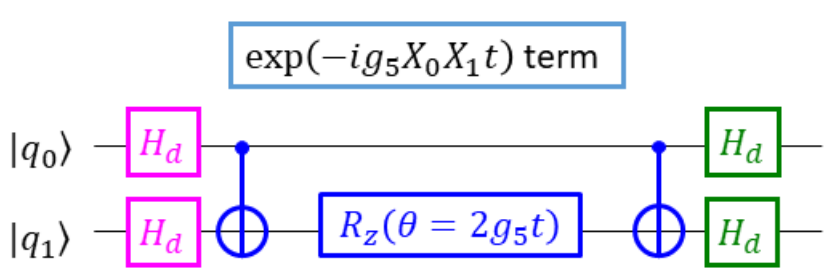
$$H = 0.5X_0X_1 + 0.5Y_0Y_1$$

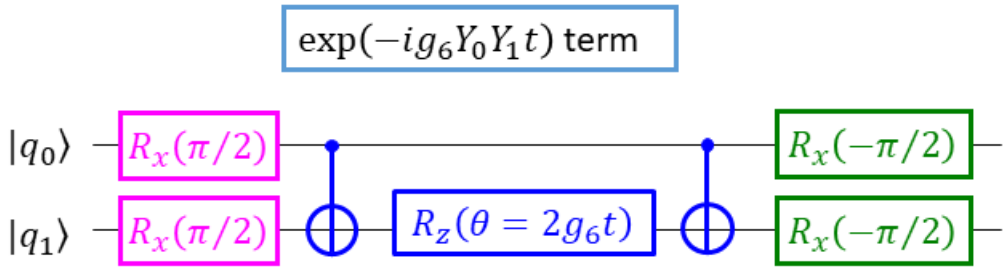
1) Construct a quantum circuit on IBM-Q for the time evolution operator with t = π

$$U = \exp(-iHt) \approx \exp(-0.5iX_0X_1t) \times \exp(-0.5iY_0Y_1t)$$

2) Simulate the time evolution circuit with following conditions.

- Start from the |10⟩ state by adding an X gate before the time evolution circuit
- Measure two qubits after time evolution
- Set evolution time t = π/4, π/2, 3π/4, and π
- Run the circuit on IBM-Q simulator_statevector and check the measurement outcome.
- Run the circuit on any IBM-Q machine (not simulators) and check the measurement outcome.

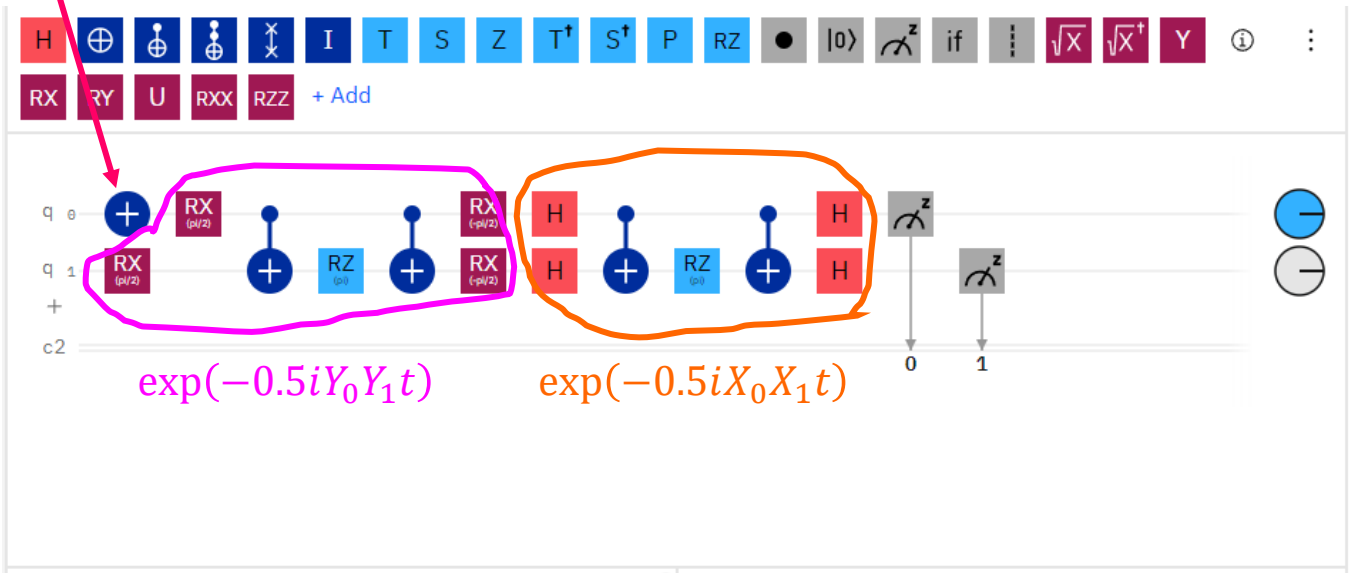


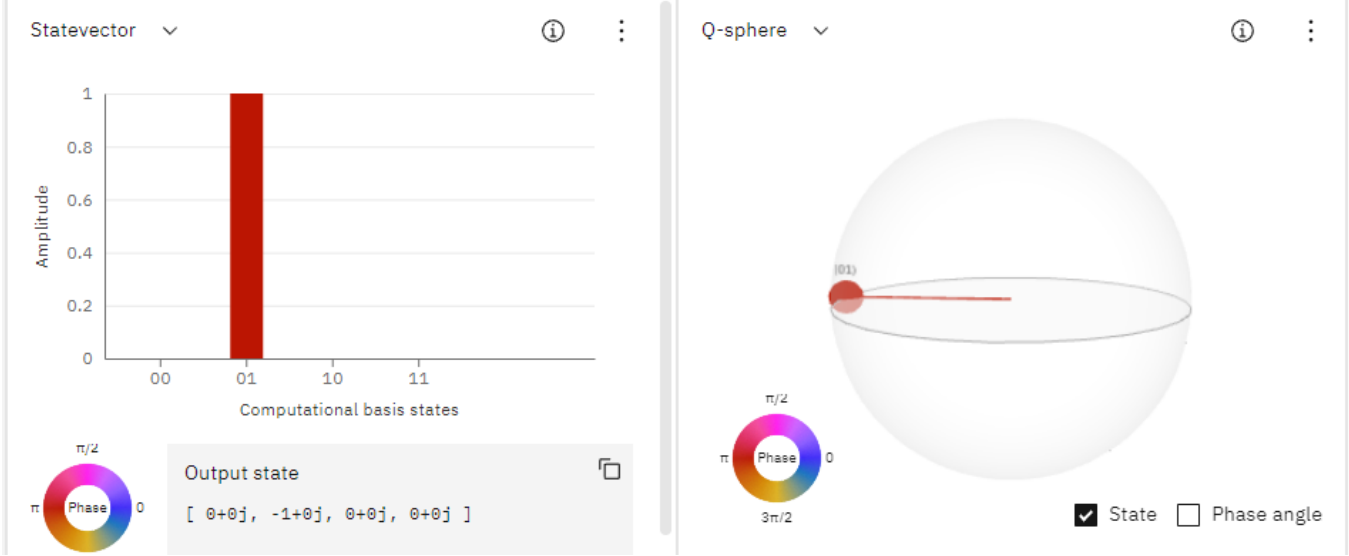


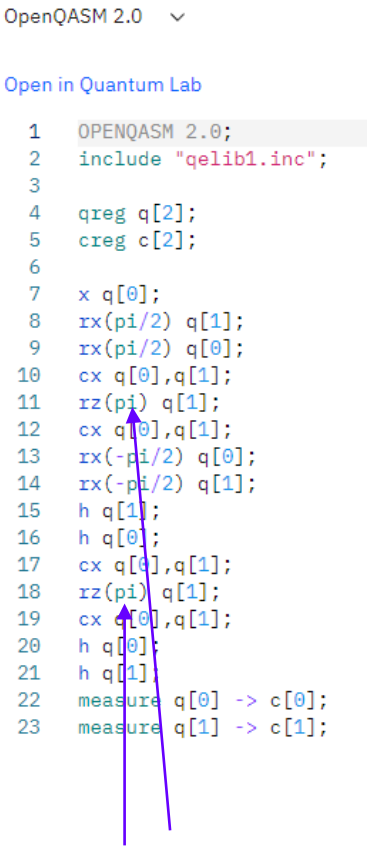
An exercise in the previous lecture

Pauli-X to generate $|10\rangle$

$$|\Psi(t)\rangle = \exp(-0.5iX_0X_1t)\exp(-0.5iY_0Y_1t)\,|10\rangle$$







Rotational angle corresponding to t

An exercise in the previous lecture

$$H = \left(a_0^\dagger a_1 + a_1^\dagger a_0\right) \xrightarrow{\text{JWT}} H = 0.5X_0X_1 + 0.5Y_0Y_1$$