

Topic:OpenQASM
Subtopic:Quantum Teleportation

Reddi Kishore

July 2022

Introduction

Quantum teleportation is a technique used to transfer quantum information from source to the destination. Suppose Alice and Bob are two friends, Alice wants to transfer the qubit $|\psi\rangle = \alpha|0\rangle + \beta|1\rangle$. But according to no-cloning theorem in quantum mechanics we cannot copy a unknown quantum state, hence Alice cannot simply copy the quantum state. we can only copy the classical states.

For teleportation to happen it needs an entangled pair of qubits along with two classical bits. To transfer a qubit Alice and Bob should need a third party to send them an entangled pair. Alice do some operations on his qubit, then sent it to the Bobs end, and then Bob performs some operations to get the qubit that Alice sent.

All these operations are done by using a OpenQASM (Open Quantum Assembly Language) programming language, which is used to design the quantum circuits in a easy and simpler manner. Building of quantum circuits will be done in IBM Quantum Composer using 'Open Quantum Assembly language' (OpenQASM). Step by step explanation to the circuit will be explained in this report.

1. Quantum Teleportation

```
OPENQASM 2.0; //Protocol uses 3 qubits and 2 classical bits in 2 different registers
include "qelib1.inc";
qreg q[4];
creg c[4];
```