# Quantum dataset for Noisy GHZ and Cluster State

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# ==============================================================================
# This code allows to parametrize the GHZ and Cluster state in Cirq which can be
# combined with TFQ.The code allows allocation of arbitrary number of qubits
# including the noise such as depolarizing channel or amplitude damping.
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import cirq
from cirq import Simulator
from cirq.ops import CZ, H,  CNOT
import numpy as np


" Create the GHZ state with DP noise=0.01"

num_qubits = 2
num_repetition=1000
noise=0.01

# Build the GHZ circuit
q = [cirq.GridQubit(i, 0) for i in range(num_qubits)]
circuit = cirq.Circuit()
circuit.append(H(q[0]))
for i in range(num_qubits-1):
    circuit.append([CNOT(q[i], q[i+1])])
print(circuit)

# add depolarizing noise
for i in range (num_qubits):
    circuit.append(cirq.depolarize(p=noise)(q[i]))

# Run the cirq to measure the GHZ circuit
qmeas=range(num_qubits)
circuit_meas=circuit
for i in range(len(qmeas)):
    circuit_meas.append(cirq.measure(q[qmeas[i]-1]))
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simulator_meas_DP = cirq.Simulator()
result_meas_DP = simulator_meas_DP.run(circuit_meas,
repetitions=1000)
result_meas=result_meas_DP
values=cirq.plot_state_histogram(result_meas)
```

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(0, 0): ———H———@———D(0.01)———
                |
(1, 0): ———————X———D(0.01)———
```