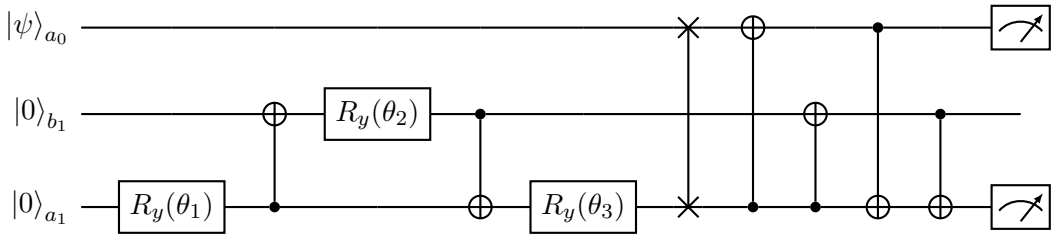
Quantum project: Report 1

December 8, 2020

1 Report 2

1.1 Updated circuit

We updated the circuit considering only 1 SWAP gate:



This is also how IBM transpiles the original circuit proposed in [Ref Buzek-Hillery] in order to run it with only nearest neighbour couplings.

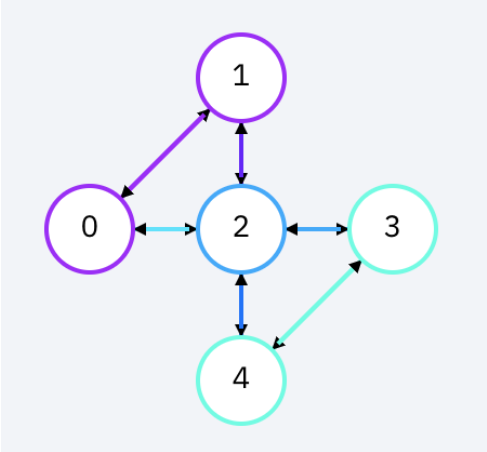
We are now measuring both the copies. We are checking whether the QCM is actually symmetric.

1.2 Results on Starmon

See Jupyter.

1.3 Results on IBM

See Jupyter. We turned off the optimization in the transpiling process. The transpiler only adds the SWAP gate in order to allow the circuit to run when only nearest neighbour coupling are allowed (usually it is not possible to have three qubits reciprocally connected). When using the Yorktown backend, no SWAP gate is necessary.



1.4 Comparison

	Starmon 5	**Athens**	**Ourense**	**Santiago**	**Valencia**	**Vigo**	**Yorktown**
F_1	0.73	0.77	0.78	0.73	0.6	0.76	0.76
σ_{F_1}	0.03	0.02	0.03	0.04	0.2	0.03	0.02
F_2	0.73	0.78	0.72	0.72	0.6	0.75	0.76
σ_{F_2}	0.05	0.02	0.03	0.04	0.2	0.03	0.02
F_2/F_1	1.00	1.01	0.93	0.98	1.1	0.99	1.00
σ_{F_2/F_1}	0.04	0.03	0.03	0.03	0.7	0.02	0.03

1.5 Next meetings

1. Readout correction on IBM
2. Phase covariant cloning machine (optimal copy of the states on one equator)
3. Economical cloning machine (2 qubits, we could run it on Spin-2!)
4. Asymmetric Fourier cloning machine (?)