

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

QASM 2.0: A Quantum Circuit Intermediate Representation

LEV S. BISHOP, IBM T J Watson Res Ctr, IBM QUANTUM TEAM — A quantum circuit is a sequence of unitary operations and measurements to be performed on a quantum state (where later operations may be conditional on earlier measurement results). As a mathematical abstraction, a circuit is a POVM; and at a hardware implementation level it is the sequence of signals that are sent to and from a physical quantum device. In between these two extremes there is a need for a representation where one can reason about optimization, mapping of abstract algorithms under device constraints, etc. We present a specification for a minimal, architecture-independent, extensible language suitable for such circuit-rewriting tasks. We also discuss our application of this language, QASM 2.0, to recent superconducting qubit experiments, as well as related software tools. This language currently has real-world use, serving as the interface to the IBM Quantum Experience, a publicly-accessible cloud quantum processor demonstration platform.

Lev Bishop
IBM T J Watson Res Ctr

Date submitted: 15 Nov 2016

Electronic form version 1.4