

Fault tolerant quantum computing R&D | PATHFINDER

NQCP LADDER

- A6. Usecases
- A5. Experiments / simulations
- A4. Models
- A3. Algorithms
- A2. Algorithm to circuit
- A1. Resource estimation

9. Applying FTQC

8. Interconnects

7. QPU (single unit)

6. Universal gate set (logic)

5. Logic gate operations

4. Error correction

3. Parity check (Error detection)

2. Qubits (physical)

1. Materials / subsystems

PULL / INFORM

PUSH / ENABLE

SUB-LEVEL TRL /
METRICS OF INTEREST

HW resource estimation for a given Quantum Algorithm

QA width (#N logical qubits) and depth (#N seq. operations)

QUALITY

FIDELITY | ERROR RATE METRICS

ALGORITHMIC SPECIFIC FIDELITY (ASF)
e.g. trotter step

QA REQ

ASF METRIC INVOLVING INTERCONNECTS

QA REQ

ASF RELEVANT METRIC OF QPU MODULE

QA REQ

UNIVERSAL GATE SET FIDELITY METRIC

QA REQ

LOGICAL GATE FIDELITIES
E.g. Logic H, CNOT

QA REQ

ERROR CORRECTION FIDELITY

QA REQ

PARITY CHECK OPERATION FIDELITY
Unit of error rate detection

QA REQ

PHYSICAL GATE FIDELITIES
e.g. randomized compiling H, CNOT

QA REQ

MATERIAL / SUBSYSTEM QUALITY METRICS

QA REQ

SPEED

OPERATION TIME METRICS

ALGORITHMIC SPECIFIC CLOCK CYCLE (ASCC)

QA REQ

ASCC METRIC INVOLVING INTERCONNECTS

QA REQ

ASCC RELEVANT METRIC OF QPU MODULE

QA REQ

UNIVERSAL GATE SET OPERATION TIME

QA REQ

LOGIC GLIFFORD SET OPERATION TIME

QA REQ

ERROR CORRECTION CYCLE TIME

QA REQ

PARITY CHECK OPERATION SPEED

QA REQ

QUBIT CONTROL & READOUT SPEED

QA REQ

MATERIAL TRANSITION RATES /
SUBSYSTEM SPEED, FREQUENCY

QA REQ

SCALE

FEASIBILITY | POWER | DISSIPATION METRICS

HYBRID COMPUTE INFRASTRUCTURE REQUIRED FOR SOLVING AQ

QA REQ

#N HPC nodes c-interconnects

QA REQ

INTERCONNECTED QPU'S INFRASTRUCTURE

QA REQ

#N QPUs and q-interconnects

QA REQ

QPU MODULE INCL. CONTROL & READOUT / POWER CONSUMPTION

QA REQ

#N logic cells per QPU

QA REQ

'LOGIC CELL'

QA REQ

#N logic qubits per cell

QA REQ

LOGIC GLIFFORD Q1, Q2 DEVICE

QA REQ

#N logic qubits per logic 2Q

QA REQ

1 LOGICAL QUBIT FOOTPRINT

QA REQ

#N parity check units per logic

QA REQ

PARITY CHECK DEVICE FOOTPRINT

QA REQ

#N physical qubits per parity

QA REQ

PHYSICAL QUBIT

A&A

HW