

Post selection and weak measurements with an ensemble quantum processor

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NMR ensemble quantum processors can be used for implementing a universal quantum circuit with a limited number of qubits using current technologies. The computation is carried out with high fidelity over a large number of processors (individual molecules) in parallel and the readout corresponds to ensemble averages of single-qubit observables. This type of readout poses an obstacle when the algorithm requires post-processing on individual outcomes, for example when post-selecting on specific outcomes of final measurements. I will present a method for overcoming the challenge of post-selection in an ensemble processor and present experimental results of the first weak measurement in NMR. The experiment involves 3 qubits but can be extended to larger systems of up to 12 qubits using conventional methods. These extensions may be useful for carrying out weak measurements experiments that cannot be done with the more common optical setup.

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