Measuring the parity of an N-qubit state B. ZENG, Department
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Georgia 30332, USA — We present a scheme for a projective measurement of the
parity operator $P_z = \prod_{i=1}^{N} \sigma_z^{(i)}$ of N-qubits. Our protocol uses a single ancillary
qubit, or a probe qubit, and involves manipulations of the total spin of the N qubits
without requiring individual addressing. We illustrate our protocol in terms of an
experimental implementation with atomic ions in a two-zone linear Paul trap, and
further discuss its extensions to several more general cases.

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