Coherence-path duality relations for N paths[1] MARK HILLERY,
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College of Technology — For an interferometer with two paths, there is a relation
between the information about which path the particle took and the visibility of the
interference pattern at the output. The more path information we have, the smaller
the visibility, and vice versa. We generalize this relation to a multi-path interferom-
eter, and we substitute two recently defined measures of quantum coherence for the
visibility, which results in two duality relations. The path information is provided
by attaching a detector to each path. In the first relation, which uses an l_1 mea-
sure of coherence, the path information is obtained by applying the minimum-error
state discrimination procedure to the detector states. In the second, which employs
an entropic measure of coherence, the path information is the mutual information
between the detector states and the result of measuring them. Both approaches are
quantitative versions of complementarity for N-path interferometers.

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