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Cohering and de-cohering power of quantum channels

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Abstract

We introduce the concepts of cohering and de-cohering power of quantum channels. Using the axiomatic definition of coherence measure, we show that the optimization required for calculations of these measures can be restricted to pure input states and hence greatly simplified. We then use two examples of this measure, one based on the skew information and the other based on l_1 norm, we find the cohering and de-cohering measures of a number of one, two and n -qubit channels. Contrary to a view at first sight, it is seen that quantum channels can have cohering power. It is also shown that a specific property of a qubit unitary map, is that it has equal cohering and de-cohering power in any basis. Finally we derive simple relations between cohering and de-cohering powers of unitary qubit gates and their tensor products, results which have physically interesting implications.