About conditional probabilities of events regarding the quantum mechanical measurement process

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Abstract

We consider the successive measurement of position and momentum of a single particle. Let P be the conditional probability to measure the momentum with precision dk, given a previously successful position measurement of precision dq. Several upper bounds of the probability P are derived. For arbitrary, but given precisions dq and dk, these bounds refer to the variation of the state vector of the particle. The first bound is given by the inequality P<=dkdq/h, where h is Planck's quantum of action. This bound is nontrivial for all measurements with dkdq<h$. As our main result, the least upper bound of P is determined. Both bounds are independent of the order with which the measuring of the position and momentum is made.

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