Luis and Sánchez-Soto Reply: We would like to point out that in our article [1] we did not consider arbitrary which-way detectors, but we restricted our analysis to arrangements that neither modify the state vectors $|\psi_1\rangle, |\psi_2\rangle$ associated with each path nor affect the path probabilities. Our demonstration about the enforcement of complementarity by random classical phase kicks applies just to such a class of arrangements. Our article does not exactly imply the statement labeled as (i) in the preceding Comment [2], and accordingly we avoided suggesting the kind of universality associated with "always."

Leaving aside this minor precision, we disagree with the claim that statements (i) and (ii) [or more precisely Eqs. (4) and (6)] are opposite. On the contrary, we think they are fully equivalent, as argued in Ref. [3]. In fact, we have demonstrated that Eq. (6) implies Eq. (4). The link between these two equations is established by the eigenstates and eigenvalues of the operator $V_1^\dagger V_2$ defined by the unitary interaction with the detector device [Eqs. (13) and (15) in Ref. [1]]. These eigenvectors and eigenvalues embody the details of the particular working processes producing the phase-difference shifts. Contrary to what is alleged in the Comment, our approach to the problem naturally depends on the actual physical mechanisms. They determine the values for the possible phase kicks (in particular, whether they are a continuous or a numerable set) and their probabilities. This is not in contradiction with the fact that different mechanisms can lead to the same reduced state for the observed system. Some examples confirming these points can be found in Ref. [4].

Let us stress that the random-phase picture also applies to the double-slit interferometer for atoms introduced by the authors of the Comment [5]. This is explicitly shown in paragraphs following Eq. (10) of Ref. [1]. The dynamics is perfectly unitary and free of elements of randomness, provided we focus on the whole system formed by the atom and the detectors (and any other degree of freedom that might be involved). In other words, there is an absence of noise as far as we consider a closed system. However, unitary evolution for the whole system does not imply unitary evolution for its parts, since they are open systems. The atom and the detectors mutually affect each other leading to randomness, fluctuations, and coherence loss when regarded separately. The atom modifies the state of the detectors in such a way that it is possible to infer the path followed. On the other hand, the detectors affect the state of the atom in the way we showed in Ref. [1].

We have found that the probability distribution for the quantum-phase difference transforms under the coupling with the detectors as a classical probability distribution will transform under random-phase kicks. This does not imply the presence of any uncontrollable source of classical noise as being the actual mechanism responsible for such a transformation. The randomization of the relative phase can have a pure quantum mechanical origin. In particular, we have demonstrated that this random-phase picture is compatible with quantum erasure.

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