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ADDENDUM TO "VARIATIONAL FORMULATION OF TRANSACTIONAL AND RELATED INTERPRETATIONS OF QUANTUM MECHANICS"[1]

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In deriving a differential field equation from the stationary principle for the "equivalent" variational expression it is usual to employ a reasonable source distribution for the retarded field, which is supposed to be continuous and analytic in order for the spacetime derivatives in the field equation to have a well-defined meaning at the source locus. After obtaining the retarded-field (Euler-Lagrange) equation, one makes a special choice of a delta-function source to find the transition kernel.

In his theory of measurement of Maxwell's fields, Nozawa[2] proposed a variational expression for the amount of Maxwell's field energy absorbed per unit time by a given absorber distribution. The proposed variational expression is bilinear in the retarded Maxwell's fields generated by a given source and their adjoint (advanced) fields converging towards the given absorber. That is, the variational expression is defined relative to the absorber as well as the source distribution. There the retarded Maxwell fields were interpreted as continuous linear functionals acting on test functions (in the sense of the theory of generalized functions) and the advanced adjoint fields as the test functions having a bounded support and continuous partial derivatives of all orders at all points, including the interface across which physical properties of the medium can change abruptly.

Although extensive work has been done on the theory of functionals, up to the present not much attention seems to have been devoted to their possible applications to the quantum theory of measurement.[3] It seems that recurring controversies surrounding the interpretational question in early quantum mechanics, of whether or not a particle knows its destination, arose from the mathematical

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difficulty of constructing the well-defined variational expression for the transition amplitude between realizable initial and final states of a particle progressing forwards in time or between inlet and outlet states of a particle world-line going both forwards and backwards in time in the Einstein-Podolsky-Rosen situation.

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REFERENCES

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