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Naoto Kumano-go* (ft24343@ns.kogakuin.ac.jp), 1-24-2, Nishishinjuku, Shinjuku-ku, Tokyo, 163-8677. *Phase space Feynman path integrals with smooth functional derivatives by time slicing approximation.*

We give two general classes of functionals for which the phase space Feynman path integrals have a mathematically rigorous meaning. More precisely, for any functional belonging to each class, the time slicing approximation of the phase space path integral converges uniformly on compact subsets with respect to the starting point of momentum paths and the endpoint of position paths. Each class is closed under addition, multiplication, translation, real linear transformation and functional differentiation. Therefore, we can produce many functionals which are phase space path integrable. Furthermore, though we need to pay attention for use, the interchange of the order with the integrals with respect to time, the interchange of the order with some limits, the semiclassical approximation of Hamiltonian type, the natural property under translation, the integration by parts with respect to functional differentiation, and the natural property under orthogonal transformation are valid in the phase space path integrals. [1] N. Kumano-go, Bull. Sci. math. 135 (2011), 936–987. (Received June 27, 2012)