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DIRICHLET FORMS PERTURBATED BY ADDITIVE FUNCTIONALS OF EXTENDED KATO CLASS

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1. Introduction

In recent years there were many authors in theory of Dirichlet forms and related fields who studied the so-called Feynman-Kac semigroups, Schrödinger operators and the corresponding bilinear forms. Particularly, the multiplicative functionals in consideration are not necessarily the exponential of classical positive continuous additive functionals or abbreviated as PCAF's. In a series of papers by Albeverio and Ma ([1], [2] and references therein) they investigated the perturbation of Dirichlet forms by signed smooth measures $\mathcal{E}^\mu = \mathcal{E} + Q_\mu$, where μ is a signed smooth measure and $Q_\mu(f,g) = \mu(f \cdot g)$, and found necessary and sufficient conditions for $\mathcal{E}^\mu$ to be a lower semi-bounded closed quadratic form. In [15] the author studied the killing transformation by general decreasing multiplicative functionals and perturbation of Dirichlet forms by bivariate smooth measures: $\mathcal{E}^\nu = \mathcal{E} + Q_\nu$, where ν is a bivariate smooth measure and $Q_\nu(f,g) = \nu(f \otimes g)$, and proved the generalized Feynman-Kac formula. He also proved that the killing transformation in theory of Markov processes is equivalent in some sense to the notion of subordination in theory of Dirichlet forms in [17]. In [13] the author also studied the additive functionals in the form of $A_t = A_t^\mu + \sum_{s \le t} F(X_{s-}, X_s)$, where μ is a signed smooth measure, A^μ the difference of two PCAF's associated with μ and F a bounded Borel function vanishing on the diagonal, but his base processes are symmetric stable processes on $\mathbb{R}^d$. He found the conditions for the Feynman-Kac semigroup $Q_t f(x) := P^x(e^{-A_t} f(X_t))$ to be strongly continuous and the bilinear form corresponding to it. In quite different approach, Albeverio and Song [3] studied the perturbation caused by

$$\mathcal{E}^\nu(u,u) := \mathcal{E}(u,u) + \int (u(x) - u(y))^2 \nu(dxdy).$$

They gave a necessary and sufficient condition for the form to be closable and constructed the corresponding resolvent which is not the killing type. Very recently Stollmann and Voigt [14] made a thorough investigation on perturbation by a

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