QUANTUM FIELD THEORY BY GIBBS MEASURES ON CÀDLÀG PATH SPACE

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We consider a semi-relativistic Pauli-Fierz model (SRPF) in QED. This describes an interaction system governed by a relativistic Schrödinger operator $\sqrt{-\Delta+m^2}+V$ minimally coupled to a massless quantized radiation field. The Hamiltonian of SRPF is given as a self-adjoint operator H on the tensor product Hilbert space, $\mathcal{H}=L^2(\mathbb{R}^d)\otimes Fock$, by

$$H=\sqrt{(-i\nabla_x\otimes 1+\sqrt{\alpha}A(x))^2+m^2}+V\otimes 1+1\otimes H_{\rm rad}.$$

Here $A_\mu(x)$ denotes a Gaussian random process and $H_{\rm rad}$ the 2nd quantization of $\sqrt{-\Delta}$. In this talk we show (1) H has a unique ground state $\phi_g\in\mathcal{H}$, (2) there exists a Gibbs measure μ_∞ associated with ϕ_g on a discontinuous path space D, (3) for some observable F, ground state expectation $(\phi_g, F\phi_g)=\int_D F_g\mu_\infty$ is given, (4) several properties (spatial decay, Gaussian domination, density of bosons) of ϕ_g is derived from representation in (3).