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Modelling the interaction of stochastic electromagnetic fields and stochastic structures

Time-domain electromagnetic interaction theory is briefly recalled for local configurations in an embedding space. We show that generic observables, quantifying essential characteristics of an interaction, are represented by distributions corresponding to ``time-reversed'' space-time distributions of electric charge. Canonical stochastic electromagnetic fields are defined such that their covariance operator is ``natural'' and has the embedding space's Green function as kernel distribution. With these definitions, we derive expressions for the auto-covariance function of observables on stochastic fields. This gives the possibility to construct stochastic processes which are statistically equivalent with the actual observables. In order, to account for the uncertainties in the local physical configuration itself, we replace the distribution defining the observable by a stochastic distribution, defined by the solution of a stochastic boundary value problem. A simplified analysis of stochastic distributions is presented in the form of a frequency domain integral equation on a surface with small stochastic fluctuations. It is shown how we can characterise the stochastic observable when both the geometry and the environment field are stochastic.