Efficient Characterization of Stochastic Electromagnetic Fields using Eigenvalue Decomposition and Principal Component Analysis Method

Stochastic electromagnetic fields can be described by the correlation function of the field amplitudes in all pairs of space points. We show that the description of stochastic electromagnetic fields by correlation matrices can be simplified using the principal component analysis (PCA) for eigenvalue decomposition. In this paper, the principal component analysis and the eigenvalue decomposition approach are applied for decomposing and reducing the correlation matrix describing the correlations of the sampled field amplitudes. Subsequently conventional eigenvalue decomposition and the PCA approaches are compared.