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Title:Near field antenna diagnostics of plasma and plasmous nanostructures by solution of inverse problem for waveguide probe

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Abstract:The possibility of microwave diagnostics of volume gas-discharge plasma and plasmous nanostructures, containing thin metal (nanodimensional) or semiconductor films on a substrate is analysed on the basis of the method of the integral equations and the scattering inverse problem solution for waveguide probe structures. For such diagnostics the electrodynamic structures in the form of the rectangular waveguide (probe) connected to multimodal rectangular waveguide or resonator are considered. The model in the form of radiation from a rectangular wave guide with a flange in the multilayered environment is considered also. As the nanodimensional structures it is possible to use the quasi-periodically located metal films. The strict full-wave models offered in works of the author are used. The possibility of diagnostics of electrophysical properties of considered structures is defined as the essential scattering parameters dependence from the specified properties in microwave frequency range. The model of multicomponent plasma is used for modeling. Numerical results of modelling testify to possibility of similar diagnostics, including the measurement of thickness of metal and semiconductor films. For accuracy increase the losses in a waveguide or in the resonator are considered. More exact definition of parameters demands to use higher frequencies, including terahertz range.

Number of references:44

Inspec controlled terms:electrodynamics - integral equations - inverse problems - microwave measurement - microwave resonators - nanostructured materials - plasma diagnostics - rectangular waveguides - S-parameters

Uncontrolled terms:near field antenna diagnostics - waveguide probe - microwave diagnostics - volume gas-discharge plasma - plasmous nanostructures - thin metal - semiconductor films - integral equations - scattering inverse problem solution - electrodynamic structures - multimodal rectangular waveguide - resonator - electrophysical properties - scattering parameters dependence Inspec classification codes:A5270 Plasma diagnostic techniques and instrumentation - A0750 Electrical instruments and techniques - A0230 Function theory, analysis - B7310N Microwave measurement techniques - B0290R Integral equations (numerical analysis) - B1310 Waveguides and striplines

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