Investigations of electromagnetic properties of artificial and natural materials with used open quasioptical resonators in microwave frequency range. Spectroscopy of different materials in terahertz frequency range.

Grigory **Dunaevsky**

Research has been carried out to increase sensitivity of spectroscopic methods and design new types of devices for nondestructive electromagnetic control. We have studied features of an open quasioptical resonator with samples of materials in the shape of plane parallel sheets and threadlike. We developed a model of an open resonator with inclined plane parallel sheet dielectric. This model creates a basis of a method of the contactless control of a thickness polymeric films. A mathematical model of the open resonator with thin threadlike inclusion allows to realise a new method of measurements of resistance diameter of ultra-thin metal threads (microwire), including threads under a layer of dielectric isolation. Devices for the contactless control of threadlike materials are developed. Application of open quasioptical resonators for spectroscopy and nondestruction control is especially perspective in terahertz frequency range. We also conduct research on modern composite radiomaterials in a wide frequency range.

Parametric and non-parametric statistics and adaptive control systems

Vyacheslav Vasiliev

We develop the sequential method of parameters estimation in continuous- and discrete-time systems by full observations and observations with noises. This method gives a possibility to solve identification problems with guaranteed accuracy in various statistical senses. In particular, we can estimate parameters of multivariate dynamic systems with a preassigned mean square accuracy. We apply results of the previous section to adaptive control problems of continuous- and discrete-time systems with unknown parameters. These results give a possibility to draw statistical conclusions for finite sample sizes (what is important for practitioners). We develop non-parametric methods for solving classical problems of non-parametric statistics (e.g., distribution density and regression function estimation problems) by dependent observations with applications to construction of probabilistic models of dynamic systems