

# QUANTUM PHYSICS, OPTICS AND LASER TECHNOLOGIES

May 09-10, 2018 Tokyo, Japan

## Parametric structural schematic diagram of multilayer electromagnetoelastic actuator for adaptive optics

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The multilayer actuators based on the electromagnetoelasticity (the piezoelectric, piezomagnetic, electrostriction, magnetostriction effects) for the nano and micro-displacements are used for the adaptive optics, the astronomy, the nanotechnology, the nanobiology and the microelectronic. The multilayer electromagnetoelastic actuators are applied for the precision alignment, the compensation of the temperature and gravity deformations, and the correction of the wave front. Multilayer piezoactuator provide the movement range from several nanometers to tens of microns, the sensitivity of up to 10 nm/V, the loading capacity of up to 1000 N. Multilayer piezoactuator provide high stress and speed of operation and return to the initial state when switched off. Multilayer piezoactuator is used in the majority of the scanning tunneling microscopes, the atomic force microscopes. By solving the matrix equations using the Laplace transform and taking the equation of the electromagnetoelasticity, the boundary conditions on loaded faces of multilayer electromagnetoelastic actuator, the strains along the coordinate axes, it is possible to construct its structural parametric model. Effects of the geometric and physical parameters of the multilayer electromagnetoelastic actuator and external load on its dynamic characteristics are determined. For calculation of the control systems the generalized parametric structural schematic diagram and the transfer functions of the multilayer electromagnetoelastic actuator are obtained. The static and dynamic characteristics of the multilayer piezoactuator are determined. From the decision matrix equations the generalized structural-parametric model, the generalized parametric structural schematic diagram, the generalized transfer functions of the multilayer electromagnetoelastic actuator are obtained. The generalized structural-parametric model of the multilayer electromagnetoelastic actuator provides the determination of the parametric structural schematic diagrams, the transfer functions of the actuator and calculation of its static and dynamic characteristics. The parametric structural schematic diagrams, the transfer functions of the multilayer piezoactuator for transverse, longitudinal, shift piezoeffects are determined from the generalized structural-parametric model of the multilayer electromagnetoelastic actuator for adaptive optics.