Mathematical models of micromechanical wave gyroscope

Small size, weight and cost of modern micromechanical inertial sensors together with their low power consumption, as well as advances in the collection and processing of large amounts of data allow to use them increasingly in various areas of technology. Wider application of such sensors are limited by their relatively low accuracy. One of the ways of increasing the accuracy is based on the use of built-in algorithms for processing of primary measurements. Such algorithms are generally based on Kalman filter ideas or similar approaches. Effectiveness of the use of such algorithms depends heavily on the accuracy of the used sensor models. For this reason, the development of mathematical models of micro electromechanical sensors (MEMS) inertial measuring devices should be considered an important stage in the design of navigation and measurement systems for aerospace vehicles. In most publications, the investigation of the dynamics of such a device does not include the full effect of the elastic suspension on the parameters of the resonator. It is shown here that in the micromechanical wave gyroscope, due to the relatively small mass of the ring, the influence of the suspension is more significant than in other types of micromechanical gyroscopes. The presence of suspension changes the effective mass of the resonator, the elastic and viscoelastic forces and affects the additional Coriolis forces due to rotation of the unit base in space.