



Test of advanced schemes for the geometry stabilization of large-frame square-cavity ring laser gyroscopes

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The ultimate limit to the long-term stability of very large ring laser gyroscopes for Geodesy and Geophysics is given by the fluctuation of the shape of the laser beam closed path inside the ring resonator. In the case of square cavities, the effects of the environmental parameters on the ring laser beam path stability are strongly reduced if the two diagonals of the square are constrained to a constant length value. For this reason, we have proposed a novel stabilization approach based on the injection of the linear resonators formed by the opposite mirrors of the square resonator with a high-stability optical reference. A ring laser prototype, called GP2, is dedicated to this investigation. It is 1.6 m in side and is located in Pisa, by the INFN laboratories. Its plane is oriented perpendicularly to the Earth rotation axis, in order to have a maximum bias for the Sagnac effect and to minimize the contribution of the orientation errors. The optical cavity is equipped with a multiple PZT mirror positioning system that makes it possible to control the cavity deformations down to the sub-nanometric level. The experimental techniques and the present status of the stabilization system will be presented.