**"Gyroskopiya i Navigatsiya" №3, 2004**

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| Very large ring lasers have been constructed to monitor small variations of Earth rotation. After more than a decade of research, rings with areas of up to 367 square meters are outperforming gyros for navigation by several orders of magnitude. As a consequence periodic geophysical signals with periods around one day and half a day have become visible in the time-series of ring laser observations. These signals are introduced by variations in the orientation of the ring laser plane and currently limit the uncorrected sensor resolution to 2x10-8 with respect to the Earth rotation rate. It is important to note that over the past 30 years the theoretical model of forced diurnal polar motion has been developed and is used to reduce these contributions from very long baseline interferometry (VLBI) measurements. There are still some uncertainties remaining, since the theoretical models use some simplifications to account for a deformable Earth. Large ring laser gyroscopes are sensitive to the instantaneous rotation axis of the Earth and provide a new and independent technology, which can measure the amplitudes and frequencies of the forced modes of Earth rotation directly and monitor polar motion to unprecedented high temporal resolution. This effectively provides a direct probe of the Earth's moment of inertia. Therefore we expect that future improvements in ring laser technology will lead to quantitative improvements in the nutation models themselves, and provide a new tool for studying aspects of the Earth's interior. The superior sensitivity of such instruments has also been found very useful in seismology, where the seismically induced rotation rate can be accurately measured by ring lasers only. The results obtained by large ring lasers are discussed in this article. | |  |

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| As one of the parents of the technology (under its former name (Photonetics) and thanks to its team of highly skilled research engineers, Ixsea has improved year after year its FOG basic design for always better performance. This was achieved with the same optical configuration by understanding all microscopic effects creating parasitic interferometers and reducing them one after the other. This led to gyros with a noise as low as 10-4 degree per square root of hour and with bias stability lower than 10-4 degree per hour. Even scale factor performance over large temperature range, which was thought as a limiting factor of FOG technology, is getting close to RLG performance.  This performance is so high level that our FOG technology provides a solution for all applications, even the most demanding ones in terms of performance, reliability and lifetime. Among them, space applications for various satellite types will be fitted with our FOGs.  This paper describes our FOG technology and the solutions for achieving such performance: a very efficient light source with controlled spectrum and power although without any temperature control (which would add cost and power consumption), a smart fully digital signal processing and various key enhancements in the optical design. Performance of our FOGs with respect to these parameters will be described.  From our FOG sensors, we have developed and marketed inertial systems.  With these products, Ixsea has demonstrated that high performance FOG is no more a lab technology but a field proven, cost effective and industrialized technology. The success of Octans and Phins is a daily proof for that: close to 450 Octans are presently in service all over the world. | |  |

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**Materials of the 11th Saint Petersburg International Conference  
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