MERMIG is a technology-intensive project that aims to exploit silicon photonic integration on CMOS and Nano-Imprint Lithography used in telecoms, and provide a modular, compact and low cost optical gyroscope that meets the requirements of new generation micro-sensors for space robotics, micro-payloads and power/cost-efficient satellite systems.

Objective 1: Silicon Gyroscope Photonic Integrated Circuit (SGPIC)

MERMIG will exploit advances in silicon photonics heavily invested in R&D for terrestrial applications and develop a silicon gyroscope photonic integrated circuit (SGPIC) using CMOS-compatible fabrication. The SGPIC will comprise: an integrated racetrack cavity, PIN junctions and a cascaded phase decoder circuit. This will be the first integrated gyroscope which exploits an active cavity based on stimulated Raman scattering effect. The SGPIC will be integrated as a module using a smart packaging technique that will allow efficient optical pumping and hermetic shielding.

Objective 2: High performance Gyroscope Laser Module (GLM)

MERMIG will exploit and develop cost-effective Nano-Imprint lithography technology currently being adopted for highperformance telecom lasers for the development of the MERMIG optical pumping source. A high-power 1550 nm gyroscope laser module (GLM) will be developed for pumping the SGPIC. The laser component will exhibit record high (150 mW) fibre-coupled optical power to enable a modular system for space missions and will be integrated as a module together with current driver and temperature controller electronics focusing on low-power and small footprint designs.

Objective 3: Fully-functional Gyroscope System (MGS)

MERMIG will develop the fully functional, compact optoelectronic gyroscope system (MGS). The MGS will integrate the SGPIC and GLM modules in an optoelectronic board with driving and read-out electronic circuits, meeting the power and space requirements set by the space system vendor ASTRIUM.

Objective 4: Experimental performance evaluation

MERMIG will validate the MGS system through inertial system tests and verify performance in space envrironments . The tests will follow the detailed test plan outlined by ASTRIUM. Specific focus will be paid to radiation tests on the SGPIC in order to verify radiation hardness against FOGs that employ radiation-sensitive doped fibres.