The aim of the MERMIG project is to build an optical micro-gyroscope prototype based on the latest innovations in nanotechnology, more specifically silicon nanophotonics.

This technology-intensive project has achieved significant advances in the modelling of guided-wave optical components, which are at the heart of the technology. A complete multiphysics approach to silicon optical nanostructure, considering non-linear optics, thermal and stress effects, was carried out to outline the fundamental design rules and achieve an efficient gyrochip, able to meet industrial needs.

A packaged silicon gyroscope photonic integrated circuit (SGPIC) has been developed and integrated as a module together with current driver and temperature controller electronics. A specific packaging process has been developed, with specific attention paid to the optical feedthrough and thermal dissipation, in order to assure the SGPIC performance over the lifetime of a space mission.

The different modules (Laser, Gyro Chip and Readout modules) have been designed, built and integrated in a first gyroscope system breadboard. Taking advantage of the proposed technological breakthroughs to achieve significantly reduced dimensions, the sensor features few Watts of power consumption, < 1 kg of mass, and a potential volume of few cm3, thus meeting the requirements set by the space system vendor AIRBUS DS.

Such technology enables the development of a new line of micro-gyroscopes capable of withstanding the harsh environments of telecommunications missions in geostationary orbit, as well as the mass constraints typical of rovers used in robotic exploration.