Optical Sensors for Aerospace Applications

There is growing interest in optical sensors in the aerospace industry, mainly due to the prospective use of composite materials in airframes, which has created a need for lightweight sensors and cabling that is immune to electromagnetic interference (EMI). The use of composite materials in the airframe brings weight savings, improved performance and lower maintenance, but as a drawback, lightning protection is lost. Thus, electrical and electronic sensors and actuators become exposed to the EMI effects of lightning. Optical sensors are potential solution since they are intrinsically EMI-immune; they normally use dielectric materials (e.g. silica fibres) and they are electrically passive components, relying only upon the light emitted by a remote light-source in the avionics bay and transmitted to the sensor and reflected back to the interrogator via an optical fibre. Moreover, optical sensors have other advantages: they can be lighter than electronic sensors (optical fibres are lighter than copper cables, especially when the weight of lightening suppression electronics is taken into consideration), can measure multiple parameters at the same time (e.g. pressure, temperature and refractive index) [1-3] and can be routed within the airframe adjacent to power cables.

Following the success of the SCARLETT project (SCAlable & ReconfigurabLe elEctronics plaTforms and Tools, 2008-2012) for the development of next generation of Integrated Modular Avionics (IMA), the European Commission launched in 2013 the ASHLEY project (Avionics Systems Hosted on a distributed modular electronics Large scale dEmonstrator for multiple tYpes of aircraft). One of the work package of ASHLEY managed by Airbus is entirely devoted to the development of Photonics Solutions for Avionics Systems.