New Photonic Architectures with High Dynamic Range using GaAs Modulators for Aviation Industry Applications

This Aerospace communication research project is funded by **National Aerospace Technology Programme (NATEP)** UK, where we as academic partner have worked jointly in partnership with Leonardo MW Ltd, as end-user and **aXenic**, as component supplier. In civilian aerospace systems there is increasing demand for higher information capacity links to both ground stations and space based satellite networks for a wide range of applications including: on-board "Wi-Fi", passenger and crew telecommunication and data communication, airframe and engine health monitoring systems, air traffic control communication, GPS and continuous airplane status and location monitoring. Similarly in military aerospace live video feeds from the aircraft in addition to the continuous monitoring and control of on- board systems are envisaged. Photonics being largely Radio Frequency (RF) "blind", hold the key prospect of combining multiple RF radios into a single architecture and antenna either through processing in parallel or serially in time.

More capability for less weight is the fundamental design principle in all forms of aerospace, which this project seeks to address by utilising new development in photonics to pre-process RF signals. Such photonics pre-processed signals should require fewer and lower power electronics components because of the better photonic down conversion (cleaner signals) and their unprecedented frequency agility thereby allowing the reuse of time redundant electronic channels.

There are two fundamental problems that we address in this research area:

1) The size, weight, power and avionics environment limits how much processing of analogue microwave signals can be achieved immediately behind the antenna.
2) In attempts to get over 1), traditionally microwave analogue optical links have been used as a direct substitute for rigid coaxial cable. This is because fibre has an almost perfect performance in terms of loss and dispersion within an avionics platform. Historically this approach has struggled because of limited (spurious free) dynamic range for the wide microwave bandwidths required for some applications.

Project partners and their activities involved are shown below:

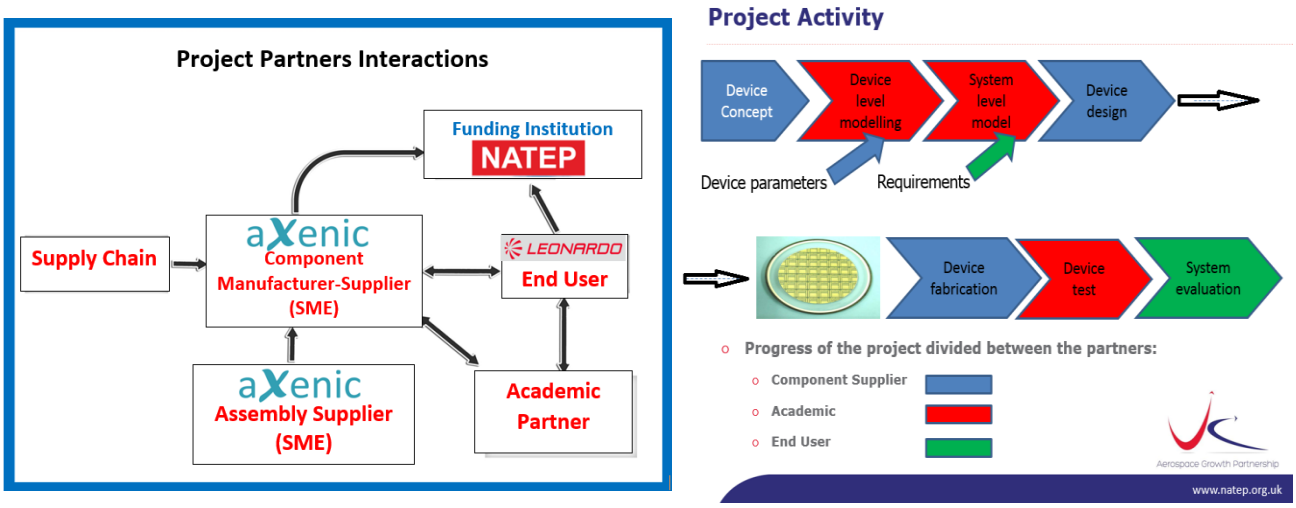

Illustration of partner interactions and their activities