DAPHNE

Developing aircraft photonic networks
Newsletter #4 Sep-2011

Welcome to the September 2011 DAPHNE newsletter!

This is the fourth of six newsletters to disseminate the objectives and results of the project. More information may be found on the project website (www.fp7daphne.eu) which is kept up-to-date with all the latest news, and has links to related technology and events. This newsletter is intended to provoke interest: please contact us if you have further questions. Contact info is given at the foot of the page.

- DAPHNE started in Sep-2009 and will run for three years
- The project has fifteen partners from seven nations
- Balance of academic & research organisations with large & small industrial partners
- Project lead organisation: Airbus.

DAPHNE is a project supported by the European Commission's Seventh Framework Programme to develop photonic networks and components for aircraft. The core of the project is to exploit photonic technology from terrestrial communications networks and to identify and address technology gaps in implementing photonics extensively throughout the aircraft industry. The project brings together avionic equipment and aircraft manufacturers with photonic industry members and academic network specialists.

Contents

Consortium

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Project progress: SQS PON development

One of the key areas of DAPHNE is the development of networks for IFE (in-flight entertainment) systems and the potential to simultaneously use these networks for other applications. This should eventually provide passengers with improved multi-play services such as video on demand (VOD) and Voice over IP (VoiP) over a common network which could provide a versatile and reliable medium for other types of communication within the aircraft.

One part of such a fibre optic network could be based on a PON network built from passive components such as ruggedised splitters connectorised by specialised fibre optic single or multiway ferrule connectors and distributed throughout the aircraft using specialised breakout technology.

SQS PON module for DAPHNE

The photograph above shows the DAPHNE aeronautical two-drawer module with fibre optic breakout boxes made by SQS Vlaknova Optika. This system has a number of significant features:

- Operating temperature tested from -55℃ to 85℃
- Vibration tested from 5 Hz to 2000 Hz vibration at 20g
- VITA 66 backplane MT type connectors
- 12/12 SM/MM transfer channel drawer
- AirPon drawer with SQS PLC splitters and monitoring channel.

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Harsh environments and flexible network topology optical transceivers

D-Lightsys is the DAPHNE partner responsible for prototyping harsh environment compatible optical transceivers.

Thermo-mechanical constraints

The main environment constraints are: a large temperature range due to the flying altitude or the localisation of the equipment within the platform, the vibration and shock compatibility and the overall module weight and the EMI constraints.

Network topology constraints

The architecture constraints are: the number of channels, the bit rate of each channel, the type of data to transfer and the network topology.

Constraints driven design

These two set of constraints drive the specification towards a small, lightweight and integrated device. The number of channel, fibre choice or number of channel enables the different architecture and topology of the network.

Fully characterised devices

Dedicated test benches allow complete characterisation of devices over the entire temperature range. Temperature behaviour is monitored and compensation algorithm defined and programmed for module ruggedisation.

Performance validation

Electro-optical validation

A full set of tests is used to retrieve the module intrinsic performances over temperature.

Environmental validation

Module designs and performances deviation are analyzed over mechanical stress such as vibration, shocks and handling.

Transceiver solutions

Bidirectional MM transceivers

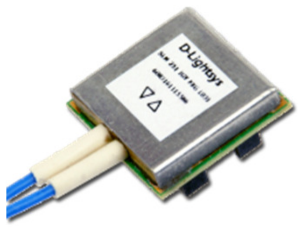
Single wavelength single fibre bidirectional MM transceivers challenge the connector and media count and reduce logistical aspects in simplifying the network node connection.

Multiple channel transceivers

Parallel devices allow a larger bandwidth for demanding applications such as IFE or data computing and minimise the node connection..

Long wavelength MM & SM transceivers

Longer wavelength devices are suitable for single mode application and enable wavelength division multiplex access network architectures.



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DAPHNE at ECOC 2011

European Conference and Exhibition on Optical Communications
ECOC2011
Geneva, Switzerland; 18-22 Sep-2011; www.ecoc2011.org

DAPHNE had a very strong presence at ECOC this year, reflecting the importance of terrestrial technology to avionic networks and the project. Mark Farries (Gooch and Housego) chaired the session on optical avionic networks, and most of the presentations were by DAPHNE partners or DAG members. The conference outline describes the relevance of DAPHNE very well:

"Deployment of fibre optic networks in aircraft is driven by the need for broadband and high density video to each passenger seat and the requirements for high bandwidth taxiing aids and all weather flying visibility for enhanced pilot observation. The need for a greener aircraft is putting pressure on aircraft manufacturers to reduce the weight and complexity of existing copper cables. A fibre optic network is an obvious solution, but the environment and maintenance issues present some tough challenges. This symposium brings together academics and industrial companies who are working to solve these challenges.

The design of optical networks that form a backbone in the aircraft onto which multiple services can be connected is discussed in several papers. Aircraft operate over wider temperature ranges than terrestrial telecommunications equipment; therefore the standard optical components must be re-designed with more robust materials. Fibre optics offers real advantages for sensor systems that operate in parts of the aircraft that preclude the use of electrical signals."

The DAPHNE partner papers included:

- *On scalable, adaptable and fault-tolerant designs for an integrated avionics photonic network*
    - João Baptista (GMV)
- *Avionic network design*
    - Jiang Zhang, Yi An, Michael Berger and Anders Clausen (DTU)
- *Model-based architectural design of avionic optical networks in the DAPHNE project*
    - Armin Zimmermann and Karin Schulze (TU Ilmenau)
- *Application of passive optical networks for aircraft*
    - Michael Pisarik and Ilja Kopacek (SQS)
- *Wireless services distribution over GPON for avionics*
    - L. Pessoa, D. Coelho, J. Oliveira, J. Castro and H. Salgado (INESC Porto)
- *State of the art transceivers for aircraft networks*
    - Alexandre Bacou, Vincent Foucal, François Quentel, Daniel Mousseaux, Christian Claudepierre and Mathias Pez (D-Lightsys)
- *Developing COTS parts for avionic applications*
    - Mark Farries and David Smith (G&H).

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