Optoelectronic solution for harsh environments

10/12/2015

Content

- Radiall optoelectronic expertise
- Standard product range
- Developments for space applications

Mission & Market

- Active Components & Systems Business Unit designs and manufactures optoelectronic modules for short distance optical communications within severe environments

- Current main markets:
  - Avionics
  - Defense

Products scope

- D-Lightsys product line offers optical interconnect modules and answers the following requirements:
  - Digital optical data transmission
  - Within a system
    - Short distance optical communication
    - With potentially many interconnects within the same system
  - Within a constrained environment
    - Temperature, vibrations, weight, dimension, power consumption, EMI, radiations, installation constraints…
    - Where standard telecoms product cannot survive or ensure a reliable enough behavior

Strong Experience in Mil / Aero

Military helicopters

Commercial airplanes

A320-A350-A380

Submarine

Radiall active components inside

A400M

Radar

Fighter

Business Jet

XC-2

Qualified solution

- Temperature range
  - Qualified: -40;+90°C
  - Operating: -55;+125°C (S-Light)

- Compatible with severe environments
  - Modules qualified according to the ARINC804 aeronautic standard
  - Temperature, vibration, shocks, damp heat,…
  - Vibration tested up to 30Grms (Pluggable package)
  - Humidity (Mil-STD-810g)
  - EMI insensitive (up to 800V/m)

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Product functionalities (1/3)

- D-Lightsys modules are electro/optical converters with 4 constitutive elements :

An electrical adaptation circuitry

- To be compatible with the electrical physical layer (standardised electrical levels)
- Integrated circuit (driver, amplifier)

An optoelectronic converter

- Photonics components (laser / photodiode)

An optical interface (pigtailed optical fiber)

- Multimode fiber

An electrical interface

- To enable electrical installation on customer platform

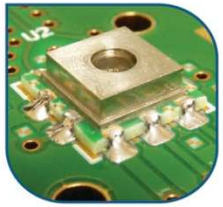
Product Families

Active Optics

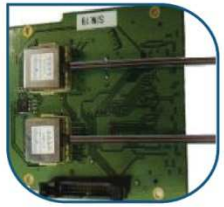

S-Light
Single channel modules



D-Light
Multiple channel modules



F-Light
Free space optical data links

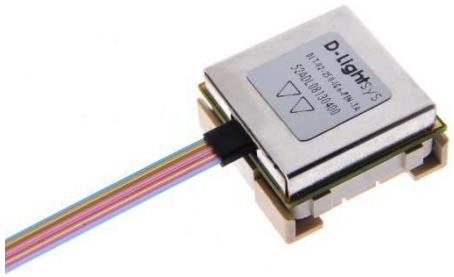
Others
Subsystems
Added value
EVM boards

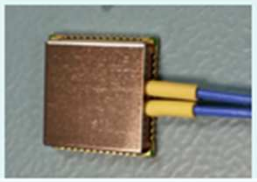
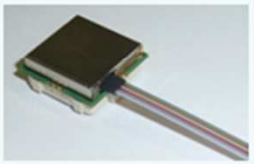
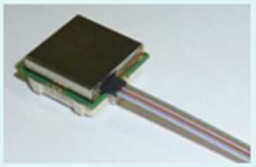
Designed for harsh environment

- Pigtailed fiber optic interface
  - Optical coupling optimized between the laser diode and the optical fiber
  - No degradation due to dust, temperature, humidity, vibration or shocks
- Monitored performances over temperature
  - Steady optical power over the temperature range
  - High optical link budget
- Built In Self Tests (BIST)
  - Laser supervision and monitoring
  - Integrated optical power meter in the receiver

D-Lightsys range: extension to 10 Gbps products

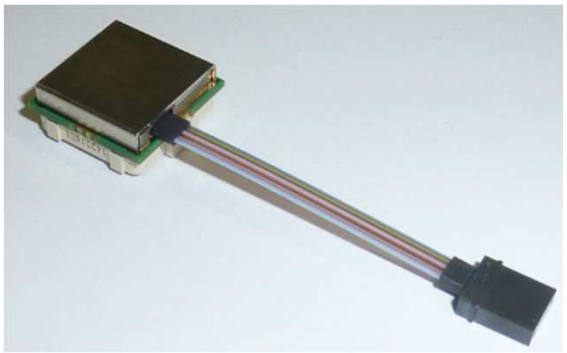
- Expanded port-folio with modules working up to 10 Gbps/ch
  - Same package: same size, same electrical and optical interfaces
  - Same configurations:
    - SLM (1Tx+1Rx), DLM-04 (4Tx+4Rx), DLT-12 (12Tx), DLR12 (12Rx)



Product		Status
SLM-1001-IGN/IL		*AVAILABLE*
DLR-12-1000-IGM (only pluggable now)		*AVAILABLE*
DLT-12-1000-IGM (only pluggable now)		*AVAILABLE*

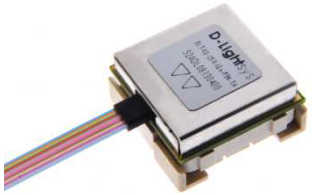
Multiple channels DLR-12-1001 / DLT-12-1000

- **Characteristics**
  - Up to 10Gbps
  - 10G Base-SR or any balanced network protocols
  - Ribbon fiber 50/125 or 62,5/125µm
  - Low power consumption
  - Budget link >10dB (Typ.12dB)
  - Compliant with aeronautic requirements ARINC804
    - [-40;+90°C] (Monitoring of the optical power)
    - Vibration / Mechanical shock,
    - Damp heat,…
  - µController included
  - Pluggable interface
  - Small form factor

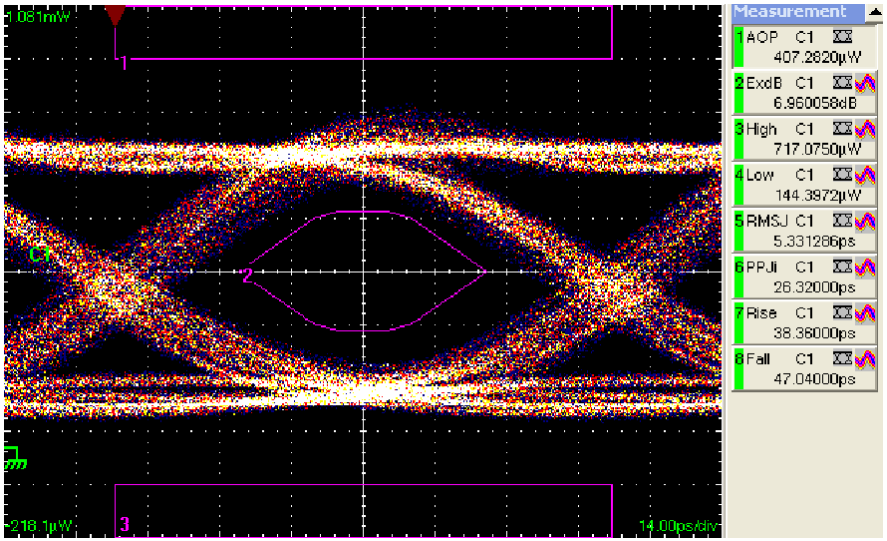


Multiple channels DLR-12-1001 / DLT-12-1000

- Performances

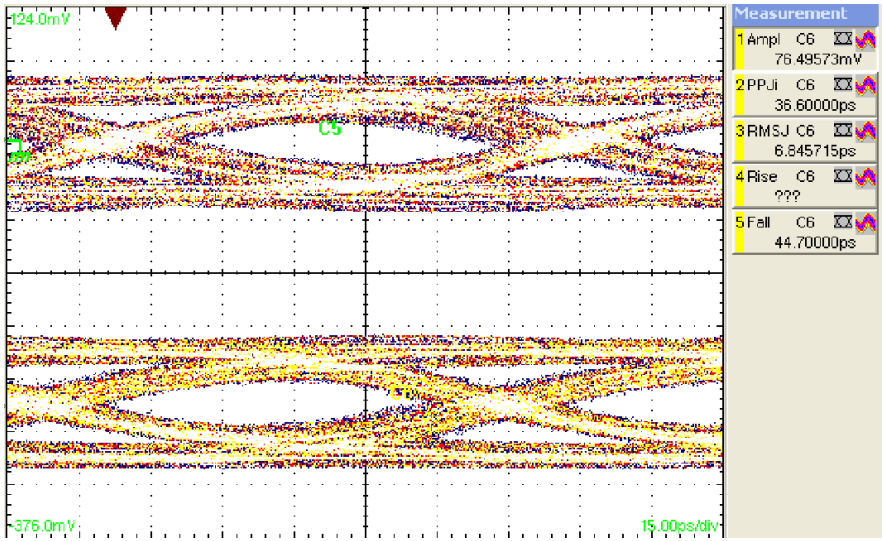


Tx Optical Eye Diagram (DLT-12)



T= +90˚C
ER=6,9dB

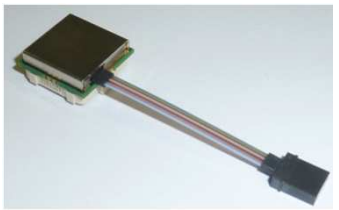
Rx Electrical Eye Diagram (DLR-12)



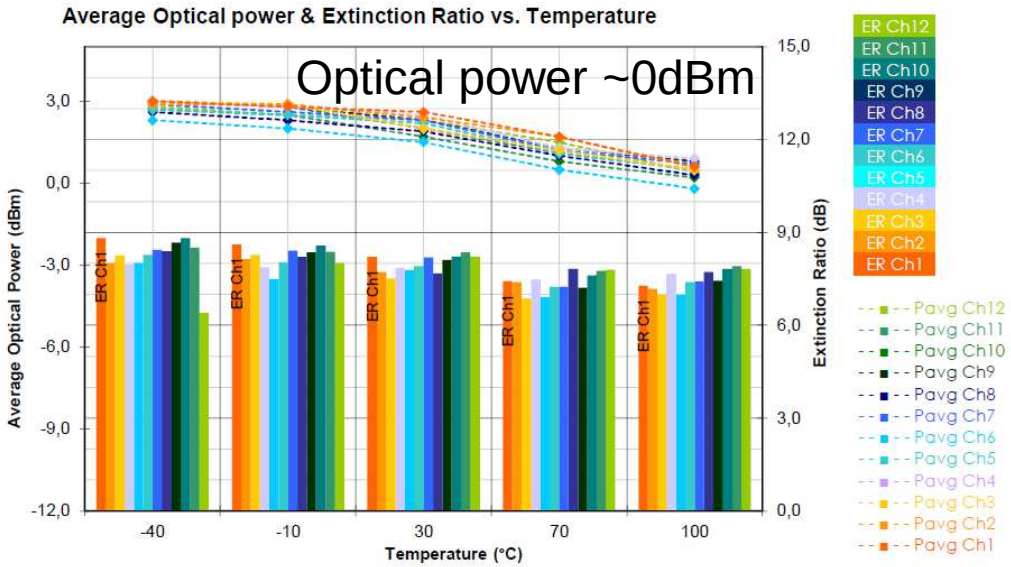
T=-40˚C
P_{opt}=-12dBm

Multiple channels DLR-12-1001 / DLT-12-1000

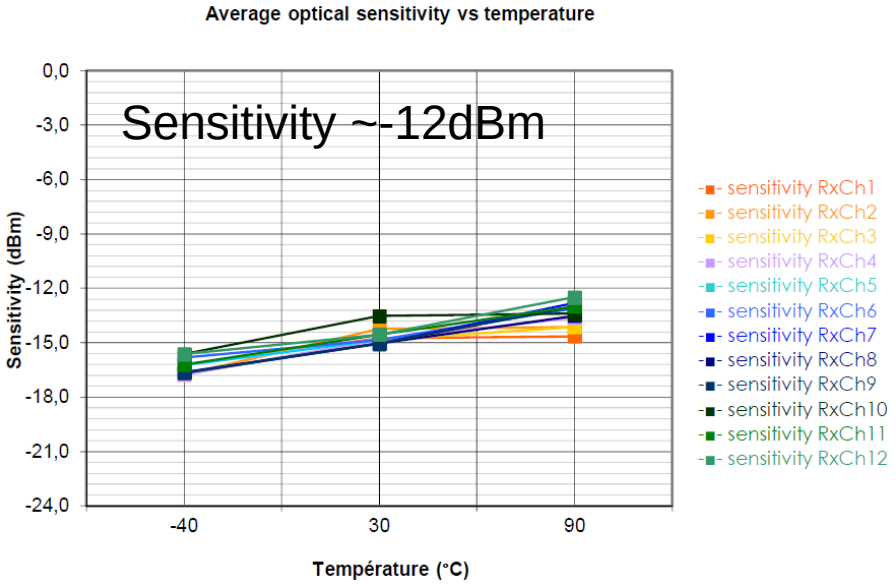
- Performances



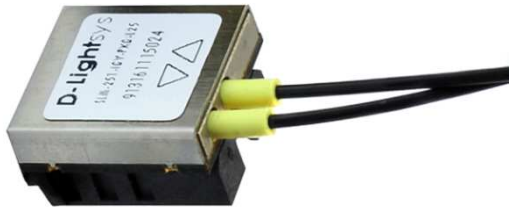
DLT-12-1000 typical test result



DLR-12-1000 typical test result

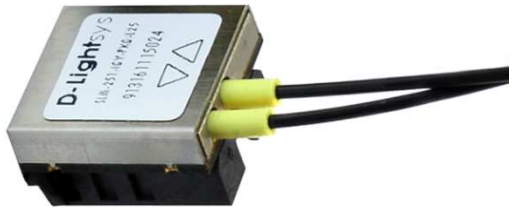


Transceiver SLM-1001



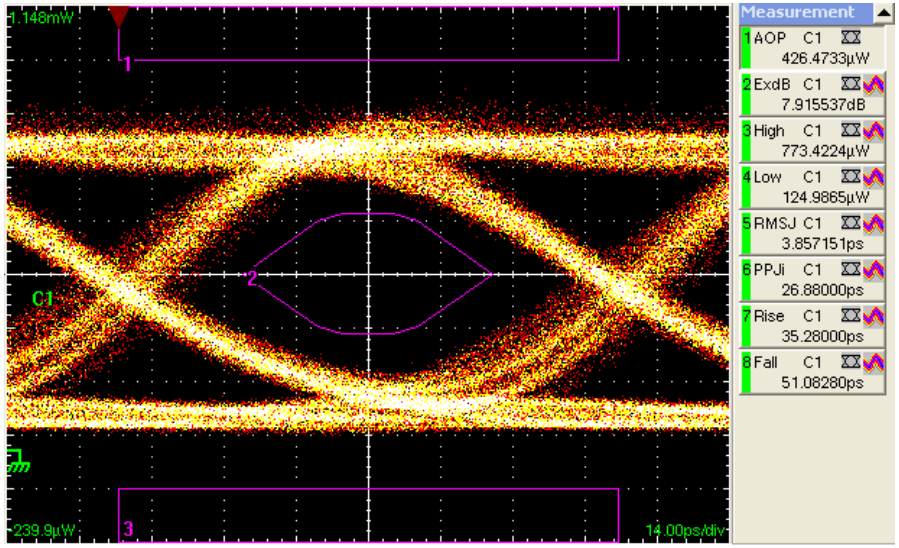
- **Characteristics**
  - Up to 10Gbps
  - 10G Base-SR or any balanced network protocols
  - Fiber 50/125 or 62,5/125µm
  - Low power consumption
  - Budget link >10dB (Typ.12dB)
  - Compliant with aeronautic requirements ARINC804
    - [-40;+90°C] (Monitoring of the optical power)
    - Vibration / Mechanical shock,
    - Damp heat,…
  - Pluggable or solderable interface

Transceiver SLM-1001



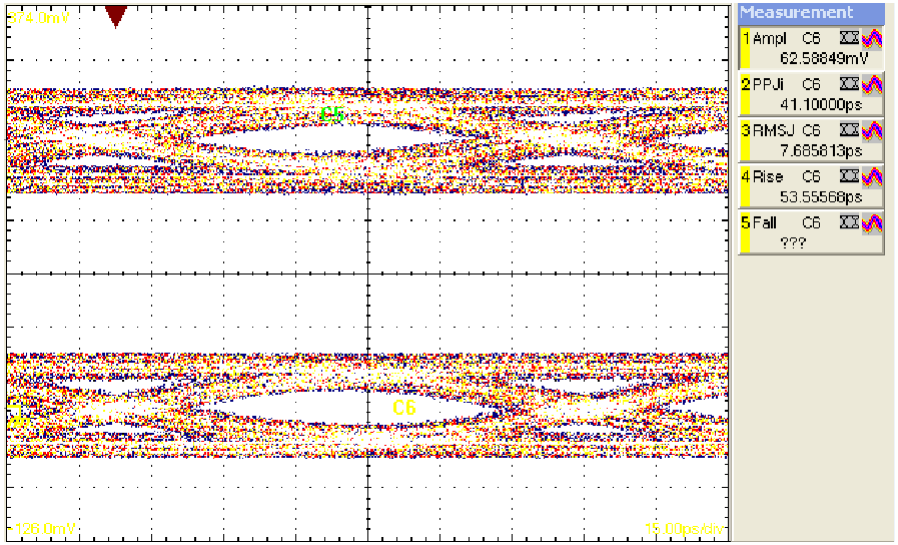
- Performances

Tx Optical Eye Diagram



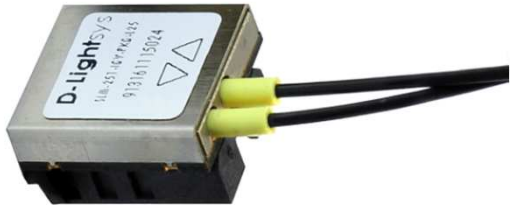
T= +70°C
ER=7,9dB

Rx Optical Eye Diagram

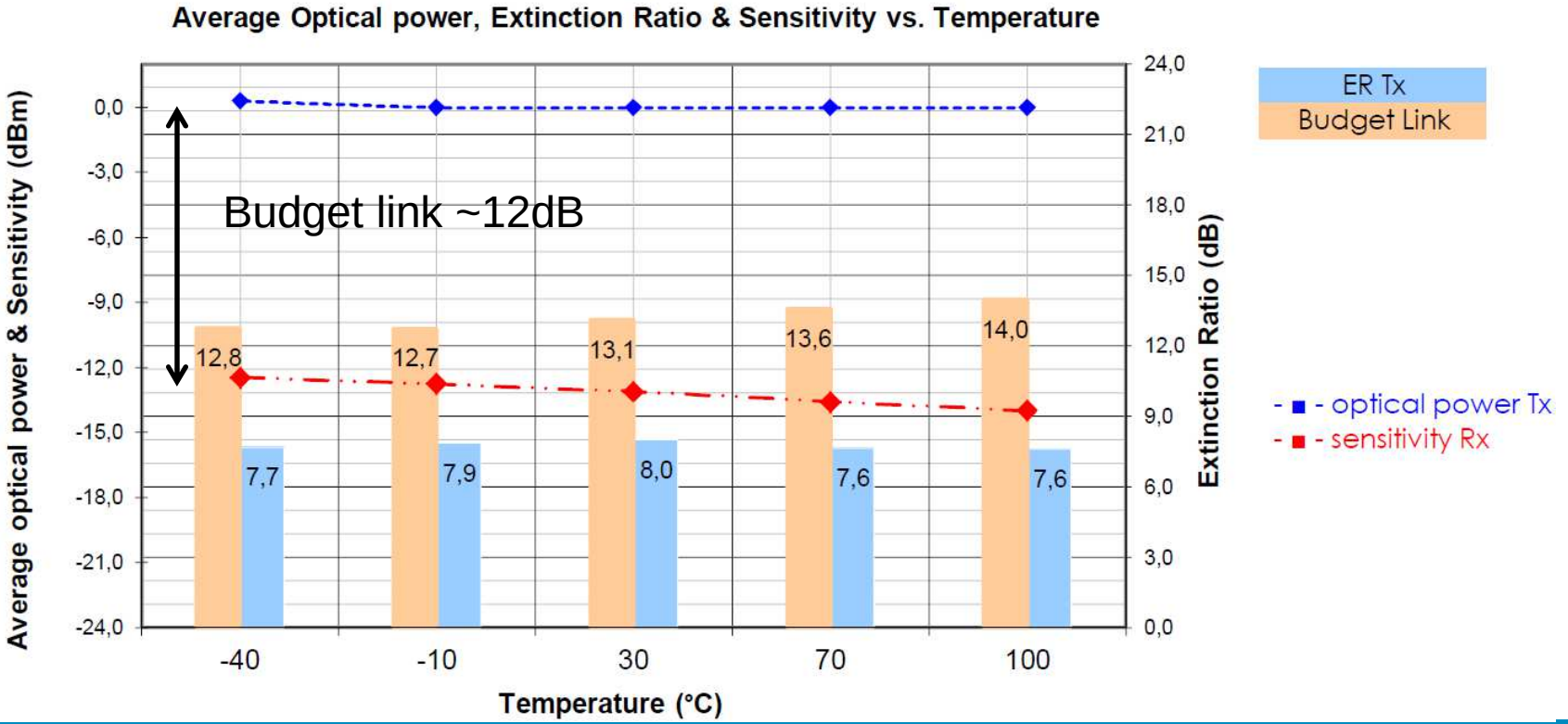


T=-40°C
P_{opt}=-12dBm

Transceiver SLM-1001



- Performances



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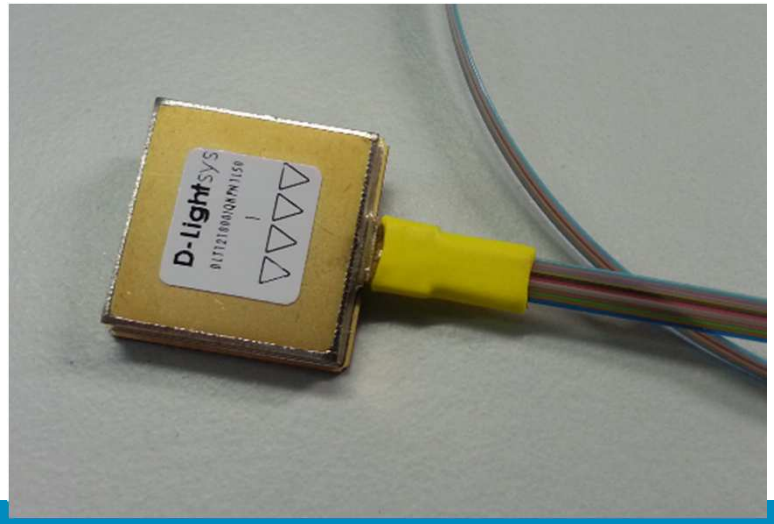
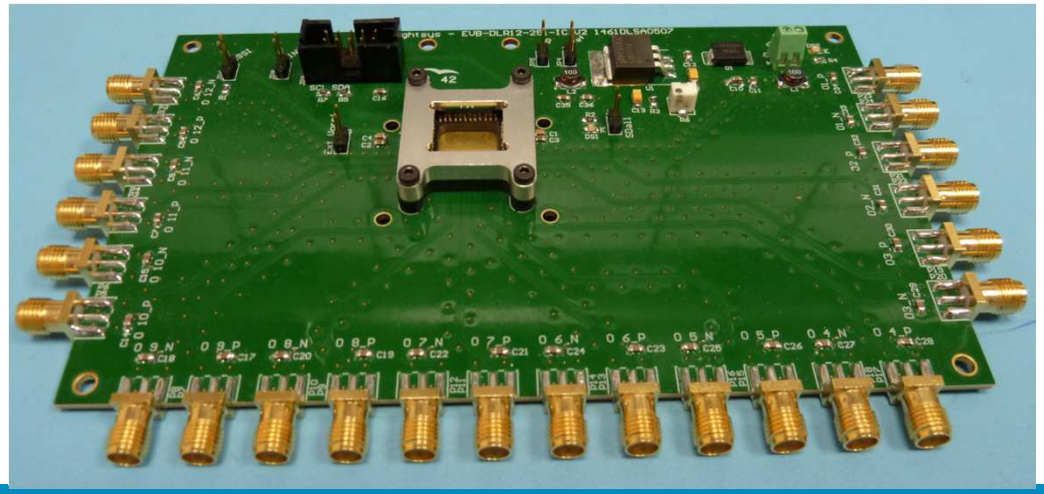
Projet ESA OI²

Optical Inter-Board Interconnects for High Throughput On Board Processors

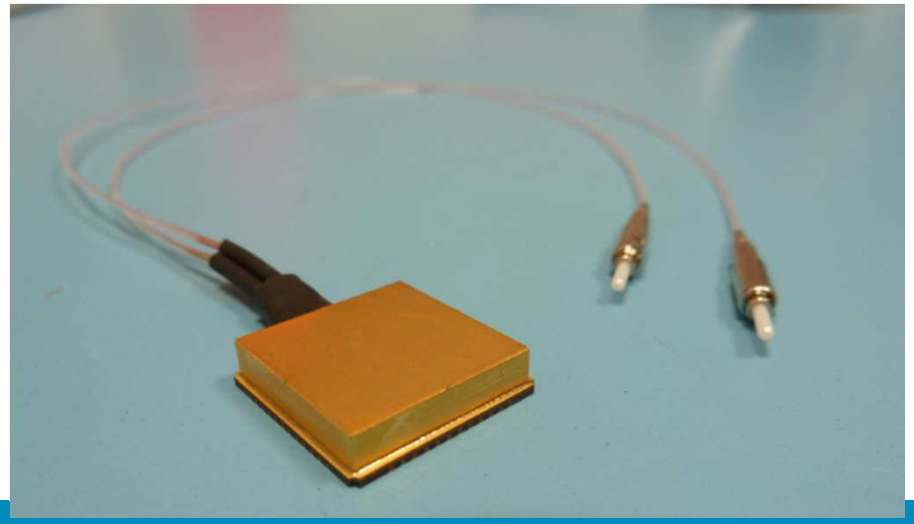
- **Prototypes:**
  - 12-channel transmitter / 12-channel receiver
  - 10Gbps/ch (MM fiber)
  - 17x17x4mm
  - Hermetic packaging *(major issue)*
  - Radiation test (Ionisation dose 100Krad - Proton 1e12 protons/cm²)
- **Schedule :** closed in 2014

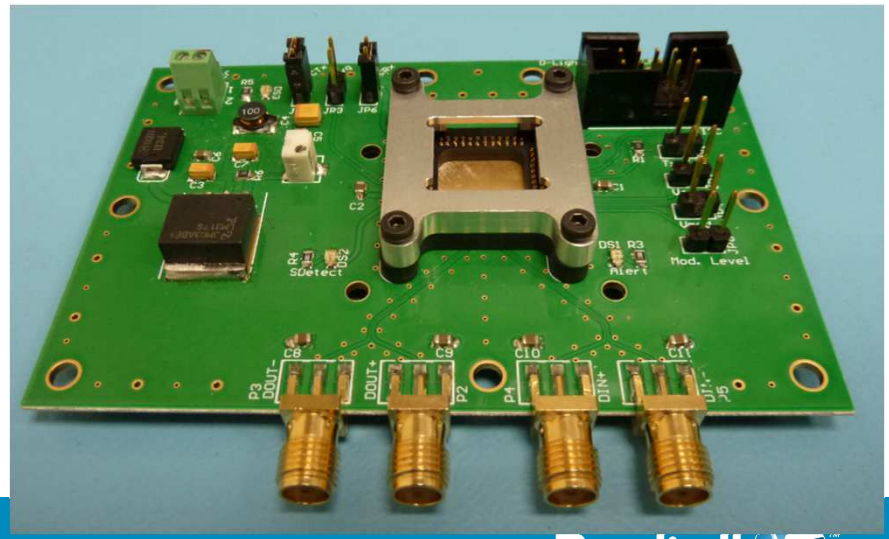




Projet ESA SpaceFiber

- **Prototypes:**
  - Transceiver (1Tx+1Rx)
  - 10Gbps (MM fiber)
  - 17x17x4mm
  - Hermetic packaging *(major issue)*
  - Radiation test (Ionisation dose 100Krad - Proton 1e12 protons/cm² - Heavy Ions 15MeV.cm²/mg)
  - **Schedule :** closed in 2013





Radiall

Future development

- **Objectives**
  - Industrialized solution for the space market
  - Functionality : 12-channel Tx or Rx / 4-channel transceiver
  - 10Gbps (MM fiber)
  - Hermetic packaging
  - Integration of rad-hard driver and amplifier
- **Funding**
  - Research of fundings to start the project (CNES)
- **Schedule**
  - 2016-2020

Thank you!