



Robust High Speed Communications Technology over POF on Airborne applications

March 2017

Agenda



- The Opportunity
- Standardization
- Performance
- Product Portfolio

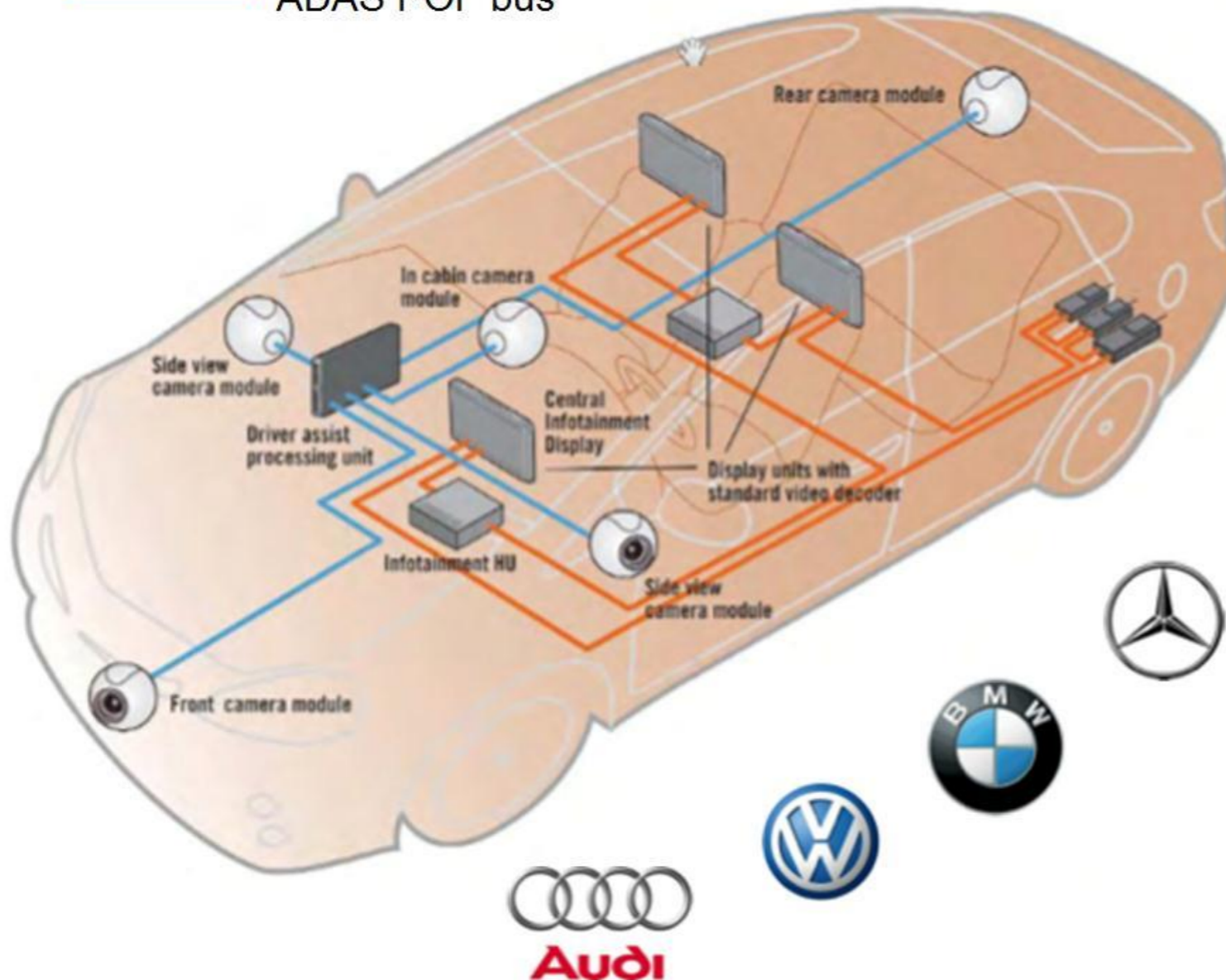


The Opportunity

Plastic Optical Fiber (POF) in automotive



- Infotainment POF bus
- ADAS POF bus



- KDPOF overpasses the limit of 100 Mbps over POF
- Automotive industry is demanding links of up to 3 and 5 Gbps
- All ADAS & Infotainment over POF:
 - Scalability
 - Secure and cost effective
- KDPOF tech. provides the solution for future Infotainment and ADAS systems
- Reusing already qualified:
 - Connectors
 - Optoelectronics
 - Cables
- **KDPOF** is working today with leading car makers and supplier to define next generation Vehicle Area Networks

ADAS: *Advanced Driver Assistance Systems*

1 Gbps POF advantages

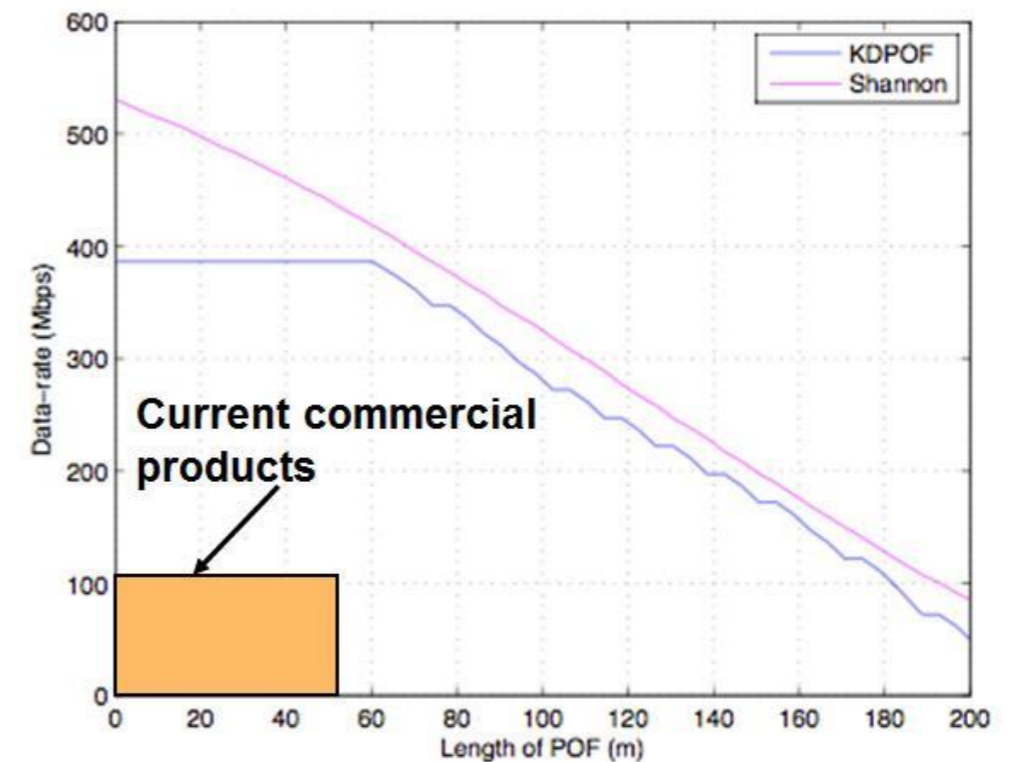
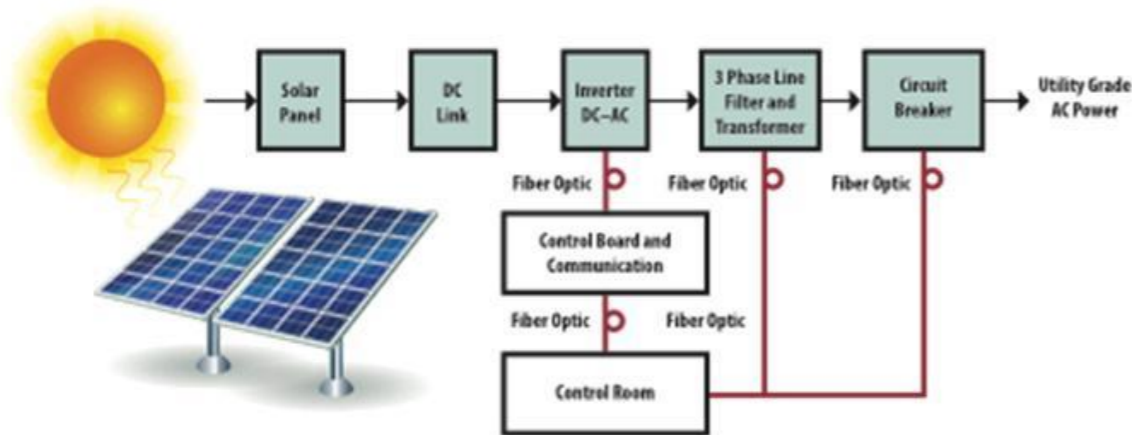


- EMC problems free, is the main advantage
 - Yazaki EMC measurements demonstrate the EMS/EMI performance of the PHY and connector (FOT)
 - > 140 V/m
 - CISPR 25 - Class 5
- POF is a very reliable cable. Compared with COAX and STP.
- Low weight
- Predictable price, and competitive price compared with COAX in big volumes
- Good bending performance
- Availability of early products
- POF is an already automotive qualified media
- New POF products and IEEE standard will operate from -40°C to 105°C

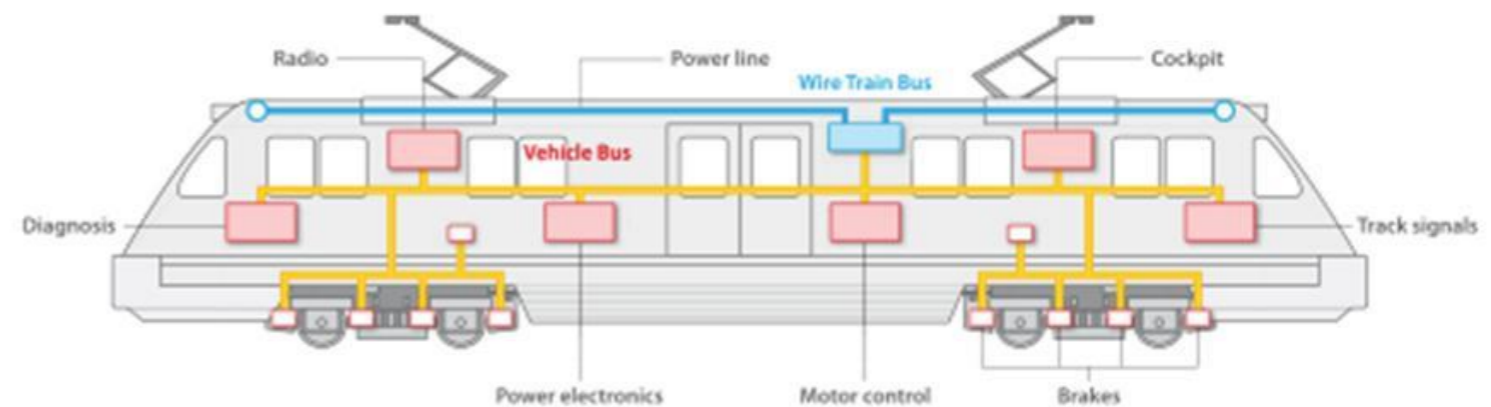
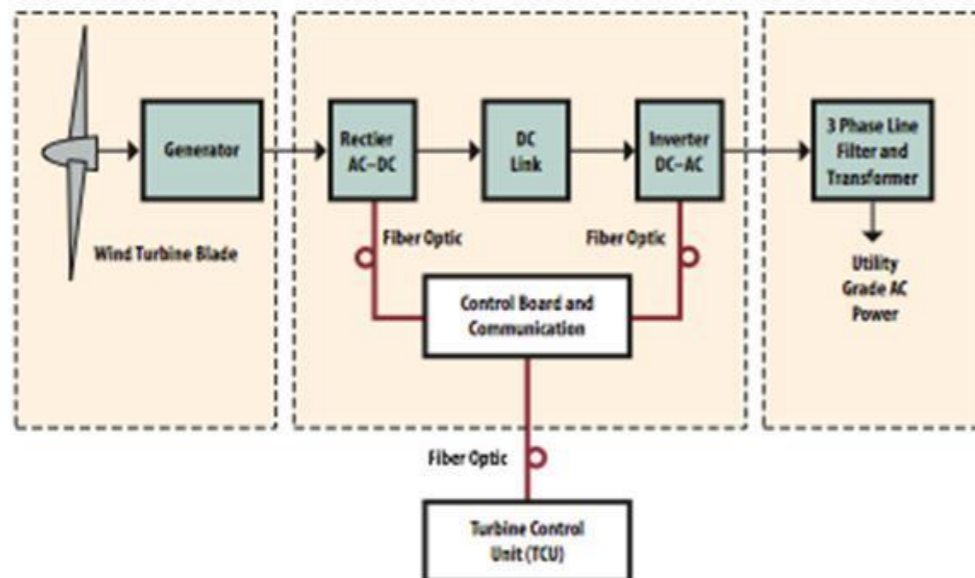
Plastic Optical Fiber (POF) in Industry

- Using the same fibre and components KDPOF extends the reach and speed over POF
- Profinet or Ethernet IP now running at 100 Mbps over POF increase they reach up to more than 130 m maintaining the industrial link budget.

Solar Power Generation



Wind Turbine Power Generation



POF in yellow

Plastic Optical Fiber (POF) in UAV



Lighter weight
Portability
Ruggedness
Reduced need for shielding
High safety levels
Lower cost (easier installation and maintenance)

Potential for degradation in a nuclear environment
Limited high temperature operational point to 105°C
Up to now was limited in speed and length. Now reaches 1 Gbps and 40m

POF for Defense/Airborne applications



Application Category	System	Benefits of POF
Communications	Intrusion Detection Optical Communications (IDOC) system	Allows nonencrypted system EMI/EMP immunity. Improved security
Surveillance Submarines		Ability to hold up in corrosive sea environment High Sensitivity
UAV	Timbercon's products	Covert operation EMI/EMP Immunity
Airborne Platform Avionics	Fly-by-light system F-22 and RA-66: SDDN, VDDN	EMP/EMI immunity Weight/space savings
Radar	Phased array	Weight savings Capability to exploit parallelism of array
Shipboard	Information system Damage control system (in tandem with sensor network)	Weight/space savings Low cost EMI/RFI immunity Ability to hold up in corrosive sea environment High data rate No spark hazard Ability to service live cable

POF on UAV for signal paths



Security

- No electromagnetic fields are produced, eliminating the possibility of eavesdropping. Copper needs a conduit to eliminate this problem, enhancing the weight savings of POF.

Ruggedness

- POF is immune to short circuits and is resistant to chemical and nuclear effects. POF can also be run in damp and highly corrosive environments.

Maintenance

- Because POF carries no current, live cable may be service.

Installation

- Because POF does not produce heat or sparks, cable can be run in small, closed areas (including ammunition magazines or fuel points), with no special provisions for fire or explosion hazards.



Standardization

- ETSI TS 105 175-1-1 Published in Dec 2013: POF application requirements for HN.



- ETSI has approved an application requirements document:
 - How to use POF in home networking environment.
 - Linked to VDE v 0885-763 and CENELEC 50173-1 and 50173-4: European norm.
 - Linked to ETSI TS 105 175-1.
 - Standardization done in collaboration with Orange.
- IEEE is currently standardized as a new Ethernet PHY layer for Gigabit over POF: 1000BASE-RH.
 - Target applications: Automotive, Professional and Consumer
 - Speed: 1 Gbps over 40 meters or 15 meters with 4 in-line connectors
- ISO is currently being under standardization on TC22/SC31-32



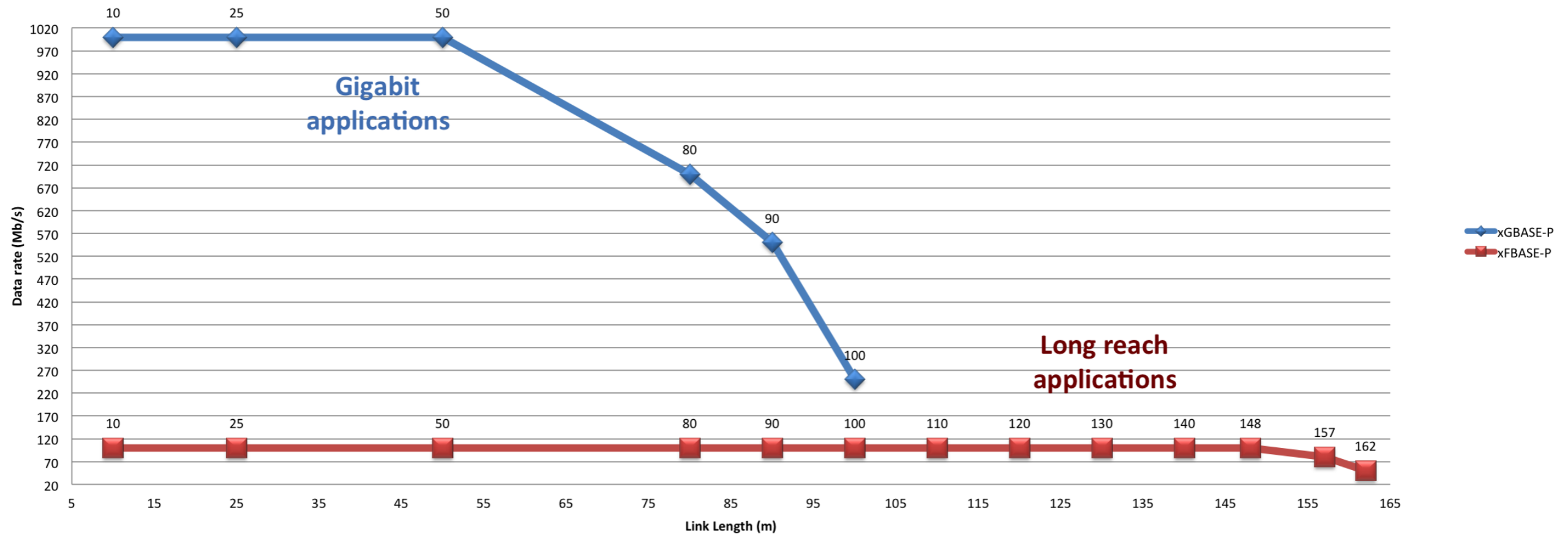


Performance

Performance: Adaptive Bit Rate



Adaptive Bit Rate

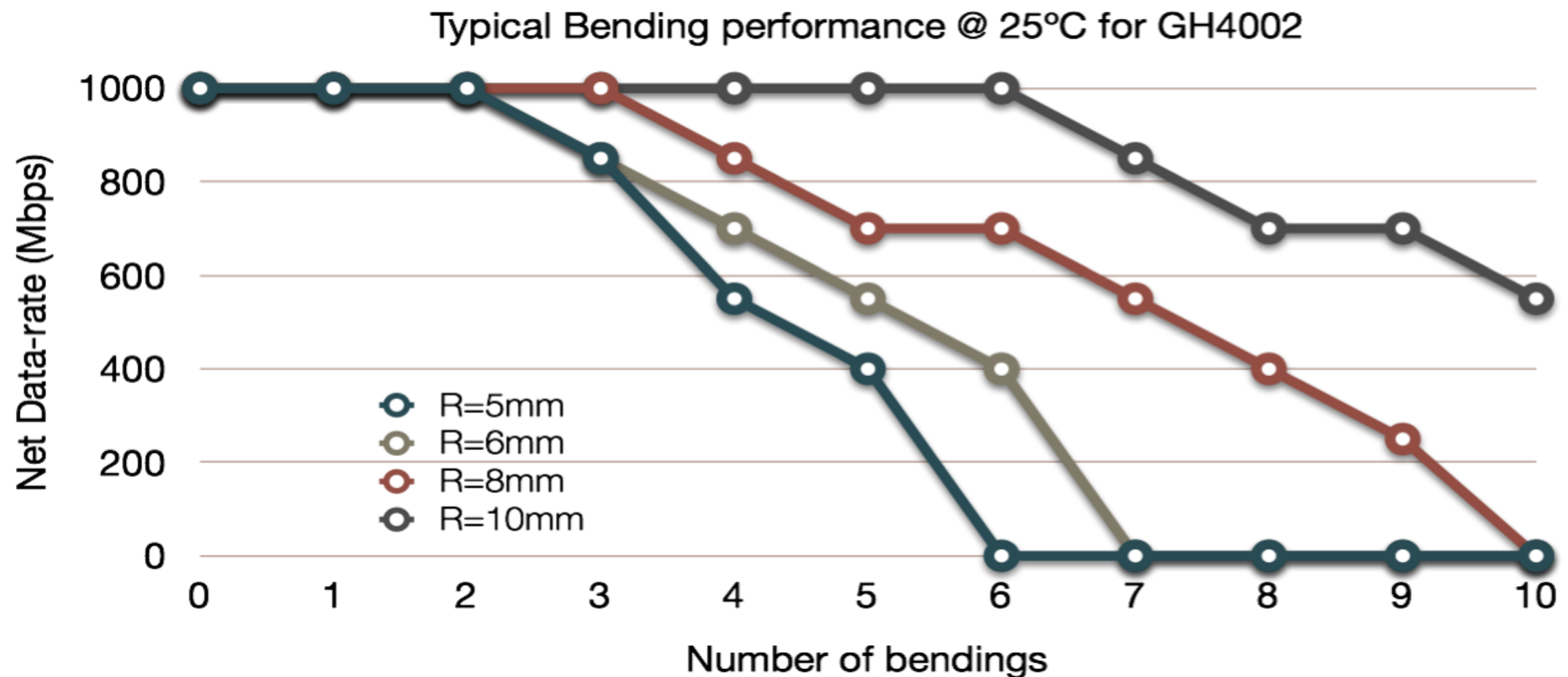


Performance: bending (single-core POF)



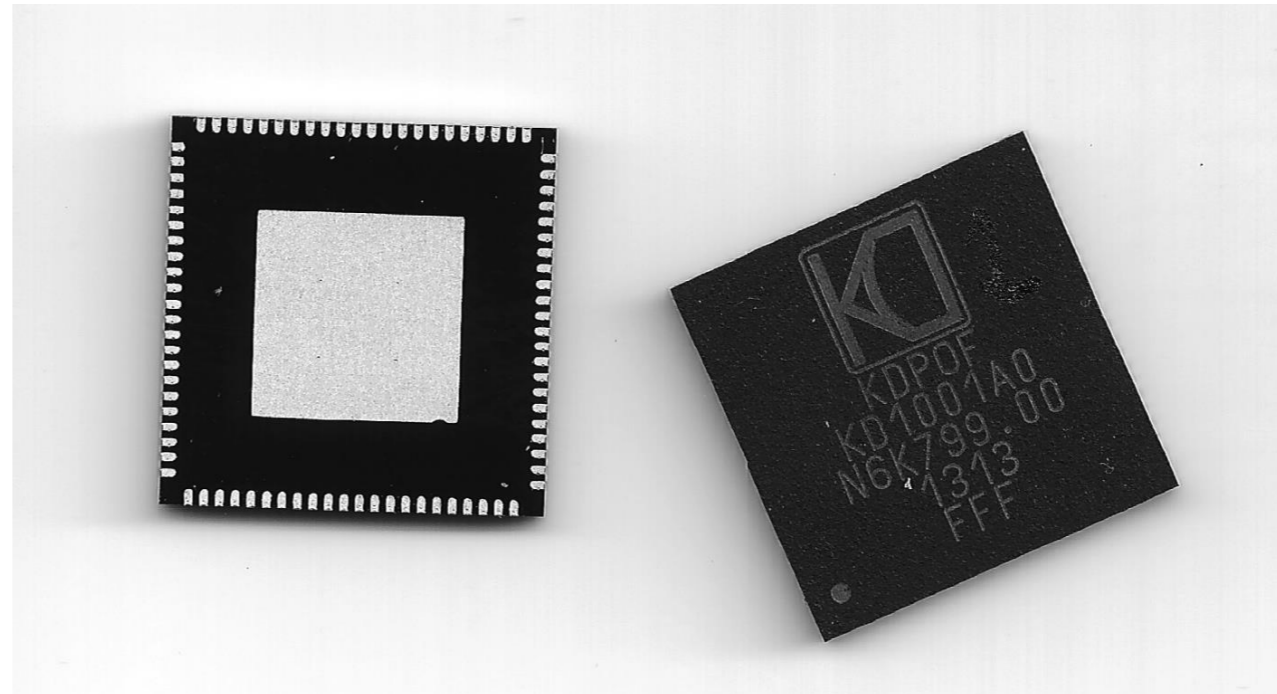
- TEST SETUP:

- LED OMA: 0 dBm.
- LED ER: 10 dBo
- POF Length: 50 m
- Temperature: 27 °C
- BER: 10^{-12}
- Bending: 90 ° / bend

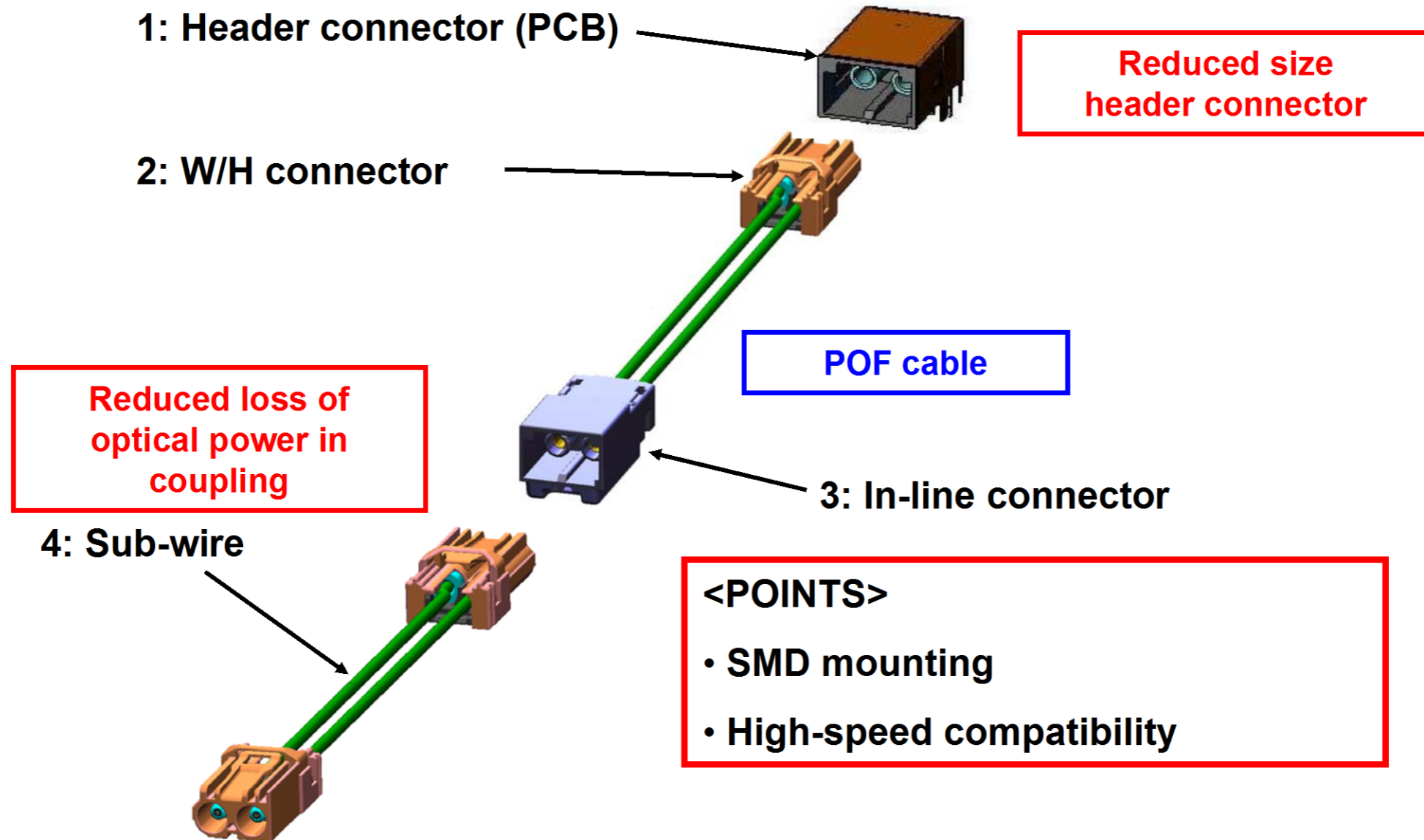




Components



Fiber and Connectors



Integrated Circuits Portfolio



Market	Product	Data Interfaces	Comments
Industrial	KD1011	RGMII, RMII, MII	Industrial grade and temperature range: -40°C to 85°C
	KD1012	SGMII, SerDes 100BASE-X	Optimized for long reach (100 Mbps, >100 m) applications
Automotive	KD105x	Ethernet (xGMII) P2P video (DVP)	Optimized for automotive quality grade, temperature range (-40°C to 105°C) and EMC Wake-up capability Real Time (time stamping, PTP, SyncE) support Full duplex over single POF operation mode ASIL>3 safety grade

Products for the Industrial/Professional markets

KD1011

- RGMII interface
- PHY and MAC operation
- 100BASE-FX backwards compatibility
- Industrial temperature grade

RGMII



KD1011

POF

Industrial

KD1012

- RGMII & SGMII interface. SFP ready
- 100BASE-FX backwards compatible
- Industrial temperature grade

SGMII



KD1012

POF

Optical Transceiver

- AVAGO Technologies analog POF transceiver provides the system designer with the ability to implement Gigabit Ethernet over 2.2mm jacketed standard POF
- Features
 - Similar form factor to the well-known RJ45 connector
 - Easy bare fiber termination solution for 2.2mm jacket POF
 - EMI/ EMC robust
 - Operating temperature range -40°C to 85°C
 - Single 3.3V power supply operation
 - Integrated optics to efficiently focus light for fiber coupling

