RF over Fiber System Market Study

A European Training Network

TERAOPTICS

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Motivation

- Conventional copper-based cabling suffers from
  - High loss
  - Heavy
  - Bulky
- Exploiting RF over fiber system benefits from
  - Low loss
  - Low weight
  - Compact
  - Immunity to EMI
  - Reconfigurability

Motivation

- Inherent KPIs for RF over fiber system
  - Broadband operation
  - High linearity
  - Hermetic packaging
  - **Low power consumption**
  - **Solderless integration**
  - **Multi-channel operation**

RFoF systems in the market can provide

Lacking features of the current RFoF systems in the market

Goal: Development of a low power consumption multi-channel RFoF system for Ka-band Intra-satellite links

List of RFoF System Providers

Company name	Country
ETL Systems	UK
Aaronia AG	Germany
APIC Corporation	USA
DEV Systemtechnik GmbH	Germany
Coherent	USA
Foxcom	Israel
Glenair	USA
HUBER+SUHNER	Switzerland
Microwave Photonic Systems	USA
Narda-MITEQ	USA
Octane Wireless	USA

Company name	Country
Optical Zonu	USA
Photonic Systems	USA
PPM Test	UK
Raditeq B.V.	Netherlands
RF SPIN	Czech Republic
RFOptic	Israel
Rover Instruments	Italy
Vectrawave	France
Vialite Communications	USA
BSRF	France
DEV Systemtechnik	Germany

List of RFoF System Providers

- Companies provide RFoF system with >30 GHz frequency range

Company name	Country
Microwave Photonic Systems	USA
Octane Wireless	USA
RFOptic	Israel

Benchmarking of RFoF Systems

Microwave Photonics Systems: MP-8001-40 Series Low NF Unamplified Microwave Fiber Optic Transmitter
https://www.b2bphotonics.com/products/optical-link-modules/

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https://www.b2bphotonics.com/products/optical-link-modules/

Microwave Photonics Systems: MP-8000-RX Series Microwave Fiber Optic Receiver
https://www.b2bphotonics.com/products/optical-link-modules/

Octane Wireless: PTX-030-500 and PRX-030-500
https://www.octanewireless.com/product/3-50-ghz-rf-over-fiber-link-ptx-030-500-prx-030-500/

RFoptics: 40GHz RF over Fiber Mini-Q High SFDR
https://rfoptic.com/data-sheets-2-2/

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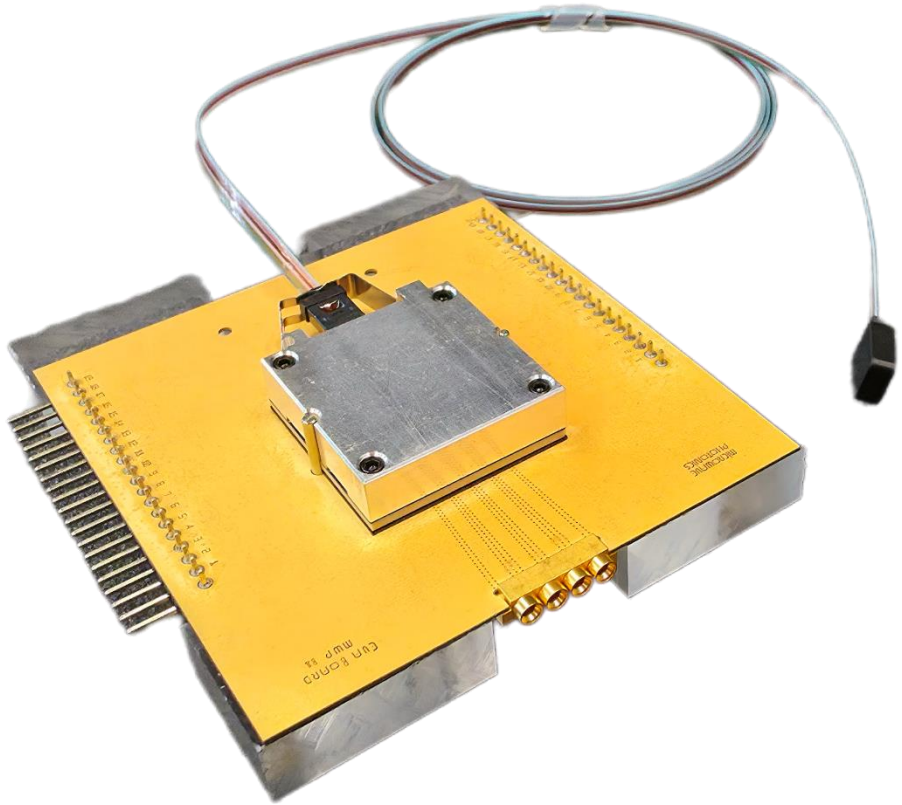
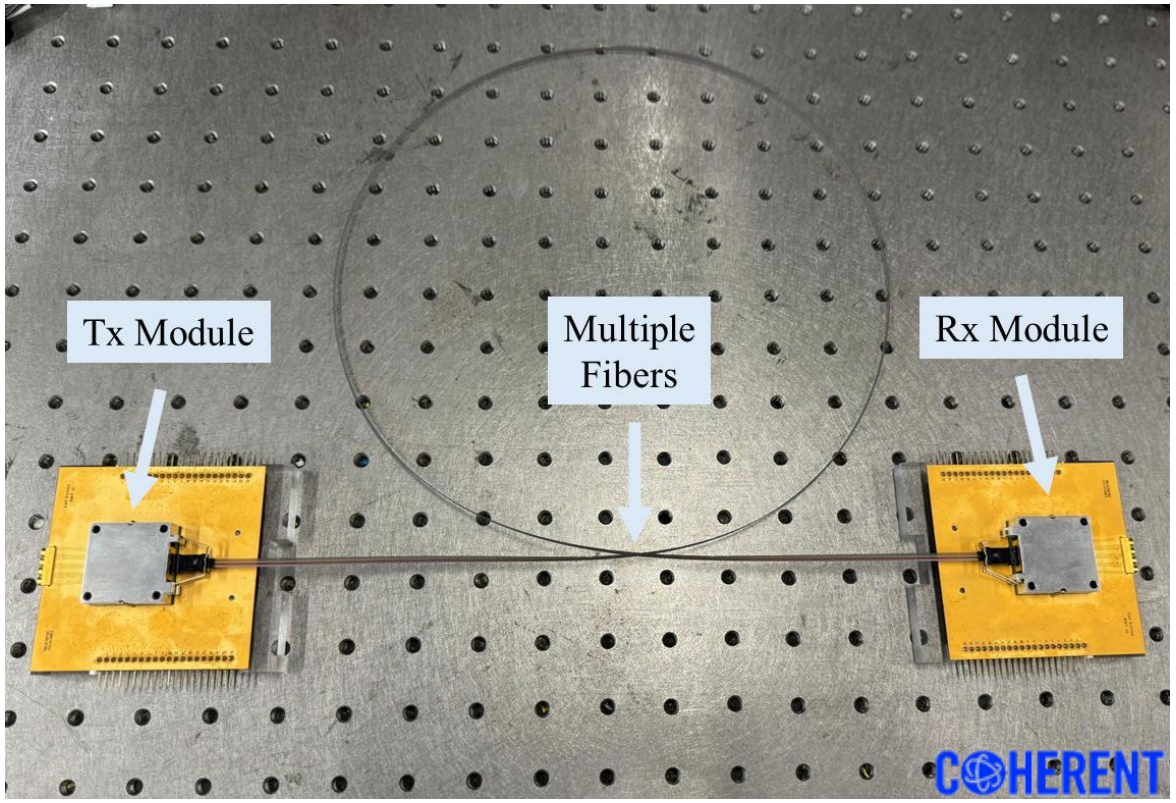
Developed RFoF System





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Benchmarking of RFoF Systems

Company name	Model	Number of channel	Operational wavelength (nm)	RF frequency range (GHz)	Link gain (dB)	Noise figure (dB)	SFDR (dB*Hz$^{2/3}$)	Power consumption per link (W)	Footprint per module (mm)	Weight per module (g)
Microwave Photonics Systems	MP-8001-40 Low NF Amplified Transmitter and MP-8000-RX Receiver Module	1	1550	0.5 - 40	0	17	108	14	165.1 × 50.8 (Tx) 127.0 × 50.8 (Rx)	-
Microwave Photonics Systems	MP-8001-40 Series Low NF Unamplified Transmitter and and MP-8000-RX Receiver Module	1	1550	0.01 - 40	-18	26	110	8	165.1 × 50.8 (Tx) 127.0 × 50.8 (Rx)	-
Octane Wireless	PTX-030-500 and PRX-030-500	1	1550	3 - 50	6	8	100	21.5	482.6 × 409.45 (Tx) 215.6 × 205.7 (Rx)	-
RFoptics	40GHz RF over Fiber Mini-Q High SFDR	1	1550	1 - 40	-27	33	112	3	75 × 154	450
Microwave Photonics GmbH (TERAOPTICS)	Multi-channel low power consumption RFoF modules	4	1310	0.01 - 32	0	43	83	<0.4	30 × 30	< 25

Summary

- RFoF system developed to replace copper-based cabling in intra-satellite links
- The developed system features
  - Drastically reduced power consumption
  - Small size
  - Low weight
  - Multi-channel operation

Key Parameters	
Power consumption per channel	< 0.4 W
Weight per module	< 25 g
Footprint per module	3x3 cm^2
Number of channel	4

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