

# MODEL Optiva OTS-2 Q/V-Band 60 GHz Unamplified Microwave Band Fiber Optic Links

emcore®



## Applications

- Microwave Antenna Signal Distribution
- Electronic Warfare (EW) Systems
- Broadband Delay Line and Signal Processing Systems
- Frequency Distribution Systems
- Radar System Calibration
- Phased Array Antenna Systems, Interferometric Antenna Arrays

## Features / Benefits

- 50 MHz -60 GHz - Eliminates the performance and cost penalty of block up/down conversion
- Low RIN Source Laser - Provides high dynamic range of  $>100 \text{ dB-Hz}^{2/3}$  sub-octave
- Microprocessor-Based Transmitter Control for Laser Bias, Modulator Bias & Link Gain - Provides consistent high performance operation and allows for modulator low-bias operation and higher SFDR
- Compatible with EMCORE's Modular Optiva Platform - Allows multiple format and frequency transport in a single chassis
- DWDM Operation - Increases transport capacity without increasing fiber count

## 50 MHz to 60 GHz Unamplified Microwave Transport System

The Optiva OTS-2 Q/V-Band 60 GHz Microwave Band transmitter and receiver are ideal to construct transparent fiber optic links in the 50 MHz to 60 GHz frequency range for antenna remoting, electronic warfare systems, broadband delay lines, signal processing systems and other high-dynamic-range applications.



Optiva microwave band transmitters and receivers are SNMP compliant. They can be housed in the same chassis and monitored by the same Network Management System (NMS) as other Optiva cards to support transport of multiple signal formats and frequency bands in a single flexible platform.

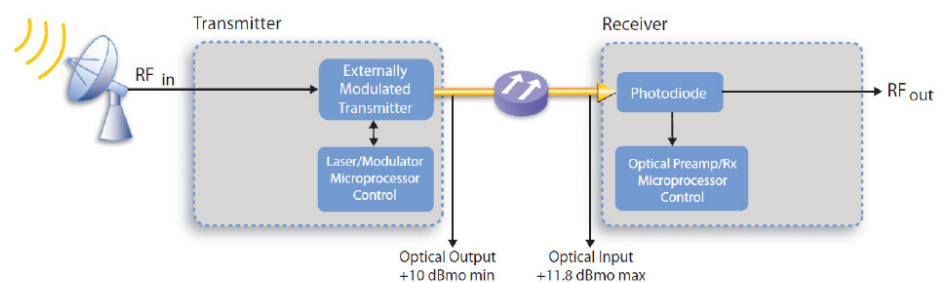
## System Design

The Optiva platform includes a wide range fiber optic transport products for satellite and microwave communications from 1 MHz to 60 GHz. These units can be used to construct transparent inter- and intra-facility links for RF and microwave signal transport, antenna remoting, electronic warfare systems and other high-dynamic-range applications.

optiva | PLATFORM

Optiva is a completely modular, hot-swappable platform. Both 19" rack-mount and compact tabletop, or wall-mountable enclosures are available. The 3 RU 19" rack-mount, fan-cooled enclosures Model OT-CC-16F can support up to 16 insert cards and utilize two dual-redundant, hot-swappable, 200 watt power supplies. The 1 RU 19" rack-mount, fan-cooled enclosure Model: OT-CC-6-1U can accommodate 6 insert cards and utilizes two hot-swappable 60 watt power supplies. Compact two-slot OT-DTCR-2 enclosures are also available that use an external wall-mount power supply.

## Block Diagram



\*50 Ohm "K" female connectors

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## Performance Highlights

Parameter	Min	Typical	Max	Units
Frequency Range	0.05	--	60	GHz
RF Input Power	--	--	20	dBm
Wavelength	--	1550	--	nm
Optical Output Power	9	--	11	dBm
Operating Temperature Range	-10	--	50	°C

## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the datasheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Units
Operating Temperature	T <sub>OP</sub>	-20	60	°C
Storage Temperature	T <sub>STG</sub>	-40	85	°C
RF Input	S <sub>in</sub>	--	25	dBm

## Transmitter & Receiver Optical Characteristics

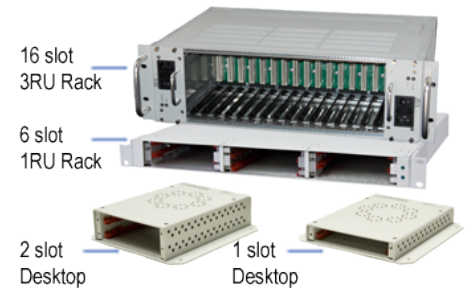
Parameter	Symbol	Condition	Min	Typical	Max	Units
Wavelength	$\lambda$	--	1530	1550	1562	nm
Optical Output Power	P <sub>L</sub>	--	9	10	11	dBm
Connector Return Loss	--	--	40	--	--	dB
Optical Connector Type	--	SC/APC	--	--	--	dBm
Receiver Optical Input Power	P <sub>in</sub>	--	--	--	+10	dBm
Receiver Responsivity	--	--	0.5	--	--	A/W

Note: In order to prevent reflection-induced distortion degradation, the laser should be connected to an optical cable having a return loss of at least 55 dB for discrete reflections and 30 dB for distributed reflections.

## Environmental Specifications

Parameter	Symbol	Min	Max	Units
Operating Temperature	T <sub>OP</sub>	-10	50	°C
Operating Humidity, Maximum Non-Condensing	--	--	95%	
Operating Altitude, Above Sea Level	--	--	6000	ft
	--	--	1828.8	m
Storage Temperature	T <sub>STG</sub>	-40	70	°C
Storage Humidity, Maximum Non-Condensing	--	--	95%	--
Storage Altitude, Above Sea Level	--	--	50,000	ft
	--	--	15,240	m

## Enclosure Options



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## Transmitter & Receiver RF Characteristics

Parameter	Symbol	Condition	Min	Typical	Max	Units
Operational Bandwidth*		--	0.05	--	60	GHz
RF Input Impedance		--	--	50	--	ohm
RF Return Loss		--	--	--	-6	dB
Amplitude Flatness Tx	$S_{out} - S_{in}$	Any 500 MHz 1 GHz - 60 GHz	-- --	-- --	2.5 10.0	dB, p-p
Amplitude Flatness Rx	$P_R - S_{out}$	Any 500 MHz 1 GHz - 60 GHz	-- --	-- --	3.5 10.0	dB, p-p
2nd Harmonic Suppression		RF Input 0 dBm	--	-70	-50	dBc
1 dB Compression Point		@20 GHz @40 GHz	+15 +15	--	--	dBm
RF Connector		1.85 mm (V) Female				

\*RF response below 50 MHz and above the maximum stated RF frequency is provided with degraded performance and not guaranteed.

\*\*Test point performance beyond the stated frequency range is provided; only the test point reference value tolerance may increase beyond the above stated +/- 1 dB

## DC Power Consumption - Max

Module Type	Input Voltage (VDC)	Max Current (@+70 oC)
Transmitter	+12	750 mA
Receiver	+12	750 mA

## Link Performance - 60 GHz Wideband

Parameter	Symbol	Condition	Min	Typical	Max	Units
RF Bandwidth	--	--	0.05	--	60	GHz
Link Gain (+10 dBm <sub>o</sub> Rx optical input)* <sup>^</sup>	G	@ 20 GHz	-29	--	--	dB
	G	@ 40 GHz	-33	--	--	
	G	@ 60 GHz	-41	--	--	
Link Gain (+0 dBm <sub>o</sub> Rx optical input)* <sup>^</sup>	G	@ 20 GHz	-49	--	--	dB
	G	@ 40 GHz	-53	--	--	
	G	@ 60 GHz	-61	--	--	
Noise Figure (+10 dBm <sub>o</sub> Rx optical input) <sup>^</sup>	NF	@ 20 GHz	--	--	35	dB
	NF	@ 40 GHz	--	--	39	
	NF	@ 60 GHz	--	--	47	
Input IP3 <sup>^</sup>	IIP3	@ 20 GHz	25	--	--	dBm
	IIP3	@ 40 GHz	25	--	--	
	IIP3	@ 60 GHz	25	--	--	
Spurious Free Dynamic Range <sup>^</sup>	SFDR	@ 20 GHz	-	100	--	dB-Hz <sup>2/3</sup>
	SFDR	@ 40 GHz	-	100	--	
	SFDR	@ 60 GHz	-	100	--	
Gain Variation	--	1 GHz - 60 GHz	--	--	20	dB
	--	Any 500 MHz	--	--	6	

\*Link Gain output will change 2 dB for every 1 dB of optical attenuation.

<sup>^</sup>Performance based on OTS-2T/K5 without EDFA unamplified, OTS-2R/K5 unamplified

# Optiva OTS-2 Q/V-Band 60 GHz Unamplified Microwave Band Fiber Optic Links



## Ordering Information: Transmitter

Transmitter
OTS-2T / K5-2.060-10-WW-XX-1-00-Z

- When ordering replace "WW" with one of the ITU Channel Options
- When ordering replace "XX" with one of the Optical Connector Options
- When ordering replace "Z" with one of the Enclosure Options

ITU Channel Options (THz / nm) "WW"	Optical Connector Options "XX"	RF Amplifier	Enclosure Options "Z"
Standard: 00 = non-ITU: 1520-1580 nm	SA = SC / APC FA = FC / APC EA = E2000 / APC	00 = No Amp	1 = Optiva Indoor Rack-Mount Installation
Optional: 22 = 192.2 THz/1559.79 nm 23 = 192.3 THz/1558.98 nm 24 = 192.4 THz/1558.17 nm 25 = 192.5 THz/1557.36 nm 26 = 192.6 THz/1556.56 nm 27 = 192.7 THz/1555.75 nm 28 = 192.8 THz/1554.94 nm 29 = 192.9 THz/1554.13 nm 30 = 193 THz/1553.33 nm 31 = 193.1 THz/1552.52 nm 32 = 193.2 THz/1551.72 nm 33 = 193.3 THz/1550.92 nm 34 = 193.4 THz/1550.12 nm 35 = 193.5 THz/1549.32 nm 36 = 193.6 THz/1548.51 nm 37 = 193.7 THz/1547.72 nm			2 = Optiva Outdoor MiniHub Installation

## Ordering Information: Receiver

Receiver
OTS-2R / K5-2.060-10-XX-00-1-1-00-Z

- When ordering replace "XX" with one of the Optical Connector Options
- When ordering replace "Z" with one of the Enclosure Options

Optical Connector Options "WW"	RF Amplifier	Enclosure Options "Z"
SA = SC / APC FA = FC / APC EA = E2000 / APC	00 = No Amp	1 = Optiva Indoor Rack-Mount Installation  2 = Optiva Outdoor MiniHub Installation

# Optiva OTS-2 Q/V-Band 60 GHz Unamplified Microwave Band Fiber Optic Links

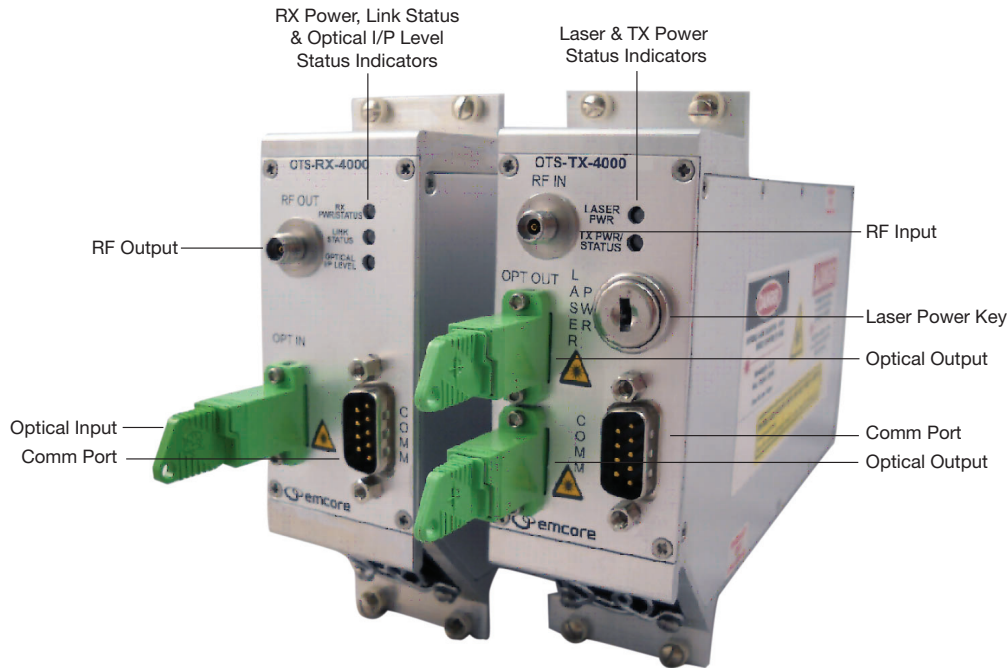
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## Mechanical Configuration

Each Transmitter and Receiver module occupies two slots in the EMCORE Optiva Chassis.

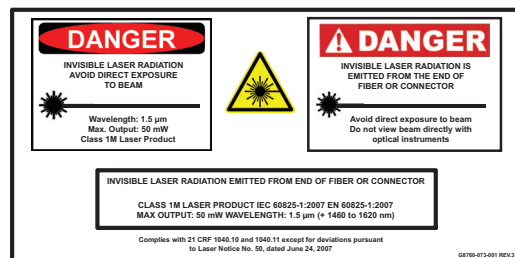


## Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. All versions of this laser are Class 1M laser product, tested according to IEC 60825-1:2007 / EN 60825-1:2007. An additional warning for Class 1M laser products. For diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example: eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. For collimated beams, this warning shall state that viewing the laser output with certain instruments designed for use at a distance (for example: telescopes and binoculars) may pose an eye hazard.

Wavelength = 1.3/1.5  $\mu\text{m}$ .

Maximum power = 30 mW.



\*Caution - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

\*IEC is a registered trademark of the International Electrotechnical Commission.

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