

Bi-directional Programmable 6.0GHz RF over Fiber System



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RFOptic’s bi-directional programmable RFoF system provides RF performance that is superior to coaxial cable interface. The system is composed of two terminals (B1, B2) that are connected to each other by single mode fibers (SMF). The system is tailored to the 5G cellular band and covers the entire 450MHz to 6GHz bandwidth. Each enclosure contains 4 RFoF terminals that use CWDM technology to route RF signal in both directions on a fiber connection. The bi-directional RFoF channels that are formed in this way provide excellent SFDR and are independently configurable. This flexibility of configuration and the sub-system remote management and control functionality through HTML/REST/SNMP interface allow the system to handle very different application requirements. Bi-directional link operation requires attention to loop gain as detailed in RFOptic’s Bidirectional System Loop Gain Application Note.

Key Features:

- Integrated and flexible bi-directional RFoF subsystem
- Full support for the 450MHz to 6.0GHz bandwidth.
- Excellent linearity, gain flatness, and gain control.
- Programmable RF and Optical performance.
- Built-in end-to-end diagnostics reduces installation and maintenance time.
- Integrated RF power sensors.
- Reduced gain variation over temperature option.
- Remote management and control via HTML/REST/SNMP interface

Configuration:

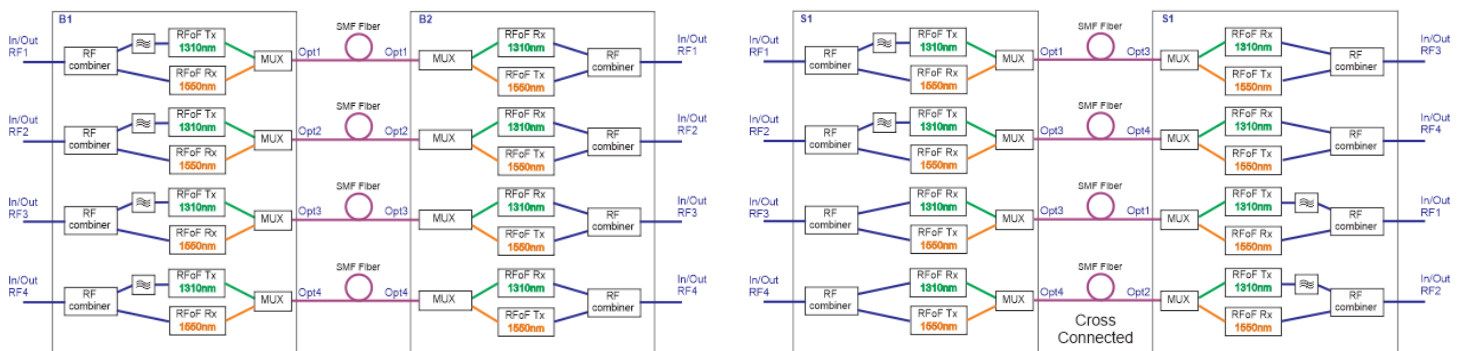
- Two 1U Indoor enclosures
- 4 bi-directional RF channels
- Outdoor Configuration is available

Both enclosures include are Tx and Rx RFoF terminal units. Each of these include LNAs and variable attenuators which can be used to customize the Noise Figure, Input P1dB, and IP3 over wide range of values. For special applications requiring RF temperature stability operation, a unique optional temperature compensation algorithm supports ± 0.5 dB over 100°C variation of the ambient temperature. The RFoF link has excellent gain flatness with 0.5dB gain adjustment and tracking between different links.

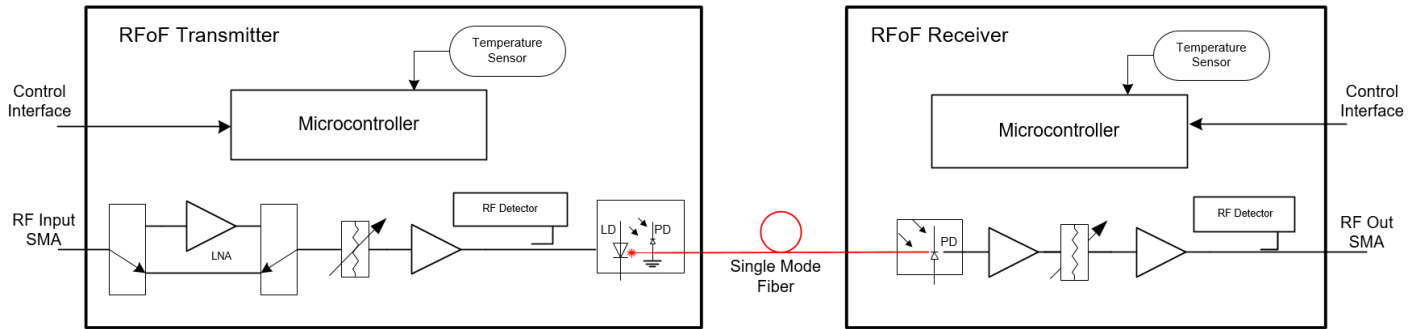
Applications:

- 5G test sites
- DAS
- Distributed Antenna

The Bi-directional Programmable 6.0GHz RF over Fiber System is comprised of two 19” 1U Bi-Directional enclosures: B1 and B2 or two S1. Each of the enclosures includes four (4) Bidirectional terminals. Each Bidirectional terminal includes Tx units, Rx units, optical mux (1310/1550nm) and combiners. B1 and S1 enclosures includes additionally RF filters to improve the loop gain isolation.



Each of the signals is transmitted over an RFoF programmable link. A simplified block diagram of such a link is shown below.



Bi-directional Programmable 6.0GHz RF over Fiber System Specifications

RF Performance	Unit	Specification
		LNA Off
Frequency Range	MHz	0.5 - 6000
Adjustable Bi-Dir Link Gain (nominal value) ^[1]	dB	-5
Input Power Range ^[2]	dBm	(-60) – (+5)
Tx/Rx Attenuators 0 to 31dB, 0.5 step ^[3]	dB	0.5
Gain Flatness	dB	±2.5
Input P1dBc ^[4]	dBm	8
Noise Figure ^[4]	dB	32
Calculated SFDR ^[4]	dB/Hz ^{2/3}	106
Max Input Return Loss	dB	-11
Max Output Return Loss	dB	-11
Maximum Input No damage	dBm	+20
Input / Output impedance	Ohm	50
Optical and Electrical		
Laser diode wavelength	µm	1.31 and 1.55
System Monitor & Control	-	HTML/REST/SNMP
Optical Power in the fiber	mw	3
Power	-	110/220 VAC
Mechanical and Environmental Parameters		
19" 1U Enclosure dimensions	mm	445(W)* 476(L)*44(H)
No of Bi-Dir links (terminals) ^[5]	-	4
RF Input / Output Connector	-	SMA
Optical Connectors	-	FC/APC or SC/APC
Power Connector	-	HP Socket
Data Connector	-	RJ-45
Operating temperature	°C	-20 to +70
Storage temperature	°C	-40 to +85
EMC and Safety ^[6]	-	CE & FCC

[1] The link Gain can be adjusted by the Tx/Rx Attenuators, using the user software, subject to the below operating instructions.

[2] This is the Input power range assuming 20MHz signal bandwidth and 9dB SNR.

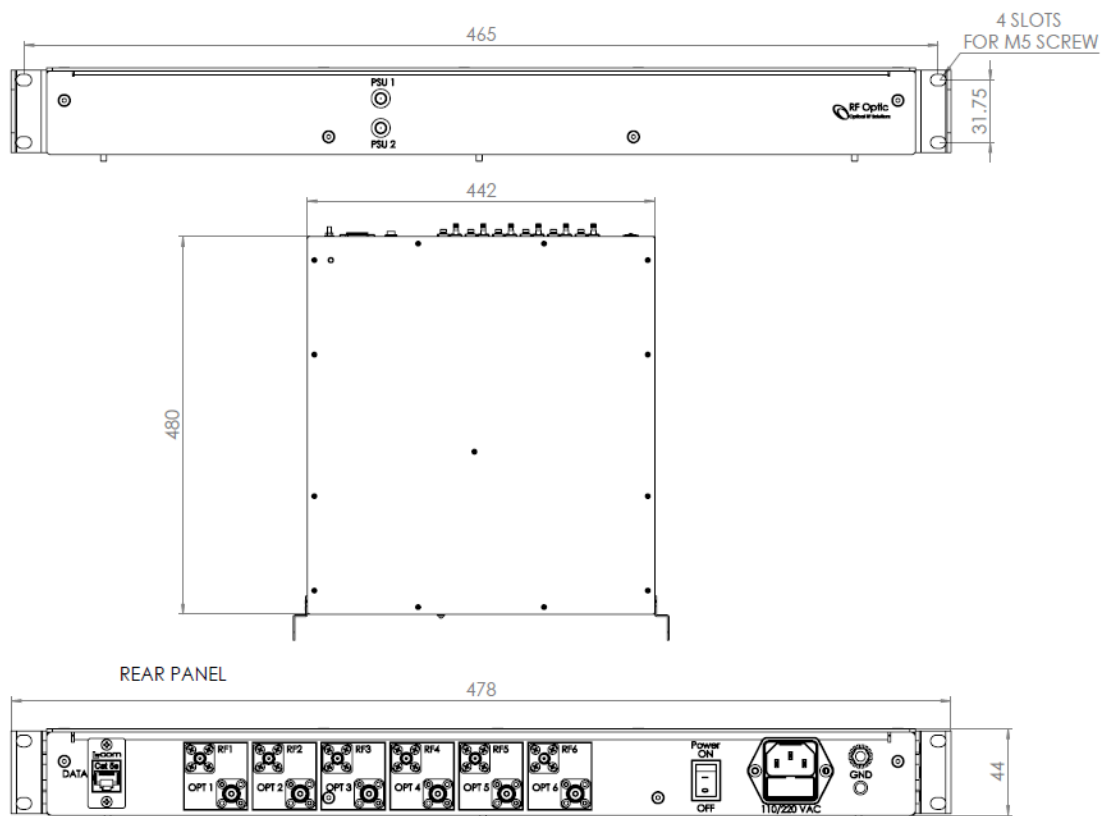
[3] Tx Attenuators are set to 0 dB during the manufacturing. Rx Attenuators are set to about 2dB to limit the Bi-Dir loop gain.

[4] Noise Figure and Input P1 dB are measured at 3.0GHz; It can be adjusted by using the Tx Attenuator and 'LNA Off/On'.

[5] Bidirectional RFoF System includes suitable RF Combiners and filters.

[6] Safety EN60950-1:2006(2nd); EMC: ETSI EN 300 386 v1.6.1 (2012-04) and FCC CFR-47 part 15 Sub part B.

19" 1U enclosure drawings



Generic drawing used for illustration purpose only

Ordering Information:

For custom configuration, define the following:

1. Enclosure type - 1U Generic
2. Upper Frequency - 6.0GHz
3. Number of bidirectional terminals - 4* bi-dir terminals
4. Communication type - HTML
5. Power - 220VAC
6. Optical connector - SC/APC
7. RF connector – SMA
8. Combiner & Filter / Combiner

Part Number	Description
RFoFc-I1SS4T4RIHNA06-B1	19" 1U Enclosure with 4*RFoF 6GHz bidirectional 1310nm terminals, 4*SMA, 4*SC/APC, 4*Combiners and 4*Filters, 4*1310/1550nm multiplexers, HTML, 220VAC
RFoFc-I1SS4T4RIHNA06-B2	19" 1U Enclosure with 4*RFoF 6GHz bidirectional 1550nm terminals, 4*SMA, 4*SC/APC, 4*Combiners, 4*1310/1550nm multiplexers, HTML, 220VAC
RFoFc-I1SS4T4RIHNA06-S1	19" 1U Enclosure with 4*RFoF 6GHz bidirectional 1310/1550 terminals: 2 terminals at 1310nm and 2 terminals at 1550nm, 4*SMA, 4*SC/APC, 4*Combiners and 2*Filters, 4*1310/1550nm multiplexers, HTML, 220VAC
RFoFc-I1SF4T4RIHNA06-B1	19" 1U Enclosure with 4*RFoF 6GHz bidirectional 1310nm terminals, 4*SMA, 4*FC/APC, 4*Combiners and 4*Filters, 4*1310/1550nm multiplexers, HTML, 220VAC
RFoFc-I1SF4T4RIHNA06-B2	19" 1U Enclosure with 4*RFoF 6GHz bidirectional 1550nm terminals, 4*SMA, 4*FC/APC, 4*Combiners, 4*1310/1550nm multiplexers, HTML, 220VAC
RFoFc-I1SF4T4RIHNA06-S1	19" 1U Enclosure with 4*RFoF 6GHz bidirectional 1310/1550 terminals: 2 terminals at 1310nm and 2 terminals at 1550nm, 4*SMA, 4*FC/APC, 4*Combiners and 2*Filters, 4*1310/1550nm multiplexers, HTML, 220VAC