

Programmable Phase Matched 6.0GHz RF over Fiber system



Key Features:

- Next generation RFoF system with significant performances improvement.
- Supports up to 6.0GHz.
- Phased matched CWDM system of $\pm 7.5^\circ$ from 0.5 MHz up to 6GHz
- Gain matched 6.0GHz full band of ± 2.5 dB
- Better linearity, excellent gain flatness, and Tx, Rx and Link gain control.
- Noise Figure down to 6 dB with LNA with MDS ~ 168 dB/Hz for very low incoming signals.
- Internal Microcontroller allows RF and Optical control, enabled by software.
- End-to-end diagnostics reduces installation and maintenance time, enabled by software.
- Gain variation S21 (fo) of ± 1 dB for 90° C variation, utilizing special algorithm.
- Remote management by GUI installed on PC.
- Impedances of 50 Ohms and 75 Ohm.
- Outdoor solution including IFL capability of control the remote side

Applications:

- Phased Array Radar
- Electronic Warfare
- Interferometry

RFOptic presents its new innovative controllable Phased Matched system RFoF product line.

RFOptic CWDM 6.0GHz RFoF 6 link system is phase matched up to $\pm 7.5^\circ$ up to 6.0GHz. Each of the six links is comprised of a Tx unit with LNA and an Rx unit, both with variable attenuators that enable adjustment of the Gain, Noise Figure, Input P1dB, and IP3 over wide range of values. The LNA can be activated through an RFoF software tool allowing RF input power MDS of -108 dBm @ 1MHz bandwidth. It is especially suitable for low signal wideband applications, with a low Noise Figure of 6dB. The RFoF link has excellent gain flatness with 0.5dB gain adjustment and tracking between different links. For special applications requiring temperature stability, a unique algorithm supporting 1 dB over 100°C has been developed. The DC power of the RFoF modules is flexible from 5 to 12 Volts.

A user-friendly RFoF software enables adjustment of the RF and Optical parameters, such as link gain, Noise Figure, P1dB, Optical power, LED indication and module information, either locally or remotely.

Furthermore, the RFoF link has full diagnostic capability including Tx, Rx and complete link test (Optical and RF). These features save cost of test equipment and provide real time diagnostic of any deployed link.

Programmable Phase Matched 6.0GHz RF over Fiber System Specifications:

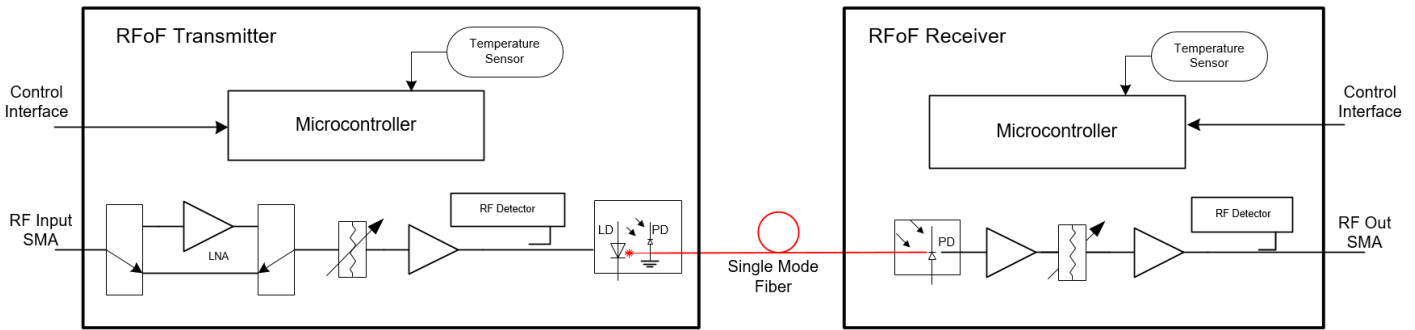
The following spec describes RFOptic system's parameters end to end including the following key features:

- 6 links with excellent phase match capability
- 4 links remote controlled amplitude matching
- Fully Remote Controlled and Monitoring including, RF and Optical monitoring, Gain adjustment, temperature compensation capability, and saving maintenance expenditures significantly.
- Excellent noise Figure of 6 dB.
- Frequency bandwidth of 500 KHZ to 6000 MHz

Electrical	Unit	CWDM System Specification LNA "OFF"	CWDM System Specification LNA "ON"
Frequency Range	MHz	0.5 - 6000	0.5 - 6000
Adjustable Link Gain (nominal value) ^[1]	dB	2	32
Attenuator 31 dB (Tx, Rx) ^[2]	dB	0.5	0.5
Gain Flatness	dB	±2.5	±2.5
Input P1 dB ^[3]	dBm	0	-33
Noise Figure ^[3]	dB	29	7
Phased matched up to 8 links with optical cable less than 100m ^[4]	deg	≤ ±7.5 ⁰	≤ ±7.5 ⁰
Phased matched up to 8 links with optical cable less than 1.5Km ^[4]	deg	≤ ±10 ⁰	≤ ±10 ⁰
Gain matched up to 8 links ^[4,5]	dB	≤ ±2.5	≤ ±2.5
SFDR ^[3]	dB/Hz ^{2/3}	102	100
Maximum Input No damage	dBm	20	20
Spurious	dBm	-90	-80
VSWR Input / Output	dBm	2:1	2:1
Input / Output impedance	Ohm	50	50
Optical and Electrical			
Laser diode wavelengths - 6 links	-	CWDM	CWDM
Optical Power in the fiber (per link)	mW	2.3 ±0.5	2.3 ±0.5
RF Monitoring Capability	-	Yes	Yes
System Monitor & Control - RF and Optical parameters	-	USB/SNMP/HTML/REST	USB/SNMP/HTML/REST
Mechanical and Environmental Parameters			
Operating temperature	°C	-20 to +80	-20 to +80
Storage temperature	°C	-40 to +85	-40 to +85
EMC and Safety ^[6]	-	CE & FCC	CE & FCC
Environmental & EMI/EMC Safety		CE, FCC, MIL-STD-461F, DO-160G & MIL-STD-810F	
Enclosure			
Enclosure		MIL Qualified (Ground / Airborne /Shipborne) Chassis. Any engineering customization can be done per customer requirement	
Fiber Description		1Km 8 Core Rodent Deterrent Outdoor Tactical Fiber Cable	

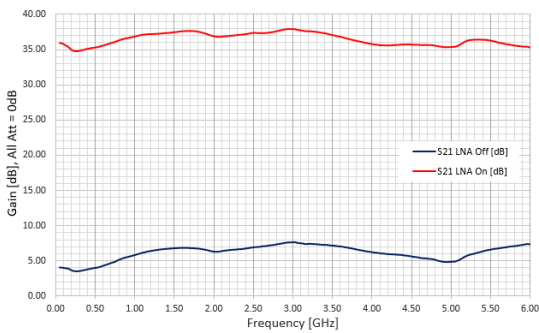
- [1] LNA 'ON' or 'OFF' is selected by RFOptic manufacturing, or by using the RFoF user software.
 [2] 'No Attenuation' is the default for Tx and Rx units. Attenuation values can be selected by the user software.
 [3] Noise Figure and Input P1dBc are measured at 3.0GHz, for both LNA Off and ON. Input IP3 and SFDR are calculated values.
 [4] For full frequency band up to 6.0GHz.
 [5] Using the Tx and/or Rx Attenuators.
 [6] Safety EN60950-1:2006(2nd); EMC: ETSI EN 300 386 v1.6.1 (2012-04) and FCC CFR-47part 15 Sub part B.

Programmable 6.0GHz RFoF – Simplified Block Diagram

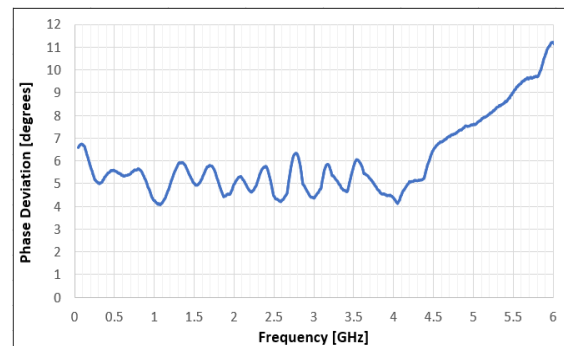


Programmable 6.0 GHz RFoF - Test Results

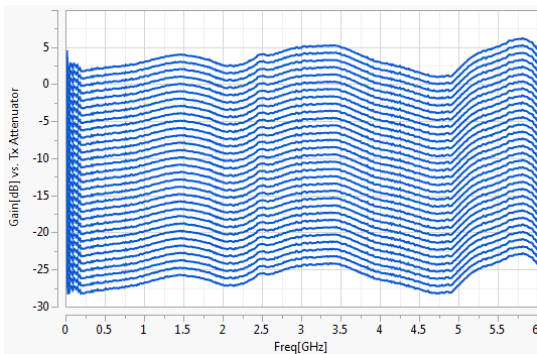
Gain vs. Freq. (S21), 6.0 GHz RFoF
'LNA Off' (bottom), 'LNA On' (top)



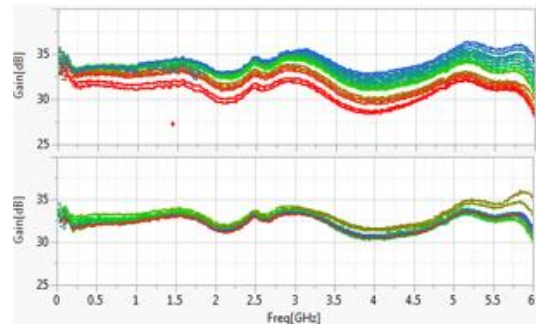
RFoF 6.0 GHz CWDM Relative Phase Error
for 6 links with 'LNA On'



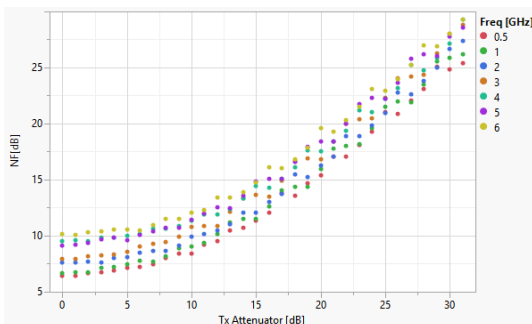
Gain vs. Tx Attenuation value: 0 to 31 dB in 1 dB step,
6.0 GHz RFoF for 'LNA Off' w/ similar behavior for 'LNA On'



Gain Variation over Temperature for -20 0C (blue) to +70 0C (red),
'LNA On' (i) without Compensation (top); (ii) with Compensation.
Similar behavior for Gain Variation over Temperature for 'LNA Off'



Noise Figure for 7 Freq. vs. Attenuator value, 6.0 GHz RFoF - 'LNA ON'



Input P1dBc at 7 frequencies, 6.0 GHz RFoF - 'LNA On'

