

# SITU3022/3122 .05-22 GHz Externally-Modulated Unamplified Transmitter



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## Applications

- Microwave Antenna Signal Distribution
- Broadband Delay Line and Signal Processing Systems
- Frequency Distribution Systems
- Radar System Calibration
- Phased Array Antenna Systems
- Interferometric Antenna Arrays

## Features

- 50 MHz - 22 GHz Frequency Range
- 7 dBm or 10 dBm Optical Output
- High-Dynamic-Range
- Fully Integrated Unit
- Bias Control Circuits for Laser and Modulator

The EMCORE SITU3022/3122 (Small Integrated Transmitter Unit) is a high-performance externally-modulated transmitter for applications from 50 MHz to 22 GHz. The SITU family is a fully-integrated unit that contains both the optics and the control electronics. Only DC input voltages and the RF signal are required for operation.

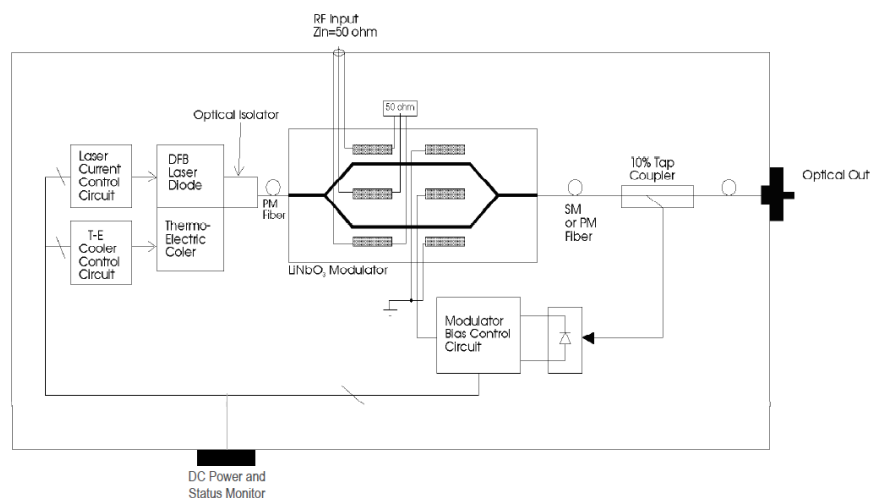
The broad bandwidth of the unit makes it ideal to construct transparent links for microwave antenna signal distribution, Electronic Warfare (EW) systems and satcom systems. Other applications include delay lines, signal processing, radar system calibration, phased array antennas and other systems where it is necessary to transport RF and microwave signals over long distances without signal degradation.

The system operates at a nominal optical wavelength of 1550 nm. Wavelength selected lasers on the ITU grid are also available for WDM applications.

## Performance Highlights

Parameter	Min	Typical	Max	Units
Frequency Range	.05	-	22	GHz
RF Input Power	0	-	+25	dBm
Wavelength	-	1550	-	nm
Optical Output Power				
SITU3022	7	8	9	dBm
SITU3122	10	11	12	dBm
Temperature Range	-40	-	70	°C

## Block Diagram



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## 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 data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Units
Operating Temperature (within specifications)	$T_{OP}$	0	50	°C
Operating Temperature (with degraded performance)	$T_{OP}$	-40	70	°C
Storage Temperature	$T_{STG}$	-40	70	°C
RF Input (damage level threshold)	$S_{IN}$	NA	25	dBm
Receiver Optical Input Power (damage level threshold)	SIRU3000	NA	+13	dBm

## Optical Specifications

Parameter	Symbol	Condition	Min	Typical	Max	Unit
Wavelength	$\lambda$	-	1530	1550	1562	nm
Optical Output Power	$P_L$	SITU3022 Version	7	-	9	dBm
		SITU3122 Version	10	-	12	dBm
Transmitter Source Laser RIN	-	-	-	-165	-163	db-Hz
Connector Return Loss	-	-	60	-	-	dB
Optical Connector Type	-	SC/APC	-	-	-	-

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.

## Transmitter RF Specifications

Parameter	Symbol	Condition	Min	Typical	Max	Unit
Operational Bandwidth		SITU Version	0.05	-	22	GHz
RF Input Impedance		-	-	50	-	$\Omega$
RF Return Loss		-	9	20	-	dB
Transmitter Gain (@ +7 dBm Optical)	TG	@ 10 GHz	22	18	-	dB
		@ 22 GHz	24	21	-	dB
Transmitter Gain (@ +10 dBm Optical)	TG	@ 10 GHz	16	12	-	dB
		@ 22 GHz	18	15	-	dB
2nd Harmonic Suppression	IP2	RF Input 0 dBm	60	70	-	dBc
1 dB Compression Point		@ 10 GHz	+13	+15	-	dBm
		@ 13 GHz	+13	+15	-	dBm
		@ 18 GHz	+13	+17	-	dBm
		@ 22 GHz	+15	+19	-	dBm
RF Connector		SITU3x22 Version K (Female) - 2.9 mm	-	50	-	ohm

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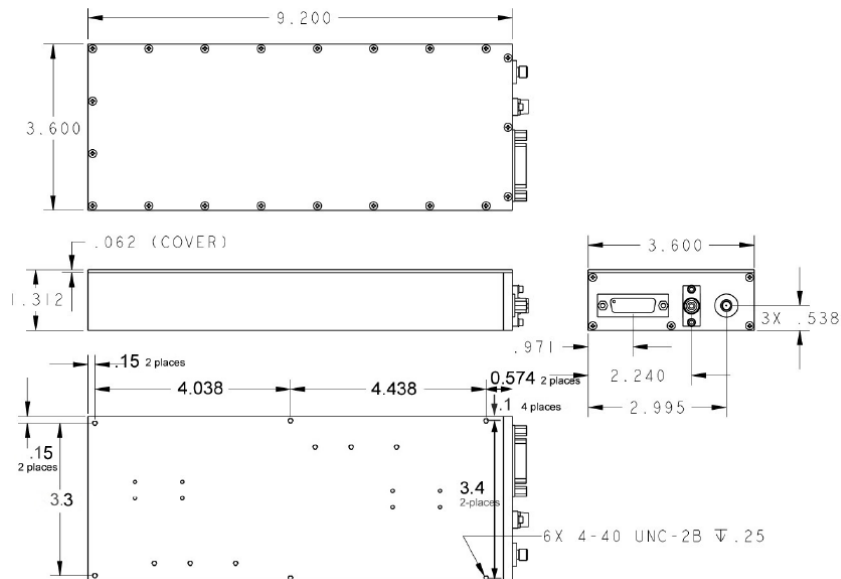
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## Broadband Link Performance

SITU3022 transmitter @ quadrature bias with 0 dBm RF input and SIRU3022 receiver with +7 dBm and +10 dBm optical input

Parameter	Symbol	Condition	Min	Typical	Max	Unit
RF Bandwidth	-	-	0.05	-	22	GHz
Link Gain (+7 dBm Rx Optical Input)		@ 10 GHz	-34	-30	-	dB
		@ 22 GHz	-36	-33	-	dB
Link Gain (+10 dBm Rx Optical Input)		@ 10 GHz	-28	-24	-	dB
		@ 22 GHz	-30	-27	-	dB
Noise Figure (+7 dBm Rx Optical Input)		@ 10 GHz	40	39	-	dB
		@ 22 GHz	43	45	-	dB
Noise Figure (+10 dBm Rx Optical Input)	NF	@ 10 GHz	37	36	-	dB
		@ 22 GHz	40	42	-	dB
Input IP3	IIP3	@ 10 GHz	-	+23	-	dBm
		@ 22 GHz	-	+28	-	dBm
Spurious Free Dynamic Range	SFDR	@ 7 dBm Rx Optical	101	106	-	dB-Hz <sup>2/3</sup>
		@ +10 dBm Rx Optical	104	109	-	dB-Hz <sup>2/3</sup>
Gain Variation		1 GHz to 22 GHz	-	5	10	dB

## Package Outline



# SITU3022/3122 .05-22 GHz Externally-Modulated Unamplified Transmitter

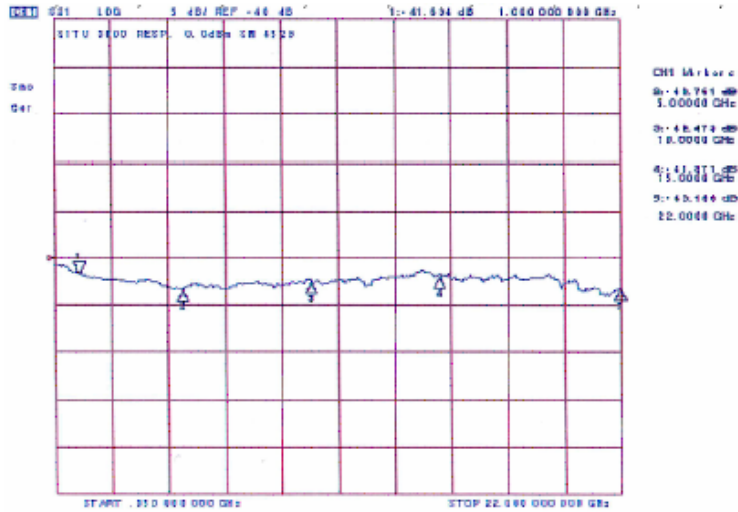


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## SITU3022/3122 Typical S21 Frequency Response

SITU3022 transmitter with 0 dBm RF input and SIRU3022 receiver with 0 dBm optical output.



## D-Connector Pin Out

Pin	Function	Comments
1	+15 VDC	
2	-15 VDC	
3	+5 VDC	
4	-5 VDC	
5	Laser Current Monitor	1 V/A
6	Optical Power Monitor	0.25 V/mW
7	Reserved for Factory Use	
8	Reserved for Factory Use	
9	Tx Power Control	0 V off; 5 V on
10	NC	
11	NC	
12	GND	
13	GND	
14	GND	
15	Reserved for Factory Use	

## Physical Parameters

Parameter	Condition	Min	Typical	Max	Unit
Configuration	Self Contained Housing	-	-	-	-
Dimensions	1.3 H x 3.6 W x 9.2 D	-	-	-	in
	33 H x 91.4 W x 233.7 D	-	-	-	mm
Operating/Storage Temperature		-40	-	+70	°C
Weight		-	29	-	oz
			822.14		g

## DC Power Consumption

Input Voltage	Max Current
+5	2 A
+15	0.1 A
-5	0.4 A
-15	0.1 A

# SITU3022/3122 .05-22 GHz Externally-Modulated Unamplified Transmitter

## Ordering Information

### Transmitter Modules:

Product Name	Description
SITU3022-00	0.05 - 22 GHz Externally-Modulated Fiber Optic Transmitter Module, 7 dBm Optical Output
SITU3122-00	0.05 - 22 GHz Externally-Modulated Fiber Optic Transmitter Module, 10 dBm Optical Output

### Receiver Modules:

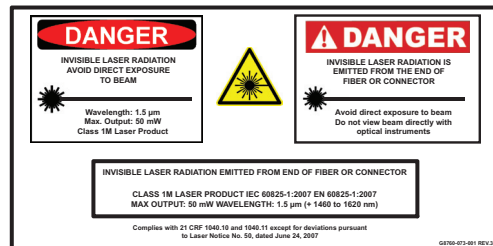
Product Name	Description
SIRU3022	0.05 - 22 GHz Fiber Optic Receiver Module

## Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191. 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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