



FEATURES

- Full C-Band Reference Transmitter
- Up to 12.5 Gb/s DPSK, NRZ
- Analog modulation up to 10 GHz
- Reliable & reproducible measurements
- High eye diagram stability

APPLICATIONS

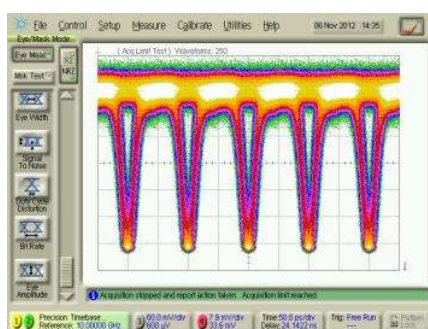
- Transmission system test
- Components characterization
- Production test
- R&D laboratories

The ModBox-CBand-12.5Gb/s-DPSK is an optical modulation unit that generates high performance DPSK and NRZ optical data streams up to 12.5 Gb/s, and analog modulation up to 10 GHz. The equipment incorporates a modulation stage based on a high data rate LiNbO₃ Mach-Zehnder modulator, coupled with a high performance RF driver and an automatic bias control circuitry. It can also receive an internal tunable laser source.

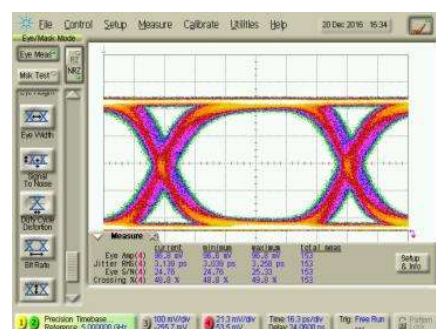
The ModBox-CBand-12.5Gb/s-DPSK provides R&D and production engineers with state of the art performance and the peace of mind of a turn-key instrument. It can be used as a reference transmitter in optical telecommunications laboratories, or in production test beds.

Performance Highlights

Parameter	Min	Typ	Max
Operating wavelength	-	C-Band	-
Modulation format	DPSK and NRZ / Analog		
Modulation bandwidth	12.5 Gb/s / 10 GHz		

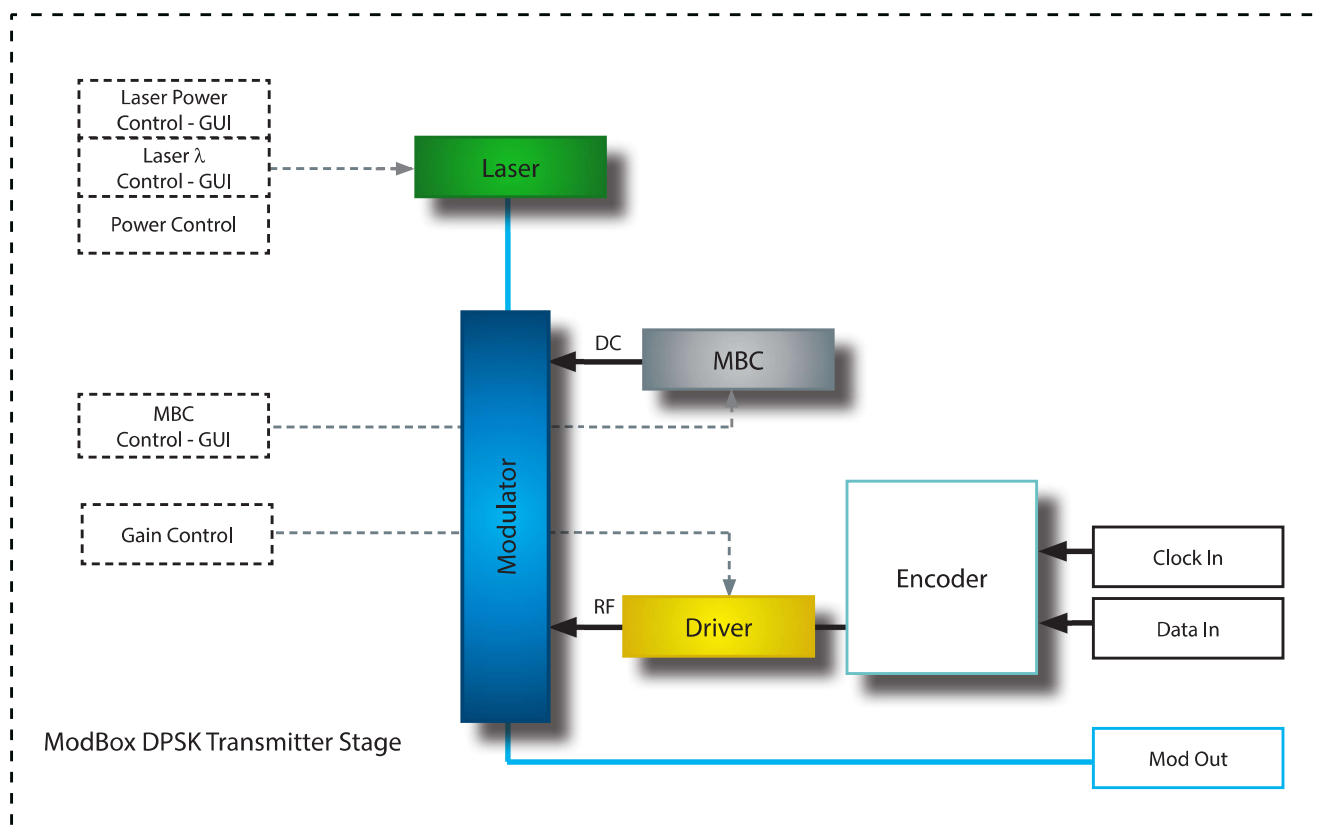


10 Gb/s Optical DPSK Eye Diagram



10 Gb/s Electrical Demodulated Eye Diagram

Functional Block Diagram



The ModBox-CBand-12.5Gb/s-DPSK integrates:

- a high bandwidth, chirp-free, X-cut LiNbO₃ Mach-Zehnder modulator,
- a high bandwidth NRZ RF driver with gain level adjustment for eye diagram optimization,
- a bias control circuit to lock the Mach-Zehnder modulator and ensure a highly stable output optical signal,
- an optional laser source, DFB or tunable type, with its high precision driver that allows control of output power,
- an optional electrical encoder.

Input Electrical Specifications User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Data-rate	PRBS	NRZ	0.1	-	12.5	Gb/s
Data input voltage	Data _{IN}	NRZ ⁽¹⁾	0.400	0.450	0.500	Vpp
		Analog mode ⁽¹⁾	-	0.125	0.150	Vpp
Jitter	J _{RMS}	-	-	1	1.2	ps
Rise / fall time	t _r / t _f	20 % - 80 %	-	40	-	ps
Clock input voltage	Clock _{IN}	Analog signal	-	0.500	-	Vpp

(1): AC coupled - 50 Ω - Single ended

Modulated Output Optical Specifications Specifications below are given with embedded 1550 nm

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Embedded laser type	-	-	Tunable			-
Wavelength	λ	-	1527.60	-	1565.50	nm
Wavelength accuracy	Δλ _{acc}	-	-1.5	-	1.5	GHz
Spectrum linewidth	Δλ	FWHM @-3 dB, instantaneous	-	-	100	kHz
Optical output power	Mod Out	Modulated signal	7	10	-	dBm
Data-rate	Mod Out	DPSK, NRZ modulation schemes	0.1	-	12.5	Gb/s
Analog	Mod Out	Analog modulation	0.1	-	10	GHz
Dynamic Signal to Noise Ratio	SNR	NRZ	-	20	-	dB
Dynamic extinction ratio	ER	NRZ	-	12	-	dB
Added RMS jitter	J _{RMS}	NRZ	-	1.2	-	ps
Rise / fall time	t _r / t _f	20 % - 80 %	-	40	-	ps
Electrical Return loss	ORL	-	-40	-45	-	dB

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	Unit
Data input voltage	Data _{IN}	-	1	Vpp
Clock input voltage	Clock _{IN}	-	1	Vpp

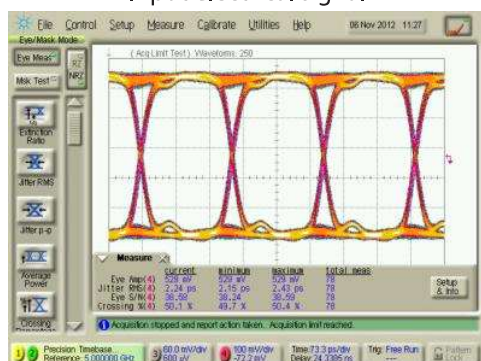
Modulated DPSK Eye Diagrams from ModBox Transmitter

The following equipment was used in obtaining these results :

- Agilent Infinium DCA 86100B
- Anritsu synthesizer MG3694C
- Anritsu Signal Analyzer MP1800A
- Photodiode finisar XPDV2320R

5 Gb/s data rate

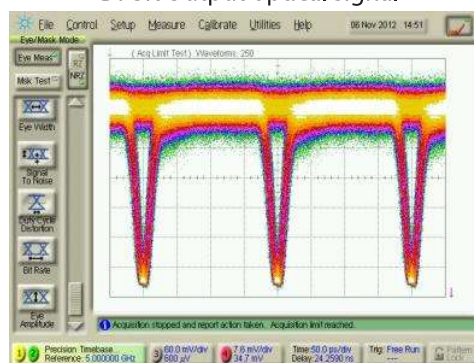
Input electrical signal



Eye Amp = 529 mV
Jitter RMS = 2.2 ps
Eye S/N = 38

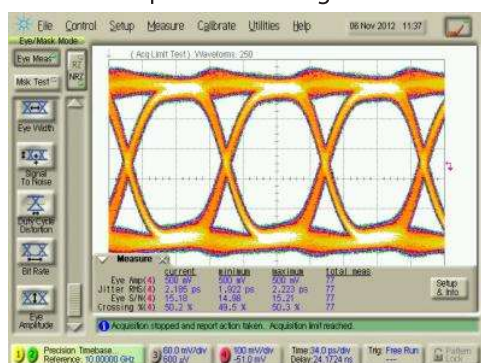
Jitter p-p = 11 ps
Rise time (10/90) = 42 ps
Fall time (10/90) = 44 ps

DPSK Output optical signal



10 Gb/s data rate

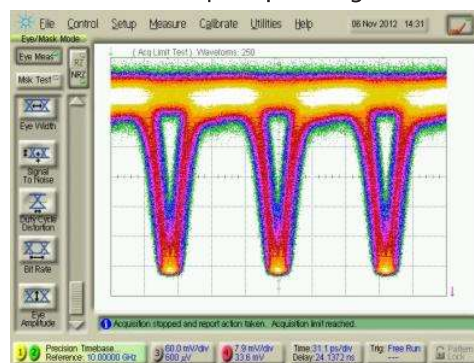
Input electrical signal



Eye Amp = 500 mV
Jitter RMS = 2.18 ps
Eye S/N = 15

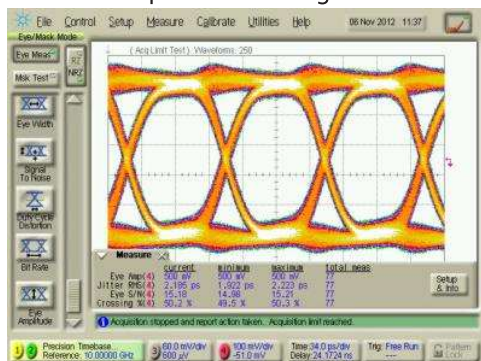
Jitter p-p = 12 ps
Rise time (10/90) = 43 ps
Fall time (10/90) = 38 ps

DPSK Output optical signal



12 Gb/s data rate

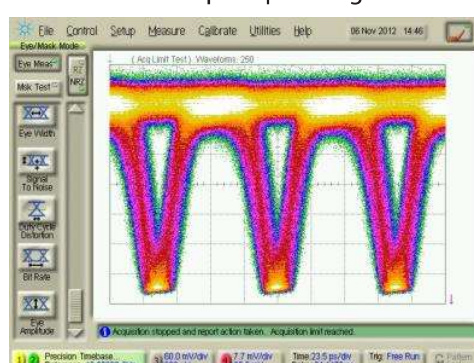
Input electrical signal



Eye Amp = 500 mV
Jitter RMS = 2.18 ps
Eye S/N = 15

Jitter p-p = 12 ps
Rise time (10/90) = 43 ps
Fall time (10/90) = 38 ps

DPSK Output optical signal



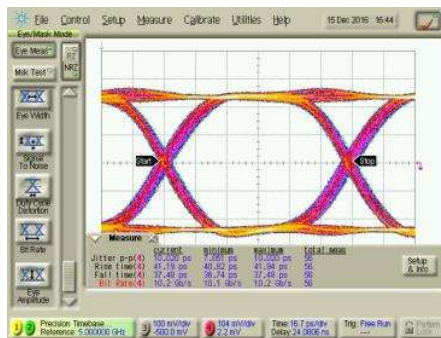
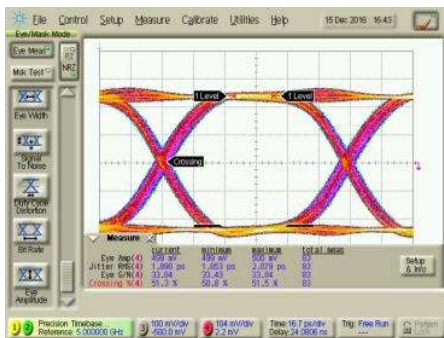
Modulated NRZ Eye Diagrams from ModBox Transmitter

The following equipment was used in obtaining these results :

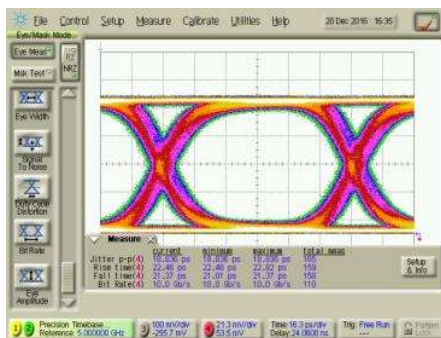
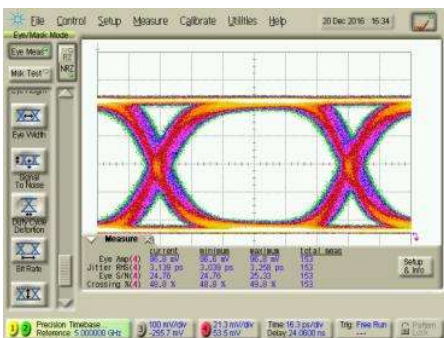
- Agilent Infinium DCA 86100B
- Anritsu Signal Analyzer MP1800A
- Photodiode finisar XPDV2320R

10 Gb/s data rate

Electrical input PRBS31 10 Gb/s



Optical Output Eye Diagrams - 10 Gb/s NRZ



Interfaces, Dimensions and Compliance

Interfaces	
Optical output fiber	Polarization maintaining fiber, PM1550
RF input	Single SMA female RF connector - 50 Ω
Control	Smart Interface (front panel), GUI (Ethernet)
Power supply	100-120V/220-240 automatic switch 50-60Hz (Rear panel)
Dimensions / Weight	Rack 19" x 3U, Depth=495mm / 5 kg



Ordering information

ModBox-CBand-12.5Gb/s-DPSK

CBand = Full band of operation, embeds laser, C-Band Tunable laser
NRZ and DPSK modes: up to 12 Gb/s - Analog mode : 10 GHz

About us

ixblue Photonics produces specialty optical fibers and Bragg gratings based fiber optics components and provides optical modulation solutions based on the company lithium niobate (LiNbO₃) modulators and RF electronic modules.

ixblue Photonics serves a wide range of industries: sensing and instruments, defense, telecommunications, space and fiber lasers as well as research laboratories all over the world.