

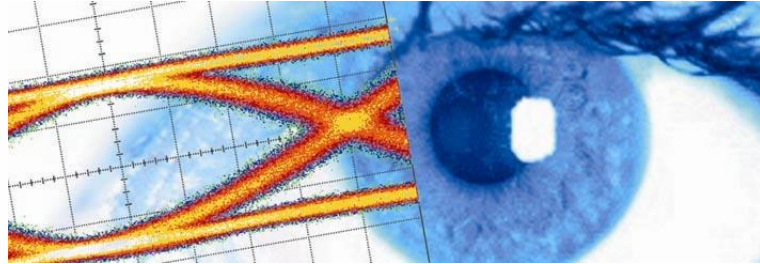


## SHF Communication Technologies AG

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# Datasheet

## SHF 46214 D

### Optical DQPSK Transmitter

### 100 GBit/s



## Description

The SHF 46214 D is an optical DQPSK transmitter unit. It is a field replaceable plug-in module which needs to be installed in a mainframe type SHF 10001 B or SHF 10000 C. Together with other plug-in modules from this instruments series, a modular and scalable measurement system can be put together.

In a DQPSK (Differential Quadrature Phase Shift Keying) transmission system, the data is transmitted in the differential optical phase change between the symbols. The data is encoded in four different phase states. Since one transmitted symbol includes the information of two bits the symbol rate is reduced by the factor  $\frac{1}{2}$ . Therefore one advantage of a DQPSK transmission system is a high spectral efficiency.

The 2 electrical input data streams are amplified and shaped by a set of 60 GHz drivers. These signals are fed to thermally stable Lithium Niobate Mach-Zehnder modulator which includes a nested MZI-structure. Before superposition of the two light streams inside the nested MZI, the Q part gets  $\pi/2$  shifted in order to have four different phase states in the transmitted signal.

The SHF 46214 D does not require a clock signal.

The 2 data channels can be switched On and Off independently, thus permitting to generate either DPSK or DQPSK signals.

To detect and to demodulate either the I or the Q channel, our 50 Gbps DPSK optical receiver SHF 47214 A is the ideal instrument. It is possible to switch between the I and the Q channel for eye analysis or BER measurement of both channels separately.

For a BER measurement the SHF 12103 A or 12104 A Bit Pattern Generator provides the Data and Data-inverted outputs for the I and Q data streams.

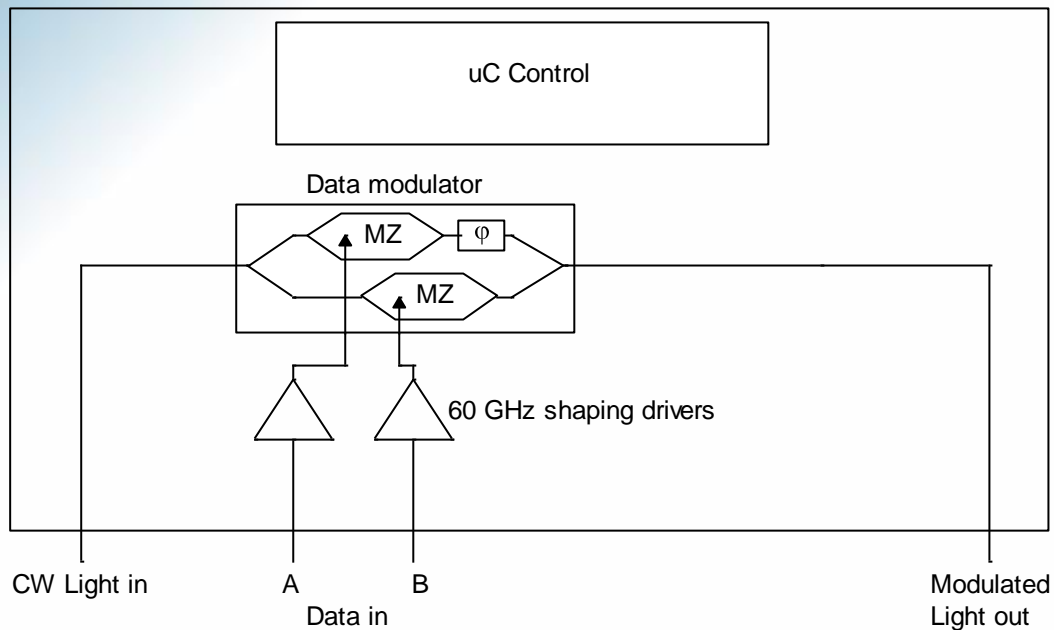
The temperature stable modulator and an automatic bias circuit for the data channels ensure high stability of the output signal.

## Features

- Up to 108 Gbps (54 GSymbol/s) optical data streams
- Separate analysis of I and Q channel possible
- Quick optimization of optical eye diagram performance by user adjustable modulator bias control
- All features computer controlled
- All modulators' bias conditions controlled automatically
- Selectable automatic and manual bias control (ABC circuit)



## Functional block diagram



## Specifications – SHF 46214 D

Parameter	Unit	Min.	Typ.	Max.	Comment
<b>Optical parameters</b>					
Wavelength range		C- and L-band			
Insertion loss	dB		8	10	connector to connector, maximum transmission without modulation
DC Extinction ratio	dB		20		
Return loss	dB		30		without optical connector
<b>Electrical and electro-optical parameters</b>					
Electro-optical bandwidth of Data modulator	GHz	25			-3dB electrical
Symbol rate	Gsym/s	5		54	
Electrical input return loss	dB			-10	
Electrical input level	Vpp	0.3		0.8	
Dynamic signal to noise ratio DPSK-mode, either Data A or B		10	12		measured with SHF 47214A DPSK-receiver @ 50 Gbps.



## Absolute maximum ratings

Parameter	Unit	Min.	Typ.	Max.	Conditions
Optical input power	dBm			16	
Electrical data input power	dBm			4	NRZ data

## General specifications

Parameter	Unit	Min.	Typ.	Max.	Conditions
Weight	kg		3.3		
Dimensions	mm		59x213x450		w/o Frontpanel - Connectors
Power consumption	W		20.5		
Operating temperature	°C	10		35	
Electrical data input connectors					male K (2.92mm)
Optical connectors			FC/PC		FC/PC <sup>1</sup>

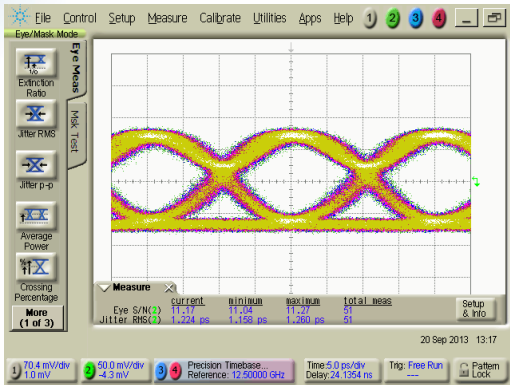
<sup>1</sup> Other connectors available on request



# Test Measurements

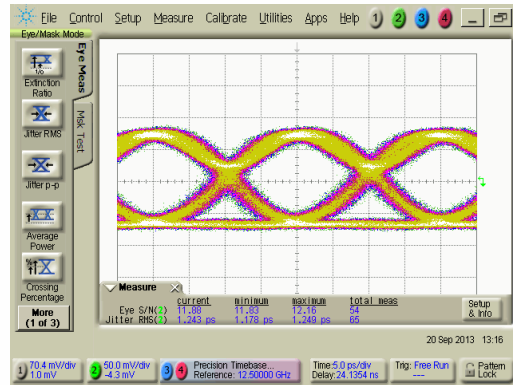
The following equipment was used in obtaining these results:  
 SHF12100 B Pattern Generator at 50 Gbps, PRBS 2<sup>31</sup>-1  
 SHF 1550DFB Laser source set to 15mW output power @ 1550 nm.  
 AMPAQ EDFA + bandpass filter  
 Agilent 86100A DCA with 70GHz plugin and precision timebase module  
 D(Q)PSK signals detected with SHF 47214A 50 GBit/s DPSK receiver

only Data A switched ON



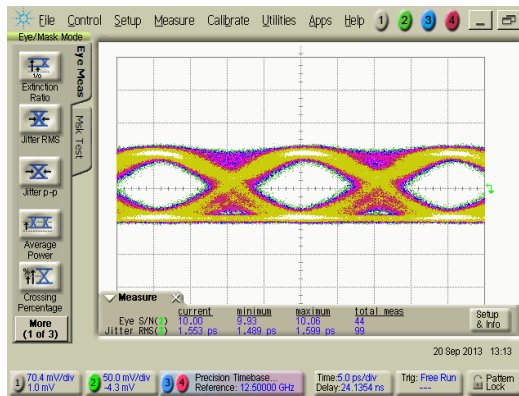
S/N: 11

only Data B switched ON



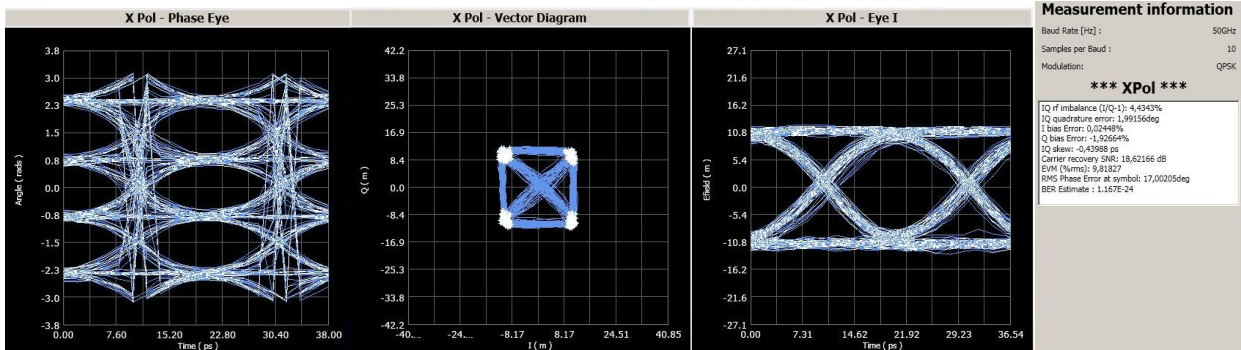
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Both Data A and Data B channel switched ON (DQPSK), 50 GSymbols/s



S/N: 10

## Constellation:



EVM: 9.8