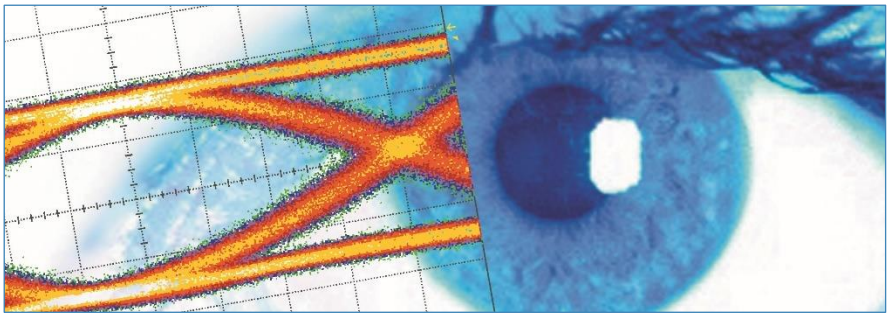


Data Sheet

SHF C684 B

Analog FIR Filter

Description

The SHF C684 B is a tunable analog 5-tap finite impulse response (FIR) filter. The differential input signal is amplified and filtered by a 5-stage FIR filter structure with fixed tap delays of about 6 ps. The frequency response can be arbitrarily modified by adjusting the filter coefficients (i.e. the gain of the tap amplifiers in the GUI). Equalizing operation has been verified for heavily degraded signals up to 100 GBaud PAM4 and 100 Gbps NRZ signals (please be referred to the signals below). All RF in- and output ports are AC-coupled and internally terminated with 50 Ohm to GND. Unused in- or output ports should be terminated with 50 Ohm.

Features

- Single ended or differential operation (either In or In! or both can be used)
- Compact module to be placed wherever adaptive equalization is required e.g. close to the DUT
- Complementary DSP software (“SHF Optimizer”) to calculate optimum settings from s2p-files and captured traces from oscilloscopes

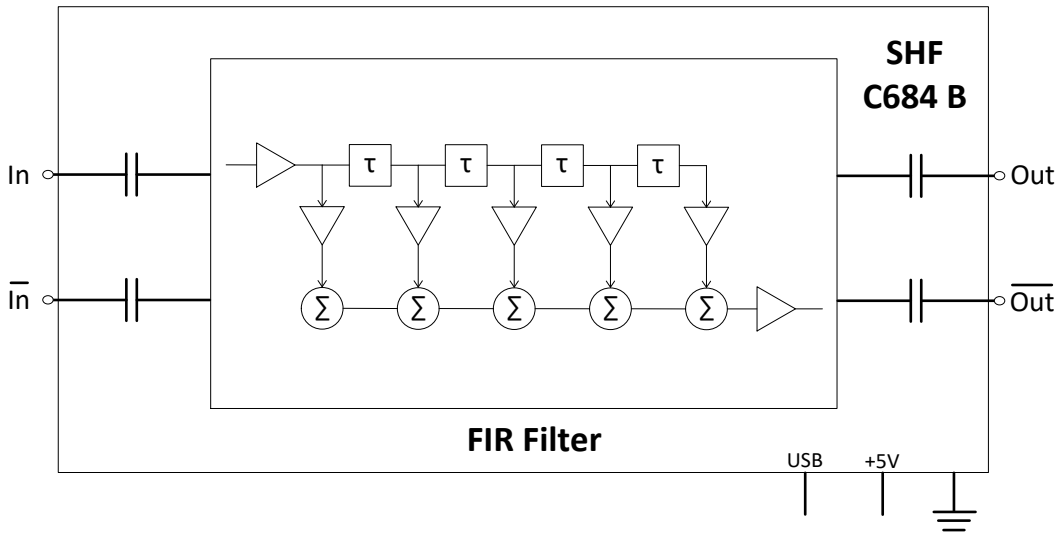
Applications

- Quality improvement of a degraded signal e.g. for BER measurements
- Equalization of transmission channels
- Emulation of various RF and microwave modules
- Signal predistortion to simulate various transmission channels
- 400GbE, 800GbE and 1.6TbE system evaluation & development
- Telecom transmission
- Broadband test and measurement equipment

Accessories

- +5 V Power Supply Desktop Adapter
- Functional Earth Cable → Connection to test setup ground has to be set up first before any other connection to prevent instrument damage!
- Mini-USB cable

Block Diagram



Specifications

Absolute Maximum Ratings

Parameter	Unit	Symbol	Min	Typ	Max	Comment
Data Input Voltage	mV	$V_{data\ in}$			900	Peak-to-Peak Single-ended
External DC Voltage on RF Input Ports	V	V_{DCin}	-6		+6	AC coupled input
External DC Voltage on RF Output Ports	V	V_{DCout}	-6		+6	AC coupled output
DC Supply Voltage	V	V_{cc}	0		+6	

Input Parameters

Parameter	Unit	Symbol	Min	Typ	Max	Comment
Maximum Analog Bandwidth	GHz	f_{-3dB}	70[1]			
Data Input Voltage	mV	$V_{data\ in}$			500	Eye Amplitude Single-ended
1 dB Compression	mV	V_{1dB}		350 175		Eye Amplitude Single ended drive Differential drive (each input port)

[1] Analog Bandwidth depends on the set filter characteristic

Output Parameters

Parameter	Unit	Symbol	Min	Typ	Max	Comment
Output Amplitude	mV	V_{out}			1000	Eye Amplitude Single-ended Depending on tap settings and input amplitude

Power Requirements

Parameter	Unit	Symbol	Min	Typ	Max	Comment
Supply Voltage	V	V_{CC}	+4.8		+5.2	2.5 x 0.7 mm DC Power Jack
Supply Current	mA	I_{CC}		1400	1500	
Power Dissipation	W	P_d			7.5	@ V_{CC} = +5V

Mechanical Characteristics

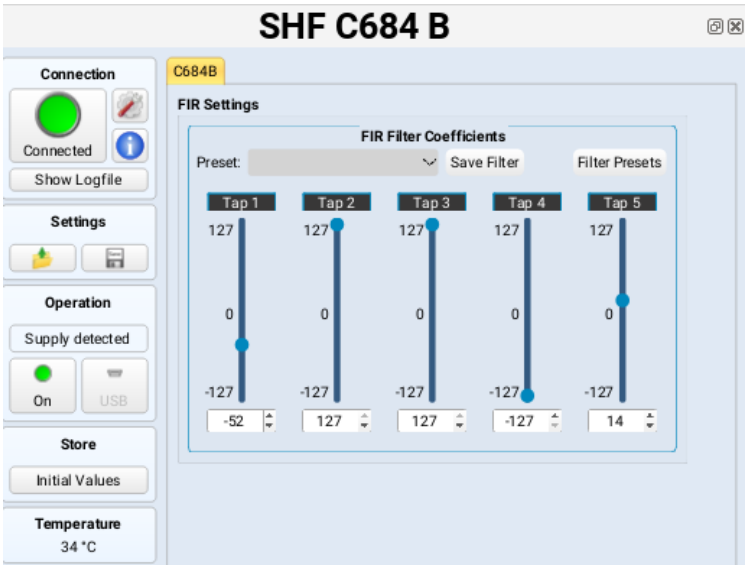
Parameter	Unit	Symbol	Min	Typ	Max	Comment
Input Connectors	Ω			50		1.85 mm (V) female
Output Connectors	Ω			50		1.85 mm (V) female
Dimensions	mm					See pages 11-12
Weight	g g			90 420		module module + heat sink

Conditions

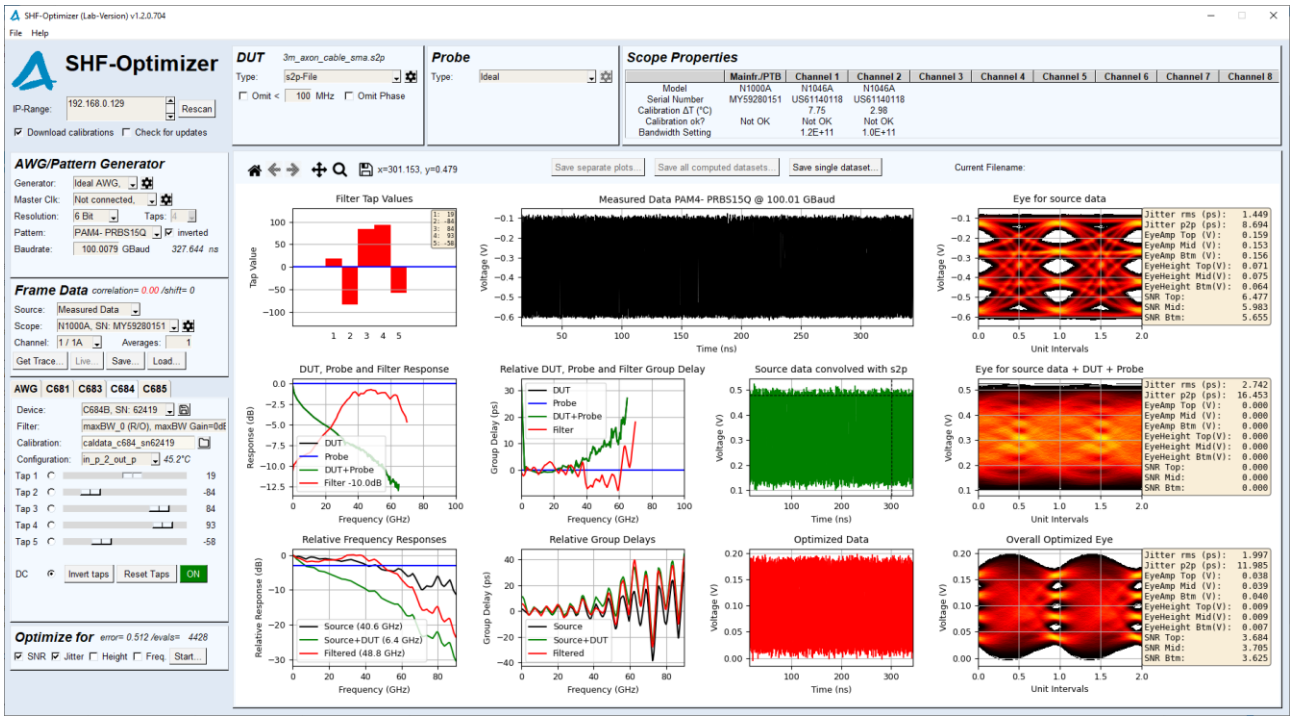
Parameter	Unit	Symbol	Min	Typ	Max	Comment
Operating Temperature	°C	$T_{ambient}$	15		35	

Remote Interface & Software

The filter is controlled either by the SHF Control Center (SCC) software or by the dedicated DSP program SHF-Optimizer. The SCC is an easy to use tool for setting the filter coefficient. The SHF-Optimizer can do the same, but is much more powerful as it provides various algorithms to calculate the optimum settings (e.g. based on signal traces from supported oscilloscopes or S-parameters). In addition, the SHF Optimizer provides accurate prediction of the output eye, frequency response and group delay at any stage of the signal chain. Both software packages are a complementary part of the SHF C684 B.



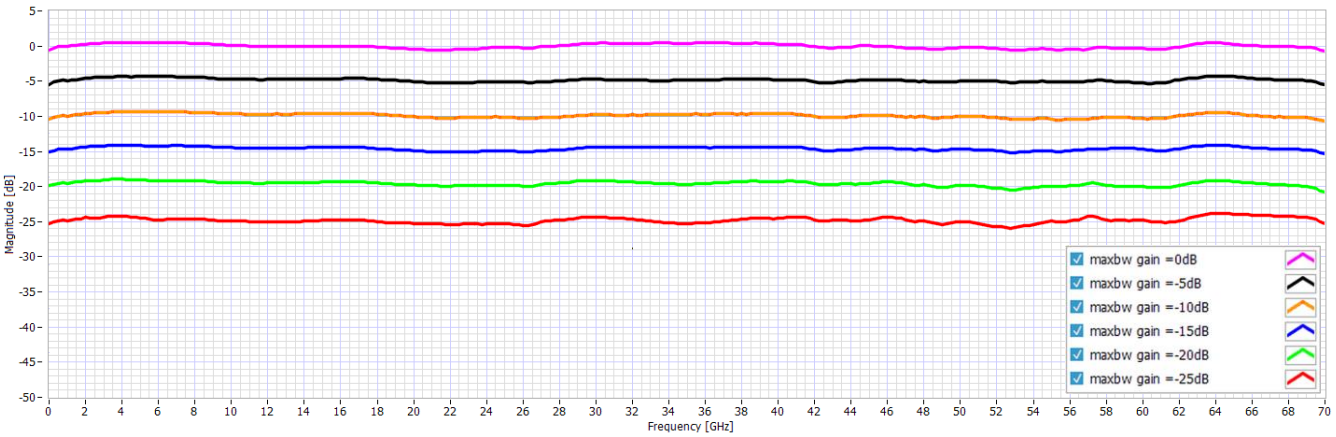
GUI – SHF Control Center SCC



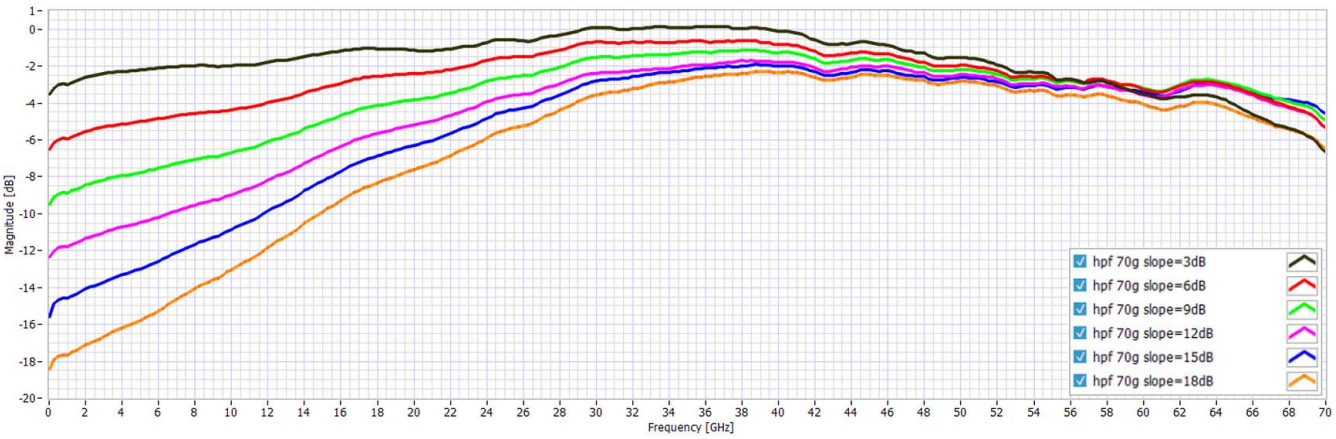
GUI – SHF-Optimizer

Typical FIR Filter Presets

Flat frequency responses for maximum bandwidth at various gain levels. Increasing the gain above 0 dBm reduces the maximum filter bandwidth.

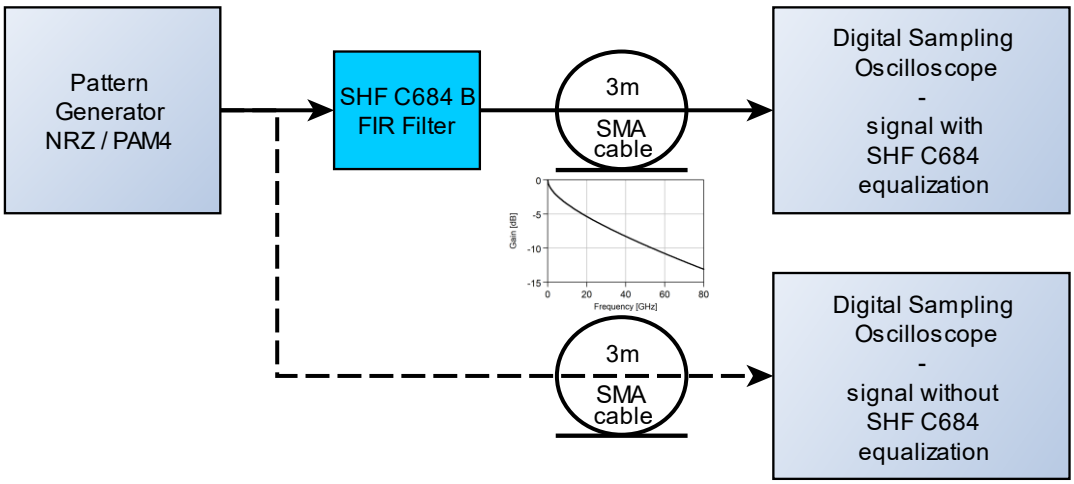


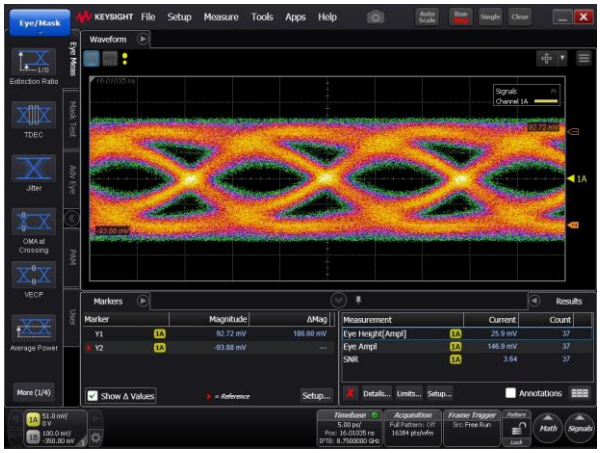
Frequency responses for a 3, 6, 9, 12, 15 and 18 dB slope @ 35 GHz.



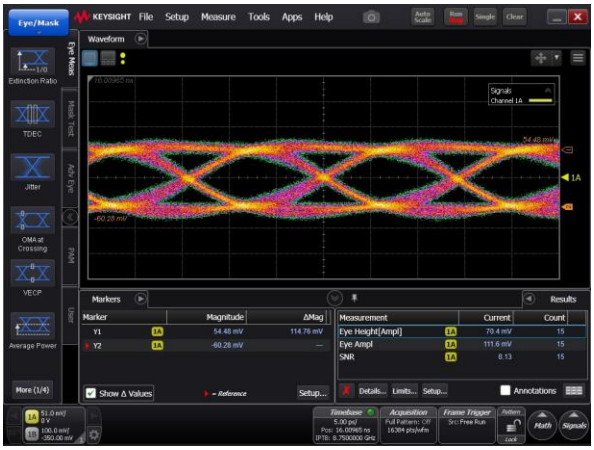
Example Application

Compensation of a 3m SMA cable



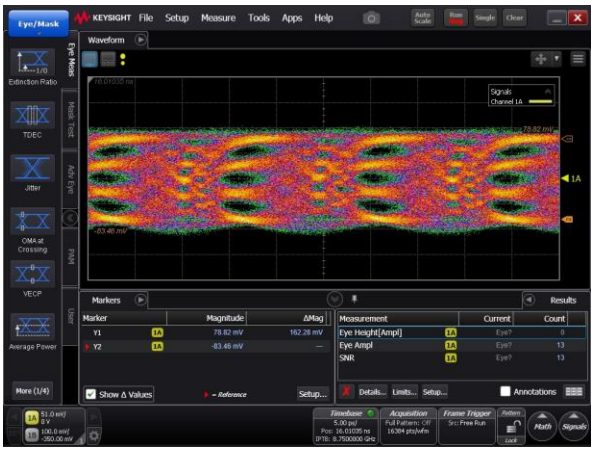


NRZ @ 70 Gbps without equalization



NRZ @ 70 Gbps with equalization

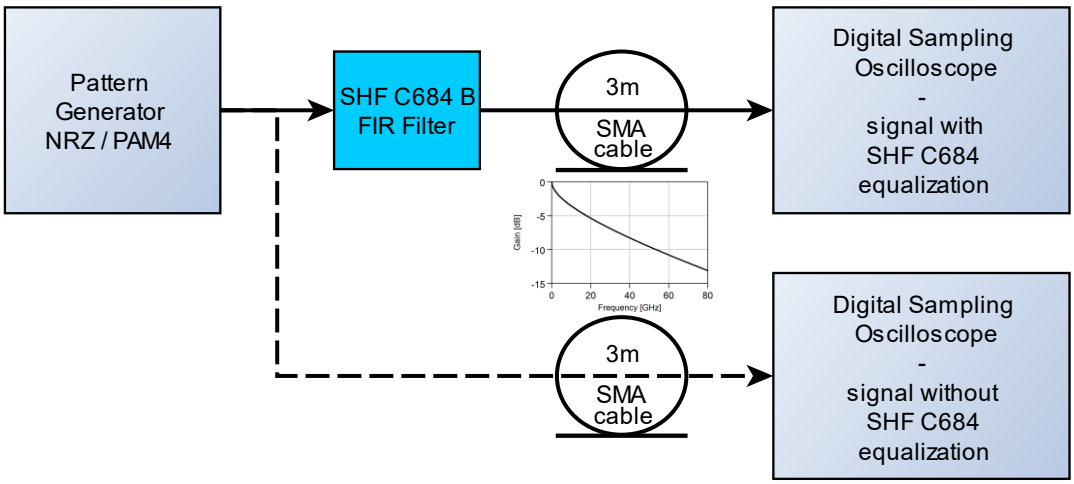
PAM4 @ 70 GBaud without equalization

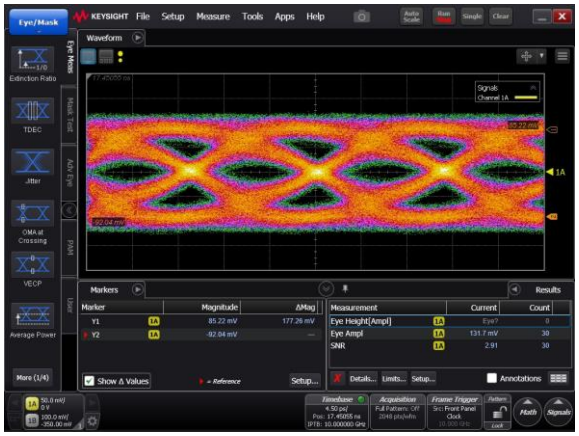


PAM4 @ 70 GBaud with equalization

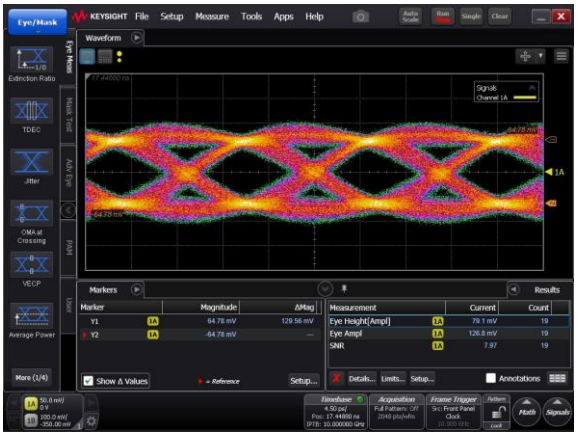
Example Application

Compensation of a 3m SMA cable

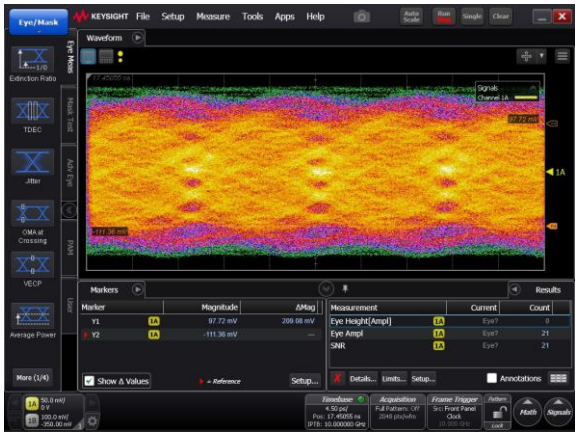




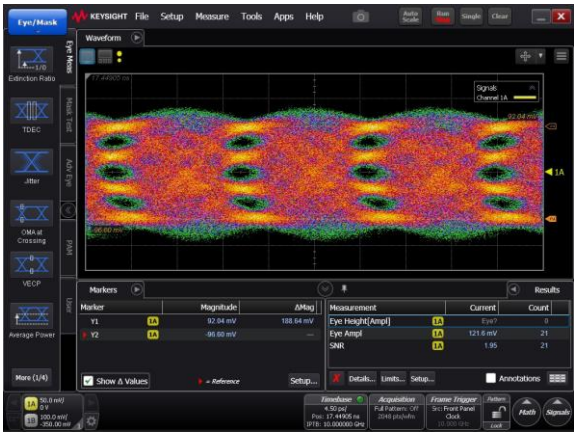
NRZ @ 80 Gbps without equalization



NRZ @ 80 Gbps with equalization



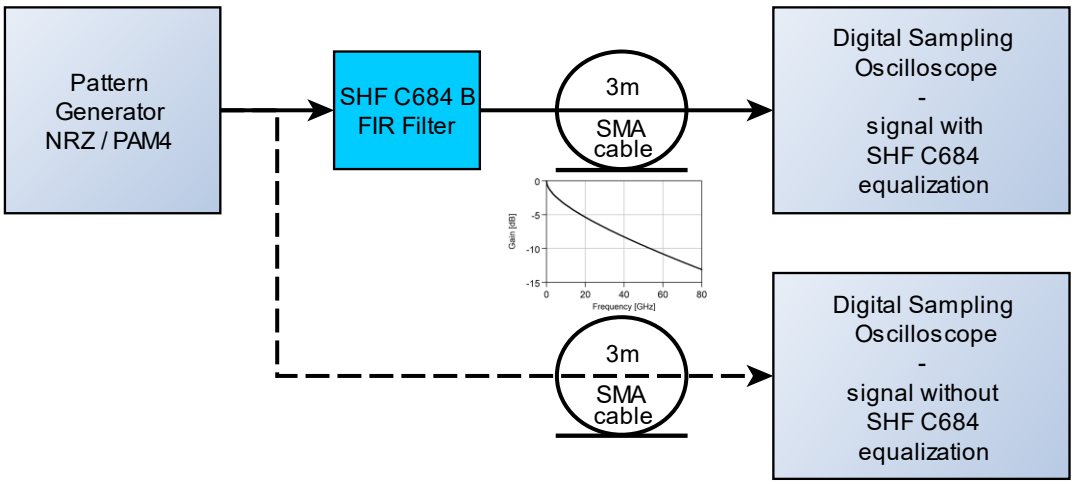
PAM4 @ 80 GBaud without equalization



PAM4 @ 80 GBaud with equalization

Example Application

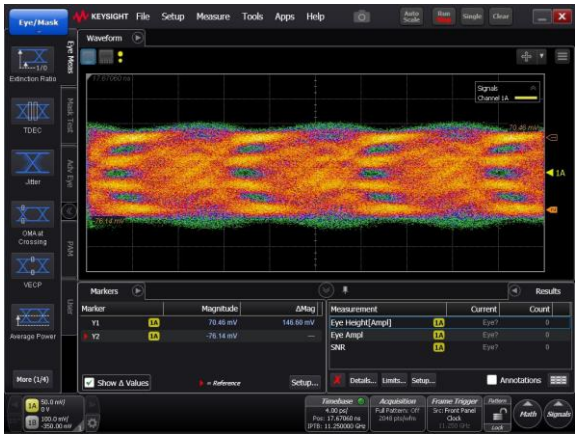
Compensation of a 3m SMA cable



NRZ @ 90 Gbps without equalization

NRZ @ 90 Gbps with equalization

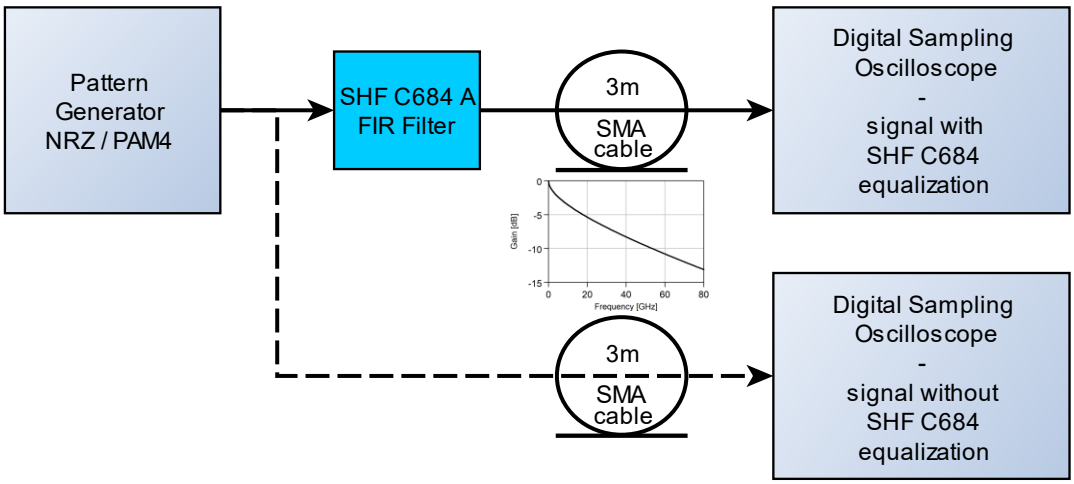
PAM4 @ 90 GBaud without equalization

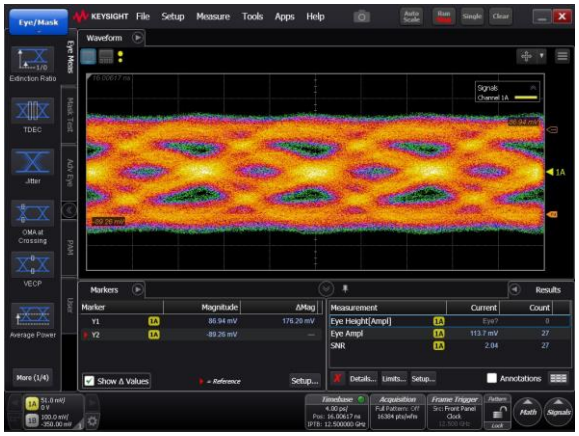


PAM4 @ 90 GBaud with equalization

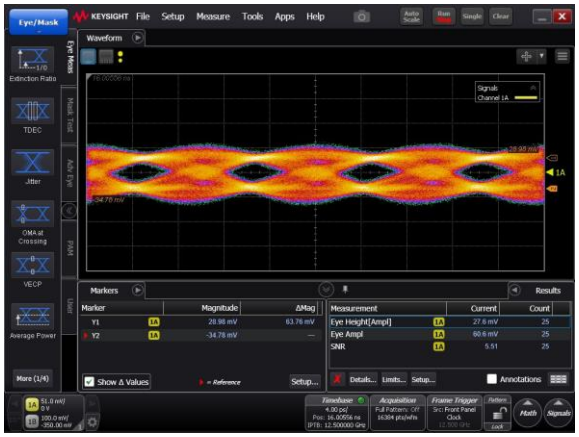
Example Application

Compensation of a 3m SMA cable



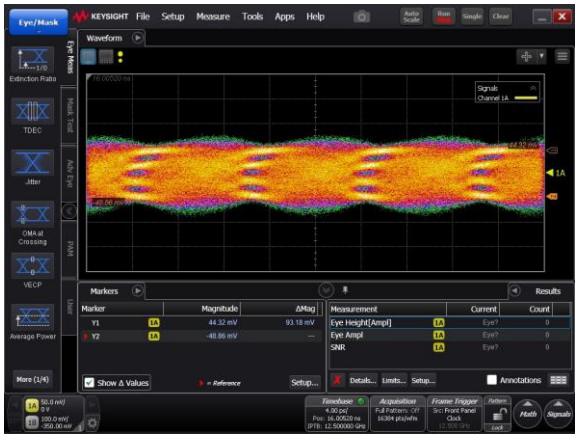


NRZ @ 100 Gbps without equalization



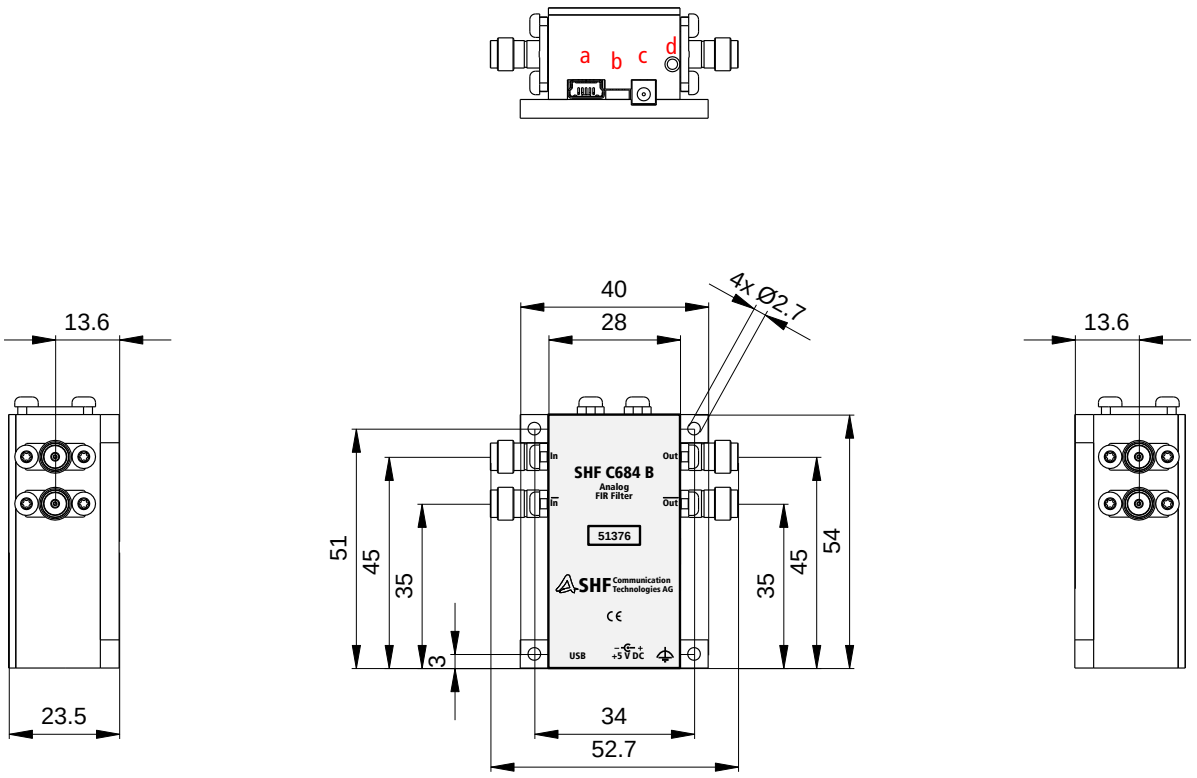
NRZ @ 100 Gbps with equalization

PAM4 @ 100 GBaud without equalization

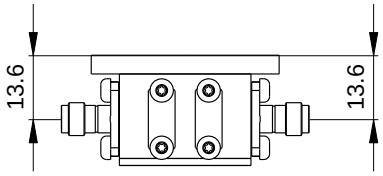


PAM4 @ 100 GBaud with equalization

Mechanical Drawing



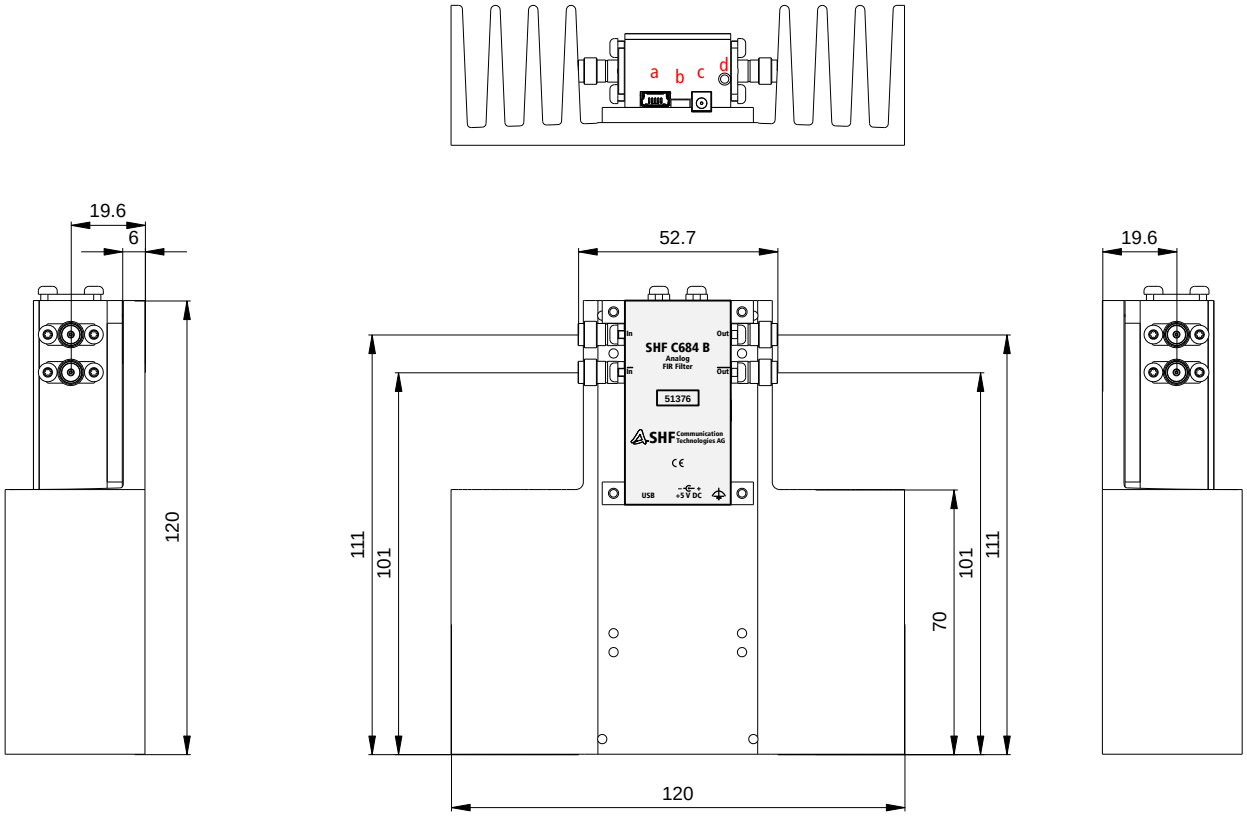
Port	Connector
In	1.85mm (V) female
$\overline{\text{In}}$	1.85mm (V) female
Out	1.85mm (V) female
$\overline{\text{Out}}$	1.85mm (V) female



All dimensions are in mm

Port	Connector
a	Mini-USB
b	Power-LED
c	Power
d	Functional earth (FE)

Mechanical Drawing with Heat Sink



Port	Connector
In	1.85mm (V) female
$\overline{\text{In}}$	1.85mm (V) female
Out	1.85mm (V) female
$\overline{\text{Out}}$	1.85mm (V) female

All dimensions are in mm

Port	Connector
a	Mini-USB
b	Power-LED
c	Power
d	Functional earth (FE)

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