

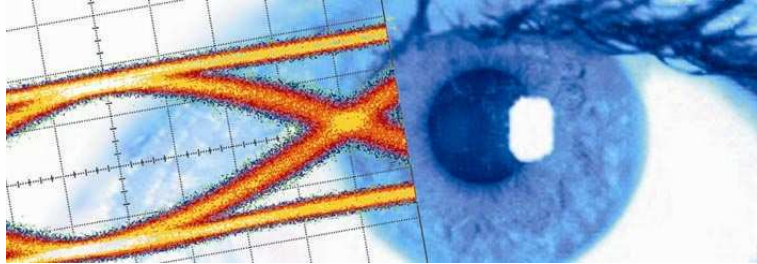


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SHF 10000 Series

Modular High Speed Test & Measurement Solution



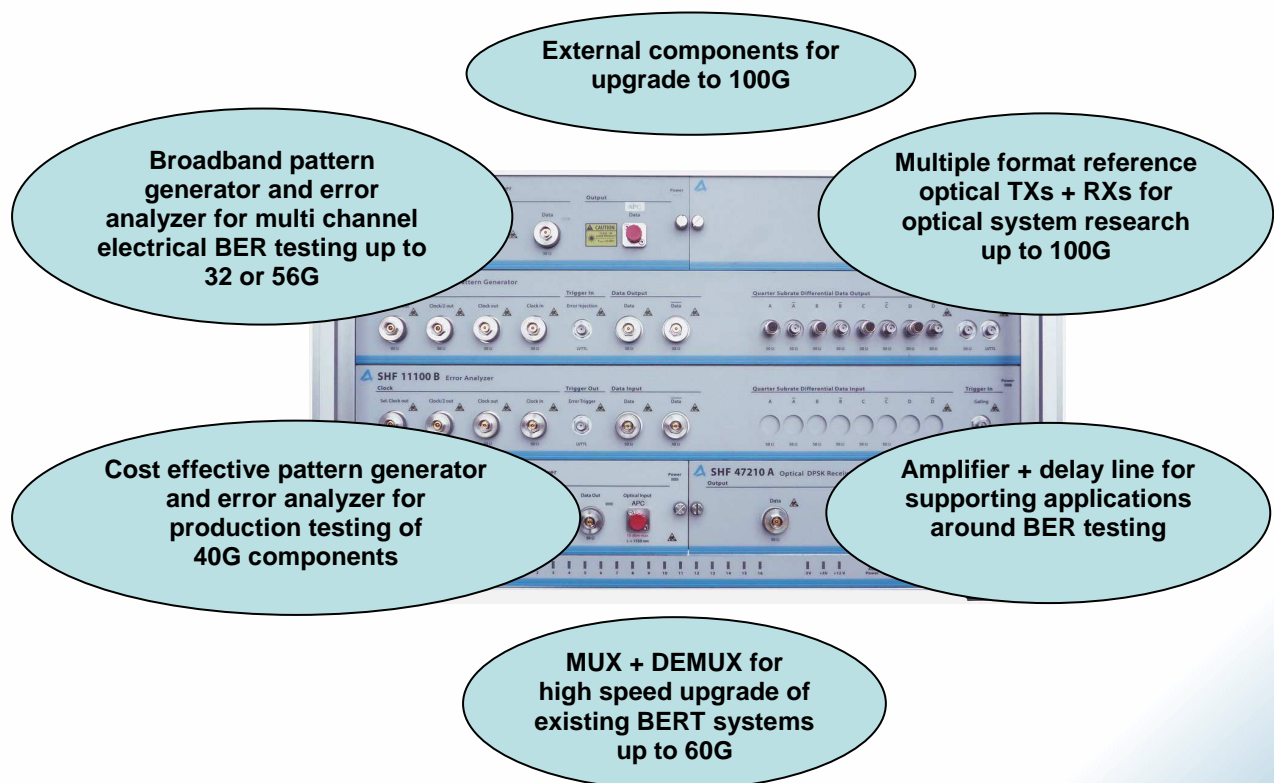


The Complete Solution

The SHF 10000 series is a modular and scalable T&M solution for high speed electrical and optical transmission experiments for data rates of more than 100 Gbps. The system operates over a broad bit rate band and can be configured to the customer's particular requirements. It offers an outstanding signal quality combined with various advanced measurement utilities. As a result of the flexible and future proof modular concept, the system allows funding step by step, easy upgrade and expansion.

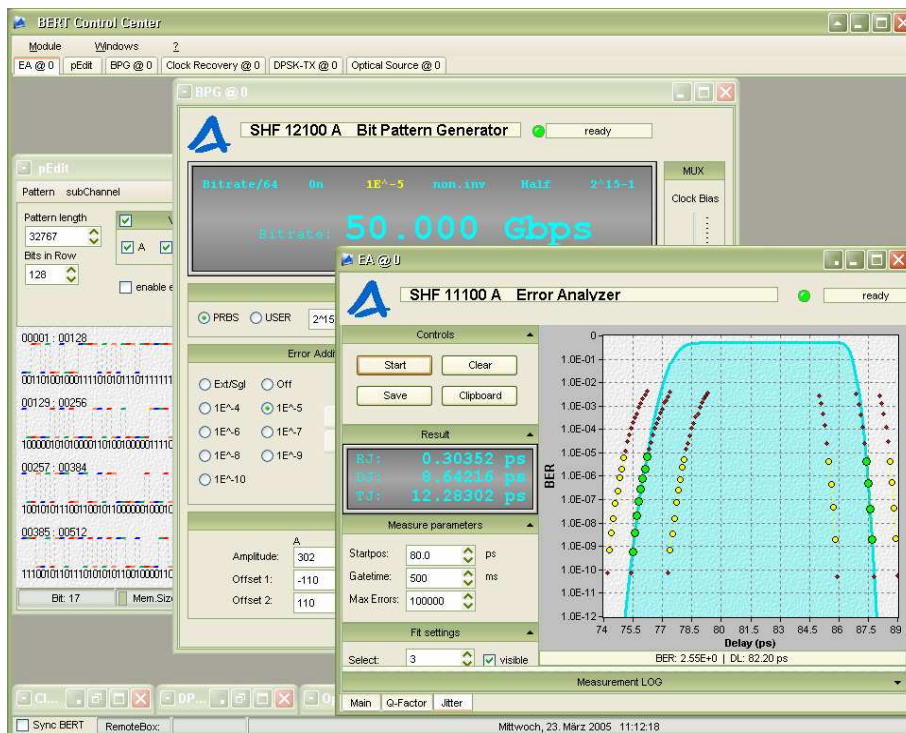
Two different sized mainframes can host a wide range of electrical and optical plug-in modules. This enables the user to form a variety of system configurations supporting an extensive range of applications around broad band BER testing.

This SHF 10000 series BERT system is another example of the technical achievements of SHF. We produced the world's first 20 Gbps and 40 Gbps BERT systems, and now we are pushing back the frontiers of technology still further with this innovative range of test equipment.



The modular SHF 10000 Series instruments are controlled over the Ethernet by any standard PC with MS Windows OS using the TCP/IP protocol. The Ethernet connection means that the system can be easily implemented in the customer's local area network if necessary, or the system can be controlled via a dedicated laptop or desk top computer. An easy to use software package provides not only a user friendly interface for changing the operating parameters but also powerful measurement utilities and the capabilities of feature enhancement through firmware & software upgrades. All text commands used to control the system are well documented, to enable the customers to use their own control routines or implementing the system in environments like LabView or HP VEE.

Data can be exported in text or XML format for analysis by other programs. In addition, future improvements to the system can easily be made in the form of a software upgrade.



Screenshot from the SHF BERT control software showing the pattern editor, the controls for the pattern generator and jitter measurements performed by the error analyzer

General System Features

- Scalable and modular System
- Broad band operation from 1.5 to > 100 Gbps¹
- Windows style Bert Control Center software package with advanced measurement utilities such as jitter, Q-factor and eye contour measurements
- Computer controlled operation over the Ethernet which also enables remote access
- Multi-mainframe and multi-computer control
- Extensive range of plug-in modules
- All half size plug-in modules are field replaceable

¹ Depending on the configuration of the particular system

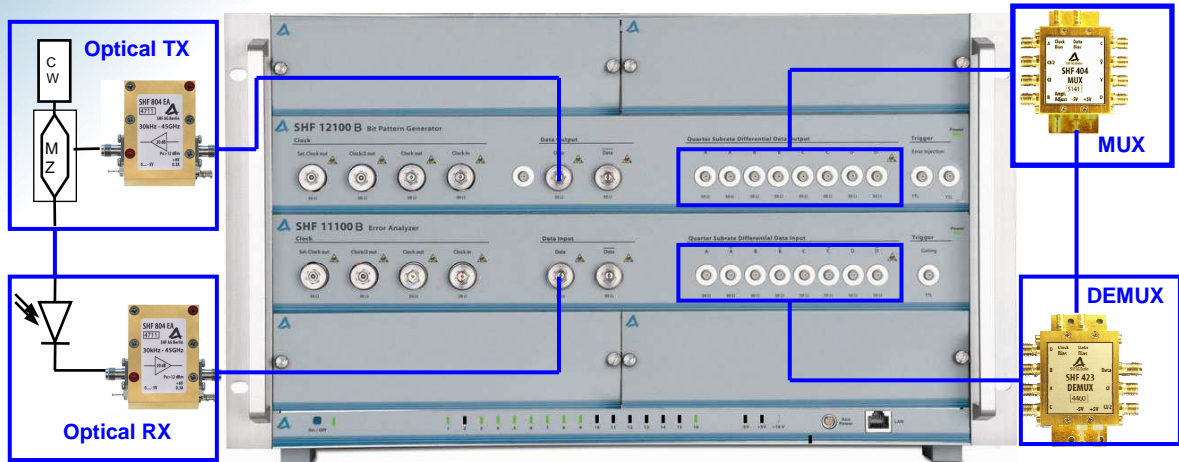


Example Configurations

Pure Electrical BERT

A basic configuration of the SHF BERT allows devices to be developed and tested with continuously variable bit rates between 1.5 and 56 Gbps.

By taking advantage of the differential sub-rate ports on both instruments, an ideal solution for multiplexer and demultiplexer development and testing with input signals from 1.5 to 12.5 Gbps has been formed.



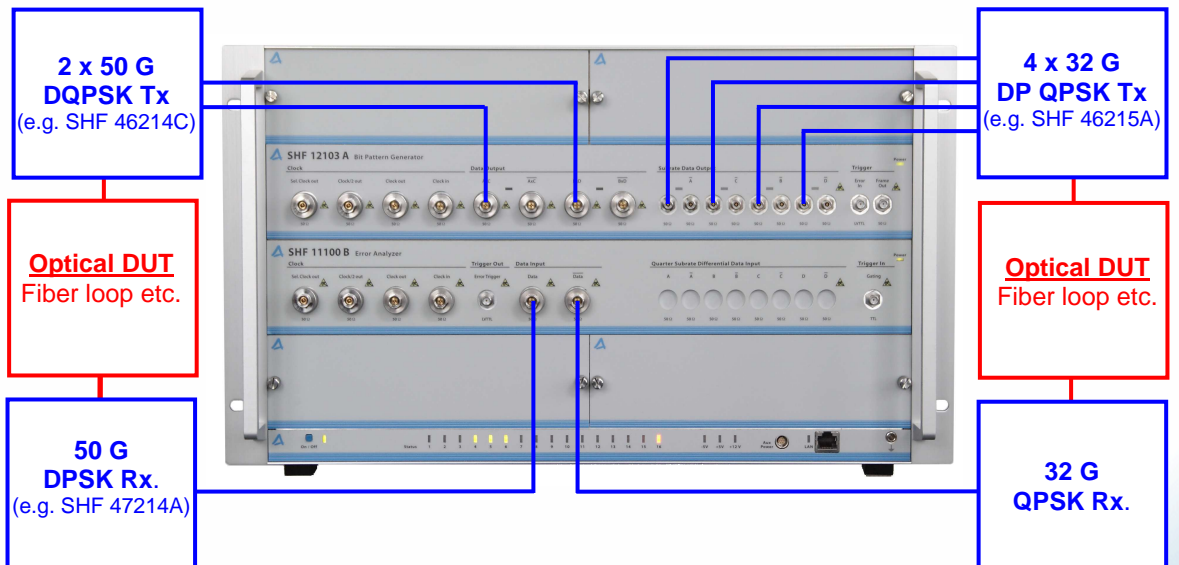
Optical transmitter and receiver development and testing

MUX/DEMUX development and testing

Electrical BERT for 100 GbE modulation schemes

The four independent 3 to 28/32 Gbps differential outputs of the SHF 12103 A pattern generator are perfect drive signals for 100GbE research based on a DP-QPSK approach. The scheme on the right hand side below shows how the electrical hardware pre-coded data signals with an aggregated bit rate of up to 128 Gbps can be created.

With its dual-channel 56 Gbps capabilities (shown on the left hand side), the SHF 12103 A is well prepared for research on future 100GbE networks in conjunction with a 100Gbps optical DQPSK transmitter like the SHF 46214 A.



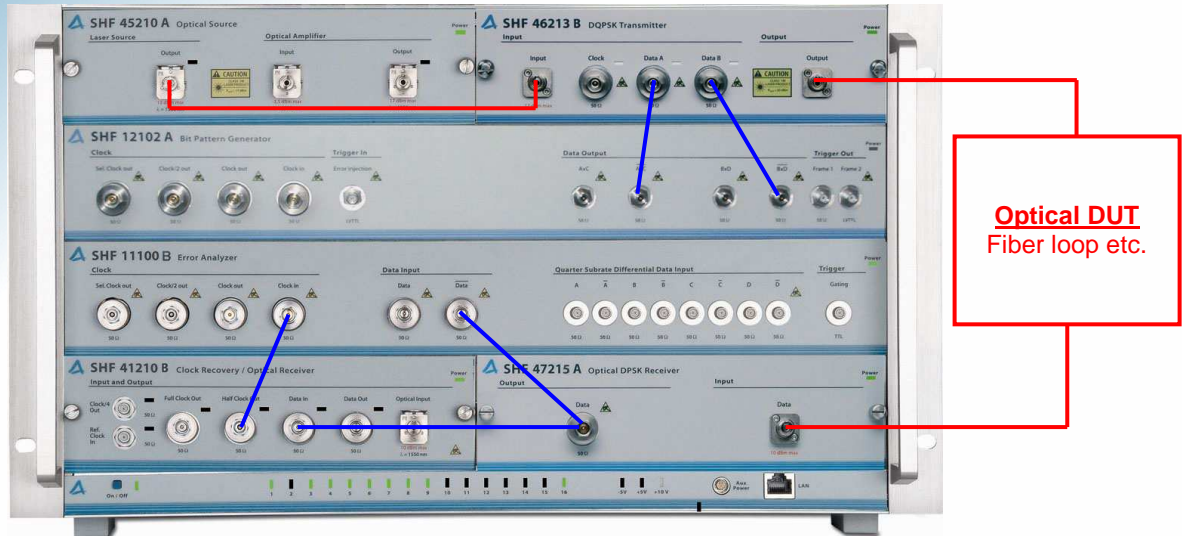
100 Gbps DQPSK transmission

128 Gbps DP-QPSK transmission



Electrical BERT + Optics

One of the most impressive demonstrations of the SHF BERT is its capability to conduct optical transmission experiments. The scheme below shows how an electrical hardware pre-coded data signal can be created, converted into an optical DQPSK signal, detected and turned back into an electrical signal – with clock recovery – and finally analyzed as a standard PRBS data stream.



Research and development for optical DQPSK transmission

40G BERT for Production Testing

With particular emphasis on the right balance between cost and functionality, SHF has developed a bit error test system addressing applications in the production environment of 40G components, modules and subsystems. CCITT conform PRBS pattern generation can be performed over multiple bit rate bands. These bands cover 40 Gbps and the related standard FEC rates up to 44 Gbps, as well as the corresponding sub-rate bands of around 20, 10, 5 and 2.5 Gbps. The error analysis can be performed around 40 Gbps and the related FEC rates up to 44 Gbps, with internal clock recovery built-in.

If future test capabilities expansion, future application changes, modularity, flexibility, scalability and best cost-effectiveness for multiple test stations is the customer's main concern, the plug-in style is the ideal solution. It makes use of the proven SHF modular test system approach, using the same mainframes to host the modules. However, whenever it is required to fit instruments into a space-conscious production test environment, the bench-top version of the Multi-band BERT is the right choice. It is light weight, ultra-compact and easily transportable.



SHF 12110 A, Multi-band BPG (plug-in)



SHF 11110 A, 40G EA (plug-in)



Available Plug-in Modules

| SHF Part Number | Description | Comment |
|---|---|-----------|
| Mainframes | | |
| SHF 10000 B | Large Mainframe able to host 2 full size modules and 4 half size modules | |
| SHF 10001 A | Small Mainframe able to host 2 full size modules or 4 half size modules or 1 full size & 2 half size modules | |
| Electrical Bit Error Testing | | |
| SHF 12100 B | 56 Gbps broadband pattern generator | full size |
| SHF 12103 B | Broadband Quad-32 and Dual-56 pattern generator | full size |
| SHF 11100 B | 56 Gbps broadband error analyzer | full size |
| SHF 11102 A | 28 Gbps broadband error analyzer | full size |
| SHF 12110 A | Multi-band pattern generator | half size |
| SHF 11110 A | 40 Gbps production error analyzer | half size |
| Optical Transmitters and Receivers | | |
| SHF 46210 C | 40 Gbps multi-format (ASK & DPSK) optical transmitter | half size |
| SHF 46211 C | 10 Gbps multi-format (ASK & DPSK) optical transmitter | half size |
| SHF 46212 A | 40 Gbps duo binary optical transmitter | half size |
| SHF 46213 C | 56 (2 x 28) Gbps DQPSK optical transmitter | half size |
| SHF 46214 C | 100 (2 x 50) Gbps DQPSK optical transmitter | half size |
| SHF 46215 A | 128 (4x 32) Gbps DP-QPSK optical transmitter | half size |
| SHF 41210 B | Up to 50 Gbps ASK receiver and/or 40 Gbps clock recovery (single ended output) | half size |
| SHF 41211 A | Up to 50 Gbps ASK receiver and/or 28 or 32 Gbps clock recovery (single ended output) | half size |
| SHF 41211 C | Up to 32 Gbps ASK receiver and/or 28 or 32 Gbps clock recovery (limiting differential output) | half size |
| SHF 47210 A | 40 Gbps optical DPSK receiver (single ended output) | half size |
| SHF 47211 A | 10 Gbps optical DPSK receiver (single ended output) | half size |
| SHF 47211 C | 10 Gbps optical DPSK receiver (limiting differential output) | half size |
| SHF 47213 A | 20 Gbps optical DPSK receiver (single ended output) | half size |
| SHF 47213 C | 20 Gbps optical DPSK receiver (limiting differential output) | half size |
| SHF 47214 A | 50 Gbps optical DPSK receiver (single ended output) | half size |
| SHF 47215 A | 28 Gbps optical DPSK receiver (single ended output) | half size |
| SHF 47215 C | 28 Gbps optical DPSK receiver (limiting differential output) | half size |



| SHF Part Number | Description | Comment |
|--|--|-----------|
| <u>Clock Recovery Solutions</u> | | |
| SHF 41210 B | Up to 50 Gbps optical ASK receiver and/or 40 Gbps clock recovery | half size |
| SHF 41211 A | Up to 50 Gbps ASK receiver and/or 28 or 32 Gbps clock recovery (single ended output) | half size |
| SHF 41211 C | Up to 32 Gbps ASK receiver and/or 28 or 32 Gbps clock recovery (differential output) | half size |
| <u>40/60 Gbps Upgrade Solutions for BERT Systems, MUX/DEMUX</u> | | |
| SHF 24210 A | 60 Gbps 4:1 multiplexer | half size |
| SHF 34210 A | 60 Gbps 1:4 demultiplexer | half size |
| SHF 23210 A | 28 Gbps 2:1 multiplexer | half size |
| SHF 33210 A | 28 Gbps 1:2 demultiplexer | half size |
| SHF 58210 A | 15 Gbps Signal splitter / signal selector | full size |
| <u>Miscellaneous Modules</u> | | |
| SHF 60120 A | 25 GHz precision delay line | half size |
| SHF 58211 A | 50 Gbps dual channel amplifier plug-in | half size |
| SHF 50120 A | Clock source plug-in | half size |
| SHF 45210 B | Tunable CW laser source | half size |



The SHF 10000 Series bit error rate test platform received the 2008 Best Practices Award from Frost & Sullivan for an outstanding product line strategy. SHF is proud of being recognized with this prestigious award for systems designed for engineers by engineers.

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