Demonstration of BER Test with AMIQ controlled by WinIQSIM

Application Note 1MA16_0E

Products:

AMIQ/WinIQSIM
SMIQ
FSE

Contents

1.   Overview

A test setup is described for easy demonstration of the Bit Error Rate Test (BERT) function of AMIQ/AMIQ-B1. The test setup contains I/Q Modulation Generator **AMIQ/AMIQ-B1** controlled by I/Q Simulation Software **WinIQSIM**, Vector Signal Generator **SMIQ** and Spectrum/Vector Signal Analyzer **FSE/FSE-B7**. The FSE with FSE-B7 is used as online FSK demodulator (setting: Analog demodulation, FM Signal, DC coupling, Real Time On) to demodulate the SMIQ RF signal FSK-modulated by PRBS data.

The AMIQ is controlled by WinIQSIM software and receives the demodulated AF output signal from the FSE for BER testing.

2.   Test Set-up

Fig. 1 shows the test set-up and necessary cabling. To obtain the simplest possible set-up, the SMIQ is internally modulated without using the signal generation capability of AMIQ/WinIQSIM (may be used alternatively). The FSE/FSE-B7 serves as demodulator in this demo set-up. Because the digital demodulation capability of the FSE/FSE-B7 is only available in offline mode, the analog FM demodulator is used. With 2FSK, suitable filtering (B*T>0.7) and symbol rate ($\leq$ 20 kHz), the FSE-B7 analog FM demodulator works well in online mode with DC coupling and 100 kHz demodulation bandwidth. The AF output signal of the FSE available on the front panel is connected by means of a jack plug[*] (stereo 3.5 mm) to the BER Data input of the 9-pin sub-D connector[**] on the rear side of the AMIQ (Pin 7). The Bit Clock signal of the SMIQ (front panel BNC connector) is fed to the BER Clock input of the same AMIQ connector (pin 6).

[*] R&S part number: 1015.1585.00, both center connectors of the jack plug tied together.

[**] Use R&S part numbers 0434.9362.00 (female connector), 0704.1414.00 (shielding) and 0704.1495.00 (screws, 2x). Connect shielding to pin 1 to 5 (ground pins).
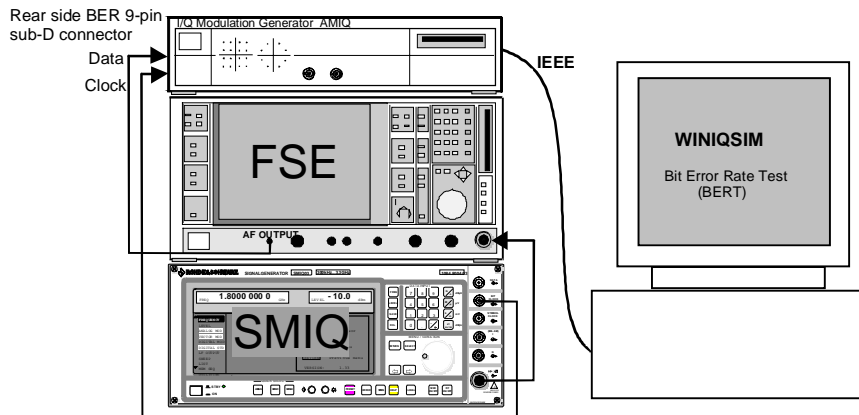

Fig. 1: Test Set-up for demonstration of AMIQ BER Test function

3.   Starting the BER Measurement

Set SMIQ and AMIQ as described in the following:

Setting of SMIQ:

PRESET

FREQ *1 GHz*

LEVEL *0 dBm*

DIGITAL MOD: STATE ON

SOURCE: PRBS

PRBS LENGTH 9

MODULATION: TYPE 2FSK

FSK DEV: 20 kHz

SYMBOL RATE: 20 kHz

FILTER TYPE: GAUSS

FILTER PARAMETER: 1.0

Setting of FSE:

PRESET

CENTER *1 GHz*

LEVEL REF *0 dBM*

MODE*: VECTOR ANALYZER: ANALOG DEMOD*

MEAS RESULT: FM SIGNAL: REAL TIME ON

VOLUME: 80 %:

MODULATION PARAMETER: AF COUPL'G DC

RANGE: Y PER DIV: 10 kHz

SWEEP: SWEEP TIME 1ms

The WinIQSIM software has to be started and set as described in the following:

Setting of WinIQSIM:

AMIQ: REMOTE CONTROL AND BERT..

Adjust BERT Setting according to the Fig. 2:

PRBS 9,
Data Polarity inverted***),
Clock Slope high/rising

and Start Bit Error Rate Test with

Cont.

A continuous BER measurement will start. The IQSIM software should display 0.00 % BER if everything is set correctly.

In order to introduce bit errors you can lower the level of SMIQ by 20 to 26 dB (-20 dBm to –26 dBm) to decrease the signal-to-noise ratio. A BER of some percent will occur. Restart measurement when changing the level.

You may use other PRBS lengths (e.g. 11,13,etc.) by changing the settings of SMIQ and WinIQSIM accordingly. Please note that for PRBS 15 and 23 you have to use Data Polarity Normal (PRBS 15 and 23 of SMIQ are inverse to WinIQSIM).

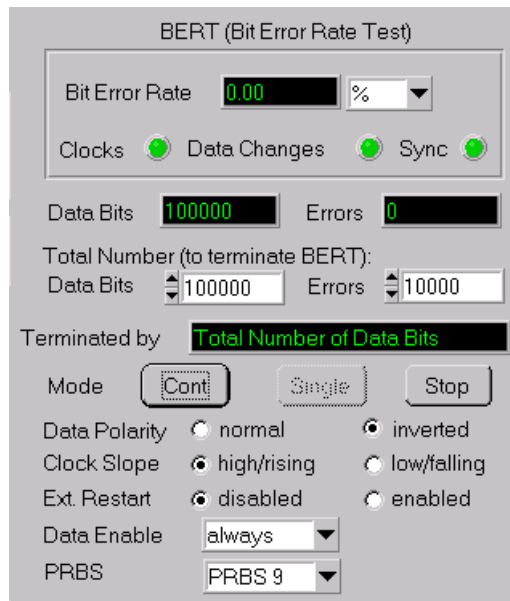***) This to compensate for the inverting AF-output of the FSE.

Fig. 2: Detail of WinIQSIM menu with BER Test Settings

4. Ordering Information

I/Q Modulation Generator
AMIQ/WinIQSIM   1110.2003.02
(Firmware versions ≥ 2.0 for both AMIQ and WinIQSIM)

Option required for AMIQ
AMIQ-B1 BER Measurement   1110.3500.02

Vector Signal Generator
SMIQ02   (300 kHz to 2.2 GHz)   1084.8004.02
SMIQ03   (300 kHz to 3.3 GHz)   1084.8004.03
SMIQ02E   (300 kHz to 2.2 GHz)   1106.1506.02
SMIQ03E   (300 kHz to 3.3 GHz)   1106.1506.03

Options required for SMIQ:
SMIQB10   Modulation Coder   1085.5009.02
SMIQB11   Data Generator   1085.4502.02

Spectrum Analyzer
FSEA20   (9 kHz to 3.5 GHz)   1065.6000.20
FSEA30   (20 Hz to 3.5 GHz)   1065.6000.30
FSEB20   (9 kHz to 7.0 GHz)   1066.3010.20
FSEB30   (20 Hz to 7.0 GHz)   1066.3010.30
FSEM20   (9 kHz to 26.5 GHz)   1080.1505.20
FSEM30   (20 Hz to 26.5 GHz)   1079.8500.30
FSEK20   (9 kHz to 40 GHz)   1088.1491.20
FSEK30   (20 Hz to 40 GHz)   1088.3494.30

Option required for FSE:
FSE-B7   Vector Signal Analyzer   1066.4317.02

ROHDE&SCHWARZ

ROHDE & SCHWARZ GmbH & Co. KG · P.O.B. 80 14 69 · D-81614 München
Telephone +49 89 4129 -0 · Telefax +49 89 4129 - 3777 · Internet: http://www.rsd.de