

## Demonstration of BER Test with AMIQ controlled by WinIQSIM

Application Note 1MA16\_0E

### Products:

**AMIQ/WinIQSIM**  
**SMIQ**  
**FSE**

Subject to change - Roland Minihold 98-09



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## 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 ( $B \cdot T > 0.7$ ) 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).

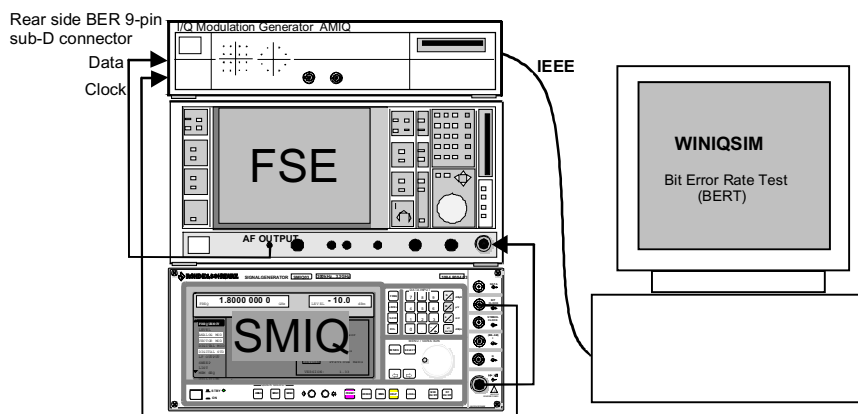


Fig. 1: Test Set-up for demonstration of AMIQ BER Test function

### 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<sup>\*\*\*)</sup>,

**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).

<sup>\*\*\*)</sup> This to compensate for the inverting AF-output of the FSE.

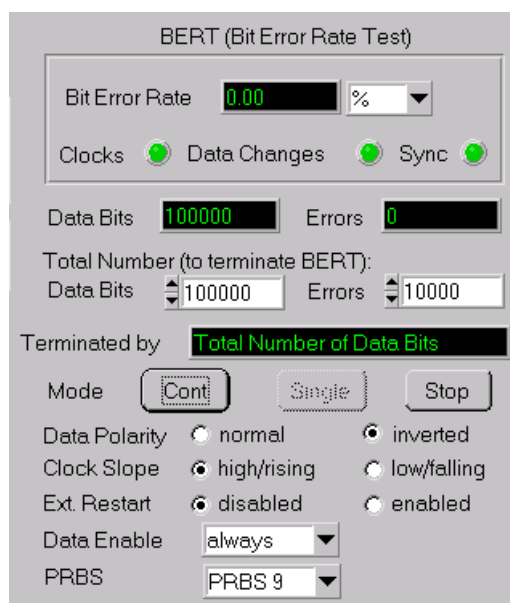


Fig. 2: Detail of WinIQSIM menu with BER Test Settings

## 4. Ordering Information

### I/Q Modulation Generator

AMIQ/WinIQSIM 1110.2003.02  
(Firmware versions  $\geq 2.0$  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>