			GSM900 F	Receiver Quality	Packet Digit Dida E	Connect Control
			BLER RLC Blacks		6 aling States Capabilities	BLER
			0 1.41 s 213 1.43 s 210	Skit 1 - Sign Skit 2 @ - 109.0 dBm MS MS	aling info 001.01.012345571 0.0010101.00.019574	Appl.
Hohde&Schwaiz GSM Fading Level Correction v1.50		8	6.42 x 218	Slot 4 8 - 109.0 dBm Col Slot 5 8 - 109.0 dBm Pag	Red Namber - ding Scheme CS 2 a. Control setilion Confinuous	Analyzer Level
Ele Heb	1		0	Dot 7 +BS-S +Pao	ister Level Sgrall sket Data d BLER Levels	MS Signal
Communication Tester RohdelSchwarz,OMU 200-1100.0008.02,100714,V3.10!	Fading Simulator RohdetSchwaz/ABFS.835441/0001.1.12	Quit	3 % 847 40 Miler/s RLCData	010 4	a aller Carall	BS Signal
PAD 🗘 20 SAD 💭 3 Jrit	PAD 💭 29 🔤					Network
Type "GSM900MS_Sig"	Fading Type		S CS2 m BLDR			
Analyzer Generator Ref.Level/d8m Channel	STANDARD FAD Fading Standard		n Person N	todulation Spectrum	Receiver Quality	Menus
30.00 1 Channel RF Lv1 / dBm ExtAtten/dB Gen.Loss/dB	GSM Typical Urban 5 Hardware Loss / dB Software Loss / dB	Cable Loss	:/d8			
1 -85.00 0.52 = 0.05		+ 🗐 🔹	0.25			
Get Setting:	cate Calculate					

Products: CMU (B17), SMIQ (B14, B15), ABFS

# GSM/GPRS/EDGE Receiver Tests Under Fading Conditions with CMU and SMIQ/ABFS

# **Application Note**

This application note describes how to generate GSM signals for wide ranging receiver tests under fading conditions for GSM/GPRS/EDGE mobile and base station equipment. The test setup requires an R&S Universal Radio Communication Tester CMU with IQ-IF interface option CMU-B17 and an R&S vector signal generator SMIQ or baseband fading simulator ABFS. The GSMFadLevCor program included with this application note performs a semi automatic level correction of the power fed to the Device Under Test (DUT).



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# **1** Overview

The signal strength and quality of signals received by Base Stations (BS) and Mobile Stations (MS) can be influenced by effects resulting from the movement of the mobile, and the overlay of numerous delayed signals caused by reflections. This phenonemon is called fading and is classified in profiles such as Constant Phase, Pure Doppler, Rice, Rayleigh and Moving Propagation fading. This application note describes how to connect a R&S Radio Communication Tester CMU with IQ-IF interface option CMU-B17 to an R&S SMIQ vector signal generator or R&S ABFS baseband fading simulator for generating GSM signals suitable for tests under fading conditions. The supplied program GSMFadLevCor calibrates the hardware attenuation of an external fading simulator ABFS or SMIQ connected to the CMU IQ loop. GSMFadLevCor can also calculate the mathematical signal loss resulting from various fading profiles and optionally perform an automatic level correction.

The following abbreviations are used in the following text for R&S test equipment:

- The R&S Universal Radio Communication Tester CMU200 and CMU300 are referred to as CMU.
- The R&S baseband fading simulator ABFS is referred to as ABFS.
- The R&S vector signal generator SMIQ ar referred to as SMIQ.

## **2** Software Features

- Program and device configuration storage
- Auto detection of ABFS / SMIQ fading model and active paths
- Variable CMU GPIB secondary address setup
- Automatic IQ loss calibration routine

# 3 Hardware and Software Requirements

# Hardware Requirements

The software runs on a PC with

CPU	Pentium 300MHz or better
RAM	64 MBytes or more
Monitor	SVGA color monitor 800x600 or better
IEC/IEEE BUS	IEC/IEEE bus interface Rohde & Schwarz IEEE-488.2 bus interface <b>PS-B4</b> , 1006.6207.04, or National Instruments <b>AT-</b> <b>GPIB, PCI-GPIB</b> or <b>PCMCIA-GPIB</b> card.

# **Software Requirements**

WINDOWS 9x/NT/2000/XP	Microsoft operating system
NI-488.2 ∨1.6 (or above)	IEC/IEEE – bus driver from National Instru- ments. See <u>http://www.natinst.com</u> for latest revision.
NI-VISA v2.01 (or above)	VISA driver from National Instruments. See <u>http://www.natinst.com</u> for latest revision.
MICROSOFT INSTALLER	Versions for Windows 95/98/NT are avai- lable at <u>http://www.rohde-schwarz.com</u> .

# 4 GSM Fading on Baseband Level (IQ) with CMU and ABFS / SMIQ

## **Connecting the Instruments**

#### CMU and ABFS

Connect the controlling PC to the CMU and ABFS with a GPIB bus cable. The ABFS is additionally connected to the CMU in the IQ RX (mobile station) or TX (base station) loop with a 1100.6993 cable. The DUT (mobile telephone or base station) is connected to the RF2 connector of the CMU which is set to bidirectional operating mode (input/output).

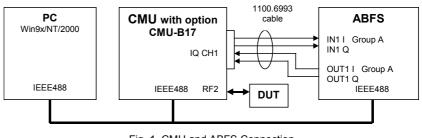


Fig. 1 CMU and ABFS Connection

## CMU and SMIQ

Complete the connects as above with the additional detail that the SMIQ has separate I- and Q-faded outputs located on the rear panel.

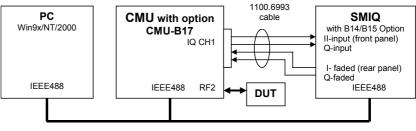


Fig. 2 CMU and SMIQ Connection

<u>Note:</u> GSMFadLevCor does not support the option for Noise/Distortion SMIQ-B17 since it normalizes the I/Q level for maximum accuracy. The output level is compensated by an internal offset which cannot be accessed remotely. If the Noise/Distortion option is installed, the hardware loss must be measured by applying a CW signal at the I- or Q-input (i.e. 7MHz, +7dBm = 0.5V at 50 $\Omega$ ), selecting the desired fading profile and measuring the power at the I- or Q-faded output manually (set software loss to 0.0dB). The expected SMIQ (ABFS) hardware loss with one active fading path (pure Doppler) at 0.0dB loss is approximately 18 (12) dB.

## Basics of Fading Tests with IQ IF Loop

The ABFS / SMIQ adds fading effects to the CMU signal on the IQ level (baseband). When an ABFS / SMIQ is inserted into the CMU IQ loop by switching the CMU-B17 option the signal power decreases due to the losses on the switched path. The ABFS / SMIQ displays a general insertion loss depending on the number of active fading channels and appropriate channel losses which applies to the worst case (all channels turned on) to avoid overdrive at the CMU IQ input. In order to maintain a defined signal level at the DUT the CMU generator level setting must compensate the hardware loss. This can be achieved by setting the EXTERNAL ATTENUATION parameter of the CMU generator to the value of this hardware loss. The SMIQ signal generator and ABFS fading simulator support several GSM fading standards (GSM Typical Urban, GSM Hilly Terrain, etc.) with multiple paths and profiles (Rayleigh, Pure Doppler, etc.).

A power component (software loss) resulting from the sum of the power of each path must be added to the hardware loss in order to obtain the correct total insertion loss of the ABFS / SMIQ. The following schematic shows the signal paths and their calculation.

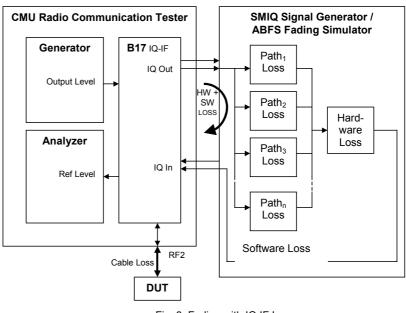


Fig. 3 Fading with IQ IF Loop

The software invoked portion of the insertion loss is calculated as:

SoftwareLoss = 
$$-10 * \log \left( \sum_{n=1}^{N} 10^{\frac{-PnLoss}{10}} \right)$$

 $P_{nLOSS}$  = Loss of n-th path. Must be calculated as negative amplification Hardware Loss = hardware attenuation of IQ path

N = 12 for ABFS or SMIQ with SMIQ-B14 and -B15 option, N = 6 in SMIQ with only SMIQ-B14 option

Since the paths are switched together parallel, the sum of the power amplification factors (delogarithmized path losses) must be added and the resulting sum logarithmized. **GSMFADLEvCor** sets the CMU external generator attenuation to this value. The CMU generator output level display shows the power actually applied to the DUT.

<u>Note:</u> The formula above applies to fading profiles consisting of non correlated signal paths (usually Raleigh). The calculated result will not be precise as soon as the fading profile contains at least two correlated paths (e.g. CPHAS), since their calculation is voltage instead of power based.

<u>Example:</u> 2 active paths with 0dB and 6dB path loss and Raleigh fading type. The basic ABFS hardware loss is 11.81dB as measured according to the IQ calibration routine described in the following section. The total external attenuation:

See chapter "Calibrating Hardware Loss" for a detailed description of Gen-Loss.

$$ExtAtt = -0.01 + 11.93 - 10 * \log\left(10^{\frac{-0}{10}} + 10^{\frac{-6}{10}}\right) + 0.00 = 10.95$$

This precise calculating method makes an a additional power measurement at the DUT input obsolete.

## **Calibrating Hardware Loss**

The hardware invoked attenuation is device dependant and must be determined for the individual setup. This measurement setup uses RF2 as output and RF1 as input. The **CALIBRATE** button of the program **GSMFADLEvCor** performs this procedure:

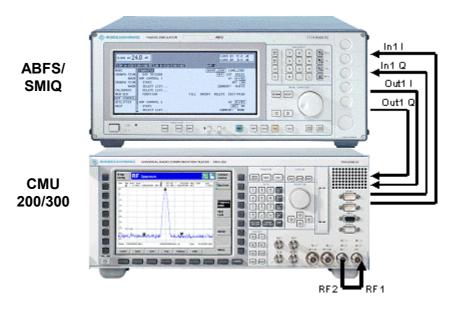


Fig. 4 Calibration Configuration

1. Switch the fading simulator to **STANDARD...** -> **CALIBRATION MODE** (1 path, CPHAS profile, 0.0dB path loss). This sets the digital loss to zero and the measured value will only reflect the hardware attenuation.

FREQ	1.000 00	)O O	MHz		LEVEL PEP		30.00 dBm 18.74 dBm
ECTOR DIST F	SIK					ALC-SA	H
DIGITAL STD	PATH	1	2	3	4	5	6
ARB MOD	STATE	ON	OFF	OFF	OFF	OFF	OFF
NOISE/DIST	PROFILE	CPHAS	CPHAS	CPHAS	CPHAS	CPHAS	CPHAS
FADING SIM	DISCRETE COMP	OFF	OFF	OFF	OFF	OFF	OFF
BERT LF OUTPUT							
SHEEP	CONST PHASE	0.0	0.0	0.0	0.0	0.0	0.0 des
LIST	SPEED	107.93	107.93	107.93	107.93	107.93	107.93 km/ł
MEM SEQ	DOPPLER FREQ	0.1	0.1	0.1	0.1	0.1	0.1 Hz
UTILITIES	PATH LOSS	0.0	0.0	0.0	0.0	0.0	0.0 dB
HELP	DELAY	0.00	0.00	0.00	0.00	0.00	0.00 Ps

Fig. 5 ABFS/SMIQ Calibrating Mode

2. Configure the CMU generator to GSM900 non-signalling mode with the following generator settings.

GSM900	Analyze	er / Genei	rator		. <b>- 1</b>	Connect Control
😑 GSM900 Connectio	n Control 🚪	4			RF G	enerator On
			- 10.0 dBm RF Level used 948.0 MHz		30.0 dB unused	Generator RF Channel
			+0.000 kHz			Frequency Offset
				SM 0 🗄		Training Sequence
				All 0 #		Bit Modulation
			E	Burst		Trans- mission
	Analyzer	Generator	LA L	i/rf 🕞	Sync.	1 2

Fig. 6 CMU Generator Setup

3. Set the CMU analyzer to the same frequency (not channel) as the generator.

	SM900	Analyze	er / Gener	ator		, d 🐪	Connect Control
GSM900	Connectio	n Control 🚪	4			RF Ge	nerator On
				0.0 d			Max. Level
				948.0	and a second sec		RF Channel
				+ 0.000	kHz		Frequency Offset
					GSM 0 🗄		Training Sequence
					Peak		Wideband Power
		Analyzer	Generator		AF/RF ⊕	Sync.	1 2

Fig. 7 CMU Analyzer Setup

4. Set the IQ/IF board to Bypass mode (Fig.8) in order to obtain the reference Average Burst Power **PREF** (Fig.9).

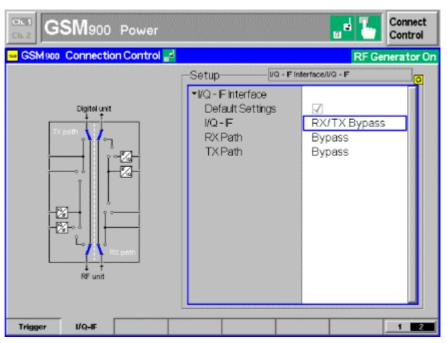


Fig. 8 IQ/IF Bypass Configuration

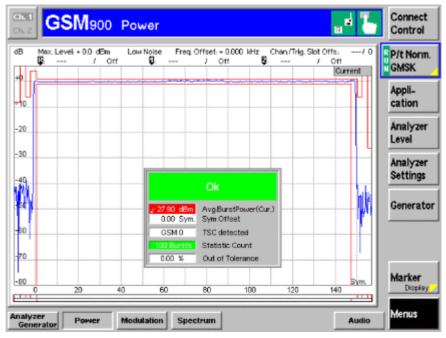


Fig. 9 Burst Power in Bypass Mode

5. Activate the IQ loop and send the signal through the fading simulator.

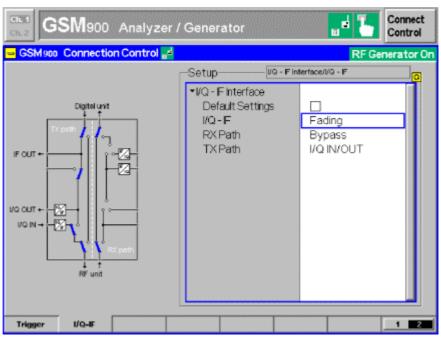


Fig. 10 IQ/IF Fading Configuration

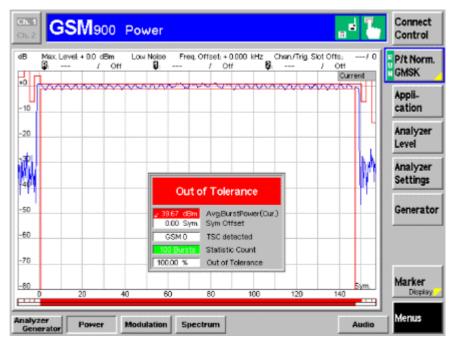


Fig. 11 Burst Power with Calibration Mode Standard Fading

6. The resulting Average Burst Power  $\mathbf{P}_{\text{MEAS}}$  must be subtracted from the reference power  $\mathbf{P}_{\text{REF}}$  to obtain the hardware attenuation of the IQ path.

Hardware Loss =  $P_{ref} - P_{meas}$  = -27.90dBm + 39.67dBm = 11.77dB

The **GSMFADLEvCor** indicator **GEN LOSS** and the control **HARDWARE LOSS** can be automatically updated by pressing **CALIBRATE**; alternatively **HARDWARE LOSS** may be entered manually. This value is device dependant and is valid for signalling and non-signalling measurements.

Gen Loss is calculated as:

*GenLoss* = *Genlev* – Pr *ef* – *CabLoss* 

## Installing the Level Correction Software

The following installation files are required to install the level correction software GSMFADLEVCOR on the controlling PC.

GSMFADLEVCOR v1.xx.MSI

DISTFILE.CAB

Execute GSMFADLevCor v1.xx.msi and select the installation directory. A new menu item GSMFADLevCor is created in START -> PROGRAM FILES. The installation directory contains the files named below:

GSMFADLevCor.Exe	Executable
GSMFADLEVCOR.CFG	Configuration file
GSMFADLEVCOR.CHM	Online help manual

## **Running the Level Correction Software**

1. On the CMU assign at least one of the desired GSM **SIGNALLING** or **NON-SIGNALLING** function groups to one or more of the 29 possible GPIB secondary addresses (1..29).

GSM400 Analyz	er / Genei	rator		. d 🐍	Connec Control
Setup					
-Setup		S	econdery Addre	ss (OPIB)	<mark>0</mark>
SCPI Connection     Primary Address [GPIB]					
<ul> <li>Secondary Address [GPIB]</li> </ul>	Function Gro	up	Mode		
Address 1	GSM 400		Non-Sign	alling	Compress
Address 2	GSM 900		Signalling		
Address 3	GSM 180	0	Non-Signa	alling	
Address 4	Not Mapp	bed			
Address 5	Not Mapp				
Address 6	Not Mapp	bed			
Address 7	Not Mapp	bed			
Address 8	Not Mapp	bed			
Address 9	Not Mapp	bed			
Address 10	Not Mapp	bed			
Address 11	Not Mapp	Not Mapped			
Address 12		Not Mapped			
Print Remote Comm.	Options	Time	Misc.	[	

Fig. 12 CMU GPIB secondary address setup

- 2. Start **GSMFADLevCor.Exe** on the PC.
- 3. Set the primary GPIB addresses (PAD) according to the CMU settings.
- 4. Set the secondary GPIB address (SAD) according to the CMU settings.
- Initialize the CMU and SMIQ or ABFS by pressing the corresponding INIT buttons. After both instruments have been initialized correctly the identification strings of the devices are displayed and the GET SETTINGS, EXTERNAL ATTEN LED, CALIBRATE and CALCULATE controls are high lighted.

-	arz GSM Fadir	ng Level Correcti	on v1.50			e z
<u>F</u> ile <u>H</u> elp						4
C	ommunicatio	on Tester		Fading	g Simulator	
Rohde&Schwarz	.CMU 200-1100.0	0008.02,100714,V3.1	10!	Rohde&Schwarz,ABI	S,835441/0001,1.12	Quit
PAD 륒 20 SA	.D 🗘 2 🚺 Init			PAD 륒 28 🔤 Init	]	
UCC	Туре					
1 450	4900MS_NSig"				Fading Type STANDARD FAD	
Analyzer	Generator				Endine Chevaleral	
Ref.Level/dBm	RF Freq / MHz				Fading Standard CALIBRATION MODE	
0.00	1000.000000				JUALIBRA HON MODE	
RF Freq / MHz	RF LvI / dBm	Est.Atten/dB	Gen.Loss/dB	Hardware Loss / dB	Software Loss / dB	Cable Loss/dB
1000.000000	-27.00	11.92 =	0.05	+ 🗘 11.62	+ 🗘 0.00	+ 🗘 0.25
<u>G</u> et S	ettings	<b>E</b>	Calil	prate	Calculate	
<u></u>				P		1

Fig. 13 Main Window

- 6. Press the **GET SETTINGS** button to read the current CMU generator and analyzer settings.
- To determine GEN LOSS (= RF Level Cable Loss with shortened CMU-B17) and HARDWARE LOSS of fading simulator press the CALIBRATE button.
- 8. Press the **CALCULATE** button to read the current ABFS/SMIQ fading configuration and update the **SOFTWARE LOSS** with the calculated value.
- 9. If the **ON/OFF** checkbox is active the CMU generator external attenuation parameter is automatically set to the **Ext Att** value.
- <u>Note:</u> The EXT ATT display is automatically updated when the CALIBRATE or CALCULATE buttons are pressed or the HARDWARE LOSS, SOFTWARE LOSS and CABLE LOSS values are changed manually. If the EXT ATT checkbox is active this value is immediately transfered to the CMU.

The GsmFadLevCor indicator  ${\rm RF}$  Level shows the CMU RF Level (used timeslot) in non-signalling mode.

GSM400	Analyze	er / Gener	ator		. e L	Connect Control
😑 GSM 400 Connectio	on Control 🚪	4			RFG	enerator On
			- 40.0 dBm	-	80.0 dB unused	Generator
			1000.0 MHz		]	RF Channel
			+ 0.000 kHz	1		Frequency Offset
			Genérafoi Modul	GSM 0	1	Training Sequence
				All 0		Bit Modulation
				Burst		Trans- mission
	Analyzer	Generator		IF/RF 🕞+	Sync.	1 2

Fig. 14 GSM Non-Signalling RF Level used

In signalling mode RF LEVEL refers to the BCCH and TCH level.

Ch.1 Ch.2	SM900	Power			Packet Data BLER	1	Connect Control
🛥 GSM 900	Connectio	n Control	4				Idle
Frequency Offset		+ 0 Hz	TCHARCCH	TCH			
Mode		BCCHa	nd TCH 🛓		0 dB		PO
BCCH Level	- 70.	0 dBm		- 70.0 TCH Ref			Slot Config.
RF Channel	62			62			RF Channel
				3			Main Timeslot
Connection		MS Signal	BS Signal	Network	af/rf ⊕+	Sync.	1 2

Fig. 15 GSM Signalling BCCH and TCH Level

## **Controls and Indicators**

CMU

- PAD GPIB primary address of the CMU. Range: 0 to 31.
- SAD GPIB secondary address of the active CMU option GSM 400, GSM 850, GSM 900, GSM 1800 SIGNALLING and NON SIGNALLING. Range: 1 to 29.
- **INIT** Checks for the presence of a device and displays the identification string of a device found in the text field.

#### Generator

- **RF FREQUENCY** displays current RF frequency of the CMU generator.
- RF Level RF Level of used TimeSlot. Range: -137.0 to –10 dBm.
- **CABLE LOSS** The Attenuation set for the cable from the RF2 connector to the DUT. The CABLE LOSS is added to the level offset EXT ATT.
- **Ext Att** The level offset applied to output power to compensate for cable loss, generator loss, and hardware loss, software loss.

*ExtAtt* = *GenLoss* + *HWLoss* + *SWLoss* + *CableLoss* 

The maximum value depends on the device specification. GSMFADLEVCOR displays the following error message in case the Ext Att value exceeds its maximum.

🔊 Warning	8	×				
Level exceeded maximum device level!						
	1					

Fig. 16 Level Warning

• **ON/OFF** – Activates/deactivates CMU external attenuation.

Analyzer

- **RF FREQUENCY** displays the current RF frequency of the CMU analyzer.
- LEVEL Current reference level of the CMU analyzer.

#### ABFS

- PAD GPIB primary address of the ABFS. Range: 1 to 32.
- **INIT** Checks for the presence of a device and displays the identification string of a device found in the text field.

The GSM fading profiles can be selected on the SMIQ / ABFS by pressing

GROUPA FSIM (ABFS) / FADING SIM (SMIQ) STANDARD FAD -> STANDARD

GSM TYPICAL URBAN3,6 PATHGSM TYPICAL URBAN3,12 PATHGSM TYPICAL URBAN50,6 PATHGSM TYPICAL URBAN50,12 PATHGSM HILLY TERRAIN100,6 PATHGSM RURAL AREA250,6 PATHGSM EQUAL TEST50,6 PATH

• **TYPE** – fading type indicator. <u>Range:</u> STANDARD FAD.

<u>Note:</u> Keep in mind that GSMFADLEVCOR supports only GSM signal generation on the CMU. It makes no sense to choose a different fading standard other than GSM on the ABFS / SMIQ.

- **STANDARD** Indicator for predefined fading profiles, see list above.
- **HARDWARE LOSS** Attenuation of the IQ path as determined manually or by pressing the **Calibrate** button (see section 'CALIBRATING HARDWARE LOSS' on page 6).
- CALIBRATE Performs full automatic calibration and update of the HARDWARE LOSS indicator.
- SOFTWARE LOSS Fading path loss inserted by the fading simulator. It is calculated by pressing CALCULATE as shown in the section 'Basics of Fading Tests with IQ/IF Loop' (page 5).
- CALCULATE Reads the current fading parameters and updates the appropriate indicators as necessary. Software Loss is updated with the calculated value.

### Menu

#### File

All program and device specific data can be saved and loaded from a configuration file.

🐺 Rohde&Schwarz G
<u>File</u> <u>H</u> elp
Load Configuration
Save Configuration
Quit

- LOAD CONFIGURATION the default file extension is \*.cfg. The configura-• tion file contains the following parameters:
  - 1. X = last horizontal window position
  - Y = last vertical window position
     CMU GPIB primary address

  - 4. CMU GPIB secondary address of GSM xxxx module
  - 5. SMIQ / ABFS GPIB address
  - 6. External loss
  - 7. Software Loss Attenuation
- SAVE CONFIGURATION the default file extension is \*.cfg. Similar file • dialog as Load Configuration.

#### Help

- HELP Displays online help •
- ABOUT displays revision and copyright information .

# 5 Testing MS Receiver Quality with BLER Measurements Under Fading Conditions

A criteria for MS or BS receiver quality is the bit error rate (BER) or block error rate (BLER) which are therefore specified in the GSM/GPRS/EDGE test standards for base and mobile stations. The following example describes a BS BLER measurement under fading conditions.

- 1. Connect  $\mathbf{RF2}_{OUT}$  with  $\mathbf{RF1}_{IN}$  on the CMU.
- 2. Start **GSMFADLevCor.exe**, **INIT** devices and determine **GEN Loss** and **HARDWARE LOSS** by pressing the **CALIBRATE** button.

<mark>ØRohde&amp;Schwa</mark> File <u>H</u> elp	arz GSM Fadir	ng Level Correct	ion v1.50			
Communication Tester Rohde&Schwarz,CMU 200-1100.0008.02,100714,V3.10			Fading Rohde&Schwarz,ABR	Quit		
P	Type M900MS_Sig''			PAD 륒 28init	Fading Type STANDARD FAD	
Analyzer Ref.Level/dBm	Generator Channel				Fading Standard	
30.00	Lnannei 1				GSM Typical Urban 5	
Channel 1	RF LvI / dBm -85.00	Ext.Atten/dB 0.52 =	Gen.Loss/dB	Hardware Loss / dB	+ Software Loss / dB	Cable Loss/dB
<u>G</u> et Se	ettings		Calib	rate	Calculate	_

Fig. 18 GSMFadLevCor Setup

- 3. Select the desired fading profile on ABFS / SMIQ, e.g. **GSM Typical URBAN 50**.
- 4. Optionally edit the CABLE LOSS, e.g. 0.25dB.
- 5. Calculate the **SOFTWARE LOSS** by pressing the **CALCULATE** button.

6. Transfer the **Ext. Att** value to the CMU by activating the **ON/OFF** checkbox (e.g. **Ext. Att** 8.39dB = **Gen Loss** 0.05dB + **HARDWARE Loss** 11.62dB + **SOFTWARE LOSS** -3.52dB + **CABLE LOSS** 0.3dB).

GSM900 c	Dverviev	"		Facket Dolla DCLR	- <b>L</b>	Connect Control
GSMstel Connection	Control 📑					Idie
AF Connector C			70	Connector Detur	:	
Arayan 2 💽 💿 (seremo 2		PF 3 OLIT	ero Ge	RF 1	RF Output	
Analyza : O O O O O O O O O O O O O O O O O O			+ 0.0 an	-	0.0 eD	Ext. Att. Output
Speech Encoder	Handset	IJ	RF / N	RF2 O+	RF 1	RF Input
Speech Decoder	Handset	4	+ 0.0 an	+2.0 +0 +	- 0.0 vid	Ext. Att. Input
				eeee		R Wideband Power
Commution 6	AS Signal	RS: Signal	Nelvenk	AFARE 🕞	Sym	1 2

Fig. 19 Connection Control

- 7. Switch the CMU to  $\mathbf{RF2}_{INOUT}$  mode and connect the MS.
- 8. When changing the fading profile repeat the procedure starting with step  $3_{,j}$ .
- 9. To select the BLER test choose for example **GSM900 SignalLing** mode -> **RECEIVER QUALITY** -> **APPLICATION** -> **BLER**.

3 C1	G	SM900 R	eceiver Qualit	y	Packet & Data BLER D	° 7	Connect Control
Ξ	LER 1.41 × 1.43 × 6.42 × 1.94 × 2.83 ×	RLC Blocks 0 213 210 218 206 0 0 847 RLC Data R	Slot 0 Slot 1 Slot 2 @ - 1090 dBm Slot 3 @ - 1090 dBm Slot 4 @ - 1090 dBm Slot 5 @ - 1090 dBm Slot 6 @ - 1090 dBm Slot 7 Over all	Settings • Signaling States • MS Capabilities • Signaling Info MS IMB Dialed Number Coding Scheme • Meas. Control Repetition	001.01.012345 010101.00.019 - CS 2 Continuous	6789	Control BLER Appli- cation Analyzer Level MS Signal BS Signal Network
OPRS CS CS 2 Bit Stream BLER Overview Power Modulation Spectrum				n Re	Quality	Audio	Menus

Fig. 20 BLER Measurement

10. The generator **RF LeveL** can be varied manually as shown on page 15.

# **6** Additional Information

Please contact <u>TM-Applications@rsd.rohde-schwarz.com</u> for comments and further suggestions.

# 7 Ordering information

Communication Tester CMU 200 CMU 300		1100.0008.02 1100.0008.03
Vector Signal Generator		
SMIQ02B	(300 kHz to 2.2 GHz)	1125.5555.02
SMIQ03B	(300 kHz to 3.3 GHz)	1125.5555.03
SMIQ03HD	(300 kHz to 3.3 GHz)	1125.5555.33
SMIQ04B	(300 kHz to 4.4 GHz)	1125.5555.04
SMIQ06B	(300 kHz to 6.4 GHz)	1125.5555.06
Fading Simulator ABFS Fading Simulator		1111.8506.02
Options		
CMU-B17 IQ-IF Interface		1100.6906.02
SMIQ-B14	Fading simulator 6 path, man- datory	1085.4002.02
SMIQ-B15	2nd Fading simulator, optional	1085.4402.02



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