

# Agilent E6701D GSM/GPRS Lab Application

## Data Sheet

For use with the E5515B/C (8960)  
wireless communication test

### Part of the Network on a Bench solution from Agilent

The E6701D GSM/GPRS lab application gives R&D engineers a network emulator with RF measurement capability on their desk, allowing them to quickly troubleshoot and validate GSM and GPRS wireless device designs. The flexible, comprehensive protocol analysis and data channel of the test set provides R&D engineers with the tools needed to accurately evaluate and verify a device's signaling functionality, IP performance, and user experience.

The E5515C (8960) wireless communications test set provides real-time phone-to-internet connectivity. Live user data transfers test and verify real-life application scenarios to validate new wireless device designs quickly and accurately. These lab applications, designed specifically for wireless device development, are affordable enough to put on every design engineer's desk!

#### Features

- Reduce cost of test right at your desk with data channel functionality to test end-to-end connectivity and to verify throughput, robustness of radio link control, and IP connectivity

Wireless Protocol Advisor - Post Capture - [mobile\_init\_gprs\_attach.tol Traffic Overview]

Num	Direction	Timestamp	System Time	Protocol	Message	Transport Channel
10	For/Down	12:55:52.080000	1340	MAC	CCCH	FACH
11	For/Down	12:55:52.090000	1341	RLC	RLC UMD PDU	
12	For/Down	12:55:52.090000	1341	MAC	CCCH	FACH
13	For/Down	12:55:52.100000	1342	RLC	RLC UMD PDU	
14	For/Down	12:55:52.100000	1342	MAC	CCCH	FACH
15	Rev/Up	12:55:52.920000	1424	MAC	DCCH	DCH
16	Rev/Up	12:55:52.920000	1424	RLC	RLC AM PDU	
17	Rev/Up	12:55:52.960000	1428	MAC	DCCH	DCH
18	Rev/Up	12:55:52.960000	1428	RLC	RLC AM PDU	
19	For/Down	12:55:52.980000	1431	RLC	RLC AM PDU	
20	For/Down	12:55:52.980000	1431	MAC	DCCH	DCH
21	Rev/Up	12:55:53.090000	1441	RRC	RRConnectionSetupComplete	
22	Rev/Up	12:55:53.160000	1448	MAC	DCCH	DCH
23	Rev/Up	12:55:53.160000	1448	RLC	RLC AM PDU	
24	Rev/Up	12:55:53.200000	1452	MAC	DCCH	DCH
25	Rev/Up	12:55:53.200000	1452	RLC	RLC AM PDU	
26	For/Down	12:55:53.230000	1455	RLC	RLC AM PDU	
27	For/Down	12:55:53.230000	1455	MAC	DCCH	DCH
28	Rev/Up	12:55:53.330000	1465	RRC	InitialDirectTransfer	
29	Rev/Up	12:55:53.330000	1465	GMM/SM	GMM - Attach Request	
30	For/Down	12:55:53.330000	1465	GMM/SM	GMM - Identity Request	
31	For/Down	12:55:53.330000	1465	RRC	DownlinkDirectTransfer	
32	For/Down	12:55:53.350000	1467	RLC	RLC AM PDU	
33	For/Down	12:55:53.350000	1467	MAC	DCCH	DCH
34	Rev/Up	12:55:53.520000	1484	MAC	DCCH	DCH
35	Rev/Up	12:55:53.520000	1484	RLC	RLC AM PDU	
36	Rev/Up	12:55:53.560000	1488	MAC	DCCH	DCH
37	Rev/Up	12:55:53.560000	1488	RLC	RLC AM PDU	
38	For/Down	12:55:53.590000	1491	RLC	RLC AM PDU	
39	For/Down	12:55:53.590000	1491	MAC	DCCH	DCH
40	Rev/Up	12:55:53.690000	1501	RRC	UplinkDirectTransfer	
41	Rev/Up	12:55:53.690000	1501	GMM/SM	GMM - Identity Response	
42	For/Down	12:55:53.690000	1501	GMM/SM	GMM - Authentication And Ciphering Req	
43	For/Down	12:55:53.700000	1502	RRC	DownlinkDirectTransfer	

MSB Bin LSB Hex Description  
 11011101 dd System Time=1501(dec)  
 00000101 05  
 00000000 00  
 00000000 00  
 00000100 04 Protocol=GMM/SM  
 00001000 08 Protocol Discriminator=GPRS MM  
 00001000 GPRS MM Skip Indicator = Skip Indicator  
 00010110 18 GPRS Mobility Management Message Type=Identity Response  
 00000111 07 Length=7 octet(s)  
 01001001 48 Odd/Even Indicator=Odd number of identity digits  
 01001001 Type of Identity= IMSI  
 01001001 IMSI Identity Digits= 4407931787902  
 00000100 04

- Get complete verifications of designs with selectable and powerful triggering, filtering, and search capabilities of logs, viewing of raw data in either hex, decimal, or binary form

#### Also Available

- EGPRS integrated with GSM and GPRS with purchase of E6704A EGPRS lab application
- Verify your design's performance under real network conditions using incremental redundancy



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## Audio Functionality

- Choice of speech encoded on downlink TCH: none, echo, 300 Hz sine, 1 kHz sine, 3 kHz sine, PRBS-15, multitone, and custom
- GSM analog audio measurement (audio level, distortion, frequency, SINAD)

## Receiver Measurements

- GSM bad frame indication (BFI)
- GSM FACCH frame erasure rate (FER)
- GSM burst-by-burst bit error ratio (fast BER)
- GSM bit error ratio (BER)
- GPRS multislot bit error ratio (BER)
- GPRS multislot block error ratio (BLER)
- AMR in-band frame error (AMR I-FER)
- USF BLER (assigned)
- USF BLER (unassigned)

## Transmitter Measurements

(Maximum of two uplink timeslots)

- Multislot-tolerant transmit power
- GSM/GPRS multislot-tolerant frequency error
- GSM/GPRS multislot-tolerant phase error (peak and rms with confidence limits)
- Multislot-power versus time (burst mask comparison with settable masks)
- Burst timing
- Multislot-tolerant output RF spectrum due to modulation and switching
- IQ tuning
- GSM decoded audio level
- Dynamic power

## Instruments

- Audio generator
- General-purpose spectrum monitor
- Data throughput monitor
- GSM multi-tone audio

## Protocol Functionality

- GPRS PS data channel
- GSM CS data channel
- Frequency hopping on TCH or PDTCH
- AMR voice echo
- Highly configurable GSM and GPRS SMS
- RRLP layer for A-GPS and E-OTD
- Protocol event trigger outputs
- Protocol logging with WPA software
- SACCH and PACCH measurement reports

Measurement/Instrument Screen						
Control	GSM FACCH Frame Erasure Rate			TCH Params		
FER Setup ▾	<b>FACCH Frame Erasure Rate</b>			Timeslot	4	
	<b>6.600 %</b>			Timing Advance	0	
	Frames Erased: 33			Mobile Loopback	Speech	
	Frames Sampled: 500					
	500 / 500			PRBS-15		
	Single			Return		
	Frame Erasure Rate Setup		Value			
	Samples To Test		500			
	FACCH Repetition Interval		120.0 ms			
	Trigger Arm		Single			
Measurement Timeout		Off				
Close Menu						
		Active Cell Connected	Sys Type: GSM			
			Logging: Active			
1 of 2		IntRef	Offset	2 of 2		

Figure 1. Verify your GSM wireless device's reference sensitivity on FACCH/F as per 3GPP 51.010-1.

## GSM and GPRS Frequency Hopping

Applies to a traffic channel, TCH or PDTCH. The following settings can be changed when Cell Off operating mode is selected.

- **Cell allocation (CA) table:** 1 to 16 settable traffic channel ARFCN(s) to be used within the cell
- **Mobile allocation (MA) configuration:** selection of manual (user configures MA table entries) or auto (automatically enable every applicable entry in the CA table)
- **MA table:** 1 to 16 entries settable to indicate which entries within the CA table are used for hopping

The following settings can be changed at any time.

- **Mobile allocation index offset (MAIO):** settable between 0 and 15
- **Hopping sequence number (HSN):** settable between 0 and 63; 0 corresponds to a cyclic hopping sequence, 1 to 63 correspond to a pseudo-random hopping sequence
- **Measurement ARFCN:** settable measurement frequency based on valid entries in the MA table

## AMR Voice Echo

- Make MO and MT calls with speech received by the test set looped back to the mobile
- Use stress mode to force the mobile to change codec mode on the uplink as often as allowable
- MS request option configures instrument to respond to mobile requests for codec rate changes
- In call changes of codec set, threshold or hysteresis values via RATSCCH signaling
- Current downlink and uplink AFS codec mode selectable as 4.75 kHz, 5.15 kHz, 5.9 kHz, 6.7 kHz, 7.4 kHz, 7.95 kHz, 10.2 kHz, 12.2 kHz, or stress mode
- Current downlink and uplink AHS codec mode selectable as 4.75 kHz, 5.15 kHz, 5.9 kHz, 6.7 kHz, 7.4 kHz, 7.95 kHz, or stress mode

The following settings can be changed.

- Logical speech channel setup selectable as half rate (HR), full-rate (FS), enhanced full-rate (EFS), adaptive full-rate (AFS), half-rate (HS), or adaptive half-rate (AHS)
- **AFS codec set:** one to four codecs selectable as 4.75 kHz, 5.15 kHz, 5.9 kHz, 6.7 kHz, 7.4 kHz, 7.95 kHz, 10.2 kHz, or 12.2 kHz
- **AHS codec set:** one to four codecs selectable as 4.75 kHz, 5.15 kHz, 5.9 kHz, 6.7 kHz, 7.4 kHz, or 7.95 kHz
- **Threshold values:** zero to three AFS threshold values or zero to three AHS threshold values are settable between 0 and 31.5 dB in 0.5 dB steps; number of threshold values settable is dependent on number of selected codec modes in the AFS or AHS codec set
- **Hysteresis values:** one to three AFS hysteresis values or one to three AHS hysteresis values are settable between 0 and 7.5 dB in 0.5 dB steps; number of threshold values settable is dependent on number of selected codec modes in the AFS or AHS codec set

## GSM and GPRS SMS

Test WAP push, MMS, EMS messaging, and concatenated SMS with expanded GSM and GPRS SMS functionality.

Use the 8960's HTTP SMS interfaces to connect via Ethernet to a SMS gateway using industry standard protocols. Use tools provided by the SMS gateway to automate message configuration and content generation for all types of MT SMS messages. Two instruments can be linked via SMS gateway to enable phone to phone MMS test.

### MT point-to-point SMS

- Determine the state of the last MT message sent as either idle, send, ack, nack, or reject
- Choose to send either GSM or GPRS SMS
- Send UCS2 and binary MT SMS configured using a custom data GPIB command or send one of two fixed ASCII text messages or configure a custom ASCII text message using GPIB (TP-UD)

#### Fixed message 1:

0123456789ABCDEFGHIJKLMN  
OPQRSTUVWXYZabcdefghijklmnopqr  
stuvwxyz

**Fixed message 2:** Agilent Technologies, your partner in wireless solutions

- Configure the message type of any MT SMS as SMS-DELIVER, SMS-SUBMIT-REPORT, or SMS-STATUS-REPORT with the option to configure the SMS-SUBMIT-REPORT as RP-ERR (negative) or RP-ACK (positive)
- **SMS-DELIVER message type header:** configure data coding scheme and message class (TP-DCS), more messages to send (TP-MMS), protocol identifier (TP-PID), reply path (TP-RP), status report indication (TP-SRI), and user data header indication (TP-UDHI)

- **SMS-SUBMIT-REPORT message type header:** configure data coding scheme and message class (TP-DCS), failure cause (TP-FCS), parameter indicator (TP-PI), protocol identifier (TP-PID), user data header indication (TP-UDHI) parameters, originating address (TP-OA) and recipient address (TP-RA)
- **SMS-STATUS-REPORT message type header:** configure data coding scheme and message class (TP-DCS), message reference (TP-MR), more messages to send (TP-MMS), parameter indicator (TP-PI), protocol identifier (TP-PID), status (TP-ST), and user data header indication (TP-UDHI) parameters

### MO point-to-point SMS

- Choose to receive either GSM or GPRS SMS
- Loop back MO SMS to the mobile as a new message
- View on the test set's display all types of MO SMS received, including header content, as an ASCII string or string of hexadecimal characters
- Determine the header content of any MO SMS using GPIB queries for TP-DA, TP-DL, TP-DCS, TP-UDHI, TP-PID, TP-SRR, and TP-MR
- Determine the content of any MO SMS including header content and length, filler data, and message content using GPIB queries
- Determine when MO SMS has been received by the test set using GPIB interrupt or polling mechanisms
- **SMS-SUBMIT-REPORT:** respond automatically to an MO SMS or manually construct report and report type (RP-ACK or RP-ERR) and send when desired using GPIB

- **SMS-STATUS-REPORT:** send automatically when requested by the mobile in an MO SMS or manually construct and send when desired using GPIB
- Be sure to capture all concatenated MO SMS by using message queuing

### GSM cell broadcast SMS

- Send up to three messages simultaneously with settable message ID, message code update number, and language
- Send one of two fixed ASCII text messages or configure a custom ASCII text message using GPIB

#### Fixed message 1:

The quick brown fox jumps over the lazy dog

#### Fixed message 2:

This instrument provides functional testing of broadcast SMS by sending up to three broadcast messages to the device under test. Two fixed messages and a user-defined message are available for selection. The second fixed message spans multiple pages.

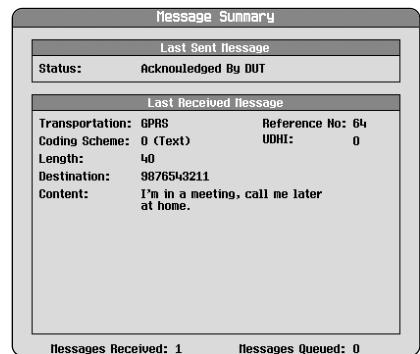


Figure 2. Test your device's SMS performance with configurable MO and MT SMS.

## IP Data Connection

- Transfer of IP packet data between a DUT and a network with full PDP context activation
- **Test device's IP packet data functionality:** WAP or Web browsing, FTP throughput rates, serial or USB modem functionality, e-mail, and data downloads to PC
- GSM CS and GPRS PS connections
- Change multislot configurations, coding schemes, power levels, and channel numbers during data transfer
- **Ping:** test set ping of DUT or other device on a network, network ping of test set or device

## GSM CS data connection

- Mobile-originated establishment of a CS data connection at 2.4, 4.8, or 9.6 kbps using a full-rate GSM channel
- Transparent data (raw rate-adapted bits directly to PPP) at 2.4, 4.8, and 9.6 kbps
- Non-transparent data (using RLP layer) at 4.8 and 9.6 kbps
- Full logging of RLP, PPP, and IP layers using WPA

## GPRS PS data connection

- Mobile-originated and mobile-terminated establishment of a PS data connection using multislot configurations for Class 12 devices
- **GPRS class B:** page voice and SMS during an active GPRS data transfer
- **GPRS suspend and resume:** active GPRS data transfer suspended upon acceptance of voice or GSM SMS request, then resumed after voice call or SMS is complete
- Full logging of decoded Layer 1 through IP layer with WPA

## Trigger Output Functionality

- **Frame trigger outputs:** any combination of every frame, every frame except idle frames, every radio block, every BCH multi-frame, every PDTCH multiframe, or on a specific frame number (once per hyperframe)
- **Protocol event trigger output timing:** protocol events associated with an MS action can provide a trigger when the BS event occurs, when the MS is expected to receive, or when the MS is expected to transmit
- **RLC/RR layer protocol event trigger outputs:** any combination of packet uplink assignment, packet downlink assignment, packet timeslot reconfigure, packet power control and timing advance, and packet immediate assignment messages
- **Upper layer protocol event trigger outputs:** any combination of identity request, attach accept, detach request, request PDP context activation, and PDP context activation accept messages

Call Setup Screen					
Control	Call Setup				BCH Params
Operating Mode	DUT Information				Cell Power
Active Cell	INSI: 001012345678901		Multislot Class (GPRS): 8		-70.00
Connection Type	Called Num: 9876		Multislot Class (EGPRS): ----		dBm
Auto	Traffic Channel Downlink Power				Cell Band
End Call	Burst 1, 2, 3, 4: -70.00, ----, ----, ---- dBm				PCS
Paging INSI	Unused Bursts: ---- dBm				Broadcast Chan
001012345678901	Counters				512
Handover Setup	Page: 0	DUT IP Tx, Packets: 1			
Cell Info	RACH: 4	Bytes: 261			
	PRACH: 0	DUT IP Rx, Packets: 2			
	Missing Burst: 0	Bytes: 168			
	Corrupt Burst: 0				
	Decode Error: 5				
	Error Reports				Return
	Burst Timing Error: -0.25 T				
	BLER (Block Error Rate): ---- % over ---- blocks				
	USF BLER: ---- % over ---- blocks				
	Active Cell		Sys Type: GPRS		
	Connected + Data		Logging: No Conn.		
1 of 2	IntRef	Offset			

Figure 3. Test your device's internet connectivity using CS data.

## Integrated GSM and GPRS Functionality

- Switch between GSM and GPRS serving cells
- Switch between data and voice connections without losing camp or attach
- Establish a voice or data connection after initial GPRS attach
- Send SMS while on a voice call
- Send SMS while a PS data connection is active
- Initiate a voice call while a PS data connection is active; data transfer is suspended and resumes after the voice call is terminated

## GSM Functionality

**Mobile station power output level control:** meets GSM phase one and phase two power control levels

**Traffic channels:** TCH/FS-FR, EFR, HR, AFS, and AHS speech modes

**Broadcast channel configuration:** BCCH + CCCH + SDCCH/4

**Signaling protocol setup:** FACCH audio speech echo with one-second fixed delay

## GPRS Functionality

**Multislot classes supported:** 1 through 12

**Control channels:** BCH on timeslot 0 on any ARFCN in any band

**Broadcast channel configuration:** FCCH + SCH + BCCH + CCCH + SDCCH/4 (0-3) + SACCH/C4 (0-3)

**Packet broadcast channel configuration:** PBCCH + PCCCH + PDTCH + PACCH + PTCCH. PDTCH, PACCH, and PTCCH currently unused

**Downlink PDTCH:** one, two, three, or four on the same PDTCH ARFCN with one or two PDTCH amplitudes settable between 0 and 55 dB below BCH amplitude; amplitudes in adjacent timeslots selectable as off, PRL (power reduction level) one, or PRL two

## Call Processing Functionality

- GSM 450 MHz, GSM 480 MHz, GSM 750 MHz, GSM 850 MHz, PGSM 900 MHz, EGSM 900 MHz, RGSM 900 MHz, DCS 1800 MHz, PCS 1900 MHz bands
- GSM MS and BS origination
- GSM MS and BS release
- GPRS mobile-initiated attach and detach
- GPRS network-initiated detach
- GPRS packet data transfers on uplink and downlink
- Intra-cell channel assignments
- Inter-cell handovers between all bands
- BA table with 16 settable neighbor cells

## BCH setup and parameters

- PBCCH on or off
- PRACH length of 8 or 11
- Settable downlink power, band, and channel number
- Settable maximum control channel power used by the MS for access bursts of 0 to 31
- Settable maximum control channel power offset value for DCS 1800 MHz band of 0 to 3
- Band indication of DCS or PCS
- Selectable MSC/SGSN revision
  - Release 98 or older
  - Release 99 onwards

## GSM TCH parameters

- Settable downlink TCH power including power in adjacent bursts, uplink band, channel number, and power level
- Channel modes of FR, EFR, AMR, and HR, plus HR subchannel of 0 or 1
- Settable uplink timeslot of 1 to 7
- Settable timing advance of 0 to 63
- Mobile loopback of off, type A, type B, or type C as defined in ETSI 04.14 or 3GPP 44.014
- Downlink TCH speech types of none, echo, 300 Hz sine, 1 kHz sine, 3 kHz sine, PRBS-15, multitone, and custom

## GPRS PDTCH parameters

- Settable downlink PDTCH power including power in adjacent bursts, uplink band, channel number, and power level
- GPRS coding schemes of CS-1, CS-2, CS-3, or CS-4
- GPRS multislot configurations of 1x1, 1x2, 1x3, 1x4, 2x1, 2x2, 2x3, 3x1, 3x2, 4x1, (downlink x uplink)
- Selection of which contiguous downlink bursts to loop back on the uplink with connection type GPRS ETSI type B
- Selection of which uplink burst to use for multislot-tolerant RF measurements

## Cell parameters

- Three-digit MNC off or on in PCS 1900 MHz band
- Settable MCC, MNC, LAC, RAC, NCC, and BCC
- Option to get IMEI at call setup
- Mobile DTX on or off
- Paging mode reorganized or normal
- Settable paging multiframes of 2 to 9
- Repeat paging on or off
- Tx level FACCH signaling on or off
- Guard period length of 9 or 10
- Uplink frame segmentation of asymmetric or symmetric

## Handover setup

- GSM traffic band, traffic channel, timeslot, channel mode, half-rate speech subchannel, MS Tx level
- GPRS traffic band, traffic channel, coding scheme, multislot configuration, P0 (power reduction reference), MS Tx level burst 1, MS Tx level burst 2, uplink state flag (USF)

## Calling party number (Caller ID)

- Include/exclude
- Settable calling party number
- **Number type:** unknown, international, national, network, dedicated
- **Number plan:** unknown, ISDN/telephony, data, telex, private, national
- **Presentation indicator:** allowed, restricted, number not available
- **Screening indicator:** user no screen, user verify pass, user verify fail, network

## DUT information

- International mobile subscriber identity (IMSI)
- International mobile equipment identity (IMEI) (when selected)
- GPRS multislot class
- Called number

## Counters reported

- RACH count
- PRACH count
- Corrupt burst count
- Page count
- Decode error count
- Missing burst count
- DUT IP Tx packet and byte counts
- DUT IP Rx packet and byte counts

## Errors reported

- Burst timing error
- BLER (block error rate)
- USF BLER (assigned)
- USF BLER (unassigned)

## Neighbor cell reports

- Channel number
- Base station color code (BCC)
- Rx level
- Network color code (NCC)

## Last location information reported

- Location area code (LAC)
- Mobile country code (MCC)
- Mobile network code (MNC)

## SACCH reports

(on a GSM voice call)

- Timing advance
- Tx level
- Rx level
- Rx qual

## PACCH reports

(on a GPRS data connection)

- C value
- Rx qual
- Signal variance
- I level for timeslots 0 to 7

## GPRS Layer 1 protocol control

- Downlink corruption on or off
- Sequence length settable between 1 and 2048 blocks
- Blocks in sequence to corrupt settable between 1 and 2048
- Corruption applied to burst(s) 1, 2, 3, and/or 4
- First corrupted symbol settable between 1 and 148
- Number of symbols to corrupt settable between 1 and 148
- Corruption pattern selectable as all zeros, all ones, or invert

## RLC/MAC protocol control

- **MAC control:** medium access control mode dynamic, fixed or extended dynamic, settable USF value, settable assigned USF value of 0 to 100 percent, selectable unassigned USF, random, or manual
- **Handover control:** packet time-slot reconfigure off or on, packet power timing advance off or on
- **Block poll rate:** settable value from one to 32
- **Frame start position:** relative, absolute, or immediate
- **RLC/MAC header:** off or on in GPRS BCH+PDTCH operating mode

## LLC protocol control

- **FCS for BLER:** valid or corrupt
- **Payload patterns in ETSI B or for BLER with corrupt FCS:** all zeros, all ones, alternate bits, alternate pairs, alternate quads, PRBS-15, fixed 2B (hex), custom GMM info for BLER

## GMM protocol control

- **Attach accept:** selectable GMM cause, reject IMSI for non-GPRS services off or on
- **Attach reject:** selectable GMM cause, reject all attach attempts off or on
- **Detach request:** selectable GMM cause
- **Identity request:** IMSI, IMEI, IMEISV, TMSI

## SM protocol control

- **Activate PDP context accept:** override requested reliability class off or on with selectable value, selectable subscribed reliability class, includes acknowledged LLC
- **Activate PDP context reject:** selectable SM cause

## E-OTD and A-GPS Functionality

- Partially customizable RRPL layer
- Configure and send measure position request and assistance data messages from the test set
- Ensure assistance data messages are acknowledged by the DUT
- Receive and display RRLP protocol error messages
- Retrieve parameters from the last measure position response message from the DUT
- GPIB access only
- The ESG series of RF signal generators and E4406A VSA transmitter tester also have E-OTD and A-GPS functionality that can be used with the 8960 test set
- ULTS UMTS location test system for A-GPS performance analysis of GSM/GPRS mobile devices available through Spirent Communications at [www.spirentcom.com](http://www.spirentcom.com)
- Refer to *Configuring the GSM/GPRS Lab Application for E-OTD Performance Testing* application note (literature number 5988-8458EN) at [www.agilent.com/find/e6701d](http://www.agilent.com/find/e6701d)

## WPA Logging Software

Allows real-time protocol logging of GSM, GPRS, EGPRS, W-CDMA, and cdma2000 messages as well as post-capture analysis of signaling. Please refer to the E6584A Wireless Protocol Advisor data sheet at [www.agilent.com/find/e6584a](http://www.agilent.com/find/e6584a)

## Technical Specifications

These specifications apply to the following software.

- E6701D GSM/GPRS lab applications with firmware revision D.01
- E6785C GSM/GPRS\_W-CDMA fast switching lab applications with firmware revision C.01

These specifications apply to E5515C mainframes supplied after March 2005. Depending on exact configuration, earlier E5515C and E5515B instruments may require hardware upgrade to obtain certain features and capability. Features which may require hardware upgrades include: GPRS Class 12, spectrum monitor, E6704A EGPRS lab application extension, and RF out only port.

**CAUTION:** Loading an application onto your E5515 that is not compatible with your test set's hardware revision can cause your E5515 to lock-up. For information on application/E5515 compatibility go to [www.agilent.com/find/E5515](http://www.agilent.com/find/E5515) and select the relevant link; either E5515B Release Notes or E5515C Release Notes. Always refer to this information before loading an application.

### Transmitter and receiver measurement specifications

The time until a measurement times-out and returns control to the user can be set independently for each measurement. All measurements return a measurement integrity result indicating the accuracy and usefulness of each measurement's results.

### Frequency coverage and amplitude range

Unless otherwise noted, all specifications apply to frequencies of 450 to 496 MHz, 700 to 960 MHz, and 1.7 to 1.99 GHz, signals with peak input power at the test set's RF IN/OUT not higher than +37 dBm and temperatures of 0 to +55 °C. Input signal transmit power (defined as the average power over the useful part of the burst) at the test set's RF IN/OUT must be within ±3 dB of the test set's expected power for warranted performance.

### Receiver measurement specifications

#### GSM bad frame indication (BFI) measurement

**Standards reference:** bad frame indication on TCH/FS as per 3GPP 51.010-1, section 14.1.1

**Types of signals measured:** GSM carrier (TCH/FS) modulated with random data sent at 11 dB above the reference sensitivity level, SACCH and silence descriptor (SID) frames sent at 20 dB above the reference sensitivity level with the mobile configured to signal bad frames and using discontinuous transmission (DTX)

**Minimum input level:** all uplink signals at test set's RF IN/OUT must have transmit power ≥ -30 dBm

**Mobile loopback:** type A as defined in ETSI 04.14 or 3GPP 44.014

**Speech frames delay:** settable between 1 and 15

**Numerical results:** undetected bad frame rate, number of frames sampled, number of SIDs sent, number of undetected bad frames, number of SIDs marked as BFI

**Multi-measurement capabilities:** 1 to 999,999 frames sampled

**Concurrency capabilities:** GSM BFI measurements can be made concurrently with all other measurements

#### Supplemental characteristics

**Measurement resolution:** 0.001 percent

#### AMR in-band frame error (I-FER) measurement data:

- **Standards reference:** reference sensitivity - TCH/AFS-INB as per 3GPP 51.010-1 section 14.2.19, reference sensitivity - TCH/AHS-INB as per 3GPP 51.010-1 section 14.2.20, TCH loop without signaling of erased frames for in-band channel error as per 3GPP 51-010-1 section 5.1.7a

- **Types of signal measured:** reference sensitivity of AMR channel with cycled sequence of CMI and CMC bits

- **Minimum input level:** all uplink signals at test set's RF IN/OUT must have transmit power = -30 dBm

- **Speech frames loopback delay:** settable between 0 and 10

- **Change period:** settable period between codec mode changes, between 1 and 100

- **Numerical results:** I-FER speech frames tested, I-FER ratio, I-FER count, I-FER speech frame delay

- **Multi-measurement capabilities:** 1 to 900,000 frames sampled

- **Concurrency capabilities:** AMR I-FER measurements can be made concurrently with all other measurements except GSM BER or FBER

#### Supplemental characteristics

**Measurement resolution:** 0.01 percent

#### GSM FACCH/F frame erasure rate (FER) measurement

**Standards reference:** reference sensitivity on FACCH/F as per 3GPP 51.010-1, section 14.2.3

**Types of signals measured:** count of Layer 2 repeated frames when downlink stimulated with GSM Layer 3 MM information message sent on the FACCH

**Minimum input level:** all uplink signals at test set's RF IN/OUT must have transmit power ≥ -30 dBm

**Mobile loopback:** selectable in active cell operating modes as type A, type B, type C, or off

**FACCH repetition interval:** settable from 120 ms to 1 s

**Numerical results:** FACCH FER, number of frames erased, number of frames sampled

**Multi-measurement capabilities:** 1 to 999,999 frames sampled

**Concurrency capabilities:** GSM FACCH FER measurements can be made concurrently with all other measurements

#### Supplemental characteristics

**Measurement resolution:** 0.001 percent

## Data throughput monitor

**Description:** measures instantaneous, peak, and average data rates and the accumulations of all transferred IP packets and bytes

**Axis control:** settable time span up to 600 seconds, and start and stop data rates

**Trace display:** over-the-air (OTA) Tx, OTA Rx, IP Tx, and/or IP Rx

**Trace markers:** one marker settable for each of the four possible traces to display

**Freeze display:** freeze display for analysis then resume to see cumulative results

**Graphical results:** line graph of instantaneous data rate versus time

**Numerical results:** current, average and peak data rates for OTA and IP packets transferred, data rate at marker position, total bytes of data transferred

**Historical results:** previous 600 seconds of results stored and retrievable via GPIB

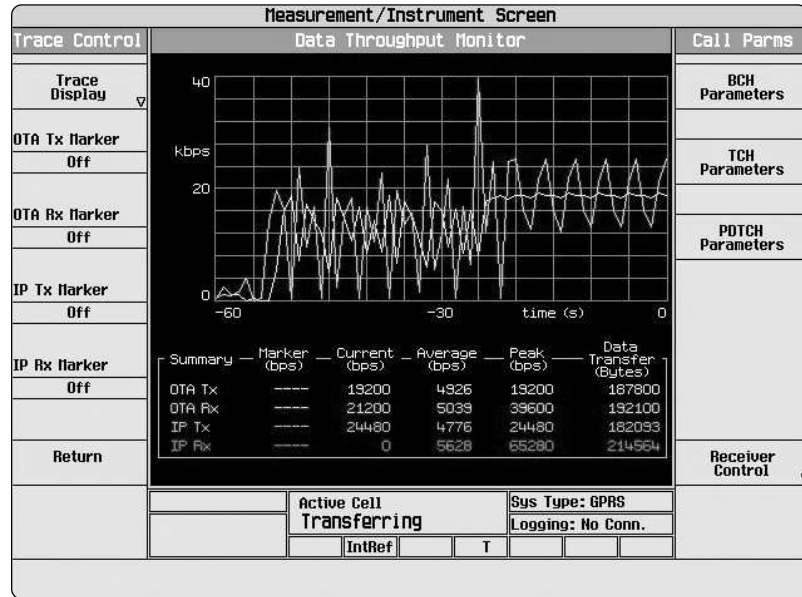


Figure 4. Graphical views of OTA and IP packet throughput help you to test your device.

## Test Subscriber Identification Module (SIM) Cards

Test SIM cards are available for purchase from Agilent. Two types are available as follows.

- **Programmed SIM card micro-size:** fits most current wireless devices (about 15 x 25 mm), part number 08922-61887
- **Programmed SIM card standard:** rarely used in current phones, fits older, large phones (about the size of a credit card), part number 08922-80047

## For More Information

All other technical specifications and operating modes are included in the E1968A GSM/GPRS/EGPRS mobile test application data sheet on the web at

[www.agilent.com/find/e1968a](http://www.agilent.com/find/e1968a)

## Ordering Information

For the most up-to-date lab application ordering information, please visit the Agilent site at [www.agilent.com/find/8960devicedesign](http://www.agilent.com/find/8960devicedesign)

For more information on ordering test SIM cards, visit the Agilent site at [www.parts.agilent.com/](http://www.parts.agilent.com/)

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