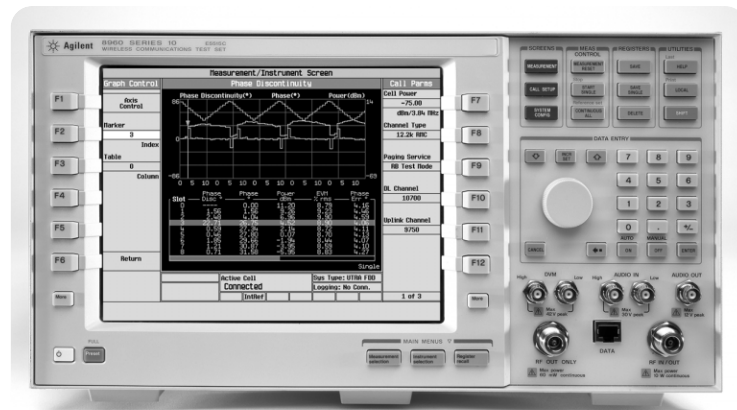


# Agilent E6703B W-CDMA Lab Application

Data Sheet

**For the E5515B/C/T (8960) wireless communication test set  
And the E6785B GSM/GPRS/W-CDMA lab application**

The Agilent E6703B W-CDMA lab application for the E5515 wireless communications test set is a strategic bench top tool for W-CDMA UE design, integration, and debugging. This solution provides lab engineers with W-CDMA features for network emulation, RF measurements, protocol analysis, and real-life data connections. In addition, since the E6703B is device independent, one application is all that is needed for any compliant W-CDMA device.



**The E6703B W-CDMA lab application delivers new tools for:**

## Quick and easy parametric verification

- RF tests
  - thermal power
  - channel power
  - adjacent channel leakage ratio
  - waveform quality
  - BER over Loopback Type 1
  - BLER over Loopback Type 2
  - raw BER at 33k
  - spectrum emission mask
  - occupied bandwidth
  - code domain power
  - IQ constellation
  - PRACH on/off power
  - dynamic power analysis
  - spectrum analysis
- mixed tests
  - inner loop power
  - phase discontinuity
  - PRACH preamble analysis

## Quick and easy functional verification

- call types:
  - AMR voice echo
  - radio bearer test mode with rates from 12.2k to 384k
  - packet data at rates from 64k to 384k
  - circuit data at rates from 14.4k to 57.6k
- network operations
  - system handovers to GSM from voice or RB test mode
  - soft/softer handoff
  - compressed mode
  - physical channel reconfigurations
  - transport channel reconfigurations
  - security authentication and integrity protection

## Quick and easy signaling verification with wireless protocol advisor

- real time node B and UE logging
- simple Windows® interface
- access points from MAC through TCP/IP
- pre and post triggers and filters
- logs saved in native format, text, or comma delimited

## Quick and easy application verification

- packet data channels route through the test set to Ethernet
  - bi-directional PING
  - throughput testing from real sources on the Web
  - get FTP, HTTP, WAP, video, and audio from real servers
- circuit data channels routed to serial or Ethernet for similar testing
- IP throughput monitor
  - graphical and numeric returns
  - over the air throughput
  - IP throughput



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## Wireless Protocol Advisor (WPA) Logging Software

Allows real-time protocol logging of W-CDMA, GSM, GPRS, EGPRS, 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)

## W-CDMA Paging Services

- AMR voice service
- radio bearer (RB) test mode (TC connection)
- circuit-switched data service
- UMTS/GPRS packet-switched data service

### AMR voice

- establish a voice call using call processing
- **AMR radio access bearer:** 12.2 kbps as per TS 34.108
- **voice echo:** fixed one-second delay

### Radio bearer test mode

- **channel types (per TS 25.101):**  
12.2 kbps RMC UL/DL  
64 kbps RMC UL/DL  
144 kbps RMC UL/DL  
384 kbps RMC UL/DL  
33 kbps no coding RMC (12.2 kbps RMC with no convolutional coding)
- **loopback modes:** 1 and 2 as per TS 34.109
- **loopback delay control:** auto or manual with settable delay between 1 and 40 blocks
- handoff between channel types using transport channel reconfiguration message
- **settable DL DTCH data contents:** all zeros, all ones, CCITT PRBS-9, CCITT PRBS-15, incrementing count
- **UL DTCH RMC CRC presence:** present or used for data
- **RRC state setting:** CELL\_DCH or CELL\_FACH

### Circuit-switched data service

- asynchronous, non-transparent circuit-switched (CS) data at rates of 14.4 or 57.6 kbps
- support for RLP versions 0 and 2 (WPA supports version 2 only)
- connection to IP for CS testing of WAP or Web browsing
- bi-directional serial connection with software flow control

### UMTS/GPRS packet-switched data service

- **packet-switched (PS) transfer of IP data between a device under test and a network with full PDP context activation**
- **test your device's IP data functionality:** WAP or Web browsing, FTP throughput rates with local or remote servers, serial or USB modem functionality, e-mail, and data downloads to PC via data port
- **PS radio access bearers (RAB) as per TS 34.108:**  
64 kbps PS UL and DL  
64 kbps PS UL and 384 kbps PS DL  
64 kbps UL and 384 kbps DL (RMC transport configuration)
- **ping:** test set ping of device under test or other device on a network or network ping of test set or device, with settable number of pings, timeout, and packet size
- **data counters:** Tx and Rx counts of packets and bytes transferred

## W-CDMA Call Processing

- BS origination to W-CDMA from camp on W-CDMA cell for RB test mode and AMR voice paging service
- UE origination to W-CDMA from camp on W-CDMA cell for AMR voice paging service
- BS and UE GPRS attach from camp on W-CDMA cell for UMTS/GPRS packet data paging service
- BS initiation of CELL\_FACH state for RB test mode (allows for testing of TS 34.121, section 6.8 Spurious Emissions)
- UE initiation of circuit-switched (CS) data connection from camp on W-CDMA cell
- BS release from W-CDMA AMR voice call, RB test mode and UMTS/GPRS packet data connections to W-CDMA cell
- BS release from GSM voice call to GSM cell after inter-system handoff
- UE release from W-CDMA AMR voice call and UMTS/GPRS packet data connection to W-CDMA cell
- location update
- hard handoffs between intra-cell DL and UL UARFCNs using physical channel reconfiguration message
- soft handoff
- inter-system handoffs from W-CDMA to GSM
- compressed mode

### Soft handoff

- **second cell:** CPICH, DPCH, P-CCPCH/SCH with settable power level, primary scrambling code, time offset, and power control mode
- **UE measurement events:** set and trigger six independent events with settable state, reporting range, hysteresis, and 'W' value
- **UE analysis:** perform loop-back BER measurements during soft handoff
- **UE reports:** event number, CPICH  $E_c/N_o$ , CPICH RSCP, and pathloss for cells 1 and 2 and DTCH BLER

### Inter-system handoffs

**W-CDMA to GSM system handoffs:** hand down from a W-CDMA TC connection to a GSM voice call or from a W-CDMA AMR voice call to a GSM voice call

### Compressed mode

Compressed mode is accomplished by spreading factor reduction as defined in TS 34.121, Tables C.5.1, and C.5.2 with one transmission gap and one transmission gap pattern. A physical channel reconfiguration message is used for compressed mode setup.

### Compressed mode parameters

- transmission gap pattern sequence (TGPS) definition: during RB setup (setup defined in RB setup message and compressed mode activated using physical channel reconfiguration message) during CM activation (setup defined in physical channel reconfiguration message)
- transmission gap starting slot number (TGSN) of 0 to 14
- transmission gap length (TGL) of 1 to 7 slots
- transmission gap pattern length (TGPL) of 2 to 144 frames
- all other parameters are fixed per TS 34.121, Table C.5.1

## UE measurement setup

- UE-reported compressed mode measurements on or off
- compressed mode measurement purpose of GSM RSSI or FDD measurements
- GSM RSSI measurement reporting quantity of 1, 2, 4, 8, 16, 32, 64, or infinity
- GSM RSSI measurement reporting interval of 0.25, 0.5, 1 to 4, 6, 8, 12, 16, 20, 24, 28, 32, or 64 seconds
- inter-frequency measurement reporting quantity of 1, 2, 4, 8, 16, 32, 64, or infinity
- inter-frequency measurement reporting interval of 0.25, 0.5, 1 to 4, 6, 8, 12, 16, 20, 24, 28, 32, or 64 seconds

## GSM measurement results

- total number of GSM cells
- BCH ARFCN for each cell
- RSSI value and decode for each cell

## FDD measurement results

- total number of inter-frequency cells
- scrambling code for each cell
- DL channel number for each cell
- RSSI value and decode for each cell
- Ec/No value and decode for each cell
- RSCP value and decode for each cell
- pathloss for each cell

## W-CDMA Signaling

**resident format:** W-CDMA FDD, R99, March 2002 release

**CDMA modulation type:** QPSK per 3GPP standard

### Downlink signaling

#### DL frequency ranges:

- U.S. cellular band (869 to 894 MHz)
- GSM/E-GSM band (925 to 960 MHz)
- DCS1800/PCS band (1805 to 1880 MHz)
- U.S. PCS band (1930 to 1990 MHz)
- IMT-2000 band (2110 to 2170 MHz)

### Cell parameters in active cell operating mode

- BCCH update page inhibit or automatically send
- settable MCC, MNC, LAC, RAC
- ATT (IMSI attach) flag set or not set
- repeat paging on or off
- primary CPICH Tx power of -10 to +50 dBm
- uplink interference of -110 to -70 dBm
- constant value of -35 to -10 dBm

## Uplink signaling

### UL frequency ranges:

- U.S. cellular band (824 to 849 MHz)
- GSM/E-GSM band (880 to 915 MHz)
- DCS1800/PCS band (1710 to 1785 MHz)
- U.S. PCS band (1850 to 1910 MHz)
- IMT-2000 band (1920 to 1980 MHz)
- **MS Tx power:** settable and maintained by closed-loop power control
- **UL scrambling code:** 0 to 38399

## Radio Link and Cell Configuration

**DL PICH contents:** all indications set to 1 (page) or all indications set to 0 (no page)

**DL PICH data in FDD test operating mode:** all zeros, all ones

**primary scrambling code:** settable as 0 to 511 in 64 groups (secondary sync code pattern is linked to the scrambling code group and all channels use the same scrambling code)

**signaling radio bearer (SRB) configurations in active cell operating mode:** 2.2 kbps DCCH, 3.4 kbps DCCH, 13.6 kbps DCCH

**DL TFCI in FDD test operating mode:** settable pattern

**AWGN interference source:** settable power level

**OCNS interference source:** 16 channels per TS 25.101, Table C.6 or TS 34.121, Table E.3.6

**reestablish RLC in active cell operating mode:** automatically decide or off

**call limit state in active cell operating mode:** on or off

**call drop timer in active cell operating mode:** on or off

### CDMA channels and channelization codes

Channel	Default assignment	Alternate choices
CPICH	256, 0	
P-CCPCH	256, 1	
S-CCPCH	64, 7	6, 9, 16, 17, 26, 57
AICH	256, 10	3, 6 to 9, 11
PICH	256, 16	14, 15, 17
DPCH, 15 ksps for 2.2 k, 3.4 k SRB	256, 12	13, 20, 21, 40, 43, 58, 126, 127, 142, 153, 174, 235, 255
DPCH, 30 ksps for 13.6 k SRB 12.2 k RMC 33 k NC RMC 12.2 k AMR RAB	128, 9	6, 10, 20, 29, 37, 45, 54, 60, 63, 70, 76, 87, 93, 112, 118
DPCH, 120 ksps for 64 k RMC, 64 k PS RAB	32, 6	10, 12, 14, 16, 18, 20, 22, 24 to 27
DPCH, 240 ksps for 144 k RMC	16, 12	13
DPCH, 480 ksps for 384 k RMC, 64 k UL/384 k DL PS RAB	8, 6	None
OCNS (test model 1)	Spreading factor of 128 at the fixed OVFSF codes of 2, 11, 17, 23, 31, 38, 47, 55, 62, 69, 78, 85, 94, 113, 119, 125	

### Overhead channels

**common pilot:** fixed at OVFSF 256, 0

**primary sync:** fixed to primary sync code

**secondary sync:** code pattern determined by cell primary scrambling code (one of 64 patterns to indicate long code set)

**primary CCPCH:** valid SIBs (1, 2, 3, 4, 7, and 11) and MIB in active cell operating mode, carries broadcast channel with valid SFN where broadcast channel data consists of  $2^9-1$  PRBS in FDD test operating mode

### Security settings in active cell operating mode

- **security operations:** none, authentication and integrity protection, authentication only
- **authentication algorithm:** test 34.108, Milenage (Rijndael)
- settable authentication key, operator variant authentication algorithm, random (RAND), and AMF values
- **operator variant parameter type:** OPc, OP
- user-initiated reset of authentication SQN

### Security results in active cell operating mode

- authentication results of MM and GMM
- MS reported failure cause

### SIB11 cell information list in active cell operating mode

- SIB11 cell information list absent or present
- zero to eight intra-frequency cells with settable scrambling codes
- zero to eight inter-frequency cells with settable scrambling codes and DL channels
- zero to eight GSM cells with settable BCC, NCC, frequency band, and ARFCN

## Generator information reported

- current and desired levels of cell 1 power, AWGN power, and total RF power
- current and desired levels of cell 2 power in active cell operating mode
- primary scrambling code in FDD test operating mode
- current and desired levels, spreading factor, and channel code for cell 1 CPICH, P-CCPCH/SCH, PICH, DPCH, and composite OCNS
- current and desired levels, spreading factor, and channel code for cell 1 S-CCPCH and AICH in active cell operating mode
- current and desired levels, spreading factor, and channel code for cell 2 CPICH, P-CCPCH/SCH, DPCH, and composite OCNS in active cell operating mode

## Uplink closed-loop power control parameters

- modes of active bits, alternating bits, all up bits, all down bits, and 10 up/down bits for both cell 1 and cell 2
- algorithm 1 or 2 with settable step size in algorithm 1 in active cell operating mode
- user-initiated sending of step up or step down TPC bit pattern

## Uplink parameter settings in active cell operating mode

- PRACH power step of 1 to 8 dB
- settable upper and lower PRACH signature bit masks
- PRACH scrambling codeword of 0 to 15
- PRACH  $\beta_c/\beta_d$  automatically set or manually set with  $\beta_c$  of 2 to 15 and  $\beta_d$  of 0 to 15
- UL timing offset of  $\pm 256$  chips
- PRACH preambles of 1 to 64
- PRACH ramping cycles (MMAX) of 1 to 32
- 0 to 12 available subchannels
- UL dummy DCCH data on or off
- UL DPCH scrambling code of 0 to 38399
- UL DPCH  $\beta_c/\beta_d$  automatically set or manually set with  $\beta_c$  of 2 to 15 and  $\beta_d$  of 0 to 15
- maximum UL transmit power level of  $-50$  to  $+33$  dBm

## UE information reported in active cell operating mode

- IMSI
- IMEI
- power class
- detected PRACH signature
- initial PRACH open-loop Tx power
- initial DPCCCH open-loop Tx power

## Call processing status

- current service type
- GMM state
- soft handoff state
- compressed mode state
- RRC state
- MM status

## Technical Specifications

Specifications apply to the following hardware and software

- E5515B mainframes with Option E5515B-003 (Option E5515B-002 for GSM/GPRS operation)
- E5515C mainframes with option E5515C-003 (Option E5515C-002 for GSM/GPRS operation)
- E5515T mainframes with Option E5515T-003 (Option E5515T-002 for GSM/GPRS operation)
- E6703B W-CDMA lab applications with firmware revision A.03
- E6785B GSM/GPRS/W-CDMA lab application with firmware revision A.03

## PRACH preamble analysis

**trigger source:** protocol, external, or RF rise

**trigger delay:** ±5120 chips when using RF rise triggering

**transient period:** include or exclude 96 chips at the edges of the timeslot

**analysis interval:** first PRACH preamble received

**graphical results:** IQ constellation diagram, EVM per chip, phase error per chip, and relative power per chip

**numerical results:** rms EVM, peak EVM, frequency error, rms phase error, rms magnitude error, origin offset, timing error, IQ gain and phase imbalance, and PRACH preamble signature

Modulation quality measurement specifications from the E1963A data sheet apply to PRACH preamble analysis results. See [www.agilent.com/find/e1963a](http://www.agilent.com/find/e1963a) for more information.

## Data throughput monitor

**description:** measures instantaneous, peak and average data rates, and the accumulations of all transferred PS 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

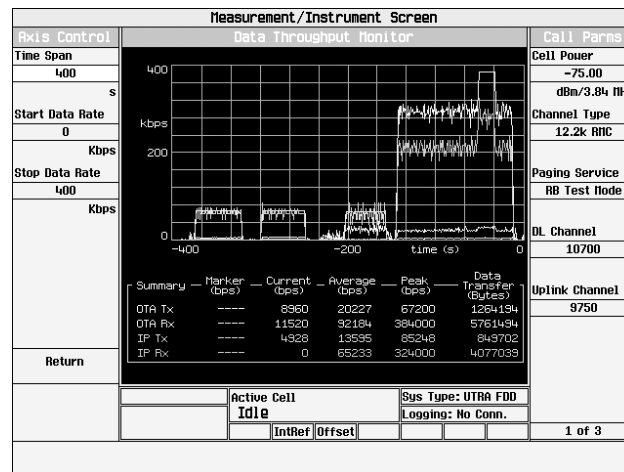
**trace markers:** one marker settable for each of the four possible traces to display

**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



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

## For More Information

All other technical specifications are included in the E1963A W-CDMA mobile test application data sheet on the web at: [www.agilent.com/find/e1963a](http://www.agilent.com/find/e1963a)

## Ordering Information

For the most up-to-date ordering information, please visit the Agilent site at:

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