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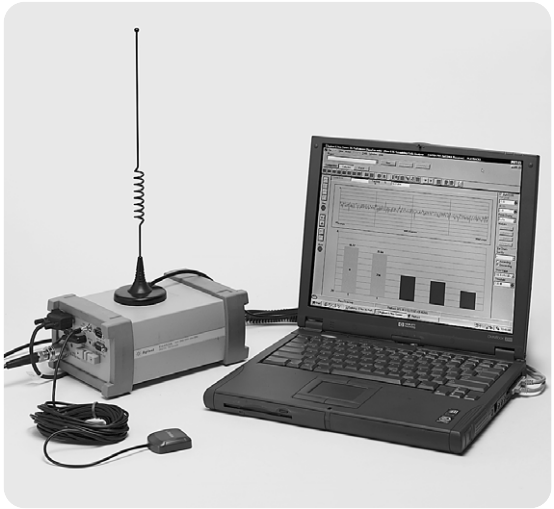
Agilent E7476A W-CDMA (UMTS) Drive Test System with the E6455C IMT2000 Digital Receiver

Data Sheet



The Agilent E7476A (UMTS) drive test system is used to obtain RF coverage and service performance measurements for wireless communications networks that use the advanced 3GPP W-CDMA (UMTS) technology. The full system planned for the future will include a 3GPP phone, when available, to work in conjunction with the key measurements of the receiver.

The system software runs on a PC that interfaces with an Agilent digital RF receiver. Future plans include adding a 3GPP phone to the system. The system can control up to four receivers and four phones simultaneously. The drive test system is a platform product: features such as carry-around testing, indoor testing and real-time map information can be added, as well as measurement capabilities in other technologies such as IS-95 CDMA, cdma2000, GSM, and TDMA.

Further points that should be noted are that the SW platform can support testing of any combination of different technologies simultaneously with the addition of the appropriate licenses. All measurements can be made with reference to position, using both the receivers' internal GPS or with the use of pen tablet option offered primarily for the monitoring of network performance indoors.

Agilent Technologies

System software

The system software controls Agilent digital RF receivers, and eventually will be used as a common platform to control W-CDMA (UMTS) mobile phones. Multiple measurements can be made simultaneously. All measurements can be displayed in real-time and logged to the database with reference to position. Three system software options are available:

- **Option 110:** W-CDMA receiver-based software license
- **Option 160:** Real time mapping software license
- **Option 180:** Indoor measurement software license

Receiver-based software

The receiver measurement functions of the Agilent E7476A system are provided by Option 110. This option, combined with the E6455C digital receiver option, is composed of four primary elements:

- W-CDMA (UMTS) scrambling code analysis
- Spectrum analysis
- CW power with external trigger
- Channel power

Each element has an associated control and display window called a virtual front panel (VFP). The software can control up to four Agilent E6455C digital receivers for simultaneous monitoring of up to four 5 Mhz bands. The controls listed below are available for the receiver measurements:

- Measurement interval
  - ❑ Time
  - ❑ Distance
- Averaging (spectrum, CW, and channel power only)
  - ❑ Running
  - ❑ Group
  - ❑ Max hold
  - ❑ At least (CW and channel power only)

The measurement interval defines the duration between measurements. This can be specified in terms of time (execute a measurement every 200 milliseconds), or distance (execute a measurement every 10 meters).

There are two ways to define the interval by distance. One is with the use of the GPS and the other is by using the external trigger capability. If the user defines an interval that the system can not achieve, a busy light indicates this condition.

W-CDMA (UMTS) scrambling code analysis

The Agilent E7476A system measures 3GPP W-CDMA (UMTS) physical layer. The system makes absolute and relative power measurements of the primary sync channel, secondary sync channel and the scrambling codes (CPICH). These measurements are independent of network parameter settings. The system executes three different types of W-CDMA (UMTS) scrambling code measurements (listed below). Any or all of them can be executed simultaneously and in conjunction with other types of measurements, such as spectral analysis.

Measurement types

- Primary SCH scan: The system measures the power in either Ec and Ec/Io and Eb/Io of Each Primary SCH. The results are displayed as a trace that shows the power for each primary synchronization channel detected in one timeslot of 2560 chips. Exported data has Ec, Ec/Io, and Eb/Io available.

- Top N: The system measures all of the scrambling codes in a timeslot of 2560 chips and returns the 'N' strongest scrambling codes received, where 'N' is a user definable integer from 1 to 20. The sensitivity can be varied by averaging over several time slots. The results are displayed in a bar graph format. (The primary sync and secondary sync are also measured as part of the Top N measurement and can be displayed on top of each bar in the bar graph).

- User list: The user manually inputs a list of up to 40 scrambling codes to be measured. It should be noted that this measurement only correlates the codes chosen by the user and does not process any sync channel information.

Measurement controls
- Carrier frequency
  - ❑ Frequency
  - ❑ Channel
- Measurement types
  - ❑ All sync channels
  - ❑ Top N
  - ❑ User list
- Sync channel decode

Display controls
- Power display (Y-axis parameter)
  - ❑ Ec/Io (alternatively Eb/Io)
  - ❑ Ec (alternatively Ec/Io)

Top N measurements and show value
- ❑ Primary sync code power Ec
- ❑ Primary sync code power Ec/Io
- ❑ Scrambling code group
- ❑ Secondary sync code
- ❑ Secondary sync code Ec
- ❑ Secondary sync code Ec/Io
- ❑ Scrambling code peak Ec
- ❑ Scrambling code peak Ec/Io
- ❑ Scrambling code peak Eb/Io
- ❑ Scrambling code aggregate Ec
- ❑ Scrambling code aggregate Ec/Io
- ❑ Scrambling code aggregate – peak
- ❑ Scrambling code delay spread
- ❑ Scrambling code time offset
- ❑ SSCH – PSCH
- ❑ SC – PSCH

Markers (trace displays only)
- Multiple markers
- Delta markers
- To max function
- Drag and drop

Measurement results
- Io
- Primary sync channel
- Primary sync channel Ec
- Primary sync channel Ec/Io
- Primary sync channel Eb/Io
- Carrier frequency error
- Time stamp

Top N and user list and show value
- Scrambling code
- Scrambling code peak Ec
- Scrambling code peak Ec/Io
- Scrambling code peak Eb/Io
- Relative time
- Scrambling code aggregate Ec
- Scrambling code aggregate Ec/Io
- Scrambling code aggregate Eb/Io
- Scrambling code aggregate – peak power
- Delay spread

Notes: Instead of Ec/Io values, Eb/Io values may be displayed. The scrambling code can be displayed in decimal or hexadecimal format.

Measurement methodologies and definitions

In Top N measurements scrambling code peak power (Ec, Ec/Io and Eb/Io) is computed by following the following sequence:

By averaging over a user defined number of Timeslots and selecting the strongest signal of the visible. The value of the associated secondary sync is then correlated for power and the secondary sync sequence is achieved to determine the scrambling code group. The scrambling code (or codes) variables are then determined from within this group. This is repeated for all values of primary syncs above the pre-determined threshold.

Io is the total received power integrated across the entire 3.84 MHz signal bandwidth.

Scrambling code aggregate power (Ec, Ec/Io, Eb, and Eb/Io) is computed for a given scrambling code by integrating the power received over the time dispersion of that scrambling code.

User List Ec, Ec/Io, Eb/Io is calculated by correlating the energy attributed to the user defined scrambling code. This is calculated directly and does not use the sync channel.

Delay spread is the duration of time over which this power is dispersed. Both aggregate power and delay spread are determined with respect to an Ec/Io threshold of –17 dB. The system also reports the difference between the aggregate and peak power (aggregate – peak). This difference along with the delay spread provides a characterization of the multipath effect on that scrambling code. Aggregate power and delay spread are only measured for the Top N and user list measurement types.

Relative time is defined as the difference in time between when a scrambling code signal is received relative to the start of the 2560 chip timeslot as arbitrarily defined in the receiver. For example, the receiver will arbitrarily record a 2560 chip sequence where the beginning of this sequence is defined as zero time. Each scrambling code will have some delay from this start and thus will have a relative time to the start of the time defined in the receiver.

Carrier frequency error is defined as the difference between the measured carrier frequency and the user-specified carrier frequency. Carrier frequency error can be due to both base station carrier error and doppler shift (if moving).

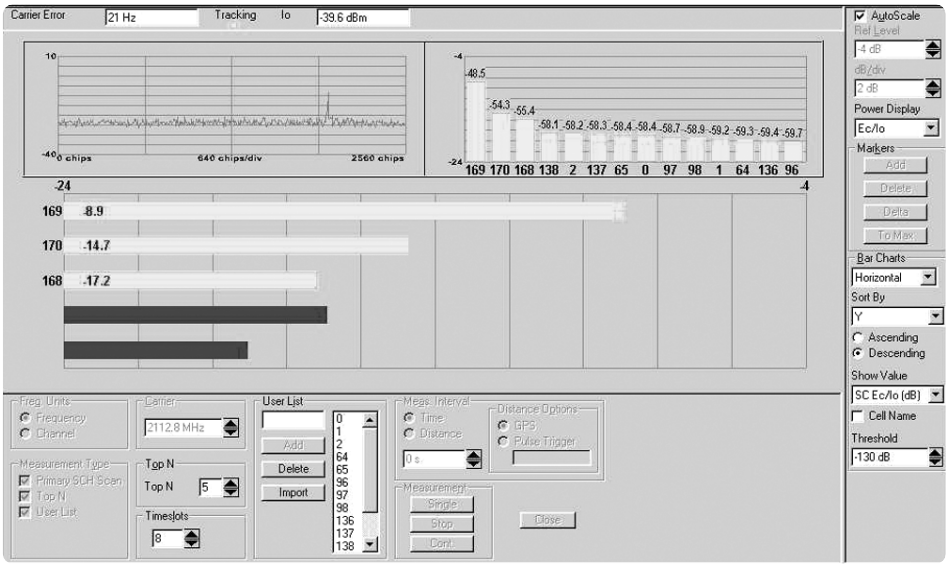


Figure 1. Scrambling code VFP

Scrambling code measurements.
(Typical/characteristic performance measures:)

General parameter thresholds for the Top N measurement with no other VFPs open.

1. Each primary sync with Ec/Io greater than the noise threshold which equals –21.5 dB for greater than 12 timeslots, will be processed.
2. Each and every associated secondary sync, with Ec/Io greater than the noise which equals –21.5 dB for greater than 12 timeslots, will be processed. There can be multiple secondary syncs per each primary sync.
3. For every secondary sync that is processed, any and all scrambling codes within that group, of amplitude greater than –20.5 dB, will be reported.
4. If no scrambling code can be detected under a processed secondary sync, then the group alone will be reported, if the secondary sync's Ec/Io value is greater than –17 dB.

Table 1. Top N measurements approximate update rates with 16 timeslot averaging:

Top N with primary sync	Without carrier tracking (ms)	With carrier tracking (ms)
1 SC Present	570	640
2 SC present	590	660
3 SC present	610	680
8 SC Present	710	780
N SC Present	550 + 20N	620 + 20N

Table 2. Top N dynamic range with variable timeslots:

Top N With primary sync	# Timeslots	Process synchronization channel above (dB)	Report scrambling codes above (dB)
"	3	–17.0	–20.5
"	8	–19.5	–20.5
"	16	–21.5	–20.5

General parameter thresholds for the user list measurement with no other VFPs open.

The user list measurement does not use any aspect of the synchronization channel. The noise threshold for reliable measurements of Ec/Io is –18.5 dB.

Table 3. User list measurement approximate update rates:

User list only	# Scrambling codes	Without carrier tracking (ms)	With carrier tracking (ms)
"	1	700	770
"	5	1500	1570
"	10	2500	2560
"	L>10	approximately 500 + 200L	approximately 570 + 200L

Note:
This information represents typical or characteristic aspects of the measurement and is not specified (tested on the pro duction line) nor warranted. Agilent Technologies reserves the right to change the measurement algorithm, at it's discretion, to improve performance or to fix defects.

Spectrum analysis

The spectrum display provides the controls listed below. Frequencies can be specified in terms of frequency units or channel number.

Measurement controls

- Frequency, tunable range[1]
  - ❑ IMT 2000 receiver (Option 360 or 361)
    - –1920 – 1980 MHz [1895 – 1990]
    - –2110 – 2170 MHz [2100 – 2180]
- Frequency, maximum span[1]
  - ❑ IMT 2000receiver (Option 360 or 361)
    - –60 MHz [70]
- IF bandwidth
  - ❑ 1.25 MHz
  - ❑ 5 MHz
- Resolution bandwidth
  - ❑ 8.36 kHz to 1 MHz (with 1.25 MHz IF bandwidth)
  - ❑ 25.08 kHz to 2.85 MHz (with 5MHz IF bandwidth)
- Average mode
  - ❑ Log power
  - ❑ Power

Markers

- Multiple markers
- Delta markers
- Marker to max
- Marker value to center frequency
- Drag and drop

Minimum sweep speed (characteristic)[2]:

1.25 MHz IF bandwidth	70 MHz / sec
5.0 MHz IF bandwidth	200 MHz / sec

Spectrum noise floor (characteristic)[2]:

	Average	Peak
1.25 MHz IF bandwidth / 1 MHz span	–127 dBm	–118 dBm
5.0 MHz IF bandwidth / 1 MHz span	–123 dBm	–113 dBm
1.25 MHz IF bandwidth / 25 MHz span	–123 dBm	–117 dBm
5.0 MHz IF bandwidth / 25 MHz span	–117 dBm	–113 dBm

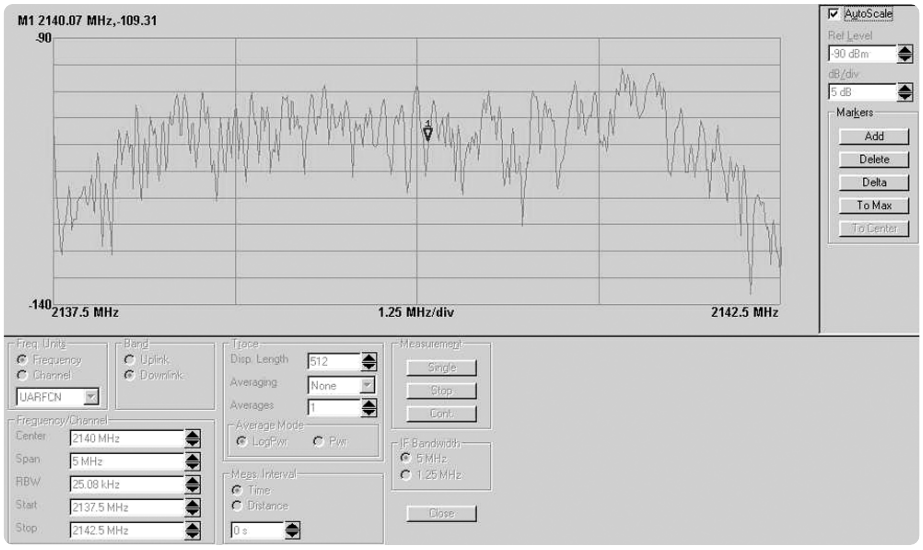


Figure 2. Spectrum Analysis VFP

1 Spectrum measurement allows tuning ±10 MHz above and below specified frequency ranges. In addition the Japan PHS band is also covered (down to 1895MHz). The extended ranges are shown in brackets –[ ] The performance is not specified in these extended ranges. Characteristic noise floor increase is 2 dB ±10 MHz. At –25MHz with respect to specified range, the characteristic noise floor increase is 5dB. Characteristic amplitude accuracy is unchanged with respect to specified range.

2 Does not imply warranted performance, but rather characteristic performance. Tested with minimum resolution bandwidth: 8.36 kHz with 1.25 MHz IF Bandwidth, 25.08 kHz with 5.0 MHz IF bandwidth.

Note:

Specifications describe warranted performance over the temperature range of 0 to 55 °Celsius and include a 30 minute warm-up from ambient conditions. Typical and characteristic information provides useful but non-warranted performance parameters. Typical refers to test data at the fiftieth percentile for a 25 °Celsius room temperature. Characteristic information describes product information for parameters that are either not subject to variation, non-measurable, verifiable through functional pass/fail tests, or routinely not measured.

CW power and channel power

The Agilent E7476A can measure the peak power (CW power) at user-defined frequencies within a user-defined resolution bandwidth. The systems can also measure the total power (channel power) within a user-defined bandwidth at a user-defined set of frequencies. Channel power differs from the CW power measurement in that the total power is integrated across the specified channel width. The user can define the frequencies measured in two different ways, indicated below.

Frequency entry methods

- **List:** Enter an arbitrary list of frequencies.

- **Trace:** Enter a start frequency, step size, and count. The system measures at the start frequency, at the (start + step) frequency, ... , (start + (count - 1)*step) frequency. For example, if the start frequency is set to 1900 MHz, the step size is set to 1 MHz, and the count is set to 4; then measurements are made at 1900 MHz, 1901 MHz, 1902 MHz and 1903MHz.

Frequencies can be specified in terms of frequency units or channel number.

Measurement controls

- Frequency
  - ❑ Arbitrary list (list)
  - ❑ Start / step / count (trace)
- IF bandwidth
  - ❑ 1.25 MHz
  - ❑ 5.0 MHz
- Resolution bandwidth (CW power only)
  - ❑ 8.36 kHz to 1 MHz (with 1.25 MHz IF bandwidth)
  - ❑ 25.08 kHz to 2.85 MHz (with 5.0 MHz IF bandwidth)
- Channel width (channel power only)
  - ❑ IMT 2000 receiver (Option 300 or 301)
    - –30 kHz to 80 MHz (with 1.25 MHz IF bandwidth)
    - –100 kHz to 80 MHz (with 5.0 MHz IF bandwidth)
- Measurement interval
  - ❑ Time
  - ❑ Distance
    - GPS
    - External pulse triggering

External pulse triggering is used for precise distance measurements by using pulses sent from the vehicle speed sensor to detect how far the vehicle has traveled. A maximum pulse rate of 3,333 pulses/ second with a minimum pulse width of 100 ns can be measured. (At 1 pulse per centimeter, this would correspond to a speed of approximately 120 km/hour). The maximum TTL voltage is 15 volts and triggering is on the negative edge of the pulse.

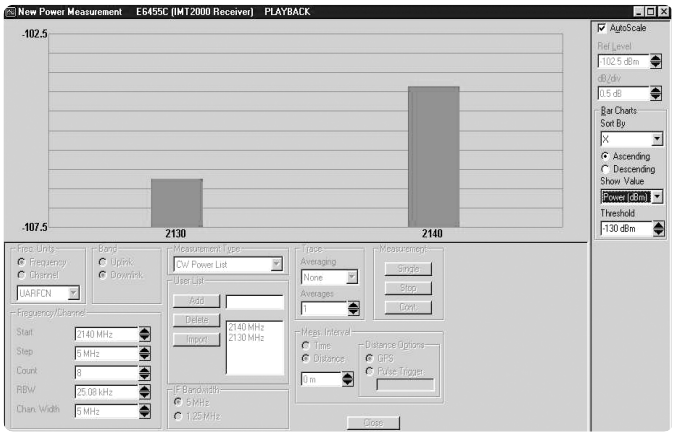


Figure 3. Power VFP

Note:

Specifications describe warranted performance over the temperature range of 0 to 55 °Celsius and include a 30 minute warm-up from ambient conditions. Typical and characteristic information provides useful but non-warranted performance parameters. Typical refers to test data at the fiftieth percentile for a 25 °Celsius room temperature. Characteristic information describes product information for parameters that are either not subject to variation, non-measurable, verifiable through functional pass/fail tests, or routinely not measured.

Alerts and alarms

The Agilent E7476A has sophisticated alarm capabilities. An alert is defined as a single condition on a single measurement. An alarm is a boolean expression made up of multiple conditions on multiple measurements. If the alert or alarm condition occurs while data is being logged, each data record includes the alert and alarm information.

The alarm wizard provides fast, easy setup of commonly used alarms. The alarms available for W-CDMA (UMTS) via the wizard are listed below.

- No coverage
- Weak CW
- Lost GPS fix
- No location fix
- Low disk space
- Low battery
- No AC power
- High CPU usage
- Pilot pollution

When an alert or alarm condition occurs, any or all of the actions listed below can be executed.

Actions

- Play a .wav audio file
- Display a text message
- Pause or stop measurements

Alert operators

- Value
- Maximum
- Minimum

Alarm operators

- Value
- Maximum
- Minimum
- Sub-set
- OR
- AND
- XOR (exclusive OR)

Alert conditions

- Greater than (>)
- Greater than or equal to (≥)
- Less than (<)
- Less than or equal to (≤)
- Equal to (=)
- Not equal to (≠)

Alarm conditions

- Greater than (>)
- Greater than or equal to (≥)
- Less than (<)
- Less than or equal to (≤)
- Equal to (=)
- Not equal to (≠)
- Is a sub-set
- Is not a sub-set
- Sets intersect
- Sets do not intersect

Any measurement can be an operand in an alert or alarm. Below are some examples to illustrate alerts and alarms.

Alerts:
1. Value (primary SCH Io) < – 85 dBm
2. Max (scrambling code Top N) < – 10 dB

Alarms:
3. (Value (primary SCH Io) < – 85 dBm) AND (Max (scrambling code Top N) < – 10 dB)

System status parameters can also be used as operands in alerts and alarms. For example, an alert can be defined to trigger when the available disk space on the PC drops below 10 MB or when the GPS position fix is lost.

System status parameters

- Available disk space
- GPS fix
- Location
- Velocity
- Percent CPU usage
- PC battery level
- PC AC power
- Time of day

Data recording and playback

Logging of drives and playback of data are controlled by easy to use buttons. While logging data, the user can enter notes into the data. Two methods of user note entry are provided. One prompts the user to enter a text string, for example, entering a tunnel. The other automatically enters a numbered note into the database requiring minimum interaction with the keyboard. A summary of record and playback features are listed below.

Record features

- User note
- Automatically numbered note
- Display on/off
- Pause/resume
- User-defined data set name

Playback features

- Play forward
- Play reverse
- Step forward
- Step reverse
- Variable speed
- Advance to alert/alarm
- Advance to user note/auto-numbered note

Report generator and display printing

The Agilent E7476A provides fast and easy report generation. All of the current displays (virtual front panels) are captured to an HTML file. Each report includes a header section. After selecting generate report, a dialog box prompts the user to enter the header information listed below. Smart defaults and persistent information are used, so minimal text entry is required.

Header elements

- Title
- User name
- Company
- Time
- Date
- Location – defaults to current GPS fix
- Comments – user entered notes

There is no limit to the number of reports that can be generated. Reports can be generated during playback as well as during live data collection.

Any virtual front panel can be printed by selecting the print command from the file menu.

Data export

Data can be exported from the Agilent E7476A database for display and post-processing. All measurement data can be exported. The export function provides flexible filtering capability that defines the specific data to be exported. Multiple data types can be exported to a single output file.

The user can save export plans. Once an export plan has been saved it can be retrieved to quickly and easily export the desired data. An export plan is made up of:

- Data type(s): Defines which data will be exported. Column order is user definable.
- Alarms: Defines which alarms will be exported.
- Processing functions: Defines the functions that will be applied to the data during export.
- Exclusion rules: Defines a set of conditions that, if true, the associated data will be excluded from the export.
- Geographic binning: Data-reduction process in which the data is averaged over geographic area or distance.

Several different operations can be executed in order to provide the desired data in the desired format.

Processing functions

- All values
- Count – counts number of values above or below a specified threshold
- Count with summary – same as count with a text file summarizing the results
- Maximum
- Minimum
- Value(x)

Conditionals

- Greater than (>) a threshold
- Less than (<) a threshold
- All values
- Qualified against another measurement

Sorting

- Ascending
- Descending
- None

Geographic binning methods

- Grid - drive area is overlaid by a grid of user-definable size. The average of the data over each square is reported.
- Linear distance – user defines a drive distance over which to average. The average of the data over each segment of that distance is reported.
- None

The output formats supported by the Agilent E7476A are listed below. The system is designed to work with MapInfo in an integrated manner via an object link embedded (OLE) link to the MapInfo application. This exports the data, launches MapInfo, creates the necessary MapInfo tables, and creates a thematic map display in MapInfo. This function requires MapInfo be present. MapInfo is not included with the E7476A system.

Data output formats

- MapInfo OLE
- MapInfo text file
- ArcView text file
- Plain text file (no headers)
- PlaNET result (CW power data only)
- Raw binary

RF receiver hardware

There is one digital RF receiver designed to work with the Agilent E7476A system:

- E6455C: 2100 MHz IMT2000 receiver with internal GPS receiver

The Agilent E7476A system with Option 110 has software function for controlling the receivers. The system supports any combination of receivers from the Agilent drive test family, up to a total of four. Using multiple receiver configurations can greatly improve drive test efficiency for applications such as simultaneously monitoring both uplink and downlink, and monitoring competitive networks. In multiple receiver configurations the receivers communicate with each other via a high speed serial ring. Communication with the PC is done via a single RS-232 link to one of the receivers in the ring.

It is also the case that multi-technology testing can be achieved by the use of GSM, CDMA, cdma2000, TDMA receivers with addition of the necessary license up to the maximum of four receivers of any technologies.

Each receiver option includes:

- RF antenna for the corresponding frequency band
- Cable to connect to other receivers
- Cable to connect to PC
- Kit for mounting receiver in a vehicle
- AC/DC power supply
- Cigarette lighter power cord
- GPS antenna and cables

Agilent digital RF receiver specifications (E6455C)

Frequency

Frequency range[1]	
Options 360, 361	1920-1980 MHz [1895 – 1990] 2110-2170 MHz [2100 – 2180]
Frequency accuracy with GPS time synchronization	± 1 ppm ± 0.05 ppm characteristic
IF bandwidth	1.25 MHz characteristic 5 MHz characteristic
Aging of TCXO	± 1 ppm/year

Amplitude

Accuracy	
1.25 MHz IF bandwidth	± 0.5 dB typical from –25dBm to –110 dBm
5 MHz IF bandwidth	± 0.5 dB typical from –25dBm to –100 dBm
Noise figure	8 dB typical
Internally generated spurious, input referred	–120 dBm for 1.25MHz IF Bandwidth –115 dBm for 5MHz IF bandwidth
Maximum safe input level	+10 dBm, 20V DC characteristic
1 dB compression point [2]	–15 dBm characteristic
Adjacent channel desensitization [3]	–20 dBm typical
Adjacent channel rejection [4]	25 dB typical

Input/output

RF input	50W type-N
External trigger input	BNC connector

Connectors

Computer	RS-232 (DB9) male
GPS	RS-232 (DB9) male
Power	DC power jack 100 mils, positive center

Miscellaneous

Operating temperature range	0 to 55 °C
Maximum relative humidity	80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity at 40 °C
Storage temperature range	-40 to 70 °C
Dimensions	6 in x 3 5/8 in x 8 3/4 in 15.24 cm x 9.21 cm x 20.32 cm
Weight	4.6 lbs. (2.1 kg)
Power	9-34 V DC, 9W
with Internal GPS (Option 301 and 311)	9-34 V DC, 10W

Internal GPS

GPS receiver	8 channel internal GPS receiver
Connector type	SMA
Differential compatible without dead reckoning	

1 Spectrum measurement allows tuning ±10 MHz above and below specified frequency ranges. In addition, the Japan PHS band is also covered (down to 1895MHz). These extended ranges are shown in brackets – [ ]. The performance is not specified in these extended ranges. Characteristic noise floor increase is 2 dB ±10 MHz. At –25MHz with respect to specified range, the characteristic noise floor increase is 5dB. Characteristic amplitude accuracy is unchanged with respect to specified range.

2 It is recommended that the input signal level not exceed –40 dBm.

3 Adjacent channel desensitization applies to the 5.0 MHz IF filter and is defined as the 1 dB compression of tuned signal with interfering signal ±5.0 MHz from tuned signal.

4 Adjacent channel rejection applies to the 1.25 MHz IF filter and is defined as the Suppression of an interfering signal ±1.25 MHz from tuned signal.

Note:

Specifications describe warranted performance over the temperature range of 0 to 55 °Celsius and include a 30-minute warm-up from ambient conditions. Typical and characteristic information provide useful information by giving non-warranted performance parameters. Typical refers to test data at the fiftieth percentile for a 25 °Celsius room temperature. Characteristic information describes product information for parameters that are either not subject to variation, non-measurable, verifiable through functional pass/fail tests, or as a matter of routine not measured.

GPS

The Agilent E7476A system has the ability to work with several types of GPS interfaces. The system is compatible with the communications protocols listed below. The physical interface is RS-232 with a DB9 connector.

Compatible protocols

- TAIP
- TSIP
- NMEA

Internal GPS receiver

- 8 channel GPS receiver
- Mounted inside Agilent RF receiver enclosure
- SMA antenna connector
- Bulkhead mount antenna with cable
- Magnetic mount antenna with cable
- Differential compatible
- Not dead reckoning compatible

The Agilent E7476A software includes a virtual front panel for the GPS receiver. This window displays a bar graph with the individual satellite signal strengths (TSIP protocol only), a text display of the GPS statistics, and a map of location history. This map also displays the base station locations and names.

GPS receiver model	Interconnect requirement
Trimble placer GPS/DR	Option 211
Trimble placer GPS 455	Option 212
Trimble sveeSix	Straight-through RS-232 cable
Trimble placer GPS 400	Straight-through RS-232 cable

Agilent 86154A Option 230: differential GPS receiver

- Differential corrections, incorporated RDS-3000
- Magnetic mount antenna
- Interconnect cables

Two different GPS receiver configurations are available from Agilent Technologies for our drive test systems[1]:

Agilent E7476A receiver Option 361 includes a GPS receiver mounted inside the receiver enclosure. This configuration provides excellent portability and convenience.

Agilent 86154A Option 210 adds a Trimble Placer GPS 455 receiver with dead reckoning for external connection to the system.

Agilent 86154A Option 210

- Trimble Placer GPS 455 with dead reckoning
- Heading sensor
- Interconnect adapter (to connect to the Agilent RF receiver)
- Interconnect cables
- Bulkhead mount antenna with cable
- Magnetic mount antenna with cable
- Differential compatible

External GPS receivers communicate with the E7476A via an RS-232 serial connection. The table below lists several GPS receiver models and the associated requirements for connection to an E7476A system. For other models of external GPS receivers, consult an Agilent representative for interconnect requirements.

If a GPS receiver is purchased from Agilent, all necessary interconnect parts are provided.

Differential GPS can be used with the Agilent E7476A systems, provided the GPS receiver being used is differential compatible. Agilent 86514A Option 230 adds a differential GPS receiver to the system.

1 With the Agilent W-CDMA (UMTS) receiver with internal GPS (E7476A, Option 361), an external GPS source may be used with the receiver even though an internal GPS exists within the receiver housing. This is valuable for differential or dead reckoning measurements that may be needed.

Note:
Only one GPS source can be used at any given time.

Real-time mapping

The Agilent E7476A Option 160 software license provides real-time data mapping. A single measurement parameter is plotted on the map, in color-coded thematic format, as the data is collected. Base station locations are plotted on the map with site names, sector orientations and PN offsets. Alarms are plotted on the map. Double clicking on the alarm symbol displays the corresponding alarm text message.

Measurement parameters that can be plotted on map

- Scrambling code analysis (receiver)
- Best server Ec/Io – from topN
- Best server Ec/Io – from user list
- Io – from topN
- Io – from user list
- Carrier frequency
- 4/CW and channel power
- Max CW power list
- Max CW power trace
- Max channel power list
- Max channel power trace

An indicator line is drawn from the current location to the serving sector.

Measurement parameters that can represent serving sector

- Scrambling code analysis (receiver)
- Best server scrambling code – from topN
- Best server scrambling code – from user list

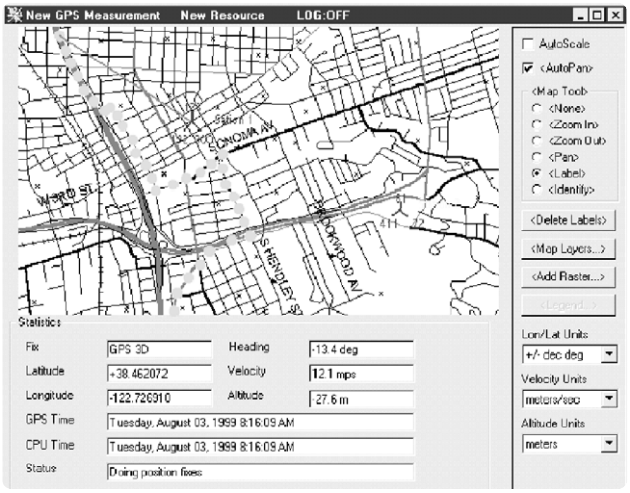


Figure 4: Real-time mapping

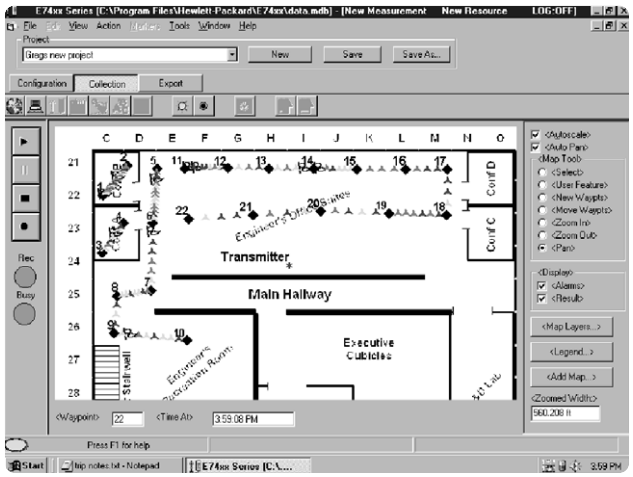


Figure 5: Indoor measurements

The underlying map is in MapInfo .TAB format. The software can convert a raster image (.GIF or .TIF) to .TAB format, so the user can use any map that is in .TAB, .GIF, or .TIF format.

E7476A software option 180 provides indoor measurement functionality. The indoor measurement virtual front panel provides the ability to make phone based W-CDMA (UMTS) wireless measurements inside of buildings. While walking through a building, waypoints are recorded on a floor plan of the building. Measurements are interpolated between waypoints. Indoor measurements require a floor plan or sketch of the building to be measured. This floor plan can be in .gif, .tif, or .png format.

An essential part of the indoor measurement system is a pen tablet computer which allows the user to correlate measurements with positions on a floor plan. Additional accessories are available which provide a simple, ergonomic way of making indoor measurements (see *CDMA Configuration Guide*, literature number 5968-5553E).

Indoor measurement features

- Autoscale
- Autopan
- Auto legend
- Ability to link receiver measurements to plot
- Ability to save plot as a .tab file (Mapinfo)
- Waypoints with interpolation
- Moveable waypoints

Computer hardware

The Agilent E7476A system requires a PC. The minimum PC requirements are listed. If you wish to purchase a laptop computer with the system, the Agilent 86154A Option 010 adds a Hewlett-Packard OmniBook.

Agilent 86154A Option 010 PC specifications

- HP OmniBook
- PentiumII processor (>300 MHz)
- Windows 98
- 64 MB RAM
- 6.4 GB hard disk
- 24X CD-ROM drive
- Enhanced lithium ion battery pack
- 14.1 inch active matrix display
- 1024 x 768 display resolution

Minimum PC requirements

- Pentium III® processor (>300 MHz)
- Windows® 95, 98 or Windows NT® (4.0 or greater)
- RS-232 (DB9) serial port
- PCMCIA slot (2 if using more than 2 phones)
- 32 MB RAM if using Windows 95 or 98
- 64 MB RAM if using Windows NT
- 50 MB disk space for software installation
- 400 MB disk space recommended for data
- CD-ROM drive recommended
- 800 x 600 display resolution

More information on the HP Omnibook can be found at **http://www.hp.com**.

Portability accessories

The Agilent E7476A is a lightweight, portable system. The Agilent 86154A Option 531 adds a carrying case.

Agilent 86154A Option 531: briefcase carrier

For transporting an Agilent E7476A system: one Agilent receiver, one mobile phone, laptop PC and connecting cables. The system is not intended to be operated from within case.

Training

One day of on-site start-up assistance is provided with Option 110.

Technical support

One year of on-line technical support is provided with Option 100 and 120.

Warranty

One-year warranty on hardware components is included with the Agilent E7476A system. Extended warranties and calibrations services are also available.

- Option W30: Three years of customer return repair service
- Option W32: Three years of customer return calibration service
- Option W50: Five years of customer return repair service
- Option W52: Five years of customer return calibration service

Additional Agilent literature

Product overviews

E7480A CDMA Post Processing Product Overview	5968-1549E
E7490A CDMA Over-Air Maintenance Tool Product Overview	5968-8697E
Indoor Wireless Measurement System Product Overview	5968-8691E
N3419A Vehicle Mounted System Display Product Overview	5980-0721E
E7478A GPRS Drive Test System Product Overview	5980-2375E
Wireless Data Measurement Product Overview	5980-2310E

Technical specifications

E7473A CDMA Drive Test Data Sheet	5968-5555E
E7474A TDMA Drive Test Data Sheet	5968-5556E
E7475A GSM Drive Test Technical Specifications	5968-5564E
E7477A cdma2000 Drive Test Data Sheet	5980-2306EN
E7490A CDMA BTS Maintenance Tool Data Sheet	5968-8687E
E7478A GPRS Drive Test Systems Data Sheet	5988-1506E
Wireless Data Measurement Data Sheet	5988-1507EN

Configuration guides

E7473A CDMA Drive Test Configuration Guide	5968-5553E
E7474A TDMA Drive Test Configuration Guide	5968-5861E
E7475A GSM Drive Test Configuration Guide	5968-5563E
E7476A W-CDMA (UMTS) Drive Test Configuration Guide	5980-2307E
E7477A cdma2000 Drive Test Configuration Guide	5980-2308E
E7490A CDMA Over-Air Maintenance Tool Configuration Guide	5968-8696E
E7478A GPRS Drive Test System Configuration Guide	5988-1505EN

Application and product notes

CDMA Drive Test Systems Product Note	5968-5554E
Spectrum and Power Measurements Using the Agilent CDMA, TDMA, and GSM Drive Test Systems	5968-8598E
Optimizing your CDMA Wireless Network Today and Tomorrow Using Drive Test Solutions Application Note 1345	5968-9916E
Optimizing your TDMA Network Today and Tomorrow Using Drive Testing to Identify Interference in IS-136 TDMA Wireless Networks Application Note 1342	5980-0219E
Optimizing your GSM Network Today and Tomorrow Using Drive Testing To Troubleshoot Coverage, Interference, Handover Margin, and Neighbor Lists Application Note 1344	5980-0218E
E7478A GPRS Drive Test System	5988-1505E

For the latest news, product and support information, and application literature, visit our Web site: **www.agilent.com/find/drive _test**

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Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

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