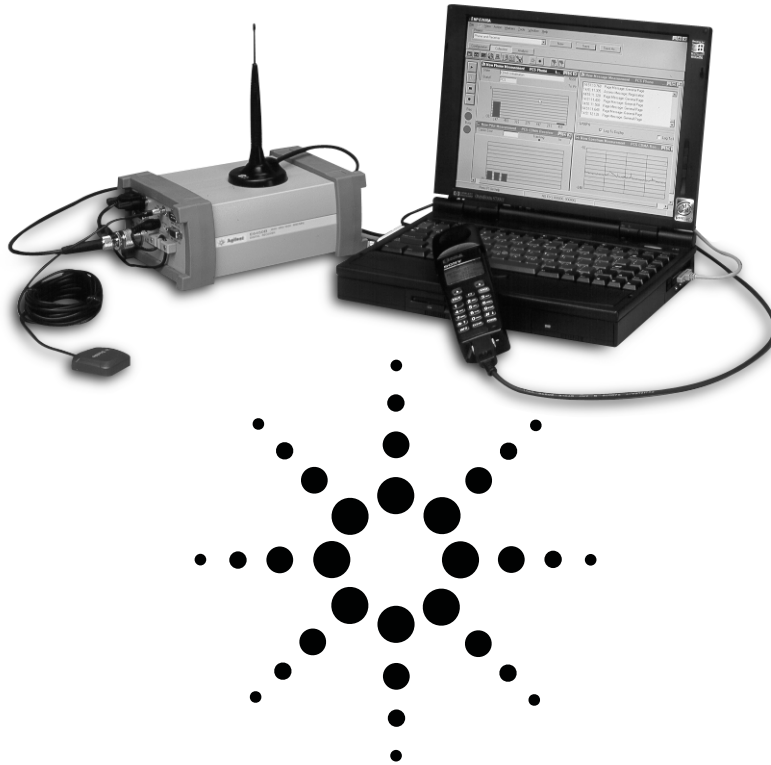# Agilent E7473A
CDMA Drive-Test System

Data Sheet

The Agilent Technologies E7473A
CDMA drive-test system is used to
obtain RF coverage and service
performance measurements for
wireless communications networks
that use IS-95 and J-STD-008
technologies. The system software
runs on a PC that interfaces with
an Agilent digital RF receiver
and/or a CDMA mobile phone.
The system can control up to
four receivers and four phones
simultaneously.

Agilent Technologies
Innovating the HP Way

System software

The system software controls Agilent digital RF receivers and CDMA/AMPS mobile phones. Multiple measurements can be made simultaneously. All measurements can be displayed in real-time and logged to the database. Eight system software options are available:

- **Option 100:** CDMA phone-based software license
- **Option 101:** CDMA phone-based BTS test software license
- **Option 110:** CDMA receiver-based software license
- **Option 111:** Code domain power and spectrum mask software license
- **Option 120:** CDMA receiver-and phone-based software license
- **Option 150:** CDMA multiple-phone capability software license
- **Option 160:** Real-time mapping software license
- **Option 180:** Indoor measurement software license

Option 120 combines all of the functions of Options 100 and 110 into a single, integrated package. Options 100 and 120 have the capability to control a single CDMA mobile phone. Option 150 adds multiple-phone control capability to Options 100 and 120.

Phone-based software

The Option 100 and 120 phone-based function of the E7473A system is comprised of three primary elements:

- **Phone control**

- **Phone measurements**

- **Messaging**

Each function element has an associated control and display window called a virtual front panel (VFP).

E7473A Options 100 and 120 provide the phone-based function described above for a single CDMA mobile phone. Option 150, when combined with Option 100 or 120, extends the phone-based software function to include up to four mobile phones.

Each phone requires a cable to connect to the PC. Agilent offers a choice of cables for several CDMA handsets. For a list of the phones supported by theE7473A and cables available from Agilent, see *Handset compatibility* on page 14.

Phone control

The system software provides automated control of the handset. The phone control VFP provides the control functions listed below.

Call controls

- Call initiation mode
  - Sequence
  - Single (long) call
  - Termination

- Call mode preference
  - No analog (forces phone to digital-only operation)

- Call initiation control
  - Start / continue
  - Pause
  - Stop

- Automatic call sequencing
  - Access time (duration of call)
  - Redial wait (duration between calls)
  - Total calls (number of calls to be executed)

- Automatic redial
  - On a dropped call
  - On a blocked call (failed origination)
  - Redial interval (wait duration after drop or block)
  - Maximum redial attempts

- Phone number pick list

- Call type pick list
  - Voice (8 or 13 kbps)
  - Markov (set 1 or set 2)
  - Loopback (8 or 13 kbps)
  - Enhanced Variable Rate Codec (EVRC)

State controls

- Automatic answer

- Channel display units
  - Channel number
  - Frequency units

Statistics logging controls

- Attempted calls

- Dropped calls

- Blocked calls (failed originations)

- Markov data

In addition to the control function, the phone control VFP displays the information listed below in a tabular format.

Tabular display (text)
- Channel
- Access time counter
- Redial time counter
- Calls remaining counter
- Total attempts
- Total drops
- Total blocks
- Dropped call rate equals total drops/total attempts
- Blocked call rate equals total blocks/total attempts

Figure 1. Phone control

Phone measurements

The E7473A system extracts measurement data from the mobile handset. Extraction of the specific measurement types is controlled by a set of check boxes. The data types are listed below.

Display fields (text)
- Status (for example, CDMA initialization or CDMA conversation)
- State (for example CDMA or analog)
- RSSI (mobile received power)
- Mobile transmit power
- Transmit gain adjust
- SAT (supervisory audio tone)
- Pilot increment
- FER (frame erasure rate)
- Ec/Io
  - Aggregate
  - Dominant

Tabular displays
- PN list

Bar graph displays
- Finger data (TA fingers)
- Pilot data
  - Active
  - Candidate
  - Neighbor

Line graph displays
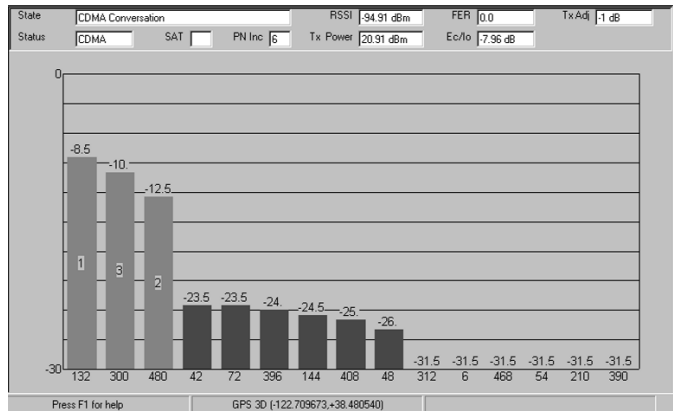- Rx / Tx level
- Temporal analyzer (TA searcher)

Figure 2. Phone measurements

Messaging

The E7473A extracts and decodes over-the-air messaging from the handset. The user can select any or all of the message types listed below to extract and decode.

Message type selection controls
- Access
- Paging
- Sync
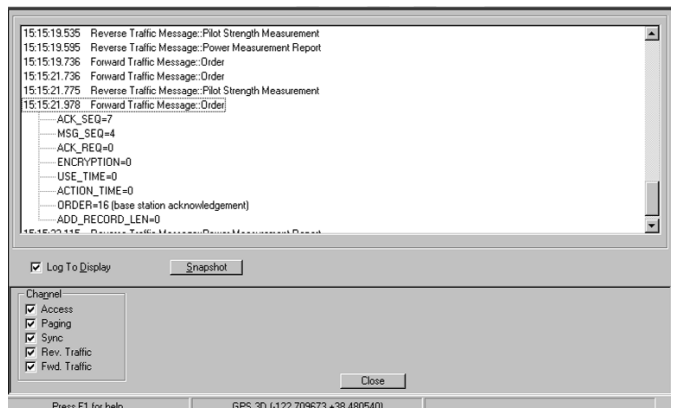- Forward traffic
- Reverse traffic

Figure 3. Messaging

In the messaging display the user can double-click on any message to show the next level of detail. A snapshot function captures the last 50 messages in a separate window while the main display continues to update and record new messages.

Message logging controls
- Log to display
- Snapshot

Multiple-phone capability

Option 150, when combined with Option 100 or 120, extends the phone-based software function to include up to four mobile phones. The All Phones window pane in the call control VFP allows the user to control dialing functions of any or all of the phones from a single window.

Use of multiple phones can significantly improve optimization efficiency. The following are some applications of multiple-phone configurations:

- Simultaneously evaluate performance on multiple frequencies

- Execute origination, termination and dropped-call testing simultaneously

- Execute measurements on your network and a competitive network simultaneously

In multiple-phone configurations each phone communicates with the PC via a dedicated serial port. Each phone requires a cable. Agilent offers a choice of cables (86154A with option number) for several CDMA handsets. For a list of the phones supported by the E7473A and cables available from Agilent, see *Handset compatibility* on page 14.

Phone-based BTS test

The E7473A Option 101 software enables automated sequencing of key presses during an active call.

Measurement controls

- Phone number – to be dialed

- Function code – key press combination to be sequenced

- Function test interval – duration to dwell between entries of function code

This capability automates the CDMA MOST function in networks using Lucent infrastructure with MOST enabled. To perform a MOST test the phone number is set to the MOST number, the function code is set to the key combination that commands a channel element step, and the function test interval is set to the time to dwell on each channel element. When executing a MOST test the VFP reports the parameters listed below, in tabular format, for each channel element step.

Measurement results

- Frequency channel
- Cell site
- Antenna face
- Cluster controller
- Channel unit
- Channel element
- FER

Receiver-based software

The receiver-based function of the E7473A system, provided by Options 110 and 120, is comprised of four primary elements:

- **CDMA pilot channel analysis**
- **Spectrum analysis**
- **CW power**
- **Channel power**

Each element has an associated control and display window called a VFP. The software can control up to four Agilent digital receivers.

The controls listed below are available for all receiver measurements:

Measurement interval

- Time
- Distance
- 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 (for example, execute a measurement every 200 milliseconds), or distance (for example, execute a measurement every 10 meters). If the user defines an interval that the system cannot achieve, a busy light indicates this condition.

CDMA pilot channel analysis

The E7473A system measures IS-95 and J-STD-008 CDMA pilot channels. These measurements are independent of network parameter settings. The system executes four different types of CDMA pilot channel measurements (listed below). Any or all of them can be executed simultaneously.

Measurement types

- All pilots:
  The system measures the power, both Ec and Ec/Io, of all 512 pilot channels. The results are displayed as a trace with one point for each of the 512 PN offsets.

- TopN:
  The system measures all of the pilots in the network and returns the 'N' strongest pilot channels received, where 'N' is a user-definable integer from 1 to 20. The results are displayed in bar graph format.

- Zoomed pilots: The user sets the center and span in terms of chips (or PN offsets). The results are displayed as a trace.

- User list:
  The user manually inputs a list of up to 40 PN offsets to be measured. The measurements are displayed in bar graph format—up to 20 bars. If more than 20 channels are in the list, all channels will be measured and recorded, but only 20 will be displayed.

Measurement results
- Peak Ec/Io
- Peak Ec
- Io
- Aggregate Ec/Io (TopN and user list only)
- Aggregate Ec (TopN and user list only)
- Aggregate–peak (TopN and user list only)
- Delay spread (TopN and user list only)
- Pilot delay
- Carrier frequency error

Peak pilot power (both Ec and Ec/Io) is computed by selecting the strongest peak of the correlation for each pilot. Io is the total received power integrated across the entire 1.2288 MHz signal bandwidth.

Aggregate pilot power (both Ec and Ec/Io) is computed for a given pilot by integrating the power received over the time dispersion of that pilot. **Delay spread** is the duration of time over which this power is dispersed. Both aggregate pilot 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 pilot power **(aggregate-peak)**. This difference, along with the delay spread, provides a characterization of the multipath effect on that pilot. Aggregate pilot power and delay spread are only measured for the TopN and user list measurement types.

Pilot delay is defined as the difference between the time a pilot signal is received and the time it should have been transmitted, as defined by GPS timing. For example, a base station transmitting PN offset 0 is expected to start a new short-code pattern synchronous with the GPS even second clock. If the signal is received 3 chips after the GPS even second clock, then the pilot delay is said to be 3 chips (1 chip ≈ 0.8 microseconds). Timing offsets can be due to both propagation delay and base station timing problems.

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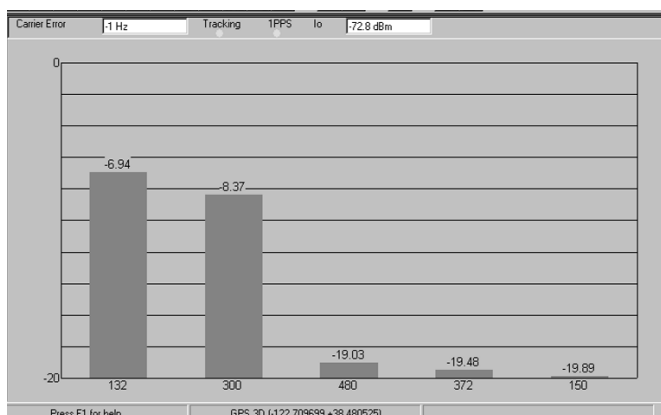

Figure 4. Pilot analyzer

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]

Cellular band receiver (Option 300 or 310)
- 824 to 849 MHz [819 to 854]
- 869 to 894 MHz [864 to 899]

PCS band receiver (Option 320 or 330)
- 1850 to 1910 MHz [1845 to 1915]
- 1930 to 1990 MHz [1925 to 1995]

Japan Cellular band receiver (Option 380 or 381)
- 832 to 870 MHz [827 to 875]
- 887 to 925 MHz [882 to 930]

Korea PCS band receiver (Option 390 or 391)
- 1710 to 1785 MHz [1705 to 1790]
- 1805 to 1880 MHz [1800 to 1885]

Frequency, maximum span[1]

Cellular band receiver (Option 300 or 310)
- 25 MHz [35]

PCS band receiver (Option 320 or 330)
- 60 MHz [70]

Japan Cellular band receiver (Option 380 or 381)
- 38 MHz [48]

Korea PCS band receiver (Option 390 or 391)
- 75 MHz [85]

IF bandwidth
- 1.25 MHz (wideband mode)
- 30 kHz (narrowband mode)
- 200 kHz (narrowband mode-Korea PCS receiver)

Resolution bandwidth
- 8.36 kHz to 1 MHz in wideband mode
- 246 Hz to 28 kHz in narrowband mode
- 1.68 kHz to 190 kHz in narrowband mode
  - Korea PCS receiver

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

Spectrum noise floor (characteristic)[2]

	Average	Peak
Narrowband mode / 300 kHz span	–139 dBm	–131 dBm
Wideband mode / 300 kHz span	–128 dBm	–119 dBm
Narrowband mode / 25 MHz span	–132 dBm	–129 dBm
Wideband mode / 25 MHz span	–123 dBm	–117 dBm

Minimum sweep speed (characteristic)[2]

Narrowband mode: 1 MHz / sec
Narrowband mode - Korea PCS receiver: 5 MHz per second
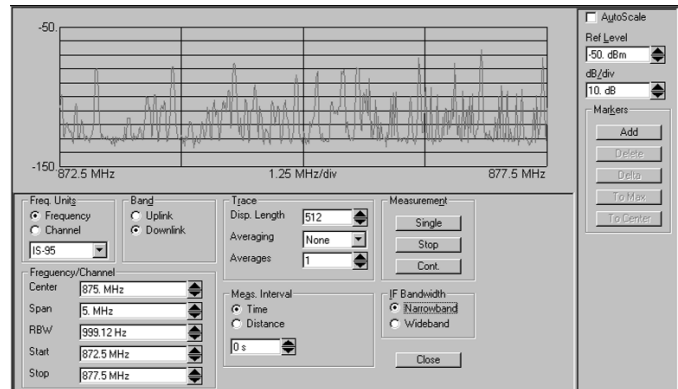Wideband mode: 70 MHz per second

Figure 5. Spectrum analysis

CW power and channel power

The E7473A 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, as indicated below.

1. Spectrum measurement allows tuning 5 MHz above and below specified frequency ranges. These extended ranges are shown in brackets – []. The performance is not specified in these ranges. Characteristic noise floor increase is 2 dB with respect to specified range. Characteristic amplitude accuracy is unchanged with respect to specified range.

2. Tested with minimum resolution bandwidth: 246 Hz in narrowband mode, 8.46 kHz in wideband mode, 1.68 kHz narrowband-Korea PCS receiver

Note: Specifications describe warranted performance over the temperature range of 0 to 55 degrees 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-degree 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.

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, ... , and lastly at the (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, 1901, 1902 and 1903 MHz.

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 (wideband mode)
- 30 kHz (narrowband mode)
- 200 kHz (narrowband mode-Korea PCS receiver)

Resolution bandwidth (CW power only)
- 8.36 kHz to 1 MHz in wideband mode
- 246 Hz to 28 kHz in narrowband mode
- 1.68 kHz to 190 kHz (in narrowband mode - Korea PCS receiver)

Channel width (channel power only)

Cellular band receiver (Option 300 or 310)
- 8.36 kHz to 25 MHz in wideband mode
- 246 Hz to 25 MHz in narrowband mode

PCS band receiver (Option 320 or 330)
- 8.36 kHz to 60 MHz in wideband mode
- 246 Hz to 60 MHz in narrowband mode

Japan cellular band receiver (Option 380 or 381)
- 8.36 kHz to 38 MHz in wideband mode
- 246 Hz to 38 MHz in narrowband mode

Korea PCS band receiver (Option 390 or 391)
- 8.36 kHz to 75 MHz
- 1.68 kHz to 75 kHz

Figure 6. CW/channel power

Code domain power and spectrum mask

The E7473A Option 111 is a receiver-based software option that provides two primary functions:

- **Code domain power**
- **Spectrum display with IS-97 mask**

Each function has an associated control and display window called a VFP. Option 111 can operate stand-alone or be combined with other software options.

CDMA code domain power

The E7473A Option 111 software measures code domain power for IS-95 and J-STD-008 signals. These measurements provide real-time insight for traffic analysis, capacity management and base station health. The code domain power VFP is segmented into three measurement types (listed below). Any or all of them can be executed simultaneously.

Measurement types

- **CDP Trace:**
  The system measures the relative powers of each of the 64 Walsh codes. Data is displayed in bar graph format with a unique color for each channel type – pilot, paging, sync and traffic.

- **CDP Stats:**
  The system displays 18 different measurement parameters in large font text format.

- **TopN Pilots:**
  The system measures all of the pilots in the network and returns the 'N' strongest pilot channels received, where 'N' is a user-definable integer from 1 to 20. The results are displayed in bar graph format. This display is equivalent to the TopN measurement type of the pilot channel analysis virtual front panel.

Measurement controls

Carrier frequency
- Frequency
- Channel

Measurement types
- Code domain power trace
- Code domain power stats
- TopN pilots

Markers (CDP trace display only)

- Multiple markers
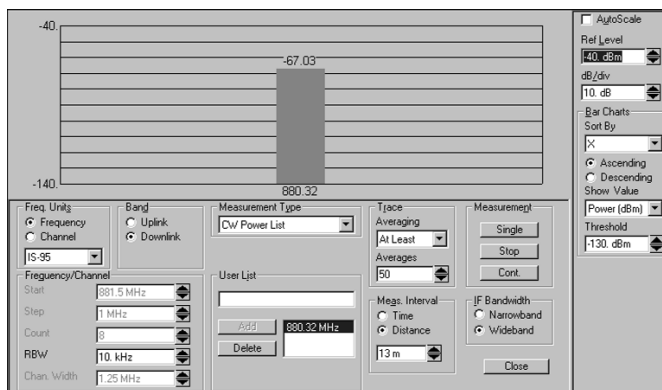- Delta markers
- To Max function
- Drag and drop

Measurement results

CDP trace
  • Relative power for each Walsh code
  • Active channel threshold

CDP stats
  • Frequency channel
  • Channel power
  • Pilot power
  • PN offset number
  • Pilot delay (absolute delay with respect to GPS time)
  • Pilot-paging amplitude delta
  • Pilot-sync amplitude delta
  • Estimated Rho
  • Code domain noise floor
  • Multipath power
  • Pilot dominance
  • Carrier feedthrough
  • Instantaneous number of active traffic channels
  • Average number of active traffic channels
  • Peak number of active traffic channels
  • Average power per active traffic channel
  • Peak power per active traffic channel
  • Percentage of amplifier capacity

TopN pilots
  • See CDMA pilot channel analysis section

Frequency error

Pilot-paging amplitude delta is the difference, in dB, between the amplitudes of the pilot and paging channels. Pilot-sync delta is the difference, in dB, between the amplitudes of the pilot and sync channels.

Multipath power is equivalent to the aggregate-peak power measurement of the pilot channel analyzer. Pilot dominance is the difference, in dB, between the amplitudes of the strongest pilot and the second strongest pilot.

Estimated Rho is a measure of modulation quality. Rho is the formal measure of modulation quality defined in IS-95, but it requires the transmitter be in a pilot-only state. Estimated Rho is measured with the transmitter in service, so there is no impact on traffic.

Code domain noise floor is the averaged power of all of the inactive channels.

The number of active traffic channels is displayed in three different ways:

• **Instantaneous:** number of active traffic channels for that specific code domain measurement

• **Average:** number of active averaged over the duration a specific pilot is dominant

• **Peak:** the maximum number of active traffic channels over the duration a specific pilot is dominant
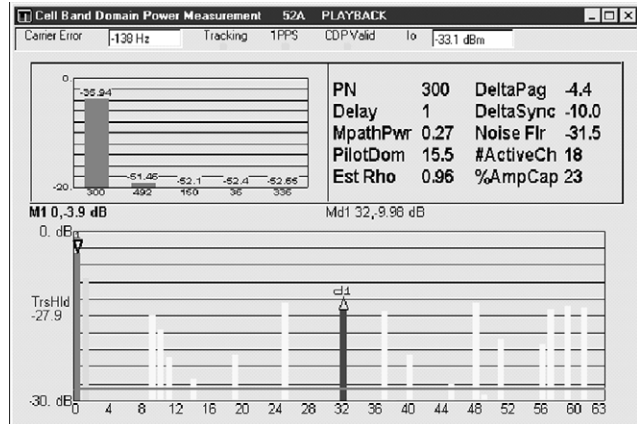

Figure 7. Code domain power

Spectrum with IS-97 mask

The E7473A Option 111 software provides a spectrum display that includes the spectrum mask as defined in the IS-97 standard. Pass/fail indicators for the mask are provided at each of the IS-97 frequency offsets. The controls are simple and intended for fast test execution.

Measurement controls

Channel
  • Channel
  • Frequency

Frequency span
  • 2 MHz
  • 7 MHz

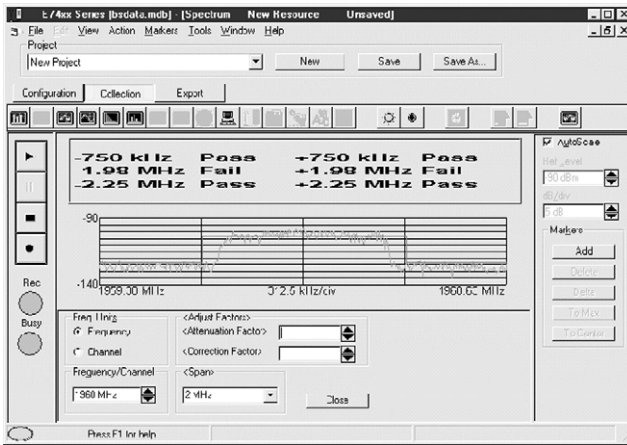The resolution bandwidth is fixed at 30 kHz. The marker functions are the same as for the spectrum analysis display.

Figure 8. Spectrum with IS-97 mask

Alerts and alarms

The E7473A 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 CDMA via the wizard are:

- Missing neighbor
- Pilot pollution
- Dropped call
- High FER
- Low phone Ec/Io
- No coverage
- Weak CW
- Lost GPS fix
- No location fix
- Low disk space
- Low battery
- No AC power
- High CPU usage

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 ($\geq$)
- Less than (<)
- Less than or equal to ($\leq$)
- Equal to (=)
- Not equal to ($\neq$)

Alarm conditions

- Greater than (>)
- Greater than or equal to ($\geq$)
- Less than (<)
- Less than or equal to ($\leq$)
- Equal to (=)
- Not equal to ($\neq$)
- Is a subset
- Is not a subset
- 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. Example 4 is the missing neighbor alarm, which triggers when the receiver measures a pilot signal above –15 dB Ec/Io that the handset does not measure. This provides very quick identification of neighbor list problems.

Example alerts: 1. Value (FER) >2.0%

2. Maximum (TopN Ec/Io) <–10 dB

Example alarms: 3. Value (FER) >2.0% AND Maximum (TopN Ec/Io) <–10 dB

4. Subset (TopN Ec/Io >–15 dB) IS-NOT-A-SUBSET (PNlist)

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.

9

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 and playback of data are controlled by VCR-like 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, minimizing 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 E7473A provides fast and easy report generation. All of the current displays (VFP) 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 VFP can be printed by selecting the print command from the file menu.

Data export

Data can be exported from the E7473A 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, will cause the associated data to be excluded from the export.
- **Geographic binning:** Data-reduction process in which the data is averaged over a 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 E7473A 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 E7473A system.

Data output formats

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

RF receiver hardware

There are eight digital RF receiver options for the E7473A system:

- **Option 300:** Cellular band receiver
- **Option 310:** Cellular band receiver with internal GPS receiver
- **Option 320:** PCS band receiver
- **Option 330:** PCS band receiver with internal GPS receiver
- **Option 380:** Japan Cellular band receiver
- **Option 381:** Japan Cellular band receiver with internal GPS receiver
- **Option 390:** Korea PCS band receiver
- **Option 391:** Korea PCS band receiver with internal GPS receiver

The E7473A system with Option 110 or 120 has a software function for controlling the receivers. The system supports any combination of receivers, up to a total of four. Using multiple receiver configurations can greatly improve drive-test efficiency for applications such as measuring at 850/1900 MHz borders, simultaneously measuring 850 and 1900 in overlay areas, simultaneously monitoring both forward and reverse links, 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.

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 (Options 310, 330, 381 and 391 only)

Agilent Digital RF Receiver Specifications

(E7473A Options 300, 310, 320, 330, 380, 381, 390 and 391)

Frequency

Range[1]:

Options 300, 310:
  824 to 849 MHz [819 to 854]
  869 to 894 MHz [864 to 899]

Options 320, 330:
  1850 to 1910 MHz [1945 to 1915]
  930 to 1990 MHz [1925 to 1995]

Options 380, 381:
  832 to 870 MHz [827 to 875]
  887 to 925 MHz [882 to 930]

Options 390, 391:
  1710 to 1785 MHz [1705 to 1790]
  1805 to 1880 MHz [1800 to 1885]

Accuracy: ±1 ppm.

With GPS time synchronization: ±0.05 ppm (characteristic)

IF bandwidth:
  1.25 MHz (characteristic)
  30 kHz (characteristic)
  200 kHz (characteristic Opt. 390, 391)

Aging of TCXO: ±1 ppm/year

---

1. Spectrum measurement allows tuning 5 MHz above and below specified frequency ranges. These extended ranges are shown in brackets – []. The performance is not specified in these ranges. Characteristic noise floor increase is 2 dB with respect to specified range. Characteristic amplitude accuracy is unchanged with respect to specified range. GPS receivers.

Amplitude

Accuracy:

1.25 MHz IF bandwidth:
    ±1 dB (±0.5 dB typical)
    (20 to 30 ˚C, –40 to –100 dBm)
    ±2 dB (0 to 55 ˚C, –40 to –100 dBm)

30 kHz IF bandwidth:
    ±1.5 dB (± 0.5 dB typical)
    (20 to 30 ˚C, –40 to –100 dBm)
    ±2.5 dB (0 to 55 ˚C, –40 to –100 dBm)

Noise figure: 8 dB (typical)

Internally generated spurious: –120 dBm

Maximum safe input level: +10 dBm, 20 V DC (characteristic)

1 dB compression point: –15 dBm (characteristic)

Adjacent channel desensitization[4]: –25 dBm (typical)

Adjacent channel rejection[5]: 45 dB (typical)

Input/output

RF input: 50 Ω type N

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

Storage temperature range: 40 to 70 ˚C

Dimensions: 6 inch x 3-5/8 inch x 8-3/4 inch

Weight: 4.5 lbs.

Power:
   With internal GPS: 9 to 34 Vdc, 9 W
   Options 310, 330, 381, 391: 9 to 34 Vdc, 10 W

GPS

The E7473A 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

Two different GPS receiver configurations are available from Agilent for our drive-test systems. E7473A receiver Options 310, 330, 381 and 391 include GPS receivers mounted inside the receiver enclosure.

This configuration provides excellent portability and convenience. Accessories for the E7473A are ordered using the 86154A drive system accessories. The

Agilent 86154A is a model number that provides ease-of-ordering for accessories for all Agilent drive-test products. 86154A Option 210 adds a Trimble Placer GPS 455 receiver with dead-reckoning for external connection to the system.[6]

GPS receiver with Options 310, 330, 381 and 391

• 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

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

The E7473A software includes a VFP 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.

---

4. Adjacent channel desensitization applies to the wideband mode (1.25 MHz IF filter) and is defined as the 1 dB compression level of a tuned signal with an interfering signal ±1.25 MHz from the tuned signal.

5. Adjacent channel rejection applies to the narrowband mode (30 kHz IF filter) and is defined as the suppression of an interfering signal ±30 kHz away from the tuned signal.

6. Option 310, 330, 381 and 391 receivers do not support connection to external GPS receivers.

Real-time mapping

The E7473A 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

Phone measurements
  • FER
  • Ec/Io
  • RSSI
  • Transmit gain adjust
  • Transmit power
  • Carrier frequency
  • PN increment
  • Active sector

Pilot channel analysis (receiver)
  • Best server Ec/Io – from TopN
  • Best server Ec/Io – from User List
  • Io – from TopN
  • Io – from User List
  • Carrier frequency

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, or sectors in the case of soft handoff.

Measurement parameters that can represent serving sector

Phone measurements
  • Active sector(s)

Pilot channel analysis (receiver)
  • Best server PN offset – from TopN
  • Best server PN offset – from User List
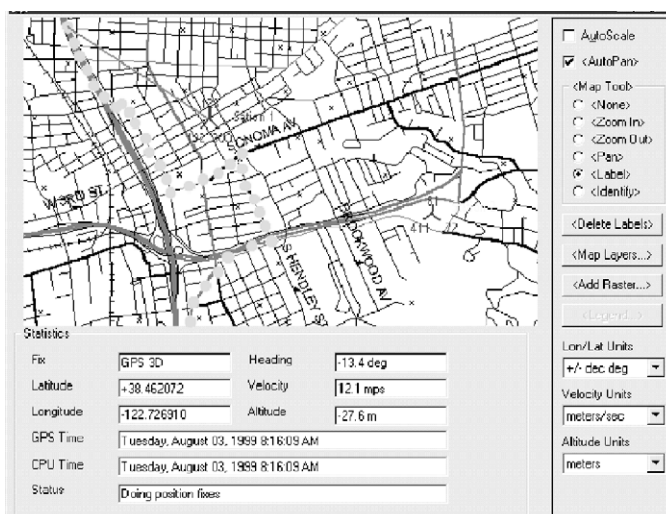
Figure 9. Real-time mapping display

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.

GPS interconnections

External GPS receivers communicate with the E7473A via an RS-232 serial connection. The table below lists several GPS receiver models and the associated requirements for connection to an E7473A system. For other models of external GPS receivers, consult an Agilent representative for interconnect requirements.

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

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

Differential GPS can be used with the E7473A system, provided the GPS receiver is differential compatible. The 86514A Option 230 adds a differential GPS receiver to the system.

Agilent 86154A Option 230: differential GPS receiver

- **Differential corrections, incorporated RDS-3000**

- **Magnetic mount antenna**

- **Interconnect cables**

E7473A software Option 180 provides indoor measurement functionality. The indoor measurement VFP provides the ability to make phone based CDMA 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 Drive-Test System Configuration Guide, literature number 5968-5553E).

Indoor measurement features
- Autoscale
- Autopan
- Auto legend
- Abllity to link phone or receiver measurements to plot
- Ability to save plot as a .tab file (Mapinfo)
- Waypoints with interpolation
- Moveable waypoints
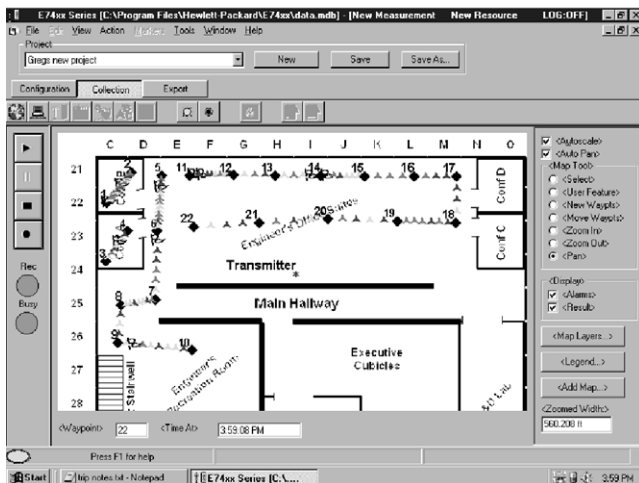
Figure 10. Indoor measurement VFP

Handset compatibility

The E7473A CDMA drive-test system can interface with several CDMA handsets. Each handset requires a cable to connect to the PC. Agilent offers a choice of cables for several CDMA handsets. The cables are designed to work with or without the USB hub kits. The USB hub kits not only provide phone connectivity to the PC but also provide power to the phone.

The USB hub kits are ordered using the drive-test accessory product number, E6473A:

- **E6473A Option 010:** Vehicle-mounted USB hub kit is suitable for drive-test (i.e. in-vehicle) environments.
- **E6473A Option 020:** Portable USB hub kit is suitable for indoor (i.e. portable) environments

The supported CDMA handsets are listed below. The list is complete as of this printing. At this time, handsets are not available from Agilent. Contact your Agilent representative regarding handset compatibility and availability plans.

Compatible handsets
- Qualcomm QCP-820, QCP-1920, QCP-2700
- Qualcomm QCP-860, QCP-1960, QCP-2760
- Kyocera QCP-2035

Each phone requires a cable to connect to the PC. Agilent offers a choice of cables for several CDMA handsets:

Cable model/option	Handsets
E6473A Option 801:	QCP-820, QCP-1920, QCP-2700
E6473A Option 802: (no external RF connection)	QCP-860, QCP-1960, QCP-2760
E6473A Option 803: (with external RF connection)	QCP-860, QCP-1960, QCP-2760
86154A Option 719:	QCP-2035

Computer hardware

The E7473A system requires a PC. The minimum PC requirements are listed. If you wish to purchase a laptop computer with the system, the 86154A Option 010 adds a Hewlett-Packard OmniBook*.

Minimum PC requirements

- Pentium® processor (233 MHz)
- Windows® 95, 98 or Windows NT® (4.0 or greater)
- RS-232 (DB9) serial port
- PCMCIA slot (two if using more than two 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

Agilent 86154A Option 010 PC specifications

- HP OmniBook 6000
- Pentium III processor (700 MHz)
- Windows 98
- 128 MB RAM
- 10 GB hard disk
- 8X DVD-ROM drive
- Enhanced lithium ion battery pack
- 14.1-inch active matrix display
- 1024 x 768 display resolution

Post-processing software

The Agilent E6481A CDMA OPAS32 network analysis software analyzes and displays E7473A data in a format that quickly identifies causes and solutions of problems.

Portability accessories

The E7473A is a lightweight, portable system. 86154A Option 531 adds a carrying case.

Agilent 86154A Option 531: briefcase carrier

This carrying case is for transporting an E7473A system (one Agilent receiver, one mobile phone, laptop PC and connecting cables).The system is not intended to be operated from within the case.

Training

One day of start-up assistance is provided with Options 110 and 120.

Technical support

One year of on-line technical support is provided with Options 100, 110 and 120.

Warranty

A one-year warranty on hardware components is included with the E7473A 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

---

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

Pentium® is a U.S registered trademark of Intel Corporation.

Microsoft®, Windows® and Windows NT® are U.S. registered trademarks of Microsoft Corporation.

Additional literature

For more information about Agilent Technologies wireless products, applications, and services visit our website: **www.agilent.com/find/networks**

Agilent Technologies
Innovating the HP Way