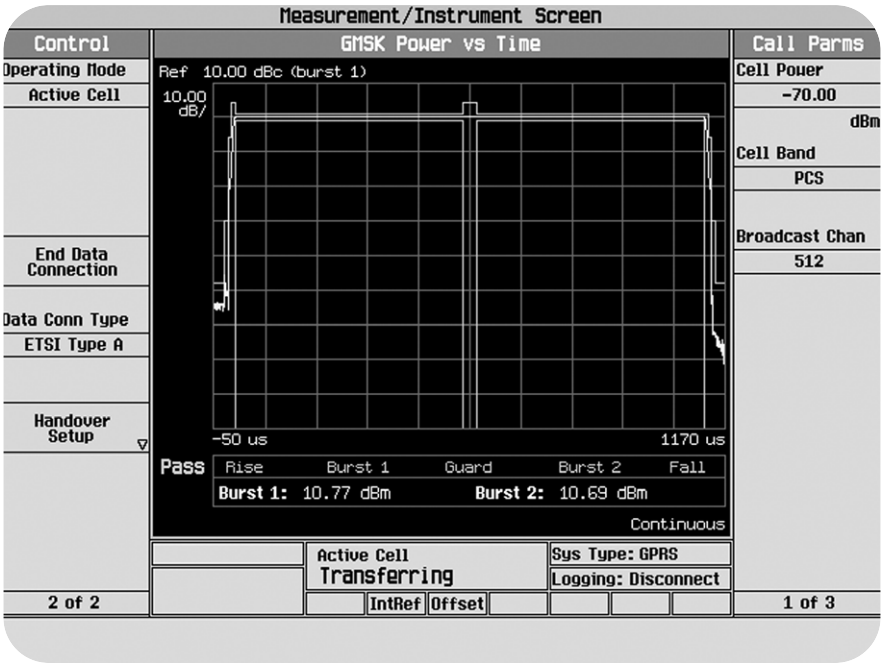
Agilent
8960 Series 10 with GPRS

Data Sheet

For the E5515A/B/C/T mainframes and the
E1964A and E1985A test applications



Transmitter measurements

- multislot-tolerant frequency error
- multislot-tolerant transmit power
- multislot-tolerant phase error (peak and rms)
- multislot power versus time (burst mask comparison)
- burst timing
- multislot-tolerant output RF spectrum due to switching
- multislot-tolerant output RF spectrum due to modulation
- general purpose spectrum monitor

Receiver measurements

- multislot bit error ratio (BER) using ETSI test mode B
- multislot block error ratio (BLER)

Agilent Technologies

GPRS functionality

Coding schemes: CS-1, CS-2, CS-3, CS-4
Multislot configurations: 1x1, 2x1, 3x1, 4x1, 2x2, 3x2 (downlink x uplink)
Multislot classes supported: 1 through 10
Control channels: BCH on timeslot 0 on any ARFCN in any band
Broadcast channel configuration: FCCH + SCH + BCCH + CCCH + SDCCH/4 (0-3) + SACCH/C4 (0-3)
Downlink PDTCH: One, two, three or four on the same PDTCH ARFCN with one or two PDTCH amplitudes user-settable between 0 and 42 dB below BCH amplitude; amplitudes in unused time slots user-selectable as off, PRL one or PRL two
External trigger: signal output each frame with user-settable timeslot and bit

Call processing functionality

- GSM 450 MHz, GSM 480 MHz, GSM 750 MHz, GSM 850 MHz, PGSM 900 MHz, EGSM 900 MHz, RGSM 900 MHz, DCS 1800 MHz, PCS 1900 MHz bands
- mobile-initiated attach and detach
- cell initiated detach
- packet data transfers on uplink and downlink
- RACH count reported
- inter-cell handovers between all bands
- BA table with user-settable neighbor cell
- guard period length of 9 or 10
- three-digit MNC off or on in PCS 1900 MHz band
- selection of which contiguous downlink bursts to loop back on the uplink
- RLC/MAC header off or on in GPRS BCH+PDTCH operating mode

PDTCH protocol control

- packet time slot reconfigure off or on
- packet power timing advance off or on

Connection parameters

- TBF frame starting position (relative, absolute, immediate)
- LLC frame check sequence valid or corrupt
- BLER block polling interval settable between 1 and 32
- payload data pattern user-selectable in data connection types ETSI B and BLER

Active cell: A BCH is generated on the downlink. Attach and detach procedures and packet data transfers on the uplink(s) and downlink(s) can be executed. Multislot configuration, coding scheme and downlink and uplink power level(s) can be changed. All transmitter measurements can be made. Three data connection types are available in active cell operating mode as follows:

- **data connection type ETSI type A:** Test mode A is as defined in ETSI GSM 04.14. The downlink is terminated once the uplink has been established.
- **data connection type ETSI type B:** Test mode B is as defined in ETSI GSM 04.14. Downlink PDTCH(s) data is generated and the mobile loops back the downlink data on the uplink(s). BER measurements can be made.
- **data connection type BLER:** Agilent-proprietary data connection with the primary purpose of making BLER measurements

GPRS test mode BCH: A BCH is generated on the downlink, but no uplink demodulation occurs.

GPRS test mode BCH+PDTCH(s): A BCH and PDTCH(s) is generated on the downlink and the downlink multislot configuration can be changed. A forced call can be established if the mobile is manually synchronized to the test set's downlink and the mobile's uplink PDTCH(s) uses the same ARFCN and time slot(s) as the downlink. When a forced call is established, BER measurements can be made and demodulation and channel decoding of the uplink are available, although no messages are decoded.

Technical specifications

These specifications apply to the following hardware and software.

- E5515A mainframes with GPRS upgrade installed (E5515BU 085)
- E5515B mainframes with serial numbers lower than US40300311 or lower than GB40300127 with GPRS upgrade installed (E5515BU 085)
- E5515B mainframes with serial numbers US40300311 and higher or GB40300127 and higher
- E5515C mainframes
- E5515T mainframes with cdma2000 upgrade installed (E5515TU x62)
- E1964A test application of firmware revision A.04
- E1985A test application of firmware revision B.01

Specifications describe the test set's warranted performance and are valid over the entire operation and environmental ranges unless otherwise noted. All specifications are valid after a 30-minute warm-up period of continuous operation and within the frequency ranges of 450 to 496 MHz, 810 to 960 MHz and 1.7 to 1.99 GHz.

Supplemental characteristics are intended to provide additional information useful in applying the instrument by giving typical, but non-warranted performance parameters. These characteristics are shown in Italics and labeled as "typical," or "supplemental," and apply at +25 °C.

RF (downlink) generator specifications

RF generator specifications apply to both RF generators in the 8960.

RF frequency

Frequency ranges: 450 to 496 MHz, 810 to 960 MHz, 1.7 to 1.99 GHz

Accuracy and stability: same as timebase reference

Supplemental characteristics

Operating frequency range: *292 to 2700 MHz*

Setting resolution: *1 Hz*

RF amplitude

Output level range at RF IN/OUT: –110 to –13 dBm

Output level range at RF OUT ONLY: –110 to –5 dBm

Absolute output level accuracy: < ±1.0 dB

VSWR at RF IN/OUT: < 1.14:1 for 450 to 496 MHz and 810 to 960 MHz, < 1.2:1 for 1.7 to 1.99 GHz

Reverse power at RF IN/OUT: < 2.5 W continuous, < 5 W peak bursted power

Reverse power at RF OUT ONLY: < 500 mW continuous

Supplemental characteristics

Typical output level accuracy: *< ±0.5 dB*

Typical output level repeatability at RF IN/OUT *(returning to the same frequency and level): < ±0.1 dB*

Typical VSWR at RF OUT ONLY: *< 1.4 for 450 to 496 MHz and 810 to 960 MHz, < 1.45:1 for 1.7 to 1.99 GHz*

Typical isolation from RF OUT ONLY port to RF IN/OUT port *(when the RF generator is routed to the RF OUT ONLY port): > 60 dB for 450 to 496 MHz and 810 to 960 MHz, > 40 dB for 1.7 to 1.99 GHz*

Operating level range at RF IN/OUT: *–127 to –10 dBm*

Operating level range at RF OUT ONLY: *–119 to –2 dBm*

Output level setting resolution: *0.1 dB*

GMSK signal generation

Absolute output level accuracy with GMSK modulation on:

Specification	Ranges
< ±1.09 dB	Single slot from –110 to –13 dBm
< ±1.09 dB	1 multislot level between –110 and –13 dBm
< ±1.50 dB	2 multislot levels ≤ 20 dB apart between –110 and –70 dBm

Peak phase error: < ±4 degrees

rms phase error: < 1 degree

Frequency error: < ±0.005 ppm plus timebase reference for 810 to 960 MHz and 1.7 to 1.99 GHz, < ±0.006 ppm plus timebase reference for 450 to 496 MHz

Amplitude flatness: < ±0.3 dB for single-slot GMSK signals, < ±1.0 dB for multislot GMSK signals

Supplemental characteristics

Typical absolute output level accuracy with GMSK modulation on:

Specification	Ranges
< ±0.55 dB	*Single slot from –110 to –13 dBm*
< ±0.55 dB	*1 multislot level between –110 and –13 dBm*
< ±0.85	*≤ 20 dB apart between –110 and –70 dBm*

Typical burst modulation on/off ratio *(referenced to lowest signal level): > 50 dB*

Spectral purity

Harmonics: ≤ –25 dBc for levels ≤ –17 dBm

Subharmonics: ≤ –40 dBc

Non-harmonics: < –55 dBc for 100 to ≤ 1500 kHz offsets from carrier < –68 dBc for > 1500 kHz offsets from carrier

Supplemental characteristics

Typical non-harmonic performance: *< –55 dBc for 3 to < 100 kHz offsets*
< –53 dBc for line-related non-harmonics

Typical spurious due to receiver LO leakage: *< –50 dBm for spurious at 105 ± 2.5 MHz below expected transmitter frequency and its second harmonic*

RF analyzer functionality

RF frequency

Ranges applied to demodulation and transmitter specifications: 450 to 496 MHz, 810 to 960 MHz and 1.7 to 1.99 GHz

Supplemental characteristics

Operating range: *292.5 to 2700 MHz*

Transmitter and receiver measurement specifications

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

Frequency coverage and amplitude range

Unless otherwise noted, all specifications apply to frequencies of 450 to 496 MHz, 810 to 960 MHz and 1.7 to 1.99 GHz, signals with peak input power at the test set's RF IN/OUT not higher than +37 dBm and temperatures of 0 to +55 °C. Input signal transmit power (defined as the average power over the useful part of the burst) at the test set's RF IN/OUT must be within ±3 dB of the test set's expected power for warranted performance.

Receiver measurement specifications

Simultaneous demodulation and measurements

The test set's RF analyzer provides dedicated signal paths for demodulation (maintaining the link) and measurements to be performed simultaneously.

Demodulation frequency capture range: Signal must be within ±200 Hz of test set's expected frequency for warranted performance.

Single-slot demodulation sensitivity: ≥ –30 dBm for BER measurements

Multislot demodulation sensitivity: all uplink timeslots ≥ –30 dBm for maintaining a data link when adjacent time slots are ≤ 20 dB different in level

Supplemental characteristics

Typical single-slot demodulation sensitivity: *≥ –40 dBm for maintaining a link*

Typical multislot demodulation sensitivity: *all uplink timeslots ≥ –40 dBm for maintaining a data link when adjacent time slots are ≤ 30 dB different in level*

Bit error ratio (BER) measurement

Types of signals measured: data looped back by the mobile

Minimum input level: All uplink signals at test set's RF IN/OUT must have transmit power ≥ –30 dBm and ≤ 20 dB difference in power between levels of adjacent timeslots for warranted performance.

Measurement data patterns: user-selectable as all zeros, all ones, alternate bits, alternate pairs, alternate quads, PRBS-15 or fixed 2B (hex)

Block delay: user-settable from 1 to 6 or automatically determined

Zero bad blocks: user-settable as off or on; when on, all bits within a bad block are set to 0

Numerical results: number of bits tested, BER, number of bad bits and block delay

Multi-measurement capabilities: 1 to 999,000 bits

Concurrency capabilities: BER measurements cannot be made concurrently with BLER measurements, but can be made concurrently with all transmitter measurements.

Supplemental characteristics

Measurement resolution: *0.01 percent*

Block error ratio (BLER) measurement

Types of signals measured: data looped back by the mobile or information reported by the mobile when polled using Packet Ack/Nack messages

Minimum input level: All uplink signals at test set's RF IN/OUT must have transmit power ≥ –30 dBm and ≤ 20 dB difference in power between levels of adjacent timeslots for warranted performance.

Measurement data patterns: With data connection type ETSI B and data looped back by the mobile, user-selectable as all zeros, all ones, alternate bits, alternate pairs, alternate quads, PRBS-15 or fixed 2B (hex).

Block delay: user-settable between 1 and 6 or automatically determined

Numerical results: number of blocks tested, BLER, number of bad blocks and block delay

Multi-measurement capabilities: 1 to 99,000 blocks

Concurrency capabilities: BLER measurements cannot be made concurrently with BER measurements, but can be made concurrently with all transmitter measurements.

Supplemental characteristics

Measurement resolution: *0.01 percent*

Transmitter measurement specifications

Multislot phase and frequency error measurement

Types of signals measured: normal bursts, RACH bursts for a single uplink timeslot only

Multislot input signal conditions: 30 dB difference in power level between adjacent time slots

Multislot signal measurement capability: measurement of one user-specified time slot transmitted as a single time slot or two adjacent time slots

Frequency capture range (for any mobile burst): Signal must be within ±100 kHz of test set's expected warranted performance.

Minimum input level: Signal at test set's RF IN/OUT must have transmit power ≥ –15 dBm for warranted performance.

Frequency error measurement accuracy: < ±12 Hz plus timebase accuracy for normal bursts
< ±18 Hz plus timebase accuracy for RACH bursts

When using the RF generator as the RF reference frequency for the mobile, the RF generator frequency error relative to the timebase reference must be added.

rms phase error measurement accuracy: < 1 degree

Peak phase error measurement accuracy: < 4 degrees

Measurement trigger sources: RF rise, protocol, immediate, auto

Measurement trigger delay: user-settable between ±2.31 ms

Measurement synchronization: midamble, RF amplitude, none for a single uplink timeslot; midamble for two uplink timeslots

Numerical results: rms and peak phase error, frequency error

Displayed graphical results: peak phase error in degrees vs. bits with user-settable marker, variable bit and amplitude axes

Multi-measurement capabilities: 1 to 999 bursts; maximum, minimum and average phase and frequency error, and worst-case frequency error results

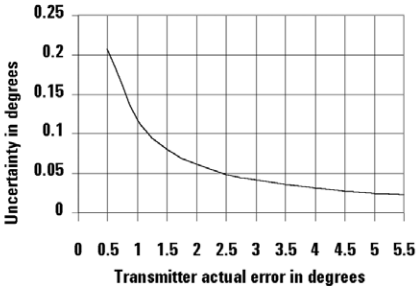
Concurrency capabilities: Multislot phase and frequency error measurements can be made concurrently with all other measurements.

Supplemental characteristics

Frequency error measurement resolution: *0.01 Hz*

Phase error measurement resolution: *0.01 degrees*

Typical rms phase error uncertainty vs. transmitter actual error:



Multislot transmit power measurement

Types of signals measured: normal bursts and CW, RACH bursts for a single uplink timeslot only

Multislot input signal conditions: ≤ 30 dB difference in power level between adjacent time slots

Multislot signal measurement capability: measurement of one user-specified time slot transmitted as a single time slot or two adjacent time slots

Frequency capture range: Signal must be within ±100 kHz of test set's expected frequency for warranted performance.

Minimum input level: Signal at test set's RF IN/OUT must have transmit power ≥ –25 dBm for warranted performance.

Measurement accuracy (for +20 to +55 °C): for single-slot signals and multislot signals at the same level:

450 to 496 MHz	810 to 960 MHz	1.7 to 1.99 MHz
< ±0.29 dBm, < ±0.30 dBm with RF OUT ONLY	< ±0.27 dBm, < ±0.28 dBm with RF OUT ONLY	< ±0.29 dBm, < ±0.33 dBm with RF OUT ONLY

For multislot signals at different levels:

450 to 496 MHz	810 to 960 MHz	1.7 to 1.99 MHz
< ±0.54 dBm, < ±0.55 dBm with RF OUT ONLY	< ±0.52 dBm, < ±0.53 dBm with RF OUT ONLY	< ±0.54 dBm, < ±0.58 dBm with RF OUT ONLY

VSWR at RF IN/OUT: < 1.14:1 for 450 to 496 MHz and 810 to 960 MHz, < 1.2:1 for 1.7 to 1.99 GHz

Measurement trigger sources: RF rise, protocol, immediate, auto

Measurement trigger delay: user-settable between ±2.31 ms

Measurement synchronization: RF amplitude (midamble-synchronized output power result is available as part of the multislot power versus time measurement)

Numerical result: output power

Multi-measurement capabilities: 1 to 999 bursts; minimum, maximum, average and standard deviation results

Concurrency capabilities: Multislot transmit power measurements can be made concurrently with all other measurements.

Supplemental characteristics

Extended amplitude range: *Results are provided for signals at test set's RF IN/OUT for transmit power within –10 and +5 dB of expected power.*

Typical measurement accuracy:

For single-slot and multislot signals at the same level:

450 to 496 MHz	*810 to 960 MHz*	*1.7 to 1.99 MHz*
< ±0.10 dBm, < ±0.11 dBm with RF OUT ONLY	*< ±0.13 dBm, < ±0.14 dBm with RF OUT ONLY*	*< ±0.14 dBm, < ±0.18 dBm with RF OUT ONLY*

For multislot signals at different levels:

450 to 496 MHz	*810 to 960 MHz*	*1.7 to 1.99 MHz*
< ±0.32 dBm, < ±0.33 dBm with RF OUT ONLY	*< ±0.35 dBm, < ±0.36 dBm with RF OUT ONLY*	*< ±0.36 dBm, < ±0.40 dBm with RF OUT ONLY*

Multislot power vs. time measurement

All specifications for the multislot power versus time measurement are valid between +20 and +55 °C. Multislot transmit power measurement accuracy specifications apply to output power result.

Types of signals measured: normal bursts and CW, RACH bursts for a single uplink timeslot only

Multislot input signal conditions: ≤ 30 dB difference in power level between adjacent time slots.

Multislot input signal conditions for warranted performance: two adjacent time slots at the same level or two adjacent time slots with the first time slot lower in level than the second

Multislot signal measurement capability: measurement of a single uplink time slot or two adjacent uplink time slots

Frequency capture range: Signal must be within ±10 kHz of test set's expected frequency for warranted performance.

Minimum input level: Signal at test set's RF IN/OUT must have transmit power ≤ –15 dBm for warranted performance.

Mask placement timing accuracy: < ±0.1 bits (0.3692 µs) with midamble synchronization

Relative measurement accuracy (referenced to average output power during useful part of burst):

Specification	Power range
< ±0.5 dB	–7 to +1 dB
< ±1.0 dB	–20 to < –7 dB
< ±2.0 dB	–32 to < –20 dB
< ±2.5 dB	–45 to < –32 dB
< ±2.7 dB	–50 to < –45 dB, ≥ –46 dBm
< ±3.0 dB	–60 to < –50 dB, ≥ –46 dBm

Measurement trigger sources: RF rise, protocol, immediate, auto

Measurement trigger delay: user-settable between ±2.31 ms

Measurement synchronization: midamble, RF amplitude, none for a single uplink timeslot; midamble for two uplink timeslots

Marker measurement points: Twelve time points within each burst are user-definable.

PCS ETSI limit: User selects narrow or relaxed mask in PCS 1900 MHz band.

Numerical results:

- for entire single or multislot signal: pass/fail and burst area where failure occurred.
- for each burst: output power, worst case upper mask limit margin and time, worst case lower mask limit margin and time, amplitude at marker measurement points.

Displayed graphical results:

- for single-slot signals: fixed dBc vs. µs views of full, rising edge, falling edge and useful part of burst.
- for multislot signals: fixed dBc vs. µs views of both bursts, guard period, burst 1 and burst 2.
- for all signals: ETSI-defined mask, pass/fail indicators, user-settable marker, and variable time and amplitude axes.

Multi-measurement capabilities: 1 to 999 bursts; minimum, maximum, average and standard deviation results

Concurrency capabilities: Multislot power versus time measurements can be made concurrently with all other measurements.

Supplemental characteristics

Typical relative measurement accuracy: *< ±0.25 dB for –7 to +1 dB*

Typical dynamic range: *> 74 dB*

Typical noise floor: *< –62 dBm, whichever dominates*

Measurement resolution: *0.01 dB*

Burst timing error measurement

Burst timing error measurement result is available on Call Setup screen.

Types of signals measured: normal bursts, RACH bursts for a single uplink timeslot only

Measurement capture range: Signal must be within ±3 T (bit periods) of test set's expected position.

Minimum input level: Signal at test set's RF IN/OUT must have transmit power ≥ –30 dBm and ≤ 20 dB difference in levels of adjacent timeslots.

Numerical result: burst timing error

Concurrency capabilities: Burst timing error measurements can be made concurrently with all other measurements, but burst timing result is not available when PDTCH(s) are not active.

Supplemental characteristics

Typical measurement repeatability: *< ±0.25 T (0.923 µs)*

Measurement resolution: *0.25 T (0.923 µs)*

Multislot output RF spectrum (ORFS) due to modulation measurement

All specifications for the multislot ORFS due to modulation measurement are valid between +20 and +55 °C. Multislot transmit power measurement accuracy specifications apply to output power result.

Measurement implementation

The multislot ORFS due to modulation measurement is performed using a five-pole, synchronously tuned 30 kHz RBW filter averaged over 40 bits, with a video bandwidth of 30 kHz.

Types of signals measured: normal bursts

Multislot input signal conditions: ≤ 30 dB difference in power level between adjacent time slots

Multislot signal measurement capability: measurement of one user-specified time slot transmitted as a single time slot or two adjacent time slots

Frequency capture range: Signal must be within ±200 Hz of test set's expected frequency for warranted performance.

Minimum input level: Signal at test set's RF IN/OUT must have transmit power ≥ –10 dBm for warranted performance.

Measurement accuracy (referenced to output power in a 30 kHz bandwidth and averaged over 100 measurements):
< ±1.5 dB for single-slot signals and multislot signals at the same level
< ±1.75 dB for multislot signals with different levels

Specifications apply for the following conditions.

Offset from reference carrier	Power below (whichever is highest)
±100 kHz	–10 dB or –46 dBm
±200 kHz	–40 dB or –46 dBm
±250 kHz	–43 dB or –46 dBm
±400 to ±1800 kHz	–62 dB or –66 dBm

Measurement trigger sources: RF rise, protocol, immediate, auto

Measurement trigger delay: user-settable between ±2.31 ms

Measurement synchronization: RF amplitude

Measurement offsets: 22 offsets from carrier are user-definable

Pass/fail limits: ETSI or user-defined

Numerical results: modulation result at each selected offset, output power, output power in 30 kHz bandwidth, modulation and switching pass/fail indicators

Displayed graphical results: fixed dB vs. frequency views of modulation and both modulation and switching, user-settable marker and pass/fail limits, modulation and switching pass/fail indicators, variable frequency and amplitude axes

Multi-measurement capabilities: 1 to 999 measurements, average result

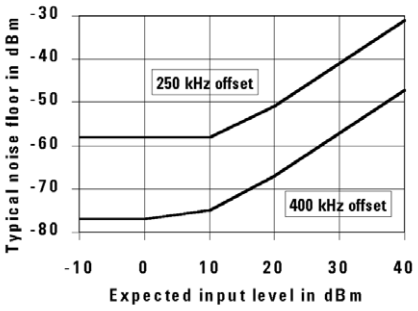
Concurrency capabilities: Multislot ORFS measurements can be made concurrently with all other measurements.

Supplemental characteristics

Typical measurement accuracy: *< ±0.7 dB at ±400 kHz offsets from carrier for single-slot signals and multislot signals at the same level*
< ±0.87 dB at ±400 kHz offsets from carrier for multislot signals at different levels

Measurement resolution: *0.01 dB*

Typical multislot ORFS due to modulation measurement noise floor versus expected input level at 900 MHz:



Multislot output RF spectrum (ORFS) due to switching measurement

All specifications for the multislot ORFS due to switching measurement are valid between +20 and +55 °C. Multislot transmit power measurement accuracy specifications apply to output power result.

Measurement implementation

The multislot ORFS, due to switching measurement, is performed using a five-pole, synchronously tuned 30 kHz RBW filter with peak hold during the whole burst, and a video bandwidth of 100 kHz.

Types of signals measured: normal bursts

Multislot input signal conditions: ≤ 30 dB difference in power level between adjacent time slots

Multislot signal measurement capability: measurement of one user-specified time slot transmitted as a single time slot or two adjacent time slots

Frequency capture range: Signal must be within ±200 Hz of test set's expected frequency for warranted performance.

Minimum input level: Signal at test set's RF IN/OUT must have transmit power ≥ –10 dBm for warranted performance.

Absolute measurement accuracy (peak hold over ten measurements): < ±1.5 dB for offsets of ±(400 to 1800) kHz, < ±1.6 dB when RF OUT ONLY is selected for signal generation

Measurement trigger sources: RF rise, protocol, immediate, auto

Measurement trigger delay: user-settable between ±2.31 microsceonds

Measurement synchronization: RF amplitude

Measurement offsets: 8 offsets from carrier are user-definable.

Pass/fail limits: ETSI or user-defined

Numerical results: switching result at each selected offset, output power, modulation and switching pass/fail indicators

Displayed graphical results: fixed dBm vs. frequency views of switching and both modulation and switching, user-settable marker and pass/fail limits, modulation and switching pass/fail indicators, variable frequency and amplitude axes

Multi-measurement capabilities: 1 to 999 bursts; maximum, average and standard deviation results

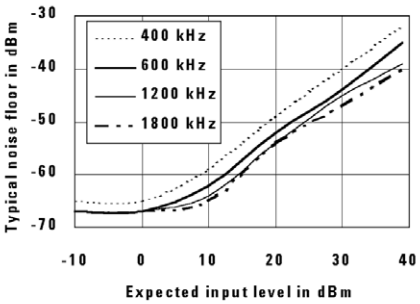
Concurrency capabilities: Multislot ORFS measurements can be made concurrently with all other measurements.

Supplemental characteristics

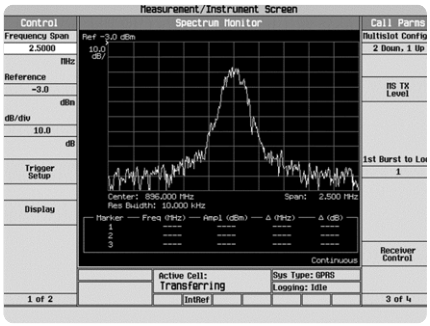
Typical absolute measurement accuracy (peak hold over 10 measurements): *< ±1.0 dB for offsets of ±(400 to 1800) kHz*

Measurement resolution: *0.01 dB*

Typical multislot ORFS due to switching measurement noise floor vs. expected input level at 900 MHz:



General-purpose spectrum monitor



Use the general-purpose spectrum monitor to view signals while on a call.

Operating modes: active cell and test mode

Measurement modes: swept mode or zero span

Frequency ranges: Although the spectrum monitor is available at any frequency supported by the test set, specifications apply only inside of the calibrated bands: 450 to 496 MHz, 810 to 960 MHz and 1.7 to 1.99 GHz.

Frequency spans, resolution bandwidth, displayed dynamic range: coupled with the following combinations these are available:

Span	RBW	Displayed dynamic range
100 MHz	5 MHz	50 dB
80 MHz	1 MHz	55 dB
40 MHz	300 kHz	60 dB
20 MHz	100 kHz	65 dB
12 MHz	100 kHz	65 dB
10 MHz	100 kHz	65 dB
5 MHz	30 kHz	70 dB
4 MHz	30 kHz	70 dB
2.5 MHz	10 kHz	75 dB
1.25 MHz	3 kHz	80 dB
500 kHz	1 kHz	80 dB
125 kHz	300 Hz	80 dB
0	1 MHz	55 dB
0	300 kHz	60 dB
0	100 kHz	65 dB

RBW filter types: flattop in swept mode, Gaussian in zero span

Zero span sweep time: user-settable from 50 ms to 70 ms

Zero span offset time: user-settable from 0 to 10 s

Reference level range: user-settable from –50 to +37 dBm or automatically determined

Amplitude scaling: user-settable from 0.1 to 20 dB/division in 0.1 dB steps

Trigger source: immediate, protocol, RF rise, external, auto

Trigger delay: user-settable between ±50 microseconds

Peak threshold: user-settable from –120 to +37 dBm

Peak excursion: user-settable from 1 to 100 dB.

Trace functions: clear write, max hold, min hold

Timebase specifications

Detector types: peak or sample

Averaging capabilities: user-settable between 1 and 999 or off

Marker functions: Three independent markers with modes of normal, delta and off. Operations are peak search, marker to expected power and marker to expected frequency.

Concurrency capabilities: Spectrum monitor analysis can be performed concurrently with all measurements.

Supplemental characteristics

Typical level accuracy:
< ±2 dB for signals within 50 dB of a reference level ≥ 10 dBm and RBW < 5 MHz
< ±2 dB for signals within 30 dB of a reference level ≥ –10 dBm and RBW = 5 MHz using 5 averages
< ±3.5 dB for signals > –70 dBm and within 50 dB of a reference level < –10 dBm with RBW < 5 MHz

Displayed average noise level:
< –90 dBm for reference level of –40 dBm and 30 kHz bandwidth

Typical residual responses: *< –70 dB with input terminated, reference level of –10 dBm and RF generator power < –80 dBm*

Typical spurious responses: *< –50 dBc with expected frequency tuned to carrier, carrier > 420 MHz, signal and reference level at –10 dBm and all spectral components within 100 MHz of carrier*

Frequency resolution: *1 Hz*

Marker amplitude resolution: *0.01 dB*

Internal high-stability 10 MHz oven-controlled crystal oscillator (OCXO)

Aging rates: < ±0.1 ppm per year, < ±0.005 ppm peak-to-peak per day during any 24-hour period starting 24 hours or more after a cold start

Temperature stability: < ±0.01 ppm frequency variation from +25 °C over the temperature range 0 to +55 °C

Warm-up times: 5 minutes to be within ±0.1 ppm of frequency at one hour; 15 minutes to be within ±0.01 ppm of frequency at one hour

Supplemental characteristics

Typical accuracy after a 30-minute warm-up period of continuous operation is derived from: *±[(time since last calibration) x (aging rate) + (temperature stability) + (accuracy of calibration)]*

Typical initial adjustment: *±0.03 ppm*

External reference input

Input frequency: 10 MHz

Supplemental characteristics

Input frequency range: *< ±5 ppm of nominal reference frequency*

Input level range: *0 to +13 dBm*

Input impedance: *50 Ω nominal*

External reference output

Output frequency: same as timebase (internal 10 MHz OCXO or external reference input)

Supplemental characteristics

Typical output level: *≥ 0.5 V rms*

Output impedance: *50 Ω nominal*

Remote programming

GPIB: IEEE standard 488.2

Remote front panel lockout: Allows remote user to disable the front panel display to improve GPIB measurement speed.

Functions implemented: T6, TE0, L4, LE0, SH1, AH1, RL1, SR1, PP0, DC1, DT0, C0, E2

General specifications

Dimensions (H x W x D): 8.75 x 16.75 x 24.63 inches (222 x 426 x 625 mm)

Weight: 66 lbs. (30 kg)

Display: 10.5 inches (26.7 cm), active matrix, color and liquid crystal

LAN (local area network) port: RJ-45 connector, 10 Base T Ethernet with TCP/IP support

Operating temperature: 0 to +55 °C

Storage temperature: –20 to +70 °C

Power: 88 to 135 VAC, 193 to 269 VAC, 50 to 60 Hz, 550 VA maximum

Calibration interval: 2 years

EMI: Conducted and radiated interference meets CISPR-11, susceptibility meets IEC 1000-4-2, 1000-4-3 and 1000-4-4.

Supplemental characteristics

Typical power consumption: *400 to 450 W continuous*

Typical radiated leakage due to RF generator: *< 2.5 µV induced in a resonant dipole antenna one inch from any surface except the underside and rear panel at set RF generator output frequency and output level of –40 dBm with no cable connected to rear-panel LAN port*

Typical spurious leakage: *< 5 µV induced in a resonant dipole antenna one inch from any surface except the underside and rear panel at frequencies other than the RF generator output frequency and output level of –40 dBm with no cable connected to rear-panel LAN port*

Typical measurement speed: *Measured using a 600 MHz Pentium® processor. Measurement speeds may vary depending on controller GPIB environment and processor speed.*

	One measurement	Five measurements
Phase and frequency error		
	19 ms	66 ms
Transmit power		
	12 ms	27 ms
Power vs. time (8 time offsets)		
	24 ms	89 ms
ORFS (2 modulation and 4 switching offsets)		
	192 ms	302 ms

Ordering information

For current ordering information, please refer to the configuration guide, literature number 5968-7873E, on the web at: www.agilent.com/find/8960.

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