

PRODUCT INTRODUCTION

MX268x30A/MX860x30A

Wireless LAN measurement software

ANRITSU CORPORATION

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MX268x30A MX860x30A
Wireless LAN measurement software

Product Introduction

ANRITSU CORPORATION
Measurement Business Center Wireless Measurement Div.

V4.0

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- **Product Concept**
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Features

- 1) Supports the **IEEE802.11g/a/b, HiSWANa, HiperLAN2 standards.**
- 2) **One-box solution** with excellent cost performance, enabling spectrum analysis, modulation analysis and power meter measurement of wireless LAN signals.
- 3) Integrates a high-performance DSP, enabling high-speed and high-accuracy measurement. Modulation accuracy can be measured completely in **1 sec or less.**
- 4) Capable of measuring harmonics up to **5-time waves of the 5GHz band wireless LAN (IEEE802.11a, HiSWANa, HiperLAN2)** when the MS2687B is used.
- 5) **Analyzes OFDM signals** that implement a high-speed data transfer of 54Mbps.
- 6) **One-touch measurement of tests on transmission characteristics,** including modulation analysis and spurious.
- 7) Provides a **batch measurement function** that automatically measures items which were individually measured before, and displays judgements results for the specified reference value.

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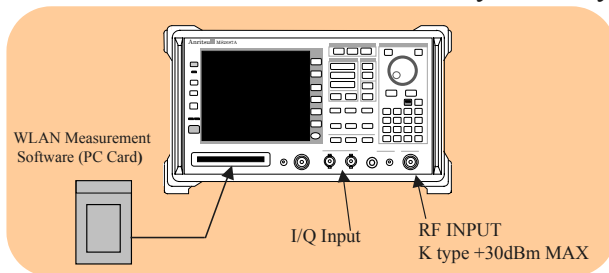
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Product Concept 1/4

All in One

OFDM modulation analysis, Spectrum analysis and High accuracy power measurement can be done with only 1-box by installing



Main Flame

- Spectrum analyzer
 - MS2687B 9kHz to 30GHz
 - MS2683A 9kHz to 7.8GHz
 - MS2681A 9kHz to 3GHz
- Tx Tester (built-in power meter)
 - MS8609A 9kHz to 13.2GHz
 - MS8608A 9kHz to 7.8GHz

| Model Name | Frequency range | Pre amp | IQ-Balance | IQ-Unbalance | Power meter |
|------------|-----------------|---------------|---------------|--------------|-----------------------|
| MS2687B | 9kHz to 30GHz | Not available | Not available | Option | Option |
| MS2683A | 9kHz to 7.8GHz | Option(3GHz) | Option | Option | Not available |
| MS2681A | 9kHz to 3GHz | Option(3GHz) | Option | Option | Not available |
| MS8609A | 9kHz to 13.2GHz | Option(3GHz) | Standard | Standard | Standard(Built-in) *1 |
| MS8608A | 9kHz to 7.8GHz | Option(3GHz) | Standard | Standard | Standard(Built-in) *1 |

*1: The frequency range of built-in power sensor is 50MHz to 6GHz, which is available for power measurement of 5GHz-band wireless LAN.

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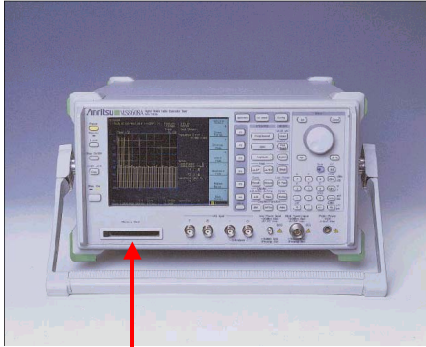
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Product Concept 4/4

Various support systems and Expandability

Selectable various analysis functions ranging from mobile systems to wireless LAN systems.



PC Card
(Flash memory)

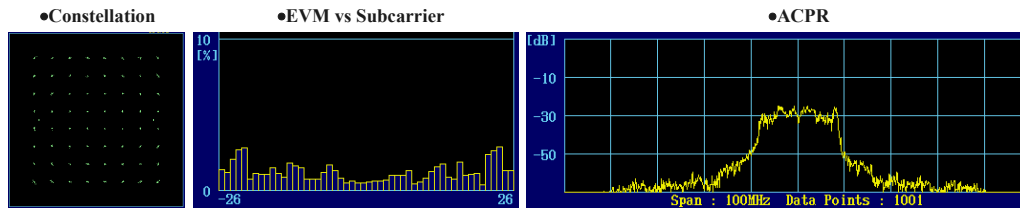
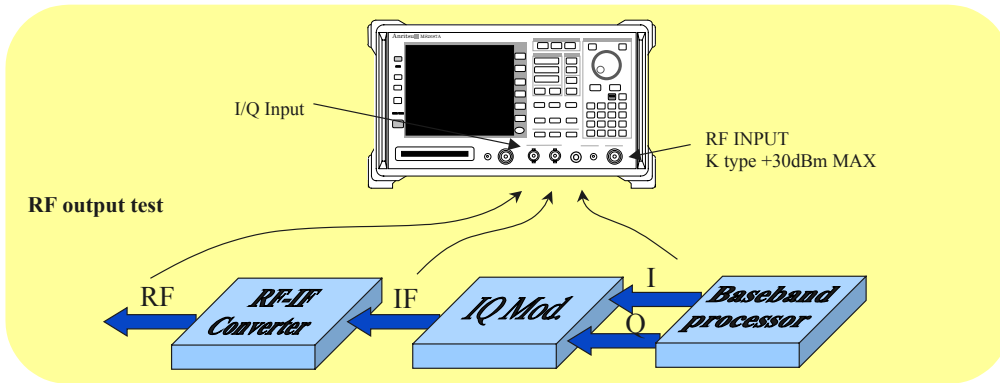
| Standards | MS2681A MS2683A MS2687B | MS8608A MS8609A |
|---|-------------------------------|--------------------|
| W-CDMA | O | O |
| GSM EDGE | O | O |
| cdmaOne cdma2000 1x | O | O |
| CDMA2000 1xEV-DO | O | O |
| psi4EQ PSK PDC PHS NADC(IS-136) STD-39/T79 STD-T61 | O | O |
| WLAN IEEE802.11a IEEE802.11b IEEE802.11g HiSWANa HiperLAN2 | O | O |
| HSDPA | X | O |

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The example of evaluation(1): Transmitter Test

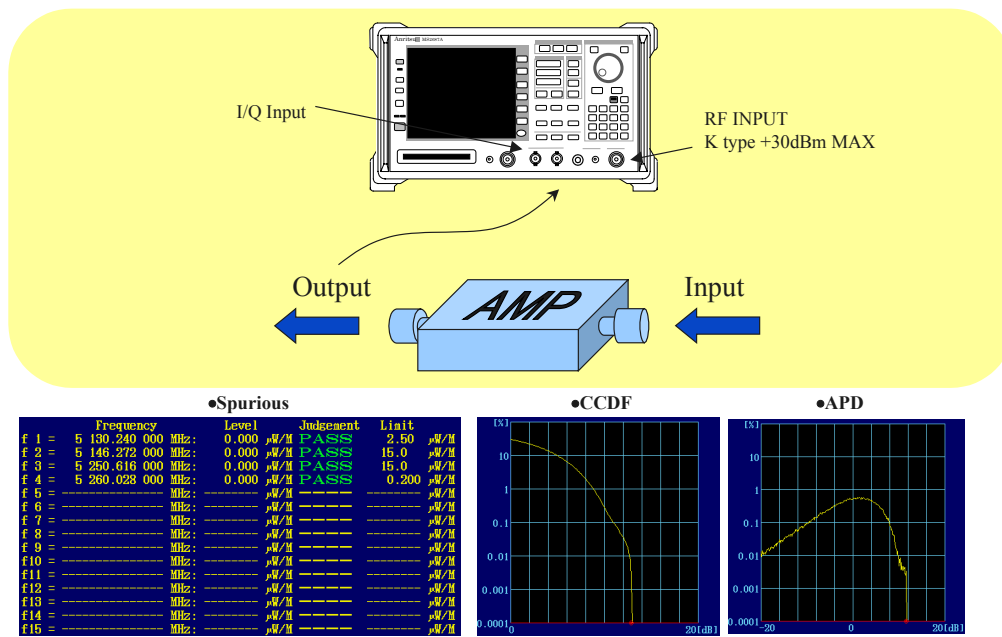


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The example of evaluation(2): Device Test



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List of measurement items

Modulation analysis

[IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa, HiperLAN2]
Frequency (Carrier frequency, Carrier frequency error)
Modulation Characteristic (EVM-RMS, EVM-Peak, Phase error-RMS)
OFDM-spectrum (Carrier leak, Spectrum flatness)
Display waveform (Constellation, EVM vs Symbol, EVM vs Sub-carrier, Phase error vs Symbol, Spectrum flatness)

[IEEE802.11b, IEEE802.11g (ERP-DSSS/CCK)]
Frequency (Carrier frequency, Carrier frequency error)
Modulation Characteristic (EVM-RMS, EVM-Peak, Phase error-RMS, Amplitude error-RMS, Origin offset)
Display waveform (Constellation, EVM vs Chip, Phase error vs Chip, Eye-diagram)

Power

Average power,
Maximum Power,
Carrier off power,
Burst on/off ratio,
Burst rising/falling time *2

Occupied bandwidth,

Spreading bandwidth *2

Adjacent channel power *1

Spectrum mask

Spurious,

Out-band leakage power

CCDF, APD

Chip clock error *2

Macro function (Batch processing)

*1: Can be measured complying with "IEEE802.11a, HiSWANa and HiperLAN2."

*2: Can be measured complying with "IEEE802.11b and IEEE802.11g (ERP-DSSS/CCK)."

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Example of Measurement result (1)

Parameter setting

This screen is used to set common parameters such as signaling system, input level, frequency, data rate, target system and so on before starting analysis. Setting these parameters simplifies measurement operations.

MS2687B 2003/05/23 19:17:04
 << Setup Common Parameter (WLAN) >>

Input
 Terminal : [RF]
 Reference Level : [-6.00dBm]
 Offset Level : [0.00dB]

Frequency
 Carrier Frequency : [5230.000000MHz]

Signal
 Target System : [IEEE802.11a]
 Measuring Object : [Burst]
 Data Rate : [54Mbps]
 Modulation : [OFDM-64QAM]

Trigger : [Free Run]

System : IEEE802.11a Freq : 5230.000000MHz
 Rate : 54Mbps Level : -6.00dBm
 Mod : OFDM-64QAM Offset : 0.00dB Correction : Off

| | | | |
|------------------------|-------------------|----|---------------|
| Setup Parameter | Setup Parameter | F1 | P27/P22 |
| Batch Measure | CCDF | F2 | P10-16/P24,25 |
| Modulation Analysis | Spurious Emission | F3 | P17,18 |
| RF Power | | F4 | P19/P26 |
| Occupied Bandwidth | Chip Clock Error | F5 | P20 |
| Adjacent Channel Power | IQ Level | F6 | P21 |
| Spectrum Mask | | | more |

Example of Measurement result (2)

Modulation Analysis:

Frequency, EVM, Phase Error, Carrier Leak, Spectrum Flatness

Displays numeric results, including the frequency, RMS and maximum value of the Error Vector Magnitude(EVM) and the RMS of the phase error.

Error Vector Magnitude(EVM) indicates vector synthesis of phase error and amplitude error, functioning as a yardstick for modulation quality. Lower EVM achieves higher quality and transmission rate.

<< Modulation Analysis (WLAN) >> Measure : Single
 Storage : Normal
 Trace : No Trace

Frequency
 Carrier Frequency : 5170.0000750 MHz
 Carrier Frequency Error : 75.0 Hz 0.015 ppa

Modulation
 : OFDM-64QAM
 EVM (RMS) : 1.39 % -37.11 dB
 EVM (Peak) : 5.45 %
 Phase Error (RMS) : 0.78 deg.

Spectrum
 Carrier Leak : -30.19 dB
 Flatness (Outside) Max. : 0.11 dB (Subcarrier: -26)
 Min. : -0.18 dB (Subcarrier: 26)
 (Inside) Max. : 0.08 dB (Subcarrier: -16)
 Min. : -0.11 dB (Subcarrier: 16)

System : IEEE802.11a Freq : 5170.000000MHz
 Rate : Auto Level : 4.00dBm Pre Appl : Off
 Mod : Auto Offset : 0.00dB Correction : Off

IEEE802.11a

<< Modulation Analysis (WLAN) >> Measure : Single
 Storage : Normal
 Trace : No Trace

Frequency
 Carrier Frequency : 2412.0000535 MHz
 Carrier Frequency Error : 53.5 Hz 0.022 ppa

Modulation
 : CCK-11Mbps
 EVM (RMS) : 1.06 %
 EVM (Peak) : 2.31 %
 Phase Error (RMS) : 0.43 deg.
 Magnitude Error (RMS) : 0.75 %
 Origin Offset : -49.82 dB

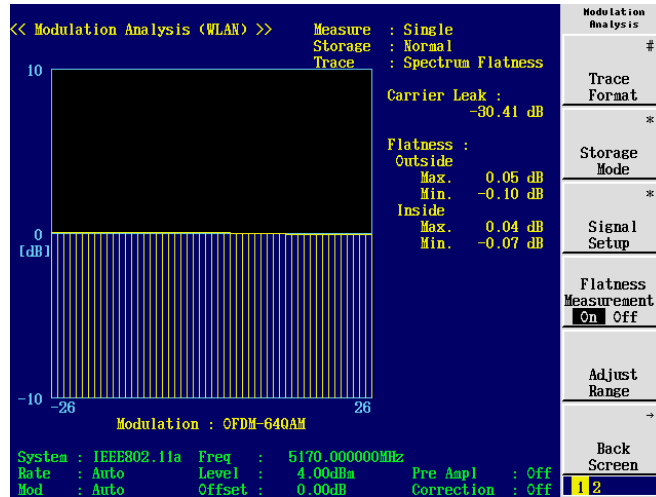
System : IEEE802.11b Freq : 2412.000000MHz
 Rate : 11Mbps Level : -18.00dBm Pre Appl : Off
 Mod : CCK-11Mbps Offset : 0.00dB Correction : Off

IEEE802.11b

Example of Measurement result (3)

Modulation Analysis: Spectrum Flatness

Displays the spectrum flatness for each sub-carrier in a graph.
(IEEE802.11a, IEEE802.11g_ERP-OFDM, IEEE802.11g_DSSS-OFDM, HiSWANa, HiperLAN2)



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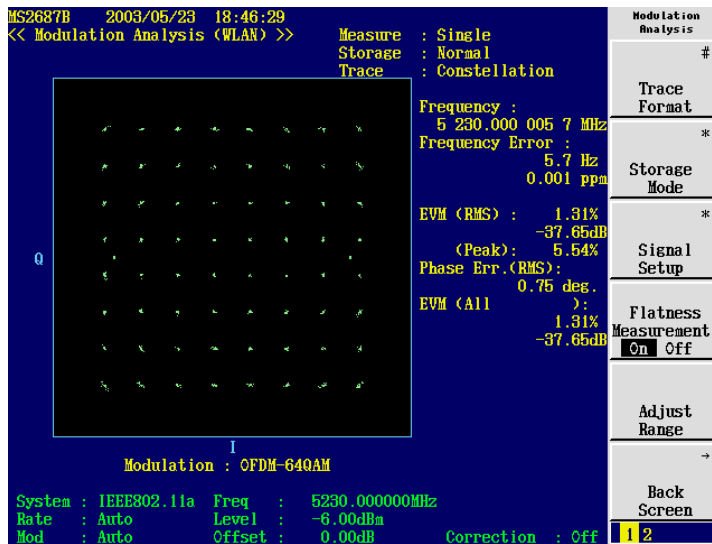
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Example of Measurement result (4)

Modulation Analysis: Constellation

Displays the constellation in a graph. This shows the vector error from ideal constellation point as a method to analyze the factor of vector error.



Constellation display is selectable from the followings.

ALL: Displays all sub-carriers for the symbol specified with the analysis length.

First Symbol: Displays only the top symbol of the signal.

Last Symbol: Displays only the last symbol of the signal.

Pilot Only: Displays only sub-carriers with pilots.

One Sub-carrier: Displays only sub-carriers specified with markers.

Outside Pair: Displays only sub-carrier -26 and +26.

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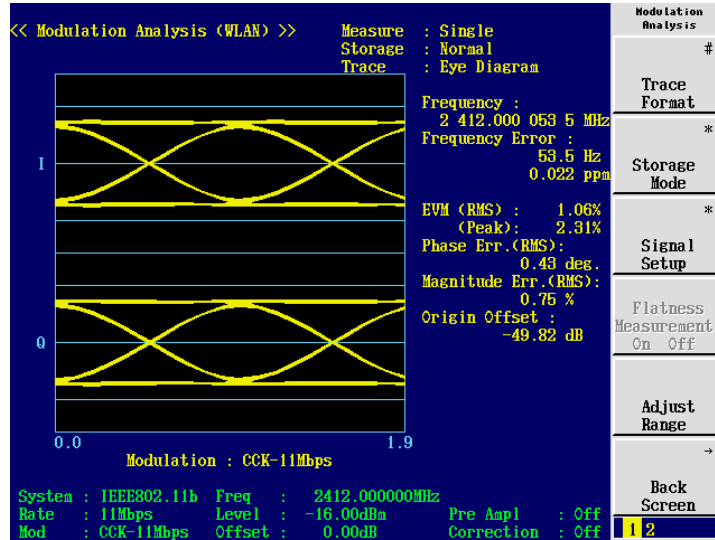
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Example of Measurement result (5)

Modulation Analysis: Eye diagram

Displays the eye diagrams(IEEE802.11b, IEEE802.11g_ERP-DSSS/CCK).



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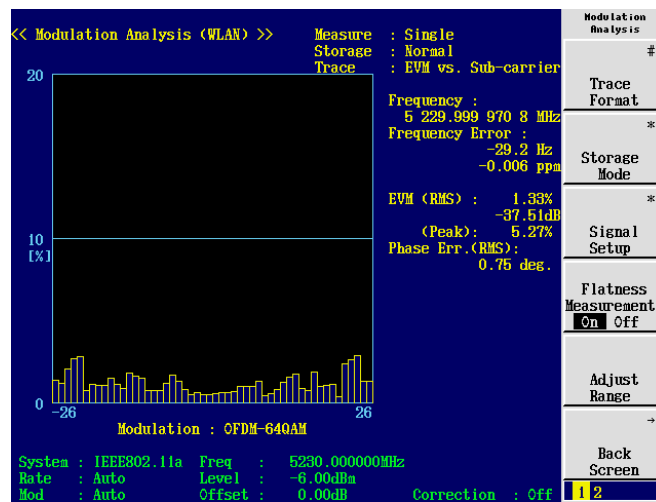
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Example of Measurement result (6)

Modulation Analysis: EVM vs Sub-carrier

Displays EVM for each sub-carrier when measuring the OFDM modulation signal.

(IEEE802.11a, IEEE802.11g_ERP-OFDM, IEEE802.11g_DSSS-OFDM, HiSWANa, HiperLAN2)



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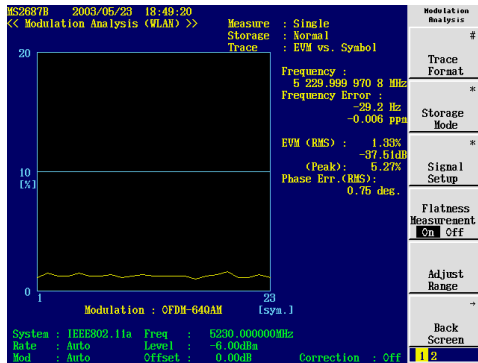
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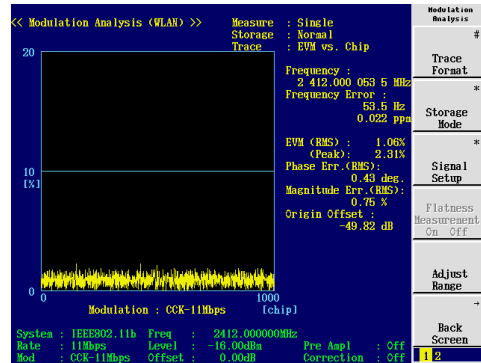
Example of Measurement result (7)

Modulation Analysis: EVM vs Symbol/Chip

Displays EVM for each symbol/Chip.



IEEE802.11a



IEEE802.11b

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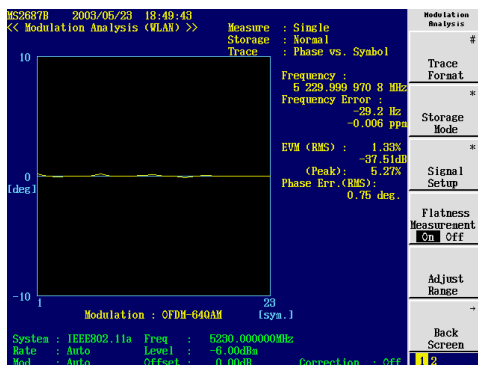
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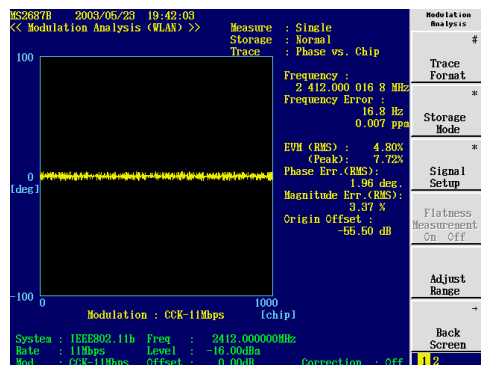
Example of Measurement result (8)

Modulation Analysis: Phase Error vs Symbol/Chip

Displays Phase Error for each symbol/Chip.



IEEE802.11a



IEEE802.11b

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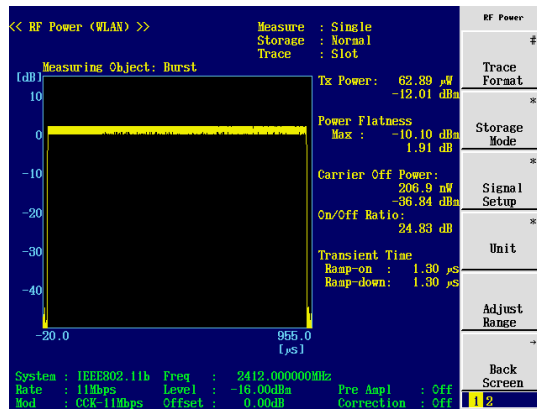
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Example of Measurement result (9)

RF Power: Slot

Displays the waveform data in one slot. A slot refers to the section from the beginning of a signal and up to the (analysis length + preamble length). The spectrum analyzer can automatically detect burst falling edge when the measured signal length is unknown to set appropriate analysis length (number of symbols). In addition, burst signal rising edge can be detected based on preamble information.



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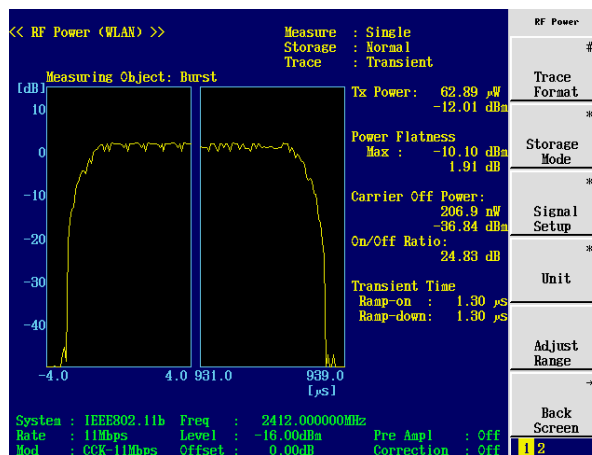
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Example of Measurement result (10)

RF Power: Transient

Displays zoom of the leading and trailing edges of a slot. The slot length is the (analysis length + preamble length). If the analysis length is not set correctly, the trailing edge may not be displayed. The horizontal-axis range of the waveform display of rising/falling can be changed.(8 μ s ~ 40 μ s)



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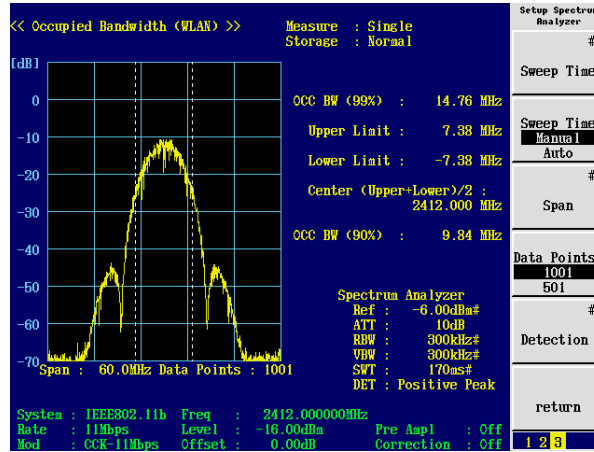
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Example of Measurement result (11)

Occupied Bandwidth

This software can perform occupied frequency bandwidth measurements according to the Technical Regulations Conformity Certification stipulated by TELEC(Telecom Engineering Center)with easy operations. Measurements can also be performed by using any parameter. Moreover, in IEEE802.11b/IEEE802.11g_ERP-DSSS/CCK the frequency bandwidth containing 90% of the total radiation power is also displayed.



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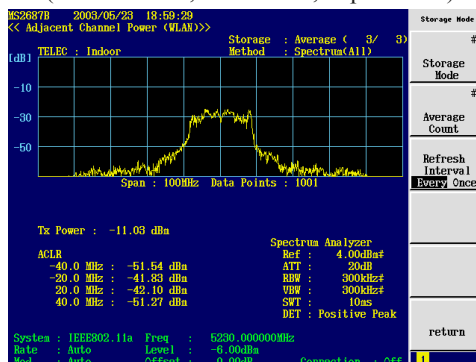
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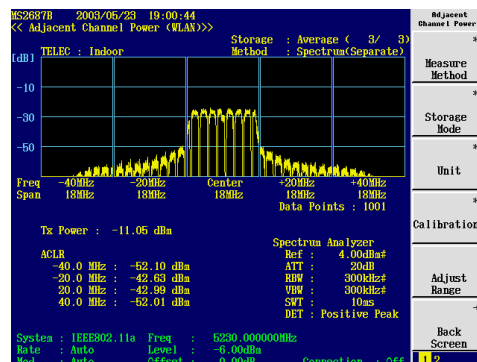
Example of Measurement result (12)

Adjacent Channel Power

This software can perform adjacent channel leakage power measurements according to the Technical Regulations Conformity Certification stipulated by TELEC(Telecom Engineering Center)with easy operations. Measurements can also be performed by using any parameter. Waveform display method is also selectable from continuous display to the second adjacent channel(lower left) and dividing display per channel(lower right). The unit of leakage power (ACLR) can be changed to [dBm], [mW], [μ W], [nW] or [dB]. (IEEE802.11a, HiSWANa, HiperLAN2)



Spectrum(ALL): Continuous display



Spectrum(Separate): Dividing display per channel

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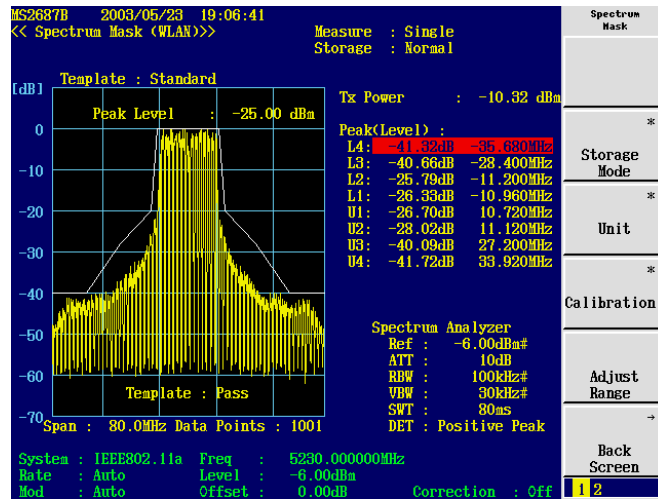
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Example of Measurement result (13)

Spectrum Mask

The software can perform measurements by the methods conforming to IEEE802.11a or IEEE802.11b with easy operations. Measurements can also be performed by using any parameter.



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Example of Measurement result (14)

CCDF

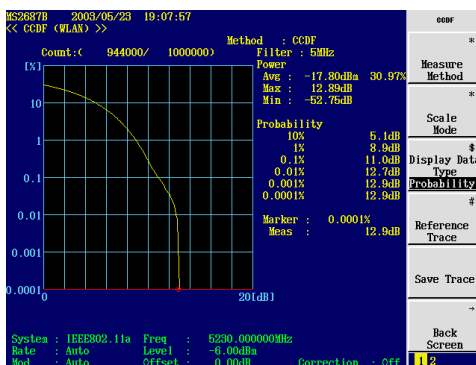
CCDF and APD are measured and displayed in graph.

CCDF(Complementary Cumulative Distribution Function) :

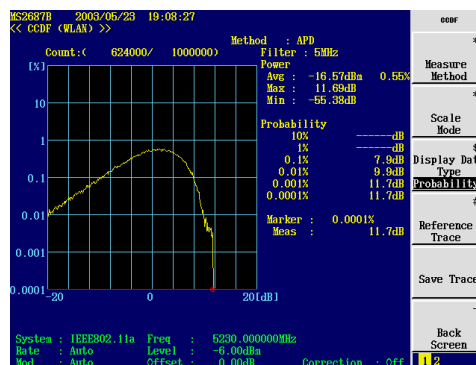
The cumulative distribution of the deviation of instantaneous power from average power is measured and displayed.

APD(Amplitude Probability Density):

The deviation of instantaneous power from average power is measured and displayed.



CCDF



APD

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Example of Measurement result (15-1)

Spurious Emission

This software can perform measurements according to the Technical Regulations Conformity Certification stipulated by TELEC (Telecom Engineering Center) /FCC (Federal Communications Commission)/ETSI(The Europeans Telecommunications Standards Institute) , etc. with simple operations. Measurements can also be performed using any parameter.

- Spot : Measures spurious for specified frequency.
- Sweep: Sweeps within the specified frequency range and detects the maximum level spurious.
- Search: Sweeps within the specified frequency range as in "Sweep" above, and searches the maximum level signal. In addition, performs zero-span measurement by setting the signal frequency as the center, and Sample wave detection to measure accurate signal level.

| Standard | TELEC 2.4G Data Communication System Spur TELEC 2.4G Data Communication System Secondary Emission TELEC 5G Wireless Access 5.03GHzBand Spur & OBL TELEC 5G Wireless Access 4.9GHzBand Spur & OBL TELEC 5G Wireless Access Secondary Emission TELEC 5G Data Communication System Spur TELEC 5G Data Communication System OBL TELEC 5G Data Communication System Secondary Emission ETSI TS101 475 (HiperLAN2)Signal ON ETSI TS101 475 (HiperLAN2)Signal OFF FCC 15.407 5.15-5.25GHz Band FCC 15.407 5.25-5.35GHz Band FCC 15.407 5.725-5.825GHz Band FCC 15.247 2.4GHz Band |
|----------|---|
|----------|---|

Example of Measurement result (15-2)

Spurious Emission

| f | Frequency | Level | Judgement | Limit |
|-----|-------------------|-----------------|-----------|-----------------|
| f 1 | 5 130 240 000 MHz | 0.000 μ W/M | PASS | 2.50 μ W/M |
| f 2 | 5 146 272 000 MHz | 0.000 μ W/M | PASS | 15.0 μ W/M |
| f 3 | 5 250 616 000 MHz | 0.000 μ W/M | PASS | 15.0 μ W/M |
| f 4 | 5 280 028 000 MHz | 0.000 μ W/M | PASS | 0.200 μ W/M |
| f 5 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f 6 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f 7 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f 8 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f 9 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f10 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f11 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f12 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f13 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f14 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |
| f15 | ----- MHz | ----- μ W/M | ----- | ----- μ W/M |

Total Judgement : PASS

System : IEEE802.11a Freq : 5230.000000MHz
Rate : Auto Level : -6.00dbm
Mod : Auto Offset : 0.00dB Correction : Off

| f | Frequency | Level | Ref Level | ATT |
|-----|-------------------|-----------------|------------|----------|
| f 1 | 5 130 240 000 MHz | 0.000 μ W/M | -10.00 dBm | 20 dB |
| f 2 | 5 146 272 000 MHz | 0.000 μ W/M | -10.00 dBm | 20 dB |
| f 3 | 5 250 616 000 MHz | 0.000 μ W/M | -10.00 dBm | 20 dB |
| f 4 | 5 280 028 000 MHz | 0.000 μ W/M | -20.00 dBm | 10 dB |
| f 5 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f 6 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f 7 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f 8 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f 9 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f10 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f11 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f12 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f13 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f14 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |
| f15 | ----- MHz | ----- μ W/M | ----- dBm | ----- dB |

Total Judgement : PASS

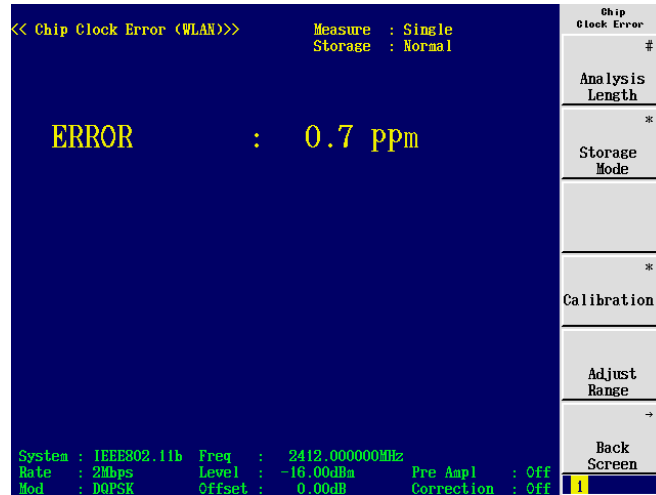
System : IEEE802.11a Freq : 5230.000000MHz
Rate : Auto Level : -6.00dbm
Mod : Auto Offset : 0.00dB Correction : Off

Example of Measurement result (16)

Chip Clock Error

Measuring Chip Clock Frequency is enabled when the target system is set to IEEE802.11b, IEEE802.11g(ERP-DSSS/CCK).

Displays the results of chip clock frequency measurement in "ppm" units.



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Example of Measurement result (17)

Batch Measure

By presetting the judgement values, simultaneous measurement and automatic PASS/FAIL evaluation are executed for the following items. Measured results are displayed in three screens.

Measurement items :

Modulation analysis

(Frequency error, EVM, Phase error, Carrier leak *1, Flatness *1, Amplitude Magnitude error *2, Origin offset *2),

RF power

(Transmit power, Carrier off power, Burst On/Off ratio, Rising/falling time *2),

Occupied frequency bandwidth (99%),

Spreading bandwidth (90%) *2,

Adjacent channel leakage power *3,

Spectrum mask, Spurious (2 tables)

*1: Can be measured complying with "IEEE802.11a, IEEE802.11g (ERP-OFDM, DSSS-OFDM), HiSWANa and HiperLAN2."

*2: Can be measured complying with "IEEE802.11b and IEEE802.11g (ERP-DSSS/CCK)."

*3: Can be measured complying with "IEEE802.11a, HiSWANa and HiperLAN2."

After pushing the "Measure start" button, each measurement item is measured in order automatically. And the measurement result of each measurement item and a total measurement result are displayed. Since this standalone equipment can measure both spectrum analysis and modulation analysis with 1-box, it does not need to change the connection place of RF input cable in the middle of measurement. All the above-mentioned items can be measured at once.

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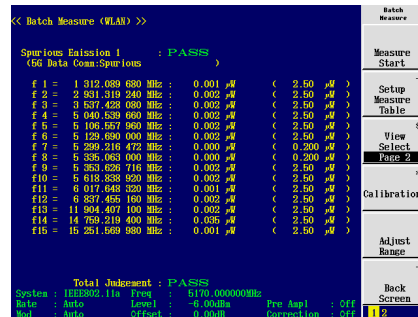
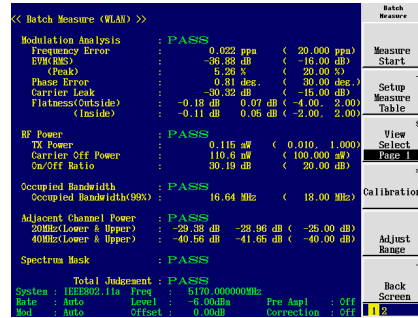
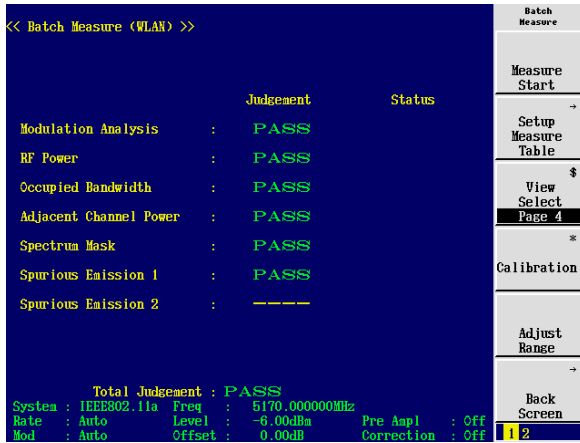
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Example of Measurement result (17)

Batch Measure

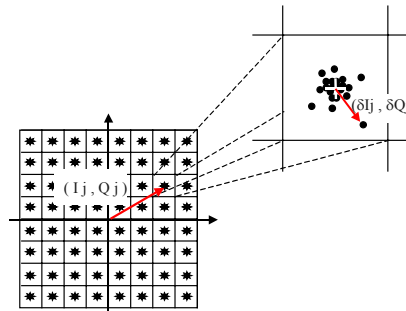


Features of Modulation accuracy Measurement (1) : EVM and BER

• Error Vector Magnitude(EVM):

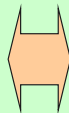
In actual transmission signal, various noise components are added to ideal signal. The factors of this noise are spurious signal, phase noise, linear/non-linear distortion, etc.

In I/Q display, vector error from ideal constellation point (amplitude error + phase error) is called EVM (Error Vector Magnitude) and used as a yardstick for modulation quality.



• Features of Modulation Accuracy

- Direct evaluation of signal quality
- Short measurement time
- EVM vs C/N characteristic is almost linear
- High C/N sections are evaluated.

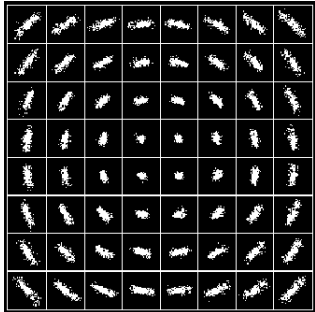


• Features of BER

- Normally BER itself is not measured and the margin for BER deterioration is measured by additive noise.
- Signal quality is indirectly evaluated (via receiver).
- Time-consuming measurement
- High C/N sections are not evaluated.
- C/N features are non-linear, especially the measurement is difficult with good C/N.
- BER vs C/N characteristic is non-linear.

Features of Modulation accuracy Measurement (2) : Troubleshooting

Constellation monitoring helps debugging.



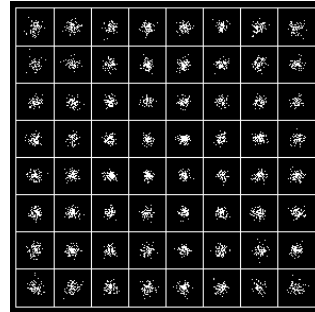
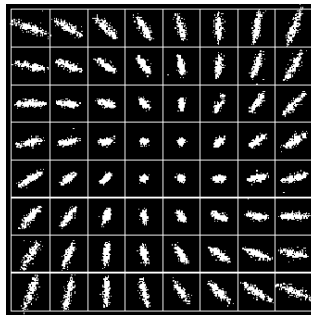
Phase rotation

[Factor]

- Carrier frequency difference
- Symbol clock difference

Variation of amplitude direction
[Factor]

- AGC oscillation



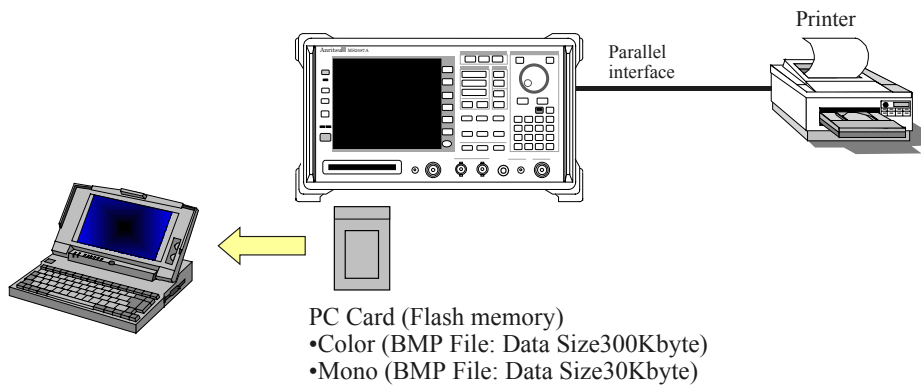
Point spread

[Factor]

- S/N deterioration

Save and Recall

Saves and recalls setting condition and displayed data to internal memory(max.12) or memory card. Also, displayed data can be hard-copied with the printer via parallel interface.



Save and Recall

The printer recommended

| control code | maker | model No |
|--------------|-------|---|
| ESC/P-J84 | EPSON | VP-6200,VP-5200, VP-1850,VP-870,VP-700 |
| | hp | deskjet 5650 |

(PCL level 3 or lower, or ESC/P-J83, J84 compatible models only)

The PC card recommended

<Compact Flash Card>

| maker | capacity | model No |
|---------|----------|----------|
| SanDisk | 32M | SDCFB |

Remote control functions(1)

The MS2681A/MS2683A/MS2687B/MS8608A/MS8609A, when combined with an external controller(host computer, personal computer, etc), can automate your measurement system.

For this purpose, the MS2681A/MS2683A/MS2687B/MS8608A/MS8609A is equipped with an RS-232C interface-port, and GPIB interface bus(IEEE std 488.2-1987) as standard compositions.

Ethernet interface can also be installed as an option.

The remote control functions of the MS2681A/MS2683A/MS2687B/MS8608A/MS8609A are used to do the following:

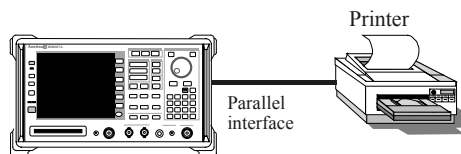
- (1) Control all functions except a few manual operations by power switch and [LOCAL] key.
- (2) Recall all parameter settings.
- (3) Set the RS-232C interface settings from the panel.
- (4) Set the GPIB address from the panel.
- (5) Set the IP address for Ethernet interface from the panel.(Optional)
- (6) Select the interface port from the panel.
- (7) Configure the automatic measurement system when the spectrum analyzer function is combined with a personal computer and other measuring instruments.

Remote control functions (2)

Examples of system upgrades using RS-232C and GPIB.

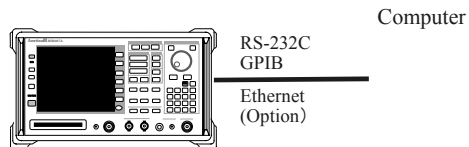
(1) Stand-alone type 1

Waveforms measured with MS2681A/MS2683A/MS2687B/MS8608A/MS8609A are outputted to the printer.



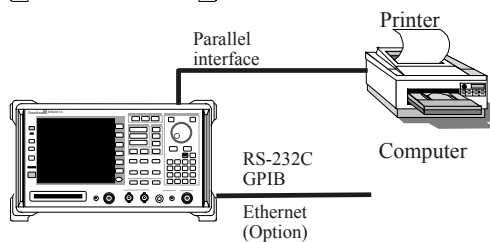
(2) Control by the host computer 1

The spectrum analyzer is controlled automatically or remotely from the computer.



(3) Control by the host computer 2

The waveforms measured by controlling analyzer automatically or remotely are outputted to the printer.



Appended Chart (Measurement functional list)

| Measurement function | MX268*30A (* = 1,3,7) MX860*30A (* = 8,9) | | | | | | MX268*32A (* = 1,3,7) MX860*32A (* = 8,9) | | | | | | | |
|-------------------------|--|-------------------------------|---------------------------|----------------------------|-------------|---------|--|-------------|-------------------------------|---------------------------|----------------------------|-------------|---------|-----------|
| | IEEE802.11b | IEEE802.11g (ERP-DSSS/CCK) | IEEE802.11g (ERP-OFDM) | IEEE802.11g (DSSS-OFDM) | IEEE802.11a | HISWANA | HiperLAN2 | IEEE802.11b | IEEE802.11g (ERP-DSSS/CCK) | IEEE802.11g (ERP-OFDM) | IEEE802.11g (DSSS-OFDM) | IEEE802.11a | HISWANA | HiperLAN2 |
| Modulation analysis | | | | | | | | | | | | | | |
| Numeric data forms | | | | | | | | | | | | | | |
| Carrier frequency | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Carrier frequency error | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| EVM (RMS) | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| EVM (Peak) | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Phase error (RMS) | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Amplitude error (RMS) | o | o | x | x | x | x | x | o | x | x | x | x | x | x |
| Carrier leak | x | x | o | o | o | o | o | x | x | o | o | o | o | o |
| Origin offset | o | o | x | x | x | x | x | o | o | x | x | x | x | x |
| Spectrum flatness | x | x | o | o | o | o | o | x | x | o | o | o | o | o |
| Display waveform | | | | | | | | | | | | | | |
| Constellation | o | o | o | o | o | o | o | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| EVM vs Symbl | x | x | o | o | o | o | o | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| EVM vs Sub-carrier | x | x | o | o | o | o | o | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| EVM vs Chip | o | o | x | x | x | x | x | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| Phase error vs Symbl | x | x | o | o | o | o | o | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| Phase error vs Chip | o | o | x | x | x | x | x | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| Spectrum flatness | x | x | o | o | o | o | o | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| Eye-diagram | o | o | x | x | x | x | x | xxx | xxx | xxx | xxx | xxx | xxx | xxx |

o = It can measure.

X-Since there is nothing to a standard, it does not measure.

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| Measurement function | MX268*30A (* = 1,3,7) MX860*30A (* = 8,9) | | | | | | MX268*32A (* = 1,3,7) MX860*32A (* = 8,9) | | | | | | | |
|---|--|-------------------------------|---------------------------|----------------------------|-------------|---------|--|-------------|-------------------------------|---------------------------|----------------------------|-------------|---------|-----------|
| | IEEE802.11b | IEEE802.11g (ERP-DSSS/CCK) | IEEE802.11g (ERP-OFDM) | IEEE802.11g (DSSS-OFDM) | IEEE802.11a | HISWANA | HiperLAN2 | IEEE802.11b | IEEE802.11g (ERP-DSSS/CCK) | IEEE802.11g (ERP-OFDM) | IEEE802.11g (DSSS-OFDM) | IEEE802.11a | HISWANA | HiperLAN2 |
| Power | | | | | | | | | | | | | | |
| Numeric data forms | | | | | | | | | | | | | | |
| Average power | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Maximum Power | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Carrier off power | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Burst on/off ratio | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Burst rising/falling time | o | o | x | x | x | x | x | o | o | x | x | x | x | x |
| Display waveform | | | | | | | | | | | | | | |
| Slot display | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Transient display | o | o | o | o | o | o | o | xxx | xxx | xxx | xxx | xxx | xxx | xxx |
| Occupied bandwidth, Spreading bandwidth | | | | | | | | | | | | | | |
| Numeric data forms | | | | | | | | | | | | | | |
| Occ BW 99% | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Occ BW 90% | o | o | x | x | x | x | x | o | o | x | x | x | x | x |
| Occ Upper limit frequency | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Occ Lower limit frequency | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Center frequency | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Display waveform | o | o | o | o | o | o | o | o | o | o | o | o | o | o |
| Adjacent channel power | | | | | | | | | | | | | | |
| Numeric data forms | | | | | | | | | | | | | | |
| Tx power | x | x | x | x | o | o | o | x | x | x | x | o | o | o |
| ACLR | x | x | x | x | o | o | o | x | x | x | x | o | o | o |
| Display waveform | x | x | x | x | o | o | o | x | x | x | x | o | o | o |

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| Measurement function | MX268*30A (* = 1,3,7) MX860*30A (* = 8,9) | | | | | | |
|----------------------------------|--|-------------------------------|---------------------------|----------------------------|-------------|----------|-----------|
| | IEEE802.11b | IEEE802.11g (ERP-DSSS/CCK) | IEEE802.11g (ERP-OFDM) | IEEE802.11g (DSSS-OFDM) | IEEE802.11a | HIS/WANa | HiperLAN2 |
| Spectrum mask | | | | | | | |
| Numeric data forms | | | | | | | |
| Tx power | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Peak (margin) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Peak (level) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Display waveform | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Spurious, Out-band leakage power | | | | | | | |
| Numeric data forms | | | | | | | |
| Spurious frequency | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Spurious level | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Judgement | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Limit | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Total judgement | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Display waveform | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| CCDF | | | | | | | |
| Numeric data forms | | | | | | | |
| Power(average, max, min) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Distribution | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Display waveform | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| CCDF | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| APD | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Chip clock error measurement | | | | | | | |
| Numeric data forms | | | | | | | |
| Chip clock error | ○ | ○ | x | x | x | x | x |

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| Measurement function | MX268*30A (* = 1,3,7) MX860*30A (* = 8,9) | | | | | | |
|---|--|-------------------------------|---------------------------|----------------------------|-------------|----------|-----------|
| | IEEE802.11b | IEEE802.11g (ERP-DSSS/CCK) | IEEE802.11g (ERP-OFDM) | IEEE802.11g (DSSS-OFDM) | IEEE802.11a | HIS/WANa | HiperLAN2 |
| Macro function (Batch processing) | | | | | | | |
| Numeric data forms | | | | | | | |
| Frequency accuracy | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| EVM (RMS) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| EVM (Peak) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Phase error (RMS) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Amplitude error (RMS) | ○ | ○ | x | x | x | x | x |
| Carrier leak | x | x | ○ | ○ | ○ | ○ | ○ |
| Origin offset | ○ | ○ | x | x | x | x | x |
| Spectrum flatness | x | x | ○ | ○ | ○ | ○ | ○ |
| Tx power | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Carrier off power | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Burst on/off ratio | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Burst rising/falling time | ○ | ○ | x | x | x | x | x |
| Occupied bandwidth, Spreading bandwidth | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Adjacent channel power | x | x | x | x | ○ | ○ | ○ |
| Spectrum mask | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Spurious | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

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Specifications are subject to change without notice.

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