



Vector Signal Generator MG3710E



Vector Signal Generator MG3710E Features

Supports Various Communication Systems

Pre-installed Waveform Patterns:

LTE-FDD/TDD (E-TM1.1 to E-TM3.3),
W-CDMA/HSDPA, GSM/EDGE, PDC, PHS,
CDMA2000 1x/1xEV-DO, AWGN,
WLAN (IEEE802.11a/11b/11g), *Bluetooth*[®], GPS,
Digital Broadcast (ISDB-T/BS/CS/CATV)

Waveform Patterns [Software & license optional]

Interference Signal for 5G UE Receiver Tests (3GPP)
Interference Signal for LTE UE Receiver Tests (3GPP)
DFS Radar Pattern [for FCC/Japan MIC]
DFS(ETSI) Waveform Pattern [for ETSI]

IQproducer [Software license optional]

Waveform generation software

5G NR (FDD/TDD),
LTE/LTE-Advanced (FDD/TDD),
HSDPA/HSUPA, W-CDMA, TD-SCDMA,
WLAN 11ac/a/b/g/n/j/p,
TDMA (PDC, PHS, ARIB, etc.)
CDMA2000 1xEV-DO, DVB-T/H,
Multi-carrier, Fading

AWGN generator [MG3710E-049/079]

AM/FM/φM/PM Functions [Standard]

Additional analog modulation input option (MG3710E-050/080)

Supports modulation by external signal input.

Key Performance and Functions

Frequency range: [Option]

100 kHz to 2.7/4.0/6.0 GHz

Wide vector modulation bandwidth

160 MHz* /120 MHz (Internal baseband generator)

Sampling Rate

20 kHz to 200 MHz* /160 MHz

SSB Phase noise

< -140 dBc/Hz nominal (100 MHz, 20-kHz offset, CW)
< -131 dBc/Hz typ. (1 GHz, 20-kHz offset)

ACLR performance

-68 dBc (W-CDMA, TestModel1, 64DPCH, 2 GHz)

High power output [MG3710E-041/071]

+23 dBm (CW, 400 MHz to 3 GHz)

Fast switching speed

< 600 μs (List/Sweep Mode)

High level accuracy

±0.5 dB (Absolute level accuracy)
±0.2 dB typ. (Linearity)

Multi RF output [option]

Two RF outputs @ RF x 2
Baseband signal combine function @ RF x 1

Large-capacity baseband memory [option]

64/256/1024 Msamples

BER test function [MG3710E-021]

Input Bit Rate: 100 bps to 40 Mbps

*: Only when using MX370111A WLAN IQproducer and
MX370111A-002 802.11ac (160 MHz) option.

Supports Various Communication Systems

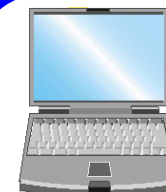
Pre-installed waveform patterns



LTE-FDD/TDD (E-TM1.1 to 3.3)
W-CDMA, GSM/EDGE,
CDMA2000 1x/1xEV-DO
WLAN (IEEE802.11a/b/g)
AWGN, *Bluetooth*[®], GPS, PDC, PHS,
Digital Broadcast (ISDB-T/BS/CS/CATV)

Anritsu product

Customer's item



Any IQ data
- C language
- MATLAB
- Microwave Office
etc.

The waveform patterns are arbitrarily generated.

IQ sample data files (in ASCII format) programmed by using general EDA (Electronic Design Automation) tools such as MATLAB[®] can also be converted to waveform patterns for MG3710E. And a custom-made waveform pattern file can be generated arbitrarily.



Interference Signal for 5G UE Receiver Tests (3GPP)
Interference Signal for LTE UE Receiver Tests (3GPP)
DFS Radar Pattern (FCC / Japan MIC)
DFS (ETSI) Waveform Pattern (ETSI)

Waveform Pattern [option]

Waveform patterns with fixed parameters



5G NR (FDD), 5G NR (TDD)
LTE/LTE-Advanced (FDD),
LTE/LTE-Advanced (TDD),
W-CDMA, HSDPA/HSUPA,
TDMA, Multi-carrier,
DVB-T/H, Fading,
WLAN IEEE802.11ac/a/b/g/j/n/p,
TD-SCDMA

IQproducer [Option]

PC application software to generate waveform patterns by setting parameters at PC

Basic Performance (1/4)

Frequency Range [Option]

100 kHz to 2.7/4.0/6.0 GHz

[1stRF: MG3710E-032/034/036]

[2ndRF: MG3710E-062/064/066]

The MG3710E supports two built-in vector signal generators with two RF units (1stRF and optional 2ndRF).

Not only different frequencies but also different levels and waveform patterns can be set independently at each SG while each is tracking the other.

1: Supported frequency bands cannot be changed after shipment.

2: IQ input/output is supported only by SG1 (1stRF) and requires MG3710E-017.

Wide Vector Modulation Bandwidth: 160 MHz*/120 MHz

(using internal baseband signal generator)

Sampling Rate : 20 kHz to 200 MHz*/160 MHz

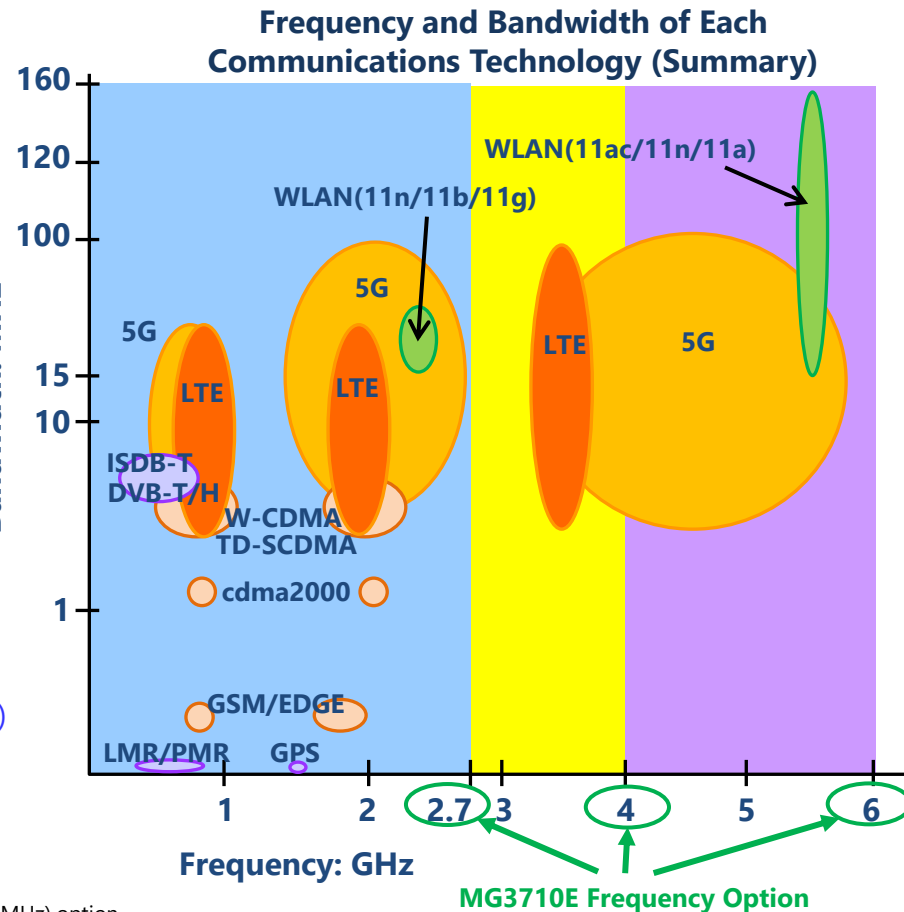
An RF modulation bandwidth of 160 MHz is supported using internal baseband signal generation.

*: Supports firmware version 2.00.00 and later.
Only when using MX370111A WLAN IQproducer and MX370111A-002 802.11ac (160 MHz) option.

Level Accuracy:

Absolute level accuracy: ± 0.5 dB

Linearity: ± 0.2 dB typ.



SSB Phase Noise

< -140 dBc/Hz nominal (100 MHz, 20 kHz offset, CW)

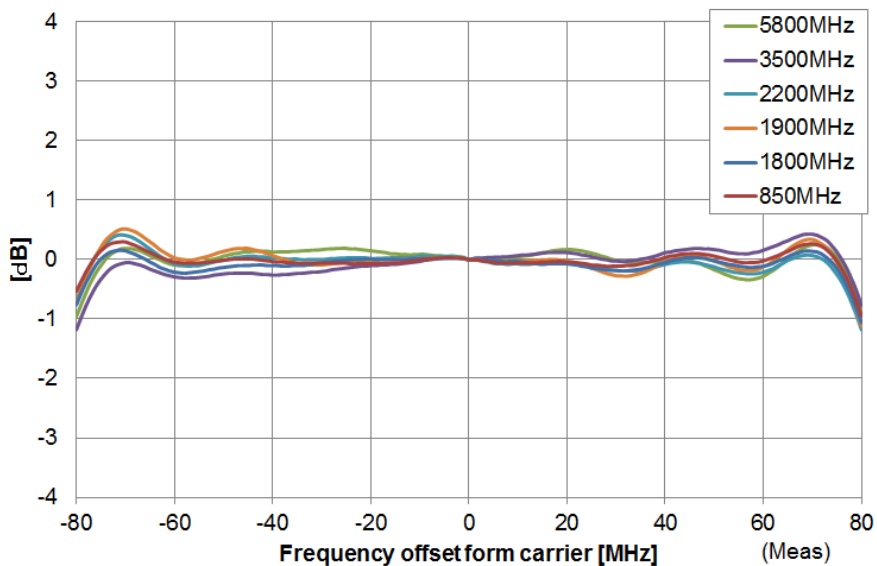
< -131 dBc/Hz typ. (1 GHz, 20 kHz offset, CW)

< -125 dBc/Hz typ. (2 GHz, 20 kHz offset, CW)

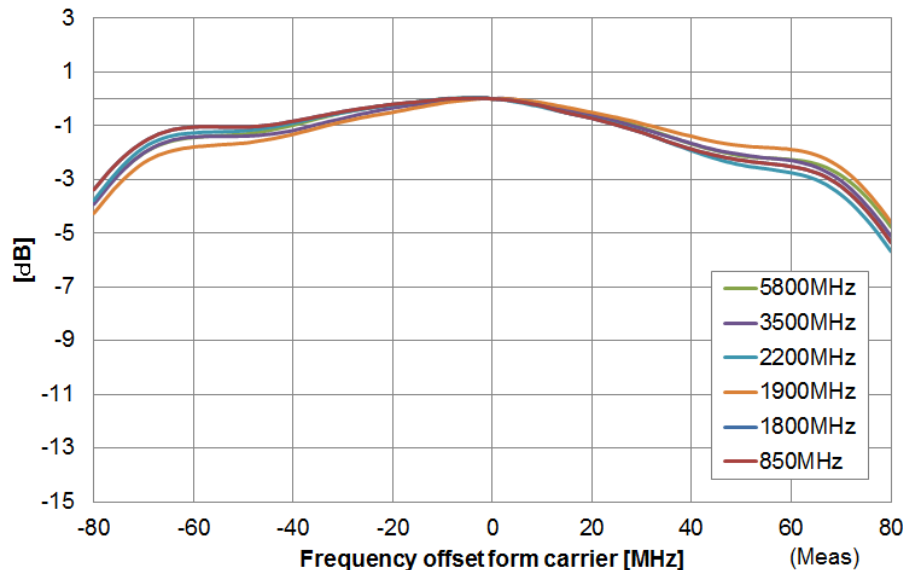
RF Vector Modulation Bandwidth: Performance Graph

Vector Modulation Bandwidth (Using Internal baseband generator)

I/Q bandwidth plot using optional internal baseband generator (Internal Channel Corrections ON)

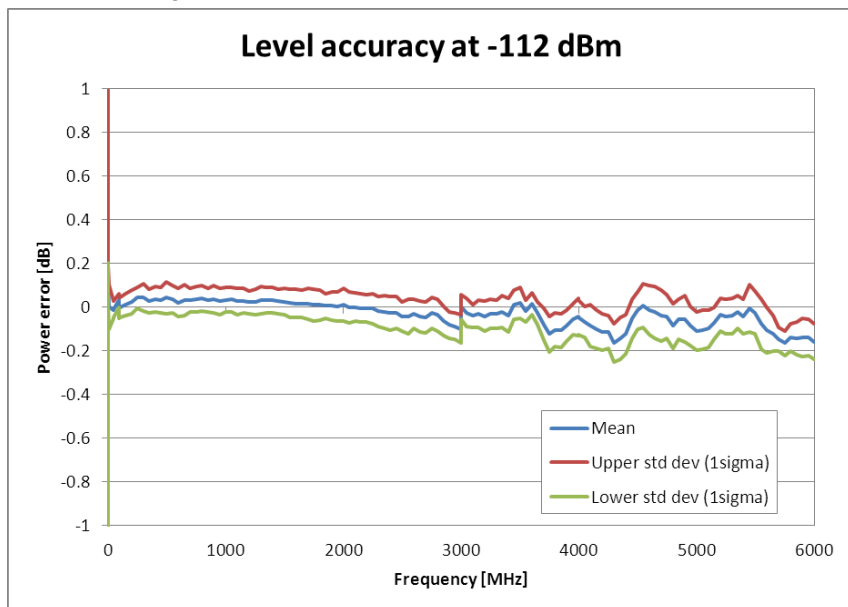


I/Q bandwidth plot using optional internal baseband generator

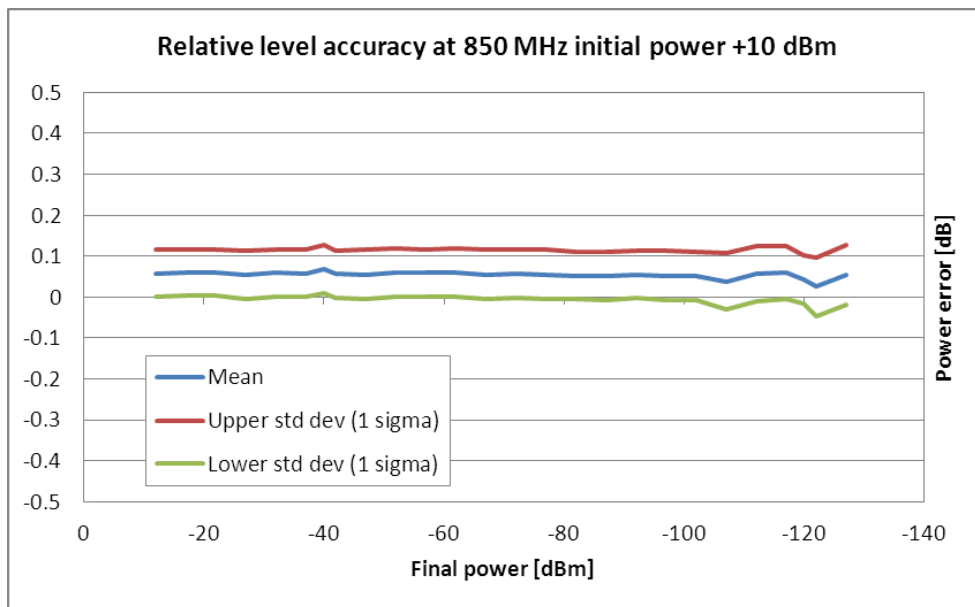


Level Accuracy: Performance Graph

Frequency Characteristics



Linearity



SSB Phase Noise: Performance Graph

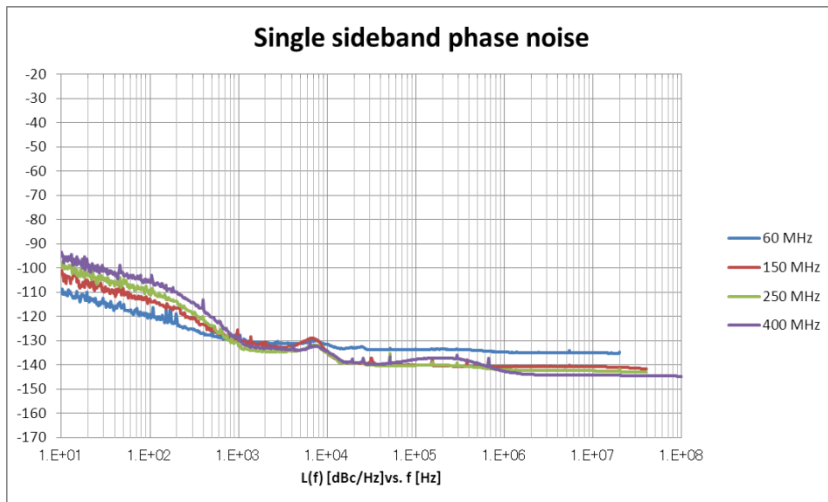
SSB phase noise is an important performance index for signal generators.

For example, when using a signal generator for the following purposes, it is important to pre-confirm that the signal generator performance satisfies the measurement specifications.

- ◆ Communications with narrow bandwidth of several kHz
- ◆ OFDM Signals with narrow subcarrier gap
- ◆ CW interference waveforms

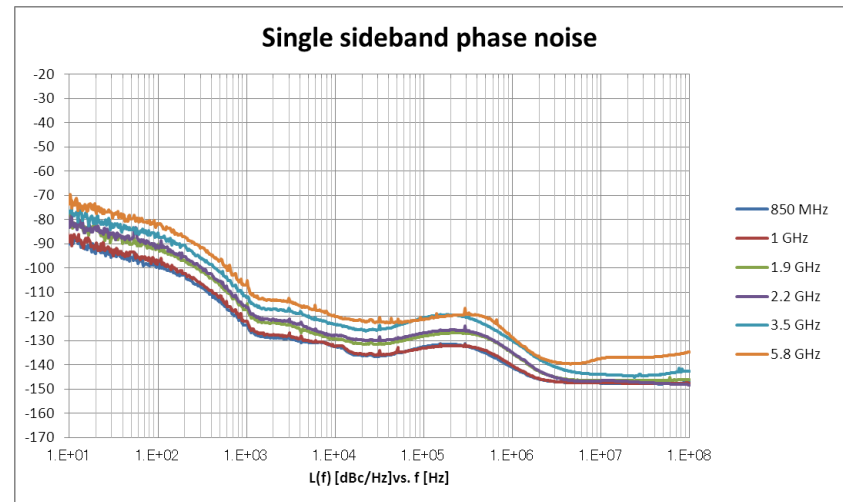
Frequency: 60/150/260/400 MHz

(Mod = On, with MG3710E-002,
Phase Noise Optimization < 200 kHz)



Frequency: 850 MHz, 1/1.9/2.2/3.5/5.8 GHz

(Mod = On, with MG3710E-002,
Phase Noise Optimization < 200 kHz)



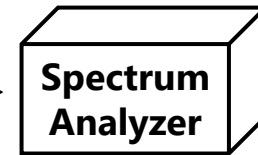
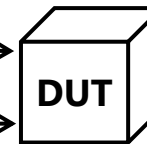
ACLR Performance (1/2)

Top-class ACLR
-71 dBc*

Reference Signal Generator



Transmitter Test

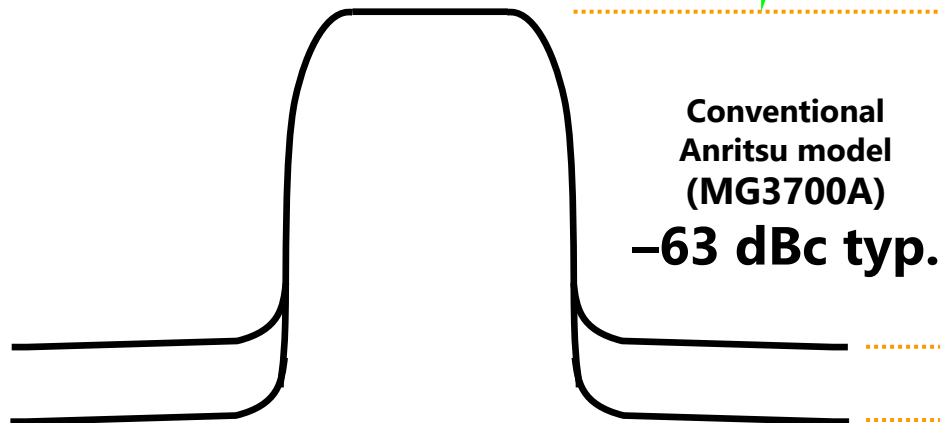


Large measurement margin



Stable meas.

Improve yield



Conventional
Anritsu model
(MG3700A)
-63 dBc typ.

MG3710E
-68 dBc*

*: At W-CDMA, TestModel1, 64DPCH, 2 GHz

Top-class ACLR performance supports measurement closer to the DUT original ACLR performance. High ACLR performance increases margin specifications and improves measurement stability and yield.

ACLR Performance (2/2)

Evaluation of base station amplifiers, etc., requires excellent adjacent channel leakage power (ACLR) performance. Normally, the signal from the vector signal generator is inserted to an amplifier, and the amplifier output signal ACLR characteristics, etc., are measured with a spectrum analyzer. Instruments for these measurements require high ACLR performance.

[Measurement Example: ACLR]

- Measurement conditions
Center frequency: 2.1GHz,
Measurement signal: LTE FDD 10 MHz E-TM 1.1QPSK

Vector Signal Generator
MG3710E



Signal Analyzer



Model: MG3710E



L1 : -68.5 dBc U1 : -67.4 dBc

Reference: MG3710A example

The MG3710A (conventional model) has slightly better ACLR performance than the MG3710E. This is the only difference between the MG3710E and MG3710A.



L1 : -68.8 dBc U1 : -68.6 dBc

Example: Performance not warranted. Data actually measured by randomly selected measuring instruments.

High Power Output (1/2)

High power output
+23 dBm @ CW

No External Amp

Cuts cost

Stable level accuracy

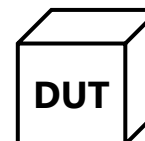
Reduces risk of damage to DUT

High Power Extension for 1stRF [MG3710E-041]
High Power Extension for 2ndRF [MG3710E-071]

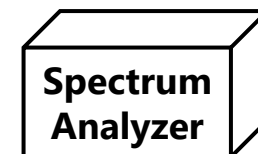
Reference Signal Generator



Path loss
(switches,
couplers,
combiners,
isolators, etc.)



Transmitter Test



In conventional measurement systems, path loss is increased by the various external equipment. An external amp is required when the output of the general signal source is insufficient.

The MG3710E High Power Extension option supports signals required for measuring path loss. It eliminates the cost of an external amp, supports stable level accuracy measurements and reduces risk of damage to the DUT from the external amp.

High-Power Extension Option

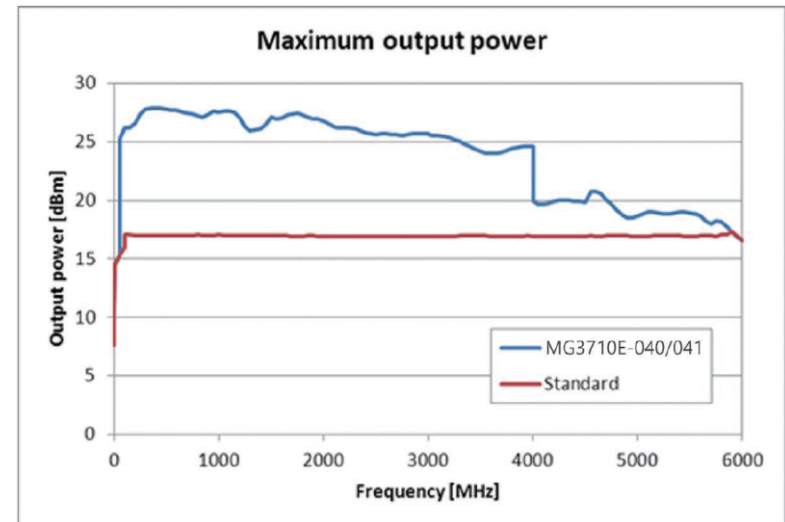
High Power Extension for 1stRF [MG3710E-041]
High Power Extension for 2ndRF [MG3710E-071]

These options expand the MG3710E RF output upper limit.

Generally, an external amplifier is used when managing path losses occurring in measurement systems as well as when the signal generator has inadequate output power, such as when inputting high-level modulation signals for evaluating amp distortion. In these cases, not only must the external amp output accuracy be assured, but it must also be checked with a power meter each time the frequency and level change. Moreover, sometimes operating mistakes when using an external amp can damage the device under test (DUT). The MG3710E High Power Extension options output the signal level required by the DUT without requiring compensation for path losses. In addition, the assured accuracy range supports stable measurements. And finally, there is no risk of unexpected damage to the DUT even when used at the output setting limit.

Assured level accuracy at high levels (CW)

Frequency Range	Standard	MG3710E-041/071
$100 \text{ kHz} \leq f < 10 \text{ MHz}$	+5 dBm	+5 dBm
$10 \text{ MHz} \leq f < 50 \text{ MHz}$	+10 dBm	+10 dBm
$50 \text{ MHz} \leq f < 400 \text{ MHz}$	+13 dBm	+20 dBm
$400 \text{ MHz} \leq f \leq 3 \text{ GHz}$		+23 dBm
$3 \text{ GHz} < f \leq 4 \text{ GHz}$		+20 dBm
$4 \text{ GHz} < f \leq 5 \text{ GHz}$		+13 dBm
$5 \text{ GHz} < f \leq 6 \text{ GHz}$	+11 dBm	+11 dBm



(meas)

Low-Power Output Reverse Input Power Protection

Low-Power Extension

Low Power Extension for 1stRF [MG3710E-042]
Low Power Extension for 2ndRF [MG3710E-072]

This option expands the MG3710E RF output lower limit.

The lower limit of the standard level setting range
–110 dBm.

Adding this option expands the limit to –144 dBm.

Refer to the appended data sheet for the level accuracy.

Reverse Input Power Protection

Reverse Power Protection for 1stRF [MG3710E-043]
Reverse Power Protection for 2ndRF [MG3710E-073]

This option protects the 1stRF and 2ndRF signal
output connector from reverse input power.

Maximum Reverse Input Power:

DC: ±50 Vdc max.

AC: 20 W nom. (1 MHz < f ≤ 2 GHz)

10 W nom. (2 GHz < f ≤ 6 GHz)

Installing MG3710E-043/073 does not
provide 100% assured protection against
damage from reverse input power, so take
care not to impress reverse input power
whenever possible.

Installing MG3710E-043/073 lowers ACLR
performance. Refer to the appended data
sheet for details.

Level Setting Range

Option	Setting Range [dBm]	
	without MG3710E-043/073	with MG3710E-043/073
Standard	–110 to +17	–110 to +17
With MG3710E-041/071	–110 to +30	–110 to +25
With MG3710E-042/072	–144 to +17	–144 to +17
With MG3710E-041/071 & MG3710E-042/072	–144 to +30	–144 to +25

Pre-installed Reference Oscillator

Aging Rate	$\pm 1 \times 10^{-7}/\text{day}$, $\pm 1 \times 10^{-6}/\text{year}$
Temperature stability	$\pm 2.5 \times 10^{-6}$ (5°C to 45°C)

High Stability Reference Oscillator [MG3710E-002]

Aging Rate	$\pm 1 \times 10^{-8}/\text{day}$, $\pm 1 \times 10^{-7}/\text{year}$
Temperature stability	$\pm 2 \times 10^{-8}$ (5°C to 45°C)
Start-up characteristics*	$\pm 5 \times 10^{-7}$ (2 minutes after power on) $\pm 5 \times 10^{-8}$ (5 minutes after power on)

Rubidium Reference Oscillator [MG3710E-001]

Aging Rate	$\pm 1 \times 10^{-10}/\text{month}$
Temperature stability	$\pm 2 \times 10^{-9}$ (5°C to 45°C)
Start-up characteristics*	$\pm 1 \times 10^{-9}$ (7.5 minutes after power on)

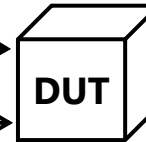
*Compared to frequency after 24-h warm-up, at 23°C

Three reference oscillator options are supported. Select the High-Stability Reference Oscillator option [MG3710E-002] when requiring high accuracy, depending on the measurement conditions; for even higher accuracy, select the Rubidium Reference Oscillator option [MG3710E-001]. However, if external high-accuracy reference signals are available, selecting the standard reference oscillator option helps reduce unnecessary costs.

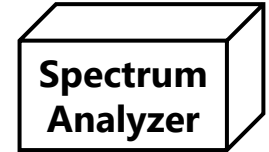
High-Speed Switching (1/2)

Fast switching speed
Frequency
&
Amplitude
< 600 μ s

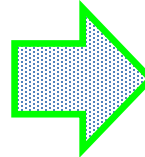
Reference Signal Generator



Transmitter Test



High-speed switching



Cuts test times

Switching target: Frequency, amplitude, waveform data

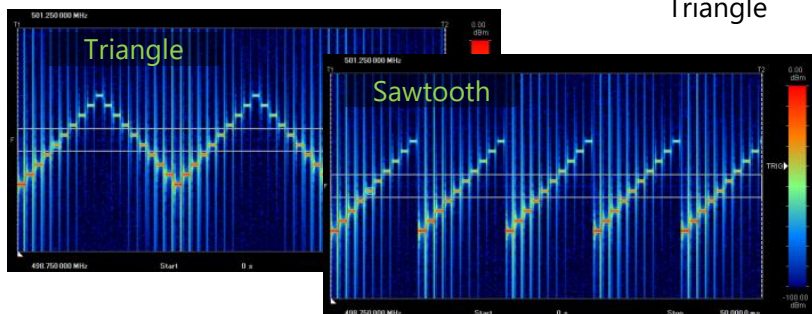
**Switching timing: External trigger, dwell time,
remote command, panel operation**

The MG3710E supports high-speed switching in the sweep/list mode separately from normal remote control. It is ideal for production lines requiring short test times.

Sweep/List mode

Sweep mode

In this mode, the dwell time per point or number of points is split between the frequency range and level range (Start/Stop) This mode is used when matching dwell time per point and frequency/level steps.

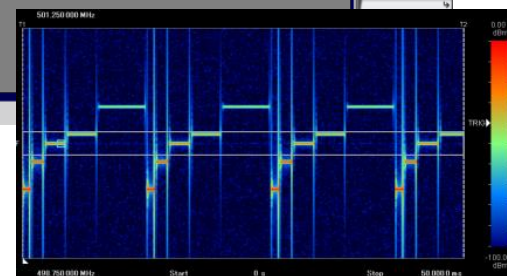


Example: Points: 10; Dwell Time: 500 μs

List mode

In this mode, the frequency, level and dwell time can be set for each of up to 500 points. This mode is used when wanting to set any dwell time, and frequency/level step per point.

SG	Frequency	Level	Dwell
1	SG2 499.50000000 MHz	-10.00 dBm	500 μs
2	SG2 499.80000000 MHz	-20.00 dBm	1 ms
3	SG2 500.00000000 MHz	-30.00 dBm	2 ms
4	SG2 500.10000000 MHz	-40.00 dBm	3 ms
5	SG2 500.40000000 MHz	-50.00 dBm	5 ms

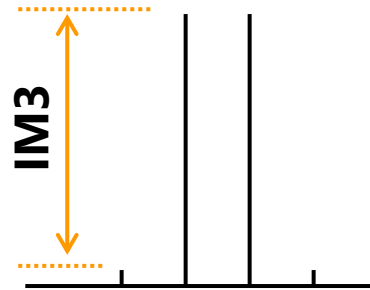


Example: Points: 5; Dwell Time: Random

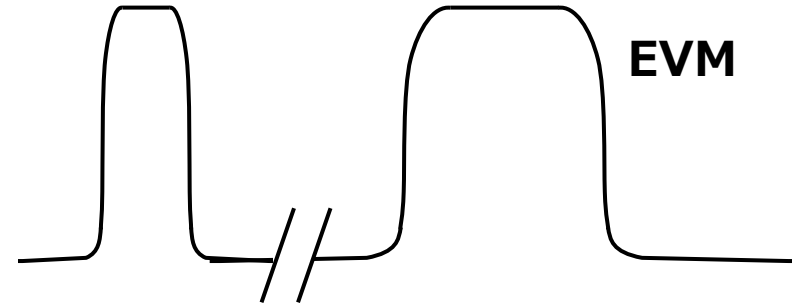
One Unit Supports Two Separate RF Outputs (1/3)

Two separate
RF outputs

CW x 2



Wideband multi-systems
and multi-carriers



Reference Signal Generator

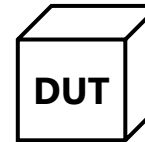


RF2

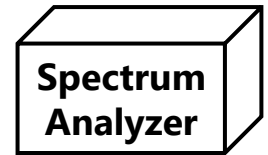
Isolator

Isolator

RF1



Transmitter Test



One unit supports Two RF outputs

Modulated signal x 2, CW x 2,
Modulated signal + CW

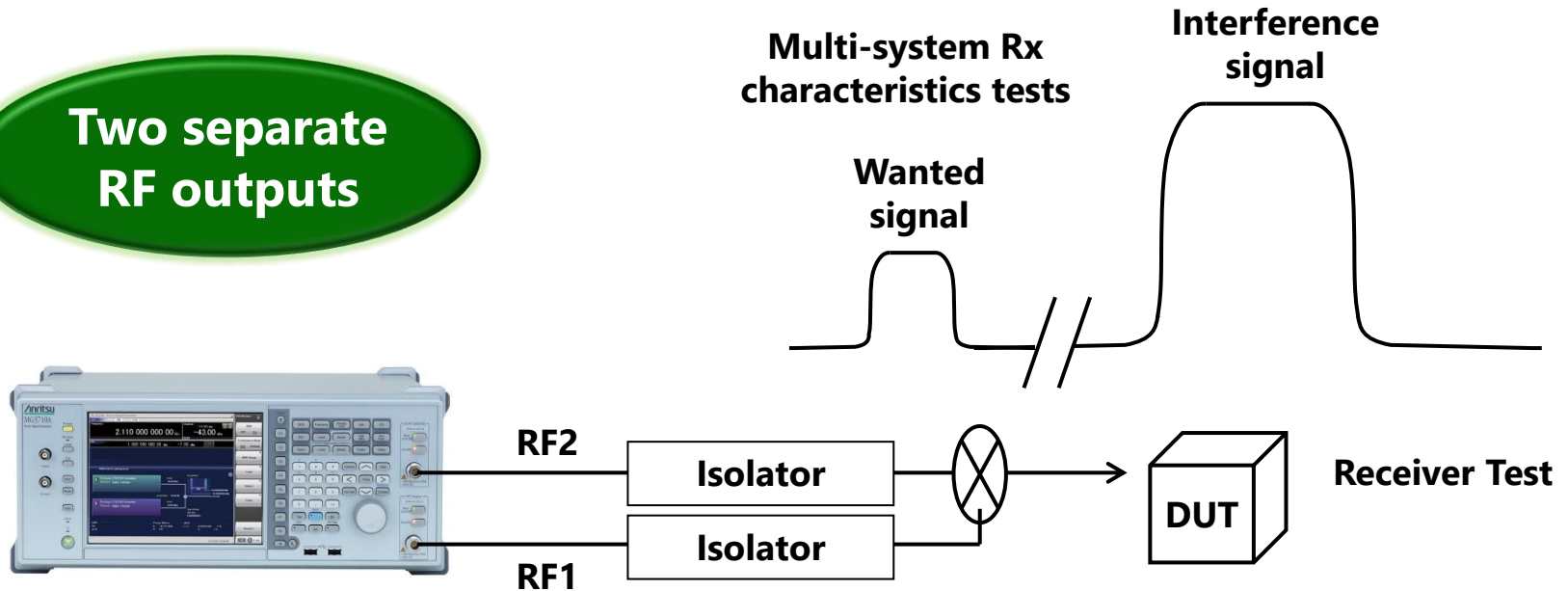


Cuts costs

The MG3710E supports two separate built-in RF outputs (option). The frequency can be selected from 2.7/4.0/6.0 GHz. The two RF outputs can be set to different frequencies, levels and waveform data/CW. As a result, there is no need for two expensive vector signal generators.

One Unit Supports Two Separate RF Outputs (2/3)

Two separate
RF outputs



Example: LTE + WLAN, LTE + Bluetooth, ISDB-T + WLAN, etc.

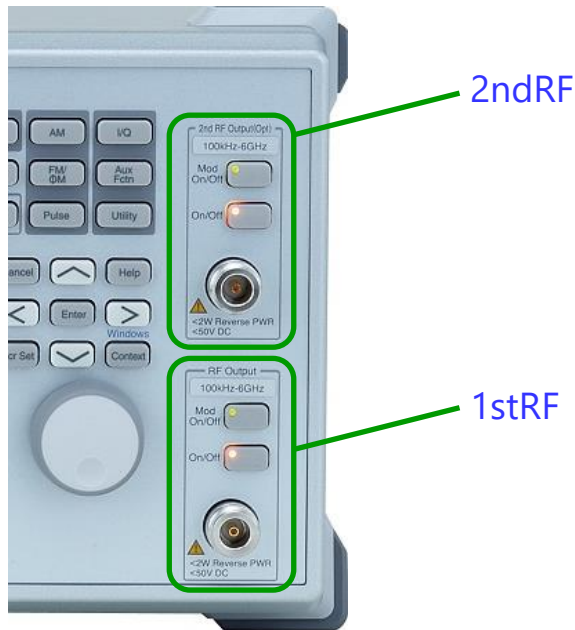
One unit supports Two RF outputs
Wanted signal + Interference signal



Cuts costs

The MG3710E supports two separate built-in RF outputs (option). Each can output a different frequency, level, and waveform data/CW and is ideal for Rx tests using two frequency offset signals that cannot be set using the baseband combine function.

One Unit Supports Two Separate RF Outputs (3/3)



Frequency Range:

2ndRF 100 kHz to 2.7 GHz [MG3710E-062/162]

2ndRF 100 kHz to 4 GHz [MG3710E-064/164]

2ndRF 100 kHz to 6 GHz [MG3710E-066/166]

*Any frequency option can be selected.

*One of these options can be retrofitted only if the 2ndRF option is not installed.

Frequency Range:

1stRF 100 kHz to 2.7 GHz [MG3710E-032]

1stRF 100 kHz to 4 GHz [MG3710E-034]

1stRF 100 kHz to 6 GHz [MG3710E-036]

*One of these must be installed.

This is convenient in the R&D phase for evaluating interference between two different systems using different frequency bands.

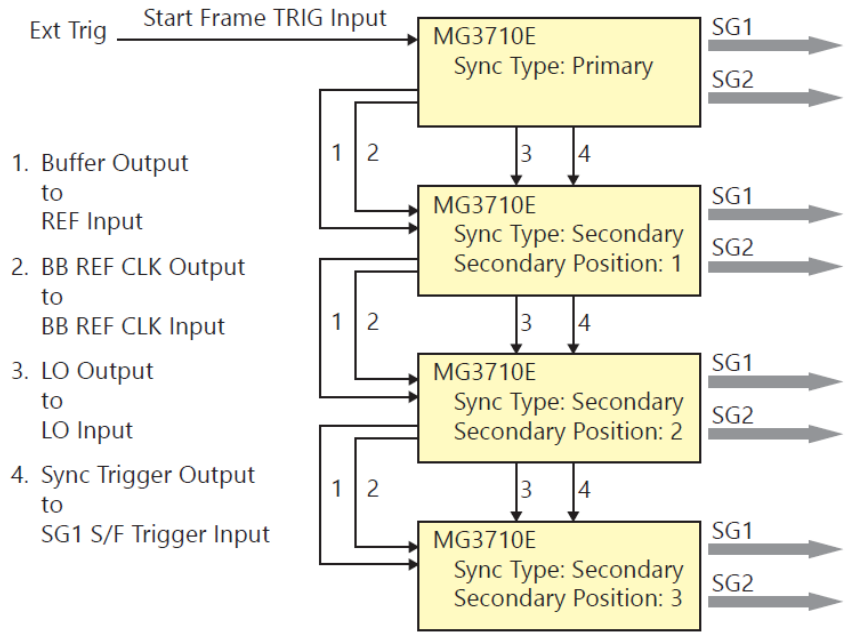
For example, considering WLAN 11b/g as the wanted signal, LTE-FDD, LTE-TDD, W-CDMA, GSM, etc., mobile signals are interference waveforms. Usually, this requires hardware and software costs for a second separate signal generator to create these interference signals. However, selecting one MG3710E model with different frequencies for the 1stRF and 2ndRF outputs supports efficient interference waveform testing using WLAN+LTE-FDD, ISDB-T+W-CDMA signals under realistic service conditions at greatly reduced total costs.

1: Supported frequency bands cannot be changed after shipment.

2: IQ input/output is supported only by SG1 (1stRF) and requires MG3710E-017.

Phase adjustment and local signal synchronization

Common Setting
 Number of Secondaries: 3
 LO Sync: On



1. Buffer Output to REF Input
2. BB REF CLK Output to BB REF CLK Input
3. LO Output to LO Input
4. Sync Trigger Output to SG1 S/F Trigger Input

Universal Input/Output [MG3710E-017]

This option installs connectors for the following I/O signals on the main-frame rear panel, supporting local frequency sync for MIMO applications.

- Baseband Reference Clock Input/Output
- Sweep Output (only supports SG1)
- Local Signal Input/Output

*Bundled with J1539A AUX Conversion Adapter for MG3710E-017/117 to use rear-panel AUX connector.

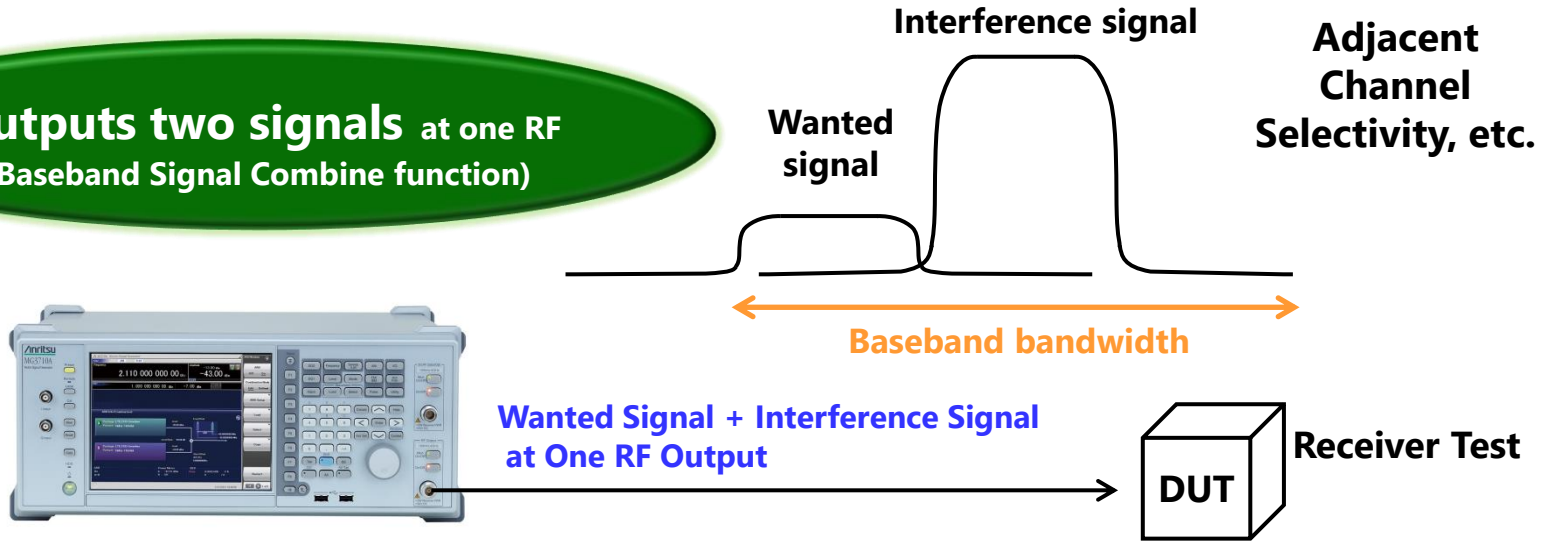
The Sync Multi SG function shares local signals, baseband clocks and trigger signals between multiple MG3710E units to output phase coherency signals with synchronized signal output timing. An 8x8 MIMO test system can be configured from one Primary and three Secondary MG3710E units.

- Synchronization mode: Primary, Secondary, SG1 & 2
- No. of Secondaries: 1 to 3
- Secondary position: 1 to 3
- Local synchronization: On/Off
- IQ phase adjustment: -360 to +360 deg, resolution 0.01 deg
- IQ output delay: -400 to 400 ns, resolution 1 ps

Refer to the Application Note for details.
[Adjusting MIMO Phase Coherence using Vector Signal Generator]

One RF Outputs Wanted + Interference Signals (1/6) Advancing beyond

Outputs two signals at one RF
(Baseband Signal Combine function)



Combination of Baseband Signal function:

Waveform data = 2 patterns (dual memory);
modulated signal x 2, CW x 2, modulated signal + CW, etc.

Setting: Frequency offset, level offset, delay time

Frequency offset range: < baseband bandwidth (± 60 MHz max.)

One RF outputs
Wanted + Interference signals


Cuts costs

The MG3710E has two waveform memories for each RF output for setting and outputting different waveform data. One RF outputs the combined wanted + interference signals for the baseband bandwidth.

Combination of Baseband Signal Function

Combination of Baseband Signal for 1stRF [MG3710E-048]
 Combination of Baseband Signal for 2ndRF [MG3710E-078]

The Combination of Baseband Signal option installs two waveform memories for either the 1stRF (or 2ndRF) SG to combine two waveform patterns as the baseband for output, eliminating the need for two separate and expensive vector signal generators.



Level Setting
 Setting Range: -80 to +80 dB
 Resolution: 0.01 dB

Frequency Offset Setting Range
 Setting Range: -80 MHz to +80 MHz
 Resolution: 1 Hz

CW Selection
 A: Pattern A center
 B: Pattern B center
 Baseband DC:
 Centered at baseband DC position

Time offset Setting Range
 Setting Range:
 0 ~ pattern B sampling data count - 1

Waveform pattern A
 Example: Wanted Signal

Waveform pattern B
 Example: Interference Signal, Delay Signal

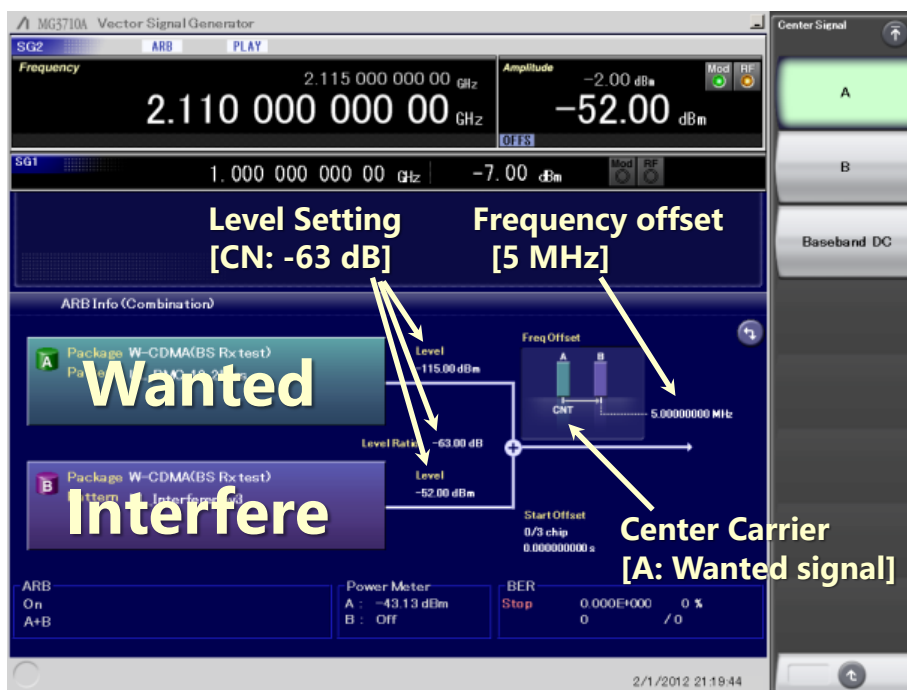
Combination of Baseband Signal Example

[Combination of Baseband Signal Function Example]

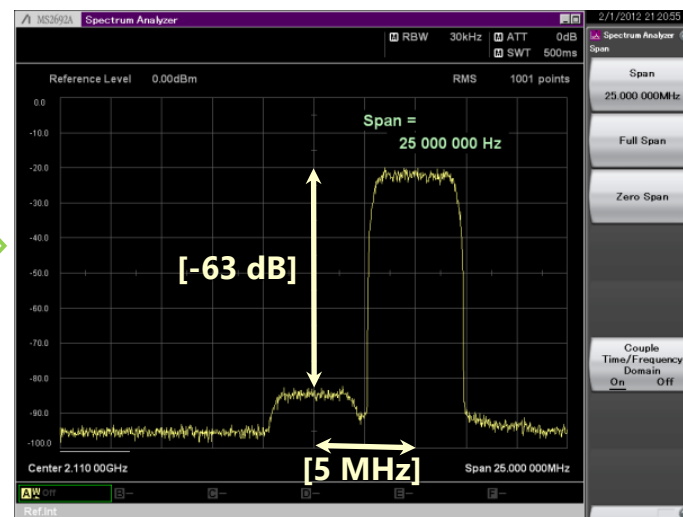
**Wanted Signal
+ Modulated Interference Signal**

Parameters:

- Frequency offset: 5 MHz
- Level offset: -63 dB
- Center carrier: Wanted signal = Memory A



MG3710E Settings for Wanted Signal + Modulated Interference Signal



MG3710E Settings for Wanted Signal + Modulated Interference Signal (Spectrum)

[Combination of Baseband Signal Function Example]

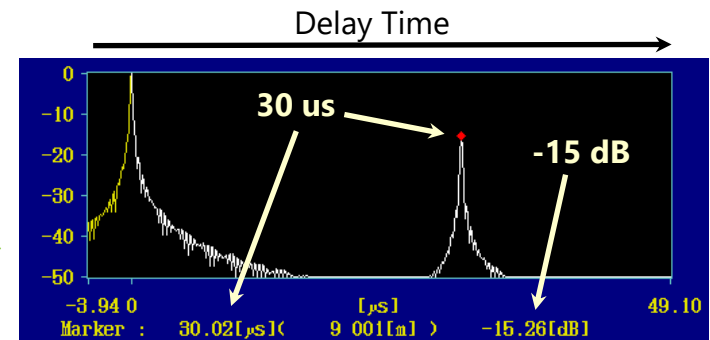
**Wanted Signal
+ Delayed Signal**

Parameters:

- Frequency offset: 0 Hz
- Level offset: 15 dB
- Time offset (Delay): 30 μ s

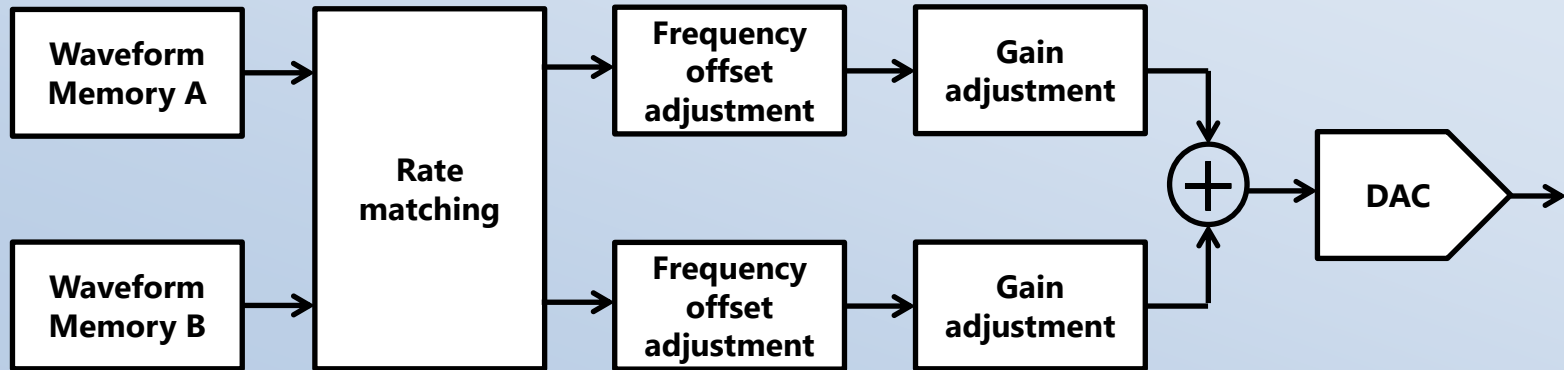


**MG3710E Settings for
Wanted Signal + Delayed Signal**



**Wanted Signal + Delayed Signal
(Delay Profile)**

[Rate Matching Function]



The conventional MG3700A only supports combination of two waveform patterns at the same sampling rate in memory A and and memory B. The sampling rate of the two waveform patterns must be matched in advance using Multi-Carrier IQproducer (MX370104A).

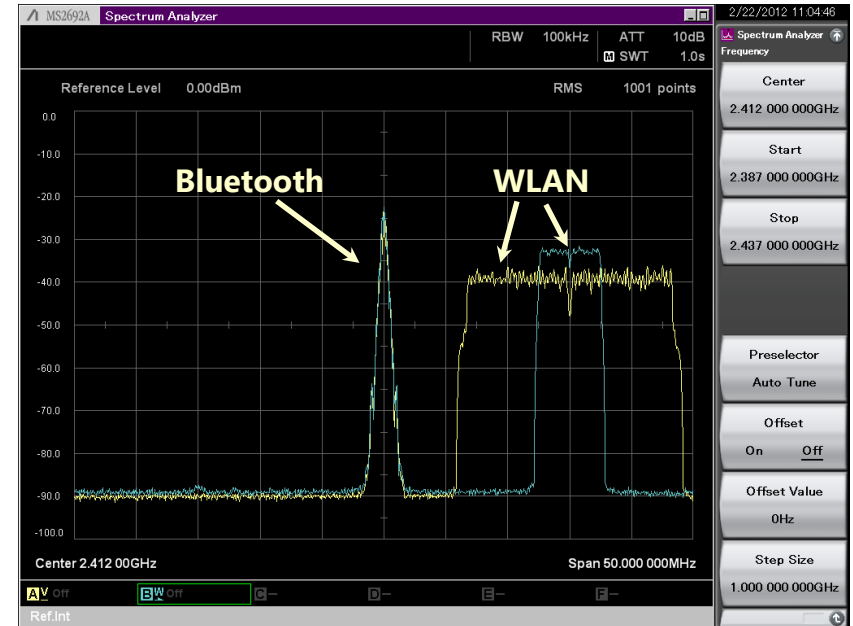
Combining two signals with the MG3710E rate matching function performs combination by matching the sampling rates and data point counts automatically, eliminating a great deal of time and effort matching the waveform pattern sampling rates before waveform combination.

[Rate Matching Function]

[Baseband Signal Combine Function Example]

Yellow: MG3710E

Blue: Anritsu conventional model (MG3700A) Note



Combine Waveforms with Different Sampling Rate

Using the MG3710E Rate Matching function, two signals are output at each true spectrum.

Example:
 Bluetooth DH1: Sampling Rate 12 MHz
 WLAN 11a 54 Mbps: Sampling Rate 40 MHz

Note: With the conventional MG3700A, the sampling rates are pre-matched using the Adjust Rate function of Multi-Carrier IQproducer.

AWGN Generator

AWGN for 1stRF [MG3710E-049]

AWGN for 2ndRF [MG3710E-079]

**Built-in AWGN
Generator**

This option adds internally generated AWGN to wanted signals. The On/Off button switches the AWGN output.

When there is no carrier, only AWGN is output (ARB = Off).



Select AWGN On/Off

Noise Bandwidth

AWGN Flat Bandwidth part

Carrier Level

Noise (AWGN) Level

(Enabled when no wanted signal)

Carrier/Noise Ratio

Setting Range: -40 to +40 dB
Resolution: 0.01 dB

C/N Set Signal

Sets change target when setting C/N Ratio
Carrier: Changes carrier (fixed AWGN)
Noise: Changes AWGN (fixed carrier)
Constant: Fixes output level and change carrier and AWGN

Waveform
pattern A

Example:
Wanted Signal

AWGN Generator

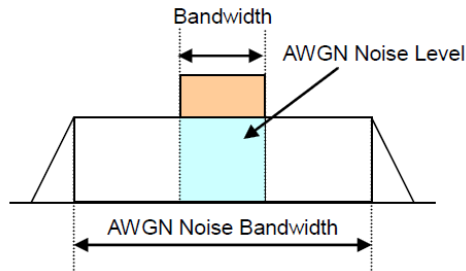
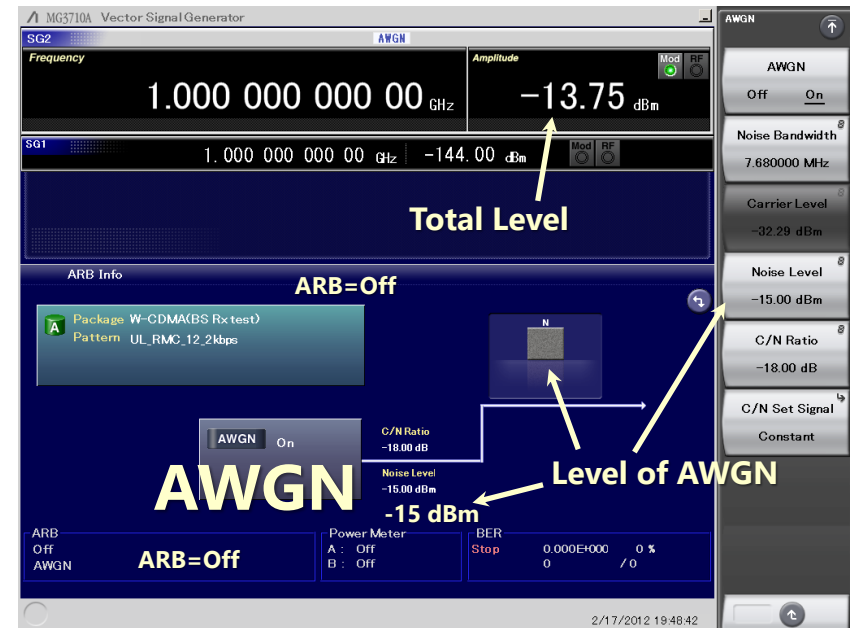
Example of AWGN Generator

One RF Outputs Wanted + AWGN Signals (2/2)

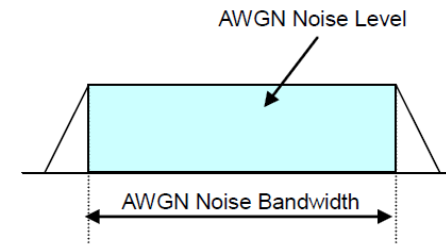
Example: Wanted Signal + AWGN



Example: AWGN only



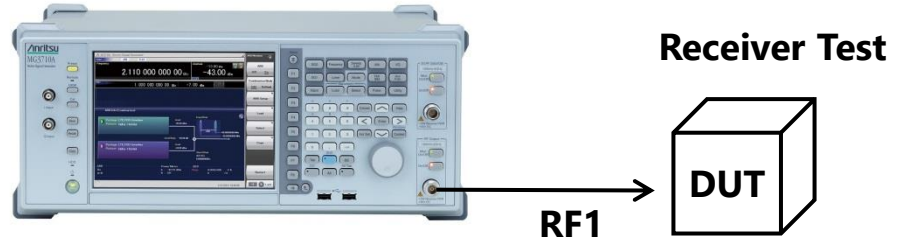
When adding AWGN to the wanted signal, Noise Level on the screen displays the noise level in the wanted signal band.



When outputting only AWGN, Noise Level on the screen displays the set noise bandwidth level. In the above setting example, it is the power in the 7.68 MHz band.

Large Memory Cuts Measurement Times (1/2)

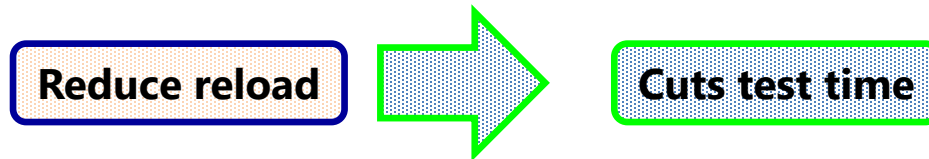
Large memory
4 GB max



Example: Testing with many waveforms with different bandwidths and parameters
Testing with waveforms for many systems with multi-system terminals

With large waveform memory

- 1. Switch loaded waveform data instantaneously**
- 2. Load multiple test waveforms → Reduce number of reloads → Cuts time**



The MG3710E can save up to 1024 Msa (4 GB) per one RF output. Memory size is one of the most important specifications for an arbitrary waveform signal generator. Large memory can load multiple waveform data, cutting reload and measurement times.

ARB Memory Upgrade

64 Msample for 1stRF [with 1stRF]

ARB Memory Upgrade 256 Msample for 1stRF [MG3710E-045]

ARB Memory Upgrade 1024 Msample for 1stRF [MG3710E-046]

64M sample for 2ndRF [with 2ndRF]

ARB Memory Upgrade 256 Msample for 2ndRF [MG3710E-075]

ARB Memory Upgrade 1024 Msample for 2ndRF [MG3710E-076]

Memory size is the most important specification for arbitrary waveform memory. If the memory is small, large waveform patterns cannot be handled and the number of cases when multiple waveform patterns cannot be loaded increases. When this happens, the time to reload another waveform pattern wastes evaluation time and lowers efficiency.

1stRF (MG3710E-032/034/036)

Combination of Baseband Signal (MG3710E-048)	ARB Memory Upgrade 256 Msample for 1stRF [MG3710E-045] ARB Memory Upgrade 1024 Msample for 2ndRF [MG3710E-046]		
	without MG3710E-045/046	with MG3710E-045	with MG3710E-046
Without MG3710E-048	64 Msa x 1 pc	256 Msa x 1 pc	1024 Msa x 1 pc ^{*1}
With MG3710E-048 ^{*2}	64 Msa x 2 pcs 128 Msa x 1 pc	256 Msa x 2 pcs 512 Msa x 1 pc	1024 Msa x 2 pcs ^{*1}

2ndRF (MG3710E-062/064/066)

Combination of Baseband Signal (MG3710E-078)	ARB Memory Upgrade 256 Msample for 2ndRF [MG3710E-075] ARB Memory Upgrade 1024 Msample for 2ndRF [MG3710E-076]		
	without MG3710E-075/076	with MG3710E-075	with MG3710E-076
Without MG3710E-078	64 Msa x 1pc	256 Msa x 1 pc	1024 Msa x 1 pc ^{*1}
With MG3710E-078 ^{*2}	64 Msa x 2pcs 128 Msa x 1pc	256 Msa x 2 pcs 512 Msa x 1 pc	1024 Msa x 2 pcs ^{*1}

*1: The maximum size per waveform pattern supported by the MG3710E varies with the IQproducer version.

*2: The Combination of Baseband Signal option supports two arbitrary waveform memories and can either set two different waveform patterns or combine them in one memory to support one large waveform pattern.

Two Signal Flowcharts (1/2)

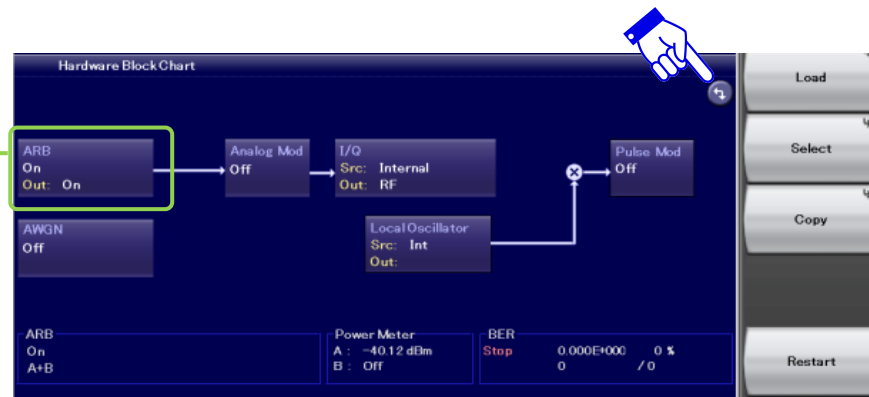
Pressing the on-screen  button toggles instantly between the Hardware Block Chart and the ARB Info screens.

The Hardware Block Chart is a quick-and-easy way to grasp the status of each block (ARB, AWGN, I/Q, Analog Mod, Pulse Mod, Local) at a glance.

The ARB Info screen displays more details about the ARB/AWGN block showing the baseband signal combine status of memory A + memory B, memory A + AWGN, etc.



ARB Info Screen



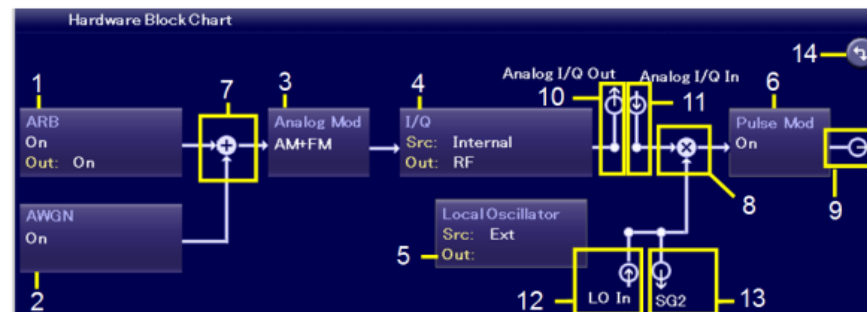
Hardware Block Chart Screen

Two Signal Flowcharts (2/2)

Hardware Block Chart Display Contents (explanation)

No.	Display Example	Display	Description
1		ARB	ARB block
		On/Off	Indicates On/Off of ARB (function to generate modulated signals with arbitrary waveform patterns).
2		Out:	Indicates On/Off of the arbitrary waveform pattern output.
		AWGN	AWGN block
3		On/Off	Indicates On/Off of AWGN addition.
		Analog Mod	Analog Modulation block
4		AM/FM/φM	Indicates the analog modulation (AM/FM/φM) during modulation.
		I/Q	I/Q block
5		Src:Internal/ Analog I/Q In	Indicates the I/Q signal source.
		Local Oscillator	Local Oscillator block
6		Src: Int/Ext/Sync	Indicates the Local signal source.
		Out: ---/On/Off	Indicates On/Off of the Local signal external output.
7		Pulse Mod	Pulse Modulation block
		On/Off	Indicates On/Off of Pulse modulation.
8		---	Indicates that inputs from two function blocks of the left side and bottom side are combined and output to the function block of the right side.
		---	Indicates that the input Local signal from the bottom side is modulated with the input signal from the left side and output to the function block of the right side.
9		---	Indicates the RF Output is On.
10		Analog I/Q Out	Indicates the Analog I/Q signal is set to the external output.

Hardware Block Chart (explanation)



No.	Display Example	Display	Description
11		Analog I/Q In	Indicates the Analog I/Q signal is set to the external input.
12		LO In (For SG1)	Indicates the SG1 Local signal source is set to Ext (input from the rear LO Input connector).
		SG1 (For SG2)	Indicates the SG2 Local signal source is set to Sync and the signal is input from SG1.
13		SG2 (For SG1)	Indicates the SG1 Local signal external output setting is On and the signal is output to SG2. If SG2 is not installed, "LO Out" (output from the rear LO Output connector) is displayed.
		LO Out (For SG2)	Indicates the Local signal external output setting (output from the rear LO Output connector) is On.
14		---	Click to switch Hardware Block Chart and ARB Info display.

Analog IQ Input/Output [MG3710E-018]

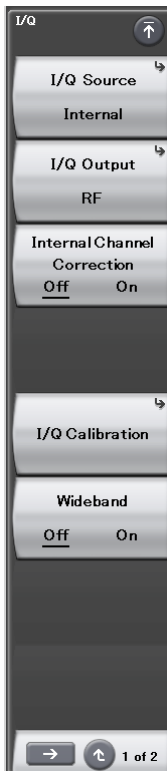
This option adds analog IQ input and output connectors to the front and rear panels, respectively

This function supports SG1 (1stRF) only when MG3710E-018 is installed.

Input: I Input, Q Input

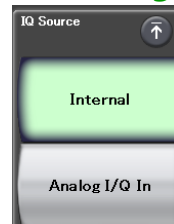
Output: I Output, I⁻ Output, Q Output, Q⁻ Output

Page 1/2



[1]

[1] I/Q signal Source



I/Q signal with the internal baseband

[2]

Signal input from analog I/Q In connector (SG1 can only be selected when MG3710E-018 is installed.)

[3]

[2] Output destination for BB signals



Output RF signal

[4]

Output I/Q signal (SG1 can only be selected when MG3710E-018 is installed.)

[5]

[3] Baseband in-band correction

Enable/Disables baseband in-band correction.

When it is set to On, the in-band flatness is improved. However, the switching time for the frequency and pattern change becomes longer because the correction filter recalculation time and filter passing time become longer. If the in-band characteristics are not important, setting this function to Off supports high-speed operation. This function is disabled at CW output.

[4] I/Q Calibration



Executes calibration for the IQ gain balance, Origin offset and IQ quadrature angle.

DC: Executes optimal adjustment with currently specified frequency (default). For other frequency points, the existing correction value is used without change.

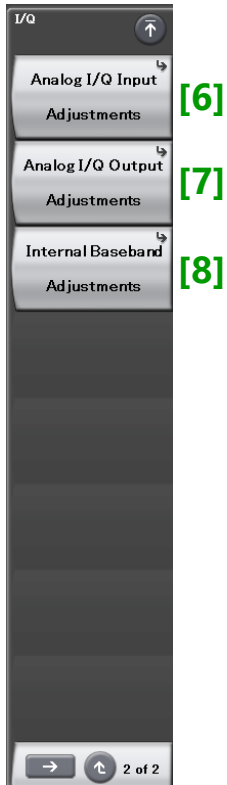
Full: Executes calibration with range of all frequencies.

[5] Switching mode for RF bandwidth

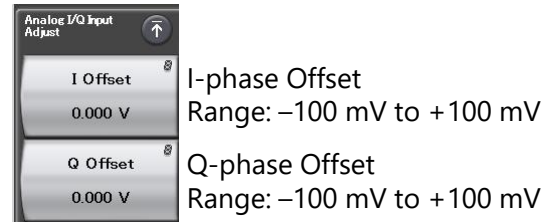
Off: Harmonics distortion characteristic has priority (Default).

On: In-band flatness has priority. This function allows using the maximum modulation bandwidth with low frequency. (The harmonics cut filter is disabled.)

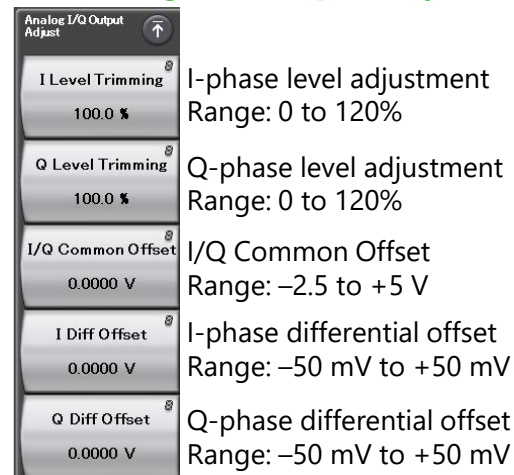
Page 2/2



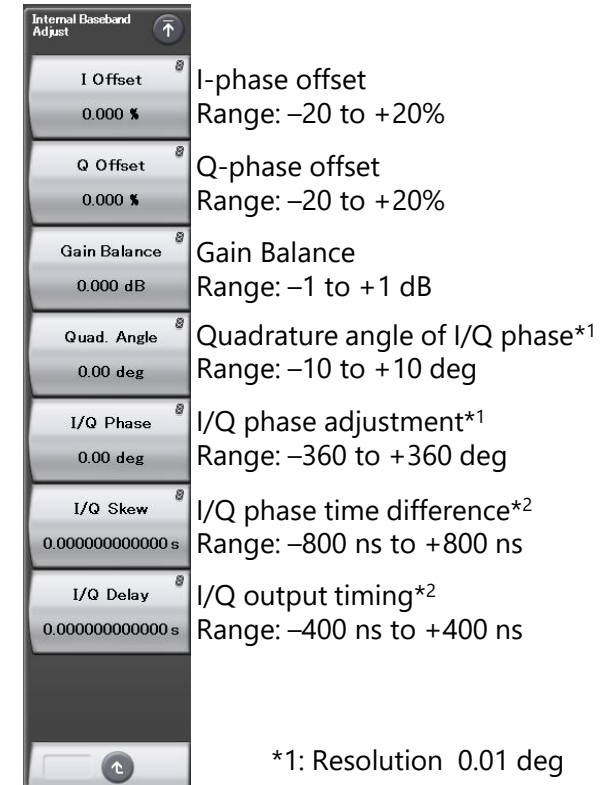
[6] Analog I/Q Input Adjustments



[7] Analog I/Q Output Adjustments



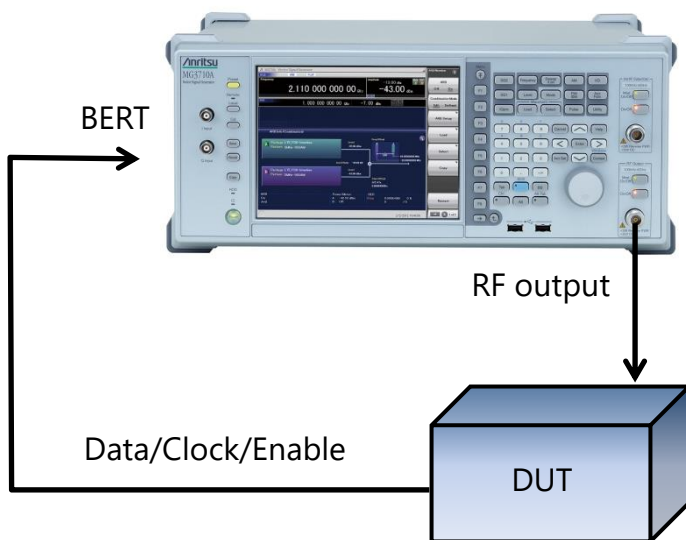
[8] Internal Baseband Adjustments



*1: Resolution 0.01 deg

*2: Resolution 1 ps

Built-in BER Measurement Function



Returns Data/Clock/Enable demodulated by DUT to MG3710E BER function

BER Test Function [MG3710E-021]

Input bit rate: 100 bps to 40 Mbps

Input signal: Data, Clock, Enable
(Polarity inversion enabled)

Input level: TTL

Measurable patterns:

PN9/11/15/20/23, ALL1, ALL0,
Alternate (0101...), User Data,
PN9fix/11fix/15fix/20fix/23fix

Count mode: Data, Error

Number of measurable bits:
 $\leq 2^{32}-1$ (4,294,967,295 bits)

Measure mode: Single, Continuous, Endless

This option installs a BER measurement function for measuring error rates between 100 bps and 40 Mbps using the DUT demodulated Data/Clock/Enable signals. The results are displayed on the MG3710E screen.

Built-in BER Measurement Function (2/4)

BER Test Start or Stop

Clears measurement result

Measure Mode

Count Mode

Data Type
PN9/11/15/20/23, ALL1, ALL0,
Alternate (0101...), User Data,
PN9fix/11fix/15fix/20fix/23fix

Error Rate

Error Bit

BER Measurement Example

Measurement bit

Measure Mode

Single: Measures selected data patterns until result reaches specified number of bits or specified number of error bits

Continuous: Repeats single measurements (default)

Endless: Measures data until result reaches upper limit of measurement count bit

Count Mode

Data: Specifies number of measurement bits (default)

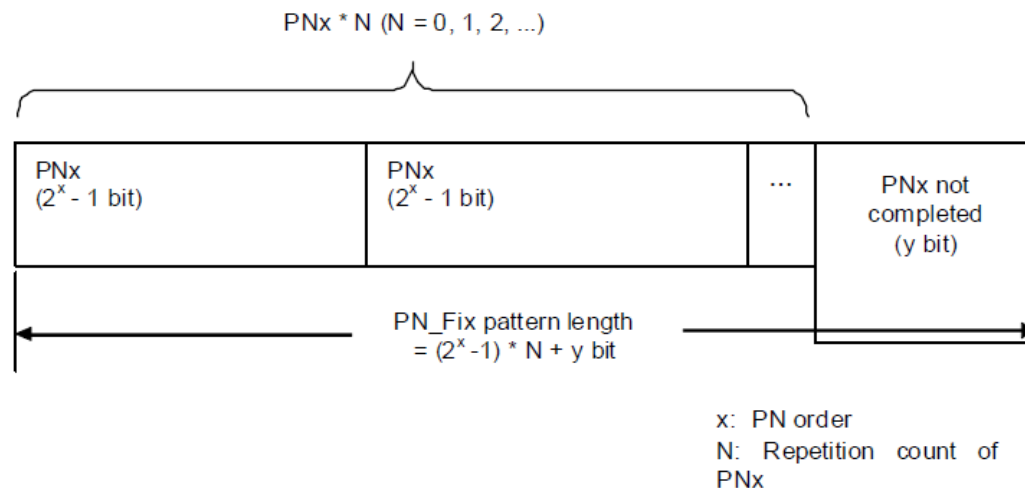
Error: Specifies number of measurement error bits

Built-in BER Measurement Function (3/4)

[PN Fix pattern]

At BER measurement, special PN patterns called PN_Fix patterns can be used. A PN Fix pattern consists of repeated parts of PN patterns, and PN patterns with a shorter length than 1 cycle.

Even when the PN data part of the waveform pattern output from the MG3710E has no periodicity, BER measurement is supported by selecting PN Fix at the BER measurement function.



Initial Pattern

Data Type	Initial Pattern Setting Range		Resolu- tion	Default
	Binary	Hex		
PN9Fix	000000000 to 111111111 (9 bits)	000 to 1FF	1	1FF
PN11Fix	00000000000 to 11111111111 (11 bits)	000 to 7FF	1	7FF
PN15Fix	000000000000000 to 111111111111111 (15 bits)	0000 to 7FFF	1	7FFF
PN20Fix	0000000000000000000 to 111111111111111111 (20 bits)	00000 to FFFFF	1	FFFFF
PN23Fix	000000000000000000000 to 111111111111111111111 (23 bits)	000000 to 7FFFFFF	1	7FFFFFF

Pattern Length

Setting Range:
96 to 134217728 bit (0 x 8000000)
Resolution: 1 bit

Built-in BER Measurement Function (4/4)

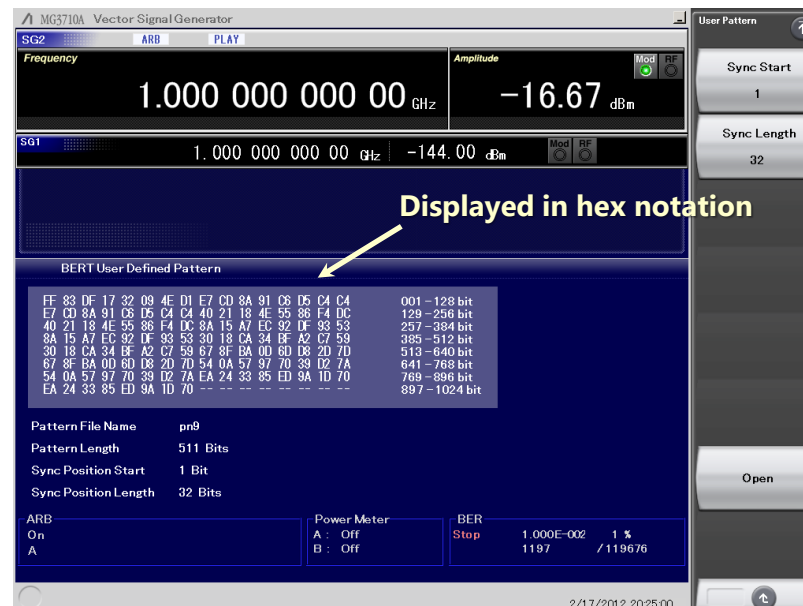
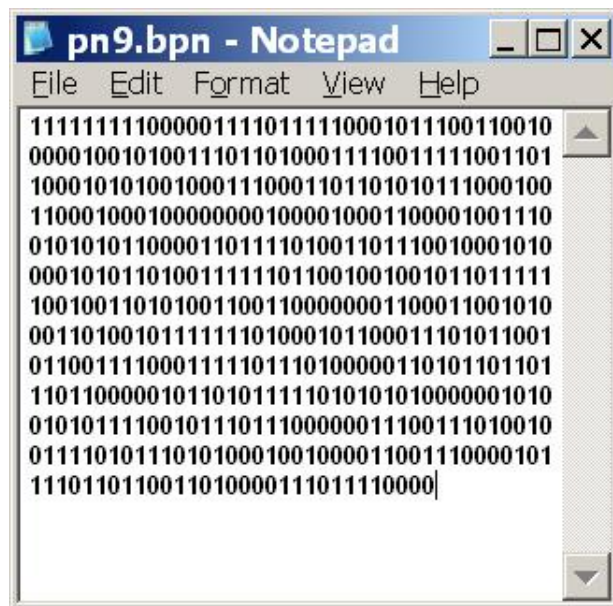
[User Defined Pattern]

The BER measurement can use a user-defined pattern, which is an arbitrary binary string that is 8- to 1024 bits long and consists of a data bit string to determine whether synchronization is established plus a data bit string used as measurement data. A PC can be used to create a user-defined pattern in text file format. Load the file from USB memory or MG3710E internal hard disk.

Length: 8 to 1024 (Binary)

Extension: ***.bpn**

Saved Folder: *:\Anritsu\MG3710A\User Data\BERT BitPattern



Example of User-Defined Pattern

Supports Two USB Type Power Sensor (1/4)

Supports two USB power sensors max.

USB Power Sensor [Sold Separately]

Model	Frequency Range	Dynamic Range
MA24104A*	600 MHz to 4 GHz	+3 to +51.76 dBm
MA24105A	350 MHz to 4 GHz	+3 to +51.76 dBm
MA24106A	50 MHz to 6 GHz	-40 to +23 dBm
MA24108A	10 MHz to 8 GHz	-40 to +20 dBm
MA24118A	10 MHz to 18 GHz	-40 to +20 dBm
MA24126A	10 MHz to 26 GHz	-40 to +20 dBm

Level Offset: -100 to +100 dB

*: MA24104A has been discontinued.
Replacement model is MA24105A.

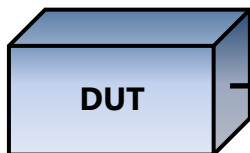
Average: 1 to 2048

Unit: dBm, W

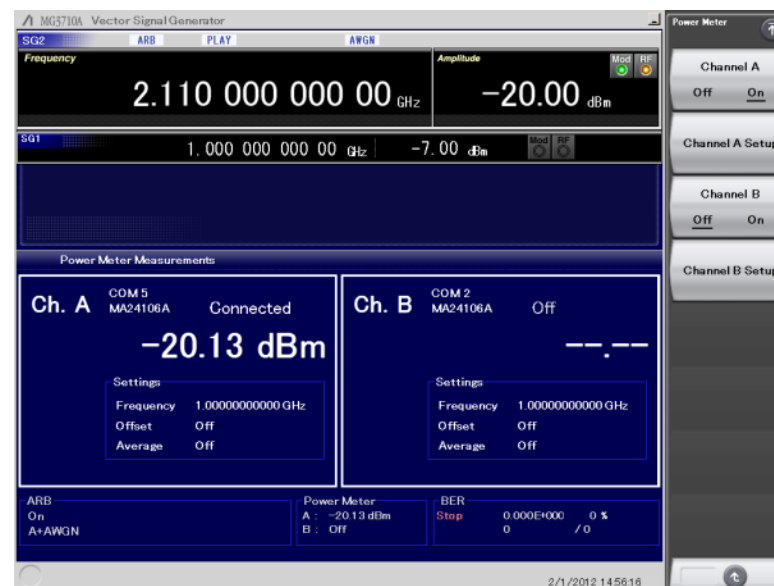
COM Port: 2 to 8



USB Connection



Example:
MA24106



Power Meter Measurement Screen

Up to two USB power sensors can be connected to the MG3710E to display the measurement results on the MG3710E screen.

Supports Two USB Type Power Sensor (2/4)

[Power Meter Setting]

Measurement Frequency: Channel Freq (See Table 1.)

Select Level Offset On/Off

Level Offset Value
Range: -100 to +100 dB
Resolution: 0.01 dB

Select Averaging On/Off

Average Count
Range: 1 to 2048
Resolution: 1

Measurement Units
dBm, W

Table 1: Measurement Frequency Setting Range

Power Sensor	Minimum Value	Maximum Value	Resolution	Default
MA24104A	600 MHz	4 GHz	1 kHz	1 GHz
MA24105A	350 MHz	4 GHz	100 kHz	1 GHz
MA24106A	50 MHz	6 GHz	1 kHz	1 GHz
MA24108A	10 MHz	8 GHz	100 kHz	1 GHz
MA24118A	10 MHz	18 GHz	100 kHz	1 GHz
MA24126A	10 MHz	26 GHz	100 kHz	1 GHz

COM Port: 2 to 8

Model: MA24104A, MA24105A, MA24106A,
MA24108A, MA24118A, MA24126A.

Zero Sensor: Zero adjusts for power sensor

Supports Two USB Type Power Sensor (3/4)

[Checking Com Port]

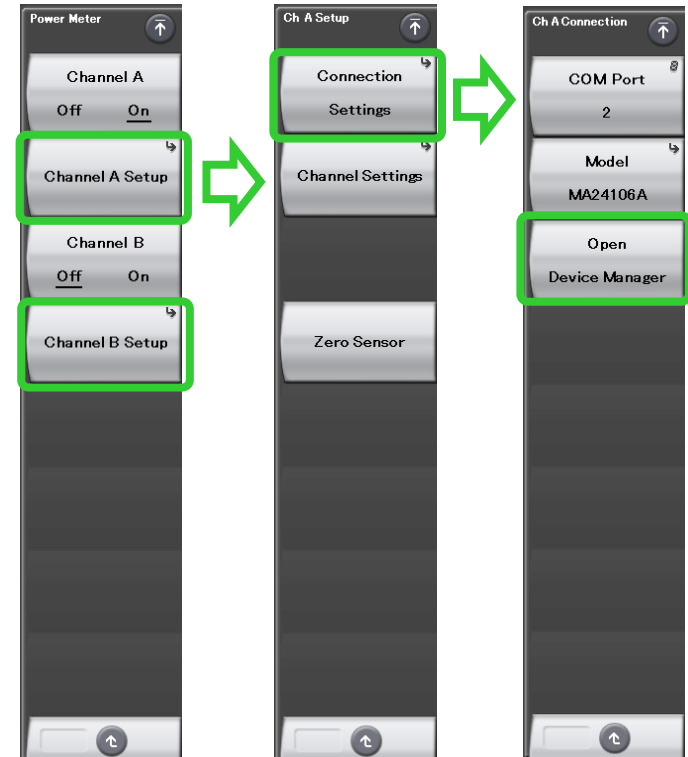
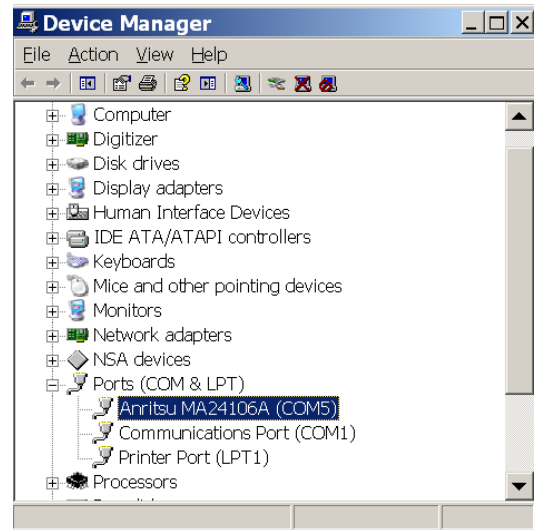
1. Display Windows Device Manager

[F2: Channel A Setup] or [F4: Channel B Setup]

> [F1: Connection Settings]

> [F3: Open Device Manager]

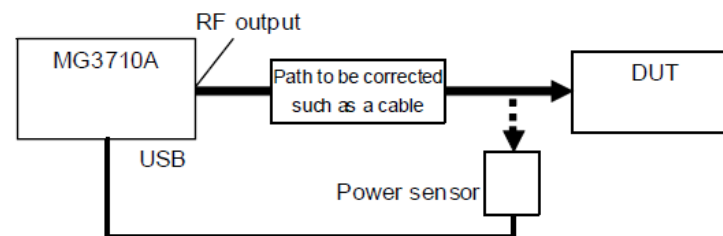
2. Check Ports (COM & LPT)



Supports Two USB Type Power Sensor (4/4)

[Correction Table Creation Function]

This function supports creating a correction table for specified frequency range, such as pass-loss using USB power sensor.



This function can be used from [Level]. It cannot be used when a USB power sensor is not connected.

[Top] > [Level] > (P.2)[F2: Configure Correction] > [F5: Use Power Sensor]



Example of Creating Correction Table

Frequency Setting Range

Power Sensor	Minimum Value	Maximum Value		
		MG3710A/MG3740A Options		
		032/062/162	034/064/164	036/066/166
MA24104A	600 MHz	2.7 GHz	4 GHz	4 GHz
MA24105A	350 MHz	2.7 GHz	4 GHz	4 GHz
MA24106A	50 MHz	2.7 GHz	4 GHz	6 GHz
MA24108A	10 MHz	2.7 GHz	4 GHz	6 GHz
MA24118A	10 MHz	2.7 GHz	4 GHz	6 GHz
MA24126A	10 MHz	2.7 GHz	4 GHz	6 GHz

Level Offset Setting

Sets loss/gain correction values included in measurement path.
Setting Range: -100 to +100 dB
Resolution: 0.01 dB

No. of Measurement Point for Correction Data

Setting Range: 2 to 4096

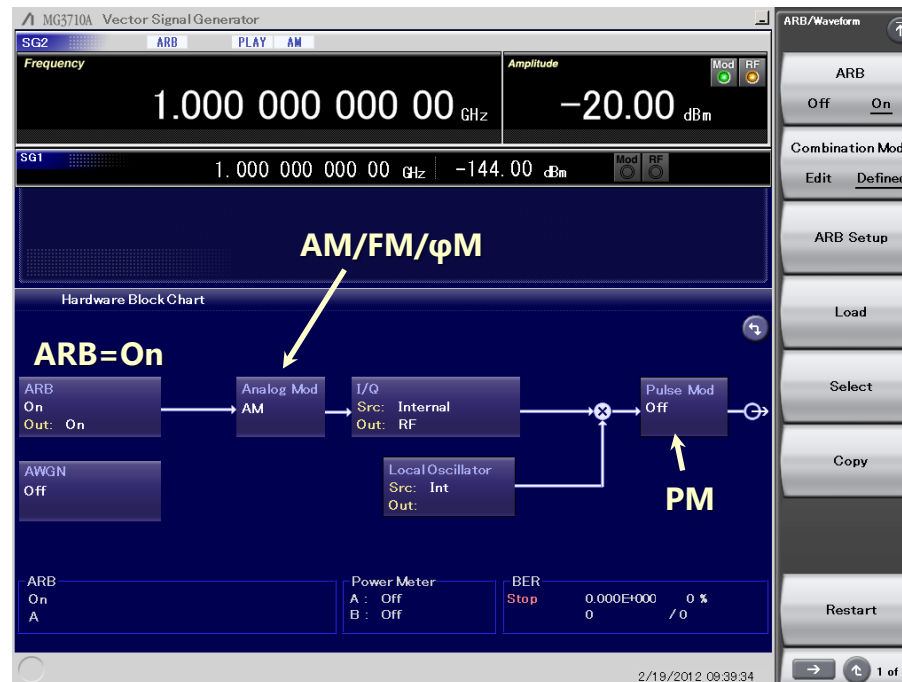
Average of Correction Data

Setting Range: 1 to 2048

AM/FM/φM/PM

This function executes analog modulation (AM/FM/φM) for modulated signals created using a CW signal or ARB. When using with a low output frequency, the impact of the second harmonic wave cut filter may degrade the characteristics of the high-frequency wave.

Pulse modulation is executed at any frequency and timing setting. Pulse modulation using external input signals is also supported. The RF Gate function, which runs in tandem with the waveform pattern and the pulse modulation, can be applied simultaneously, and pulse modulation is executed because of OR.



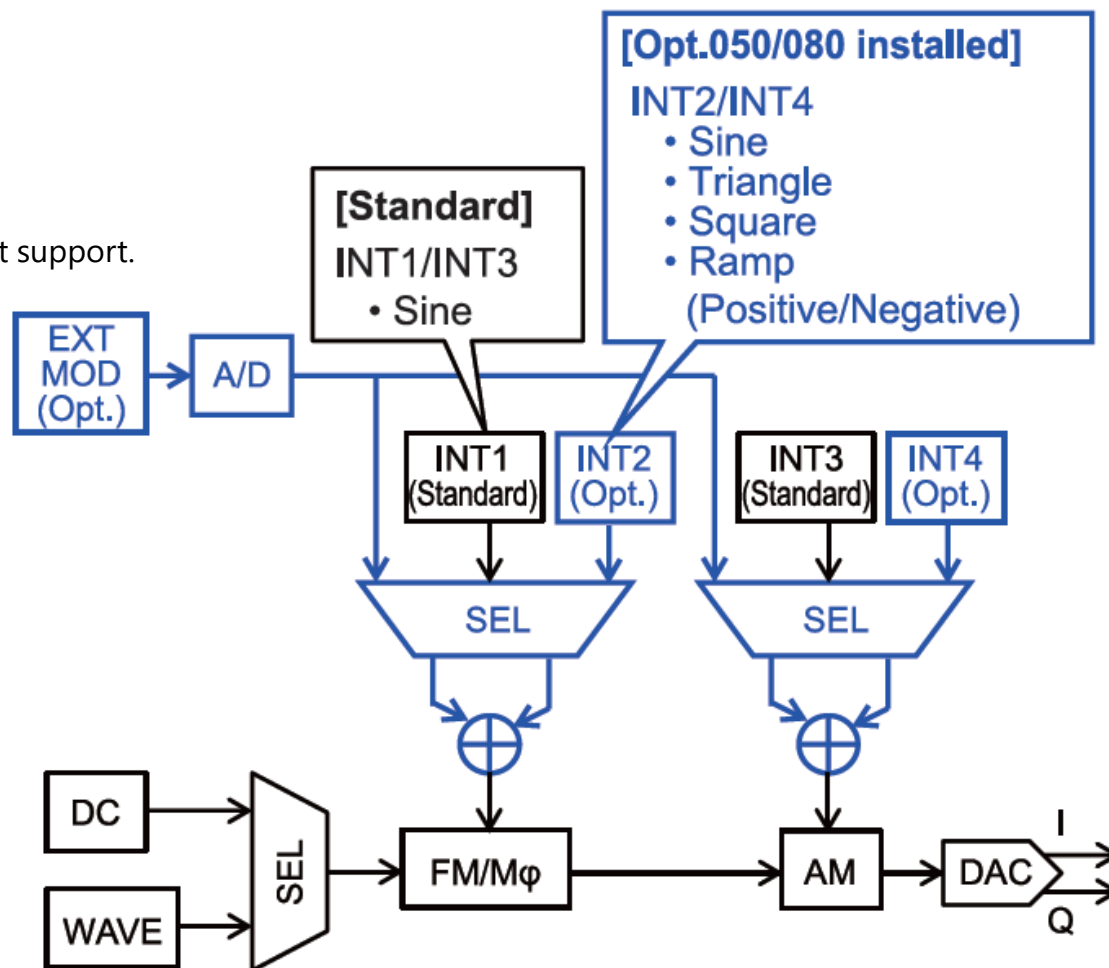
**Example of Analog Modulation Block Chart Screen
(ARB = On, AM = On)**

Additional Analog Modulation Input [MG3710E-050/080]

Adding additional analog modulation input options (MG3710E-050/080) extends to two internal modulation sources (AM/FM/ ϕ M) and one external modulation source supporting simultaneous two-signal modulation.

- AM + FM
- AM + ϕ M
- Internal 1 + Internal 2
- Internal + External

* FM + ϕ M does not support.



AM Setting Screen

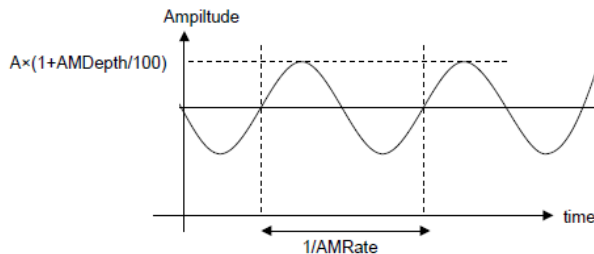
Frequency
1.000 000 000 00 GHz -20.00 dBm

SG1
1.000 000 000 00 GHz -144.00 dBm

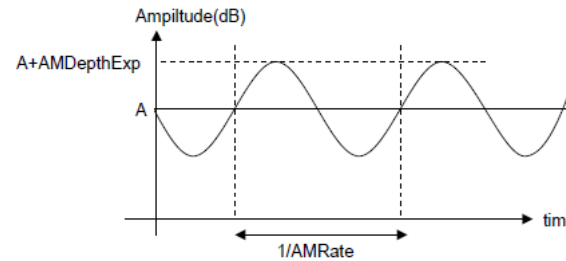
Modulation	State	Depth/Deviation	Source	Rate	Delay	Width
AM	On	10.0 %		1.0000 kHz		
FM	Off	1.0000 kHz		400.0 Hz		
φM	Off	0.000 rad		400.0 Hz		
Pulse	Off		Freerun	400.0 Hz	0.00000000 s	2.00 μs
Pulse 2	Off		Freerun	400.0 Hz	0.00000000 s	2.00 μs

AM Settings:
 AM: On
 AM Depth Scale: Lin
 AM Depth (Lin): 10.0 %
 AM Depth (Log): 3.00 dB
 AM Rate: 1.0000 kHz

AM Setting Screen



AM Image (Lin)



AM Image (Log)

FM/φM Setting Screen

MG3710A Vector Signal Generator

SG2 Frequency: 1.000 000 000 00 GHz, Amplitude: -20.00 dBm

SG1 Frequency: 1.000 000 000 00 GHz, Amplitude: -144.00 dBm

SG2 Modulation: FM Rate: 10.000 0 kHz, Increment: 100.0 Hz

Modulation	State	Depth/Deviation	Source	Rate	Delay	Width
AM	Off	10.0 %		1.0000 kHz		
FM	On	1.0000 kHz		10.0000 kHz		
φM	Off	0.000 rad		400.0 Hz		
Pulse	Off		Freerun	400.0 Hz	0.00000000 s	2.00 μs
Pulse 2	Off		Freerun	400.0 Hz	0.00000000 s	2.00 μs

ARB: Off, CW: Off, Power Meter: A: Off, B: Off, BER: Stop, 0.000E+000, 0 %

2/19/2012 09:42:49

Select FM On/Off

FM Deviation:

Range: 0 Hz to 40 MHz or (50 MHz-FM Rate)
Resolution: 0.1 Hz

FM Rate:

Range: 0.1 Hz to 40 MHz or (50 MHz-FM Deviation)
Resolution: 0.1 Hz

Select φM On/Off

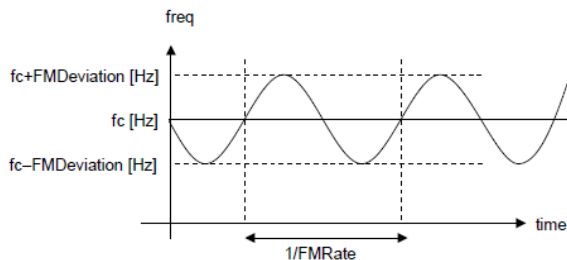
φM Deviation:

Range: 0 to 160 rad
or (40 MHz/φM Rate) rad
Resolution: 0.1 Hz

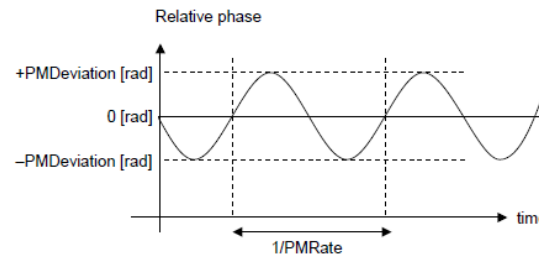
φM Rate:

Range: 0.1 Hz to 40 MHz
or (40 MHz/φM Deviation)
Resolution: 0.1 Hz

FM/φM Setting Screen

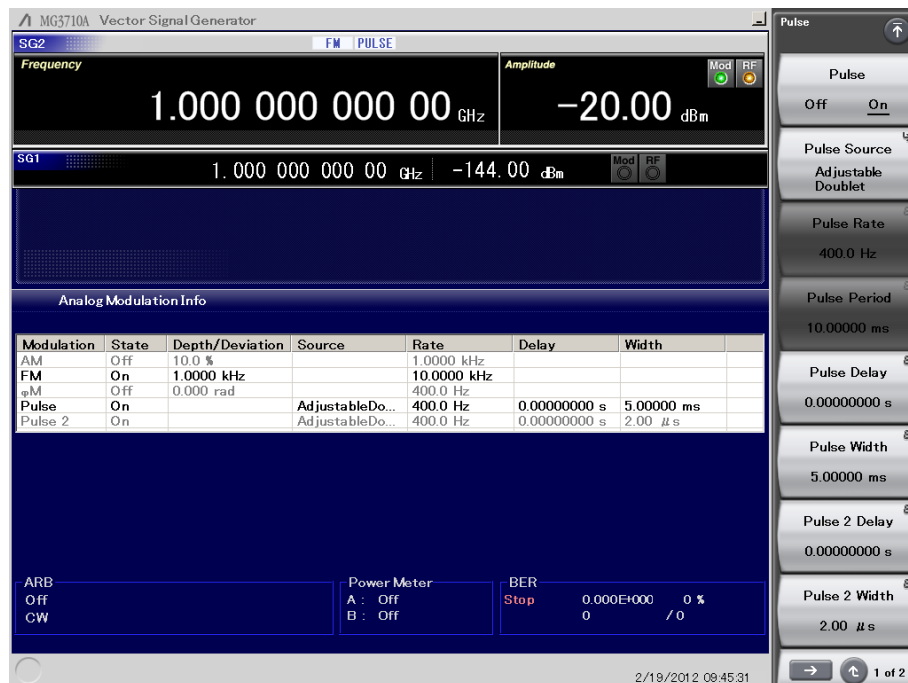


FM Image



φM Image

PM Setting Screen



Select PM On/Off

Pulse Source:

(See next slide.)

Pulse Rate:

Range: 0.1 Hz to 10 MHz
Resolution: 0.1 Hz

Pulse Period:

Range: 10 ns to 20 s
Resolution: 10 ns

Pulse Delay from trigger:

Range: 0 to 20s – Pulse Width
Resolution: 10 ns

Pulse Width:

Range: 10 ns to Pulse Period*1
10 ns to 20 s – Pulse Delay*2
Resolution: 10 ns

Delay time from first to second Pulse:
Pulse 2 Delay

Range: 0s to 20s – Pulse 2 Width – Pulse Delay
Resolution: 10ns

Second pulse width: Pulse 2 Width

Range: 10 ns to 20 s – Pulse 2 Delay – Pulse Delay
Resolution: 10 ns

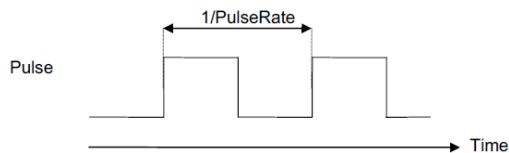
*1: When Pulse Source is [Free run] or [Gated]

*2: When Pulse Source is [Triggered], [Adjustable], [Doublet] or [Trigger Doublet].

PM: Pulse Source

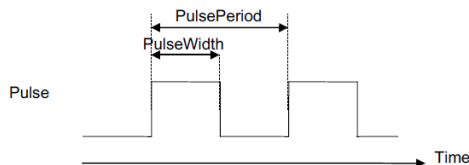
Square

Internal freerun pulse string with 50% of duty cycle.
The period is set with Pulse Rate.



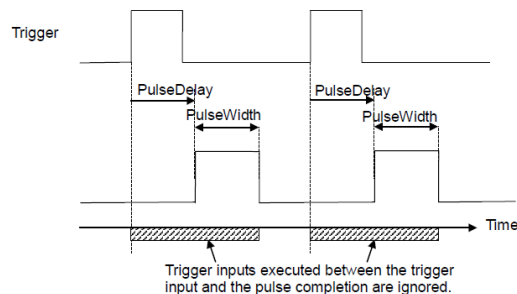
Freerun

Internal freerun pulse string (Default)
The period and pulse width are set with Pulse Period and Pulse Width.



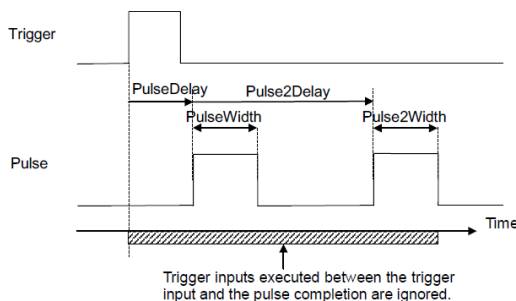
Triggered

Generates the pulse in synchronization with the trigger event.
The delay time after the trigger event and pulse width are set with Pulse Delay and Pulse Width.



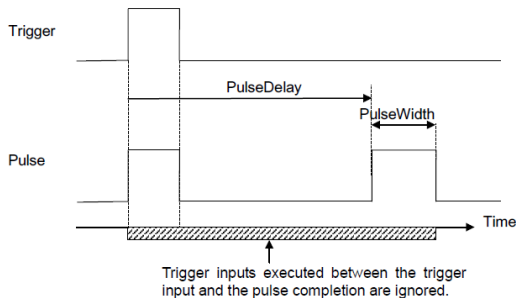
Adjustable Doublet

Generates two pulses in synchronization with the trigger event.
The delay time after the trigger event and pulse width are set with Pulse Delay and Pulse 2 Delay, and Pulse Width and Pulse 2 Width. The second pulse delay is based on the first pulse rise.



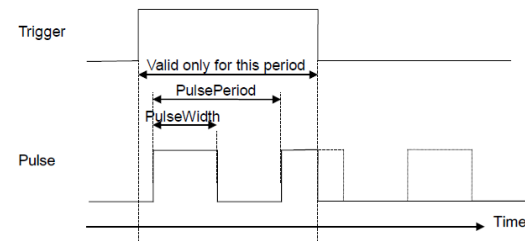
Trigger Doublet

Generates two pulses in synchronization with the trigger event.
The delay time after the trigger event and pulse width are set with Pulse Delay and Pulse Width. The first pulse synchronizes with the external trigger signal. The second pulse delay is based on the first pulse rise.



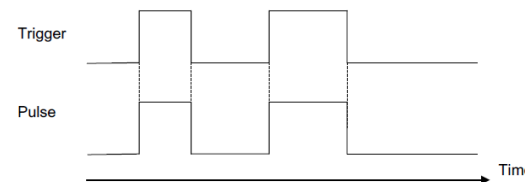
Gated

Generates the internal pulse string. However, pulses are valid only when the trigger is being input.
The period and pulse width are set with Pulse Period and Pulse Width.



Ext Pulse

Generates the pulse signal in synchronization with the external trigger signal.



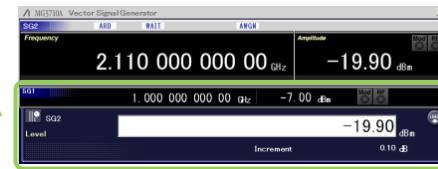
Simple Touch-Panel Operation

Touching the easy-to-use GUI with hierarchical menus fetches related function and numeric input keys for simple fast settings.

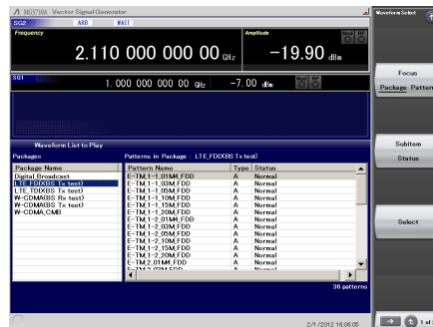
For Modulation (Mode) Screen



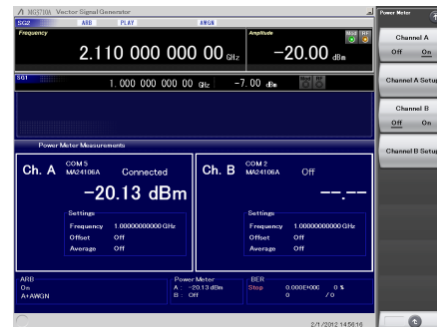
Frequency Setting



Level Setting



Waveform pattern Selection Screen



Power Meter Function Screen



BER Function Screen

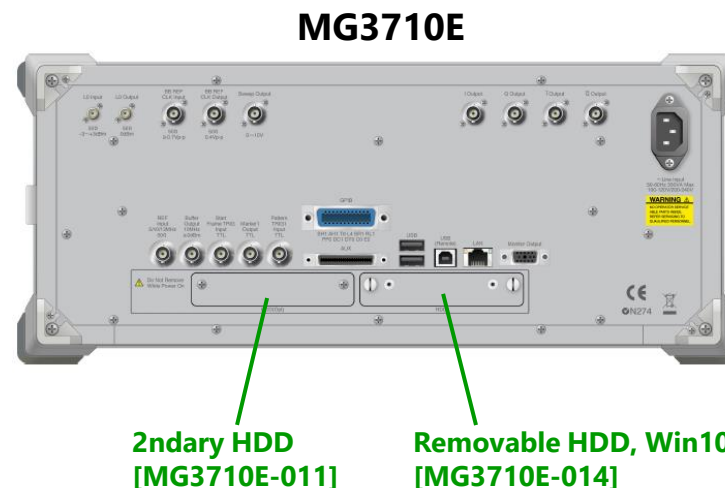
2ndaryHDD [MG3710E-011]

This removable 2ndary HDD is installed in the HDD Option Slot of the G3710E main unit to expand the user data storage space. It does not have the Windows OS installed.

It is useful when taking the instrument for calibration but the security of saved user data, such as measurement results, must be protected.

Removable HDD, Win10 [MG3710E-014]

This additional user-changeable hard disk contains the same Windows OS and programs as the factory installed system HDD. It supports a Windows 10 install for one specific MG3710E and is for use during service repair and calibration.



CPU/Windows10 Upgrade Retrofit [MG3710E-182/282]

The standard OS in MG3710E units ordered until August 2020 is Windows 7. The OS of these MG3710E units can be upgraded to Window 10 using MG3710E-182.

Note: The standard OS in MG3710E units shipped after September 2020 is Windows 10.

GPIB

Conforms to IEEE488.1/IEEE488.2 standard
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0, E2

Ethernet

Conforms to VXI-11 protocol using TCP/IP
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0

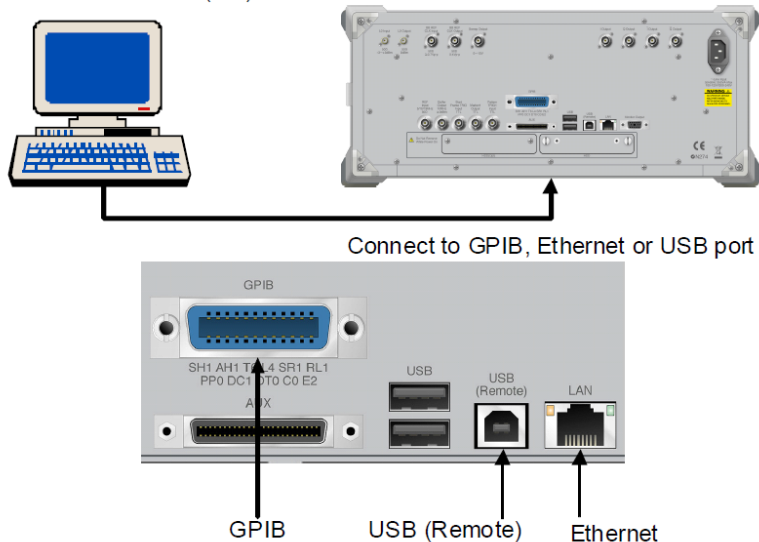
USB

Conforms to USBTMC-USB488 protocol
SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C0n

The MG3710E has GPIB, Ethernet and USB interfaces as standard. The following functions are supported via these interfaces:

- Control of all functions, except power switch
- Reading of all status conditions and settings
- Interrupts and serial polls

External controller (PC)



The interface to be used is determined automatically according to the communication start command received from the external controller (PC) while in Local status. It enters Remote status when the interface is determined. "Remote" on the front panel goes off in the Local status and lights up in the Remote status.

To change the interface, the MG3710E must enter Local status again. Press "Local" on the front panel to enter Local status, then send a command via the desired interface.

Vector Signal Generator MG3710E

Waveform Generation Software

IQproducer Introduction

Some of these functions require a separate charged license.

IQproducer (1/11)

IQproducer Functions

IQproducer is PC software for generating waveform patterns mainly for the MG3710E. There are four types. Some require a paid option license (license in below []).

For the waveform pattern generation function (**black**), refer to the IQproducer brochure and each Product Introduction.

This explains IQproducer basic functions (**blue**).

Cellular

5G NR FDD	[MX370114A]
5G NR TDD	[MX370113A]
LTE FDD	[MX370108A]
LTE-Advanced FDD Option	[MX370108A-001]
LTE TDD	[MX370110A]
LTE-Advanced FDD Option	[MX370110A-001]
HADPA/HSUPA DL/UL	[MX370101A]
TD-SCDMA	[MX370112A]
W-CDMA DL/UL	
1xEV-DO FWD/RVS	[MX370103A]

Non-Cellular

WLAN	[MX370111A]
802.11ac (160 MHz) Option	[MX370111A-001]
DVB-T/H	[MX370106A]

General Purpose

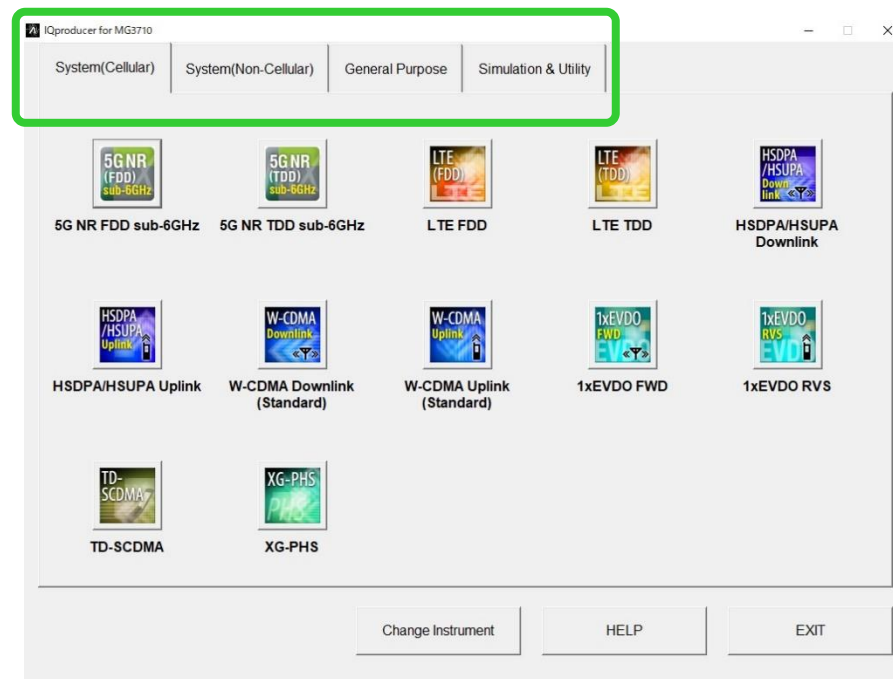
TDMA	[MX370102A]
Multi-Carrier	[MX370104A]
Fading	[MX370107A]

Convert
Clipping

AWGN

Simulation & Utility

CCDF, FFT, Time Domain
Transfer & Setting Panel/Wizard



Convert function

This function converts waveform patterns for the MG3710E based on three types of data files.

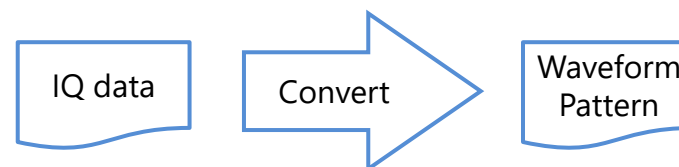
The waveform pattern bit width can be selected as 14, 15, or 16 bits.

Bit Width	Specifiable RMS Value Range	Usable Marker Signals
14 bit	1 to 8191	Marker 1 to 3, RF Gate
15 bit	1 to 16383	Marker 1, RF Gate
16 bit	1 to 32767	None

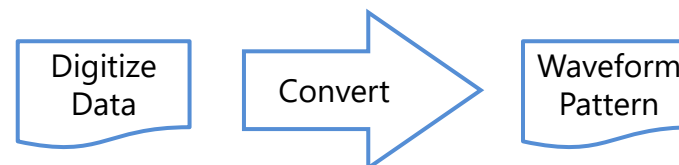
The specifiable bit widths differ for each conversion file format as follows.

Input File Format	Selectable Bit Width
ASCII1	14/15/16 bit
ASCII2	15/16 bit
ASCII3	14/15 bit
MS269x/MS2830A Digitizer	14/15/16 bit
MG3710/MS269x/MS2830A (to MG3700)	14 bit
MG3700/MS269x/MS2830A (to MG3710)	14 bit
MG3710/MG3700A/MS2830A (to MS269x)	14 bit
MG3710/MG3700A/MS269x (to MS2830A)	14 bit

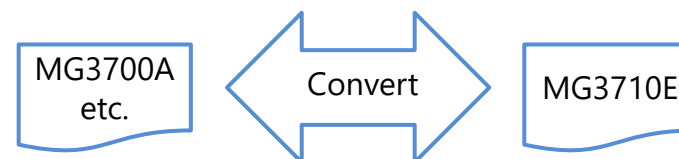
(1) ASCII-format IQ data created by other general-purpose EDA [Electronic Design Automation] tools, such as MATLAB, can be converted into MG3700A waveform pattern files.



(2) Data files captured with Anritsu Signal Analyzer MS269xA and the capture function of the Signal Analyzer MS2830A can be converted to waveform pattern files used by the MG3710E.



(3) Waveform patterns created by other Anritsu vector signal generators (MG3700A, MS269xA-020, MS2830A-020/021) can be converted to waveform pattern files used by the MG3710E and *vice versa*.



Convert Function

Input file selection

Sampling rate

Range: 20 kHz to 160 MHz

File format

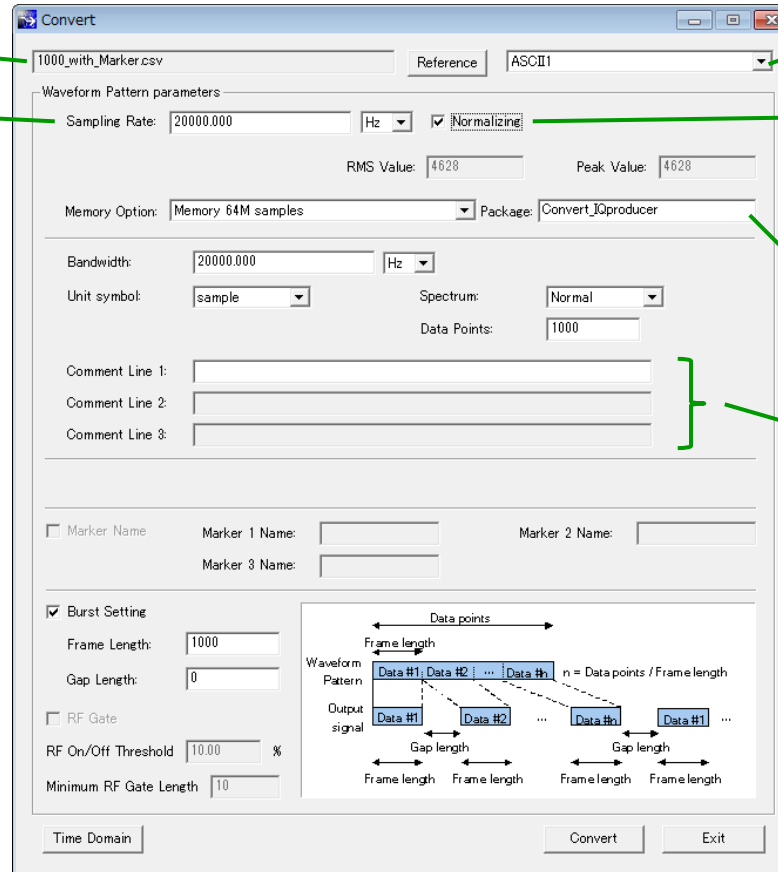
(See previous slide.)

Normalizing

Sets amplitude value for converting waveform pattern to RMS (Root Mean Square), which is a standard waveform pattern used for MG3710E.

Package name

Comment



Convert Setting Screen

Convert Function: ASCII 1, 2, 3 format

The followings are descriptions of each format (ASCII1, ASCII2, ASCII3) that can be entered in Convert.

ASCII 1

The ASCII 1 format is composed of a file of waveform patterns before conversion. One line indicates one piece of data. The data is separated by commas in the order of I-phase data, Q-phase data, Marker 1, Marker 2, Marker 3 and RF Gate. "0" or "1" must be specified for Marker 1~3 and RF Gate. Marker 1~3 and RF Gate can be omitted. In this case, however, Marker1~3 is regarded as "0" (LO level), and RF Gate (RF output On) as "1". Also, a line that does not begin with numbers, "+" and "-" is disregarded as a comment line. I-phase data and Q-phase data is decimally described or described with exponents using an "e" or "E", such as "2.0E+3".

```
// IQ Data
Comment Line
-0.214178, -0.984242
-0.187286, -1.245890
-0.073896, -1.368888
0.091758, -1.316199
-0.073896, -1.368888,1 # Marker1=1
0.091758, -1.316199,0,1 # Marker2=1
0.248275, -1.089333,0,0,1 # Marker3=2
0.331432, -0.729580,0,0,0 # RF output=Off
0.331432, -0.729580,0,0,1 # Marker1=0, RF output=On
```

ASCII 2

The ASCII 2 format is composed of two files of I-phase data and Q-phase data excluding a Marker data file from ASCII 3. While this format is used, Marker 1~3=0 and RF Gate=1 are specified. Also, Marker output is all "0" and pulse modulation is not used. Therefore, RF output is On in all sample waveform patterns. I-phase data and Q-phase data is decimally described or described with exponents using an "e" or "E", such as "2.0E+3".

ASCII 3

The ASCII 3 format is composed of three files of waveform patterns before conversion. I-phase data, Q-phase data and "Marker 1 to 3 & RF Gate" is divided into three separate files. Marker 1~3 and RF Gate can specify "0" and "1" only. Marker 1 to 3 and RF Gate can be omitted. In this case, however, Marker1 to 3 is regarded as "0", and RF Gate as "1". Also, I-phase data, Q-phase data and Marker 1 to 3 & RF Gate data is combined among the same line numbers in each file where line feeds are inserted by <cr> <lf>. If a comment line is added to the head of any file, the number of lines in the other files must be conformed accordingly by adding a comment line or , <cr> <lf> to the head of the file. An error occurs unless the number of lines is conformed between I-phase data and Q-phase data. Even if Marker 1 to 3 & RF Gate data exists in a line that does not include I-phase data and Q-phase data, the line is regarded as having no data. A data line of the other file, allocated to a line corresponding to the comment line of one file, is disregarded. Also, a line that does not begin with numbers, "+" and "-" is disregarded as a comment line. I-phase data and Q-phase data is decimally described or described with exponents using an "e" or "E", such as "2.0E+3".

File 1 (I-phase data)

```
// I Data
Comment Line
-0.214178
-0.187286
-0.073896
0.091758
0.248275
0.331432
...
```

File 2 (Q-phase data)

```
// Q Data # The number of
lines must be conformed
accordingly because two
comment lines are added in
I-phase data.
<cr> <lf>
-0.984242
-1.245890
-1.368888
-1.316199
-1.089333
-0.729580
```

File 3 (Marker data)

```
<cr> <lf>
<cr> <lf>
<cr> <lf>
# Marker1 to 3=0 and RF
Gate=1 are specified for the
3rd and 4th lines.
<cr> <lf>
1 # Corresponds to the 5th
line data of I-phase and Q-
phase data.
0,1
0,0,1
1,0,0,1
...
```

Clipping function

This function performs clipping for a waveform pattern generated by each signal generation application. Filter, bandwidth, and number of repetitions are set to generate a clipped waveform pattern.

Clipping is used when restricting the input signal peak, such as at amplifier evaluation.

In addition, it can also be used to filter unwanted signals at the adjacent channel for Rx test interference patterns.

Input File
Selects waveform pattern for clipping

Threshold Level
Level for clipping
Setting Range: 0 to 20 dB
Resolution: 0.1 dB

Filter Type
Ideal,
None,
Nyquist,
Root Nyquist,
Gaussian

Bandwidth
Setting Range: Sampling Rate/1000 or 0.001
~ Sampling Rate

Roll Off/BT
(Enabled for Nyquist, Root Nyquist, Gaussian)
Setting Range: 0.10 to 1.00
Resolution: 0.01

Repetition
Repeat count for clipping and filtering
Setting Range: 1 to 20
Resolution: 1

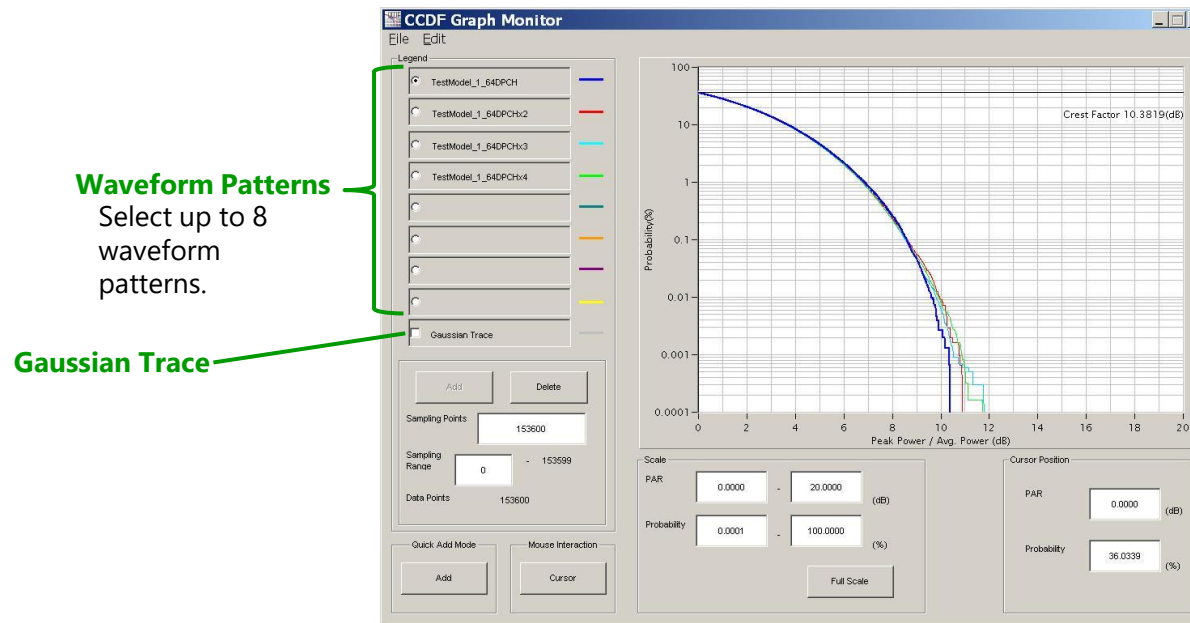
Clipping Setting Screen

The screenshot shows a software window titled "Clipping" with a menu bar (File, Transfer Setting, Simulation, Edit) and a toolbar. The "Input File" field contains "TestModel_1_64DPCH.wvi" and a "Reference" button. The "Clipping Setting" section includes a "Threshold Level" field set to "10.0 [dB]" and a "Repetition" dropdown menu set to "10". The "Filter Setting" section includes a "Filter Type" dropdown menu set to "Ideal", a "Bandwidth" field set to "3.84000000 [MHz]", and a "Roll Off/BT" field set to "0.50".

CCDF Function

The Complementary Cumulative Distribution Function (CCDF) of a waveform pattern generated by a signal generation application can be displayed.

In a CCDF graph, the signal peak/average power is displayed on the x-axis, and the cumulative probability that the signal peak/average power is equal to or less than the value on the x-axis is displayed on the y-axis. As a result, the distribution of peak powers of various modulation signals are displayed on the screen. This is convenient for estimating the output waveform distortion characteristics when a generated signal is input from the MG3710E to a power amplifier or other devices.



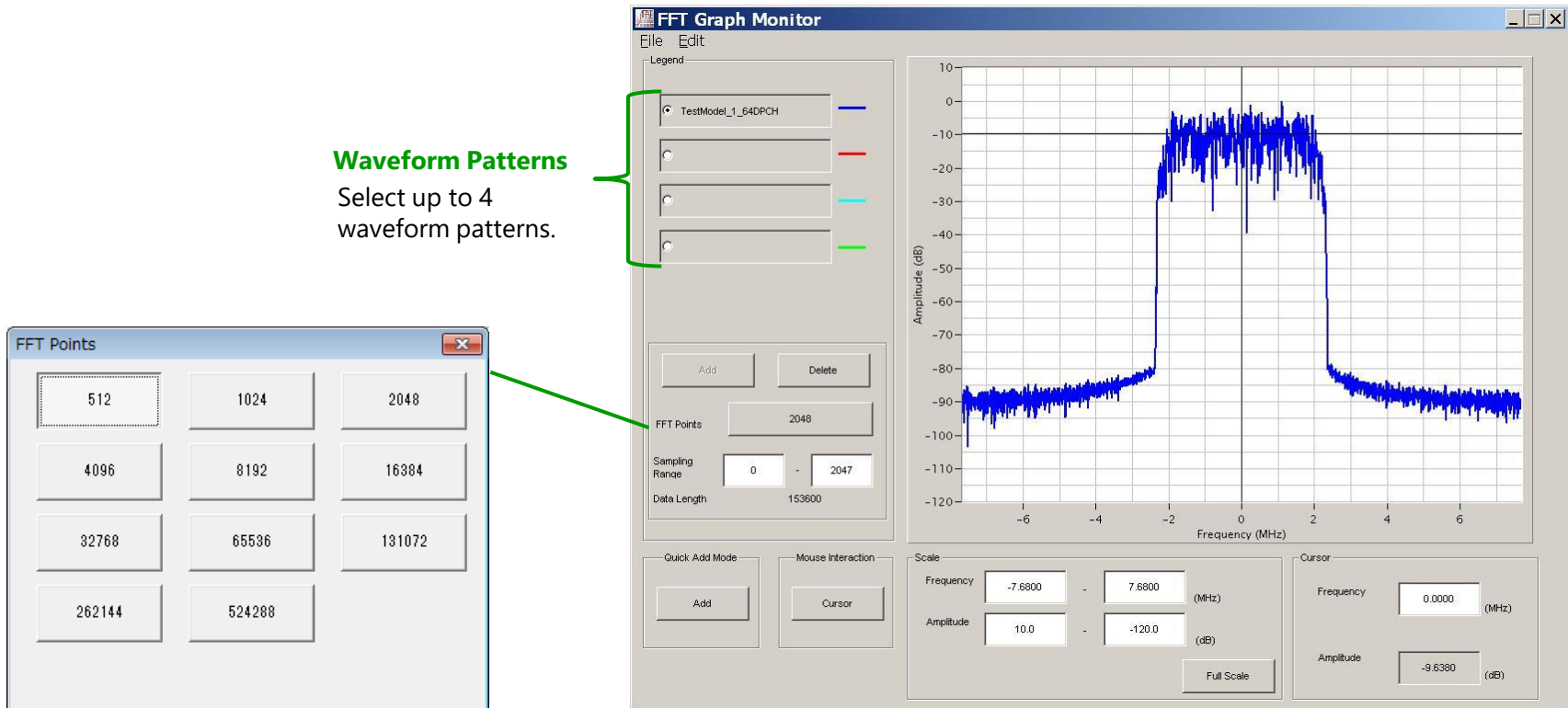
Waveform Patterns
Select up to 8
waveform
patterns.

Gaussian Trace

CCDF Screen

FFT Function

The Fast Fourier Transform (FFT) of the waveform pattern are displayed as a graph using the Blackman-Harris window function.

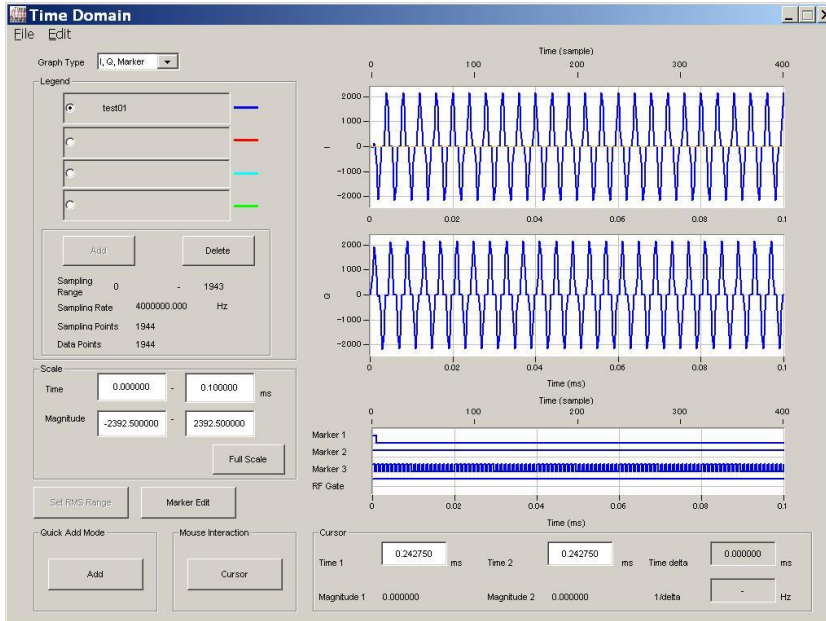


FFT Screen

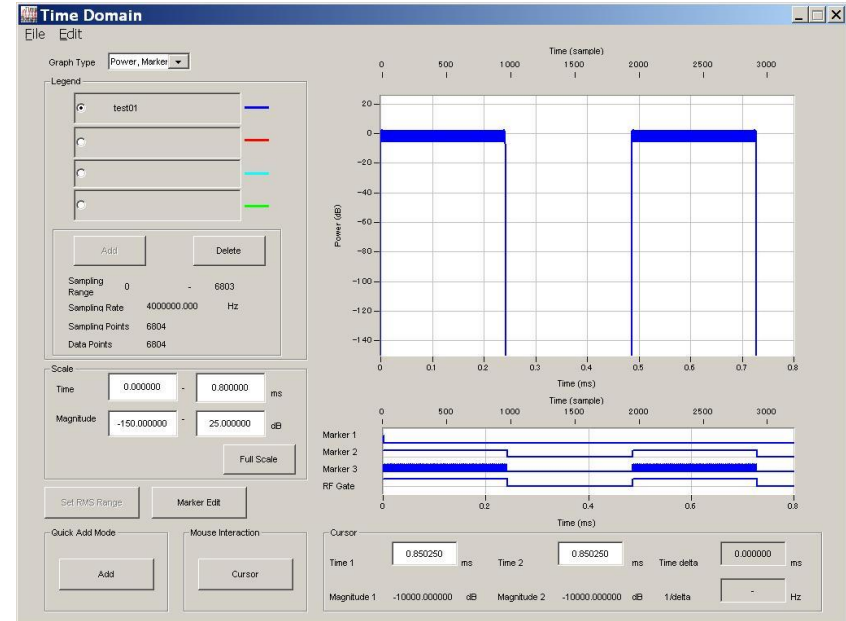
Time Domain Function

The waveform pattern generated by each signal generation application is displayed as a time domain graph.

When “I, Q, Marker” is selected from the Graph Type drop-down, the time domain waveform of the I-phase, Q-phase, and marker data of the selected waveform pattern are displayed. When “Power, Marker” is selected, the time domain waveform of the marker data and the power based on the rms value (in the wvi file) of the selected waveform pattern are displayed.



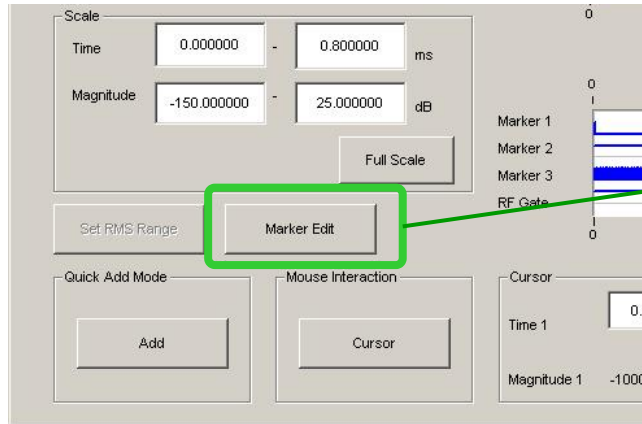
**Time Domain Screen
Graph Type: I,Q, Marker**



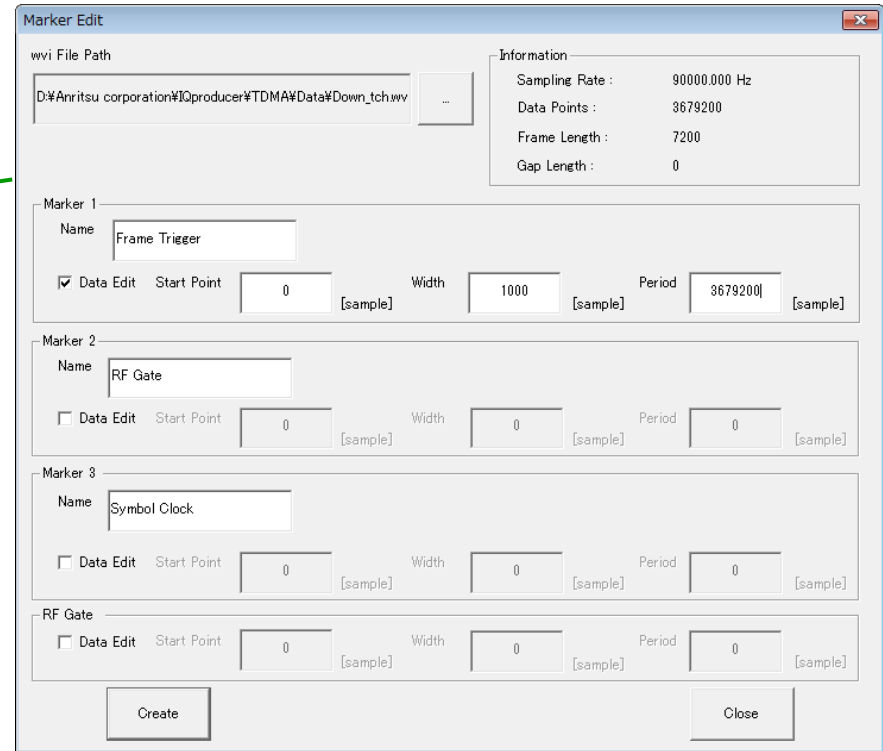
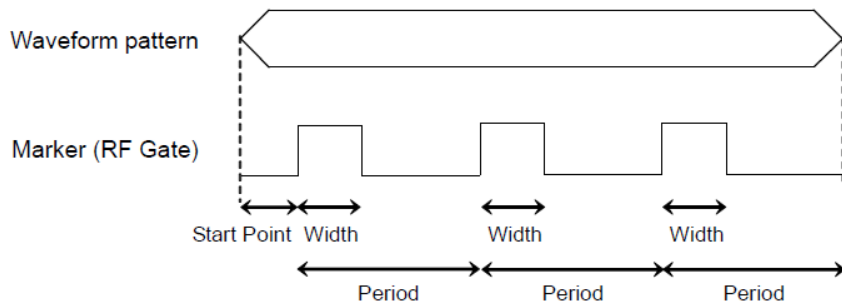
**Time Domain Screen
Graph Type: Power, Marker**

Time Domain: Marker Edit

A new waveform pattern can be created by reading an existing waveform pattern and editing the marker data and name using this function.



Time Domain screen



Marker Edit Screen

Transfer & Setting Function

When changing the MG3710E network setting to DHCP Off and connecting the MG3710E and PC using a LAN crossover cable, restart the MG3710E after changing the network setting before connecting the LAN cable.

PC



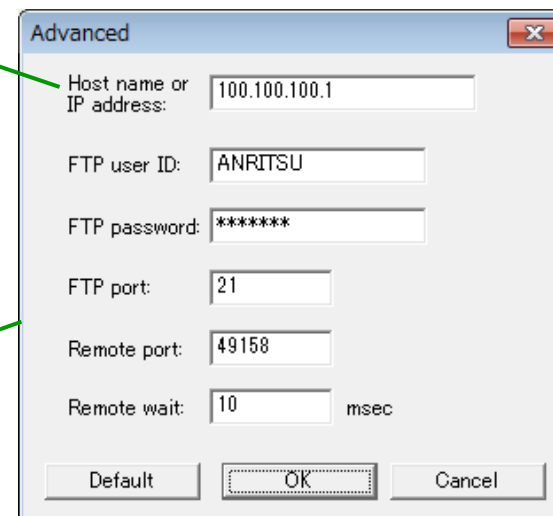
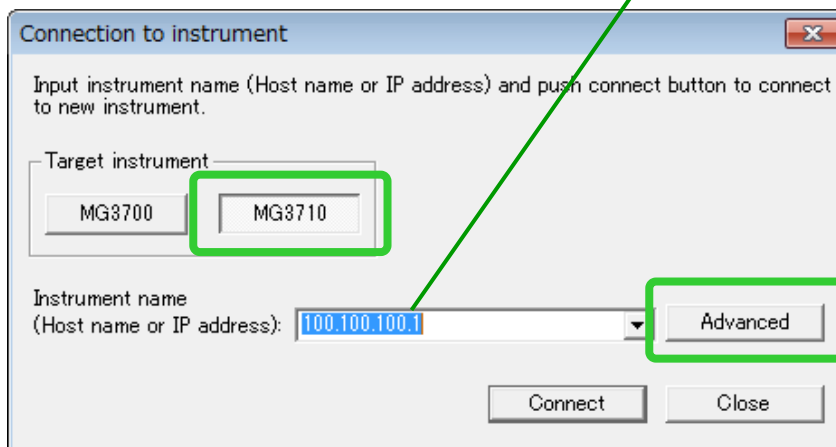
LAN Crossover Cable



MG3710E



Input MG3710E IP address.



Transfer & Setting: Operation

The screenshot shows the 'Transfer & Setting Panel' window. The interface is divided into two main sections: 'PC side' and 'MG3710E side'. The 'PC side' contains a file tree with various folders like '1xEVDO_FWD', 'AWGN', 'LTE', etc. The 'MG3710E side' contains a file tree with folders like 'Bluetooth', 'CDMA2000', 'GSM', 'LTE-FDD', etc. The top toolbar includes several icons: a connection icon (labeled 'Connects/Dis connects'), a delete icon (labeled 'Deletes file'), a transfer icon (labeled 'Transfers file'), a license key icon (labeled 'Installs license key'), a waveform memory icon (labeled 'Loads and clears waveform pattern in waveform memory'), and a play icon (labeled 'Starts waveform pattern output'). The status bar at the bottom shows system information for the connected device: '100.100.100.1 HDD:81,865,436KB/103,811,996KB MemA:4,294,889,520B/4,294,967,296B MemB:4,294,967,296B/4,294,967,296B'.

Connects/Dis connects

Deletes file

Transfers file

Installs license key

Loads and clears waveform pattern in waveform memory

Starts waveform pattern output

PC side

MG3710E side

Ready | 100.100.100.1 HDD:81,865,436KB/103,811,996KB MemA:4,294,889,520B/4,294,967,296B MemB:4,294,967,296B/4,294,967,296B

Vector Signal Generator MG3710E

Waveform Generation Software

Waveform Patterns Introduction

These functions require a separate charged license.

Waveform Patterns (charged license) (1/3)

Functions

Each category contains multiple waveform pattern files each with preset parameters for each system.

Each waveform pattern is used to evaluate the Rx sensitivity, interference wave resistance, etc., of the wireless equipment.

Installing waveform patterns in the MG3710E instantly outputs signals matching each standard.

To learn more, refer to the Waveform Patterns brochure and each Product Introduction.

Cellular

Interference Signal for 5G UE Receiver Test [MX371055A] (3GPP)

Interference Signal for LTE UE Receiver Test [MX371054A] (3GPP)

Non-Cellular

DFS Radar Pattern [MX370073B] (FCC/Japan MIC)

DFS (ETSI) Waveform Pattern [MX370075A] (ETSI)



Instant output of signals
matching each standard

Waveform Patterns (charged license) (2/3)

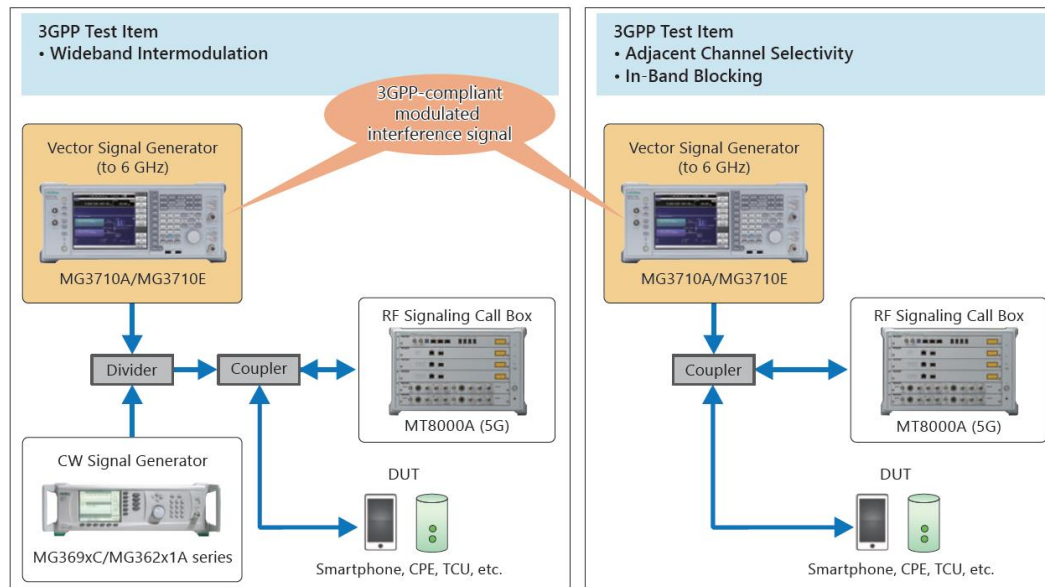
Interference Signals for 5G/LTE User Equipment (UE) Receiver Tests

■ Interference Waveform Pattern for 5G NR Receiver Test MX371055A

■ Interference Waveform Pattern for LTE Receiver Test MX371054A

- Modulated interference waveform patterns for 3GPP Rx tests
- Supports wide range of UE/module test items when combining RF Signaling Call Box*.
- Uses same waveform patterns as Anritsu RF Conformance Test System
- Standards: 3GPP TS 38.521-1V17(5G), 3GPP TS 36.521-1V16(LTE)
- Test Items: Adjacent Channel Selectivity, In-band blocking, Wide band Intermodulation

Measurement Setup (Outline)



*Radio Communication Test Station
MT8000A, Radio Communication
Analyzer MT8821C, etc.

Waveform Patterns (charged license) (3/3)

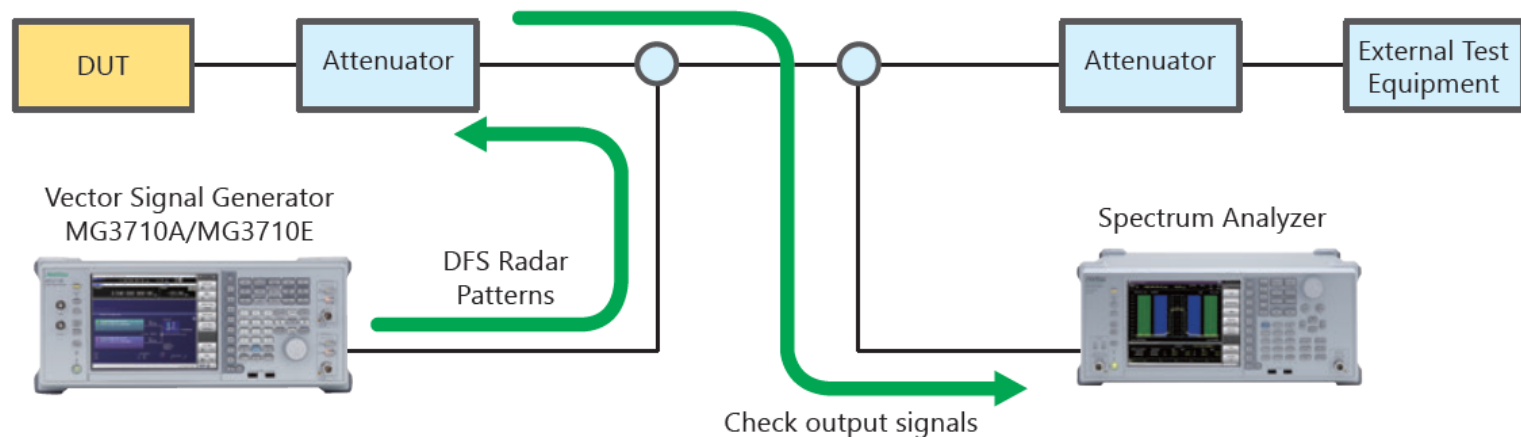
DFS Test Signals for 5-GHz band WLAN Devices

- **DFS Radar Pattern** **MX370073B** (for FCC/Japan MIC)
- **DFS (ETSI) Waveform Pattern** **MX370075A** (for ETSI)

- Test signals for evaluating DFS function of 5-GHz band WLAN devices
- Test signals simulate actual 5-GHz band radar signals combining complex pulse, chirp and hopping signal conditions for easy output of DFS test signals by installing patterns in MG3710E
- Eliminates need for external PC controller
- Standards: FCC06-96, FCC13-22, Japan MIC (Reference: TELEC-T403)*, ETSI EN 301 893

*Supports 5.3-GHz band waveform patterns adopted by Japan MIC standard in July 2019

Measurement Setup (Outline)





Anritsu
Advancing beyond