

P25-Phase 2 Rx Test Solution

MG3710A

Vector Signal Generator

P25-Phase 2

Rx Test Solution

P25 Phase 2 Technical Specifications

Physical Layer Protocol Specification

TIA-102.BBAB (Jul 2009)

Transceiver Performance Recommendations

TIA-102.CCBA (Oct 2011)

Transceiver Measurement Methods

TIA-102.CCAA (Aug 2011)

Note: For details, refer to the TIA-102 standard.

Version 1.00

May 2014

Anritsu Corporation

[Anritsu] P25-Phase 2 Rx Test Solution

For Rx Evaluation

Output multi-signals with one unit!

Single

MG3710A
Vector Signal Generator



Single memory
in **one** RF port

Normal

Wanted Signal



Dual



Dual memory*
in one RF port

+ Opt-048

Wanted Signal +
Unwanted Signal (Mod)



Triple



Dual memory*
& **two** RF ports

+ Opt-062 (2.7 GHz)

Wanted Signal +
Unwanted Signal (Mod) +
Unwanted Signal (CW)



***Combination of Baseband Signal option:** (Two internal ARB memories)

Selects two waveform patterns per RF output for setting mutual frequency offset, level offset, delay time, etc., to output two signals from one RF port.

Frequency (recommended range: ± 60 MHz) and level (CN: ± 80 dB) can also be set at the screen.

[Anritsu] P25-Phase 2 Rx Test Solution

Note: For details, refer to the TIA-102 standard.

TIA-102		Receiver test items	Signal Generator		
CCAB	CCAA		Wanted Signal	Unwanted Signal	
3.1.4	2.1.4	Reference Sensitivity	STTP	---	---
3.1.5	2.1.5	Faded Reference Sensitivity	Faded STTP	---	---
3.1.6	2.1.6	Signal Delay Spread Capability	Faded STTP	Faded STTP	---
3.1.7	2.1.7	Adjacent Channel Rejection	STTP	SITP	---
			STTP	---	SITP
3.1.8	2.1.8	Co-channel Rejection	STTP	SITP	---
3.1.9	2.1.9	Spurious Response Rejection	STTP	---	FM
3.1.10	2.1.10	Intermodulation Rejection	STTP	SITP	CW
3.1.11	2.1.11	Signal Displacement Bandwidth	STTP	---	---
3.1.12	2.1.12	Audio Output Noise Ratio	STTP	---	---
3.1.13	2.1.13	Residual Audio Noise Ratio	STTP SSTP MUTE	---	---
3.1.14	2.1.14	Average Radiation Sensitivity	STTP	---	---
3.1.15	2.1.15	Acoustic Audio Output	STTP	---	---
3.1.16	2.1.16	Bit error Rate Floor	STTP	---	---
3.1.17	2.1.17	Blocking Rejection	STTP	---	CW

Faded STTP:
User can create Faded pattern by using Fading IQproducer(Optional).

FM:
User can output FM signal by using analog function of main frame.

CW:
User can output CW signal by using non-modulation mode of main frame.



MG3710A
Vector Signal Generator

One RF port

Single

Two RF ports

Dual

Dual or Triple

STTP: Standard Tone Test Pattern
SITP: Standard Interference Test Pattern
STP: Silence Test Pattern

[Anritsu] P25-Phase 2 Rx Test Solution

Note: For details, refer to the TIA-102 standard.

TIA-102.CCAA			Waveform for SG	
			Package	Pattern
1.6.1.1	Outbound Standard Tone Test Pattern	STTP	P25_Phase2_OB	Tone1031Hz
1.6.1.2	Alternate Outbound Standard Tone Test Pattern	STTP	P25_Phase2_IB	Tone1031Hz-Alt
1.6.2.1	Inbound Standard Tone Test Pattern, Channel 0	STTP		Tone1031Hz-0ch
1.6.2.2	Inbound Standard Tone Test Pattern, Channel 1	STTP		Tone1031Hz-1ch
1.6.2.3	Alternate Inbound Standard Tone Test Pattern, Channel 0	STTP		Tone1031Hz-0ch-Alt
1.6.2.3	Alternate Inbound Standard Tone Test Pattern, Channel 1	STTP		Tone1031Hz-1ch-Alt
1.6.3	Outbound Silence Test Pattern	STP	P25_Phase2_OB	Silence
1.6.3.1	Alternate Outbound Silence Test Pattern	STP		Silence-Alt
1.6.4.1	Inbound Silence Test Pattern, Channel 0	STP	P25_Phase2_IB	Silence-0ch
1.6.4.2	Inbound Silence Test Pattern, Channel 1	STP		Silence-1ch
1.6.4.3	Alternate Inbound Silence Test Pattern, Channel 0	STP		Silence-0ch-Alt
1.6.4.3	Alternate Inbound Silence Test Pattern, Channel 1	STP		Silence-1ch-Alt
1.6.5	Inbound Symmetrical Time Slot Test Pattern			Symmetrical-0ch
1.6.6	Outbound Calibration Test Pattern		P25_Phase2_OB	Calibration
1.6.7	Inbound Calibration Test Pattern, Channel 0		P25_Phase2_IB	Calibration-0ch
1.6.7	Inbound Calibration Test Pattern, Channel 1			Calibration-1ch
1.6.8	Standard Interference Test Pattern	SITP	(Both)	Interference
1.6.9	Inbound Low Deviation Test Pattern		P25_Phase2_IB	TxLowDeviation
1.6.10	Inbound High Deviation Test Pattern			TxHighDeviation

STTP: Standard Tone Test Pattern
 SITP: Standard Interference Test Pattern
 STP: Silence Test Pattern

TDMA IQproducer:

These patterns are uploaded in the Anritsu website. The user only [purchases a license \(TDMA IQproducer\)](#) and may omit work to create these patterns.

Receiver Performance Measurement Methods

Reference Sensitivity

Note: For details, refer to the TIA-102 standard.

Measures input level when **BER = 5%**



The Vector SG is supported as an MG2830A option.

The MS2830A is recommended when **only "Reference Sensitivity"** is included in the manufacturing Rx test.



Standard Tone Test Pattern

RF Signal (Static)



Expected Value: **BER of 5% when 360 ms or more (4320 bits)**

Limits:

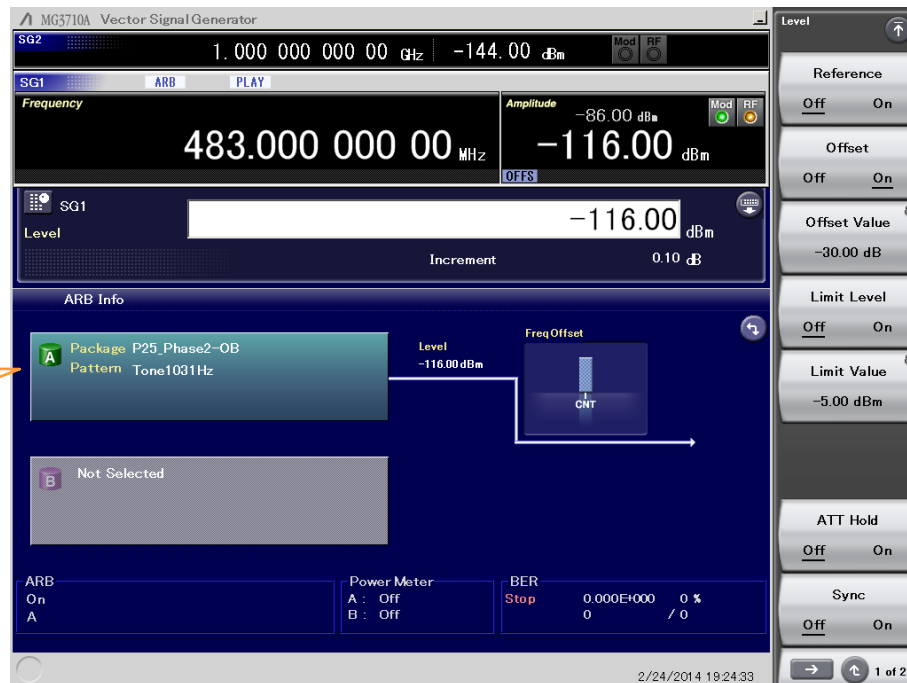
Radio Application	Mobile	Portable	Base Station
Class A	-116 dBm	-116 dBm	-116 dBm
Class B	-113 dBm	-113 dBm	-113 dBm

Receiver Performance Measurement Methods

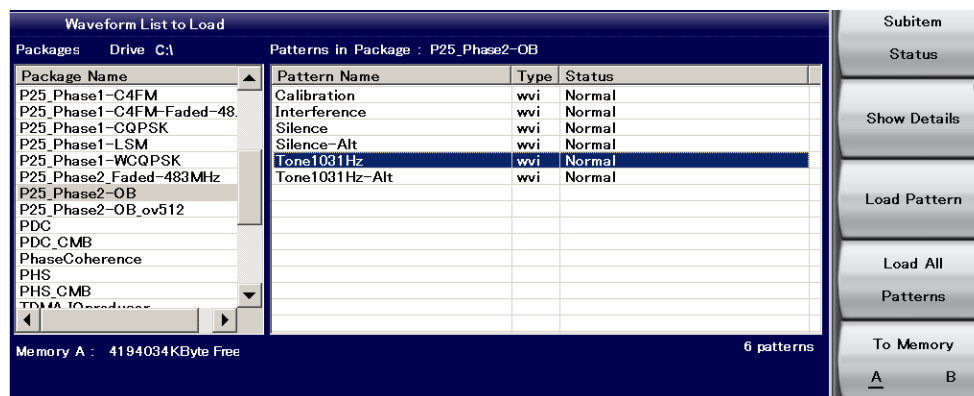
Reference Sensitivity



Wanted Signal
(Faded)



Choose P25 Phase2 signal
you want from the list.



Package Name	Pattern Name	Type	Status
P25_Phase1-C4FM	Calibration	wvi	Normal
P25_Phase1-C4FM-Faded-48.	Interference	wvi	Normal
P25_Phase1-CQPSK	Silence	wvi	Normal
P25_Phase1-LSM	Silence-Alt	wvi	Normal
P25_Phase1-WCQPSK	Tone1031Hz	wvi	Normal
P25_Phase2-Faded-483MHz	Tone1031Hz-Alt	wvi	Normal
P25_Phase2-OB			
P25_Phase2-OB_ov512			
PDC			
PDC.CMB			
PhaseCoherence			
PHS			
PHS.CMB			
TDMA-ICarduser			

Memory A : 4194034KByte Free 6 patterns

Measurement Methods Receiver Performance

Faded Reference Sensitivity

Note: For details, refer to the TIA-102 standard.

Measures input level when $BER = 5\%$.

Fading IQproducer:

“Fading (Flat/Rayleigh)”
pattern created by Fading
IQproducer.
This is supported only by
the MG3710A.



Faded
Standard Tone Test Pattern

RF Signal (Faded)

Fading conditions

- Single path
- Flat Rayleigh fading
- Doppler frequency 30 Hz



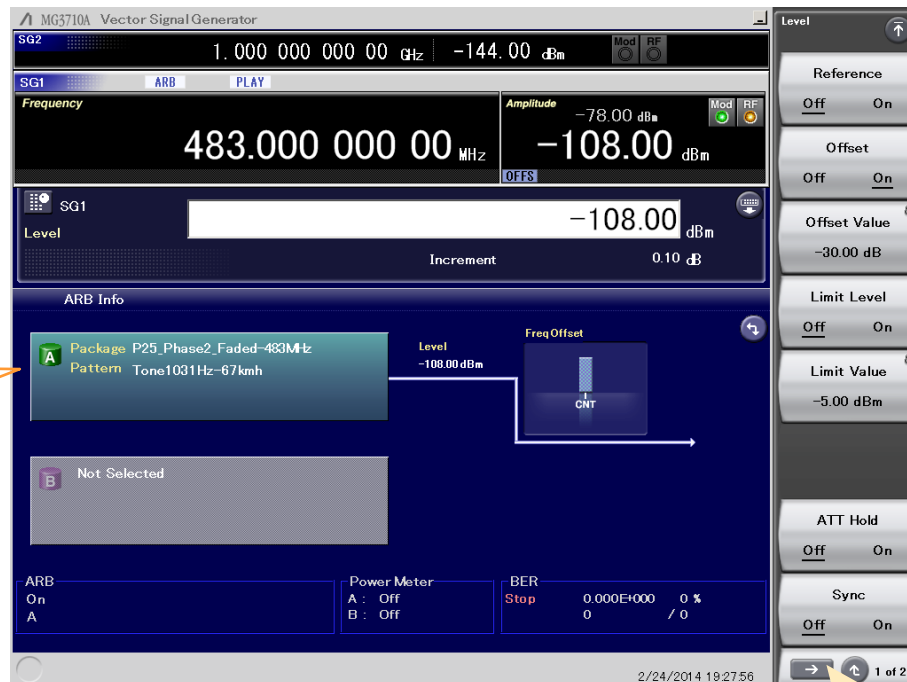
Expected Value: BER of 5% over time interval of ≥ 10 s (120,000 bits)

Limits:

Radio Application	Mobile	Portable	Base Station
Class A	-108 dBm	-108 dBm	-108 dBm
Class B	-108 dBm	-108 dBm	-108 dBm

Receiver Performance Measurement Methods

Faded Reference Sensitivity

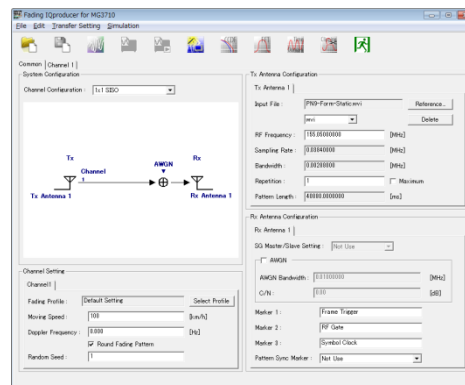


Wanted Signal
(Faded)

Load to Memory



User creates Fading pattern
using Fading IQproducer



Fading IQproducer:
“Fading (Flat/Rayleigh)”
pattern created by Fading
IQproducer.
This is supported only by
the MG3710A.

**Standard Tone
Test Pattern**

Load to
Fading IQproducer

Receiver Performance Measurement Methods

Signal Delay Spread Capability

Note: For details, refer to the TIA-102 standard.

Measures delay time between two paths when **BER = 5%**

Dual Memory:

One RF port has two memories. Two signals are output at one RF port. The Frequency, Level and Delay-Time can be set. This is supported only by the MG3710A.



Faded
Standard Tone Test Pattern

RF Signal (Faded) x 2
– 47 dBm

Faded
Standard Tone Test Pattern

Fading conditions

- Single path
- Flat Rayleigh fading
- Doppler frequency 30 Hz



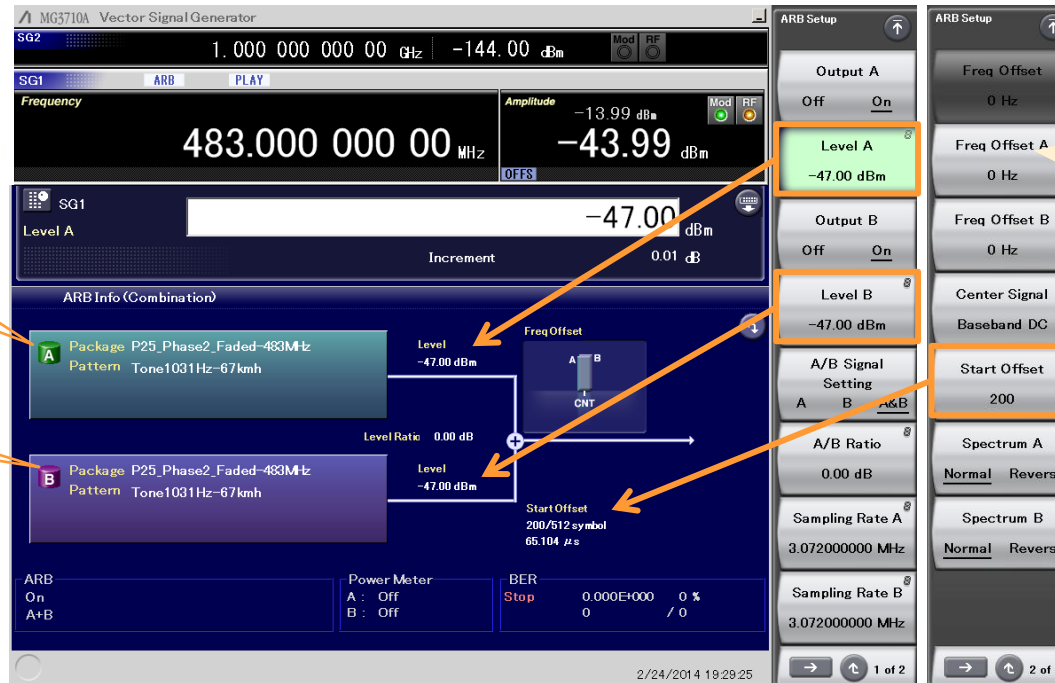
Expected Value: **BER of 5% over time interval ≥ 10 s (120,000 bits)**

Limits:

Modulation Type	Delay Spread
H-CPM	35 μ s
H-DQPSK	65 μ s

Receiver Performance Measurement Methods

Signal Delay Spread Capability

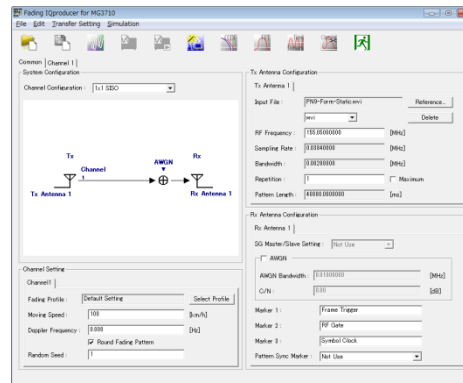


Wanted Signal
(Faded)

Delayed Signal
(Faded)

Load to Memory

User creates Fading pattern
using Fading IQproducer



Load to
Fading IQproducer

Merit of Dual Memory:

- Two signals of “Wanted signal” and “Unwanted signal” are output by one RF-port.
- Both Level and C/N set for each level
- Frequency offset set by direct input.

1 point = 0.326 μs
200 points = 65.1 μs
~~~~~  
Symbol Rate = 6000 sps  
Oversampling = 512

1 s/6000 symbols = 167 μs  
167 μs/512 = 0.326 μs

### Fading IQproducer:

“Fading (Flat/Rayleigh)”  
pattern created by Fading  
IQproducer.  
This is supported only by  
the MG3710A.

Standard Tone  
Test Pattern

# Receiver Performance Measurement Methods

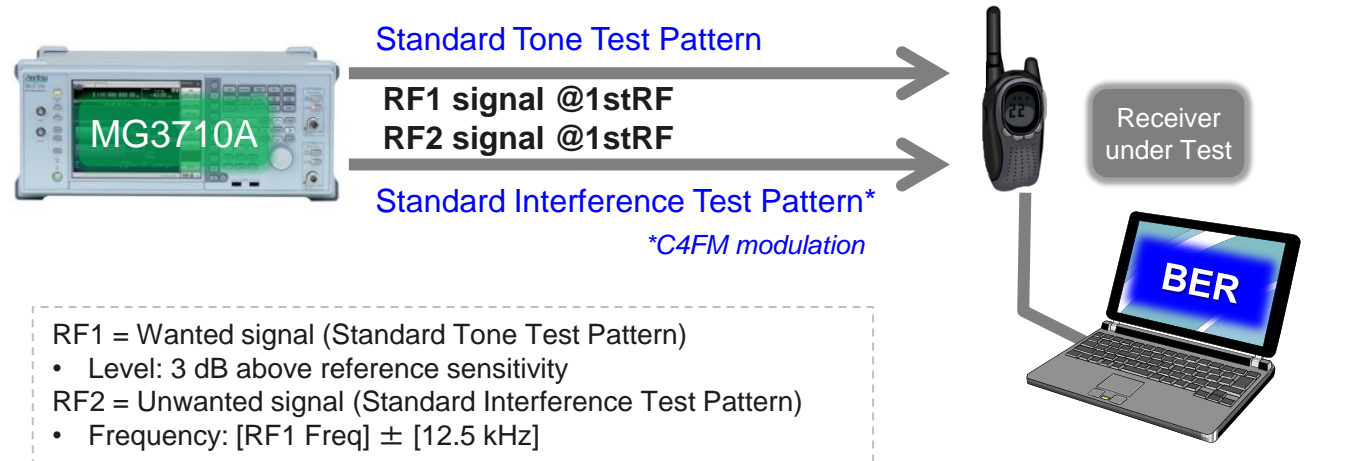
## Adjacent Channel Rejection

*Note: For details, refer to the TIA-102 standard.*

Measure the capability to reject an unwanted signal applied to **adjacent channels**.

### Dual Memory:

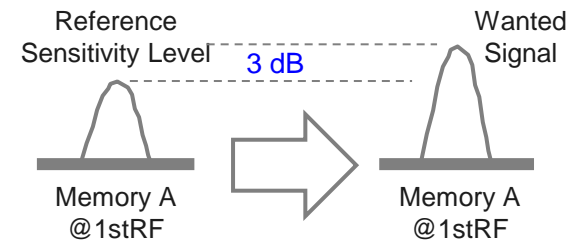
One RF port has two memories. Two signals are output at one RF port. The Frequency, Level and Delay-Time can be set. This is supported only by the MG3710A.



Expected Value: **BER of 5%**

Limits: Adjacent Channel Rejection Limits

| Radio Application | Mobile | Portable | Base Station |
|-------------------|--------|----------|--------------|
| Class A           | 60 dB  | 60 dB    | 60 dB        |
| Class B           | 50 dB  | 50 dB    | 50 dB        |



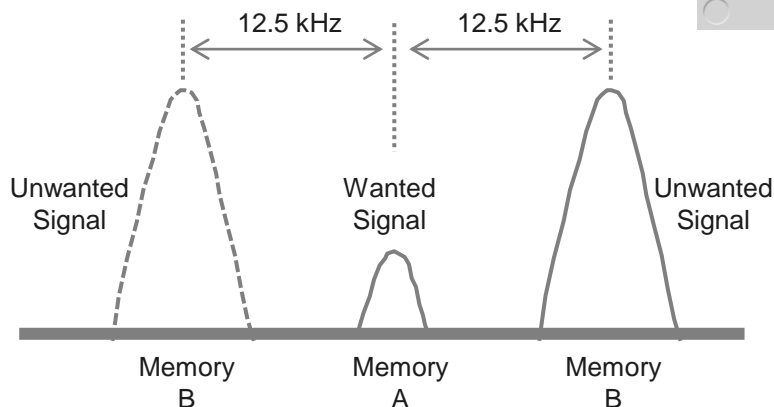
# Receiver Performance Measurement Methods

## Adjacent Channel Rejection



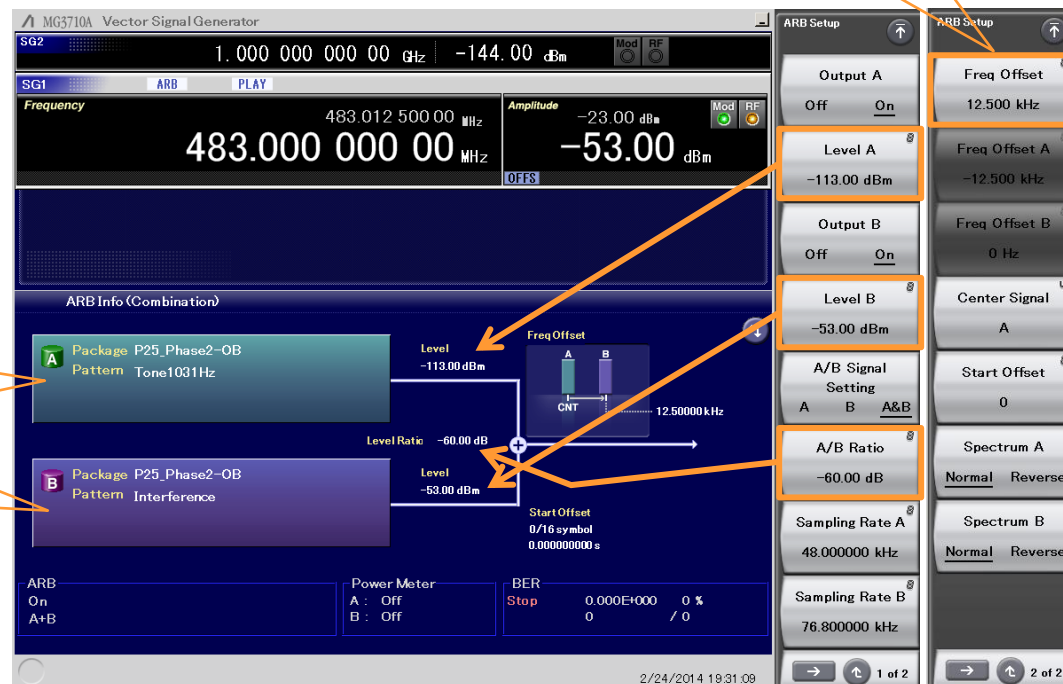
### Merit of Dual Memory:

- Two signals of "Wanted signal" and "Unwanted signal" are output by one RF-port.
- Both Level and C/N set for each level
- Frequency offset set by direct input.



Wanted Signal

Unwanted Signal

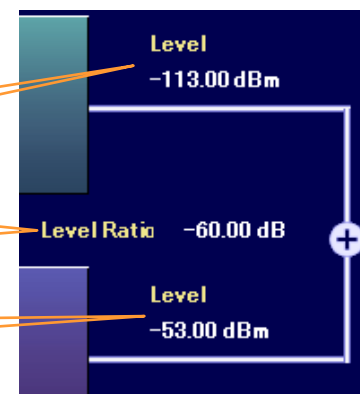


Frequency Offset

Wanted Signal Level

Wanted/Unwanted Level Ratio

Unwanted Signal Level



# Receiver Performance Measurement Methods

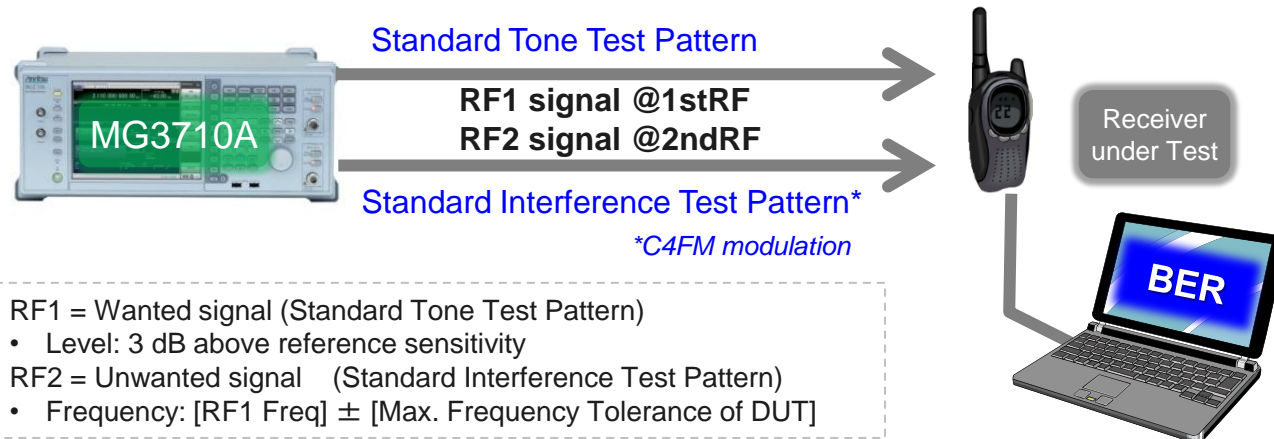
## Digital Offset Adjacent Channel Rejection

*Note: For details, refer to the TIA-102 standard.*

Measures capability to reject unwanted signal applied to **adjacent channels**

### Dual Memory:

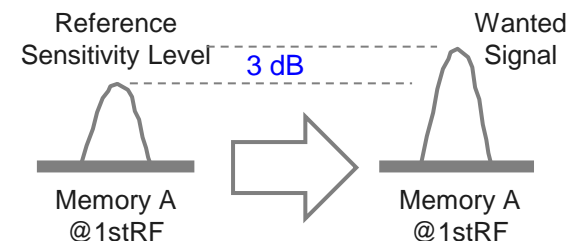
One RF port has two memories. Two signals are output at one RF port. The Frequency, Level and Delay-Time can be set. This is supported only by the MG3710A.



Expected Value: **BER of 5%**

Limits: Digital Offset Adjacent Channel Rejection Limits

| Radio Application | Mobile | Portable | Base Station |
|-------------------|--------|----------|--------------|
| Class A           | 47 dB  | 47 dB    | 47 dB        |
| Class B           | 37 dB  | 37 dB    | 37 dB        |



# Receiver Performance Measurement Methods

## Digital Offset Adjacent Channel Rejection



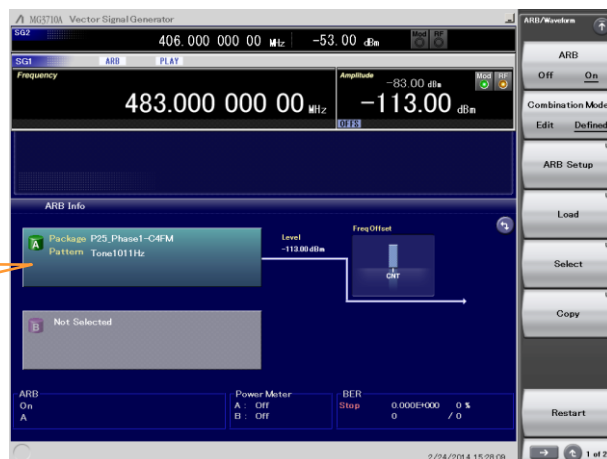
### Two RF Ports:

The MG3710A supports two RF ports in one unit, cutting equipment costs.

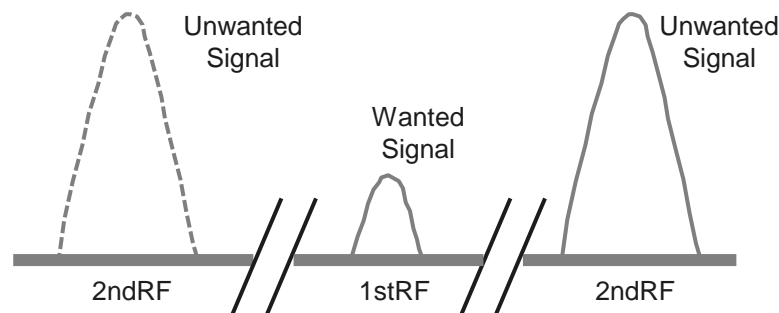
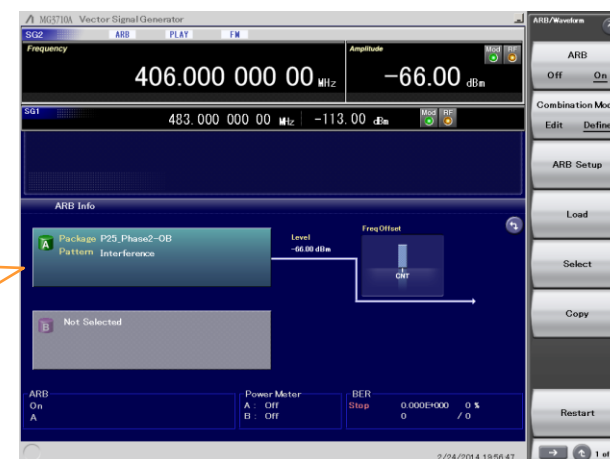
1stRF

2ndRF

Wanted Signal



Unwanted Signal (Interference)





# Receiver Performance Measurement Methods

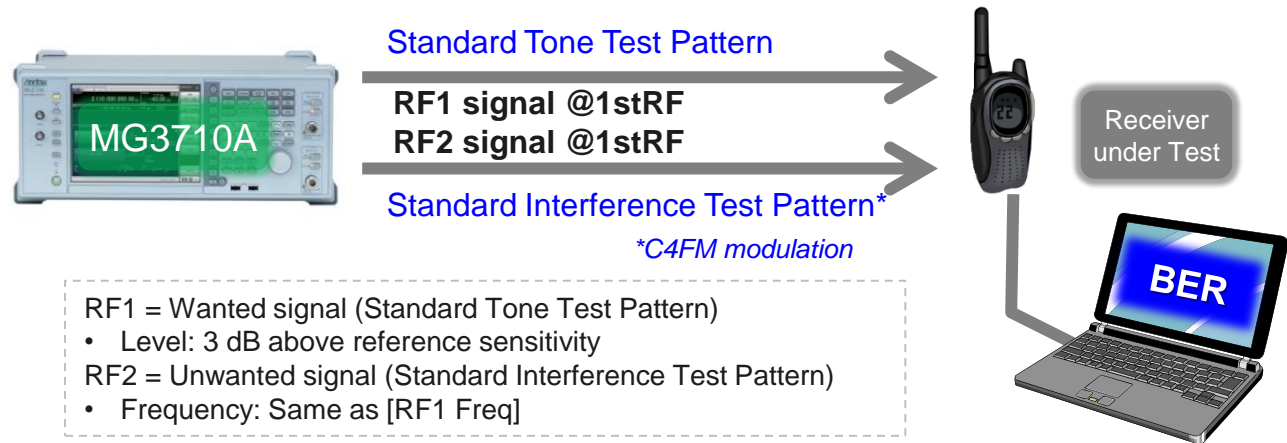
## Co-channel Rejection

*Note: For details, refer to the TIA-102 standard.*

Measure of the capability to reject an unwanted signal applied to the **same channel**.

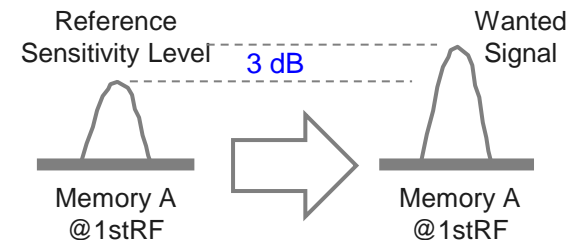
### Dual Memory:

One RF port has two memories. Two signals are output at one RF port. The Frequency, Level and Delay-Time can be set. This is supported only by the MG3710A.



Expected Value: **BER of 5%**

Limits: **≤9 dB**





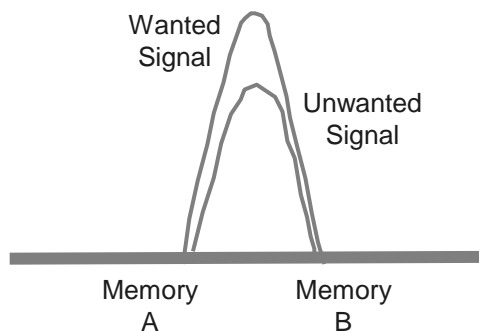
# Receiver Performance Measurement Methods

## Co-channel Rejection



### Merit of Dual Memory:

- Two signals of “Wanted signal” and “Unwanted signal” are output by one RF-port.
- Both Level and C/N set for each level
- Frequency offset set by direct input.



Wanted Signal

Unwanted Signal

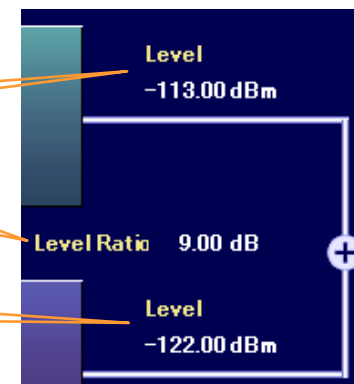


Same Frequency

Wanted Signal Level

Wanted/Unwanted Level Ratio

Unwanted Signal Level



# Receiver Performance Measurement Methods

## Spurious Response Rejection

*Note: For details, refer to the TIA-102 standard*

Measures ability to reject specified unwanted signal applied to receiver under test

The frequency of the unwanted signal is varied over a range from half of the **lowest IF frequency** of the receiver under test **to twice the highest receiver frequency or 1000 MHz, whichever is higher.**

Exclude all responses **within  $\pm 50$  kHz** of the receiver frequency.

### Two RF Ports:

The MG3710A supports two RF ports in one unit, cutting equipment costs.



Standard Tone Test Pattern

RF1 signal @1stRF  
RF2 signal @2ndRF

Unwanted Signal (FM)



RF1 = Wanted signal (Standard Tone Test Pattern)

- Level: 3 dB above reference sensitivity

RF2 = Unwanted signal (FM)

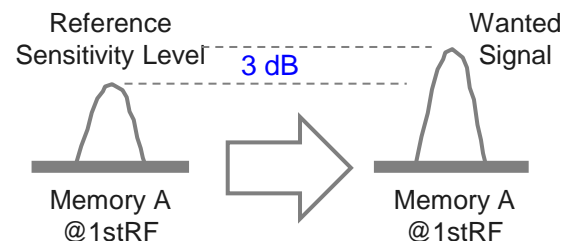
- FM with 400 Hz tone
- 1500 Hz deviation

$$P_U = P_{REF} + SRR + 6\text{dB}$$

$P_U$  : Level of the unwanted signal [dBm]

$P_{REF}$  : Level of reference sensitivity [dBm]

SRR : Manufacturer specified limit [db]



Expected Value: **BER of 5%**

Limits:

| Radio Application | Mobile | Portable | Base Station |
|-------------------|--------|----------|--------------|
| Class A           | 80 dB  | 70 dB    | 90 dB        |
| Class B           | 70 dB  | 60 dB    | 70 dB        |

# Receiver Performance Measurement Methods

## Spurious Response Rejection



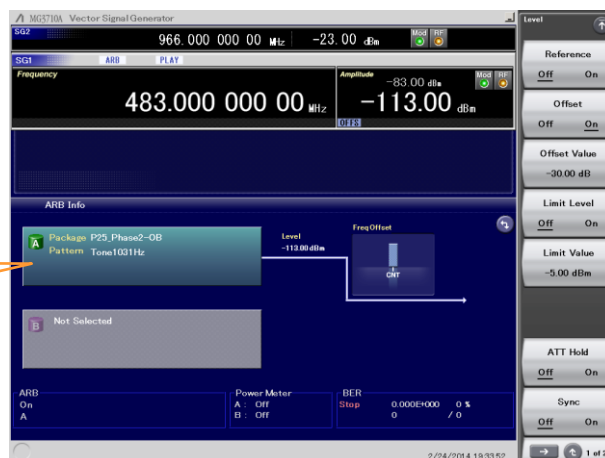
### Two RF Ports:

The MG3710A supports two RF ports in one unit, cutting equipment costs.

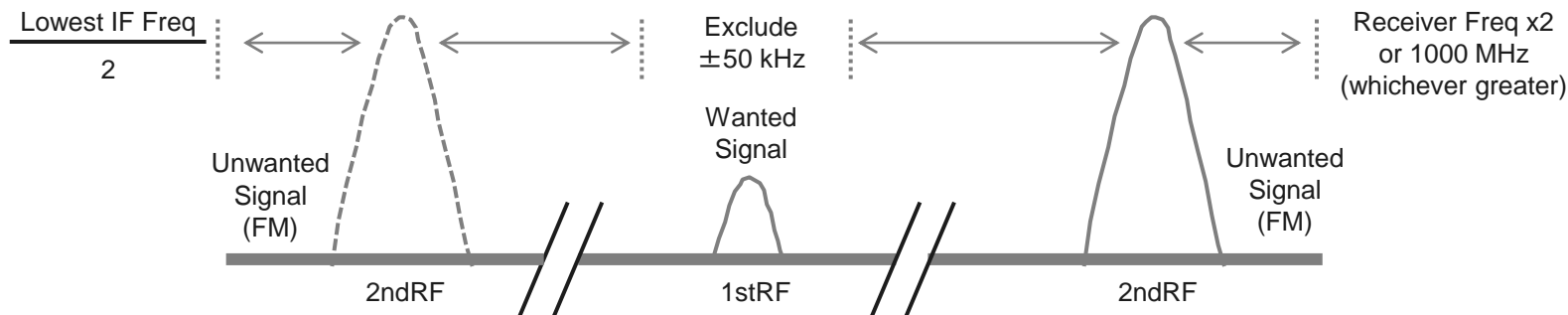
1stRF

2ndRF

Wanted Signal



Unwanted Signal (FM)



# Receiver Performance Measurement Methods

## Intermodulation Rejection

*Note: For details, refer to the TIA-102 standard.*

Measures ability to reject intermodulation caused by unwanted signals with **offset frequency of +50 kHz/+100 kHz or -50 kHz/-100 kHz**

### Dual Memory:

One RF port has two memories. Two signals are output by one RF port. The Frequency, Level and Delay-Time can be set. This is supported only by the MG3710A.

### Two RF Ports:

The MG3710A supports two RF ports in one unit, cutting equipment costs.



### Standard Tone Test Pattern

RF1 signal @1stRF  
RF3 signal @1stRF

### Standard Interference Test Pattern\*

RF2 signal @2ndRF

### Unwanted Signal (CW)

*\*C4FM modulation*



RF1 = Wanted signal (Standard Tone Test Pattern)

- Level: 3 dB above reference sensitivity

RF2 = Unwanted signal (CW)

- Frequency: [RF1 Freq]  $\pm$  [50 kHz]

RF3 = Unwanted signal (Standard Interference Test Pattern)

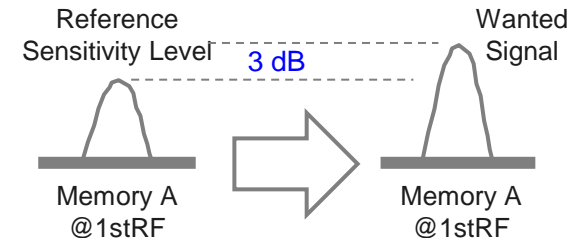
- Frequency: [RF1 Freq]  $\pm$  [100 kHz]

Same level

Expected Value: **BER of 5%**

Limits:

| Radio Application | Mobile | Portable | Base Station |
|-------------------|--------|----------|--------------|
| Class A           | 75 dB  | 70 dB    | 80 dB        |
| Class B           | 70 dB  | 50 dB    | 70 dB        |



# Receiver Performance Measurement Methods

## Intermodulation Rejection



Frequency Offset  
e.g. +50 kHz

Unwanted Signal (CW:  
Mod = Off) @2nd RF

Frequency Offset  
e.g. +100 kHz

Wanted Signal

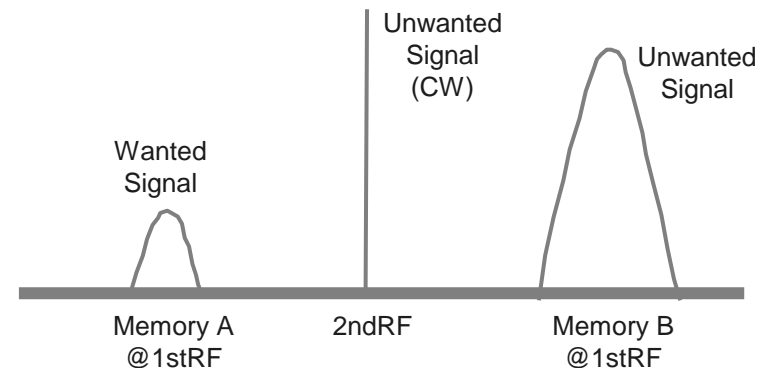
Unwanted Signal  
(Standard Interference  
Test Pattern)

### Merit of Dual Memory:

- Two signals of "Wanted signal" and "Unwanted signal" are output by one RF-port.
- Both Level and C/N set for each level
- Frequency offset set by direct input.

### Two RF Ports:

The MG3710A supports two RF ports in one unit, cutting equipment costs.



\*Combination of Baseband Signal option: (Two internal ARB memories)

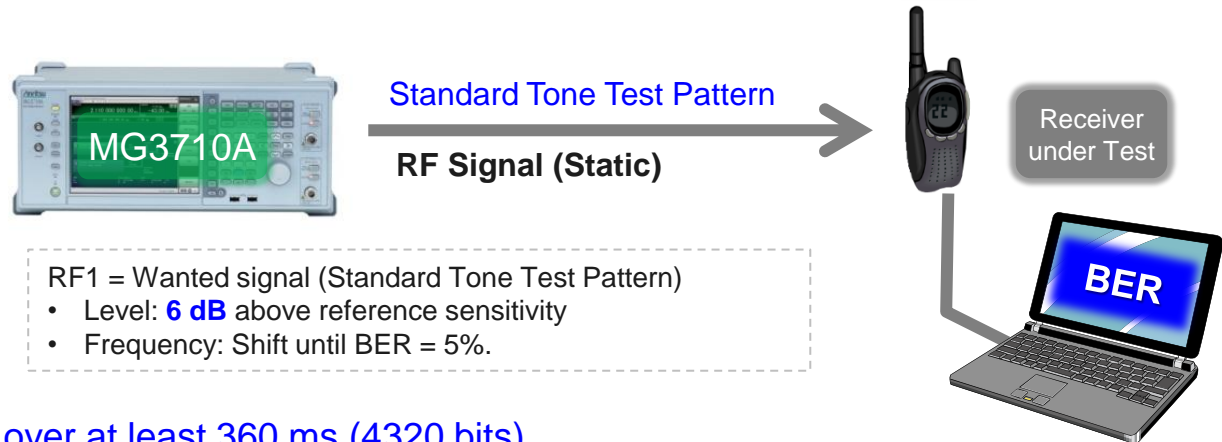
Frequency (recommended range:  $\pm 60$  MHz) and level (CN:  $\pm 80$  dB) can also be set at the screen.

# Receiver Performance Measurement Methods

## Signal Displacement Bandwidth

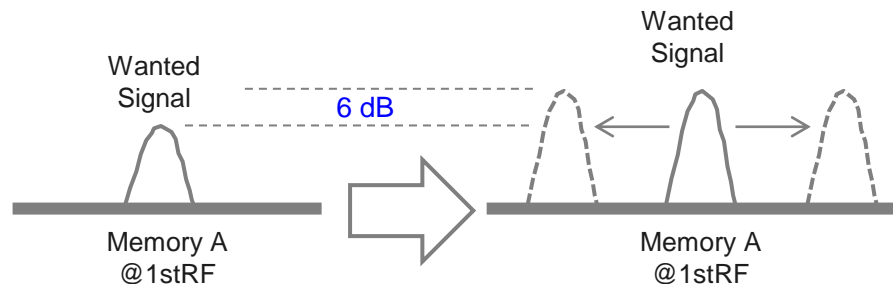
*Note: For details, refer to the TIA-102 standard.*

Measures ability to reject signal in standard modulation state with specified **offset frequency from nominal frequency**



Expected Value: **BER of 5% over at least 360 ms (4320 bits)**

Limits: **Minimum signal displacement bandwidth of 1000 Hz.**

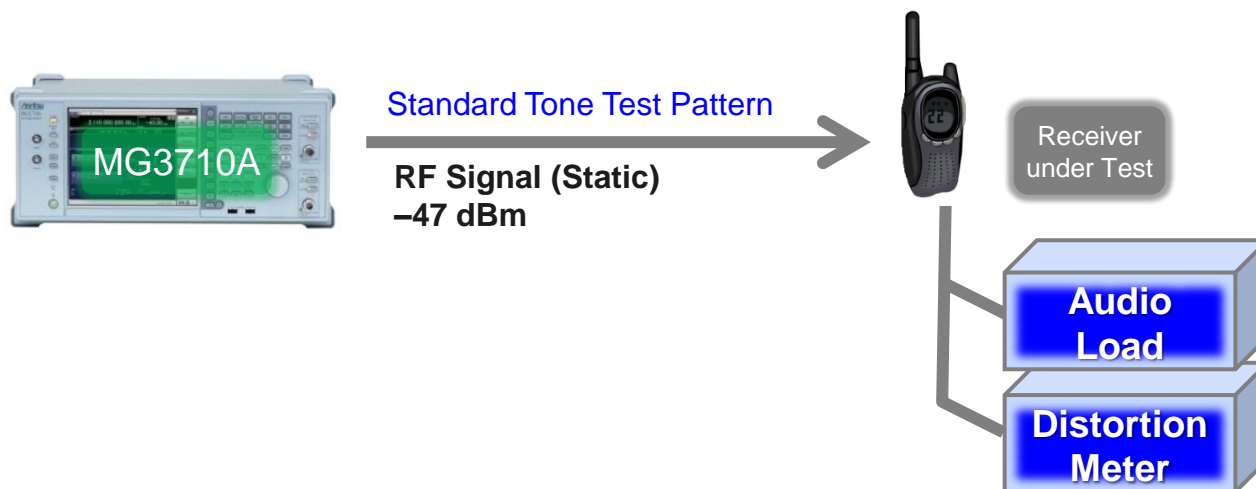


# Receiver Performance Measurement Methods

## Audio Output Distortion

*Note: For details, refer to the TIA-102 standard.*

Measures audio distortion factor under audio frequency load



Limits: Maximum audio output distortion of 5% when tested at both rated audio power, and 17 dB below rated audio power

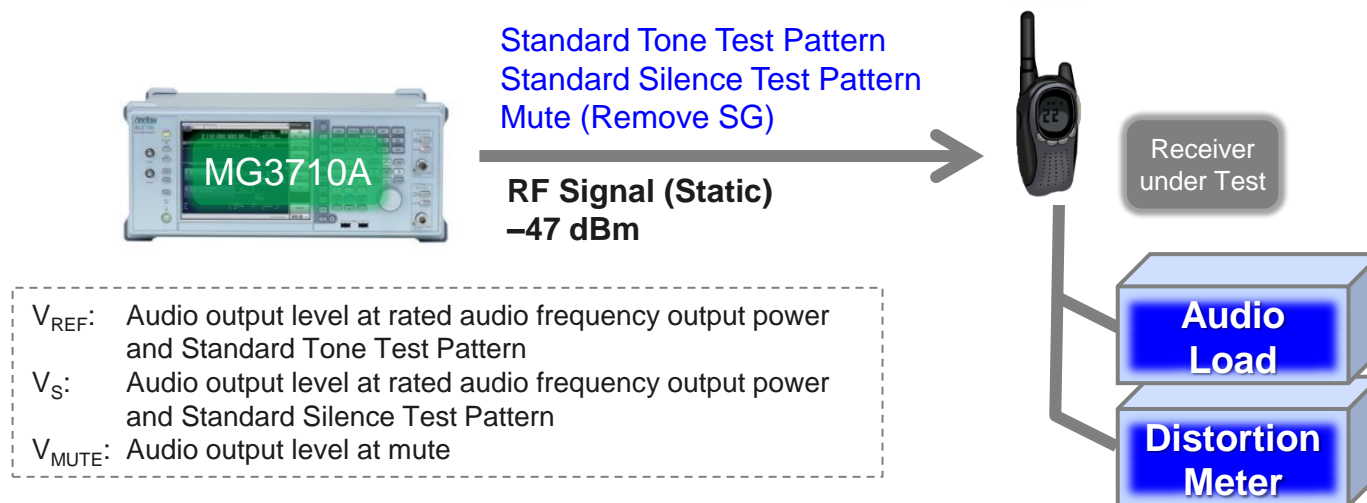


# Receiver Performance Measurement Methods

## Residual Audio Noise Ratio

*Note: For details, refer to the TIA-102 standard.*

Measures audio output level in three states (Tone/Silence/Mute)



$$\text{residual audio noise ratio (silence): } 20 \log_{10} \left[ \frac{V_{REF}}{V_S} \right]$$

$$\text{residual audio noise ratio (mute): } 10 \log_{10} \left[ 1000 \frac{V_{MUTE}^2}{R_{ROAD}} \right]$$

Limits:

| Radio Application | Silence Pattern | Muted  |
|-------------------|-----------------|--------|
| Class A           | 45 dB           | -35 dB |
| Class B           | 35 dB           | -27 dB |

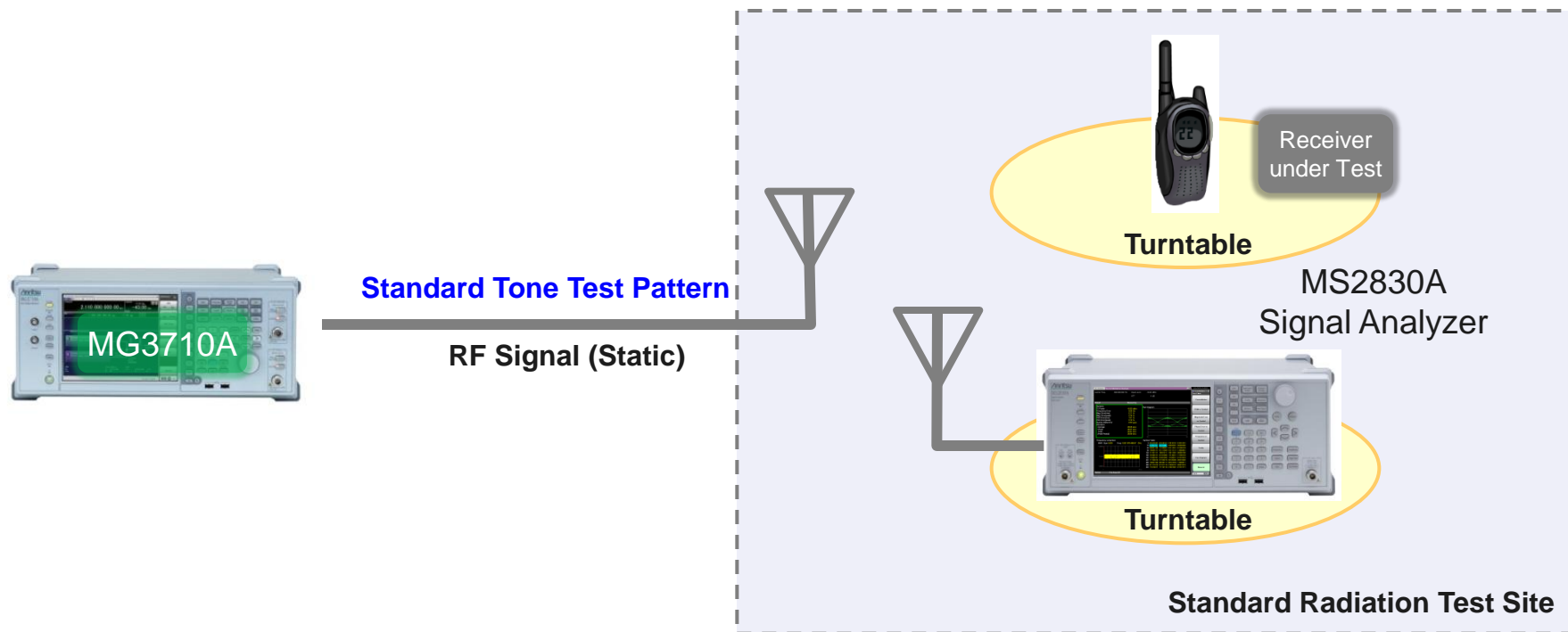


# Receiver Performance Measurement Methods

## Average Radiation Sensitivity

*Note: For details, refer to the TIA-102 standard.*

Measures power received by half-wave dipole antenna



Limits:

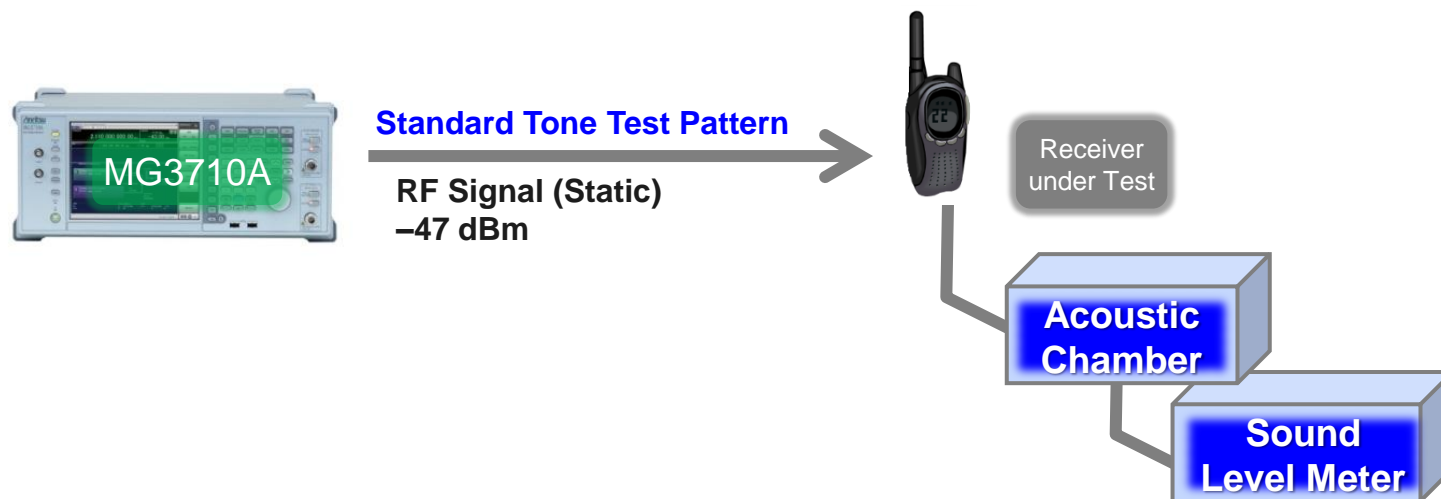
| Frequency Range<br>(25 MHz to 1 GHz) | Equipment with<br>External Antennas | Equipment with<br>Internal Antennas |
|--------------------------------------|-------------------------------------|-------------------------------------|
| Class A                              | -98 dbm                             | -80 dBm                             |
| Class B                              | -95 dBm                             | -77 dBm                             |

# Receiver Performance Measurement Methods

## Acoustic Audio Output

*Note: For details, refer to the TIA-102 standard.*

Measures reading of sound level meter



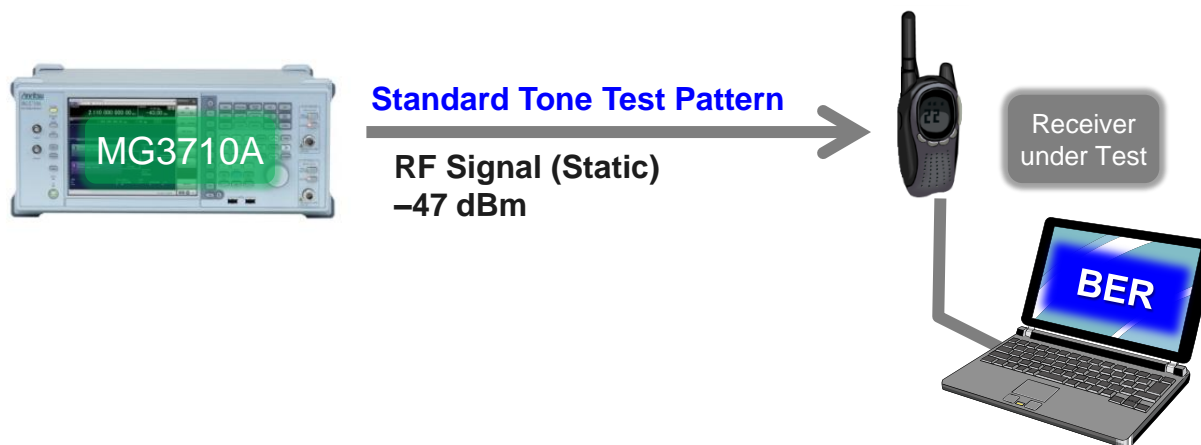
Limits: This requirement applies only to units with a speaker.  
The measured C weighted level shall not be less than  
 $[80 + 10 \log_{10} (\text{rated audio output power, in watts}) ] \text{ dB}_{\text{SPL}}$

# Receiver Performance Measurement Methods

## Bit Error Rate Floor

*Note: For details, refer to the TIA-102 standard.*

Measures resulting bit error rate



Expected Value: Over time interval of  $\geq 10$  s (120,000 bits)

Limits: The maximum bit error rate shall be  $\leq 0.01\%$ .

# Receiver Performance Measurement Methods

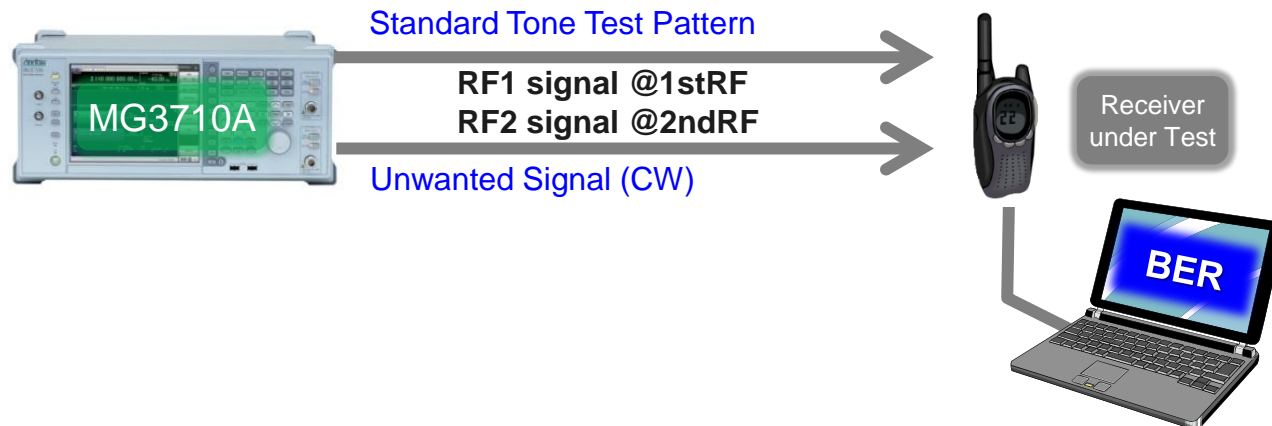
## Blocking Rejection

Measures the ratio of the level of an unwanted input signal to the reference sensitivity.

*Note: For details, refer to the TIA-102 standard.*

### Dual Memory:

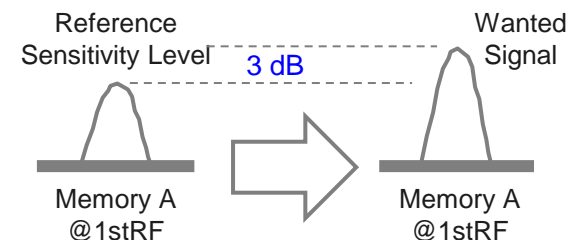
One RF port has two memories. Two signals are output at one RF port. The Frequency, Level and Delay-Time can be set. This is supported only by the MG3710A.



Expected Value: **BER of 5%**

Limits:

| Radio Application | Mobile | Portable | Base Station |
|-------------------|--------|----------|--------------|
| Class A           | 90 dB  | 80 dB    | 90 dB        |
| Class B           | 80 dB  | 70 dB    | 80 dB        |



# Receiver Performance Measurement Methods

## Blocking Rejection

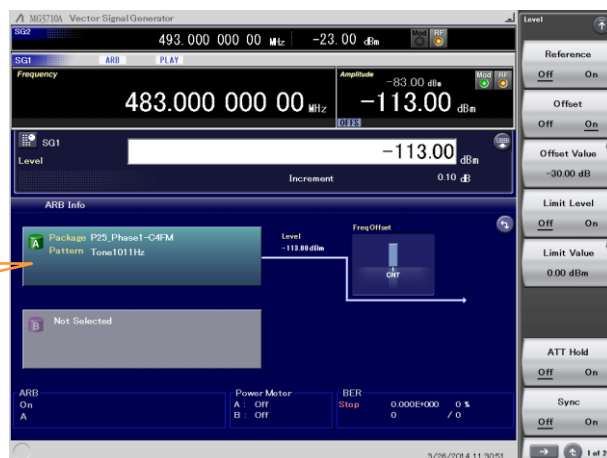


1stRF

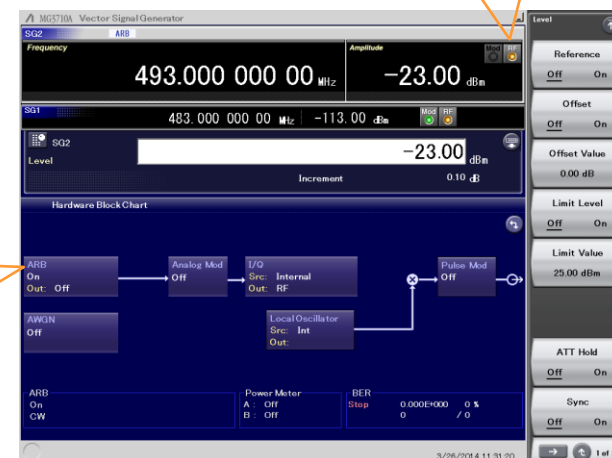
2ndRF

Unwanted Signal  
(CW: Mod = Off) @2nd RF

Wanted Signal

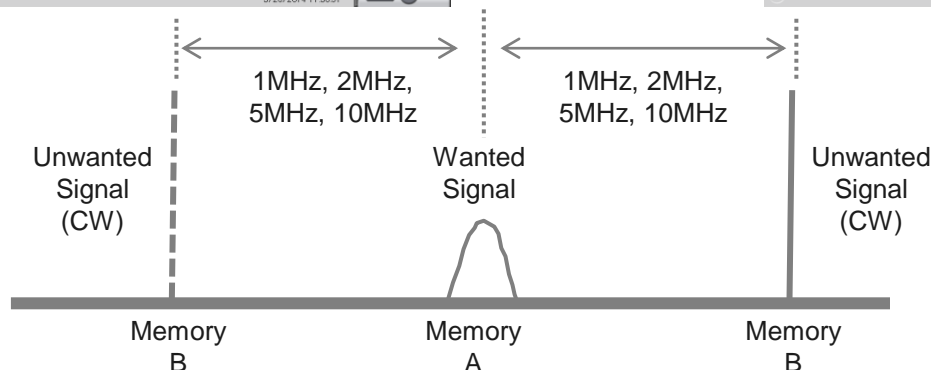


Unwanted Signal  
(CW)



### Two RF Ports:

The MG3710A supports two RF ports in one unit, cutting equipment costs.



*Note: For details, refer to the TIA-102 standard.*

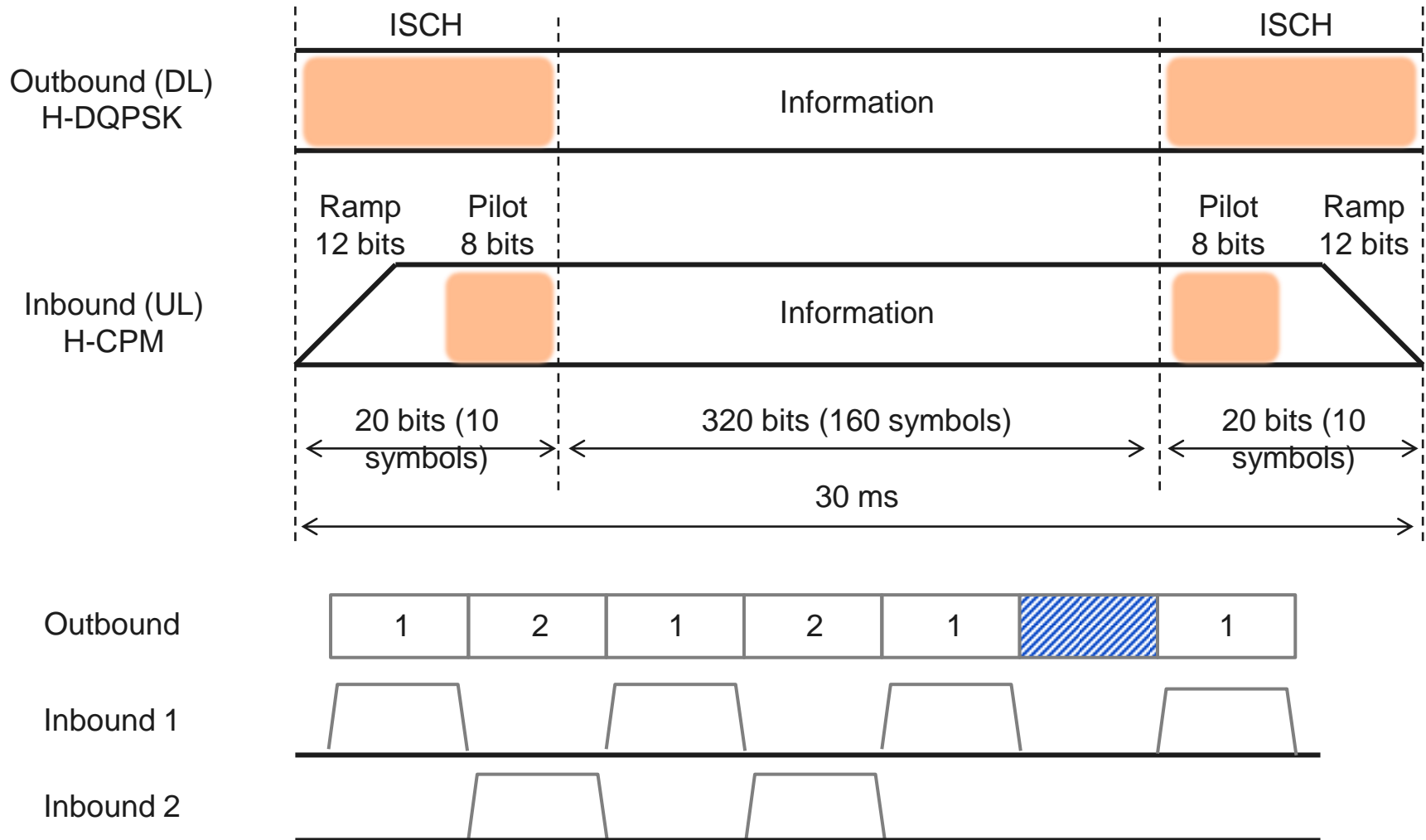
## ► Two-Slot TDMA Modulation

- ✓ Uplink Modulation: H-CPM (Harmonized Continuous Phase Modulation)
- ✓ Downlink Modulation: Pi/4-DQPSK
- ✓ Data Rate: 12 kbps
- ✓ Symbol Rate: 6000 sps

# [Appendix] P25 Phase 2 PHY Specification 2/2

## ► Two-Slot TDMA Transmission Format

*Note: For details, refer to the TIA-102 standard.*



# [Appendix] How to Set FM Signal 1/2

Select SG2.

[SG2]

Set FM conditions.

[FM/φM]

[F1: FM/φM Setup]

[F1: FM] = On

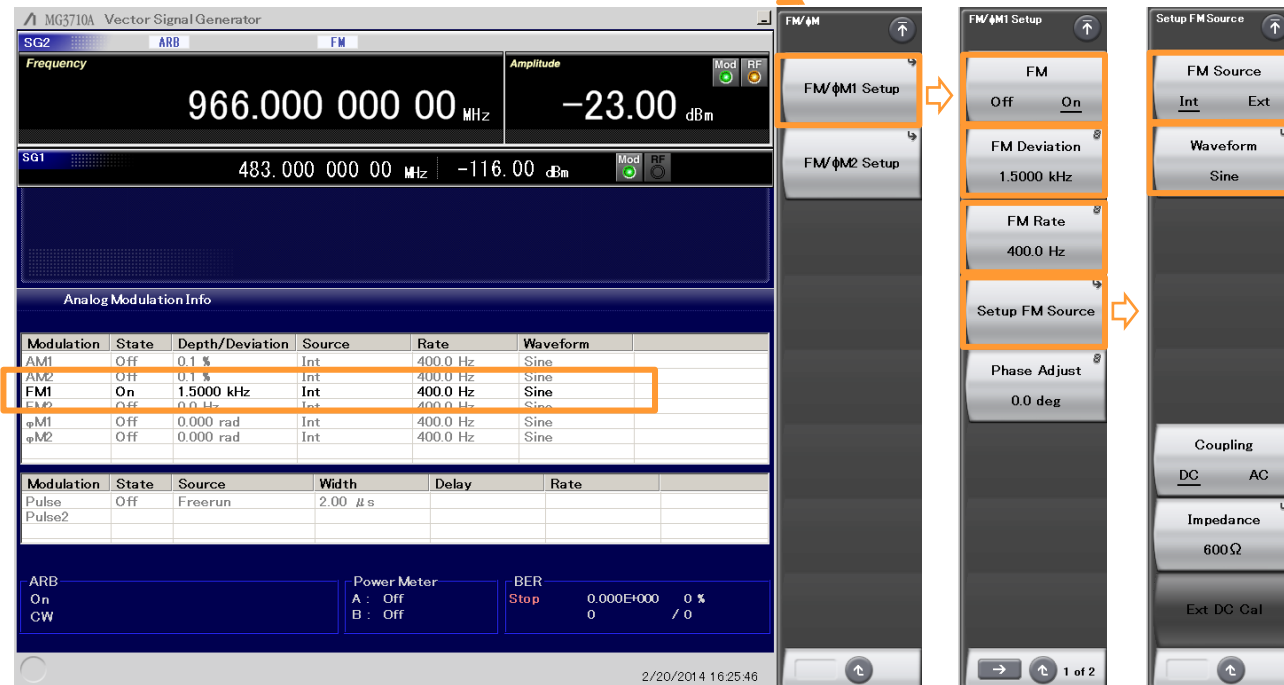
[F2: FM Deviation] = 1500 Hz

[F3: FM Rate] = 400 Hz

[F4: Setup FM Source]

[F1: FM Source] = Int

[F2: Waveform] = Sine





# [Appendix] How to Set FM Signal 2/2

Set ARB for disable.

[Mode]

[F1: ARB] = Off

Set Modulation and RFoutput condition.

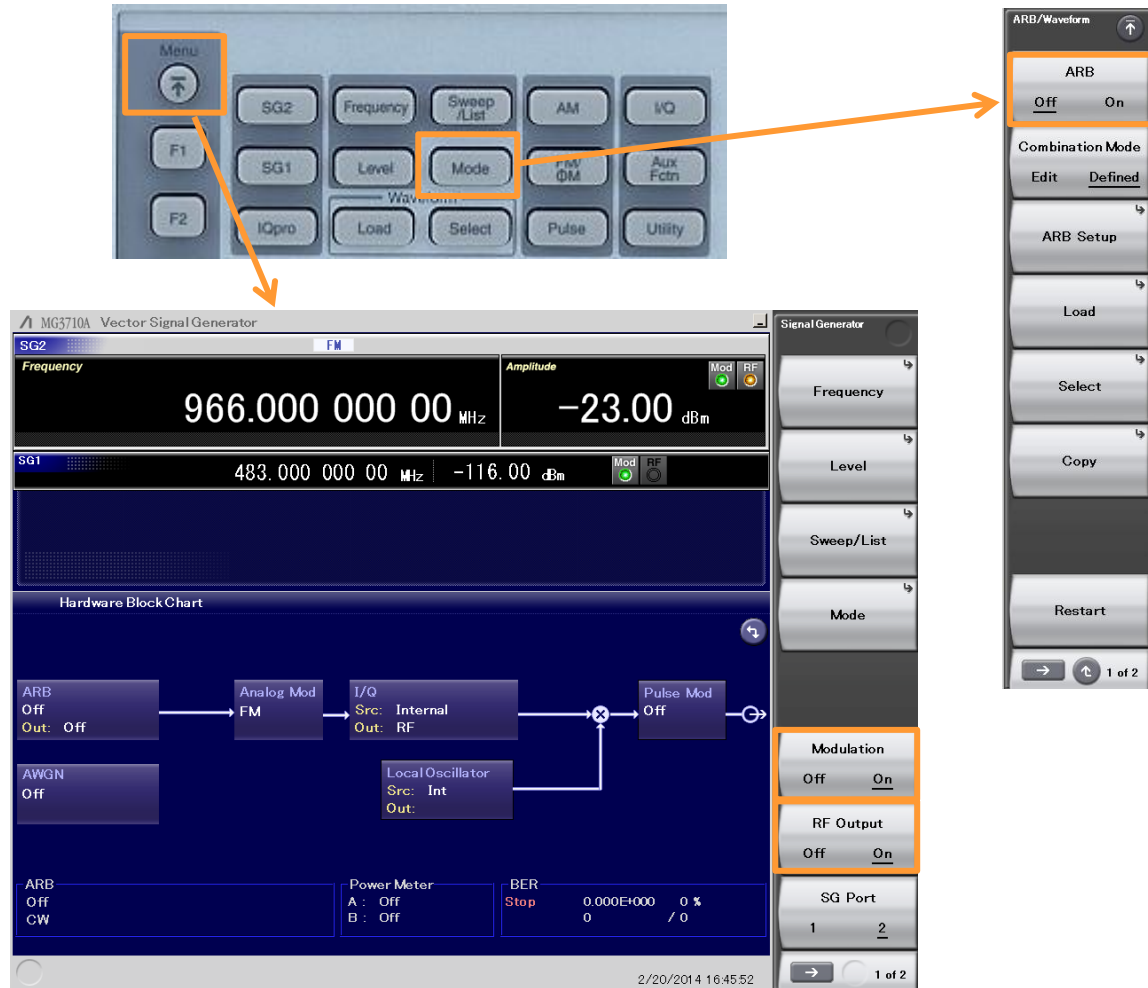
[Menu]

[F1: FM/φM Setup]

[F6: Modulation] = On

[F7: RF Output] = On

Finish



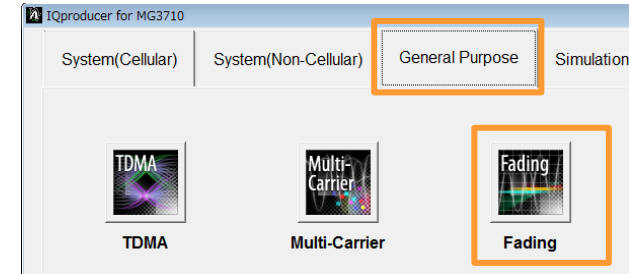
# [Appendix] How to Create Faded Pattern 1/2

Start Fading IQproducer.

[IQpro]

Click [General Purpose] tab.

Click [Fading] icon.



Set Fading parameter.

(Tx Antenna Configuration)

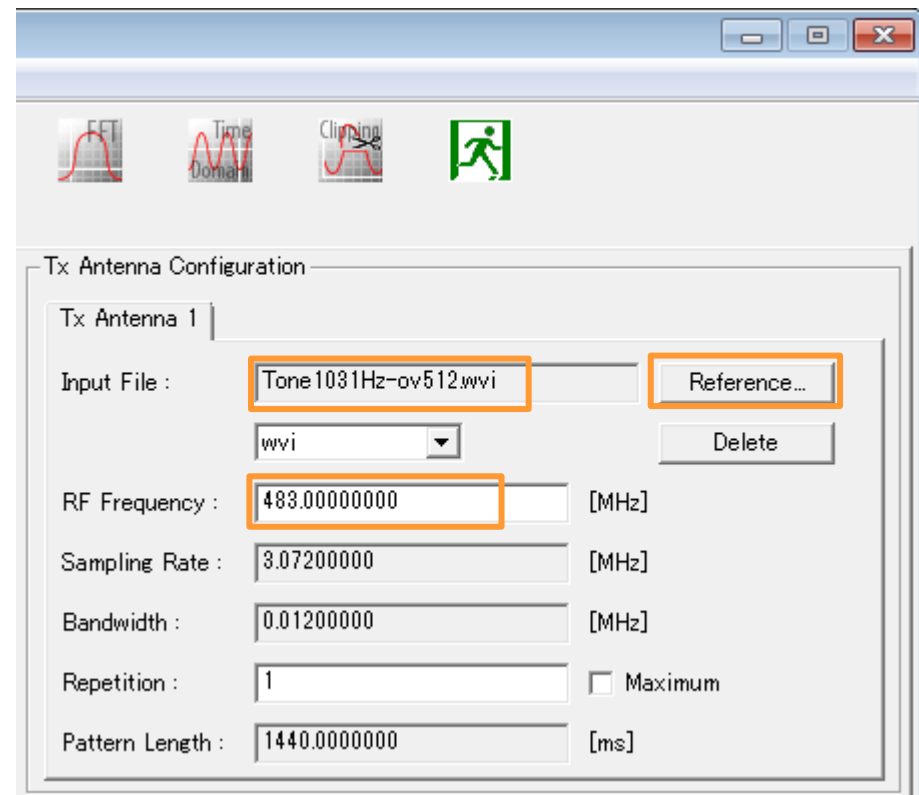
Click [Reference].

Select [Tone1031Hz-ov512].

(C:\¥Anritsu¥MG3710A¥User Data¥Waveform  
¥P25\_Phase2\_OB) in MG3710A HDD

Set RF Frequency (ex: 483 MHz).

Create different patterns  
for each evaluated  
frequency



# [Appendix] How to Create Faded Pattern 2/2

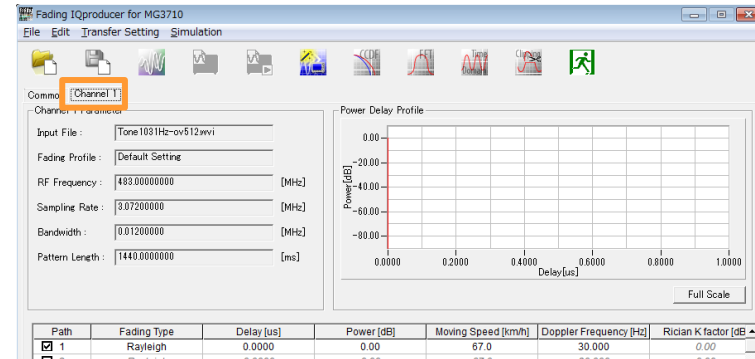
Set Fading parameter (Channel condition).

Click [Channel 1] tab.

Set [Fading Type] = Rayleigh.

Set [Doppler Frequency] = 30 Hz.

Set [Spectrum Shape] = Flat.



| Path                                  | Fading Type | Delay [us] | Power [dB] | Moving Speed [km/h] | Doppler Frequency [Hz] |
|---------------------------------------|-------------|------------|------------|---------------------|------------------------|
| <input checked="" type="checkbox"/> 1 | Rayleigh    | 0.0000     | 0.00       | 67.0                | 30.000                 |

| Rician K factor [dB] | Angle of Arrival [deg] | Phase shift [deg] | Spectrum Shape | Correlation Setting |
|----------------------|------------------------|-------------------|----------------|---------------------|
| 0.00                 | 0.0                    | 0.0               | Flat           | Not Use             |

Create pattern (Calculation).

Click [Calculation].

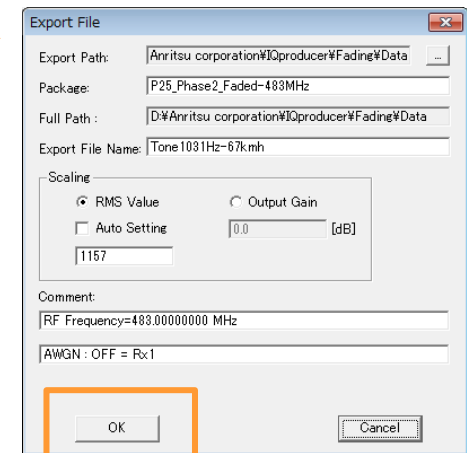
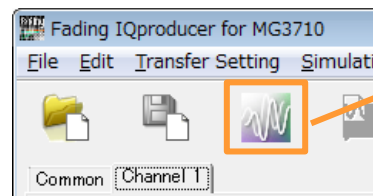
Input [Package] name.

(Ex: P25\_Phase2\_Faded-483MHz)

Input [Pattern] name.

(Ex: Tone1031Hz-67kmh)

Click [OK].



Finish

# Ordering Information

## ► Base Configuration

| Model       | Product Name                             | One RF port |      | Two RF ports |
|-------------|------------------------------------------|-------------|------|--------------|
|             |                                          | Single      | Dual | Triple       |
| MG3710A     | Vector Signal Generator                  | √           | √    | √            |
| MG3710A-032 | 1stRF 100 kHz to 2.7 GHz                 | √           | √    | √            |
| MG3710A-042 | Low Power Extension for 1stRF            | √           | √    | √            |
| MG3710A-048 | Combination of Baseband Signal for 1stRF |             | √    | √            |
| MG3710A-062 | 2ndRF 100 kHz to 2.7 GHz                 |             |      | √            |
| MX370102A   | TDMA IQproducer                          | √           | √    | √            |

## ► Additional Recommended Options

| Model           | Product Name                        | Note                                                                                               |
|-----------------|-------------------------------------|----------------------------------------------------------------------------------------------------|
| MG3710A-002     | High Stability Reference Oscillator | Aging Rate: $\pm 1 \times 10^{-7}$ /year, $\pm 1 \times 10^{-8}$ /day                              |
| MG3710A-043/073 | Reverse Power Protection            | Protects signal output connector against reverse input power. 20W@<2 GHz<br>(Standard 2 W nominal) |
| MG3710A-045/075 | ARB Memory Upgrade 256Msamples      | Upgrades ARB size to 256 Msamples (1 GB)                                                           |
| MX370107A       | Fading IQproducer                   | Create Faded signal                                                                                |

Required for Reference Sensitivity (Faded)

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