

NXDN Rx Test Solution

MG3710A

Vector Signal Generator

NXDN

Rx Test Solution

NXDN Technical Specifications

Common Air Interface

NXDN TS 1-A Version 1.3 (Nov 2011)

Common Air Interface Type.D

NXDN TS 2-A Version 1.1 (Mar 2012)

Transceiver Performance Test

NXDN TS 1-E Version 1.1 (Jun 2012)

Note: For details, refer to the NXDN standard.

Version 1.00

May 2014

Anritsu Corporation

[Anritsu] NXDN 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] NXDN Rx Test Solution

Note) For detail, refer to the NXDN standard.

NXDN TS 2-A	Receiver test items	Signal Generator		
		Wanted Signal	Unwanted Signal	
5.1.4	Reference Sensitivity (Static)	SMS/FSMS	---	---
5.1.5	Reference Sensitivity (Faded)	Faded SMS /Faded FSMS	---	---
5.1.6	Adjacent Channel Rejection	SMS/FSMS	IMDS	---
5.1.7	Co-channel Rejection	SMS/FSMS	IMDS	---
5.1.8	Spurious Rejection	SMS/FSMS	---	IMDS
5.1.9	Intermodulation Rejection	SMS/FSMS	IMDS	CW
5.1.10	Sensitivity of Frequency Offset	SMS/FSMS	---	---

SMS: Standard Modulation State

FSMS: Formatted Standard Modulation State

IMS: Interfering Modulation State

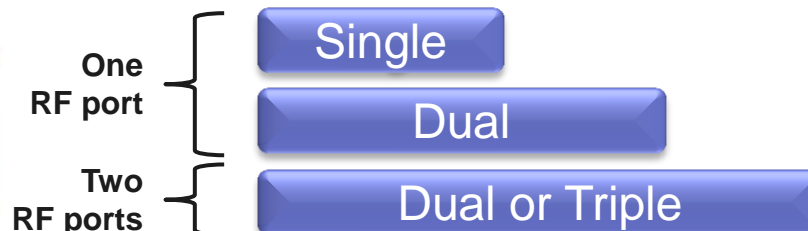
Faded SMS/Faded FSMS:
User can create Faded pattern by
using Fading IQproducer (Option).

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



MG3710A

Vector Signal Generator



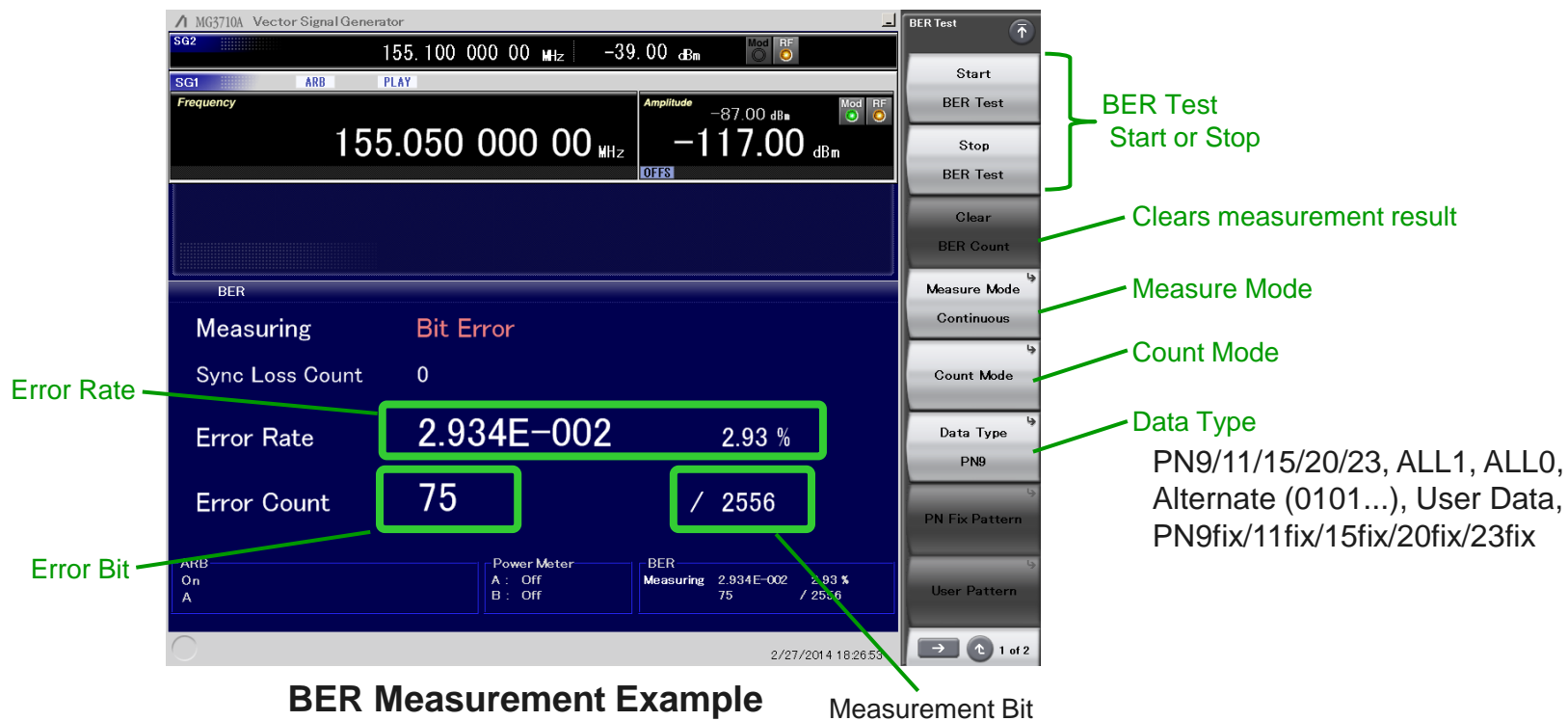
NXDN TS 2-A		Pattern Name for SG
4.1.4	Standard Modulation State	PN9-NonForm-Static
4.1.4	Formatted Standard Modulation State	PN9-Form-Static
4.1.5	Interfering Modulation State	PN15-Interfering-Sig
4.1.6	Non-modulation State	(Non-modulation mode)
4.1.7	Maximum Frequency Deviation Symbol Stream	Max_Dev_+3+3-3-3
4.1.8	1/3 Frequency Deviation Symbol Stream	Min_Dev_+1+1-1-1

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.

[Anritsu] NXDN Rx Test Solution

Built-in BER Measurement Function (Opt-021)



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)

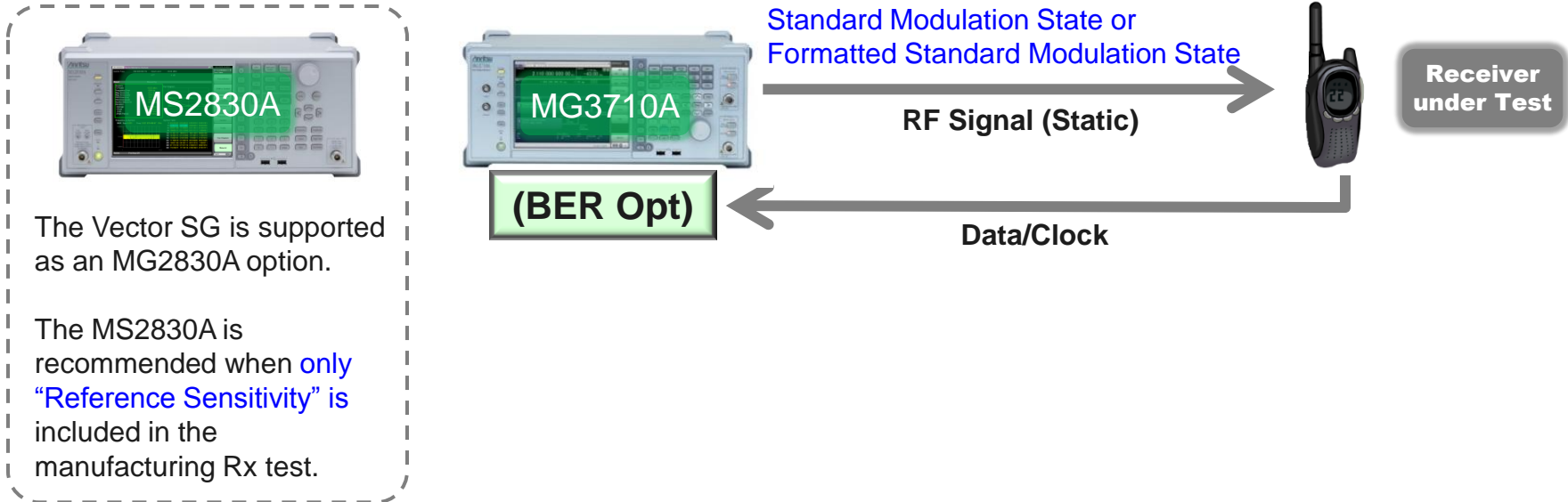
Error: Specifies number of measurement error bits

Receiver Performance Measurement Methods

Reference Sensitivity (Static)

Note: For details, refer to the NXDN standard.

Measures input level when **BER = 3%**



Expected Value: **BER of 3% when 2556 or more data bits captured**

Limits:

Channel Spacing	Class	BE	ME	PE
6.25 kHz (4800 bps)	A	-117 dBm	-117 dBm	-117 dBm
	B	-114 dBm	-114 dBm	-114 dBm
12.5 kHz (9600 bps)	A	-115 dBm	-115 dBm	-115 dBm
	B	-112 dBm	-112 dBm	-112 dBm

*PE: Portable Radio Equipment
ME: Mobile Radio Equipment
BE: Base Radio Equipment*

Note:

Class A performance levels are the recommended performance for transceivers with enhanced interference protection characteristics.
Class B performance levels are the recommended minimum performance for transceivers.

Receiver Performance Measurement Methods

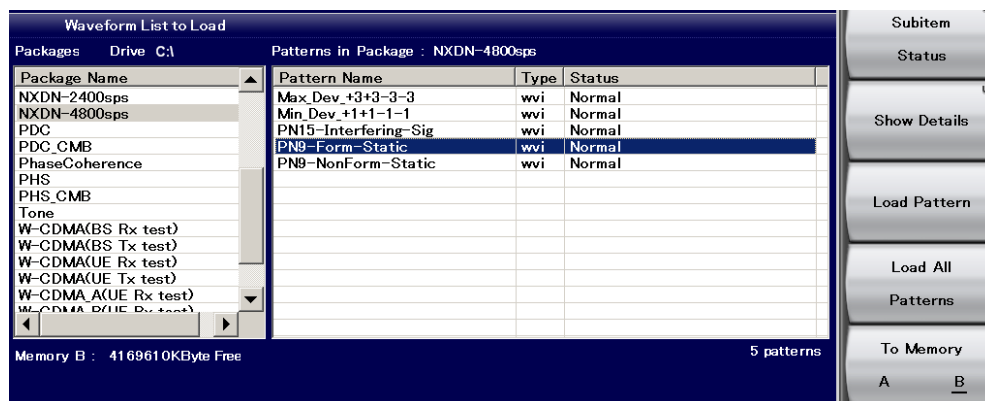
Reference Sensitivity (Static)



Wanted Signal
(Static)



Choose NXDN signal
you want from the list.



Receiver Performance Measurement Methods

Reference Sensitivity (Faded)

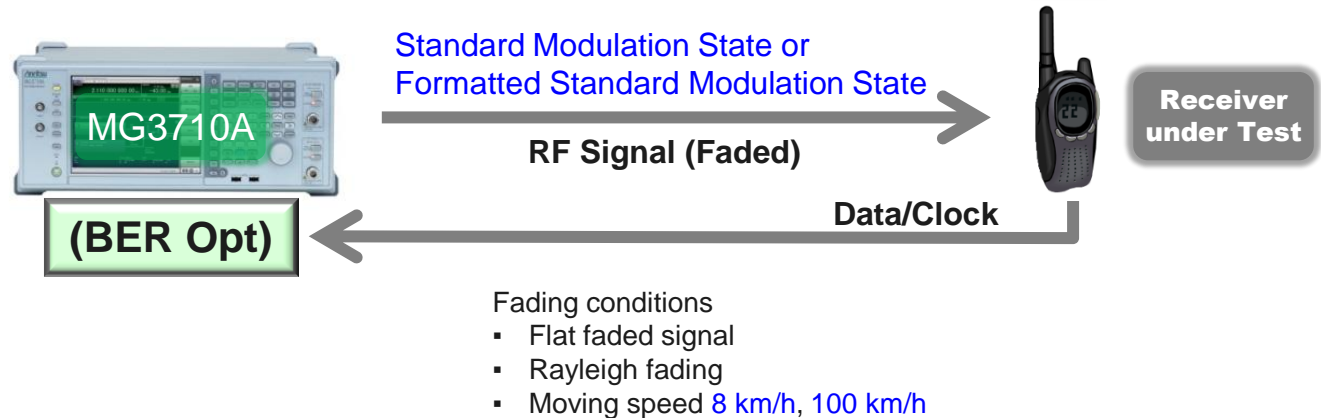
Note: For details, refer to the NXDN standard.

Measures input level when **BER = 3%**

A **flat faded** signal is input to the receiver via a **Rayleigh fading** simulator.

Fading IQproducer:

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



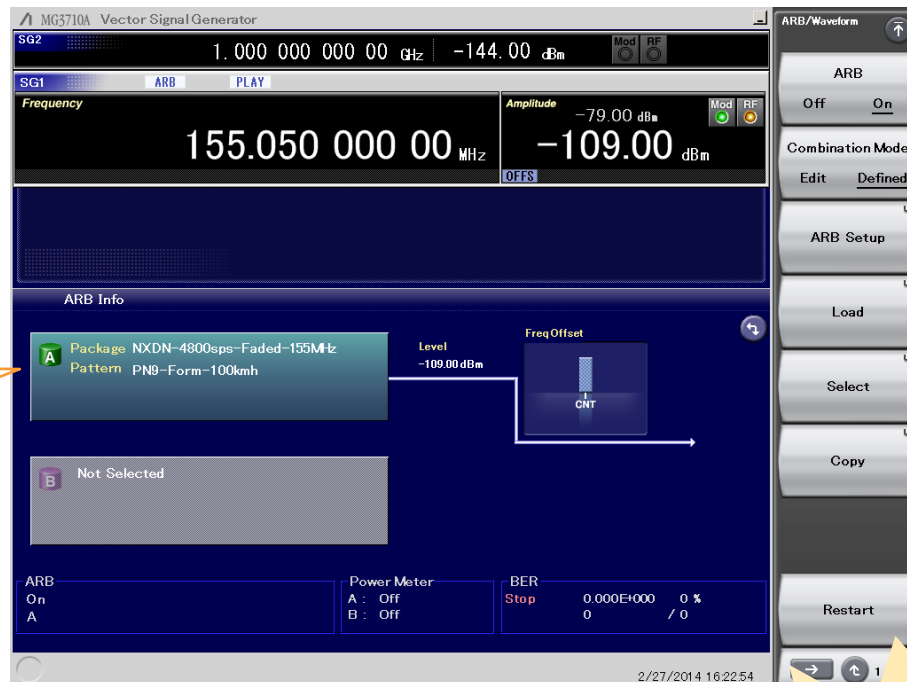
Expected Value: **BER of 3% when 2556 or more data bits captured**

Limits:

Channel Spacing	Class	BE	ME	PE
6.25 kHz (4800 bps)	A	-109 dBm	-109 dBm	-109 dBm
	B	-106 dBm	-106 dBm	-106 dBm
12.5 kHz (9600 bps)	A	-107 dBm	-107 dBm	-107 dBm
	B	-104 dBm	-104 dBm	-104 dBm

Receiver Performance Measurement Methods

Reference Sensitivity (Faded)

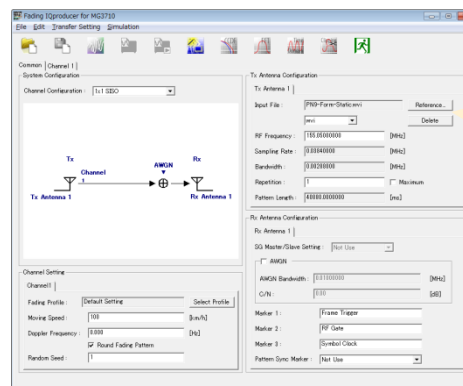


Wanted Signal
(Faded)

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.

Load to
Fading IQproducer

Standard
Modulation
State

Formatted
Standard
Simulcast
Modulation

Receiver Performance Measurement Methods

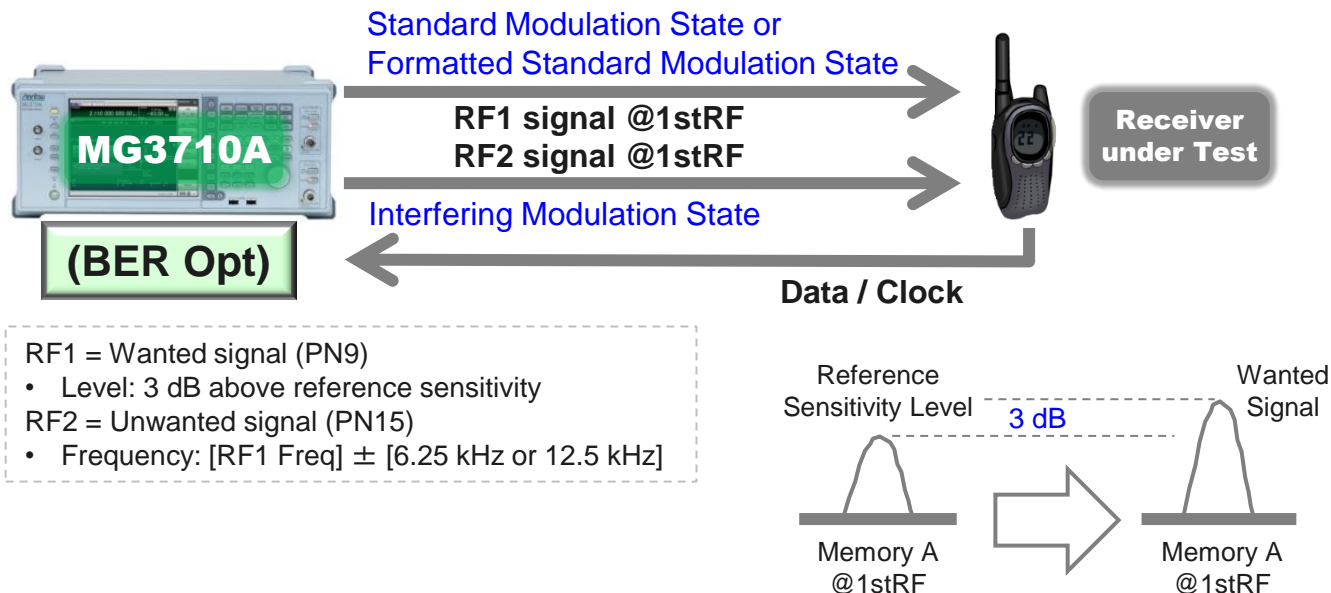
Adjacent Channel Rejection

Note: For details, refer to the NXDN standard.

Measures ability to reject unwanted signal applied to adjacent channels of ± 6.25 kHz or ± 12.5 kHz

Dual Memory:

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



Expected Value: BER of 3% when 2556 or more data bits captured

Limits:

Channel Spacing	Class	BE	ME	PE
6.25 kHz (4800 bps)	A	50 dB	50 dB	50 dB
	B	45 dB	45 dB	45 dB
12.5 kHz (9600 bps)	A	55 dB	55 dB	55 dB
	B	55 dB	55 dB	55 dB

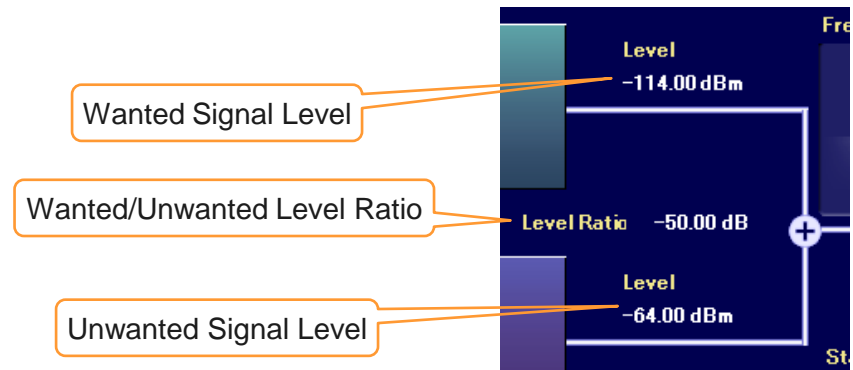
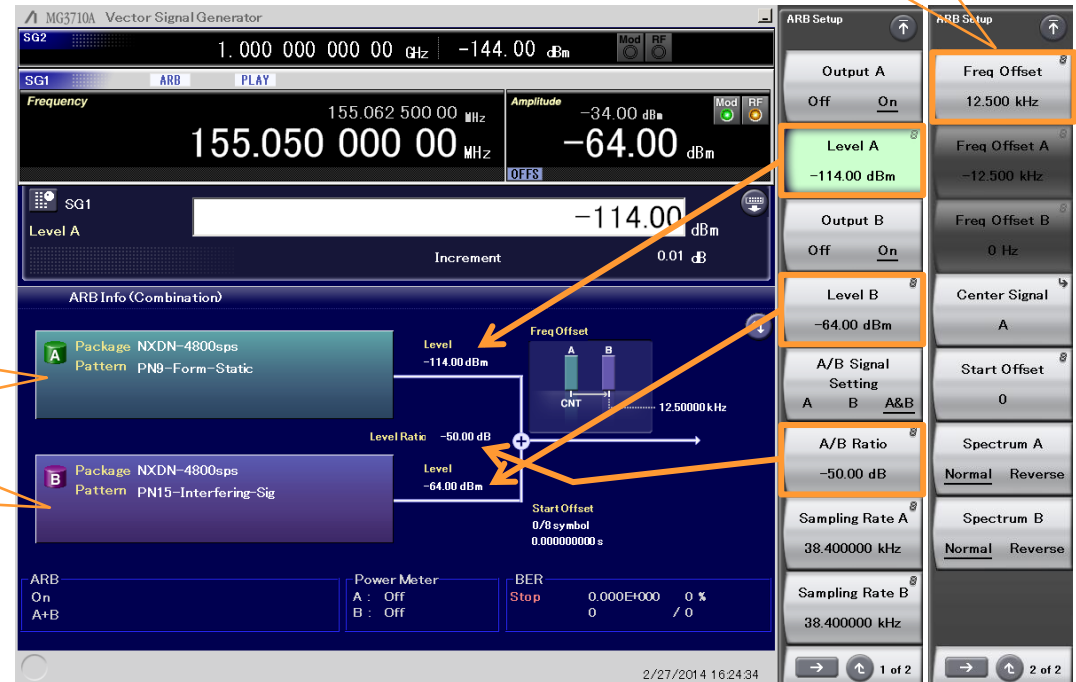
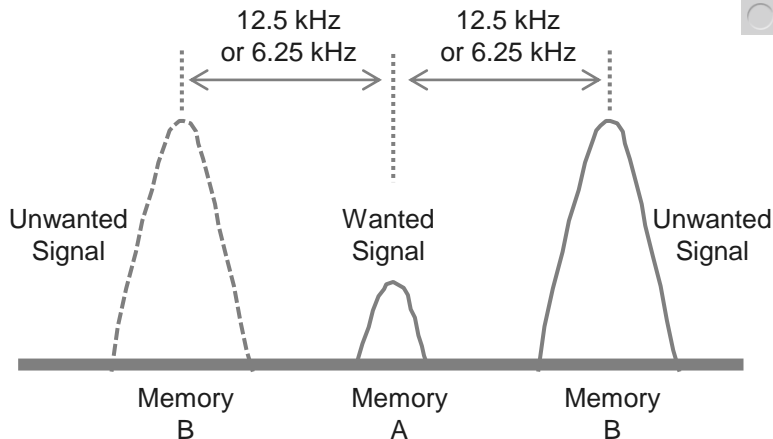
Receiver Performance Measurement Methods

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.



Receiver Performance Measurement Methods

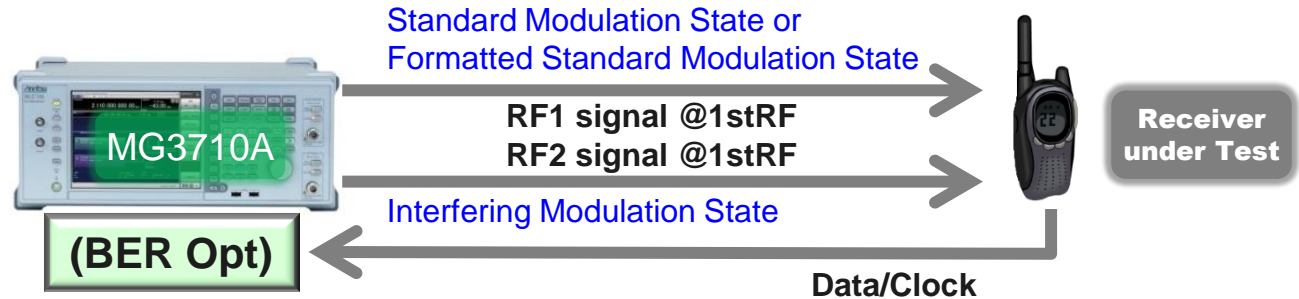
Co-channel Rejection

Note: For details, refer to the NXDN standard.

Measures ability to reject unwanted signal applied to **same channel**.

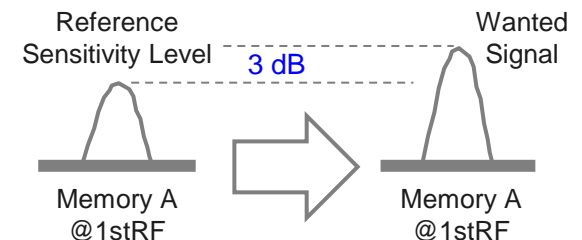
Dual Memory:

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



Expected Value: **BER of 3% when 2556 or more data bits captured**

Limits: **≤12 dB**

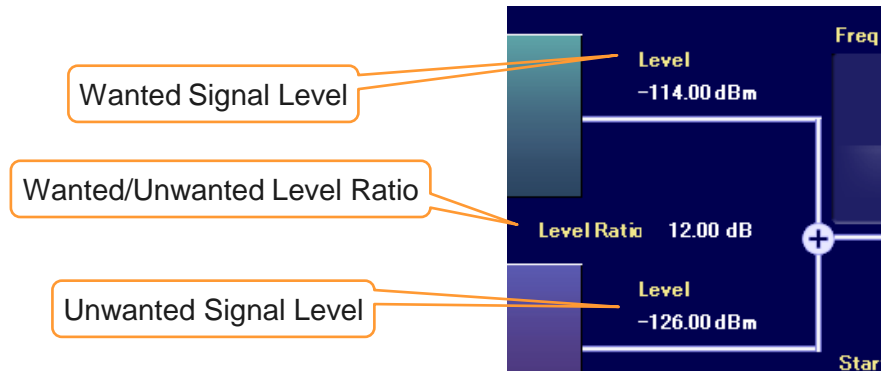
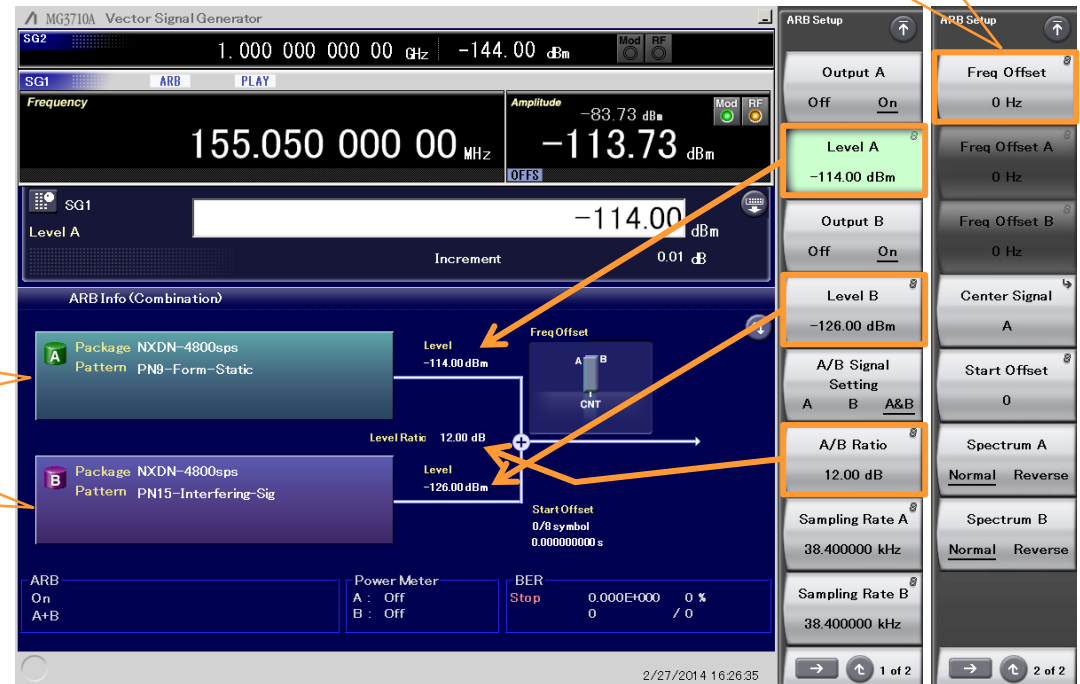
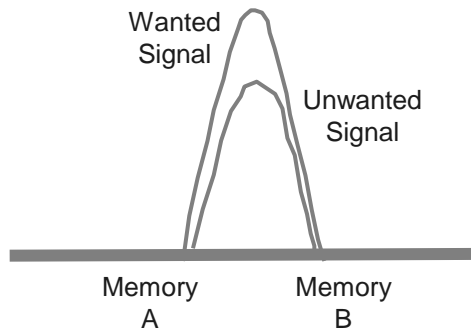


Co-channel Rejection



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.



Receiver Performance Measurement Methods

Spurious Rejection

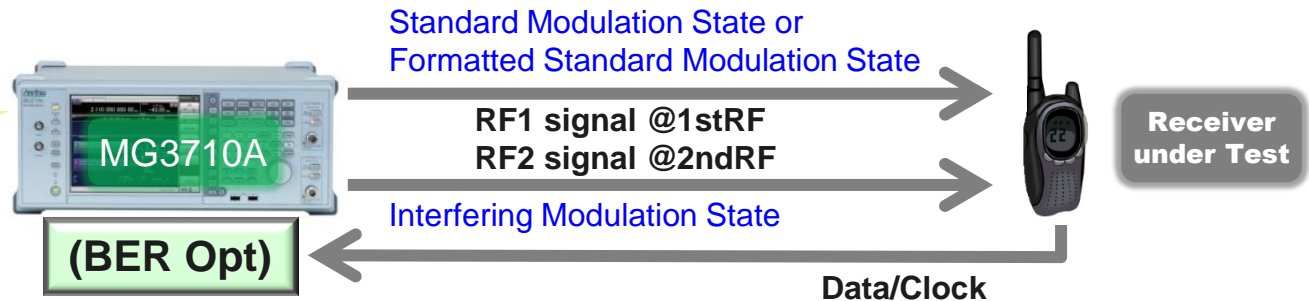
Note: For details, refer to the NXDN standard.

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 ± 50 kHz** of the receiver frequency.

Two RF Ports:

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



- RF1 = Wanted signal (PN9)
- Level: 3 dB above reference sensitivity
- RF2 = Unwanted signal (PN15)
- Frequency: Refer to above
 - Level: PU

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

PU is the level of the signal generator 2 [dBm]

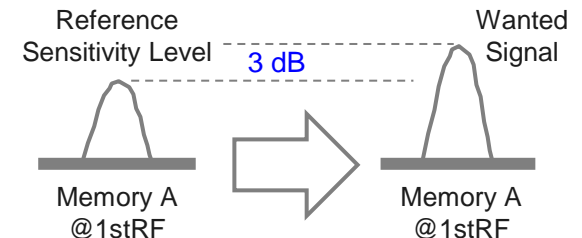
P_{REF} is the level of reference sensitivity [dBm]

SRR is the manufacturer specified limit for spurious rejection [dB]

Expected Value: **BER of 3% when 2556 or more data bits captured**

Limits:

Class	BE	ME	PE
A	75 dB	75 dB	70 dB
B	70 dB	70 dB	60 dB



Receiver Performance Measurement Methods

Spurious Rejection



MG3710A

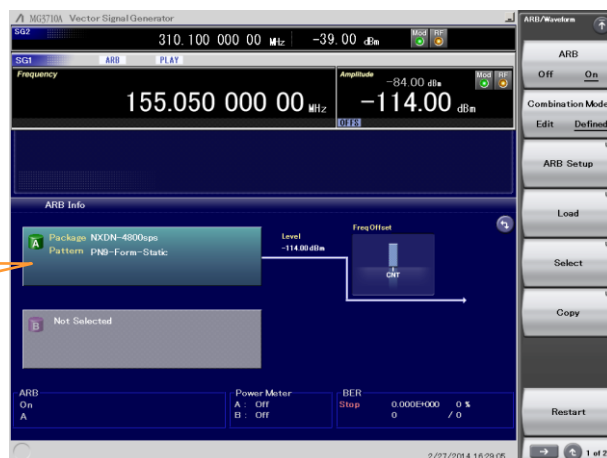
1stRF

2ndRF

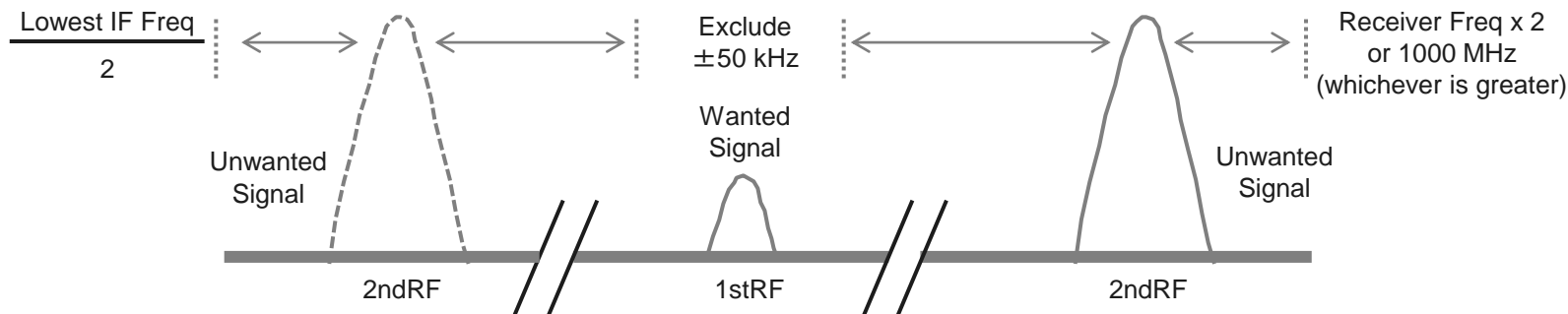
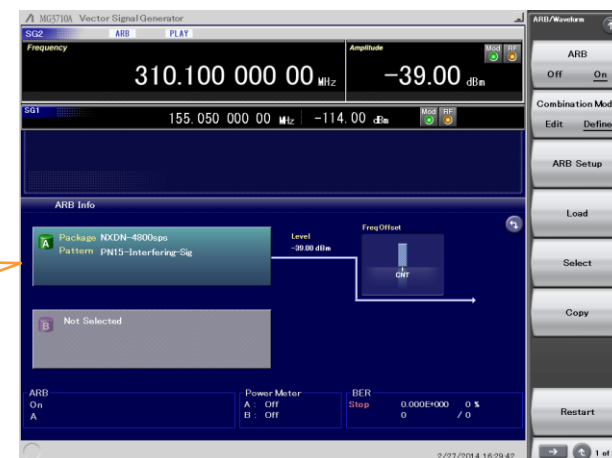
Two RF Ports:

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

Wanted Signal



Unwanted Signal



Receiver Performance Measurement Methods

Intermodulation Rejection

Note: For details, refer to the NXDN standard.

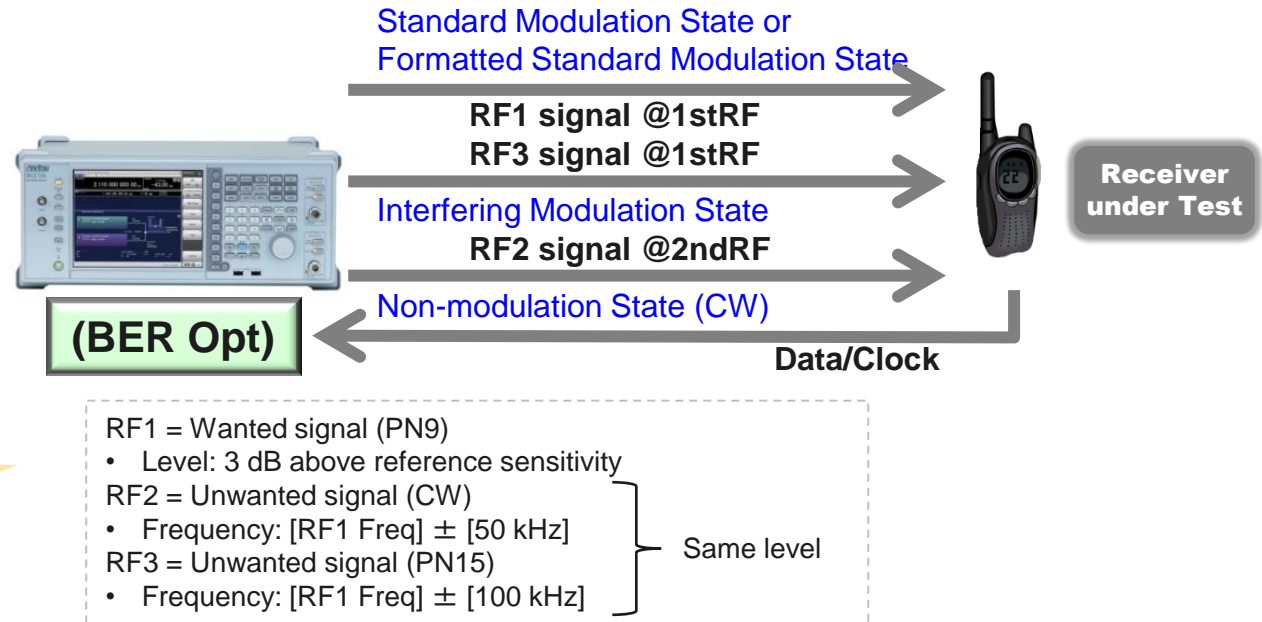
Measures ability to reject intermodulation caused by unwanted signals with **offset frequency of +50 kHz/+100 kHz or -50 kHz/-100 kHz**

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:

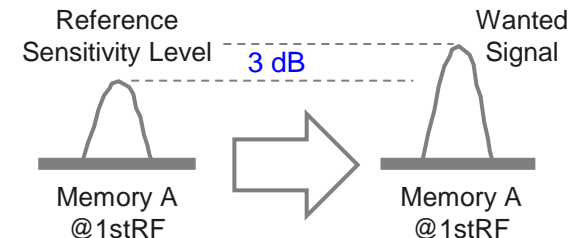
The MG3710A supports two RF ports in one unit, cutting equipment costs.



Expected Value: **BER of 3% when 2556 or more data bits captured**

Limits:

Class	BE	ME	PE
A	75 dB	70 dB	65 dB
B	70 dB	65 dB	50 dB



Receiver Performance Measurement Methods

Intermodulation Rejection



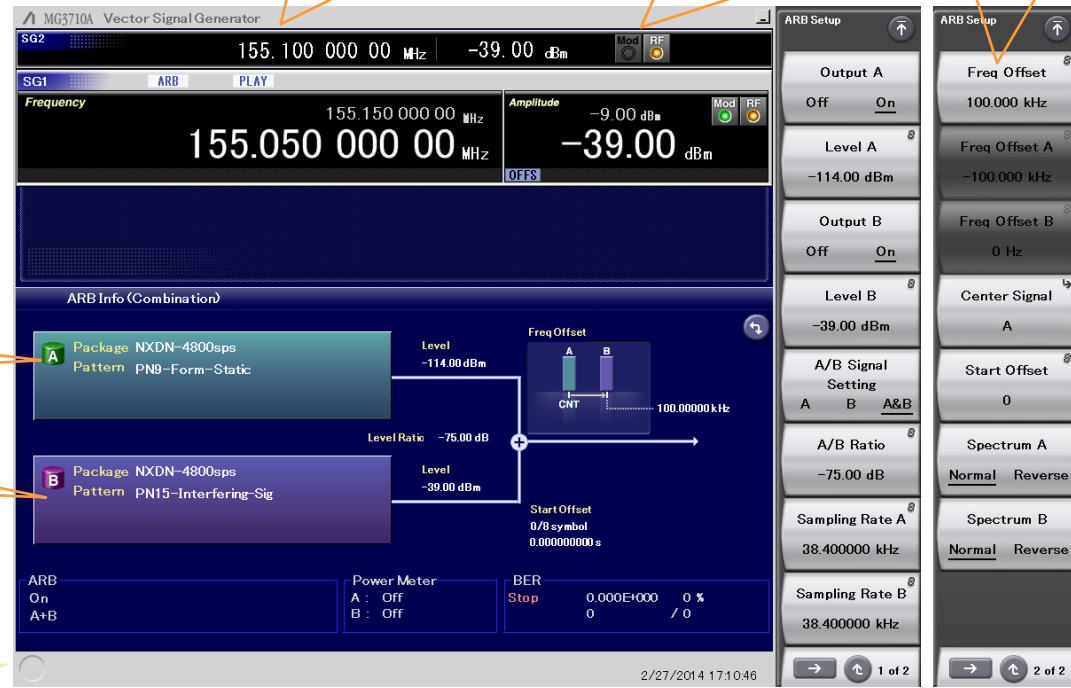
Frequency Offset
e.g. +50 kHz

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

Frequency Offset
e.g. +100 kHz

Wanted Signal

Unwanted Signal



Merit of Dual Memory:

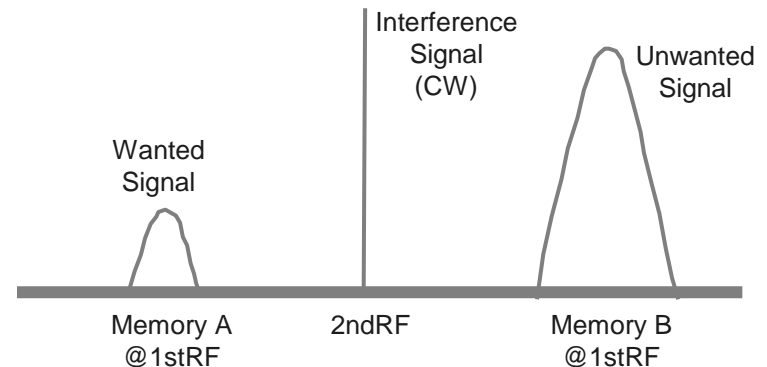
- Two signals of "Wanted signal" and "Unwanted signal" are output by one RF-port.
- Both Level and C/N set for each level
- Frequency offset set by direct input.

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

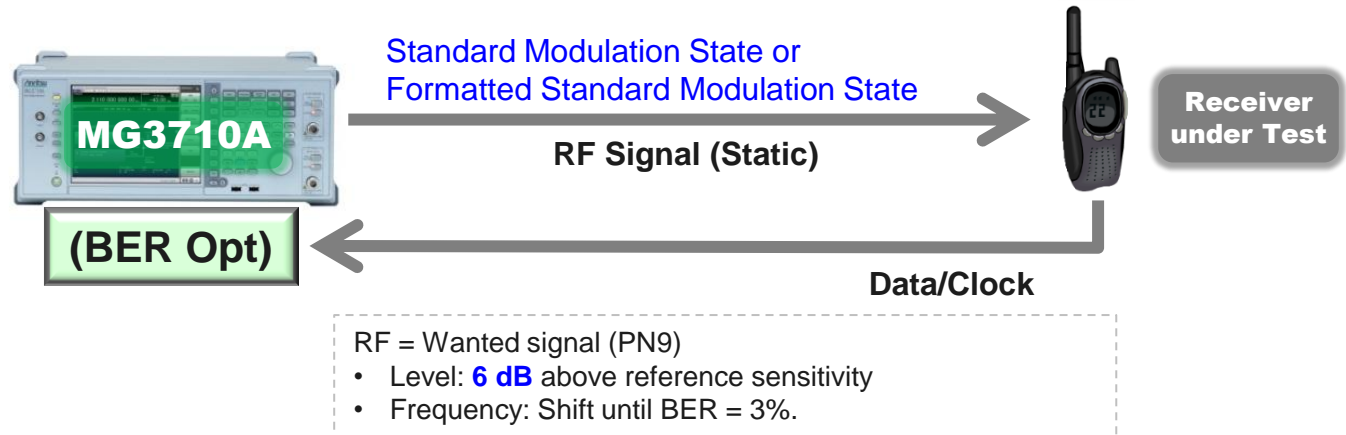


Receiver Performance Measurement Methods

Frequency Offset Sensitivity

Note: For details, refer to the NXDN standard.

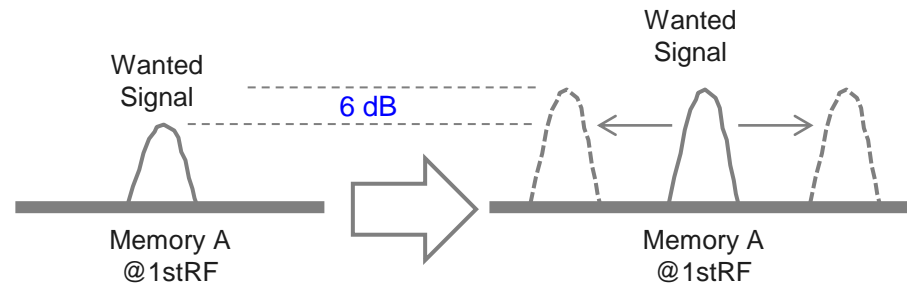
Measures ability to reject signal in standard modulation state with specified **offset frequency from nominal frequency**



Expected Value: **BER of 3% when 2556 or more data bits captured**

Limits:

Channel Spacing	Frequency Offset
6.25 kHz	± 500 Hz
12.5 kHz	± 1000 Hz



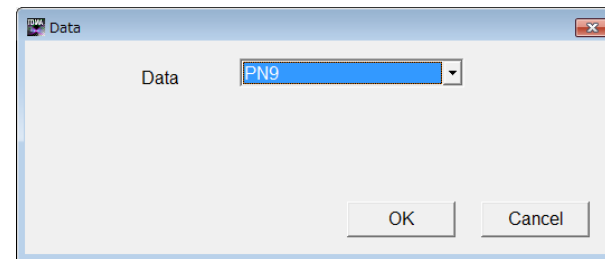
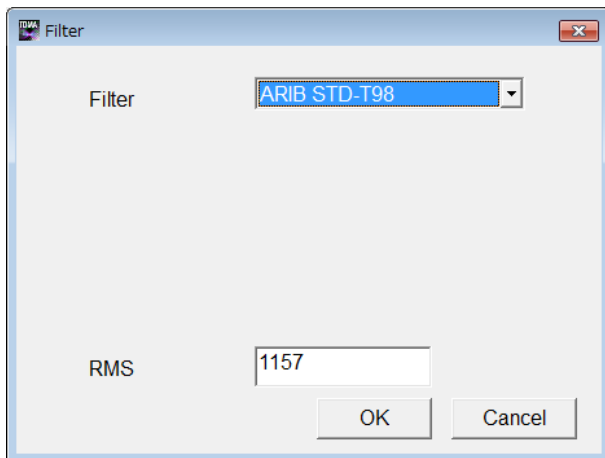
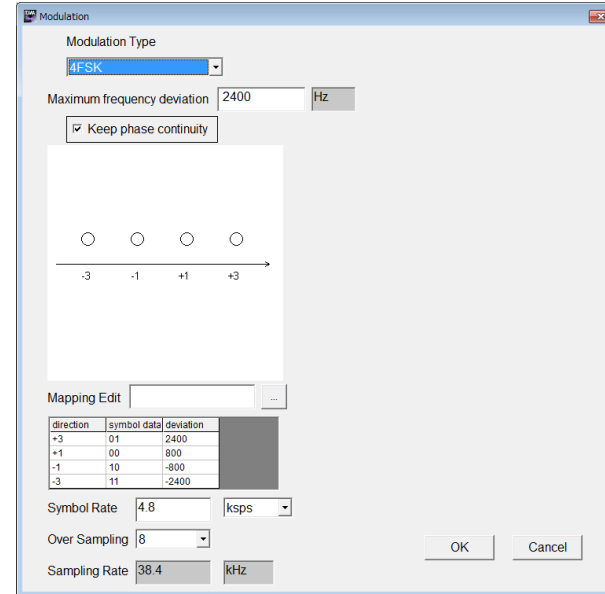
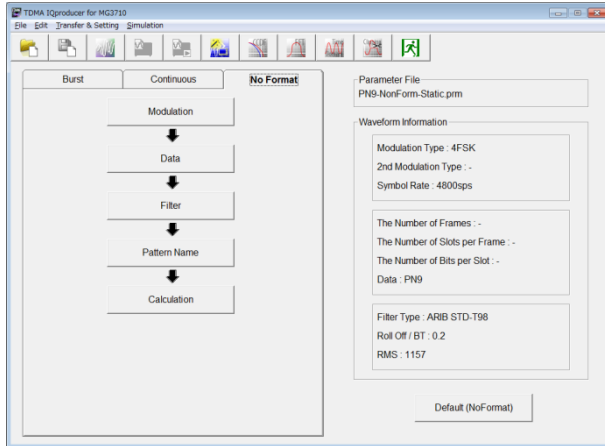
[Appendix] How to Create NXDN Pattern 1/2

► TDMA IQproducer

Standard Modulation State (Non-Formatted)

PN9

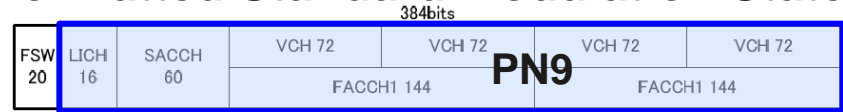
TDMA IQproducer



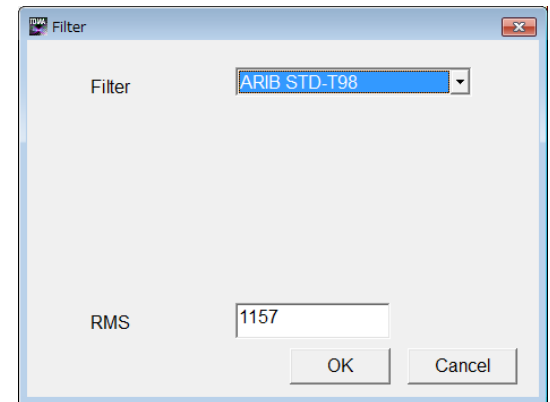
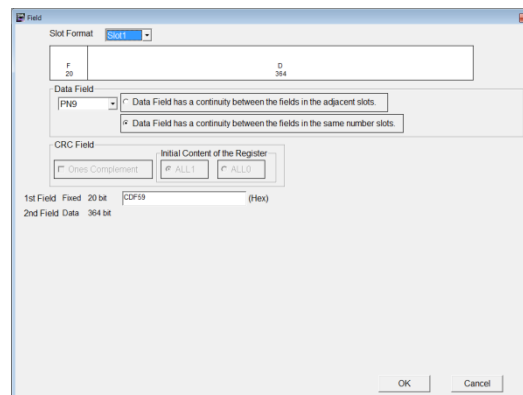
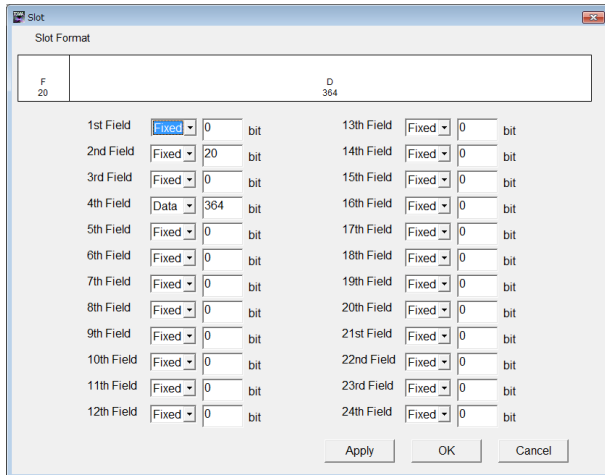
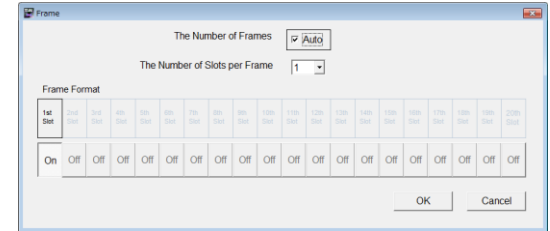
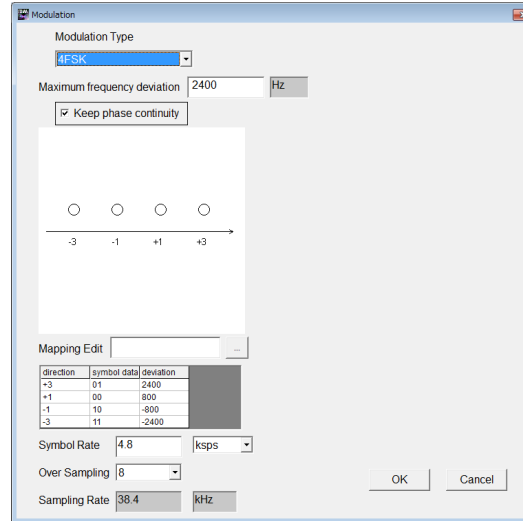
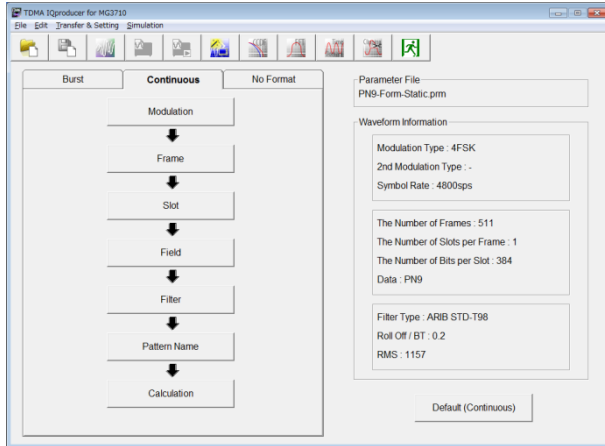
[Appendix] How to Create NXDN Pattern 2/2

► TDMA IQproducer

Formatted Standard Modulation State



TDMA IQproducer



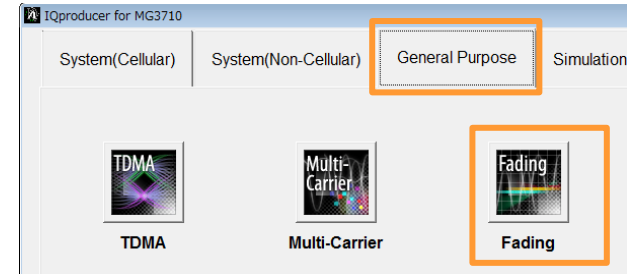
[Appendix] How to Create Faded Pattern 1/2

Start Fading IQproducer

[IQpro]

Click [General Purpose] tab.

Click [Fading] icon.



Set Fading Parameter

(Tx Antenna Configuration)

Click [Reference].

Select [PN9-Form-Static] or [PN9-NonForm-Static].

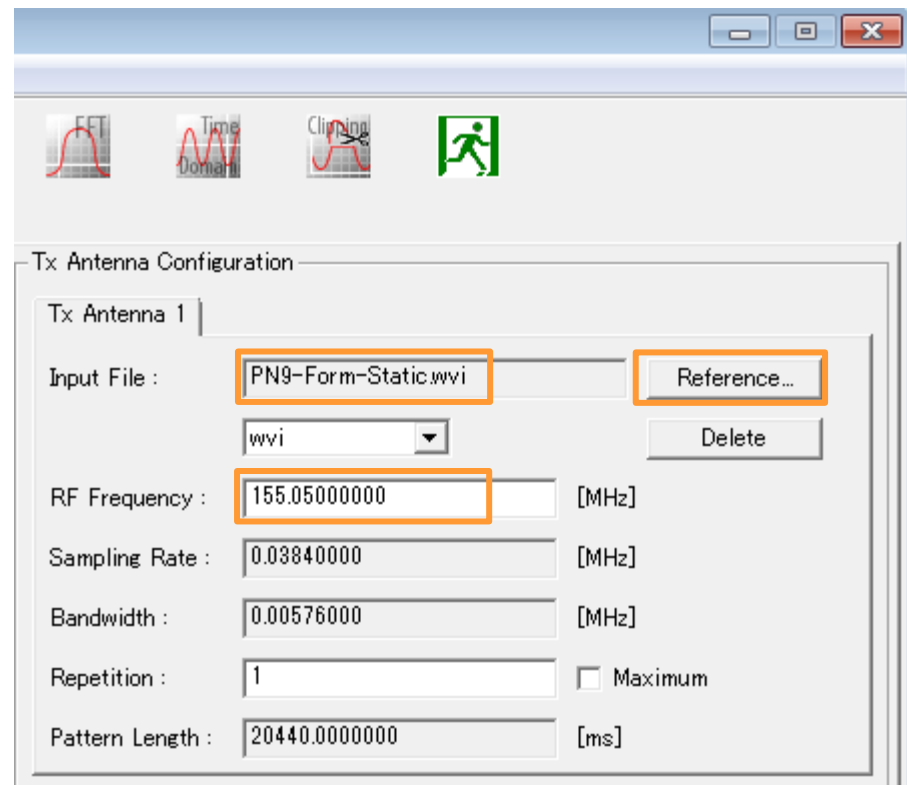
(C:\¥Anritsu¥MG3710A¥User Data¥Waveform
¥NXDN-2400sps*) on MG3710A HDD

*Or NXDN-4800 sps

Set RF Frequency (e.g. : 155.05 MHz)



Create different patterns
for each evaluated frequency



[Appendix] How to Create Faded Pattern 2/2

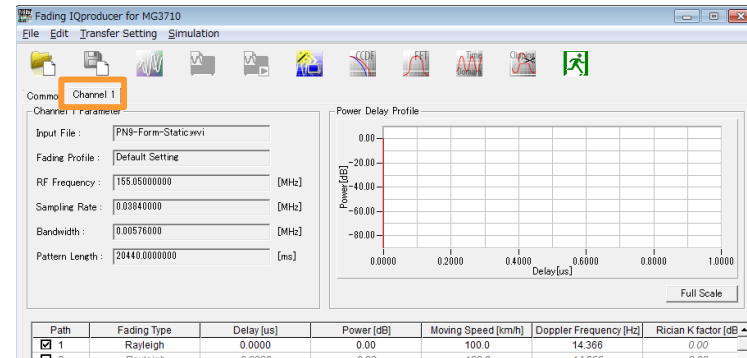
Set Fading Parameter (Channel condition)

Click [Channel 1] tab.

Set [Fading Type] = Rayleigh.

Set [Moving Speed] = 8 km/h or 100 km/h.

Set [Spectrum Shape] = Flat.



Path	Fading Type	Delay [us]	Power [dB]	Moving Speed [km/h]	Doppler Frequency [Hz]	Rician K
1	Rayleigh	0.0000	0.00	100.0	14.366	0.00
2	Rayleigh	0.0000	0.00	100.0	14.366	0.00

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

Create Pattern (Calculation)

Click [Calculation].

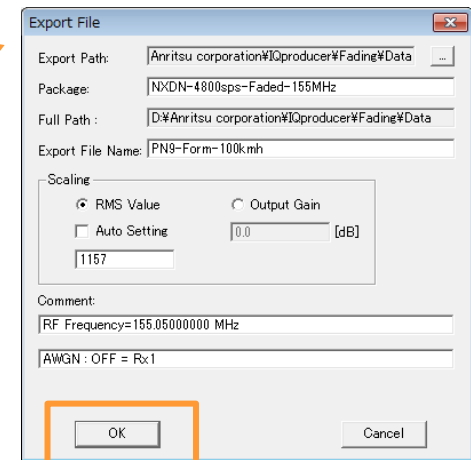
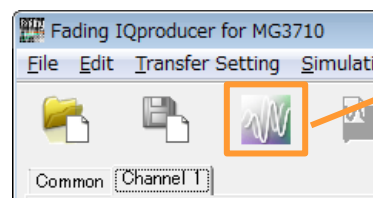
Input [Package] name.

(e.g. : NXDN-4800sps-Faded-155MHz)

Input [Pattern] name.

(e.g. : PN9-Form-100kmh)

Click [OK].



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			√
MG3710A-021	BER Test Function	√	√	√
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. 20 W @ <2 GHz (Standard 2 W nominal)
MG3710A-045/075	ARB Memory Upgrade 256 Msample	Upgrades ARB size to 256 Msamples (1 GB)
MX370107A	Fading IQproducer	To create Faded signal

Required for Reference Sensitivity (Faded)

● United States

Anritsu Company

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TX 75081, U.S.A.
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Fax: +1-972-671-1877

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Fax: +1-613-591-1006

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Fax: +52-55-5254-3147

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● Finland

Anritsu AB

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Fax: +358-20-741-8111

● Denmark

Anritsu A/S

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Fax: +45-7211-2210

● Russia

Anritsu EMEA Ltd.

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