Anritsu envision : ensure

DMR
Tx Test Solution

Signal Analyzer
MS2830A

Reference Specifications

ETSI EN 300 113 Version 2.1.1 (2016-08) / Technical characteristics of the transmitter

ETSI TS 102 361-1 Version 2.4.1 (2016-02) / Air Interface protocol

[Anritsu] DMR Tx Test Solution

Tx Evaluation

Multi-functions supported with one unit!

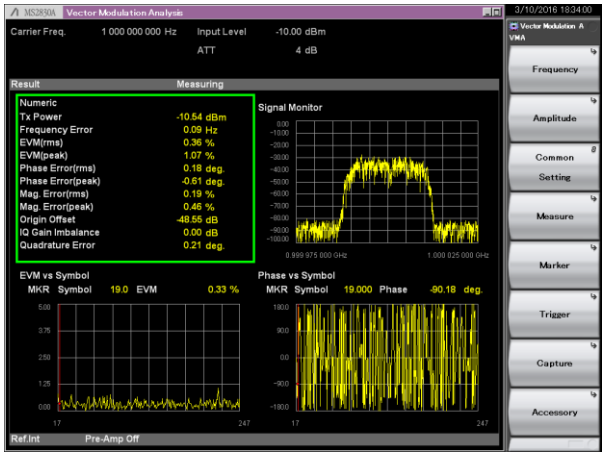
Unit, Module*

*Output in Test Mode

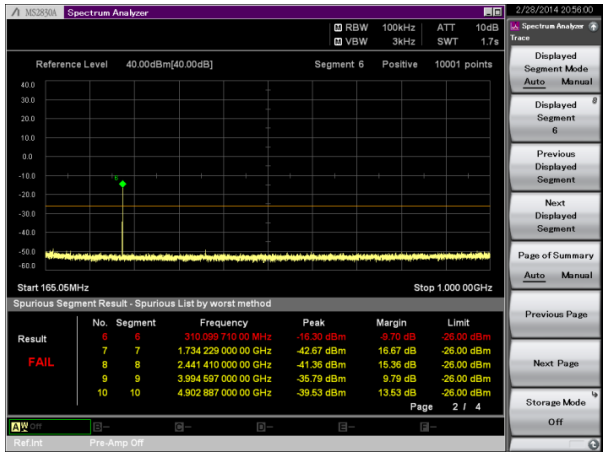
MS2830A
Signal Analyzer

- Spectrum Analyzer
- Signal Analyzer
- Modulation Analyzer (MX269017A)
- Signal Generator

MX269017A
Vector Modulation Analysis Software



Spectrum Analyzer
Spurious Emission Function



Note: For details, refer to the DMR standard.

EN 300 113	Transmitter Test Items	Signal Analyzer	Other
		MS2830A	
7.1	Frequency Error	✓(SPA, 17A)	---
7.2	Transmitter power (conducted)	✓(SPA, 17A) 4	Power Meter
7.3	Maximum Effective radiated power	---	Radiation Test Site
7.4	Adjacent and alternate channel power	✓(SPA) 3	---
7.5	Unwanted emissions in the spurious domain	✓(SPA)	---
7.6	Intermodulation attenuation	✓(SPA)	Signal Generator

1. Requires MS2830A-006 Analysis Bandwidth 10 MHz for Frequency vs. Time function
2. Requires MX269017A Vector Modulation Analysis Software with MS2830A-006
3. Requires MS2830A-066 Low Phase Noise Performance
4. Requires MA2410xA USB Power Sensor

Test Signals

Measures transmitter and receiver

(Specified by EN 300 113 6.3 Normal test signals (wanted and unwanted signals))

Test Signals	Contents
D-M0	consisting of an infinite series of 0 bits; → Non Modulation (648Hz)
D-M1	consisting of an infinite series of 1 bits; → Non Modulation (-1944Hz)
D-M2	consisting of a pseudo-random bit sequence of at least 511 bits according to ITU-T Recommendation O.153 [4]; → Random Modulation for 4FSK
D-M2’	this is the same type as D-M2, but the pseudo-random bit sequence is independent of D-M2 (perhaps identical with D-M2 but started at another point of time); → Add Start Offset base D-M2
A-M3	consisting of an RF signal, modulated by an audio frequency signal of 400 Hz with a deviation of 12 % of the channel separation. This signal is used as an unwanted signal. → FM Modulation = 1500Hz (12.5kHz * 12%) , FM Rate=400Hz For co-channel rejection and adjacent channel selectivity.
D-M4	consists of correctly coded signals. For ACLR and Spurious measurement. clause 8.1.2.2
D-M5	consisting of a pseudo-random bit sequence of at least 511 bits according to ITU-T Recommendation O.153 [4];
D-M5'	this is the same type as D-M5, but the pseudo-random bit sequence is independent of D-M5 (perhaps identical with D-M5 but started at another point of time);
C1	shall be any signal that provides a constant envelope of output power at the output of the transmitter. This may be a CW tone or a modulated signal with constant envelope (e.g. GMSK). The envelope shall be flat to ±1 dB.
D-M7	consists of correctly coded signals. For ACLR and Spurious measurement. trains of correctly coded bits or messages. For radio frequency occupied bandwidth. Largest possible value of output power (PEP)

Frequency Error

Measures transmitter transmit frequency

Limits: (Specified by EN 300 113 7.1.3 Limits)

Transmitter under Test

Non-Modulation State (CW) or Continuous Modulation

RF Signal

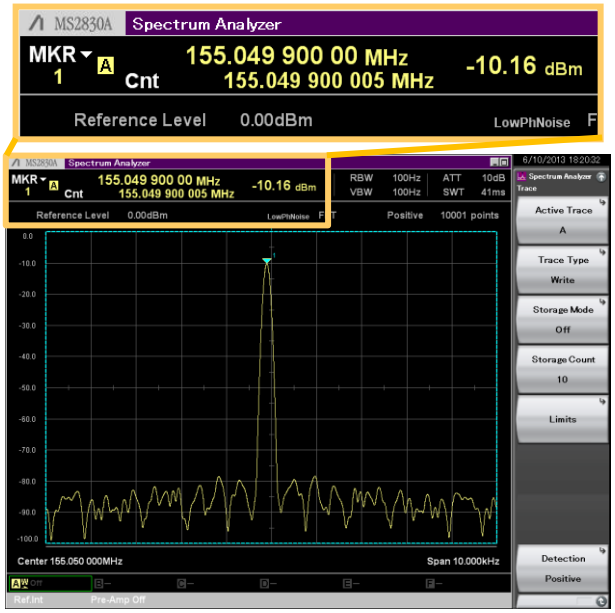
Frequency Counter Function [pre-installed]

Vector Modulation Analysis [MX269017A]

Frequency Counter

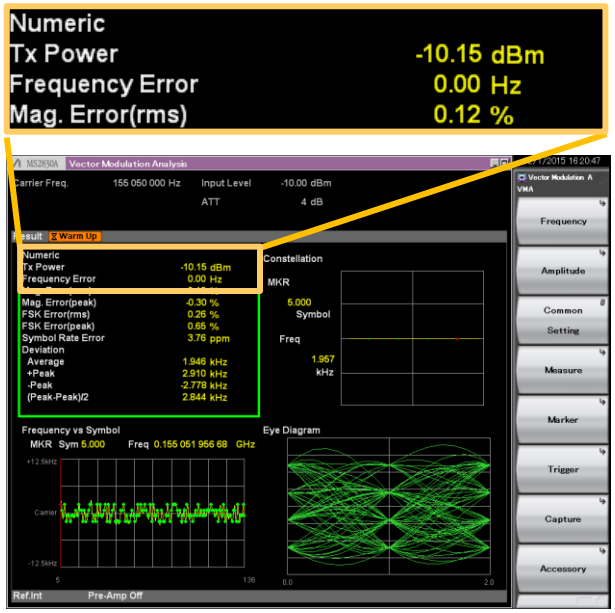
Frequency Counter Function [pre-installed]

For Non-Modulation State (CW)



Vector Modulation Analysis [MX269017A]

For Continuous Modulation State



Frequency Error

Table 2: Frequency error

Channel separation (kHz)	Frequency error limit (kHz)				
	below 47 MHz	47 MHz to 137 MHz	above 137 MHz to 300 MHz	above 300 MHz to 500 MHz	above 500 MHz to 1 000 MHz
20 and 25	±0,60	±1,35	±2,00	±2,00 (see note 2)	±2,50 (see note 2)
12,5	±0,60	±1,00	±1,00 (B) ±1,50 (M)	±1,00 (B) ±1,50 (M) (see note 2)	No value specified

NOTE 1: For handportable stations having integral power supplies, these limits only apply to the reduced extreme temperature range 0 °C to +40 °C.

NOTE 2: However for the full extreme temperature conditions (see clause 5.4.1), exceeding the reduced extreme temperature range above, the following frequency error limits apply:
±2,50 kHz between 300 MHz and 500 MHz;
±3,00 kHz between 500 MHz and 1 000 MHz.

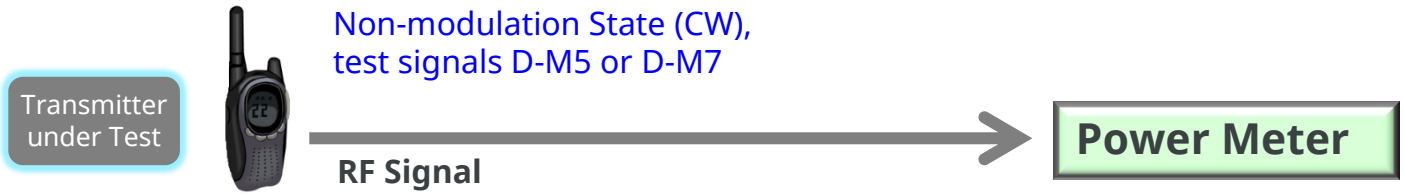
NOTE 3: (B) base station.

NOTE 4: (M) mobile station.

Transmitter Power

Measures transmitter power

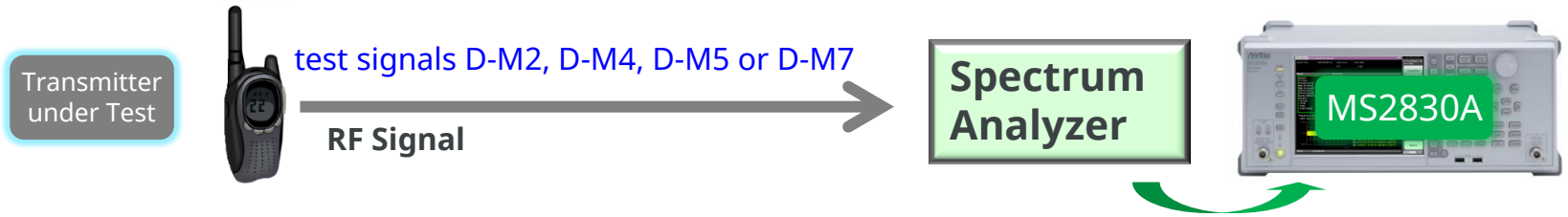
Limits: (Specified by manufacturer)



Test Condition	Spec
Normal test condition (see ES300 113 5.3 Normal test conditions)	±1.5 [dB]
Extreme test condition (conducted) (see ES300 113 5.4 Extreme test conditions)	+2.0 [dB] and -3 [dB]

Adjacent Channel Power Ratio

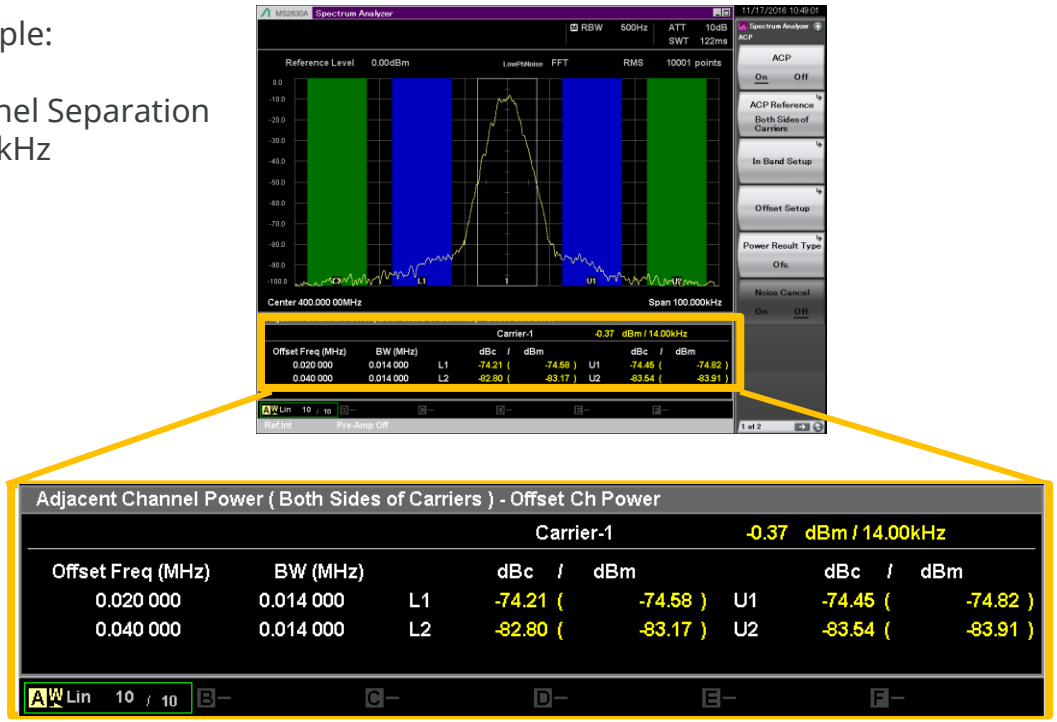
Measures ratio of total power of transmitter in the standard modulation state to leakage power within bandwidth of adjacent channels



Example:

Channel Separation
= 20 kHz

Adjacent Channel Power Function



Adjacent Channel Power Ratio

Limits: (Specified by EN 300 113 7.4.3 Limits)

Channel Separation	Measurement Band Width	ACLR Limit [dB]	ACLR Limit [dBm]
12.5 kHz	8.5 kHz	60 dB	-37 dBm (0.2 uW)
20 kHz	14 kHz		
25 kHz	16 kHz		

Unwanted emissions in the spurious domain

Measures power of spurious signals missions at frequencies other than those of the carrier and sidebands associated with normal modulation.

Limits: (Specified by EN 300 113 7.5.4 Limits)

Conducted emissions

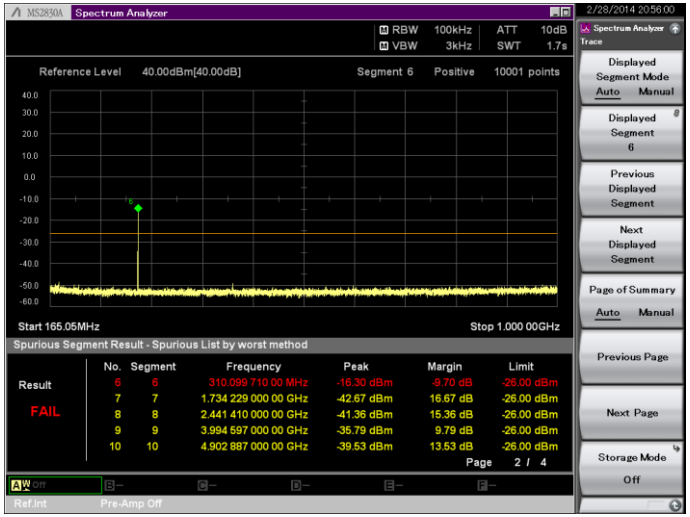
Transmitter under Test

Non-modulation State (CW)
test signals D-M2, D-M4, D-M5 or D-M7
continuous transmission mode

RF Signal

Spectrum Analyzer

Spurious Function [pre-installed]



Unwanted emissions in the spurious domain

Limits: (Specified by EN 300 113 7.5.4 Limits)

Table 4: Conducted emissions

Frequency range	Tx operating	Tx standby
9 kHz to 1 GHz	0,25 µW (-36 dBm)	2,0 nW (-57 dBm)
above 1 GHz to 4 GHz or above 1 GHz to 12,75 GHz	1,00 µW (-30 dBm)	20 nW (-47 dBm)

Table 5: Radiated emissions

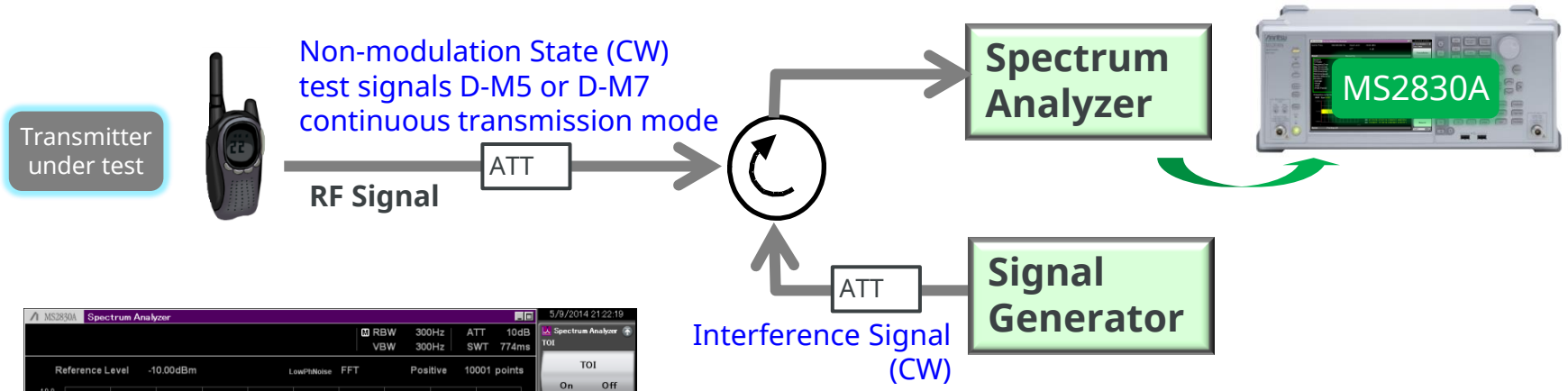
Frequency range	Tx operating	Tx standby
30 MHz to 1 GHz	0,25 µW (-36 dBm)	2,0 nW (-57 dBm)
above 1 GHz to 4 GHz or above 1 GHz to 12,75 GHz	1,00 µW (-30 dBm)	20 nW (-47 dBm)

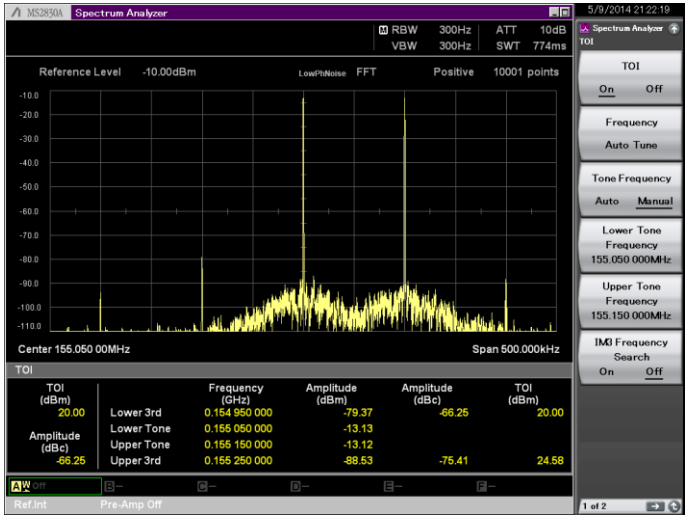
The measurements shall be made, for equipment operating on frequencies not exceeding 470 MHz, in the frequency range from 9 kHz to 4 GHz, and for equipment operating on frequencies above 470 MHz, additionally in the frequency range from 4 GHz to 12,75 GHz, except for the channel on which the transmitter is intended to operate, and its adjacent channels.

Intermodulation Attenuation

Measures ability of transmitter to withstand generation of intermodulation components caused by carrier signal and interfering signal entering transmitter antenna of BE(RU).

Limits: 40 dB max.





TOI Function [pre-installed]

Limits: 40 dB max.

Limits: (Specified by EN 300 113 7.6.3 Limits)

Note: For details, refer to the DMR standard.

TS102 361-1	Test Items	Signal Analyzer
		MS2830A
10	Physical Layer	
10.1.3	Transmitter frequency error	✓(17A)
10.1.4	Time base clock drift error	✓(17A)
10.2.2.1	Deviation index	✓(17A)
10.2.2.3	4FSK Modulator	✓(17A)
10.2.3 10.2.3.1 10.2.3.1.1	Burst timing Normal burst Power ramp time	✓(17A)
10.2.3.1.2	Symbol timing	----
10.2.3.2 10.2.3.2.1	Reverse channel (RC) burst Power ramp time	✓(17A)
10.2.3.2.2	Symbol timing	----

Physical Layer

Measures Frequency Error, Deviation, FSK Error, Timming Offset

MX269017A
Digital Modulation Analysis

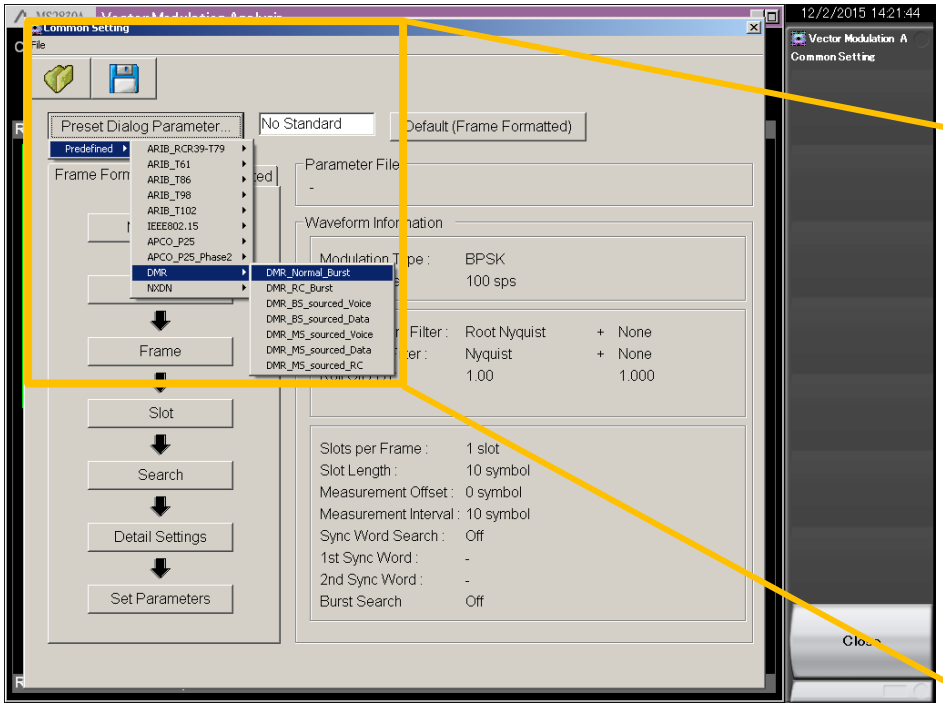
Transmitter under Test

Continuous or Burst Modulation

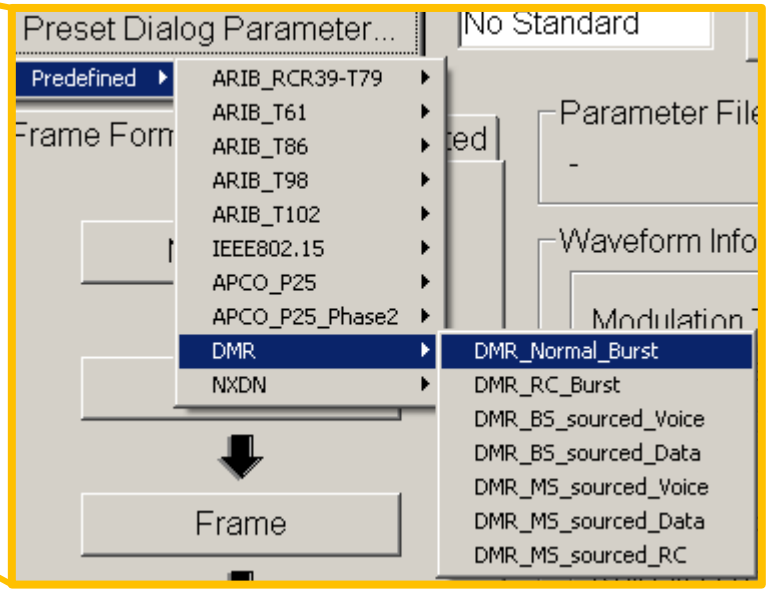
RF Signal

Modulation Analyzer

@Trigger mode



Preset Dialog Parameter [pre-installed]



Physical Layer

Preset Dialog Parameters

DMR Predefined Name	BS/MS	Remakes.
DMR_Normal_Burst	--	Standard first measurement. Can measurement Continuous and Burst signal. For adjust Frequency, Deviation, FSKErr, SymbolRate. Not detect Syncword.
DMR_RC_Burst	--	For RC Burst measurement. Base parameter is same as DMR_Normal_Burst.
DMR_BS_sourced_Voice	BS	Standard measurement apply FrameSync 12Slot TDMA mode. SyncWordPattern is BS voice.
DMR_BS_sourced_Data	BS	SyncWordPattern is BS data. Base parameter is same as DMR_BS_sourced_Voice.
DMR_MS_sourced_Voice	MS	Standard measurement apply FrameSync 12Slot TDMA mode. SyncWordPattern is MS voice.
DMR_MS_sourced_Data	MS	SyncWordPattern is MS data. Base parameter is same as DMR_MS_sourced_Voice.

Physical Layer

Measures Frequency Error, Deviation, FSK Error
(Predefined selected "DMR_Normal_Burst")

MX269017A
Digital Modulation Analysis

Numeric Trace

Numeric	Avg / Max	
Tx Power	-10.42 /	-10.42 dBm
Frequency Error	0.04 /	0.39 Hz
Mag. Error(rms)	0.09 /	0.09 %
Mag. Error(peak)	-0.04 /	0.30 %
FSK Error(rms)	0.55 /	0.79 %
FSK Error(peak)	2.90 /	4.85 %
Symbol Rate Error	-6.47 /	-47.85 ppm
Deviation		
Average	1.945 /	1.947 kHz
+Peak	2.850 /	3.033 kHz
-Peak	-2.987 /	-3.403 kHz
(Peak-Peak)/2	2.918 /	3.218 kHz

Custom Numeric Trace

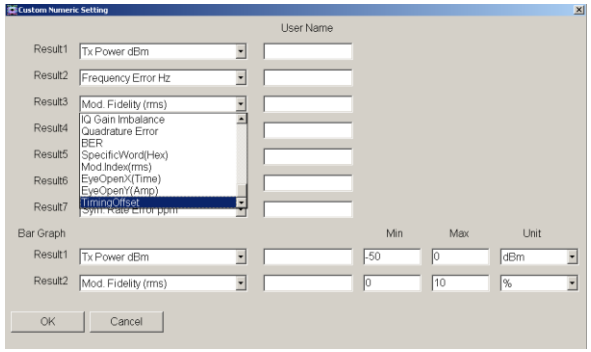
Custom Numeric		
Tx Power	-10.42 /	-10.42 dBm
Frequency Error	0.04 /	0.39 Hz
Mod. Fidelity (rms)	0.55 /	0.78 %
Deviation Average	1.945 /	1.947 kHz
SpecificWord(Hex)		(3A)
BER	*** /	*** %
Sym. Rate Error	-6.47 /	-47.85 ppm

Tx Power -10.42dBm

-50 0 dBm

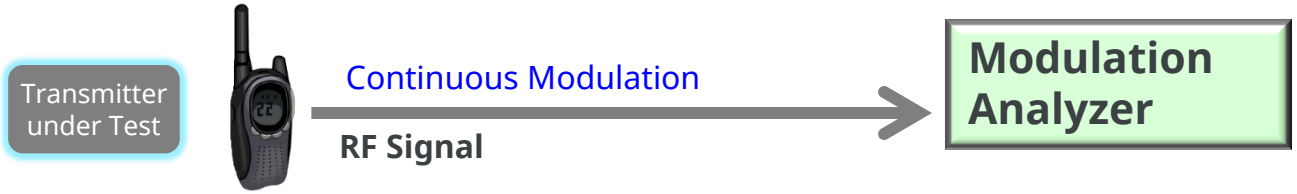
Mod. Fidelity (rms) 0.55%

0 10 %

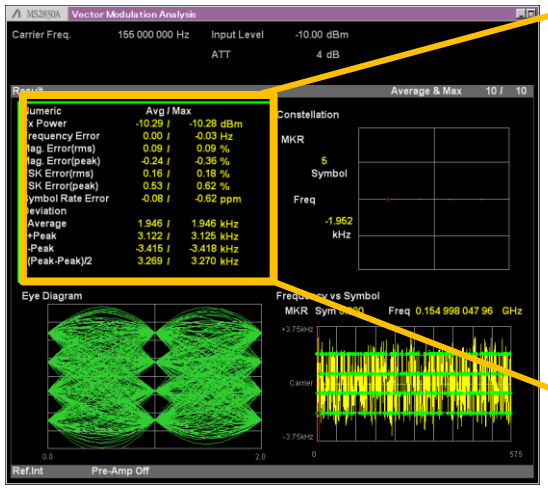


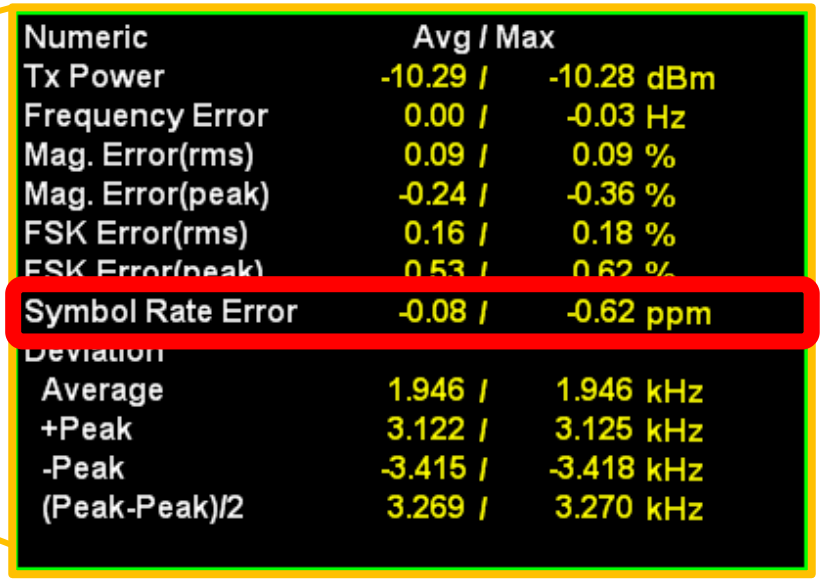
Physical Layer

Measures SymbolRate Error
(Predefined selected "DMR_Normal_Burst"
And change to Non-Formatted Mode.)



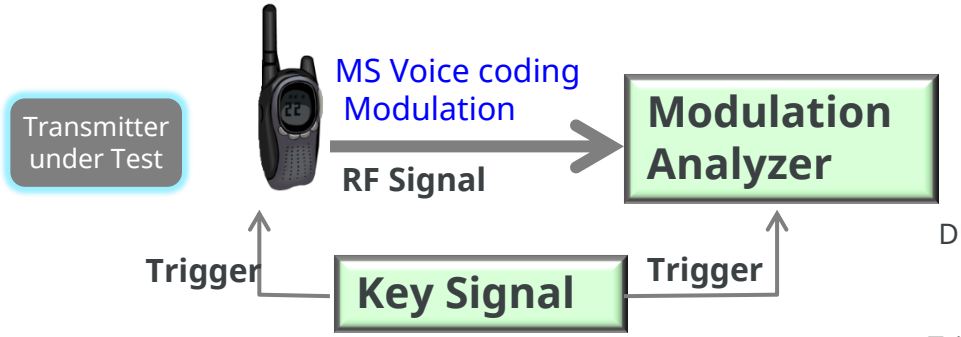
MX269017A
Digital Modulation Analysis

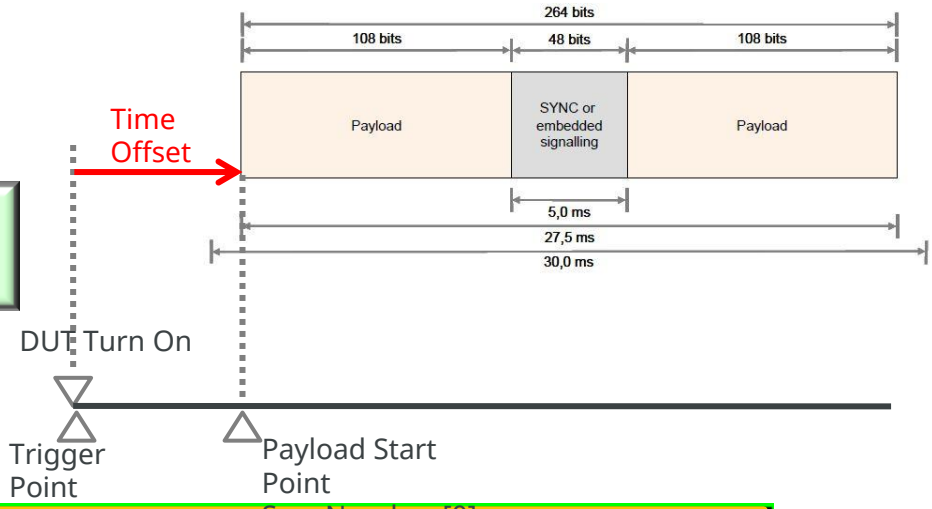




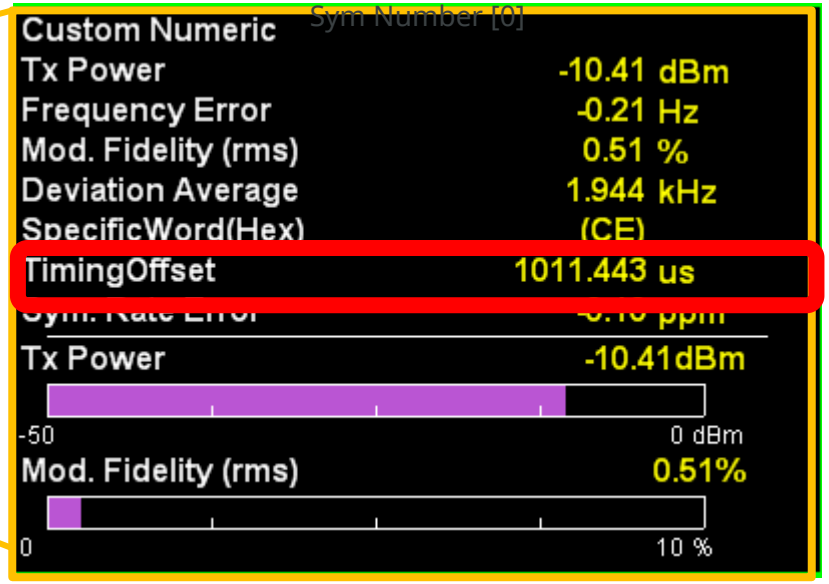
Physical Layer

Measures Transmit Timming from Trigger.
(Predefined selected "DMR_MS_sourced_Voice"
And set Trigger Mode External.)





MX269017A
Digital Modulation Analysis



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envision : ensure

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