

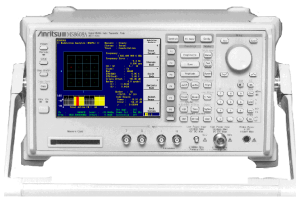
MX860802A/MX860902A

GSM Measurement Software

MS8608A/MS8609A

Digital Mobile Radio Transmitter Tester

MX860802A/MX860902A GSM Measurement Software Application Note



April 2006
Anritsu Corporation
Version 1.0

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MS8609A-E-F-2

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Contents

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*The number in parentheses means the standard chapter.

Appendix

1. MG3700A Settings

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- GSM Standards

- 1.1 Related standards
- 1.2 Frequency and channel
- 1.3 BTS Output power
- 1.4 Frame configuration
- 1.5 BTS Measurement items

1.1 Related standards



RF Specification

BS

3GPP



3GPP TS 05.05 v8.16.0 (2003-08)
Technical Specification

3rd Generation Partnership Project;
 Technical Specification Group GSM/EDGE;
 Radio Access Network;
 Radio transmission and reception
 (Release 1999)

3GPP TS 51.021 v5.0.0 (2002-06)
Technical Specification


3rd Generation Partnership Project;
 Technical Specification Group GSM/EDGE;
 Radio Access Network;
 Digital cellular telecommunications system (Phase 2 & Phase 2+);
 Base Station System (BSS) equipment specification;
 Radio aspects
 (Release 5)

ETSI

ETSI EN 300 910 v6.5.1 (1999-12)
European Standard (Telecommunications series)

Digital cellular telecommunications system (Phase 2+);
 Radio transmission and reception
 (GSM 05.05 version 6.5.1 Release 1997)



ETSI EN 301 087 v8.2.1 (2000-10)
European Standard (Telecommunications series)

Digital cellular telecommunications system (Phase 2 & Phase 2+);
 Base Station System (BSS) equipment specification;
 Radio aspects
 (GSM 11.21 version 8.2.1 Release 1999)



1.2 Frequency and channel

Frequency Table 1: Frequency Bands for GSM Base Station Systems

	TX:	RX:
P-GSM900	935 MHz to 960 MHz	890 MHz to 915 MHz
DCS1800	1805 MHz to 1,880 MHz	1710 MHz to 1785 MHz
E-GSM900	925 MHz to 960 MHz	880 MHz to 915 MHz
R-GSM900	921 MHz to 960 MHz	876 MHz to 915 MHz
GSM 450	460.4 MHz to 467.6 MHz	450.4 MHz to 457.6 MHz
GSM 480	488.8 MHz to 496 MHz	478.8 MHz to 486 MHz
GSM 850 and MXM 850	869 MHz to 894 MHz	824 MHz to 849 MHz
PCS 1900 and MXM 1900	1930 MHz to 1990 MHz	1850 MHz to 1910 MHz

Channel

Table 2: Channel Numbering Frequencies in MHz

P-GSM900	$F_l(n) = 890 + 0.2 \cdot n$	$1 \leq n \leq 124$	$F_u(n) = F_l(n) + 45$
E-GSM900	$F_l(n) = 890 + 0.2 \cdot n$ $F_l(n) = 890 + 0.2 \cdot (n-1024)$	$0 \leq n \leq 124$ $975 \leq n \leq 1023$	$F_u(n) = F_l(n) + 45$
R-GSM900	$F_l(n) = 890 + 0.2 \cdot n$ $F_l(n) = 890 + 0.2 \cdot (n-1024)$	$0 \leq n \leq 124$ $955 \leq n \leq 1023$	$F_u(n) = F_l(n) + 45$
DCS1800	$F_l(n) = 1710.2 + 0.2 \cdot (n-512)$	$512 \leq n \leq 885$	$F_u(n) = F_l(n) + 95$
PCS 1900 and MXM 1900	$F_l(n) = 1850.2 + 0.2 \cdot (n-512)$	$512 \leq n \leq 810$	$F_u(n) = F_l(n) + 80$
GSM 450	$F_l(n) = 450.6 + 0.2 \cdot (n-259)$	$259 \leq n \leq 293$	$F_u(n) = F_l(n) + 10$
GSM 480	$F_l(n) = 479 + 0.2 \cdot (n-306)$	$306 \leq n \leq 340$	$F_u(n) = F_l(n) + 10$
GSM 850 and MXM 850	$F_l(n) = 824.2 + 0.2 \cdot (n-128)$	$128 \leq n \leq 251$	$F_u(n) = F_l(n) + 45$

Carrier space 200 kHz

3GPP TS05.21

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1.3 BTS Output power

Normal BTS

3GPP TS05.05

GSM 400 & GSM 900 & GSM 850 & MXM 850		DCS 1 800 & PCS 1 900 & MXM 1900	
TRX Power Class	Maximum Output Power	TRX Power Class	Maximum Output Power
1	320 - (<640) W	1	20 - (<40) W
2	160 - (<320) W	2	10 - (<20) W
3	80 - (<160) W	3	5 - (<10) W
4	40 - (<80) W	4	2.5 - (<5) W
5	20 - (<40) W		
6	10 - (<20) W		
7	5 - (<10) W		
8	2.5 - (<5) W		

Tolerance: ±2dB

Micro BTS & Pico BTS

3GPP TS05.05

GSM 900 & GSM 850 & MXM 850 Micro and Pico BTS		DCS 1 800 & PCS 1 900 & MXM 1900 Micro and Pico BTS	
TRX Power Class	Maximum Output Power	TRX Power Class	Maximum Output Power
Micro		Micro	
M1	(>19) - 24 dBm	M1	(>27) - 32 dBm
M2	(>14) - 19 dBm	M2	(>22) - 27 dBm
M3	(>9) - 14 dBm	M3	(>17) - 22 dBm
Pico		Pico	
P1	(>13) - 20 dBm	P1	(>16) - 23 dBm

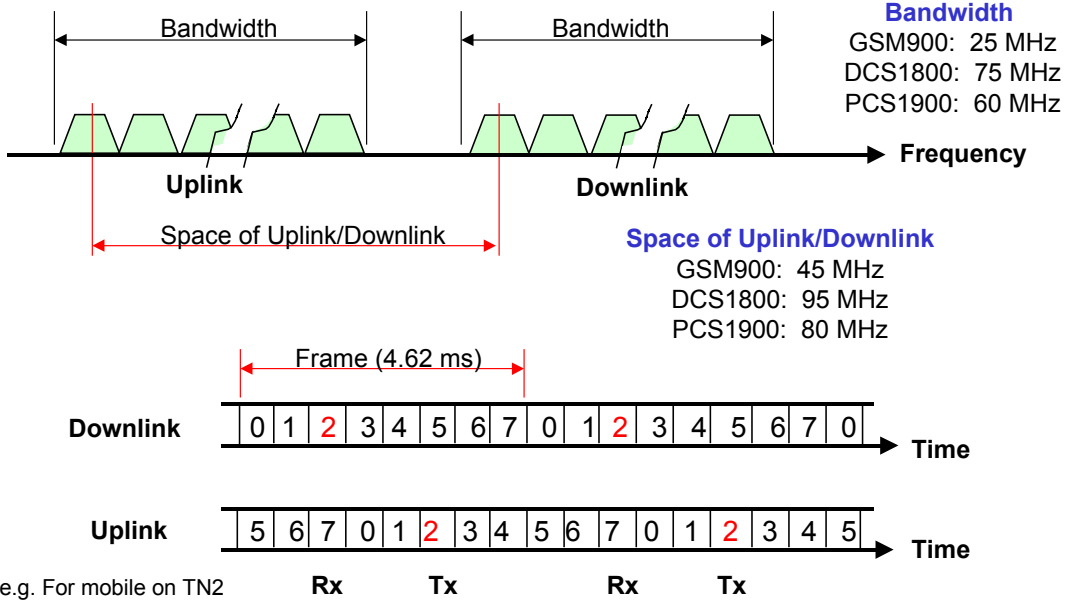
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1.4 Frame configuration



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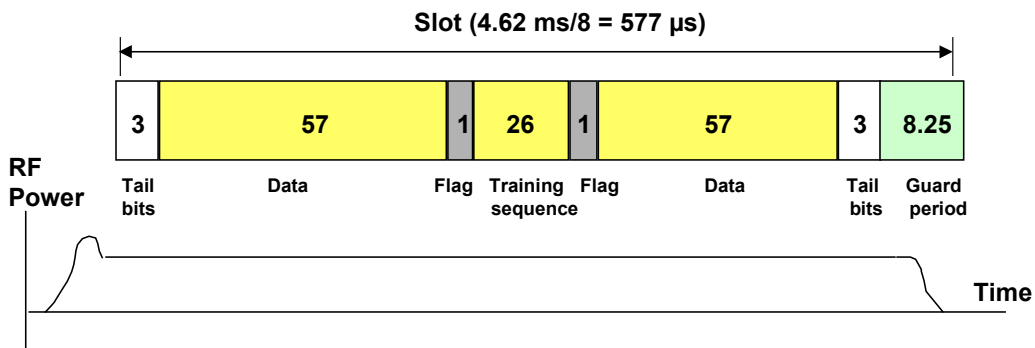
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1.4 Frame configuration

Normal Bursts

- Bit period: 3.69 μs (Bit Rate = 270.833 kbps)
- Burst length: 577 μs
- Frame length: 4.62 ms (Frame Rate = 217 fps)



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1.5 BTS Measurement items

TS05.05	Transmission Characteristics	MS8608/09A
4.1.2	Base station output power	Yes
4.2	Output RF spectrum	
4.2.1	Spectrum due to modulation and wideband noise	Yes
4.2.2	Spectrum due to switching transients	Yes
4.3	Spurious emissions	Yes
4.3.2	Base Transceiver Station (BTS)	Yes
4.4	Radio frequency tolerance	Yes
4.5	Output level dynamic operation	Yes
4.6	Modulation accuracy	
4.6.1	GMSK Modulation	Yes
4.6.2	8-PSK Modulation	Yes
4.7	Intermodulation attenuation	Yes

3GPP TS05.05

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2. Connections

2.1 Connection to signal generator

2.2 Connection to base station

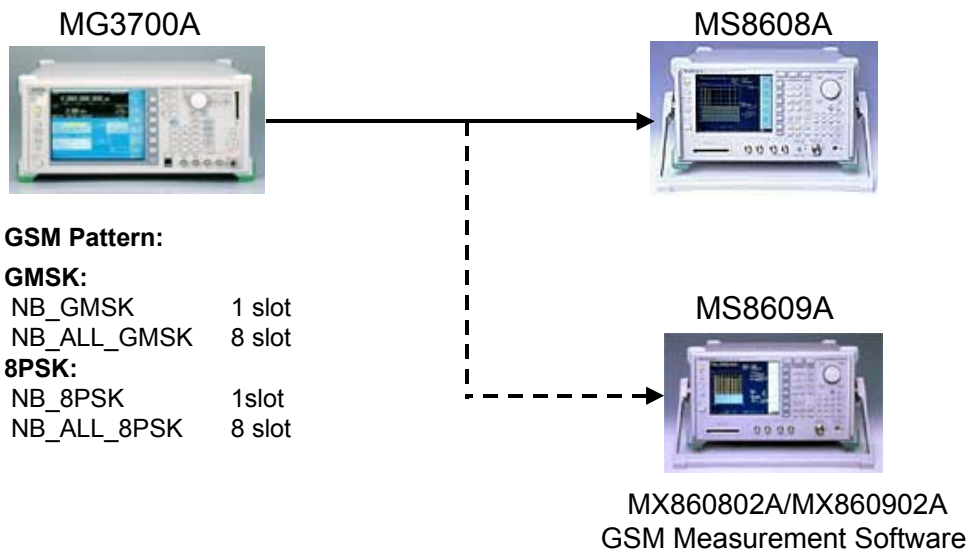
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2.1 Connection to signal generator



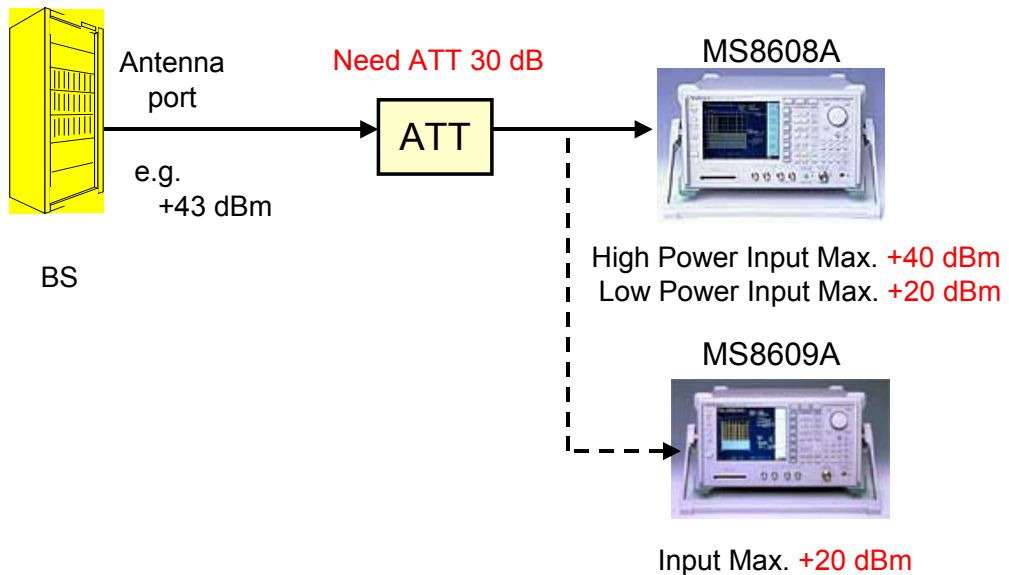
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2.2 Connection to base station



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3. BTS Tx Characteristics tests

- 3.1 Output power (4.1*)
- 3.2 Output RF spectrum (4.2)
 - 3.2.1 Spectrum due to modulation and wideband noise (4.2.1)
 - 3.2.2 Spectrum due to switching transients (4.2.2)
- 3.3 Spurious emissions (4.3)
- 3.4 Radio frequency tolerance (4.4)
- 3.5 Output level dynamic operation (4.5.1)
- 3.6 Modulation accuracy (4.6)
 - 3.6.1 GMSK Modulation (4.6.1)
 - 3.6.2 8PSK Modulation (4.6.2)
 - (1) RMS EVM (4.6.2.1)
 - (2) Origin Offset Suppression (4.6.2.2)
 - (3) Peak EVM (4.6.2.3)
 - (4) 95:th Percentile (4.6.2.4)

*The number in parentheses is the standard chapter.

MX860x02A Settings

```

MS8609A 2005/04/11 15:24:19
<< Setup Common Parameter (GSM) >>

Input
Terminal          : [RF          ]
Reference Level & Offset : [-14.00dBm] [ 0.00dB]
Frequency
Band              : [Free       ]
Channel & Frequency : [ 1CH1 = [ 890.200000MHz]
Channel Spacing   : [ 0.200000MHz]

Signal
Modulation        : [GMSK      ]
Measuring Object  : [Normal Burst(Multislot)]
Symbol Offset     : [1/2symbol]

Trigger
Trigger           : [Free Run   ]

Ch :          1CH Level : -14.00dBm Power Cal : Off
Freq : 890.200000MHz Offset : 0.00dB Correction : Off
    
```

1. Set Channel & Frequency

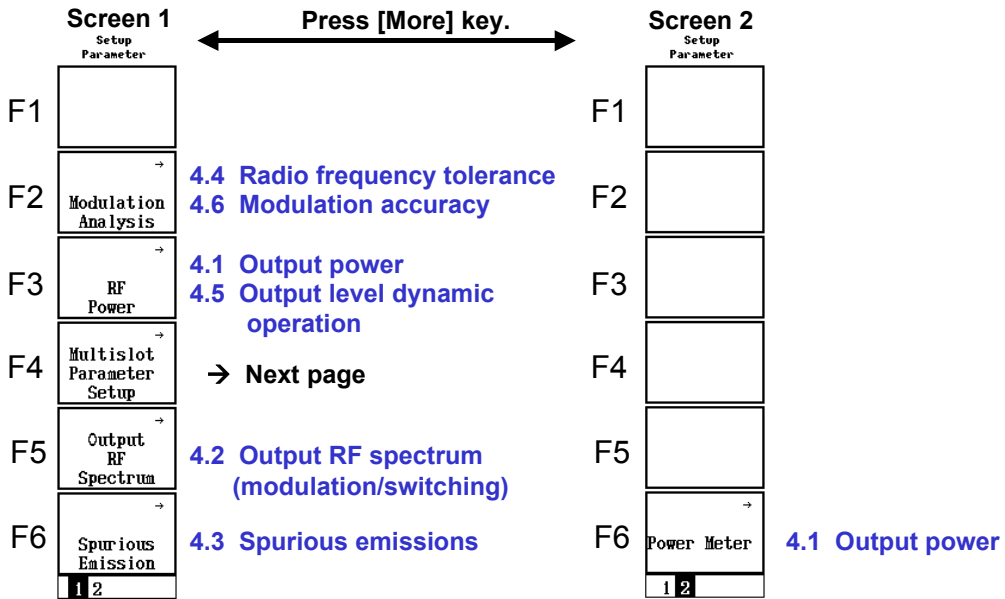
2. GMSK set as Modulation
GMSK/8PSK

3. Normal Burst or Normal Burst (Multislot)
Normal Burst
Normal Burst(Multislot)
Access Burst
Synchronization Burst
Continuous

4. 1/2symbol set as Symbol Offset
0symbol/1/2symbol

5. Free Run set as Trigger

MX860x02A Settings



MX860x02A Settings

Multislot Parameter Setup

```

MS8609A 2005/04/11 15:32:16
<< Multislot Parameter Setup (GSM) >>
  
```

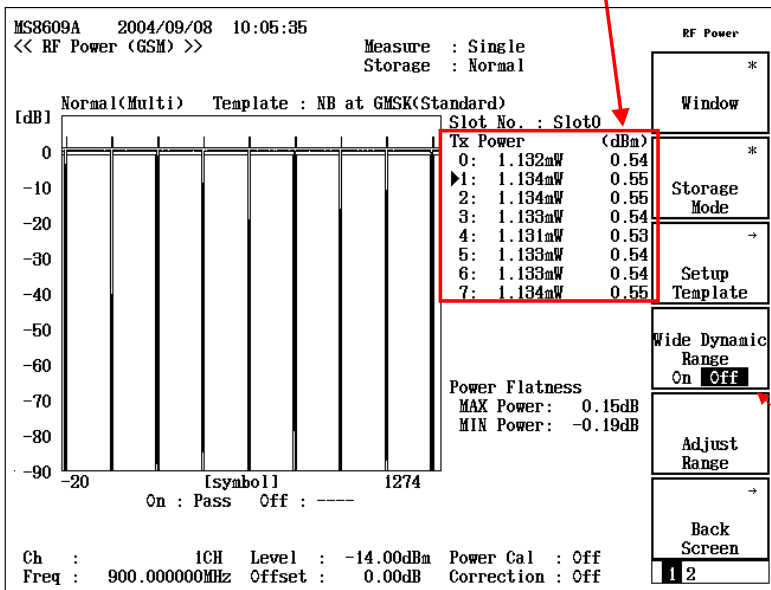
Burst	Training Sequence	Multislot Parameter Setup
Slot0 : (On)	[TSC0] (= 0970897)	Burst All On
Slot1 : [On]	[TSC0] (= 0970897)	Burst All Off
Slot2 : [On]	[TSC0] (= 0970897)	
Slot3 : [On]	[TSC0] (= 0970897)	
Slot4 : [On]	[TSC0] (= 0970897)	
Slot5 : [On]	[TSC0] (= 0970897)	
Slot6 : [On]	[TSC0] (= 0970897)	
Slot7 : [On]	[TSC0] (= 0970897)	

```

Ch : 1CH Level : -14.00dBm Power Cal : Off
Freq : 890.200000MHz Offset : 0.00dB Correction : Off
  
```

3.1 Output power (4.1)

Comply GPRS: Multislot measured



- Press the [F3] RF Power key at the Setup Common Parameter screen 1.
- Press the [F5] Adjust Range key.
- Press the [More] key.
- Press the [F5] Calibration key.
- Press the [F3] Multi Carr. Power Calibration key.
- Press the [F1] Window key.
- Press the [F3] Frame key.

Wide Dynamic Range (Change input ATT)
Off: Multislot
On: Burst

Standard: ±2 dB

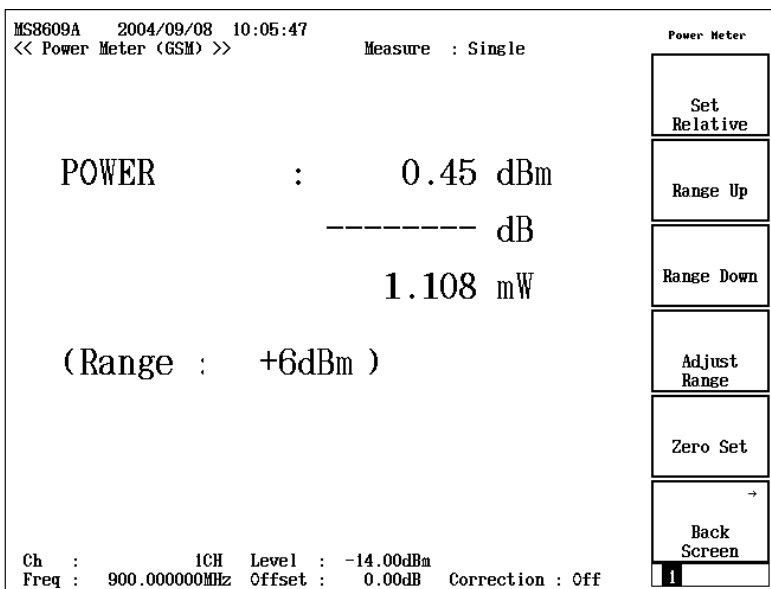
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3.1 Output power (4.1)



- Press the [F6] RF power key at the Setup Common Parameter screen 2.
- Disconnect the input cable.
- Press the [F5] Zero Set key.
- Connect the input cable.
- Press the [F4] Adjust Range key.

GSM uses the TDD method.
Confirm the number of the ON slot.

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3.2 Output RF spectrum (modulation) (4.2.1)

(a2) GSM 400 and GSM 900 and GSM 850 and MXM 850 normal BTS:

Standard GSM900

The standard value differs with the class.

	100	200	250	400	≥600 <1200	≥1200 <1800	≥1800 <6000	≥6000
≥43	+0.5	-30	-33	-60*	-70	-73	-75	-80
41	+0.5	-30	-33	-60*	-68	-71	-73	-80
39	+0.5	-30	-33	-60*	-66	-69	-71	-80
37	+0.5	-30	-33	-60*	-64	-67	-69	-80
35	+0.5	-30	-33	-60*	-62	-65	-67	-80
≤33	+0.5	-30	-33	-60*	-60	-63	-65	-80

Note: *For equipment supporting 8-PSK, the requirement for 8-PSK modulation is -56 dB.

(b2) DCS 1800 normal BTS:

DCS1800

	100	200	250	400	≥600 <1200	≥1200 <1800	≥1800 <6000	≥6000
≥43	+0.5	-30	-33	-60*	-70	-73	-75	-80
41	+0.5	-30	-33	-60*	-68	-71	-73	-80
39	+0.5	-30	-33	-60*	-66	-69	-71	-80
37	+0.5	-30	-33	-60*	-64	-67	-69	-80
35	+0.5	-30	-33	-60*	-62	-65	-67	-80
≤33	+0.5	-30	-33	-60*	-60	-63	-65	-80

Note: *For equipment supporting 8-PSK, the requirement for 8-PSK modulation is -56 dB.

(c2) PCS 1900 & MXM 1900 normal BTS:

PCS1900

	100	200	250	400	≥600 <1200	≥1200 <1800	≥1800 <6000	≥6000
≥43	+0.5	-30	-33	-60*	-70	-73	-75	-80
41	+0.5	-30	-33	-60*	-68	-71	-73	-80
39	+0.5	-30	-33	-60*	-66	-69	-71	-80
37	+0.5	-30	-33	-60*	-64	-67	-69	-80
35	+0.5	-30	-33	-60*	-62	-65	-67	-80
≤33	+0.5	-30	-33	-60*	-60	-63	-65	-80

Note: *For equipment supporting 8-PSK, the requirement for 8-PSK modulation is -56 dB.

3GPP TS05.05

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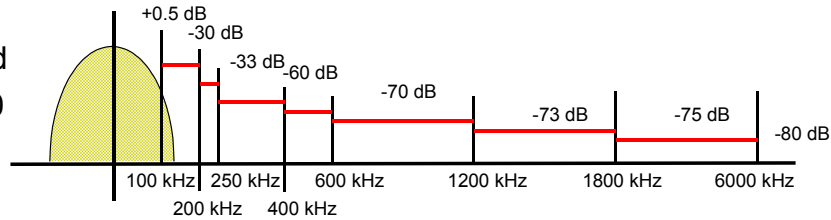
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3.2.1 Output RF spectrum (modulation) (4.2.1)

Standard GSM900



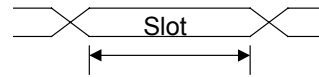
MS8609A 2004/09/08 09:55:28
 << Output RF Spectrum (GSM) >>

Measure : Single
 Storage : Normal
 Method : High Speed

Offset Freq	Modulation		Switching Transients	
	Lower	Upper	Lower	Upper
0.000MHz	-7.25dBm		-0.16dBm	
f 1 = 0.100MHz	-8.46dB	-7.71dB	-7.48dBm	-7.17dBm
f 2 = 0.200MHz	-34.11dB	-36.92dB	-35.89dBm	-31.52dBm
f 3 = 0.250MHz	-45.12dB	-42.58dB	-40.98dBm	-40.07dBm
f 4 = 0.400MHz	-70.75dB	-70.98dB	-66.42dBm	-65.30dBm
f 5 = 0.600MHz	-74.15dB	-75.86dB	-71.62dBm	-72.45dBm
f 6 = 0.800MHz	-74.34dB	-78.40dB	-73.23dBm	-74.63dBm
f 7 = 1.000MHz	-76.88dB	-77.62dB	-74.93dBm	-76.18dBm
f 8 = 1.200MHz	-79.19dB	-76.37dB	-77.57dBm	-76.51dBm
f 9 = 1.400MHz	-75.74dB	-79.08dB	-75.90dBm	-78.21dBm
f 10 = 1.600MHz	-80.13dB	-76.68dB	-77.98dBm	-75.83dBm
f 11 = 1.800MHz	-75.68dB	-74.01dB	-77.42dBm	-79.41dBm

Ch : 1CH Level : -14.00dBm Power Cal : Off
 Freq : 900.000000MHz Offset : 0.00dB Correction : Off

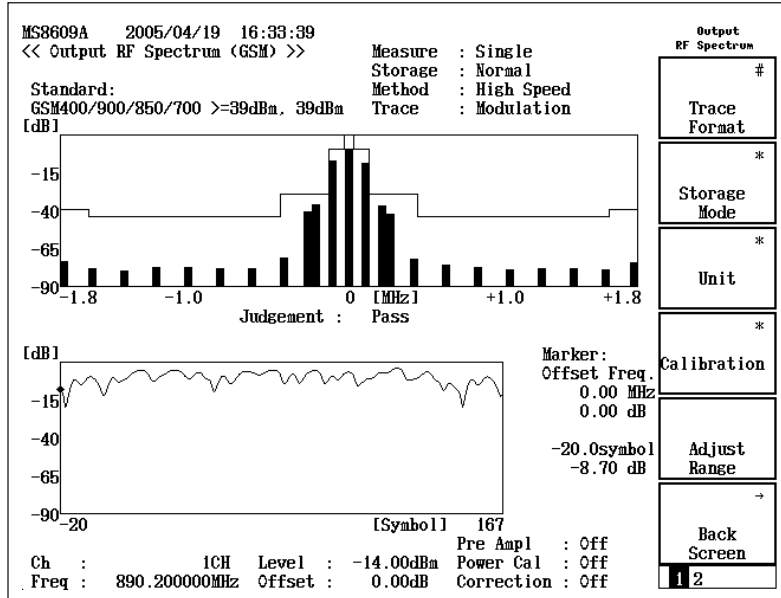
Modulation of the output RF spectrum measures the signal ON period of the measured slot.



- Press the [F5] Output RF Spectrum key at the Setup Common Parameter screen 1.
- Press the [F5] Adjust Range key.

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3.2.1 Output RF spectrum (modulation) (4.2.1)



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3.2.2 Output RF spectrum (switching transient) (4.2.2)

Standard

(b) BTS:

The maximum level measured at the indicated offset from the carrier (after any filters and combiners) is either:

	Maximum Level Measured				
	400 kHz	600 kHz	1200 kHz	1800 kHz	
GSM 400 & GSM 900 & GSM 850 & MXM 850 (GMSK)	-57 dBc	-67 dBc	-74 dBc	-74 dBc	GMSK
GSM 400 & GSM 900 & GSM 850 & MXM 850 (8-PSK)	-52 dBc	-62 dBc	-74 dBc	-74 dBc	
DCS 1800 & PCS 1900 & MXM 1900 (GMSK)	-50 dBc	-58 dBc	-66 dBc	-66 dBc	GMSK
DCS 1800 & PCS 1900 & MXM 1900 (8-PSK)	-50 dBc	-58 dBc	-66 dBc	-66 dBc	8PSK

or -36 dBm, whichever is higher.

dBc means relative to the output power at the BTS measured at the same point and in a filter bandwidth of at least 300 kHz.

3GPP TS05.05

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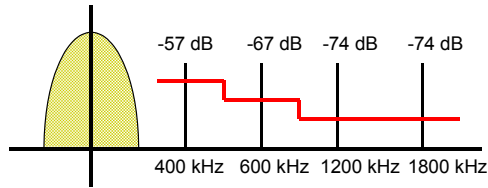
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3.2.2 Output RF spectrum (switching transient) (4.2.2)

Standard
GSM900

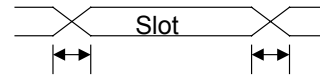


MS8609A 2004/09/08 09:55:28
 << Output RF Spectrum (GSM) >> Measure : Single
 Storage : Normal Method : High Speed

Offset Freq.	Modulation	Switching Transients			
		Lower	Upper	Lower	Upper
0.000MHz	-7.25dBa			-0.16dBa	
f 1 = 0.100MHz	-8.46dB	-7.71dB	-7.48dBa	-7.17dBm	
f 2 = 0.200MHz	-34.11dB	-36.92dB	-35.89dBa	-31.52dBm	
f 3 = 0.250MHz	-45.12dB	-42.58dB	-40.98dBa	-40.07dBm	
f 4 = 0.400MHz	-70.75dB	-70.98dB	-66.42dBa	-65.30dBm	
f 5 = 0.600MHz	-74.15dB	-75.86dB	-71.62dBa	-72.45dBm	
f 6 = 0.800MHz	-74.34dB	-78.40dB	-73.23dBa	-74.63dBm	
f 7 = 1.000MHz	-76.88dB	-77.62dB	-74.93dBa	-76.18dBm	
f 8 = 1.200MHz	-79.19dB	-76.37dB	-77.57dBa	-76.51dBm	
f 9 = 1.400MHz	-75.74dB	-79.08dB	-75.90dBa	-78.21dBm	
f10 = 1.600MHz	-80.13dB	-76.68dB	-77.98dBa	-75.83dBm	
f11 = 1.800MHz	-75.68dB	-74.01dB	-77.42dBa	-79.41dBm	

Ch : 1CH Level : -14.00dBa Power Cal : Off
 Freq : 900.000000MHz Offset : 0.00dB Correction : Off

The switching transient of output RF spectrum measures the change period before and after the measured slot.



- Press the [F5] Output RF Spectrum key at the Setup Common Parameter screen 1.
- Press the [F5] Adjust Range key.



3.2.2 Output RF spectrum (switching transient) (4.2.2)

MS8609A 2005/04/19 16:34:05
 << Output RF Spectrum (GSM) >> Measure : Continuous
 Storage : Normal Method : High Speed
 Standard: GSM400/900/850/700 >=39dBa, 39dBa Trace : Switching Tran.

Judgement : Pass

Marker:
 Offset Freq. 0.00 MHz
 -0.59 dBa
 -20.0symbol
 -10.94 dBa

Ch : 1CH Level : -14.00dBa Power Cal : Off
 Freq : 890.200000MHz Offset : 0.00dB Correction : Off



3.3 Spurious emissions (4.3)

Standard

In-band

4.3.1a

Band	Frequency Offset (Offset from carrier)	Measurement Bandwidth
Relevant transmit Band	≥1.8 MHz	30 kHz
	≥6 MHz	100 kHz

Out-of-band

4.3.1b

Band	Frequency Offset	Measurement Bandwidth
100 kHz to 50 MHz	-	10 kHz
50 MHz to 500 MHz outside relevant transmit band	(Offset from edge of relevant transmit band) ≥2 MHz	30 kHz
	≥5 MHz	100 kHz
Above 500 MHz outside relevant transmit band	(Offset from edge of relevant transmit band) ≥2 MHz	30 kHz
	≥5 MHz	100 kHz
	≥10 MHz	300 kHz
	≥20 MHz	1 MHz
	≥30 MHz	3 MHz

The power measured in the conditions specified in clause 4.3.1a shall be no more than -36 dBm.

The power measured in the conditions specified in clause 4.3.1b shall be no more than:

1. 250 nW (-36 dBm) in the frequency band 9 kHz to 1 GHz;
2. 1 μW (-30 dBm) in the frequency band 1 GHz to 12.75 GHz.

3GPP TS05.05

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3.3 Spurious emissions (4.3)

3GPP TS05.05

In the **BTS receive band**, the power measured using the conditions specified in subclause 4.2.1, with a filter and video bandwidth of 100 kHz shall be no more than:

Rx Band

	GSM 900 & GSM 850 & MXM 850 (dBm)	DCS 1800 & PCS 1900 & MXM 1900 (dBm)
Normal BTS	-98	-98
Micro BTS M1	-91	-96
Micro BTS M2	-86	-91
Micro BTS M3	-81	-86
Pico BTS P1	-70	-80
R-GSM 900 BTS	-89	

In geographic areas where **GSM and UTRA networks are deployed**, the power measured in the conditions specified in subclause 4.2.1, with a filter and video bandwidth of 100 kHz shall be no more than:

GSM/UTRA

Band (MHz)	Power (dBm)	Note
1900 – 1920	-62	UTRA/TDD band
1920 – 1980	-62	UTRA/FDD BS Rx band
2010 – 2025	-62	UTRA/TDD band
2110 – 2170	-62	UTRA/FDD UE Rx band

When **GSM and UTRA BS are co-located**, the power measured in the conditions specified in subclause 4.2.1, with a filter and video bandwidth of 100 kHz shall be no more than:

GSM+UTRA

Band (MHz)	Power (dBm)	Note
1900 – 1920	-96	UTRA/TDD band
1920 – 1980	-96	UTRA/FDD BS Rx band
2010 – 2025	-96	UTRA/TDD band
2110 – 2170	-62	UTRA/FDD UE Rx band

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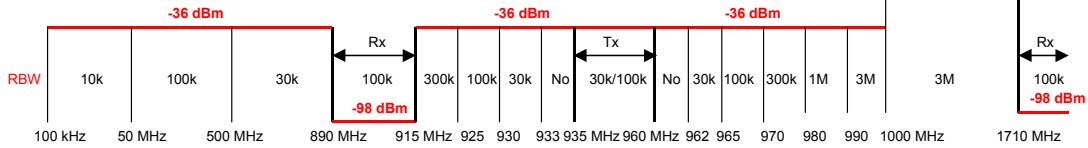
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3.3 Spurious emissions (4.3)

GSM900



Limit Value Setting Screen

MS8609A 2004/09/08 15:30:58
 << Setup Sweep Table (GSM) >>

View Select : BW Ref.ATT.SWT Limit(dB) Limit(W)

Start Frequency	Stop Frequency	IntgrLW	RBW#	VBW#
f 1 : 0.100000MHz	50.000000MHz	10000Hz	10kHz	10kHz
f 2 : 50.000000MHz	500.000000MHz	10000Hz	100kHz	100kHz
f 3 : 500.000000MHz	824.000000MHz	130.00kHz	30kHz	30kHz
f 4 : 849.000000MHz	859.000000MHz	130.00kHz	300kHz	300kHz
f 5 : 859.000000MHz	864.000000MHz	100.00kHz	100kHz	100kHz
f 6 : 864.000000MHz	867.000000MHz	130.00kHz	30kHz	30kHz
f 7 : 896.000000MHz	899.000000MHz	130.00kHz	30kHz	30kHz
f 8 : 899.000000MHz	904.000000MHz	100.00kHz	100kHz	100kHz
f 9 : 904.000000MHz	914.000000MHz	130.00kHz	300kHz	300kHz
f 10 : 914.000000MHz	924.000000MHz	11MHz	1MHz	1MHz
f 11 : 924.000000MHz	934.000000MHz	3MHz	3MHz	3MHz
f 12 : 934.000000MHz	1000.000000MHz	3MHz	3MHz	3MHz
f 13 : 1000.000000MHz	12750.000000MHz	3MHz	3MHz	3MHz
f 14 : -----MHz	-----MHz	HZ	HZ	HZ
f 15 : -----MHz	-----MHz	HZ	HZ	HZ

Detection : [Average] 1

Ch : 128CH Level : -6.00dBa Power Cal : Off
 Freq : 894.600000MHz Offset : 14.00dB Correction : Off

Measurement Result Screen

MS8609A 2004/09/08 15:35:18
 << Spurious Emission (GSM) >>

Storage : Normal
 Spurious : Sweep
 Detect : Average

Abs Ref Power (Set) : -14.00 dBa
 Rel Ref Power (Set) : -14.00 dBa

Frequency	Level	Limit	Unit	Margin
f 1 = 0.100 000 MHz	-104.52	-36.0	dBa/100kHz	-68.52 dB
f 2 = 445.100 000 MHz	-98.22	-36.0	dBa/100kHz	-62.22 dB
f 3 = 815.252 000 MHz	-104.26	-36.0	dBa/300kHz	-68.26 dB
f 4 = 849.710 000 MHz	-94.06	-36.0	dBa/300kHz	-58.06 dB
f 5 = 859.950 000 MHz	-97.02	-36.0	dBa/100kHz	-61.02 dB
f 6 = 865.785 000 MHz	-103.56	-36.0	dBa/300kHz	-67.56 dB
f 7 = 897.737 000 MHz	-103.10	-36.0	dBa/300kHz	-67.10 dB
f 8 = 900.890 000 MHz	-96.47	-36.0	dBa/100kHz	-60.47 dB
f 9 = 906.970 000 MHz	-83.40	-36.0	dBa/300kHz	-47.40 dB
f 10 = 919.350 000 MHz	-88.47	-36.0	dBa/1MHz	-52.47 dB
-f 11 = 930.090 000 MHz	-82.49	-36.0	dBa/3MHz	-46.49 dB
f 12 = 936.838 000 MHz	-82.68	-36.0	dBa/3MHz	-46.68 dB
f 13 = 12 503.250 000 MHz	-75.82	30.0	dBa/3MHz	-105.82 dB
f 14 = -----MHz	-----	-----	-----	-----
f 15 = -----MHz	-----	-----	-----	-----

Total Judgement : PASS

Ch : 128CH Level : -6.00dBa Power Cal : Off
 Freq : 894.600000MHz Offset : 14.00dB Correction : Off

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3.4 Radio frequency tolerance (4.4)

See Standard TS05.10 Chapter 5.1

Normal BTS: **0.05 ppm**, Pico BTS: **0.1 ppm**

MS8609A 2004/09/08 09:52:49
 << Modulation Analysis (GSM) >>

Measure : Single
 Storage : Normal
 Trace : Non

Frequency	
Carrier Frequency	: 900.000 005 5 MHz
Carrier Frequency Error	: 0.005 5 kHz 0.01 ppm

Modulation

RMS Phase Error	: 0.50 deg. (rms)
Peak Phase Error	: 1.28 deg.
Magnitude Error	: 0.62 % (rms)

Ch : 1CH Level : -14.00dBa Power Cal : Off
 Freq : 900.000000MHz Offset : 0.00dB Correction : Off

- Press the [F2] Modulation Analysis key at the Setup Common Parameter screen 1.
- Press the [F1] Trace Format key and select Non.
- Press the [F5] Adjust Range key.

This screen is for the GMSK signal.

If the signal is 8PSK, set Modulation in the Setup Common Parameter screen to 8PSK.

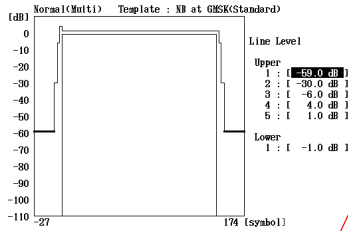
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3.5 Output level dynamic operation (4.5.1)



Flatness of all slots displayed in Window OFF

- Press the [F3] RF Power key at the Setup Common Parameter screen 1.
- Press the [F5] Adjust Range key.

MS8609A 2004/09/08 10:13:39
 << RF Power (GSM) >>

Tx Power	Watt	dBm	Pwr	Flatness	Judgement
Slot0:	1.137mW	0.56	0.13	-0.20	Pass
Slot1:	1.137mW	0.56	0.12	-0.20	Pass
Slot2:	1.134mW	0.55	0.13	-0.19	Pass
Slot3:	1.135mW	0.55	0.14	-0.18	Pass
Slot4:	1.136mW	0.55	0.14	-0.18	Pass
Slot5:	1.135mW	0.55	0.13	-0.18	Pass
Slot6:	1.140mW	0.57	0.12	-0.21	Pass
Slot7:	1.136mW	0.55	0.14	-0.19	Pass

Ch : 900.000000MHz ICH Level : -14.00dBm Power Cal : Off
 Freq : 900.000000MHz Offset : 0.00dB Correction : Off

Individual Slot Measurement Screen

MS8609A 2004/09/08 11:39:13
 << RF Power (GSM) >>

Storage : Normal

Slot No. : Slot4

Tx Power	(dBm)
0:	1.137mW 0.56
1:	1.137mW 0.56
2:	1.134mW 0.55
3:	1.135mW 0.55
4:	1.136mW 0.55
5:	1.135mW 0.55
6:	1.140mW 0.57
7:	1.136mW 0.55

Power Flatness
 MAX Power : 0.14dB
 MIN Power : -0.18dB
 Marker : 643.45 syabol 0.01 dB

Ch : 900.000000MHz ICH Level : -14.00dBm Power Cal : Off
 Freq : 900.000000MHz Offset : 0.00dB Correction : Off

3.6.1 GMSK Modulation (4.6.1)

Standard
 Phase error
 RMS: 5°
 peak: 20°

- Press the [F2] Modulation Analysis key at the Setup Common Parameter screen 1.
- Press the [F1] Trace Format key and select Non or Phase Error.
- Press the [F5] Adjust Range key.

MS8609A 2004/09/08 09:52:49
 << Modulation Analysis (GSM) >>

Measure : Single
 Storage : Normal
 Trace : Non

Frequency : 900.000 005 5 MHz
 Carrier Frequency Error : 0.005 5 kHz
 Carrier Frequency Error : 0.01 ppa

Modulation	
RMS Phase Error	: 0.50 deg. (rms)
Peak Phase Error	: 1.28 deg.
Magnitude Error	: 0.62 % (rms)

Ch : 900.000000MHz ICH Level : -14.00dBm Power Cal : Off
 Freq : 900.000000MHz Offset : 0.00dB Correction : Off

MS8609A 2004/09/08 09:51:58
 << Modulation Analysis (GSM) >>

Measure : Single
 Storage : Normal
 Trace : Phase Error

Frequency : 900.000 005 5 MHz
 Frequency Error : 0.005 5 kHz
 Frequency Error : 0.01 ppa

RMS Phase Error : 0.50 deg. (rms)
 Peak Phase Error : 1.28 deg.

Ch : 900.000000MHz ICH Level : -14.00dBm Power Cal : Off
 Freq : 900.000000MHz Offset : 0.00dB Correction : Off

3.6.2 8PSK Modulation (4.6.2)

Setup Common Parameter Screen

```

MS8609A 2006/03/13 15:06:31
<< Setup Common Parameter (GSM) >>

Input
Terminal      : [RF      ]
Reference Level & Offset : [-12.00dBm] [ 0.00dB]
Frequency
Band          : [Free   ]
Channel & Frequency : [ 1CH] = [ 890.200000MHz]
Channel Spacing  : [ 0.200000MHz]

Signal
Modulation    : [QPSK]
Measuring Object : [Normal Burst]
Symbol Offset  : [1/2symbol]
Training Sequence Pattern : [TSC0 ](=77177171117777177717717111)

Trigger
Trigger       : [Free Run ]

Ch :          1CH Level : -12.00dBm Pre Ampl : Off
Freq : 890.200000MHz Offset : 0.00dB Power Cal : Off
Correction : Off
    
```

1. Set Channel & Frequency

2. 8PSK set as Modulation GMSK/8PSK

3. Normal Burst set as Modulation Normal Burst Normal Burst (Multislot) Continuous

4. 1/2symbol set as Symbol Offset Offset 0symbol/1/2symbol

- Press the [F2] Modulation Analysis key at the Setup Common Parameter screen 1.
- Press the [F1] Trace Format key and select Non or Phase Error.
- Press the [F5] Adjust Range key.

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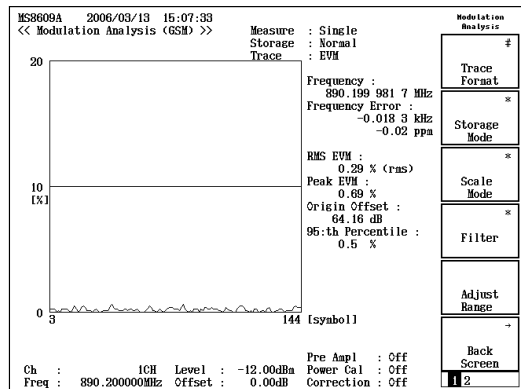
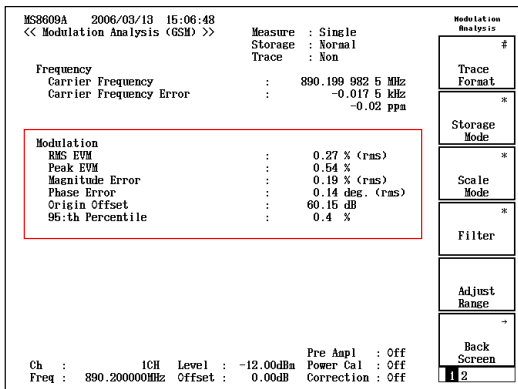
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3.6.2 8PSK Modulation (4.6.2)

Standard

- | | |
|---|---------------------------------------|
| (1) RMS EVM (4.6.2.1) | BTS: $\leq 7.0\%$ (MS: $\leq 9.0\%$) |
| (2) Origin Offset Suppression (4.6.2.2) | BTS: ≥ 3 dB (MS: ≥ 30 dB) |
| (3) Peak EVM (4.6.2.3) | BTS: $\leq 22\%$ (MS: $\leq 30\%$) |
| (4) 95:th Percentile (4.6.2.4) | BTS: $\leq 11\%$ (MS: $\leq 15\%$) |



Averaged over 200 bursts

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Appendix

1. MG3700A Settings

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1. MG3700A Settings

Select GSM using [F1] key (HDD → Memory).

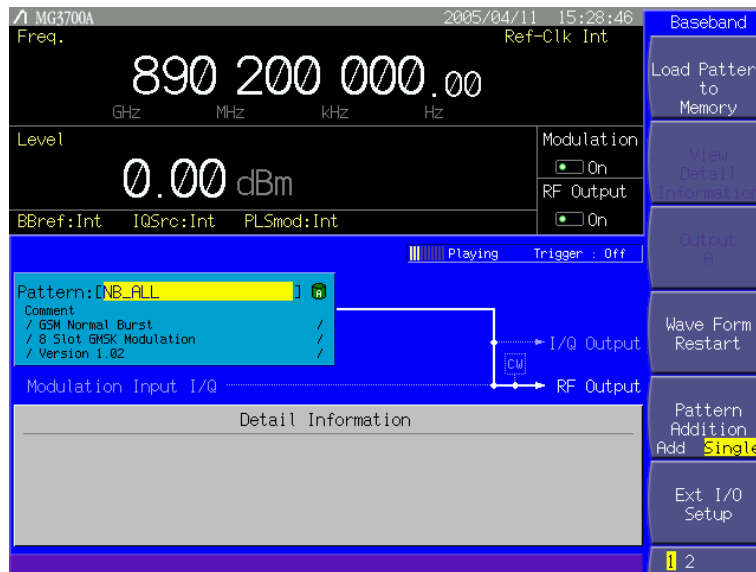
Select the NB_ALL pattern in GSM.
GSM: NB_GMSK
 NB_ALL_GMSK
8PSK: NB_8PSK
 NB_ALL_8PSK

File Name	Size(KB)	Ver
**** ALL Load ****	3,271,267	----
8PSK_PN9	384	1.04
8PSK_TN0	3,743	1.04
CS-1_1SLOT	194,620	1.04
CS-4_1SLOT	194,620	1.04
DL_MCS-1_1SLOT	194,620	1.04
DL_MCS-5_1SLOT	194,620	1.04
DL_MCS-9_1SLOT	194,620	1.04
DL_MCS-9_4SLOT	778,477	1.04
GMSK_PN9	96	1.04
GMSK_TN0	3,743	1.04
NB_8PSK	3,665	1.00
NB_ALL	29,942	1.04
NB_ALL_8PSK	29,964	1.00
NB_ALL_GMSK	29,964	1.00
NB_GMSK	3,665	1.00
NB_TN0	3,743	1.04
TCH_LFS	48,655	1.04
ULL_MCS-1_1SLOT	194,620	1.04
ULL_MCS-5_1SLOT	194,620	1.04

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1. MG3700A Settings



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Anritsu

Anritsu Corporation

5-1-1 Onna, Atsugi-shi, Kanagawa, 243-8555 Japan
Phone: +81-46-223-1111
Fax: +81-46-296-1264

• U.S.A.

Anritsu Company

1155 East Collins Blvd., Richardson, TX 75081, U.S.A.
Toll Free: 1-800-ANRITSU (267-4878)
Phone: +1-972-644-1777
Fax: +1-972-671-1877

• Canada

Anritsu Electronics Ltd.

700 Silver Seven Road, Suite 120, Kanata,
Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

• Brazil

Anritsu Eletrônica Ltda.

Praca Amadeu Amaral, 27 - 1 Andar
01327-010-Paraiso-São Paulo-Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

• U.K.

Anritsu EMEA Ltd.

200 Capability Green, Luton, Bedfordshire LU1 3LU, U.K.
Phone: +44-1582-433280
Fax: +44-1582-731303

• Germany

Anritsu GmbH

Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49 89 442308-0
Fax: +49 89 442308-55

• France

Anritsu S.A.

9, Avenue du Québec, Z.A. de Courtabœuf, 91951 Les
Ulis Cedex, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

• Italy

Anritsu S.p.A.

Via Elio Vittorini, 129, 00144 Roma, Italy
Phone: +39-6-509-9711
Fax: +39-6-502-2425

• Sweden

Anritsu AB

Borgarfjordsgatan 13, 164 40 KISTA, Sweden
Phone: +46-853470700
Fax: +46-853470730

• Finland

Anritsu AB

Teknobulevardi 3-5, FI-01530 Vantaa, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

• Denmark

Anritsu A/S

Kirkebjerg Allé 90, DK-2605 Brøndby, Denmark
Phone: +45-72112200
Fax: +45-72112210

• Singapore

Anritsu Pte Ltd.

10, Hoe Chiang Road, #07-01/02, Keppel Towers,
Singapore 089315
Phone: +65-62828-2400
Fax: +65-6282-2533

• P.R. China (Hong Kong)

Anritsu Company Ltd.

Suite 923, 9/F., Chinachem Golden Plaza, 77 Mody
Road, Tsimshatsui East, Kowloon, Hong Kong, P.R. China
Phone: +852-2301-4980
Fax: +852-2301-3545

• P.R. China (Beijing)

Anritsu Company Ltd.

Beijing Representative Office

Room 1515, Beijing Fortune Building,
No. 5, Dong-San-Huan Bei Road,
Chao-Yang District, Beijing 10004, P.R. China
Phone: +86-10-6590-9230
Fax: +86-10-6590-9235

• Korea

Anritsu Corporation, Ltd.

8/F Hyunjuk Building, 832-41, Yeoksam dong,
Kangnam-ku, Seoul, 135-080, Korea
Phone: +82-2-553-6603
Fax: +82-2-553-6604

• Australia

Anritsu Pty Ltd.

Unit 21/270 Ferntree Gully Road, Notting Hill,
Victoria 3168, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

• Taiwan

Anritsu Company Inc.

7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817

• India

Anritsu Corporation

India Liaison Office

Unit No. S-3, Second Floor, Esteem Red Cross Bhavan,
No. 26, Race Course Road, Bangalore 560 001, India
Phone: +91-80-30944707
Fax: +91-80-22356648

Please Contact: