



FCC RADIO TEST REPORT FOR THE QUALIFICATION OF RICAM 0D2 /ABM2 IN NG2 GSM 18000 INDOOR BTS IN NORMAL CONDITIONS

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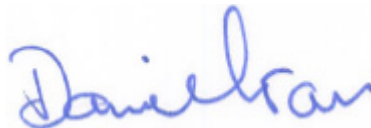
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Creation

APPROVALS

Approved By: _____



Daniel Tan / GSM Product Approvals Manager

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1. INTRODUCTION

This document presents the measurement results of tests performed on this report presents the test data in accordance with FCC Part 24 & Part22, for the Nortel Networks NG2 GSM 18000 Indoor BTS in Dual Band GSM850 / PCS1900 band.

This report presents test data for GMSK and 8PSK modulation (EDGE functionality).

1.1 SCOPE OF THIS DOCUMENT

This document presents the radio qualification plan of following modules introduction:

- New NG2 GSM 18000 Indoor BTS mechanical frame & new dust filter on Indoor cabinets.
- New DCR Digital Modules RICAM 0D2 (CIL17, Rel D2) & ABM2 (CIL9, Rel. D2).

Following RF performances tests will be performed to check FCC compliance:

- At ambient temperature, Radio tests will be performed in NG2 GSM 18000 Indoor BTS.

Radio Tests will be performed in GMSK & 8PSK modulation

1.2 AUDIENCE FOR THIS DOCUMENT

This document is to be used by any person needing a view on Nortel Networks GSM 18000 Indoor BTS.

2. RELATED DOCUMENTS

2.1 APPLICABLES DOCUMENTS

[A1]	47 CFR Part 24	PERSONAL COMMUNICATION SERVICES , January2003
[A2]	47 CFR Part 22	PUBLIC MOBILE SERVICES
[A3]	47 CFR Part2	FREQUENCY ALLOCATION AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS , October 2003
[A4]	IC RSS-133	Spectrum Management and Telecommunication Policy – Radio Standard Specifications, Issue 3- June 2005

2.2 REFERENCE DOCUMENTS

[R1]	PE/BTS/DPL/RICAM-ABM -NG2/S18K_RF-TP01	Radio Test Plan for the introduction of DCR RICAM/ABM in NG2 GSM S18000 Indoor BTS
[R2]	PE/BTS/DJD/021878	GSM 18000 Indoor BTS Radio Test Report according to FCC Part 24 & FCC Part 22 (FCC ID AB6BTS18IND)
[R3]	PE/BTS/DJD/022904	GSM BTS Radio Qualification (FCC) Test Report for RM2 1900 introduction

3. ABBREVIATIONS AND DEFINITIONS

3.1 ABBREVIATIONS

RM	Radio Module
BCF	Base Common Function
BTS	Base Transceiving Station
DDM	Dual Diplexer Module
GSM	Global System for Mobile Communications
GPRS	General Packet Radio Service
EDGE	Enhanced Data for GSM Evolution
PDTCH	Packet Data Logical Channel
PA	Power Amplifier
e-SCPA	EDGE Single Carrier PA
HePA	Edge High Power Amplifier
LNA	Low Noise Amplifier
OMC	Operation and Maintenance Center
TCU	Trans-Coding Unit
MSC	Mobile Switching Center
RF	Radio Frequency
Tx	Transmitter
TxF	Emission Filter

3.2 DEFINITIONS

NG2 GSM S18000 Indoor BTS: Nortel product line
GSM S18000 Indoor BTS: Nortel product line

B Bottom ARFCN. Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follow:

GSM 850: $F_{B \text{ downlink}} = 869.2 \text{ MHz};$ $F_{B \text{ uplink}} = 824.2 \text{ MHz}$
PCS1900: $F_{B \text{ downlink}} = 1930.2 \text{ MHz};$ $F_{B \text{ uplink}} = 1850.2 \text{ MHz}$

M Middle ARFCN. Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follow:

GSM 850: $F_{M \text{ downlink}} = 881.4 \text{ MHz};$ $F_{M \text{ uplink}} = 836.4 \text{ MHz}$
PCS1900: $F_{M \text{ downlink}} = 1960.0 \text{ MHz};$ $F_{M \text{ uplink}} = 1880.0 \text{ MHz}$

T Top ARFCN. Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follow:

GSM 850: $F_{T \text{ downlink}} = 893.8 \text{ MHz};$ $F_{T \text{ uplink}} = 848.8 \text{ MHz}$
PCS1900: $F_{T \text{ downlink}} = 1989.8 \text{ MHz};$ $F_{T \text{ uplink}} = 1909.8 \text{ MHz}$

4. TEST CONFIGURATION

4.1 BTS CONFIGURATION UNDER TESTS

DDM-0 850			DDM-1 850			DDM-2 850		
DDM-3 1900			DDM-4 1900			DDM-5 1900		
			RM-0 850 60/45W	RM-1 850 60/45W	RM-2 850 60/45W	RICAM2 _u		
			RM2-3 1900 50/30W	RM2-4 1900 50/30W	RM2-5 1900 50/30W	ABM2 _u		

Radio Modules is equipped with Tx0 for channel B.M.T

For the RM of PCS1900@50/30W, MPRM2 was configured in BTS.

For the RM of GSM850@60/45W, HPRM was configured in BTS.

Two types of coupling device are tested:

- Diplexer is the worst case for spurious level.
- H2 combiner introduces additional 3dB losses

4.2 MODULE CONFIGURATION UNDER TEST

Designation	Hardware code PEC Code	Release	Serial number	comments
Cable Cabinet	NTN016AS	02	NNTM7880Z8G8	
RICAM	NTN024AA	D2	NNTMGWF306VD	RICAM
ABM	NTN029AF	D2	NNTMGWC50PYR	ABM2
SICS	NTN071GM	02	NNTMLA08N3E9	with new dust filter
DDM	NNT063AM	05	FICT06000E3K	PCS 1900
DDM	NNT063AM	05	FICT06000E2E	PCS 1900
DDM	NNT063AM	04	FICT06000L5Y	PCS 1900
DDM	NTN063HM	05	MANT01600021	GSM 850
DDM	NTN063HM	05	MANT01600025	GSM 850
DDM	NTN063HM	05	MANT01600051	GSM 850
RM2	NTN050PP	D2	NNTM7880Y9QN	PCS 1900
RM2	NTN050PP	D2	NNTM7880Y9QV	PCS 1900
RM2	NTN050CP	D1	NNTM7880Y9R3	PCS 1900
HPRM	NTN050JA	01	NNTM7880WT5G	GSM 850
HPRM	NTN050JA	02	NNTM78901TBX	GSM 850
HPRM	NTN050JA	02	NNTM78901UDS	GSM 850

4.3 TEST EQUIPMENT

Equipment	Model	S/N	Last Cal.	Cal. due
PSA series spectrum analyzer	E4440A	MY44300413	2008-04-22	2009-04-22

- PC, RF cables, attenuators

4.4 BTS SOFTWARE

HPRM 850 Load software version: V16_B4 E14

MPRM2 Load software version: V16_A4 E17

RICAM Load software version: V16_A4 E16

4.5 TEST SOFTWARE

TIL_alarm: V01f 205

TIL_COAM: V16e403

WINTOOL: V05A2_E19.0

5. TEST REPORT: RM2 PCS1900

5.1 INTRODUCTION

The following information is to introduce new DCR digital modules RICAM 0D2&ABM2 in NG2 GSM 18000 Indoor BTS for Nortel Network, in accordance with FCC Part 24 of the FCC Rules and Regulations.

5.2 MEASUREMENT CASE

Tests performed on RM2 PCS1900 (50W GMSK/30W 8PSK) (NTN050PP) as follow:

Test Case	Modulation	RESULT
RF Power Output	GMSK / 8PSK	Complies
Occupied Bandwidth	GMSK / 8PSK	Complies

5.3 NAME OF TEST: RF POWER OUTPUT

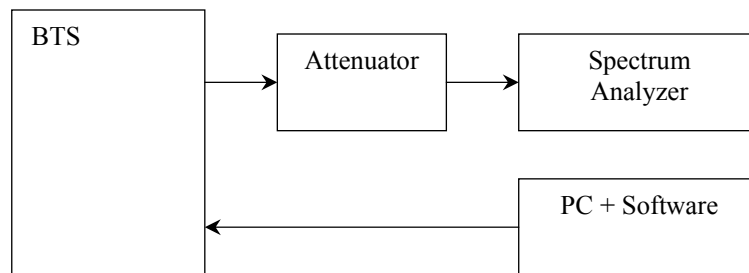
5.3.1 FCC REQUIREMENTS – FCC PART 24.232

Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power. In no case may the peak output power of a base station transmitter exceed 100 watts.

Specification for Radio Modulation Test:

Band	Modulation	Power	DDM Diplexer		DDM H2	
			Low Limit	Up Limit	Low Limit	Up Limit
PCS1900	GMSK	50w	44.7	47.2	40.7	44.0
	8PSK	30w	42.5	45.1	38.5	42.4

5.3.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (static level 0 & Dynamic level 0):

- For GMSK modulation, in mode GMSK no synchro,
- For 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5.

Measurements were carried on frequencies which are C512 (B), C587, C661 (M), C687, C735, and C810 (T).

The output power was measured using the PSA which has the following settings:

- Mode: Average
- Reference Level Offset: Corrected to account for cable(s) and attenuator losses

5.3.3 TEST RESULTS

The Table shows the test results of RF Output Power for **GMSK & 8PSK** modulation with several coupling configurations:

5.3.3.1 OUTPUT POWER AT ANTENNA WITH MPRM2 50/30W

➤ **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C512	GMSK	42.14	Pass
	8PSK	40.41	Pass
C587	GMSK	42.49	Pass
	8PSK	40.65	Pass
C661	GMSK	42.53	Pass
	8PSK	40.71	Pass
C687	GMSK	42.51	Pass
	8PSK	40.67	Pass
C735	GMSK	42.60	Pass
	8PSK	40.76	Pass
C810	GMSK	42.68	Pass
	8PSK	40.87	Pass

➤ **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C512	GMSK	45.59	Pass
	8PSK	43.82	Pass
C587	GMSK	46.01	Pass
	8PSK	44.27	Pass
C661	GMSK	46.04	Pass
	8PSK	44.11	Pass
C687	GMSK	45.95	Pass
	8PSK	44.10	Pass
C735	GMSK	45.93	Pass
	8PSK	44.07	Pass
C810	GMSK	46.05	Pass
	8PSK	44.21	Pass

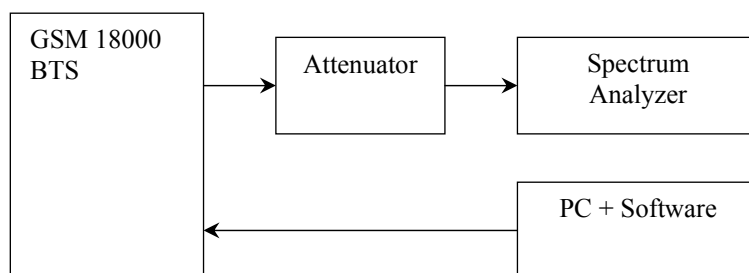
Note: Slight variations in power levels for GSM 1900 and GSM 850 can be observed in the Class II report when they are compared to their original reports; these slight variations are due to measurement uncertainty.

5.4 NAME OF TEST: OCCUPIED BANDWIDTH

5.4.1 FCC REQUIREMENTS

The occupied bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

5.4.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (Static Level 0). Measurements were made at frequencies which were at the bottom and top of the transmit band.

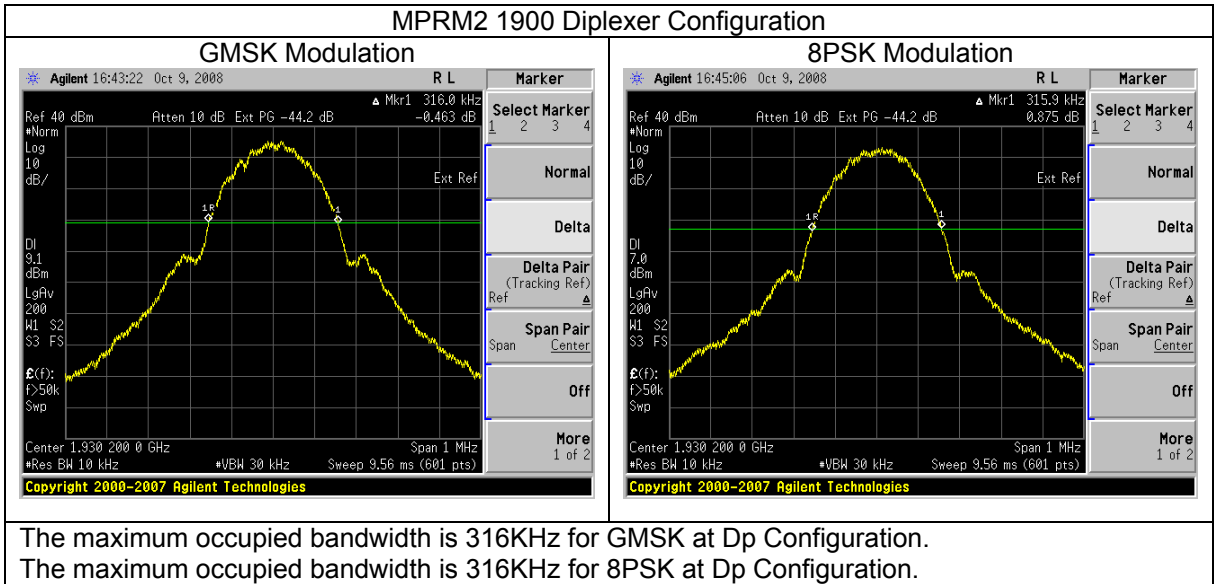
The occupied bandwidth was measured by determining the bandwidth out of which all emissions are attenuated at least 26 dB below the transmitter power.

The spectrum analyzer had the following settings:

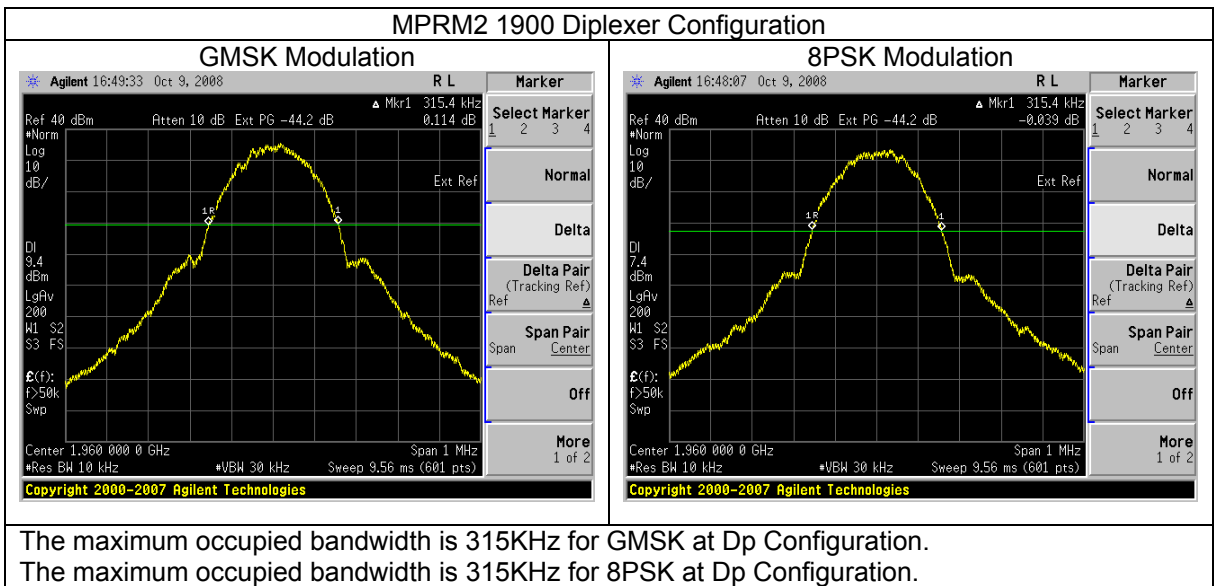
Resolution bandwidth:	10 kHz
Video bandwidth:	30 kHz
Span:	1 MHz
Reference level:	40 dBm
Reference Level Offset:	Corrected to account for cable(s) and attenuator losses
Level range:	100 dB
Sweep time:	25 ms

5.4.3 TEST RESULTS

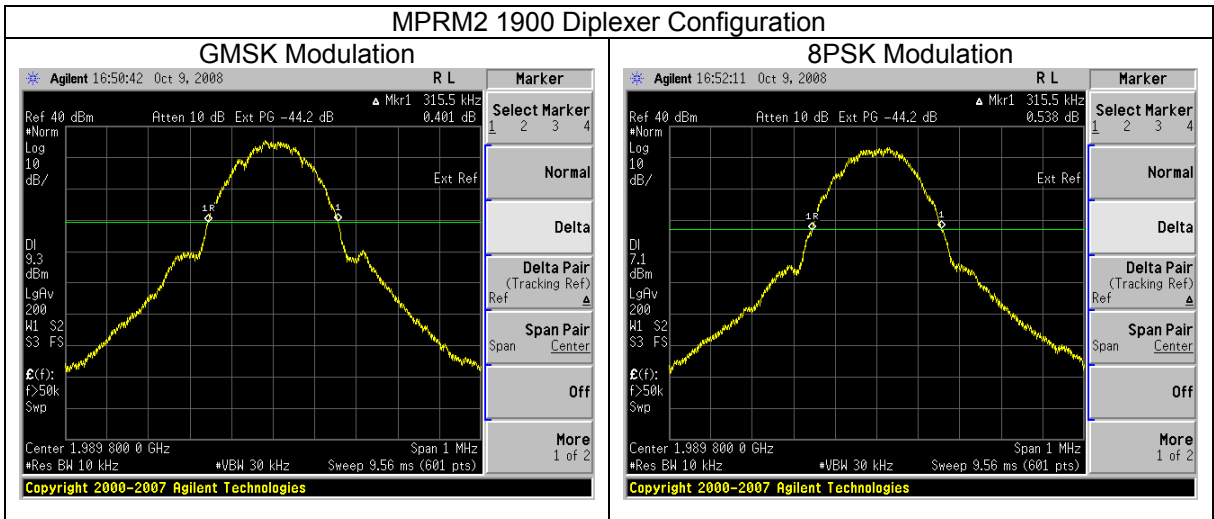
➤ Channel B



➤ Channel M



➤ Channel T



The maximum occupied bandwidth is 316KHz for GMSK at Dp Configuration.
 The maximum occupied bandwidth is 316KHz for 8PSK at Dp Configuration.

6. TEST REPORT: RM GSM850

6.1 INTRODUCTION

The following information is to introduce new DCR digital modules RICAM 0D2 & ABM2 in NG2 GSM 18000 indoor BTS for Nortel Network, in accordance with FCC Part 22 of the FCC Rules and Regulations.

6.2 MEASUREMENT CASE

Tests performed on RM GSM850 (60W GMSK/45W 8PSK) (NTN050JA) as follow:

Test Case	Modulation	RESULT
RF Power Output	GMSK / 8PSK	Complies
Occupied Bandwidth	GMSK / 8PSK	Complies

6.3 NAME OF TEST: RF POWER OUTPUT

6.3.1 FCC REQUIREMENTS – FCC PART 22.913L

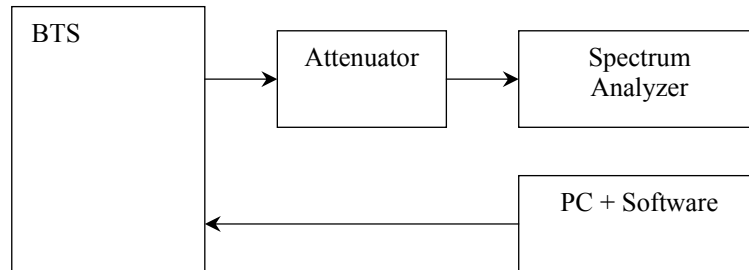
Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT. See 24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power. In no case may the peak output power of a base station transmitter exceed 100 watts.

Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

Specification for Radio Modulation Test:

Band	Modulation	Power	DDM Diplexer		DDM H2	
			Low Limit	Up Limit	Low Limit	Up Limit
GSM850	GMSK	60w	45.7	47.9	41.9	45.1
	8PSK	45w	44.4	46.6	40.6	43.8

6.3.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (static level 0 & Dynamic level 0):

- For GMSK modulation, in mode GMSK no synchro,
- For 8PSK modulation, in mode logical PDCH, Type GPRS, coding MCS5.

Measurements were carried on frequencies which are C128 (B), C131, C183, C190 (M), C231, C241, and C251 (T).

The output power was measured using the PSA which has the following settings:

- Mode: Average
- Reference Level Offset: Corrected to account for cable(s) and attenuator losses

6.3.3 TEST RESULTS

The Table shows the test results of RF Output Power for **GMSK & 8PSK** modulation with several coupling configurations:

6.3.3.1 OUTPUT POWER AT ANTENNA WITH HPRM2 60/45W

➤ **H2D configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	42.71	Pass
	8PSK	41.85	Pass
C131	GMSK	42.81	Pass
	8PSK	41.92	Pass
C183	GMSK	43.17	Pass
	8PSK	42.29	Pass
C190	GMSK	43.26	Pass
	8PSK	42.33	Pass
C231	GMSK	43.37	Pass
	8PSK	42.36	Pass
C241	GMSK	43.30	Pass
	8PSK	42.35	Pass
C251	GMSK	43.27	Pass
	8PSK	42.30	Pass

➤ **Diplexer configuration:**

ARFCN	Modulation	Mean Power	Sanction
C128	GMSK	46.19	Pass
	8PSK	45.29	Pass
C131	GMSK	46.26	Pass
	8PSK	45.40	Pass
C183	GMSK	46.71	Pass
	8PSK	45.76	Pass
C190	GMSK	46.75	Pass
	8PSK	45.79	Pass
C231	GMSK	46.77	Pass
	8PSK	45.86	Pass
C241	GMSK	46.74	Pass
	8PSK	45.87	Pass
C251	GMSK	46.72	Pass
	8PSK	45.81	Pass

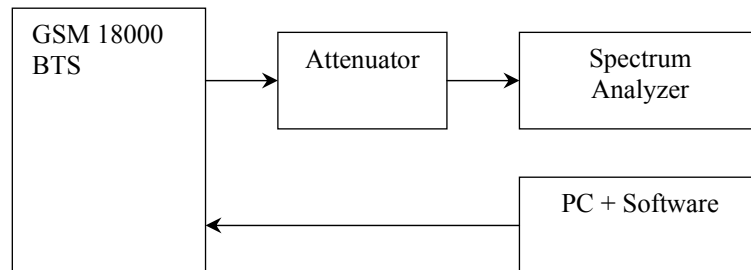
Note: Slight variations in power levels for GSM 1900 and GSM 850 can be observed in the Class II report when they are compared to their original reports; these slight variations are due to measurement uncertainty.

6.4 NAME OF TEST: OCCUPIED BANDWIDTH

6.4.1 FCC REQUIREMENTS

The occupied bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

6.4.2 TEST PRINCIPLE



The BTS was configured to transmit at maximum power (Static Level 0). Measurements were made at frequencies which were at the bottom and top of the transmit band.

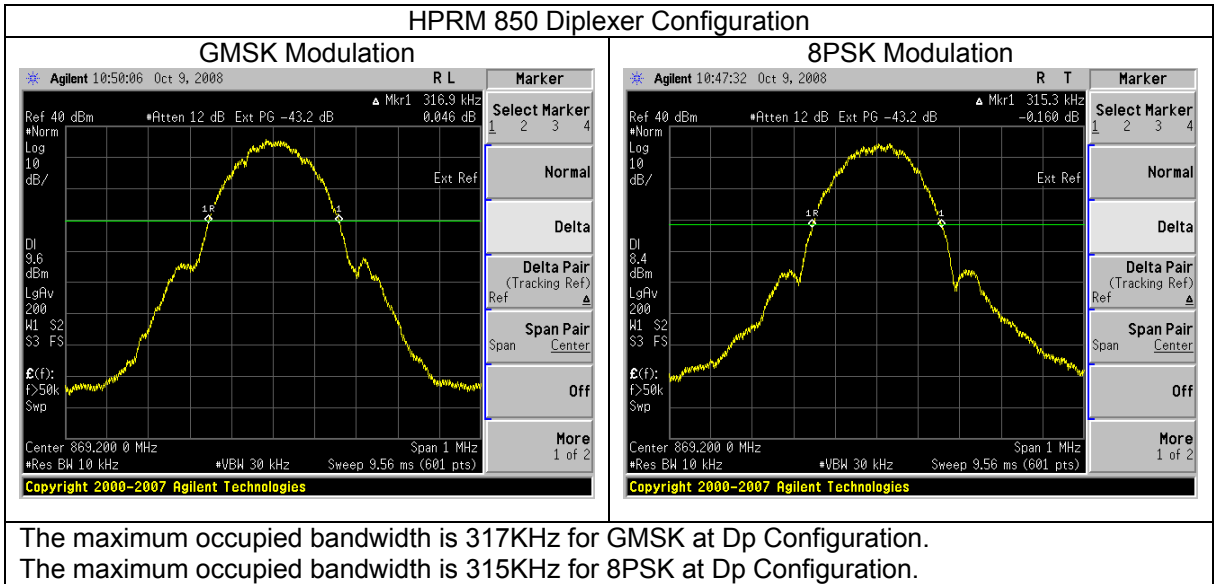
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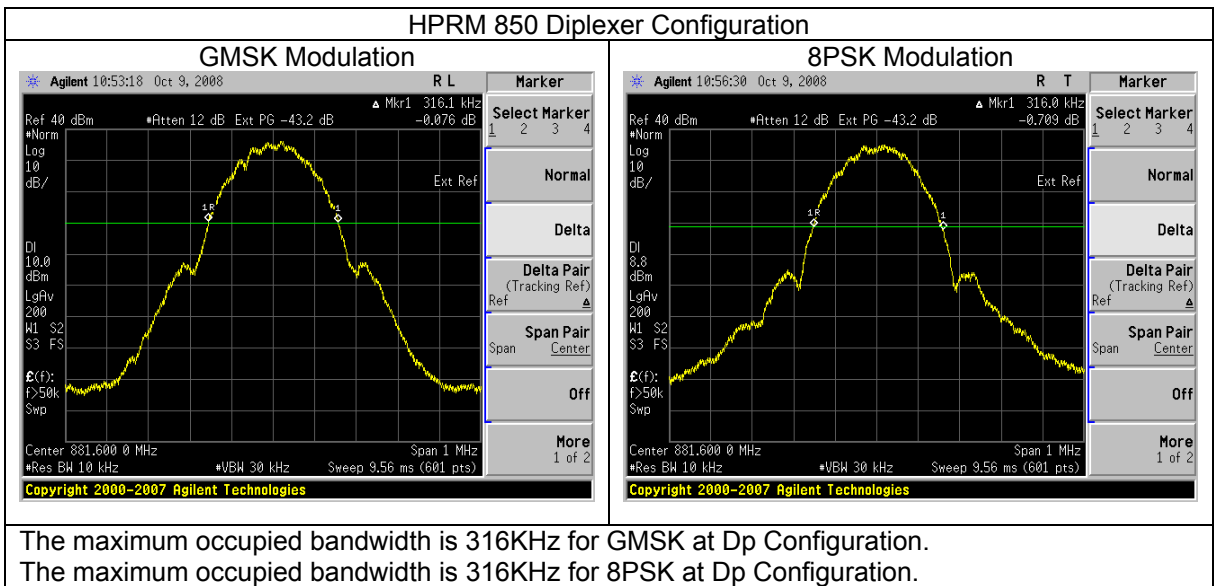
Resolution bandwidth:	10 kHz
Video bandwidth:	30 kHz
Span:	1 MHz
Reference level:	40 dBm
Reference Level Offset:	Corrected to account for cable(s) and attenuator losses
Level range:	100 dB
Sweep time:	25 ms

6.4.3 TEST RESULTS

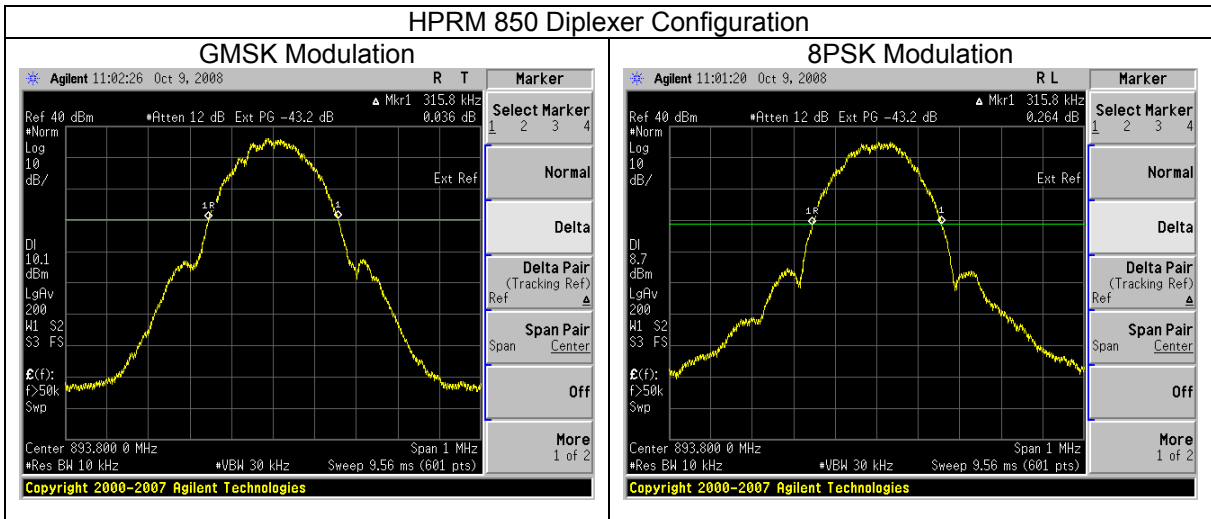
➤ Channel B



➤ Channel M



➤ Channel T



The maximum occupied bandwidth is 316KHz for GMSK at Dp Configuration.
 The maximum occupied bandwidth is 316KHz for 8PSK at Dp Configuration.

& END of DOCUMENT &