

# FCC Part 22H & 24E Measurement and Test Report

For

Etung Technology Co., Ltd

RM305 Geng Fang Plaza, jia 13 Huayuan Road Haidian Dist. Beijing, China

**FCC ID: 2AEWIMD-309**

**FCC Rules:** FCC Part 22H, FCC Part 24E

**Product Description:** Wireless Data Terminal

**Tested Model:** MD-309

**Report No.:** STR15078184I

**Tested Date:** 2015-07-15 to 2015-07-22

**Issued Date:** 2015-07-22

**Tested By:** Mark Chen / Engineer

*Mark Chen*

**Reviewed By:** Lahm Peng / EMC Manager

*Lahm peng*

**Approved & Authorized By:** Jandy So / PSQ Manager

*Jandyso*

**Prepared By:**

**Shenzhen SEM.Test Technology Co., Ltd.**

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,  
Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM. Test Technology Co., Ltd.

**TABLE OF CONTENTS**


<b>1. GENERAL INFORMATION.....</b>	<b>3</b>
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	4
1.3 TEST METHODOLOGY.....	4
1.4 TEST FACILITY.....	5
1.5 EUT SETUP AND TEST MODE.....	5
1.6 TEST EQUIPMENT LIST AND DETAILS.....	6
<b>2. SUMMARY OF TEST RESULTS.....</b>	<b>7</b>
<b>3. RF EXPOSURE.....</b>	<b>8</b>
3.1 STANDARD APPLICABLE.....	8
3.2 TEST RESULT.....	8
<b>4. RF OUTPUT POWER.....</b>	<b>9</b>
4.1 STANDARD APPLICABLE.....	9
4.2 TEST PROCEDURE.....	9
4.3 ENVIRONMENTAL CONDITIONS.....	9
4.4 SUMMARY OF TEST RESULTS/PLOTS.....	9
<b>5. PEAK-TO-AVERAGE RADIO (PAR) OF TRANSMITTER.....</b>	<b>13</b>
5.1 STANDARD APPLICABLE.....	13
5.2 TEST PROCEDURE.....	13
5.3 ENVIRONMENTAL CONDITIONS.....	13
5.4 SUMMARY OF TEST RESULTS.....	14
<b>6. EMISSION BANDWIDTH.....</b>	<b>15</b>
6.1 STANDARD APPLICABLE.....	15
6.2 TEST PROCEDURE.....	15
6.3 ENVIRONMENTAL CONDITIONS.....	15
6.4 SUMMARY OF TEST RESULTS/PLOTS.....	16
<b>7. OUT OF BAND EMISSIONS AT ANTENNA TERMINAL.....</b>	<b>23</b>
7.1 STANDARD APPLICABLE.....	23
7.2 TEST PROCEDURE.....	23
7.3 ENVIRONMENTAL CONDITIONS.....	23
7.4 SUMMARY OF TEST RESULTS/PLOTS.....	24
<b>8. SPURIOUS RADIATED EMISSIONS.....</b>	<b>40</b>
8.1 MEASUREMENT UNCERTAINTY.....	40
8.2 STANDARD APPLICABLE.....	40
8.3 TEST PROCEDURE.....	40
8.4 ENVIRONMENTAL CONDITIONS.....	40
8.5 SUMMARY OF TEST RESULTS/PLOTS.....	40
<b>9. FREQUENCY STABILITY.....</b>	<b>51</b>
9.1 STANDARD APPLICABLE.....	51
9.2 TEST PROCEDURE.....	51
9.3 ENVIRONMENTAL CONDITIONS.....	51
9.4 SUMMARY OF TEST RESULTS/PLOTS.....	51

## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: Wireless Data Terminal  
Address of applicant: RM305 Geng Fang Plaza, jia 13 Huayuan Road  
Haidian Dist. Beijing, China  
Manufacturer: Wireless Data Terminal  
Address of manufacturer: RM305 Geng Fang Plaza, jia 13 Huayuan Road  
Haidian Dist. Beijing, China

General Description of EUT	
Product Name:	Wireless Data Terminal
Brand Name:	
Model No.:	MD-309
Adding Model(s):	/
Hardware Version:	V1
Software Version:	V1
IMEI:	240305003021754
Rated Voltage:	DC 12V adapter
Battery Capacity:	/
Power Adaptor:	IVP1200-1000
	INPUT: AC100-240V OUTPUT: 12V/1A
Device Category:	Fixed Device
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

Technical Characteristics of EUT	
2G	
Support Networks:	GSM, GPRS
Support Band:	GSM850/PCS1900
Uplink Frequency:	GSM/GPRS 850: 824~849MHz GSM/GPRS 1900: 1850~1910MHz
Downlink Frequency:	GSM/GPRS 850: 869~894MHz GSM/GPRS 1900: 1930~1990MHz
Max RF Output Power:	GPRS850: 31.61dBm, GPRS1900: 28.79dBm
Type of Modulation:	GMSK, 8PSK
Type of Emission:	GSM850: 256KGXW, GSM1900: 257KGXW
Type of Antenna:	SMA-reverse Antenna
Antenna Gain:	1dBi
GPRS Class:	Class 12

## 1.2 Test Standards

The following report is prepared on behalf of the Etung Technology Co., Ltd in accordance with FCC Part 2 subpart J, FCC Part 22 subpart H and FCC Part 24 subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 2 subpart J, FCC Part 22 subpart H and FCC Part 24 subpart E of the Federal Communication Commissions rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with TIA/EIA 603-C: 2004, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

## 1.4 Test Facility

- **FCC – Registration No.: 934118**

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

- **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

- **CNAS Registration No.: L4062**

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101)

## 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	GSM 850	Low, Middle, High Channels
TM2	GPRS 850	Low, Middle, High Channels
TM3	GSM 1900	Low, Middle, High Channels
TM4	GPRS 1900	Low, Middle, High Channels

Testing Configure			
Support Band	Support Standard	Channel Frequency	Channel Number
GSM 850	GSM/GPRS	824.2 MHz	128
		836.4 MHz	190
		848.8 MHz	251
PCS 1900	GSM/GPRS	1850.2 MHz	512
		1880.0 MHz	661
		1909.8 MHz	810
Note: the transmitter has been tested on the communications mode of GSM, GPRS, compliance test and record the worst case.			

## EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/
/	/	/	/

## Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/

## Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

## 1.6 Test Equipment List and Details

Kind of Equipment	Manufacturer	Type	S/N	Cal. Date	Due Date
Equipment list of < Shenzhen SEM.Test Technology Co., Ltd.>					
Test SIM card	-		-	N/A	
GSM Tester	Rohde & Schwarz	CMU200	104036	2015-06-17	2016-06-16
Spectrum Analyzer	Agilent	E4407B	MY41440400	2015-06-17	2016-06-16
Spectrum Analyzer	Agilent	N9020A	US47140102	2015-06-17	2016-06-16
Signal Generator	Agilent	83752A	3610A01453	2015-06-17	2016-06-16
Vector Signal Generator	Agilent	N5182A	MY47070202	2015-06-17	2016-06-16
Power Divider	Weinschel	1506A	PM204	2015-06-17	2016-06-16
Power Divider	RF-Lambda	RFLT4W5M1 8G	14110400027	2015-06-17	2016-06-16
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2015-06-17	2016-06-16
Amplifier	Agilent	8447F	3113A06717	2015-06-17	2016-06-16
Amplifier	C&D	PAP-1G18	2002	2015-06-17	2016-06-16
Broadband Antenna	Schwarz beck	VULB9163	9163-333	2015-06-17	2016-06-16
Horn Antenna	ETS	3117	00086197	2015-06-17	2016-06-16

## 2. SUMMARY OF TEST RESULTS

---

FCC Rules	Description of Test Item	Result
§ 1.1307, § 2.1093	RF Exposure	Compliant
§ 22.913 (a), § 24.232 (c)	RF Output Power	Compliant
§ 22.917 (b), § 24.238 (b)	Emission Bandwidth	Compliant
§ 22.917 (a), § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliant
§ 22.917 (a), § 24.238 (a)	Spurious Radiation Emissions	Compliant
§ 22.917 (a), § 24.238 (a)	Out of Band Emissions	Compliant
§ 22.355, § 24.235	Frequency Stability	Compliant

### **3. RF Exposure**

---

#### **3.1 Standard Applicable**

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

#### **3.2 Test Result**

This product complied with the requirement of the RF exposure, please see the SAR report.



## 4. RF Output Power

---

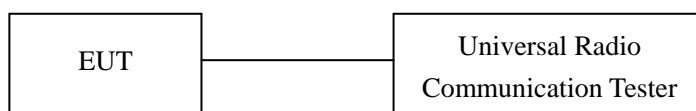
### 4.1 Standard Applicable

According to §22.913(a)(2), The ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

According to §24.232 (c), Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

### 4.2 Test Procedure

Conducted output power test method:



Radiated power test method:

1. The setup of EUT is according with per TIA/EIA Standard 603C and ANSI C63.4-2003 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

### 4.3 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

### 4.4 Summary of Test Results/Plots

## Radiated Power

## ERP For GSM Mode GSM850

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
824.2	28.37	1.5	0	H	1.5	0	26.87	38.45
824.2	30.36	1.5	0	V	1.5	0	28.86	38.45
Middle Channel								
836.4	28.16	1.5	0	H	1.5	0	26.66	38.45
836.4	30.14	1.5	0	V	1.5	0	28.64	38.45
High Channel								
848.8	28.18	1.5	0	H	1.5	0	26.68	38.45
848.8	30.19	1.5	0	V	1.5	0	28.69	38.45

## EIRP For GSM Mode PCS1900

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	DBm	dBm
Low Channel								
1850.2	16.00	1.5	0	H	1.9	7.7	21.80	33
1850.2	17.97	1.5	0	V	1.9	7.7	23.77	33
Middle Channel								
1880.0	16.46	1.5	0	H	1.9	7.7	22.26	33
1880.0	18.43	1.5	0	V	1.9	7.7	24.23	33
High Channel								
1909.8	16.68	1.5	0	H	1.9	7.7	22.48	33
1909.8	18.66	1.5	0	V	1.9	7.7	24.46	33

## ERP For GPRS Mode GSM850

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
824.2	28.36	1.5	0	H	1.5	0	26.86	38.45
824.2	30.35	1.5	0	V	1.5	0	28.85	38.45
Middle Channel								
836.4	28.20	1.5	0	H	1.5	0	26.70	38.45
836.4	30.18	1.5	0	V	1.5	0	28.68	38.45
High Channel								
848.8	28.23	1.5	0	H	1.5	0	26.73	38.45
848.8	30.24	1.5	0	V	1.5	0	28.74	38.45

## EIRP For GPRS Mode PCS1900

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	DBm	dBm
Low Channel								
1850.2	16.06	1.5	0	H	1.9	7.7	21.86	33
1850.2	18.03	1.5	0	V	1.9	7.7	23.83	33
Middle Channel								
1880.0	16.46	1.5	0	H	1.9	7.7	22.26	33
1880.0	18.43	1.5	0	V	1.9	7.7	24.23	33
High Channel								
1909.8	16.63	1.5	0	H	1.9	7.7	22.43	33
1909.8	18.61	1.5	0	V	1.9	7.7	24.41	33

Note: Result = Substitute - Cable loss + Antenna Gain

Max. Conducted Output Power

For Cellular Band (GSM850)

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 22.913 Limit (dBm)
GSM	Low Channel	824.2	31.61	38.45
	Middle Channel	836.4	31.31	38.45
	High Channel	848.8	31.31	38.45
GPRS(1 Slot)	Low Channel	824.2	31.60	38.45
	Middle Channel	836.4	31.35	38.45
	High Channel	848.8	31.36	38.45

For PCS Band (GSM1900)

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 24.232 Limit (dBm)
GSM	Low Channel	1850.2	28.01	33.0
	Middle Channel	1880.0	28.49	33.0
	High Channel	1909.8	28.79	33.0
GPRS(1 Slot)	Low Channel	1850.2	28.07	33.0
	Middle Channel	1880.0	28.49	33.0
	High Channel	1909.8	28.74	33.0

\

## 5. Peak-to-average Radio (PAR) of Transmitter

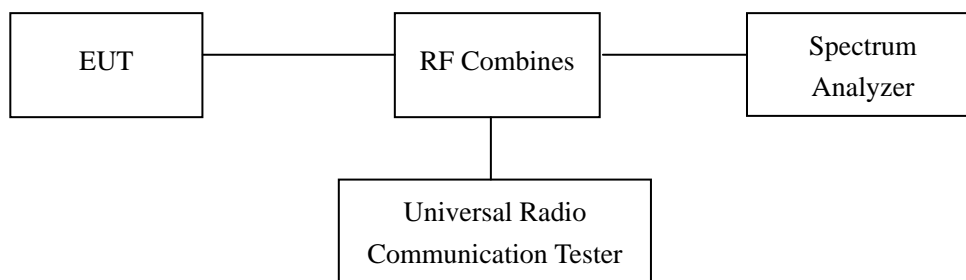
### 5.1 Standard Applicable

According to §24.232(d), Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

### 5.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 30kHz and the peak-to-average ratio (PAR) of the transmission was recorded.

Test Configuration for the emission bandwidth testing:



### 5.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

## 5.4 Summary of Test Results

For Cellular Band

Test Mode	Channel	Frequency (MHz)	Peak Power (dBm)	Average Power (dBm)	PAR (dB)	Limit (dB)
GSM	128	824.2	34.66	31.61	3.05	13
	190	836.4	34.21	31.31	2.90	13
	251	848.8	34.33	31.31	3.02	13
GPRS (1 Slot)	128	824.2	35.39	31.60	3.79	13
	190	836.4	34.66	31.35	3.31	13
	251	848.8	34.67	31.36	3.31	13

## 6. Emission Bandwidth

### 6.1 Standard Applicable

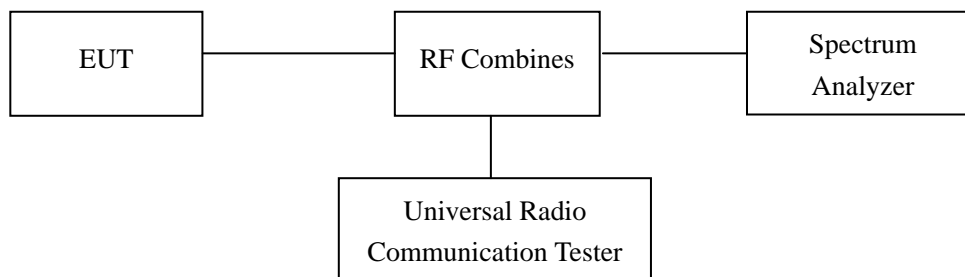
According to §22.917(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

According to §24.238(b), The emission 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.

### 6.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 30kHz and the 26dB bandwidth was recorded.

Test Configuration for the emission bandwidth testing:



### 6.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

## 6.4 Summary of Test Results/Plots

For Cellular Band

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	128	824.2	254.7010	335.631
	190	836.6	253.6104	333.724
	251	848.8	256.5188	335.575
GPRS	128	824.2	254.0553	344.466
	190	836.6	254.0285	340.721
	251	848.8	255.1773	340.197

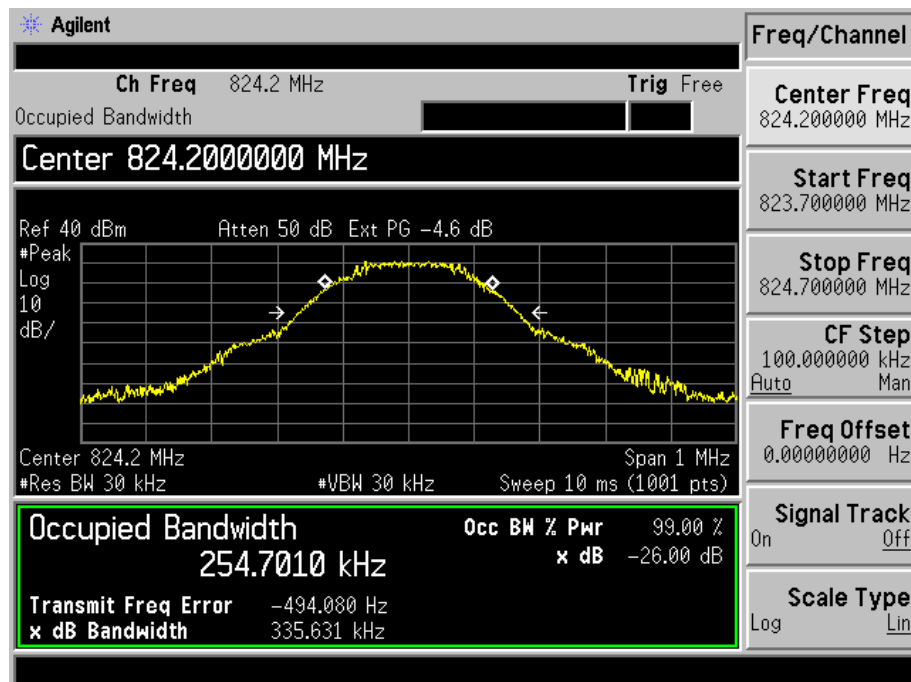
For PCS Band

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	512	1850.2	251.9048	334.989
	661	1880.0	254.3602	335.263
	810	1909.8	257.5154	336.908
GPRS	512	1850.2	253.9253	339.891
	661	1880.0	252.4719	340.565
	810	1909.8	254.7485	338.393

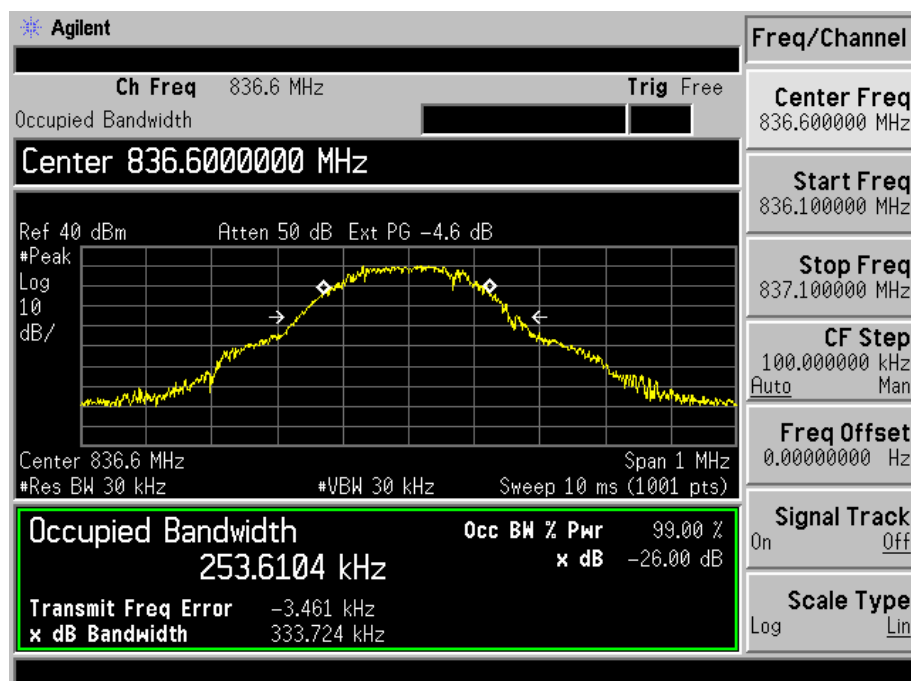
*Please refer to the following test plots:*



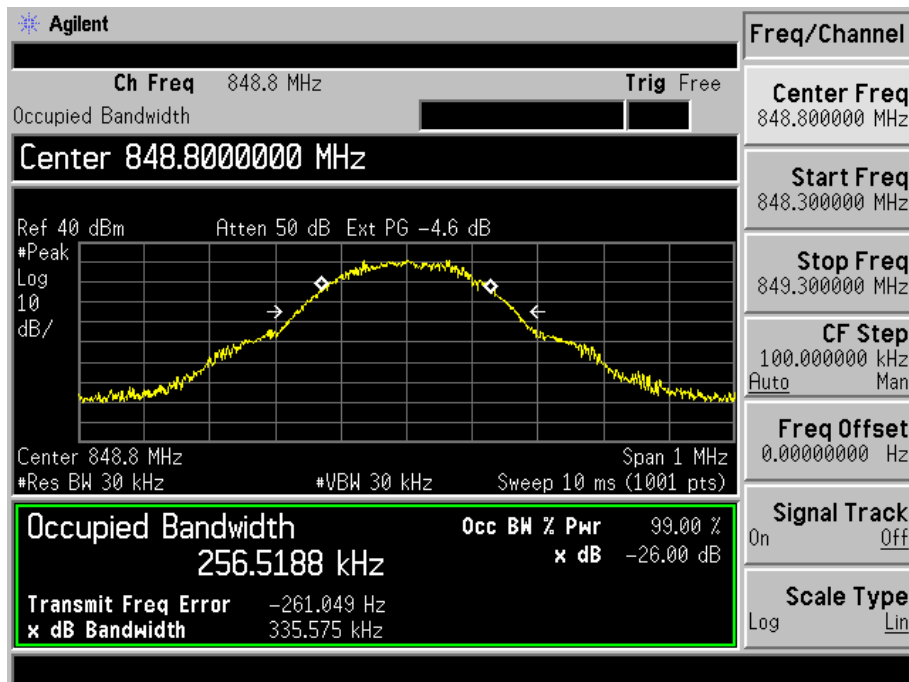
For Cellular Band  
GSM Low Channel



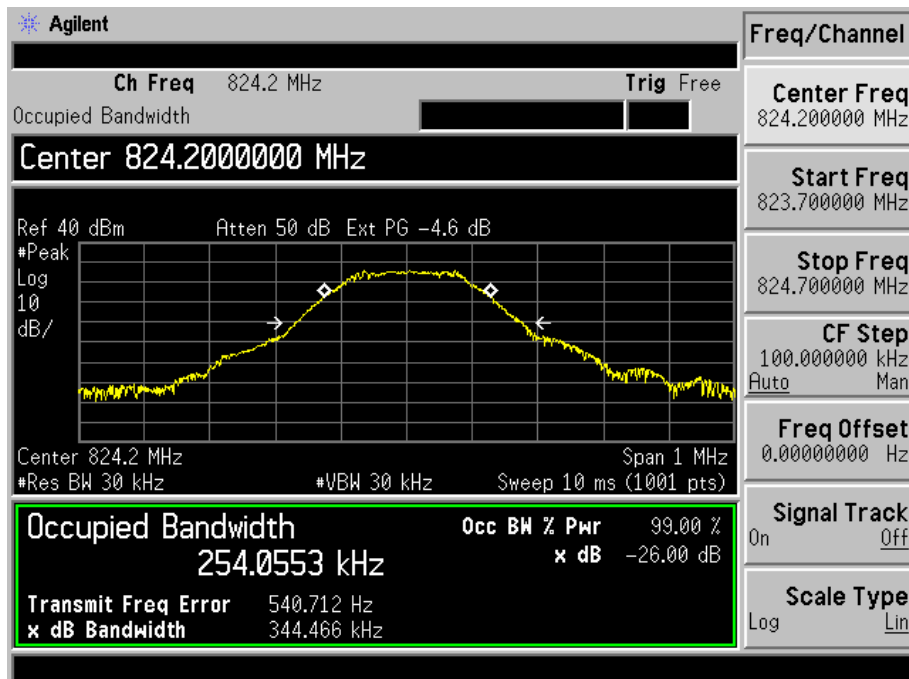
GSM Middle Channel



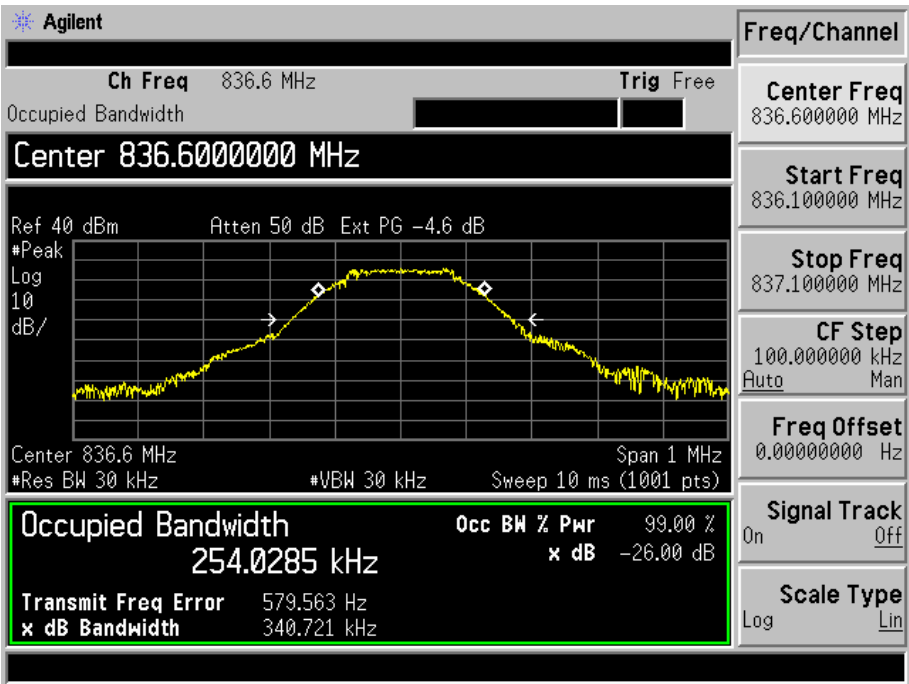
## GSM High channel



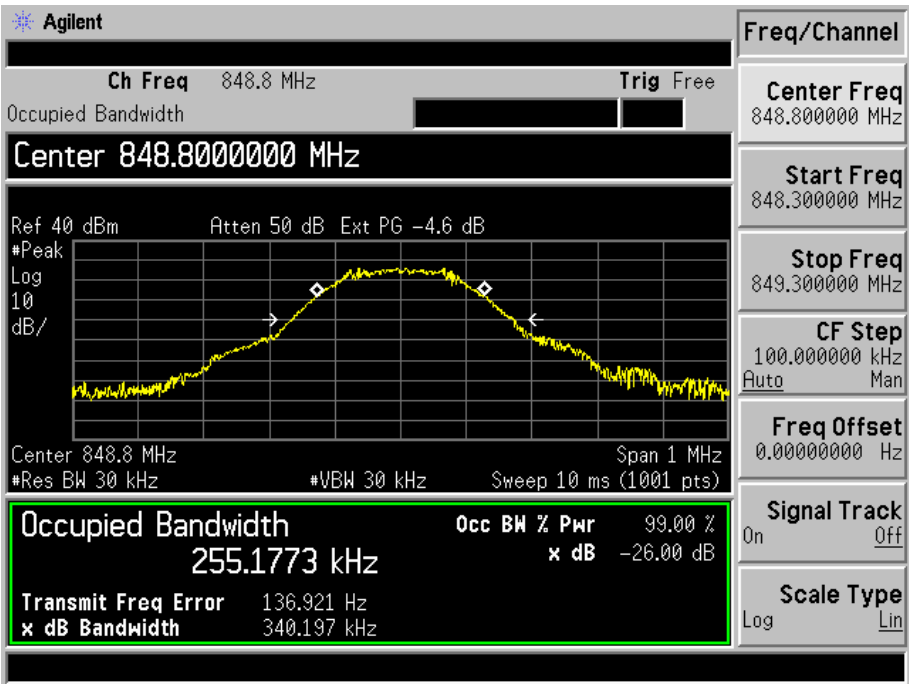
## GPRS Low Channel



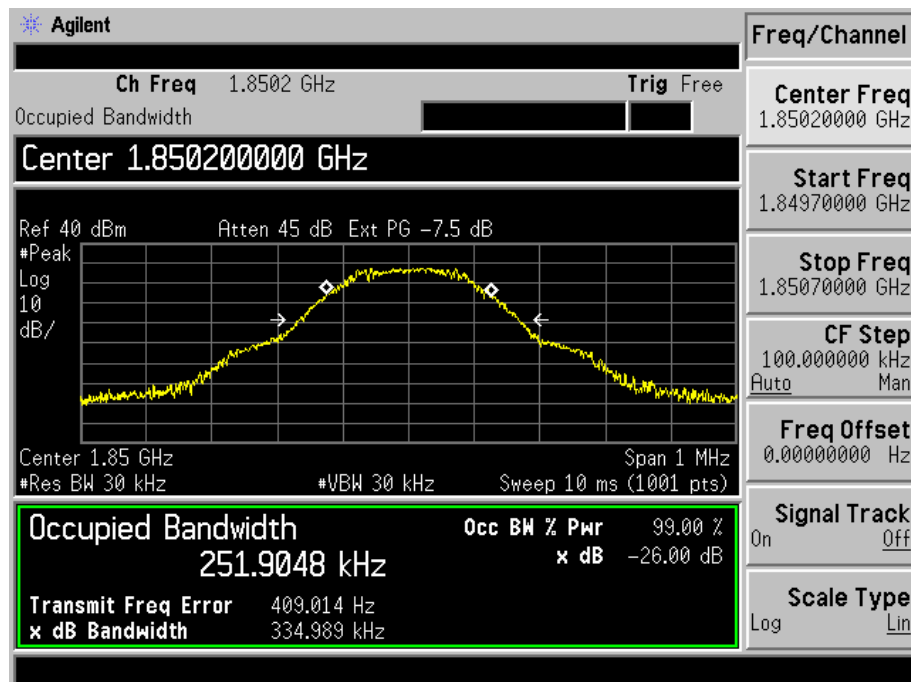
GPRS Middle Channel



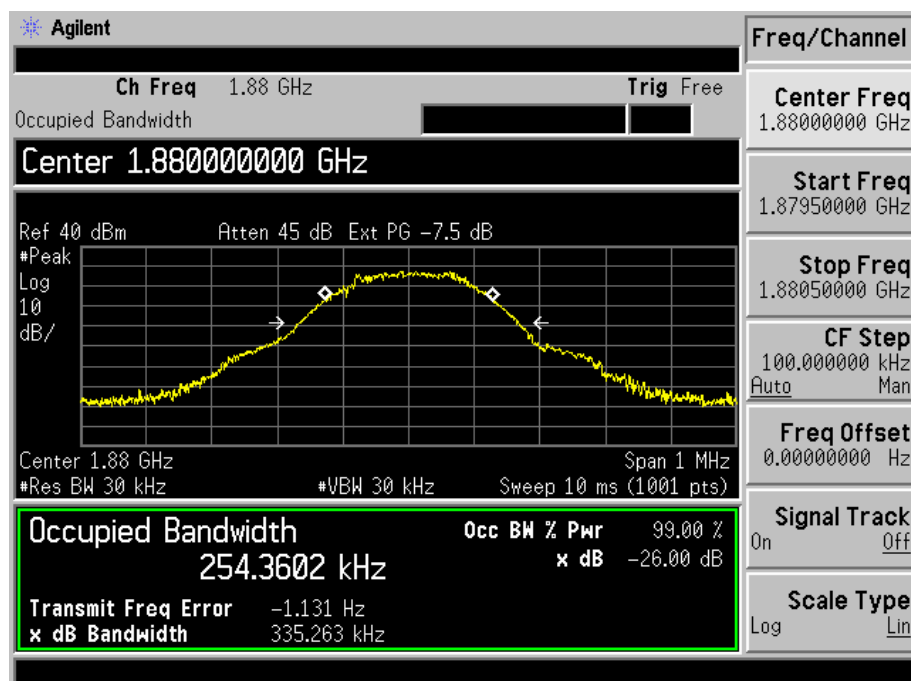
GPRS High Channel



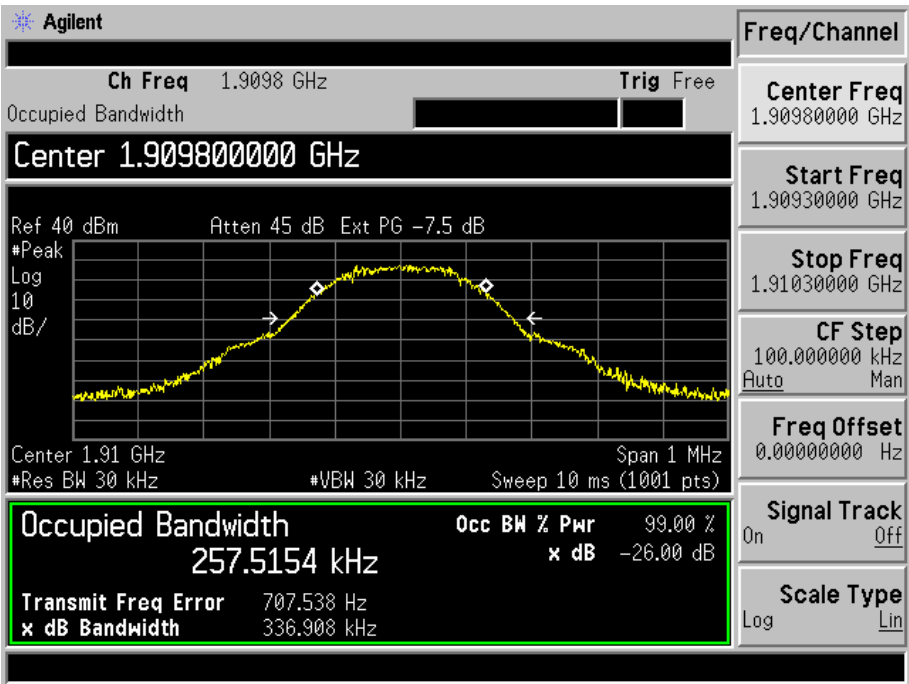
For PCS Band  
GSM Low Channel



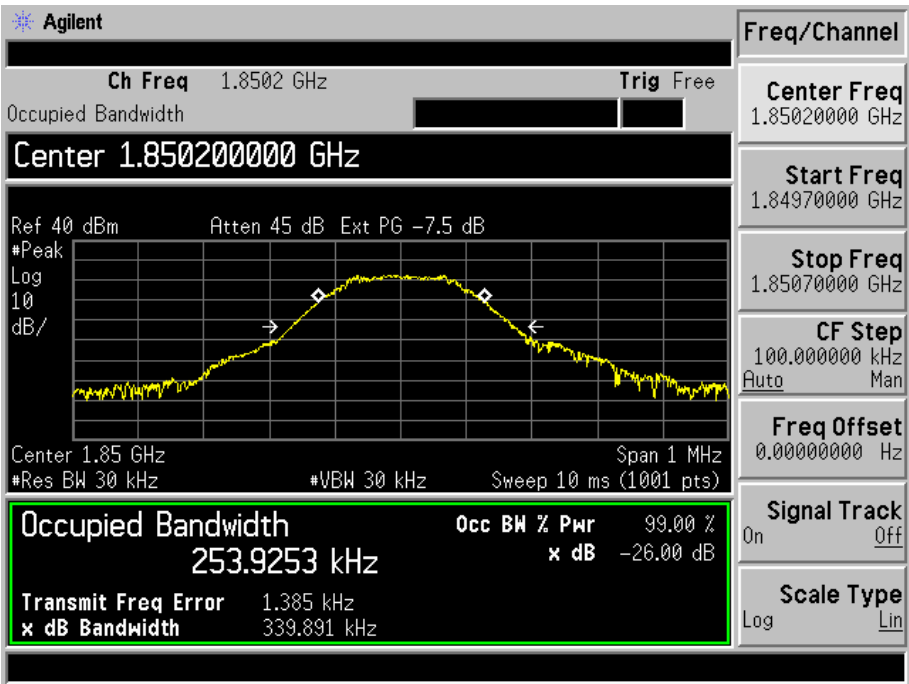
GSM Middle Channel



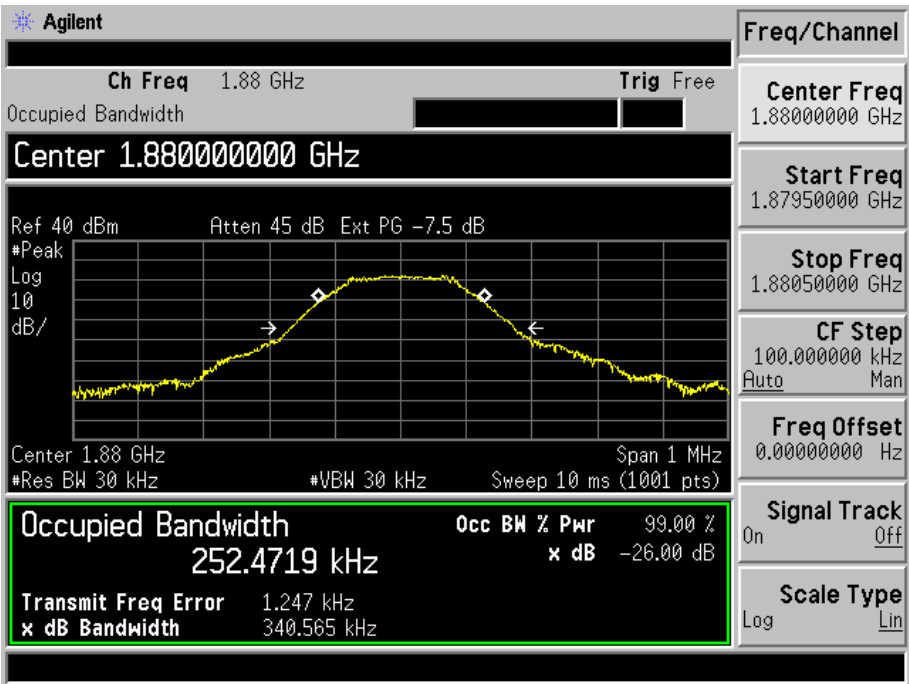
GSM High channel



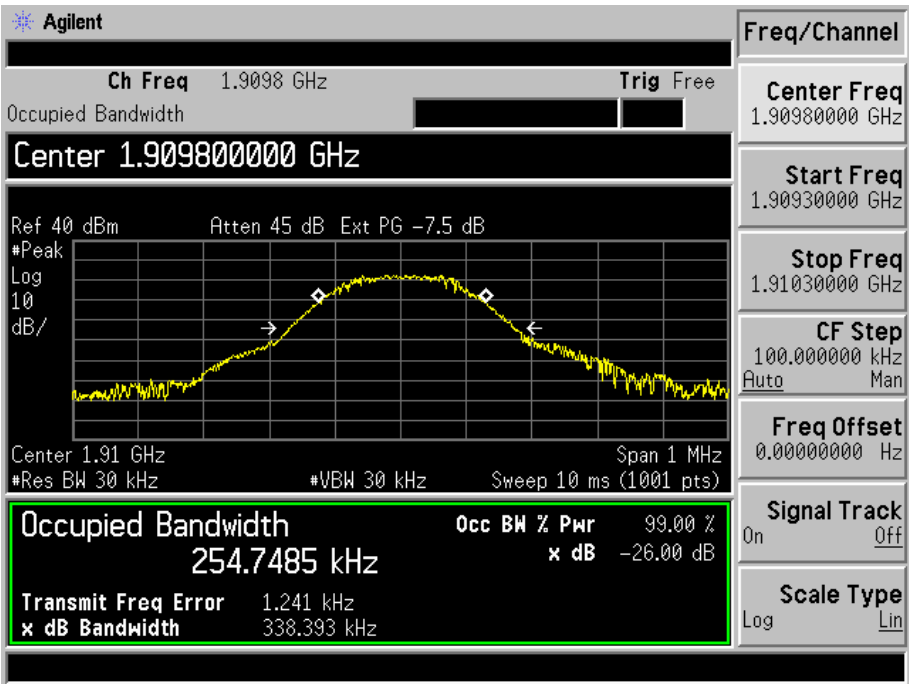
GPRS Low Channel



GPRS Middle Channel



GPRS High Channel



## 7. Out of Band Emissions at Antenna Terminal

### 7.1 Standard Applicable

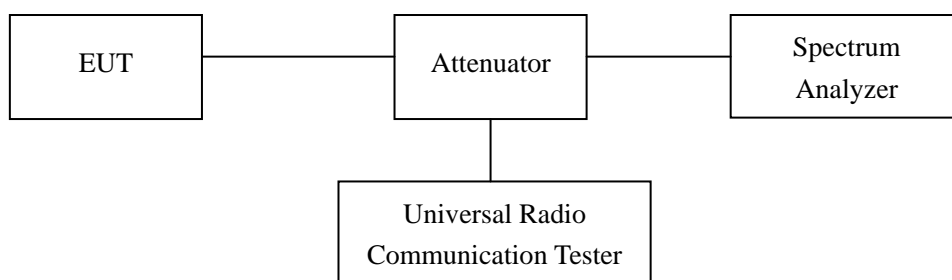
According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 7.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 100kHz and 1MHz for the scan frequency from 30MHz to 1GHz and the scan frequency from 1GHz to up to 10<sup>th</sup> harmonic.

Test Configuration for the out of band emissions testing:

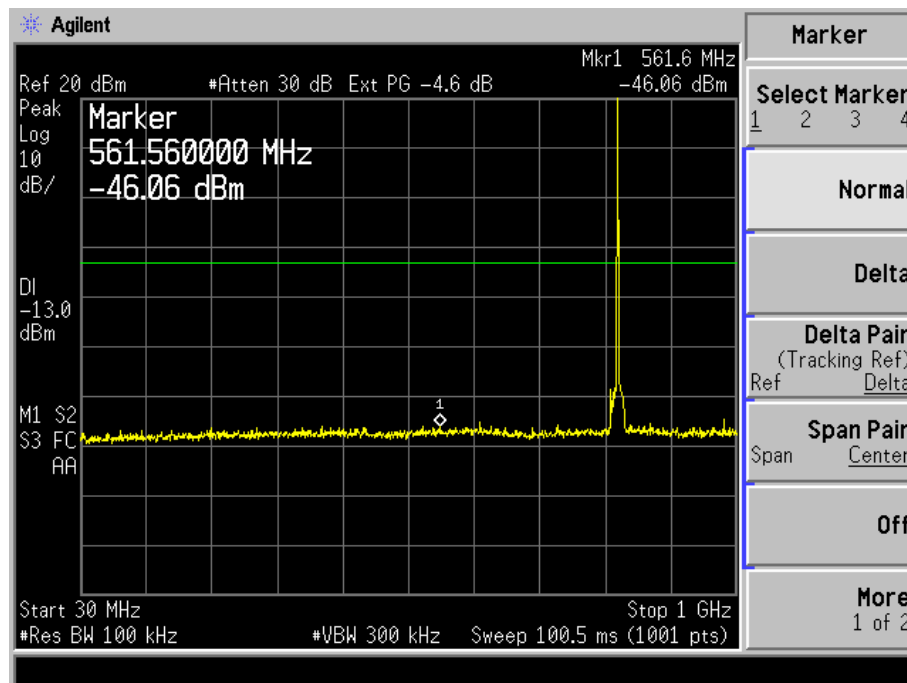


### 7.3 Environmental Conditions

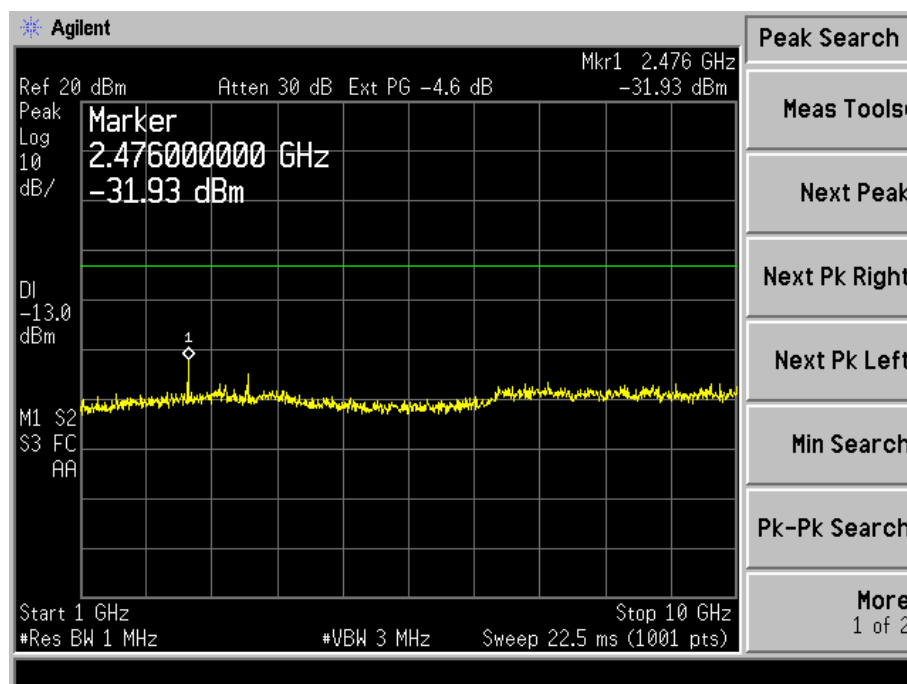
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

## 7.4 Summary of Test Results/Plots

Please refer to the following test plots For Cellular Band  
GSM Low Channel 30MHz to 1GHz

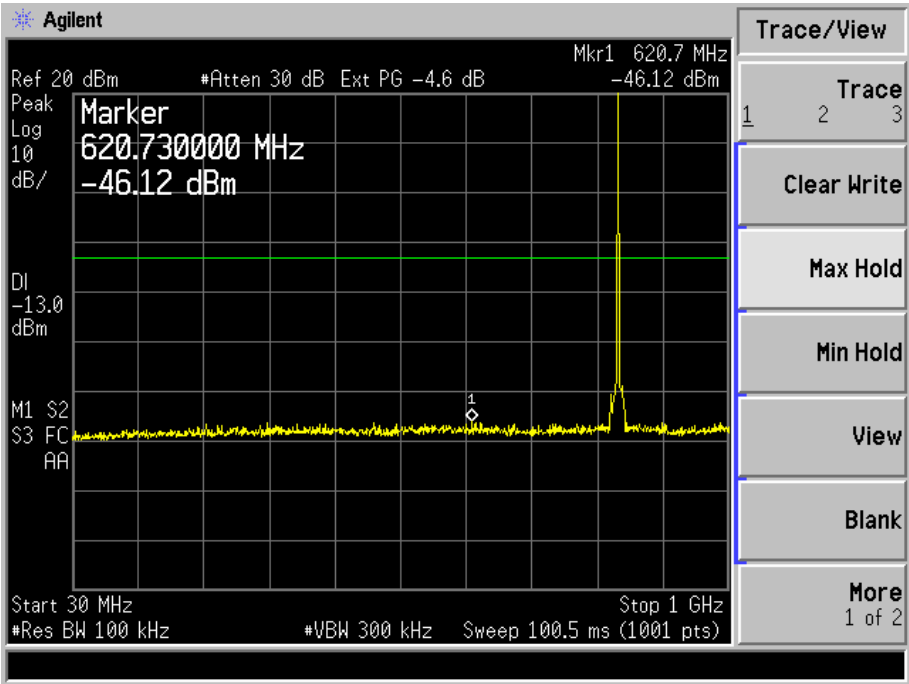


Above 1GHz

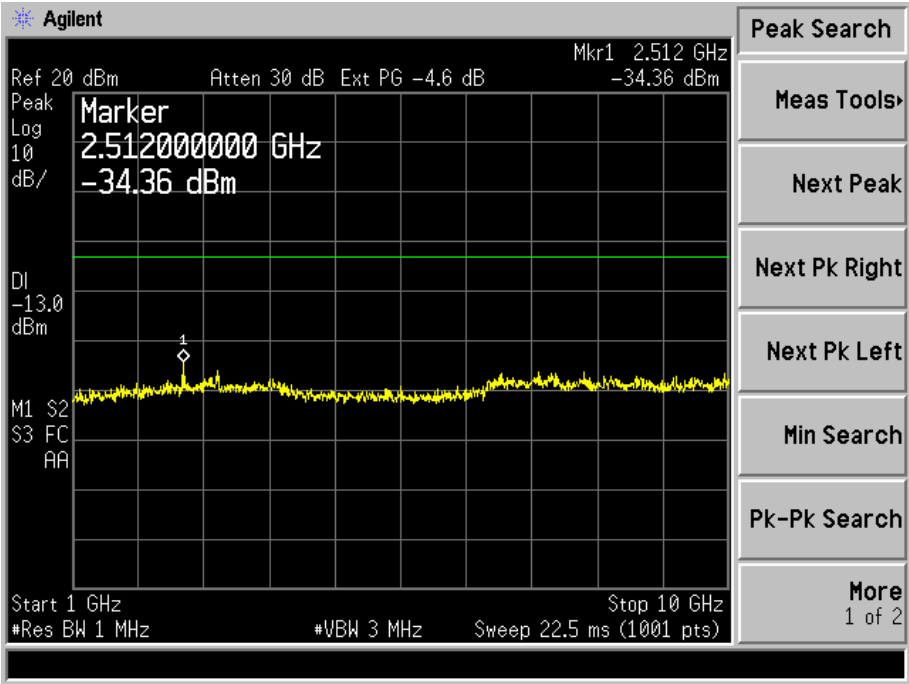




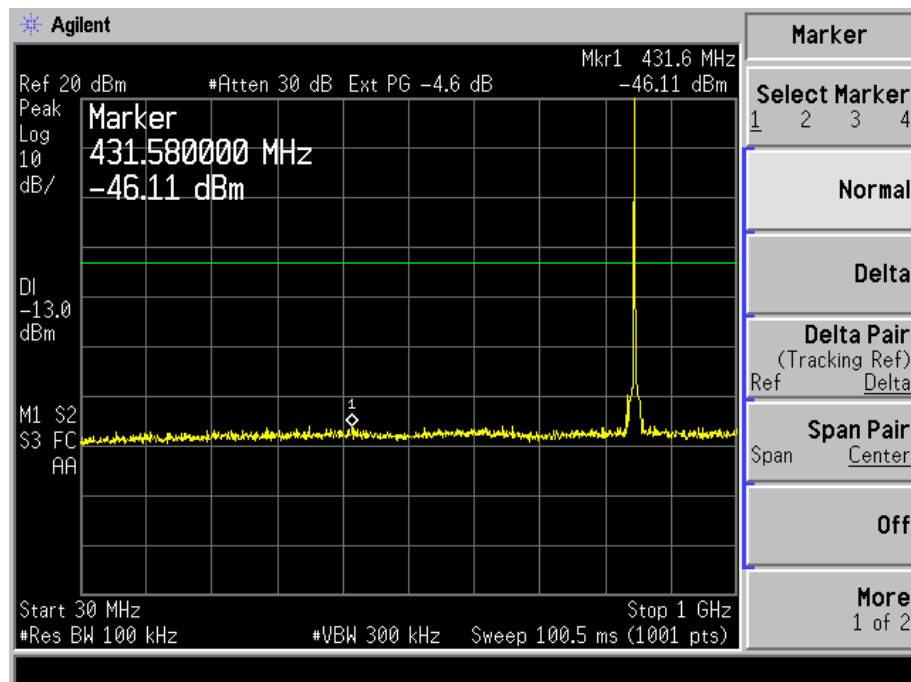
GSM Middle Channel  
30MHz to 1GHz



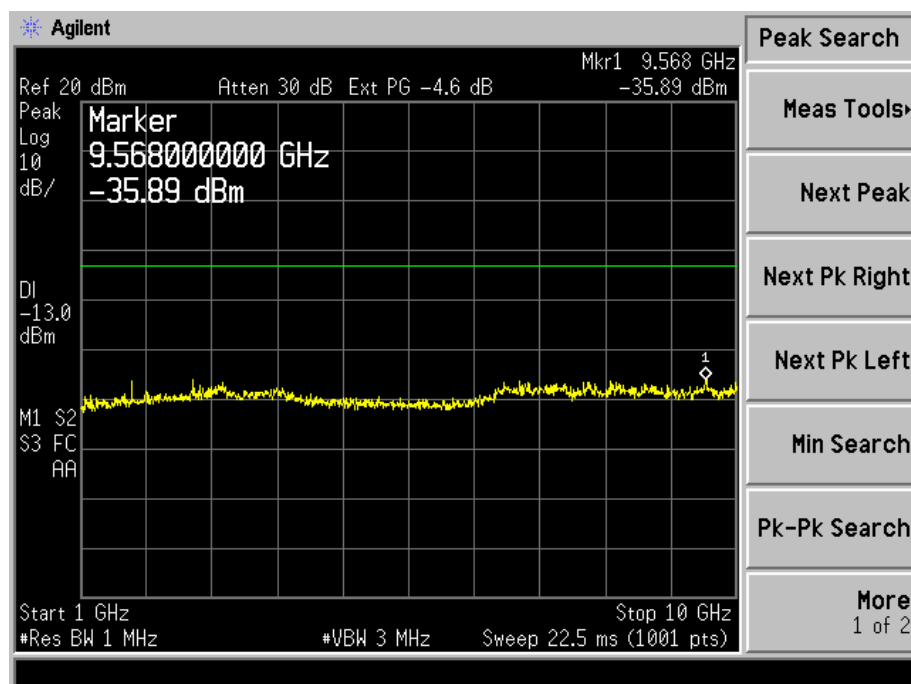
Above 1GHz



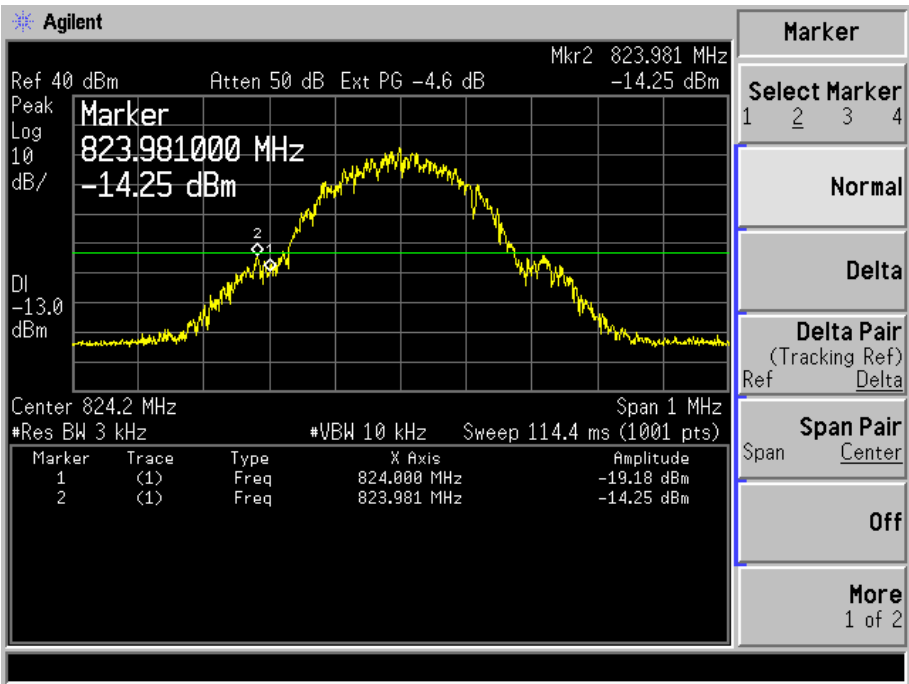
GSM High Channel  
30MHz to 1GHz



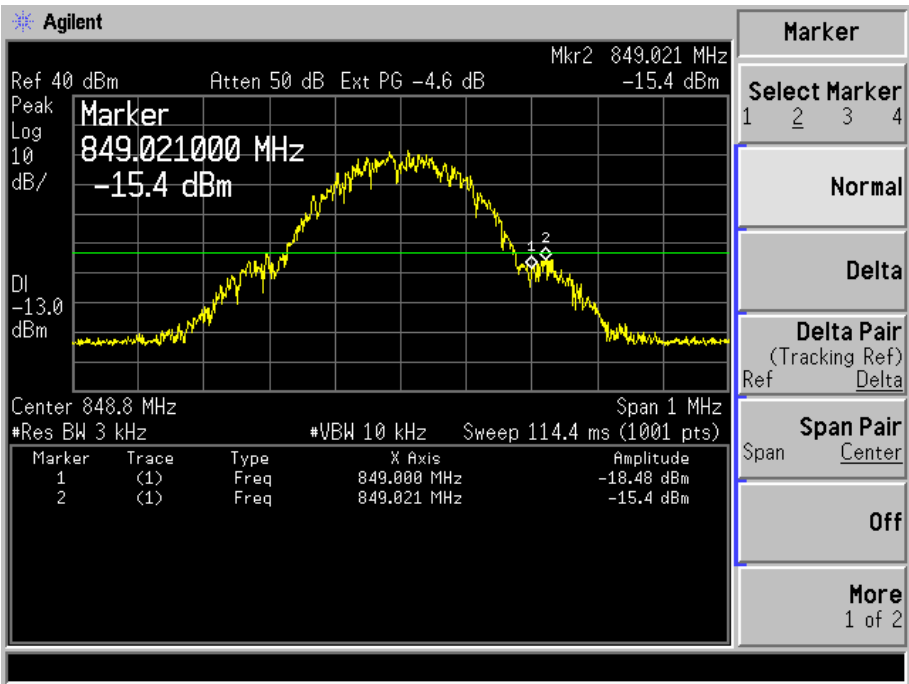
Above 1GHz



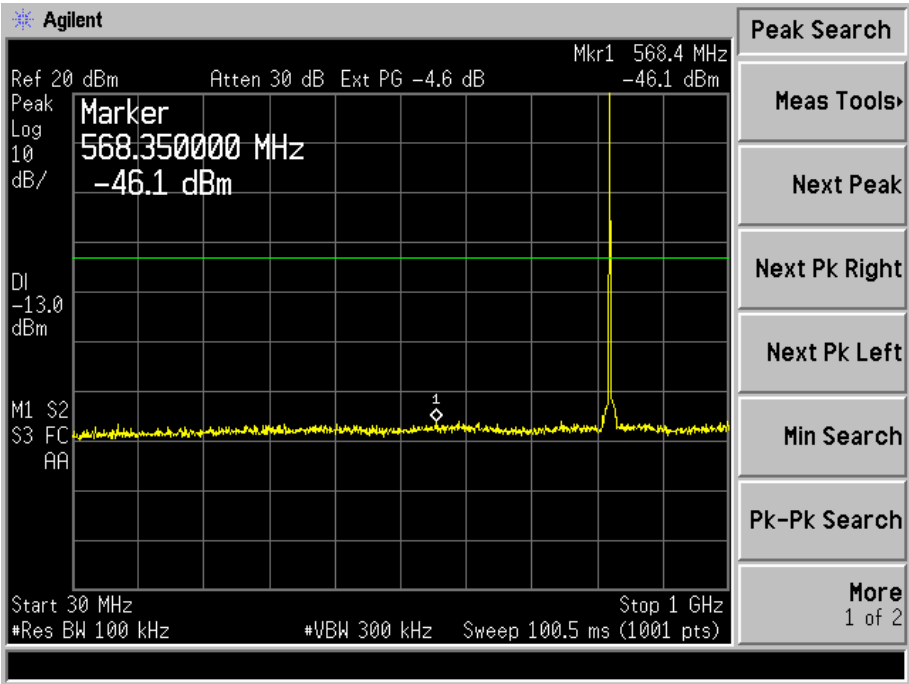
GSM Low Band Emission



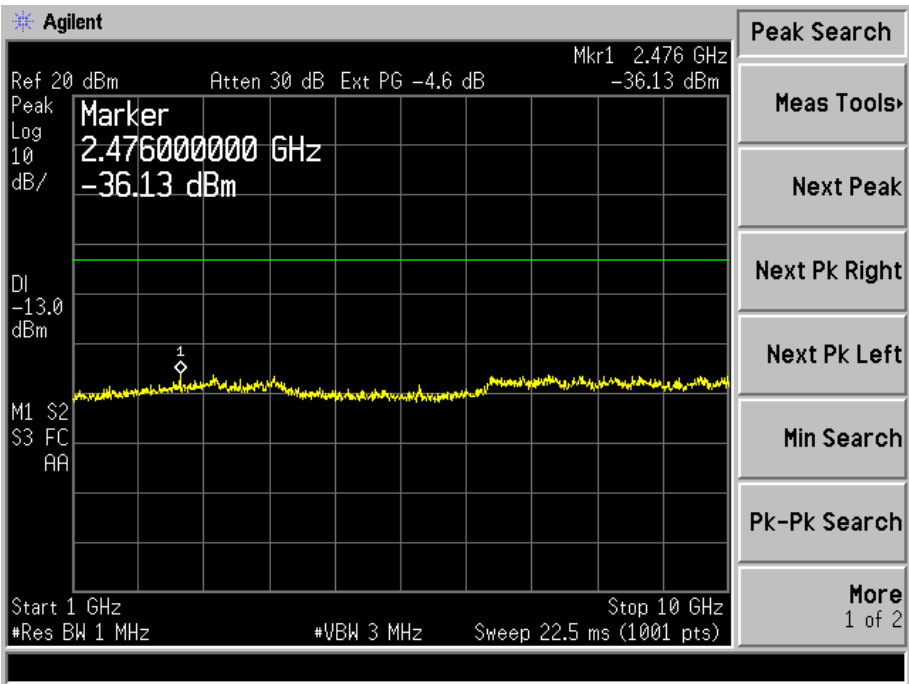
GSM High Band Emission



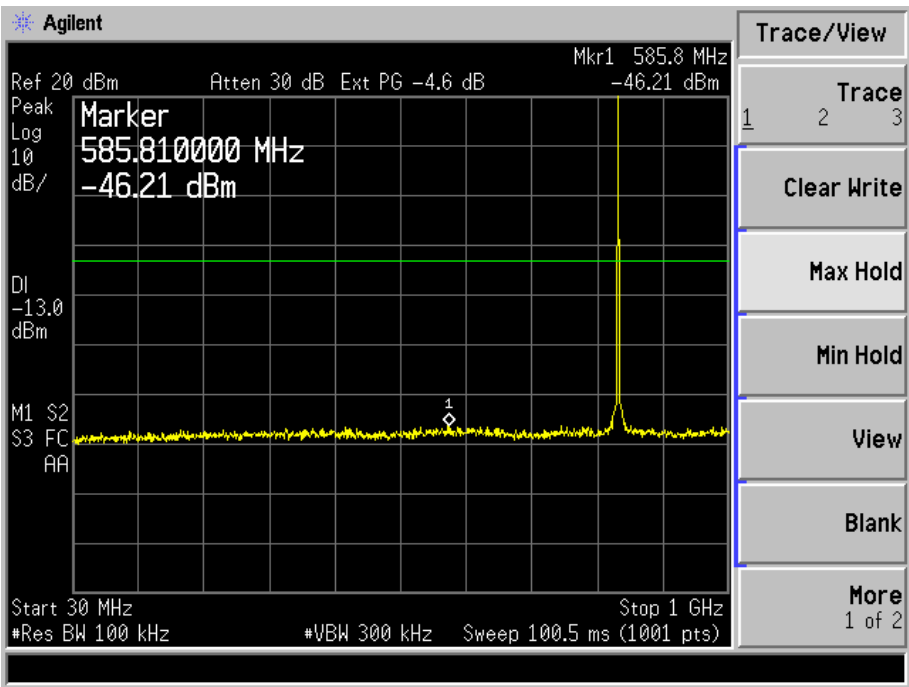
GPRS Low Channel  
30MHz to 1GHz



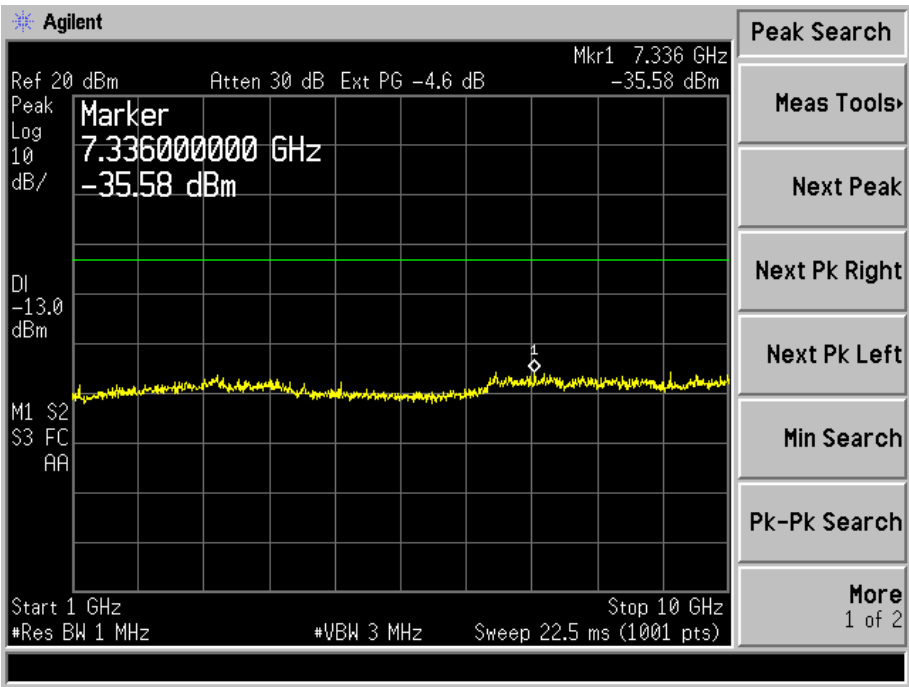
Above 1GHz



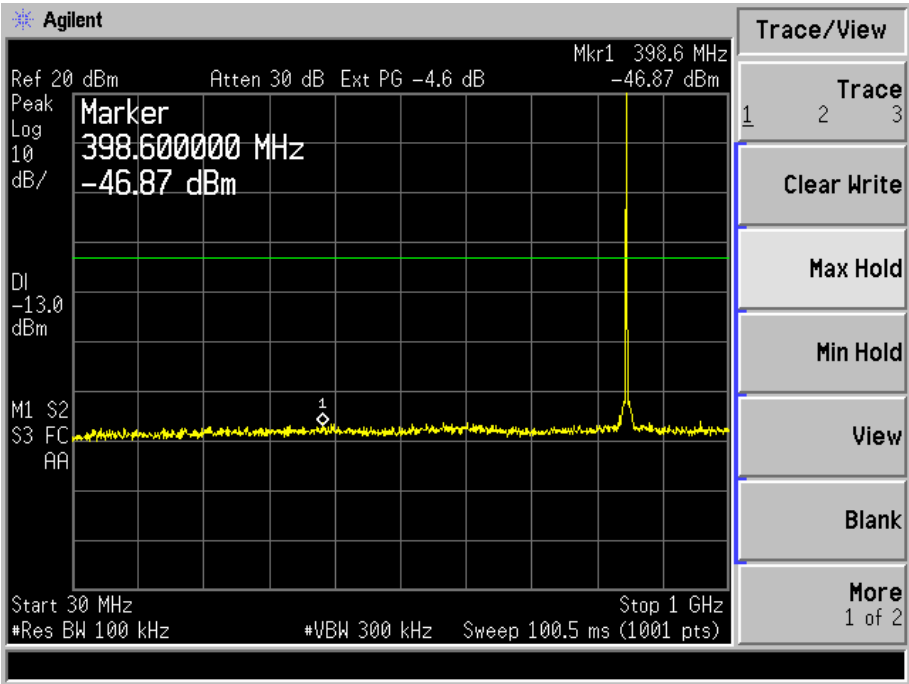
GPRS Middle Channel  
30MHz to 1GHz



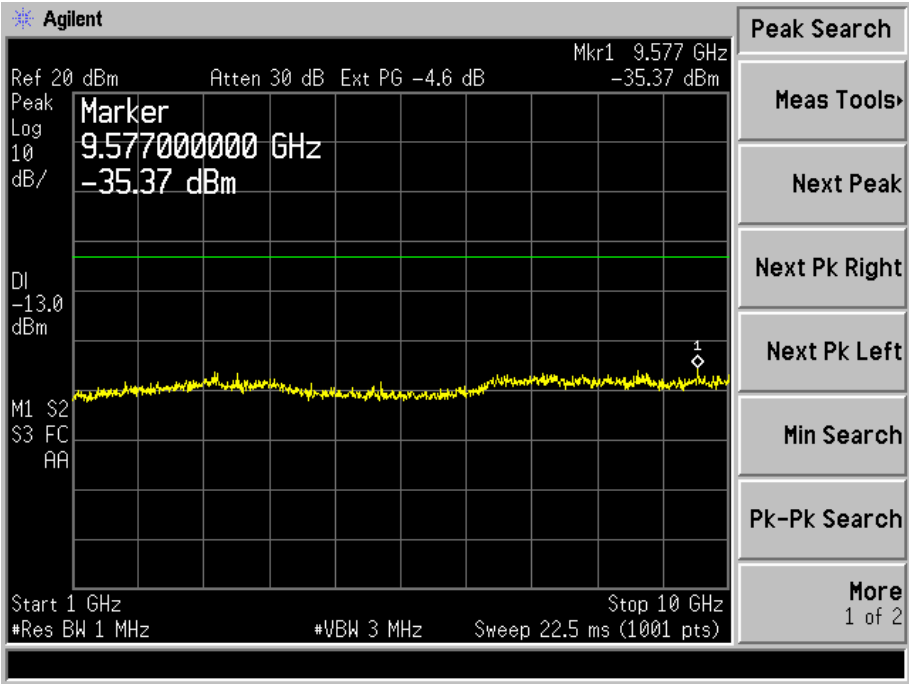
Above 1GHz



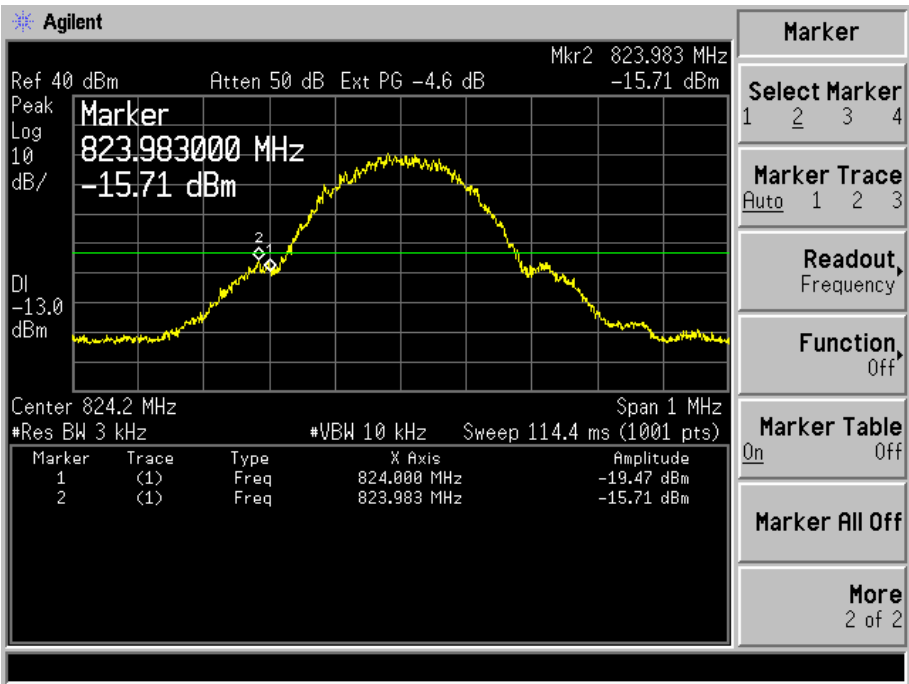
GPRS High Channel  
30MHz to 1GHz



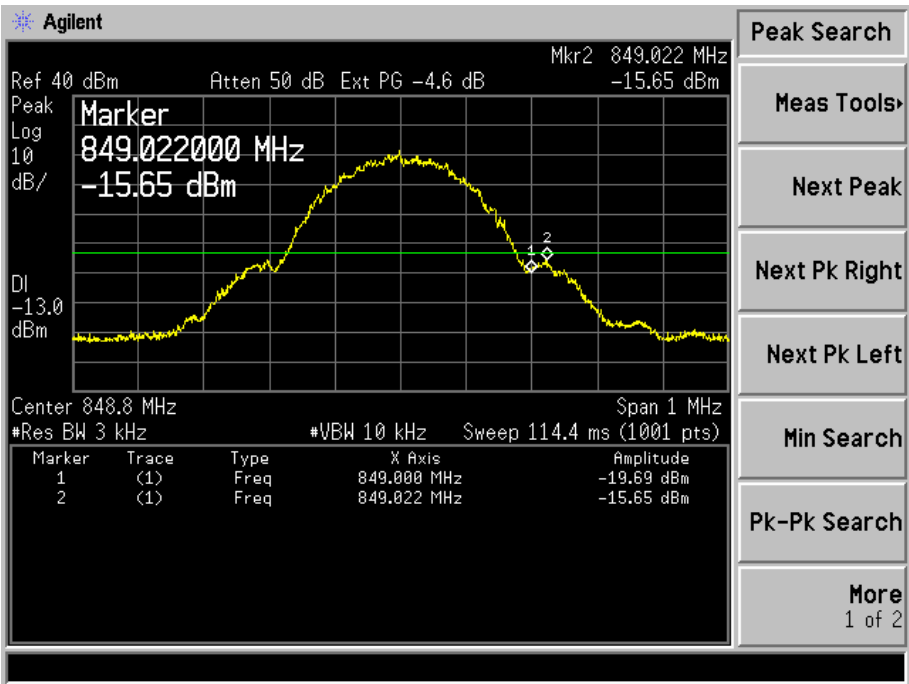
Above 1GHz



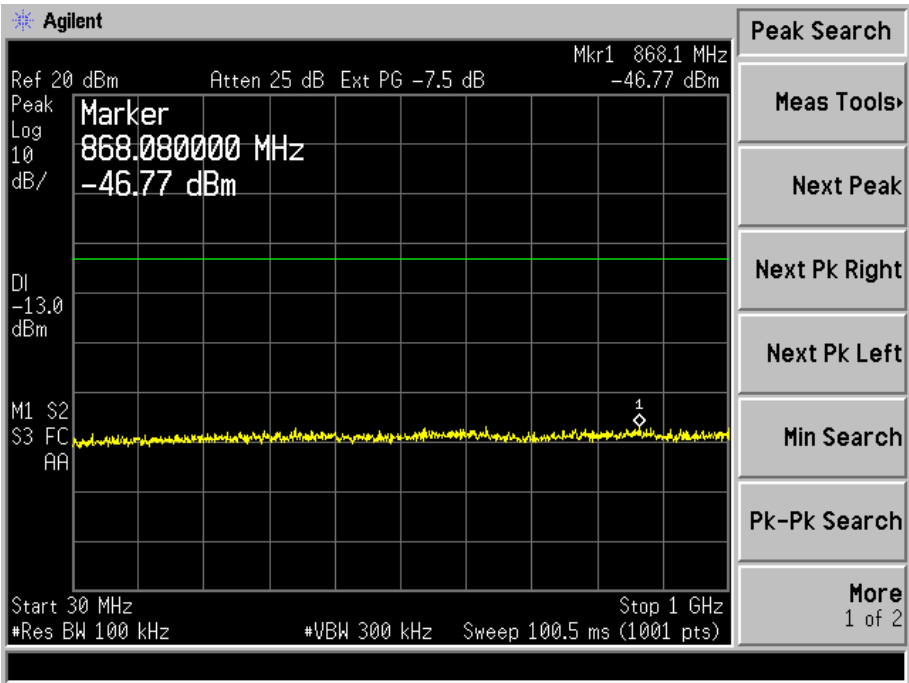
GPRS Low Band Emission



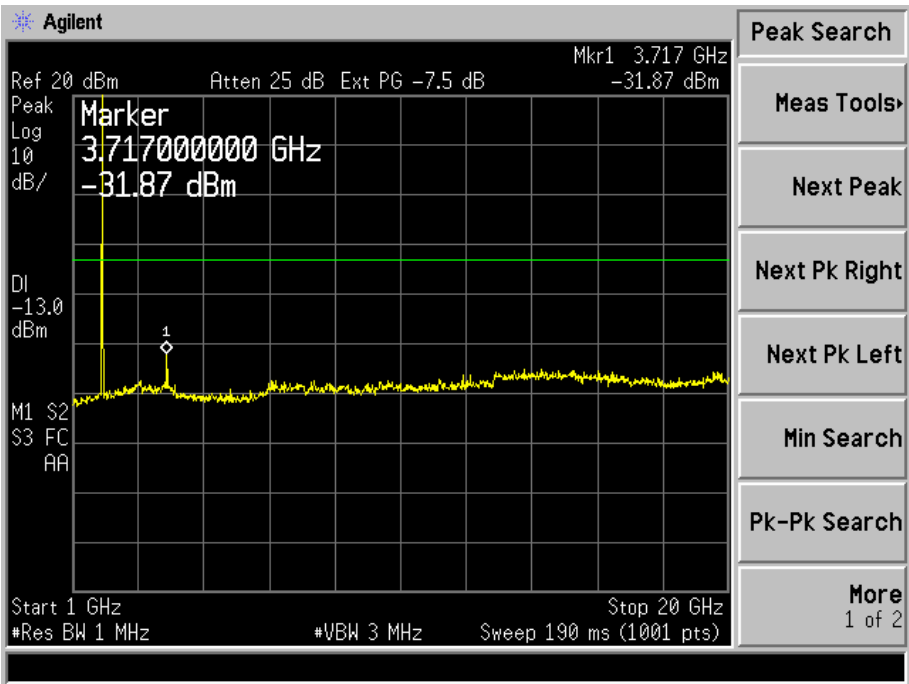
GPRS High Band Emission



For PCS Band  
GSM Low Channel  
30MHz to 1GHz

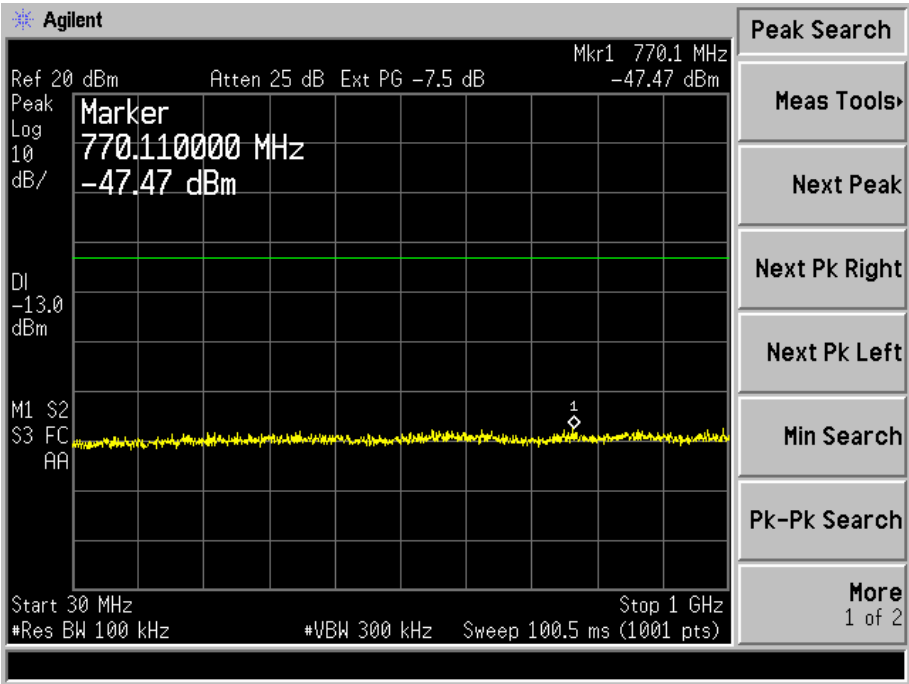


Above 1GHz

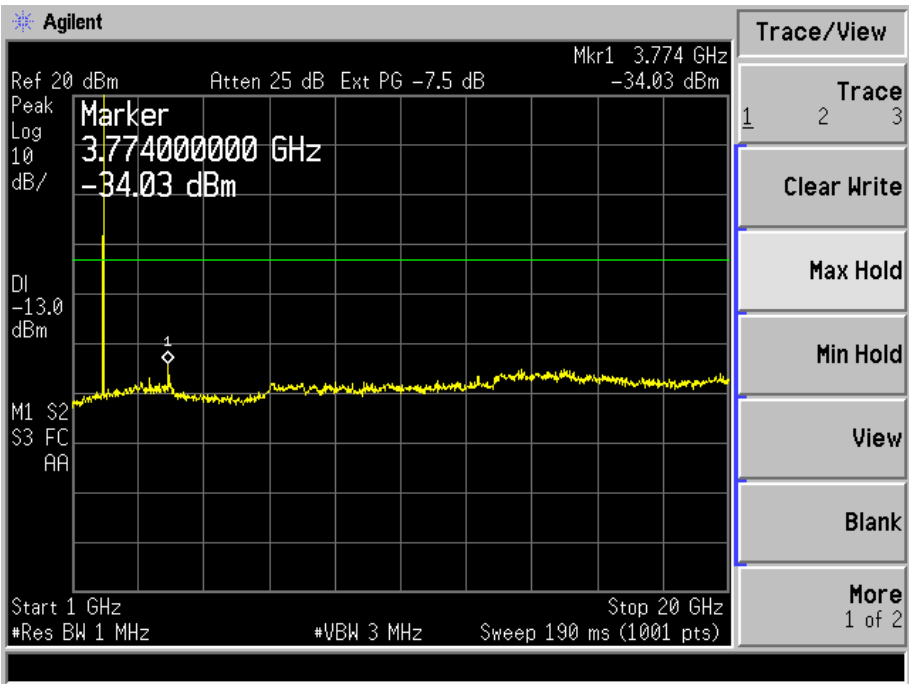




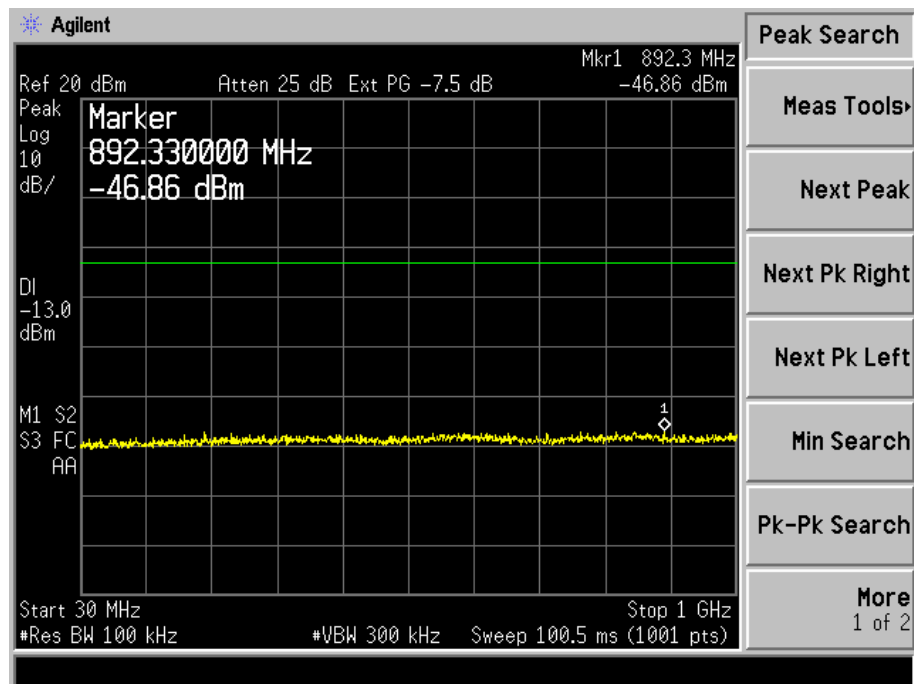
GSM Middle Channel  
30MHz to 1GHz



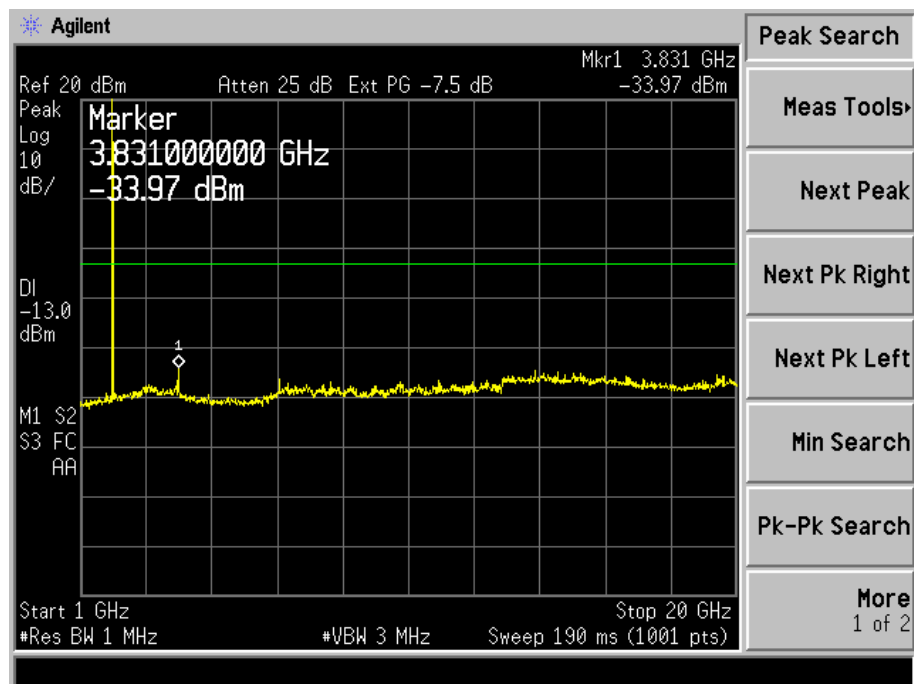
Above 1GHz



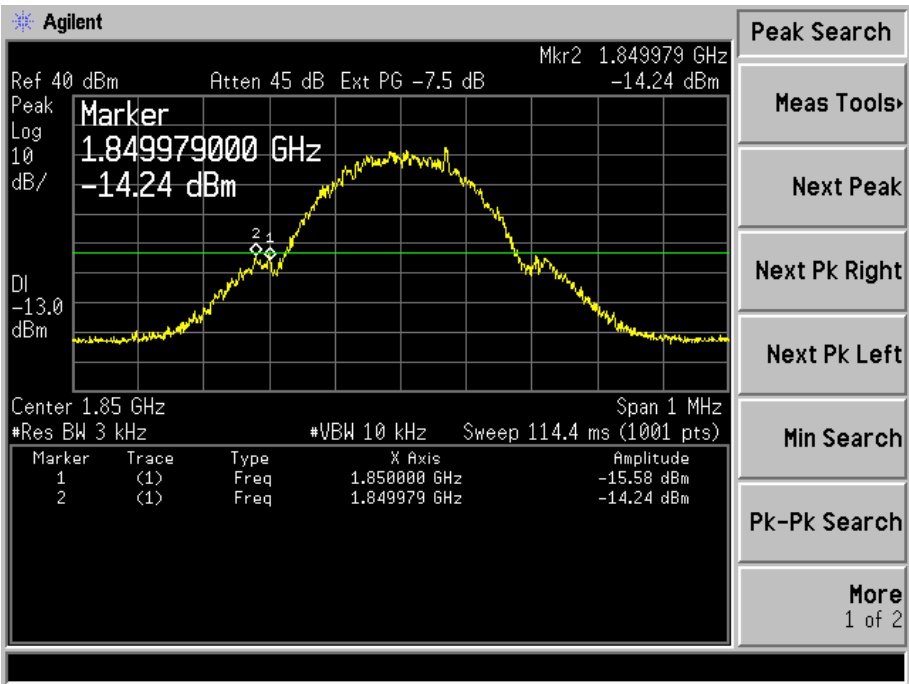
GSM High Channel  
30MHz to 1GHz



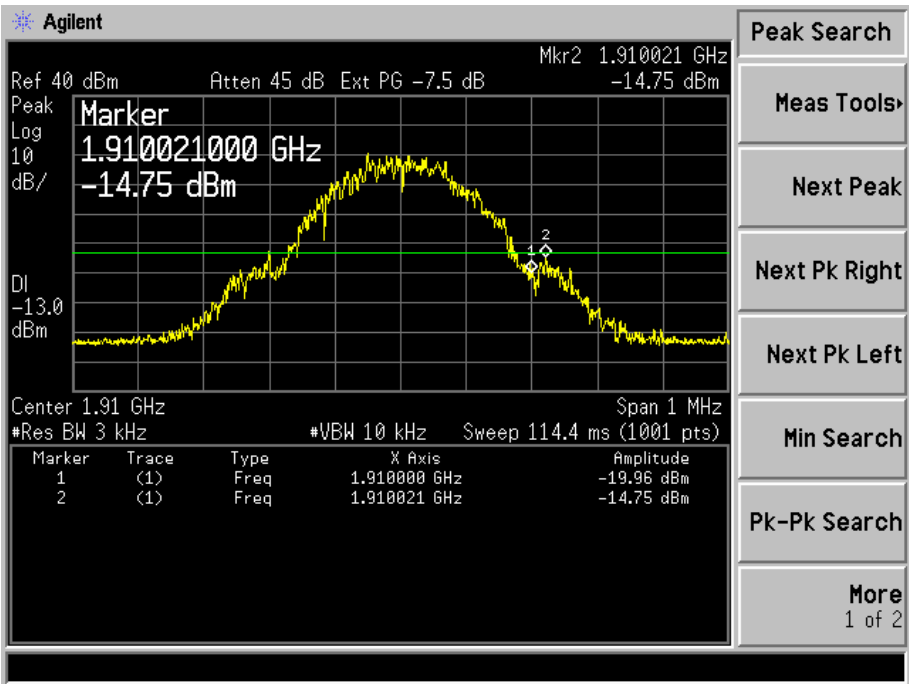
Above 1GHz



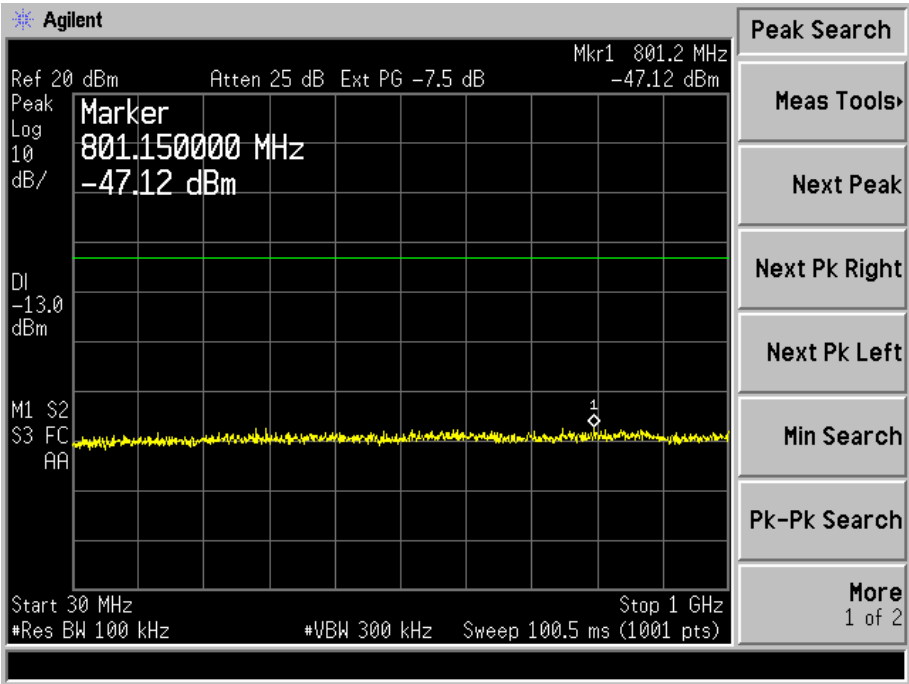
GSM Low Band Emission



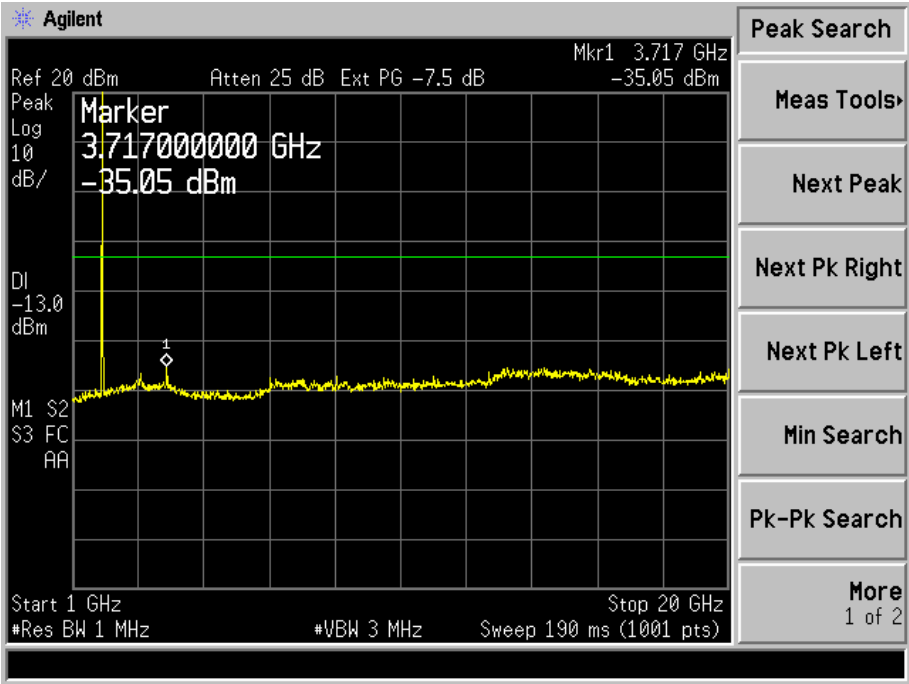
GSM High Band Emission



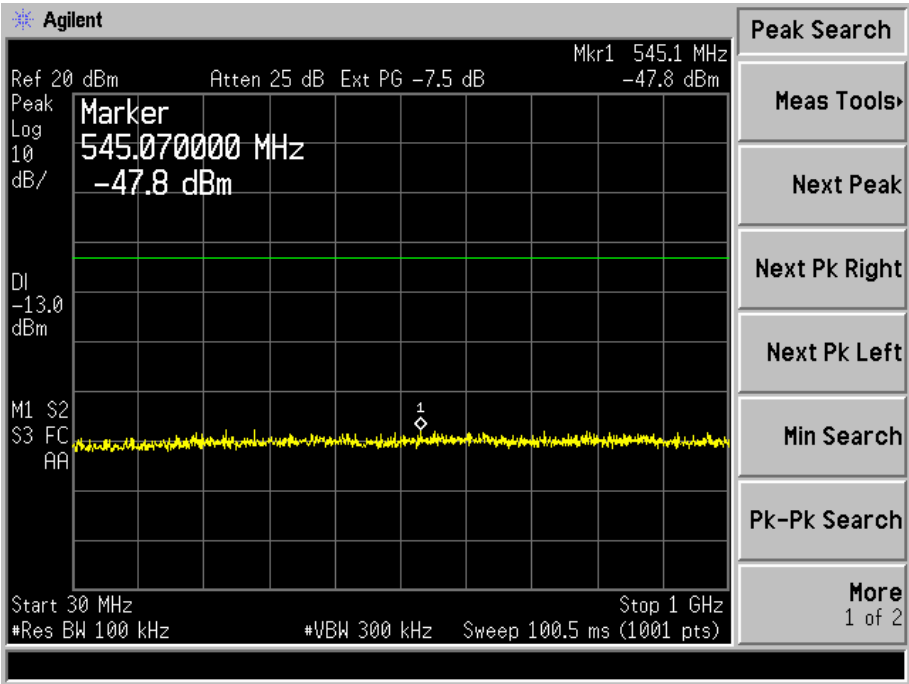
GPRS Low Channel  
30MHz to 1GHz



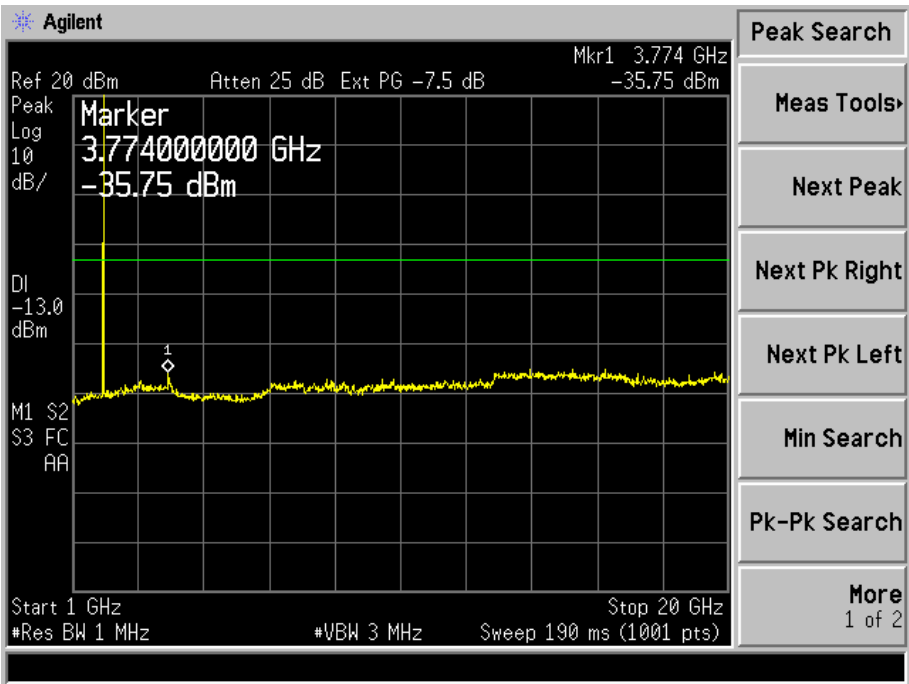
Above 1GHz



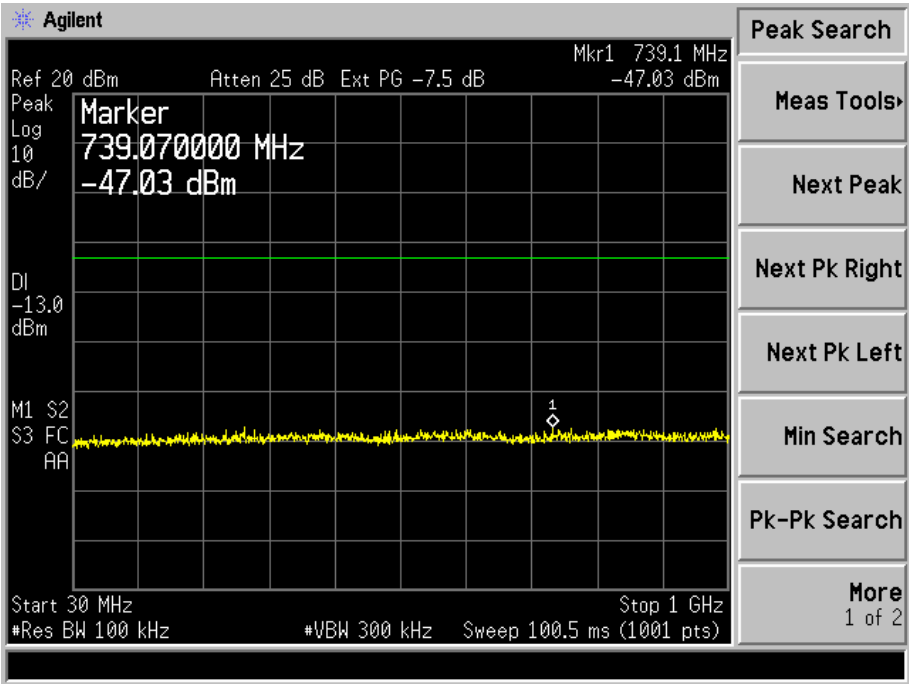
GPRS Middle Channel  
30MHz to 1GHz



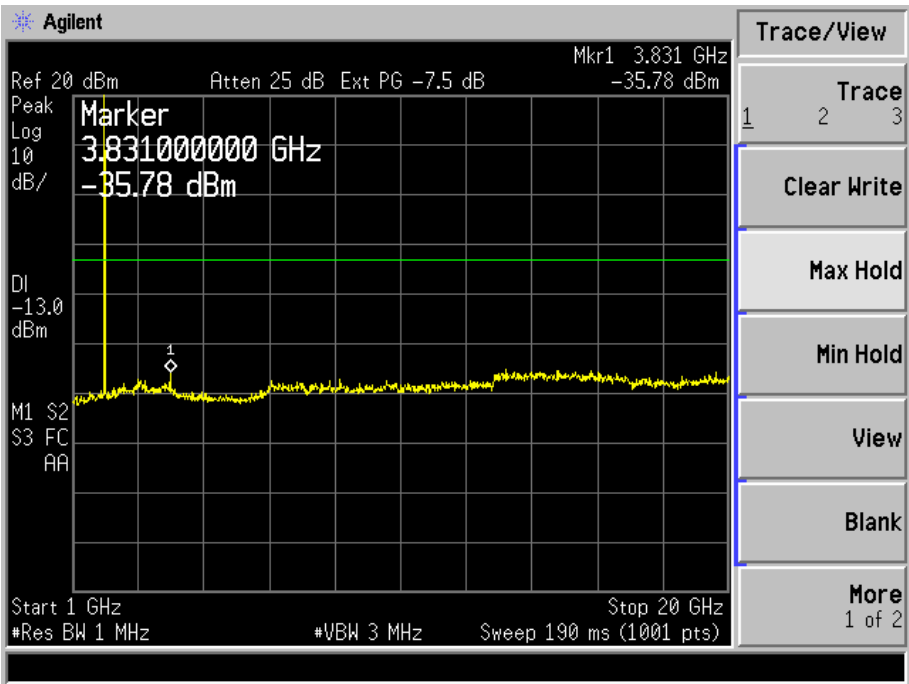
Above 1GHz



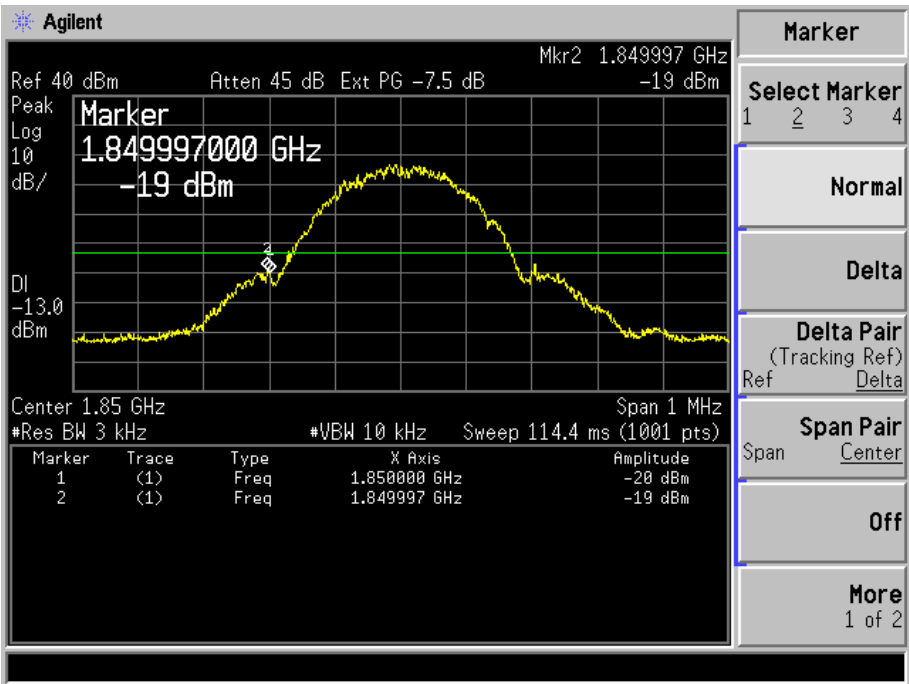
GPRS High Channel  
30MHz to 1GHz



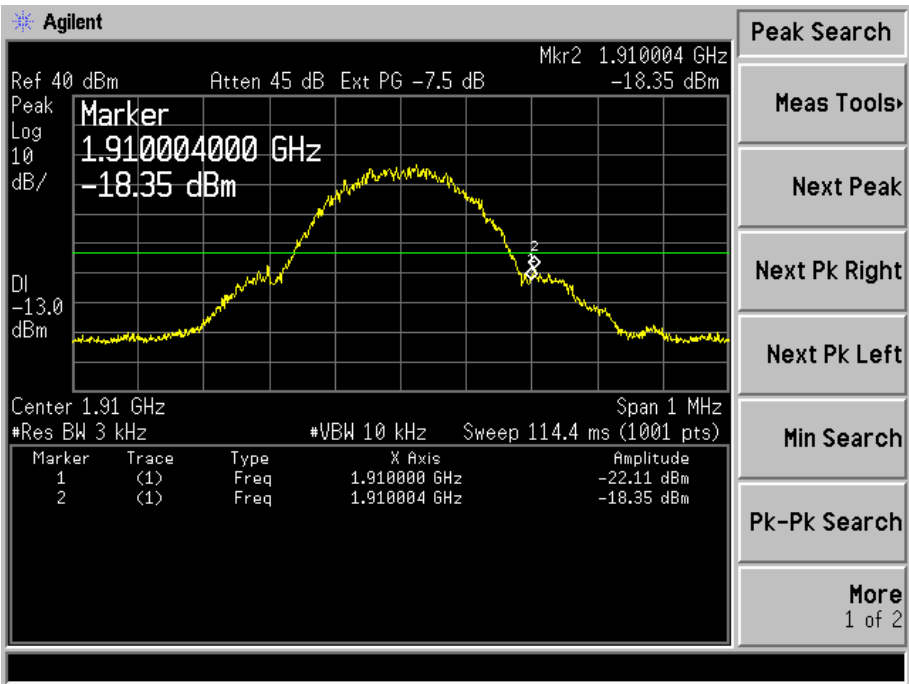
Above 1GHz



GPRS Low Band Emission



GPRS High Band Emission



## 8. Spurious Radiated Emissions

---

### 8.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is  $\pm 5.20$  dB.

### 8.2 Standard Applicable

According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 8.3 Test Procedure

1. The setup of EUT is according with per TIA/EIA Standard 603C and ANSI C63.4-2003 measurement procedure.
2. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious attenuation limit in dB =  $43 + 10 \log_{10}$  (power out in Watts)

### 8.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

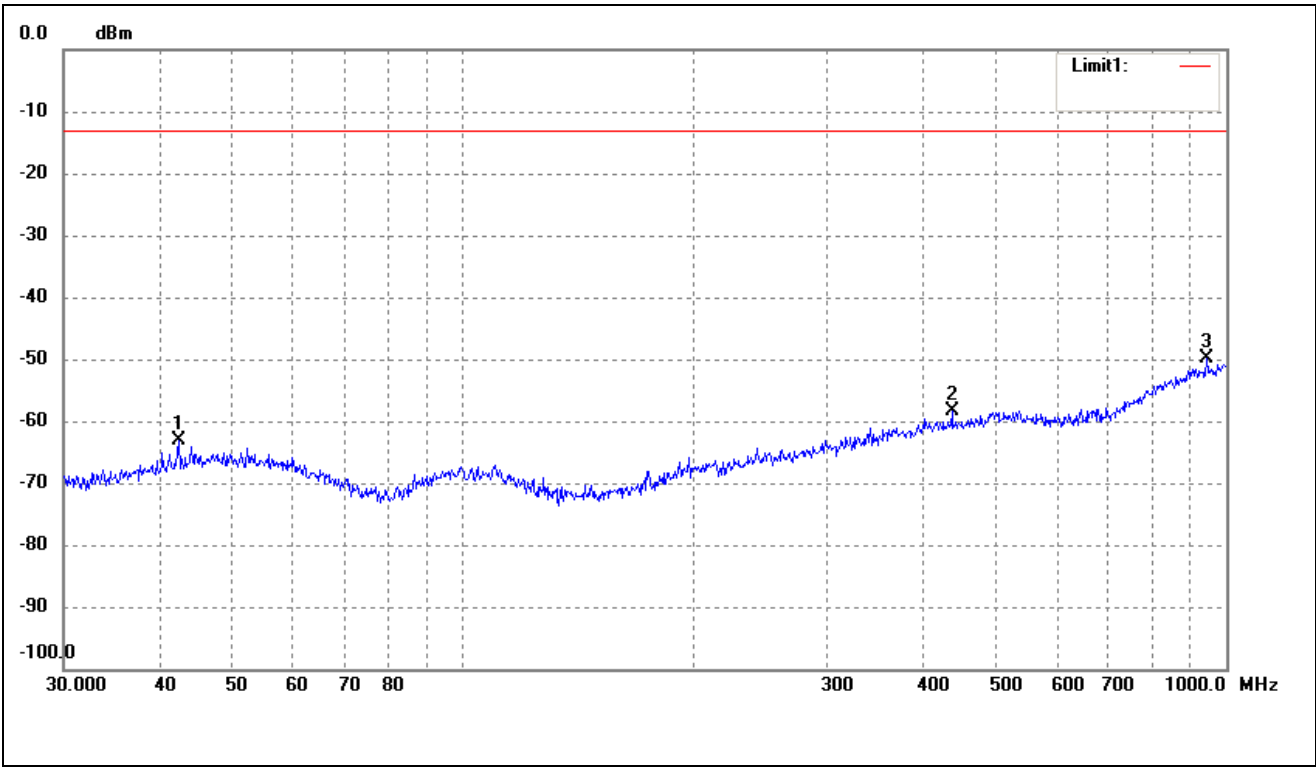
### 8.5 Summary of Test Results/Plots

According to the data below, the FCC Part 22.917 and 24.238 standards, and had the worst margin of:

*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

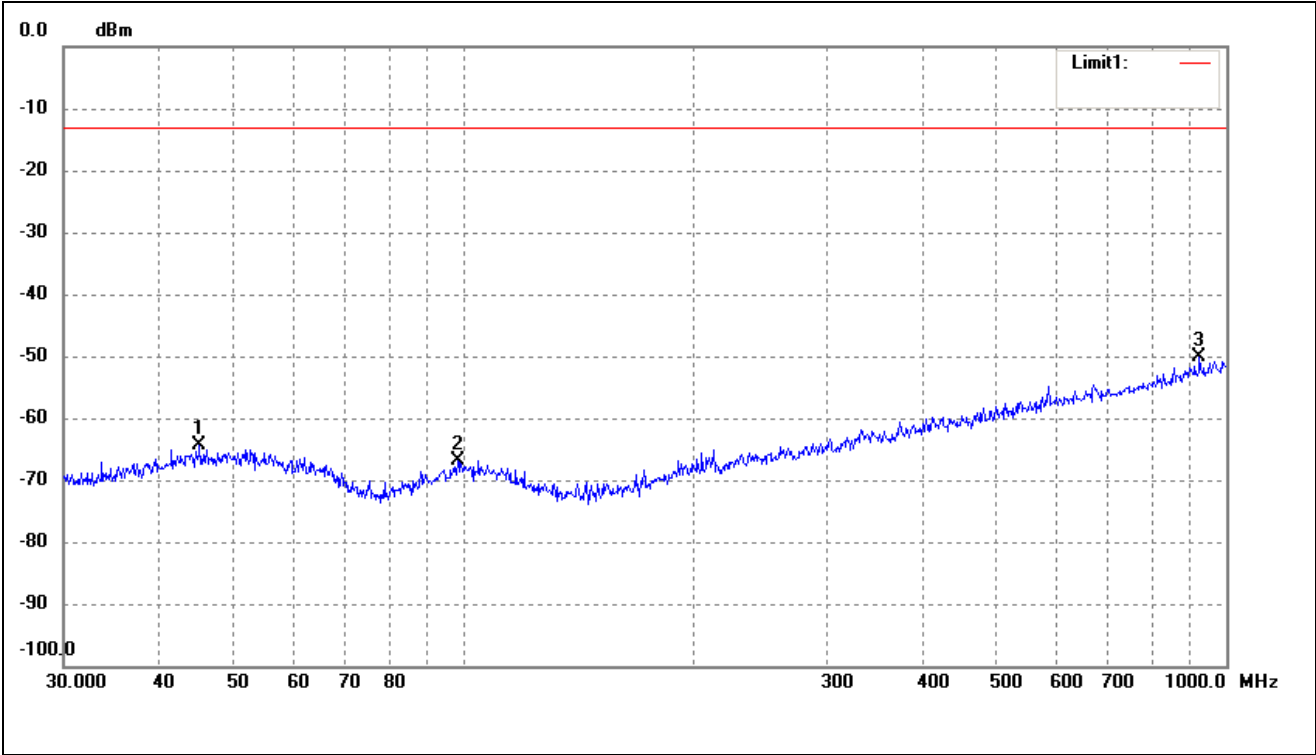


Spurious Emission From 30MHz to 1GHz  
For Cellular Band\_ GSM850 Mode  
Horizontal:



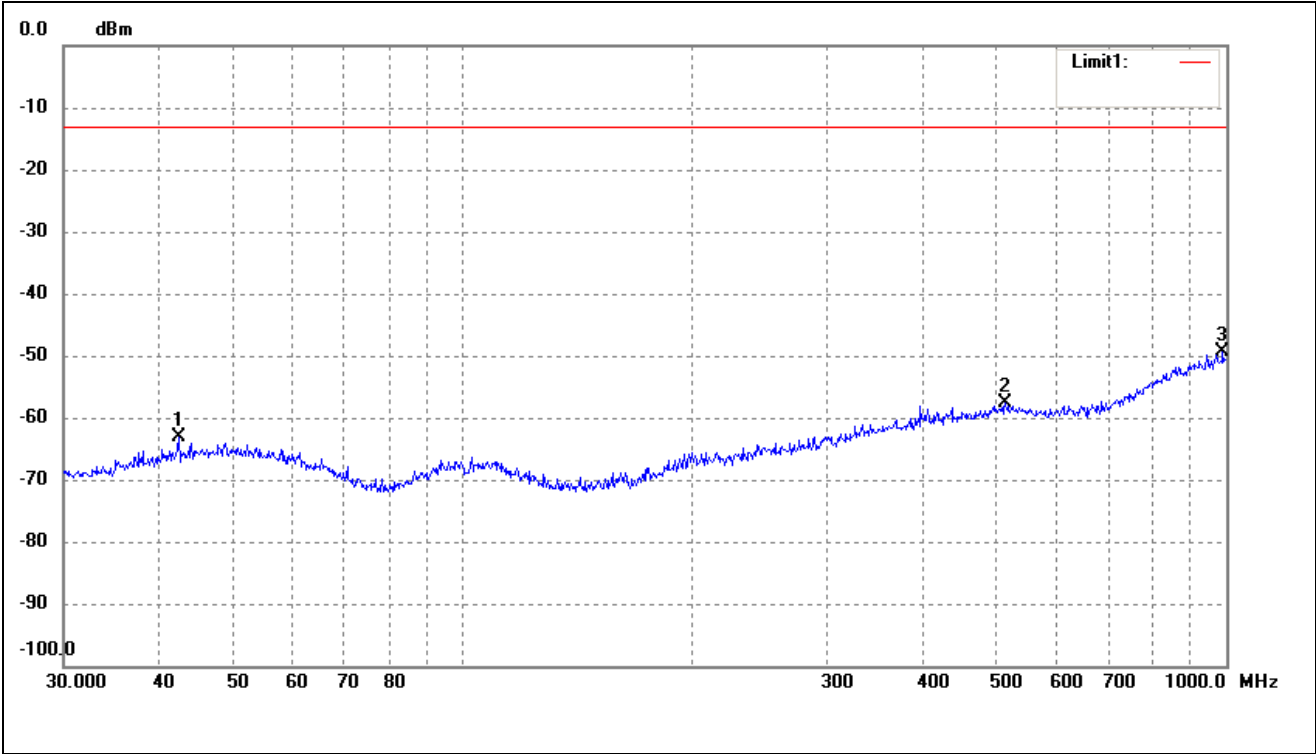
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	42.4508	-67.01	3.83	-63.18	-13.00	-50.18	ERP
2	437.1199	-67.89	9.50	-58.39	-13.00	-45.39	ERP
3	942.1305	-67.47	17.64	-49.83	-13.00	-36.83	ERP

Vertical:



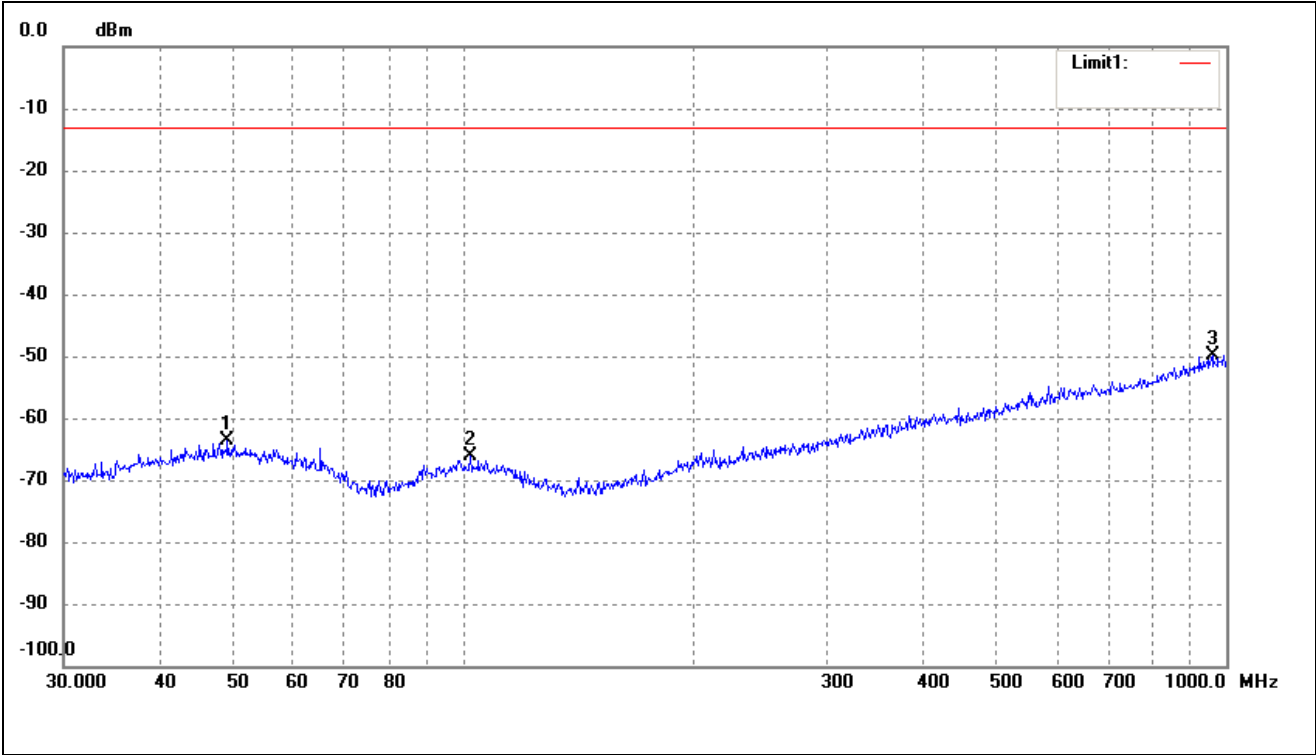
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	45.2166	-68.82	4.33	-64.49	-13.00	-51.49	ERP
2	98.4866	-68.84	2.05	-66.79	-13.00	-53.79	ERP
3	922.5157	-67.65	17.43	-50.22	-13.00	-37.22	ERP

For Cellular Band\_ GSM1900 Mode  
Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	42.4508	-67.01	3.83	-63.18	-13.00	-50.18	ERP
2	513.6331	-68.17	10.61	-57.56	-13.00	-44.56	ERP
3	989.5355	-67.66	18.32	-49.34	-13.00	-36.34	ERP

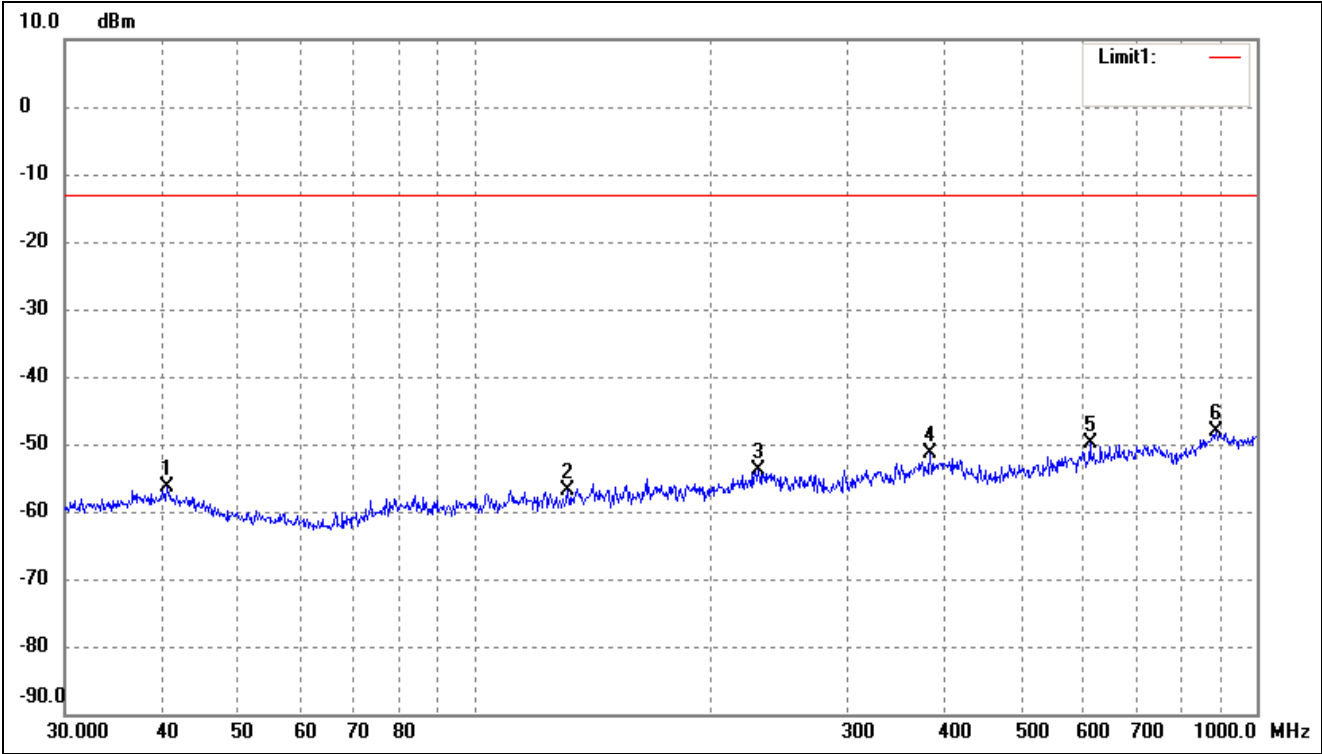
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	49.1866	-68.00	4.35	-63.65	-13.00	-50.65	ERP
2	102.3597	-68.24	2.23	-66.01	-13.00	-53.01	ERP
3	958.7943	-67.76	17.86	-49.90	-13.00	-36.90	ERP

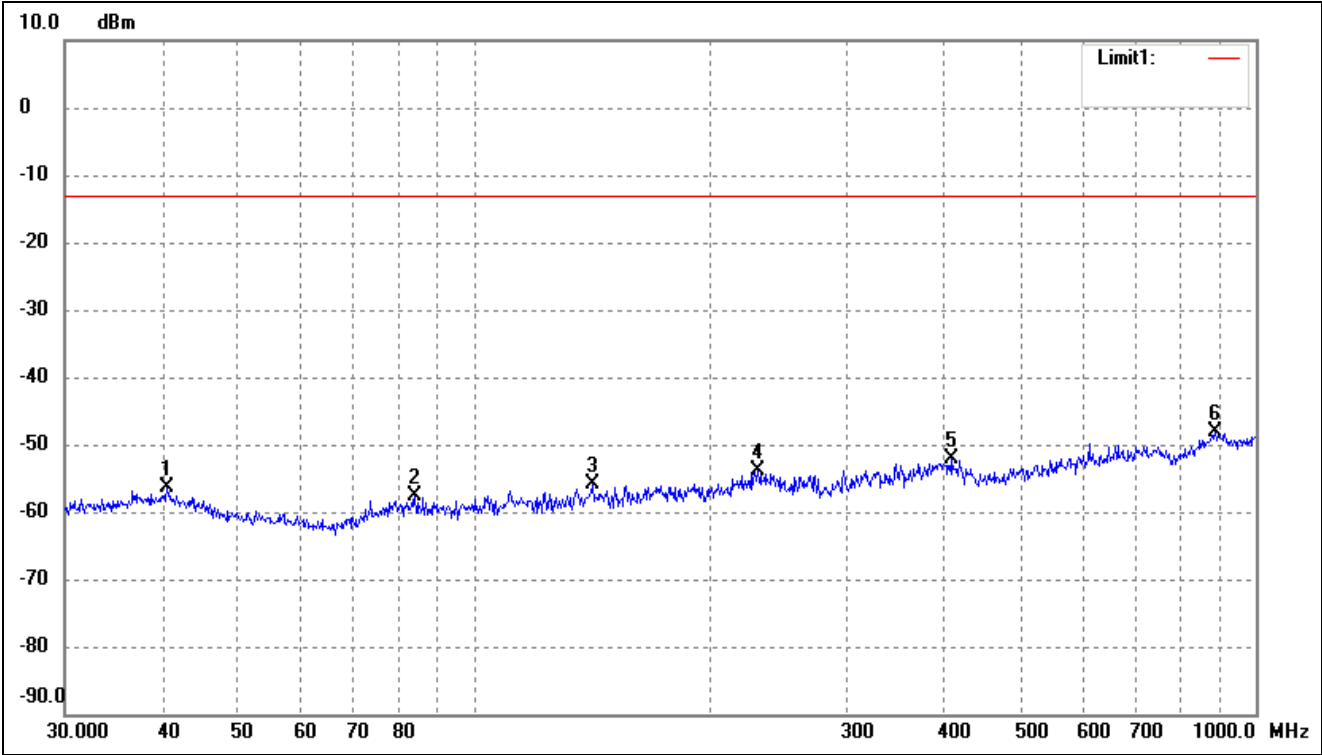
Note:  $\text{Margin} = (\text{Reading} + \text{Correct}) - \text{Limit}$

For GPRS 850 Mode  
Horizontal:



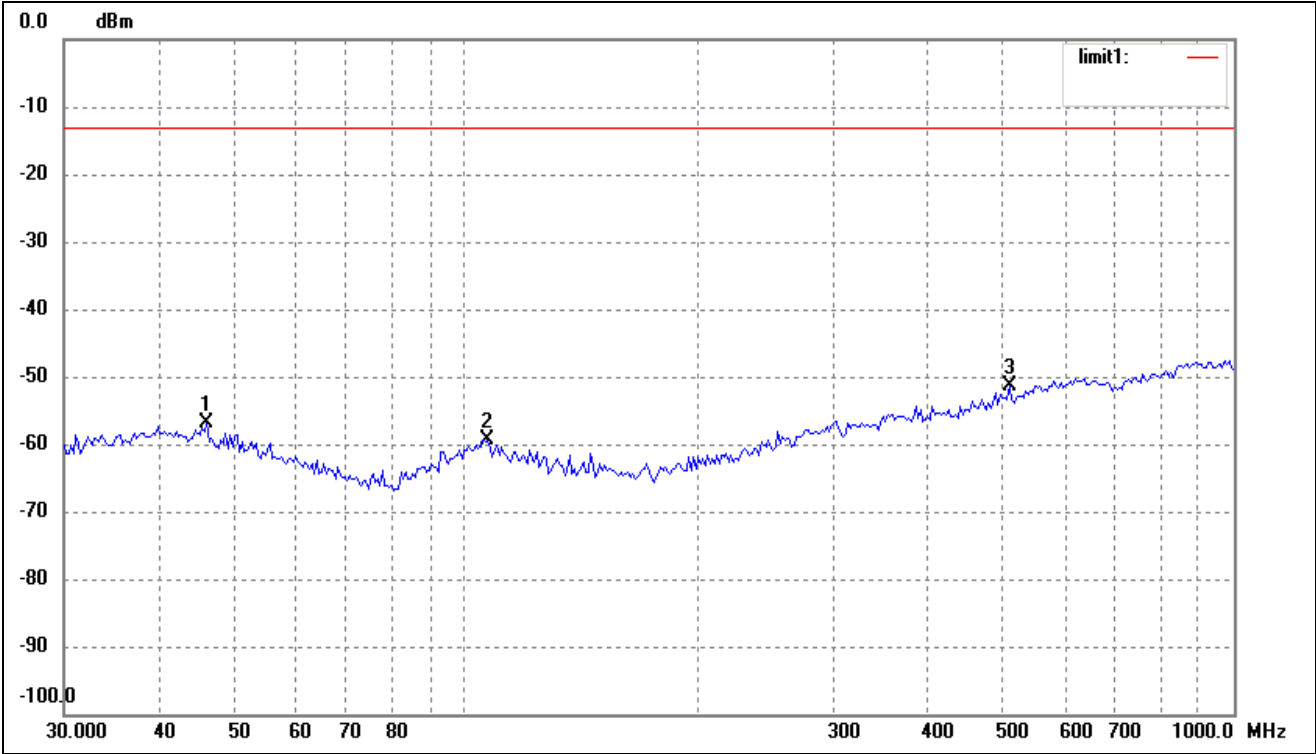
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	40.5591	-75.39	18.99	-56.40	-13.00	-43.40	ERP
2	131.7577	-71.72	14.87	-56.85	-13.00	-43.85	ERP
3	230.9068	-71.46	17.57	-53.89	-13.00	-40.89	ERP
4	382.5879	-72.45	21.12	-51.33	-13.00	-38.33	ERP
5	612.0642	-74.08	24.28	-49.80	-13.00	-36.80	ERP
6*	887.6099	-76.82	28.64	-48.18	-13.00	-35.18	ERP

Vertical:



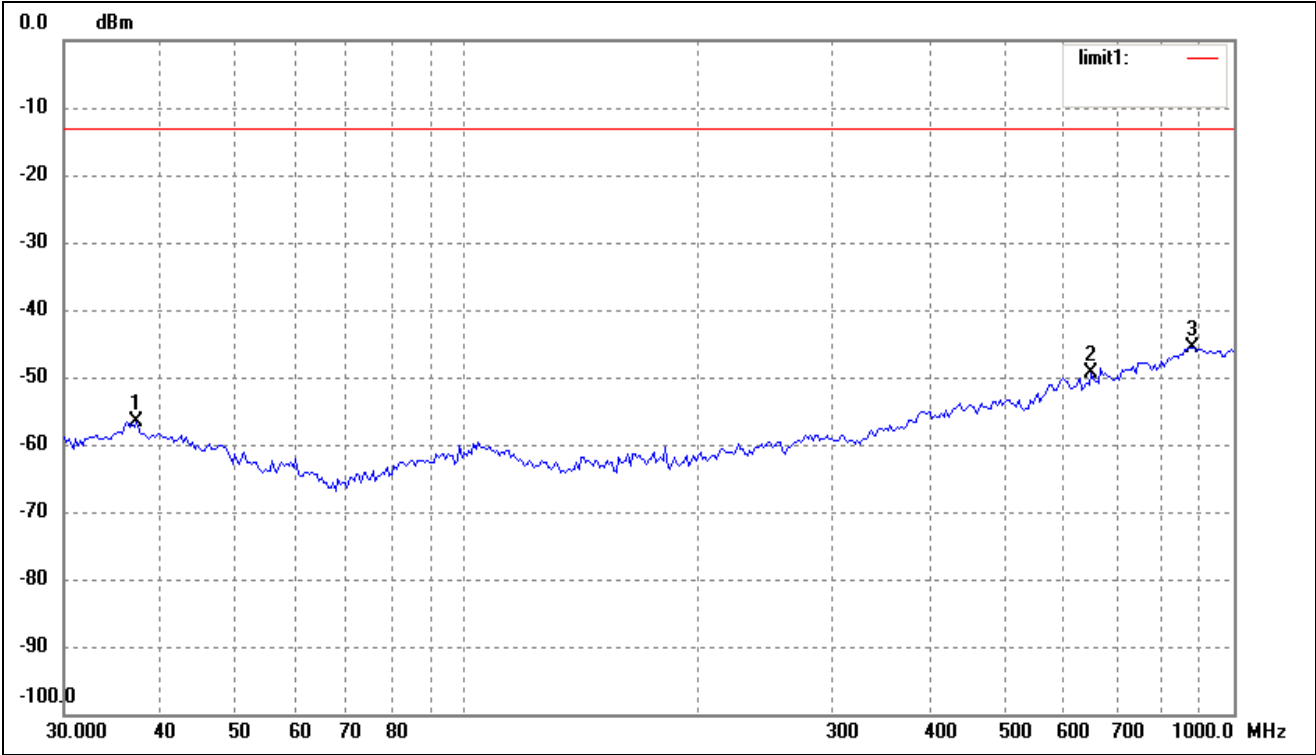
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	40.5591	-77.28	20.88	-56.40	-13.00	-43.40	ERP
2	84.1100	-71.40	13.88	-57.52	-13.00	-44.52	ERP
3	141.8262	-70.17	14.22	-55.95	-13.00	-42.95	ERP
4	230.9068	-71.46	17.57	-53.89	-13.00	-40.89	ERP
5	407.5145	-73.76	21.65	-52.11	-13.00	-39.11	ERP
6*	887.6099	-76.82	28.64	-48.18	-13.00	-35.18	ERP

For GPRS 1900 Mode  
Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	46.0163	-76.55	19.65	-56.90	-13.00	-43.90	ERP
2	106.7587	-77.35	17.98	-59.37	-13.00	-46.37	ERP
3	510.0436	-75.85	24.36	-51.49	-13.00	-38.49	ERP

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	37.2854	-77.65	21.05	-56.60	-13.00	-43.60	ERP
2	651.9415	-76.30	26.87	-49.43	-13.00	-36.43	ERP
3	881.4067	-76.38	30.83	-45.55	-13.00	-32.55	ERP



*Spurious Emissions Above 1GHz**For Cellular Band\_GSM850 Mode*

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (824.2MHz)						
1648.4	-55.38	4.94	-50.44	-13	-37.44	H
2472.6	-54.23	8.46	-45.77	-13	-32.77	H
1648.4	-54.73	4.94	-49.79	-13	-36.79	V
2472.6	-53.39	8.46	-44.93	-13	-31.93	V
Middle Channel (836.6MHz)						
1673.2	-54.99	5.11	-49.88	-13	-36.88	H
2509.8	-54.40	8.54	-45.86	-13	-32.86	H
1673.2	-54.95	5.11	-49.84	-13	-36.84	V
2509.8	-55.06	8.54	-46.52	-13	-33.52	V
High Channel (848.8MHz)						
1697.6	-51.62	5.29	-46.33	-13	-33.33	H
2546.4	-53.82	8.59	-45.23	-13	-32.23	H
1697.6	-51.60	5.29	-46.31	-13	-33.31	V
2546.4	-53.74	8.59	-45.15	-13	-32.15	V

*For PCS Band\_GSM1900 Mode*

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (1850.2MHz)						
3700.4	-46.77	10.54	-36.23	-13	-23.23	H
5550.6	-57.21	13.37	-43.84	-13	-30.84	H
3700.4	-46.12	10.54	-35.58	-13	-22.58	V
5550.6	-59.43	13.37	-46.06	-13	-33.06	V
Middle Channel (1880MHz)						
3760.0	-46.38	10.64	-35.74	-13	-22.74	H
5640.0	-57.88	13.54	-44.34	-13	-31.34	H
3760.0	-46.03	10.64	-35.39	-13	-22.39	V
5640.0	-58.06	13.54	-44.52	-13	-31.52	V
High Channel (1909.8MHz)						
3819.6	-47.25	10.74	-36.51	-13	-23.51	H
5729.4	-59.51	13.71	-45.8	-13	-32.80	H
3819.6	-46.81	10.74	-36.07	-13	-23.07	V
5729.4	-59.15	13.71	-45.44	-13	-32.44	V

*Spurious Emissions Above 1GHz**For GPRS850 Mode*

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (824.2MHz)						
1648.4	-62.12	4.94	-57.18	-13.00	-44.18	H
2472.6	-51.95	8.46	-43.49	-13.00	-30.49	H
1648.4	-51.51	4.94	-46.57	-13.00	-33.57	V
2472.6	-53.45	8.46	-44.99	-13.00	-31.99	V
Middle Channel (836.6MHz)						
1673.2	-47.68	5.11	-42.57	-13.00	-29.57	H
2509.8	-51.95	8.54	-43.41	-13.00	-30.41	H
1673.2	-49.68	5.11	-44.57	-13.00	-31.57	V
2509.8	-52.79	8.54	-44.25	-13.00	-31.25	V
High Channel (848.8MHz)						
1697.6	-62.48	5.29	-57.19	-13.00	-44.19	H
2546.4	-55.12	8.59	-46.53	-13.00	-33.53	H
1697.6	-62.88	5.29	-57.59	-13.00	-44.59	V
2546.4	-57.86	8.59	-49.27	-13.00	-36.27	V

*For GPRS1900 Mode*

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (1850.2MHz)						
3700.4	-68.93	10.54	-58.39	-13.00	-45.39	H
5550.6	-65.79	13.37	-52.42	-13.00	-39.42	H
3700.4	-59.64	10.54	-49.10	-13.00	-36.10	V
5550.6	-57.37	13.37	-44.00	-13.00	-31.00	V
Middle Channel (1880.0MHz)						
3760.0	-55.11	10.64	-44.47	-13.00	-31.47	H
5640.0	-56.49	13.54	-42.95	-13.00	-29.95	H
3760.0	-54.67	10.64	-44.03	-13.00	-31.03	V
5640.0	-56.49	13.54	-42.95	-13.00	-29.95	V
High Channel (1909.8MHz)						
3819.6	-58.7	10.74	-47.96	-13.00	-34.96	H
5729.4	-58.08	13.71	-44.37	-13.00	-31.37	H
3819.6	-54.47	10.74	-43.73	-13.00	-30.73	V
5729.4	-58.3	13.71	-44.59	-13.00	-31.59	V

## 9. Frequency Stability

### 9.1 Standard Applicable

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Cellular Band

Frequency range (MHz)	Base, fixed (ppm)	Mobile ≤3 watts (ppm)	Mobile ≤3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	N/A	N/A
929 to 960	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

### 9.2 Test Procedure

According to §2.1055, the following test procedure was performed.

The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.

The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode

Temperature:	Supply Voltage
20°C	85-115% of declared nominal voltage
-30°C to +50°C	Normal

### 9.3 Environmental Conditions

Temperature:	20°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

### 9.4 Summary of Test Results/Plots

## For Cellular Band GSM Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	120	57	0.0681
40	120	53	0.0634
30	120	48	0.0574
20	120	46	0.0550
10	120	51	0.0610
0	120	45	0.0538
-10	120	-10	-0.0120
-20	120	-21	-0.0251
-30	120	-25	-0.0299

## For PCS Band GSM Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	120	53	0.0282
40	120	50	0.0266
30	120	46	0.0245
20	120	55	0.0293
10	120	51	0.0271
0	120	55	0.0293
-10	120	66	0.0351
-20	120	61	0.0324
-30	120	68	0.0362

## For Cellular Band GPRS Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	120	51	0.0610
40	120	47	0.0562
30	120	42	0.0502
20	120	40	0.0478
10	120	45	0.0538
0	120	39	0.0466
-10	120	-16	-0.0191
-20	120	-27	-0.0323
-30	120	-31	-0.0371

## For PCS Band GPRS Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	120	61	0.0324
40	120	58	0.0309
30	120	54	0.0287
20	120	63	0.0335
10	120	59	0.0314
0	120	63	0.0335
-10	120	74	0.0394
-20	120	69	0.0367
-30	120	76	0.0404

So, Frequency Stability Versus Input Voltage is:

Reference Frequency(Middle Channel): GSM 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	102	60	0.0717
	120	55	0.0657
	138	53	0.0634
Reference Frequency(Middle Channel): GSM 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	102	65	0.0346
	120	61	0.0324
	138	70	0.0372
Reference Frequency(Middle Channel): GPRS 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	102	58	0.0693
	120	63	0.0753
	138	57	0.0681
Reference Frequency(Middle Channel): GPRS 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VAC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	102	66	0.0351
	120	70	0.0372
	138	81	0.0431

\*\*\*\*\* END OF REPORT \*\*\*\*\*