

FCC Part 22H & 24E Measurement and Test Report

For

SUPERDIGITAL TECHNOLOGY CO., LIMITED

19th Floor, Block B, Nanxian Building, Longhua New District, Shenzhen

518000, P.R. China

FCC ID: 2ACDFX20

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

Product Description: Mobile Phone

Tested Model: X20

Report No.: STR15048006I-1

Tested Date: 2015-04-01 to 2015-04-16

Issued Date: 2015-04-17

Tested By: Silin Chen / Engineer

Silin Chen

Reviewed By: Lahm Peng / EMC Manager

Lahm Peng

Approved & Authorized By: Jandy So / PSQ Manager

Jandy So

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

1. GENERAL INFORMATION.....	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	5
1.3 TEST METHODOLOGY.....	5
1.4 TEST FACILITY	5
1.5 EUT SETUP AND TEST MODE.....	6
2. SUMMARY OF TEST RESULTS	7
3. RF EXPOSURE	8
3.1 STANDARD APPLICABLE.....	8
3.2 TEST RESULT.....	8
4. RF OUTPUT POWER	9
4.1 STANDARD APPLICABLE.....	9
4.2 TEST EQUIPMENT LIST AND DETAILS	9
4.3 TEST PROCEDURE.....	9
4.4 ENVIRONMENTAL CONDITIONS	10
4.5 SUMMARY OF TEST RESULTS/PLOTS	10
5. PEAK-TO-AVERAGE RADIO (PAR) OF TRANSMITTER.....	13
5.1 STANDARD APPLICABLE.....	13
5.2 TEST EQUIPMENT LIST AND DETAILS	13
5.3 TEST PROCEDURE.....	13
5.4 ENVIRONMENTAL CONDITIONS	13
5.5 SUMMARY OF TEST RESULTS	14
6. EMISSION BANDWIDTH.....	15
6.1 STANDARD APPLICABLE.....	15
6.2 TEST EQUIPMENT LIST AND DETAILS	15
6.3 TEST PROCEDURE.....	15
6.4 ENVIRONMENTAL CONDITIONS	15
6.5 SUMMARY OF TEST RESULTS/PLOTS	16
7. OUT OF BAND EMISSIONS AT ANTENNA TERMINAL.....	23
7.1 STANDARD APPLICABLE.....	23
7.2 TEST EQUIPMENT LIST AND DETAILS	23
7.3 TEST PROCEDURE.....	23
7.4 ENVIRONMENTAL CONDITIONS	23
7.5 SUMMARY OF TEST RESULTS/PLOTS	24
8. SPURIOUS RADIATED EMISSIONS.....	40
8.1 MEASUREMENT UNCERTAINTY	40
8.2 STANDARD APPLICABLE.....	40
8.3 TEST EQUIPMENT LIST AND DETAILS	40
8.4 TEST PROCEDURE.....	40
8.5 ENVIRONMENTAL CONDITIONS	41
8.6 SUMMARY OF TEST RESULTS/PLOTS	41
9. FREQUENCY STABILITY	50
9.1 STANDARD APPLICABLE.....	50
9.2 TEST EQUIPMENT LIST AND DETAILS	50
9.3 TEST PROCEDURE.....	50
9.4 ENVIRONMENTAL CONDITIONS	51
10.5 SUMMARY OF TEST RESULTS/PLOTS	51

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: SUPERDIGITAL TECHNOLOGY CO., LIMITED
Address of applicant: 19th Floor, Block B, Nanxian Building, Longhua New District, Shenzhen 518000, P.R. China

Manufacturer: SUPERDIGITAL TECHNOLOGY CO., LIMITED
Address of manufacturer: 19th Floor, Block B, Nanxian Building, Longhua New District, Shenzhen 518000, P.R. China

General Description of EUT	
Product Name:	Mobile Phone
Brand Name:	Superinworld
Model No.:	X20
IMEI:	356034059847581/35603459847599
Rated Voltage:	DC 3.7V Li-ion Battery
Battery:	850mAh
Power Adaptor:	Input 100-260V, 50/60Hz, Output DC 5V/500mA
Device Category:	Portable Device
<i>The EUT is GSM 850/900/1800/1900 Mobile Phone, the Mobile Phone is intended for speech and Multimedia Message Service (MMS) transmission. It is equipped with GPRS class 12 for GSM850 and GSM1900 and Bluetooth, camera functions. For more information see the following datasheet</i>	
<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:	GSM850: 31.94dBm, GSM1900: 28.99dBm
Type of Modulation:	GMSK, 8PSK
Type of Emission:	GSM850: 258KGXW, GSM1900: 256KGXW
Type of Antenna:	Integral Antenna
Antenna Gain:	0dBi
GPRS Class:	Class 12

1.2 Test Standards

The following report is prepared on behalf of the SUPERDIGITAL TECHNOLOGY CO., LIMITED 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 and ANSI C63.4-2003, 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/GPR	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
Earphone	0.8	Unshielded	Without Ferrite

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	E10	LR-63C8R
Adapter	/	ETA-U90	/

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
USB Cable	1.0	Shielded	Without Core

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.

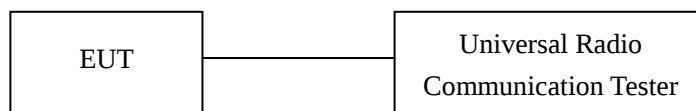
According to §24.232 (c), Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

4.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2014-05-07	2015-05-06
Pre-amplifier	Agilent	8447F	3113A06717	2014-05-07	2015-05-06
Pre-amplifier	Compliance Direction	PAP-0118	24002	2014-05-07	2015-05-06
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2014-05-07	2015-05-06
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-334	2014-05-07	2015-05-06
Horn Antenna	ETS	3117	00086197	2014-05-07	2015-05-06
Horn Antenna	ETS	3117	00086198	2014-05-07	2015-05-06
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	112012	2014-05-07	2015-05-06
Signal Generator	R&S	SMR20	100047	2014-05-07	2015-05-06

4.3 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.

4.4 Environmental Conditions

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

4.5 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	28.45	1.5	0	H	1.5	0	26.95	38.45
824.2	30.25	1.5	0	V	1.5	0	28.75	38.45
Middle Channel								
28.35	28.86	1.5	0	H	1.5	0	26.85	38.45
30.17	30.86	1.5	0	V	1.5	0	28.67	38.45
High Channel								
848.8	27.86	1.5	0	H	1.5	0	26.36	38.45
848.8	29.92	1.5	0	V	1.5	0	28.42	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	18.89	1.5	0	H	1.9	7.7	24.69	33
1850.2	20.54	1.5	0	V	1.9	7.7	26.34	33
Middle Channel								
1880.0	18.45	1.5	0	H	1.9	7.7	24.25	33
1880.0	20.35	1.5	0	V	1.9	7.7	26.15	33
High Channel								
1909.8	18.64	1.5	0	H	1.9	7.7	24.44	33
1909.8	20.48	1.5	0	V	1.9	7.7	26.28	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	28.09	1.5	0	H	1.5	0	26.59	38.45
824.2	30.17	1.5	0	V	1.5	0	28.67	38.45
Middle Channel								
836.6	27.92	1.5	0	H	1.5	0	26.42	38.45
836.6	29.60	1.5	0	V	1.5	0	28.10	38.45
High Channel								
848.8	27.59	1.5	0	H	1.5	0	26.09	38.45
848.8	29.96	1.5	0	V	1.5	0	28.46	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	18.58	1.5	0	H	1.9	7.7	24.38	33
1850.2	20.62	1.5	0	V	1.9	7.7	26.42	33
Middle Channel								
1880.0	18.53	1.5	0	H	1.9	7.7	24.33	33
1880.0	20.61	1.5	0	V	1.9	7.7	26.41	33
High Channel								
1909.8	18.39	1.5	0	H	1.9	7.7	24.19	33
1909.8	20.78	1.5	0	V	1.9	7.7	26.58	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	31.77	38.45
	Middle Channel	836.6	31.78	38.45
	High Channel	848.8	31.83	38.45
GPRS(1 Slot)	Low Channel	824.2	31.86	38.45
	Middle Channel	836.6	31.88	38.45
	High Channel	848.8	31.94	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	28.53	33.0
	Middle Channel	1880.0	28.60	33.0
	High Channel	1909.8	28.97	33.0
GPRS(1 Slot)	Low Channel	1850.2	28.53	33.0
	Middle Channel	1880.0	28.61	33.0
	High Channel	1909.8	28.99	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.

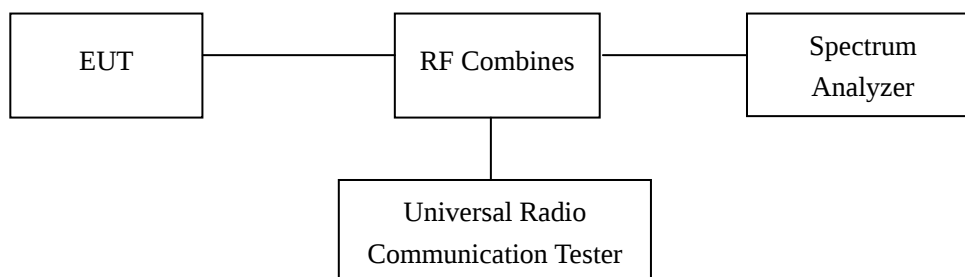
5.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Aglient	Spectrum Analyzer	E4402B	US41192821	2014-05-07	2015-05-06
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	112012	2014-05-07	2015-05-06

5.3 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:



5.4 Environmental Conditions

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

5.5 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	33.69	31.77	1.92	13
	190	836.6	33.78	31.78	2.00	13
	251	848.8	34.05	31.83	2.22	13
GPRS (1 Slot)	128	824.2	33.72	31.86	1.86	13
	190	836.6	33.91	31.88	2.03	13
	251	848.8	34.09	31.94	2.15	13

For PCS Band

Test Mode	Channel	Frequency (MHz)	Peak Power (dBm)	Average Power (dBm)	PAR (dB)	Limit
GSM	512	1850.2	31.05	28.53	2.52	13
	661	1880.0	31.12	28.60	2.52	13
	810	1909.8	31.42	28.97	2.45	13
GPRS (1 Slot)	512	1850.2	31.00	28.53	2.47	13
	661	1880.0	31.22	28.61	2.61	13
	810	1909.8	31.60	28.99	2.61	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.

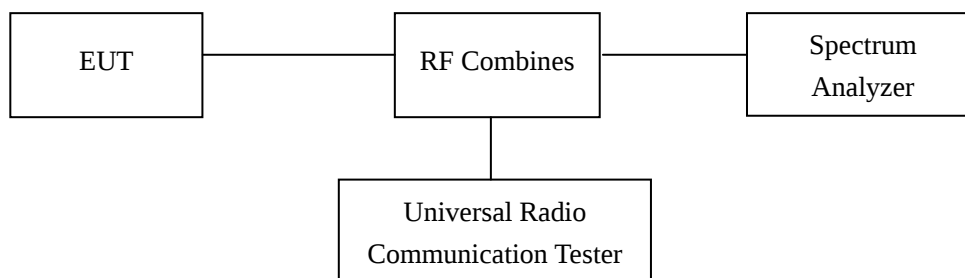
6.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Aglient	Spectrum Analyzer	E4402B	US41192821	2014-05-07	2015-05-06
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	112012	2014-05-07	2015-05-06

6.3 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:



6.4 Environmental Conditions

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

6.5 Summary of Test Results/Plots

For Cellular Band

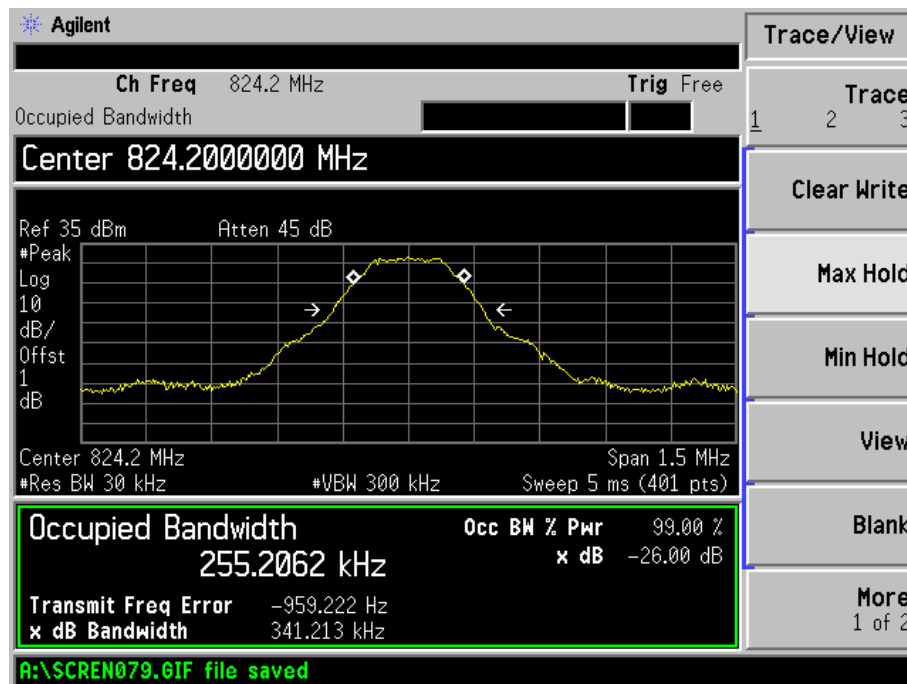
Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	128	824.2	255.2062	341.213
	190	836.6	256.4853	343.522
	251	848.8	255.4075	341.941
GPRS	128	824.2	256.5792	352.829
	190	836.6	257.0154	352.648
	251	848.8	257.6825	355.788

For PCS Band

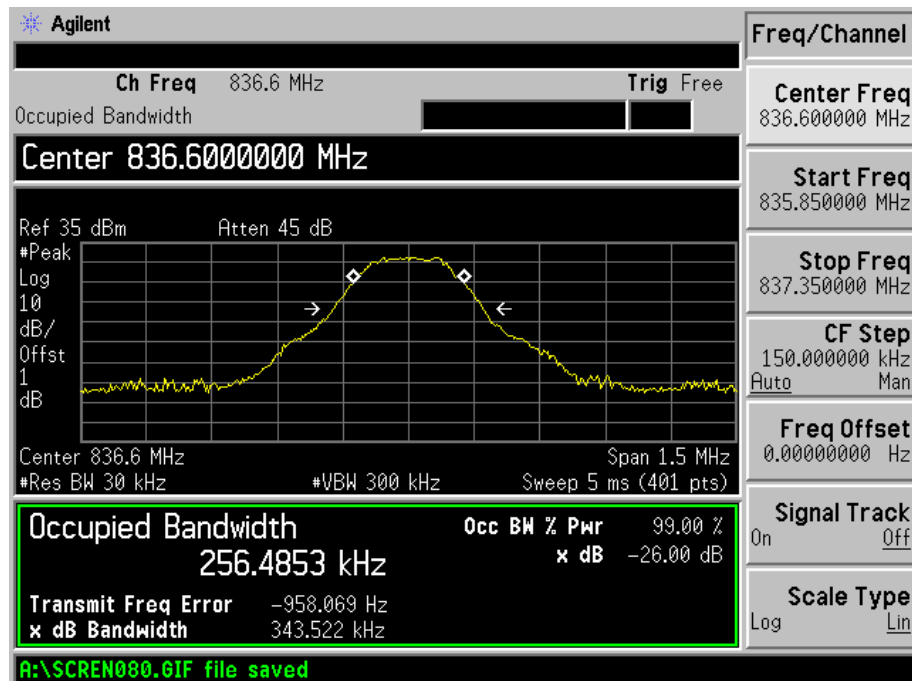
Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	512	1850.2	251.0270	337.646
	661	1880.0	255.0860	337.520
	810	1909.8	255.4384	338.564
GPRS	512	1850.2	256.3206	348.375
	661	1880.0	255.3819	345.806
	810	1909.8	254.9431	345.384

Please refer to the following test plots:

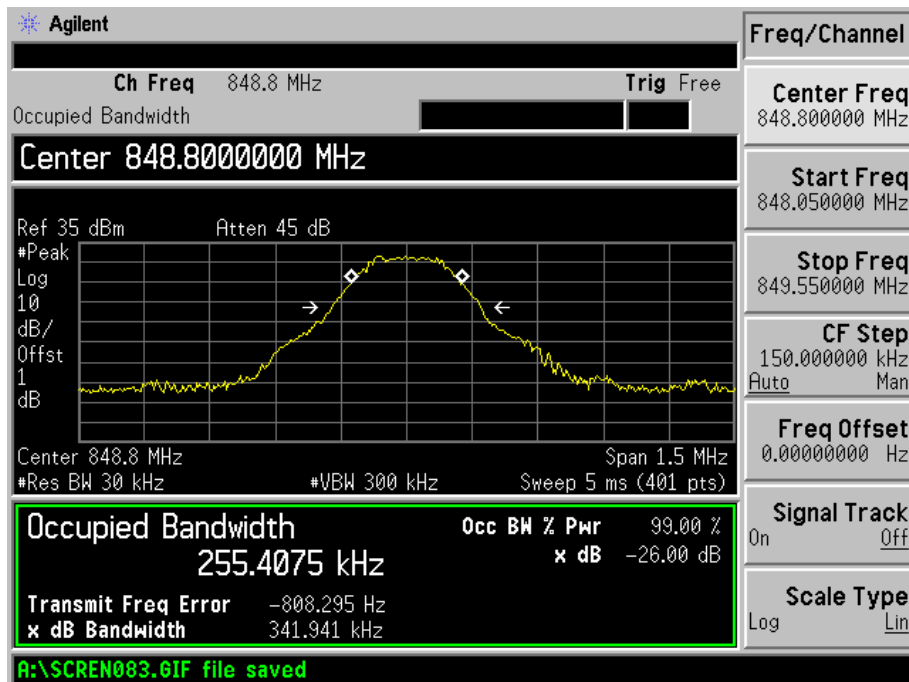
For Cellular Band
GSM Low Channel



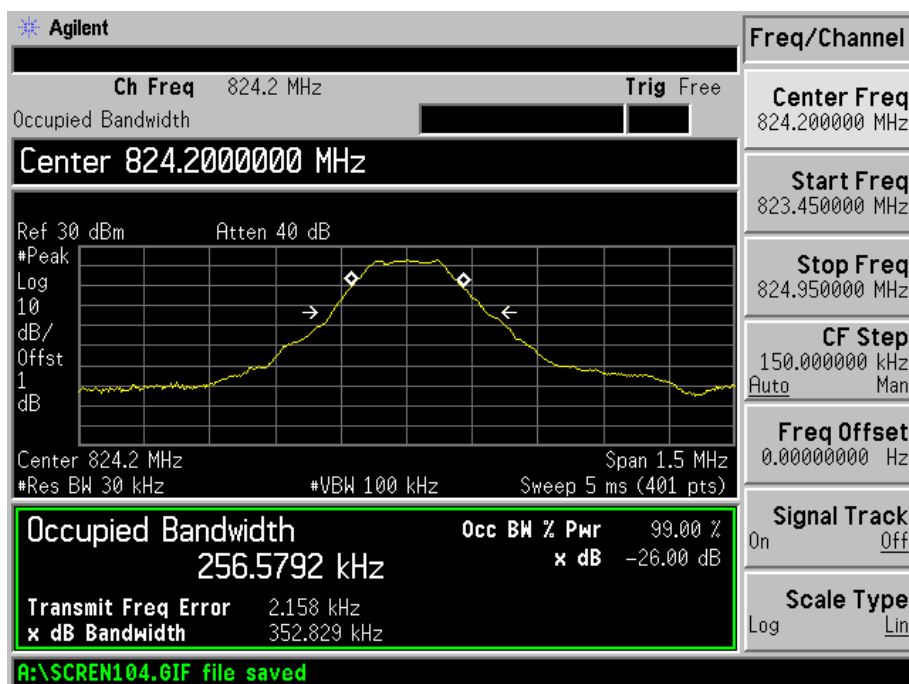
GSM Middle Channel



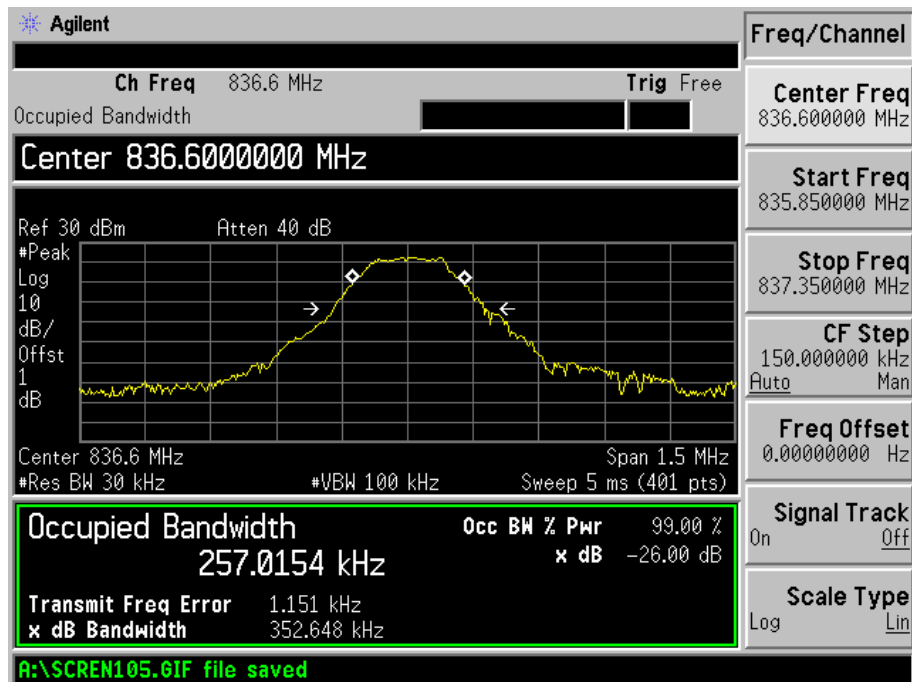
GSM High channel



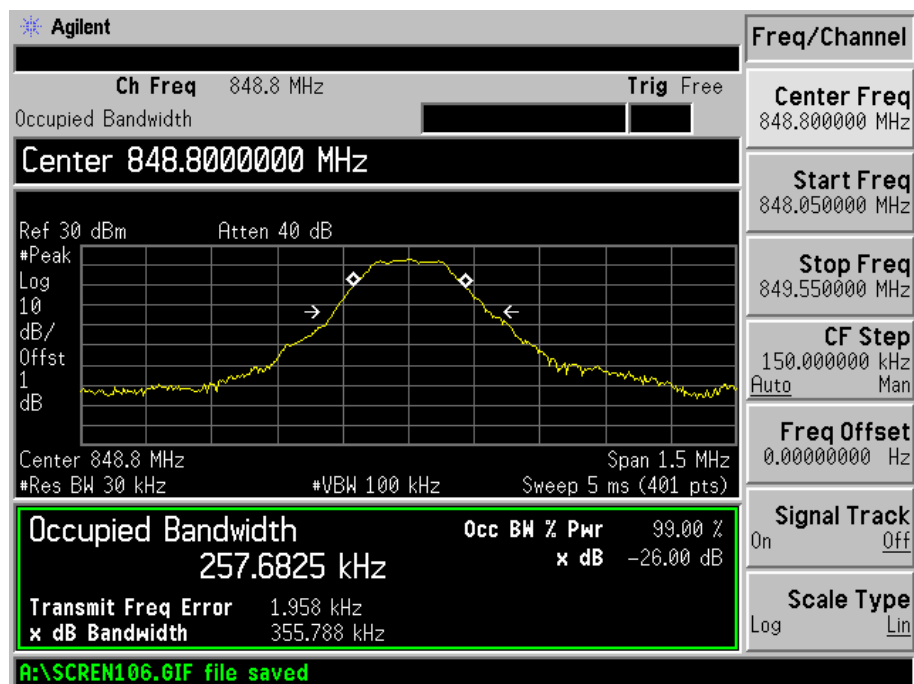
GPRS Low Channel



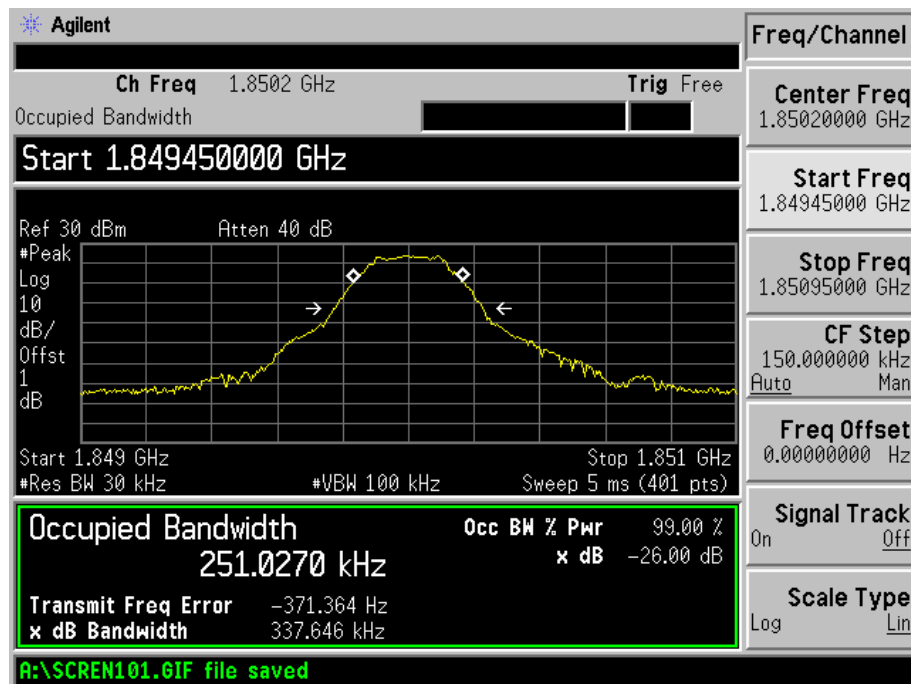
GPRS Middle Channel



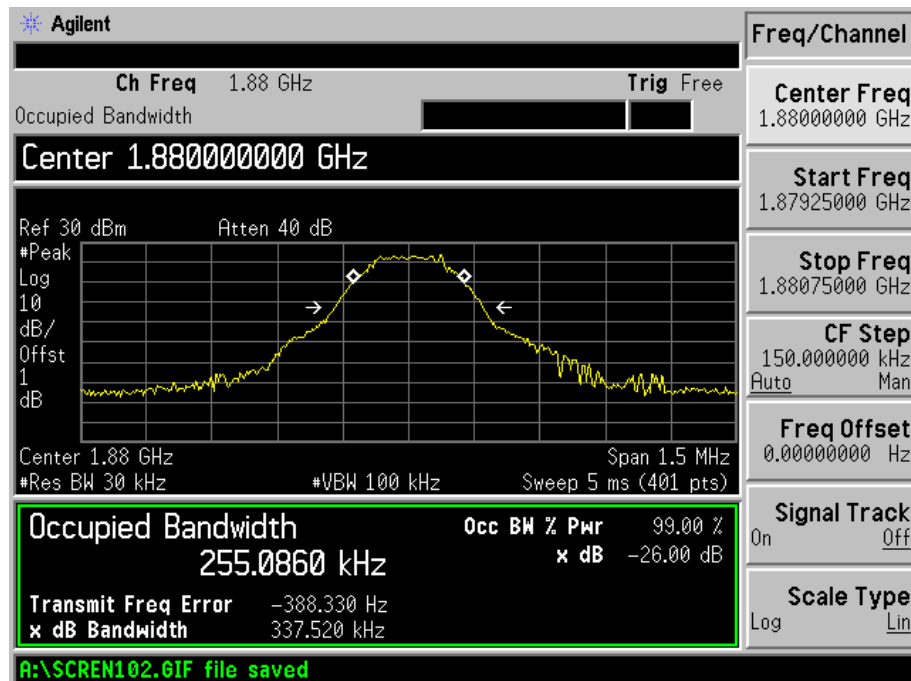
GPRS High Channel



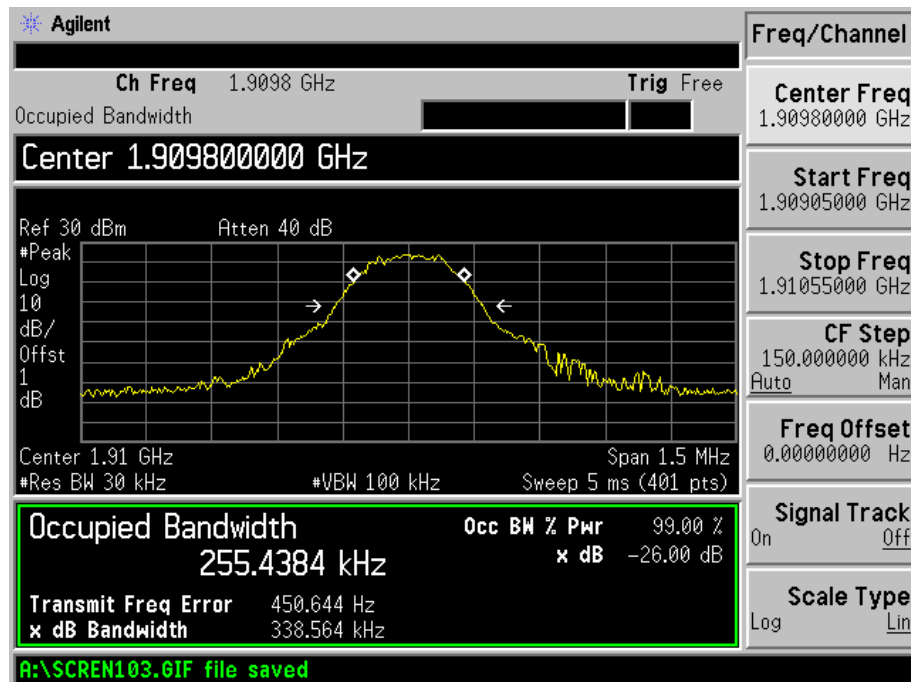
For PCS Band
GSM Low Channel



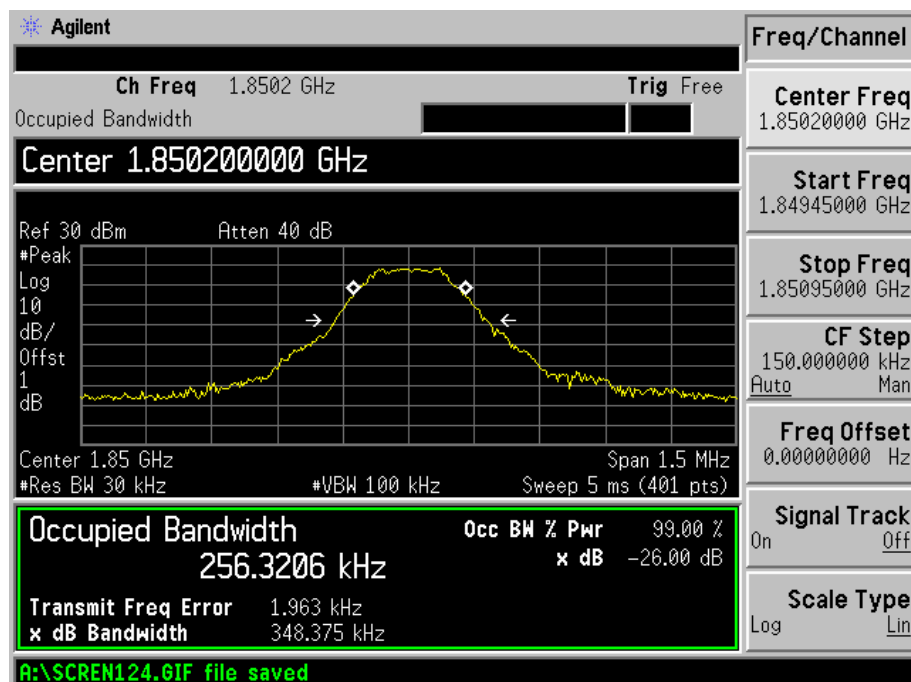
GSM Middle Channel



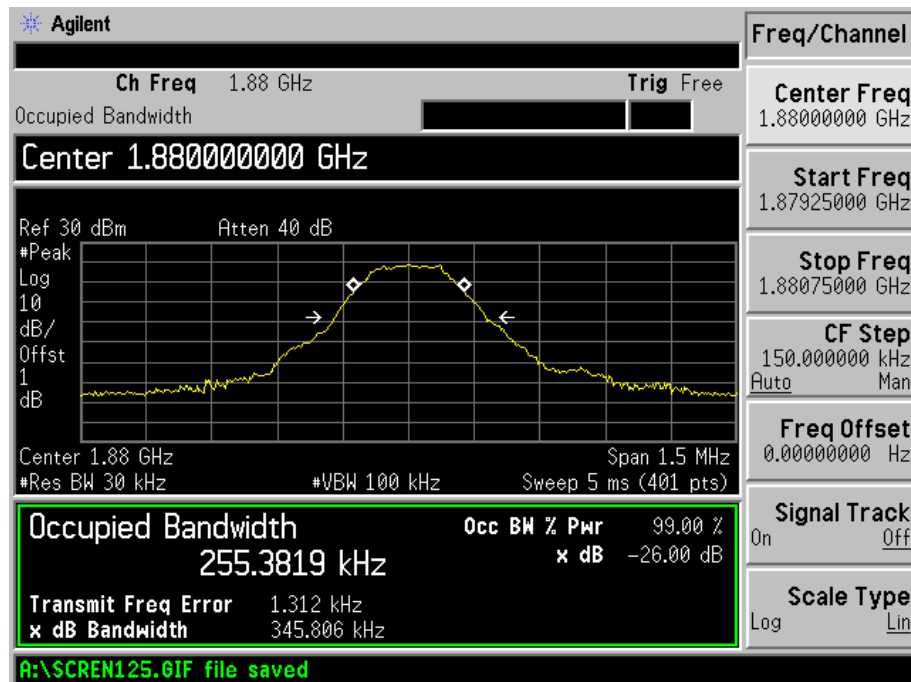
GSM High channel



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.

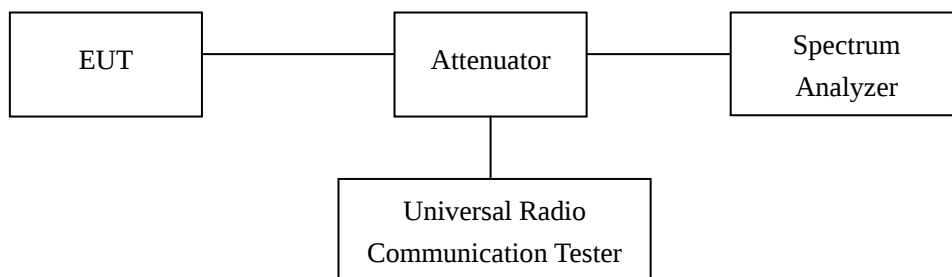
7.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Aglient	Spectrum Analyzer	E4402B	US41192821	2014-05-07	2015-05-06
Rohde & Schwarz	Spectrum Analyzer	FSP	836079/035	2014-05-07	2015-05-06
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	112012	2014-05-07	2015-05-06

7.3 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 10th harmonic.

Test Configuration for the out of band emissions testing:

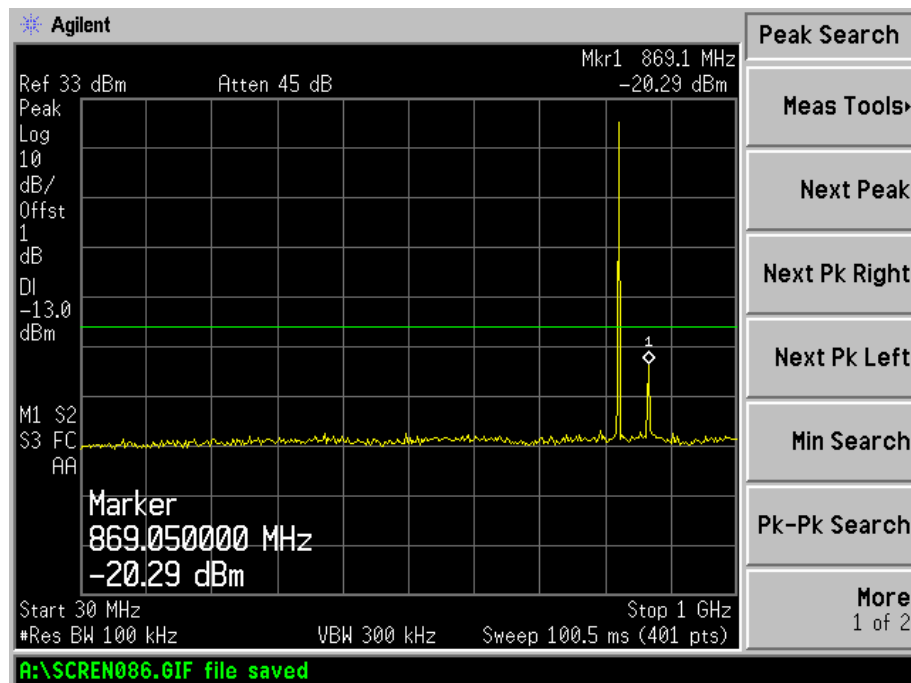


7.4 Environmental Conditions

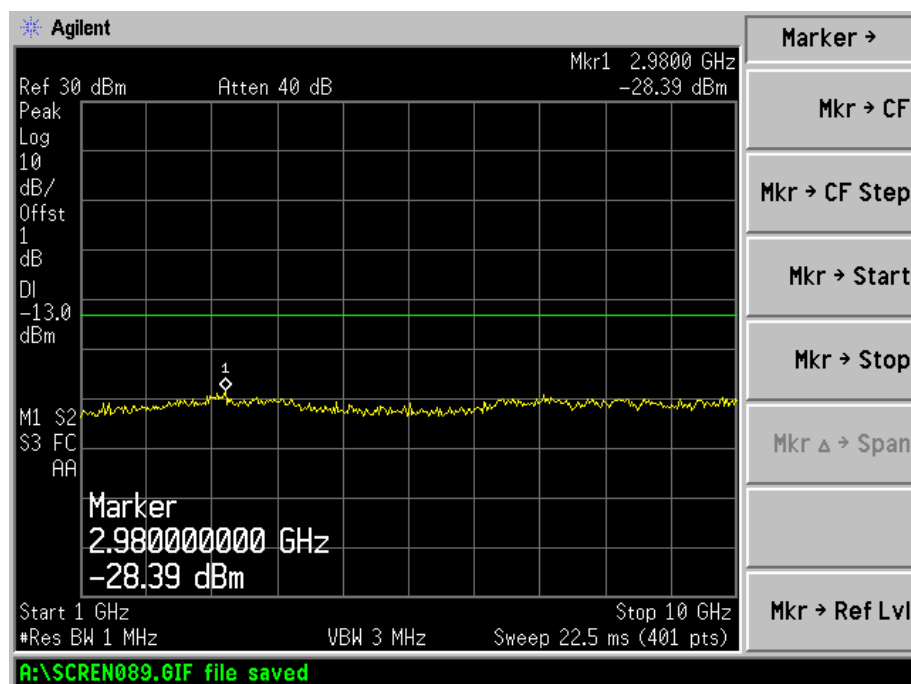
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

7.5 Summary of Test Results/Plots

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

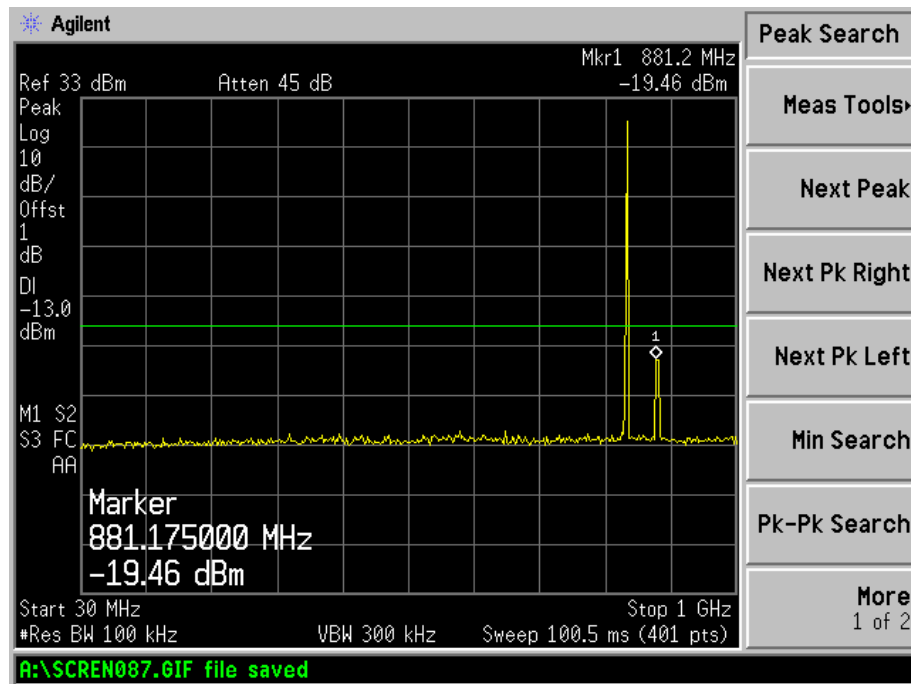


Above 1GHz

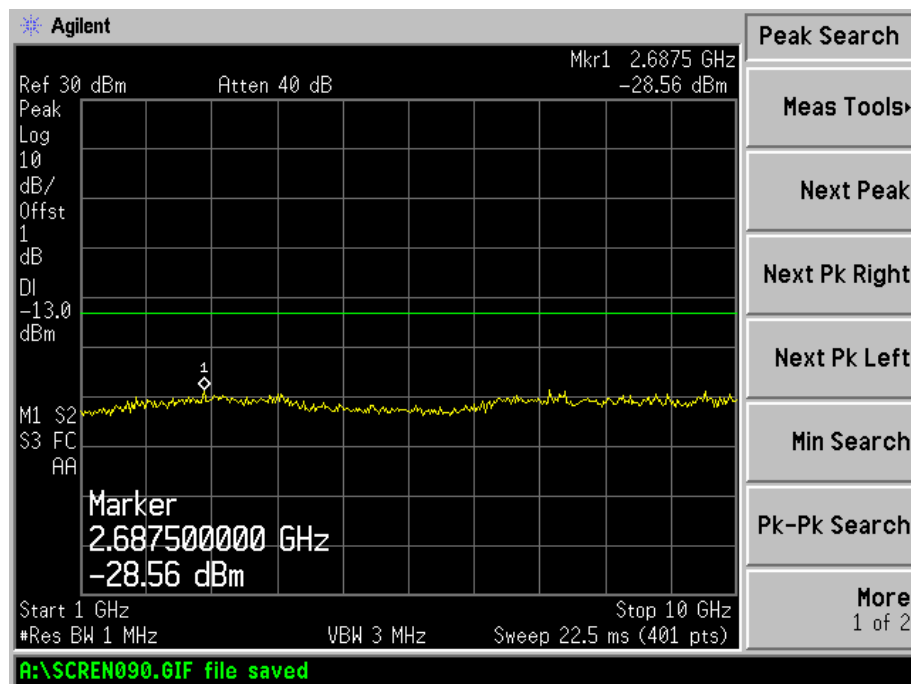


GSM Middle Channel

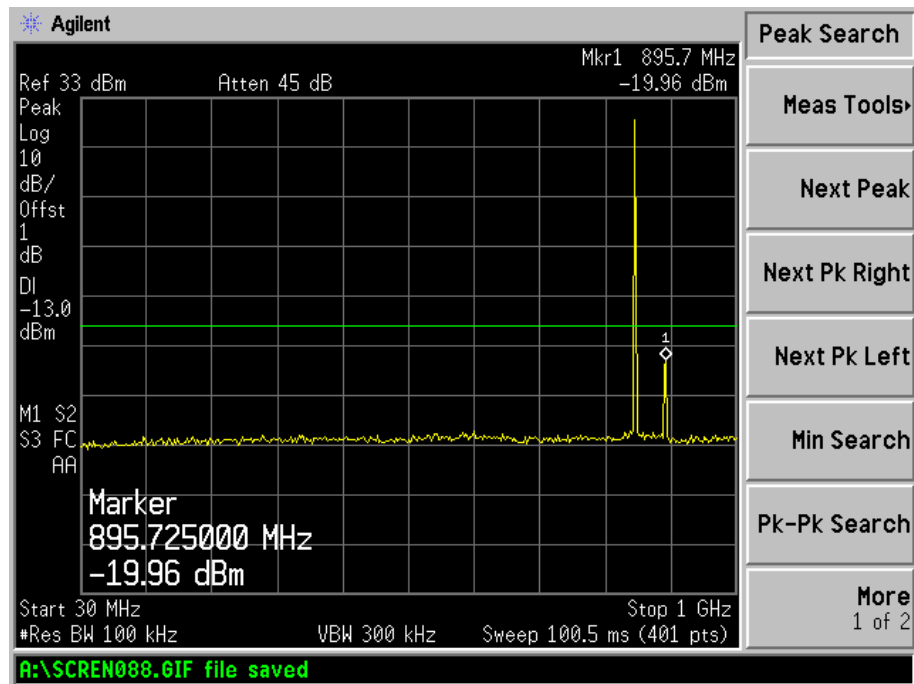
30MHz to 1GHz



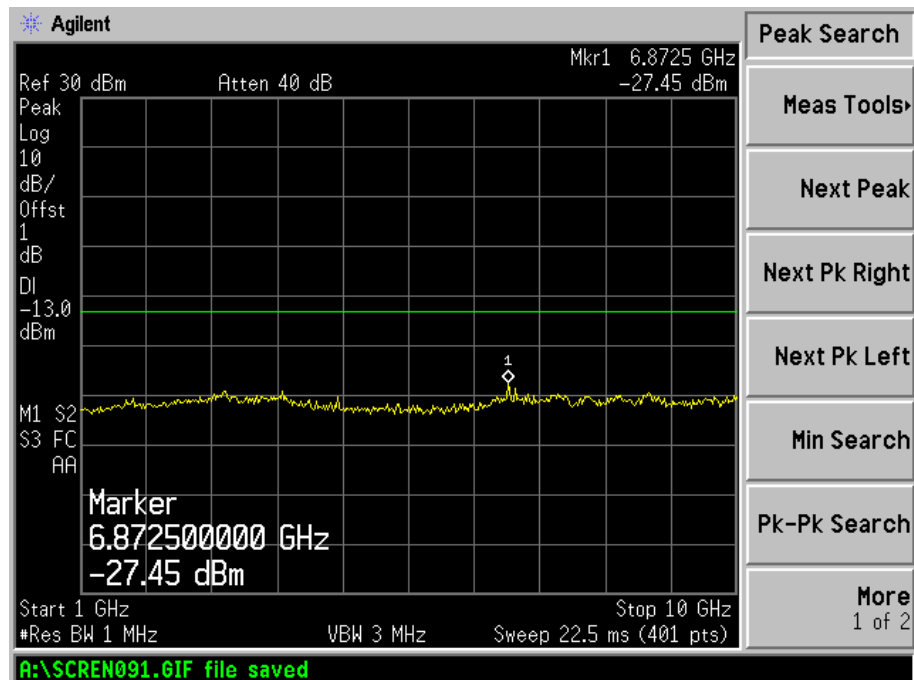
Above 1GHz



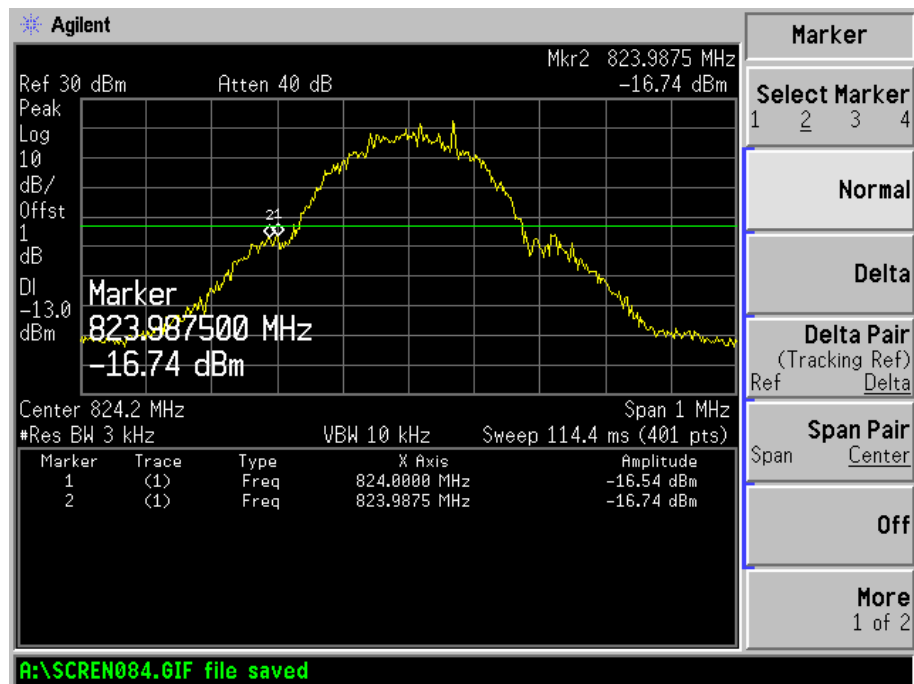
GSM High Channel
30MHz to 1GHz



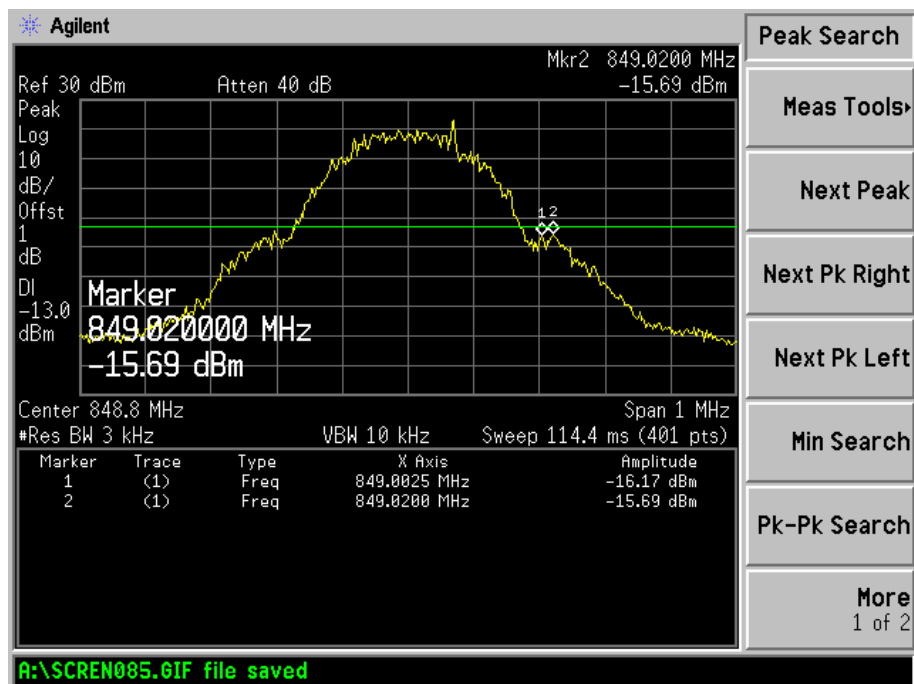
Above 1GHz



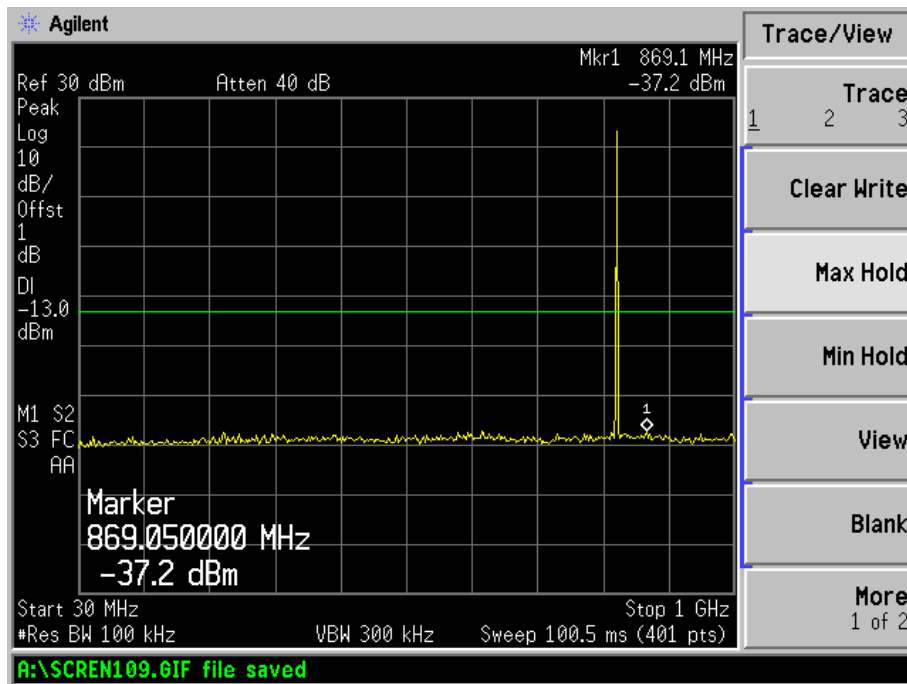
GSM Low Band Emission



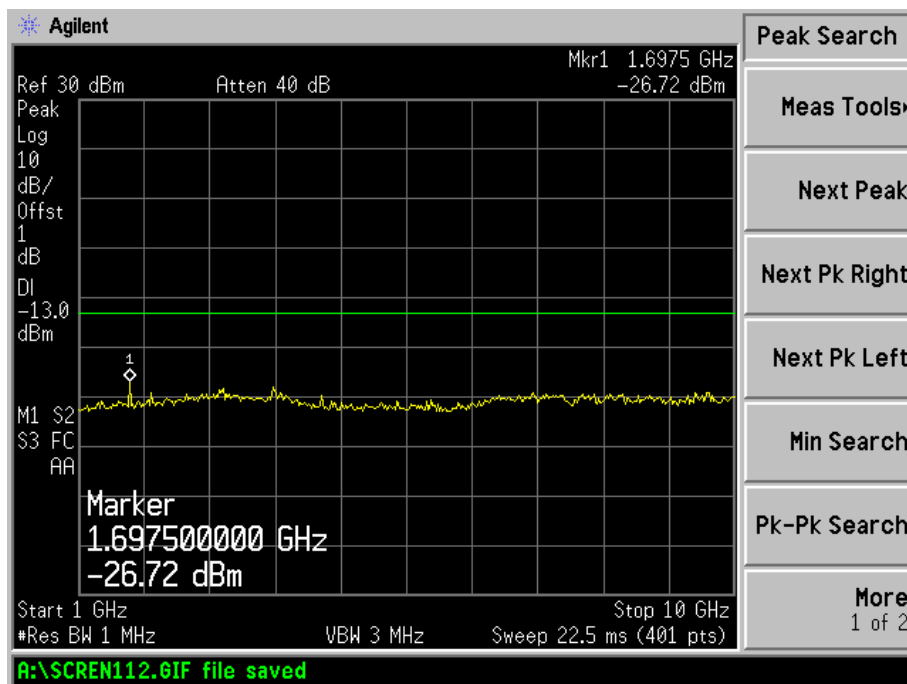
GSM High Band Emission



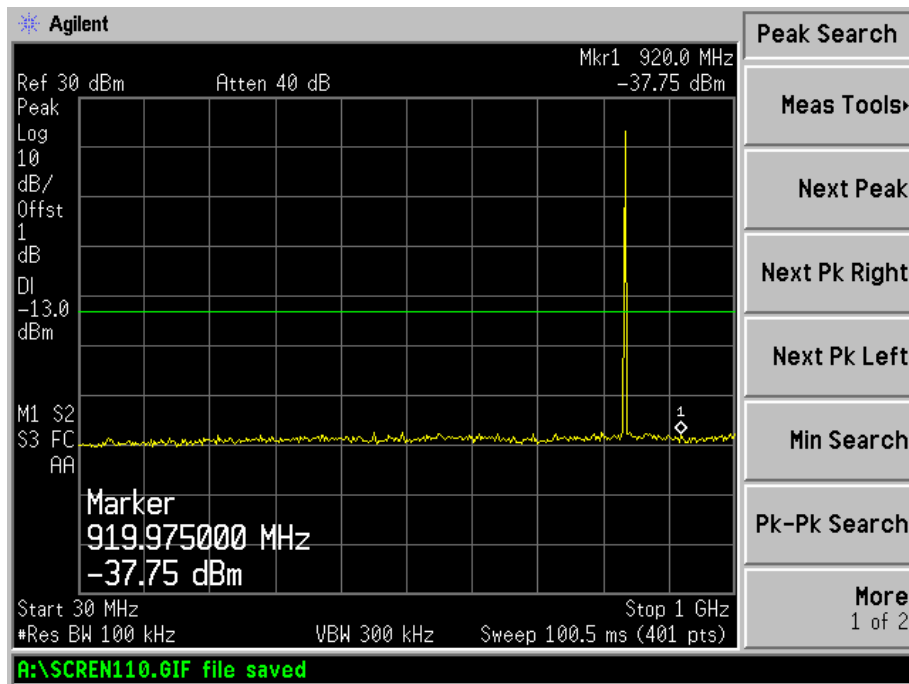
GPRS Low Channel
30MHz to 1GHz



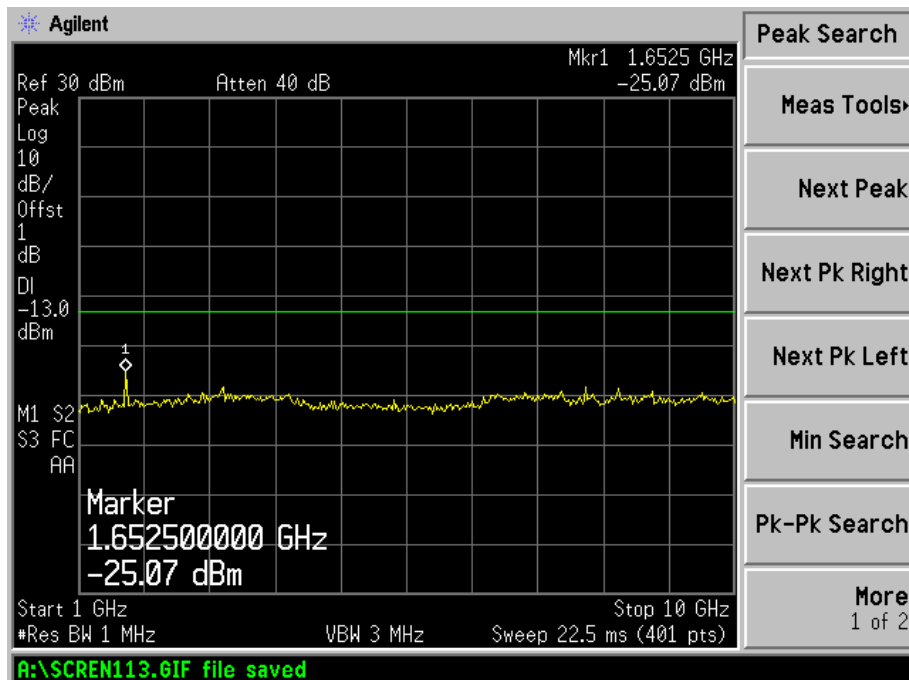
Above 1GHz



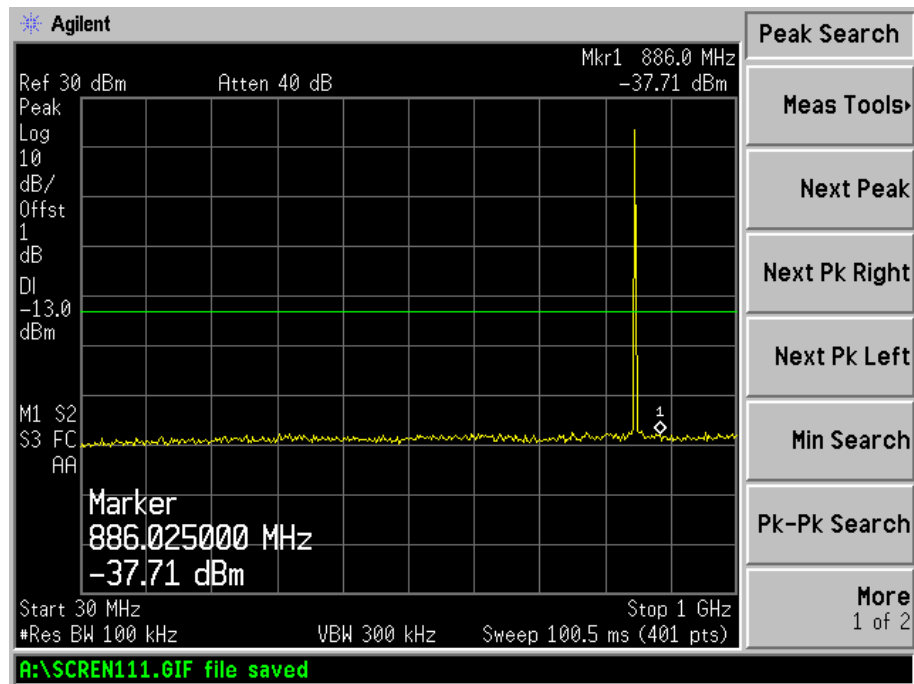
GPRS Middle Channel
30MHz to 1GHz



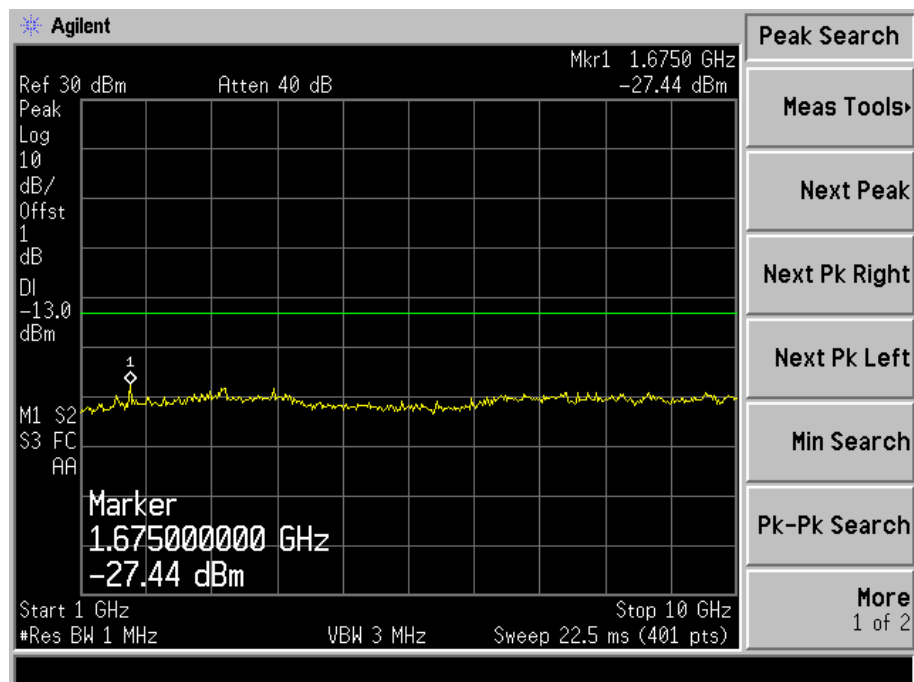
Above 1GHz



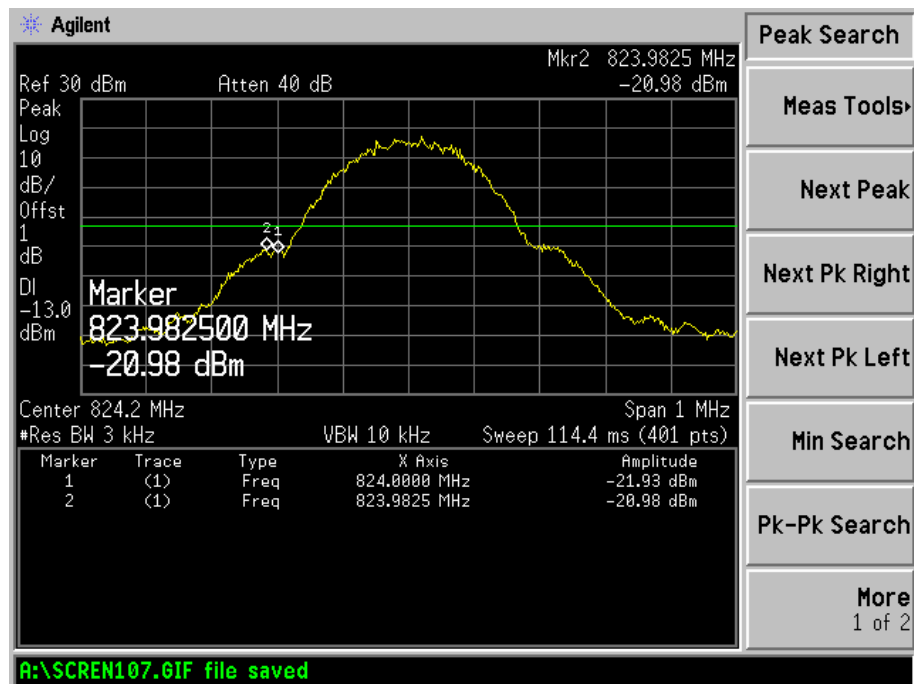
GPRS High Channel
30MHz to 1GHz



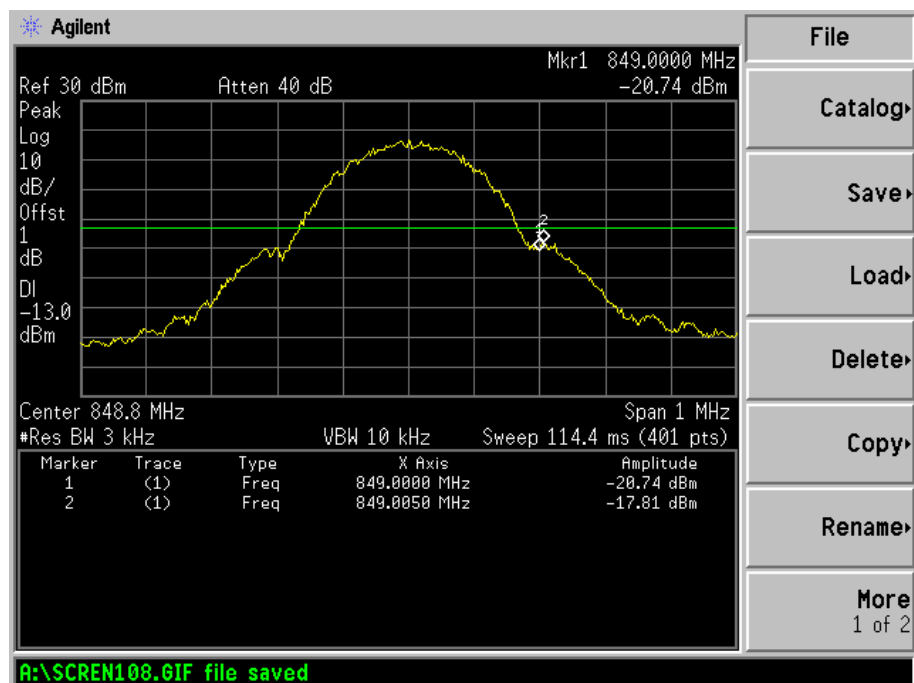
Above 1GHz



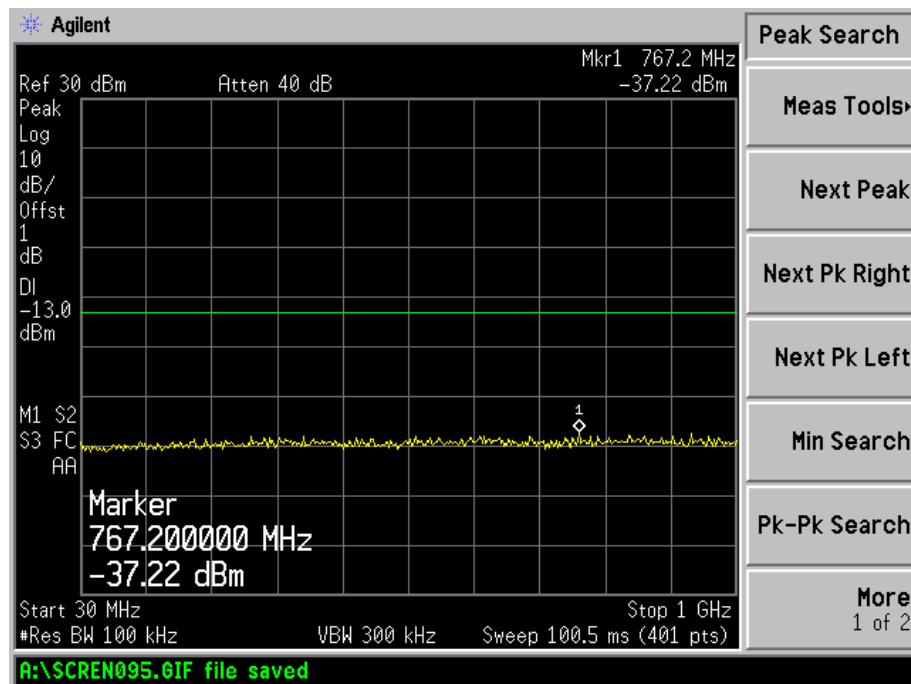
GPRS Low Band Emission



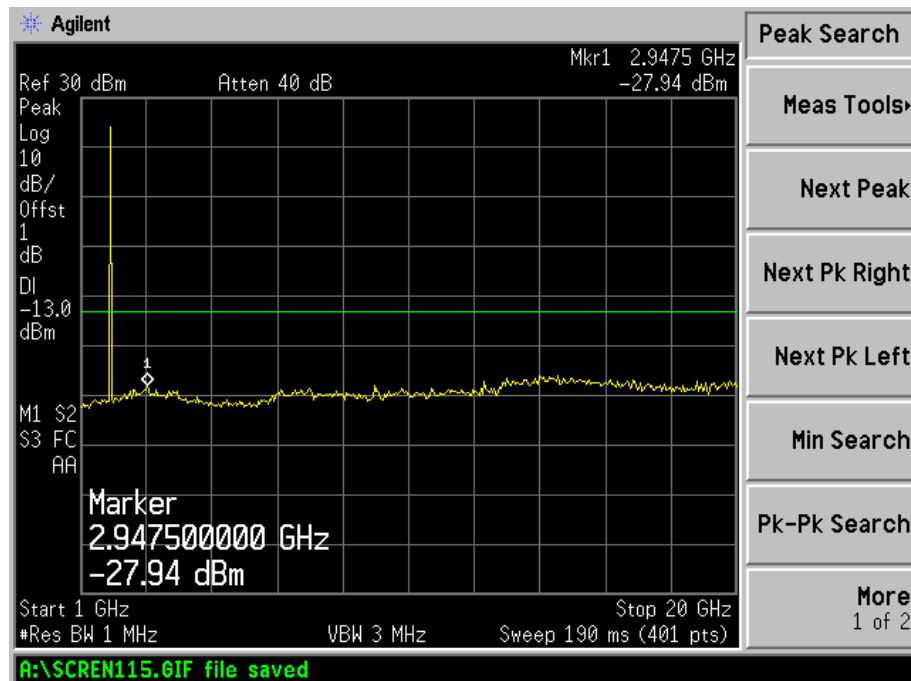
GPRS High Band Emission



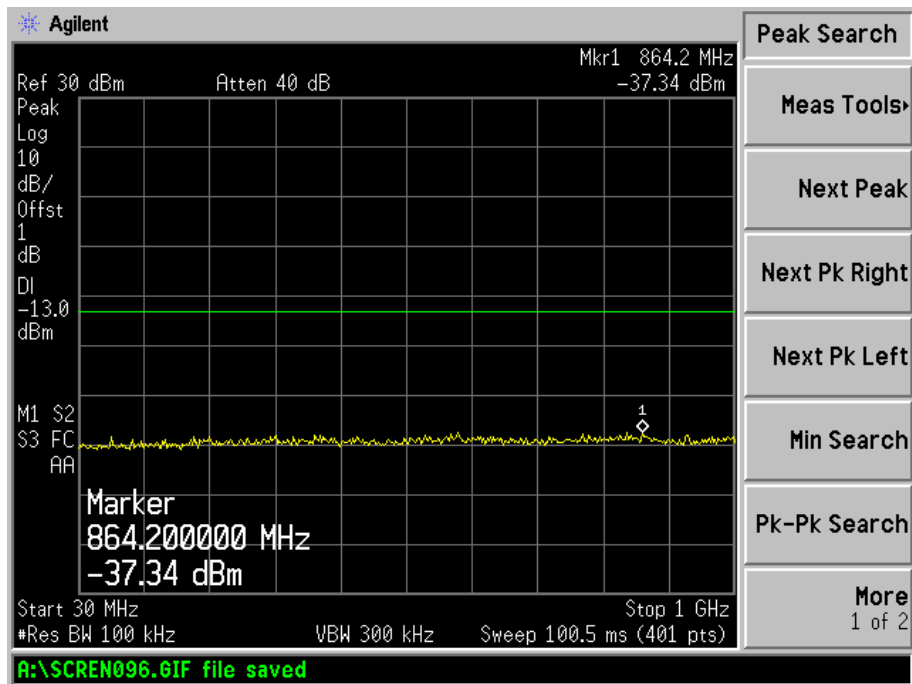
For PCS Band
GSM Low Channel
30MHz to 1GHz



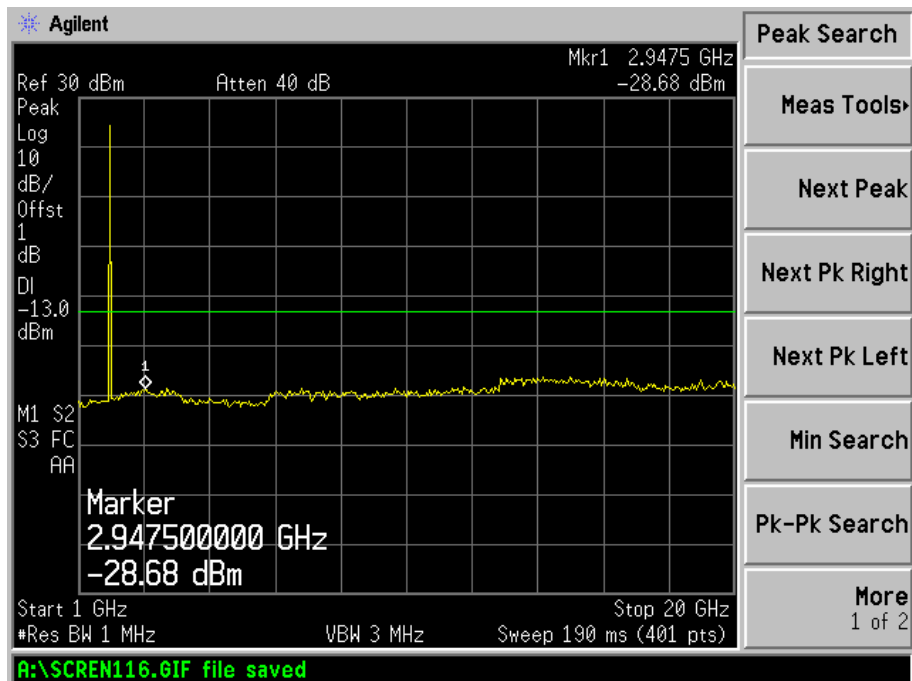
Above 1GHz



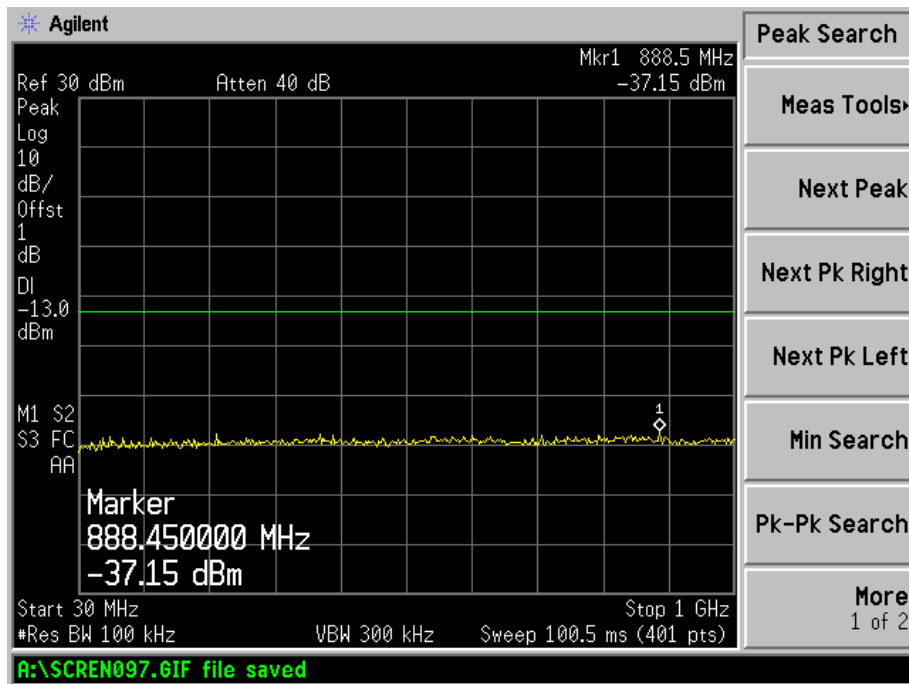
GSM Middle Channel
30MHz to 1GHz



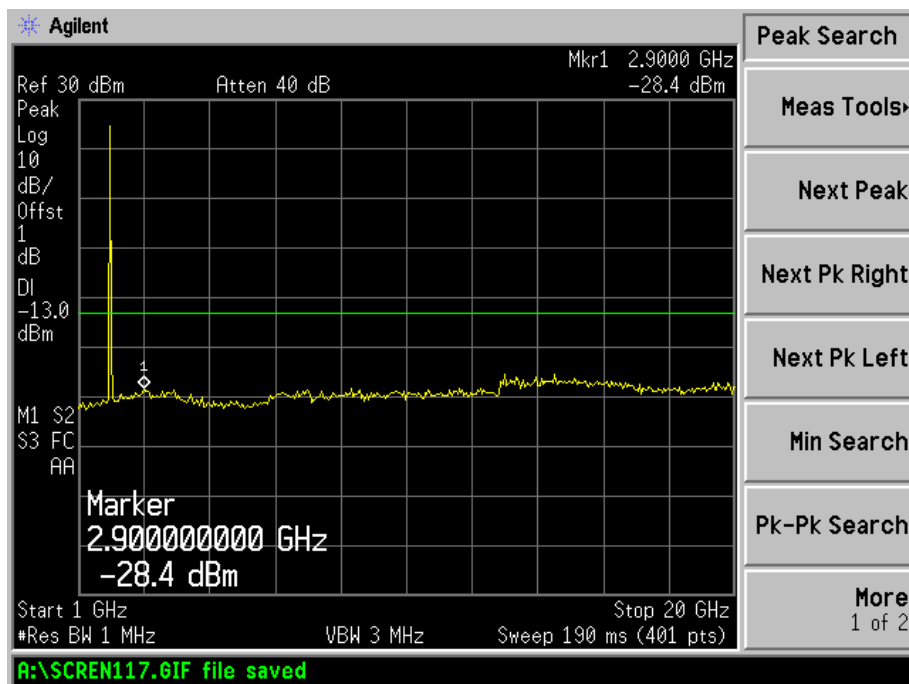
Above 1GHz



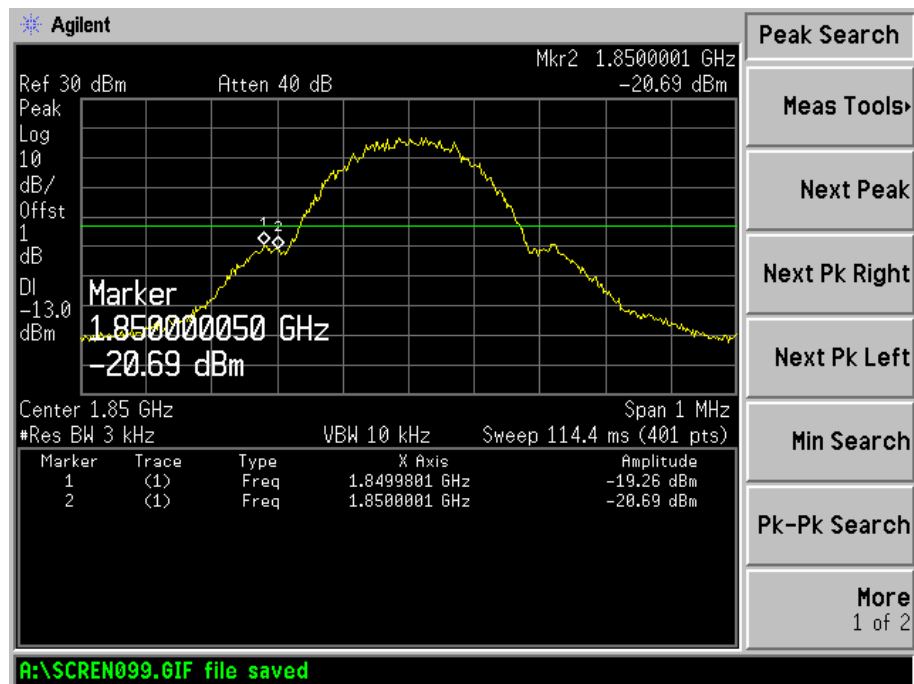
GSM High Channel
30MHz to 1GHz



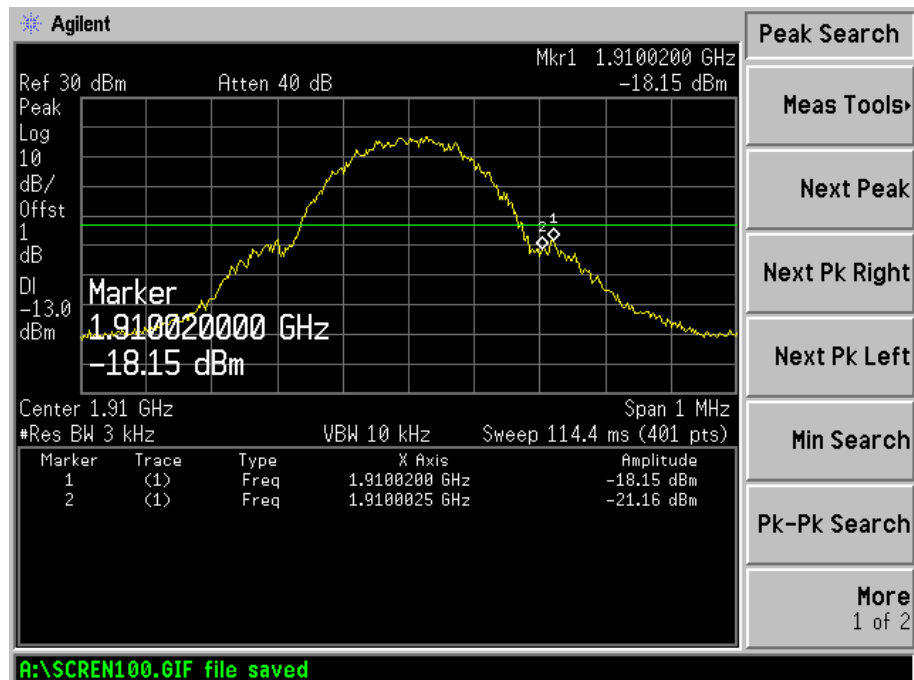
Above 1GHz



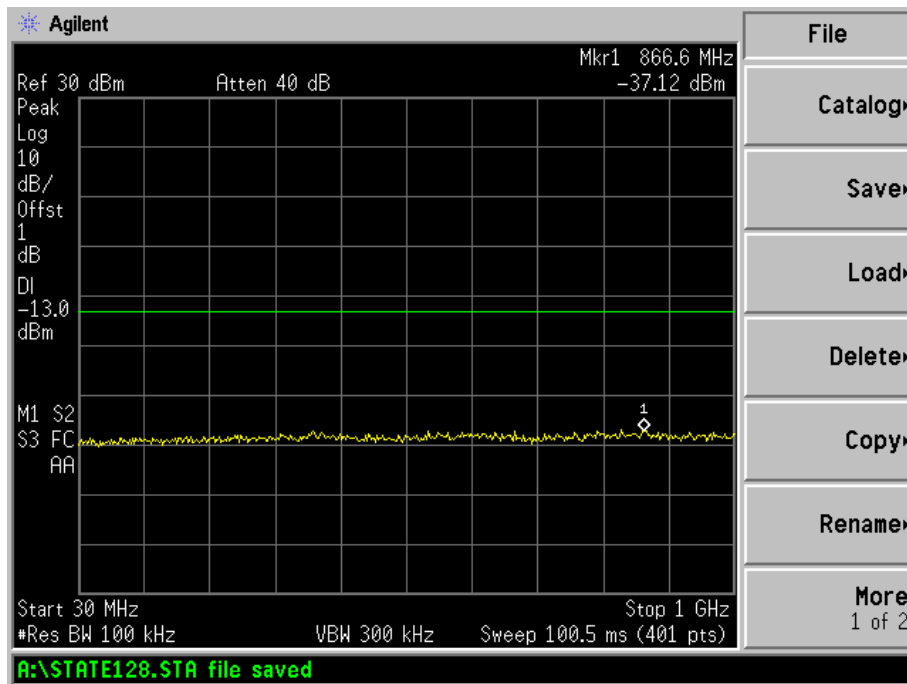
GSM Low Band Emission



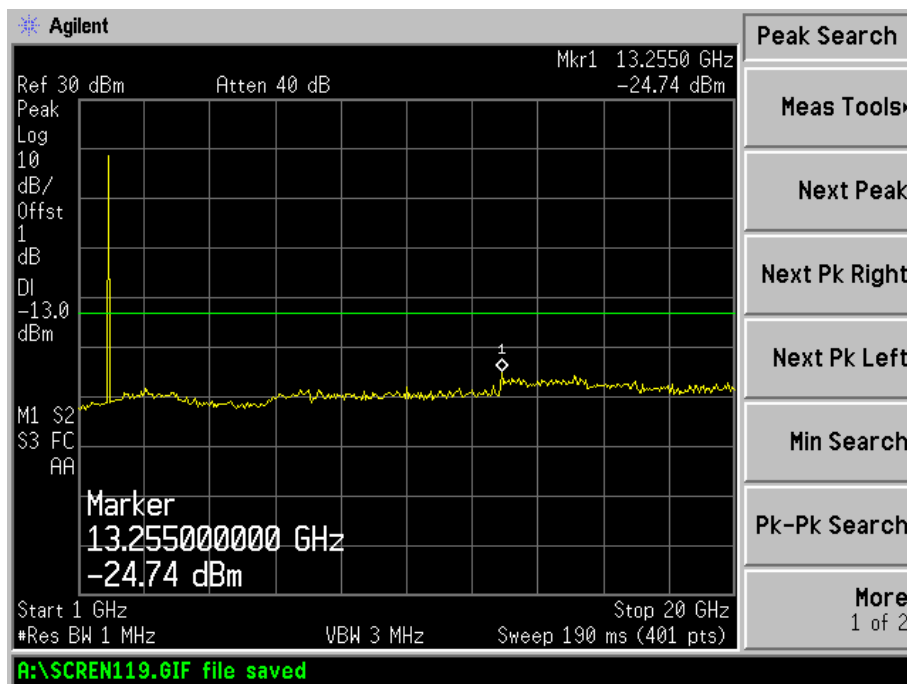
GSM High Band Emission



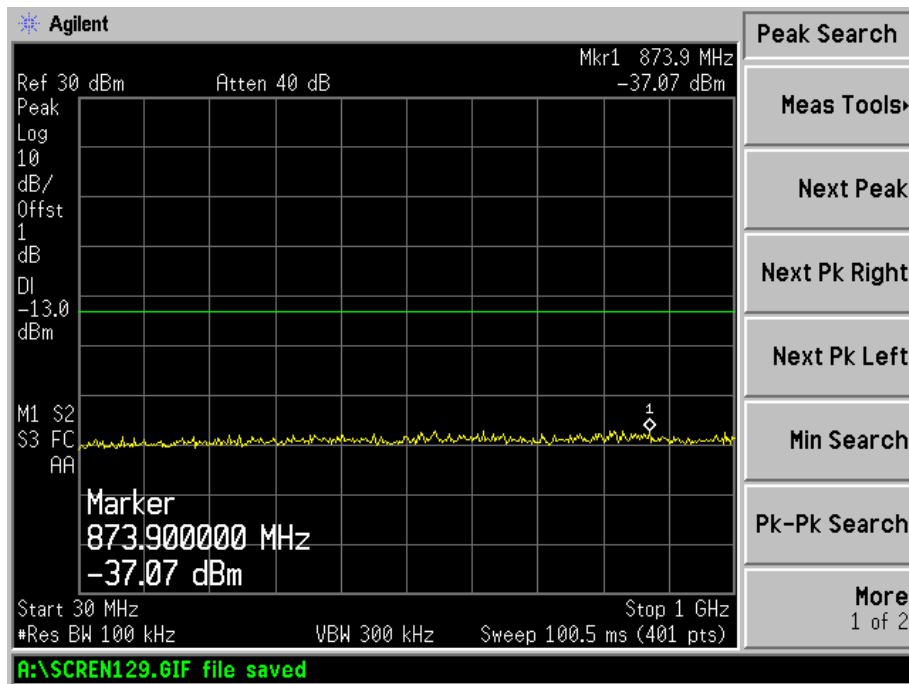
GRPS Low Channel
30MHz to 1GHz



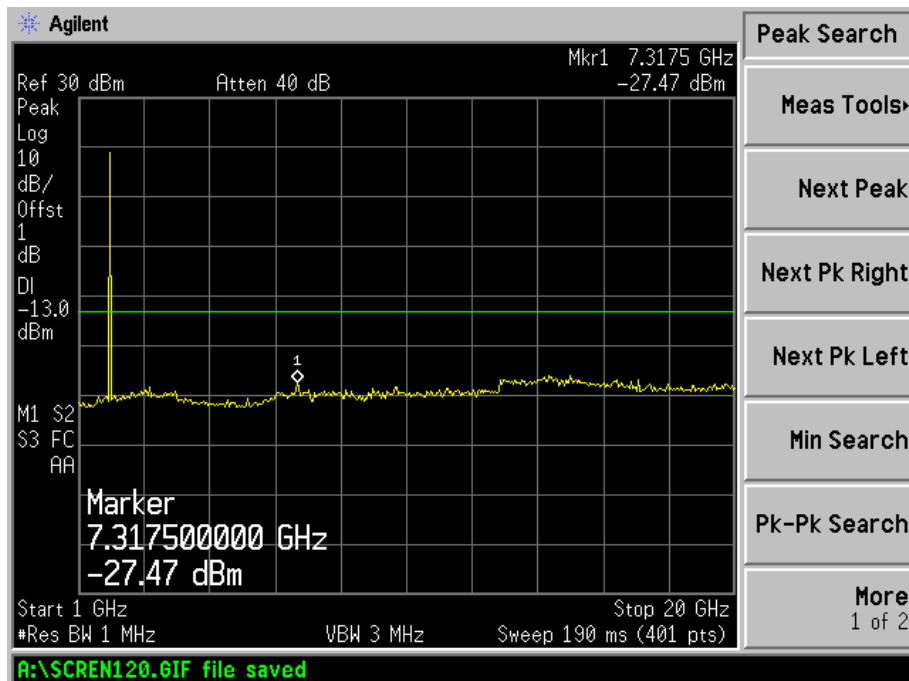
Above 1GHz



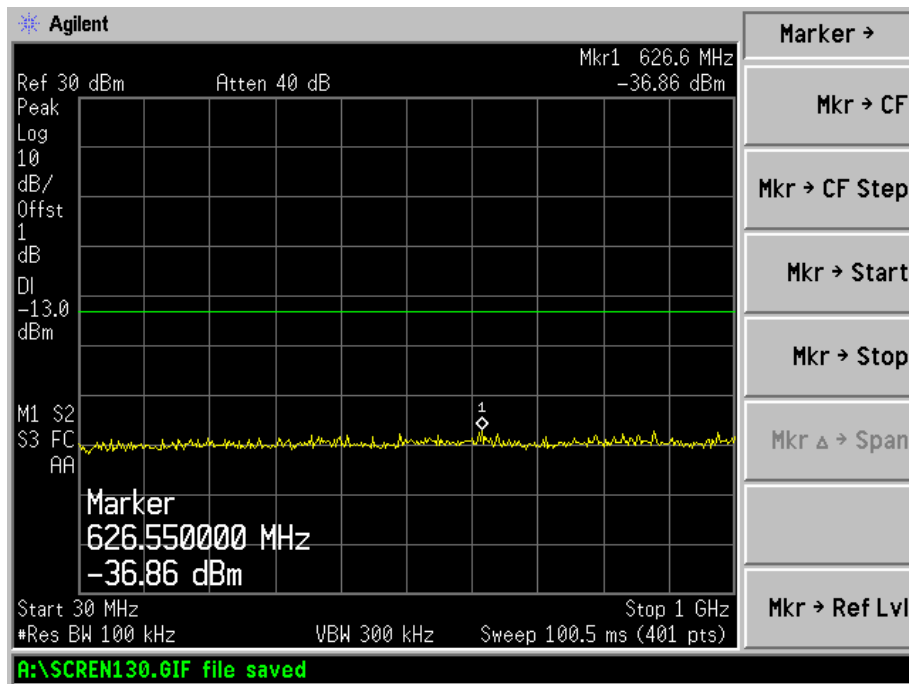
GPRS Middle Channel
30MHz to 1GHz



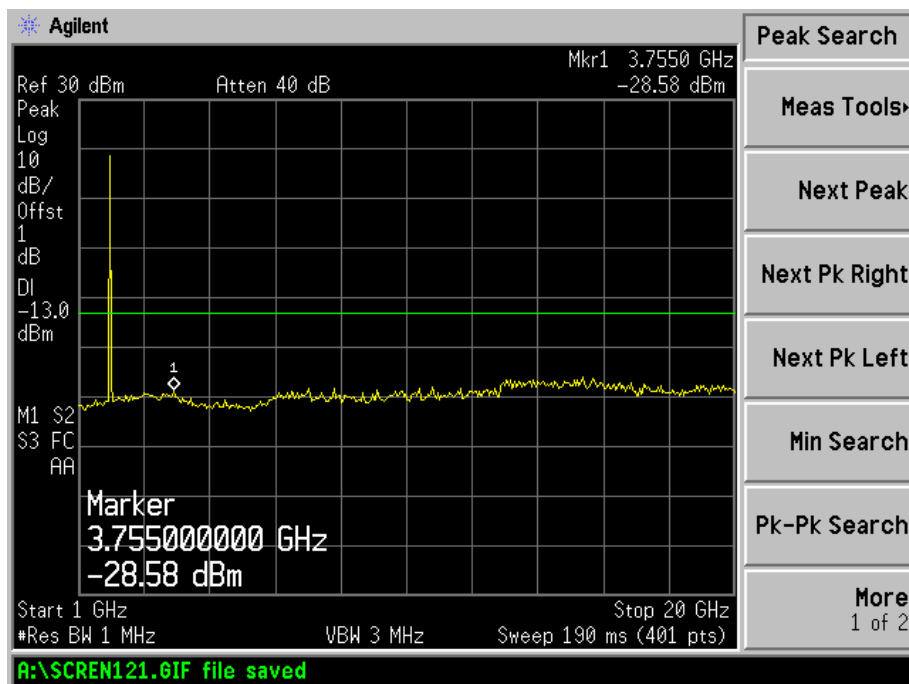
Above 1GHz



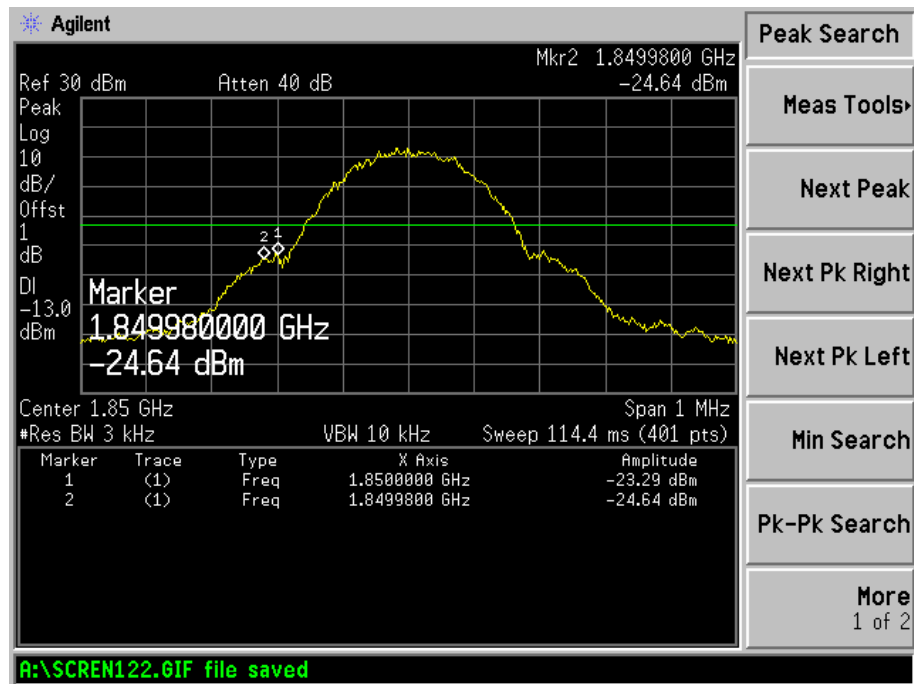
GPRS High Channel
30MHz to 1GHz



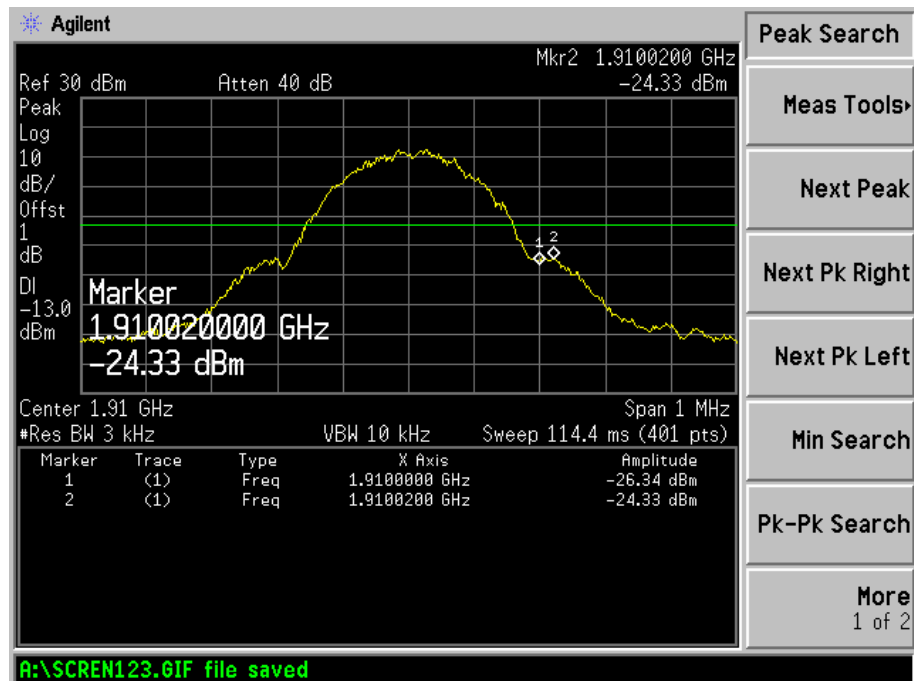
Above 1GHz



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 ± 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 Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2014-05-07	2015-05-06
Pre-amplifier	Agilent	8447F	3113A06717	2014-05-07	2015-05-06
Pre-amplifier	Compliance Direction	PAP-0118	24002	2014-05-07	2015-05-06
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2014-05-07	2015-05-06
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-334	2014-05-07	2015-05-06
Horn Antenna	ETS	3117	00086197	2014-05-07	2015-05-06
Horn Antenna	ETS	3117	00086198	2014-05-07	2015-05-06
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	112012	2014-05-07	2015-05-06
Signal Generator	R&S	SMR20	100047	2014-05-07	2015-05-06

8.4 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 = $43 + 10 \log_{10}(\text{power out in Watts})$

8.5 Environmental Conditions

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

8.6 Summary of Test Results/Plots

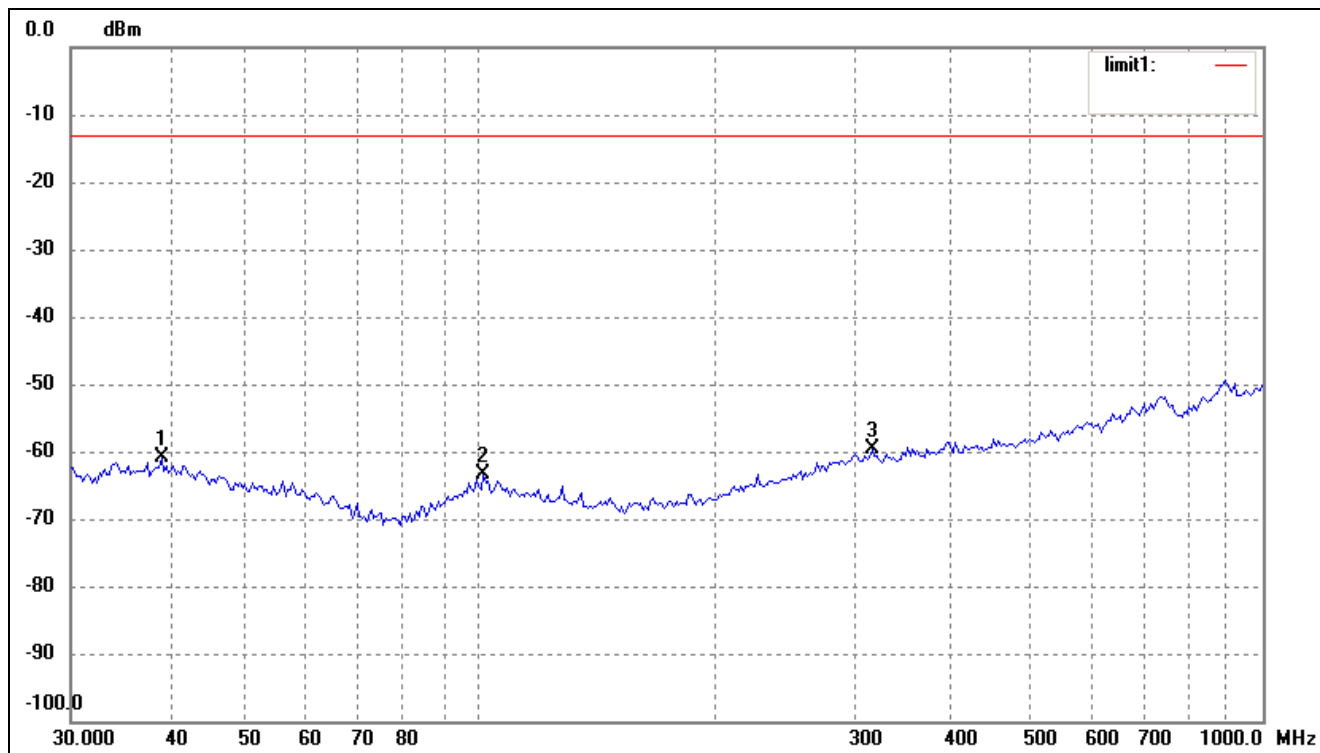
According to the data below, the FCC Part 22.917 and 24.238 standards, and had the worst margin of:

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

Spurious Emission From 30MHz to 1GHz

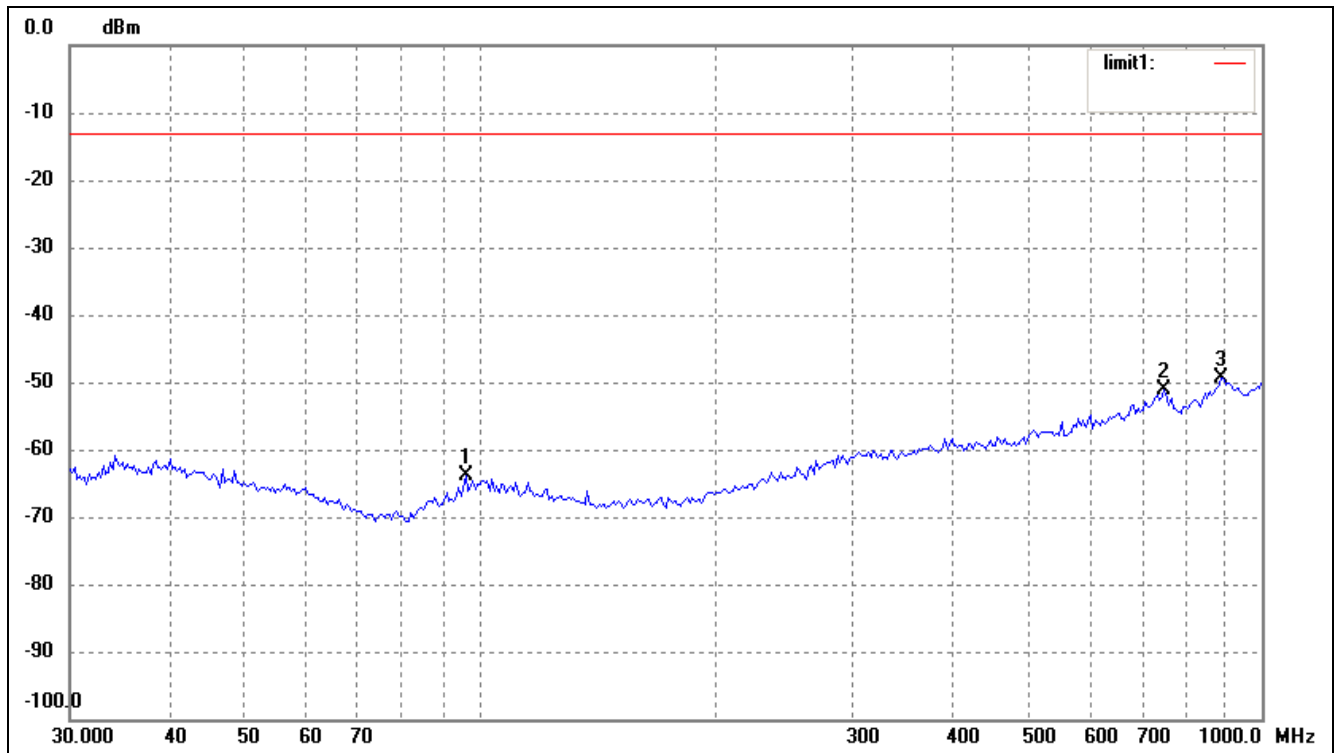
For Cellular Band_GSM Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	39.1616	-82.13	21.34	-60.79	-13.00	-47.79	ERP
2	100.9340	-81.91	18.55	-63.36	-13.00	-50.36	ERP
3	316.5890	-81.88	22.24	-59.64	-13.00	-46.64	ERP

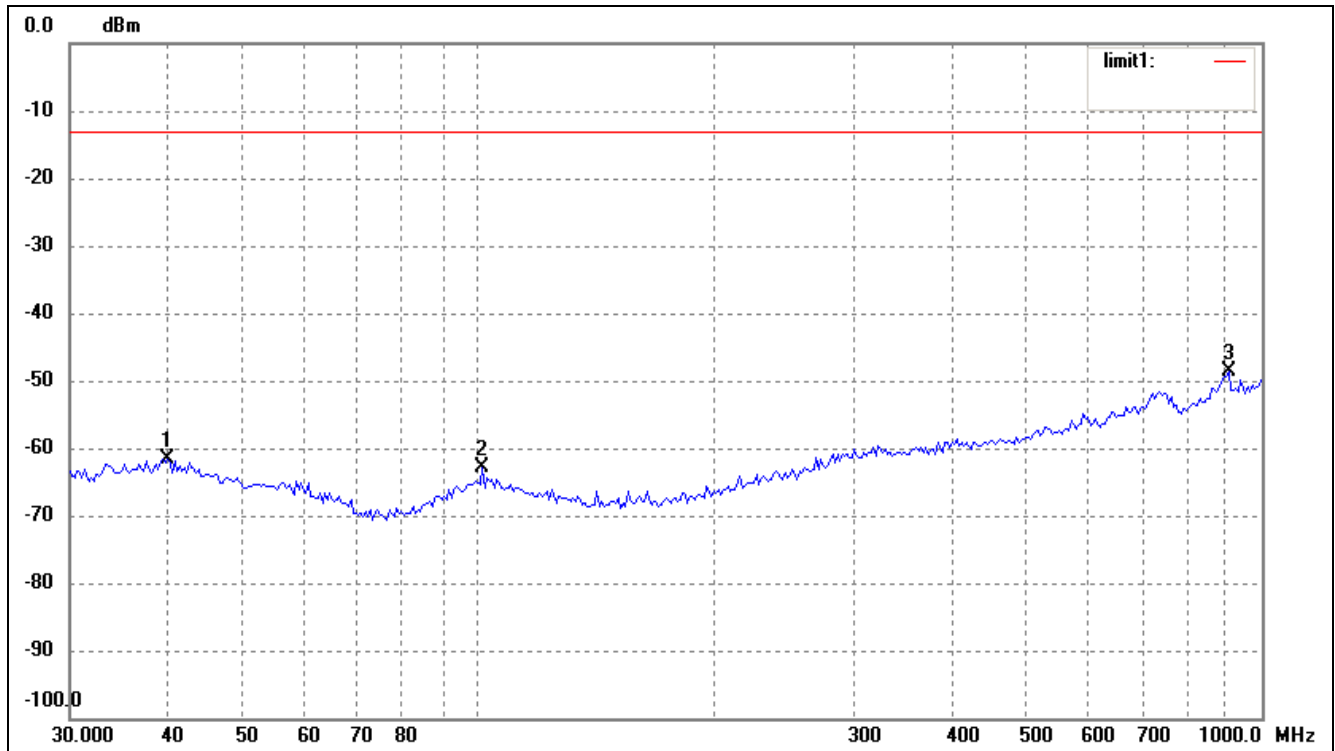
Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	96.0986	-81.53	17.67	-63.86	-13.00	-50.86	ERP
2	750.1083	-80.64	29.58	-51.06	-13.00	-38.06	ERP
3	887.6099	-80.34	30.95	-49.39	-13.00	-36.39	ERP

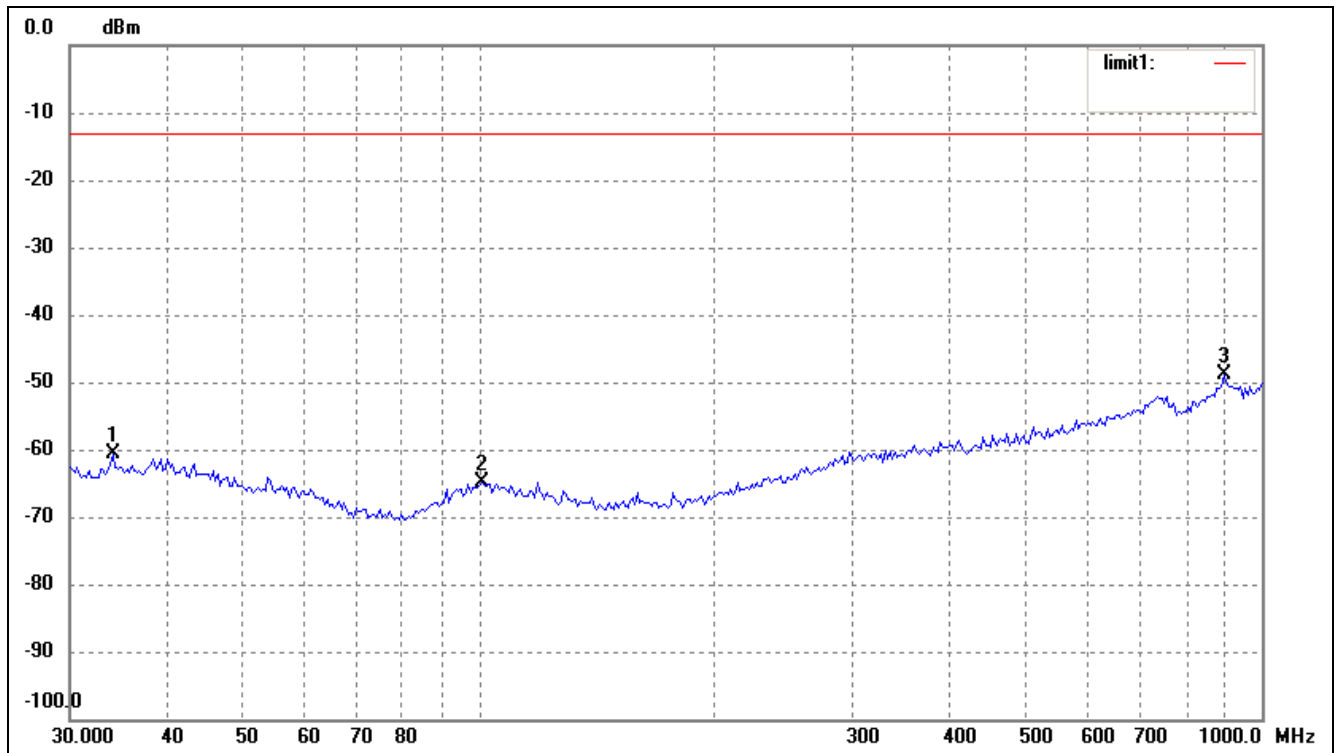
For Cellular Band_GPRS Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	39.9942	-83.15	21.48	-61.67	-13.00	-48.67	ERP
2	100.9340	-81.53	18.55	-62.98	-13.00	-49.98	ERP
3	906.4824	-79.46	30.95	-48.51	-13.00	-35.51	ERP

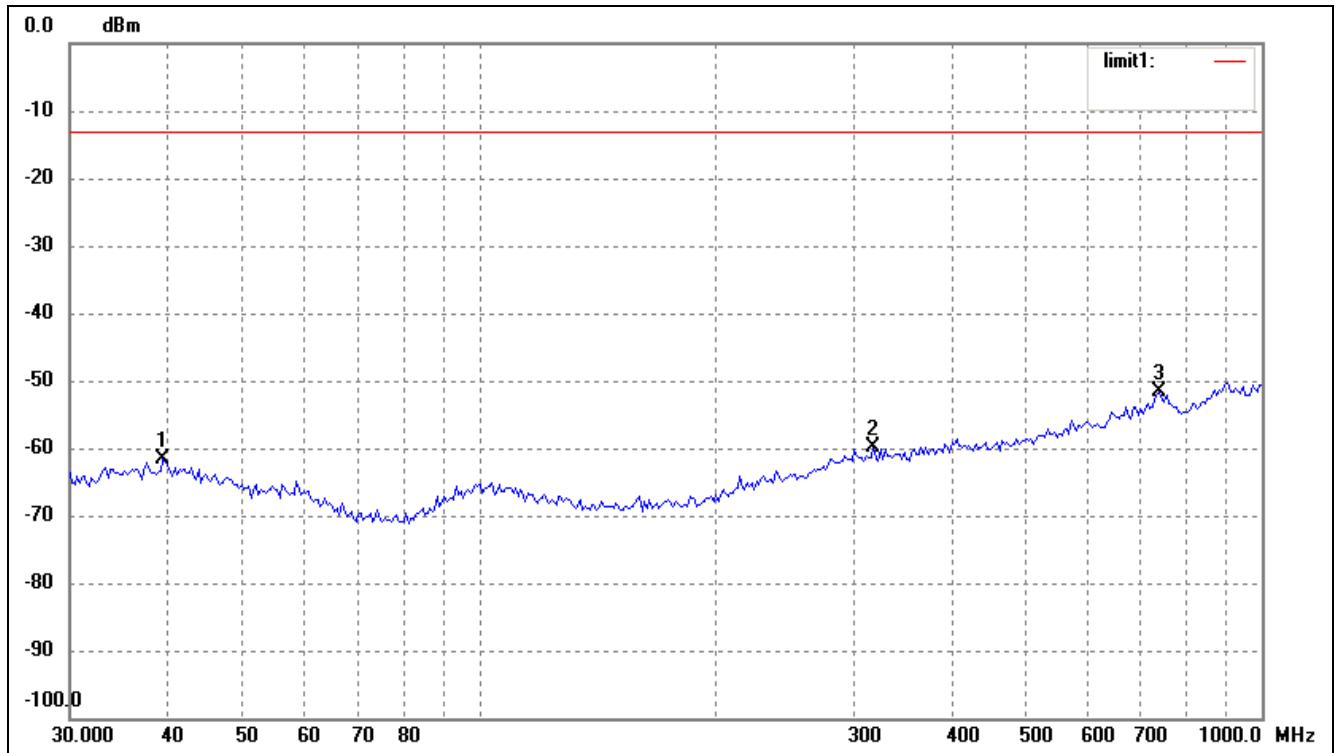
Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	34.0365	-81.12	20.52	-60.60	-13.00	-47.60	ERP
2	100.9340	-83.38	18.55	-64.83	-13.00	-51.83	ERP
3	893.8567	-80.01	31.07	-48.94	-13.00	-35.94	ERP

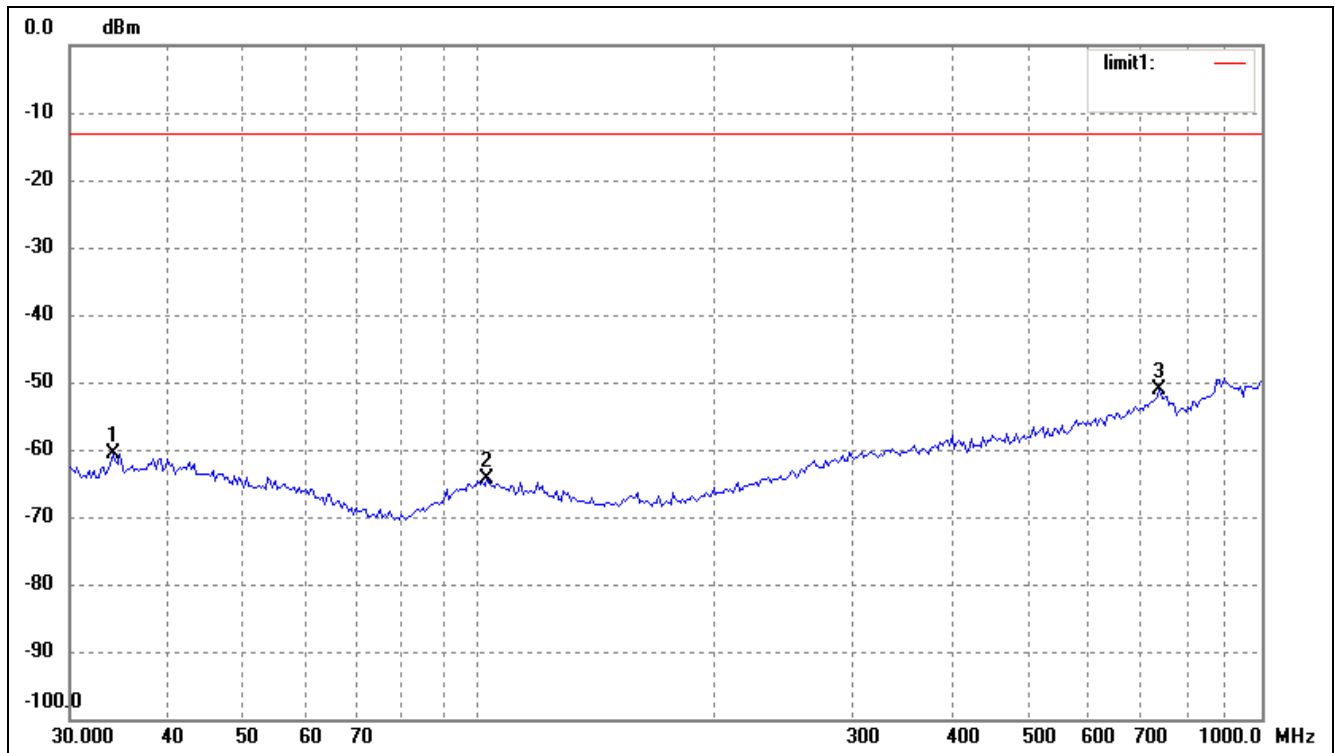
For PCS Band_GSM Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	39.4372	-83.12	21.40	-61.72	-13.00	-48.72	ERP
2	318.8170	-82.12	22.26	-59.86	-13.00	-46.86	ERP
3	739.6605	-81.53	29.87	-51.66	-13.00	-38.66	ERP

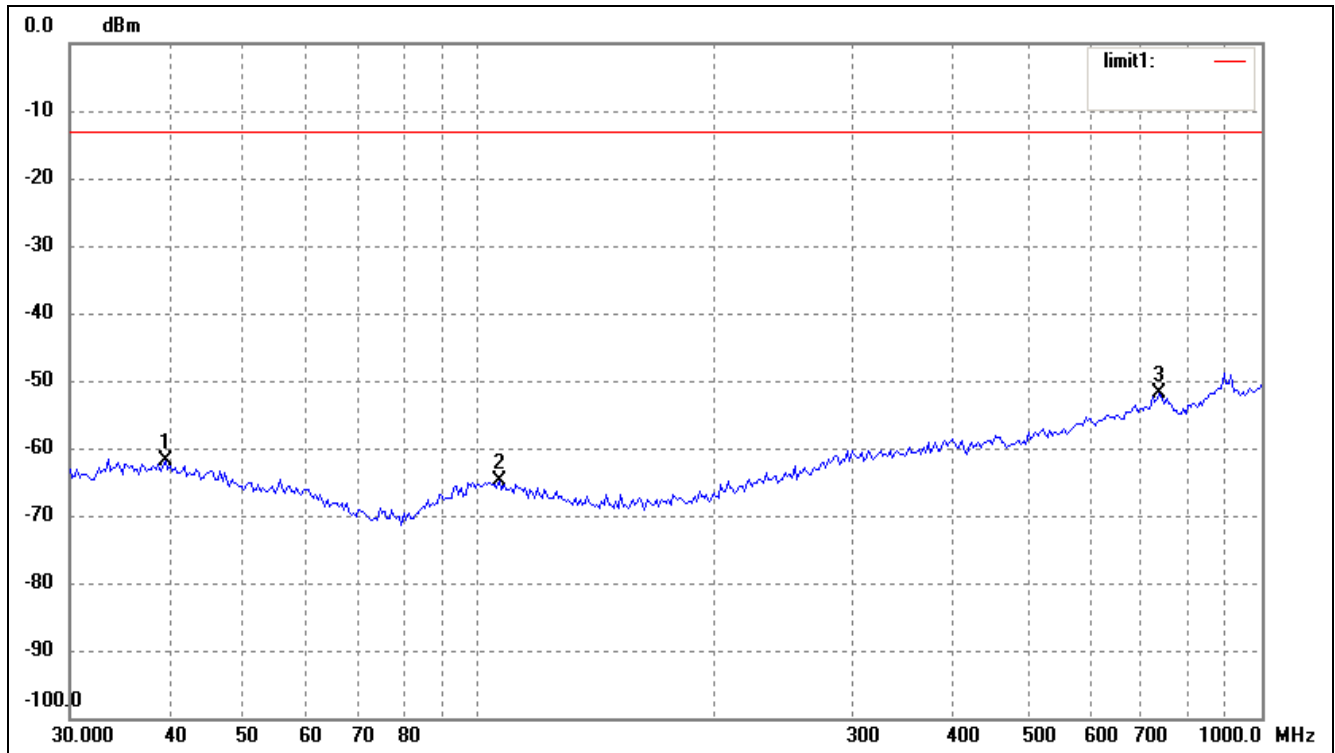
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	34.0365	-81.12	20.52	-60.60	-13.00	-47.60	ERP
2	102.3597	-82.77	18.41	-64.36	-13.00	-51.36	ERP
3	739.6605	-80.87	29.87	-51.00	-13.00	-38.00	ERP

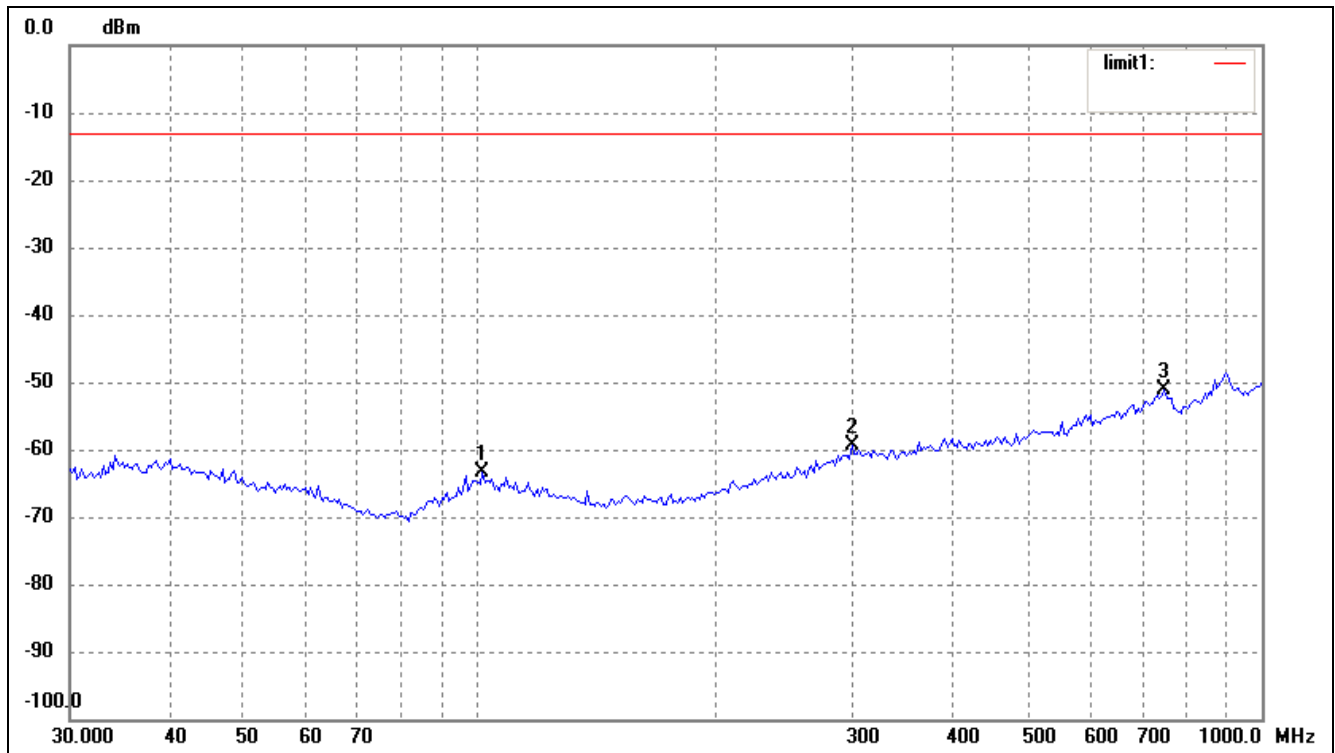
For PCS Band_GPRS Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	39.7147	-83.43	21.44	-61.99	-13.00	-48.99	ERP
2	106.0126	-83.03	18.04	-64.99	-13.00	-51.99	ERP
3	739.6605	-81.83	29.87	-51.96	-13.00	-38.96	ERP

Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	100.9340	-81.96	18.55	-63.41	-13.00	-50.41	ERP
2	299.3158	-81.21	21.95	-59.26	-13.00	-46.26	ERP
3	750.1083	-80.64	29.58	-51.06	-13.00	-38.06	ERP

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

*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	-38.00	-0.63	-38.63	-13.00	-25.63	H
2472.6	-61.29	15.78	-45.51	-13.00	-32.51	H
1648.4	-53.89	13.66	-40.23	-13.00	-27.23	V
2472.6	-63.65	15.78	-47.87	-13.00	-34.87	V
Middle Channel (836.6MHz)						
1673.2	-53.45	16.53	-36.92	-13.00	-23.92	H
2509.8	-59.45	15.98	-43.47	-13.00	-30.47	H
1673.2	-52.71	15.15	-37.56	-13.00	-24.56	V
2509.8	-60.56	15.78	-44.78	-13.00	-31.78	V
High Channel (848.8MHz)						
1697.6	-39.04	-0.63	-39.67	-13.00	-26.67	H
2546.4	-56.33	13.77	-42.56	-13.00	-29.56	H
1697.6	-41.04	-0.63	-41.67	-13.00	-28.67	V
2546.4	-55.55	10.18	-45.37	-13.00	-32.37	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	-36.92	-0.75	-37.67	-13.00	-24.67	H
5550.6	-51.57	6.91	-44.66	-13.00	-31.66	H
3700.4	-50.44	10.27	-40.17	-13.00	-27.17	V
5550.6	-62.51	15.25	-47.26	-13.00	-34.26	V
Middle Channel (1880.0MHz)						
3760.0	-53.58	14.98	-38.60	-13.00	-25.60	H
5640.0	-59.64	17.02	-42.62	-13.00	-29.62	H
3760.0	-55.87	15.77	-40.10	-13.00	-27.10	V
5640.0	-62.01	16.34	-45.67	-13.00	-32.67	V
High Channel (1909.8MHz)						
3819.6	-49.58	9.92	-39.66	-13.00	-26.66	H
5729.4	-58.14	13.47	-44.67	-13.00	-31.67	H
3819.6	-58.19	16.97	-41.22	-13.00	-28.22	V
5729.4	-61.75	15.46	-46.29	-13.00	-33.29	V

Note: Margin= (Reading+ Correct)- Limit

Testing is carried out with frequency rang 9kHz to 20GHz, which above 3th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so the data is not display.

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Aglient	Spectrum Analyzer	E4402B-ESA	US41192821	2014-05-07	2015-05-06
Rohde & Schwarz	Universal Radio Communication	CMU200	112012	2014-05-07	2015-05-06
GONGWEN	Moisture Test Chamber	GDS-150	SEMT-0013	2014-05-07	2015-05-06

9.3 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

9.4 Environmental Conditions

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

10.5 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 (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	3.7	55	0.0657
40	3.7	43	0.0514
30	3.7	36	0.0430
20	3.7	33	0.0394
10	3.7	28	0.0335
0	3.7	24	0.0287
-10	3.7	39	0.0466
-20	3.7	42	0.0502
-30	3.7	55	0.0657

For PCS Band GSM Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	3.7	63	0.0335
40	3.7	53	0.0282
30	3.7	44	0.0234
20	3.7	29	0.0154
10	3.7	20	0.0106
0	3.7	12	0.0064
-10	3.7	23	0.0122
-20	3.7	35	0.0186
-30	3.7	46	0.0245

For Cellular Band GPRS Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	3.7	52	0.0622
40	3.7	49	0.0586
30	3.7	38	0.0454
20	3.7	32	0.0383
10	3.7	26	0.0311
0	3.7	20	0.0239
-10	3.7	34	0.0406
-20	3.7	39	0.0466
-30	3.7	50	0.0598

For PCS Band GPRS Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	3.7	44	0.0234
40	3.7	41	0.0218
30	3.7	35	0.0186
20	3.7	30	0.0160
10	3.7	25	0.0133
0	3.7	15	0.0080
-10	3.7	22	0.0117
-20	3.7	23	0.0122
-30	3.7	29	0.0154

So, Frequency Stability Versus Input Voltage is:

Reference Frequency(Middle Channel): GSM 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	3.3	41	0.0490
	3.7	12	0.0143
	4.2	31	0.0371
Reference Frequency(Middle Channel): GSM 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	3.3	39	0.0207
	3.7	15	0.0080
	4.2	31	0.0165
Reference Frequency(Middle Channel): GPRS 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	3.3	32	0.0383
	3.7	20	0.0239
	4.2	34	0.0406
Reference Frequency(Middle Channel): GPRS 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	3.3	40	0.0213
	3.7	15	0.0080
	4.2	37	0.0197

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