FCC Part 22H & 24E
Measurement and Test Report

For

Shenzhen Starshine Industrial Limited

Floor 4th, FuYuan Industrial Park, No.140, FuMing Road, Guanlan,

Baoan District, Shenzhen, Guangdong, China

FCC ID: 2APWP-G8

FCC Rules:	FCC Part 22H, FCC Part 24E
Product Description:	gps tracker
Tested Model:	G8
Report No.:	STR18058111I
Sample Receipt Date:	2018-05-11
Tested Date:	2018-05-12 to 2018-05-24
Issued Date:	2018-05-24
Tested By:	Jason Su / Engineer
Reviewed By:	Silin Chen / EMC Manager
Approved & Authorized By:	Jandy So / PSQ Manager

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
1.6 MEASUREMENT UNCERTAINTY 8
1.7 TEST EQUIPMENT LIST AND DETAILS 8
2. SUMMARY OF TEST RESULTS 10
3. RF EXPOSURE 11
3.1 STANDARD APPLICABLE 11
3.2 TEST RESULT 11
4. RF OUTPUT POWER 12
4.1 STANDARD APPLICABLE 12
4.2 TEST PROCEDURE 12
4.3 ENVIRONMENTAL CONDITIONS 12
4.4 SUMMARY OF TEST RESULTS/PLOTS 13
5. PEAK-TO-AVERAGE RATIO (PAR) OF TRANSMITTER 16
5.1 STANDARD APPLICABLE 16
5.2 TEST PROCEDURE 16
5.3 ENVIRONMENTAL CONDITIONS 16
5.4 SUMMARY OF TEST RESULTS 17
6. EMISSION BANDWIDTH 18
6.1 STANDARD APPLICABLE 18
6.2 TEST PROCEDURE 18
6.3 ENVIRONMENTAL CONDITIONS 18
6.4 SUMMARY OF TEST RESULTS/PLOTS 19
7. OUT OF BAND EMISSIONS AT ANTENNA TERMINAL 26
7.1 STANDARD APPLICABLE 26
7.2 TEST PROCEDURE 26
7.3 ENVIRONMENTAL CONDITIONS 26
7.4 SUMMARY OF TEST RESULTS/PLOTS 27
8. SPURIOUS RADIATED EMISSIONS 46
8.1 STANDARD APPLICABLE 46
8.2 TEST PROCEDURE 46
8.3 ENVIRONMENTAL CONDITIONS 46
8.4 SUMMARY OF TEST RESULTS/PLOTS 46
9. FREQUENCY STABILITY 52
9.1 STANDARD APPLICABLE 52
9.2 TEST PROCEDURE 52
9.3 ENVIRONMENTAL CONDITIONS 52
9.4 SUMMARY OF TEST RESULTS/PLOTS 53

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	Shenzhen Starshine Industrial Limited
Address of applicant:	Floor 4th, FuYuan Industrial Park, No.140, FuMing Road, Guanlan, Baoan District, Shenzhen, Guangdong, China
Manufacturer:	Shenzhen Starshine Industrial Limited
Address of manufacturer:	Floor 4th, FuYuan Industrial Park, No.140, FuMing Road, Guanlan, Baoan District, Shenzhen, Guangdong, China

General Description of EUT:	
Product Name:	gps tracker
Brand Name:	/
Model No.:	G8
Adding Model(s):	Z8, K8, K10, GT002, GT008, K80, D19, D79, TK207, T6A
Rated Voltage:	Battery DC 3.7V
Adapter Model:	/
Software Version:	/
Hardware Version:	/
Device Category:	Portable Device
The EUT Main board support GSM850/PCS1900 function. It is intended for speech, Multimedia Message Service (MMS) transmission. It is equipped with GPRS class 12 for GSM850/PCS1900 functions. For more information see the following datasheet	
Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model G8, but the circuit and the electronic construction do not change, declared by the manufacturer.	

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: 32.42dBm, GSM1900: 28.46dBm
Type of Emission:	GSM850: 249KGXW, GSM1900: 255KGXW
Type of Modulation:	GMSK
Type of Antenna:	Integral Antenna
Antenna Gain:	GSM850: -3.0dBi; GSM1900: -2.0dBi
GPRS Class:	Class 12

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Starshine Industrial 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 ANSI/TIA-603-D: 2010 and ANSI C63.4-2014, 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. The measurement guide KDB 971168 D01 Power Meas License Digital Systems v03 shall be performed also.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

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.

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
		836.6 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 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Frequency Stability	Conducted	2.3%
Transmitter Spurious Emissions	Conducted	±0.42dB
Transmitter Spurious Emissions	Radiated	30-200MHz ±4.52dB
		0.2-1GHz ±5.56dB
		1-6GHz ±3.84dB
		6-18GHz ±3.92dB

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
SEMT-1075	Communication Tester	Rohde & Schwarz	CMW500	148650	2017-06-12	2018-06-11
SEMT-1063	GSM Tester	Rohde & Schwarz	CMU200	114403	2017-06-12	2018-06-11
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-12	2018-06-11
SEMT-1079	Spectrum Analyzer	Agilent	N9020A	US47140102	2017-06-12	2018-06-11
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2017-06-12	2018-06-11
SEMT-1081	Vector Signal Generator	Agilent	N5182A	MY47070202	2017-06-12	2018-06-11
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2017-06-12	2018-06-11
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2017-06-12	2018-06-11
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2020-06-07
SEMT-1068	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2020-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2020-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2020-06-07
SEMT-1168	Pre-amplifier	Direction	PAP-0126	14141-12838	2017-08-15	2018-08-14

		Systems Inc.				
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2017-08-15	2018-08-14
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2017-06-12	2018-06-11
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2018-03-19	2021-03-18
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2017-06-12	2018-06-11
SEMT-1048	RF Limiter	ATTEN	AT-BSF-2400~2500	/	2017-06-12	2018-06-11
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2017-06-12	2018-06-11
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	2018-03-19	2019-03-18
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	2018-03-19	2019-03-18
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	2018-03-19	2019-03-18
SEMT-C004	Cable	Zheng DI	2M0RFC	/	2018-03-19	2019-03-18
SEMT-C005	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18
SEMT-C006	Cable	Zheng DI	1M0RFC	/	2018-03-19	2019-03-18

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
§ 24.51	Peak-to-average Ratio (PAR) of Transmitter	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

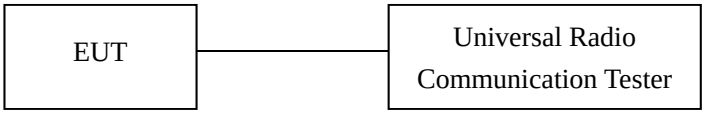
4.1 Standard Applicable

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 ANSI/TIA Standard 603D and ANSI C63.4-2014 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

Max. Radiated Power

ERP For GSM Mode GSM850

Frequency	Substitude 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	32.17	1.5	24	H	1.5	0	30.67	38.45
824.2	31.11	1.5	55	V	1.5	0	29.61	38.45
Middle Channel								
836.4	31.27	1.5	128	H	1.5	0	29.77	38.45
836.4	30.77	1.5	48	V	1.5	0	29.27	38.45
High Channel								
848.8	32.13	1.5	25	H	1.5	0	30.63	38.45
848.8	30.75	1.5	111	V	1.5	0	29.25	38.45

EIRP For GSM Mode PCS1900

Frequency	Substitude 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	22.57	1.5	65	H	1.9	7.7	28.37	33.00
1850.2	21.02	1.5	78	V	1.9	7.7	26.82	33.00
Middle Channel								
1880.0	22.46	1.5	44	H	1.9	7.7	28.26	33.00
1880.0	21.49	1.5	12	V	1.9	7.7	27.29	33.00
High Channel								
1909.8	21.99	1.5	37	H	1.9	7.7	27.79	33.00
1909.8	22.91	1.5	22	V	1.9	7.7	28.71	33.00

ERP For GPRS Mode GSM850

Frequency	Substitude 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	31.25	1.5	134	H	1.5	0	29.75	38.45
824.2	29.42	1.5	88	V	1.5	0	27.92	38.45
Middle Channel								
836.6	31.42	1.5	25	H	1.5	0	29.92	38.45
836.6	29.89	1.5	255	V	1.5	0	28.39	38.45
High Channel								
848.8	30.22	1.5	164	H	1.5	0	28.72	38.45
848.8	31.9	1.5	175	V	1.5	0	30.4	38.45

EIRP For GPRS Mode PCS1900

Frequency	Substitude 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	21.05	1.5	18	H	1.9	7.7	26.85	33.00
1850.2	20.22	1.5	109	V	1.9	7.7	26.02	33.00
Middle Channel								
1880.0	22.13	1.5	152	H	1.9	7.7	27.93	33.00
1880.0	21.02	1.5	143	V	1.9	7.7	26.82	33.00
High Channel								
1909.8	21.39	1.5	176	H	1.9	7.7	27.19	33.00
1909.8	20.91	1.5	22	V	1.9	7.7	26.71	33.00

Note: Result = Substitude - 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	32.27	38.45
	Middle Channel	836.6	32.36	38.45
	High Channel	848.8	32.35	38.45
GPRS(1 Slot)	Low Channel	824.2	32.31	38.45
	Middle Channel	836.6	32.42	38.45
	High Channel	848.8	32.40	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	28.31	33.0
	Middle Channel	1880.0	28.42	33.0
	High Channel	1909.8	28.46	33.0
GPRS(1 Slot)	Low Channel	1850.2	28.01	33.0
	Middle Channel	1880.0	28.16	33.0
	High Channel	1909.8	28.27	33.0

5. Peak-to-average Ratio (PAR) of Transmitter

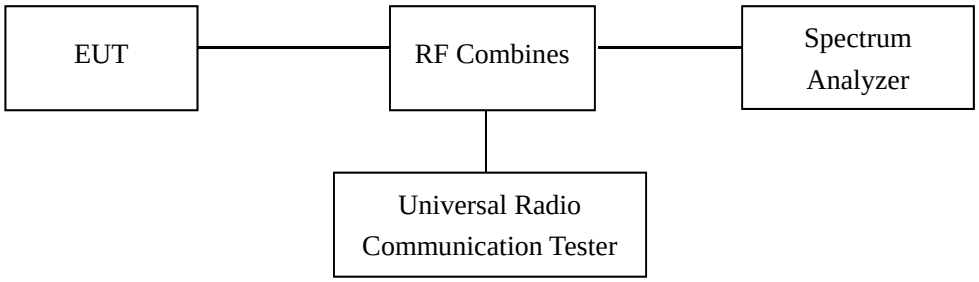
5.1 Standard Applicable

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. Record the maximum PAPR level associated with a probability of 0.1%.

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

Only the worst case was selected to record

For PCS Band

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
GSM	512	1850.2	6.65	13
GPRS(1 Slot)	512	1850.2	7.25	13

6. Emission Bandwidth

6.1 Standard Applicable

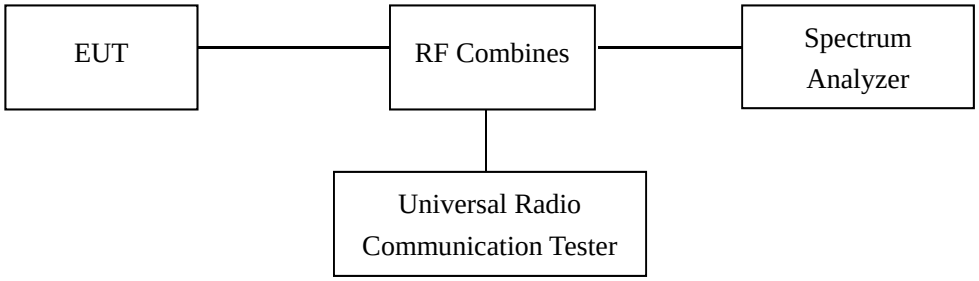
According to §22.917(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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 10kHz for GSM mode and 100kHz for WCDMA mode, VBW shall be at least 3 times the RBW, 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

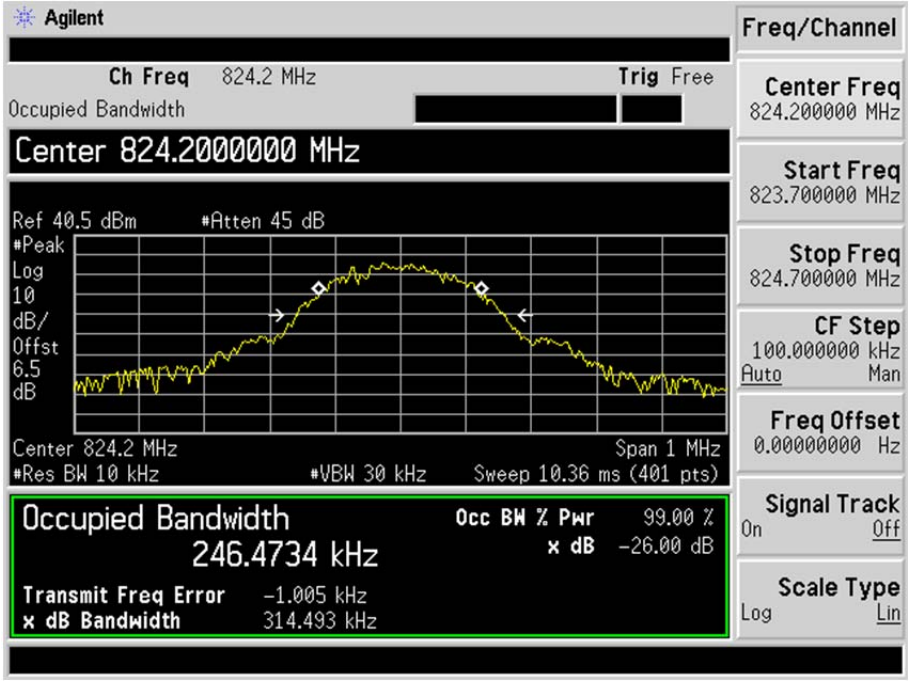
Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	128	824.2	246.4734	314.493
	190	836.6	247.2846	321.276
	251	848.8	243.7413	307.678
GPRS	128	824.2	239.4670	322.525
	190	836.6	247.5882	309.005
	251	848.8	249.0544	320.828

For PCS Band

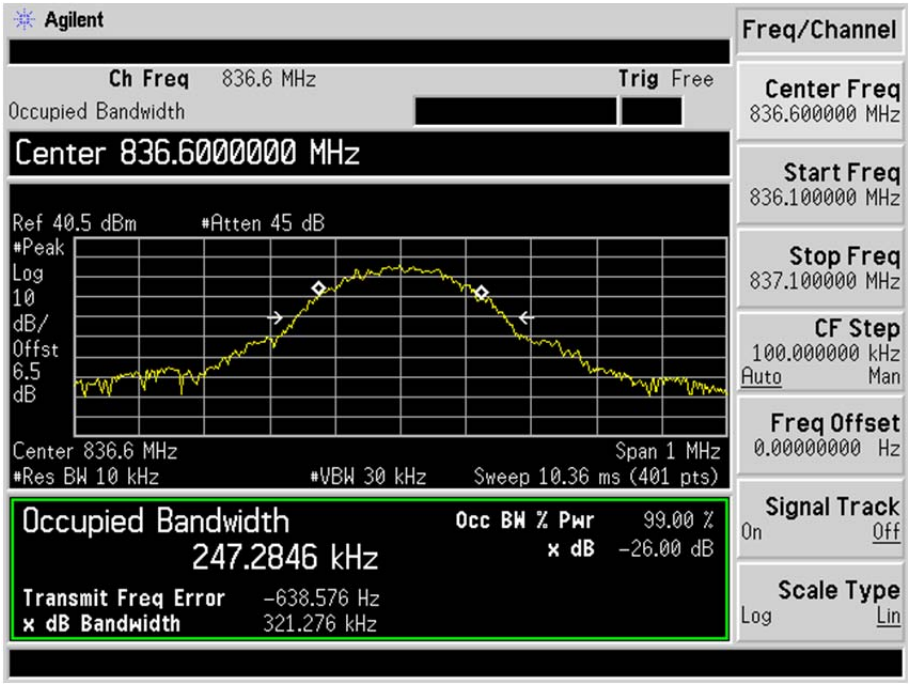
Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	512	1850.2	250.8253	316.791
	661	1880.0	244.3342	308.691
	810	1909.8	245.8515	305.987
GPRS	512	1850.2	241.5874	314.365
	661	1880.0	245.2140	311.527
	810	1909.8	255.4321	315.903

For Cellular Band

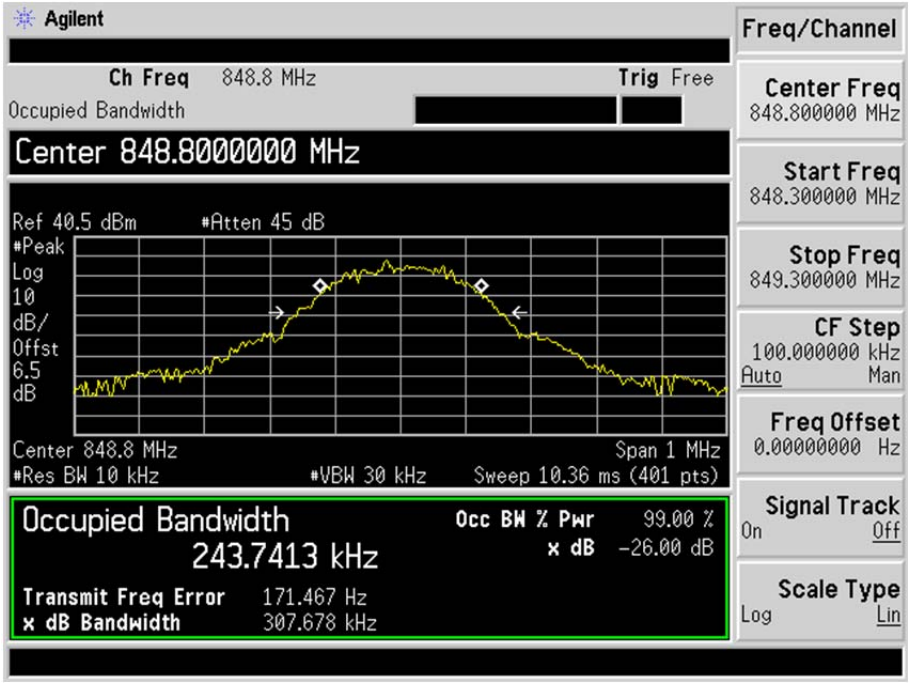
GSM Low Channel



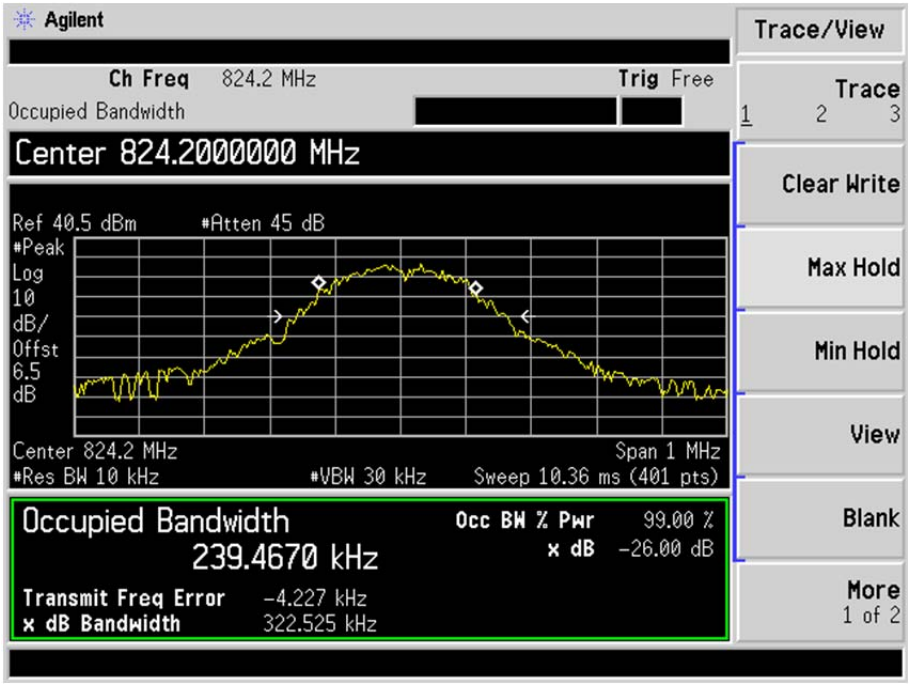
GSM Middle Channel



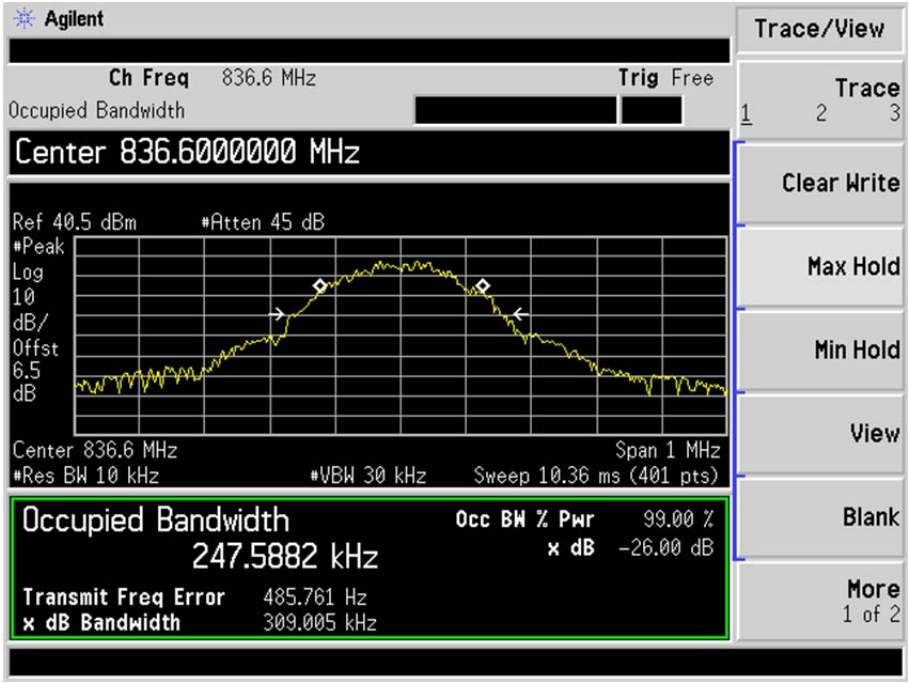
GSM High channel



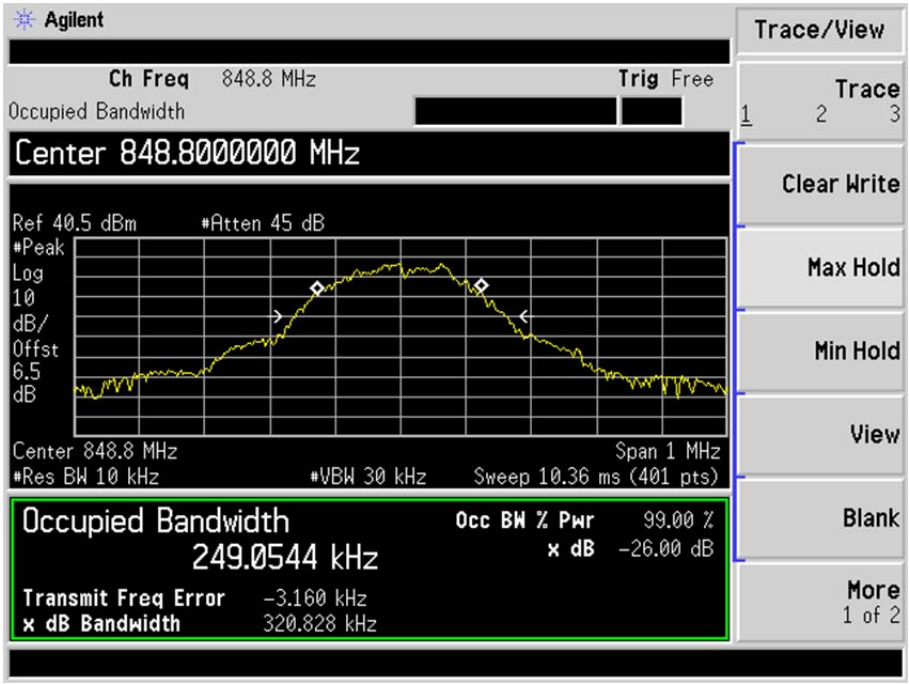
GPRS Low Channel



GPRS Middle Channel

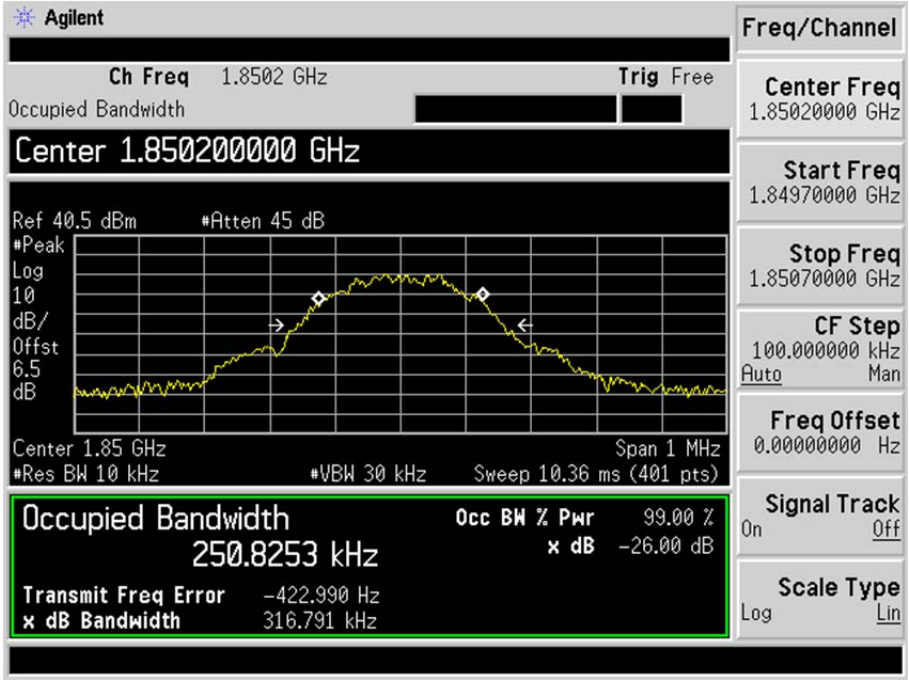


GPRS High Channel

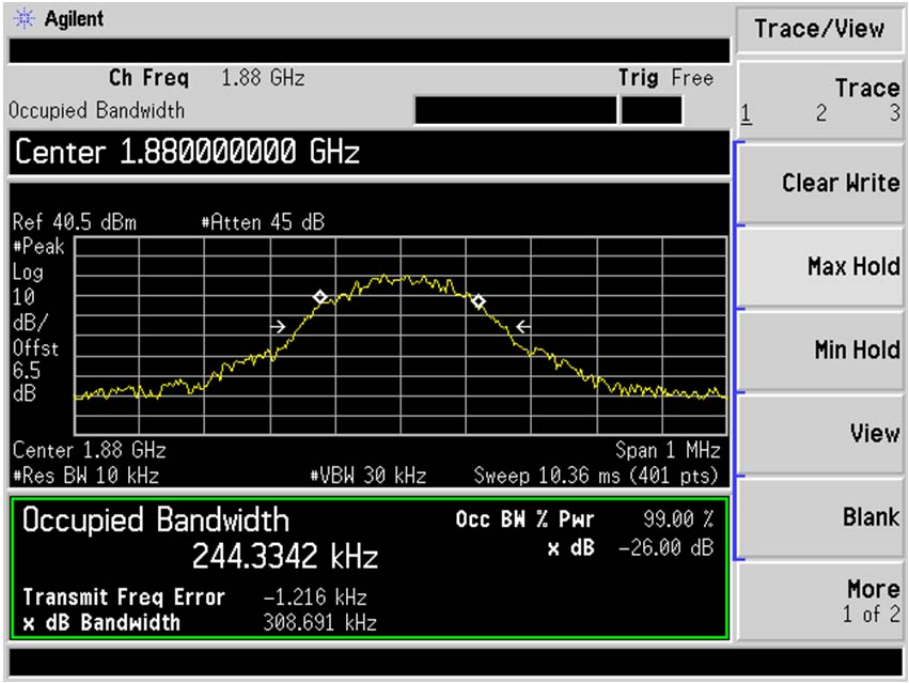


For PCS Band

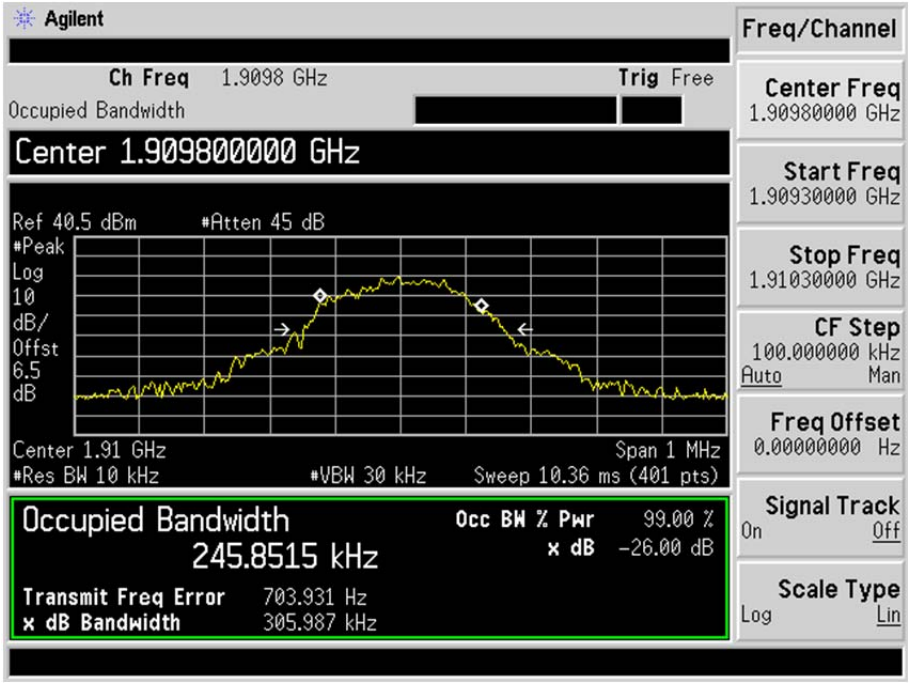
GSM Low Channel



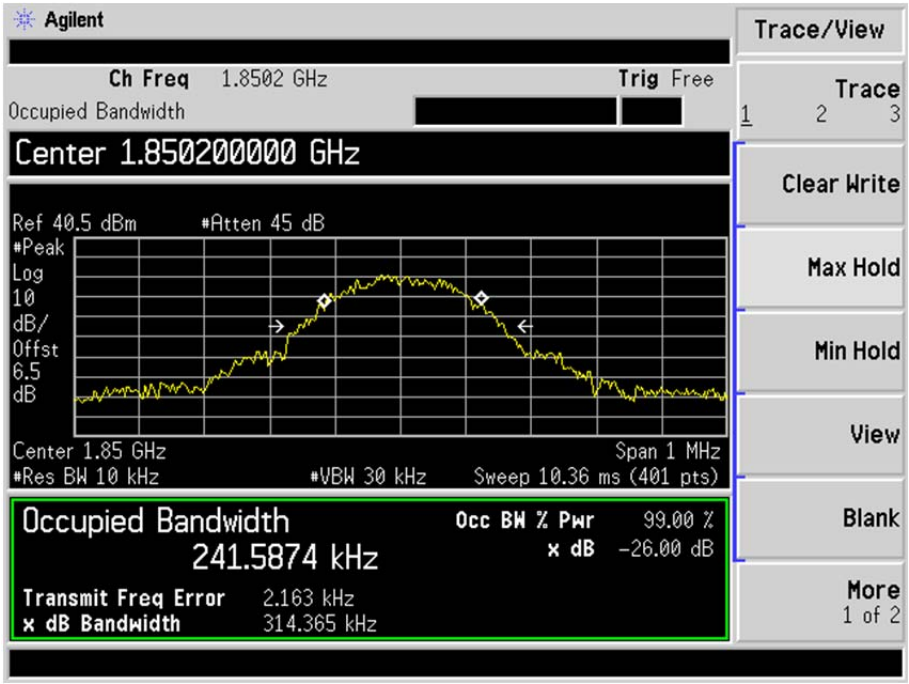
GSM Middle Channel



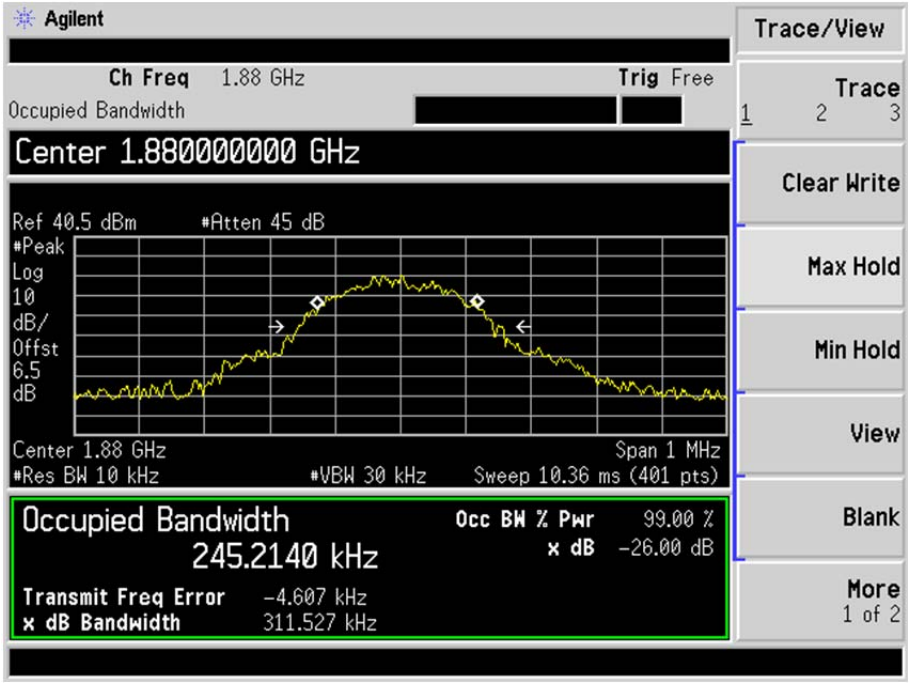
GSM High channel



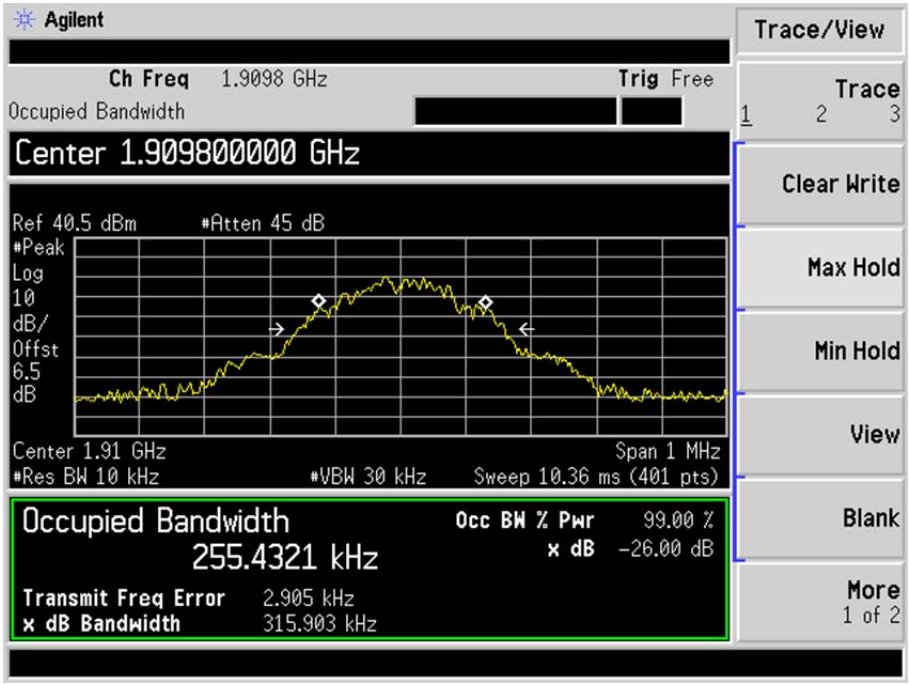
GPRS Low Channel



GPRS Middle Channel



GPRS High Channel



7. Out of Band Emissions at Antenna Terminal

7.1 Standard Applicable

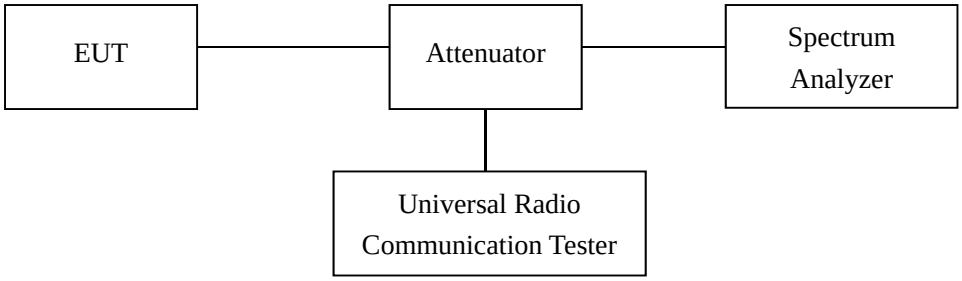
According to §22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

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 10th harmonic.

Test Configuration for the out of band emissions testing:



7.3 Environmental Conditions

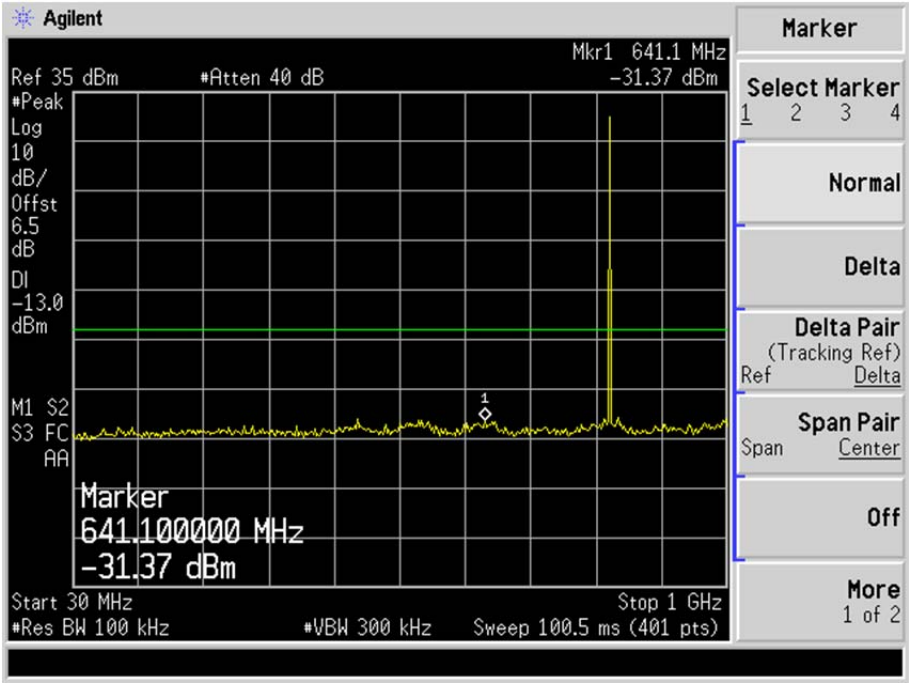
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

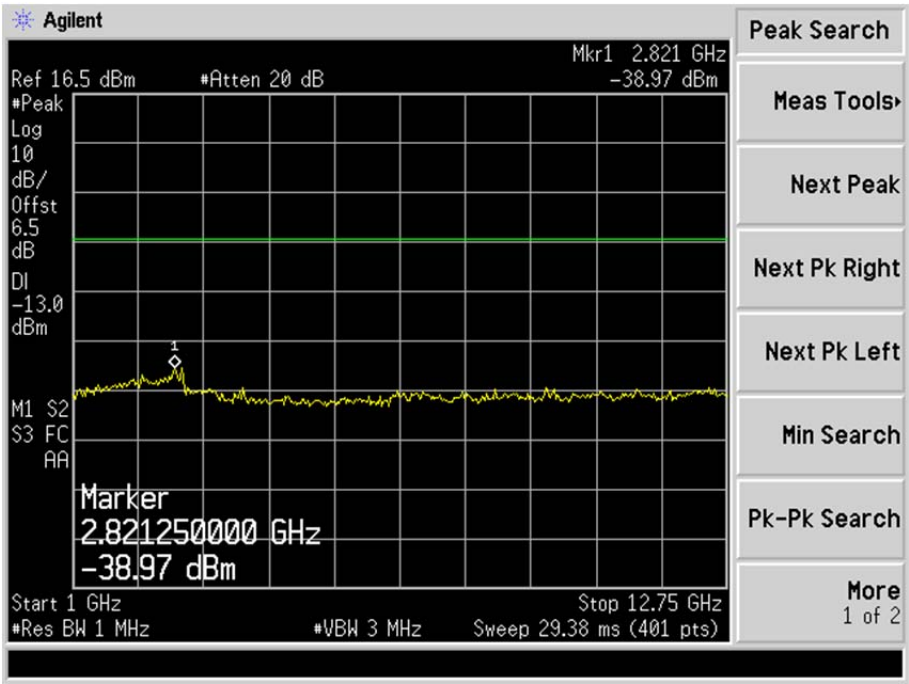
7.4 Summary of Test Results/Plots

Please refer to the following test plots For Cellular Band

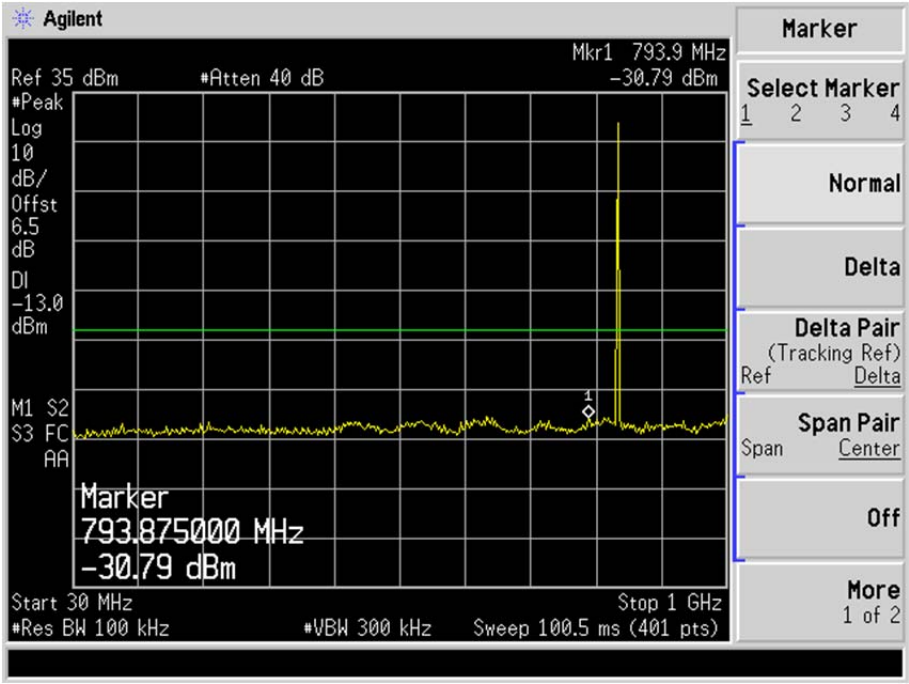
Please refer to the following test plots For Cellular Band

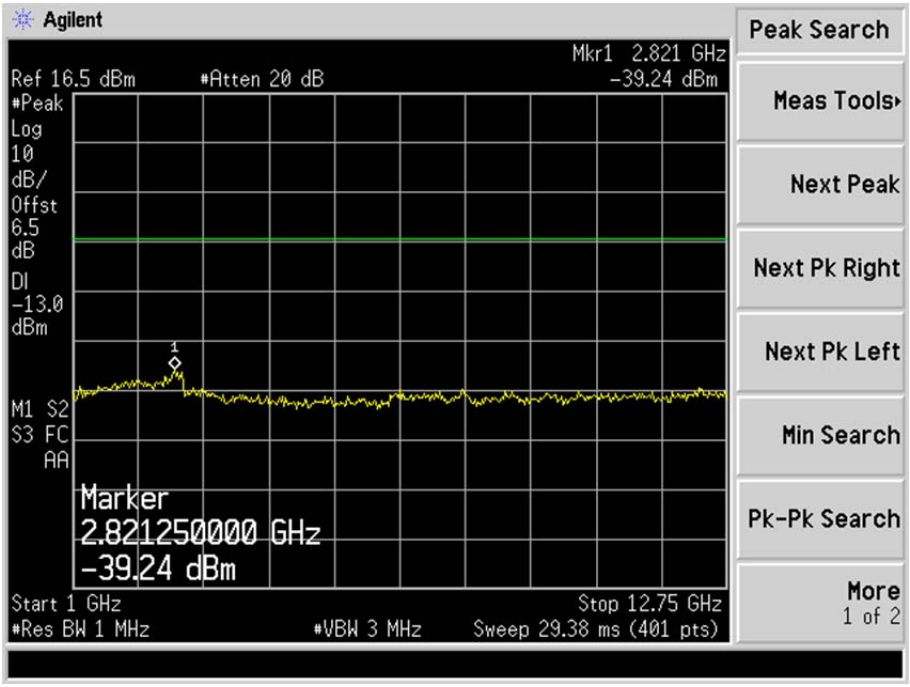
GSM Low Channel



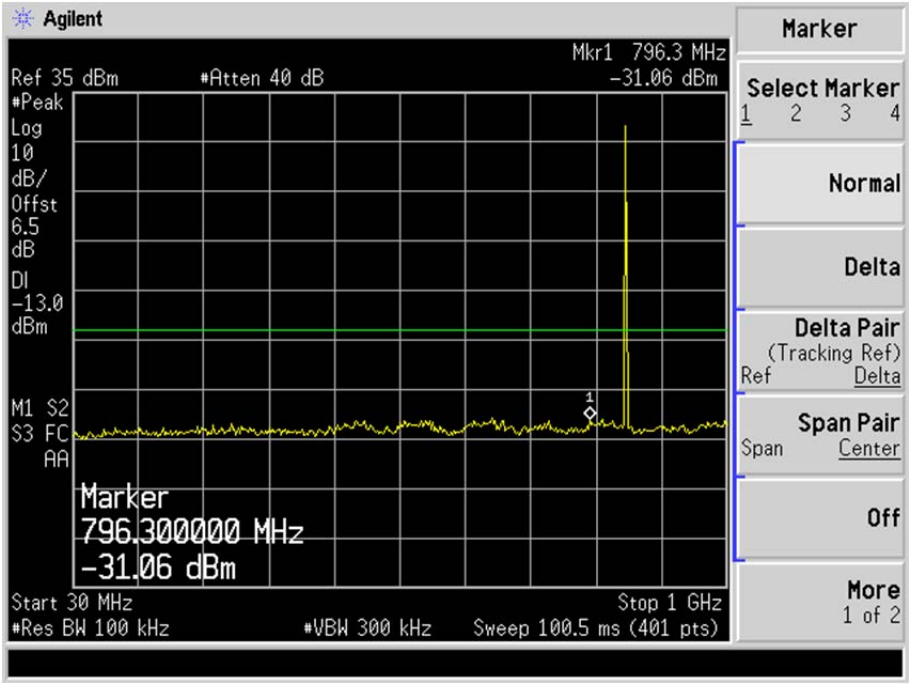


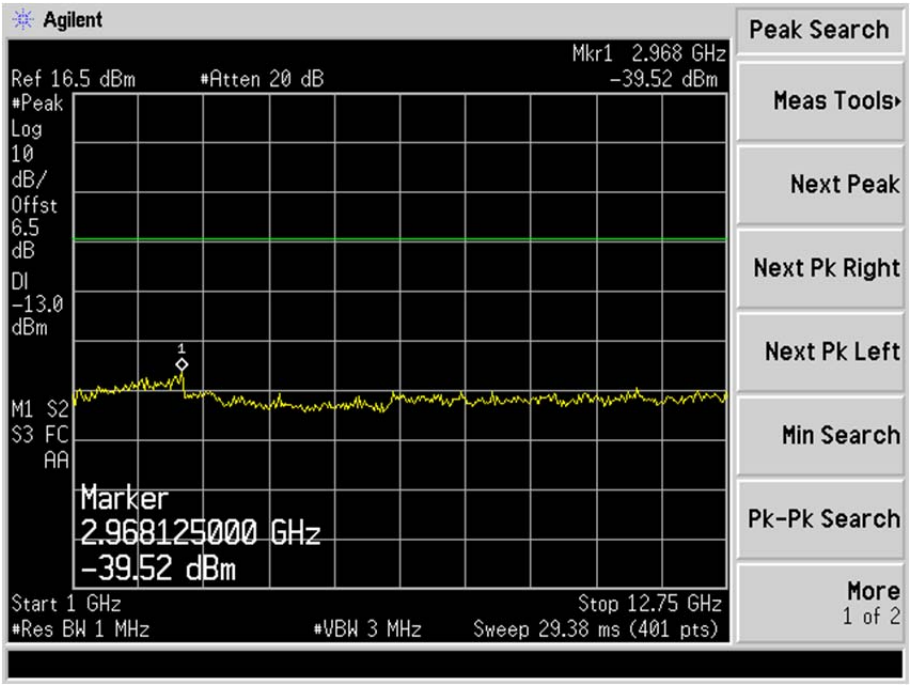
GSM Middle Channel



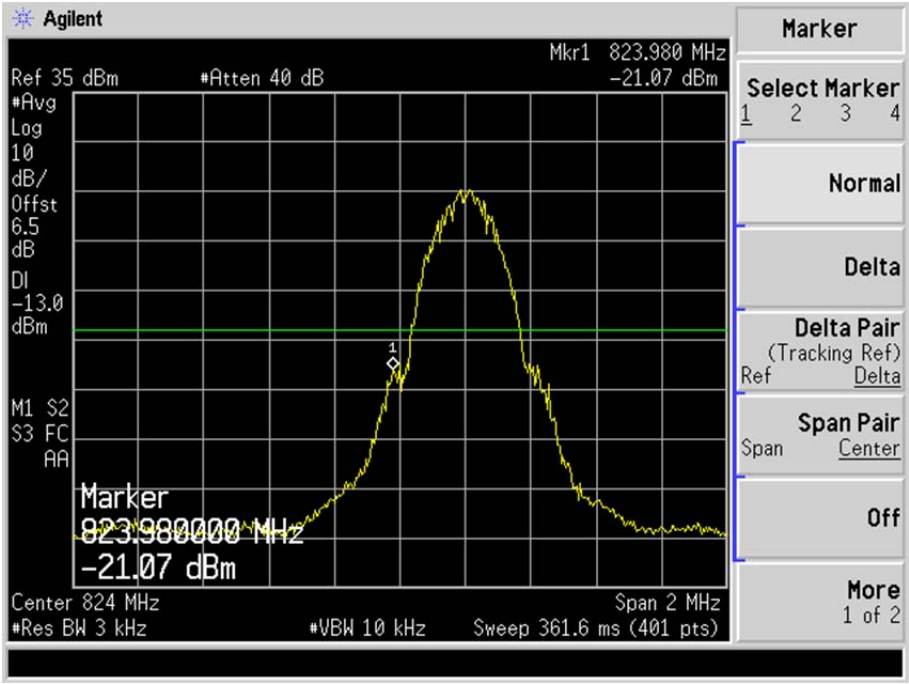


GSM High Channel

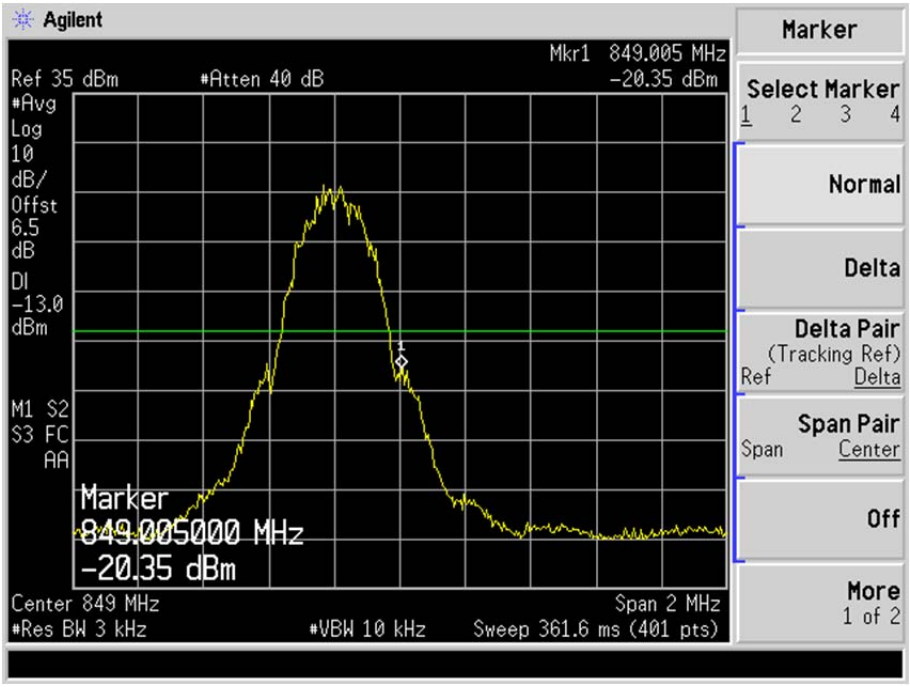




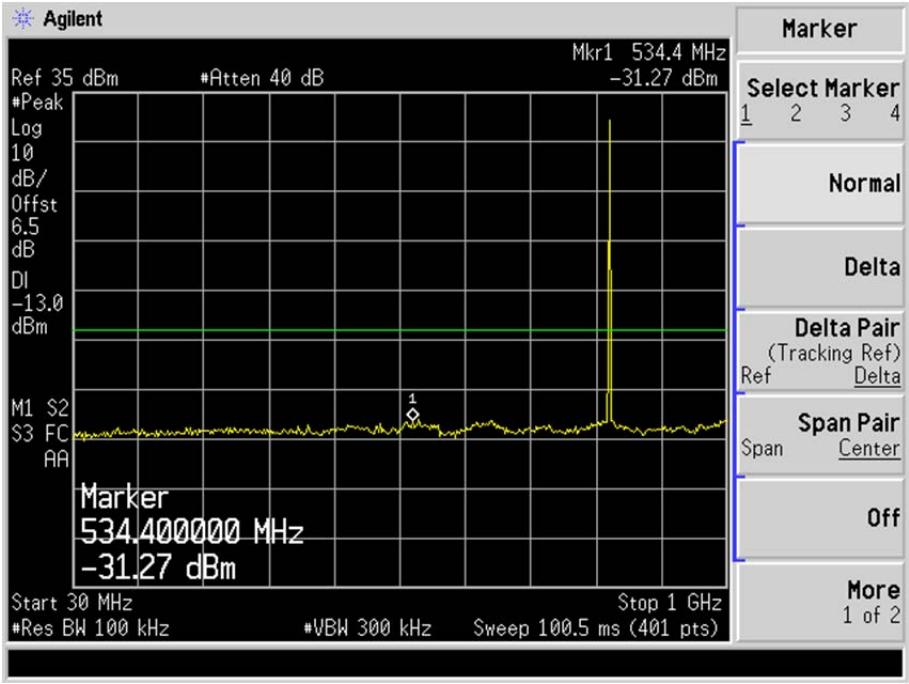
GSM Low Band Emission

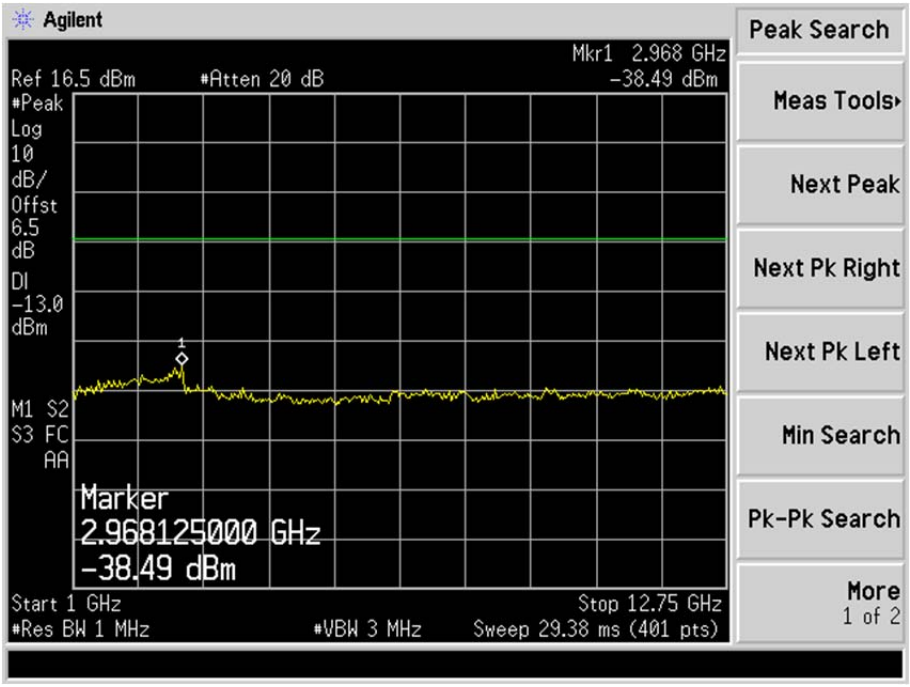


GSM High Band Emission

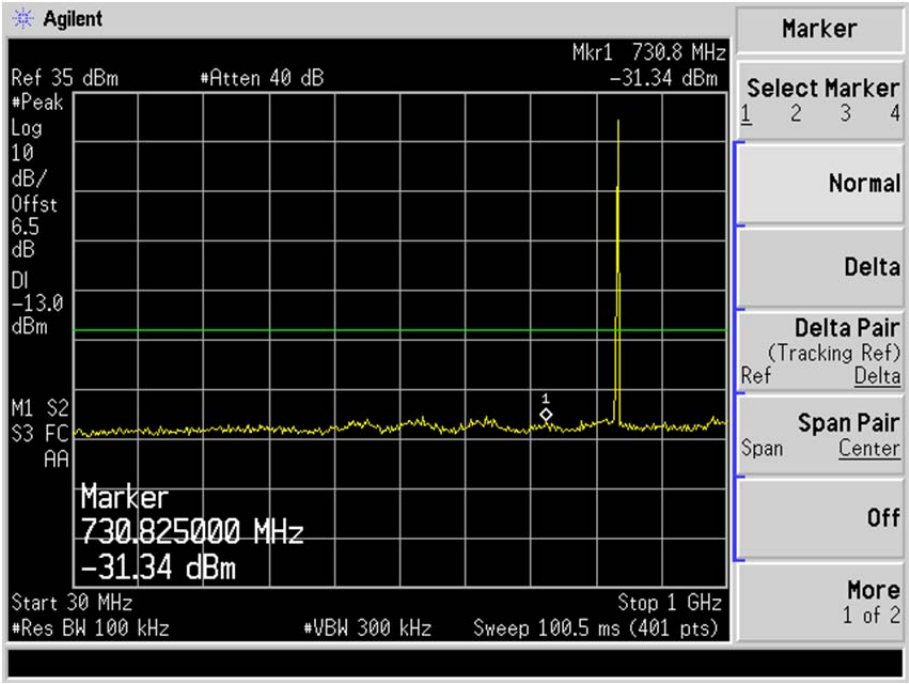


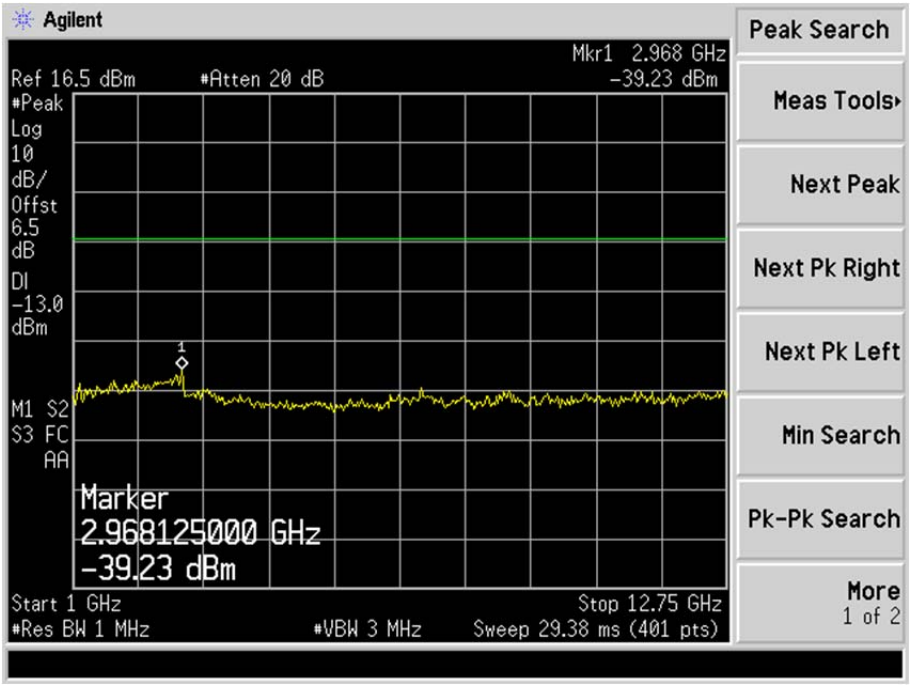
GPRS Low Channel



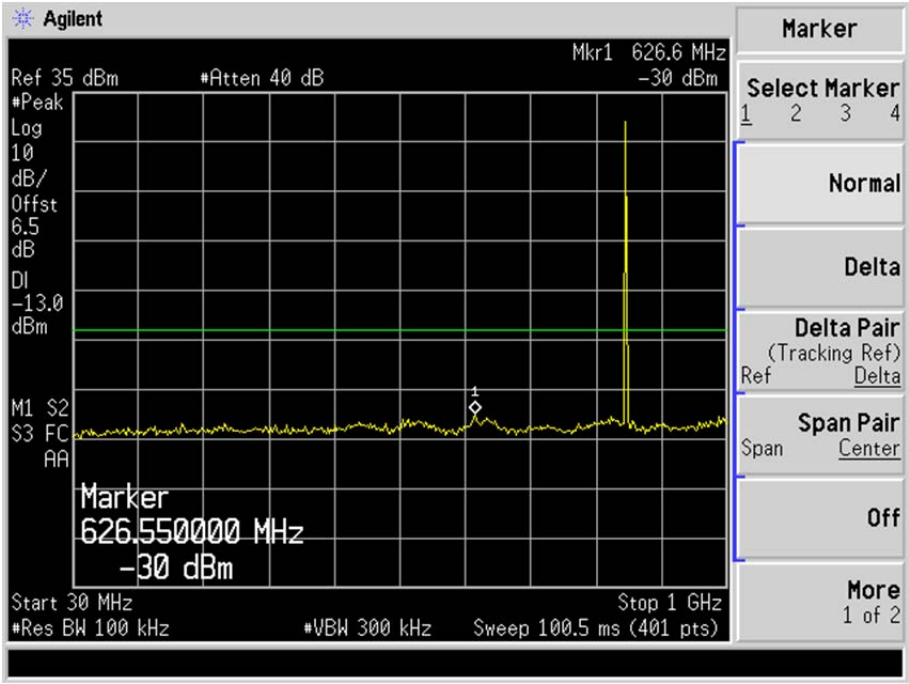


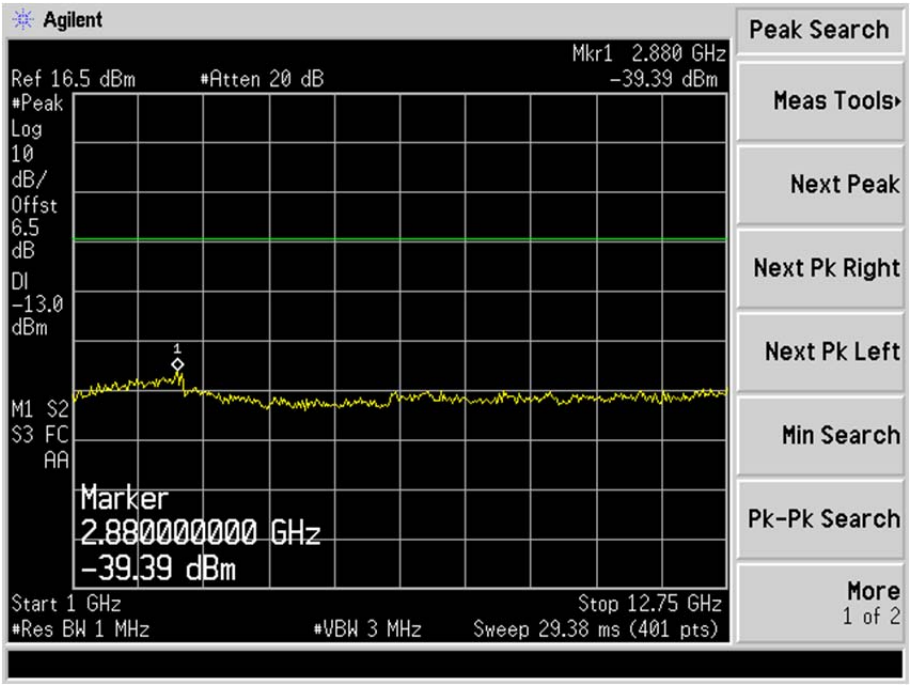
GPRS Middle Channel



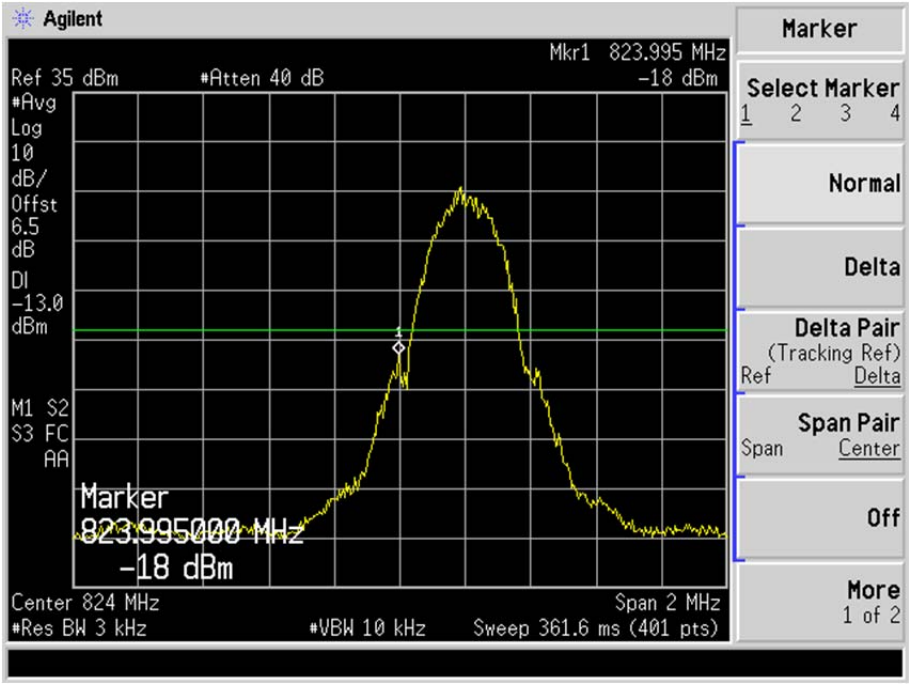


GPRS High Channel

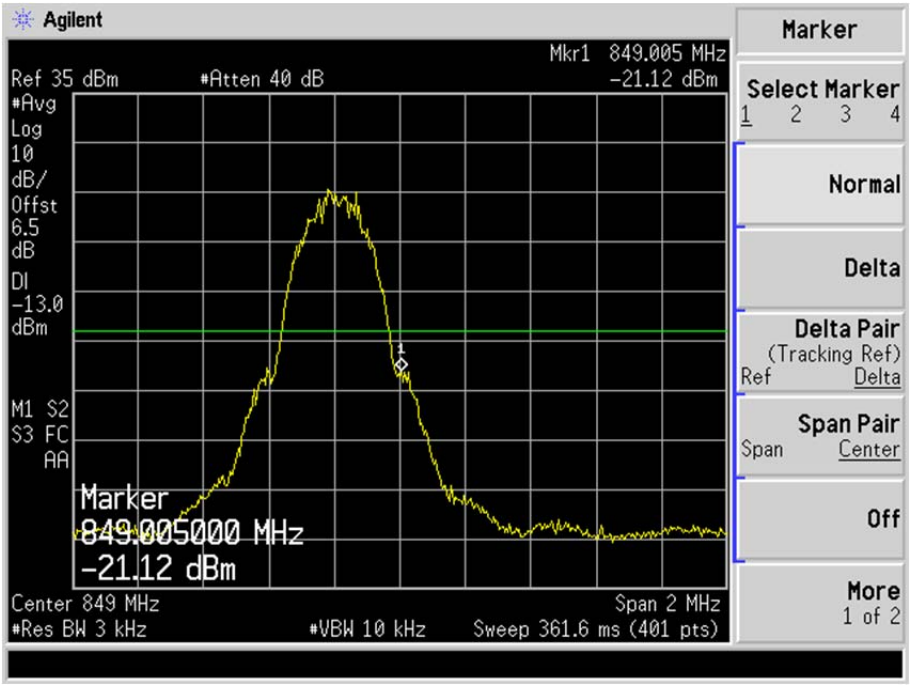




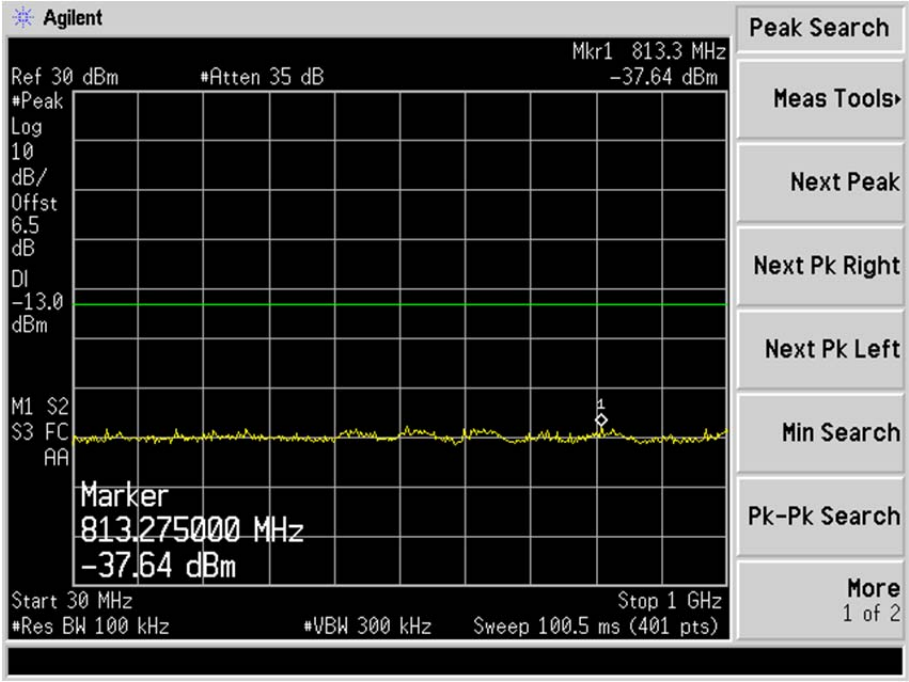
GPRS Low Band Emission

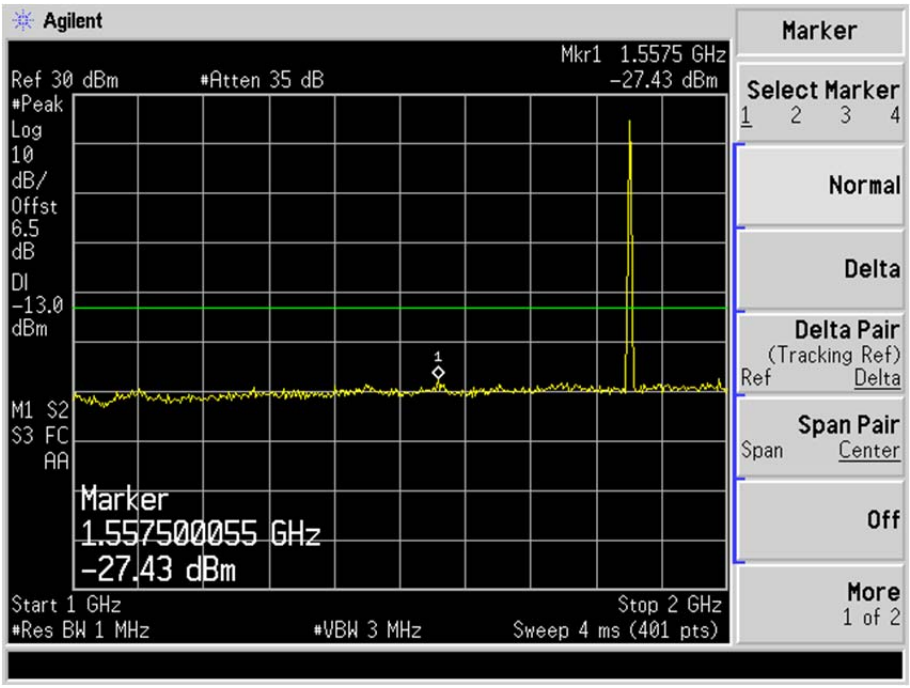


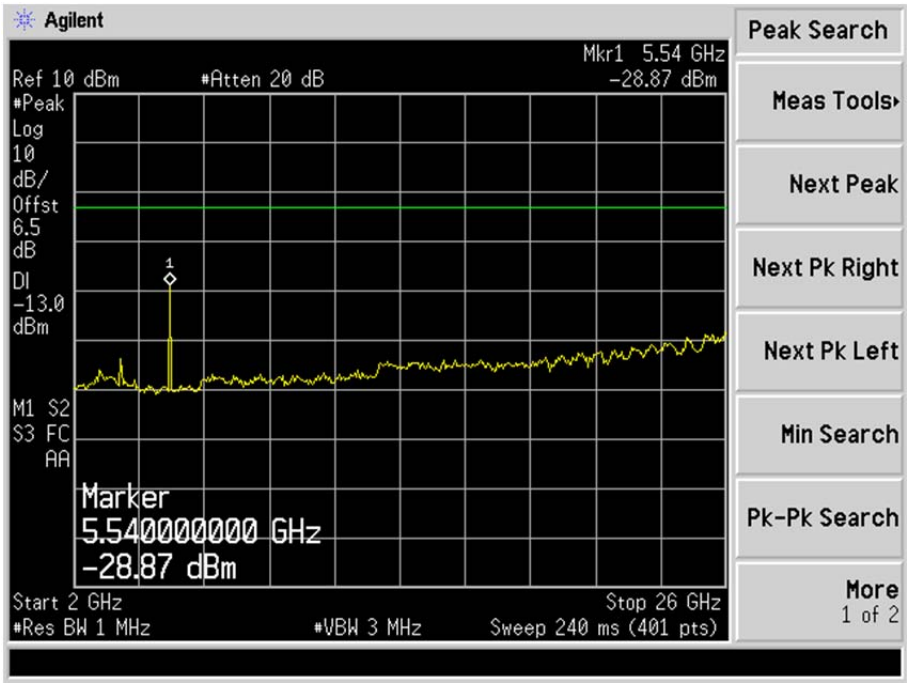
GPRS High Band Emission



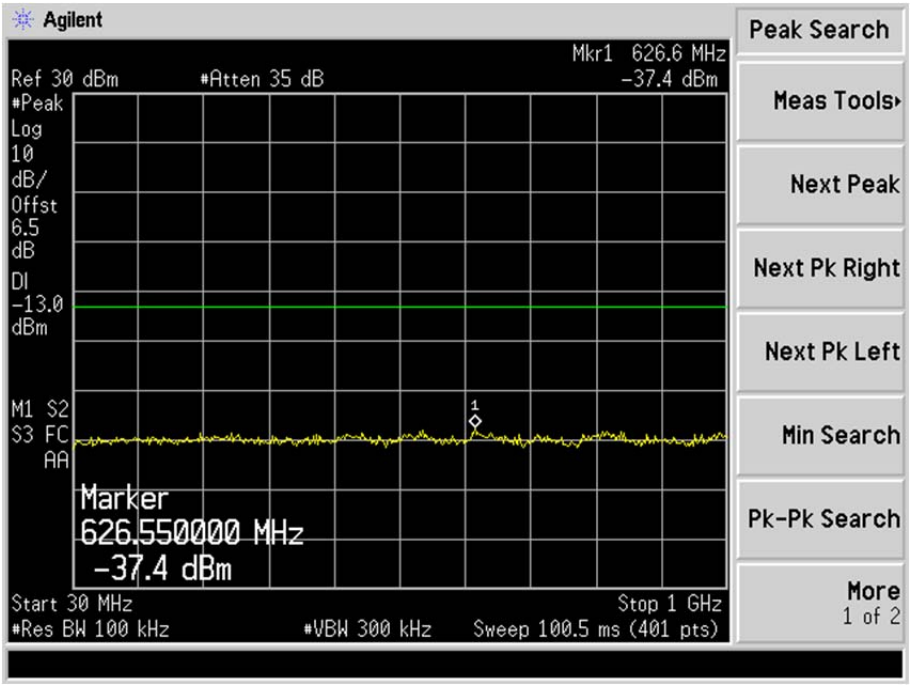
For PCS Band
GSM Low Channel

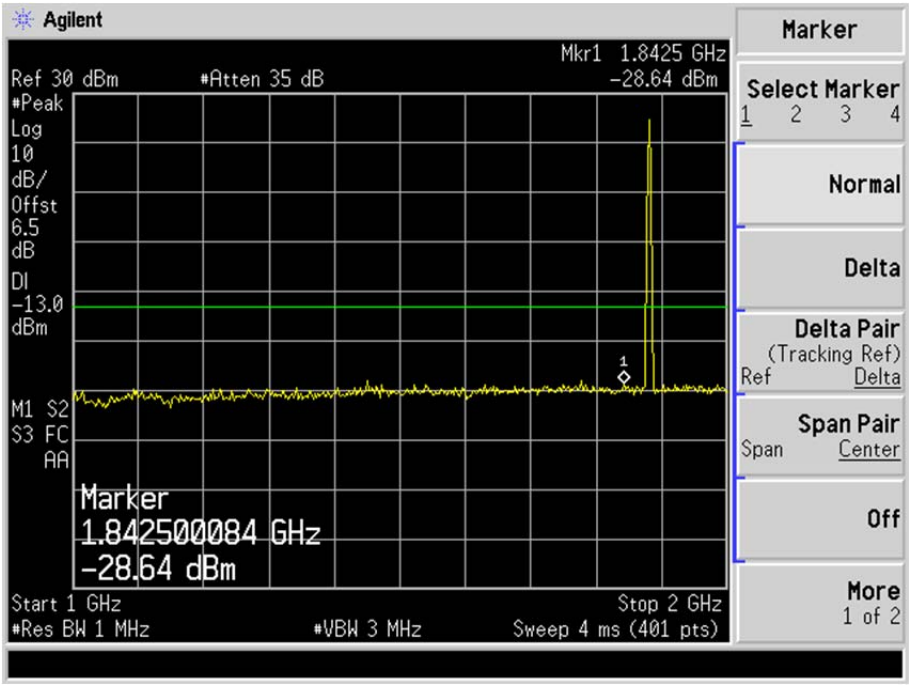


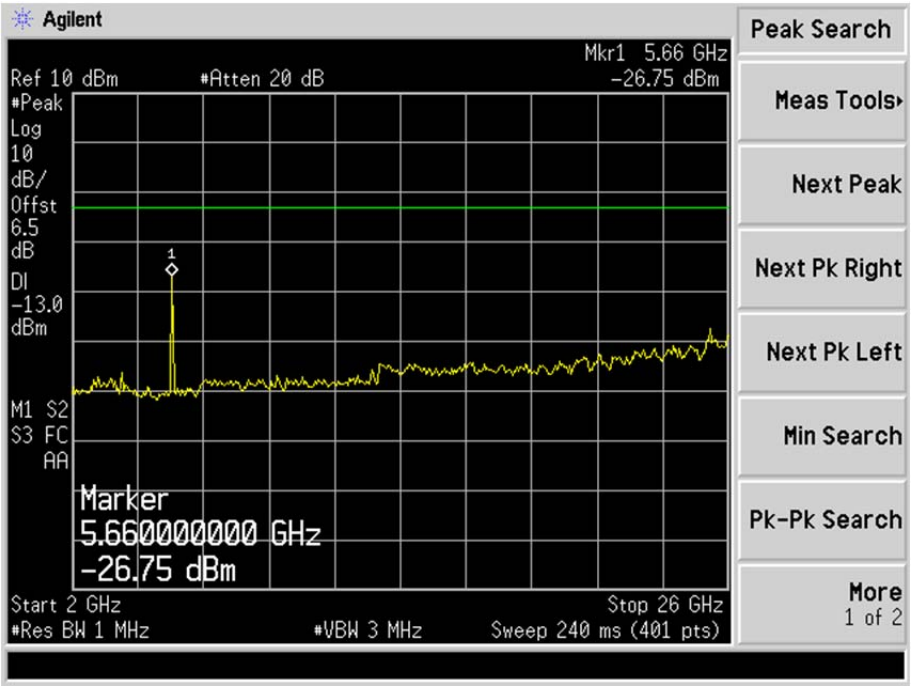




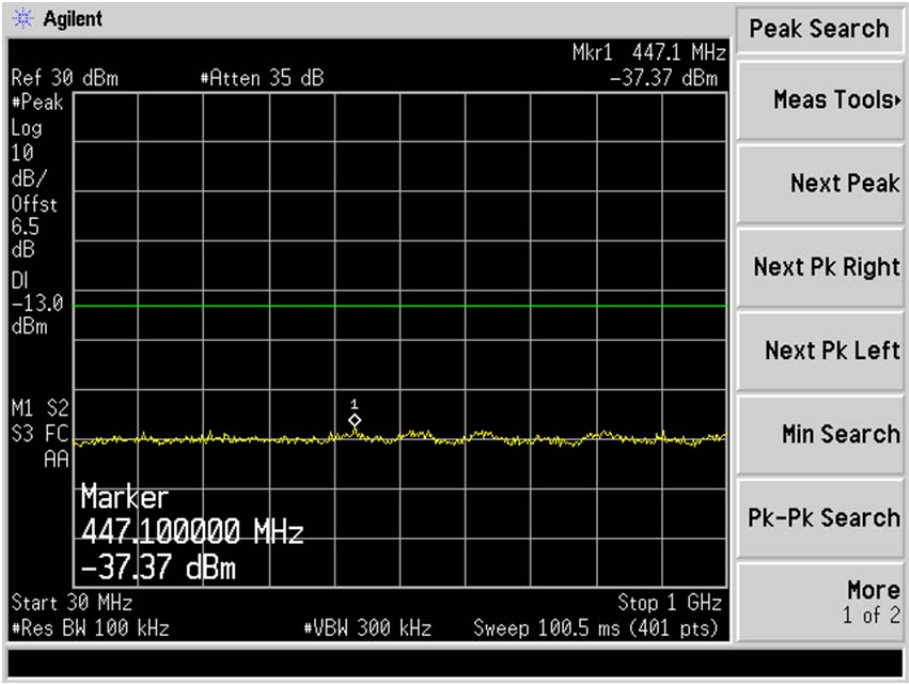
GSM Middle Channel

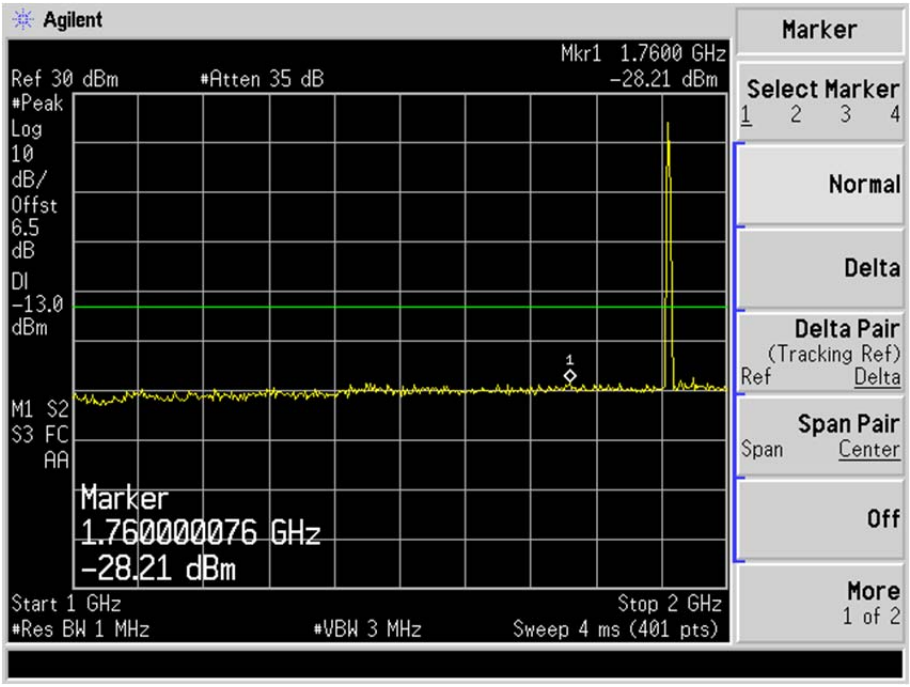


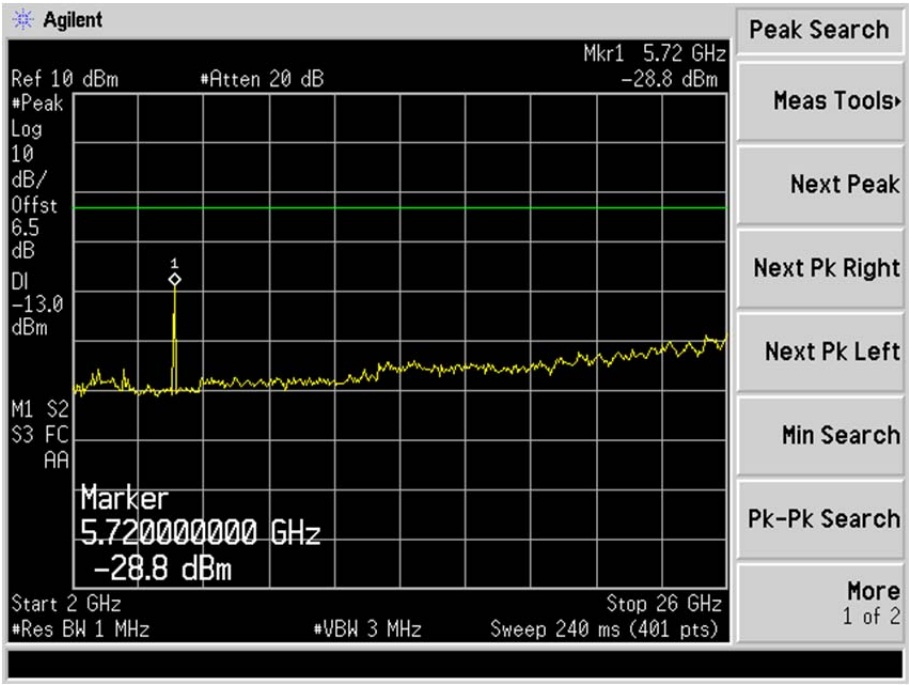

Agilent
Mkr1 1.8425 GHz
Ref 30 dBm
#Atten 35 dB
-28.64 dBm
#Peak
Log
10
dB/
Offst
6.5
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
Marker
1.842500084 GHz
-28.64 dBm
Start 1 GHz
Stop 2 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
Mkr1 5.66 GHz
Ref 10 dBm
#Atten 20 dB
-26.75 dBm
#Peak
Log
10
dB/
Offst
6.5
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
Marker
5.660000000 GHz
-26.75 dBm
Start 2 GHz
Stop 26 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 240 ms (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

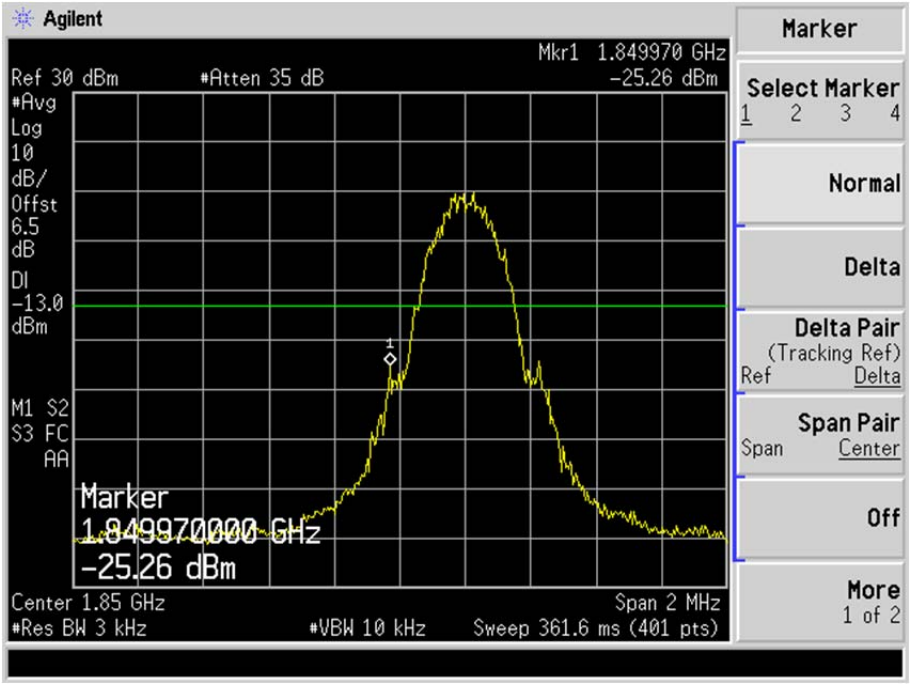
GSM High Channel



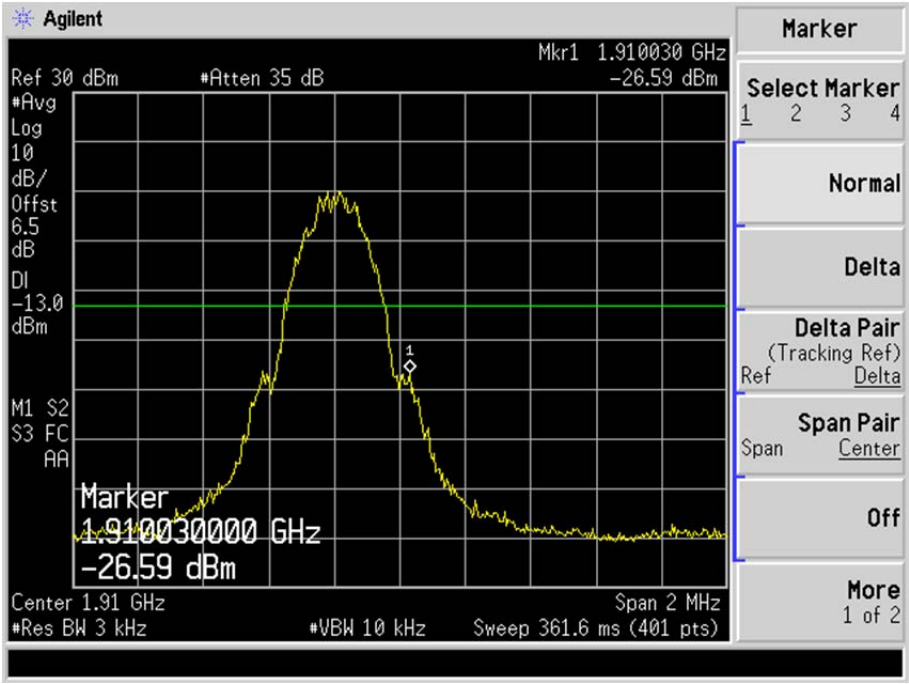




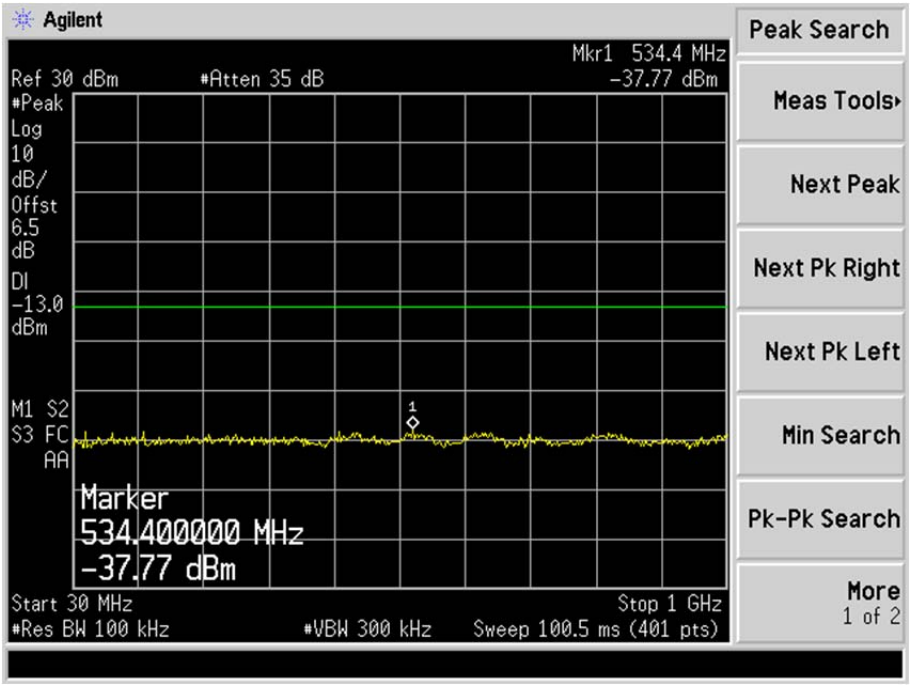
GSM Low Band Emission

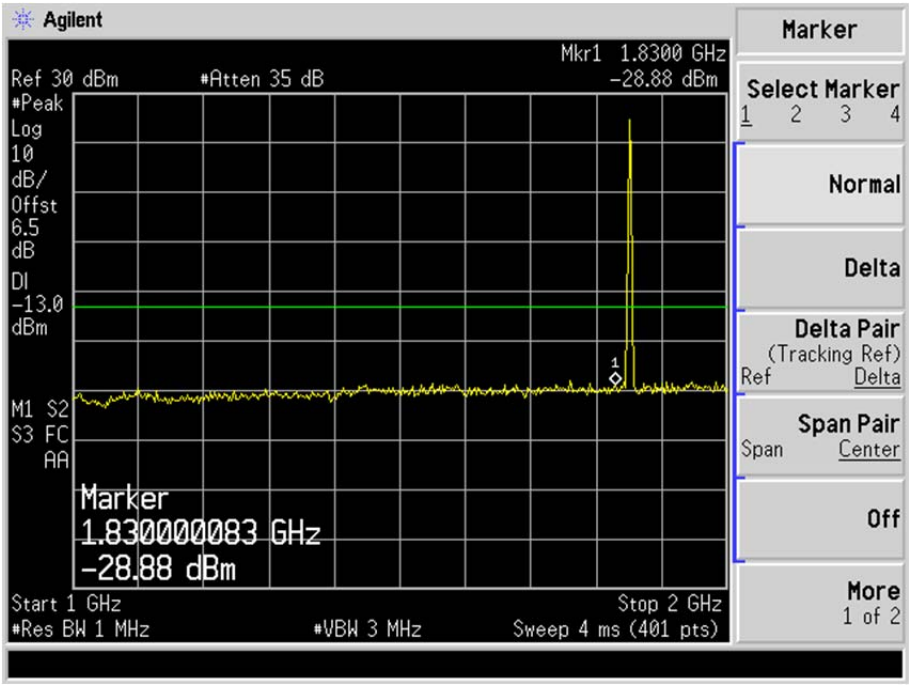


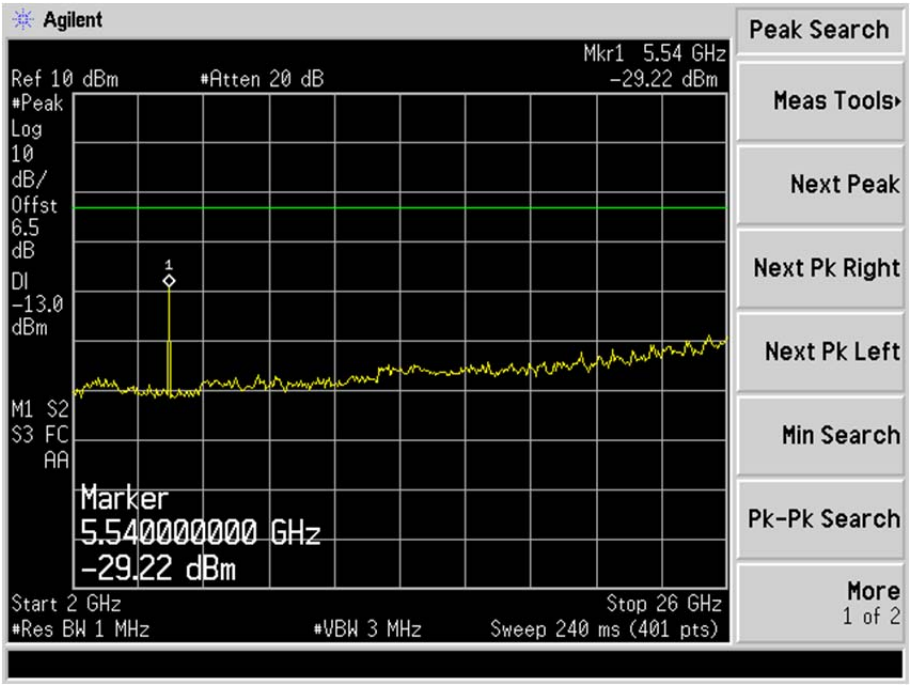
GSM High Band Emission



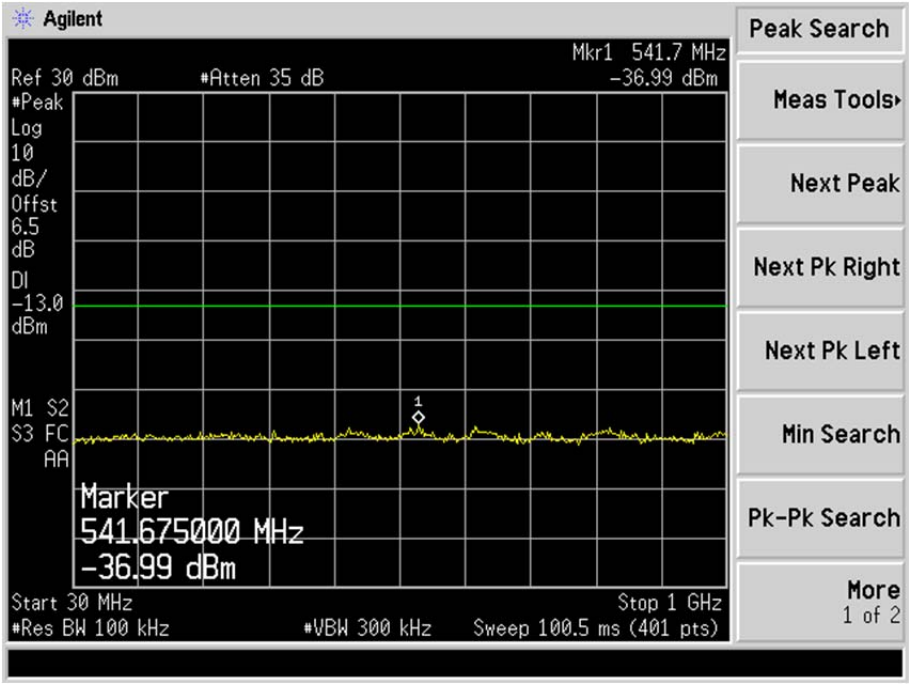
GPRS Low Channel

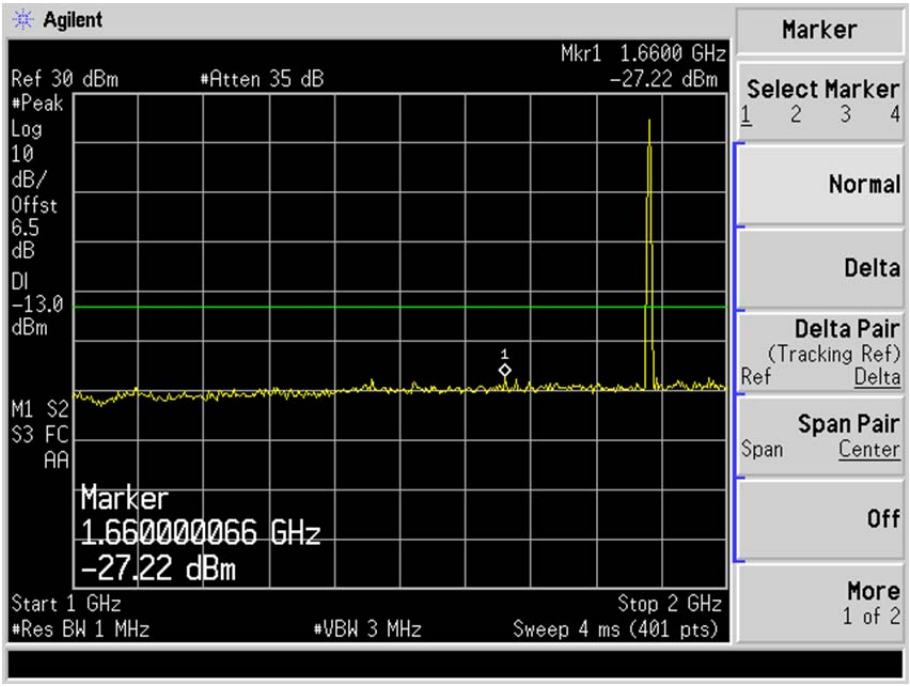


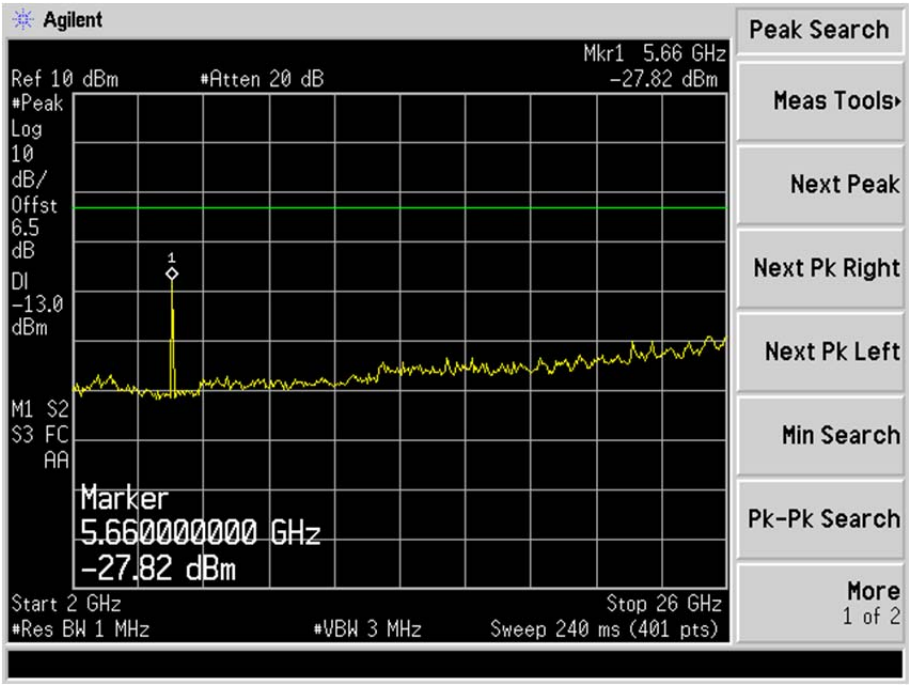

Agilent
Mkr1 1.8300 GHz
Ref 30 dBm
#Atten 35 dB
-28.88 dBm
#Peak
Log
10
dB/
Offst
6.5
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
Marker
1.830000083 GHz
-28.88 dBm
Start 1 GHz
Stop 2 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
Mkr1 5.54 GHz
Ref 10 dBm
#Atten 20 dB
-29.22 dBm
#Peak
Log
10
dB/
Offst
6.5
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
Marker
5.540000000 GHz
-29.22 dBm
Start 2 GHz
Stop 26 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 240 ms (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

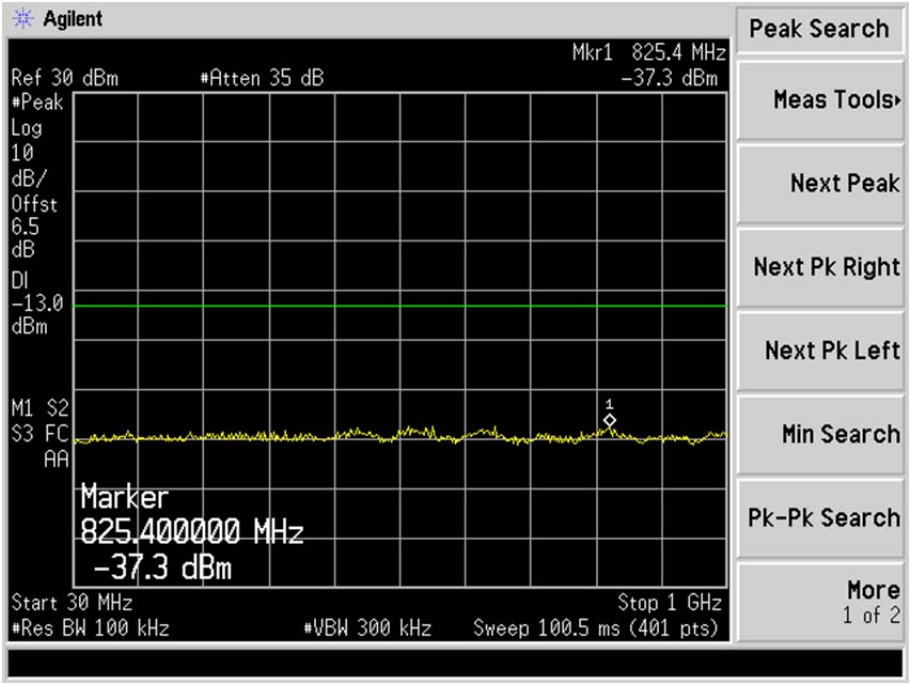
GPRS Middle Channel

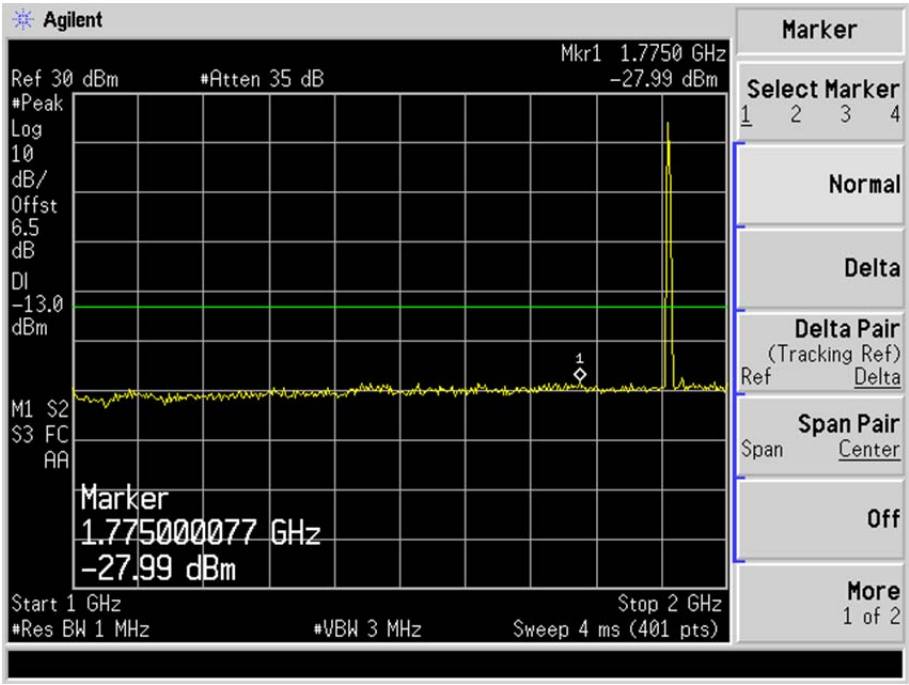


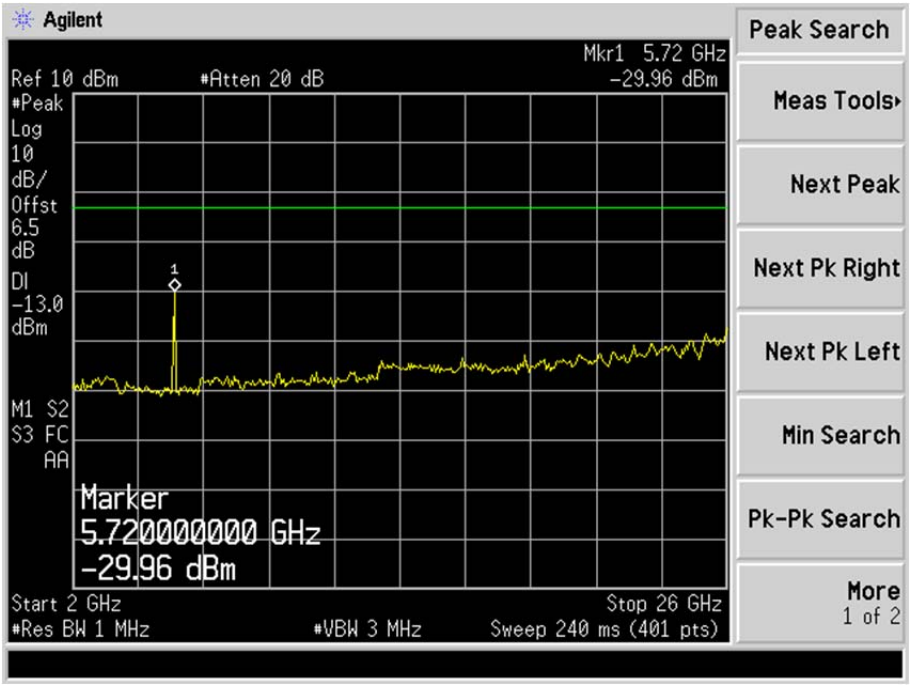




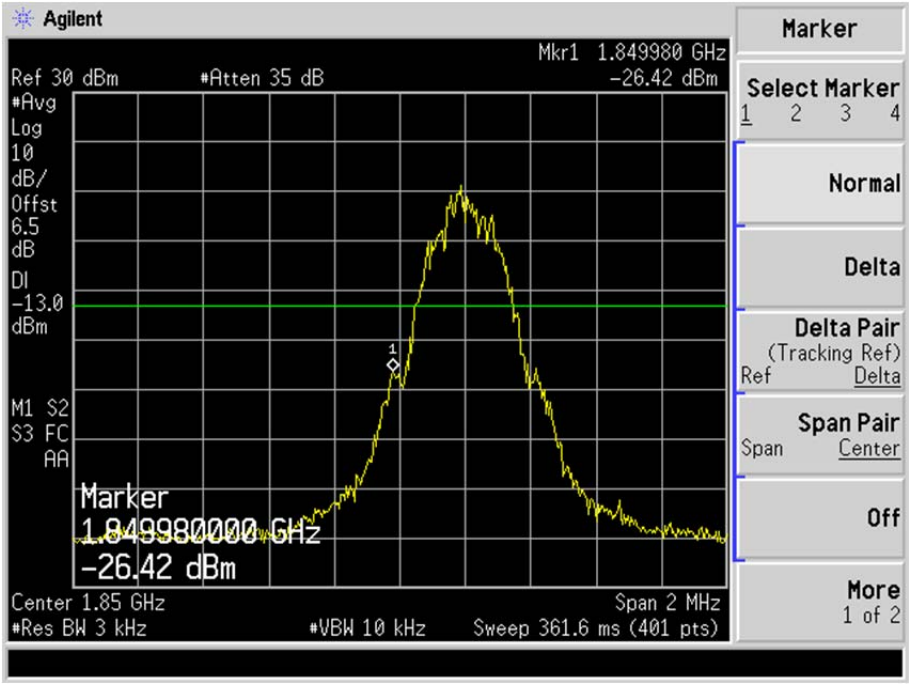
GPRS High Channel



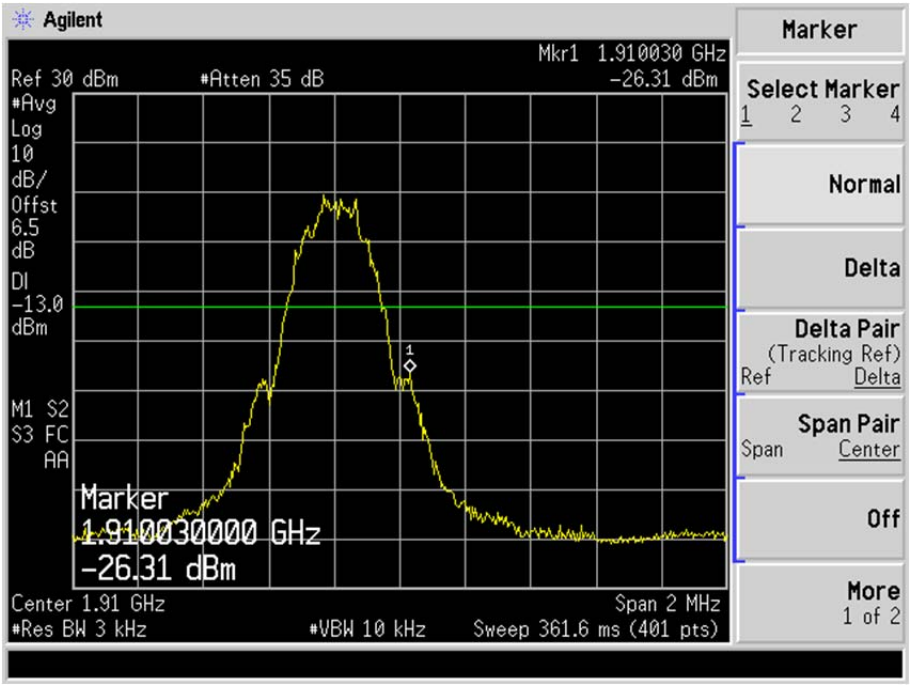

Agilent
Mkr1 1.7750 GHz
Ref 30 dBm
#Atten 35 dB
-27.99 dBm
#Peak
Log
10
dB/
Offst
6.5
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
Marker
1.775000077 GHz
-27.99 dBm
Start 1 GHz
Stop 2 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 4 ms (401 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
Mkr1 5.72 GHz
Ref 10 dBm
#Atten 20 dB
-29.96 dBm
#Peak
Log
10
dB/
Offst
6.5
dB
Dl
-13.0
dBm
M1 S2
S3 FC
AA
Marker
5.720000000 GHz
-29.96 dBm
Start 2 GHz
Stop 26 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 240 ms (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

GPRS Low Band Emission



GPRS High Band Emission



8. Spurious Radiated Emissions

8.1 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.

8.2 Test Procedure

1. The setup of EUT is according with per ANSI/TIA Standard 603D and ANSI C63.4-2014 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)

8.3 Environmental Conditions

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

8.4 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:

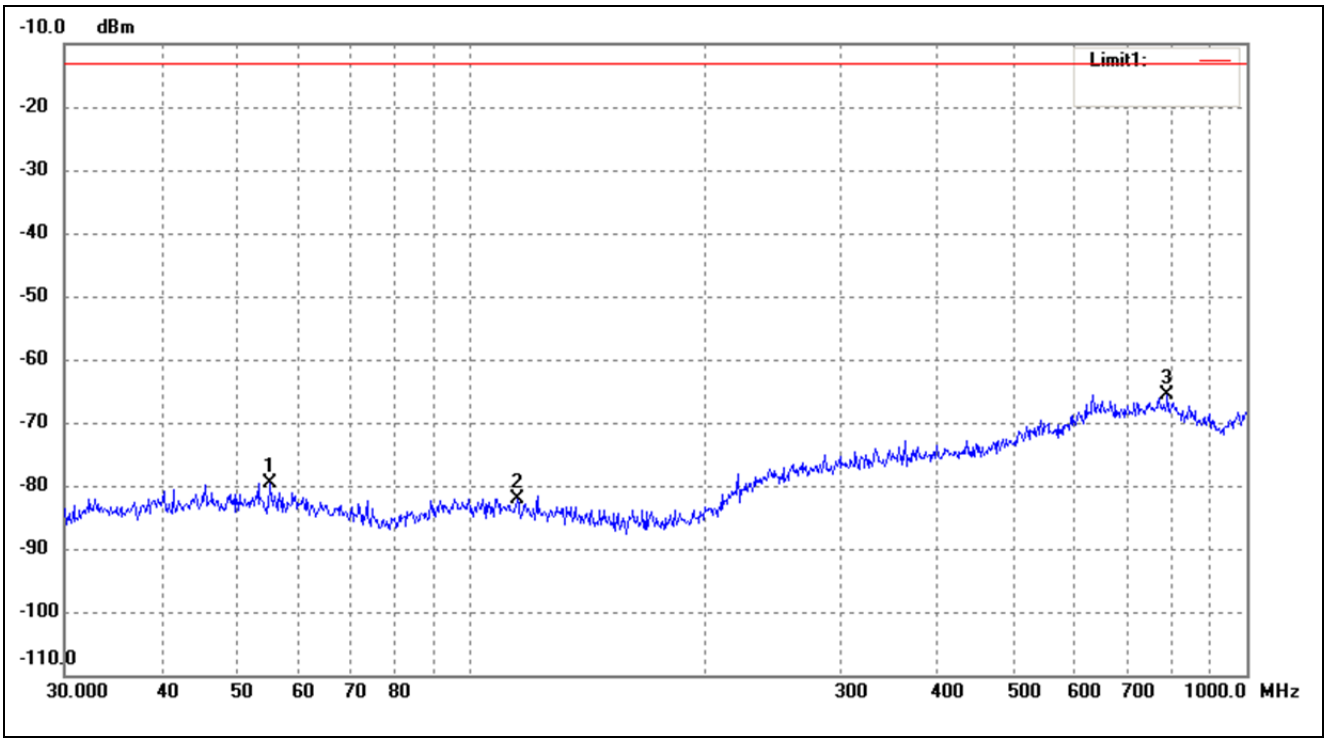
Note: 1.this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

2.Pre-Scan test GSM/GPRS mode, and find the worst case at GSM mode, and only show the worst case in the test report.

Spurious Emission From 30MHz to 1GHz

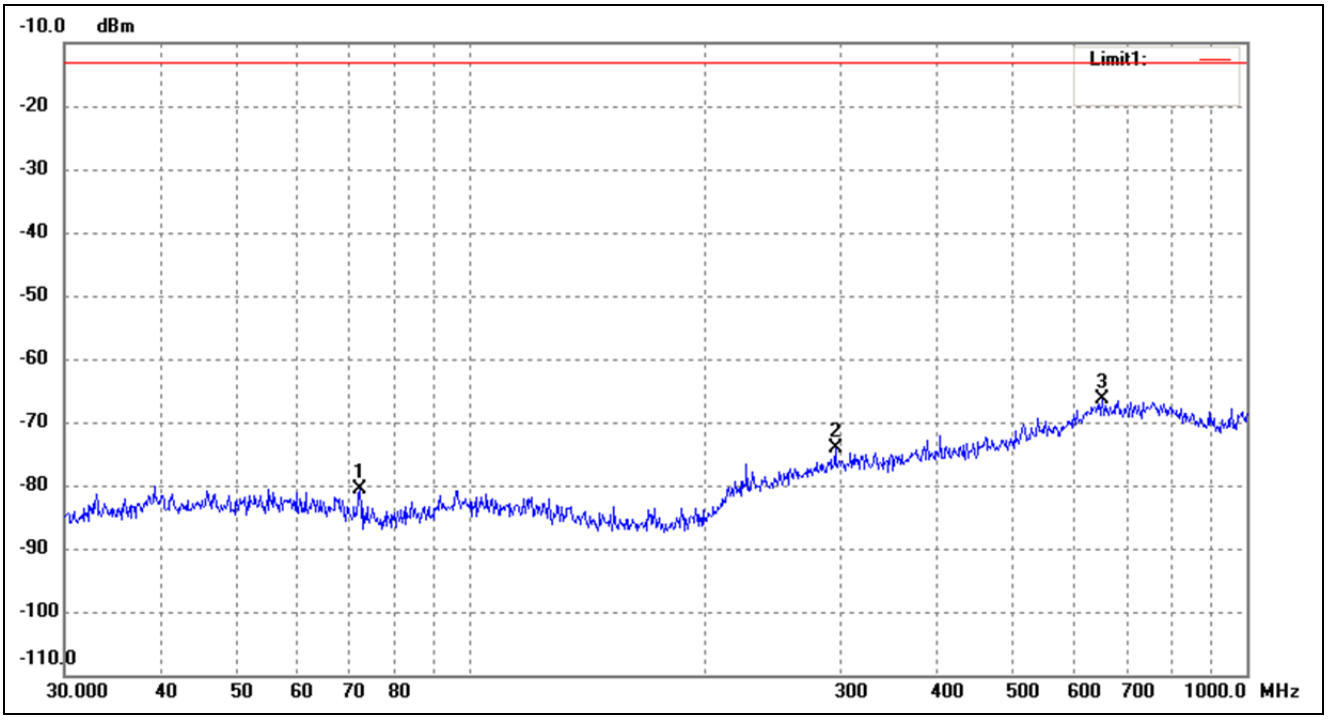
For Cellular Band_ GSM850 Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct Factor(dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	55.2207	-74.88	-4.71	-79.59	-13.00	-66.59	ERP
2	114.9169	-77.23	-4.84	-82.07	-13.00	-69.07	ERP
3	790.6188	-75.45	9.76	-65.69	-13.00	-52.69	ERP

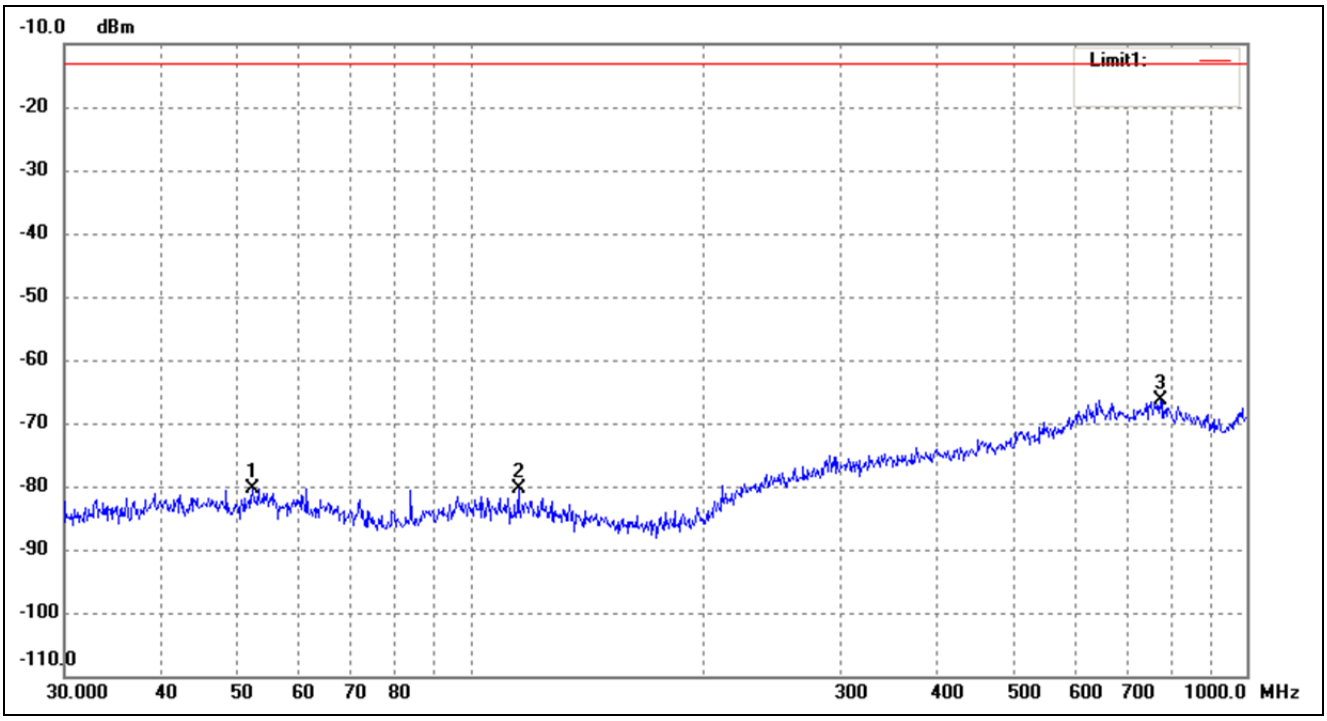
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	72.0843	-73.42	-7.17	-80.59	-13.00	-67.59	ERP
2	295.1469	-76.28	2.05	-74.23	-13.00	-61.23	ERP
3	651.9417	-76.88	10.48	-66.40	-13.00	-53.40	ERP

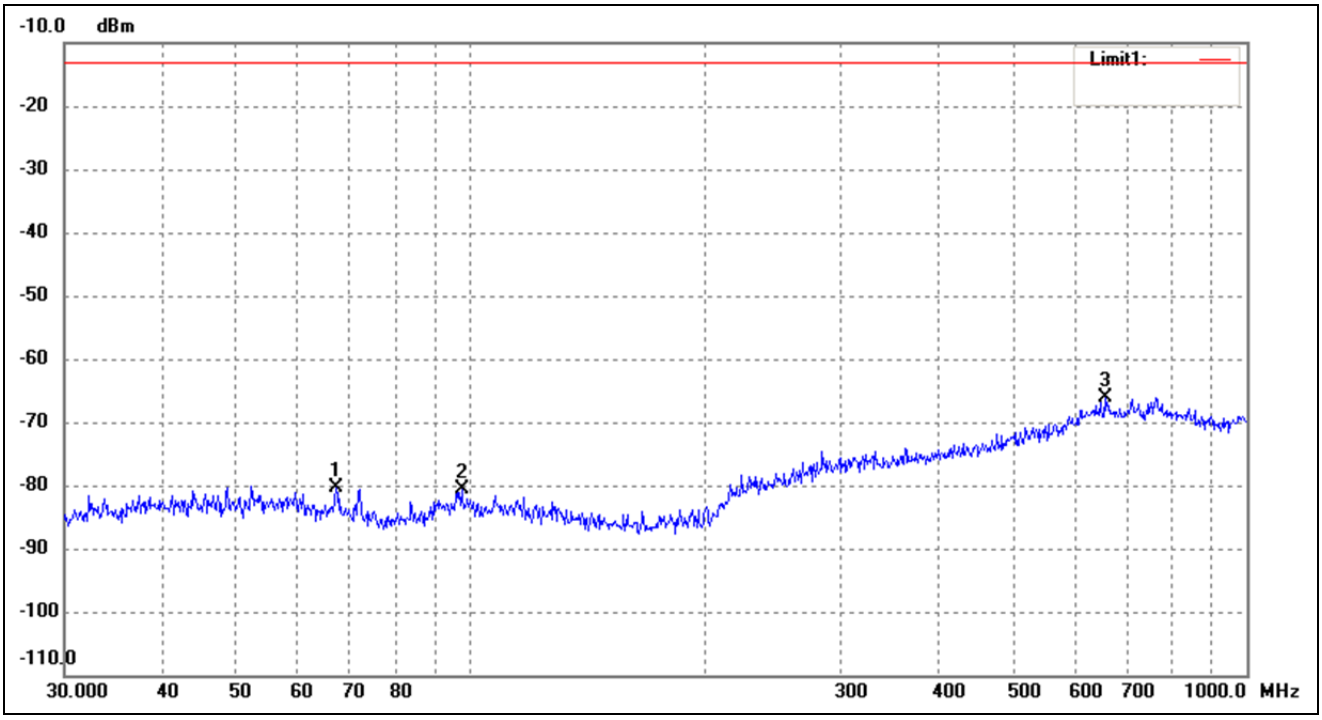
For Cellular Band_ GSM1900 Mode

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	52.3913	-75.57	-4.70	-80.27	-13.00	-67.27	ERP
2	115.3205	-75.42	-4.84	-80.26	-13.00	-67.26	ERP
3	774.1584	-76.76	10.33	-66.43	-13.00	-53.43	ERP

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	67.2022	-73.98	-6.28	-80.26	-13.00	-67.26	ERP
2	97.4560	-75.43	-5.13	-80.56	-13.00	-67.56	ERP
3	656.5300	-76.57	10.39	-66.18	-13.00	-53.18	ERP

Note: Margin= (Reading+ Correct)- Limit

Spurious Emissions Above 1GHz

For Cellular Band_GSM850 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (824.2MHz)						
1648.4	-34.97	4.94	-30.03	-13	-17.03	H
2472.6	-37.7	8.46	-29.24	-13	-16.24	H
1648.4	-32.33	4.94	-27.39	-13	-14.39	V
2472.6	-38.75	8.46	-30.29	-13	-17.29	V
Middle Channel (836.6MHz)						
1673.2	-33.26	5.11	-28.15	-13	-15.15	H
2509.8	-36.09	8.54	-27.55	-13	-14.55	H
1673.2	-33.89	5.11	-28.78	-13	-15.78	V
2509.8	-36.92	8.54	-28.38	-13	-15.38	V
High Channel (848.8MHz)						
1697.6	-32.28	5.29	-26.99	-13	-13.99	H
2546.4	-36.31	8.59	-27.72	-13	-14.72	H
1697.6	-33.34	5.29	-28.05	-13	-15.05	V
2546.4	-39.37	8.59	-30.78	-13	-17.78	V

For PCS Band_GSM1900 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1850.2MHz)						
3700.4	-37.46	10.54	-26.92	-13	-13.92	H
5550.6	-40.72	13.37	-27.35	-13	-14.35	H
3700.4	-36.8	10.54	-26.26	-13	-13.26	V
5550.6	-41.23	13.37	-27.86	-13	-14.86	V
Middle Channel (1880MHz)						
3760.0	-34.74	10.64	-24.1	-13	-11.1	H
5640.0	-41.47	13.54	-27.93	-13	-14.93	H
3760.0	-34.04	10.64	-23.4	-13	-10.4	V
5640.0	-39.18	13.54	-25.64	-13	-12.64	V
High Channel (1909.8MHz)						
3819.6	-34.96	10.74	-24.22	-13	-11.22	H
5729.4	-41.45	13.71	-27.74	-13	-14.74	H
3819.6	-36.59	10.74	-25.85	-13	-12.85	V
5729.4	-41.01	13.71	-27.3	-13	-14.3	V

Note: Result=Reading+ Correct, Margin= Result- Limit

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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

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 (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	3.7	68	0.0809
40	3.7	59	0.0708
30	3.7	55	0.0653
20	3.7	49	0.0588
10	3.7	45	0.0533
0	3.7	38	0.0451
-10	3.7	42	0.0506
-20	3.7	46	0.0552
-30	3.7	53	0.0634

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	72	0.0385
40	3.7	61	0.0323
30	3.7	49	0.0262
20	3.7	42	0.0221
10	3.7	37	0.0196
0	3.7	29	0.0155
-10	3.7	36	0.0192
-20	3.7	41	0.0217
-30	3.7	47	0.0250

For Cellular Band GPRS Mode

Reference Frequency(Middle Channel): 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	3.7	71	0.0846
40	3.7	57	0.0680
30	3.7	46	0.0552
20	3.7	38	0.0460
10	3.7	34	0.0405
0	3.7	28	0.0331
-10	3.7	32	0.0386
-20	3.7	40	0.0478
-30	3.7	47	0.0561

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	72	0.0385
40	3.7	62	0.0327
30	3.7	52	0.0278
20	3.7	47	0.0250
10	3.7	43	0.0229
0	3.7	35	0.0188
-10	3.7	41	0.0217
-20	3.7	46	0.0245
-30	3.7	51	0.0270

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	40	0.0478
	3.7	30	0.0359
	4.3	45	0.0542
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	45	0.0237
	3.7	31	0.0164
	4.3	37	0.0196
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	46	0.0552
	3.7	35	0.0423
	4.3	50	0.0598
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	21	0.0110
	3.7	15	0.0082
	4.3	19	0.0102

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