

FCC PART 22H&24E

Measurement and Test Report

For

ENVOTECH NETWORK SDN BHD

25, Jalan Kilang 2, Kawasan Perindustrian Jelapang, (Taman Pertama), 30100

Jelapang, Ipoh, Perak, Malaysia.

FCC ID: CO8-30076009

Report Concerns: Original Report	Equipment Type: RADIOSECURE SLM
Model:	<u>RS-SLM-324x</u>
Report No.:	<u>STR12038016I-1</u>
Test Date:	<u>2012-03-28 to 2012-04-06</u>
Issue Date:	<u>2012-04-10</u>
Tested By:	<u>Seven Song / Engineer</u> <i>Seven Song</i>
Reviewed By:	<u>Lahm Peng / EMC Manager</u> <i>Lahm peng</i>
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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 SEM.Test Compliance Service Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: ENVOTECH NETWORK SDN BHD
Address of applicant: 25, Jalan Kilang 2, Kawasan Perindustrian Jelapang,
(Taman Pertama), 30100 Jelapang, Ipoh, Perak, Malaysia.

Manufacturer: ENVOTECH NETWORK SDN BHD
Address of manufacturer: 25, Jalan Kilang 2, Kawasan Perindustrian Jelapang,
(Taman Pertama), 30100 Jelapang, Ipoh, Perak, Malaysia.

General Description of E.U.T

Items	Description
EUT Description:	RADIOSECURE SLM
Trade Name:	E-SEAL
Model No.:	RS-SLM-324x
Hardware Version:	TKv108
Software Version:	SLMv1008
Rated Voltage:	Battery DC 3.7V, Charging: DC 5V
Frequency range:	GSM/GPRS 850: 824~849MHz GSM/GPRS 1900: 1850~1910MHz
Max. RF Power(Conducted):	GSM850: 32.95 dBm PCS1900: 29.69 dBm
Max. RF Power(ERP/EIRP):	GSM850: 32.45 dBm PCS1900: 28.99 dBm
Cellular Network Protocol:	GSM/GPRS
Modulation:	GMSK
Type of Emission:	GSM(GSM850): 259KGXW GPRS(GSM850): 258KG7W GSM(PCS1900): 258KGXW GPRS(PCS1900): 258KG7W
Antenna Gain:	GSM850: 0.5dBi, PCS1900: 1.3dBi
Type of Antenna:	Integral Antenna
Battery:	M/N: ESB; DC 3.7V/19.2Ah
Device Category:	Mobile Device

The test data is gathered from a production sample, provided by the manufacturer.

1.2 Test Standards

The following report is prepared on behalf of the ENVOTECH NETWORK SDN BHD 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.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted with Low Channel, Middle Channel and High Channel, accordingly in reference to the Operating Instructions.

1.4 Test Facility

- **FCC – Registration No.: 994117**

SEM.Test Compliance Services 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 994117.

- **Industry Canada (IC) Registration No.: 7673A**

The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

- **CNAS Registration No.: L4062**

Shenzhen SEM.Test Electronics Service 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 3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C (518101)

1.5 EUT Exercise Software

The EUT exercise program used during the testing was designed to exercise the system components.

1.6 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/

1.7 EUT Cable List and Details

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

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	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 complies with the requirement of the RF exposure, please see the RF exposure evaluation report.

4. RF OUTPUT POWER

4.1 Standard Applicable

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

According to §24.232 (c), no any case may the peak output power of mobile or portable station transmitter exceed 2 Watt EIRP.

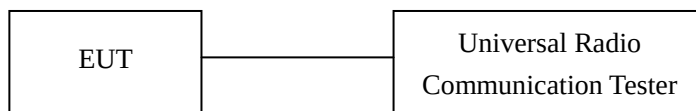
4.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	112012	2012-03-28	2013-03-27
Signal Generator	R&S	SMR20	100047	2012-03-28	2013-03-27

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

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	Corrected Ampl.	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
824.2	29.15	1.5	0	H	1.5	0	27.65	38.45
824.2	33.95	1.5	0	V	1.5	0	32.45	38.45
Middle Channel								
836.6	29.75	1.5	0	H	1.5	0	28.25	38.45
836.6	33.92	1.5	0	V	1.5	0	32.42	38.45
High Channel								
848.8	29.14	1.5	0	H	1.5	0	27.64	38.45
848.8	33.88	1.5	0	V	1.5	0	32.38	38.45

EIRP For GSM Mode PCS1900

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Corrected Ampl.	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1850.2	19.44	1.5	0	H	1.9	7.7	25.24	33
1850.2	23.19	1.5	0	V	1.9	7.7	28.99	33
Middle Channel								
1880.0	19.67	1.5	0	H	1.9	7.7	25.47	33
1880.0	23.16	1.5	0	V	1.9	7.7	28.96	33
High Channel								
1909.8	19.80	1.5	0	H	1.9	7.7	25.60	33
1909.8	22.69	1.5	0	V	1.9	7.7	28.49	33

ERP For GPRS Mode GSM850

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Corrected Ampl.	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
824.2	29.04	1.5	0	H	1.5	0	27.54	38.45
824.2	33.61	1.5	0	V	1.5	0	32.11	38.45
Middle Channel33.04								
836.6	29.52	1.5	0	H	1.5	0	28.02	38.45
836.6	33.72	1.5	0	V	1.5	0	32.22	38.45
High Channel								
848.8	29.62	1.5	0	H	1.5	0	28.12	38.45
848.8	33.75	1.5	0	V	1.5	0	32.25	38.45

EIRP For GPRS Mode PCS1900

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Corrected Ampl.	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	DBm	dBm
Low Channel								
1850.2	20.04	1.5	0	H	1.9	7.7	25.84	33
1850.2	22.95	1.5	0	V	1.9	7.7	28.75	33
Middle Channel								
1880.0	19.97	1.5	0	H	1.9	7.7	25.77	33
1880.0	22.78	1.5	0	V	1.9	7.7	28.58	33
High Channel								
1909.8	19.84	1.5	0	H	1.9	7.7	25.64	33
1909.8	22.75	1.5	0	V	1.9	7.7	28.55	33

Max. Conducted Output Power

For Cellular Band (GSM850)

Test Mode	Channel	Frequency (MHz)	Output Power (dBm)	FCC Part 22.913 Limit (dBm)
GSM	Low Channel	824.2	32.95	38.45
	Middle Channel	836.6	32.92	38.45
	High Channel	848.8	32.88	38.45
GPRS	Low Channel	824.2	32.61	38.45
	Middle Channel	836.6	32.72	38.45
	High Channel	848.8	32.75	38.45

For PCS Band (GSM1900)

Test Mode	Channel	Frequency (MHz)	Output Power (dBm)	FCC Part 24.232 Limit (dBm)
GSM	Low Channel	1850.2	29.69	33
	Middle Channel	1880.0	29.66	33
	High Channel	1909.8	29.19	33
GPRS	Low Channel	1850.2	29.45	33
	Middle Channel	1880.0	29.28	33
	High Channel	1909.8	29.25	33

5. EMISSION BANDWIDTH

5.1 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.

5.2 Test Equipment List and Details

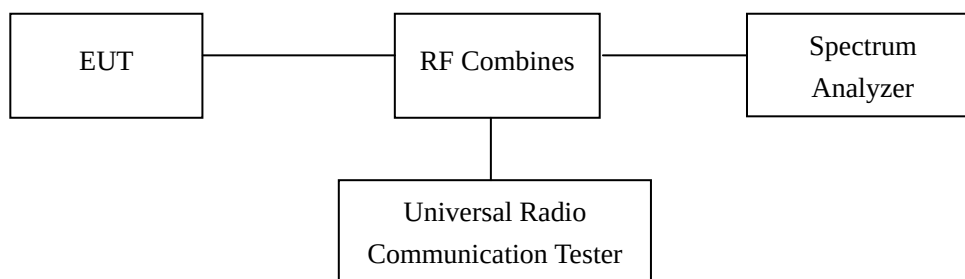
Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Aglient	Spectrum Analyzer	E4402B	US41192821	2012-03-28	2013-03-27
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	112012	2012-03-28	2013-03-27

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

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 26dB bandwidth 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/Plots

For Cellular Band

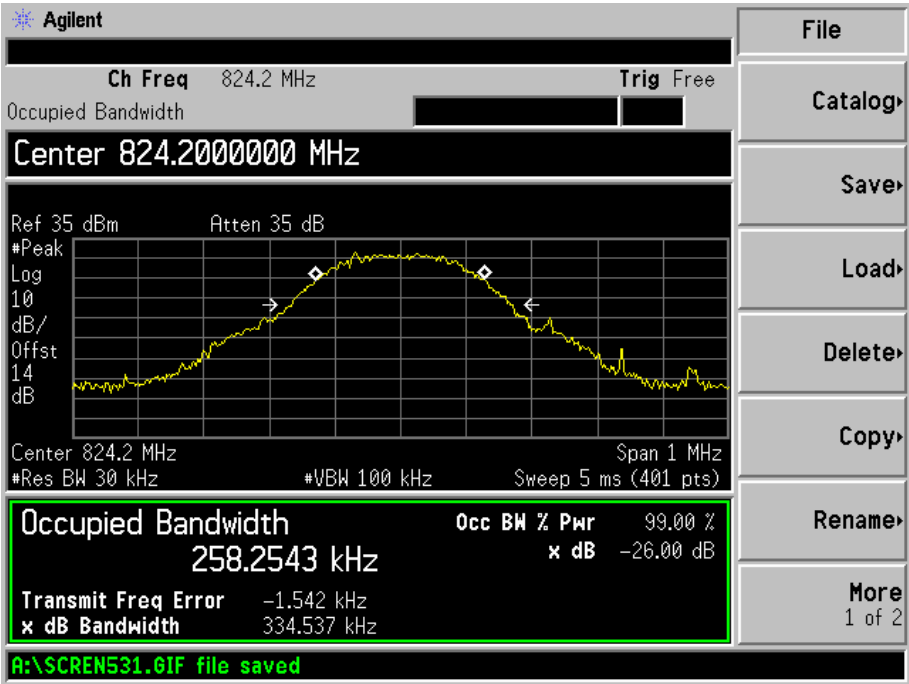
Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	128	824.2	258.2543	334.537
	190	836.6	256.2954	350.230
	251	848.8	259.7859	345.141
GPRS	128	824.2	257.8245	339.885
	190	836.6	258.4305	341.335
	251	848.8	258.4161	347.877

For PCS Band

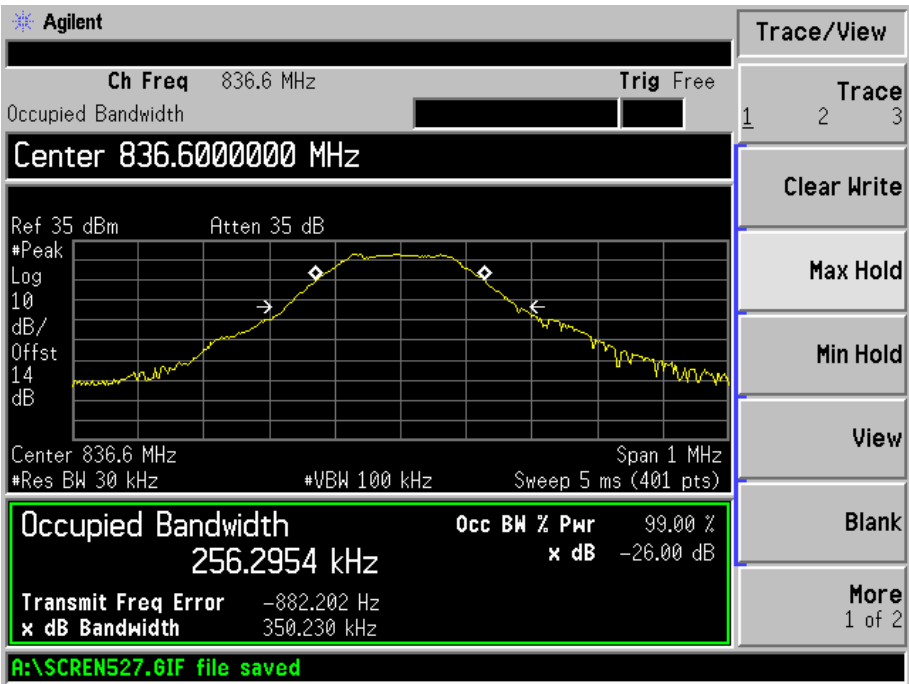
Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	512	1850.2	249.3937	322.368
	661	1880.0	251.4405	321.886
	810	1909.8	258.8734	347.024
GPRS	512	1850.2	257.9697	344.803
	661	1880.0	257.1767	342.126
	810	1909.8	258.5658	343.056

Please refer to the following test plots:

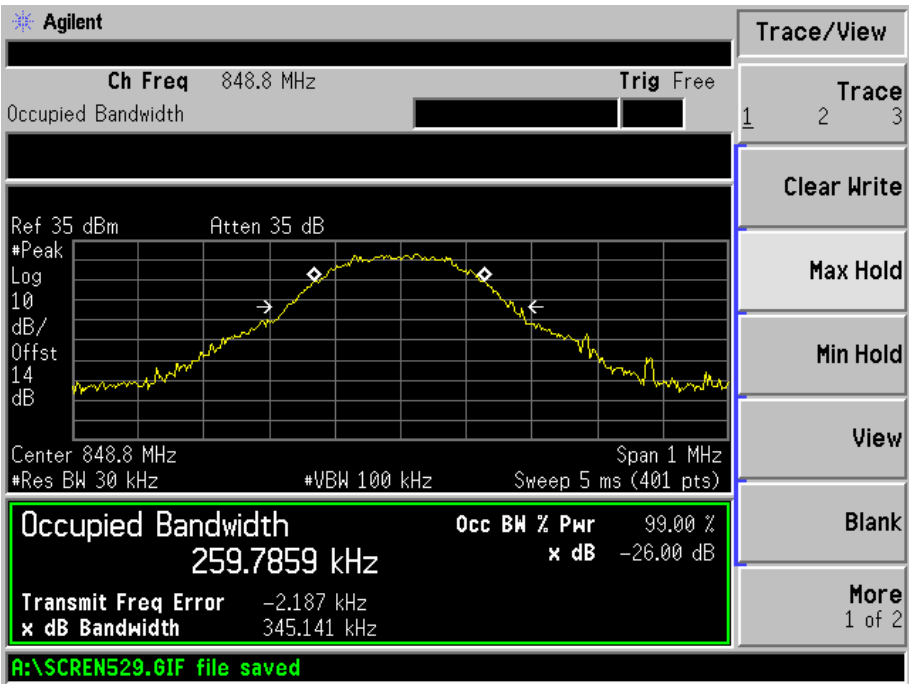
For Cellular Band
GSM Low Channel



GSM Middle Channel



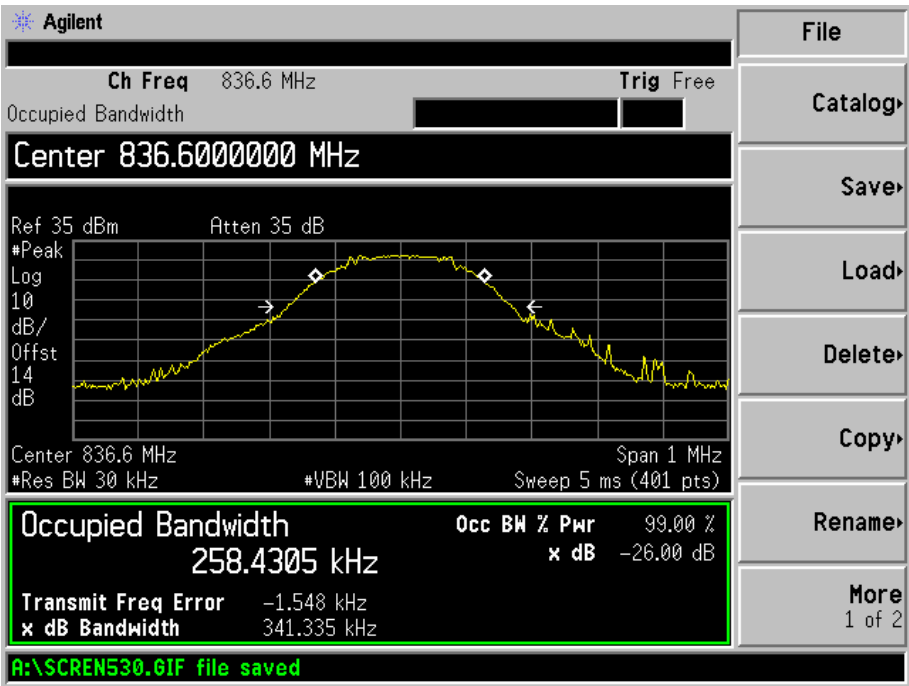
GSM High channel



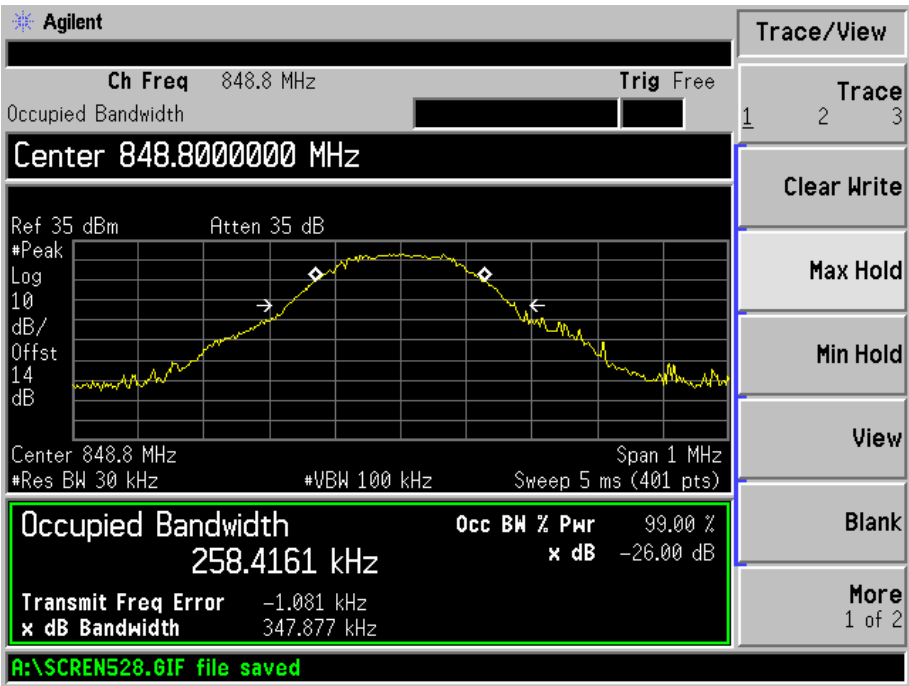
GPRS Low Channel



GPRS Middle Channel



GPRS High Channel



For PCS Band
GSM Low Channel



GSM Middle Channel



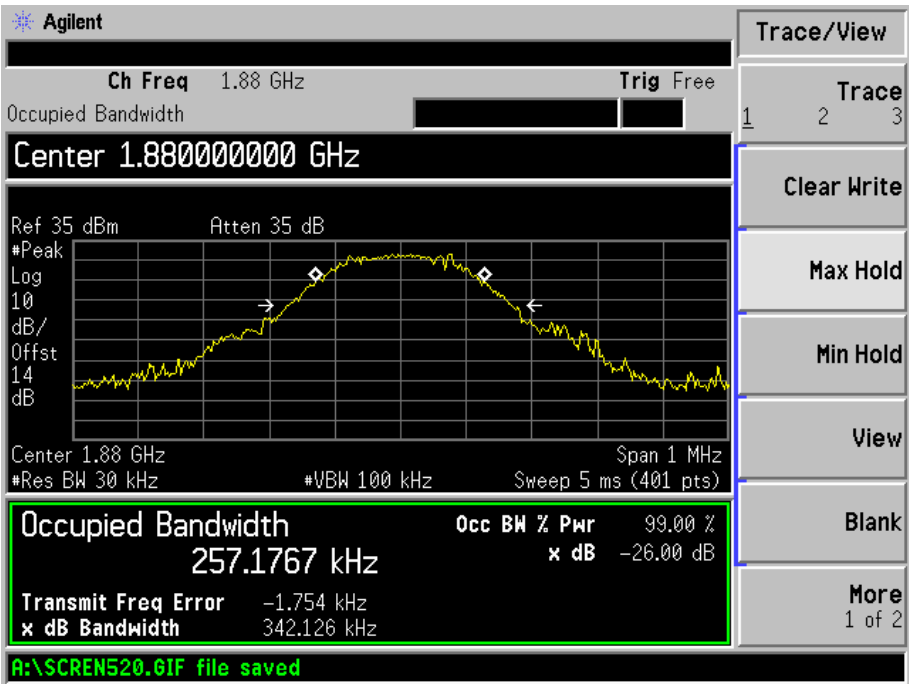
GSM High channel



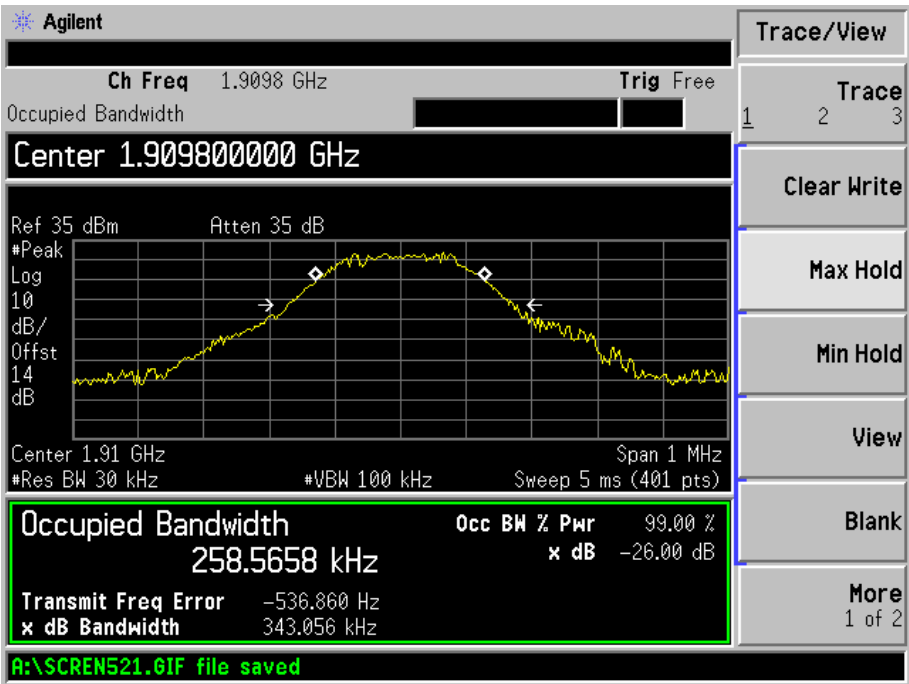
GPRS Low Channel



GPRS Middle Channel



GPRS High Channel



6. OUT OF BAND EMISSION AT ANTENNA TERMINAL

6.1 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.

6.2 Test Equipment List and Details

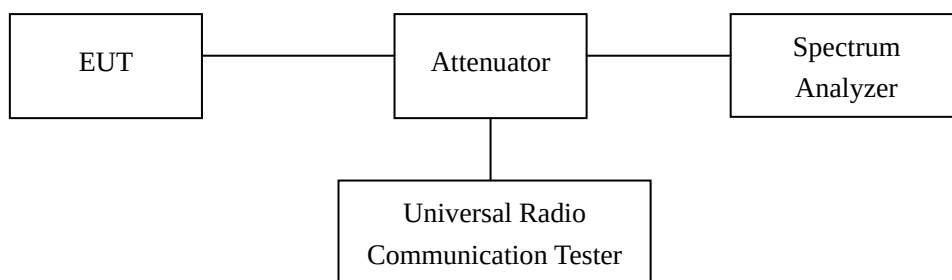
Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Aglient	Spectrum Analyzer	E4402B	US41192821	2012-03-28	2013-03-27
Rohde & Schwarz	Spectrum Analyzer	FSP	836079/035	2012-03-28	2013-03-27
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	112012	2012-03-28	2013-03-27

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

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 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:



6.4 Environmental Conditions

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

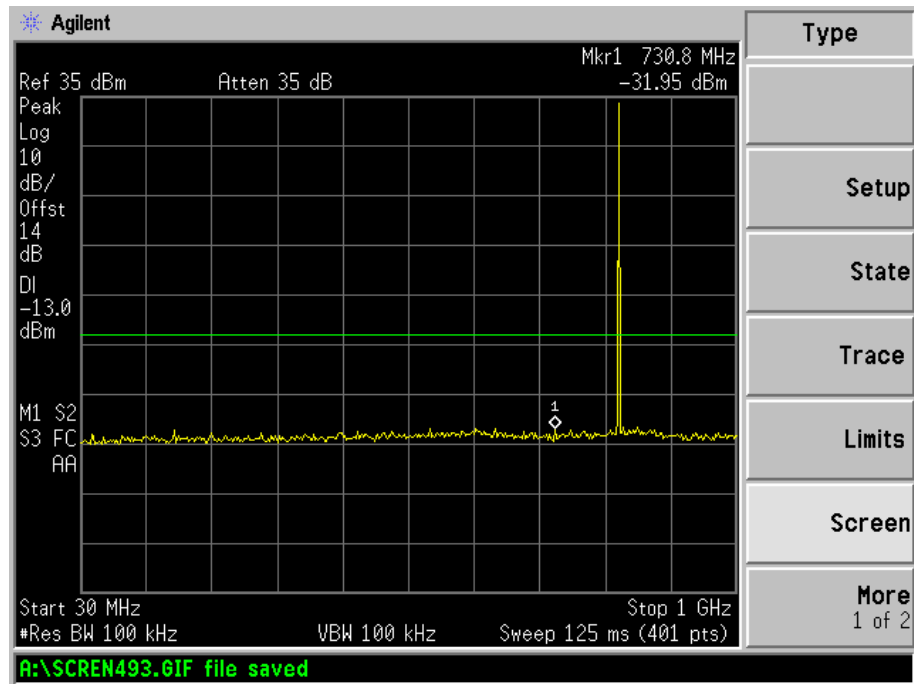
6.5 Summary of Test Results/Plots

Please refer to the following test plots

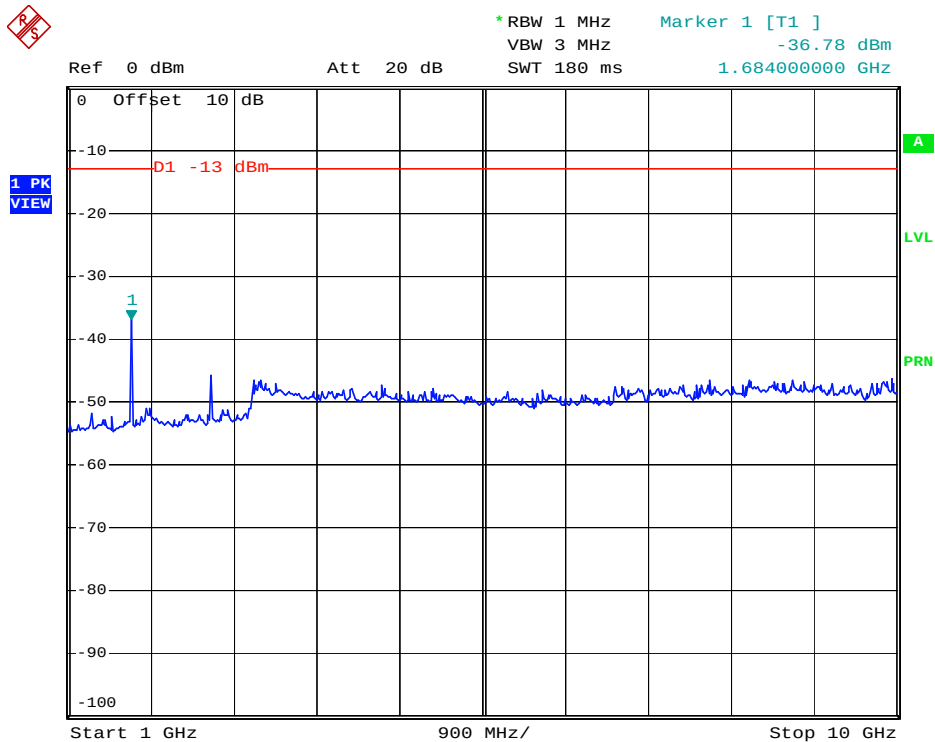
For Cellular Band

GSM Low Channel

30MHz to 1GHz

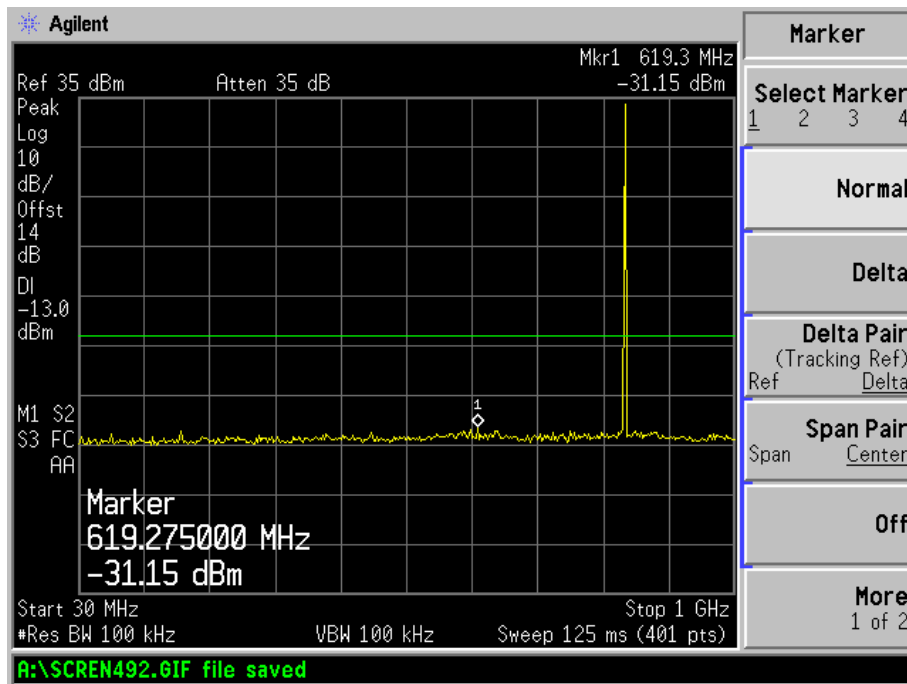


Above 1GHz

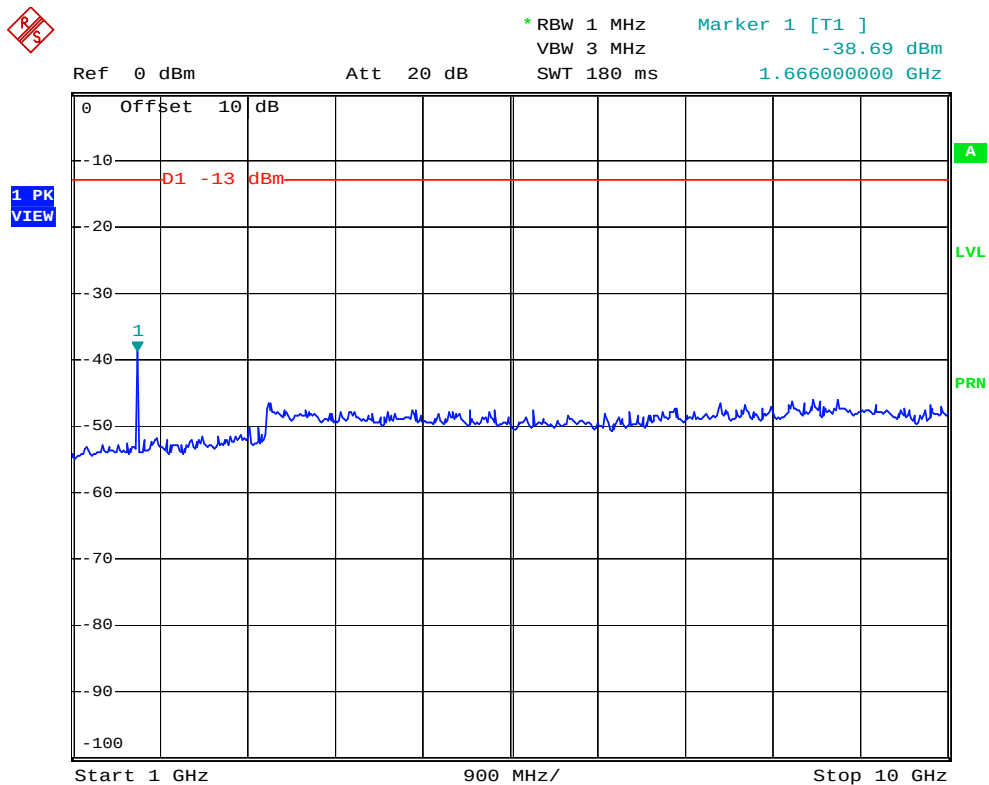


GSM Middle Channel

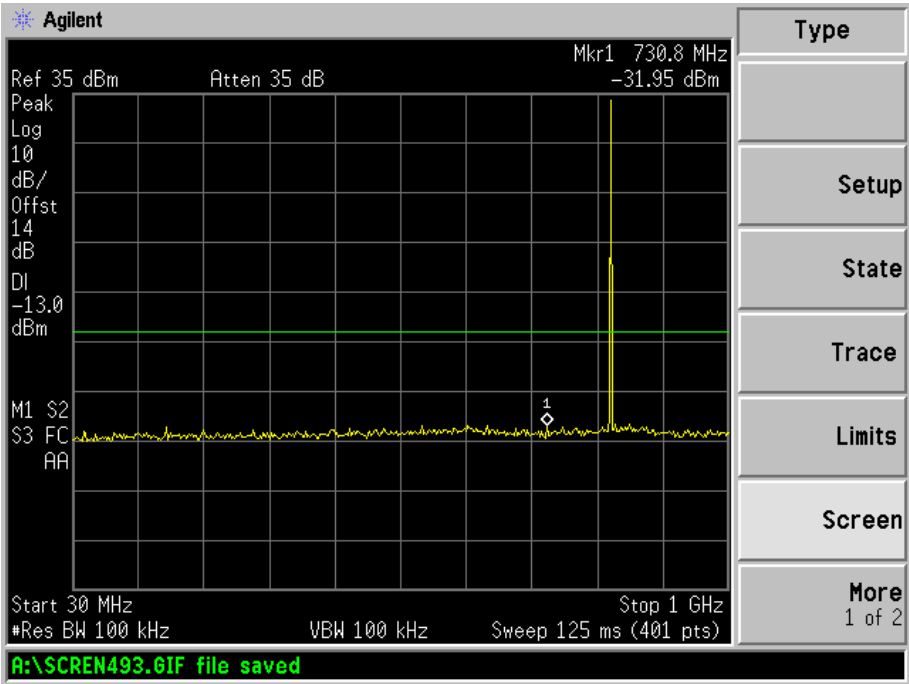
30MHz to 1GHz



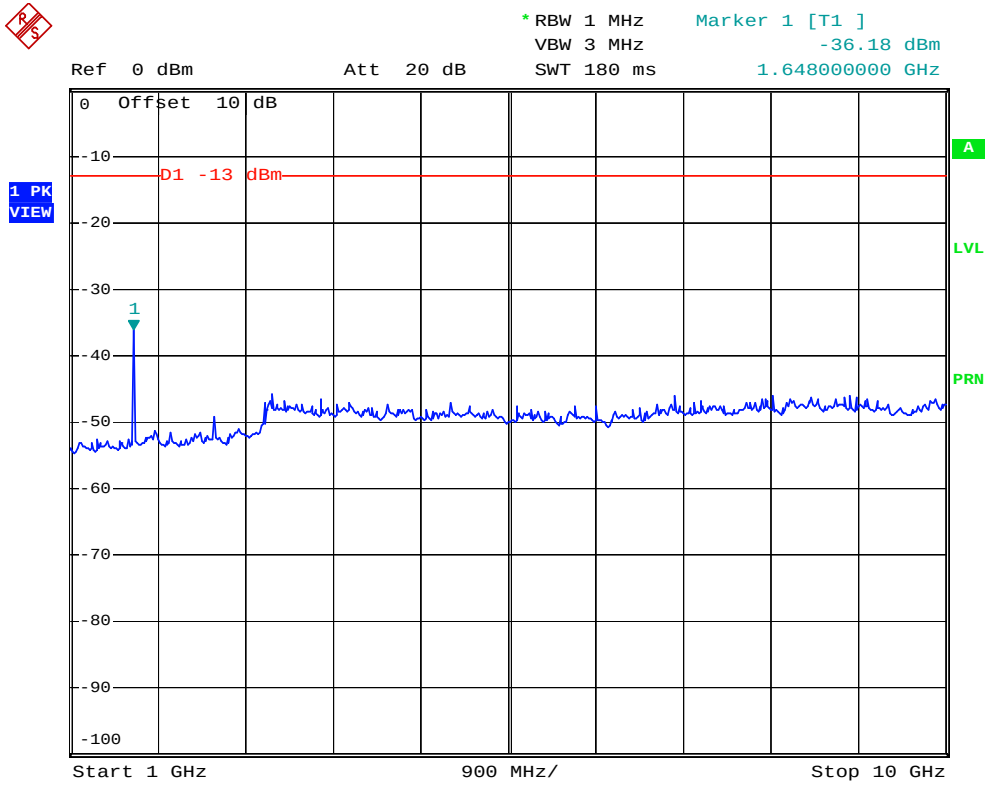
Above 1GHz



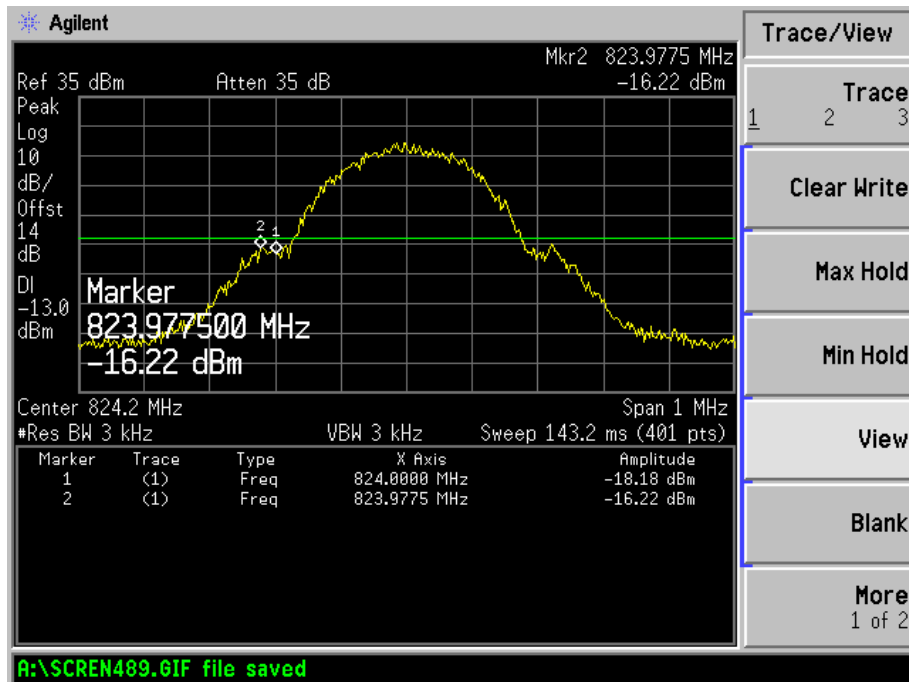
GSM High Channel
30MHz to 1GHz



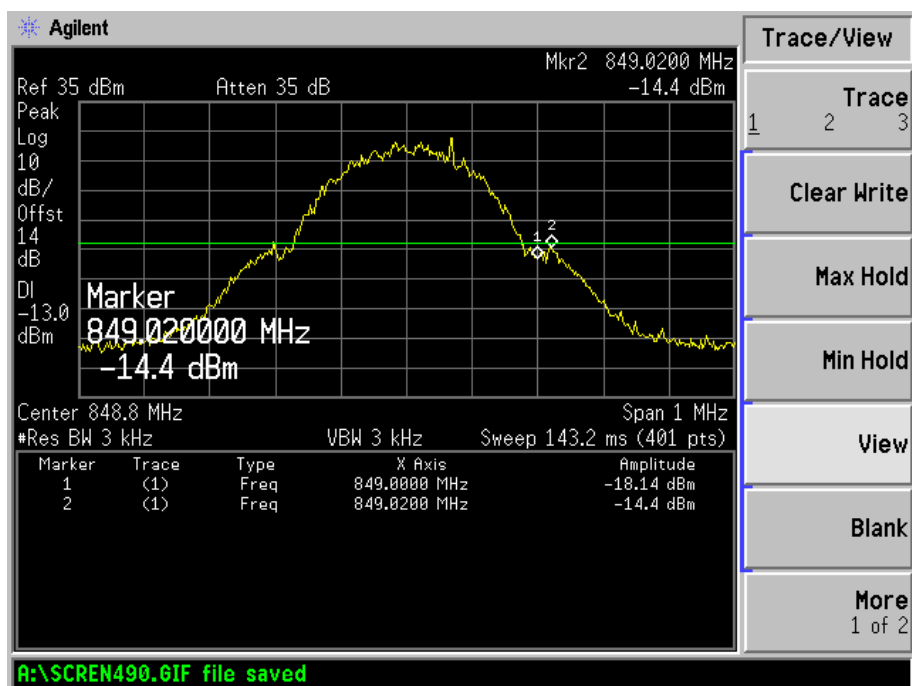
Above 1GHz



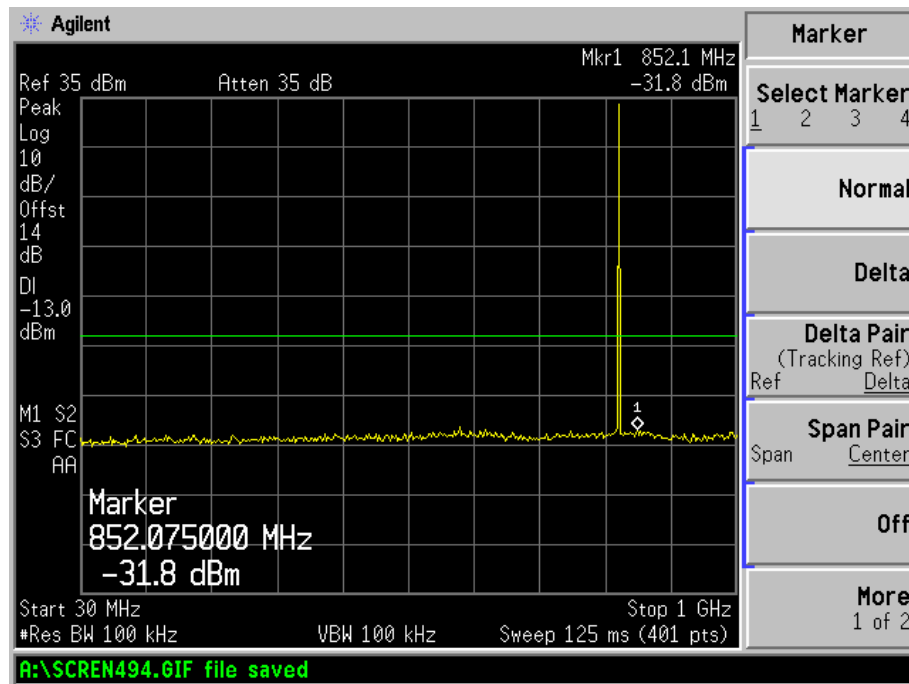
GSM Low Band Emission



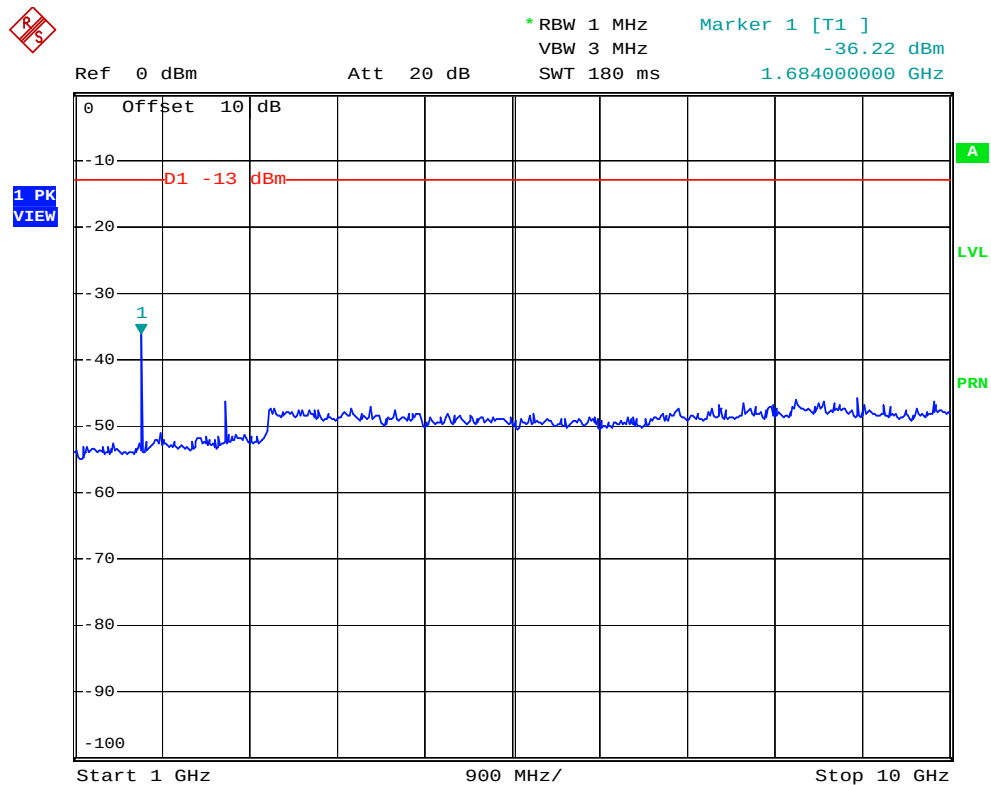
GSM High Band Emission



GPRS Low Channel
30MHz to 1GHz

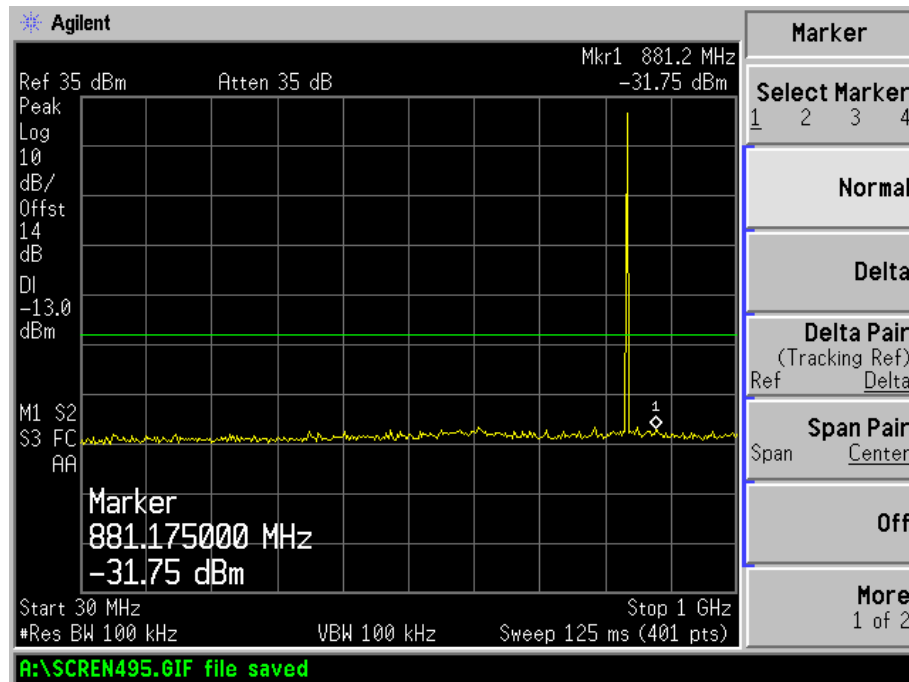


Above 1GHz

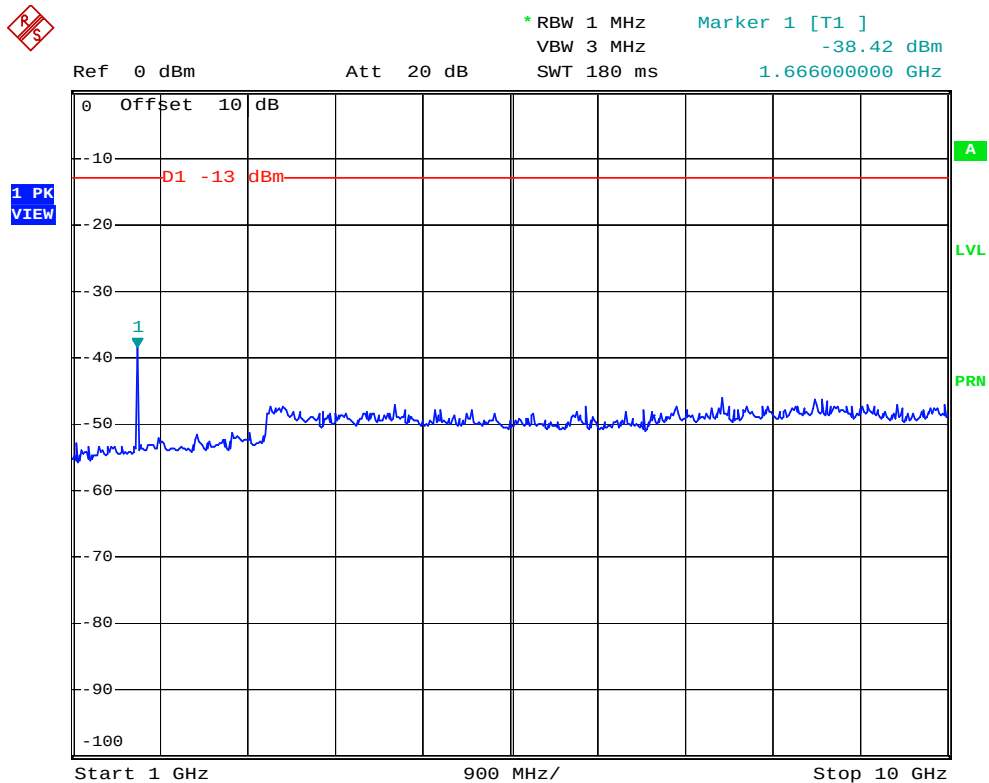


GPRS Middle Channel

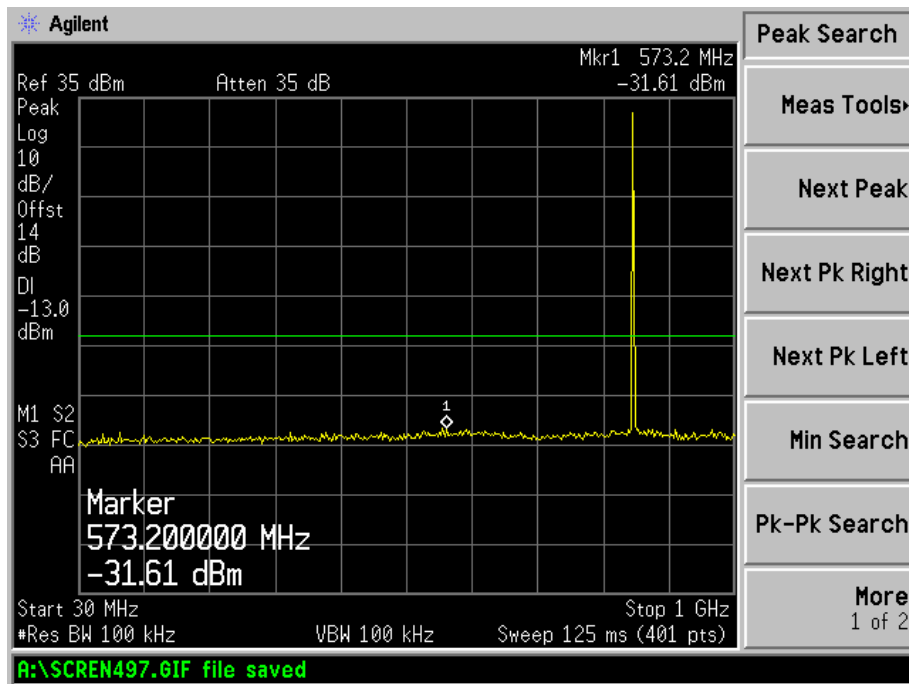
30MHz to 1GHz



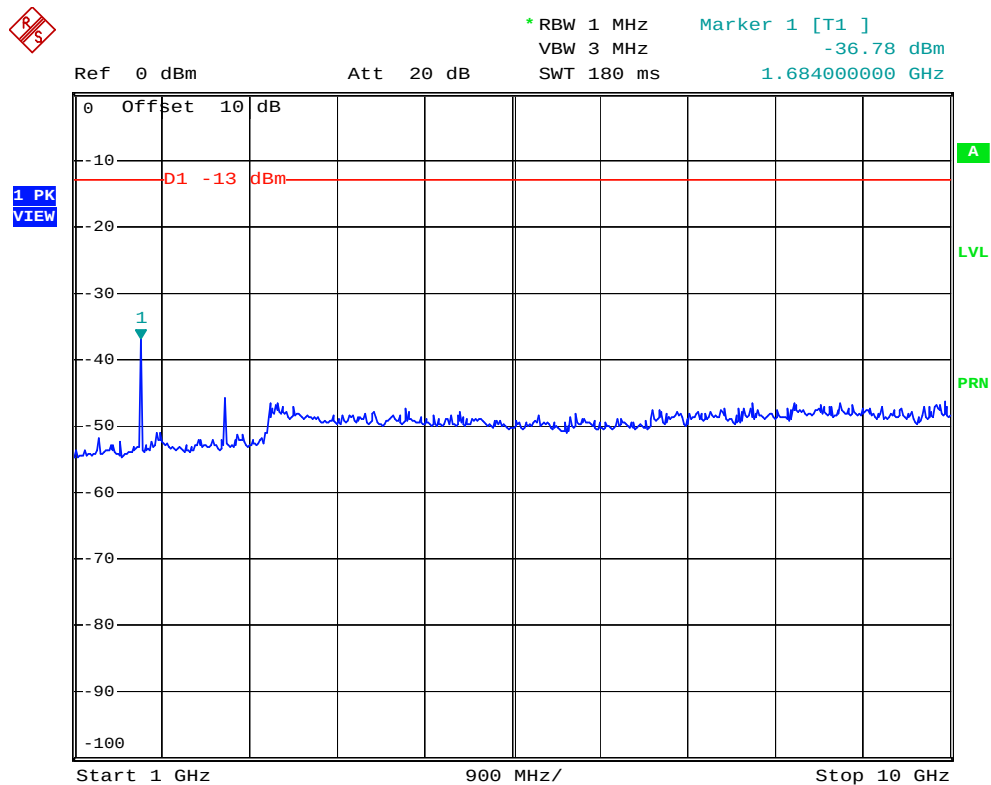
Above 1GHz



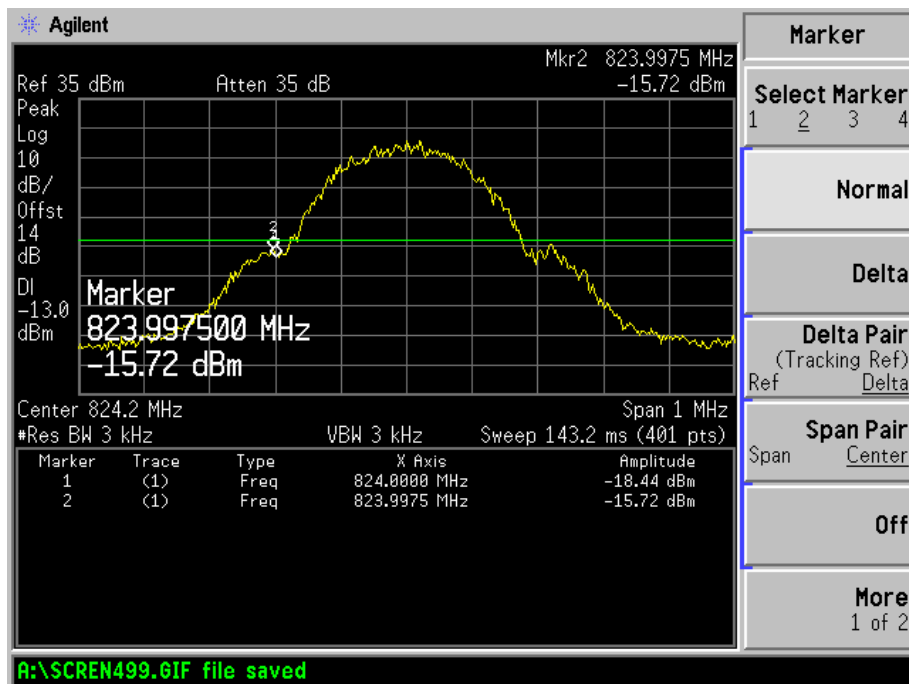
GPRS High Channel
30MHz to 1GHz



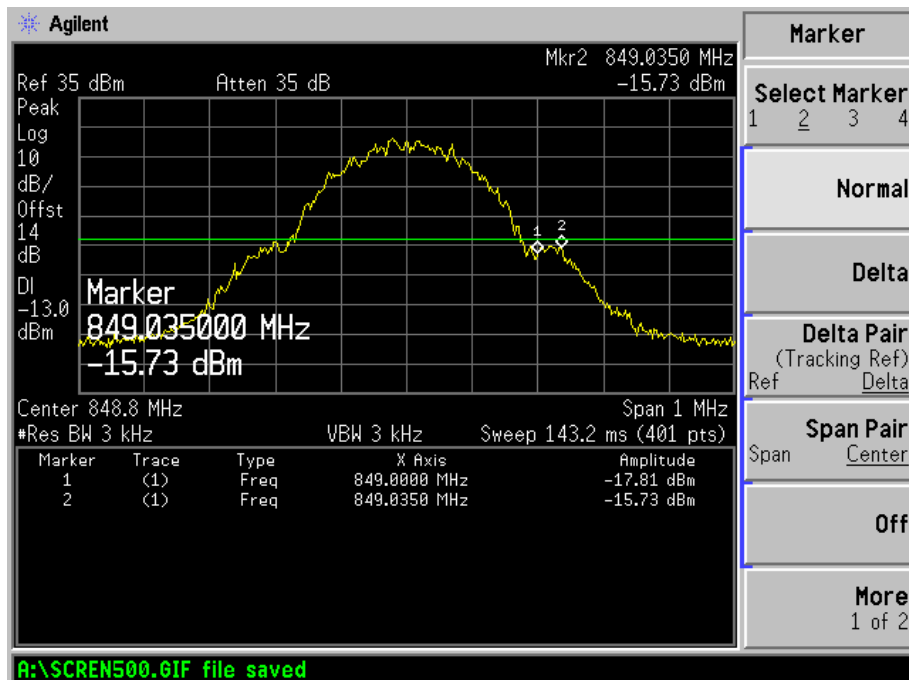
Above 1GHz



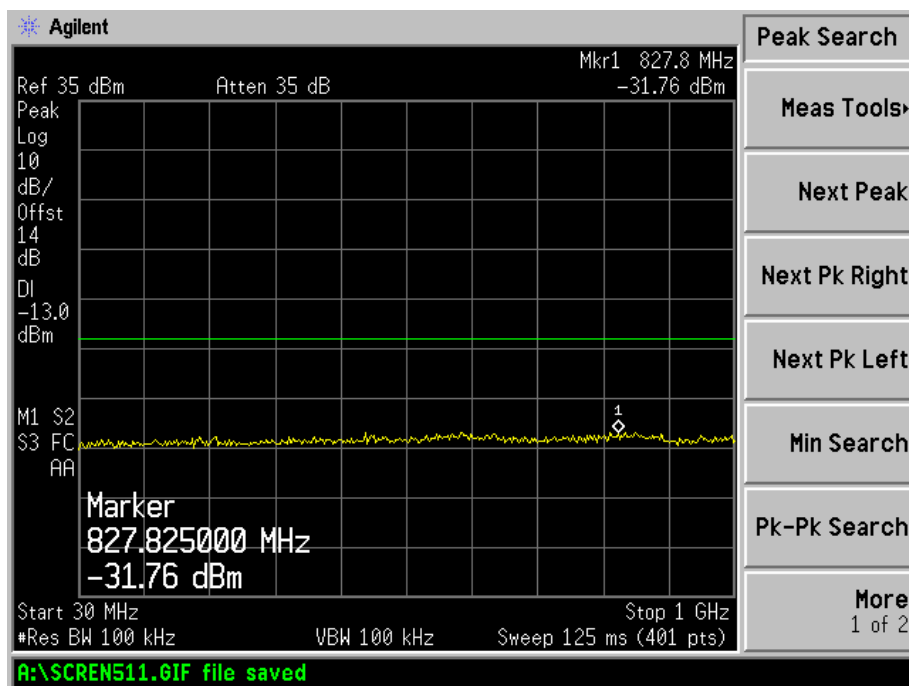
GPRS Low Band Emission



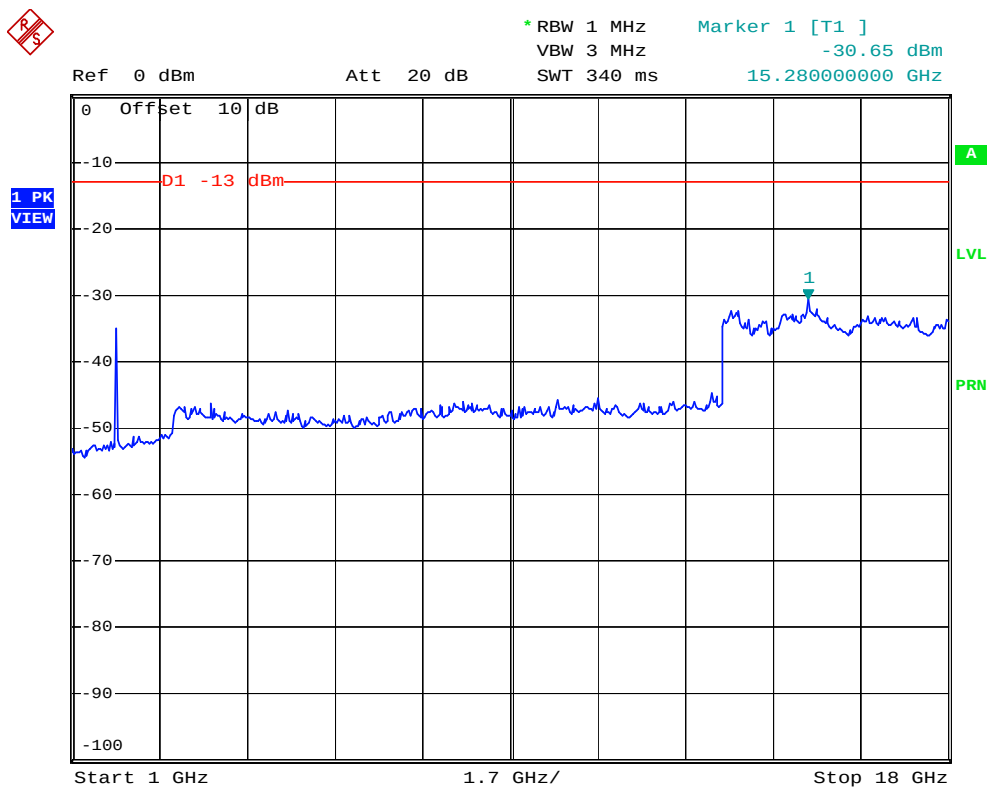
GPRS High Band Emission



For PCS Band
GSM Low Channel
30MHz to 1GHz

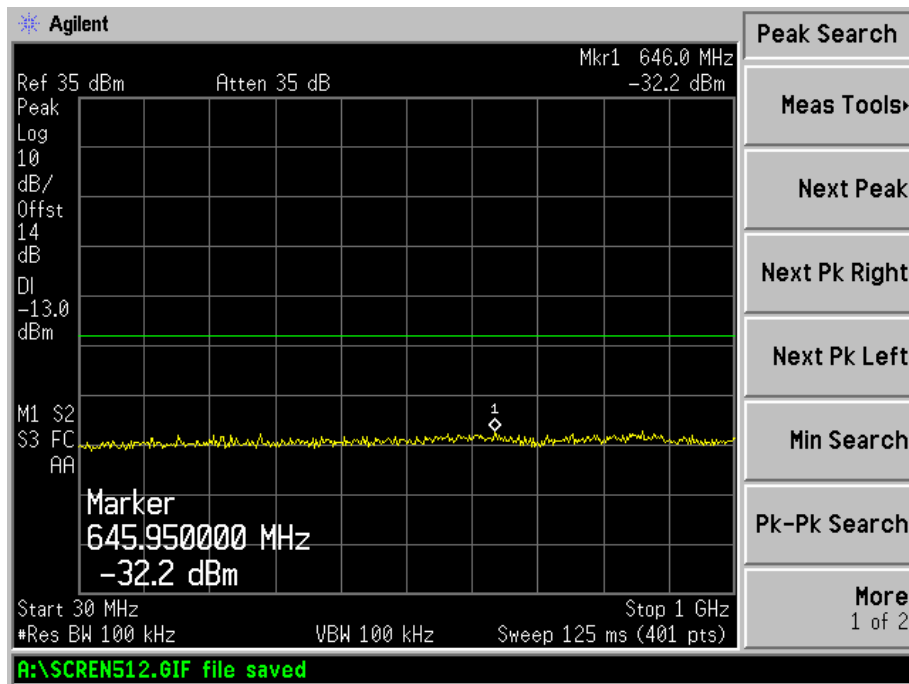


Above 1GHz

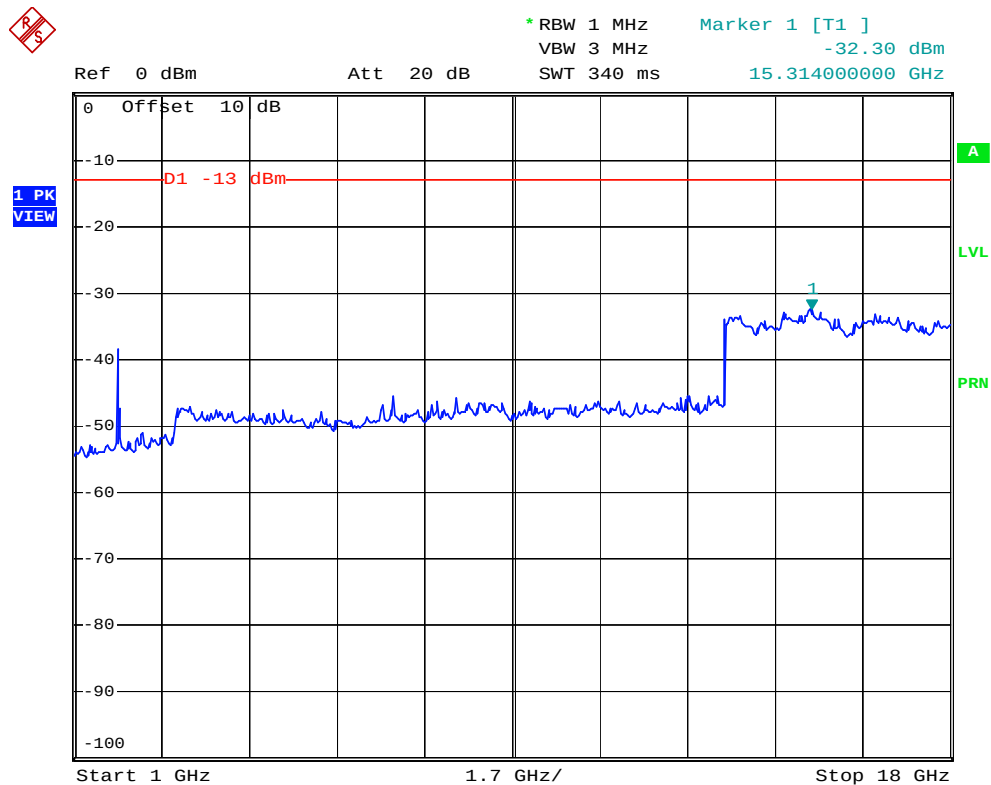


GSM Middle Channel

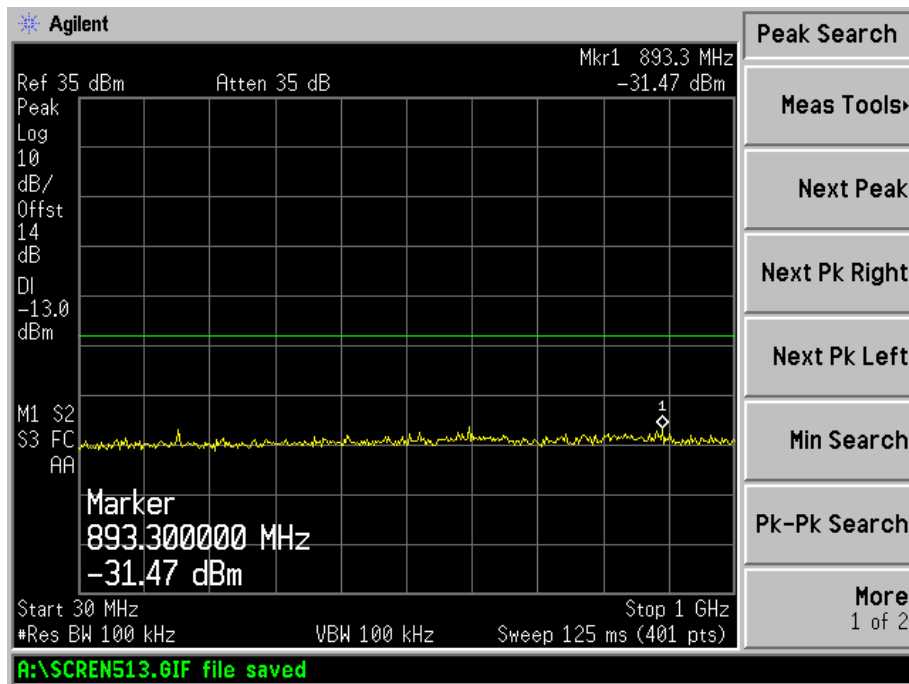
30MHz to 1GHz



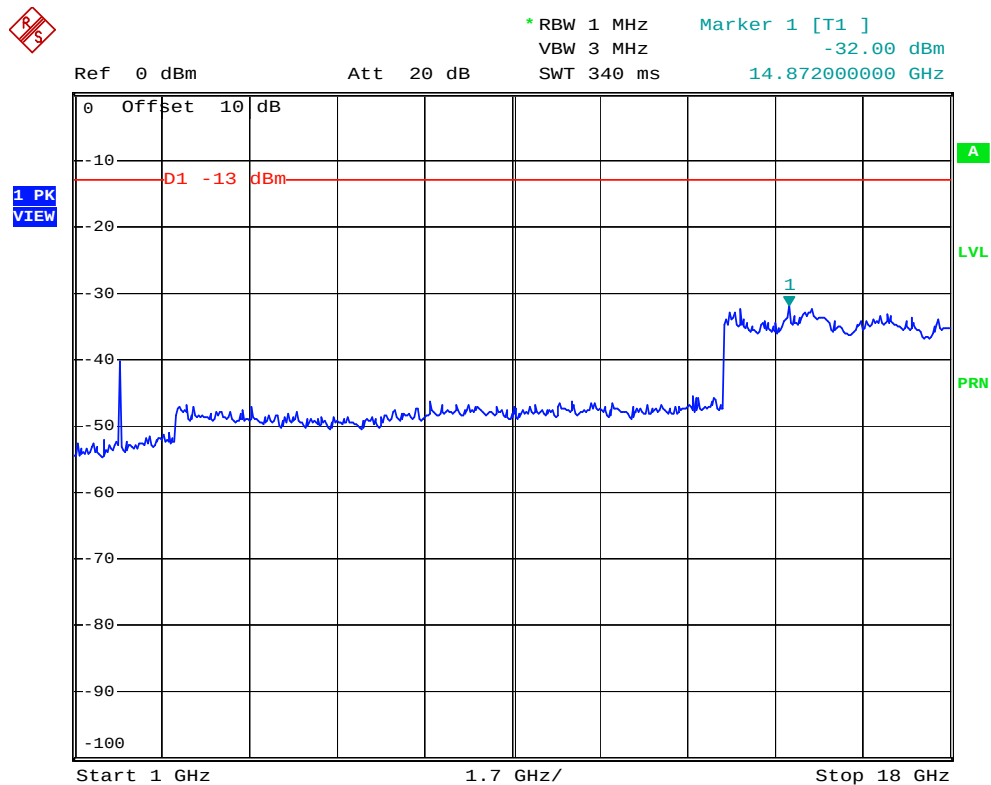
Above 1GHz



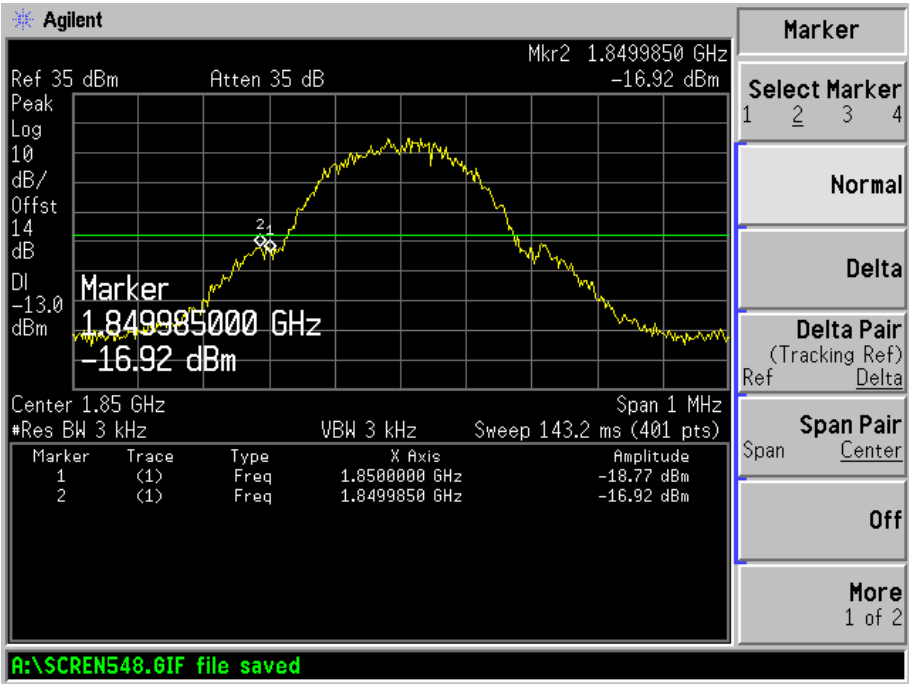
GSM High Channel
30MHz to 1GHz



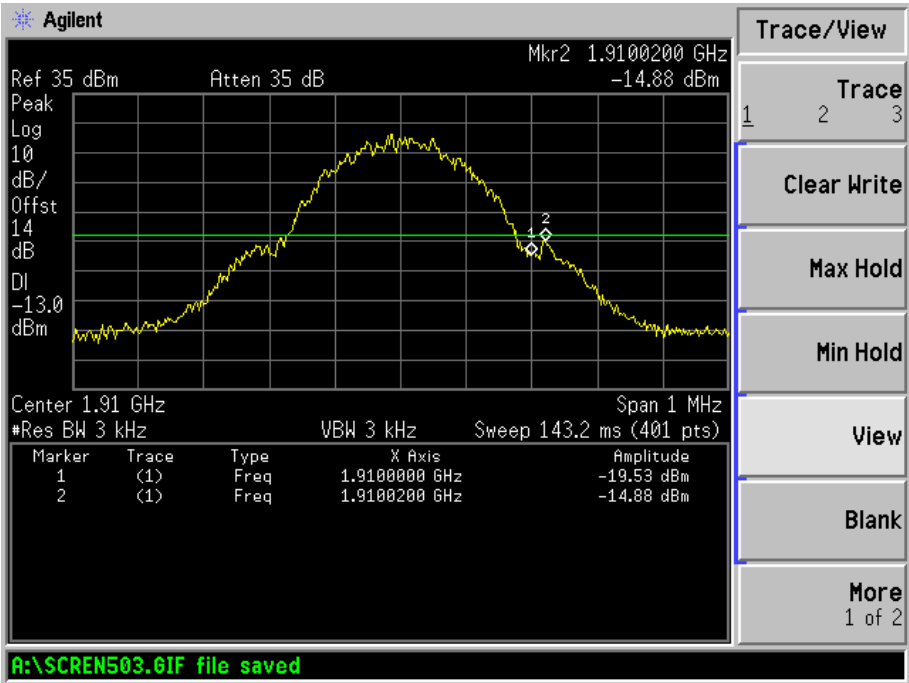
Above 1GHz



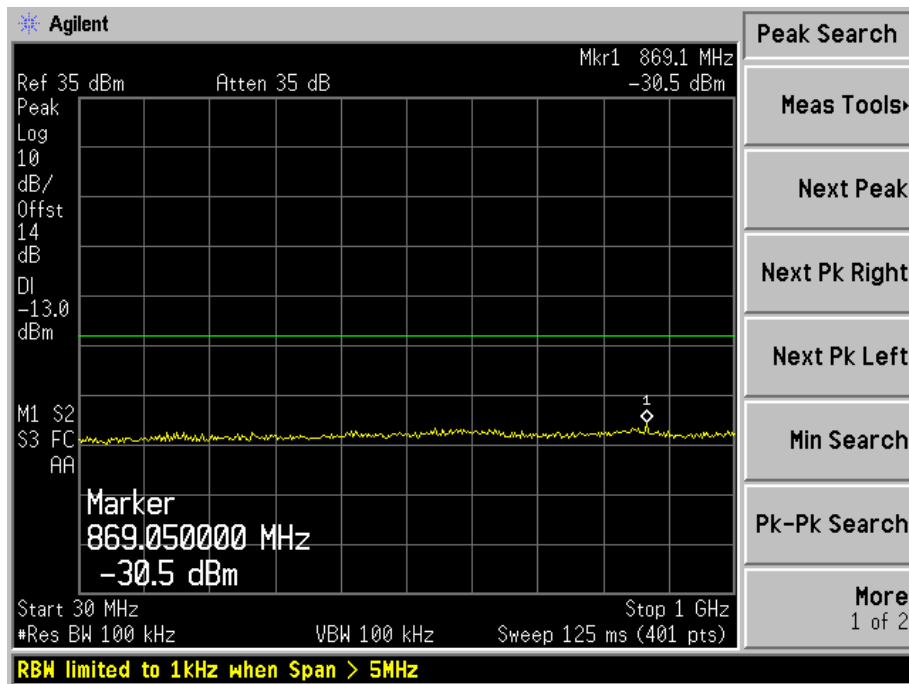
GSM Low Band Emission



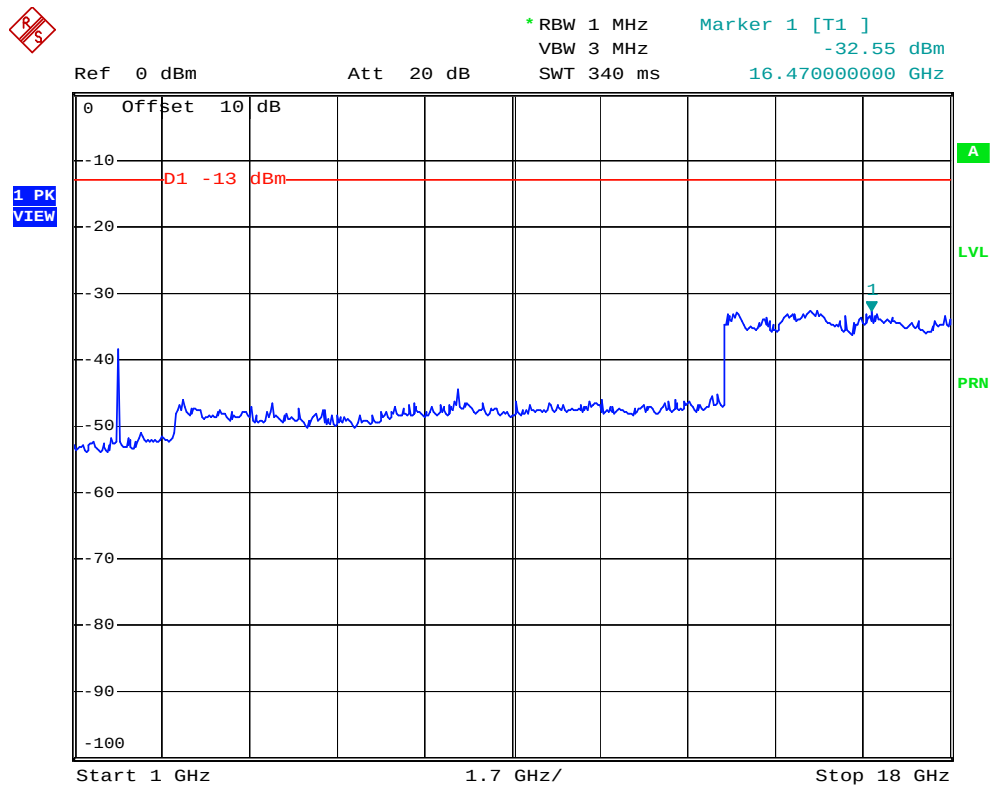
GSM High Band Emission



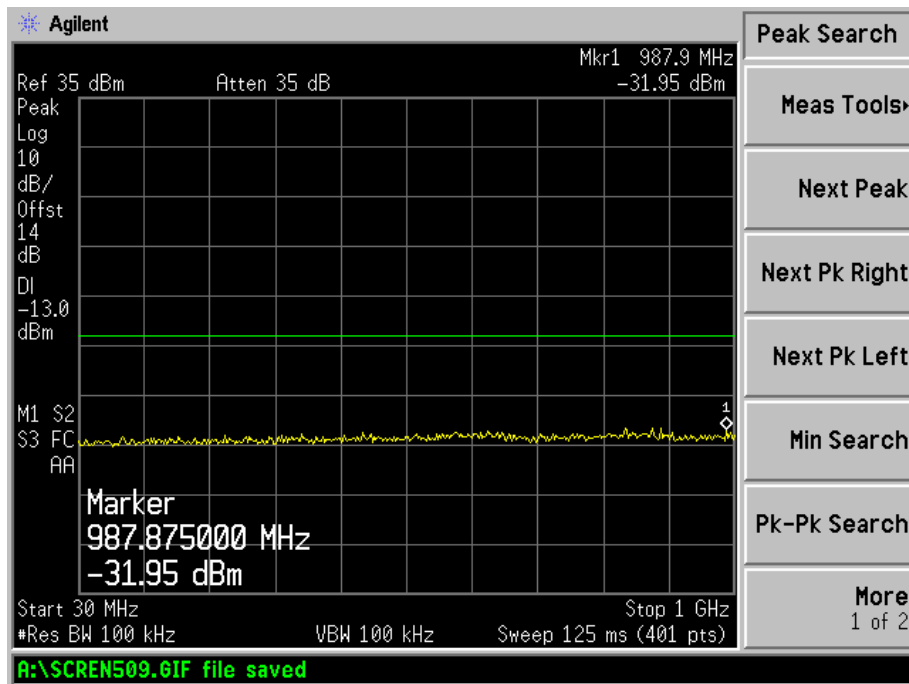
GPRS Low Channel
30MHz to 1GHz



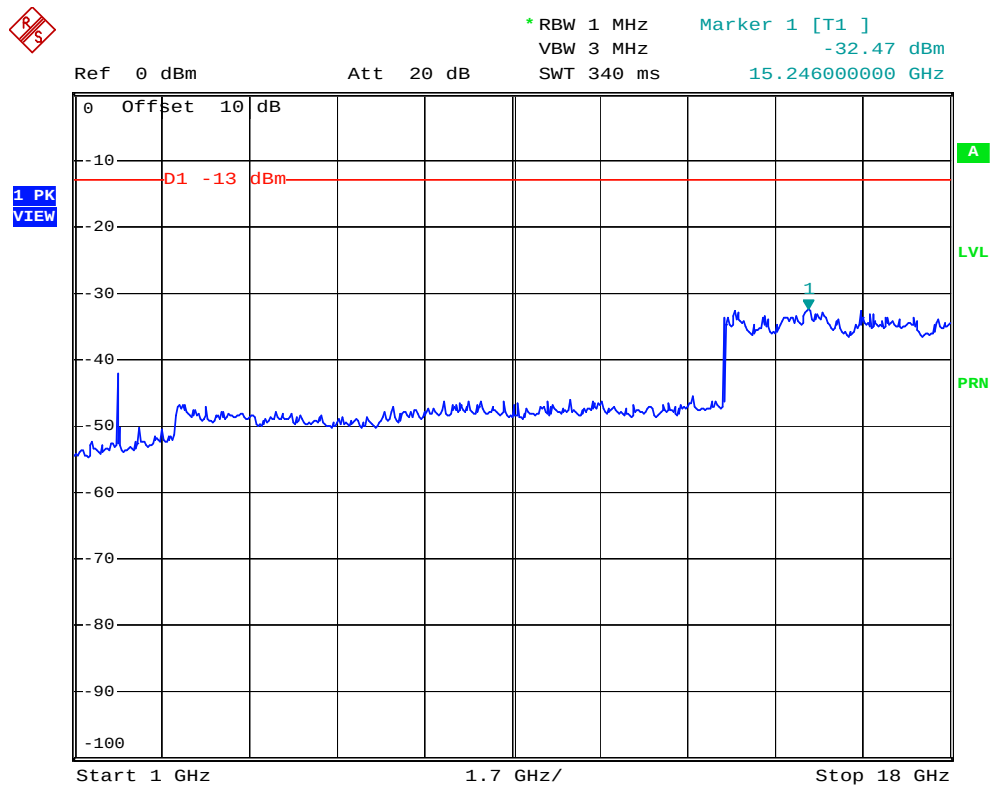
Above 1GHz



GPRS Middle Channel
30MHz to 1GHz

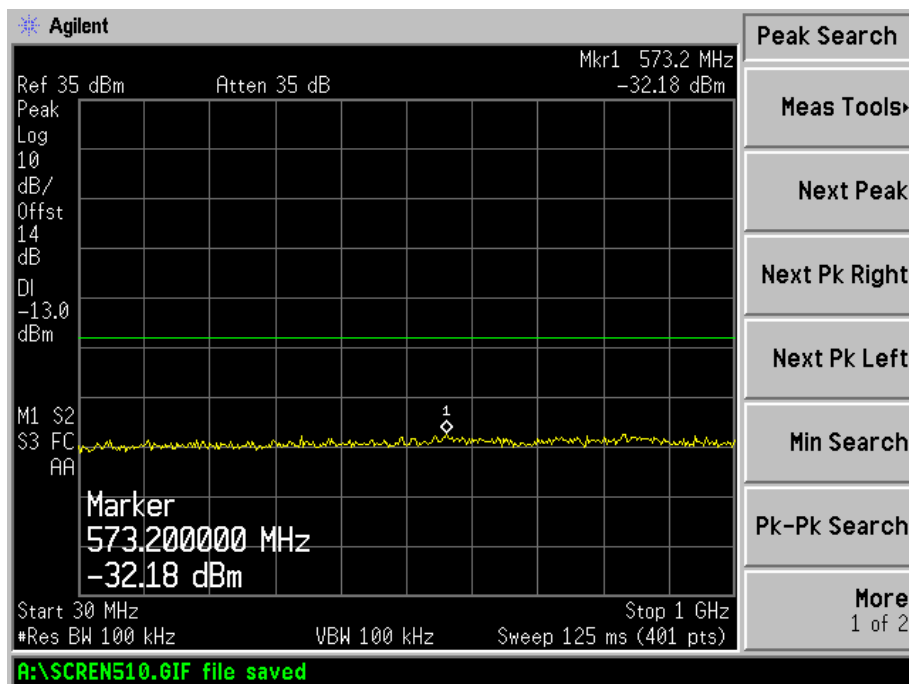


Above 1GHz

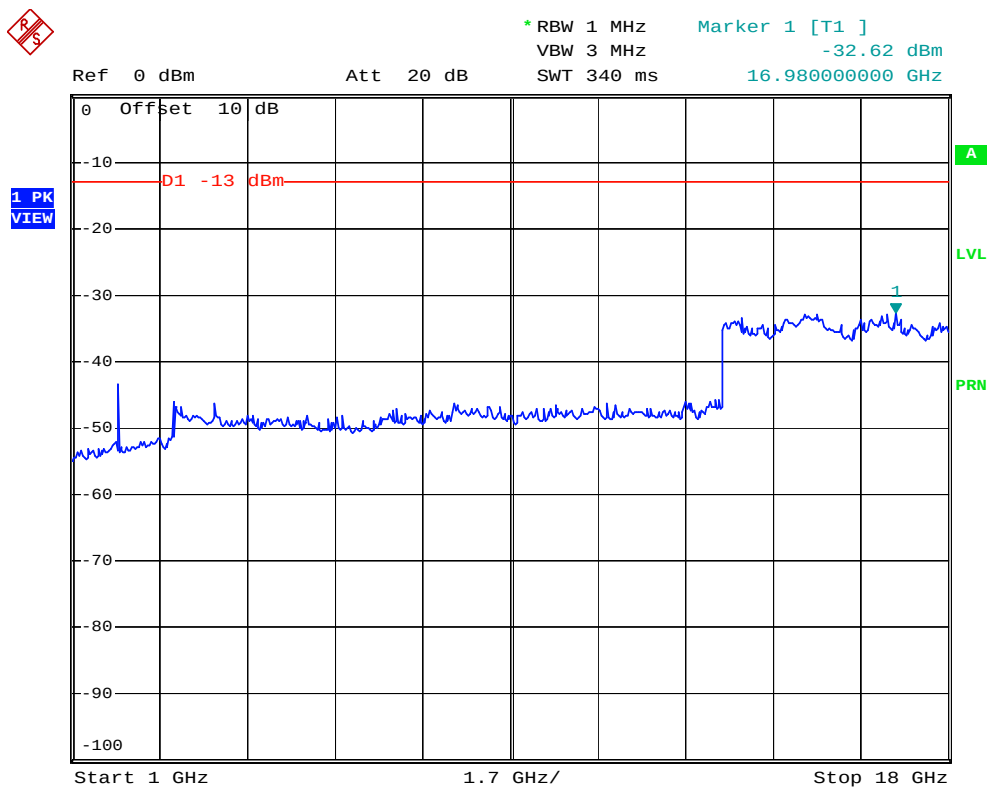


GPRS High Channel

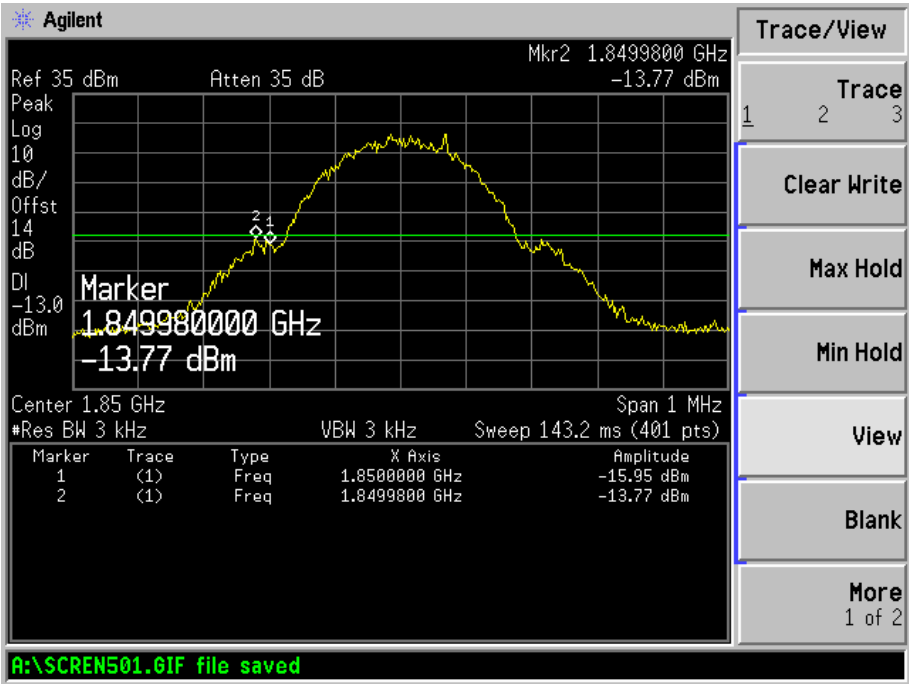
30MHz to 1GHz



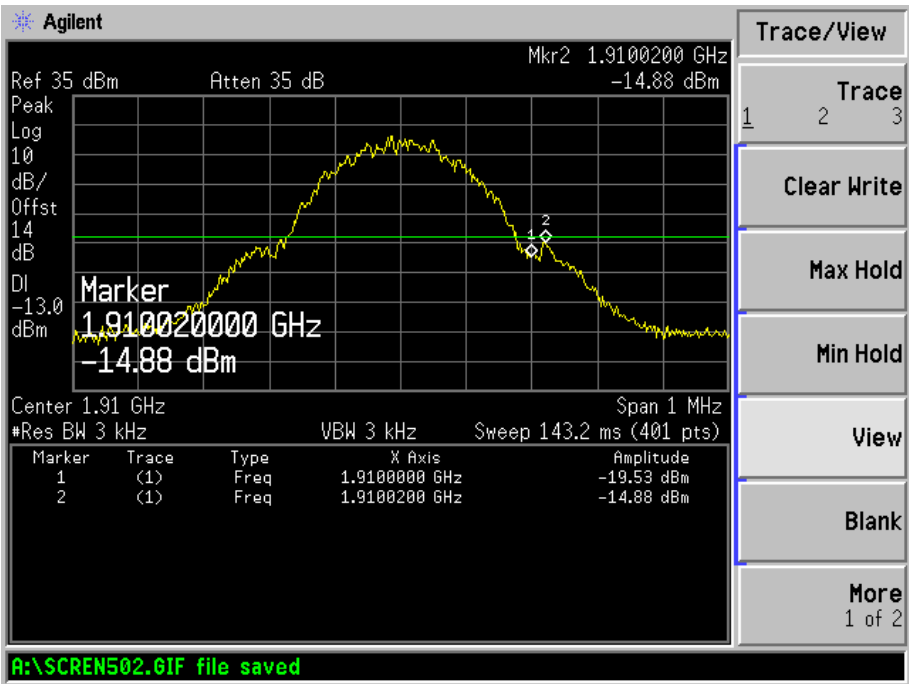
Above 1GHz



GPRS Low Band Emission



GPRS High Band Emission



7. SPURIOUS RADIATION EMISSIONS

7.1 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.

7.2 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.

7.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	112012	2012-03-28	2013-03-27
Signal Generator	R&S	SMR20	100047	2012-03-28	2013-03-27

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

7.4 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 = $43 + 10 \log_{10}(\text{power out in Watts})$

7.5 Environmental Conditions

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

7.6 Summary of Test Results/Plots

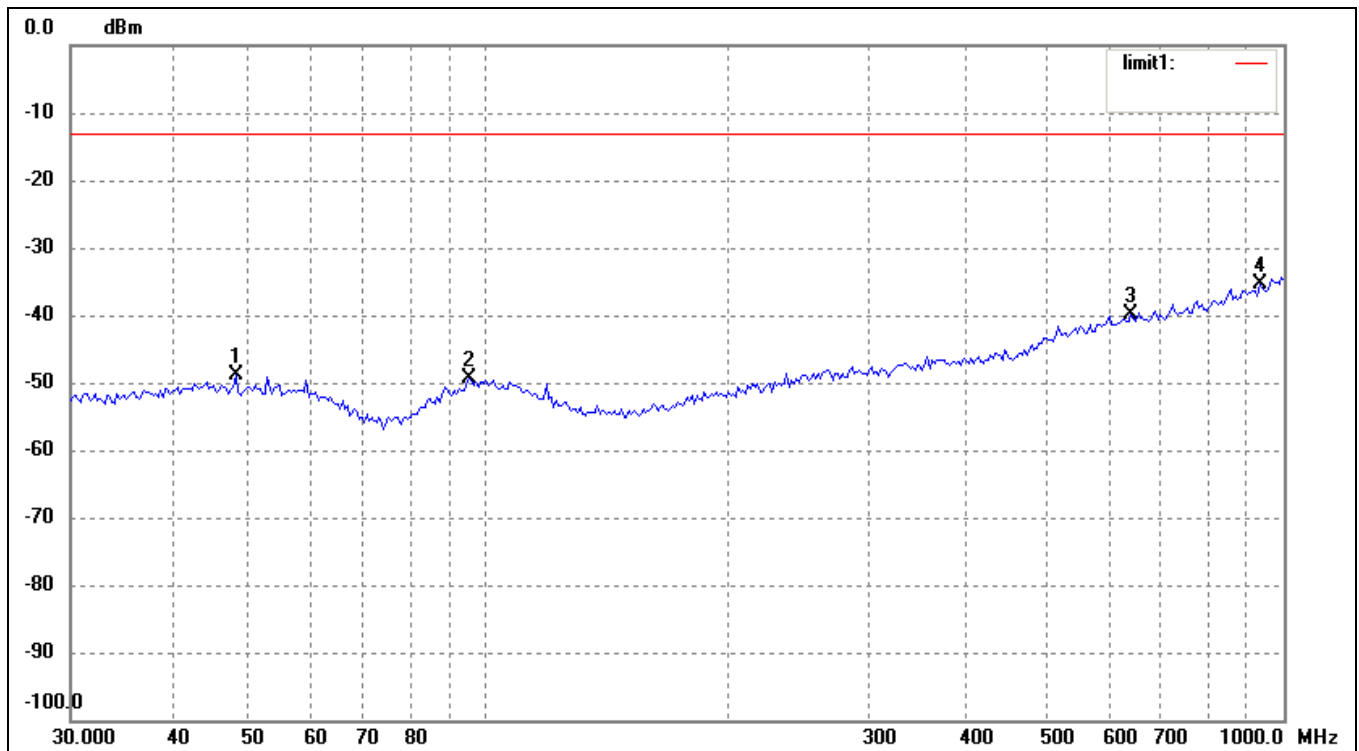
According to the data below, the FCC Part 22.917 and 24.238 standards, and had the worst margin of:

-17.2 at 3700.4 MHz in the Vertical polarization for PCS Band GSM Mode Middle channel, 30 MHz to 18 GHz.

Spurious Emission From 30MHz to 1GHz

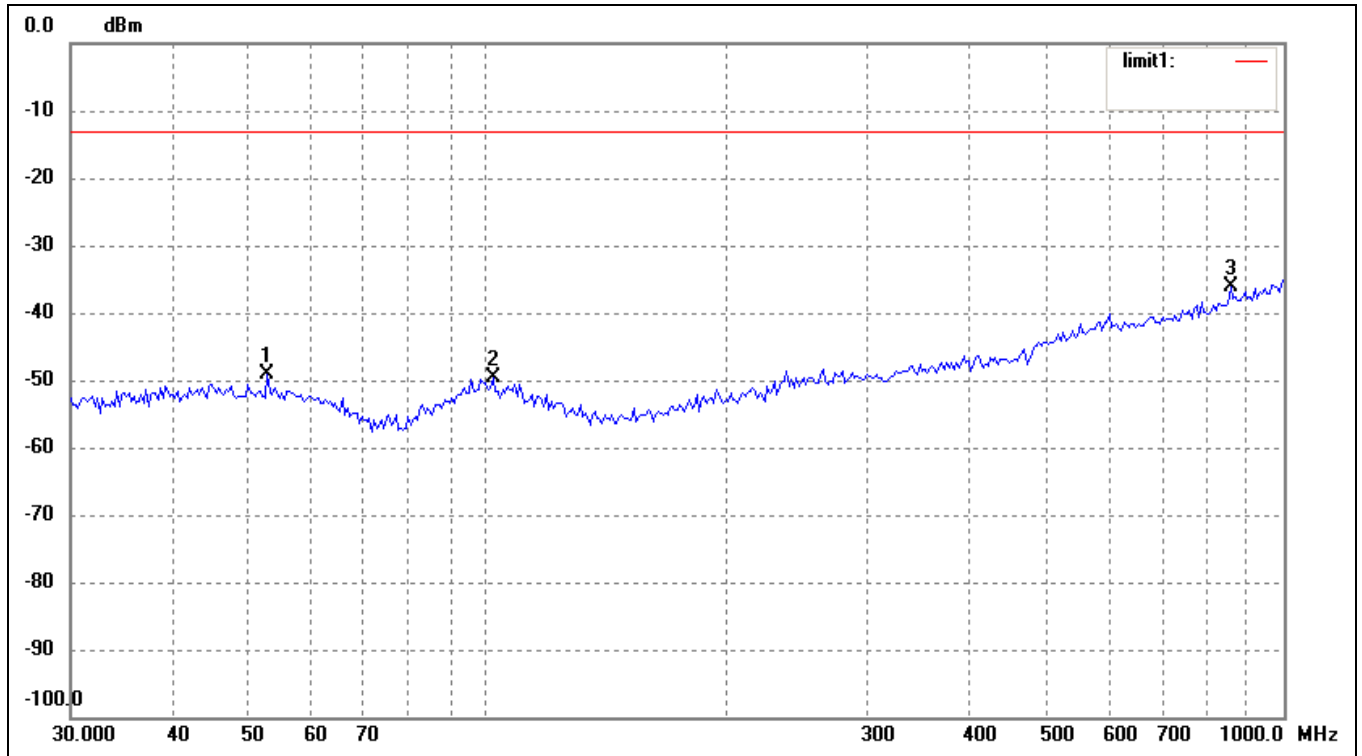
For Cellular Band_GSM Mode Low channel

Horizontal:



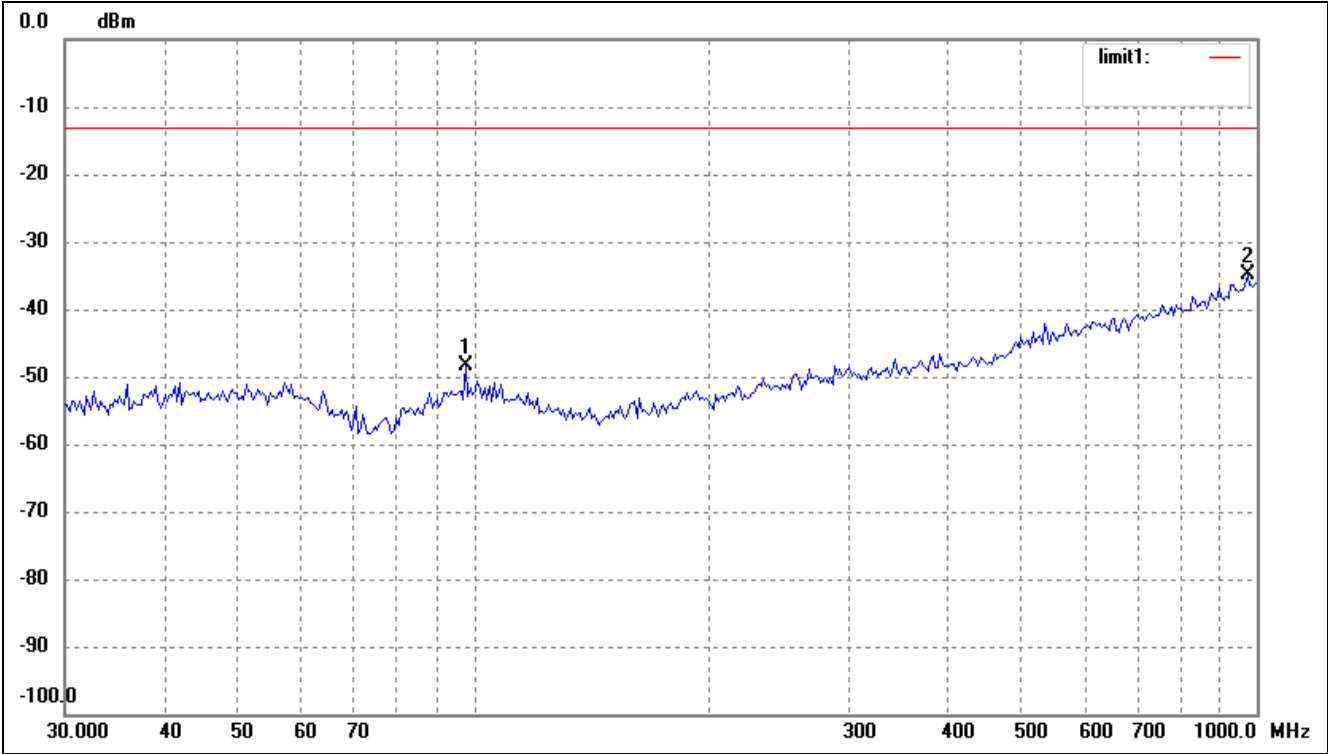
No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	48.3318	-68.74	19.86	-48.88	-13.00	-35.88	ERP
2	94.7601	-69.14	19.81	-49.33	-13.00	-36.33	ERP
3	642.8613	-68.66	28.82	-39.84	-13.00	-26.84	ERP
4	932.2715	-68.63	33.30	-35.33	-13.00	-22.33	ERP

Vertical:



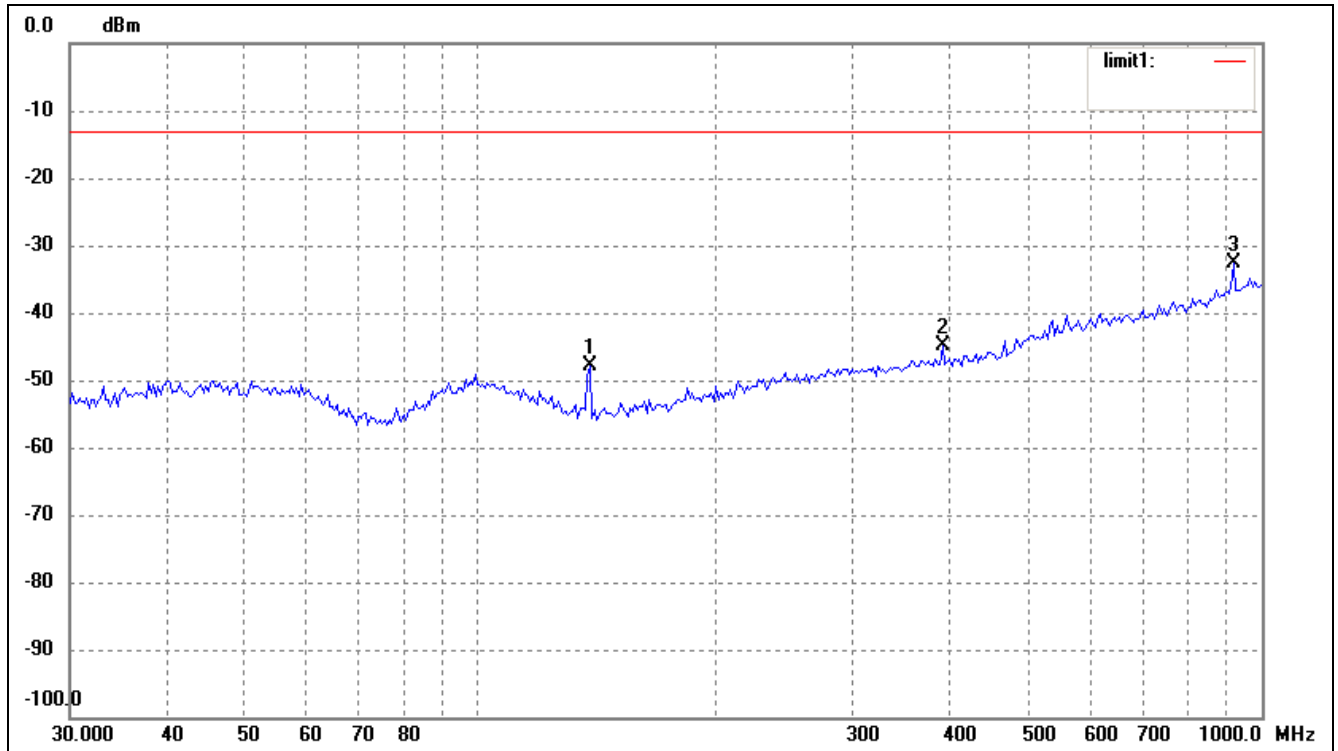
No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	52.9453	-68.72	19.65	-49.07	-13.00	-36.07	ERP
2	101.6443	-69.78	20.09	-49.69	-13.00	-36.69	ERP
3	857.0247	-68.10	31.88	-36.22	-13.00	-23.22	ERP

For Cellular Band_GSM Mode Middle channel
Horizontal:



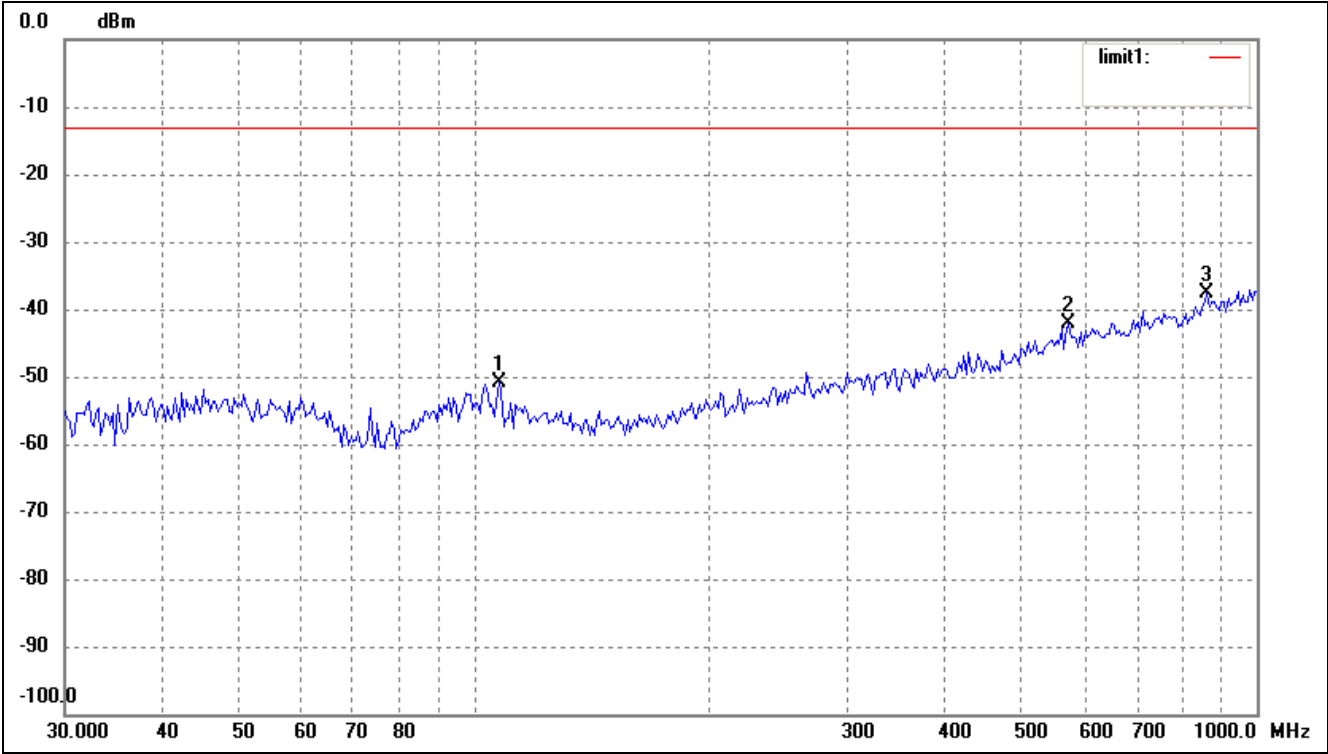
No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	97.4560	-68.43	20.03	-48.40	-13.00	-35.40	ERP
2	972.3374	-68.82	34.03	-34.79	-13.00	-21.79	ERP

Vertical:



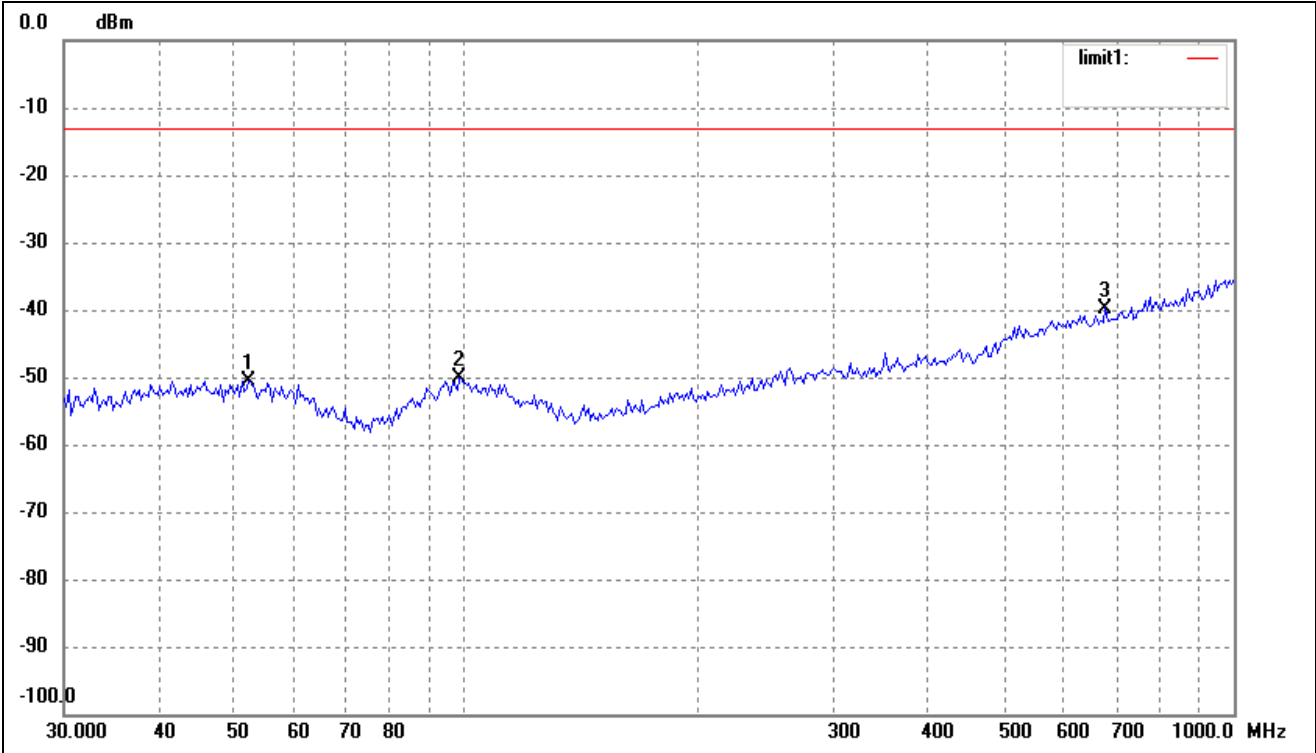
No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	138.3873	-63.72	15.86	-47.86	-13.00	-34.86	ERP
2	390.7226	-67.98	23.11	-44.87	-13.00	-31.87	ERP
3	919.2866	-65.76	33.06	-32.70	-13.00	-19.70	ERP

For Cellular Band_GSM Mode High channel
Horizontal:



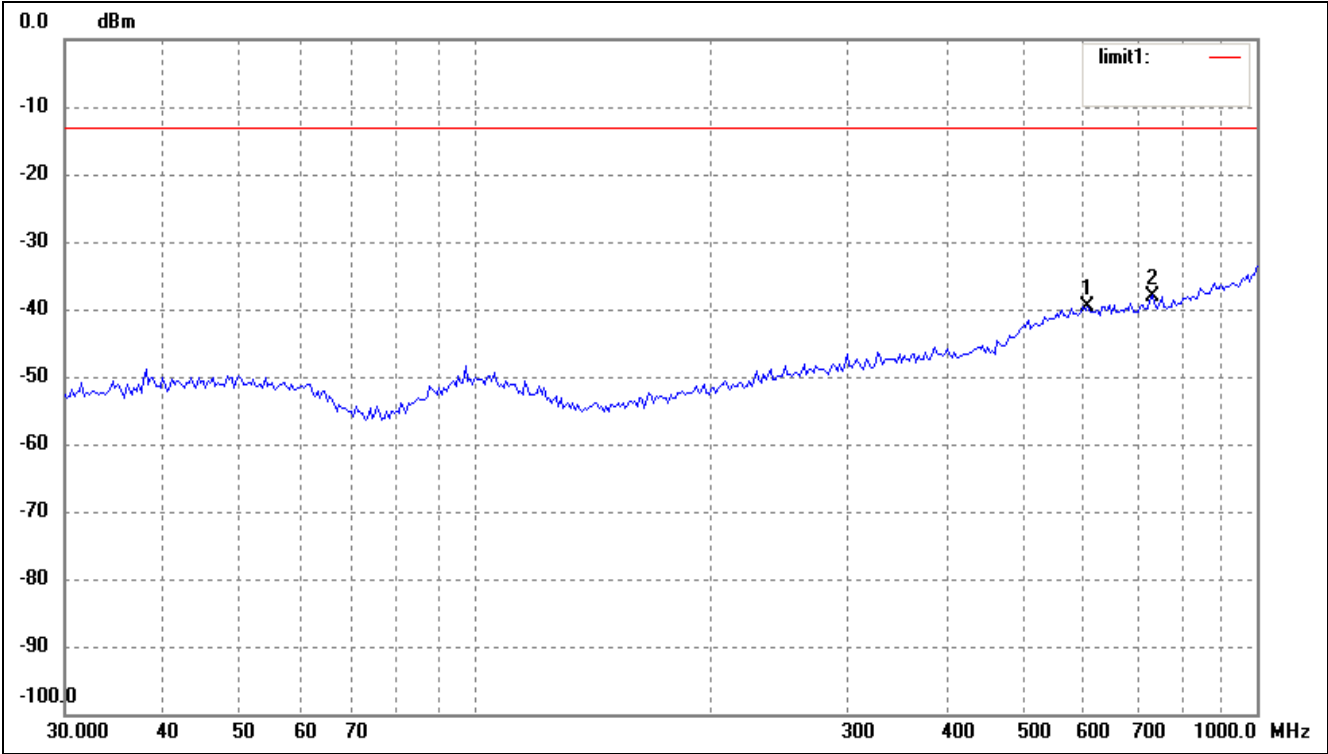
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	107.5101	-70.51	19.60	-50.91	-13.00	-37.91	ERP
2	574.6258	-70.05	27.90	-42.15	-13.00	-29.15	ERP
3	863.0562	-69.68	32.01	-37.67	-13.00	-24.67	ERP

Vertical:



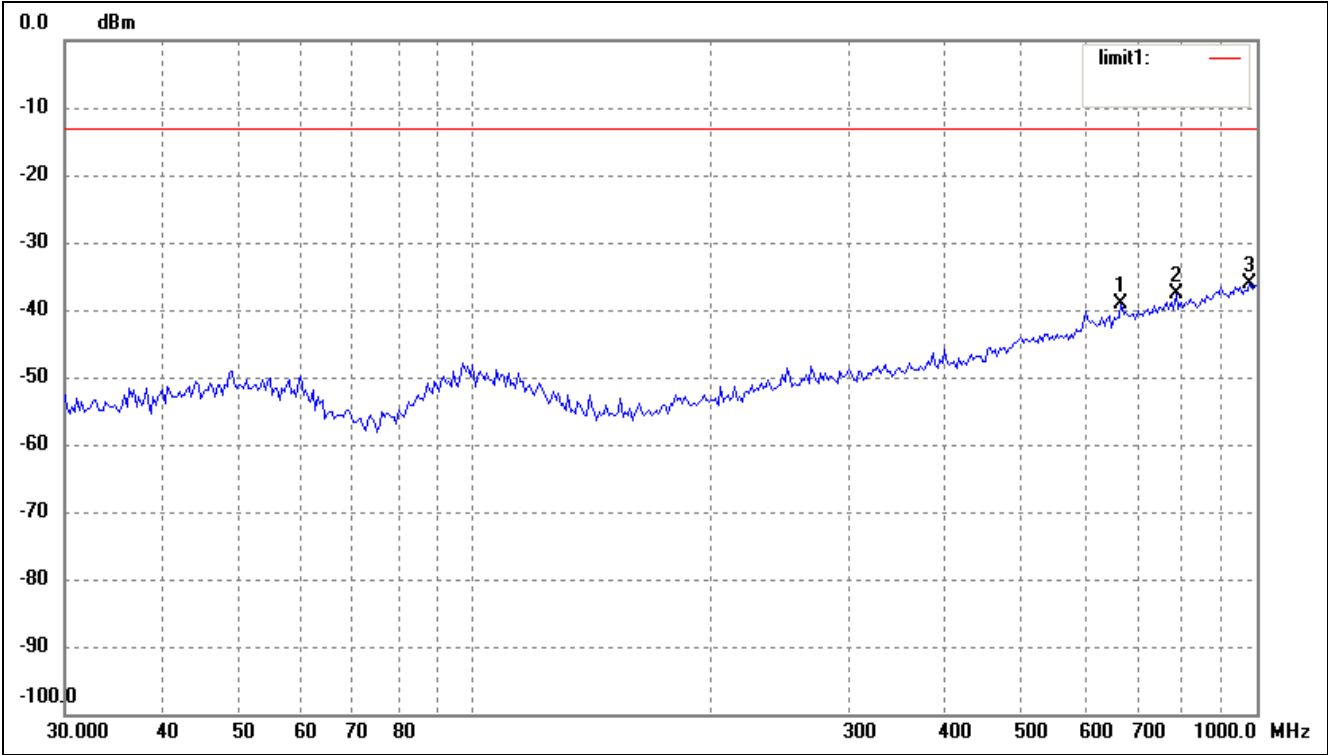
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	52.2079	-70.26	19.68	-50.58	-13.00	-37.58	ERP
2	98.1419	-70.24	20.10	-50.14	-13.00	-37.14	ERP
3	679.9600	-68.88	29.13	-39.75	-13.00	-26.75	ERP

For Cellular Band_GPRS Mode Low channel
Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	607.7867	-68.10	28.53	-39.57	-13.00	-26.57	ERP
2	734.4913	-67.82	29.82	-38.00	-13.00	-25.00	ERP

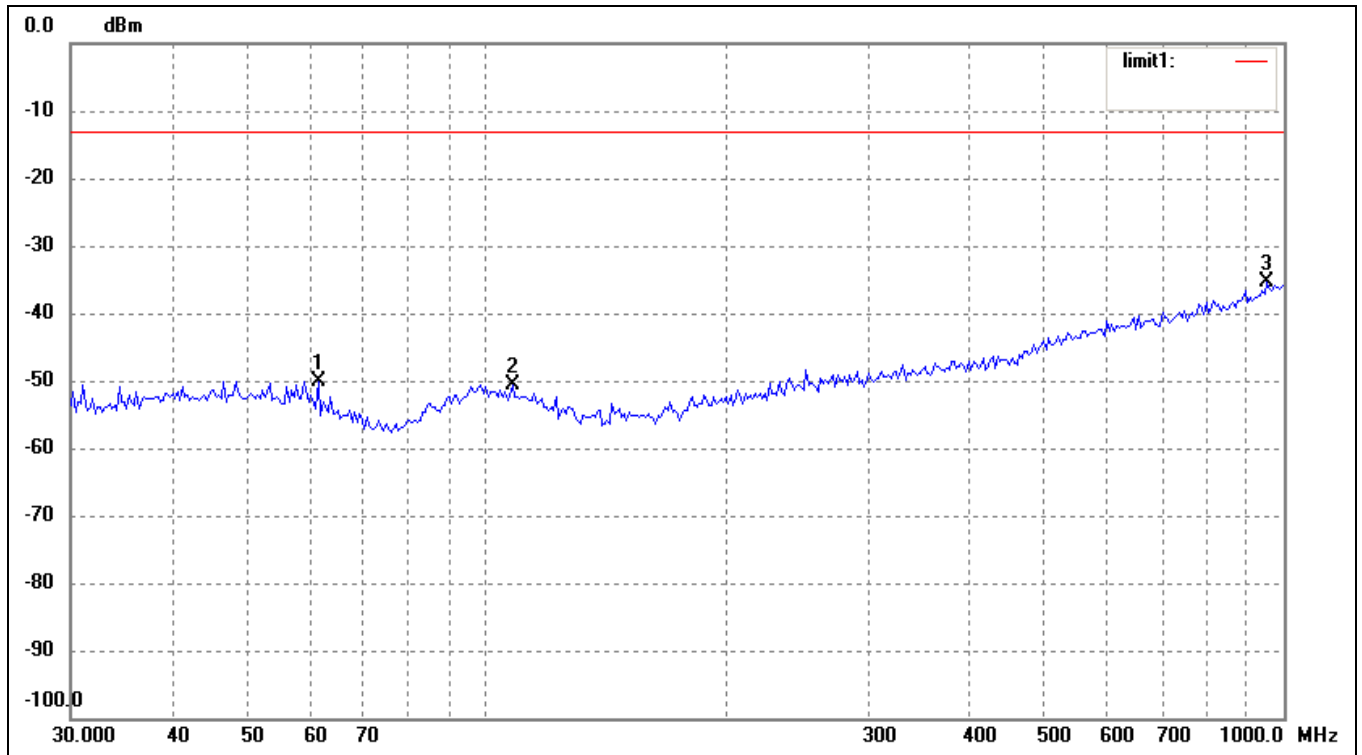
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	670.4892	-68.11	29.06	-39.05	-13.00	-26.05	ERP
2	787.8513	-68.34	30.63	-37.71	-13.00	-24.71	ERP
3	979.1803	-70.29	34.16	-36.13	-13.00	-23.13	ERP

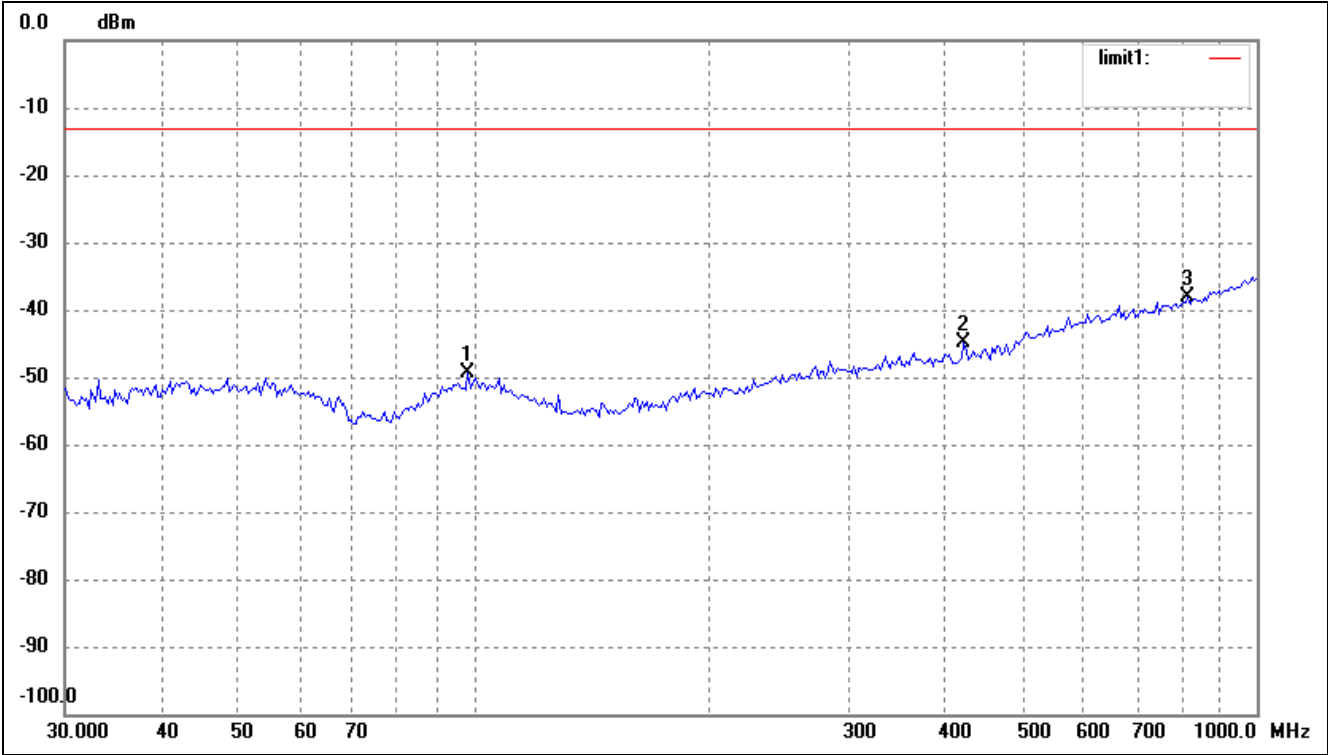
For Cellular Band_GPRS Mode Middle channel

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	61.3463	-68.88	18.80	-50.08	-13.00	-37.08	ERP
2	107.5101	-70.24	19.60	-50.64	-13.00	-37.64	ERP
3	952.0937	-68.95	33.66	-35.29	-13.00	-22.29	ERP

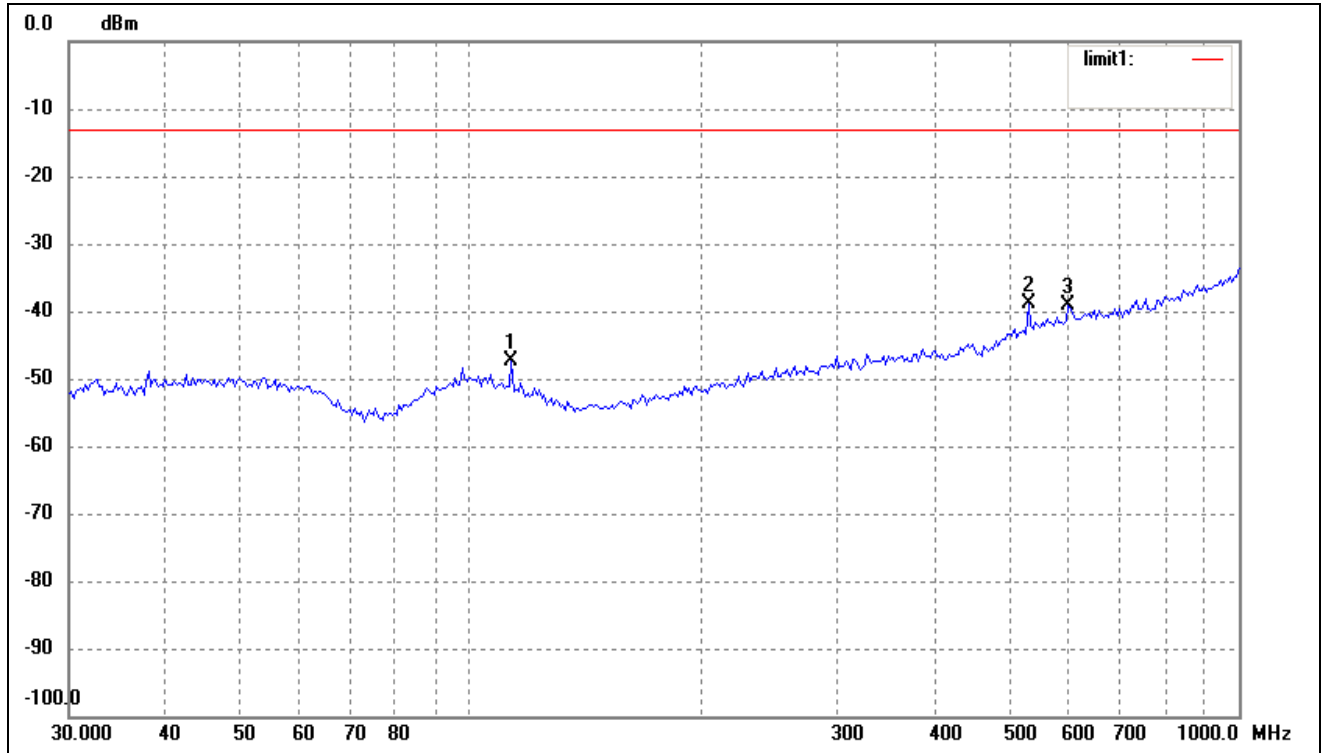
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	98.1419	-69.48	20.10	-49.38	-13.00	-36.38	ERP
2	422.0577	-68.21	23.24	-44.97	-13.00	-31.97	ERP
3	815.9678	-69.27	31.11	-38.16	-13.00	-25.16	ERP

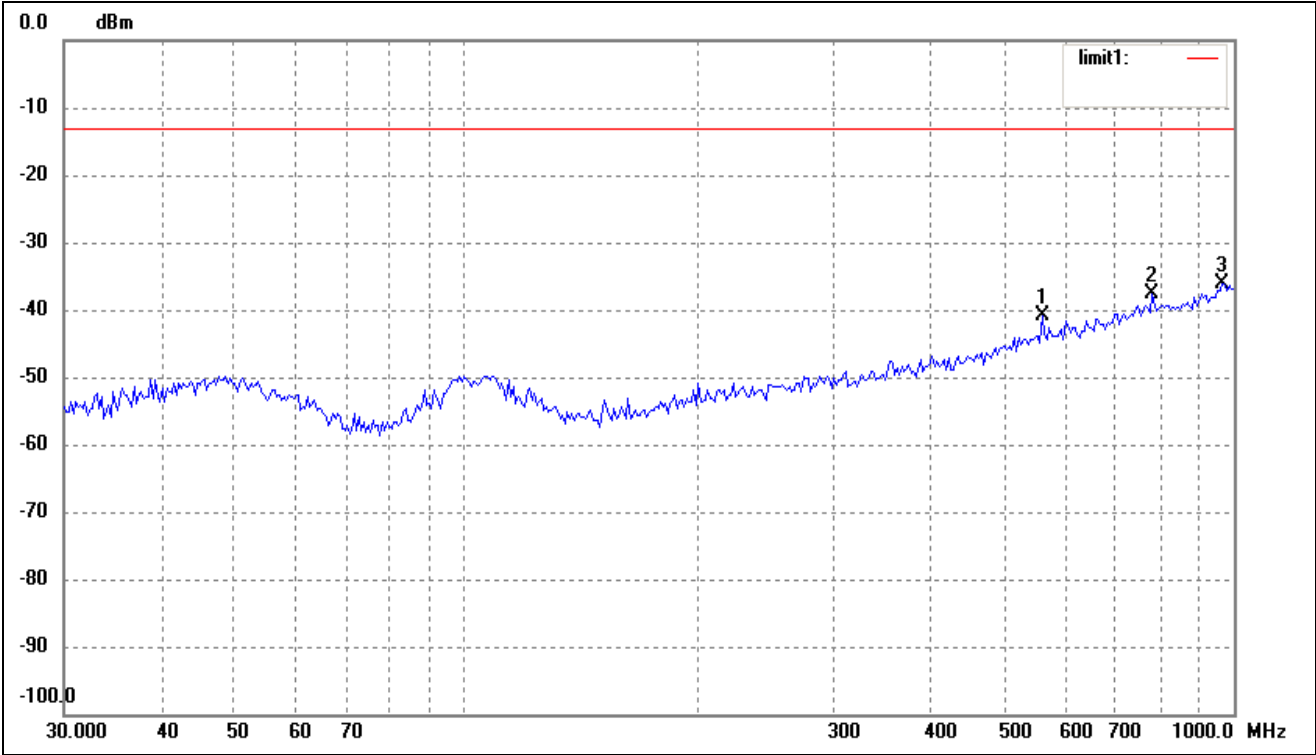
For Cellular Band_GPRS Mode High channel

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	112.9196	-66.31	18.91	-47.40	-13.00	-34.40	ERP
2	531.9635	-65.89	26.92	-38.97	-13.00	-25.97	ERP
3	599.3213	-67.53	28.45	-39.08	-13.00	-26.08	ERP

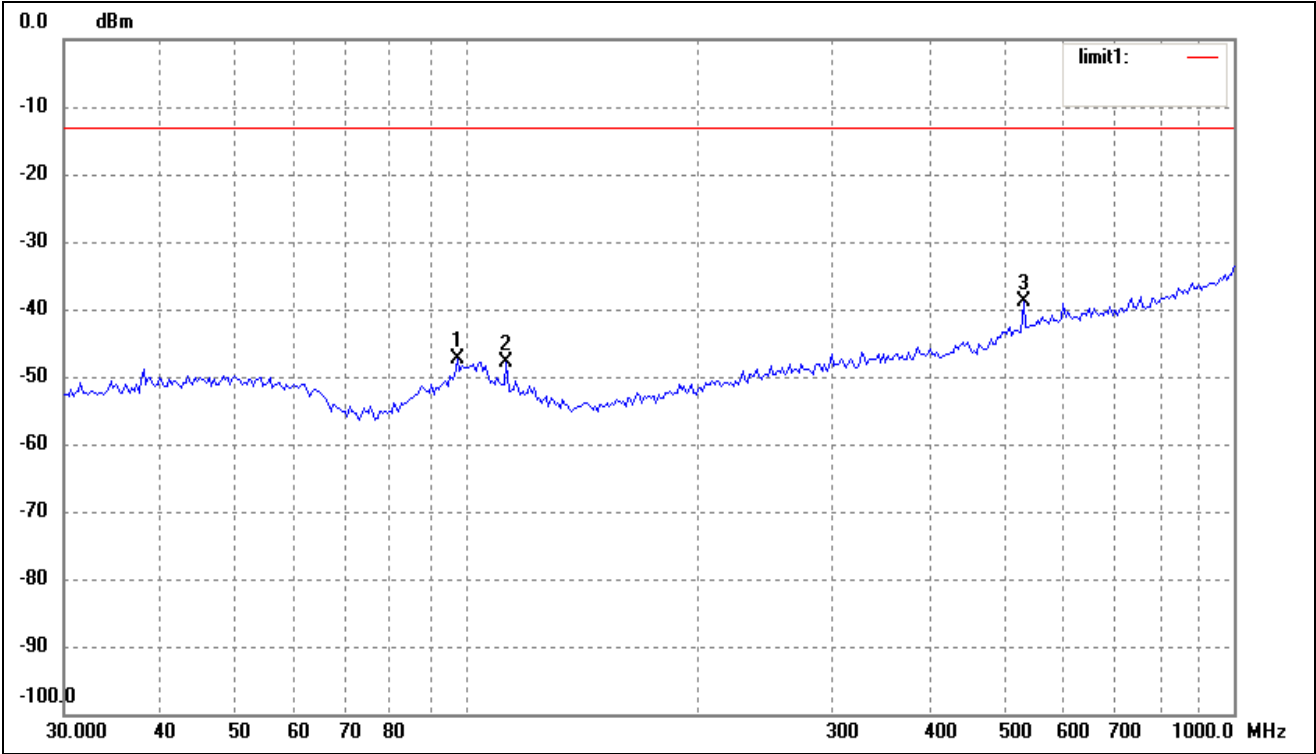
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	562.6624	-68.54	27.63	-40.91	-13.00	-27.91	ERP
2	782.3452	-68.20	30.54	-37.66	-13.00	-24.66	ERP
3	965.5421	-70.08	33.90	-36.18	-13.00	-23.18	ERP

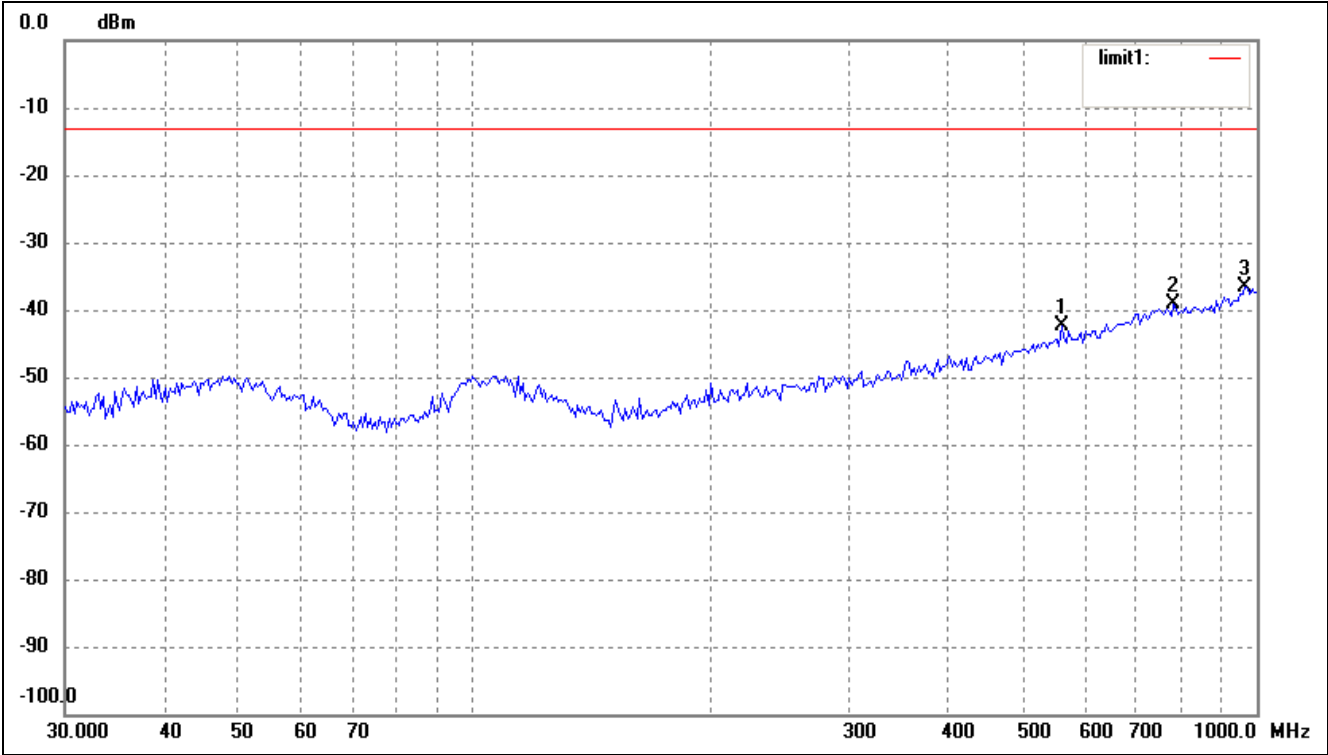
For PCS Band_GSM Mode Low channel

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	97.4560	-67.43	20.03	-47.40	-13.00	-34.40	ERP
2	112.9196	-66.81	18.91	-47.90	-13.00	-34.90	ERP
3	531.9634	-65.89	26.92	-38.97	-13.00	-25.97	ERP

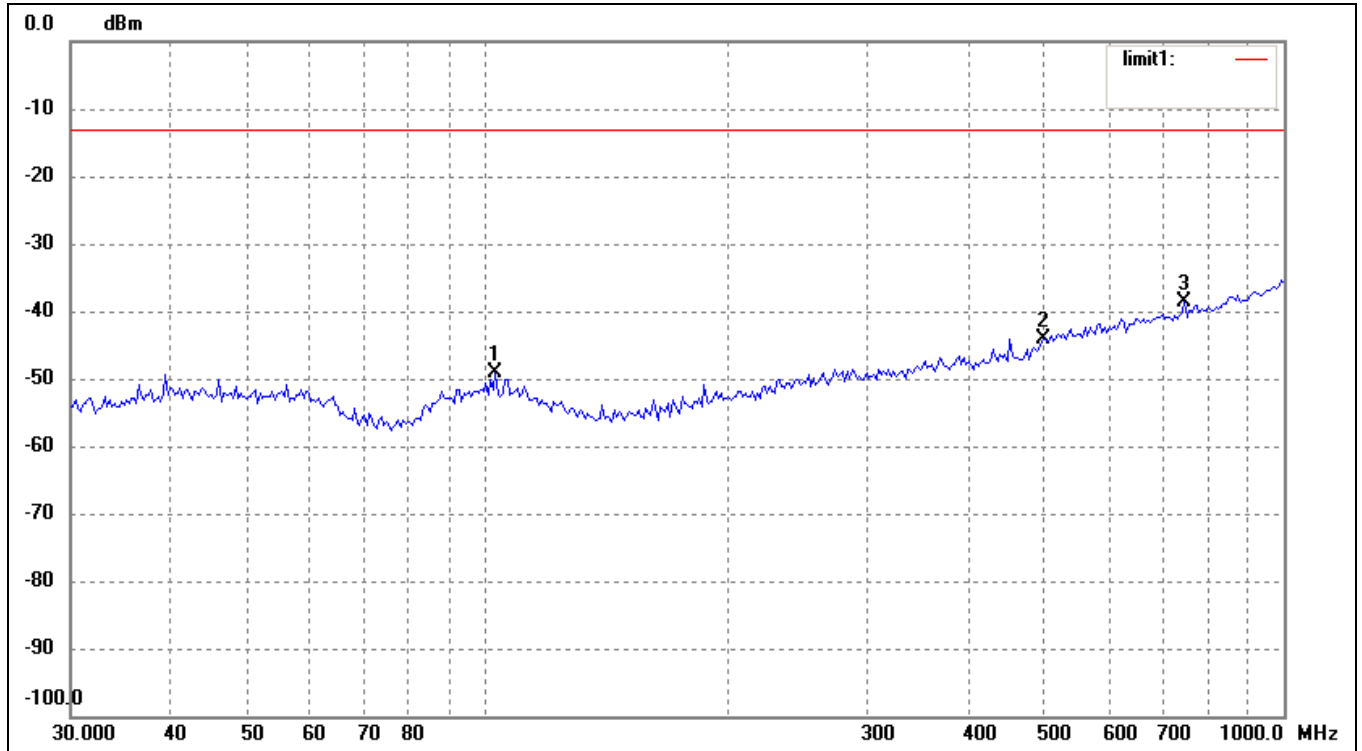
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	562.6624	-70.04	27.63	-42.41	-13.00	-29.41	ERP
2	782.3452	-69.70	30.54	-39.16	-13.00	-26.16	ERP
3	965.5421	-70.58	33.90	-36.68	-13.00	-23.68	ERP

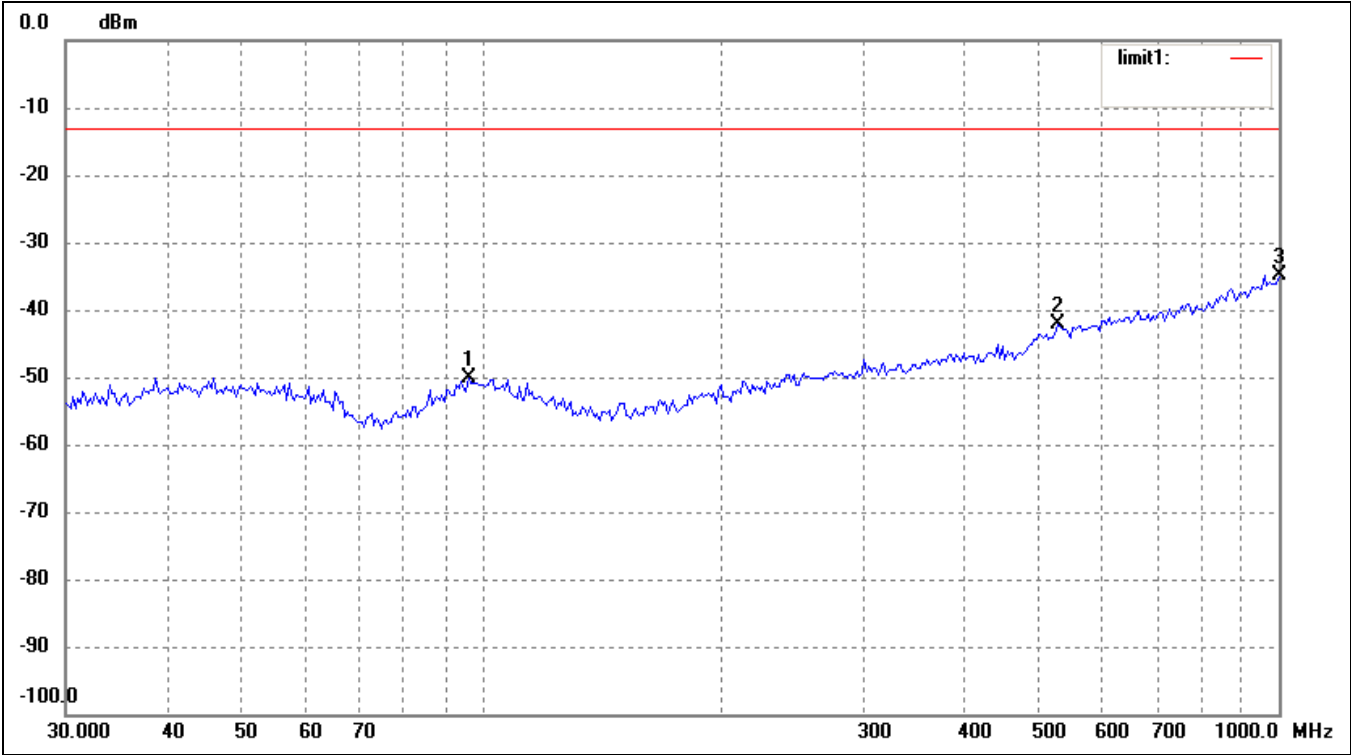
For PCS Band_GSM Mode Middle channel

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	102.3597	-69.05	20.03	-49.02	-13.00	-36.02	ERP
2	499.4247	-70.18	26.16	-44.02	-13.00	-31.02	ERP
3	750.1083	-68.75	30.06	-38.69	-13.00	-25.69	ERP

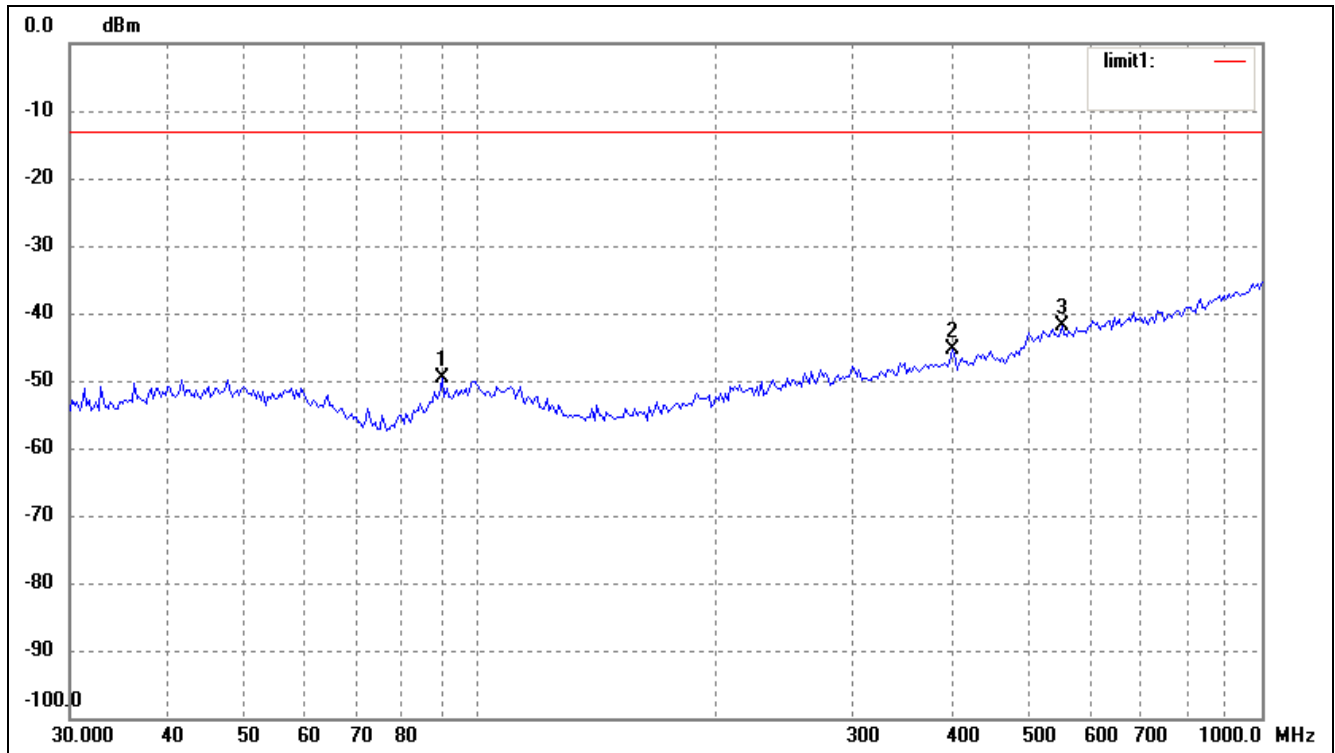
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	96.0986	-70.13	19.94	-50.19	-13.00	-37.19	ERP
2	528.2458	-68.98	26.86	-42.12	-13.00	-29.12	ERP
3	1000.0000	-69.34	34.54	-34.80	-13.00	-21.80	ERP

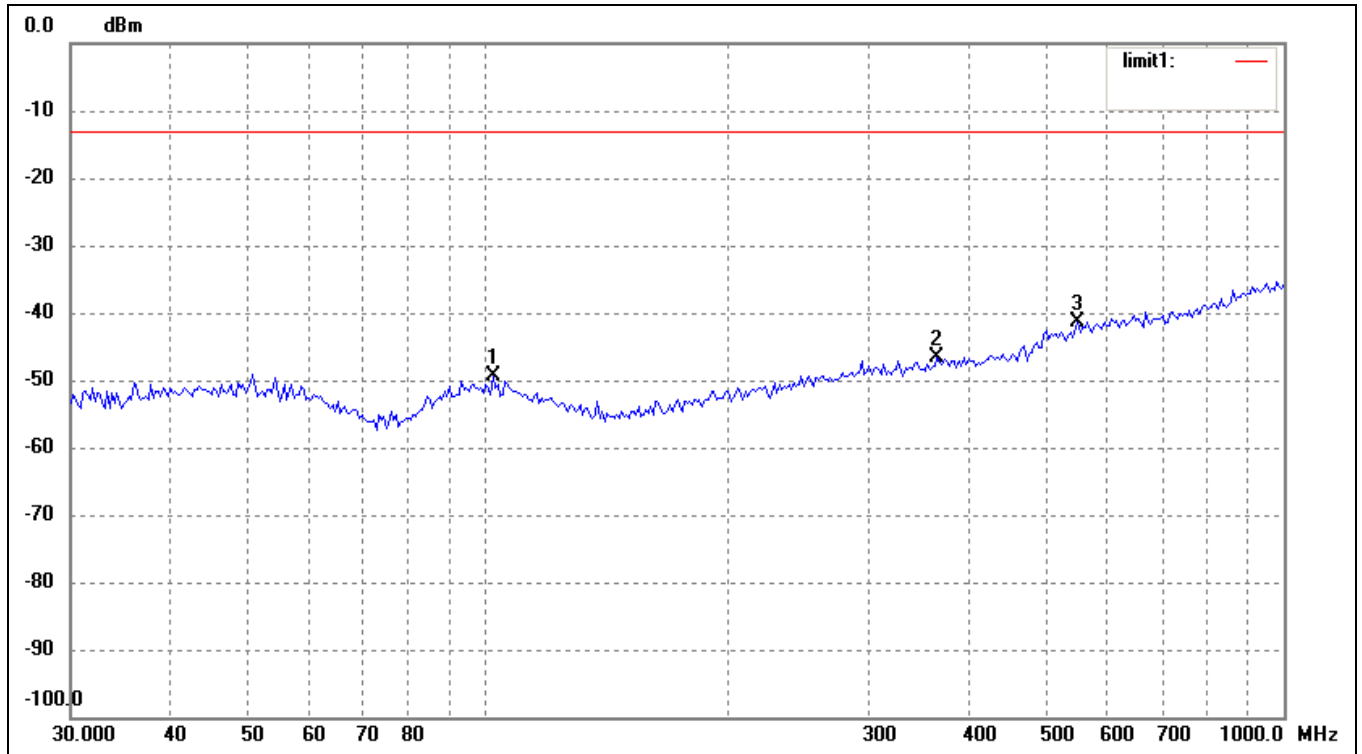
For PCS Band_GSM Mode High channel

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	89.5900	-68.46	18.75	-49.71	-13.00	-36.71	ERP
2	401.8385	-68.66	23.20	-45.46	-13.00	-32.46	ERP
3	554.8254	-69.43	27.45	-41.98	-13.00	-28.98	ERP

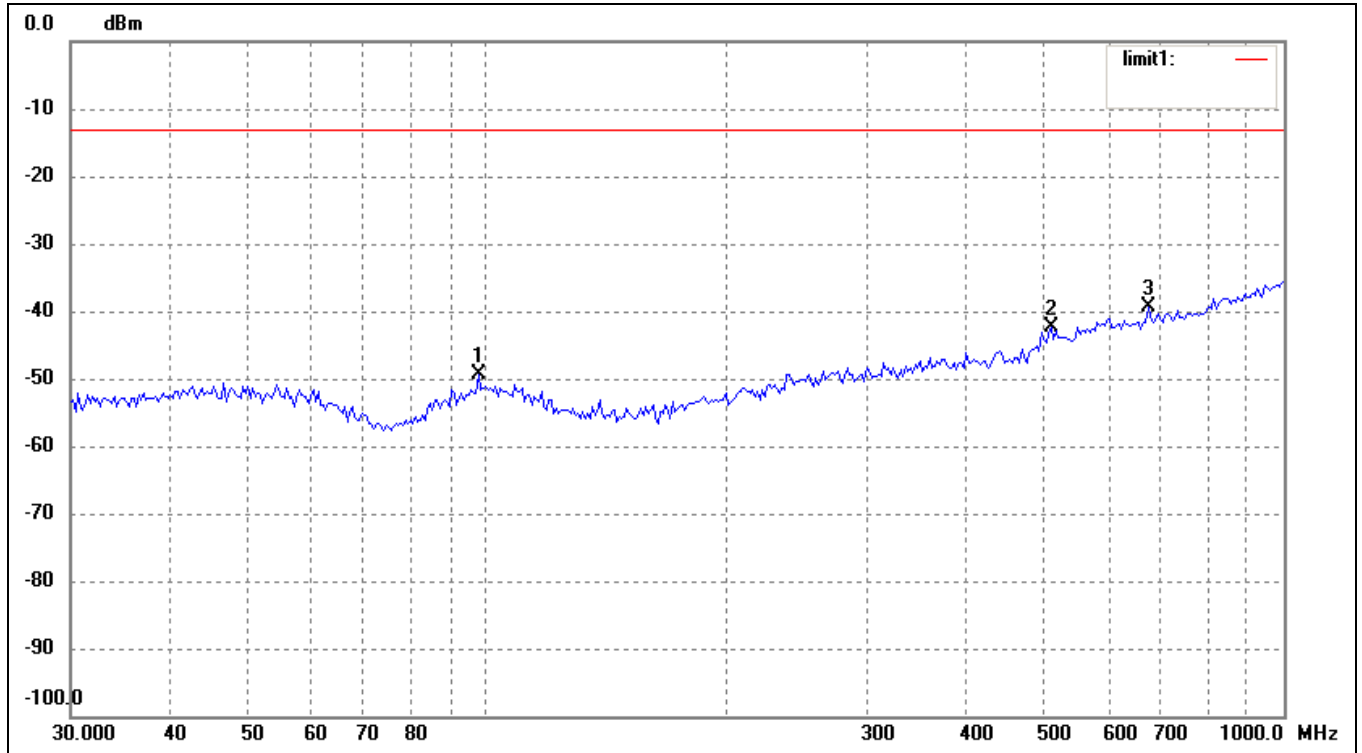
Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	101.6443	-69.58	20.09	-49.49	-13.00	-36.49	ERP
2	366.8231	-69.48	22.79	-46.69	-13.00	-33.69	ERP
3	550.9480	-68.64	27.37	-41.27	-13.00	-28.27	ERP

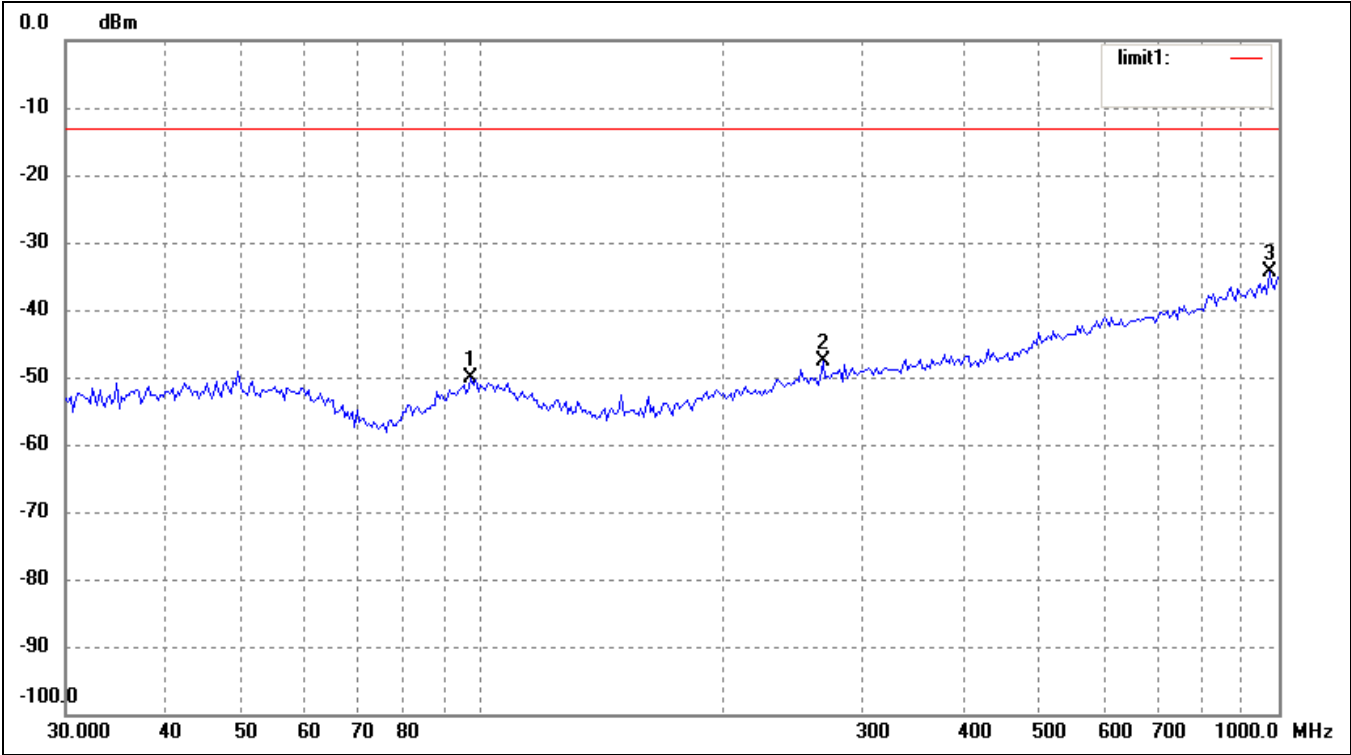
For PCS Band_GPRS Mode Low channel

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	97.4560	-69.29	20.03	-49.26	-13.00	-36.26	ERP
2	510.0436	-68.85	26.44	-42.41	-13.00	-29.41	ERP
3	675.2080	-68.58	29.09	-39.49	-13.00	-26.49	ERP

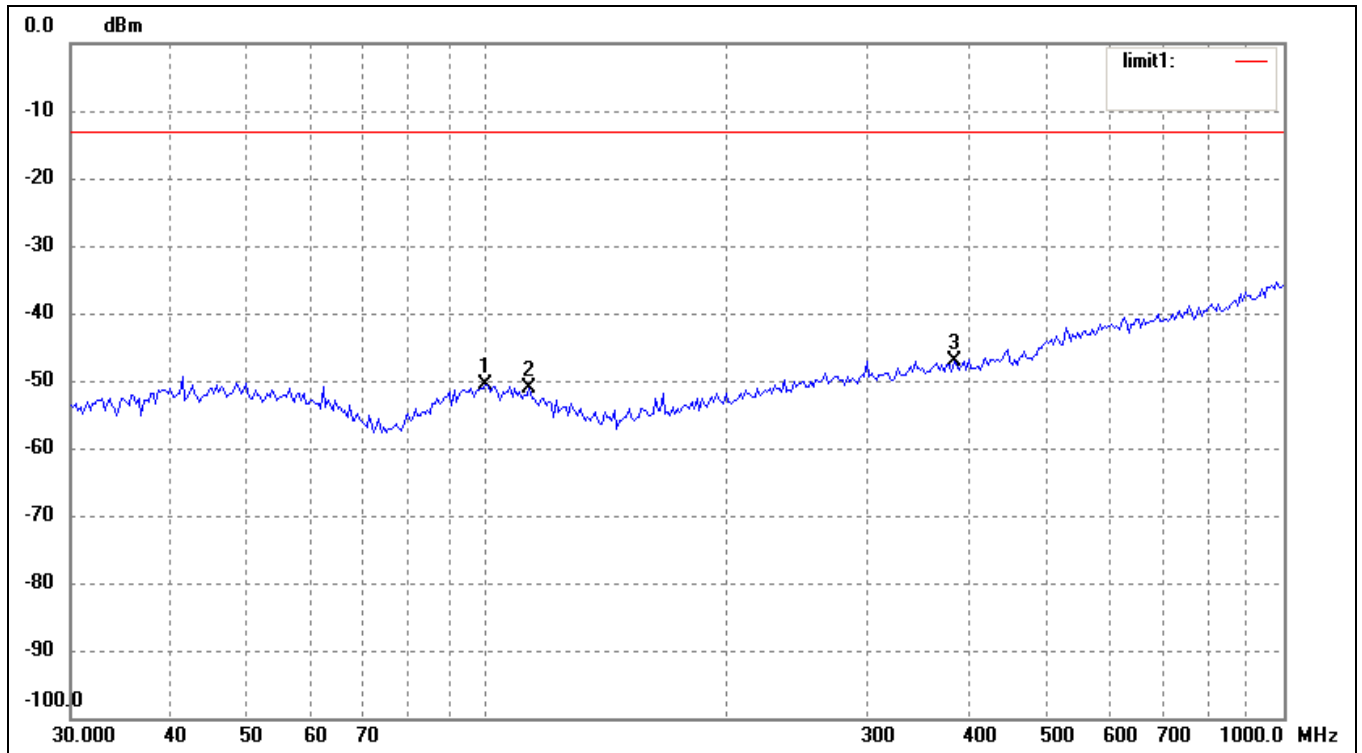
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	96.7749	-70.04	19.99	-50.05	-13.00	-37.05	ERP
2	267.5455	-68.68	20.97	-47.71	-13.00	-34.71	ERP
3	972.3374	-68.46	34.03	-34.43	-13.00	-21.43	ERP

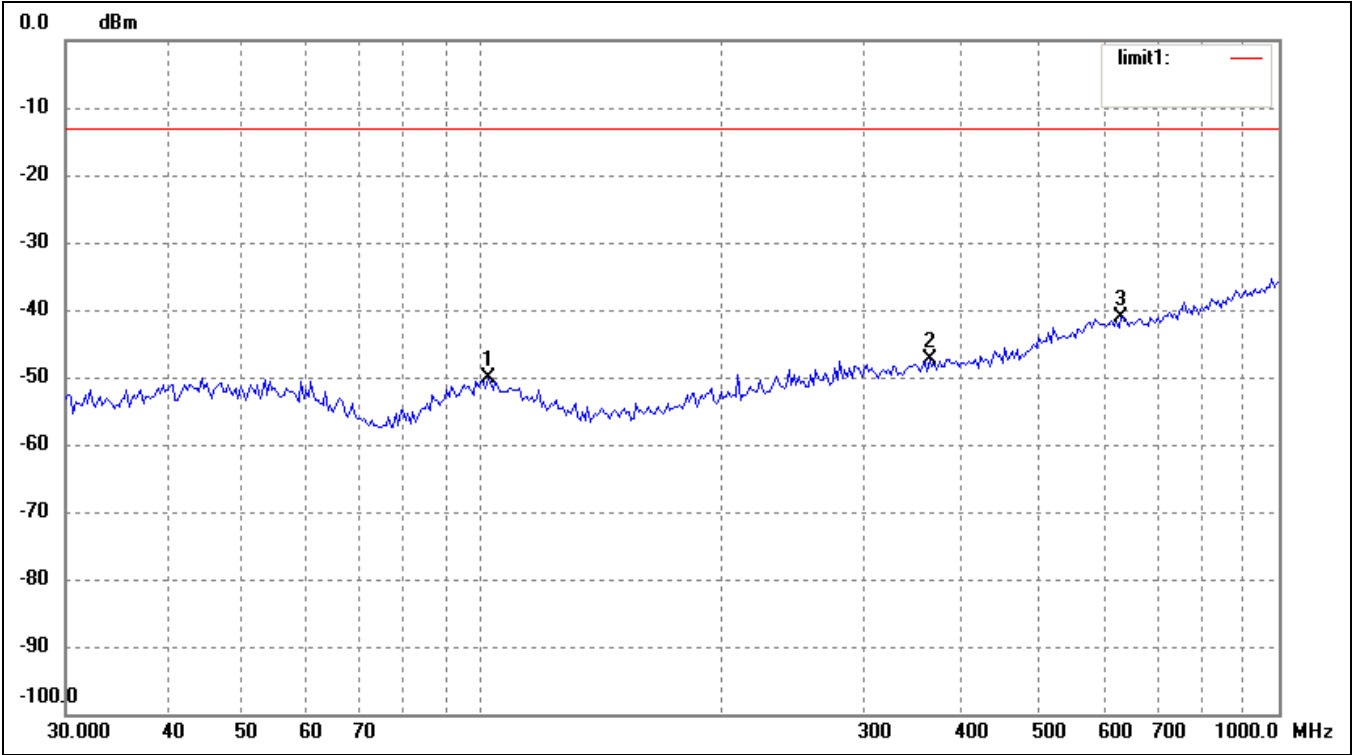
For PCS Band_GPRS Mode Middle channel

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	99.5281	-70.92	20.20	-50.72	-13.00	-37.72	ERP
2	112.9196	-70.04	18.91	-51.13	-13.00	-38.13	ERP
3	385.2805	-70.08	23.05	-47.03	-13.00	-34.03	ERP

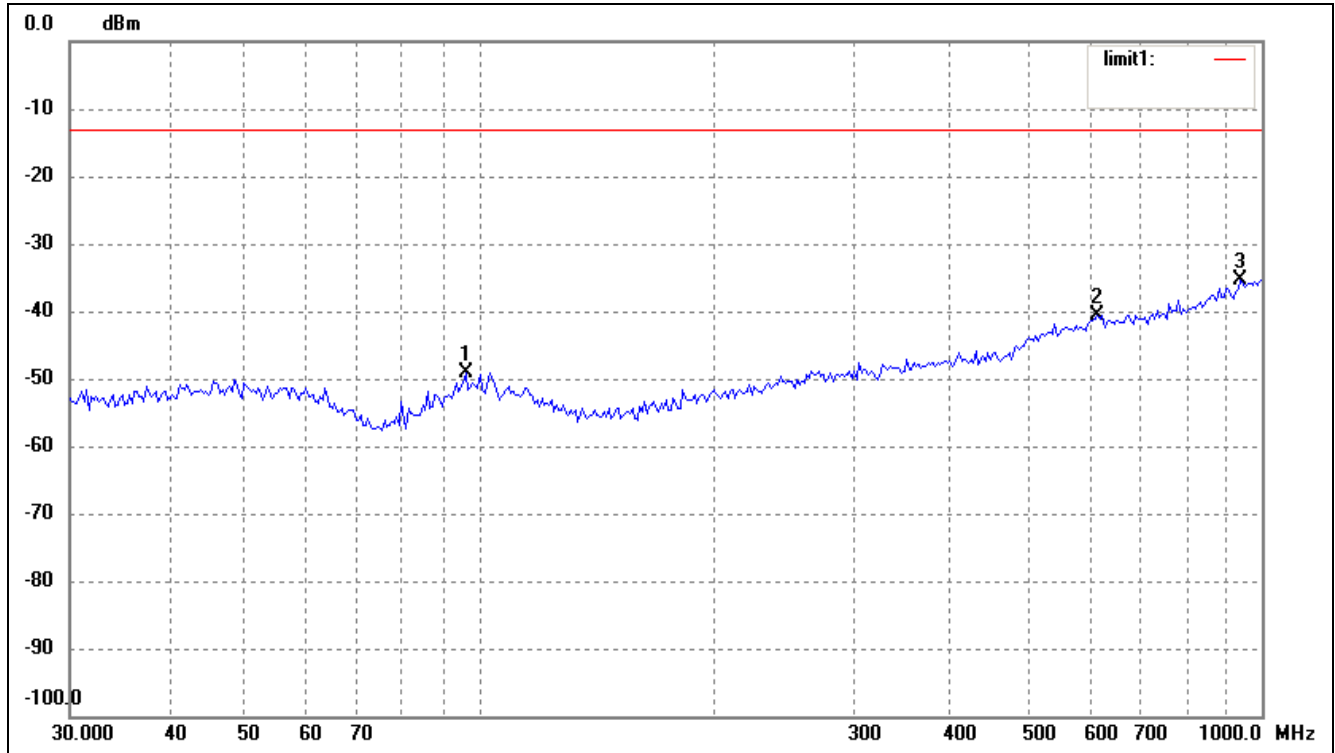
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	101.6443	-70.30	20.09	-50.21	-13.00	-37.21	ERP
2	364.2595	-70.02	22.76	-47.26	-13.00	-34.26	ERP
3	633.9073	-69.89	28.75	-41.14	-13.00	-28.14	ERP

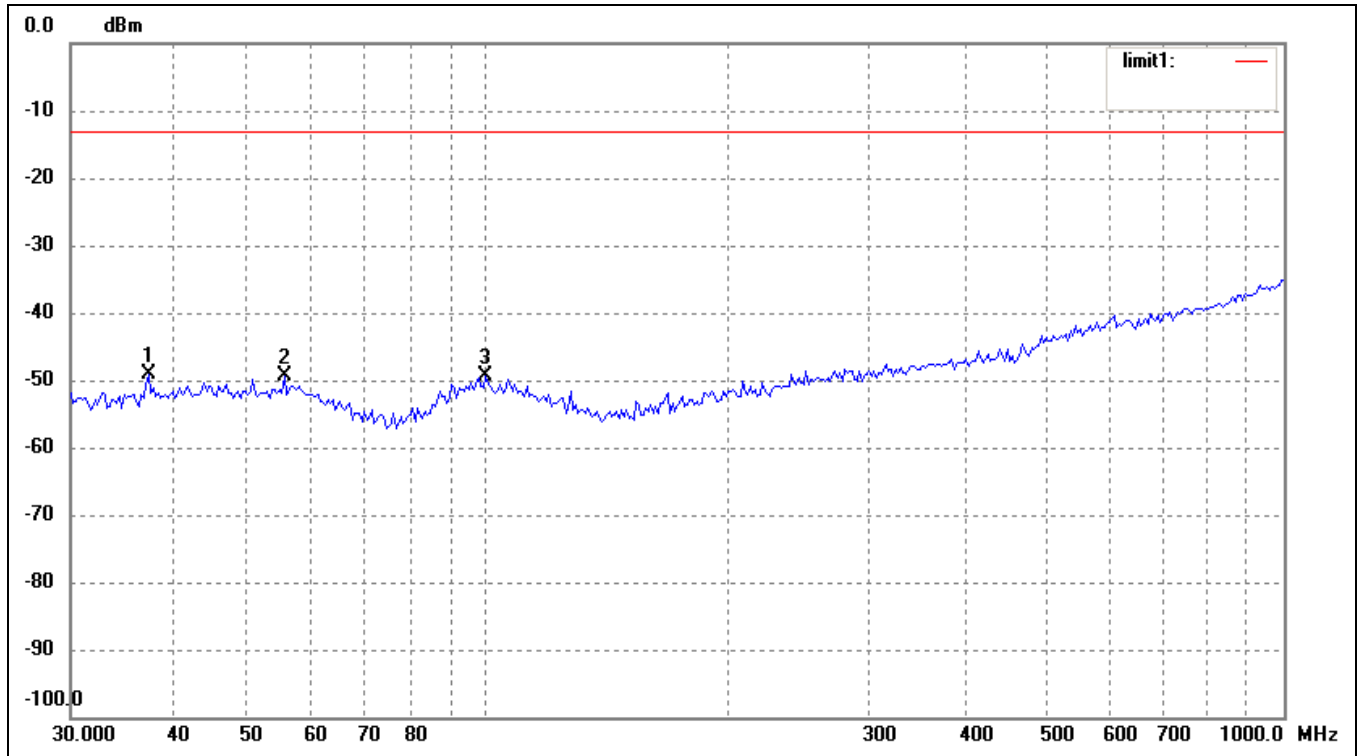
For PCS Band_GPRS Mode High channel

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Remark
1	96.0986	-69.05	19.94	-49.11	-13.00	-36.11	ERP
2	616.3718	-69.21	28.60	-40.61	-13.00	-27.61	ERP
3	938.8326	-68.73	33.41	-35.32	-13.00	-22.32	ERP

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	37.5479	-68.36	19.27	-49.09	-13.00	-36.09	ERP
2	55.6094	-68.86	19.54	-49.32	-13.00	-36.32	ERP
3	99.5281	-69.52	20.20	-49.32	-13.00	-36.32	ERP

*Spurious Emissions Above 1GHz**For Cellular Band_GSM Mode*

Frequency	SG	Height	Polar	Cable loss	Antenna	Corrected Ampl.	FCC Part 22H	
	Reading				Gain		Limit	Margin
MHz	dBm	Meter	H / V	dB	dB	dBm	dBm	dB
Low Channel (824.2MHz)								
1648.4	-36.1	1.5	V	1.8	7.6	-30.3	-13	-17.3
2472.6	-38.0	1.5	V	2.4	7.9	-32.5	-13	-19.5
1648.4	-40.0	1.5	H	1.8	7.6	-34.2	-13	-21.2
2472.6	-44.1	1.5	H	2.4	7.9	-38.6	-13	-25.6
Middle Channel (836.6MHz)								
1673.2	-36.9	1.5	V	1.9	7.6	-31.2	-13	-18.2
2509.8	-38.8	1.5	V	2.5	7.9	-33.4	-13	-20.4
1673.2	-41.2	1.5	H	1.9	7.6	-35.5	-13	-22.5
2509.8	-42.8	1.5	H	2.5	7.9	-37.4	-13	-24.4
High Channel (848.8MHz)								
1697.6	-36.7	1.5	V	2.0	7.6	-31.1	-13	-18.1
2546.4	-38.9	1.5	V	2.6	7.9	-33.6	-13	-20.6
1697.6	-40.3	1.5	H	2.0	7.6	-34.7	-13	-21.7
2546.4	-41.8	1.5	H	2.6	7.9	-36.5	-13	-23.5

For PCS Band_GSM Mode

Frequency	SG	Height	Polar	Cable loss	Antenna	Corrected Ampl.	FCC Part 24E	
	Reading				Gain		Limit	Margin
MHz	dBm	Meter	H / V	dB	dB	dBm	dBm	dB
Low Channel (1850.2MHz)								
3700.4	-35.6	1.5	V	2.9	8.3	-30.2	-13	-17.2
5550.6	-38.4	1.5	V	3.7	8.6	-33.5	-13	-20.5
3700.4	-38.7	1.5	H	2.9	8.3	-33.3	-13	-20.3
5550.6	-41.6	1.5	H	3.7	8.6	-36.7	-13	-23.7
Middle Channel (1880MHz)								
3760	-36.0	1.5	V	2.9	8.4	-30.5	-13	-17.5
5640	-39.5	1.5	V	3.7	8.7	-34.5	-13	-21.5
3760	-39.7	1.5	H	2.9	8.4	-34.2	-13	-21.2
5640	-40.2	1.5	H	3.7	8.7	-35.2	-13	-22.2
High Channel (1909.8MHz)								
3819.6	-35.8	1.5	V	2.9	8.4	-30.3	-13	-17.3
5729.4	-38.4	1.5	V	3.7	8.7	-33.4	-13	-20.4
3819.6	-41.1	1.5	H	2.9	8.4	-35.6	-13	-22.6
5729.4	-41.7	1.5	H	3.7	8.7	-36.7	-13	-23.7

For Cellular Band_GPRS Mode

Frequency	SG	Height	Polar	Cable loss	Antenna	Corrected Ampl.	FCC Part 22H	
	Reading				Gain		Limit	Margin
MHz	dBm	Meter	H / V	dB	dB	dBm	dBm	dB
Low Channel (824.2MHz)								
1648.4	-36.8	1.5	V	1.8	7.6	-31.0	-13	-18.0
2472.6	-41.7	1.5	V	2.4	7.9	-36.2	-13	-23.2
1648.4	-40.1	1.5	H	1.8	7.6	-34.3	-13	-21.3
2472.6	-42.5	1.5	H	2.4	7.9	-37.0	-13	-24.0
Middle Channel (836.6MHz)								
1673.2	-37.2	1.5	V	1.9	7.6	-31.5	-13	-18.5
2509.8	-41.7	1.5	V	2.5	7.9	-36.3	-13	-23.3
1673.2	-40.2	1.5	H	1.9	7.6	-34.5	-13	-21.5
2509.8	-42.0	1.5	H	2.5	7.9	-36.6	-13	-23.6
High Channel (848.8MHz)								
1697.6	-37.6	1.5	V	2.0	7.6	-32.0	-13	-19.0
2546.4	-40.8	1.5	V	2.6	7.9	-35.5	-13	-22.5
1697.6	-42.3	1.5	H	2.0	7.6	-36.7	-13	-23.7
2546.4	-43.5	1.5	H	2.6	7.9	-38.2	-13	-25.2

For PCS Band_GPRS Mode

Frequency	SG	Height	Polar	Cable loss	Antenna	Corrected Ampl.	FCC Part 24E	
	Reading				Gain		Limit	Margin
MHz	dBm	Meter	H / V	dB	dB	dBm	dBm	dB
Low Channel (1850.2MHz)								
3700.4	-37.9	1.5	V	2.9	8.3	-32.5	-13	-19.5
5550.6	-39.2	1.5	V	3.7	8.6	-34.3	-13	-21.3
3700.4	-41.0	1.5	H	2.9	8.3	-35.6	-13	-22.6
5550.6	-42.1	1.5	H	3.7	8.6	-37.2	-13	-24.2
Middle Channel (1880MHz)								
3760	-37.7	1.5	V	2.9	8.4	-32.2	-13	-19.2
5640	-40.7	1.5	V	3.7	8.7	-35.7	-13	-22.7
3760	-41.2	1.5	H	2.9	8.4	-35.7	-13	-22.7
5640	-43.6	1.5	H	3.7	8.7	-38.6	-13	-25.6
High Channel (1909.8MHz)								
3819.6	-37.8	1.5	V	2.9	8.4	-32.3	-13	-19.3
5729.4	-40.4	1.5	V	3.7	8.7	-35.4	-13	-22.4
3819.6	-40.2	1.5	H	2.9	8.4	-34.7	-13	-21.7
5729.4	-42.9	1.5	H	3.7	8.7	-37.9	-13	-24.9

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 10th Harmonics is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4.

8. FREQUENCY STABILITY

8.1 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.

8.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date	Due. Date
Aglient	Spectrum Analyzer	E4402B-ESA	US41192821	2012-03-28	2013-03-27
Rohde & Schwarz	Universal Radio Communication	CMU200	112012	2012-03-28	2013-03-27
GONGWEN	Moisture Test Chamber	GDS-150	SEMT-0013	2011-07-16	2012-07-15

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

8.3 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

8.4 Environmental Conditions

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

8.5 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	-80	-0.0956
40	3.7	-79	-0.0944
30	3.7	-78	-0.0932
20	3.7	-75	-0.0896
10	3.7	-70	-0.0837
0	3.7	-65	-0.0777
-10	3.7	-72	-0.0861
-20	3.7	-77	-0.0920
-30	3.7	-79	-0.0944

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	-48	-0.0255
40	3.7	-45	-0.0239
30	3.7	-38	-0.0202
20	3.7	-34	-0.0181
10	3.7	-36	-0.0191
0	3.7	-38	-0.0202
-10	3.7	-42	-0.0223
-20	3.7	-47	-0.0250
-30	3.7	-50	-0.0266

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	-21	-0.0251
40	3.7	-17	-0.0203
30	3.7	-12	-0.0143
20	3.7	-9	-0.0108
10	3.7	-15	-0.0179
0	3.7	-20	-0.0239
-10	3.7	-30	-0.0359
-20	3.7	-32	-0.0383
-30	3.7	-33	-0.0394

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	57	0.0303
40	3.7	48	0.0255
30	3.7	42	0.0223
20	3.7	36	0.0191
10	3.7	35	0.0186
0	3.7	43	0.0229
-10	3.7	55	0.0293
-20	3.7	65	0.0346
-30	3.7	62	0.0330

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	-80	-0.0956
	3.7	-75	-0.0896
	4.2	-69	-0.0825
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	-28	-0.0149
	3.7	-34	-0.0181
	4.2	-42	-0.0223
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	-17	-0.0203
	3.7	-9	-0.0108
	4.2	-20	-0.0239
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	44	0.0234
	3.7	36	0.0191
	4.2	53	0.0282

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