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TEST REPORT

Report Number: 100061439LEX-002
Project Number: G100061439

Report Issue Date: 8/24/2010

Product Name: Touchscreen
FCCID: JI5-RB5701
ICID: 4137A-RB5701
Standards: FCC Part 22 Subpart H
FCC Part 24 Subpart E
RSS-132 Issue 2
RSS-133 Issue 5
RSS-GEN Issue 2

Tested by:
Intertek Testing Services NA, Inc.
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Client:
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20 Mason Street
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1 Introduction and Conclusion

The tests indicated in section 2 were performed on the product constructed as described in section 3. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test method, a list of the actual test equipment used, documentation photos, results and raw data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complied with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

The INTERTEK-Lexington is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1 and ANSI C63.4. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters. The test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number IC 2042M-1.

2 Test Summary

Page	Test full name	FCC Reference	IC Reference	Result
6	Conducted Output Power	§2.1046	---	Pass
8	Occupied Bandwidth	§2.1049, §22.917(b)(d), and §24.238(a)	RSS-GEN 4.6.1	Pass
13	Conducted Spurious Emissions	§2.1049, §2.1051, §22.917(a)(b), and § 24.238(a)(b)	RSS-132 (4.5), RSS-133 (6.3)	Pass
31	Radiated Output Power	§ 22.913(a) and § 24.232(c)	RSS-132 (4.4), RSS-133 (6.4)	Pass
32	Radiated Spurious Emissions (Transmitter)	§2.1053, §22.917(a)(b), and §24.238(a)(b)	RSS-132 (4.3), RSS-133 (6.3)	Pass
37	Radiated Spurious Emissions (Receiver)	§ 15.109	RSS-Gen (7.2.3.2)	Pass
39	AC Powerline Conducted Emissions	§ 15.107	RSS-Gen (7.2.2)	Pass

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	SMC Networks
Model Number	RB5701-Z
Serial Number	Test Sample 1
FCC Identifier	JI5-RB5701
IC Identifier	4137A-RB5701
Receive Date	6/1/2010
Test Start Date	6/1/2010
Test End Date	6/27/2010
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	824MHz - 849MHz (GSM850) 1850MHz – 1910MHz (GSM1900)
Modulation Type	GSM and EDGE
Transmission Control	Base Station Simulator
Maximum Output Power (Conducted)	31.2dBm (GSM850) 28.5dBm (GSM1900)
Test Channels	128, 190, and 251 (GSM850) 512, 661, and 810 (GSM1900)
Antenna Type	Fixed, Internal, PCB Antenna (2.25dbi Gain)
Operating Voltage	120VAC

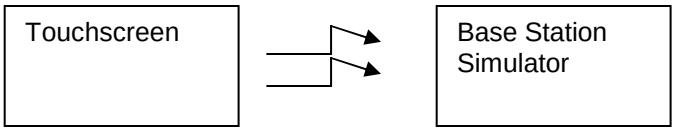
Description of Equipment Under Test
The test sample was a touch screen automation device manufactured by SMC Netowrks.

Operating modes of the EUT:

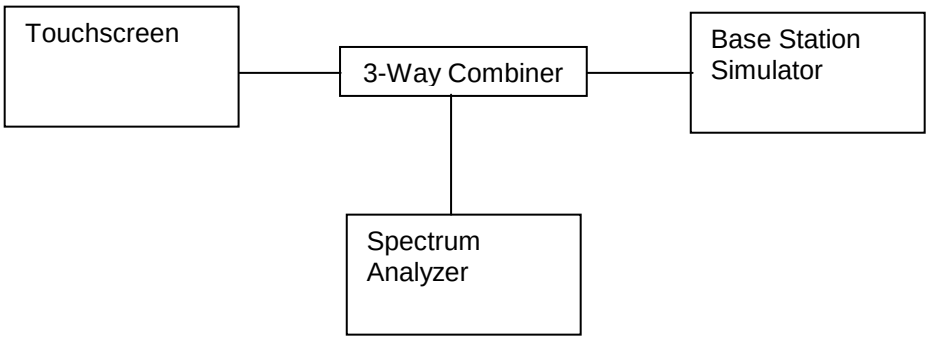
No.	Descriptions of EUT Exercising
1	Transmitting either a GSM or GSM/EDGE signal
2	Receive / idle mode

3.1 System setup including cable interconnection details, support equipment and simplified block diagram

3.2 EUT Block Diagram:



Block Diagram for Radiated Tests



Block Diagram for Conducted Tests at the Antenna Port

3.3 Cables:

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
AC Power Cable	5 ft.	None	None	AC Power Source	AC Input

3.4 Support Equipment:

No Support equipment was used in this evaluation. The Touchscreen was tested in a stand alone configuration.

4 Conducted Output Power

4.1 Test Limits

§ 2.1046

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in §2.1033(c)(8).

4.2 Test Procedure

The transmitter output was connected to a calibrated coaxial cable, the other end of which was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed into a call and the transmitter output was read off the base station simulator in dBm. The power output at the transmitter antenna port was determined by adding the value of the cable insertion loss to the base station simulator power reading.
Tests were performed at three frequencies (low, middle, and high channels) and on the highest power levels, which can be setup on the transmitters.

4.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	837198089	Rohde & Schwarz	CMU200	6/24/2009	6/24/2010

4.4 Results:

Configuration	Temp	Power (VDC)	Ch. 128	Ch. 190	Ch. 251
GSM850	-30	3.7	30.07	30.1	30.08
	20	3.7	31.22	31.23	31.23
	20	3.33	31.25	31.2	31.11
	20	4.07	31.22	31.14	30.98
	60	3.7	31.4	31.29	31.12

Configuration	Temp	Power (VDC)	Ch. 512	Ch. 661	Ch. 810
GSM850 (EDGE)	-30	3.7	27.47	27.53	27.48
	20	3.7	28.79	28.63	28.8
	20	3.33	28.78	28.6	28.54
	20	4.07	28.62	28.57	28.38
	60	3.7	28.93	28.69	28.69

Configuration	Temp	Power (VDC)	Ch. 512	Ch. 661	Ch. 810
GSM1900	-30	3.7	28	28.12	27.5
	20	3.7	28.11	28.14	28.11
	20	3.33	28.15	28.2	28.15
	20	4.07	28.12	28.23	28.1
	60	3.7	28.5	28.42	28.32

Configuration	Temp	Power (VDC)	Ch. 512	Ch. 661	Ch. 810
GSM1900 (EDGE)	-30	3.7	27.43	27.51	27.02
	20	3.7	27.5	27.66	27.54
	20	3.33	27.65	27.63	27.62
	20	4.07	27.51	27.7	27.57
	60	3.7	28.02	27.81	27.82

5 Occupied Bandwidth

5.1 Test Limits

§2.1049:

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

5.2 Test Procedure

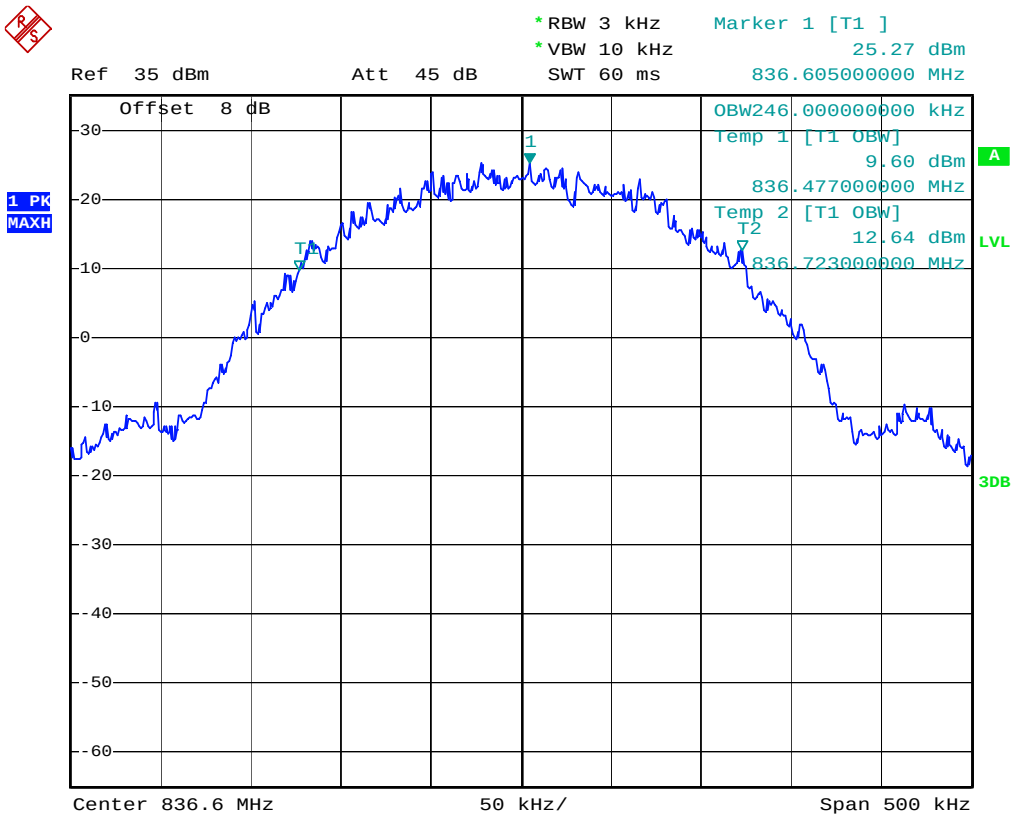
The EUT was connected to a spectrum analyzer using a calibrated coaxial cable and power divider. The EUT was placed into a call using base station simulator. The base station simulator was set to force the EUT to its maximum power setting. The occupied bandwidth function of the analyzer was used to automatically generate the occupied bandwidth plots below.

5.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	8/17/2009	8/17/2010
Base Station Simulator	837198089	Rohde & Schwarz	CMU200	6/24/2009	6/24/2010

5.4 Results:

Mode	Transmit Band	Frequency (MHz)	Occupied Bandwidth
GSM Mode	GSM850	836.52	246kHz
EDGE (8PSK)	GSM850	836.52	240kHz
GSM Mode	GSM1900	1880	243kHz
EDGE (8PSK)	GSM1900	1880	239kHz



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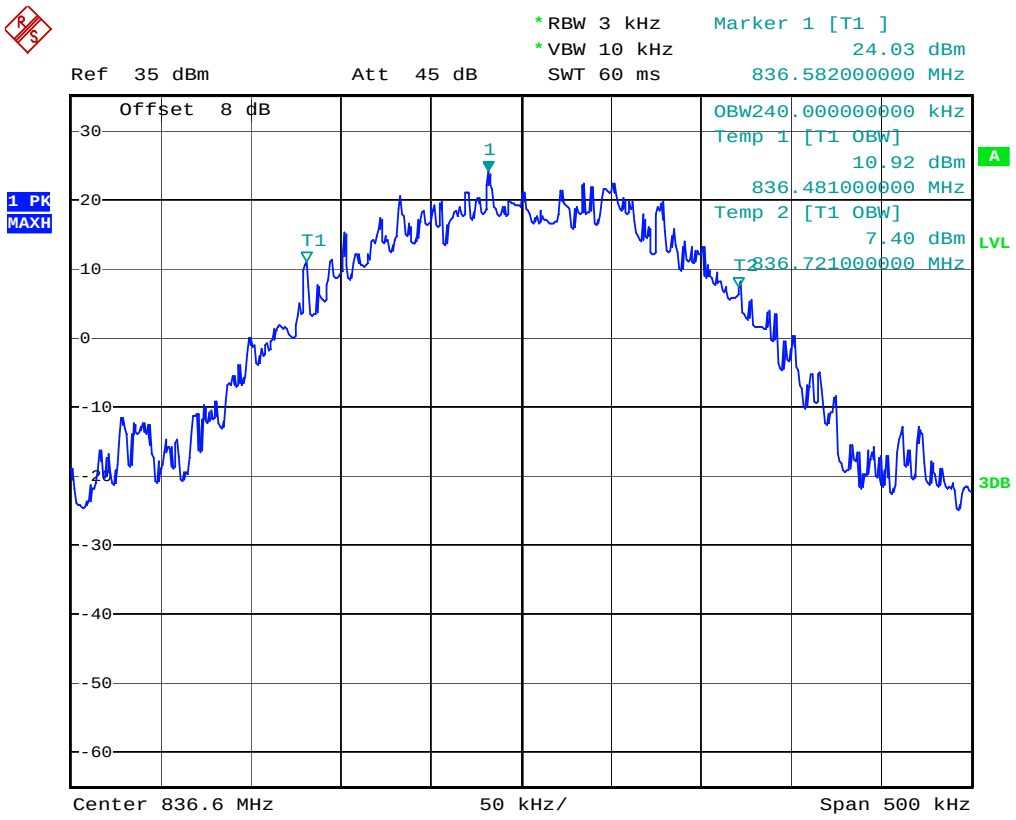
GSM850 Band, Mid Channel, GSM Mode



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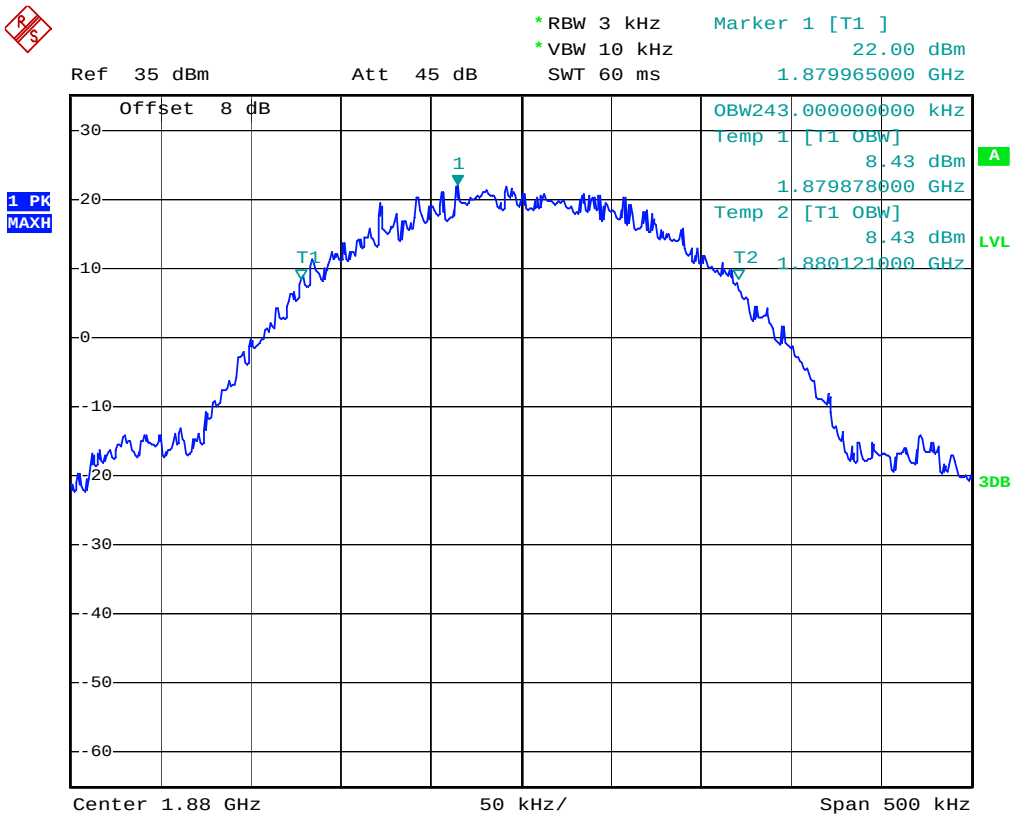
GSM850 Band, Mid Channel, EDGE (8PSK)



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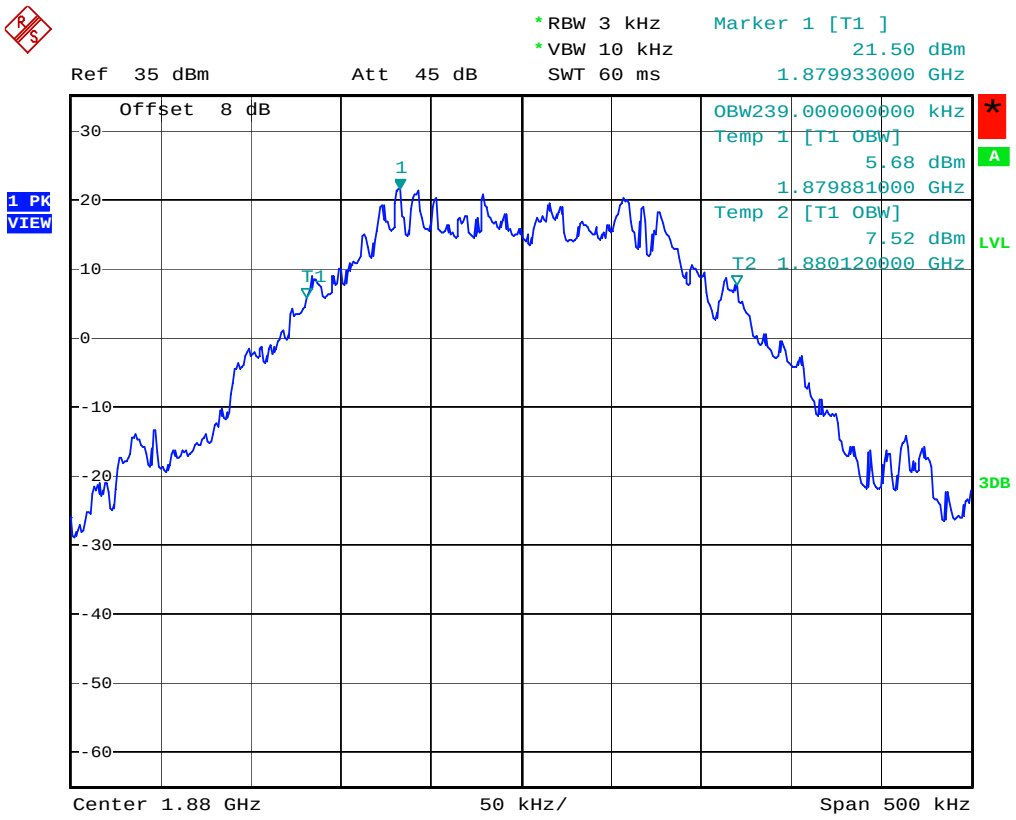
GSM1900 Band, Mid Channel, GSM Mode



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GSM1900 Band, Mid Channel, EDGE (8PSK)

6 Conducted Spurious Emissions at Antenna Terminals

6.1 Test Limits

§ 2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

§ 2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 22.917

(a) Out of band emissions. The power of any emission 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.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). 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.

§ 24.238

(a) Out of band emissions. The power of any emission 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.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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 of the EUT was connected to a spectrum analyzer through appropriate attenuation. The base station simulator was set to force the EUT to its maximum power setting. The resolution bandwidth of the spectrum analyzer was set at 100kHz or 1MHz depending on the transmit band. Sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

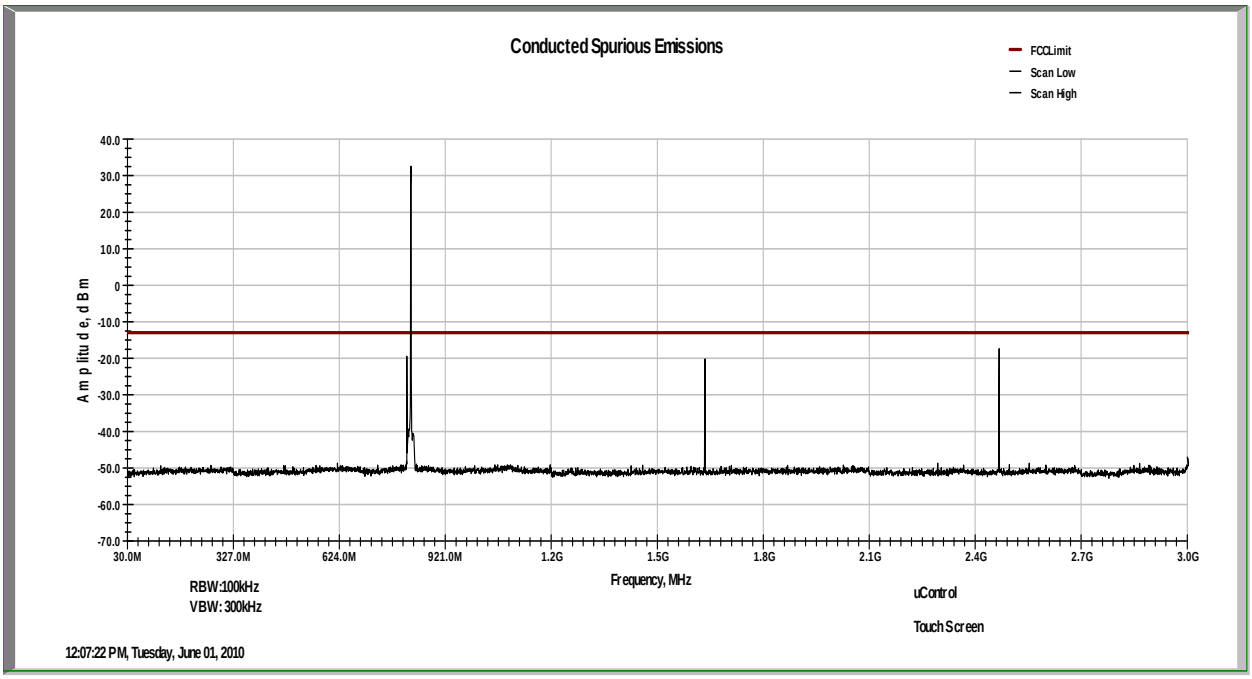
6.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	8/21/2009	8/21/2010
Base Station Simulator	837198089	Rohde & Schwarz	CMU200	6/24/2009	6/24/2010

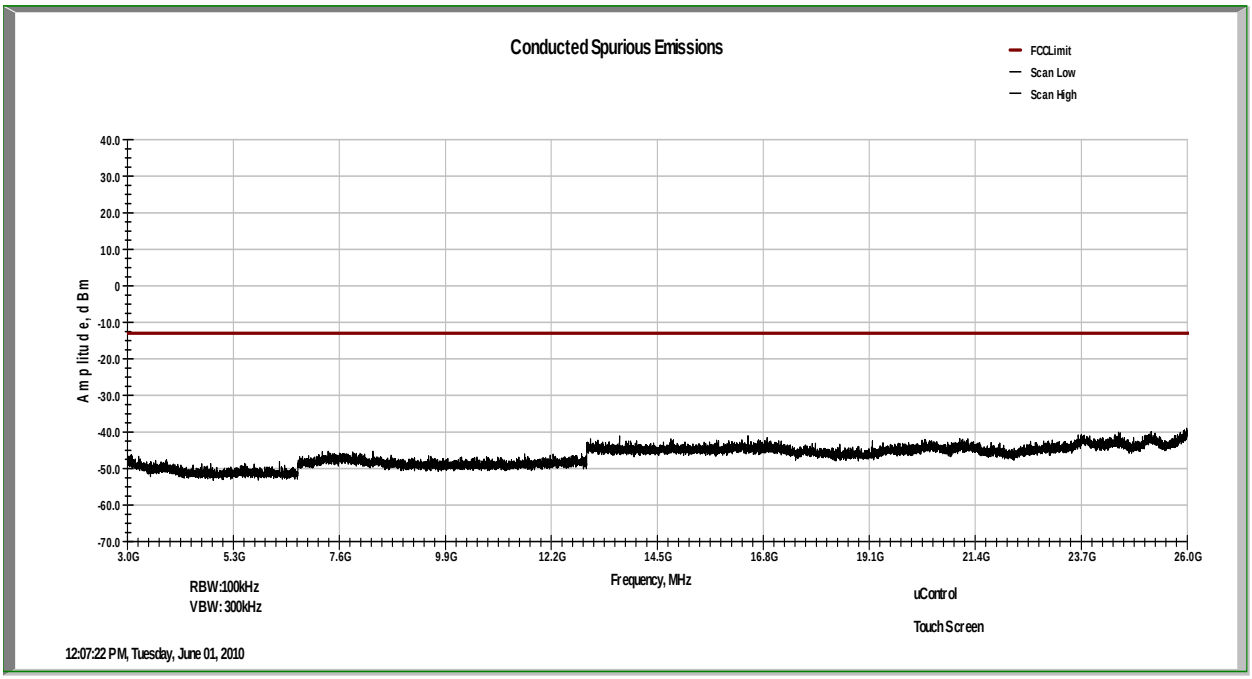
6.4 Results:

The following plots show that all spurious emissions are attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. Plots for emissions within 1MHz of the band edge as well as for emission outside of this range are shown.

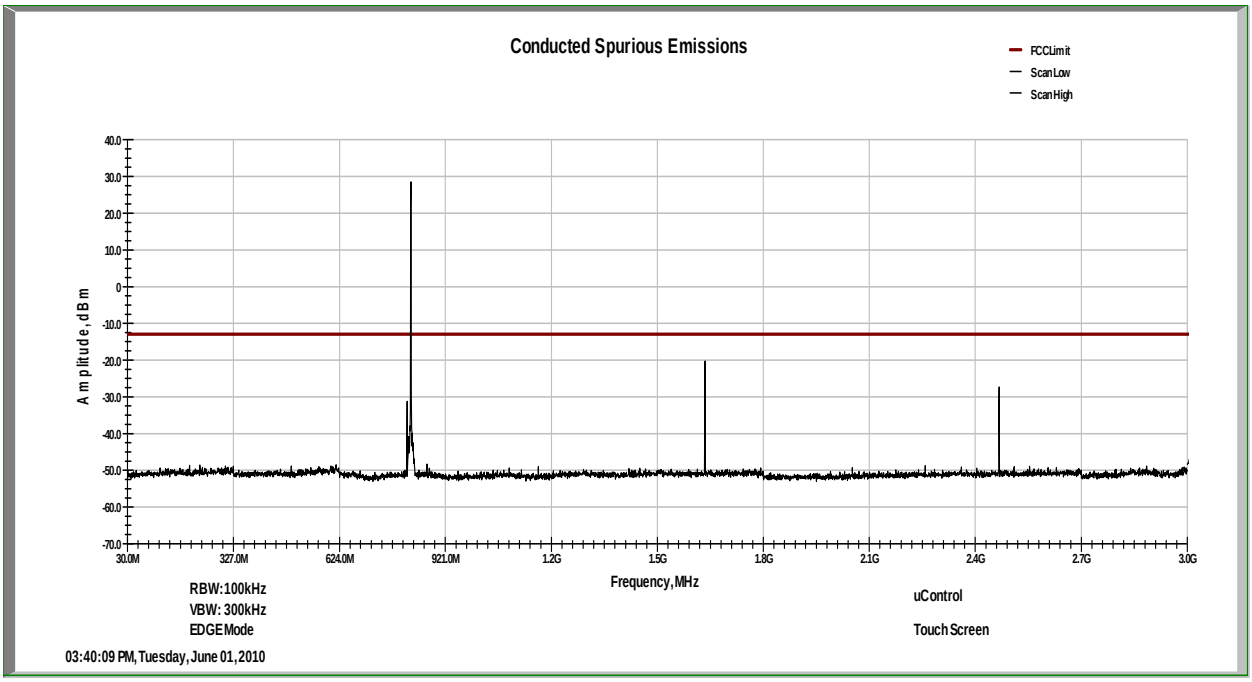
Plots for emissions more than 1MHz from the band edge:



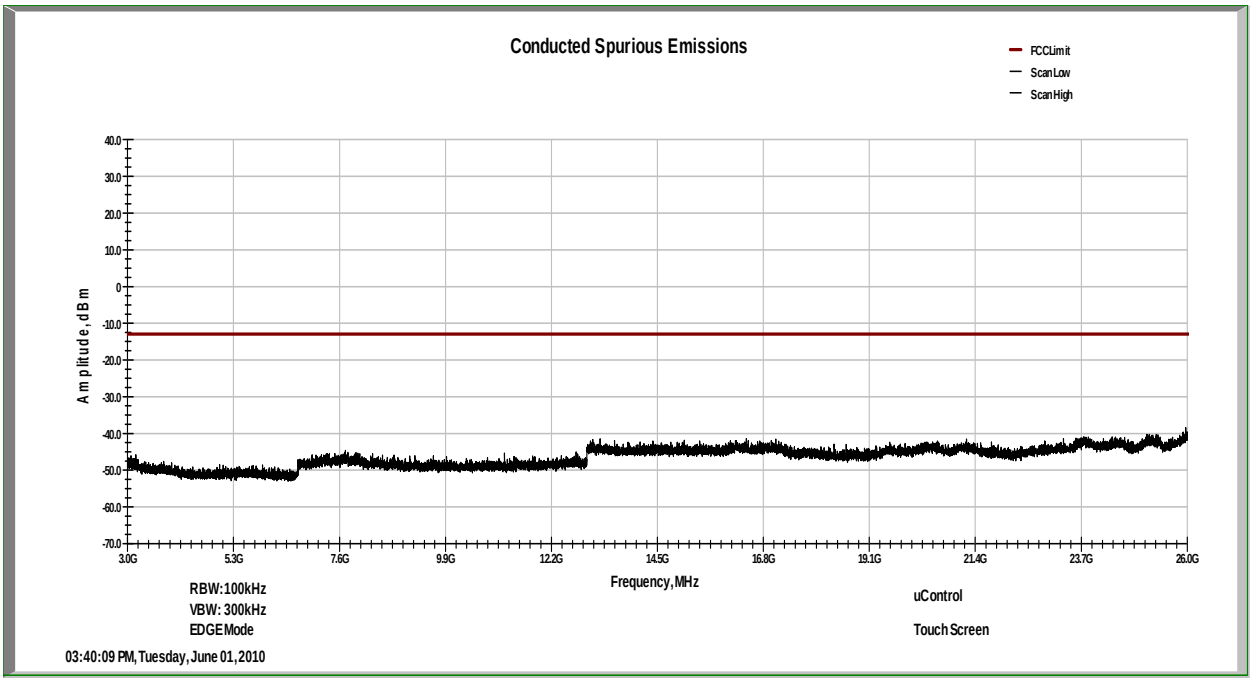
GSM 850 Band, Low Channel, GSM Mode, 30MHz – 3GHz



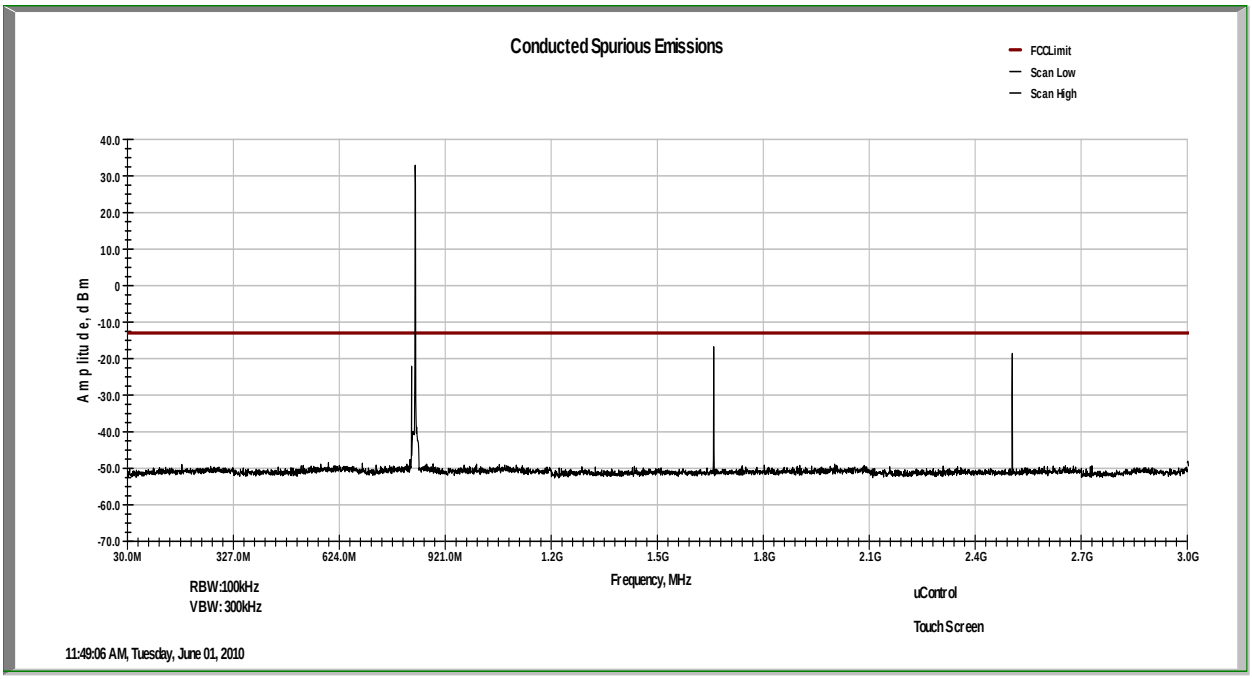
GSM 850 Band, Low Channel, GSM Mode, 3GHz – 26GHz



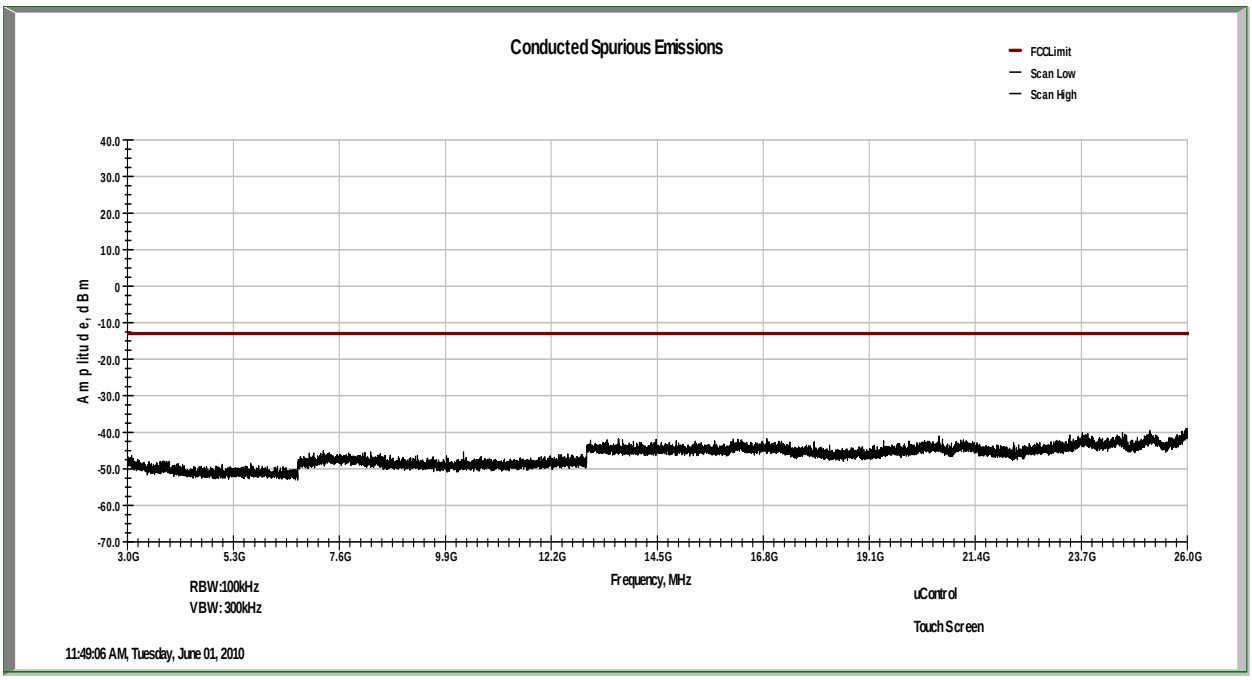
GSM 850 Band, Low Channel, EDGE Mode, 30MHz – 3GHz



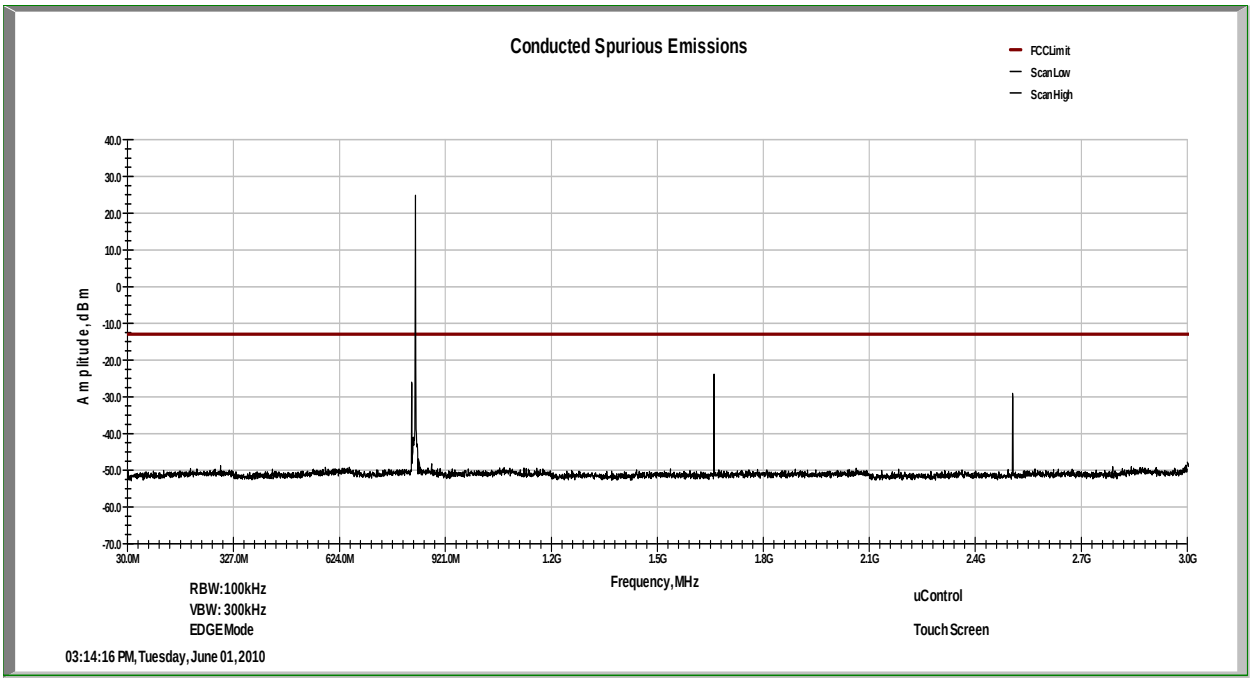
GSM 850 Band, Low Channel, EDGE Mode, 3GHz – 26GHz



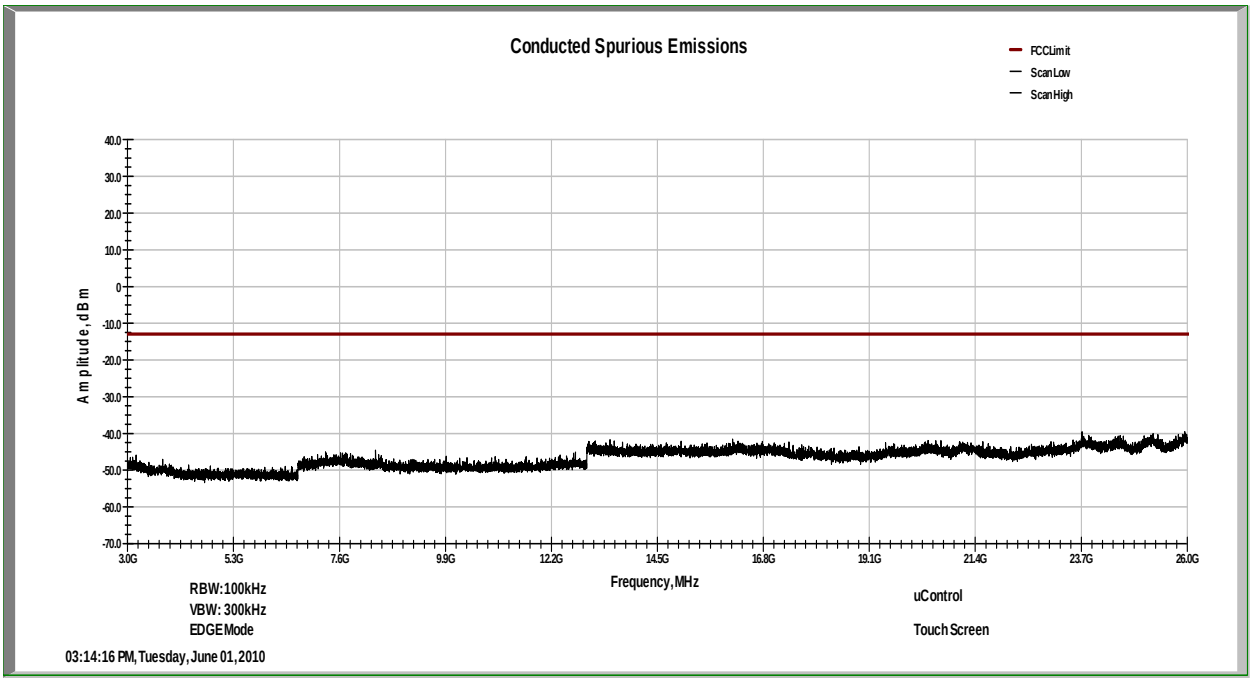
GSM 850 Band, Mid Channel, GSM Mode, 30MHz – 3GHz



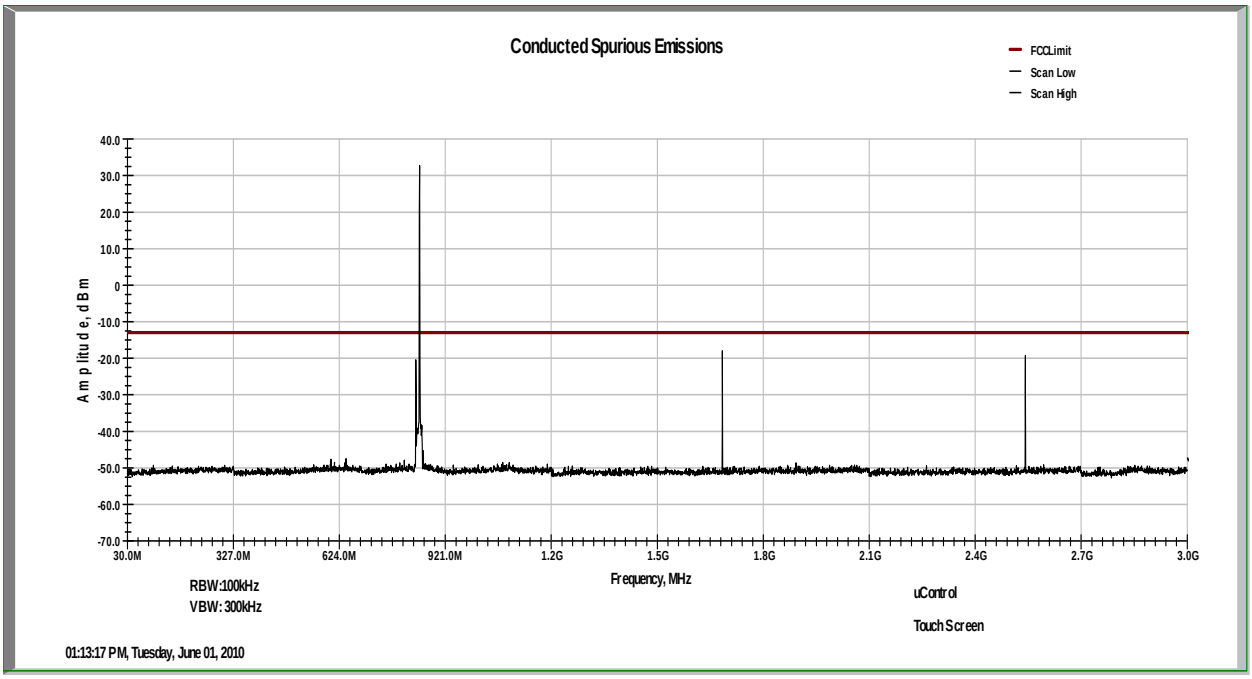
GSM 850 Band, Mid Channel, GSM Mode, 3GHz – 26GHz



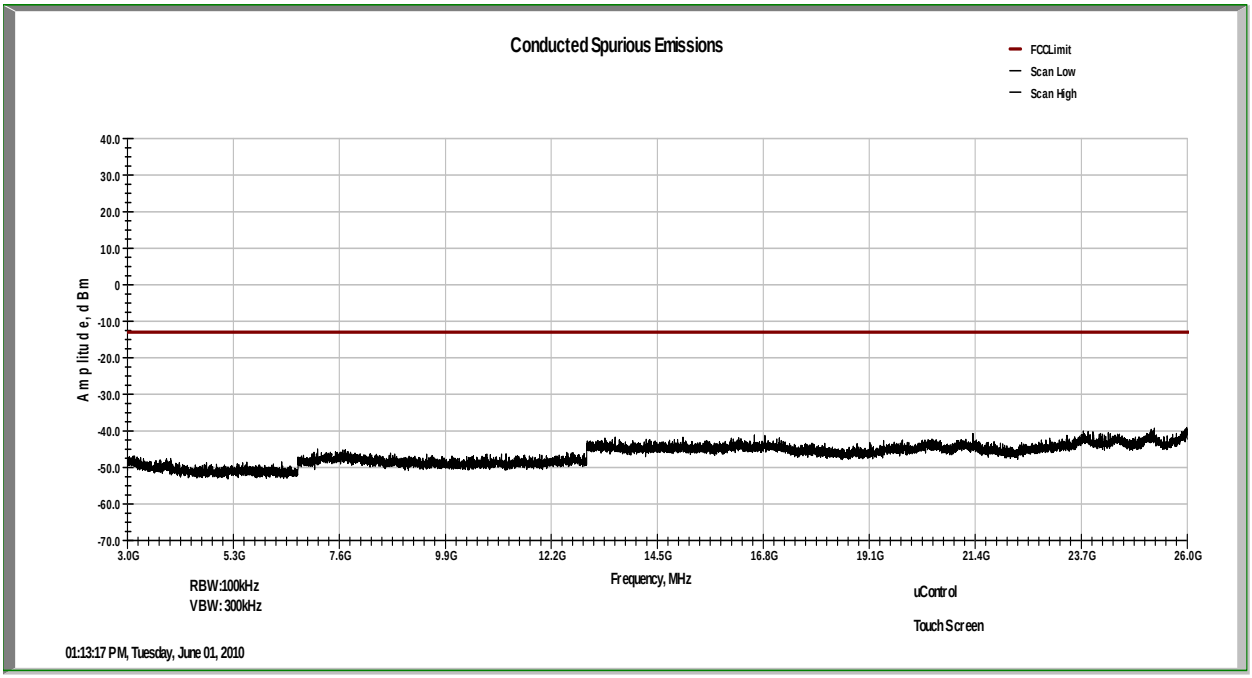
GSM 850 Band, Mid Channel, EDGE Mode, 30MHz – 3GHz



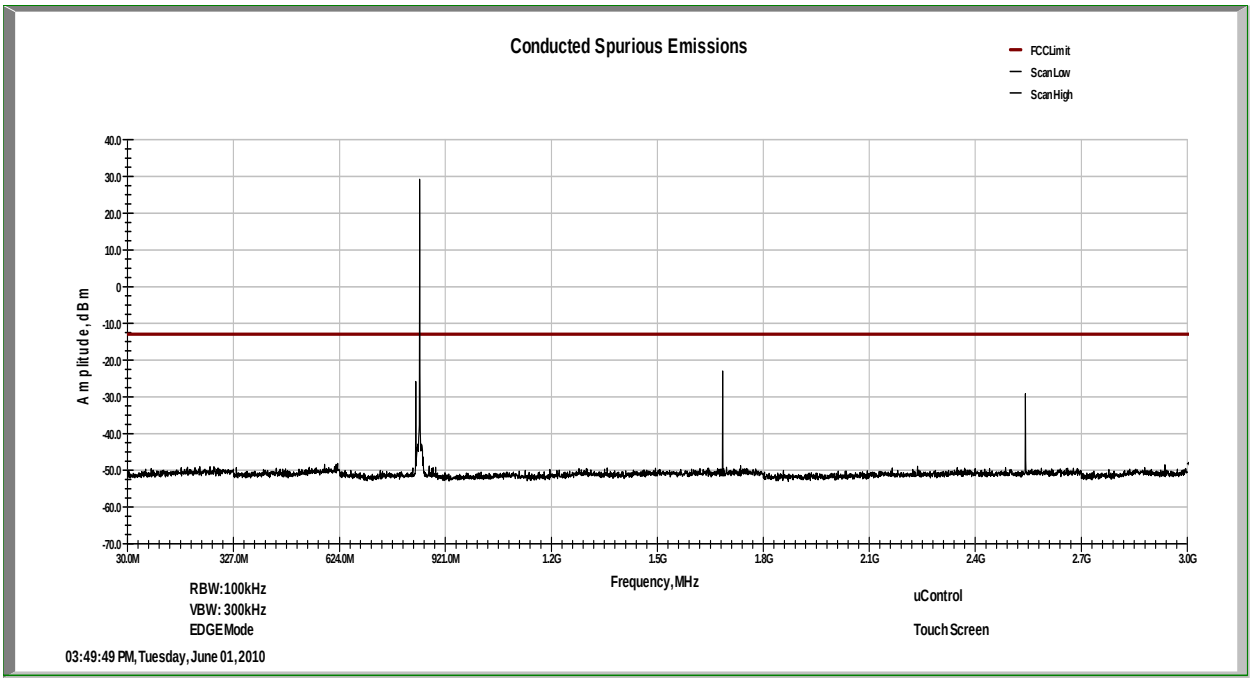
GSM 850 Band, Mid Channel, EDGE Mode, 3GHz – 26GHz



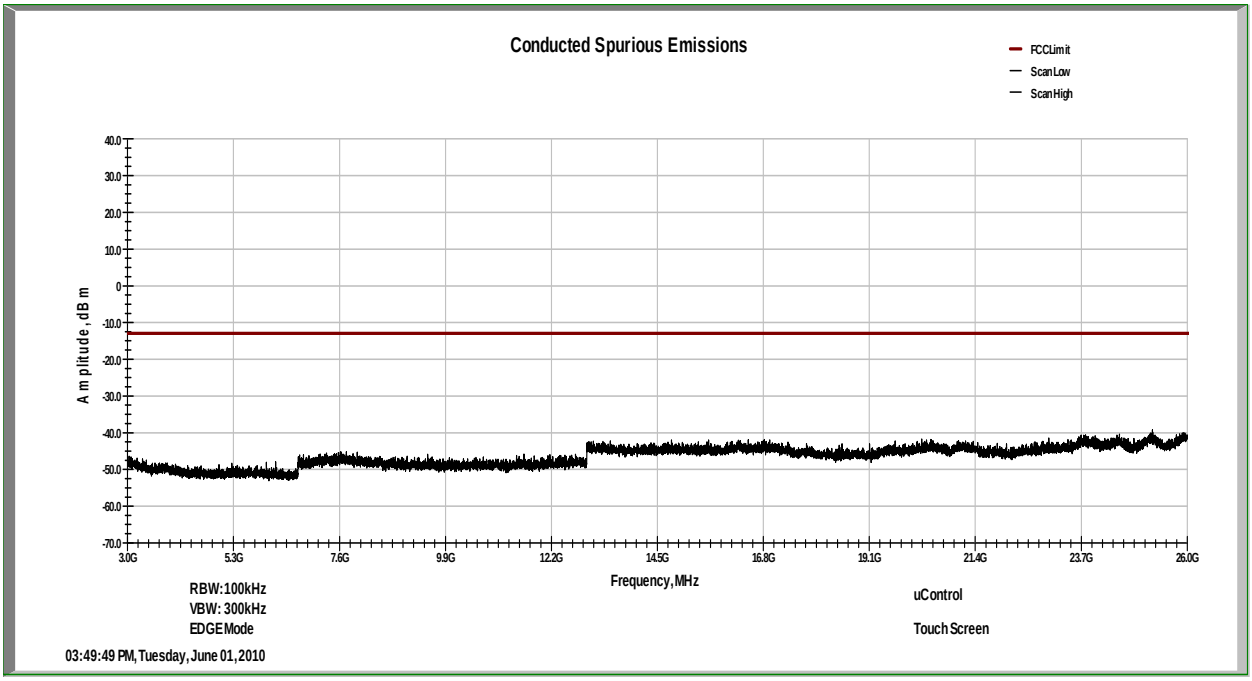
GSM 850 Band, High Channel, GSM Mode, 30MHz – 3GHz



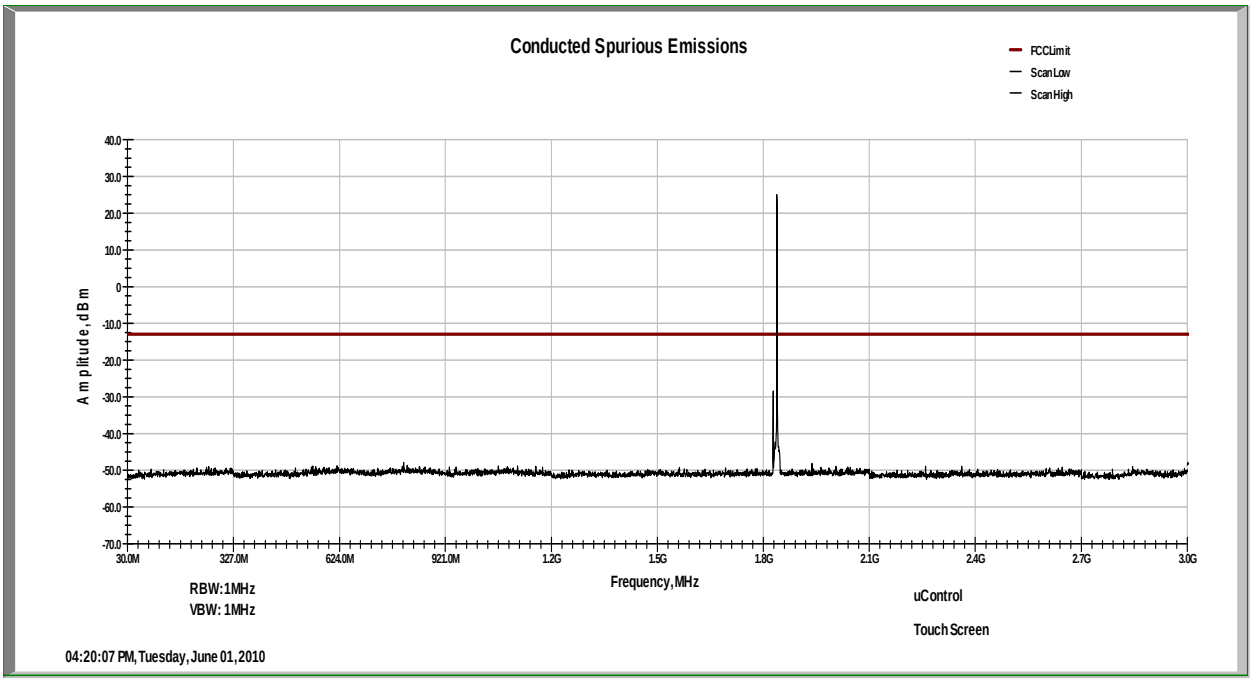
GSM 850 Band, High Channel, GSM Mode, 3GHz – 26GHz



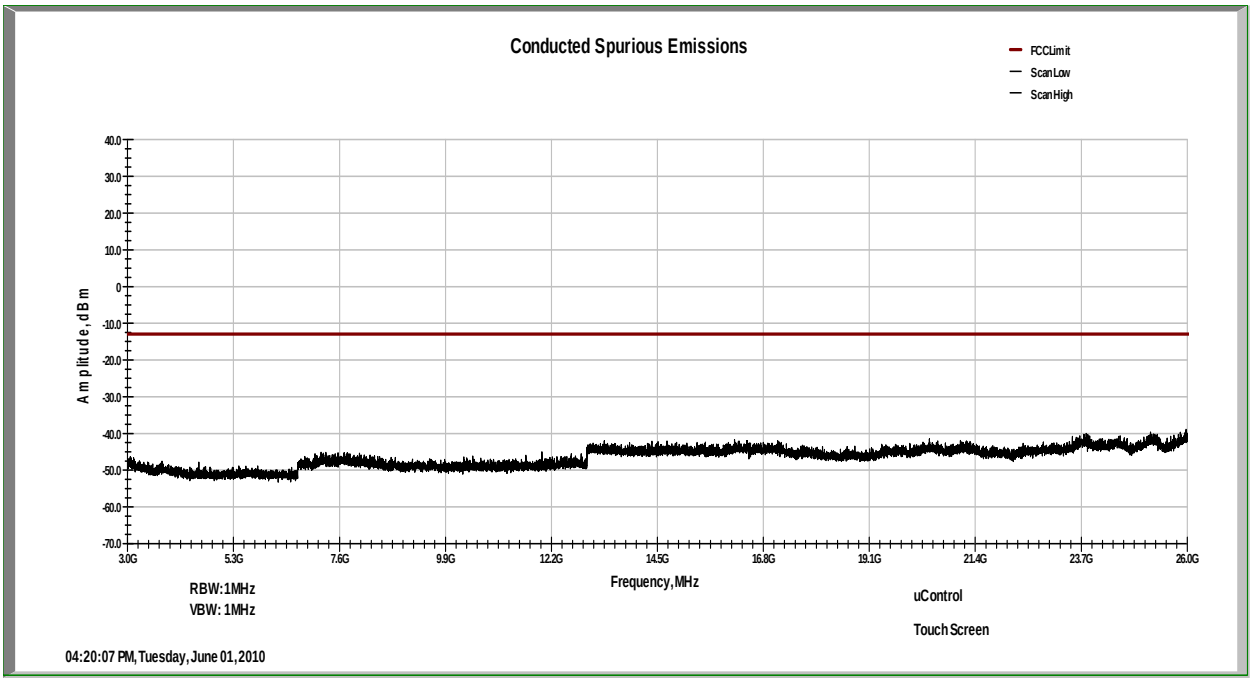
GSM 850 Band, High Channel, EDGE Mode, 30MHz – 3GHz



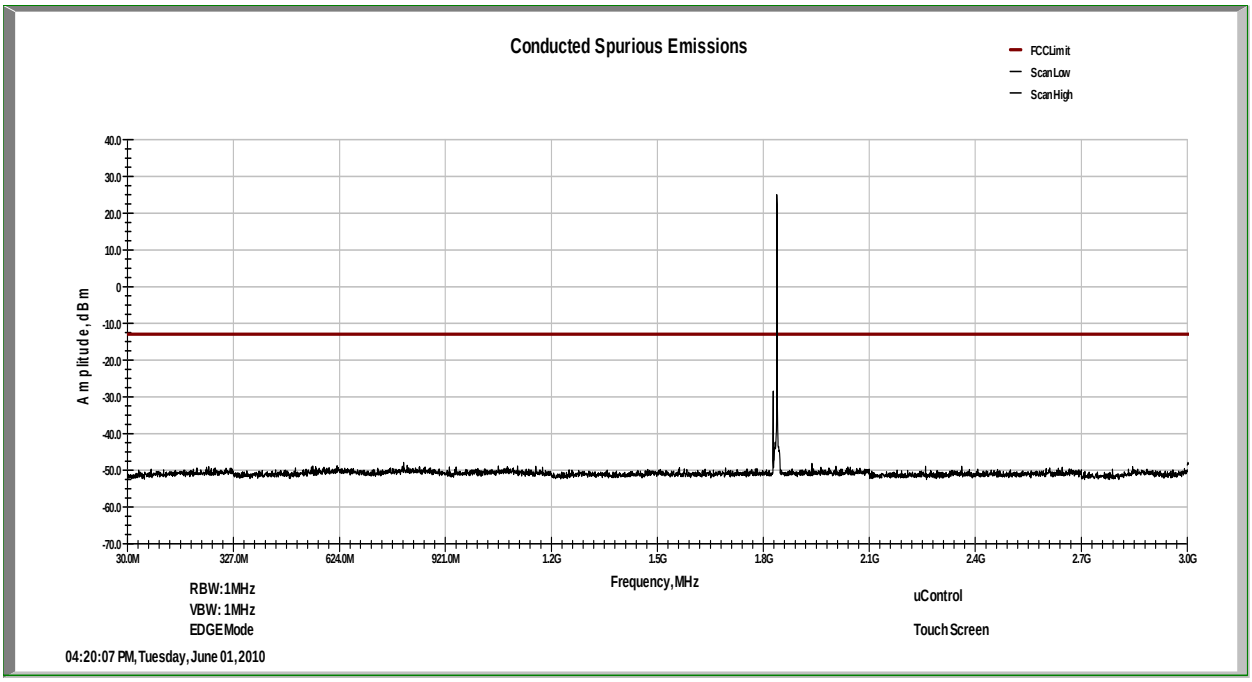
GSM 850 Band, High Channel, EDGE Mode, 3GHz – 26GHz



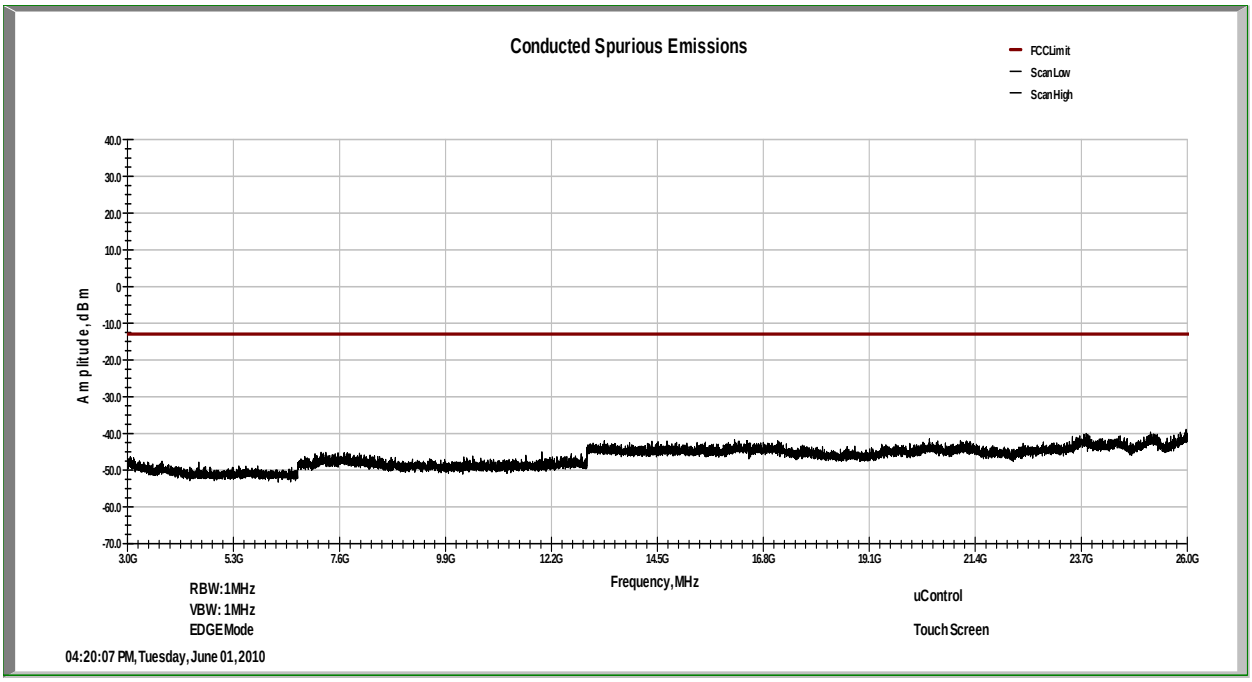
GSM 1900 Band, Low Channel, GSM Mode, 30MHz – 3GHz



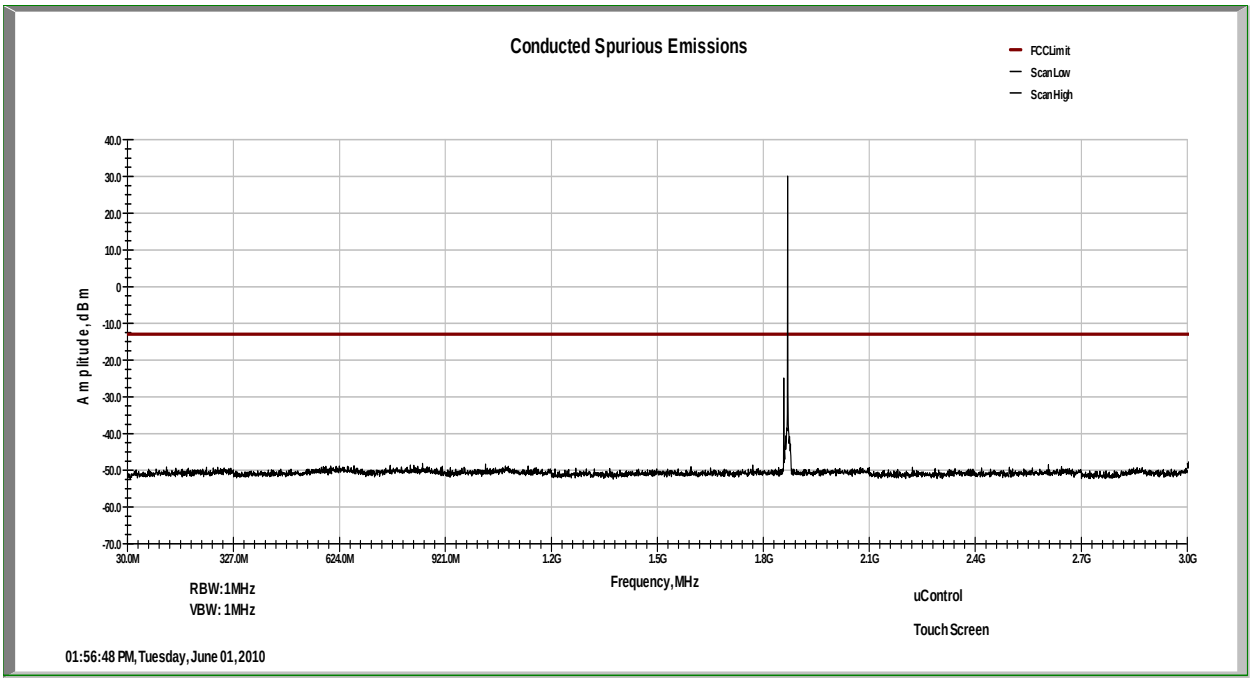
GSM 1900 Band, Low Channel, GSM Mode, 3GHz – 26GHz



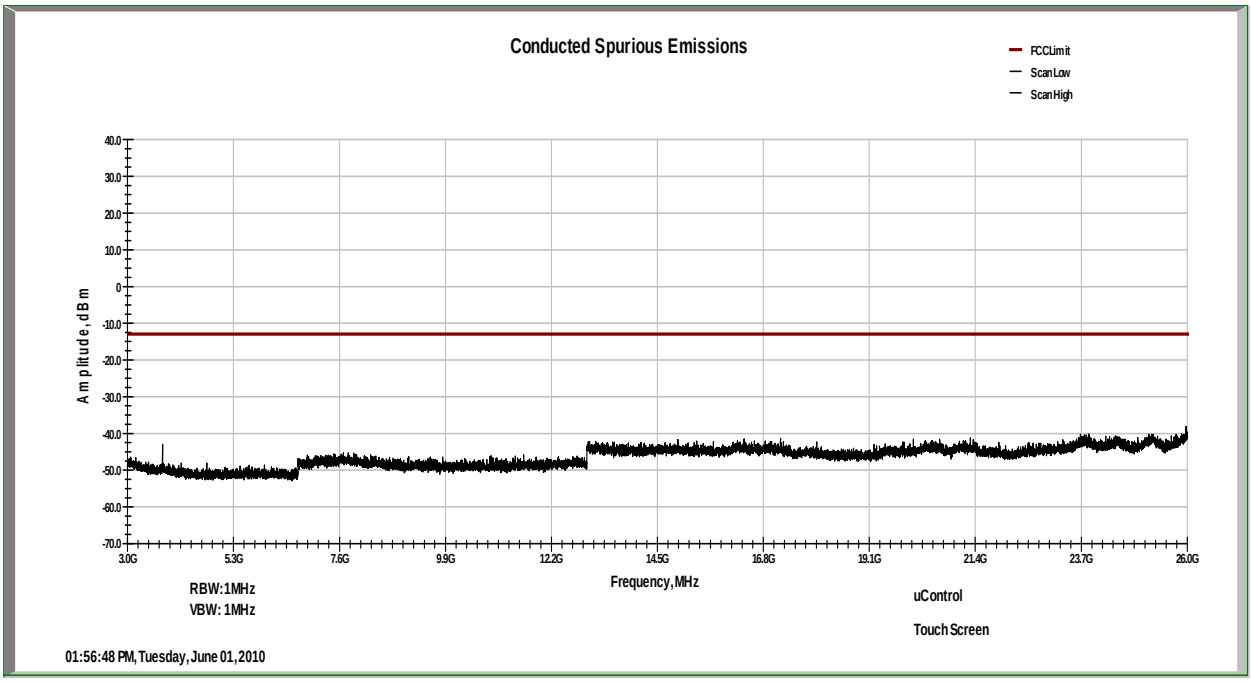
GSM 1900 Band, Low Channel, EDGE Mode, 30MHz – 3GHz



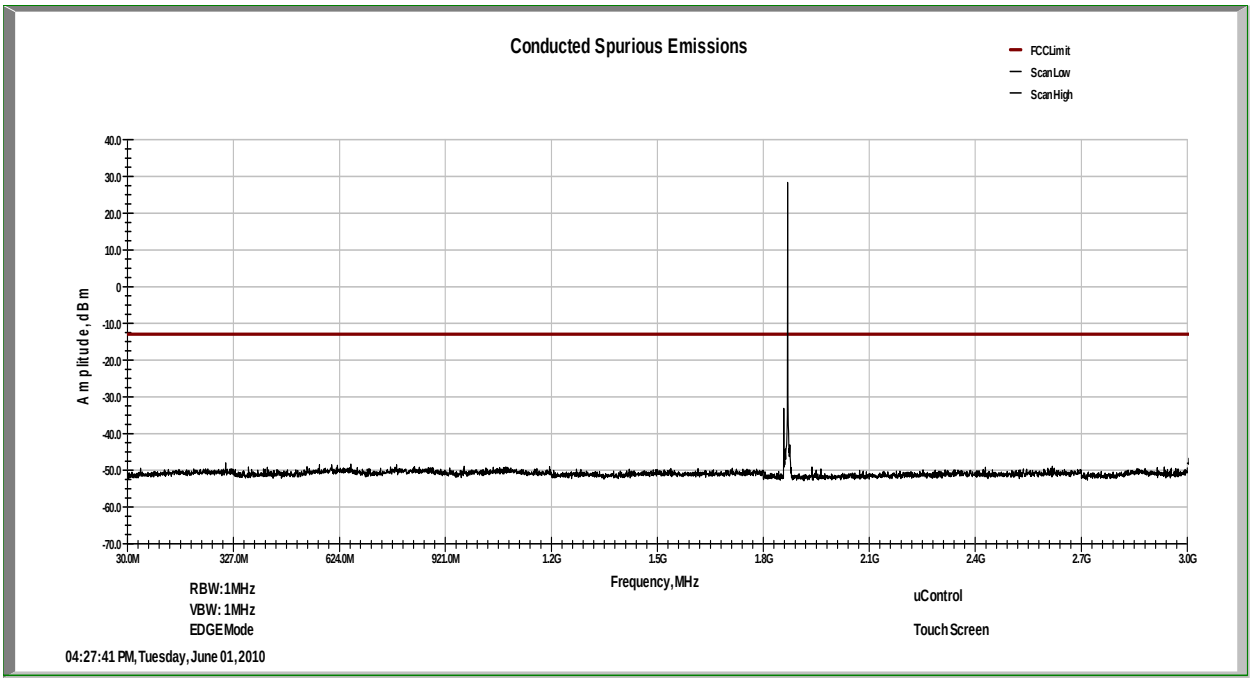
GSM 1900 Band, Low Channel, EDGE Mode, 3GHz – 26GHz



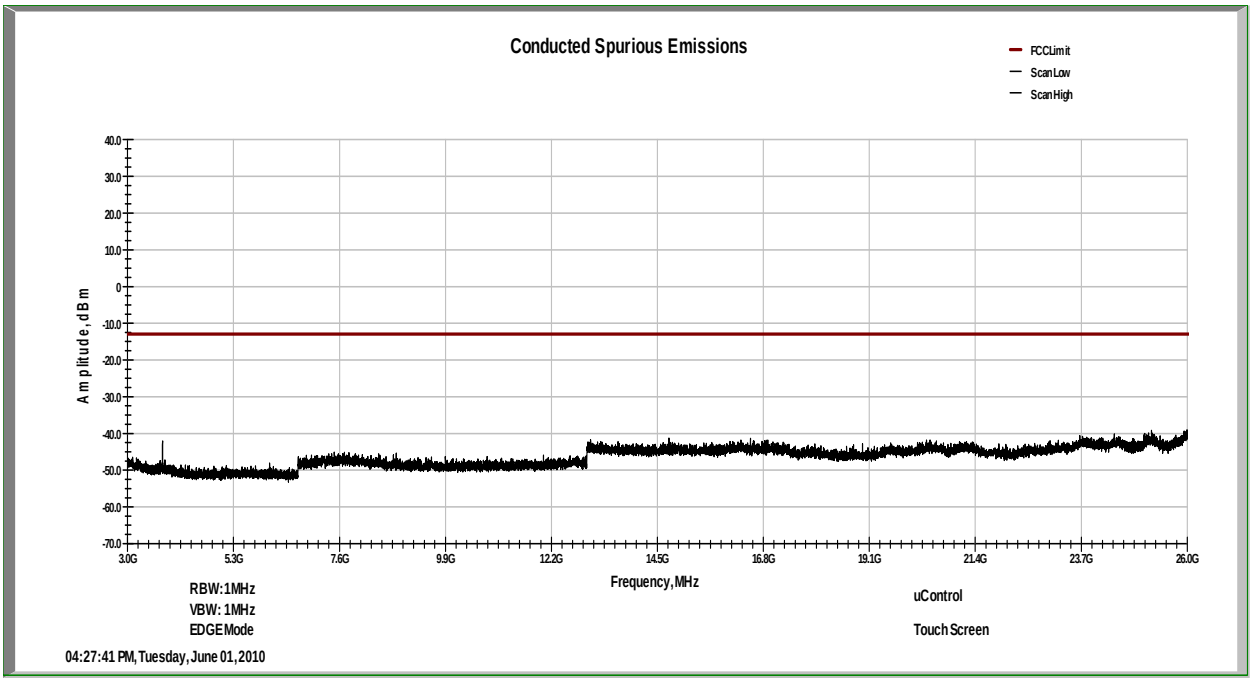
GSM 1900 Band, Mid Channel, GSM Mode, 30MHz – 3GHz



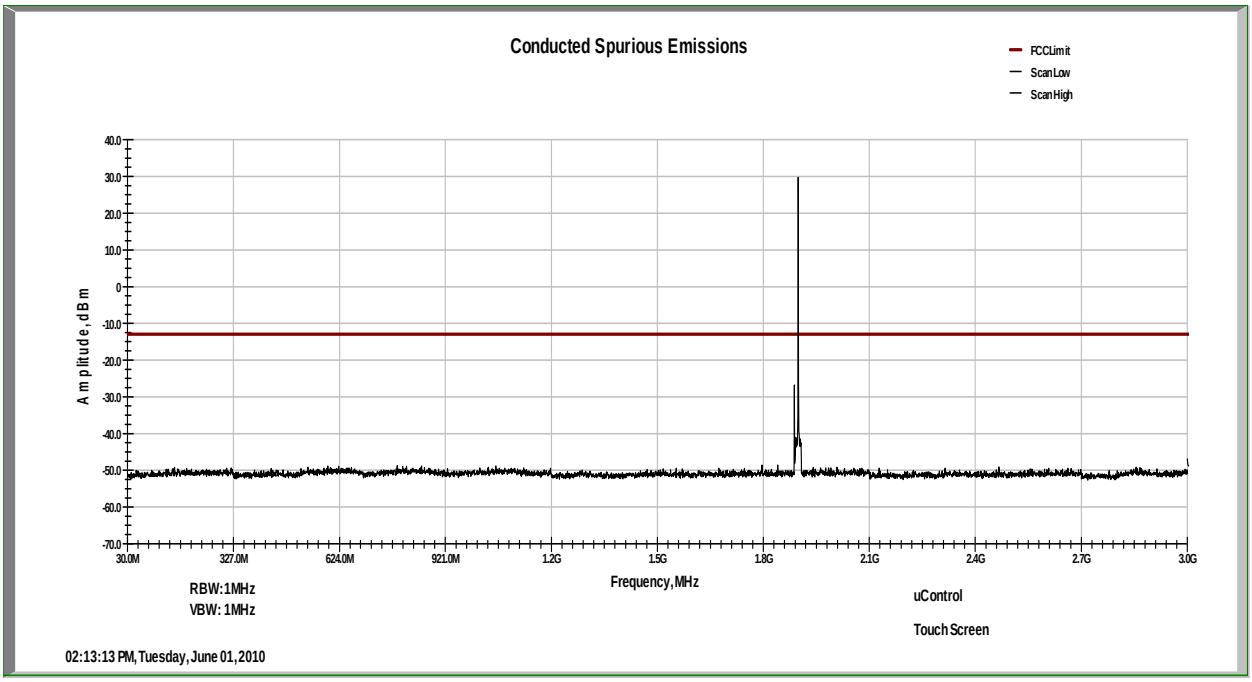
GSM 1900 Band, Mid Channel, GSM Mode, 3GHz – 26GHz



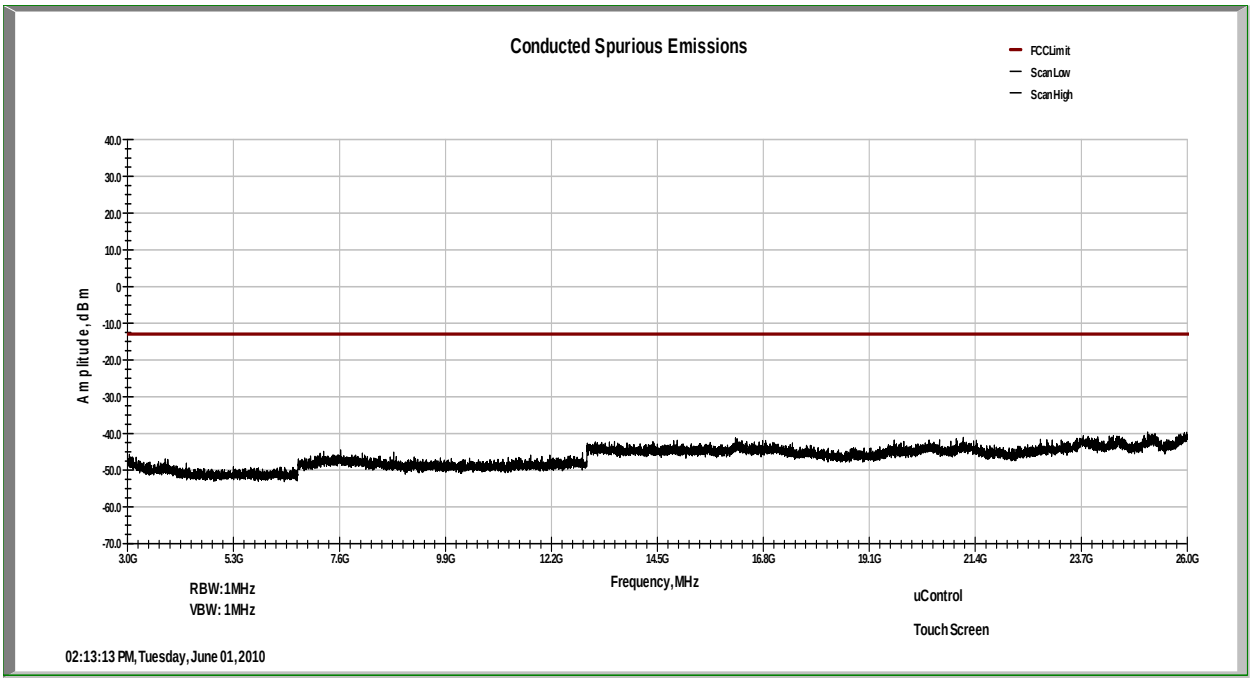
GSM 1900 Band, Mid Channel, EDGE Mode, 30MHz – 3GHz



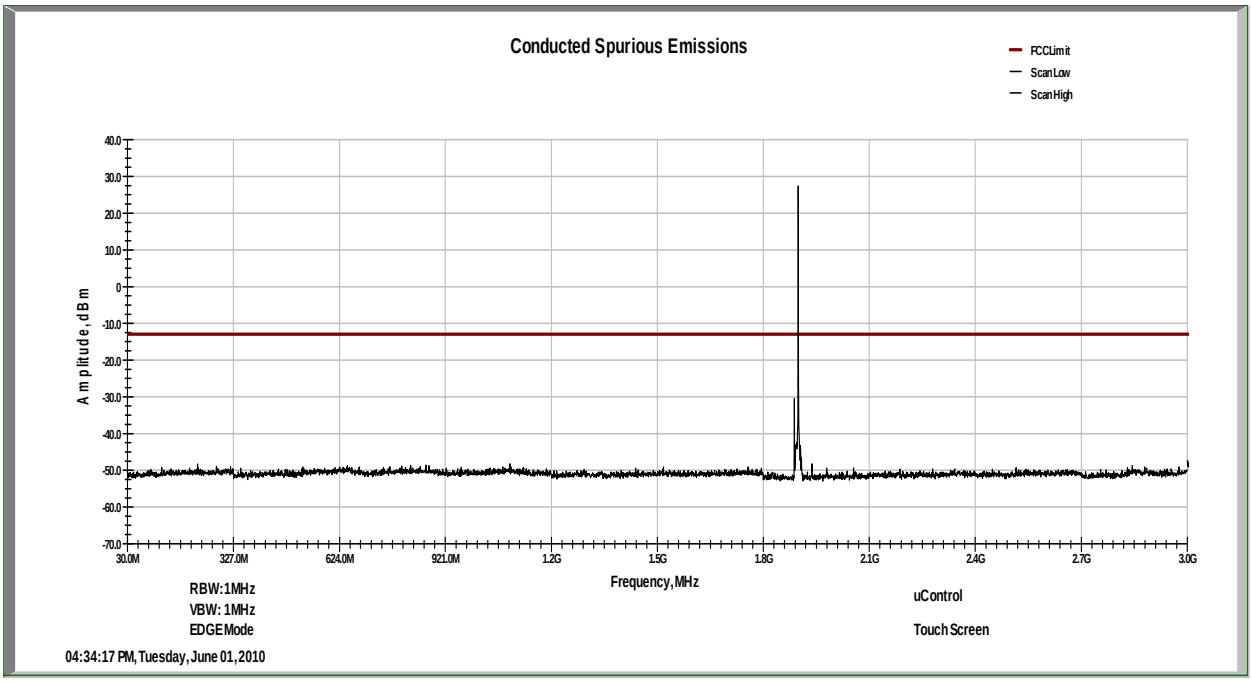
GSM 1900 Band, Mid Channel, EDGE Mode, 3GHz – 26GHz



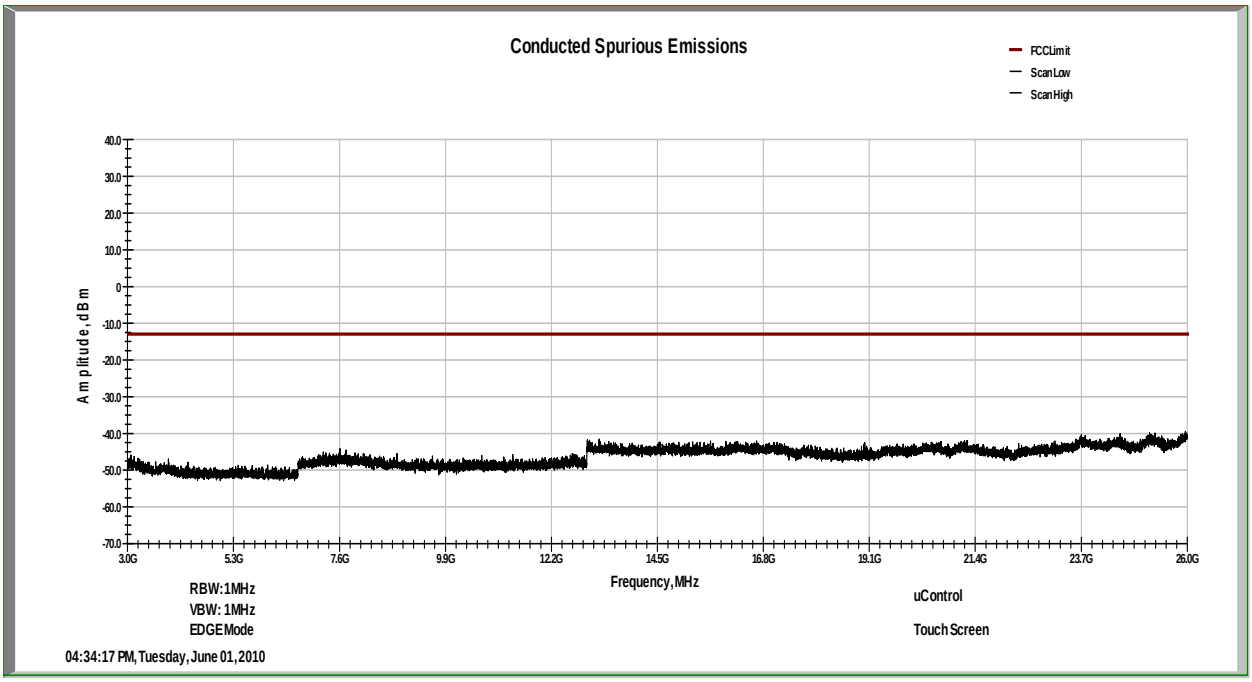
GSM 1900 Band, High Channel, 30MHz – 3GHz



GSM 1900 Band, High Channel, 3GHz – 26GHz

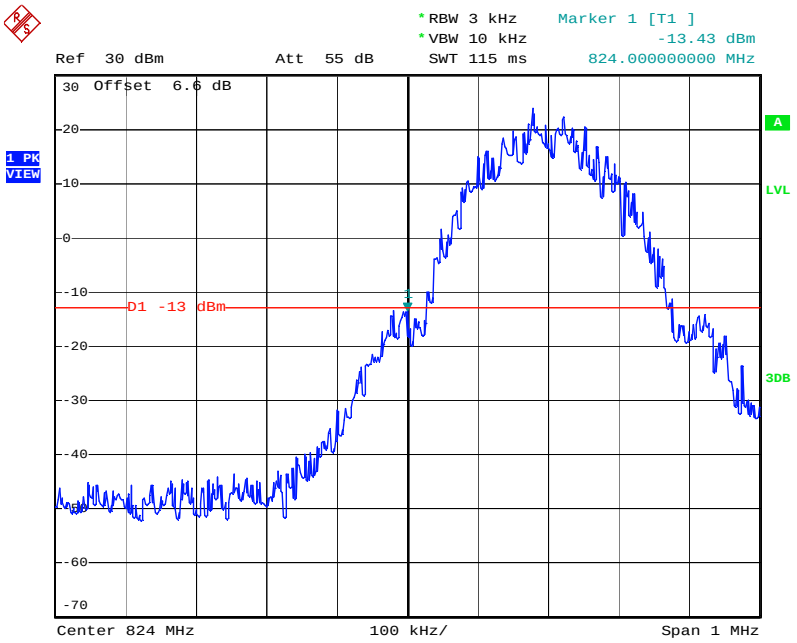


GSM 1900 Band, High Channel, EDGE Mode, 30MHz – 3GHz



GSM 1900 Band, High Channel, EDGE Mode, 3GHz – 26GHz

Emissions within 1MHz of the band edge:



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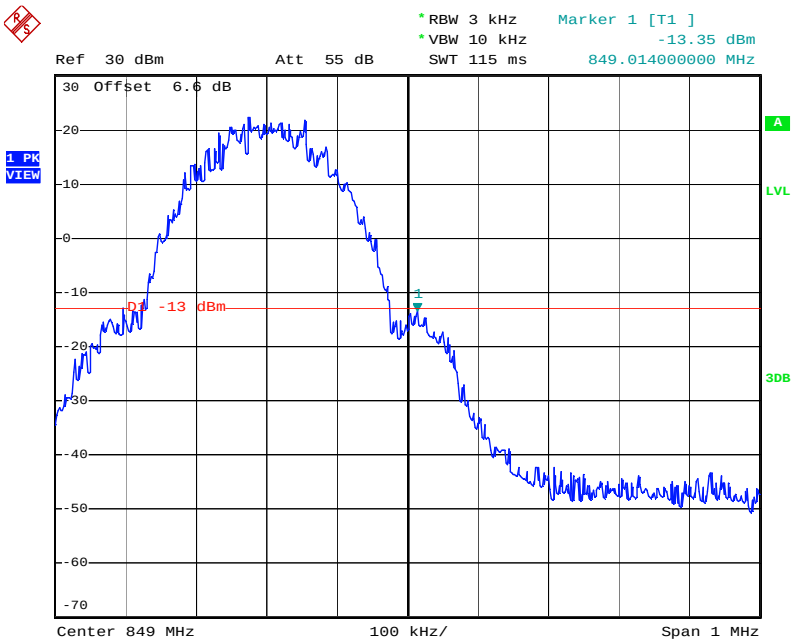
GSM 850 Low Band Edge, GSM Mode



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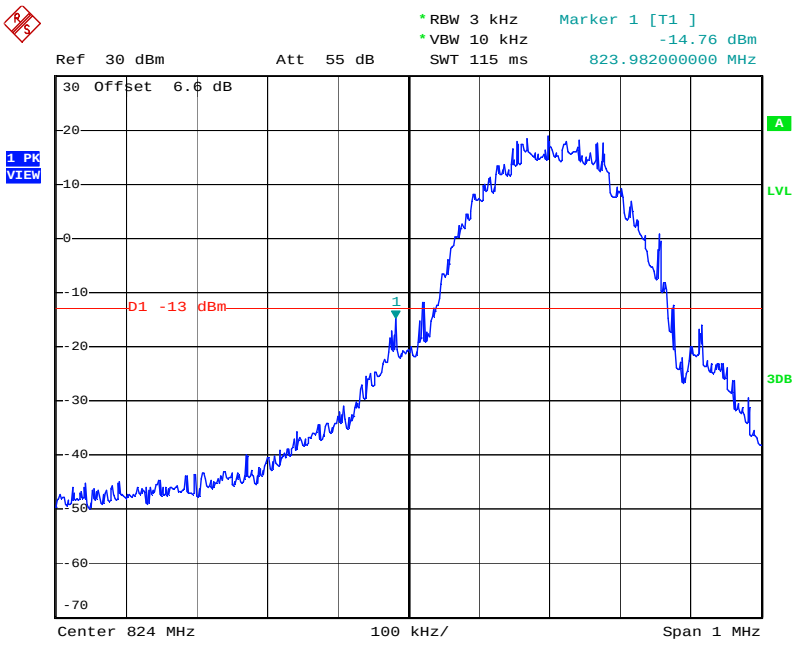
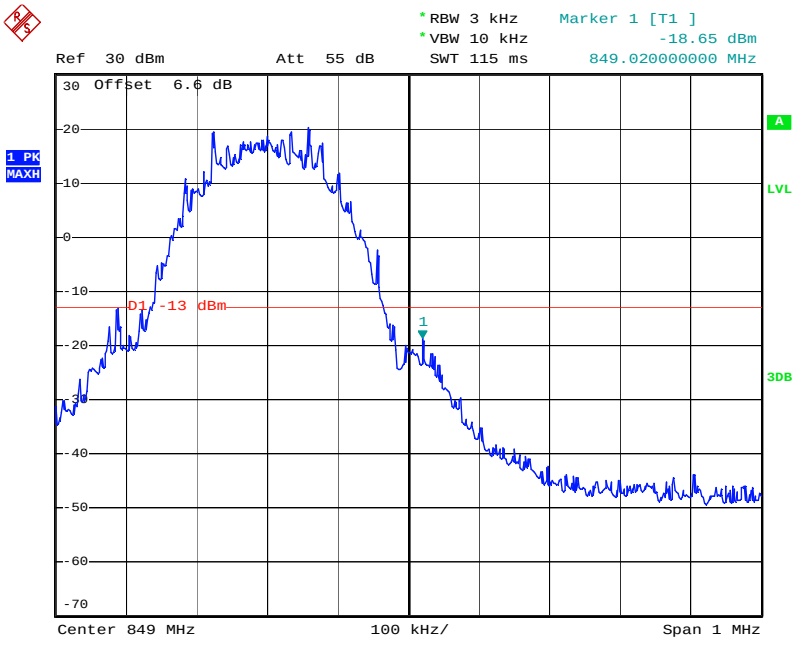
GSM 850 High Band Edge, GSM Mode



Date: 2.JUN.2010 11:07:29

GSM 850 Low Band Edge. EDGE Mode (8PSK)



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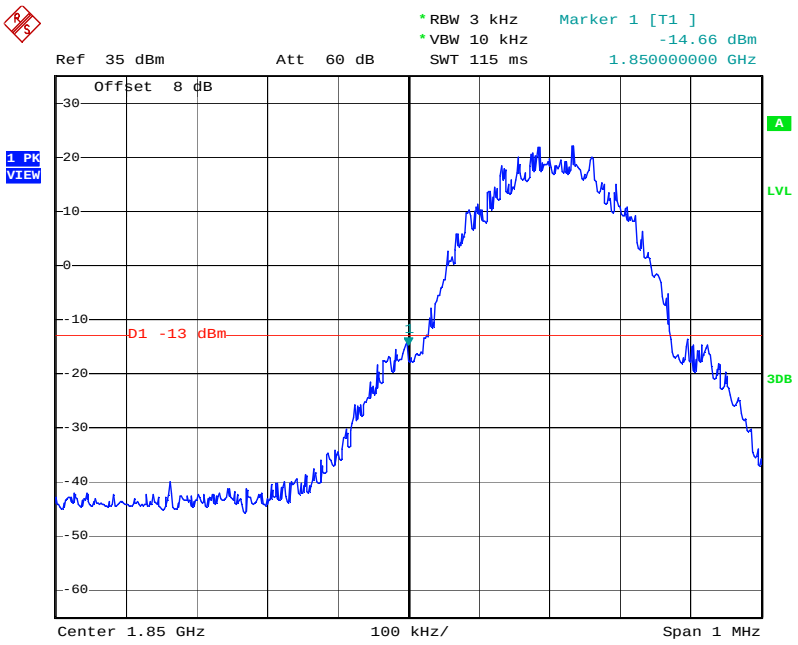
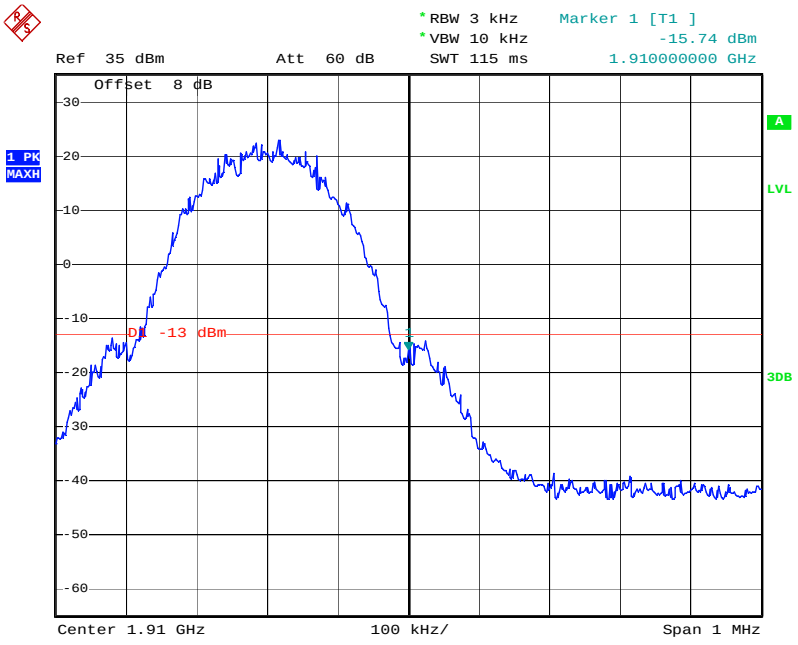
GSM 850 High Band Edge, EDGE Mode (8PSK)



Date: 2.JUN.2010 10:10:26

GSM 1900 Low Band Edge, GSM Mode



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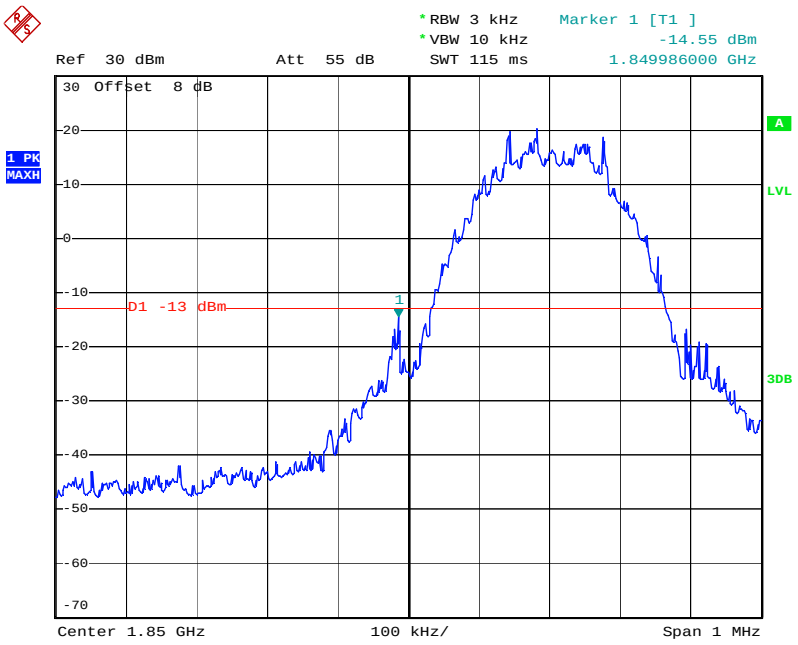
GSM 1900 High Band Edge, GSM Mode



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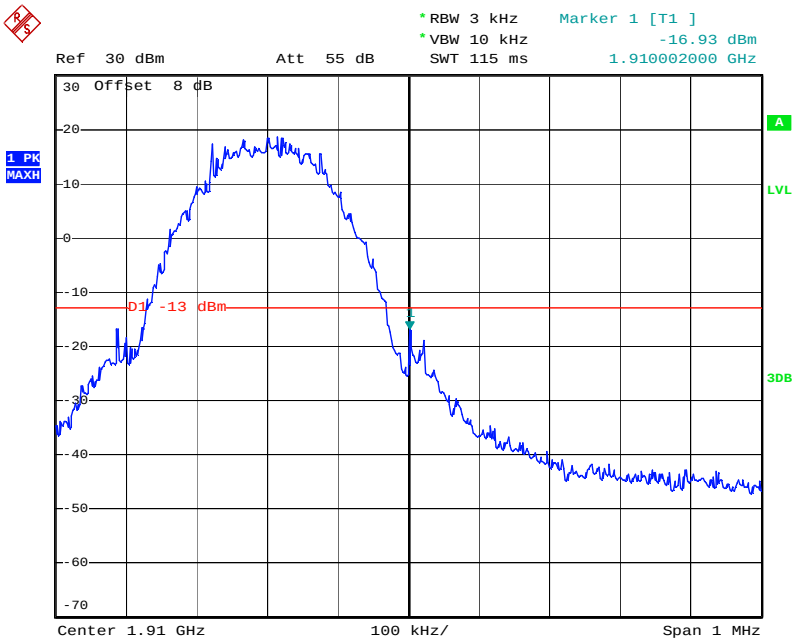
GSM 1900 Low Band Edge, EDGE Mode (8PSK)



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GSM 1900 High Band Edge, EDGE Mode (8PSK)

7 Radiated Output Power

7.1 Test Limits

§ 22.913

The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

§ 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.

7.2 Test Procedure

The radiated output power was measured using the substitution measurement method detailed in TIA-603C. Measurements were performed in a specially designed fully anechoic chamber specifically designed to measure the radiated output power of wireless devices.

7.3 Test Equipment Used:

Description	Asset Number	Manufacturer	Model	Cal. Date	Cal. Due
Base Station Simulator	837198089	Rohde & Schwarz	CMU200	6/24/2009	6/24/2010
Spectrum Analyzer	3065	Rohde & Schwarz	FSP3	3/18/2010	3/18/2011
System Controller	2523	ETS Lindgren	2092	TOU	TOU
ETS Anechoic Chamber	2527	ETS Lindgren	MAPS System	4/12/2010	4/12/2011
Multi-Axis Positioning System (MAPS)	2527	ETS Lindgren	MAPS System	4/12/2010	4/12/2011
Horn Antenna	2524	ETS Lindgren	3164-04	4/12/2010	4/12/2011

7.4 Results:

Technology	Band	Channel	Frequency	EIRP (dBm)
GSM	850	128	824.2 MHz	27.53
GSM	850	190	836.6 MHz	27.83
GSM	850	251	848.8 MHz	27.33
GSM	1900	512	1850.2 MHz	33.52
GSM	1900	661	1880.0 MHz	33.32
GSM	1900	810	1909.8 MHz	31.55

8 Radiated Spurious Emissions (Transmitter)

8.1 Test Limits

§ 2.1053

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

§ 22.917

(a) Out of band emissions. The power of any emission 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.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). 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.

§ 24.238

(a) Out of band emissions. The power of any emission 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.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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.

8.2 Test Procedure

The EUT was placed on a non-conductive turntable. The measurement antenna was placed at a distance of 3 meters from the EUT. The EUT was forced to transmit at its maximum output power setting. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.
The frequency range up to tenth harmonic was investigated in order to identify the spurious emission. Once the spurious emissions were identified, the power of the emission was determined using the substitution method described in TIA-603-C.
The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and at the spurious emissions frequency.

8.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	8/17/2009	8/17/2010
Preamplifier	987410	Miteq	AFS44-00102000-30-10P-44	6/17/2010	6/17/2011
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	2/12/2010	2/12/2011
Biconnilog Antenna	00051864	ETS	3142C	12/21/2009	12/21/2010
Horn Antenna	6556	ETS	3115	8/4/2009	8/4/2010
Horn Antenna	1096	Antenna Research	DRG-118/A	8/4/2009	8/4/2010
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use
High Pass Filter	3986-01 DC0408	Microwave Circuits, Inc.	H3G020G2	2/10/2010	2/10/2011
Base Station Simulator	837198089	Rohde & Schwarz	CMU200	6/24/2009	6/24/2010

8.4 Results:

All radiated spurious emissions were attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The data shown below represent the worst case spurious emissions between GPRS and EDGE operating modes. In each case the GPRS mode yielded the higher measurement.

Worst Case Spurious Measurements

EUT Mode	TX Channel	Polarity	Spurious Emission Frequency	Device Reading (dBuV)	Signal Generator Output (dBm)	Cable Loss (dB)	Tx Antenna Gain (dBi)	Tx Antenna Gain (dBd)	Radiated Power (dBm)
GSM850	128	V	1648.4	33.32	-38.7	3.3	8.4	6.26	-35.74
		H	1648.4	33.04	-37.8	3.3	8.4	6.26	-34.84
		V	2472.6	32.76	-31.3	4.2	8.0	5.86	-29.64
		H	2472.6	32.44	-33	4.2	8.0	5.86	-31.34
		V	3296.8	63.19	-39.6	4.6	8.2	6.06	-38.14
		H	3296.8	60.8	-40.3	4.6	8.2	6.06	-38.84
GSM850	190	V	1673.2	33.12	-39.3	3.3	8.4	6.26	-36.34
		H	1673.2	34.1	-36.7	3.3	8.4	6.26	-33.74
		V	2509.8	34.47	-28.2	4	7.8	5.66	-26.54
		H	2509.8	32.46	-31.9	4	7.8	5.66	-30.24
		V	3346.4	64.68	-37.4	4.6	8.3	6.16	-35.84
		H	3346.4	62.42	-41.2	4.6	8.3	6.16	-39.64
GSM850	251	V	1697.6	33.06	-39.4	3.3	8.5	6.36	-36.34
		H	1697.6	29.88	-42.1	3.3	8.5	6.36	-39.04
		V	2546.4	33.5	-28.2	4	7.5	5.36	-26.84
		H	2546.4	33.7	-27.8	4	7.5	5.36	-26.44
		V	3395.2	61.4	-39.6	4.6	8.8	6.66	-37.54
		H	3395.2	56.57	-46.7	4.6	8.8	6.66	-44.64
GSM1900	512	V	3700.4	68.86	-29.5	5	8.5	6.36	-28.14
		H	3700.4	74.0	-27.6	5	8.5	6.36	-26.24
		V	5550.6	51.75	-45.2	6.7	12.1	9.96	-41.94
		H	5550.6	52.45	-43.8	6.7	12.1	9.96	-40.54
		V	7400.8	49.9	-39.9	7.7	9.6	7.46	-40.14
		H	7400.8	49.8	-38.3	7.7	9.6	7.46	-38.54
		V	11101.2	45.45	-33.5	10.5	14.3	12.16	-31.84
		H	11101.2	40.95	-40	10.5	14.3	12.16	-38.34
GSM1900	661	V	3760	69.85	-31	5	10.1	7.96	-28.04
		H	3760	73.26	-27	5	10.1	7.96	-24.04
		V	5640	52.2	-45.7	7	12.4	10.26	-42.44
		H	5640	50.72	-47.4	7	12.4	10.26	-44.14
		V	7520	49.06	-40.2	8.1	10	7.86	-40.44
		H	7520	45.18	-42.9	8.1	10	7.86	-43.14
		V	11280	48.1	-29	10.2	13.3	11.16	-28.04
		H	11280	40.44	-40.4	10.2	13.3	11.16	-39.44
GSM1900	810	V	3819.2	68.28	-32.9	5	11.1	8.96	-28.94
		H	3819.2	70.76	-27.9	5	11.1	8.96	-23.94
		V	5729.4	52.79	-45.4	7	14	11.86	-40.54
		H	5729.4	51.89	-45.6	7	14	11.86	-40.74
		V	7639.2	48.11	-38.7	8.1	10.5	8.36	-38.44
		H	7639.2	43.81	-45.3	8.1	10.5	8.36	-45.04
		V	11458.8	46.1	-33.8	9.8	12.7	10.56	-33.04
		H	11458.8	42.81	-39.8	9.8	12.7	10.56	-39.04

9 Frequency Stability

9.1 Test Limits

§ 2.1055, §22.355, §24.235

The frequency stability of the transmitter was required to maintain a ±2.5ppm tolerance.

9.2 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a Base Station Simulator. The Base Station Simulator was set to force the EUT to its maximum power setting. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for that purpose. After the temperature stabilized for approximately 30 minutes, the frequency error was read from the base station simulator. At 20C the input voltage was varied from 85% to 115% and the frequency stability vs input voltage was recorded.

9.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
Environmental Chamber	32692	Thermotron	SM-8C	1/29/2010	1/29/2011
Base Station Simulator	837198089	Rohde & Schwarz	CMU200	6/24/2009	6/24/2010

9.4 Results:

The tables below show the frequency stability data for both GSM850 and 1900. In both cases the test sample met the ±2.5ppm limit.

Operating Freqeuncy: 836,600,000 Hz
Channel: 190
Reference Voltage: 3.7 VDC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in GSM850 Mode

Voltage (%)	Power (VDC)	Temp	Frequency Error	Deviation (%)	Deviation (ppm)
100%	3.7	-30	-13	-0.0000016	-0.0155
100%	3.7	-20	7	0.0000008	0.0084
100%	3.7	-10	-9	-0.0000011	-0.0108
100%	3.7	0	8	0.0000010	0.0096
100%	3.7	10	-13	-0.0000016	-0.0155
100%	3.7	20	7	0.0000008	0.0084
100%	3.7	30	-11	-0.0000013	-0.0131
100%	3.7	40	-6	-0.0000007	-0.0072
100%	3.7	50	-11	-0.0000013	-0.0131
100%	3.7	60	16	0.0000019	0.0191
115%	4.255	20	12	0.0000014	0.0143
85%	3.4	20	10	0.0000012	0.0120

Frequency Stability for GSM850

Operating Freqeuncy: 1,880,000,000 Hz
Channel: 661
Reference Voltage: 3.7 VDC
Deviation Limit: 2.5 ppm
Notes: Frequency Stability in GSM1900 Mode

Voltage (%)	Power (VDC)	Temp	Frequency Error	Deviation (%)	Deviation (ppm)
100%	3.7	-30	-20	-0.0000011	-0.0106
100%	3.7	-20	-21	-0.0000011	-0.0112
100%	3.7	-10	-10	-0.0000005	-0.0053
100%	3.7	0	-19	-0.0000010	-0.0101
100%	3.7	10	-21	-0.0000011	-0.0112
100%	3.7	20	-18	-0.0000010	-0.0096
100%	3.7	30	-13	-0.0000007	-0.0069
100%	3.7	40	-15	-0.0000008	-0.0080
100%	3.7	50	-23	-0.0000012	-0.0122
100%	3.7	60	19	0.0000010	0.0101
115%	4.255	20	15	0.0000008	0.0080
85%	3.4	20	8	0.0000004	0.0043

Frequency Stability for GSM1900

10 Radiated Spurious Emissions (Receiver)

10.1 Test Limits

§ 15.109

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (microvolts/meter)	Field strength (dBuV/m)
30–88	100	40
88–216	150	43.5
216–960	200	46
Above 960	500	54

10.2 Test Procedure

ANSI C63.4: 2003

10.3 Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculations are listed below:

Formula:
FS = RA + AF + CF

FS = Field Strength in dBμV/m
RA = Receiver Amplitude in dBμV
AF = Antenna Factor in dB
CF = Cable Attenuation Factor in dB (Including preamplifier and filter attenuation)

Example Calculation:

RA = 19.48 dBμV
AF = 18.52 dB
CF = 0.78 dB

FS = 19.48 + 18.52 + 0.78 = 38.78 dBμV/m
Level in μV/m = Common Antilogarithm [(38.78 dBμV/m)/20] = 86.89 μV/m

10.4 Test Equipment Used:

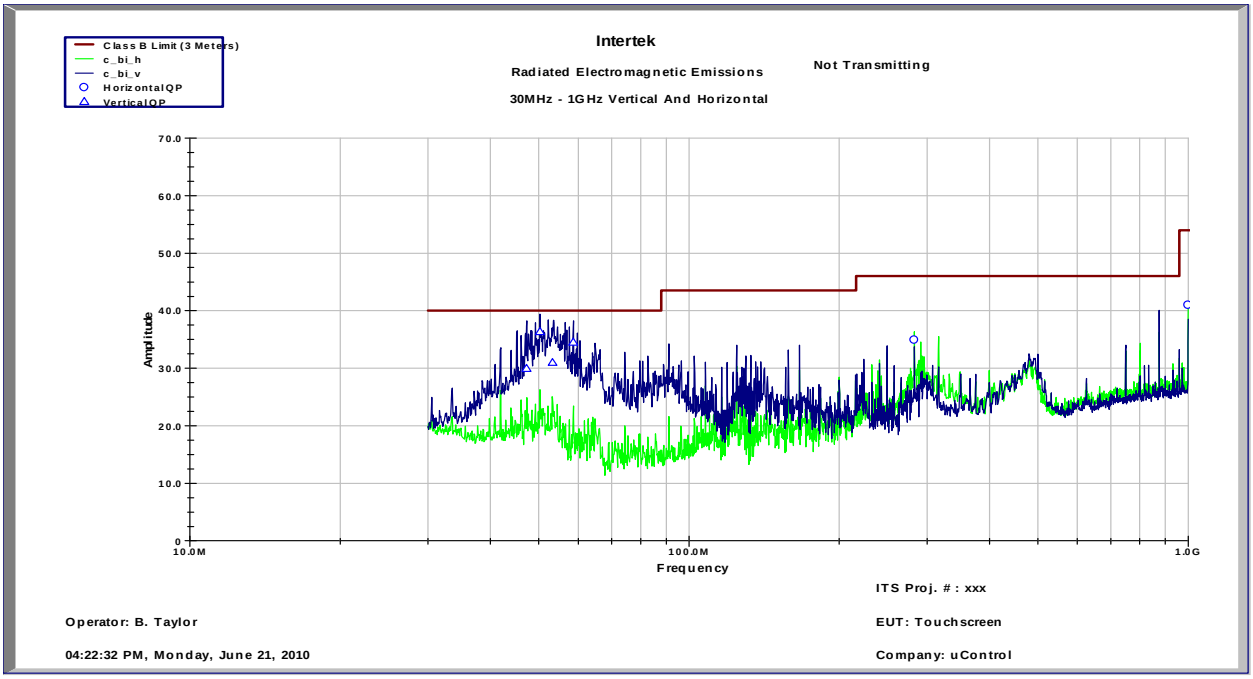
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/14/2009	9/14/2010
Preamplifier	SF456200904	Mini-Circuits	ZX60-3018G-S+	2/12/2010	2/12/2011
Biconnilog Antenna	00051864	ETS	3142C	12/21/2009	12/21/2010
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use

10.5 Results:

All spurious emissions with the test sample in receive mode were below the limits specified in Part 15.109 for a class B digital device.

Radiated Emissions										
Test Engineer:	Bryan Taylor	**Start Date:**	6/21/2010		**End Date:**	6/21/2010				
Temperature:	23.2C	**Humidity:**	43.80%		**Pressure:**	990.3mBar				
Specification:	FCC Part 15B	**Test Limit:**	Class B							
Notes:	Not Transmitting									
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Frequency	**Polarity (H/V)**	**Raw Reading (dBuV)**	**Cab. (dB)**	**Ant. (dB)**	**Corr. Reading. (dBuV/m)**	**Limit (dBuV/m)**	**Delta (dB)**	**RBW / Detector**	**Test Distance**	**Results**
282.75 MHz	H	36.11	-14.36	13.16	34.91	46.02	-11.11	120kHz/QP	3m	**Compliant**
1.0001 GHz	H	28.04	-10.96	23.9	40.98	53.98	-13	120kHz/QP	3m	**Compliant**
47.258 MHz	V	37.92	-16.02	8.05	29.95	40	-10.05	120kHz/QP	3m	**Compliant**
50.263 MHz	V	44.54	-15.79	7.6	36.35	40	-3.65	120kHz/QP	3m	**Compliant**
53.295 MHz	V	38.86	-15.65	7.76	30.97	40	-9.03	120kHz/QP	3m	**Compliant**
58.645 MHz	V	40.97	-15.94	9.47	34.5	40	-5.5	120kHz/QP	3m	**Compliant**
Calculations:					F = C + D + E		H = F - G			

Maximized Quasi Peak Emissions



Peak Scan (Receive Mode)

11 AC Powerline Conducted Emissions

11.1 Test Limits

§ 15.107

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

11.2 Test Procedure

ANSI C63.4: 2003

11.3 Test Equipment Used:

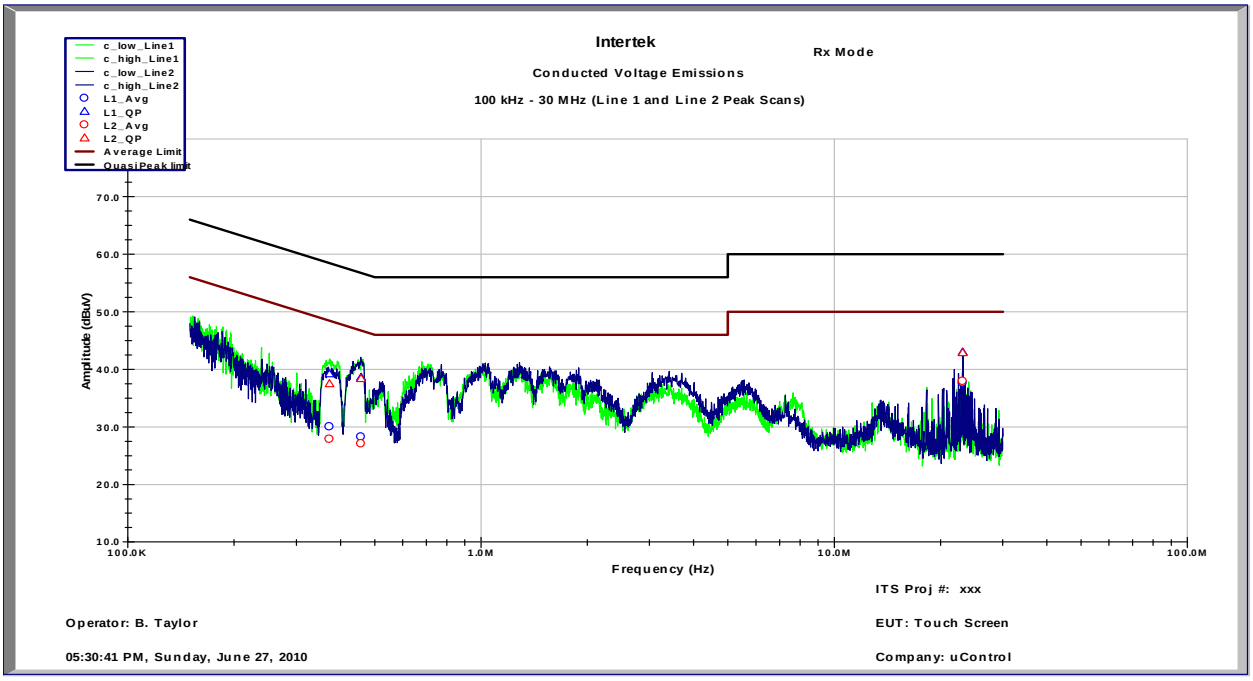
Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMC Analyzer	2142	HP	E7405	8/21/2009	8/21/2010
LISN	3333	Teseq	NNB52	2/23/2010	2/23/2011

11.4 Results:

Conducted Voltage Emissions on Power Lines								
Test Engineer:	Bryan Taylor	**Start Date:**	6/27/2010	**End Date:**	6/27/2010			
Temperature:	22.4C	**Humidity:**	40.50%	**Pressure:**	989.3mBar			
Specification:	FCC Part 15B	**Test Limit:**	Class B	**RBW:**	9kHz			
Notes:	Not Transmitting							

Line	Frequency (MHz)	Quasi-Peak (dBuV)	Quasi-Peak Limit (dBuV)	Quasi-Peak Delta (dB)	Average (dBuV)	Average Limit (dBuV)	Average Delta (dB)	Results
L1	372.5 KHz	39.17	58.44	-19.27	30.03	48.44	-18.41	**Compliant**
L1	457.5 KHz	38.61	56.74	-18.13	28.27	46.74	-18.47	**Compliant**
L1	23.1 MHz	43	60	-17	37.61	50	-12.39	**Compliant**
L2	372.5 KHz	37.49	58.44	-20.95	27.86	48.44	-20.58	**Compliant**
L2	457.5 KHz	38.37	56.74	-18.37	27.07	46.74	-19.67	**Compliant**
L2	23.1 MHz	42.88	60	-17.12	37.94	50	-12.06	**Compliant**

Quasi-Peak and Average Measurements – Rx Mode



Peak Scan (Line 1 and 2) – Rx Mode

12 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of k = 2, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty	Notes
Radiated emissions, 30 to 1000 MHz	±3.9dB	
Radiated emissions, 1 to 18 GHz	±4.2dB	
Radiated emissions, 18 to 40 GHz	±4.3dB	
Power Port Conducted emissions, 150kHz to 30 MHz	±2.8dB	

13 Revision History

Revision Level	Date	Report Number	Notes
0	8/24/2010	100061439LEX-002	Original Issue