

4. Spurious Emission At Antenna Terminals (+/-1MHz)

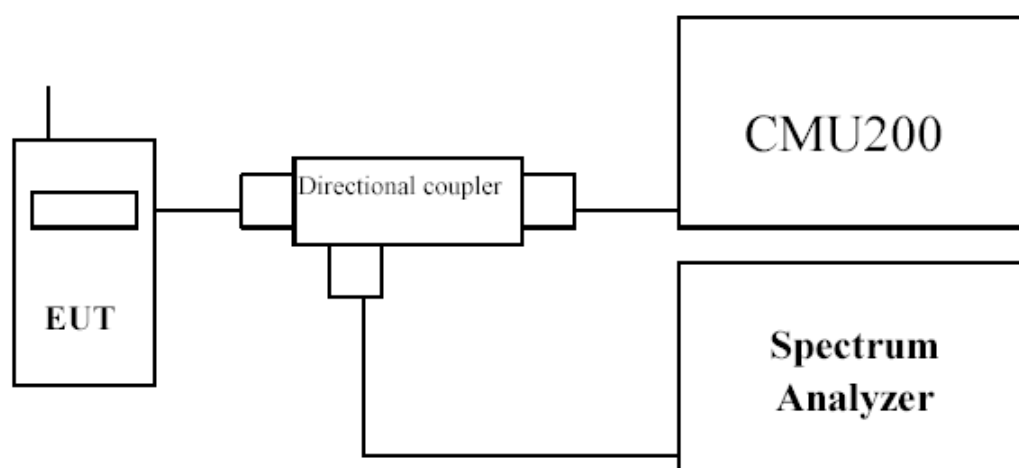
4.1. Test Equipment

The following test equipments are used during the spurious emission test

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	Agilent	N9020A / MY48010570	2012/05/31
Universal Radio Communication Tester	R & S	CMU200 / 104846	2012/05/14
Directional coupler	Agilent	87300C / MY44300353	2011/09/13
Directional coupler	Agilent	778D-012 / 50550	2012/09/14

Note: All equipments upon which need to be calibrated are with calibration period of 1 year.

4.2. Setup



4.3. Limits

Cellular Band Transmitter limits for narrowband spurious emission

Lower Block Edge Test Frequencies	Upper Block Edge Test Frequencies
Block A Channel : 128 Frequency : 824.2 MHz	Block B Channel : 251 Frequency : 848.8 MHz

PCS Band Transmitter limits for narrowband spurious emission

Lower Block Edge Test Channels/Frequencies	Upper Block Edge Test Channels/Frequencies
Block A Channel : 512 Frequency : 1850.2 MHz	Block C Channel : 810 Frequency : 1909.8 MHz

4.4. Test Procedure

In accordance with Part 22.917 and 24.238, at least 1% of the emission bandwidth was used for the resolution and video bandwidths up to 1MHz away from the Block Edge. At greater than 1MHz, the resolution and video bandwidth were increased to 1MHz.

The reference power and path losses of all channels used for testing in each frequency block were measured.

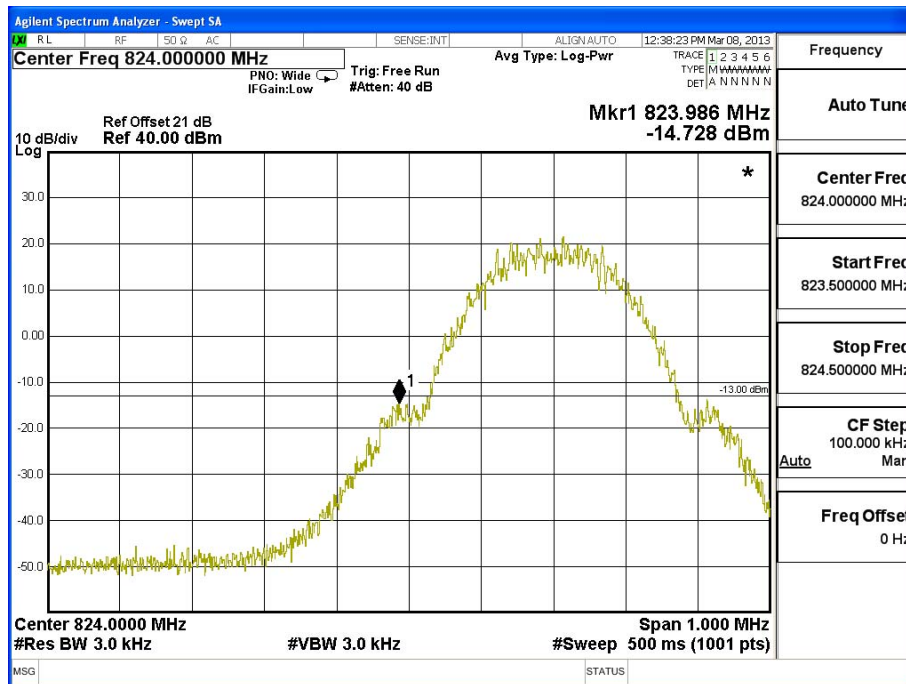
4.5. Test Specification

According to Part 2.1049, 22.917,24.238.

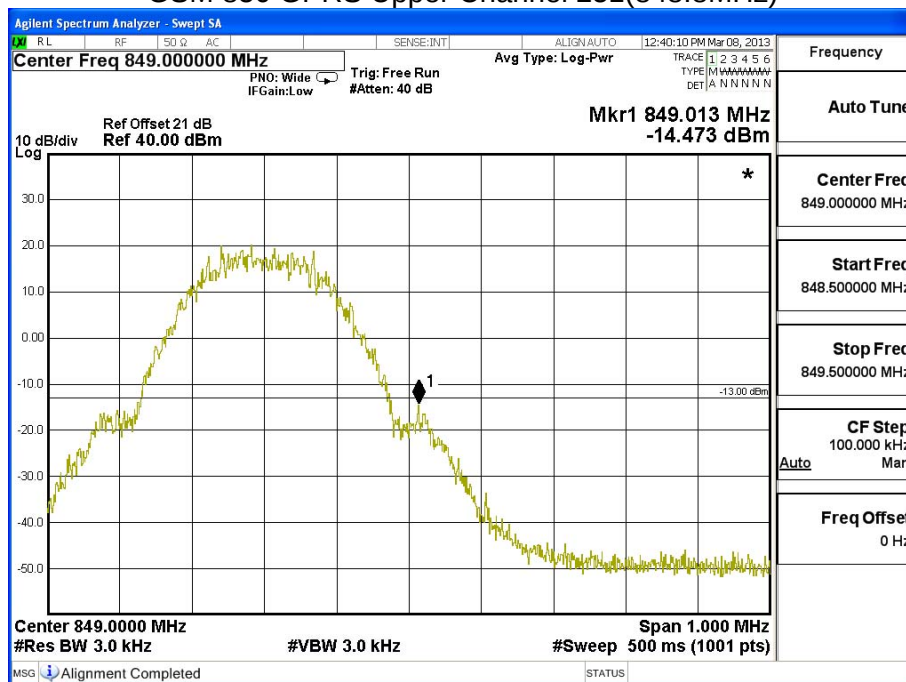
4.6. Test Result of Spurious Emission At Antenna Terminals (+/-1MHz)

Product	Mobile Computer		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2013/03/08	Test Site	CTR
Test Condition	Block Edge Test (GSM 850 GPRS)		

GSM 850 GPRS Lower Channel 128 (824.2MHz)

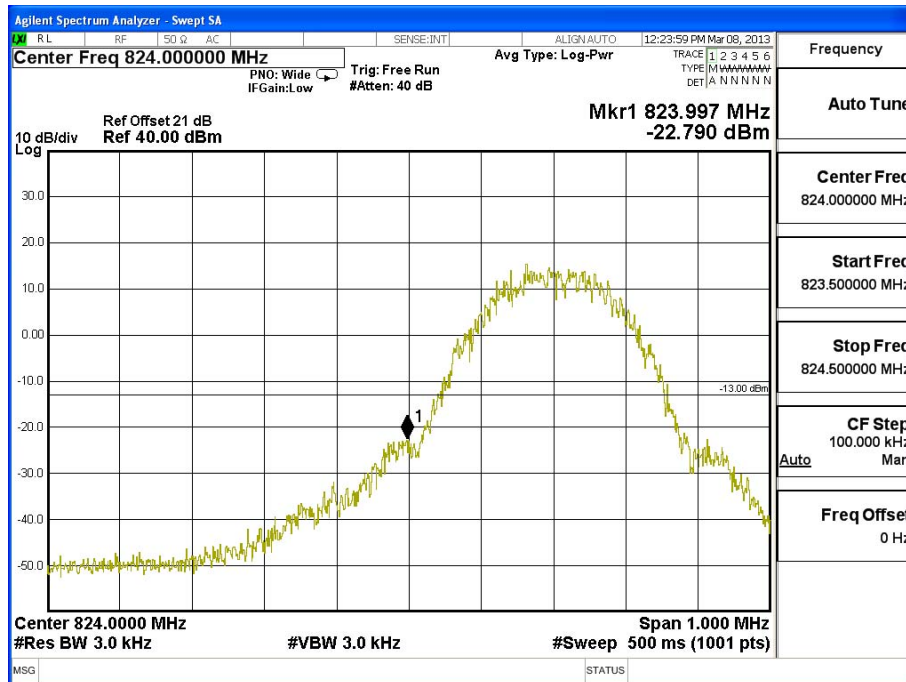


GSM 850 GPRS Upper Channel 251(848.8MHz)

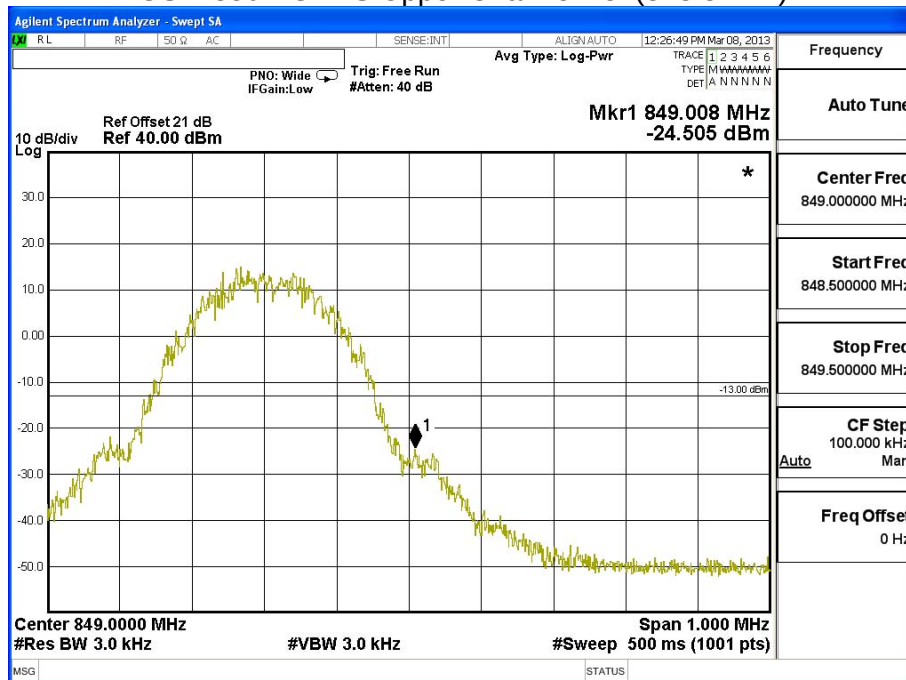


Product	Mobile Computer		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2013/03/08	Test Site	CTR
Test Condition	Block Edge Test (GSM 850 EGPRS)		

GSM 850 EGPRS Lower Channel 128 (824.2MHz)

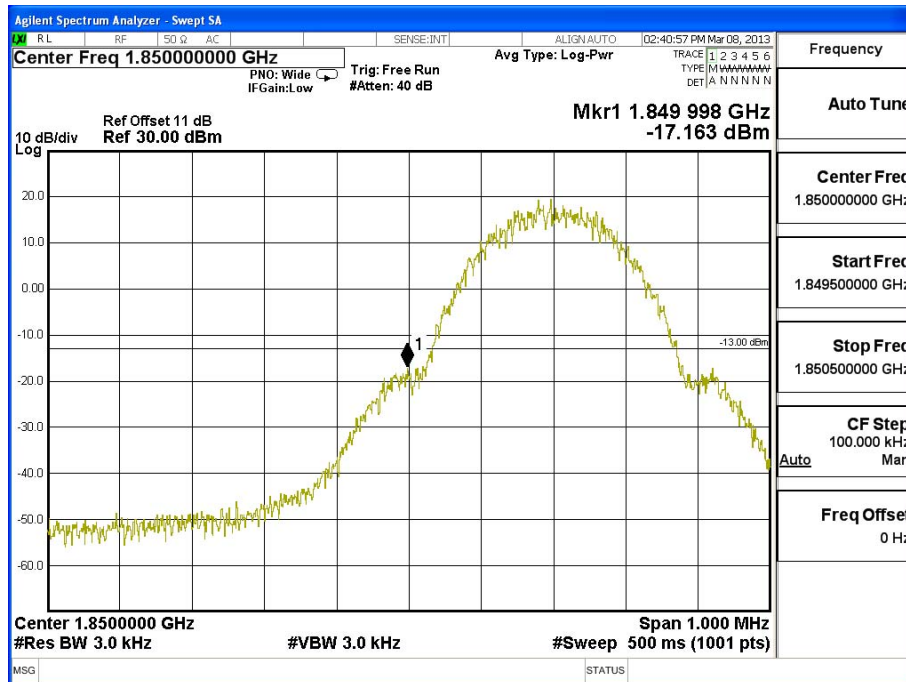


GSM 850 EGPRS Upper Channel 251(848.8MHz)

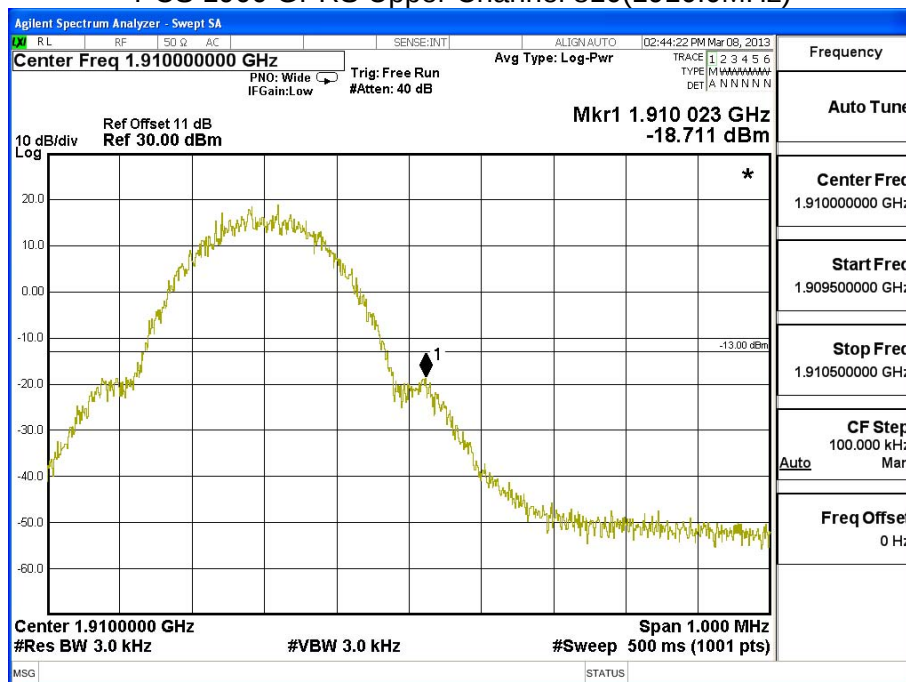


Product	Mobile Computer		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2013/03/08	Test Site	CTR
Test Condition	Block Edge Test (PCS 1900 GPRS)		

PCS 1900 GPRS Lower Channel 512 (1850.2MHz)

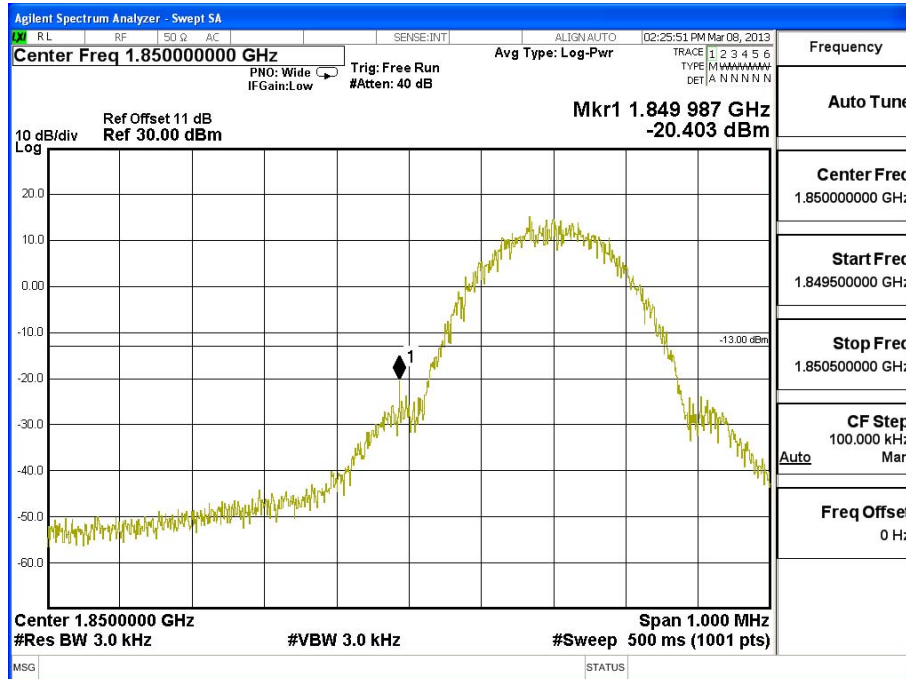


PCS 1900 GPRS Upper Channel 810(1910.0MHz)

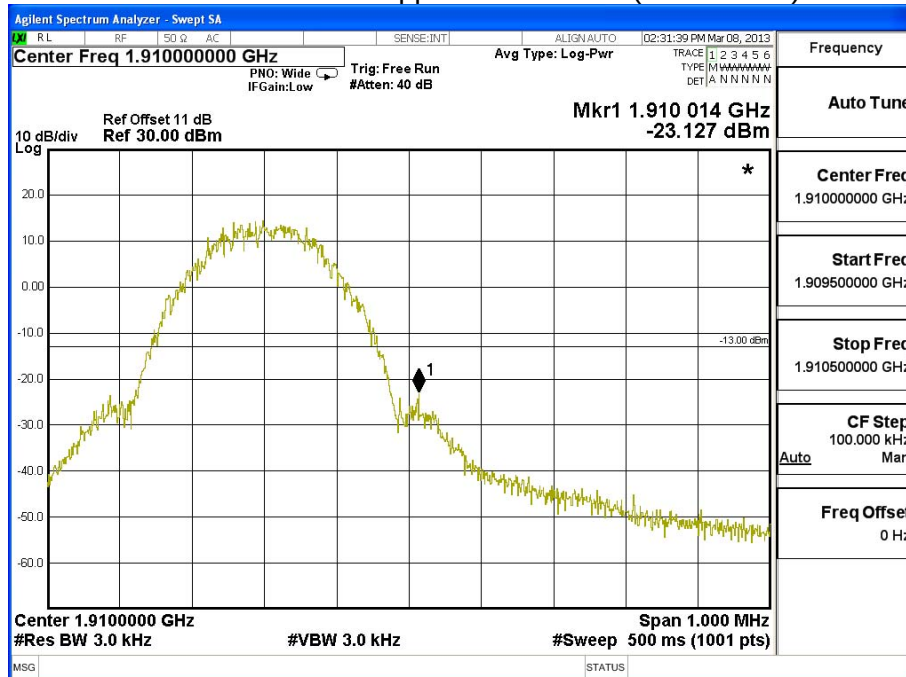


Product	Mobile Computer		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2013/03/08	Test Site	CTR
Test Condition	Block Edge Test (PCS 1900 EGPRS)		

PCS 1900 EGPRS Lower Channel 512 (1850.2MHz)



PCS 1900 EGPRS Upper Channel 810(1910.0MHz)



5. Spurious Emission

5.1. Test Equipment

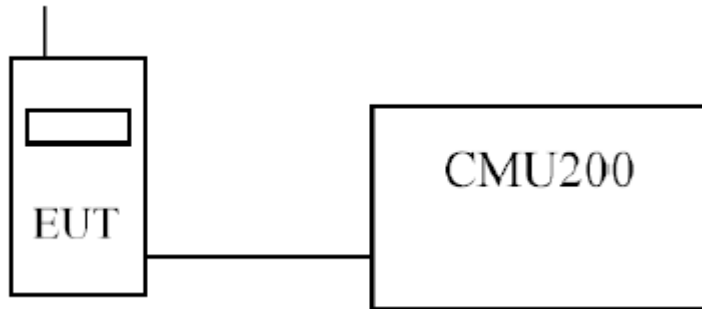
The following test equipments are used during the radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ CTR	Spectrum Analyzer	Agilent	N9020A / MY48010570	2012/05/31
	Dual Directional couple	Agilent	778D / 50550	2012/09/14
	Directional coupler	Agilent	87300C / 3239A01864	2012/09/10
☒ Site#3	Test Receiver	R & S	ESCS 30/ 100367	2012/11/30
	Universal Radio Communication Tester	R&S	CMU200/104846	2012/05/14
	Spectrum Analyzer	Agilent	N9000A/ MY50510070	2012/03/12
	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	2012/07/14
	Horn Antenna	Schwarzbeck	9120D / 556	2012/12/22
	Pre-Amplifier	QTK	QTK-LK-E-I-AMP4/ CHM-0201003	2012/07/02

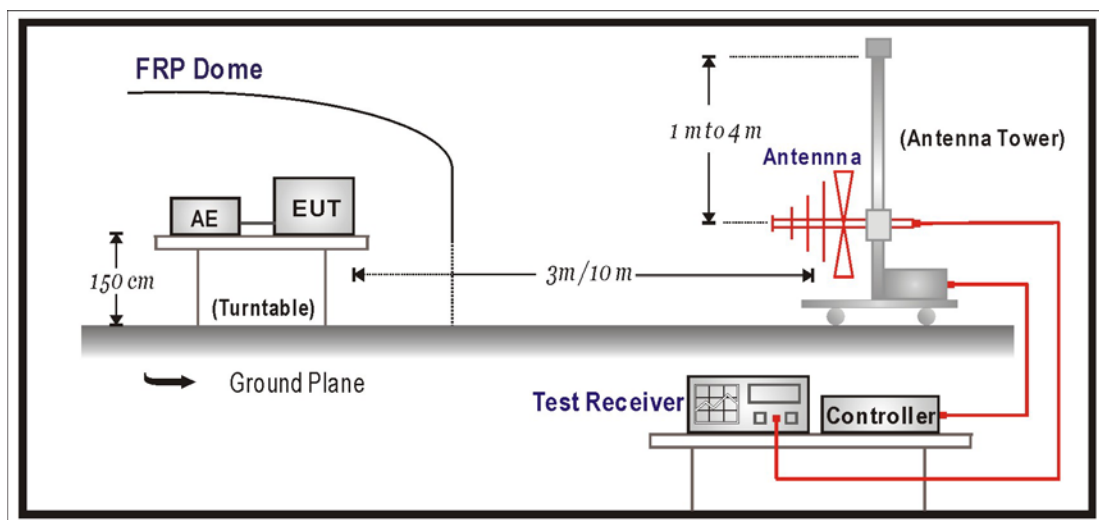
Note: All equipments that need to be calibrated are with calibration period of 1 year.

5.2. Test Setup

5.2.1.1 Spurious emissions at antenna terminals.



5.2.1.2 Field strength of spurious radiation.



5.3. Limits

Limit	<-13dBm
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$43 + 10\log(P)$ down on the carrier where P is the power in Watts.

5.4. Test Procedure

In accordance with Part 2.1051, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 30MHz to 20GHz. The EUT was set to transmit on full power. The EUT was tested on Low, middle and High channels for both power levels. The resolution and video bandwidth was set to 3MHz in accordance with Part 22.917&24.238. The spectrum analyzer detector was set to Max Hold. In addition, measurements were made up to the 10th harmonic of the fundamental. The device was then replaced with a substitution antenna, which input signal was adjusted until the received level matched that of the previously detected emission.

- (1) The EUT is tested with maximum rated TX power via the Base Station simulator.
- (2) The EUT is tested in three orthogonal planes, The worst case test configuration was found in the horizontal position.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to TIA/EIA 603-C on radiated measurement.

5.5. Test Specification

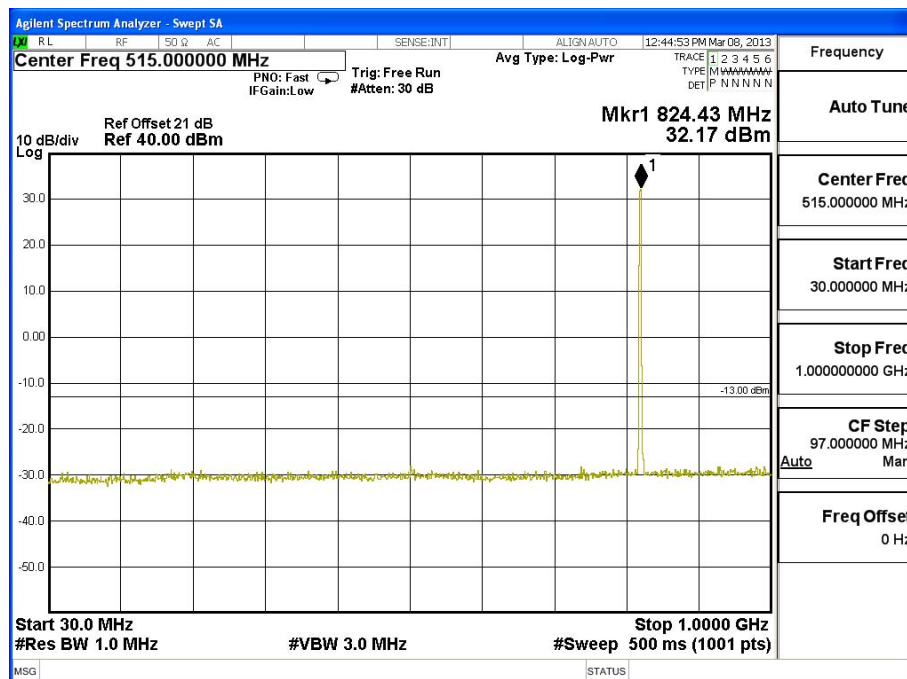
According to Part 2.1051, 2.1053, 22.917(a), 24.238(a).

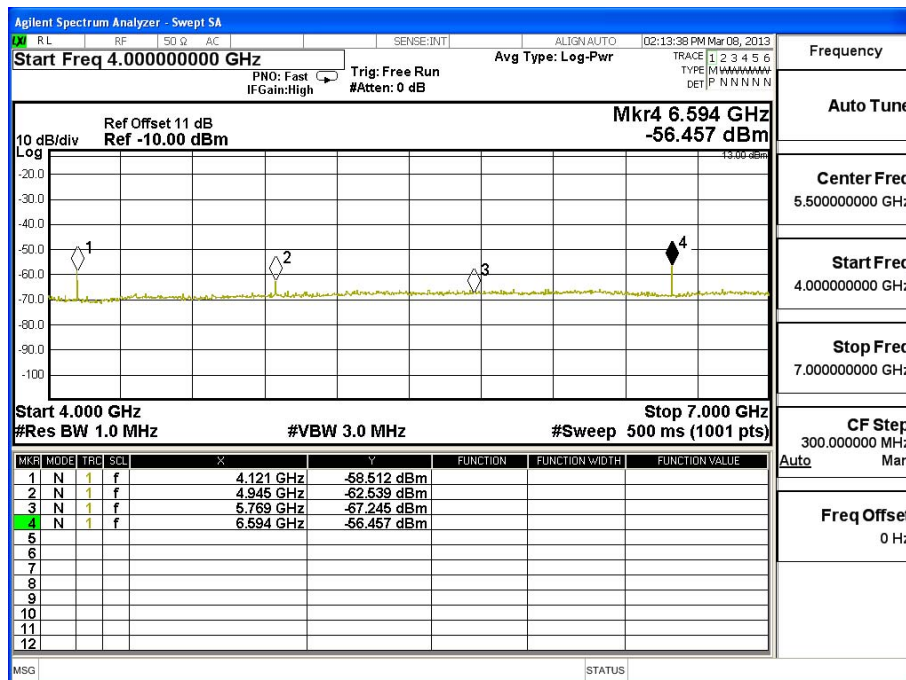
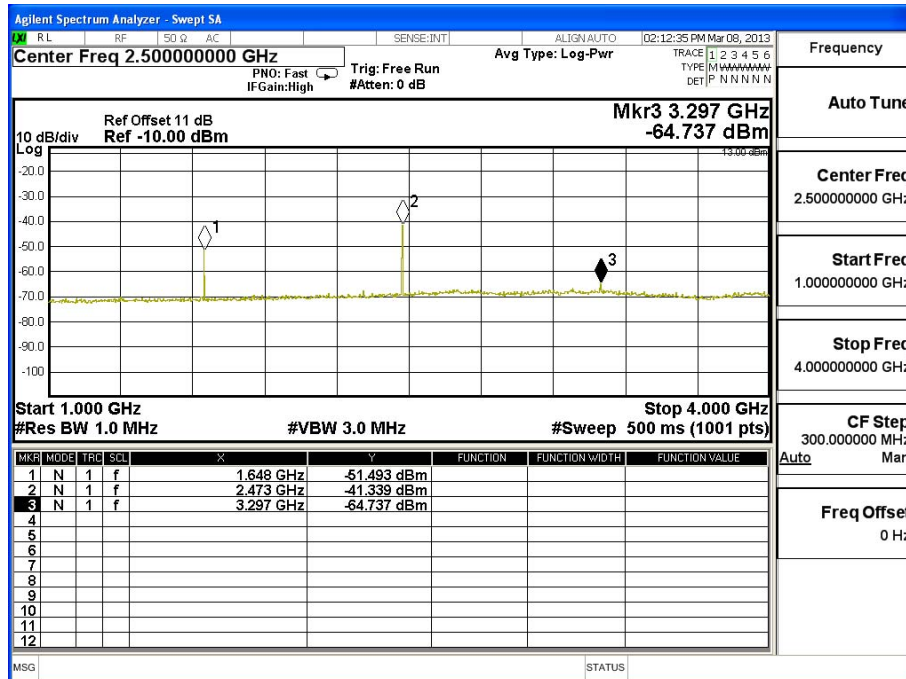
5.6. Test Result of Spurious Emission

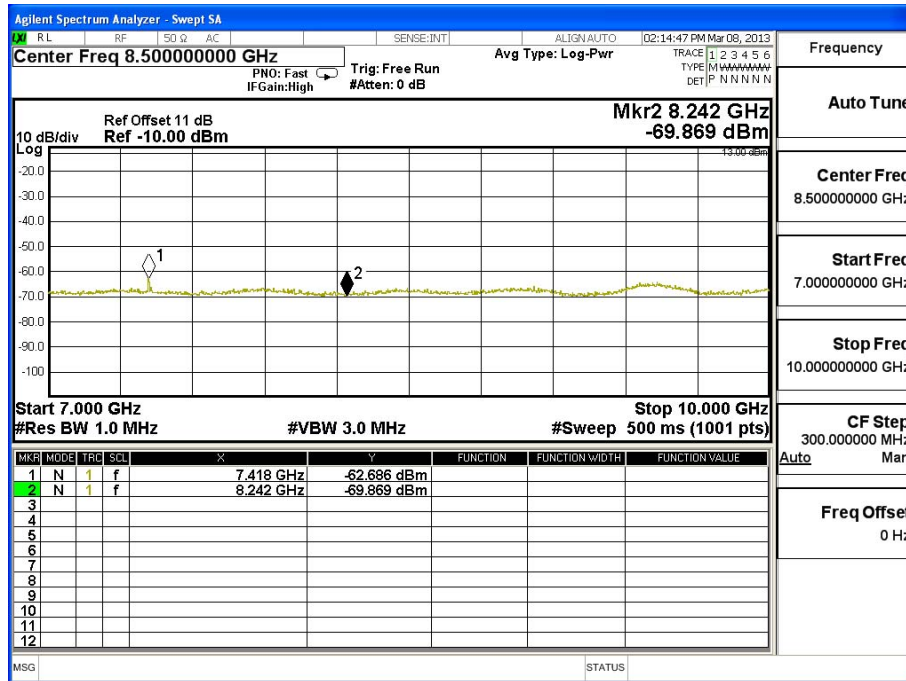
Product	Mobile Computer		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2013/03/08	Test Site	CTR
Test Condition	GSM 850 GPRS	Test Range	30MHz~10GHz

GSM 850 GPRS Low-Channel 128

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1648.4	-51.493	0.58	-50.913	-13
2472.6	-41.339	0.7	-40.639	-13
3296.8	-64.737	1.01	-63.727	-13
4121	-58.512	1.18	-57.332	-13
4945.2	-62.539	1.23	-61.309	-13
5769.4	-67.245	1.45	-65.795	-13
6593.6	-56.457	1.56	-54.897	-13
7417.8	-62.686	1.59	-61.096	-13
8242	-69.869	1.82	-68.049	-13



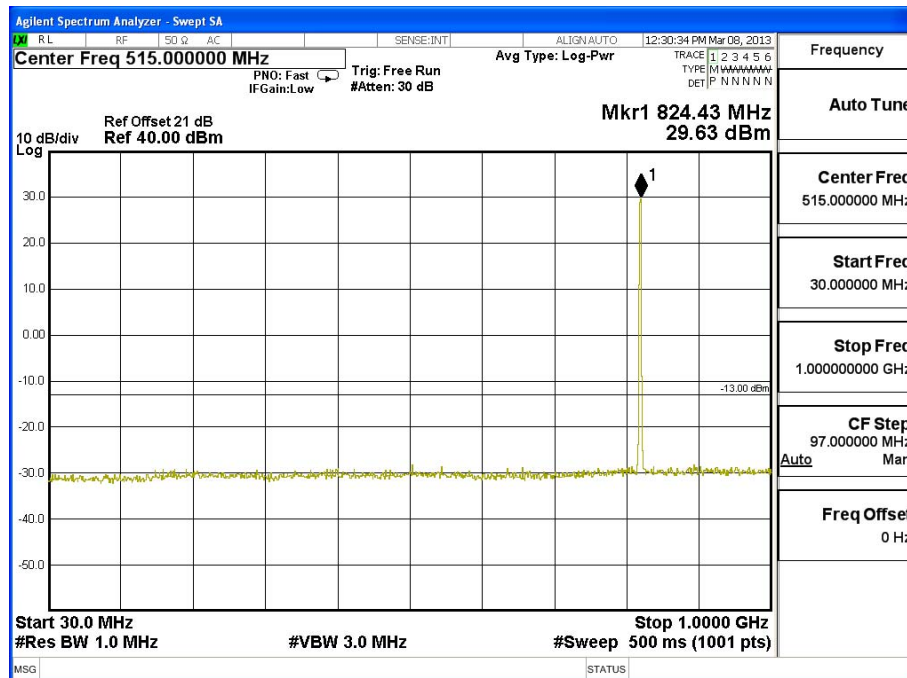


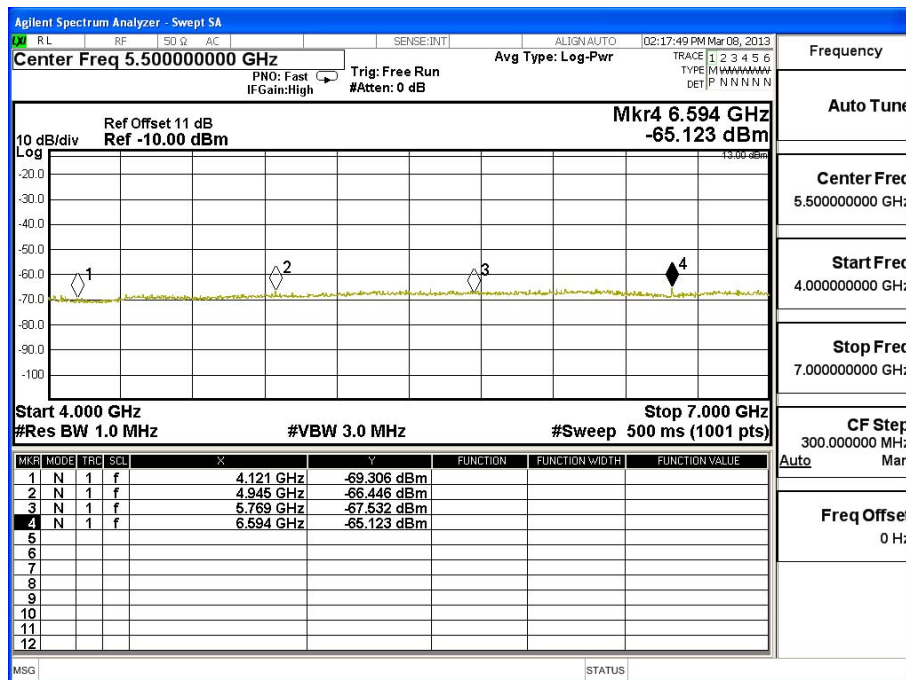
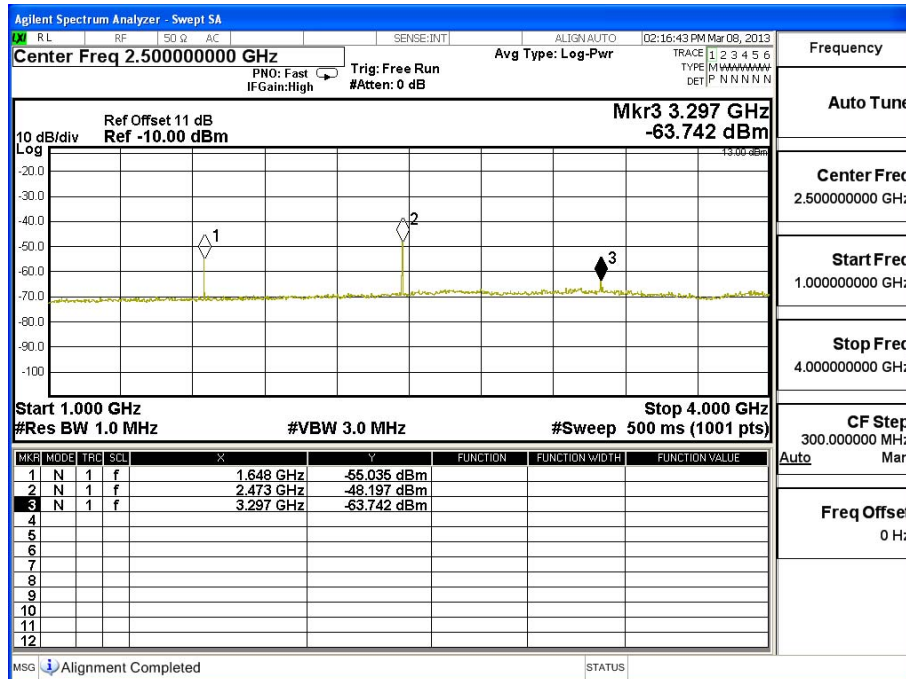


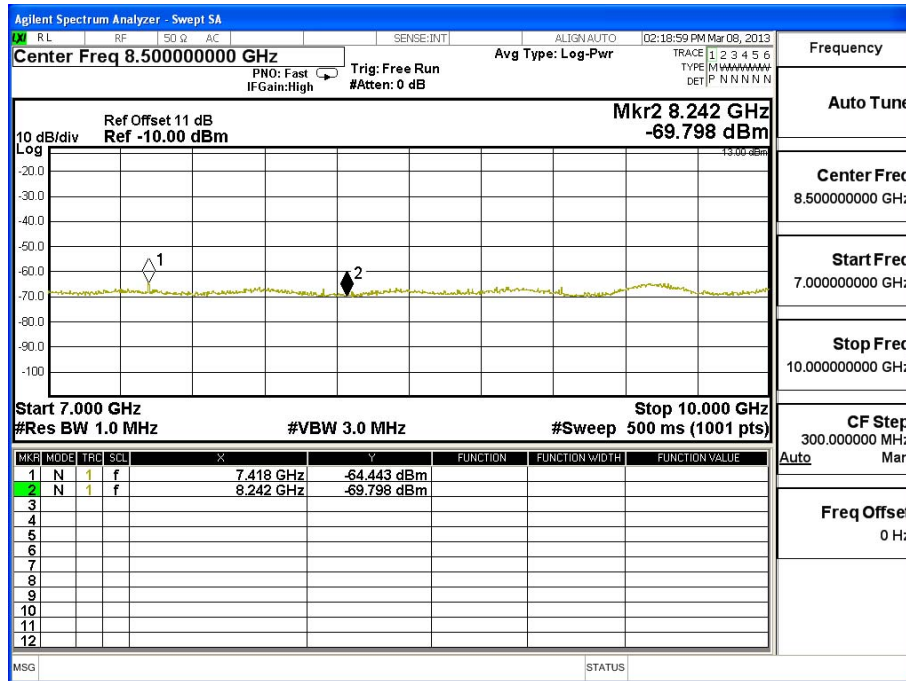
Product	Mobile Computer		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2013/03/08	Test Site	CTR
Test Condition	GSM 850 EGPRS	Test Range	30MHz~10GHz

GSM 850 EGPRS Low-Channel 128

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1648.4	-55.035	0.58	-54.455	-13
2472.6	-48.197	0.7	-47.497	-13
3296.8	-63.742	1.01	-62.732	-13
4121	-69.306	1.18	-68.126	-13
4945.2	-66.446	1.23	-65.216	-13
5769.4	-67.532	1.45	-66.082	-13
6593.6	-65.123	1.56	-63.563	-13
7417.8	-64.443	1.59	-62.853	-13
8242	-69.798	1.82	-67.978	-13



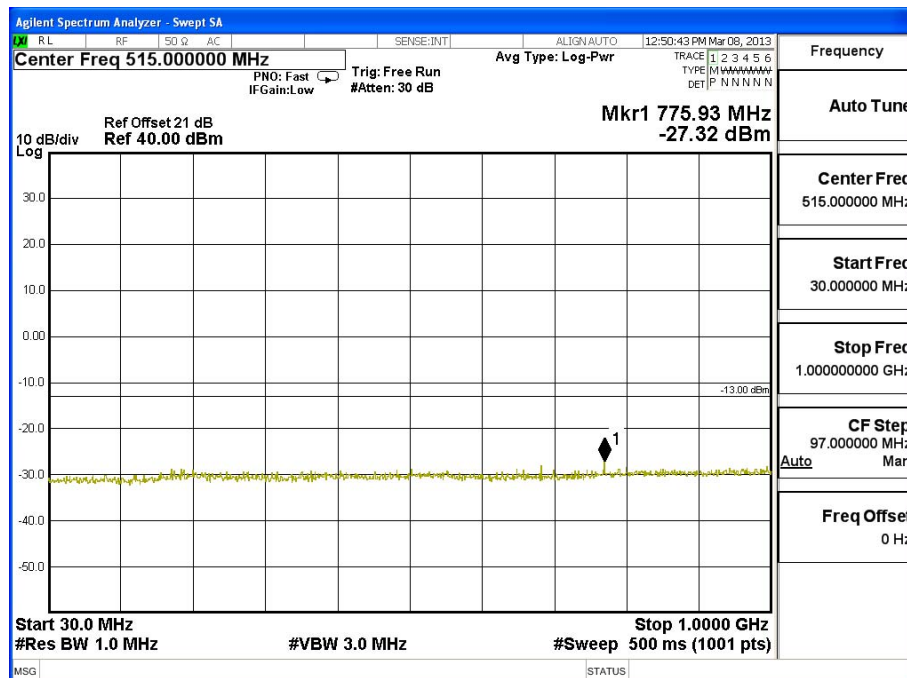


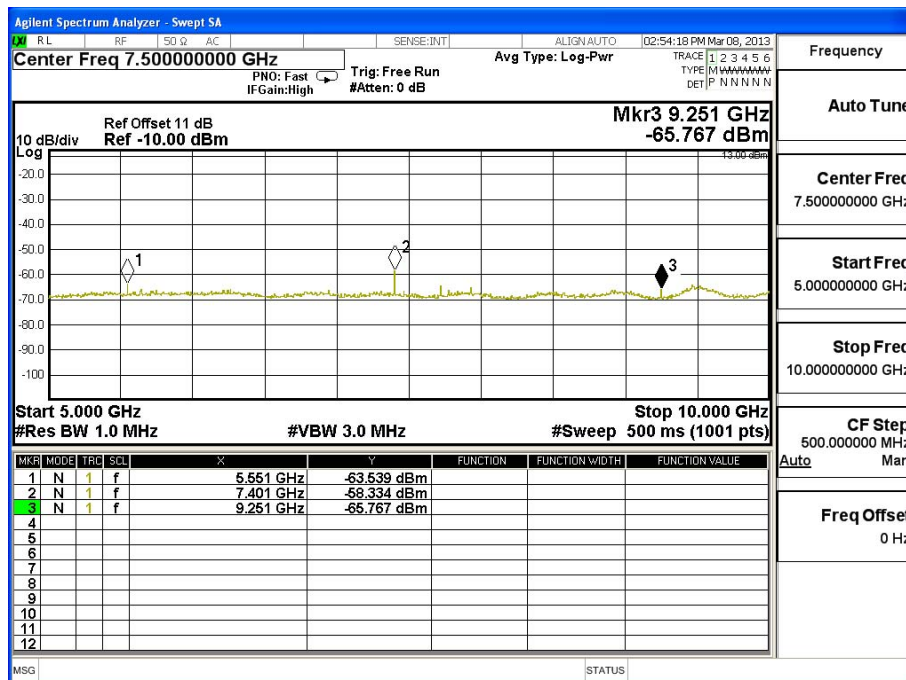
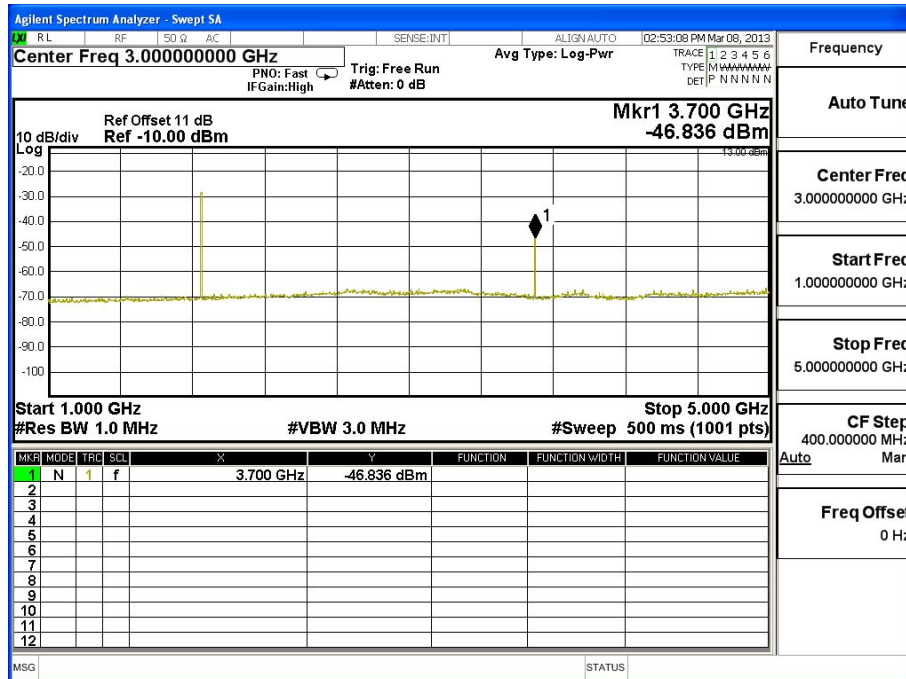


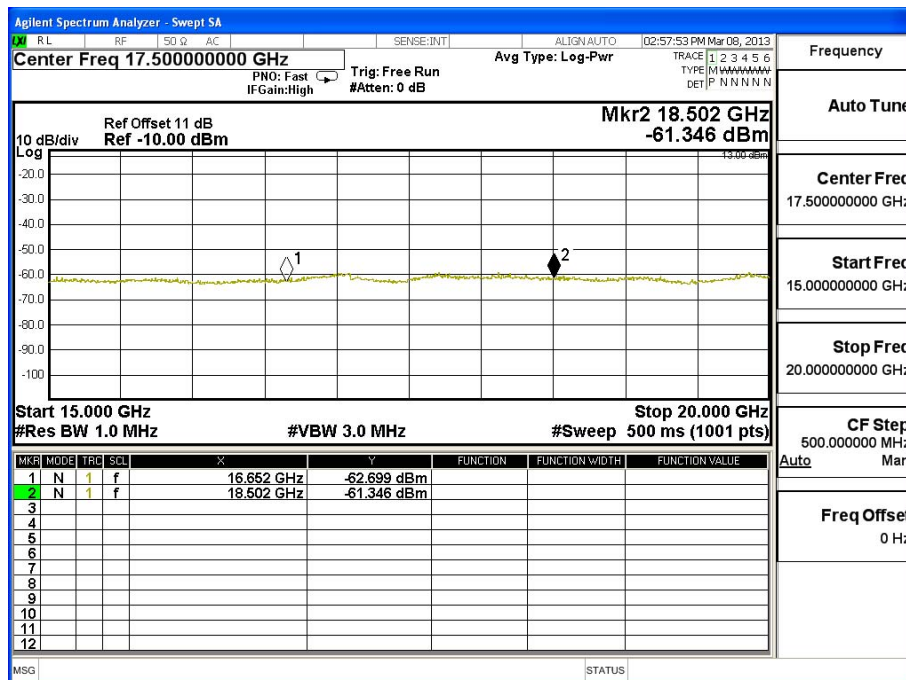
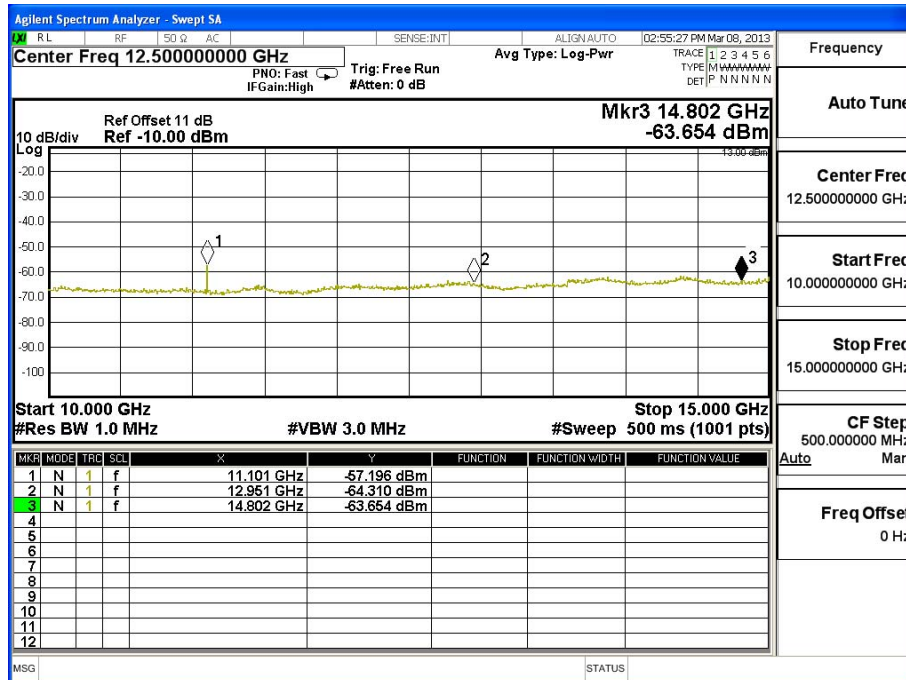
Product	Mobile Computer		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2013/03/08	Test Site	CTR
Test Condition	PCS 1900 GPRS	Test Range	30MHz~20GHz

PCS 1900 GPRS Low-Channel 512

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3700.4	-46.836	1.1	-45.736	-13
5550.6	-63.539	1.23	-62.309	-13
7400.8	-58.334	1.59	-56.744	-13
9251	-65.767	1.89	-63.877	-13
11101.2	-57.196	2.07	-55.126	-13
12951.4	-64.310	2.26	-62.050	-13
14801.6	-63.654	2.64	-61.014	-13
16651.8	-62.699	3.5	-59.199	-13
18502	-61.346	3.7	-57.646	-13



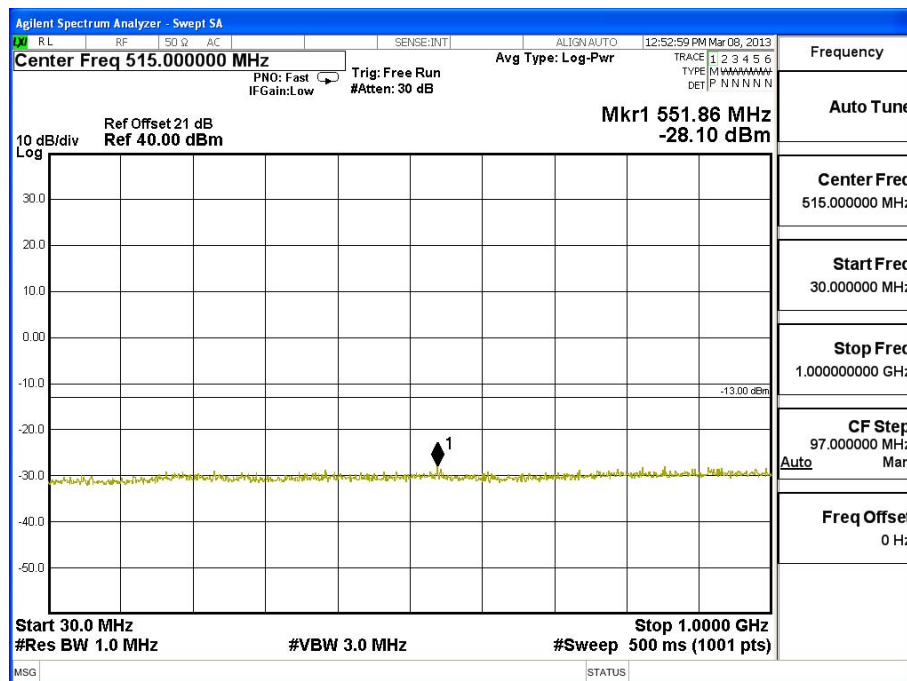


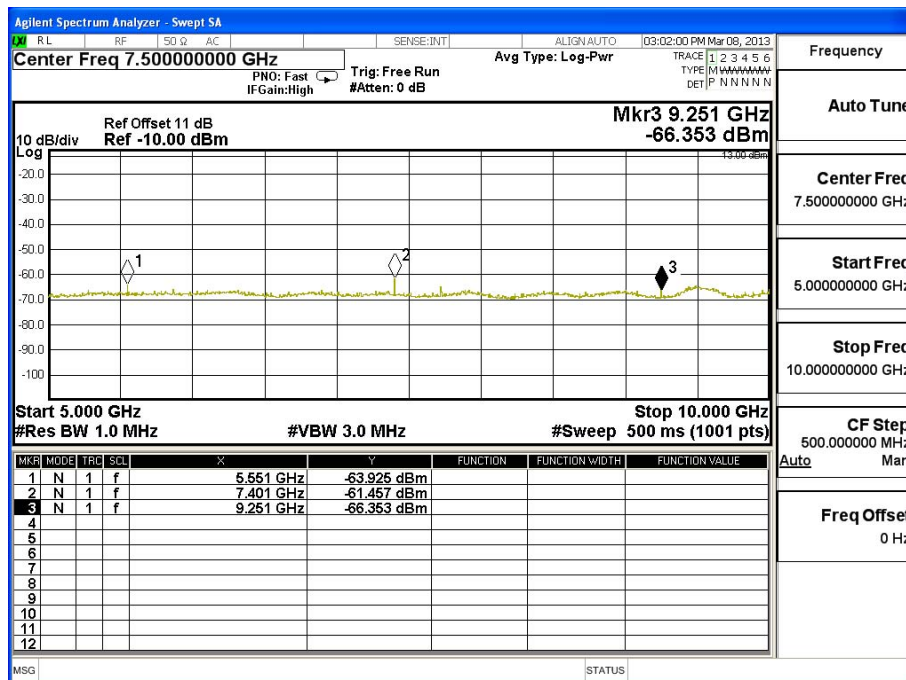
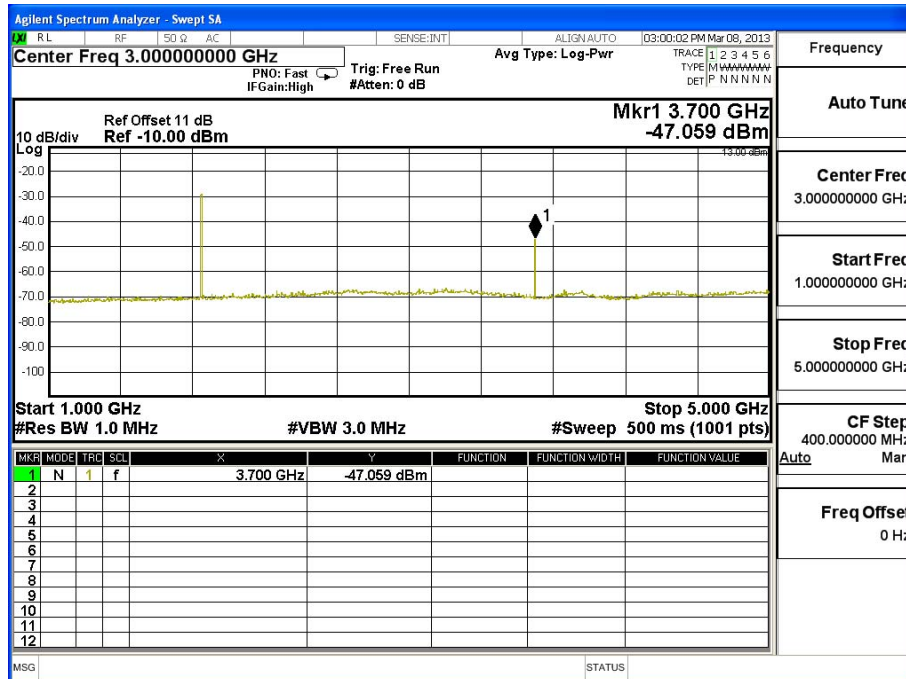


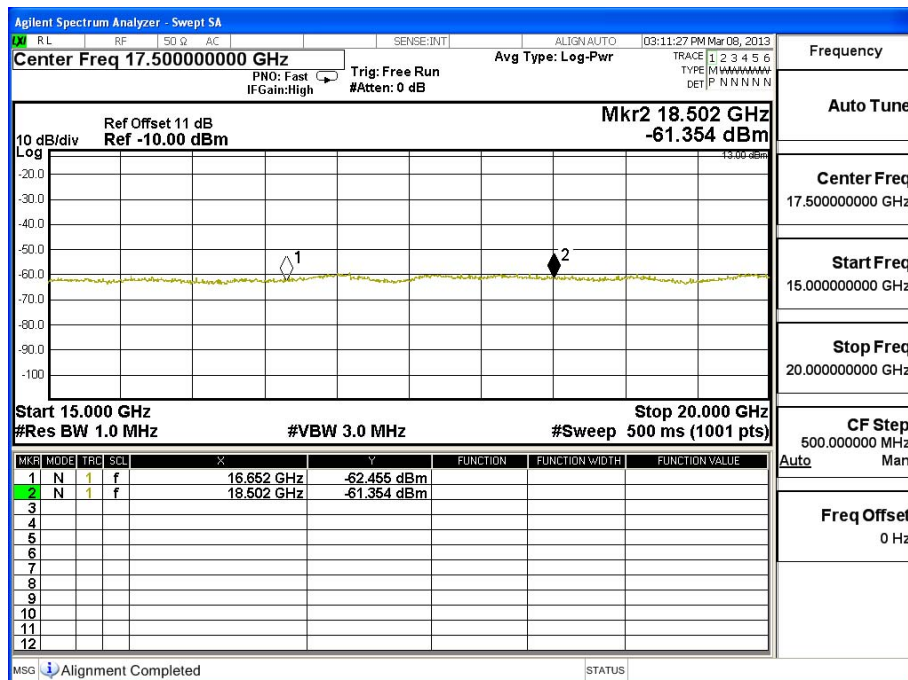
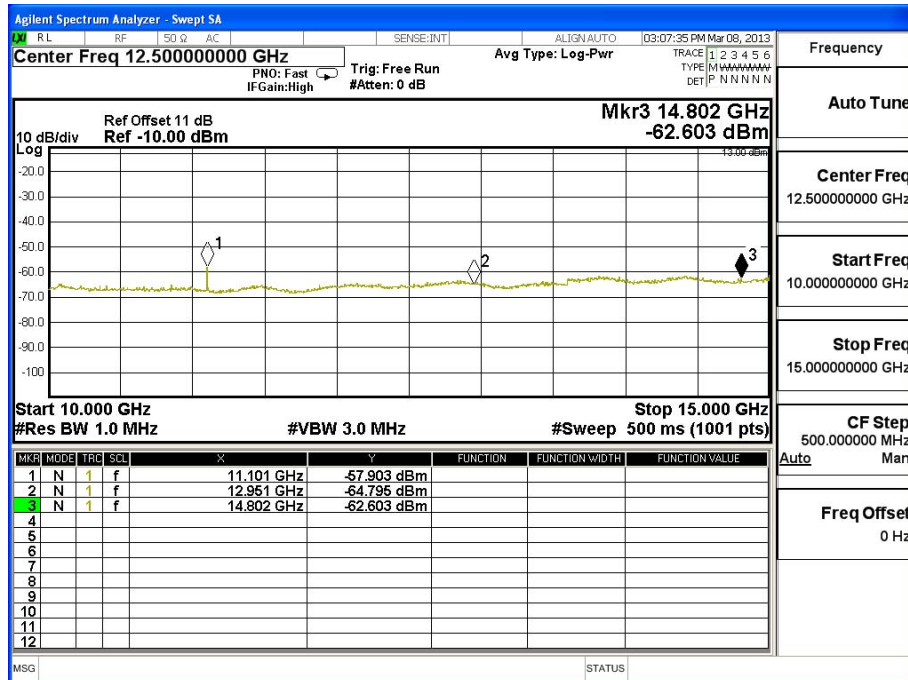
Product	Mobile Computer		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2013/03/07	Test Site	CTR
Test Condition	PCS 1900 EGPRS	Test Range	30MHz~20GHz

PCS 1900 EGPRS Low-Channel 512

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
3700.4	-47.059	1.1	-45.959	-13
5550.6	-63.925	1.23	-62.695	-13
7400.8	-61.457	1.59	-59.867	-13
9251	-66.353	1.89	-64.463	-13
11101.2	-57.903	2.07	-55.833	-13
12951.4	-64.795	2.26	-62.535	-13
14801.6	-62.603	2.64	-59.963	-13
16651.8	-62.455	3.5	-58.955	-13
18502	-61.354	3.7	-57.654	-13







Product	Mobile Computer		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2013/03/07	Test Site	Site3
Test Condition	Channel 251 (GSM 850 GPRS)	Test Range	9KHz ~10GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	ERP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions

1697.600	-47.323	-50.063	1.630	9.800	-41.893	-13
2546.400	-42.757	-43.597	2.100	10.600	-35.097	-13
3395.200	-59.226	-60.709	2.350	12.300	-50.759	-13
4244.000	-55.661	-53.945	2.700	12.600	-44.045	-13
5092.800	-60.133	-55.569	2.830	12.700	-45.699	-13
5941.600	-60.459	-56.254	3.200	13.000	-46.454	-13

Vertical Emissions

1697.600	-42.06	-44.375	1.630	9.800	-36.205	-13
2546.400	-43.465	-43.456	2.100	10.600	-34.956	-13
3395.200	-58.675	-59.059	2.350	12.300	-49.109	-13
4244.000	-57.572	-54.708	2.700	12.600	-44.808	-13
5092.800	-60.442	-55.597	2.830	12.700	-45.727	-13
5941.600	-60.045	-55.780	3.200	13.000	-45.98	-13

Note:

1. Receiver setting (Peak Detector) : RBW:3MHz; VBW:3MHz
2. ERP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 6 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	Mobile Computer		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2013/03/07	Test Site	Site3
Test Condition	Channel 251 (GSM 850 EGPRS)	Test Range	9KHz ~10GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	ERP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions

1697.600	-50.289	-53.029	1.630	9.800	-44.859	-13
2546.400	-56.875	-57.715	2.100	10.600	-49.215	-13
3395.200	-59.213	-60.696	2.350	12.300	-50.746	-13
4244.000	-61.09	-59.374	2.700	12.600	-49.474	-13
5092.800	-59.763	-55.199	2.830	12.700	-45.329	-13
5941.600	-59.747	-55.542	3.200	13.000	-45.742	-13

Vertical Emissions

1697.600	-44.731	-47.046	1.630	9.800	-38.876	-13
2546.400	-55.818	-55.809	2.100	10.600	-47.309	-13
3395.200	-59.303	-59.687	2.350	12.300	-49.737	-13
4244.000	-59.965	-57.101	2.700	12.600	-47.201	-13
5092.800	-59.929	-55.084	2.830	12.700	-45.214	-13
5941.600	-60.856	-56.591	3.200	13.000	-46.791	-13

Note:

- Receiver setting (Peak Detector) : RBW:3MHz; VBW:3MHz
- ERP Value = Signal Generator Level + Antenna Gain - Cable Loss
- Spurious emissions past 6 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	Mobile Computer		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2013/03/07	Test Site	Site3
Test Condition	Channel 698 (PCS1900 GPRS)	Test Range	9KHz ~20GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions

3760	-49.370	-49.718	2.530	12.600	-39.648	-13
5640	-59.913	-57.232	3.050	13.100	-47.182	-13
7520	-61.584	-47.216	3.650	11.500	-39.366	-13
9400	-61.210	-45.892	3.850	12.000	-37.742	-13
11280	-60.548	-44.087	4.580	12.000	-36.667	-13

Vertical Emissions

3760	-48.868	-46.886	2.530	12.600	-36.816	-13
5640	-59.785	-56.635	3.050	13.100	-46.585	-13
7520	-61.820	-46.838	3.650	11.500	-38.988	-13
9400	-60.877	-45.046	3.850	12.000	-36.896	-13
11280	-61.121	-44.467	4.580	12.000	-37.047	-13

Note:

1. Receiver setting (Peak Detector) : RBW:3MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 12GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	Mobile Computer		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2013/03/07	Test Site	Site3
Test Condition	Channel 698 (PCS1900 EGPRS)	Test Range	9KHz ~20GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

Horizontal Emissions

3760	-52.188	-52.536	2.530	12.600	-42.466	-13
5640	-59.312	-56.631	3.050	13.100	-46.581	-13
7520	-61.778	-47.410	3.650	11.500	-39.560	-13
9400	-60.404	-45.086	3.850	12.000	-36.936	-13
11280	-61.498	-45.037	4.580	12.000	-37.617	-13

Vertical Emissions

3760	-51.024	-49.042	2.530	12.600	-38.972	-13
5640	-60.101	-56.951	3.050	13.100	-46.901	-13
7520	-61.809	-46.827	3.650	11.500	-38.977	-13
9400	-61.858	-46.027	3.850	12.000	-37.877	-13
11280	-61.221	-44.567	4.580	12.000	-37.147	-13

Note:

4. Receiver setting (Peak Detector) : RBW:3MHz; VBW:3MHz
 5. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
- Spurious emissions past 12GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

6. Frequency Stability Under Temperature & Voltage Variations

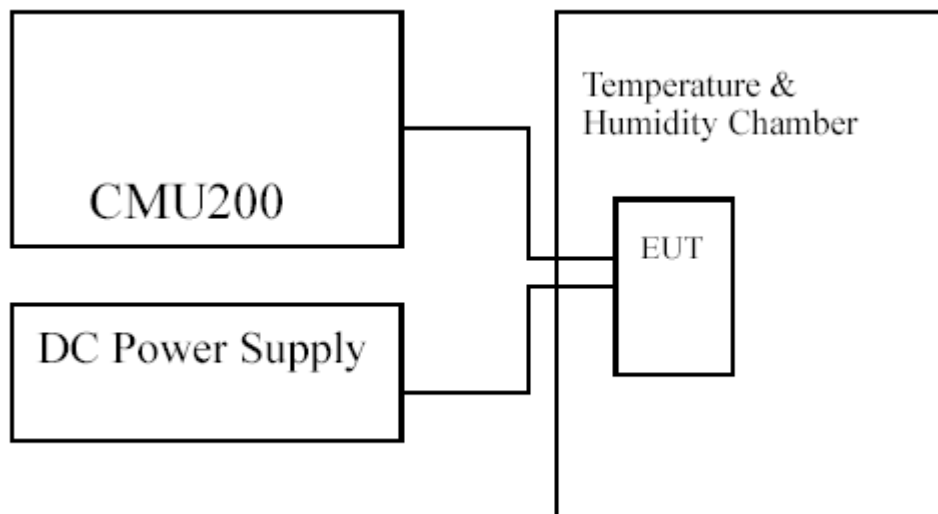
6.1. Test Equipment

The following test equipments are used during the frequency stability test:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Universal Radio Communication Tester	R & S	CMU200 / 104846	2012/05/14
Standard Temperature & Humidity Chamber	WIT	TH-1S-B / EQ-201-00146	2012/09/26

Note: All equipments upon which need to be calibrated are with calibration period of 1 year

6.2. Test Setup



6.3. Limits

Limit	$\leq \pm 2.5\text{ppm}$
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6.4. Test Procedure

The frequency stability of transmitter is measured by:

- (a) Temperature: The temperature is varied from -30 °C to 50 °C in 10 °C increment using a standard temperature & Humidity chamber.
- (b) Primary Supply Voltage: The primary supply voltage is varied 85% to 115% of the nominal value for non hand-carried equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating endpoint which shall be specified by the manufacturer.

The EUT was connected via the base station simulator. Universal Radio Communication Tester, (CMU200), was used to measure The Frequency Error. The maximum result of measurements was recorded.

6.5. Test Specification

According to Part 2.1055, 22.355, 24.235

6.6. Test Result of Frequency Stability Under Temperature Variations

Product	Mobile Computer		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2013/03/10	Test Site	CTR
Test Condition	GSM 850 GPRS / Channel 189	Test Range	-20°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (Hz)	Limit (KHz)
-30	0.836	-19	±2.0913
-20	0.836	-22	±2.0913
-10	0.836	-17	±2.0913
0	0.836	-18	±2.0913
10	0.836	-18	±2.0913
20	0.836	-23	±2.0913
30	0.836	-20	±2.0913
40	0.836	-24	±2.0913
50	0.836	-15	±2.0913

Voltage Variations

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)	Limit (KHz)
4.2	0.836	-16	±2.0913
3.9	0.836	-18	±2.0913
3.8	0.836	-18	±2.0913

Product	Mobile Computer		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2013/03/10	Test Site	CTR
Test Condition	GSM 850 EGPRS / Channel 189	Test Range	-20°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (Hz)	Limit (KHz)
-30	0.836	-21	±2.0913
-20	0.836	-23	±2.0913
-10	0.836	-20	±2.0913
0	0.836	-18	±2.0913
10	0.836	-23	±2.0913
20	0.836	-28	±2.0913
30	0.836	-16	±2.0913
40	0.836	-14	±2.0913
50	0.836	-19	±2.0913

Voltage Variations

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)	Limit (KHz)
4.2	0.836	22	±2.0913
3.9	0.836	25	±2.0913
3.8	0.836	-19	±2.0913

Product	Mobile Computer		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2013/03/10	Test Site	CTR
Test Condition	PCS 1900 GPRS / Channel 661	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (Hz)	Limit (KHz)
-30	1.88	-39	±2.0913
-20	1.88	-36	±2.0913
-10	1.88	-37	±2.0913
0	1.88	-26	±2.0913
10	1.88	-40	±2.0913
20	1.88	-20	±2.0913
30	1.88	-37	±2.0913
40	1.88	-31	±2.0913
50	1.88	-36	±2.0913

Voltage Variations

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)	Limit (KHz)
4.2	1.88	-29	±2.0913
3.9	1.88	-32	±2.0913
3.8	1.88	-30	±2.0913

Product	Mobile Computer		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2013/03/10	Test Site	CTR
Test Condition	PCS 1900 EGPRS / Channel 661	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (Hz)	Limit (KHz)
-30	1.88	-45	±2.0913
-20	1.88	-30	±2.0913
-10	1.88	-38	±2.0913
0	1.88	-27	±2.0913
10	1.88	-28	±2.0913
20	1.88	-26	±2.0913
30	1.88	14	±2.0913
40	1.88	-32	±2.0913
50	1.88	-34	±2.0913

Voltage Variations

DC Voltage (V)	Test Frequency (GHz)	Deviation (Hz)	Limit (KHz)
4.2	1.88	-22	±2.0913
3.9	1.88	-16	±2.0913
3.8	1.88	27	±2.0913

7. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs