FCC Report

Mobile Phone

Product Description: Smart Phone Projector

Trade Mark: Akyumen

Model No.: Hawk01, Hawk02, Hawk03, Hawk04, Hawk05, Hawk06, Hawk07, Hawk08, Hawk09, Hawk10, Hawk11, Hawk12, Hawk13, Hawk14, Hawk15, Hawk16, Hawk17, Hawk18, Hawk19,

FCC ID: 2ADLD-HAWK01

Applicant: Akyumen Technologies Corp.

Address: 7401 Wiles Road, Suite 123 Coral Spring, FL 33067 USA

Applicable standards:	FCC CFR Title 47 Part 2: 2013 FCC CFR Title 47 Part22 Subpart H: 2013 FCC CFR Title 47 Part24 Subpart E: 2013
Test Date:	24 November ~ 08 December, 2014
Issued Date:	08 December, 2014
Test Result:	Complied

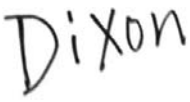
James Wu
Laboratory Manager

2 Version

Version No.	*Date*	*Description*
00	*08 December, 2014*	*Original*

Prepared By:  ***Date:*** *08 December, 2014*

Young Li
Project Engineer

Check By:  ***Date:*** *08 December, 2014*

Dixon Hao
Reviewer

3 Contents

4 Test Summary

Test Item	Test Method	Result
Conducted Output Power	Part 2.1046	Pass
Effective Radiated Power	Part22.913(a)(2)	Pass
Equivalent Isotropic Radiated Power	Part 24.232(c)	Pass
Occupied Bandwidth	Part 2.1049 Part 22.917 (a) Part 24.238 (a)	Pass
Spurious Emissions at Antenna Terminal	Part 2.1051 Part 22.917 (a) Part 24.238 (a)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 22.917 (a) Part 24.238 (a)	Pass
Out of band emission, Band Edge	Part 2.1051 Part 22.917 (a) Part 24.238 (a)	Pass
Frequency stability vs. temperature	Part 2.1055(a)(1)(b)	Pass
Frequency stability vs. voltage	Part 2.1055(d)(1)(2)	Pass

Complied: The EUT has complied with the essential requirements in the standard.

5 General Information

5.1 Client Information

Applicant:	Akyumen Technologies Corp.
Address:	7401 Wiles Road, Suite 123 Coral Spring, FL 33067 USA
Manufacturer:	Akyumen Technologies Corp.
Address:	7401 Wiles Road, Suite 123 Coral Spring, FL 33067 USA

5.2 General Description of EUT

Product Name:	Smart Phone Projector
Brand Mark:	Akyumen
Model No.:	Hawk01, Hawk02, Hawk03, Hawk04, Hawk05, Hawk06, Hawk07, Hawk08, Hawk09, Hawk10, Hawk11, Hawk12, Hawk13, Hawk14, Hawk15, Hawk16, Hawk17, Hawk18, Hawk19,
Test model No.:	Hawk01
Software version:	V1.0
Hardware version:	V1.0
Mobile phone	
Support Networks:	GSM/GPRS
TX Frequency:	GSM850/GPRS850: 824.2MHz ~ 848.8MHz GSM1900/GPRS1900: 1850.2MHz ~ 1909.8MHz
RX Frequency:	GSM850/GPRS850: 869.2MHz ~ 893.8MHz GSM1900/GPRS1900: 1930.2MHz ~ 1989.8MHz
Modulation Type:	GSM/GPRS: GMSK
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi
AC Adapter:	Model: JHD-AP012C-050150AB Input: AC 100~240V 50/60Hz 0.35A Output: DC 5.0V 1.5A
Power supply:	lithium-ion charge battery 3.7V

Operation Frequency List:

GSM 850		PCS1900	
Channel:	Frequency (MHz)	Channel:	Frequency (MHz)
128	824.20	512	1850.20
129	824.40	513	1850.40
⋮	⋮	⋮	⋮
189	836.40	660	1879.80
190	836.60	661	1880.00
191	836.80	662	1880.20
⋮	⋮	⋮	⋮
250	848.60	809	1909.60
251	848.80	810	1909.80

Regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	GSM 850		PCS1900	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)
Lowest	128	824.20	512	1850.20
Middle	190	836.60	661	1880.00
Highest	251	848.80	810	1909.80

5.3 Test Mode

Communicate mdoe (GSM 850)	Keep the EUT in communicating mode on GSM 850 Band.
Data mode (GPRS850)	Keep the EUT in data communicating mode on GPRS 850 Band.
Communicate mdoe (PCS1900)	Keep the EUT in communicating mode on PCS1900 Band.
Data mode (GPRS1900)	Keep the EUT in data communicating mode on GPRS 1900 Band.

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS —Registration No.: CNAS L5775**

  CNAS has accredited Global United Technology Services Co., Ltd. to ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **FCC —Registration No.: 600491**

  Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fuly described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, July 20, 2010.

- **Industry Canada (IC) —Registration No.: 9079A-1**

  The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-1.

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China

6 Test Instruments list

Instrument	Manufacturer	Model No.	Inventory No.	Next Cal. Date
3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 27 2015
Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A
EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jun. 30 2015
BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Feb. 22 2015
Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 26 2015
Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 27 2015
EMI Test Software	AUDIX	E3	N/A	N/A
Coaxial Cable	GTS	N/A	GTS213	Mar. 28 2015
Coaxial Cable	GTS	N/A	GTS211	Mar. 28 2015
Coaxial cable	GTS	N/A	GTS210	Mar. 28 2015
Coaxial Cable	GTS	N/A	GTS212	Mar. 28 2015
Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jun. 30 2015
Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jun. 30 2015
Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 26 2015
Band filter	Amindeon	82346	GTS219	Mar. 28 2015
Universal radio communication tester	Rohde & Schwarz	CMU200	GTS235	May 09 2015
Signal Generator	Rohde & Schwarz	SML03	GTS236	May 09 2015
Temp. Humidity/ Barometer	Oregon Scientific	BA-888	GTS248	May 09 2015
D.C. Power Supply	Instek	PS-3030	GTS232	NA
Splitter	Agilent	11636B	GTS237	May 09 2015

Conducted Emission				
Instrument	Manufacturer	Model No.	Inventory No.	Next Cal. Date
Shielding Room	ZhongYu Electron	7.0(L)x3.0(W)x3.0(H)	GTS264	Sep. 06 2015
EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jun. 30 2015
10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	Jun. 30 2015
Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jun. 30 2015
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	Jun. 30 2015
Coaxial Cable	GTS	N/A	GTS227	Jun. 30 2015
EMI Test Software	AUDIX	E3	N/A	N/A
Shielding Room	ZhongYu Electron	7.0(L)x3.0(W)x3.0(H)	GTS264	Sep. 06 2015
EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jun. 30 2015

7 System test configuration

☞ EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application

☞ EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency which was for the purpose of the measurements

☞ Test Procedure

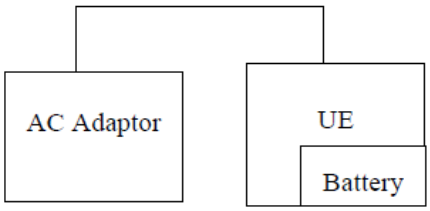
Conducted Emissions

The EUT is placed on a turn table which is 0.8m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15MHz and 30MHz using CISPR Quasi-Peak and Average detector mode

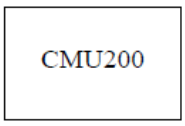
Radiated Emissions

The EUT is placed on a turn table which is 1.0m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4-2003

☞ Configuration of Tested System



Remote Side



☞ Desription of test mode

1. The EUT has been tested under operating condition.
2. EUT staying in continuous transmitting mode. Channel Low, Mid and High for each type band with rated data rate were chosen for full testing.
3. The field strength of spurious radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for both GSM/PCS with power adaptors, earphone and Data cable. The worst-case H mode for GSM850, PCS1900, WCDMA Band V and WCDMA Band II.

8 Measurement Data and Test Results

8.1 Conducted Emissions

☞ Standard requirement

FCC Part15 C Section 15.207

☞ Test method

ANSI C63.4:2003

☞ Receiver set

RBW=9KHz, VBW=30KHz, Sweep time=auto

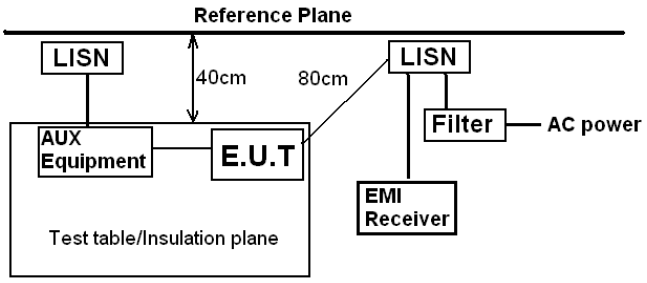
☞ Limit

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

☞ Test mode

Refer to section 5.3 for details

☞ Test setup



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

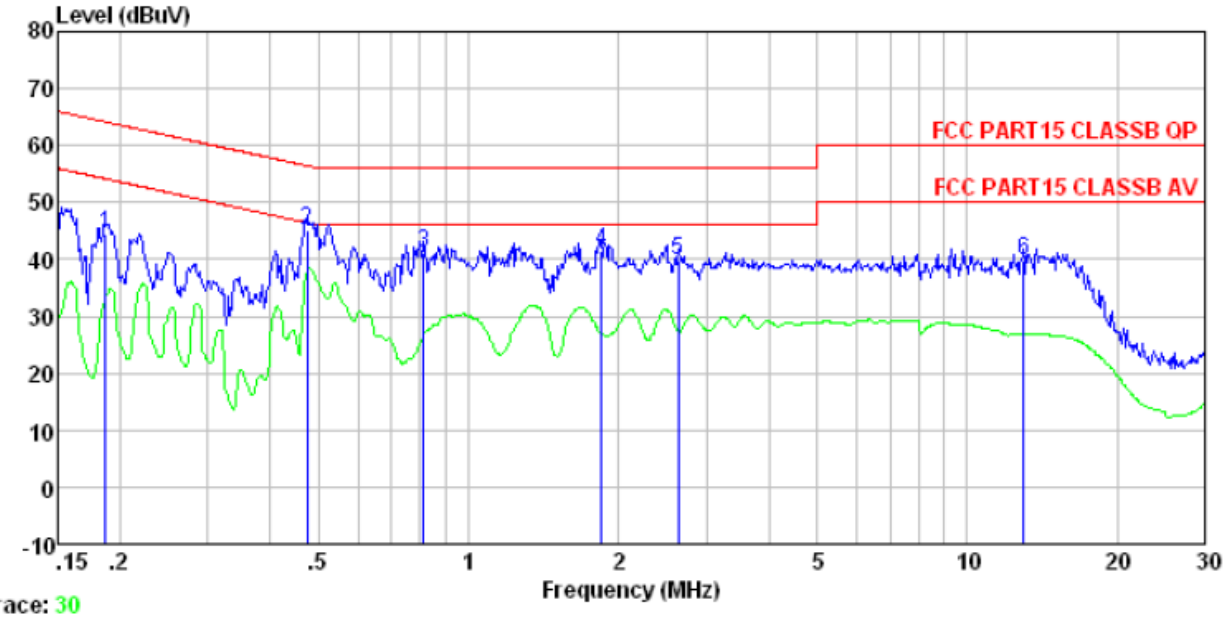
☞ Test mode

1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.

☞ Test Result

Complied

Test mode:	GSM mode	Temperature:	24~26℃
Phase Polarity:	Line	Relative Humidity:	50~53%



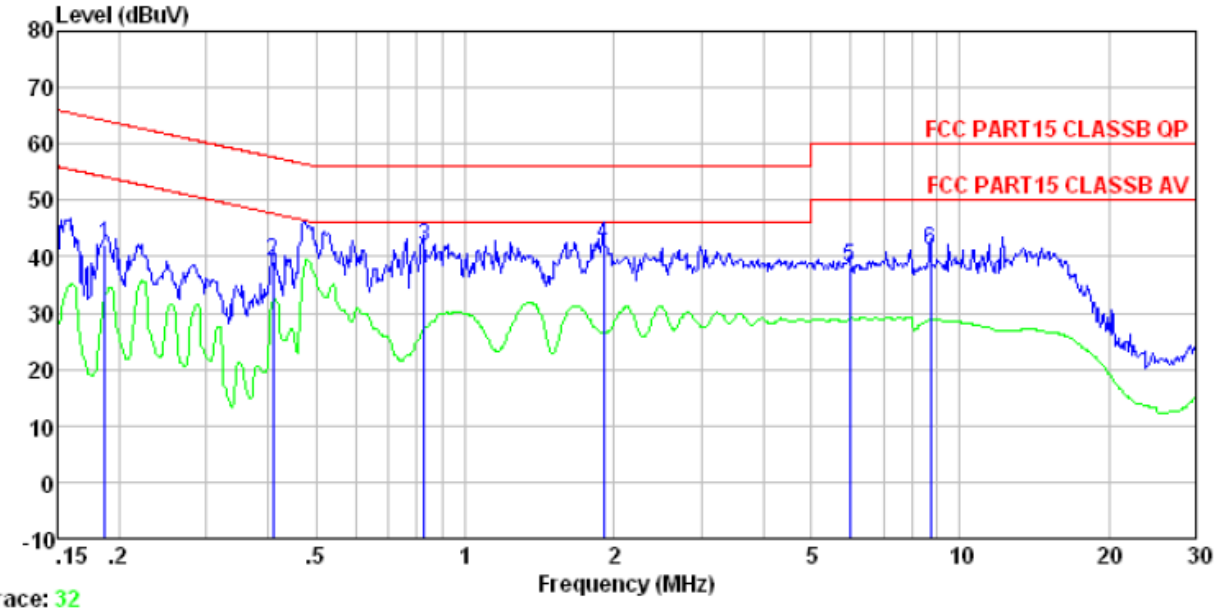
Trace: 30

Condition: FCC PART15 CLASSB QP LISN-2013 LINE

Test mode: GSM mode

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.187	44.24	0.14	0.13	44.51	64.15	-19.64	QP
2	0.474	44.86	0.12	0.11	45.09	56.45	-11.36	QP
3	0.813	40.85	0.14	0.13	41.12	56.00	-14.88	QP
4	1.848	41.17	0.12	0.14	41.43	56.00	-14.57	QP
5	2.636	39.60	0.14	0.15	39.89	56.00	-16.11	QP
6	12.988	39.34	0.34	0.21	39.89	60.00	-20.11	QP

Test mode:	GSM mode	Temperature:	24~26℃
Phase Polarity:	Nertral	Relative Humidity:	50~53%



Trace: 32
Condition: FCC PART15 CLASSB QP LISN-2013 NEUTRAL
Test mode: GSM mode

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.187	42.10	0.07	0.13	42.30	64.15	-21.85	QP
2	0.408	38.88	0.06	0.11	39.05	57.68	-18.63	QP
3	0.826	41.59	0.07	0.13	41.79	56.00	-14.21	QP
4	1.908	41.79	0.09	0.14	42.02	56.00	-13.98	QP
5	5.993	37.89	0.16	0.16	38.21	60.00	-21.79	QP
6	8.729	40.75	0.21	0.19	41.15	60.00	-18.85	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

8.2 Conducted Output Power

☞ **Standard requirement**

FCC part22.913(a) and FCC part24.232(b)

☞ **Test method**

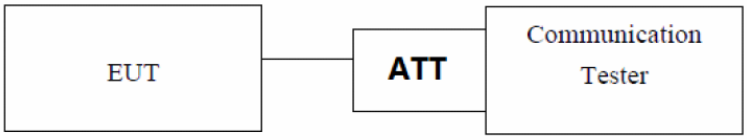
FCC part2.1046

☞ **Limit**

WCDMA Band V: 7W

WCDMA Band II: 2W

☞ **Test setup**



Note: Measurement setup for testing on Antenna connector

☞ **Test Procedure**

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a spectrum analysis. Transmitter output was read off the CMU200 in dBm.

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test Result** **Complied**

Measurement Data

Mode	Test channel	Frequency (MHz)	Burst Conducted Power (dBm)
GSM 850 (GSM link)	128	824.20	32.49
	190	836.60	32.57
	251	848.80	32.64
GSM 850 (GPRS 1 uplink)	128	824.20	32.48
	190	836.60	32.56
	251	848.80	32.63
GSM 850 (GPRS 2 uplink)	128	824.20	31.73
	190	836.60	31.81
	251	848.80	31.86
GSM 850 (GPRS 3 uplink)	128	824.20	30.08
	190	836.60	30.10
	251	848.80	30.16
GSM 850 (GPRS 4 uplink)	128	824.20	29.37
	190	836.60	29.40
	251	848.80	29.46
PCS 1900 (GSM link)	512	1850.20	29.66
	661	1880.00	29.51
	810	1909.80	29.48
PCS 1900 (GPRS 1 uplink)	512	1850.20	29.59
	661	1880.00	29.45
	810	1909.80	29.44
PCS 1900 (GPRS 2 uplink)	512	1850.20	28.73
	661	1880.00	28.71
	810	1909.80	28.68
PCS 1900 (GPRS 3 uplink)	512	1850.20	27.01
	661	1880.00	26.97
	810	1909.80	26.94
PCS 1900 (GPRS 4 uplink)	512	1850.20	26.19
	661	1880.00	26.11
	810	1909.80	26.04

8.3 Occupy Bandwidth

☞ **Standard requirement**

FCC part22.913(a) and FCC part24.232(b)

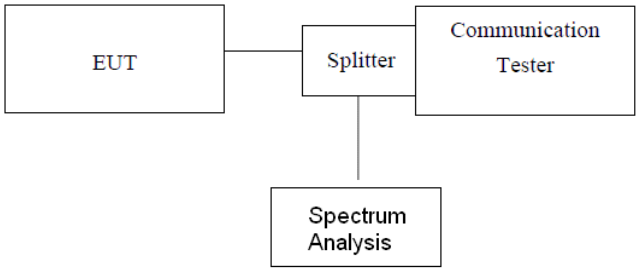
☞ **Test method**

FCC part2.1049

☞ **Limit**

N/A

☞ **Test setup**



Note: Measurement setup for testing on Antenna connector

☞ **Test Procedure**

1. The EUT's output RF connector was connected with a short cable to the spectrum analyzer
2. RBW was set to about 1% of emission BW, VBW= 3 times RBW.
3. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

☞ **Test mode**

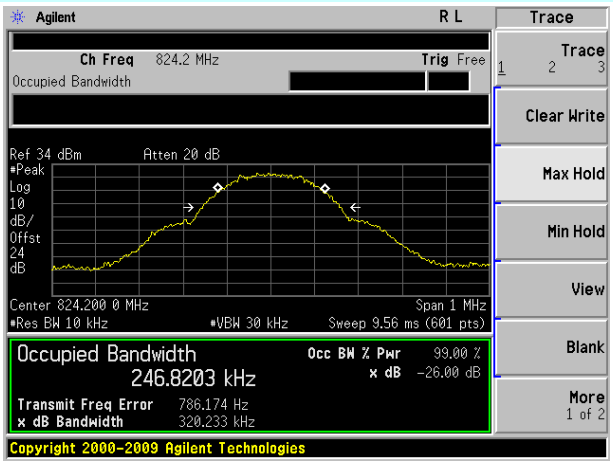
Refer to section 5.3 for details

☞ **Test Result** **Complied**

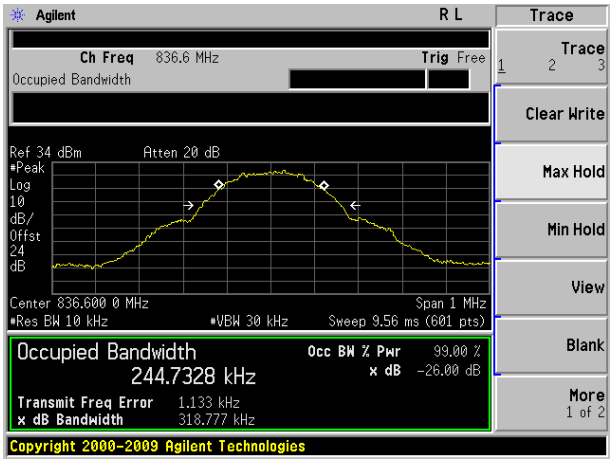
Measurement Data

Mode	Test channel	Frequency (MHz)	99% Occupy bandwidth (KHz)	-26dB bandwidth (KHz)
GSM 850 (GSM link)	128	824.20	246.820	320.233
	190	836.60	244.733	318.777
	251	848.80	245.420	315.870
GSM 850 (GPRS 4 link)	128	824.20	244.013	316.929
	190	836.60	243.453	318.428
	251	848.80	244.407	322.705
PCS 1900 (GSM link)	512	1850.20	247.924	320.913
	661	1880.00	245.821	317.945
	810	1909.80	242.397	319.690
PCS 1900 (GPRS 4 link)	512	1850.20	244.800	323.581
	661	1880.00	244.258	322.928
	810	1909.80	250.410	323.940

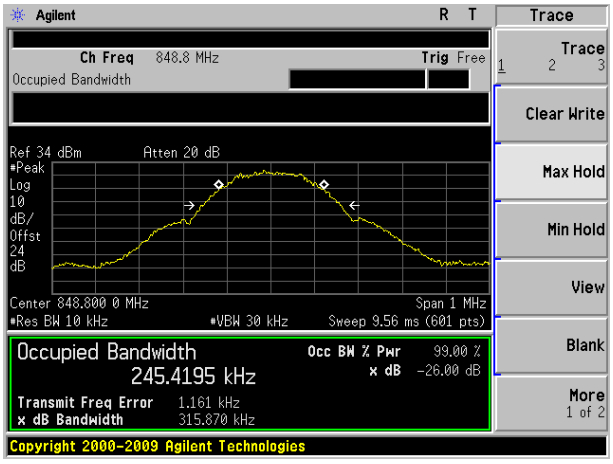
Mode: **GSM 850 (GSM link)**



Lowest channel

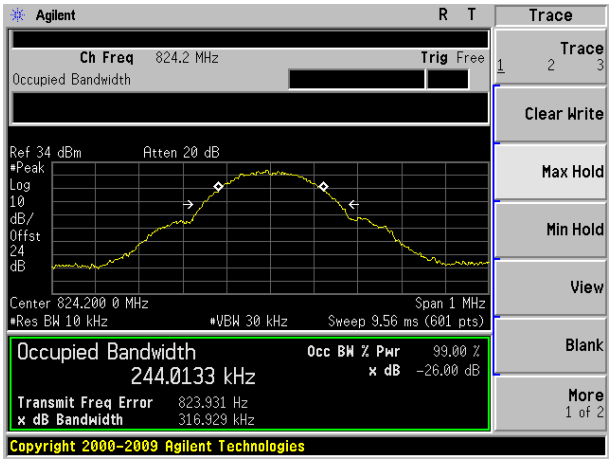


Middle channel

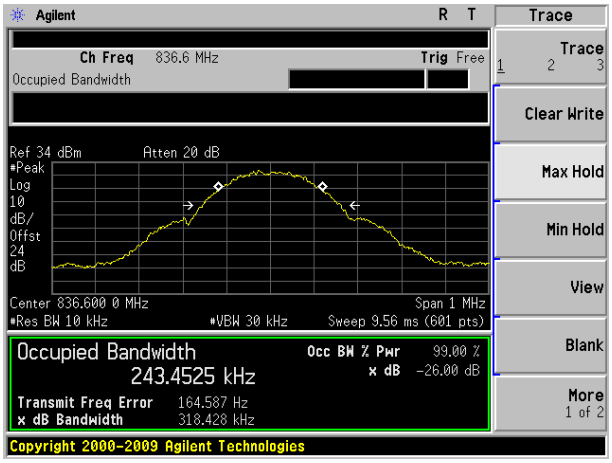


Highest channel

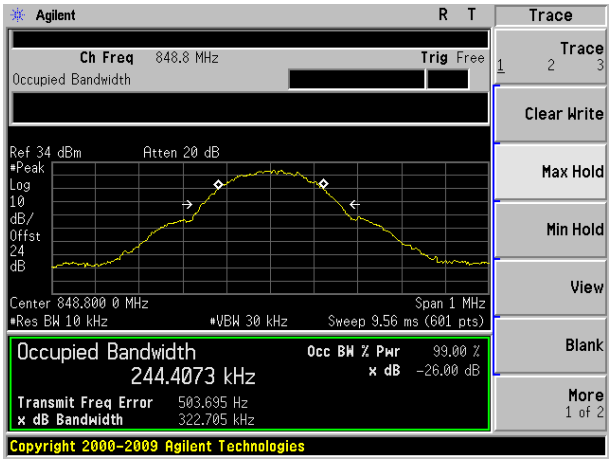
Mode: **GSM 850 (GPRS 4 link)**



Lowest channel

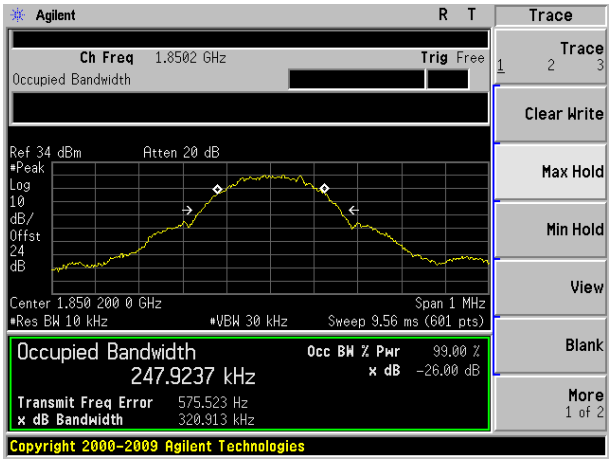


Middle channel

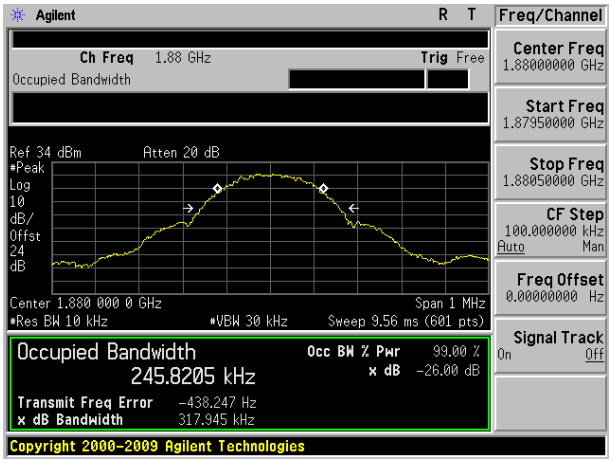


Highest channel

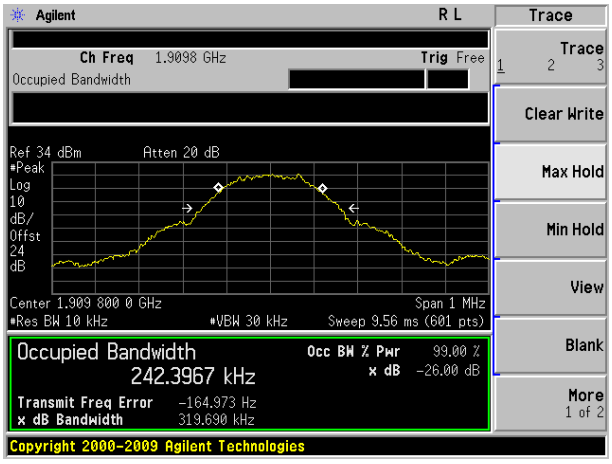
Mode: **PCS 1900 (GSM link)**



Lowest channel

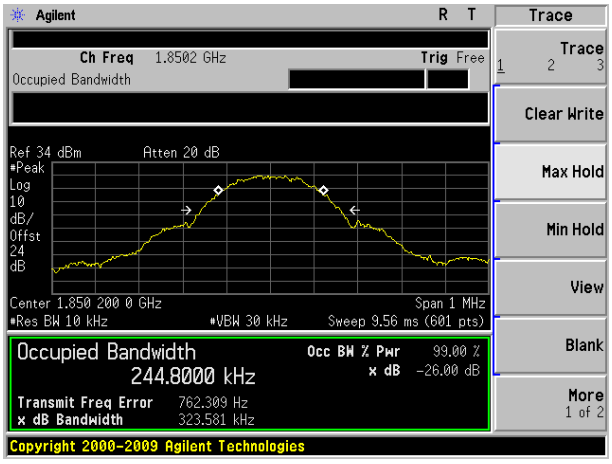


Middle channel

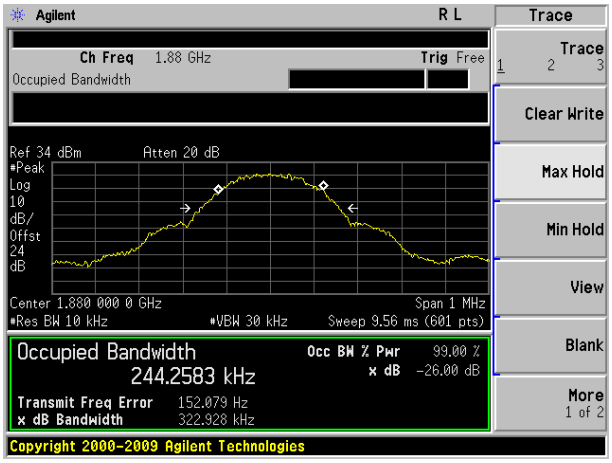


Highest channel

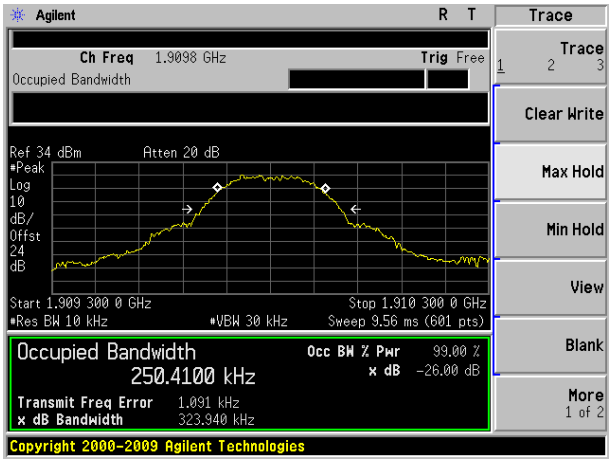
Mode: **PCS 1900 (GPRS 4 link)**



Lowest channel



Middle channel



Highest channel

8.4 Modulation characteristic

According to FCC § 2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

8.5 Out of band emission at antenna terminals

☞ **Standard requirement**

FCC part22.917(a) and FCC part24.238(a)

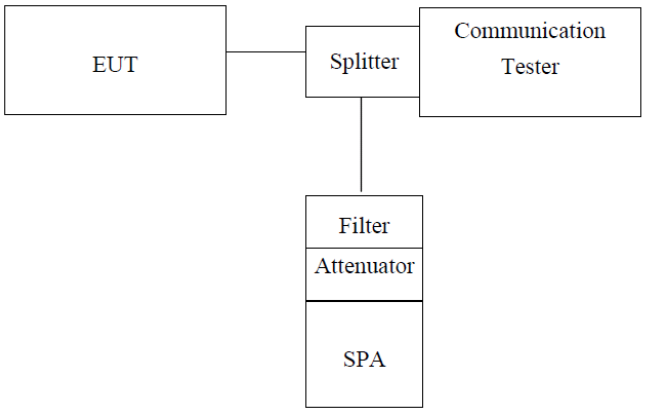
☞ **Test method**

FCC part2.1051

☞ **Limit**

-13dBm

☞ **Test setup**



Note: *Measurement setup for testing on Antenna connector*

☞ **Test Procedure**

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.
3. For the out of band: Set the RBW, VBW = 1MHz, Start=30MHz, Stop= 10th harmonic.
4. Band Edge Requirements: In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions.

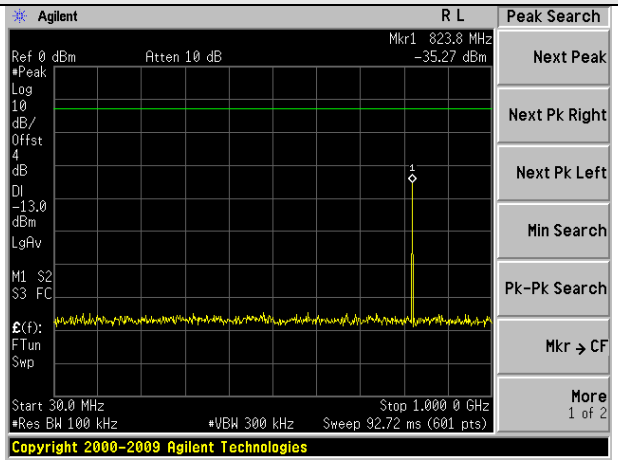
☞ **Test mode**

Refer to section 5.3 for details

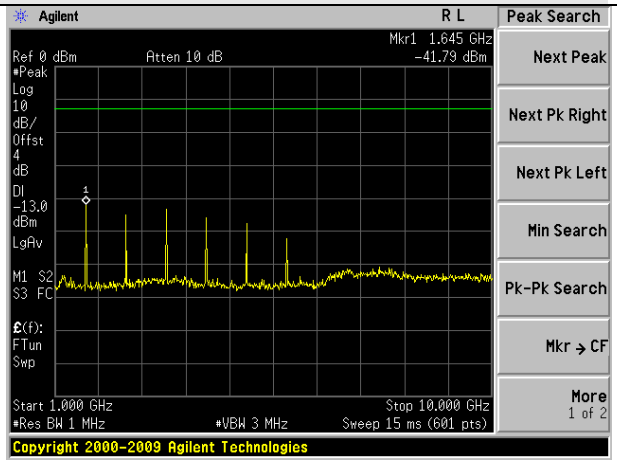
☞ **Test Result** **Complied**

Test item:	Spurious emission	Mode:	GSM 850 (GSM link)

Test channel: Lowest channel

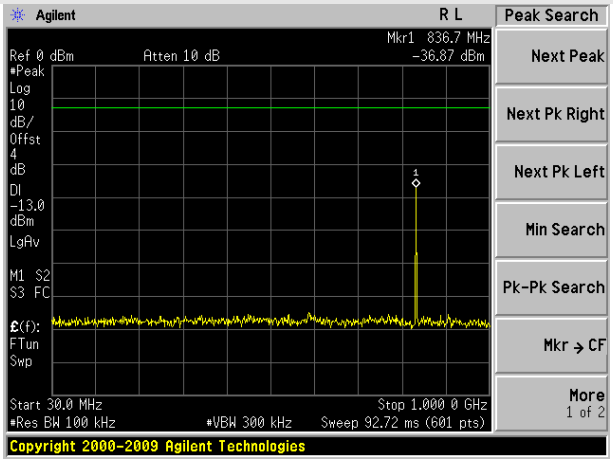


30MHz~1GHz

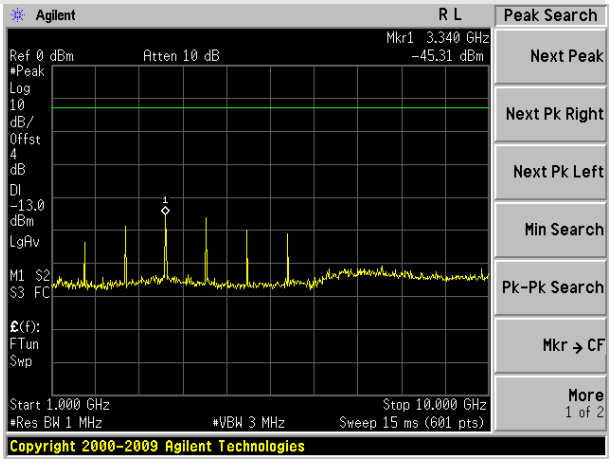


1GHz~9GHz

Test channel: Middle channel

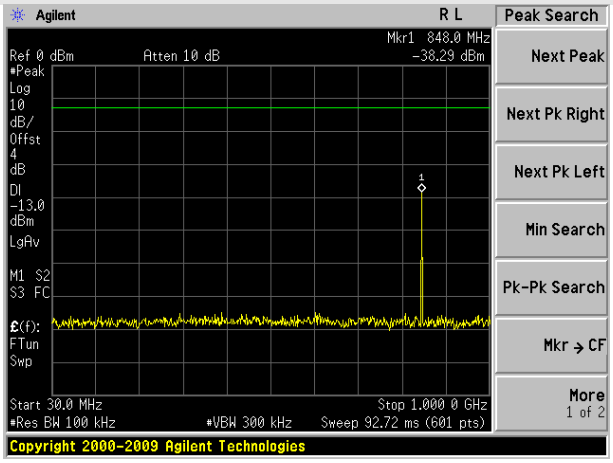


30MHz~1GHz

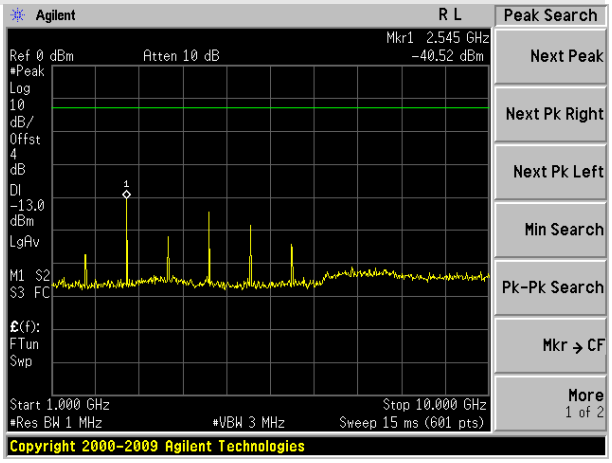


1GHz~9GHz

Test channel: Highest channel



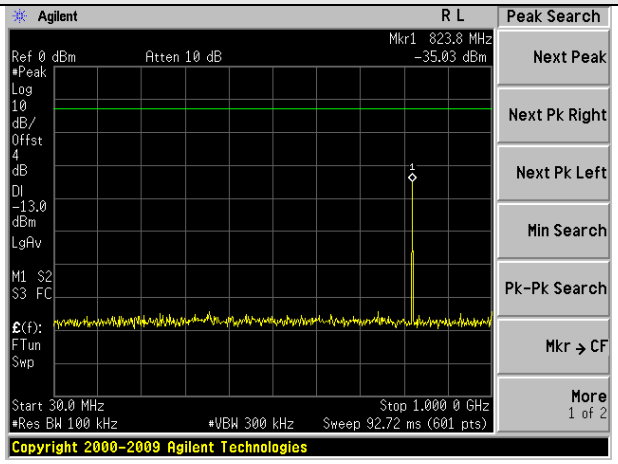
30MHz~1GHz



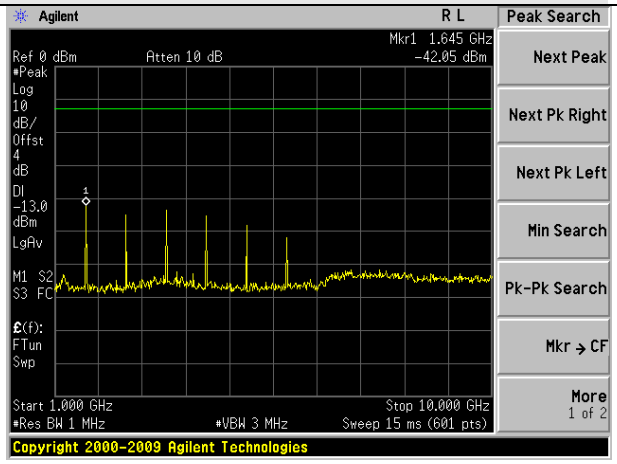
1GHz~9GHz

Test item:	Spurious emission	Mode:	GSM 850 (GPRS 4 link)

Test channel: Lowest channel

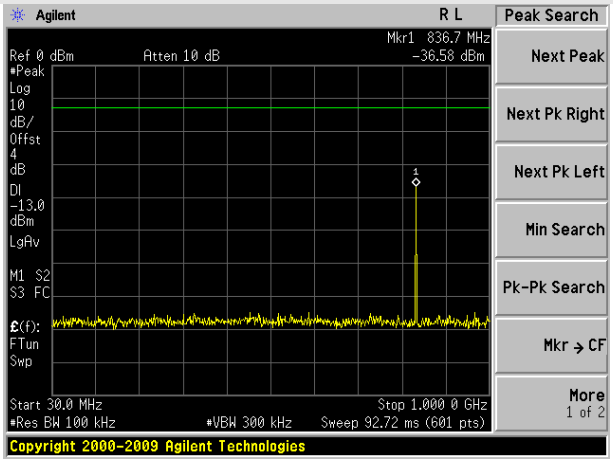


30MHz~1GHz

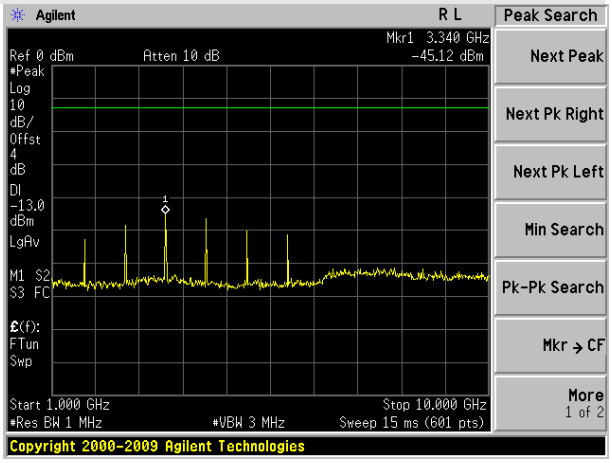


1GHz~9GHz

Test channel: Middle channel

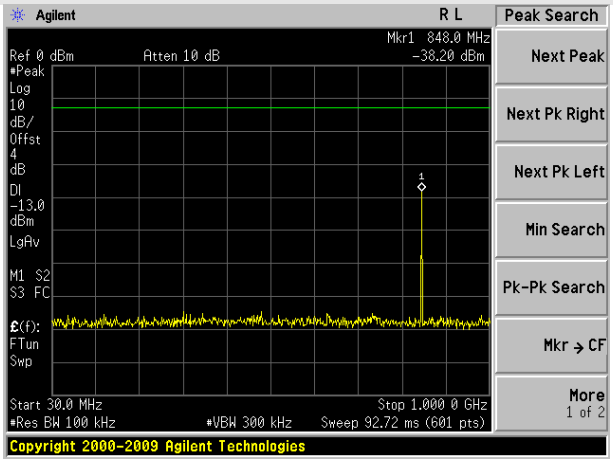


30MHz~1GHz

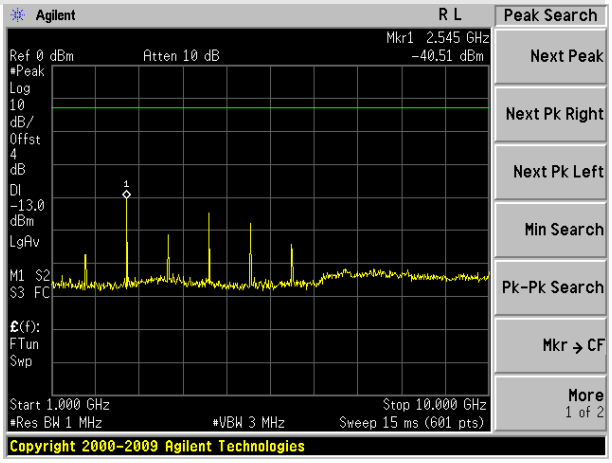


1GHz~9GHz

Test channel: Highest channel



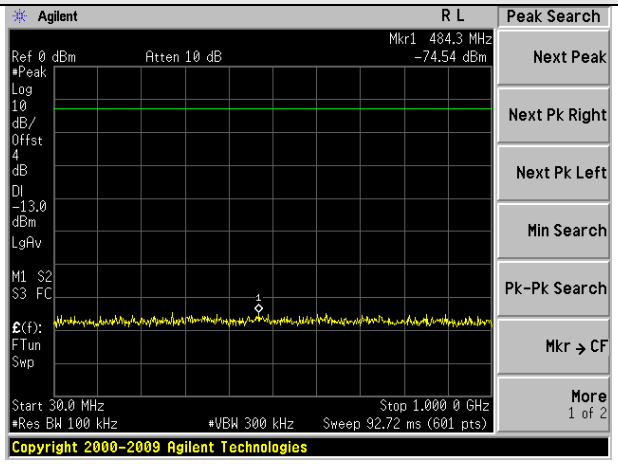
30MHz~1GHz



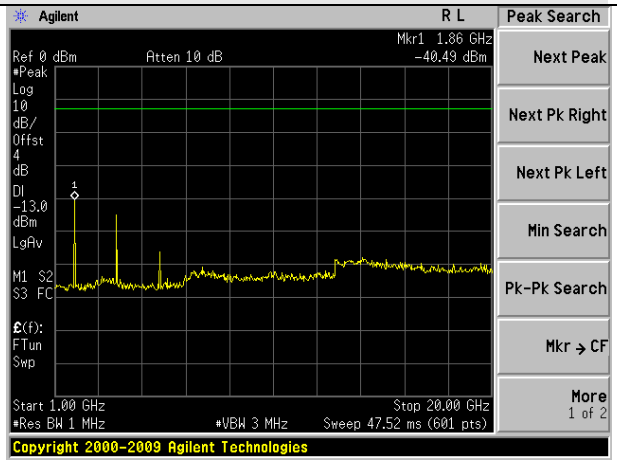
1GHz~9GHz

Test item:	Spurious emission	Mode:	PCS1900 (GSM link)

Test channel: Lowest channel

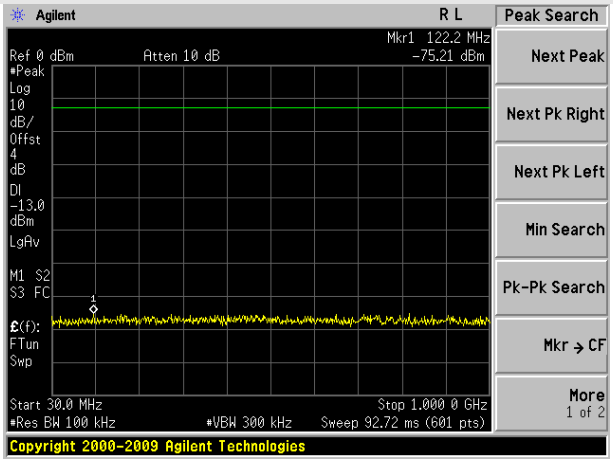


30MHz~1GHz

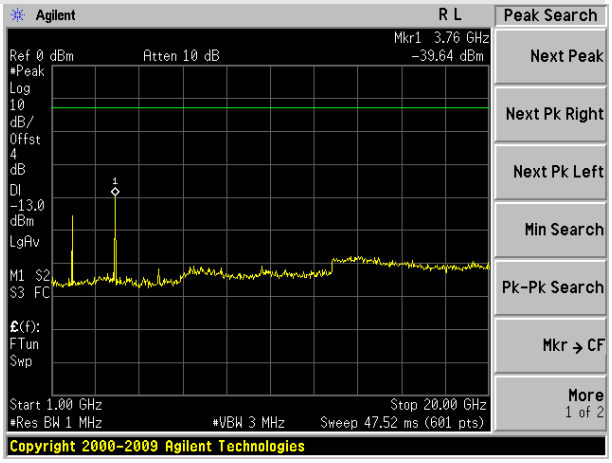


1GHz~20GHz

Test channel: Middle channel

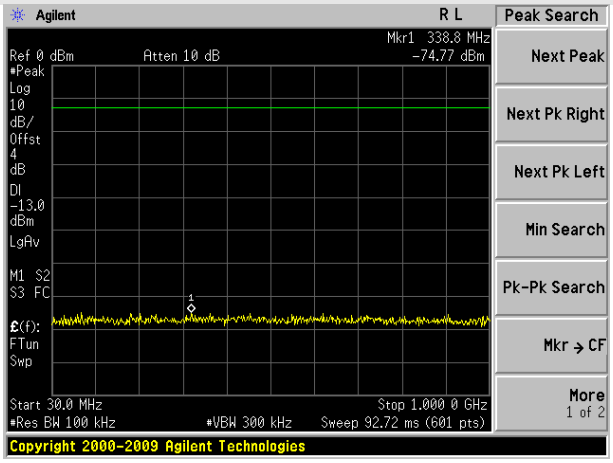


30MHz~1GHz

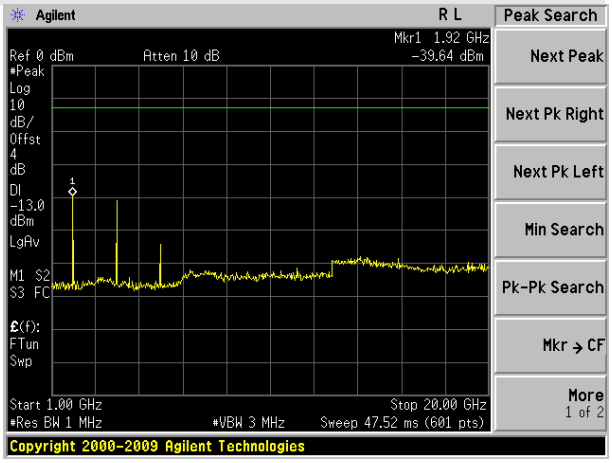


1GHz~20GHz

Test channel: Highest channel



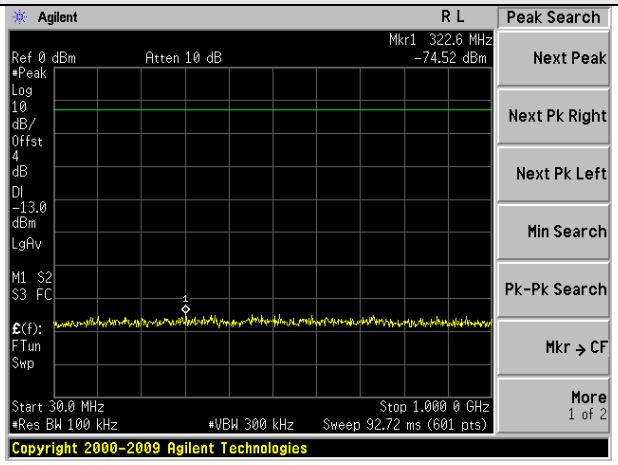
30MHz~1GHz



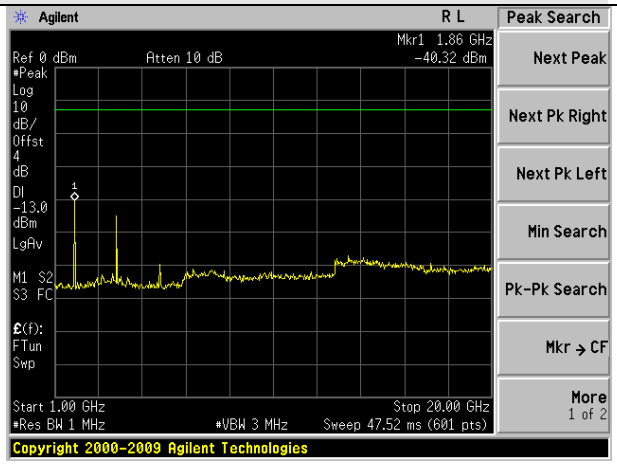
1GHz~20GHz

Test item:	Spurious emission	Mode:	PCS1900 (GPRS 4 link)

Test channel: Lowest channel

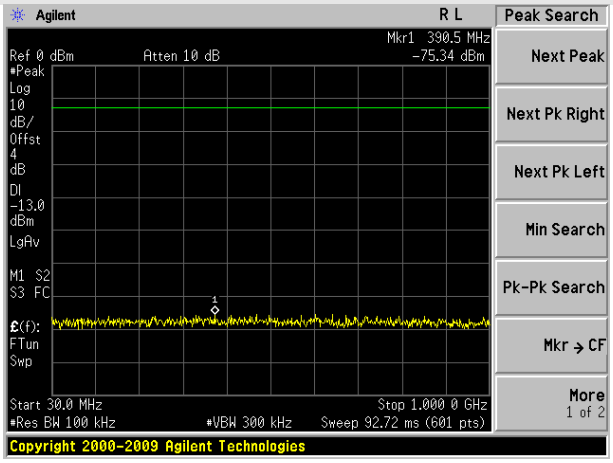


30MHz~1GHz

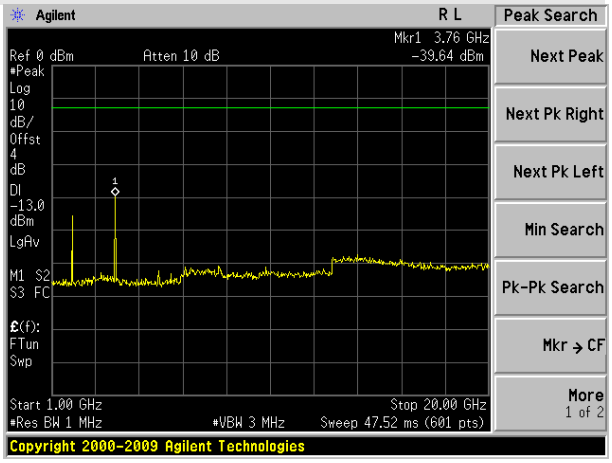


1GHz~20GHz

Test channel: Middle channel

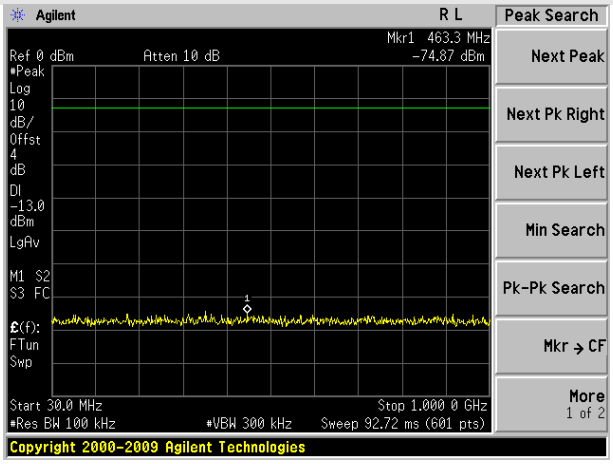


30MHz~1GHz

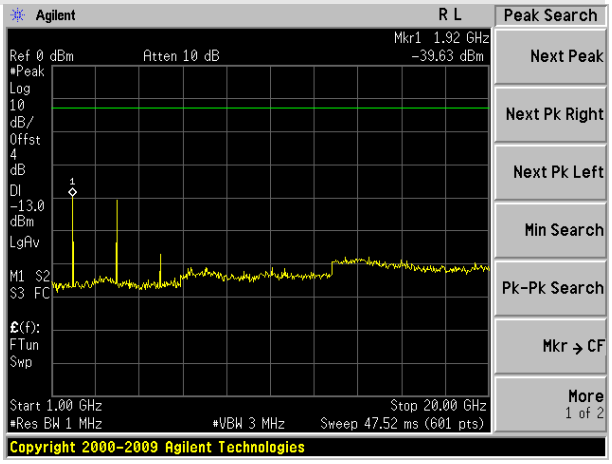


1GHz~20GHz

Test channel: Highest channel

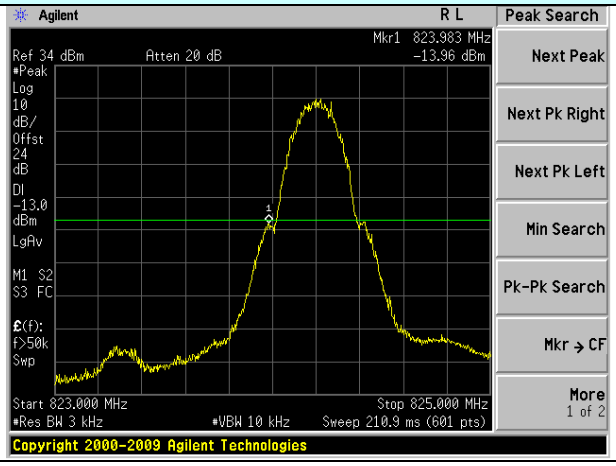


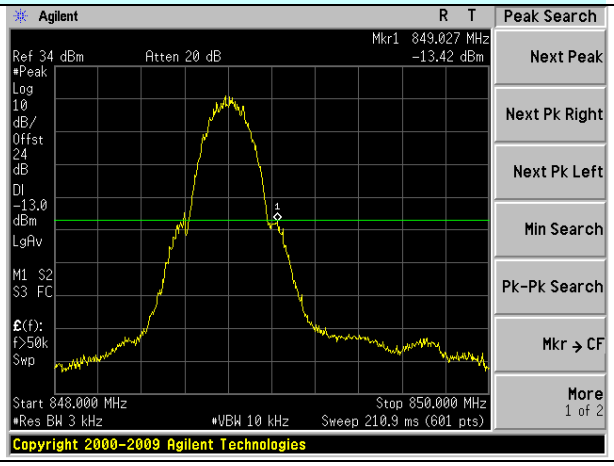
30MHz~1GHz



1GHz~20GHz

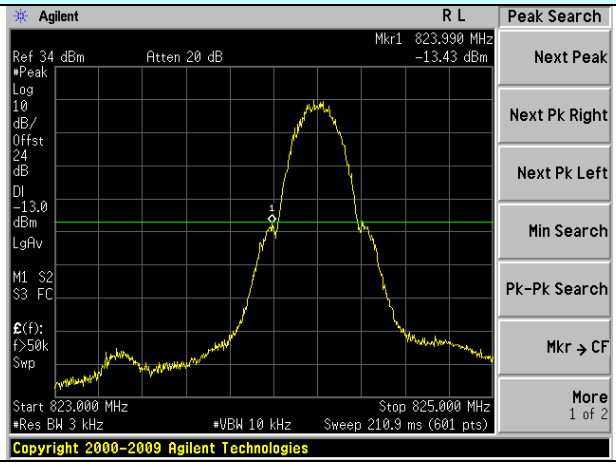
Test item:	Band edge	Mode:	GSM850 (GSM link)

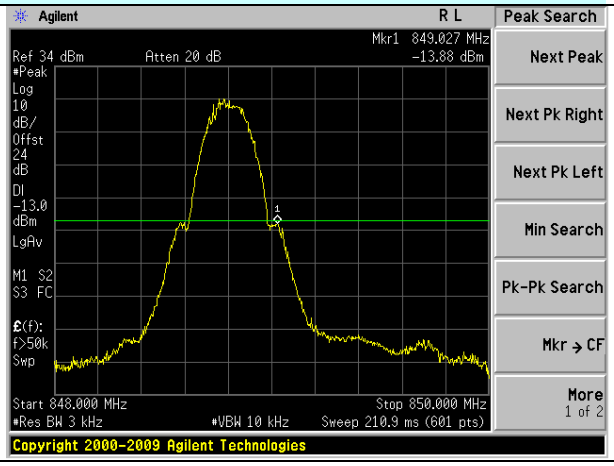




Lowest channel | Highest channel

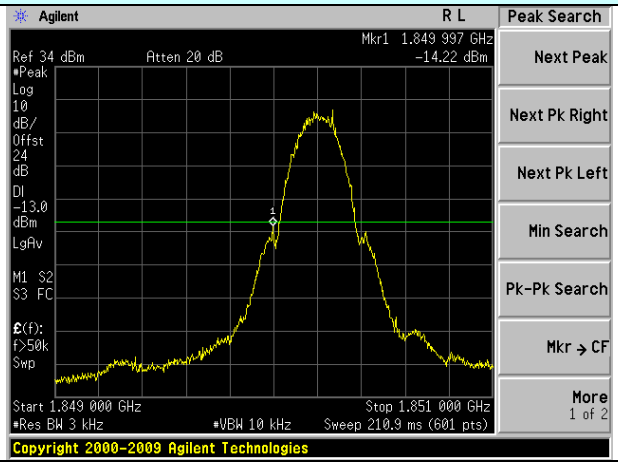
Test item:	Band edge	Mode:	GSM850 (GPRS 4 link)



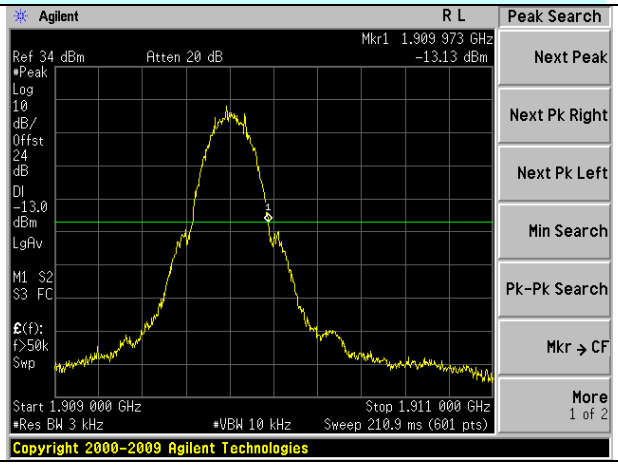


Lowest channel | Highest channel

Test item:	Band edge	Mode:	PCS1900 (GSM link)

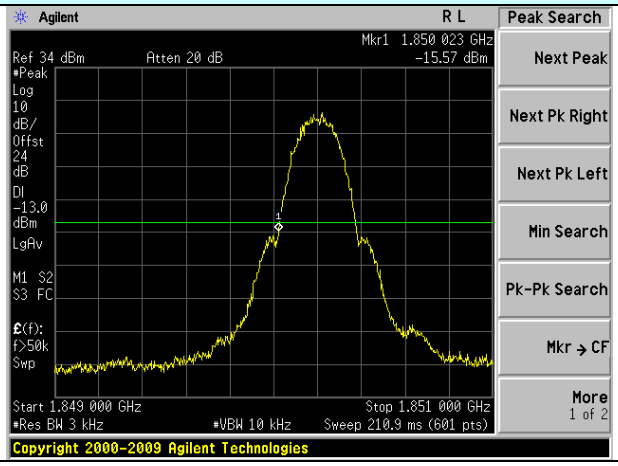


Lowest channel

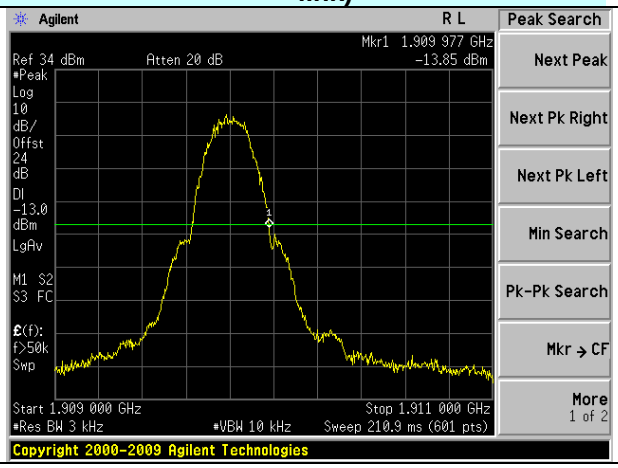


Highest channel

Test item:	Band edge	Mode:	PCS1900 (GPRS 4 link)



Lowest channel



Highest channel

8.6 ERP, EIRP Measurement

☞ **Standard requirement**

FCC part22.913(a) and FCC part24.232(b)

☞ **Test method**

FCC part2.1046

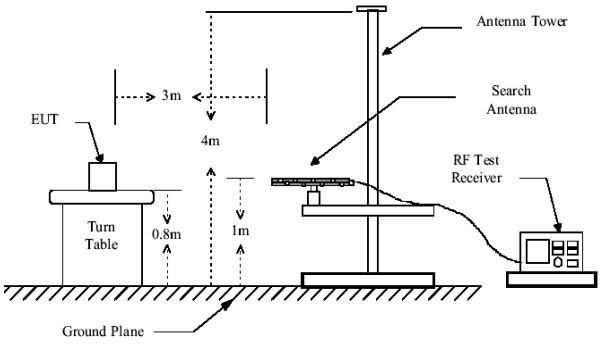
☞ **Limit**

GSM850 / WCDMA Band V: 7W ERP

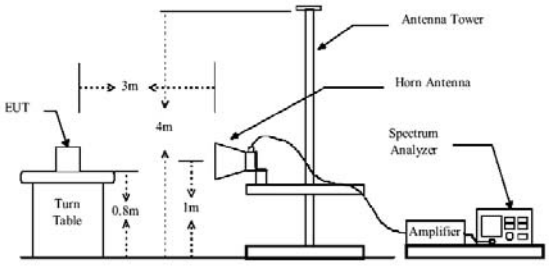
PCS1900 / WCDMA Band II: 2W EIRP

☞ **Test setup**

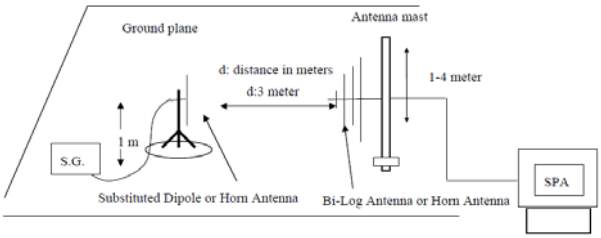
Below 1GHz



Above 1GHz



Substituted method:



☞ **Test Procedure**

1. The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
2. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated.
3. ERP in frequency band 824.2 –848.80.8MHz were measured using a substitution method. The EUT was replaced by dipole antenna connected, the S.G. output was recorded and ERP was calculated asfollows:

   ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable Loss (dB)
4. EIRP in frequency band 1850.2 –1909.8MHz were measured using a substitution method. The EUT was replaced by or horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows:

   EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable Loss (dB)

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test Result** **Complied**

Measurement Data

GSM850 / GPRS850 Band						
Channel	**Mode**	**EUT Pol.**	**Antenna Pol.**	**ERP(dBm)**	**Limit (dBm)**	**Result**
Lowest 824.2MHz	GSM850 (GSM link)	H	V	32.05	38.45	Pass
			H	28.94		
		E1	V	23.59		
			H	29.14		
		E2	V	22.68		
			H	26.78		
Middle 836.6MHz	GSM850 (GSM link)	H	V	31.97	38.45	Pass
			H	28.84		
		E1	V	23.57		
			H	29.16		
		E2	V	24.31		
			H	27.33		
Highest 848.8MHz	GSM850 (GSM link)	H	V	32.39	38.45	Pass
			H	28.64		
		E1	V	23.59		
			H	28.12		
		E2	V	22.55		
			H	27.94		

PCS1900 / GPRS1900 Band						
Channel	**Mode**	**EUT Pol.**	**Antenna Pol.**	**EIRP(dBm)**	**Limit (dBm)**	**Result**
Lowest 1850.2MHz	PCS1900 (GSM link)	H	V	28.37	33.01	Pass
			H	25.59		
		E1	V	20.81		
			H	25.80		
		E2	V	20.01		
			H	23.70		
Middle 1880MHz	PCS1900 (GSM link)	H	V	28.39	33.01	Pass
			H	25.61		
		E1	V	20.91		
			H	25.92		
		E2	V	21.55		
			H	24.27		
Highest 1909.8MHz	PCS1900 (GSM link)	H	V	28.86	33.01	Pass
			H	25.51		
		E1	V	21.00		
			H	25.07		
		E2	V	20.03		
			H	24.88		

8.7 Field strength of spurious radiation measurement

☞ **Standard requirement**

FCC part22.917(a) and FCC part24.238(a)

☞ **Test method**

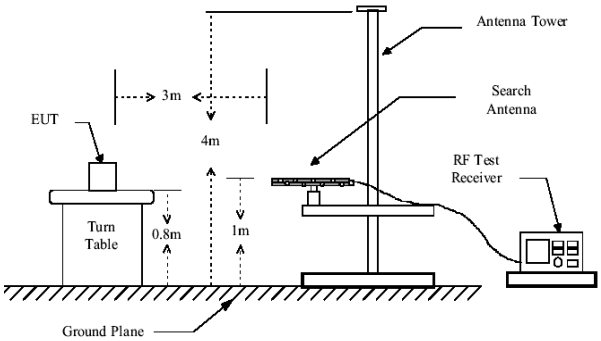
FCC part2.1053

☞ **Limit**

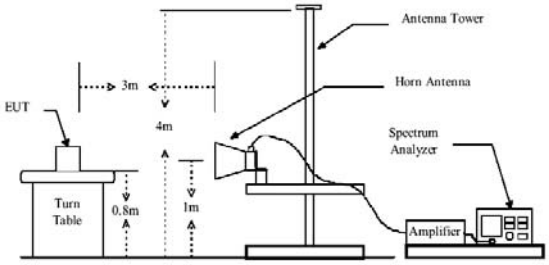
-13dBm

☞ **Test setup**

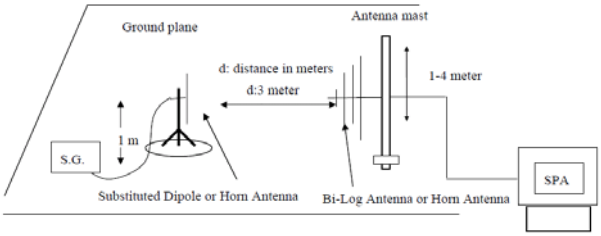
Below 1GHz



Above 1GHz



Substituted method:



☞ **Test Procedure**

1. The EUT was placed on an non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
2. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated.
3. ERP in frequency band 824.2 –848.80.8MHz were measured using a substitution method. The EUT was replaced by dipole antenna connected, the S.G. output was recorded and ERP was calculated asfollows:

   ERP = S.G. output (dBm) + Antenna Gain (dBd) – Cable Loss (dB)
4. EIRP in frequency band 1850.2 –1909.8MHz were measured using a substitution method. The EUT was replaced by or horn antenna connected, the S.G. output was recorded and EIRP was calculated as follows:

   EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable Loss (dB)

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test Result** **Complied**

Measurement Data

Test mode:	GSM850		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1648.40	Vertical	-35.97	-13.00	Pass
2472.60	V	-38.70		
3296.80	V	-40.97		
4121.00	V	-43.13		
4945.20	V	---		
1648.40	Horizontal	-41.21	-13.00	Pass
2472.60	H	-45.07		
3296.80	H	-46.64		
4121.00	H	-49.38		
4945.20	H	---		
Test mode:	**GSM850**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1673.20	Vertical	-37.33	-13.00	Pass
2509.80	V	-39.61		
3346.40	V	-41.50		
4183.00	V	-43.30		
5019.60	V	---		
1673.20	Horizontal	-41.70	-13.00	Pass
2509.80	H	-44.92		
3346.40	H	-46.23		
4183.00	H	-48.51		
5019.60	H	---		
Test mode:	**GSM850**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
1697.60	Vertical	-37.56	-13.00	Pass
2546.40	V	-39.59		
3395.20	V	-41.26		
4244.00	V	-42.88		
5092.80	V	---		
1697.60	Horizontal	-41.45	-13.00	Pass
2546.40	H	-44.32		
3395.20	H	-45.48		
4244.00	H	-47.51		
5092.80	H	---		

Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test mode:	PCS1900		Test channel:	Lowest
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3700.40	Vertical	-37.24	-13.00	Pass
5550.60	V	-39.61		
7400.80	V	-41.57		
9251.00	V	-43.46		
11101.20	V	---		
3700.40	Horizontal	-41.79	-13.00	Pass
5550.60	H	-45.16		
7400.80	H	-46.50		
9251.00	H	-48.86		
11101.20	H	---		
Test mode:	**PCS1900**		**Test channel:**	**Middle**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3760.00	Vertical	-35.06	-13.00	Pass
5640.00	V	-37.51		
7520.00	V	-39.53		
9400.00	V	-41.49		
11280.00	V	---		
3760.00	Horizontal	-39.77	-13.00	Pass
5640.00	H	-43.23		
7520.00	H	-44.63		
9400.00	H	-47.06		
11280.00	H	---		
Test mode:	**PCS1900**		**Test channel:**	**Highest**
Frequency (MHz)	Spurious Emission		Limit (dBm)	Result
	Polarization	Level (dBm)		
3819.60	Vertical	-36.18	-13.00	Pass
5729.40	V	-38.56		
7639.20	V	-40.52		
9549.00	V	-42.41		
11458.80	V	---		
3819.60	Horizontal	-40.75	-13.00	Pass
5729.40	H	-44.11		
7639.20	H	-45.46		
9549.00	H	-47.82		
11458.80	H	---		

Remark：

1. The emission behaviour belongs to narrowband spurious emission.
2. Remark"---" means that the emission level is too low to be measured
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

8.8 Frequency stability V.S. Temperature measurement

☞ **Standard requirement**

FCC Part2.1055(a)(1)(b)

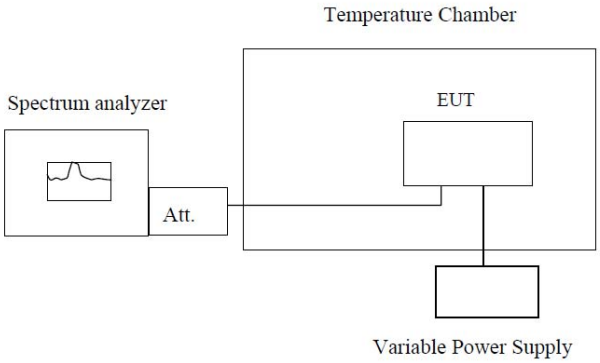
☞ **Test method**

FCC Part2.1055(a)(1)(b)

☞ **Limit**

2.5ppm

☞ **Test setup**



Note : Measurement setup for testing on Antenna connector

☞ **Test Procedure**

1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25℃ operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to –20℃. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test Result** **Complied**

Measurement Data

Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	36	0.0428	2.5	Pass
	-20	40	0.0478		
	-10	34	0.0411		
	0	29	0.0344		
	10	33	0.0394		
	20	29	0.0344		
	30	46	0.0545		
	40	41	0.0495		
	50	40	0.0478		
Reference Frequency: GSM850 (GPRS 4 link) Middle channel=190 channel=836.6MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	27	0.0328	2.5	Pass
	-20	30	0.0359		
	-10	26	0.0312		
	0	24	0.0281		
	10	25	0.0296		
	20	22	0.0265		
	30	37	0.0436		
	40	31	0.0374		
	50	30	0.0359		

Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	50	0.0265	2.5	Pass
	-20	58	0.0310		
	-10	50	0.0265		
	0	43	0.0228		
	10	50	0.0265		
	20	44	0.0235		
	30	68	0.0362		
	40	60	0.0317		
	50	60	0.0317		
Reference Frequency: PCS1900 (GPRS 4 link) Middle channel=661 channel=1880MHz					
Power supplied (Vdc)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70	-30	44	0.0236	2.5	Pass
	-20	51	0.0270		
	-10	42	0.0222		
	0	35	0.0187		
	10	43	0.0229		
	20	35	0.0187		
	30	57	0.0305		
	40	48	0.0256		
	50	51	0.0270		

8.9 Frequency stability V.S. Voltage measurement

☞ **Standard requirement**

FCC Part2.1055(d)(1)(2)

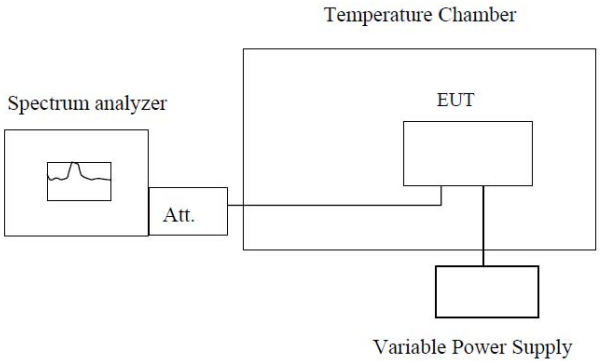
☞ **Test method**

FCC Part2.1055(d)(1)(2)

☞ **Limit**

2.5ppm

☞ **Test setup**



Note : Measurement setup for testing on Antenna connector

☞ **Test Procedure**

1. Set chamber temperature to 25℃. Use a variable DC power source to power the EUT and set the voltage to rated voltage.
2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
3. Reduce the input voltage to specified extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.

☞ **Test mode**

Refer to section 5.3 for details

☞ **Test Result** **Complied**

Measurement Data

Reference Frequency: GSM850 (GSM link) Middle channel=190 channel=836.6MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	23	0.0275	2.5	Pass
	3.70	26	0.0311		
	3.40	29	0.0347		
Reference Frequency: GSM850 (GPRS 4 link) Middle channel=190 channel=836.6MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	35	0.0422	2.5	Pass
	3.70	28	0.0329		
	3.40	30	0.0360		
Reference Frequency: PCS1900 (GSM link) Middle channel=661 channel=1880MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	38	0.0202	2.5	Pass
	3.70	46	0.0242		
	3.40	46	0.0242		
Reference Frequency: PCS1900 (GPRS 4 link) Middle channel=661 channel=1880MHz					
Temperature (℃)	Power supplied (Vdc)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
25	4.25	57	0.0305	2.5	Pass
	3.70	44	0.0236		
	3.40	47	0.0250		

------End------