FCC RF Test Report

APPLICANT	:	**LG Electronics Inc.**
EQUIPMENT	:	**Cellular/PCS GSM/WCDMA Phone with WLAN, Bluetooth**
BRAND NAME	:	**LG**
MODEL NAME	:	**LG-X150, X150, LGX150**
FCC ID	:	**ZNFX150**
STANDARD	:	**FCC 47 CFR Part 2, 22(H), 24(E)**
CLASSIFICATION	:	**PCS Licensed Transmitter Held to Ear (PCE)**

The product was received on Mar. 27, 2015 and testing was completed on Apr. 24, 2015. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-C-2004 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
2627

SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG532708	Rev. 01	Initial issue of report	Jun. 12, 2015

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	N/A	PASS	-
3.2	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	-
3.3	§22.913(a)(2)	Effective Radiated Power	< 7 Watts	PASS	-
	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.4	§2.1049 §22.917(b) §24.238(b)	Occupied Bandwidth	N/A	PASS	-
3.5	§2.1051 §22.917(a) §24.238(a)	Band Edge Measurement	< 43+10log$_{10}$(P[Watts])	PASS	-
3.6	§2.1051 §22.917(a) §24.238(a)	Conducted Spurious Emission	< 43+10log$_{10}$(P[Watts])	PASS	-
3.7	§2.1053 §22.917(a) §24.238(a)	Field Strength of Spurious Radiation	< 43+10log$_{10}$(P[Watts])	PASS	Under limit 33.70 dB at 5644.000 MHz
3.8	§2.1055 §22.355	Frequency Stability for Temperature & Voltage	< 2.5 ppm for Part 22 Within Authorized Band	PASS	-
	§2.1055 §24.235				

1 General Description

1.1 Applicant

LG Electronics Inc.
60-39, Gasan-dong, Gumcheon-gu, Seoul, 153-023, Korea

1.2 Manufacturer

Arima Communications Corp.
6F, No.866, Jhongjheng Rd., Jhonghe Dist., New Taipei City 23586, Taiwan

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Cellular/PCS GSM/WCDMA Phone with WLAN, Bluetooth
Brand Name	LG
Model Name	LG-X150, X150, LGX150
FCC ID	ZNFX150
EUT supports Radios application	GSM/GPRS/EGPRS(Downlink Only) WCDMA/HSPA/HSPA+(Downlink Only) WLAN 2.4GHz 802.11b/g/n HT20/HT40 Bluetooth v3.0 + EDR/Bluetooth v4.0 LE
IMEI Code	Conducted: 351522070006380 Radiated: 351522070006364 ERP/EIRP: 351522070005267
HW Version	v0.2
SW Version	v08a
EUT Stage	Production Unit

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8MHz
Rx Frequency	GSM850: 869.2 MHz ~ 893.8 MHz GSM1900: 1930.2 MHz ~ 1989.8 MHz
Maximum Output Power to Antenna	GSM850 : 32.86 dBm GSM1900 : 30.35 dBm
Antenna Type	IFA Antenna
Type of Modulation	GSM: GMSK GPRS: GMSK EDGE: GMSK / 8PSK (Downlink Only)

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	Maximum ERP/EIRP (W)	Frequency Tolerance (ppm)	Emission Designator
Part 22	GSM850 GSM	GMSK	0.7636	0.0490 ppm	246KGXW
Part 24	GSM1900 GSM	GMSK	0.7112	0.0266 ppm	244KGXW

1.7 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	**Sporton Site No.**	
	03CH10-HY	

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.	
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958	
Test Site No.	**Sporton Site No.**	
	TH01-KS	OTA01-KS

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC 47 CFR Part 2, 22(H), 24(E)
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r02 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 9000 MHz for GSM850.
2. 30 MHz to 19000 MHz for GSM1900.

All modes and data rates and positions were investigated.

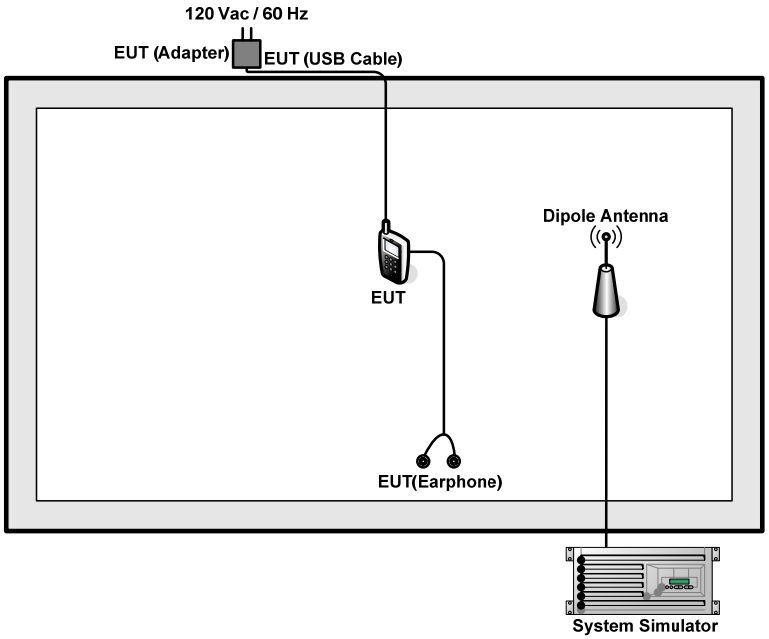
Test modes are chosen to be reported as the worst case configuration below:

Test Modes		
Band	**Radiated TCs**	**Conducted TCs**
GSM 850	■ GSM Link	■ GSM Link
GSM 1900	■ GSM Link	■ GSM Link

Conducted Power Measurement Results:

Conducted Power (*Unit: dBm)						
Band	**GSM850**			**GSM1900**		
Channel	**128**	**189**	**251**	**512**	**661**	**810**
Frequency	**824.2**	**836.4**	**848.8**	**1850.2**	**1880.0**	**1909.8**
GSM	32.78	32.79	**32.86**	30.32	30.33	**30.35**
GPRS class 8	32.77	32.78	32.85	30.31	30.32	30.34
GPRS class 10	31.66	31.72	31.83	28.99	28.96	28.95
GPRS class 11	28.79	28.88	29.00	25.95	25.87	25.84
GPRS class 12	27.30	27.33	27.45	24.40	24.32	24.25

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	DC Power Supply	GW INSTEK	GPD-2303S	N/A	N/A	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
The following shows an offset computation example with RF cable loss 6 dB and a 10dB attenuator.

Example:
Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 6 + 10 = 16 (dB)

3 Test Result

3.1 Conducted Output Power Measurement

3.1.1 Description of the Conducted Output Power Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

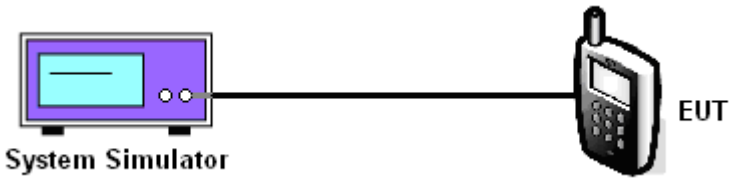
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power

Cellular Band			
Modes	**GSM850 (GSM)**		
Channel	**128 (Low)**	**189 (Mid)**	**251 (High)**
Frequency (MHz)	**824.2**	**836.4**	**848.8**
Conducted Power (dBm)	32.78	32.79	32.86

PCS Band			
Modes	**GSM1900 (GSM)**		
Channel	**512 (Low)**	**661 (Mid)**	**810 (High)**
Frequency (MHz)	**1850.2**	**1880**	**1909.8**
Conducted Power (dBm)	30.32	30.33	30.35

Note: maximum burst average power for GSM.

3.2 Peak-to-Average Ratio

3.2.1 Description of the PAR Measurement

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

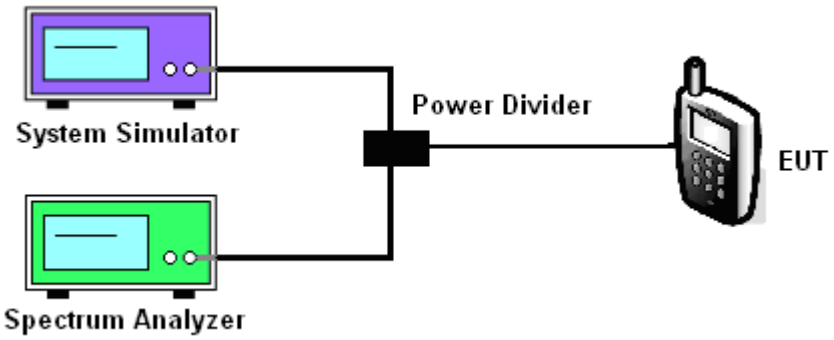
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.7.1.
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. For GSM/GPRS operating modes:
   a. Set EUT in maximum power output.
   b. Set the RBW = 1MHz, VBW = 3MHz, Peak detector on spectrum analyzer for first trace.
   c. Set the RBW = 1MHz, VBW = 3MHz, RMS detector on spectrum analyzer for second trace.
   d. The wanted burst signal is triggered by spectrum analyzer, and measured respectively the peak level and Mean level without burst-off time, after system simulator has synchronized with the spectrum analyzer.
4. Record the deviation as Peak to Average Ratio.

3.2.4 Test Setup



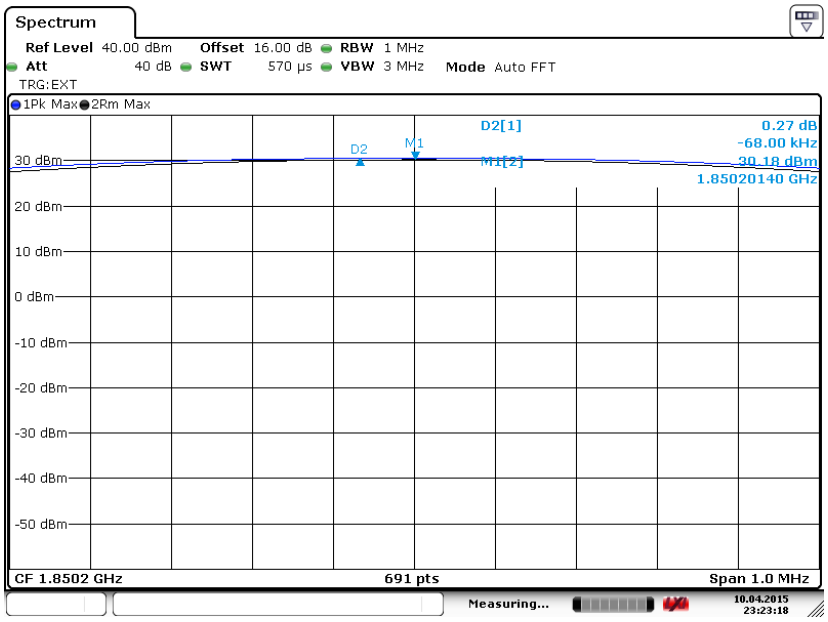
3.2.5 Test Result of Peak-to-Average Ratio

PCS Band			
Modes	**GSM1900 (GSM)**		
Channel	**512 (Low)**	**661 (Mid)**	**810 (High)**
Frequency (MHz)	**1850.2**	**1880**	**1909.8**
Peak-to-Average Ratio (dB)	0.27	0.27	0.27

3.2.6 Test Result (Plots) of Peak-to-Average Ratio

Band :	GSM 1900	Test Mode :	GSM Link (GMSK)

Peak-to-Average Ratio on Channel 512 (1850.2 MHz)



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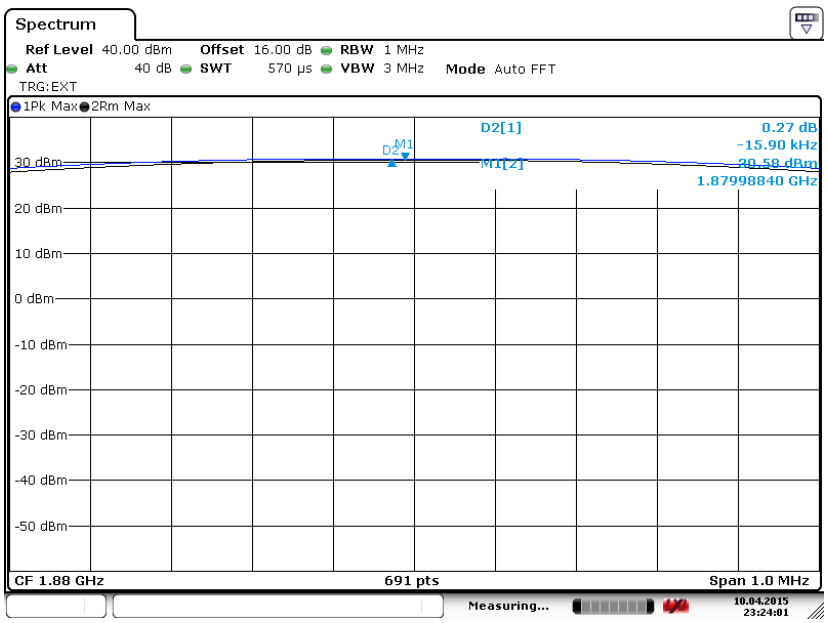
Peak-to-Average Ratio on Channel 661 (1880.0 MHz)



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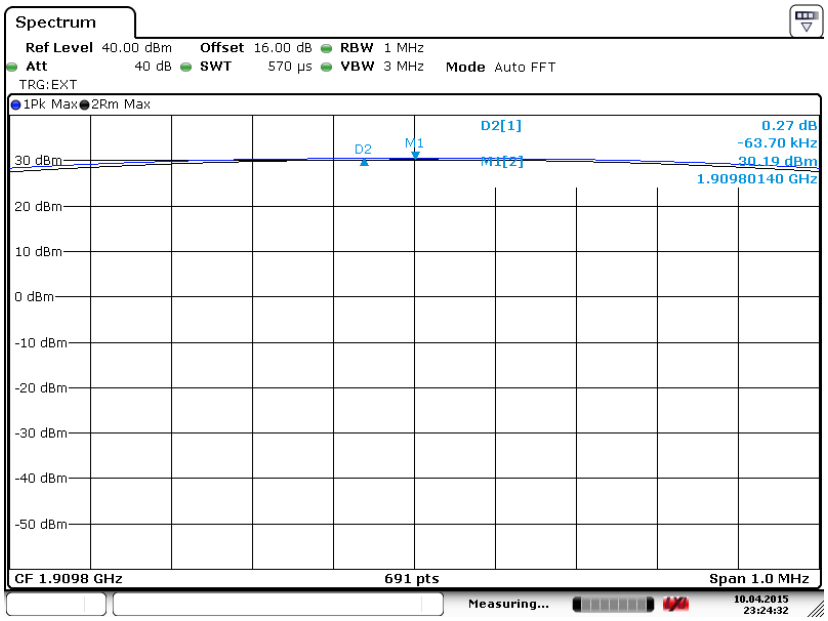
Peak-to-Average Ratio on Channel 810 (1909.8 MHz)



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3.3 Effective Radiated Power and Effective Isotropic Radiated Power Measurement

3.3.1 Description of the ERP/EIRP Measurement

The substitution method, in ANSI / TIA / EIA-603-C-2004, was used for ERP/EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r02. The ERP of mobile transmitters must not exceed 7 Watts and the EIRP of mobile transmitters are limited to 2 Watts.

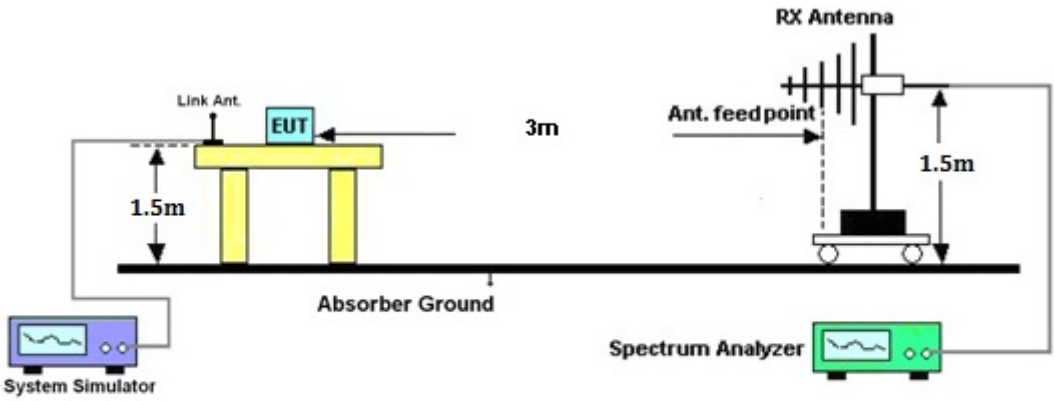
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.2.2.2 (for GSM/GPRS) and ANSI / TIA-603-C-2004 Section 2.2.17.
2. The EUT was placed on a turntable 1.5 meters high in a fully anechoic chamber.
3. The EUT was placed 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. GSM operating modes: Set RBW= 1MHz, VBW= 3MHz, RMS detector over burst; and use channel power option with bandwidth=5MHz, per KDB 971168 D01.
5. The table was rotated 360 degrees to determine the position of the highest radiated power.
6. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
7. Taking the record of maximum ERP/EIRP.
8. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
9. The conducted power at the terminal of the dipole antenna is measured.
10. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
11. ERP/EIRP = Ps + Et – Es + Gs = Ps + Rt – Rs + Gs
    Ps (dBm)：Input power to substitution antenna.
    Gs (dBi or dBd)：Substitution antenna Gain.
    Et = Rt + AF
    Es = Rs + AF
    AF (dB/m)：Receive antenna factor
    Rt：The highest received signal in spectrum analyzer for EUT.
    Rs：The highest received signal in spectrum analyzer for substitution antenna.

3.3.4 Test Setup



3.3.5 Test Result of ERP

GSM850 (GSM) Radiated Power ERP						
Horizontal Polarization						
Frequency (MHz)	**Rt (dBm)**	**Rs (dBm)**	**Ps (dBm)**	**Gs (dBd)**	**ERP (dBm)**	**ERP (W)**
824.20	-20.26	-48.12	0.00	-1.08	26.78	0.4760
836.40	-19.77	-48.28	0.00	-0.93	27.58	0.5725
848.80	-18.76	-48.35	0.00	-0.76	28.83	0.7636
Vertical Polarization						
Frequency (MHz)	**Rt (dBm)**	**Rs (dBm)**	**Ps (dBm)**	**Gs (dBd)**	**ERP (dBm)**	**ERP (W)**
824.20	-33.23	-47.97	0.00	-1.08	13.66	0.0232
836.40	-31.68	-48.01	0.00	-0.93	15.40	0.0347
848.80	-29.84	-48.05	0.00	-0.76	17.45	0.0556

3.3.6 Test Result of EIRP

GSM1900 (GSM) Radiated Power EIRP						
Horizontal Polarization						
Frequency (MHz)	**Rt (dBm)**	**Rs (dBm)**	**Ps (dBm)**	**Gs (dBi)**	**EIRP (dBm)**	**EIRP (W)**
1850.20	-25.32	-51.88	0.00	1.96	28.52	0.7112
1880.00	-26.87	-52.99	0.00	2.00	28.12	0.6493
1909.80	-28.21	-54.28	0.00	1.98	28.05	0.6388
Vertical Polarization						
Frequency (MHz)	**Rt (dBm)**	**Rs (dBm)**	**Ps (dBm)**	**Gs (dBi)**	**EIRP (dBm)**	**EIRP (W)**
1850.20	-25.74	-52.13	0.00	1.96	28.35	0.6835
1880.00	-26.68	-53.17	0.00	2.00	28.49	0.7062
1909.80	-28.16	-54.13	0.00	1.98	27.95	0.6242

3.4 99% Occupied Bandwidth and 26dB Bandwidth Measurement

3.4.1 Description of 99% Occupied Bandwidth and 26dB Bandwidth Measurement

The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

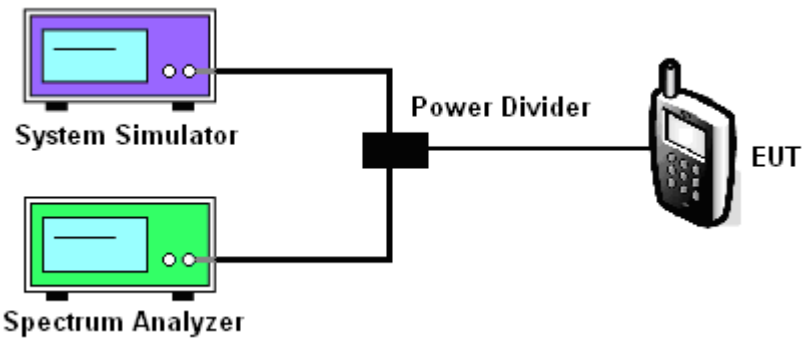
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

12. The testing follows FCC KDB 971168 v02r02 Section 4.2.
13. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
14. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
15. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold.
16. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.

3.4.4 Test Setup



3.4.5 Test Result of Occupied Bandwidth and 26dB Bandwidth

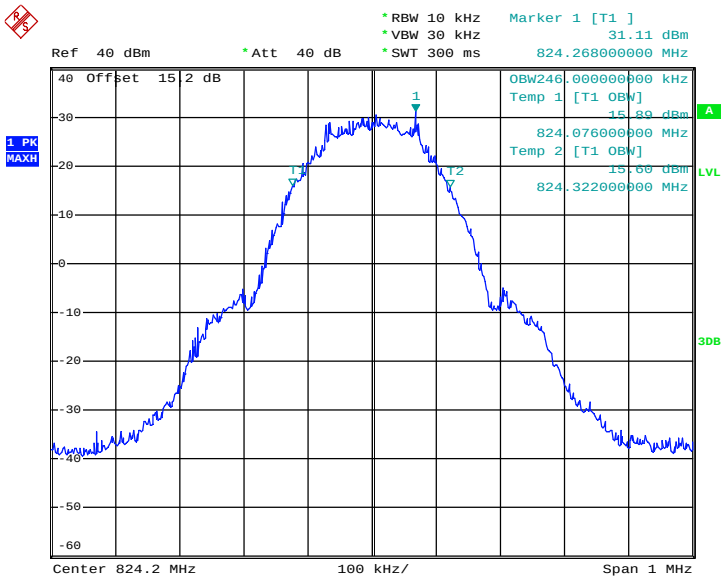
Cellular Band			
Modes	**GSM850 (GSM)**		
Channel	**128 (Low)**	**189 (Mid)**	**251 (High)**
Frequency (MHz)	**824.2**	**836.4**	**848.8**
99% OBW (kHz)	246.00	244.00	244.00
26dB BW (kHz)	310.00	316.00	320.00

PCS Band			
Modes	**GSM1900 (GSM)**		
Channel	**512 (Low)**	**661 (Mid)**	**810 (High)**
Frequency (MHz)	**1850.2**	**1880**	**1909.8**
99% OBW (kHz)	244.00	244.00	244.00
26dB BW (kHz)	314.00	310.00	314.00

3.4.6 Test Result (Plots) of Occupied Bandwidth and 26dB Bandwidth

Band :	GSM 850	Test Mode :	GSM Link (GMSK)

99% Occupied Bandwidth Plot on Channel 128 (824.2 MHz)



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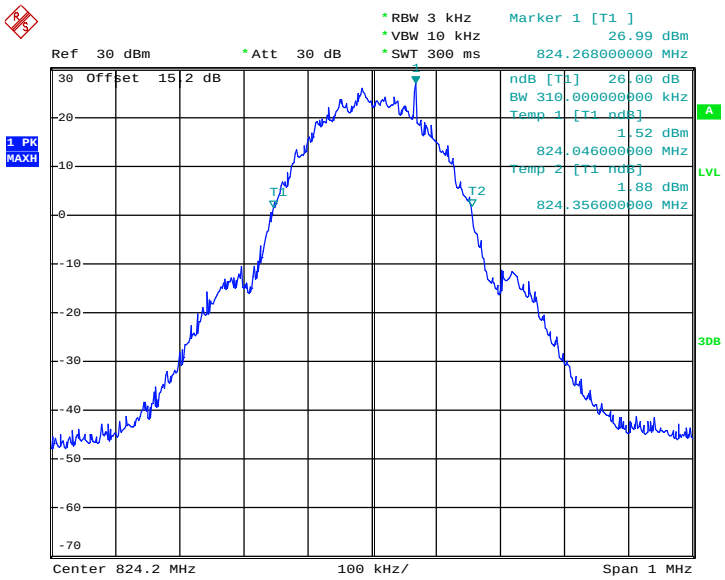
26dB Bandwidth Plot on Channel 128 (824.2 MHz)



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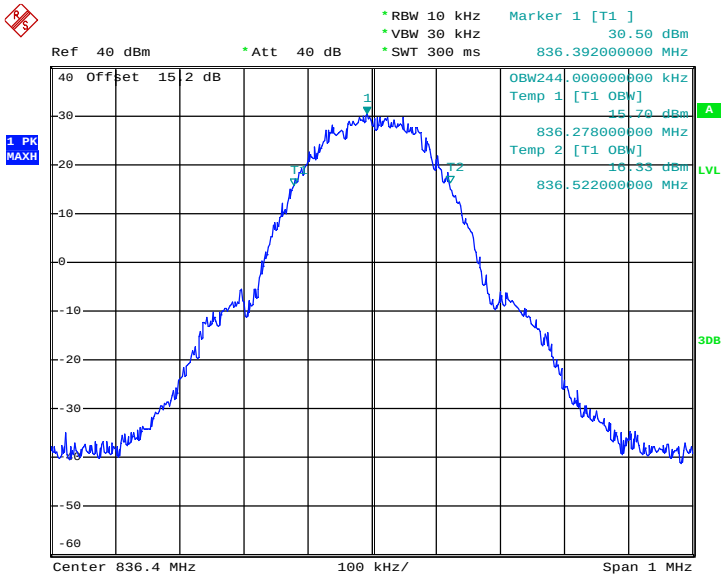
99% Occupied Bandwidth Plot on Channel 189 (836.4 MHz)



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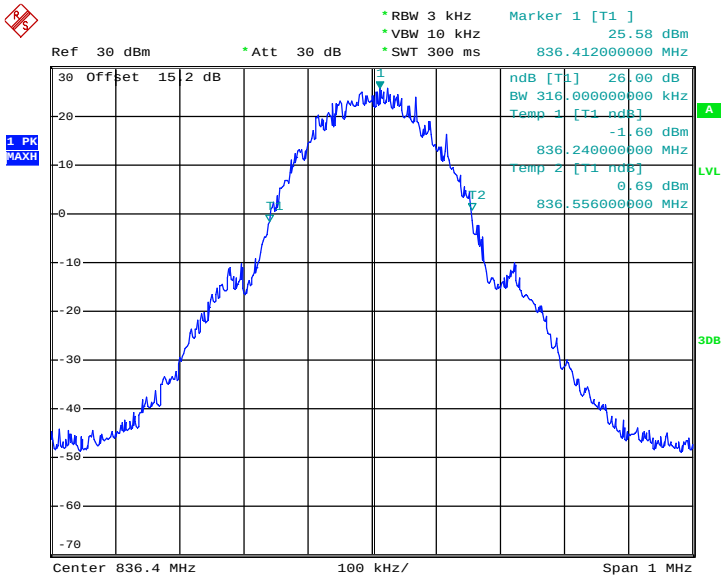
26dB Bandwidth Plot on Channel 189 (836.4 MHz)



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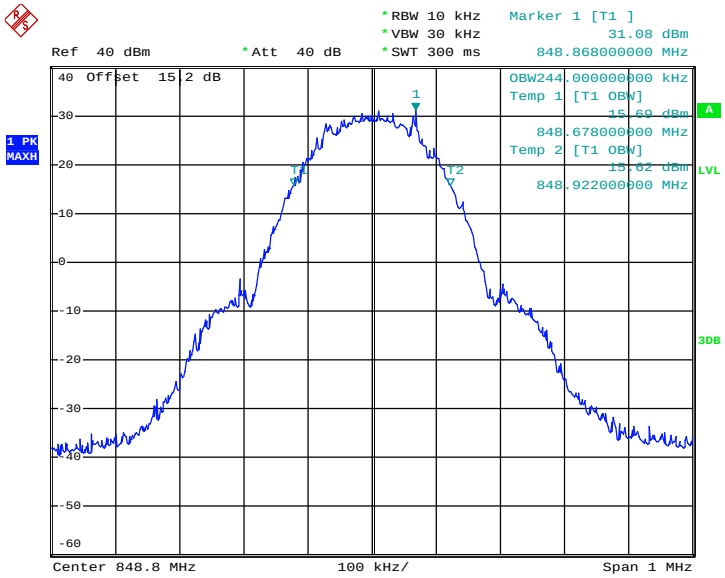
99% Occupied Bandwidth Plot on Channel 251 (848.8 MHz)



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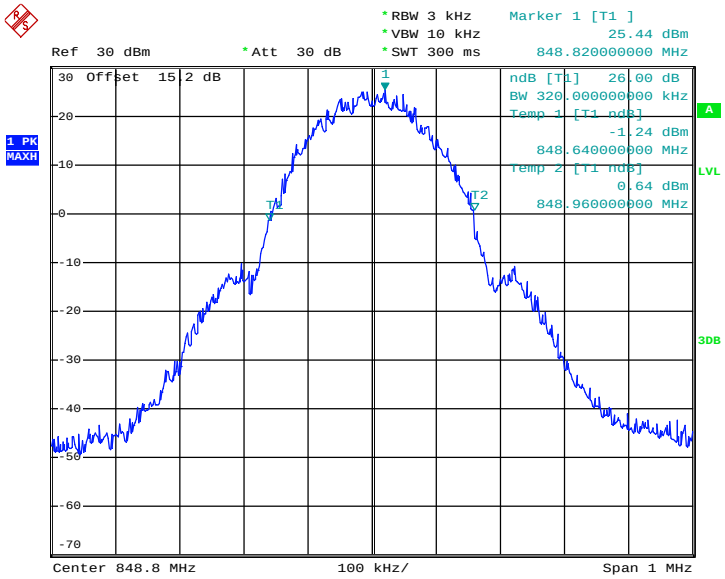
26dB Bandwidth Plot on Channel 251 (848.8 MHz)



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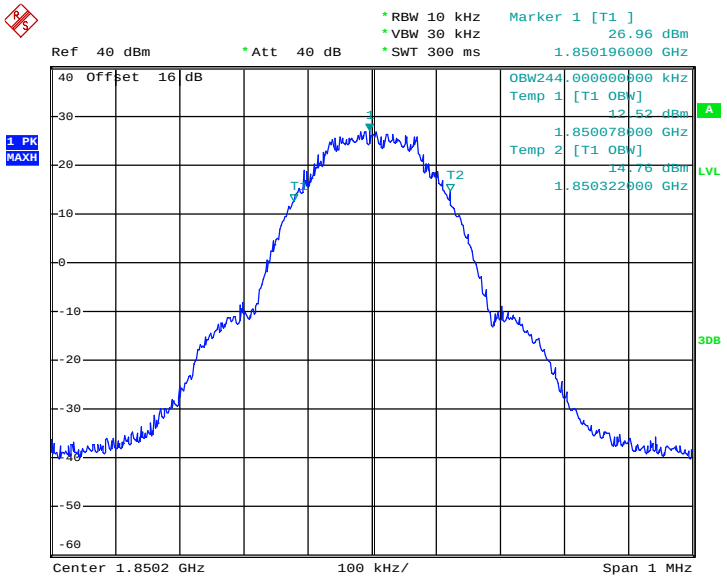
Band :	GSM 1900	Test Mode :	GSM Link (GMSK)

99% Occupied Bandwidth Plot on Channel 512 (1850.2 MHz)



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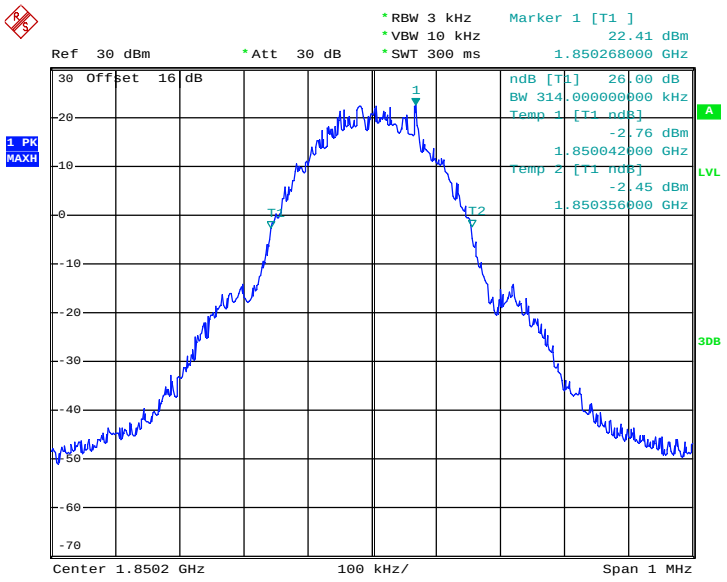
26dB Bandwidth Plot on Channel 512 (1850.2 MHz)



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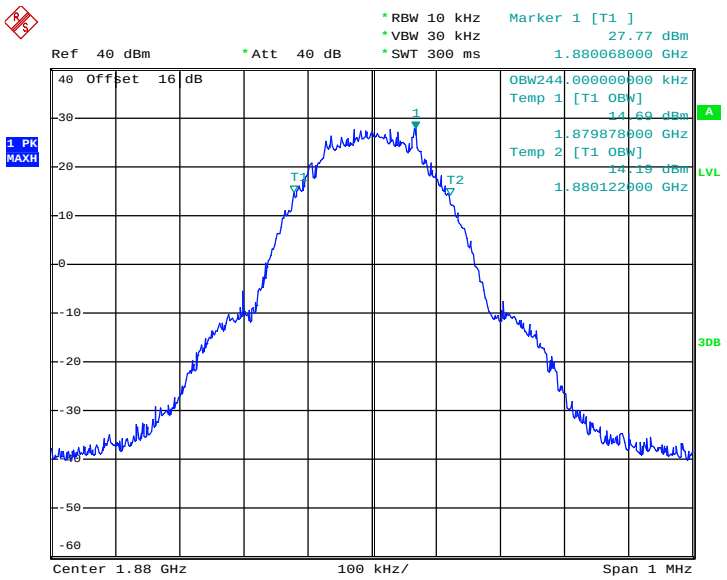
99% Occupied Bandwidth Plot on Channel 661 (1880.0 MHz)



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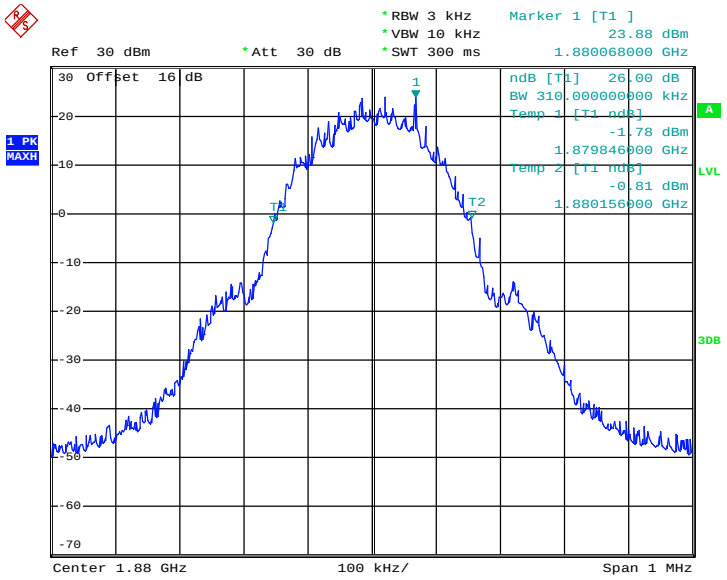
26dB Bandwidth Plot on Channel 661 (1880.0 MHz)



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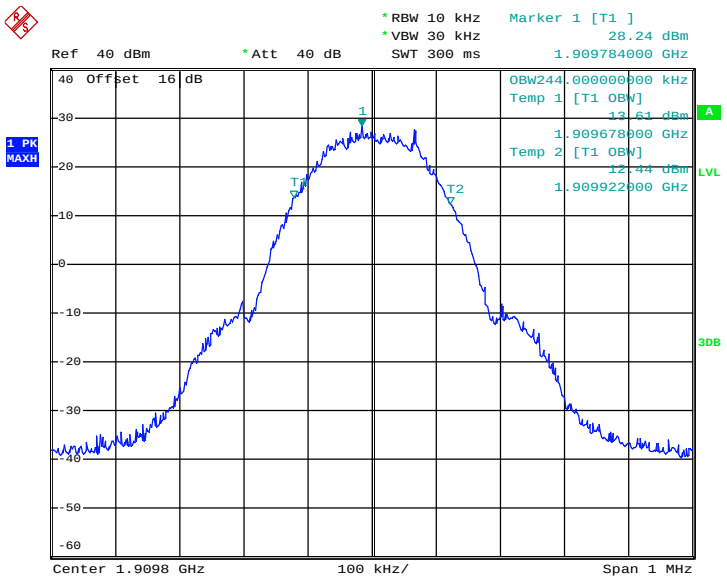
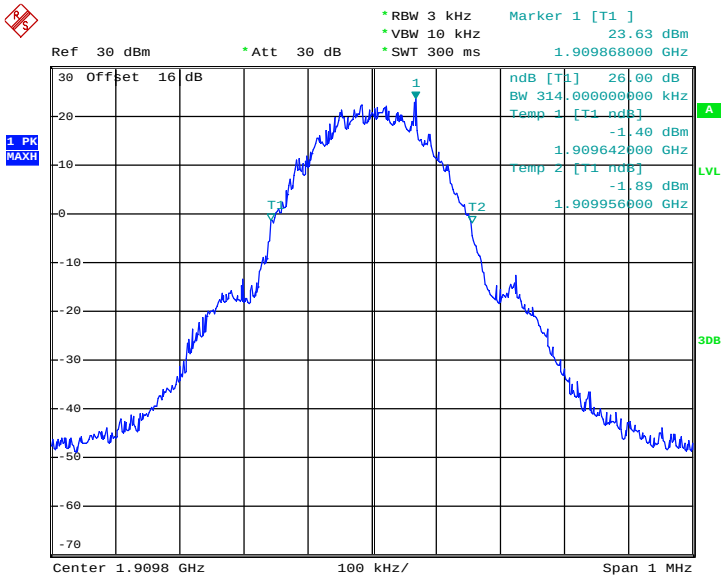
99% Occupied Bandwidth Plot on Channel 810 (1909.8 MHz)



Date: 11.APR.2015 00:51:14

26dB Bandwidth Plot on Channel 810 (1909.8 MHz)



Date: 11.APR.2015 00:47:29

3.5 Band Edge Measurement

3.5.1 Description of Band Edge Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

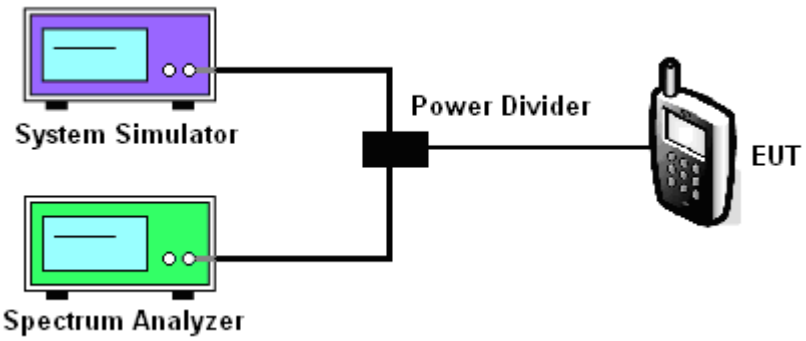
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The band edges of low and high channels for the highest RF powers were measured.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)
   = P(W) - [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
   = -13dBm.

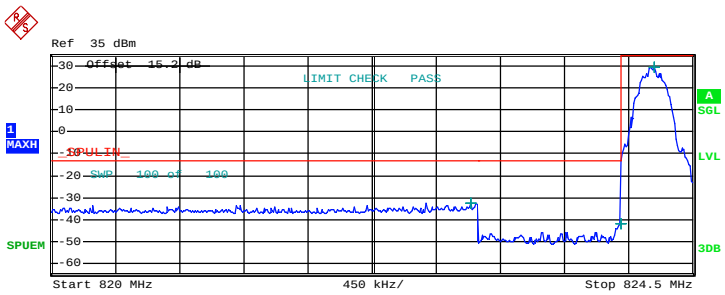
3.5.4 Test Setup



3.5.5 Test Result (Plots) of Conducted Band Edge

Band :	GSM850	Test Mode :	GSM Link (GMSK)

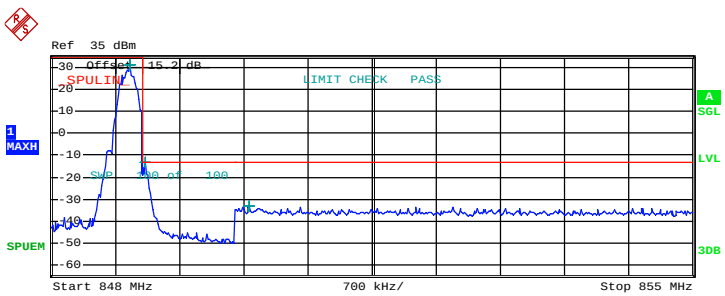
Lower Band Edge Plot on Channel 128 (824.2 MHz)



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
820.000 M	823.000 M	100.00 k	822.944500 M	-32.28	-19.28
823.000 M	824.000 M	3.00 k	823.999500 M	-41.82	-28.82
824.000 M	824.500 M	10.00 k	824.227750 M	29.31	-5.69

Date: 11.APR.2015 00:17:24

Higher Band Edge Plot on Channel 251 (848.8 MHz)

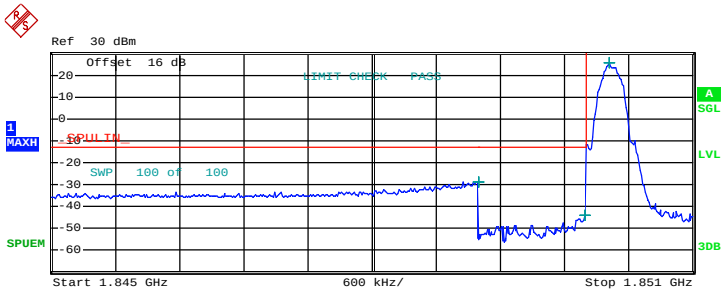


Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
848.000 M	849.000 M	10.00 k	848.858500 M	31.19	-3.81
849.000 M	850.000 M	3.00 k	849.023000 M	-13.43	-0.43
850.000 M	855.000 M	100.00 k	850.150000 M	-33.31	-20.31

Date: 11.APR.2015 00:21:34

Band :	GSM1900	Test Mode :	GSM Link (GMSK)

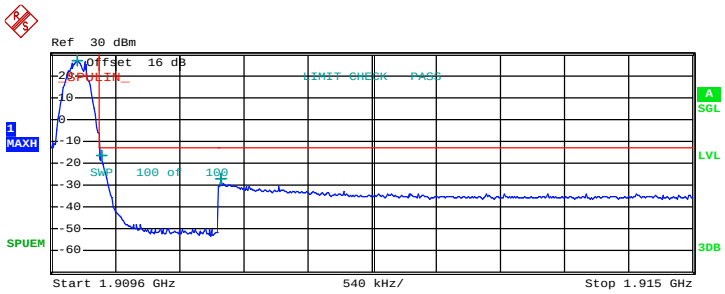
Lower Band Edge Plot on Channel 512 (1850.2 MHz)



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
1.845 G	1.849 G	1.00 M	1.849000 G	-28.52	-15.52
1.849 G	1.850 G	3.00 k	1.849998 G	-43.84	-30.84
1.850 G	1.851 G	10.00 k	1.850224 G	25.41	-9.59

Date: 11.APR.2015 01:02:33

Higher Band Edge Plot on Channel 810 (1909.8 MHz)



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
1.910 G	1.910 G	10.00 k	1.909821 G	26.96	-8.04
1.910 G	1.911 G	3.00 k	1.910025 G	-16.59	-3.59
1.911 G	1.915 G	1.00 M	1.911028 G	-27.30	-14.30

Date: 11.APR.2015 01:05:54

3.6 Conducted Spurious Emission Measurement

3.6.1 Description of Conducted Spurious Emission Measurement

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of at least 43 + 10 log (P) dB.

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

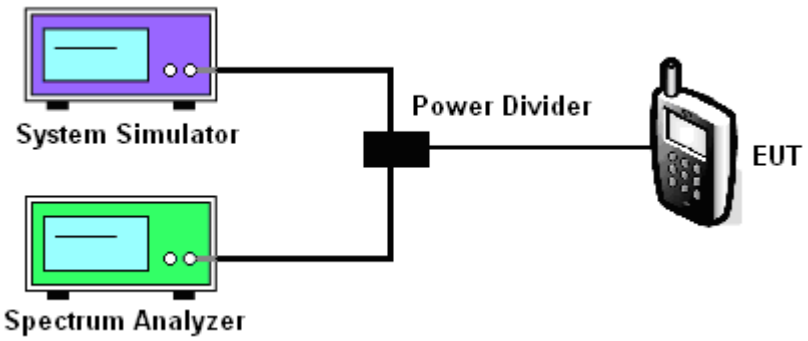
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 6.0.
2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
7. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)
   = P(W) - [43 + 10log(P)] (dB)
   = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
   = -13dBm.

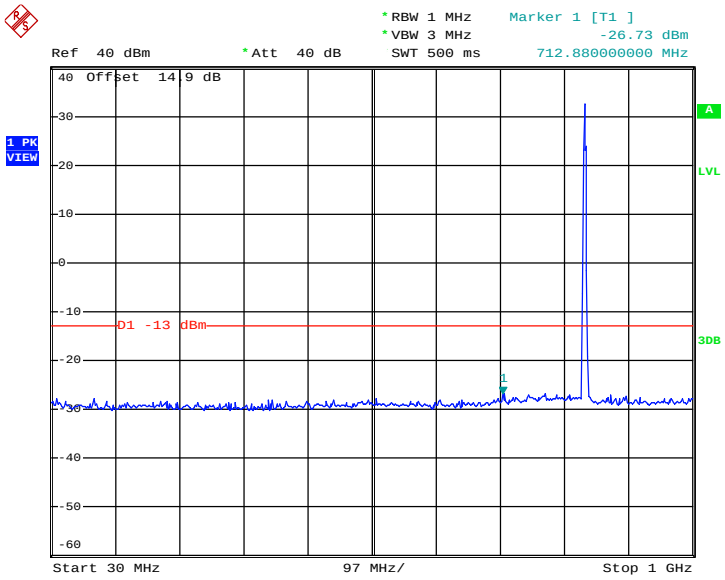
3.6.4 Test Setup



3.6.5 Test Result (Plots) of Conducted Spurious Emission

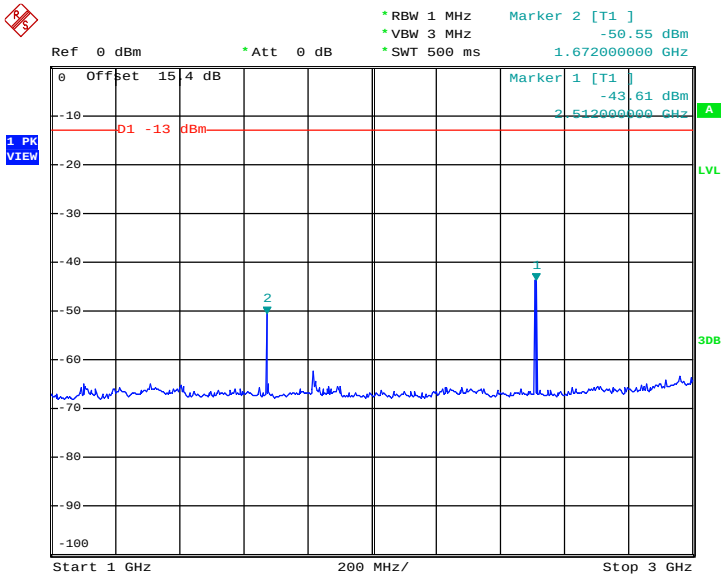
Band :	GSM850	Channel :	CH189
Test Mode :	GSM Link (GMSK)	Frequency :	836.4 MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



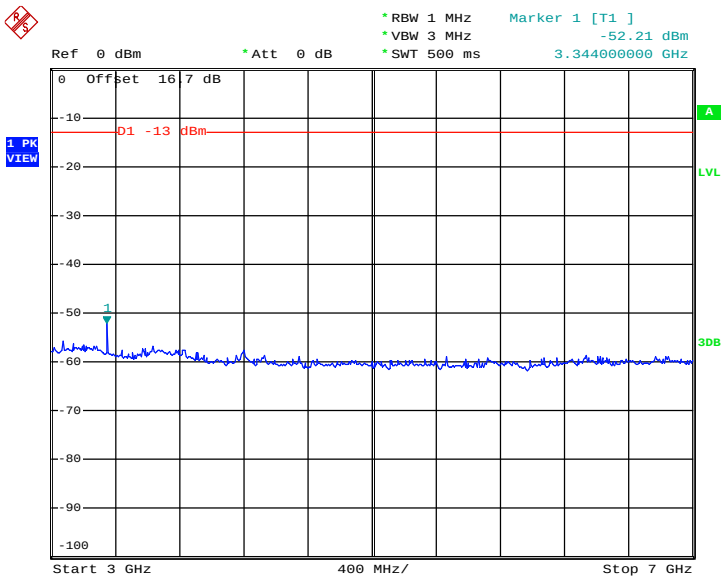
Date: 11.APR.2015 00:03:57

Conducted Spurious Emission Plot between 1GHz ~ 3GHz



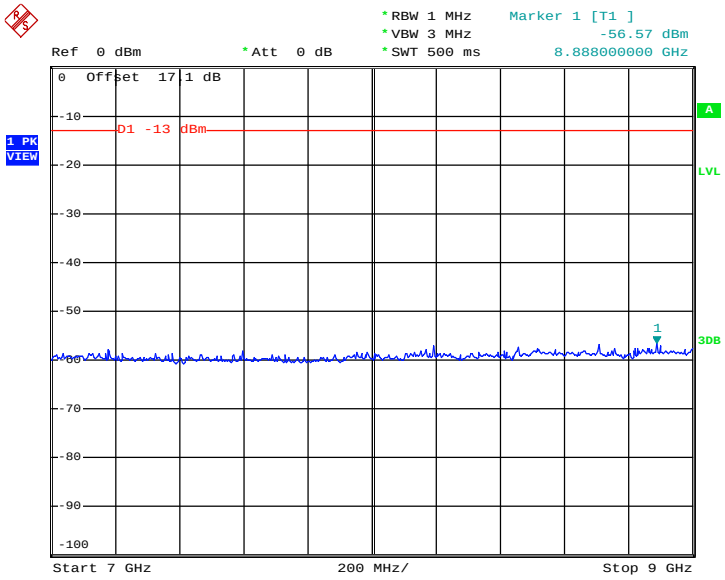
Date: 11.APR.2015 00:06:00

Conducted Spurious Emission Plot between 3GHz ~ 7GHz



Date: 11.APR.2015 00:07:40

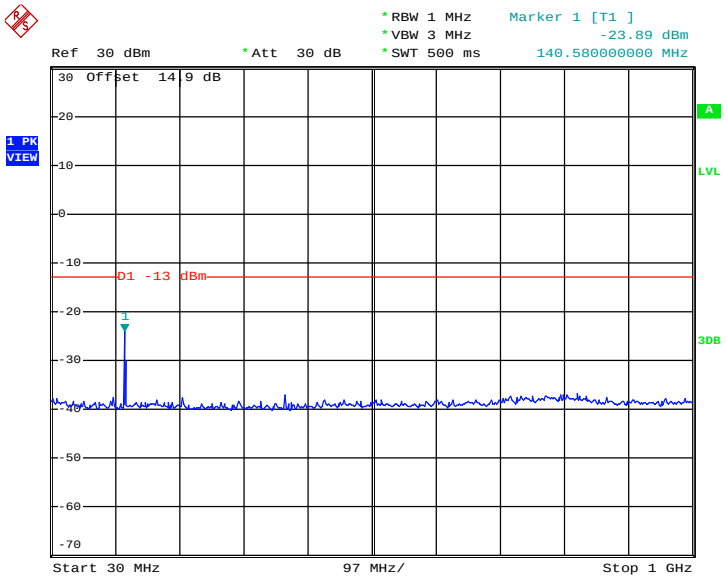
Conducted Spurious Emission Plot between 7GHz ~ 9GHz



Date: 11.APR.2015 00:09:31

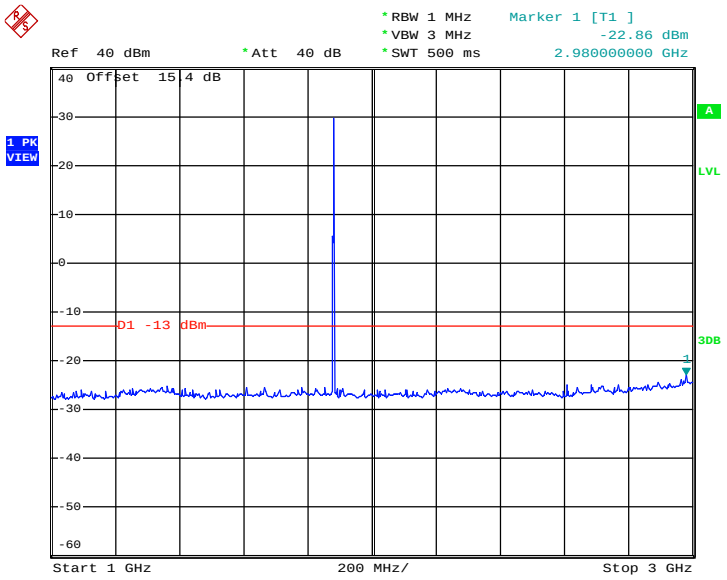
Band :	GSM1900	Channel :	CH661
Test Mode :	GSM Link (GMSK)	Frequency :	1880.0 MHz

Conducted Spurious Emission Plot between 30MHz ~ 1GHz



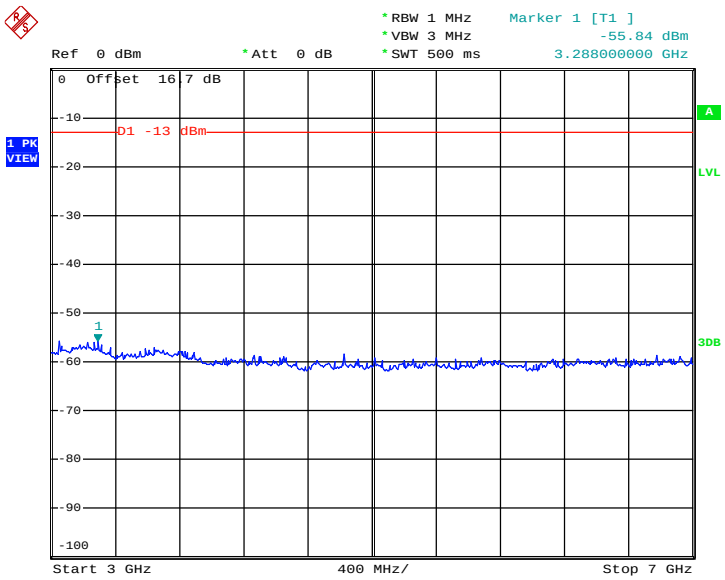
Date: 11.APR.2015 00:56:20

Conducted Spurious Emission Plot between 1GHz ~ 3GHz



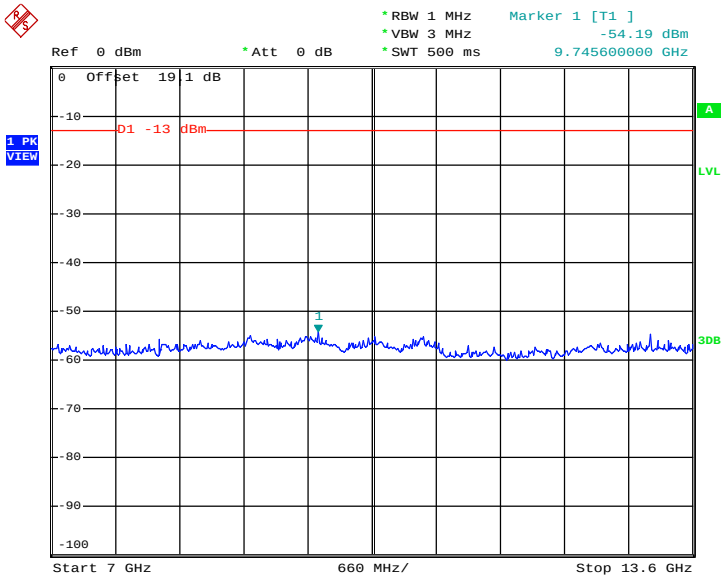
Date: 11.APR.2015 00:57:18

Conducted Spurious Emission Plot between 3GHz ~ 7GHz



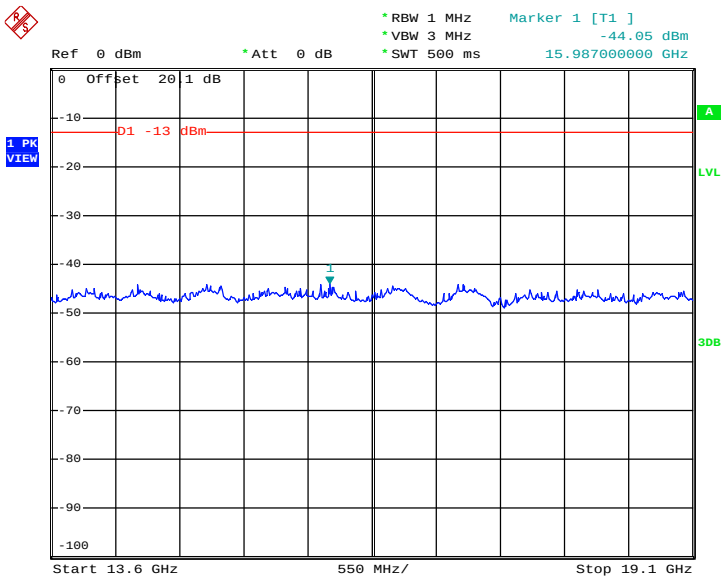
Date: 11.APR.2015 00:58:08

Conducted Spurious Emission Plot between 7GHz ~ 13.6GHz



Date: 11.APR.2015 00:58:58

Conducted Spurious Emission Plot between 13.6GHz ~ 19.1GHz



Date: 11.APR.2015 00:59:42

3.7 Field Strength of Spurious Radiation Measurement

3.7.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.7.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI / TIA-603-C-2004 Section 2.2.12.
2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
12. ERP (dBm) = EIRP - 2.15
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)

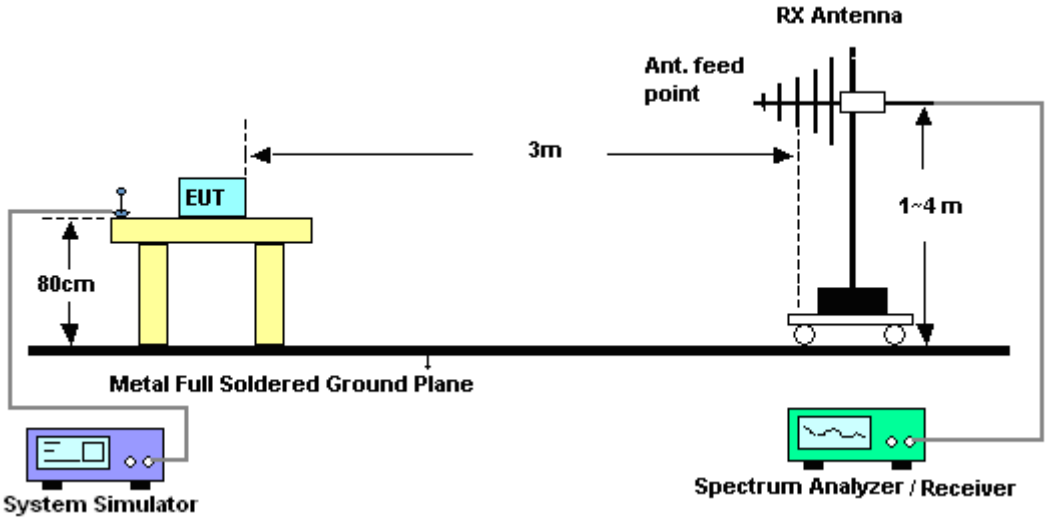
    = P(W) - [43 + 10log(P)] (dB)

    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)

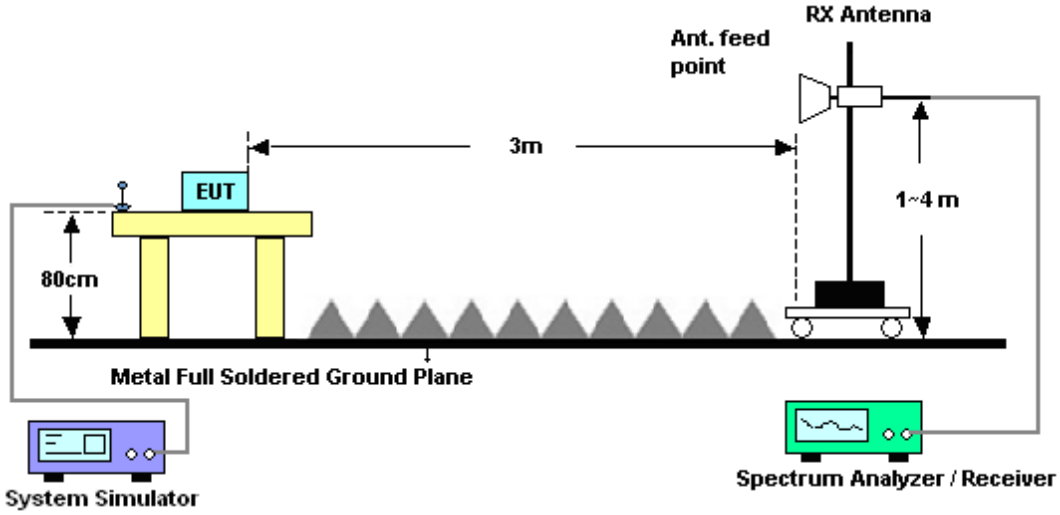
    = -13dBm.

3.7.4 Test Setup

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.7.5 Test Result of Field Strength of Spurious Radiated

Band :	GSM850 for CH128	**Temperature :**	20~22°C
Test Mode :	GSM Link (GMSK)	**Relative Humidity :**	46~48%
Test Engineer :	Lewis He	**Polarization :**	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1651	-47.46	-13	-34.46	-57.15	-49.21	0.98	4.88	H	Pass
2476	-51.12	-13	-38.12	-64.11	-53.01	1.28	5.33	H	Pass
3301	-59.00	-13	-46.00	-75.46	-62.43	1.54	7.12	H	Pass

Band :	GSM850 for CH128	**Temperature :**	20~22°C
Test Mode :	GSM Link (GMSK)	**Relative Humidity :**	46~48%
Test Engineer :	Lewis He	**Polarization :**	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1651	-55.37	-13	-42.37	-62.83	-57.12	0.98	4.88	V	Pass
2476	-53.48	-13	-40.48	-68.63	-55.37	1.28	5.33	V	Pass
3295	-61.66	-13	-48.66	-77.16	-65.07	1.54	7.10	V	Pass

Band :	GSM850 for CH189	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1675	-47.28	-13	-34.28	-56.39	-48.95	0.99	4.81	H	Pass
2512	-47.41	-13	-34.41	-61.08	-49.38	1.29	5.41	H	Pass
3349	-58.23	-13	-45.23	-74.49	-61.86	1.56	7.34	H	Pass

Band :	GSM850 for CH189	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1675	-58.61	-13	-45.61	-65.73	-60.28	0.99	4.81	V	Pass
2512	-48.24	-13	-35.24	-63.43	-50.21	1.29	5.41	V	Pass
3349	-61.45	-13	-48.45	-76.82	-65.08	1.56	7.34	V	Pass

Band :	GSM850 for CH251	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1702	-47.70	-13	-34.70	-56.85	-49.28	1.00	4.73	H	Pass
2548	-51.49	-13	-38.49	-65.54	-53.47	1.31	5.44	H	Pass
3391	-61.09	-13	-48.09	-77.45	-64.89	1.57	7.52	H	Pass

Band :	GSM850 for CH251	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1702	-57.67	-13	-44.67	-65	-59.25	1.00	4.73	V	Pass
2548	-51.66	-13	-38.66	-66.69	-53.64	1.31	5.44	V	Pass
3391	-61.36	-13	-48.36	-77.31	-65.16	1.57	7.52	V	Pass

Band :	GSM1900 for CH512	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3704	-55.42	-13	-42.42	-74.05	-62	1.67	8.24	H	Pass
5556	-48.62	-13	-35.62	-72.3	-55.69	2.66	9.72	H	Pass
7408	-48.70	-13	-35.70	-77.19	-57.86	2.46	11.62	H	Pass

Band :	GSM1900 for CH512	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3704	-56.17	-13	-43.17	-74.55	-62.75	1.67	8.24	V	Pass
5556	-52.19	-13	-39.19	-74.36	-59.26	2.66	9.72	V	Pass
7408	-49.15	-13	-36.15	-77.32	-58.31	2.46	11.62	V	Pass

Band :	GSM1900 for CH661	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3764	-53.04	-13	-40.04	-72.76	-59.67	1.69	8.32	H	Pass
5644	-46.70	-13	-33.70	-70.47	-53.75	2.71	9.76	H	Pass
7524	-48.23	-13	-35.23	-77.14	-57.62	2.42	11.81	H	Pass

Band :	GSM1900 for CH661	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3764	-56.18	-13	-43.18	-74.63	-62.81	1.69	8.32	V	Pass
5644	-50.69	-13	-37.69	-72.94	-57.74	2.71	9.76	V	Pass
7524	-49.35	-13	-36.35	-77.31	-58.74	2.42	11.81	V	Pass

Band :	GSM1900 for CH810	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3824	-53.53	-13	-40.53	-73.17	-60.21	1.71	8.39	H	Pass
5732	-51.31	-13	-38.31	-75.42	-58.34	2.76	9.79	H	Pass
7640	-48.53	-13	-35.53	-77.1	-58.03	2.38	11.88	H	Pass

Band :	GSM1900 for CH810	Temperature :	20~22°C
Test Mode :	GSM Link (GMSK)	Relative Humidity :	46~48%
Test Engineer :	Lewis He	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3824	-56.17	-13	-43.17	-74.7	-62.85	1.71	8.39	V	Pass
5732	-52.34	-13	-39.34	-75.93	-59.37	2.76	9.79	V	Pass
7640	-49.39	-13	-36.39	-77.22	-58.89	2.38	11.88	V	Pass

3.8 Frequency Stability Measurement

3.8.1 Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

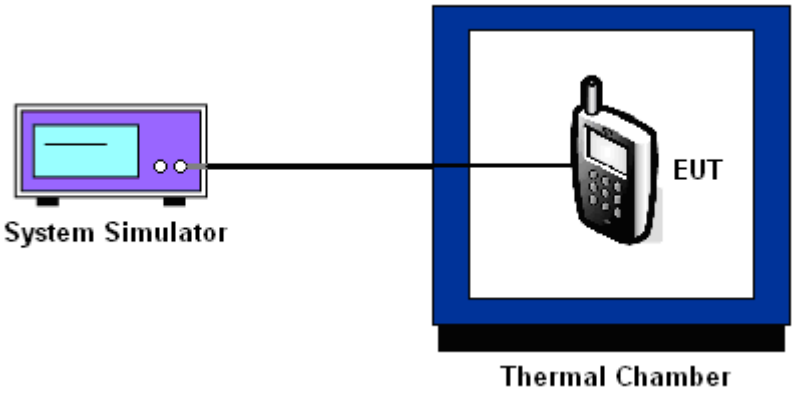
3.8.3 Test Procedures for Temperature Variation

1. The testing follows FCC KDB 971168 v02r02 Section 9.0.
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C steps up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.8.4 Test Procedures for Voltage Variation

1. The testing follows FCC KDB 971168 v02r02 Section 9.0.
2. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator.
3. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.
4. The variation in frequency was measured for the worst case.

3.8.5 Test Setup



3.8.6 Test Result of Temperature Variation

Band :	GSM 850	Channel :	189
Limit (ppm) :	2.5	Frequency :	836.4 MHz

Temperature (°C)	GSM		Result
	Freq. Dev. (Hz)	Deviation (ppm)	
50	-28	0.0215	PASS
40	-26	0.0191	
30	-15	0.0060	
20(Ref.)	-10	0.0000	
10	31	0.0490	
0	18	0.0335	
-10	-19	0.0108	
-20	22	0.0383	
-30	17	0.0323	

Band :	GSM 1900	Channel :	661
Limit (ppm) :	within authorized band	Frequency :	1880.0 MHz

Temperature (°C)	GSM		Result
	Freq. Dev. (Hz)	Deviation (ppm)	
50	29	0.0266	PASS
40	-24	0.0016	
30	27	0.0255	
20 (Ref.)	-21	0.0000	
10	17	0.0202	
0	-16	0.0027	
-10	19	0.0213	
-20	-13	0.0043	
-30	15	0.0191	

Note: The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

3.8.7 Test Result of Voltage Variation

Band & Channel	Mode	Voltage (Volt)	Freq. Dev. (Hz)	Deviation (ppm)	Limit (ppm)	Result
GSM 850 CH189	GSM	4.3	13	0.0275	2.5	PASS
		3.8	-11	0.0012		
		BEP	-9	0.0012		
GSM 1900 CH661	GSM	4.3	-18	0.0016	(Note 3.)	
		3.8	12	0.0176		
		BEP	-25	0.0021		

Note:

1. Normal Voltage = 3.8V.
2. Battery End Point (BEP) = 3.5 V.
3. The frequency fundamental emissions stay within the authorized frequency block based on the frequency deviation measured is small.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Oct. 28, 2014	Apr. 10, 2015~ Apr. 11, 2015	Oct. 27, 2015	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV30	101338	9kHz~30GHz	May 04, 2014	Apr. 10, 2015~ Apr. 11, 2015	May 03, 2015	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	-40~+150°C	Oct. 25, 2014	Apr. 10, 2015~ Apr. 11, 2015	Oct. 24, 2015	Conducted (TH01-KS)
Bilog Antenna	TESEQ	CBL 6111D	35413	30MHz~1GHz	Oct. 24, 2014	Apr. 21, 2015	Oct. 23, 2015	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz ~ 18GHz	Oct. 03, 2014	Apr. 21, 2015	Oct. 02, 2015	Radiation (03CH10-HY)
Hygrometer	TECPEL	DTM-303B	TP140320	N/A	Nov. 17, 2014	Apr. 21, 2015	Nov. 16, 2015	Radiation (03CH10-HY)
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Nov. 24, 2014	Apr. 21, 2015	Nov. 23, 2015	Radiation (03CH10-HY)
Preamplifier	Keysight	83017A	MY53270078	1GHz~26.5GHz	Nov. 20, 2014	Apr. 21, 2015	Nov. 19, 2015	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz ~ 44GHZ	Oct. 14, 2014	Apr. 21, 2015	Oct. 13, 2015	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY249564 MY249524	30MHz~1GHz	Nov. 06, 2014	Apr. 21, 2015	Nov. 05, 2015	Radiation (03CH10-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY249564 MY249524	1GHz~25GHz	Nov. 06, 2014	Apr. 21, 2015	Nov. 05, 2015	Radiation (03CH10-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	NCR	Apr. 21, 2015	NCR	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	NCR	Apr. 21, 2015	NCR	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0-360 degree	NCR	Apr. 21, 2015	NCR	Radiation (03CH10-HY)

Spectrum Analyzer	R&S	FSP 7	100819	9kHz~7GHz	May 04, 2014	Apr. 24, 2015	May 03, 2015	ERP/EIRP (OTA01-KS)
Switch Control Manframe	Agilent	3499A	MY42005452	N/A	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Dual 1-to-6(4) MW MUX	Agilent	N2276A	MY42000841	N/A	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Microwave Switch	Agilent	44476A	MY42002573	N/A	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Microwave Switch	Agilent	44476A	MY42002586	N/A	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Diagonal Dual Polarized Horn	ETS-Lindgren	3164-04	00066993	700MHz~6GHz	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Multi-Devices Controller	ETS-Lindgren	2090-OPT1	00066604	N/A	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Conical Log Spiral (Small)	ETS-Lindgren	3102	00066951	1~10GHz	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Turn Table	ETS-Lindgren	2088	N/A	Resolution : 0.1degree	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Limiting Amplifier	ETS-lindgren	109643	920326	10MHz~2.5GHz	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
EMQuest	ETS-Lindgren	EMQ-100	1125	N/A	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)
Medium Duty Holder	ETS-Lindgren	2015	N/A	N/A	N/A	Apr. 24, 2015	N/A	ERP/EIRP (OTA01-KS)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.9 dB**