

# **TEST REPORT**

of

FCC Part 22 Subpart H, Part 24 Subpart E FCC ID: ZNFLGL25

Equipment Under Test	:	Cellular/PCS GSM/GPRS/EDGE/WCDMA/HSDPA/HSUPA Smart Phone
Model Name	:	LGL25
Applicant	:	LG Electronics MobileComm U.S.A., Inc.
Manufacturer	:	LG Electronics MobileComm U.S.A., Inc.
Date of Test(s)	:	2014.09.23 ~ 2014.10.27
Date of Issue	:	2014.10.30

In the configuration tested, the EUT complied with the standards specified above.

Tested By:	Crzz	Date:	2014.10.30	
	Wonjun Sim			
Approved By:	Mr.	Date:	2014.10.30	
	Hyunchae You			

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# 1. General information

# 1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- Wireless Div. 2FL, 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 435-837 All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <u>http://www.sgs.com/en/Terms-and-Conditions.aspx</u>. Telephone : +82 31 428 5700

FAX : +82 31 427 2370

# 1.2. Details of applicant

Applicant	:	LG Electronics MobileComm U.S.A., Inc.
Address	:	10101 Old Grove Road, San Diego, CA 92131
Contact Person	:	An, Hee-Ju
Phone No.	:	+82 2 2033 1103

# 1.3. Description of EUT

Kind of Product	Cellular/PCS GSM/GPRS/EDGE/WCDMA/HSDPA/HSUPA Smart Phone
Model Name	LGL25
Power Supply	DC 3.8 V
	GSM850: 33.0 dB m
Rated Power	GSM1900: 30.0 dB m
	WCDMA850: 23.7 dB m
	GSM850: 824.2 Mz ~ 848.8 Mz
Frequency Range	GSM1900: 1 850.2 Mb ~ 1 909.8 Mb
	WCDMA850: 826.4 Mtz ~ 846.6 Mtz
Class of GPRS	Class 12, Class B
	GSM850: 247KGXW
Emission Designator	GSM1900: 247KGXW



## **1.4. Sample calculation for offset**

Where relevant, the following sample calculation is provided:

#### 1.4.1. Conducted test

Offset value (dB) = Directional Coupler (dB) + Attenuator (dB) + Cable loss (dB)

#### 1.4.2. Radiation test

E.R.P. & E.I.R.P. = [S.G level + Amp.](dB m) - Cable loss(dB) + Ant. gain (dB d/dB i)

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# 1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Signal Generator	R&S	SMBV100A	259067	Jun. 25, 2014	Annual	Jun. 25, 2015
Signal Generator	R&S	SMR40	100272	Jul. 18, 2014	Annual	Jul. 18, 2015
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 24, 2014	Annual	Sep. 24, 2015
Mobile Test Unit	R&S	CMW500	144035	Mar. 03, 2014	Annual	Mar. 03, 2015
Directional Coupler	KRYTAR	152613	122661	Mar. 18, 2014	Annual	Mar. 18, 2015
Temperature Chamber	ESPEC CORP.	SH-662	93000533	Jun. 26, 2014	Annual	Jun. 26, 2015
Low Pass Filter	Mini circuits	NLP-1200+	V 8979400903-2	Mar. 21, 2014	Annual	Mar. 21, 2015
High Pass Filter	Wainwright	WHK3.0/18G-6SS	4	Jul. 02, 2014	Annual	Jul. 02, 2015
High Pass Filter	Wainwright	WHK1.5/15G-6SS	4	Mar. 18, 2014	Annual	Mar. 18, 2015
High Pass Filter	Wainwright	WHK7.5/26.5G-6SS	15	Jun. 10, 2014	Annual	Jun. 10, 2015
DC Power Supply	Agilent	U8002A	MY49030063	Dec. 12, 2013	Annual	Dec. 12, 2014
Preamplifier	H.P.	8447D	2944A07087	Jan. 06, 2014	Annual	Jan. 06, 2015
Preamplifier	R&S	SCU 18	10117	Jan. 14, 2014	Annual	Jan. 14, 2015
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	Apr. 28, 2014	Annual	Apr. 28, 2015
Test Receiver	R&S	ESU26	100109	Mar. 04, 2014	Annual	Mar. 04, 2015
Bilog Antenna	SCHWARZBECK	VULB9163	396	Jun. 07, 2013	Biennial	Jun. 07, 2015
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170431	May 15, 2014	Biennial	May 15, 2016
Horn Antenna	R&S	HF906	100326	Dec. 10, 2013	Biennial	Dec. 10, 2015
Dipole Antenna	SCHWARZBECK MESSELEKTRONIK	VHA 9103	9103-2817	May 09, 2013	Biennial	May 09, 2015
Dipole Antenna	SCHWARZBECK MESSELEKTRONIK	UHA 9105	9105-2514	May 09, 2013	Biennial	May 09, 2015
Antenna Master	INNCO	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INNCO	DS 1200S	N/A	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.4 m)	N/A	N.C.R.	N/A	N.C.R.



# 1.6. Summary of test results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 22, 24						
Section in FCC part	Section in FCC part Test Item					
§22.913(a)(2) §24.232(c)	RF Radiated Output Power	Complied				
§2.1053 §22.917(a) §24.238(a)	Spurious Radiated Emission	Complied				
§2.1046	Conducted Output Power	See SAR Report				
§2.1049	Occupied Bandwidth	Complied				
§24.232(d)	Peak-Average Ratio	Complied				
§2.1051 §22.917(a) §24.238(a)	Spurious Emission at Antenna Terminal	Complied				
§2.1055 §22.355 §24.235	Frequency Stability	Complied				
§22.917(a) §24.238(a)	Band Edge	Complied				

# 1.7. Test report revision

Revision	Report number	Date of Issue	Description	
0	F690501/RF-RTL008120	2014.10.30	Initial	

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# 2. RF radiated output power & spurious radiated emission

# 2.1. Test setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 Mz to 1 Gz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 20 GHz Emissions.



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The diagram below shows the test setup for substituted method.



#### 2.1.1 Actual equipment used for RF radiated output power & spurious radiated emission

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Signal Generator	R&S	SMBV100A	259067	Jun. 25, 2014	Annual	Jun. 25, 2015
Signal Generator	R&S	SMR40	100272	Jul. 18, 2014	Annual	Jul. 18, 2015
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 24, 2014	Annual	Sep. 24, 2015
Mobile Test Unit	R&S	CMW500	144035	Mar. 03, 2014	Annual	Mar. 03, 2015
Low Pass Filter	Mini circuits	NLP-1200+	V 8979400903-2	Mar. 21, 2014	Annual	Mar. 21, 2015
High Pass Filter	Wainwright	WHK3.0/18G-6SS	4	Jul. 02, 2014	Annual	Jul. 02, 2015
High Pass Filter	Wainwright	WHK1.5/15G-6SS	4	Mar. 18, 2014	Annual	Mar. 18, 2015
High Pass Filter	Wainwright	WHK7.5/26.5G-6SS	15	Jun. 10, 2014	Annual	Jun. 10, 2015
Preamplifier	H.P.	8447D	2944A07087	Jan. 06, 2014	Annual	Jan. 06, 2015
Preamplifier	R&S	SCU 18	10117	Jan. 14, 2014	Annual	Jan. 14, 2015
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	Apr. 28, 2014	Annual	Apr. 28, 2015
Test Receiver	R&S	ESU26	100109	Mar. 04, 2014	Annual	Mar. 04, 2015
Bilog Antenna	SCHWARZBECK	VULB9163	396	Jun. 07, 2013	Biennial	Jun. 07, 2015
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170431	May 15, 2014	Biennial	May 15, 2016
Horn Antenna	R&S	HF906	100326	Dec. 10, 2013	Biennial	Dec. 10, 2015
Dipole Antenna	SCHWARZBECK MESSELEKTRONIK	VHA 9103	9103-2817	May 09, 2013	Biennial	May 09, 2015
Dipole Antenna	SCHWARZBECK MESSELEKTRONIK	UHA 9105	9105-2514	May 09, 2013	Biennial	May 09, 2015
Antenna Master	INNCO	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INNCO	DS 1200S	N/A	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.4 m)	N/A	N.C.R.	N/A	N.C.R.

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# 2.2. Limit

#### 2.2.1. Limit of radiated output power

FCC §22.913(a)(2), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts. FCC §24.232(c), Mobile and portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

#### 2.2.2. Limit of spurious radiated emission

FCC §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10\log(P)$  dB. FCC §24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10\log(P)$  dB.

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## 2.3. Test procedure

The test follows section 5.2.1, 5.8 of FCC KDB Publication 971168\_v02r01, section 2.2.17, 2.2.12 of ANSI/TIA-603-C-2004

- 1. On a test site, the EUT shall be placed at 80cm height on a turn table, and in the position close to normal use as declared by the applicant.
- 2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
- 3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
- 4. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions occupied bandwidth, a RMS detector, RBW = 100 kHz, VBW = 300

kHz and 1 second sweep time over a minimum of 10 sweeps, per the guideline of KDB 971168

- 5. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
- 7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- 8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
- 9. The maximum signal level detected by the measuring receiver shall be noted.
- 10. The EUT was replaced by half-wave dipole (1 GHz below) or horn antenna (1 GHz above) connected to a signal generator.
- 11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- 12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
- 13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring received, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
- 14. The input level to the substitution antenna shall be recorded as power level in dB m, corrected for any change of input attenuator setting of the measuring receiver.
- 15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.



# 2.4. Test result for RF radiated output power

Ambient temperature	:	(24	± 1) ℃
Relative humidity	:	47	% R.H.

#### **GSM850**

Frequency Ant. Pol. S.G level Cable loss	Ant. gain	E.R.P.				
(MHZ)	(H/V)	(dB m)	(dB)	(dB d)	(dB m)	(mW)
824.2	V	32.06	3.28	-0.95	27.83	606.40
824.2	Н	29.94	3.28	-0.95	25.71	372.02
836.6	V	32.05	3.31	-0.95	27.79	601.32
836.6	Н	32.61	3.31	-0.95	28.35	683.50
848.8	V	34.13	3.35	-0.94	29.84	963.08
848.8	Н	37.47	3.35	-0.94	33.18	2080.30

#### GSM850 (EDGE)

Frequency	Frequency Ant. Pol. (Mz) (H/V)	S.G level	Cable loss (dB)	Ant. gain (dB d)	E.R.P.		
(MHz)		(dB m)			(dB m)	(mW)	
848.80	V	31.79	3.35	-0.94	27.50	561.90	
848.80	Н	37.11	3.35	-0.94	32.82	1914.82	

#### GSM1900

Frequency	Ant. Pol.	S.G level + Amp.	Cable loss	able loss Ant. gain		R.P.
(MHZ)	(H/V)	(dB m)	(dB)	(dB I)	(dB m)	(mW)
1 850.2	V	11.14	5.90	7.88	13.12	20.51
1 850.2	Н	18.70	5.90	7.88	20.68	117.00
1 880.0	V	15.27	5.83	7.86	17.30	53.65
1 880.0	Н	22.91	5.83	7.86	24.94	311.74
1 909.8	V	18.09	5.77	7.84	20.16	103.86
1 909.8	Н	27.78	5.77	7.84	29.85	966.19

#### GSM1900 (EDGE)

Frequency Ant. Pol. S.G level Cable loss		Ant. gain	E.F	R.P.		
(MHz)	(H/V)	(dB m)	(dB)	(dB <b>d</b> )	(dB m)	(mW)
1909.80	V	18.18	5.77	7.84	20.25	106.03
1909.80	Н	27.57	5.77	7.84	29.64	920.58

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Frequency	Ant. Pol.	S.G level + Amp.	Cable loss	Ant. gain	E.f	R.P.
(M1Z)	(H/V)	(dB m)	(GB)	(ar a)	(dB m)	(mW)
826.4	V	21.77	3.28	-0.95	17.54	56.70
826.4	Н	22.47	3.28	-0.95	18.24	66.61
836.6	V	22.35	3.31	-0.95	18.09	64.37
836.6	Н	24.82	3.31	-0.95	20.56	113.69
846.6	V	23.07	3.35	-0.94	18.78	75.44
846.6	Н	27.31	3.35	-0.94	23.02	200.22

Remark:

1. E.R.P. & E.I.R.P. = [S.G level + Amp.](dB m) - Cable loss(dB) + Ant. gain (dB d/dB i)

2. This device was tested under all configurations and highest power is reported in GSM voice mode and WCDMA RMC mode at 12.2kbps.

3. The E.R.P. & E.I.R.P. was measured in three orthogonal EUT position(x-axis, y-axis and z-axis). Worst cases are y-axis for GSM850/WCDMA850 and GSM1900.

4. The data reported in the table above was measured in worst case.



# 2.5. Spurious radiated emission

- Measured output Power: 33.18 dB m = 2.08 W
- Modulation Signal: GSM850
- Distance: 3 meters
- Limit:  $43 + 10\log_{10}(W) = 46.18$  dB c

Frequency (Mt)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P. (dB m)	dB c	Margin (dB)	
Low Channe	el (824.2 MHz)							
1 648.56	V	-49.67	5.92	7.93	-47.66	80.84	34.66	
1 648.43	Н	-52.35	5.92	7.93	-50.34	83.52	37.34	
2 472.58	V	-40.42	5.80	8.91	-37.31	70.49	24.31	
2 472.74	Н	-29.44	5.80	8.91	-26.33	59.51	13.33	
Middle Chan	Middle Channel (836.4 Mz)							
1 673.98	V	-48.68	6.01	7.93	-46.76	79.94	33.76	
1 673.17	Н	-52.18	6.01	7.93	-50.26	83.44	37.26	
2 509.49	V	-38.87	5.86	8.98	-35.75	68.93	22.75	
2 509.76	Н	-29.68	5.86	8.98	-26.56	59.74	13.56	
High Channe	el (848.8 MHz)							
1 697.68	V	-47.68	6.09	7.93	-45.84	79.02	32.84	
1 697.55	Н	-52.32	6.09	7.93	-50.48	83.66	37.48	
2 546.38	V	-37.84	5.93	9.00	-34.77	67.95	21.77	
2 546.54	Н	-30.09	5.93	9.00	-27.02	60.20	14.02	

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- Measured output Power: 29.85 dB m = 0.97 W

- Modulation Signal: GSM1900
- Distance: 3 meters

- Limit:  $43 + 10\log_{10}(W) = 42.87 \text{ dB c}$ 

Frequency (Mt)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB i)	E.I.R.P. (dB m)	dB c	Margin (dB)
Low Channe	l(1 850.2 MHz)						
5550.48	V	-34.27	9.10	10.45	-32.92	62.77	19.90
5550.63	Н	-32.97	9.11	10.45	-31.63	61.48	18.61
Middle Chan	nel(1 880.0 M	Hz)					
5640.03	V	-35.50	9.15	10.55	-34.10	63.95	21.08
5640.76	Н	-33.36	9.15	10.55	-31.96	61.81	18.94
High Channel(1 909.8 Mz)							
5729.22	V	-35.23	9.23	10.64	-33.82	63.67	20.80
5729.38	Н	-31.32	9.23	10.64	-29.91	59.76	16.89



- Measured output Power: 23.02 dB m = 0.20 W

- Modulation Signal: WCDMA850
- Distance: 3 meters
- Limit:  $43 + 10\log_{10}(W) = 36.01 \text{ dB c}$

Frequency (Mt/2)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P. (dB m)	dB c	Margin (dB)		
Low Channe	el (826.4 MHz)								
1 652.71	V	-40.35	5.93	7.93	-38.35	61.37	25.36		
1 682.94	Н	-44.50	6.04	7.93	-42.61	65.63	29.62		
2 479.18	V	-46.88	5.81	8.93	-43.76	66.78	30.77		
2 479.36	Н	-37.82	5.81	8.93	-34.70	57.72	21.71		
3 305.48	V	-48.27	7.48	9.08	-46.67	69.69	33.68		
3 305.61	Н	-38.44	7.48	9.08	-36.84	59.86	23.85		
Middle Chan	Middle Channel (836.6 Mtz)								
1 673.18	V	-46.71	6.01	7.93	-44.79	67.81	31.80		
1 673.24	Н	-49.19	6.01	7.93	-47.27	70.29	34.28		
2 509.75	V	-45.49	5.86	8.98	-42.37	65.39	29.38		
2 509.83	Н	-38.68	5.86	8.98	-35.56	58.58	22.57		
3 346.46	V	-46.92	7.54	9.06	-45.40	68.42	32.41		
3 346.47	Н	-37.12	7.54	9.06	-35.60	58.62	22.61		
High Channe	el (846.6 M±)								
1 693.36	V	-47.88	6.08	7.93	-46.03	69.05	33.04		
1 693.47	Н	-47.03	6.08	7.93	-45.18	68.20	32.19		
2 539.67	V	-42.44	5.91	9.00	-39.35	62.37	26.36		
2 539.77	Н	-38.33	5.91	9.00	-35.24	58.26	22.25		
3 394.41	V	-47.51	7.61	9.03	-46.09	69.11	33.10		
3 394.26	Н	-35.67	7.61	9.03	-34.25	57.27	21.26		

#### Remark:

1. E.R.P. & E.I.R.P. = [S.G level + Amp.](dB m) - Cable loss(dB) + Ant. gain (dB d/dB i)

2. This device was tested under all configurations and highest power is reported in GSM voice mode and WCDMA RMC mode at 12.2kbps.

3. The E.R.P. & E.I.R.P. was measured in three orthogonal EUT position(x-axis, y-axis and z-axis). Worst cases are y-axis for GSM850/WCDMA850 and GSM1900.

4. The data reported in the table above was measured in worst case.



# 3. Occupied Bandwidth 99 %

## 3.1. Limit

Requirements: CFR 47, Section §2.1049.

## 3.2. Test Procedure

The test follows section 4.2 of FCC KDB Publication 971168\_v02r01.

- 1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
- 2. The spectrum analyzer's automatic bandwidth measurement capability was used to perform the 99 % occupied bandwidth.



#### 3.2.1 Actual equipment used for Occupied Bandwidth 99 %

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 24, 2014	Annual	Sep. 24, 2015
Mobile Test Unit	R&S	CMW500	144035	Mar. 03, 2014	Annual	Mar. 03, 2015
Directional Coupler	KRYTAR	152613	122661	Mar. 18, 2014	Annual	Mar. 18, 2015
DC Power Supply	Agilent	U8002A	MY49030063	Dec. 12, 2013	Annual	Dec. 12, 2014



# 3.3 Test Results

Ambient temperature	:	(24	± 1) ℃
Relative humidity	:	47	% R.H.

Band	Mode	Frequency (Mz)	Occupied Bandwidth (Mz)
	0.014	824.2	0.244
CSM950	Unice Voice	836.6	0.247
GSIMODU	VOICE	848.8	0.246
	EDGE	848.8	0.245
	0.014	1 850.2	0.247
CSM1000	GSM	1 880.0	0.246
G21011900	VOICE	1 909.8	0.245
	EDGE	1 909.8	0.246
WCDMA850	10.0 khao	826.4	4.182
	12.2 KDps	836.6	4.163
		846.6	4.169

Please refer to the following plots.



#### GSM850

99 % Low Channel



#### Middle Channel



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#### High Channel



#### **GSM850 EDGE** 99 % High Channel



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#### GSM1900

99 % Low Channel





#### Middle Channel

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#### High Channel



#### **GSM1900 EDGE** 99 % Low Channel



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#### WCDMA850

99 % Low Channel



#### Middle Channel



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High Channel





# 4. Peak-Average Ratio

# 4.1. Limit

§24.232(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

# 4.2. Test Procedure

The test follows section 5.7.1 of FCC KDB Publication 971168\_v02r01.

- 1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
- 2. The CCDF function of the spectrum analyzer was set.
- 3. PAR was measured with spectrum analyzer for each channel.



#### 4.2.1 Actual equipment used for Peak-Average Ratio

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 24, 2014	Annual	Sep. 24, 2015
Mobile Test Unit	R&S	CMW500	144035	Mar. 03, 2014	Annual	Mar. 03, 2015
Directional Coupler	KRYTAR	152613	122661	Mar. 18, 2014	Annual	Mar. 18, 2015
DC Power Supply	Agilent	U8002A	MY49030063	Dec. 12, 2013	Annual	Dec. 12, 2014



# 4.3 Test Results

Ambient temperature	:	(24	± 1) °C
Relative humidity	:	47	% R.H.

Please refer to the following plots.

Band	Mode	Frequency (Mz)	PAR (dB)
	0014	1 850.2	0.51
GSM1900	GSM Voice	1 880.0	0.52
	VOICE	1 909.8	0.52
	EDGE	1 909.8	0.31



Peak-Average Ratio GSM1900

Low Channel



#### Middle Channel



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#### High Channel



# GSM1900 EDGE

Low Channel



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# 5. Spurious Emissions at Antenna Terminal

# 5.1. Limit

FCC 22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

FCC 24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

# 5.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168\_v02r01.

- 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 1 Mz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



#### 5.2.1 Actual equipment used for Peak-Average Ratio

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Signal Generator	R&S	SMBV100A	259067	Jun. 25, 2014	Annual	Jun. 25, 2015
Signal Generator	R&S	SMR40	100272	Jul. 18, 2014	Annual	Jul. 18, 2015
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 24, 2014	Annual	Sep. 24, 2015
Mobile Test Unit	R&S	CMW500	144035	Mar. 03, 2014	Annual	Mar. 03, 2015
Directional Coupler	KRYTAR	152613	122661	Mar. 18, 2014	Annual	Mar. 18, 2015
DC Power Supply	Agilent	U8002A	MY49030063	Dec. 12, 2013	Annual	Dec. 12, 2014

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# 5.3. Test Results

Ambient temperature	:	(24 :	± 1) ℃
Relative humidity	:	47	% R.H.

Please refer to the following plots.

#### GSM850

Low Channel





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Middle Channel



Agilen	nt Spectr	um Analyzer -	Swept SA								
I <mark>XI</mark> Mar	kor 1	RF 50	027500	CORREC	SEI	VSE:INT	Ava Type	ALIGNAUT	0 02:02:19P	M Sep 29, 2014	Peak Search
War	Kell I	5.022065	937300	PN0: Fast G	Trig: Fre	Run			TY		
	-			IFGain:Low	Atten: 40	dB					Next Peak
		B-6.00.0						IAI	KF1 5.022	69 GHZ 43 dBm	inoviti outi
10 dE Log I	B/div	Ref 30.0	U dBm		1	1			-21.	45 UBIII	
20.0											Next Pk Right
10.0											
											Next Pk Left
0.00											
40.0											
-10.0										-13.00 dBm	Marker Delta
.20.0											
20.0				the barry of the	Lange and the second	and the state of the second	dianal partie	-	on the approximation of the	and song probably	
-30.0	a Ludem	the pleased	an a	Congress of the second s	and the states of the second	- AND	فتكلوا ومحاذ وحطافا أد	National States	فالأربيا وحالقاني للالتك	a de la seconda de la secon	
	a la strange	Andreas and a state of the st									Mkr→CF
-40.0											
-50.0	<u> </u>										Mkr→RefLvl
-60.0											
											More
Star	t 850	MHz							Stop 10	.000 GHz	1 of 2
#Re	s BW	1.0 MHz		#VBW	/ 3.0 MHz		S	weep	17.07 ms (3	2001 pts)	
MSG								<b>I</b> ost∕	ATUS		

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High Channel



Agilen	t Spectr	um Analyze	r - Swept S	A									
L <mark>XI</mark>		RF	50 Q DC	CORRE	EC	SEN	VSE:INT	Aug Tree	ALIGN AU	TO	02:06:01P	M Sep 29, 2014	Trace/Detector
Mari	ker 1	6.3820	328125	DU GHZ	L East (	Trig: Free	Run	Avgiyp	e: Log-P	wr	TYI		
				IFGa	in:Low	Atten: 40	dB				D	A NNNNN	Select Trace
									N	lkr1	6.382	03 GHz	
10 dE	8/div	Ref 30	.00 dBm	n							-21.3	56 dBm	
Log													
													<b>a 1 1 1 1</b>
20.0													Clear write
10.0													
													Trace Average
0.00													Trace Average
10.0													
-10.0												-13.00 dBm	Max Hold
								<u> </u> 1					Maxilola
-20.0				L.	illent	andaunan I	. databi	بر برابليد	بياهي بالع	ر بىلىمى ا	للالمن التصلا	telement and a state	
			فيرو بالسورين	a state of the sta	and finite a	and a state of the second	and the second	and the second s	in a set if the	س بعاقد	Sector and the	LANDING CONTRACTOR	
-30.0	وموطيليه	A CONTRACTOR	العربة: والتصمين	and the second	1441.01								Min Hold
	Arthurtheater												
-40.0													
													Minus Diamis
-50.0													View Blank
													view
-60.0													
													More
													1 012
Star	t 850	MHz									Stop 10	.000 GHz	1013
#Res	s BW	1.0 MHz			#VBW	1 3.0 MHz		5	Sweep	17.0	7 ms (3	2001 pts)	
MSG									🚺 ст	ATUS			

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GSM1900

Low Channel



Agilent Spe	ctrum Analyzer - Swept SA						
<mark>(X)</mark> Markor	RF 50 Ω DC		SENSE:INT	AL Ava Type: I		02:43:34 PM Sep 29, 2	Peak Search
Marker	1 19.1793750000	PNO: Fast	Trig: Free Run	Avg type.t	-0g-r wi	TYPE MUMANA	
		IFGain:Low	Atten: 40 dB			DEL	Noxt Boal
					Mkr	1 19.179 4 GI	Z
10 dB/div	Ref 30.00 dBm					-16.90 dB	sm
-°9							
20.0							Next Pk Righ
20.0							
10.0							
							Next Dist. of
0.00							Next PK Lei
-10.0							
							Marker Delt
-20.0			the state		mental leaded	alore politor allocation	tiyoo.
- Real	ferrent seren fregerik self findage	Contraction of Contractor	regeneration of the second	energine met dafe	يط معددين ماد.	and the second	inter -
-30.0	أمكلمهم والأحدود والتروية والعراقات	alitication and a state of the					
							Mkr→C
-40.0							
-50.0							Mkr→RefLy
-60.0							
							Mon
							1 of
Start 10		#\/B\//		C1M	een 17	Stop 20.000 GI	
writes Di		#VBVV	5.0 WH12	3₩		or ins (52001 p	
MSG					STATUS		

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Middle Channel



Agilent	: Spectru	ım Analyzer	- Swept SA								
<mark>IXI</mark> Morik	or 1	RF 1	50 Ω DC		SEN	ISE:INT	Ava Type	ALIGNAUT	0 02:45:22P	M Sep 29, 2014	Peak Search
Wall	(er i	19.0909	3730000	PNO: Fast G	Trig: Free	Run			TYP		
	_			IFGain:Low	Atten: 40	dB					Next Peak
		-						IVI	KF1 19.89	61 dBm	
10 dB Log r	div	Ref 30.0	JU dBm						-17.	or ubiii	
20.0											Next Pk Right
10.0											
											Next Pk Left
0.00											
-10.0										-13.00 c 🚹	Markor Dolta
20.0								Laura	فللموا وفي والدروان	المرابعة والاستقلال	Marker Della
-20.0	երերերն	والاستحدادي والم	Aller and the	Athen elliphone	a Marine a substant	Hario Way and	a na	Marine Lan	and a second solution of the second	and the station is not	
.30.0	بالالعصاء		فحطا فتحج ورتا فالحيا	in the second states of the	ومواردا والمأطل ألار المر	ide his contribution	Contract Difference of	u <sup>tar</sup> tar	Helder Lange 1		
30.0											Mkr→CF
-40.0											
-50.0											Mkr→RefLvl
-60.0											
											More
Start	10.00	00 GHz							Stop 20	.000 GHz	1 of 2
#Res	BW	1.0 MHz		#VBW	3.0 MHz		S	weep	17.07 ms (3	2001 pts)	
MSG								I STA	TUS		

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High Channel



Agilent S	Spectrum	Analyzer -	Swept SA								
<mark>(XI</mark> Markø	ar 1 1	RF 50	250000		SEN	JSE:INT	Ava Type	ALIGNAUT	0 04:35:07	PM Sep 29, 2014	Peak Search
meente		0.00130	200000	PNO: Fast	Trig: Free	Run			T		
				IFGain:LUW	Accent 40	40		M	kr1 18 86	1.6 GHz	Next Peak
10 dB/c	div	Ref 30.00	dBm						-15.0	18 dBm	
Log											
20.0											Next Pk Right
20.0											
10.0											
											Next Pk Left
0.00											
10.0											
-10.0										-13.00 dBm	Marker Delta
-20.0	de Indonesia		and the second		MAN Margan	montenentiale	. Anthenium	a fina ana	and proto positi	le te the second study for some	
	and put shakes	all dates to do no	والطامتان ورالحام	in a state of the second	n an	a désident dé la se	deinte de la constante de la c	positel tag	and the second	<ul> <li>I.I. Inc. adds to a</li> </ul>	
-30.0											Mkr→CF
-40.0											
-50.0											Mkr→RefLvl
-60.0											
											More
Start	10.000	GHz							Stop 2	0.000 GHz	1 of 2
#Res	BW 1.	0 MHz		#VBW	3.0 MHz		s	weep	17.07 ms (	32001 pts)	
MSG								Io ST∕	ATUS		

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WCDMA850

Low Channel



#### Middle Channel



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High Channel





# 6. Band Edge

# 6.1. Limit

FCC 22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

FCC 24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

# 6.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168\_v02r01.

- 1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
- 2. The center of the spectrum analyzer was set to block edge frequency.



#### 6.2.1 Actual equipment used for Band edge

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Signal Generator	R&S	SMBV100A	259067	Jun. 25, 2014	Annual	Jun. 25, 2015
Signal Generator	R&S	SMR40	100272	Jul. 18, 2014	Annual	Jul. 18, 2015
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 24, 2014	Annual	Sep. 24, 2015
Mobile Test Unit	R&S	CMW500	144035	Mar. 03, 2014	Annual	Mar. 03, 2015
Directional Coupler	KRYTAR	152613	122661	Mar. 18, 2014	Annual	Mar. 18, 2015
DC Power Supply	Agilent	U8002A	MY49030063	Dec. 12, 2013	Annual	Dec. 12, 2014

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# 6.3. Test Results

Ambient temperature	:	(24	± 1) °C
Relative humidity	:	47	% R.H.

Please refer to the following plots.

#### Bandedge\_GSM850

Low Channel



#### High Channel



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#### Bandedge\_GSM1900

#### Low Channel

**High Channel** 



#### arker 1 1.910020000000 GHz Marker Avg Type: Log-Pwr Trig: Free Ru PNO: Wide 😱 FGain:Low DE Select Marker Mkr1 1.910 020 Ref 30.00 dBm -20.05 dBr 10 dB/div Normal Delta **Fixed** Off Properties • Warehouse Verstein Alexand Harmith Holdmark of perfec More 1 of 2 Span 2.000 MHz 1.000 s (1001 pts) Center 1.910000 GHz #Res BW 3.9 kHz #VBW 12 kHz #Sweep Ū,

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#### Bandedge\_WDCMA850

#### Low Channel







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#### 4 MHz span plot\_WCDMA850

#### Low Channel



#### arker 1 850.0000000000 MHz PN0: Wide PN0: Wide Atten: 40 dB Peak Search Avg Type: Log-Pwr TYPE DE1 Next Peak Mkr1 850.000 MH -15.08 dBr Ref 30.00 dBm 10 dB/div Next Pk Right Next Pk Left Marker Delta Mkr→CF Mkr→RefLv More 1 of 2 Span 4.000 MHz #Sweep 1.000 s (1001 pts) Center 852.000 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Ū,

High Channel

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# 7. Frequency Stability

# 7.1. Limit

Requirements: FCC § 2.1055 (a), § 2.1055 (d) & following:

FCC §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table of this section.

For Mobile devices operating in the 824 to 849 Mb band at a power level less than or equal to 3 Watts, the limit specified in Table C-1 is +/- 2.5 ppm.

FCC §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

# 7.2. Test Procedure

The test follows ANSI/TIA-603-C-2004

- 1. Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a Mobile Test Unit via feed-through attenuators.
- 2. The EUT was placed inside the temperature chamber.
- 3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from Mobile Test Unit.



#### 7.2.1 Actual equipment used for Frequency Stability

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Mobile Test Unit	R&S	CMW500	144035	Mar. 03, 2014	Annual	Mar. 03, 2015
DC Power Supply	Agilent	U8002A	MY49030063	Dec. 12, 2013	Annual	Dec. 12, 2014
Temperature Chamber	ESPEC CORP.	SH-662	93000533	Jun. 26, 2014	Annual	Jun. 26, 2015

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# 7.3. Test Results

Ambient temperature	:	(24 =	± 1) ℃
Relative humidity	:	47	% R.H.

# GSM850 mode at middle channel

Reference Frequency: 836.6 Mz, Limit: 2.5 ppm									
Frequency Stability versus Temperature									
Environment	Power	Frequency Measure with Time Elapse							
Temperature (℃)	Supplied (Vdc)	Frequency Error (Hz)	ppm						
50		19	0.021 516						
40		14	0.015 539						
30		9	0.009 563						
24		1	Ref.						
10	3.80	42	0.049 008						
0		13	0.014 344						
-10		8	0.008 367						
-20		26	0.029 883						
-30		23	0.026 297						
	Frequency Stability ve	rsus Power Supply							
Environment	Power	Frequency Measure	with Time Elapse						
Temperature (℃)	Supplied (Vdc)	Frequency Error (Hz)	Ppm						
24	4.37	13	0.014 344						
24	3.05(batt. End point)	16	0.017 930						

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#### GSM1900 mode at middle channel

Reference Frequency: 1 880.0 Mz Frequency Stability versus Temperature				
Frequency Error (Hz)	ppm			
50	3.80	47	0.003 723	
40		43	0.001 596	
30		47	0.003 723	
24		40	Ref.	
10		42	0.001 064	
0		69	0.015 426	
-10		52	0.006 383	
-20		73	0.017 553	
-30		76	0.019 149	
Frequency Stability versus Power Supply				
Environment Temperature (℃)	Power Supplied (Vdc)	Frequency Measure with Time Elapse		
		Frequency Error (Hz)	Ppm	
24	4.37	59	0.010 106	
	3.05(batt. End point)	49	0.004 787	

#### Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured ate very small. As such it is determined that the channels at the band edge would remain in-band When the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested

http://www.sgsgroup.kr A4(210 mm × 297 mm)



#### WCDMA850 mode at middle channel

Reference Frequency: 836.4 Mz, Limit: 2.5 ppm Frequency Stability versus Temperature				
Frequency Error (Hz)	ppm			
50	3.80	2	0.005 978	
40		3	0.002 391	
30		2	0.001 196	
24		1	Ref.	
10		7	0.007 174	
0		2	0.001 196	
-10		-9	-0.011 956	
-20		4	0.003 587	
-30		-2	-0.003 587	
Frequency Stability versus Power Supply				
Environment Temperature (℃)	Power Supplied (Vdc)	Frequency Measure with Time Elapse		
		Frequency Error (Hz)	Ppm	
24	4.37	-5	-0.007 174	
	3.05(batt. End point)	-1	-0.002 391	

#### Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured ate very small. As such it is determined that the channels at the band edge would remain in-band When the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested