

TEST REPORT

of

FCC Part 22 Subpart H

FCC ID: BEJTM01LA-E

Equipment Under Test : Telematics Module
Model Name : TM01LA-E
Applicant : LG Electronics Inc.
Manufacturer : LG Electronics Inc.
Date of Receipt : 2017.04.28
Date of Test(s) : 2017.04.29 ~ 2017.05.02
Date of Issue : 2017.05.04

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

Tested By:


Jungmin Yang

Date:

2017.05.04

Technical
Manager:


Hyunchoe You

Date:

2017.05.04

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

TABLE OF CONTENTS

	Page
1. General Information -----	3
2. RF Radiated Output Power & Spurious Radiated Emission -----	6
3. Conducted Output Power -----	14
4. Occupied Bandwidth -----	16
5. Spurious Emissions at Antenna Terminal -----	24
6. Band Edge -----	31
7. Frequency Stability -----	35

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

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, 15807

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Telephone : +82 31 688 0901

FAX : +82 31 688 0921

1.2. Details of applicant

Applicant : LG Electronics Inc.

Address : 222 LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 17709, Korea

Contact Person : Park, Eui-Soon

Phone No. : +82 2 2033 1110

1.3. Description of EUT

Kind of Product	Telematics Module
Model Name	TM01LA-E
Power Supply	DC 12 V
Rated Power	GSM 850: 33 dB m WCDMA Band 5: 22.5 dB m LTE Band 7: 23.5 dB m
Frequency Range	GSM 850: 824 MHz ~ 849 MHz WCDMA Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2 500 MHz ~ 2 570 MHz
Emission Designator	GSM 850: 242KGXW (Voice) / 246KG7W (EDGE) WCDMA Band 5: 4M17F9W LTE Band 7 (5 MHz): 4M52G7D (QPSK) / 4M52W7D (16QAM) LTE Band 7 (10 MHz): 9M01G7D (QPSK) / 9M02W7D (16QAM) LTE Band 7 (15 MHz): 13M5G7D (QPSK) / 13M5W7D (16QAM) LTE Band 7 (20 MHz): 18M1G7D (QPSK) / 18M1W7D (16QAM)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

1.4. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	Agilent	E8257D	MY51501169	Jul. 07, 2016	Annual	Jul. 07, 2017
Spectrum Analyzer	R&S	FSV30	103100	Jun. 24, 2016	Annual	Jun. 24, 2017
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 23, 2016	Annual	Sep. 23, 2017
Mobile Test Unit	R&S	CMW500	144034	Feb. 28, 2017	Annual	Feb. 28, 2018
Temperature Chamber	ESPEC CORP.	PL-1J	15000793	Jun. 20, 2016	Annual	Jun. 20, 2017
Power Meter	Anritsu	ML2495A	1223004	Jun. 10, 2016	Annual	Jun. 10, 2017
Power Sensor	Anritsu	MA2411B	1207272	Jun. 10, 2016	Annual	Jun. 10, 2017
Directional Coupler	KRYTAR	152613	140972	Jun. 07, 2016	Annual	Jun. 07, 2017
High Pass Filter	Wainwright Instrument GmbH	WHKX10-900-1000-18000-40SS	7	Mar. 30, 2017	Annual	Mar. 30, 2018
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 16, 2017	Annual	Mar. 16, 2018
Preamplifier	H.P.	8447F	2944A03909	Aug. 11, 2016	Annual	Aug. 11, 2017
Preamplifier	R&S	SCU 18	10117	Apr. 08, 2017	Annual	Apr. 08, 2018
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	May 12, 2016	Annual	May 12, 2017
Test Receiver	R&S	ESU26	100109	Feb. 17, 2017	Annual	Feb. 17, 2018
Bilog Antenna	SCHWARZBECK MESSELEKTRONIK	VULB9163	396	Jun. 18, 2015	Biennial	Jun. 18, 2017
Horn Antenna	R&S	HF906	100208	Oct. 21, 2016	Biennial	Oct. 21, 2018
Horn Antenna	SCHWARZBECK MESSELEKTRONIK	BBHA9170	BBHA9170223	Aug. 25, 2016	Biennial	Aug. 25, 2018
Antenna Mast	Innco systems GmbH	MA4640-XP-ET	MA4640/536/38330516/L	N.C.R.	N/A	N.C.R.
Turn Table	Innco systems GmbH	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/38330516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.4 m)	N/A	N.C.R.	N/A	N.C.R.

► Support equipment

Description	Manufacturer	Model	Serial Number
N/A	-	-	-

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

1.5. Summary of test results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 2, 22		
Section	Test Item	Result
§22.913(a)(2)	RF Radiated Output Power	Complied
§22.917(a)	Spurious Radiated Emission	Complied
§2.1046	Conducted Output Power	Complied
§2.1049	Occupied Bandwidth	Complied
§22.917(a)	Spurious Emission at Antenna Terminal	Complied
§22.917(a)	Band Edge	Complied
§2.1055 §22.355	Frequency Stability	Complied

1.6. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL011188	2017.05.02	Initial
1	F690501/RF-RTL011188-1	2017.05.04	Modify test equipment list

1.7. Sample calculation for offset

Where relevant, the following sample calculation is provided:

1.7.1. Conducted test

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

1.7.2. Radiation test

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

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

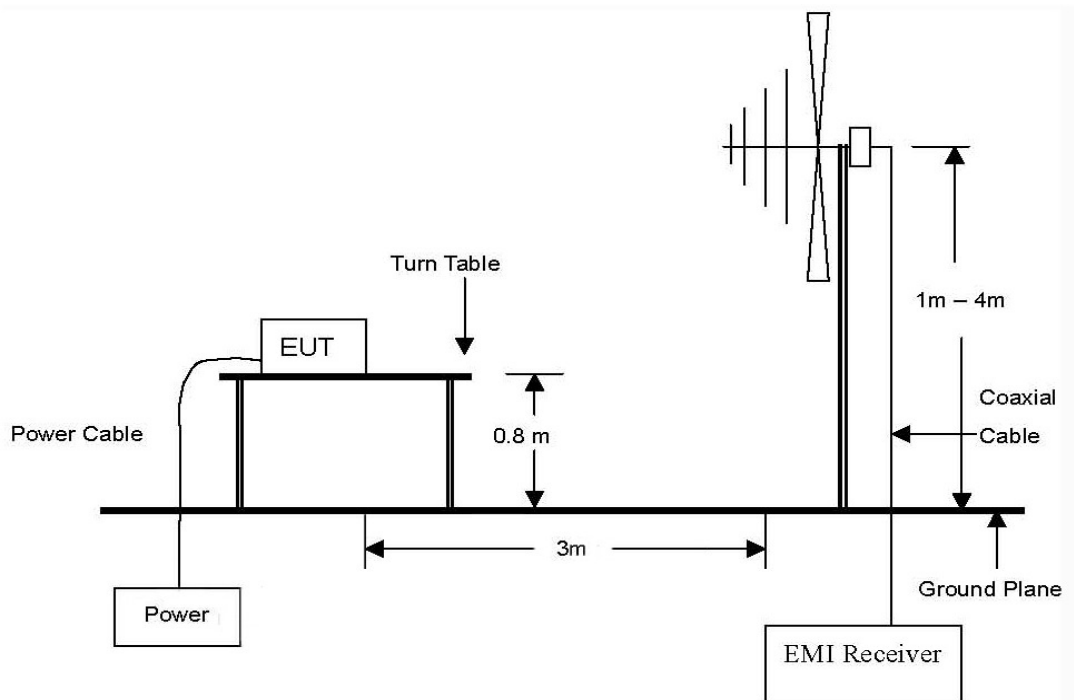
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

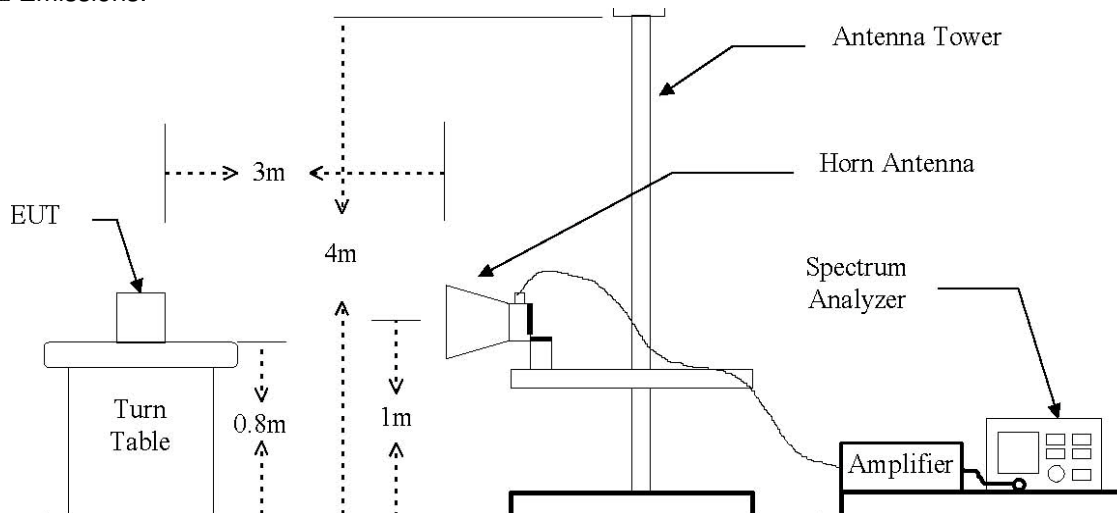
2. RF radiated output power & spurious radiated emission

2.1. Test setup

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



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 9 GHz Emissions.



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

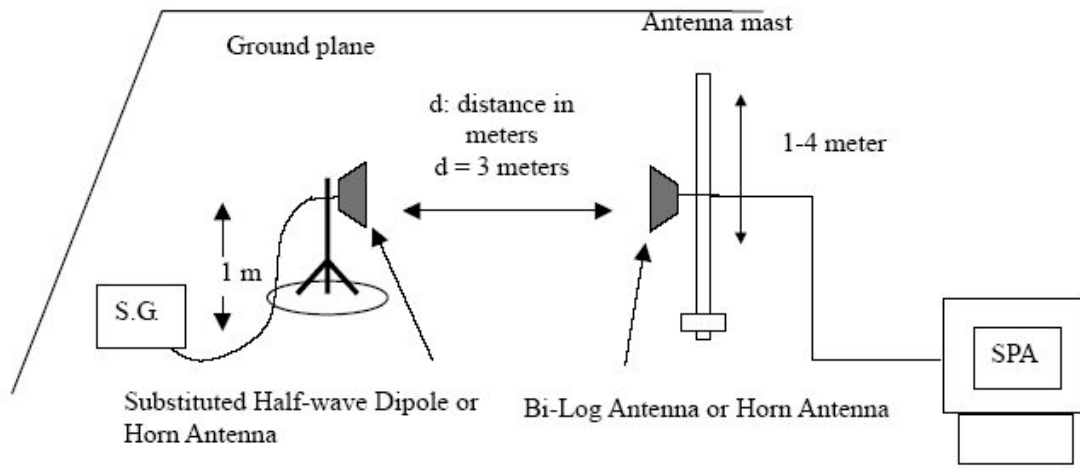
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

The diagram below shows the test setup for substituted method.



2.2. Limit

2.2.1. Limit of radiated output power

- §22.913(a)(2), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

2.2.2. Limit of spurious radiated emission

- §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.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

2.3. Test procedure: Based on ANSI/TIA 603C: 2004

1. On a test site, the EUT shall be placed at 80 cm 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, RBW = 1-5 % of the OBW (not to exceed 1 MHz), VBW $\geq 3 \times$ RBW, Detector = power averaging(rms), sweep time = auto, trace average at least 100 traces in power averaging(RMS) mode, per the guidelines of KDB 971168 D01 v03.
5. Radiated spurious emissions measurement method was set as follows:
RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz, VBW $\geq 3 \times$ RBW, Detector = Peak, trace mode = max hold, per the guidelines of KDB 971168 D01 v03.
6. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
7. 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.
8. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
9. 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.
10. The maximum signal level detected by the measuring receiver shall be noted.
11. The EUT was replaced by half-wave dipole (1 GHz below) or horn antenna (1 GHz above) connected to a signal generator.
12. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, 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.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

2.4. Test result for RF radiated output power

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

GSM 850

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P.	
					(dB m)	(mW)
824.2	V	40.34	3.24	-4.85	32.25	1 678.80
824.2	H	34.77	3.24	-4.85	26.68	465.59
836.6	V	40.37	3.45	-5.14	31.78	1 506.61
836.6	H	35.44	3.45	-5.14	26.85	484.17
848.8	V	39.48	3.52	-4.05	31.91	1 552.39
848.8	H	36.00	3.52	-4.05	28.43	696.63

GSM 850 EDGE

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P.	
					(dB m)	(mW)
824.2	V	35.90	3.24	-4.85	27.81	603.95
824.2	H	30.42	3.24	-4.85	22.33	171.00
836.6	V	35.60	3.45	-5.14	27.01	502.34
836.6	H	31.09	3.45	-5.14	22.50	177.83
848.8	V	34.34	3.52	-4.05	26.77	475.34
848.8	H	31.02	3.52	-4.05	23.45	221.31

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

WCDMA Band 5

Frequency (MHz)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P.	
					(dB m)	(mW)
826.4	V	31.22	3.31	-5.18	22.73	187.50
826.4	H	25.42	3.31	-5.18	16.93	49.32
836.6	V	30.89	3.45	-5.14	22.30	169.82
836.6	H	25.22	3.45	-5.14	16.63	46.03
846.6	V	30.08	3.51	-4.25	22.32	170.61
846.6	H	24.58	3.51	-4.25	16.82	48.08

Remark:

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

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

2.5. Spurious radiated emission

- Measured output Power : 32.25 dB m = 1.678 8 W
- Modulation Signal : GSM 850
- Distance : 3 meters
- Limit : $43 + 10\log_{10}(W) = 45.25$ dB c

Frequency (MHz)	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 Channel (824.2 MHz)							
1 648.17	V	-47.79	4.01	5.99	-45.81	78.06	32.81
1 648.58	H	-49.51	4.01	5.99	-47.53	79.78	34.53
2 472.78	V	-42.53	4.80	7.01	-40.32	72.57	27.32
2 472.70	H	-44.23	4.80	7.01	-42.02	74.27	29.02
Middle Channel (836.6 MHz)							
1 673.32	V	-50.54	4.06	6.18	-48.42	80.67	35.42
1 673.17	H	-49.59	4.06	6.18	-47.47	79.72	34.47
2 509.94	V	-47.34	4.82	6.97	-45.19	77.44	32.19
2 509.61	H	-44.79	4.82	6.97	-42.64	74.89	29.64
High Channel (848.8 MHz)							
1 697.87	V	-47.82	4.12	6.36	-45.58	77.83	32.58
1 697.67	H	-46.74	4.11	6.36	-44.49	76.74	31.49
2 546.64	V	-47.84	4.88	6.88	-45.84	78.09	32.84
2 546.26	H	-42.02	4.87	6.88	-40.01	72.26	27.01

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

- Measured output Power : 27.81 dB m = 0.603 9 W
- Modulation Signal : GSM 850 EDGE
- Distance : 3 meters
- Limit : $43 + 10\log_{10}(W) = 40.81$ dB c

Frequency (MHz)	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 Channel (824.2 MHz)							
1 648.29	V	-49.79	4.01	5.99	-47.81	75.62	34.81
1 648.29	H	-50.48	4.01	5.99	-48.50	76.31	35.50
2 472.75	V	-44.90	4.80	7.01	-42.69	70.50	29.69
2 472.55	H	-44.64	4.80	7.01	-42.43	70.24	29.43
Middle Channel (836.6 MHz)							
1 673.32	V	-50.10	4.06	6.18	-47.98	75.79	34.98
1 673.23	H	-49.78	4.06	6.18	-47.66	75.47	34.66
2 510.13	V	-49.97	4.82	6.97	-47.82	75.63	34.82
2 510.07	H	-46.58	4.82	6.97	-44.43	72.24	31.43
High Channel (848.8 MHz)							
1 697.78	V	-49.13	4.12	6.36	-46.89	74.70	33.89
1 697.70	H	-48.78	4.11	6.36	-46.53	74.34	33.53
2 546.52	V	-42.80	4.88	6.88	-40.80	68.61	27.80
2 546.52	H	-42.70	4.88	6.88	-40.70	68.51	27.70

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

- Measured output Power : 22.73 dB m = 0.187 5 W
- Modulation Signal : WCDMA Band 5
- Distance : 3 meters
- Limit : $43 + 10\log_{10}(W) = 35.73$ dB c

Frequency (MHz)	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 Channel (826.4 MHz)							
1 655.52	V	-43.94	4.02	6.04	-41.92	64.65	28.92
1 655.51	H	-43.03	4.02	6.04	-41.01	63.74	28.01
2 476.41	V	-46.92	4.80	7.01	-44.71	67.44	31.71
2 481.80	H	-47.47	4.80	7.01	-45.26	67.99	32.26
Middle Channel (836.6 MHz)							
1 670.69	V	-44.77	4.06	6.16	-42.67	65.40	29.67
1 671.77	H	-45.14	4.06	6.17	-43.03	65.76	30.03
2 513.15	V	-50.48	4.83	6.96	-48.35	71.08	35.35
2 513.50	H	-48.64	4.83	6.96	-46.51	69.24	33.51
High Channel (846.6 MHz)							
1 695.45	V	-43.19	4.11	6.34	-40.96	63.69	27.96
1 695.64	H	-41.91	4.11	6.35	-39.67	62.40	26.67
2 543.08	V	-49.87	4.87	6.89	-47.85	70.58	34.85
2 537.74	H	-47.37	4.86	6.90	-45.33	68.06	32.33

Remark:

1. E.R.P. = S.G level (dB m) - Cable loss (dB) + Ant. gain (dB d)

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

3. Conducted Output Power

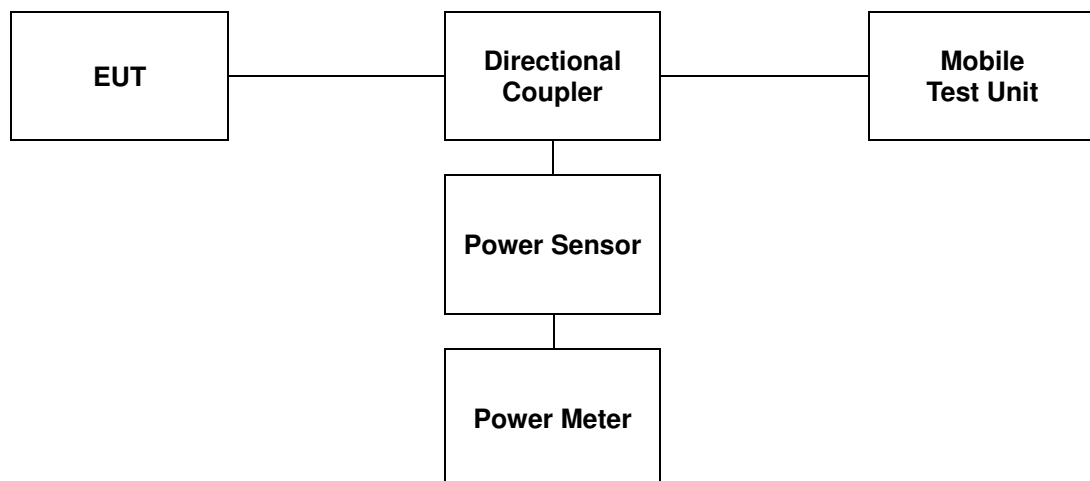
3.1. Limit

CFR 47, Section FCC §2.1046.

3.2. Test Procedure

Output power shall be measured at the RF output terminals for all configurations.

1. The RF output of the transmitter was connected to the input of the mobile test unit in order to establish communication with the EUT.
2. The EUT was set up for the max. Output power with pseudo random data modulation by using mobile test unit parameters.
3. The measurement performed using a wideband RF power meter.
4. This EUT was tested under all configurations and the highest power was investigated and reported.



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

3.3. Test Result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

- GSM

Band	Channel	Frequency (MHz)	GSM	GPRS		EDGE	
			Voice	1 Tx slot	2 Tx slot	1 Tx slot	2 Tx slot
			(dB m)	(dB m)	(dB m)	(dB m)	(dB m)
850	128	824.2	32.80	32.79	31.90	27.61	26.08
	190	836.6	32.84	32.84	32.29	27.85	26.27
	251	848.8	32.82	32.82	23.23	27.90	26.33

- WCDMA

Band	3GPP Release version	Channel		4132	4182	4233
		Frequency (MHz)		826.4	836.6	846.6
5	99	WCDMA	RMC	23.14	23.12	22.94
	99		AMR	23.06	23.09	22.88
	5	HSDPA	Subtest 1	22.02	22.01	21.85
	5		Subtest 2	22.01	22.00	21.83
	5		Subtest 3	21.54	21.40	21.32
	5		Subtest 4	21.50	21.41	21.30
	6	HSUPA	Subtest 1	21.86	21.76	21.82
	6		Subtest 2	20.45	20.40	20.34
	6		Subtest 3	20.82	20.80	20.64
	6		Subtest 4	20.51	20.46	20.20
	6		Subtest 5	21.87	21.90	21.73

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

4. Occupied Bandwidth

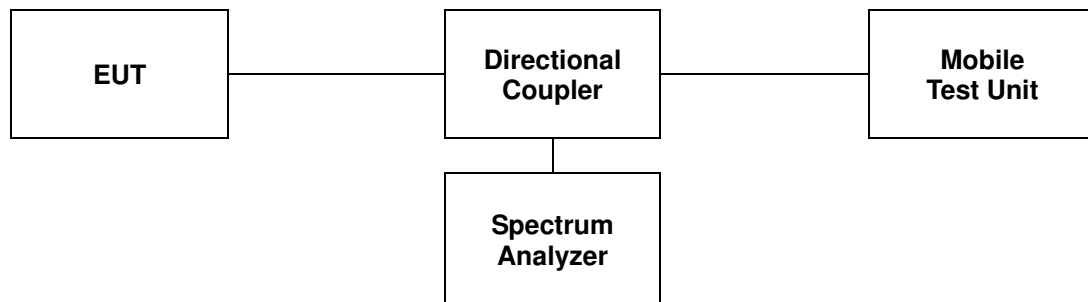
4.1. Limit

CFR 47, Section FCC §2.1049.

4.2. Test Procedure

The test follows section 4.3 of FCC KDB Publication 971168 D01 v03.

1. Set span = 2 – 5 x OBW.
2. Set resolution bandwidth (RBW) = 1 – 5 % of OBW.
3. Set video bandwidth (VBW) $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = Max hold.
6. Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

4.3 Test Results

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

- GSM

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
850	Voice	824.2	0.241
		836.6	0.241
		848.8	0.242
	EDGE	824.2	0.241
		836.6	0.242
		848.8	0.246

- WCDMA

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
5	RMC	826.4	4.151
		836.6	4.164
		846.6	4.170

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

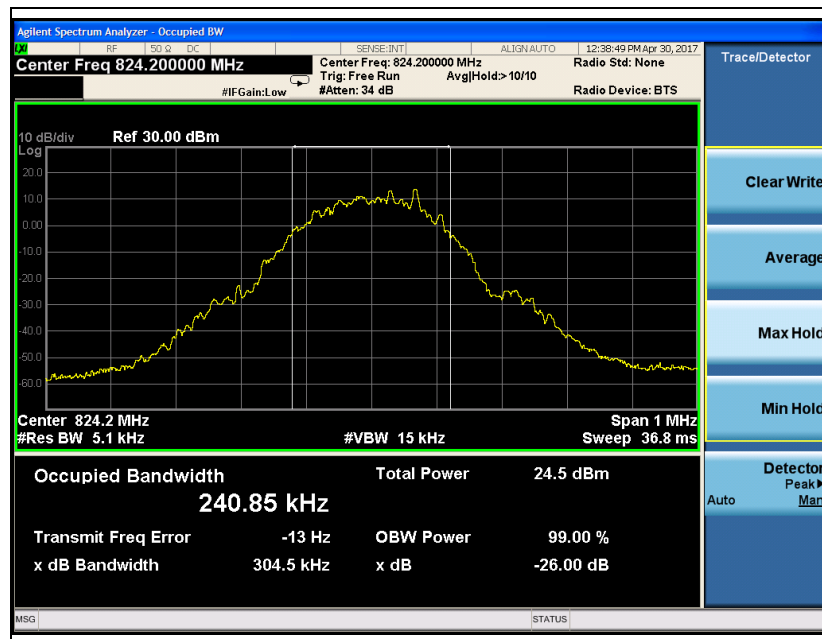
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

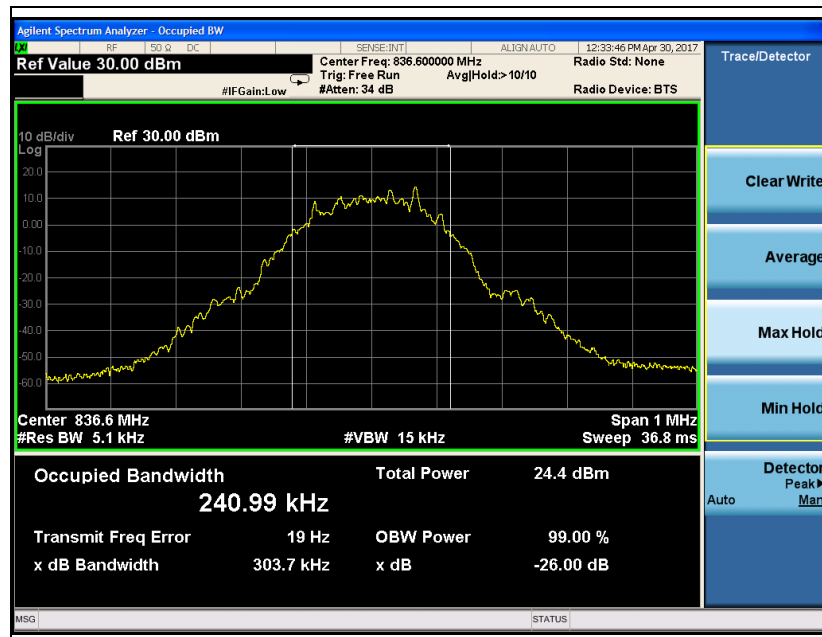
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

GSM 850 Low Channel



Middle Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

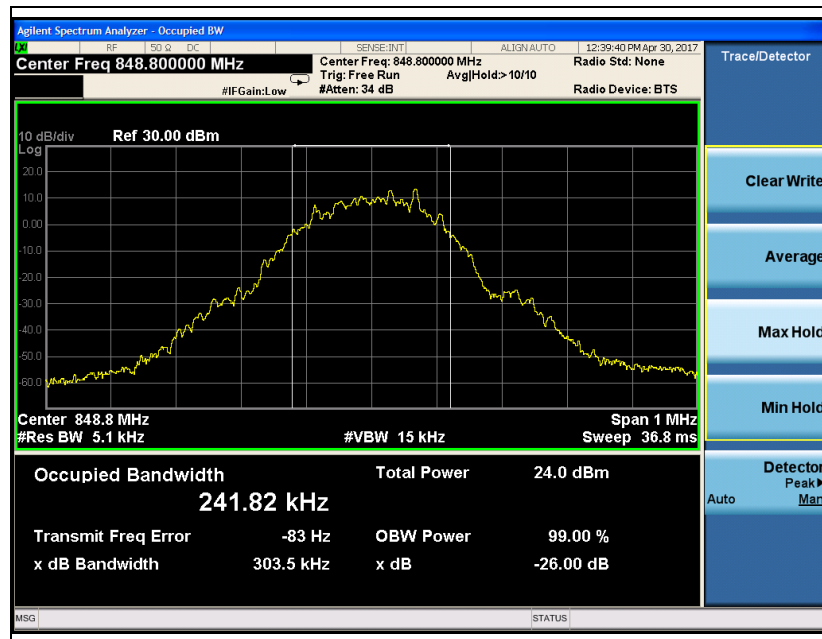
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

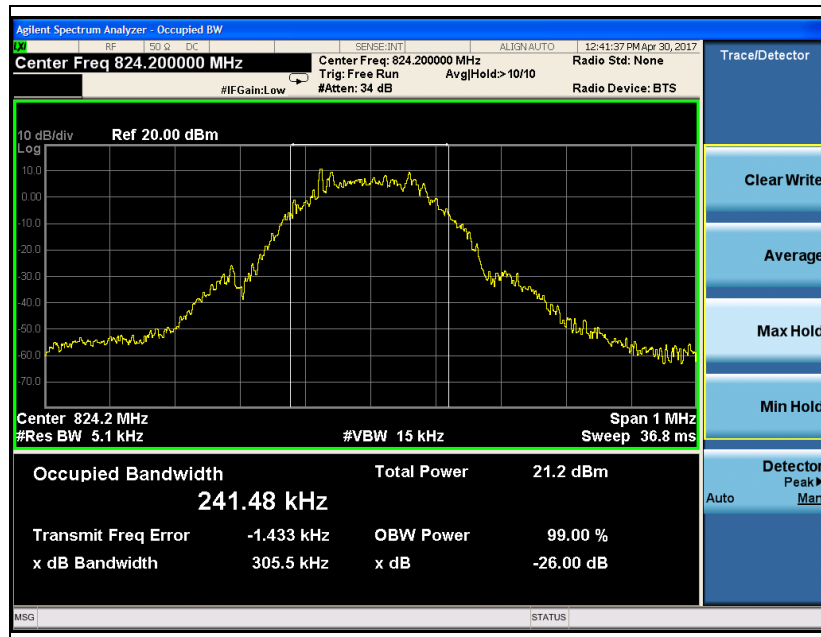
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

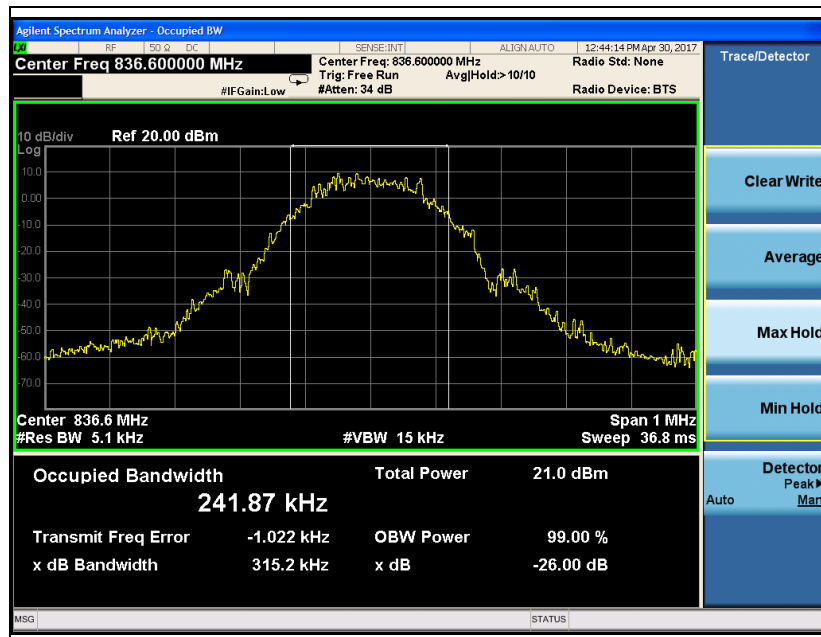
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

GSM 850 EDGE Low Channel



Middle Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

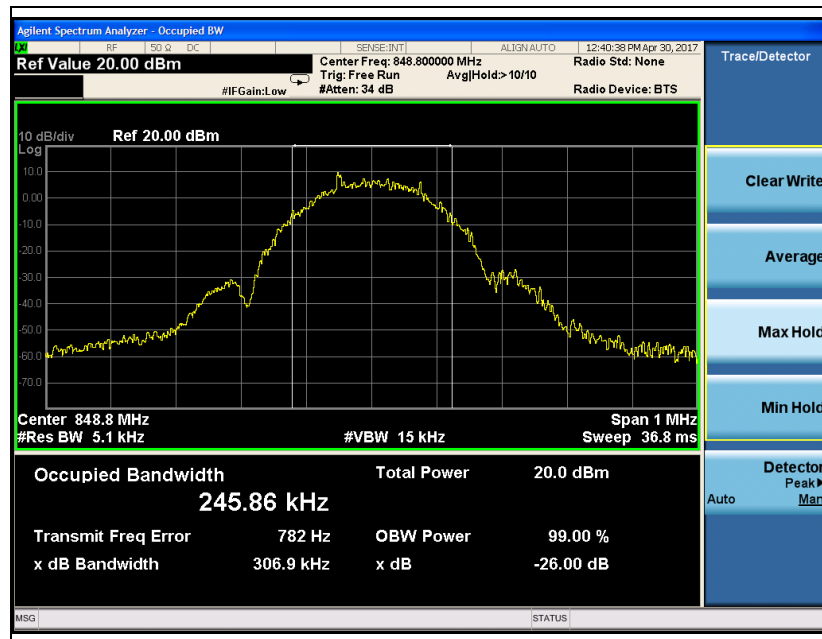
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

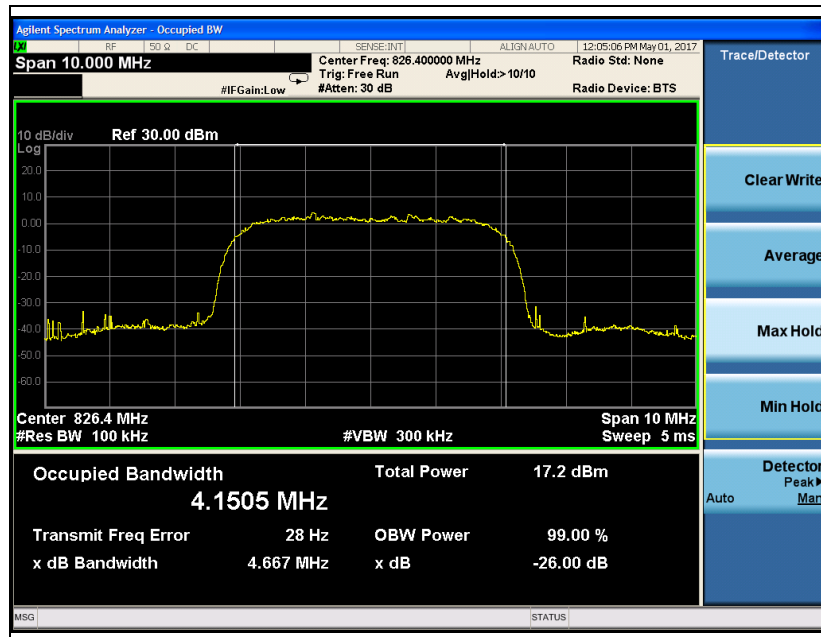
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

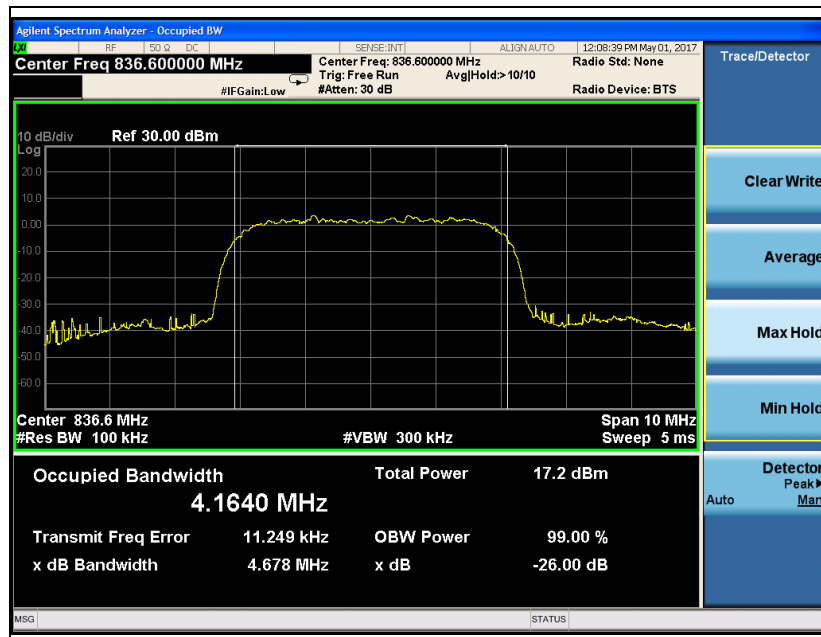
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

WCDMA Band 5 Low Channel



Middle Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

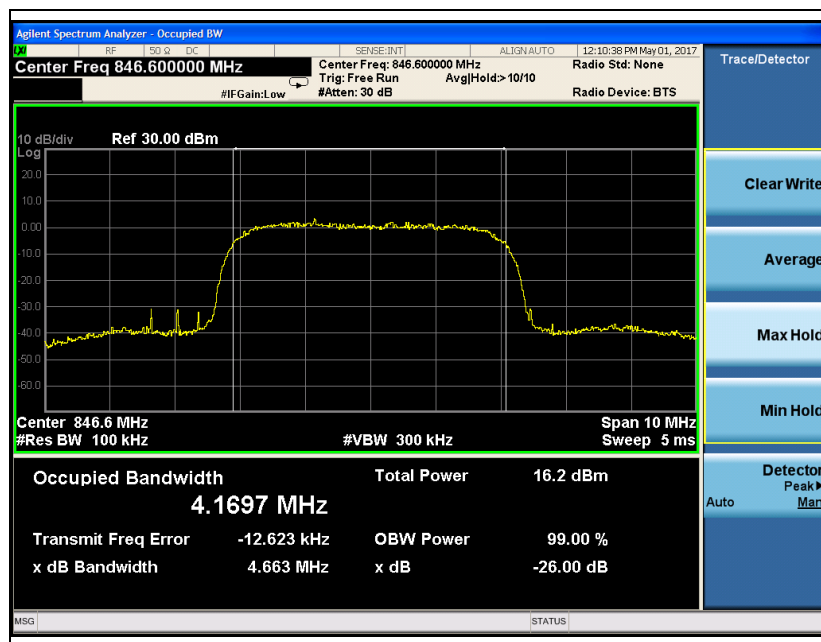
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

5. Spurious Emissions at Antenna Terminal

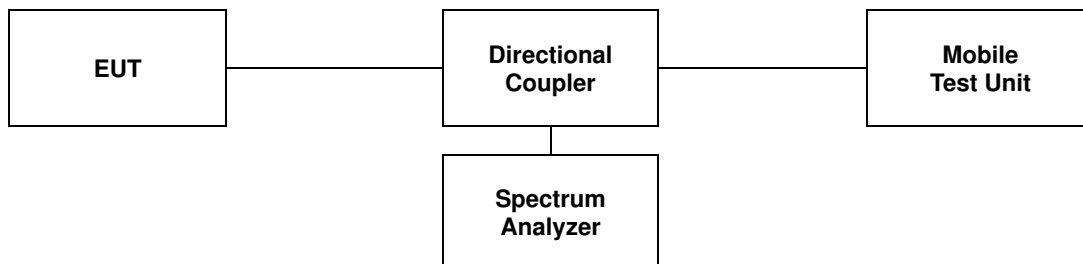
5.1. Limit

- §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.

5.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168 D01 v03.

1. Start frequency was set to 30 MHz and stop frequency was set to at least 10* the fundamental frequency.
2. Detector = Peak.
3. Trace mode = Max hold.
4. Sweep time = Auto couple.
5. The trace was allowed to stabilize.
6. Please see notes below for RBW and VBW settings.
7. For plots showing conducted spurious emissions from 30 MHz to 9 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as correction factor.



Notes;

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two point, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

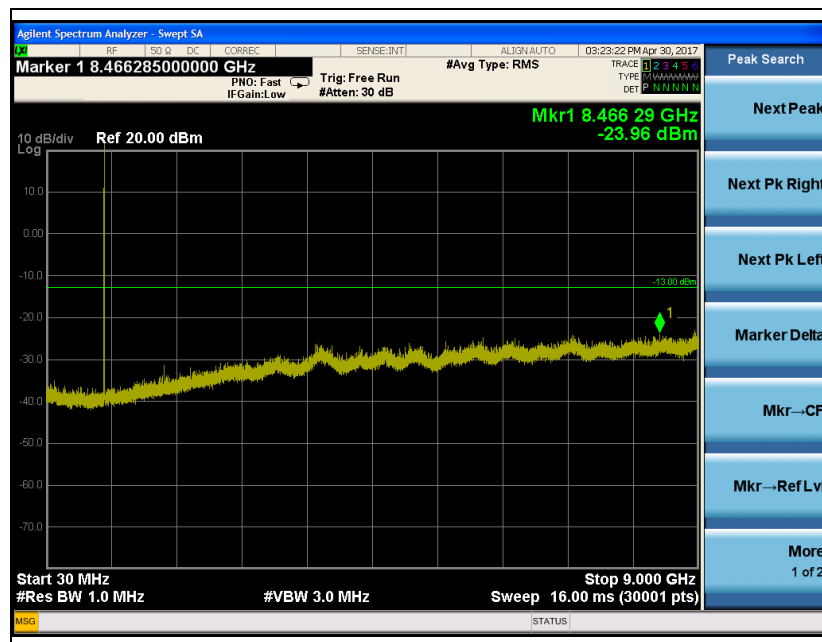
5.3. Test Results

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

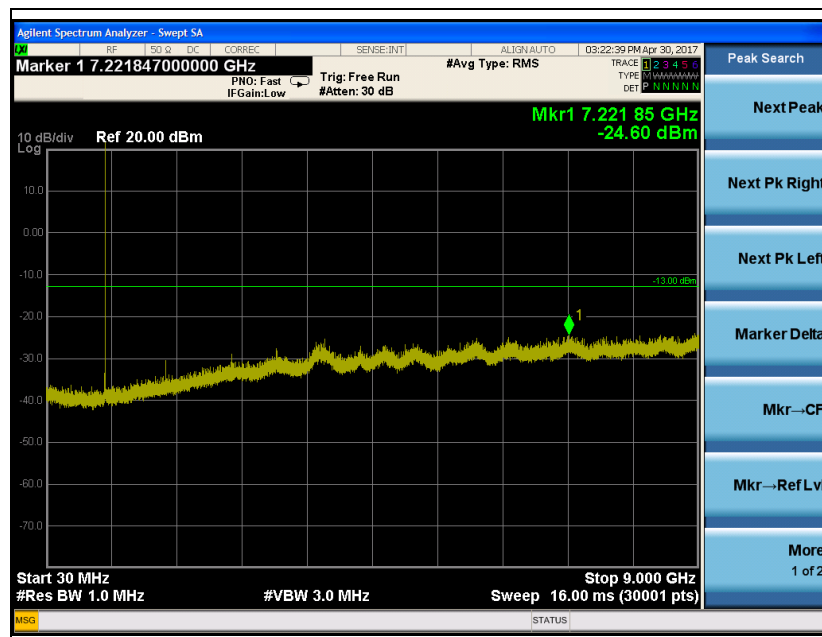
Please refer to the following plots.

GSM 850

Low Channel



Middle Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

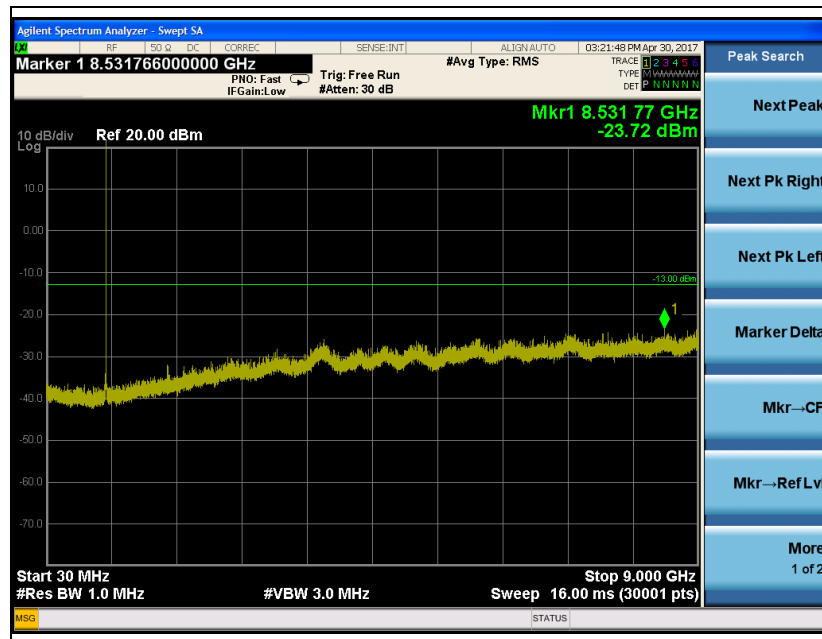
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

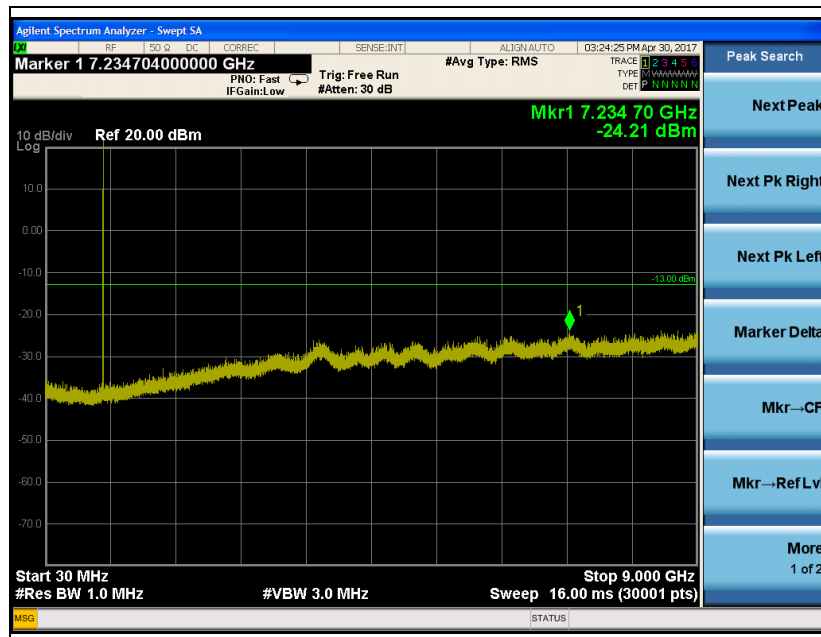
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

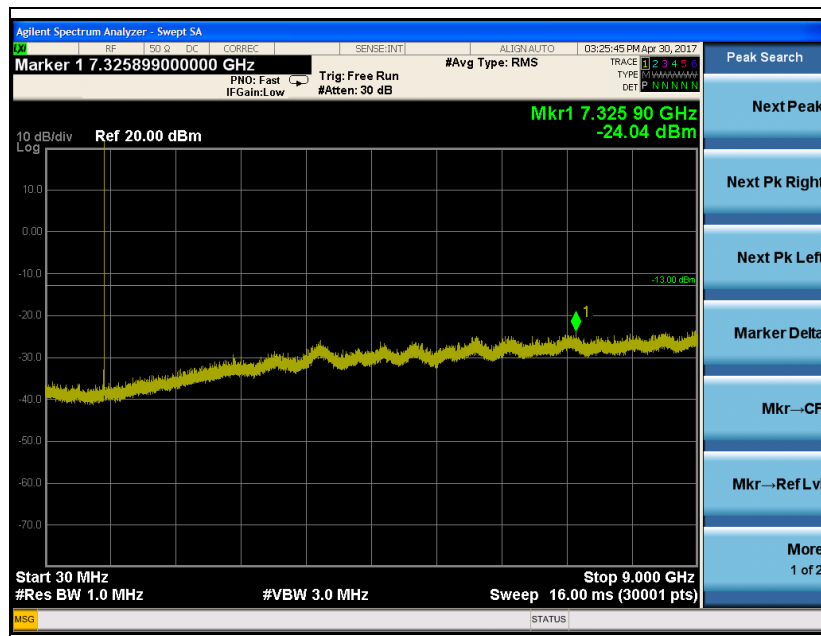
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

GSM 850 EDGE Low Channel



Middle Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

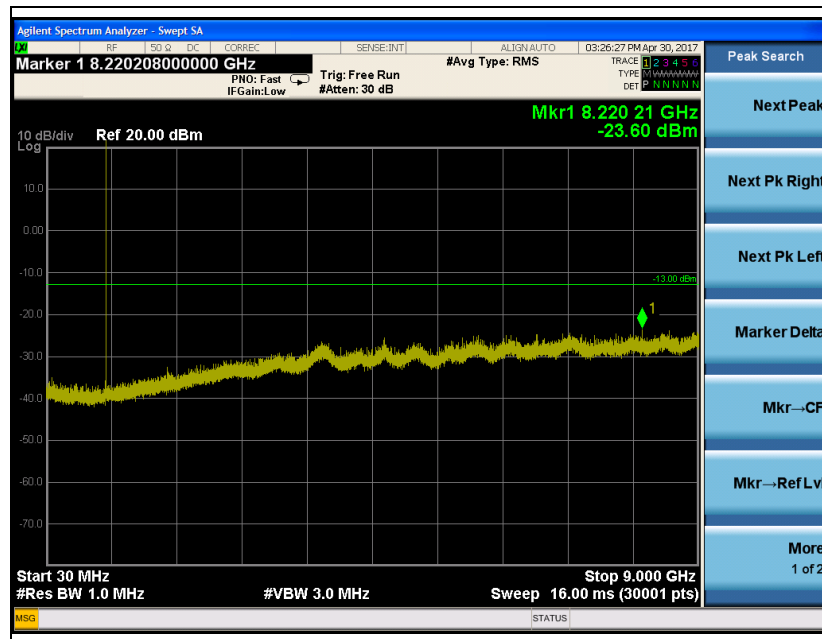
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

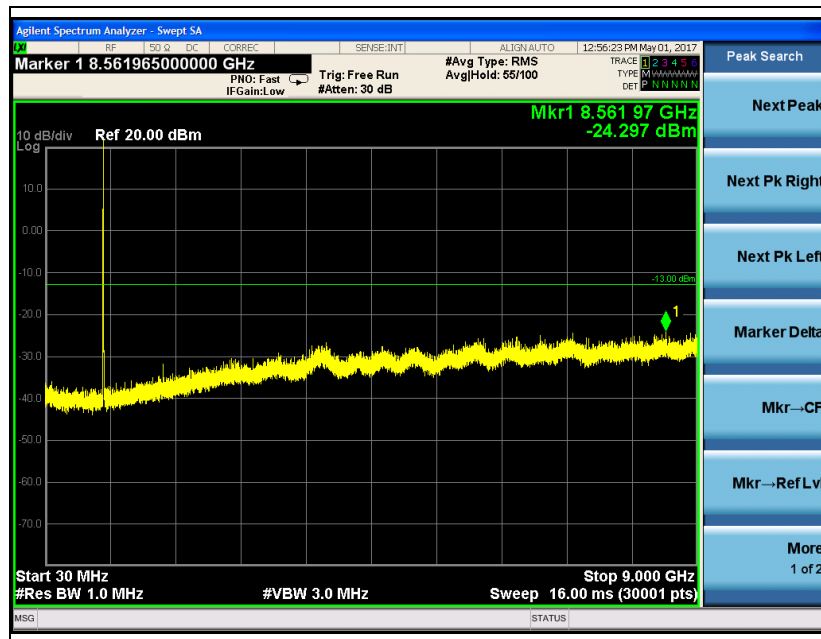
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

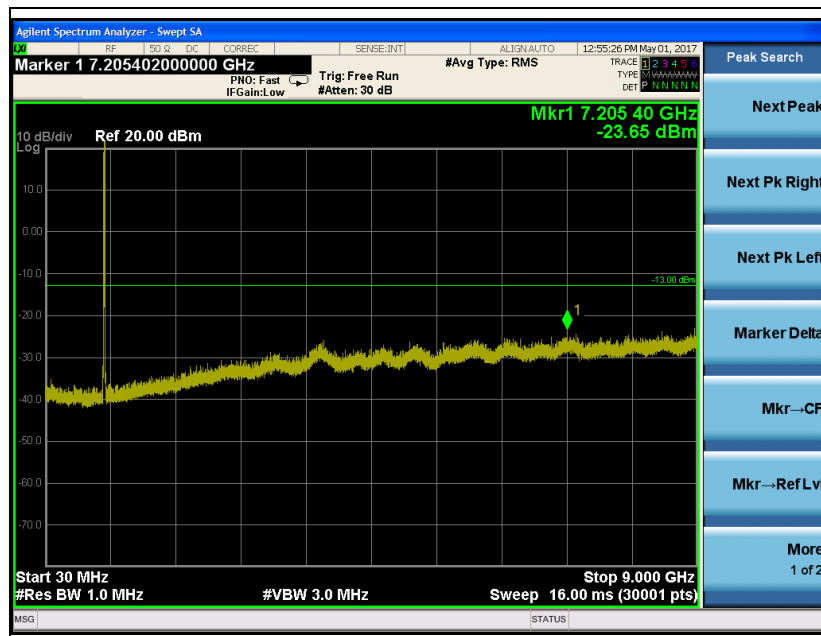
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

WCDMA Band 5 Low Channel



Middle Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

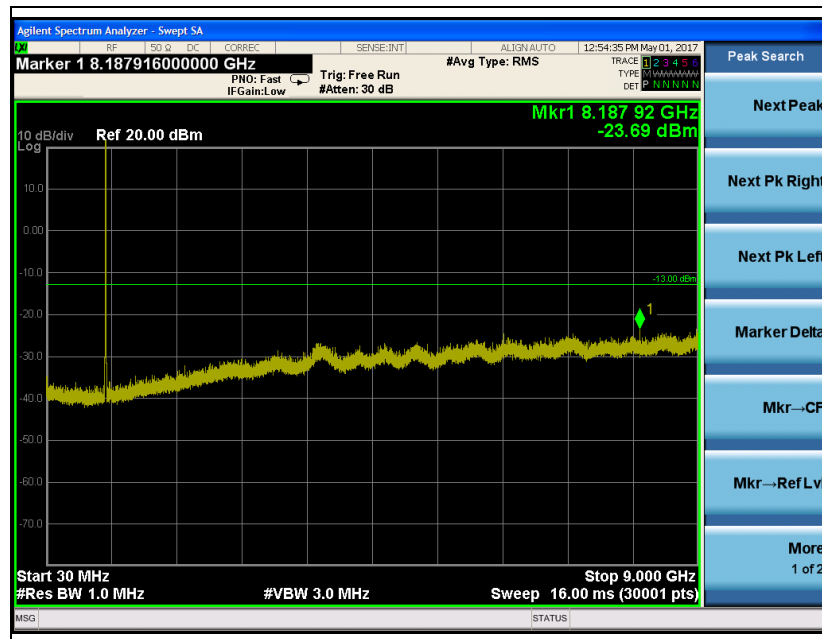
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

6. Band Edge

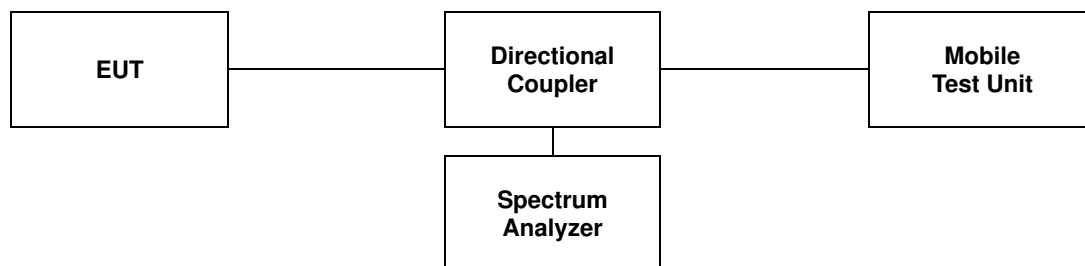
6.1. Limit

- §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.

6.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168 D01 v03.

1. Span was set large enough so as to capture all out of band emissions near the band edge.
2. RBW ≥ 1 % of OBW
3. VBW $\geq 3 \times$ RBW.
4. Detector = RMS.
5. Trace mode = Trace average.
6. Sweep time = Auto.
7. The trace was allowed to stabilize.
8. All path loss of frequency range was investigated and compensated to spectrum analyzer as correction factor.



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

6.3. Test Results

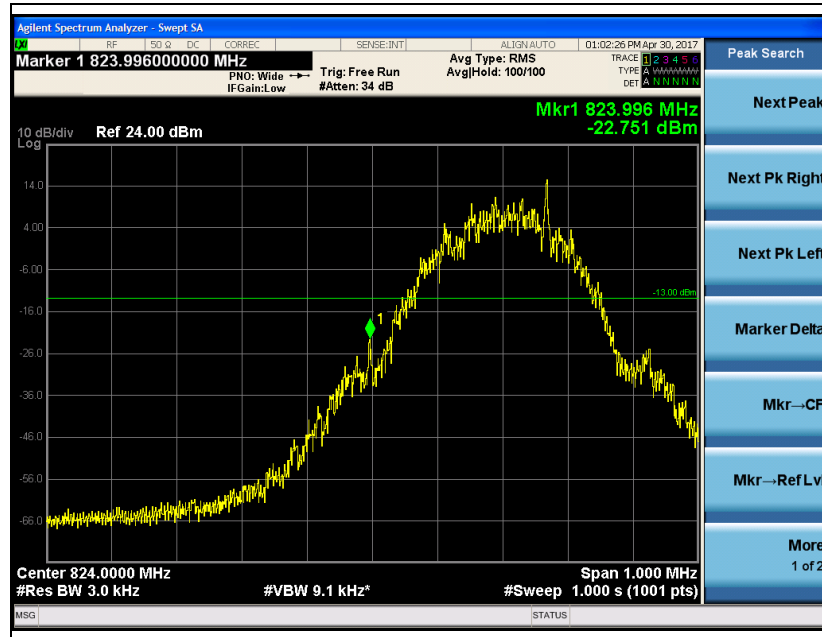
Ambient temperature : (23 ± 1) °C

Relative humidity : 47 % R.H.

Please refer to the following plots.

GSM 850

Low Channel



High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

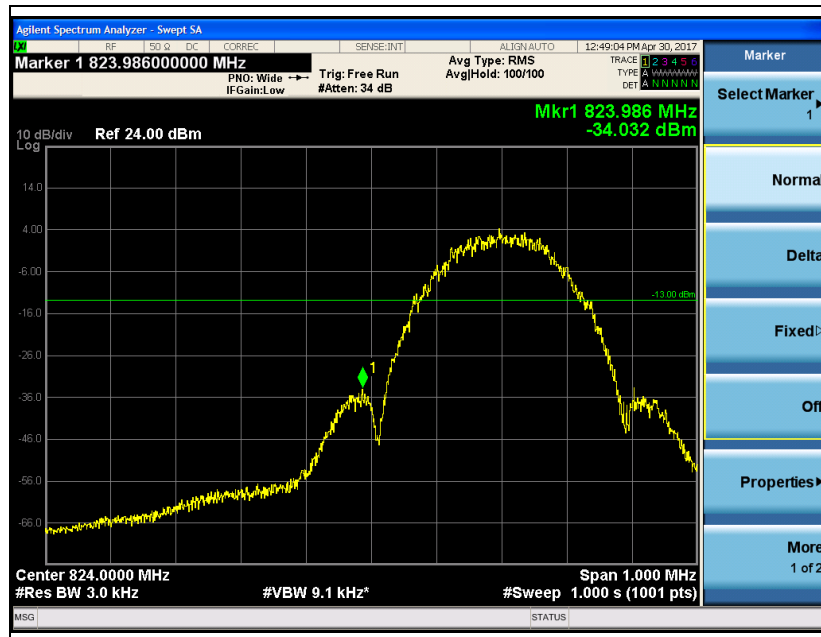
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

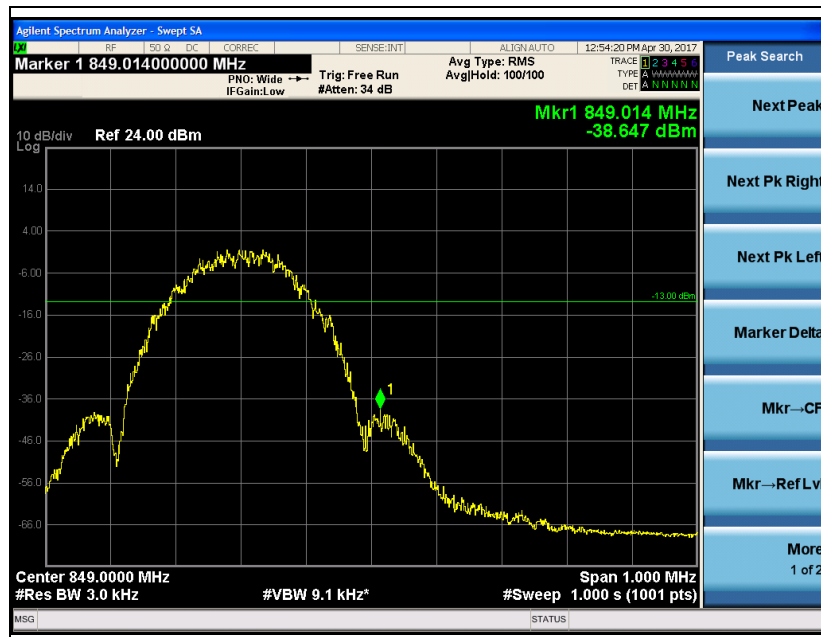
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

GSM 850 EDGE Low Channel



High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

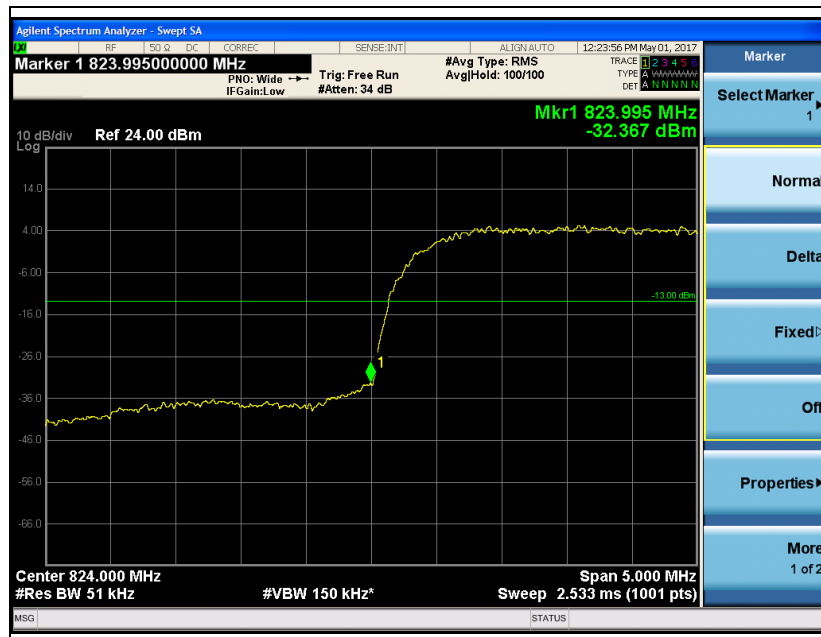
SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

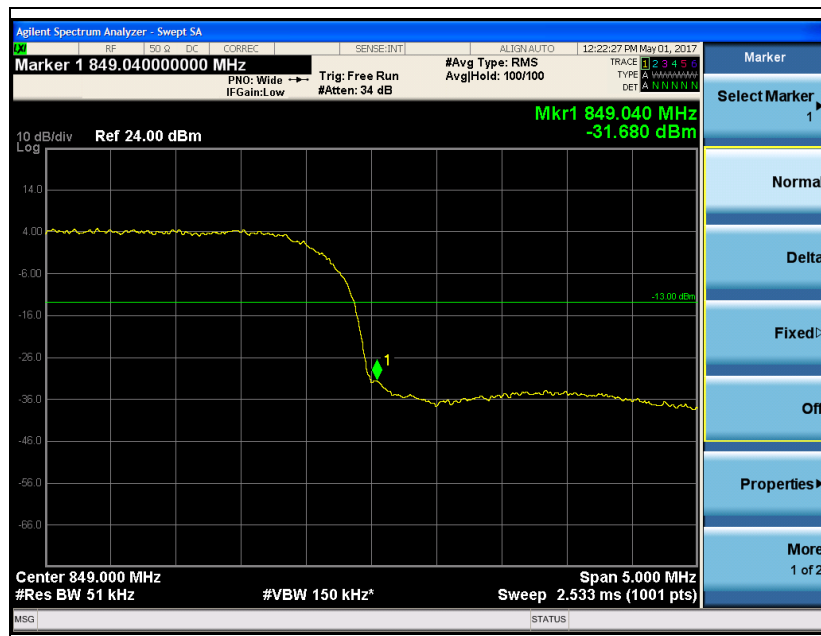
Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

WCDMA Band 5 Low Channel



High Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

7. Frequency Stability

7.1. Limit

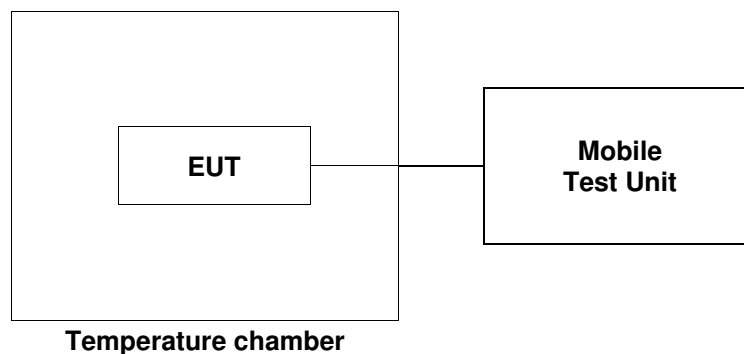
- § 2.1055 (a), § 2.1055 (d) & following:

- §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 MHz band at a power level less than or equal to 3 Watts, the limit specified in Table C-1 is +/- 2.5 ppm.

7.2. Test Procedure

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.



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

8.3. Test Results

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

GSM 850 mode at middle channel

down 500 MHz at middle channel.

Reference Frequency: 836.6 MHz			
Frequency Stability versus Temperature			
Environment Temperature (℃)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12	-1	-0.001 2
40		2	0.002 4
30		10	0.012 0
23		5	0.006 0
10		3	0.003 6
0		-2	-0.002 4
-10		-6	0.007 2
-20		-1	-0.001 2
-30		2	0.002 4
Frequency Stability versus Power Supply			
Environment Temperature (℃)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
23	13.8	5	0.006 0
	10.2	-6	-0.007 2

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)

WCDMA Band 5 mode at middle channel

Reference Frequency: 836.6 MHz			
Frequency Stability versus Temperature			
Environment Temperature (℃)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12	6	0.007 2
40		3	0.003 6
30		-3	-0.003 6
23		-6	-0.007 2
10		1	0.001 2
0		10	0.012 0
-10		-1	-0.001 2
-20		5	0.006 0
-30		8	0.009 6
Frequency Stability versus Power Supply			
Environment Temperature (℃)	Power Supplied (V _{dc})	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
23	13.8	-10	-0.012 0
	10.2	6	0.007 2

- End of the Test Report -

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

SGS Korea Co., Ltd. (Gunpo Laboratory) 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807 <http://www.sgsgroup.kr>

RTT5041-20(2015.10.01)(3)

Tel. +82 31 428 5700 / Fax. +82 31 427 2370

A4(210 mm x 297 mm)