

TEST REPORT

of

FCC Part 2 Subpart J, Part 22 Subpart C/H,
Part 24 Subpart E and Part 27 Subpart C
IC RSS-132 Issue 3, RSS-133 Issue 6,
RSS-139 Issue 3 and RSS-Gen Issue 5

FCC ID: BEJTM04ANNABM2
IC Certification: 2703H-TM04ANNABM2

Equipment Under Test : Telematics Module
Model Name : TM04ANNABM2
Variant Model Name(s) : -
Applicant : FCC: LG Electronics USA
IC: LG ELECTRONICS INC.
Manufacturer : LG Electronics Inc.
Date of Receipt : 2022.04.26
Date of Test(s) : 2020.01.13 ~ 2022.07.04
Date of Issue : 2022.07.20

In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

- 1) The results of this test report are effective only to the items tested.
- 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.
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- 4) The data marked ※ in this report was provided by the customer and may affect the validity of the test results.

We are responsible for all the information of this test report except for the data(※) provided by the customer.

Tested by:


Murphy Kim

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SGS Korea Co., Ltd. Gunpo Laboratory

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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1.2. Details of Applicant

FCC Applicant : LG Electronics USA

FCC Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States, 07632

IC Applicant : LG ELECTRONICS INC.

IC Address : 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, Korea (Republic of), 451-713

Contact Person : Kim, Sung-soo

Phone No. : +1 201 266 2215

1.3. Details of Manufacturer

Company : LG Electronics Inc.

Address : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796

1.4. Description of EUT

Kind of Product	Telematics Module
Model Name	TM04ANNABM2
Serial Number	Conducted Sample: 00400152020000 Radiated Sample: Radio#01
Power Supply	DC 12.5 V
Rated Power	GSM 850: 33 dBm GSM 1 900: 30 dBm WCDMA II, IV, V: 24 dBm
Frequency Range	GSM 850: 824 MHz ~ 849 MHz GSM 1 900: 1 850 MHz ~ 1 910 MHz WCDMA II: 1 850 MHz ~ 1 910 MHz WCDMA IV: 1 710 MHz ~ 1 755 MHz WCDMA V: 824 MHz ~ 849 MHz
Modulation Technique	QPSK, 16QAM, GMSK, 8PSK
Antenna Type	Planar Inverted F Antenna
Antenna Gain ※	824 MHz ~ 849 MHz: -4.33 dB i 1 710 MHz ~ 1 780 MHz: 3.76 dB i 1 850 MHz ~ 1 915 MHz: 2.23 dB i
H/W Version	Rev.A0
S/W Version	v002.008.022

1.5. Introduction of Test Data Reuse

This report referenced from the FCC ID: BEJ-TM04ANNABM0 and IC Certification: 2703H-TM04ANNABM0 GSM&WCDMA.

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID and IC Certification.

1.6. Difference

The FCC ID: BEJTM04ANNABM2 and IC Certification: 2703H-TM04ANNABM2 share the same enclosure as FCC ID: BEJ-TM04ANNABM0 and 2703H-TM04ANNABM0

Applicant as the manufacturer of the following products, declared that had changed the hardware of the EUT.

Band differences between TM04ANNABM0 and TM04ANNABM2

Band	Frequency (MHz)		FDD/TDD	Band	TM04ANNABM0	TM04ANNABM2
	Tx	Rx				
B2	1 850 ~ 1 910	1 930 ~ 1 990	FDD	Mid	G, W, L	G, W, L
B4	1 710 ~ 1 755	2 110 ~ 2 155	FDD	Mid	W, L	W, L
B5	824 ~ 849	869 ~ 894	FDD	Low	G, W, L	G, W, L
B7	2 500 ~ 2 570	2 620 ~ 2 690	FDD	High	L	L
B12(B17)	699 ~ 716	729 ~ 746	FDD	Low	L	L
B13	777 ~ 787	746 ~ 756	FDD	Low	L	L
B25	1 850 ~ 1 915	1 930 ~ 1 995	FDD	Mid	L	L
B26	814 ~ 849	859 ~ 894	FDD	Low	L	-
B29	-	717 ~ 728	FDD	Low	L(RX only)	-
B30	2 305 ~ 2 315	2 350 ~ 2 360	FDD	High	L(RX only)	-
B41	2 496 ~ 2 690		TDD	High	L	L
B66	1 710 ~ 1 780	2 110 ~ 2 200	FDD	Mid	L	L
B71	663 ~ 698	617 ~ 652	FDD	Low	L	L

- G(GSM), W(WCDMA), T(TD-SCDMA), L(LTE)

After confirming through preliminary E.R.P. / E.I.R.P. and conducted power that the performance of the FCC ID: BEJ-TM04ANNABM0 and IC Certification: 2703H-TM04ANNABM0 remain representative of FCC ID: BEJTM04ANNABM2 and IC Certification: 2703H-TM04ANNABM2.

The test data of FCC ID: BEJ-TM04ANNABM0 and IC Certification: 2703H-TM04ANNABM0 being submitted for this application to cover GSM&WCDMA features.

1.7. Spot Check Data

Band	Test item	Frequency (MHz)	Limit	Original model		Spot check model		Deviation (dB)	Remark
				TM04ANNABM0		TM04ANNABM2			
				FCC ID: BEJ-TM04ANNABM0 IC Certification: 2703H-TM04ANNABM0		FCC ID: BEJTM04ANNABM2 IC Certification: 2703H-TM04ANNABM2			
				(dB m)	(W)	(dB m)	(W)		
GSM 850	Conducted power	824 ~ 849	7 W	33.08	2.032	33.18	2.080	0.10	-
	E.R.P.			31.45	1.396	27.52	0.564	-3.93	-
GSM 1 900	Conducted power	1 850 ~ 1 910	2 W	29.56	0.904	29.86	0.968	0.30	-
	E.I.R.P.			33.00	1.995	32.73	1.875	-0.27	-
WCDMA II	Conducted power	1 850 ~ 1 910	2 W	23.41	0.219	23.30	0.214	-0.11	-
	E.I.R.P.			27.70	0.589	27.23	0.528	-0.47	-
WCDMA IV	Conducted power	1 710 ~ 1 755	1 W	23.72	0.236	22.55	0.180	-1.17	-
	E.I.R.P.			28.30	0.676	28.76	0.752	0.46	-
WCDMA V	Conducted power	824 ~ 849	7 W	23.77	0.238	24.12	0.258	0.35	-
	E.R.P.			21.65	0.146	18.52	0.071	-3.13	-

1.8. Reference Detail

Reference applicant that contains the reused reference data in the individual test reports:

Mode	Reference FCC ID / IC Certification	Application type	Reference test report number	Exhibit type	Data reuse
GSM	FCC: BEJ-TM04ANNABM0 IC: 2703H-TM04ANNABM0	Original grant	F690501-RF-RTL000879 (GSM)	Test report	Conducted data
WCDMA			F690501-RF-RTL000880 (WCDMA)		

1.9. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	Agilent	E8257D	MY51501169	Mar. 04, 2022	Annual	Mar. 04, 2023
Spectrum Analyzer	R&S	FSV30	103210	Dec. 08, 2021	Annual	Dec. 08, 2022
Spectrum Analyzer	Agilent	N9020A	MY53421758	Aug. 27, 2021	Annual	Aug. 27, 2022
Mobile Test Unit	R&S	CMW500	144034	Feb. 21, 2022	Annual	Feb. 21, 2023
Power Meter	Anritsu	ML2495A	1223004	May 25, 2022	Annual	May 25, 2023
Power Sensor	Anritsu	MA2411B	1207272	May 25, 2022	Annual	May 25, 2023
Temperature Chamber	ESPEC CORP.	SH-662	93000533	Jul. 15, 2021	Annual	Jul. 15, 2022
Low Pass Filter	Mini-Circuits	NLP-1200+	V9500401023-2	May 25, 2022	Annual	May 25, 2023
High Pass Filter	Wainwright Instrument GmbH	WHKX10-900-1000-18000-40SS	7	Mar. 04, 2022	Annual	Mar. 04, 2023
High Pass Filter	Wainwright Instrument GmbH	WHKX1.5/15G-6SS	4	Jun. 09, 2022	Annual	Jun. 09, 2023
High Pass Filter	Wainwright Instrument GmbH	WHKX2.2/12.75G-10SS	8	Mar. 04, 2022	Annual	Mar. 04, 2023
High Pass Filter	Wainwright Instrument GmbH	WHKX3.0/18G-6SS	21	Jun. 09, 2022	Annual	Jun. 09, 2023
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	11	Aug. 11, 2021	Annual	Aug. 11, 2022
Directional Coupler	KRYTAR	152613	122661	Mar. 04, 2022	Annual	Mar. 04, 2023
DC Power Supply	Agilent	U8002A	MY54110041	Sep. 14, 2021	Annual	Sep. 14, 2022
Preamplifier	H.P.	8447F	2944A03909	Aug. 06, 2021	Annual	Aug. 06, 2022
Preamplifier	R&S	SCU 18	10117	Jun. 13, 2022	Annual	Jun. 13, 2023
Preamplifier	TESTEK	TK-PA1840H	130016	Jan. 10, 2022	Annual	Jan. 10, 2023
Test Receiver	R&S	ESU26	100109	Jan. 18, 2022	Annual	Jan. 18, 2023
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 23, 2021	Biennial	Aug. 23, 2023
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	1126	Feb. 07, 2022	Annual	Feb. 07, 2023
Horn Antenna	R&S	HF906	100326	Feb. 18, 2022	Annual	Feb. 18, 2023
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA9170	9170-540	Nov. 30, 2021	Annual	Nov. 30, 2022
Antenna Master	Innco systems GmbH	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	Innco systems GmbH	DS 1200S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/383 30516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RFONE	MWX221-NMSNMS (4 m)	J1023142	Apr. 04, 2022	Semi-annual	Oct. 04, 2022
Coaxial Cable	micro-coax UTiflex	142A SERIES 502839-8 (10 m)	90000034	Apr. 04, 2022	Semi-annual	Oct. 04, 2022
Coaxial Cable	RADIALL	TESTPRO 3	182287	Feb. 18, 2022	Semi-annual	Aug. 18, 2022
Coaxial Cable	RADIALL	TESTPRO 3	182288	Feb. 18, 2022	Semi-annual	Aug. 18, 2022
Coaxial Cable	RADIALL	TESTPRO 3	182291	Feb. 18, 2022	Semi-annual	Aug. 18, 2022

► Support Equipment

Description	Manufacturer	Model	Serial Number
N/A	-	-	-

1.10. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 2, 22, 24 and 27 / IC part RSS-132 Issue 3, RSS-133 Issue 6, RSS-139 Issue 3 and RSS-Gen Issue 5			
Section in FCC	Section in IC	Test Item	Result
§2.1046 §22.913(a)(5) §24.232(c) §27.50(d)(4)	RSS-132 Issue 3 5.4 RSS-133 Issue 6 6.4 RSS-139 Issue 3 6.5	E.R.P. / E.I.R.P.	Complied
§2.1053 §22.917(a) §24.238(a) §27.53(h)(1)	RSS-132 Issue 3 5.5 RSS-133 Issue 6 6.5 RSS-139 Issue 3 6.6	Spurious Radiated Emission	Complied
§2.1046	RSS-Gen Issue 5 6.12	Conducted Output Power	Complied
§2.1049	RSS-Gen Issue 5 6.7	Occupied Bandwidth	Complied
§22.913(d) §24.232(d) §27.50(d)(5)	RSS-132 Issue 3 5.4 RSS-133 Issue 6 6.4 RSS-139 Issue 3 6.5	Peak-Average Ratio	Complied
§2.1051 §22.917(a) §24.238(a) §27.53(h)(1)	RSS-132 Issue 3 5.5 RSS-133 Issue 6 6.5 RSS-139 Issue 3 6.6	Spurious Emission at Antenna Terminal	Complied
§22.917(a) §24.238(a) §27.53(h)(1)	RSS-132 Issue 3 5.5 RSS-133 Issue 6 6.5 RSS-139 Issue 3 6.6	Band Edge	Complied
§2.1055 §22.355 §24.235 §27.54	RSS-Gen Issue 5 6.11 RSS-132 Issue 3 5.3 RSS-133 Issue 6 6.3 RSS-139 Issue 3 6.4	Frequency Stability	Complied

1.11. Sample Calculation for Offset

Where relevant, the following sample calculation is provided:

1.11.1. Conducted Test

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

1.11.2. Radiation test

- E.I.R.P. (dB m) = Measured level (dBμV) + Antenna factor (dB/m) + Cable loss (dB) + 20 Log D - 104.8;
where D is the measurement distance in meters.
- E.R.P (dB m) = E.I.R.P. (dB m) - 2.15 (dB)

1.12. Worst Case Configuration and Mode

GSM

The worst-case is based on the average conducted output power measurement investigation results. Output power measurements were measured on GSM, GPRS, EDGE Mode. All testing was performed using GPRS mode to represent the worst case.

The radiation test of the EUT was investigated in three orthogonal orientations X, Y, and Z, and the worst case data is reported.

WCDMA

The worst-case is based on the average conducted output power measurement investigation results. Output power measurements were measured on RMC, HSDPA, HSUPA, HSPA+ and DC-HSDPA Modulation. All testing was performed using RMC modulations to represent the worst case.

The radiation test of the EUT was investigated in three orthogonal orientations X, Y, and Z, and the worst case data is reported.

1.13. Measurement Configuration

WCDMA

Test Items	Band	Test Channel			Modulation		
		Low	Mid	High	RMC	HSUPA	HSDPA
Conducted Output Power	Band II	V	V	V	V	V	V
	Band IV	V	V	V	V	V	V
	Band V	V	V	V	V	V	V
Spurious Radiated Emission	Band II	V	V	V	V	-	-
	Band IV	V	V	V	V	-	-
	Band V	V	V	V	V	-	-

GSM

Test Items	Band	Test Channel			Modulation		
		Low	Mid	High	VOICE	GPRS	EGPRS
Conducted Output Power	GSM 850	V	V	V	V	V	V
	GSM 1900	V	V	V	V	V	V
Spurious Radiated Emission	GSM 850	V	V	V	V	-	V
	GSM 1900	V	V	V	V	-	V

Remark;

All supported GSM and WCDMA's frequency stability, occupied bandwidth, peak to average radio, band edge and spurious emission at antenna terminal have been tested in the approved module test report.

- Module model name : TM04ANNABM0
- Test report Number : F690501-RF-RTL000879(GSM) & F690501-RF-RTL000880(WCDMA)
- Issue date : 2020.07.03
- Test Laboratory : SGS Korea Co., Ltd.

1.14. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty	
RF Output Power	0.32 dB	
Radiated Emission, 9 kHz to 30 MHz	H	3.30 dB
	V	3.30 dB
Radiated Emission, below 1 GHz	H	4.80 dB
	V	5.20 dB
Radiated Emission, above 1 GHz	H	3.90 dB
	V	4.00 dB

All measurement uncertainty values are shown with a coverage factor $k = 2$ to indicate a 95 % level of confidence.

1.15. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL003309	2022.07.20	Initial

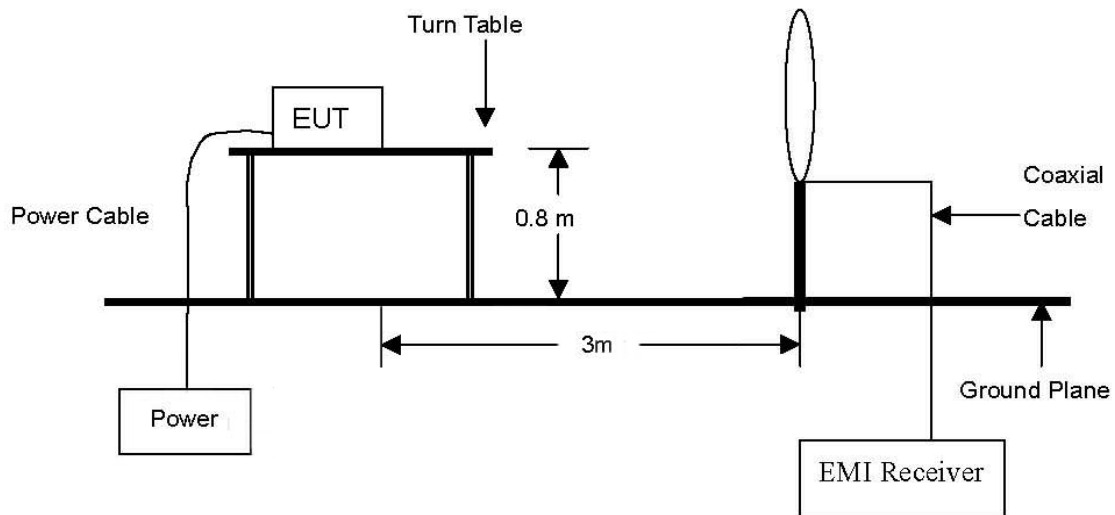
1.16. Emission Designator and Max Power

Band	Frequency Range (MHz)	Mode	Emission Designator	E.R.P. / E.I.R.P.	
				Max power (dB m)	Max power (W)
GSM 850	824.2 ~ 848.8	GPRS	241KGXW	27.52	0.564
		EDGE	246KG7W		
GSM 1900	1 850.2 ~ 1 909.8	GPRS	241KGXW	32.73	1.875
		EDGE	245KG7W		
WCDMA II	1 852.4 ~ 1 907.6	RMC	4M15F9W	27.23	0.528
WCDMA IV	1 712.4 ~ 1 752.6	RMC	4M15F9W	28.76	0.752
WCDMA V	826.4 ~ 846.6	RMC	4M14F9W	18.52	0.071

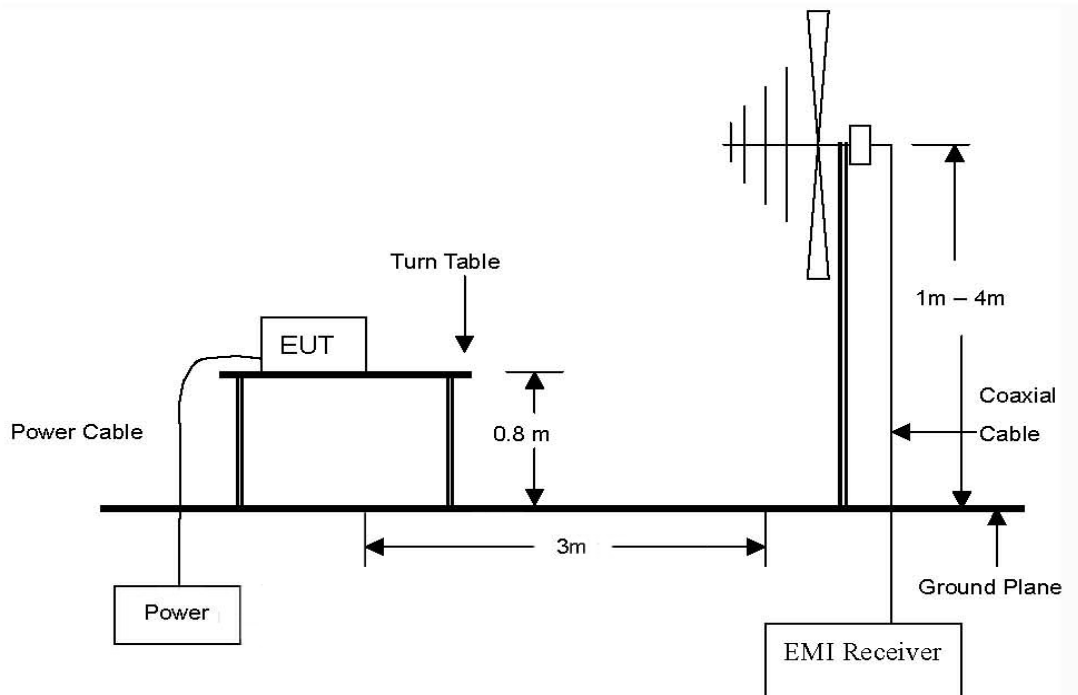
2. E.R.P. / E.I.R.P. & Spurious Radiated Emission

2.1. Test setup

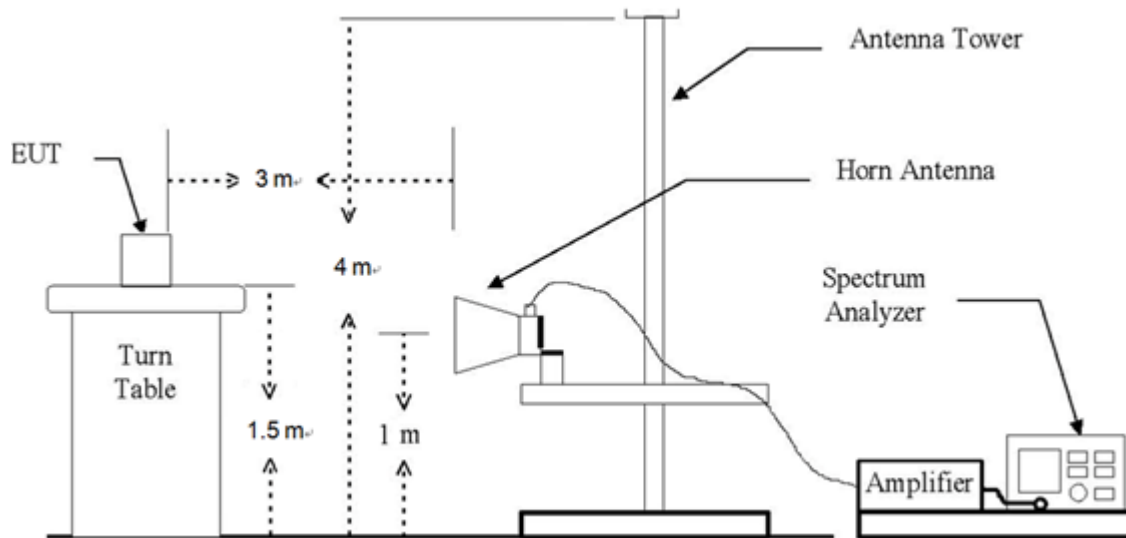
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



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 20 GHz Emissions.



2.2. Limit

2.2.1. Limit of E.R.P. / E.I.R.P.

FCC

- §22.913(a)(5), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

- §24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

- §27.50(d)(4), fixed, mobile, and portable (hand-held) stations operating in the 1 710-1 755 MHz band and mobile and portable stations operating in the 1 695-1 710 MHz and 1 755-1 780 MHz bands are limited to 1 watt EIRP.

IC

- RSS-132 Issue 3

5.4, the transmitter output power shall be measured in terms of average power.

The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts.

Refer to SRSP-503 for base station e.i.r.p. limits.

- RSS-133 Issue 6

6.4, the equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. The equipment shall employ means to limit the power to the minimum necessary for successful communication.

- RSS-139 Issue 3

6.5, the equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. The e.i.r.p. for fixed and base stations in the band 1 710-1 780 MHz shall not exceed one watt.

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.

- §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.

- §27.53(h)(1), for operations in the 1 695-1 710 MHz, 1 710-1 755 MHz, 1 755-1 780 MHz, 1 915-1 920 MHz, 1 995-2 000 MHz, 2 000-2 020 MHz, 2 110-2 155 MHz, 2 155-2 180 MHz, and 2 180-2 200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB.

IC

- RSS-132 Issue 3

5.5, Mobile and base station equipment shall comply with the limits in (i) and (ii) below.

(i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1 % of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least $43 + 10 \log_{10} p$ (watts).

(ii) After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1 % of the occupied bandwidth, power integration over 100 kHz is required.

- RSS-133 Issue 6

6.5, Equipment shall comply with the limits in (i) and (ii) below.

(i) In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1 % of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least $43 + 10 \log_{10} p$ (watts).

(ii) After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dB W) by at least $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1 % of the emission bandwidth, power integration over 1.0 MHz is required.

- RSS-139 Issue 3

6.6, (i) In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1 % of the emission bandwidth shall be attenuated below the transmitter output power P (in dB W) by at least $43 + 10 \log_{10} p$ (watts) dB.

(ii) After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dB W) by at least $43 + 10 \log_{10} p$ (watts) dB.

2.3. Test Procedure: Based on ANSI/TIA 603E: 2016 and ANSI C63.26-2015 and KDB 971168 D01 Power Meas License Digital Systems v03r01.

1. On a test site, the EUT shall be placed at 0.8 m or 1.5 m 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. 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 = RMS, trace mode = max hold.
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. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
11. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
12. The measurement shall be repeated with the test antenna orientated for horizontal polarization.

2.4. Test result for E.R.P. / E.I.R.P.

Ambient temperature : $(23 \pm 1) ^\circ\text{C}$
Relative humidity : 47 % R.H.

GSM

Band	Frequency (MHz)	Maximum Average Power (dB m)	Maximum Average Power (W)	Antenna Gain (dB i)	Maximum E.I.R.P. (dB m)	Maximum E.I.R.P. (W)	Maximum E.R.P. (dB m)	Maximum E.R.P. (W)	Output Power Limit
850	824 ~ 849	34.00	2.511	-4.33	29.67	0.927	27.52	0.564	7 W E.R.P.
1 900	1 850 ~ 1 910	30.50	1.122	2.23	32.73	1.875			2 W E.I.R.P.

WCDMA

Band	Frequency (MHz)	Maximum Average Power (dB m)	Maximum Average Power (W)	Antenna Gain (dB i)	Maximum E.I.R.P. (dB m)	Maximum E.I.R.P. (W)	Maximum E.R.P. (dB m)	Maximum E.R.P. (W)	Output Power Limit
II	1 850 ~ 1 910	25.00	0.316	2.23	27.23	0.528			2 W E.I.R.P.
IV	1 710 ~ 1 755	25.00	0.316	3.76	28.76	0.752			1 W E.I.R.P.
V	824 ~ 849	25.00	0.316	-4.33	20.67	0.117	18.52	0.071	7 W E.R.P.

Remark;

1. E.I.R.P. (dB m) = Maximum Average Power (dB m) + Maximum Antenna Gain (dB i)
2. E.R.P. (dB m) = E.I.R.P. (dB m) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.

2.5. Spurious Radiated Emission

GSM 850

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ V/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (824.2 MHz)									
1 648.32	58.02	H	25.60	-36.69	46.93	-97.41	-50.48	-13	37.48
1 648.49	66.76	V	25.60	-36.69	55.67	-97.41	-41.74	-13	28.74
2 472.79	57.68	H	28.15	-34.20	51.63	-97.41	-45.78	-13	32.78
2 472.71	59.98	V	28.15	-34.20	53.93	-97.41	-43.48	-13	30.48
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 673.29	67.55	H	25.88	-36.62	56.81	-97.41	-40.60	-13	27.60
1 673.29	65.15	V	25.88	-36.62	54.41	-97.41	-43.00	-13	30.00
2 509.55	48.96	H	28.16	-34.05	43.07	-97.41	-54.34	-13	41.34
2 509.62	51.96	V	28.16	-34.05	46.07	-97.41	-51.34	-13	38.34
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 MHz)									
1 697.57	66.95	H	26.17	-36.52	56.60	-97.41	-40.81	-13	27.81
1 697.60	61.48	V	26.17	-36.52	51.13	-97.41	-46.28	-13	33.28
2 546.60	45.80	H	28.38	-33.86	40.32	-97.41	-57.09	-13	44.09
2 546.70	45.98	V	28.38	-33.86	40.50	-97.41	-56.91	-13	43.91
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

EDGE 850

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (824.2 MHz)									
1 648.59	54.12	H	25.60	-36.69	43.03	-97.41	-54.38	-13	41.38
1 648.49	51.79	V	25.60	-36.69	40.70	-97.41	-56.71	-13	43.71
2 472.65	44.76	H	28.15	-34.20	38.71	-97.41	-58.70	-13	45.70
2 472.78	48.67	V	28.15	-34.20	42.62	-97.41	-54.79	-13	41.79
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 673.26	54.84	H	25.88	-36.62	44.10	-97.41	-53.31	-13	40.31
1 673.13	52.18	V	25.88	-36.62	41.44	-97.41	-55.97	-13	42.97
2 510.29	43.57	H	28.16	-34.06	37.67	-97.41	-59.74	-13	46.74
2 509.71	46.96	V	28.16	-34.05	41.07	-97.41	-56.34	-13	43.34
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 MHz)									
1 697.78	52.76	H	26.17	-36.52	42.41	-97.41	-55.00	-13	42.00
1 697.56	51.60	V	26.17	-36.52	41.25	-97.41	-56.16	-13	43.16
2 546.43	44.36	H	28.38	-33.86	38.88	-97.41	-58.53	-13	45.53
2 546.33	45.46	V	28.38	-33.86	39.98	-97.41	-57.43	-13	44.43
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

GSM 1 900

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
Above 0.009	Not detected		-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
Above 0.009	Not detected		-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
Above 0.009	Not detected		-	-	-	-	-	-	-

EDGE 1 900

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
Above 0.009	Not detected		-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
Above 0.009	Not detected		-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
Above 0.009	Not detected		-	-	-	-	-	-	-

WCDMA II

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 852.4 MHz)									
5 000.02	43.44	H	33.00	-26.66	49.78	-95.26	-45.48	-13	32.48
5 000.04	43.05	V	33.00	-26.66	49.39	-95.26	-45.87	-13	32.87
5 559.25	48.48	H	33.90	-25.98	56.40	-95.26	-38.86	-13	25.86
5 560.85	48.35	V	33.90	-25.97	56.28	-95.26	-38.98	-13	25.98
7 404.85	37.94	H	36.00	-22.59	51.35	-95.26	-43.91	-13	30.91
7 412.50	41.17	V	36.00	-22.62	54.55	-95.26	-40.71	-13	27.71
12 961.30	35.69	H	39.00	-15.06	59.63	-95.26	-35.63	-13	22.63
Above 13 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
5 000.30	41.45	H	33.00	-26.65	47.80	-95.26	-47.46	-13	34.46
4 999.96	43.30	V	33.00	-26.66	49.64	-95.26	-45.62	-13	32.62
5 642.45	44.29	H	33.90	-25.19	53.00	-95.26	-42.26	-13	29.26
5 642.20	45.42	V	33.90	-25.19	54.13	-95.26	-41.13	-13	28.13
7 515.35	37.12	H	35.90	-22.90	50.12	-95.26	-45.14	-13	32.14
7 515.05	39.58	V	35.90	-22.90	52.58	-95.26	-42.68	-13	29.68
13 166.70	35.49	H	39.23	-15.35	59.37	-95.26	-35.89	-13	22.89
Above 13 200.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 907.6 MHz)									
4 999.88	41.86	H	33.00	-26.66	48.20	-95.26	-47.06	-13	34.06
5 000.12	42.97	V	33.00	-26.66	49.31	-95.26	-45.95	-13	32.95
5 720.75	39.43	H	33.94	-25.07	48.30	-95.26	-46.96	-13	33.96
5 719.10	40.98	V	33.94	-25.07	49.85	-95.26	-45.41	-13	32.41
7 635.30	36.65	H	35.90	-22.64	49.91	-95.26	-45.35	-13	32.35
7 627.45	38.90	V	35.90	-22.57	52.23	-95.26	-43.03	-13	30.03
Above 7 700.00	Not detected	-	-	-	-	-	-	-	-

WCDMA IV

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 712.4 MHz)									
3 467.25	41.75	H	31.10	-32.66	40.19	-95.26	-55.07	-13	42.07
3 426.70	47.88	V	30.91	-32.80	45.99	-95.26	-49.27	-13	36.27
4 999.92	41.47	H	33.00	-26.66	47.81	-95.26	-47.45	-13	34.45
5 000.08	41.11	V	33.00	-26.66	47.45	-95.26	-47.81	-13	34.81
5 140.55	42.92	V	33.28	-26.46	49.74	-95.26	-45.52	-13	32.52
Above 5 200.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 732.6 MHz)									
3 463.40	41.19	H	31.10	-32.75	39.54	-95.26	-55.72	-13	42.72
3 463.87	45.95	V	31.10	-32.74	44.31	-95.26	-50.95	-13	37.95
4 999.84	41.92	H	33.00	-26.66	48.26	-95.26	-47.00	-13	34.00
4 999.78	41.14	V	33.00	-26.66	47.48	-95.26	-47.78	-13	34.78
5 195.65	42.93	V	33.48	-26.07	50.34	-95.26	-44.92	-13	31.92
Above 5 200.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 752.6 MHz)									
3 503.05	46.44	H	31.09	-32.65	44.88	-95.26	-50.38	-13	37.38
3 503.75	49.67	V	31.09	-32.66	48.10	-95.26	-47.16	-13	34.16
4 999.92	41.34	H	33.00	-26.66	47.68	-95.26	-47.58	-13	34.58
4 999.98	41.76	V	33.00	-26.66	48.10	-95.26	-47.16	-13	34.16
Above 5 000.00	Not detected	-	-	-	-	-	-	-	-

WCDMA V

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (826.4 MHz)									
5 000.01	39.62	H	33.00	-26.66	45.96	-97.41	-51.45	-13	38.45
4 999.94	39.56	V	33.00	-26.66	45.90	-97.41	-51.51	-13	38.51
Above 5 100.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
5 000.13	39.38	H	33.00	-26.66	45.72	-97.41	-51.69	-13	38.69
4 999.89	39.70	V	33.00	-26.66	46.04	-97.41	-51.37	-13	38.37
Above 5 100.00	Not detected	-	-	-	-	-	-	-	-
High Channel (846.6 MHz)									
5 000.08	39.48	H	33.00	-26.66	45.82	-97.41	-51.59	-13	38.59
4 999.94	39.62	V	33.00	-26.66	45.96	-97.41	-51.45	-13	38.45
Above 5 100.00	Not detected	-	-	-	-	-	-	-	-

Remark;

1. AF = Antenna Factor, CL = Cable Loss, CF = Conversion Factor.
2. E (dBμV/m) = Measured Level (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB).
3. E.I.R.P. (dB m) = E (dBμV/m) + CF (dB).
4. E.R.P. (dB m) = E (dBμV/m) + CF (dB) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.
5. CF (dB) = 20 log D - 104.8; where D is the measurement distance in meters, According to ANSI C63.26-2015 5.2.7 and KDB 971168 D01 v03r01 5.8.4
6. The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

3. Conducted Output Power

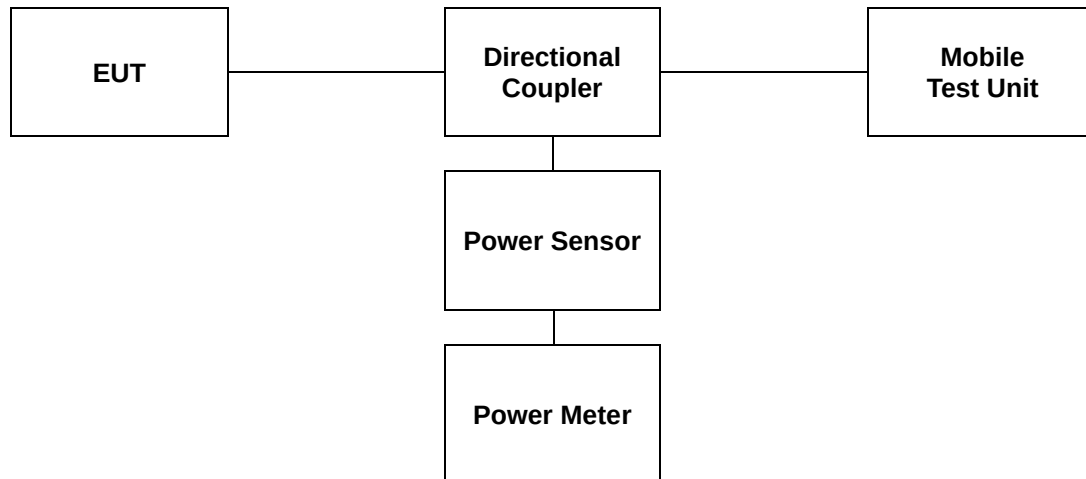
3.1. Limit

CFR 47, Section FCC §2.1046 and IC RSS-Gen Issue 5 6.12.

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.



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)	(W)	(dB m)	(W)	(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
850	128	824.2	<u>33.18</u>	<u>2.080</u>	33.14	2061	33.16	2.070	<u>27.21</u>	<u>0.526</u>	26.85	0.484
	190	836.6	33.08	2.032	33.12	2.051	33.10	2.042	26.76	0.474	26.21	0.418
	251	848.8	32.94	1.968	33.08	2.032	33.03	2.009	26.42	0.439	26.62	0.459
1 900	512	1 850.2	<u>29.86</u>	<u>0.968</u>	29.81	0.957	29.78	0.951	<u>25.94</u>	<u>0.393</u>	25.27	0.337
	661	1 880.0	29.85	0.966	29.79	0.953	29.70	0.933	25.89	0.388	25.44	0.350
	810	1 909.8	29.82	0.959	29.76	0.946	29.68	0.929	25.71	0.372	25.09	0.323

- WCDMA

Band	3GPP Release Version	Channel		9262		9400		9538	
		Frequency (MHz)		1 852.4		1 880.0		1 907.6	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
II	99	WCDMA	GPRS	23.06	0.202	<u>23.30</u>	<u>0.214</u>	23.01	0.200
	5	HSDPA	Subtest 1	22.03	0.160	22.35	0.172	22.06	0.161
	5		Subtest 2	22.05	0.160	22.34	0.171	22.06	0.161
	5		Subtest 3	21.53	0.142	21.77	0.150	21.56	0.143
	5		Subtest 4	21.53	0.142	21.81	0.152	21.59	0.144
	6	HSUPA	Subtest 1	22.11	0.163	22.39	0.173	22.14	0.164
	6		Subtest 2	20.13	0.103	20.36	0.109	20.14	0.103
	6		Subtest 3	21.11	0.129	21.36	0.137	21.14	0.130
	6		Subtest 4	20.12	0.103	20.38	0.109	20.17	0.104
	6		Subtest 5	22.11	0.163	22.43	0.175	22.14	0.164
	7	HSPA+		21.68	0.147	21.76	0.150	21.49	0.141
	8	DC-HSDPA	Subtest 1	22.28	0.169	22.31	0.170	22.02	0.159
	8		Subtest 2	22.28	0.169	22.29	0.169	22.02	0.159
	8		Subtest 3	21.68	0.147	21.78	0.151	21.11	0.129
	8		Subtest 4	21.70	0.148	21.80	0.151	21.07	0.128

Band	3GPP Release Version	Channel		1312		1413		1513	
		Frequency (MHz)		1 712.4		1 732.6		1 752.6	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
IV	99	WCDMA	GPRS	22.53	0.179	22.40	0.174	22.55	0.180
	5	HSDPA	Subtest 1	21.44	0.139	21.42	0.139	21.55	0.143
	5		Subtest 2	21.40	0.138	21.38	0.137	21.53	0.142
	5		Subtest 3	20.73	0.118	20.90	0.123	21.03	0.127
	5		Subtest 4	20.88	0.122	20.88	0.122	21.00	0.126
	6	HSUPA	Subtest 1	21.63	0.146	21.64	0.146	21.72	0.149
	6		Subtest 2	19.62	0.092	19.62	0.092	19.79	0.095
	6		Subtest 3	20.61	0.115	20.67	0.117	20.76	0.119
	6		Subtest 4	19.65	0.092	19.67	0.093	19.77	0.095
	6		Subtest 5	21.60	0.145	21.65	0.146	21.75	0.150
	7	HSPA+		20.59	0.115	20.68	0.117	20.70	0.117
	8	DC-HSDPA	Subtest 1	21.03	0.127	21.11	0.129	21.01	0.126
	8		Subtest 2	21.12	0.129	21.23	0.133	21.03	0.127
	8		Subtest 3	20.54	0.113	20.61	0.115	20.52	0.113
	8		Subtest 4	20.59	0.115	20.69	0.117	20.58	0.114

Band	3GPP Release Version	Channel		4132		4182		4233	
		Frequency (MHz)		826.4		836.6		846.6	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
V	99	WCDMA	GPRS	24.12	0.258	23.97	0.249	23.85	0.243
	5	HSDPA	Subtest 1	22.86	0.193	22.80	0.191	22.84	0.192
	5		Subtest 2	22.88	0.194	22.80	0.191	22.84	0.192
	5		Subtest 3	22.37	0.173	22.28	0.169	22.34	0.171
	5		Subtest 4	22.38	0.173	22.29	0.169	22.33	0.171
	6	HSUPA	Subtest 1	22.88	0.194	22.93	0.196	22.89	0.195
	6		Subtest 2	21.03	0.127	20.90	0.123	20.94	0.124
	6		Subtest 3	21.97	0.157	21.92	0.156	21.95	0.157
	6		Subtest 4	21.04	0.127	20.96	0.125	20.98	0.125
	6		Subtest 5	23.00	0.200	22.98	0.199	22.95	0.197
	7	HSPA+		21.89	0.155	21.92	0.156	21.90	0.155
	8	DC-HSDPA	Subtest 1	21.92	0.156	21.85	0.153	22.02	0.159
	8		Subtest 2	21.98	0.158	21.84	0.153	22.01	0.159
	8		Subtest 3	21.42	0.139	21.35	0.136	21.49	0.141
	8		Subtest 4	21.40	0.138	21.31	0.135	21.62	0.145

4. Occupied Bandwidth

4.1. Limit

CFR 47, Section FCC §2.1049 and IC RSS-Gen Issue 5 6.7.

4.2. Test Procedure

FCC

The test follows section 5.4.4 of ANSI C63.26-2015.

- a. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation. products including the emission skirts (typically a span of $1.5 \times \text{OBW}$ is sufficient).
- b. The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- c. Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- d. Set the detection mode to peak, and the trace mode to max-hold.
- e. If the instrument does not have a 99 % OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5 % of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5 % of the total is reached and record that frequency as the upper OBW frequency. The 99 % power OBW can be determined by computing the difference these two frequencies.
- f. The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

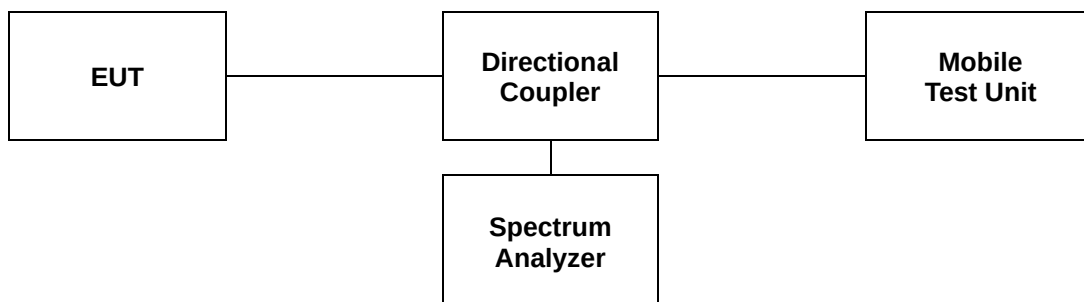
IC

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99 % emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99 % emission bandwidth).



4.3 Test Results

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

- GSM

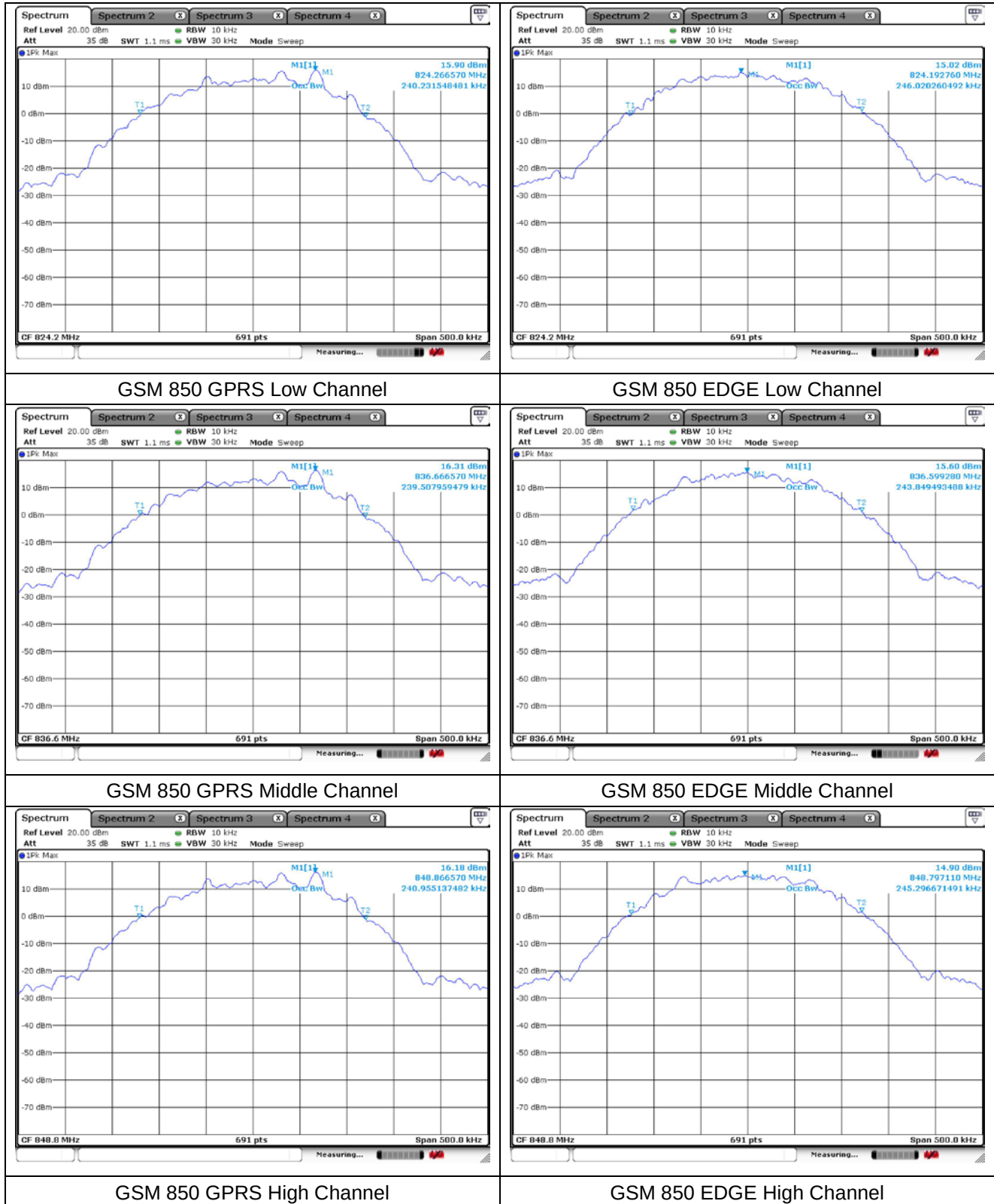
Band	Frequency (MHz)	Occupied Bandwidth (MHz)	
		GPRS	EDGE
850	824.2	0.240	0.246
	836.6	0.240	0.244
	848.8	0.241	0.245
1 900	1 850.2	0.240	0.245
	1 880.0	0.241	0.244
	1 909.8	0.240	0.241

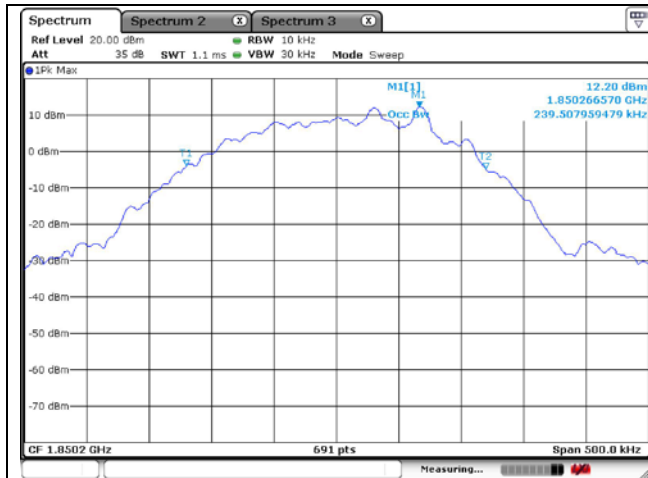
- WCDMA

Band	Frequency (MHz)	Occupied Bandwidth (MHz)
II	1 852.4	4.146
	1 880.0	4.136
	1 907.6	4.146
IV	1 712.4	4.146
	1 732.6	4.146
	1 752.6	4.126
V	826.4	4.126
	836.6	4.116
	846.6	4.136

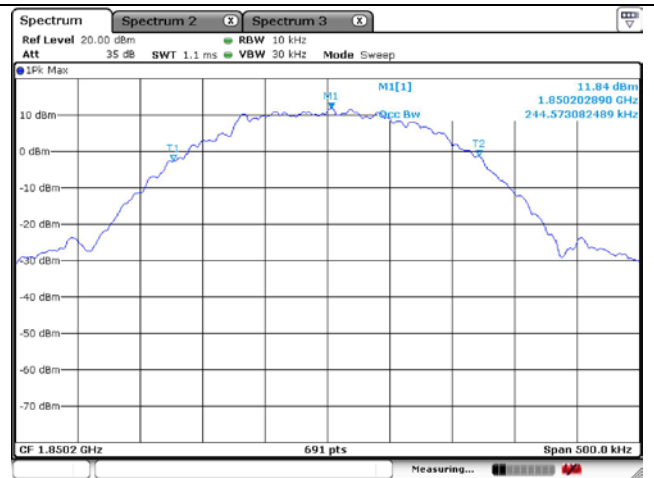
- Test plots

GSM

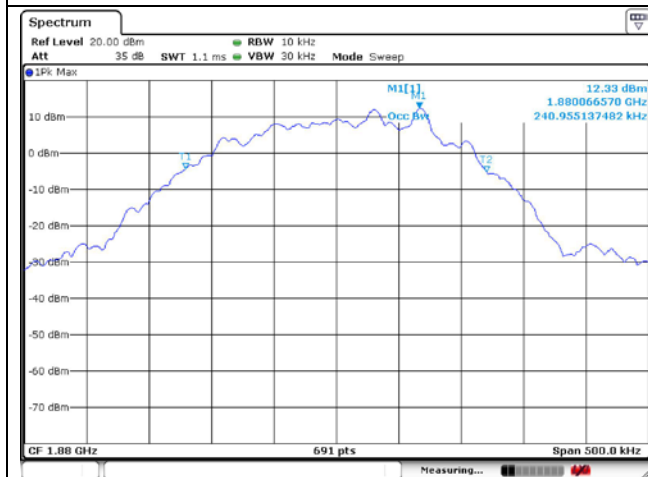




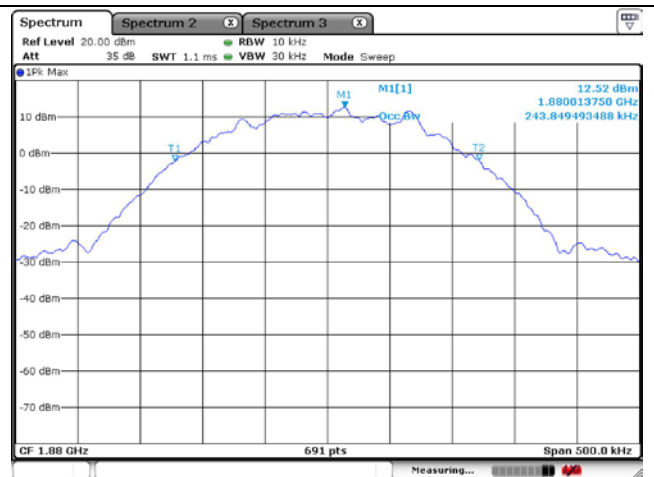
GSM 1 900 GPRS Low Channel



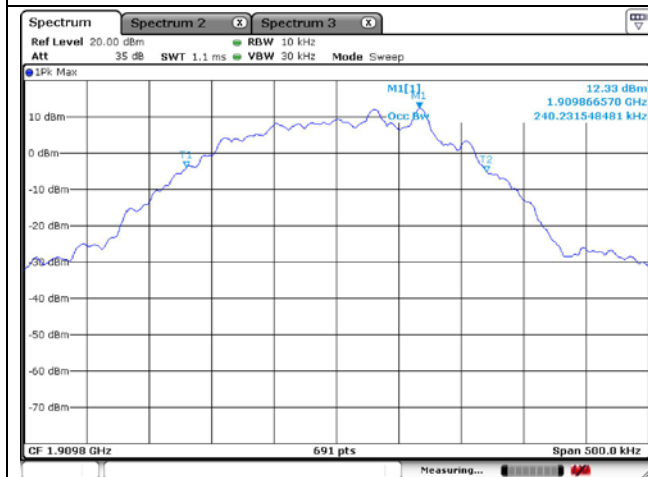
GSM 1 900 EDGE Low Channel



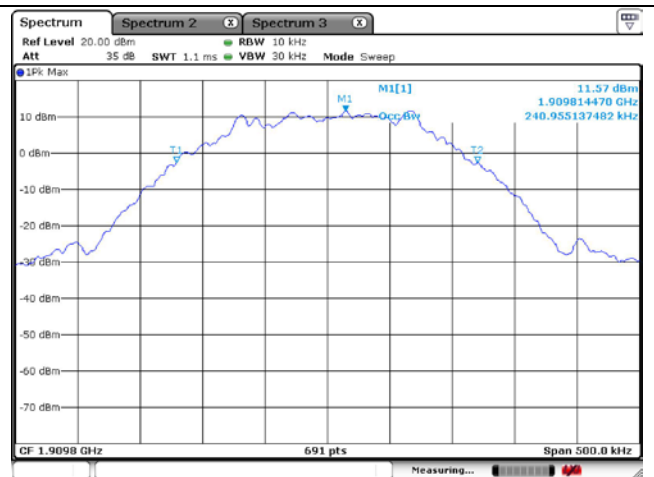
GSM 1 900 GPRS Middle Channel



GSM 1 900 EDGE Middle Channel

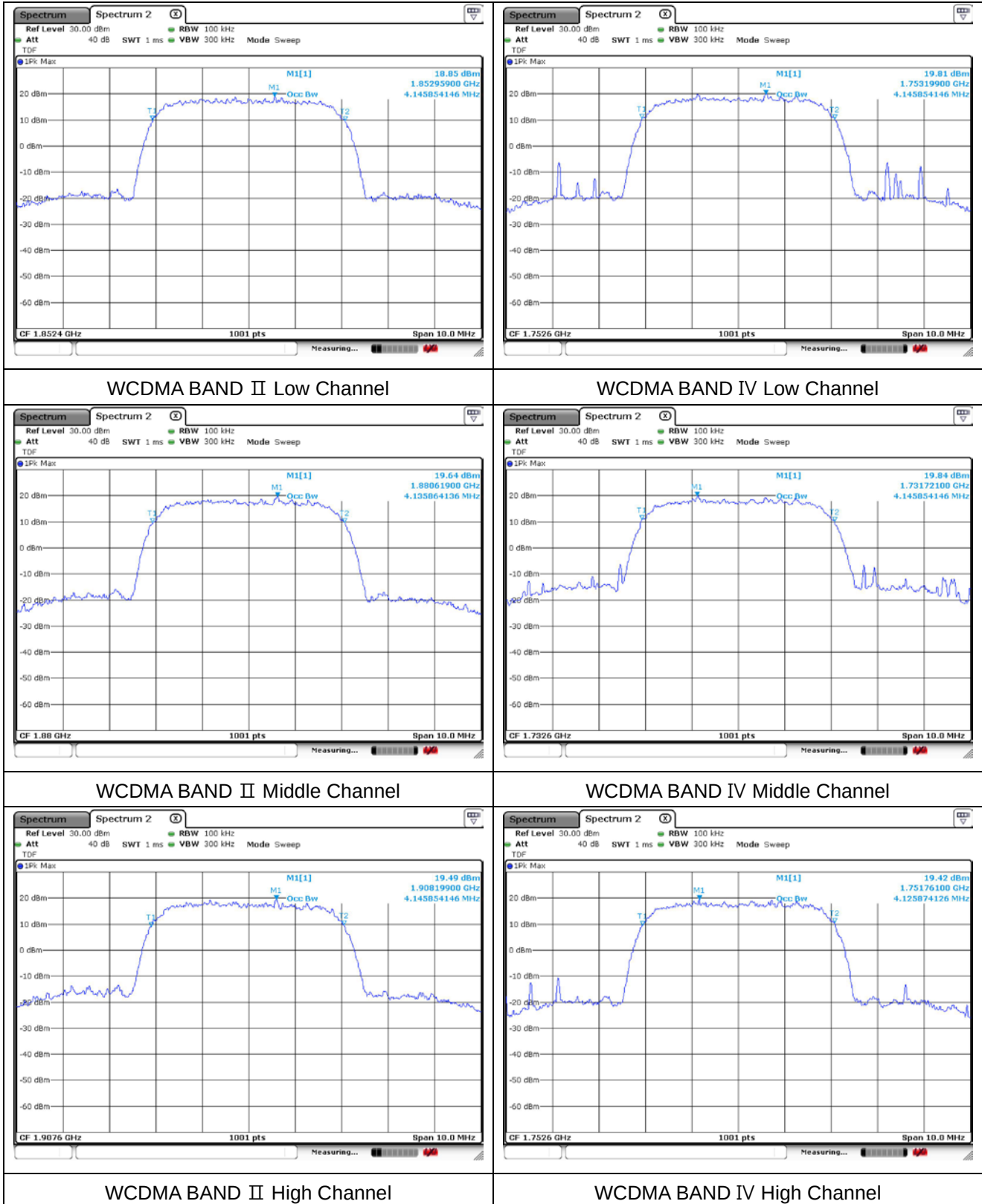


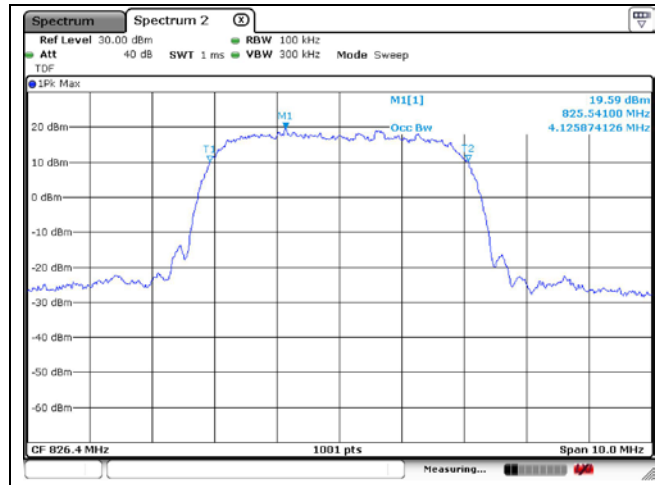
GSM 1 900 GPRS High Channel



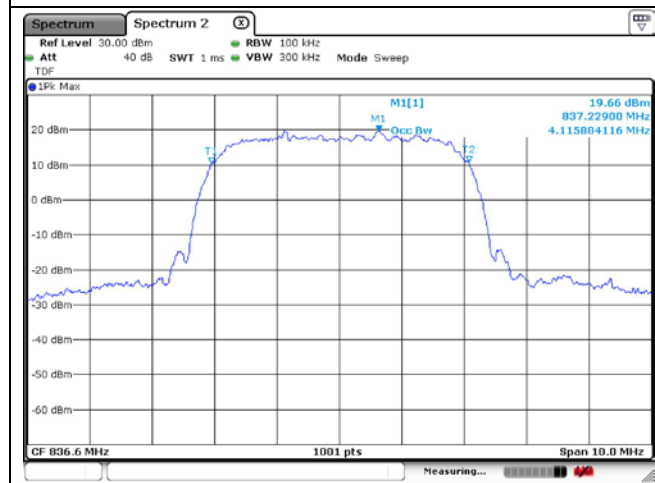
GSM 1 900 EDGE High Channel

WCDMA

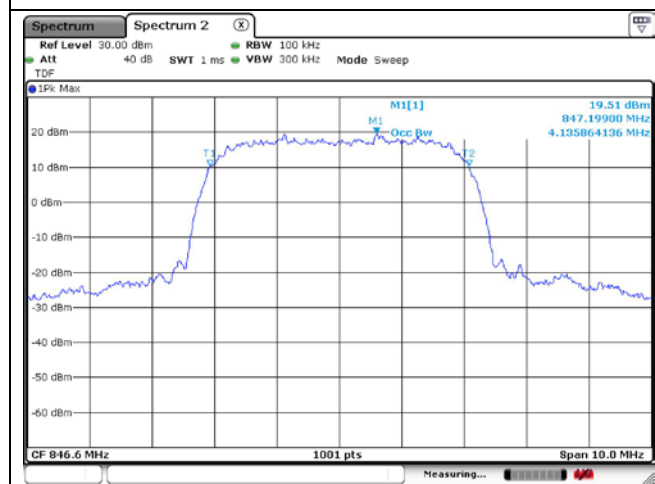




WCDMA BAND V Low Channel



WCDMA BAND V Middle Channel



WCDMA BAND V High Channel