

TEST REPORT

of

FCC Part 2 Subpart J, Part 22 Subpart C/H,
Part 24 Subpart E and Part 27 Subpart C

FCC ID: BEJTM16FNROBM0

Equipment Under Test : Telematics Module
Model Name : TM16FNROBM0
Variant Model Name(s) : -
Applicant : LG Electronics USA, Inc.
Manufacturer : LG Electronics Inc.
Date of Receipt : 2024.05.27
Date of Test(s) : 2024.06.13 ~ 2024.09.10
Date of Issue : 2024.09.11

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

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- 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.

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Tested by:



Dave Kim

Technical
Manager:



Jinhyoung Cho

SGS Korea Co., Ltd. Gunpo Laboratory

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

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- Designation number: KR0150

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1.2. Details of Applicant

Applicant : LG Electronics USA, Inc.

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

Contact Person : Kim, David

Phone No. : +1 201 470 2696

1.3. Details of Manufacturer

Company : LG Electronics Inc.

Address : 128, Yeoui-daero, Yeongdeungpo-gu, Seoul, Republic of Korea, 07336

1.4. Description of EUT

Kind of Product	Telematics Module		
Model Name	TM16FNROBM0		
Serial Number	357286160005090		
Power Supply	DC 4.1 V		
Rated Power	WCDMA II, IV, V : 24 dB m GSM850: 33 dB m GSM1900: 30 dB m		
Frequency Range	WCDMA II : 1 850 MHz ~ 1 910 MHz WCDMA IV : 1 710 MHz ~ 1 755 MHz WCDMA V : 824 MHz ~ 849 MHz GSM 850: 824 MHz ~ 849 MHz GSM 1 900: 1 850 MHz ~ 1 910 MHz		
Modulation Technique	QPSK, 16QAM, GMSK, 8PSK		
Antenna Type	Ant. 1: PIFA Antenna	Ant. 2: PIFA Antenna	Ant. 3: PIFA Antenna
Antenna Gain*	Refer to the clause 1.12		
H/W Version	Rev.D		
S/W Version	IN25XA03		

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMA100B	106887	Oct. 06, 2023	Annual	Oct. 06, 2024
Spectrum Analyzer	R&S	FSV30	100955	Mar. 08, 2024	Annual	Mar. 08, 2025
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 01, 2023	Annual	Sep. 01, 2024
Mobile Test Unit	R&S	CMW 500	144034	Feb. 28, 2024	Annual	Feb. 28, 2025
Power Meter	Anritsu	ML2495A	1223004	May 29, 2024	Annual	May 29, 2025
Power Sensor	Anritsu	MA2411B	1207272	May 29, 2024	Annual	May 29, 2025
Temperature Chamber	ESPEC CORP.	PL-2J	15004184	Jun. 03, 2024	Annual	Jun. 03, 2025
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	May 17, 2024	Annual	May 17, 2025
High Pass Filter	Wainwright Instrument GmbH	WHKX10-900-1000-18000-40SS	7	Feb. 27, 2024	Annual	Feb. 27, 2025
High Pass Filter	Wainwright Instrument GmbH	WHKX2.2/12.75G-10SS	8	Mar. 17, 2024	Annual	Mar. 17, 2025
High Pass Filter	Wainwright Instrument GmbH	WHKX3.0/18G-10SS	21	Jun. 07, 2024	Annual	Jun. 07, 2025
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	11	Oct. 17, 2023	Annual	Oct. 17, 2024
BRIDGE COUPLER	MARKI MICROWAVE INC	CBR16-0012	1542	May 13, 2024	Annual	May 13, 2025
Directional Coupler	KRYTAR	152613	122660	Jul. 09, 2024	Annual	Jul. 09, 2025
DC Power Supply	R&S	HMP2020	102133	Apr. 23, 2024	Annual	Apr. 23, 2025
Preamplifier	H.P.	8447F	2944A03909	Aug. 09, 2024	Annual	Aug. 09, 2025
Preamplifier	R&S	SCU 18F	101058	Dec. 07, 2023	Annual	Dec. 07, 2024
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	Oct. 06, 2023	Annual	Oct. 06, 2024
Test Receiver	R&S	ESU26	100109	Jan. 16, 2024	Annual	Jan. 16, 2025
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 21, 2023	Biennial	Aug. 21, 2025
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	9163-396	Apr. 02, 2024	Biennial	Apr. 02, 2026
Horn Antenna	R&S	HF906	100326	Feb. 19, 2024	Annual	Feb. 19, 2025
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	9170-540	Dec. 05, 2023	Annual	Dec. 05, 2024
Antenna Master	Innco systems GmbH	MA4640-XP-ET	MA4640/536/38330516/L	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	CO3000/963/38330516/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	SENSORVIEW	NMST-13A26-NMST-5 m	TPC2402190004	Apr. 03, 2024	Semi-Annual	Oct. 03, 2024
Coaxial Cable	SENSORVIEW	NMST-13A26-NMST-10 m	TPC2402190001	Apr. 03, 2024	Semi-Annual	Oct. 03, 2024
Coaxial Cable	RADIALL	TESTPRO 3	182284	Apr. 12, 2024	Semi-Annual	Oct. 12, 2024
Coaxial Cable	RADIALL	TESTPRO 3	182290	Apr. 12, 2024	Semi-Annual	Oct. 12, 2024
Coaxial Cable	RADIALL	TESTPRO 3	182292	Apr. 12, 2024	Semi-Annual	Oct. 12, 2024

Note;

- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 2, 22, 24 and 27		
Section(s)	Test Item	Result
§2.1046 §22.913(a)(5) §24.232(c) §27.50(d)(4)	E.R.P. / E.I.R.P.	Complied
§22.917(a) §24.238(a) §27.53(h)(1)	Radiated Spurious Emission	Complied
§2.1046	Conducted Output Power	Complied
§2.1049	Occupied Bandwidth	Complied
§22.913(d) §24.232(d) §27.50(d)(5)	Peak-Average Ratio	Complied
§22.917(a) §24.238(a) §27.53(h)(1)	Spurious Emission at Antenna Terminal	Complied
§22.917(a) §24.238(a) §27.53(h)(1)	Band Edge	Complied
§2.1055 §22.355 §24.235 §27.54	Frequency Stability	Complied

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.I.R.P. (dB m) = Measured level (dB μ V) + 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)

1.8. 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 GSM and EDGE mode, except frequency stability, spurious radiated emission spurious and emission at antenna terminal were tested only GSM mode as worst case.

WCDMA

WCDMA mode, Output power measurements were measured on RMC, HSDPA, HSUPA and DC-HSPA Modulation. All testing was performed using RMC and HSDPA modulations, except spurious radiated emission spurious and emission at antenna terminal were tested only RMC modulation as worst case. The worst-case is based on the average conducted output power measurement investigation results.

1.9. Measurement Configuration

WCDMA

Test Items	Band	Test Channel			Modulation			
		Low	Mid	High	RMC	HSUPA	HSDPA	DC-HSPA
Conducted Output Power	Band II	V	V	V	V	V	V	V
	Band IV	V	V	V	V	V	V	V
	Band V	V	V	V	V	V	V	V
Frequency Stability	Band II	-	V	-	V	-	-	-
	Band IV	-	V	-	V	-	-	-
	Band V	-	V	-	V	-	-	-
Occupied Bandwidth	Band II	-	V	-	V	-	V	-
	Band IV	-	V	-	V	-	V	-
	Band V	-	V	-	V	-	V	-
Peak to Average Ratio	Band II	V	V	V	V	-	V	-
	Band IV	V	V	V	V	-	V	-
	Band V	V	V	V	V	-	V	-
Band Edge	Band II	V	-	V	V	-	V	-
	Band IV	V	-	V	V	-	V	-
	Band V	V	-	V	V	-	V	-
Spurious Emission at Antenna Terminal	Band II	V	V	V	V	-	-	-
	Band IV	V	V	V	V	-	-	-
	Band V	V	V	V	V	-	-	-
Radiated Spurious 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
Frequency Stability	GSM 850	-	V	-	V	-	-
	GSM 1900	-	V	-	V	-	-
Occupied Bandwidth	GSM 850	-	V	-	V	-	V
	GSM 1900	-	V	-	V	-	V
Peak to Average Ratio	GSM 850	V	V	V	V	-	V
	GSM 1900	V	V	V	V	-	V
Band Edge	GSM 850	V	-	V	V	-	V
	GSM 1900	V	-	V	V	-	V
Spurious Emission at Antenna Terminal	GSM 850	V	V	V	V	-	-
	GSM 1900	V	V	V	V	-	-
Radiated Spurious Emission	GSM 850	V	V	V	V	-	-
	GSM 1900	V	V	V	V	-	-

1.10. Measurement Uncertainty

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

Parameter	Uncertainty	
RF Output Power	0.33 dB	
Occupied Bandwidth	0.05 MHz	
Conducted Spurious Emissions	0.99 dB	
Peak to Average Ratio	0.66 dB	
Frequency Stability	116 Hz	
Radiated Emission, 9 kHz to 30 MHz	H	3.60 dB
	V	3.60 dB
Radiated Emission, below 1 GHz	H	4.60 dB
	V	4.90 dB
Radiated Emission, above 1 GHz	H	3.90 dB
	V	3.80 dB

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

1.11. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL005370	2024.09.11	Initial

1.12. Antenna Designation

Ant. No	Ant. Type	Support Band			
		GSM	WCDMA	LTE	NR
Ant.1	PIFA	850, 1900	II, IV, V	2, 4, 5, 7, 12, 17, 25, 26, 38, 41	7, 41, 77, 78
Ant.2	PIFA				77, 78
Ant.3	PIFA	850, 1900	II, IV, V	2, 4, 5, 7, 12, 17, 25, 26, 38, 41	7, 41, 77, 78

Band	Operating Frequency (MHz)	Antenna Peak Gain (dB i)		
		Ant. 1	Ant. 2	Ant. 3
GSM 1900 WCDMA II LTE 25/2	1 850 ~ 1 915	<u>2.80</u>		-0.92
WCDMA IV LTE 4	1 710 ~ 1 755	<u>0.22</u>		-2.34
GSM 850 WCDMA V LTE 26/5	824 ~ 849	<u>-1.16</u>		-2.11
LTE 26	814 ~ 824	<u>-1.16</u>		-2.11
LTE 7 NR 7	2 500 ~ 2 570	1.65		<u>2.41</u>
LTE 12/17	699 ~ 716	-2.46		<u>1.04</u>
LTE 41/38 NR 41	2 496 ~ 2 690	1.65		<u>2.41</u>
NR 77	3 450 ~ 3 550	1.95	1.44	<u>3.72</u>
	3 700 ~ 3 980	1.95	1.44	<u>3.72</u>
NR 78	3 450 ~ 3 550	1.95	1.44	<u>3.72</u>
	3 700 ~ 3 800	1.95	1.44	<u>3.72</u>

Band	Operating Frequency (MHz)	Ant. 1	Ant. 2	Ant. 3
GSM 1900 WCDMA II LTE 25/2	1 850 ~ 1 915	V		-
WCDMA IV LTE 4	1 710 ~ 1 755	V		-
GSM 850 WCDMA V LTE 26/5	824 ~ 849	V		-
LTE 26	814 ~ 824	V		-
LTE 7 NR 7	2 500 ~ 2 570	-		V
LTE 12/17	699 ~ 716	-		V
LTE 41/38 NR 41	2 496 ~ 2 690	-		V
NR 77	3 450 ~ 3 550	-	-	V
	3 700 ~ 3 980	-	-	V
NR 78	3 450 ~ 3 550	-	-	V
	3 700 ~ 3 800	-	-	V

1.13. Emission Designator and Max Power

WCDMA

Band	Modulation	Low Freq. (MHz)	Upper Freq. (MHz)	Conducted Power (dB m)	Ant. Gain (dB i)	E.R.P. / E.I.R.P. Average (dB m)	E.R.P. / E.I.R.P. Average (W)	Emission Designator
WCDMA II	RMC	1 852.4	1 907.6	23.75	2.80	26.55	0.452	4M20F9W
	HSDPA			22.89		25.69	0.371	4M17F9W
WCDMA IV	RMC	1 712.4	1 752.6	23.67	0.22	23.89	0.245	4M18F9W
	HSDPA			22.78		23.00	0.200	4M17F9W
WCDMA V	RMC	826.4	846.6	23.85	-1.16	20.54	0.113	4M16F9W
	HSDPA			22.96		19.65	0.092	4M18F9W

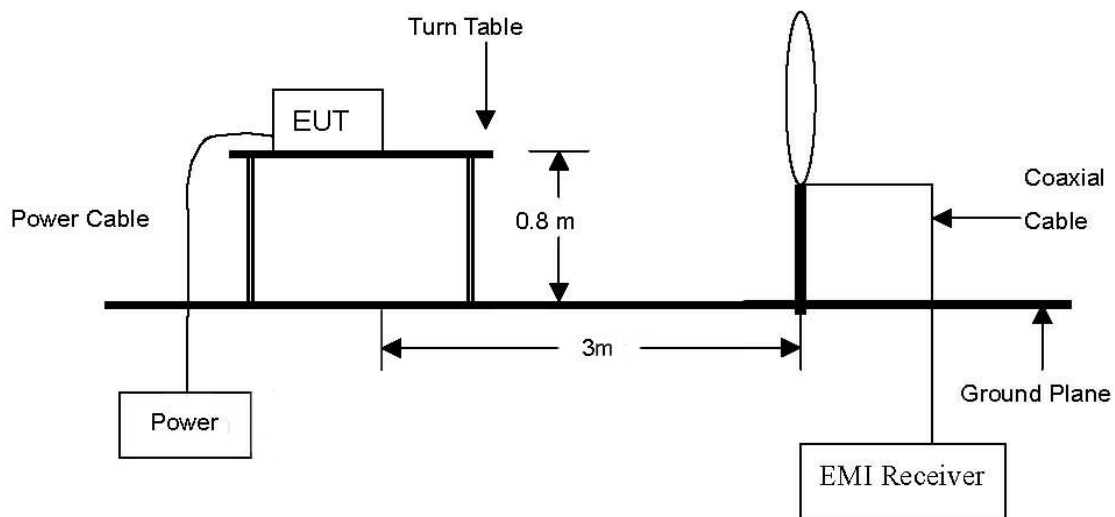
GSM

Band	Modulation	Low Freq. (MHz)	Upper Freq. (MHz)	Conducted Power (dB m)	Ant. Gain (dB i)	E.R.P. / E.I.R.P. Average (dB m)	E.R.P. / E.I.R.P. Average (W)	Emission Designator
GSM 850	VOICE	824.2	848.8	33.72	-1.16	30.41	1.099	241KGXW
	EDGE			26.98		23.67	0.233	244KG7W
GSM 1900	VOICE	1 850.2	1 909.8	29.96	2.80	32.76	1.888	238KGXW
	EDGE			25.53		28.33	0.681	250KG7W

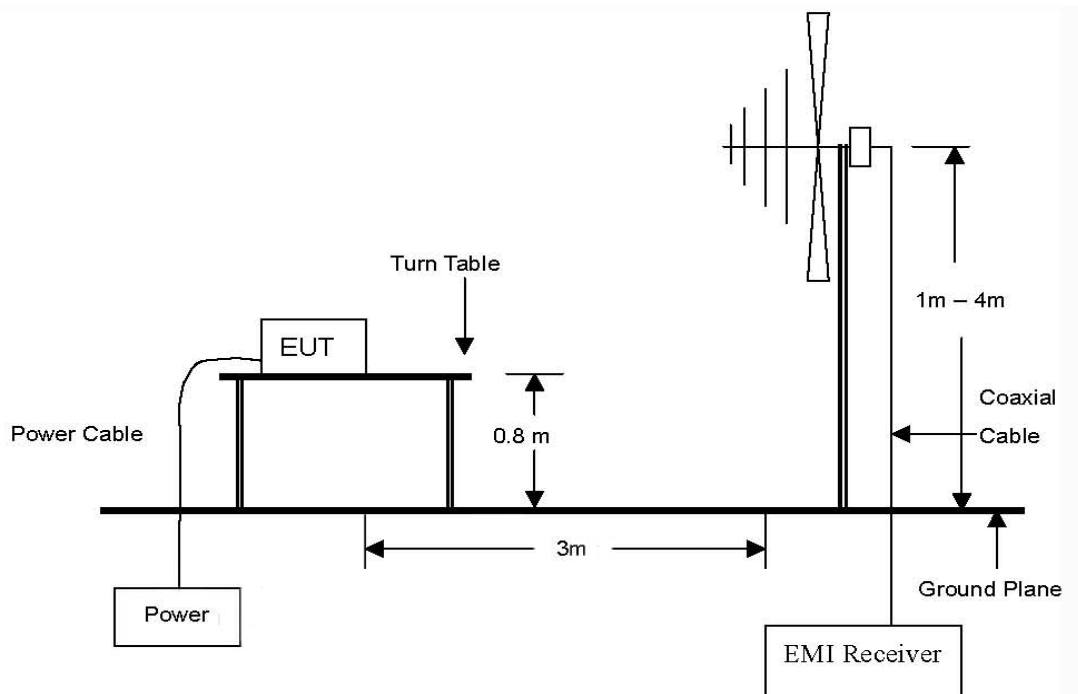
2. E.R.P / E.I.R.P. & Radiated Spurious Emission

2.1. Test setup

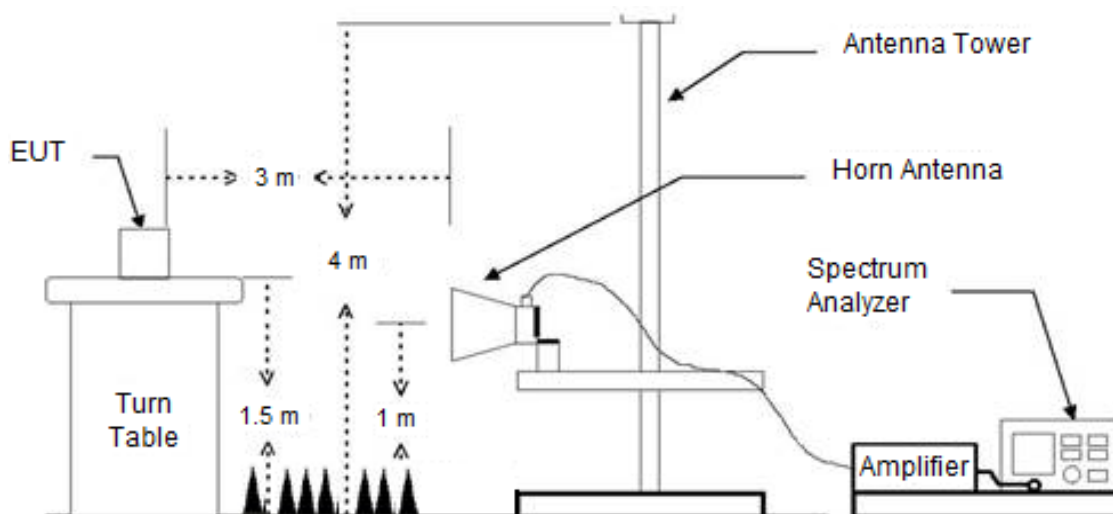
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



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.

- §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.

2.2.2. Limit of Radiated Spurious 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.
- §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.

2.3. Test Procedure

2.3.1. E.R.P. or E.I.R.P. from conducted RF output power

According to subclause 5.2.5.5 of ANSI C63.26-2015 E.R.P. and E.I.R.P. are defined as the product of the power supplied to the antenna and its gain.

The relevant equation for determining the E.R.P. or E.I.R.P. from the conducted RF output power measured using the guidance provided above is:

$$\text{E.R.P. or E.I.R.P.} = P_{\text{Meas}} + G_T$$

where:

E.R.P. or E.I.R.P. = effective radiated power or equivalent isotropically radiated power, respectively
(expressed in the same units as P_{Meas} , typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

G_T = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

2.3.2. Radiated Spurious Emissions

The test 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 ≥ 3 x RBW,
Detector = RMS, trace mode = max hold, per the guidelines of KDB 971168 D01 Power Meas License Digital Systems v03r01.
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 results

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

2.4.1. E.R.P. / E.I.R.P.

WCDMA

Band	Frequency (MHz)	Maximum Conducted Average Power (dBm)	Maximum Conducted Average Power (W)	Antenna Gain (dB i)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (W)	Maximum E.R.P. (dBm)	Maximum E.R.P. (W)	Limit
WCDMA II	1 850 ~ 1 910	23.75	0.237	2.80	26.55	0.452			2 W E.I.R.P.
WCDMA IV	1 710 ~ 1 755	23.67	0.233	0.22	23.89	0.245			1 W E.I.R.P.
WCDMA V	824 ~ 849	23.85	0.243	-1.16	22.69	0.186	20.54	0.113	7 W E.R.P.

GSM

Band	Frequency (MHz)	Maximum Conducted Average Power (dBm)	Maximum Conducted Average Power (W)	Antenna Gain (dB i)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (W)	Maximum E.R.P. (dBm)	Maximum E.R.P. (W)	Limit
GSM 850	824 ~ 849	33.72	2.355	-1.16	32.56	1.803	30.41	1.099	7 W E.R.P.
GSM 1900	1 850 ~ 1 910	29.96	0.991	2.80	32.76	1.888			2 W E.I.R.P.

Remark;

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

2.4.2. Radiated Spurious Emission

- Ant. 1

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)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 907.6 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	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)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 732.6 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 752.6 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	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)									
1 333.14	52.46	H	25.03	-37.93	39.56	-97.41	-57.85	-13	44.85
1 332.99	53.93	V	25.03	-37.93	41.03	-97.41	-56.38	-13	43.38
Above 1 400.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 333.09	52.01	H	25.03	-37.93	39.11	-97.41	-58.30	-13	45.30
1 332.84	53.99	V	25.03	-37.93	41.09	-97.41	-56.32	-13	43.32
Above 1 400.00	Not detected	-	-	-	-	-	-	-	-
High Channel (846.6 MHz)									
1 332.71	52.19	H	25.03	-37.93	39.29	-97.41	-58.12	-13	45.12
1 333.08	53.63	V	25.03	-37.93	40.73	-97.41	-56.68	-13	43.68
Above 1 400.00	Not detected	-	-	-	-	-	-	-	-

GSM 850_VOICE

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)									
1 332.62	54.39	H	25.03	-37.93	41.49	-97.41	-55.92	-13	42.92
1 332.83	52.13	V	25.03	-37.93	39.23	-97.41	-58.18	-13	45.18
2 472.46	64.42	H	28.29	-35.00	57.71	-97.41	-39.70	-13	26.70
2 472.75	60.13	V	28.29	-35.00	53.42	-97.41	-43.99	-13	30.99
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 332.93	54.84	H	25.03	-37.93	41.94	-97.41	-55.47	-13	42.47
1 333.09	52.18	V	25.03	-37.93	39.28	-97.41	-58.13	-13	45.13
2 509.98	63.85	H	28.44	-34.95	57.34	-97.41	-40.07	-13	27.07
2 509.92	59.25	V	28.44	-34.95	52.74	-97.41	-44.67	-13	31.67
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 MHz)									
1 333.08	54.38	H	25.03	-37.93	41.48	-97.41	-55.93	-13	42.93
1 333.50	52.04	V	25.03	-37.93	39.14	-97.41	-58.27	-13	45.27
2 546.35	59.69	H	28.59	-34.89	53.39	-97.41	-44.02	-13	31.02
2 546.56	59.09	V	28.59	-34.89	52.79	-97.41	-44.62	-13	31.62
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_VOICE

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)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

- Ant. 3

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)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 907.6 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	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)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 732.6 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 752.6 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	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)									
1 624.95	50.44	H	25.60	-36.97	39.07	-97.41	<u>-58.37</u>	-13	45.37
1 625.01	49.64	V	25.60	-36.97	38.27	-97.41	-58.99	-13	45.99
Above 1 700.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 625.04	50.20	H	25.60	-36.97	38.83	-97.41	-58.60	-13	45.60
1 624.73	49.39	V	25.60	-36.97	38.02	-97.41	-59.42	-13	46.42
Above 1 700.00	Not detected	-	-	-	-	-	-	-	-
High Channel (846.6 MHz)									
1 625.00	50.02	H	25.60	-36.97	38.65	-97.41	-58.64	-13	45.64
1 624.79	49.22	V	25.60	-36.97	37.85	-97.41	-59.20	-13	46.20
Above 1 700.00	Not detected	-	-	-	-	-	-	-	-

GSM 850_VOICE

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)									
1 332.62	54.39	H	25.03	-37.93	41.49	-97.41	-55.92	-13	42.92
1 332.83	52.13	V	25.03	-37.93	39.23	-97.41	-58.18	-13	45.18
2 472.46	64.42	H	28.29	-35.00	57.71	-97.41	-39.70	-13	26.70
2 472.75	60.13	V	28.29	-35.00	53.42	-97.41	-43.99	-13	30.99
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 332.93	54.84	H	25.03	-37.93	41.94	-97.41	-55.47	-13	42.47
1 333.09	52.18	V	25.03	-37.93	39.28	-97.41	-58.13	-13	45.13
2 509.98	63.85	H	28.44	-34.95	57.34	-97.41	-40.07	-13	27.07
2 509.92	59.25	V	28.44	-34.95	52.74	-97.41	-44.67	-13	31.67
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 MHz)									
1 333.08	54.38	H	25.03	-37.93	41.48	-97.41	-55.93	-13	42.93
1 333.50	52.04	V	25.03	-37.93	39.14	-97.41	-58.27	-13	45.27
2 546.35	59.69	H	28.59	-34.89	53.39	-97.41	-44.02	-13	31.02
2 546.56	59.09	V	28.59	-34.89	52.79	-97.41	-44.62	-13	31.62
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_VOICE

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)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

Remark;

1. AF = Antenna Factor, CL = Cable Loss, CF = Conversion Factor.
2. $E \text{ (dB}\mu\text{V/m)} = \text{Measured Level (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + \text{AMP (dB)}$.
3. $E.I.R.P. \text{ (dB m)} = E \text{ (dB}\mu\text{V/m)} + CF \text{ (dB)}$.
4. $E.R.P. \text{ (dB m)} = E \text{ (dB}\mu\text{V/m)} + CF \text{ (dB)} - 2.15 \text{ (dB)}$; where E.R.P. and E.I.R.P. are expressed in consistent units.
5. $CF \text{ (dB)} = 20 \log D - 104.8$; 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

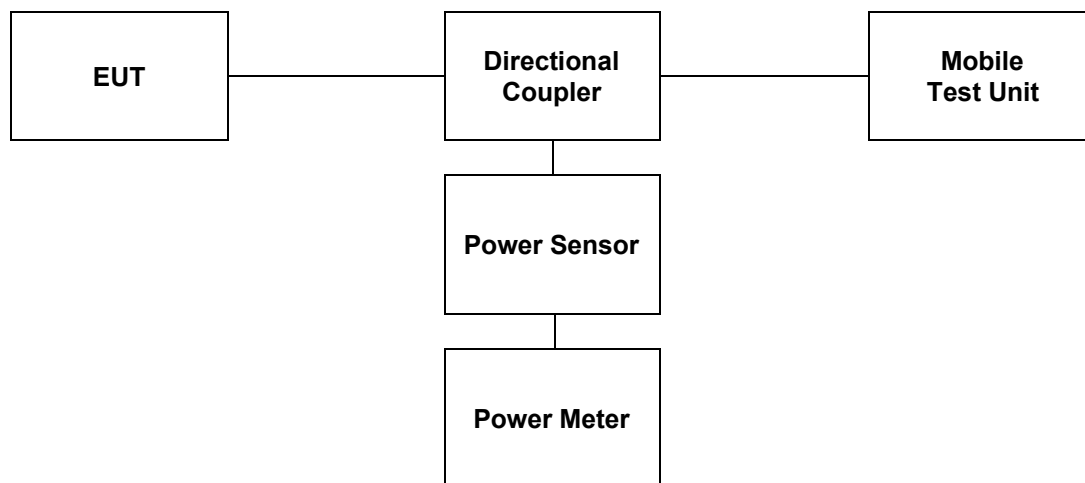
3.1. Limit

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.

WCDMA II							
Mode	3GPP 34.121 Subtest	Conducted Output Power					
		9262 (1 852.4 MHz)		9400 (1 880.0 MHz)		9538 (1 907.6 MHz)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
Release 99	12.2 Kbps RMC	23.74	0.237	23.75	0.237	23.42	0.220
HSDPA	Subtest 1	22.74	0.188	22.59	0.182	22.48	0.177
	Subtest 2	22.89	0.192	22.69	0.186	22.57	0.181
	Subtest 3	22.30	0.170	22.11	0.163	22.02	0.159
	Subtest 4	22.22	0.167	22.06	0.161	21.97	0.157
HSUPA	Subtest 1	22.70	0.186	22.52	0.179	22.48	0.177
	Subtest 2	20.89	0.123	19.96	0.099	19.91	0.098
	Subtest 3	21.96	0.157	21.79	0.151	21.59	0.144
	Subtest 4	20.96	0.125	20.75	0.119	20.70	0.117
	Subtest 5	22.77	0.189	22.63	0.183	22.55	0.180
DC-HSDPA	Subtest 1	22.76	0.189	22.64	0.184	22.60	0.182
	Subtest 2	22.84	0.195	22.69	0.186	22.58	0.181
	Subtest 3	22.36	0.172	22.17	0.165	22.11	0.163
	Subtest 4	22.22	0.167	22.07	0.161	21.98	0.158
HSPA+		22.33	0.171	22.18	0.165	22.14	0.164

WCDMA IV							
Mode	3GPP 34.121 Subtest	Conducted Output Power					
		1312 (1 712.4 MHz)		1413 (1 732.6 MHz)		1513 (1 752.6 MHz)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
Release 99	12.2 Kbps RMC	23.24	0.211	<u>23.67</u>	<u>0.233</u>	23.61	0.230
HSDPA	Subtest 1	22.26	0.168	22.48	0.177	22.63	0.183
	Subtest 2	22.36	0.172	22.56	0.180	<u>22.78</u>	<u>0.185</u>
	Subtest 3	21.79	0.151	22.02	0.159	22.14	0.164
	Subtest 4	21.82	0.152	22.04	0.160	22.13	0.163
HSUPA	Subtest 1	22.31	0.170	22.52	0.179	22.65	0.184
	Subtest 2	20.43	0.110	20.08	0.102	20.13	0.103
	Subtest 3	21.37	0.137	21.72	0.149	21.70	0.148
	Subtest 4	20.22	0.105	20.69	0.117	20.84	0.121
	Subtest 5	22.36	0.172	22.59	0.182	22.70	0.186
DC-HSDPA	Subtest 1	22.43	0.175	22.61	0.182	22.76	0.189
	Subtest 2	22.46	0.176	22.66	0.185	22.68	0.190
	Subtest 3	21.97	0.157	22.15	0.164	22.27	0.169
	Subtest 4	21.92	0.156	22.11	0.163	22.24	0.167
HSPA+		21.95	0.157	22.07	0.161	22.25	0.168

WCDMA V							
Mode	3GPP 34.121 Subtest	Conducted Output Power					
		4132 (826.4 MHz)		4183 (836.6 MHz)		4233 (846.6 MHz)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
Release 99	12.2 Kbps RMC	23.84	0.242	<u>23.85</u>	<u>0.240</u>	23.76	0.238
HSDPA	Subtest 1	22.86	0.193	22.87	0.194	22.79	0.190
	Subtest 2	<u>22.96</u>	<u>0.197</u>	22.89	0.195	22.84	0.192
	Subtest 3	22.41	0.174	22.36	0.172	22.31	0.170
	Subtest 4	22.42	0.175	22.37	0.173	22.29	0.169
HSUPA	Subtest 1	22.93	0.196	22.89	0.195	22.85	0.193
	Subtest 2	20.42	0.110	20.38	0.109	20.22	0.105
	Subtest 3	21.84	0.153	21.95	0.157	21.98	0.158
	Subtest 4	21.02	0.126	20.86	0.122	20.76	0.119
	Subtest 5	22.94	0.197	22.95	0.197	22.89	0.195
DC-HSDPA	Subtest 1	22.92	0.196	22.89	0.195	22.84	0.192
	Subtest 2	22.94	0.198	22.93	0.196	22.87	0.194
	Subtest 3	22.43	0.175	22.41	0.174	22.37	0.173
	Subtest 4	22.41	0.174	22.39	0.173	22.35	0.172
HSPA+		22.41	0.174	22.36	0.172	22.34	0.171

GSM 850							
Mode		Conducted Output Power					
		128 (824.2 MHz)		190 (836.6 MHz)		251 (848.8 MHz)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
VOICE		33.02	2.004	<u>33.72</u>	<u>2.355</u>	33.67	2.328
GPRS	1 Tx slot	33.04	2.014	33.71	2.350	33.63	2.307
	2 Tx slot	32.99	1.991	33.66	2.323	33.59	2.286
EGPRS	1 Tx slot	26.52	0.449	26.97	0.498	26.82	0.481
	2 Tx slot	26.43	0.440	<u>26.98</u>	<u>0.499</u>	26.79	0.478

GSM 1900							
Mode		Conducted Output Power					
		512 (1 850.2 MHz)		661 (1 880.0 MHz)		810 (1 909.8 MHz)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
VOICE		28.60	0.724	<u>29.96</u>	<u>0.991</u>	29.82	0.959
GPRS	1 Tx slot	28.65	0.733	29.96	0.991	29.85	0.966
	2 Tx slot	28.29	0.675	29.65	0.923	29.56	0.904
EGPRS	1 Tx slot	24.78	0.301	25.48	0.353	<u>25.53</u>	<u>0.357</u>
	2 Tx slot	24.62	0.290	25.32	0.340	25.38	0.345

4. Occupied Bandwidth

4.1. Limit

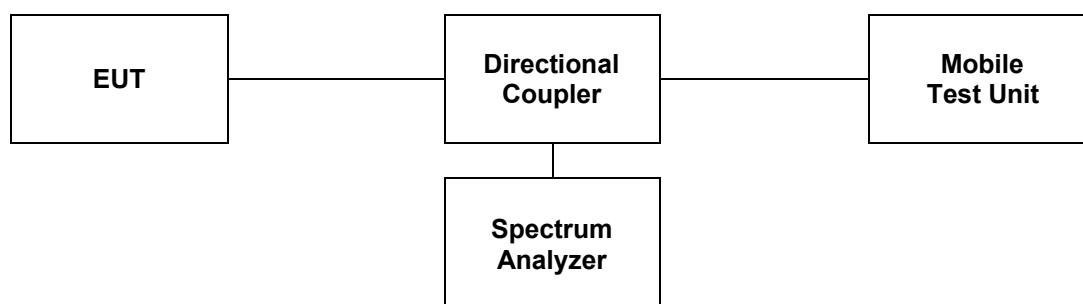
CFR 47, Section FCC §2.1049.

4.2. Test Procedure

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

- 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).
- 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 $\geq 3 \times \text{RBW}$.
- 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.
- Set the detection mode to peak, and the trace mode to max-hold.
- 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 between these two frequencies.
- 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).

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

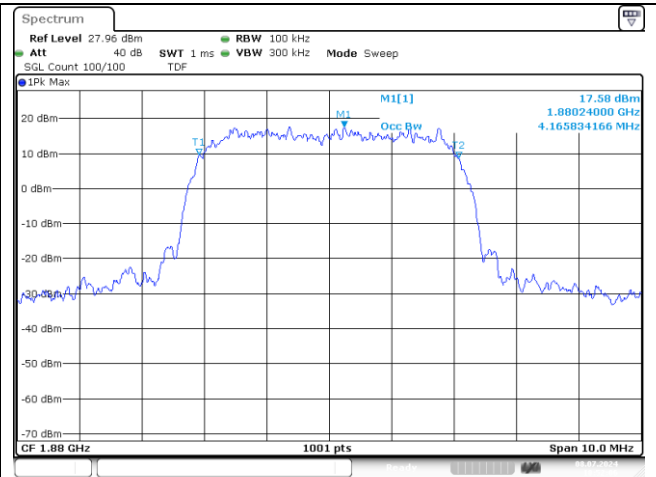
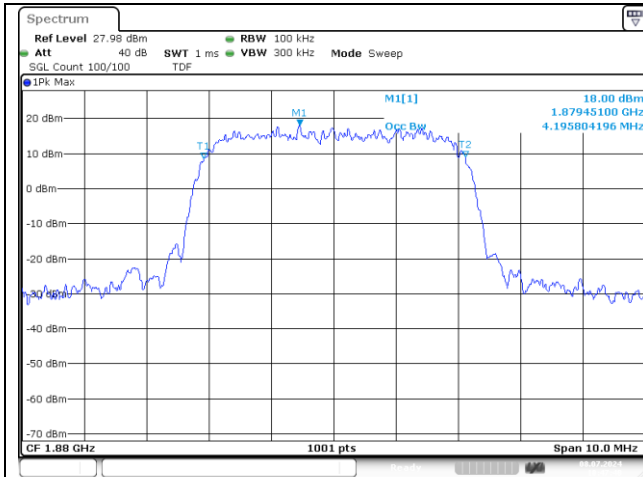
Ambient temperature : $(23 \pm 1) ^\circ\text{C}$
 Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
WCDMA II	RMC	1 880.0	4.196
	HSDPA		4.166
WCDMA IV	RMC	1 732.6	4.176
	HSDPA		4.166
WCDMA V	RMC	836.6	4.156
	HSDPA		4.176

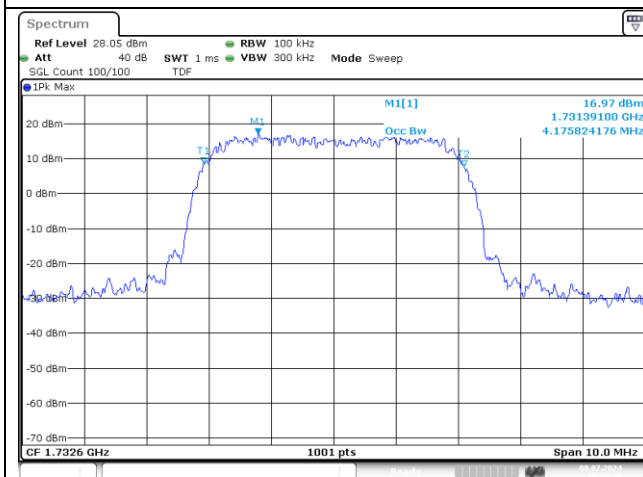
Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
GSM 850	VOICE	836.6	0.241
	EDGE		0.244
GSM 1900	VOICE	1 880.0	0.238
	EDGE		0.250

- Test plots

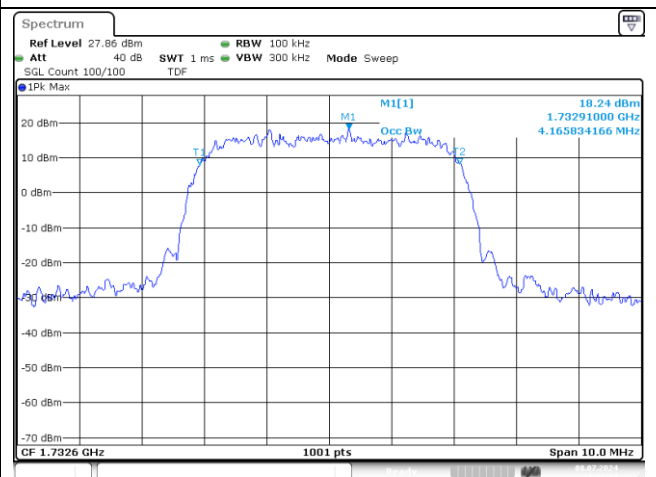
WCDMA



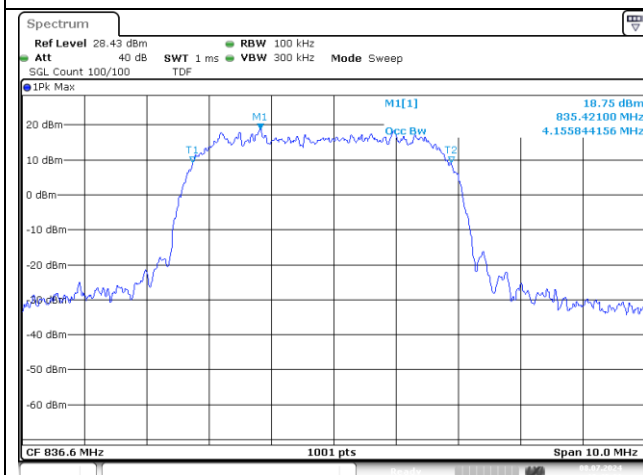
WCDMA II RMC Middle Channel



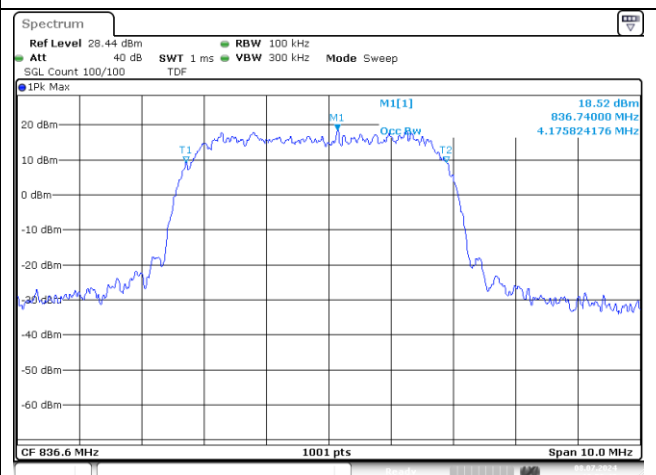
WCDMA II HSDPA Middle Channel



WCDMA IV RMC Middle Channel



WCDMA IV HSDPA Middle Channel



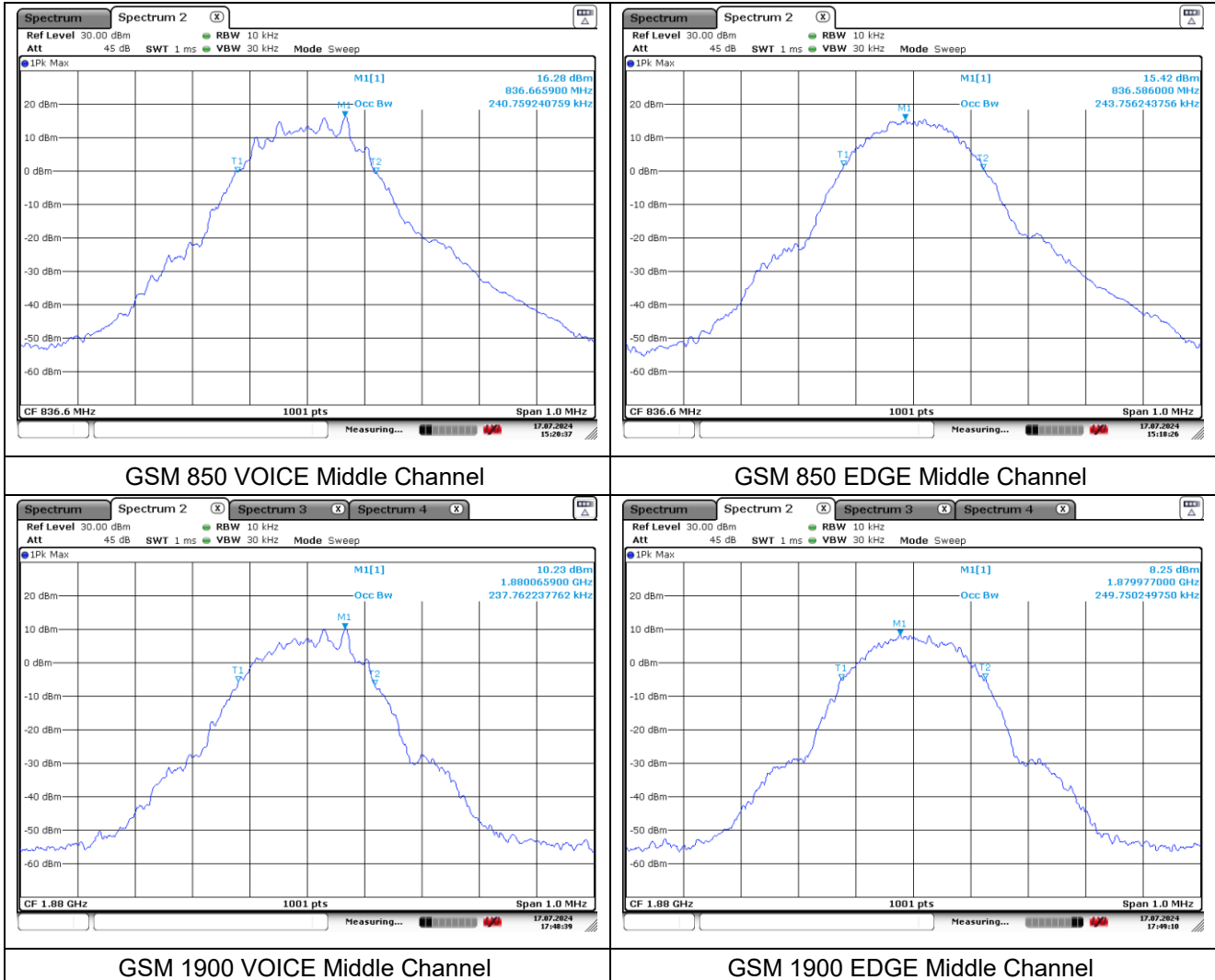
WCDMA V RMC Middle Channel



WCDMA V HSDPA Middle Channel



GSM



5. Peak-Average Ratio

5.1. Limit

- §22.913(d) Measurement of the ERP of Cellular base transmitters and repeaters must be made using an average power measurement technique. The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

- §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.

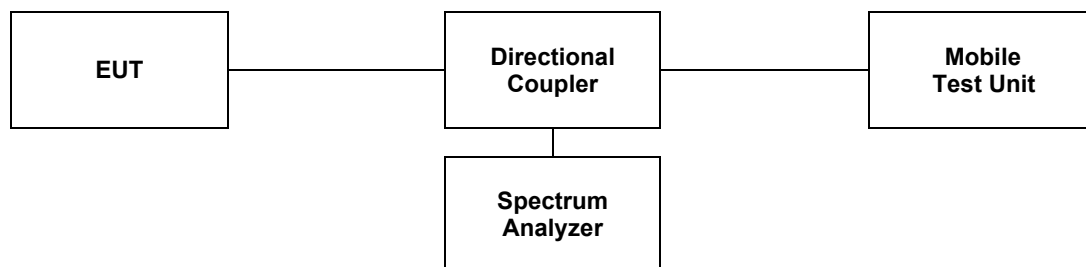
- §27.50(d)(5), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

5.2. Test Procedure

The test follows section 5.2.3.4 of ANSI C63.26-2015.

See instrumentation-specific application literature for further guidance regarding use of the CCDF capability. The following guidelines are offered for performing a CCDF measurement.

- a. Set resolution/measurement bandwidth $\geq$ OBW or specified reference bandwidth.
- b. Set the number of counts to a value that stabilizes the measured CCDF curve.
- c. Set the measurement interval as follows:
 - 1) For continuous transmissions, set to greater of $[10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$ or 1 ms.
 - 2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.
 - 3) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
- d. Record the maximum PAPR level associated with a probability of 0.1 %.
- e. The peak power level is calculated from the sum of the PAPR value from step d) to the measured average power.



5.3 Test Results

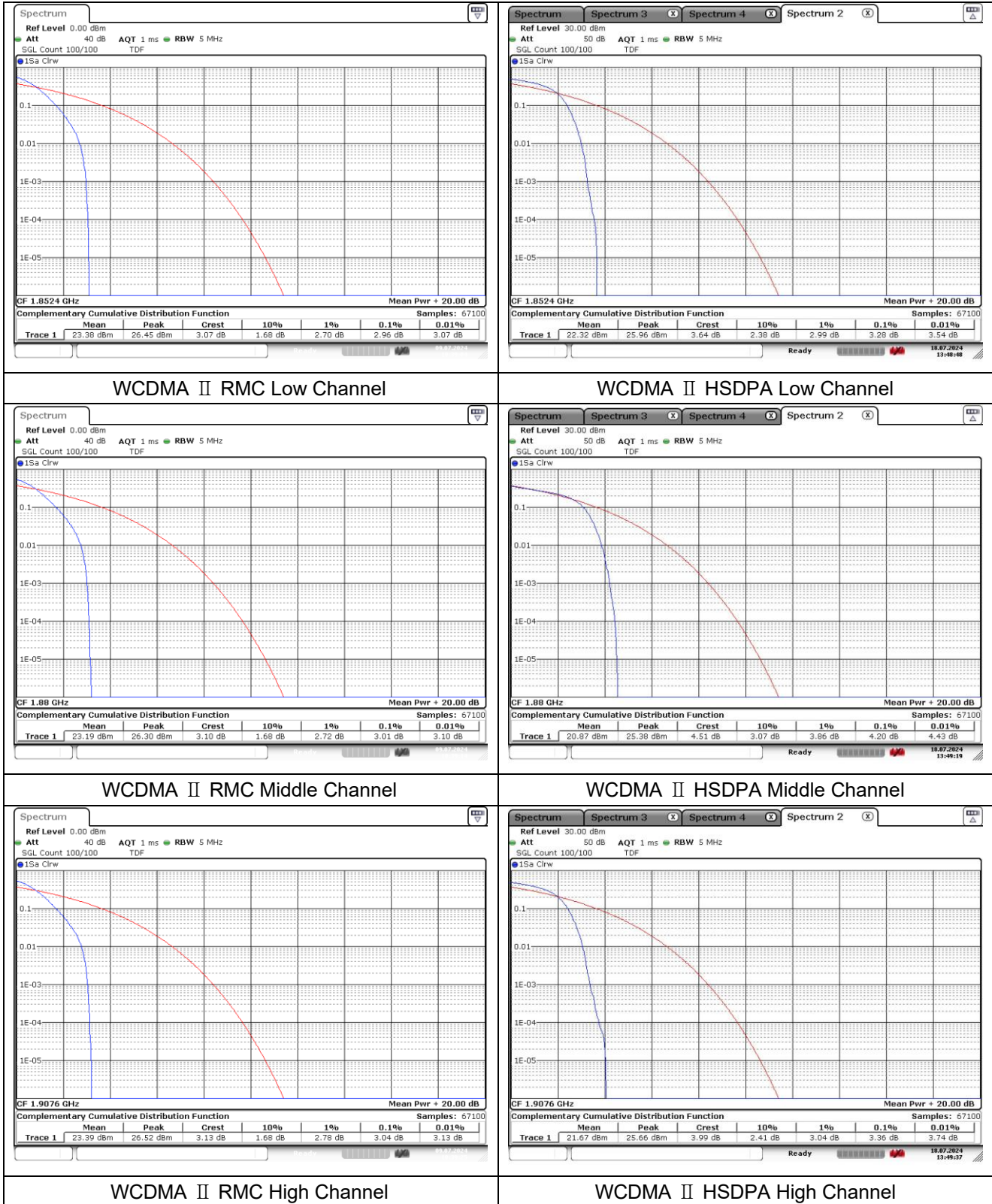
Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	PAR (dB)
WCDMA II	RMC	1 852.4	2.96
		1 880.0	3.01
		1 907.6	3.04
	HSDPA	1 852.4	3.28
		1 880.0	4.20
		1 907.6	3.36
WCDMA IV	RMC	1 712.4	3.10
		1 732.6	3.01
		1 752.6	3.13
	HSDPA	1 712.4	3.42
		1 732.6	4.38
		1 752.6	4.70
WCDMA V	RMC	826.4	2.96
		836.6	2.96
		846.6	2.96
	HSDPA	826.4	3.80
		836.6	3.19
		846.6	3.36

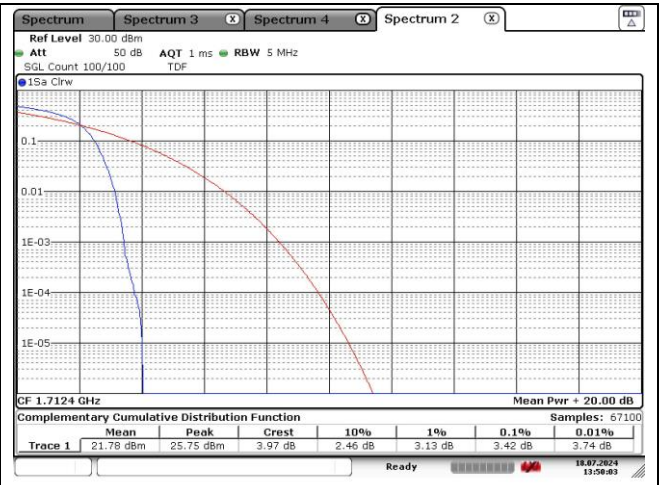
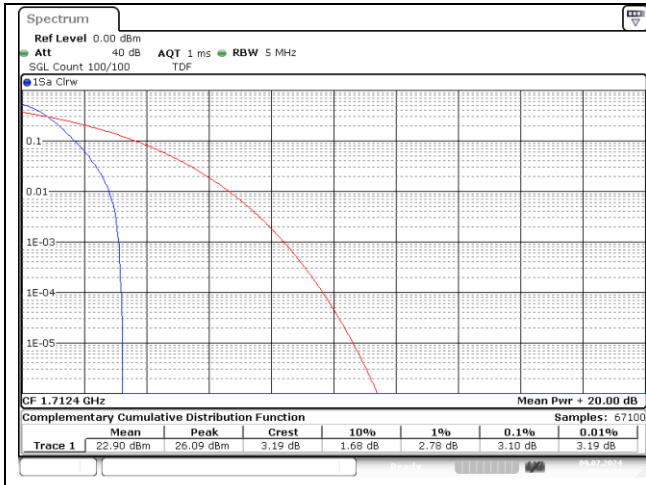
Band	Mode	Frequency (MHz)	PAR (dB)
GSM 850	VOICE	824.2	2.96
		836.6	2.96
		848.8	2.99
	EDGE	824.2	3.10
		836.6	2.90
		848.8	2.93
GSM 1900	VOICE	1 850.2	3.10
		1 880.0	3.10
		1 909.8	3.04
	EDGE	1 850.2	3.13
		1 880.0	3.10
		1 909.8	3.07

- Test plots

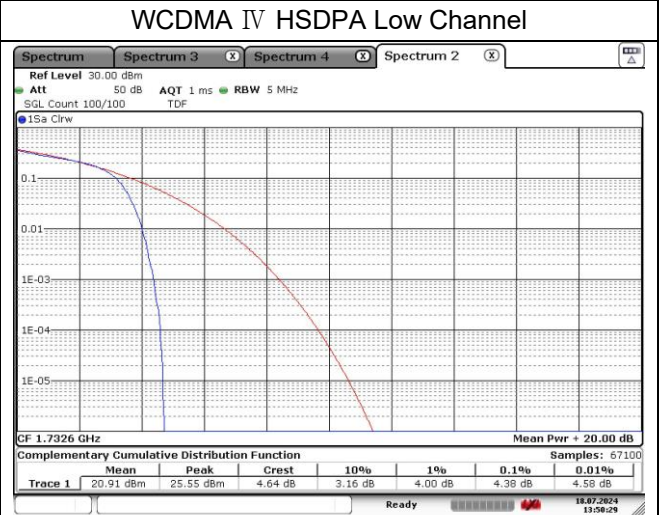
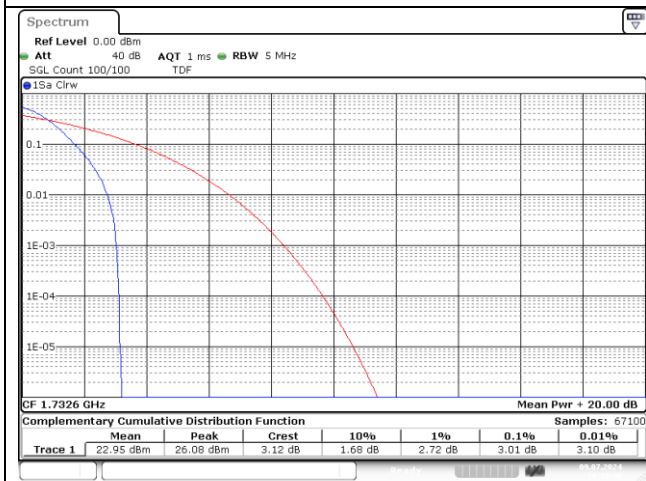
WCDMA II



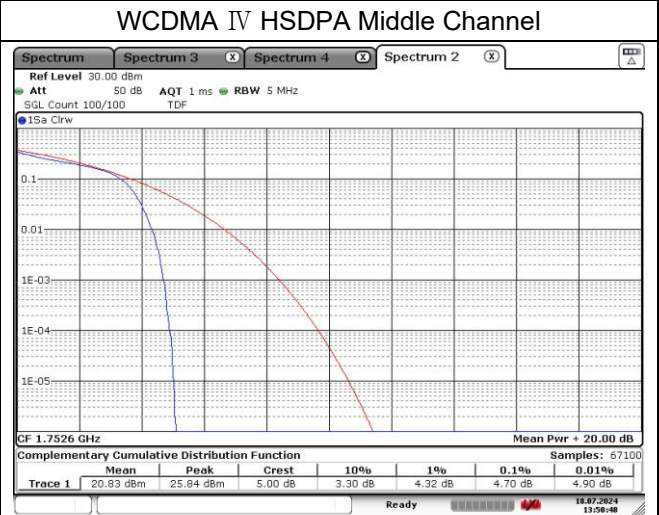
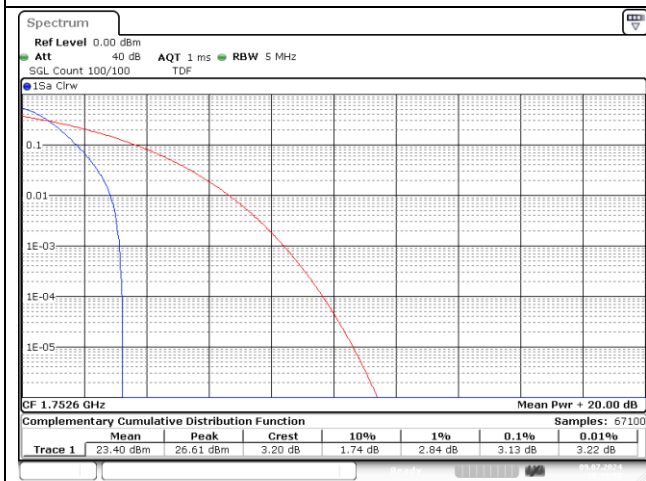
WCDMA IV



WCDMA IV RMC Low Channel



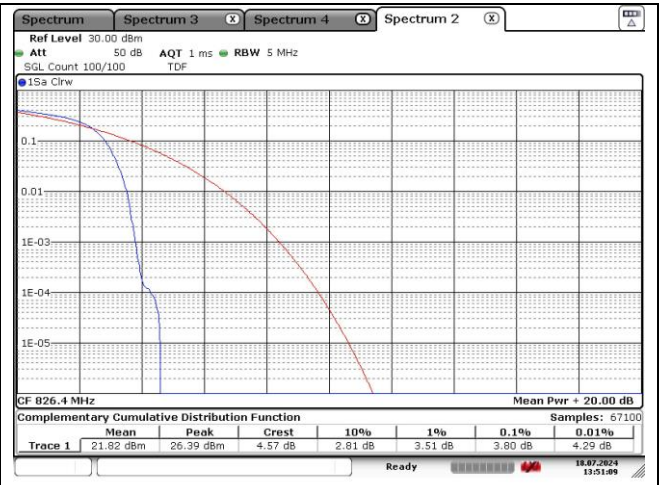
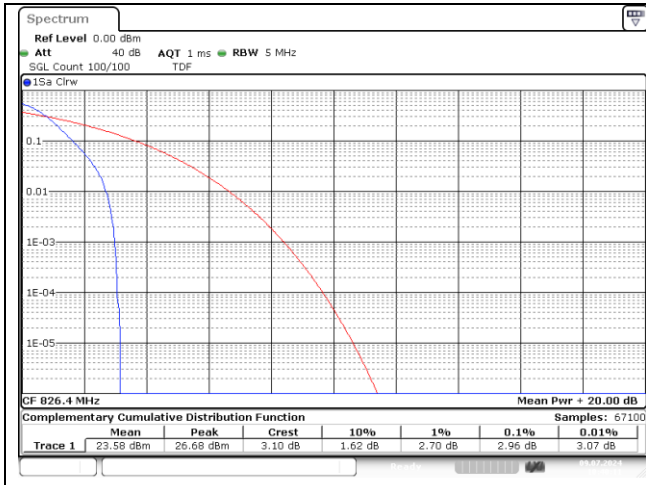
WCDMA IV RMC Middle Channel



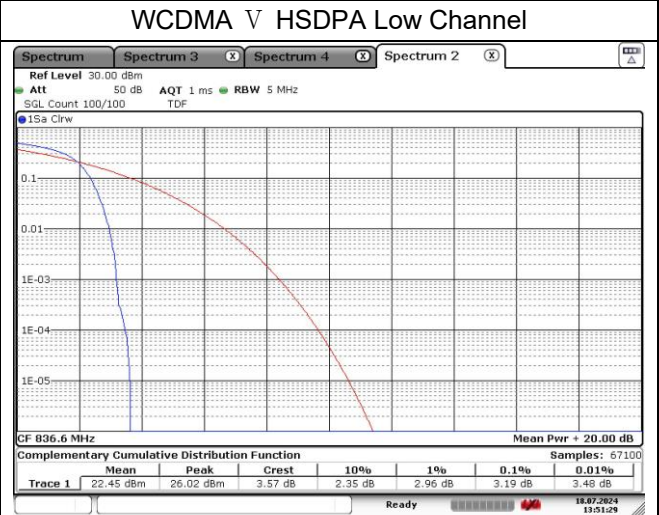
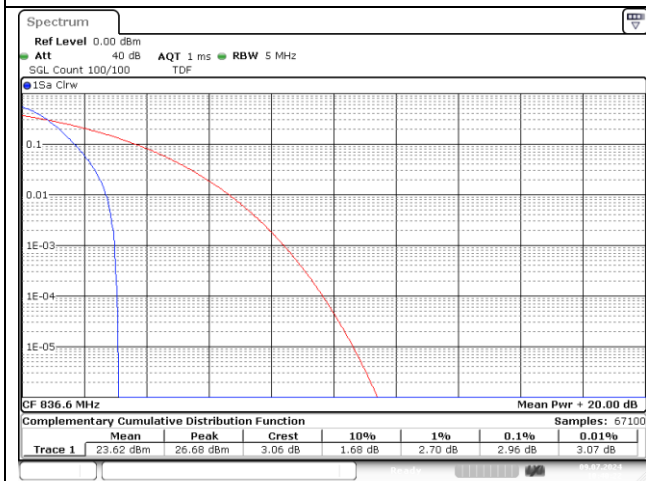
WCDMA IV RMC High Channel

WCDMA IV HSDPA High Channel

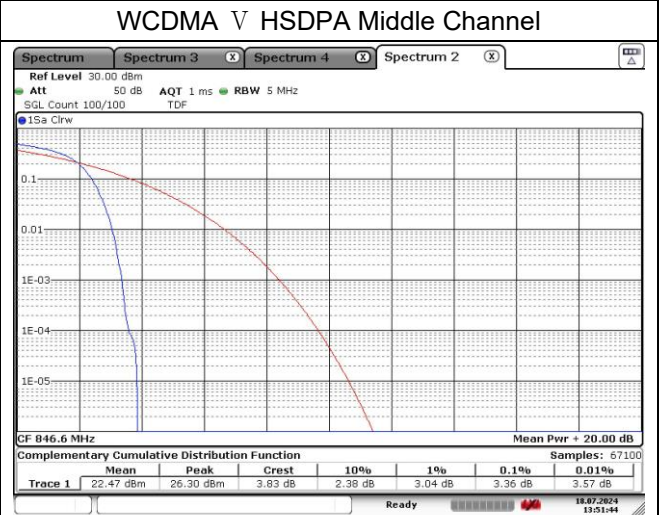
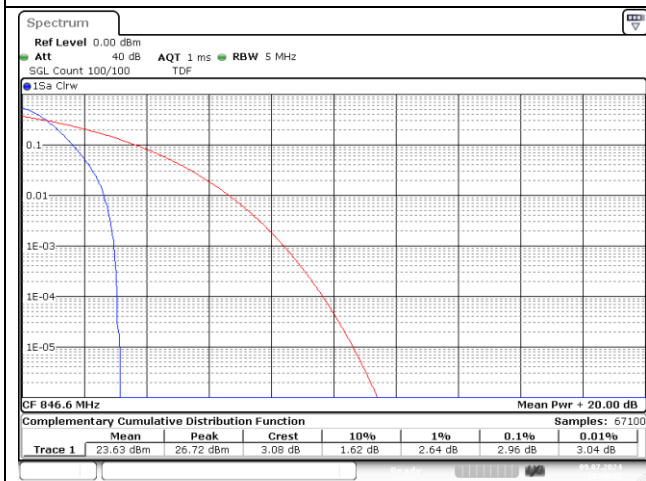
WCDMA V



WCDMA V RMC Low Channel



WCDMA V RMC Middle Channel



WCDMA V RMC High Channel

WCDMA V HSDPA High Channel