

# TEST REPORT

of

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

FCC ID: BEJ-LW9880G

Equipment Under Test : Cellular Modem  
Model Name : LW-9880G  
Variant Model Name(s) : -  
Applicant : LG Electronics USA, Inc.  
Manufacturer : LG Electronics Inc.  
Date of Receipt : 2023.11.01  
Date of Test(s) : 2023.11.04 ~ 2023.12.07  
Date of Issue : 2023.12.07

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.
- 3) This test report cannot be reproduced, except in full, without prior written permission of the Company.
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We are responsible for all the information of this test report except for the data(※) provided by the customer.

Tested by:

  
\_\_\_\_\_  
Murphy 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)

- 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

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>.

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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. : +1 201 266 2215

### 1.3. Details of Manufacturer

Company : LG Electronics Inc.

Address : 170, Seongsanpaechong-ro, Seongan-gu, Changwon-si, Gyeongsangnam-do, Korea, 51533

### 1.4. Description of EUT

<b>Kind of Product</b>	Cellular Modem
<b>Model Name</b>	LW-9880G
<b>Serial Number</b>	001
<b>Power Supply</b>	DC 5 V
<b>Rated Power</b>	WCDMA II, IV, V: 24 dBm GSM 850: 33 dBm GSM 1900: 30 dBm
<b>Frequency Range</b>	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 1900: 1 850 MHz ~ 1 910 MHz
<b>Modulation Technique</b>	QPSK, 16QAM, GMSK, 8PSK
<b>Antenna Type</b>	Carrier press Type
<b>Antenna Gain*</b>	824 MHz ~ 849 MHz: 1.11 dB i 1 710 MHz ~ 1 780 MHz: 1.57 dB i 1 850 MHz ~ 1 910 MHz: 1.97 dB i
<b>H/W Version</b>	Rev.1.0
<b>S/W Version</b>	V.1.0

### 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	103210	Dec. 07, 2022	Annual	Dec. 07, 2023
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 01, 2023	Annual	Sep. 01, 2024
Mobile Test Unit	R&S	CMW 500	144034	Feb. 17, 2023	Annual	Feb. 17, 2024
Temperature Chamber	ESPEC CORP.	SH-662	93000533	Jun. 01, 2023	Annual	Jun. 01, 2024
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	Feb. 09, 2023	Annual	Feb. 09, 2024
High Pass Filter	Wainwright Instrument GmbH	WHKX10-900-1000-18000-40SS	7	Mar. 02, 2023	Annual	Mar. 02, 2024
High Pass Filter	Wainwright Instrument GmbH	WHKX2.2/12.75G-10SS	8	Mar. 02, 2023	Annual	Mar. 02, 2024
High Pass Filter	Wainwright Instrument GmbH	WHK3.0/18G-6SS	4	Jun. 01, 2023	Annual	Jun. 01, 2024
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 16, 2023	Annual	May 16, 2024
Directional Coupler	KRYTAR	152613	122660	Jul. 13, 2023	Annual	Jul. 13, 2024
DC Power Supply	Agilent	U8002A	MY49030063	Jan. 20, 2023	Annual	Jan. 20, 2024
Preamplifier	H.P.	8447F	2944A03909	Aug. 04, 2023	Annual	Aug. 04, 2024
Preamplifier	R&S	SCU 18	10117	Jun. 15, 2023	Annual	Jun. 15, 2024
Preamplifier	TESTEK	TK-PA1840H	130016	Jan. 11, 2023	Annual	Jan. 11, 2024
Test Receiver	R&S	ESU 26	100109	Jan. 18, 2023	Annual	Jan. 18, 2024
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 21, 2023	Biennial	Aug. 21, 2025
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	01126	Feb. 09, 2023	Annual	Feb. 09, 2024
Horn Antenna	R&S	HF906	100326	Feb. 28, 2023	Annual	Feb. 28, 2024
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	BBHA9170223	Oct. 10, 2023	Annual	Oct. 10, 2024
Antenna Master	Innco systems GmbH	MA4640-XP-ET	MA4640/536/383 30516/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	CO3000/963/383 30516/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 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RFONE	MWX221-NMSNMS (4 m)	J1023142	Oct. 04, 2023	Semi-Annual	Apr. 04, 2024
Coaxial Cable	Qualwave Inc.	QA500-18-NN-10 (10 m)	22200114	Oct. 04, 2023	Semi-Annual	Apr. 04, 2024
Coaxial Cable	RADIALL	TESTPRO 3	182287	Oct. 14, 2023	Semi-Annual	Apr. 14, 2024
Coaxial Cable	RADIALL	TESTPRO 3	182288	Oct. 14, 2023	Semi-Annual	Apr. 14, 2024
Coaxial Cable	RADIALL	TESTPRO 3	182291	Oct. 14, 2023	Semi-Annual	Apr. 14, 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:

<b>APPLIED STANDARD: FCC Part 2, 22, 24 and 27</b>		
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
§2.1053 §22.917(a) §24.238(a) §27.53(h)(1)	Radiated Spurious Emissions	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
§2.1051 §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 $\mu$ 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.

The radiated 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 and 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.

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

## 1.9. Measurement Configuration

Test Items	Band	Test Channel			Modulation			
		Low	Mid	High	RMC	HSUPA	HSDPA	HSPA+
Conducted Output Power	WCDMA Band II	V	V	V	V	V	V	V
	WCDMA Band IV	V	V	V	V	V	V	V
	WCDMA Band V	V	V	V	V	V	V	V
Frequency Stability	WCDMA Band II	-	V	-	V	-	-	-
	WCDMA Band IV	-	V	-	V	-	-	-
	WCDMA Band V	-	V	-	V	-	-	-
Occupied Bandwidth	WCDMA Band II	-	V	-	V	-	V	-
	WCDMA Band IV	-	V	-	V	-	V	-
	WCDMA Band V	-	V	-	V	-	V	-
Peak to Average Ratio	WCDMA Band II	V	V	V	V	-	V	-
	WCDMA Band IV	V	V	V	V	-	V	-
	WCDMA Band V	V	V	V	V	-	V	-
Band Edge	WCDMA Band II	V	-	V	V	-	V	-
	WCDMA Band IV	V	-	V	V	-	V	-
	WCDMA Band V	V	-	V	V	-	V	-
Spurious Emission at Antenna Terminal and Radiated Spurious Emissions	WCDMA Band II	Worst case						
	WCDMA Band IV	Worst case						
	WCDMA Band V	Worst case						

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 and Radiated Spurious Emissions	GSM 850	Worst case					
	GSM 1900	Worst case					

### 1.10. Measurement Uncertainty

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

Parameter	Uncertainty	
Conducted Output Power	0.33 dB	
Occupied Bandwidth	0.04 MHz	
Conducted Spurious Emissions	0.85 dB	
Peak to Average Ratio	0.66 dB	
Frequency Stability	0.11 kHz	
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-RTL004666	2023.12.07	Initial



### 1.12. 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	23.59	1.97	25.56	0.360	4M15F9W
	HSDPA			22.65		24.62	0.290	4M13F9W
WCDMA IV	RMC	1 712.4	1 752.6	23.81	1.57	25.38	0.345	4M15F9W
	HSDPA			22.90		24.47	0.280	4M13F9W
WCDMA V	RMC	826.4	846.6	24.35	1.11	23.31	0.214	4M15F9W
	HSDPA			23.54		22.50	0.178	4M15F9W

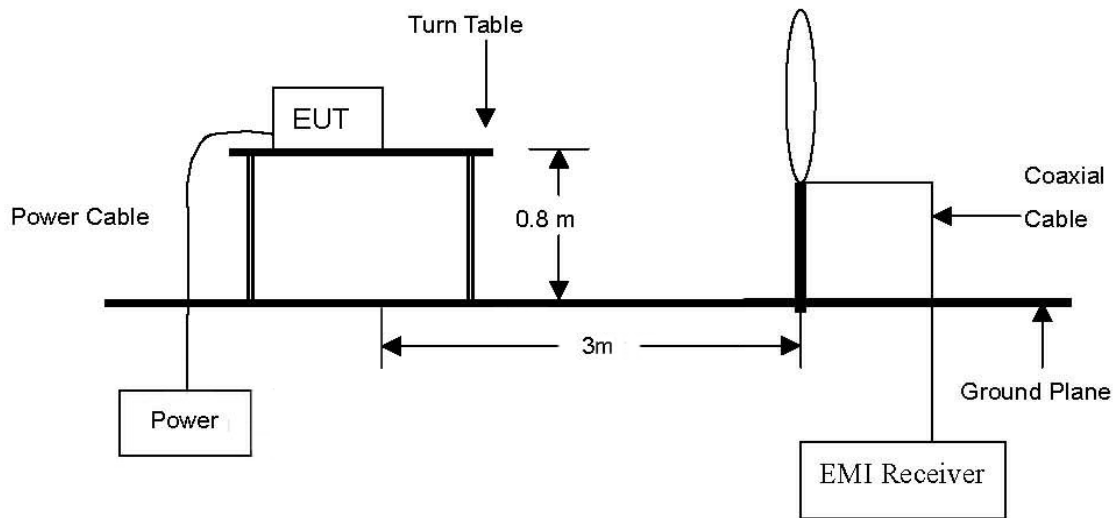
#### GSM

Band	Modulation	Low Freq. (MHz)	Upper Freq. (MHz)	Conducted Power (dB m)	Duty Cycle (%)	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	33.29	12.5	1.11	23.22	0.210	243KGXW
	EDGE			27.61			17.54	0.057	239KG7W
GSM 1900	VOICE	1 850.2	1 909.8	30.24	12.5	1.97	23.18	0.208	246KGXW
	EDGE			26.12			19.06	0.081	244KG7W

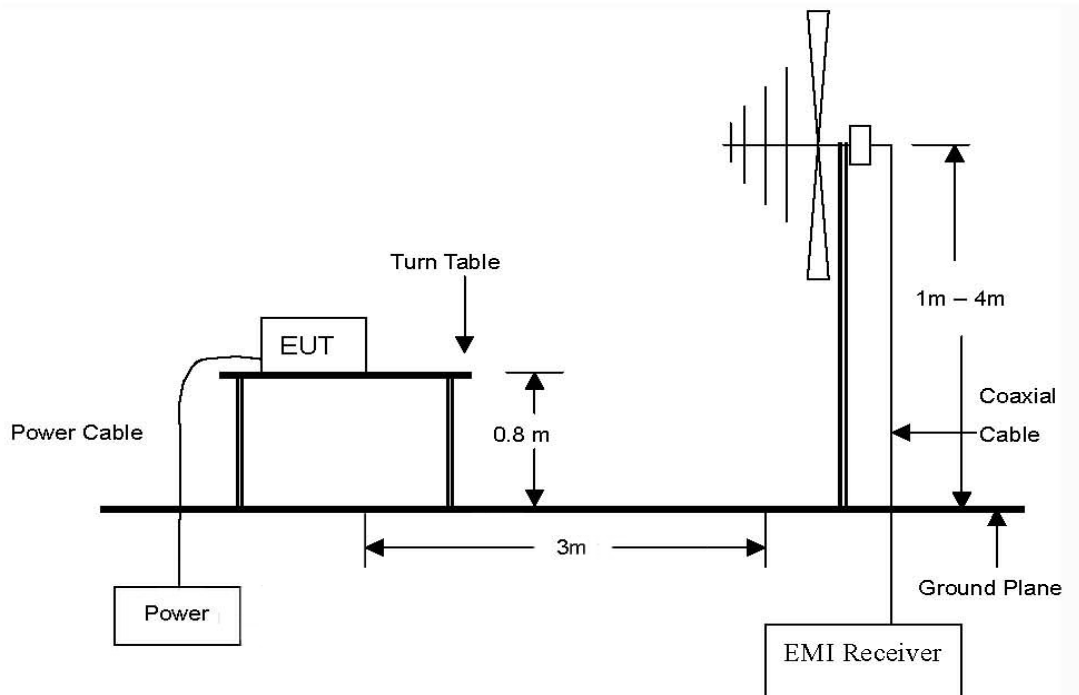
## 2. E.R.P / E.I.R.P. & Radiated Spurious Emissions

### 2.1. Test setup

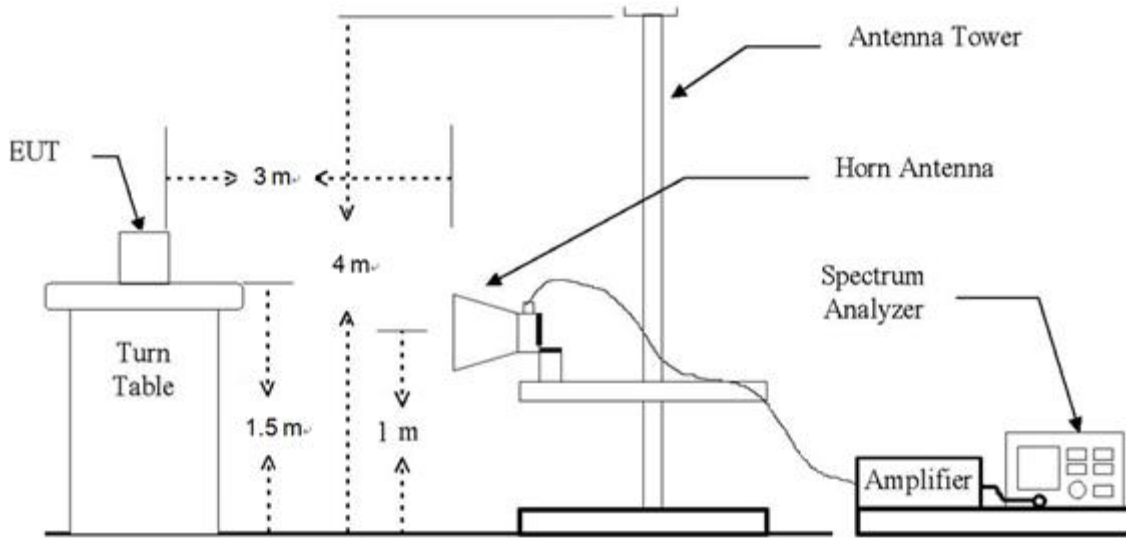
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



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 Emissions

- §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:

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

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  $\geq$  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 ± 1) °C  
 Relative humidity : 47 % R.H.

### 2.4.1. E.R.P. / E.I.R.P. from conducted RF output power measurements

#### WCDMA

Band	Frequency (MHz)	Maximum Conducted Average Power (dB m)	Maximum Conducted 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)	Limit
WCDMA II	1 850 ~ 1 910	23.59	0.229	1.97	25.56	0.360			2 W E.I.R.P.
WCDMA IV	1 710 ~ 1 755	23.81	0.240	1.57	25.38	0.345			1 W E.I.R.P.
WCDMA V	824 ~ 849	24.35	0.272	1.11	25.46	0.352	23.31	0.214	7 W E.R.P.

#### GSM

Band	Frequency (MHz)	Maximum Conducted Average Power (dB m)	Maximum Conducted Average Power (W)	Duty Cycle (%)	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)	Limit
GSM 850	824 ~ 849	33.29	2.133	12.5	1.11	25.37	0.344	23.22	0.210	7 W E.I.R.P.
GSM 1900	1 850 ~ 1 910	30.24	1.057	12.5	1.97	23.18	0.208			2 W E.R.P.

#### Remark;

1. E.I.R.P. (dB m) = Maximum Conducted Average Power (dB m) + 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.

### 2.4.2. Radiated Spurious Emissions

#### WCDMA II

Frequency (MHz)	Measured Level (dB $\mu$ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB $\mu$ V/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 (dB $\mu$ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB $\mu$ V/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 (dB $\mu$ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB $\mu$ V/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (826.4 MHz)									
1 651.40	56.09	H	25.72	-39.64	42.17	-97.41	-55.24	-13	42.24
1 651.55	59.51	V	25.72	-39.64	45.59	-97.41	-51.82	-13	38.82
2 479.35	66.09	H	28.26	-36.77	57.58	-97.41	<b>-39.83</b>	-13	26.83
2 479.45	64.25	V	28.26	-36.77	55.74	-97.41	-41.67	-13	28.67
3 301.45	55.19	H	30.70	-36.85	49.04	-97.41	-48.37	-13	35.37
3 300.65	56.31	V	30.70	-36.84	50.17	-97.41	-47.24	-13	34.24
4 136.55	41.83	H	32.13	-34.55	39.41	-97.41	-58.00	-13	45.00
4 130.80	41.26	V	32.14	-34.27	39.13	-97.41	-58.28	-13	45.28
Above 4 200.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 671.35	53.41	H	26.04	-39.32	40.13	-97.41	-57.28	-13	44.28
1 671.85	55.84	V	26.05	-39.31	42.58	-97.41	-54.83	-13	41.83
2 509.30	64.85	H	28.34	-37.92	55.27	-97.41	-42.14	-13	29.14
2 509.30	60.16	V	28.34	-37.92	50.58	-97.41	-46.83	-13	33.83
3 342.30	49.59	H	30.70	-36.79	43.50	-97.41	-53.91	-13	40.91
3 345.90	52.00	V	30.70	-36.74	45.96	-97.41	-51.45	-13	38.45
4 181.10	41.80	H	32.16	-35.92	38.04	-97.41	-59.37	-13	46.37
4 180.75	40.29	V	32.16	-35.92	36.53	-97.41	-60.88	-13	47.88
Above 4 200.00	Not detected	-	-	-	-	-	-	-	-
High Channel (846.6 MHz)									
1 695.00	49.28	H	26.42	-39.35	36.35	-97.41	-61.06	-13	48.06
1 691.90	46.95	V	26.37	-39.33	33.99	-97.41	-63.42	-13	50.42
2 539.45	63.48	H	28.46	-37.53	54.41	-97.41	-43.00	-13	30.00
2 539.65	58.11	V	28.46	-37.53	49.04	-97.41	-48.37	-13	35.37
3 387.10	44.50	H	30.92	-36.49	38.93	-97.41	-58.48	-13	45.48
3 386.65	42.70	V	30.92	-36.50	37.12	-97.41	-60.29	-13	47.29
4 230.65	36.70	H	32.20	-33.85	35.05	-97.41	-62.36	-13	49.36
4 232.40	37.44	V	32.20	-33.97	35.67	-97.41	-61.74	-13	48.74
Above 4 300.00	Not detected	-	-	-	-	-	-	-	-



**GSM 850\_VOICE**

Frequency (MHz)	Measured Level (dB $\mu$ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB $\mu$ V/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (824.2 MHz)									
1 648.30	69.07	H	25.69	-39.65	55.11	-97.41	-42.30	-13	29.30
1 648.24	64.68	V	25.69	-39.65	50.72	-97.41	-46.69	-13	33.69
2 472.66	76.24	H	28.25	-36.63	67.86	-97.41	-29.55	-13	16.55
2 472.58	77.59	V	28.25	-36.63	69.21	-97.41	-28.20	-13	15.20
3 296.98	69.46	H	30.70	-36.84	63.32	-97.41	-34.09	-13	21.09
3 297.03	63.64	V	30.70	-36.84	57.50	-97.41	-39.91	-13	26.91
4 121.14	56.54	H	32.16	-33.82	54.88	-97.41	-42.53	-13	29.53
4 120.82	56.12	V	32.16	-33.81	54.47	-97.41	-42.94	-13	29.94
4 945.68	47.61	H	33.20	-33.98	46.83	-97.41	-50.58	-13	37.58
4 945.15	55.92	V	33.20	-33.99	55.13	-97.41	-42.28	-13	29.28
5 769.80	40.43	H	34.34	-34.29	40.48	-97.41	-56.93	-13	43.93
5 769.97	42.17	V	34.34	-34.30	42.21	-97.41	-55.20	-13	42.20
6 593.23	40.59	H	34.99	-33.47	42.11	-97.41	-55.30	-13	42.30
6 594.10	42.28	V	34.99	-33.46	43.81	-97.41	-53.60	-13	40.60
7 418.18	41.90	H	36.20	-32.58	45.52	-97.41	-51.89	-13	38.89
7 418.31	42.79	V	36.20	-32.58	46.41	-97.41	-51.00	-13	38.00
8 242.55	37.35	V	36.59	-32.17	41.77	-97.41	-55.64	-13	42.64
Above 8 300.00	Not detected	-	-	-	-	-	-	-	-

Frequency (MHz)	Measured Level (dB $\mu$ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB $\mu$ V/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Middle Channel (836.6 MHz)									
1 673.44	65.81	H	26.08	-39.28	52.61	-97.41	-44.80	-13	31.80
1 673.36	60.88	V	26.07	-39.28	47.67	-97.41	-49.74	-13	36.74
2 509.94	76.44	H	28.34	-37.92	66.86	-97.41	-30.55	-13	17.55
2 509.60	83.22	V	28.34	-37.92	73.64	-97.41	<b>-23.77</b>	-13	10.77
3 346.72	73.53	H	30.70	-36.73	67.50	-97.41	-29.91	-13	16.91
3 346.62	64.55	V	30.70	-36.73	58.52	-97.41	-38.89	-13	25.89
4 182.86	57.74	H	32.17	-35.91	54.00	-97.41	-43.41	-13	30.41
4 182.90	64.02	V	32.17	-35.91	60.28	-97.41	-37.13	-13	24.13
5 019.36	54.82	H	33.28	-34.15	53.95	-97.41	-43.46	-13	30.46
5 019.39	51.59	V	33.28	-34.15	50.72	-97.41	-46.69	-13	33.69
5 856.26	44.26	H	34.43	-34.24	44.45	-97.41	-52.96	-13	39.96
5 856.21	41.28	V	34.42	-34.24	41.46	-97.41	-55.95	-13	42.95
6 692.57	41.10	H	35.27	-33.15	43.22	-97.41	-54.19	-13	41.19
6 692.44	41.36	V	35.27	-33.15	43.48	-97.41	-53.93	-13	40.93
7 529.55	45.03	H	36.14	-32.33	48.84	-97.41	-48.57	-13	35.57
7 529.33	42.72	V	36.14	-32.33	46.53	-97.41	-50.88	-13	37.88
8 366.60	37.71	V	36.50	-32.09	42.12	-97.41	-55.29	-13	42.29
Above 8 400.00	Not detected	-	-	-	-	-	-	-	-

Frequency (MHz)	Measured Level (dB $\mu$ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB $\mu$ V/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
High Channel (848.8 MHz)									
1 697.58	69.74	H	26.46	-39.36	56.84	-97.41	-40.57	-13	27.57
1 697.58	70.22	V	26.46	-39.36	57.32	-97.41	-40.09	-13	27.09
2 546.62	78.01	H	28.49	-37.36	69.14	-97.41	-28.27	-13	15.27
2 546.34	82.46	V	28.49	-37.37	73.58	-97.41	-23.83	-13	10.83
3 394.92	72.92	H	30.97	-36.29	67.60	-97.41	-29.81	-13	16.81
3 395.43	67.42	V	30.97	-36.28	62.11	-97.41	-35.30	-13	22.30
4 244.42	59.44	H	32.20	-34.74	56.90	-97.41	-40.51	-13	27.51
4 243.74	64.29	V	32.20	-34.70	61.79	-97.41	-35.62	-13	22.62
5 092.64	56.17	H	33.57	-35.41	54.33	-97.41	-43.08	-13	30.08
5 092.34	52.30	V	33.57	-35.41	50.46	-97.41	-46.95	-13	33.95
5 941.12	45.70	H	34.68	-32.78	47.60	-97.41	-49.81	-13	36.81
5 942.05	44.24	V	34.68	-32.77	46.15	-97.41	-51.26	-13	38.26
6 790.97	38.30	H	35.48	-32.90	40.88	-97.41	-56.53	-13	43.53
6 790.06	40.53	V	35.48	-32.85	43.16	-97.41	-54.25	-13	41.25
7 639.73	48.97	H	36.00	-32.29	52.68	-97.41	-44.73	-13	31.73
7 639.08	41.96	V	36.00	-32.29	45.67	-97.41	-51.74	-13	38.74
8 487.54	33.85	V	36.42	-32.49	37.78	-97.41	-59.63	-13	46.63
Above 8 500.00	Not detected	-	-	-	-	-	-	-	-

**GSM 1900\_VOICE**

Frequency (MHz)	Measured Level (dB $\mu$ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB $\mu$ V/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
3 700.19	51.10	H	32.20	-34.54	48.76	-95.26	-46.50	-13	33.50
3 700.24	52.05	V	32.20	-34.54	49.71	-95.26	-45.55	-13	32.55
5 550.63	41.00	H	34.20	-35.48	39.72	-95.26	-55.54	-13	42.54
5 550.75	48.77	V	34.20	-35.47	47.50	-95.26	-47.76	-13	34.76
Above 5 600.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
3 760.06	53.78	H	32.40	-35.37	50.81	-95.26	-44.45	-13	31.45
3 760.18	50.41	V	32.40	-35.38	47.43	-95.26	-47.83	-13	34.83
5 640.22	41.71	H	34.12	-33.35	42.48	-95.26	-52.78	-13	39.78
5 640.11	49.17	V	34.12	-33.33	49.96	-95.26	-45.30	-13	32.30
Above 5 700.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
3 819.80	51.21	H	32.36	-34.01	49.56	-95.26	-45.70	-13	32.70
3 819.79	48.81	V	32.36	-34.01	47.16	-95.26	-48.10	-13	35.10
5 729.49	44.67	H	34.22	-34.24	44.65	-95.26	-50.61	-13	37.61
5 729.29	51.74	V	34.22	-34.25	51.71	-95.26	<b>-43.55</b>	-13	30.55
Above 5 800.00	Not detected	-	-	-	-	-	-	-	-

**Remark;**

1. AF = Antenna Factor, CL = Cable Loss, CF = Conversion Factor.
2. E (dB $\mu$ V/m) = Measured Level (dB $\mu$ V) + Antenna Factor (dB/m) + Cable Loss (dB) + AMP (dB).
3. E.I.R.P. (dB m) = E (dB $\mu$ V/m) + CF (dB).
4. E.R.P. (dB m) = E (dB $\mu$ V/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 10<sup>th</sup> 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

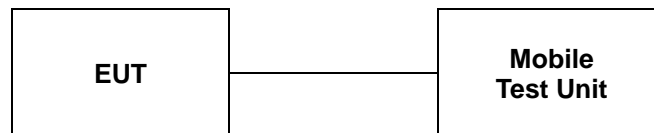
#### 3.1. Limit

CFR 47, Section FCC §2.1046.

#### 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. 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	<b>23.59</b>	<b>0.229</b>	23.51	0.224	23.37	0.217
HSDPA	Subtest 1	<b>22.65</b>	<b>0.184</b>	22.59	0.182	22.40	0.174
	Subtest 2	22.56	0.180	22.57	0.181	22.37	0.173
	Subtest 3	22.16	0.164	22.14	0.164	21.85	0.153
	Subtest 4	22.09	0.162	22.04	0.160	21.86	0.153
HSUPA	Subtest 1	22.57	0.181	22.60	0.182	22.46	0.176
	Subtest 2	22.51	0.178	22.53	0.179	22.44	0.175
	Subtest 3	22.11	0.163	22.07	0.161	21.77	0.150
	Subtest 4	22.09	0.162	22.05	0.160	21.89	0.155
	Subtest 5	22.59	0.182	22.55	0.180	22.38	0.173
DC-HSDPA	Subtest 1	22.00	0.158	22.02	0.159	21.94	0.156
	Subtest 2	21.92	0.156	21.98	0.158	22.04	0.160
	Subtest 3	21.40	0.138	21.51	0.142	21.47	0.140
	Subtest 4	21.54	0.143	21.59	0.144	21.56	0.143
HSPA+		22.59	0.182	22.57	0.181	22.37	0.173

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	23.63	0.231	<u>23.81</u>	<u>0.240</u>	23.56	0.227
HSDPA	Subtest 1	22.71	0.187	<u>22.90</u>	<u>0.195</u>	22.61	0.182
	Subtest 2	22.76	0.189	22.80	0.191	22.67	0.185
	Subtest 3	22.25	0.168	22.30	0.170	22.07	0.161
	Subtest 4	22.26	0.168	22.31	0.170	22.08	0.161
HSUPA	Subtest 1	22.84	0.192	22.83	0.192	22.67	0.185
	Subtest 2	22.88	0.194	22.88	0.194	22.77	0.189
	Subtest 3	22.29	0.169	22.34	0.171	22.11	0.163
	Subtest 4	22.26	0.168	22.33	0.171	22.10	0.162
	Subtest 5	22.73	0.187	22.82	0.191	22.72	0.187
DC-HSDPA	Subtest 1	21.86	0.153	21.78	0.151	21.74	0.149
	Subtest 2	21.88	0.154	21.89	0.155	21.85	0.153
	Subtest 3	21.18	0.131	21.12	0.129	21.27	0.134
	Subtest 4	21.04	0.127	21.12	0.129	21.08	0.128
HSPA+		22.73	0.187	22.79	0.190	22.61	0.182

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	24.32	0.270	24.32	0.270	<u>24.35</u>	<u>0.272</u>
HSDPA	Subtest 1	23.36	0.217	<u>23.54</u>	<u>0.226</u>	23.38	0.218
	Subtest 2	23.39	0.218	23.39	0.218	23.37	0.217
	Subtest 3	23.03	0.201	23.09	0.204	22.96	0.198
	Subtest 4	23.00	0.200	23.07	0.203	22.48	0.177
HSUPA	Subtest 1	23.49	0.223	23.48	0.223	23.35	0.216
	Subtest 2	23.48	0.223	23.46	0.222	23.44	0.221
	Subtest 3	23.04	0.201	22.96	0.198	22.94	0.197
	Subtest 4	23.02	0.200	23.07	0.203	23.02	0.200
	Subtest 5	22.97	0.198	23.02	0.200	22.94	0.197
DC-HSDPA	Subtest 1	22.72	0.187	22.52	0.179	22.69	0.186
	Subtest 2	22.56	0.180	22.39	0.173	22.42	0.175
	Subtest 3	22.30	0.170	22.04	0.160	21.98	0.158
	Subtest 4	22.02	0.159	21.96	0.157	22.07	0.161
HSPA+		23.49	0.223	23.43	0.220	23.38	0.218

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		33.06	2.023	<b><u>33.29</u></b>	<b><u>2.133</u></b>	33.05	2.018
GPRS	1 Tx slot	33.01	2.000	33.22	2.099	33.10	2.042
	2 Tx slot	30.74	1.186	30.94	1.242	30.67	1.167
	3 Tx slot	28.94	0.783	28.82	0.762	28.94	0.783
	4 Tx slot	27.51	0.564	27.47	0.558	27.51	0.564
EGPRS	1 Tx slot	27.31	0.538	27.51	0.564	<b><u>27.61</u></b>	<b><u>0.577</u></b>
	2 Tx slot	24.76	0.299	24.84	0.305	24.97	0.314
	3 Tx slot	22.58	0.181	22.62	0.183	22.72	0.187
	4 Tx slot	21.45	0.140	21.41	0.138	21.49	0.141

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		29.81	0.957	<b><u>30.24</u></b>	<b><u>1.057</u></b>	30.17	1.040
GPRS	1 Tx slot	29.84	0.964	30.20	1.047	30.19	1.045
	2 Tx slot	27.36	0.545	27.61	0.577	27.88	0.614
	3 Tx slot	25.67	0.369	26.03	0.401	26.09	0.406
	4 Tx slot	24.52	0.283	24.67	0.293	24.91	0.310
EGPRS	1 Tx slot	25.65	0.367	25.82	0.382	<b><u>26.12</u></b>	<b><u>0.409</u></b>
	2 Tx slot	23.06	0.202	23.04	0.201	23.41	0.219
	3 Tx slot	21.21	0.132	21.18	0.131	21.34	0.136
	4 Tx slot	19.89	0.097	20.43	0.110	20.38	0.109



## 4. Occupied Bandwidth

### 4.1. Limit

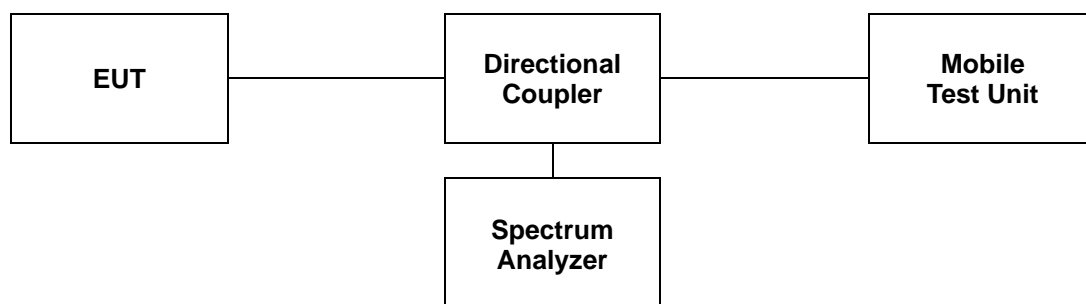
CFR 47, Section FCC §2.1049.

### 4.2. Test Procedure

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

- 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 between 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).

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

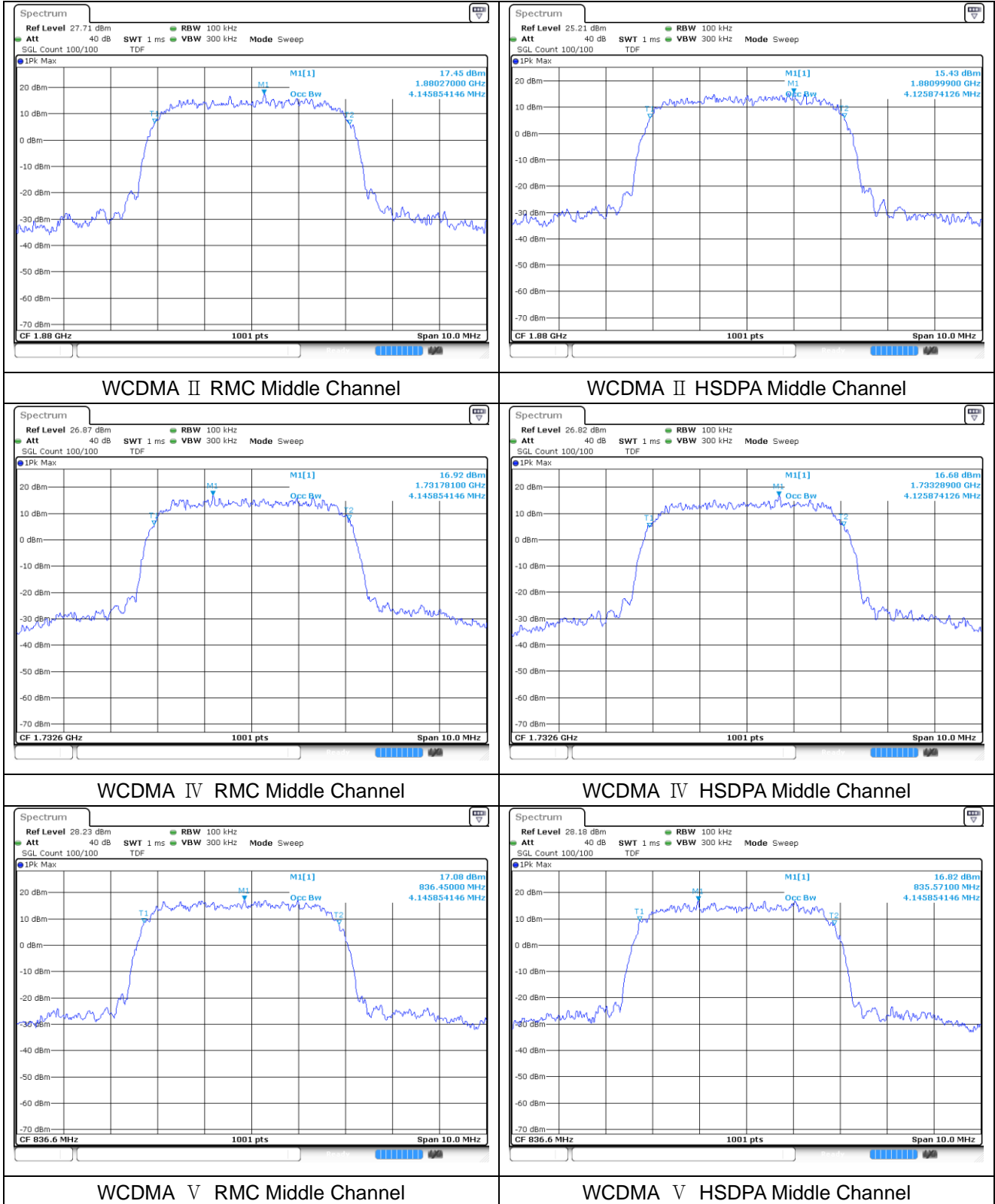
Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
WCDMA II	RMC	1 880.0	4.146
	HSDPA		4.126
WCDMA IV	RMC	1 732.6	4.146
	HSDPA		4.126
WCDMA V	RMC	836.6	4.146
	HSDPA		4.146

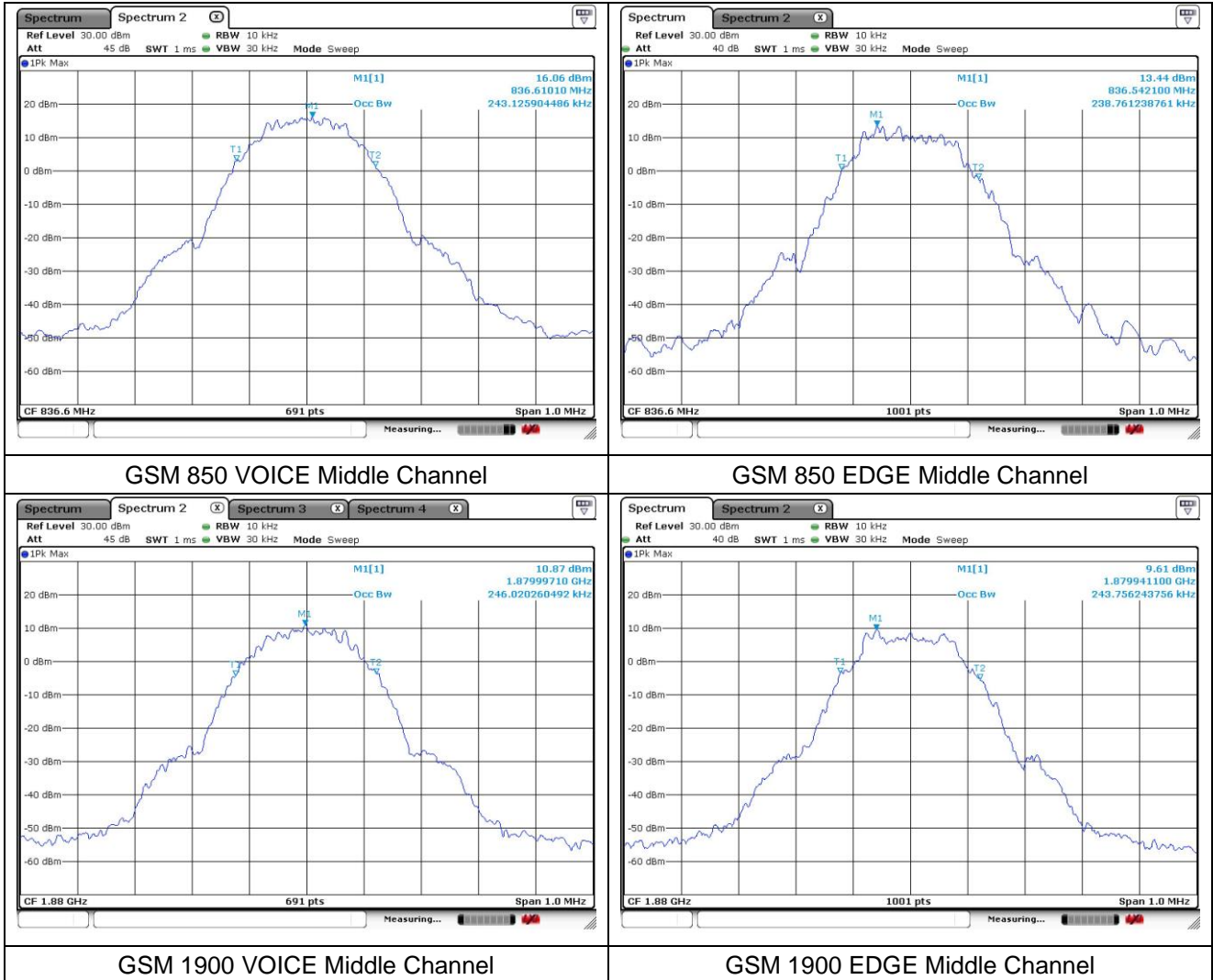
Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
GSM 850	VOICE	836.6	0.243
	EDGE		0.239
GSM 1900	VOICE	1 880.0	0.246
	EDGE		0.244

**- Test plots**

**WCDMA**



**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.

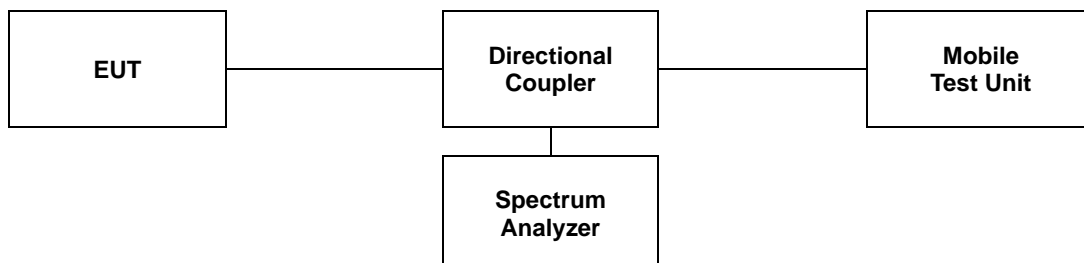
- §27.50(d)(5), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, 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

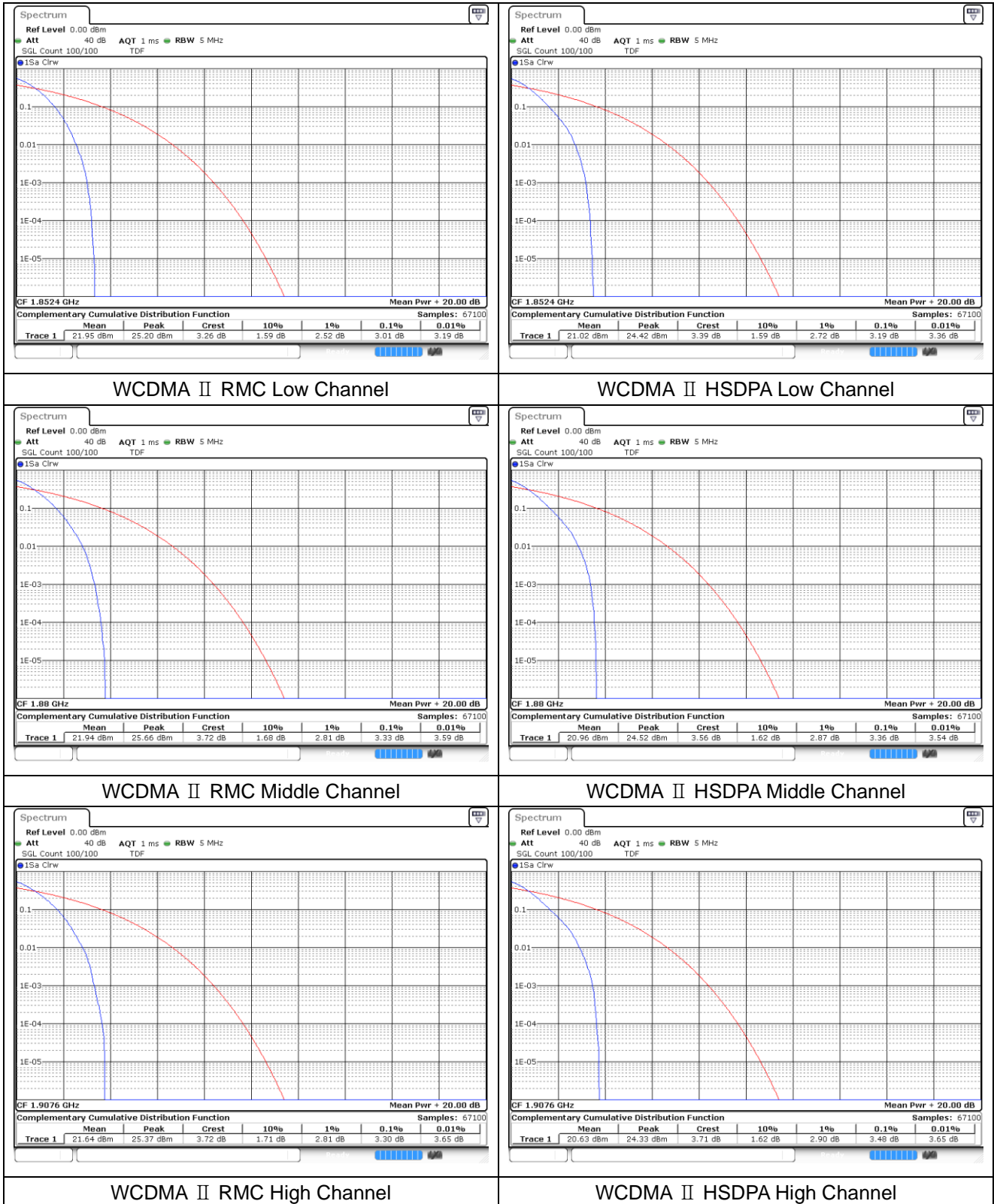
Ambient temperature : (23 ± 1) °C  
 Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	PAR (dB)
WCDMA II	RMC	1 852.4	3.01
		1 880.0	3.33
		1 907.6	3.30
	HSDPA	1 852.4	3.19
		1 880.0	3.36
		1 907.6	3.48
WCDMA IV	RMC	1 712.4	2.99
		1 732.6	2.96
		1 752.6	3.19
	HSDPA	1 712.4	3.22
		1 732.6	3.19
		1 752.6	3.28
WCDMA V	RMC	826.4	3.10
		836.6	3.19
		846.6	3.30
	HSDPA	826.4	3.16
		836.6	3.22
		846.6	3.30

Band	Mode	Frequency (MHz)	PAR (dB)
GSM 850	VOICE	824.2	3.13
		836.6	3.07
		848.8	3.10
	EDGE	824.2	3.10
		836.6	3.07
		848.8	3.10
GSM 1900	VOICE	1 850.2	3.28
		1 880.0	3.25
		1 909.8	3.19
	EDGE	1 850.2	3.28
		1 880.0	3.25
		1 909.8	3.22

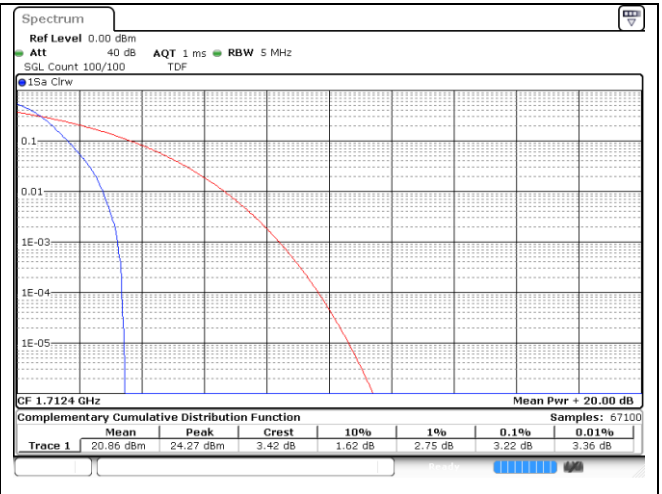
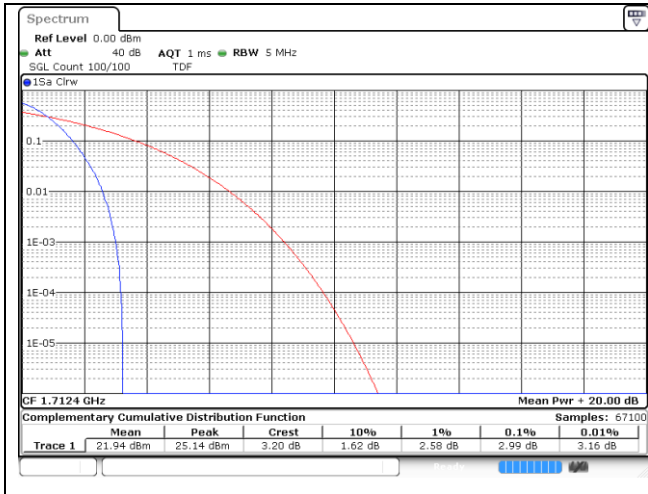
**- Test plots**

**WCDMA II**



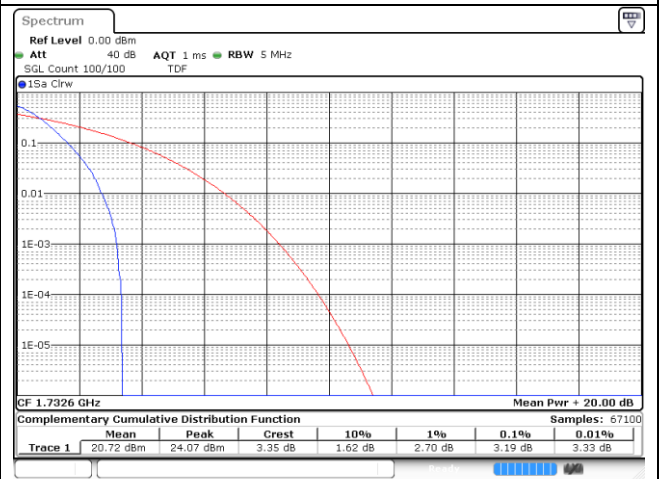
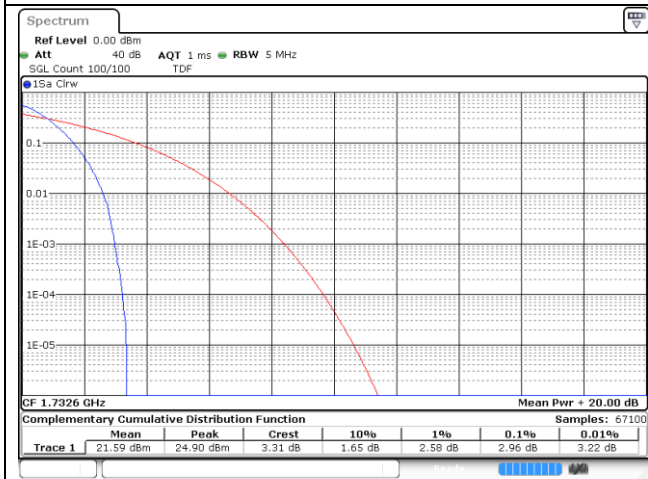


**WCDMA IV**



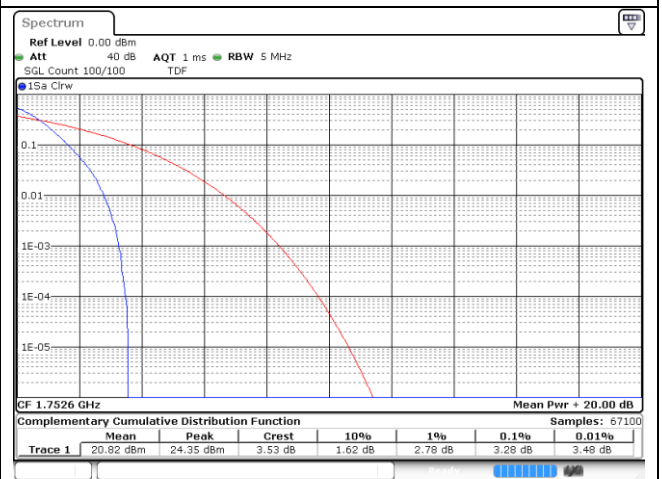
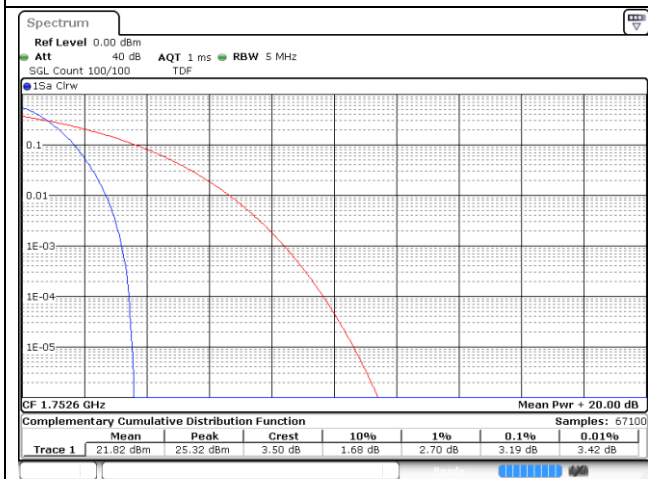
**WCDMA IV RMC Low Channel**

**WCDMA IV HSDPA Low Channel**



**WCDMA IV RMC Middle Channel**

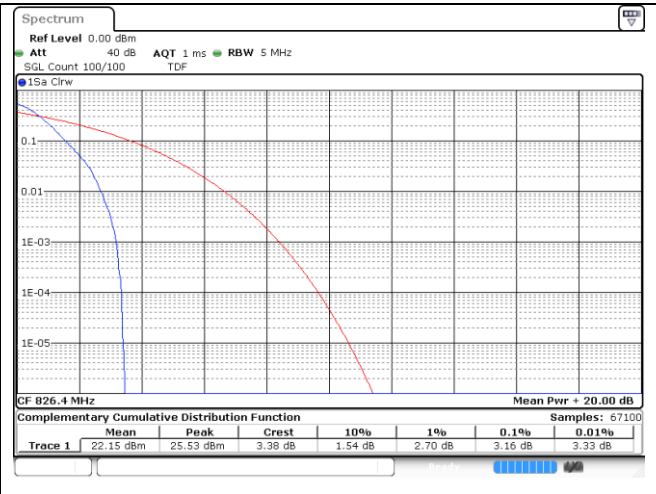
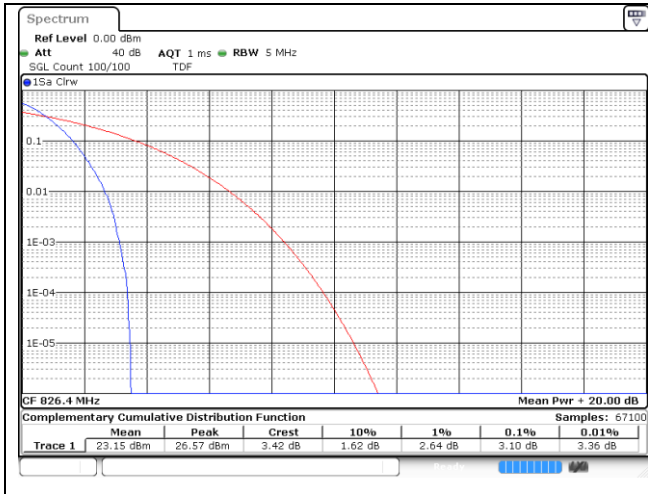
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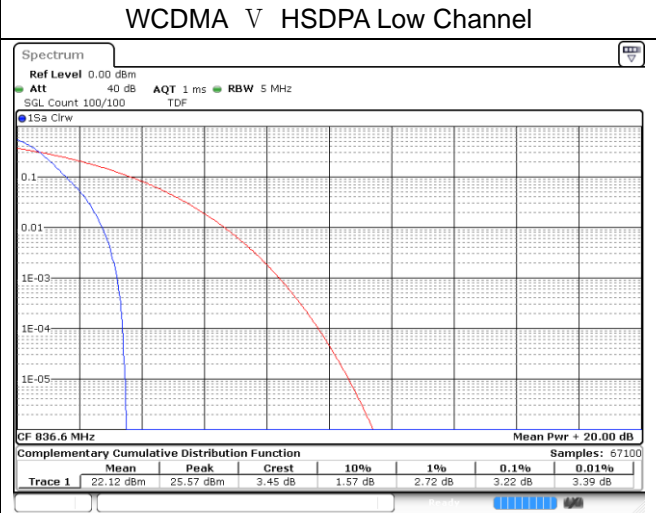
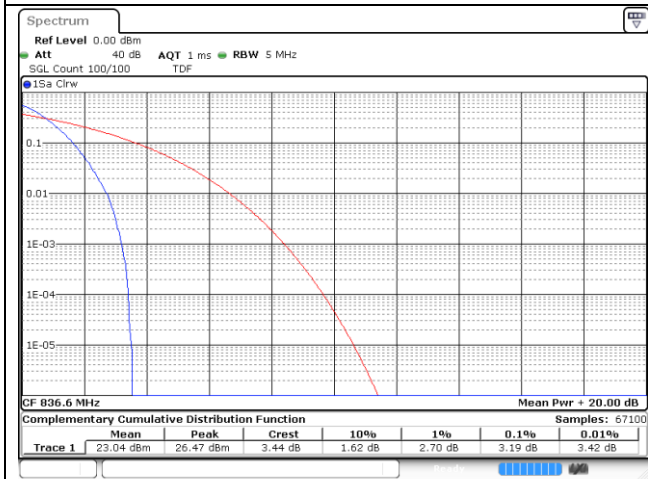
**WCDMA IV RMC High Channel**

**WCDMA IV HSDPA High Channel**

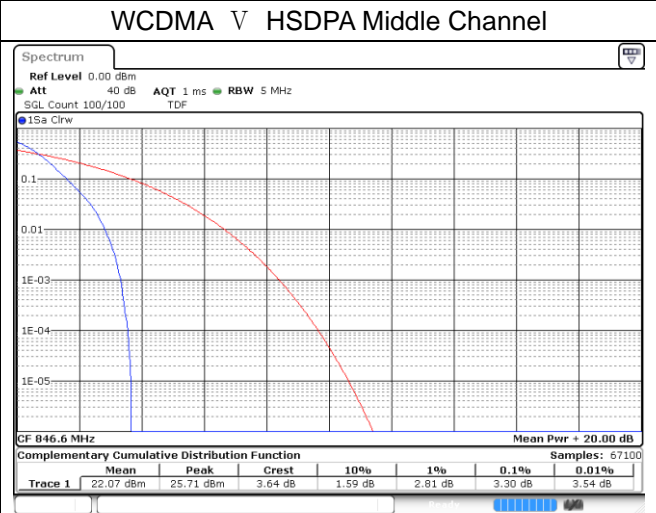
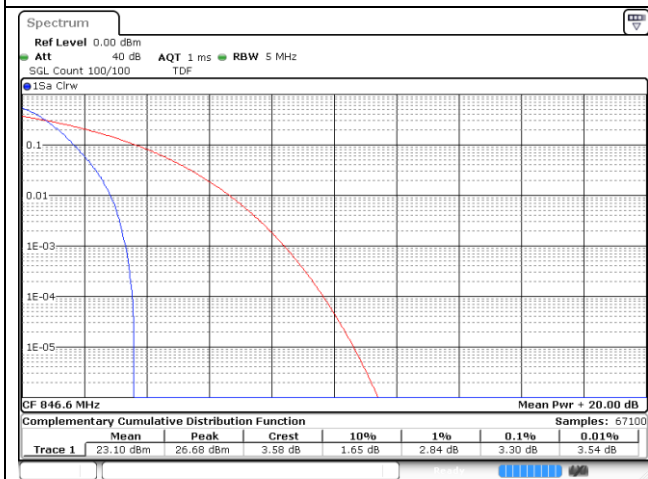
**WCDMA V**



**WCDMA V RMC Low Channel**



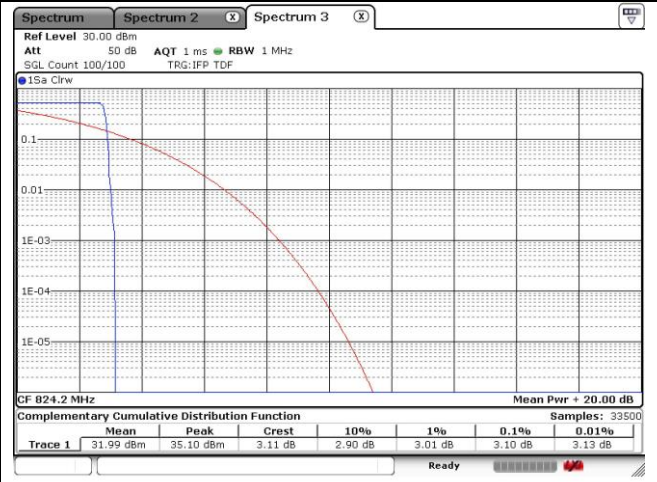
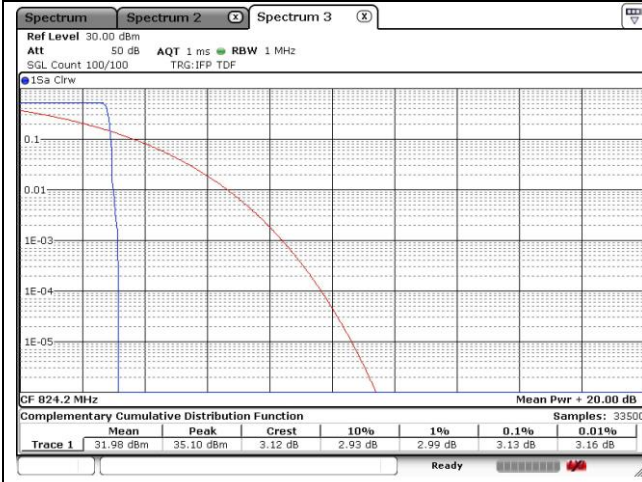
**WCDMA V RMC Middle Channel**



**WCDMA V RMC High Channel**

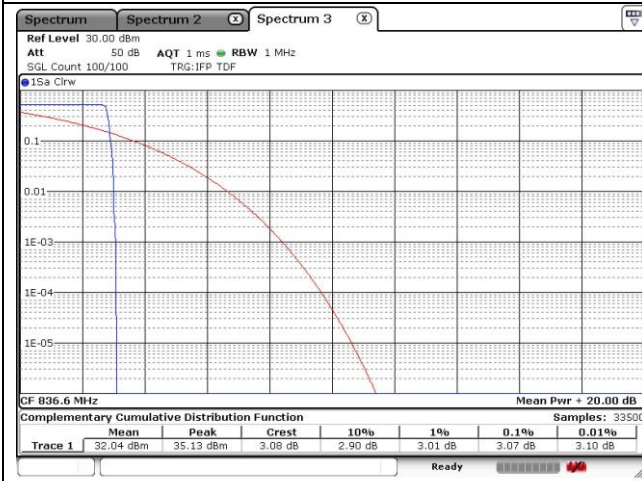
**WCDMA V HSDPA High Channel**

**GSM 850**



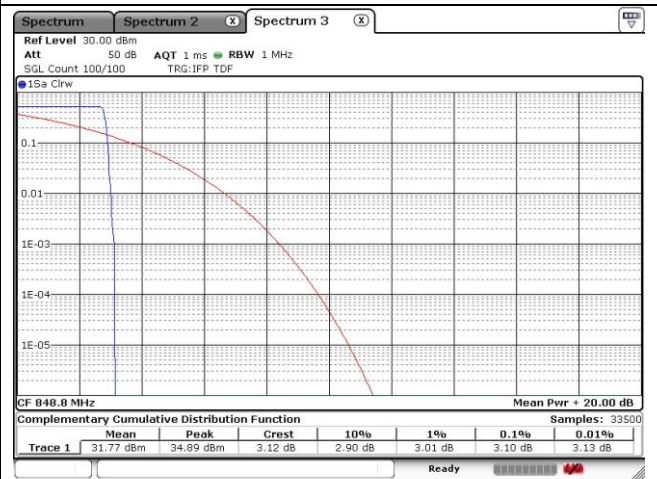
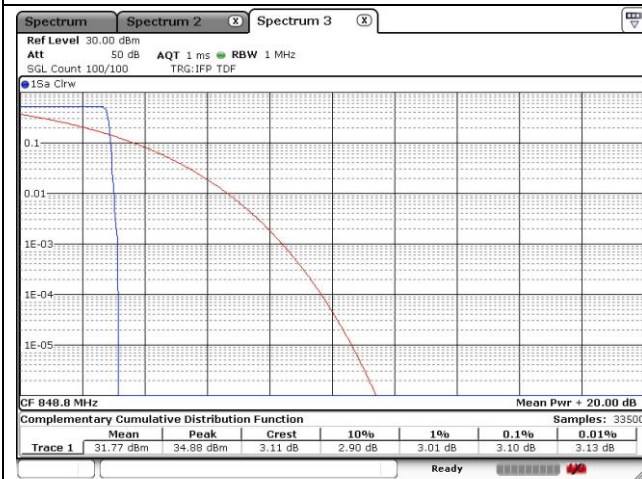
GSM 850 VOICE Low Channel

GSM 850 EDGE Low Channel



GSM 850 VOICE Middle Channel

GSM 850 EDGE Middle Channel



GSM 850 VOICE High Channel

GSM 850 EDGE High Channel