

TEST REPORT

of

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

FCC ID: BEJTM05NNNABM0
IC Certification: 2703H-TM05NNNABM0

Equipment Under Test : Module
Model Name : TM05NNNABM0
Variant Model Name(s) : -
Applicant : FCC: LG Electronics USA
IC: LG ELECTRONICS INC.
Manufacturer : LG Electronics Inc.
Date of Receipt : 2021.04.02
Date of Test(s) : 2020.04.06 ~ 2021.07.26
Date of Issue : 2021.07.28

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

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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:



Nancy Park

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

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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		Module
Model Name		TM05NNNABM0
Serial Number		Conducted: 352881170000019, Radiated: 352881170026303
Power Supply		DC 12.5 V
Rated Power	SIM 1	WCDMA II, IV, V: 24 dB m GSM850: 33 dB m GSM1900: 30 dB m
	SIM 2	GSM850: 32 dB m GSM1900: 30 dB m
Frequency Range	SIM 1	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
	SIM 2	GSM 850: 824 MHz ~ 849 MHz GSM 1 900: 1 850 MHz ~ 1 910 MHz
Modulation Technique		QPSK, 16QAM, GMSK, 8PSK
Antenna Type		External Antenna (Refer to the clause 1.11)
Antenna Gain*		Refer to the clause 1.11
H/W Version		Rev.C
S/W Version		v001.139.141

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMR40	100272	Jun. 16, 2021	Annual	Jun. 16, 2022
Signal Generator	R&S	SMVB100A	255834	May 31, 2021	Annual	May 31, 2022
Spectrum Analyzer	R&S	FSV30	103453	Nov. 04, 2020	Annual	Nov. 04, 2021
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 04, 2020	Annual	Sep. 04, 2021
Radio Communication Analyzer	Anritsu	MT8820C	620107416	Dec. 21, 2020	Annual	Dec. 21, 2021
Power Meter	Anritsu	ML2495A	1223004	Jun. 01, 2021	Annual	Jun. 01, 2022
Power Sensor	Anritsu	MA2411B	1207272	Jun. 01, 2021	Annual	Jun. 01, 2022
Temperature Chamber	ESPEC CORP.	PL-2J	15004184	Jun. 02, 2021	Annual	Jun. 02, 2022
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	Feb. 08, 2021	Annual	Feb. 08, 2022
High Pass Filter	Wainwright Instrument GmbH	WHKX10-900-1000-18000-40SS	7	Mar. 08, 2021	Annual	Mar. 08, 2022
High Pass Filter	Wainwright Instrument GmbH	WHKX2.2/12.75G-10SS	8	Mar. 04, 2021	Annual	Mar. 04, 2022
High Pass Filter	Wainwright Instrument GmbH	WHK3.0/18G-10SS	21	Jun. 04, 2021	Annual	Jun. 04, 2022
High Pass Filter	Wainwright Instrument GmbH	WHK7.5/26.5G-6SS	11	May 17, 2021	Annual	May 17, 2022
Directional Coupler	KRYTAR	152613	122660	Jun. 15, 2021	Annual	Jun. 15, 2022
DC Power Supply	Agilent	U8002A	MY49030063	Feb. 02, 2021	Annual	Feb. 02, 2022
Preamplifier	H.P.	8447F	2944A03909	Aug. 06, 2020	Annual	Aug. 06, 2021
Preamplifier	R&S	SCU-18	10117	Jun. 09, 2021	Annual	Jun. 09, 2022
Preamplifier	TESTEK	TK-PA1840H	130016	Jan. 07, 2021	Annual	Jan. 07, 2022
Test Receiver	R&S	ESU26	100109	Feb. 19, 2021	Annual	Feb. 19, 2022
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 22, 2019	Biennial	Aug. 22, 2021
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	01126	Dec. 12, 2020	Biennial	Dec. 12, 2022
Horn Antenna	R&S	HF906	100326	Feb. 04, 2021	Annual	Feb. 04, 2022
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA9170	9170-540	Nov. 26, 2020	Annual	Nov. 26, 2021
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	Jul. 05, 2021	Semi-Annual	Jan. 05, 2022
Coaxial Cable	RFONE	PL520-NMNM-10M (10 m)	20200324001	Jul. 05, 2021	Semi-Annual	Jan. 05, 2022
Coaxial Cable	RADIALL	TESTPRO 3	182287	Feb. 19, 2021	Semi-annual	Aug. 19, 2021
Coaxial Cable	RADIALL	TESTPRO 3	182288	Feb. 19, 2021	Semi-annual	Aug. 19, 2021
Coaxial Cable	RADIALL	TESTPRO 3	182291	Feb. 19, 2021	Semi-annual	Aug. 19, 2021

► Support Equipment

Description	Manufacturer	Model	Serial Number
N/A	-	-	-

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 / IC RSS-Gen Issue 5, RSS-132 Issue 3, RSS-133 Issue 6 and RSS-139 Issue 3			
Section(s) in FCC	Section(s) 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

1.7. 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 - 104.5;
 where D is the measurement distance in meters.
- E.R.P (dB m) = E.I.R.P. (dB m) - 2.15 (dB)

1.8. Manufacturer Declaration

EUT has two (SIM1 and SIM2) ports, all testing were performed both SIM1, SIM2. SIM2 is support only GSM.

1.9. Worst Case Configuration and Mode

WCDMA mode, Output power measurements were measured on RMC, HSDPA and HSUPA 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 radiation test of the EUT was investigated in three orthogonal orientations X, Y, and Z, and the worst case data is reported.

1.10. 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
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	-	-
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
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	-	V
	GSM 1900	V	V	V	V	-	V
Spurious Radiated Emission	GSM 850	V	V	V	V	-	V
	GSM 1900	V	V	V	V	-	V

1.11. Antenna Designation

SIM 1

Antenna Type	Antenna No.	Antenna Name	Antenna Part Number
Trunk	1	Antenna Box (basic)	8705921
	2	MSA TEL	920631001
	3	MSA TEL SDARS	920361002
Roof	4	DA WAVE HAF 5G-US	8705914-05
	5	DA WAVE High 5G-US	5A09D90-09

Operating Frequency (MHz)		Antenna Peak Gain (dB i)			
		Ant. No	Ant. Gain	Cable Loss	Final Gain
WCDMA V GSM 850	824 ~ 849	Ant. 1	3.00	0.22	2.78
		Ant. 2	2.10	0.52	1.58
		Ant. 3	2.30	0.52	1.78
		Ant. 4	-0.40	-	-0.40
		Ant. 5	-0.20	-	-0.20
WCDMA IV	1 710 ~ 1 755	Ant. 1	5.00	0.30	4.70
		Ant. 2	5.40	0.73	4.67
		Ant. 3	5.80	0.73	5.07
		Ant. 4	2.70	-	2.70
		Ant. 5	3.00	-	3.00
WCDMA II GSM 1900	1 850 ~ 1 910	Ant. 1	5.00	0.34	4.66
		Ant. 2	6.20	0.82	5.38
		Ant. 3	5.90	0.82	5.08
		Ant. 4	2.80	-	2.80
		Ant. 5	2.30	-	2.30

- The Roof type antennas are directly connected to the EUT, so there is no cable loss.

Test Case

Operating Frequency (MHz)		Ant. 1 (basic)	Ant. 2	Ant. 3	Ant. 4	Ant. 5
WCDMA II GSM 1900	1 850 ~ 1 915	V	V	-	-	-
WCDMA IV	1 710 ~ 1 755	V	-	V	-	-
WCDMA V GSM 850	824 ~ 849	V	-	-	-	-

SIM 2

Antenna Type	Antenna No.	Antenna Name	Antenna Part Number
Trunk	1	Antenna Box	8705921
	2	FSA WAVE 5G (left/right)	8705919/8705920
	3	HKL Mobilradioantenna (basic)	5A2D602
	4	ZB Spoilerantenna	5A0C5B0

Operating Frequency (MHz)		Antenna Peak Gain (dB i)			
		Ant. No	Ant. Gain	Cable Loss	Final Gain
GSM 850	824 ~ 849	Ant. 1	3.00	0.57	2.43
		Ant. 2	4.00	0.57	3.43
		Ant. 3	5.00	0.57	4.43
		Ant. 4	4.00	0.57	3.43
GSM 1900	1 850 ~ 1 910	Ant. 1	5.00	0.89	4.11
		Ant. 2	4.00	0.89	3.11
		Ant. 3	5.00	0.89	4.11
		Ant. 4	4.00	0.89	3.11

Test Case

Operating Frequency (MHz)		Ant. 1	Ant. 2	Ant. 3 (basic)	Ant. 4
GSM 850	824 ~ 849	-	-	V	-
GSM 1900	1 850 ~ 1 910	-	-	V	-

Note;

- The EUT has basic antenna (SIM 1: Antenna Box, SIM 2: HKL Mobilradioantenna) and all antennas support all WCDMA and GSM bands.
- For the radiated spurious emission test, Basic Antennas were used at all WCDMA and GSM band. Additional tests were performed using antennas with the highest antenna gain in each band.
- According to manufacturer's antenna specification, only the highest antenna gain of each antenna is reported.

1.12. Measurement Uncertainty

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

Parameter	Uncertainty	
RF Output Power	± 0.36 dB	
Occupied Bandwidth	± 13.12 kHz	
Conducted Spurious Emissions	± 0.63 dB	
Peak to Average Ratio	± 0.60 dB	
Frequency Stability	± 4.92 kHz	
Radiated Emission, 9 kHz to 30 MHz	H	± 3.66 dB
	V	± 3.66 dB
Radiated Emission, below 1 GHz	H	± 4.90 dB
	V	± 4.82 dB
Radiated Emission, above 1 GHz	H	± 3.62 dB
	V	± 3.64 dB

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

1.13. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL002381	2021.07.28	Initial

1.14. Emission Designator and Max Power

SIM 1

WCDMA

Band	Modulation	Low Freq. (MHz)	Upper Freq. (MHz)	Conducted Power (dB m)	Worst 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	23.15	5.38	28.53	0.713	4M14F9W
	HSDPA			22.32		27.70	0.589	4M14F9W
WCDMA IV	RMC	1 712.4	1 752.6	22.64	5.07	27.71	0.590	4M15F9W
	HSDPA			21.83		26.90	0.490	4M15F9W
WCDMA V	RMC	826.4	846.6	23.49	2.78	24.12	0.258	4M14F9W
	HSDPA			22.44		23.07	0.203	4M15F9W

GSM

Band	Modulation	Low Freq. (MHz)	Upper Freq. (MHz)	Conducted Power (dB m)	Duty Cycle (%)	Worst 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	32.48	25	2.78	27.09	0.512	242KGXW
	EDGE			26.95			21.56	0.143	247KG7W
GSM 1900	VOICE	1 850.2	1 909.8	28.53	25	5.38	27.89	0.615	240KGXW
	EDGE			25.71			25.07	0.321	243KG7W

SIM 2

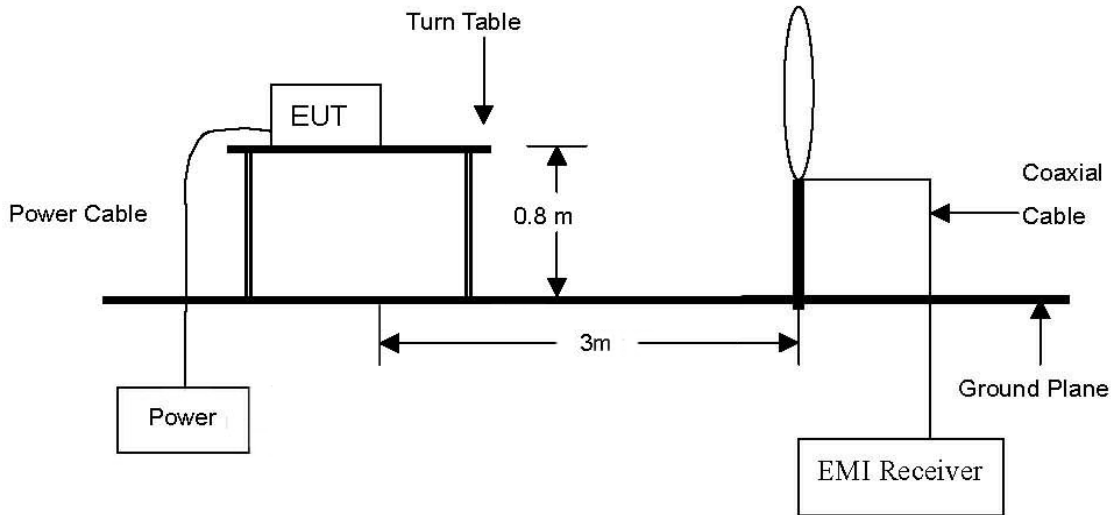
GSM

Band	Modulation	Low Freq. (MHz)	Upper Freq. (MHz)	Conducted Power (dB m)	Duty Cycle (%)	Worst 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	32.10	25	4.43	28.36	0.685	246KGXW
	EDGE			27.21			23.47	0.222	243KG7W
GSM 1900	VOICE	1 850.2	1 909.8	28.20	25	4.11	26.29	0.426	242KGXW
	EDGE			25.41			23.50	0.224	249KG7W

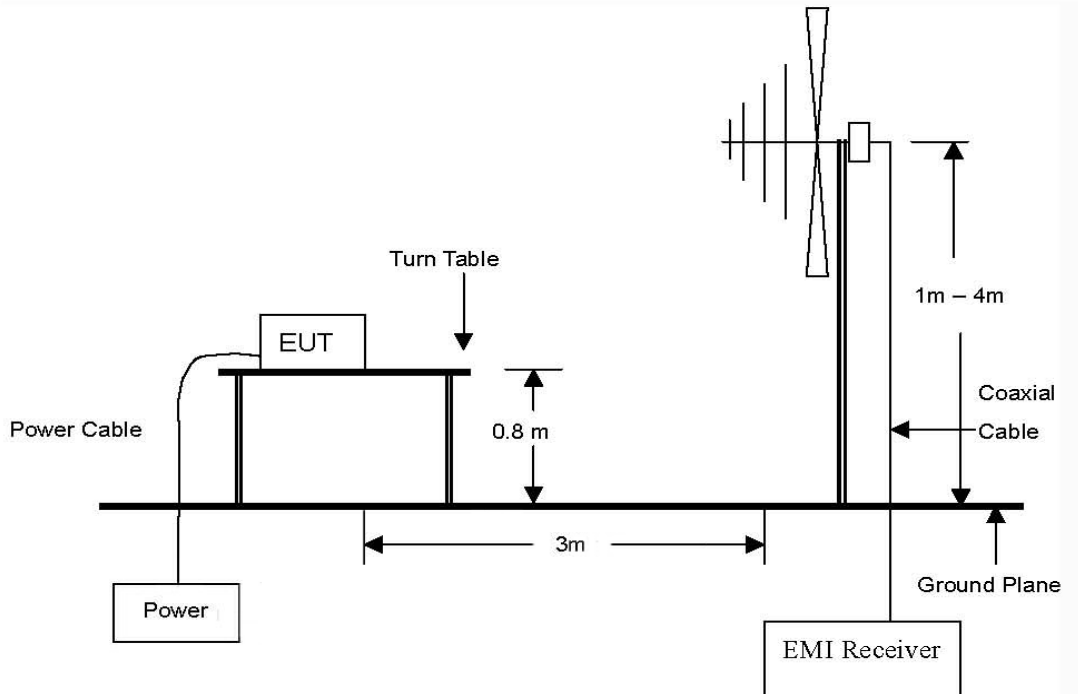
2. E.R.P / E.I.R.P. & Spurious Radiated Emission

2.1. Test setup

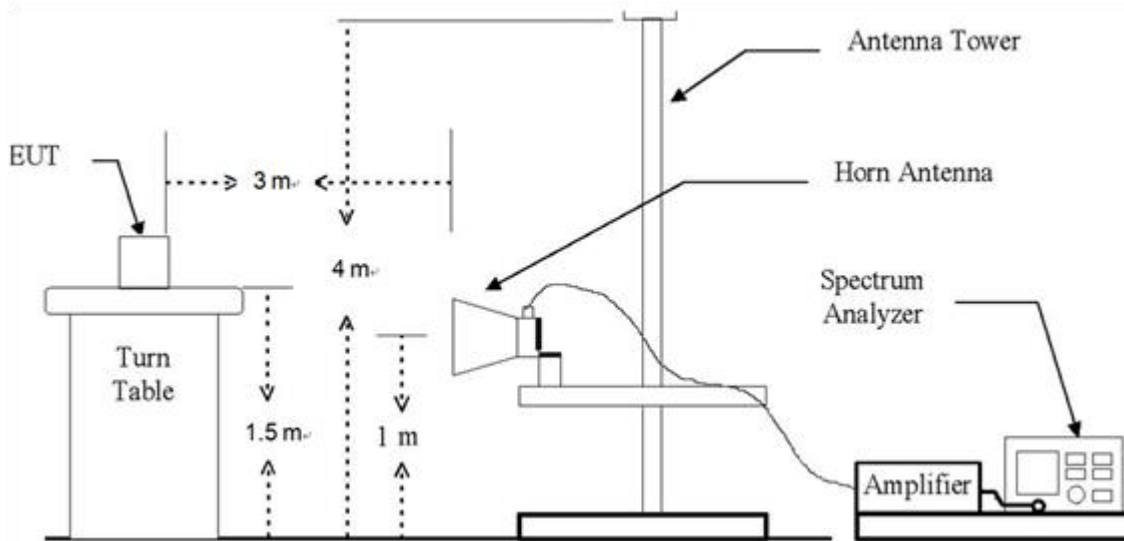
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



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, 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.

SIM 1

WCDMA

Band	Frequency (MHz)	Maximum Conducted Power (dB m)	Maximum Conducted Power (W)	Worst 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	23.15	0.207	5.38	28.53	0.713			2 W E.I.R.P.
WCDMA IV	1 710 ~ 1 755	22.64	0.184	5.07	27.71	0.590			1 W E.I.R.P.
WCDMA V	824 ~ 849	23.49	0.223	2.78	26.27	0.424	24.12	0.258	7 W E.R.P.

GSM

Band	Frequency (MHz)	Maximum Conducted Power (dB m)	Maximum Conducted Power (W)	Duty Cycle (%)	Worst 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	32.48	1.770	25	2.78	29.24	0.839	27.09	0.512	2 W E.I.R.P.
GSM 1900	1 850 ~ 1 910	28.53	0.713	25	5.38	27.89	0.615			7 W E.R.P.

Sim 2

GSM

Band	Frequency (MHz)	Maximum Conducted Power (dB m)	Maximum Conducted Power (W)	Duty Cycle (%)	Worst 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	32.10	1.622	25	4.43	30.51	1.124	28.36	0.685	2 W E.I.R.P.
GSM 1900	1 850 ~ 1 910	28.20	0.661	25	4.11	26.29	0.426			7 W E.R.P.

Remark;

1. E.I.R.P. (dB m) = Maximum Conducted 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. Spurious Radiated Emission

SIM 1

WCDMA II_Ant. 1

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ 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 II_Ant. 2

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ 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_Ant. 1

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ 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 IV_Ant. 3

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ 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_Ant. 1

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 (826.4 MHz)									
1 375.11	50.88	H	25.20	-39.43	36.65	-97.41	-60.76	-13	47.76
1 375.03	52.31	V	25.20	-39.43	38.08	-97.41	-59.33	-13	46.33
1 625.30	50.11	H	25.70	-38.99	36.82	-97.41	-60.59	-13	47.59
Above 1 700.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 374.82	50.98	H	25.20	-39.58	36.60	-97.41	-60.81	-13	47.81
1 375.25	52.02	V	25.20	-39.43	37.79	-97.41	-59.62	-13	46.62
1 625.13	50.53	H	25.70	-38.99	37.24	-97.41	-60.17	-13	47.17
Above 1 700.00	Not detected	-	-	-	-	-	-	-	-
High Channel (846.6 MHz)									
1 375.16	50.73	H	25.20	-39.43	36.50	-97.41	-60.91	-13	47.91
1 375.12	51.89	V	25.20	-39.43	37.66	-97.41	-59.75	-13	46.75
1 625.07	50.49	H	25.70	-38.99	37.20	-97.41	-60.21	-13	47.21
Above 1 700.00	Not detected	-	-	-	-	-	-	-	-

GSM 850_VOICE_Ant. 1

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)									
1 648.41	66.98	H	25.79	-38.94	53.83	-97.41	-43.58	-13	30.58
1 648.57	68.06	V	25.79	-38.94	54.91	-97.41	-42.50	-13	29.50
1 754.06	64.45	H	26.94	-38.40	52.99	-97.41	-44.42	-13	31.42
1 756.08	65.65	V	26.96	-38.38	54.23	-97.41	-43.18	-13	30.18
2 472.46	55.74	H	28.36	-36.73	47.37	-97.41	-50.04	-13	37.04
2 472.49	55.93	V	28.36	-36.73	47.56	-97.41	-49.85	-13	36.85
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 673.20	69.40	H	26.03	-38.64	56.79	-97.41	-40.62	-13	27.62
1 673.12	69.52	V	26.03	-38.64	56.91	-97.41	-40.50	-13	27.50
1 742.45	64.56	V	26.81	-38.62	52.75	-97.41	-44.66	-13	31.66
2 509.74	58.20	H	28.32	-36.63	49.89	-97.41	-47.52	-13	34.52
2 509.55	58.95	V	28.32	-36.63	50.64	-97.41	-46.77	-13	33.77
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 MHz)									
1 697.58	69.14	H	26.28	-38.52	56.91	-97.41	-40.51	-13	27.51
1 697.55	68.00	V	26.28	-38.52	55.76	-97.41	-41.65	-13	28.65
1 757.70	64.98	V	26.98	-38.38	53.58	-97.41	-43.83	-13	30.83
2 546.53	52.65	H	28.39	-36.02	45.02	-97.41	-52.39	-13	39.39
2 546.22	52.34	V	28.39	-36.02	44.71	-97.41	-52.70	-13	39.70
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

GSM 850_EDGE_Ant. 1

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)									
1 648.38	66.51	H	25.79	-38.94	53.36	-97.41	-44.05	-13	31.05
1 648.41	67.41	V	25.79	-38.94	54.26	-97.41	-43.15	-13	30.15
2 472.54	51.10	H	28.35	-36.73	42.72	-97.41	-54.69	-13	41.69
2 472.72	52.07	V	28.35	-36.73	43.69	-97.41	-53.72	-13	40.72
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 673.16	68.55	H	26.03	-38.64	55.94	-97.41	-41.47	-13	28.47
1 673.19	68.62	V	26.03	-38.64	56.01	-97.41	<u>-41.40</u>	-13	28.40
2 509.74	52.11	H	28.32	-36.63	43.80	-97.41	-53.61	-13	40.61
2 509.87	53.76	V	28.32	-36.63	45.45	-97.41	-51.96	-13	38.96
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 MHz)									
1 697.71	67.92	H	26.28	-38.52	55.68	-97.41	-41.73	-13	28.73
1 697.65	66.65	V	26.28	-38.52	54.41	-97.41	-43.00	-13	30.00
2 546.33	48.89	H	28.39	-36.02	41.26	-97.41	-56.15	-13	43.15
2 546.38	48.52	V	28.39	-36.02	40.89	-97.41	-56.52	-13	43.52
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_VOICE_Ant. 1

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ V/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
3 700.33	52.89	H	32.10	-34.43	50.56	-95.26	-44.70	-13	31.70
3 700.71	45.34	V	32.10	-34.43	43.01	-95.26	-52.25	-13	39.25
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
3 759.89	50.77	H	32.28	-33.67	49.38	-95.26	-45.88	-13	32.88
3 760.06	48.62	V	32.28	-33.67	47.23	-95.26	-48.03	-13	35.03
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
3 819.64	49.35	H	32.16	-32.82	48.69	-95.26	-46.57	-13	33.57
3 819.57	48.67	V	32.16	-32.82	48.01	-95.26	-47.25	-13	34.25
Above 3 900.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_VOICE_Ant. 2

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ V/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
3 700.35	47.21	H	32.10	-34.43	44.88	-95.26	-50.38	-13	37.38
3 700.58	50.33	V	32.10	-34.43	48.00	-95.26	-47.26	-13	34.26
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
3 760.06	51.58	H	32.28	-33.67	50.19	-95.26	-45.07	-13	32.07
3 759.90	50.15	V	32.28	-33.67	48.76	-95.26	-46.50	-13	33.50
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
3 819.40	49.30	H	32.16	-32.82	48.64	-95.26	-46.62	-13	33.62
3 819.84	47.50	V	32.16	-32.82	46.84	-95.26	-48.42	-13	35.42
Above 3 900.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_EDGE_Ant. 1

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ V/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
3 700.35	52.45	H	32.10	-34.43	50.12	-95.26	-45.14	-13	32.14
3 700.29	45.37	V	32.10	-34.43	43.04	-95.26	-52.22	-13	39.22
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
3 759.74	50.51	H	32.28	-33.67	49.12	-95.26	-46.14	-13	33.14
3 759.90	48.25	V	32.28	-33.67	46.86	-95.26	-48.40	-13	35.40
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
3 819.57	49.19	H	32.16	-32.82	48.53	-95.26	-46.73	-13	33.73
3 819.80	47.96	V	32.16	-32.82	47.30	-95.26	-47.96	-13	34.96
Above 3 900.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_EDGE_Ant. 2

Frequency (MHz)	Measured Level (dB μ V)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB μ V/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
3 700.43	46.68	H	32.10	-34.43	44.35	-95.26	-50.91	-13	37.91
3 700.36	49.87	V	32.10	-34.43	47.54	-95.26	-47.72	-13	34.72
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
3 759.93	50.65	H	32.28	-33.67	49.26	-95.26	-46.00	-13	33.00
3 759.96	49.66	V	32.28	-33.67	48.27	-95.26	-46.99	-13	33.99
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
3 819.75	48.37	H	32.16	-32.82	47.71	-95.26	-47.55	-13	34.55
3 819.59	47.44	V	32.16	-32.82	46.78	-95.26	-48.48	-13	35.48
Above 3 900.00	Not detected	-	-	-	-	-	-	-	-

SIM 2

GSM 850_VOICE_Ant. 3

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)									
1 648.42	56.50	H	25.79	-38.94	43.35	-97.41	-54.06	-13	41.06
1 648.51	55.67	V	25.79	-38.94	42.52	-97.41	-54.89	-13	41.89
2 472.87	50.15	H	28.35	-36.73	41.77	-97.41	-55.64	-13	42.64
2 472.65	44.43	V	28.35	-36.73	36.05	-97.41	-61.36	-13	48.36
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 673.42	54.90	H	26.03	-38.64	42.29	-97.41	-55.12	-13	42.12
1 673.17	53.78	V	26.03	-38.64	41.17	-97.41	-56.24	-13	43.24
2 509.78	49.91	H	28.32	-36.63	41.60	-97.41	-55.81	-13	42.81
2 509.81	50.26	V	28.32	-36.63	41.95	-97.41	-55.46	-13	42.46
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 MHz)									
1 697.74	54.38	H	26.28	-38.51	42.15	-97.41	-55.26	-13	42.26
1 697.81	52.97	V	26.28	-38.51	40.74	-97.41	-56.67	-13	43.67
2 546.70	47.18	H	28.39	-36.02	39.55	-97.41	-57.86	-13	44.86
2 546.28	46.30	V	28.39	-36.02	38.67	-97.41	-58.74	-13	45.74
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

GSM 850_EDGE_Ant. 3

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)									
1 648.41	53.87	H	25.79	-38.94	40.72	-97.41	-56.69	-13	43.69
1 648.32	53.62	V	25.79	-38.94	40.47	-97.41	-56.94	-13	43.94
2 472.68	46.86	H	28.35	-36.73	38.48	-97.41	-58.93	-13	45.93
2 472.57	43.34	V	28.35	-36.73	34.96	-97.41	-62.45	-13	49.45
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
1 673.16	52.42	H	26.03	-38.64	39.81	-97.41	-57.60	-13	44.60
1 673.10	50.77	V	26.03	-38.64	38.16	-97.41	-59.25	-13	46.25
2 510.06	46.80	H	28.32	-36.62	38.50	-97.41	-58.91	-13	45.91
2 509.87	45.56	V	28.32	-36.63	37.25	-97.41	-60.16	-13	47.16
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 MHz)									
1 697.52	49.80	H	26.28	-38.52	37.56	-97.41	-59.85	-13	46.85
1 697.52	49.81	V	26.28	-38.52	37.57	-97.41	-59.84	-13	46.84
2 546.41	43.21	H	28.39	-36.02	35.58	-97.41	-61.83	-13	48.83
2 545.90	43.95	V	28.39	-36.02	36.32	-97.41	-61.09	-13	48.09
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_VOICE_Ant. 3

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)									
3 700.61	45.37	H	32.10	-34.43	43.04	-95.26	-52.22	-13	39.22
3 700.51	46.69	V	32.10	-34.43	44.36	-95.26	-50.90	-13	37.90
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
3 759.91	50.64	H	32.28	-33.67	49.25	-95.26	-46.01	-13	33.01
3 759.97	50.63	V	32.28	-33.67	49.24	-95.26	-46.02	-13	33.02
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
3 819.58	47.67	H	32.16	-32.82	47.01	-95.26	-48.25	-13	35.25
3 819.52	44.60	V	32.16	-32.82	43.94	-95.26	-51.32	-13	38.32
Above 3 900.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_EDGE_Ant. 3

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)									
3 700.54	45.57	H	32.10	-34.43	43.24	-95.26	-52.02	-13	39.02
3 700.39	46.96	V	32.10	-34.43	44.63	-95.26	-50.63	-13	37.63
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 MHz)									
3 759.94	50.58	H	32.28	-33.67	49.19	-95.26	-46.07	-13	33.07
3 760.09	49.92	V	32.28	-33.67	48.53	-95.26	-46.73	-13	33.73
Above 3 800.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 909.8 MHz)									
3 819.68	48.03	H	32.16	-32.82	47.37	-95.26	-47.89	-13	34.89
3 819.30	43.60	V	32.16	-32.82	42.94	-95.26	-52.32	-13	39.32
Above 3 900.00	Not detected	-	-	-	-	-	-	-	-

Remark;

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

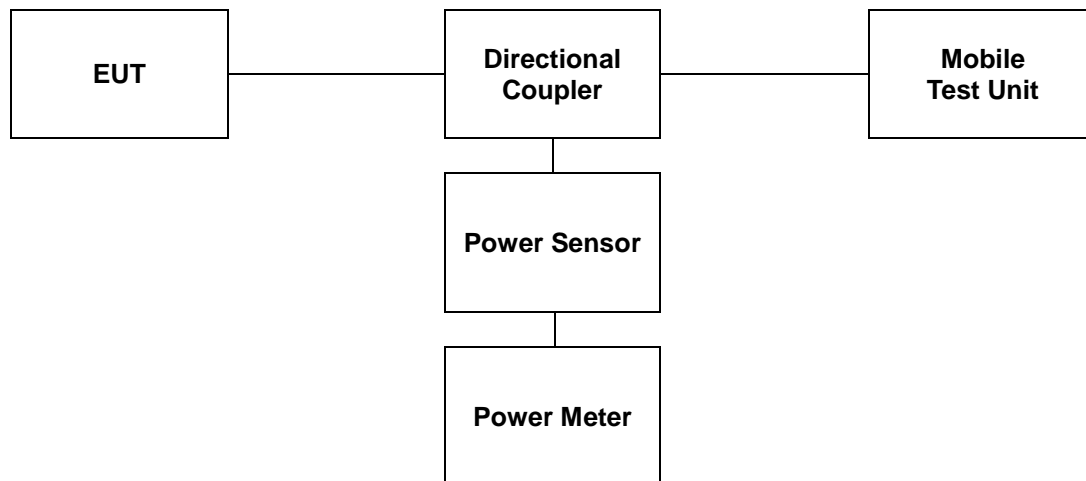
3.1. Limit

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.

SIM 1

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	22.62	0.183	22.92	0.196	<u>23.15</u>	<u>0.207</u>
HSDPA	Subtest 1	21.87	0.154	22.10	0.162	<u>22.32</u>	<u>0.171</u>
	Subtest 2	21.86	0.153	22.11	0.163	22.31	0.170
	Subtest 3	21.38	0.137	21.60	0.145	21.80	0.151
	Subtest 4	21.37	0.137	21.59	0.144	21.82	0.152
HSUPA	Subtest 1	21.88	0.154	22.11	0.163	22.33	0.171
	Subtest 2	19.89	0.097	20.11	0.103	20.36	0.109
	Subtest 3	20.91	0.123	21.14	0.130	21.32	0.136
	Subtest 4	19.89	0.097	20.11	0.103	20.32	0.108
	Subtest 5	21.89	0.155	22.10	0.162	22.35	0.172
DC-HSDPA	Subtest 1	21.50	0.141	22.22	0.167	21.78	0.151
	Subtest 2	21.51	0.142	22.23	0.167	21.77	0.150
	Subtest 3	21.02	0.126	21.72	0.149	21.28	0.134
	Subtest 4	21.00	0.126	21.72	0.149	21.25	0.133
HSPA+		20.86	0.122	21.09	0.129	21.40	0.138

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	<u>22.64</u>	<u>0.184</u>	22.57	0.181	22.59	0.182
HSDPA	Subtest 1	<u>21.83</u>	<u>0.152</u>	21.64	0.146	21.72	0.149
	Subtest 2	21.82	0.152	21.65	0.146	21.72	0.149
	Subtest 3	21.31	0.135	21.04	0.127	21.23	0.133
	Subtest 4	21.30	0.135	21.10	0.129	21.22	0.132
HSUPA	Subtest 1	21.82	0.152	21.64	0.146	21.74	0.149
	Subtest 2	19.82	0.096	19.62	0.092	19.76	0.095
	Subtest 3	20.82	0.121	20.63	0.116	20.72	0.118
	Subtest 4	19.83	0.096	19.67	0.093	19.72	0.094
DC-HSDPA	Subtest 1	21.58	0.144	21.51	0.142	21.65	0.146
	Subtest 2	21.59	0.144	21.48	0.141	21.63	0.146
	Subtest 3	21.09	0.129	20.98	0.125	21.14	0.130
	Subtest 4	21.08	0.128	20.99	0.126	21.13	0.130
HSPA+		21.18	0.131	20.92	0.124	20.93	0.124

WCDMA V							
Mode	Mode	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	23.20	0.209	23.35	0.216	<u>23.49</u>	<u>0.223</u>
HSDPA	Subtest 1	22.18	0.165	22.34	0.171	<u>22.44</u>	<u>0.175</u>
	Subtest 2	22.17	0.165	22.33	0.171	22.42	0.175
	Subtest 3	21.68	0.147	21.87	0.154	21.94	0.156
	Subtest 4	21.68	0.147	21.85	0.153	21.93	0.156
HSUPA	Subtest 1	22.15	0.164	22.30	0.170	22.40	0.174
	Subtest 2	20.12	0.103	20.32	0.108	20.40	0.110
	Subtest 3	21.14	0.130	21.28	0.134	21.38	0.137
	Subtest 4	20.15	0.104	20.30	0.107	20.41	0.110
DC-HSDPA	Subtest 1	22.73	0.187	22.78	0.190	22.66	0.185
	Subtest 2	22.72	0.187	22.77	0.189	22.65	0.184
	Subtest 3	22.24	0.167	22.27	0.169	22.17	0.165
	Subtest 4	22.23	0.167	22.26	0.168	22.16	0.164
HSPA+		20.86	0.122	21.09	0.129	21.40	0.138

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		32.12	1.629	<u>32.48</u>	<u>1.770</u>	32.28	1.690
GPRS	1 Tx slot	32.24	1.675	32.47	1.766	32.25	1.679
	2 Tx slot	30.03	1.007	30.27	1.064	29.65	0.923
	3 Tx slot	29.87	0.971	30.10	1.023	29.45	0.881
	4 Tx slot	28.31	0.678	28.84	0.766	27.68	0.586
EGPRS	1 Tx slot	<u>26.95</u>	<u>0.495</u>	26.87	0.486	26.94	0.494
	2 Tx slot	26.93	0.493	26.74	0.472	26.77	0.475
	3 Tx slot	26.79	0.478	26.61	0.458	26.63	0.460
	4 Tx slot	26.69	0.467	26.52	0.449	26.52	0.449

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		28.02	0.634	<u>28.53</u>	<u>0.713</u>	27.90	0.617
GPRS	1 Tx slot	27.93	0.621	28.50	0.708	27.73	0.593
	2 Tx slot	26.68	0.466	27.65	0.582	27.12	0.515
	3 Tx slot	26.49	0.446	27.40	0.550	26.91	0.491
	4 Tx slot	25.23	0.333	26.29	0.426	25.58	0.361
EGPRS	1 Tx slot	24.73	0.297	<u>25.71</u>	<u>0.372</u>	24.56	0.286
	2 Tx slot	24.49	0.281	25.57	0.361	24.34	0.272
	3 Tx slot	24.41	0.276	25.45	0.351	24.13	0.259
	4 Tx slot	24.16	0.261	25.21	0.332	23.90	0.245

SIM 2

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		31.75	1.496	31.43	1.390	<u>32.10</u>	<u>1.622</u>
GPRS	31.88	31.88	1.542	31.90	1.549	31.91	1.552
	30.03	30.03	1.007	28.98	0.791	29.89	0.975
	29.90	29.90	0.977	28.83	0.764	29.73	0.940
	28.86	28.86	0.769	27.57	0.571	29.01	0.796
EGPRS	26.82	26.82	0.481	<u>27.21</u>	<u>0.526</u>	27.15	0.519
	26.81	26.81	0.480	27.11	0.514	27.01	0.502
	26.75	26.75	0.473	26.92	0.492	26.81	0.480
	26.58	26.58	0.455	27.01	0.502	26.62	0.459

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		27.75	0.596	27.81	0.604	<u>28.20</u>	<u>0.661</u>
GPRS	1 Tx slot	27.66	0.583	27.73	0.593	28.02	0.634
	2 Tx slot	27.12	0.515	27.15	0.519	27.44	0.555
	3 Tx slot	27.10	0.513	27.14	0.518	27.40	0.550
	4 Tx slot	25.90	0.389	25.91	0.390	26.24	0.421
EGPRS	1 Tx slot	25.07	0.321	24.98	0.315	<u>25.41</u>	<u>0.348</u>
	2 Tx slot	24.94	0.312	24.79	0.301	25.26	0.336
	3 Tx slot	24.87	0.307	24.72	0.296	25.13	0.326
	4 Tx slot	24.72	0.296	24.56	0.286	25.06	0.321

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).

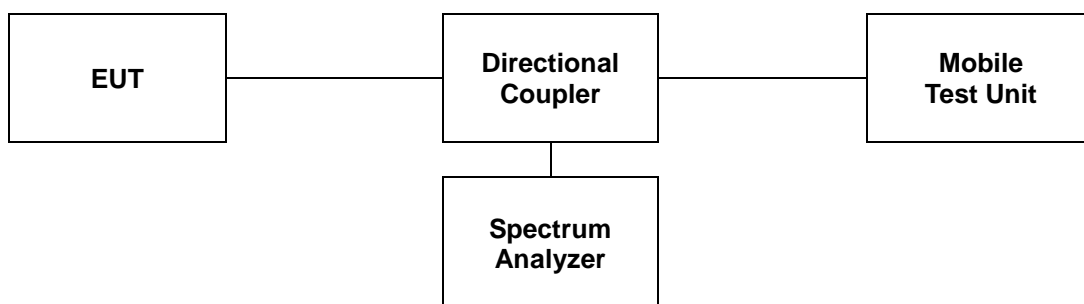
IC

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.

SIM 1

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
WCDMA II	RMC	1 880.0	4.139
	HSDPA		4.139
WCDMA IV	RMC	1 732.6	4.153
	HSDPA		4.153
WCDMA V	RMC	836.6	4.139
	HSDPA		4.153

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
GSM 850	VOICE	836.6	0.242
	EDGE		0.247
GSM 1900	VOICE	1 880.0	0.240
	EDGE		0.243

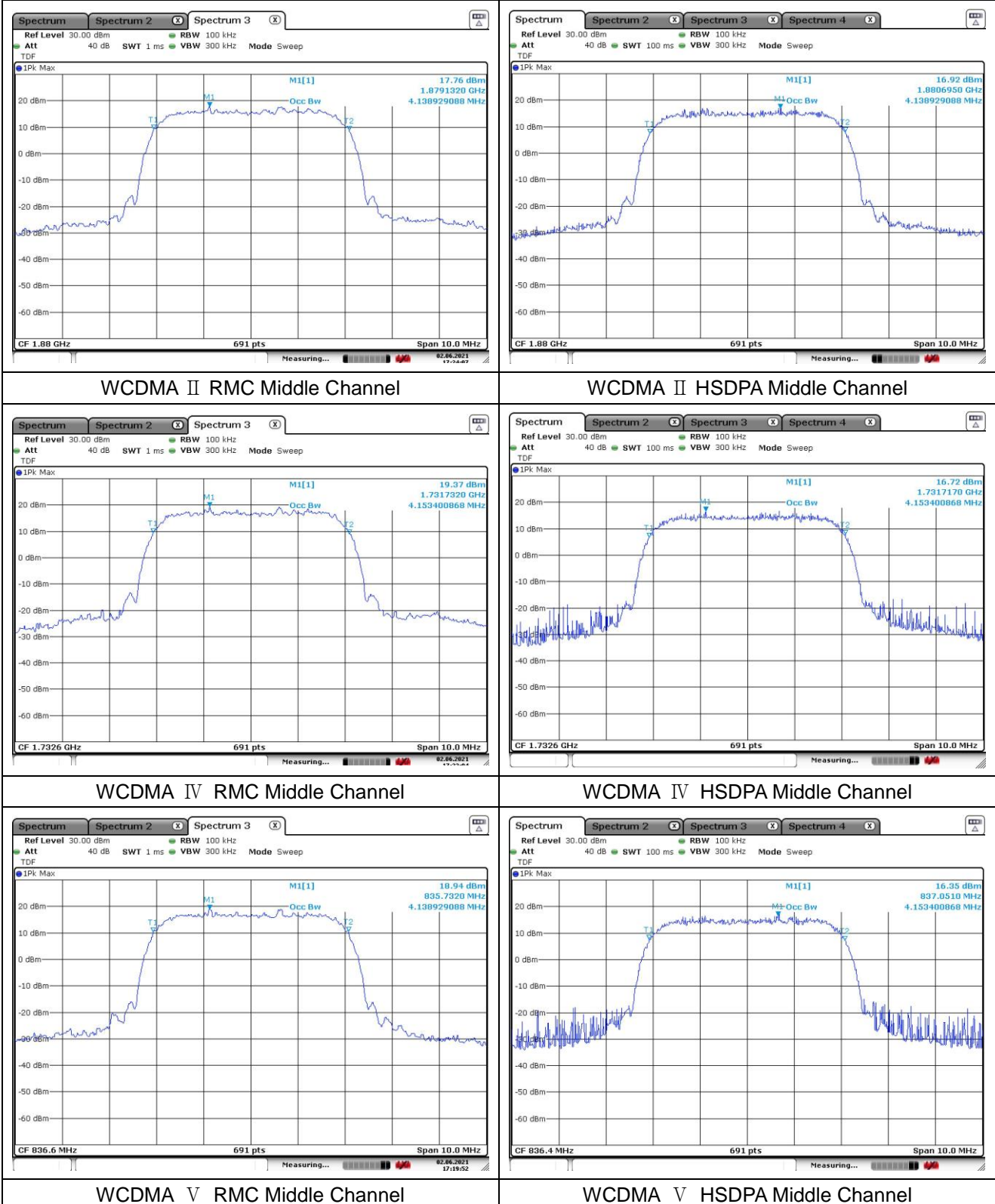
SIM 2

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
GSM 850	VOICE	836.6	0.246
	EDGE		0.243
GSM 1900	VOICE	1 880.0	0.242
	EDGE		0.249

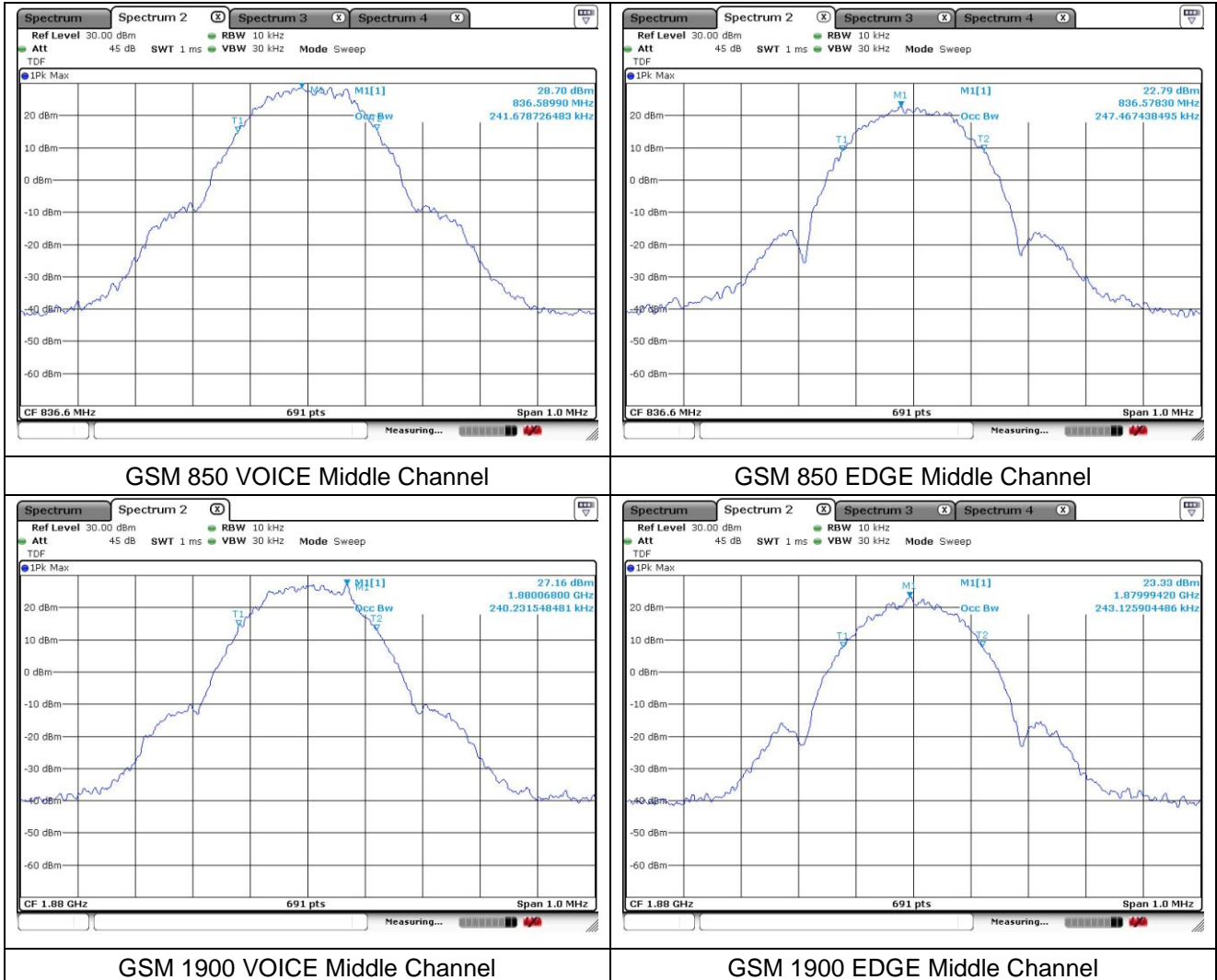
- Test plots

SIM 1

WCDMA

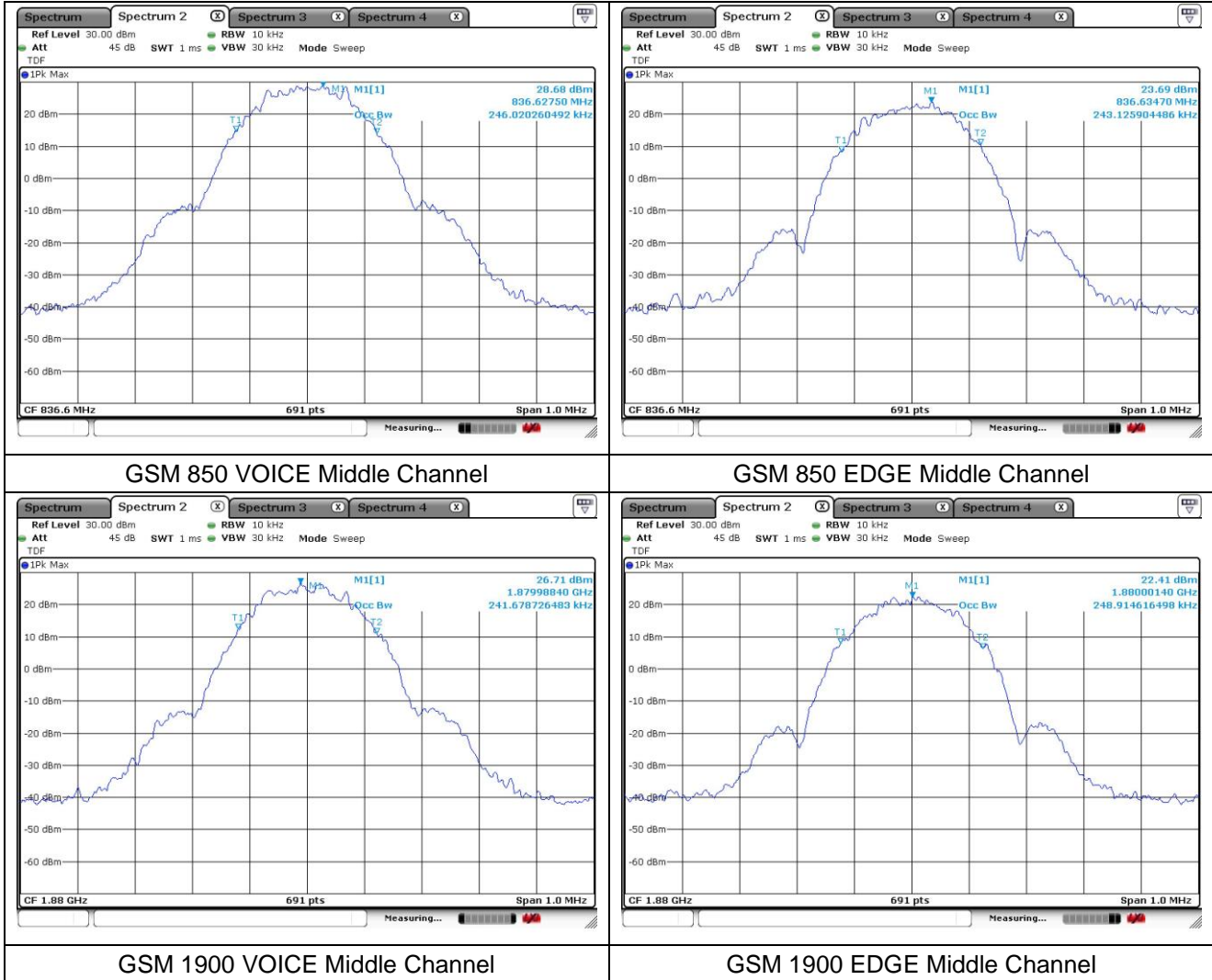


GSM



SIM 2

GSM



5. Peak-Average Ratio

5.1. Limit

FCC

- §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.

IC

- RSS-132 Issue 3

5.4, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1 % of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

- RSS-133 Issue 6

6.4, the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1 % of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

- RSS-139 Issue 3

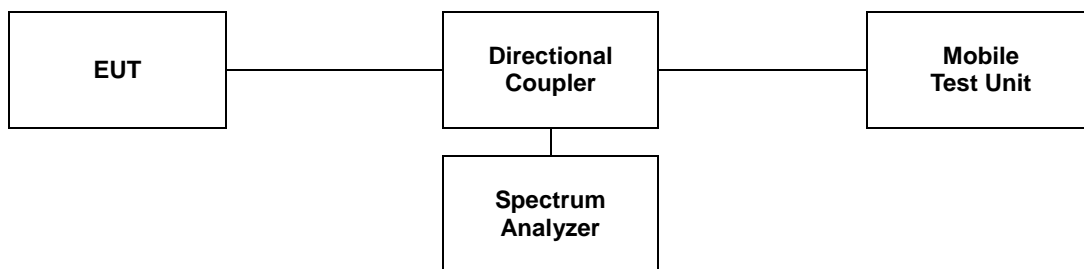
6.5, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1 % of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

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.

SIM 1

Band	Mode	Frequency (MHz)	PAR (dB)
WCDMA II	RMC	1 852.4	2.96
		1 880.0	2.99
		1 907.6	2.99
	HSDPA	1 852.4	3.33
		1 880.0	3.30
		1 907.6	3.36
WCDMA IV	RMC	1 712.4	3.07
		1 732.6	3.13
		1 752.6	3.10
	HSDPA	1 712.4	3.33
		1 732.6	3.33
		1 752.6	3.36
WCDMA V	RMC	826.4	2.96
		836.6	2.96
		846.6	3.01
	HSDPA	826.4	3.28
		836.6	3.25
		846.6	3.25

Band	Mode	Frequency (MHz)	PAR (dB)
GSM 850	VOICE	824.2	3.01
		836.6	3.01
		848.8	2.99
	EDGE	824.2	5.91
		836.6	5.68
		848.8	5.83
GSM 1900	VOICE	1 850.2	3.10
		1 880.0	3.10
		1 909.8	3.07
	EDGE	1 850.2	6.17
		1 880.0	5.88
		1 909.8	5.83

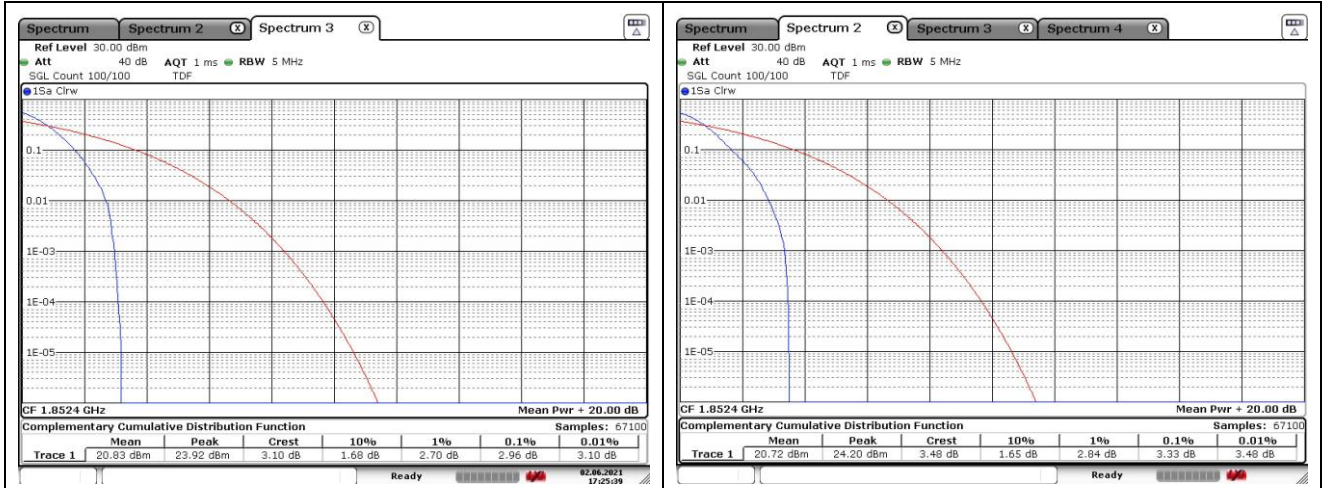
SIM 2

Band	Mode	Frequency (MHz)	PAR (dB)
GSM 850	VOICE	824.2	2.99
		836.6	2.99
		848.8	3.01
	EDGE	824.2	6.14
		836.6	5.97
		848.8	5.86
GSM 1900	VOICE	1 850.2	2.99
		1 880.0	2.96
		1 909.8	3.04
	EDGE	1 850.2	5.74
		1 880.0	5.86
		1 909.8	5.68

- Test plots

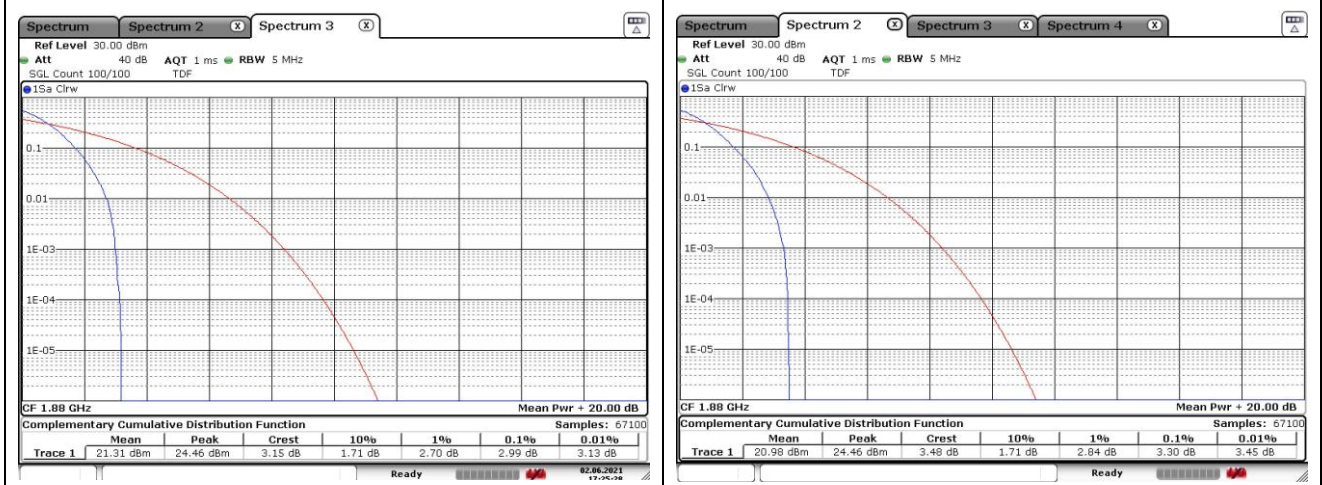
SIM 1

WCDMA II



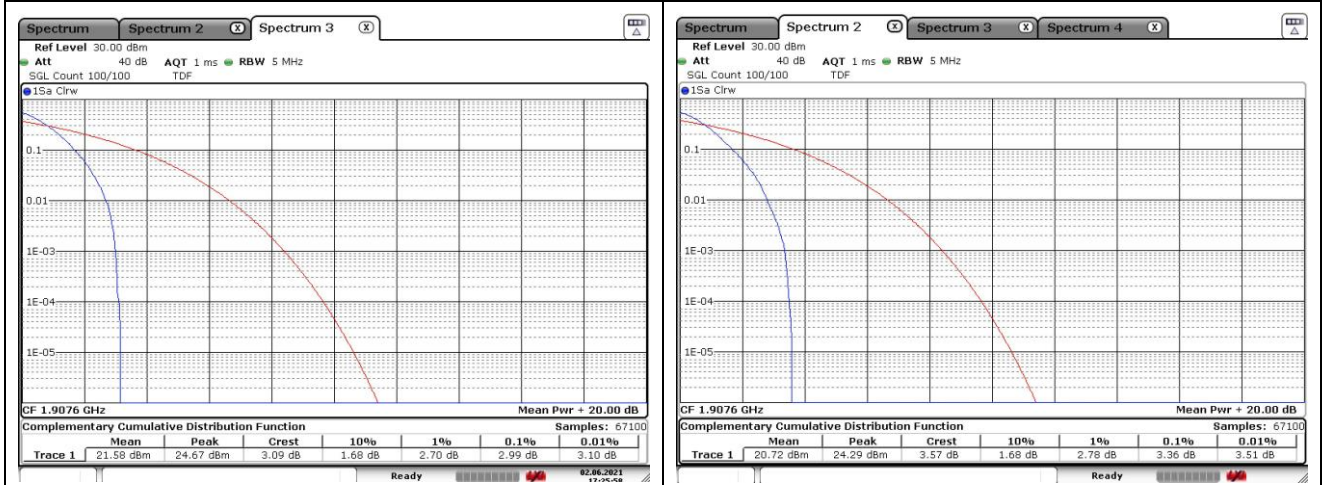
WCDMA II RMC Low Channel

WCDMA II HSDPA Low Channel



WCDMA II RMC Middle Channel

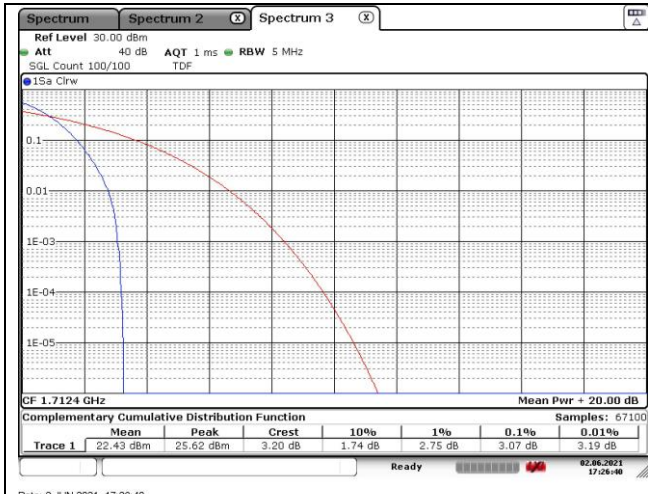
WCDMA II HSDPA Middle Channel



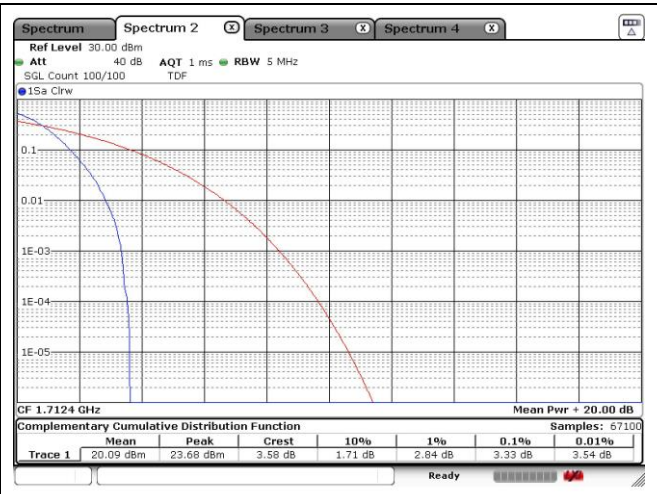
WCDMA II RMC High Channel

WCDMA II HSDPA High Channel

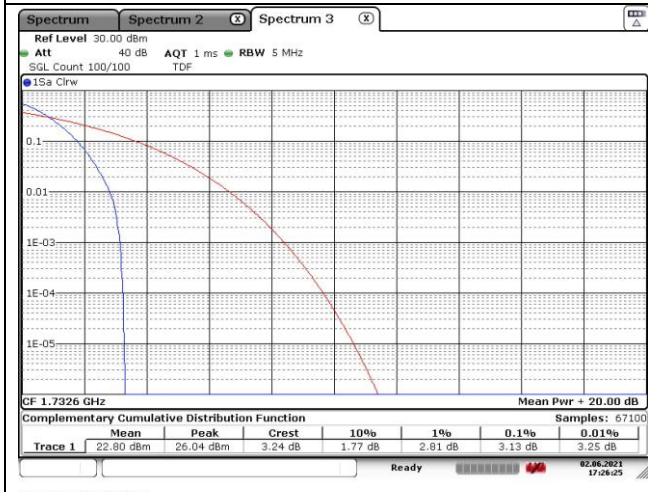
WCDMA IV



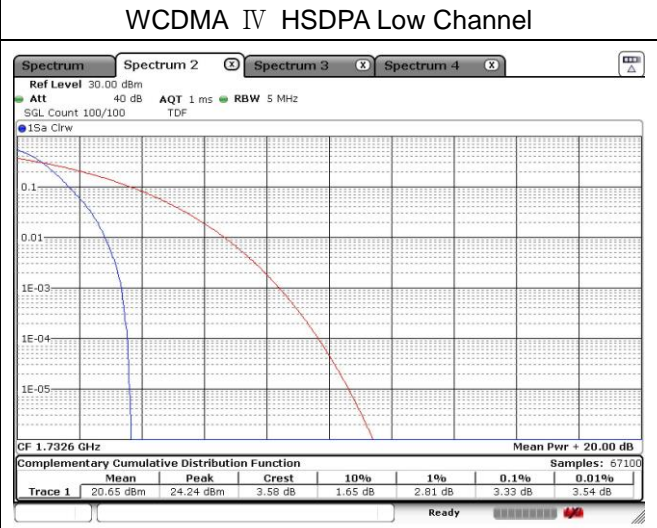
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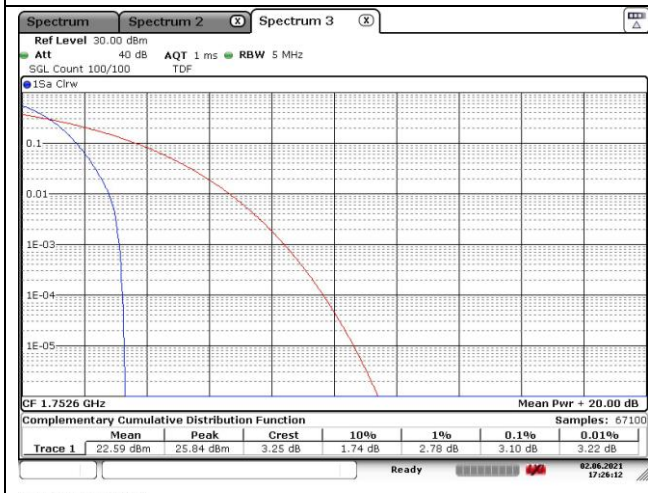
WCDMA IV RMC Low Channel



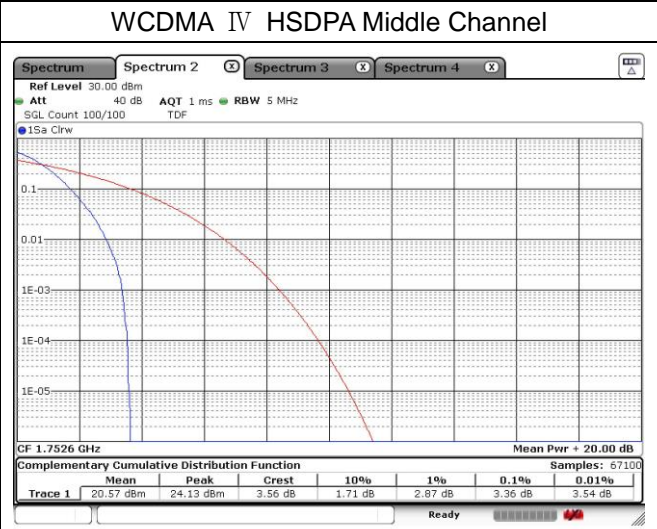
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WCDMA IV RMC Middle Channel



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WCDMA IV RMC High Channel

WCDMA IV HSDPA High Channel