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TEST REPORT

of

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

FCC ID: BEJTL1R22NR

Equipment Under Test	:	Telematics
Model Name	:	TL1R22NR
Variant Model Name(s)	:	Refer to the page 3
Applicant	:	LG Electronics USA
Manufacturer	:	LG Electronics Inc.
Date of Receipt	:	2022.11.04
Date of Test(s)	:	2022.11.04 ~ 2022.12.26
Date of Issue	:	2022.12.26

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

1) The results of this test report are effective only to the items tested.
2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.
3) This test report cannot be reproduced, except in full, without prior written permission of the Company.
4) The data marked ※ in this report was provided by the customer and may affect the validity of the test results.
We are responsible for all the information of this test report except for the data(※) provided by the customer.

Tested by: Murphy Kim

Technical Manager: Jinhyoung Cho

SGS Korea Co., Ltd. Gunpo Laboratory

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
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- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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1.2. Details of Applicant

Applicant : LG Electronics USA
Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States, 07632
Contact Person : Kim, Sung-soo
Phone No. : +1 201 266 2215

1.3. Details of Manufacturer

Company : LG Electronics Inc.
Address : 10, Magokjungang 10-ro, Gangseo-gu, Seoul, Korea, 07796

1.4. Description of EUT

Kind of Product	Telematics
Model Name	TL1R22NR
Variant Model Name	TL1R22NE
Serial Number	352162110229030
Power Supply	DC 12.5 V
Rated Power	WCDMA Ⅱ, Ⅳ, Ⅴ: 24 ㏈m GSM850: 33 ㏈m GSM1900: 30 ㏈m
Frequency Range	WCDMA Ⅱ: 1 850 ㎒ ~ 1 910 ㎒ WCDMA Ⅳ: 1 710 ㎒ ~ 1 755 ㎒ WCDMA Ⅴ: 824 ㎒ ~ 849 ㎒ GSM 850: 824 ㎒ ~ 849 ㎒ GSM 1 900: 1 850 ㎒ ~ 1 910 ㎒
Modulation Technique	QPSK, 16QAM, GMSK, 8PSK
Antenna Type	External Antenna
Antenna Gain※	824 ㎒ ~ 849 ㎒: -0.6 ㏈i 1 710 ㎒ ~ 1 755 ㎒: 2.0 ㏈i 1 850 ㎒ ~ 1 915 ㎒: 2.8 ㏈i
H/W Version	Rev.D
S/W Version	v001.039.026

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMR40	100272	Jun. 16, 2022	Annual	Jun. 16, 2023
Signal Generator	R&S	SMBV100A	255834	May 25, 2022	Annual	May 25, 2023
Spectrum Analyzer	R&S	FSV30	103210	Dec. 07, 2022	Annual	Dec. 07, 2023
Mobile Test Unit	R&S	CMW 500	144034	Feb. 21, 2022	Annual	Feb. 22, 2023
Power Meter	Anritsu	ML2495A	1223004	Nov. 29, 2022	Annual	Nov. 29, 2023
Power Sensor	Anritsu	MA2411B	1207272	May 27, 2022	Annual	May 27, 2023
Temperature Chamber	ESPEC CORP.	SH-662	15004184	Jun. 02, 2022	Annual	Jun. 02, 2023
Low Pass Filter	Mini-Circuits	NLP-1200+	V 8979400903-2	Feb. 10, 2022	Annual	Feb. 10, 2023
High Pass Filter	Wainwright Instrument GmbH	WHKX10-900-1000-18000 -40SS	7	Mar. 04, 2022	Annual	Mar. 04, 2023
High Pass Filter	Wainwright Instrument GmbH	WHKX2.2/12.75G-10SS	8	Mar. 04, 2022	Annual	Mar. 04, 2023
High Pass Filter	Wainwright Instrument GmbH	WHKX3.0/18G-6SS	21	Jun. 09, 2022	Annual	Jun. 09, 2023
High Pass Filter	Wainwright Instrument GmbH	WHNX7.5/26.5G-6SS	11	Oct. 24, 2022	Annual	Oct. 24, 2023
BRIDGE COUPLER	MARKI MICROWAVE INC	CBR16-0012	1542	May 02, 2022	Annual	May 02, 2023
Directional Coupler	KRYTAR	152613	122109	Jul. 06, 2022	Annual	Jul. 06, 2023
DC Power Supply	Agilent	U8002A	MY49030063	Jan. 25, 2022	Annual	Jan. 25, 2023
Preamplifier	H.P.	8447F	2944A03909	Aug. 04, 2022	Annual	Aug. 04, 2023
Preamplifier	R&S	SCU 18	10117	Jun. 13, 2022	Annual	Jun. 13, 2023
Preamplifier	TESTEK	TK-PA1840H	130016	Jan. 10, 2022	Annual	Jan. 10, 2023
Test Receiver	R&S	ESU26	100368	Jan. 18, 2022	Annual	Jan. 18, 2023
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 23, 2021	Biennial	Aug. 23, 2023
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	01126	Feb. 07, 2022	Annual	Feb. 07, 2023
Horn Antenna	R&S	HF906	100326	Feb. 18, 2022	Annual	Feb. 18, 2023
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9170	9170-540	Nov. 30, 2022	Annual	Nov. 30, 2023
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 × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RFONE	MWX221-NMSNMS (4 m)	J1023142	Oct. 04, 2022	Semi-Annual	Apr. 04, 2023
Coaxial Cable	Qualwave Inc.	QA500-18-NN-10 (10 m)	22200114	Oct. 04, 2022	Semi-Annual	Apr. 04, 2023
Coaxial Cable	RADIALL	TESTPRO 3	182287	Aug. 18, 2022	Semi-Annual	Feb. 18, 2023
Coaxial Cable	RADIALL	TESTPRO 3	182288	Aug. 18, 2022	Semi-Annual	Feb. 18, 2023
Coaxial Cable	RADIALL	TESTPRO 3	182291	Aug. 18, 2022	Semi-Annual	Feb. 18, 2023

▶ **Support Equipment**

Description	Manufacturer	Model	Serial Number
N/A	-	-	-

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

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 2, 22, 24 and 27		
Section(s)	**Test Item**	**Result**
§2.1046 §22.913(a)(5) §24.232(c) §27.50(d)(4)	E.R.P. / E.I.R.P.	Complied
§2.1053 §22.917(a) §24.238(a) §27.53(h)(1)	Spurious Radiated Emission	Complied
§2.1046	Conducted Output Power	Complied
§2.1049	Occupied Bandwidth	Complied
§22.913(d) §24.232(d) §27.50(d)(5)	Peak-Average Ratio	Complied
§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 (㏈) = Directional Coupler (㏈) + Cable loss (㏈)

1.7.2. Radiation test

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

1.8. Worst Case Configuration and Mode

GSM
The worst-case is based on the average conducted output power measurement investigation results. Output power measurements were measured on GSM, GPRS, EDGE Mode. All testing was performed using GSM and EDGE mode, except frequency stability, spurious radiated emission spurious and emission at antenna terminal were tested only GSM mode as worst case.

WCDMA
WCDMA mode, Output power measurements were measured on RMC, HSDPA 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.

1.9. 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	-	-
	GSM 1900	V	V	V	V	-	-
Spurious Radiated Emission	GSM 850	V	V	V	V	-	-
	GSM 1900	V	V	V	V	-	-

1.10. Measurement Uncertainty

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

Parameter	Uncertainty	
RF Output Power	0.32 dB	
Occupied Bandwidth	3.90 ㎑	
Conducted Spurious Emissions	0.61 dB	
Peak to Average Ratio	0.60 dB	
Frequency Stability	5.97 ㎑	
Radiated Emission, 9 ㎑ to 30 ㎒	H	3.30 dB
	V	3.30 dB
Radiated Emission, below 1 ㎓	H	4.80 dB
	V	5.20 dB
Radiated Emission, above 1 ㎓	H	3.90 dB
	V	4.00 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-RTL003659	2022.12.26	Initial

1.12. Emission Designator and Max Power

WCDMA

Band	Modulation	Low Freq. (㎒)	Upper Freq. (㎒)	Conducted Power (㏈m)	Ant. Gain (㏈i)	E.R.P. / E.I.R.P. Average (㏈m)	E.R.P. / E.I.R.P. Average (W)	Emission Designator
WCDMA Ⅱ	RMC	1 852.4	1 907.6	22.77	2.8	25.57	0.361	4M12F9W
	HSDPA			21.85		24.65	0.292	4M14F9W
WCDMA Ⅳ	RMC	1 712.4	1 752.6	22.85	2.0	24.85	0.305	4M14F9W
	HSDPA			21.85		23.85	0.243	4M14F9W
WCDMA Ⅴ	RMC	826.4	846.6	23.11	-0.6	20.36	0.109	4M11F9W
	HSDPA			22.19		19.44	0.088	4M12F9W

GSM

Band	Modulation	Low Freq. (㎒)	Upper Freq. (㎒)	Conducted Power (㏈m)	Duty Cycle (%)	Ant. Gain (㏈i)	E.R.P. / E.I.R.P. Average (㏈m)	E.R.P. / E.I.R.P. Average (W)	Emission Designator
GSM 850	VOICE	824.2	848.8	32.61	25	-0.6	23.84	0.242	242KGXW
	EDGE			26.54			17.77	0.060	246KG7W
GSM 1900	VOICE	1 850.2	1 909.8	29.47	25	2.8	26.25	0.422	240KGXW
	EDGE			25.56			22.34	0.171	245KG7W

1.13. Information of Variant Model

Model Name		Description
Basic Model	TL1R22NR	Fully mounted module on hardware.
Variant Model	TL1R22NE	Band 21 duplexer, PA are removed.

- Supported Cellular Band

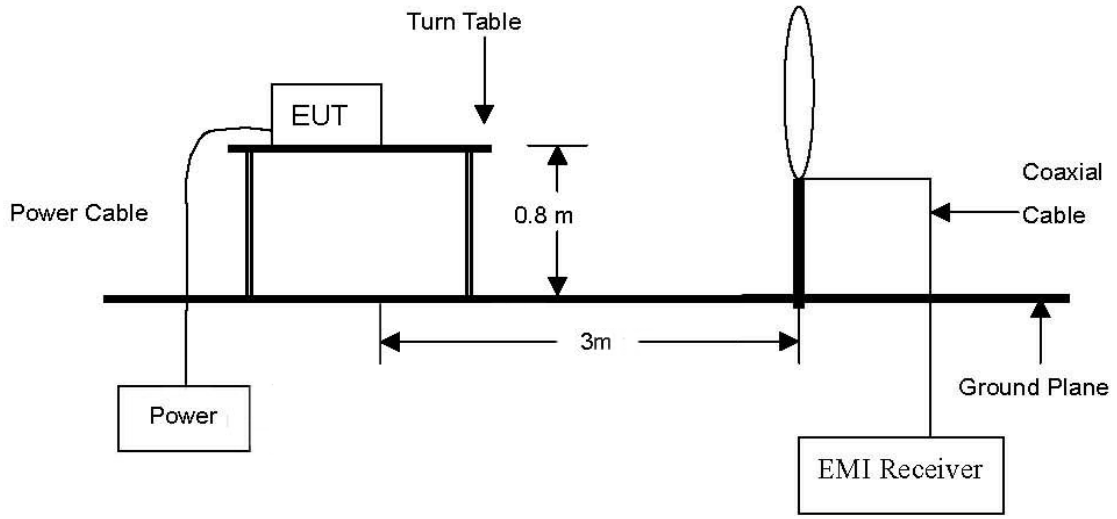
MODEL	GSM	WCDMA	LTE
TL1R22NR	GSM850, PCS1900	B2, B4, B5	B2, B4, B5, B7, B12, B17, B26, B41
TL1R22NE	N/A	B2, B4, B5	B2, B4, B5, B7, B12, B17

*Difference between two models does not affect bands that can be used in the US.

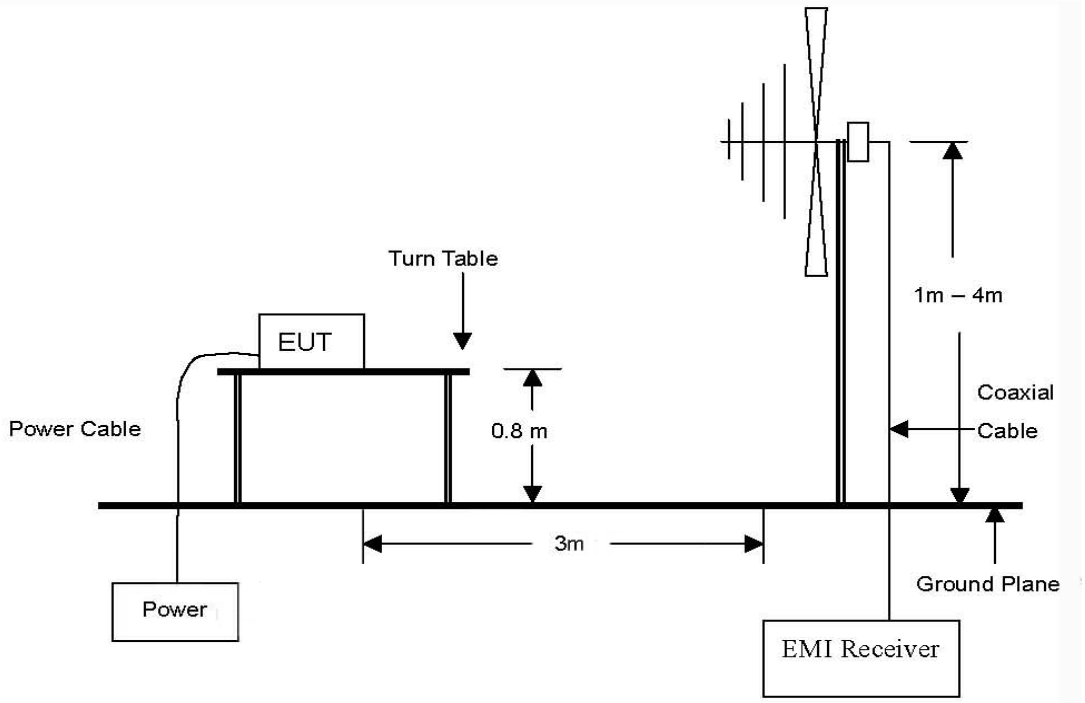
2. E.R.P / E.I.R.P. & Spurious Radiated Emission

2.1. Test setup

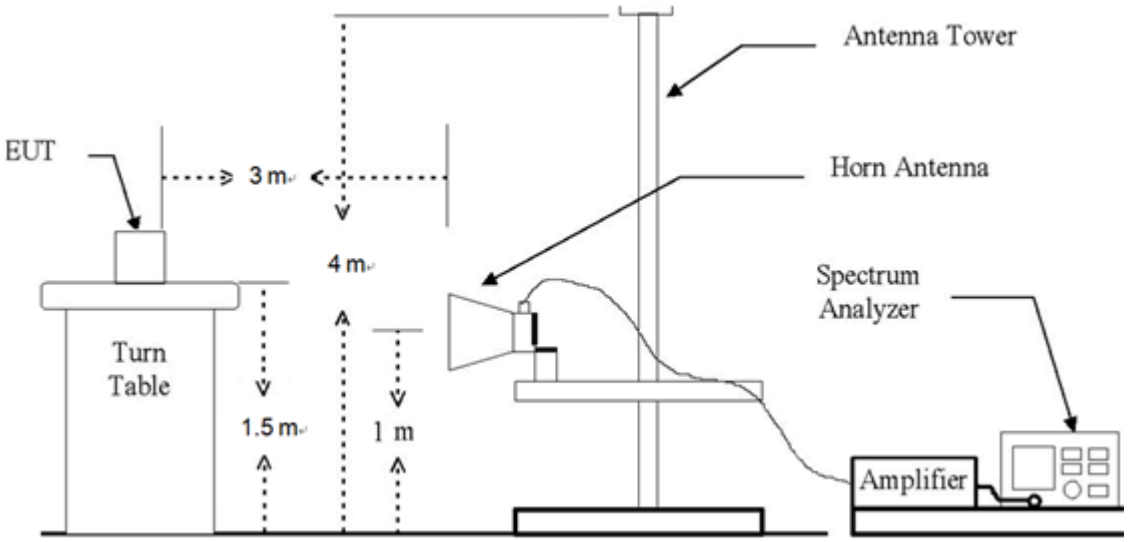
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒.



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



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to 20 ㎓ 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 ㎒ band and mobile and portable stations operating in the 1 695-1 710 ㎒ and 1 755-1 780 ㎒ bands are limited to 1 watt EIRP.

2.2.2. Limit of Spurious Radiated Emission

- §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) ㏈.

- §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) ㏈.

- §27.53(h)(1), for operations in the 1 695-1 710 ㎒, 1 710-1 755 ㎒, 1 755-1 780 ㎒, 1 915-1 920 ㎒, 1 995-2 000 ㎒, 2 000-2 020 ㎒, 2 110-2 155 ㎒, 2 155-2 180 ㎒, 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) ㏈.

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 ㎑ for emissions below 1 ㎓ and 1 ㎒ for emissions above 1 ㎓, VBW ≥ 3 x RBW,
   Detector = RMS, trace mode = max hold, per the guidelines of KDB 971168 D01 Power Meas License Digital Systems v03r01.
5. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
11. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
12. The measurement shall be repeated with the test antenna orientated for horizontal polarization.

2.4. Test results

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

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

WCDMA

Band	Frequency (㎒)	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	22.77	0.189	2.8	25.57	0.361			2 W E.I.R.P.
WCDMA Ⅳ	1 710 ~ 1 755	22.85	0.193	2	24.85	0.305			1 W E.I.R.P.
WCDMA Ⅴ	824 ~ 849	23.11	0.205	-0.6	22.51	0.178	20.36	0.109	7 W E.R.P.

GSM

Band	Frequency (㎒)	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	32.61	1.824	25.0	-0.6	25.99	0.397	23.84	0.242	7 W E.I.R.P.
GSM 1900	1 850 ~ 1 910	29.47	0.885	25.0	2.8	26.25	0.422			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. Spurious Radiated Emission

WCDMA Ⅱ

Frequency (㎒)	Measured Level (dB㎶)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB㎶/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 852.4 ㎒)									
9 255.85	45.74	H	37.21	-32.68	50.27	-95.26	-44.99	-13	31.99
9 257.85	50.38	V	37.22	-32.68	54.92	-95.26	-40.34	-13	27.34
12 974.30	40.64	V	39.00	-27.25	52.39	-95.26	-42.87	-13	29.87
14 826.60	39.45	H	41.05	-23.45	57.05	-95.26	-38.21	-13	25.21
14 827.50	40.89	V	41.05	-23.49	58.45	-95.26	-36.81	-13	23.81
Above 14 900.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 880.0 ㎒)									
9 398.25	40.27	H	37.59	-32.39	45.47	-95.26	-49.79	-13	36.79
9 405.00	46.61	V	37.61	-32.30	51.92	-95.26	-43.34	-13	30.34
13 152.30	43.62	V	39.20	-28.09	54.73	-95.26	-40.53	-13	27.53
15 032.60	44.47	H	40.63	-26.29	58.81	-95.26	**-36.45**	-13	23.45
15 032.90	39.79	V	40.63	-26.29	54.13	-95.26	-41.13	-13	28.13
Above 15 100.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 907.6 ㎒)									
9 533.75	40.15	H	37.70	-32.32	45.53	-95.26	-49.73	-13	36.73
9 542.90	49.99	V	37.70	-32.27	55.42	-95.26	-39.84	-13	26.84
13 360.30	43.31	V	39.74	-27.54	55.51	-95.26	-39.75	-13	26.75
15 269.20	35.89	H	40.16	-24.63	51.42	-95.26	-43.84	-13	30.84
15 252.40	39.12	V	40.20	-23.69	55.63	-95.26	-39.63	-13	26.63
Above 15 300.00	Not detected	-	-	-	-	-	-	-	-

WCDMA Ⅳ

Frequency (㎒)	Measured Level (dB㎶)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB㎶/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 712.4 ㎒)									
5 139.44	50.57	H	33.28	-35.47	48.38	-95.26	-46.88	-13	33.88
5 139.38	54.06	V	33.28	-35.47	51.87	-95.26	-43.39	-13	30.39
Above 5 200.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (1 732.6 ㎒)									
5 194.90	49.64	H	33.48	-35.20	47.92	-95.26	-47.34	-13	34.34
5 193.96	54.24	V	33.48	-35.20	52.52	-95.26	**-42.74**	-13	29.74
Above 5 200.00	Not detected	-	-	-	-	-	-	-	-
High Channel (1 752.6 ㎒)									
5 258.92	47.10	H	33.64	-35.04	45.70	-95.26	-49.56	-13	36.56
5 254.62	47.58	V	33.62	-35.07	46.13	-95.26	-49.13	-13	36.13
Above 5 300.00	Not detected	-	-	-	-	-	-	-	-

WCDMA Ⅴ

Frequency (㎒)	Measured Level (dB㎶)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB㎶/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (826.4 ㎒)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 ㎒)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (846.6 ㎒)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

GSM 850_VOICE

Frequency (㎒)	Measured Level (dB㎶)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dB㎶/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (824.2 ㎒)									
1 648.34	67.95	H	25.60	-38.67	54.88	-97.41	**-42.53**	-13	29.53
1 648.35	67.25	V	25.60	-38.67	54.18	-97.41	-43.23	-13	30.23
2 472.68	53.18	H	28.15	-36.80	44.53	-97.41	-52.88	-13	39.88
2 472.78	54.37	V	28.15	-36.80	45.72	-97.41	-51.69	-13	38.69
Above 2 500.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 ㎒)									
1 673.14	63.39	H	25.88	-38.66	50.61	-97.41	-46.80	-13	33.80
1 673.11	65.87	V	25.88	-38.66	53.09	-97.41	-44.32	-13	31.32
2 509.63	57.65	H	28.16	-37.07	48.74	-97.41	-48.67	-13	35.67
2 509.70	58.84	V	28.16	-37.07	49.93	-97.41	-47.48	-13	34.48
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-
High Channel (848.8 ㎒)									
1 697.39	59.31	H	26.17	-38.77	46.71	-97.41	-50.70	-13	37.70
1 697.61	67.47	V	26.17	-38.77	54.87	-97.41	-42.54	-13	29.54
2 546.59	56.68	H	28.38	-36.57	48.49	-97.41	-48.92	-13	35.92
2 546.10	56.31	V	28.38	-36.57	48.12	-97.41	-49.29	-13	36.29
Above 2 600.00	Not detected	-	-	-	-	-	-	-	-

GSM 1900_VOICE

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

Remark;

1. AF = Antenna Factor, CL = Cable Loss, CF = Conversion Factor.
2. E (dBμV/m) = Measured Level (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) + AMP (dB).
3. E.I.R.P. (dB m) = E (dBμV/m) + CF (dB).
4. E.R.P. (dB m) = E (dBμV/m) + CF (dB) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.
5. CF (dB) = 20 log D - 104.8; where D is the measurement distance in meters, According to ANSI C63.26-2015 5.2.7 and KDB 971168 D01 v03r01 5.8.4
6. The frequency spectrum is examined from 9 ㎑ 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

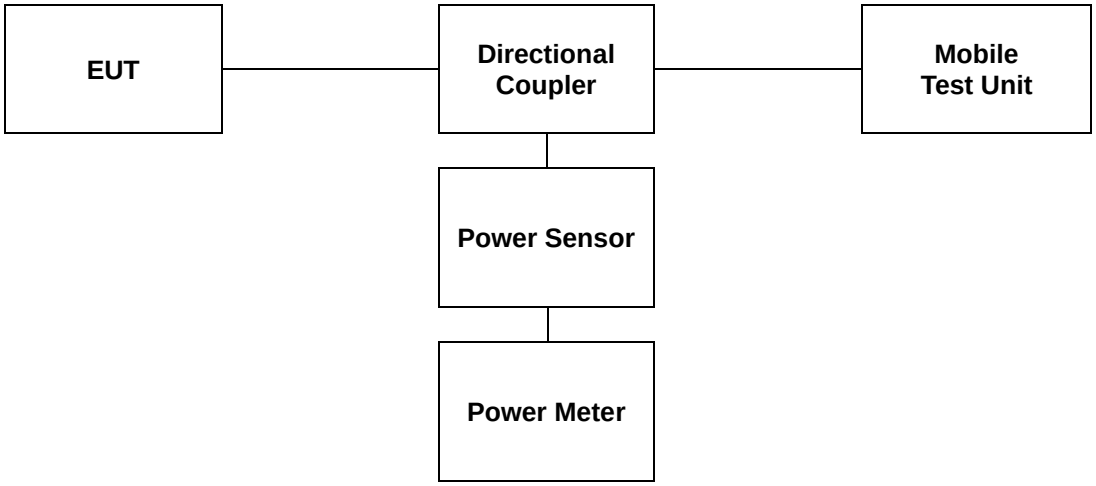
3.1. Limit

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) ℃
Relative humidity : 47 % R.H.

WCDMA Ⅱ							
Mode	3GPP 34.121 Subtest	Conducted Output Power					
		9262 (1 852.4 ㎒)		9400 (1 880.0 ㎒)		9538 (1 907.6 ㎒)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
Release 99	12.2 Kbps RMC	22.71	0.187	**22.77**	**0.189**	22.74	0.188
HSDPA	Subtest 1	21.75	0.150	21.82	0.152	21.80	0.151
	Subtest 2	21.79	0.151	21.81	0.152	**21.85**	**0.153**
	Subtest 3	21.72	0.149	21.81	0.152	21.85	0.153
	Subtest 4	21.70	0.148	21.77	0.150	21.72	0.149
HSUPA	Subtest 1	21.75	0.150	21.71	0.148	21.70	0.148
	Subtest 2	19.71	0.094	19.70	0.093	19.81	0.096
	Subtest 3	20.80	0.120	20.80	0.120	20.80	0.120
	Subtest 4	19.77	0.095	19.75	0.094	19.80	0.095
	Subtest 5	21.77	0.150	21.71	0.148	21.81	0.152
DC-HSDPA	Subtest 1	21.84	0.153	21.78	0.151	21.82	0.152
	Subtest 2	21.78	0.151	21.77	0.150	21.85	0.153
	Subtest 3	21.79	0.151	21.71	0.148	21.77	0.150
	Subtest 4	21.76	0.150	21.79	0.151	21.76	0.150
HSPA+		19.80	0.095	19.76	0.095	19.71	0.094

WCDMA Ⅳ							
Mode	3GPP 34.121 Subtest	Conducted Output Power					
		1312 (1 712.4 ㎒)		1413 (1 732.6 ㎒)		1513 (1 752.6 ㎒)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
Release 99	12.2 Kbps RMC	22.72	0.187	**22.85**	**0.193**	22.70	0.186
HSDPA	Subtest 1	21.83	0.152	21.79	0.151	21.85	0.153
	Subtest 2	21.75	0.150	**21.85**	**0.153**	21.73	0.149
	Subtest 3	21.76	0.150	21.71	0.148	21.75	0.150
	Subtest 4	21.78	0.151	21.81	0.152	21.81	0.152
HSUPA	Subtest 1	21.72	0.149	21.73	0.149	21.70	0.148
	Subtest 2	19.76	0.095	19.71	0.094	19.77	0.095
	Subtest 3	20.78	0.120	20.76	0.119	20.80	0.120
	Subtest 4	19.85	0.097	19.70	0.093	19.77	0.095
	Subtest 5	21.84	0.153	21.76	0.150	21.73	0.149
DC-HSDPA	Subtest 1	21.82	0.152	21.85	0.153	21.80	0.151
	Subtest 2	21.80	0.151	21.72	0.149	21.78	0.151
	Subtest 3	21.80	0.151	21.72	0.149	21.82	0.152
	Subtest 4	21.79	0.151	21.74	0.149	21.72	0.149
HSPA+		19.78	0.095	19.73	0.094	19.73	0.094

WCDMA Ⅴ							
Mode	3GPP 34.121 Subtest	Conducted Output Power					
		4132 (826.4 ㎒)		4183 (836.6 ㎒)		4233 (846.6 ㎒)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
Release 99	12.2 Kbps RMC	**23.11**	**0.205**	23.00	0.200	23.02	0.200
HSDPA	Subtest 1	**22.19**	**0.166**	21.96	0.157	22.04	0.160
	Subtest 2	21.91	0.155	21.99	0.158	22.09	0.162
	Subtest 3	22.04	0.160	22.05	0.160	21.90	0.155
	Subtest 4	21.94	0.156	22.16	0.164	22.09	0.162
HSUPA	Subtest 1	21.90	0.155	22.14	0.164	21.98	0.158
	Subtest 2	20.01	0.100	20.12	0.103	20.18	0.104
	Subtest 3	20.97	0.125	21.06	0.128	21.14	0.130
	Subtest 4	19.93	0.098	20.20	0.105	20.06	0.101
	Subtest 5	22.09	0.162	22.13	0.163	22.17	0.165
DC-HSDPA	Subtest 1	21.98	0.158	22.07	0.161	22.15	0.164
	Subtest 2	21.95	0.157	22.16	0.164	22.19	0.166
	Subtest 3	21.90	0.155	22.12	0.163	22.00	0.158
	Subtest 4	22.02	0.159	22.11	0.163	21.91	0.155
HSPA+		20.16	0.104	20.18	0.104	19.91	0.098

GSM 850							
Mode		Conducted Output Power					
		128 (824.2 ㎒)		190 (836.6 ㎒)		251 (848.8 ㎒)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
VOICE		**32.61**	**1.824**	32.57	1.807	32.54	1.795
GPRS	1 Tx slot	32.45	1.758	32.55	1.799	32.51	1.782
	2 Tx slot	32.42	1.746	32.56	1.803	32.52	1.786
EGPRS	1 Tx slot	**26.54**	**0.451**	26.51	0.448	26.52	0.449
	2 Tx slot	25.49	0.354	26.47	0.444	26.49	0.446

GSM 1900							
Mode		Conducted Output Power					
		512 (1 850.2 ㎒)		661 (1 880.0 ㎒)		810 (1 909.8 ㎒)	
		(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
VOICE		29.34	0.859	**29.47**	**0.885**	29.44	0.879
GPRS	1 Tx slot	29.33	0.857	29.40	0.871	29.35	0.861
	2 Tx slot	29.31	0.853	29.45	0.881	29.42	0.875
EGPRS	1 Tx slot	**25.56**	**0.360**	25.54	0.358	25.38	0.345
	2 Tx slot	25.55	0.359	25.51	0.356	25.41	0.348

4. Occupied Bandwidth

4.1. Limit

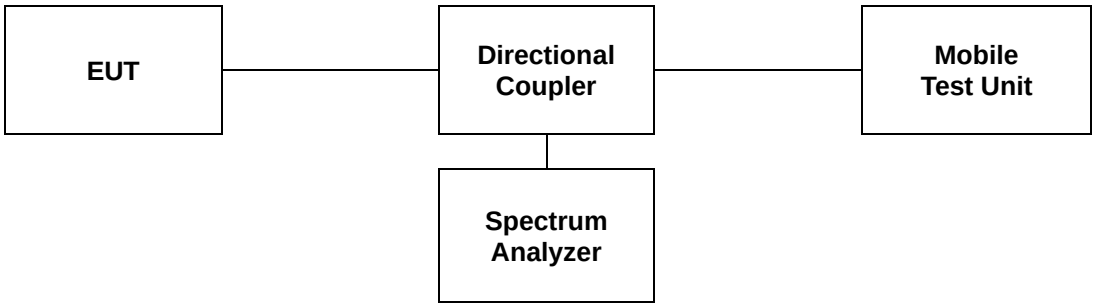
CFR 47, Section FCC §2.1049.

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 × 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 ≥ 3 × 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).

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

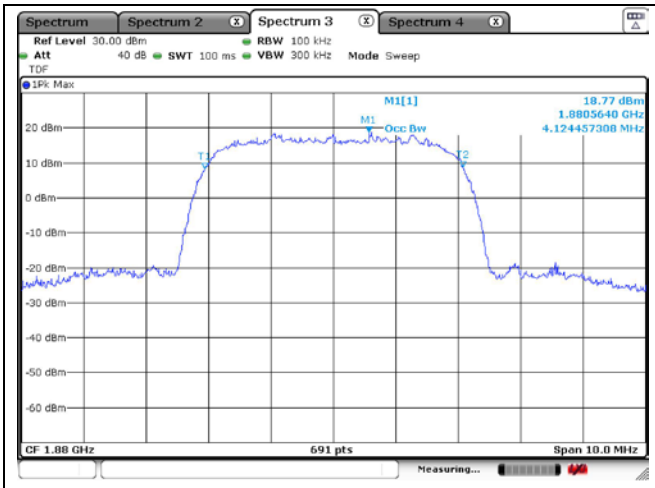
Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Band	Mode	Frequency (㎒)	Occupied Bandwidth (㎒)
WCDMA Ⅱ	RMC	1 880.0	4.124
	HSDPA		4.139
WCDMA Ⅳ	RMC	1 732.6	4.139
	HSDPA		4.139
WCDMA Ⅴ	RMC	836.6	4.110
	HSDPA		4.124

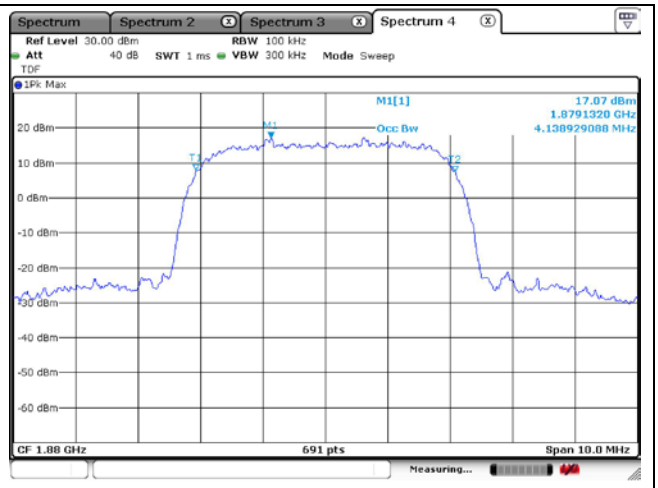
Band	Mode	Frequency (㎒)	Occupied Bandwidth (㎒)
GSM 850	VOICE	836.6	0.242
	EDGE		0.246
GSM 1900	VOICE	1 880.0	0.240
	EDGE		0.245

- Test plots

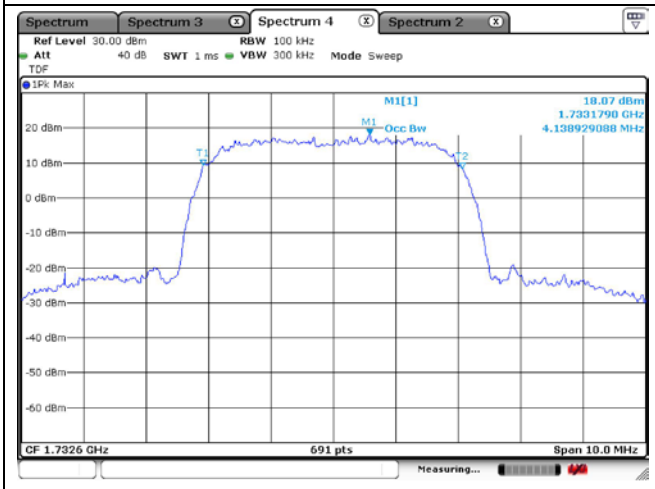
WCDMA



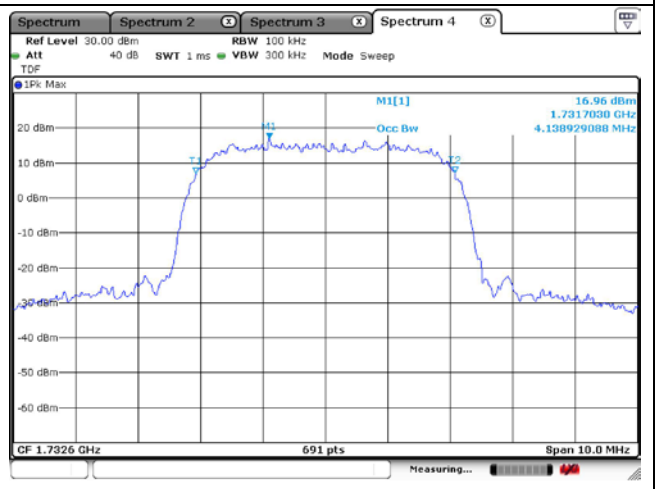
WCDMA Ⅱ RMC Middle Channel



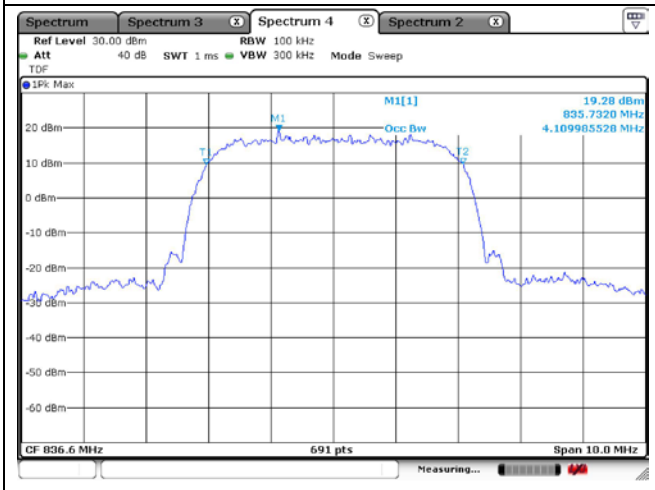
WCDMA Ⅱ HSDPA Middle Channel



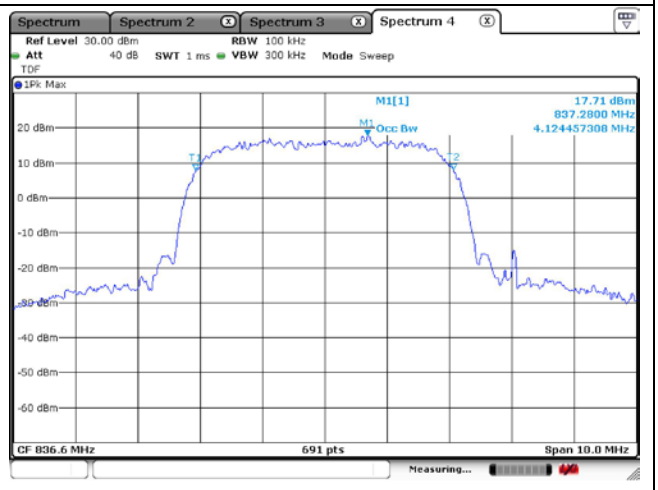
WCDMA Ⅳ RMC Middle Channel



WCDMA Ⅳ HSDPA Middle Channel

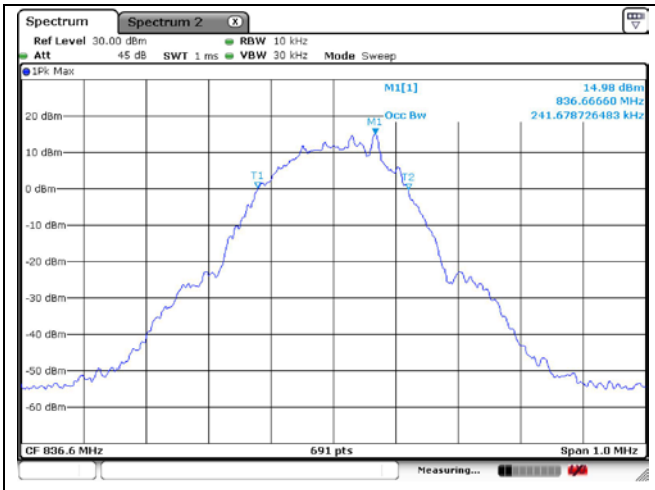


WCDMA Ⅴ RMC Middle Channel

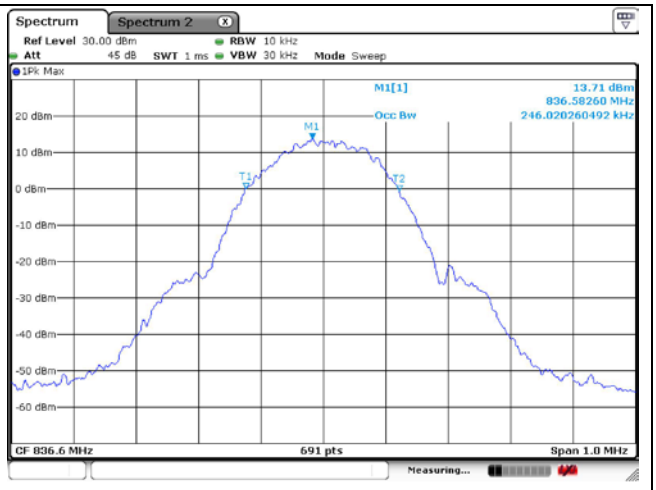


WCDMA Ⅴ HSDPA Middle Channel

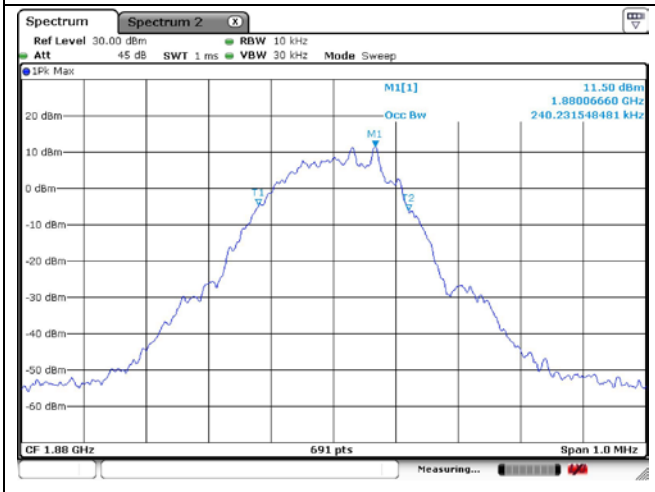
GSM



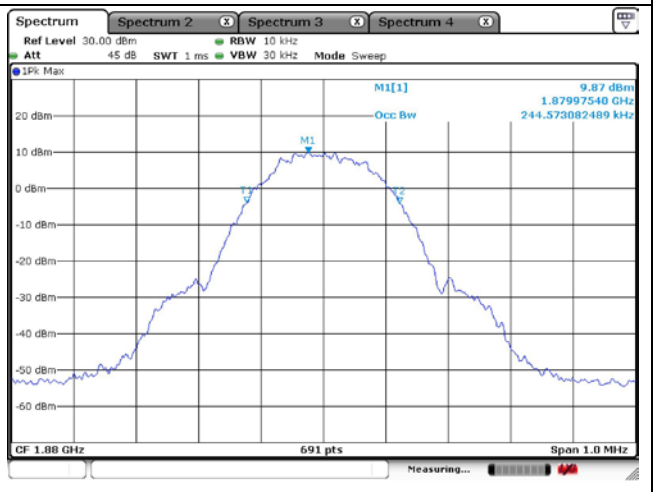
GSM 850 VOICE Middle Channel



GSM 850 EDGE Middle Channel



GSM 1900 VOICE Middle Channel



GSM 1900 EDGE Middle Channel

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 ㏈.

- §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 ㏈.

- §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 ㏈.

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 ≥ 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:

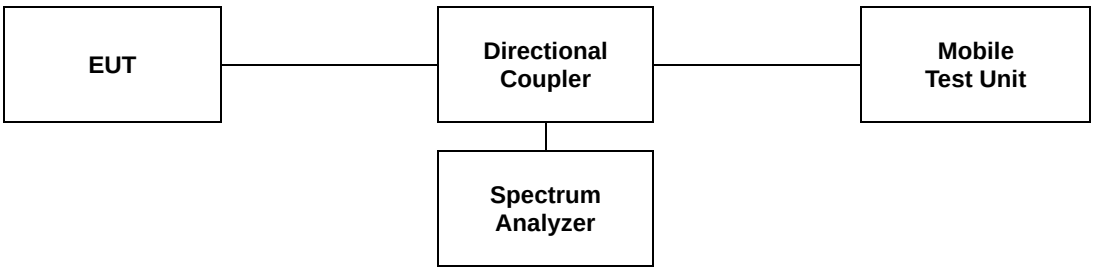
1) For continuous transmissions, set to greater of [10 x (number of points in sweep) x (transmission symbol period)] or 1 ㎳.

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 form the sum of the PAPR value from step d) to the measured average power.



5.3 Test Results

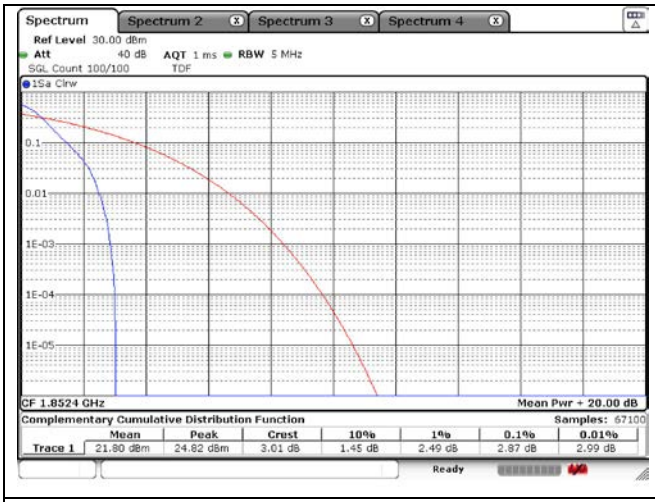
Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Band	Mode	Frequency (㎒)	PAR (㏈)
WCDMA Ⅱ	RMC	1 852.4	2.87
		1 880.0	2.96
		1 907.6	2.99
	HSDPA	1 852.4	3.10
		1 880.0	3.13
		1 907.6	3.07
WCDMA Ⅳ	RMC	1 712.4	2.93
		1 732.6	2.87
		1 752.6	3.04
	HSDPA	1 712.4	3.16
		1 732.6	2.96
		1 752.6	3.16
WCDMA Ⅴ	RMC	826.4	3.22
		836.6	3.28
		846.6	3.07
	HSDPA	826.4	3.45
		836.6	3.42
		846.6	3.33

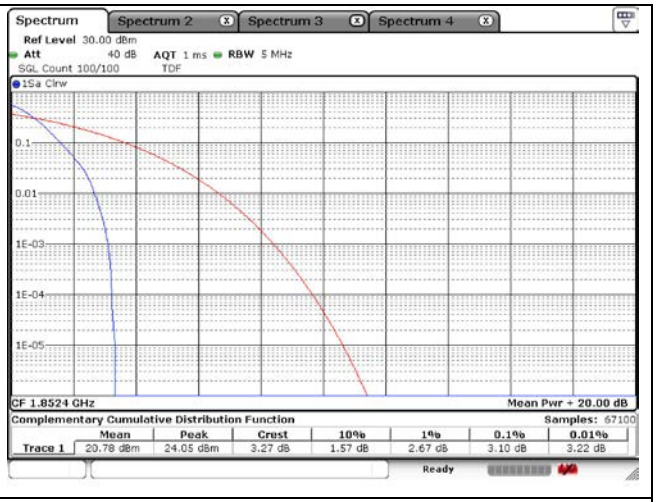
Band	Mode	Frequency (㎒)	PAR (㏈)
GSM 850	VOICE	824.2	3.04
		836.6	3.04
		848.8	3.04
	EDGE	824.2	3.04
		836.6	3.04
		848.8	3.01
GSM 1900	VOICE	1 850.2	3.04
		1 880.0	3.01
		1 909.8	3.22
	EDGE	1 850.2	2.99
		1 880.0	3.04
		1 909.8	3.30

- Test plots

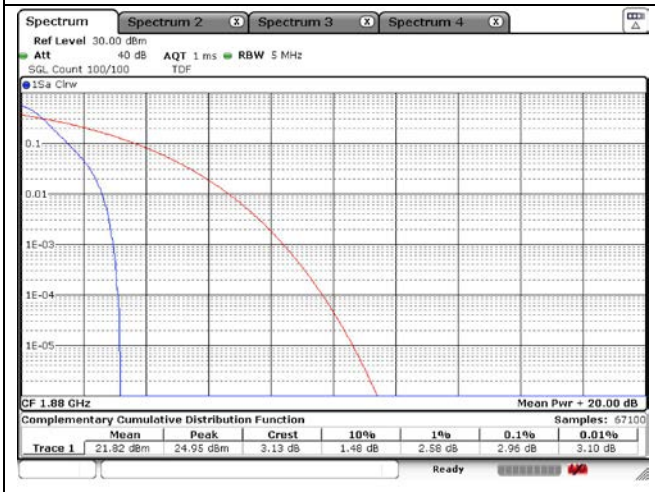
WCDMA Ⅱ



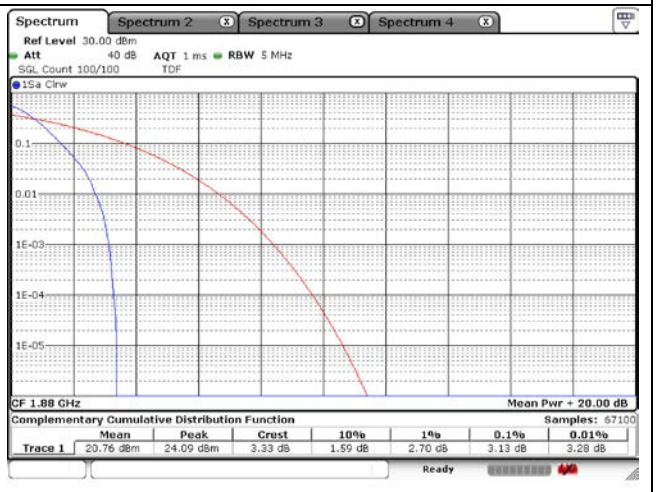
WCDMA Ⅱ RMC Low Channel



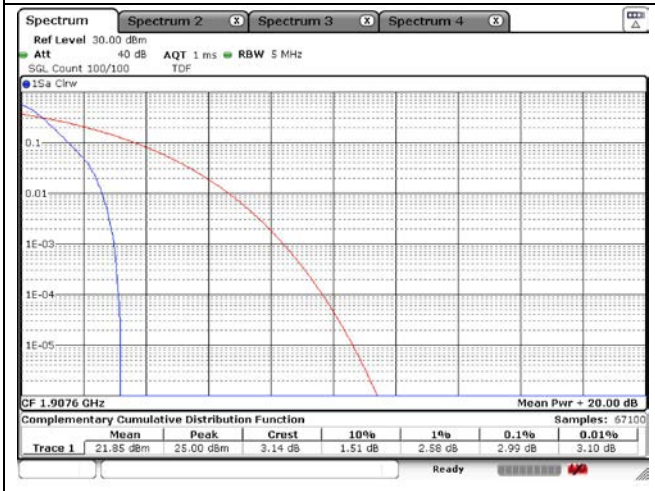
WCDMA Ⅱ HSDPA Low Channel



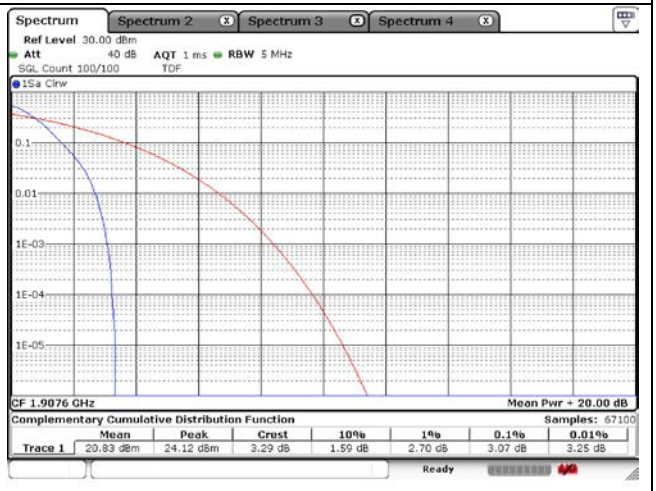
WCDMA Ⅱ RMC Middle Channel



WCDMA Ⅱ HSDPA Middle Channel

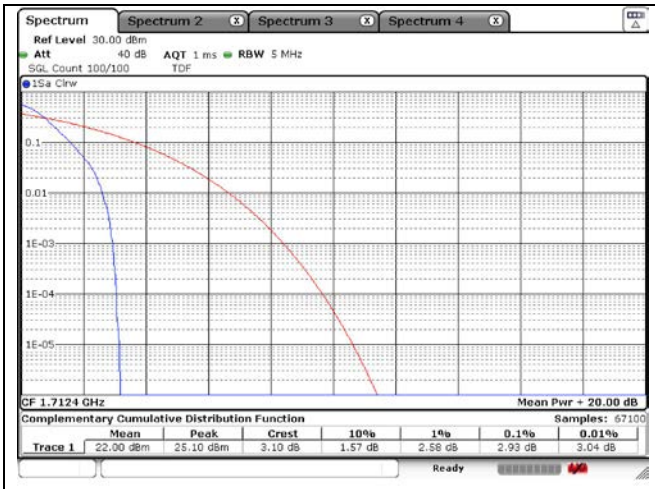


WCDMA Ⅱ RMC High Channel

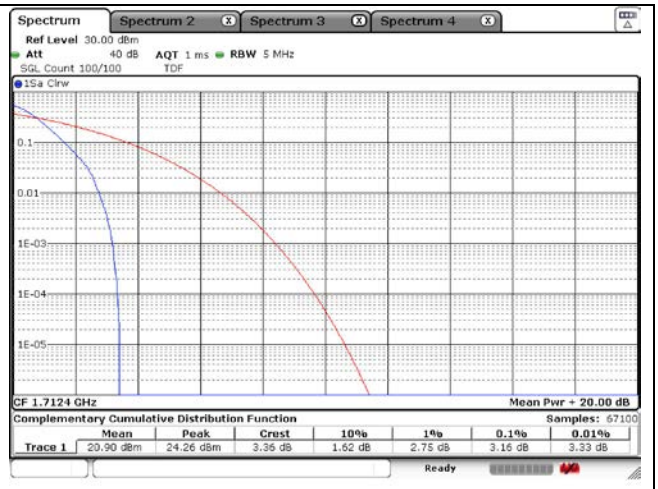


WCDMA Ⅱ HSDPA High Channel

WCDMA Ⅳ



WCDMA Ⅳ RMC Low Channel



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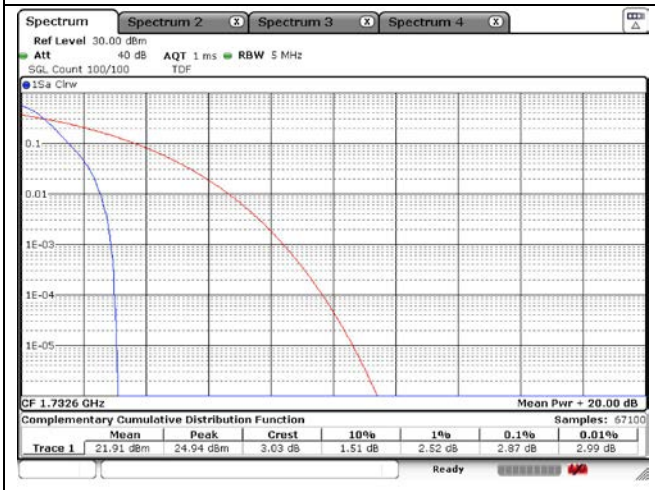

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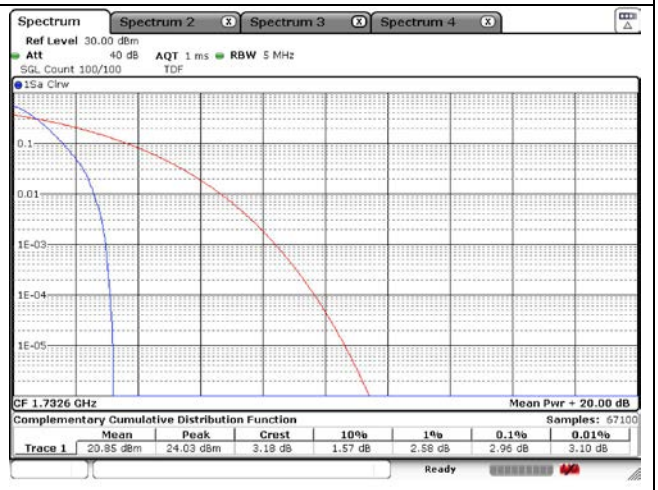

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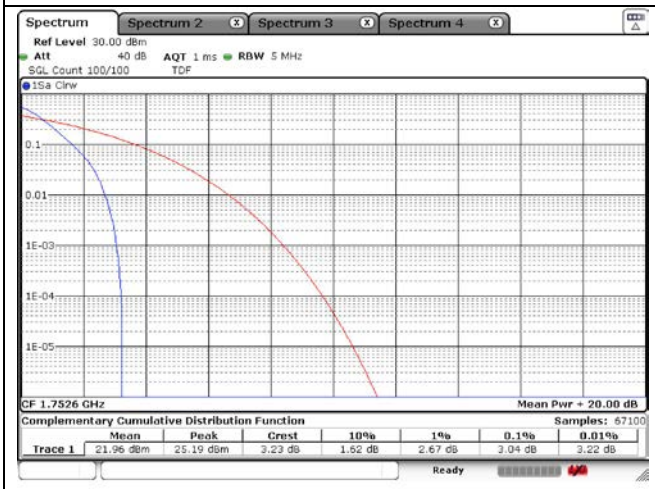
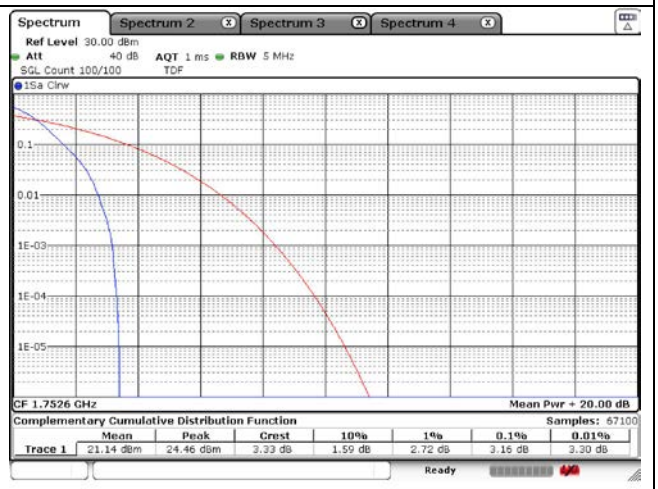
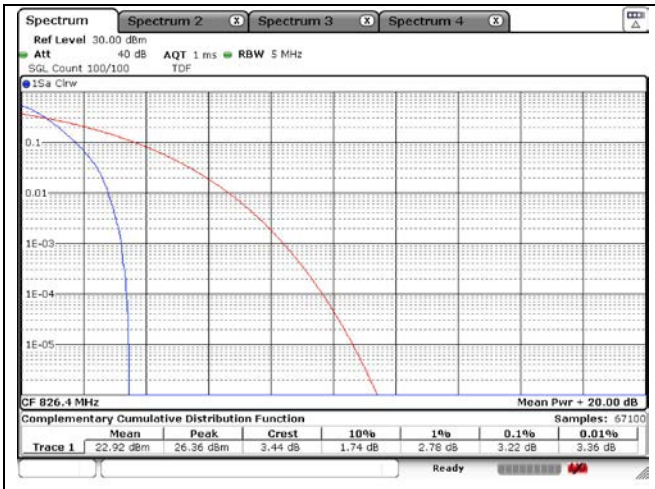


WCDMA Ⅳ RMC High Channel



WCDMA Ⅳ HSDPA High Channel

WCDMA Ⅴ



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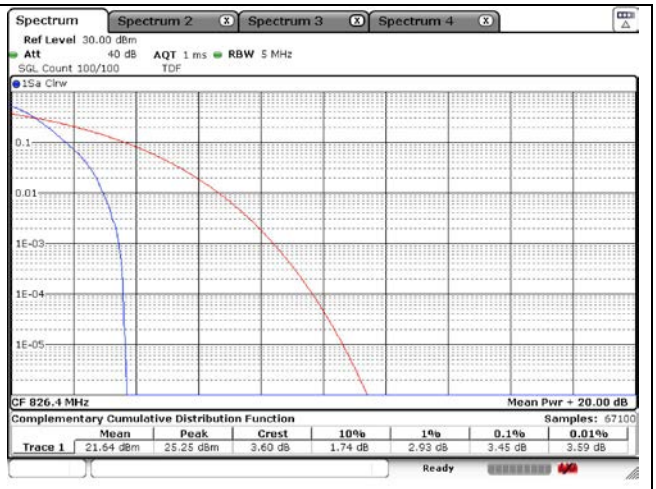

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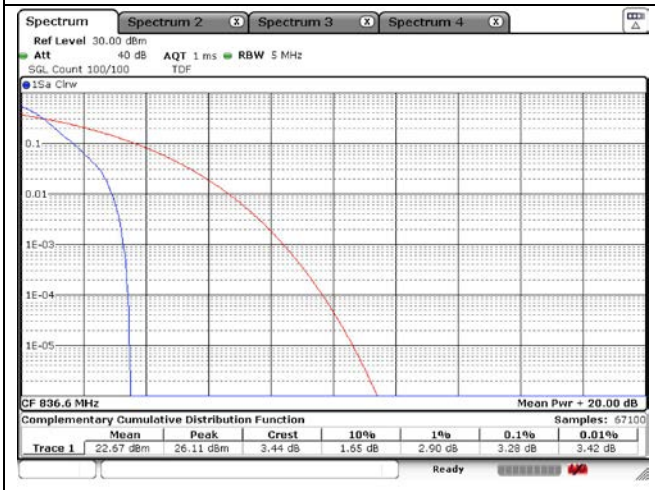
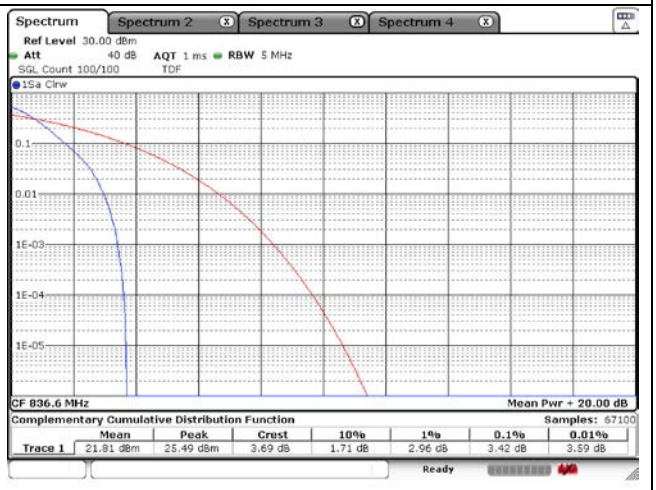
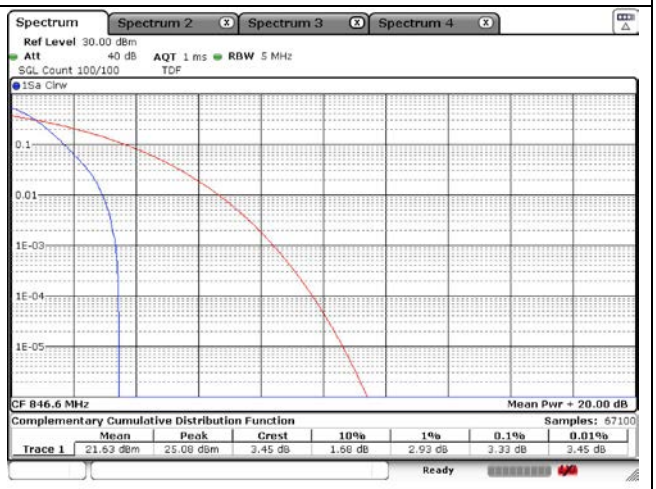


WCDMA Ⅴ RMC Middle Channel



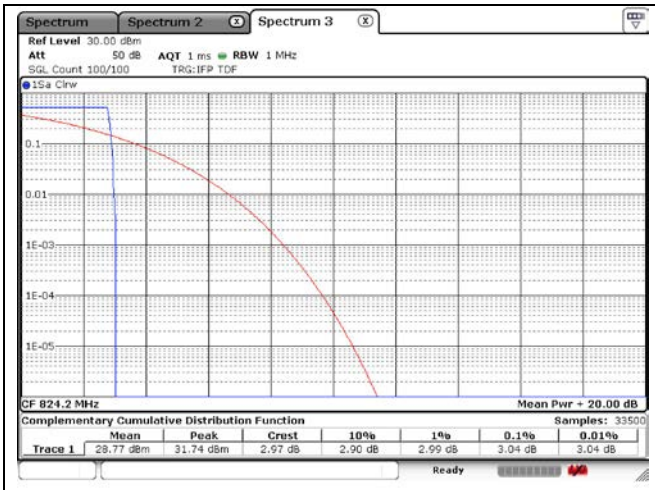
WCDMA Ⅴ HSDPA Middle Channel

WCDMA Ⅴ RMC High Channel

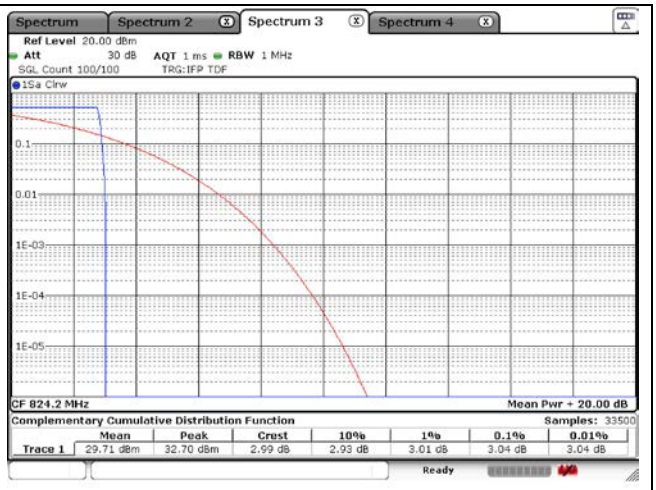


WCDMA Ⅴ HSDPA High Channel

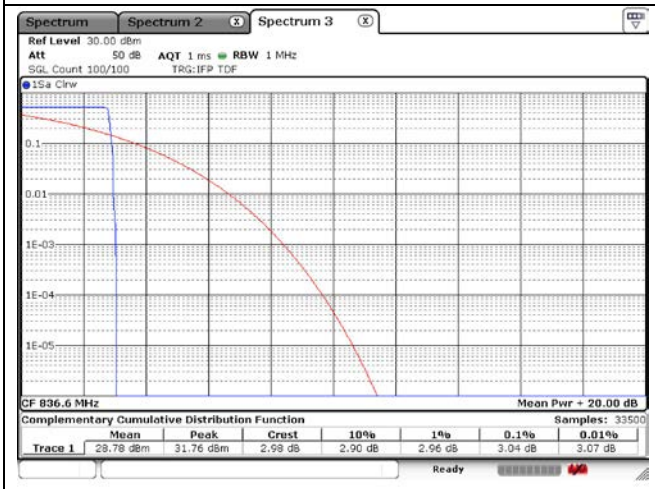
GSM 850



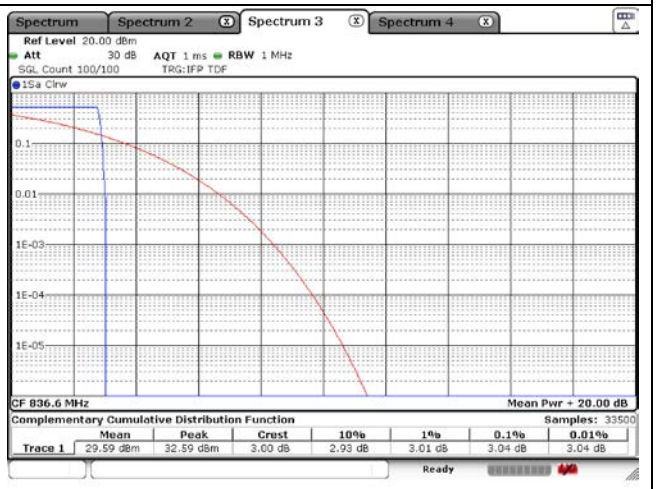
GSM 850 VOICE Low Channel



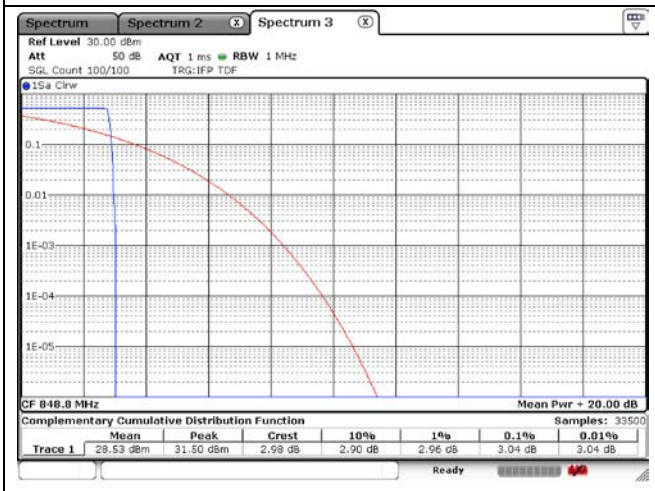
GSM 850 EDGE Low Channel



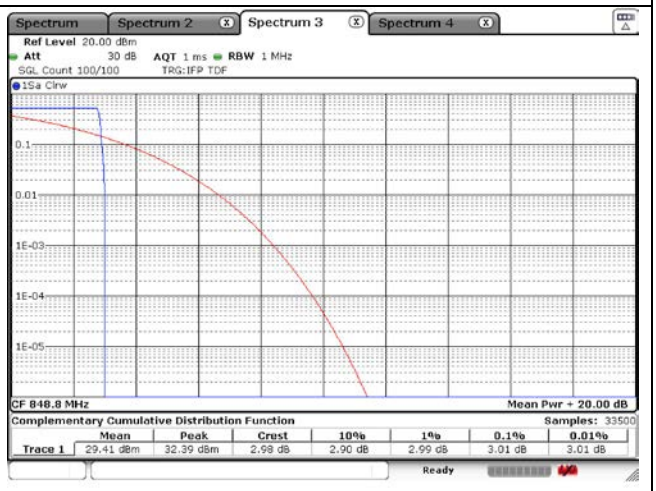
GSM 850 VOICE Middle Channel



GSM 850 EDGE Middle Channel

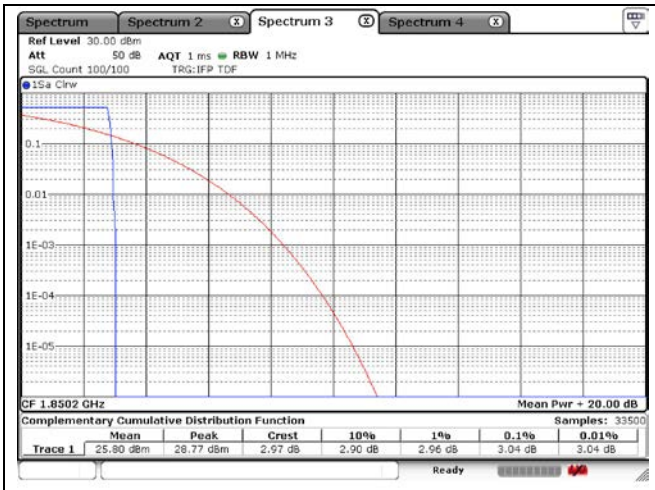


GSM 850 VOICE High Channel

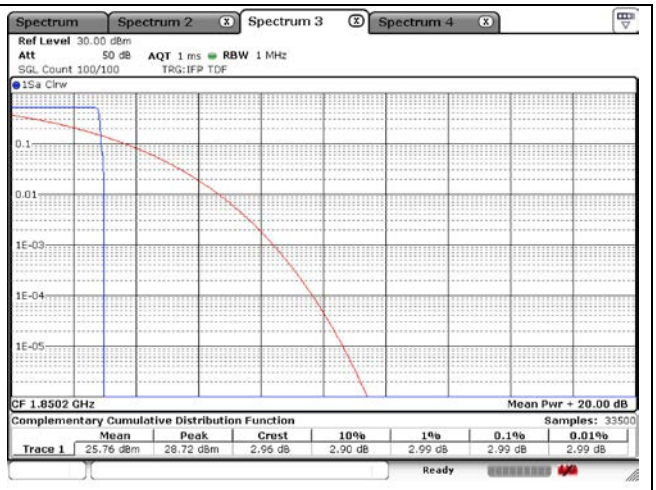


GSM 850 EDGE High Channel

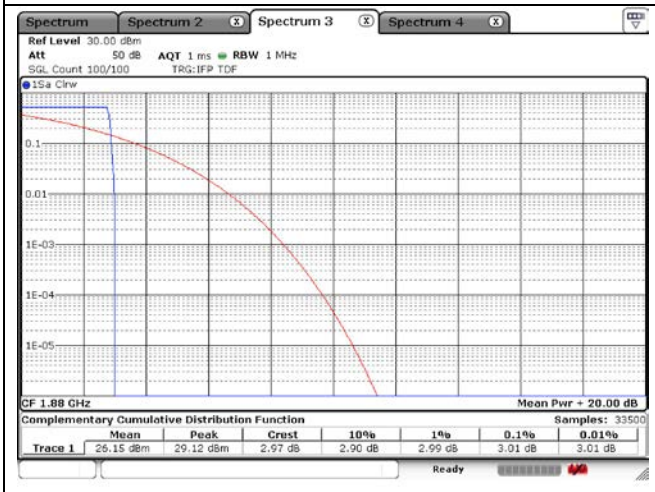
GSM 1900



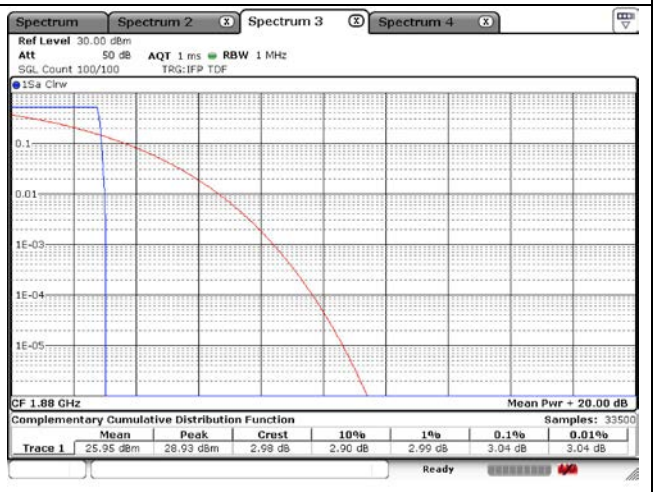
GSM 1900 VOICE Low Channel



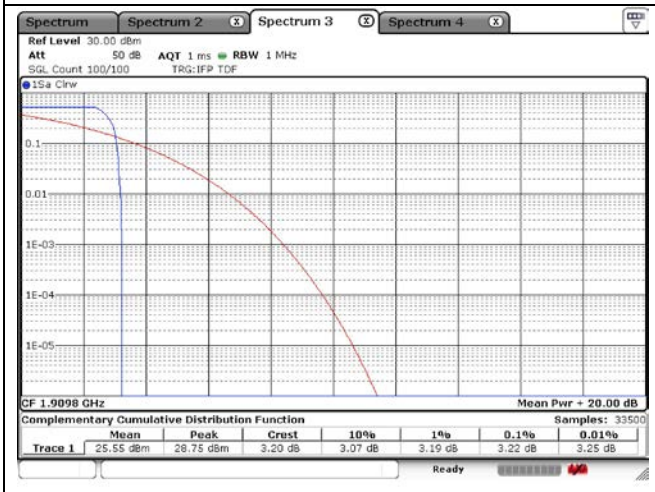
GSM 1900 EDGE Low Channel



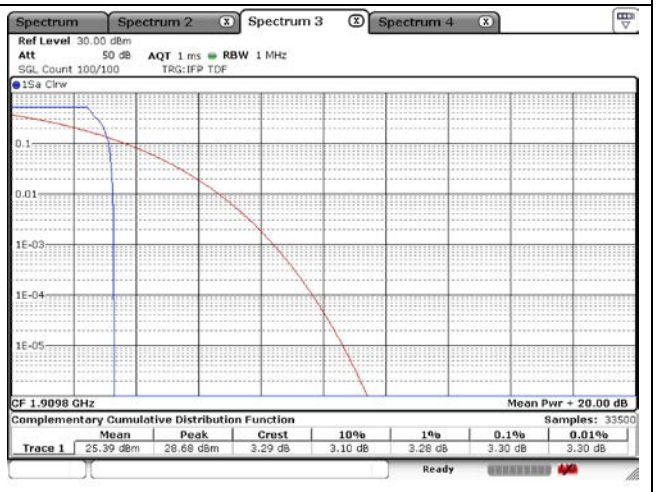
GSM 1900 VOICE Middle Channel



GSM 1900 EDGE Middle Channel



GSM 1900 VOICE High Channel



GSM 1900 EDGE High Channel