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TEST REPORT

of

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

FCC ID: BEJ-TM04ANNABM0
IC Certification: 2703H-TM04ANNABM0

1. Equipment Under Test	:	Telematics Module
2. Model Name	:	TM04ANNABM0
3. Variant Model Name(s)	:	-
4. FCC Applicant	:	LG Electronics USA
5. IC Applicant	:	LG ELECTRONICS INC.
6. Manufacturer	:	LG Electronics Inc.
7. Date of Receipt	:	2019.12.10
8. Date of Test(s)	:	2020.01.13 ~ 2020.06.19
9. Date of Issue	:	2020.07.03

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.

Tested by: **Nancy Park**

Technical Manager: **Jungmin Yang**

SGS Korea Co., Ltd. Gunpo Laboratory

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.

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1.2. Details of Applicant

FCC Applicant : LG Electronics USA
FCC Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632
IC Applicant : LG ELECTRONICS INC.
IC Address : 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyenggi-do, Korea (Republic of), 451-713
Contact Person : Han, Kyung-su
Phone No. : +1 201 472 2623

1.3. Details of Manufacturer

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

1.4. Description of EUT

Kind of Product	Telematics Module
Model Name	TM04ANNABM0
Model Serial Number	001, 002
Power Supply	DC 12.5 V
Rated Power	GSM 850: 33 ㎧ m GSM 1 900: 30 ㎧ m
Frequency Range	GSM 850: 824 ㎒ ~ 849 ㎒ GSM 1 900: 1 850 ㎒ ~ 1 910 ㎒
Emission Designator	GSM 850: 241KGXW (Voice) / 246KG7W (EDGE) GSM 1900: 241KGXW (Voice) / 245KG7W (EDGE)
Modulation Technique	GMSK, 8PSK
Antenna Type	Shark antenna
Antenna gain	824 ㎒ ~ 849 ㎒: -1.9 ㎧ i 1 850 ㎒ ~ 1 910 ㎒: 2.0 ㎧ i
H/W Version	Rev.C3
S/W Version	WN22XA28

1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	Agilent	E8257D	MY51501169	Jul. 03, 2019	Annual	Jul. 03, 2020
Spectrum Analyzer	R&S	FSV30	103210	Dec. 05, 2019	Annual	Dec. 05, 2020
Spectrum Analyzer	Agilent	N9030A	US51350132	Sep. 11, 2019	Annual	Sep. 11, 2020
Mobile Test Unit	R&S	CMW500	144034	Feb. 28, 2020	Annual	Feb. 28, 2021
Power Meter	Anritsu	ML2495A	1223004	Jun. 01, 2020	Annual	Jun. 01, 2021
Power Sensor	Anritsu	MA2411B	1207272	Jun. 01, 2020	Annual	Jun. 01, 2021
Temperature Chamber	ESPEC CORP.	PL-1J	15000796	Sep. 18, 2019	Annual	Sep. 18, 2020
High Pass Filter	Wainwright Instrument GmbH	WHKX10-900-1000-18000-40SS	7	Mar. 04, 2020	Annual	Mar. 04, 2021
High Pass Filter	Wainwright Instrument GmbH	WHKX2.2/12.75G-10SS	8	Mar. 04, 2020	Annual	Mar. 04, 2021
High Pass Filter	Wainwright Instrument GmbH	WHK7.5/26.5G-6SS	15	Jun. 05, 2020	Annual	Jun. 05, 2021
Directional Coupler	KRYTAR	152613	122660	Jun. 11, 2020	Annual	Jun. 11, 2021
DC Power Supply	Agilent	U8002A	MY50060028	Mar. 03, 2020	Annual	Mar. 03, 2021
Preamplifier	H.P.	8447F	2944A03909	Aug. 07, 2019	Annual	Aug. 07, 2020
Preamplifier	R&S	SCU 18	10117	Jun. 10, 2020	Annual	Jun. 10, 2021
Preamplifier	TESTEK	TK-PA1840H	130016	Jan. 06, 2020	Annual	Jan. 06, 2021
Test Receiver	R&S	ESU26	100109	Feb. 18, 2020	Annual	Feb. 18, 2021
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 22, 2019	Biennial	Aug. 22, 2021
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	396	Mar. 21, 2019	Biennial	Mar. 21, 2021
Horn Antenna	R&S	HF906	100326	Feb. 14, 2020	Annual	Feb. 14, 2021
Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA9170	9170-540	Jul. 24, 2019	Biennial	Jul. 24, 2021
Antenna Master	Innco systems GmbH	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	Innco systems GmbH	DS 1200S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/383 30516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.4 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RFONE	PL520-NMNM-4M (4 m)	20200324001	May 06, 2020	Semi-annual	Nov. 06, 2020
Coaxial Cable	RFONE	PL520-NMNM-10M (10 m)	20200324001	May 06, 2020	Semi-annual	Nov. 06, 2020
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 01/20	Feb. 13, 2020	Semi-annual	Aug. 13, 2020
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 05/20	Feb. 13, 2020	Semi-annual	Aug. 13, 2020
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 10/20	Feb. 13, 2020	Semi-annual	Aug. 13, 2020

▶ 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 and 24 / IC part RSS-132 Issue 3, RSS-133 Issue 6 and RSS-Gen Issue 5			
Section in FCC	**Section in IC**	**Test Item**	**Result**
§2.1046 §22.913(a)(5) §24.232(c)	RSS-132 Issue 3 5.4 RSS-133 Issue 6 6.4	RF Radiated Output Power	Complied
§2.1053 §22.917(a) §24.238(a)	RSS-132 Issue 3 5.5 RSS-133 Issue 6 6.5	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)	RSS-132 Issue 3 5.4 RSS-133 Issue 6 6.4	Peak-Average Ratio	Complied
§2.1051 §22.917(a) §24.238(a)	RSS-132 Issue 3 5.5 RSS-133 Issue 6 6.5	Spurious Emission at Antenna Terminal	Complied
§22.917(a) §24.238(a)	RSS-132 Issue 3 5.5 RSS-133 Issue 6 6.5	Band Edge	Complied
§2.1055 §22.355 §24.235	RSS-Gen Issue 5 6.11 RSS-132 Issue 3 5.3 RSS-133 Issue 6 6.3	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 (dBμV) + Antenna factor (dB) + 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. Measurement Uncertainty

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

Parameter	Uncertainty
Radiated Emission, 9 ㎑ to 30 ㎒	± 3.59 ㏈
Radiated Emission, below 1 ㎓	± 5.88 ㏈
Radiated Emission, above 1 ㎓	± 5.94 ㏈

Uncertainty figures are valid to a confidence level of 95 %.

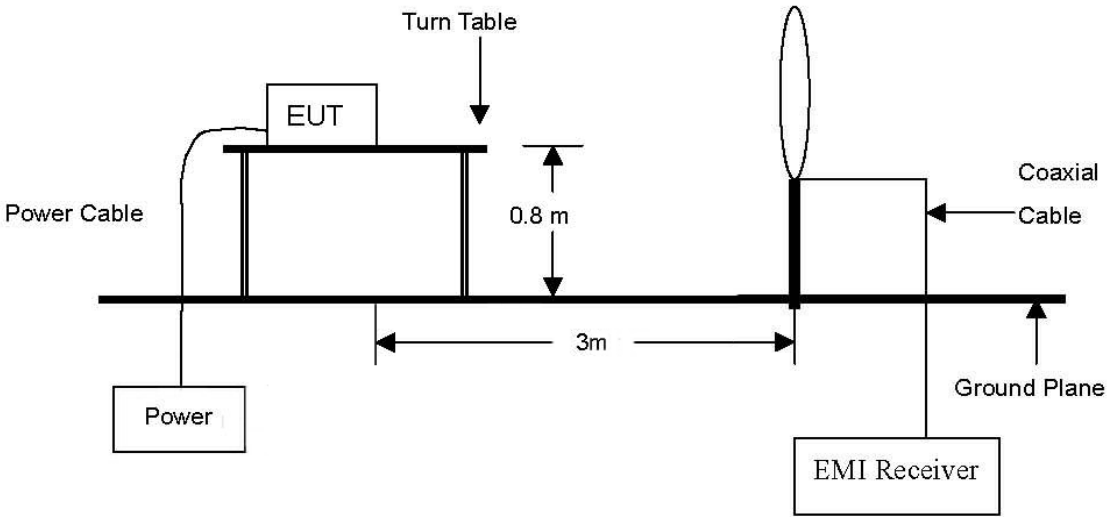
1.9. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL000879	2020.07.03	Initial

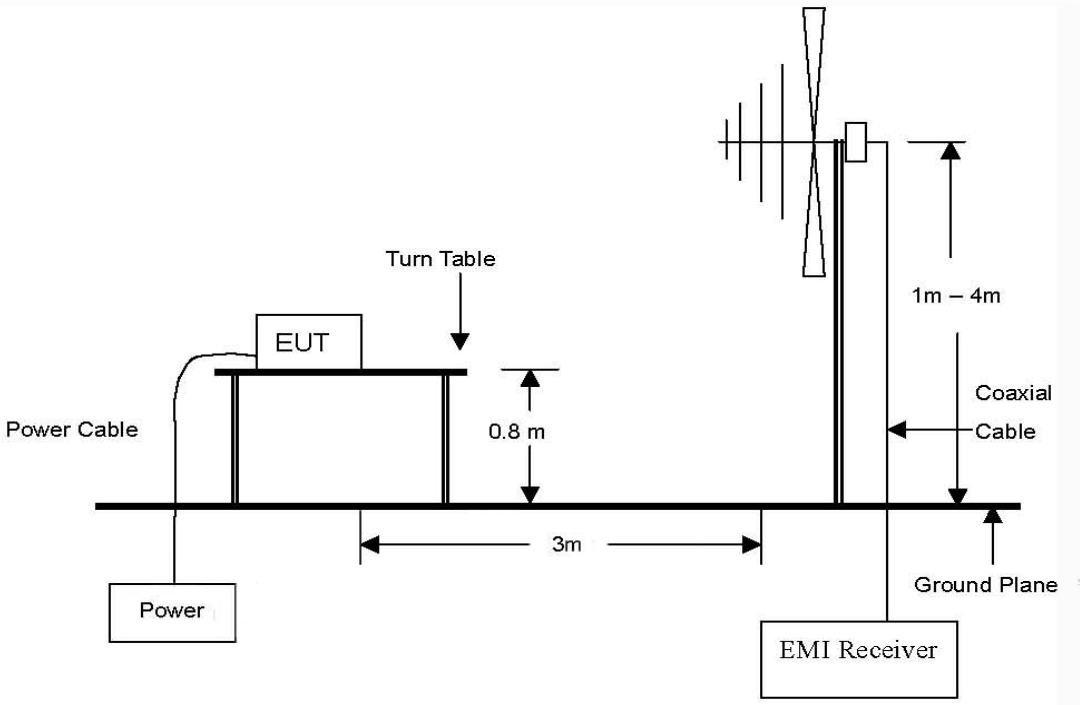
2. RF radiated output power & spurious radiated emission

2.1. Test setup

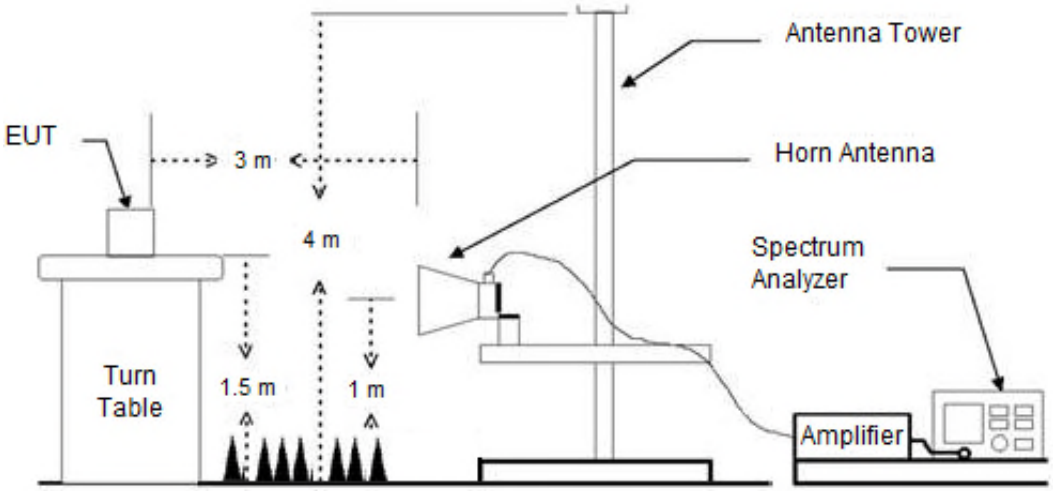
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒.



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 Radiated Output Power

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 to limiting power to the minimum necessary for successful communications.

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. Moreover, base station transmitters operating in the band 1 930-1 995 ㎒ shall not have output power exceeding 100 watts.

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 + 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) ㏈.

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 ㎒ 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 ㏈) below the transmitter output power P (㏈ W) by at least 43 + 10 $\log_{10}$ p (watts).

(ii) After the first 1.0 ㎒ immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 ㎑ bandwidth shall be attenuated (in dB) below the transmitter output power P (㏈ 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 ㎑ is required.

- RSS-133 Issue 6

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

(i) In the 1.0 ㎒ 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 ㏈) below the transmitter output power P (㏈ W) by at least 43 + 10 $\log_{10}$ p(watts).

(ii) After the first 1.0 ㎒, the emission power in any 1 ㎒ bandwidth shall be attenuated (in ㏈) below the transmitter output power P (㏈ 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 ㎒ is required.

2.3. Test Procedure: Based on ANSI/TIA 603E: 2016 and ANSI C63.26-2015

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. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions occupied bandwidth, RBW = 1-5 % of the OBW (not to exceed 1 ㎒), VBW ≥ 3 x RBW, Detector = power averaging (rms), sweep time = auto, trace average at least 100 traces in power averaging (rms) mode, per the guidelines of KDB 971168 D01 Power Meas License Digital Systems v03r01.
5. 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 ANSI C63.26-2015 and KDB 971168 D01 Power Meas License Digital Systems v03r01.
6. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
7. 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.
8. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
9. 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.
10. The maximum signal level detected by the measuring receiver shall be noted.
11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The measurement shall be repeated with the test antenna orientated for horizontal polarization.

2.4. Test Result for RF Radiated Output Power

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

Band	Frequency (㎒)	Maximum Conducted Power (㏈m)	Maximum Conducted Power (W)	Antenna Gain (㏈i)	Maximum E.I.R.P. (㏈m)	Maximum E.I.R.P. (W)	Maximum E.R.P. (㏈m)	Maximum E.R.P. (W)	Output Power Limit
GSM 850	1 850 ~ 1 910	31.00	1.259	2.0	33.00	1.995			2 W E.I.R.P.
GSM 1 900	824 ~ 849	35.50	3.548	-1.9	33.60	2.291	31.45	1.396	7 W E.R.P.

Remark;

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

2.5. Spurious radiated emission

GSM 850

Frequency (㎒)	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 ㎒)									
1 648.56	55.92	H	25.78	-40.48	41.22	-97.41	-56.19	-13	43.19
1 648.12	51.59	V	25.77	-40.48	36.88	-97.41	-60.53	-13	47.53
2 472.86	56.43	H	28.41	-38.54	46.30	-97.41	-51.11	-13	38.11
2 472.69	60.13	V	28.41	-38.54	50.00	-97.41	-47.41	-13	34.41
Middle Channel (836.6 ㎒)									
1 673.91	56.23	H	26.37	-40.41	42.19	-97.41	-55.22	-13	42.22
1 673.22	51.87	V	26.36	-40.41	37.82	-97.41	-59.59	-13	46.59
2 509.73	56.30	H	28.30	-38.83	45.77	-97.41	-51.64	-13	38.64
2 509.93	56.07	V	28.30	-38.83	45.54	-97.41	-51.87	-13	38.87
High Channel (848.8 ㎒)									
1 697.89	56.22	H	26.95	-40.39	42.78	-97.41	-54.63	-13	41.63
1 697.86	49.92	V	26.95	-40.39	36.48	-97.41	-60.93	-13	47.93
2 546.53	58.07	H	28.30	-38.79	47.58	-97.41	-49.83	-13	36.83
2 546.22	59.17	V	28.30	-38.79	48.68	-97.41	-48.73	-13	35.73

EDGE 850

Frequency (㎒)	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 ㎒)									
1 648.23	57.19	H	25.77	-40.48	42.48	-97.41	-54.93	-13	41.93
1 648.41	51.77	V	25.77	-40.48	37.06	-97.41	-60.35	-13	47.35
2 472.37	54.81	H	28.41	-38.54	44.68	-97.41	-52.73	-13	39.73
2 472.43	56.86	V	28.41	-38.54	46.73	-97.41	-50.68	-13	37.68
Middle Channel (836.6 ㎒)									
1 673.12	57.52	H	26.35	-40.41	43.46	-97.41	-53.95	-13	40.95
1 673.18	50.57	V	26.36	-40.41	36.52	-97.41	-60.89	-13	47.89
2 509.93	54.66	H	28.30	-38.83	44.13	-97.41	-53.28	-13	40.28
2 509.80	56.64	V	28.30	-38.83	46.11	-97.41	-51.30	-13	38.30
High Channel (848.8 ㎒)									
1 697.66	58.43	H	26.94	-40.39	44.98	-97.41	-52.43	-13	39.43
1 697.59	51.92	V	26.94	-40.39	38.47	-97.41	-58.94	-13	45.94
2 546.21	55.31	H	28.30	-38.79	44.82	-97.41	-52.59	-13	39.59
2 546.50	54.33	V	28.30	-38.79	43.84	-97.41	-53.57	-13	40.57

GSM 1 900

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 ㎒)									
Above 0.009	Not Detected		-	-	-	-	-	-	-
Middle Channel (1 880.0 ㎒)									
Above 0.009	Not Detected		-	-	-	-	-	-	-
High Channel (1 909.8 ㎒)									
Above 0.009	Not Detected		-	-	-	-	-	-	-

EDGE 1 900

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 ㎒)									
Above 0.009	Not Detected		-	-	-	-	-	-	-
Middle Channel (1 880.0 ㎒)									
Above 0.009	Not Detected		-	-	-	-	-	-	-
High Channel (1 909.8 ㎒)									
Above 0.009	Not Detected		-	-	-	-	-	-	-

Remark;

1. E (dBμV/m) = Measured Level (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB).
2. E.I.R.P. (dB m) = E (dBμV/m) + 20 log D - 104.8; where D is the measurement distance in meters.
3. 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.
4. CF (dB) (E.I.R.P.) = 20 log D - 104.8.
5. CF (dB) (E.R.P.) = 20 log D - 104.8 - 2.15.
6. AF = Antenna Factor, CL = Cable Loss, CF = Conversion Factor.

3. Conducted Output Power

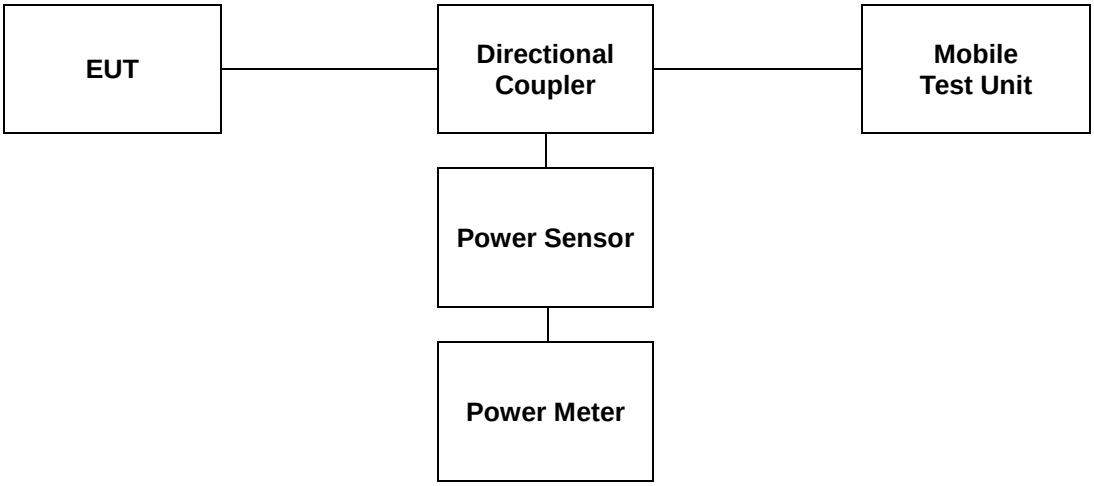
3.1. Limit

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.

Band	Channel	Frequency (㎒)	GSM	GPRS		EDGE	
			Voice	1 Tx slot	2 Tx slot	1 Tx slot	2 Tx slot
			(㏈m)	(㏈m)	(㏈m)	(㏈m)	(㏈m)
850	128	824.2	32.21	32.69	32.47	26.00	25.79
	190	836.6	32.61	33.08	32.84	25.95	25.69
	251	848.8	32.51	33.06	32.72	25.85	25.61
1 900	512	1 850.2	28.64	29.36	29.15	24.47	24.21
	661	1 880.0	28.74	29.56	29.32	24.37	24.13
	810	1 909.8	28.73	29.52	29.40	24.46	24.18

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 × 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).

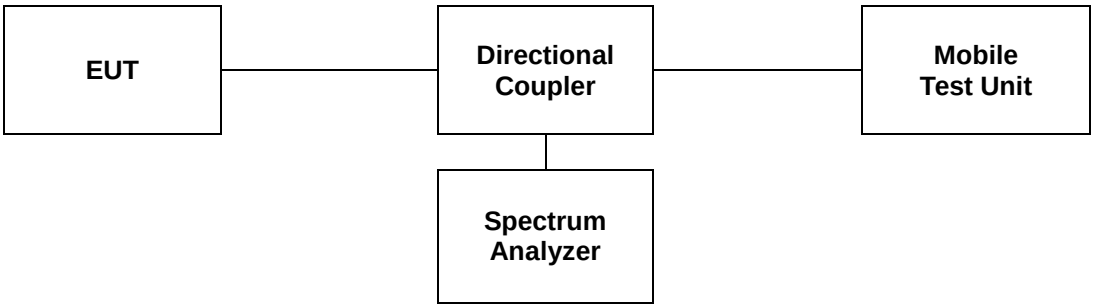
IC

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) ℃
Relative humidity : 47 % R.H.

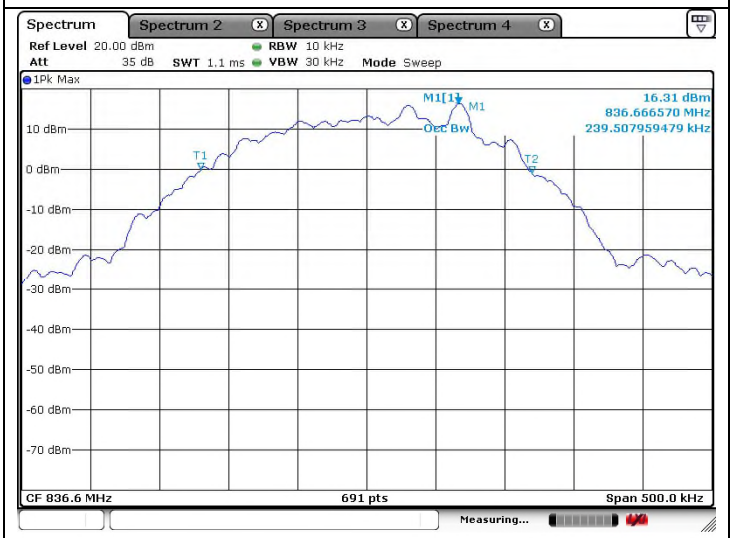
Band	Mode	Frequency (㎒)	Occupied Bandwidth (㎒)
850	Voice	824.2	0.240
		836.6	0.240
		848.8	0.241
	EDGE	824.2	0.246
		836.6	0.244
		848.8	0.245
1 900	Voice	1 850.2	0.240
		1 880.0	0.241
		1 909.8	0.240
	EDGE	1 850.2	0.245
		1 880.0	0.244
		1 909.8	0.241

-Test plots

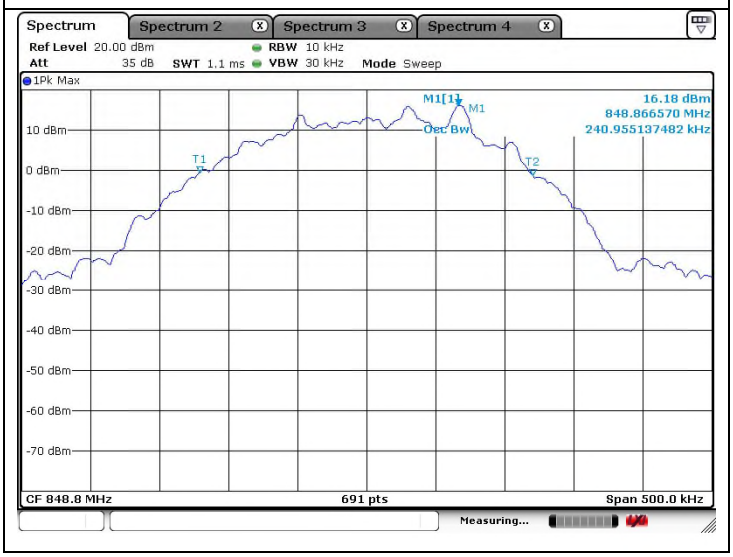
GSM 850

Low Channel

Middle Channel

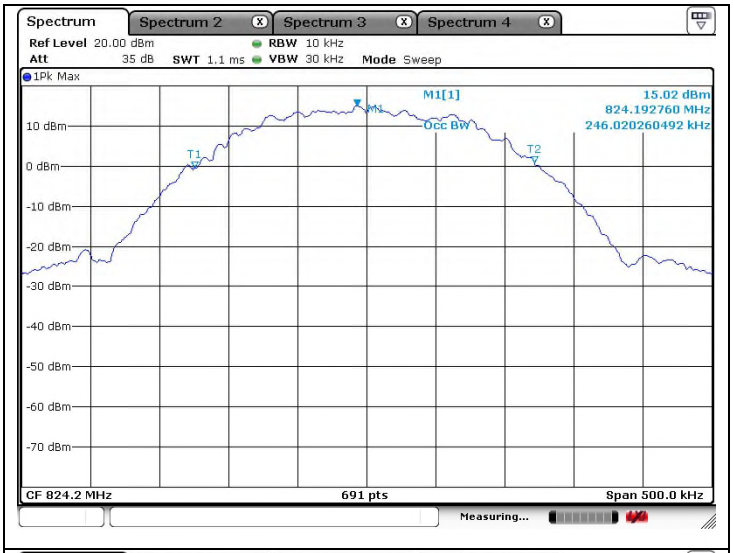


High Channel

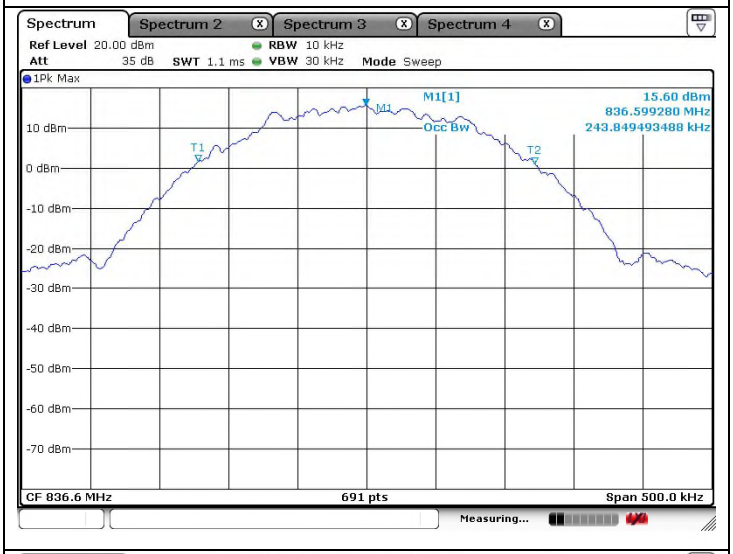


EDGE 850

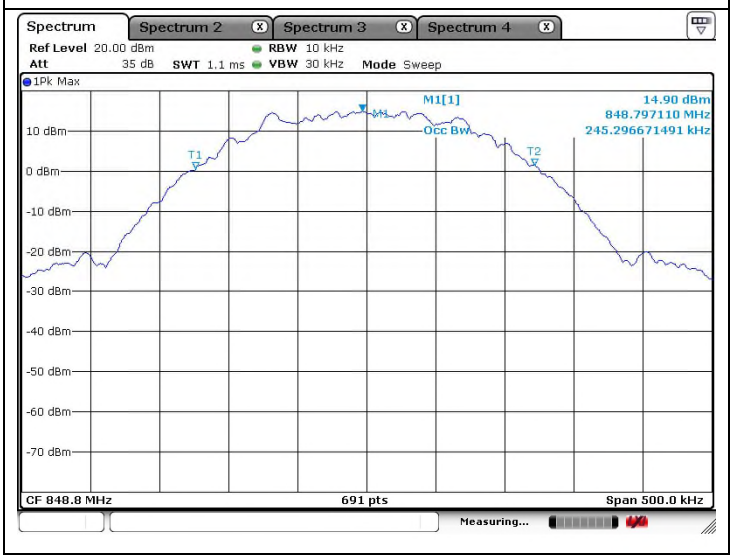
Low Channel



Middle Channel

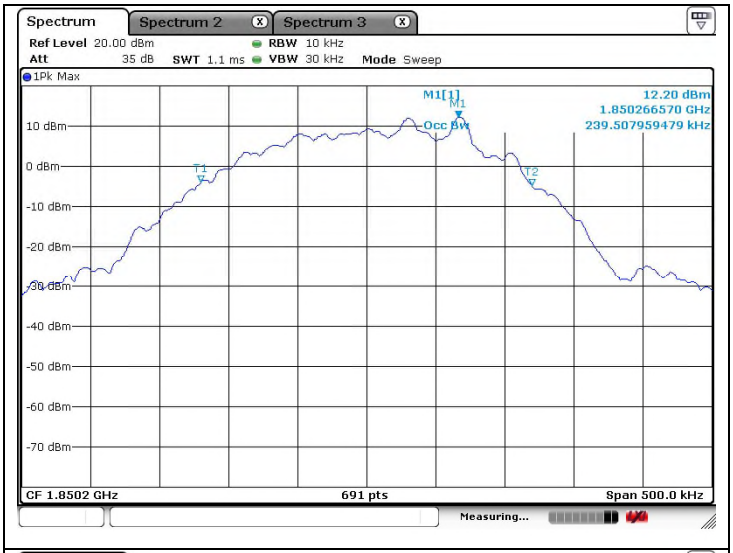


High Channel

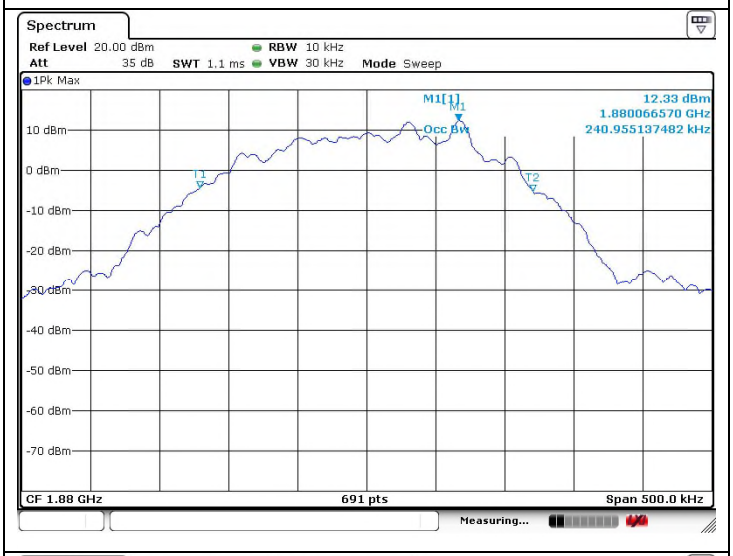


GSM 1 900

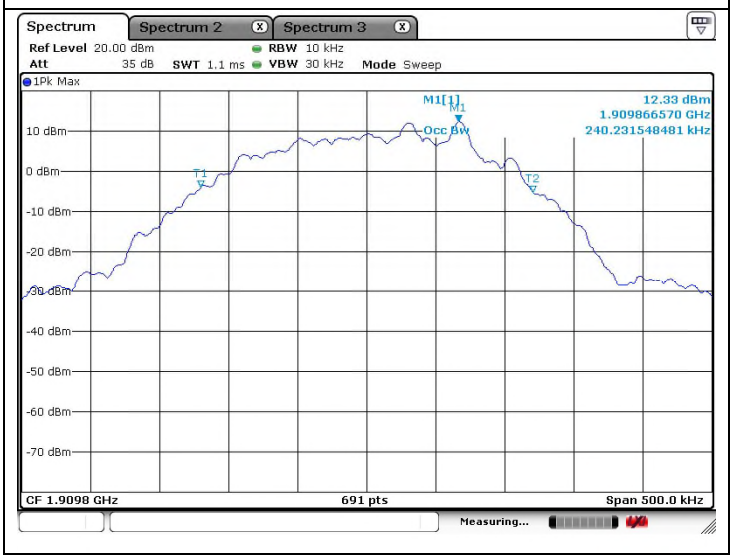
Low Channel



Middle Channel

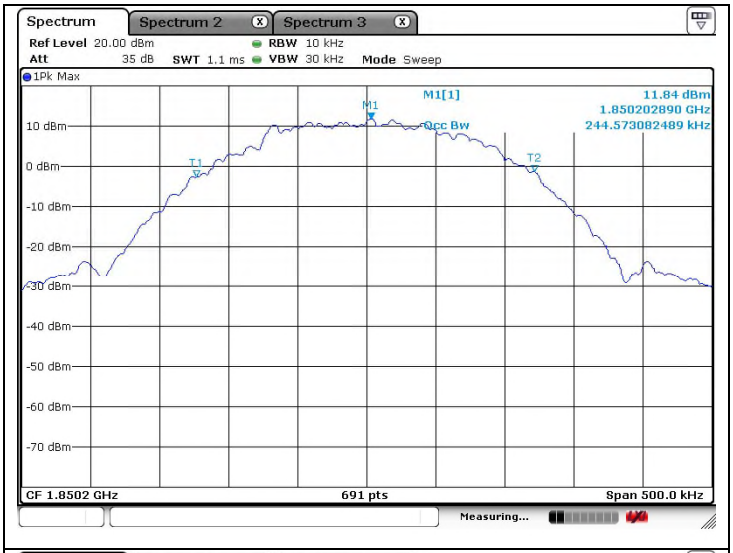


High Channel

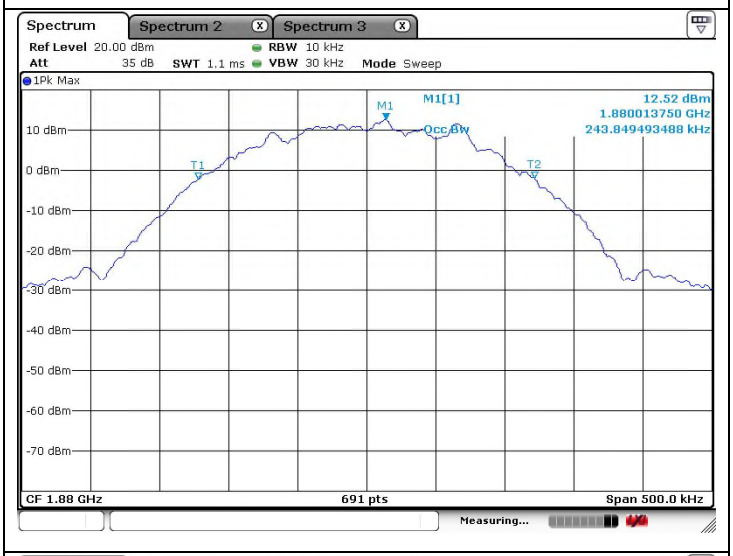


EDGE 1 900

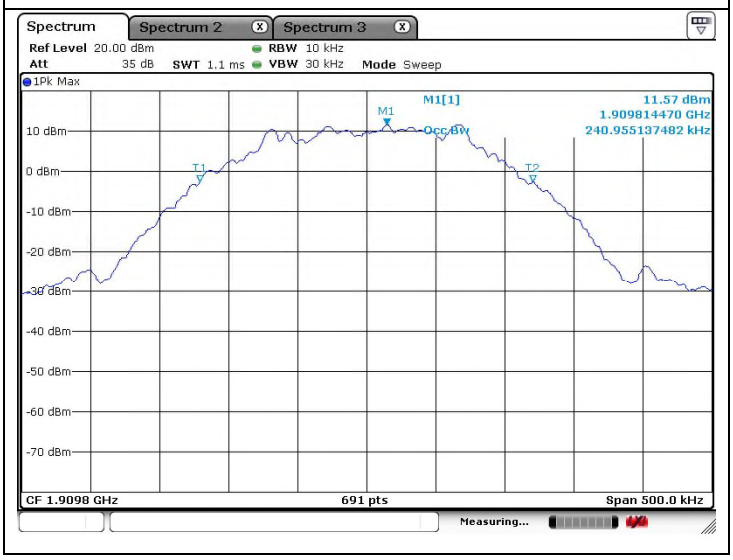
Low Channel



Middle Channel



High Channel



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 ㎧.

- §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 ㎧.

IC

- RSS-132 Issue 3

5.4, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 ㎧ 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 ㎧ for more than 0.1 % of the time using a signal corresponding 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 ≥ 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:

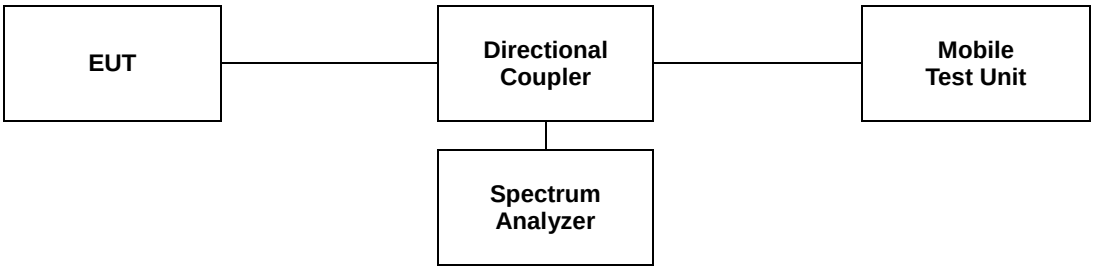
1) For continuous transmissions, set to greater of [10 x (number of points in sweep) x (transmission symbol period)] or 1 ㎳.

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

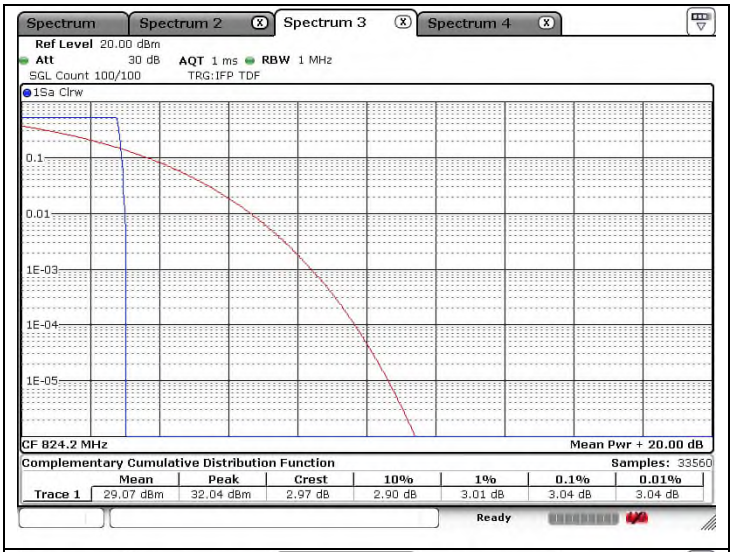
Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Band	Mode	Frequency (㎒)	PAR (㏈)
850	Voice	824.2	3.04
		836.6	3.01
		848.8	3.01
	EDGE	824.2	3.04
		836.6	3.04
		848.8	3.01
1 900	Voice	1 850.2	3.04
		1 880.0	3.04
		1 909.8	3.04
	EDGE	1 850.2	3.04
		1 880.0	3.10
		1 909.8	3.04

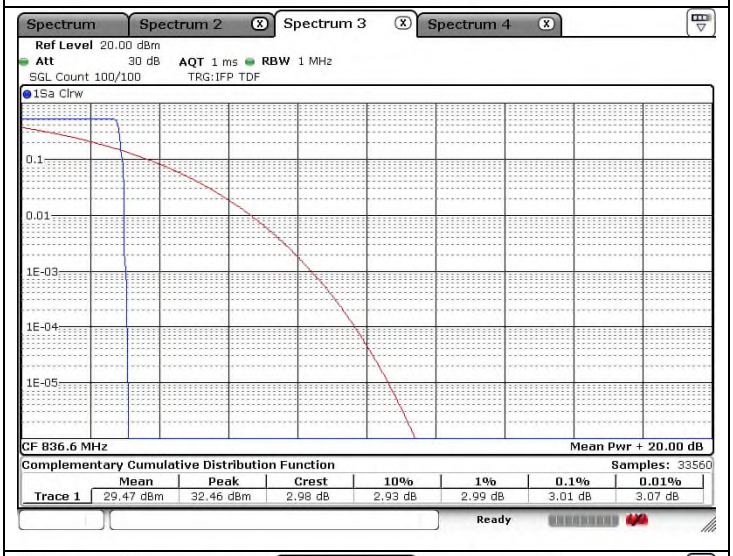
-Test plots

GSM 850

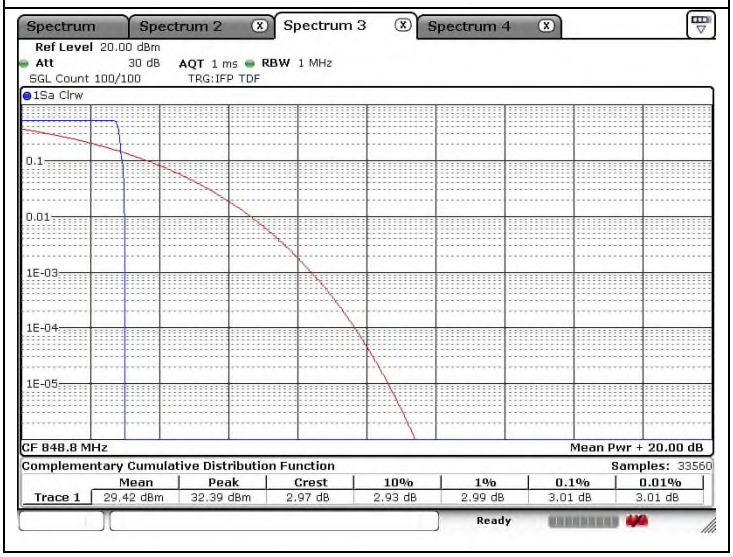
Low Channel



Middle Channel

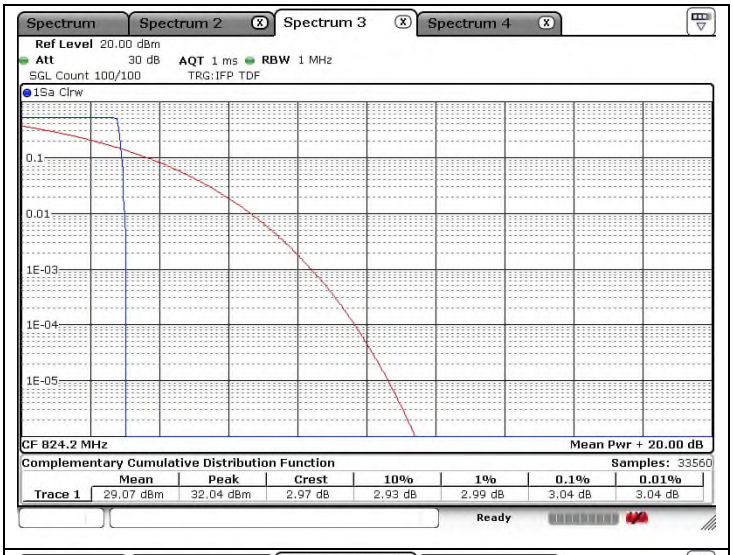


High Channel

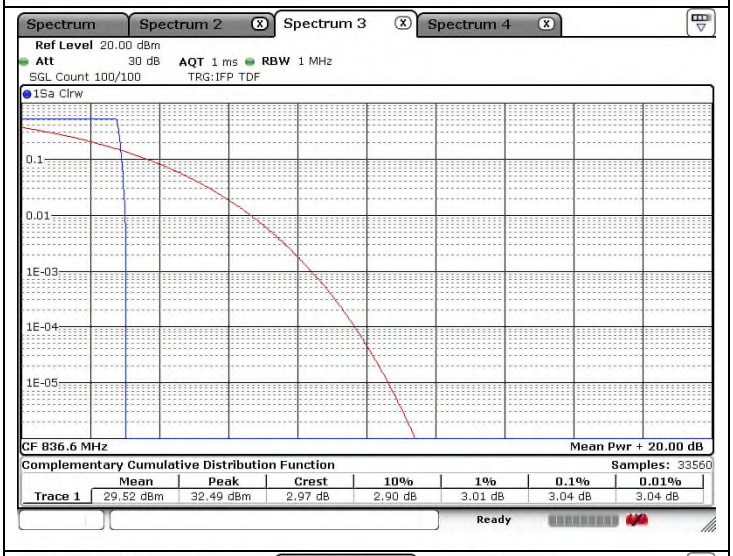


EDGE 850

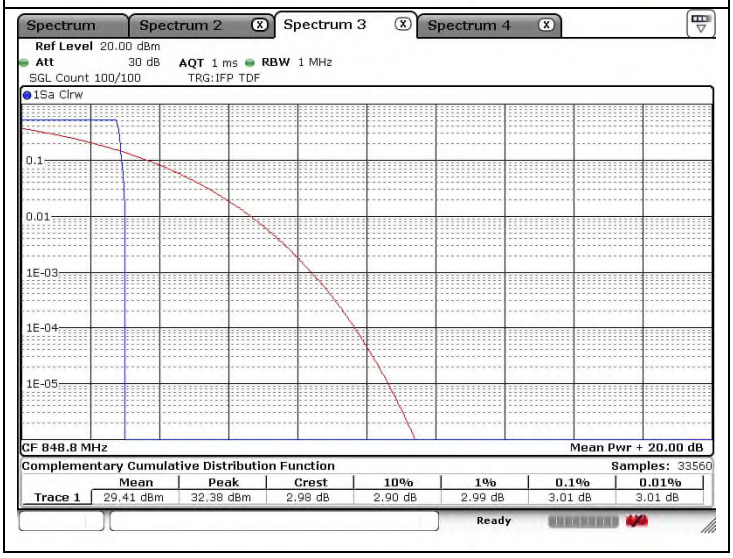
Low Channel



Middle Channel

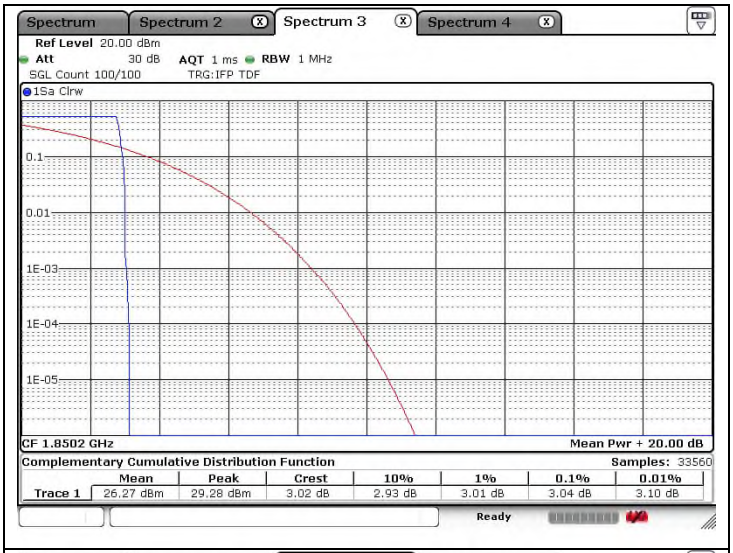


High Channel

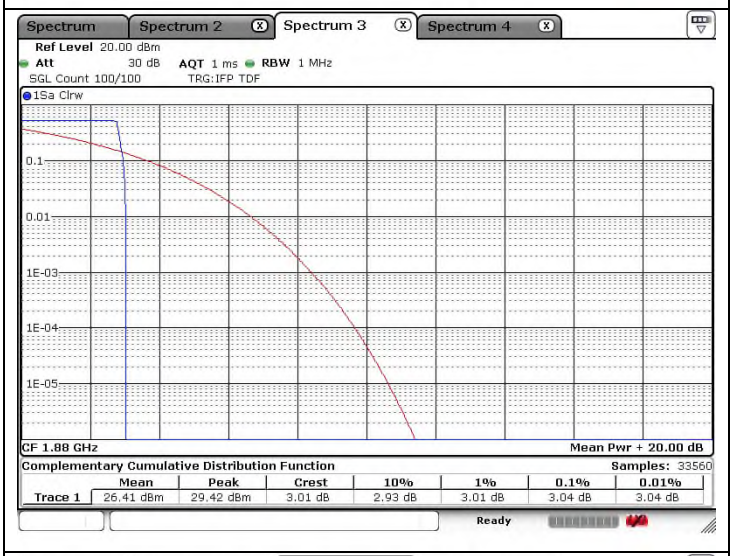


GSM 1 900

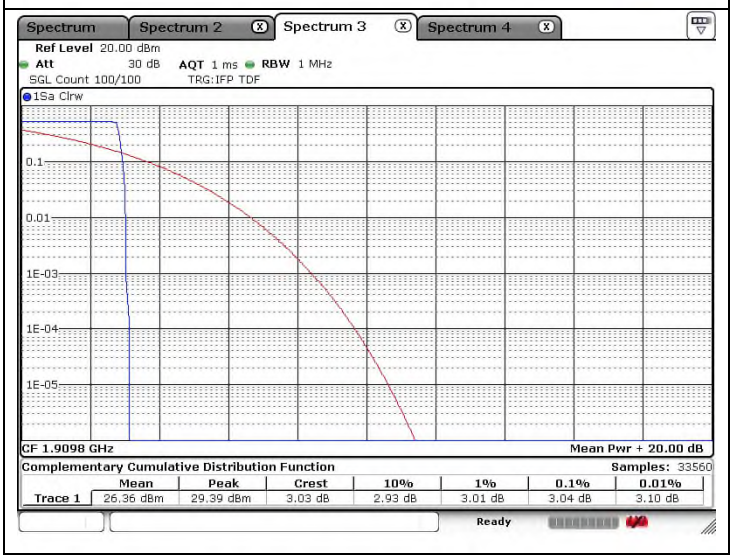
Low Channel



Middle Channel

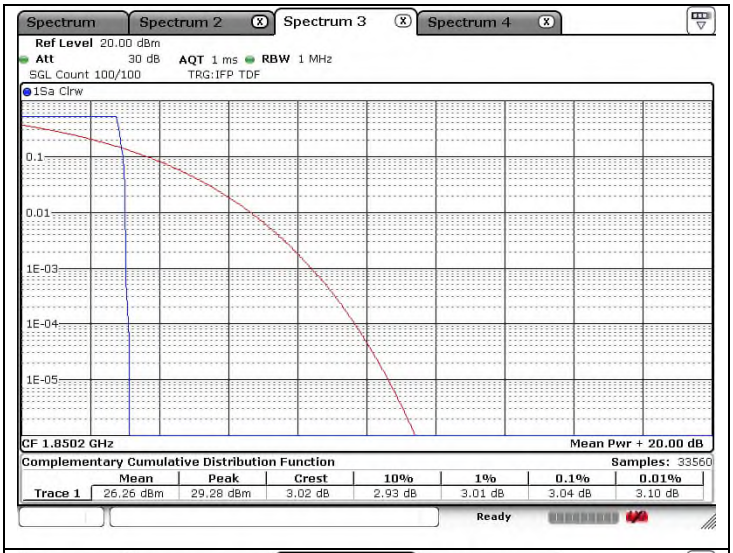


High Channel

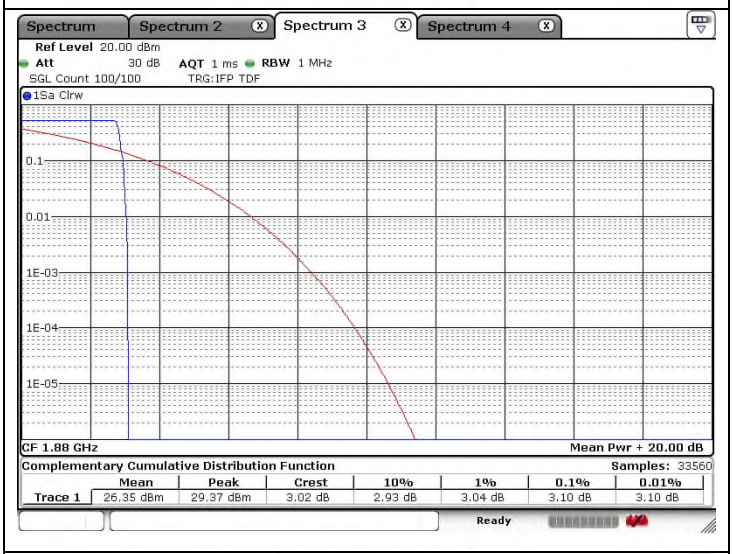


EDGE 1 900

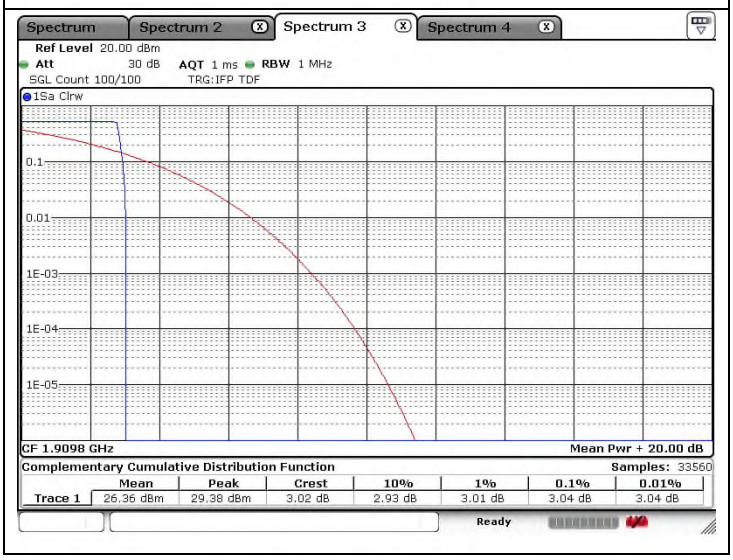
Low Channel



Middle Channel



High Channel



6. Spurious Emissions at Antenna Terminal

6.1. Limit

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 + 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) ㎧.

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 ㎒ 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 ㎧) below the transmitter output power P (㎧ W) by at least 43 + 10 log10 p (watts).

(ii) After the first 1.0 ㎒ immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 ㎑ bandwidth shall be attenuated (in ㎧) below the transmitter output power P (㎧ W) by at least 43 + 10 log10 p (watts). If the measurement is performed using 1 % of the occupied bandwidth, power integration over 100 ㎑ is required.

- RSS-133 Issue 6
6.5, Equipment shall comply with the limits in (i) and (ii) below.

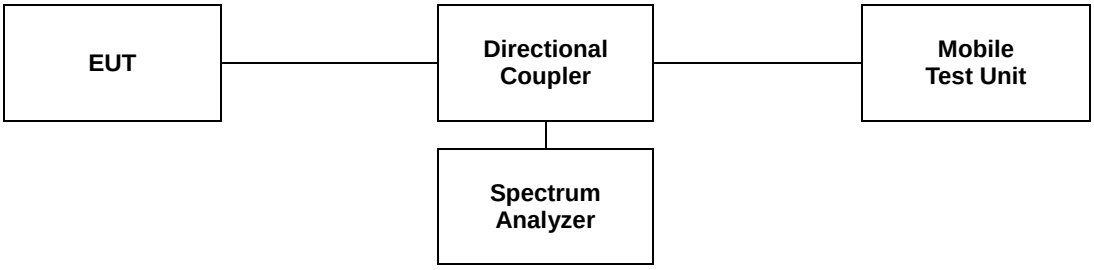
(i) In the 1.0 ㎒ bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1 % of the emission bandwidth shall be attenuated (in ㎧) below the transmitter output power P (㎧ W) by at least 43 + 10 log10 p(watts).

(ii) After the first 1.0 ㎒, the emission power in any 1 ㎒ bandwidth shall be attenuated (in ㎧) below the transmitter output power P (㎧ W) by at least 43 + 10 log10 p(watts). If the measurement is performed using 1 % of the emission bandwidth, power integration over 1.0 ㎒ is required.

6.2. Test Procedure

The test follows section 5.7 of ANSI C63.26-2015.

1. Start frequency was set to 9 ㎑ and stop frequency was set to at least 10* the fundamental frequency.
2. Detector = Peak.
3. Trace mode = Max hold.
4. Sweep time = Auto couple.
5. The trace was allowed to stabilize.
6. Please see notes below for RBW and VBW settings.
7. For plots showing conducted spurious emissions from 9 ㎑ to 20 ㎓, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as correction factor.



Note;

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 ㎑ or greater for frequencies less than 1 ㎓ and frequencies greater than 1 ㎓. However, in the 1 ㎒ bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two point, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 ㏈ below the transmitter power.

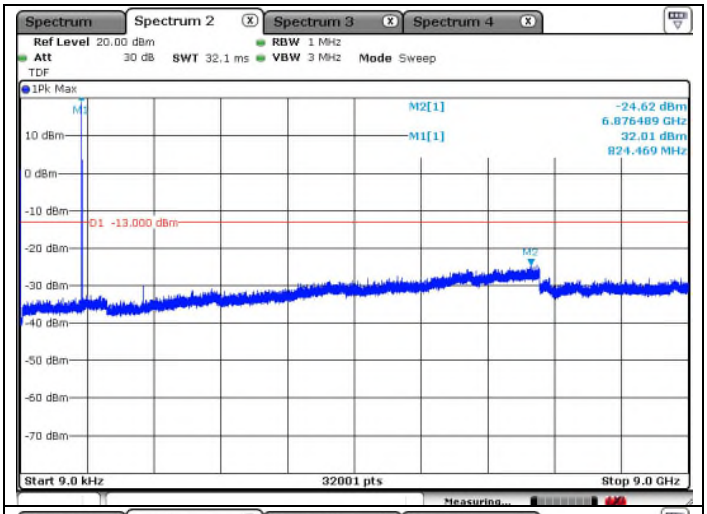
6.3. Test Results

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

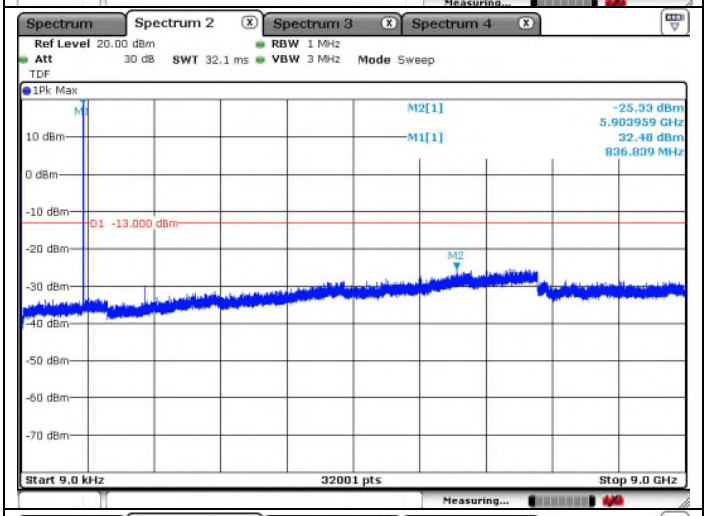
-Test plots

GSM 850

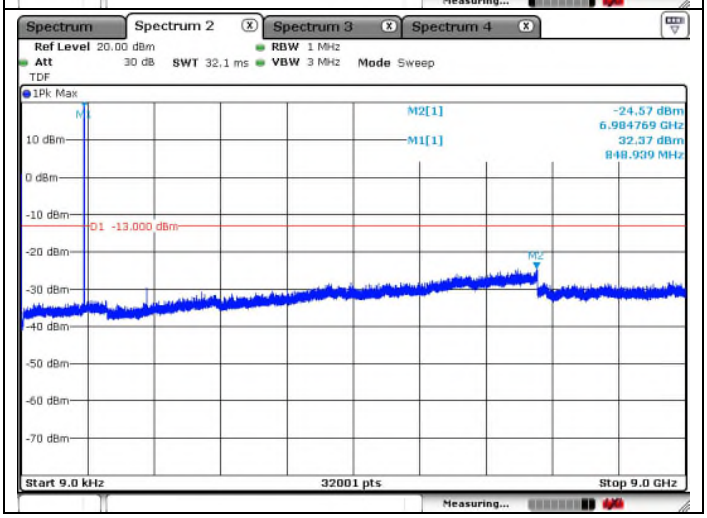
Low Channel



Middle Channel

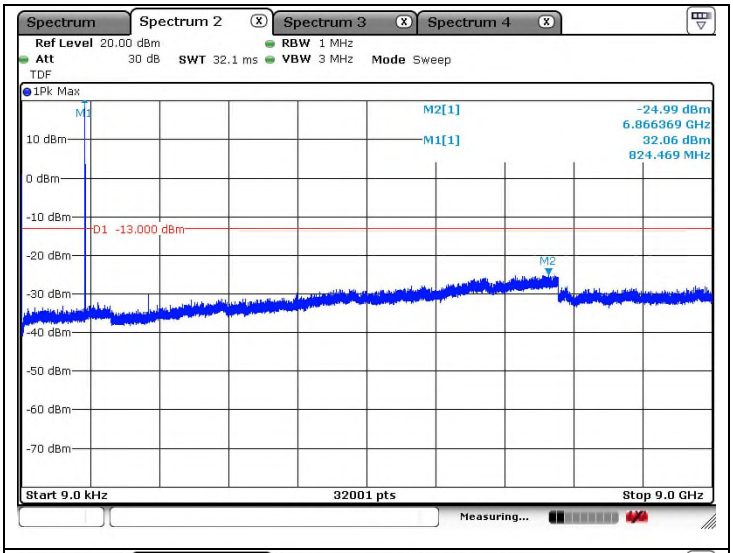


High Channel

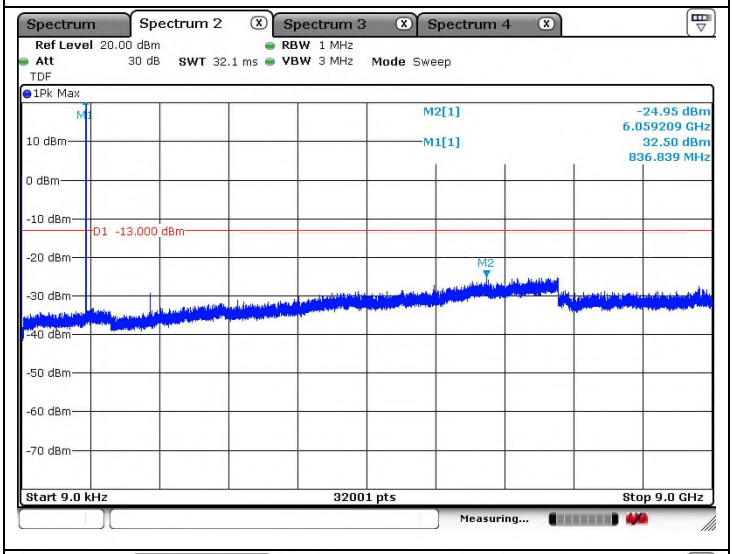


EDGE 850

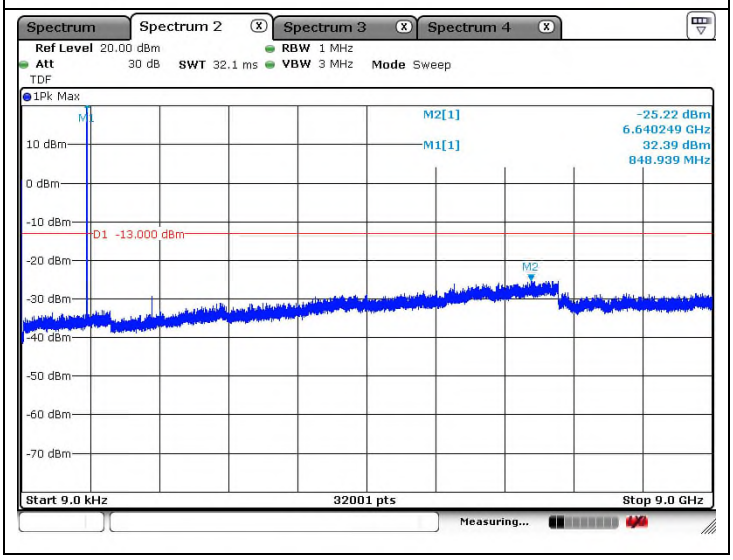
Low Channel



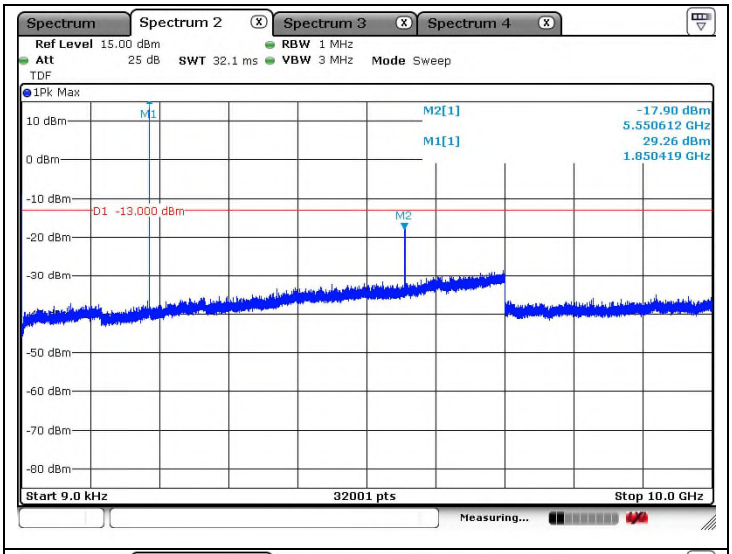
Middle Channel

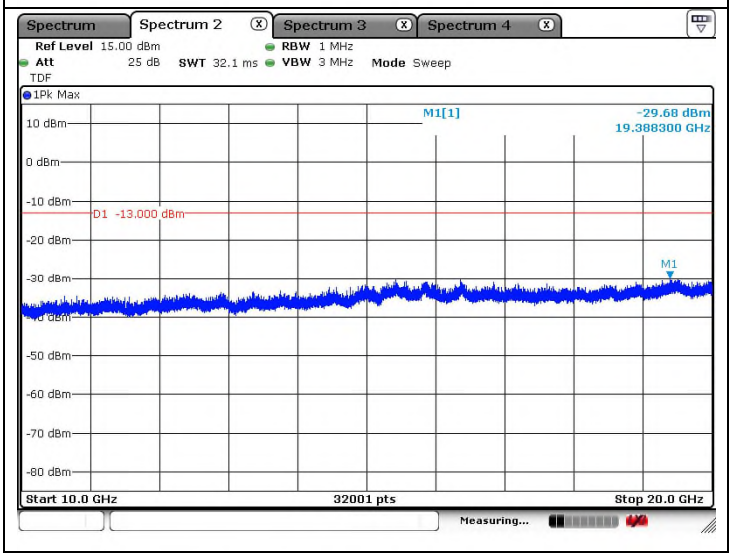


High Channel

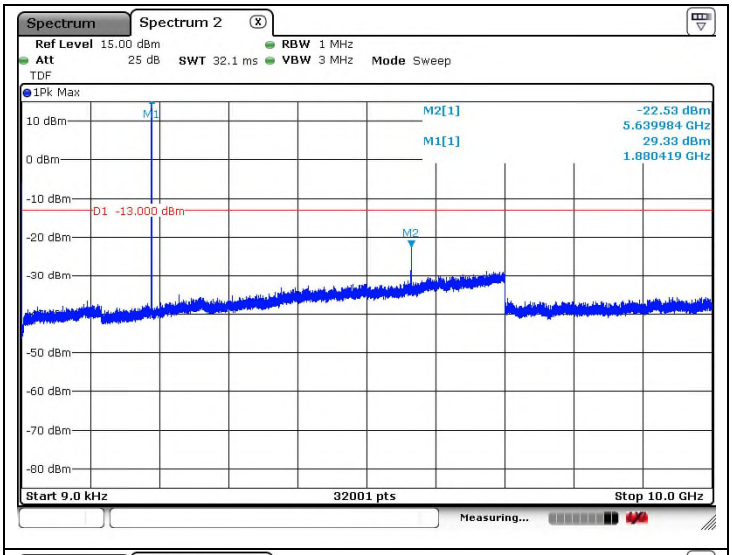


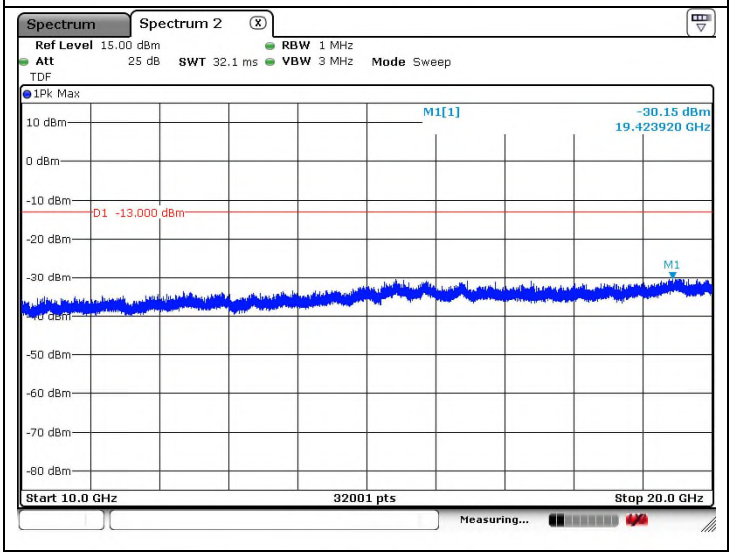
GSM 1 900
Low Channel



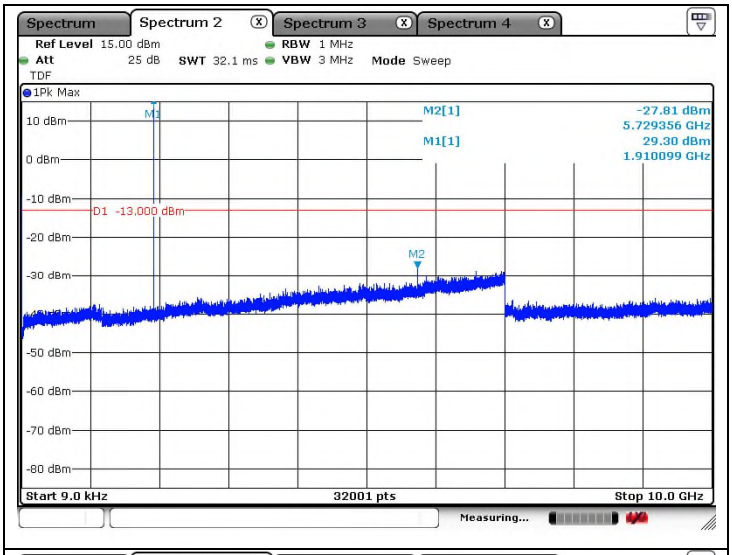


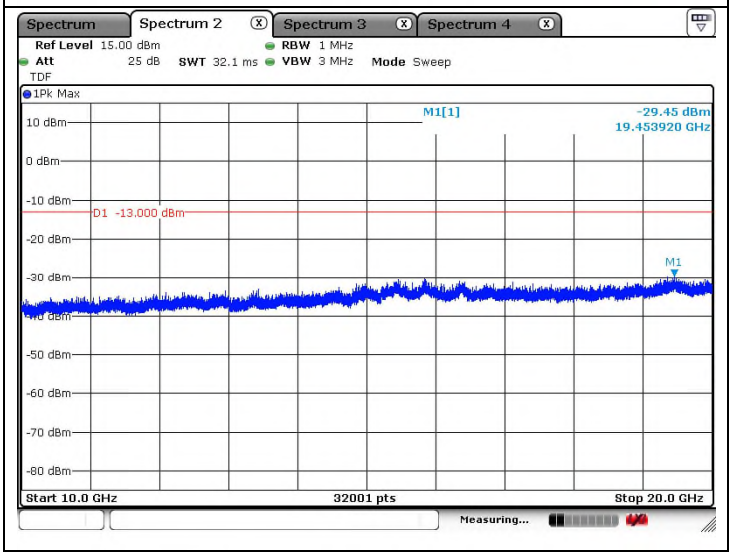
Middle Channel



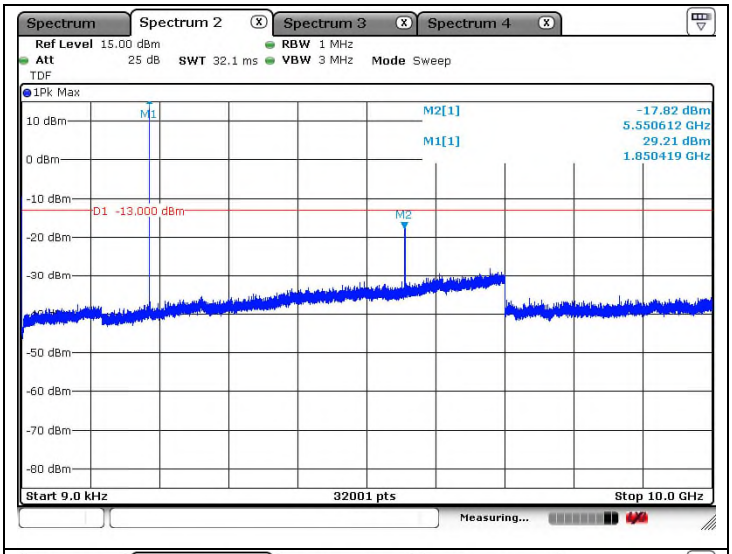


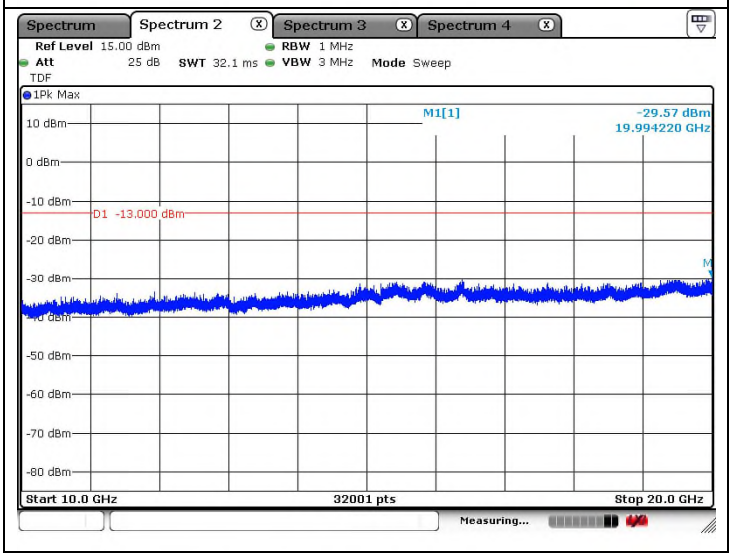
High Channel



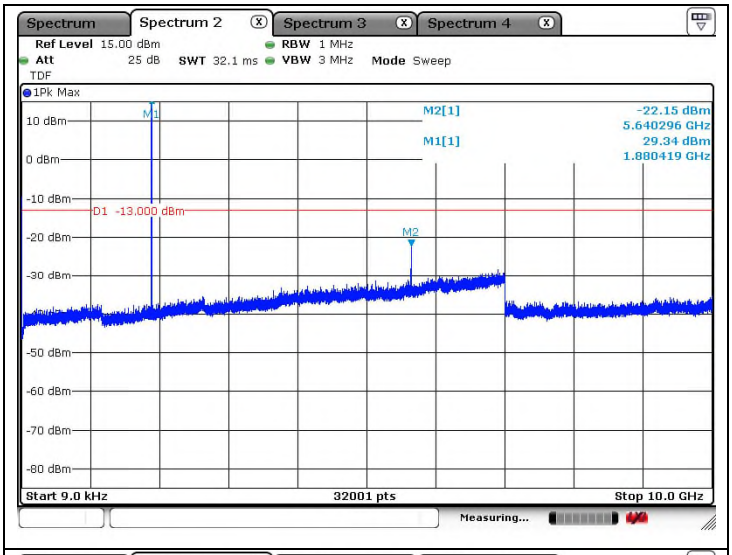


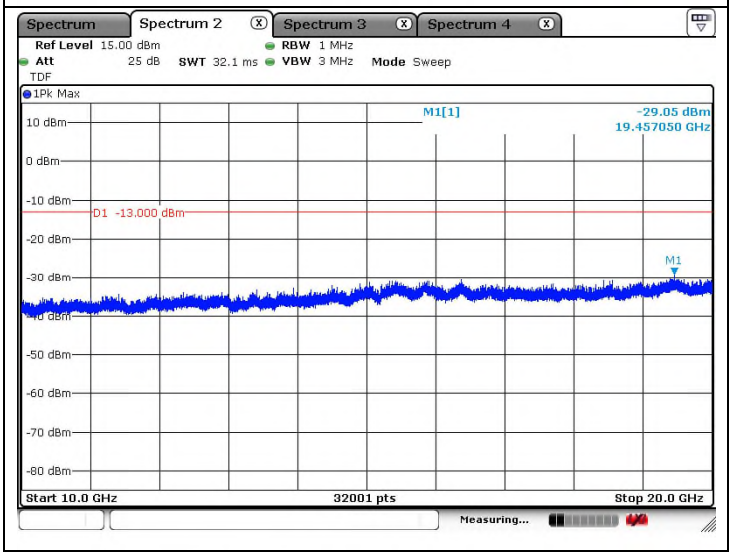
EDGE 1 900
Low Channel



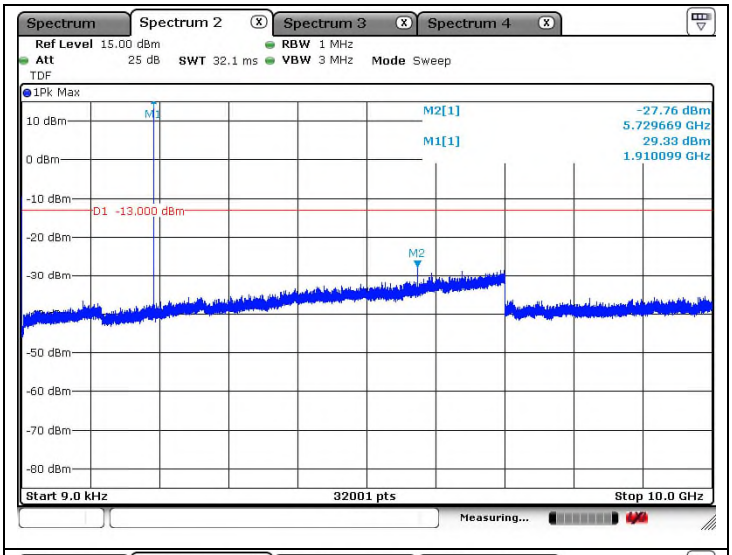


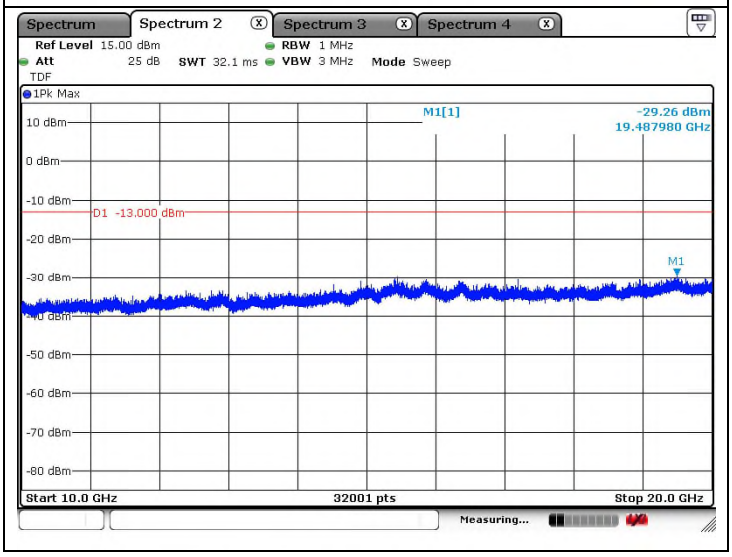
Middle Channel





High Channel





7. Band Edge

7.1. Limit

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 + 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) ㏈.

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 ㎒ 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 ㏈) below the transmitter output power P (㏈ W) by at least 43 + 10 $\log_{10}$ p (watts).

(ii) After the first 1.0 ㎒ immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 ㎑ bandwidth shall be attenuated (in dB) below the transmitter output power P (㏈ 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 ㎑ is required.

- RSS-133 Issue 6
6.5, Equipment shall comply with the limits in (i) and (ii) below.

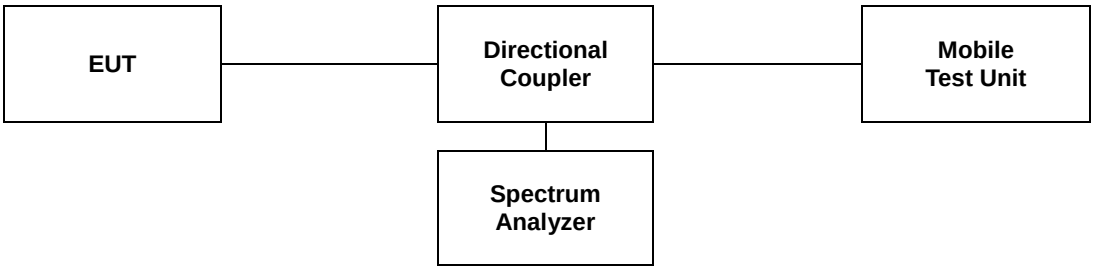
(i) In the 1.0 ㎒ bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1 % of the emission bandwidth shall be attenuated (in ㏈) below the transmitter output power P (㏈ W) by at least 43 + 10 $\log_{10}$ p(watts).

(ii) After the first 1.0 ㎒, the emission power in any 1 ㎒ bandwidth shall be attenuated (in ㏈) below the transmitter output power P (㏈ 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 ㎒ is required.

7.2. Test Procedure

The test follows section 5.7 of ANSI C63.26-2015.

a. Span was set large enough so as to capture all out of band emissions near the band edge.
b. RBW ≥ 1 % of OBW
c. VBW ≥ 3 x RBW.
d. Detector = RMS.
e. Trace mode = Average.
f. Sweep time = Auto.
g. The trace was allowed to stabilize.
h. All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function.

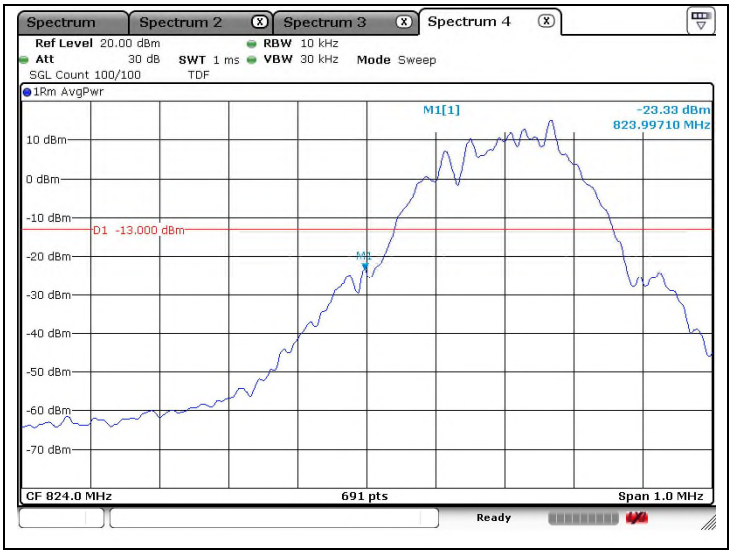


7.3. Test Results

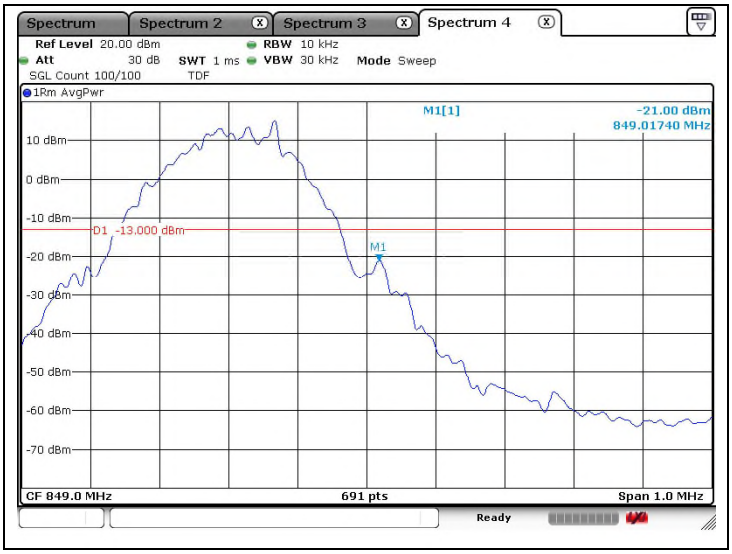
Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

-Test plots

GSM 850
Low Channel

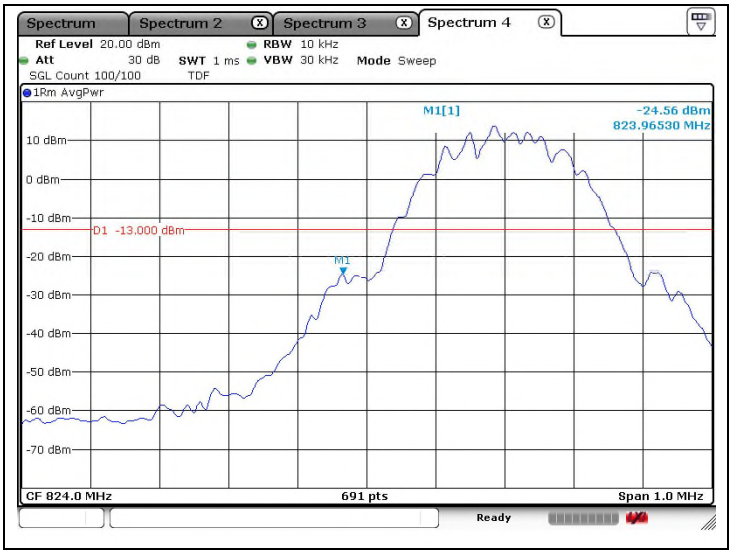


High Channel

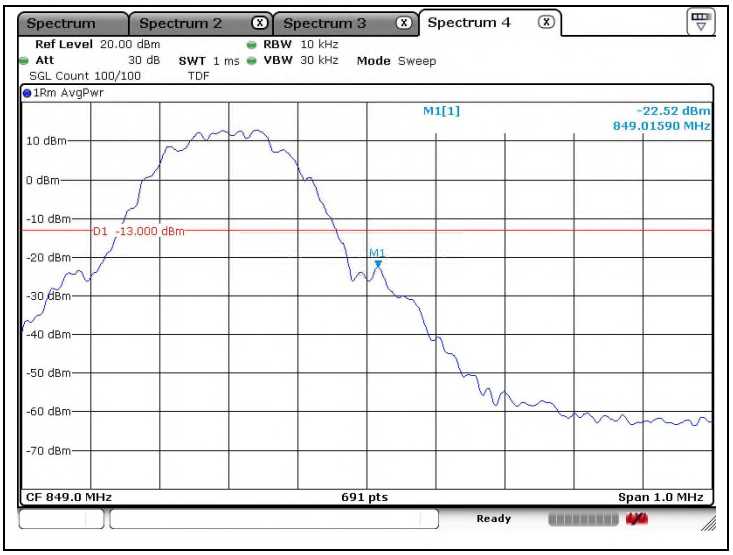


EDGE 850

Low Channel

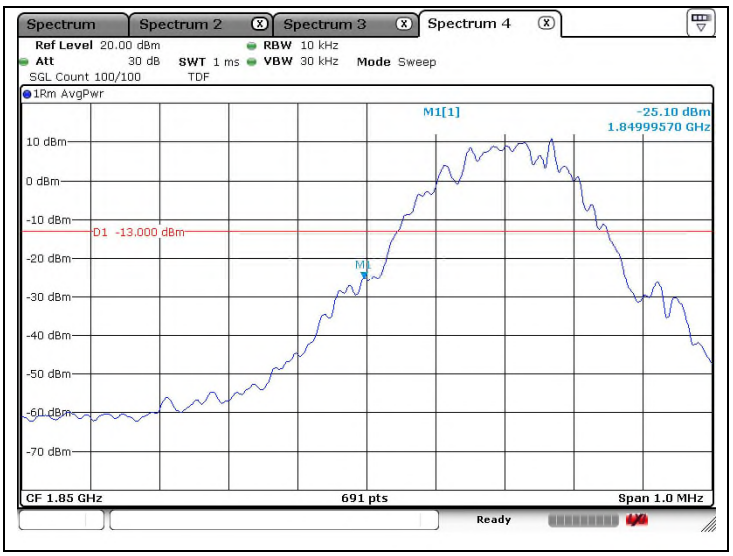


High Channel

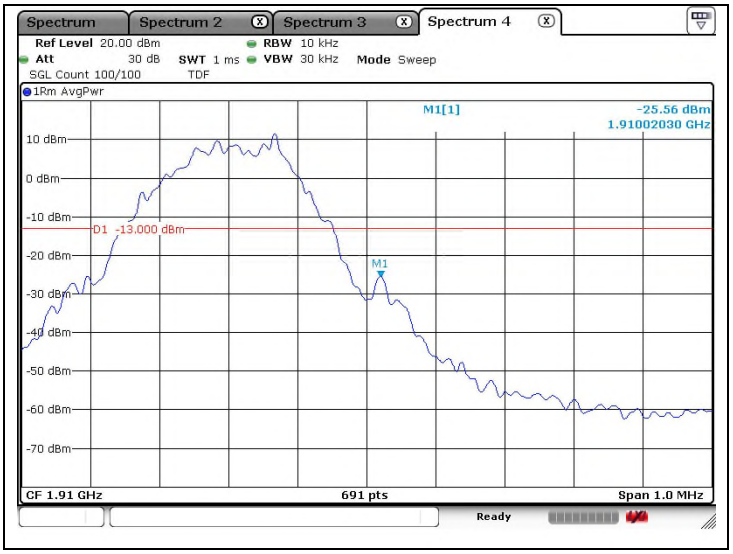


GSM 1 900

Low Channel

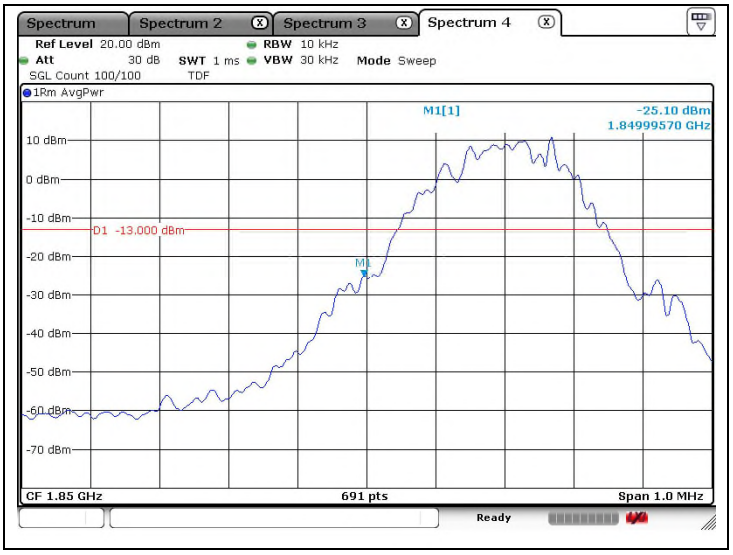


High Channel

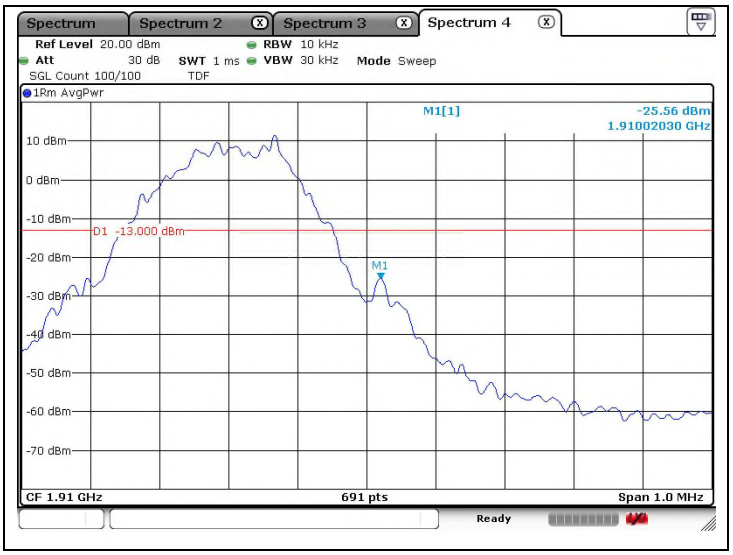


EDGE 1 900

Low Channel



High Channel



8. Frequency Stability

8.1. Limit

FCC
- § 2.1055 (a), § 2.1055 (d) & following:

- §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table of this section.
For Mobile devices operating in the 824 to 849 ㎒ band at a power level less than or equal to 3 Watts, the limit specified in Table C-1 is +/- 2.5 ppm.

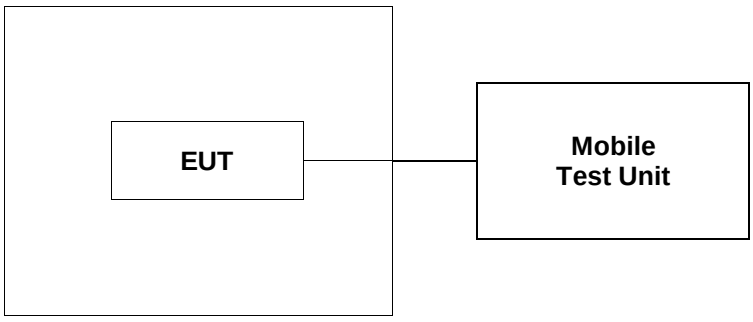
- §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

IC
- RSS-132 Issue 3
5.3, the carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations and ±1.5 ppm for base stations.

- RSS-133 Issue 6
6.3, the carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations and ±1.0 ppm for base stations.

8.2. Test Procedure

1. Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a Mobile Test Unit via feed-through attenuators.
2. The EUT was placed inside the temperature chamber.
3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from Mobile Test Unit.



8.3. Test Results

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

GSM 850 mode at middle channel

Reference Frequency: 836.6 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	12	5.2	0.006 2
40		-4.1	-0.004 9
30		-1.6	-0.001 9
23		6.4	0.007 7
10		3.2	0.003 8
0		-2.4	-0.002 9
-10		-4.3	-0.005 1
-20		-5.3	-0.006 3
-30		3.1	0.003 7
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	13.8	3.1	0.001 6
	10.2	1.9	0.001 0

GSM 1 900 mode at middle channel

Reference Frequency: 1 880.0 ㎒			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	12	5.3	0.002 8
40		2.4	0.001 3
30		1.5	0.000 8
23		3.2	0.001 7
10		-4.4	-0.002 3
0		-2.1	-0.001 1
-10		-2.8	-0.001 5
-20		3.2	0.001 7
-30		4.3	0.002 3
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	13.8	4.5	0.002 6
	10.2	1.6	0.000 9

- End of the Test Report -