TEST REPORT

of

FCC Part 22 Subpart H and Part 24 Subpart E

FCC ID: BEJ-TTA20ANEBR

Equipment Under Test	:	Telematics
Model Name	:	TTA20ANEBR
Variant Model Names	:	TTA20ANENR, TTA20ANEBS, TTA20ANENS, TTA20GNEBS, TTA20GNENS, TTA20BNEBR, TTA20BNENR, TTA20GNEBR, TTA20GNENR, TTA20BNEBS, TTA20BNENS
Applicant	:	LG Electronics Inc.
Manufacturer	:	LG Electronics Inc.
Date of Receipt	:	2018.12.05
Date of Test(s)	:	2018.03.16 ~ 2018.03.21
Date of Issue	:	2018.12.06

In the configuration tested, the EUT complied with the standards specified above.

Tested By:	**Nancy Park**	**Date:**	**2018.12.06**
Technical Manager:	**Harim Lee**	**Date:**	**2018.12.06**

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TABLE OF CONTENTS

Page

1. General Information ---------- 3

2. RF radiated output power & spurious radiated emission ---------- 8

3. Conducted Output Power ---------- 17

4. Occupied Bandwidth 99 % ---------- 19

5. Peak-Average Ratio ---------- 29

6. Spurious Emissions At Antenna Terminal ---------- 39

7. Band Edge ---------- 48

8. Frequency Stability ---------- 53

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- Wireless Div. 2FL, 10-2, 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.

Telephone : +82 31 688 0901
FAX : +82 31 688 0921

1.2. Details of applicant

Applicant : LG Electronics USA.
Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632
Contact Person : Han, Kyung-Su
Phone No. : +1 201 816 2003

1.3. Details of manufacturer

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

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1.4. Description of EUT

Kind of Product	Telematics
Model Name	TTA20ANEBR
Variant Model Names	TTA20ANENR, TTA20ANEBS, TTA20ANENS, TTA20GNEBS, TTA20GNENS, TTA20BNEBR, TTA20BNENR, TTA20GNEBR, TTA20GNENR, TTA20BNEBS, TTA20BNENS
Power Supply	DC 12 V
Rated Power	GSM 850: 33 ㎧ m GSM 1 900: 30 ㎧ m WCDMA 2, 5: 23 ㎧ m LTE Band 2, 4, 5: 23 ㎧ m
Frequency Range	GSM 850: 824 ㎒ ~ 849 ㎒ GSM 1 900: 1 850 ㎒ ~ 1 910 ㎒ WCDMA 2: 1 850 ㎒ ~ 1 910 ㎒ WCDMA 5: 824 ㎒ ~ 849 ㎒ LTE Band 2: 1 850 ㎒ ~ 1 910 ㎒ LTE Band 4: 1 710 ㎒ ~ 1 755 ㎒ LTE Band 5: 824 ㎒ ~ 849 ㎒
Emission Designator	GSM 850: 244KGXW (Voice) / 243KG7W (EDGE) GSM 1900: 246KGXW (Voice) / 243KG7W (EDGE) WCDMA 2: 4M17F9W WCDMA 5: 4M15F9W LTE Band 2 (1.4 ㎒): 1M10G7D (QPSK) / 1M10W7D (16QAM) LTE Band 2 (3 ㎒): 2M69G7D (QPSK) / 2M69W7D (16QAM) LTE Band 2 (5 ㎒): 4M52G7D (QPSK) / 4M52W7D (16QAM) LTE Band 2 (10 ㎒): 8M97G7D (QPSK) / 8M97W7D (16QAM) LTE Band 2 (15 ㎒): 13M5G7D (QPSK) / 13M5W7D (16QAM) LTE Band 2 (20 ㎒): 17M9G7D (QPSK) / 17M9W7D (16QAM)
Emission Designator	LTE Band 4 (1.4 ㎒): 1M10G7D (QPSK) / 1M10W7D (16QAM) LTE Band 4 (3 ㎒): 2M69G7D (QPSK) / 2M70W7D (16QAM) LTE Band 4 (5 ㎒): 4M52G7D (QPSK) / 4M52W7D (16QAM) LTE Band 4 (10 ㎒): 8M94G7D (QPSK) / 8M94W7D (16QAM) LTE Band 4 (15 ㎒): 13M5G7D (QPSK) / 13M5W7D (16QAM) LTE Band 4 (20 ㎒): 17M9G7D (QPSK) / 17M9W7D (16QAM) LTE Band 5 (1.4 ㎒): 1M10G7D (QPSK) / 1M10W7D (16QAM) LTE Band 5 (3 ㎒): 2M70G7D (QPSK) / 2M69W7D (16QAM) LTE Band 5 (5 ㎒): 4M52G7D (QPSK) / 4M52W7D (16QAM) LTE Band 5 (10 ㎒): 8M97G7D (QPSK) / 8M97W7D (16QAM)

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1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due.
Signal Generator	Agilent	E8257D	MY51501169	Jul. 07, 2017	Annual	Jul. 07, 2018
Spectrum Analyzer	R&S	FSW67	103242	Jan. 19, 2018	Annual	Jan. 19, 2019
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 25, 2017	Annual	Sep. 25, 2018
Mobile Test Unit	R&S	CMW500	144034	Mar. 08, 2017	Annual	Mar. 09, 2019
Power Meter	Anritsu	ML2495A	1223004	Jun. 09, 2017	Annual	Jun. 09, 2018
Power Sensor	Anritsu	MA2411B	1207272	Jun. 09, 2017	Annual	Jun. 09, 2018
Directional Coupler	KRYTAR	152613	140972	Jun. 12, 2017	Annual	Jun. 12, 2018
Temperature Chamber	ESPEC CORP.	PL-1J	15000793	Jun. 14, 2017	Annual	Jun. 14, 2018
High Pass Filter	Wainwright Instrument GmbH	WHKX10-900-1000-180 00-40SS	7	Mar. 30, 2017	Annual	Mar. 30, 2018
High Pass Filter	Wainwright Instrument GmbH	WHK3.0/18G-10SS	344	May 28, 2017	Annual	May 28, 2018
High Pass Filter	Wainwright Instrument GmbH	WHKX2.2/12.75G-10SS	8	Mar. 30, 2017	Annual	Mar. 30, 2018
DC Power Supply	Agilent	U8002A	MY48490027	Dec. 07, 2017	Annual	Dec. 07, 2018
Preamplifier	H.P.	8447F	2944A03909	Aug. 11, 2017	Annual	Aug. 11, 2018
Preamplifier	R&S	SCU 18	102244	Sep. 22, 2017	Annual	Sep. 22, 2018
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	May 15, 2017	Annual	May 15, 2018
Test Receiver	R&S	ESU26	100109	Feb. 07, 2018	Annual	Feb. 07, 2019
Log-Periodic Antenna	R&S	HK116	837942/015	Dec. 01, 2017	Biennial	Dec. 01, 2019
Biconical Antenna	R&S	HL223	8374141/007	Dec. 01, 2017	Biennial	Dec. 01, 2019
Horn Antenna	R&S	HF906	100326	May 11, 2017	Biennial	May 11, 2018
Dipole Antenna	SCHWARZBECK MESSELEKTRONIK	UHA 9105	9105-2514	May 15, 2017	Biennial	May 15, 2019
Dipole Antenna	SCHWARZBECK MESSELEKTRONIK	VHA 9103	9103-2817	May 15, 2017	Biennial	May 15, 2019
Horn Antenna	SCHWARZBECK MESSELEKTRONIK	BBHA 9170	BBHA9170431	Aug. 25, 2016	Biennial	Aug. 25, 2018
Horn Antenna	SCHWARZBECK MESSELEKTRONIK	BBHA 9170	BBHA9170223	Aug. 25, 2016	Biennial	Aug. 25, 2018
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.

▶ Support equipment

Description	Manufacturer	Model	Serial Number
N/A	-	-	-

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1.6. Summary of test results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 2, 22 and 24		
Section in FCC part	**Test Item**	**Result**
§2.1046 §22.913(a)(5) §24.232(c)	RF Radiated Output Power	Complied
§2.1053 §22.917(a) §24.238(a)	Spurious Radiated Emission	Complied
§2.1046	Conducted Output Power	Complied
§2.1049	Occupied Bandwidth	Complied
§22.913(d) §24.232(d)	Peak-Average Ratio	Complied
§2.1051 §22.917(a) §24.238(a)	Spurious Emission at Antenna Terminal	Complied
§22.917(a) §24.238(a)	Band Edge	Complied
§2.1055 §22.355 §24.235	Frequency Stability	Complied

1.7. Test report revision

Revision	Report number	Date of Issue	Description
0	F690501/RF-RTL012489	2018.03.22	Initial
1	F690501/RF-RTL012489-1	2018.12.06	Added variant model names

1.8. Sample calculation for offset

Where relevant, the following sample calculation is provided:

1.8.1. Conducted test

Offset value (dB) = Directional Coupler (dB) + Cable loss (dB)

1.8.2. Radiation test

E.R.P. & E.I.R.P. = [S.G level + Amp.] (dB m) - Cable loss (dB) + Ant. gain (dB d/dB i)

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1.9. Information of Variant Models

-			CAN	-	Ethernet	BUB(B/N)	Region
TT	A	20	A	N	E	B	R
TT	A	20	A	N	E	N	R
TT	A	20	B	N	E	B	R
TT	A	20	B	N	E	N	R
TT	A	20	G	N	E	B	R
TT	A	20	G	N	E	N	R
TT	A	20	A	N	E	B	S
TT	A	20	A	N	E	N	S
TT	A	20	B	N	E	B	S
TT	A	20	B	N	E	N	S
TT	A	20	G	N	E	B	S
TT	A	20	G	N	E	N	S

CAN: Vehicle communication interface A: High/Low Speed support B: High Speed support G: High Speed support	**Ethernet: Vehicle Network** G: 1Gb Speed support E: 100Mb Speed support
BUB: B: Backup Battery N: Non-Backup Battery	**Region** R: Rest of World S: South America

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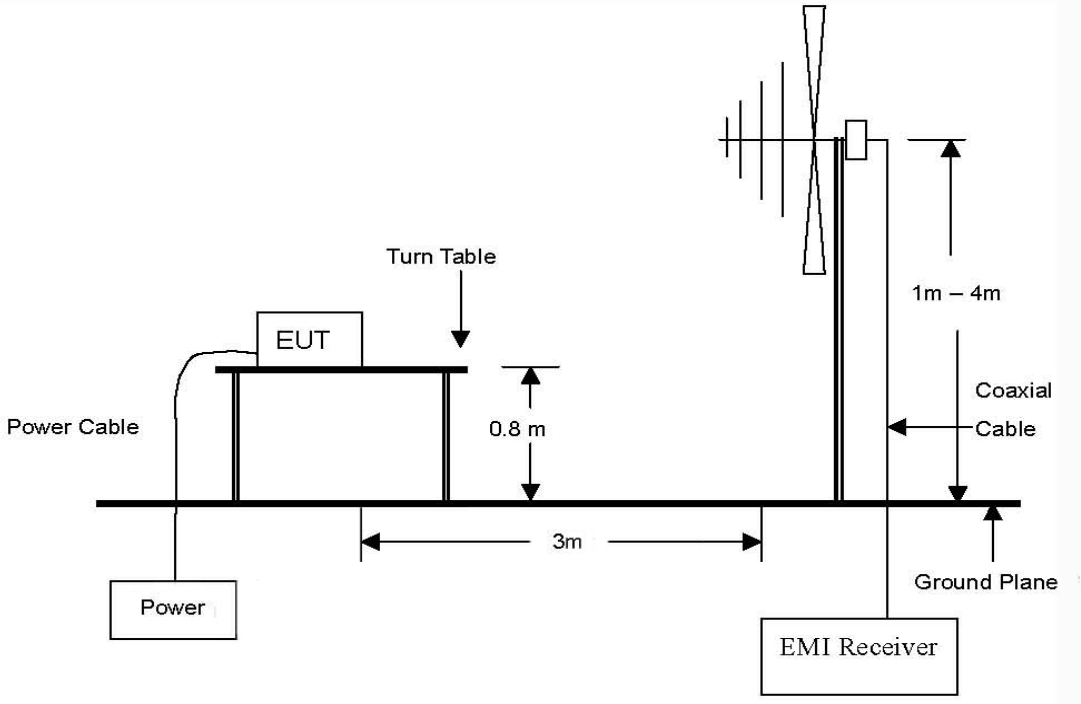
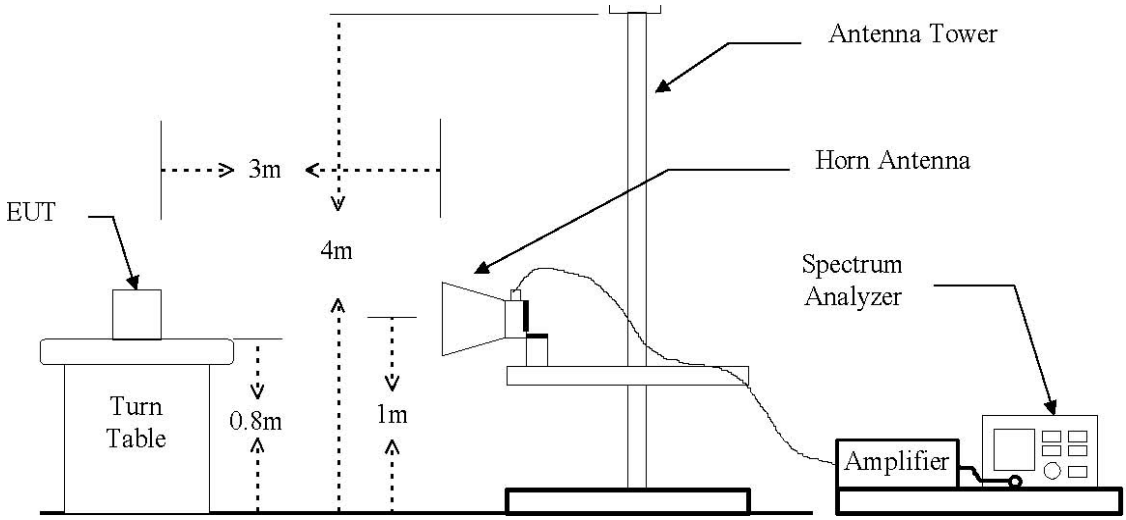
2. RF radiated output power & spurious radiated emission

2.1. Test setup

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



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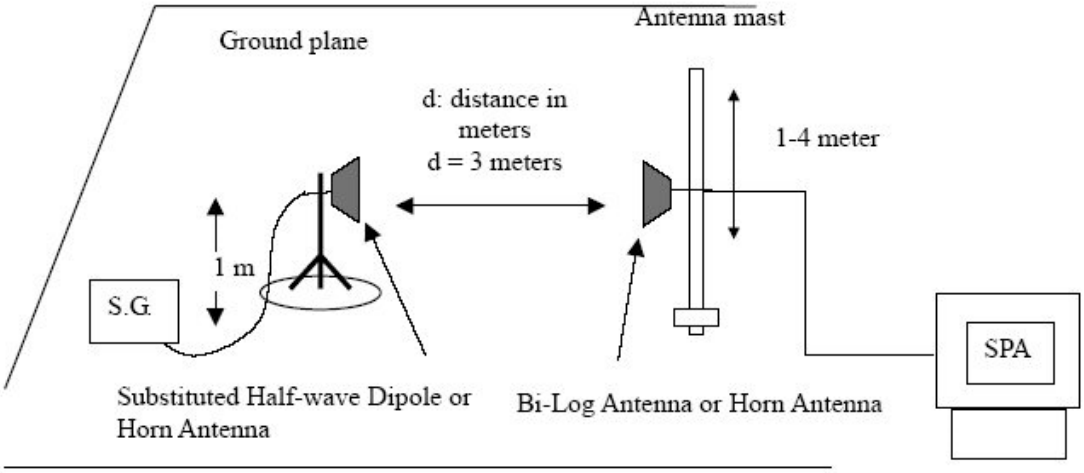
The diagram below shows the test setup for substituted method.



2.2. Limit

2.2.1. Limit of radiated output power

- §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.

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) ㏈.

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2.3. Test procedure: Based on ANSI/TIA 603E: 2016

1. On a test site, the EUT shall be placed at 80 cm 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 v03.
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 = Peak, trace mode = max hold, per the guidelines of KDB 971168 D01 v03.
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. The EUT was replaced by half-wave dipole (1 ㎓ below) or horn antenna (1 ㎓ above) connected to a signal generator.
12. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring received, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

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2.4. Test result for RF radiated output power

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

GSM 850

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P.	
					(dB m)	(㎽)
824.2	H	31.99	3.24	-4.85	23.90	245.47
824.2	V	27.69	3.24	-4.85	19.60	91.20
836.6	H	32.71	3.45	-5.14	24.12	258.23
836.6	V	32.05	3.45	-5.14	23.46	221.82
848.8	H	32.89	3.52	-4.05	25.32	340.41
848.8	V	30.13	3.52	-4.05	22.56	180.30

GSM 850 EDGE

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P.	
					(dB m)	(㎽)
824.2	H	25.71	3.24	-4.85	17.62	57.81
824.2	V	21.80	3.24	-4.85	13.71	23.50
836.6	H	26.11	3.45	-5.14	17.52	56.49
836.6	V	25.36	3.45	-5.14	16.77	47.53
848.8	H	26.14	3.52	-4.05	18.57	71.94
848.8	V	23.44	3.52	-4.05	15.87	38.64

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GSM 1900

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (㏈ m)	Cable loss (㏈)	Ant. gain (㏈ i)	E.I.R.P.	
					(㏈ m)	(㎽)
1 850.2	H	11.65	4.33	8.53	15.85	38.46
1 850.2	V	22.34	4.33	8.53	26.54	450.82
1 880.0	H	14.23	4.34	8.63	18.52	71.12
1 880.0	V	20.36	4.34	8.63	24.65	291.74
1 909.8	H	14.00	4.36	8.59	18.23	66.53
1 909.8	V	20.65	4.36	8.59	24.88	307.61

GSM 1900 EDGE

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (㏈ m)	Cable loss (㏈)	Ant. gain (㏈ i)	E.I.R.P.	
					(㏈ m)	(㎽)
1 850.2	H	4.90	4.33	8.53	9.10	8.13
1 850.2	V	15.25	4.33	8.53	19.45	88.10
1 880.0	H	7.22	4.34	8.63	11.51	14.16
1 880.0	V	13.43	4.34	8.63	17.72	59.16
1 909.8	H	7.23	4.36	8.59	11.46	14.00
1 909.8	V	13.78	4.36	8.59	18.01	63.24

Remark:

1. E.R.P. & E.I.R.P. = [S.G level + Amp.] (㏈ m) - Cable loss (㏈) + Ant. gain (㏈ d/㏈ i)

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2.5. Spurious radiated emission

- Measured output Power : 25.32 ㎧m = 0.340 4 W
- Modulation Signal : GSM 850
- Distance : 3 meters
- Limit : 43 + 10log$_{10}$(W) = 38.32 ㎧c

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (㎧m)	Cable loss (㎧)	Ant. gain (㎧d)	E.R.P. (㎧m)	Limit (㎧m)	Margin (㎧)
Low Channel (824.2 ㎒)							
1 648.36	H	-63.46	4.01	5.99	-61.48	-13.00	-48.48
1 648.56	V	-62.98	4.01	5.99	-61.00	-13.00	-48.00
Middle Channel (836.6 ㎒)							
1 673.64	H	-63.46	4.06	6.18	-61.34	-13.00	-48.34
1 674.09	V	-60.17	4.06	6.18	-58.05	-13.00	-45.05
High Channel (848.8 ㎒)							
1 697.74	H	-63.57	4.12	6.36	-61.33	-13.00	-48.33
1 697.64	V	-63.09	4.11	6.36	-60.84	-13.00	-47.84

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- Measured output Power : 18.57 ㏈m = 0.071 9 W
- Modulation Signal : GSM 850 EDGE
- Distance : 3 meters
- Limit : 43 + 10log$_{10}$(W) = 31.57 ㏈c

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (㏈m)	Cable loss (㏈)	Ant. gain (㏈d)	E.R.P. (㏈m)	Limit (㏈m)	Margin (㏈)
Low Channel (824.2 ㎒)							
1 647.91	H	-64.31	4.80	7.02	-62.09	-13.00	-49.09
1 648.50	V	-66.48	4.80	7.02	-64.26	-13.00	-51.26
Middle Channel (836.6 ㎒)							
1 673.06	H	-62.71	4.82	6.97	-60.56	-13.00	-47.56
1 673.34	V	-66.89	4.82	6.97	-64.74	-13.00	-51.74
High Channel (848.8 ㎒)							
1 697.36	H	-62.81	4.87	6.88	-60.80	-13.00	-47.80
1 697.98	V	-66.76	4.87	6.88	-64.75	-13.00	-51.75

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- Measured output Power : 26.54 ㏈m = 0.450 8 W
- Modulation Signal : GSM 1 900
- Distance : 3 meters
- Limit : 43 + 10log$_{10}$(W) = 39.54 ㏈c

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (㏈m)	Cable loss (㏈)	Ant. gain (㏈i)	E.I.R.P. (㏈m)	Limit (㏈m)	Margin (㏈)
Low Channel (1 850.2 ㎒)							
9 250.98	H	-45.85	10.15	12.62	-43.38	-13.00	-30.38
9 251.06	V	-45.09	10.15	12.62	-42.62	-13.00	-29.62
Middle Channel (1 880.0 ㎒)							
9 400.04	H	-47.67	10.28	12.46	-45.49	-13.00	-32.49
9 400.32	V	-42.87	10.28	12.46	-40.69	-13.00	-27.69
High Channel (1 909.8 ㎒)							
9 549.14	H	-50.34	10.23	12.62	-47.95	-13.00	-34.95
9 548.88	V	-49.43	10.23	12.62	-47.04	-13.00	-34.04

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- Measured output Power : 19.45 ㏈m = 0.088 1 W
- Modulation Signal : GSM 1 900 EDGE
- Distance : 3 meters
- Limit : 43 + 10log$_{10}$(W) = 32.45 ㏈c

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (㏈m)	Cable loss (㏈)	Ant. gain (㏈i)	E.I.R.P. (㏈m)	Limit (㏈m)	Margin (㏈)
Low Channel (1 850.2 ㎒)							
9 251.02	H	-47.41	10.15	12.62	-44.94	-13.00	-31.94
9 251.32	V	-45.97	10.15	12.63	-43.49	-13.00	-30.49
Middle Channel (1 880.0 ㎒)							
9 400.14	H	-48.11	10.28	12.46	-45.93	-13.00	-32.93
9 400.44	V	-42.97	10.28	12.46	-40.79	-13.00	-27.79
High Channel (1 909.8 ㎒)							
9 548.64	H	-50.96	10.23	12.62	-48.57	-13.00	-35.57
9 548.62	V	-50.29	10.23	12.62	-47.90	-13.00	-34.90

Remark:

1. E.R.P. & E.I.R.P. = S.G level (㏈m) - Cable loss (㏈) + Ant. gain (㏈d/㏈i)

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3. Conducted Output Power

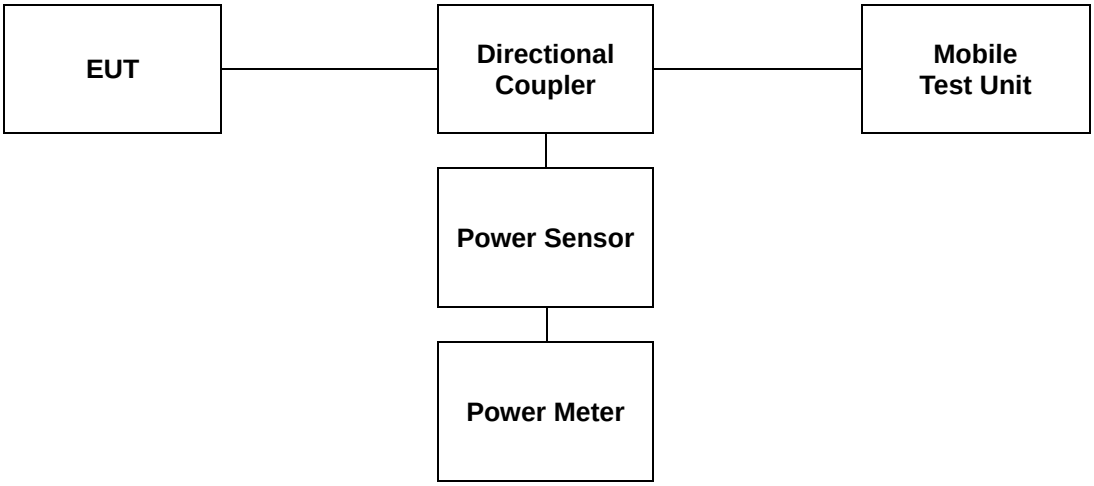
3.1. Limit

CFR 47, Section FCC §2.1046.

3.2. Test Procedure

Output power shall be measured at the RF output terminals for all configurations.

1. The RF output of the transmitter was connected to the input of the mobile test unit in order to establish communication with the EUT.
2. The EUT was set up for the max. output power with pseudo random data modulation by using mobile test unit parameters.
3. 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.



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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
			(dB m)	(dB m)	(dB m)	(dB m)	(dB m)
850	128	824.2	33.25	33.22	31.74	27.80	27.52
	190	836.6	33.26	33.20	31.63	27.55	27.33
	251	848.8	33.33	33.28	31.59	27.40	27.16
Band	**Channel**	**Frequency (㎒)**	**GSM**	**GPRS**		**EDGE**	
			Voice	**1 Tx slot**	**2 Tx slot**	**1 Tx slot**	**2 Tx slot**
			(dB m)	**(dB m)**	**(dB m)**	**(dB m)**	**(dB m)**
1 900	512	1 850.2	30.47	30.45	28.07	24.17	24.10
	661	1 880.0	30.30	30.31	28.04	24.36	24.08
	810	1 909.8	30.33	30.30	27.87	24.35	23.97

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4. Occupied Bandwidth 99 %

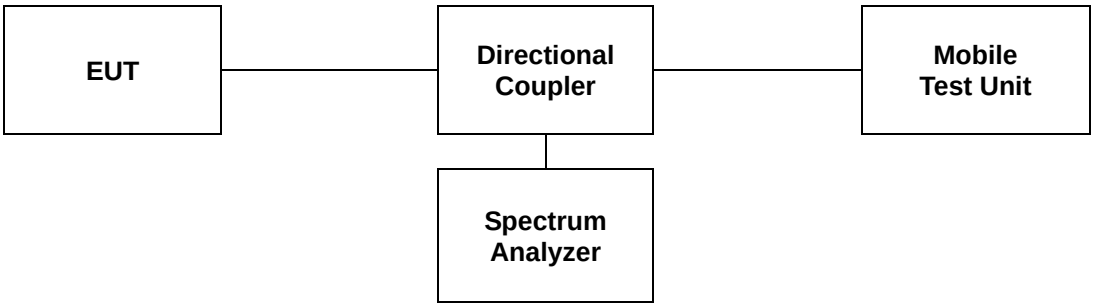
4.1. Limit

CFR 47, Section FCC §2.1049.

4.2. Test Procedure

The test follows section 4.3 of FCC KDB Publication 971168 D01 v03.

1. Set span = 2 – 5 x OBW.
2. Set resolution bandwidth (RBW) = 1 – 5 % of OBW.
3. Set video bandwidth (VBW) ≥ 3 x RBW.
4. Detector = Peak.
5. Trace mode = Max hold.
6. Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.



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4.3 Test Results

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

Band	Mode	Frequency (㎒)	Occupied Bandwidth (㎒)
850	Voice	824.2	0.244
		836.6	0.244
		848.8	0.241
	EDGE	824.2	0.237
		836.6	0.243
		848.8	0.236
1 900	Voice	1 850.2	0.246
		1 880.0	0.244
		1 909.8	0.242
	EDGE	1 850.2	0.235
		1 880.0	0.242
		1 909.8	0.243

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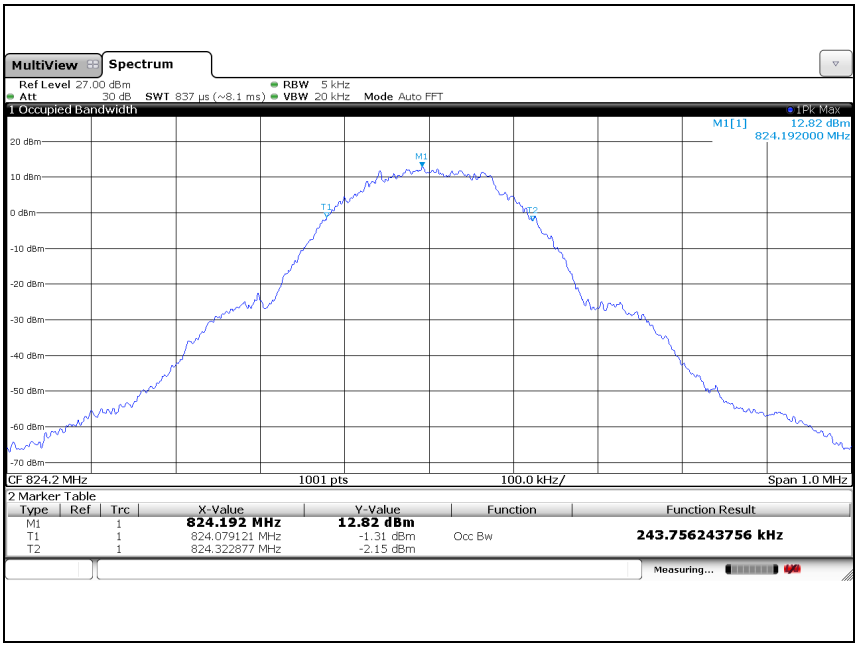
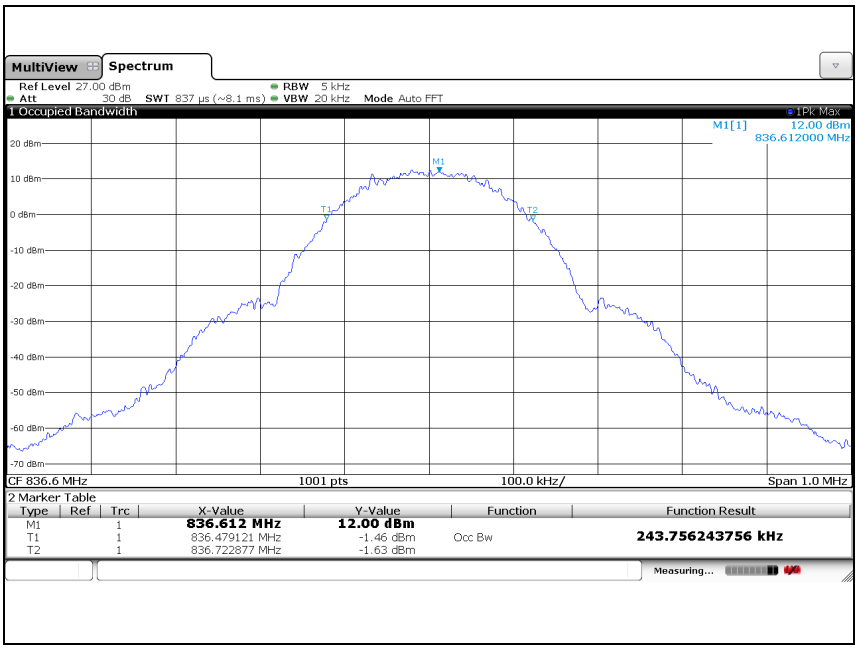
GSM 850

Low Channel



Middle Channel



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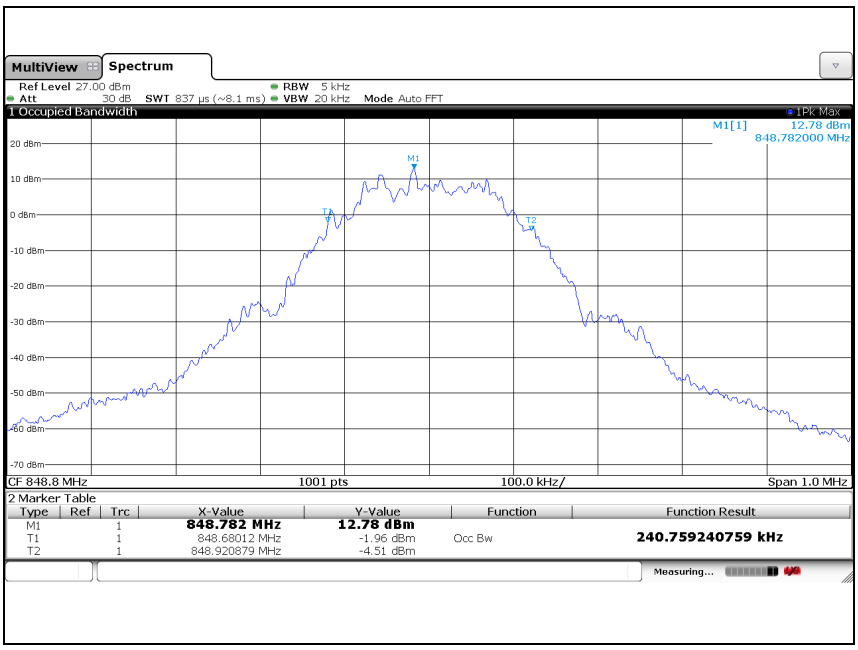
High Channel



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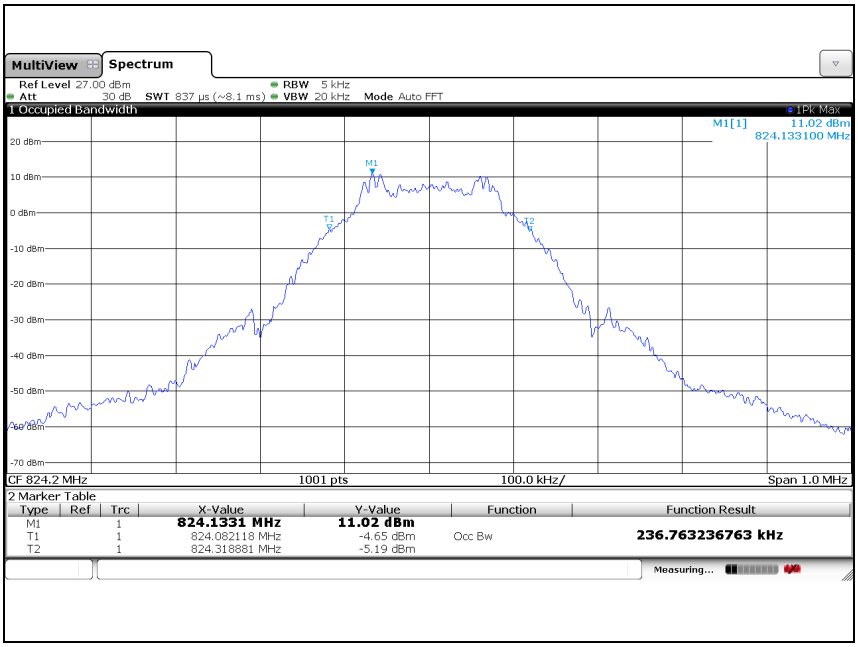
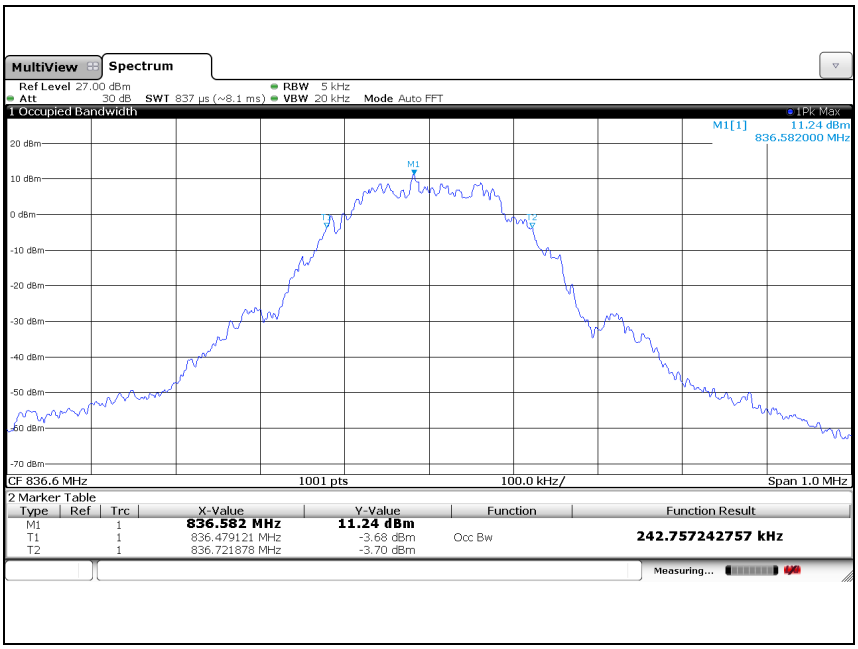
EDGE 850

Low Channel



Middle Channel



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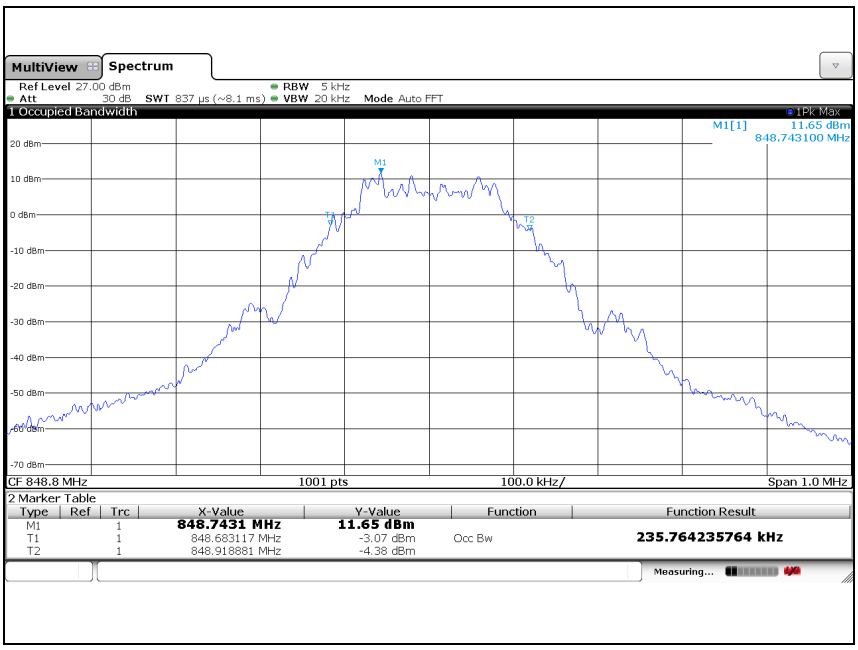
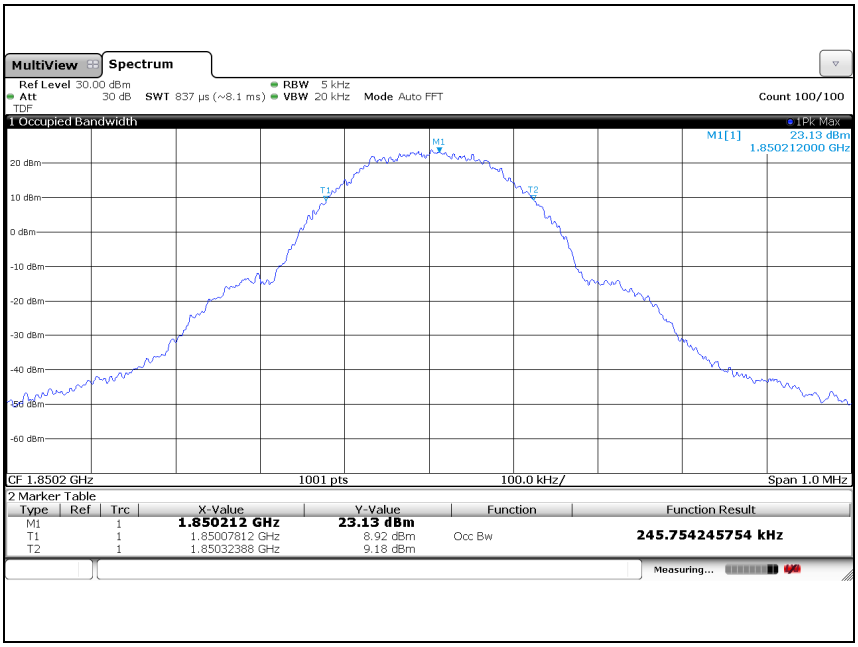
High Channel

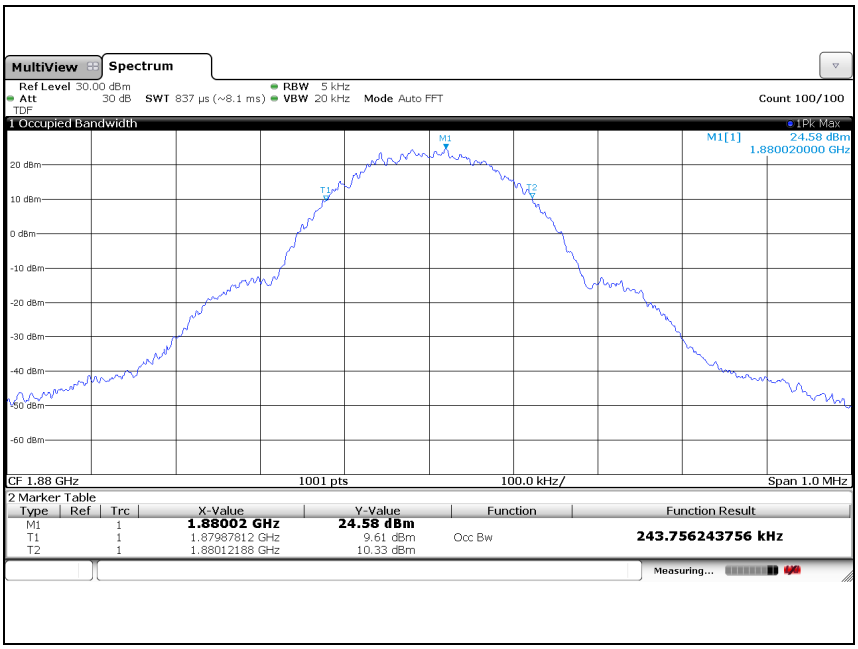


GSM 1 900

Low Channel



Middle Channel



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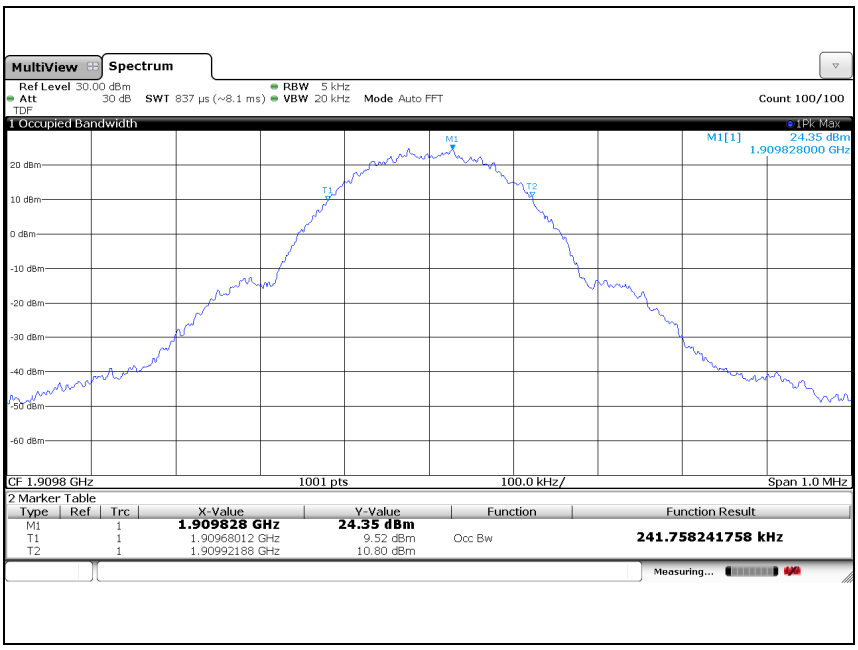
High Channel



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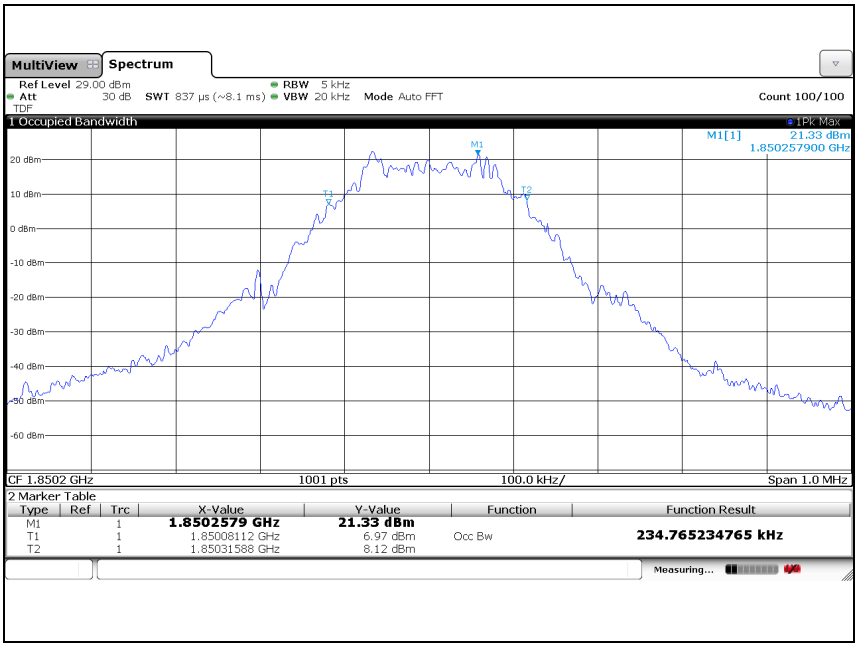
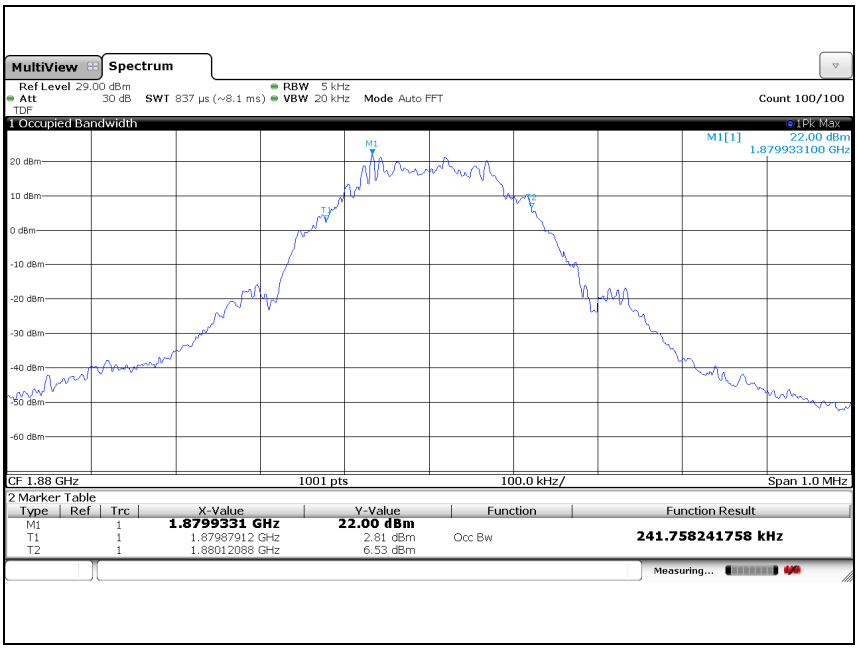
EDGE 1 900

Low Channel



Middle Channel



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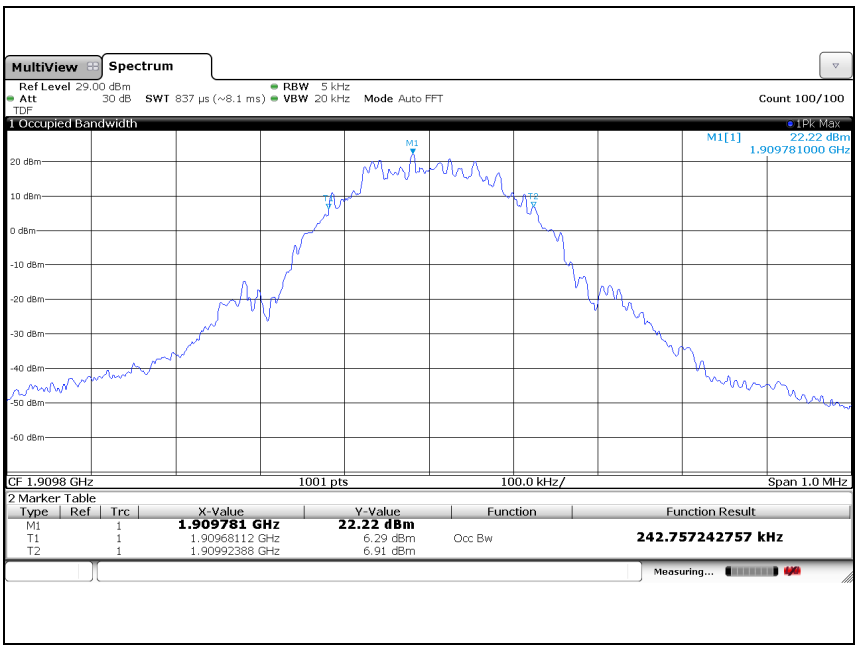
High Channel



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5. Peak-Average Ratio

5.1. Limit

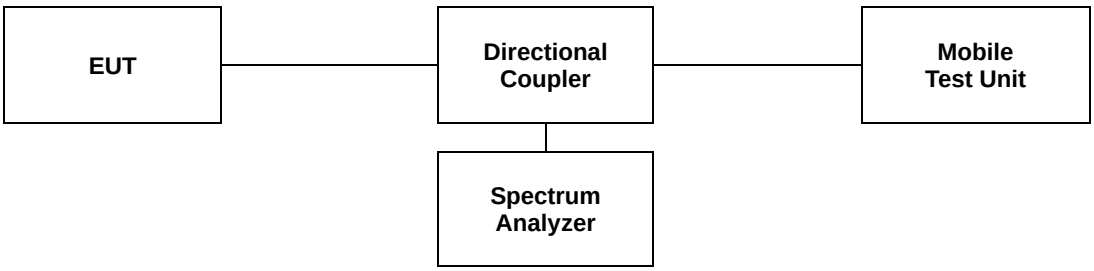
- §22.913(d) Measurement of the ERP of Cellular base transmitters and repeaters must be made using an average power measurement technique. The peak-to-average ratio (PAR) of the transmission must not exceed 13 ㎧.

- §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 ㎧.

5.2. Test Procedure

The test follows section 5.7.2 of FCC KDB Publication 971168 D01 v03.

1. Refer to the instruction manual of the instrument for details on how to use the power statistics/CCDF function.
2. Set resolution/measurement bandwidth ≥ OBW of the signal, or ≥ signal's occupied bandwidth.
3. Set the number of counts to a value that stabilizes the measured CCDF curve.
4. Set the measurement interval as follows:
   a) For continuous transmissions, set to [10 x (number of points in sweep) x (transmission symbol period)] or 1 ㎳.
   b) 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.
   c) If there are multiple carriers (i.e., multiple emission signals with specific associated necessary bandwidths) in a single antenna port, the peak power for that port shall be determined for each individual carrier by disabling the other carriers while measuring the required carrier, then the total peak power is calculated from the sum of the individual carrier peak powers.
5. Record the maximum PAPR level associated with a probability of 0.1 %.



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5.3 Test Results

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

Band	Mode	Frequency (㎒)	PAR (㏈)
850	Voice	824.2	1.28
		836.6	1.38
		848.8	1.36
	EDGE	824.2	5.51
		836.6	5.73
		848.8	5.97
1 900	Voice	1 850.2	2.77
		1 880.0	2.83
		1 909.8	2.80
	EDGE	1 850.2	8.38
		1 880.0	8.71
		1 909.8	8.74

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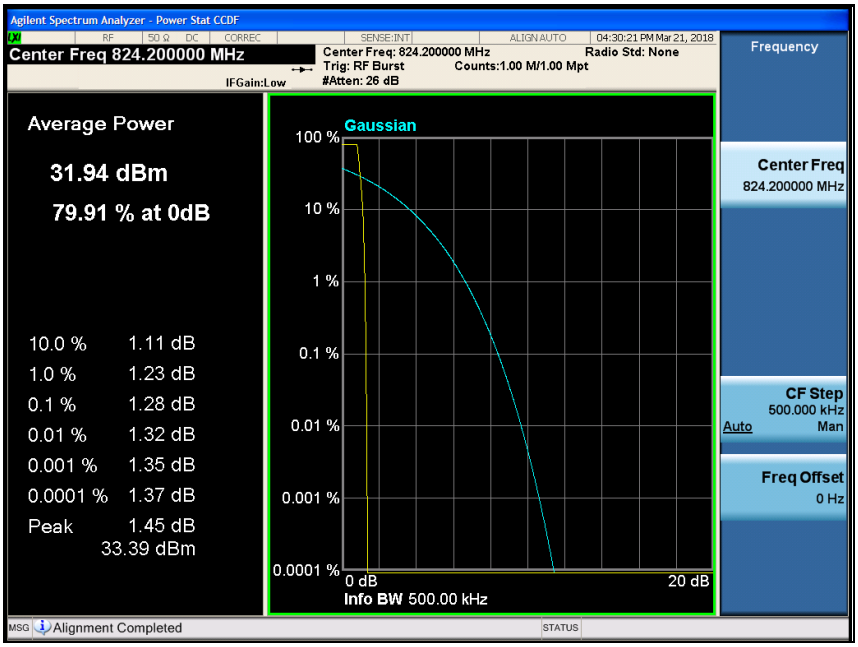
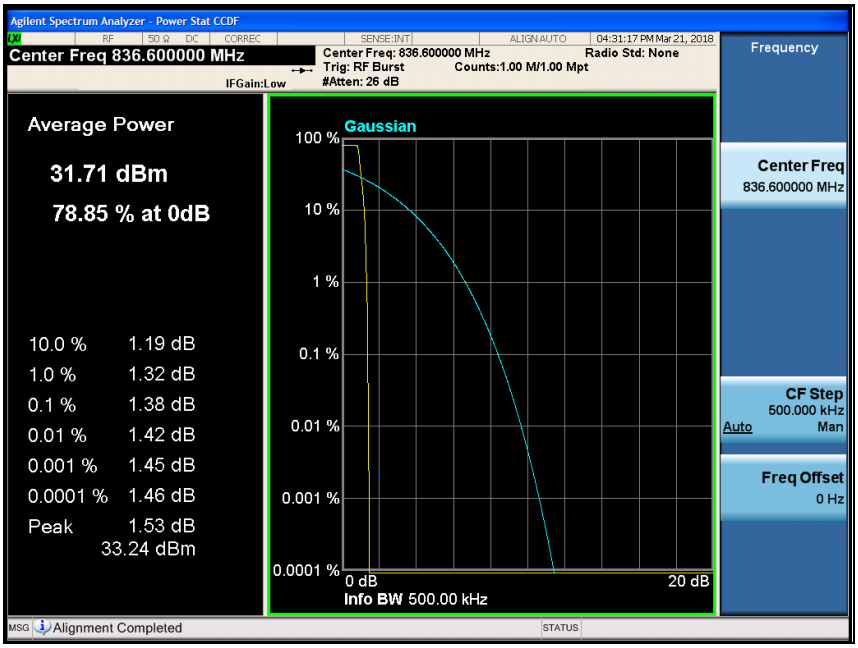
GSM 850

Low Channel



Middle Channel



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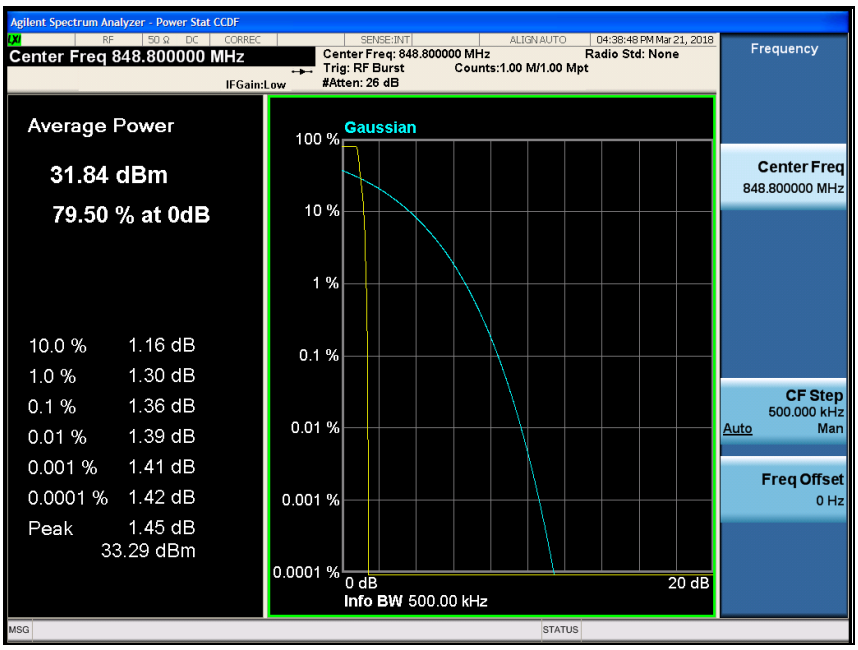
High Channel



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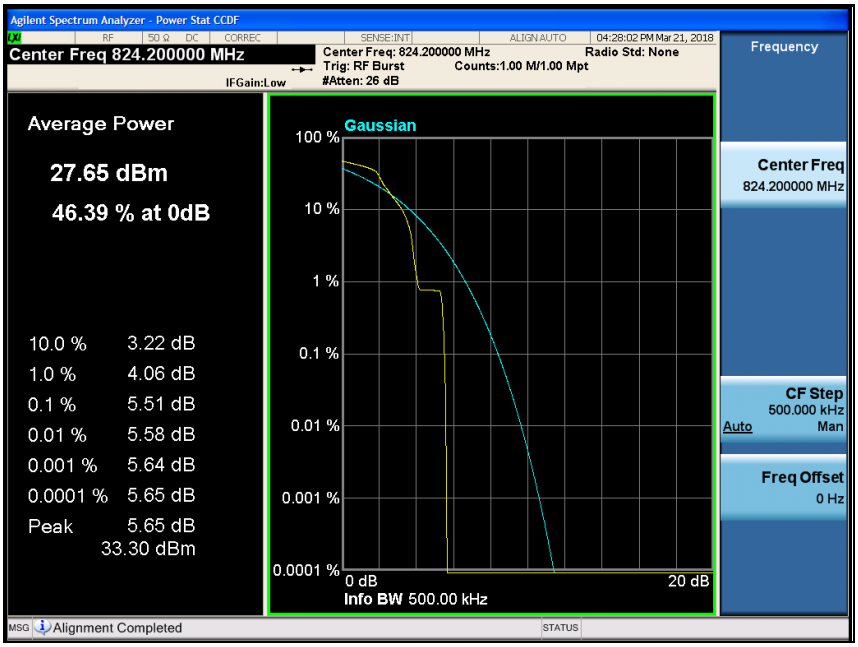
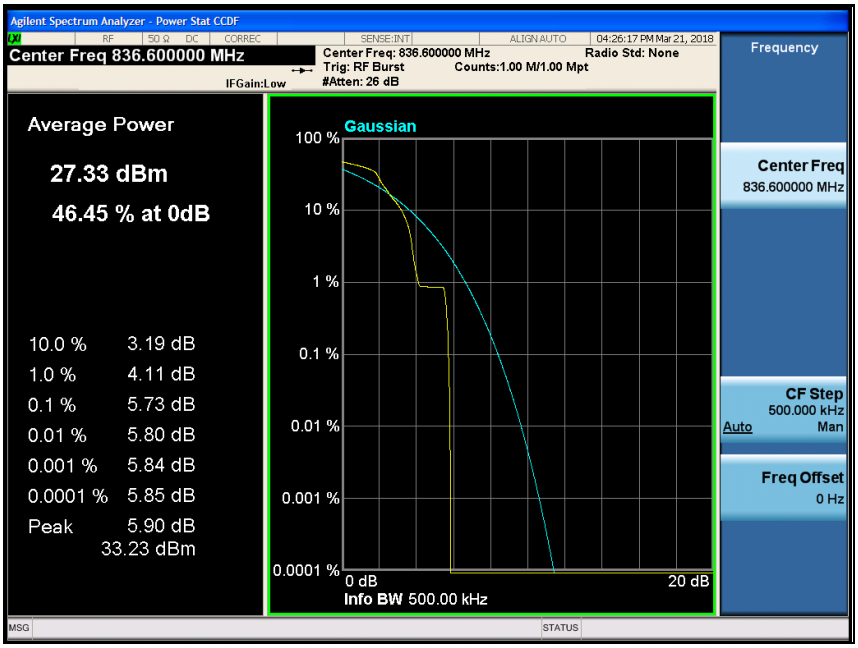
EDGE 850

Low Channel



Middle Channel



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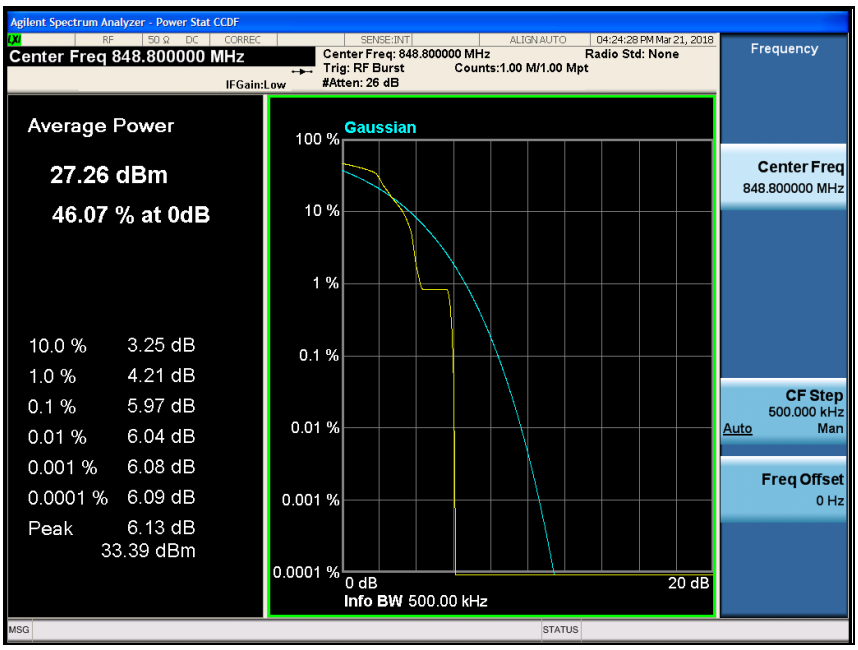
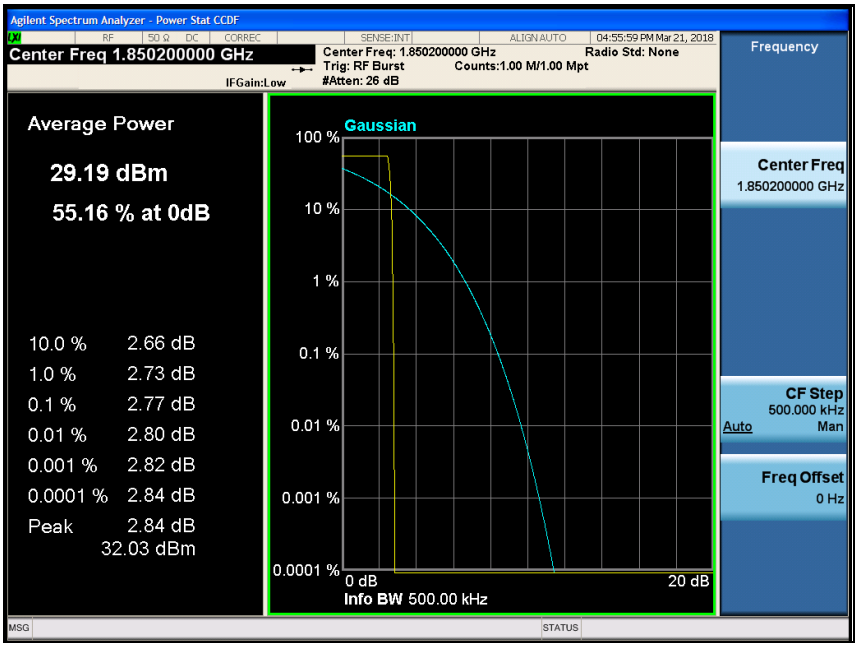
High Channel

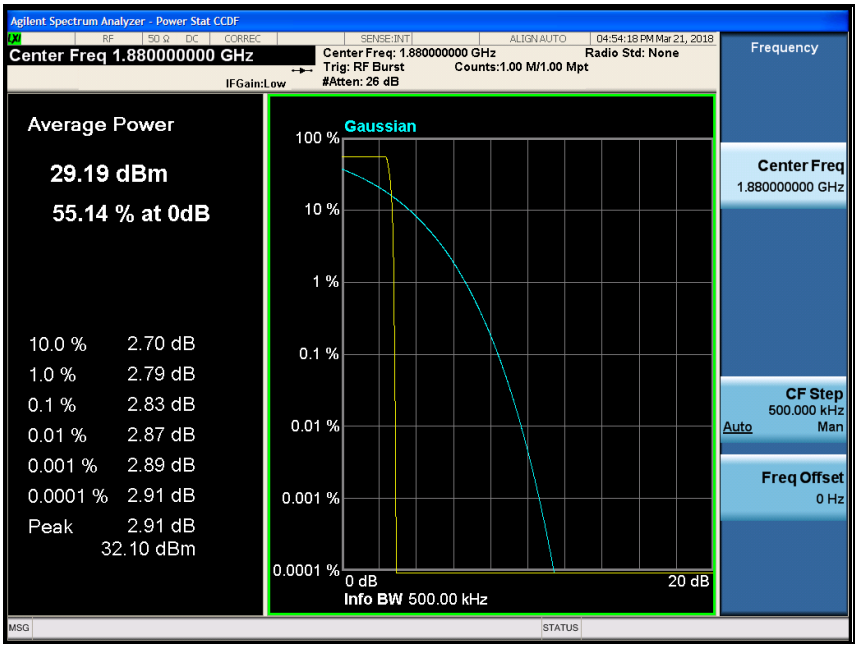


GSM 1 900

Low Channel



Middle Channel



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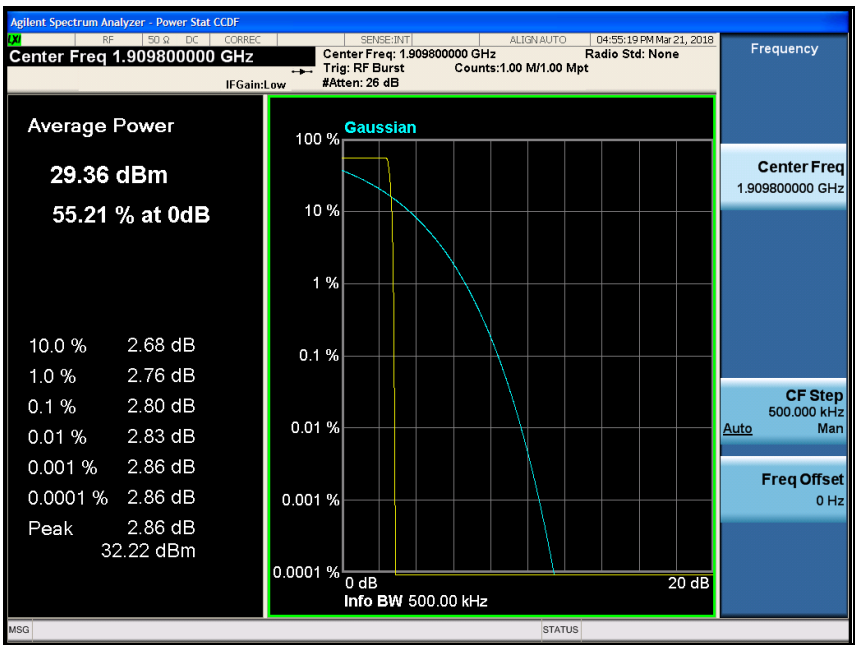
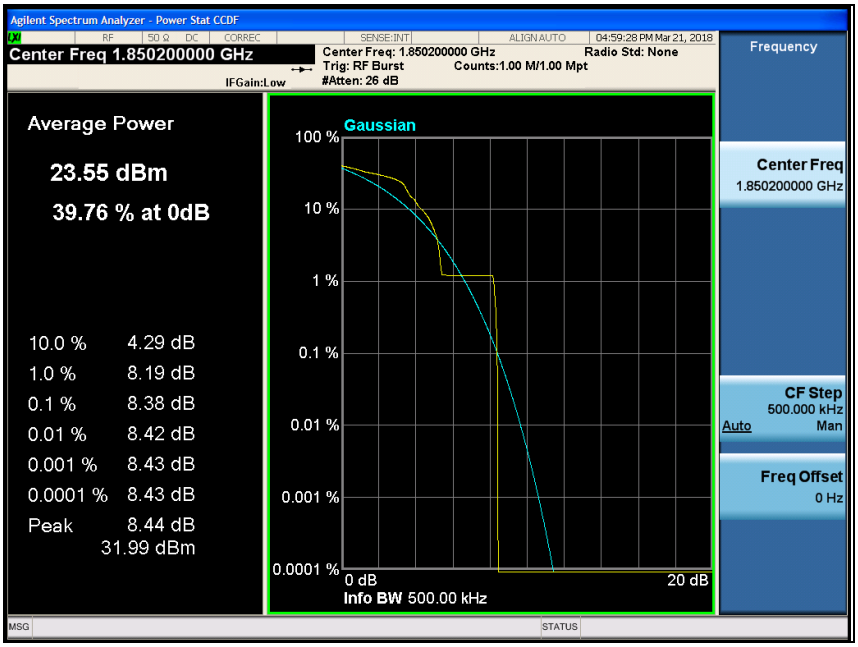
High Channel

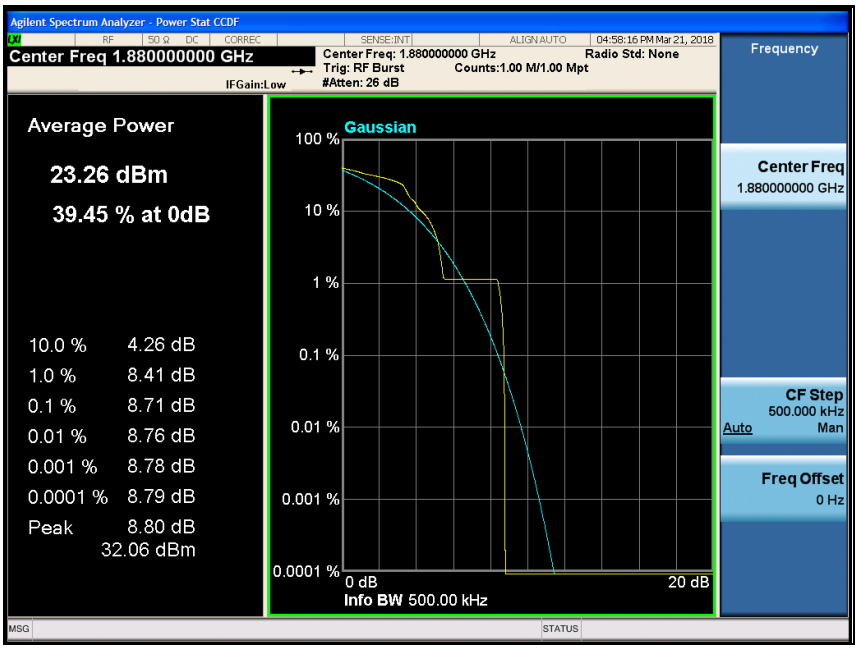


EDGE 1 900

Low Channel



Middle Channel



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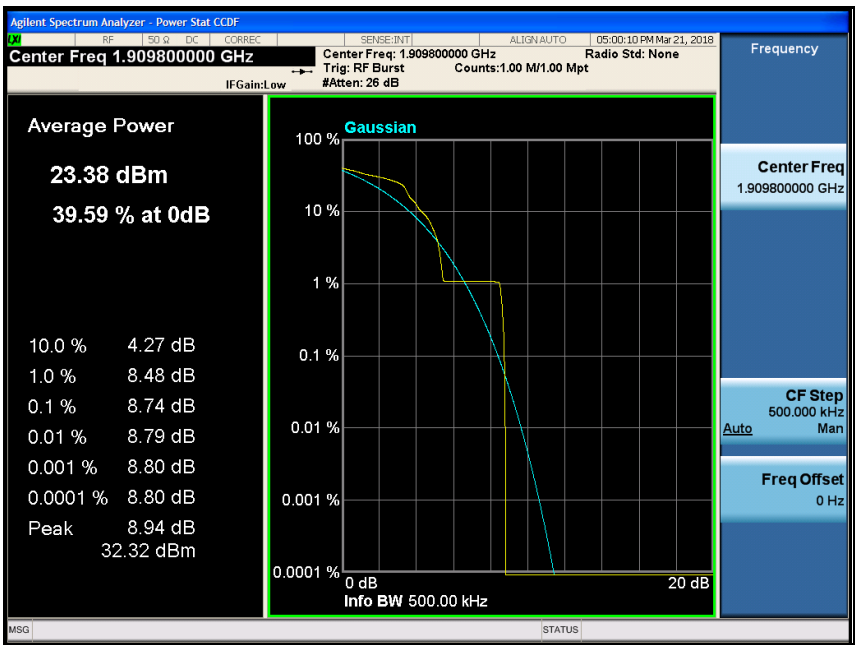
High Channel



6. Spurious Emissions at Antenna Terminal

6.1. Limit

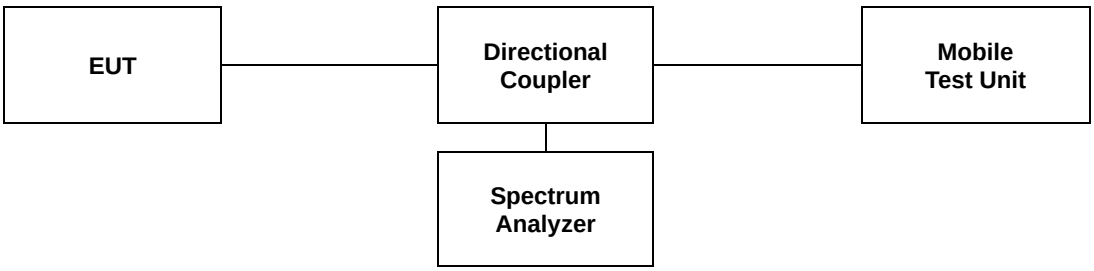
- §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) ㎧.

- §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) ㎧.

6.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168 D01 v03.

1. Start frequency was set to 30 ㎒ 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 30 ㎒ to 19.5 ㎓, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as TDF function.



Notes;

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.

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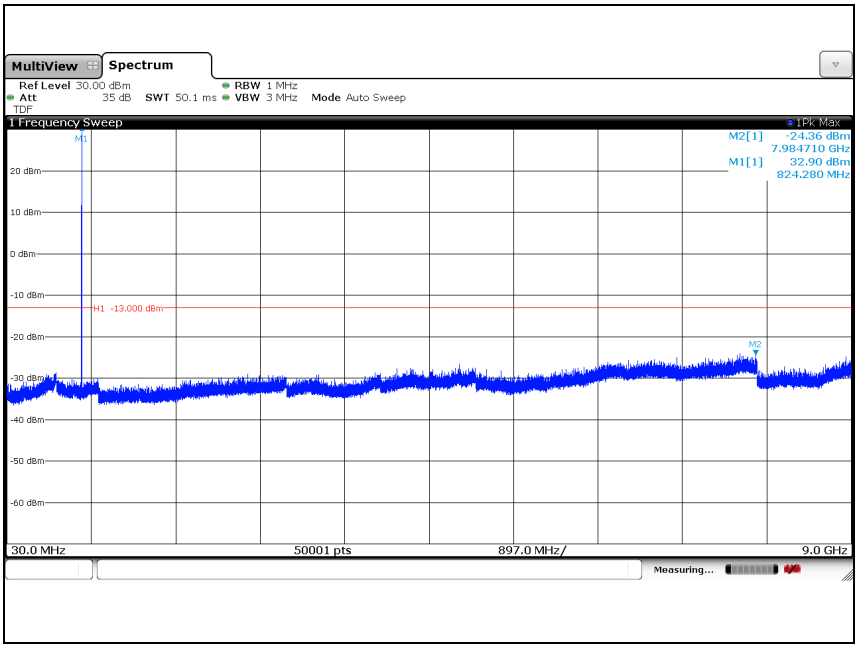
6.3. Test Results

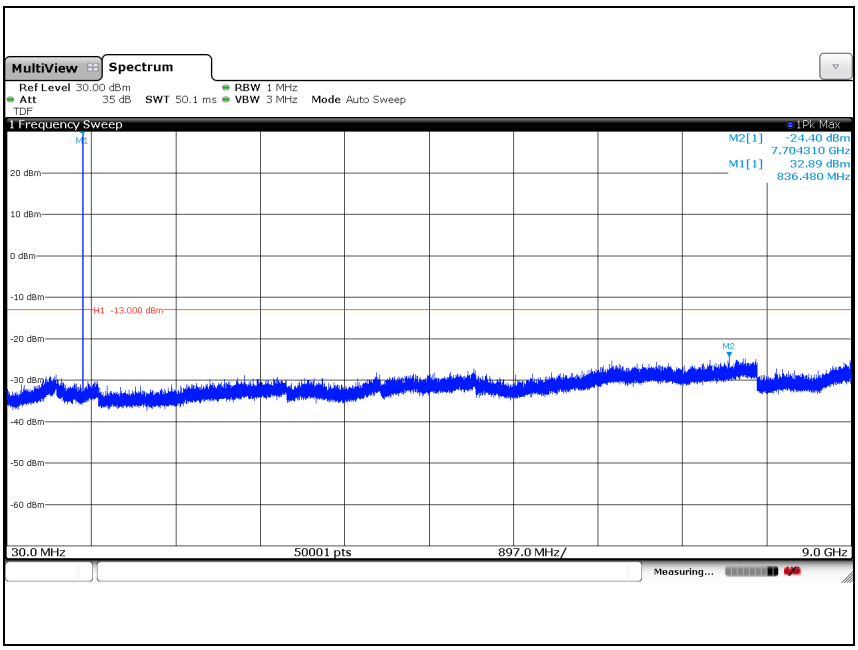
Ambient temperature : (23 ± 1) ℃
Relative humidity : 47 % R.H.

Please refer to the following plots.

GSM 850
Low Channel



Middle Channel



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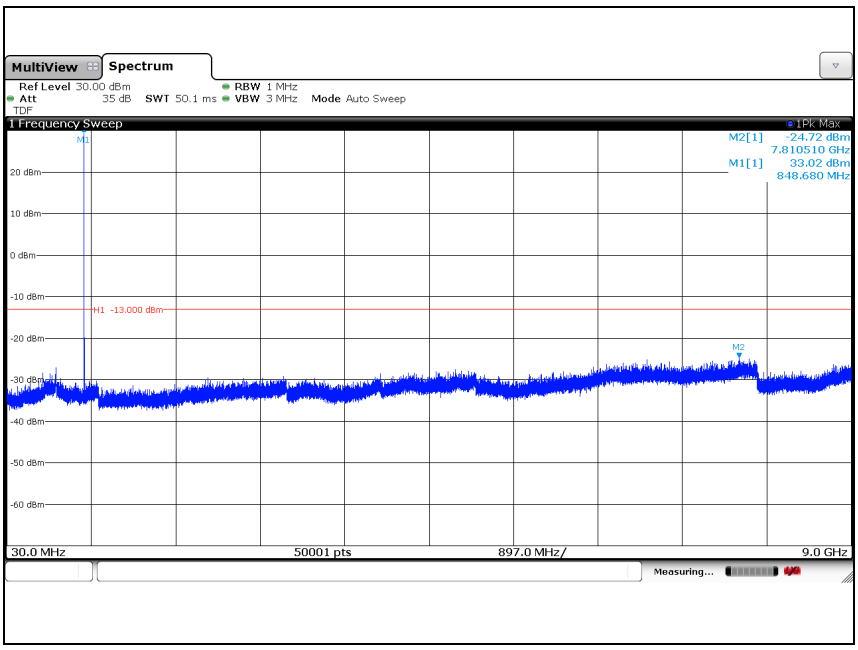
High Channel



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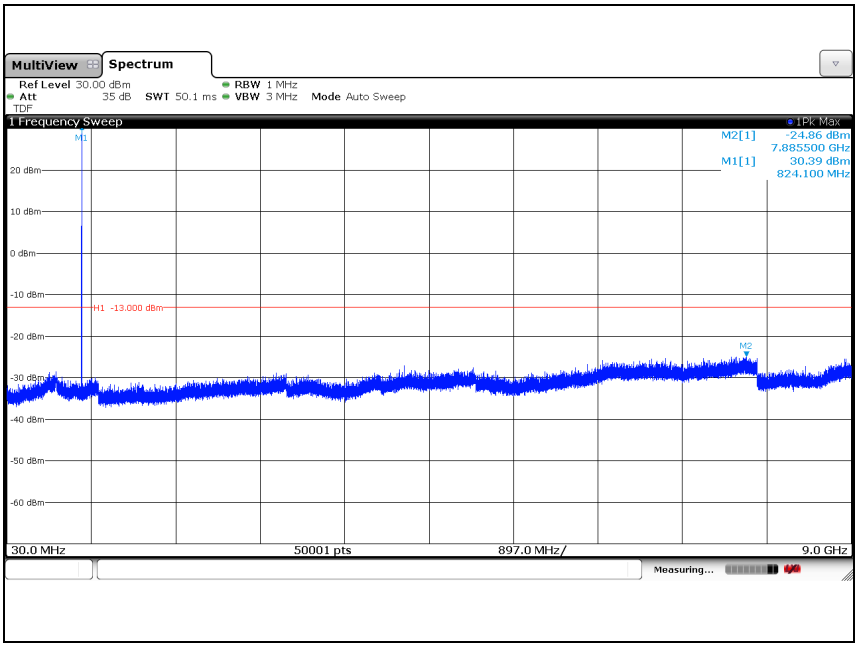
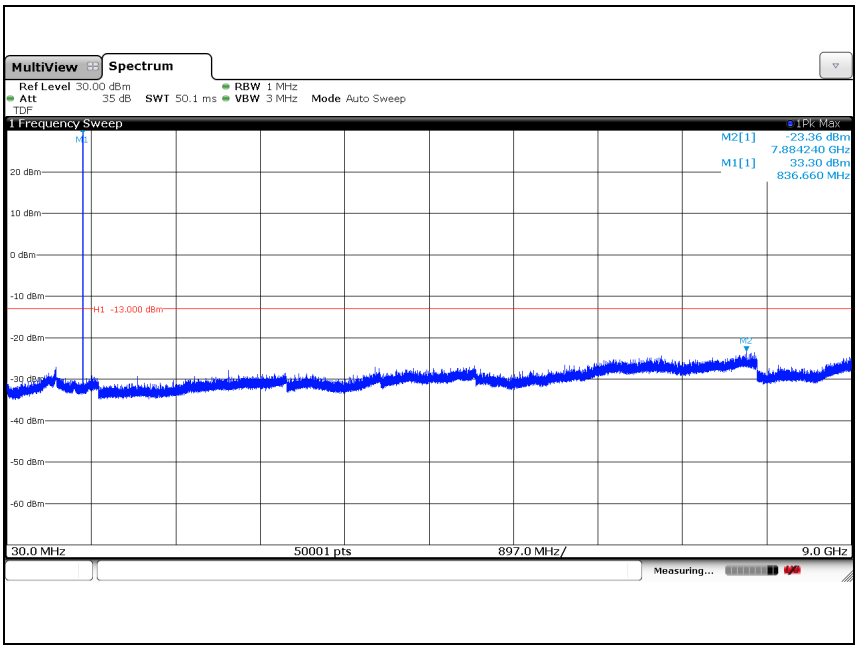
EDGE 850

Low Channel



Middle Channel



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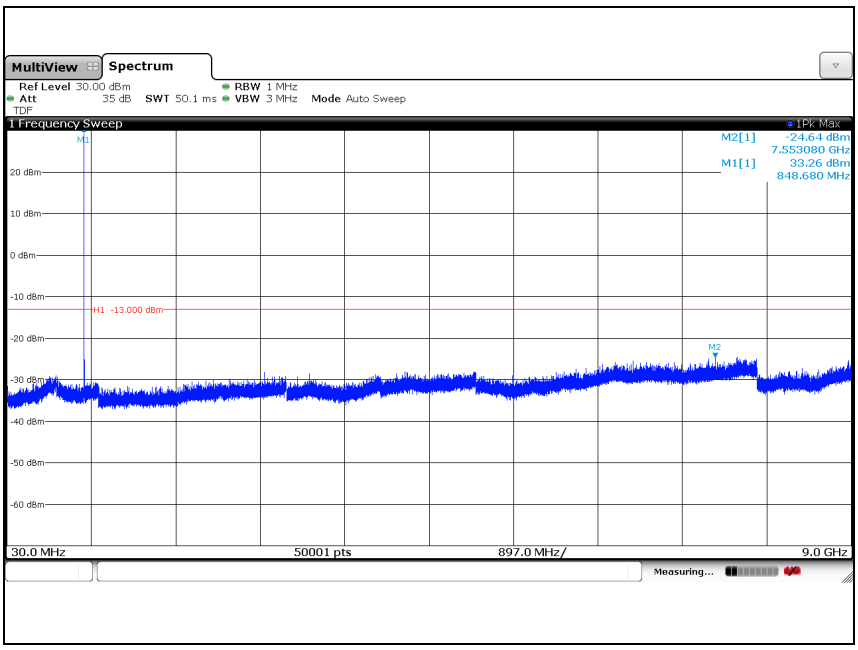
High Channel



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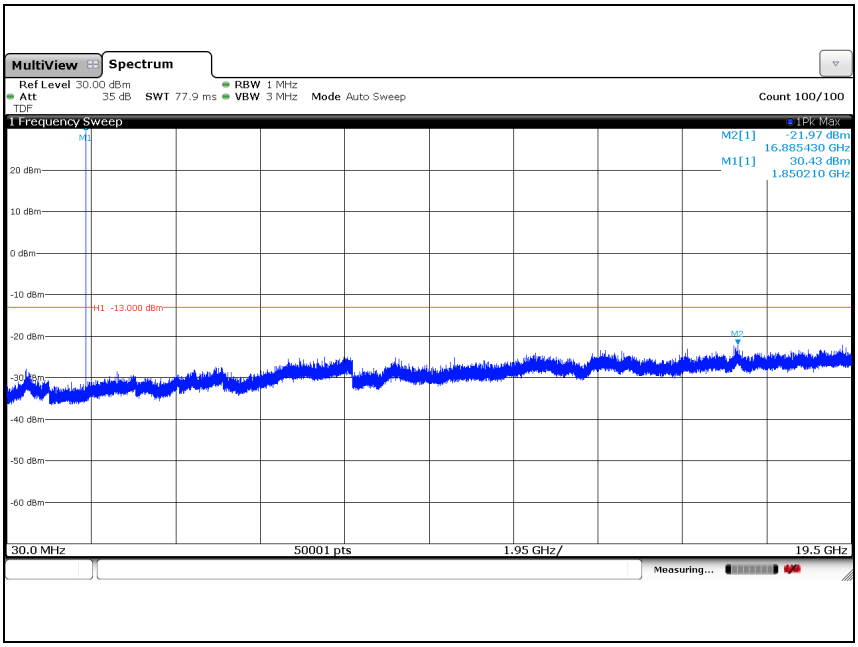
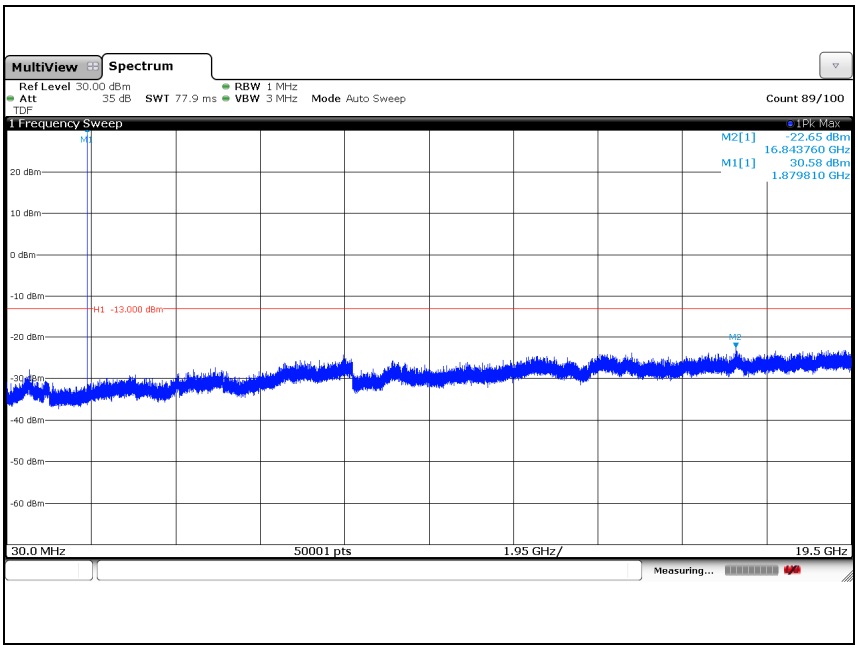
GSM 1 900

Low Channel



Middle Channel



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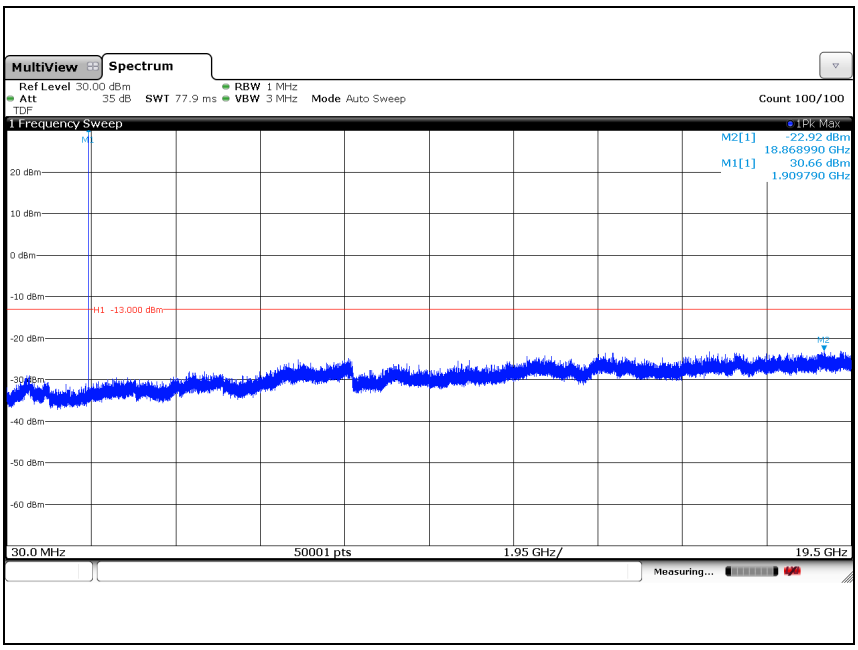
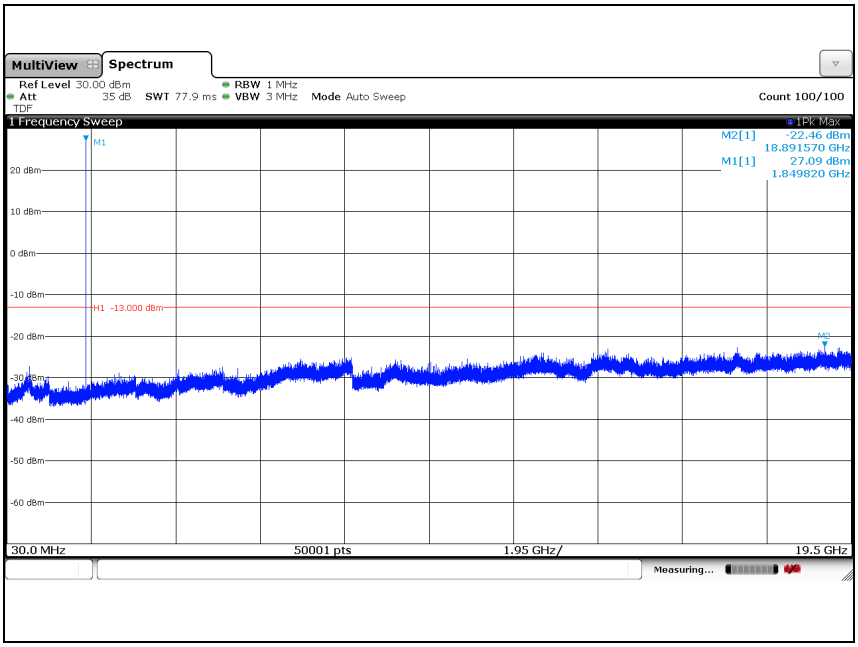
High Channel

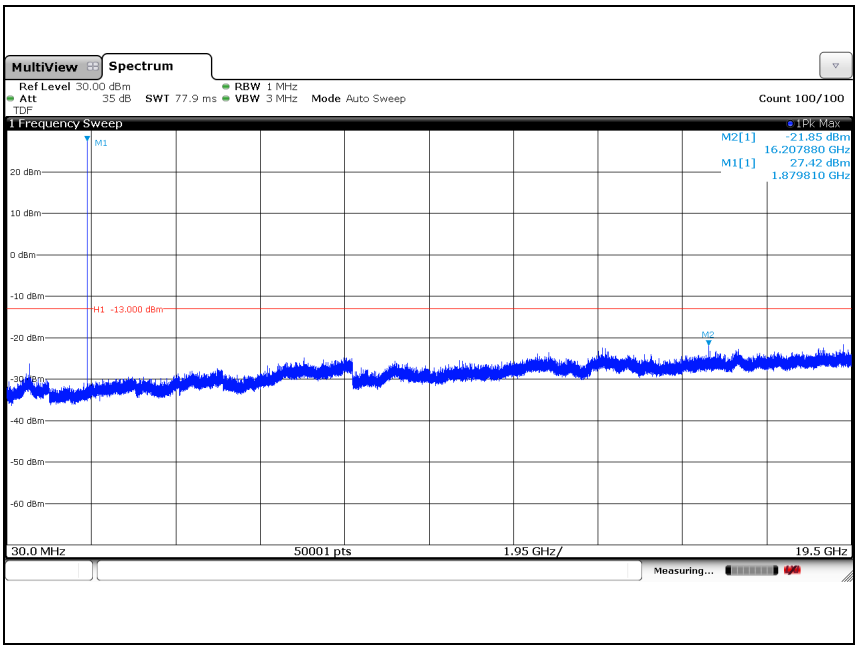


EDGE 1 900

Low Channel



Middle Channel



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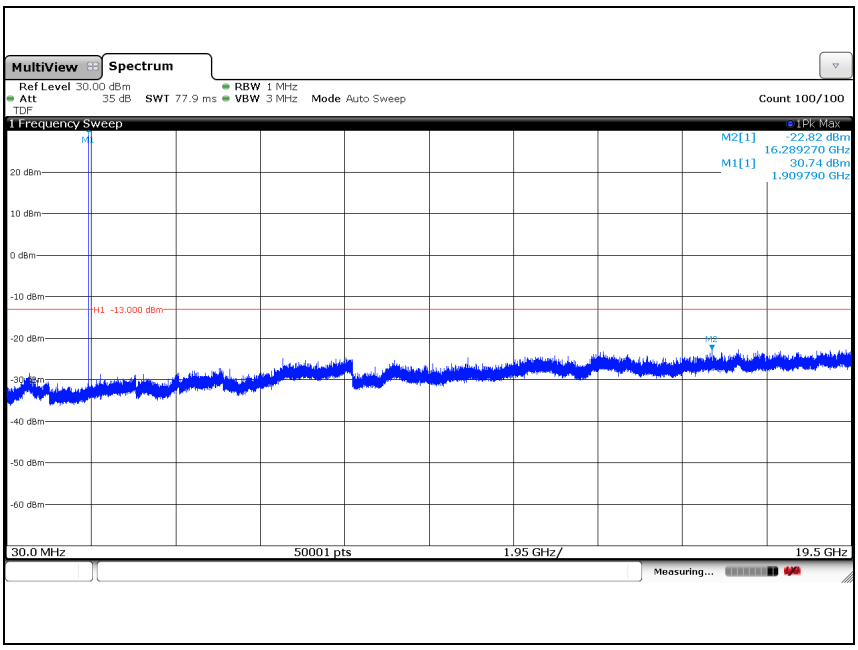
High Channel



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7. Band Edge

7.1. Limit

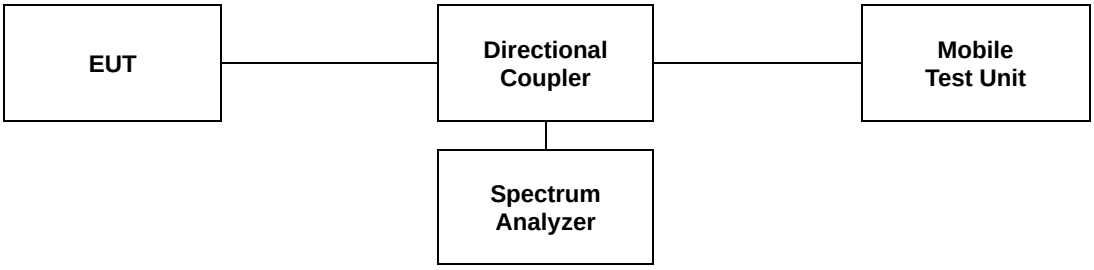
- §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) ㏈.

- §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) ㏈.

7.2. Test Procedure

The test follows section 6.0 of FCC KDB Publication 971168 D01 v03.

1. Span was set large enough so as to capture all out of band emissions near the band edge.
2. RBW ≥ 1 % of OBW
3. VBW ≥ 3 x RBW.
4. Detector = RMS.
5. Trace mode = Average.
6. Sweep time = 1s.
7. The trace was allowed to stabilize.
8. All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function.



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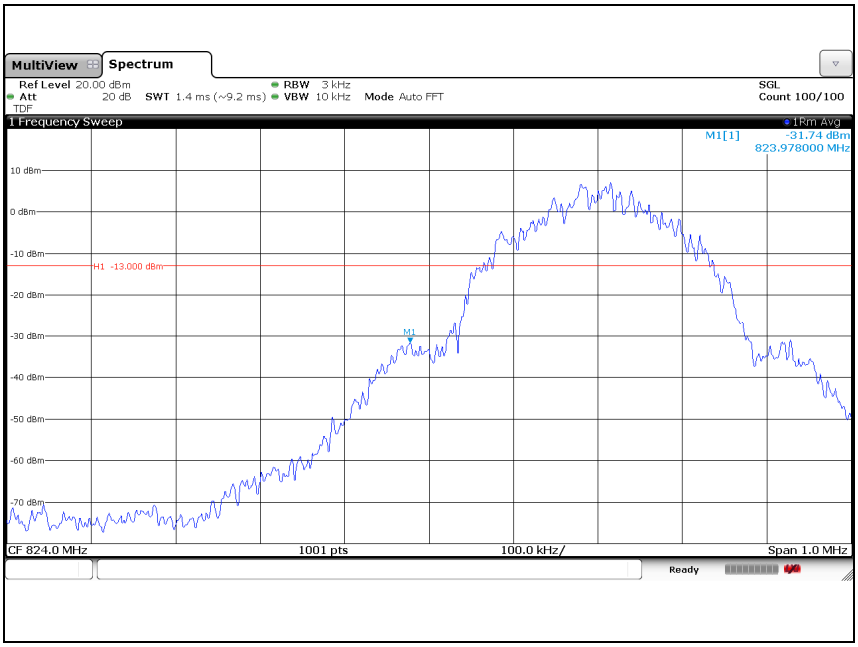
7.3. Test Results

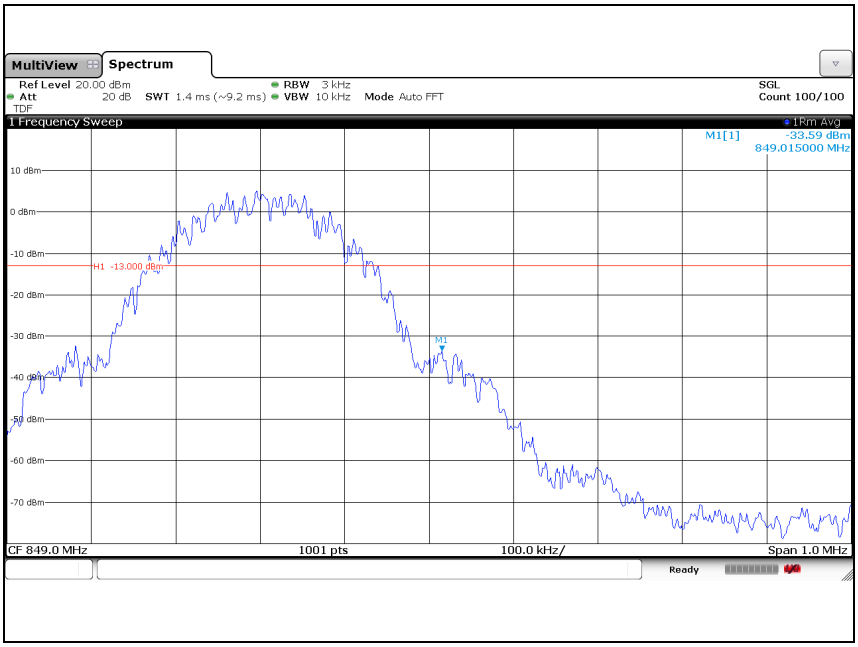
Ambient temperature	:	(23 ± 1) ℃
Relative humidity	:	47 % R.H.

Please refer to the following plots.

GSM 850
Low Channel



High Channel



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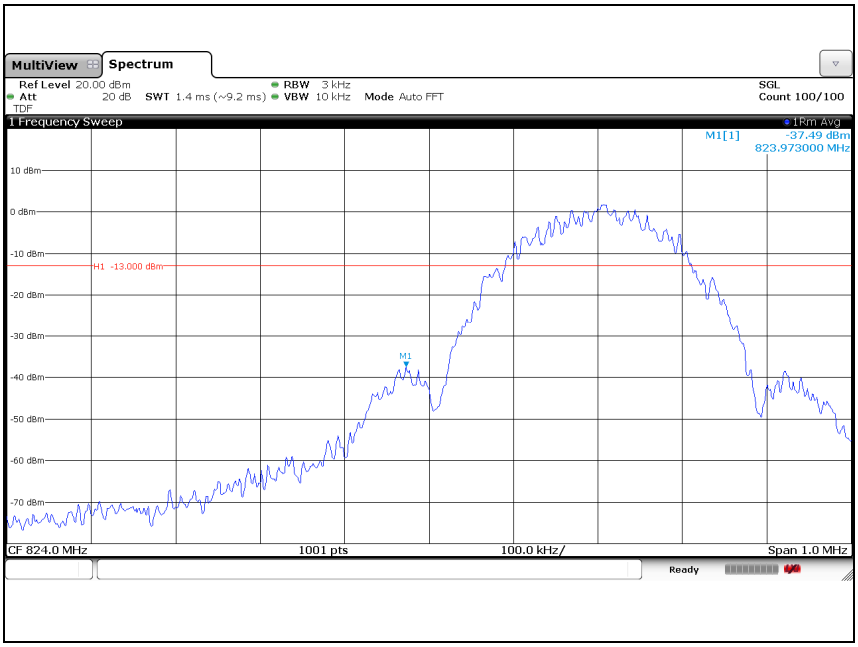
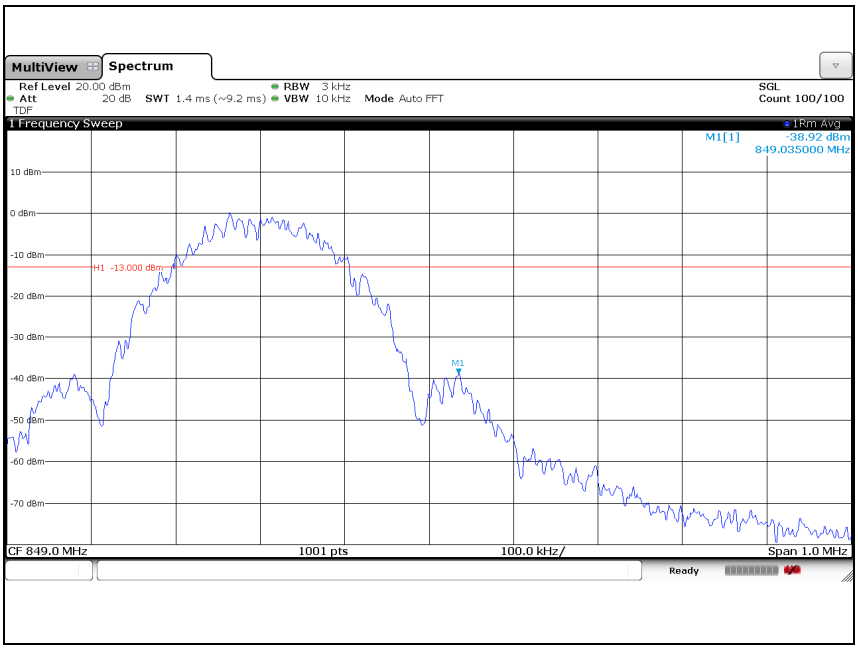
EDGE 850

Low Channel



High Channel



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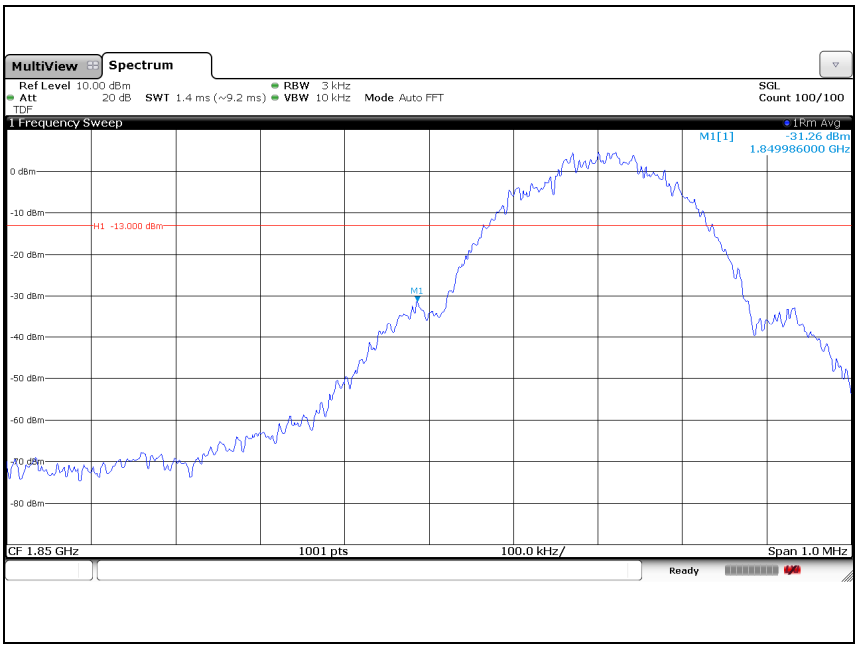
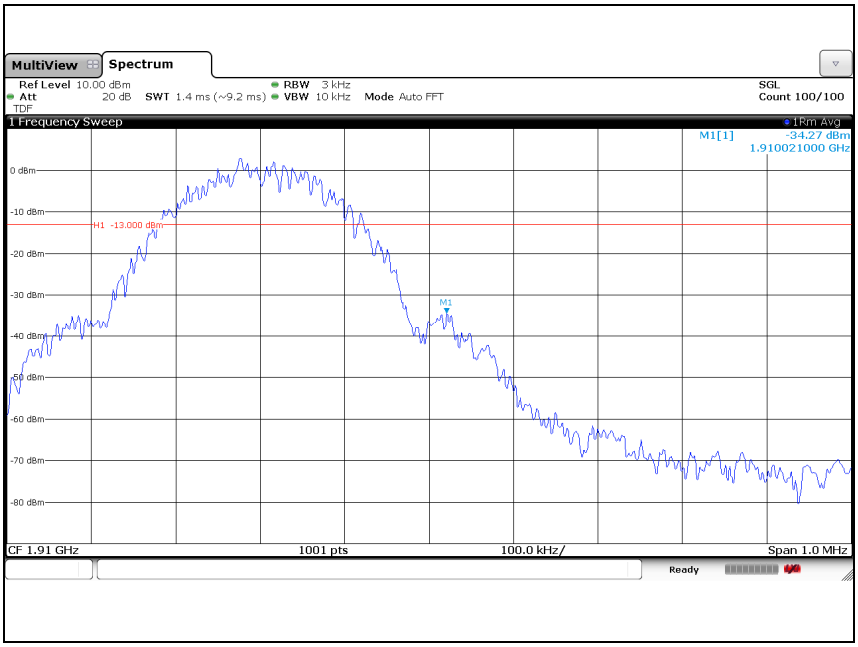
GSM 1 900

Low Channel



High Channel



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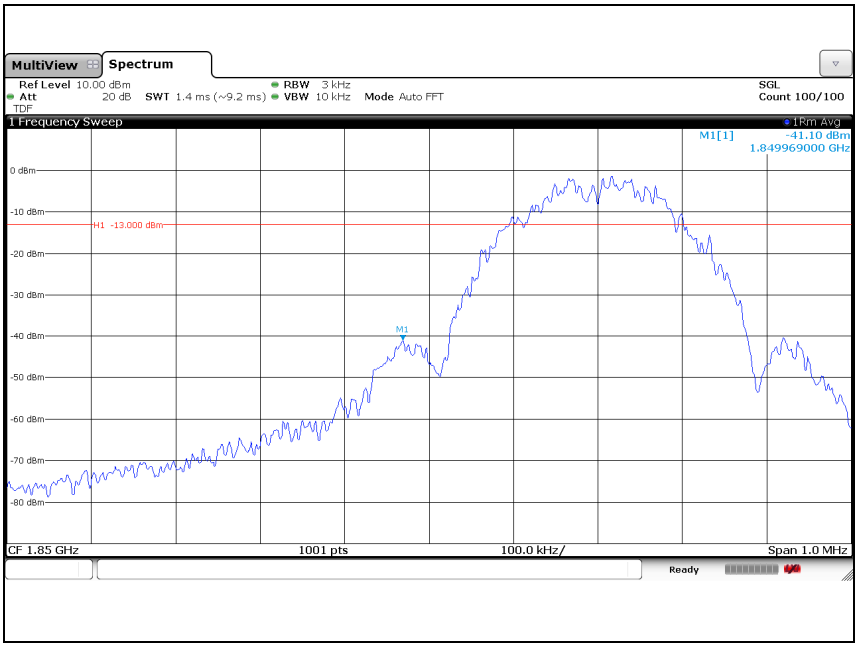
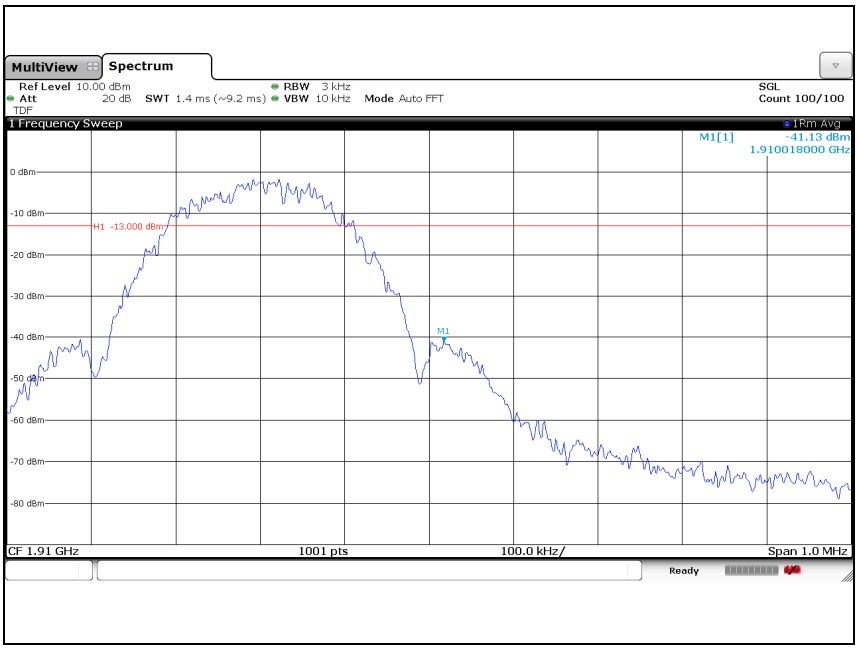
EDGE 1 900

Low Channel



High Channel



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8. Frequency Stability

8.1. Limit

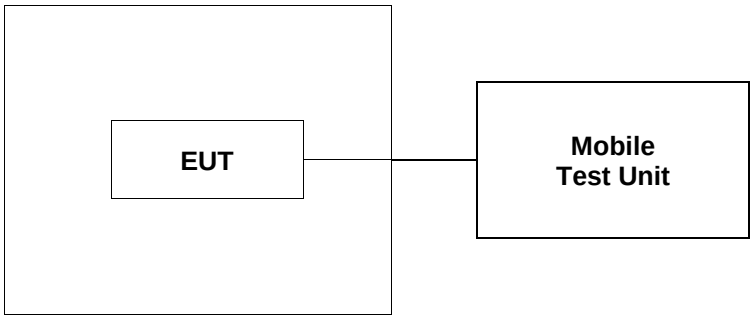
- § 2.1055 (a), § 2.1055 (d) & following:

- §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.

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.



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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	-0.006 0
40		-3	-0.003 6
30		3	0.003 6
23		7	0.008 4
10		5	0.006 0
0		7	0.008 4
-10		10	0.012 0
-20		-3	-0.003 6
-30		5	0.006 0
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	13.8	10	0.012 0
	10.2	5	0.006 0

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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	3	0.001 6
40		-4	-0.002 1
30		-2	-0.001 1
23		3	0.001 6
10		-5	-0.002 7
0		5	0.002 7
-10		3	0.001 6
-20		7	0.003 7
-30		-1	-0.000 5
Frequency Stability versus Power Supply			
Environment Temperature (℃)	**Power Supplied (V_{dc})**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
23	13.8	5	0.002 7
	10.2	-3	-0.001 6

- End of the Test Report -

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