

TEST REPORT

of

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

FCC ID: BEJTA4HEBW2

Equipment Under Test : Car Telematics Device
 Model Name : TA4HEB-W
 Variant Model Name(s) : TA4HEB-W2, TA4LEN-W, TA4LEN-W2
 Applicant : LG Electronics USA
 Manufacturer : LG Electronics Inc.
 Date of Receipt : 2020.11.16
 Date of Test(s) : 2021.01.13 ~ 2021.02.09
 Date of Issue : 2021.02.26

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

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- 2) The SGS Korea is not responsible for the sampling, the results of this test report apply to the sample as received.
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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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- 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, Dae-woong

Phone No. : +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	Car Telematics Device
Model Name	TA4HEB-W
Variant Model Names	TA4HEB-W2, TA4LEN-W, TA4LEN-W2
Power Supply	DC 12 V
Rated Power	WCDMA : 23 dBm GSM 850: 32 dBm GSM 1 900: 30 dBm
Frequency Range	WCDMA : 824 MHz ~ 849 MHz GSM 850: 824 MHz ~ 849 MHz GSM 1 900: 1 850 MHz ~ 1 910 MHz
Emission Designator	WCDMA : 4M14F9W (RMC) / 4M15F9W (HSDPA) GSM 850: 239KGXW (VOICE) / 247KG7W (EDGE) GSM 1 900: 239KGXW (VOICE) / 246KG7W (EDGE)
Modulation Technique	QPSK, 16QAM, GMSK, 8PSK
Antenna Type	External antenna
Antenna gain	824 MHz ~ 849 MHz: -0.69 dB i 1 850 MHz ~ 1 910 MHz: 0.85 dB i
H/W Version	Rev.D
S/W Version	V9.1.02

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Signal Generator	R&S	SMR40	100272	Jun. 18, 2020	Annual	Jun. 18, 2021
Signal Generator	R&S	SMBV100A	255834	Jun. 03, 2020	Annual	Jun. 03, 2021
Spectrum Analyzer	R&S	FSV30	103101	Jun. 01, 2020	Annual	Jun. 01, 2021
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 04, 2020	Annual	Sep. 04, 2021
Spectrum Analyzer	Agilent	N9030A	US51350132	Nov. 12, 2020	Annual	Nov. 12, 2021
Mobile Test Unit	R&S	CMW500	144034	Feb. 28, 2020	Annual	Feb. 28, 2021
Mobile Test Unit	Anritsu	MT8821C	6262192291	Oct. 08, 2020	Annual	Oct. 08, 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	Nov. 06, 2020	Annual	Nov. 06, 2021
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	MY53150029	Jun. 04, 2020	Annual	Jun. 04, 2021
Preamplifier	H.P.	8447F	2944A03909	Aug. 06, 2020	Annual	Aug. 06, 2021
Preamplifier	R&S	SCU 18	10117	Jun. 10, 2020	Annual	Jun. 10, 2021
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	May 08, 2020	Annual	May 08, 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	R&S	HF907	102270	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	MWX221-NMSNMS (4 m)	J1023142	Dec. 01, 2020	Semi-annual	Jun. 01, 2021
Coaxial Cable	RFONE	SFX086-NMNM-10M (10 m)	20200324001	Dec. 01, 2020	Semi-annual	Jun. 01, 2021
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 07/20	Aug. 21, 2020	Semi-annual	Feb. 21, 2021
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 10/20	Aug. 21, 2020	Semi-annual	Feb. 21, 2021
Coaxial Cable	Rosenberger	LA1-C006-1500	131014 11/20	Aug. 21, 2020	Semi-annual	Feb. 21, 2021

► Support Equipment

Description	Manufacturer	Model	Serial Number
N/A	-	-	-

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 2, 22 and 24		
Section	Test Item(s)	Result
§22.913(a)(5) §24.232(c)	E.R.P. / E.I.R.P.	Complied
§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
§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. 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 kHz to 30 MHz	H	± 3.66 dB
	V	± 3.66 dB
Radiated Emission, below 1 GHz	H	± 4.90 dB
	V	± 4.82 dB
Radiated Emission, above 1 GHz	H	± 3.62 dB
	V	± 3.64 dB

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-RTL001652	2021.02.09	Initial
1	F690501-RF-RTL001652-1	2021.02.26	Revise variant model name

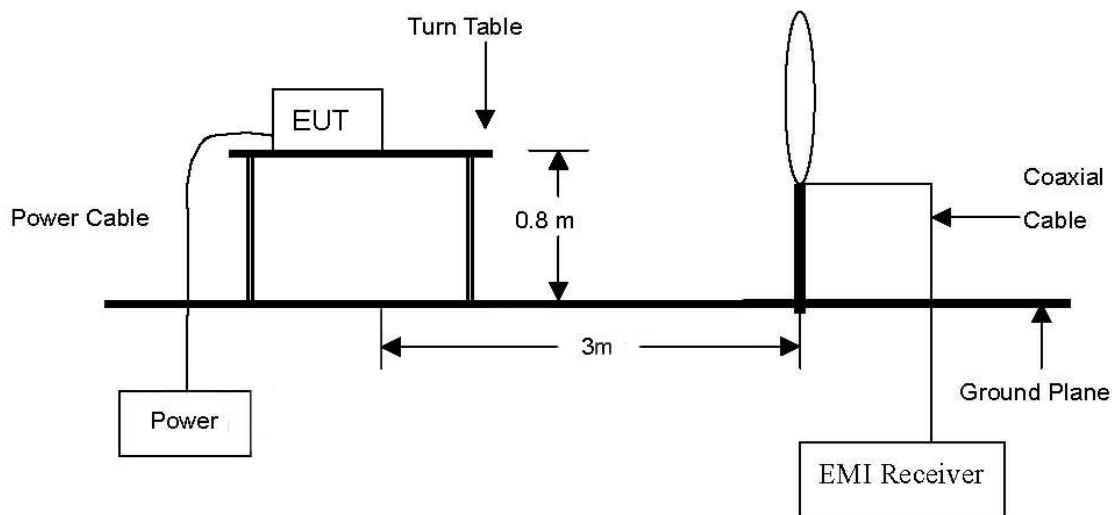
1.10. Information of Variant Models

Model Name	Information
TA4HEB-W	- Basic model
TA4LEN-W	- Same RF module and circuit to basic model, except below. - De-populated to Audio amp, DSP part - De-populated to BUB (Backup battery) part
TA4HEB-W2	- Same to basic model - Model name for Costa Rica, Thailand
TA4LEN-W2	- Same RF module and circuit to basic model, except below. - De-populated to Audio amp, DSP part - De-populated to BUB(Backup battery) part - Model name for Costa Rica, Thailand

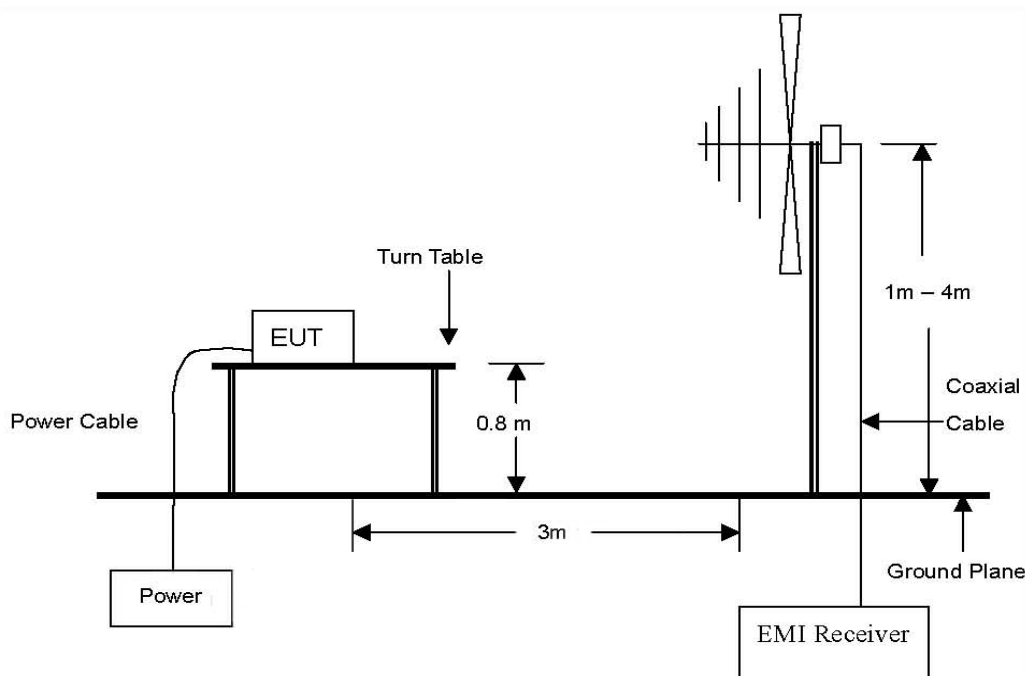
2. Spurious Radiated Emission

2.1. Test Setup

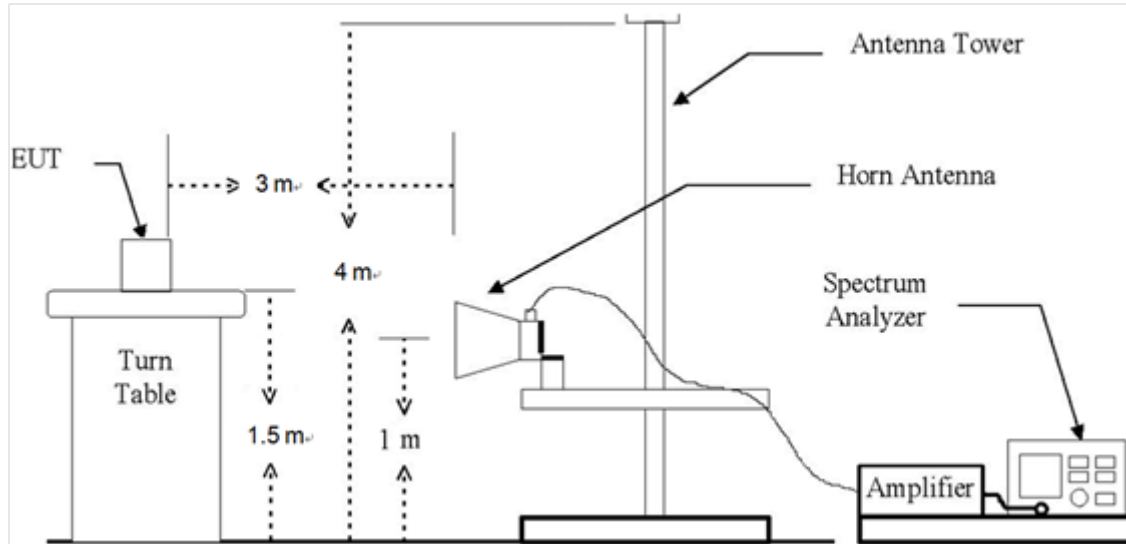
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



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



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 20 GHz.



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.

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

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 MHz), VBW $\geq 3 \times$ 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 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz, VBW $\geq 3 \times$ 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 E.R.P./E.I.R.P.

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

Band	Frequency (MHz)	Maximum Conducted Power (dB m)	Maximum Conducted 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)	Output Power Limit
WCDMA II	1 850 ~ 1 910	25.5	0.355	0.85	26.35	0.432			2 W E.I.R.P.
gsm 850	824 ~ 849	32.7	1.862	-0.69	32.01	1.589	29.86	0.968	7 W E.R.P.
gsm 1 900	1 850 ~ 1 910	32.0	1.585	0.85	32.85	1.928			2 W E.I.R.P.

Remark;

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

2.5. Spurious Radiated Emission

WCDMA V

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (826.4 MHz)									
Above 0.009	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.6 MHz)									
2 507.68	60.41	H	28.30	-39.01	49.70	-97.41	-47.71	-13	34.71
2 513.34	54.04	V	28.30	-38.98	43.36	-97.41	-54.05	-13	41.05
High Channel (846.6 MHz)									
2 542.06	63.95	H	28.30	-38.92	53.33	-97.41	-44.08	-13	31.08
2 537.56	63.52	V	28.30	-38.92	52.90	-97.41	-44.51	-13	31.51

GSM 850 (VOICE)

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (824.2 MHz)									
1 648.44	57.29	H	25.78	-40.61	42.46	-97.41	-54.95	-13	41.95
1 648.36	63.13	V	25.77	-40.61	48.29	-97.41	-49.12	-13	36.12
Middle Channel (836.6 MHz)									
1 673.26	62.82	H	26.36	-40.48	48.70	-97.41	-48.71	-13	35.71
1 673.27	66.72	V	26.36	-40.48	52.60	-97.41	-44.81	-13	31.81
High Channel (848.8 MHz)									
1 697.73	60.67	H	26.95	-40.22	47.40	-97.41	-50.01	-13	37.01
1 697.54	64.59	V	26.94	-40.23	51.30	-97.41	-46.11	-13	33.11

GSM 850 (EDGE)

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (824.2 MHz)									
1 647.23	56.34	H	25.76	-40.61	41.49	-97.41	-55.92	-13	42.92
1 647.33	60.11	V	25.76	-40.61	45.26	-97.41	-52.15	-13	39.15
Middle Channel (836.6 MHz)									
1 672.11	61.56	H	26.33	-40.48	47.41	-97.41	-50.00	-13	37.00
1 672.36	64.22	V	26.34	-40.48	50.08	-97.41	-47.33	-13	34.33
High Channel (848.8 MHz)									
1 695.44	56.77	H	26.89	-40.25	43.41	-97.41	-54.00	-13	41.00
1 696.25	62.15	V	26.91	-40.24	48.82	-97.41	-48.59	-13	35.59

GSM 1 900 (VOICE)

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
5 550.37	47.11	H	34.00	-34.89	46.22	-95.26	-49.04	-13	36.04
5 550.75	54.00	V	34.00	-34.89	53.11	-95.26	-42.15	-13	29.15
Middle Channel (1 880.0 MHz)									
5 640.09	52.44	H	34.00	-35.01	51.43	-95.26	-43.83	-13	30.83
5 640.05	57.66	V	34.00	-35.01	56.65	-95.26	-38.61	-13	25.61
High Channel (1 909.8 MHz)									
5 729.48	51.59	H	34.04	-34.82	50.81	-95.26	-44.45	-13	31.45
5 729.33	58.06	V	34.04	-34.82	57.28	-95.26	-37.98	-13	24.98

GSM 1 900 (EDGE)

Frequency (MHz)	Measured Level (dBμV)	Ant. Pol.	AF (dB/m)	AMP+CL (dB)	E (dBμV/m)	CF (dB)	E.I.R.P. (dB m)	Limit (dB m)	Margin (dB)
Low Channel (1 850.2 MHz)									
5 549.55	47.05	H	34.00	-34.89	46.16	-95.26	-49.10	-13	36.10
5 551.22	52.11	V	34.00	-34.90	51.21	-95.26	-44.05	-13	31.05
Middle Channel (1 880.0 MHz)									
5 637.34	50.35	H	34.00	-34.99	49.36	-95.26	-45.90	-13	32.90
5 636.55	55.67	V	34.00	-34.99	54.68	-95.26	-40.58	-13	27.58
High Channel (1 909.8 MHz)									
5 730.11	50.11	H	34.04	-34.82	49.33	-95.26	-45.93	-13	32.93
5 731.15	56.42	V	34.04	-34.83	55.63	-95.26	-39.63	-13	26.63

Remark;

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

3. Conducted Output Power

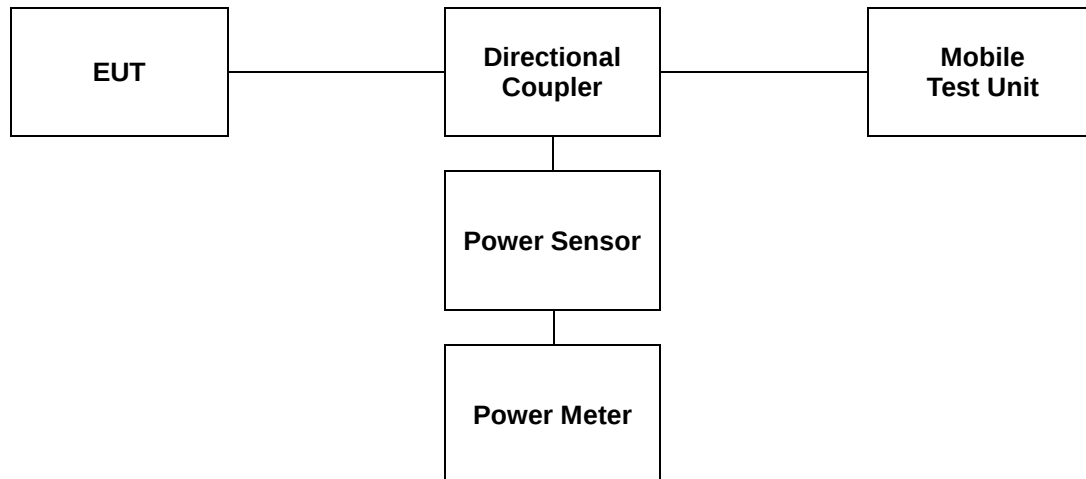
3.1. Limit

CFR 47, Section §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.



3.3. Test Result

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

Band	3GPP Release Version	Channel		Conducted Output Power (dB m)		
				4132	4182	4233
		Frequency (MHz)		826.4	836.6	846.6
V	99	WCDMA	RMC	22.46	22.47	22.57
	5	HSDPA	Subtest 1	21.55	21.52	21.59
	5		Subtest 2	21.50	21.51	21.58
	5		Subtest 3	21.11	21.04	21.01
	5		Subtest 4	21.07	21.04	20.99
	6	HSUPA	Subtest 1	21.45	21.40	21.45
	6		Subtest 2	19.46	19.40	19.44
	6		Subtest 3	20.42	20.39	20.64
	6		Subtest 4	19.45	19.39	19.65
	6		Subtest 5	21.42	21.38	21.57

Band	Channel	Frequency (MHz)	Conducted Output Power (dB m)				
			GSM	GPRS		EDGE	
			Voice	1 Tx slot	2 Tx slot	1 Tx slot	2 Tx slot
GSM 850	128	824.2	32.40	32.11	32.01	26.41	25.94
	190	836.6	32.53	32.24	32.18	26.35	25.95
	251	848.8	32.60	32.32	32.21	26.60	26.15
GSM 1 900	512	1 850.2	29.31	29.31	29.18	25.34	24.91
	661	1 880.0	29.06	29.16	29.07	24.97	24.42
	810	1 909.8	29.32	29.28	29.55	25.09	24.52

4. Occupied Bandwidth

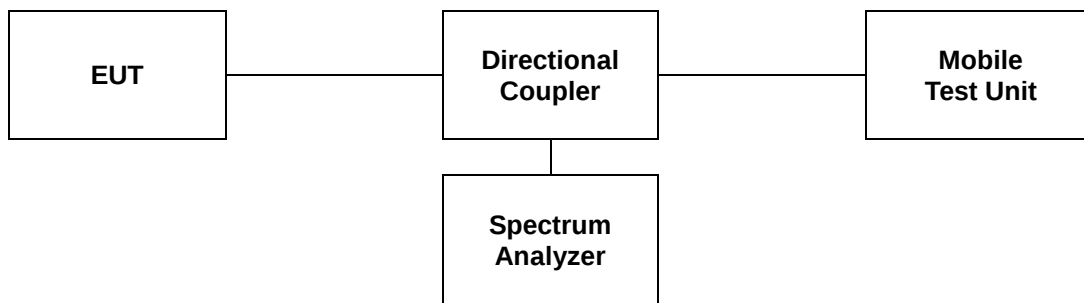
4.1. Limit

CFR 47, Section §2.1049

4.2. Test Procedure

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

- The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation. products including the emission skirts (typically a span of $1.5 \times \text{OBW}$ is sufficient).
- The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- 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.
- Set the detection mode to peak, and the trace mode to max-hold.
- 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.
- 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).



4.3 Test Results

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

Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
WCDMA V	RMC	836.6	4.139
	HSDPA		4.153

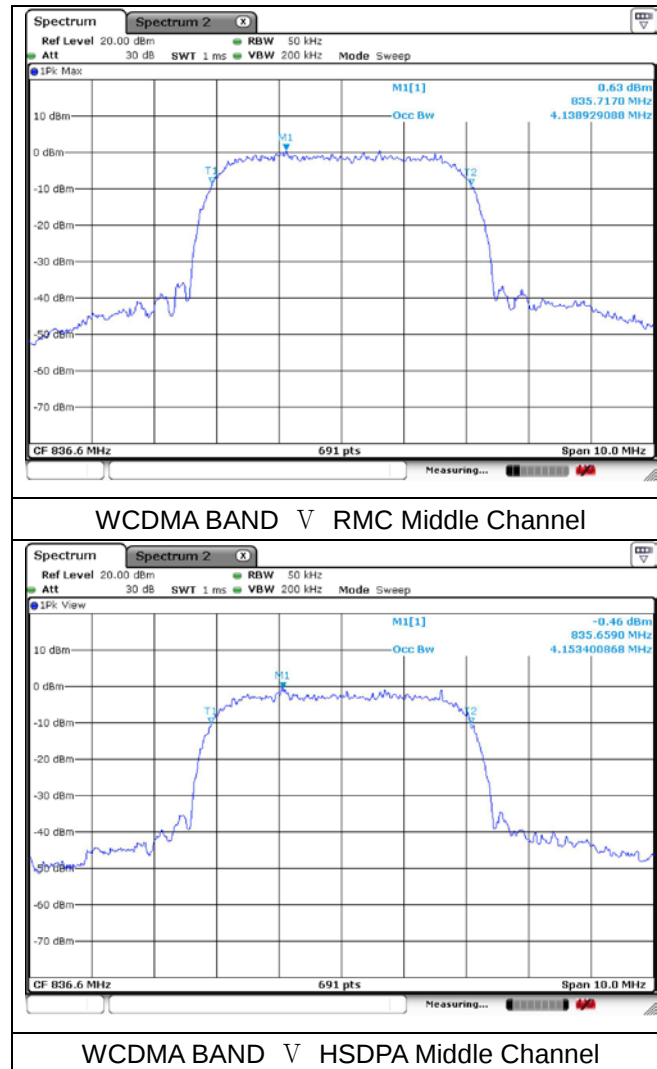
Band	Mode	Frequency (MHz)	Occupied Bandwidth (MHz)
GSM 850	VOICE	836.6	0.239
	EDGE		0.247
GSM 1 900	VOICE	1 880.0	0.239
	EDGE		0.246

Note;

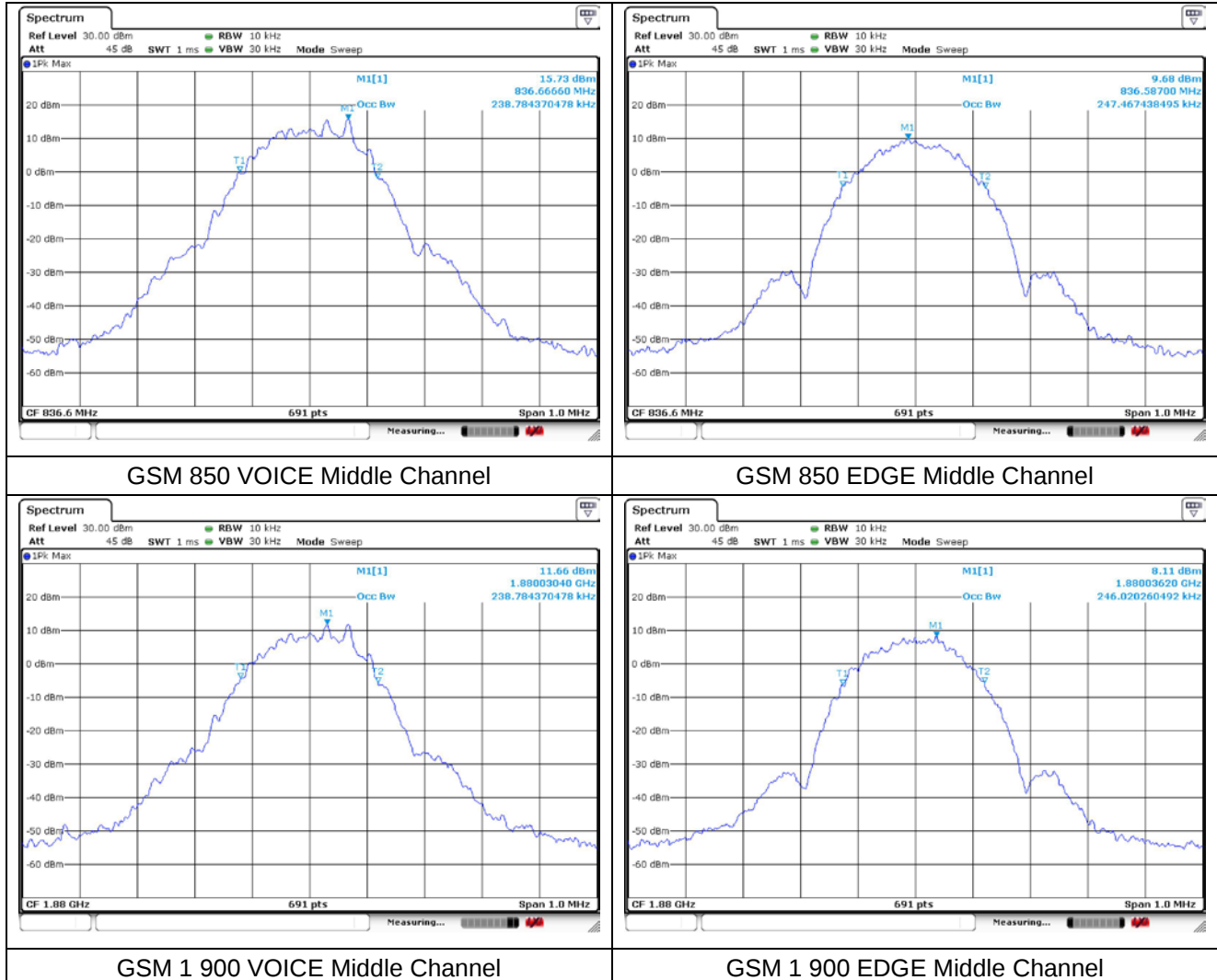
There is no limit required and power is the same for low, middle and high channel; therefore, All channels were tested but only middle channel was reported.

-Test plots

WCDMA



GSM



5. Peak-Average Ratio

5.1. Limit

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

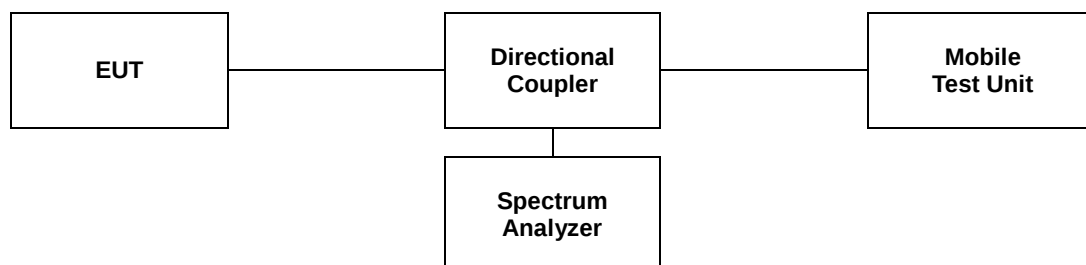
- §24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

5.2. Test Procedure

The test follows section 5.2.3.4 of ANSI C63.26-2015.

See instrumentation-specific application literature for further guidance regarding use of the CCDF capability. The following guidelines are offered for performing a CCDF measurement.

- a. Set resolution/measurement bandwidth $\geq$ OBW or specified reference bandwidth.
- b. Set the number of counts to a value that stabilizes the measured CCDF curve.
- c. Set the measurement interval as follows:
 - 1) For continuous transmissions, set to greater of $[10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$ or 1 ms.
 - 2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.
 - 3) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
- d. Record the maximum PAPR level associated with a probability of 0.1 %.
- e. The peak power level is calculated from the sum of the PAPR value from step d) to the measured average power.



5.3 Test Results

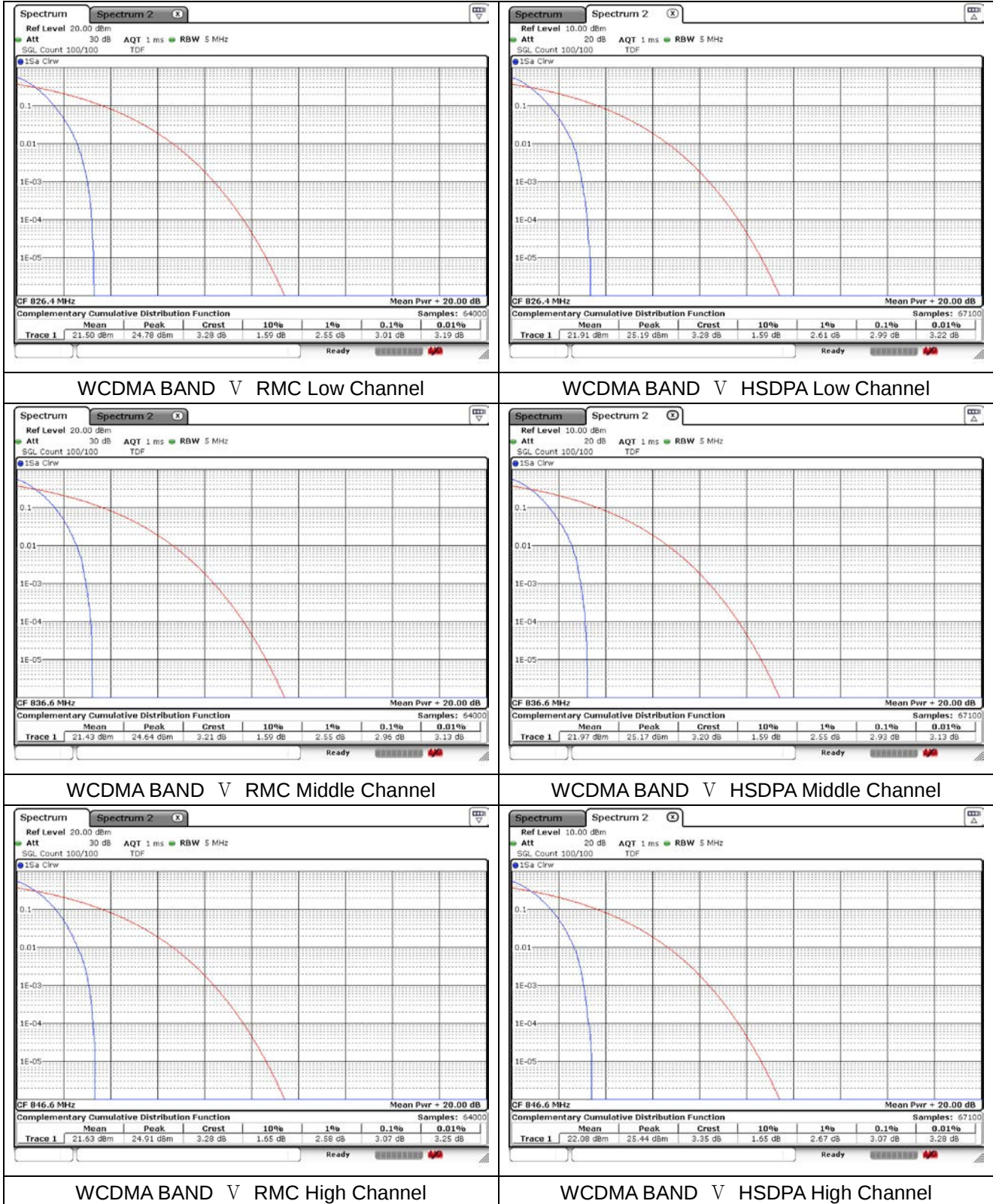
Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 % R.H.

Band	Frequency (MHz)	PAR (dB)	
		RMC	HSDPA
WCDMA V	826.4	3.01	2.99
	836.6	2.96	2.93
	846.6	3.07	3.07

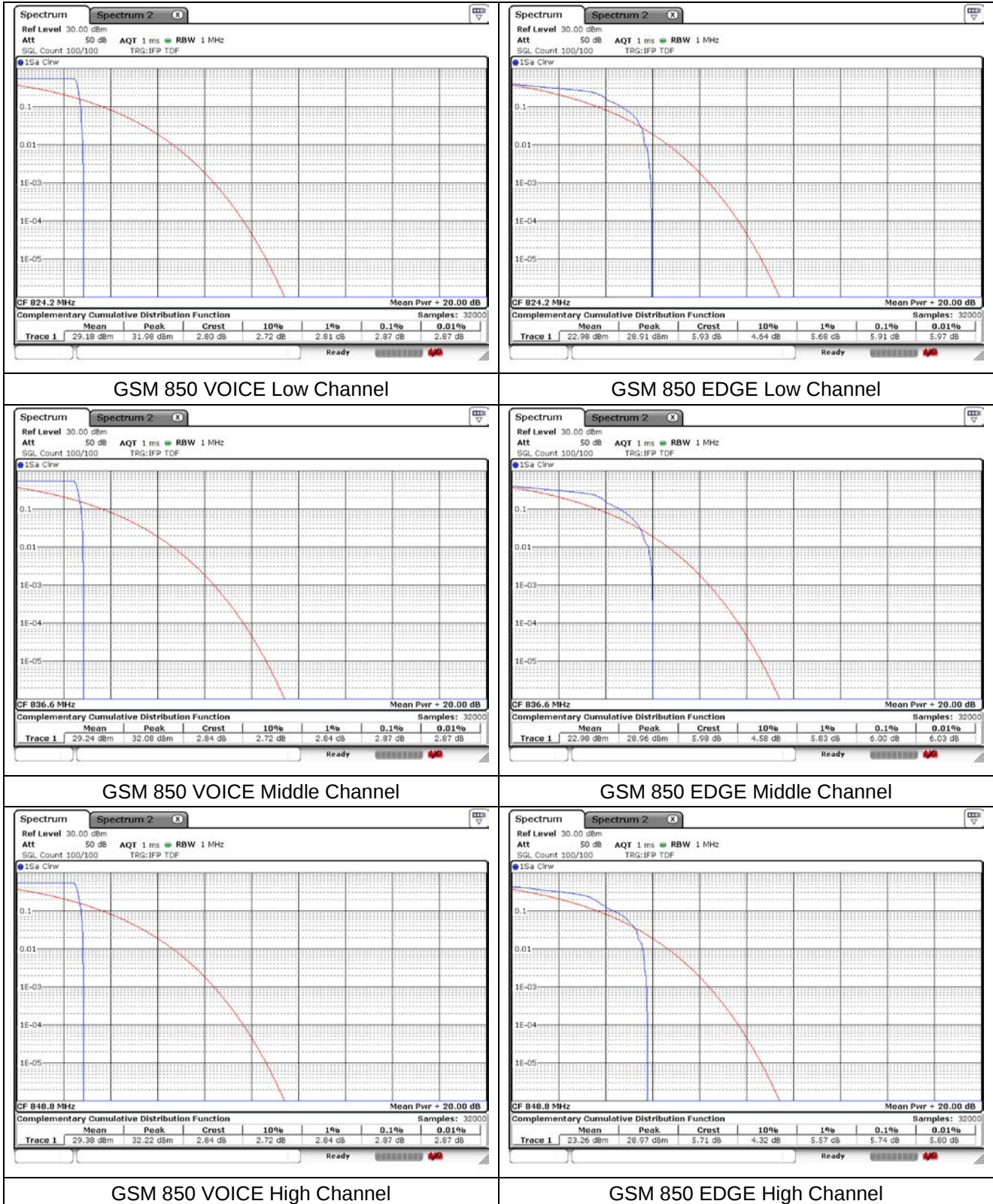
Band	Frequency (MHz)	PAR (dB)	
		VOICE	EDGE
GSM 850	824.2	2.87	5.91
	836.6	2.87	6.00
	848.8	2.87	5.74
GSM 1 900	1 850.2	3.07	5.86
	1 880.0	3.13	6.03
	1 909.8	3.16	5.97

-Test plots

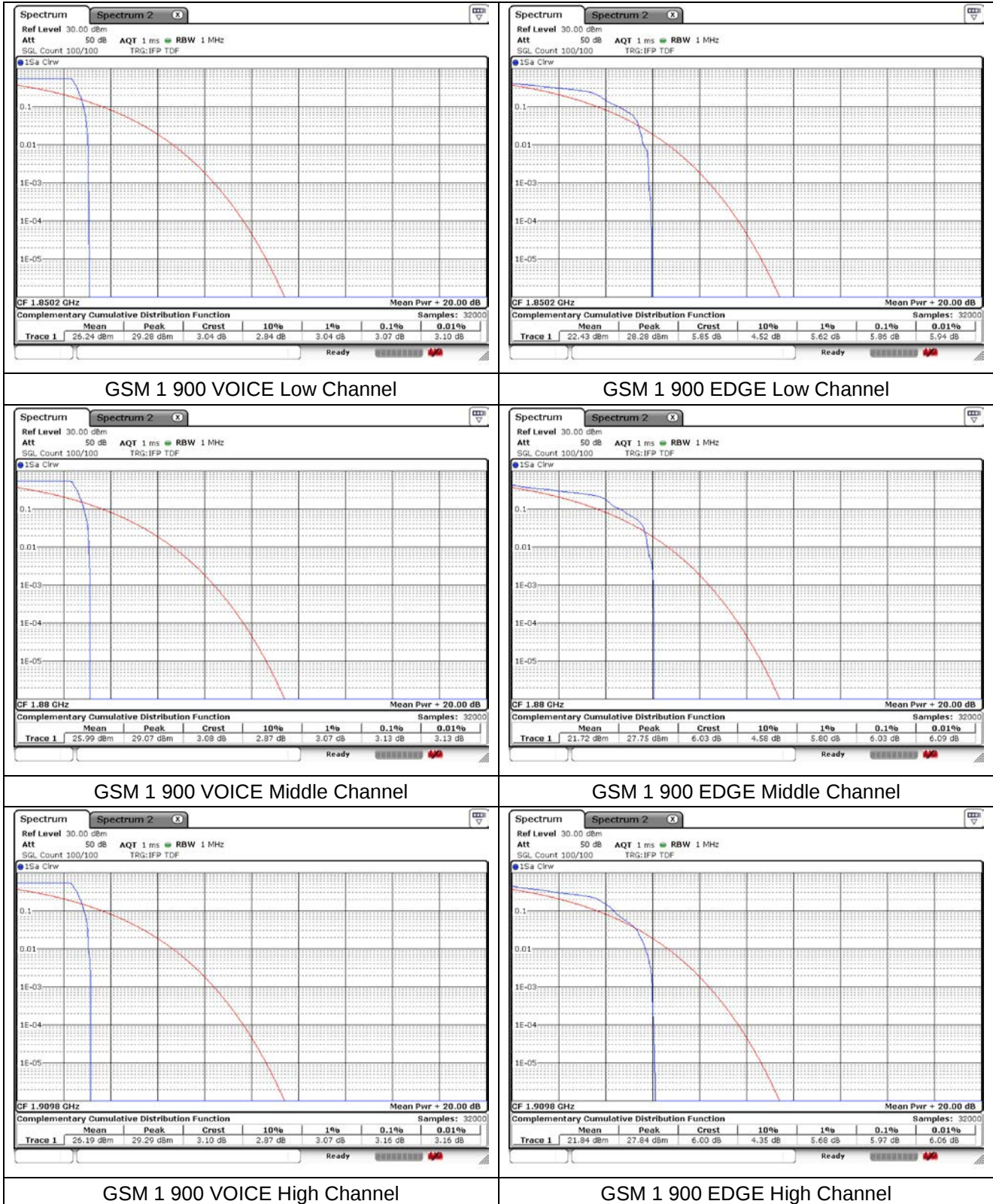
WCDMA



GSM



GSM



6. Spurious Emissions at Antenna Terminal

6.1. Limit

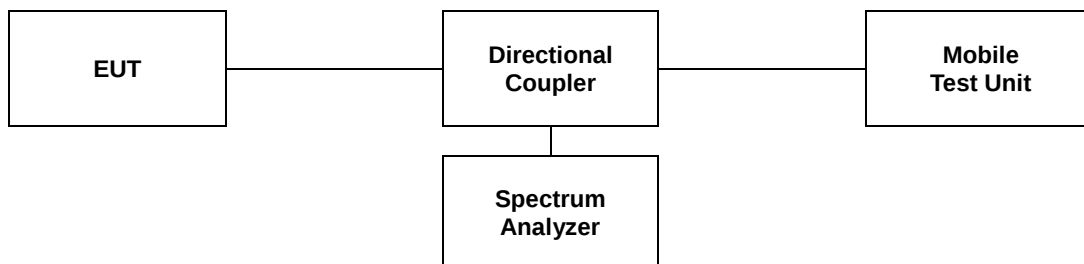
- §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

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

6.2. Test Procedure

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

1. Start frequency was set to 9 kHz 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 kHz to 20 GHz, all path loss of wide frequency range was investigated and compensated to spectrum analyzer as correction factor.



Note;

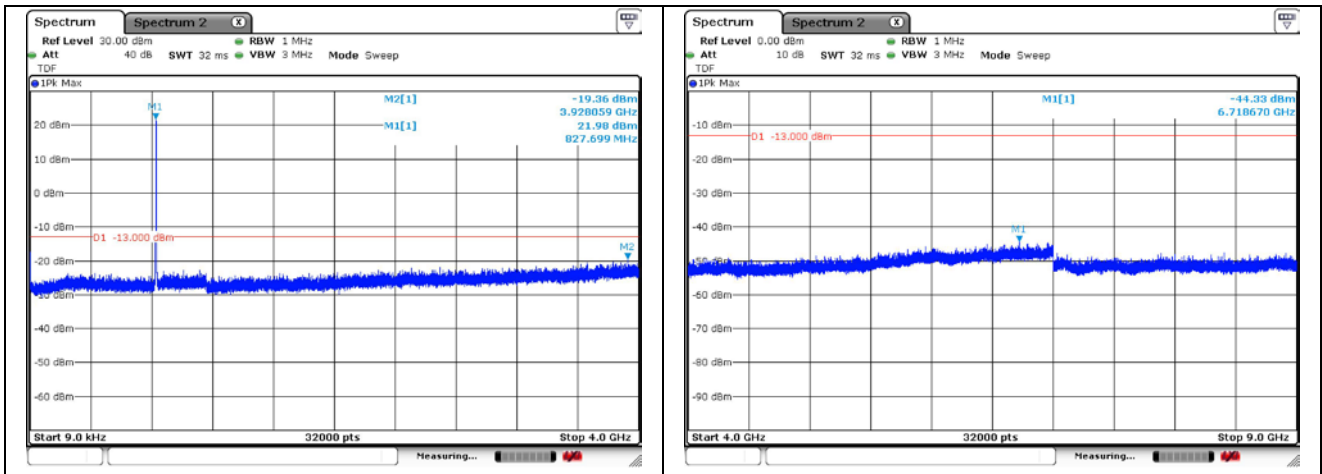
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution 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 dB below the transmitter power.

6.3. Test Results

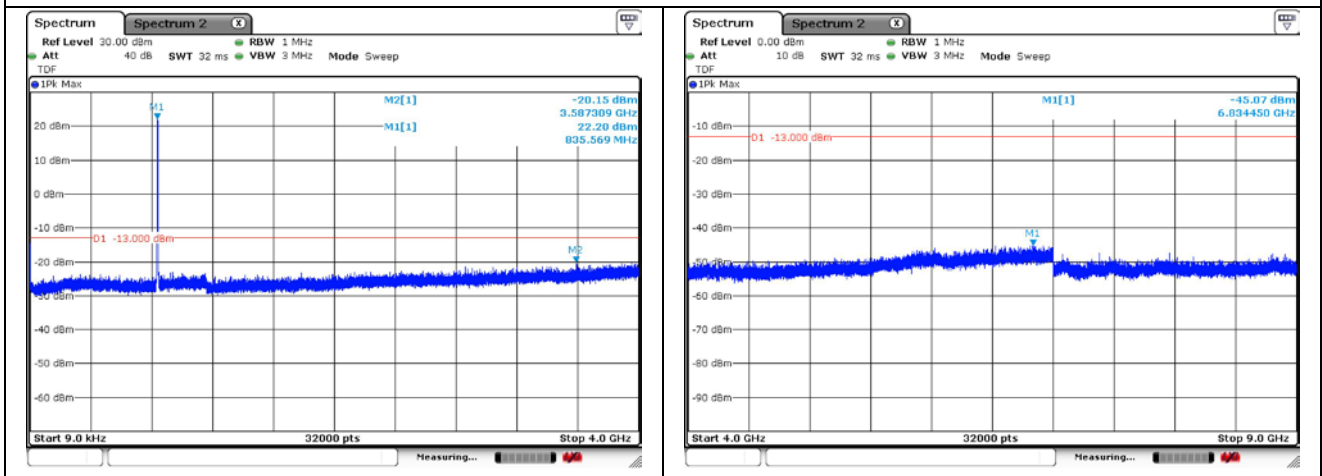
Ambient temperature : $(23 \pm 1) ^\circ\text{C}$
 Relative humidity : 47 % R.H.

-Test plots

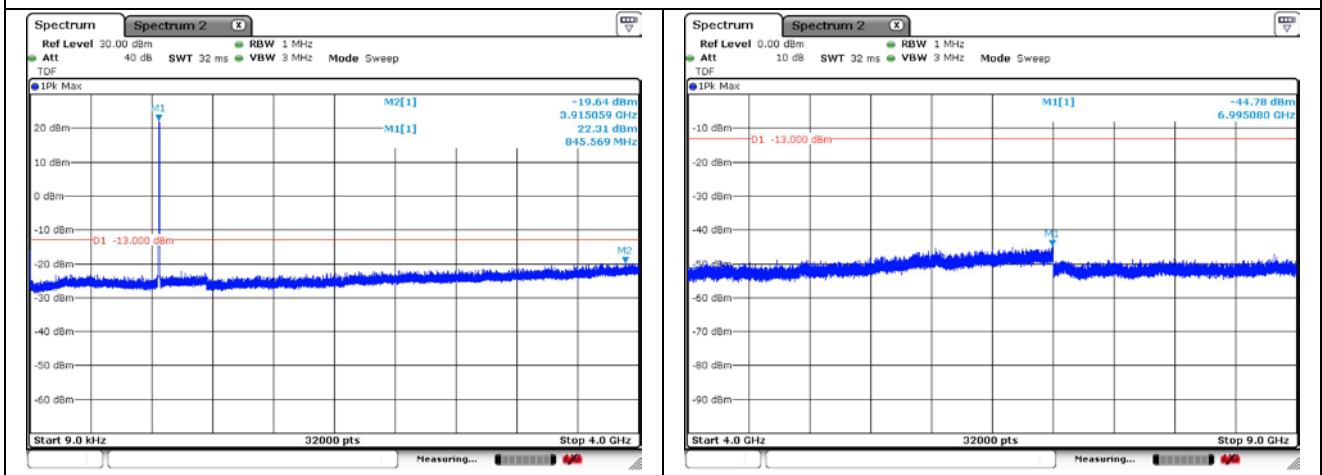
WCDMA V



WCDMA V RMC Low Channel

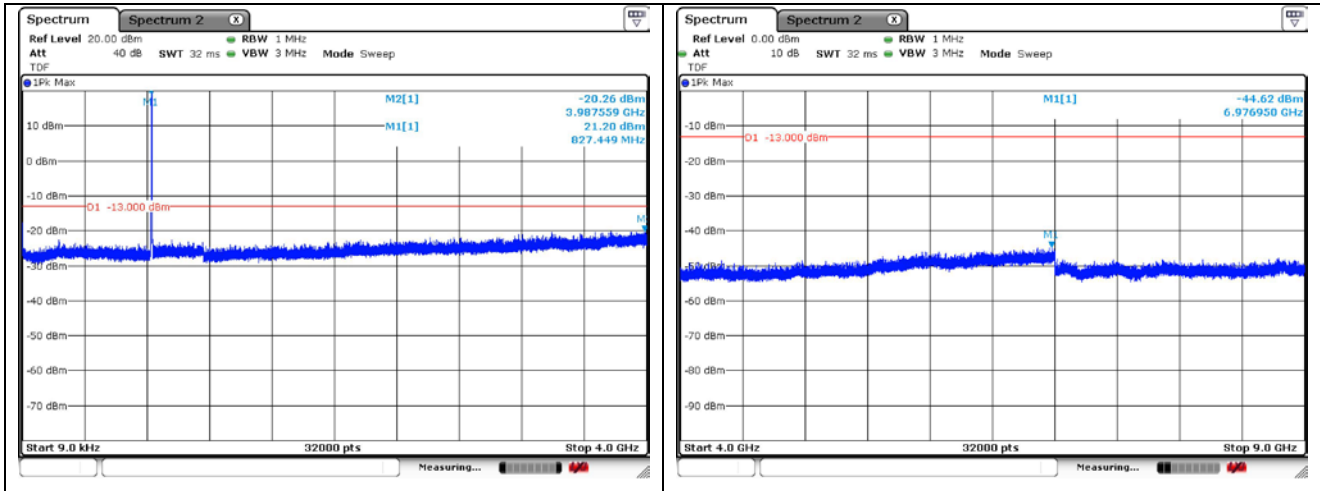


WCDMA V RMC Middle Channel

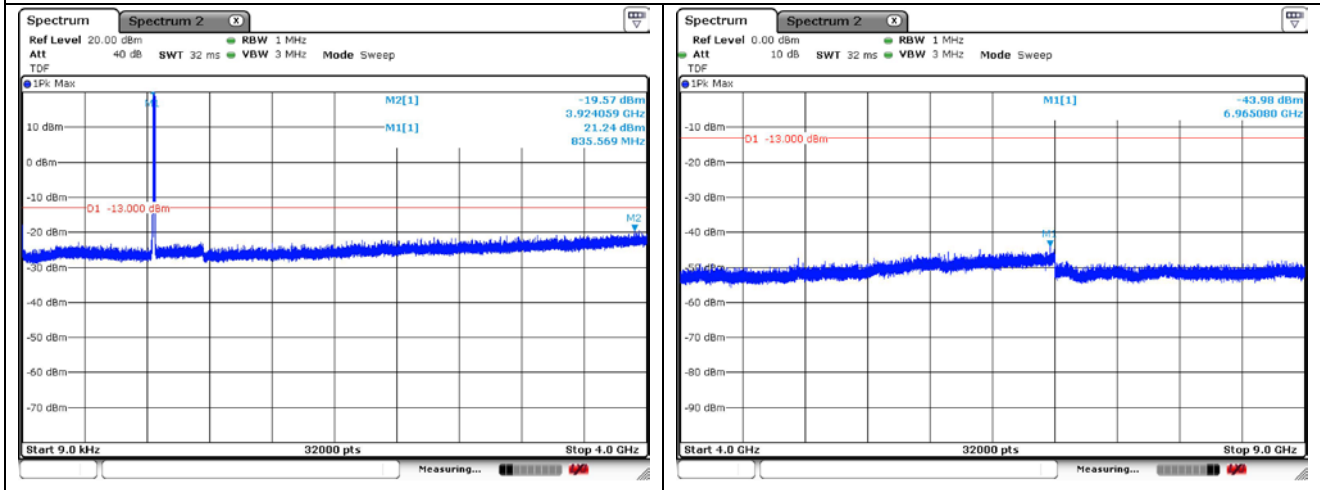


WCDMA V RMC High Channel

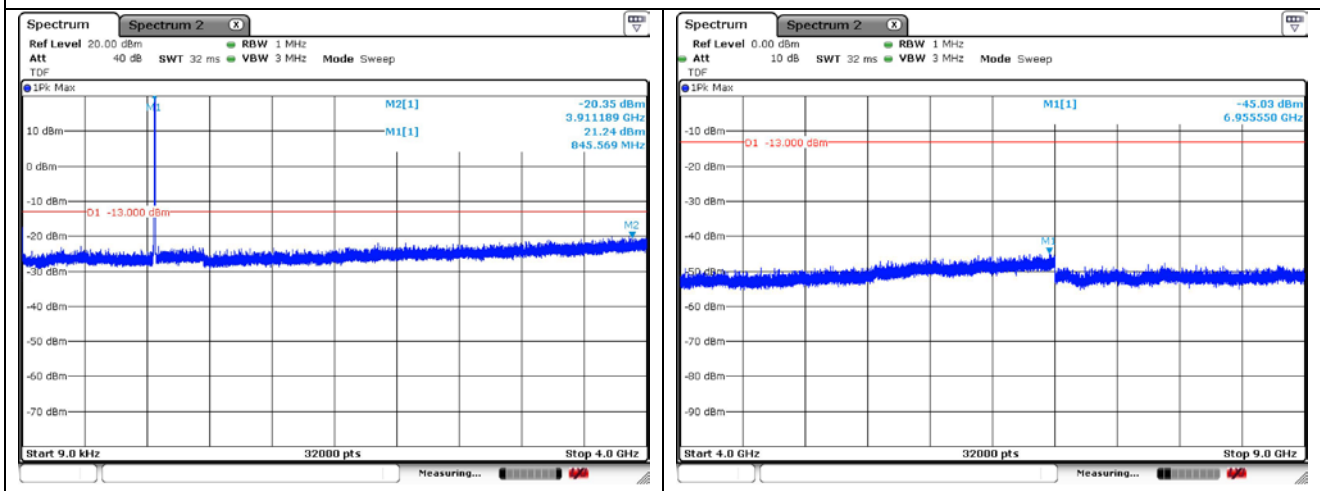
WCDMA V



WCDMA V HSDPA Low Channel

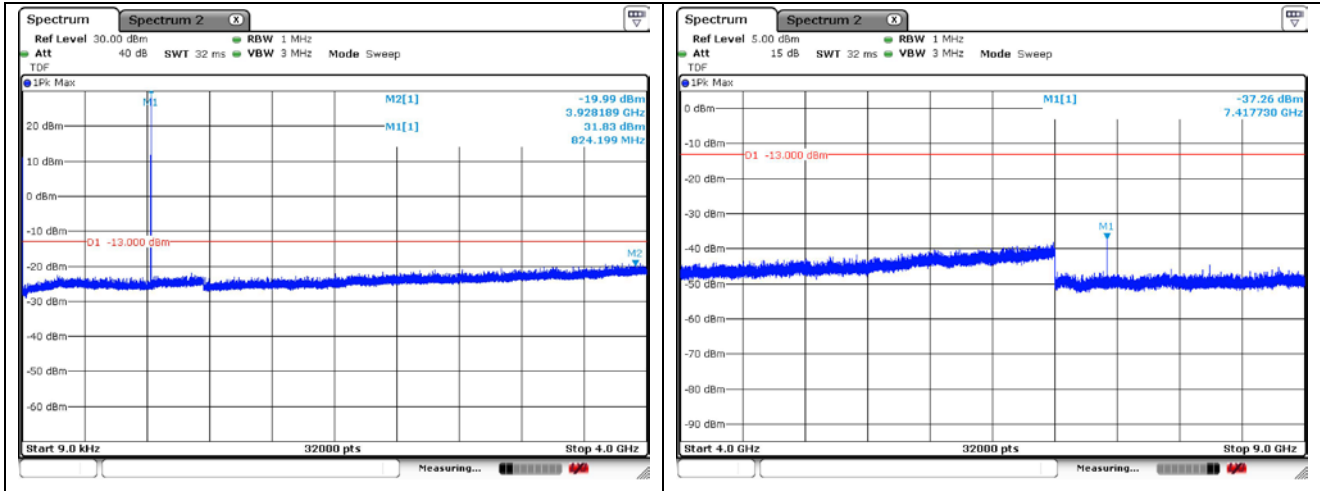


WCDMA V HSDPA Middle Channel

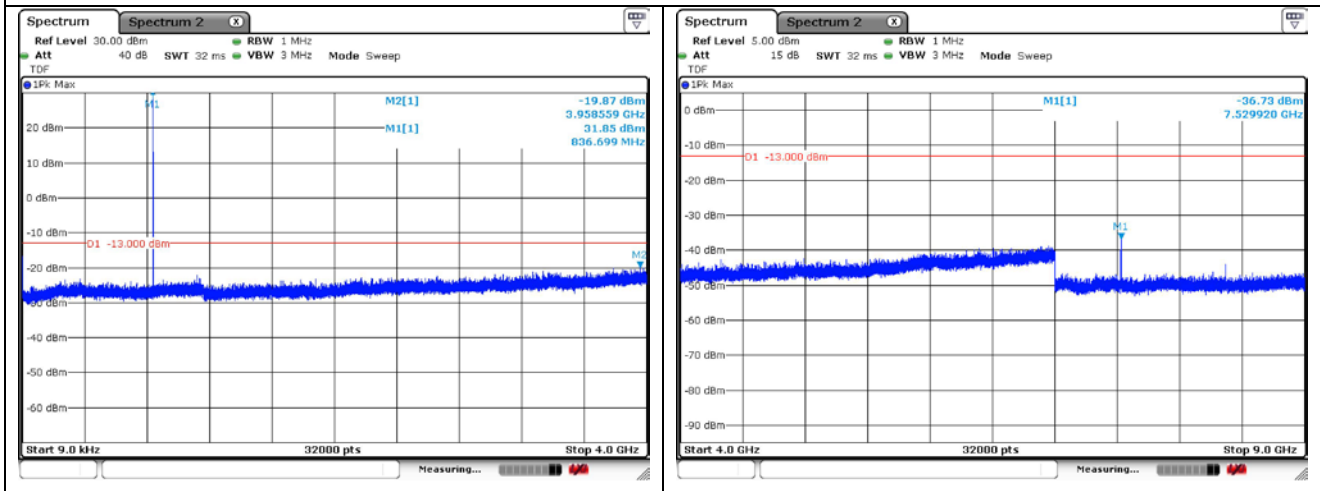


WCDMA V HSDPA High Channel

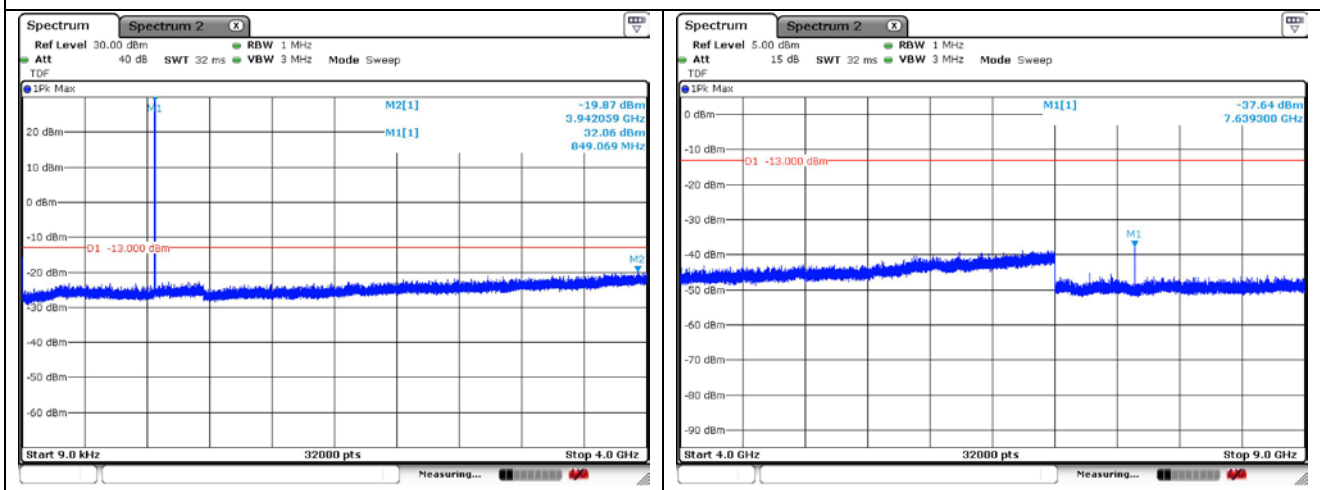
GSM 850



GSM 850 VOICE Low Channel

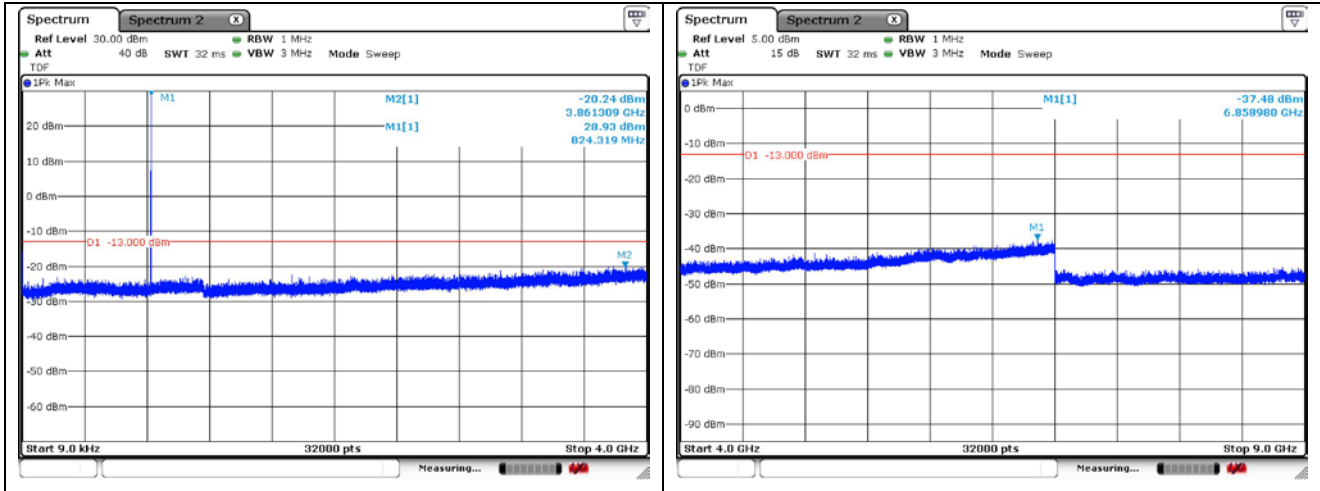


GSM 850 VOICE Middle Channel

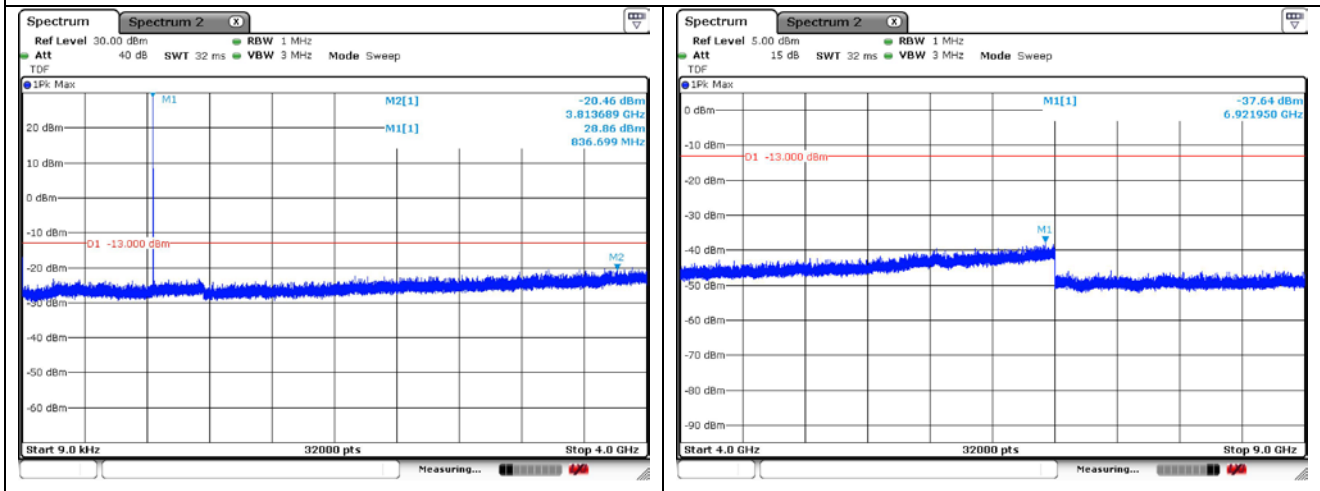


GSM 850 VOICE High Channel

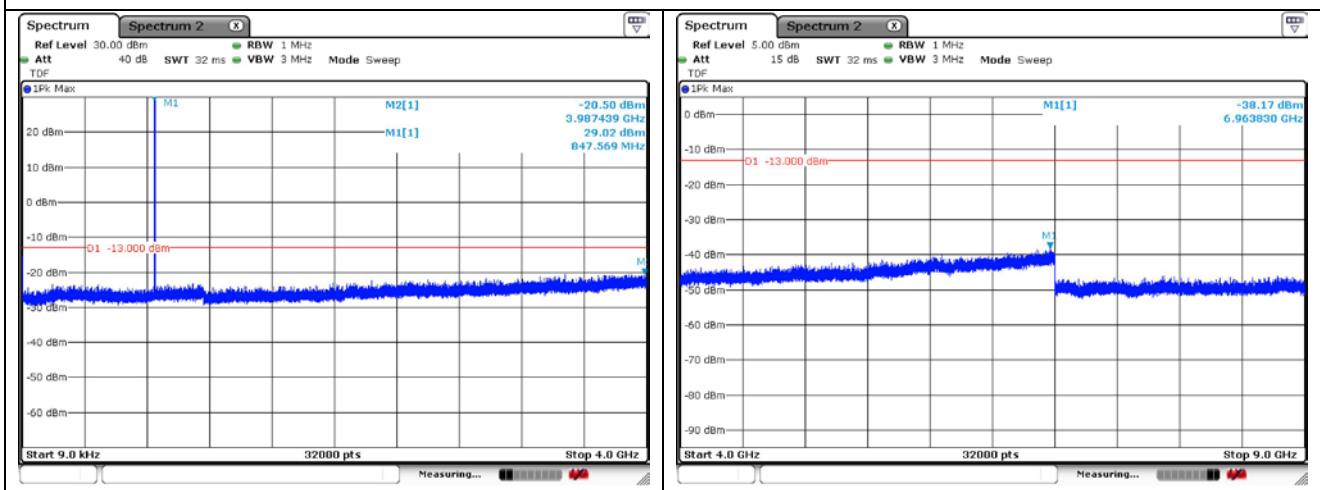
GSM 850



GSM 850 EDGE Low Channel

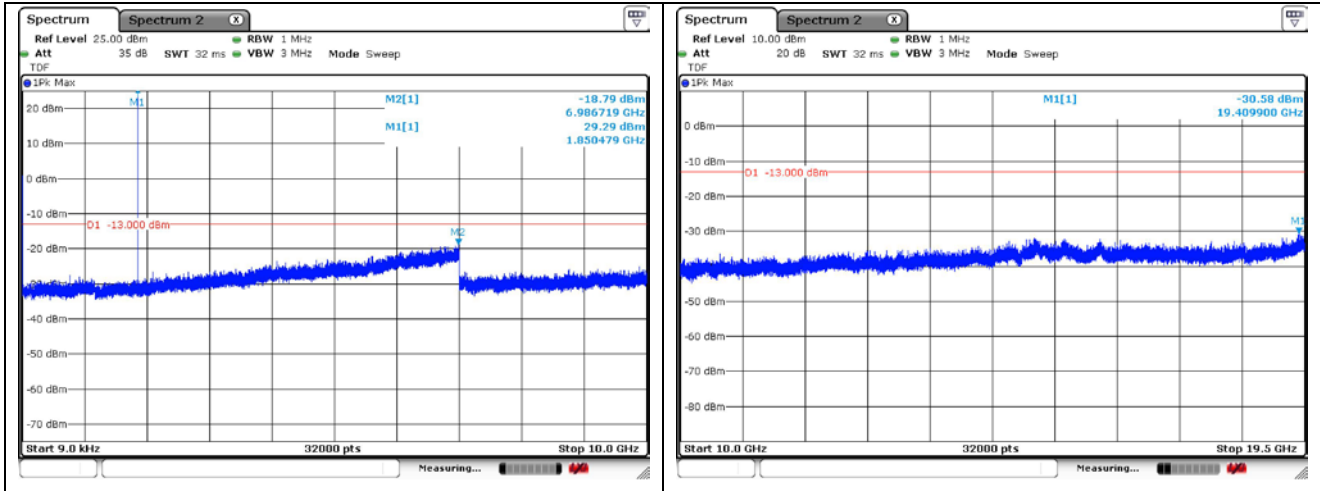


GSM 850 EDGE Middle Channel

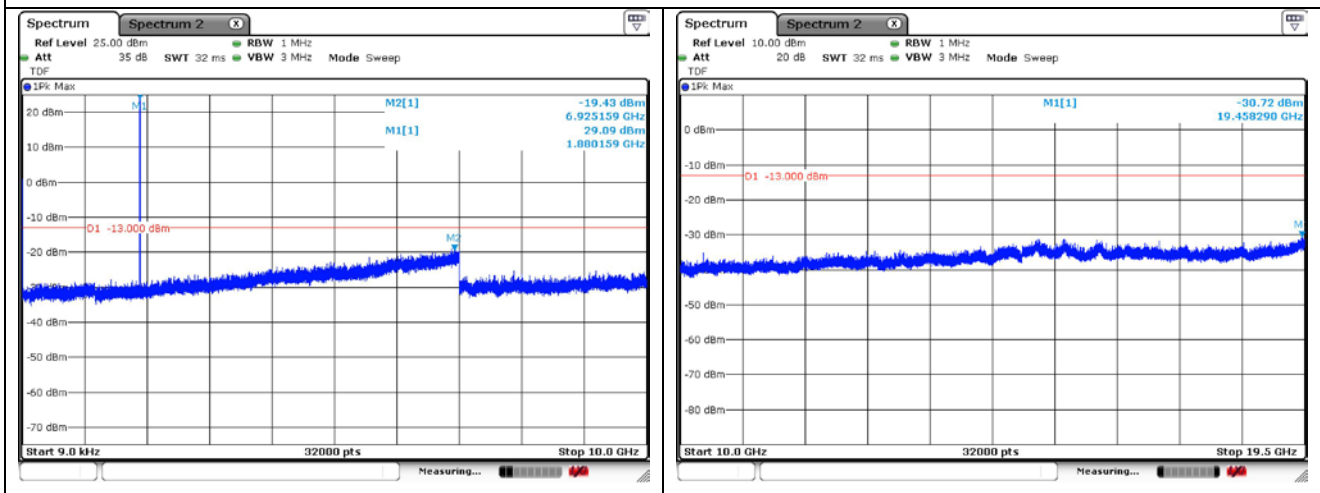


GSM 850 EDGE High Channel

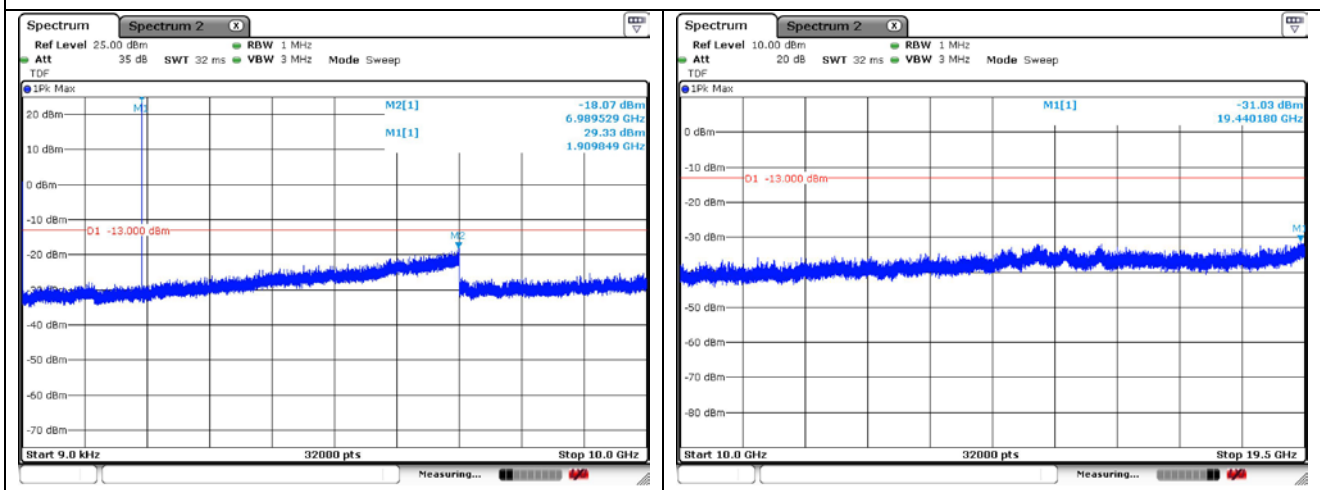
GSM 1 900



GSM 1 900 VOICE Low Channel

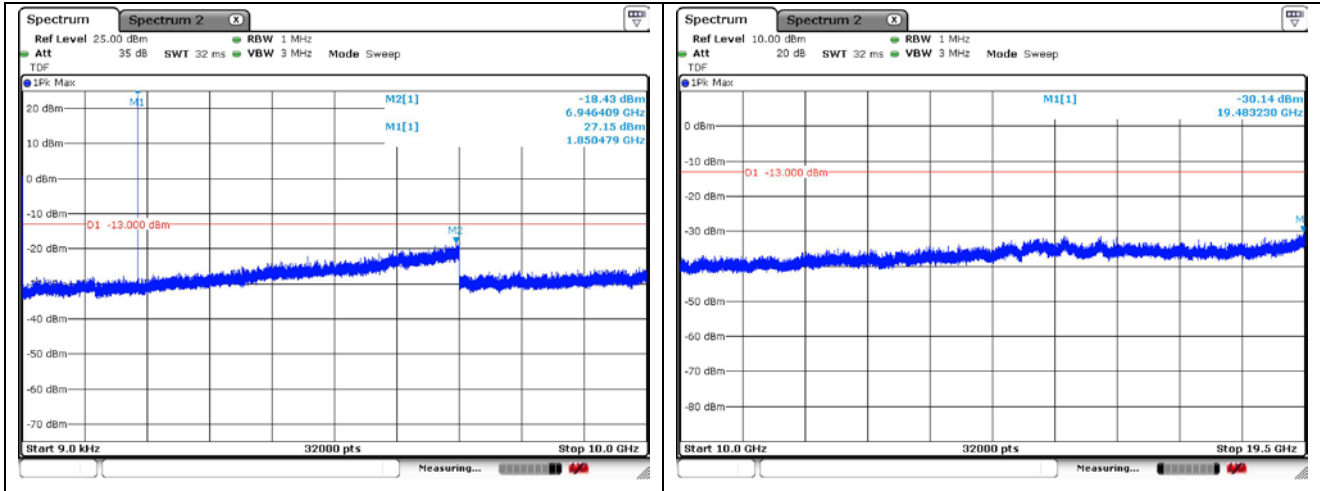


GSM 1 900 VOICE Middle Channel

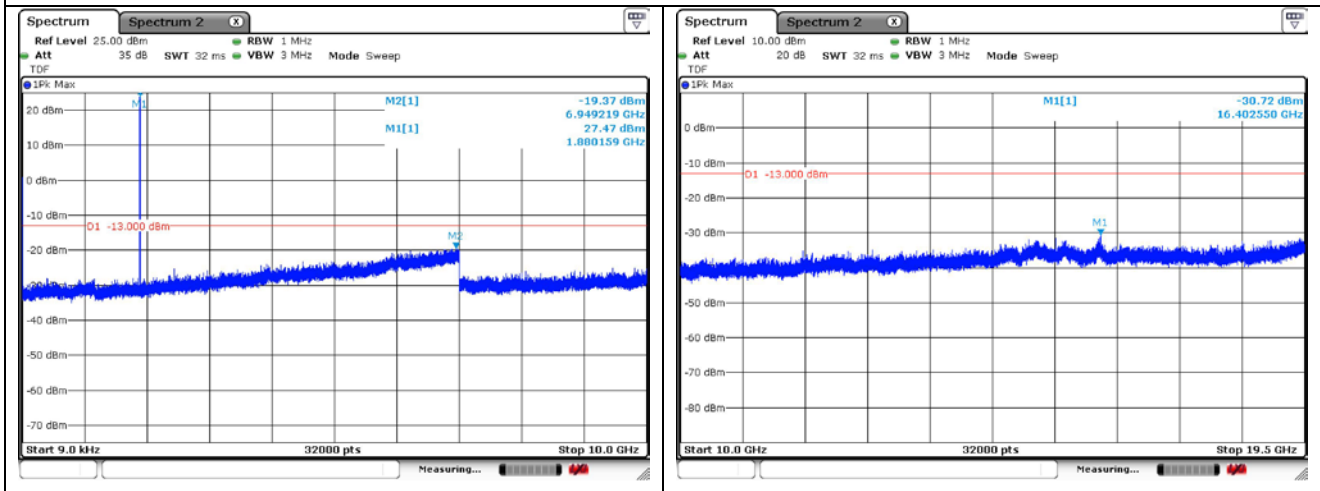


GSM 1 900 VOICE High Channel

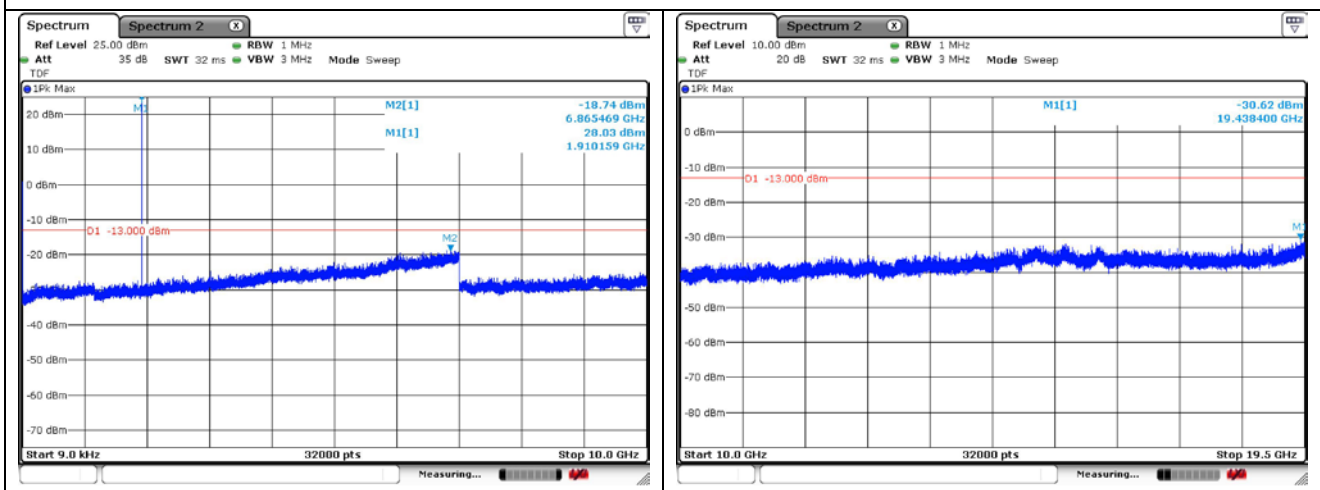
GSM 1 900



GSM 1 900 EDGE Low Channel



GSM 1 900 EDGE Middle Channel



GSM 1 900 EDGE High Channel

7. Band Edge

7.1. Limit

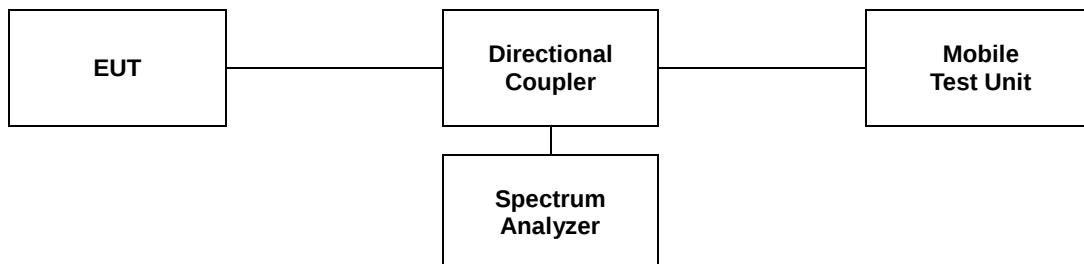
- §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

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

7.2. Test Procedure

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

- Span was set large enough so as to capture all out of band emissions near the band edge.
- RBW ≥ 1 % of OBW
- VBW $\geq 3 \times$ RBW.
- Detector = RMS.
- Trace mode = Average.
- Sweep time = Auto.
- The trace was allowed to stabilize.
- All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function.

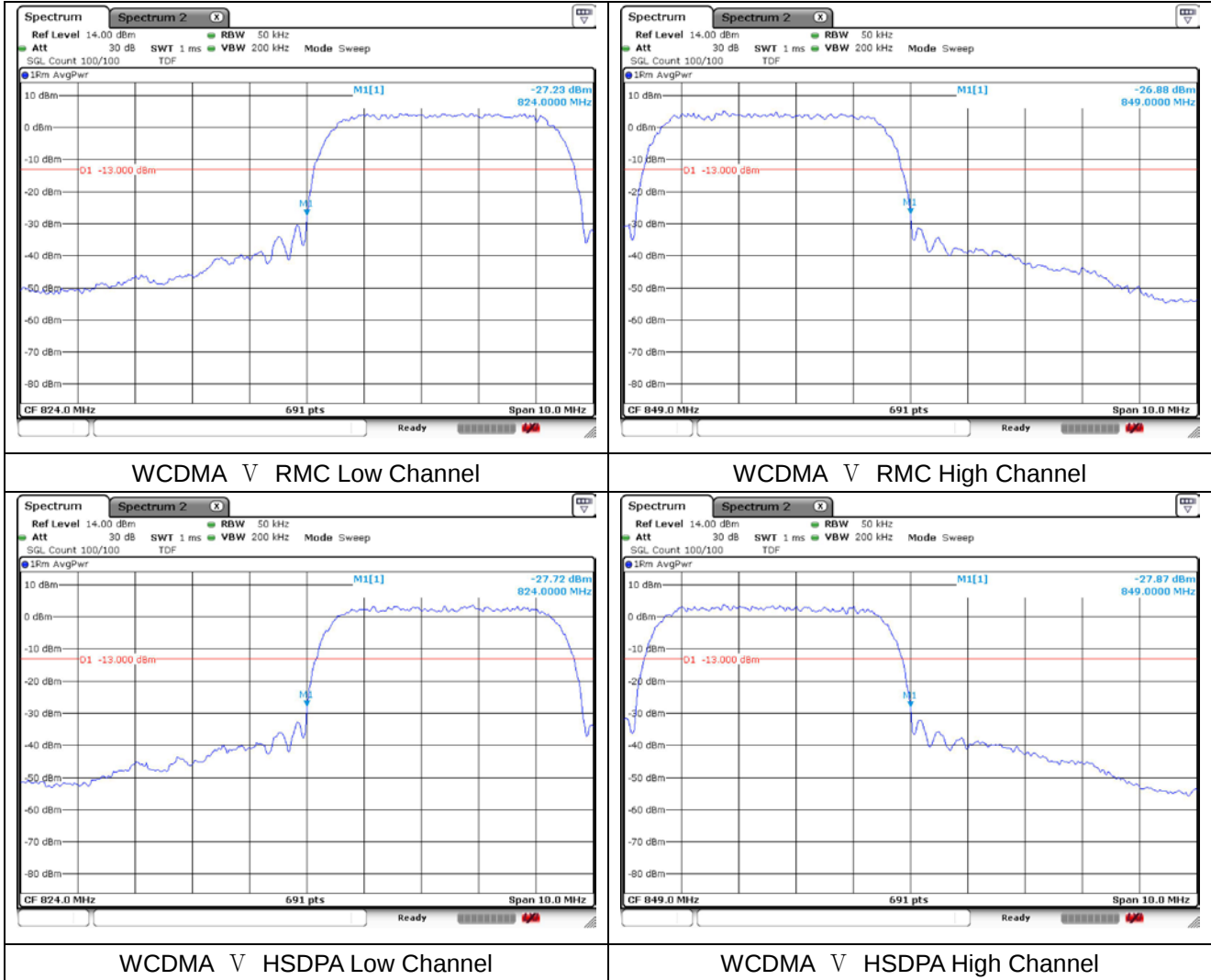


7.3. Test Results

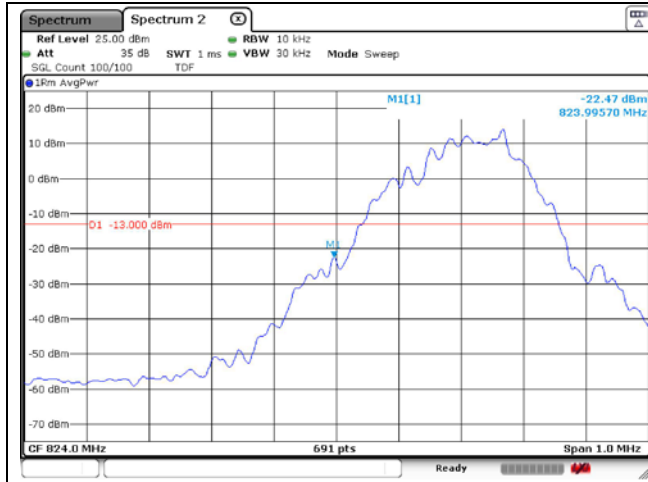
Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 % R.H.

-Test plots

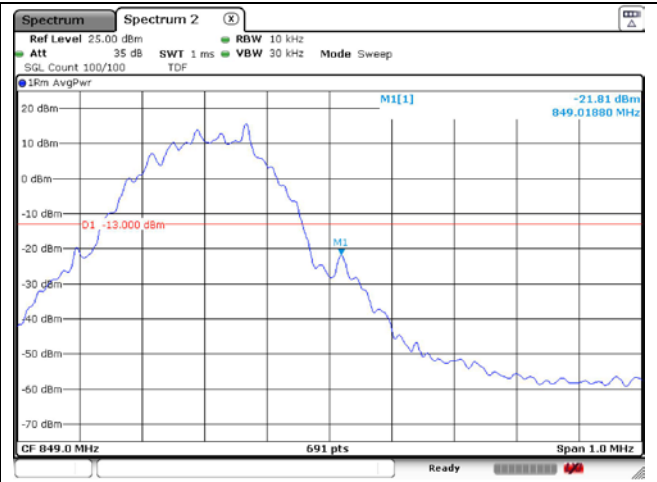
WCDMA V



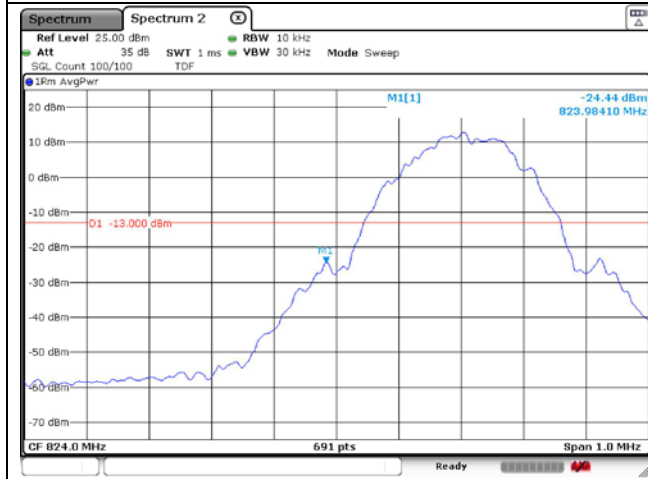
GSM 850



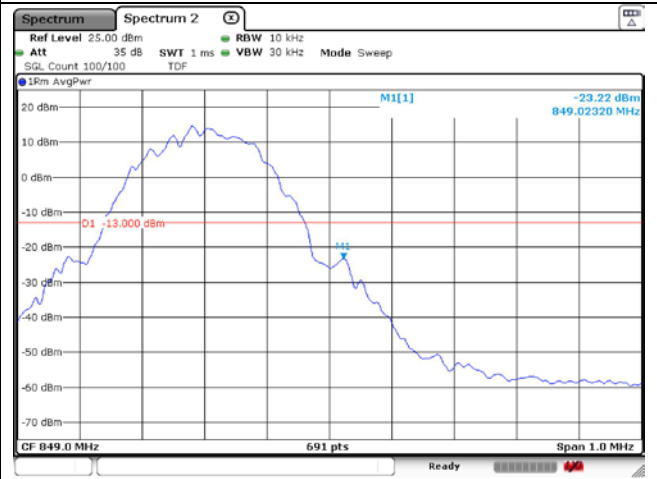
GSM 850 VOICE Low Channel



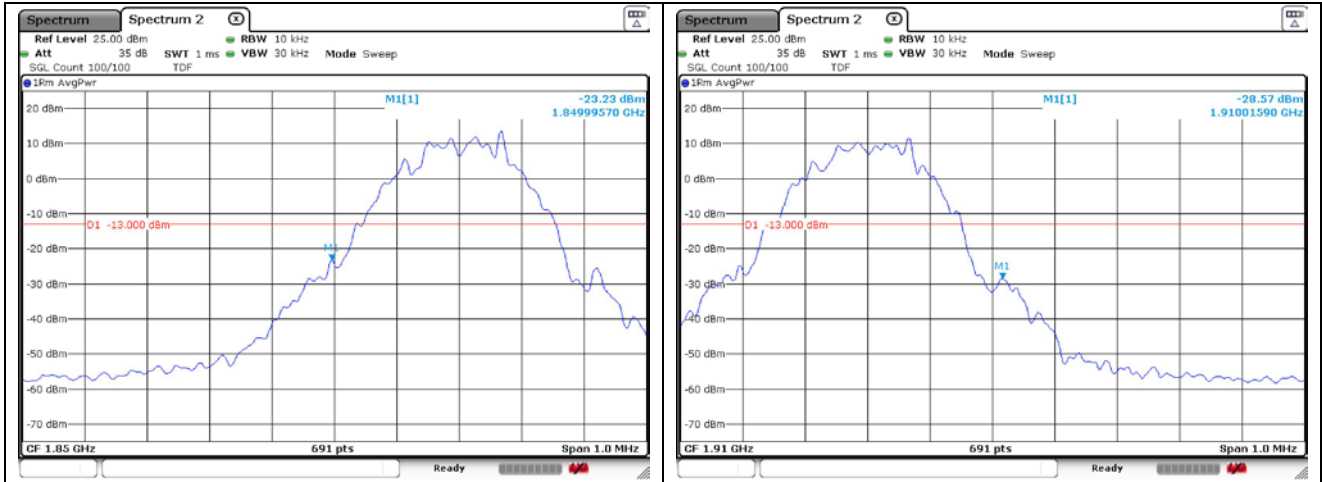
GSM 850 VOICE High Channel



GSM 850 EDGE Low Channel

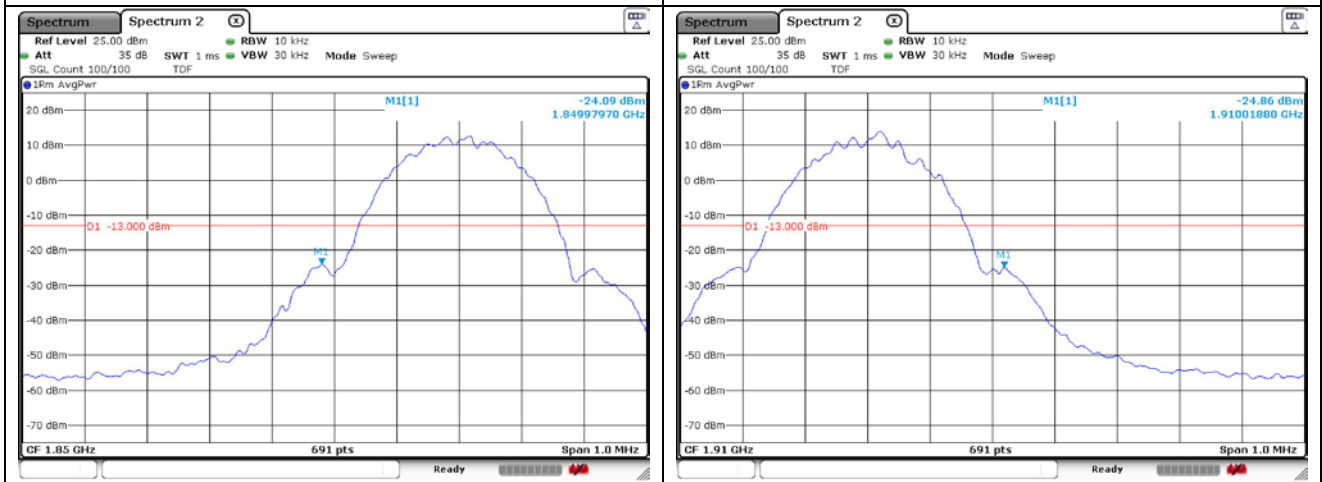


GSM 850 EDGE High Channel

GSM 1 900


GSM 1 900 VOICE Low Channel

GSM 1 900 VOICE High Channel



GSM 1 900 EDGE Low Channel

GSM 1 900 EDGE High Channel

8. Frequency Stability

8.1. Limit

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

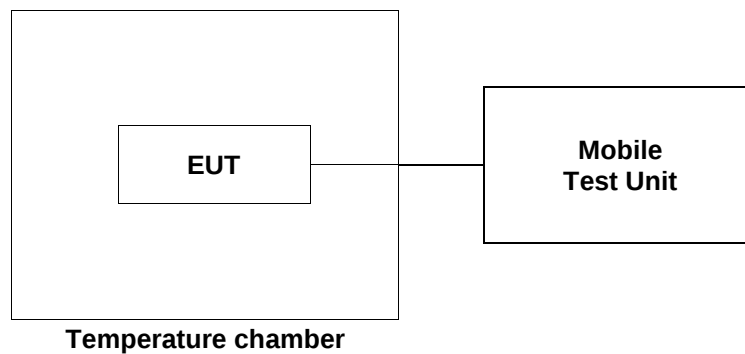
- §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table of this section.

For Mobile devices operating in the 824 to 849 MHz 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.



8.3. Test Results

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

WCDMA V mode at middle channel

Operating Frequency: 836.6 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12.0	-0.38	-0.000 06
40		-0.39	-0.000 07
30		-1.00	-0.000 80
20 (Ref.)		-0.33	-
10		-2.07	-0.002 08
0		-2.45	-0.002 53
-10		-2.12	-0.002 14
-20		-1.63	-0.001 55
-30		0.67	0.001 20
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
20	13.8	-1.83	-0.001 79
	10.2	-0.87	-0.000 65

GSM 850 mode at middle channel

Operating Frequency: 836.6 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12.0	5.20	-0.002 58
40		5.55	-0.002 16
30		-1.71	-0.010 84
20 (Ref.)		7.36	-
10		5.04	-0.002 77
0		4.66	-0.003 23
-10		3.58	-0.004 52
-20		3.71	-0.004 36
-30		5.26	-0.002 51
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
20	13.8	-1.10	-0.010 11
	10.2	1.23	-0.007 33

GSM 1 900 mode at middle channel

Operating Frequency: 1 880.0 MHz			
Frequency Stability versus Temperature			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
50	12.0	-0.74	-0.004 07
40		-2.78	-0.005 15
30		16.56	0.005 13
20 (Ref.)		6.91	-
10		-2.78	-0.005 15
0		8.91	0.001 06
-10		5.97	-0.000 50
-20		6.19	-0.000 38
-30		7.81	0.000 48
Frequency Stability versus Power Supply			
Environment Temperature (°C)	Power Supplied (V)	Frequency Measure with Time Elapse	
		Frequency Error (Hz)	ppm
20	13.8	6.49	-0.000 22
	10.2	10.85	0.002 10

- End of the Test Report -