

TEST REPORT

of

FCC Part 22 Subpart C/H, and Part 90 Subpart S
IC RSS-132 Issue 4 and RSS-Gen Issue 5

FCC ID: : BEJTM05FNNAGM0
IC Certification: 2703H-TM05FNNAGM0

Equipment Under Test : Telematics Module
Model Name : TM05FNNAGM0
Variant Model Name(s) : TM05FNNAGM1
Applicant : FCC: LG Electronics USA
IC: LG ELECTRONICS INC.
Manufacturer : LG Electronics Inc.
Date of Receipt : 2024.05.08
Date of Test(s) : 2024.05.15 ~ 2024.06.25
Date of Issue : 2024.07.03

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

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Tested by:



Youngbin 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

FCC Applicant : LG Electronics USA

FCC Address : 111 Sylvan Avenue, North Building, Englewood Cliffs, New Jersey, United States, 07632

IC Applicant : LG ELECTRONICS INC.

IC Address : 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, Korea (Republic of), 451-713

Contact Person : Kim, David

Phone No. : +1 201 470 2696

1.3. Details of Manufacturer

Company : LG Electronics Inc.

Address : 128, Yeoui-daero, Yeongdeungpo-gu, Seoul, Republic of Korea, 07336

1.4. Description of EUT

Kind of Product	Telematics Module
Model Name	TM05FNNAGM0
Variant Model Name	TM05FNNAGM1
Serial Number	Conducted: 351015130056680 Radiated: 351015130065751
Power Supply	DC 3.90 V
Rated Power	LTE Band 26 : 24 dBm
Frequency Range	LTE Band 26(FCC Only): 814 MHz ~ 824 MHz LTE Band 26: 824 MHz ~ 849 MHz
Modulation Technique	QPSK, 16QAM, 64QAM
Antenna Type	Metal Antenna
Antenna Gain*	814 MHz ~ 824 MHz : 0.37 dBi 824 MHz ~ 849 MHz : 0.37 dBi
H/W Version	Rev.D
S/W Version	SW175
FVIN	SW175

1.5. Test Equipment List

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Interval	Cal. Due
Spectrum Analyzer	R&S	FSV30	100955	Mar. 08, 2024	Annual	Mar. 08, 2025
Spectrum Analyzer	Agilent	N9020A	MY53421758	Sep. 01, 2023	Annual	Sep. 01, 2024
Signal Generator	R&S	SMA100B	106887	Oct. 06, 2023	Annual	Oct. 06, 2024
DC Power Supply	R&S	HMP2020	102133	Apr. 23, 2024	Annual	Apr. 23, 2025
Communication Analyzer	Anritsu	MT8821C	6262094325	Mar. 05, 2024	Annual	Mar. 05, 2025
Temperature Chamber	ESPEC CORP.	PL-2J	15004184	Jun. 03, 2024	Annual	Jun. 03, 2025
Directional Coupler	KRYTAR	152613	140972	Jul. 04, 2023	Annual	Jul. 04, 2024
BRIDGE Coupler	MARK MICROWAVE INC	CBR16-0012	1542	May 13, 2024	Annual	May 13, 2025
Power Sensor	Anritsu	MA2411B	1207272	May 29, 2024	Annual	May 29, 2025
Power Meter	Anritsu	ML2495A	1223004	May 29, 2024	Annual	May 29, 2025
High Pass Filter	Wainwright Instrument GmbH	WHNX10-900-1000-18000-40-SS	7	Feb. 27, 2024	Annual	Feb. 27, 2025
Preamplifier	H.P.	8447F	2944A03909	Aug. 04, 2023	Annual	Aug. 04, 2024
Preamplifier	R&S	SCU 18F	101058	Dec. 07, 2023	Annual	Dec. 07, 2024
Test Receiver	R&S	ESU26	100109	Jan. 16, 2024	Annual	Jan. 16, 2025
Loop Antenna	Schwarzbeck Mess-Elektronik	FMZB 1519	1519-039	Aug. 21, 2023	Biennial	Aug. 21, 2025
Bilog Antenna	Schwarzbeck Mess-Elektronik	VULB9163	9163-437	May 29, 2024	Annual	May 29, 2025
Horn Antenna	R&S	HF906	100326	Feb. 19, 2024	Annual	Feb. 19, 2025
Antenna Master	Innco systems GmbH	MA4640-XP-ET	MA4640/536/383 30516/L	N.C.R.	N/A	N.C.R.
Turn Table	Innco systems GmbH	DS 1200S	N/A	N.C.R.	N/A	N.C.R.
Controller	Innco systems GmbH	CONTROLLER CO3000-4P	CO3000/963/383 30516/L	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m × 6.4 m × 6.6 m)	N/A	N.C.R.	N/A	N.C.R.
Coaxial Cable	RADIALL	TESTPRO 3	182287	Apr. 12, 2024	Semi-Annual	Oct. 12, 2024
Coaxial Cable	RADIALL	TESTPRO 3	182288	Apr. 12, 2024	Semi-Annual	Oct. 12, 2024
Coaxial Cable	RADIALL	TESTPRO 3	182291	Apr. 12, 2024	Semi-Annual	Oct. 12, 2024
Coaxial Cable	RF ONE	NMST-13A26-NMST-5m	TPC2402190004	Apr. 03, 2024	Semi-Annual	Oct. 03, 2024
Coaxial Cable	RF ONE	NMST-13A26-NMST-10m	TPC2402190001	Apr. 03, 2024	Semi-Annual	Oct. 03, 2024

Note;

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

1.6. Summary of Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 22 and 90 / IC RSS-Gen Issue 5 and RSS-132 Issue 4			
Section in FCC	Section in IC	Test Item(s)	Result
§22.913(a)(5) §90.635(b)	RSS-132 Issue 4 5.4	E.R.P. / E.I.R.P.	Complied
§22.917(a) §90.691(a)	RSS-132 Issue 4 5.5	Radiated Spurious 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)	RSS-132 Issue 4 5.4	Peak-Average Ratio	Complied
§22.917(a) §90.691(a)	RSS-132 Issue 4 5.5	Spurious Emission at Antenna Terminal	Complied
§22.917(a) §90.691(a)	RSS-132 Issue 4 5.5	Band Edge and Emission Mask	Complied
§22.355 §90.213(a)	RSS-Gen Issue 5 6.11 RSS-132 Issue 4 5.3	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 (dB μ V) + Antenna factor (dB/m) + Cable loss (dB) + 20 Log D - 104.8;
 where D is the measurement distance in meters.
- E.R.P. (dB m) = E.I.R.P. (dB m) - 2.15 (dB)

1.8. Worst Case Configuration and Mode

The worst-case is based on the conducted output power measurement investigation results. All testing was performed using QPSK, 16QAM and 64QAM modulations. However, the spurious radiated emission and spurious at antenna terminal were only performed on bandwidth and RB offset (with RB size 1) with the highest conducted power in QPSK.

The radiation test of the EUT was investigated in three orthogonal orientations X, Y, and Z, and the worst case data is reported.

1.9. Manufacturer Declaration

The EUT supports two ports and LTE and 5G NR FDD bands support only port 1. The 5G NR TDD (n41, n77, n78) band supports both port 1 and port 2

1.10. Measurement Configuration

Test Items	Band	Test Channel			Bandwidth (MHz)						Modulation			RB #		
		Low	Mid	High	1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full
Conducted Power	26 Part22	V	V	V	V	V	V	V	V		V	V	V	V	V	V
	26 Part90	V	V	V	V	V	V	V	V		V	V	V	V	V	V
Frequency Stability	26 Part22	-	V	-	-	-	V	-	-		V	-	-	-	-	V
	26 Part90	-	V	-	-	-	V	-	-		V	-	-	-	-	V
Occupied Bandwidth	26 Part22	V	V	V	V	V	V	V	V		V	V	V	-	-	V
	26 Part90	V	V	V	V	V	V	V	V		V	V	V	-	-	V
Peak-to-Average Ratio	26 Part22	V	V	V	V	V	V	V	V		V	V	V	-	-	V
	26 Part90	V	V	V	V	V	V	V	V		V	V	V	-	-	V
Band edge	26 Part22	V	-	V	V	V	V	V	V		V	V	-	V	-	V
	26 Part90	V	-	V	V	V	V	V	V		V	V	-	V	-	V
Spurious at antenna terminal & Spurious Radiated Emission	26 Part22	V	V	V	worst case											
	26 Part90	V	V	V	worst case											

1.11. Measurement Uncertainty

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

Parameter	Uncertainty	
Conducted Output Power	0.33 dB	
Occupied Bandwidth	0.05 MHz	
Conducted Spurious Emissions	0.99 dB	
Peak to Average Ratio	0.66 dB	
Frequency Stability	116 Hz	
Radiated Emission, 9 kHz to 30 MHz	H	3.60 dB
	V	3.60 dB
Radiated Emission, below 1 GHz	H	4.60 dB
	V	4.90 dB
Radiated Emission, above 1 GHz	H	3.90 dB
	V	3.80 dB

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

1.12. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL005226	2024.07.03	Initial

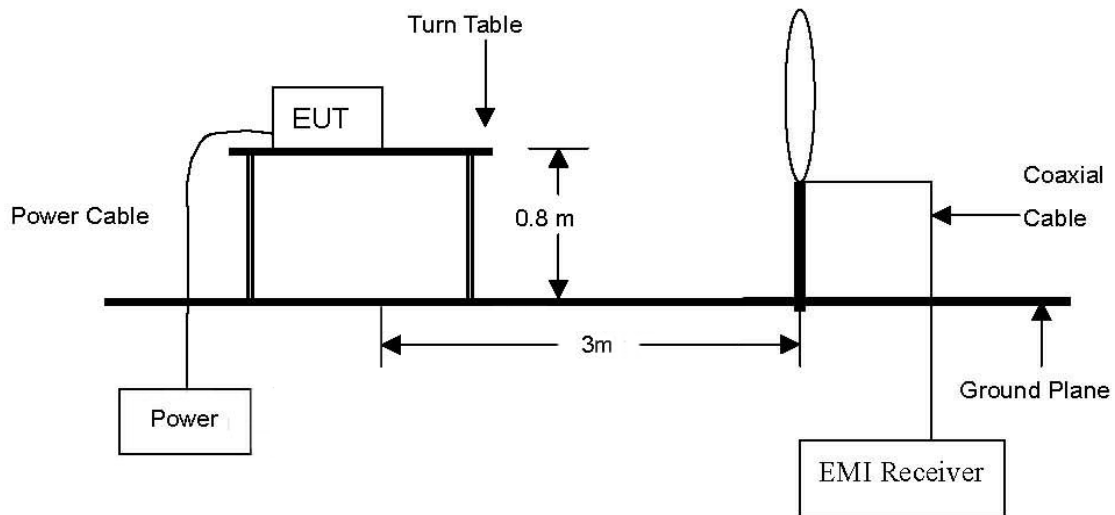
1.13. Emission Designator and Max Power

Band	Band width (MHz)	Modulation	Low Freq. (MHz)	Upper Freq. (MHz)	Conducted Average (dB m)	Ant. Gain (dB i)	E.R.P. Average (dB m)	E.R.P. Average (W)	Emission Designator
26/5 Part 22	1.4	QPSK	824.7	848.3	23.99	0.37	22.21	0.166	1M10G7D
		16QAM			23.40		21.62	0.145	1M09D7D
	3	QPSK	825.5	847.5	24.05		22.27	0.169	2M68G7D
		16QAM			23.59		21.81	0.152	2M68D7D
	5	QPSK	826.5	846.5	24.07		22.29	0.169	4M49G7D
		16QAM			23.45		21.67	0.147	4M49D7D
	10	QPSK	829.0	844.0	24.10		22.32	0.171	8M92G7D
		16QAM			23.66		21.88	0.154	8M92D7D
	15	QPSK	831.5	841.5	23.98		22.20	0.166	13M4G7D
		16QAM			23.39		21.61	0.145	13M5D7D
26 Part 90	1.4	QPSK	814.7	823.3	23.86	0.37	22.08	0.161	1M09G7D
		16QAM			23.37		21.59	0.144	1M09D7D
	3	QPSK	815.5	822.5	24.12		22.34	0.171	2M67G7D
		16QAM			23.63		21.85	0.153	2M68D7D
	5	QPSK	816.5	821.5	23.99		22.21	0.166	4M50G7D
		16QAM			23.58		21.80	0.151	4M49D7D
	10	QPSK	819.0	23.49	21.71		0.148	8M92G7D	
		16QAM		22.71	20.93		0.124	8M94D7D	
	15	QPSK	821.5	23.85	22.07		0.161	13M4G7D	
		16QAM		23.09	21.31		0.135	13M5D7D	

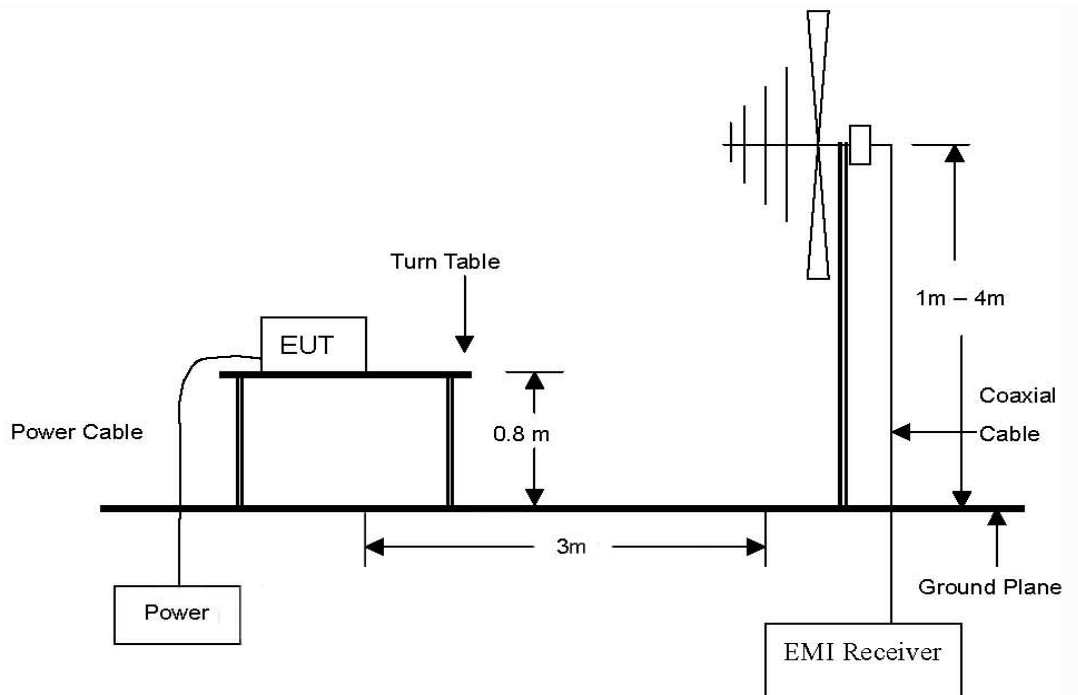
2. E.R.P. / E.I.R.P. & Radiated Spurious Emission

2.1. Test setup

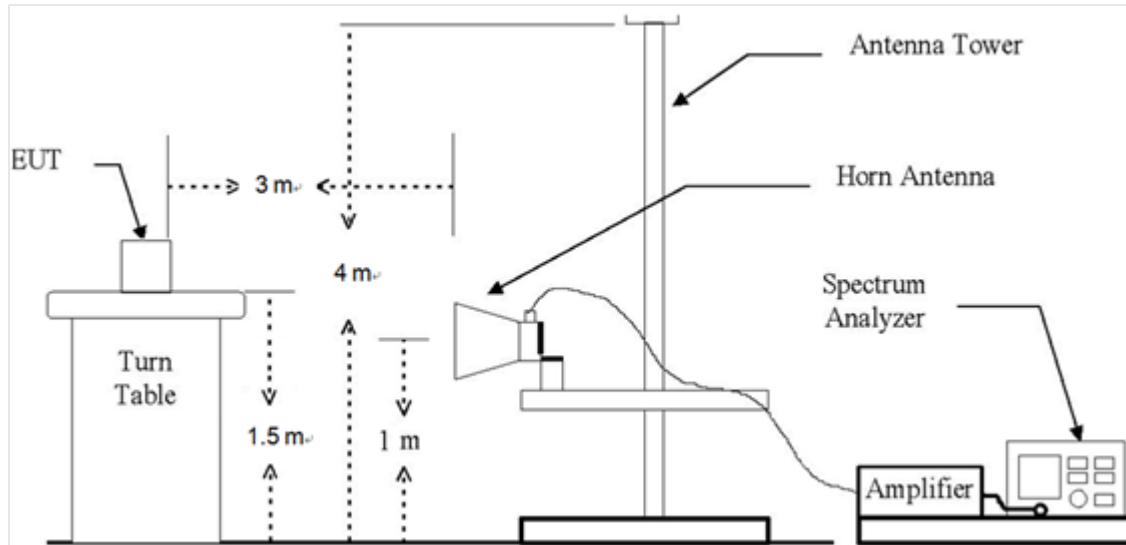
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz.



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



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 9 GHz Emissions.



2.2. Limit

2.2.1. Limit of E.R.P. / E.I.R.P.

FCC

- §22.913(a)(5), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.
- §90.635(b), the maximum output power of the transmitter for mobile stations is 100 watts (20 dBW).

IC

- RSS-132 Issue 4

5.4, The transmitter output power shall be measured in terms of average power. The equivalent radiated power (e.r.p.) shall not exceed 7 watts for mobile equipment and 3 watts for portable equipment. The effective isotropic radiated power (e.i.r.p.) shall not exceed the limits specified in SRSP-503 for base station equipment.

2.2.2. Limit of Radiated Spurious Emission

FCC

- §22.917(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.
- §90.691(a), out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f / 6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

IC

- RSS-132 Issue 4

Equipment shall meet the unwanted emission limits specified below:

(i) In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least $43 + 10 \log(p)$ dB.

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

p is the output power specified in watts

2.3. Test Procedure

2.3.1. E.R.P. / E.I.R.P. from conducted RF output power

According to subclause 5.2.5.5 of ANSI C63.26-2015 E.R.P. and E.I.R.P. are defined as the product of the power supplied to the antenna and its gain.

The relevant equation for determining the E.R.P. or E.I.R.P. from the conducted RF output power measured using the guidance provided above is:

$$\text{E.R.P. or E.I.R.P.} = P_{\text{Meas}} + G_T$$

where:

E.R.P. or E.I.R.P. = effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas} , typically dBW or dBm);

P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;

G_T = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

2.3.2. Radiated Output Power & Radiated Spurious Emissions

The test based on ANSI/TIA 603E: 2016 and ANSI C63.26-2015 and KDB 971168 D01 Power Meas License Digital Systems v03r01.

1. On a test site, the EUT shall be placed at 0.8 m or 1.5 m height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. Radiated spurious emissions measurement method was set as follows:
RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1 GHz, VBW $\geq 3 \times$ RBW,
Detector = RMS, trace mode = max hold, per the guidelines of KDB 971168 D01 Power Meas License Digital Systems v03r01.
5. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
11. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
12. The measurement shall be repeated with the test antenna orientated for horizontal polarization.

2.4. Test results

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

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

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)	Limit
26 Part 22	824 ~ 849	24.10	0.257	0.37	24.47	0.280	22.32	0.171	7 W E.R.P.
26 Part 90	814 ~ 824	24.12	0.258	0.37	24.49	0.281	22.34	0.171	100 W

Remark;

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

2.4.2. Radiated Spurious emission

LTE band 26 Part 22 (10 MHz - QPSK)

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 (829.0 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (836.5 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (844.0 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

LTE band 26 Part 90 (3 MHz - QPSK)

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 (815.5 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
Middle Channel (819.0 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-
High Channel (822.5 MHz)									
Below 1 000.00	Not detected	-	-	-	-	-	-	-	-
Above 1 000.00	Not detected	-	-	-	-	-	-	-	-

Remark;

1. AF = Antenna Factor, CL = Cable Loss, CF = Conversion Factor.
2. E (dBμV/m) = Measured Level (dBμV) + Antenna Factor (dB/m) + AMP (dB) + Cable Loss (dB).
3. E.I.R.P. (dB m) = E (dBμV/m) + CF (dB).
4. E.R.P. (dB m) = E (dBμV/m) + CF (dB) - 2.15 (dB); where E.R.P. and E.I.R.P. are expressed in consistent units.
5. CF (dB) = 20 log D - 104.8; where D is the measurement distance in meters, According to KDB 971168 D01 v03r01 5.8.4.
6. The frequency spectrum is examined from 9 kHz to the 10th harmonic of the fundamental frequency of the transmitter. No other spurious and harmonic emissions were reported greater than listed emissions above table.

3. Conducted Output Power

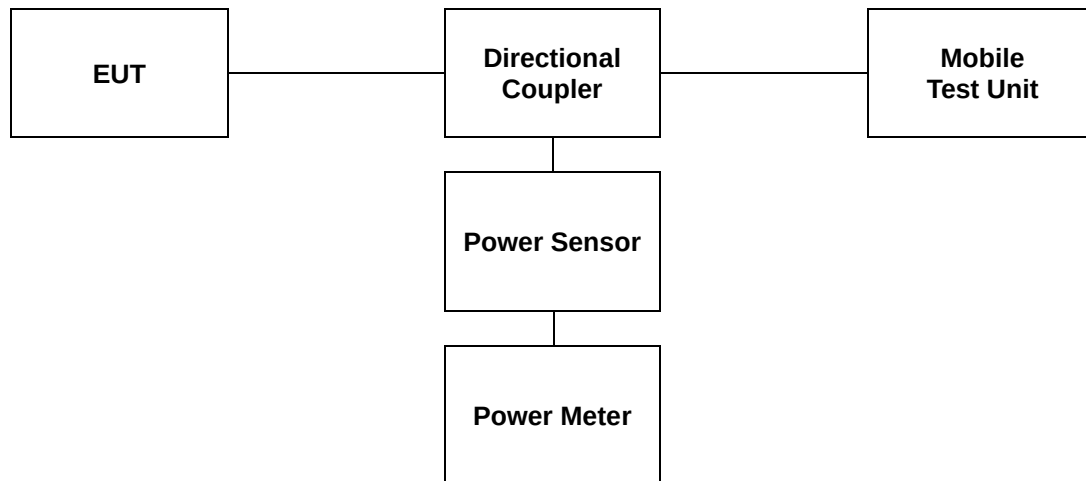
3.1. Limit

CFR 47, Section FCC §2.1046 and IC RSS-Gen Issue 5 6.12.

3.2. Test Procedure

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

1. The RF output of the transmitter was connected to the input of the mobile test unit in order to establish communication with the EUT.
2. The EUT was set up for the max. output power with pseudo random data modulation by using mobile test unit parameters.
3. The measurement performed using a wideband RF power meter.
4. This EUT was tested under all configurations and the highest power was investigated and reported.



3.3. Test Result

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

LTE Band 26 part 22									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26797 (824.7 MHz)		26915 (836.5 MHz)		27033 (848.3 MHz)	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
1.4	QPSK	1	0	23.90	0.245	23.81	0.240	23.76	0.238
		1	2	23.99	0.251	23.83	0.242	23.76	0.238
		1	5	23.88	0.244	23.83	0.242	23.75	0.237
		3	0	23.90	0.245	23.84	0.242	23.58	0.228
		3	2	23.96	0.249	23.91	0.246	23.74	0.237
		3	3	23.89	0.245	23.90	0.245	23.75	0.237
		6	0	23.05	0.202	23.01	0.200	22.81	0.191
	16QAM	1	0	23.25	0.211	23.33	0.215	23.23	0.210
		1	3	23.40	0.219	23.31	0.214	23.13	0.206
		1	5	23.40	0.219	23.22	0.210	23.11	0.205
		3	0	23.09	0.204	23.14	0.206	23.17	0.207
		3	2	23.15	0.207	23.44	0.221	23.12	0.205
		3	3	23.06	0.202	23.30	0.214	23.30	0.214
		6	0	22.35	0.172	22.45	0.176	22.36	0.172
	64QAM	1	0	22.01	0.159	22.13	0.163	22.18	0.117
		1	2	22.04	0.160	22.10	0.162	22.05	0.132
		1	5	22.01	0.159	22.10	0.162	22.06	0.118
		3	0	22.03	0.160	22.13	0.163	21.27	0.134
		3	2	22.09	0.162	22.27	0.169	21.23	0.133
		3	3	22.08	0.161	22.19	0.166	21.29	0.135
		6	0	21.05	0.127	21.33	0.136	21.28	0.134

LTE Band 26 part 22									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26805 (825.5 MHz)		26915 (836.5 MHz)		27025 (847.5 MHz)	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
3	QPSK	1	0	23.90	0.245	24.00	0.251	23.81	0.240
		1	7	24.03	0.253	23.95	0.248	23.74	0.237
		1	14	24.05	0.254	23.95	0.248	23.74	0.237
		8	0	23.16	0.207	23.02	0.200	22.99	0.199
		8	4	23.20	0.209	23.09	0.204	23.00	0.200
		8	7	23.13	0.206	22.99	0.199	22.94	0.197
		15	0	23.00	0.200	23.04	0.201	22.99	0.199
	16QAM	1	0	23.27	0.212	23.25	0.211	23.26	0.212
		1	7	23.59	0.229	23.59	0.229	23.08	0.203
		1	14	23.52	0.225	23.47	0.222	22.99	0.199
		8	0	22.25	0.168	22.11	0.163	22.11	0.163
		8	4	22.37	0.173	22.17	0.165	22.17	0.165
		8	7	22.35	0.172	22.11	0.163	22.11	0.163
		15	0	22.08	0.161	22.09	0.162	22.09	0.162
	64QAM	1	0	22.23	0.167	22.22	0.167	22.26	0.134
		1	7	22.27	0.169	22.20	0.166	22.00	0.126
		1	14	22.29	0.169	22.08	0.161	22.03	0.127
		8	0	21.29	0.135	21.06	0.128	21.11	0.129
		8	4	21.25	0.133	21.12	0.129	21.19	0.132
		8	7	21.28	0.134	21.06	0.128	21.19	0.132
		15	0	21.08	0.128	21.05	0.127	21.12	0.129

LTE Band 26_part 22									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26815 (826.5 MHz)		26915 (836.5 MHz)		27015 (846.5 MHz)	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
5	QPSK	1	0	23.90	0.245	23.95	0.248	23.85	0.243
		1	12	24.05	0.254	23.99	0.251	23.57	0.228
		1	24	24.07	0.255	24.03	0.253	23.65	0.232
		12	0	23.13	0.206	23.14	0.206	22.85	0.193
		12	6	23.07	0.203	23.20	0.209	23.01	0.200
		12	13	23.13	0.206	23.19	0.208	22.91	0.195
		25	0	23.15	0.207	23.15	0.207	22.94	0.197
	16QAM	1	0	23.41	0.219	23.26	0.212	23.06	0.202
		1	12	23.20	0.209	23.24	0.211	22.85	0.193
		1	24	23.33	0.215	23.45	0.221	22.96	0.198
		12	0	22.33	0.171	22.29	0.169	21.95	0.157
		12	6	22.33	0.171	22.26	0.168	22.05	0.160
		12	13	22.25	0.168	22.26	0.168	22.02	0.159
		25	0	22.12	0.163	22.16	0.164	21.97	0.157
	64QAM	1	0	22.16	0.164	22.21	0.166	22.18	0.165
		1	12	22.17	0.165	22.31	0.170	21.77	0.150
		1	24	22.28	0.169	22.13	0.163	21.87	0.154
		12	0	21.30	0.135	21.24	0.133	21.07	0.128
		12	6	21.34	0.136	21.32	0.136	21.01	0.126
		12	13	21.35	0.136	21.17	0.131	21.27	0.134
		25	0	21.26	0.134	21.06	0.128	21.10	0.129

LTE Band 26_part 22									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26840 (829.0 MHz)		26915 (836.5 MHz)		26990 (844.0 MHz)	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
10	QPSK	1	0	23.95	0.248	24.01	0.252	23.96	0.249
		1	25	24.10	0.257	23.93	0.247	23.98	0.250
		1	49	24.05	0.254	24.10	0.257	23.59	0.229
		25	0	23.10	0.204	23.19	0.208	23.18	0.208
		25	12	23.08	0.203	23.13	0.206	23.19	0.208
		25	25	23.23	0.210	23.23	0.210	23.18	0.208
		50	0	22.96	0.198	22.96	0.198	23.01	0.200
	16QAM	1	0	23.36	0.217	23.57	0.228	23.66	0.232
		1	25	23.28	0.213	23.34	0.216	23.45	0.221
		1	49	23.57	0.228	23.57	0.228	22.86	0.193
		25	0	22.43	0.175	22.37	0.173	22.39	0.173
		25	12	22.40	0.174	22.43	0.175	22.25	0.168
		25	25	22.51	0.178	22.35	0.172	22.42	0.175
		50	0	22.27	0.169	22.07	0.161	22.08	0.161
	64QAM	1	0	22.31	0.170	22.34	0.171	22.21	0.166
		1	25	22.29	0.169	22.17	0.165	22.10	0.162
		1	49	22.27	0.169	22.34	0.171	22.19	0.166
		25	0	21.43	0.139	21.47	0.140	21.44	0.139
		25	12	21.44	0.139	21.29	0.135	21.20	0.132
		25	25	21.30	0.135	21.29	0.135	21.41	0.138
		50	0	21.39	0.138	21.27	0.134	21.22	0.132

LTE Band 26_part 22									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26865 (831.5 MHz)		-		26965 (841.5 MHz)	
				(dB m)	(W)	-	-	(dB m)	(W)
15	QPSK	1	0	23.98	0.250	-	-	23.91	0.246
		1	36	23.97	0.249	-	-	23.97	0.249
		1	74	23.92	0.247	-	-	23.97	0.249
		36	0	23.16	0.207	-	-	23.21	0.209
		36	18	23.12	0.205	-	-	23.22	0.210
		36	37	23.15	0.207	-	-	23.16	0.207
		75	0	23.17	0.207	-	-	23.06	0.202
	16QAM	1	0	23.31	0.214	-	-	23.27	0.212
		1	36	23.39	0.218	-	-	23.37	0.217
		1	74	23.30	0.214	-	-	23.38	0.218
		36	0	22.40	0.174	-	-	22.22	0.167
		36	18	22.30	0.170	-	-	22.28	0.169
		36	37	22.37	0.173	-	-	22.27	0.169
		75	0	22.31	0.170	-	-	22.03	0.160
	64QAM	1	0	22.24	0.167	-	-	22.15	0.164
		1	36	22.20	0.166	-	-	22.18	0.165
		1	74	22.22	0.167	-	-	22.23	0.167
		36	0	21.35	0.136	-	-	21.23	0.133
		36	18	21.28	0.134	-	-	21.29	0.135
		36	37	21.38	0.137	-	-	21.32	0.136
		75	0	21.16	0.131	-	-	21.04	0.127

LTE Band 26_part 90									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26697 (814.7 MHz)		26740 (819.0 MHz)		26783 (823.3 MHz)	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
1.4	QPSK	1	0	23.49	0.223	23.74	0.237	23.80	0.240
		1	2	23.47	0.222	23.78	0.239	23.75	0.237
		1	5	23.34	0.216	23.44	0.221	23.72	0.236
		3	0	23.76	0.238	23.68	0.233	23.81	0.240
		3	2	23.74	0.237	23.86	0.243	23.74	0.237
		3	3	23.59	0.229	23.63	0.231	23.83	0.242
		6	0	22.81	0.191	22.61	0.182	22.93	0.196
	16QAM	1	0	23.13	0.206	23.03	0.201	23.20	0.209
		1	2	22.73	0.187	22.71	0.187	23.37	0.217
		1	5	22.61	0.182	23.07	0.203	23.34	0.216
		3	0	22.91	0.195	23.02	0.200	23.22	0.210
		3	2	22.94	0.197	22.95	0.197	23.20	0.209
		3	3	22.90	0.195	22.93	0.196	23.31	0.214
		6	0	22.19	0.166	22.25	0.168	22.25	0.168
	64QAM	1	0	21.21	0.132	20.96	0.125	21.68	0.147
		1	2	20.61	0.115	21.05	0.127	21.69	0.148
		1	5	20.49	0.112	20.98	0.125	21.65	0.146
		3	0	21.09	0.129	20.97	0.125	21.45	0.140
		3	2	21.02	0.126	21.12	0.129	21.41	0.138
		3	3	21.00	0.126	21.18	0.131	21.38	0.137
		6	0	20.04	0.101	20.61	0.115	20.79	0.120

LTE Band 26_part 90									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26705 (815.5 MHz)		26740 (819.0 MHz)		26775 (822.5 MHz)	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
3	QPSK	1	0	23.39	0.218	23.65	0.232	23.92	0.247
		1	7	23.42	0.220	23.57	0.228	24.03	0.253
		1	14	23.40	0.219	23.90	0.245	24.12	0.258
		8	0	22.83	0.192	22.83	0.192	23.02	0.200
		8	4	22.89	0.195	23.01	0.200	23.02	0.200
		8	7	22.85	0.193	23.01	0.200	23.03	0.201
		15	0	22.75	0.188	23.00	0.200	23.03	0.201
	16QAM	1	0	23.09	0.204	23.06	0.202	23.35	0.216
		1	7	22.75	0.188	22.87	0.194	23.41	0.219
		1	14	22.70	0.186	23.20	0.209	23.63	0.231
		8	0	22.12	0.163	21.96	0.157	22.08	0.161
		8	4	22.16	0.164	22.15	0.164	22.05	0.160
		8	7	22.14	0.164	22.07	0.161	22.13	0.163
		15	0	22.16	0.164	22.04	0.160	22.06	0.161
	64QAM	1	0	21.74	0.149	21.96	0.157	21.98	0.158
		1	7	21.65	0.146	21.70	0.148	21.83	0.152
		1	14	21.64	0.146	21.92	0.156	21.82	0.152
		8	0	21.04	0.127	19.92	0.098	21.06	0.128
		8	4	21.14	0.130	20.13	0.103	21.06	0.128
		8	7	21.15	0.130	20.33	0.108	21.05	0.127
		15	0	20.06	0.101	20.07	0.102	21.05	0.127

LTE Band 26_part 90									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26715 (816.5 MHz)		26740 (819.0 MHz)		26765 (821.5 MHz)	
				(dB m)	(W)	(dB m)	(W)	(dB m)	(W)
5	QPSK	1	0	23.39	0.218	23.66	0.232	<u>23.99</u>	<u>0.251</u>
		1	12	23.39	0.218	23.51	0.224	23.96	0.249
		1	24	23.40	0.219	23.75	0.237	23.90	0.245
		12	0	23.13	0.206	22.71	0.187	22.99	0.199
		12	6	22.87	0.194	22.89	0.195	23.07	0.203
		12	13	22.83	0.192	23.10	0.204	23.00	0.200
		25	0	22.75	0.188	22.82	0.191	23.06	0.202
	16QAM	1	0	23.05	0.202	22.78	0.190	23.27	0.212
		1	12	22.71	0.187	22.75	0.188	<u>23.58</u>	<u>0.228</u>
		1	24	22.74	0.188	23.00	0.200	23.55	0.226
		12	0	22.16	0.164	22.02	0.159	22.15	0.164
		12	6	22.15	0.164	22.18	0.165	22.09	0.162
		12	13	22.18	0.165	22.26	0.168	22.03	0.160
		25	0	22.18	0.165	21.91	0.155	22.01	0.159
	64QAM	1	0	21.38	0.137	21.33	0.136	21.46	0.140
		1	12	21.22	0.132	21.39	0.138	21.44	0.139
		1	24	21.59	0.144	21.55	0.143	<u>21.72</u>	<u>0.149</u>
		12	0	21.09	0.129	20.77	0.119	20.53	0.113
		12	6	20.93	0.124	20.94	0.124	21.00	0.126
		12	13	20.93	0.124	21.00	0.126	21.04	0.127
		25	0	20.93	0.124	19.83	0.096	20.79	0.120

LTE Band 26_part 90									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				-		26740 (819.0 MHz)		-	
				-	-	(dB m)	(W)	-	-
10	QPSK	1	0	-	-	<u>23.49</u>	<u>0.223</u>	-	-
		1	25	-	-	23.33	0.215	-	-
		1	49	-	-	23.35	0.216	-	-
		25	0	-	-	22.83	0.192	-	-
		25	12	-	-	22.78	0.190	-	-
		25	25	-	-	22.69	0.186	-	-
		50	0	-	-	22.64	0.184	-	-
	16QAM	1	0	-	-	<u>22.71</u>	<u>0.187</u>	-	-
		1	25	-	-	22.59	0.182	-	-
		1	49	-	-	22.62	0.183	-	-
		25	0	-	-	21.89	0.155	-	-
		25	12	-	-	21.85	0.153	-	-
		25	25	-	-	21.69	0.148	-	-
		50	0	-	-	21.07	0.128	-	-
	64QAM	1	0	-	-	<u>21.27</u>	<u>0.134</u>	-	-
		1	25	-	-	21.15	0.114	-	-
		1	49	-	-	21.07	0.113	-	-
		25	0	-	-	20.74	0.119	-	-
		25	12	-	-	20.65	0.116	-	-
		25	25	-	-	20.66	0.116	-	-
		50	0	-	-	20.73	0.118	-	-

LTE Band 26_part 90									
Bandwidth (MHz)	Modulation	RB Size	RB Offset	Conducted Output Power					
				26765 (821.5 MHz)		-		-	
				(dB m)	(W)		-	-	-
15	QPSK	1	0	23.85	0.243			-	-
		1	36	23.58	0.228			-	-
		1	74	23.53	0.225			-	-
		36	0	22.98	0.199			-	-
		36	18	22.81	0.191			-	-
		36	37	22.76	0.189			-	-
		75	0	22.86	0.193			-	-
	16QAM	1	0	23.09	0.204			-	-
		1	36	22.91	0.195			-	-
		1	74	22.79	0.190			-	-
		36	0	22.19	0.166			-	-
		36	18	22.15	0.164			-	-
		36	37	22.13	0.163			-	-
		75	0	22.12	0.163			-	-
	64QAM	1	0	21.69	0.148			-	-
		1	36	21.51	0.142			-	-
		1	74	21.56	0.143			-	-
		36	0	20.59	0.115			-	-
		36	18	20.53	0.113			-	-
		36	37	20.38	0.109			-	-
		75	0	20.23	0.105			-	-

4. Occupied Bandwidth

4.1. Limit

CFR 47, Section FCC §2.1049 and IC RSS-Gen Issue 5 6.7.

4.2. Test Procedure

FCC

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

- a. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation. products including the emission skirts (typically a span of $1.5 \times \text{OBW}$ is sufficient).
- b. The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- c. Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- d. Set the detection mode to peak, and the trace mode to max-hold.
- e. If the instrument does not have a 99 % OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5 % of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5 % of the total is reached and record that frequency as the upper OBW frequency. The 99 % power OBW can be determined by computing the difference these two frequencies.
- f. The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

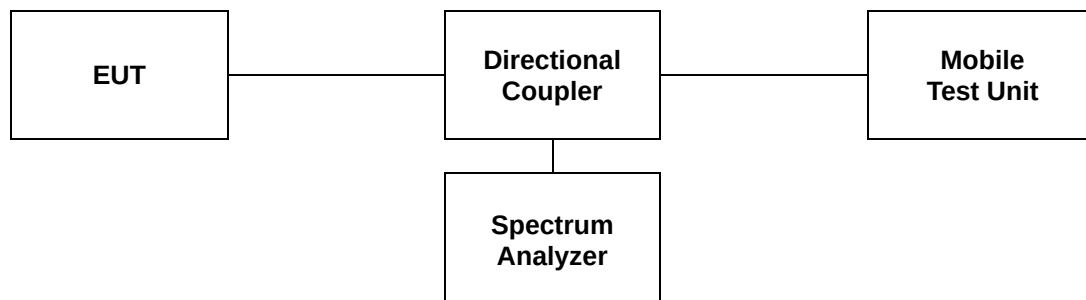
IC

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99 % emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99 % emission bandwidth).



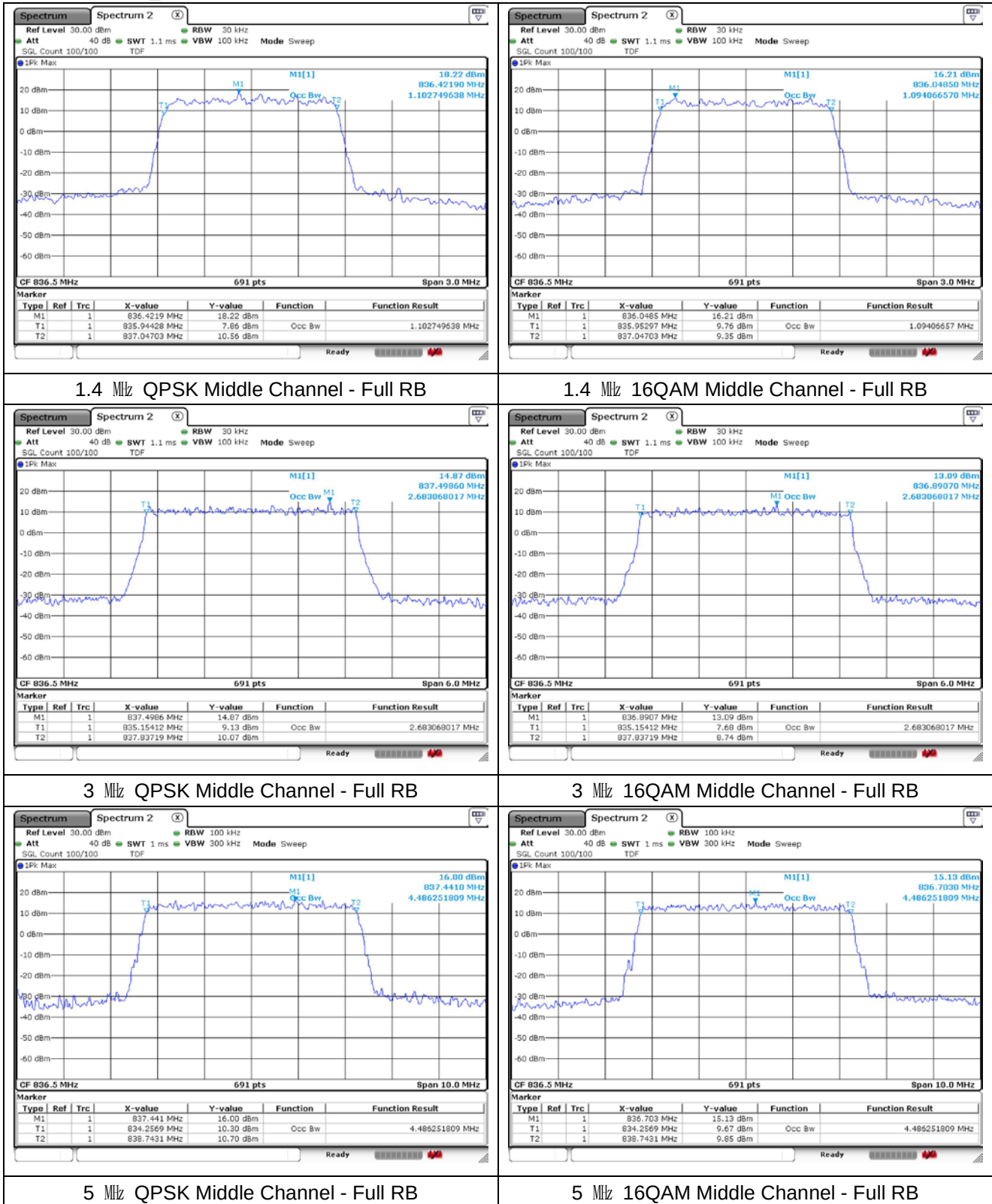
4.3 Test Results

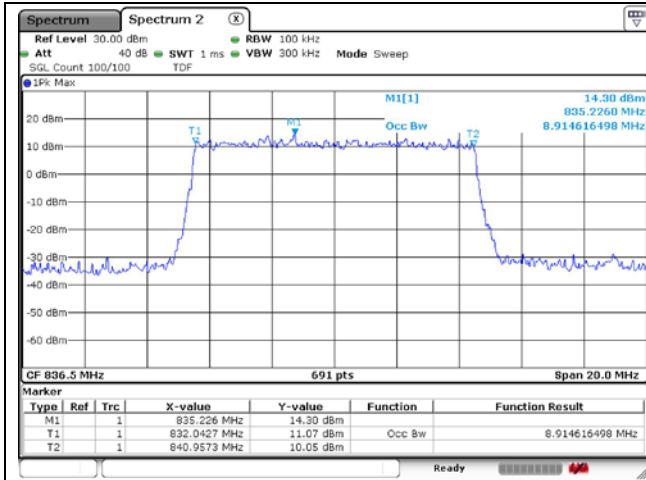
Ambient temperature : (23 ± 1) °C
 Relative humidity : 47 % R.H.

Band	Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (MHz)	
			QPSK	16QAM
26 Part 22	1.4	836.5	1.103	1.094
	3		2.683	2.683
	5		4.486	4.486
	10		8.915	8.915
	15	831.5	13.415	13.459
26 Part 90	1.4	819.0	1.094	1.094
	3		2.674	2.683
	5		4.501	4.486
	10		8.915	8.944
	15	821.5	13.415	13.502

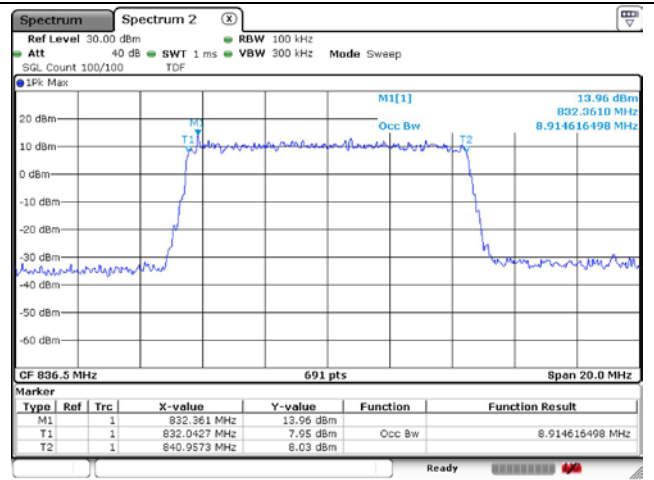
- Test plots

LTE band 26/5 Part 22

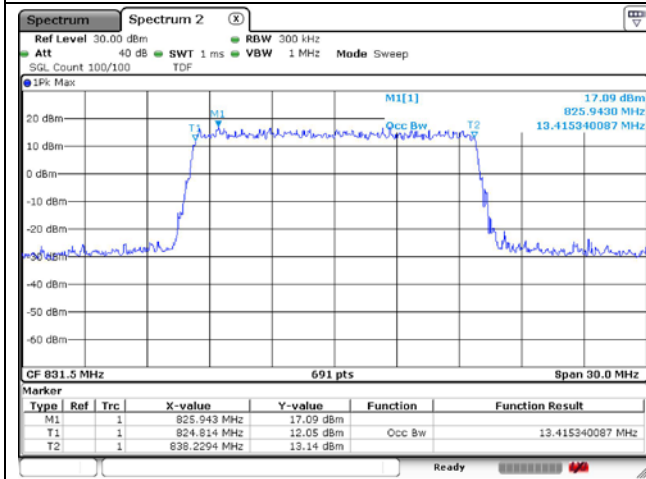




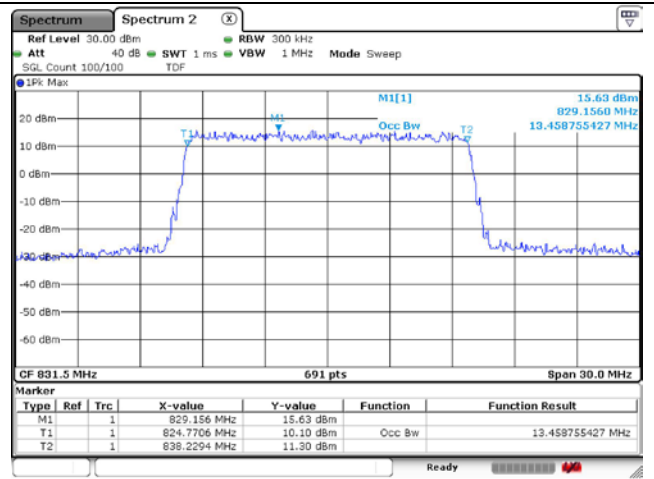
10 MHz QPSK Middle Channel - Full RB



10 MHz 16QAM Middle Channel - Full RB

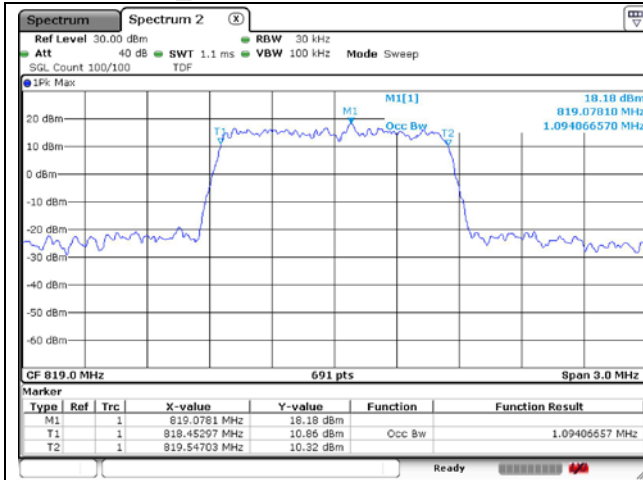


15 MHz QPSK Low Channel - Full RB

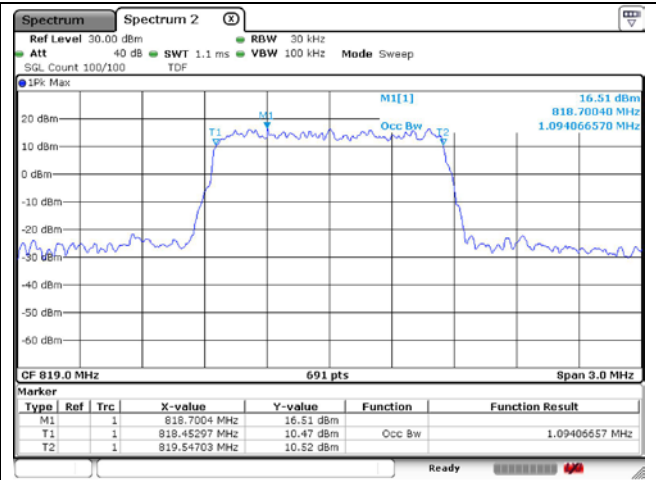


15 MHz 16QAM Low Channel - Full RB

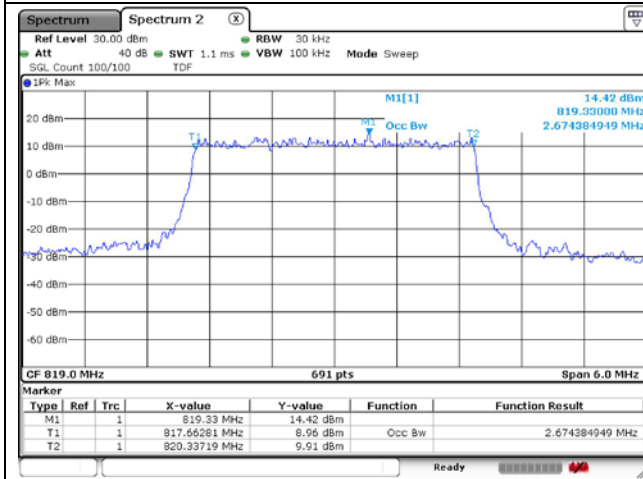
LTE band 26 Part 20



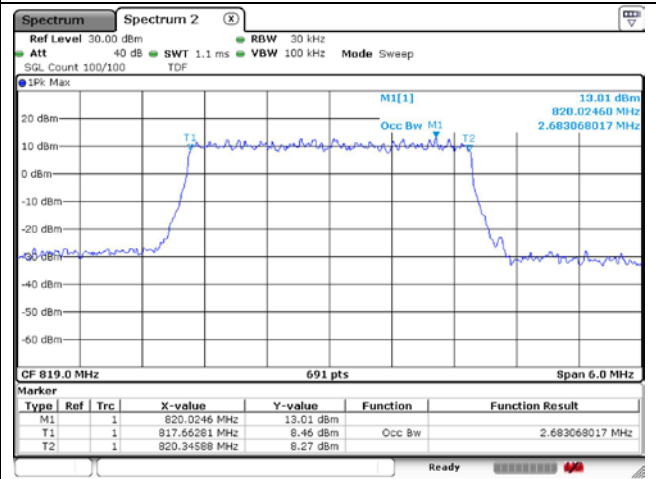
1.4 MHz QPSK Middle Channel - Full RB



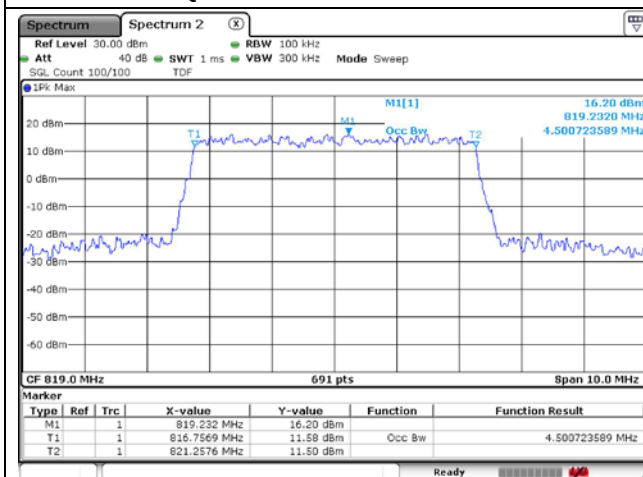
1.4 MHz 16QAM Middle Channel - Full RB



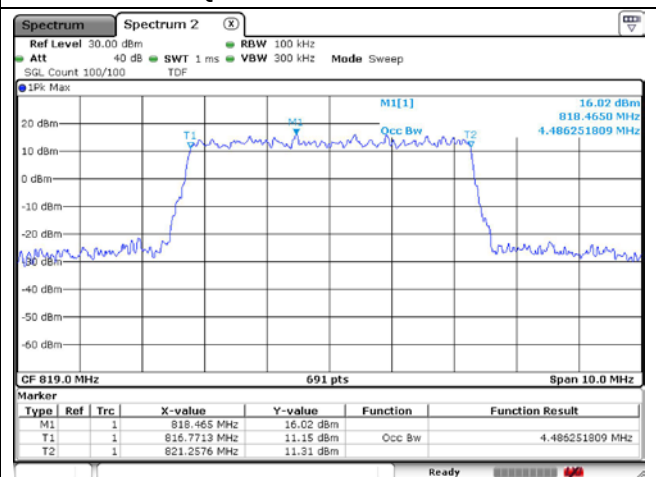
3 MHz QPSK Middle Channel - Full RB



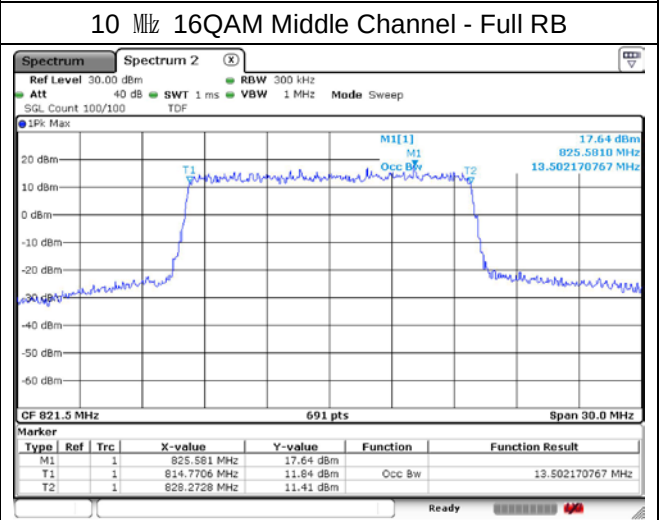
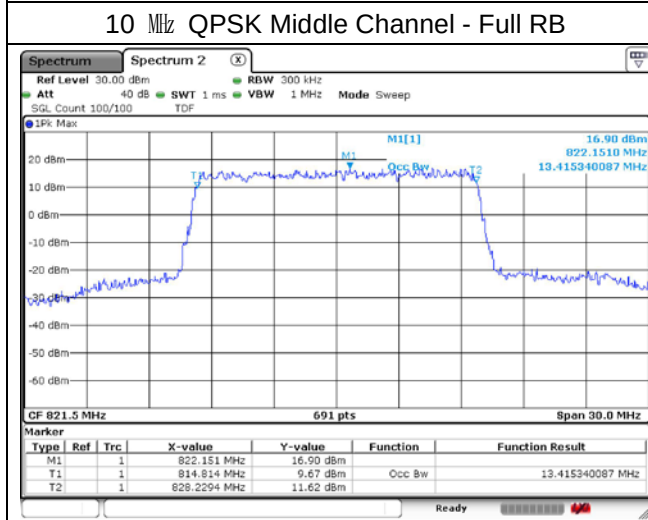
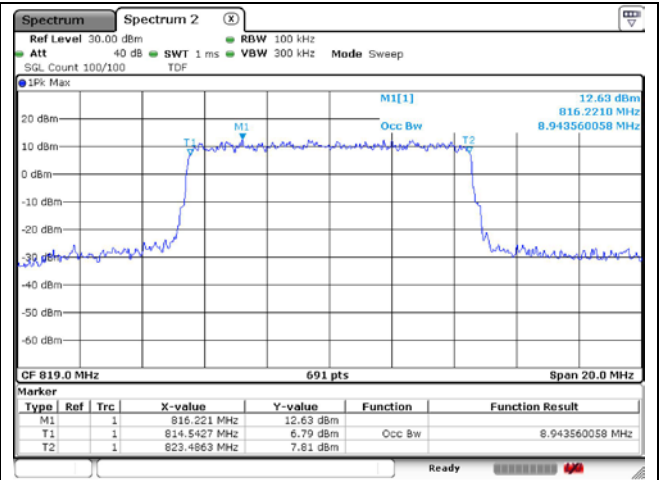
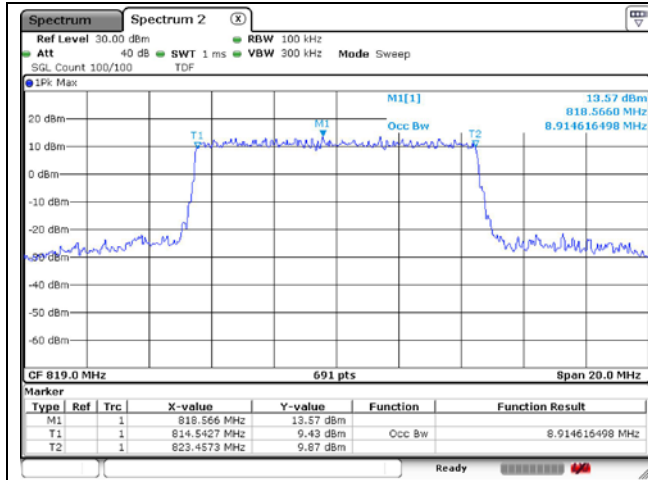
3 MHz 16QAM Middle Channel - Full RB



5 MHz QPSK Middle Channel - Full RB



5 MHz 16QAM Middle Channel - Full RB



5. Peak-Average Ratio

5.1. Limit

FCC

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

IC

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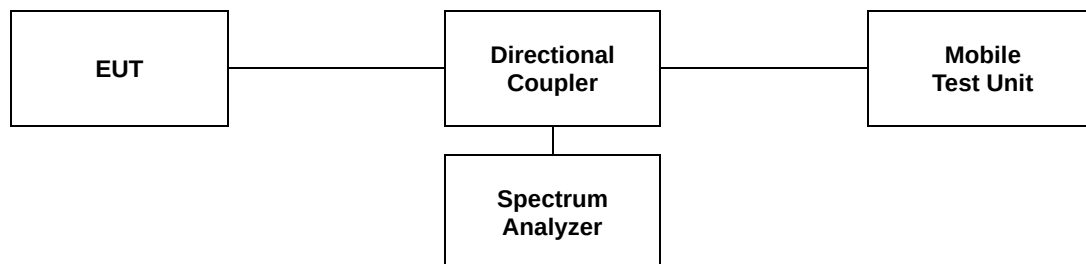
5.4, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1 % of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

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.



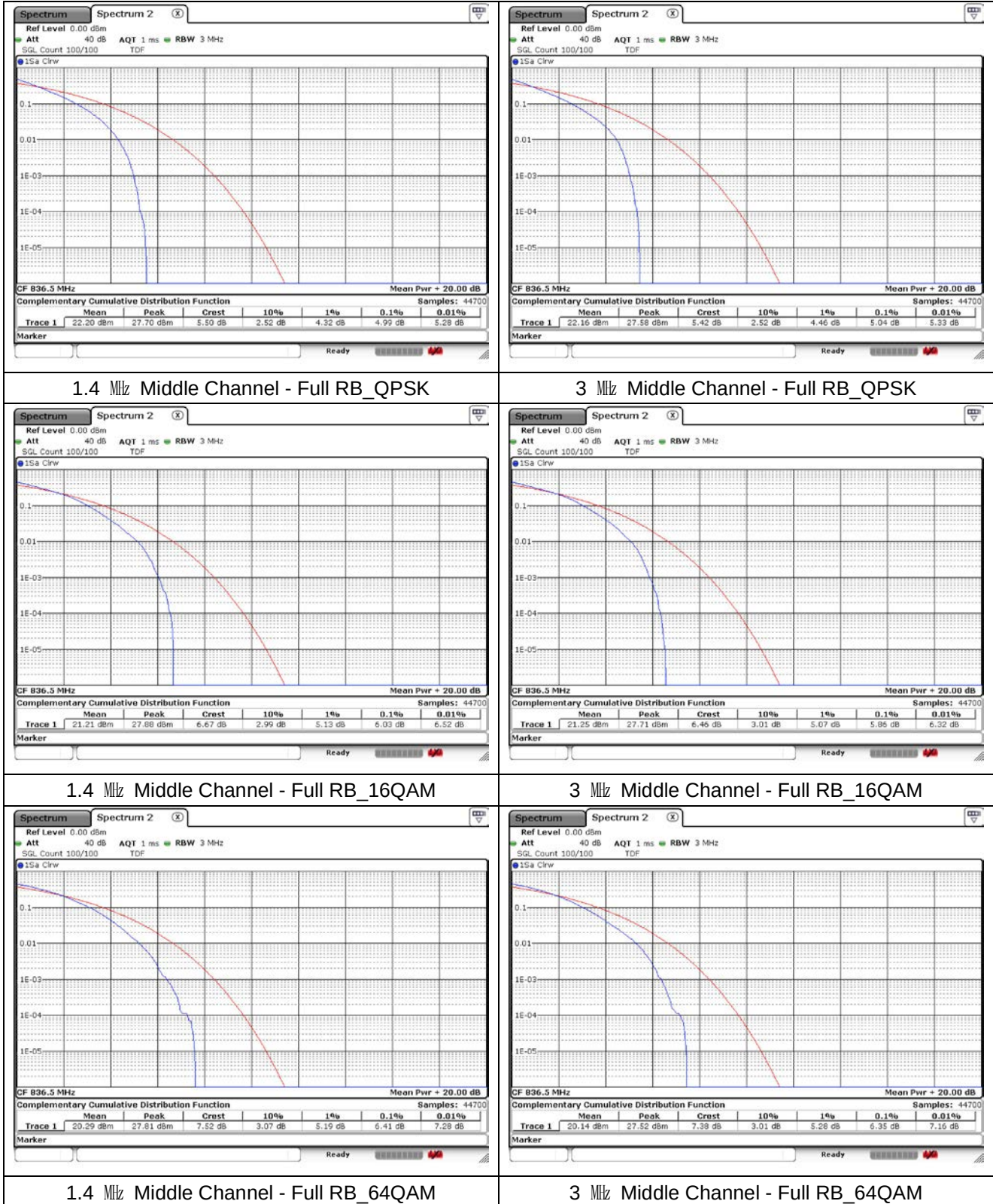
5.3 Test Results

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

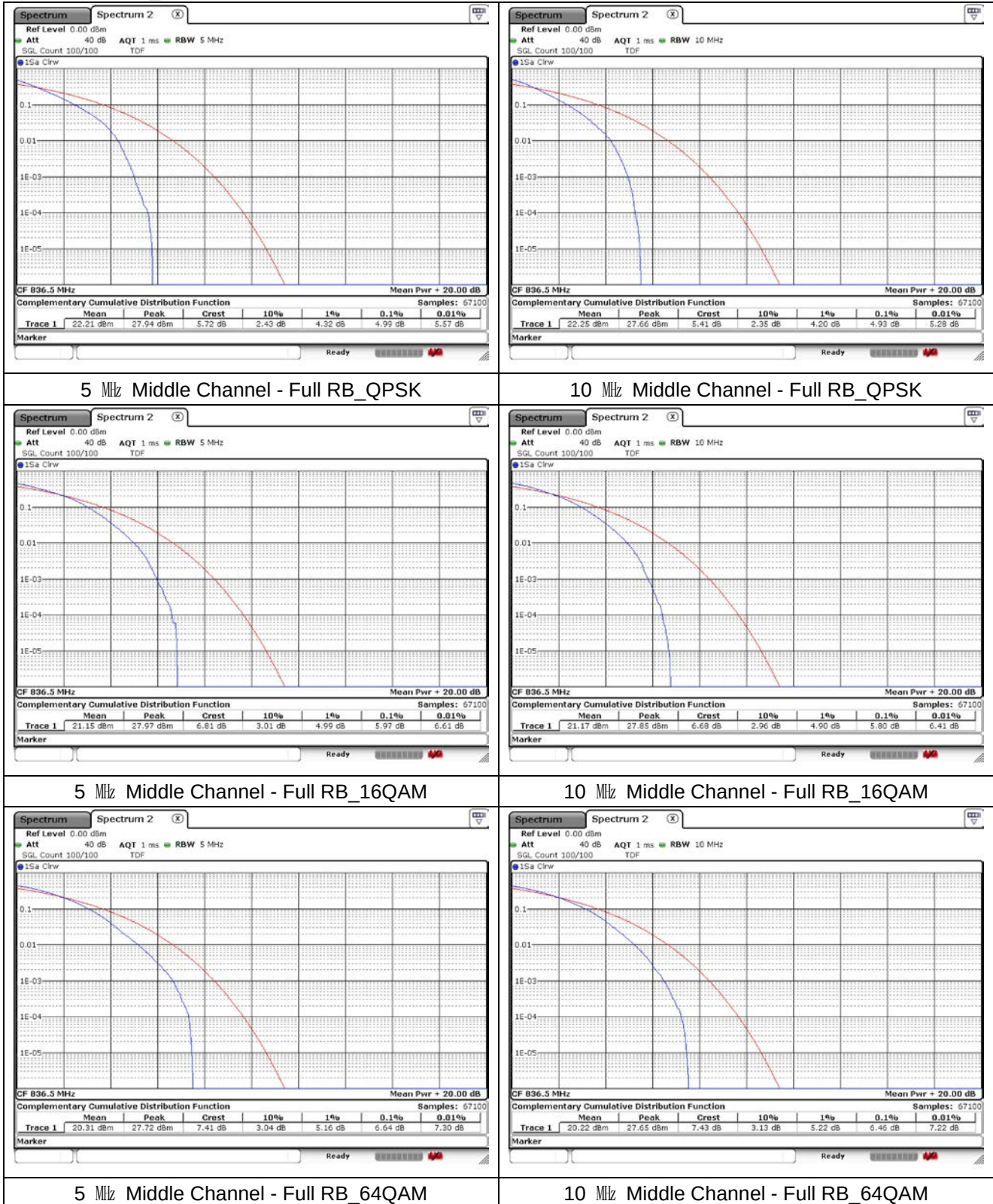
Band	Bandwidth (MHz)	Frequency (MHz)	PAR (dB)		
			QPSK	16QAM	64QAM
26/5 Part 22	1.4	824.7	5.83	6.41	7.25
		836.5	4.99	6.03	6.41
		848.3	4.70	5.68	6.55
	3	825.5	5.07	5.91	6.58
		836.5	5.04	5.86	6.35
		847.5	4.64	5.74	6.49
	5	826.5	5.16	6.12	6.58
		836.5	4.99	5.97	6.64
		846.5	4.55	5.68	6.46
	10	829.0	5.16	5.97	6.52
		836.5	4.93	5.80	6.46
		844.0	4.78	5.80	6.52
	15	831.5	5.28	6.09	6.64
		841.5	5.01	6.03	6.46
26 Part 90	1.4	814.7	4.78	5.80	6.81
		819.0	4.84	5.65	6.93
		823.3	5.65	6.46	7.04
	3	815.5	4.49	5.68	6.70
		819.0	4.49	5.65	6.52
		822.5	5.01	6.06	6.70
	5	816.5	4.58	5.62	6.55
		819.0	4.55	5.71	6.46
		821.5	4.87	5.97	6.46
	10	819.0	4.61	5.71	6.67
	15	821.5	5.04	6.06	6.67

- Test plots

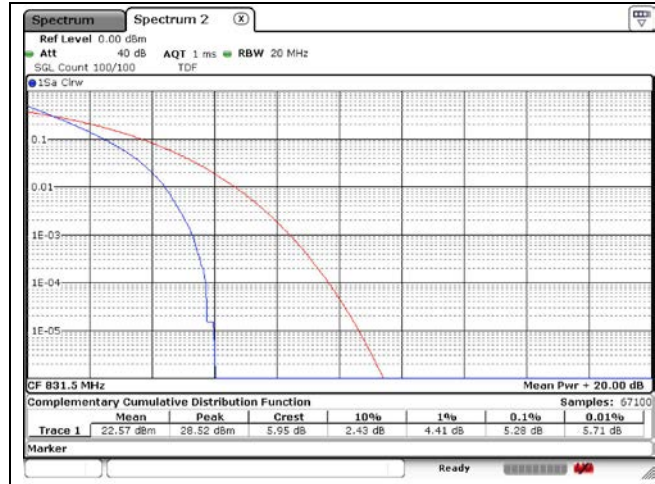
LTE band 26/5 Part 22



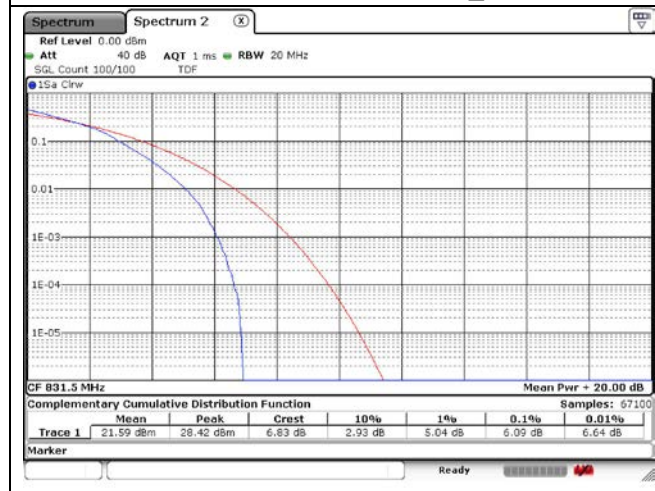
LTE band 26/5 Part 22



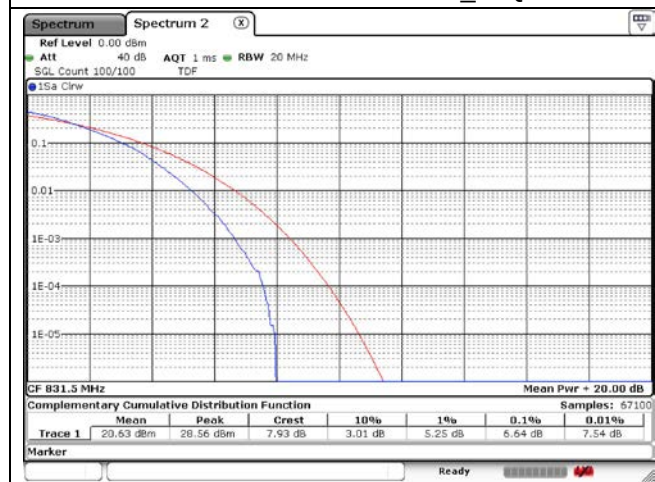
LTE band 26_Part 22



15 MHz Low Channel - Full RB_QPSK



15 MHz Low Channel - Full RB_16QAM



15 MHz Low Channel - Full RB_64QAM