TEST REPORT

No. I20N00390-RF-LTE

for

MobiWire SAS

4G Smart Feature Phone

Model Name: HomePhone 4G

FCC ID: QPN-HOMEPHONE

with

Hardware Version: V01

Software Version: MOBIWIRE_HOMEPHONE4G_V01_200413

Issued Date: 2020-05-19

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of SAICT.

Test Laboratory:

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I20N00390-RF-LTE	Rev.0	1st edition	2020-05-19

CONTENTS

1. SUMMARY OF TEST REPORT

1.1. Test Items

Description	4G Smart Feature Phone
Model Name	HomePhone 4G
Applicant's name	MobiWire SAS
Manufacturer's Name	MobiWire SAS

1.2. Test Standards

FCC Part 2/27	10-1-18 Edition
ANSI C63.26	2015
KDB971168 D01	v03r01

1.3. Test Result

All test items are pass. Please refer to "6 Summary of Test Results" for detail.

1.4. Testing Location

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518026

1.5. Project Data

Testing Start Date: 2020-03-18 Testing End Date: 2020-05-03

1.6. Signature

Lai Minghua
(Prepared this test report)

Huang Qiuqin
(Reviewed this test report)

Zhang Hao
(Approved this test report)

2. CLIENT INFORMATION

2.1. Applicant Information

Company Name:	MobiWire SAS
Address /Post:	79 AVENUE FRANCOIS ARAGO 92017 NANTERRE CEDEX France.
Contact Person:	Leander.Xu
Contact Email	leander.xu@mobiwire.com.cn
Telephone:	+86 574 59555707
Fax:	/

2.2. Manufacturer Information

Company Name:	MobiWire SAS
Address /Post:	79 AVENUE FRANCOIS ARAGO 92017 NANTERRE CEDEX France.
Contact Person:	Leander.Xu
Contact Email	leander.xu@mobiwire.com.cn
Telephone:	+86 574 59555707
Fax:	/

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE)

3.1. About EUT

Description	4G Smart Feature Phone
Model Name	HomePhone 4G
FCC ID	QPN-HOMEPHONE
Frequency Bands	LTE Band 7
Antenna	Integrated
Extreme vol. Limits	3.6VDC to 4.2VDC (nominal: 3.7VDC)
Extreme temp. Tolerance	-10°C to +55°C
Condition of EUT as received	No abnormality in appearance

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version	Sample Arrival Date
UT06aa	355245110000918	V01	MOBIWIRE_HOMEPHONE4G_V01_200413	2020-03-17
UT01aa	355245110000595	V01	MOBIWIRE_HOMEPHONE4G_V01_200413	2020-03-17

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description
AE1	Battery

AE1

Model	5C 1000mAh (178136112)
Manufacturer	Shenzhen Aerospace Electronic Co.,Ltd.
Capacity	1000mAh
Nominal Voltage	3.7V

*AE ID: is used to identify the test sample in the lab internally.

3.4. General Description

The Equipment Under Test (EUT) is a model 4G Smart Feature Phone with integrated antenna. It consists of normal options: lithium battery, charger. Manual and specifications of the EUT were provided to fulfil the test. Samples undergoing test were selected by the Client.

4. REFERENCE DOCUMENTS

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	10-1-18 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-18 Edition
ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio Service	2015
KDB971168 D01	Power Meas License Digital Systems	v03r01

5. LABORATORY ENVIRONMENT

Shielded room did not exceed following limits along the RF testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz>60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 4 Ω

Fully-anechoic chamber did not exceed following limits along the EMC testing

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Voltage Standing Wave Ratio （VSWR）	≤ 6 dB, from 1 to 18 GHz，3 m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

6. SUMMARY OF TEST RESULTS

Abbreviations used in this clause:		
Verdict Column	P	Pass
	F	Fail
	NA	Not applicable
	NM	Not measured
Location Column	A/B/C/D	The test is performed in test location A, B, C or D which are described in section 1.4 of this report

LTE Band 7

Items	Test Name	Clause in FCC rules	Section in this report	Verdict
1	Output Power	2.1046/27.50(h)	A.1	P
2	Field Strength of Spurious Radiation	2.1053/27.53(m)	A.2	P
3	Frequency Stability	2.1055/27.54	A.3	P
4	Occupied Bandwidth	2.1049/27.53(m)	A.4	P
5	Emission Bandwidth	2.1049/27.53(m)	A.5	P
6	Band Edge Compliance	2.1051/27.53(m)	A.6	P
7	Conducted Spurious Emission	2.1051/27.53(m)	A.7	P
8	Peak-to-Average Power Ratio	27.50(a)/ KDB971168 D01	A.8	P

7. STATEMENT

Since the information of samples in this report is provided by the client, the laboratory is not respo nsible for the authenticity of sample information.
This report takes measured values as criterion of test conclusion. The test conlusion meets the li mit requirements.

8. TEST EQUIPMENTS UTILIZED

NO.	Description	Type	Manufacture	Series Number	Cal Due Date
1	Test Receiver	ESR7	R&S	101676	2020-11-27
2	BiLog Antenna	3142E	ETS	00224831	2021-05-17
3	Horn Antenna	3117	ETS-lindgren	00066577	2022-04-02
4	Antenna	BBHA 9120D	Schwarzbeck	1593	2022-12-05
5	Antenna	VUBA 9117	Schwarzbeck	207	2020-07-16
6	preamplifier	83017A	Agilent	MY39501110	/
7	Signal Generator	SMB100A	R&S	179725	2020-11-27
8	Fully Anechoic Chamber	FACT3-2.0	ETS-Lindgren	1285	2021-07-19
9	Spectrum Analyzer	FSV40	R&S	101192	2021-01-14
10	Universal Radio Communication Tester	CMW500	R&S	152499	2020-07-17
11	Horn Antenna	QSH-SL-18 -26-S-20	Q-par	17013	2023.01.06
12	Horn Antenna	QSH-SL-18 -40-K-SG	Q-par	15979	2023.01.06
13	Universal Radio Communication Tester	CMW500	R&S	129146	2021-04-24
14	Spectrum Analyzer	FSU	R&S	101506	2020-12-13
15	Temperature Chamber	SH-241	ESPECs	92007516	2020-10-15
16	DC Power Supply	U3606A	Agilent Technologies	MY50450012	2020-11-13

Test software

Item	Name	Vesion
Radiated	EMC32	Version 10.01.00

ANNEX A: MEASUREMENT RESULTS

A.1 OUTPUT POWER

Reference

FCC: CFR Part 2.1046, 27.50.

A.1.1 Summary

During the process of testing, the EUT was controlled via Rhode & Schwarz Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation.

This result contains peak output power and ERP/EIRP measurements for the EUT.

In all cases, output power is within the specified limits.

A.1.2 Conducted

A.1.2.1 Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.

These measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each bandwidth.

A.1.2.2 Measurement result

LTE band 7

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)	
			QPSK	16QAM
5MHz	1 RB high	2567.5	22.36	21.39
		2535.0	22.18	21.24
		2502.5	22.01	20.96
	1 RB low	2567.5	22.36	21.45
		2535.0	22.13	20.77
		2502.5	22.06	21.01
	50% RB mid	2567.5	21.56	20.48
		2535.0	21.34	20.30
		2502.5	21.17	20.04
	100% RB	2567.5	21.59	20.48
		2535.0	21.36	20.30
		2502.5	21.21	20.04
10MHz	1 RB high	2565.0	22.86	21.54
		2535.0	22.30	21.33
		2505.0	22.04	21.02
	1 RB low	2565.0	22.39	21.59
		2535.0	22.21	21.35
		2505.0	22.10	21.04
	50% RB mid	2565.0	21.59	20.53
		2535.0	21.39	20.29
		2505.0	21.20	19.99

	100% RB	2565.0	21.68	20.59
		2535.0	21.43	20.36
		2505.0	21.15	20.00
15MHz	1 RB high	2562.5	22.78	21.47
		2535.0	22.20	21.27
		2507.5	21.96	21.08
	1 RB low	2562.5	22.62	21.42
		2535.0	22.09	21.26
		2507.5	22.00	21.01
	50% RB mid	2562.5	21.58	20.51
		2535.0	21.33	20.28
		2507.5	21.16	19.98
	100% RB	2562.5	21.61	20.53
		2535.0	21.39	20.33
		2507.5	21.23	19.90
20MHz	1 RB high	2560.0	22.50	21.76
		2535.0	22.36	21.54
		2510.0	22.29	21.51
	1 RB low	2560.0	22.20	21.52
		2535.0	22.20	21.49
		2510.0	22.16	21.22
	50% RB mid	2560.0	21.99	20.96
		2535.0	21.85	20.76
		2510.0	21.57	20.44
	100% RB	2560.0	22.12	21.06
		2535.0	21.90	20.82
		2510.0	21.29	20.18

Note: Expanded measurement uncertainty is U = 0.49 dB, k = 1.96

A.1.3 Radiated

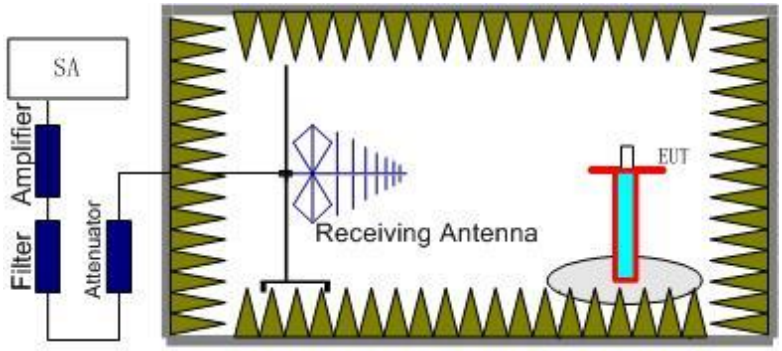
A.1.3.1 Description

This is the test for the maximum radiated power from the EUT.

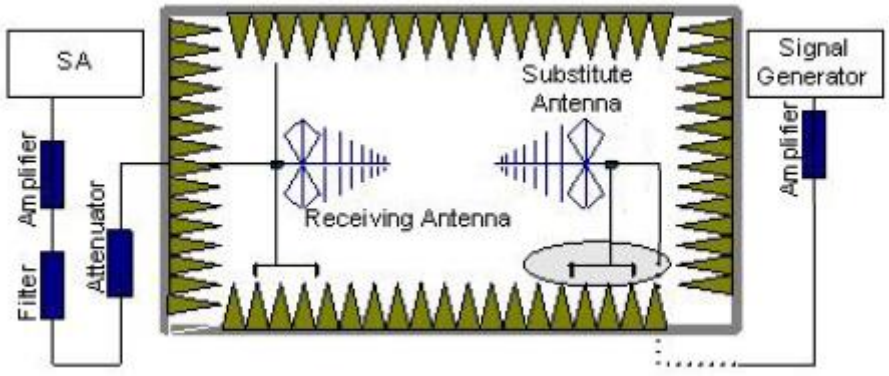
Rule Part 27.50(h)(2) specifies “Mobile stations are limited to 2.0 watts EIRP.”.

A.1.3.2 Method of Measurement

1. For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, EUT was placed on a 80 cm high non-conductive stand at a 3 meter test distance from the receive antenna. For radiated measurements performed at frequencies above 1 GHz, EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. Receiving antenna was placed on the antenna mast 3 meters from the EUT. For emission measurements. The receiving antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna and adjusts the level of the signal generator output until the value of the

receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. An amplifier should be connected to the Signal Source output port. And the cable should be connected between the amplifier and the substitution antenna.
   The cable loss (P_{cl}), the substitution Antenna Gain(dBi) (G_a) and the amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power (EIRP) = P_{Mea} - P_{Ag} - P_{cl} + G_a
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dB.

A.1.3.3 Measurement result

LTE Band 7- EIRP 27.50(h)(2)

Limits: ≤33 dBm (2W)

LTE Band 7_5MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)+ P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2502.50	-16.07	-28.70	10.70	23.33	33.00	H
2535.00	-16.12	-28.60	10.70	23.18	33.00	H
2567.50	-16.04	-28.60	10.70	23.26	33.00	H

LTE Band 7_10MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)+ P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2505.00	-15.84	-28.70	10.70	23.56	33.00	H
2535.00	-15.99	-28.60	10.70	23.31	33.00	H
2565.00	-15.79	-28.60	10.70	23.51	33.00	H

LTE Band 7_15MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)+ P_{Ag}(dB)	G_a Antenna Gain(dB)	EIRP(dBm)	Limit(dBm)	Polarization
2507.50	-15.86	-28.70	10.70	23.54	33.00	H
2535.00	**-15.72**	**-28.60**	**10.70**	**23.58**	**33.00**	**H**
2562.50	-16.22	-28.60	10.70	23.08	33.00	H

LTE Band 7_20MHz_QPSK

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)+ P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2510.00	-16.04	-28.70	10.70	23.36	33.00	H
2535.00	-15.76	-28.60	10.70	23.54	33.00	H
2560.00	-16.24	-28.60	10.70	23.06	33.00	H

LTE Band 7_5MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)+ P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2502.50	-16.32	-28.70	10.70	23.08	33.00	H
2535.00	-16.26	-28.60	10.70	23.04	33.00	H
2567.50	-16.23	-28.60	10.70	23.07	33.00	H

LTE Band 7_10MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)+ P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2505.00	-16.38	-28.70	10.70	23.02	33.00	H
2535.00	-16.09	-28.60	10.70	23.21	33.00	H
2565.00	-15.97	-28.60	10.70	23.33	33.00	H

LTE Band 7_15MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)+ P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2507.50	-16.39	-28.70	10.70	23.01	33.00	H
2535.00	-15.92	-28.60	10.70	23.38	33.00	H
2562.50	-16.22	-28.60	10.70	23.08	33.00	H

LTE Band 7_20MHz_16QAM

Frequency(MHz)	P_{Mea}(dBm)	P_{cl}(dB)+ P_{Ag}(dB)	G_a Antenna Gain(dBi)	EIRP(dBm)	Limit(dBm)	Polarization
2510.00	-16.14	-28.70	10.70	23.26	33.00	H
2535.00	-15.91	-28.60	10.70	23.39	33.00	H
2560.00	-16.16	-28.60	10.70	23.14	33.00	H

Peak EIRP (dBm)=P_{Mea}(-15.72dBm)-(P_{cl}+P_{Ag})(-28.60dB)+G_a(10.70dB) =23.58dBm

ANALYZER SETTINGS:

RBW = VBW = 8MHz for occupied bandwidths equal to or less than 5MHz.

RBW = VBW = 20MHz for occupied bandwidths equal to or greater than 10MHz.

Note: The maximum value of expanded measurement uncertainty for this test item is U = 2.90dB(30MHz-3GHz)/3.50dB(3GHz-18GHz)/3.90dB(18GHz-40GHz), k = 2

Note: Both of Vertical and Horizontal polarizations are evaluated, but only the worst case is recorded in this report.

A.2 FIELD STRENGTH OF SPURIOUS RADIATION

Reference

FCC: CFR 2.1053, 27.53.

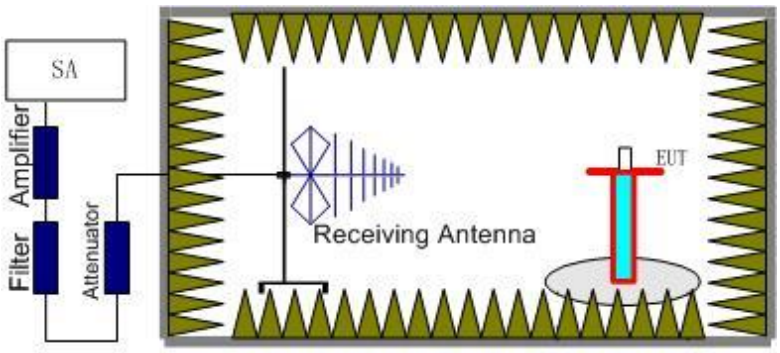
A.2.1 Measurement Method

This measurement is carried out in fully-anechoic chamber FAC-3.

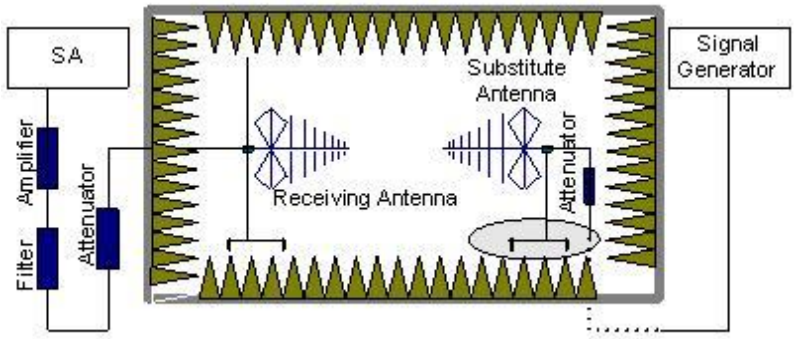
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 27.53(h). The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Band 7.

The procedure of radiated spurious emissions is as follows:

1. For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, EUT was placed on a 80 cm high non-conductive stand at a 3 meter test distance from the receive antenna. For radiated measurements performed at frequencies above 1 GHz, EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. Receiving antenna was placed on the antenna mast 3 meters from the EUT. For emission measurements. The receiving antenna shall be varied from 1 m to 4 m in height above the reference ground in a search for the relative positioning that produces the maximum radiated signal level. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna and adjusts the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain(dBi) (G_a) should be recorded after test.
   An amplifier should be connected in for the test.
   The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.
   The measurement results are obtained as described below:
   Power (EIRP)=P_{Mea} - P_{pl} + G_a
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dB.

A.2.2 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Band 7. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the LTE Band 7 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.
Only worst case result is given below.

LTE Band 7, 5 MHz, QPSK, Channel 20775

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
2906.93	-57.35	1.00	11.50	-46.85	-25.00	V
5237.50	-63.10	1.80	12.50	-52.40	-25.00	H
7501.00	-40.71	1.80	11.30	-31.21	-25.00	V
10001.50	-53.44	2.00	11.30	-44.14	-25.00	V
15347.50	-52.95	2.40	12.40	-42.95	-25.00	V
17069.00	-52.66	2.90	14.50	-41.06	-25.00	V

LTE Band 7, 5 MHz, QPSK, Channel 21100

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
2943.20	-57.19	1.00	11.50	-46.69	-25.00	H
6724.50	-61.15	1.60	12.40	-50.35	-25.00	H
7598.50	-40.53	1.80	11.30	-31.03	-25.00	V
10131.00	-52.86	2.00	11.30	-43.56	-25.00	V
13223.50	-56.97	2.30	13.30	-45.97	-25.00	V
17171.00	-52.15	2.90	14.50	-40.55	-25.00	V

LTE Band 7, 5 MHz, QPSK, Channel 21425

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
2949.60	-57.35	1.00	11.50	-46.85	-25.00	H
7696.00	-41.62	1.80	11.30	-32.12	-25.00	V
10261.50	-51.39	2.00	11.30	-42.09	-25.00	V
11598.00	-52.48	2.60	10.50	-44.58	-25.00	V
14516.50	-52.48	2.60	11.20	-43.88	-25.00	H
16832.50	-54.71	2.90	16.50	-41.11	-25.00	H

LTE Band 7, 5 MHz, 16QAM, Channel 20775

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
2824.00	-57.74	1.00	11.50	-47.24	-25.00	V
7501.00	-42.15	1.80	11.30	-32.65	-25.00	V
10001.50	-53.22	2.20	11.30	-44.12	-25.00	V
11940.50	-52.76	2.30	10.50	-44.56	-25.00	H
14877.50	-51.91	2.70	11.20	-43.41	-25.00	V
17524.50	-50.20	3.30	12.80	-40.70	-25.00	V

LTE Band 7, 5 MHz, 16QAM, Channel 21100

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
2855.20	-56.94	1.00	11.50	-46.44	-25.00	H
5300.50	-61.49	1.30	12.50	-50.29	-25.00	H
7598.50	-41.60	1.80	11.30	-32.10	-25.00	V
10131.00	-53.43	2.20	11.30	-44.33	-25.00	V
14816.00	-52.19	2.70	11.20	-43.69	-25.00	V
16803.50	-54.33	2.90	16.50	-40.73	-25.00	V

LTE Band 7, 5 MHz, 16QAM, Channel 21425

Frequency(MHz)	P_{Mea}(dBm)	Path Loss	Antenna Gain(dBi)	Peak EIRP(dBm)	Limit(dBm)	Polarization
2879.20	-57.32	1.00	11.50	-46.82	-25.00	V
7696.00	-42.87	1.80	11.30	-33.37	-25.00	V
10261.50	-53.05	2.20	11.30	-43.95	-25.00	V
12074.00	-53.89	2.70	12.60	-43.99	-25.00	H
14470.00	-52.13	2.60	11.20	-43.53	-25.00	V
17037.00	-52.93	2.90	14.50	-41.33	-25.00	V

Note: The maximum value of expanded measurement uncertainty for this test item is U = 2.90dB(30MHz-3GHz)/3.50dB(3GHz-18GHz)/3.90dB(18GHz-40GHz), k = 2

A.3 FREQUENCY STABILITY

Reference

FCC: CFR Part 2.1055, 27.54.

A.3.1 Method of Measurement

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -10℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at -10℃ increments from -10℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃ increments from +50℃ to -10℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

A.3.2 Measurement Limit

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d) (2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.6VDC and 4.2VDC, with a nominal voltage of 3.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance from -5.4% to 10.8%. For the purposes of measuring frequency stability these voltage limits are to be used.

A.3.3 Measurement results

LTE Band 7, 5MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.6	26	12	0.010	0.005
3.7	19	8	0.007	0.003
4.2	11	14	0.004	0.006

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
-10	22	16	0.009	0.006
0	31	2	0.012	0.001
10	25	14	0.010	0.006
20	18	8	0.007	0.003
30	17	7	0.007	0.003
40	4	13	0.002	0.005
50	11	24	0.004	0.009

Expanded measurement uncertainty is 10 Hz, k = 2

A.4 OCCUPIED BANDWIDTH

Reference

FCC: CFR Part 2.1049, 27.53.

A.4.1 Occupied Bandwidth Results

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequencies of the US Cellular/PCS frequency bands. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

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 (i.e., two to five times the OBW).

b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

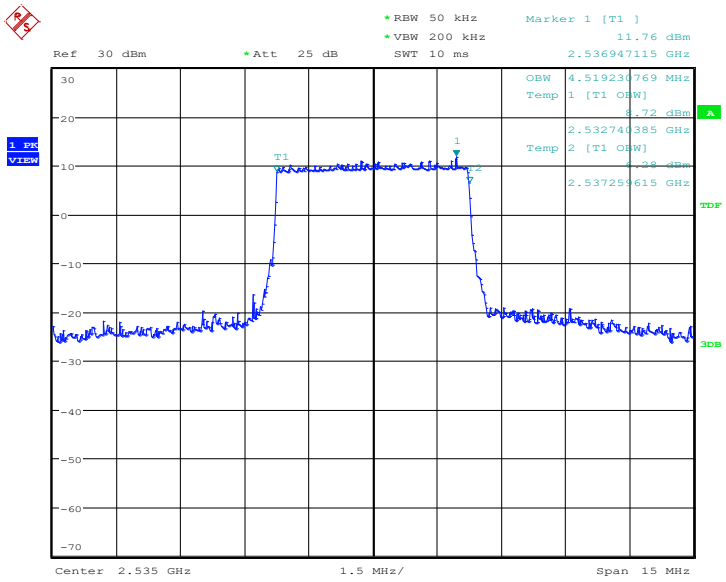
d) Set the detection mode to peak, and the trace mode to max hold.

e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

LTE band 7, 5MHz (99% BW)

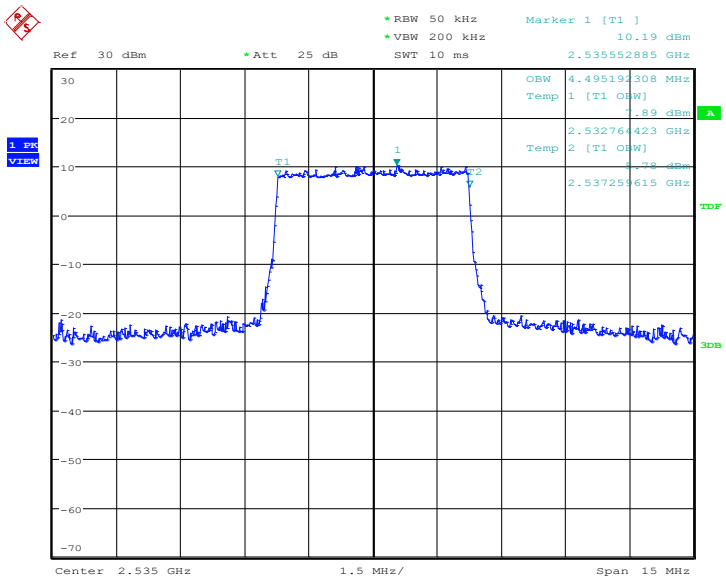
Frequency(MHz)	Occupied Bandwidth (99% BW)(kHz)	
2535.0	QPSK	16QAM
	4519.23	4495.19

LTE band 7, 5MHz Bandwidth, QPSK (99% BW)



Date: 17.MAR.2020 15:40:07

LTE band 7, 5MHz Bandwidth,16QAM (99% BW)

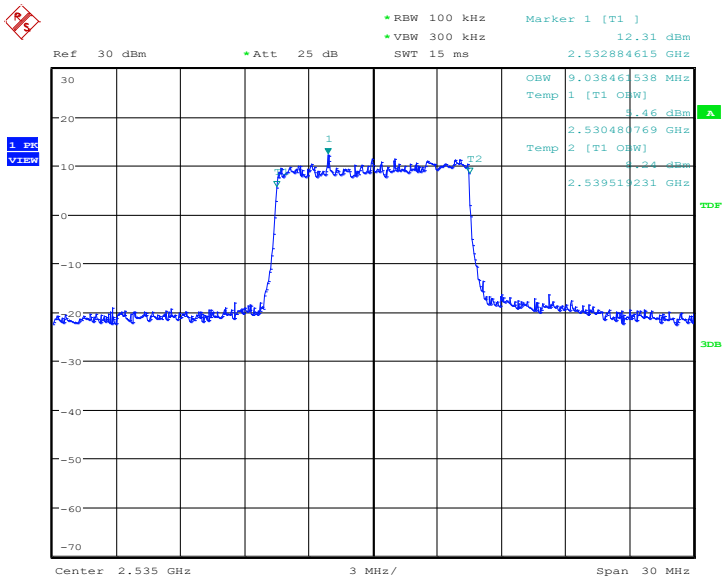


Date: 17.MAR.2020 15:40:21

LTE band 7, 10MHz (99% BW)

Frequency(MHz)	Occupied Bandwidth (99% BW)(kHz)	
2535.0	QPSK	16QAM
	9038.46	8990.38

LTE band 7, 10MHz Bandwidth, QPSK (99% BW)



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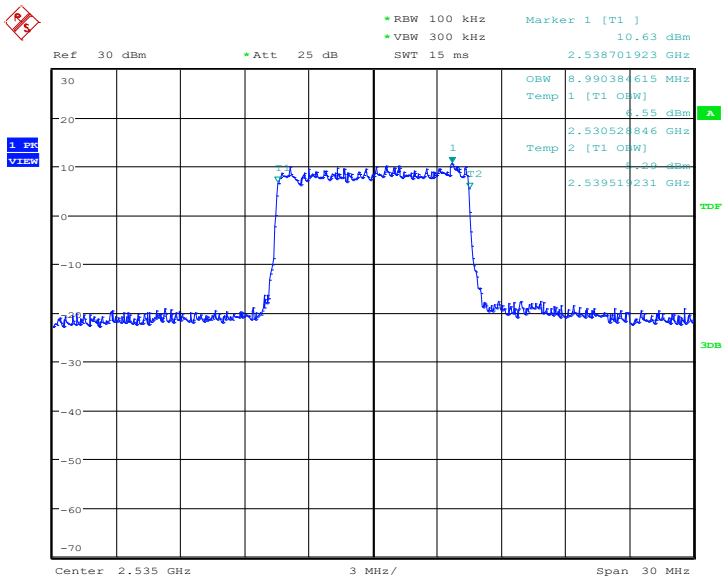
LTE band 7, 10MHz Bandwidth, 16QAM (99% BW)

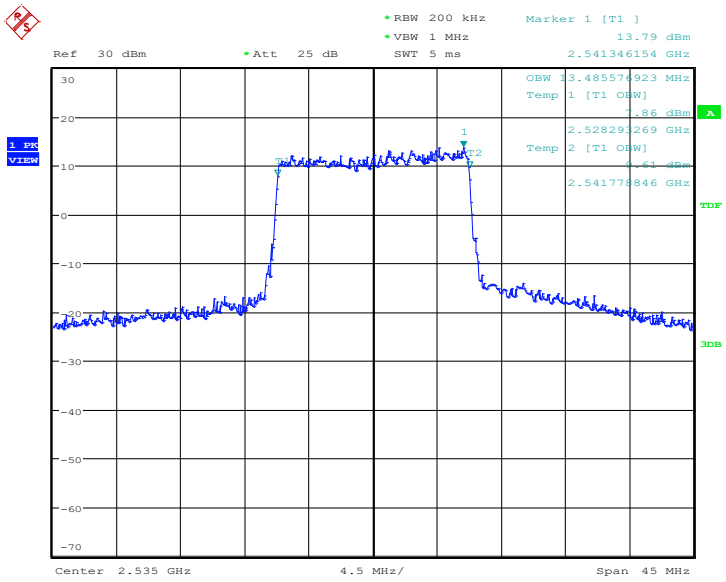


Date: 17.MAR.2020 15:44:39

LTE band 7, 15MHz (99% BW)

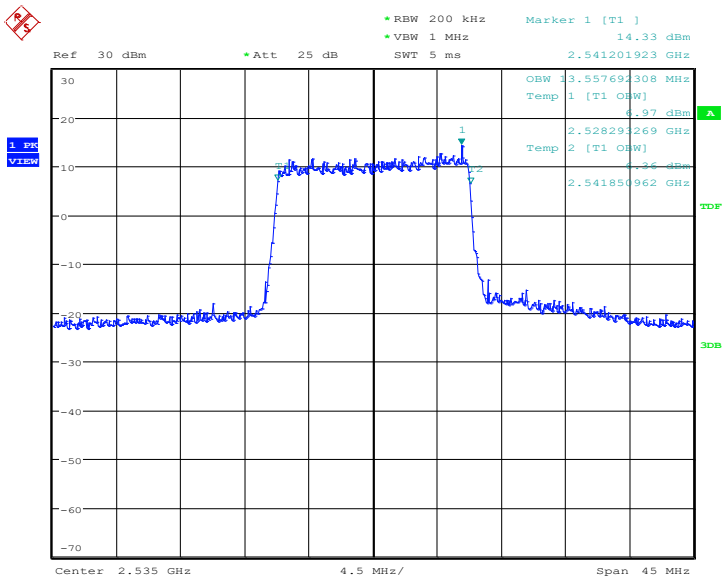
Frequency(MHz)	Occupied Bandwidth (99% BW)(kHz)	
2535.0	QPSK	16QAM
	13485.58	13557.69

LTE band 7, 15MHz Bandwidth, QPSK (99% BW)



Date: 17.MAR.2020 15:48:47

LTE band 7, 15MHz Bandwidth, 16QAM (99% BW)

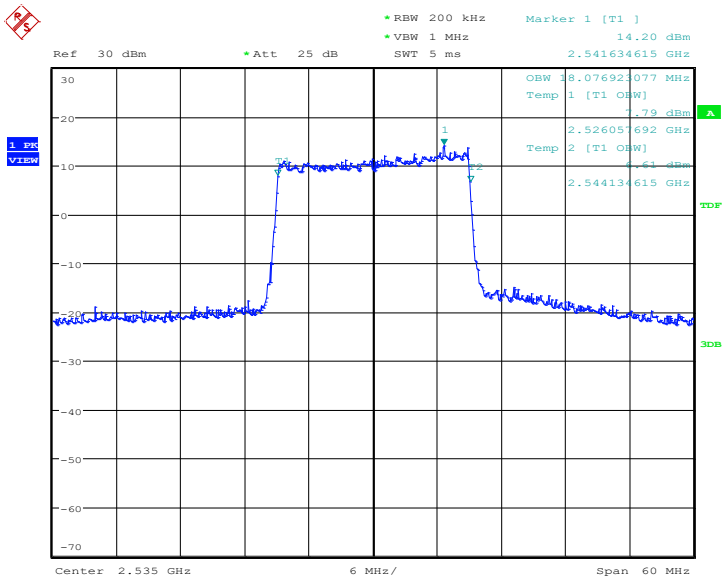


Date: 17.MAR.2020 15:49:01

LTE band 7, 20MHz (99% BW)

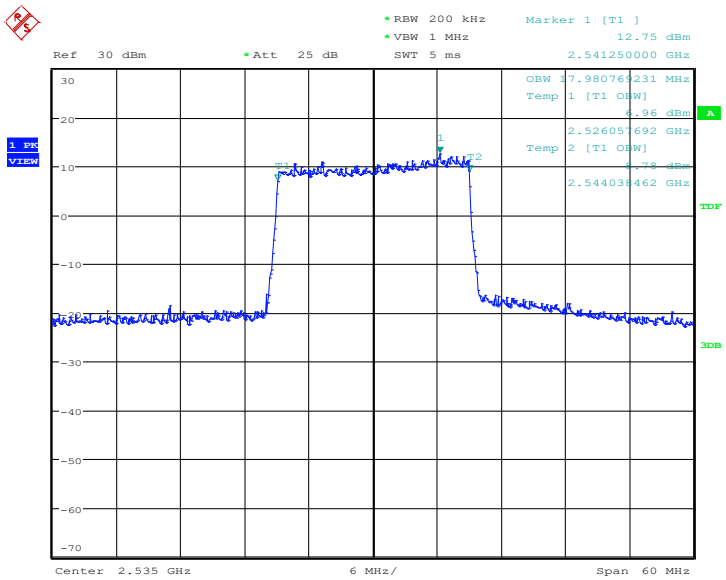
Frequency(MHz)	Occupied Bandwidth (99% BW)(kHz)	
2535.0	QPSK	16QAM
	18076.92	17980.77

LTE band 7, 20MHz Bandwidth, QPSK (99% BW)



Date: 17.MAR.2020 15:54:05

LTE band 7, 20MHz Bandwidth, 16QAM (99% BW)



Date: 17.MAR.2020 15:54:19

Note: Expanded measurement uncertainty is U = 3428 Hz, k = 2

A.5 EMISSION BANDWIDTH

Reference

FCC: CFR Part 2.1049, 27.53.

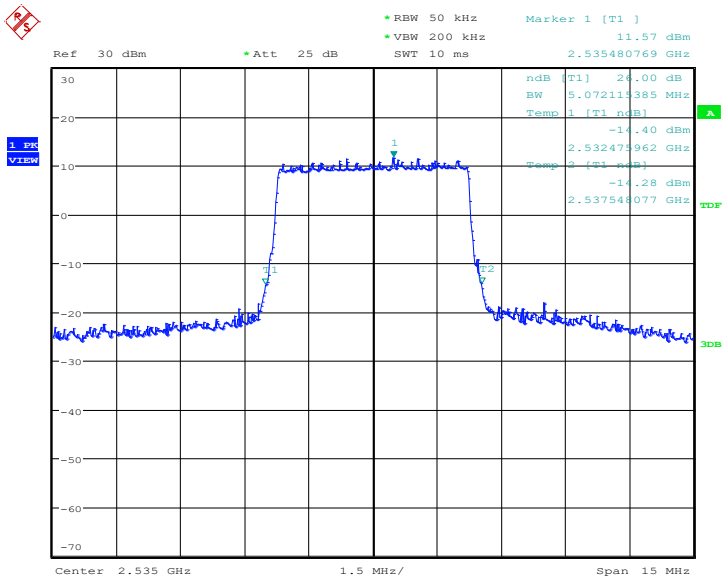
A.5.1Emission Bandwidth Results

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

LTE band 7, 5MHz (-26dBc BW)

Frequency(MHz)	Emission Bandwidth (-26dBc BW)(kHz)	
	QPSK	16QAM
2535.0	5072.12	5096.15

LTE band 7, 5MHz Bandwidth, QPSK (-26dBc BW)



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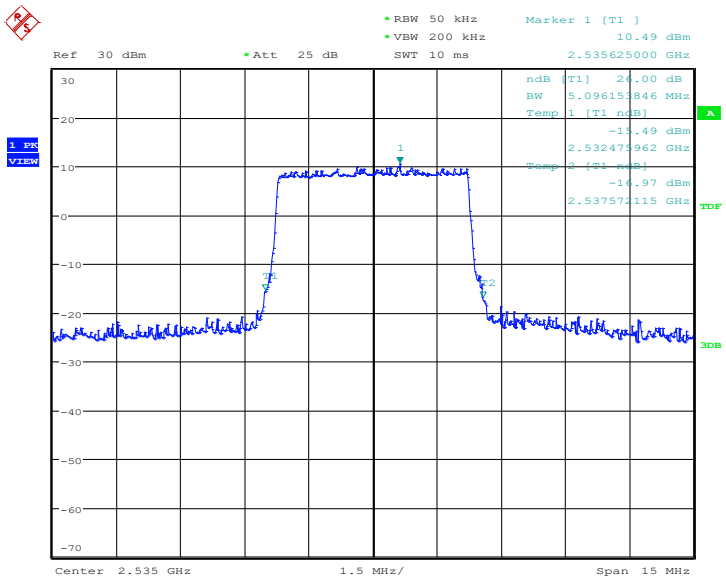
LTE band 7, 5MHz Bandwidth,16QAM (-26dBc BW)

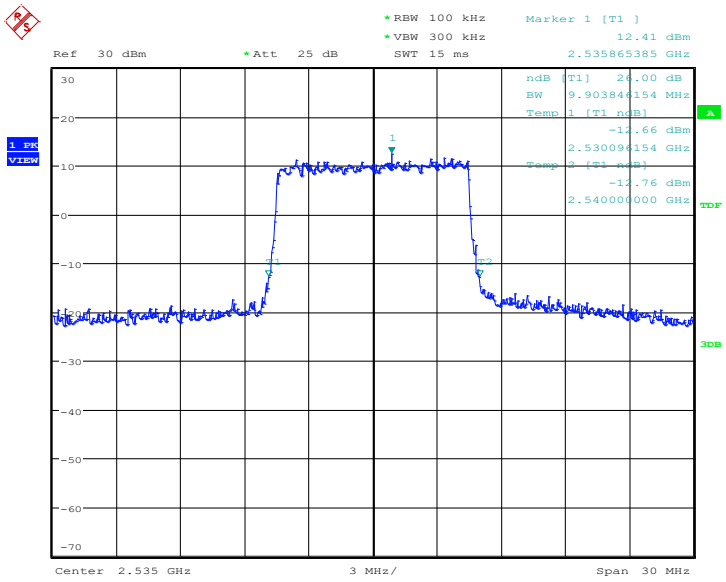


Date: 17.MAR.2020 15:41:31

LTE band 7, 10MHz (-26dBc BW)

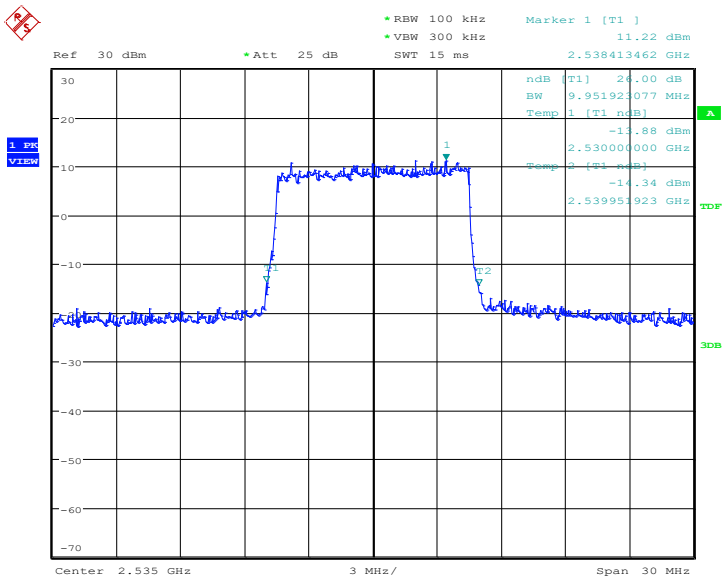
Frequency(MHz)	Emission Bandwidth (-26dBc BW)(kHz)	
	QPSK	16QAM
2535.0	9903.85	9951.92

LTE band 7, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.MAR.2020 15:45:33

LTE band 7, 10MHz Bandwidth, 16QAM (-26dBc BW)

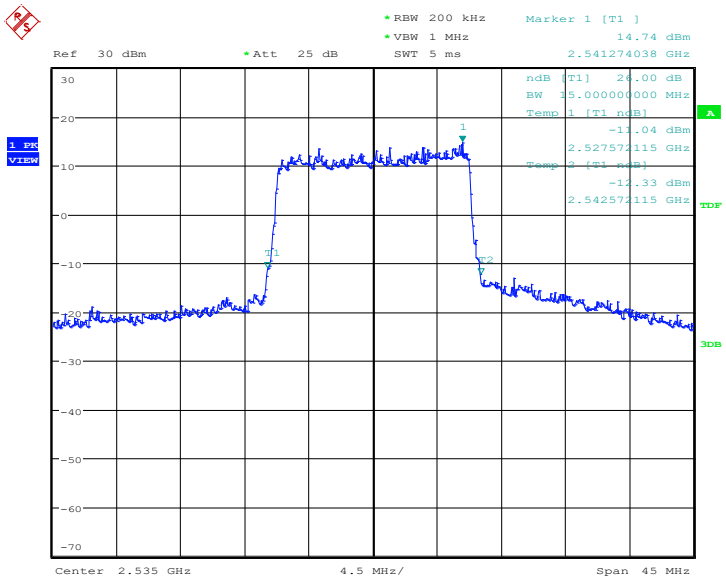


Date: 17.MAR.2020 15:45:49

LTE band 7, 15MHz (-26dBc BW)

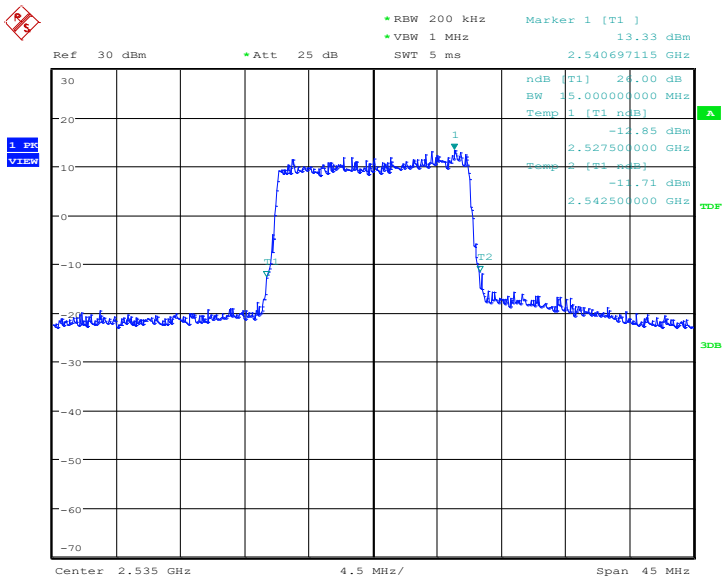
Frequency(MHz)	Emission Bandwidth (-26dBc BW)(kHz)	
	QPSK	16QAM
2535.0	15000.00	15000.00

LTE band 7, 15MHz Bandwidth, QPSK (-26dBc BW)



Date: 17.MAR.2020 15:49:55

LTE band 7, 15MHz Bandwidth, 16QAM (-26dBc BW)



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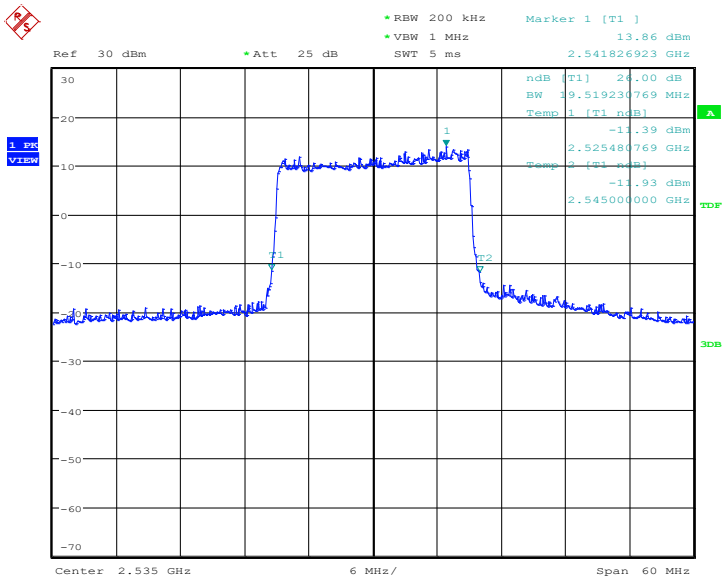
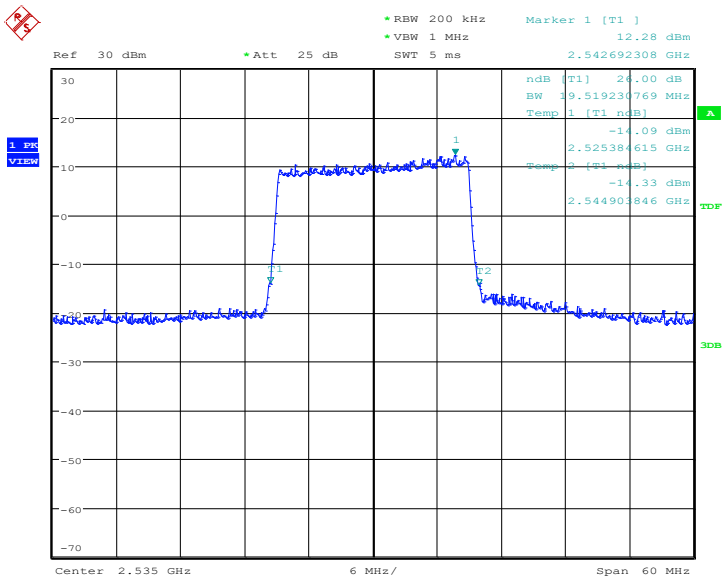
LTE band 7, 20MHz (-26dBc BW)

Frequency(MHz)	Emission Bandwidth (-26dBc BW)(kHz)	
2535.0	QPSK	16QAM
	19519.23	19519.23

LTE band 7, 20MHz Bandwidth, QPSK (-26dBc BW)



LTE band 7, 20MHz Bandwidth, 16QAM (-26dBc BW)



Note: Expanded measurement uncertainty is U = 3428 Hz, k = 2

A.6 BAND EDGE COMPLIANCE

Reference

FCC: CFR Part 2.1051, 27.53.

A.6.1 Measurement limit

On any frequency outside frequency ban

d of the US Cellular/PCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log (P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

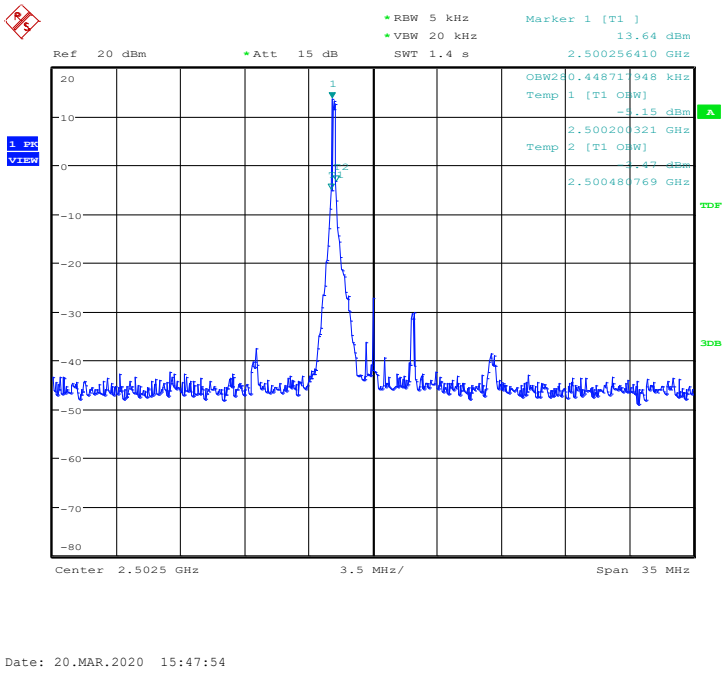
A relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.

A.6.2 Measurement result

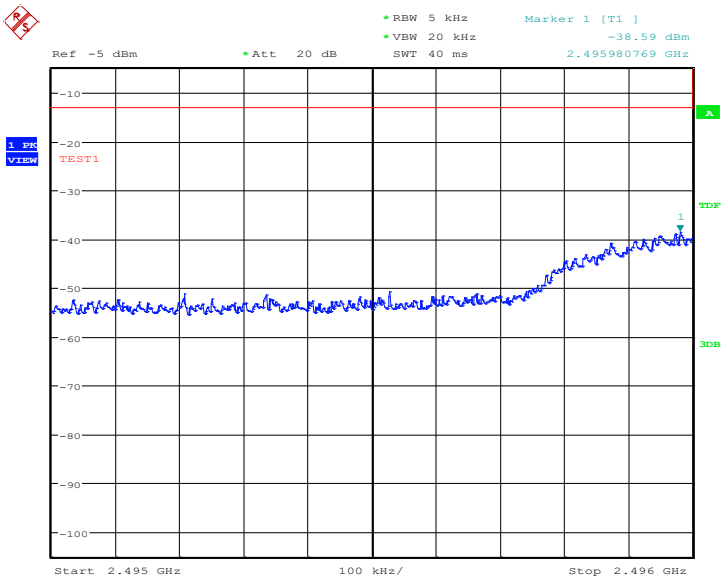
Only worst case result is given below

LTE band 7

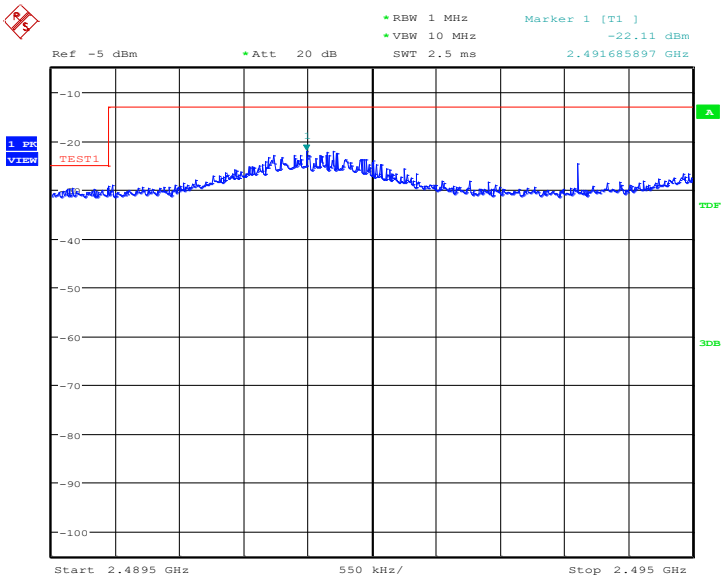
OBW: 1RB-low_offset



LOW BAND EDGE BLOCK-1RB-low_offset

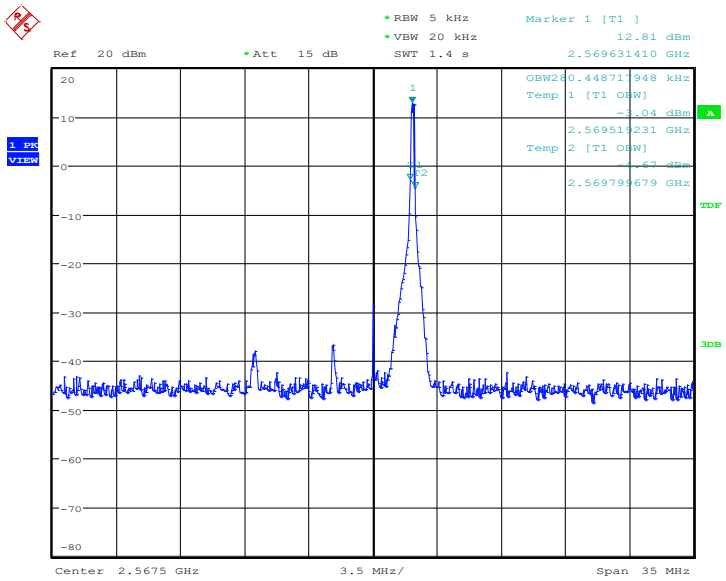


Date: 20.MAR.2020 15:54:38

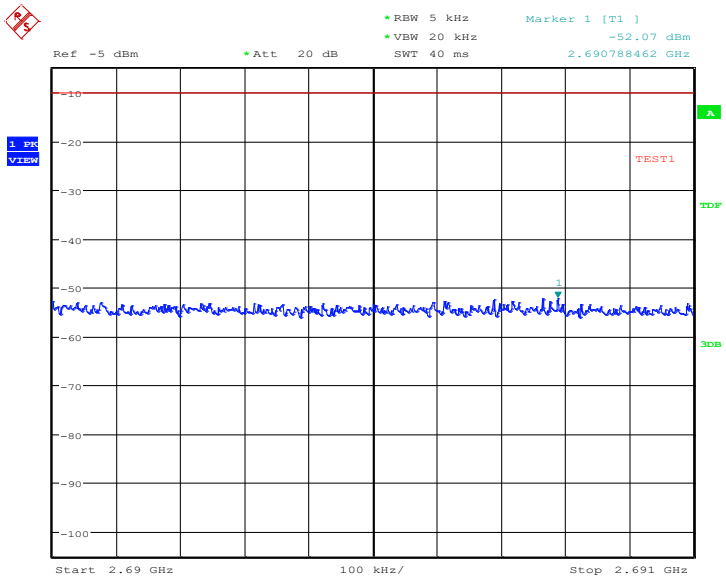


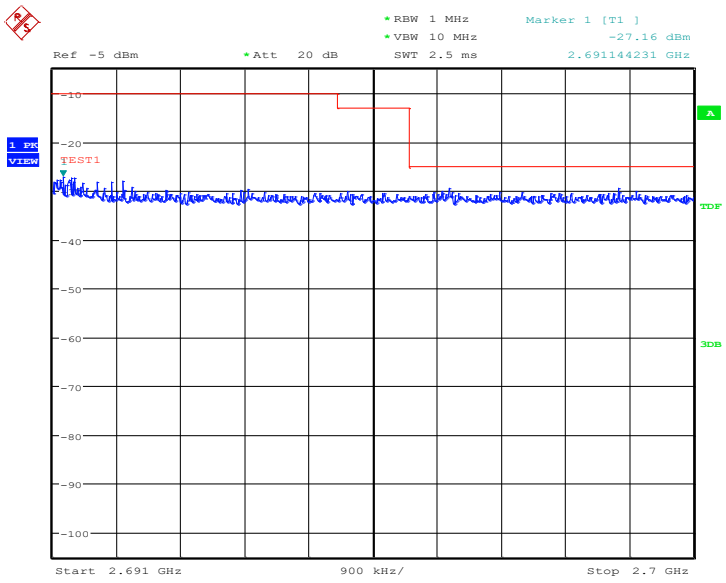
Date: 20.MAR.2020 15:53:27

OBW: 1RB-high_offset



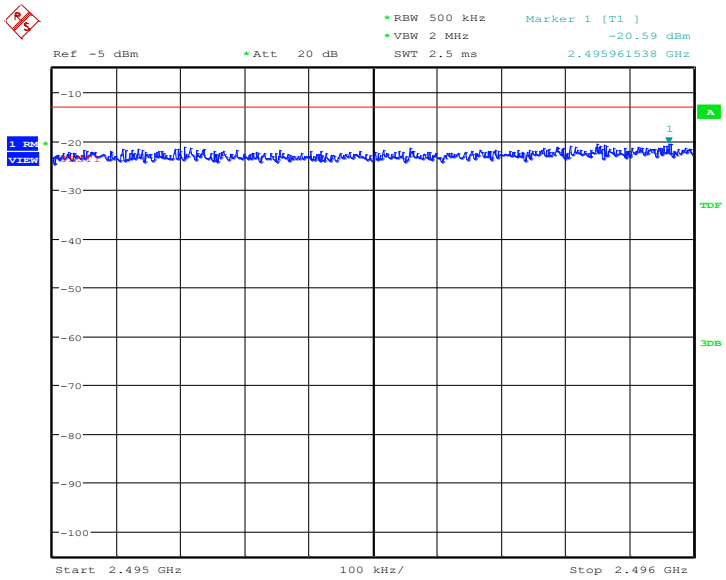
HIGH BAND EDGE BLOCK-1RB-high_offset



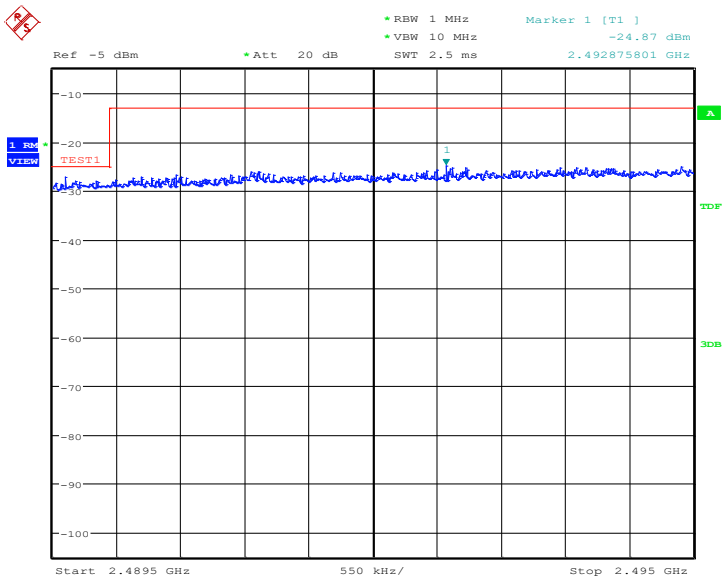


Date: 20.MAR.2020 15:51:59

LOW BAND EDGE BLOCK-20MHz-100%RB

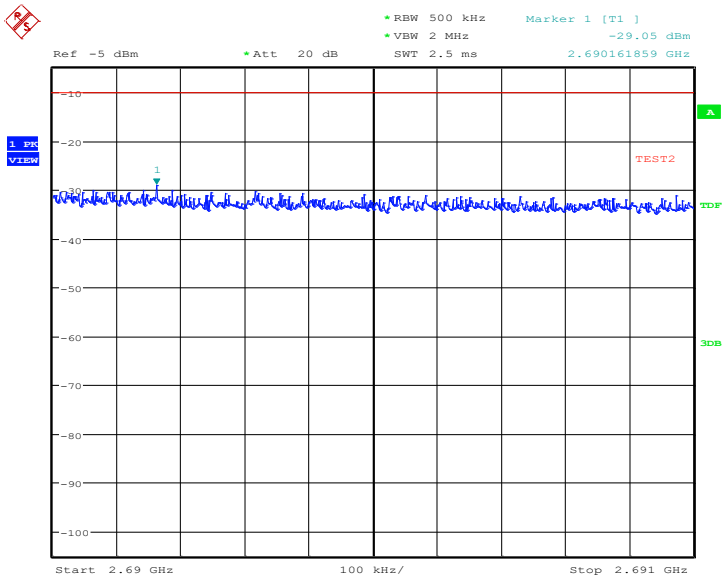


Date: 20.MAR.2020 15:57:22

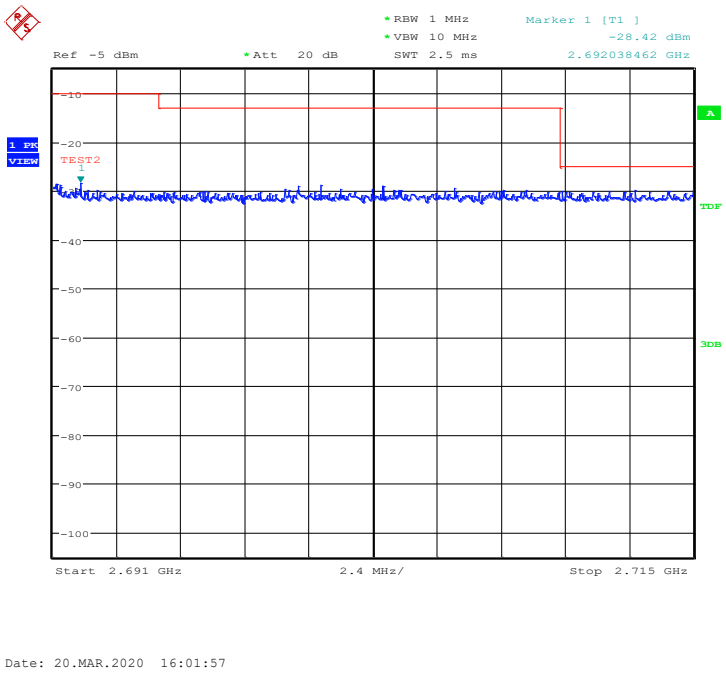


Date: 20.MAR.2020 16:00:23

HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 20.MAR.2020 16:02:49



Note: Expanded measurement uncertainty is U = 0.49dB(100KHz-2GHz)/1.21dB(2GHz-26.5GHz), k = 1.96

A.7 CONDUCTED SPURIOUS EMISSION

Reference

FCC: CFR Part 2.1051, 27.53.

A.7.1 Measurement Method

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1051 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 9 GHz, data taken from 10 MHz to 25 GHz.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.
3. The number of sweep points of spectrum analyzer is set to 30001 which is greater than span/RBW.

A. 7.2 Measurement Limit

Part 27.53(m)(4) specifies for mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

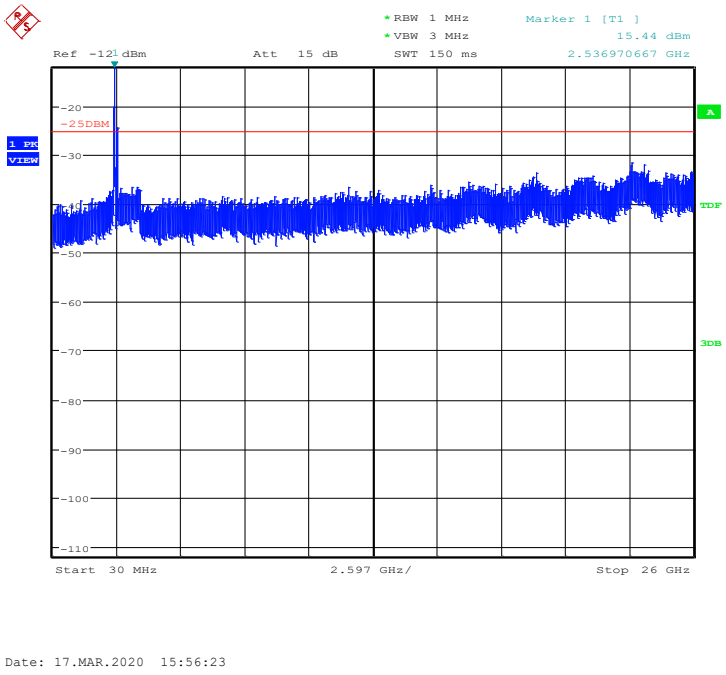
A. 7.3 Measurement result

Only worst case result is given below

LTE band 7 20MHz QPSK: 30MHz – 26GHz

Spurious emission limit –25dBm.

NOTE: peak above the limit line is the carrier frequency.



Note: Expanded measurement uncertainty is U = 0.49dB(100KHz-2GHz)/1.21dB(2GHz-26.5GHz), k = 1.96

A.8 PEAK-TO-AVERAGE POWER RATIO

Reference

FCC: CFR Part 27.50(d), KDB971168 D01(5.7).

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

a)Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;

b) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

d) Set the measurement interval to 1 ms

e)Record the maximum PAPR level associated with a probability of 0.1%

A.8.1 Measurement limit

not exceed 13 dB

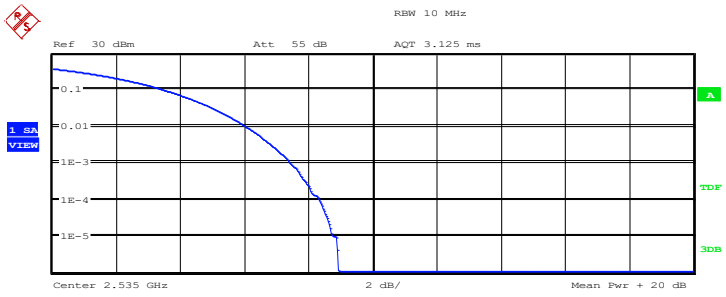
A.8.2 Measurement results

Only worst case result is given below

LTE band 7

Frequency(MHz)	Bandwidth(MHz)	PAPR(dB)	
		QPSK	16QAM
2510.0	20	7.40	7.88

LTE band 7, 20MHz Bandwidth, QPSK (PAPR)



Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	17.99 dBm
Peak	26.91 dBm
Crest	8.92 dB
10 %	3.49 dB
1 %	6.03 dB
.1 %	7.40 dB
.01 %	8.33 dB

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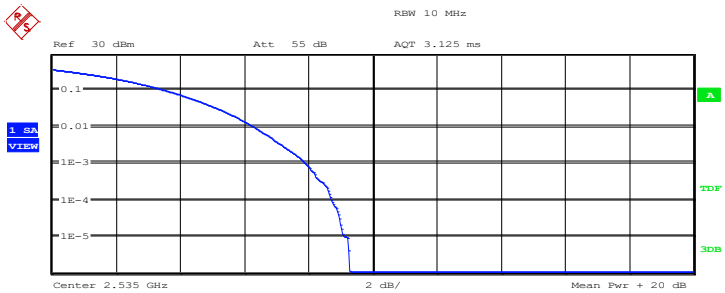
LTE band 7, 20MHz Bandwidth, 16QAM (PAPR)



Complementary Cumulative Distribution Function (100000 samples)

	Trace 1
Mean	17.21 dBm
Peak	26.49 dBm
Crest	9.28 dB
10 %	3.56 dB
1 %	6.28 dB
.1 %	7.88 dB
.01 %	8.72 dB

Date: 17.MAR.2020 16:02:50

Note: Expanded measurement uncertainty is U = 0.48, k = 2

*****END OF REPORT*****