LTE TEST REPORT

Report Number: C21T00079-RF02-V00

Applicant	Doro AB
Product Name	4G Bar Feature Phone
Model Name	DFB-0370
Brand Name	Doro
FCC ID	WS5DFB0370

Industrial Internet Innovation Center (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in FCC Part 2/27, ANSI/TIA-603-E, ANSI C63.26, KDB 971168 D01.

Prepared by	范宇航	Reviewed by	王长青
Approved by		Issue Date	2021-10-18

Industrial Internet Innovation Center (Shanghai) Co., Ltd.

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Test Laboratory:
Industrial Internet Innovation Center (Shanghai) Co., Ltd.
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Revision Version

Report Number	Revision	Date	Memo
C21T00079-RF02-V00	00	2021-10-18	Initial creation of test report

CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name	Industrial Internet Innovation Center (Shanghai) Co., Ltd.
Address	Building 4, No. 766 Jingang Rd, Pudong, Shanghai, China
FCC Registration No.	958356
FCC Degistration No.	CN1177

1.2. Testing Environment

Normal Temperature	15℃~35℃
Relative Humidity	30%RH~60%RH
Supply Voltage	120V/60Hz

1.3. Project Information

Project Leader	XU Yuting
Testing Start Date	2021-07-20
Testing End Date	2021-10-09

2. Client Information

2.1. Applicant Information

Company Name	Doro AB
Address	Jörgen Kocksgatan 1B, SE 211 20 MALMÖ, SWEDEN
Telephone	+46 46 280 5000

2.2. Manufacturer Information

Company Name	Doro AB
Address	Jörgen Kocksgatan 1B, SE 211 20 MALMÖ, SWEDEN
Telephone	+46 46 280 5000

3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Product Name	4G Bar Feature Phone
Model name	DFB-0370
Supported Radio Technology and Bands	GSM900/DCS1800/PCS1900 WCDMA Band I/VIII LTE Band 1/3/7/8/20/28/38 BT EDR FM
Hardware Version	V01(HW code: 2011/2021)
Software Version	DFB-0370_SL272_N_S01A_V01_0_M210723_CE
FCC ID	WS5DFB0370
Extreme Temperature	-15℃~55℃
Nominal Voltage	3.7V
Extreme High Voltage	4.2V
Extreme Low Voltage	3.6V

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of Receipt
N02	354661370003601	V01(HW code: 2011)	DFB-0370_SL272_N_S01A_V01_0_M210723_CE	2021-07-20
N04	354661370009111	V01(HW code: 2011)	DFB-0370_SL272_N_S01A_V01_0_M210723_CE	2021-08-25

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

3.3. Internal Identification of AE used during the test

AE ID*	Description	Model	SN/Remark
AE1	RF cable	N/A	N/A

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

4. Reference Documents

4.1. Reference Documents for testing

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	2018-10-01
FCC Part 22	PUBLIC MOBILE SERVICES	2018-10-01
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	2018-10-01
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	2018-10-01
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.26	American National Standard of Procedures for Compliance Testing of Licensed Transmitters Used in Licensed Radio	2015
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01

5. Test Summary

5.1. Summary of Test Results

LTE Band 7

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50(d)(4)	Pass
2	Emission Limit	27.53(m), 2.1051	Pass
3	Frequency Stability	27.54, 2.1055	Pass
4	Occupied Bandwidth	2.1049(h)(i)	Pass
5	Emission Bandwidth	27.53(m)	Pass
6	Band Edge Compliance	27.53(m)	Pass
7	Conducted Spurious Emission	27.53(m), 2.1057	Pass
8	Peak to Average Power Ratio	27.50(a)	Pass

LTE Band 38

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50(h)(2)	Pass
2	Emission Limit	27.53(m), 2.1051	Pass
3	Frequency Stability	27.54, 2.1055	Pass
4	Occupied Bandwidth	2.1049(h)(i)	Pass
5	Emission Bandwidth	27.53(m)	Pass
6	Band Edge Compliance	27.53(m)	Pass
7	Conducted Spurious Emission	27.53(m), 2.1057	Pass
8	Peak to Average Power Ratio	27.50(a)	Pass

Test Conditions

Tnom	Normal Temperature
Tmin	Low Temperature
Tmax	High Temperature
Vnom	Normal Voltage
Vmin	Low Voltage
Vmax	High Voltage
Hnom	Norm Humidity
Anom	Norm Air Pressure

For this report, all the test case listed above are tested under Normal Temperature and Normal Voltage, and also under norm humidity, the specific conditions as following:

Temperature	Tnom	25℃
Voltage	Vnom	3.7V
Humidity	Hnom	48%
Air Pressure	Anom	1010hPa

5.2. Statements

The DFB-0370, manufactured by Doro AB is a new product for testing.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 5.1.

Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

6. Measurement Results

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5
Temperature	Min. = 15 ℃, Max. = 35 ℃

Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =30 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 k
Ground system resistance	< 0.5

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 25 %, Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 k
Ground system resistance	< 0.5
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB,30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

6.1. Output Power

6.1.1. 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.

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

CMW500 setting：

1: CMW500 is connected to the DUT

2: Set RX Expected PEP to 30 dBm

6.1.2. Conducted

6.1.2.1. 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.

6.1.2.2 Measurement result

LTE band 7

LTE7				Output power (dBm)		
Modulation	RB	RB Offset	Tune up	5MHz		
				20775	21100	21425
QPSK	1	Low	21.5	20.72	20.68	20.78
		Middle		20.60	20.71	20.83
		High		20.64	20.71	20.86
	50%	Low	20.5	19.84	19.71	20.00
		Middle		19.74	19.72	19.86
		High		19.70	19.73	19.92
	100%	/	20.5	19.64	19.76	20.03
16QAM	1	Low	21	20.29	20.48	20.33
		Middle		20.24	20.46	20.27
		High		20.03	20.43	20.32
	5	Low	20.5	19.36	19.64	19.55
		Middle		19.47	19.67	19.70
		High		19.27	19.41	19.57
	100%	/	20.5	19.31	19.50	19.53
Modulation	RB	RB Offset	Tune up	10MHz		
				20800	21100	21400
QPSK	1	Low	21.5	20.72	20.61	20.79
		Middle		20.60	20.67	20.75
		High		20.67	20.64	20.79
	50%	Low	20.5	19.71	19.77	19.89
		Middle		19.68	19.82	19.89
		High		19.76	19.79	20.00
	100%	/	20.5	19.76	19.85	19.92
16QAM	1	Low	21	20.42	20.25	20.60

		Middle		20.22	20.11	20.68
		High		20.28	20.24	20.67
	50%	Low	20.5	19.62	19.81	19.48
		Middle		19.59	19.71	19.65
		High		19.68	19.69	19.90
	100%	/	20.5	19.63	19.75	19.71
Modulation	RB	RB Offset	Tune up	15MHz		
				20825	21100	21375
QPSK	1	Low	21.5	20.59	20.42	20.59
		Middle		20.56	20.60	20.61
		High		20.61	20.72	20.72
	50%	Low	20.5	19.67	19.74	19.86
		Middle		19.78	19.83	19.95
		High		19.71	19.89	19.97
	100%	/	20.5	19.76	19.78	20.02
16QAM	1	Low	21	20.45	20.41	20.60
		Middle		20.35	20.43	20.56
		High		20.47	20.54	20.69
	50%	Low	20.5	19.71	20.03	19.54
		Middle		19.51	19.70	19.60
		High		19.62	19.57	19.86
	100%	/	20.5	19.66	19.81	19.68
Modulation	RB	RB Offset	Tune up	20MHz		
				20850	21100	21350
QPSK	1	Low	21.5	20.75	20.70	20.67
		Middle		20.58	20.76	20.68
		High		20.67	20.80	20.82
	50%	Low	20.5	19.60	19.71	19.87
		Middle		19.78	19.81	19.76
		High		19.87	19.83	19.93
	100%	/	20.5	19.75	19.65	19.91
16QAM	1	Low	21	20.43	20.02	20.10
		Middle		20.54	20.10	20.04
		High		20.65	20.17	20.18
	50%	Low	20.5	19.63	19.91	19.29
		Middle		19.61	19.73	19.41
		High		20.08	19.79	19.92
	100%	/	20.5	19.82	19.81	19.59

LTE band 38

LTE				Output power (dBm)		
Modulation	RB	RB Offset	Tune up	5MHz		
				37775	38000	38225
QPSK	1	Low	22	21.14	21.26	21.51
		Middle		21.23	21.32	21.55
		High		21.33	21.42	21.41
	50%	Low	21	20.21	20.38	20.36
		Middle		20.35	20.41	20.41
		High		20.24	20.49	20.40
	100%	/	21	20.23	20.29	20.45
16QAM	1	Low	21	20.04	20.13	20.16
		Middle		20.11	20.13	20.18
		High		20.07	20.29	20.14
	5	Low	20	19.36	19.51	19.59
		Middle		19.50	19.54	19.62
		High		19.50	19.60	19.58
	100%	/	20	19.66	19.58	19.66
Modulation	RB	RB Offset	Tune up	10MHz		
				37800	38000	38200
QPSK	1	Low	22	21.38	21.46	21.41
		Middle		21.35	21.54	21.61
		High		21.50	21.51	21.60
	50%	Low	21	20.29	20.31	20.58
		Middle		20.37	20.46	20.53
		High		20.45	20.43	20.57
	100%	/	21	20.43	20.48	20.58
16QAM	1	Low	21	20.17	20.02	20.18
		Middle		20.03	20.08	20.27
		High		20.19	20.23	20.34
	50%	Low	20	19.62	19.59	19.65
		Middle		19.56	19.57	19.77
		High		19.56	19.74	19.78
	100%	/	20	19.60	19.57	19.79
Modulation	RB	RB Offset	Tune up	15MHz		
				37825	38000	38175
QPSK	1	Low	22	21.40	21.32	21.37
		Middle		21.41	21.50	21.58
		High		21.44	21.46	21.50
	50%	Low	21	20.45	20.45	20.61
		Middle		20.40	20.47	20.66
		High		20.51	20.62	20.60

	100%	/	21	20.38	20.42	20.55
16QAM	1	Low	21	20.12	20.04	20.11
		Middle		20.13	20.18	20.24
		High		20.14	20.24	20.30
	50%	Low	20	19.45	19.54	19.51
		Middle		19.41	19.58	19.60
		High		19.55	19.56	19.70
	100%	/	20	19.55	19.66	19.62
Modulation	RB	RB Offset	Tune up	20MHz		
				37850	38000	38150
QPSK	1	Low	22	21.23	21.24	21.39
		Middle		21.30	21.37	21.55
		High		21.44	21.40	21.57
	50%	Low	21	20.29	20.35	20.48
		Middle		20.35	20.38	20.51
		High		20.48	20.49	20.69
	100%	/	21	20.49	20.42	20.46
16QAM	1	Low	21	20.04	20.09	20.10
		Middle		20.07	20.11	20.25
		High		20.15	20.25	20.32
	50%	Low	20	19.55	19.62	19.65
		Middle		19.43	19.58	19.75
		High		19.47	19.54	19.79
	100%	/	20	19.40	19.55	19.63

6.1.3 Radiated

6.1.3.1 Description

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

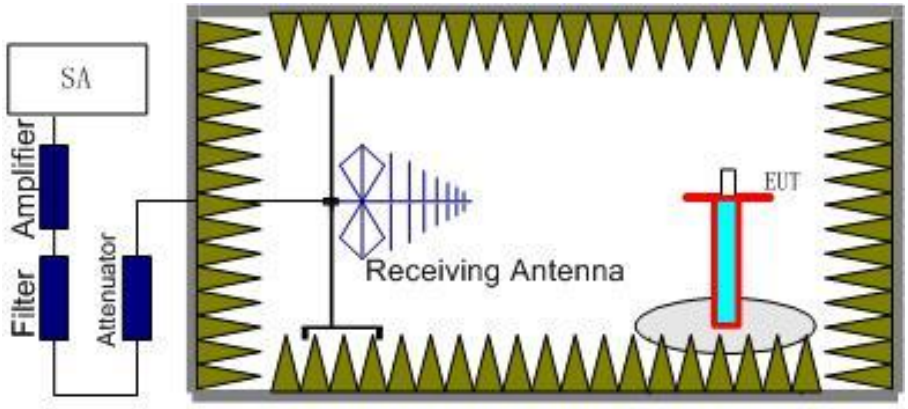
Rule Part 24.232(b) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

Rule Part 27.50(d) specifies “Fixed, mobile, and portable (handheld) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP”.

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

Rule Part 27.50(c) specifies “Portable stations (hand-held de-vices) are limited to 3 watts ERP.”.

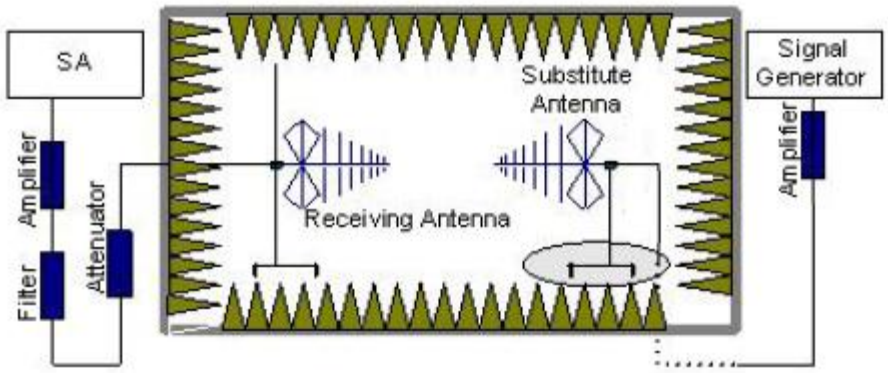
6.1.3.2 Method of Measurement



The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. 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. Adjust 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 (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 -2.15dBi.

6.1.3.3 Measurement result

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

Limits: ≤33 dBm (2W)

LTE Band 7_5MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2502.5	19.22	33.00	H
2535	19.21	33.00	H
2567.5	19.36	33.00	H

LTE Band 7_10MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2505	19.22	33.00	H
2535	19.17	33.00	H
2565	19.29	33.00	H

LTE Band 7_15MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2507.5	19.09	33.00	H
2535	19.22	33.00	H
2562.5	19.22	33.00	H

LTE Band 7_20MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2510	19.25	33.00	H
2535	19.30	33.00	H
2560	19.32	33.00	H

LTE Band 7_5MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2502.5	18.79	33.00	H
2535	18.98	33.00	H
2567.5	18.83	33.00	H

LTE Band 7_10MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2505	18.92	33.00	H
2535	18.75	33.00	H
2565	19.18	33.00	H

LTE Band 7_15MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2507.5	18.95	33.00	H
2535	19.04	33.00	H
2562.5	19.19	33.00	H

LTE Band 7_20MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2510	19.15	33.00	H
2535	18.67	33.00	H
2560	18.60	33.00	H

LTE Band 38- EIRP 27.50(h)(2)

Limits: ≤33 dBm (2W)

LTE Band 38_5MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2572.5	18.83	33.00	H
2595	18.92	33.00	H
2617.5	19.05	33.00	H

LTE Band 38_10MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2575	18.88	33.00	H
2595	19.04	33.00	H
2615	19.11	33.00	H

LTE Band 38_15MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2577.5	18.94	33.00	H
2595	19.00	33.00	H
2612.5	19.08	33.00	H

LTE Band 38_20MHz_QPSK

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2580	18.94	33.00	H
2595	18.90	33.00	H
2610	19.07	33.00	H

LTE Band 38_5MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2572.5	17.61	33.00	H
2595	17.79	33.00	H
2617.5	17.56	33.00	H

LTE Band 38_10MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2575	17.69	33.00	H
2595	17.73	33.00	H
2615	17.84	33.00	H

LTE Band 38_15MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2577.5	17.64	33.00	H
2595	17.74	33.00	H
2612.5	17.8	33.00	H

LTE Band 38_20MHz_16QAM

Frequency(MHz)	EIRP(dBm)	Limit(dBm)	Polarization
2580	17.57	33.00	H
2595	17.75	33.00	H
2610	17.82	33.00	H

ANALYZER SETTINGS:

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

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

6.2. Emission Limt

Reference

CFR 2.1051, 27.53(g), 27.53(h), 27.53(m).

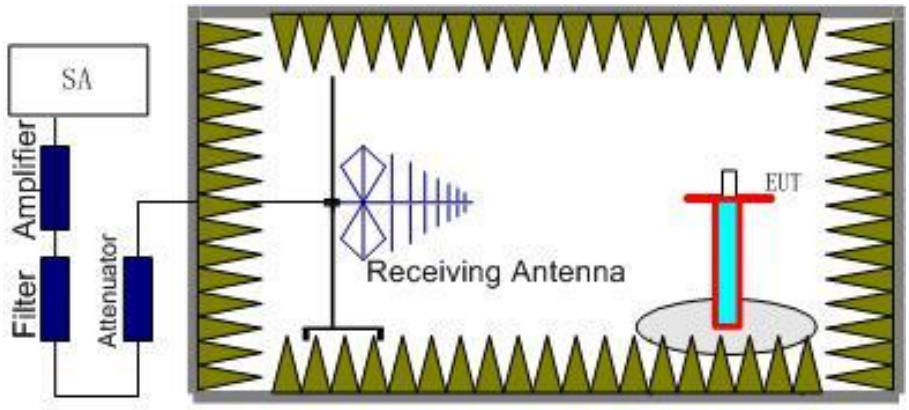
6.2.1 Measurement Method

The measurements procedures in TIA-603E-2016 are used. This measurement is carried out in fully-anechoic chamber FAC-3.

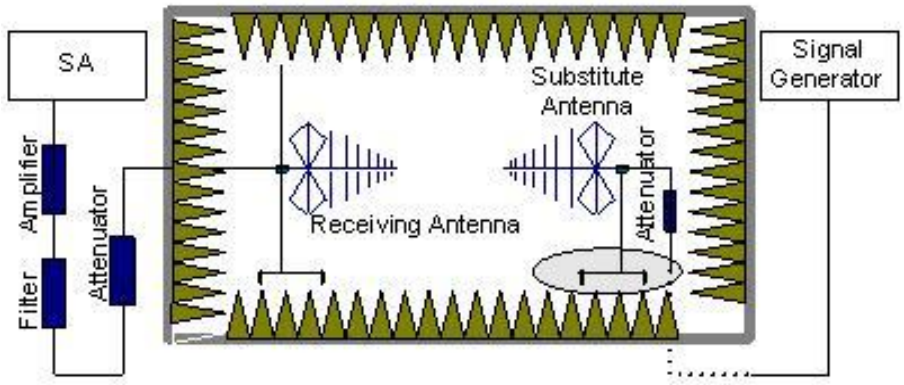
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 27.53(g), Part 27.53(h), Part 27.53(m). The spectrum was scanned with the mobile station transmitting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

The procedure of radiated spurious emissions is as follows:

1. Below 1 GHz, EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. 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.EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. 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 non-harmonic and harmonics of the transmit frequency through the 10th harmonic 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. Adjust 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 (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 -2.15dBi.

6.2.2 Measurement Limit

Part 27.53(g),27.53(h), 27.53(m) state that on any frequency outside frequency band 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.

According to KDB 971168 6, 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.

Part 27.53(m) states that 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.

6.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands.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 Bands. 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. The evaluated frequency range is from 30MHz to 26GHz.

Band 7

	Channel		Result
Band 7	L	20775	Pass
	M	21100	Pass
	H	21425	Pass

Band 38

	Channel		Result
Band 38	L	37775	Pass
	M	38000	Pass
	H	38225	Pass

RSE-LTE7-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3742.4	-51.56	6.6	7.9	-50.26	-25	H
5000.8	-46.74	7.8	9.6	-44.94	-25	H
6059.6	-49.43	8.6	10.2	-47.83	-25	V
7500.8	-37.23	9.7	11.6	-35.33	-25	H
10001.2	-38.76	11.2	12.5	-37.46	-25	H
12501.5	-33.5	12.7	12.3	-33.9	-25	H

RSE-LTE7-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3941.6	-50.94	6.8	8.6	-49.14	-25	H
5065.6	-45.35	7.8	9.6	-43.55	-25	H
6284.4	-49.48	8.8	10.3	-47.98	-25	H
7598.4	-40.14	9.7	11.6	-38.24	-25	V
10131.6	-38.43	11.3	12.5	-37.23	-25	H
12664.2	-30.32	12.7	12.3	-30.72	-25	H

RSE-LTE7-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3943.2	-51.68	6.8	8.6	-49.88	-25	H
5130.4	-44.51	7.9	9.4	-43.01	-25	H
6368.4	-48.91	8.8	10.3	-47.41	-25	V
7696.0	-42.86	9.8	11.8	-40.86	-25	H
10261.2	-39.25	11.5	12.3	-38.45	-25	H
12827.0	-27.58	12.5	12.3	-27.78	-25	H

RSE-LTE38-L

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3872.8	-50.93	6.7	7.9	-49.73	-25	V
5140.8	-44.81	7.9	9.4	-43.31	-25	H
6407.6	-50.26	8.9	10.6	-48.56	-25	V
7710.8	-39.95	9.8	11.8	-37.95	-25	V
10281.6	-36.41	11.5	12.3	-35.61	-25	V
12851.5	-26.85	13.0	12.3	-27.55	-25	H

RSE-LTE38-M

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3878.8	-52.01	6.8	8.6	-50.21	-25	H
5186.0	-41.97	8.0	9.4	-40.57	-25	V
6408.0	-49.94	8.9	10.6	-48.24	-25	V
7778.4	-39.24	9.9	11.8	-37.34	-25	V
10371.2	-34.45	11.6	12.3	-33.75	-25	H
12963.5	-25.65	13.2	12.3	-26.55	-25	H

RSE-LTE38-H

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit（dBm）	Polarization
3946.8	-51.58	6.8	8.6	-49.78	-25	H
5230.8	-42.52	8.0	9.4	-41.12	-25	H
6636.4	-49.13	9.1	10.9	-47.33	-25	V
7846.0	-36.32	9.9	11.8	-34.42	-25	H
10461.6	-36.29	11.6	12.3	-35.59	-25	H
13077.2	-28.11	13.0	12.3	-28.81	-25	H

6.3. Frquency Stability

Reference

CFR Part 2.1055, 27.54.

6.3.1 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 for LTE band 7. 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 ℃ decrements 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.

6.3.2 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. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. 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 4.35VDC, with a nominal voltage of 3.8VDC. 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. For the purposes of measuring frequency stability these voltage limits are to be used.

6.3.3 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
3.60	-45.748	35.062	0.018	0.014
3.70	-29.569	28.296	0.012	0.011
4.20	-49.939	10.142	0.019	0.004

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	-29.225	27.838	0.011	0.011
40°	-11.587	-31.514	0.005	0.012
30°	-41.456	25.291	0.016	0.010
20°	-47.750	-8.326	0.019	0.003
10°	-25.363	7.467	0.010	0.003
0°	-49.224	-17.567	0.019	0.007
- 10°	-30.355	-12.817	0.012	0.005
- 20°	-31.528	-15.092	0.012	0.006
- 30°	-25.806	-17.853	0.010	0.007

LTE Band 38, 20MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
3.60	44.217	-21.701	0.017	0.008
3.70	15.750	-68.278	0.006	0.026
4.20	46.234	-67.019	0.018	0.026

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
50°	57.249	-37.708	0.022	0.015
40°	17.366	-62.485	0.007	0.024
30°	-15.993	-70.996	0.006	0.027
20°	20.428	-63.200	0.008	0.024
10°	32.086	-64.030	0.012	0.025
0°	43.702	-49.324	0.017	0.019
- 10°	12.074	-34.976	0.005	0.013
- 20°	19.212	15.779	0.007	0.006
- 30°	25.163	-51.184	0.010	0.020

6.4. Occupied Bandwidth

Reference

CFR Part 2.1049(h) (i)

6.4.1 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.

The measurement method is from KDB 971168 4:

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.

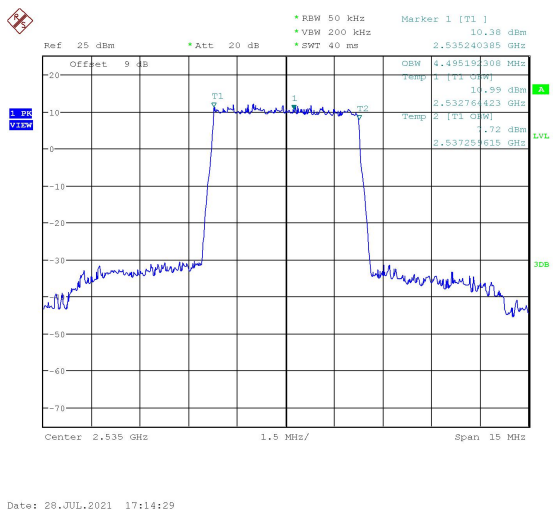
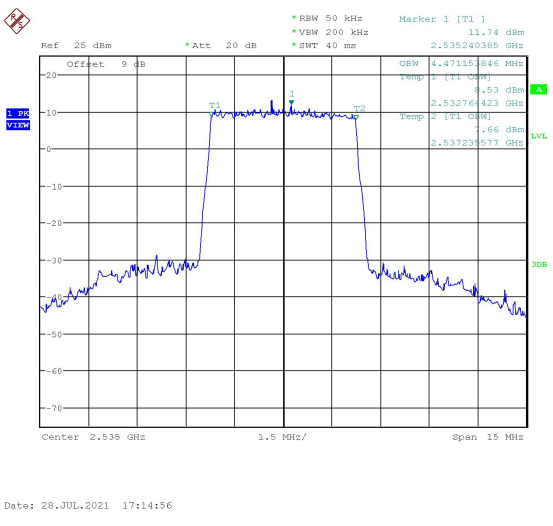
c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

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

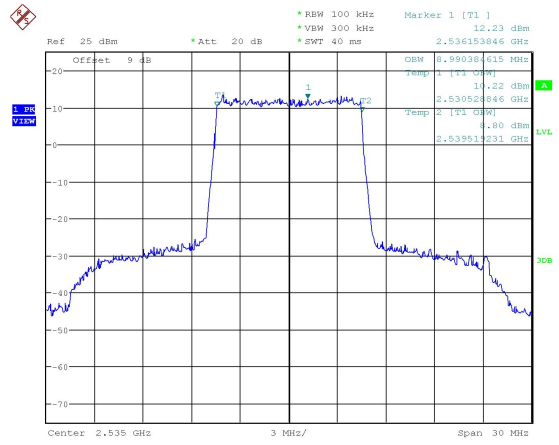
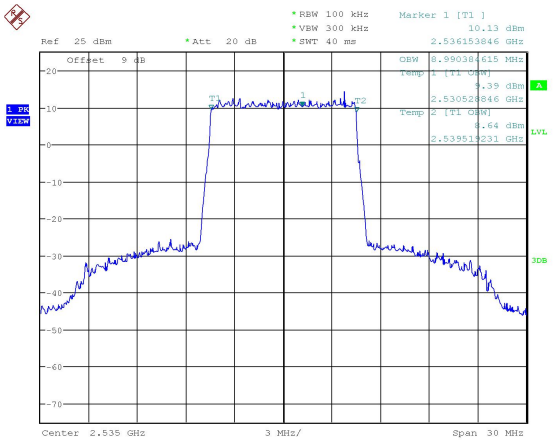
e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

Occupied Bandwidth Measurement Results:

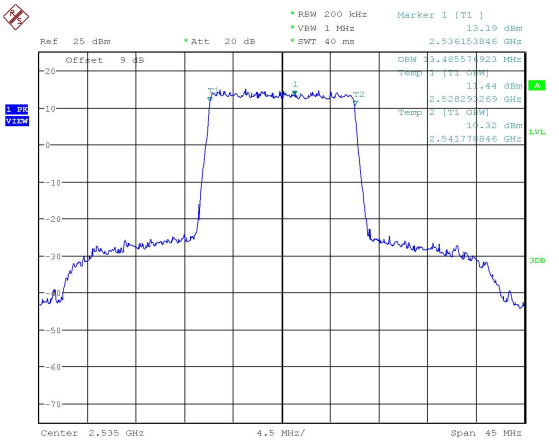
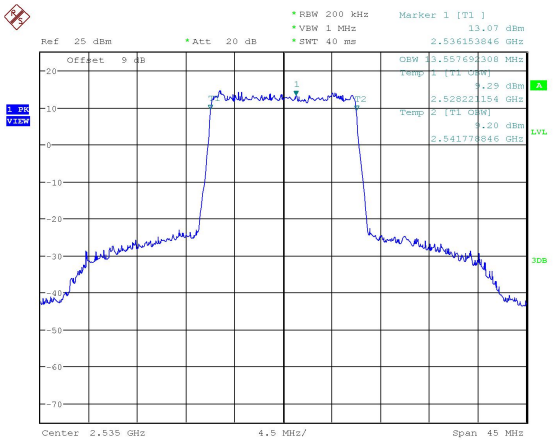
LTE band 7, 5MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2535.0	4.495	4.471
QPSK (99% BW)	16QAM (99% BW)	
		

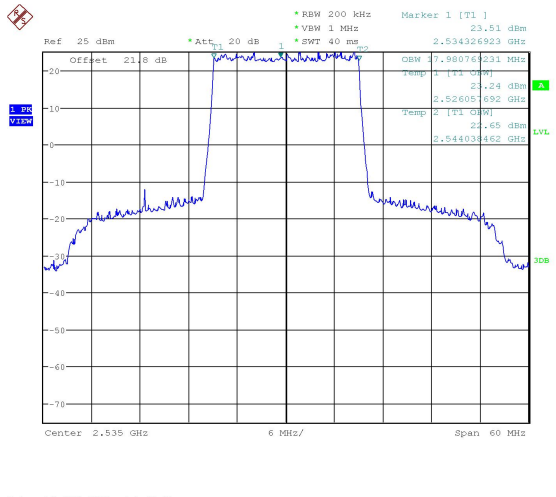
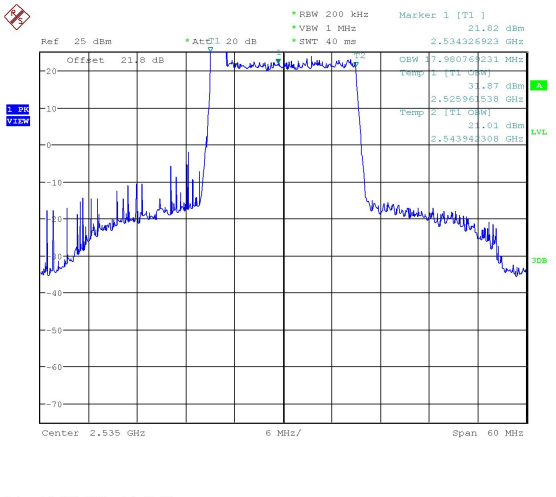
LTE band 7, 10MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2535.0	8.99	8.99
QPSK (99% BW)	16QAM (99% BW)	
		

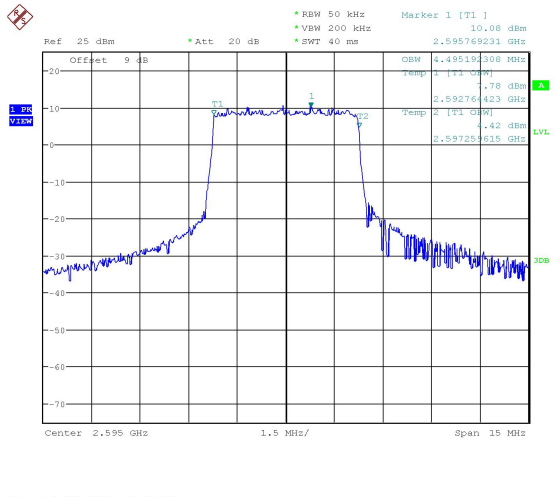
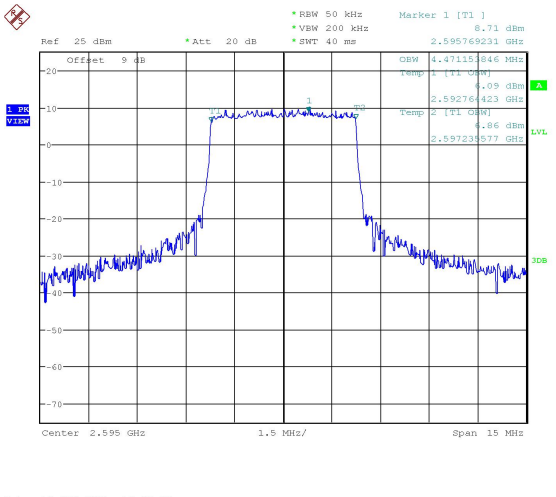
LTE band 7, 15MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2535.0	13.486	13.558
QPSK (99% BW)	16QAM (99% BW)	
		

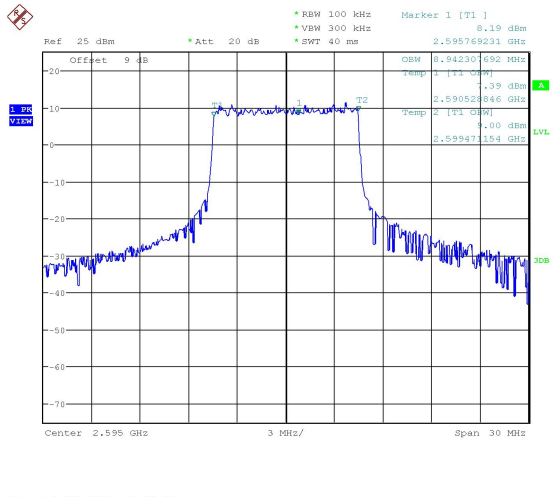
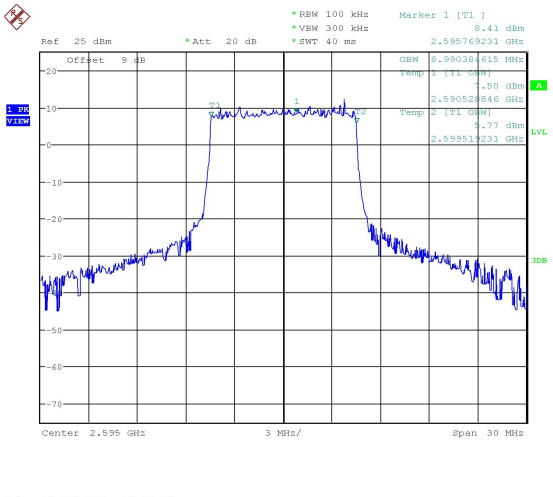
LTE band 7, 20MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2535.0	17.981	17.981
QPSK (99% BW)	16QAM (99% BW)	
		

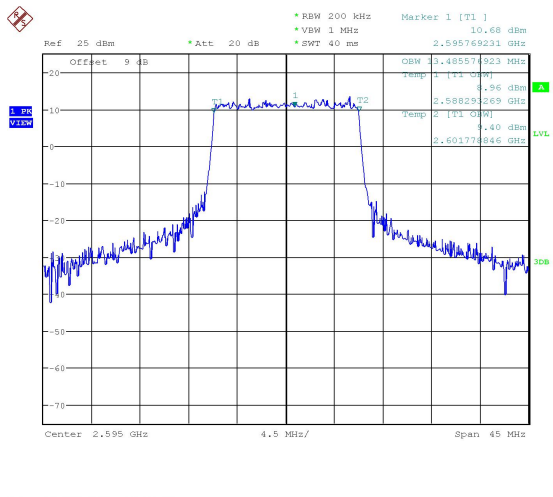
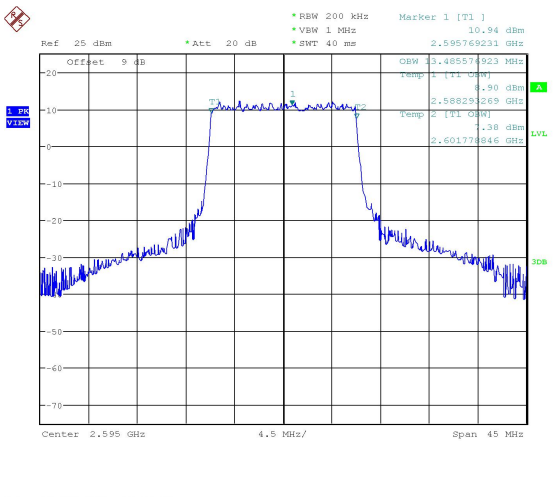
LTE band 38, 5MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2595.0	4.495	4.471
QPSK (99% BW)	16QAM (99% BW)	
		

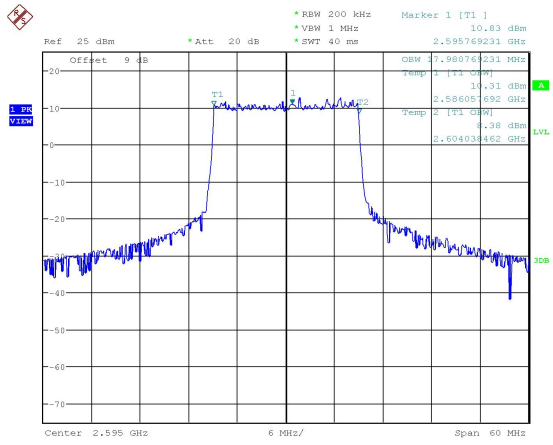
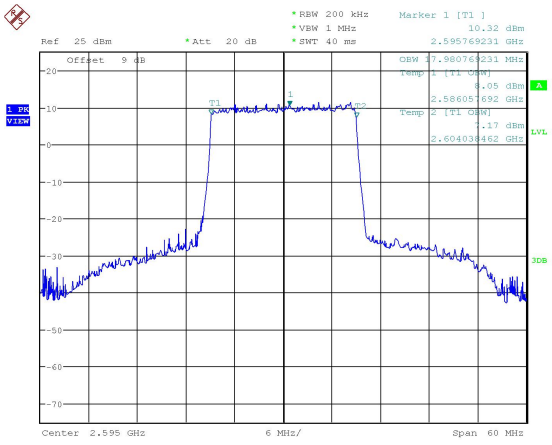
LTE band 38, 10MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2595.0	8.942	8.99
QPSK (99% BW)	16QAM (99% BW)	
		

LTE band 38, 15MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
	QPSK	16QAM
2595.0	13.486	13.486
QPSK (99% BW)	16QAM (99% BW)	
		

LTE band 38, 20MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
2595.0	QPSK	16QAM
	17.981	17.981
QPSK (99% BW)	16QAM (99% BW)	
		

6.5. Emission Bandwidth

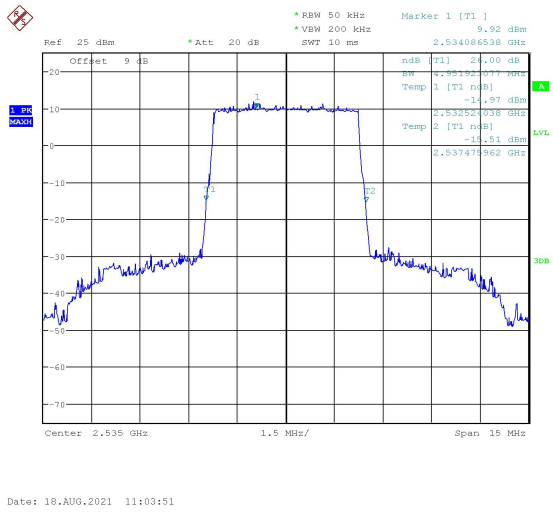
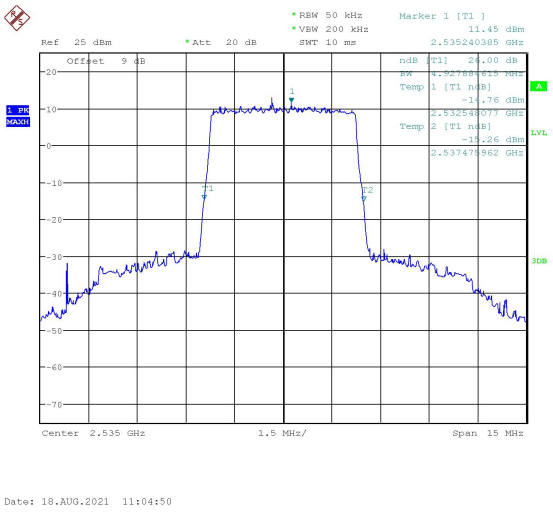
Reference

CFR Part 27.53(g),27.53(h), 27.53(m)

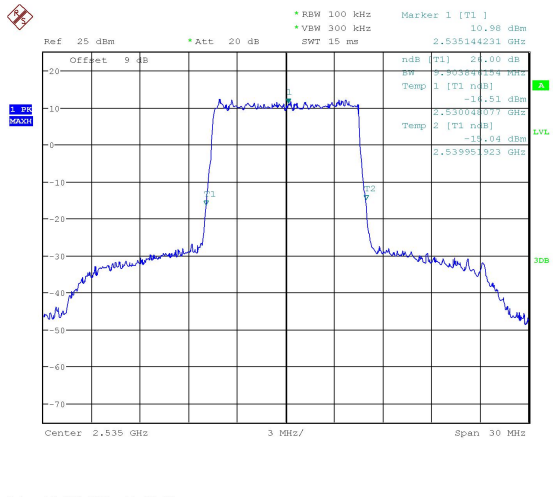
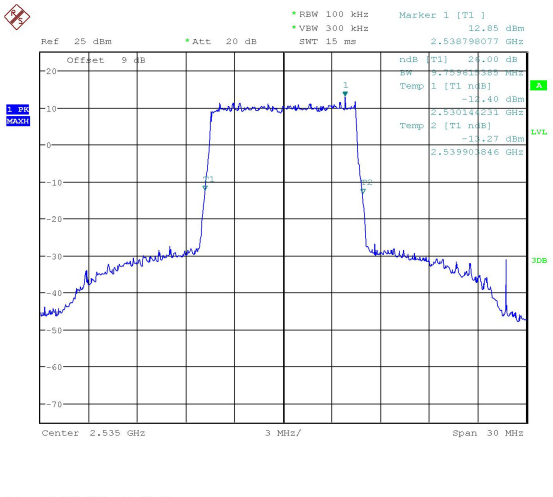
6.5.1Emission Bandwidth Results

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.

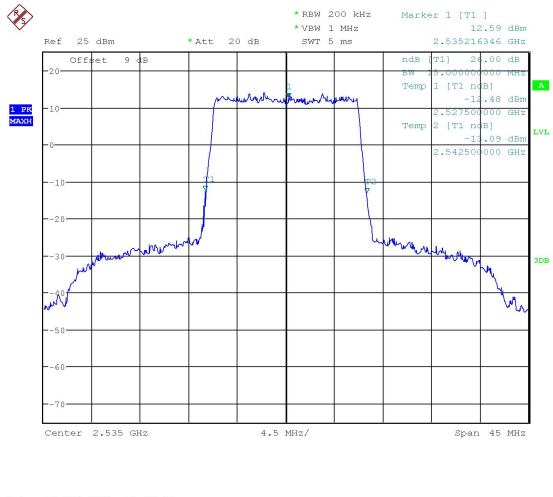
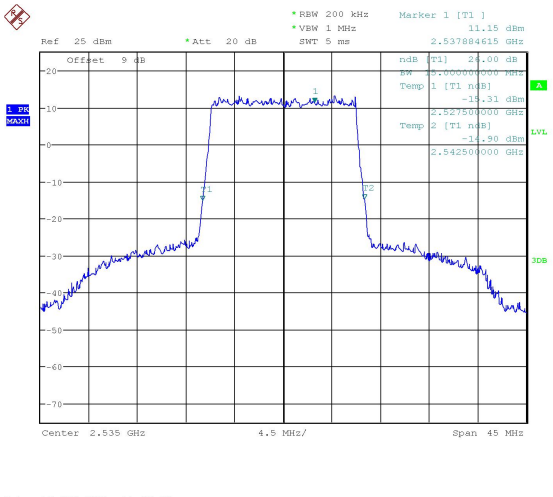
LTE band 7, 5MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
2535.0	QPSK	16QAM
	4.95	4.93
QPSK (-26dBc)	16QAM(-26dBc)	
		

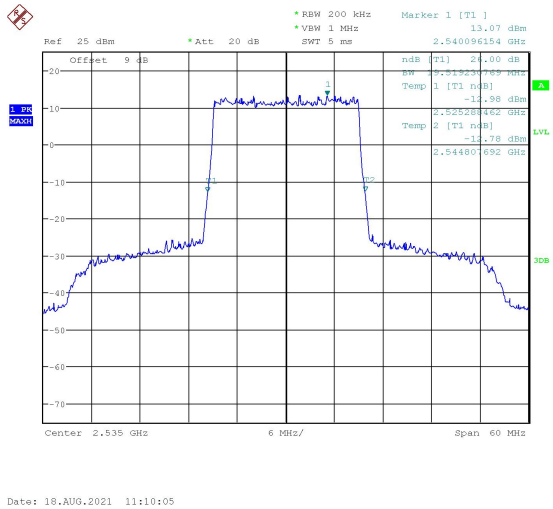
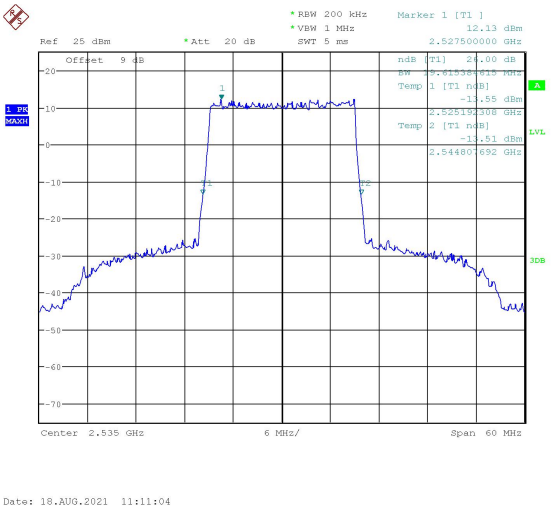
LTE band 7, 10MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2535.0	9.90	9.76
QPSK (-26dBc)	16QAM(-26dBc)	
		

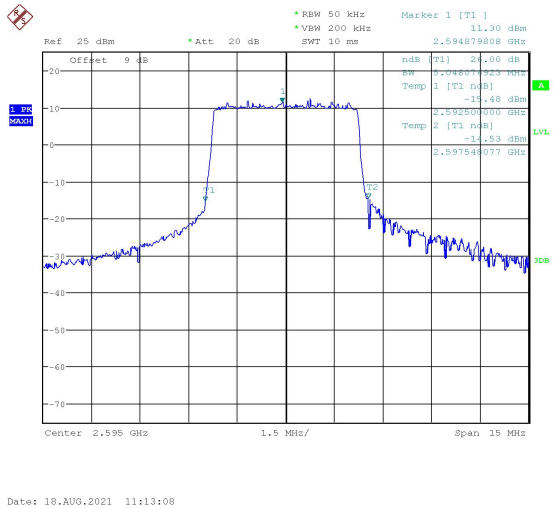
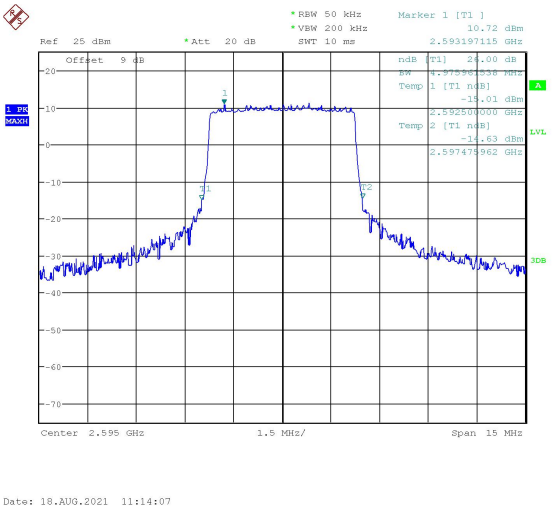
LTE band 7, 15MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2535.0	15.00	15.00
QPSK (-26dBc)	16QAM(-26dBc)	
		

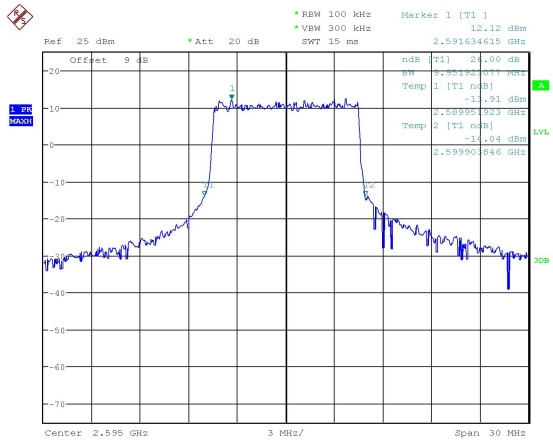
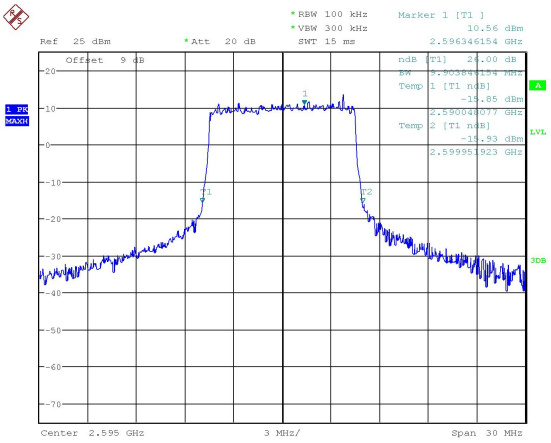
LTE band 7, 20MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2535.0	19.52	19.62
QPSK (-26dBc)	16QAM(-26dBc)	
		

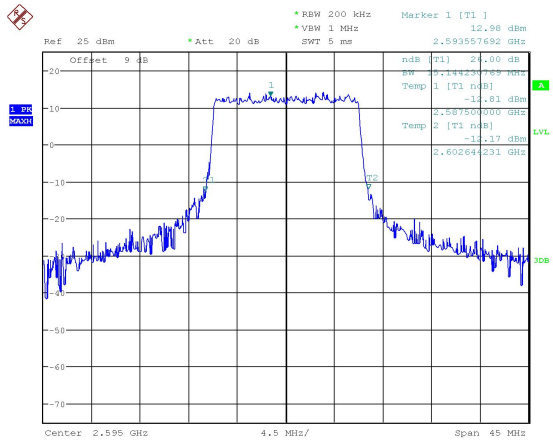
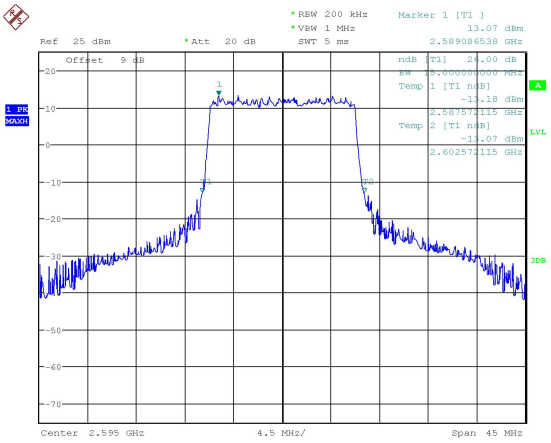
LTE band 38, 5MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2595.0	5.05	4.98
QPSK (-26dBc)	16QAM(-26dBc)	
		

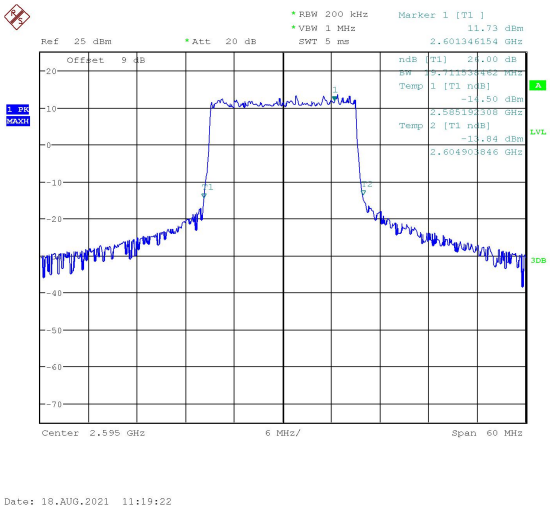
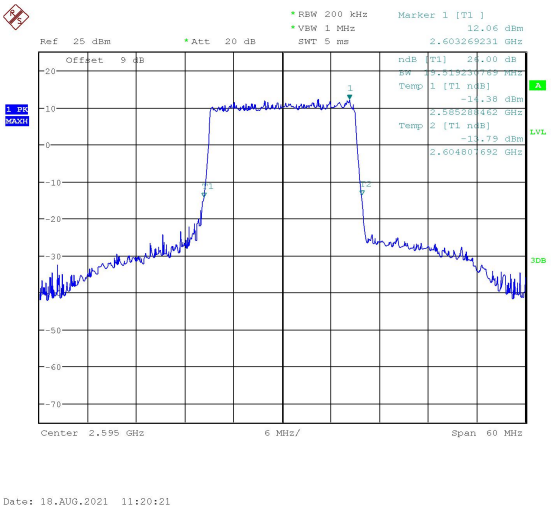
LTE band 38, 10MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2595.0	9.95	9.90
QPSK (-26dBc)	16QAM(-26dBc)	
		

LTE band 38, 15MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2595.0	15.14	15.00
QPSK (-26dBc)	16QAM(-26dBc)	
		

LTE band 38, 20MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
	QPSK	16QAM
2595.0	19.71	19.52
QPSK (-26dBc)	16QAM(-26dBc)	
		

6.6. Band Edge Compliance

Reference

CFR Part 27.53(g),27.53(h), 27.53(m)

6.6.1 Measurement limit

Part 27.53(g),27.53(h), 27.53(m) state that on any frequency outside frequency band 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.

According to KDB 971168 6, 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.

Part 27.53(m) states that 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.