TEST REPORT

Report Number: C20T00030-RFA02-V00

Applicant	MobiWire SAS
Product Name	4G Smart phone
Model Name	MobiWire Ituha, MBW Vodafone Smart N12
Brand Name	MobiWire
FCC ID	QPN-ITUHA

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	刘艳	Reviewed by	范逸艳
Approved by	熊增勤	Issue Date	2021-03-15

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

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Test Laboratory:
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Revision Version

Report Number	Revision	Date	Memo
C20T00030-RFA02-V00	00	2021-03-15	Initial creation of test report

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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 Designation 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	2020-12-08
Testing End Date	2021-03-05

2. Client Information

2.1. Applicant Information

Company Name	MobiWire SAS
Address	79 AVENUE FRANCOIS ARAGO 92017 NANTERRE France
Telephone	+33 625 028 368-33

2.2. Manufacturer Information

Company Name	MobiWire SAS
Address	79 AVENUE FRANCOIS ARAGO 92017 NANTERRE France
Telephone	+33 625 028 368-33

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

3.1. About EUT

Product Name	4G Smart phone
Model name	MobiWire Ituha, MBW Vodafone Smart N12
Supported Radio Technology and Bands	GSM850/GSM900/GSM1800/GSM1900 WCDMA Band I/ II/V/VIII LTE Band 1/3/7/8/20/28B BT5.1 WLAN 802.11b/g/n GNSS GLONASS G1/GPS L1
Hardware Version	V00A
Software Version	VFD_NZ_SMART_N12_SS_O_T_L_V01
FCC ID	QPN-ITUHA
Extreme Temperature	-10℃~55℃
Nominal Voltage	3.80V
Extreme High Voltage	4.35V
Extreme Low Voltage	3.60V
Maximum of Antenna Gain	Band7: -1.5dBi

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of Receipt
N01	352110690001343	V00A	VFD_NZ_SMART_N12 _SS_O_T_L_V01	2020-12-03
N04	352110690004057	V00A	VFD_NZ_SMART_N12 _SS_O_T_L_V01	2020-12-03
N05	352110690003984	V00A	VFD_NZ_SMART_N12 _SS_O_T_L_V01	2020-12-03

*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	---	AE1

*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 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

4.2. Reference Information from client

Antenna gain Information of the test sample provided by MobiWire SAS
Maximum of Antenna Gain Band7: -1.5dBi

5. Test Summary

5.1. Summary of Test Results

LTE Band 7

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

Note: please refer to Annex C in this test report for the detailed test results.

The following terms are used in the above table.

P	Pass, the EUT complies with the essential requirements in the standard.
NM	Not measure, the test was not measured by 3IN.
NA	Not applicable, the test was not applicable.
F	Fail, the EUT does not comply with the essential requirements in the standard.

5.2. Statements

The MobiWire Ituha, MBW Vodafone Smart N12, manufactured by MobiWire SAS 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

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

LTE			Out put power (dBm)		
Modulation	RB	RB Offset	5MHz		
			20775	21100	21425
QPSK	1	Low	21.44	21.54	21.75
		Middle	21.74	21.82	21.94
		High	21.50	21.59	21.83
	50%	Low	20.61	20.72	20.90
		Middle	20.66	20.74	20.95
		High	20.59	20.71	20.96
	100%	/	20.63	20.74	20.96
16QAM	1	Low	20.71	20.75	21.03
		Middle	20.86	20.93	21.23
		High	20.70	20.71	21.01
	50%	Low	19.61	19.66	19.86
		Middle	19.61	19.75	19.94
		High	19.62	19.73	19.96
	100%	/	19.58	19.64	19.97
Modulation	RB	RB Offset	10MHz		
			20800	21100	21400
QPSK	1	Low	21.60	21.67	21.79
		Middle	21.73	21.80	21.95
		High	21.70	21.76	21.96
	50%	Low	20.66	20.74	21.01
		Middle	20.74	20.77	21.01
		High	20.69	20.78	21.06

	100%	/	20.71	20.78	20.99
16QAM	1	Low	20.73	20.89	21.02
		Middle	20.92	21.04	21.23
		High	20.86	20.82	21.22
	50%	Low	19.65	19.68	19.91
		Middle	19.64	19.72	19.91
		High	19.66	19.68	19.96
	100%	/	19.64	19.71	19.98
Modulation	RB	RB Offset	15MHz		
			20825	21100	21375
QPSK	1	Low	21.45	21.50	21.68
		Middle	21.65	21.66	21.91
		High	21.59	21.62	21.80
	50%	Low	20.65	20.66	20.92
		Middle	20.68	20.72	21.01
		High	20.70	20.70	20.98
	100%	/	20.69	20.71	20.98
16QAM	1	Low	20.47	20.70	21.00
		Middle	20.82	20.84	21.11
		High	20.68	20.80	21.09
	50%	Low	19.60	19.58	19.86
		Middle	19.60	19.64	19.91
		High	19.63	19.66	19.96
	100%	/	19.61	19.59	19.91
Modulation	RB	RB Offset	20MHz		
			20850	21100	21350
QPSK	1	Low	21.15	21.27	21.18
		Middle	21.51	21.74	21.42
		High	21.15	21.26	21.68
	50%	Low	20.69	20.64	20.40
		Middle	20.42	20.78	20.46
		High	20.60	20.69	20.66
	100%	/	20.67	20.61	20.43
16QAM	1	Low	20.36	20.53	20.25
		Middle	21.08	20.91	20.79
		High	20.68	20.68	20.49
	50%	Low	19.65	19.57	19.34
		Middle	19.65	19.70	19.44
		High	19.66	19.65	19.45
	100%	/	19.67	19.55	19.39

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”.

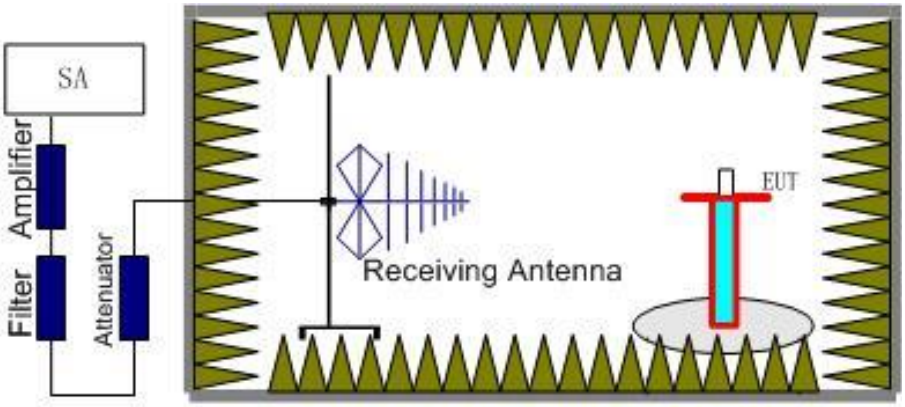
Rule Part 27.50(h)(2) specifies “Mobile stations are limited to 2.0 watts EIRP.”.

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

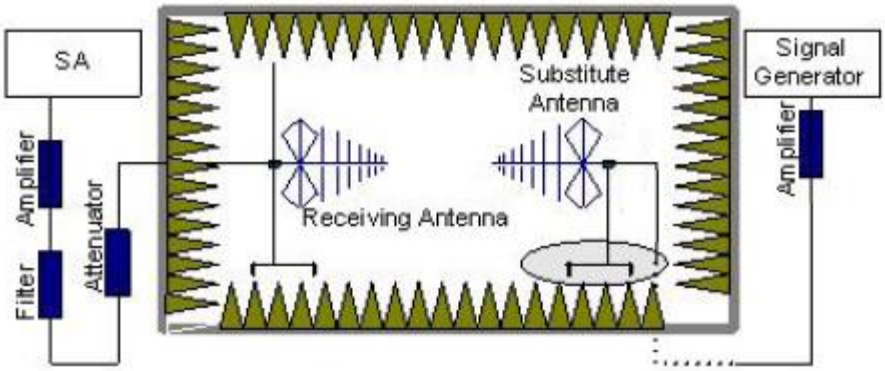
6.1.3.2 Method of Measurement

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)

Bandwidth	Modulation	Channel	EIRP (dBm)	Limit (dBm)	Polarization
5MHz	QPSK	20775	19.00	33.00	H
		21100	19.07	33.00	H
		21425	19.19	33.00	H
	16QAM	20775	18.13	33.00	H
		21100	18.29	33.00	H
		21425	18.42	33.00	H
10MHz	QPSK	20800	18.85	33.00	H
		21100	18.90	33.00	H
		21400	19.08	33.00	H
	16QAM	20800	17.87	33.00	H
		21100	18.10	33.00	H
		21400	18.40	33.00	H
15MHz	QPSK	20825	18.55	33.00	H
		21100	18.67	33.00	H
		21375	18.58	33.00	H
	16QAM	20825	17.76	33.00	H
		21100	17.93	33.00	H
		21375	17.65	33.00	H
20MHz	QPSK	20850	19.00	33.00	H
		21100	19.07	33.00	H
		21350	19.19	33.00	H
	16QAM	20850	18.13	33.00	H
		21100	18.29	33.00	H
		21350	18.42	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

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

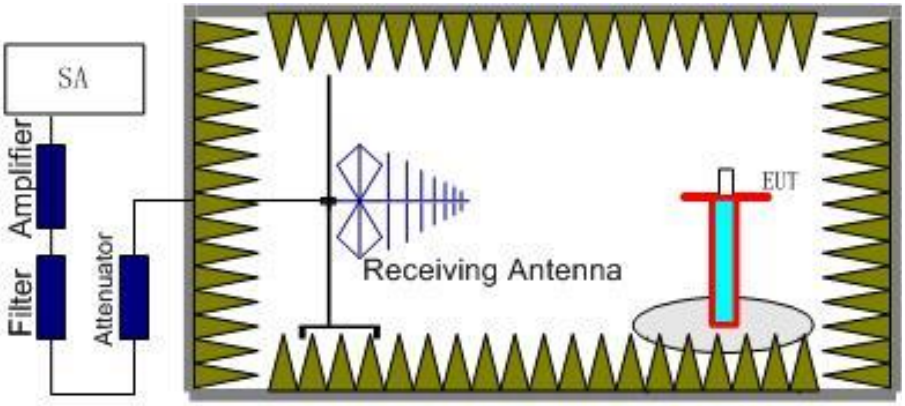
6.2.1 Measurement Method

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

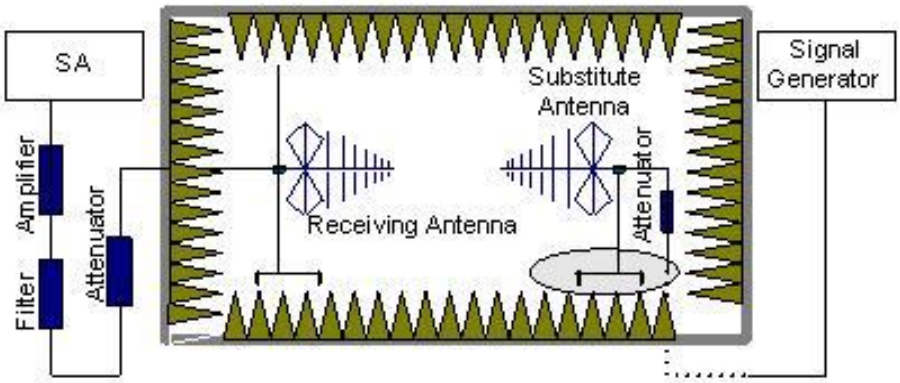
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz as outlined in Part 27.53(g), Part 27.53(h), Part 27.53(m). The spectrum was scanned with the mobile station transmitting 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), Part 27.53(h), Part 27.53(m) all specify that 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. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

6.2.3 Measurement Results

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

RSE-LTE7-L-N04

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit（dBm）	Polarization
5000.8	-41.71	7.8	9.0	-40.51	-13	H
7500.8	-40.88	9.7	14.6	-35.98	-13	V
10001.6	-44.25	11.2	17.6	-37.85	-13	V
12506.8	-40	12.7	18.7	-34	-13	H
15023.2	-35.25	14.4	24.4	-25.25	-13	H
17499.5	-25.42	15.1	20.1	-20.42	-13	V

RSE-LTE7-M-N04

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit（dBm）	Polarization
5065.2	-38.82	7.8	9.0	-37.62	-13	H
7598.4	-38.65	9.7	14.6	-33.75	-13	V
10131.2	-43.82	11.3	17.4	-37.72	-13	V
12669.5	-39.4	12.7	19.2	-32.9	-13	H
15177.2	-36	14.5	25.1	-25.4	-13	H
17721.8	-27.07	15.8	20.6	-22.27	-13	V

RSE-LTE7-H-N04

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBi)	Peak EIRP (dBm)	Limit（dBm）	Polarization
3610.4	-43.07	6.5	4.7	-44.87	-13	H
5130.8	-38.71	7.9	8.7	-37.91	-13	V
7695.6	-39.99	9.8	15.3	-34.49	-13	V
10261.6	-42.09	11.4	17.4	-36.09	-13	H
12827.0	-39.57	12.5	19.2	-32.87	-13	H
15392.5	-36.06	14.4	24.2	-26.26	-13	V

6.3. FREQUENCY STABILITY

Reference

FCC: 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 +55℃. 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 +55℃.
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 +55℃ 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	-6.495	-16.594	0.003	0.007
3.80	-9.127	20.399	0.004	0.008
4.35	-16.594	16.136	0.007	0.006

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
	QPSK	16QAM	QPSK	16QAM
55	-13.218	-17.495	0.005	0.007
50	-18.525	18.940	0.007	0.007
40	12.960	25.363	0.005	0.010
30	-16.193	21.629	0.006	0.009
20	-12.116	20.828	0.005	0.008
10	-16.365	21.486	0.006	0.008
0	-12.903	18.668	0.005	0.010
-10	-12.717	20.070	0.005	0.008

6.4. OCCUPIED BANDWIDTH

Reference

FCC: CFR Part 2.1049(h) (i)

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.

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).

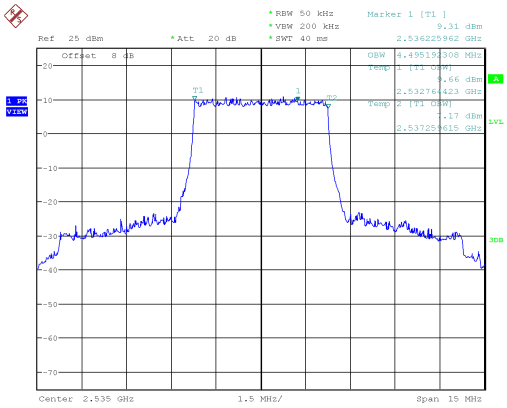
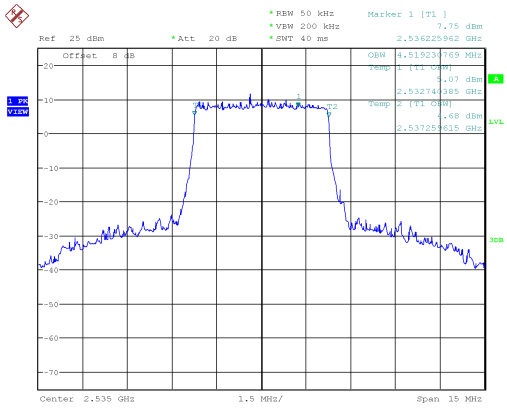
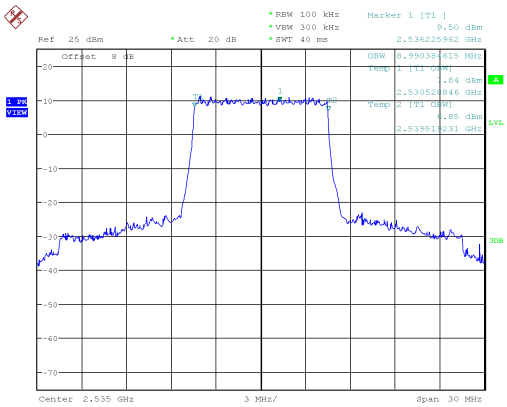
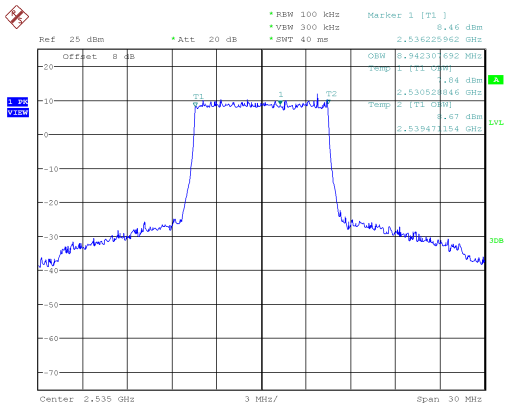
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.

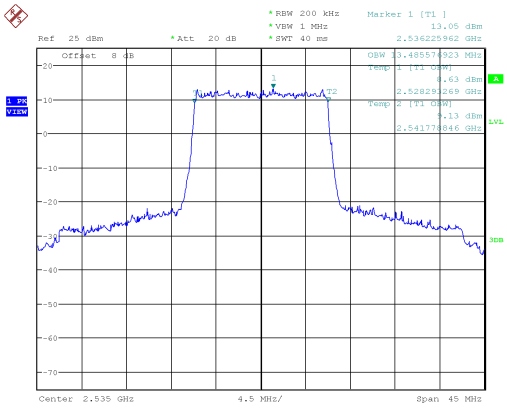
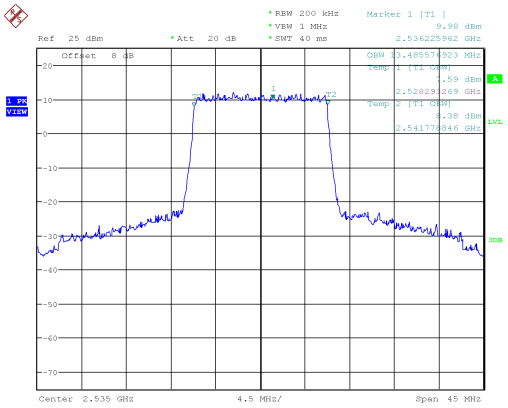
c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.

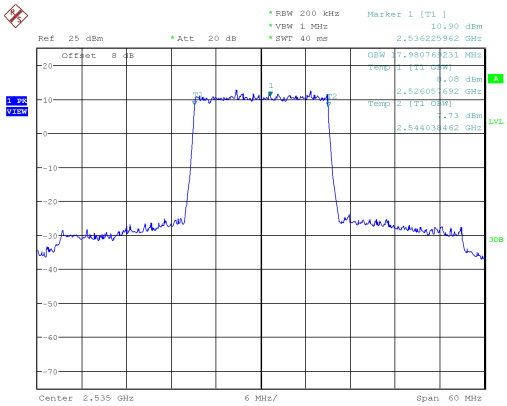
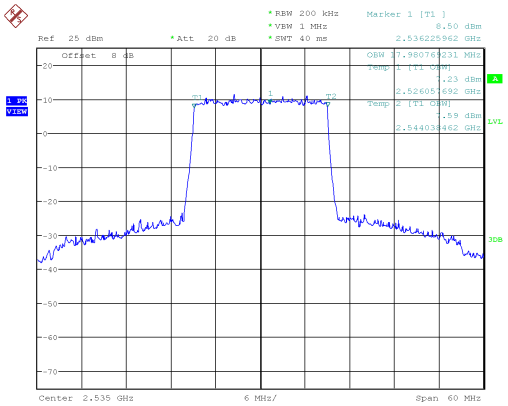
d) Set the detection mode to peak, and the trace mode to max hold.

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

Occupied Bandwidth Measurement Results:

LTE band 7		
Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
2535.0	QPSK	16QAM
	4.50	4.51
LTE band 7, 5MHz Bandwidth, QPSK (99% BW)	LTE band 7, 5MHz Bandwidth, 16QAM (99% BW)	
		
Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
2535.0	QPSK	16QAM
	8.99	8.94
LTE band 7, 10MHz Bandwidth, QPSK (99% BW)	LTE band 7, 10MHz Bandwidth, 16QAM (99% BW)	
		

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
2535.0	QPSK	16QAM
	13.49	13.49
LTE band 7, 15MHz Bandwidth, QPSK (99% BW)	LTE band 7, 15MHz Bandwidth, 16QAM (99% BW)	
		

Frequency(MHz)	Occupied Bandwidth (99%)(MHz)	
2535.0	QPSK	16QAM
	17.98	17.98
LTE band 7, 20MHz Bandwidth, QPSK (99% BW)	LTE band 7, 20MHz Bandwidth, 16QAM (99% BW)	
		

6.5. EMISSION BANDWIDTH

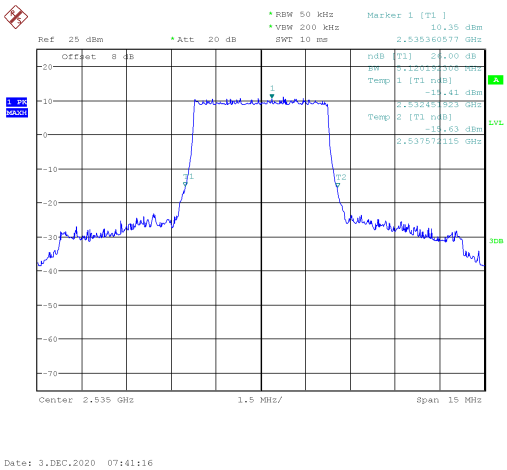
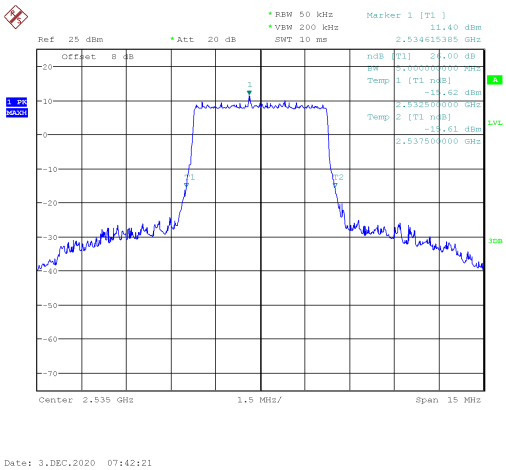
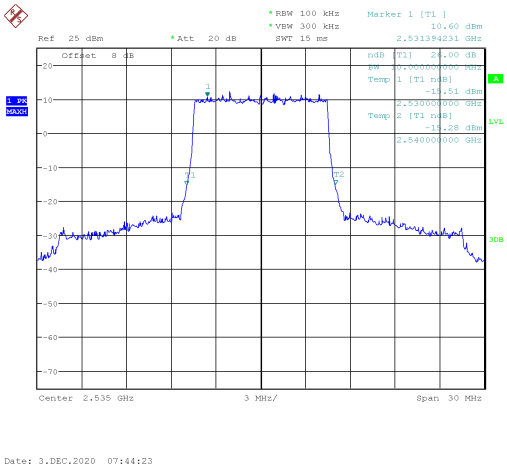
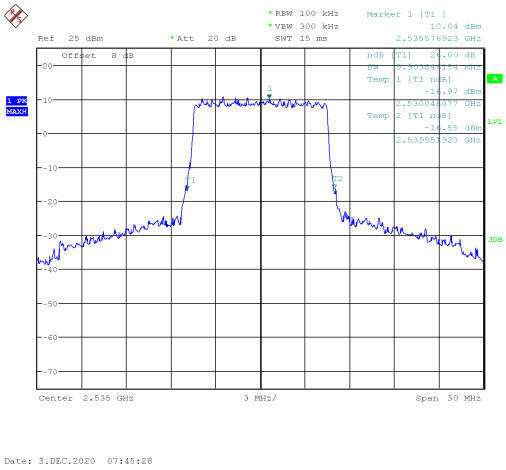
Reference

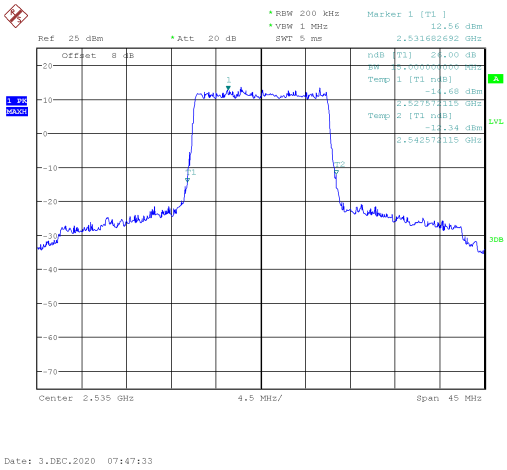
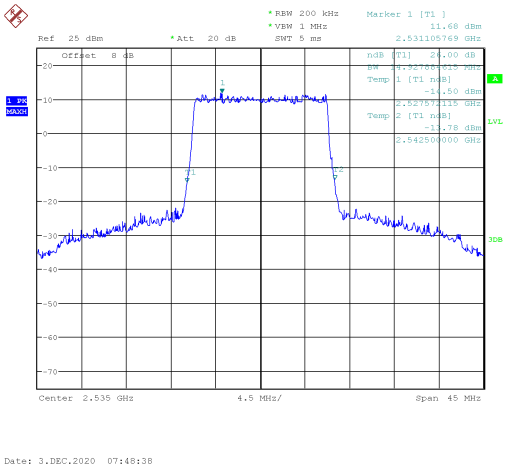
FCC: CFR Part 27.53(g),27.53(h), 27.53(m)

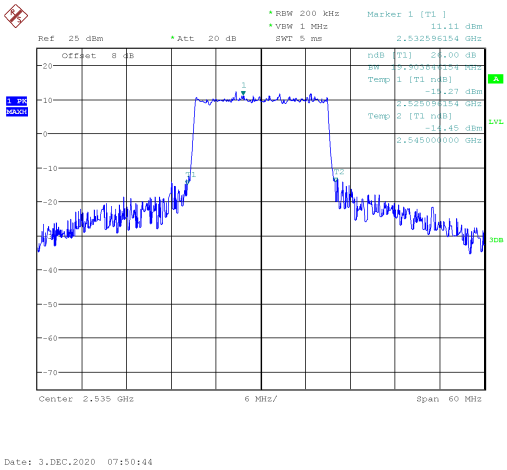
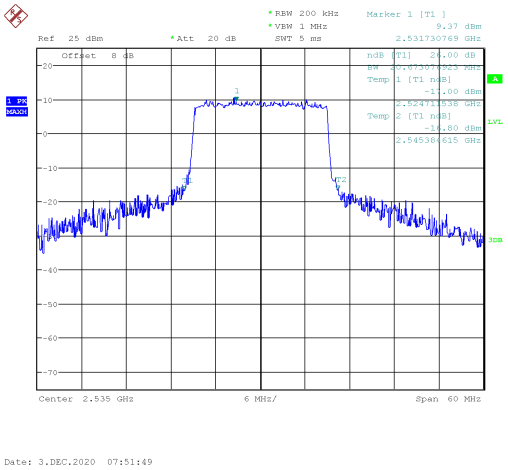
A.5.1Emission Bandwidth Results

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.

Emission Bandwidth Measurement Results:

LTE band 7		
Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
2535.0	QPSK	16QAM
	5.12	5.00
LTE band 7, 5MHz Bandwidth, QPSK (-26dBc BW)	LTE band 7, 5MHz Bandwidth, 16QAM (-26dBc BW)	
		
Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
2535.0	QPSK	16QAM
	10.00	9.90
LTE band 7, 10MHz Bandwidth, QPSK (-26dBc BW)	LTE band 7, 10MHz Bandwidth, 16QAM (-26dBc BW)	
		

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
2535.0	QPSK	16QAM
	14.92	14.90
LTE band 7, 15MHz Bandwidth, QPSK (-26dBc BW)	LTE band 7, 15MHz Bandwidth, 16QAM (-26dBc BW)	
		

Frequency(MHz)	Occupied Bandwidth (-26dBc)(MHz)	
2535.0	QPSK	16QAM
	19.90	20.67
LTE band 7, 20MHz Bandwidth, QPSK (-26dBc BW)	LTE band 7, 20MHz Bandwidth, 16QAM (-26dBc BW)	
		

6.6. BAND EDGE COMPLIANCE

Reference

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

A.6.1 Measurement limit

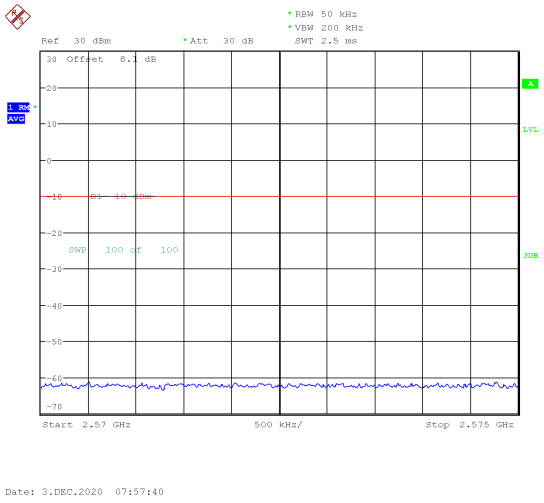
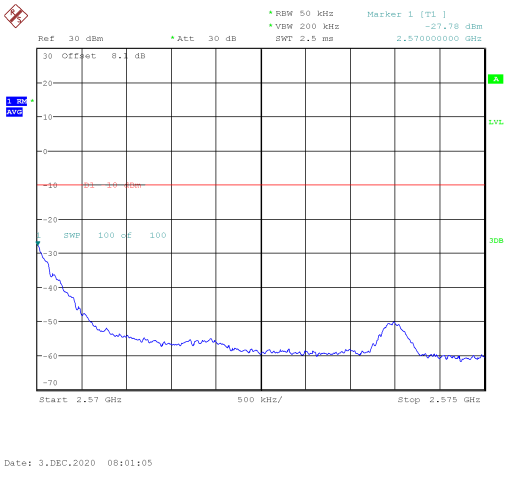
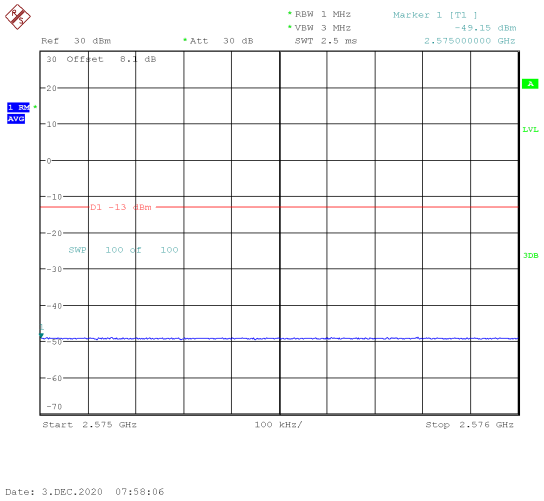
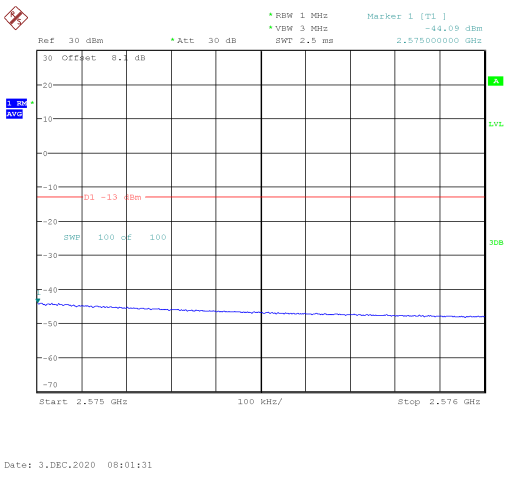
Part 27.53(g),27.53(h), 27.53(m) state that on any frequency outside frequency band of the US Cellular/PCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log (P) dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

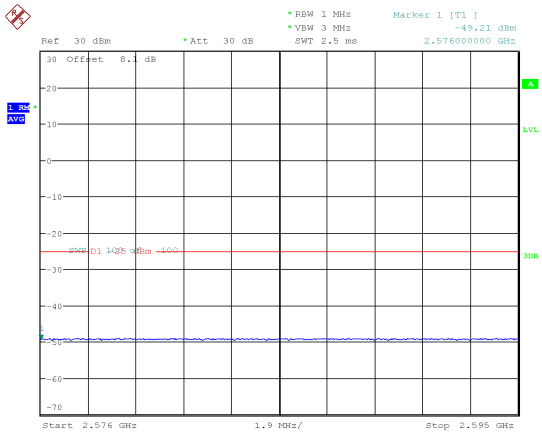
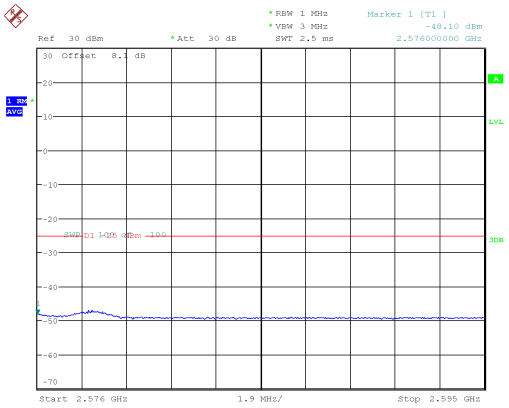
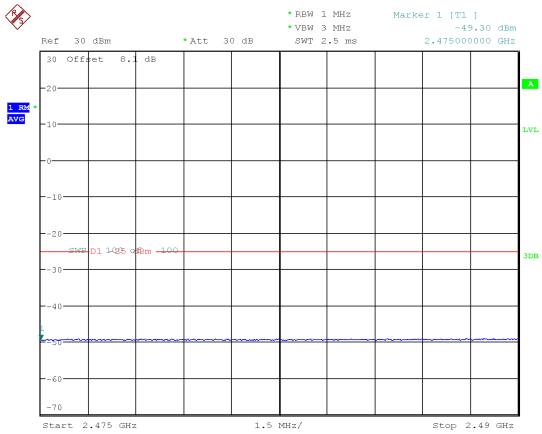
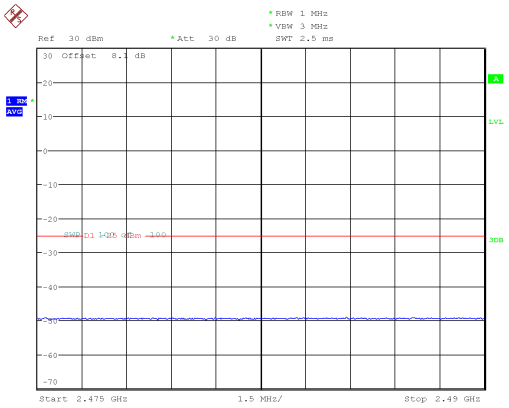
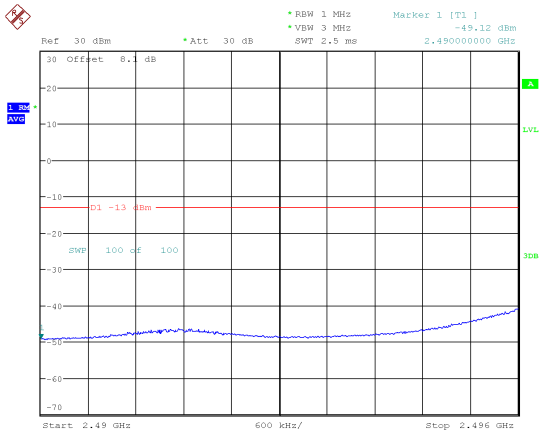
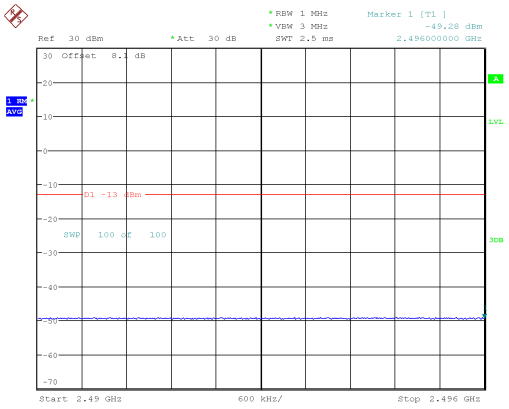
According to KDB 971168 6, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.

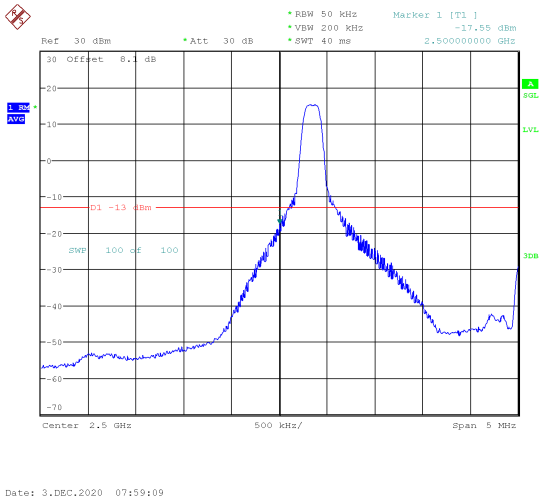
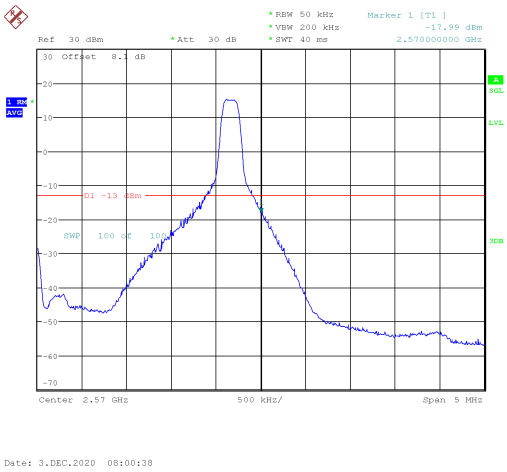
Part 27.53(m) states that for mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 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.

A.6.2 Measurement result

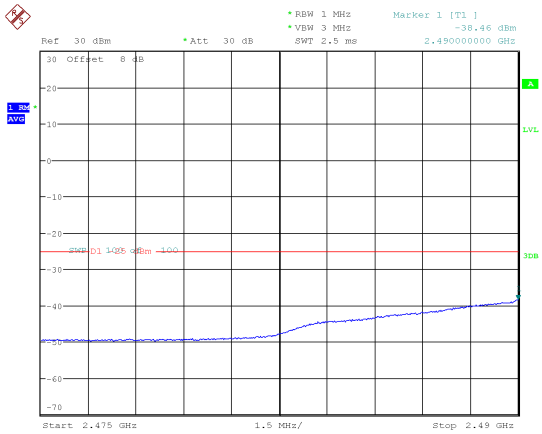
Only worst case result is given below

LTE band 7	
LOW BAND EDGE BLOCK-1RB- high _offset	HIGH BAND EDGE BLOCK-1RB-high_offset
	
LOW BAND EDGE BLOCK-1RB- high _offset	HIGH BAND EDGE BLOCK-1RB-high_offset
	

LOW BAND EDGE BLOCK-1RB- high _offset	HIGH BAND EDGE BLOCK-1RB-high_offset
 Date: 3.DEC.2020 07:58:32	 Date: 3.DEC.2020 08:01:57
LOW BAND EDGE BLOCK-1RB-low_offset	**HIGH BAND EDGE BLOCK-1RB- low _offset**
 Date: 3.DEC.2020 07:59:35	 Date: 3.DEC.2020 08:02:32
LOW BAND EDGE BLOCK-1RB-low_offset	**HIGH BAND EDGE BLOCK-1RB- low _offset**
 Date: 3.DEC.2020 08:00:02	 Date: 3.DEC.2020 08:02:58

LOW BAND EDGE BLOCK-1RB-low_offset	HIGH BAND EDGE BLOCK-1RB-high_offset
	

LOW BAND EDGE BLOCK-20MHz-100%RB



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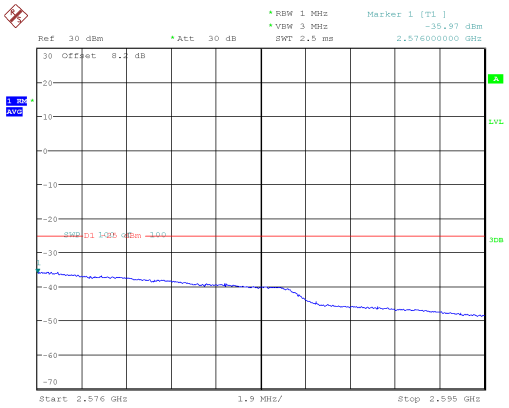
HIGH BAND EDGE BLOCK-20MHz-100%RB



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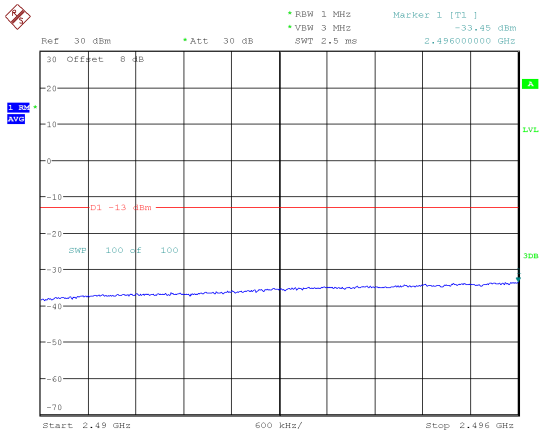
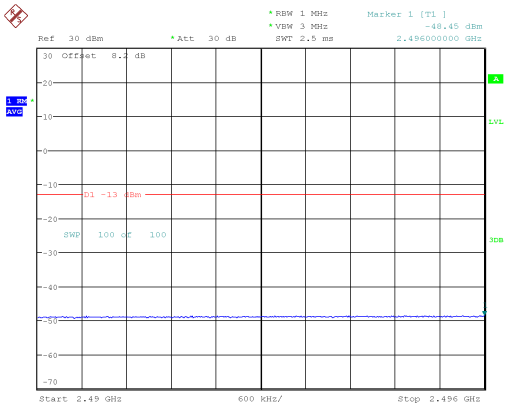
LOW BAND EDGE BLOCK-20MHz-100%RB



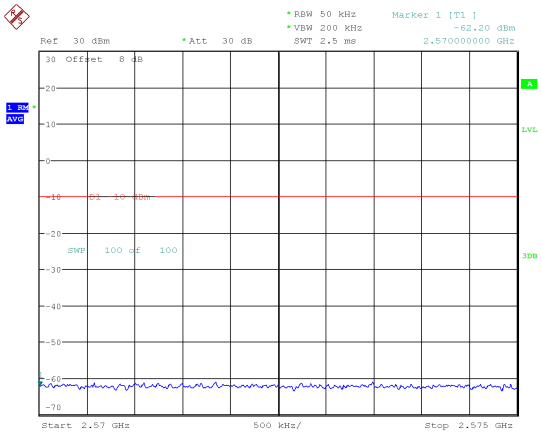
Date: 3.DEC.2020 08:06:01

HIGH BAND EDGE BLOCK-20MHz-100%RB



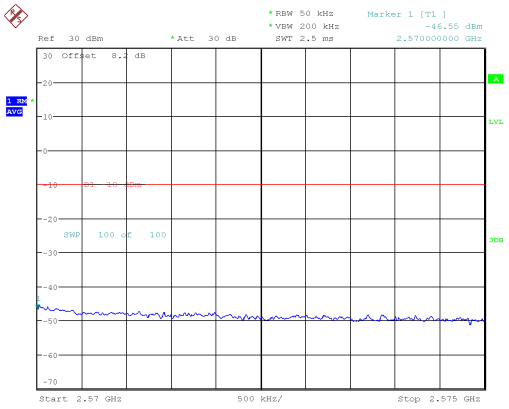
Date: 3.DEC.2020 08:08:51

LOW BAND EDGE BLOCK-20MHz-100%RB

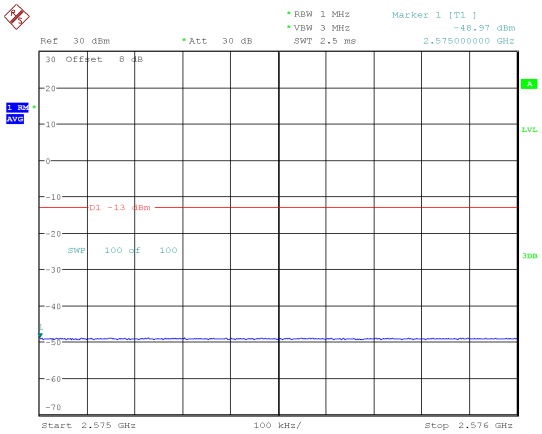
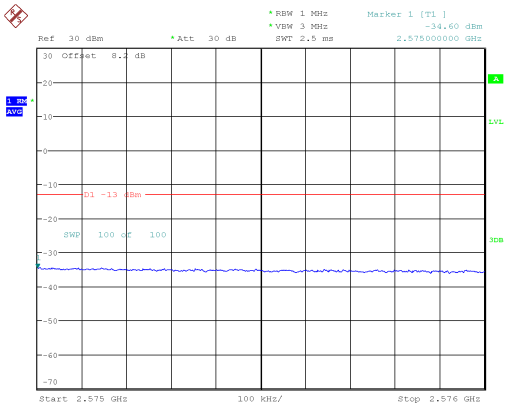


Date: 3.DEC.2020 08:06:27

HIGH BAND EDGE BLOCK-20MHz-100%RB



Date: 3.DEC.2020 08:09:18

LOW BAND EDGE BLOCK-20MHz-100%RB	HIGH BAND EDGE BLOCK-20MHz-100%RB
 Date: 3.DEC.2020 08:06:54	 Date: 3.DEC.2020 08:09:44
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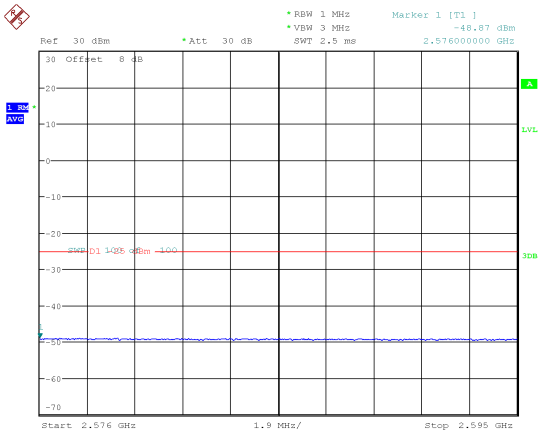
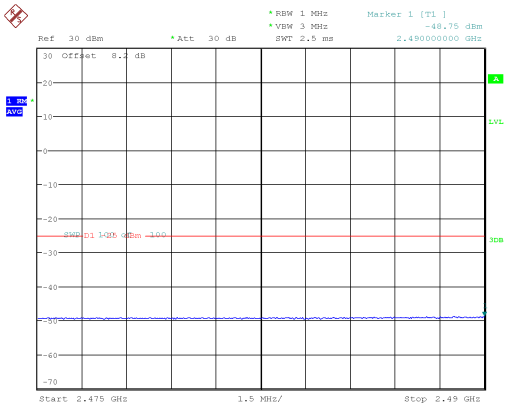
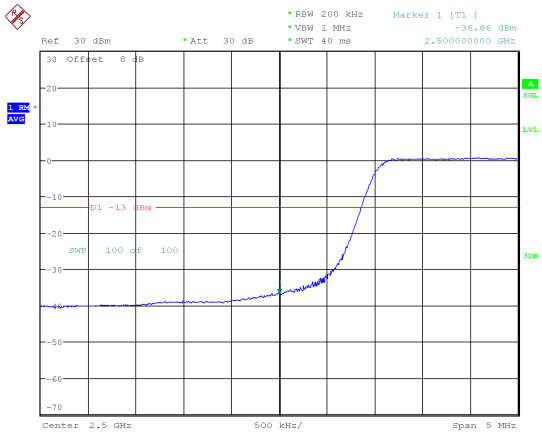
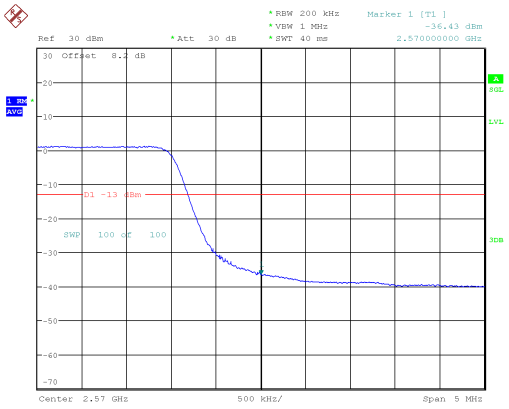
 Date: 3.DEC.2020 08:07:21	 Date: 3.DEC.2020 08:08:25
LOW BAND EDGE BLOCK-20MHz-100%RB	HIGH BAND EDGE BLOCK-20MHz-100%RB
 Date: 3.DEC.2020 08:05:07	 Date: 3.DEC.2020 08:07:58

6.7. CONDUCTED SPURIOUS EMISSION

Reference

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

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 2.1057 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

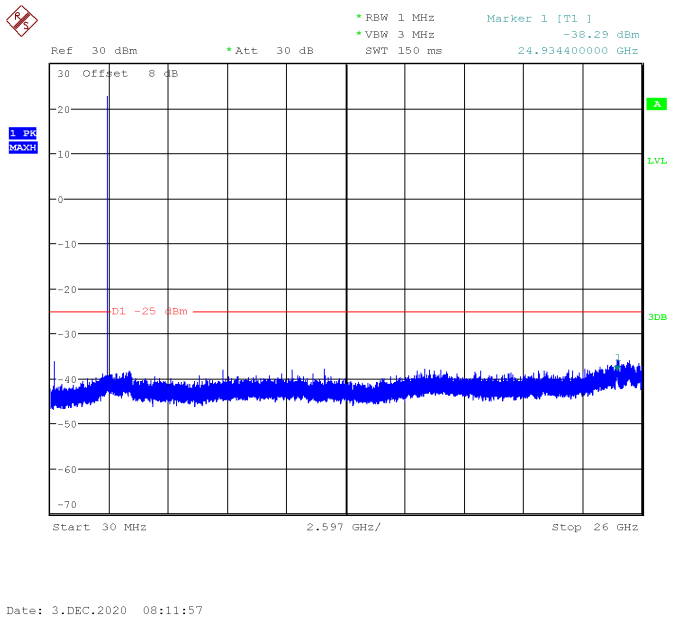
Part 27.53(g),27.53(h), 27.53(m) specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

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: 30MHz – 26GHz


6.8. PEAK-TO-AVERAGE POWER RATIO

Reference

FCC: CFR Part 24.232 (d), 27.50(a)

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.

According to KDB 971168 5.7:

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

LTE band 7, 20MHz

Frequency(MHz)	PAPR(dB)	
	QPSK	16QAM
2535.0	4.94	6.25

7. Test Equipment List

Conducted Test System

Item	Equipment Name	Type	Serial Number	Manufacturer	Cal. Date	Cal. Interval
1	Vector Signal Analyzer	FSQ40	200063	R&S	2020-05-10	1 year
2	DC Power Supply	ZUP60-14	LOC-220Z006-0007	TDL-Lambda	2020-05-10	1 year
3	Universal Radio Communication Tester	CMW500	104178	R&S	2020-05-10	1 year
4	Eagle Test Software	Eagle V3.1 FCC LTE	NA	ECIT	NA	NA

Radiated Emission Test System

Item	Equipment Name	Type	Serial Number	Manufacturer	Cal. Date	Cal. Interval
1	Universal Radio Communication Tester	CMW500	104178	R&S	2020-05-10	1 year
2	Test Receiver	ESU40	100307	R&S	2020-05-10	1 year
3	TRILOG Antenna	VULB9163	VULB9163-515	Schwarzbeck	2020-02-28	2 years
4	Double Ridged Guide Antenna	ETS-3117	135890	ETS	2020-02-28	2 years
5	2-Line V-Network	ENV216	101380	R&S	2020-05-10	1 year
6	RF Signal Generator	SMF100A	102314	R&S	2020-05-10	1 year
7	Amplifier	SCU08	10146	R&S	2020-05-10	1 year
8	EMI Test Software	EMC32 V9.15.00	NA	R&S	NA	NA

Climate chamber

Item	Equipment Name	Type	Serial Number	Manufacturer	Cal. Date	Cal. Interval
1	Climate chamber	UT333 BT	C191995461	UNI-T	2020-05-10	1 year

Anechoic chamber

Fully anechoic chamber by ETS

Annex A: Measurement Uncertainty

Annex B: Measurement uncertainty for all the testing in this report are within the limit specified in 3IN documents. The detailed measurement uncertainty to see the column, k=2

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Peak Output Power-Conducted	2412MHz-2462MHz	95%	0.544dB
Peak Power Spectral Density	2412MHz-2462MHz	95%	0.502dB
Occupied 6dB Bandwidth	2412MHz-2462MHz	95%	69.26kHz
Band Edges-Conducted	2412MHz-2462MHz	95%	0.544dB
Conducted Emission	30MHz-2GHz	95%	0.90dB
Conducted Emission	2GHz-3.6GHz	95%	0.88dB
Conducted Emission	3.6GHz-8GHz	95%	0.96dB
Conducted Emission	8GHz-20GHz	95%	0.94dB
Conducted Emission	20GHz-22GHz	95%	0.88dB
Conducted Emission	22GHz-26GHz	95%	0.86dB
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	5.66dB
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	4.98dB
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	5.06dB
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	5.20dB
AC Power line Conducted Emission	0.15MHz-30MHz	95%	3.66 dB

Annex B: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

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

Shanghai, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of any additional program requirements in the «field» field. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 6th day of May 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3682.01
Valid to April 30, 2021
Revised February 17, 2021

For the tests to which this accreditation applies, please refer to the laboratory's Electrical«field» Scope of Accreditation.

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