TEST REPORT

No. I19Z61861-WMD03

for

TCL Communication Ltd.

USB Connect 4G V2 (APAC)

Model Name: IK41CQ

FCC ID: 2ACCJB116

with

Hardware Version: V3.0

Software Version: IK41_ZZ_02.00_01

Issued Date: 2019-11-29

Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z61861-WMD03	Rev.0	1st edition	2019-11-29

Note: the latest revision of the test report supersedes all previous version.

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0 and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Location 1: CTTL (huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191

Location 2: CTTL (Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China 100191

1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-11-05

Testing End Date: 2019-11-29

1.5. Signature

Dong Yuan

(Prepared this test report)

Zhou Yu

(Reviewed this test report)

Zhao Hui Lin

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address /Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
Contact:	Gong Zhizhou
Email:	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
Contact:	Gong Zhizhou
Email:	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

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

3.1. About EUT

Description	USB Connect 4G V2 (APAC)
Model Name	IK41CQ
FCC ID	2ACCJB116
Antenna	Embedded
Output power	18.47dBm maximum EIRP measured for LTE Band 5
Extreme vol. Limits	4.25VDC to 5.75VDC (nominal: 5.0VDC)
Extreme temp. Tolerance	-10°C to +55°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version	Date of receipt
UT05a	352600110000578	V3.0	IK41_ZZ_02.00_01	2019-10-11
UT09a	352600110000388	V3.0	IK41_ZZ_02.00_01	2019-11-06

*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	Cable for supply power

AE1

Model	/
Manufacturer	/
Capacitance	/

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

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 22	PUBLIC MOBILE SERVICES	10-1-18 Edition
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-18 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI/TIA-102.CAAA-E	DIGITAL C4FMCQPSK TRANSCEIVER MEASUREMENT METHODS	2016
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03r01

5. LABORATORY ENVIRONMENT

Fully-anechoic chamber FAC-3 (9 meters×6.5 meters×4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

6. SUMMARY OF TEST RESULT

6.1. Summary of test results

LTE Band 5

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	22.913	P
2	Emission Limit	22.917	P
3	Frequency Stability	2.1055	P
4	Occupied Bandwidth	2.1049	P
5	Emission Bandwidth	22.917	P
6	Band Edge Compliance	22.917	P
7	Conducted Spurious Emission	22.917	P

LTE Band 40

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	27.50	P
2	Emission Limit	27.53	P
3	Frequency Stability	2.1055	P
4	Occupied Bandwidth	2.1049	P
5	Emission Bandwidth	27.53	P
6	Band Edge Compliance	27.53	P
7	Conducted Spurious Emission	27.53	P
8	Peak-to-Average Power Ratio	27.50	P

Terms used in Verdict column

P	Pass. The EUT complies with the essential requirements in the standard.
NP	Not Performed. The test was not performed by CTTL.
NA	Not Applicable.The test was not applicable.
BR	Re-use test data from basic model report.
F	Fail. The EUT does not comply with the essential requirements in the standard.

7. Test Equipment Utilized

NO.	Description	Type	Series Number	Manufacture	Cal Due Date	Calibration Interval
1	Universal Radio Communication Tester	CMU200	108646	R&S	2020-01-03	1 year
2	Spectrum Analyzer	FSU26	200030	R&S	2020-06-03	1 year
3	Climate chamber	SH-242	93008556	ESPEC	2019-12-21	2 year
4	EMI Antenna	VULB9163	9163-235	Schwarzbeck	2020-11-20	1 year
5	EMI Antenna	3117	00058889	ETS-Lindgren	2020-02-02	1 year
6	EMI Antenna	3117	00119024	ETS-Lindgren	2020-02-25	1 year
7	EMI Antenna	9117	167	Schwarzbeck	2020-05-27	1 year
8	Signal Generator	N5183A	MY49060052	R&S	2020-06-24	1 year
9	Test Receiver	E4440A	MY48250642	Agilent	2020-03-18	1 year
10	Universal Radio Communication Tester	CMW500	143008	R&S	2020-11-26	1 year

ANNEX A: MEASUREMENT RESULTS

A.1 OUTPUT POWER

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.
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 5

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)	
			QPSK	16QAM
1.4MHz	1 RB high	848.3	22.07	21.11
		836.5	22.43	21.09
		824.7	22.06	21.21
	1 RB low	848.3	22.13	21.24
		836.5	22.14	21.12
		824.7	22.06	21.08
	50% RB mid	848.3	22.22	21.45
		836.5	22.40	21.43
		824.7	21.23	20.42
	100% RB	848.3	21.20	20.35
		836.5	21.33	20.51
		824.7	22.13	21.63
3MHz	1 RB high	847.5	22.47	21.17
		836.5	22.34	21.55
		825.5	22.25	21.50
	1 RB low	847.5	22.31	21.82
		836.5	22.13	21.94
		825.5	21.04	20.49
	50% RB mid	847.5	21.14	20.64
		836.5	21.23	20.53
		825.5	21.16	20.28
	100% RB	847.5	21.09	20.50
		836.5	21.20	20.47
		825.5	22.18	21.23
5MHz	1 RB high	846.5	22.13	21.14
		836.5	22.45	21.27
		826.5	22.42	21.03
	1 RB low	846.5	22.03	21.19
		836.5	22.38	21.16
		826.5	21.21	20.29
	50% RB mid	846.5	21.23	20.19
		836.5	21.32	20.13
		826.5	21.29	20.49
	100% RB	846.5	21.22	20.13
		836.5	21.32	20.34
		826.5	22.37	21.38
10MHz	1 RB high	844.0	22.33	21.36
		836.5	22.31	21.01

		829.0	22.50	21.16
	1 RB low	844.0	22.25	20.97
		836.5	22.17	21.17
		829.0	21.39	20.33
	50% RB mid	844.0	21.25	20.28
		836.5	21.41	20.42
		829.0	21.40	20.30
	100% RB	844.0	21.43	20.36
		836.5	21.33	20.15
		829.0	22.07	21.11

LTE band 40(2305MHz~2315MHz)

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)	
			QPSK	16QAM
5MHz	1 RB high	2312.5	22.90	22.11
		2310	22.95	22.13
		2307.5	22.73	21.42
	1 RB low	2312.5	22.73	22.09
		2310	22.68	21.86
		2307.5	22.50	21.36
	50% RB mid	2312.5	21.89	21.04
		2310	21.88	21.05
		2307.5	21.76	20.90
	100% RB	2312.5	21.92	20.86
		2310	21.88	20.83
		2307.5	21.82	20.75
10MHz	1 RB high	2310	22.87	22.37
	1 RB low	2310	22.62	22.15
	50% RB mid	2310	21.94	21.01
	100% RB	2310	21.97	21.02

LTE band 40(2350MHz~2360MHz)

Bandwidth	RB size/offset	Frequency (MHz)	Power (dBm)	
			QPSK	16QAM
5MHz	1 RB high	2357	22.95	21.56
		2355	22.87	21.49
		2353	22.78	21.47
	1 RB low	2357	22.74	21.47
		2355	22.76	21.48
		2353	22.69	21.53
	50% RB mid	2357	21.97	21.15
		2355	22.04	21.13
		2353	21.86	20.93
	100% RB	2357	22.03	21.04
		2355	21.96	20.96
		2353	21.98	20.93
10MHz	1 RB high	2355	23.44	21.90
	1 RB low	2355	23.17	21.81
	50% RB mid	2355	21.96	21.03
	100% RB	2355	21.99	21.06

A.1.3 Radiated

A.1.3.1 Description

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

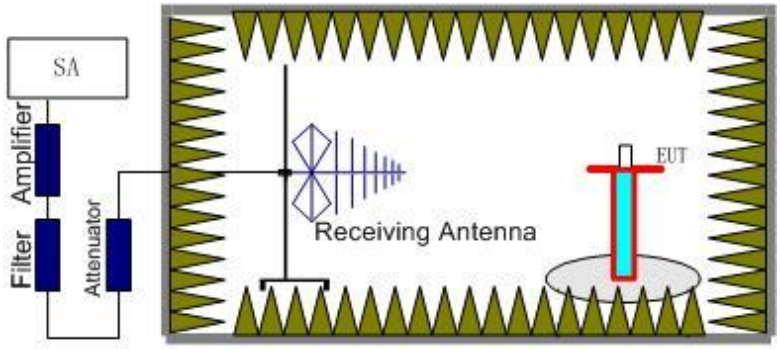
Rule Part 22.913(a) specifies "Mobile stations are limited to 2.0 watts EIRP.".

Rule Part 27.50(a)(3) specifies "For mobile and portable stations transmitting in the 2305–2315 MHz band or the 2350–2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, except that for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth."

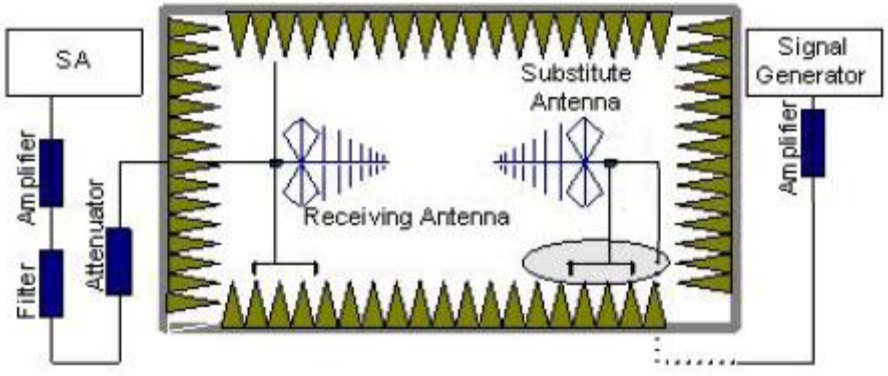
A.1.3.2 Method of Measurement

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 RMS 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 - 2.15 .

A.1.3.3 Measurement result

LTE Band 5- ERP

Limits: ≤38.45dBm (7W)

LTE Band 5_1.4MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.70	-24.50	2.26	45.79	0.95	2.15	17.83	38.45	20.62	H
836.50	-23.60	2.26	45.66	0.82	2.15	18.47	38.45	19.98	H
848.30	-26.21	2.27	45.55	0.80	2.15	15.72	38.45	22.73	V

LTE Band 5_3MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
825.50	-24.49	2.26	45.79	0.94	2.15	17.83	38.45	20.62	H
836.50	-24.63	2.26	45.66	0.82	2.15	17.44	38.45	21.01	H
847.50	-26.25	2.27	45.56	0.81	2.15	15.70	38.45	22.75	H

LTE Band 5_5MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
826.50	-24.61	2.25	45.77	0.93	2.15	17.69	38.45	20.76	H
836.50	-24.48	2.26	45.66	0.82	2.15	17.59	38.45	20.86	H
846.50	-26.22	2.26	45.56	0.82	2.15	15.75	38.45	22.70	H

LTE Band 5_10MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
829.00	-25.10	2.13	45.74	0.90	2.15	17.26	38.45	21.19	H
836.50	-24.53	2.26	45.66	0.82	2.15	17.54	38.45	20.91	H
844.00	-26.26	2.26	45.59	0.82	2.15	15.74	38.45	22.71	H

LTE Band 5_1.4MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.70	-25.26	2.26	45.79	0.95	2.15	17.07	38.45	21.38	H
836.50	-24.71	2.26	45.66	0.82	2.15	17.36	38.45	21.09	H
848.30	-27.03	2.27	45.55	0.80	2.15	14.90	38.45	23.55	V

LTE Band 5_3MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
825.50	-25.26	2.26	45.79	0.94	2.15	17.06	38.45	21.39	H
836.50	-25.40	2.26	45.66	0.82	2.15	16.67	38.45	21.78	H
847.50	-26.97	2.27	45.56	0.81	2.15	14.98	38.45	23.47	V

LTE Band 5_5MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
826.50	-25.64	2.25	45.77	0.93	2.15	16.66	38.45	21.79	H
836.50	-25.31	2.26	45.66	0.82	2.15	16.76	38.45	21.69	H
846.50	-27.23	2.26	45.56	0.82	2.15	14.74	38.45	23.71	H

LTE Band 5_10MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
829.00	-26.03	2.13	45.74	0.90	2.15	16.33	38.45	22.12	H
836.50	-25.42	2.26	45.66	0.82	2.15	16.65	38.45	21.80	H
844.00	-26.98	2.26	45.59	0.82	2.15	15.02	38.45	23.43	V

LTE Band 40- EIRP

Limits: ≤17 dBm (0.05W)

LTE Band 40(2305MHz~2315MHz)_5MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2307.50	-31.95	3.47	44.55	5.52	14.65	17.00	2.35	H
2310.00	-32.04	3.47	44.55	5.53	14.57	17.00	2.43	H
2312.50	-31.93	3.47	44.56	5.54	14.69	17.00	2.31	H

LTE Band 40(2305MHz~2315MHz)_10MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2310.00	-31.62	3.47	44.55	5.53	14.99	17.00	2.01	H

LTE Band 40(2305MHz~2315MHz)_5MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2307.50	-33.49	3.47	44.55	5.52	13.11	17.00	3.89	H
2310.00	-33.45	3.47	44.55	5.53	13.16	17.00	3.84	H
2312.50	-33.33	3.47	44.56	5.54	13.29	17.00	3.71	H

LTE Band 40(2305MHz~2315MHz)_10MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2310.00	-33.23	3.47	44.55	5.53	13.38	17.00	3.62	H

LTE Band 40(2350MHz~2360MHz)_5MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2353.00	-32.43	3.53	44.63	5.66	14.33	17.00	2.67	H
2355.00	-32.40	3.53	44.64	5.67	14.37	17.00	2.63	H
2357.00	-32.76	3.52	44.64	5.67	14.03	17.00	2.97	H

LTE Band 40(2350MHz~2360MHz)_10MHz_QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2355.00	-32.19	3.53	44.64	5.67	14.58	17.00	2.42	H

LTE Band 40(2350MHz~2360MHz)_5MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2353.00	-33.86	3.53	44.63	5.66	12.90	17.00	4.10	H
2355.00	-33.10	3.53	44.64	5.67	13.67	17.00	3.33	H
2357.00	-34.15	3.52	44.64	5.67	12.64	17.00	4.36	H

LTE Band 40(2350MHz~2360MHz)_10MHz_16QAM

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	P_{Ag} (dB)	G_a (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
2355.00	-32.90	3.53	44.64	5.67	13.87	17.00	3.13	H

Frequency: 2355.00MHz

Peak EIRP(dBm) = P_{Mea}(-32.90 dBm) - G_a (-5.67dBi) - P_{Ag} (-44.64dB) - P_{cl} (3.53dB) = 13.87dBm

Note: Expanded measurement uncertainty is U = 2.84 dB, k = 2.

A.2 EMISSION LIMIT

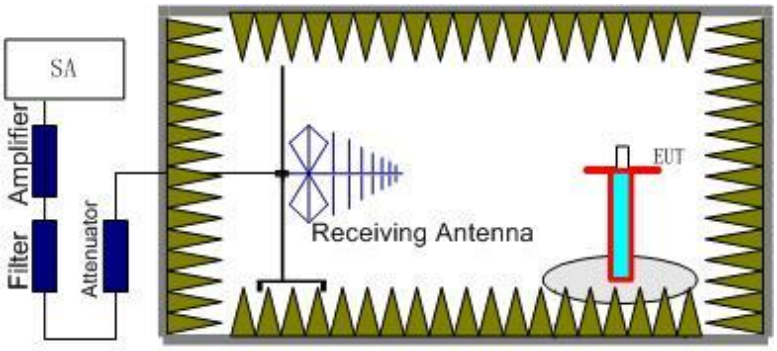
A.2.1 Measurement Method

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

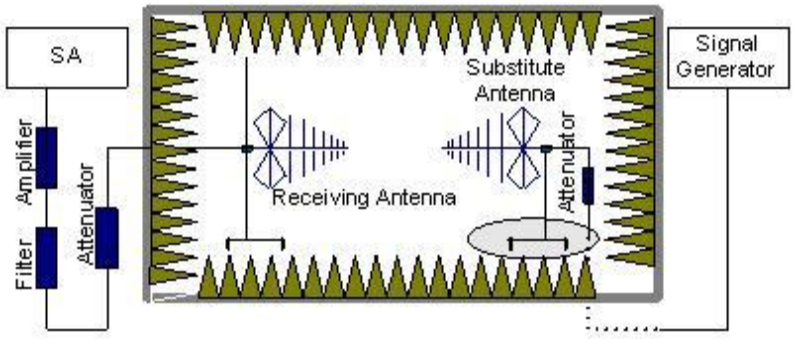
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier. The resolution bandwidth is set 1MHz. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE Bands 5,40.

The procedure of radiated spurious emissions is as follows:

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 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 -2.15dB.

A.2.2 Measurement Limit

Part 22.917, 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(a) states for mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands: By a factor of not less than: 43 +10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE Bands 5,40. 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 5,40 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.

LTE Band 5, 1.4MHz, QPSK, Channel 20407

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1650.01	-55.88	3.57	5.23	2.15	-56.37	-13.00	43.37	H
2475.00	-40.62	4.60	6.03	2.15	-41.34	-13.00	28.34	H
3302.02	-55.05	5.29	7.72	2.15	-54.77	-13.00	41.77	H
4125.02	-46.95	6.04	9.03	2.15	-46.11	-13.00	33.11	H
4961.01	-53.58	6.67	9.86	2.15	-52.54	-13.00	39.54	V
5785.01	-54.10	7.21	10.54	2.15	-52.92	-13.00	39.92	H

LTE Band 5, 1.4MHz, QPSK, Channel 20525

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.01	-58.56	3.58	5.19	2.15	-59.10	-13.00	46.10	H
2510.00	-40.53	4.63	6.12	2.15	-41.19	-13.00	28.19	H
3331.02	-53.71	5.30	7.79	2.15	-53.37	-13.00	40.37	H
4184.02	-49.54	6.17	9.08	2.15	-48.78	-13.00	35.78	H
5010.01	-54.85	6.59	9.91	2.15	-53.68	-13.00	40.68	V
5864.01	-52.05	7.28	10.53	2.15	-50.95	-13.00	37.95	H

LTE Band 5, 1.4MHz, QPSK, Channel 20643

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1697.01	-57.79	3.60	5.15	2.15	-58.39	-13.00	45.39	H
2545.00	-46.65	4.66	6.18	2.15	-47.28	-13.00	34.28	H
3393.02	-54.49	5.36	7.94	2.15	-54.06	-13.00	41.06	V
4246.02	-55.44	6.24	9.15	2.15	-54.68	-13.00	41.68	H
5091.01	-55.02	6.75	10.03	2.15	-53.89	-13.00	40.89	H
5948.01	-52.78	7.47	10.51	2.15	-51.89	-13.00	38.89	H

LTE Band 40(2305MHz~2315MHz), 5 MHz, QPSK, Channel 38725

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4616.02	-64.64	6.45	9.52	-61.57	-40.00	21.57	V
6925.01	-56.33	7.72	11.51	-52.54	-40.00	12.54	H
9239.01	-63.27	9.02	13.24	-59.05	-40.00	19.05	V
11545.01	-60.54	9.81	13.09	-57.26	-40.00	17.26	H
13849.01	-58.70	10.70	14.41	-54.99	-40.00	14.99	V
16154.00	-55.54	11.79	13.67	-53.66	-40.00	13.66	H

LTE Band 40(2305MHz~2315MHz), 5 MHz, QPSK, Channel 38750

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4621.02	-64.86	6.45	9.52	-61.79	-40.00	21.79	V
6932.01	-56.16	7.77	11.52	-52.41	-40.00	12.41	H
9241.01	-63.34	9.02	13.24	-59.12	-40.00	19.12	H
11551.01	-57.81	9.81	13.09	-54.53	-40.00	14.53	H
13865.01	-58.68	10.73	14.42	-54.99	-40.00	14.99	H
16167.00	-55.71	11.77	13.67	-53.81	-40.00	13.81	V

LTE Band 40(2305MHz~2315MHz), 5 MHz, QPSK, Channel 38775

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4626.02	-64.51	6.44	9.53	-61.42	-40.00	21.42	V
6938.01	-58.59	7.82	11.53	-54.88	-40.00	14.88	H
9251.01	-63.74	9.04	13.25	-59.53	-40.00	19.53	H
11547.01	-60.96	9.81	13.09	-57.68	-40.00	17.68	H
13867.01	-58.68	10.74	14.42	-55.00	-40.00	15.00	H
16167.00	-55.67	11.77	13.67	-53.77	-40.00	13.77	V

LTE Band 40(2350MHz~2360MHz), 5 MHz, QPSK, Channel 39180

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4709.02	-66.20	6.51	9.61	-63.10	-40.00	23.10	H
7061.01	-60.06	8.21	11.67	-56.60	-40.00	16.60	H
9417.01	-63.93	9.12	13.35	-59.70	-40.00	19.70	V
11766.01	-57.66	9.94	13.05	-54.55	-40.00	14.55	H
14146.01	-57.29	10.98	14.47	-53.80	-40.00	13.80	H
16473.00	-54.13	11.93	13.61	-52.45	-40.00	12.45	H

LTE Band 40(2350MHz~2360MHz), 5 MHz, QPSK, Channel 39200

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4712.02	-65.66	6.51	9.61	-62.56	-40.00	22.56	V
7067.01	-59.06	8.20	11.68	-55.58	-40.00	15.58	H
9425.01	-62.83	9.16	13.36	-58.63	-40.00	18.63	H
11785.01	-58.70	10.04	13.04	-55.70	-40.00	15.70	H
14148.01	-57.36	10.98	14.47	-53.87	-40.00	13.87	H
16495.00	-54.26	11.98	13.60	-52.64	-40.00	12.64	H

LTE Band 40(2350MHz~2360MHz), 5 MHz, QPSK, Channel 39220

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
4716.02	-65.04	6.52	9.62	-61.94	-40.00	21.94	V
7074.01	-50.97	8.19	11.69	-47.47	-40.00	7.47	H
9438.01	-63.41	9.23	13.36	-59.28	-40.00	19.28	V
11786.01	-57.45	10.04	13.04	-54.45	-40.00	14.45	H
14156.01	-57.19	10.96	14.47	-53.68	-40.00	13.68	H
16501.00	-54.56	11.99	13.60	-52.95	-40.00	12.95	H

Note: The maximum value of expanded measurement uncertainty for this test item is $U = 5.16$ dB, $k = 2$.

A.3 FREQUENCY STABILITY

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 -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE Bands 5,40, 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 -30℃ 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 center 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 -30℃ to +50℃. 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.

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 4.25VDC and 5.75VDC, with a nominal voltage of 5.0VDC. 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.

A.3.2 Measurement results

LTE Band 5, 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
		QPSK	16QAM	QPSK	16QAM
4.25	20	-3.76	-24.78	0.0045	0.0296
5.0		-2.95	-24.53	0.0035	0.0293
5.75		-5.18	-24.89	0.0062	0.0298

Frequency Error vs Temperature

Temperature (℃)	Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
		QPSK	16QAM	QPSK	16QAM
50	5.0	-4.25	-24.40	0.0051	0.0292
40		-3.08	-25.26	0.0037	0.0302
30		-3.59	-25.68	0.0043	0.0307
20		-4.16	-25.94	0.0050	0.0310
10		-3.09	-24.95	0.0037	0.0298
0		-3.95	-25.76	0.0047	0.0308
-10		-4.43	-27.25	0.0053	0.0326
-20		-3.20	-24.89	0.0038	0.0298
-30		-3.79	-24.43	0.0045	0.0292

LTE Band 40(2305MHz~2315MHz), 5MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
		QPSK	16QAM	QPSK	16QAM
4.25	20	15.92	-18.10	0.0069	0.0078
5.0		17.21	14.79	0.0075	0.0064
5.75		12.27	11.96	0.0053	0.0052

Frequency Error vs Temperature

Temperature (℃)	Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
		QPSK	16QAM	QPSK	16QAM
50	5.0	12.06	-12.36	0.0052	0.0054
40		19.93	14.05	0.0086	0.0061
30		13.86	13.93	0.0060	0.0060
20		18.67	11.99	0.0081	0.0052
10		18.32	15.58	0.0079	0.0067
0		13.53	13.49	0.0059	0.0058
-10		15.23	12.60	0.0066	0.0055
-20		12.93	11.79	0.0056	0.0051
-30		14.10	10.69	0.0061	0.0046

LTE Band 40(2350MHz~2360MHz), 5MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)	
		QPSK	16QAM	QPSK	16QAM
4.25	20	16.64	20.11	0.0071	0.0085
5.0		13.49	21.79	0.0057	0.0093
5.75		18.31	21.64	0.0078	0.0092

Frequency Error vs Temperature

Temperature (℃)	Voltage (V)	Frequency error (Hz)		Frequency error (ppm)	
		QPSK	16QAM	QPSK	16QAM
50	5.0	19.00	19.64	0.0081	0.0083
40		15.52	18.61	0.0066	0.0079
30		16.01	22.02	0.0068	0.0094
20		15.74	21.67	0.0067	0.0092
10		15.65	15.05	0.0066	0.0064
0		18.21	18.53	0.0077	0.0079
-10		11.50	19.01	0.0049	0.0081
-20		15.66	19.05	0.0066	0.0081
-30		14.02	18.25	0.0060	0.0077

A.4 OCCUPIED BANDWIDTH

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 ANSI C63.26:

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.

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

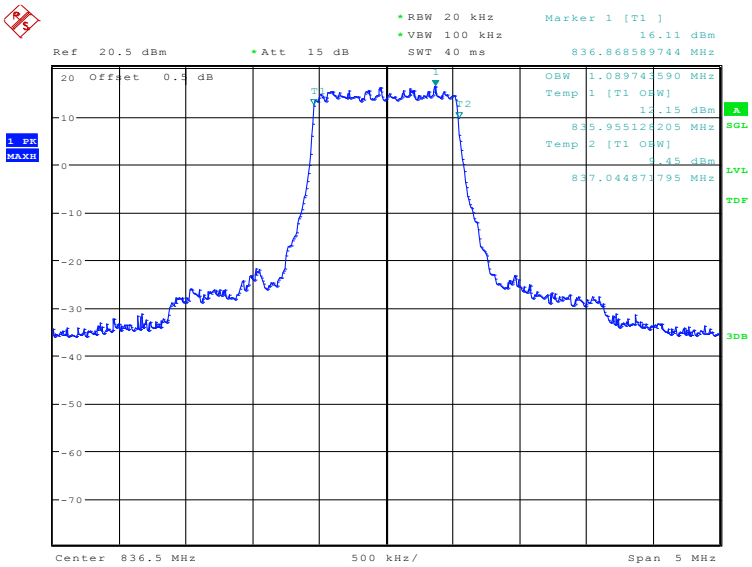
c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.

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

LTE band 5, 1.4MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
836.5	QPSK	16QAM
	1089.74	1097.76

LTE band 5, 1.4MHz Bandwidth, QPSK (99%BW)



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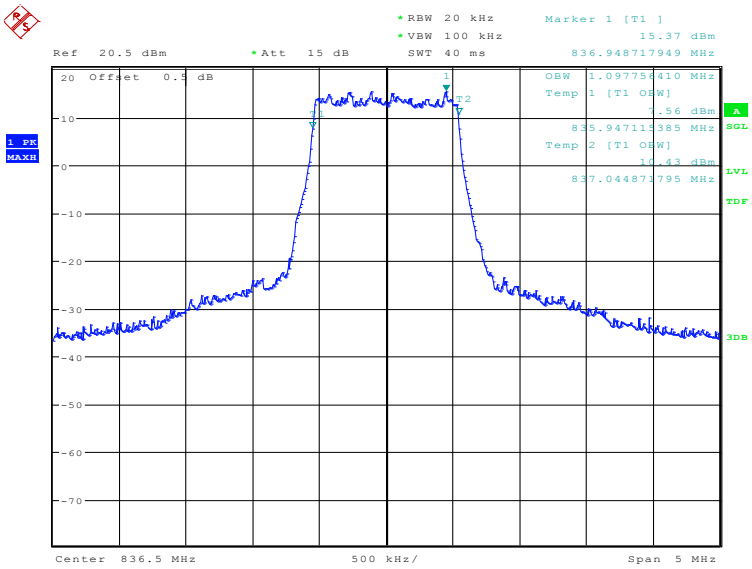
LTE band 5, 1.4MHz Bandwidth, 16QAM (99%BW)



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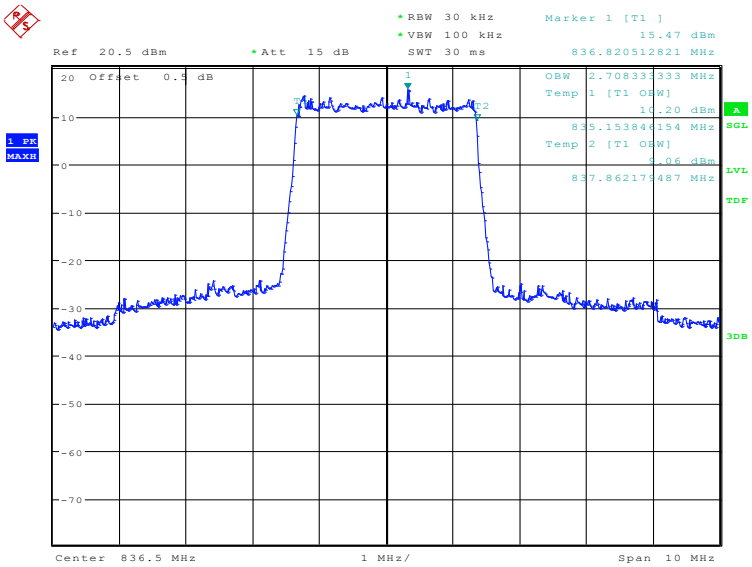
LTE band 5, 3MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
836.5	QPSK	16QAM
	2708.33	2692.31

LTE band 5, 3MHz Bandwidth, QPSK (99%BW)



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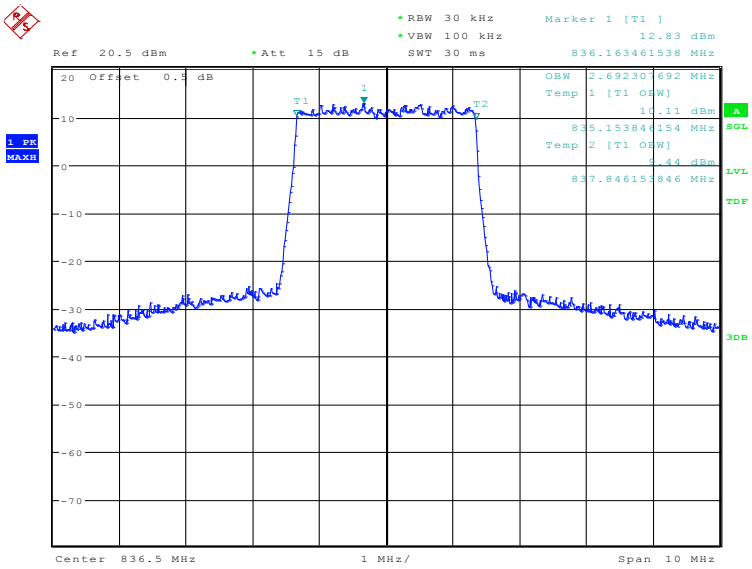
LTE band 5, 3MHz Bandwidth, 16QAM (99%BW)



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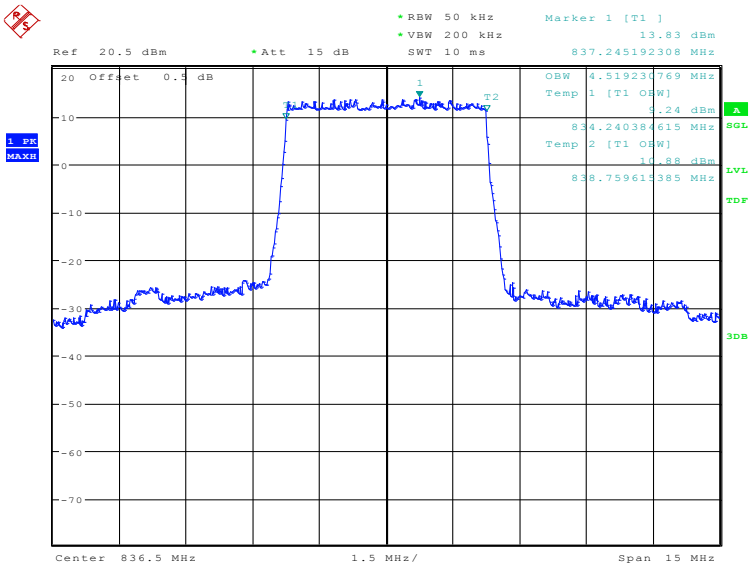
LTE band 5, 5MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
836.5	QPSK	16QAM
	4519.23	4519.23

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



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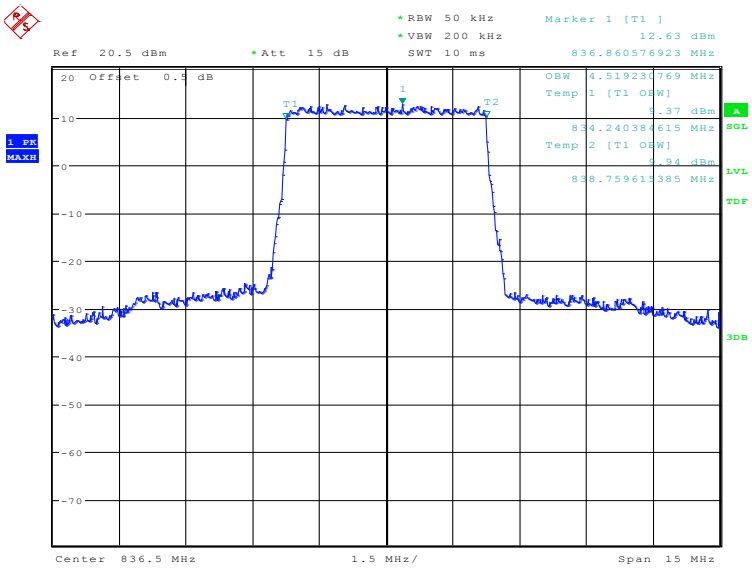
LTE band 5, 5MHz Bandwidth, 16QAM (99%BW)



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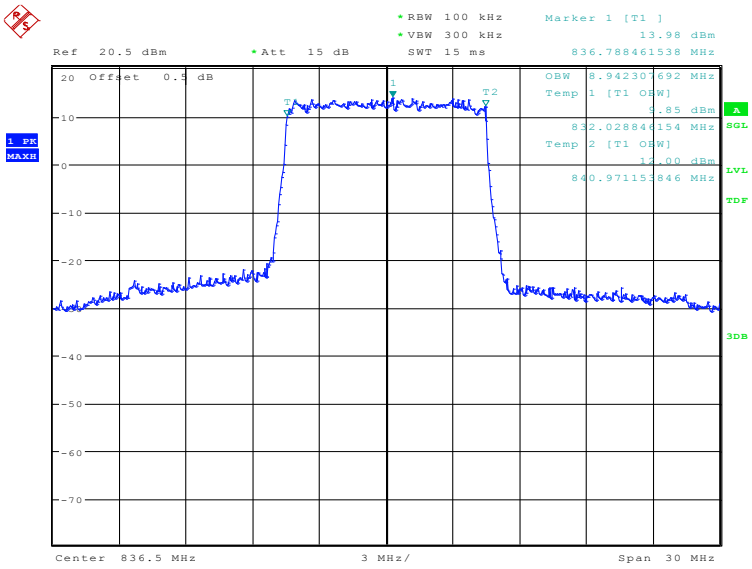
LTE band 5, 10MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
836.5	QPSK	16QAM
	8942.31	8990.38

LTE band 5, 10MHz Bandwidth, QPSK (99%BW)



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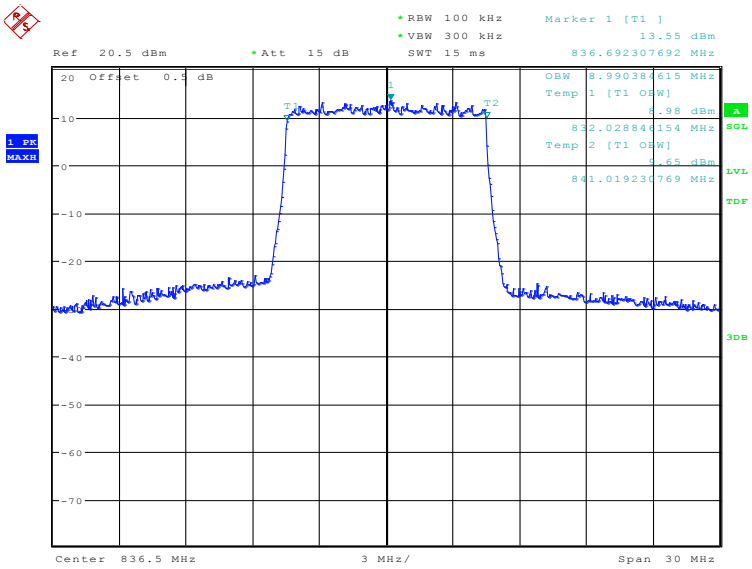
LTE band 5, 10MHz Bandwidth, 16QAM (99%BW)



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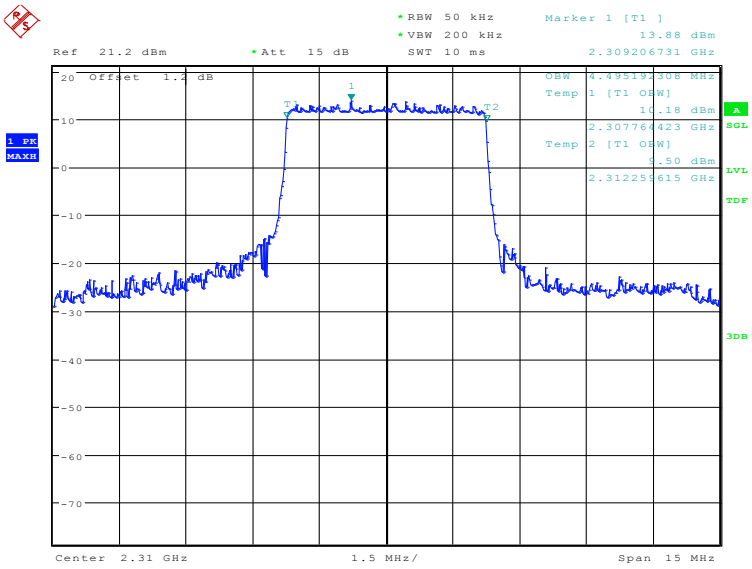
LTE band 40(2305MHz~2315MHz), 5MHz (99%)

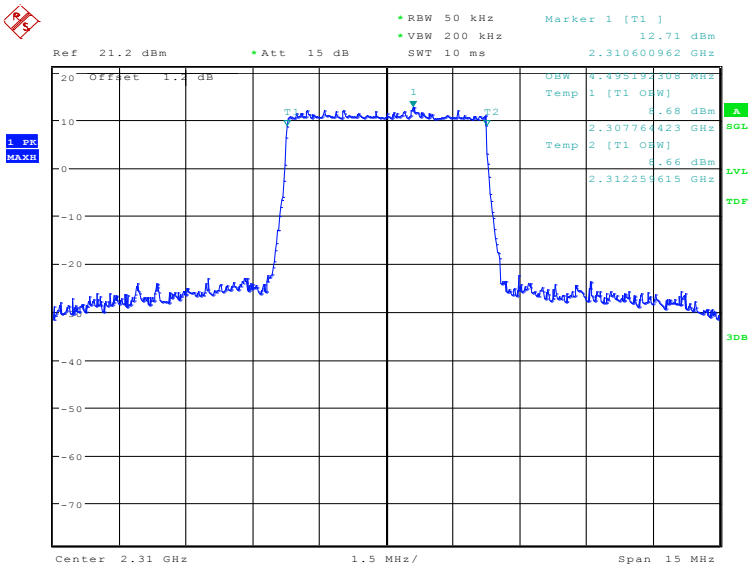
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
2310.0	QPSK	16QAM
	4495.19	4495.19

LTE band 40(2305MHz~2315MHz), 5MHz Bandwidth, QPSK (99%BW)



Date: 5.NOV.2019 14:15:04

LTE band 40(2305MHz~2315MHz), 5MHz Bandwidth,16QAM (99%BW)

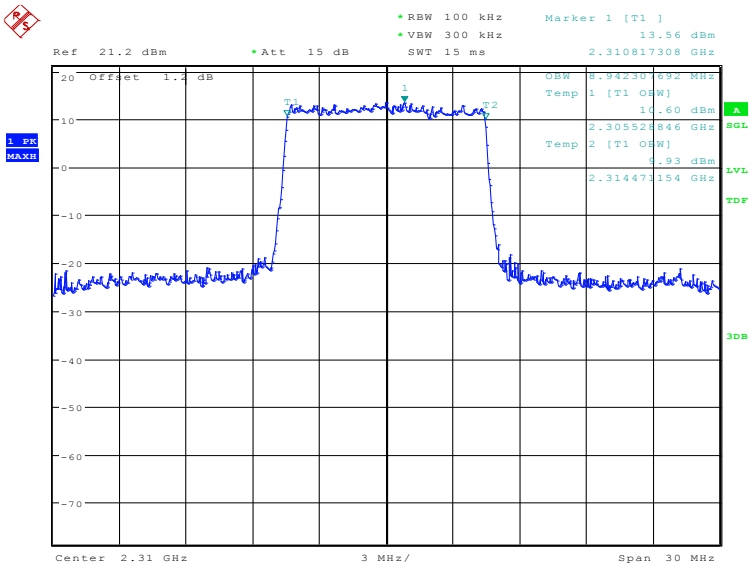


Date: 5.NOV.2019 14:16:28

LTE band 40(2305MHz~2315MHz), 10MHz (99%)

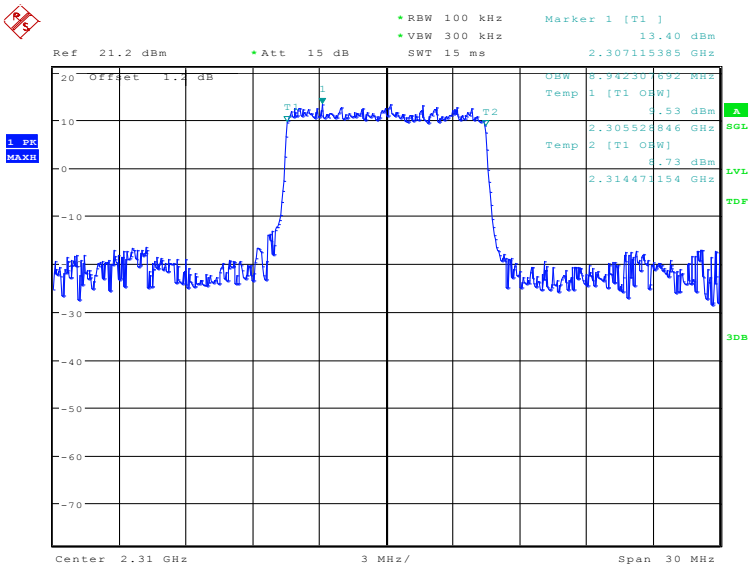
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
2310.0	QPSK	16QAM
	8942.31	8942.31

LTE band 40(2305MHz~2315MHz), 10MHz Bandwidth, QPSK (99%BW)



Date: 5.NOV.2019 14:17:54

LTE band 40(2305MHz~2315MHz), 10MHz Bandwidth,16QAM (99%BW)

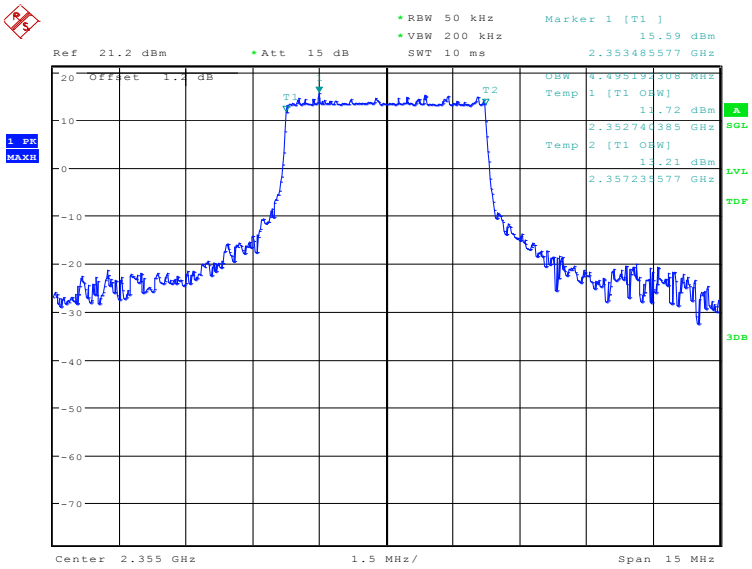


Date: 5.NOV.2019 14:19:18

LTE band 40(2350MHz~2360MHz), 5MHz (99%)

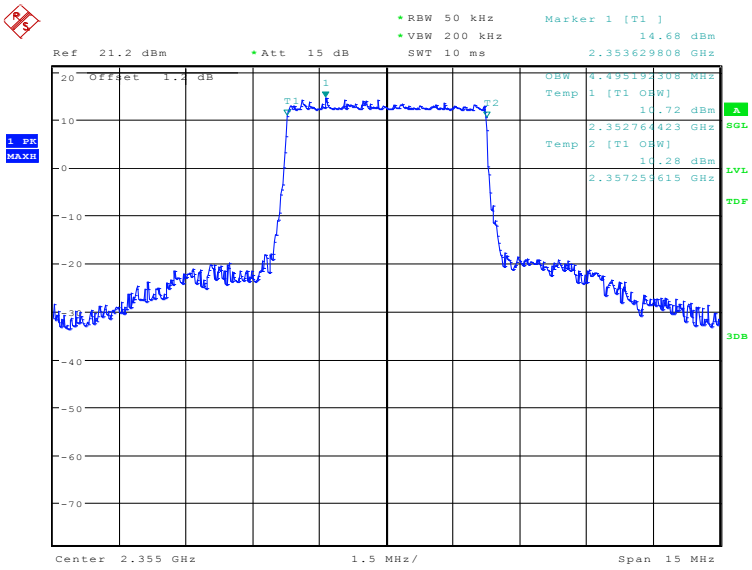
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
2355.0	QPSK	16QAM
	4495.19	4495.19

LTE band 40(2350MHz~2360MHz), 5MHz Bandwidth, QPSK (99%BW)



Date: 5.NOV.2019 14:20:44

LTE band 40(2350MHz~2360MHz), 5MHz Bandwidth,16QAM (99%BW)

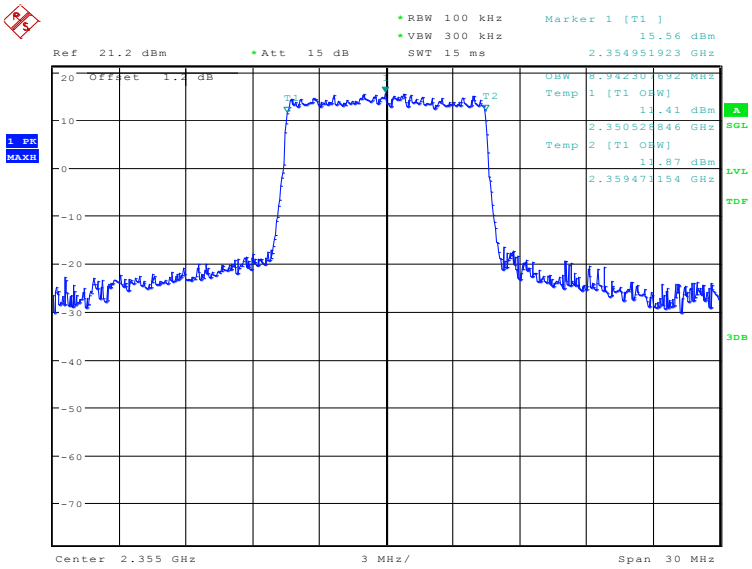


Date: 5.NOV.2019 14:22:09

LTE band 40(2350MHz~2360MHz), 10MHz (99%)

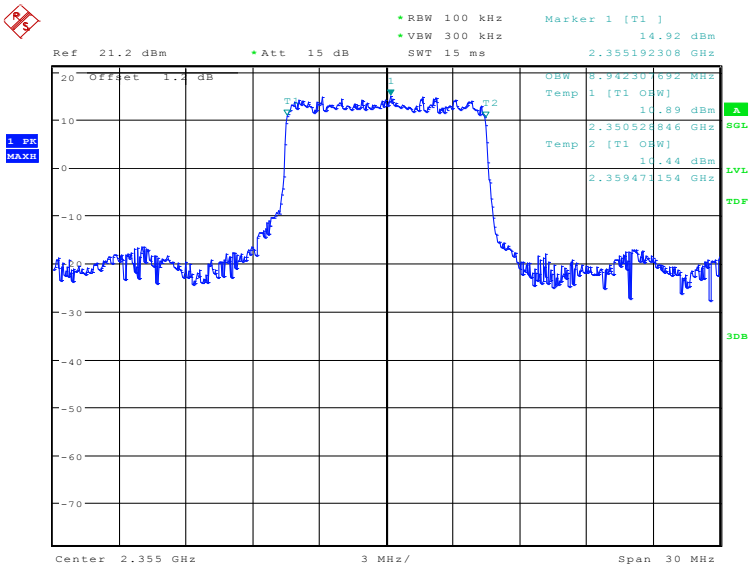
Frequency(MHz)	Occupied Bandwidth (99%) (kHz)	
2355.0	QPSK	16QAM
	8942.31	8942.31

LTE band 40(2350MHz~2360MHz), 10MHz Bandwidth, QPSK (99%BW)



Date: 5.NOV.2019 14:23:35

LTE band 40(2350MHz~2360MHz), 10MHz Bandwidth,16QAM (99%BW)



Date: 5.NOV.2019 14:24:59

A.5 EMISSION BANDWIDTH

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.

The measurement method is from ANSI C63.26:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.

b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.

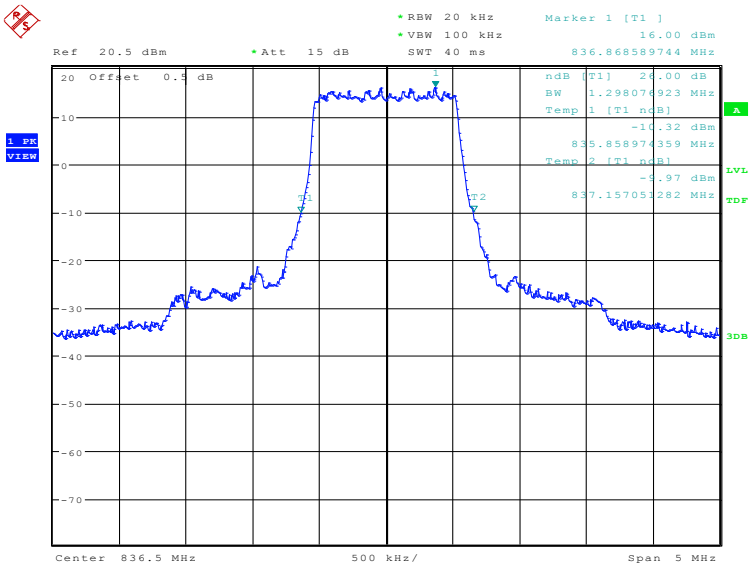
d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.

e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

LTE band 5, 1.4MHz (-26dBc)

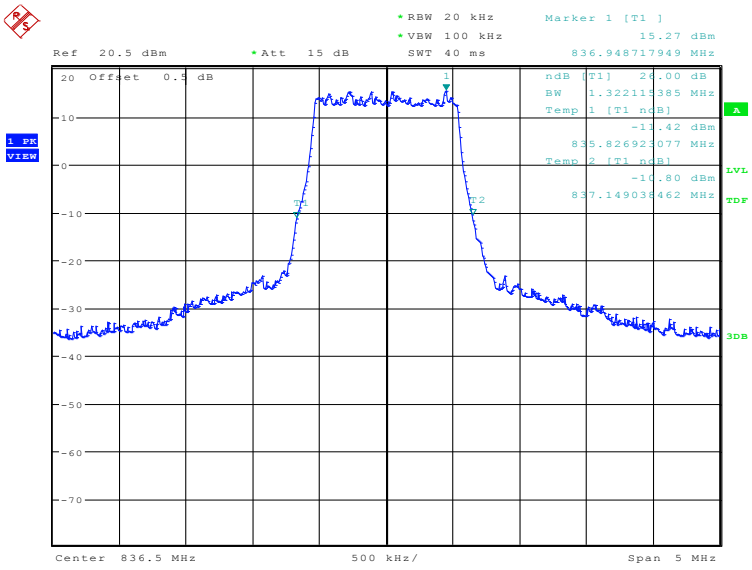
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
836.5	QPSK	16QAM
	1298.08	1322.12

LTE band 5, 1.4MHz Bandwidth, QPSK (-26dBc BW)



Date: 5.NOV.2019 14:26:58

LTE band 5, 1.4MHz Bandwidth, 16QAM (-26dBc BW)

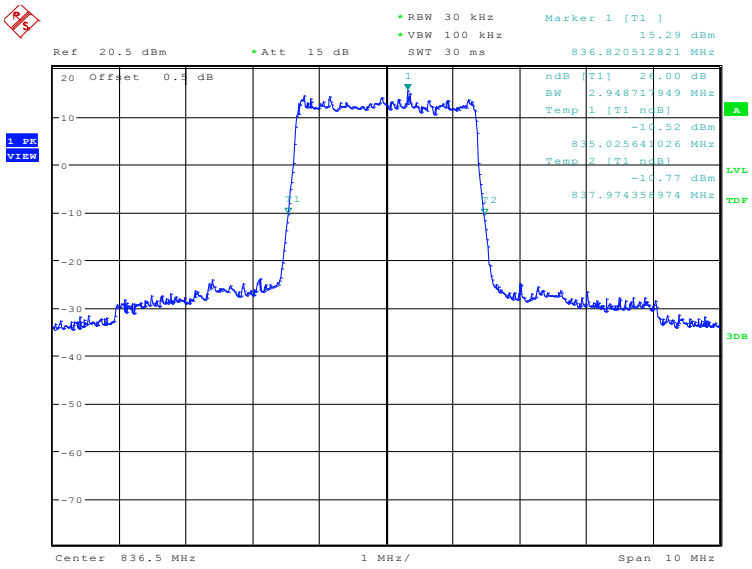


Date: 5.NOV.2019 14:28:23

LTE band 5, 3MHz (-26dBc)

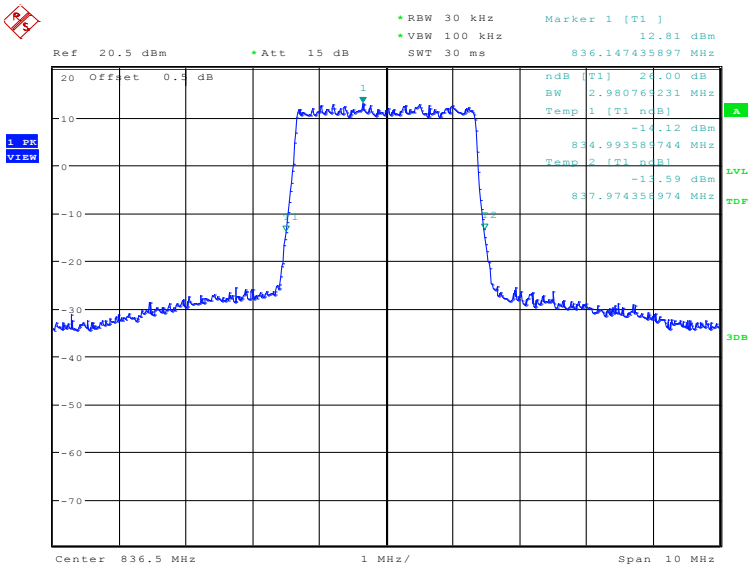
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
836.5	QPSK	16QAM
	2948.72	2980.77

LTE band 5, 3MHz Bandwidth, QPSK (-26dBc BW)



Date: 5.NOV.2019 14:29:49

LTE band 5, 3MHz Bandwidth, 16QAM (-26dBc BW)

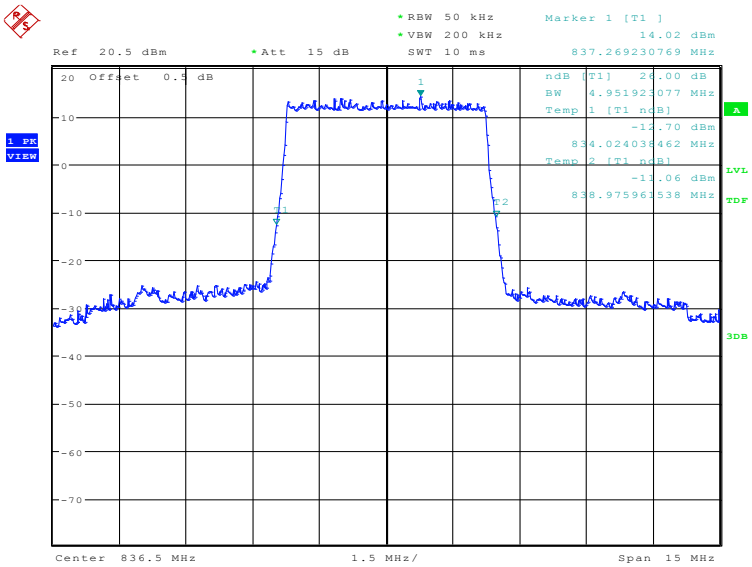


Date: 5.NOV.2019 14:31:13

LTE band 5, 5MHz (-26dBc)

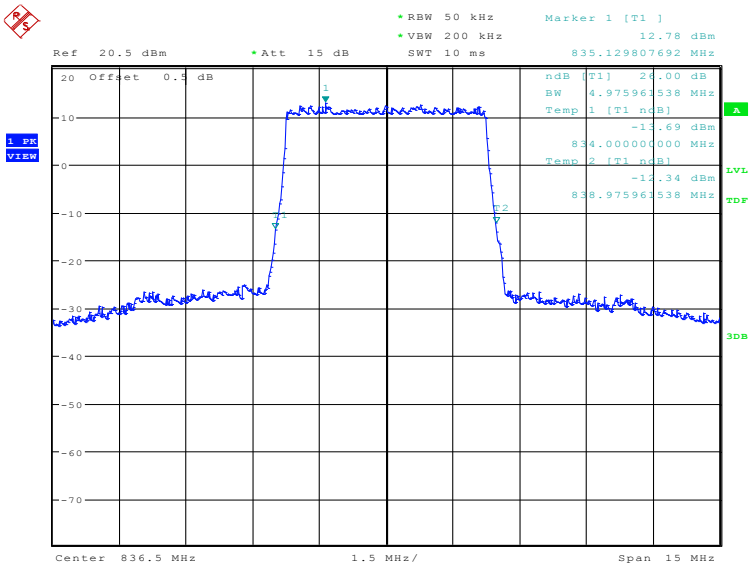
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
836.5	QPSK	16QAM
	4951.92	4975.96

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



Date: 5.NOV.2019 14:32:39

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

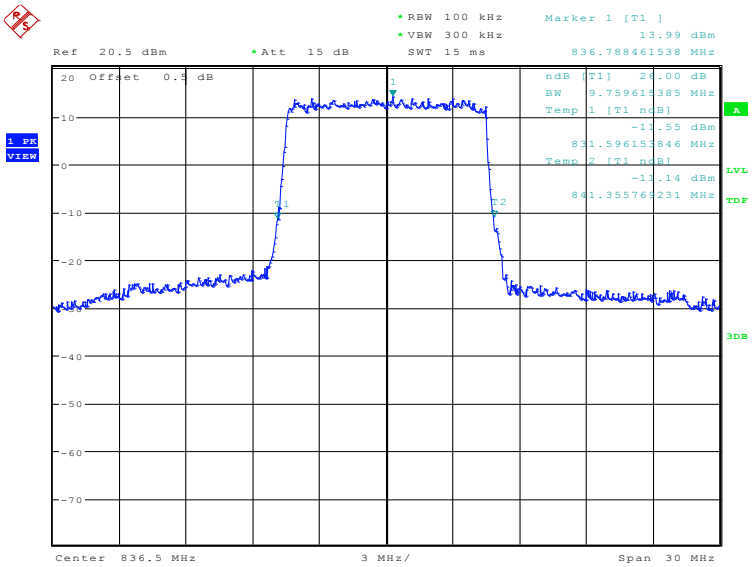


Date: 5.NOV.2019 14:34:04

LTE band 5, 10MHz (-26dBc)

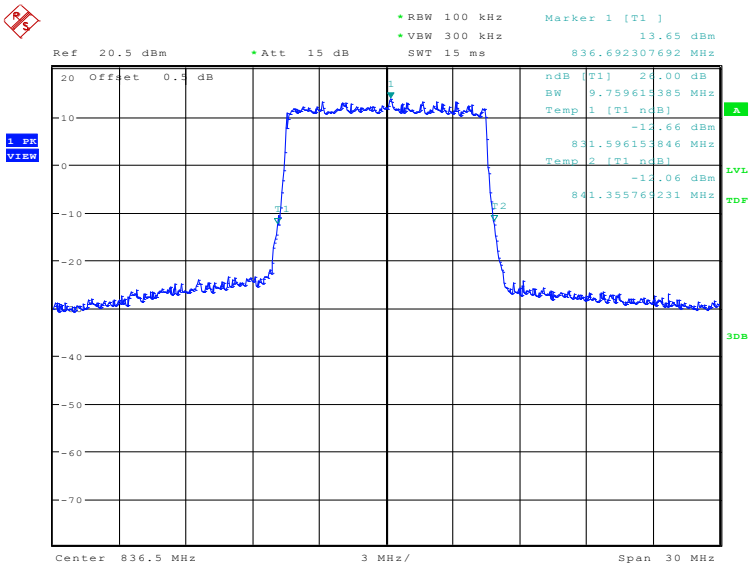
Frequency(MHz)	Occupied Bandwidth (-26dBc) (kHz)	
836.5	QPSK	16QAM
	9759.62	9759.62

LTE band 5, 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 5.NOV.2019 14:35:30

LTE band 5, 10MHz Bandwidth, 16QAM (-26dBc BW)

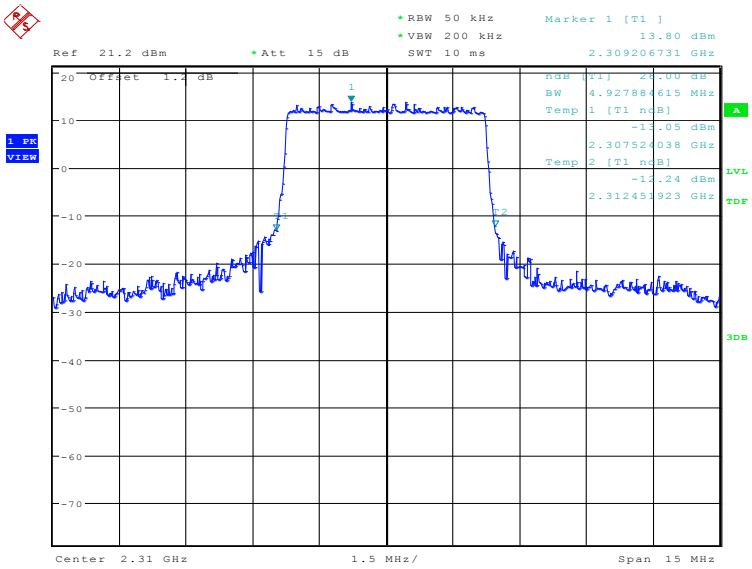


Date: 5.NOV.2019 14:36:54

LTE band 40(2305MHz~2315MHz), 5MHz (-26dBc BW)

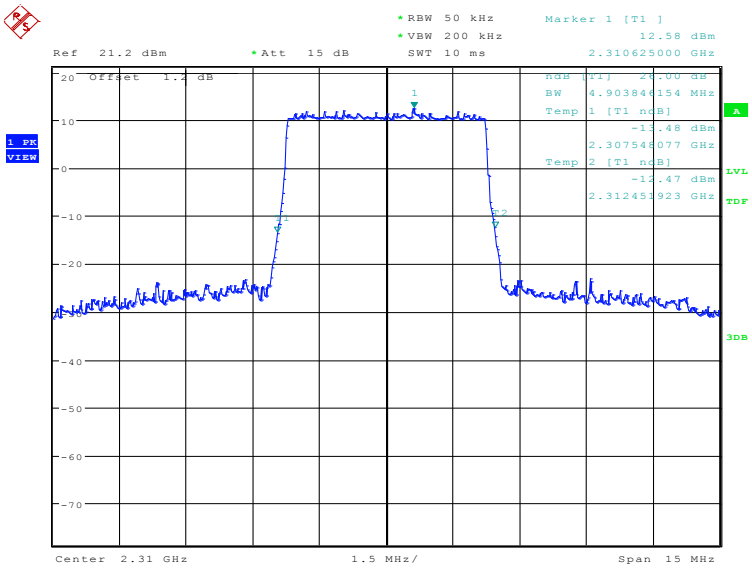
Frequency(MHz)	Occupied Bandwidth (-26dBc BW) (kHz)	
2310.0	QPSK	16QAM
	4927.88	4903.85

LTE band 40(2305MHz~2315MHz), 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 5.NOV.2019 14:38:38

LTE band 40(2305MHz~2315MHz), 5MHz Bandwidth,16QAM (-26dBc BW)

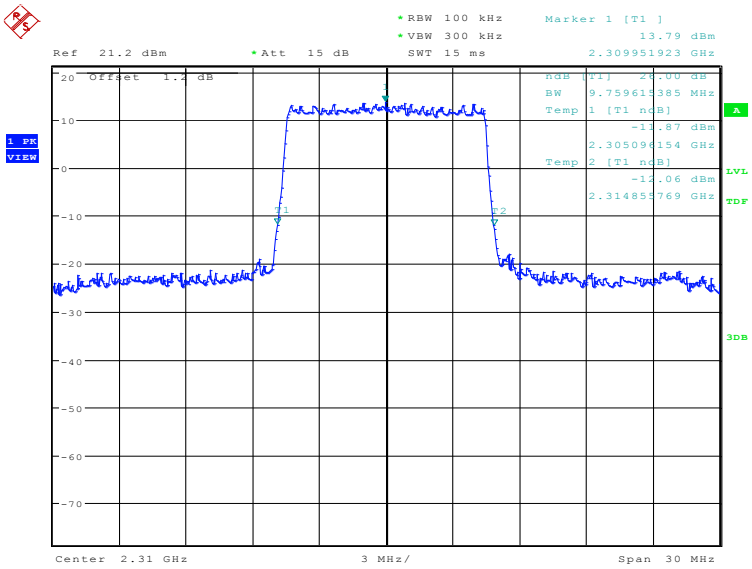


Date: 5.NOV.2019 14:40:02

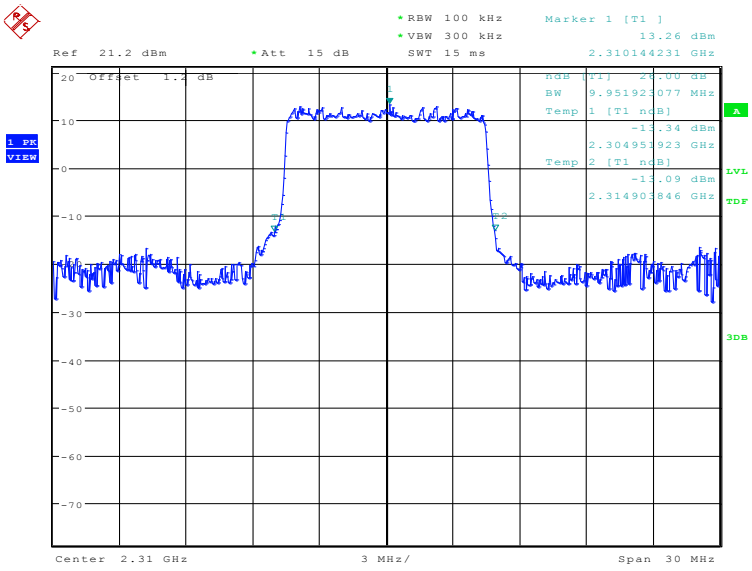
LTE band 40(2305MHz~2315MHz), 10MHz (-26dBc BW)

Frequency(MHz)	Occupied Bandwidth (-26dBc BW) (kHz)	
2310.0	QPSK	16QAM
	9759.62	9951.92

LTE band 40(2305MHz~2315MHz), 10MHz Bandwidth, QPSK (-26dBc BW)



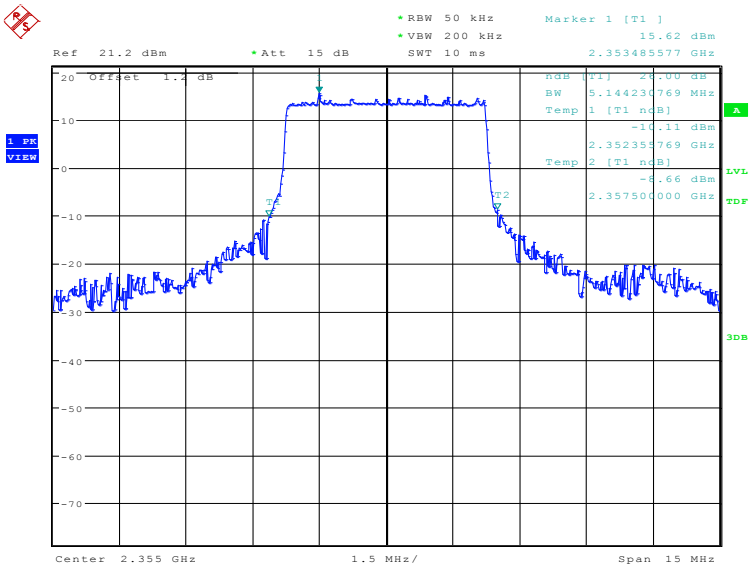
LTE band 40(2305MHz~2315MHz), 10MHz Bandwidth,16QAM (-26dBc BW)



LTE band 40(2350MHz~2360MHz), 5MHz (-26dBc BW)

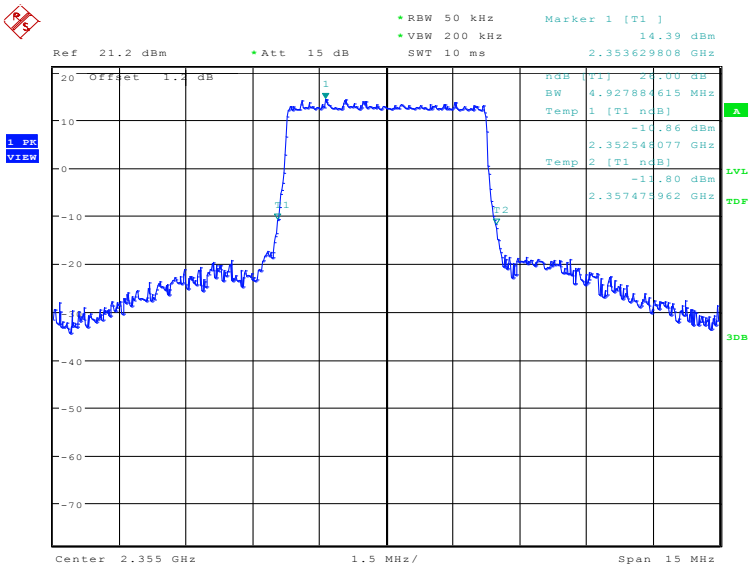
Frequency(MHz)	Occupied Bandwidth (-26dBc BW) (kHz)	
2355.0	QPSK	16QAM
	5144.23	4927.88

LTE band 40(2350MHz~2360MHz), 5MHz Bandwidth, QPSK (-26dBc BW)



Date: 5.NOV.2019 14:44:19

LTE band 40(2350MHz~2360MHz), 5MHz Bandwidth,16QAM (-26dBc BW)

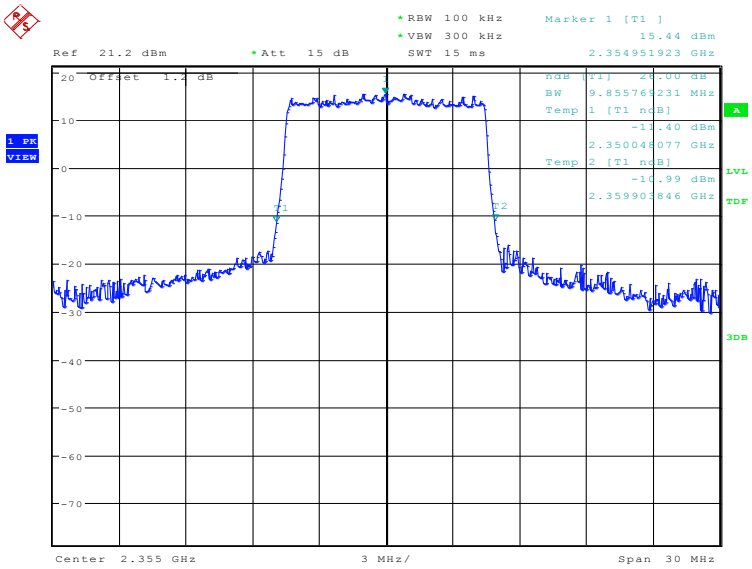


Date: 5.NOV.2019 14:45:44

LTE band 40(2350MHz~2360MHz), 10MHz (-26dBc BW)

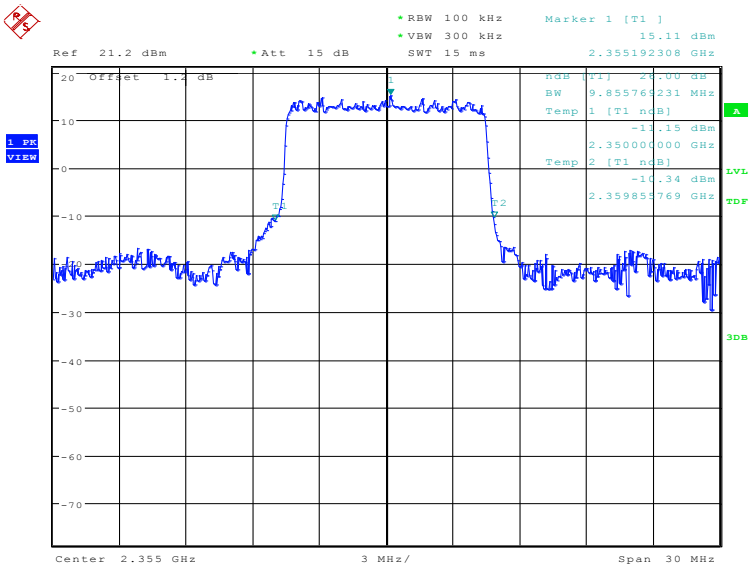
Frequency(MHz)	Occupied Bandwidth (-26dBc BW) (kHz)	
2355.0	QPSK	16QAM
	9855.77	9855.77

LTE band 40(2350MHz~2360MHz), 10MHz Bandwidth, QPSK (-26dBc BW)



Date: 5.NOV.2019 14:47:10

LTE band 40(2350MHz~2360MHz), 10MHz Bandwidth,16QAM (-26dBc BW)



Date: 5.NOV.2019 14:48:35

A.6 BAND EDGE COMPLIANCE

A.6.1 Measurement limit

Part 22.917, 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.

According to KDB 971168, 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.

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.

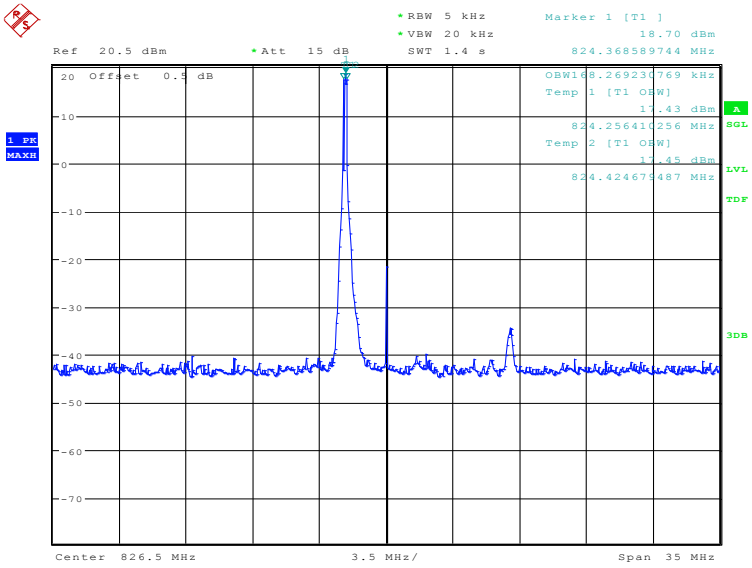
Part 27.53(a) states for mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands: By a factor of not less than: 43 +10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300 MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

A.6.2 Measurement result

Only the worst case result is given below

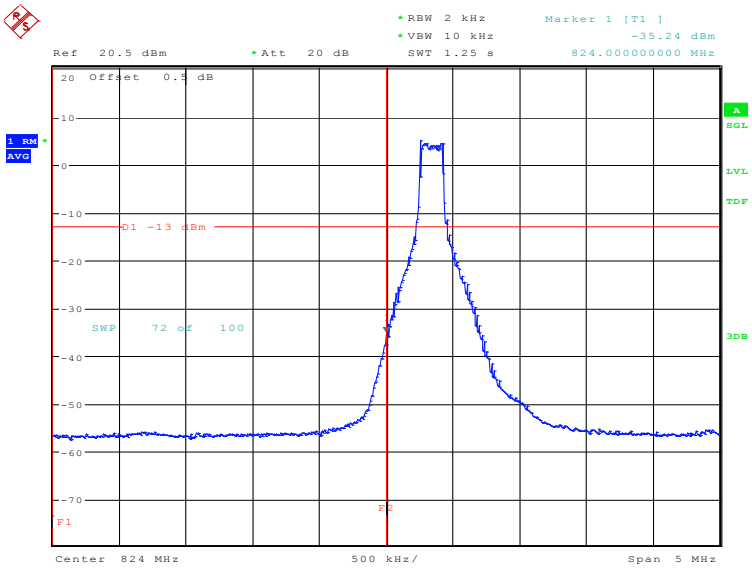
LTE band 5

OBW: 1RB-low_offset



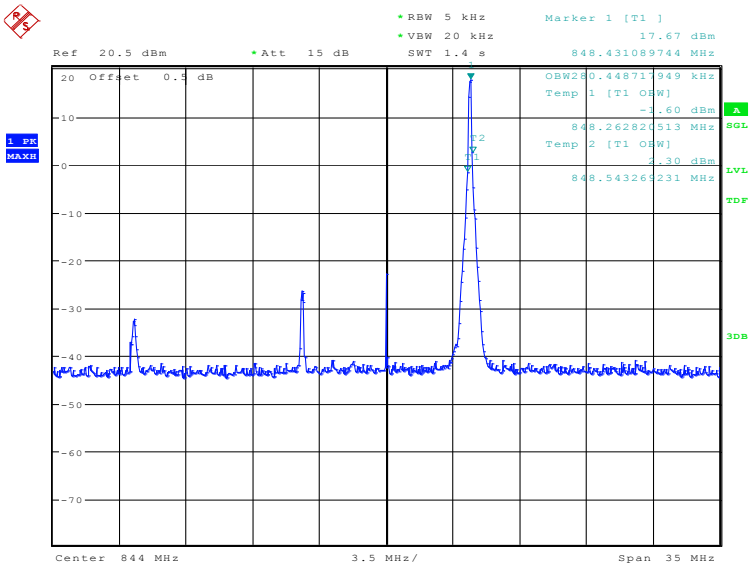
Date: 28.NOV.2019 09:08:45

LOW BAND EDGE BLOCK-1RB-low_offset



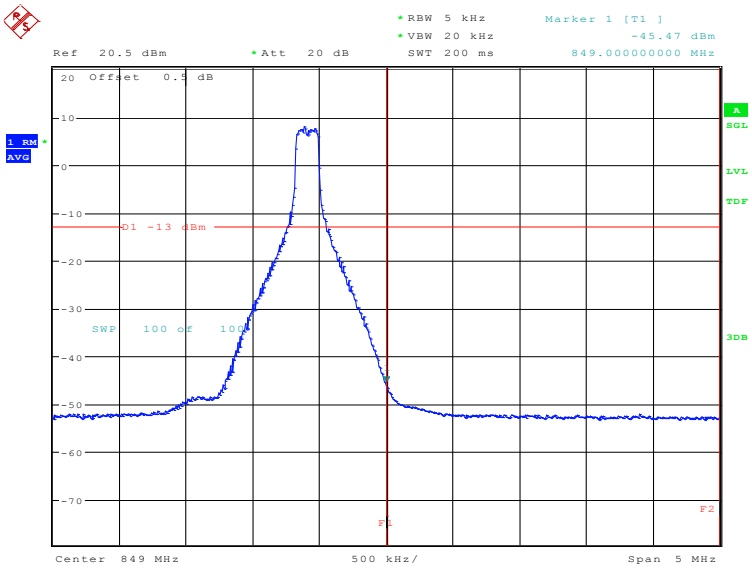
Date: 28.NOV.2019 09:10:23

OBW: 1RB-high_offset



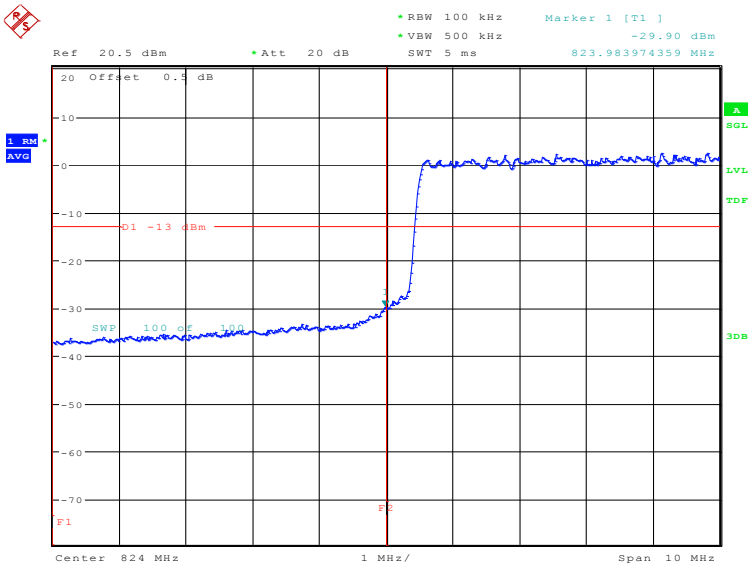
Date: 28.NOV.2019 09:13:37

HIGH BAND EDGE BLOCK-1RB-high_offset



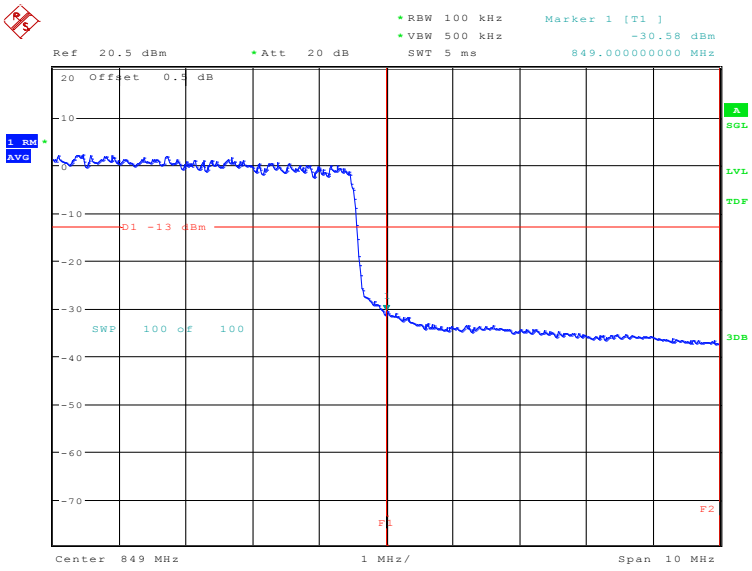
Date: 28.NOV.2019 09:15:16

LOW BAND EDGE BLOCK-10MHz-100%RB



Date: 28.NOV.2019 09:12:18

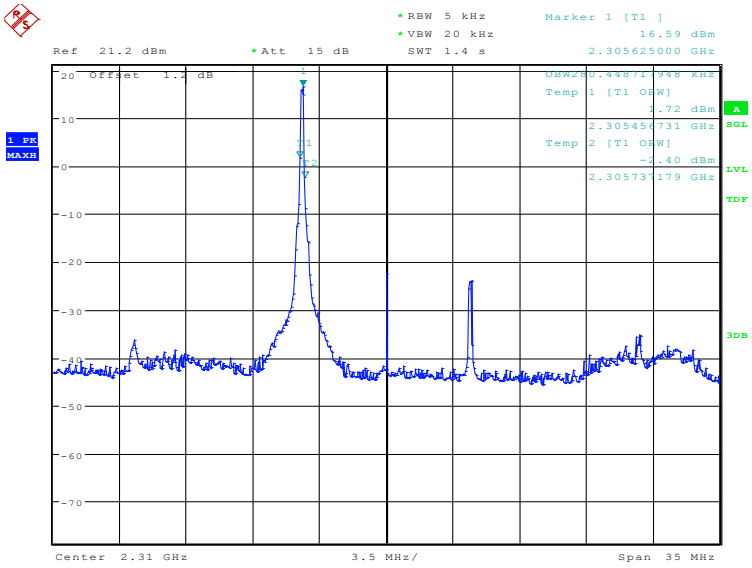
HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 28.NOV.2019 09:17:08

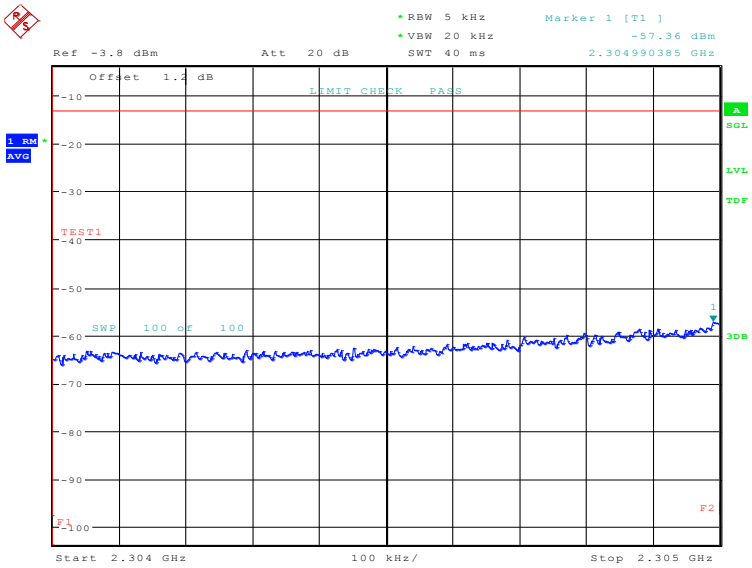
LTE band 40(2305MHz~2315MHz)

OBW: 1RB-low_offset

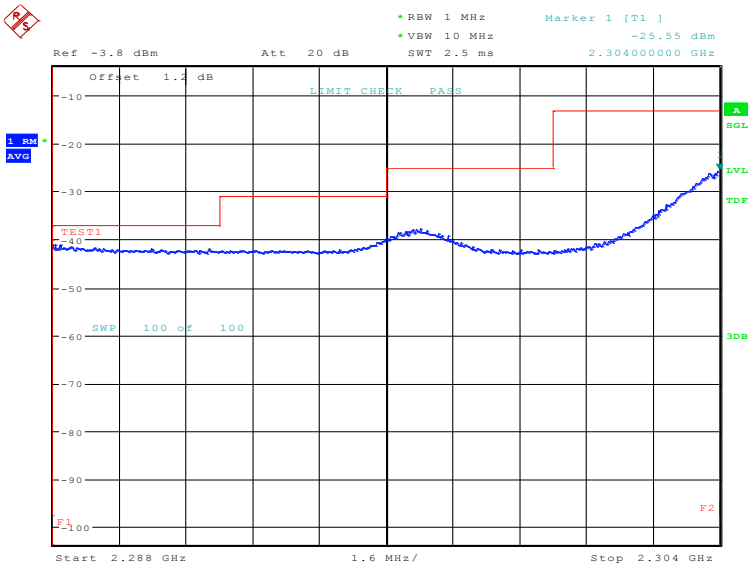


Date: 28.NOV.2019 09:25:43

LOW BAND EDGE BLOCK-1RB-low_offset

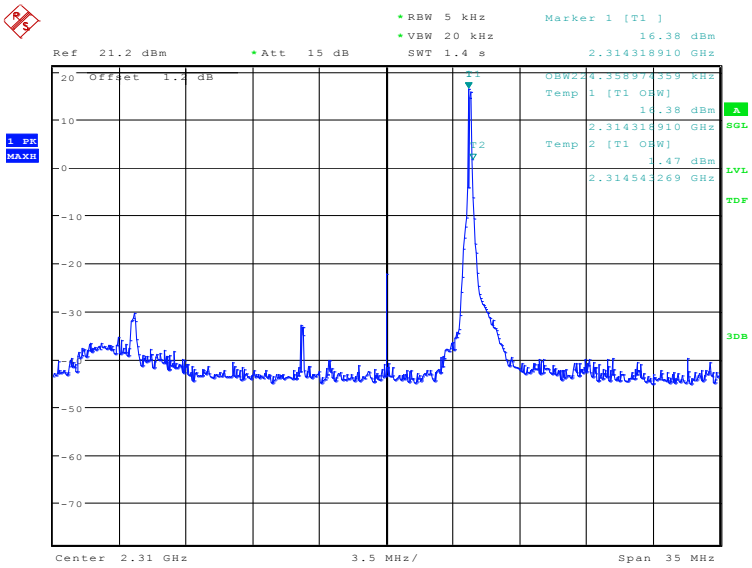


Date: 28.NOV.2019 09:27:29



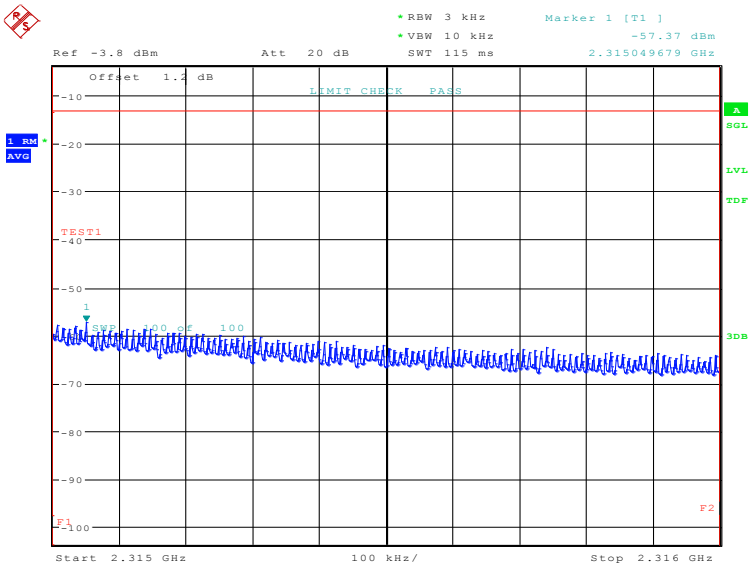
Date: 28.NOV.2019 09:29:09

OBW: 1RB-high_offset

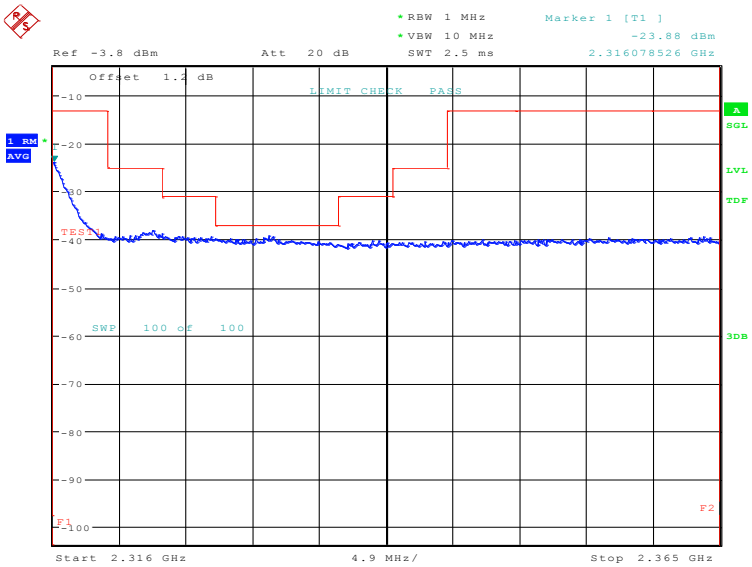


Date: 28.NOV.2019 09:33:49

HIGH BAND EDGE BLOCK-1RB-high_offset

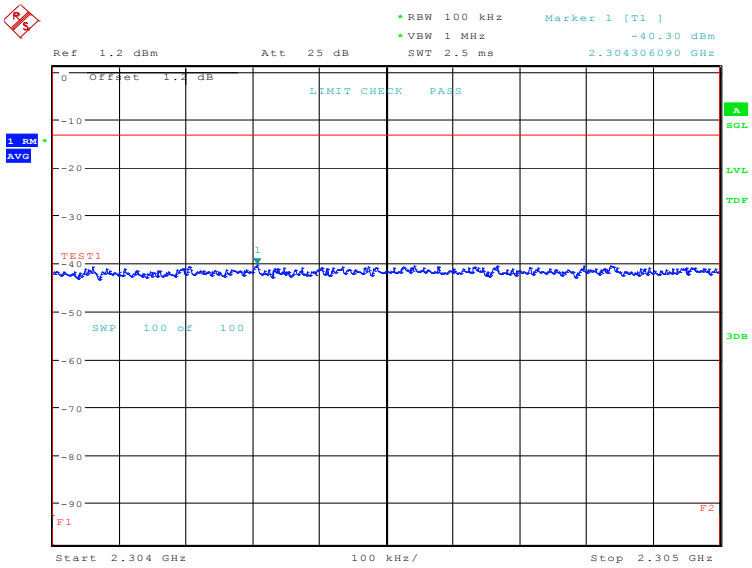


Date: 28.NOV.2019 09:35:43

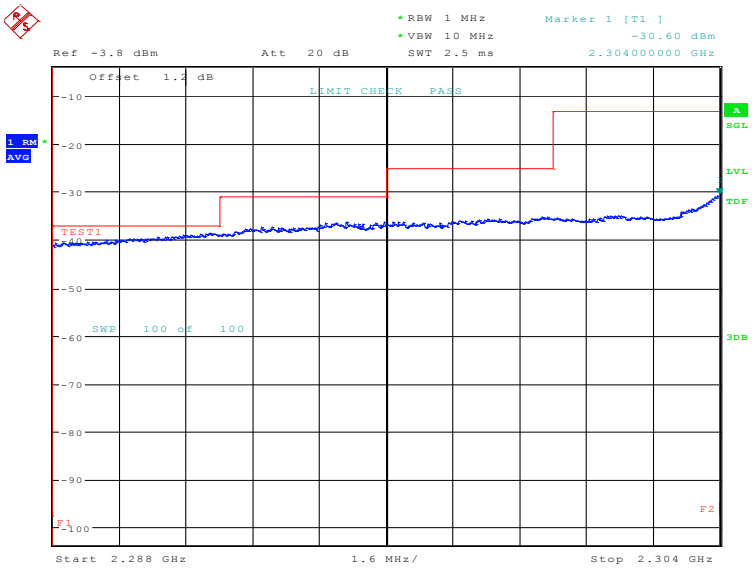


Date: 28.NOV.2019 09:37:23

LOW BAND EDGE BLOCK-10MHz-100%RB

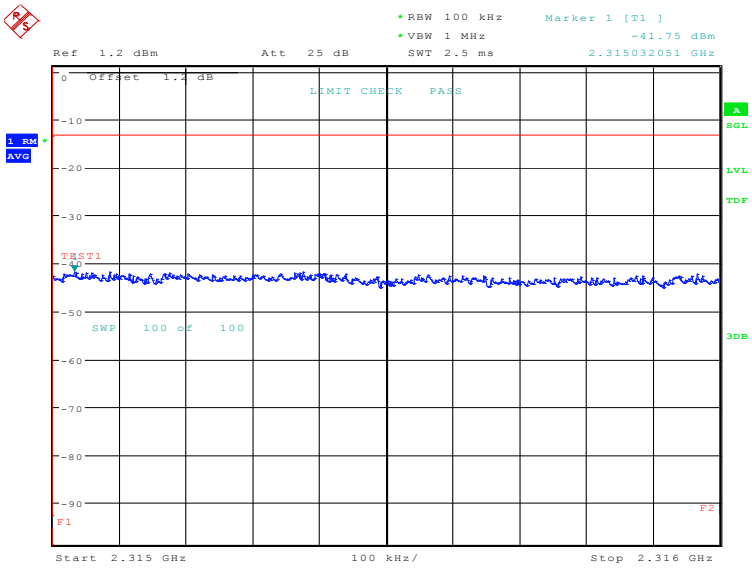


Date: 28.NOV.2019 09:48:09

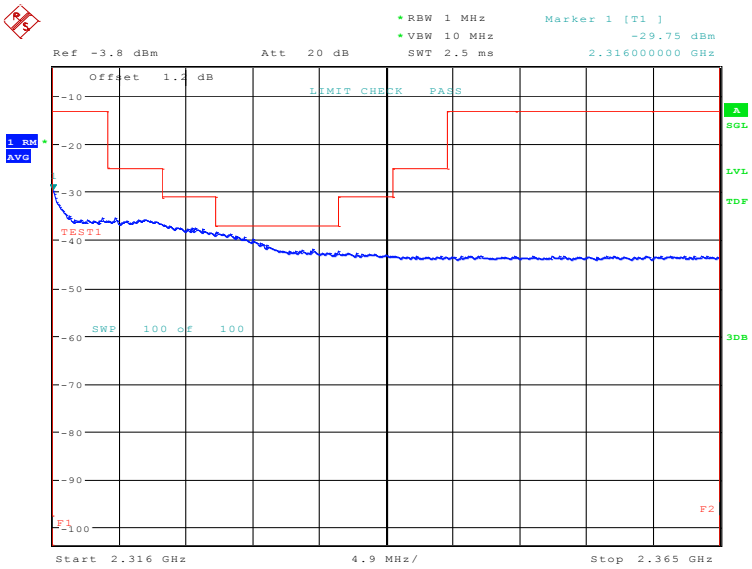


Date: 28.NOV.2019 09:49:49

HIGH BAND EDGE BLOCK-10MHz-100%RB



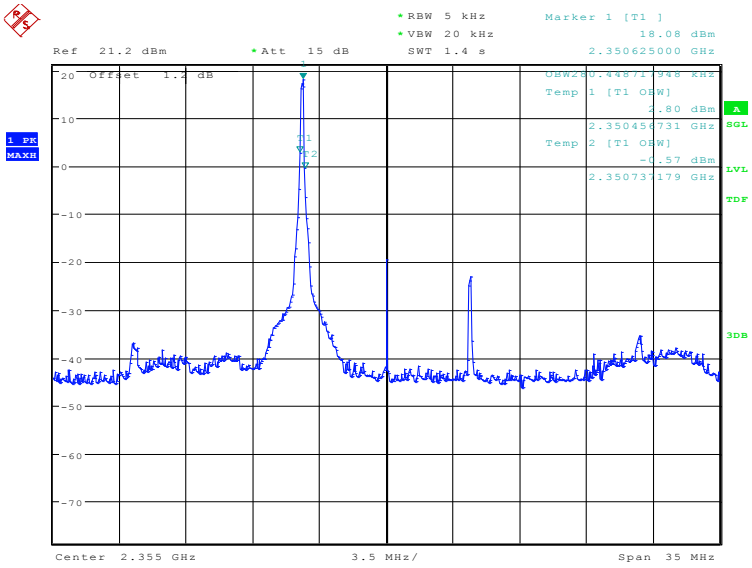
Date: 28.NOV.2019 09:51:47



Date: 28.NOV.2019 09:53:27

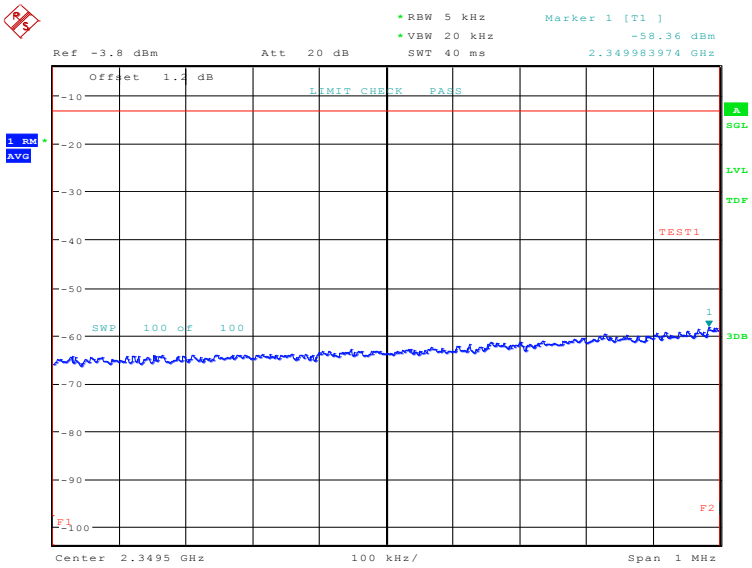
LTE band 40(2350MHz~2360MHz)

OBW: 1RB-low_offset



Date: 28.NOV.2019 10:06:03

LOW BAND EDGE BLOCK-1RB-low_offset



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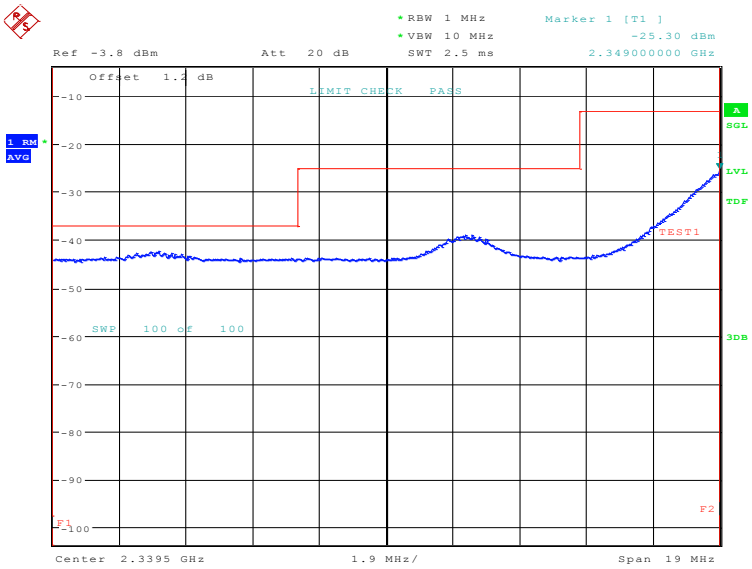
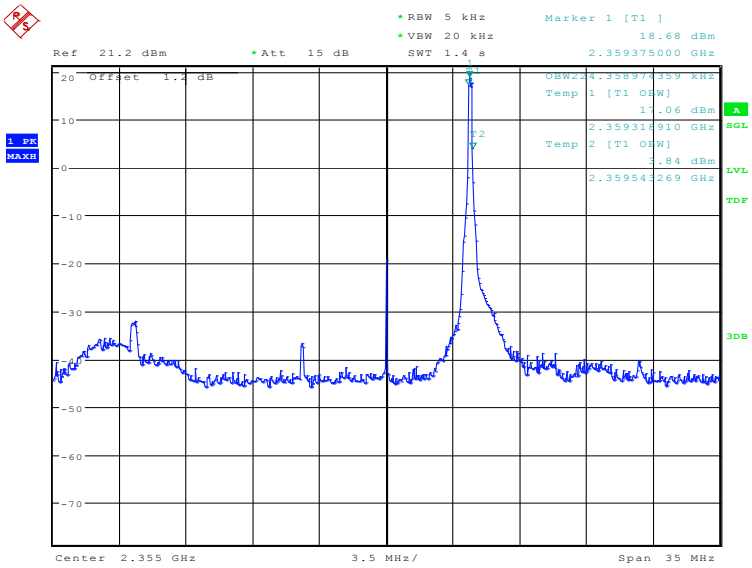


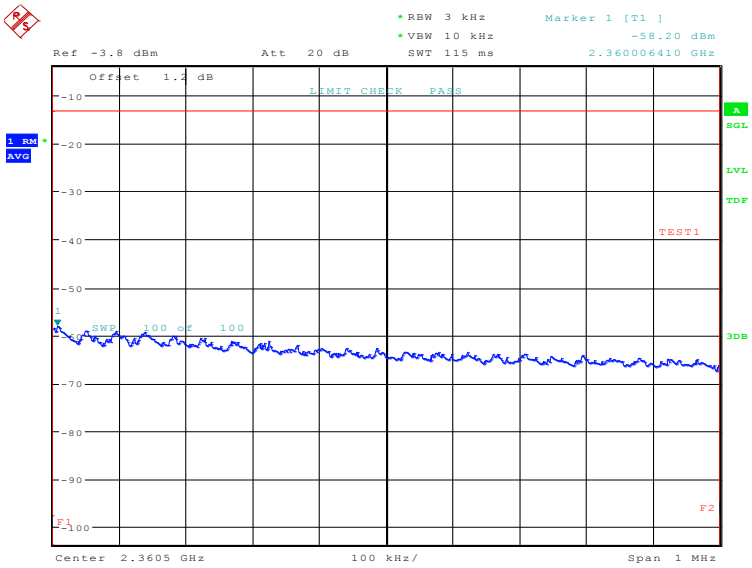
Date: 28.NOV.2019 10:09:19

OBW: 1RB-high_offset

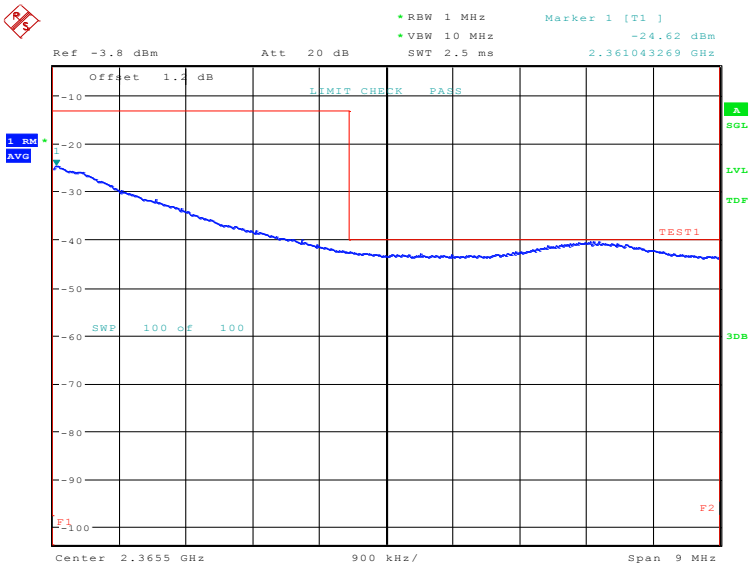


Date: 28.NOV.2019 10:14:12

HIGH BAND EDGE BLOCK-1RB-high_offset

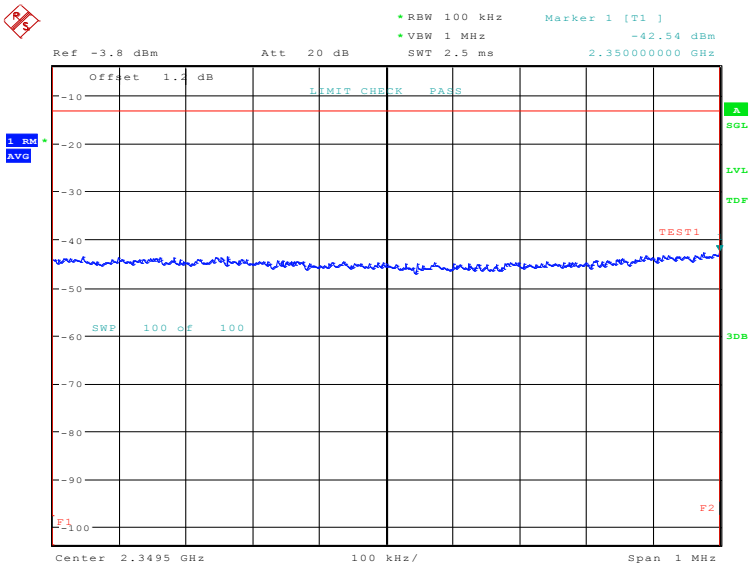


Date: 28.NOV.2019 10:15:51

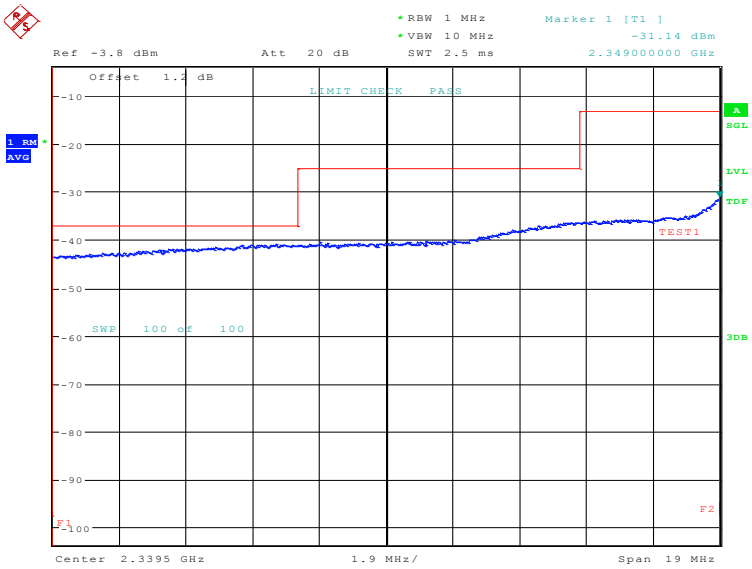


Date: 28.NOV.2019 10:17:28

LOW BAND EDGE BLOCK-10MHz-100%RB

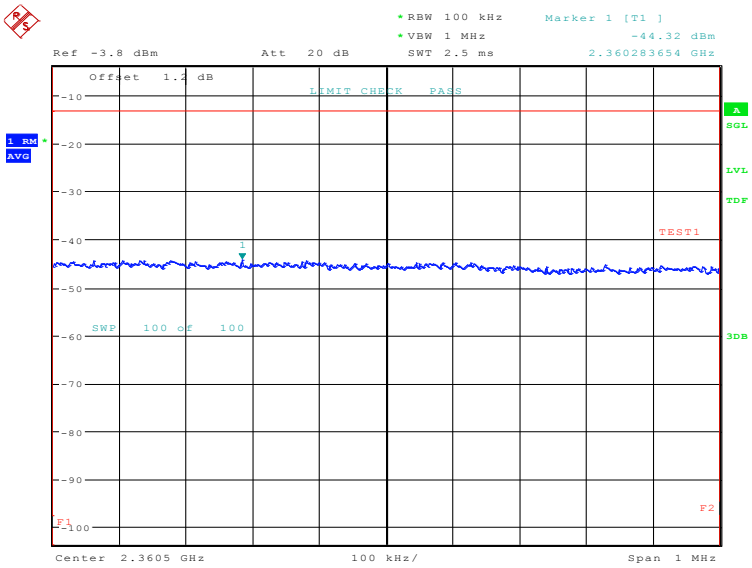


Date: 28.NOV.2019 10:11:14

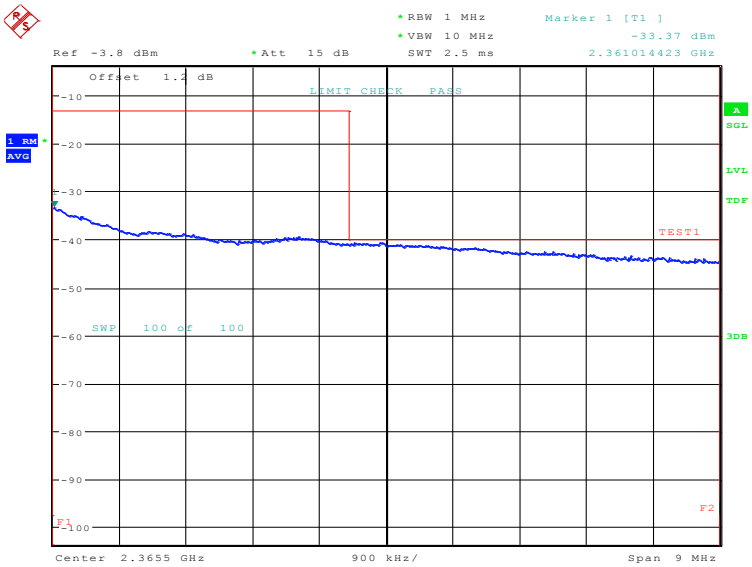


Date: 28.NOV.2019 10:12:51

HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 28.NOV.2019 10:28:28



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A.7 CONDUCTED SPURIOUS EMISSION

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 22.917, 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.

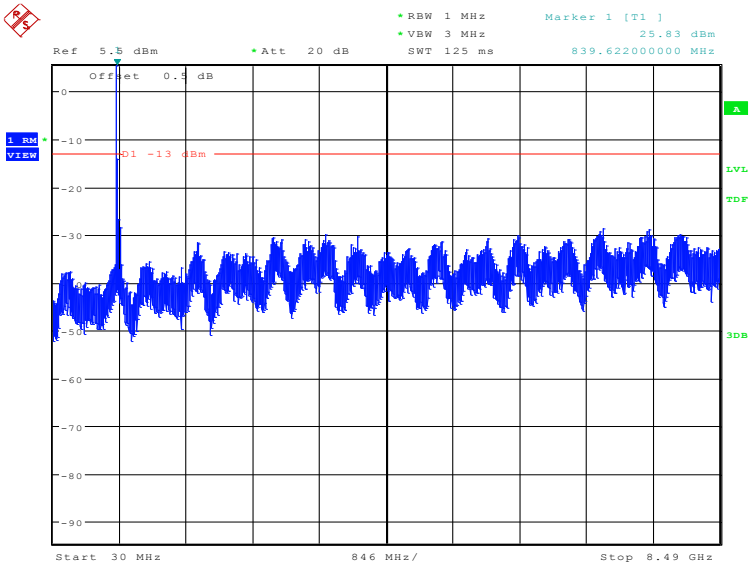
The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. 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(a) states for mobile and portable stations operating in the 2305–2315 MHz and 2350–2360 MHz bands: By a factor of not less than: 43 +10 log (P) dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than 55 + 10 log (P) dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than 61 + 10 log (P) dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than 67 + 10 log (P) dB on all frequencies between 2328 and 2337MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2300 and 2305 MHz, 55 + 10 log (P) dB on all frequencies between 2296 and 2300MHz, 61 + 10 log (P) dB on all frequencies between 2292 and 2296 MHz, 67 + 10 log (P) dB on all frequencies between 2288 and 2292 MHz, and 70 + 10 log (P) dB below 2288 MHz; By a factor of not less than 43 + 10 log (P) dB on all frequencies between 2360 and 2365 MHz, and not less than 70 + 10 log (P) dB above 2365 MHz.

A. 7.2 Measurement result

Only the worst case result is given below

LTE band 5: 30MHz – 8.49GHz



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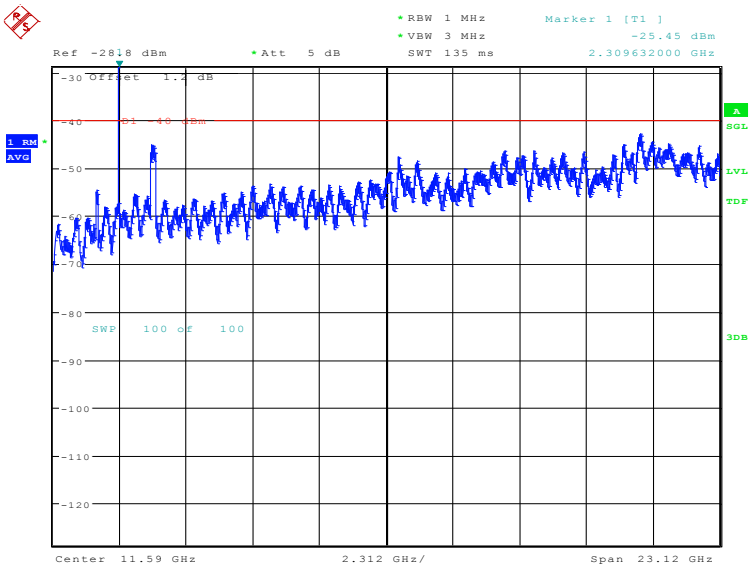
LTE band 40: 30MHz – 23.15GHz



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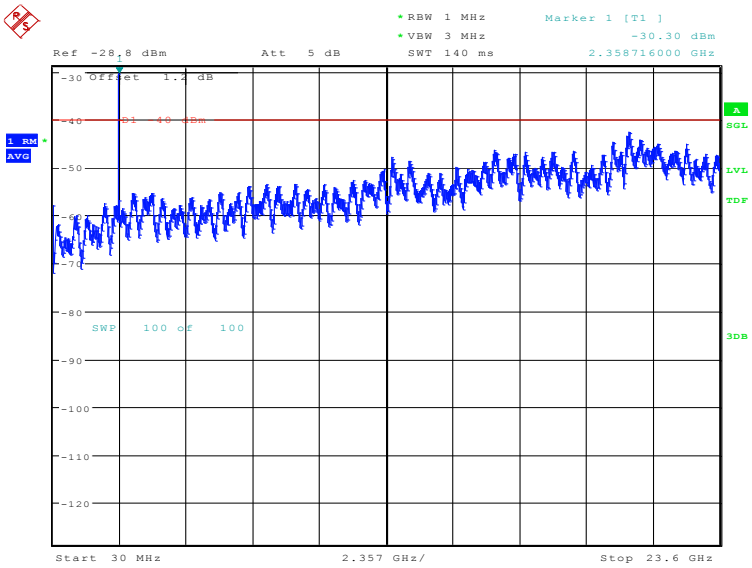
LTE band 40: 30MHz – 23.6GHz



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A.8 PEAK-TO-AVERAGE POWER RATIO

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 5.7.1:

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 40(2305MHz~2315MHz)

Frequency(MHz)	PAPR(dB)	
2310.0	QPSK	16QAM
	7.08	8.01

LTE band 40(2350MHz~2360MHz)

Frequency(MHz)	PAPR(dB)	
2355.0	QPSK	16QAM
	7.08	8.04

ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2019-09-26 through 2020-09-30
Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program

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