TEST REPORT

No. I19Z61038-WMD01

for

Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd

smartphone

Model Name: cp3648A

FCC ID: R38YLCP3648A

with

Hardware Version: P1

Software Version: 9.0.002.P1.190609.cp3648A

Issued Date: 2019-07-12

TESTING
NVLAP LAB CODE 600118-0

Note:

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The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z61038-WMD01	Rev.0	1st edition	2019-07-12

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

1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-07-10

Testing End Date: 2019-07-12

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:	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address /Post:	Building B, Boton Science Park, Chaguang Road, Xili Town, Nanshan District, Shenzhen
Contact:	Yentl Chen
Email:	chenyanting@yulong.com
Telephone:	+86 15927320221
Fax:	NA

2.2. Manufacturer Information

Company Name:	Yulong Computer Telecommunication Scientific (Shenzhen) Co., Ltd
Address /Post:	Building B, Boton Science Park, Chaguang Road, Xili Town, Nanshan District, Shenzhen
Contact:	Yentl Chen
Email:	chenyanting@yulong.com
Telephone:	+86 15927320221
Fax:	NA

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

3.1. About EUT

Description	smartphone
Model Name	cp3648A
FCC ID	R38YLCP3648A
Antenna	Embedded
Extreme vol. Limits	3.7VDC to 4.4VDC (nominal: 3.85VDC)
Extremetemp. Tolerance	-15C 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
UT03a	990013500007864	P1	9.0.002.P1.190609.cp3648A	2019-06-27

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

3.3. Internal Identification of AE used during the test

AE ID*	Description
AE1	Battery
AE2	Battery

AE1

Model	Li-ion Polymer
Manufacturer	Tianjin Lishen
Capacitance	2450mAh
Nominal Voltage	3.85V

AE2

Model	Li-ion Polymer
Manufacturer	Zhuhai Coslight
Capacitance	2450mAh
Nominal Voltage	3.85V

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

3.4. General Description

The Equipment Under Test (EUT) is a model of smartphone with embedded antenna. Manual and specifications of the EUT were provided to fulfil the test.

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 90	PRIVATE LAND MOBILE RADIO SERVICES	10-1-18 Edition
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. SUMMARY OF TEST RESULT

5.1. Summary of test results

LTE Band 26(814MHz~824MHz)

Items	Test Name	Clause in FCC rules	Verdict
1	Output Power	90.635	P
2	Frequency Stability	2.1055	P
3	Occupied Bandwidth	2.1049	P
4	Emission Bandwidth	2.1049	P
5	Band Edge Compliance	90.691	P
6	Conducted Spurious Emission	90.691	P

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NP	Not Perform, 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

5.2. Statements

The test cases listed in section 5.1 of this report for the EUT specified in section 3 were performed by CTTL according to the standards or reference documents in section 4.1

The EUT met all applicable requirements of the standards or reference documents in section 4.1.

This report only deals with the LTE functions among the features described in section 3.

6. Test Equipments Utilized

NO.	Description	TYPE	series number	MANUFACTURE	CAL DUE DATE	Calibration interval
1	Universal Radio Communication Tester	CMW500	159082	R&S	2019-12-25	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	Radio Communication Analyzer	MT8821C	6201763159	Anritsu	2019-07-18	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 26(814MHz~824MHz)

Bandwidth	RB size/offset	Frequency (MHz)	Power(dBm)		
			QPSK	16QAM	64QAM
1.4MHz	1 RB high	823.3	22.85	21.92	21.03
		819.0	22.79	21.88	21.00
		814.7	22.76	21.86	21.01
	1 RB low	823.3	22.78	21.86	21.00
		819.0	22.79	21.91	21.01
		814.7	22.75	21.80	20.99
	50% RB mid	823.3	22.95	22.16	20.92
		819.0	22.94	22.13	20.91
		814.7	22.97	22.13	20.91
	100% RB	823.3	21.92	21.10	19.93
		819.0	21.92	21.11	19.91
		814.7	21.91	20.83	19.90
3MHz	1 RB high	822.5	22.84	22.01	21.06
		819.0	22.83	22.02	21.08
		815.5	22.87	22.10	21.07
	1 RB low	822.5	22.83	21.99	21.02
		819.0	22.87	22.05	21.03
		815.5	22.84	22.04	21.01
	50% RB mid	822.5	21.90	21.01	19.90
		819.0	21.94	21.04	19.91
		815.5	21.94	21.04	19.92

	100% RB	822.5	21.90	20.95	19.89
		819.0	21.88	20.93	19.88
		815.5	21.87	20.94	19.88
5MHz	1 RB high	821.5	22.82	22.16	20.95
		819.0	22.79	22.13	20.92
		816.5	22.80	22.13	20.94
	1 RB low	821.5	22.78	22.12	20.94
		819.0	22.80	22.12	20.96
		816.5	22.78	22.11	20.95
	50% RB mid	821.5	21.96	21.09	19.94
		819.0	21.98	21.08	19.95
		816.5	21.98	21.14	19.97
	100% RB	821.5	21.91	20.99	19.90
		819.0	21.90	21.00	19.89
		816.5	21.93	21.00	19.90
10MHz	1 RB high	819.0	22.87	22.05	21.05
	1 RB low	819.0	22.81	22.04	21.05
	50% RB mid	819.0	21.99	21.01	19.94
	100% RB	819.0	21.96	21.02	19.93

A.2 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 -10℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE band 26(814MHz~824MHz), measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -10℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃increments from -10℃ 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 3.7VDC and 4.4VDC, with a nominal voltage of 3.85VDC. 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 26(814MHz~824MHz), 1.4MHz bandwidth (worst case of all bandwidths)

Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)			Frequency error (ppm)		
	QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
3.7	-8.20	-17.91	2.30	0.0100	0.0219	0.0028
3.85	-12.02	-26.02	2.80	0.0147	0.0318	0.0034
4.4	-10.59	-29.15	4.60	0.0129	0.0356	0.0056

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)			Frequency error (ppm)		
	QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
50	-11.69	-24.49	2.10	0.0143	0.0299	0.0026
40	-12.22	-28.64	-9.90	0.0149	0.0350	0.0121
30	-13.10	-28.12	-8.80	0.0160	0.0343	0.0107
20	-10.77	-26.11	-5.10	0.0132	0.0319	0.0062
10	-13.75	-26.32	-6.10	0.0168	0.0321	0.0074
0	-11.37	-22.93	-3.60	0.0139	0.0280	0.0044
-10	-15.19	-29.15	-5.50	0.0185	0.0356	0.0067

A.3 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 KDB 971168 4.2:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).

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

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

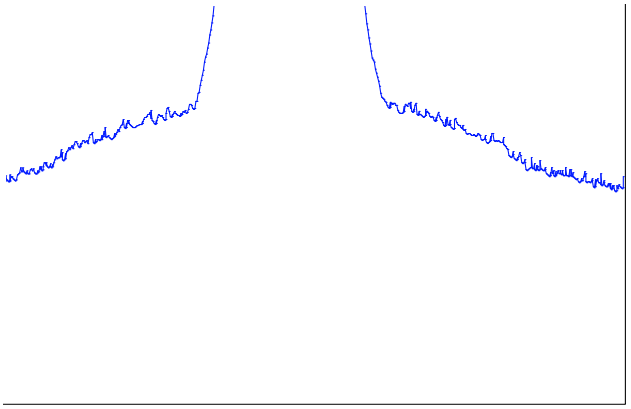
d) Set the detection mode to peak, and the trace mode to max hold.

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

LTE band 26(814MHz~824MHz), 1.4MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)		
819.0	QPSK	16QAM	64QAM
	1097.76	1089.74	1089.74

LTE band 26(814MHz~824MHz), 1.4MHz Bandwidth, QPSK (99% BW)



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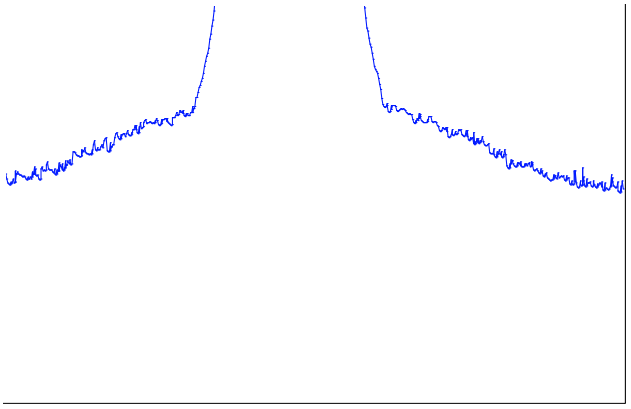
LTE band 26(814MHz~824MHz), 1.4MHz Bandwidth, 16QAM (99% BW)



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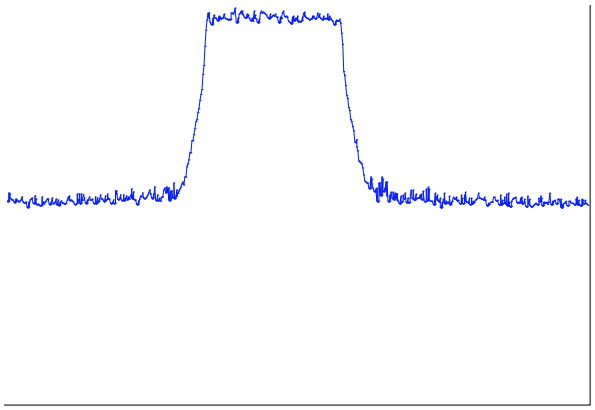
LTE band 26(814MHz~824MHz), 1.4MHz Bandwidth, 64QAM (99% BW)

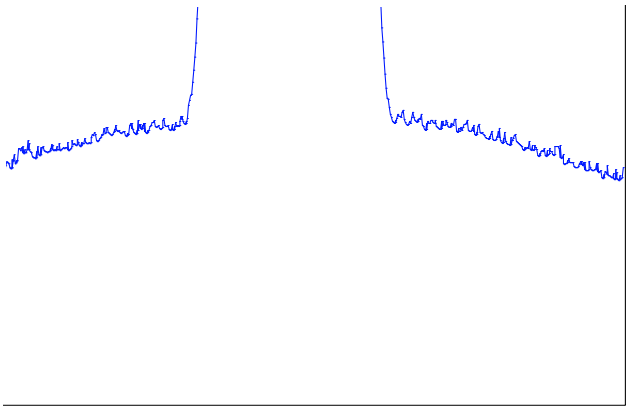


Date: 12.JUL.2019 10:20:11

LTE band 26(814MHz~824MHz), 3MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)		
819.0	QPSK	16QAM	64QAM
	2692.31	2692.31	2692.31

LTE band 26(814MHz~824MHz), 3MHz Bandwidth, QPSK (99% BW)



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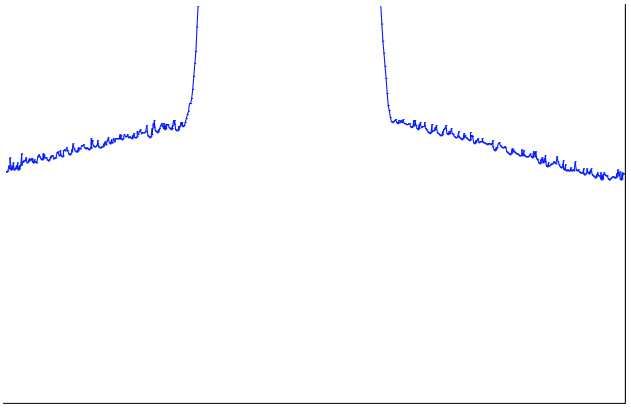
LTE band 26(814MHz~824MHz), 3MHz Bandwidth, 16QAM (99% BW)



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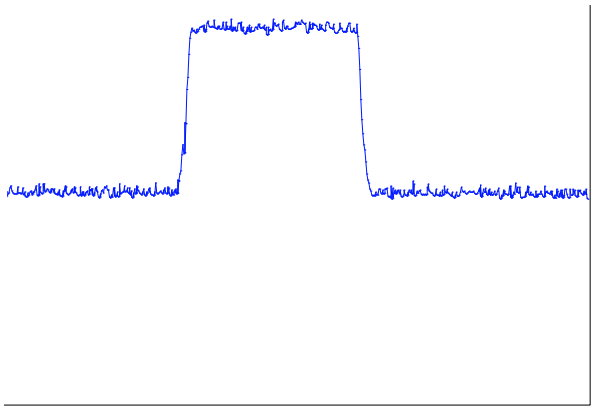
LTE band 26(814MHz~824MHz), 3MHz Bandwidth, 64QAM (99% BW)

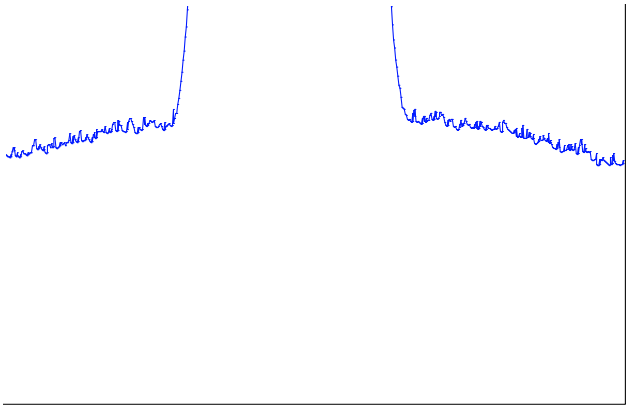


Date: 12.JUL.2019 10:21:40

LTE band 26(814MHz~824MHz), 5MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)		
819.0	QPSK	16QAM	64QAM
	4495.19	4519.23	4495.19

LTE band 26(814MHz~824MHz), 5MHz Bandwidth, QPSK (99% BW)



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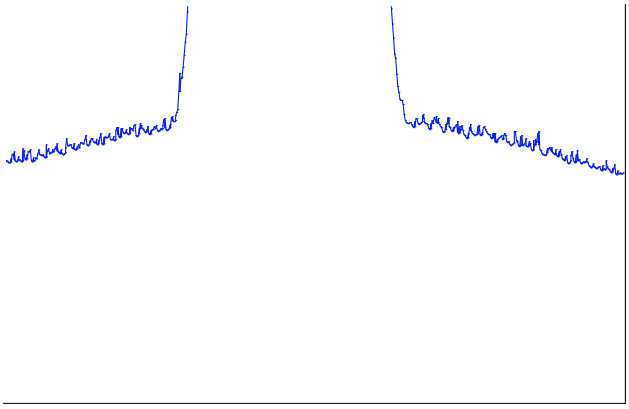
LTE band 26(814MHz~824MHz), 5MHz Bandwidth, 16QAM (99% BW)



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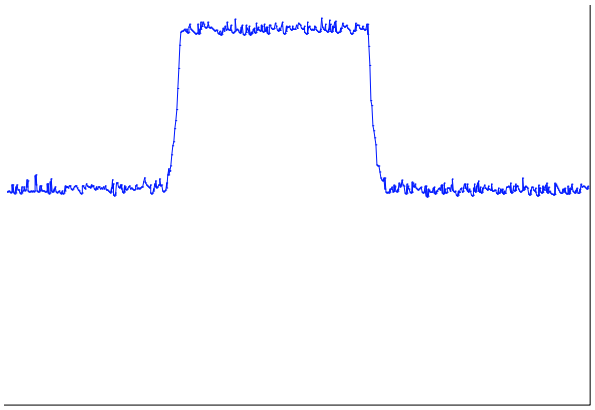
LTE band 26(814MHz~824MHz), 5MHz Bandwidth, 64QAM (99% BW)

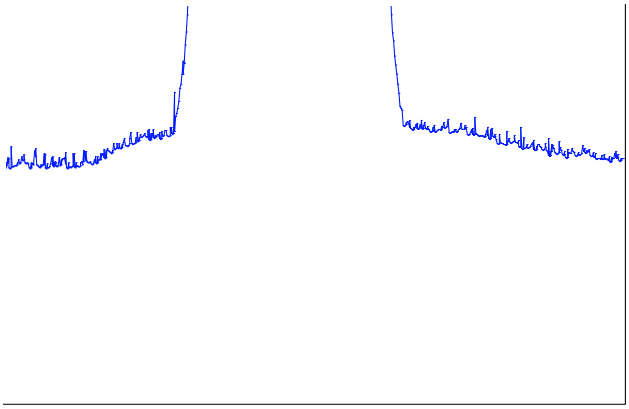


Date: 12.JUL.2019 10:22:56

LTE band 26(814MHz~824MHz), 10MHz (99%)

Frequency(MHz)	Occupied Bandwidth (99%)(kHz)		
819.0	QPSK	16QAM	64QAM
	8942.31	9038.46	8990.38

LTE band 26(814MHz~824MHz), 10MHz Bandwidth, QPSK (99% BW)



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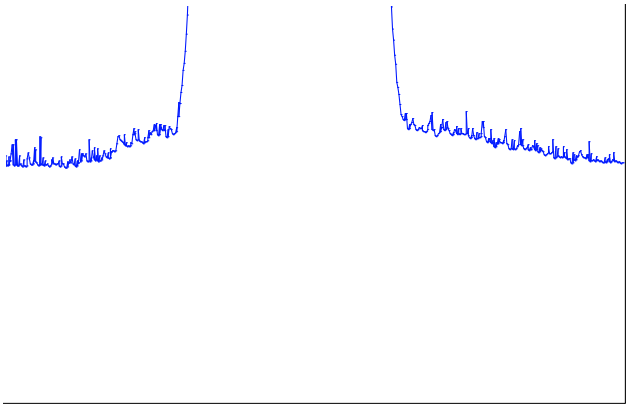
LTE band 26(814MHz~824MHz), 10MHz Bandwidth, 16QAM (99% BW)



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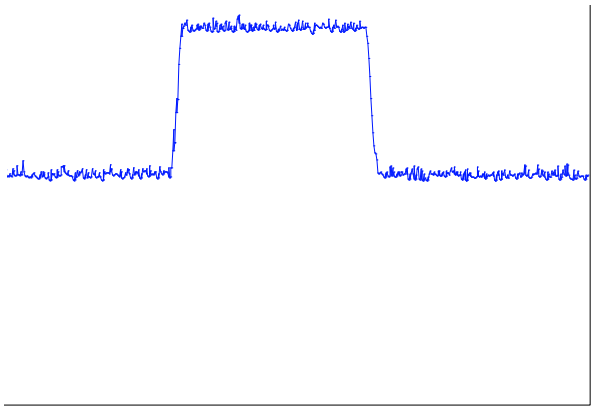
LTE band 26(814MHz~824MHz), 10MHz Bandwidth, 64QAM (99% BW)



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A.4 EMISSION BANDWIDTH

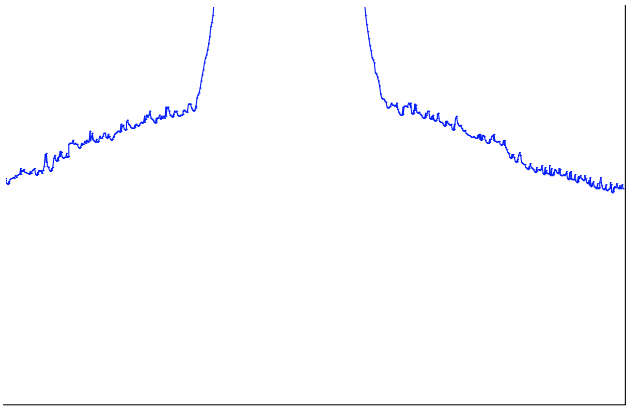
A.5.1Emission Bandwidth Results

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.

LTE band 26(814MHz~824MHz), 1.4MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)		
819.0	QPSK	16QAM	64QAM
	1282.05	1290.06	1274.04

LTE band 26(814MHz~824MHz), 1.4MHz Bandwidth, QPSK (-26dBc BW)



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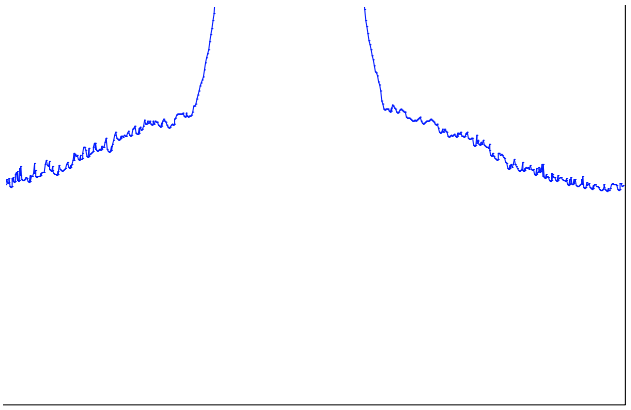
LTE band 26(814MHz~824MHz), 1.4MHz Bandwidth, 16QAM (-26dBc BW)



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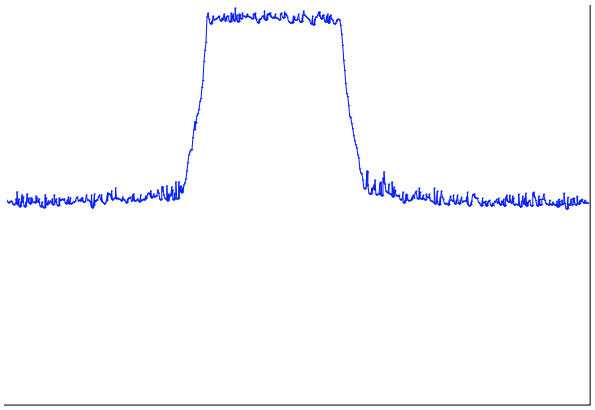
LTE band 26(814MHz~824MHz), 1.4MHz Bandwidth, 64QAM (-26dBc BW)



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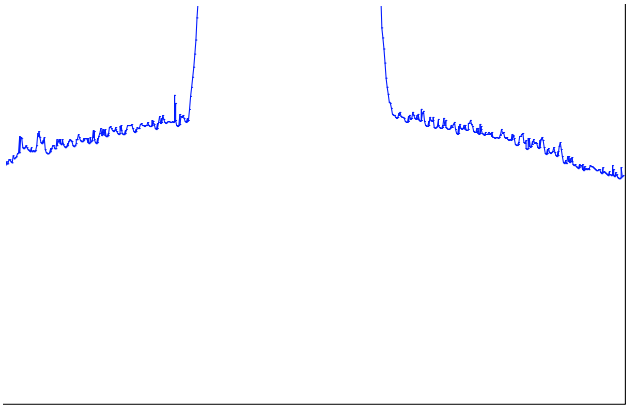
LTE band 26(814MHz~824MHz), 3MHz (-26dBc)

Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)		
819.0	QPSK	16QAM	64QAM
	2884.62	2900.64	2884.62

LTE band 26(814MHz~824MHz), 3MHz Bandwidth, QPSK (-26dBc BW)



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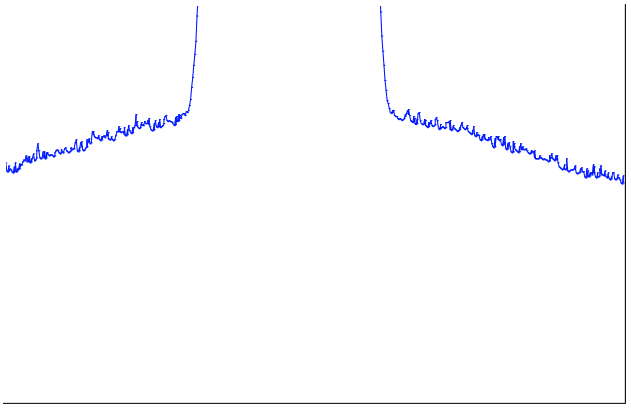

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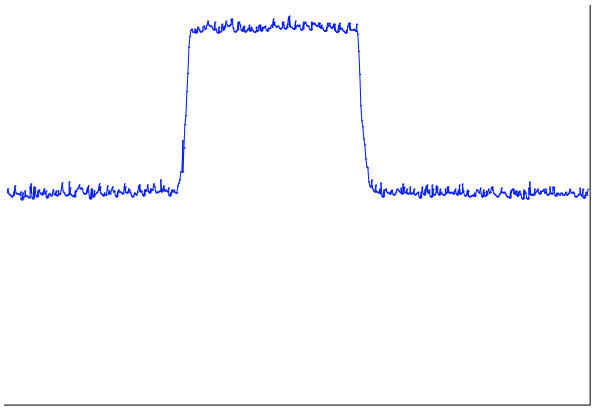
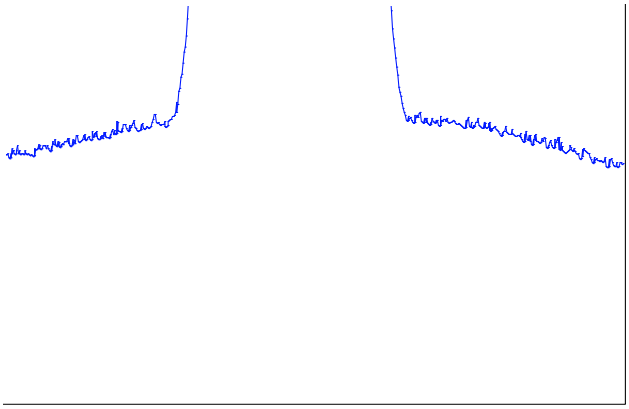


Date: 12.JUL.2019 10:22:01

LTE band 26(814MHz~824MHz), 5MHz (-26dBc)

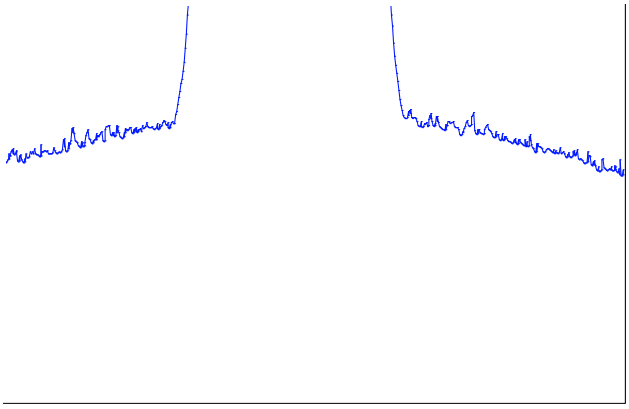
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)		
819.0	QPSK	16QAM	64QAM
	4855.77	4807.69	4807.69

LTE band 26(814MHz~824MHz), 5MHz Bandwidth, QPSK (-26dBc BW)



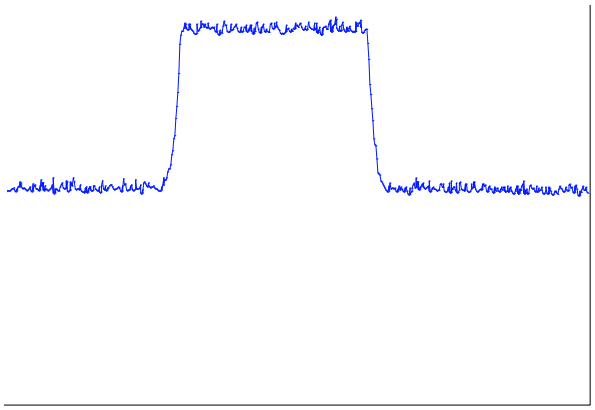
Date: 10.JUL.2019 13:39:10

LTE band 26(814MHz~824MHz), 5MHz Bandwidth, 16QAM (-26dBc BW)



Date: 10.JUL.2019 13:40:33

LTE band 26(814MHz~824MHz), 5MHz Bandwidth, 64QAM (-26dBc BW)

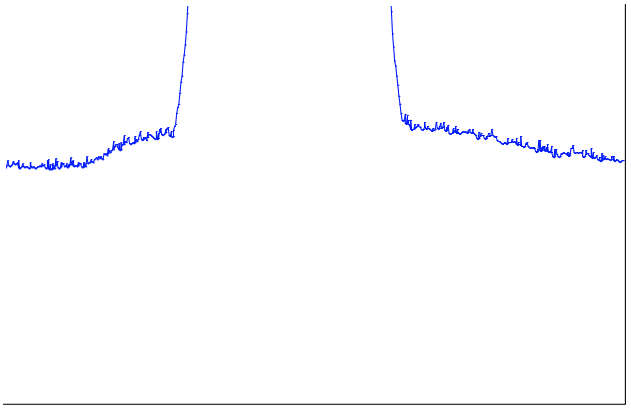


Date: 12.JUL.2019 10:24:13

LTE band 26(814MHz~824MHz), 10MHz (-26dBc)

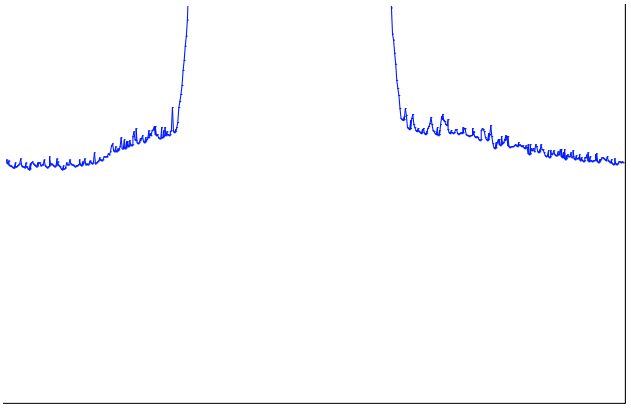
Frequency(MHz)	Occupied Bandwidth (-26dBc)(kHz)		
819.0	QPSK	16QAM	64QAM
	9663.46	9663.46	9567.31

LTE band 26(814MHz~824MHz), 10MHz Bandwidth, QPSK (-26dBc BW)



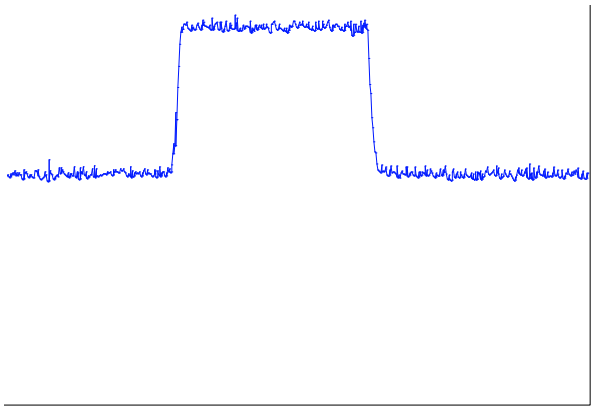
Date: 10.JUL.2019 13:43:28

LTE band 26(814MHz~824MHz), 10MHz Bandwidth, 16QAM (-26dBc BW)



Date: 10.JUL.2019 13:44:52

LTE band 26(814MHz~824MHz), 10MHz Bandwidth, 64QAM (-26dBc BW)



Date: 12.JUL.2019 10:26:36

A.5 BAND EDGE COMPLIANCE

A.6.1 Measurement limit

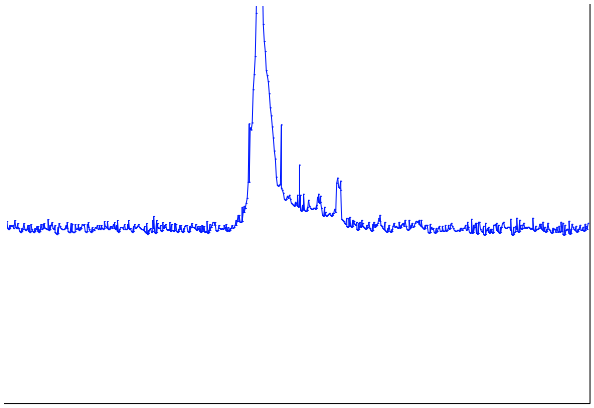
Part 90.691 states that out-of-band emission requirement shall apply only to the ‘‘outer’’ channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:For any frequency removed from the EA licensee’s frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116\text{Log}_{10}(f/6.1)$ decibels or $50 + 10\ \text{Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz. For any frequency removed from the EA licensee’s frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\text{Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

A.6.2 Measurement result

Only worst case result is given below

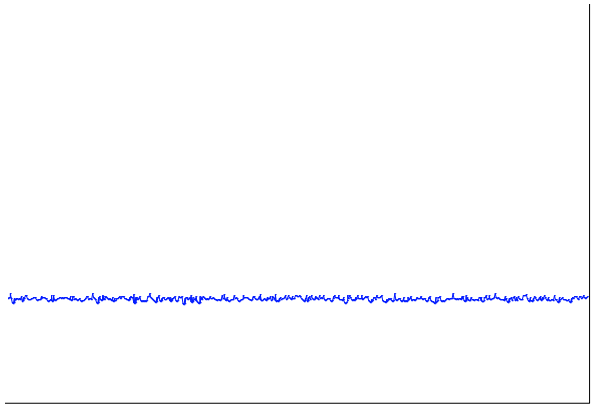
LTE band 26(814MHz~824MHz)

OBW: 1RB-low_offset



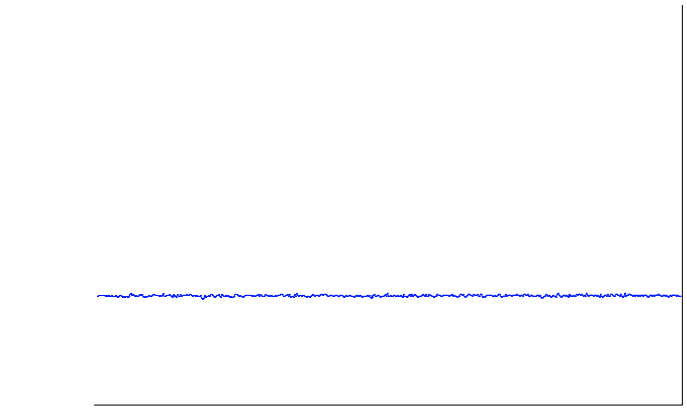
Date: 11.JUL.2019 10:46:18

LOW BAND EDGE BLOCK-1RB-low_offset



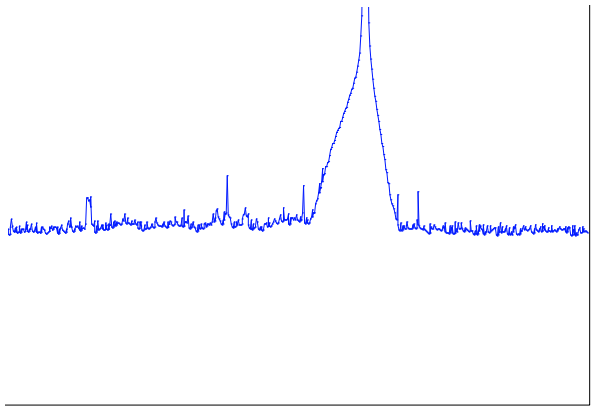
Date: 11.JUL.2019 10:46:58

LOW Emission Mask -1RB-low_offset



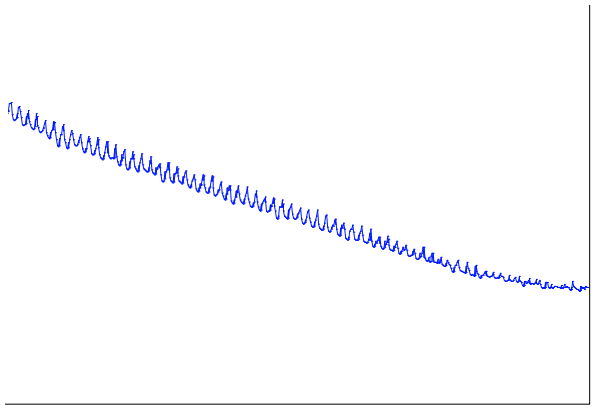
Date: 11.JUL.2019 10:49:20

OBW: 1RB-high_offset



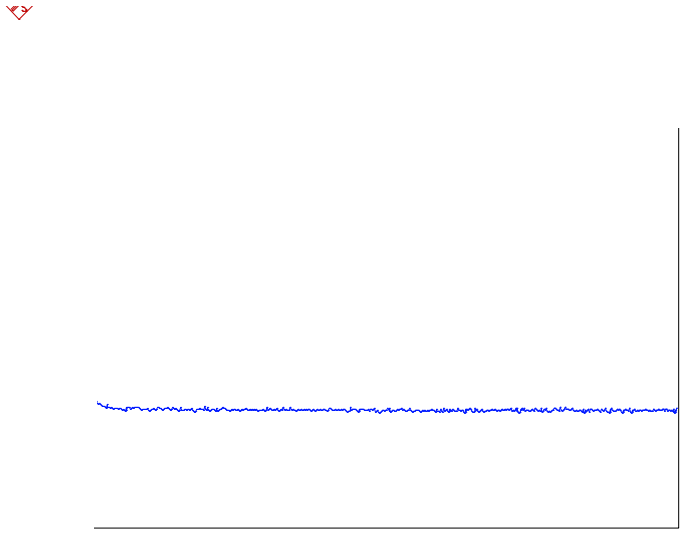
Date: 11.JUL.2019 10:51:35

HIGH BAND EDGE BLOCK-1RB-high_offset



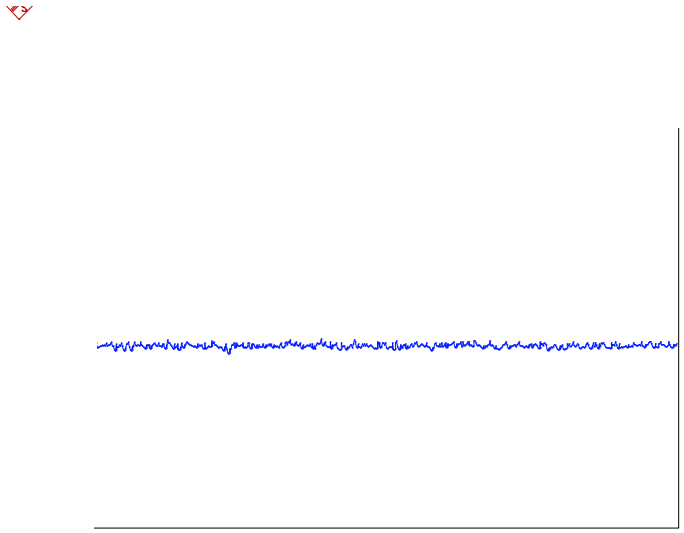
Date: 11.JUL.2019 10:52:00

HIGH Emission Mask -1RB-high_offset



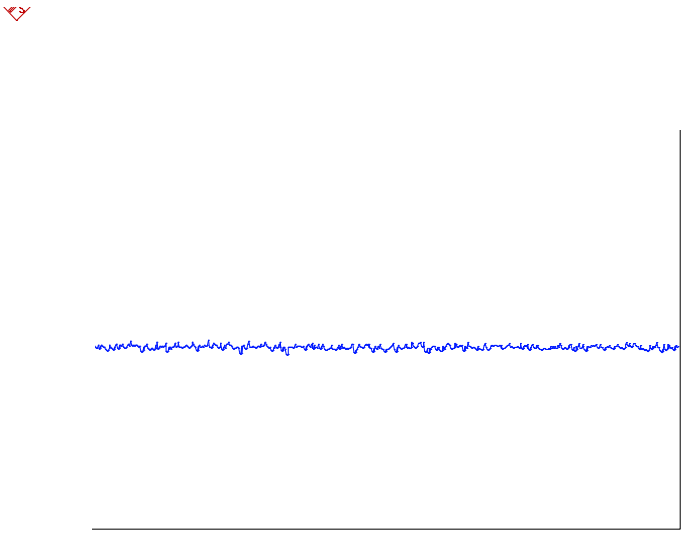
Date: 11.JUL.2019 10:53:12

LOW Emission Mask -10MHz-100%RB



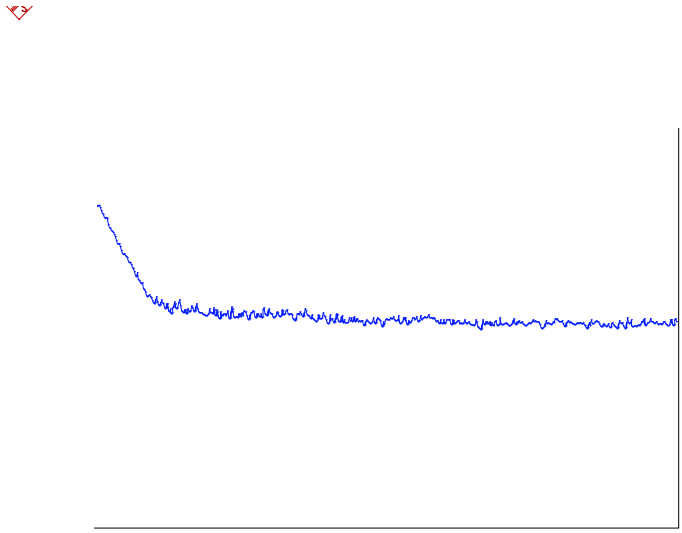
Date: 11.JUL.2019 10:49:57

LOW BAND EDGE BLOCK-10MHz-100%RB



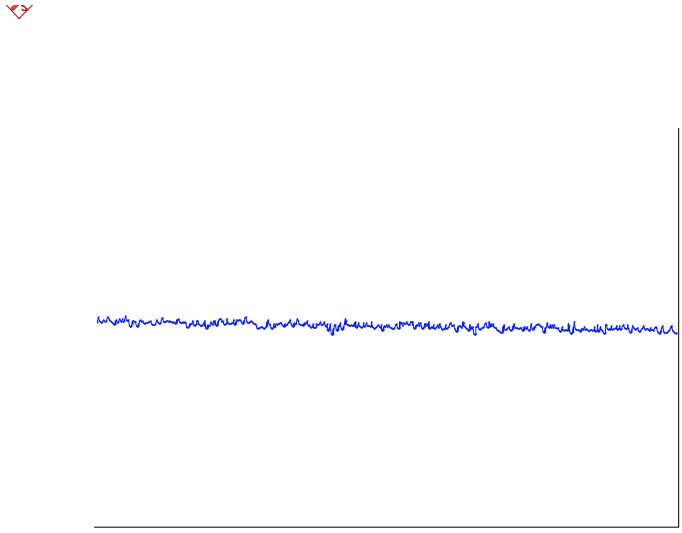
Date: 11.JUL.2019 10:50:16

HIGH Emission Mask -10MHz-100%RB



Date: 11.JUL.2019 10:53:41

HIGH BAND EDGE BLOCK-10MHz-100%RB



Date: 11.JUL.2019 10:53:58

A.6 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.

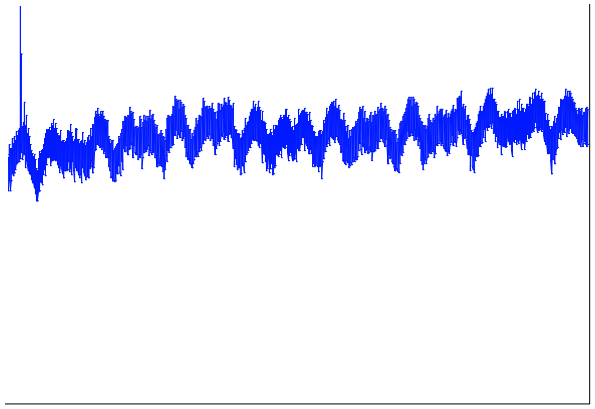
A. 7.2 Measurement Limit

Part 90.691 states that out-of-band emission requirement shall apply only to the ‘‘outer’’ channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:For any frequency removed from the EA licensee’s frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116\text{Log}_{10}(f/6.1)$ decibels or $50 + 10\ \text{Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz. For any frequency removed from the EA licensee’s frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\text{Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

A. 7.2 Measurement result

Only worst case result is given below

LTE band 26(814MHz~824MHz): 30MHz – 8.24GHz



Date: 11.JUL.2019 10:43:39

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).

2018-09-28 through 2019-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

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