FCC PART 24TEST REPORT

Part 22H Subpart E

Report Reference No.....:	HK1902130277-3E
FCC ID.....:	2APRD-CATM
Compiled by (position+printed name+signature)..:	File administrators Gary Qian
Supervised by (position+printed name+signature)..:	Technique principal Eden Hu
Approved by (position+printed name+signature)..:	Manager Jason Zhou
Date of issue.....:	Feb. 21, 2019

Testing Laboratory Name .....:	**Shenzhen HUAK Testing Technology Co., Ltd.**
Address .....:	1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen,China
Applicant's name.....:	**CHEP**
Address .....:	2901 Tasman Drive Suite 107 Santa Clara, CA 95054
Test specification .....**:**	
Standard .....:	**FCC CFR Title 47 Part 2, Part 22H** **EIA/TIA 603-D: 2010** **KDB 971168 D01**
TRF Originator.....:	Shenzhen HUAK Testing Technology Co., Ltd.

Test item description .....:	Container tracker
Trade Mark .....:	N/A
Manufacturer.....:	**iTraq Inc**
Model/Type reference.....:	ULTRA M CATM
Listed Models .....:	/
Modulation Type.....:	QPSK, BPSK
Rating .....:	DC 10.5V From Battery
Hardware version .....:	V2.0
Software version.....:	V2.0
Result.....:	**PASS**

TEST REPORT

Test Report No. :	HK1902130277-3E	Feb. 21, 2019 Date of issue

Equipment under Test	:	Container tracker
Model /Type	:	ULTRA M CATM
Listed Models	:	/
Applicant	:	**CHEP**
Address	:	2901 Tasman Drive Suite 107 Santa Clara, CA 95054
Manufacturer	:	**iTraq Inc**
Address	:	7554 185th Ave NE STE 200 Redmond Washington 98052

Test Result:	**PASS**

Revison History

Revision	Issue Date	Revisions	Revised By
V1.0	2019-02-21	Initial Issue	James Zhou

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

The tests were performed according to following standards:
FCC Part 22 : PUBLIC MOBILE SERVICES
TIA/EIA 603 D June 2010:Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
47 CFR FCC Part 15 Subpart B: - Unintentional Radiators
FCC Part 2: FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS
KDB971168 D01 v02r02: MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS
ANSI C63.4:2014: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Feb. 13, 2019
Testing commenced on	:	Feb. 13, 2019
Testing concluded on	:	Feb. 21, 2019

2.2 Product Description

Name of EUT	Container tracker
Model/Type reference:	ULTRA M CATM
List Model:	/
Power supply:	DC 10.5V From Battery
Adapter Information	N/A
Modilation Type	QPSK,BPSK
Antenna Type	Internal Antenna
Operation Frequency Band	NB-IoT eFDD5
Operation frequency	NB-IoT eFDD5: 824~849 MHz
LTE Release	R8
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	9.45VDC to 11.55VDC (nominal: 10.50VDC)

2.3 Equipment under Test

Power supply system utilised

Power supply voltage	:	○	120V/ 60 Hz	○	115V/60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 10.5V From Battery

2.4 Normal Accessory setting

Fully charged battery was used during the test.

2.5 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2APRD-CATM** filing to comply with FCC Part 22H, Rules.

2.7 Modifications

No modifications were implemented to meet testing criteria.

2.8 GeneralTest Conditions/Configurations

2.10.1 TestEnvironment

EnvironmentParameter	SelectedValuesDuringTests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	3.40V
	VN	3.70V
	VH	4.20V

NOTE:VL=lowerextreme testvoltageVN=nominalvoltage
VH=upperextreme testvoltageTN=normaltemperature

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
Add.:1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park,Heping Community, Fuhai Street, Bao'an District, Shenzhen, China

3.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3 Test Description

PCSBand (824~849 MHz)

Test Item	FCCRuleNo.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §22.913(a)(2)	EIRP ≤ 2W	Pass
Peak-AverageRatio	§24.232(d)	FCC:Limit≤13dB	compliance *
Modulation Characteristics	§2.1047	Digitalmodulation	compliance *
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	compliance *
Band Edges Compliance	§2.1051, §24.238	≤ -13dBm/1%*EBW, In1MHz band simmediately outside and adjacent to The frequency block.	compliance *
Spurious Emissionat AntennaTerminals	§2.1051, §24.238	≤-13dBm/1MHz, from 9kHz to10th harmonicsbut outside authorized Operating frequency ranges.	compliance *
Field Strength of Spurious Radiation	Clause 7of KDB971168 D01 v02r02	≤ -13dBm/1MHz.	Pass
Frequency Stability	§2.1055, §22.355, §24.235	FCC:with in authorized frequency block.	compliance *
NOTE 1: For the verdict, the " compliance *" denotes "not applicable", the "N/T" de notes "not tested". Test data refers to FCC ID:XPY2AGQN4NNN, and report number is:MDE_UBLOX_1708_FCCb_rev1.			

Remark:
1. The measurement uncertainty is not included in the test result.

3.4 Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	ENV216	R&S	HKE-059	2018/12/28	2019/12/27
LISN	R&S	ENV216	HKE-002	2018/12/28	2019/12/27
Broadband antenna	Schwarzbeck	VULB 9163	HKE-012	2017/12/27	2019/12/26
Receiver	R&S	ESCI 7	HKE-010	2018/12/28	2019/12/27
Spectrum analyzer	Agilent	N9020A	HKE-048	2018/12/28	2019/12/27
RF automatic control unit	Tonscend	JS0806-2	HKE-060	2018/12/28	2019/12/27
Horn antenna	Schwarzbeck	9120D	HKE-013	2017/12/27	2019/12/26
Loop antenna	Schwarzbeck	FMZB 1519 B	HKE-014	2017/12/27	2019/12/26
Preamplifier	EMCI	EMC051845SE	HKE-015	2018/12/28	2019/12/27
Preamplifier	Agilent	83051A	HKE-016	2018/12/28	2019/12/27
Temperature and humidity meter	Boyang	HTC-1	HKE-075	2018/12/28	2019/12/27
High pass filter unit	Tonscend	JS0806-F	HKE-055	2018/12/28	2019/12/27
RF cable	Times	1-40G	HKE-034	2018/12/28	2019/12/27
Power meter	Agilent	E4419B	HKE-085	2018/12/28	2019/12/27
Power Sensor	Agilent	E9300A	HKE-086	2018/12/28	2019/12/27
Wireless Communication Test Set	R&S	CMW500	HKE-026	2018/12/28	2019/12/27

4 TEST CONDITIONS AND RESULTS

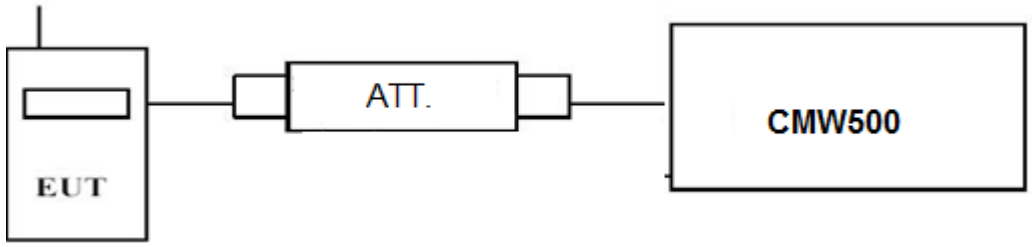
4.1 Output Power

4.1.1 Coducted Output Power

TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

TEST CONFIGURATION



TEST PROCEDURE

Conducted Power Measurement:

a) Place the EUT on a bench and set it in transmitting mode.
b) Connect a low loss RF cable from the antenna port to a CMW500 by an Att.
c) EUT Communicate with CMW500 then selects a channel for testing.
d) Add a correction factor to the display CMW500, and then test.

TEST RESULTS

compliance *

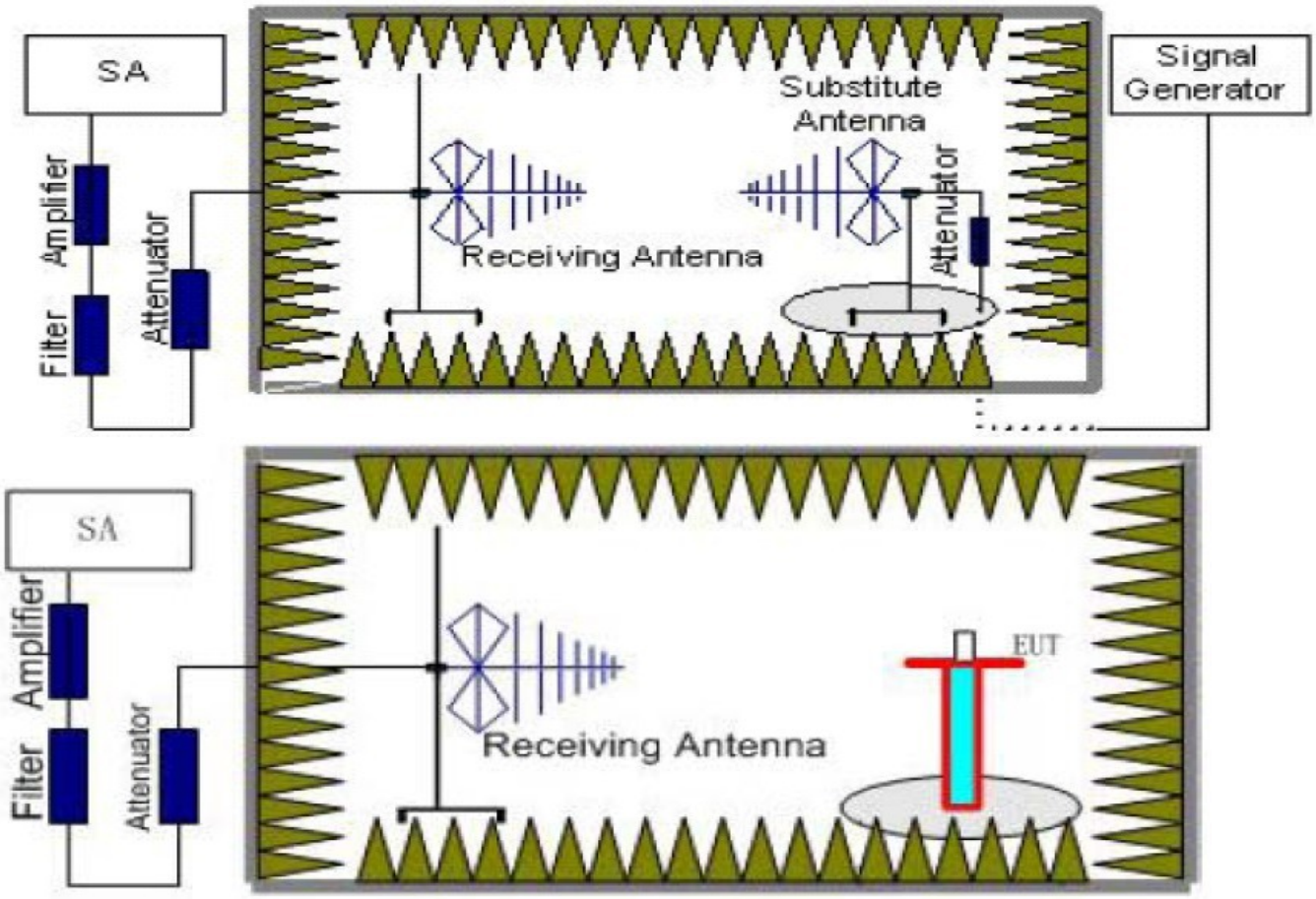
Note: Test data refers to FCC ID:XPY2AGQN4NNN, and report number is:MDE_UBLOX_1708_FCCb_rev1.

4.1.2. Radiated Output Power

LIMIT

This is the test for the maximum radiated power from the EUT.
Rule Part 22H.232(b) specifies, "Mobile/portable stations are limited to 7 watts e.i.r.p.

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 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 1.50m. 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. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna.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 isconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach 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.

5. A amplifier should be connected to the Signal Source output port. And the cable should be connect 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
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   Power(EIRP)=P_{Mea}- P_{cl}+ G_a
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST RESULTS

Radiated Measurement:

Radio Technology	Modulation Type	Reference Test Frequencies	Channel	Sub-carrier	RMS Conducted (dBm)	FCC EIRP Limit(W)
NB-IoT eFDD5	QPSK	Standalone	20401	12	22.35	7
NB-IoT eFDD5	QPSK	Standalone	20525	12	21.76	7
NB-IoT eFDD5	QPSK	Standalone	20649	12	22.52	7
NB-IoT eFDD5	QPSK	In-land	20406	12	21.82	7
NB-IoT eFDD5	QPSK	In-land	20460	12	21.93	7
NB-IoT eFDD5	QPSK	In-land	20469	12	21.77	7
NB-IoT eFDD5	QPSK	In-land	20516	12	21.87	7
NB-IoT eFDD5	QPSK	In-land	20535	12	22.05	7
NB-IoT eFDD5	QPSK	In-land	20544	12	21.74	7
NB-IoT eFDD5	QPSK	In-land	20644	12	22.02	7
NB-IoT eFDD5	QPSK	In-land	20610	12	22.13	7
NB-IoT eFDD5	QPSK	In-land	20619	12	21.76	7
NB-IoT eFDD5	BPSK	guard-band	20401	12	21.93	7
NB-IoT eFDD5	BPSK	guard-band	20501	12	21.74	7
NB-IoT eFDD5	BPSK	guard-band	20649	12	22.15	7
NB-IoT eFDD5	QPSK	Standalone	20401	6	21.72	7
NB-IoT eFDD5	QPSK	Standalone	20525	6	21.99	7
NB-IoT eFDD5	QPSK	Standalone	20649	6	21.72	7
NB-IoT eFDD5	QPSK	In-land	20406	6	21.73	7
NB-IoT eFDD5	QPSK	In-land	20460	6	22.16	7
NB-IoT eFDD5	QPSK	In-land	20469	6	22.02	7
NB-IoT eFDD5	QPSK	In-land	20516	6	22.07	7
NB-IoT eFDD5	QPSK	In-land	20535	6	22.15	7
NB-IoT eFDD5	QPSK	In-land	20544	6	21.82	7
NB-IoT eFDD5	QPSK	In-land	20644	6	22.09	7
NB-IoT eFDD5	QPSK	In-land	20610	6	22.05	7
NB-IoT eFDD5	QPSK	In-land	20619	6	21.76	7
NB-IoT eFDD5	BPSK	guard-band	20401	6	22.04	7
NB-IoT eFDD5	BPSK	guard-band	20501	6	22.07	7
NB-IoT eFDD5	BPSK	guard-band	20649	6	22.03	7
NB-IoT eFDD5	QPSK	Standalone	20401	3	21.94	7
NB-IoT eFDD5	QPSK	Standalone	20525	3	21.95	7
NB-IoT eFDD5	QPSK	Standalone	20649		22.16	7
NB-IoT eFDD5	QPSK	In-land	20406	3	22.08	7
NB-IoT eFDD5	QPSK	In-land	20460	3	22.05	7
NB-IoT eFDD5	QPSK	In-land	20469	3	21.78	7
NB-IoT eFDD5	QPSK	In-land	20516	3	21.71	7
NB-IoT eFDD5	QPSK	In-land	20535	3	22.10	7
NB-IoT eFDD5	QPSK	In-land	20544	3	21.74	7
NB-IoT eFDD5	QPSK	In-land	20644	3	21.95	7
NB-IoT eFDD5	QPSK	In-land	20610	3	22.01	7
NB-IoT eFDD5	QPSK	In-land	20619	3	22.04	7

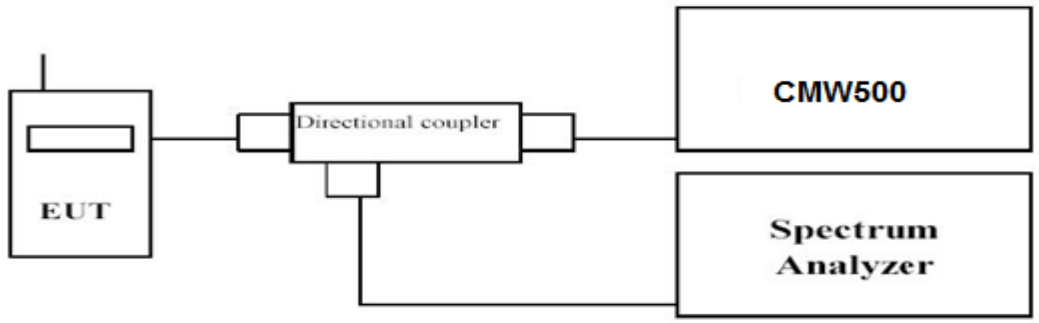
Radio Technology	Modulation Type	Reference Test Frequencies	Channel	Sub-carrier	RMS Conducted (dBm)	FCC EIRP Limit(W)
NB-IoT eFDD5	BPSK	guard-band	20401	3	21.93	7
NB-IoT eFDD5	BPSK	guard-band	20501	3	21.99	7
NB-IoT eFDD5	BPSK	guard-band	20649	3	21.93	7
NB-IoT eFDD5	QPSK	Standalone	20401	1	21.81	7
NB-IoT eFDD5	QPSK	Standalone	20525	1	22.03	7
NB-IoT eFDD5	QPSK	Standalone	20649	1	21.73	7
NB-IoT eFDD5	QPSK	In-land	20406	1	21.96	7
NB-IoT eFDD5	QPSK	In-land	20460	1	21.77	7
NB-IoT eFDD5	QPSK	In-land	20469	1	22.01	7
NB-IoT eFDD5	QPSK	In-land	20516	1	21.86	7
NB-IoT eFDD5	QPSK	In-land	20535	1	21.98	7
NB-IoT eFDD5	QPSK	In-land	20544	1	22.01	7
NB-IoT eFDD5	QPSK	In-land	20644	1	21.97	7
NB-IoT eFDD5	QPSK	In-land	20610	1	21.95	7
NB-IoT eFDD5	QPSK	In-land	20619	1	21.83	7
NB-IoT eFDD5	QPSK	guard-band	20401	1	21.99	7
NB-IoT eFDD5	QPSK	guard-band	20501	1	21.74	7
NB-IoT eFDD5	QPSK	guard-band	20649	1	21.85	7
NB-IoT eFDD5	BPSK	Standalone	20401	1	21.82	7
NB-IoT eFDD5	BPSK	Standalone	20525	1	21.94	7
NB-IoT eFDD5	BPSK	Standalone	20649	1	22.11	7
NB-IoT eFDD5	BPSK	In-land	20406	1	21.97	7
NB-IoT eFDD5	BPSK	In-land	20460	1	22.00	7
NB-IoT eFDD5	BPSK	In-land	20469	1	21.92	7
NB-IoT eFDD5	BPSK	In-land	20516	1	22.02	7
NB-IoT eFDD5	BPSK	In-land	20535	1	22.06	7
NB-IoT eFDD5	BPSK	In-land	20544	1	21.91	7
NB-IoT eFDD5	BPSK	In-land	20644	1	21.92	7
NB-IoT eFDD5	BPSK	In-land	20610	1	21.82	7
NB-IoT eFDD5	BPSK	In-land	20619	1	21.74	7
NB-IoT eFDD5	BPSK	guard-band	20401	1	21.86	7
NB-IoT eFDD5	BPSK	guard-band	20501	1	21.88	7
NB-IoT eFDD5	BPSK	guard-band	20649	1	21.91	7

4.2 Peak-to-Average Ratio (PAR)

LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
   1). for continuous transmissions, set to 1 ms,
   2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

TEST RESULTS

compliance *

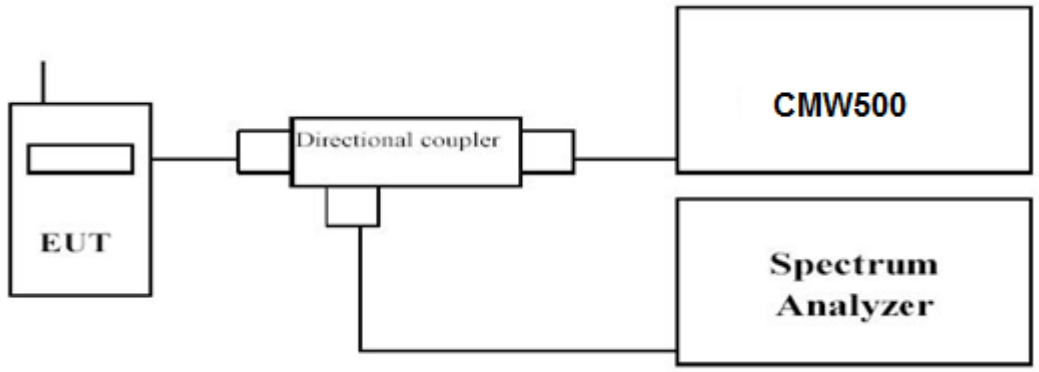
Note: Test data refers to FCC ID:XPY2AGQN4NNN, and report number is:MDE_UBLOX_1708_FCCb_rev1.

4.3 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and recorded.
Set RBWwas set to about 1% of emission BW, VBW≥3 times RBW.
-26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth isthe delta frequency between the two points where the display line intersects the signal trace.

TEST RESULTS

compliance *

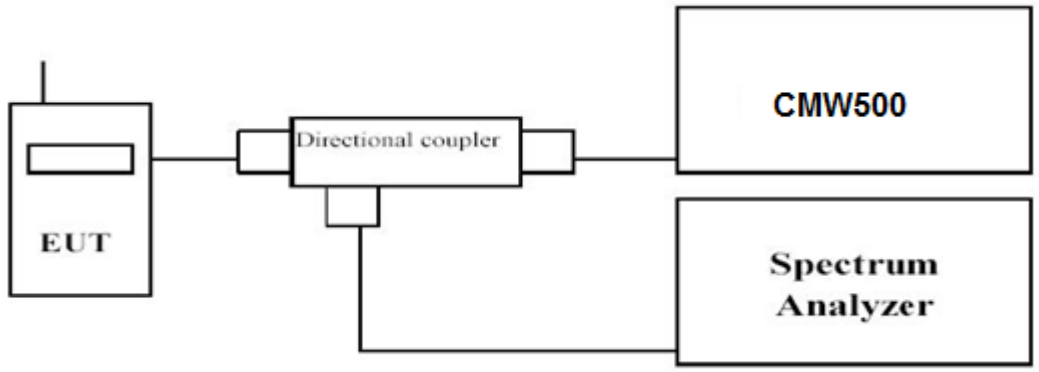
Note: Test data refers to FCC ID:XPY2AGQN4NNN, and report number is:MDE_UBLOX_1708_FCCb_rev1.

4.4 Band Edge compliance

LIMIT

Per FCC §24.238 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 + 10log(P) dB.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowestand highest channels for each band and different modulation.
5. Measure Band edge using RMS (Average) detector by spectrum

TEST RESULTS

compliance *

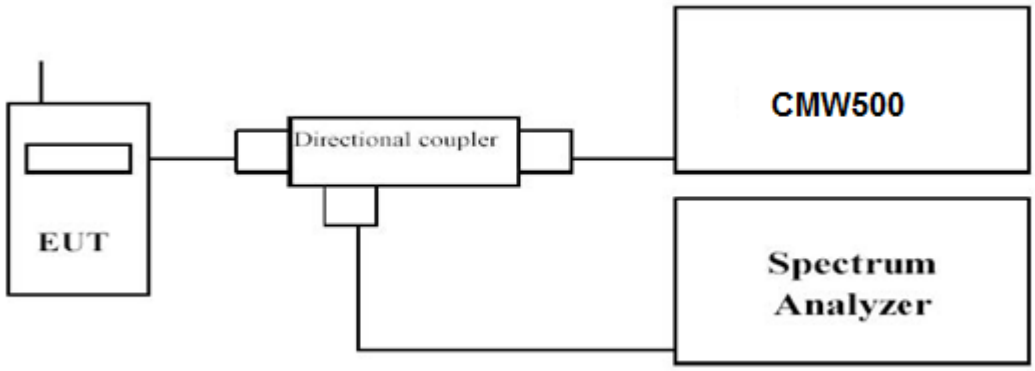
Note: Test data refers to FCC ID:XPY2AGQN4NNN, and report number is:MDE_UBLOX_1708_FCCb_rev1.

4.5 Spurious Emssion on Antenna Port

LIMIT

Per FCC §24.238, 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 + 10log(P) dB.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

a. Place the EUT on a bench and set it in transmitting mode.
b. Connect a low loss RF cable from the antenna port to a spectrum analyzer andCMW500 by a Directional Couple.
c. EUT Communicate with CMW500, then select a channel for testing.
d. Add a correction factor to the display of spectrum, and then test.
e. The resolution bandwidth of the spectrum analyzer was setsufficient scans were taken to show the out of band Emission if any up to10^{th} harmonic.
f. Please refer to following tables for test antenna conducted emissions.

Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 5	0.01~20	1 MHz	3 MHz	Auto

TEST RESULTS

compliance *

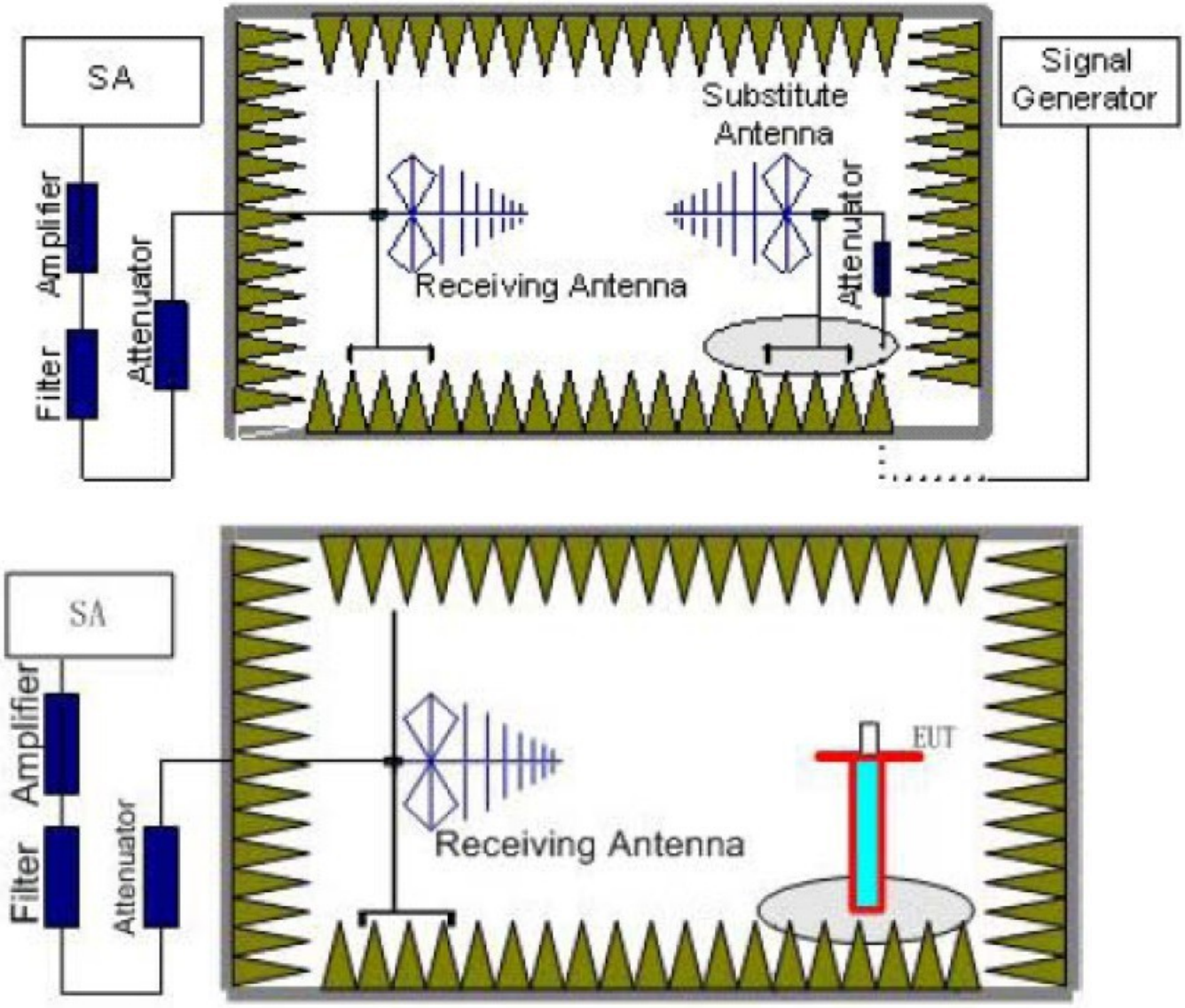
Note: Test data refers to FCC ID:XPY2AGQN4NNN, and report number is:MDE_UBLOX_1708_FCCb_rev1.

4.6 Radiated Spurious Emssion

TEST APPLICABLE

Per FCC §24.238, 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 + 10log(P) dB.

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 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 1.50m. 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. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna.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 isconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach 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.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect 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
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.
8. In order to make sure test results more clearly,we set frequency range and sweep time for difference frequency range as follows table:

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
NB-IoT eFDD5	0.03~1	100KHz	300KHz	10
	1~20	1 MHz	3 MHz	2

TEST LIMITS

According to 24.238 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.

Frequency	Channel	Frequency Range	Verdict
NB-IoT eFDD5	Low	30MHz -20GHz	PASS
	Middle	30MHz -20GHz	PASS
	High	30MHz -20GHz	PASS

Radiated Measurement:

Remark:
1. *We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT eFDD5; recorded worst case for each Channel Bandwidth of NB-IoT eFDD5.*
2. EIRP=P_{Mea}(dBm)-P_{cl}(dB) +G_a(dBi)
3. Not recorded other points as values lower than limits.
4. Margin = Limit – EIRP

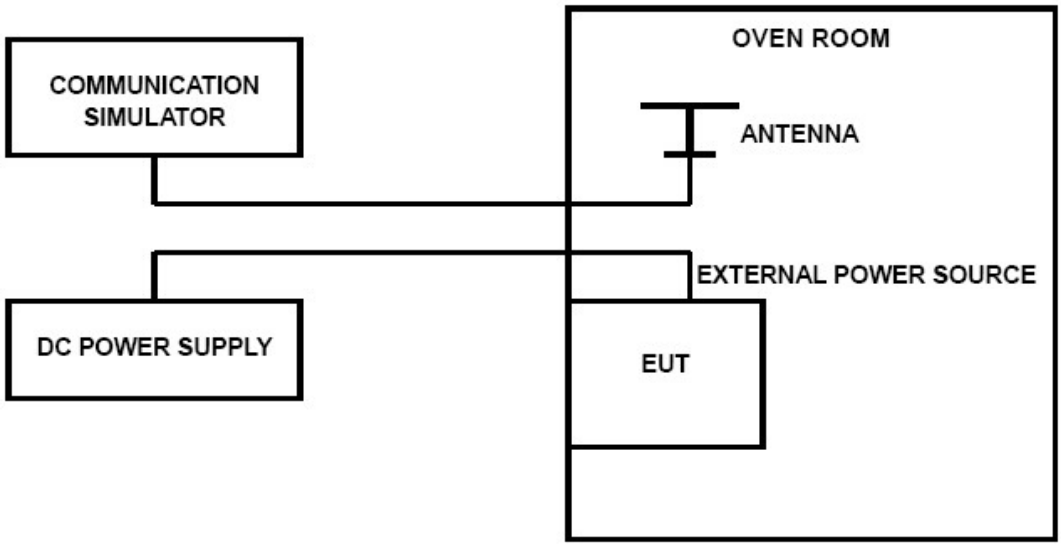
Radio Technology	Channel	Detector	Trace	Resolution Bandwidth /kHz	Frequency /MHz	Max Value /dBm	Limit /dBm	Margin to Limit /dB
eFDD 5 QPSK NB-IoT	low	peak	maxhold	5	823.98	-19.57	-13	6.57
eFDD 5 QPSK NB-IoT	mid	peak	maxhold	-	-	-	-13	>20
eFDD 5 QPSK NB-IoT	high	peak	maxhold	5	849.00	-25.25	-13	12.25

4.7 Frequency Stability

LIMIT

According to §24.235, §2.1055 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

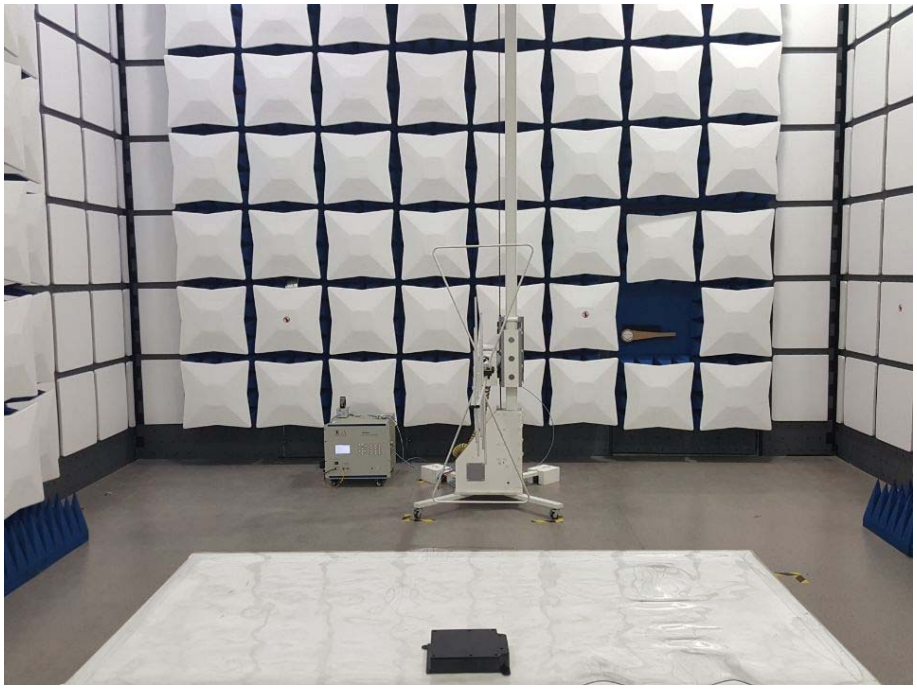
Frequency Stability Under Temperature Variations:
In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.
1. Measure the carrier frequency 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 Band 5, 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 centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃ increments from +50℃ to -30℃. 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.
Frequency Stability Under Voltage Variations:
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, recordthe maximum frequency change.

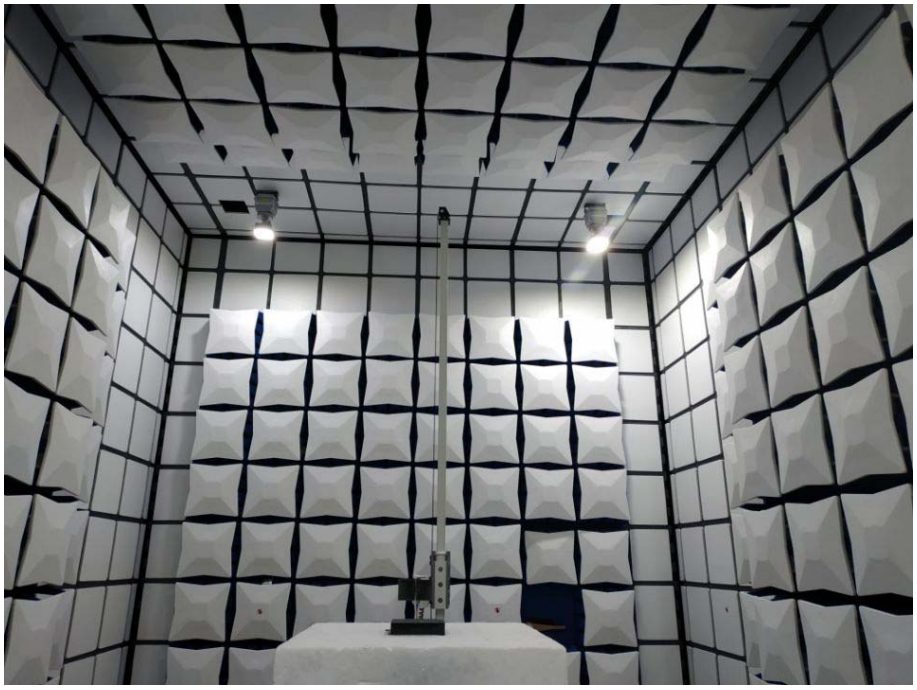
TEST RESULTS

compliance *

Note: Test data refers to FCC ID:XPY2AGQN4NNN, and report number is:MDE_UBLOX_1708_FCCb_rev1.

5 Test Setup Photos of the EUT





**********End of Report**********