FCC TEST REPORT

For

PPA-Electronics b.v.b.a

Dockmate TWIST (wireless remote control)

Test Model: TWIST

Prepared for	:	PPA-Electronics b.v.b.a
Address	:	FAID'HERBESTRAAT 3A, MECHELEN, 2800, Belgium
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Shajing Street, Bao'an District, Shenzhen, Guangdong, China
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Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	November 17, 2020
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	November 17, 2020 ~ December 31, 2020
Date of Report	:	December 31, 2020

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FCC TEST REPORT
FCC CFR 47 PART 15C(15.231)

Report Reference No.	**:**	**LCS201117007AEA**
Date of Issue	:	December 31, 2020
Testing Laboratory Name..... :		**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Shajing Street, Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name ..... :		**PPA-Electronics b.v.b.a**
Address	:	FAID'HERBESTRAAT 3A, MECHELEN, 2800, Belgium
Test Specification		
Standard	:	FCC CFR 47 PART 15 Subpart C
Test Report Form No.	:	LCSEMC-1.0
TRF Originator	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2011-03

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Test Item Description. ..... :		**Dockmate TWIST (wireless remote control)**
Trade Mark	:	Dockmate
Test Model	:	TWIST
Ratings	:	DC 3.7V by Battery(350mAh) Recharged By DC 5V 1A
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Lh Li	Jin Wang	Gavin Liang
Lh Li/ Administrators	Jin Wang/ Technique principal	Gavin Liang/ Manager

FCC TEST REPORT

Test Report No. : **LCS201117007AEA**	December 31, 2020 Date of issue

Test Mode.....	: TWIST
EUT.....	: Dockmate TWIST (wireless remote control)
Applicant.....	**: PPA-Electronics b.v.b.a**
Address.....	: FAID'HERBESTRAAT 3A, MECHELEN, 2800, Belgium
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: PPA-Electronics b.v.b.a**
Address.....	: FAID'HERBESTRAAT 3A, MECHELEN, 2800, Belgium
Telephone.....	: /
Fax.....	: /
Factory.....	**: PPA-Electronics b.v.b.a**
Address.....	: FAID'HERBESTRAAT 3A, MECHELEN, 2800, Belgium
Telephone.....	: /
Fax.....	: /

Test Result	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	December 31, 2020	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Dockmate TWIST (wireless remote control)
Test Model	:	TWIST
Hardware version	:	rev.F
Software version	:	v1.00
Power Supply	:	DC 3.7V by Battery(350mAh) Recharged By DC 5V 1A
Remote		
Transmit Frequency	:	433.081MHz - 434.757MHz
Number of Channels	:	64
Channel Space	:	26.184kHz
Modulation Type	:	GFSK
Antenna Description	:	Internal Antenna, 0dBi

1.2. Objective

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC
Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

1.3. Environmental Conditions

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

- Temperature: 15-35ºC

- Humidity: 30-60 %

- Atmospheric pressure: 86-106kPa

1.4. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
--	--	--	--	--

1.5. External I/O Port

I/O Port Description	Quantity	Cable
--	--	--

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1.6. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.7. Statement of The Measurement Uncertainty

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	3.10dB	(1)
		30MHz~200MHz	2.96dB	(1)
		200MHz~1000MHz	3.10dB	(1)
		1GHz~26.5GHz	3.80dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	1.63dB	(1)
Power disturbance	:	30MHz~300MHz	1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10: 2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the normal operating mode. The TX frequency that was fixed which was for the purpose of the measurements.
According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.231 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions (Not Applicable)

According to the requirements in Section 6.2 of ANSI C63.10: 2013, AC power-line conducted emissions shall be measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table and the turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10: 2013.

2.4. Instrument Calibration

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

2.5. Test Mode

The EUT has been tested under engineering mode. The field strength of radiation emission was measured in the following position: EUT stand-up position (Y axis), lie-down position (X, Z axis).

The worst case of X axis was reported.

Press the button on the EUT can transmit 433.081MHz (Low Channel), 433.92MHz (Mid Channel) or 434.757 MHz(High Channel) control signal. Only recorded the worst test case in this report.

***Note: Using a temporary antenna connector for the EUT when conducted measurements are performed.

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3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmit condition.

3.2. EUT Exercise Software

N/A

3.3. Special Accessories

N/A

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

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4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C: §15.231		
FCC Rules	**Description of Test**	**Result**
§15.231 (b)	Field Strength of Fundamental and Harmonics	Compliant
§15.231 (c)	20dB Bandwidth	Compliant
§15.231 (a)(1)	Transmission Cease Time	Compliant
§15.231	Duty cycle Factor	Compliant
§15.207	AC line conducted	N/A*

N/A* - Not Applicable

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5. TEST ITEMS AND RESULTS

5.1. Transmission Cease Time

5.1.1. Limit

According to §15.231 (a)

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

5.1.2. Test Procedure

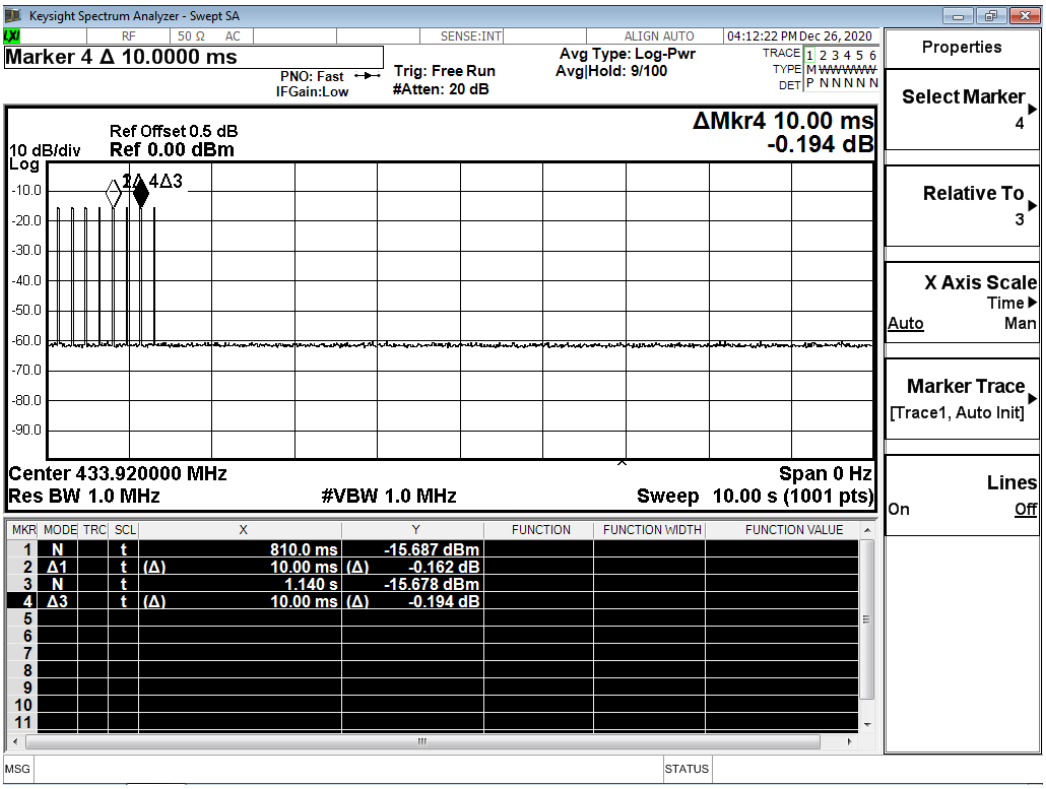
Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations. The antenna was all opened.

5.1.3. Test Results

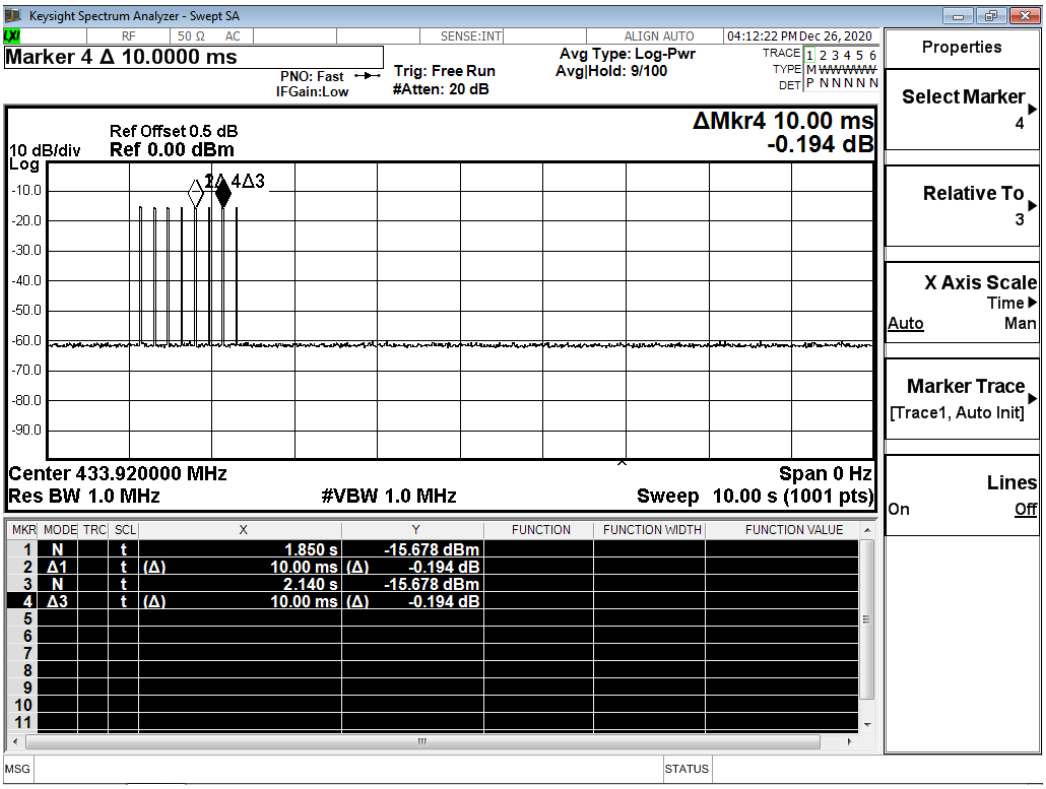
Temperature	23.5℃	Humidity	52.1%
Test Engineer	Ken He		

Frequency (MHz)	Transmission cease Time (s)	Limit: not more than 5 seconds of being released (s)	Conclusion
433.081	0.08	5	PASS
433.92	0.08	5	PASS
434.757	0.08	5	PASS

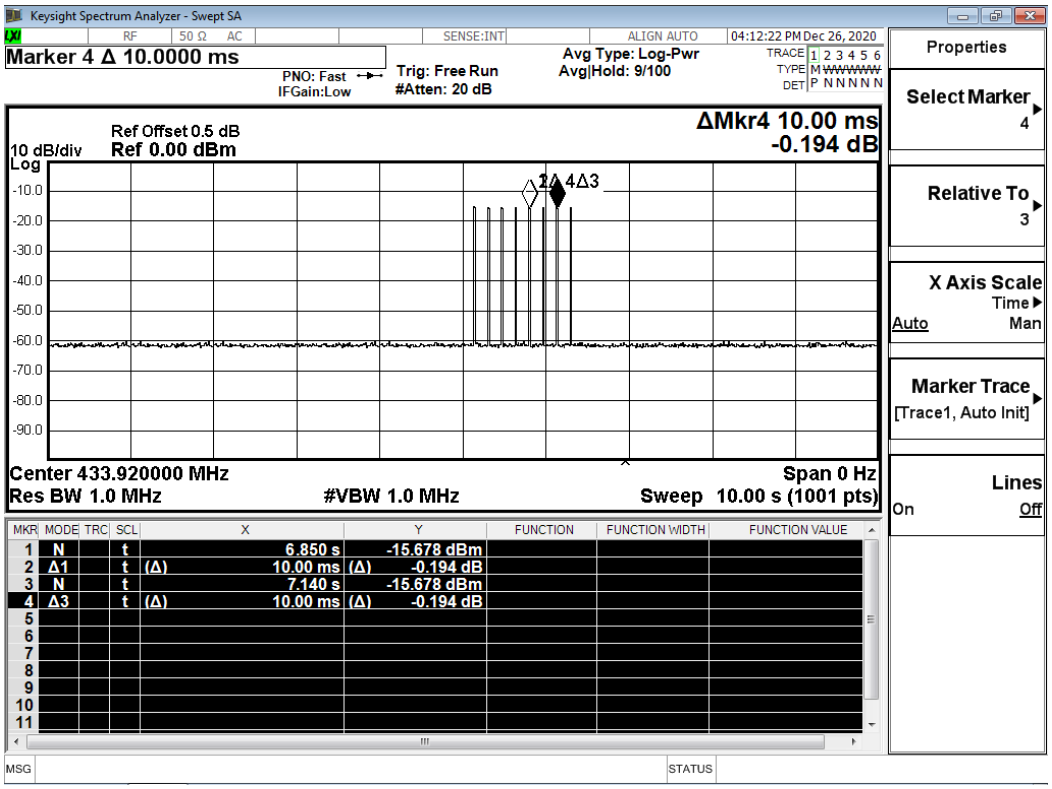
433.081MHz (Low Channel)



433.92MHz (Mid Channel)



434.757MHz (High Channel)



5.2. Transmitter Field Strength of Emissions

5.2.1. Limit

According to §15.231 (b): In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.
(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.
(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.5.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.2.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.5 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

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Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

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3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height is 1.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum found antenna polarisation and turntable position of the premeasurement the software maximizes the peaks by rotating the turntable position (0° to 360°). This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps). This procedure is repeated for both antenna polarisations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

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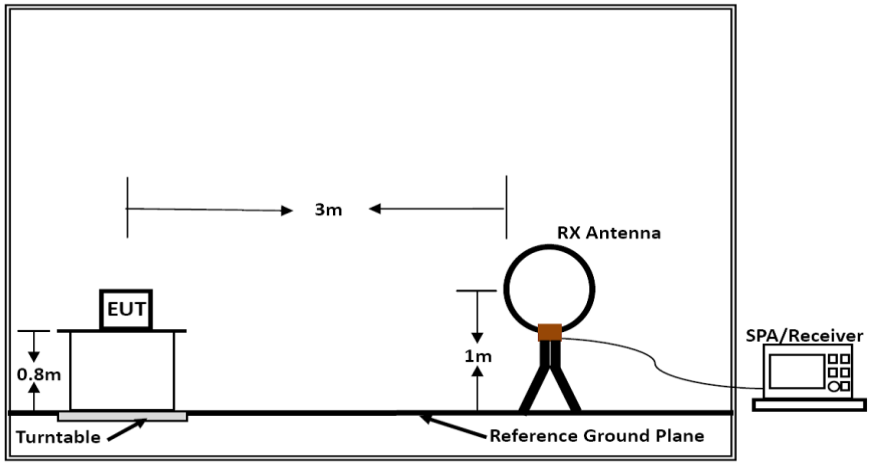
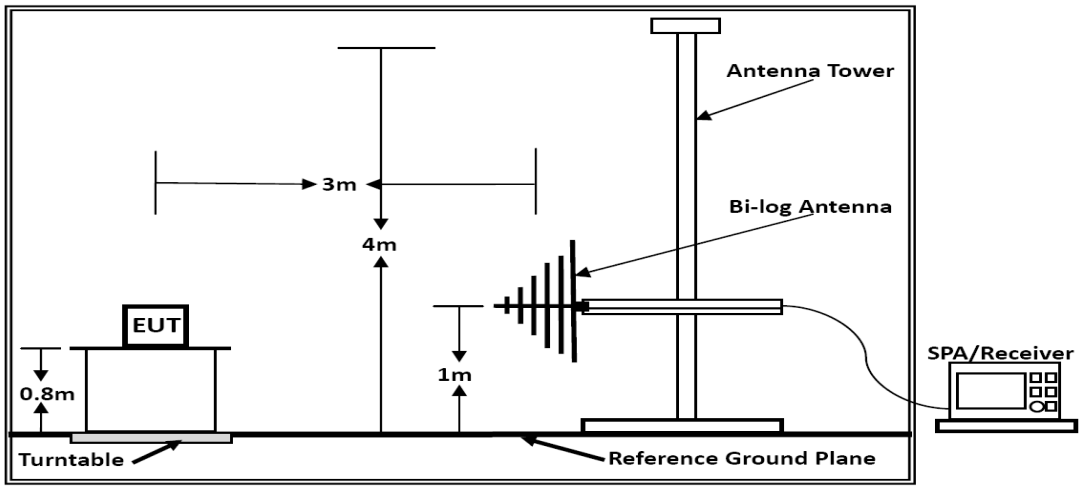
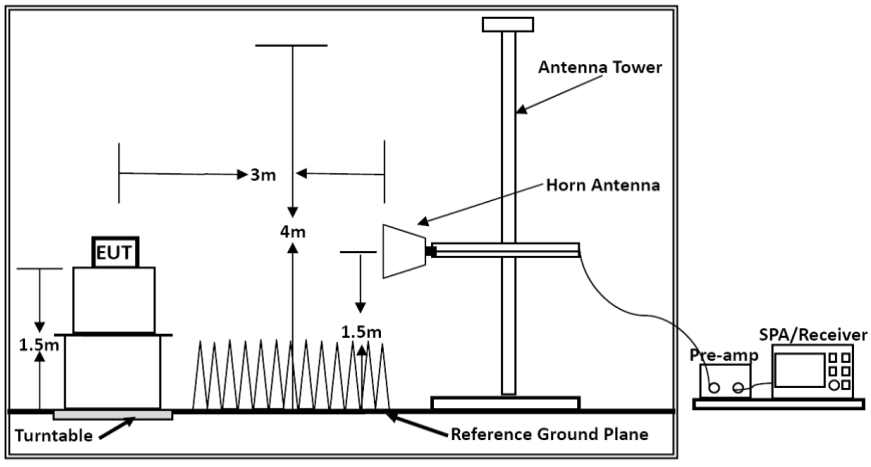
5.2.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Results of Radiated Emissions (9 KHz~30 MHz)

The low frequency, which started from 9 KHz to 30 MHz, was pre-scan and the result was 20dB lower than the limit line per 15.31(o) was not reported.

Note: Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

5.2.7. Results of Radiated Emissions (30MHz~1GHz)

Remark:

1. Level = Reading + Factor

Margin = Level - Limit

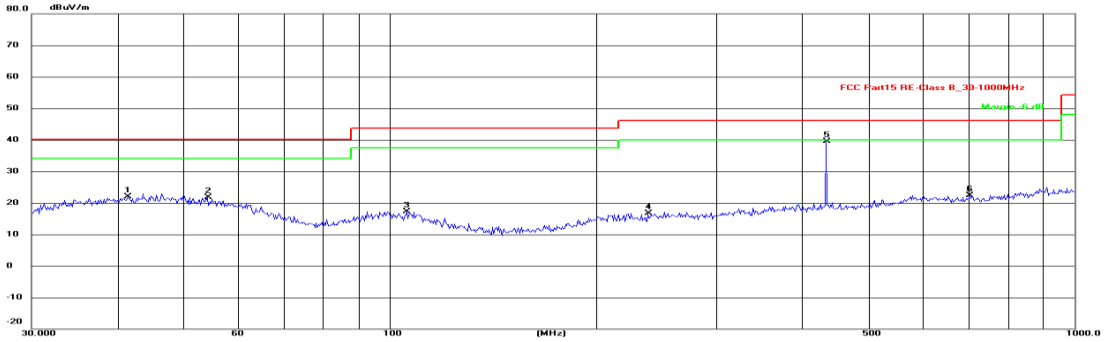
2. Average values = Peak + DC Factor

Margin = Average values – Limit

3. As the second harmonic of the EUT is too low and lower than the background Radiated Emissions, its frequency is not expressed, so 'Harmonics' is used instead.

Temperature	24.6℃	Humidity	54.1%
Test Engineer	Ken He	Test Mode	Tx(433.081MHz)

Horizontal

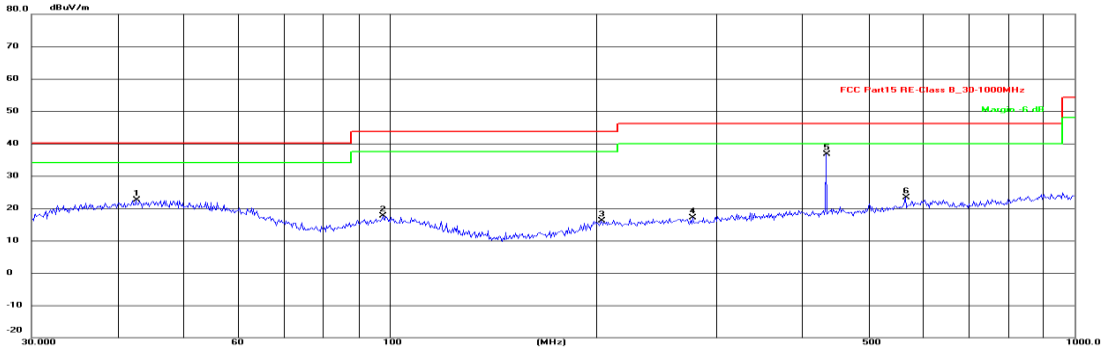


Limit:	**FCC Part15 RE-Class B_30-1000MHz**	**Antenna::Horizontal**	**Temperature(C):24.6(C)**
Power Rating:	**DC 3.7V**		**Humidity(%):54.1%**

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	41.5670	50.73	-28.73	22.00	40.00	-18.00	QP
2	54.2610	50.53	-28.73	21.80	40.00	-18.20	QP
3	106.0126	47.59	-30.39	17.20	43.50	-26.30	QP
4	238.3102	45.50	-28.74	16.76	46.00	-29.24	QP
5 *	433.0800	64.12	-24.51	39.61	46.00	-6.39	QP
6	866.1600	43.71	-21.27	22.44	46.00	-23.56	QP

Fundamental and Harmonics Average Result						
Frequency (MHz)	Peak Level (dBμV/m)	AV Factor(dBμV/m) (see Section 5.4)	Average Level (dBμV/m)	Limit(dBμV/m) (average)	Margin(dB)	Conclusion
433.08	39.61	-11.43	28.18	80.82	-52.64	PASS
Harmonics	22.44	-11.43	11.01	60.82	-49.81	PASS

Vertical



Limit:	**FCC Part15 RE-Class B_30-1000MHz**	**Antenna::Vertical**	**Temperature(C):24.6(C)**
Power Rating:	**DC 3.7V**		**Humidity(%):54.1%**

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	42.6000	51.14	-28.56	22.58	40.00	-17.42	QP
2	97.7983	48.19	-30.51	17.68	43.50	-25.82	QP
3	203.5228	46.08	-29.86	16.22	43.50	-27.28	QP
4	277.0935	44.85	-27.82	17.03	46.00	-28.97	QP
5 *	433.0800	61.30	-24.51	36.79	46.00	-9.21	QP
6	866.1600	45.16	-21.90	23.26	46.00	-22.74	QP

Fundamental and Harmonics Average Result						
Frequency (MHz)	Peak Level (dBμV/m)	AV Factor(dBμV/m) (see Section 5.4)	Average Level (dBμV/m)	Limit(dBμV/m) (average)	Margin(dB)	Conclusion
433.08	36.79	-11.43	25.36	80.82	-55.46	PASS
Harmonics	23.26	-11.43	11.83	60.82	-48.99	PASS

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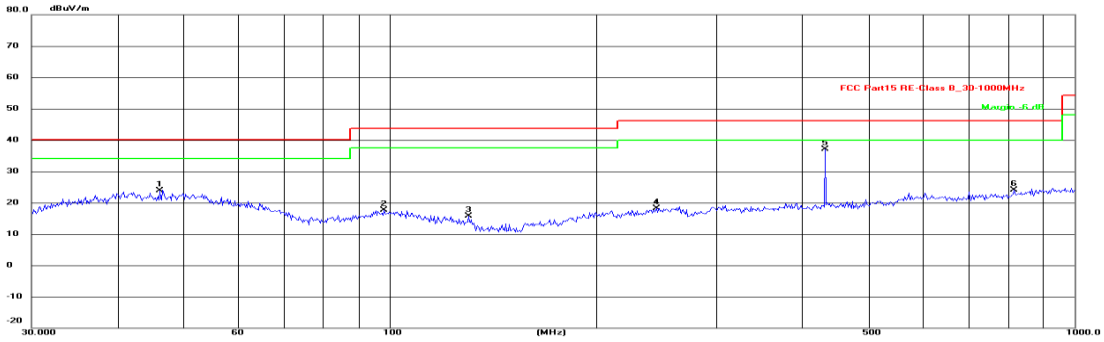
Temperature	24.6℃	Humidity	54.1%
Test Engineer	Ken He	Test Mode	Tx(433.92MHz)

Horizontal

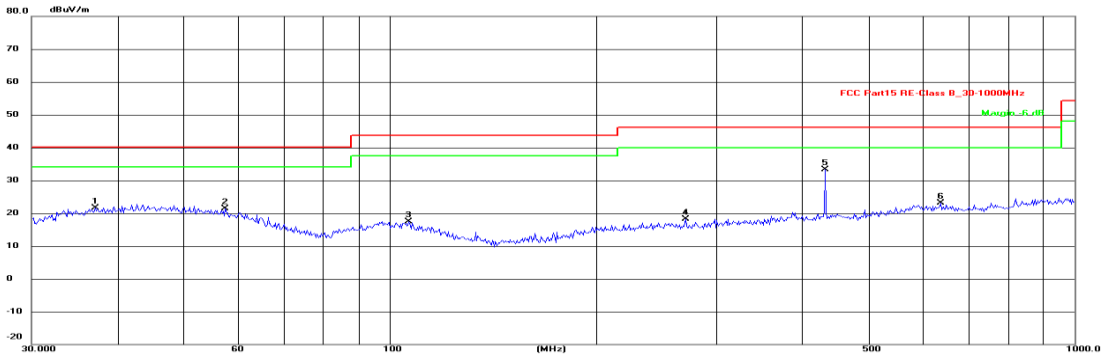


Limit: FCC Part15 RE-Class B_30-1000MHz **Antenna::Horizontal** **Temperature(C):24.6(C)**
Power Rating: DC 3.7V **Humidity(%):54.1%**

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	46.1779	52.05	-28.19	23.86	40.00	-16.14	QP
2	98.1418	48.06	-30.45	17.61	43.50	-25.89	QP
3	130.3788	49.51	-33.70	15.81	43.50	-27.69	QP
4	245.0900	46.80	-28.52	18.28	46.00	-27.72	QP
5 *	433.9200	61.67	-24.53	37.14	46.00	-8.86	QP
6	867.8400	43.94	-19.93	24.01	46.00	-21.99	QP

Fundamental and Harmonics Average Result						
Frequency (MHz)	Peak Level (dBμV/m)	AV Factor(dBμV/m) (see Section 5.4)	Average Level (dBμV/m)	Limit(dBμV/m) (average)	Margin(dB)	Conclusion
433.92	37.14	-11.43	25.71	80.82	-55.11	PASS
Harmonics	24.01	-11.43	12.58	60.82	-48.24	PASS

Vertical



Limit: FCC Part15 RE-Class B_30-1000MHz **Antenna::Vertical** **Temperature(C):24.6(C)**
Power Rating: DC 3.7V **Humidity(%):54.1%**

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	37.1548	51.29	-29.65	21.64	40.00	-18.36	QP
2	57.5938	50.63	-29.15	21.48	40.00	-18.52	QP
3	106.7587	47.89	-30.43	17.46	43.50	-26.04	QP
4	270.3747	46.14	-27.95	18.19	46.00	-27.81	QP
5 *	433.9200	57.77	-24.53	33.24	46.00	-12.76	QP
6	867.8400	44.16	-21.12	23.04	46.00	-22.96	QP

Fundamental and Harmonics Average Result						
Frequency (MHz)	Peak Level (dBμV/m)	AV Factor(dBμV/m) (see Section 5.4)	Average Level (dBμV/m)	Limit(dBμV/m) (average)	Margin(dB)	Conclusion
433.92	33.24	-11.43	21.81	80.82	-59.01	PASS
Harmonics	23.04	-11.43	11.61	60.82	-49.21	PASS

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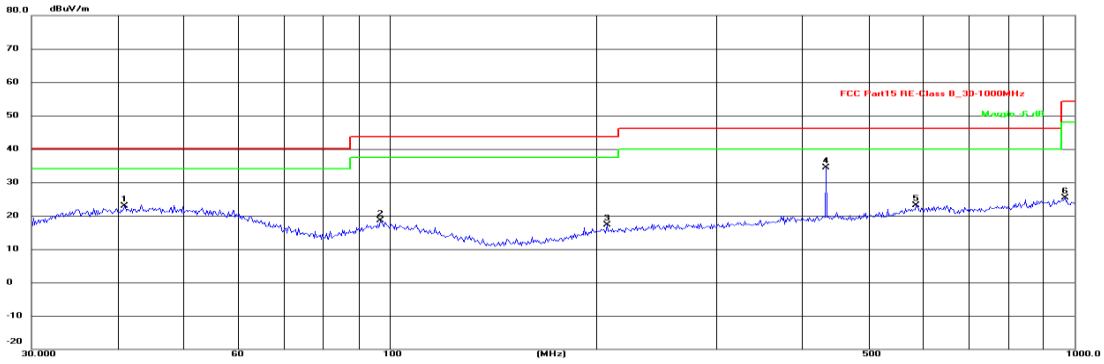
Temperature	24.6℃	Humidity	54.1%
Test Engineer	Ken He	Test Mode	Tx(434.757MHz)

Horizontal

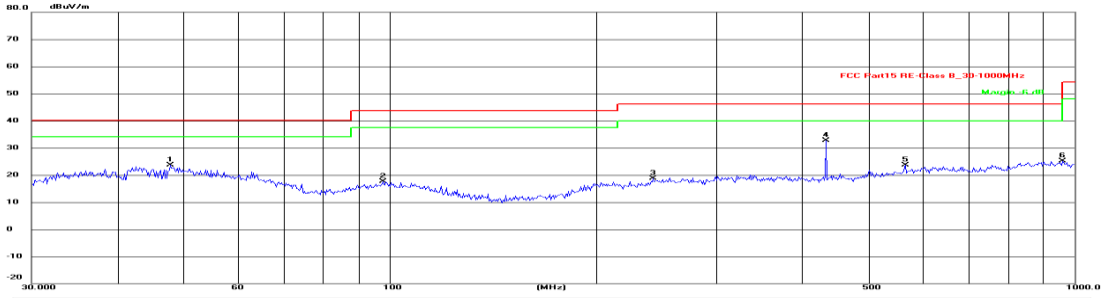


Limit:	**FCC Part15 RE-Class B_30-1000MHz**	**Antenna::Horizontal**	**Temperature(C):24.6(C)**
Power Rating:	**DC 3.7V**		**Humidity(%):54.1%**

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	40.9879	51.81	-28.82	22.99	40.00	-17.01	QP
2	97.1148	49.28	-30.64	18.64	43.50	-24.86	QP
3	207.8500	47.02	-29.72	17.30	43.50	-26.20	QP
4 *	434.7600	59.02	-24.51	34.51	46.00	-11.49	QP
5	869.5200	44.44	-21.34	23.10	46.00	-22.90	QP
6	968.9337	43.86	-18.41	25.45	54.00	-28.55	QP

Fundamental and Harmonics Average Result						
Frequency (MHz)	Peak Level (dBμV/m)	AV Factor(dBμV/m) (see Section 5.4)	Average Level (dBμV/m)	Limit(dBμV/m) (average)	Margin(dB)	Conclusion
434.76	34.51	-11.43	23.08	80.82	-57.74	PASS
Harmonics	25.45	-11.43	14.02	60.82	-46.80	PASS

Vertical



Limit:	**FCC Part15 RE-Class B_30-1000MHz**	**Antenna::Vertical**	**Temperature(C):24.6(C)**
Power Rating:	**DC 3.7V**		**Humidity(%):54.1%**

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	47.8260	51.78	-28.19	23.59	40.00	-16.41	QP
2	97.7980	48.19	-30.51	17.68	43.50	-25.82	QP
3	242.5252	47.38	-28.59	18.79	46.00	-27.21	QP
4 *	434.7600	57.30	-24.51	32.79	46.00	-13.21	QP
5	869.5200	45.66	-21.90	23.76	46.00	-22.24	QP
6	962.1621	43.67	-18.45	25.22	54.00	-28.78	QP

Fundamental and Harmonics Average Result						
Frequency (MHz)	Peak Level (dBμV/m)	AV Factor(dBμV/m) (see Section 5.4)	Average Level (dBμV/m)	Limit(dBμV/m) (average)	Margin(dB)	Conclusion
434.76	32.79	-11.43	21.36	80.82	-59.46	PASS
Harmonics	25.22	-11.43	13.79	60.82	-47.03	PASS

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5.2.8. Results of Radiated Emissions (1-5GHz)

Temperature	24.6℃	Humidity	54.1%
Test Engineer	Ken He	Test Mode	Tx

Peak Value				
Frequency (MHz)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1300.24	43.80	74.00	-30.08	Horizontal
1735.36	40.77	74.00	-33.24	Horizontal
2168.78	38.50	74.00	-33.47	Horizontal
1299.24	44.06	74.00	-28.51	Vertical
1737.54	35.64	74.00	-39.47	Vertical
2170.63	39.34	74.00	-34.04	Vertical

Average Value:						
Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Margin (dB)	Polarization
1300.24	43.80	-11.43	32.37	54.00	-21.63	Horizontal
1735.36	40.77	-11.43	29.34	54.00	-24.66	Horizontal
2168.78	38.50	-11.43	27.07	54.00	-26.93	Horizontal
1299.24	44.06	-11.43	32.63	54.00	-21.37	Vertical
1737.54	35.64	-11.43	24.21	54.00	-29.79	Vertical
2170.63	39.34	-11.43	27.91	54.00	-26.09	Vertical

Remark:

1. Measuring frequencies from 9 KHz~10th harmonic (ex. 5GHz), No emission found between lowest internal used/generated frequency to 30MHz.

2. Radiated emissions measured in frequency range from 9 KHz~10th harmonic (ex. 5GHz) were made with an instrument using Peak detector mode.

3. Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4. Average values = Peak values + DC Factor;

5. Margin = Values – Limit;

5.3. AC Power Line Conducted Emissions (Not Applicable)

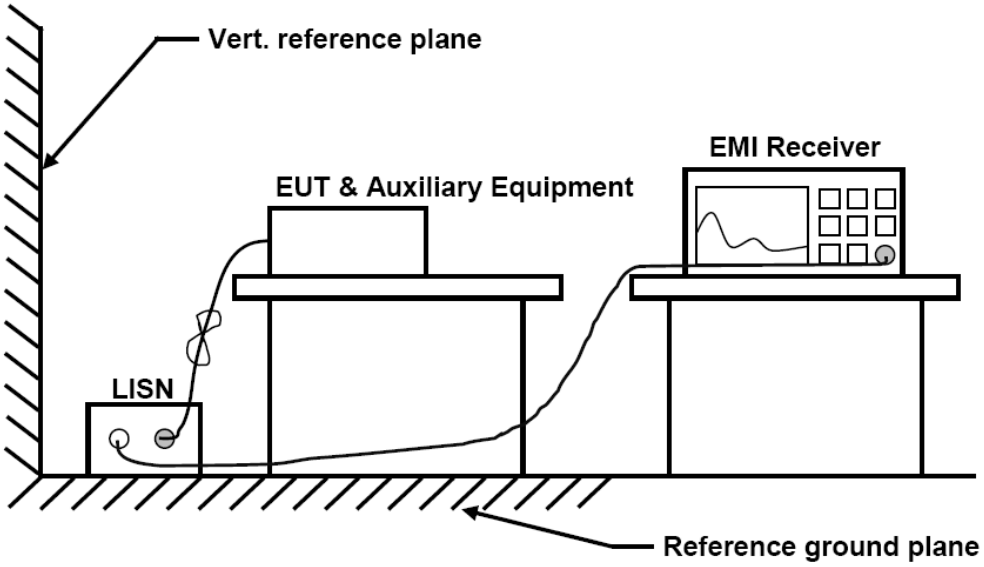
5.3.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.3.2 Block Diagram of Test Setup



5.3.3 Test Results

Not Applicable!!

The device was powered by built-in Battery!

5.4. 20dB Bandwidth Emissions

5.4.1. Limit

The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.4.2. Test Procedure

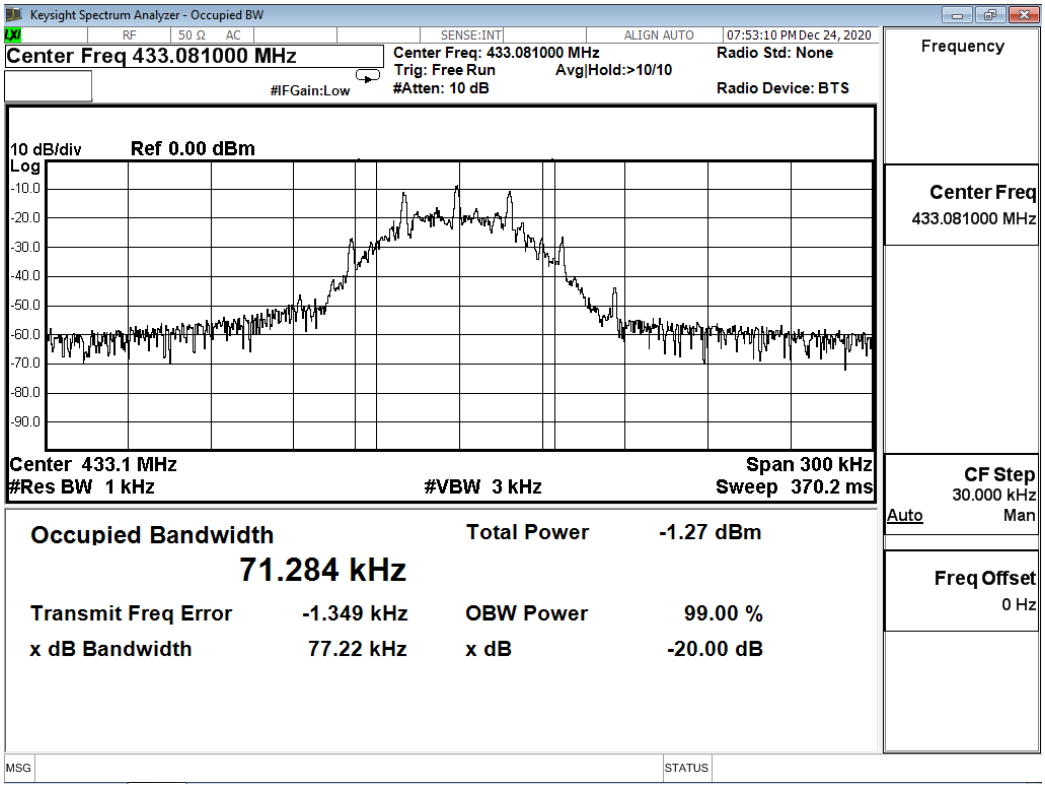
With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyser with the START and STOP frequencies set to the EUT's operation band.

5.4.3. Test Data

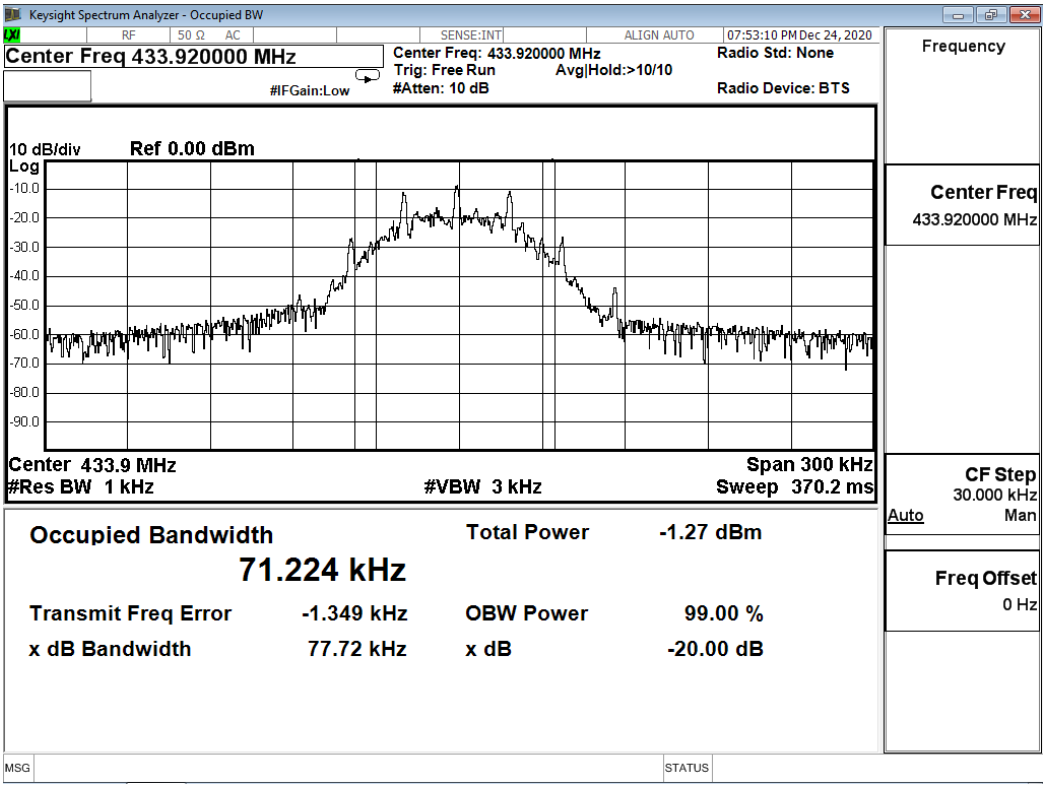
Temperature	23.5℃	Humidity	52.1%
Test Engineer	Ken He	Test Mode	TX

Transmit Frequency (MHz)	Limit (kHz)	20dB Bandwidth (kHz)	Result
433.081	1084.80	77.22	PASS
433.92	1084.80	77.72	PASS
434.757	1084.80	77.77	PASS
Maximum allowed bandwidth:	☒0.25% of the centre operating frequency ☐0.5% of the centre operating frequency		
RBW: VBW:	☐10kHz ☐100kHz ☒other kHz ☐30kHz ☐300kHz ☒other kHz		

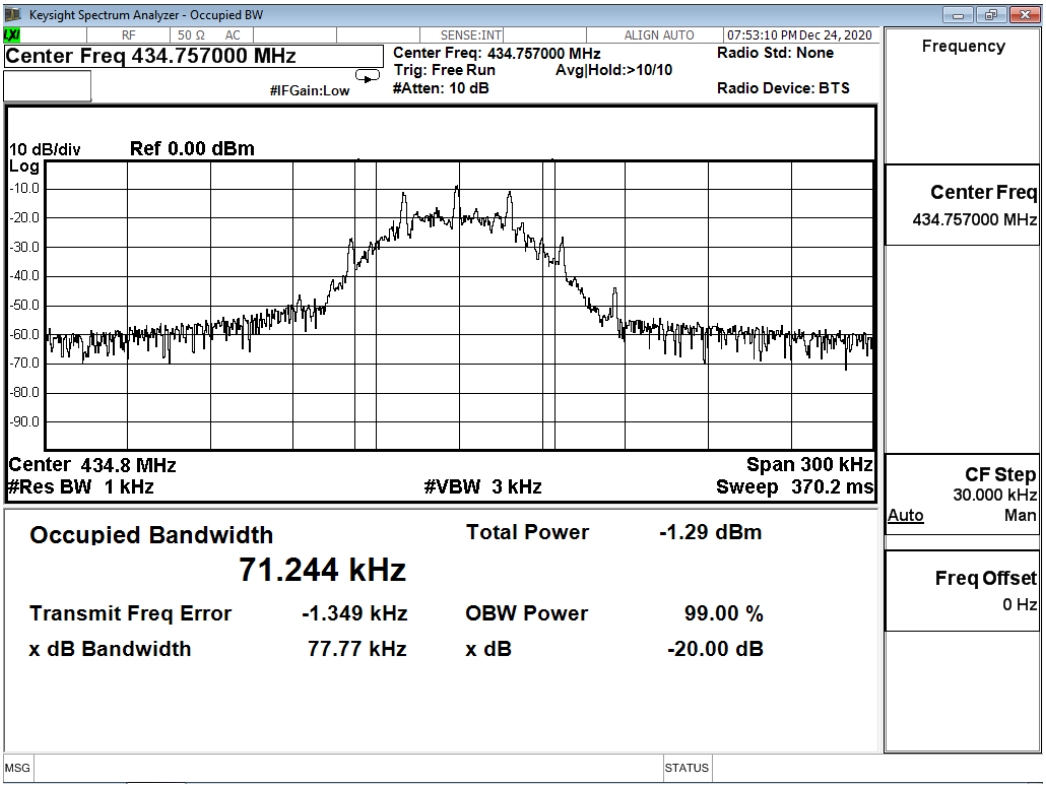
433.081MHz (Low Channel)



433.92MHz (Mid Channel)



434.757MHz (High Channel)



5.5. Duty cycle

5.5.1. Limit

No dedicated limit specified in the Rules.

5.5.2. Test Procedure

1. Place the EUT on the table and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyser.

3. Set centre frequency of spectrum analyser = operating frequency.

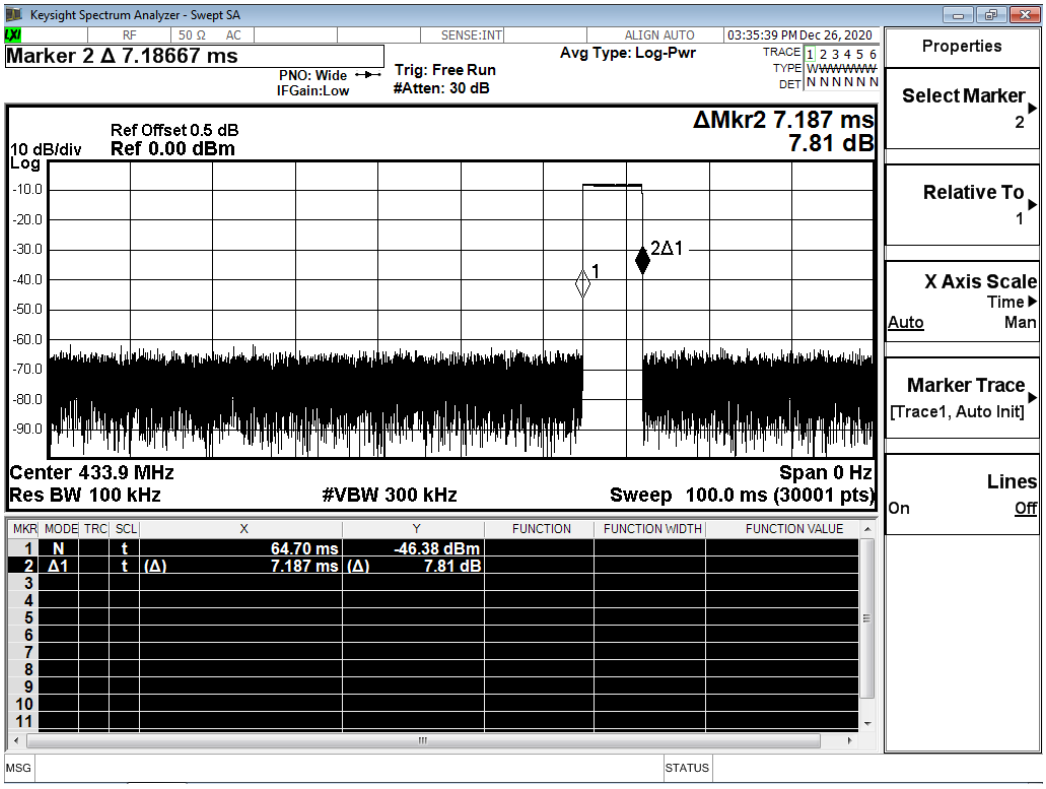
4. Set the spectrum analysers as RBW=100 kHz, VBW=300 kHz, Span=0Hz, Adjust Sweep=100ms to obtain the “worst-case” pulse on time

5. Repeat above procedures until all frequency measured was complete.

5.5.3. Test Data

T_{on} = 7.187*1 (ms) = 7.187 (ms)
T_p = 100.00(ms)
The duty cycle = 7.187/100.00 = 7.19%
Average Correction Factory = 20*log (T_{on}/T_p) =20*log (0.0719) = -11.43dB

Note: The signal bandwidth was measured and less than 100 kHz RBW so PDCF factor is not required to correct the fundamental signal peak result.



5.6. Antenna Requirement

5.6.1. Standard Applicable

According to antenna requirement of §15.203.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

5.6.2. Antenna Connected Construction

5.6.2.1. Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

5.6.2.2. Antenna Connector Construction

The gains of antenna used for transmitting is 0 dBi, and the antenna is an Internal Antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.6.2.3. Results: Compliance.

6. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Meter	R&S	NRVS	100444	2020-06-22	2021-06-21
2	Power Sensor	R&S	NRV-Z81	100458	2020-06-22	2021-06-21
3	Power Sensor	R&S	NRV-Z32	10057	2020-06-22	2021-06-21
4	Test Software	Tonscend	JS1120-2	/	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-2	N/A	2020-06-22	2021-06-21
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2020-11-22	2021-11-21
7	DC Power Supply	Agilent	E3642A	N/A	2020-11-14	2021-11-13
8	EMI Test Software	EZ	EZ-EMC	/	N/A	N/A
9	3m Full Anechoic Chamber	MRDIANZI	FAC-3M	MR009	2020-09-27	2021-09-26
10	Positioning Controller	MF	MF7082	MF78020803	2020-06-22	2021-06-21
11	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2018-07-26	2021-07-25
12	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-07-26	2021-07-25
13	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2018-07-02	2021-07-01
14	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2018-09-21	2021-09-20
15	Broadband Preamplifier	SCHWARZBECK	BBV9745	9719-025	2020-06-22	2021-06-21
16	EMI Test Receiver	R&S	ESR 7	101181	2020-06-22	2021-06-21
17	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2020-11-14	2021-11-13
18	Broadband Preamplifier	/	BP-01M18G	P190501	2020-06-22	2021-06-21
19	RF Cable-R03m	Jye Bao	RG142	CB021	2020-06-22	2021-06-21
20	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2020-06-22	2021-06-21
21	6dB Attenuator	/	100W/6dB	1172040	2020-06-22	2021-06-21
22	3dB Attenuator	/	2N-3dB	/	2020-06-22	2021-06-21
23	EMI Test Receiver	R&S	ESPI	101840	2020-06-22	2021-06-21
24	Artificial Mains	R&S	ENV216	101288	2020-06-22	2021-06-21
25	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2020-06-22	2021-06-21

Note: All equipment is calibrated through CHINA CEPREI LABORATORY and GUANGZHOU LISAI CALIBRATION AND TEST CO., LTD.

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7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

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