

# Coulisse B.V RF TEST REPORT

**Report Type:** FCC Part 15.231 RF report

Model: CM-20

**REPORT NUMBER:** 181201447SHA-001

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**TEST REPORT** 

Intertek Testing Services Shanghai Building No.86, 1198 Qinzhou Road (North) Caohejing Development Zone Shanghai 200233, China

> Telephone: 86 21 6127 8200 <u>www.intertek.com</u> Report no.: 181201447SHA-001

Applicant:	Coulisse B.V
	Vonderweg 48, 7468 DC Enter, Netherlands
Manufacturer:	Coulisse B.V
	Vonderweg 48, 7468 DC Enter, Netherlands
Manufacturing site:	NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD. No.168 Shengguang Road, Luotuo, Zhenhai, Ningbo, ZHEJIANG, China

FCC ID: ZY4CM20

#### SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification: **47CEP** Part 15 (2017): Padia Erequency Devises (Subpart C)

47CFR Part 15 (2017): Radio Frequency Devices (Subpart C)

**ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

#### PREPARED BY:

Teddy yin

Project Engineer Teddy Yin

**REVIEWED BY:** 

Samel 2hav

Reviewer Daniel Zhao

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## **Revision History**

Report No.	Version Description		Issued Date
181201447SHA-001	Rev. 01	Initial issue of report	Mar 7, 2019



## **Measurement result summary**

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Fundamental & spurious emission &Restrict band radiated emission	15.231(b) 15.209(a) 15.205	-	Pass
Power line conducted emission	15.207	-	Pass
Emission bandwidth	15.231(c)	-	Pass
Deactivating time	15.231(a)(1)	-	Pass
Antenna requirement	15.203	-	Pass

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

4: All test items were conducted by Teddy Yin.

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#### **1 GENERAL INFORMATION**

## **1.1** Description of Equipment Under Test (EUT)

Product name:	MOTION Wi-Fi bridge
Type/Model:	CM-20
Description of EUT:	The EUT is a transceiver to control the working condition of the corresponding receiver, there is one model only. The EUT contains an approved WIFI modular(FCC ID: 2AC7Z-ESPWROOM32)
Rating:	5VDC, 2A
Category of EUT:	Class B
EUT type:	Table top 🔲 Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	Dec 20, 2018
Date of test:	Dec 20, 2018~Jan 6, 2019

#### **1.2 Technical Specification**

Operation Frequency:	433.92MHz		
Type of Modulation:	FSK		
	Mobile		
	Portable		
Product Type:	Fix Location		
Channel Number:	1		
Antenna Designation:	Integral PCB antenna, non-user removable		
Gain of Antenna:	1.2dBi max (Declared by manufacture)		

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## **1.3 Description of Test Facility**

Intertek Testing Services Shanghai
Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
86 21 61278200
86 21 54262353

The test facility is recognized,	CNAS Accreditation Lab Registration No. CNAS L0139
certified, or accredited by these	FCC Accredited Lab Designation Number: CN1175
organizations:	IC Registration Lab CAB identifier.: CN0051
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

### **2 TEST SPECIFICATIONS**

#### 2.1 Standards or specification

47CFR Part 15 (2017) ANSI C63.10 (2013)

#### 2.2 Mode of operation during the test

Within this test report, EUT was tested with modulation and tested under its rating voltage and frequency.

#### 2.3 Test software list

Test Items	Software Manufacturer		Version	
Conducted emission	ESxS-K1	R&S	V2.1.0	
Radiated emission	on ES-K1 R&S		V1.71	

#### 2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Adaptor	GAT-0501000U	Input: 100-240V~, Output: DC 5V

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#### 2.5 Test environment condition:

Test items	Temperature	Humidity
Fundamental & spurious emission & Restrict band radiated emission	25°C	53% RH
Power line conducted emission	24°C	54% RH
Emission bandwidth & Deactivating time	25°C	53% RH

**TEST REPORT** 

#### 2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
$\boxtimes$	Test Receiver	R&S	ESCS 30	EC 2107	2019-07-15
$\boxtimes$	A.M.N.	R&S	ESH2-Z5	EC 3119	2019-11-30
$\boxtimes$	Shielded room	Zhongyu	-	EC 2838	2019-01-07
Radiat	ed Emission				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
$\boxtimes$	Test Receiver	R&S	ESIB 26	EC 3045	2019-09-12
$\boxtimes$	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2019-06-10
$\boxtimes$	Pre-amplifier	R&S	AFS42-00101800- 25-S-42	EC5262	2019-06-10
$\boxtimes$	Horn antenna	ETS	3117	EC 4792-1	2019-01-09
$\boxtimes$	Semi-anechoic chamber	Albatross	-	EC 3048	2019-07-31
RF tes	t				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
$\boxtimes$	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2019-03-05
Additi	onal instrument				
Used	Equipment	Manufacturer	Туре	Internal no.	Due date
$\boxtimes$	Therom- Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2019-01-18
$\boxtimes$	Therom- Hygrograph	ZJ1-2A	S.M.I.F.	EC 3326	2019-03-28
$\boxtimes$	Therom- Hygrograph	ZJ1-2A	S.M.I.F.	EC 2122	2019-03-11

## 2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	$\pm 0.74$ dB
Radiated Emissions in restricted frequency bands below 1GHz	$\pm$ 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

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## **3** Fundamental & Spurious Emission & Restrict band radiated emission

Test result: Pass

#### 3.1 Limit

**3.1.1** The emission shall test through the 10th harmonic or to 40GHz, whichever is lower. It must comply with the limits below:

Fundamental Frequency	Fundamental limit	Spurious limit
(MHz)	(uV/m)	(uV/m)
40.66 - 40.70	2250	225
70 - 130	1250	125
130 - 174	1250 to 3750	125 to 375
174 - 260	3750	375
260 - 470	3750 to 12500	375 to 1250
Above 470	12500	1250

The formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(Frequency) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(Frequency) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

For that the EUT use fundamental frequency of 433.92MHz, after calculation, the limit is:

Fundamental limit = 41.6667 \* 433.92 - 7083.3333 = 10996.68 uV/m = 80.80dBuV/m Spurious limit = 81 - 20 = 60.80dBuV/m

#### 

**3.1.2** The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3



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#### 3.2 Measurement Procedure

#### For Radiated emission below 30MHz:

- a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) Both X and Y axes of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

#### NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

#### For Radiated emission above 30MHz:

- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

#### Note:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported

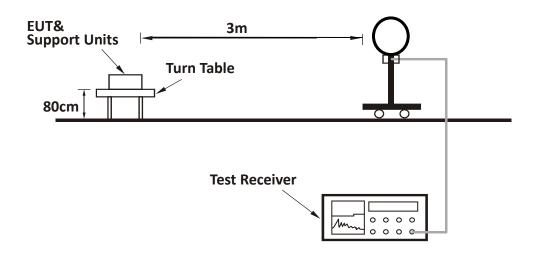
Report No.: 181201447SHA-001

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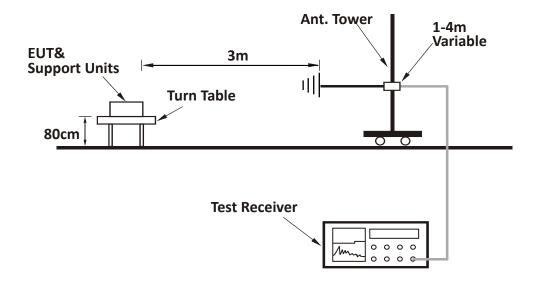
#### TEST REPORT

#### 3.3 Test Configuration

For Radiated emission below 30MHz:

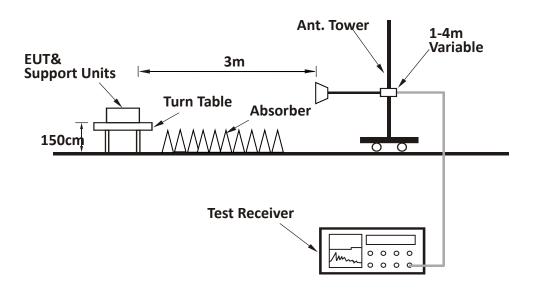


For Radiated emission 30MHz to 1GHz:



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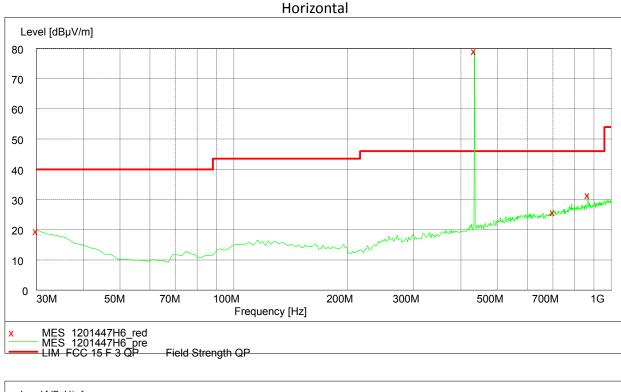
#### For Radiated emission above 1GHz:

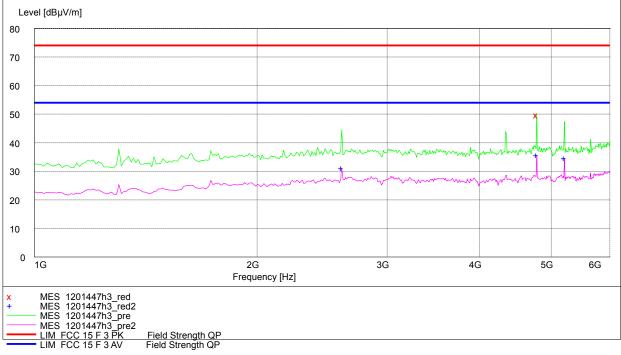


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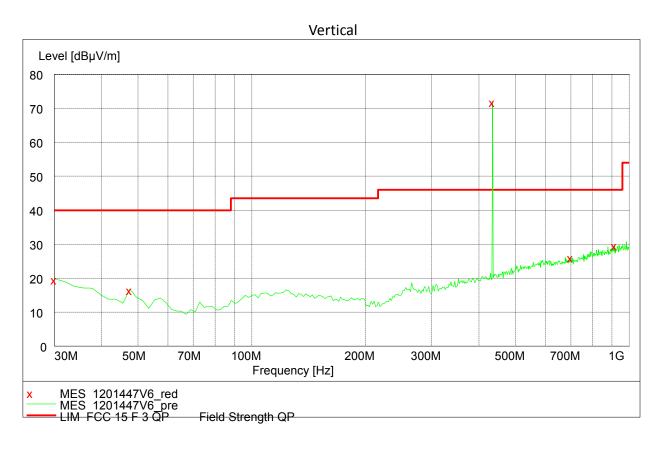
#### 3.4 Test Results of Radiated Emissions

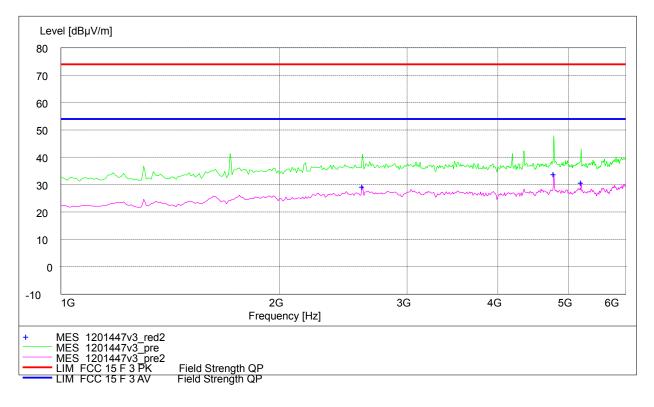
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.





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#### Test data:

Polarization	Frequency (MHz)	Corrected Reading (dBµV/m)	Correct Factor (dB/m)	Limits (dBµV/m)	Margin (dB)	Detector
	433.92	79.4	18.3	Fundamental	/	РК
	867.81	31.8	23.2	46.0	14.2	РК
Н	1296.59	38.2	-12.0	74.0	35.8	РК
п	1731.46	37.4	-9.5	74.0	36.6	РК
	2603.20	45.3	-6.6	74.0	28.7	РК
	4777.55	49.9	0.5	74.0	24.1	РК
	30.00	19.8	18.6	40.0	20.2	РК
	47.49	16.7	9.7	40.0	23.3	РК
	433.92	72.0	18.3	Fundamental	/	РК
V	867.81	29.6	23.2	46.0	16.4	РК
v	1296.59	37.2	-12.0	74.0	36.8	РК
	1731.46	41.5	-9.5	74.0	32.5	РК
	2603.20	41.4	-6.6	74.0	32.6	РК
	4777.55	48.6	0.5	74.0	25.4	РК

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.

- 2. Corrected Reading = Original Receiver Reading + Correct Factor
- 3. Margin = Limit Corrected Reading
- 4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,

Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV, Limit = 40.00dBuV/m. Then Correct Factor = 30.20 + 2.00 - 32.00 = 0.20dB/m;

Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;

Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

#### **TEST REPORT**

#### **Duty Cycle:**

The test data with maximum duty cycle was listed below.

Because the pulse train is periodic with a period exceeding 100ms, and the maximum "on time" is over 100ms.

The Duty cycle= 1



Marker	07:40:07 PM Jan 02, 2019 TRACE 1 2 3 4 5 6	ALIGN OFF		SENSE:INT		Ω DC	RF 5	u i i i i
Select Marker	Mkr2 138.0 ms	Δ		<ul> <li>Trig: Free Run #Atten: 10 dB</li> </ul>	PNO: Fast IFGain:Low	NFE		
Norma	0.16 dB					dBm	Ref 0.00	0 dB/div
Delt			2∆1					20.0
Fixed								40.0
o								50.0
Properties	lter et forfet en die te					an de Maria	te Rodovice teg	70.0 <b>(1994)</b> 80.0
Mor 1 of								30.0
	Span 0 Hz 1.000 s (1001 pts)	Sweep STATUS		/ 8.0 MHz	#VBW	MHz	33.920000 3.0 MHz	Center 4 Res BW

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	ectrum Analyzer - Swept SA						- F <b>x</b>
<mark>x</mark> Marker 2	RF         50 Ω         DC           Δ         6.60000         ms		SENSE:INT	Avg Ty	ALIGN OFF	07:41:18 PM Jan 02, 201 TRACE 1 2 3 4	6 Marker
	NFE		Trig: Free Run #Atten: 10 dB			DET N N N N	w.
10 dB/div Log	Ref 0.00 dBm				Δ	Mkr2 6.600 m -0.11 d	IS 2 B
- <sup>og</sup>							Norma
-10.0							NOTIN
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60.0							o
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.90.0							
							Mo
Center 43 Res BW 3	3.920000 MHz	#VBW 8	0 MHz		Sween_1	Span 0 H 00.0 ms (1001 pt	Z 1 of
SG		#VBVV0	54 MILL2		STATUS		9

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Antenna	Frequency (MHz)	PK Reading (dBuV/m)	Correct Factor (dB)	AV Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
н	433.92	79.4		79.4	80.8	1.4
н	867.81	31.8		31.8	60.8	29.0
н	1296.59	38.2		38.2	60.8	22.6
н	1731.46	37.4		37.4	60.8	23.4
н	2603.20	45.3		45.3	60.8	15.5
н	4777.55	49.9	0	49.9	60.8	10.9
V	433.92	72.0	0	72.0	80.8	8.8
V	867.81	29.6		29.6	60.8	31.2
V	1296.59	37.2		37.2	60.8	23.6
V	1731.46	41.5		41.5	60.8	19.3
V	2603.20	41.4		41.4	60.8	19.4
V	4777.55	48.6		48.6	60.8	12.2

#### Calculating the AV value according to the duty cycle

Remark:

1. Correct Factor = 20lg (duty cycle) = 20lg (1) = 0;

2. AV Reading = PK Reading + Correct Factor;

3. Margin = limit - AV Reading.

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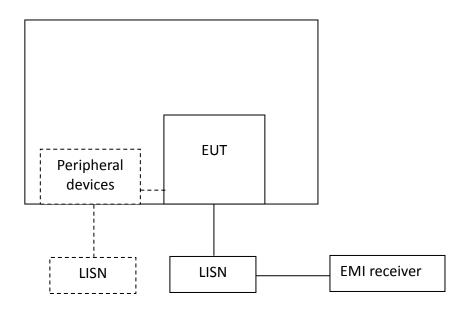
### 4 Power line conducted emission

Test result: Pass

#### 4.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)				
	QP	AV			
0.15-0.5	66 to 56*	56 to 46 *			
0.5-5	56	46			
5-30	60	50			
Decreases with the logarithm of the frequency.					

#### 4.2 Test Configuration





#### 4.3 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50  $\Omega$  LISN port (to which the EUT is connected), where permitted, terminated into a 50  $\Omega$  measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50  $\Omega$  measuring port is terminated by a measuring instrument having 50  $\Omega$  input impedance. All other ports are terminated in 50  $\Omega$  loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

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#### 4.4 Test Results of Power line conducted emission

## 

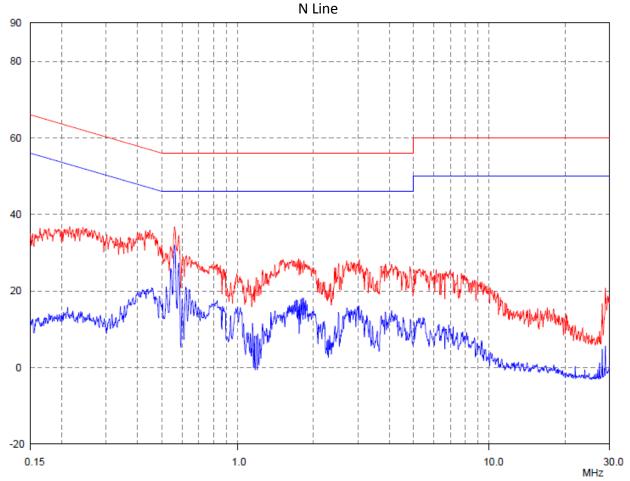
#### **Test Curve:**

Frequency		Quasi-peak				
(MHz)	level dB(μV)	Limit dB(µV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.17	*	65.0	*	*	55.3	*
0.22	*	62.7	*	*	51.9	*
0.39	*	57.9	*	*	46.0	*
4.29	*	56.0	*	*	46.0	*
10.45	*	60.0	*	*	50.0	*
19.40	*	60.0	*	*	50.0	*

Note: \*means margin is more than 10dB.

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#### Test Curve:



#### Test Data:

Frequency	Quasi-peak				Average	
(MHz)	level dB(μV)	Limit dB(µV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.17	*	65.0	*	*	55.3	*
0.22	*	62.7	*	*	51.9	*
0.39	*	57.9	*	*	46.0	*
4.29	*	56.0	*	*	46.0	*
10.45	*	60.0	*	*	50.0	*
19.40	*	60.0	*	*	50.0	*

Note: \*means margin is more than 10dB.

*Remark:* 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

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## 5 Emission Bandwidth

Test result: Pass

#### 5.1 Limit

The bandwidth of the emission shall be no wider than 0.25 % of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

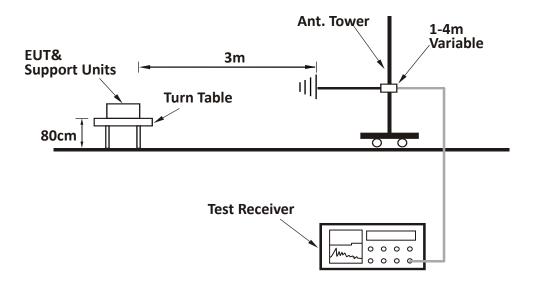
The limit for the EUT = 0.25% \* 433.92 MHz = 1085 kHz

#### 5.2 Measurement Procedure

The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The central frequency of test receiver was set near the operating frequency of EUT. The test was conducted using the Spectrum Analyzer with the resolutions bandwidth set at 3kHz, the video bandwidth set at 10kHz.

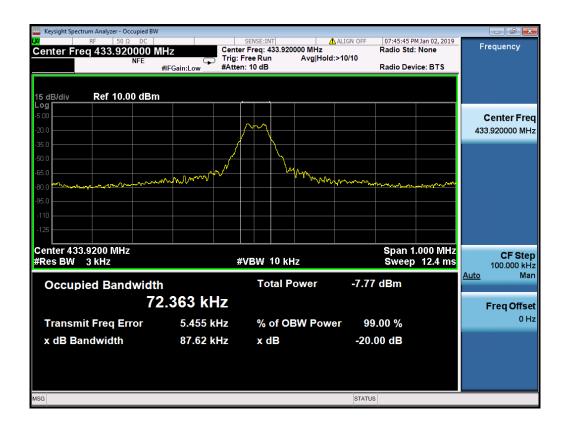
#### 5.3 Test Configuration



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#### 5.4 The results

Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
433.92	87.62	72.36
Limit	1085	1085
Result	Complied	Complied



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## 6 Deactivating time

Test result: Pass

#### 6.1 Test limit

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

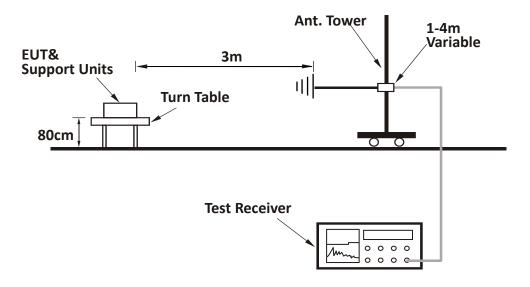
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in (1) and (2) above, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

#### 6.2 Test Configuration



TEST REPORT

#### 6.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber.

The central frequency of test receiver was set as the operating frequency of EUT and the Span was set as 0.

The EUT was switched once. The test receiver recorded the whole time from the triggered moment to the time of stopping radiating. For manual switching, to avoid uncertainty, the operating above would be repeated five times and the worst data is recorded.

#### 6.4 Test protocol

Whole time from the triggered moment to the time of stopping radiating: 1.17s. As a result, the EUT complies with the limit of 5s' deactivating time.

🔤 Keysight Spectrum Analyzer - Swept SA 👘 💼 💼						
L <mark>XI</mark>		DC 0	SENSE:INT	ALIGN OFF	07:44:52 PM Jan 02, 2019	Marker
Marker 2	Δ 1.17000 s	E PNO: Fast ↔ IFGain:Low	. Trig: Free Run #Atten: 10 dB	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE WWWWWW DET N N N N N N	Select Marker
10 dB/div Log	Ref 0.00 dBm	n			ΔMkr2 1.170 s 12.69 dB	2
-10.0			2Δ1			Normal
-20.0	^1					Delta
-40.0						Fixed⊳
-50.0						Off
-70.0				perference trapporte la facilita estas e		
-80.0						Properties►
-90.0	03.920000 MHz				Span 0 Hz	More 1 of 2
Res BW 3		#VBW	8.0 MHz	Sweep	5.000 s (1001 pts)	
MSG				STATU		



#### 7 Antenna requirement

#### **Requirement:**

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.

#### **Result:**

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.