FCC & IC TEST REPORT (433MHz)
No. 170901940SHA-001

Applicant	:	Coulisse B.V. Vonderweg 48, 7468 DC Enter, Netherlands
Manufacturer	:	Coulisse B.V. Vonderweg 48, 7468 DC Enter, Netherlands
Equipment	:	MID Motor
Type/Model	:	CM-07

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 (2017): Radio Frequency Devices

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

RSS-210 Issue 9 (August 2016): Licence-Exempt Radio Apparatus: Category I Equipment

RSS-Gen Issue 4 (Nov 2014): General Requirements for Compliance of Radio Apparatus

Date of issue: May 25, 2018

Prepared by:

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FCC ID: ZY4CM07

Description of Test Facility

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IC Assigned Code: 2042B-1

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1. General Information

1.1 Applicant Information

Applicant:	Coulisse B.V. Vonderweg 48, 7468 DC Enter, Netherlands
Name of contact:	Dora liao
Tel:	+86-574-26291888-8072
Fax:	/
Manufacturer:	Coulisse B.V. Vonderweg 48, 7468 DC Enter, Netherlands

Sample received date	:	Nov 24, 2017
Sample Identification No	:	/
Date of test	:	Nov 24, 2017 ~ March 22, 2018

1.2 Identification of the EUT

Equipment:	MID Motor
Type/model:	CM-07
FCC ID:	ZY4CM07
IC:	/

1.3 Technical specification

Operation Frequency Band:	433.92MHz
Modulation:	FSK
Antenna Designation:	Integral antenna, non-user removable.
Gain of Antenna:	1.2dBi
Rating:	Input: 12Vdc 10W 0,75A 0,8Nm 34rpm 12min Working frequency: 433.92MHz
Description of EUT:	There is one model only. The EUT is a transmitter to control the working condition of the corresponding receiver.
Channel Description:	There is one channel only, namely 433.92MHz.

2. Test Specification

2.1 Test Standard

47CFR Part 15 (2017): Radio Frequency Devices

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

RSS-210 Issue 9 (August 2016): Licence-Exempt Radio Apparatus: Category I Equipment

RSS-Gen Issue 4 (Nov 2014): General Requirements for Compliance of Radio Apparatus

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.
The EUT is a fixed installed device (horizontal or vertical installed) and therefore it was setup as its normal use

2.3 Test software list

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

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	DELL, Latitude E5470	-
2	AC/DC Adapter	HGPOWER, ADPV26B	100-240V AC input, 12V /2A DC output

2.5 Instrument list

Conducted Emission ./Disturbance Power/Tri-loop Test/CDN method					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESCS 30	EC 2107	2018-09-12
☑	A.M.N.	R&S	ESH2-Z5	EC 3119	2018-12-07
☑	A.M.N.	R&S	ENV 216	EC 3393	2018-07-30
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESIB 26	EC 3045	2018-09-12
☑	Ultra-broadband antenna	R&S	HL 562	EC 3046-1	2018-12-17
☑	Pre-amplifier	R&S	Pre-amp 18	EC5262	2018-06-20
☑	Horn antenna	R&S	HF 906	EC 3049	2018-11-17
☑	Horn antenna	ETS	3117	EC 4792-1	2019-02-24
☐	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2018-09-10
☑	Test Receiver	R&S	ESCI 7	EC 4501	2018-09-12
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Shielded room	Zhongyu	-	EC 2838	2019-01-07
☑	Semi-anechoic chamber	Albatross project	-	EC 3048	2018-09-15

2.6 Test Summary

This report applies to tested sample only. The test results have been compared directly with the limits, and the measurement uncertainty is recorded. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Fundamental & spurious emission	15.231(b)	RSS-210 Issue 9 Annex A1.2	Pass
Restrict band radiated emission	15.205	RSS-210 Issue 9 Clause 4.1	Pass
Power line conducted emission	15.207	RSS-Gen Issue 4 Clause 8.8	Pass
Emission bandwidth	15.231(c)	RSS-210 Issue 9 Annex A1.3	Pass
Deactivating time	15.231(a)(1)	RSS-210 Issue 9 Annex A1.1	Pass
Occupied bandwidth	-	RSS-Gen Issue 4 Clause 6.6	Tested

2.7 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT

Item No.	Test Items	Expanded Uncertainty (k=2) (±)
1	Radio frequency	**0.84×10^{-7}**
2	RF power, conducted	**0.74 dB**
3	RF power, radiated	**5.92 dB**
5	Power Spectral Density, conducted	**2.99 dB**
6	Occupied Channel Bandwidth	**0.88 %**
7	Conducted emission at mains ports	**3.19 dB**
8	Radiated Emissions up to 1 GHz	**4.90 dB**
9	Radiated Emissions 1-6GHz	**5.02 dB**
19	Radiated Emissions 6-18GHz	**5.28 dB**

3. Fundamental & Spurious Emission & Restrict band radiated emission

Test result: PASS

3.1 Test 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 (MHz)	Fundamental limit (uV/m)	Spurious limit (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:

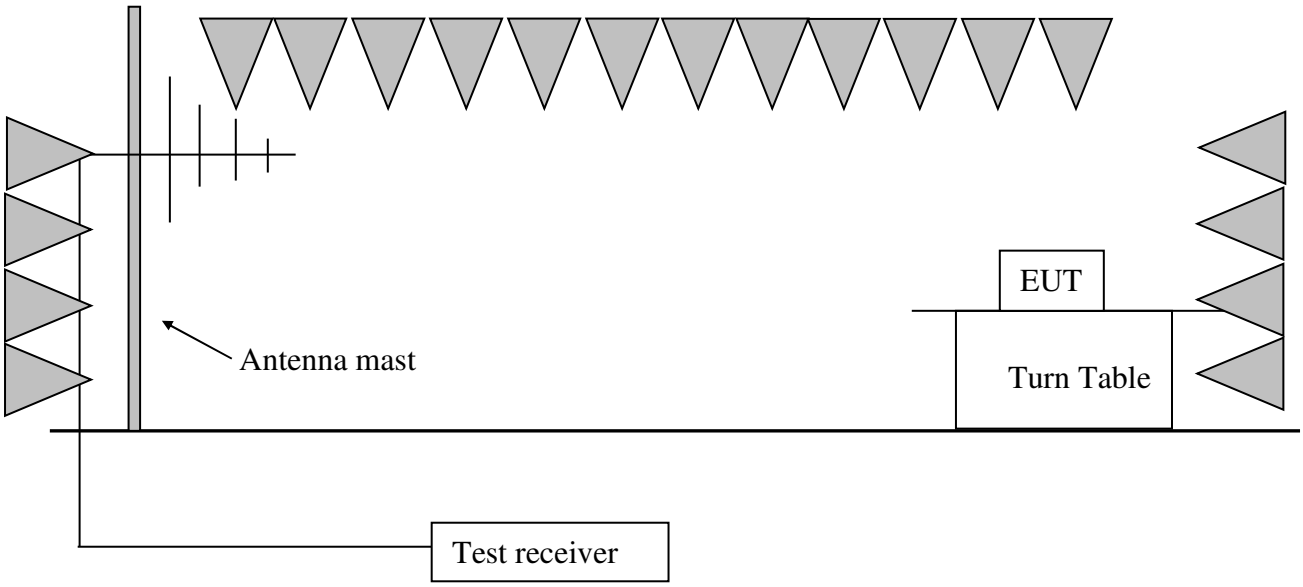
Fundamental limit = 41.6667 * 433.92 - 7083.3333 = 10996.68 uV/m = 80.80dBuV/m
Spurious limit = 81 – 20 = 60.80dBuV/m

//

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

3.2 Test Configuration



3.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

The turntable 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 radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 300 Hz, VBW = 1 kHz (9 kHz~150 kHz);
RBW = 10 kHz, VBW = 30 kHz (150 kHz~30MHz);
RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz for PK)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);
RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

Remark:
1. Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Measured level= Original Receiver Reading + Factor
3. Margin = Limit – Measured level
4. If the PK measured level 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 = 10dBuV.
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Measured level = 10dBuV + 0.20dB/m = 10.20dBuV/m
Assuming limit = 54dBuV/m,
Measured level = 10.20dBuV/m, then Margin = 54 - 10.20 = 43.80dBuV/m.

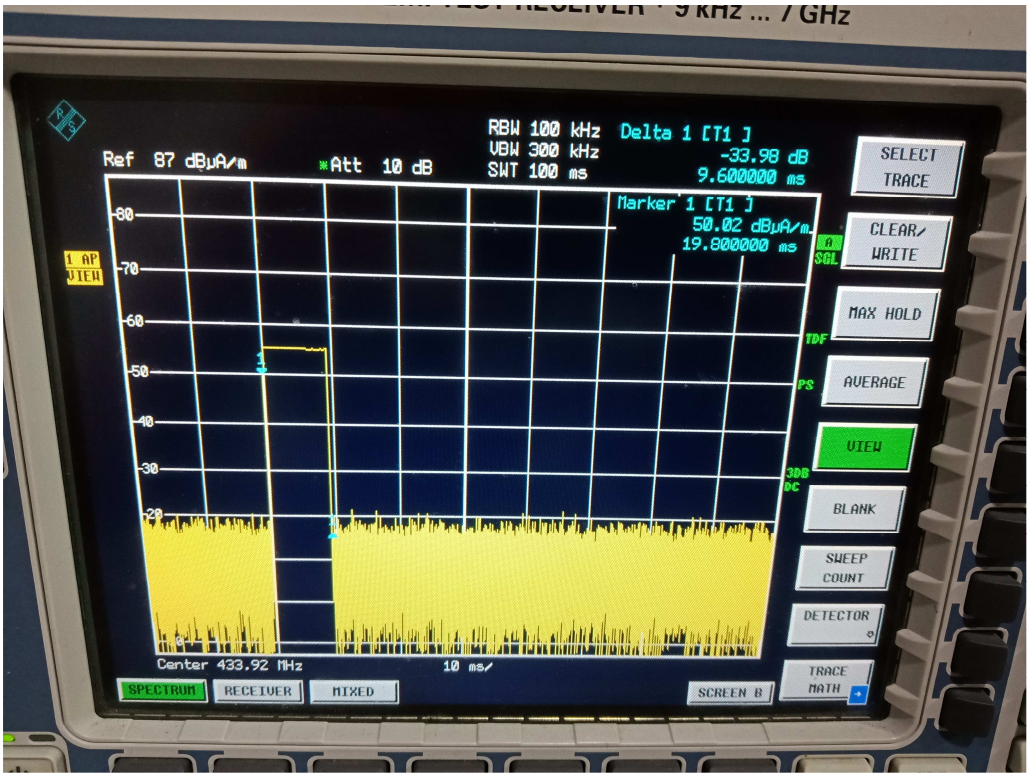
3.4 Test protocol

PK reading

Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Emission Type	Limit (dBuV/m)	Margin	Detector
V	433.92	19.10	94.20	Fundamental	100.80	6.60	PK
H	346.85	11.30	44.80	Spurious	46.00	1.20	PK
V	410.00	19.10	31.70	Restrict	46.00	14.30	PK
V	867.98	24.00	42.00	Harmonics	60.80	18.80	PK
H	1296.59	-12.20	44.10	Harmonics	60.80	16.70	PK
H	1729.45	-11.40	41.30	Harmonics	60.80	19.50	PK
V	2170.34	-10.80	42.60	Harmonics	60.80	18.20	PK
V	3036.07	-5.00	42.90	Harmonics	60.80	17.90	PK

AV calculated reading

Antenna	Frequency (MHz)	PK reading (dB/m)	Duty cycle factor	AV reading	Limit (dBuV/m)	Margin
V	433.92	94.20	-20.35	73.85	80.80	-6.95
Duty cycle factor calculation: 20lg (9.6ms / 100ms) = -20.35						



4. Deactivating time

Test result: PASS

4.1 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.

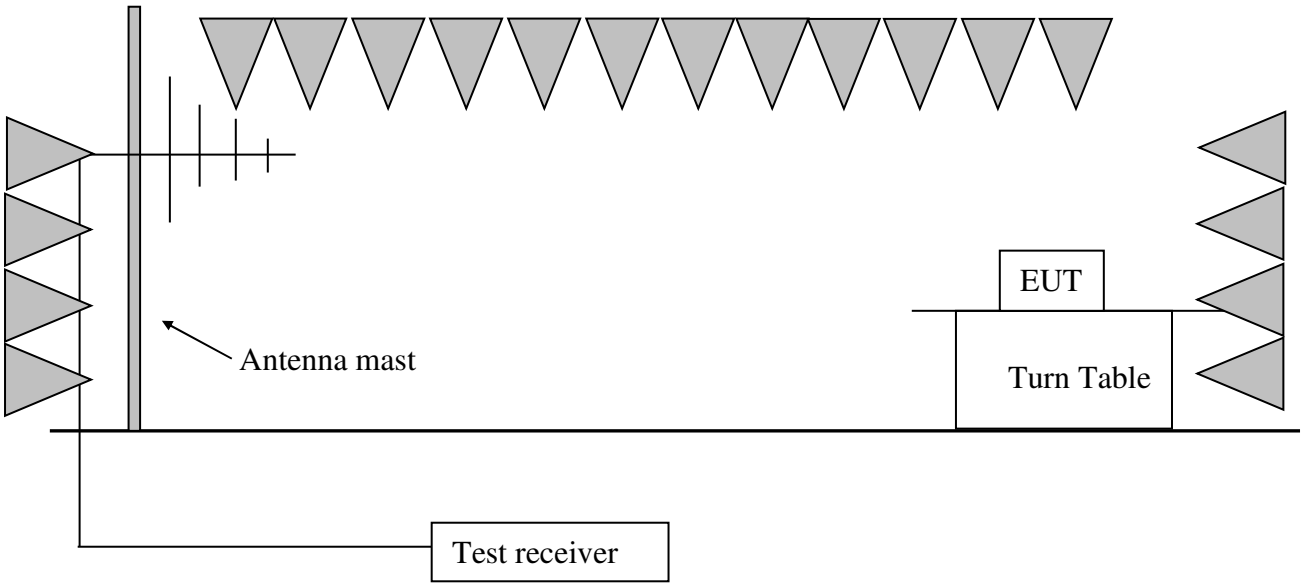
☐ (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

☐ (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.

4.2 Test Configuration

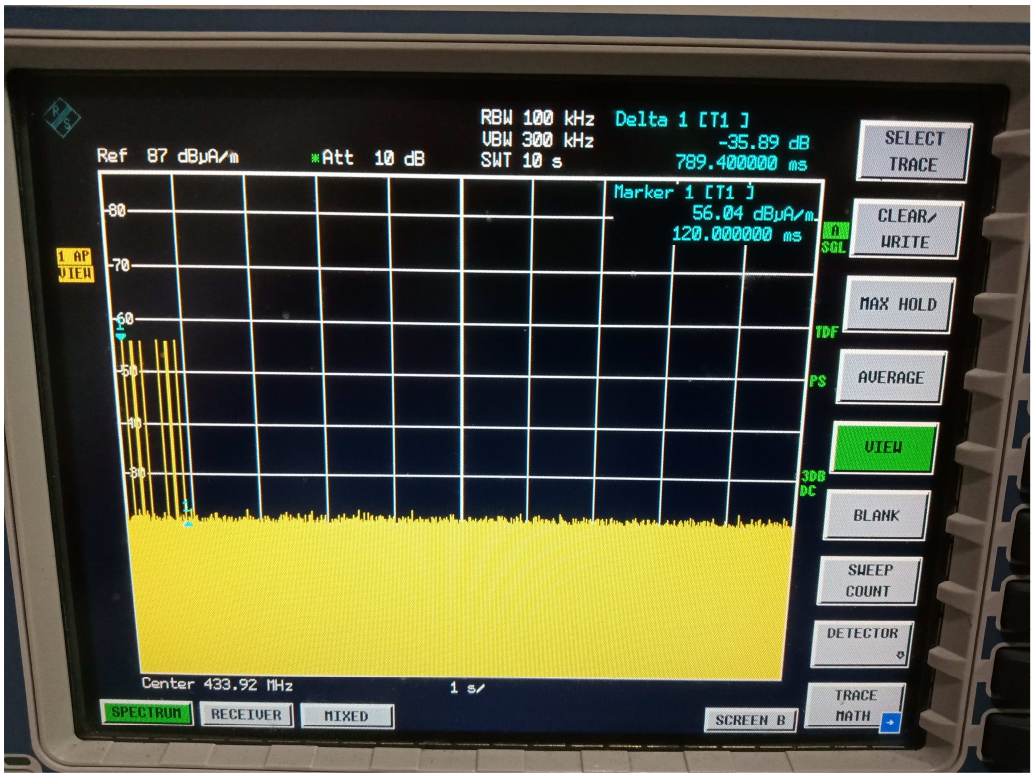


4.3 Test procedure and test setup

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.

4.4 Test protocol

Whole time from the triggered moment to the time of stopping radiating: 0.79s.
As a result, the EUT complies with the limit of 5s' deactivating time.



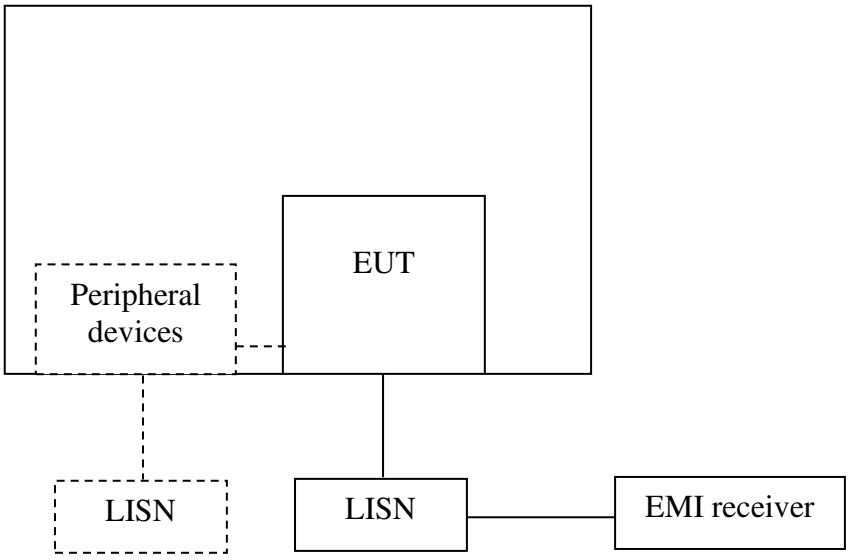
5. Power line conducted emission

Test result: **Pass**

5.1 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.		

5.2 Test configuration



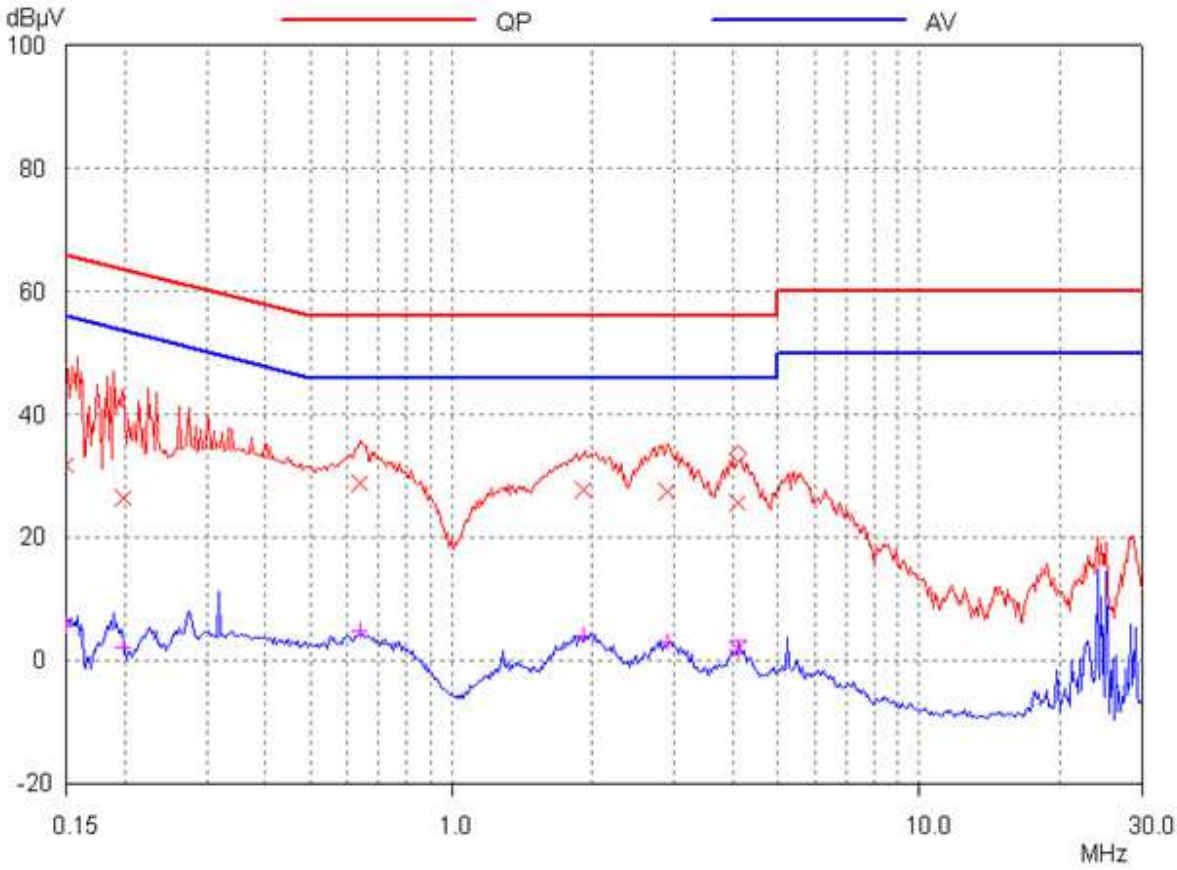
☒ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

5.3 Test procedure and test set up

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/50uH coupling impedance with 50Ω termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.
The bandwidth of the test receiver is set at 9 kHz.

5.4 Test protocol



Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.15 (L)	3.00	31.73	5.67	66.00	56.00	34.27	50.33
0.20 (N)	3.00	26.39	1.99	63.65	53.65	37.26	51.66
0.64 (L)	3.00	28.90	4.83	56.00	46.00	27.10	41.17
1.93 (L)	3.00	27.66	3.88	56.00	46.00	28.34	42.12
2.88 (N)	3.00	27.50	2.99	56.00	46.00	28.50	43.01
4.06 (L)	3.00	25.58	1.61	56.00	46.00	30.42	44.39
Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB). 2. Margin (dB) = Limit - Corrected Reading.							

6. Emission Bandwidth

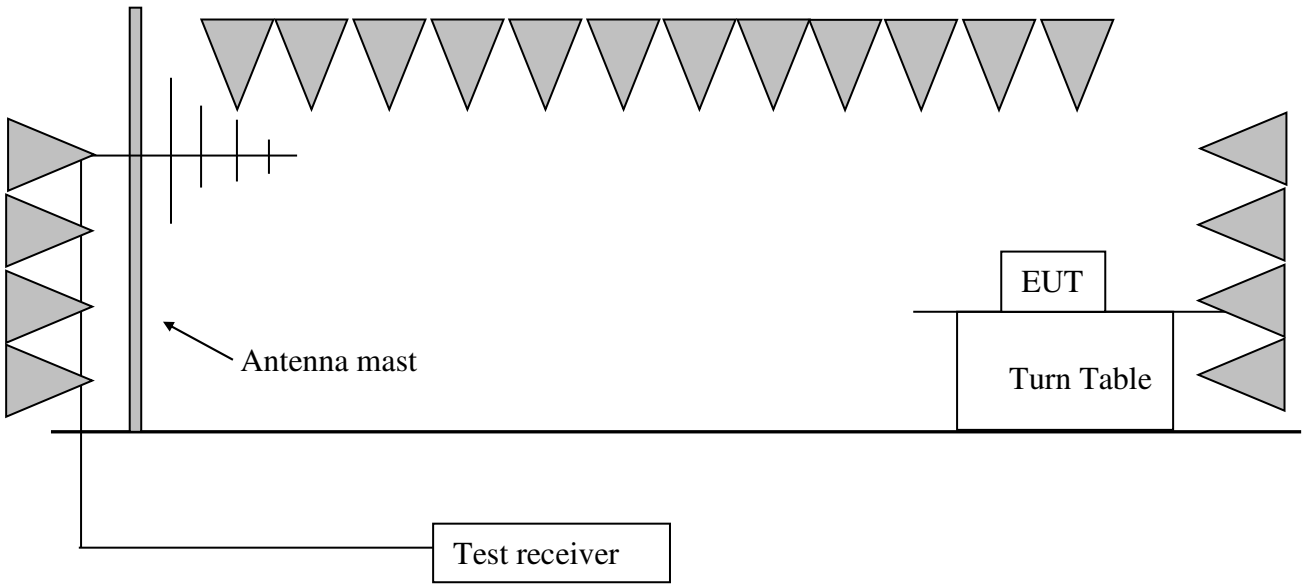
Test Status: Pass

6.1 Test limit

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

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

6.2 Test Configuration



6.3 Test procedure and test setup

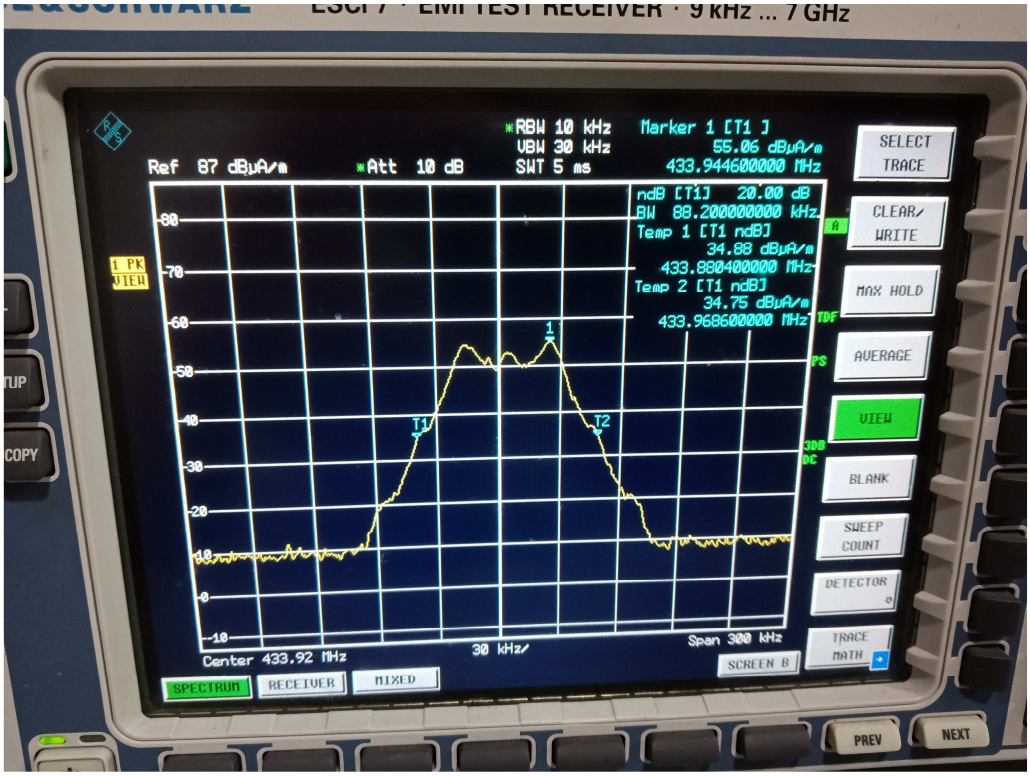
The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna 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 10kHz, the video bandwidth set at 30kHz.

6.4 Test protocol

Temperature : 25 °C

Relative Humidity : 55 %

Channel	Emission Bandwidth (kHz)	Limit (kHz)
1	88.20	1085



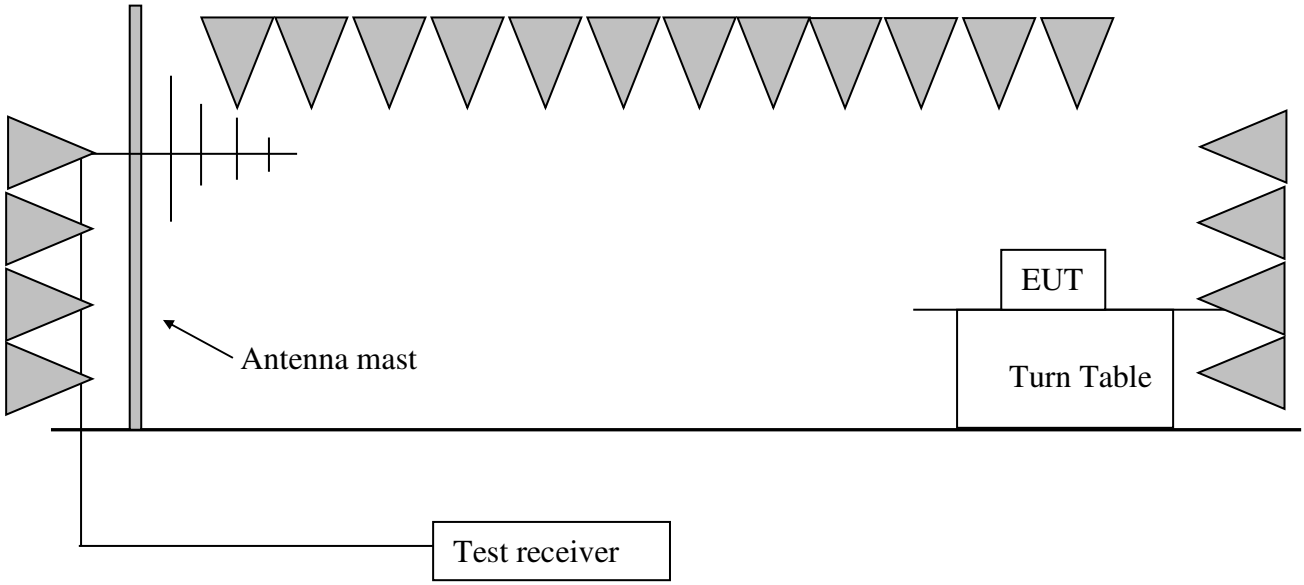
7. Occupied Bandwidth

Test Status: Tested

7.1 Test limit

None

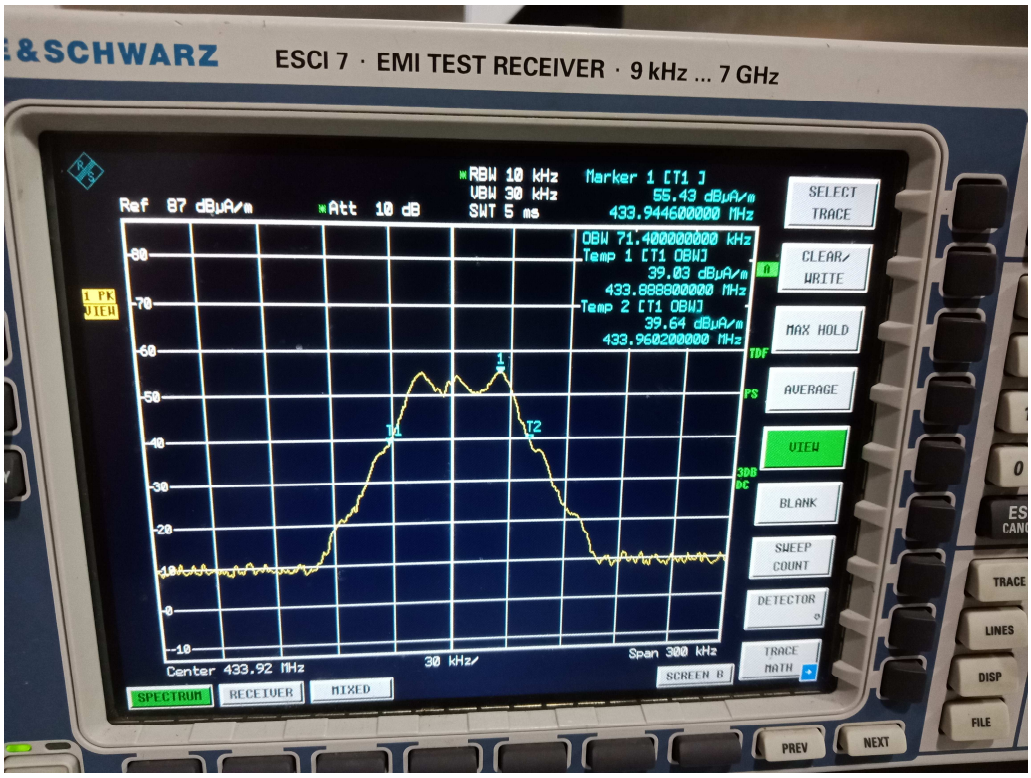
7.2 Test Configuration



7.3 Test procedure and test setup

The occupied bandwidth per RSS-Gen Issue 4 Clause 6.6 was measured using the Spectrum Analyzer with the resolutions bandwidth set at 10kHz, the video bandwidth set at 30kHz.

7.4 Test protocol

Temperature : 25 °C
Relative Humidity : 55 %

Channel	Occupied Bandwidth (kHz)
1	71.40