

FCC - TEST REPORT

Report Number : **68.710.22.0060.01** Date of Issue: **2022-06-21**

Model : **CM-07**

Product Type : **Tubular Motor**

Applicant : **Coulisse B.V.**

Address : **Vonderweg 48, Enter, 7468 DC, Netherlands**

Production Facility : **Ningbo Dooya Mechanic & Electronic Technology Co., Ltd.**

Address : **No.168 Shengguang Road, Luotuo, Zhenhai, 315202 Ningbo,**
Zhejiang province, PEOPLE'S REPUBLIC OF CHINA

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices : **19**

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Guankou Erlu, Nantou, Nanshan District,
Shenzhen, 518052 China

FCC Designation Number: CN5009

FCC Registration No.: 514049

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

3 Description of the Equipment Under Test

Product: Tubular Motor

Model no.: CM-07

FCC ID: ZY4CM07B

Rating: 12V $\overline{=}$; 1A, 12W

RF Transmission
Frequency: 433.925MHz

Modulation: FSK

Antenna Type: Monopole Antenna

Antenna Gain: -4.0dBi for 433.925 MHz

Description of the EUT: The Equipment Under Test (EUT) is a Tubular Motor supports 2.4GHz BLE/433.925MHz SRD functions.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2020 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to ANSI C63.10.

5 Summary of Test Results

Technical Requirements				
FCC Part 15 Subpart C				
Test Condition		Pages	Test Site	Test Result
§15.207	Conducted emission AC power port	10	Site 1	Pass
§15.205, §15.209, 15.35 (c) §15.231 (b)	Radiated Emission, 30MHz to 4.5GHz	13	Site 1	Pass
§15.231(c)	Bandwidth Measurement	16	Site 1	Pass
§15.231 (a) (1)	Deactivation Time	17	Site 1	Pass

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a Monopole Antenna, which gain is -4.0dBi. In accordance to §15.203, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: ZY4CM07B complies with Section 15.207, 15.209, 15.231 of the FCC Part 15.

This report is for the 433.925MHz part.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: 2022-05-10

Testing Start Date: 2022-05-12

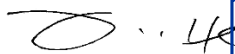
Testing End Date: 2022-06-14

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Reviewed by:

Prepared by:

Tested by:



Jessie He
EMC Project Manager



Myron Yu
EMC Project Engineer



Carry Cai
EMC Test Engineer

7 Systems test configuration

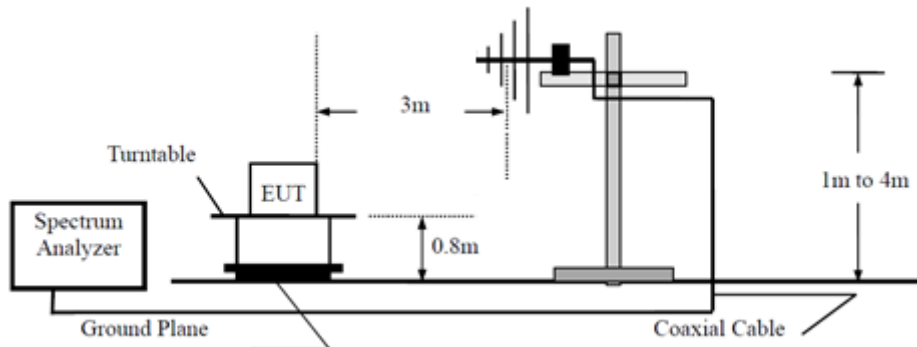
Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	REMARK
DC POWER SOURCE	NANJING SHENGBAO ELECTRONICS CO., LTD.	ROSE-122000	INPUT: 100-240VAC, 50/60HZ, 1A MAX OUTPUT:12VD C, 2A

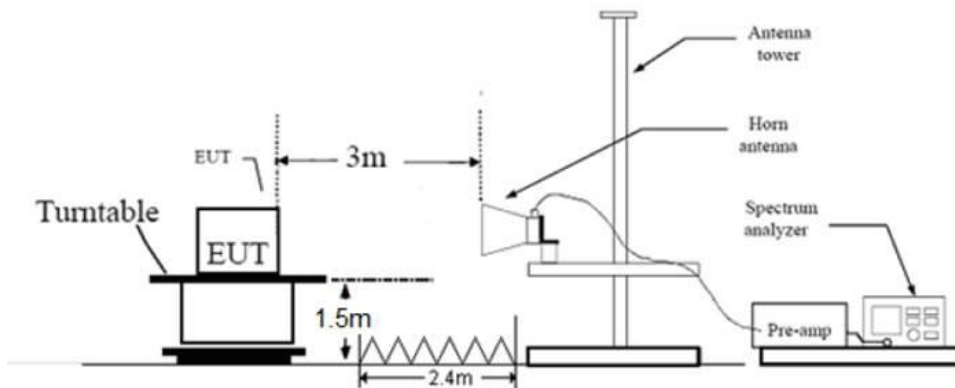
8 Test Setups

7.1 Radiated test setups

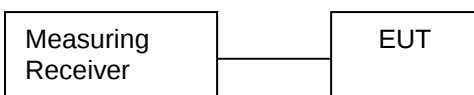
Below 1GHz



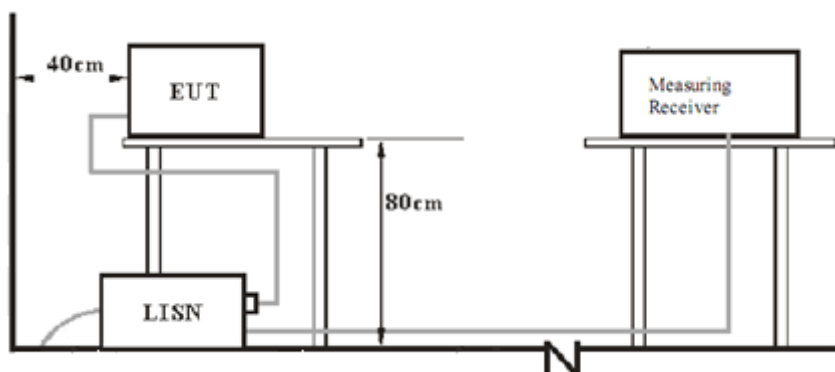
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



9 Test Methodology

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

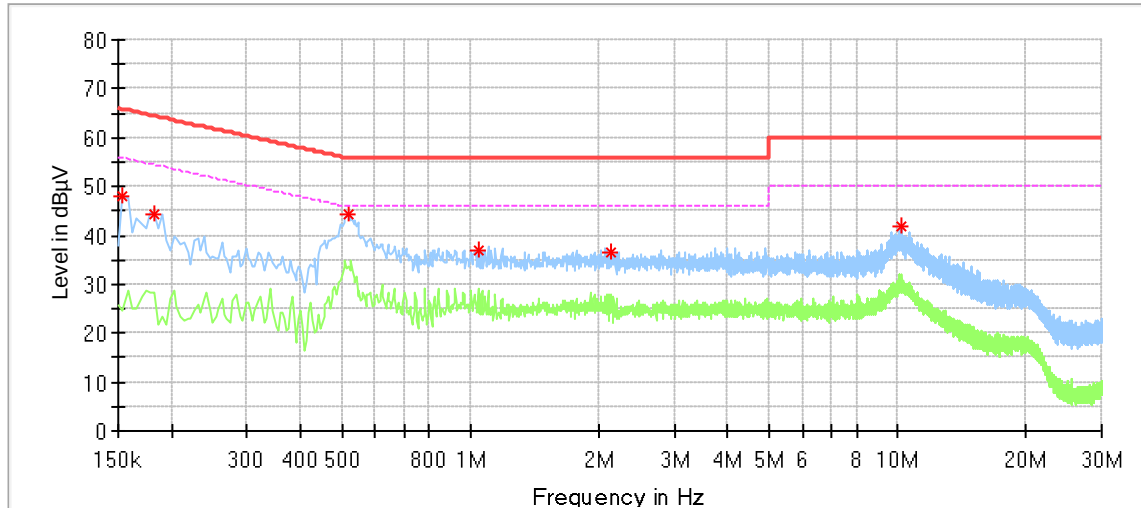
Limit

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

Conducted Emission

Product Type : Tubular Motor
 M/N : CM-07
 Operating Condition : ON + 433.925MHz
 Test Specification : Line
 Comment : 120VAC, 60Hz (External DC power source)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.154000	48.20	---	65.78	17.58	L1	9.25
0.182000	44.39	---	64.39	20.00	L1	9.25
0.518000	44.30	---	56.00	11.70	L1	9.20
1.042000	36.98	---	56.00	19.02	L1	9.20
2.126000	36.69	---	56.00	19.31	L1	9.23
10.194000	41.68	---	60.00	18.32	L1	9.39

Remark:

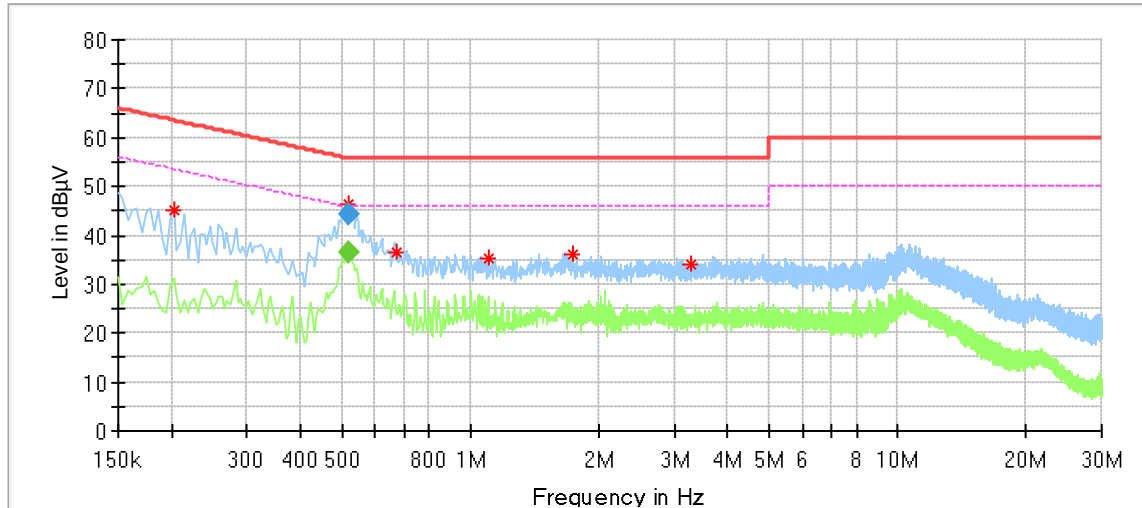
Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

Conducted Emission

Product Type : Tubular Motor
 M/N : CM-07
 Operating Condition : ON + 433.925MHz
 Test Specification : Neutral
 Comment : 120VAC, 60Hz (External DC power source)



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.202000	45.14	---	63.53	18.39	N	9.39
0.518500	46.16	---	56.00	9.84	N	9.40
0.670000	36.37	---	56.00	19.63	N	9.39
1.106000	35.42	---	56.00	20.58	N	9.40
1.730000	35.91	---	56.00	20.09	N	9.41
3.270000	34.00	---	56.00	22.00	N	9.45

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.518500	44.14	---	56.00	11.86	N	9.40
0.518500	---	36.65	46.00	9.35	N	9.40

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

9.2 Radiated Emission

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: 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.
- 4: 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.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 100 KHz to 120KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 1MHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

- a) RBW = 1MHz.
- b) VBW $\setminus$ $[3 \times \text{RBW}]$.
- c) Detector = RMS (power averaging), if $[\text{span} / (\# \text{ of points in sweep})] \setminus \text{RBW} / 2$. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
- d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
- e) Sweep time = auto.
- f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of $1 / D$, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
- g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is $[10 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty

cycle was 50%, then 3 dB shall be added to the measured emission levels.

2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is $[20 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

According to §15.231 (b), 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	1,250 to 3,370 *	125 to 375 *
174-260	3,750	375
260-470 √	3,750 to 12, 500*	375 to 1,250*
Above 470	12,500	1,250

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Radiated Emission									
Value	Emissions Frequency MHz	E-Field Polarity	PK Emission dBμV/m	Corr.	Average Factor dB	AV Emission dBμV/m	Limit dBμV/m	Margin	Emission Type
Below 1GHz									
PK	433.91	H	78.62	24.24	/	/	100.83	22.21	Fundamental
AV	433.91	H	78.62	/	-22.97	55.65	80.83	25.18	Fundamental
PK	433.91	V	69.37	24.24	/	/	100.83	31.46	Fundamental
AV	433.91	V	69.37	/	-22.97	46.40	80.83	34.43	Fundamental
PK	411.88	H	28.07	23.94	/	/	80.83	52.76	Spurious
AV	411.88	H	28.07	/	-22.97	5.10	60.83	55.73	Spurious
PK	446.66	V	27.16	24.39	/	/	80.83	53.67	Spurious
AV	446.66	V	27.16	/	-22.97	4.19	60.83	56.64	Spurious
Above 1GHz									
PK	3517.50	H	45.75	-0.26	/	/	74.00	28.25	Spurious
AV	3517.50	H	45.75	/	-22.97	22.78	54.00	31.22	Spurious
PK	3112.50	V	44.33	-1.17	/	/	74.00	29.67	Spurious
AV	3112.50	V	44.33	/	-22.97	21.36	54.00	32.64	Spurious
PK	3137.50	H	45.34	-0.91	/	/	74.00	28.66	Spurious
AV	3137.50	H	45.34	/	-22.97	22.37	54.00	31.63	Spurious
PK	3566.00	V	44.60	-0.40	/	/	74.00	29.40	Spurious
AV	3566.00	V	44.60	/	-22.97	21.63	54.00	32.37	Spurious

Remark:

1: AV Emission Level= PK Emission Level+20log(duty cycle)

2: 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.

3: “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

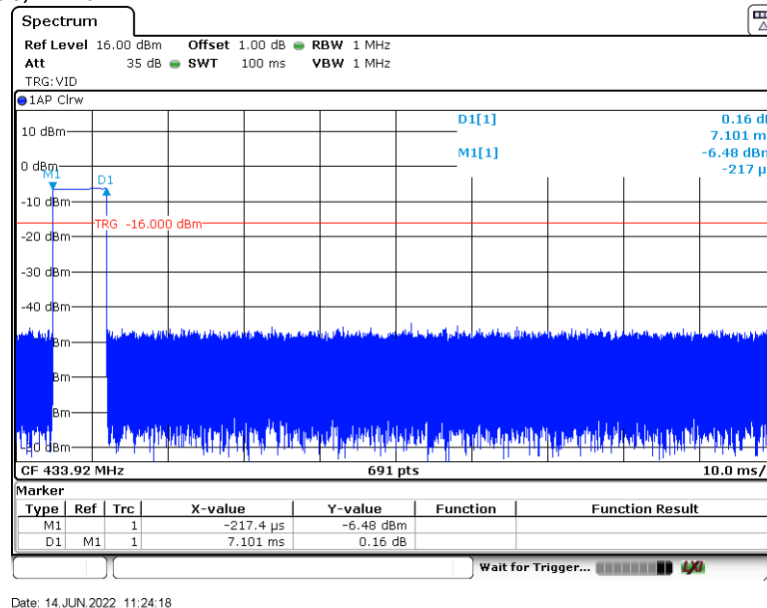
4: Level= Reading Level + Correction Factor

Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain

(The Reading Level is recorded by software which is not shown in the sheet)

Duty Cycle = 7.101(ms)/100(ms) = 7.101%

Duty Cycle Factor = 20log (Duty Cycle) = -22.97



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9.3 Bandwidth Measurement

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

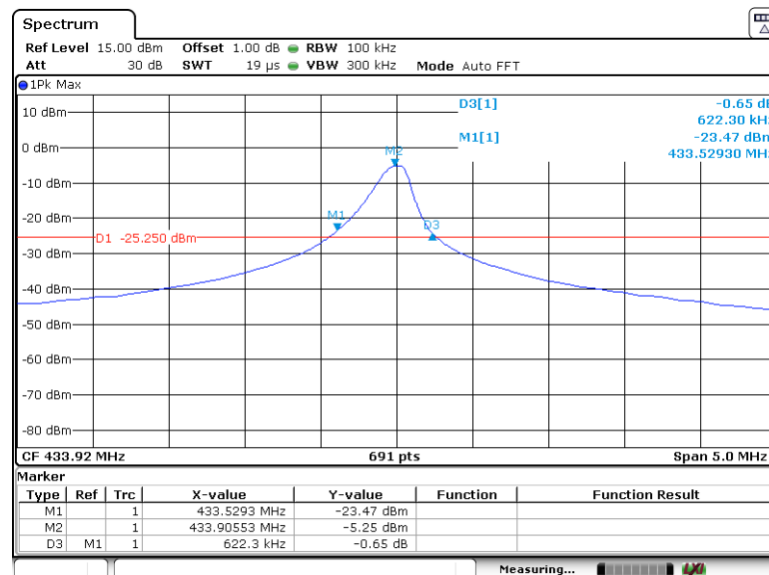
Limit

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 900MHz, 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% * 433.925 MHz = 1085 kHz

Test Result

Channel	20dB Bandwidth (KHz)	Limit (KHz)
1	622.3KHz	1085KHz



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9.4 Deactivation Time

Test Method

1. Place the EUT in the chamber and set it in transmitting mode.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=120 KHz, VBW=1MHz, Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

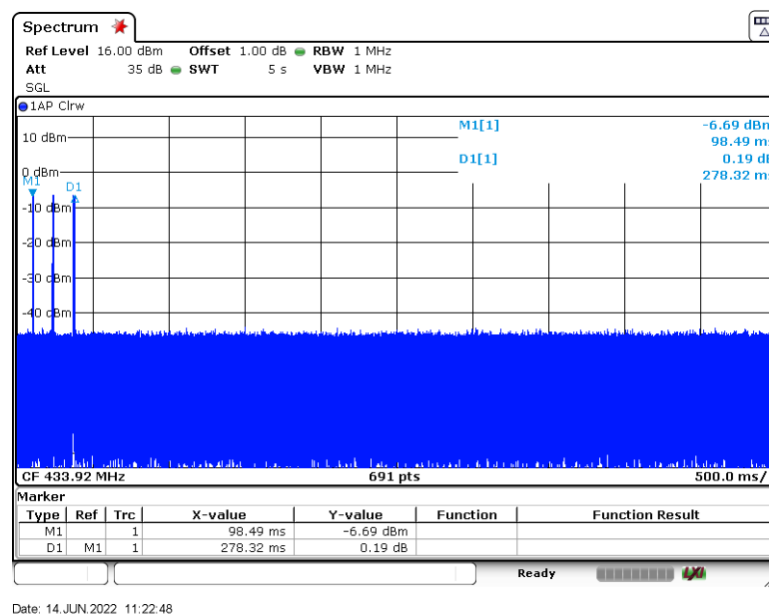
Limit

According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:

- (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.

Test Result

Channel	Frequency	Deactivation Time	Result
1	433.925MHz	278.32ms	Pass



Date: 14 JUN 2022 11:22:48

10 Test Equipment List

Conducted Emission Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-19-002	102590	1	2023-5-27
LISN	Rohde & Schwarz	ENV216	68-4-87-19-001	102472	1	2023-5-27
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2023-5-27
Test software	Rohde & Schwarz	EMC32	68-4-90-19-005-A01	Version 10.35.02	N/A	N/A
Shielding Room	TDK	CSR #2	68-4-90-19-005	----	1	2022-11-07

Radiated Emission Test 1#

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 7	68-4-74-19-001	102176	1	2023-5-27
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	68-4-80-14-002	707	1	2022-7-23
Pre-amplifier	Rohde & Schwarz	SCU 18	68-4-29-14-001	102230	1	2023-5-28
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-001	15542	1	2023-5-27
3m Semi-anechoic chamber	TDK	SAC-3 #1	68-4-90-14-001	----	2	2023-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-14-001-A10	Version 10.35.02	N/A	N/A

Radiated Emission Test 2#

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2023-5-28
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2023-5-9
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2023-5-28
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-002	100746	1	2023-5-28
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2022-7-21
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2022-7-27
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2023-5-27
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	2	2023-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version 10.35.02	N/A	N/A

RF Conducted Test

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Cal interval (year)	Cal. due date
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2023-5-27

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission (0.15MHz-30MHz)	3.31dB
Uncertainty for Radiated Emission in 3m chamber (68-4-90-14-001)30MHz-1000MHz	Horizontal: 4.68dB; Vertical: 4.65dB;
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 1000MHz-18000MHz	Horizontal: 4.76dB; Vertical: 4.75dB;
Uncertainty for Radiated Emission 18000MHz-40000MHz	Horizontal: 4.51dB; Vertical: 4.50dB
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.27dB Frequency test involved: 0.6×10^{-7} or 1%

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2021, clause 4.4.3 and 4.5.1.

---THE END OF REPORT---