



FCC TEST REPORT

Report Number : **709502409686-00C** Date of Issue: December 23, 2024

Model : CM-05

Product Type : Tubular motor

Applicant : Coulisse B.V.

Address : Vonderweg 48, 7468 DC Enter, THE NETHERLANDS

Manufacturer : Coulisse B.V.

Address : Vonderweg 48, 7468 DC Enter, THE NETHERLANDS

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

Total pages including
Appendices : 23



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2 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
709502409686-00C	First Issue	12/23/2024

3 Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
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FCC Registration No.: 820234

FCC Designation Number: CN1183

ISED CAB identifier CN0101

IC Registration No.: 31668

4 Description of the Equipment Under Test

Product: Tubular motor

Model no.: CM-05

FCC ID: ZY4CM05B1

Options and accessories: NA

Rating: Input USB-C 5V

RF Transmission Frequency: 433.92MHz
2402~2480 MHz (BLE5.0)

No. of Operated Channel:

Bluetooth Low Energy							
Ch	Fre(MHz)	Ch	Fre(MHz)	Ch	Fre(MHz)	Ch	Fre(MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Modulation: 2.4GHz BLE: GFSK; 433.92MHz: 2GFSK

Hardware Version: B1

Software Version: B1

Antenna Type: 2.4GHz BLE: Line antenna; 433.92MHz: Line antenna

Antenna Gain: 2.4GHz BLE:2.2 dBi

Description of the EUT: The Equipment Under Test (EUT) is a Tubular motor which supports 433.92MHz transceiver and support 2.4GHz BLE. We tested it and listed the worst data in this report.

Test sample no.: SHA-866063-6

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.



5 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to ANSI C63.10-2020.

6 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	11-15	Shield room	Pass
§15.205, §15.209, 15.35 (c)§15.231(b)	Radiated Emission, 30MHz to 4.5GHz	16-19	3m chamber	Pass
§15.231(c)	Bandwidth Measurement	20	Shield room	Pass
§15.231(a)(2)	Deactivation Time	21	Shield room	Pass
§15.203	Antenna requirement	--	See Note 1	Pass

Note 1: The EUT uses line antenna, which gain is 2.2dBi for 2.4GHz BLE.

In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

7 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: ZY4CM05B1, complies with Section 15.207, 15.205, 15.209, 15.231 of the FCC Part 15, Subpart C Rules.

This report is only for 433.92MHz.

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: November 12, 2024

Testing Start Date: November 14, 2024

Testing End Date: December 2, 2024

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

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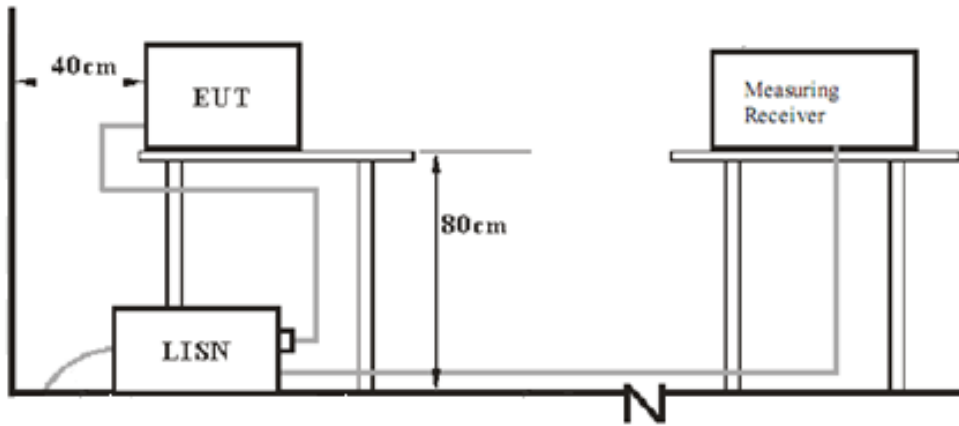
8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
AC/DC adapter	MLF	MLF-A260502000UU	--

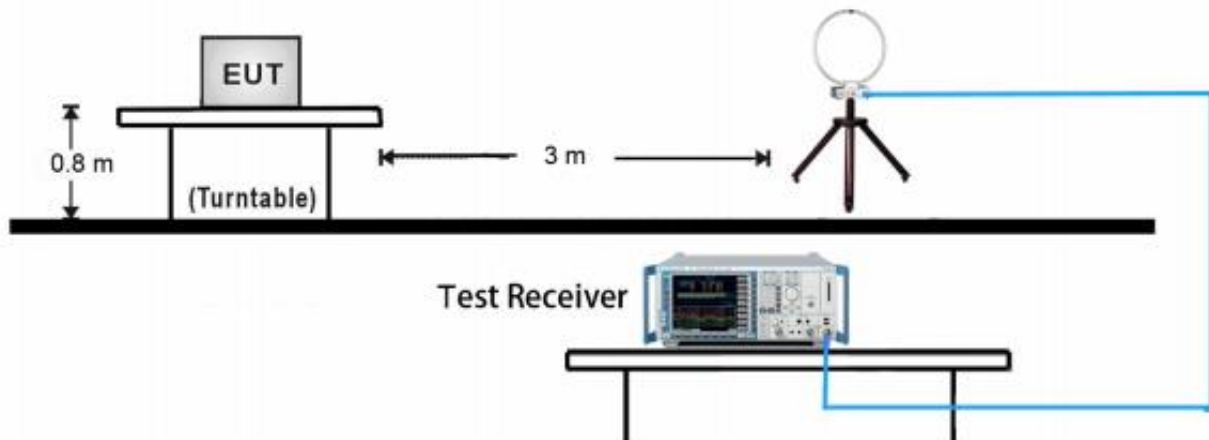
9 Test Setups

9.1 AC Power Line Conducted Emission test setups

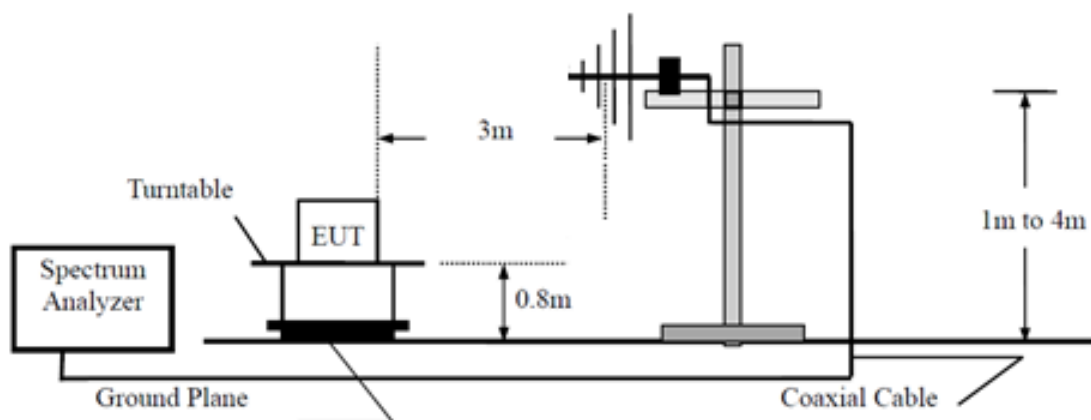


9.2 Radiated test setups

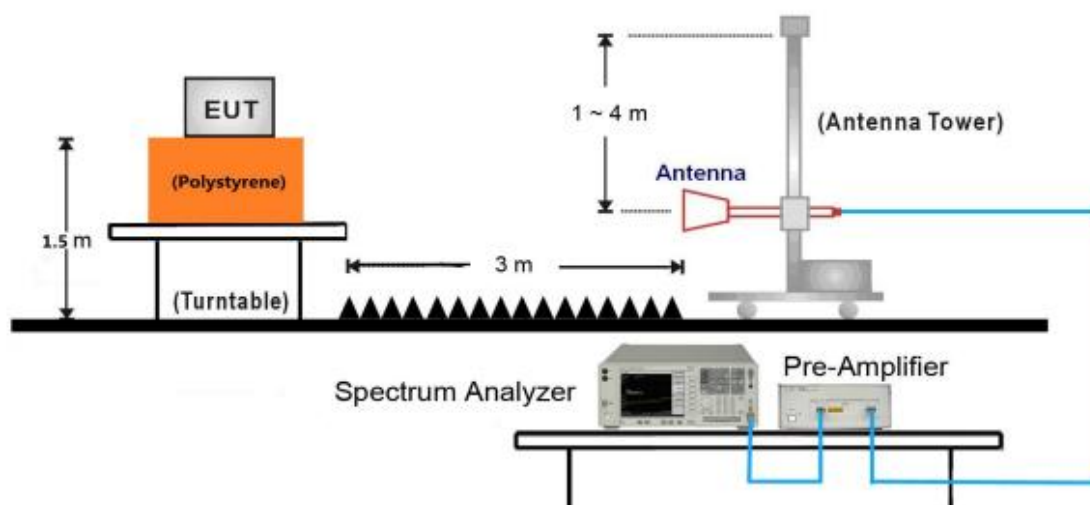
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test- Setup



1GHz ~ 18GHz Test Setup:



10 Test Methodology

10.1 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

Decreasing linearly with logarithm of the frequency

Conducted Emission

150k-30MHz Conducted Emission Test

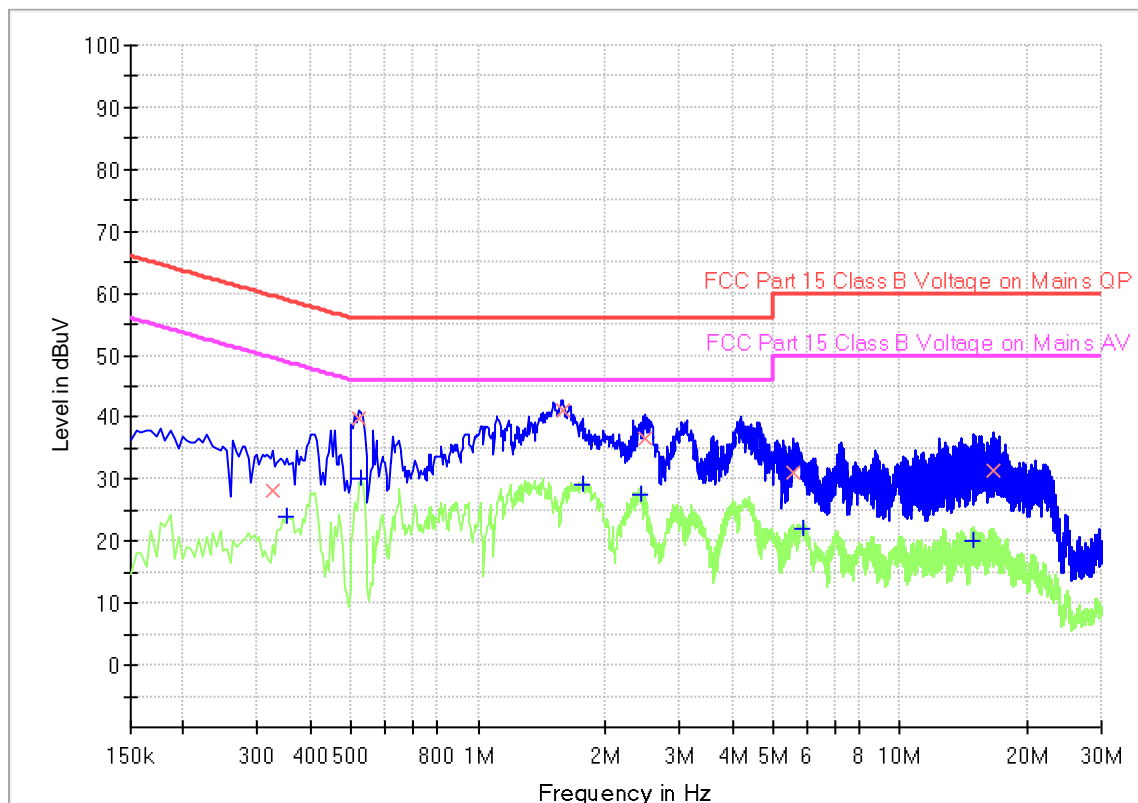
EUT Information

EUT Name: Tubular motor
 Model: CM-05
 Client: Coulisse B.V
 Op Cond: Power on and charging mode, 433.92MHz transmitting.
 Operator: Guo Chengjie
 Test Spec: FCC part 15.207(a)
 Comment: Phase L
 Sample No: SHA-866063-6

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN
 Receiver: [ESR 3]
 Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.325500	28.12	---	59.57	31.45	1000.0	9.000	L1	19.5
0.352500	---	24.12	48.90	24.78	1000.0	9.000	L1	19.5
0.519000	39.90	---	56.00	16.10	1000.0	9.000	L1	19.5
0.528000	---	29.99	46.00	16.01	1000.0	9.000	L1	19.5
1.581000	41.25	---	56.00	14.75	1000.0	9.000	L1	19.5
1.765500	---	29.05	46.00	16.95	1000.0	9.000	L1	19.5
2.422500	---	27.69	46.00	18.31	1000.0	9.000	L1	19.5
2.472000	36.74	---	56.00	19.26	1000.0	9.000	L1	19.5
5.568000	31.04	---	60.00	28.96	1000.0	9.000	L1	19.6
5.874000	---	21.94	50.00	28.06	1000.0	9.000	L1	19.6
14.977500	---	20.23	50.00	29.77	1000.0	9.000	L1	19.8
16.665000	31.39	---	60.00	28.61	1000.0	9.000	L1	20.1

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

150k-30MHz Conducted Emission Test

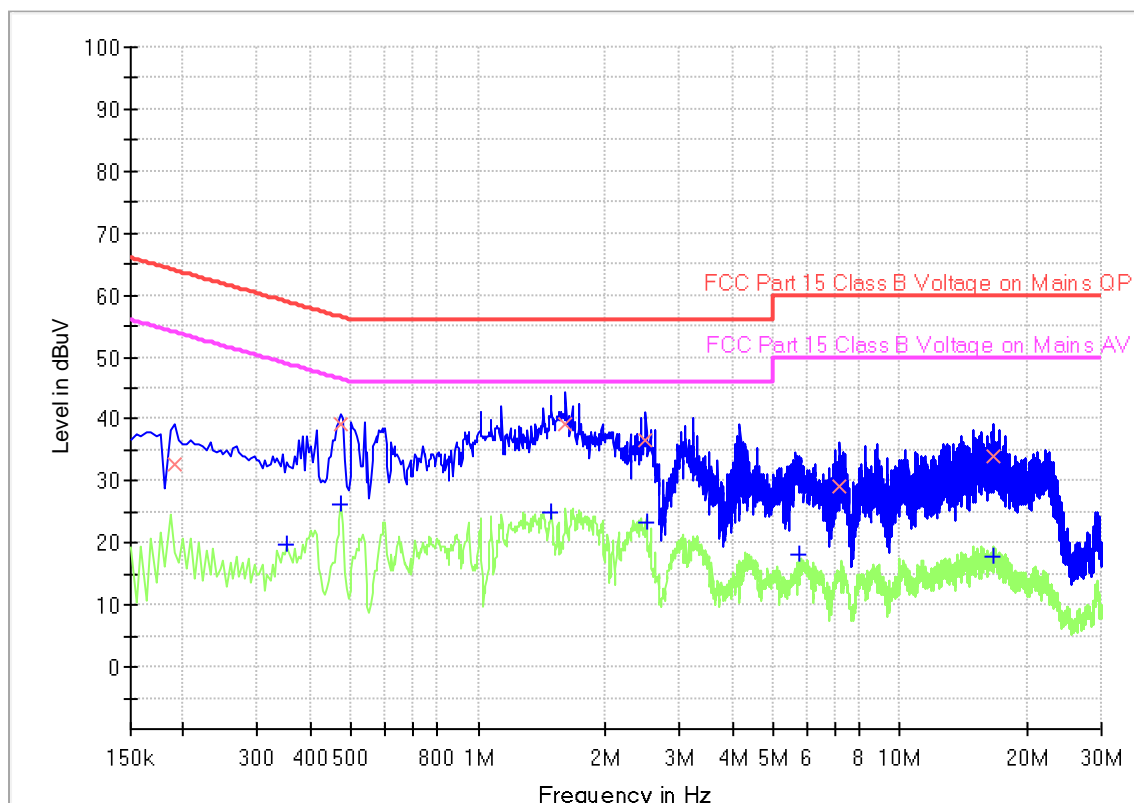
EUT Information

EUT Name: Tubular motor
Model: CM-05
Client: Coulisse B.V
Op Cond: Power on and charging mode, 433.92MHz transmitting.
Operator: Guo Chengjie
Test Spec: FCC part 15.207(a)
Comment: Phase N
Sample No: SHA-866063-6

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN
Receiver: [ESR 3]
Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB





Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.190500	32.82	---	64.01	31.19	1000.0	9.000	N	19.4
0.352500	---	19.73	48.90	29.17	1000.0	9.000	N	19.4
0.474000	---	26.36	46.44	20.08	1000.0	9.000	N	19.5
0.474000	39.16	---	56.44	17.28	1000.0	9.000	N	19.5
1.486500	---	25.02	46.00	20.98	1000.0	9.000	N	19.5
1.612500	39.26	---	56.00	16.74	1000.0	9.000	N	19.5
2.499000	36.67	---	56.00	19.33	1000.0	9.000	N	19.5
2.503500	---	23.20	46.00	22.80	1000.0	9.000	N	19.5
5.793000	---	18.15	50.00	31.85	1000.0	9.000	N	19.6
7.210500	29.19	---	60.00	30.81	1000.0	9.000	N	19.6
16.602000	---	17.91	50.00	32.09	1000.0	9.000	N	20.0
16.602000	33.93	---	60.00	26.07	1000.0	9.000	N	20.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
 Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

10.2 The Field strength of Emissions

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:
 - 9kHz -150kHz
RBW = 200Hz, VBW = 1kHz for peak measurement, Sweep = auto,
Detector function = peak, Trace = max hold.
 - 150kHz - 30MHz
RBW = 10 kHz, VBW = 30 kHz for peak measurement, Sweep = auto,
Detector function = peak, Trace = max hold.
 - 30MHz - 1GHz
RBW = 100 kHz, VBW = 300 kHz for peak measurement, Sweep = auto,
Detector function = peak, Trace = max hold.
 - For Above 1GHz
RBW = 1MHz, VBW \geq 3RBW for peak measurement, Sweep = auto, Detector function = peak,
Trace = max hold.

Limit

1. FCC Limit: 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	1,250 to 3,750 *	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
*Linear interpolation with frequency		

(a) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(b) 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.

(c) 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.

Limits for 15.209 Radiated emission limits

Frequency (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

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	E-Field	PK	Corr.	Average	AV	Limit		Emission Type
	Frequency	Polarity	Emission	Factor	Factor	Emission	dBµV/m	Margin	
	MHz		dBµV/m	dB	dB	dBµV/m		dB	
Below 1GHz									
PK	433.92	H	87.40	20.10	0.00	/	100.80	13.40	Fundamental
AV	433.92	H	87.40	/	-23.71	63.69	80.80	17.11	Fundamental
PK	433.92	V	81.80	25.70	0.00	/	100.80	19.00	Fundamental
AV	433.92	V	81.80	/	-23.71	58.09	80.80	22.71	Fundamental
PK	867.84	H	35.68	33.00	0.00	/	80.80	45.12	Spurious
AV	867.84	H	35.68	/	-23.71	11.97	60.80	48.83	Spurious
PK	867.84	V	39.20	33.20	0.00	/	80.80	41.60	Spurious
AV	867.84	V	39.20	/	-23.71	15.49	60.80	45.31	Spurious
Above 1GHz									
PK	1619.00	H	34.44	-13.90	0.00	/	74.00	39.56	Restricted band*
AV	1619.00	H	34.44	/	-23.71	10.73	54.00	43.27	Restricted band*
PK	2635.00	H	37.97	-9.00	0.00	/	80.80	42.83	Spurious
AV	2635.00	H	37.97	/	-23.71	14.26	60.80	46.54	Spurious
PK	1544.00	V	34.55	-14.20	0.00	/	74.00	39.45	Restricted band*
AV	1544.00	V	34.55	/	-23.71	10.84	54.00	43.16	Restricted band*
PK	3422.50	V	36.22	-6.50	0.00	/	80.80	44.58	Spurious
AV	3422.50	V	36.22	/	-23.71	12.51	60.80	48.29	Spurious

Remark:

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

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

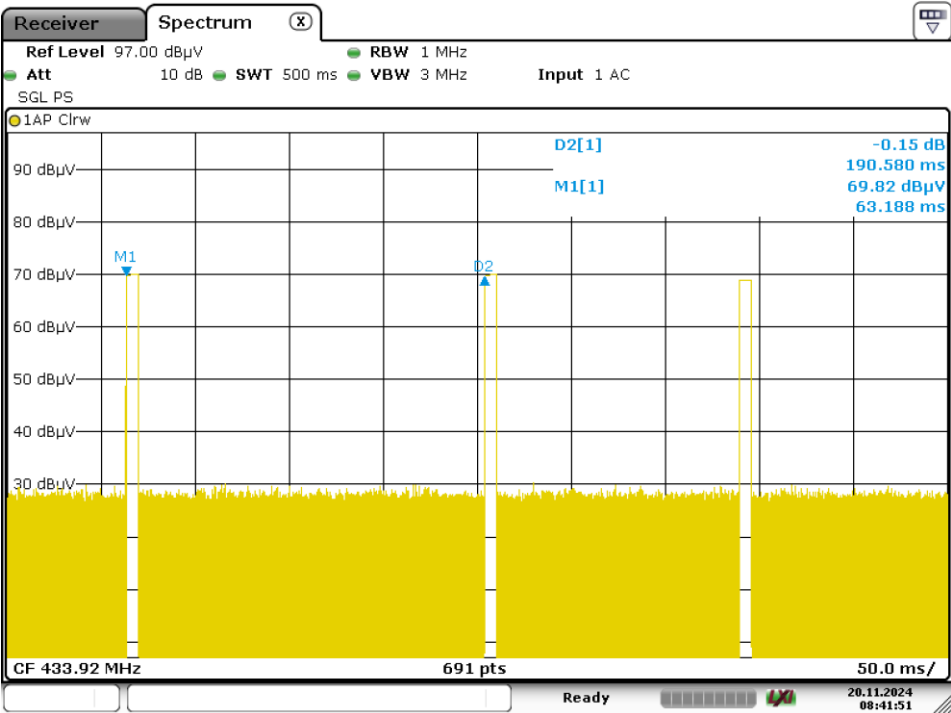
(The Reading Level is recorded by software which is not shown in the sheet)

Duty Cycle =6.52(ms)/100(ms) =6.52%

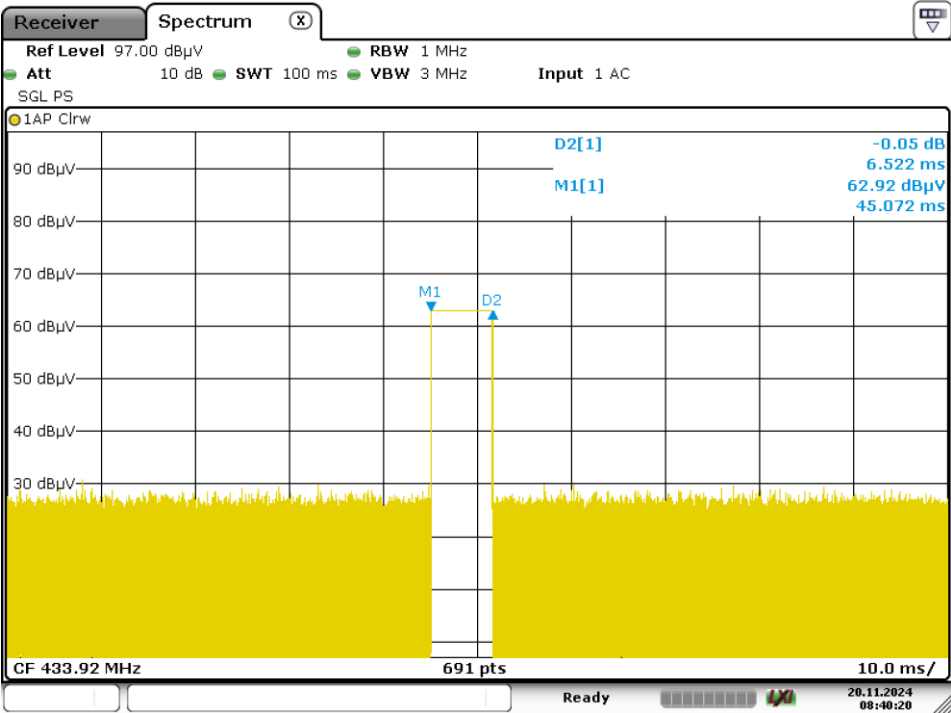
Duty Cycle Factor =20log (Duty Cycle) =-23.71



Duty Cycle



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10.320 Bandwidth Measurement

Test Method

- 1. Set to the maximum power setting and enable the EUT transmit continuously.
- 2. Use the following test receiver settings:
Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
RBW =1% to 5% of the 20dB bandwidth of the emission being measured, VBW≥RBW,
Sweep = auto, Detector function = peak, Trace = max hold
- 3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth. Record the results.
- 4. Repeat above procedures until all frequencies measured were complete.

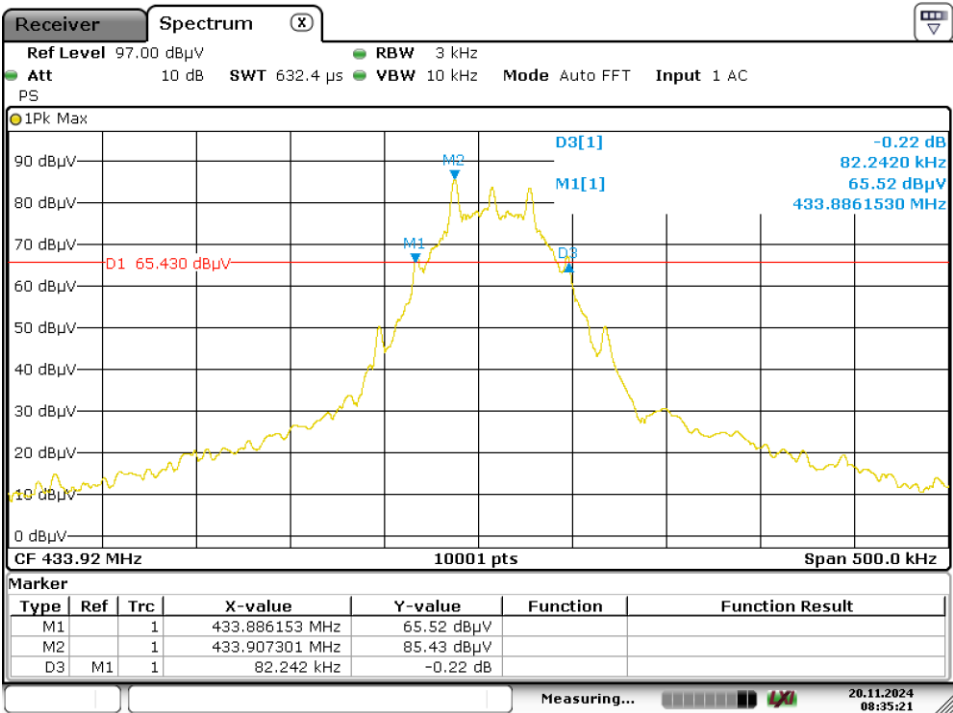
Limit

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% * 433.92 MHz = 1084.8 kHz

Test Result

Channel	20dB Bandwidth (KHz)	Limit (KHz)
1	82.242	≤1084.8



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10.4 Deactivation Time

Test Method

- 1. Set to the maximum power setting and enable the EUT 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:

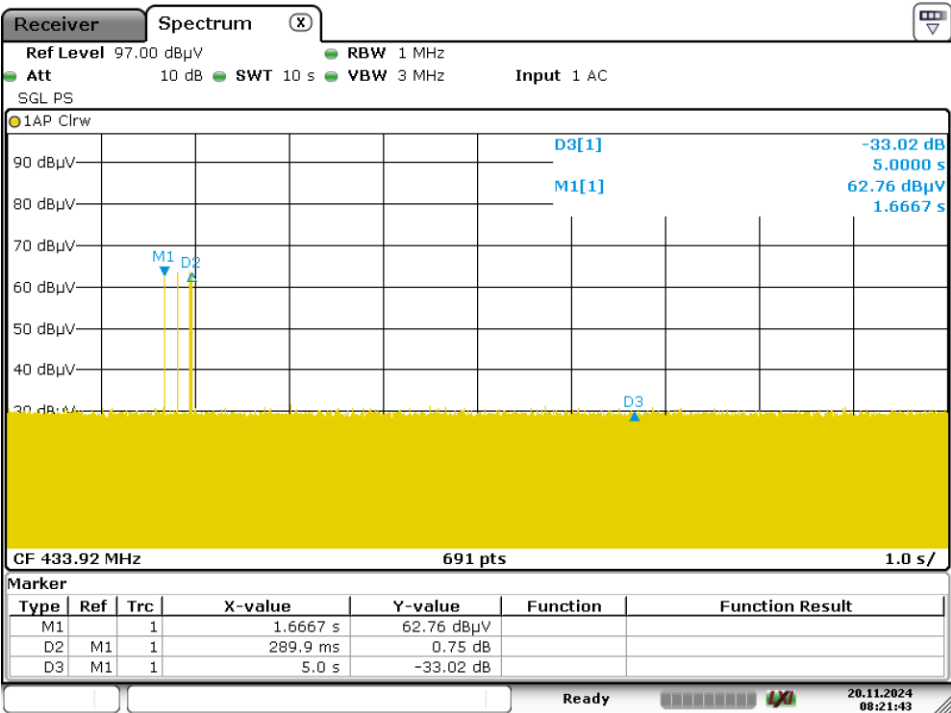
(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(√) (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	Limit	Result
1	433.92MHz	289.9ms	≤5S	Pass



Date: 20.NOV.2024 08:21:43

11 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2024-8-1	2025-7-31
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2024-8-1	2025-7-31
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2024-8-30	2025-8-29
	Horn Antenna	Rohde & Schwarz	HF907	102393	2024-4-14	2025-4-13
	Pre-amplifier	Shenzhen HzEMC	HPA-081843	HYP A23026	2024-4-16	2025-4-15
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2024-6-26	2025-6-25
	Double Ridged Horn Antenna	ETS-Lindgren	3116C	00246076	2023-7-7	2026-7-6
	3m Semi-anechoic chamber	TDK	9X6X6	----	2024-5-8	2027-5-7
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2024-8-1	2025-7-31
	LISN	Rohde & Schwarz	ENV216	101924	2024-8-1	2025-7-31

Measurement Software Information			
Test Item	Software	Manufacturer	Version
RE	EMC 32	Rohde & Schwarz	V10.50.40
CE	EMC 32	Rohde & Schwarz	V9.15.03



12 System Measurement Uncertainty

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

Items	Extended Uncertainty
Conducted Disturbance	9kHz to 30MHz, 3.16dB (AMN)
Radiated Disturbance	9kHz to 30MHz, 3.52dB 30MHz to 1GHz, 5.03dB (Horizontal) 5.12dB (Vertical) 1GHz to 18GHz, 5.49dB 18GHz to 40GHz, 5.63dB

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2023, clause 4.3.3.

-----End of Test Report-----