



FCC TEST REPORT

Report Number : **709502501813-00B** Date of Issue: April 7, 2025

Model : DM28LEU/SH-2/28, DM28LEU/SH-2/20, DM28LEU/SH-2/16

Product Type : DC Tubular Motor

Applicant : NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD.

Address : No.168 Shengguang Road, Luotuo, Zhenhai, Ningbo ZHEJIANG,China

Manufacturer : NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD.

Address : No.168 Shengguang Road, Luotuo, Zhenhai, Ningbo ZHEJIANG,China

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
709502501813-00B	First Issue	04/07/2025

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:	DC Tubular Motor
Model no:	DM28LEU/SH-2/28, DM28LEU/SH-2/20, DM28LEU/SH-2/16
FCC ID:	VYYDM28LEUSH228V0
Rating:	USB Input DC5V(type C)
RF Transmission Frequency:	DSR:433.92MHz
Modulation:	FSK
Hardware Version:	V0
Software Version:	V0
Antenna Type:	Line Antenna

Description of the EUT: The Equipment Under Test (EUT) is a DC Tubular Motor with 433.92MHz transceiver. All of the models have the same electrical construction, the only difference among them is the nominal speed.

In addition, All the three products of have two charging ports as below. We chose model DM28LEU/SH-2/28 with extend type C port to perform tests. Only the worst data listed in this report.

Model name	Type C ports	Extend the type C port
DM28LEU/SH-2/28		
DM28LEU/SH-2/20		
DM28LEU/SH-2/16		

Test sample no.: SHA-897429-2 (RF radiated); SHA-897429-3

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)	The Field strength of Emissions	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. 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: VYYDM28LEUSH228V0, complies with Section 15.207, 15.205, 15.209, 15.231 of the FCC Part 15, Subpart C Rules.

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: March 14, 2025

Testing Start Date: March 17, 2025

Testing End Date: March 28, 2025

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

Reviewed by:

Prepared by:

Tested by:

Jiaxi Xu



Hui Tong

Tianji Xu

Jiaxi XU
Reviewer Engineer

Jiaxi XU
Project Engineer

Tianji XU
Test Engineer

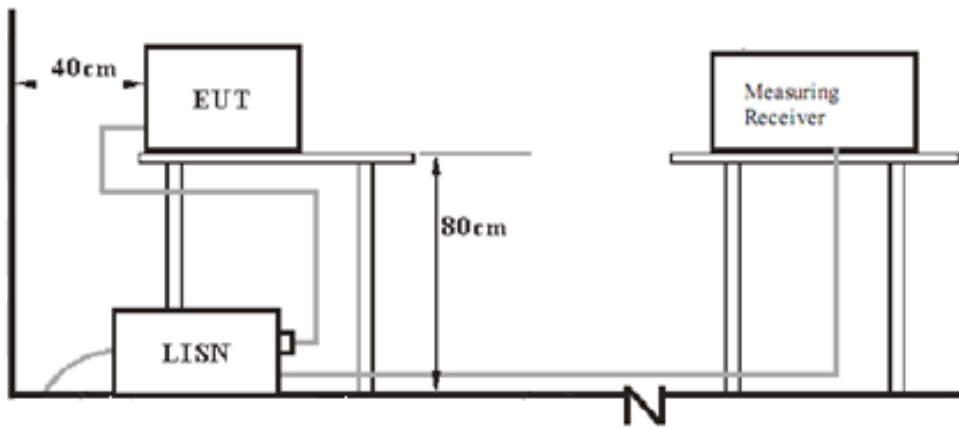
8 Systems test configuration

Auxiliary Equipment Used during Test:

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

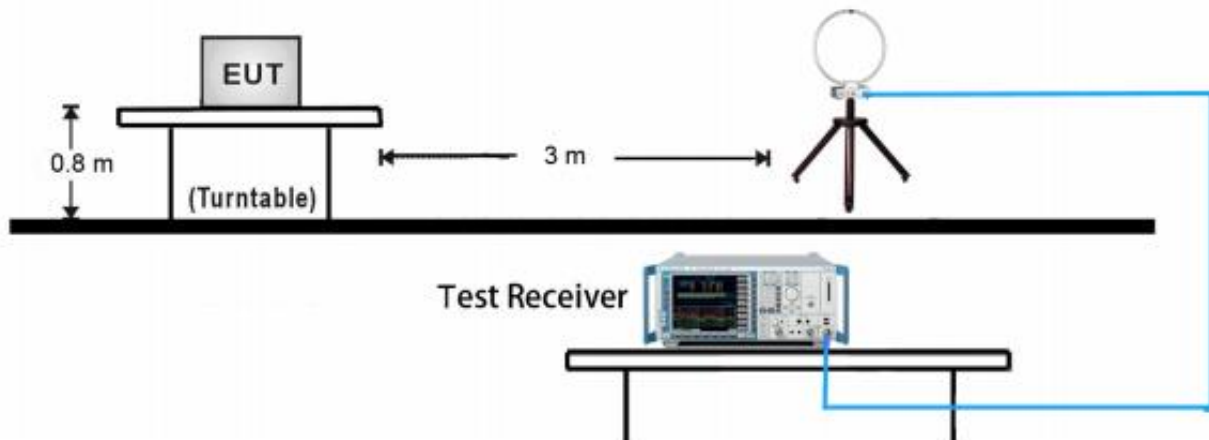
9 Test Setups

9.1 AC Power Line Conducted Emission test setups

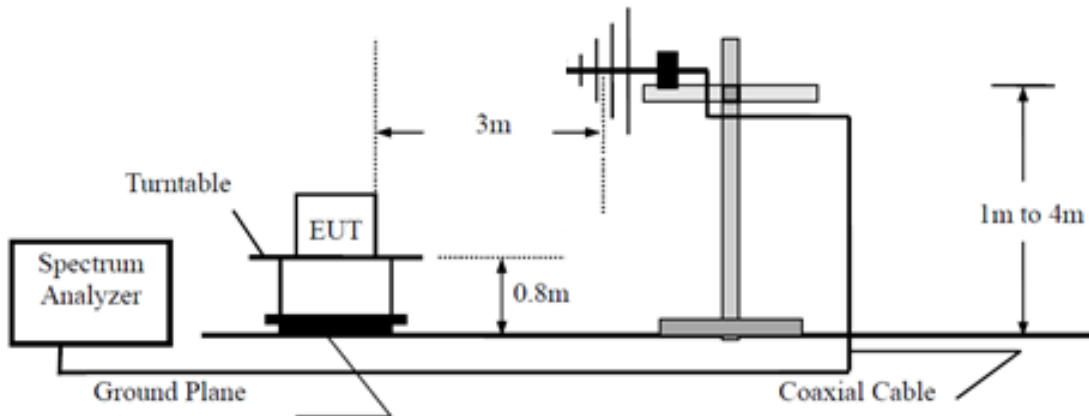


9.2 Radiated test setups

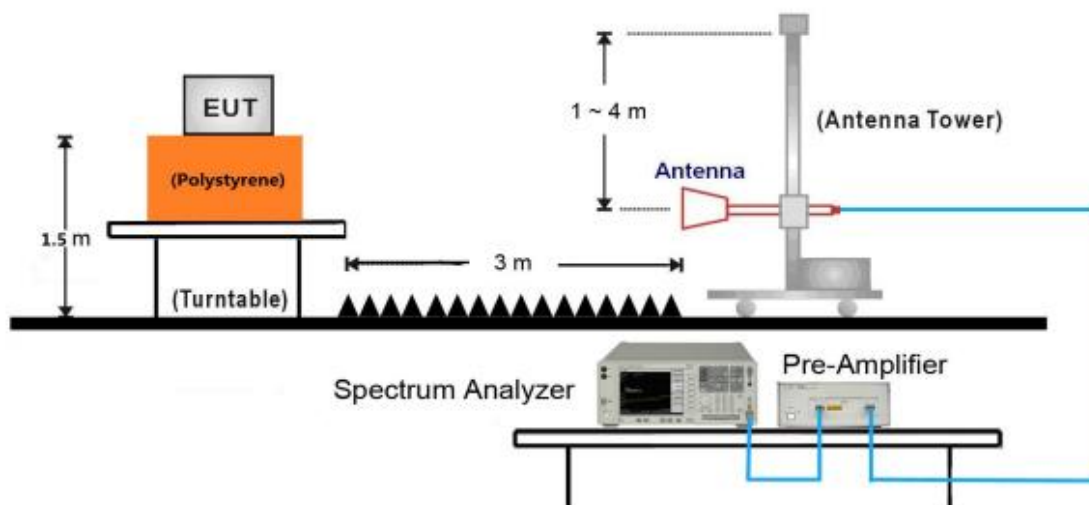
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test- Setup



1GHz ~ 18GHz Test Setup:



10 Test Methodology

10.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

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

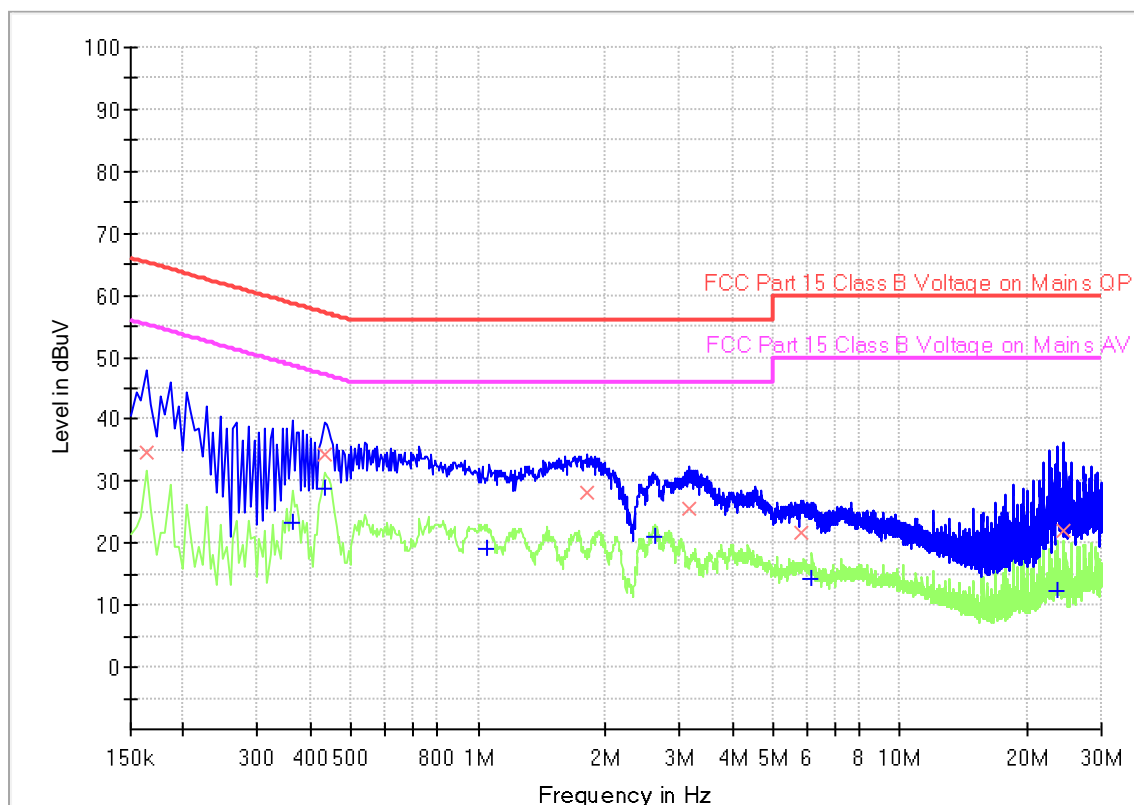
EUT Information

EUT Name:	DC Tubular motor
Model	DM28LEU/SH-2/28
Client:	Ningbo Dooya Mechanic & Electronic Technology Co., Ltd
Op Cond	Transmitted and charging mode
Operator:	Tianji XU
Standard	FCC Part 15.207(a)
Comment:	Phase L
Sample No.:	SHA-897429-2

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)
0.163500	34.57	---	65.28	30.71	1000.0	9.000	L1	19.5
0.361500	---	23.31	48.69	25.38	1000.0	9.000	L1	19.5
0.433500	---	28.84	47.19	18.35	1000.0	9.000	L1	19.5
0.433500	34.41	---	57.19	22.78	1000.0	9.000	L1	19.5
1.045500	---	18.97	46.00	27.03	1000.0	9.000	L1	19.5
1.806000	28.33	---	56.00	27.67	1000.0	9.000	L1	19.5
2.625000	---	21.16	46.00	24.84	1000.0	9.000	L1	19.5
3.151500	25.69	---	56.00	30.31	1000.0	9.000	L1	19.5
5.842500	21.86	---	60.00	38.14	1000.0	9.000	L1	19.6
6.184500	---	14.39	50.00	35.61	1000.0	9.000	L1	19.6
23.676000	---	12.31	50.00	37.69	1000.0	9.000	L1	20.8
24.418500	22.07	---	60.00	37.93	1000.0	9.000	L1	20.8

150k-30MHz Conducted Emission Test

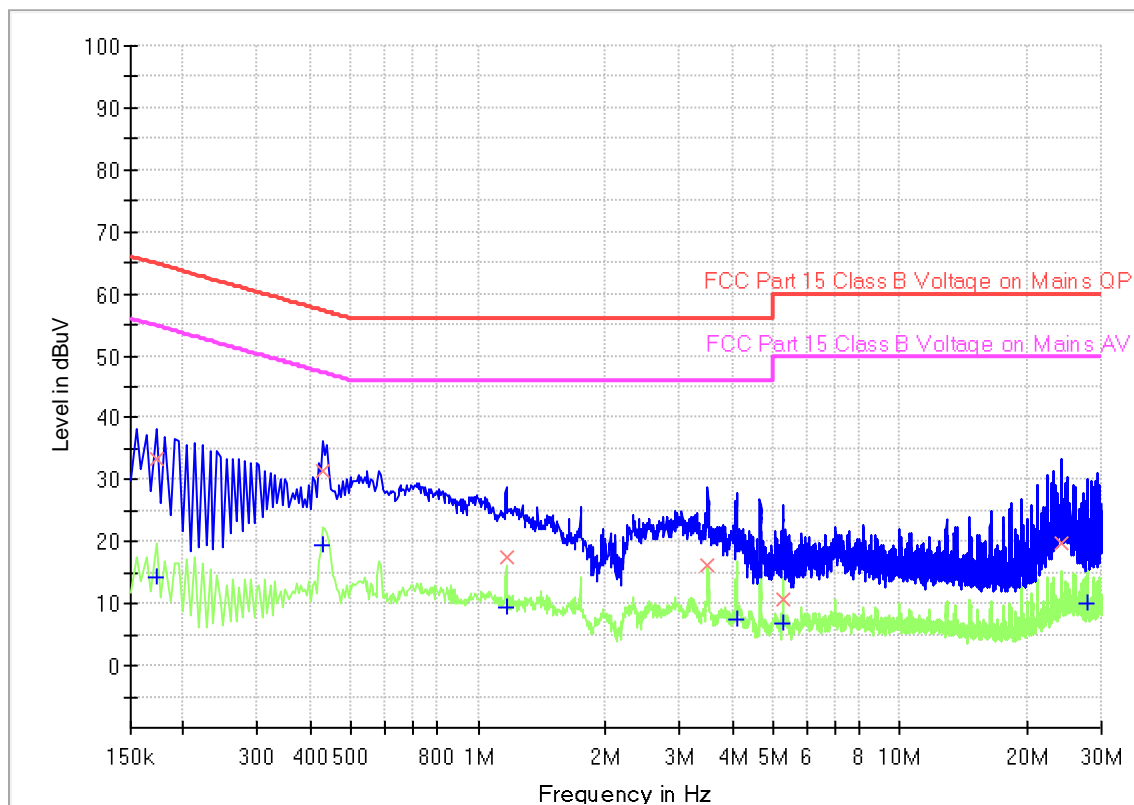
EUT Information

EUT Name:	DC Tubular motor
Model	DM28LEU/SH-2/28
Client:	Ningbo Dooya Mechanic & Electronic Technology Co., Ltd
Op Cond	Transmitted and charging mode
Operator:	Tianji XU
Standard	FCC Part 15.207(a)
Comment:	Phase N
Sample No.:	SHA-897429-2

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)
0.172500	---	14.23	54.84	40.61	1000.0	9.000	N	19.5
0.172500	33.44	---	64.84	31.40	1000.0	9.000	N	19.5
0.429000	---	19.41	47.27	27.86	1000.0	9.000	N	19.5
0.429000	31.50	---	57.27	25.77	1000.0	9.000	N	19.5
1.167000	---	9.39	46.00	36.61	1000.0	9.000	N	19.5
1.167000	17.38	---	56.00	38.62	1000.0	9.000	N	19.5
3.502500	16.36	---	56.00	39.64	1000.0	9.000	N	19.6
4.092000	---	7.50	46.00	38.50	1000.0	9.000	N	19.6
5.266500	10.67	---	60.00	49.33	1000.0	9.000	N	19.6
5.266500	---	6.69	50.00	43.31	1000.0	9.000	N	19.6
24.112500	19.72	---	60.00	40.28	1000.0	9.000	N	20.6
27.739500	---	9.93	50.00	40.07	1000.0	9.000	N	20.8

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

Field strength of Emissions

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	96.30	25.70	0.00	/	100.80	4.50	Fundamental
AV	433.92	H	96.30	/	-22.62	73.68	80.80	7.12	Fundamental
PK	433.92	V	90.50	25.70	0.00	/	100.80	10.30	Fundamental
AV	433.92	V	90.50	/	-22.62	67.88	80.80	12.92	Fundamental
PK	867.84	H	35.21	33.00	0.00	/	80.80	45.59	Spurious
AV	867.84	H	35.33	/	-22.62	12.71	60.80	48.09	Spurious
PK	867.84	V	36.59	33.20	0.00	/	80.80	44.21	Spurious
AV	867.84	V	36.59	/	-22.62	13.97	60.80	46.83	Spurious
Above 1GHz									
PK	1301.50	H	31.78	-16.00	0.00	/	74.00	42.22	Restricted band*
AV	1301.50	H	34.08	/	-22.62	11.46	54.00	42.54	Restricted band*
PK	1737.00	H	40.28	-13.60	0.00	/	80.80	40.52	Spurious
AV	1737.00	H	40.28	/	-22.62	17.66	60.80	43.14	Spurious
PK	1301.50	V	34.27	-16.00	0.00	/	74.00	39.73	Restricted band*
AV	1301.50	V	34.27	/	-22.62	11.65	54.00	42.35	Restricted band*
PK	1736.50	V	40.26	-13.60	0.00	/	80.80	40.54	Spurious
AV	1736.50	V	40.26	/	-22.62	17.64	60.80	43.16	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

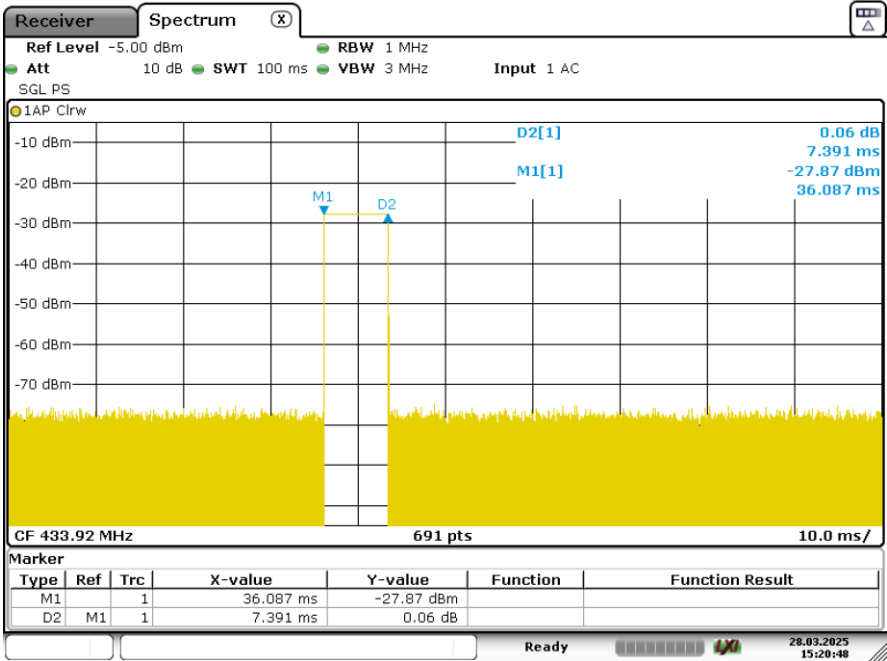
(The Reading Level is recorded by software which is not shown in the sheet)

Duty Cycle =7.391(ms)/100(ms) =7.391%

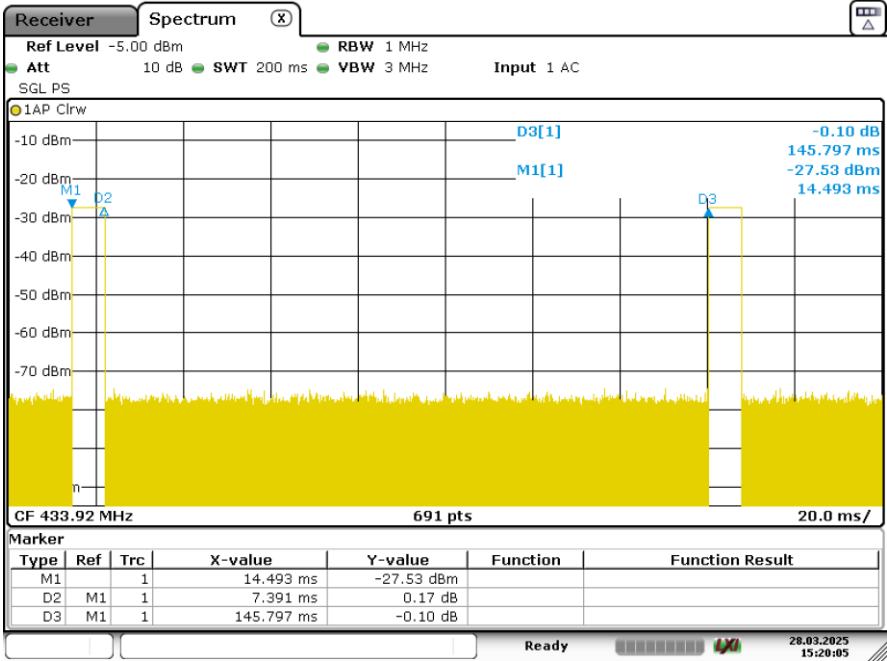
Duty Cycle Factor =20log (Duty Cycle) =-22.62



Duty Cycle



Date: 28.MAR.2025 15:20:48



Date: 28.MAR.2025 15:20:05

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.

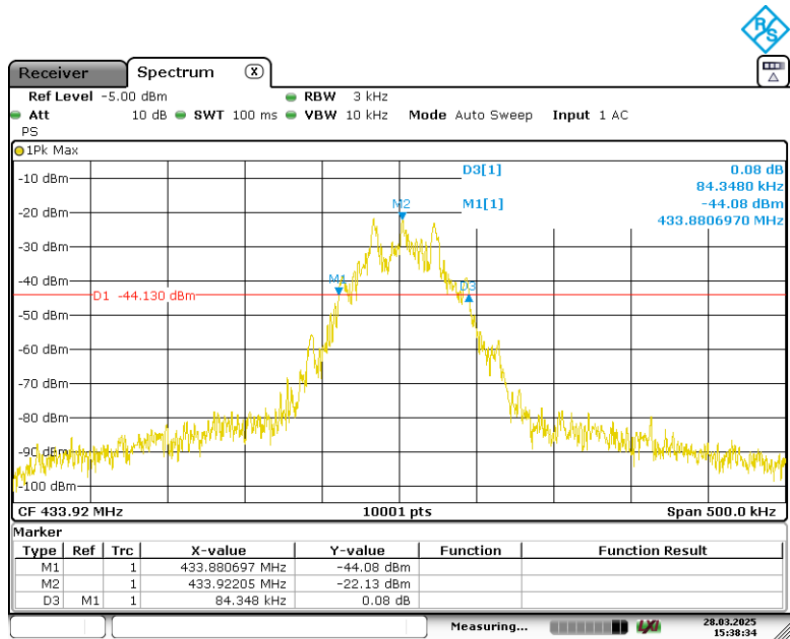
Limit

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	84.348	≤1084.8



Date: 28. MAR 2025 15:38:35

10.4 Deactivation Time

Test Method

1. The EUT was placed on 0.8m height table, the RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT in transmitting mode.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as $RBW \geq OBW$, $VBW \geq RBW$, Span=0Hz, detector=peak.
5. Repeat above procedures until all frequency measured was complete.

Limit

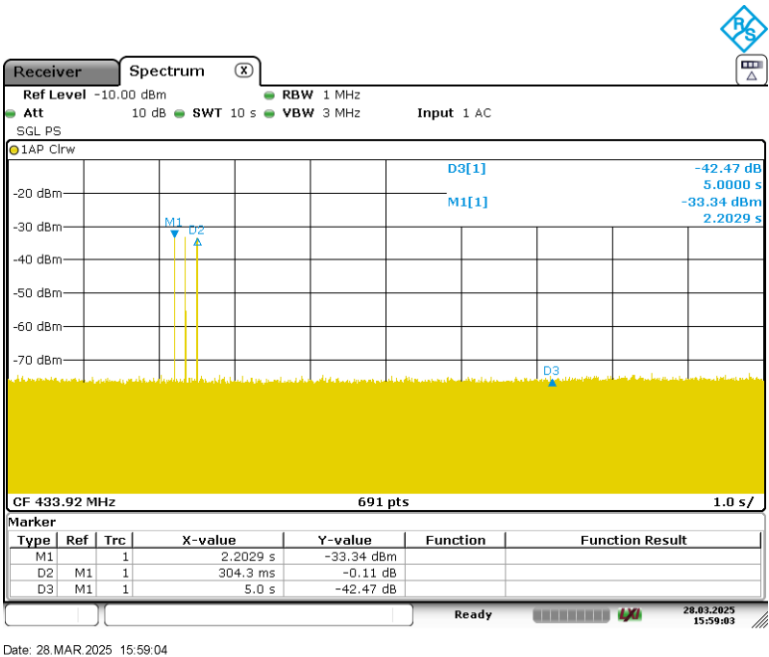
According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:
 (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(√) (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	304.3ms	≤5S	Pass



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
	Coaxial Cable	----	----	RE Cable 01	2024-8-1	2025-7-31
	Coaxial Cable	----	----	RE Cable 02	2024-8-1	2025-7-31
	Coaxial Cable	----	----	RE Cable 03	2024-8-1	2025-7-31
	Coaxial Cable	----	----	RE Cable 04	2024-8-1	2025-7-31
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-----