FCC- TEST REPORT

Report Number	: **708882136744-00**	Date of Issue:	October 21, 2021
Model	: DC313, DC307A		
Product Type	: Transmitter		
Applicant	: LT Motors LLC		
Address	: 2886 BALTING PL, Melbourne, Florida 32940, United States		
Production Facility	: Ningbo Dooya Mechanic & Electronic Technology Co., Ltd.		
Address	: No. 168 Shengguang Road, Luotuo, Zhenhai, Ningbo, Zhengjiang province 315202, P.R. China		
Test Result	: ■ **Positive** ☐ **Negative**		
Total pages including Appendices	: 18		

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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. Shanghai Branch No.16 Lane, 1951 Du Hui Road, Shanghai 201108, P.R. China
FCC Registration Number:	820234
Telephone:	+86 21 6141 0123
Fax:	+86 21 6140 8600

3 Description of the Equipment Under Test

Product:	Transmitter
Model no./HVIN:	DC313, DC307A
FCC ID:	2A2ITDC307A313
Rating:	3VDC
RF Transmission Frequency:	433.92MHz
Modulation:	OOK
Antenna Type:	PCB antenna
Antenna Gain:	1dBi
Description of the EUT:	The Equipment Under Test (EUT) is a transmitter operated at 433.92MHz.
Test sample no.:	SHA-599885-1

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4 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 C63.10-2013.

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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**	**N/A**	**N/A**	**Not Applicable**
§15.205, §15.209, 15.35 (c)§15.231(b)	**Radiated Emission, 30MHz to 4.5GHz**	**10**	**3m chamber**	**Pass**
§15.231(c)	**Bandwidth Measurement**	**15**	**Shield room**	**Pass**
§15.231(a)(1)	**Deactivation Time**	**16**	**Shield room**	**Pass**
§15.203	**Antenna requirement**	**--**	**See Note 2**	**Pass**

Note 1: N/A=Not Applicable. Conducted emission is not apply for battery operated device.
Note 2: The EUT uses an PCB Antenna, which gain is 1dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2A2ITDC307A313 complies with Section 15.205, 15.209, 15.231 of the FCC Part 15, Subpart C Rules.

According to the client's declaration, the models DC307A and DC313 have the same control board, circuit principle and product components except for the different model names caused by the appearance of the buttons.

So model DC313 was chosen to perform all the tests.

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:	September 8, 2021
Testing Start Date:	September 22, 2021
Testing End Date:	October 8, 2021

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Reviewed by:	Prepared by:	Tested by:
Hui TONG	Wenqiang LU	Chengjie GUO
EMC Section Manager	EMC Project Engineer	EMC Test Engineer

7 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
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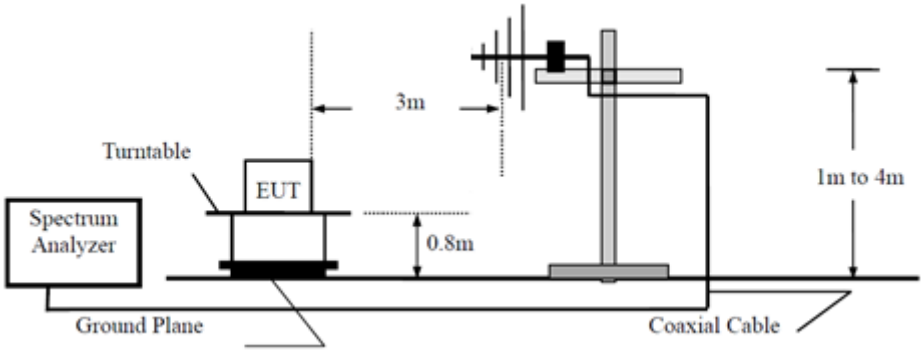
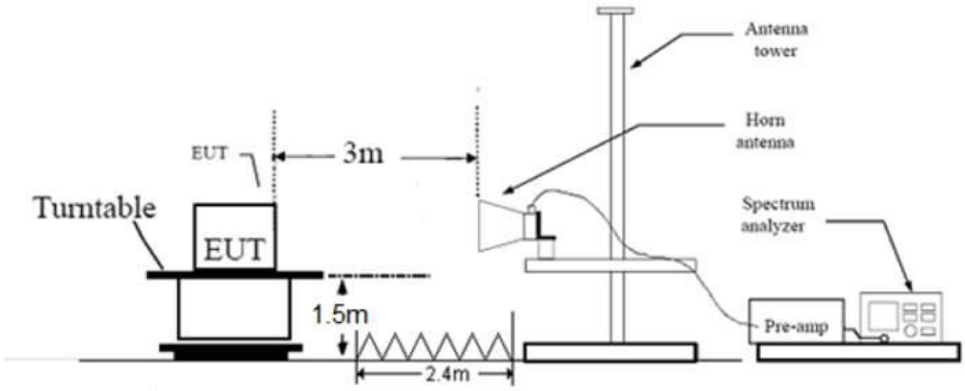
8 Test Setups

8.1 Radiated test setups

Below 1GHz



Above 1GHz



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9 Test Methodology

9.1 Radiated Emission

Test Method

1. 1 The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
4. 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.
5. 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.
6. Use the following spectrum analyzer settings According to C63.10:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥1 GHz for peak measurement.
   For average measurement:
   VBW = 10 Hz, when duty cycle is no less than 98 percent.
   VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum
   power control level for the tested mode of operation.
7. Repeat above procedures until all frequencies measured were complete.

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

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Limits for 15.209 Radiated emission limits; general requirements

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

Frequency	Limit at 3m (dBuV/m)
0.009 MHz – 0.490 MHz	128.5 to 93.8[1]
0.490 MHz – 1.705 MHz	73.8 to 63[1]
1.705 MHz – 30 MHz	69.5[1]
30 MHz – 88 MHz	40.0[1]
88 MHz – 216 MHz	43.5[1]
216 MHz – 960 MHz	46.0[1]
Above 960 MHz	54.0[1]
Above 1000 MHz	54.0[2]
Above 1000 MHz	74.0[3]

[1]Limit is with detector with bandwidths as defined in CISPR-16-1-1 except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz where an Average detector is used.
[2]Limit is with 1 MHz measurement bandwidth and using an Average detector
[3]Limit is with 1 MHz measurement bandwidth and using a Peak detector

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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.

Antenna polarization	Frequency (MHz)	Duty Cycle Factor(dB)	Corrected Reading (dBuV/m)	Emission Type	Limit (dBuV/m)	Margin	Detector
H	433.908	0	67.184	Fundamental	100.80	33.616	PK
H	433.908	-5.6	61.584	Fundamental	80.80	19.216	AV
V	433.908	0	60.170	Fundamental	100.80	40.63	PK
V	433.908	-5.6	54.570	Fundamental	80.80	26.23	AV
H	2169.5	0	48.726	Harmonics	74.00	25.274	PK
H	2169.5	-5.6	43.126	Harmonics	54.00	10.874	AV
V	2169.5	0	41.638	Harmonics	74.00	32.362	PK
V	2169.5	-5.6	36.038	Harmonics	54.00	17.962	AV
H	3037.5	0	50.961	Harmonics	74.00	23.039	PK
H	3037.5	-5.6	45.361	Harmonics	54.00	8.639	AV
V	3037.5	0	46.084	Harmonics	74.00	27.916	PK
V	3037.5	-5.6	40.484	Harmonics	54.00	13.516	AV

Remark:
1: AV Emission Level= PK Emission Level+20log(dutycycle)
2: Other than listed in the table are attenuated more than 20dB below the permissible limit of the field strength, therefore no data appear in the report.
3: "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
4: Corrected Amplitude = Read level + Corrector factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
5. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz)
6. Corrected Reading = Original Receiver Reading + Correct Factor
7. Only the worst data listed in this report

Duty Cycle = [4.913+(0.304×10)+(0.739×30)]ms/57.391 (ms) =52.487%
Duty Cycle Factor =20log (Duty Cycle) =-5.6

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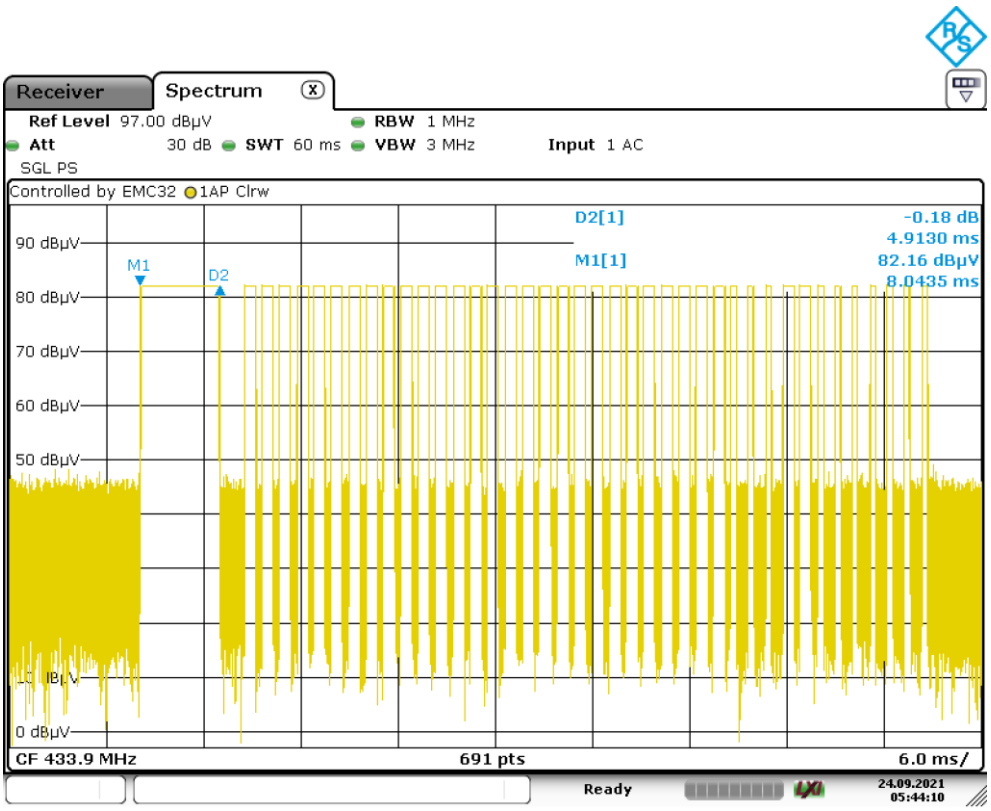

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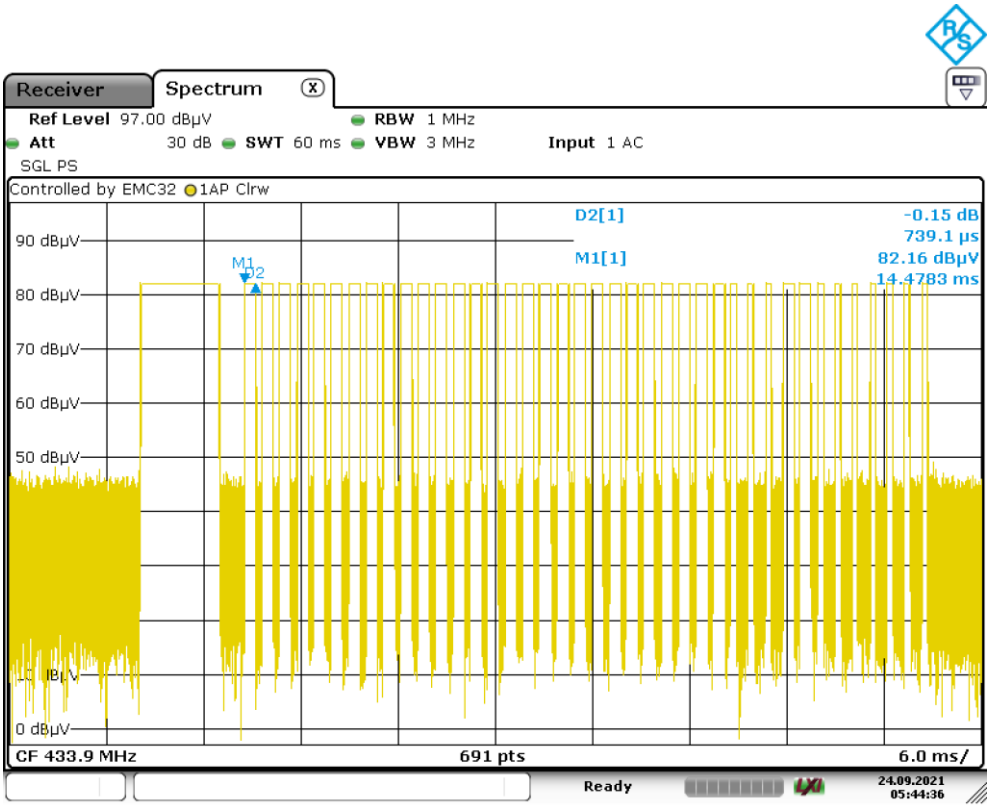

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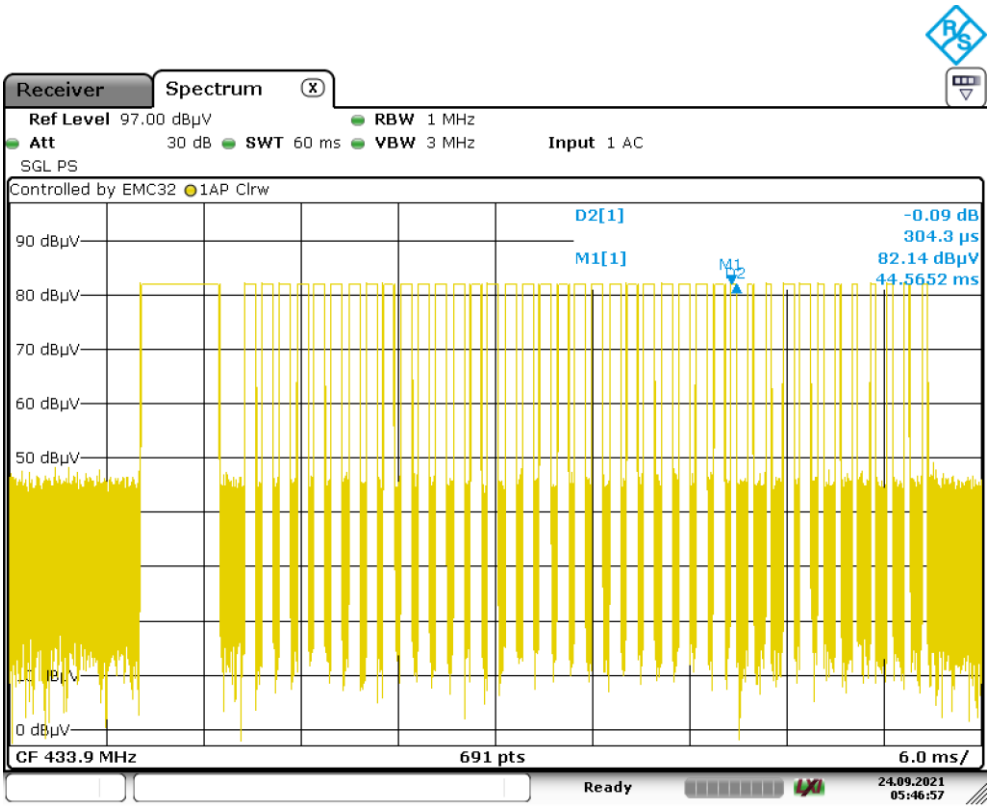

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9.2 Bandwidth Measurement

Test Method

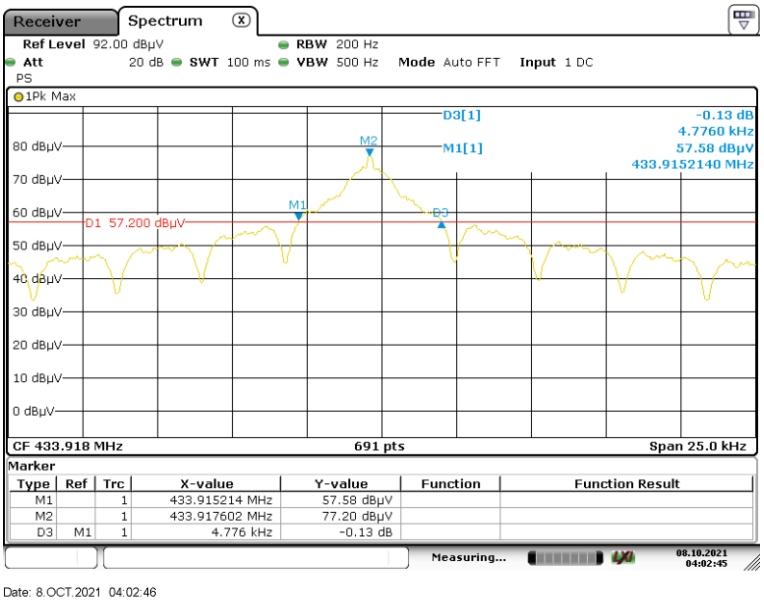
1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
   Span = approximately 5 times the 20dB 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
4. 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.
5. 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 = 1085 kHz

Test Result

Channel	20dB Bandwidth (KHz)	Limit (KHz)
1	4.776	1085



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9.3 Deactivation Time

Test Method

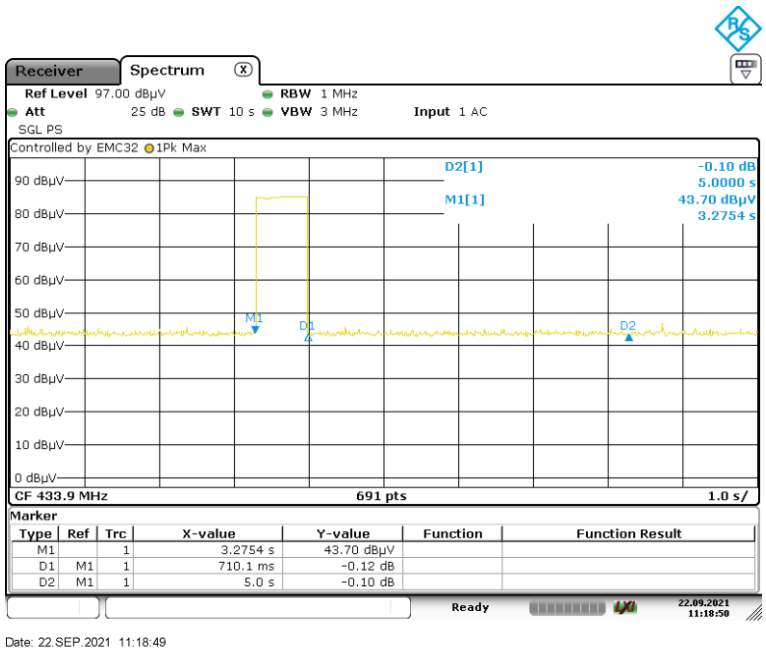
1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT in transmitting mode.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as RBW=120 KHz, VBW=1MHz, Span=0Hz.
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	Result
1	433.92MHz	710.1ms	Pass



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10 Test Equipment List

List of Test Instruments

RF Test

Description	Manufacturer	Model no.	Serial no.	Calibration Date	Calibration Due
Signal and spectrum analyzer	R&S	FSV40	S1503003-YQ-EMC	2021-8-02	2022-8-01

Radiated Emission Test

USED	Equipment Name	Model	Manufacturer	Equipment ID.	Calibration Date	Calibration Due
☒	EMI test receiver	ESR3	R&S	S1503109-YQ-EMC	2021-8-02	2022-8-01
☒	Trilog super broadband test antenna	SCHWARZBECK	VULB9168	S1808296-YQ-EMC	2019-3-16	2022-3-15
☒	Double-ridged waveguide horn antenna	HF907	R&S	S1503009-YQ-EMC	2021-4-13	2024-4-12
☒	Signal conditioning unit	SCU-18D	R&S	S1503012-YQ-EMC	2021-8-02	2022-8-01
☒	Signal and spectrum analyzer	FSV40	R&S	S1503003-YQ-EMC	2021-8-02	2022-8-01
☒	Loop antenna	HFH2-Z2	R&S	S1503013-YQ-EMC	2021-5-21	2022-5-20

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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:

Items	Extended Uncertainty
Radiated Disturbance	30MHz to 1GHz, ±5.03dB (Horizontal) ±5.11dB (Vertical) 1GHz to 18GHz, ±5.15dB (Horizontal) ±5.12dB (Vertical) 18GHz to 25GHz, ±4.76dB

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