



FCC ID TEST REPORT

Report Number : **709502403680-00A** Date of Issue: July 08, 2024

Model : 5201081006, 5201086006

Product Type : Forest EasyTouch

Applicant : Forest Group (Nederland) B.V.

Address : Teugseweg 42 7418 AM Deventer THE NETHERLANDS

Manufacturer : Forest Group (Nederland) B.V.

Address : Teugseweg 42 7418 AM Deventer THE NETHERLANDS

Production Facility : Zhejiang Jiechang Linear Motion Technology Co., Ltd.

Address : HIGH TECH PARK, QIXING STREET, XINCHANG COUNTY,
ZHEJIANG, P.R. CHINA 312500

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
-00A	First Issue	07/08/2024



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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P.R. China

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FCC Registration No.: 820234

FCC Designation Number: CN1183



4 Description of the Equipment Under Test

Product:	Forest EasyTouch
Model no.:	5201081006, 5201086006
FCC ID:	2AFO8520108X006
Options and accessories:	NA
Rating:	2x1.5V DC AAA/LR03 Battery
RF Transmission Frequency:	433.92MHz
No. of Operated Channel:	1
Modulation:	FSK
Antenna Type:	internal, PCB Antenna
Description of the EUT:	The EUT was a Forest EasyTouch transmit at 433.92MHz. We tested it and listed the worst data in this report.
Test sample no.:	SHA-812923-1 (Continue transmitting for Radiated Emission) SHA-812923-2 (Normal operating for other tests)

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 10-1-2023 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to ANSI C63.10-2013.

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	N/A	N/A	Not Applicable
§15.205, §15.209, 15.35 (c)§15.231(b)	Radiated Emission, 30MHz to 4.5GHz	11-16	3m chamber	Pass
§15.231(c)	Bandwidth Measurement	17-18	Shield room	Pass
§15.231(a)(1)	Deactivation Time	19	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 internal, PCB 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: 2AFO8520108X006, complies with Section 15.207, 15.205, 15.209, 15.231 of the FCC Part 15, Subpart C Rules.

According to the client's declaration, all models are identical and share the same technology, schematics, PCB trace layout and same critical components and mechanical constructions except model name and color.

So model 5201081006 was chosen to perform all the tests, other model 5201086006 is deemed to fulfill all the requirement without further testing.

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: June 13, 2024

Testing Start Date: June 14, 2024

Testing End Date: June 19, 2024

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

Reviewed by:

Prepared by:

Tested by:

Hui Tong



Jiaxi Xu

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Hui TONG
EMC Section Manager

Jiaxi XU
EMC Project Engineer

Cheng Huali
EMC Test Engineer



8 Systems test configuration

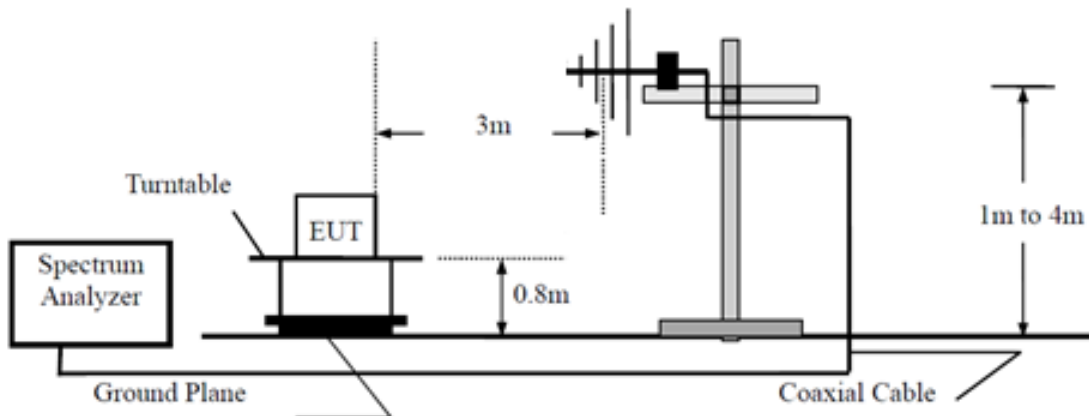
Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
--	--	--	--

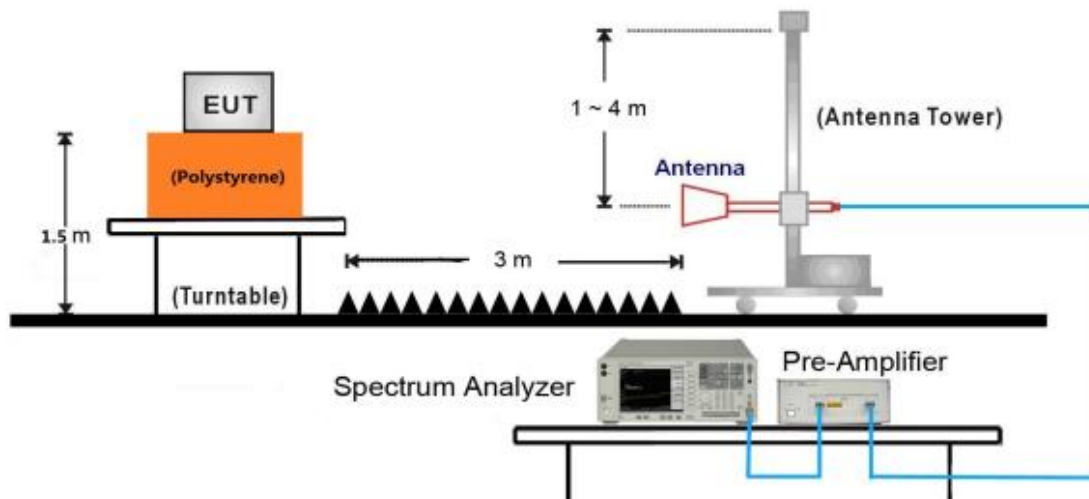
9 Test Setups

8.1 Radiated test setups

30MHz ~ 1GHz Test- Setup



1GHz ~ 5GHz Test Setup:



10 Test Methodology

10.1 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 Above 1GHz
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW \geq 3RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.
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, VBW \geq 3RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (duty cycle \geq 98%) for peak detection at frequency above 1GHz.
4. If the emission is pulsed (duty cycle $<$ 98%), modify the unit for continuous operation: use the settings shown above, then correct the reading by subtracting the peak to average duty cycle correction factor $20\log(\text{duty cycle})$, derived from the appropriate duty cycle calculation.

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 at 3m)	Field Strength of spurious emissions (Microvolts /meter at 3m)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,370 *	125 to 3750 *
174-260	3,750	375
260-470 √	3,750 to 12, 500*	375 to 1,250*
Above 470	12,500	1,250

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

¹Limit 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.

²Limit is with 1 MHz measurement bandwidth and using an Average detector

³Limit is with 1 MHz measurement bandwidth and using a Peak detector

Spurious radiated emissions for transmitter

433.92MHz Tx

Radiated Emission								
Value	Emissions	E-Field	PK	Average	AV	Limit		Emission Type
	Frequency	Polarity	Emission	Factor	Emission		Margin	
	MHz		dBµV/m	dB	dBµV/m	dBµV/m	dB	
Below 1GHz								
PK	433.92	H	86.03	0.00	/	100.80	14.77	Fundamental
AV	433.92	H	86.03	-6.74	79.29	80.80	1.51	Fundamental
PK	433.92	V	80.67	0.00	/	100.80	20.13	Fundamental
AV	433.92	V	80.67	-6.74	73.93	80.80	6.87	Fundamental
PK	867.84	H	35.03	0.00	/	80.80	45.77	Spurious
AV	867.84	H	35.03	-6.74	28.29	60.80	32.51	Spurious
PK	867.84	V	35.47	0.00	/	80.80	45.33	Spurious
AV	867.84	V	35.47	-6.74	28.73	60.80	32.07	Spurious
Above 1GHz								
PK	3037.43	H	51.60	0.00	/	74.00	22.40	Restricted band
AV	3037.43	H	51.60	-6.74	44.86	54.00	9.14	Restricted band
PK	3037.58	V	51.63	0.00	/	74.00	22.37	Restricted band
AV	3037.58	V	51.63	-6.74	44.89	54.00	9.11	Restricted band

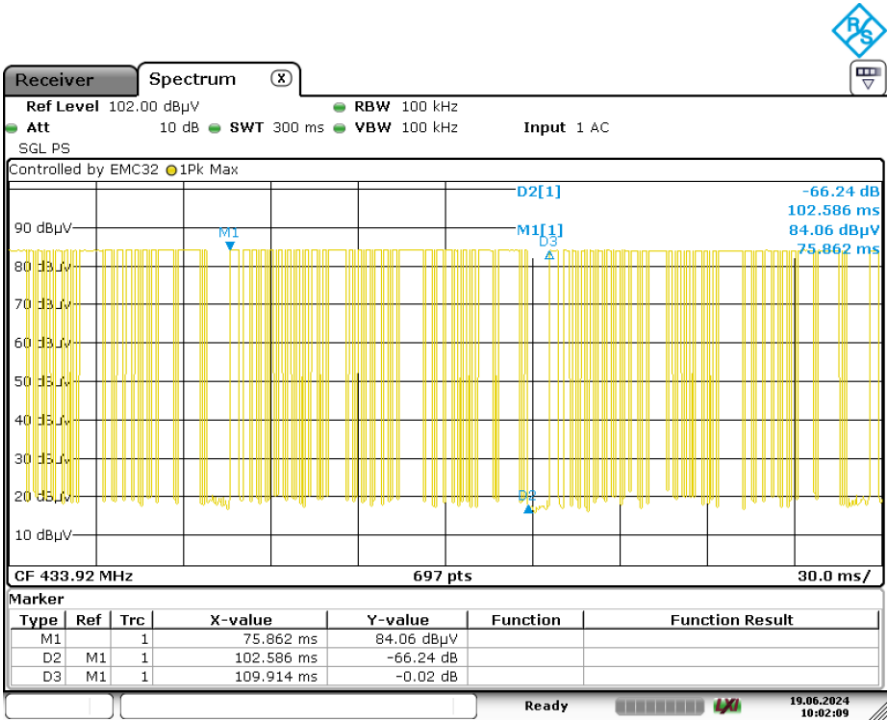
Remark:

- Corrected Amplitude = Read level + Corrector factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
- Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz)
- Corrected Reading = Original Receiver Reading + Correct Factor
- Only the worst data listed in this report, Other frequency was 20dB below the limit
- Pre-scan all test modes (different power on modes) and only the worst case listed as above.
- AV Emission Level= PK Emission Level+20log (duty cycle),
Duty Cycle = $(3.0172 \times 1 + 0.6609 \times 36 + 0.3305 \times 58)$ ms /100ms = 45.98%,
Duty Cycle Factor = $20\log(\text{Duty Cycle}) = -6.74$

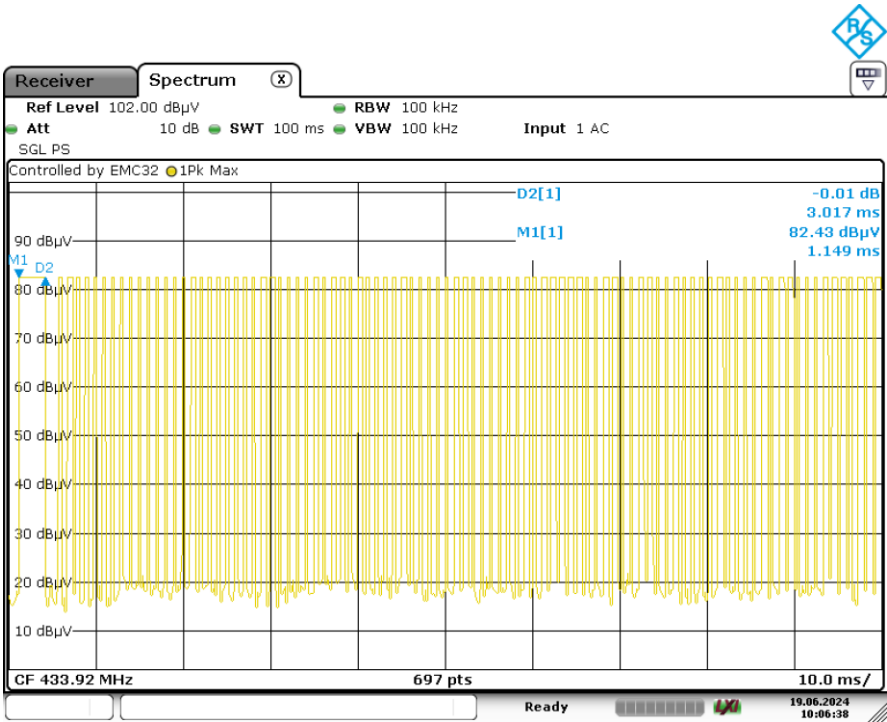


Duty Cycle

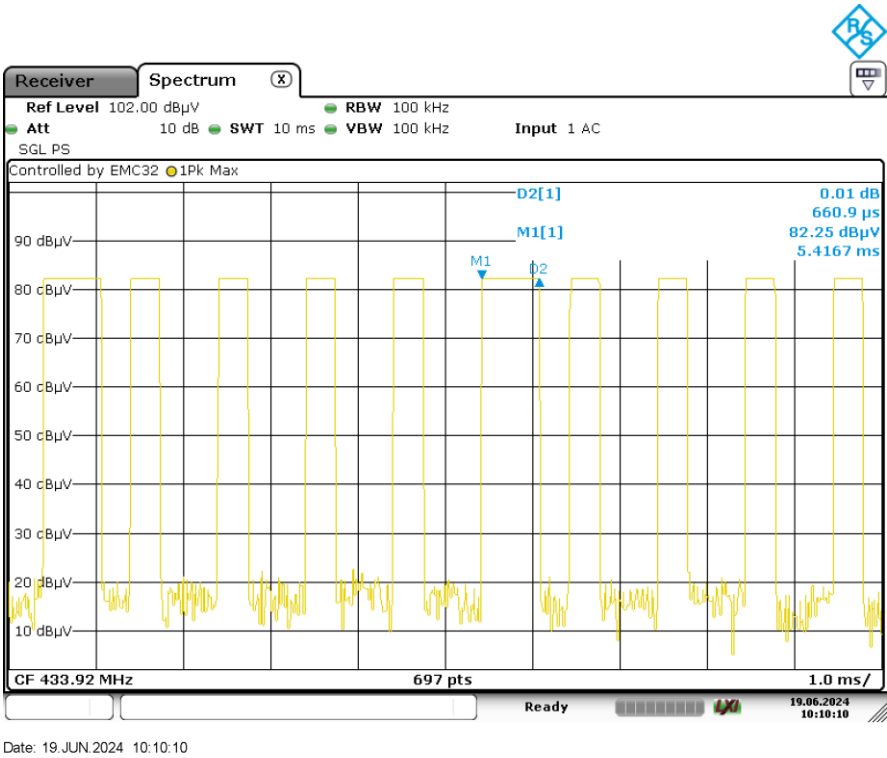
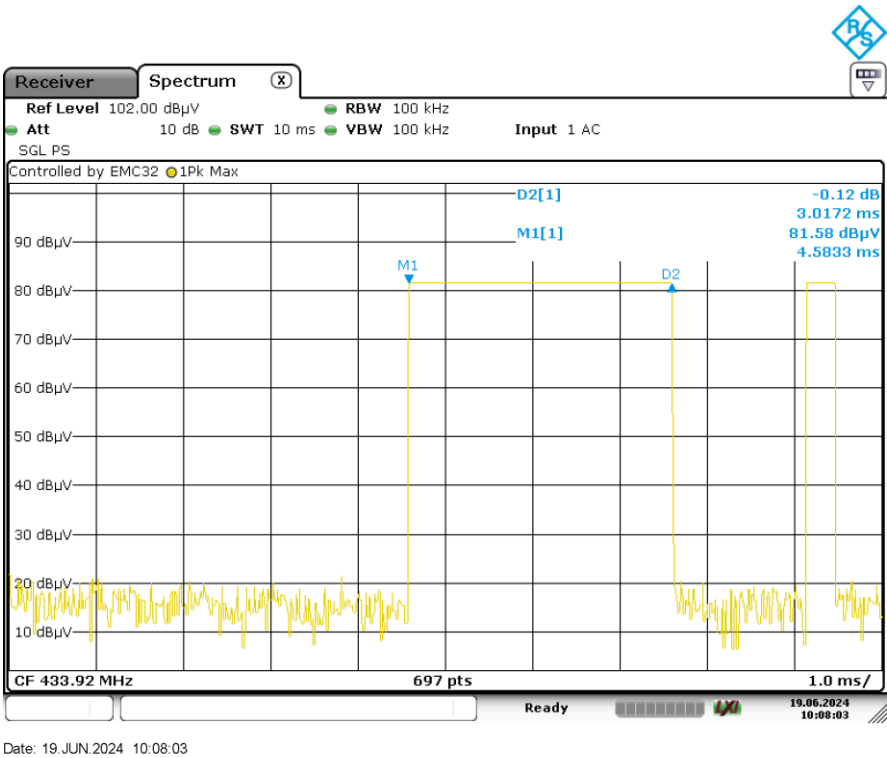
Duty Cycle = (3.0172*1+0.6609*36+0.3305*58) ms /100ms = 45.98%,
Duty Cycle Factor = 20log (Duty Cycle) = -6.74

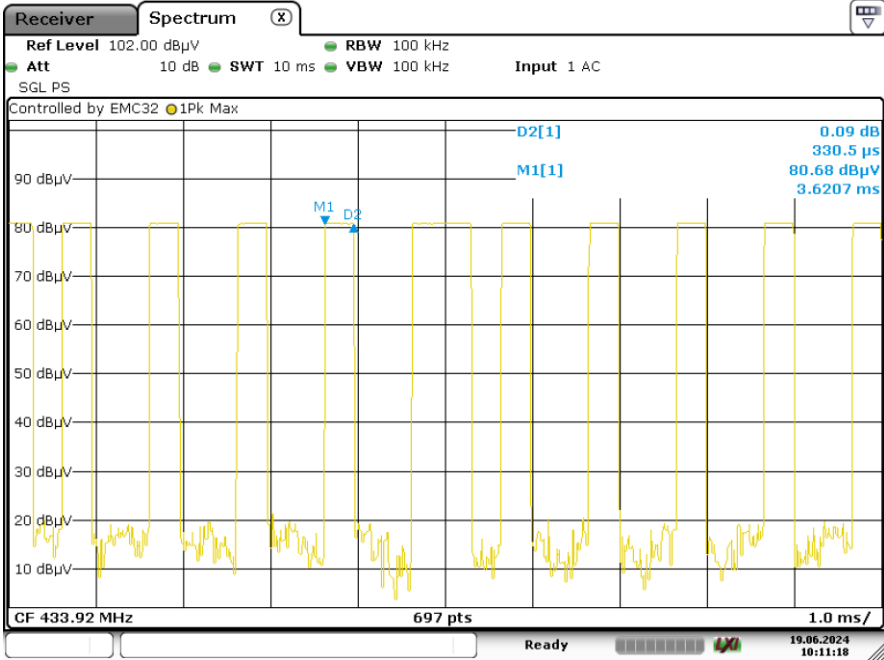


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Date: 19 JUN 2024 10:06:38





Date: 19 JUN 2024 10:11:18

10.2 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.

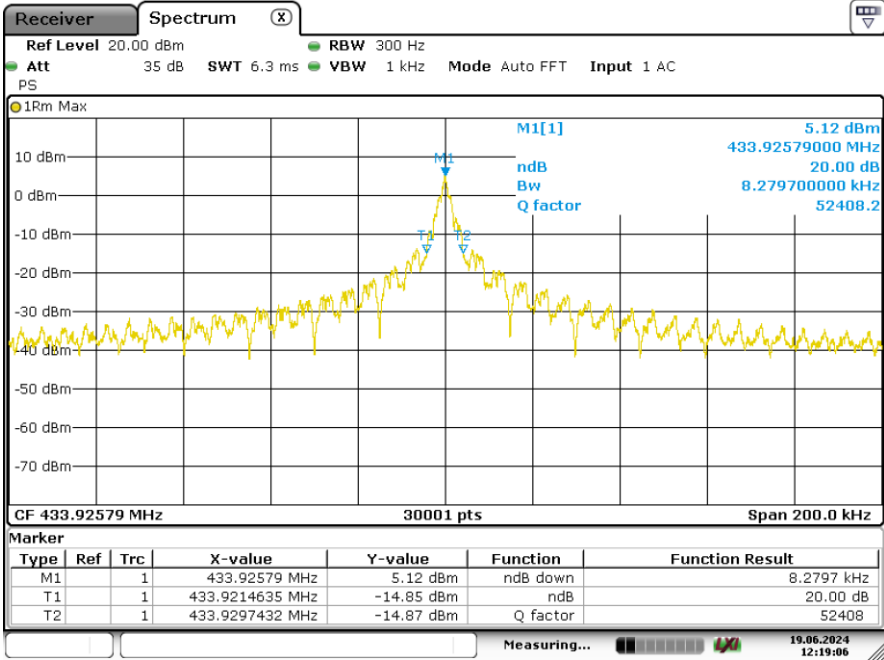
Limit

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 433.92MHz = 0.25% * 433.92 MHz = 1084.8 kHz

Test Result

Frequency	20dB Bandwidth (kHz)	Limit (kHz)
433.92MHz	8.28	<1084.8



Date: 19 JUN 2024 12:19:06



10.3 Deactivation Time

Test Method

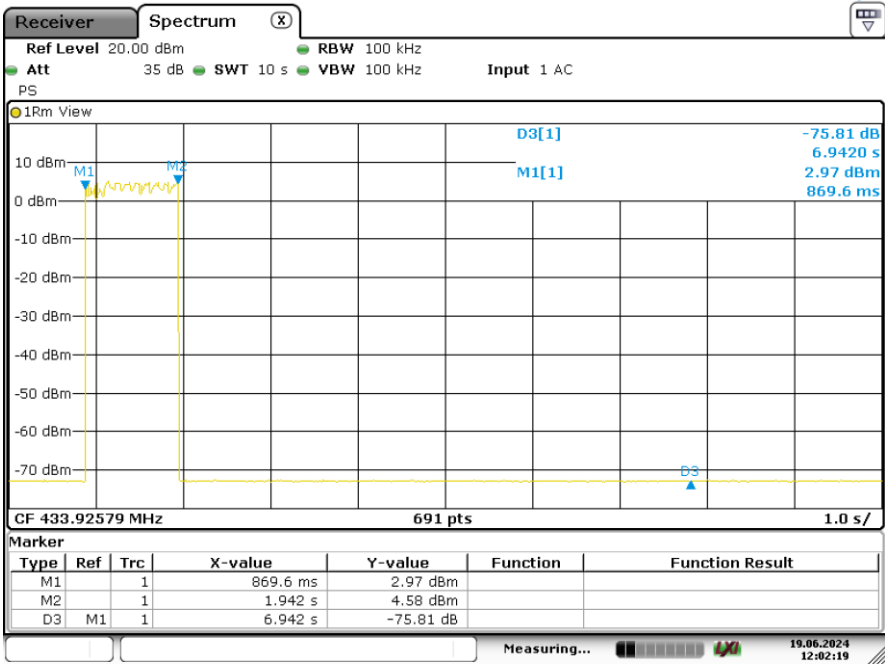
- 1. Set to the maximum power setting and enable the EUT in transmitting mode.
- 2. Set center frequency of spectrum analyzer=operating frequency.
- 3. Set the spectrum analyzer as RBW=120 KHz, VBW=1MHz, Span=0Hz.
- 4. Repeat above procedures until all frequency measured was complete.

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.

Test Result

Frequency	Deactivation Time	Limit	Result
433.92MHz	869.6ms	<5S	Pass



Date: 19 JUN 2024 12:02:18

11 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	2023-8-01	2024-7-31

Radiated Emission Test

USED	Equipment Name	Model	Manufacturer	Equipment ID.	Calibration Date	Calibration Due
<input checked="" type="checkbox"/>	EMI test receiver	ESR3	R&S	S1503109-YQ-EMC	2023-8-01	2024-7-31
<input checked="" type="checkbox"/>	Trilog super broadband test antenna	SCHWARZBECK	VULB9168	S1808296-YQ-EMC	2021-9-23	2024-9-22
<input checked="" type="checkbox"/>	Double-ridged waveguide horn antenna	HF907	R&S	S1503009-YQ-EMC	2024-4-14	2027-4-13
<input checked="" type="checkbox"/>	Pre-amplifier	HPA-081843	Shenzhen HzEMC	S2403437-YQ-EMC	2024-4-16	2025-4-15
<input checked="" type="checkbox"/>	Signal and spectrum analyzer	FSV40	R&S	S1503003-YQ-EMC	2023-8-01	2024-7-31

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: 2021, clause 4.4.3 and 4.5.1.



13 Photographs of Test Set-ups

Refer to the < Test Setup photos >.



14 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

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