

**FCC- TEST REPORT**Report Number : **709502308669-00A** Date of Issue: February 17, 2025

Model : ND4009T

Product Type : Wireless transmission(For Multifunctional Soil Survey Instrument)

Applicant : NDI TOOLS LLC

Address : 733 Ehrhorn Avenue, Mountain View, California,United States

Production Facility : NDI TOOLS LLC

Address : 733 Ehrhorn Avenue, Mountain View, California,  
United States

Test Result : ☒ **Positive** ☐ **Negative**Total pages including  
Appendices : 23

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.



# 1 Table of Contents

1	Table of Contents.....	2
2	Report Modification Record.....	3
3	Details about the Test Laboratory .....	3
4	Description of the Equipment Under Test.....	4
5	Summary of Test Standards.....	5
6	Summary of Test Results .....	6
7	General Remarks .....	7
8	Systems test configuration .....	8
9	Test Setups.....	9
10	Test Methodology .....	11
10.1	Conducted Emission.....	错误!未定义书签。
10.2	The Field strength of Emissions.....	11
10.3	20dB Bandwidth Measurement.....	15
10.4	Deactivation Time.....	16
11	Test Equipment List .....	19
12	System Measurement Uncertainty .....	20
13	Photographs of Test Set-ups .....	21
14	Photographs of EUT .....	22



## 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
709502308669-00A	First Issue	02/17/2025

## 3 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

Telephone: +86 21 6141 0123

Fax: +86 21 6140 8600

FCC Registration No.: 820234

FCC Designation Number: CN1183



#### 4 Description of the Equipment Under Test

Product:	Wireless transmission (For Multifunctional Soil Survey Instrument)
Model no.:	ND4009T
FCC ID:	2BANG4009
Options and accessories:	NA
Rating:	1.5VDC
RF Transmission Frequency:	434MHz
Modulation:	GFSK
Antenna Type:	PCB Antenna
Description of the EUT:	The Equipment Under Test (EUT) is a Wireless transmission (For Multifunctional Soil Survey Instrument) with SRD function. We tested it and listed the worst data in this report.
Test sample no.:	SHA-868895-1

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, antenna gain or any information supplied.



5 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2023 Edition	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 15.231 Subpart C				
Test Condition		Pages	Test Site	Test Result
§15.207	Conducted emission AC power port	9	Shield room	Not Applicable
§15.205, §15.209, 15.35 (c)§15.231(e)	The Field strength of Emissions	10-14	3m chamber	Pass
§15.231(c)	20dB Bandwidth Measurement	15-16	Shield room	Pass
§15.231(e)	Deactivation Time	17	Shield room	Pass
§15.203	Antenna requirement	See note 1		

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a permanently 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: 2BANG4009, complies with Section 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: January 01, 2025

Testing Start Date: January 06, 2025

Testing End Date: January 13, 2025

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

Reviewed by:

Prepared by:

Tested by:

Hui TONG  
Review Engineer

Yongqing ZHENG  
Project Engineer

Yunqi ZHOU  
Test Engineer



## 8 Systems test configuration

Auxiliary Equipment Used during Test:

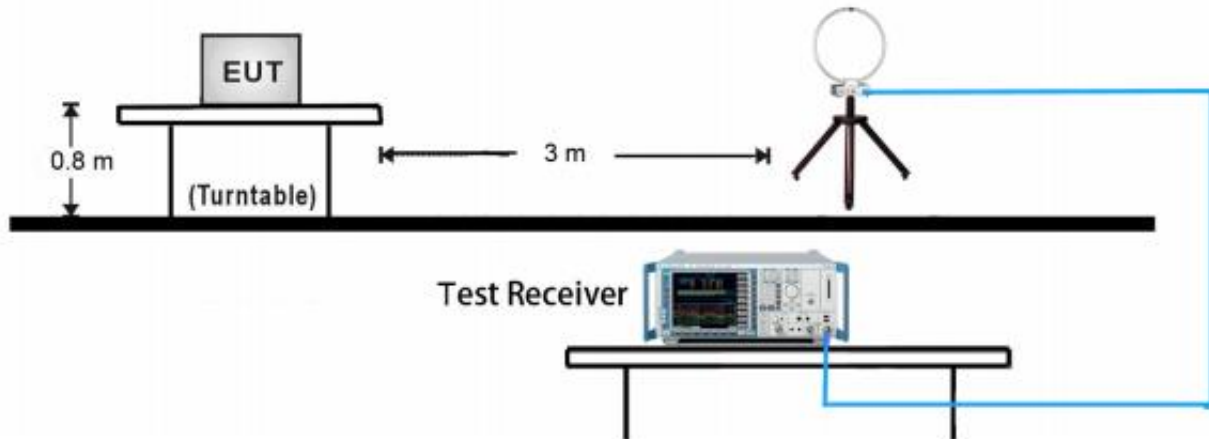
DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
--	--	--	--



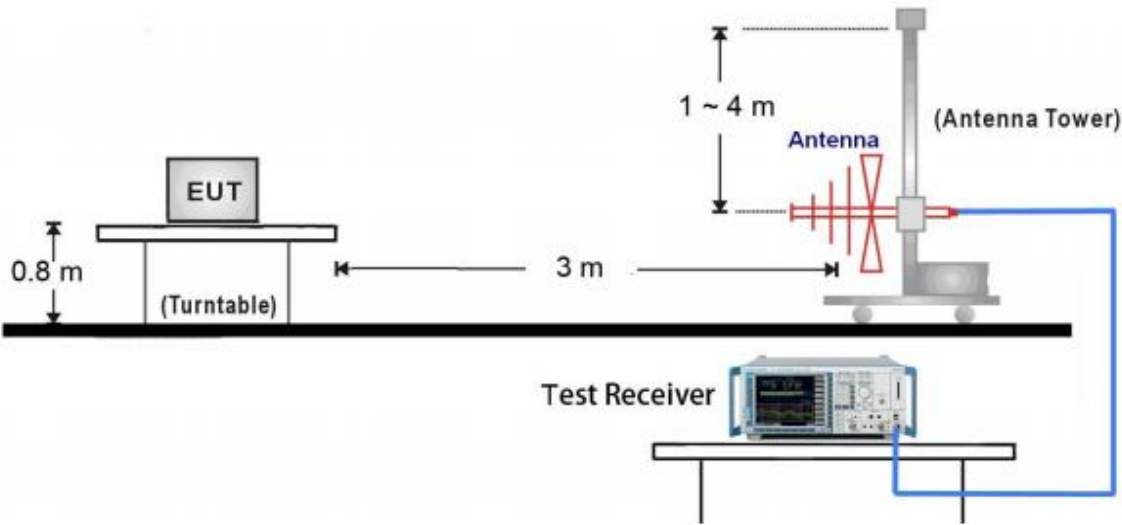
## 9 Test Setups

### 9.1 Radiated test setups

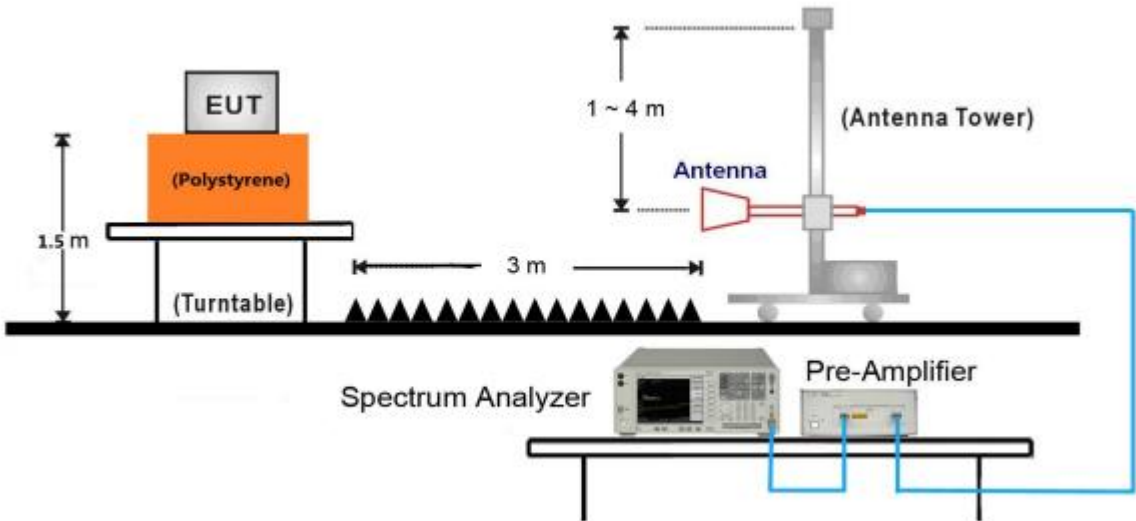
9kHz ~ 30MHz Test Setup:



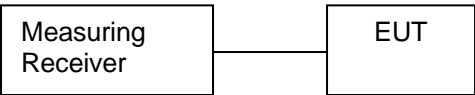
30MHz ~ 1GHz Test Setup:



Above 1GHz Test Setup:



9.3 Conducted RF test setups



## 10 Test Methodology

### 10.1 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: (e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	1,000	100
70-130	5,00	50
130-174	500 to 1,500 *	50 to 150 *
174-260	1,500	150
260-470	1,500 to 5,000*	150 to 500*
Above 470	5,000	500
*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 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	434.00	H	66.60	24.24	/	/	92.87	26.37	Fundamental
AV	434.00	H	66.60	/	-18.50	48.10	72.87	24.77	Fundamental
PK	434.00	V	59.65	24.24	/	/	92.87	33.22	Fundamental
AV	434.00	V	59.65	/	-18.50	41.15	72.87	31.72	Fundamental
PK	868.08	H	45.38	18.24	/	/	72.87	27.49	Spurious
AV	868.08	H	45.38	/	-18.50	26.88	52.87	25.99	Spurious
PK	728.24	V	38.96	31.70	/	/	72.87	33.91	Spurious
AV	728.24	V	38.96	/	-18.50	20.46	52.87	32.41	Spurious
Above 1GHz									
PK	2618.458	H	37.46	-9.6	/	/	72.87	35.41	Spurious
AV	2618.458	H	37.46	/	-18.50	18.96	52.87	33.91	Spurious
PK	3492.000	H	40.48	-6.4	/	/	72.87	31.39	Spurious
AV	3492.000	H	40.48	/	-18.50	21.98	52.87	30.89	Spurious
PK	*4300.791	H	42.87	-3.5	/	/	74	31.13	Spurious
AV	*4300.791	H	42.87	/	-18.50	24.37	54	29.63	Spurious
PK	*4926.000	V	44.07	-2.3	/	/	74	29.93	Spurious
AV	*4926.000	V	44.07	/	-18.50	15.47	54	25.50	Spurious
PK	*8041.500	V	47.38	1.5	/	/	74	26.62	Spurious
AV	*8041.500	V	47.38	/	-18.50	28.88	54	25.12	Spurious
PK	12846.000	V	50.30	15	/	/	72.87	22.47	Spurious
AV	12846.000	V	50.30	/	-18.50	31.80	52.87	21.70	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.

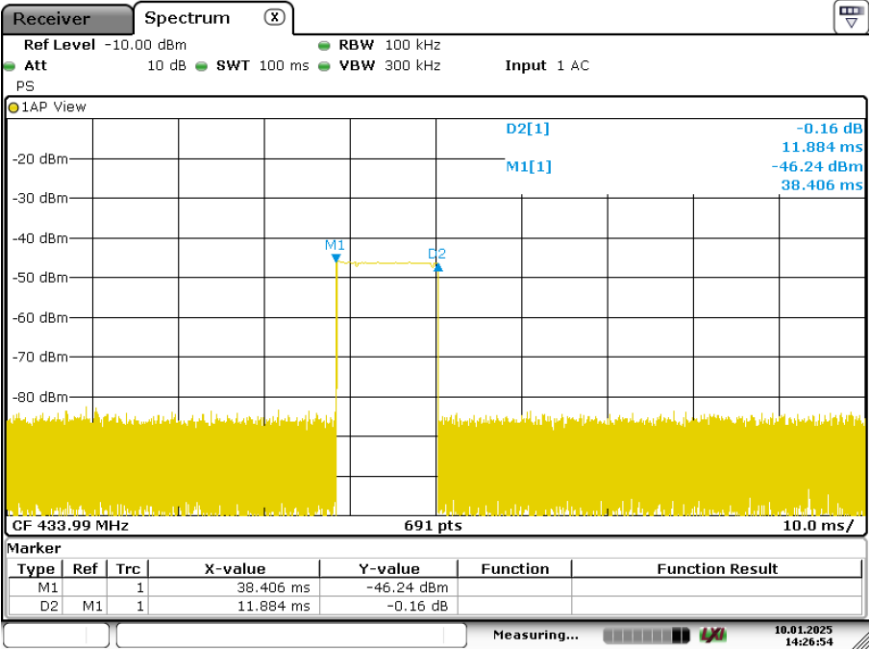
4: Level= Reading Level + Correction Factor

Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain

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

Duty Cycle =11.884(ms)/100(ms) =11.884%

Duty Cycle Factor =20log (Duty Cycle) =-18.50



Date: 10. JAN.2025 14:26:54

## 10.2 20dB Bandwidth Measurement

### 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 transmit continuously.  
Use the following test receiver settings:  
RBW = 1% to 5% of the OBW, VBW $\geq$ 3RBW, 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.

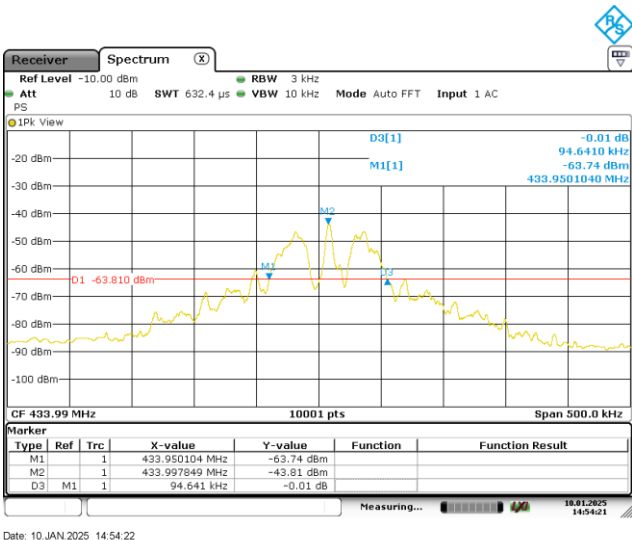
### Limit

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% \* 434.00 MHz = 1085.0 kHz

### Test Result

Channel	20dB Bandwidth (KHz)	Limit (KHz)	Result
1	94.641	$\leq$ 1085.0	Pass



### 10.3 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

The transmitter shall be complied the following requirements:

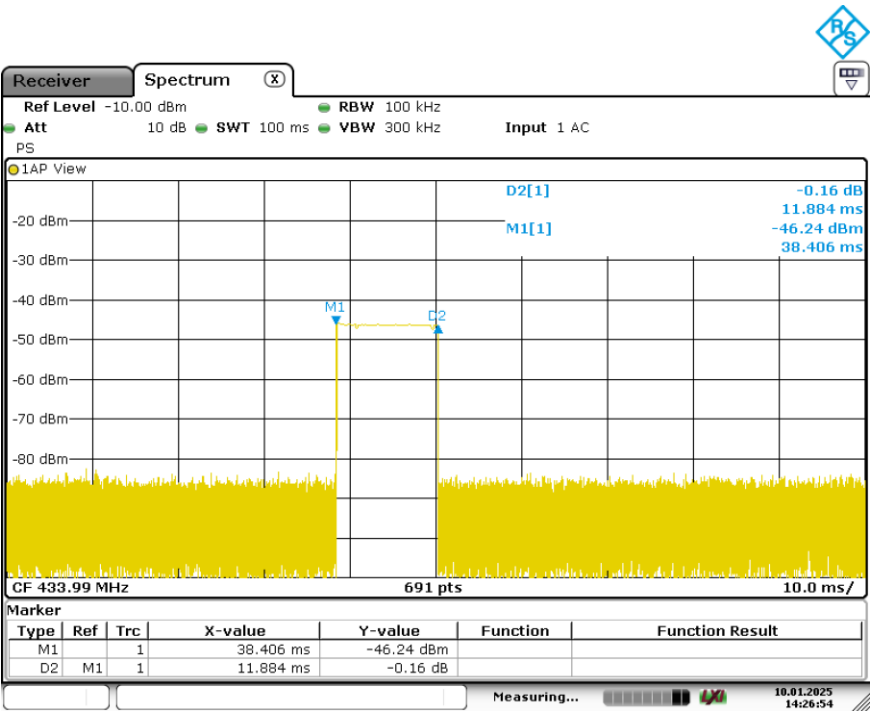
According to §15.231(e) In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

#### Test Result

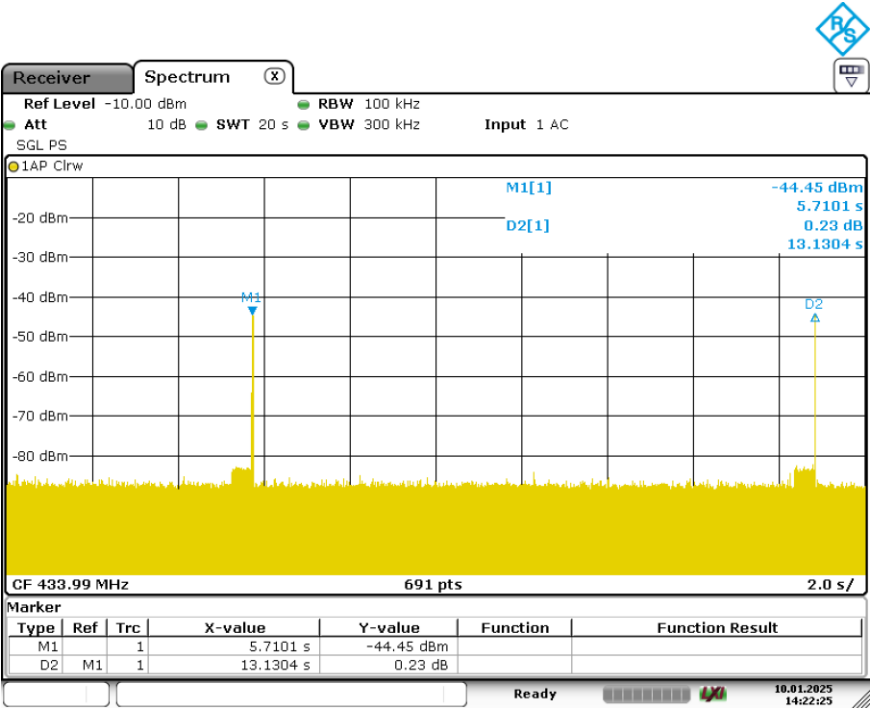
Channel	Frequency	Duration of each transmission (ms)	Limit	Result
1	434MHz	11.884	$\leq 1s$	Pass

Channel	Frequency	Duration of each transmission time (ms)	Silent period between transmissions time (ms)	Silent period between transmissions time Limit	Silent period between transmissions time / Duration of each transmission time	Silent period between transmissions time / Duration of each transmission time Limit	Result
1	434MHz	11.884	13130.4	$\geq 10s$	1104.88	$\geq 30$ times	Pass

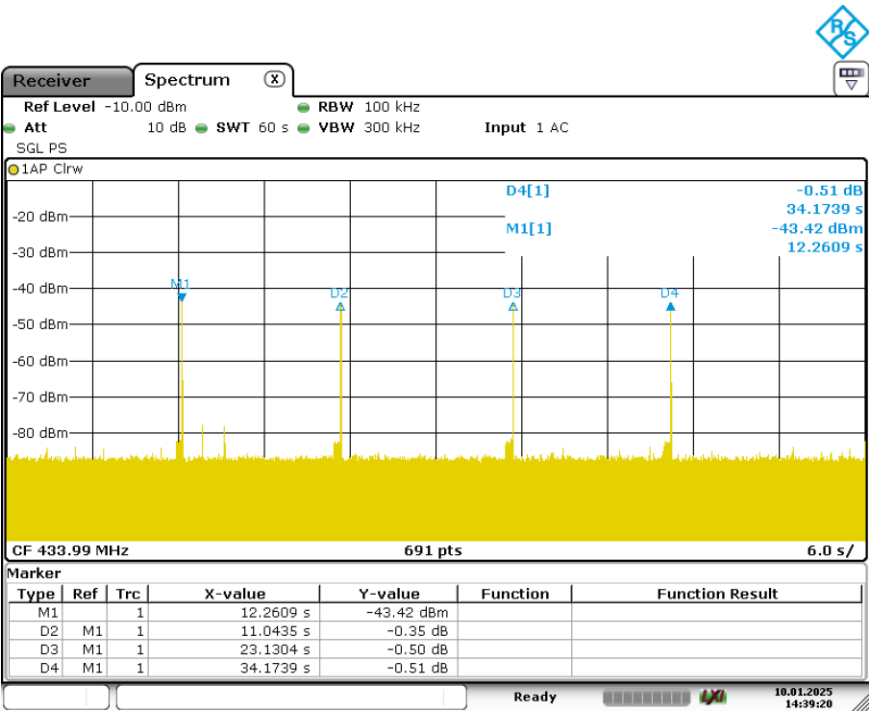




Date: 10. JAN.2025 14:26:54



Date: 10. JAN.2025 14:22:25



Date: 10. JAN.2025 14:39:19

## 11 Test Equipment List

### List of Test Instruments

Test Site1

#### RF Conductive Test

Description	Manufacturer	Model no.	Serial no.	Calibration Date	Calibration Due
Signal and spectrum analyzer	R&S	FSV40	S1503003-YQ-EMC	2024-8-01	2025-7-31

#### Conducted Emission

Description	Model no.	Manufacturer	Equipment ID.	Calibration Date	Calibration Due
EMI test receiver	ESR3	R&S	S1503001-YQ-EMC	2024-8-01	2025-7-31
2-Line V-network	ENV216	R & S	S1503103-YQ-EMC	2024-8-01	2025-7-31

#### 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	2024-8-01	2025-7-31
<input checked="" type="checkbox"/>	Trilog super broadband test antenna	SCHWARZBECK	VULB9168	S1808296-YQ-EMC	2024-8-30	2025-8-29
<input checked="" type="checkbox"/>	Double-ridged waveguide horn antenna	HF907	R&S	S1503009-YQ-EMC	2024-4-14	2025-4-13
<input checked="" type="checkbox"/>	Pre-amplifier	HPAP-9K0130	Shenzhen HzEMC	S2110423b-YQ-EMC	2024-8-01	2025-7-31
<input checked="" type="checkbox"/>	Signal and spectrum analyzer	FSV40	R&S	S1503003-YQ-EMC	2024-8-01	2025-7-31
<input checked="" type="checkbox"/>	Loop antenna	HFH2-Z2	R&S	S1503013-YQ-EMC	2024-6-26	2025-6-25

#### 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:

**System Measurement Uncertainty**

Items	Extended Uncertainty
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
Carrier power conducted measurement	50MHz~18GHz, 1.238dB
Spurious Emission Conducted Measurement	9kHz ~40GHz, 1.224dB

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.



## 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-----