

TEST REPORT

Report No.: SHE21110074-01AE

Date: 2022-06-17

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Applicant : NATHER Ventilation System Co.,Ltd.
Address of Applicant : No. 2688, Xingping 1st Road, Pinghu
Economic-Technological Development Zone, Jiaxing City,
Zhejiang Province, China.

Product Name : A1 Sensor
Model No. : A1-EA-PM2.5, A1-EA-CO2
Sample No. : E21110074-01#01
FCC ID : 2A3VE-A1EA
ISED Number : 28014-A1EA
Standards : FCC CFR47 Part 15, Subpart C Section 15.231
RSS-Gen (Issue 5, Amd.2-Feb 2021)
RSS-210 (Issue 10, Amendment-Apr 2020)

Date of Receipt : 2021-12-02
Date of Test : 2021-12-02~2022-01-21
Date of Issue : 2022-06-17

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by:



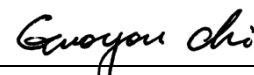
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Reviewed by:



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Approved by:



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1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Applicant Company Name	NATHER Ventilation System Co.,Ltd.
Address	No. 2688, Xingping 1st Road, Pinghu Economic-Technological Development Zone, Jiaxing City, Zhejiang Province, China.
Contact Person	Wang Xiaomei
Telephone	021-64345163
Email	wxm@nather.com.cn
Manufacturer Company Name	NATHER Ventilation System Co.,Ltd.
Address	No. 2688, Xingping 1st Road, Pinghu Economic-Technological Development Zone, Jiaxing City, Zhejiang Province, China.
Factory Company Name	Gaobiao IoT Technology Co., Ltd.
Address	4th Floor, Door B, Bldg D, XinYuan Science and Technology Park, No.97 Changping Road, Changping District, Beijing 102206

1.3 Details of EUT

Product Name	A1 Sensor
Brand Name	RuntalAire
Model Name Under Test	A1-EA-PM2.5
Series Model Name	A1-EA-CO2
Description of difference	A1-EA-PM2.5 and A1-EA-CO2 completely the same electrically identical. The difference between them lies in the different sensor modules welded between them, one is CO2 module and the other is PM2.5 module.
FCC ID	2A3VE-A1EA
IC ID	28014-A1EA
Frequency Range	470MHz
Field Strength(3m)	67.97dBuV/m(peak)@3m
Modulation Type	LORA
Number of channels	1
Hardware version	V1.4
Software version	V2.5
Antenna Type	Internal Antenna
Antenna Gain	3dBi

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Power Supply	DC 5V by USB port or DC 3.7V by battery
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1.4 Test Methodology

47 CFR Part 15, Subpart C	Telecommunication-Radio Frequency Devices-Intentional Radiators
RSS-Gen (Issue 5, Amd.2-Feb 2021)	General Requirements for Compliance of Radio Apparatus
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
RSS-210 (Issue 10, Amendment-Apr 2020)	Licence-Exempt Radio Apparatus: Category I Equipment

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

1.5 Test Summary

Test Item	FCC Rules	ISED Rules	Result
Antenna Requirement	§15.203	RSS-Gen 6.8	PASS
Operate at a periodic rate	§15.231(e)	RSS-210 Annex A.1.4	PASS
Average Factor	§15.231(e)	RSS-210 Annex A.1.4	PASS
Field Strength of Fundamental and Spurious Emission	§15.231(e) & §15.209	RSS-210 Annex A.1.4 (Table A2) & RSS-Gen 8.9	PASS
20dB Bandwidth and 99% Bandwidth	§15.231(c)	RSS-210 Annex A.1.3	PASS
AC power-line conducted emissions	§15.207	RSS-GEN 8.8	PASS

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2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-13	2022-08-12
Spectrum Analyzer	Keysight	N9020A	MY54101709	2021-08-13	2022-08-12
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-10	2022-06-09
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-10	2022-06-09
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-10	2022-06-09
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-06-10	2022-06-09
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08	2022-06-07
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-08	2023-06-07
Loop Antenna	SCHWARZBECK	FMZB 1513	/	2020-11-23	2022-11-22
Broadband Preamplifier	SCHWARZBECK	BBV 9718	346	2021-06-10	2022-06-09
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2020-06-09	2023-06-08
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2020-06-09	2022-06-08
Test Software	BL	BL410_E	N/A	N/A	N/A

2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI.

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	9KHz – 30MHz	± 3.42 dB
	30 MHz – 1GHz	± 3.42 dB
	> 1GHz	± 4.20 dB
AC power-line conducted emissions	150kHz-30MHz	± 1.71 dB

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3 Test Set-up and Operation Modes

3.1 Details of Test Mode

NO.	Test mode description
1	PM2.5 sensor-Transmitting mode (470MHz)
2	CO2 sensor-Transmitting mode (470MHz)

Note:

1. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
2. Only worst mode data recorded in the test report.

3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial No.
Adapter	N/A	A8-501000	N/A

3.3 Support Software

Description	Manufacturer	Software Name
N/A	N/A	N/A

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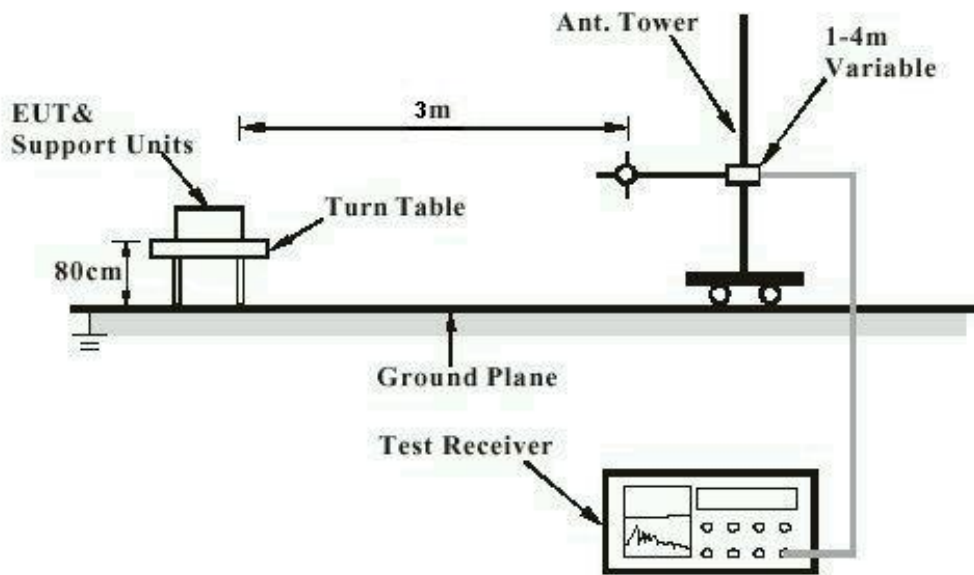
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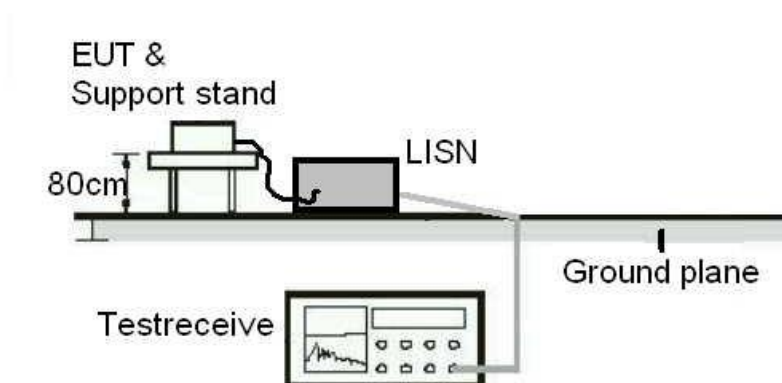
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement



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4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT:

PASS

Test standard : Part 15.203, RSS-Gen 6.8

Requirement : The use of approved antennas only with directional gains that do not exceed 6dBi

According to the manufacturer declaration, the EUT has an antenna with a gain of 3dBi. The antenna is an internal antenna with no possibility of replacement with a non-approved antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

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4.1.2 Provision For Momentary Operation

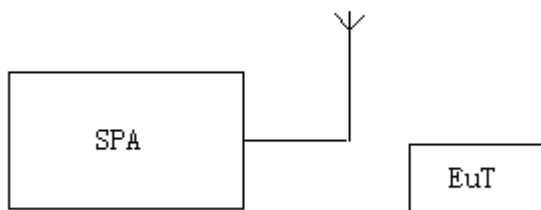
RESULT:

PASS

Test standard : §15.231(e), RSS-210 Annex A.1.4(b)

Requirement : ANSI C63.10-2013

Test Setup:



Measurement Procedure:

1. Set the parameters of SPA as below:

Centre frequency = Operation Frequency

RBW=100kHz, VBW=300KHz

Span: 0Hz

Sweep time: 30s

2. Record the data and Reported.

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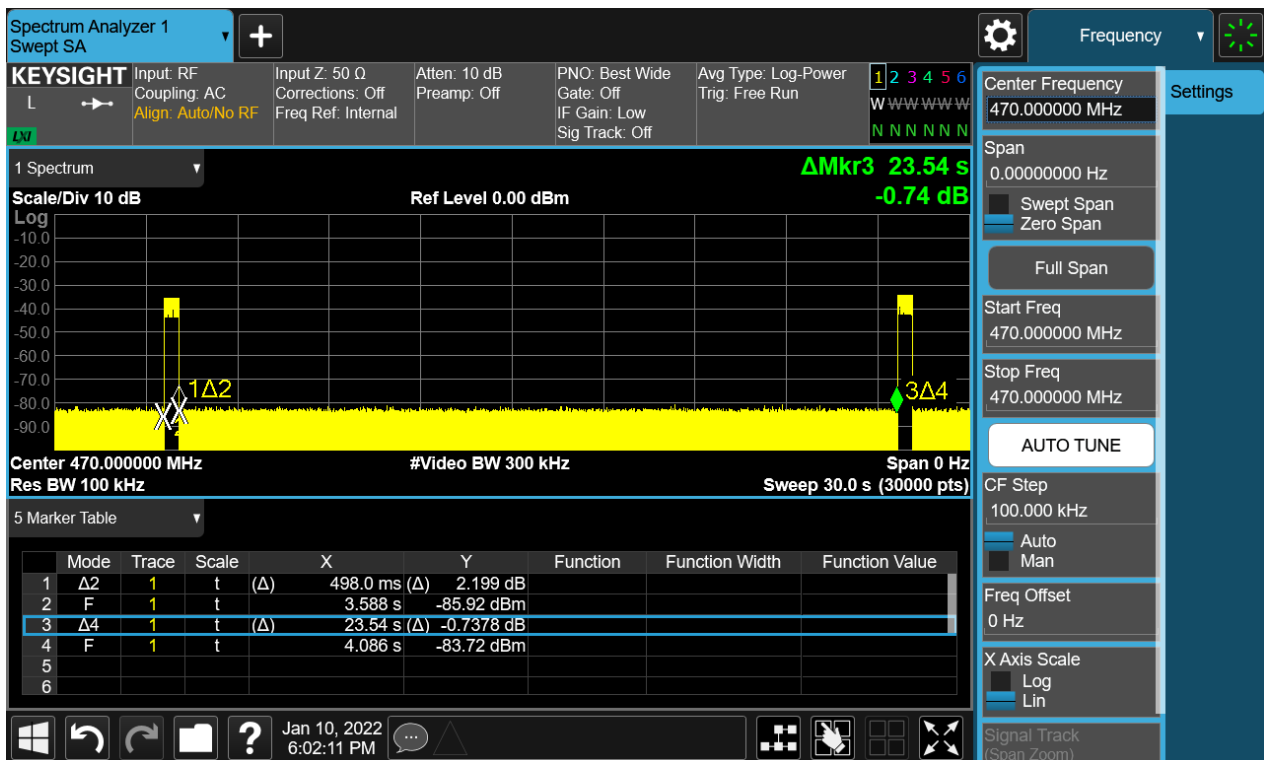
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Test Result:

Test Mode: EUT @ 470MHz for RF Transmitter

duration of each transmission (s)	Limit (s)
0.498	<1
silent period between transmissions (s)	Limit (s)
23.54	>10s and > 30*(duration of transmission)



Result: Pass

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4.1.3 Duty Cycle Correction Factor

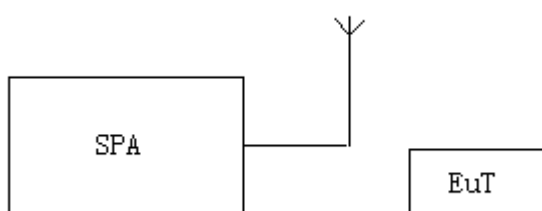
RESULT:

PASS

Test standard : §15.231(e), RSS-210 Annex A.1.4

Requirement : ANSI C63.10-2013 Clause 7.5(g)

Test Setup



Measurement Procedure

1. Set the parameters of SPA as below:
Centre frequency = Operation Frequency
RBW=100KHz; VBW=300KHz
Span: 0Hz
Sweep time: more than two pulse trains or more than each type of pulse occupancy time
2. Set the EUT to transmit. Use the "Delta mark" function of SPA to find the period time between two pulse trains and each type of pulse occupancy time.
3. Record the plots and Reported.

Test Result

Note: The EUT was tested according to ANSI C63.10 Clause 7.5(g), The 100ms period that contains the maximum "on time" is 100ms, so the Duty cycle correction factor is 0.

Duty Cycle=Total Time(Ton)/(Ton+Toff)=100ms/100ms=100%

Duty cycle correction factor=20Log(Duty Cycle)=0

Average=peak+ Duty cycle correction factor

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4.1.4 Radiated Emission

RESULT:

PASS

Test standard : §15.231(e), §15.209,
RSS-210 Annex A.1.4(table A2), RSS-Gen 8.9
Requirement : ANSI C63.10-2013
Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Diagram : Clause 3.4
Operation Mode : Transmitting mode
Ambient temperature : 25°C
Relative humidity : 50%

Notes:

According to §15.231(e), 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	1000	100
70-130	500	50
130-174	500 to 1500*	50 to 150*
174-260	1500	150
260-470	1500 to 5000*	150 to 500*
Above 470	5000	500

*Linear interpolations

The above field strength limits are specified at a distance of 3 meters.

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, CI SPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements start below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

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Measurement Procedure

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

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The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start Frequency	1000MHz
Stop Frequency	10 th carrier harmonic
RB / VB (emission in restricted band)	1MHz/1MHz for Peak, 1MHz/10Hz for Average

Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RBW 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RBW 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RBW 120KHz for QP

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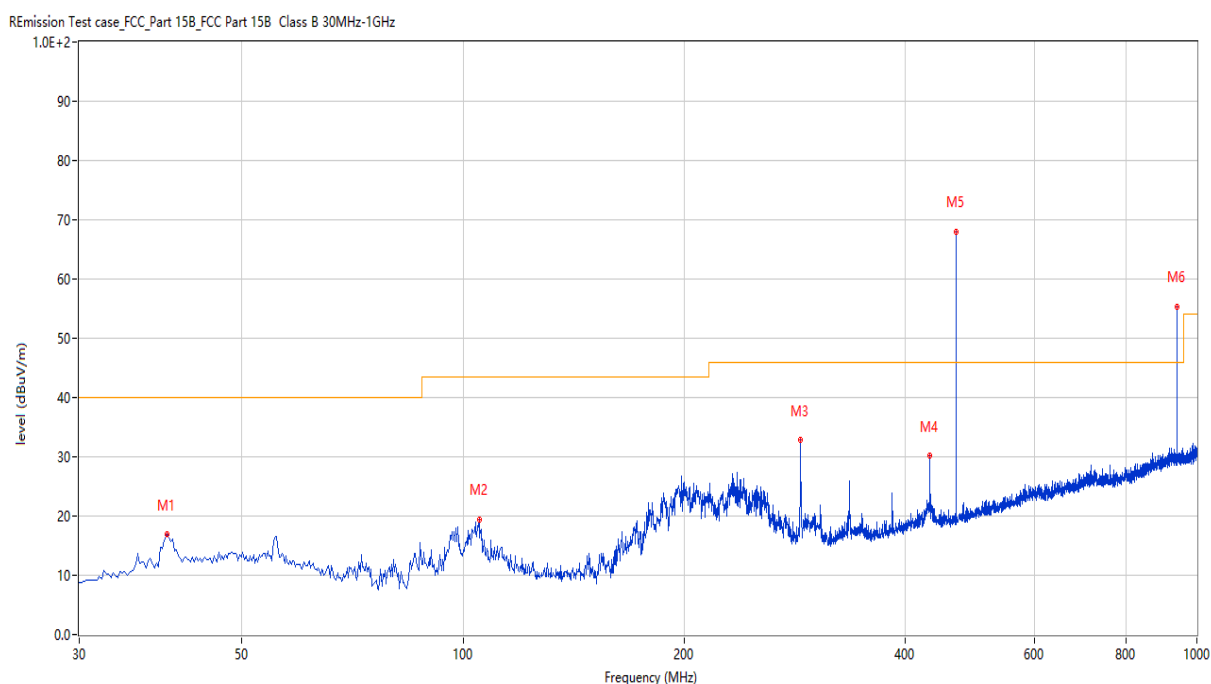
Test Result

Radiated Emission Below 30MHz

No emission found between lowest internal used/generated frequencies to 30MHz.

PM2.5 sensor-Transmitting mode (470MHz):

Radiated Emission Below 1GHz-Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	39.455	17.01	-26.52	40.0	-22.99	Peak	0.00	200	Horizontal	Pass
2	105.156	19.40	-26.57	43.5	-24.10	Peak	92.20	300	Horizontal	Pass
3	288.440	32.79	-24.09	46.0	-13.21	Peak	346.20	200	Horizontal	Pass
4	432.449	30.12	-20.33	46.0	-15.88	Peak	0.00	200	Horizontal	Pass
5	469.785	67.97	-19.59	93.98	-26.01	Peak	0.00	200	Horizontal	Pass
5*	469.785	67.97	-19.59	73.98	-6.01	AV	0.00	200	Horizontal	Pass
6	939.875	51.37	-9.13	73.98	-22.61	Peak	281.00	200	Horizontal	Pass
6*	939.875	51.37	-9.13	53.98	-2.61	AV	281.00	200	Horizontal	Pass

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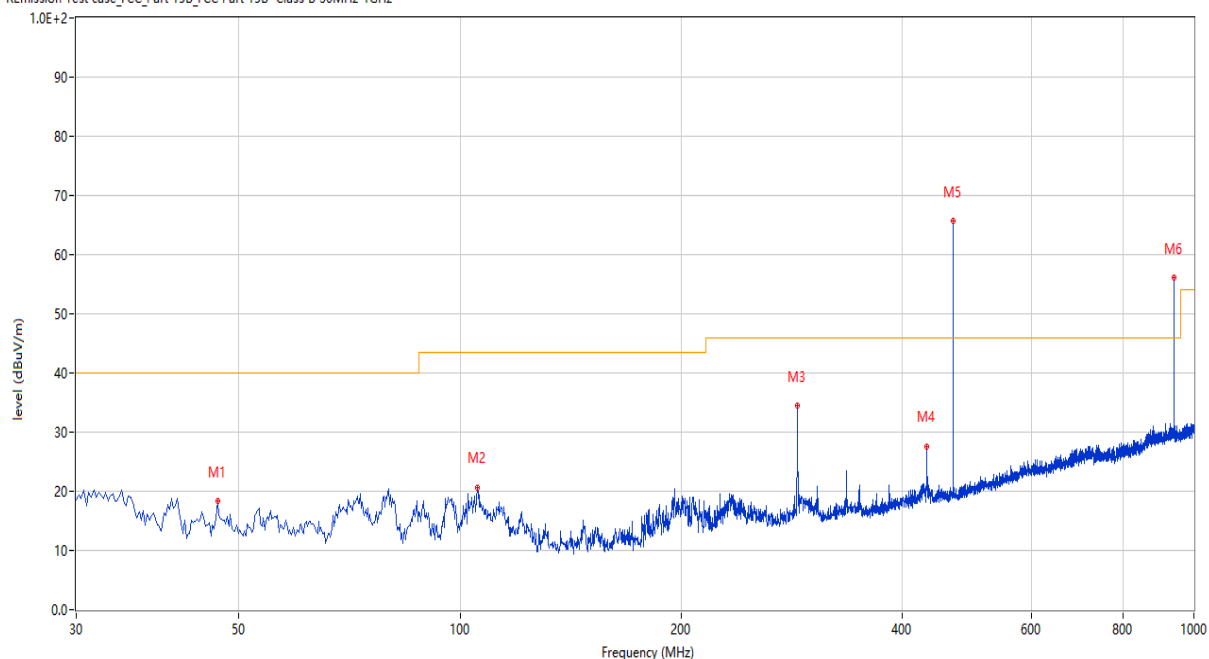
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Radiated Emission Below 1GHz-Vertical

REmission Test case_FCC_Part 15B_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	46.728	18.39	-25.17	40.0	-21.61	Peak	360.00	200	Vertical	Pass
2	105.641	20.63	-26.60	43.5	-22.87	Peak	118.00	100	Vertical	Pass
3	288.198	34.46	-24.09	46.0	-11.54	Peak	223.10	100	Vertical	Pass
4	432.449	27.63	-20.33	46.0	-18.37	Peak	62.10	100	Vertical	Pass
5	469.785	65.70	-19.59	93.98	-28.28	Peak	71.40	100	Vertical	Pass
5*	469.785	65.70	-19.59	73.98	-8.28	AV	71.40	100	Vertical	Pass
6	939.875	51.11	-9.13	73.98	-22.87	Peak	71.40	100	Vertical	Pass
6*	939.875	51.11	-9.13	53.98	-2.87	AV	71.40	100	Vertical	Pass

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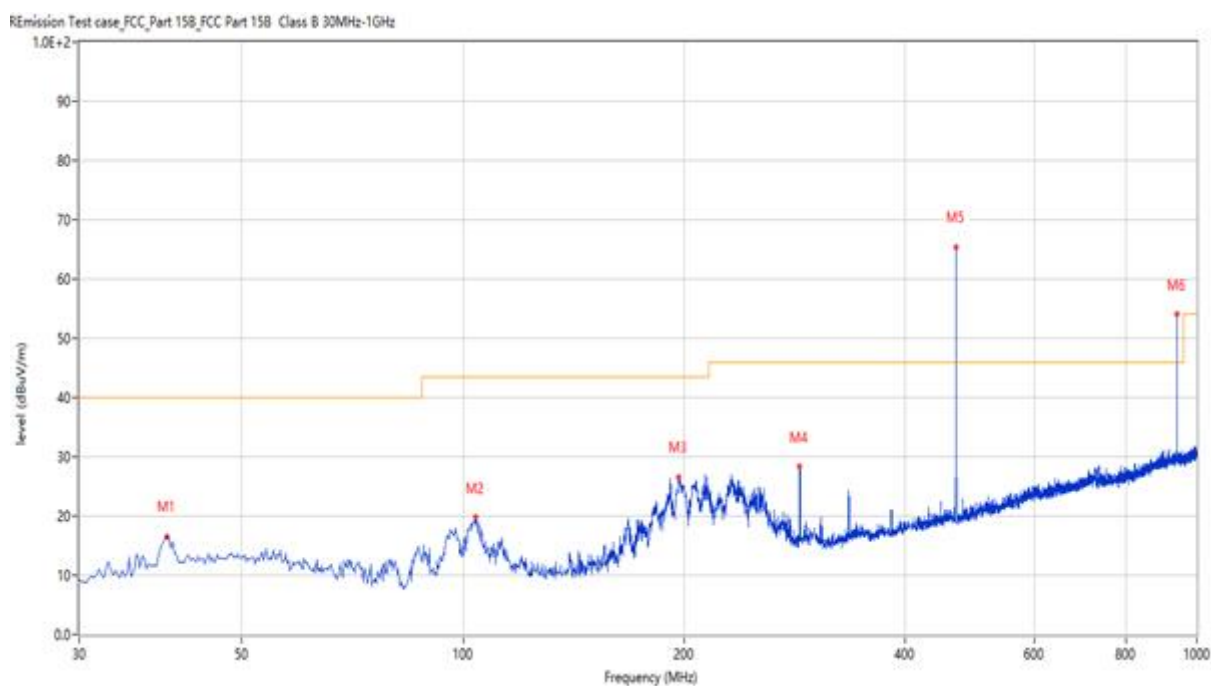
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CO2 sensor-Transmitting mode (470MHz):

Radiated Emission Below 1GHz-Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	39.453	16.32	-26.52	40.0	-23.68	Peak	0.00	200	Horizontal	Pass
2	104.178	19.78	-26.56	43.5	-23.72	Peak	290.45	300	Horizontal	Pass
3	196.789	26.48	-26.11	43.5	-17.02	Peak	176.39	100	Horizontal	Pass
4	287.711	28.31	-24.10	46.0	-17.69	Peak	192.28	200	Horizontal	Pass
5	470.025	65.39	-19.59	93.98	-28.59	Peak	0.00	200	Horizontal	Pass
5*	470.025	65.39	-19.59	73.98	-8.59	AV	0.00	200	Horizontal	Pass
6	939.875	52.35	-9.13	73.98	-21.63	Peak	0.00	200	Horizontal	Pass
6*	939.875	52.35	-9.13	53.98	-1.63	AV	0.00	200	Horizontal	Pass

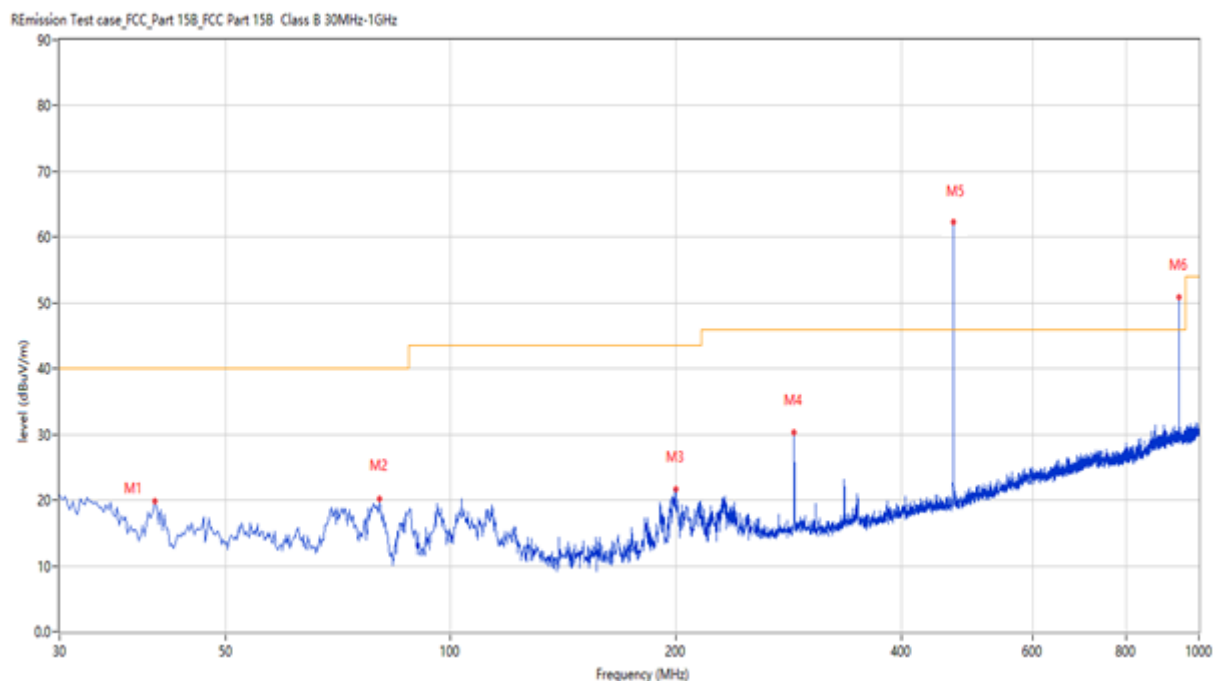
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Radiated Emission Below 1GHz-Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	40.182	19.93	-26.26	40.0	-20.07	Peak	358.60	100	Vertical	Pass
2	80.427	20.28	-31.52	40.0	-19.72	Peak	48.40	100	Vertical	Pass
3	199.950	21.72	-26.18	43.5	-21.78	Peak	234.30	300	Vertical	Pass
4	287.713	30.35	-24.10	46.0	-15.65	Peak	234.10	100	Vertical	Pass
5	469.785	63.70	-19.59	93.98	-30.28	Peak	57.40	100	Vertical	Pass
5*	469.785	63.70	-19.59	73.98	-10.28	AV	57.40	100	Vertical	Pass
6	939.875	50.83	-9.13	73.98	-23.15	Peak	57.40	100	Vertical	Pass
6*	939.875	50.83	-9.13	53.98	-3.15	AV	57.40	100	Vertical	Pass

Result: Pass

Note:

1. Factor=Antenna Factor + Cable loss - Amplifier gain, Over Limit= Results- Limit.
2. The "Factor" value can be calculated automatically by software of measurement system.
3. Average=peak+ Duty cycle correction factor, Final Average= peak-0.

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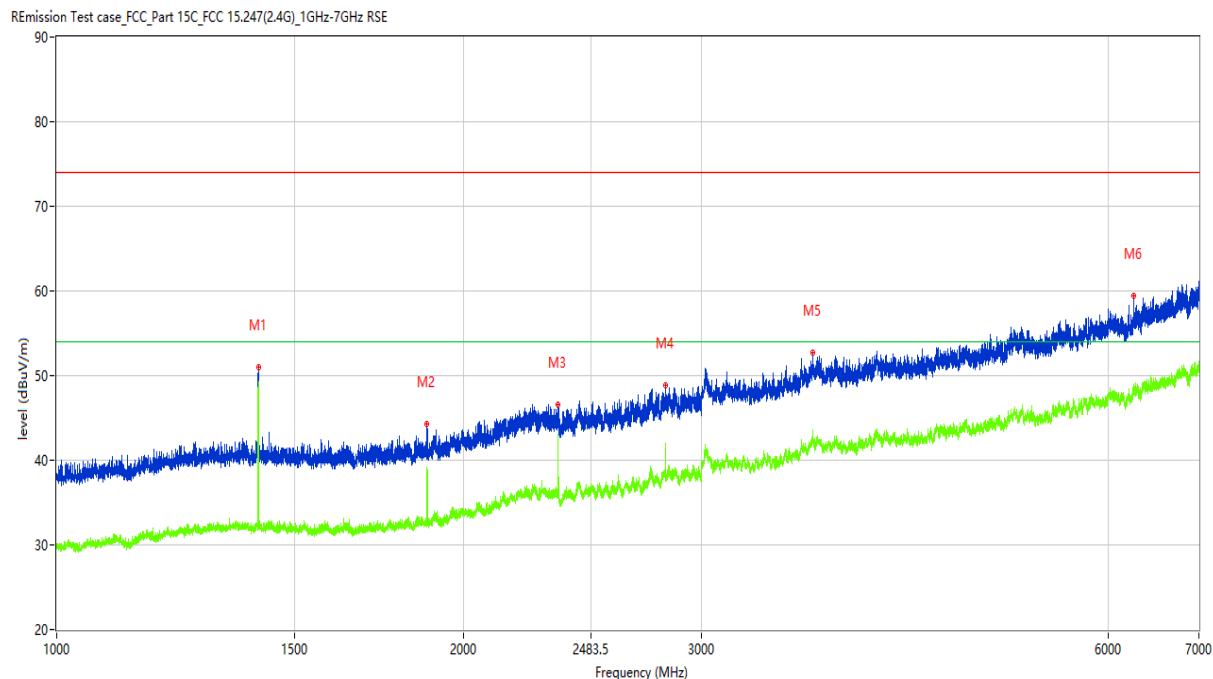
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PM2.5 sensor-Transmitting mode (470MHz):

Radiated Emission Above 1GHz-Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1409.699	51.02	-11.43	74.0	-22.98	Peak	84.60	100	Horizontal	Pass
1**	1409.699	51.02	-11.43	54.0	-2.98	AV	84.60	100	Horizontal	Pass
2	1879.890	44.35	-10.87	74.0	-29.65	Peak	84.60	100	Horizontal	Pass
2**	1879.890	44.35	-10.87	54.0	-9.65	AV	84.60	100	Horizontal	Pass
3	2349.831	46.64	-7.38	74.0	-27.36	Peak	74.50	100	Horizontal	Pass
3**	2349.831	46.64	-7.38	54.0	-7.36	AV	74.50	100	Horizontal	Pass
4	2819.773	48.84	-3.87	74.0	-25.16	Peak	84.60	100	Horizontal	Pass
4**	2819.773	48.84	-3.87	54.0	-5.16	AV	84.60	100	Horizontal	Pass
5	3624.422	52.73	1.41	74.0	-21.27	Peak	291.20	100	Horizontal	Pass
5**	3624.422	42.27	1.41	54.0	-11.73	AV	291.20	100	Horizontal	Pass
6	6268.591	59.42	6.08	74.0	-14.58	Peak	354.20	100	Horizontal	Pass
6**	6268.591	48.13	6.08	54.0	-5.87	AV	354.20	100	Horizontal	Pass

TEST REPORT

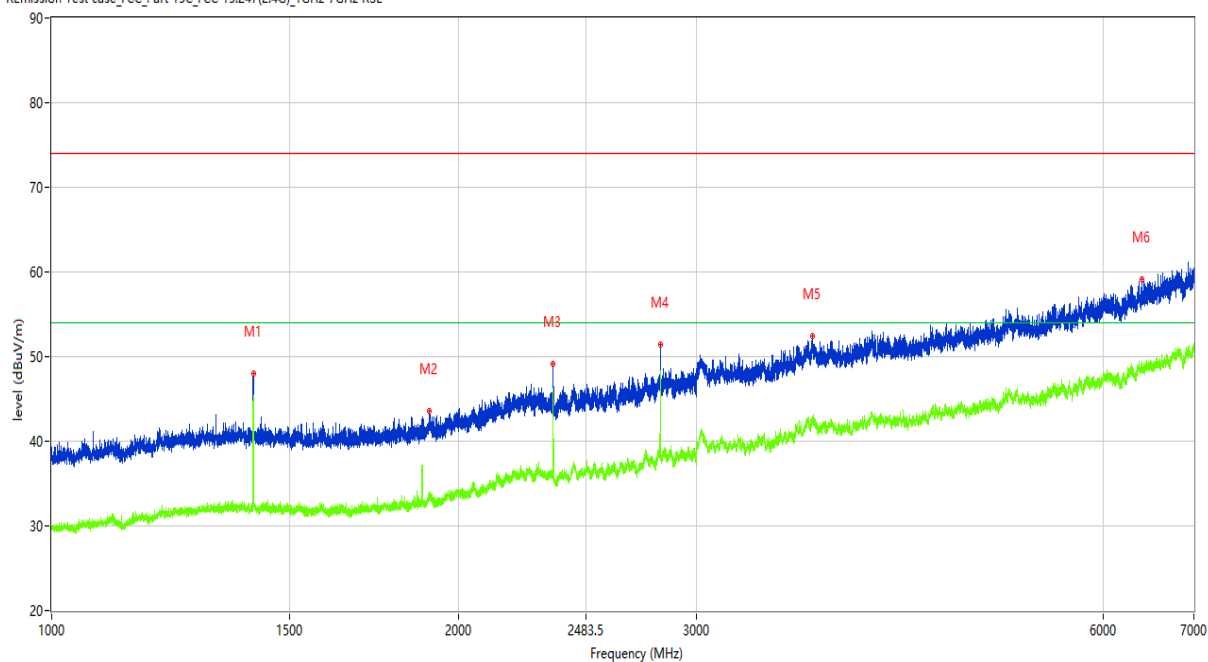
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Radiated Emission Above 1GHz-Vertical

REmission Test case_FCC_Part 15C_FCC 15.247(2.4G)_1GHz-7GHz RSE



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1409.949	48.02	-11.43	74.0	-25.98	Peak	151.20	100	Vertical	Pass
1**	1409.949	48.02	-11.43	54.0	-5.98	AV	151.20	100	Vertical	Pass
2	1903.637	43.54	-10.74	74.0	-30.46	Peak	108.00	100	Vertical	Pass
2	1903.637	33.47	-10.74	54.0	-20.53	AV	108.00	100	Vertical	Pass
3	2350.331	49.16	-7.38	74.0	-24.84	Peak	226.40	100	Vertical	Pass
3**	2350.331	49.16	-7.38	54.0	-4.84	AV	226.40	100	Vertical	Pass
4	2819.773	51.44	-3.87	74.0	-22.56	Peak	230.80	100	Vertical	Pass
4**	2819.773	51.44	-3.87	54.0	-2.56	AV	230.80	100	Vertical	Pass
5	3652.918	52.39	1.42	74.0	-21.61	Peak	56.10	100	Vertical	Pass
5**	3652.918	42.79	1.42	54.0	-11.21	AV	56.10	100	Vertical	Pass
6	6402.575	59.08	6.71	74.0	-14.92	Peak	241.80	100	Vertical	Pass
6**	6402.575	48.81	6.71	54.0	-5.19	AV	241.80	100	Vertical	Pass

TEST REPORT

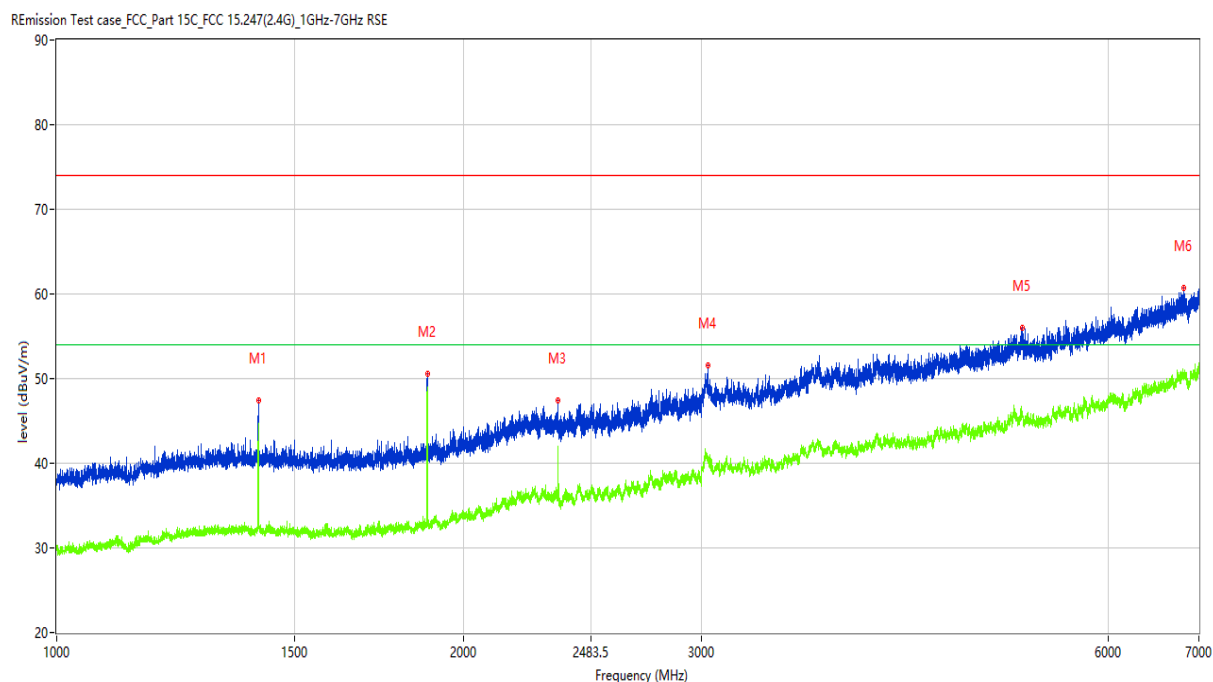
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CO2 sensor-Transmitting mode (470MHz):

Radiated Emission Above 1GHz-Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1410.199	47.42	-11.43	74.0	-26.58	Peak	166.40	100	Horizontal	Pass
1**	1410.199	47.42	-11.43	54.0	-6.58	AV	166.40	100	Horizontal	Pass
2	1880.140	50.53	-10.87	74.0	-23.47	Peak	166.40	100	Horizontal	Pass
2**	1880.140	50.53	-10.87	54.0	-3.47	AV	166.40	100	Horizontal	Pass
3	2350.081	47.36	-7.38	74.0	-26.64	Peak	166.40	100	Horizontal	Pass
3**	2350.081	47.36	-7.38	54.0	-6.64	AV	166.40	100	Horizontal	Pass
4	3031.496	51.56	-1.39	74.0	-22.44	Peak	84.30	100	Horizontal	Pass
4**	3031.496	40.64	-1.39	54.0	-13.36	AV	84.30	100	Horizontal	Pass
5	5180.227	56.07	4.13	74.0	-17.93	Peak	359.20	100	Horizontal	Pass
5**	5180.227	45.78	4.13	54.0	-8.22	AV	359.20	100	Horizontal	Pass
6	6819.523	60.78	8.11	74.0	-13.22	Peak	70.20	100	Horizontal	Pass
6**	6819.523	50.53	8.11	54.0	-3.47	AV	70.20	100	Horizontal	Pass

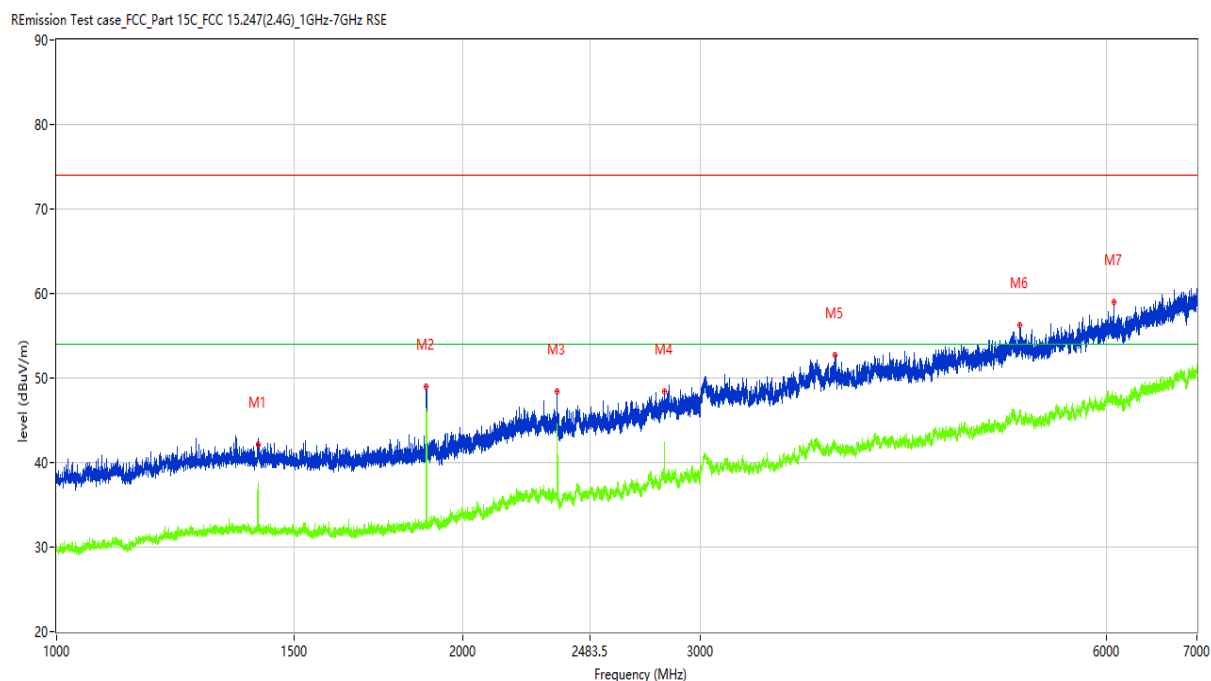
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Radiated Emission Above 1GHz-Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1409.949	42.18	-11.43	74.0	-31.82	Peak	45.50	100	Vertical	Pass
1**	1409.949	42.18	-11.43	54.0	-11.82	AV	45.50	100	Vertical	Pass
2	1879.890	49.05	-10.87	74.0	-24.95	Peak	40.60	100	Vertical	Pass
2**	1879.890	49.05	-10.87	54.0	-4.59	AV	40.60	100	Vertical	Pass
3	2350.331	48.38	-7.38	74.0	-25.62	Peak	45.50	100	Vertical	Pass
3**	2350.331	48.38	-7.38	54.0	-5.62	AV	45.50	100	Vertical	Pass
4	2823.772	48.37	-3.85	74.0	-25.63	Peak	354.00	100	Vertical	Pass
4**	2823.772	48.37	-3.85	54.0	-5.63	AV	354.00	100	Vertical	Pass
5	3774.403	52.72	1.15	74.0	-21.28	Peak	320.20	100	Vertical	Pass
5**	3774.403	42.40	1.15	54.0	-11.60	AV	320.20	100	Vertical	Pass
6	5173.228	56.30	4.13	74.0	-17.70	Peak	122.60	100	Vertical	Pass
6**	5173.228	45.84	4.13	54.0	-8.16	AV	122.60	100	Vertical	Pass
7	6077.615	58.96	5.87	74.0	-15.04	Peak	122.60	100	Vertical	Pass
7**	6077.615	47.76	5.87	54.0	-6.24	AV	122.60	100	Vertical	Pass

Result: Pass

Note:

1. Factor=Antenna Factor + Cable loss - Amplifier gain, Over Limit= Results- Limit.
2. The "Factor" value can be calculated automatically by software of measurement system.
3. The harmonic wave of AV = PK + AV Factor. AV Factor = 0.

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4.1.5 20dB Bandwidth and 99% Bandwidth

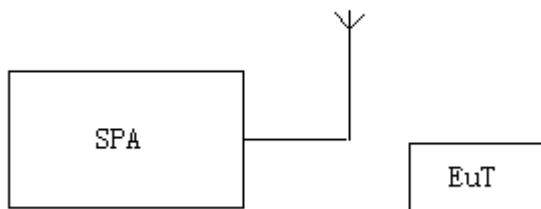
RESULT:

PASS

Test standard : §15.231(c), RSS-210 Annex A.1.3

Requirement : ANSI C63.10-2013

Test setup



Test procedure

1. Set the parameters of SPA as below:
Centre frequency = Operation Frequency
RBW=3KHz
VBW=10KHz
Span: 500KHz
Sweep time: Auto
2. Set the EUT to continue transmitting mode. Allow the trace to stabilize. Use the “N dB down” function of SPA to define the bandwidth.
3. Record the plots and Reported.

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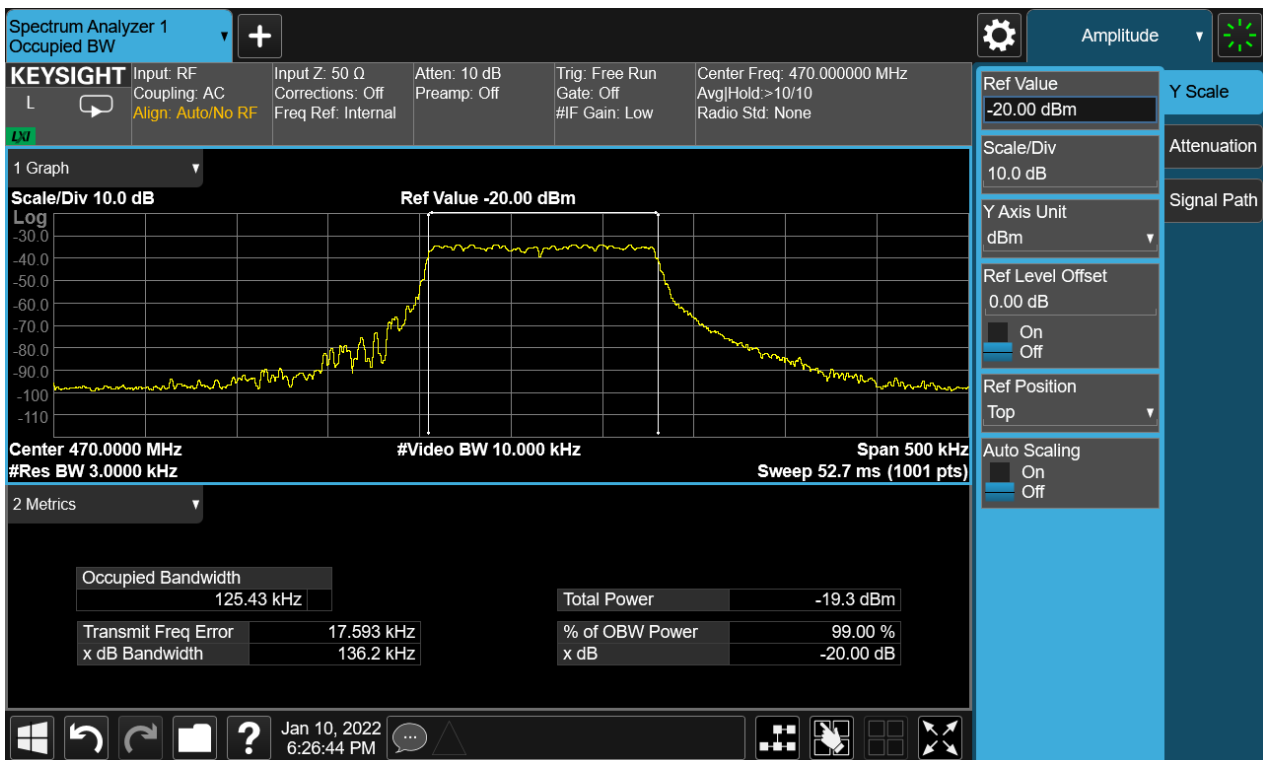
Test Result

Test Mode: EUT @ 470MHz for RF Transmitter

99% Bandwidth	-20dB Bandwidth	LIMIT	RESULT
125.43KHz	136.20KHz	1175KHz	Pass

Note: Limit= Operation Frequency $\times$ 0.25%

Figure: 20dB Bandwidth and 99% Bandwidth



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4.2 Mains Emissions

4.2.1 AC power-line conducted emissions

RESULT:

PASS

Test standard	: §15.207, RSS-GEN 8.8
Requirement	: ANSI C63.10-2013
Kind of test site	: Shielded room

Test setup

Test Diagram	: Clause 3.4
Input Voltage	: DC 5V by Adapter
Operation Mode	: Normal operation
Earthing	: Connected to ground
Ambient temperature	: 25°C
Relative humidity	: 50%

For details refer to following test plot.

Note:

The all configurations were tested respectively, but only the worst configuration (mode 1) shown here.

TEST REPORT

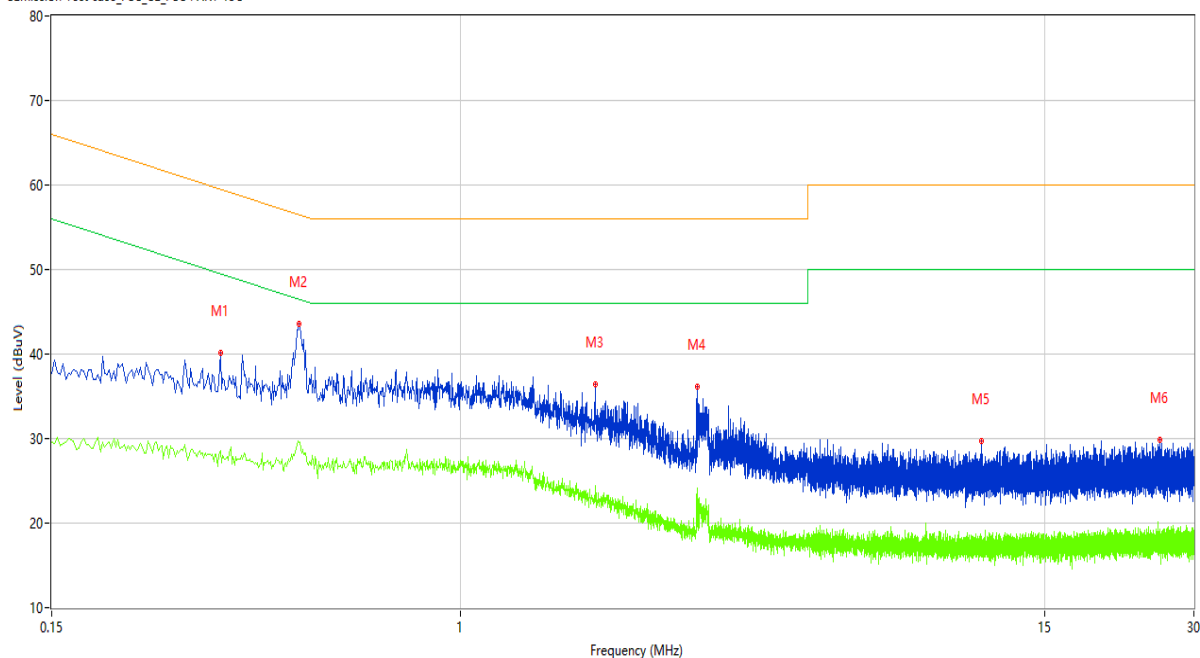
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Conducted Emission on AC Mains, L Phase

CEmission Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.328	32.95	10.23	59.50	-26.55	Peak	L	Pass
1*	0.328	24.96	10.23	59.50	-34.54	QP	L	Pass
1**	0.328	28.59	10.23	49.50	-20.91	AV	L	Pass
2	0.472	43.65	10.28	56.48	-12.83	Peak	L	Pass
2*	0.472	38.94	10.28	56.48	-17.54	QP	L	Pass
2**	0.472	29.61	10.28	46.48	-16.87	AV	L	Pass
3	1.868	30.80	10.17	56.00	-25.20	Peak	L	Pass
3*	1.868	22.96	10.17	56.00	-33.04	QP	L	Pass
3**	1.868	24.39	10.17	46.00	-21.61	AV	L	Pass
4	2.998	24.35	10.16	56.00	-31.65	Peak	L	Pass
4*	2.998	16.93	10.16	56.00	-39.07	QP	L	Pass
4**	2.998	21.32	10.16	46.00	-24.68	AV	L	Pass
5	11.186	22.32	10.39	60.00	-37.68	Peak	L	Pass
5*	11.186	14.18	10.39	60.00	-45.82	QP	L	Pass
5**	11.186	17.26	10.39	50.00	-32.74	AV	L	Pass
6	25.624	20.11	11.03	60.00	-39.89	Peak	L	Pass
6*	25.624	12.67	11.03	60.00	-47.33	QP	L	Pass
6**	25.624	18.06	11.03	50.00	-31.94	AV	L	Pass

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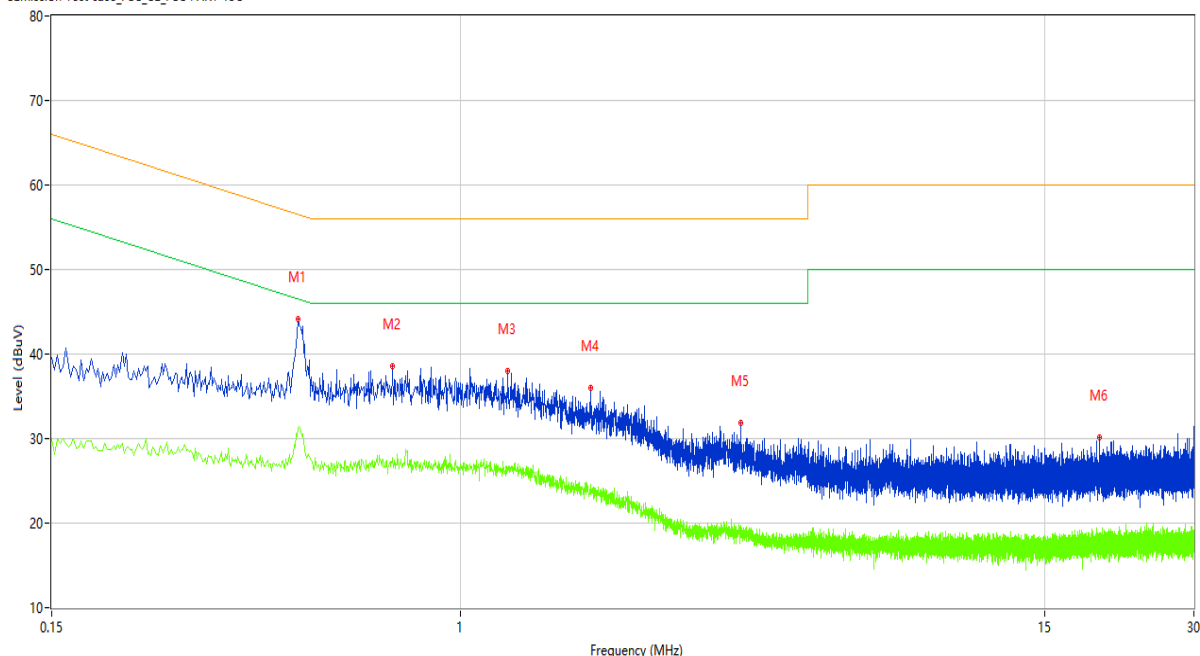
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Conducted Emission on AC Mains, N Phase

CEmission Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.470	42.48	10.28	56.51	-14.03	Peak	N	Pass
1*	0.470	37.88	10.28	56.51	-18.63	QP	N	Pass
1**	0.470	31.26	10.28	46.51	-15.25	AV	N	Pass
2	0.730	34.68	10.31	56.00	-21.32	Peak	N	Pass
2*	0.730	26.88	10.31	56.00	-29.12	QP	N	Pass
2**	0.730	27.73	10.31	46.00	-18.27	AV	N	Pass
3	1.246	29.50	10.19	56.00	-26.50	Peak	N	Pass
3*	1.246	22.42	10.19	56.00	-33.58	QP	N	Pass
3**	1.246	26.35	10.19	46.00	-19.65	AV	N	Pass
4	1.828	30.88	10.17	56.00	-25.12	Peak	N	Pass
4*	1.828	22.88	10.17	56.00	-33.12	QP	N	Pass
4**	1.828	24.27	10.17	46.00	-21.73	AV	N	Pass
5	3.662	27.01	10.19	56.00	-28.99	Peak	N	Pass
5*	3.662	20.48	10.19	56.00	-35.52	QP	N	Pass
5**	3.662	18.91	10.19	46.00	-27.09	AV	N	Pass
6	19.390	19.74	10.88	60.00	-40.26	Peak	N	Pass
6*	19.390	12.67	10.88	60.00	-47.33	QP	N	Pass
6**	19.390	17.60	10.88	50.00	-32.40	AV	N	Pass

Result: Pass

Note:

- Factor=Insertion Loss + Cable Loss, Over Limit= Results- Limit.
- Only worst mode data (mode 1) recorded in the test report.

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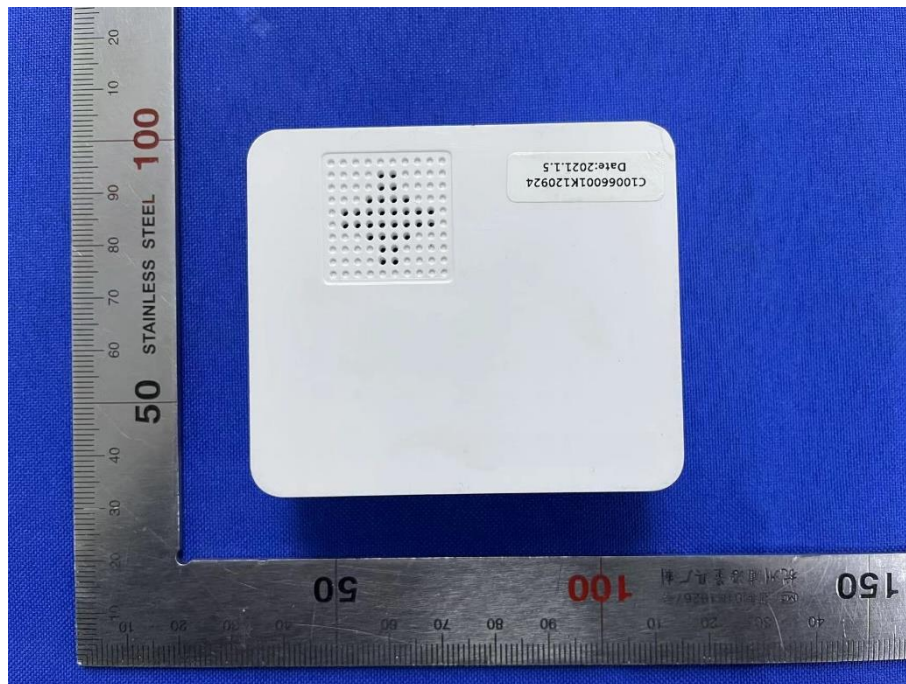
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5 Appendixes

5.1 Photographs of the Sample

A1-EA-PM2.5 Model

Top view of EUT



Bottom view of EUT



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Front view of EUT



Back view of EUT



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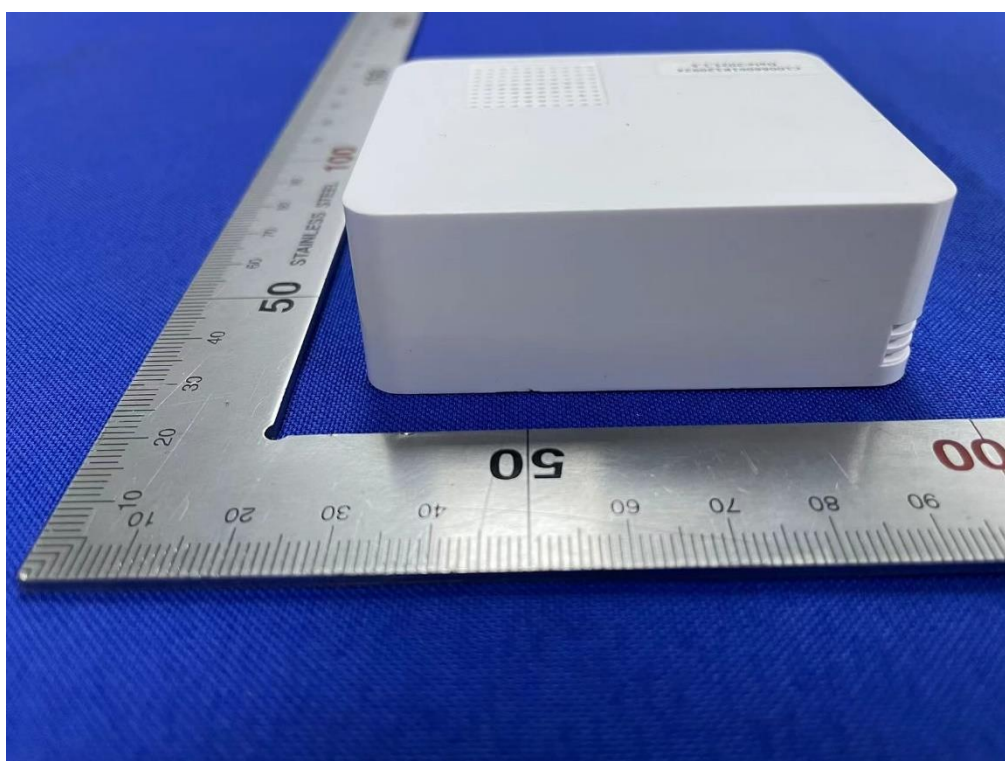
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Left view of EUT



Right view of EUT



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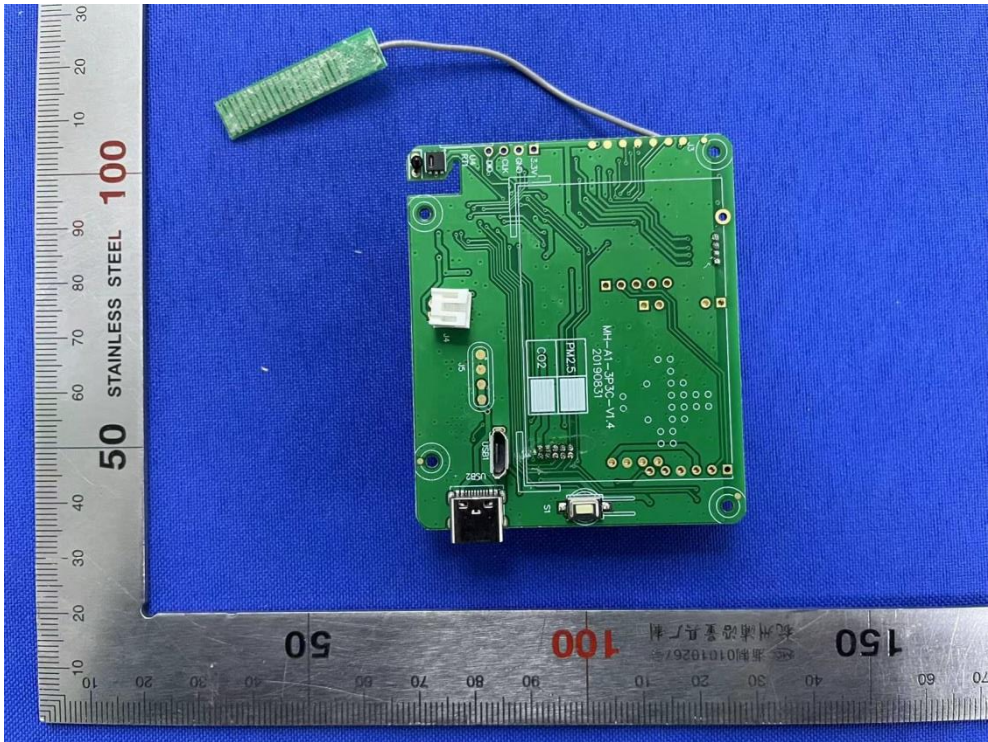
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Open view of EUT



Internal view of EUT-1



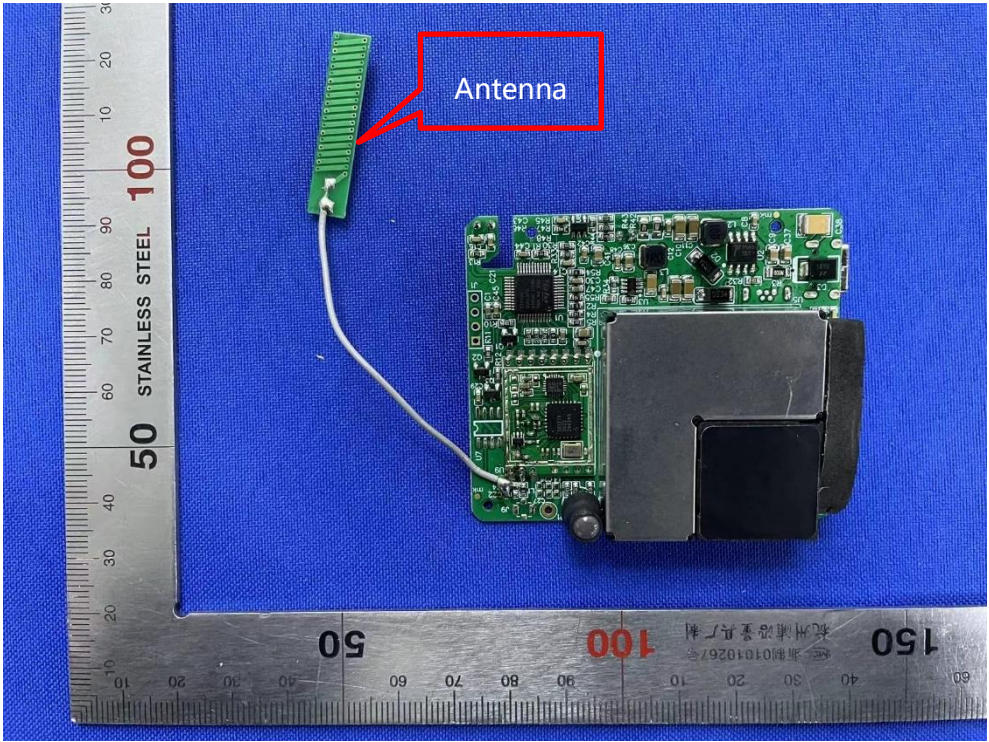
TEST REPORT

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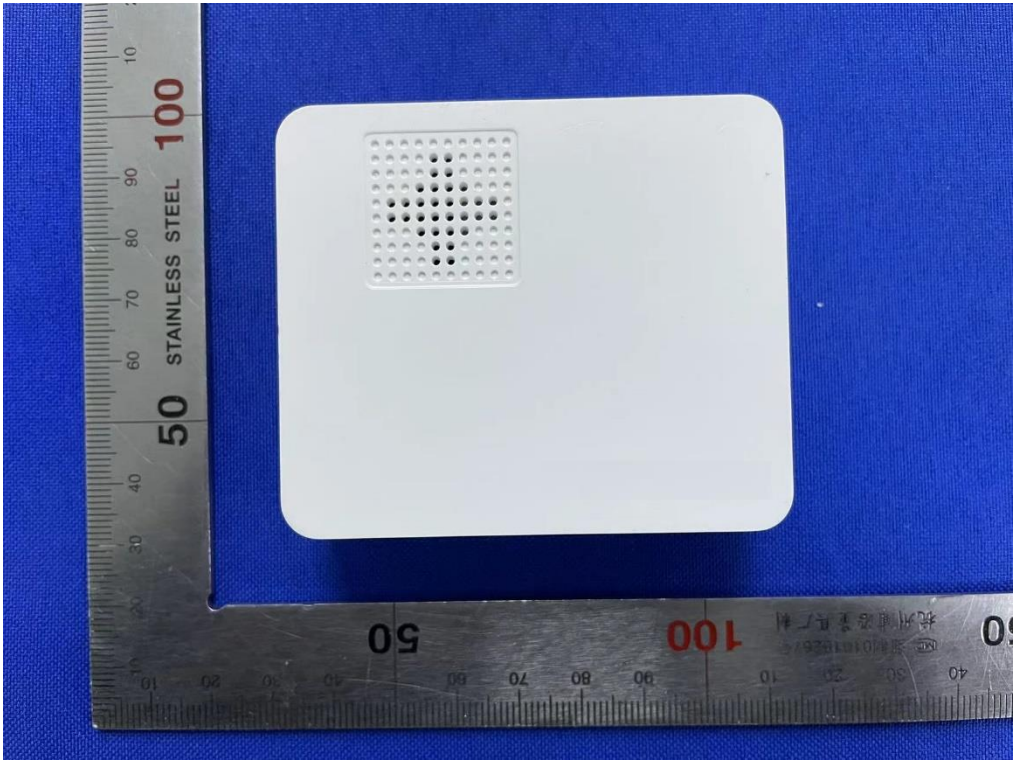
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Internal view of EUT-2



A1-EA-CO₂ Model
Top view of EUT



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Bottom view of EUT



Front view of EUT



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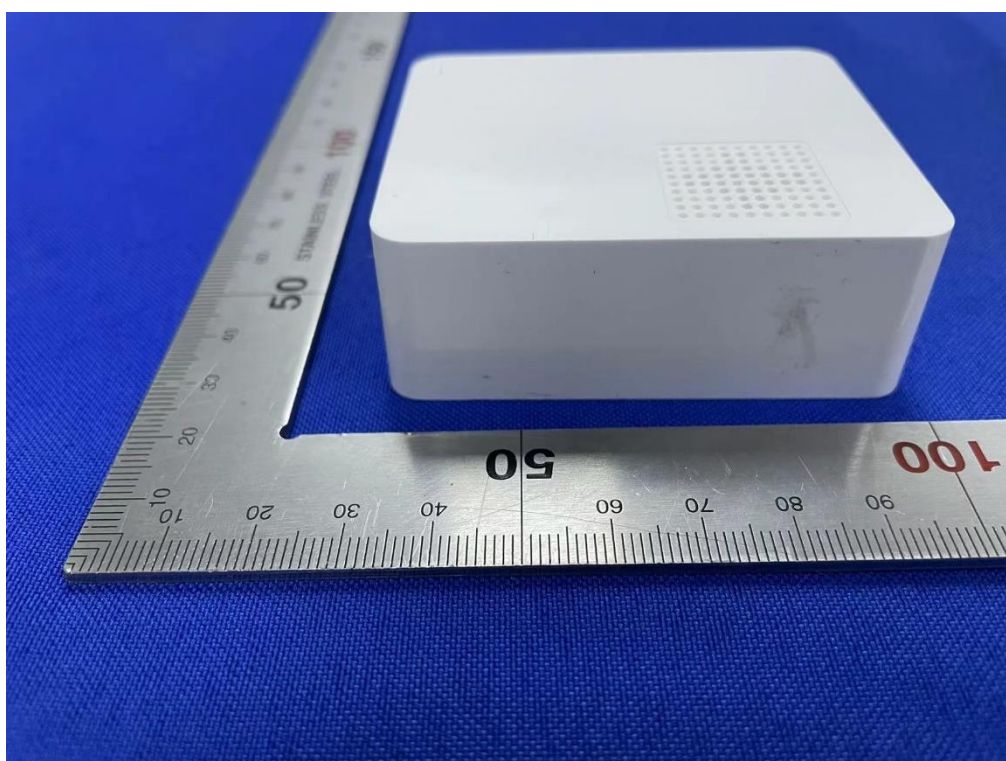
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Back view of EUT



Left view of EUT



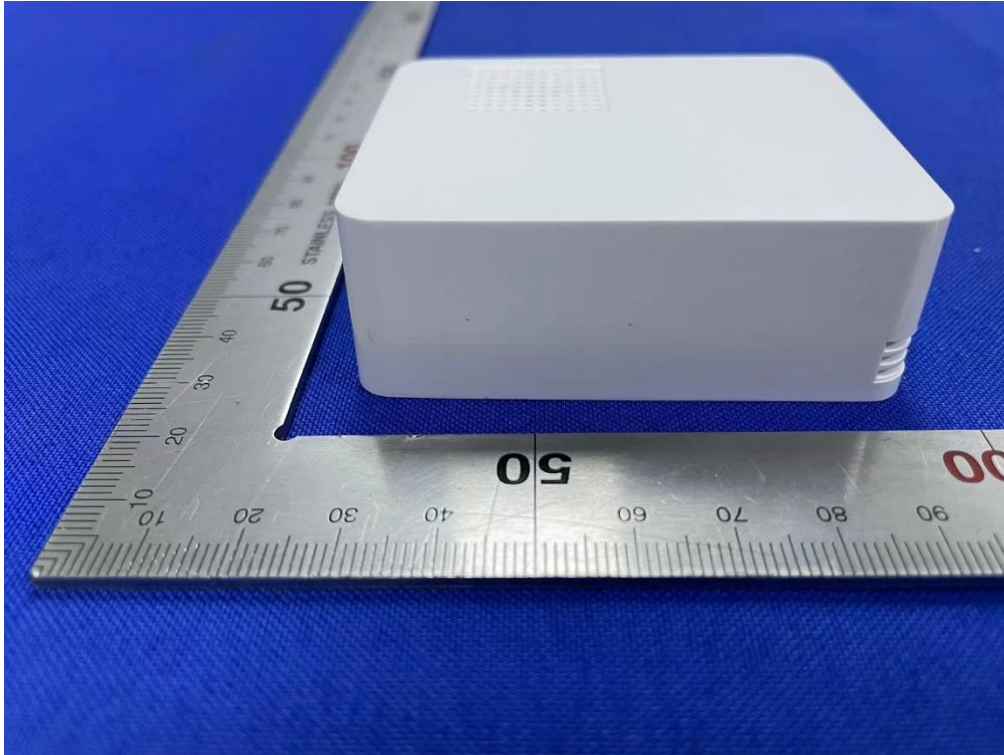
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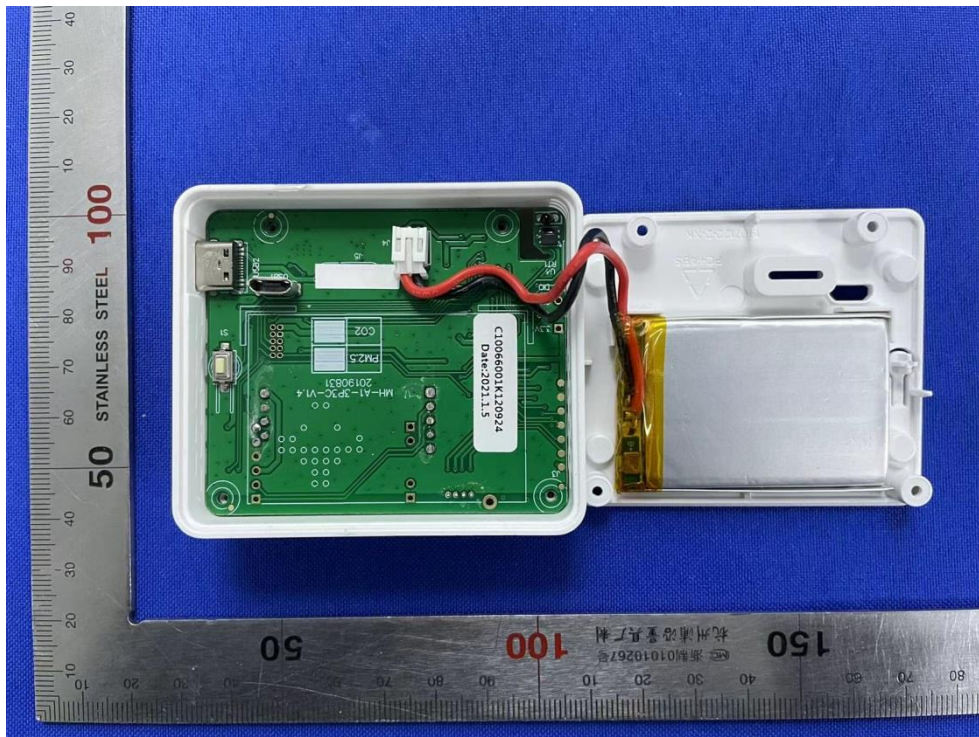
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Right view of EUT



Open view of EUT



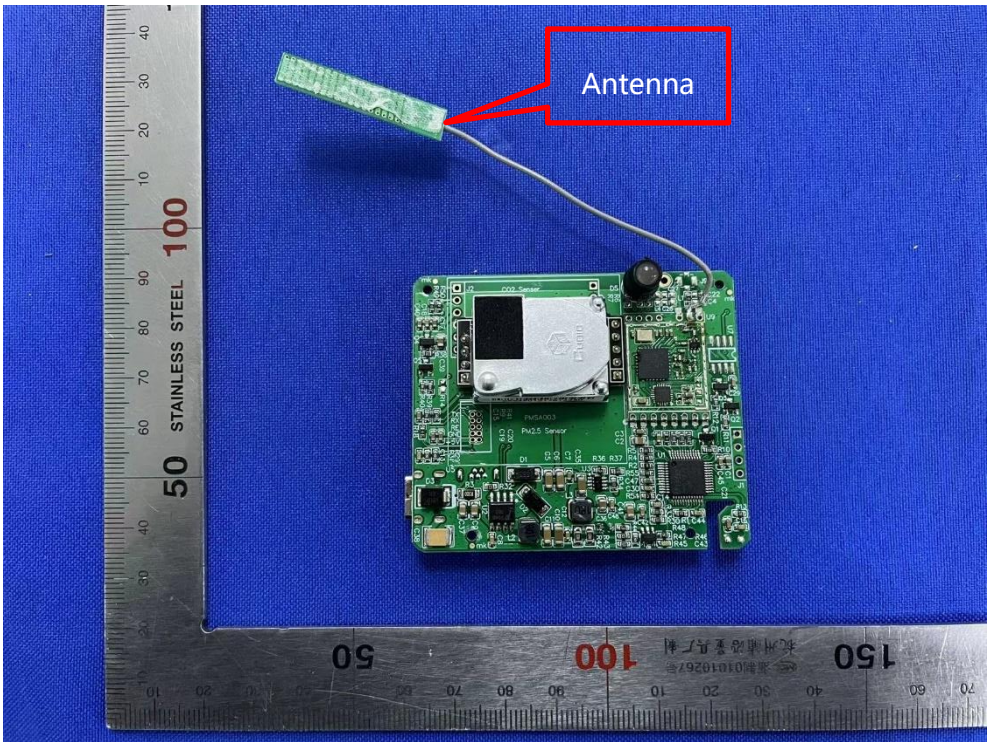
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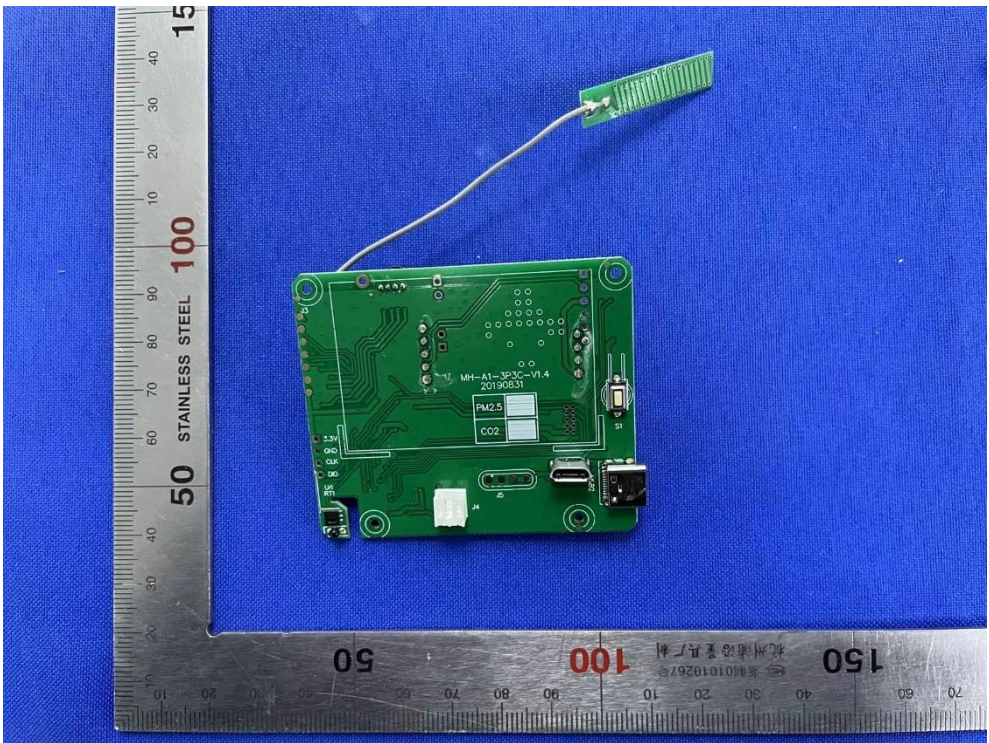
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Internal view of EUT-1



Internal view of EUT-2



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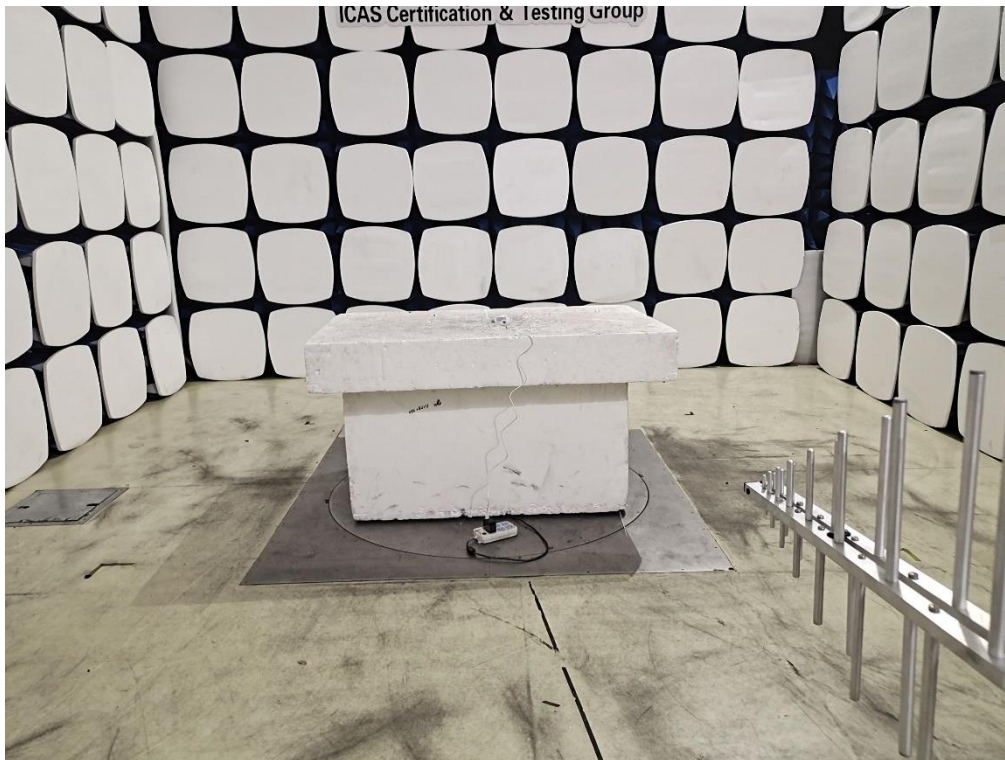
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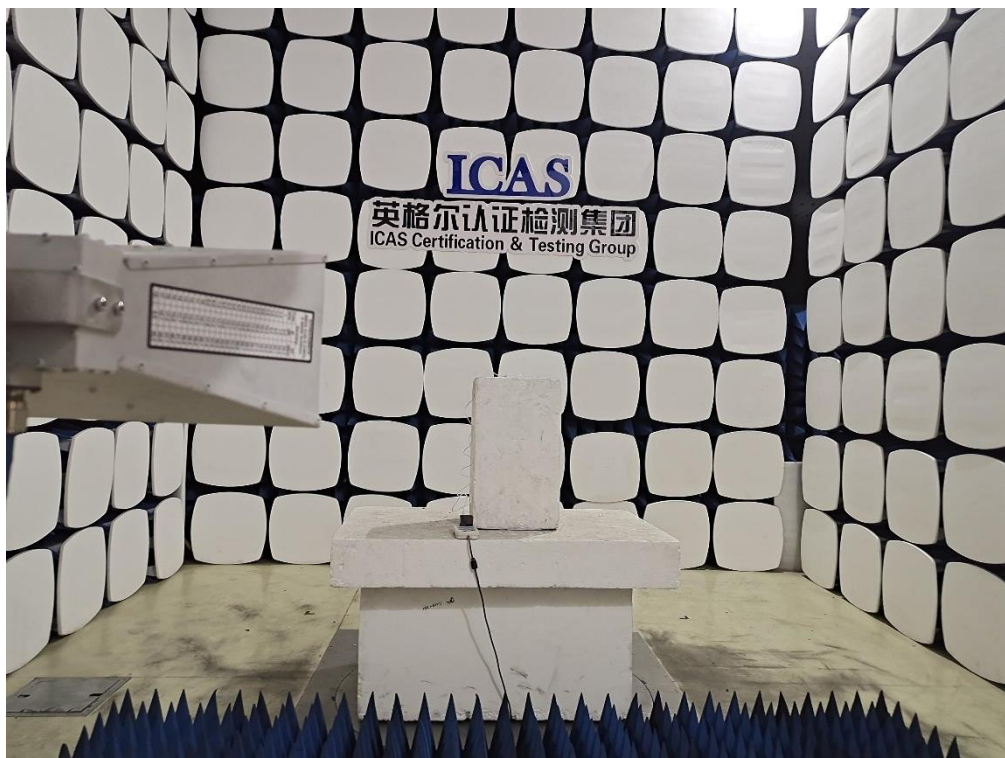
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5.2 Photographs of the Test Set-up

FCC Radiated Emission Test Setup-Below 1GHz



FCC Radiated Emission Test Setup-Above 1GHz



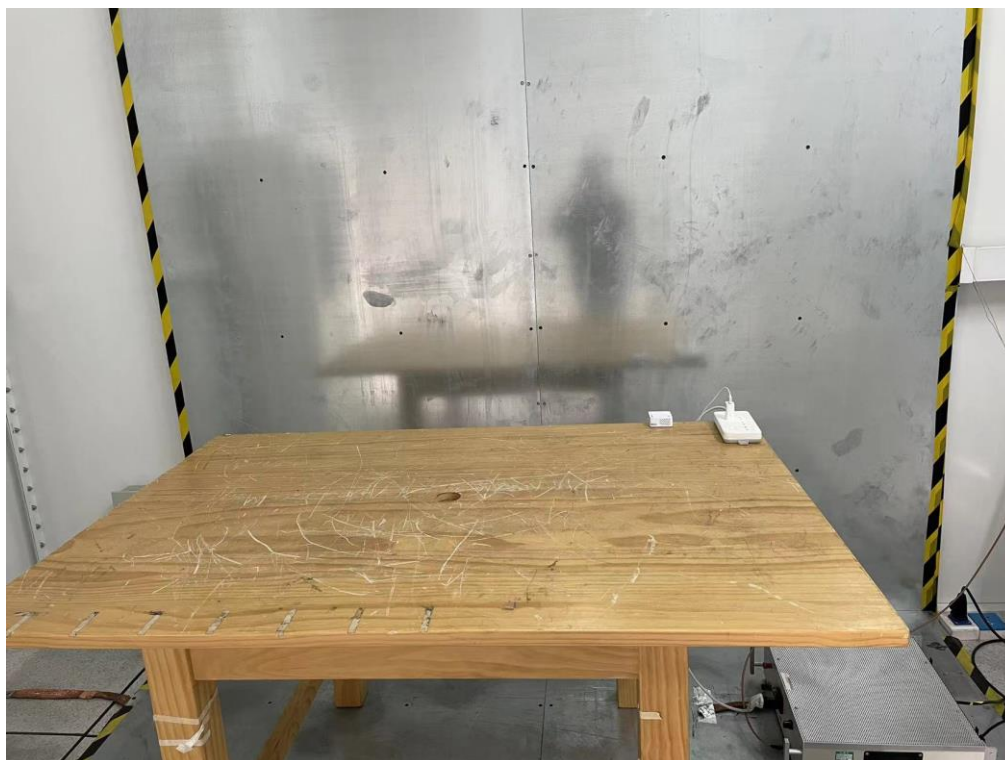
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AC power-line conducted emission Test Setup



End of the report