FCC/IC - TEST REPORT

Report Number	:	**68.760.22.0307.01** Date of Issue: **June 6, 2022**
Model / HVIN	:	**AP6398S2**
Product Type	:	Wi-Fi and Bluetooth functionalities module
Applicant	:	Roboteam Home Technology (Shenzhen) Co., Ltd
Address	:	22F, CHANGFU JINMAO BUILDING NO.5 SHIHUA ROAD, FUTIAN DISTRICT, 518000 SHENZHEN, PEOPLE'S REPUBLIC OF CHINA
Manufacturer	:	Roboteam Home Technology (Shenzhen) Co., Ltd
Address	:	22F, CHANGFU JINMAO BUILDING NO.5 SHIHUA ROAD, FUTIAN DISTRICT, 518000 SHENZHEN, PEOPLE'S REPUBLIC OF CHINA
Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	**24**

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TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

1. Table of Contents

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

2. Details about the Test Laboratory

Details about the Test Laboratory

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration Number:	514049
FCC Designation Number:	CA5009
IC Registration No.:	10320A
Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299

3. Description of the Equipment Under Test

Product:	Wi-Fi and Bluetooth functionalities module
Model no.:	AP6398S2
Brand name:	t ē m i
FCC ID:	2ASJLAP6398S2
Rating:	Supplied by 3.3VDC
Transmit Frequency	2402-2480MHz for BR+EDR+BLE 2412-2462MHz for 2.4GWiFi 5150-5350MHz, 5470-5725MHz, 5745-5825MHz for 5GWiFi
Receive Frequency	2402-2480MHz for BR+EDR+BLE 2412-2462MHz for 2.4GWiFi 5150-5350MHz, 5470-5725MHz, 5745-5825MHz for 5GWiFi
Description of the EUT:	The Equipment Under Test (EUT) is a Wi-Fi and Bluetooth functionalities module which support Bluetooth function and Wi-Fi operated at 5GHz and 2.4GHz.

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4. Summary of Test Standards

Test Standards	
FCC Part 15 Subpart B 10-1-2020 Edition	Unintentional Radiators
ICES-003 Issue 7 October 2020	Information Technology Equipment (including Digital Apparatus)

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5. Summary of Test Results

Emission Tests				
FCC Part 15 Subpart B 10-1-20 Edition / ICES-003 Issue 7				
Test Condition	Pages	Test Result		
		Pass	Fail	N/A
Conducted Emission on AC 150kHz to 30MHz	10	☒	☐	☐
Radiated Emission 30MHz to 40000MHz	13	☒	☐	☐

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6. General Remarks

Remarks

The Equipment Under Test (EUT) is a Wi-Fi and Bluetooth functionalities module which support Bluetooth function and Wi-Fi operated at 5GHz and 2.4GHz.

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:	April 25, 2022
Testing Start Date:	April 27, 2022
Testing End Date:	May 17, 2022

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

Reviewed by:	Prepared by:	Tested by:
Laurent Yuan	Alan Xiong	Carry Cai
Section Manager	Project Engineer	Test Engineer

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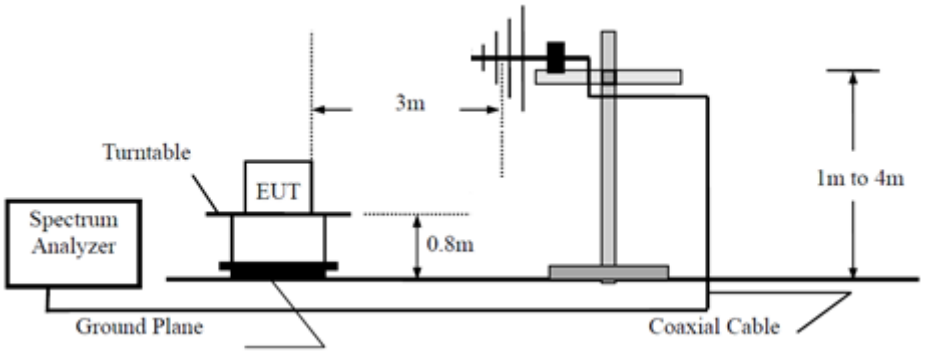
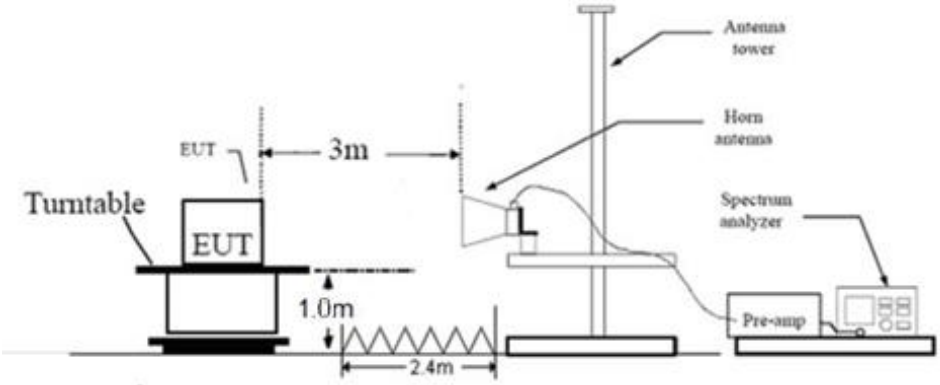
7. Test Setups

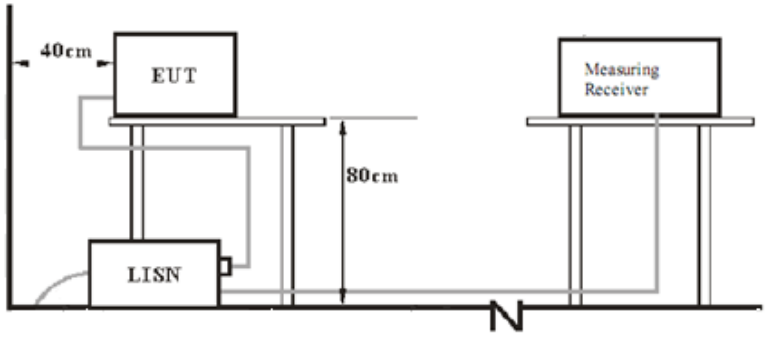
Below 1GHz



Above 1GHz



AC Power Line Conducted Emission test setups



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8. Systems test configuration

Auxiliary Equipment Used during Test:

Description	Manufacturer	Model NO.	S/N
Laptop	Thinkpad	X230	0A72162
Adapter	HOLOTO	ADS-25FSG-12	12VDC, 2.0A

Cables Used During Test:

Cable	Length	Shielded/unshielded	With / without ferrite
USB Cable	1.0m	Shielded	Without ferrite

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9. Technical Requirement

9.1 Conducted Emission Test

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.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. 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

According to §15.107 & ICES-003 Clause 3.2.1, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Remark: *Decreasing linearly with logarithm of the frequency

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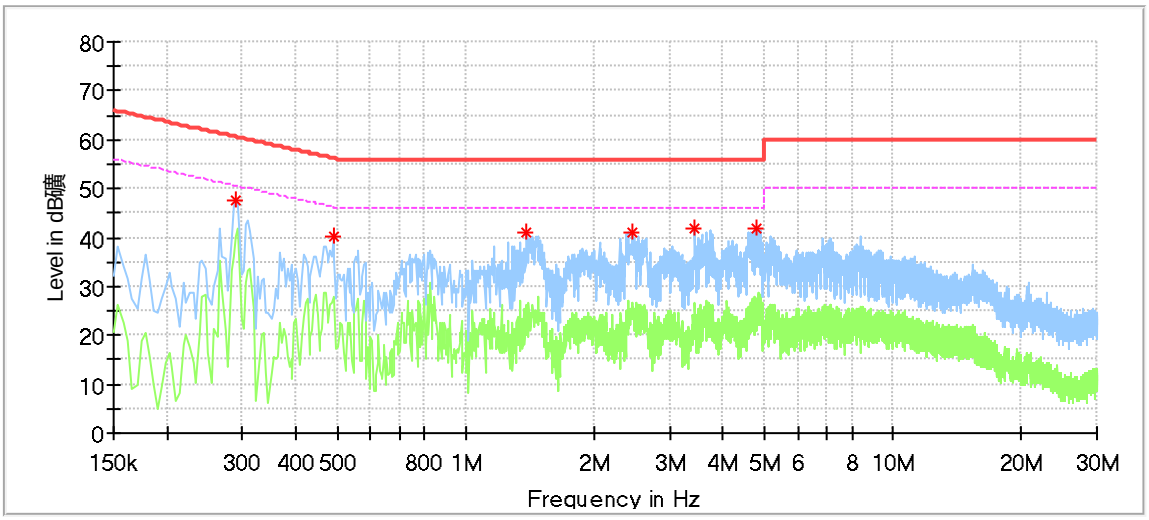
Conducted Emission

Product Type	:	Wi-Fi and Bluetooth functionalities module
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Test Specification	:	Line
Comment	:	AC 120V/60Hz



Frequency (MHz)	Max Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.290000	47.70	---	60.52	12.83	L1	9.22
0.490000	40.30	---	56.17	15.87	L1	9.20
1.390000	41.15	---	56.00	14.85	L1	9.21
2.454000	41.08	---	56.00	14.92	L1	9.24
3.446000	41.75	---	56.00	14.25	L1	9.26
4.778000	41.90	---	56.00	14.10	L1	9.30

Remark:
Max Peak= Read level + Corrector factor
Correct factor=cable loss + LISN factor
EUT has more than one typical operation, only the worst test mode will be recorded in this report.

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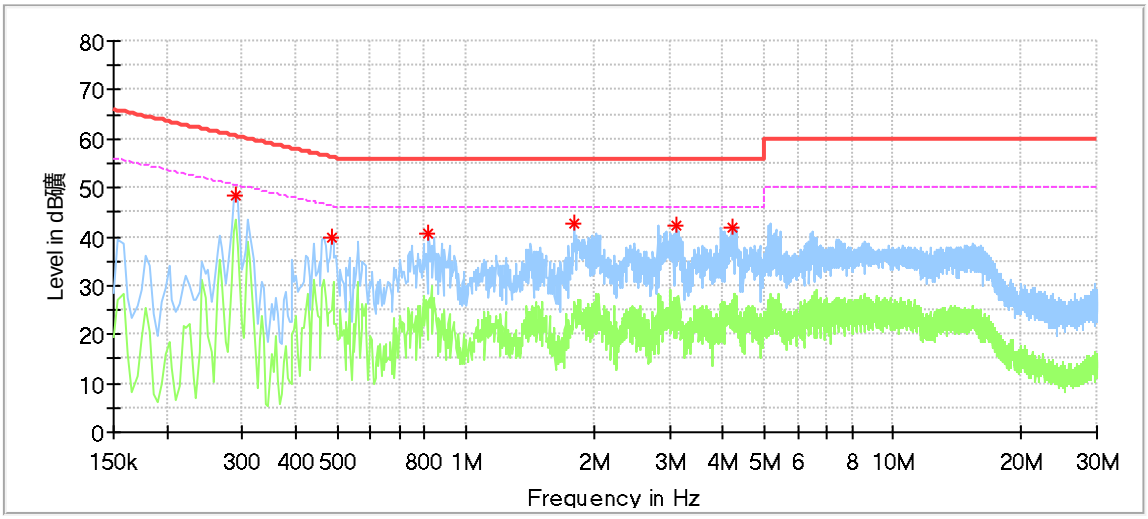
Conducted Emission

Product Type	:	Wi-Fi and Bluetooth functionalities module
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Frequency (MHz)	Max Peak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.290000	48.28	---	60.52	12.24	N	9.39
0.486000	39.81	---	56.24	16.42	N	9.39
0.818000	40.70	---	56.00	15.30	N	9.39
1.790000	42.65	---	56.00	13.35	N	9.41
3.106000	42.34	---	56.00	13.66	N	9.44
4.190000	41.93	---	56.00	14.07	N	9.47

Remark:
Max Peak= Read level + Corrector factor
Correct factor=cable loss + LISN factor
EUT has more than one typical operation, only the worst test mode will be recorded in this report.

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9.2 Radiated Emission Test

Test Method

1: The EUT was place on a turn table which is 1.0m above ground plane. 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 C63.4:2010:
For Above 1GHz
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥RBW for peak measurement and VBW = 10Hz for average 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 = 120 KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = Quasi-peak, Trace = max hold.

Limits

According to §15.109, Radiated emissions limit as below:

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

According to ICES-003 Clause 3.2.2, Radiated emissions limit as below:

Frequency MHz	Field Strength dBµV/m	Detector
30-88	40	QP
88-216	43.5	QP
216-230	46	QP
230-960	47	QP
960-1000	54	QP
Above 1000	54	AV
Above 1000	74	PK

Remark 1: we test all modes and only worse case (2.4GWiFi traffic) recorded in this report.
Remark 2: The limit of FCC Part 15.109 is more stricter than the limit of ICES-003, so only limit of FCC Part 15.109 shown in the graphs as below.

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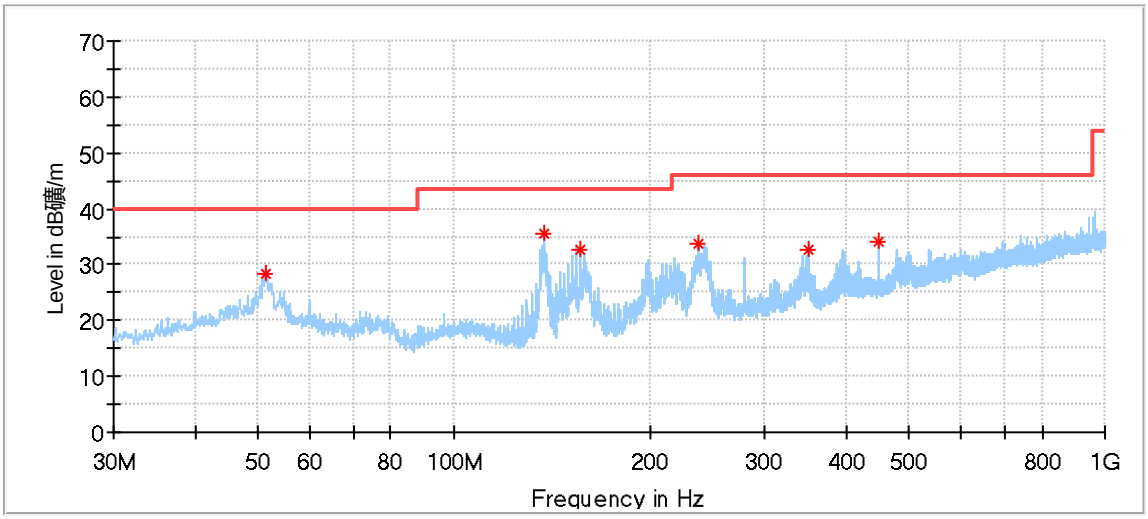
Radiated Emission

Product Type	:	Wi-Fi and Bluetooth functionalities module
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Ant. Polarity	:	Horizontal
Comment	:	30-1000MHz



Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
51.286111	28.42	40.00	11.58	200.0	H	0.0	20.81
137.616111	35.45	43.50	8.05	200.0	H	208.0	15.12
156.046111	32.78	43.50	10.72	200.0	H	263.0	15.40
237.310556	33.63	46.00	12.37	100.0	H	221.0	19.48
349.830556	32.80	46.00	13.20	100.0	H	74.0	22.42
450.010000	33.99	46.00	12.01	200.0	H	192.0	24.24

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
EUT has more than one typical operation, only the worst test mode will be recorded in this report.

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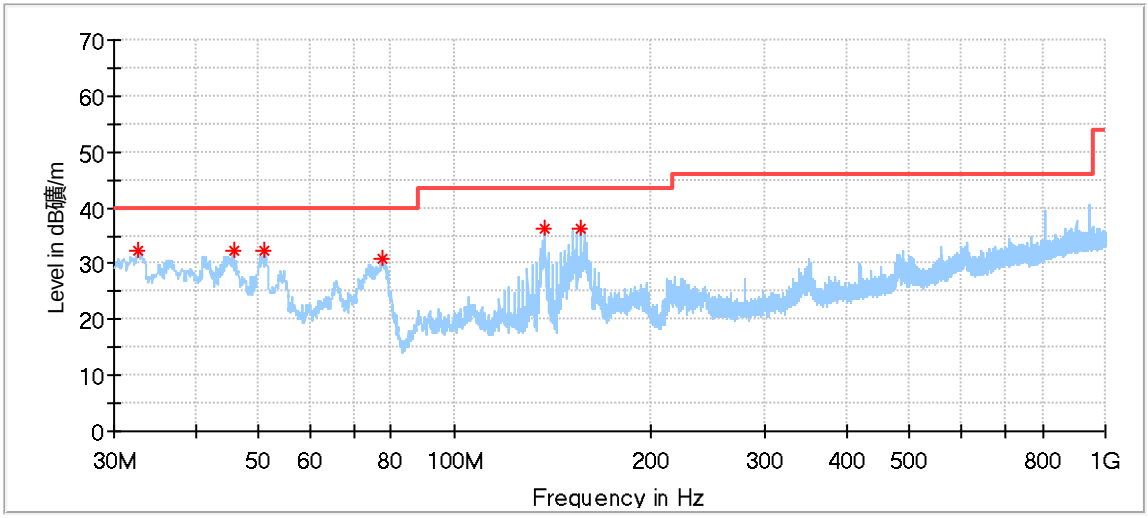
Radiated Emission

Product Type	:	Wi-Fi and Bluetooth functionalities module
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Ant. Polarity	:	Vertical
Comment	:	30-1000MHz



Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32.694444	32.42	40.00	7.58	100.0	V	121.0	16.79
45.735556	32.42	40.00	7.58	100.0	V	184.0	20.89
51.124444	32.32	40.00	7.68	100.0	V	89.0	20.83
77.583889	30.90	40.00	9.10	200.0	V	186.0	13.79
137.616111	36.40	43.50	7.10	100.0	V	303.0	15.12
155.992222	36.30	43.50	7.20	100.0	V	280.0	15.40

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
EUT has more than one typical operation, only the worst test mode will be recorded in this report.

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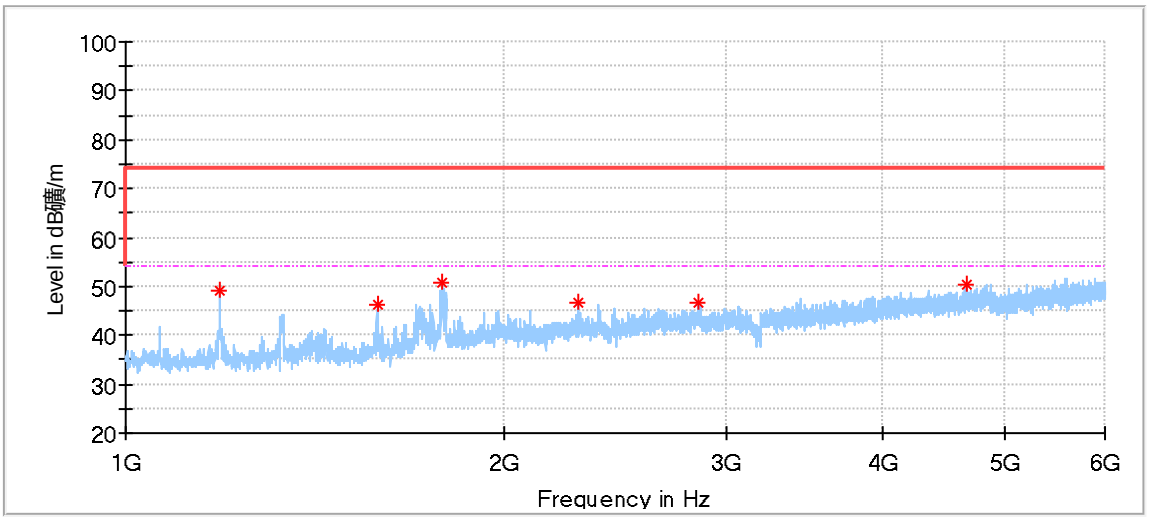
Radiated Emission

Product Type	:	Wi-Fi and Bluetooth functionalities module
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Ant. Polarity	:	Horizontal
Comment	:	1GHz-6GHz



Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1188.500000	49.16	74.00	24.84	100.0	H	356.0	-9.39
1584.000000	46.13	74.00	27.87	100.0	H	0.0	-7.51
1785.000000	50.57	74.00	23.43	100.0	H	191.0	-5.88
2289.500000	46.54	74.00	27.46	100.0	H	245.0	-3.43
2853.500000	46.72	74.00	27.28	100.0	H	225.0	-1.87
4661.000000	50.43	74.00	23.57	100.0	H	245.0	2.55

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
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Radiated Emission

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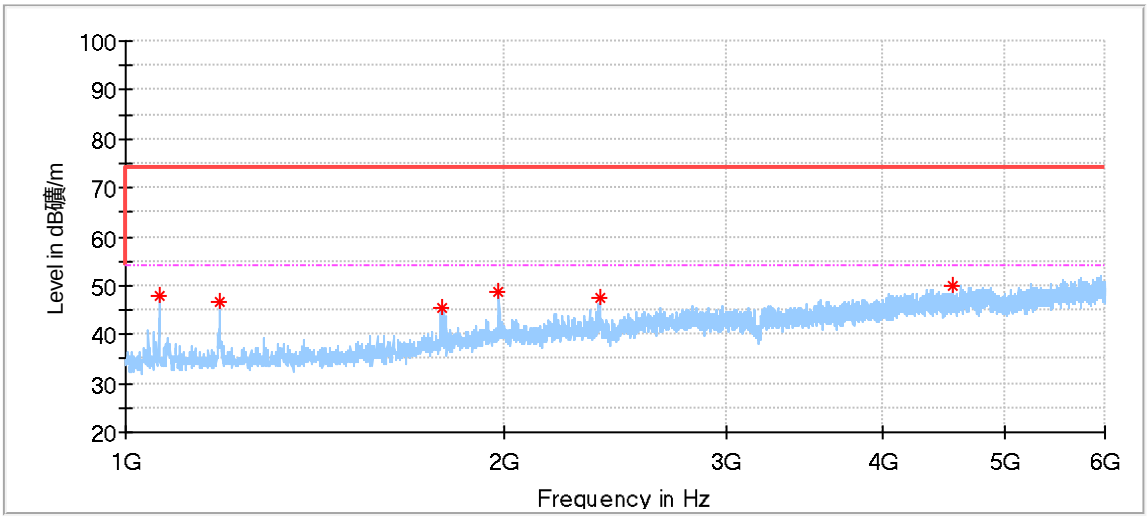
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Ant. Polarity	:	Vertical
Comment	:	1GHz-6GHz



Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1063.500000	47.90	74.00	26.10	100.0	V	9.0	-9.92
1188.000000	46.72	74.00	27.28	100.0	V	35.0	-9.39
1781.000000	45.39	74.00	28.61	100.0	V	318.0	-5.90
1980.000000	48.61	74.00	25.39	100.0	V	4.0	-4.19
2379.500000	47.64	74.00	26.36	100.0	V	344.0	-3.19
4541.500000	49.79	74.00	24.21	100.0	V	324.0	2.46

Remark:
Corrected Amplitude = Read level + Corrector factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
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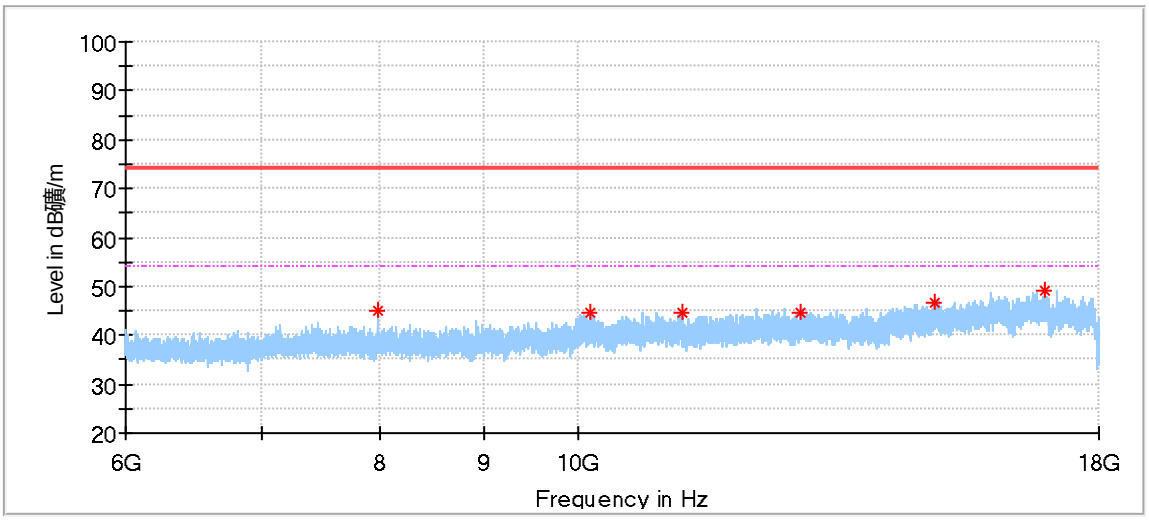
Radiated Emission

Product Type	:	Wi-Fi and Bluetooth functionalities module
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Ant. Polarity	:	Horizontal
Comment	:	6GHz-18GHz



Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7971.500000	44.91	74.00	29.09	100.0	H	142.0	6.01
10139.500000	44.58	74.00	29.42	100.0	H	201.0	9.10
11250.500000	44.63	74.00	29.37	100.0	H	221.0	8.44
12860.500000	44.54	74.00	29.46	100.0	H	241.0	9.19
14965.000000	46.79	74.00	27.21	100.0	H	221.0	12.29
16947.500000	49.16	74.00	24.84	100.0	H	0.0	16.46

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
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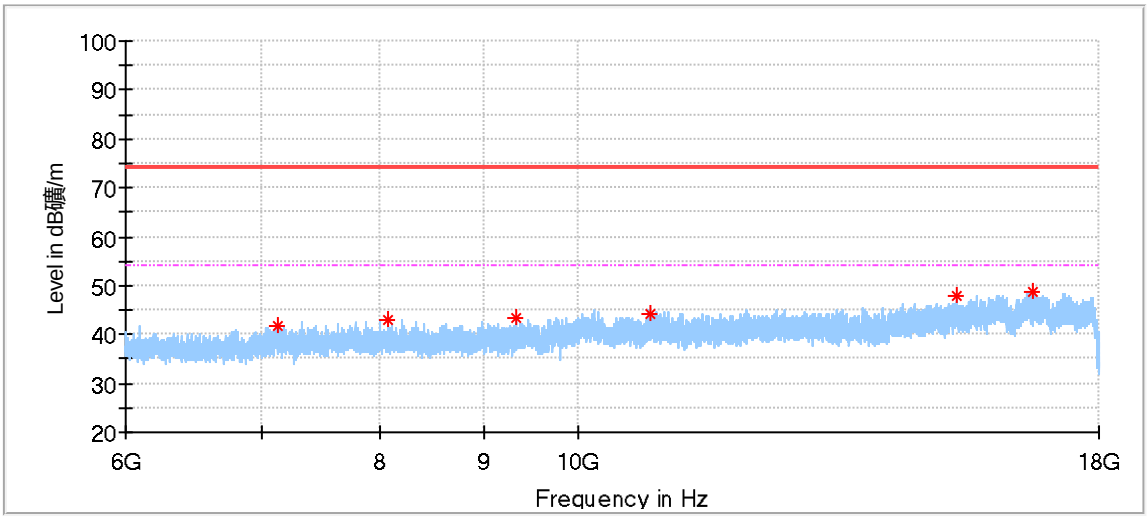
Radiated Emission

Product Type	:	Wi-Fi and Bluetooth functionalities module
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Ant. Polarity	:	Vertical
Comment	:	6GHz-18GHz



Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7117.000000	41.59	74.00	32.41	100.0	V	218.0	4.93
8061.500000	43.02	74.00	30.98	100.0	V	139.0	6.61
9321.000000	43.23	74.00	30.77	100.0	V	198.0	7.01
10839.500000	44.31	74.00	29.69	100.0	V	99.0	8.44
15322.500000	47.73	74.00	26.27	100.0	V	4.0	12.62
16713.000000	48.70	74.00	25.30	100.0	V	0.0	15.94

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
EUT has more than one typical operation, only the worst test mode will be recorded in this report.

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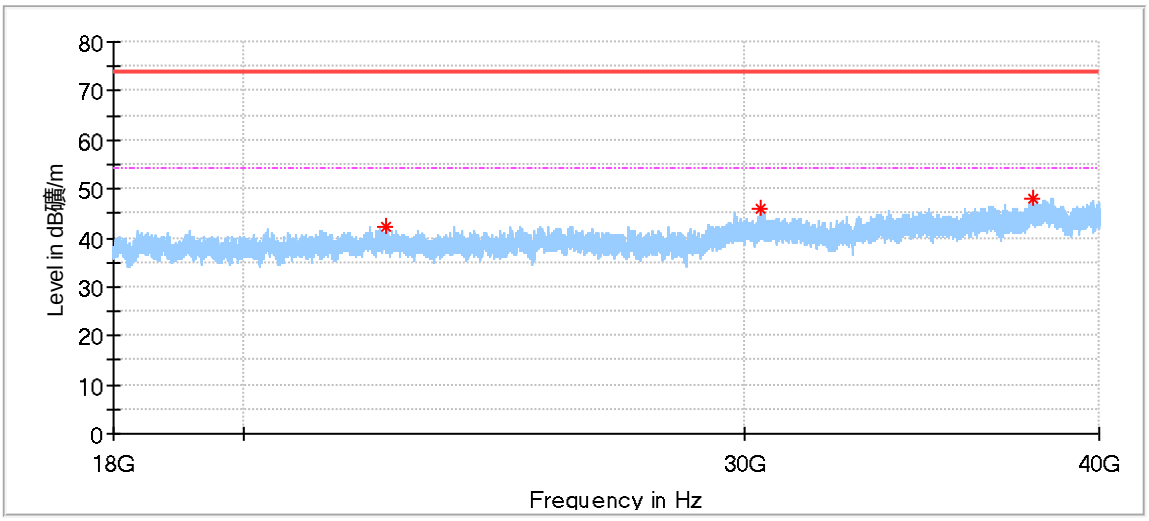
Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

Radiated Emission

Product Type	:	Wi-Fi and Bluetooth functionalities module
M/N	:	AP6398S2
Operating Condition	:	Normal Working (Bluetooth and WiFi traffic)
Ant. Polarity	:	Horizontal
Comment	:	18GHz-40GHz



Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
22456.375000	42.09	74.00	31.91	150.0	H	345.0	0.42
30425.187500	46.11	74.00	27.89	150.0	H	221.0	2.04
37885.250000	48.08	74.00	25.92	150.0	H	160.0	4.88

Remark:
Corrected Amplitude = Read level + Corrector factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
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EUT has more than one typical operation, only the worst test mode will be recorded in this report.

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Radiated Emission

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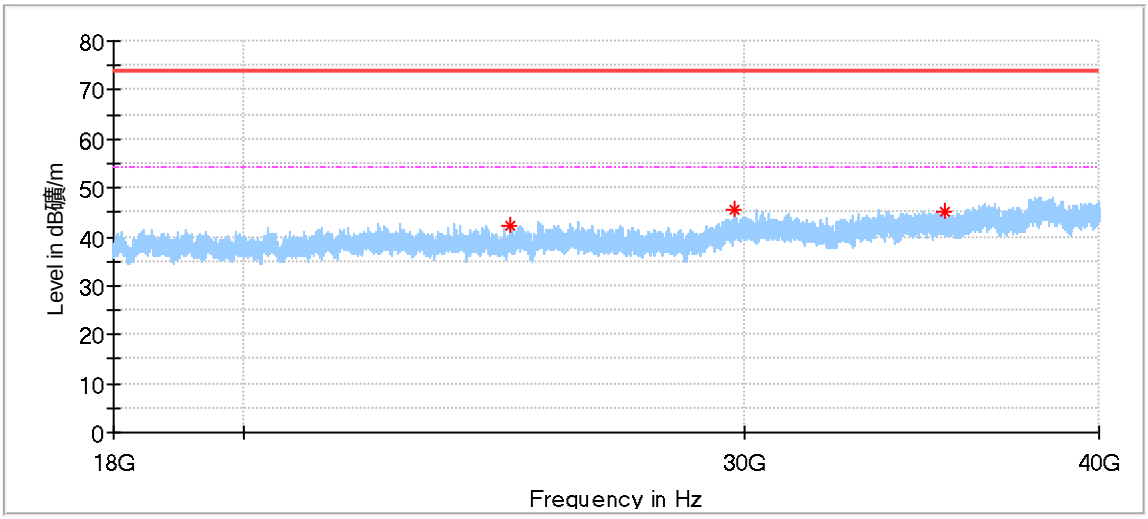

Frequency (MHz)	Max Peak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
24827.562500	42.07	74.00	31.93	150.0	V	202.0	0.85
29781.687500	45.72	74.00	28.28	150.0	V	312.0	1.99
35303.687500	45.15	74.00	28.85	150.0	V	312.0	3.72

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
EUT has more than one typical operation, only the worst test mode will be recorded in this report.

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10. Test Equipment List

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 7	68-4-74-19-001	102176	1	2022-6-4
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	68-4-80-14-002	707	1	2022-7-23
Horn Antenna	Rohde & Schwarz	HF907	68-4-80-14-005	102294	1	2022-6-23
Loop Antenna	Rohde & Schwarz	HFH2-Z2	68-4-80-14-006	100398	1	2022-8-25
Pre-amplifier	Rohde & Schwarz	SCU 18	68-4-29-14-001	102230	1	2022-6-6
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-001	15542	1	2022-8-23
3m Semi-anechoic chamber	TDK	SAC-3 #1	68-4-90-14-001	----	2	2023-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-14-001-A10	Version10.35.02	N/A	N/A

Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-14-001	101782	1	2022-6-4
LISN	Rohde & Schwarz	ENV4200	68-4-87-14-001	100249	1	2022-6-5
LISN	Rohde & Schwarz	ENV432	68-4-87-16-001	101318	1	2022-6-5
LISN	Rohde & Schwarz	ENV216	68-4-87-14-002	100326	1	2022-6-5
ISN	Rohde & Schwarz	ENY81	68-4-87-14-003	100177	1	2022-6-5
ISN	Rohde & Schwarz	ENY81-CA6	68-4-87-14-004	101664	1	2022-6-5
High Voltage Probe	Schwarzbeck	TK9420(VT9420)	68-4-27-14-001	9420-584	1	2022-6-5
RF Current Probe	Rohde & Schwarz	EZ-17	68-4-27-14-002	100816	1	2022-6-5
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2022-6-3
Test software	Rohde & Schwarz	EMC32	68-4-90-14-003-A10	Version9.15.00	N/A	N/A
Shielding Room	TDK	CSR #1	68-4-90-19-004	----	3	2022-11-07

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11. Measurement System 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**
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.21dB
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.91dB; Vertical: 4.89dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.80dB; Vertical: 4.79dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 5.05dB; Vertical: 5.04dB;

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

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12. FCC Statement

Subject: FCC Statement

To whom it may concern,

We suggest you to put following statement in the label to the product, When the device is so small, or for such use that it is impracticable to label it with the required compliance statement in a font that is four-point or larger, and the device does not have a display that can show electronic labeling, then the information required shall be placed in the instruction manual, and on the device packaging or on a removable label attached to the device.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The instruction manual shall include the following statement, placed in a prominent location in the text of the manual:

For class B digital device:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
--Reorient or relocate the receiving antenna.
--Increase the separation between the equipment and receiver.
--Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
--Consult the dealer or an experienced radio/TV technician for help.

MODIFICATION: Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the device.

THE END

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