

# RF TEST REPORT

FCC ID: 2BCFYHT-178AX

Test Report No.: RF240329016-01-001

Product(s) Name: Wireless Home Gateway

Model(s): HT-178AX

Trade Mark: HEIGHTS

Applicant: Heights Telecom T LTD

Address: Ha-Sakhlav 6, Irus, 7680900, Israel

Receipt Date: 2024.04.01

Test Date: 2024.04.02~2024.04.03

Issued Date: 2024.04.07

Standards: 47 CFR FCC Part 15, Subpart C(Section 15.247);

ANSI C63.10:2013

Testing Laboratory: Shenzhen Haiyun Standard Technical Co., Ltd.

Prepared By:	Checked By:	Approved By:	
Black Ding	Tim Zhang	Misue Su	
Black Ding	Tim Zhang	Misue Su	

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## History of this test report

Amendment Report Issue Date: 2024.04.07

- No additional attachment
- Additional attachments were issued following record

Attachment No.	Issue Date	Description
RF230808001-01-001	2023.09.04	Original report
RF240329016-01-001	2024.04.07	Add DSL functions and related circuits, So tested Radiated Emission-Below 1GHz and Conducted Emission.

## 1. General Information

### 1.1 Applicant

**Heights Telecom T LTD**

Ha-Sakhlav 6, Irus, 7680900, Israel

### 1.2 Manufacturer

**Heights Telecom T LTD**

Ha-Sakhlav 6, Irus, 7680900, Israel

### 1.3 Basic Description of Equipment Under Test

Product No.	POC240329016-S001	
Equipment Name	Wireless Home Gateway	
Model Name	HT-178AX	
Trade Mark	HEIGHTS	
Power Supply	DC 12V from adapter	
Adapter Information	Model: SOY-1200200US-063 Input: 100-240V~ 50/60Hz 0.75A Max Output: DC 12V2.0A, 24W Manufacturer: Shenzhen SOY Technology Co., Ltd.	
Operate temperature	0°C-45°C	
EUT Stage	<input type="radio"/> Product Unit <input checked="" type="radio"/> Final-Sample	
Operating Band and Conducted Output Power (Max power)	2400MHz ~ 2483.5MHz	• IEEE 802.11ax40: 22.60dBm
Product Type	IEEE 802.11b: WLAN (SISO) IEEE 802.11g: WLAN(SISO) IEEE 802.11n: WLAN(MIMO) IEEE 802.11ax: WLAN (MIMO)	
Nominal Bandwidth	20MHz / 40MHz	
Modulation	IEEE 802.11b: DSSS (DBPSK / DQPSK / CCK) IEEE 802.11g: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ax: OFDMA (BPSK / QPSK / 16QAM / 64QAM)	
Data Rate (Mbps)	IEEE 802.11b mode: 1/2/5.5/11 IEEE 802.11g mode: 6/9/12/18/24/36/48/54 IEEE 802.11n mode: up to 300 IEEE 802.11ax mode: up to 573.5	
Antenna gain	Ant1: 3.24dBi, Ant2: 3.27dBi	
Antenna type	PCB Antenna	

Eleven channels are provided for 802.11b, 802.11g, 802.11n (20MHz), 802.11ax (20MHz):

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400MHz ~ 2483.5 MHz	01	2412MHz	07	2442MHz
	02	2417MHz	08	2447MHz
	03	2422MHz	09	2452MHz
	04	2427MHz	10	2457MHz
	05	2432MHz	11	2462MHz
	06	2437MHz	/	/

Seven channels are provided for 802.11n (40MHz), 802.11ax (40MHz):

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400MHz ~ 2483.5 MHz	03	2422 MHz	07	2442MHz
	04	2427MHz	08	2447MHz
	05	2432MHz	09	2452MHz
	06	2437MHz	/	/

Note: For 802.11ax mode only support full RU mode.

## 1.4 Transmit Operating Mode

Transmit Operating Mode					Transmit Multiple Antennas						
<input checked="" type="radio"/>	Operating mode 1 (single antenna)					<input checked="" type="radio"/>	1TX				
<input type="radio"/>	Operating mode 2 (multiple antenna, no beam forming)					<input type="radio"/>	2TX	<input type="radio"/>	3TX	<input type="radio"/>	4TX
<input checked="" type="radio"/>	Operating mode 3 (multiple antenna, with beam forming)					<input checked="" type="radio"/>	2TX	<input type="radio"/>	3TX	<input type="radio"/>	4TX
<input checked="" type="radio"/>	802.11b	Operating mode	<input checked="" type="radio"/>	1TX	<input type="radio"/>	2TX	<input type="radio"/>	3TX			
<input checked="" type="radio"/>	802.11g	Operating mode	<input checked="" type="radio"/>	1TX	<input type="radio"/>	2TX	<input type="radio"/>	3TX			
<input checked="" type="radio"/>	802.11n(20MHz)	Operating mode	<input type="radio"/>	1TX	<input checked="" type="radio"/>	2TX	<input type="radio"/>	3TX			
<input checked="" type="radio"/>	802.11n(40MHz)	Operating mode	<input type="radio"/>	1TX	<input checked="" type="radio"/>	2TX	<input type="radio"/>	3TX			
<input checked="" type="radio"/>	802.11ax(20MHz)	Operating mode	<input type="radio"/>	1TX	<input checked="" type="radio"/>	2TX	<input type="radio"/>	3TX			
<input checked="" type="radio"/>	802.11ax(40MHz)	Operating mode	<input type="radio"/>	1TX	<input checked="" type="radio"/>	2TX	<input type="radio"/>	3TX			

## 2. Summary of Test Results

### 2.1 Summary of Test Items

47 CFR FCC Part 15, Subpart C (Section 15.247)			
Test item	FCC Clause	Results	Remarks
AC Power Conducted Emission	15.207	Pass	Meet the requirement of the limit
Radiated Emission and Band Edge Measurement	15.205/15.209 /15.247(d)	Pass Note3	Meet the requirement of the limit
Spurious Emission at Antenna Port	15.247(d)	Note2	Meet the requirement of the limit
6dB Bandwidth	15.247(a)(2)	Note2	Meet the requirement of the limit
Maximum Conducted Power	15.247(b)	Note2	Meet the requirement of the limit
Power Spectral Density	15.247(e)	Note2	Meet the requirement of the limit
Antenna Requirements	15.203	Compliance	Note1

Note: 1. The EUT has 2 PCB antennas arrangement which was permanently attached.  
 2. For test data, please refer to the report RF230808001-01-001; FCC ID: 2BCFYHT-178AX.  
 3. For Above 1GHz test data, please refer to the report RF230808001-01-001;  
 FCC ID: 2BCFYHT-178AX.

### 2.2 Application of Standard

47 CFR FCC Part 15, Subpart C (Section 15.247)

KDB 558074 D01 15.247 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10:2013

## 2.3 Test Instruments

Radiated Emissions						
No.	Equipment	Manufacturer	Type No.	Serial No.	Cal. date (yyyy/mm/dd)	Cal. Due date (yyyy/mm/dd)
1	Test receiver	Rohde&Schwarz	ESU	100184	2023/5/3	2024/5/2
2	MXA Signal Analyzer	Keysight	N9010A	MY514401 58	2023/4/22	2024/4/21
3	Log periodic antenna	Schwarzbeck	VULB 9168	1151	2023/5/4	2024/5/3
4	Low frequency amplifier	/	LNA 0920N	2014	2023/5/3	2024/5/2
5	High frequency amplifier	Schwarzbeck	BBV 9718	284	2023/5/3	2024/5/2
6	Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-127 3	2023/5/4	2024/5/3
7	Temp&Humidity Recorder	Meideshi	JR900	/	2023/5/3	2024/5/2
8	Horn Antenna	SCHWARZBECK	BBHA 9170	9170#685	2023/7/16	2024/7/15
9	Loop Antenna	SCHWARZBECK	FMZB1519 B	00029	2023/7/16	2024/7/15
10	Broadband preamplifier	Schwarzbeck	BBV9721	9721-019	2023/5/3	2024/5/2
13	Test software	Farad Technology Co., Ltd	EZ-EMC Ver.TW-03A2			
Conducted Emission						
1	LISN	Rohde&Schwarz	ENV216	100075	2023/5/3	2024/5/2
2	ISN	Schwarzbeck	CATE 5 8158	#171	2023/5/3	2024/5/2
3	ISN	Schwarzbeck	CAT 3 8158	00187	2024/3/31	2025/3/30
4	Test receiver	Rohde&Schwarz	ESCI	100718	2023/5/3	2024/5/2
5	Pulse limiter	Rohde&Schwarz	ESH3-Z2	102299	2023/5/3	2024/5/2
6	Temp&Humidity Recorder	Meideshi	JR900	/	2023/5/3	2024/5/2
7	Test software	Farad Technology Co., Ltd	EZ-EMC Ver.TW-03A2			
RF Conducted Emission						
1	MXA Signal Analyzer	Keysight	N9021B	MY600801 69	2023/4/23	2024/4/22
2	RF Control Unit	dsusoft	JS0806-2	21G806044 9	2023/4/23	2024/4/22
3	power supply unit	dsusoft	JS0806-4A DC	N/A	2023/4/23	2024/4/22
4	VXG Signal Generator	Keysight	M9384B	MY612707 87	2023/4/23	2024/4/22
5	EXG Analog Signal Generator	Keysight	N5173B	MY591012 82	2023/4/23	2024/4/22
6	Wideband Radio Communication Tester	Rohde&Schwarz	CMW500	1201.0002 K50-11606 4-Dt	2023/4/23	2024/4/22
7	Test software	dsusoft	JS1120-3 Ver.3.2.22.0			

## 2.4 Test Mode

Please refer to report RF230808001-01-001 details of test Mode.

## 2.5 Test Condition

Applicable to	Environmental conditions	Input Power	Tested by
AC Power Conducted Emission	23.7°C, 50% RH	AC 120V/60Hz	Freedom Zhuo
Radiated Emission below 1GHz	23.2°C, 52% RH	AC 120V/60Hz	Freedom Zhuo

Note: Adapter supply voltage AC 120V/60Hz.

The applicant declare the operating environment of EUT as below:

Normal conditions: 12V DC, 0~45°C

## 2.6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Uncertainty	
Parameter	Uncertainty
Occupied Channel Bandwidth	±143.88kHz
Power Spectral Density	±0.743dB
Conducted Spurious Emission	±1.328dB
RF power conducted	±0.384dB
Conducted emission(9kHz~30MHz) AC main	±2.72dB
Radiated emission(9kHz~30MHz)	±2.66dB
Radiated emission (30MHz~1GHz)	±4.62dB
Radiated emission (1GHz~18GHz)	±4.86dB
Radiated emission (18GHz~40GHz)	±3.80dB

## 2.7 Test Location

Company:	Shenzhen Haiyun Standard Technical CO., Ltd.
Address:	No. 110-113, 115, 116, Block B, Jinyuan Business Building, Bao'an District, Shenzhen, China
CNAS Registration Number:	CNAS L18252
CAB identifier	CN0145
A2LA Certificate Number	6823.01
Telephone:	0755-26024411

## 2.8 Description of Support Units

None

## 2.9 Deviation from Standards

None

### 3. Test Procedure And Results

#### 3.1 AC Power Line Conducted Emission

##### 3.1.1 Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB( $\mu$ V)	Average Level dB( $\mu$ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. \* Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

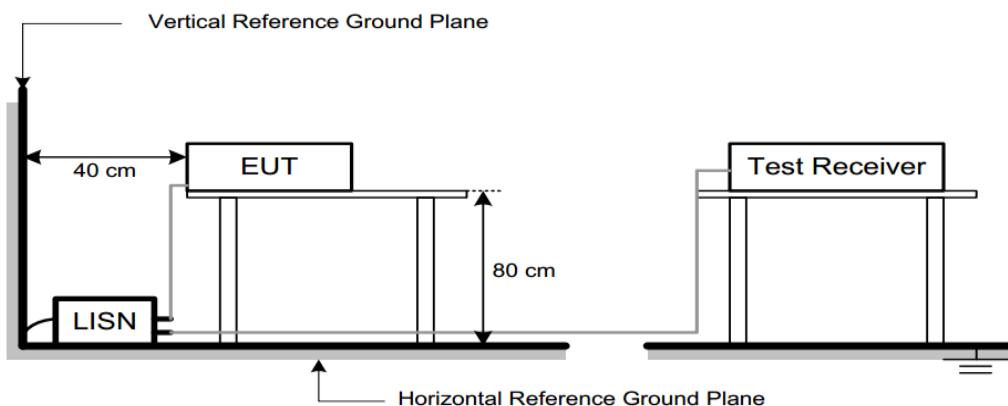
##### 3.1.2 Test Procedure

Test Method	
● Conducted Measurement	<input checked="" type="radio"/> Radiated Measurement
Test Channels	
○ Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
● Normal	<input type="radio"/> Normal and Extreme

Note: ● : Test    ○ : No Test

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

##### 3.1.3 Test Setup

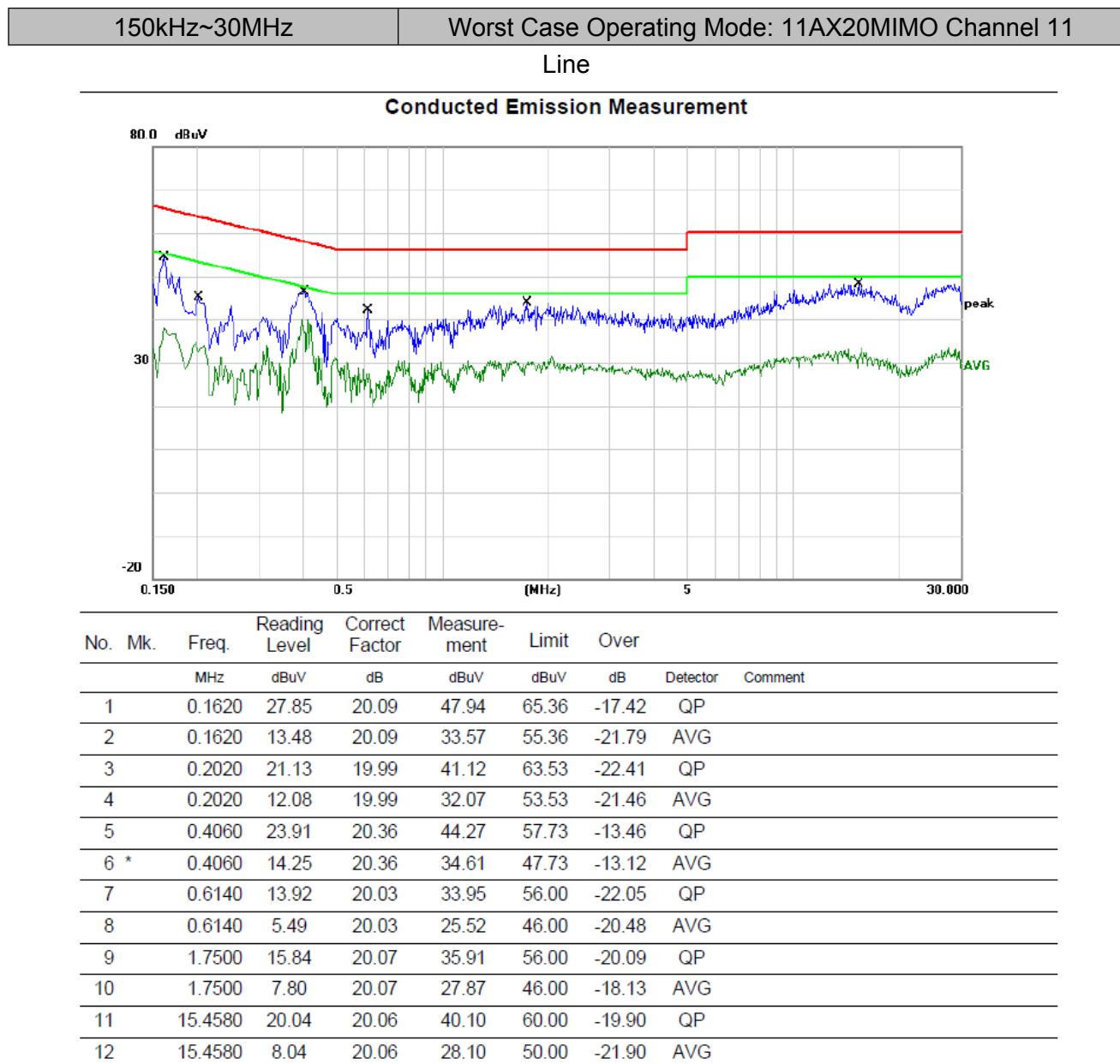


### 3.1.4 Test Result

**Note:**

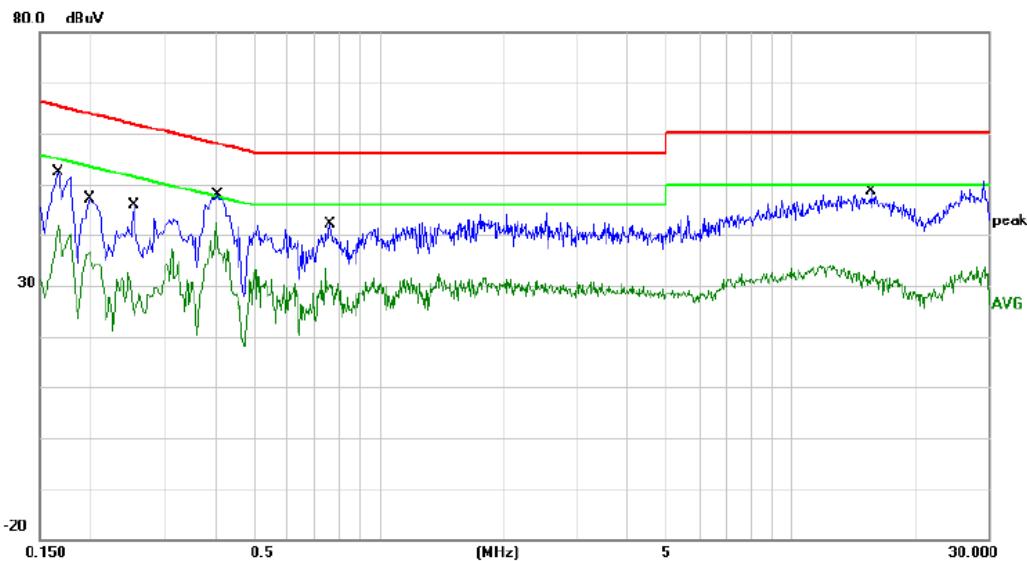
1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Measurement = Reading + Correct Factor.
3. Over = Measurement – Limit

We only recorded the data of the worst mode. Please see the following:





Conducted Emission Measurement



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV	dB			
1		0.1660	28.90	20.26	49.16	65.16	-16.00	QP	
2		0.1660	17.43	20.26	37.69	55.16	-17.47	AVG	
3		0.2007	22.60	20.35	42.95	63.58	-20.63	QP	
4		0.2007	12.70	20.35	33.05	53.58	-20.53	AVG	
5		0.2540	15.59	20.05	35.64	61.63	-25.99	QP	
6		0.2540	3.66	20.05	23.71	51.63	-27.92	AVG	
7		0.4020	25.47	20.24	45.71	57.81	-12.10	QP	
8 *		0.4020	15.77	20.24	36.01	47.81	-11.80	AVG	
9		0.7620	17.01	20.06	37.07	56.00	-18.93	QP	
10		0.7620	8.95	20.06	29.01	46.00	-16.99	AVG	
11		15.6780	19.98	20.22	40.20	60.00	-19.80	QP	
12		15.6780	7.67	20.22	27.89	50.00	-22.11	AVG	

## 3.2 Radiated Emission and Band Edge

### 3.2.1 Limit

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency (MHz)	Distance Meters(m)	Field Strength Limit	
		μV/m	dB(μV)/m
0.009 – 0.49	300	2400/F(kHz)	-
0.490 – 1.705	30	24000/F(kHz)	-
1.705 – 30	30	30	-
30~88	3	100	40.0
88~216	3	150	43.5
216~960	3	200	46.0
960~1000	3	500	54.0
Above 1000	3	74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Note: (1) Emission level  $dB\mu V = 20 \log Emission\ level\ \mu V/m$

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

### 3.2.2 Test Procedure

Test Method	
<input type="radio"/> Conducted Measurement	<input checked="" type="radio"/> Radiated Measurement
Test Channels	
<input checked="" type="radio"/> Lowest, Middle and Highest Channel	<input type="radio"/> Lowest and Highest Channel
Environmental conditions	
<input checked="" type="radio"/> Normal	<input type="radio"/> Normal and Extreme

Note:  : Test    : No Test

- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- The measuring distance of 3 m or 1.5m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of

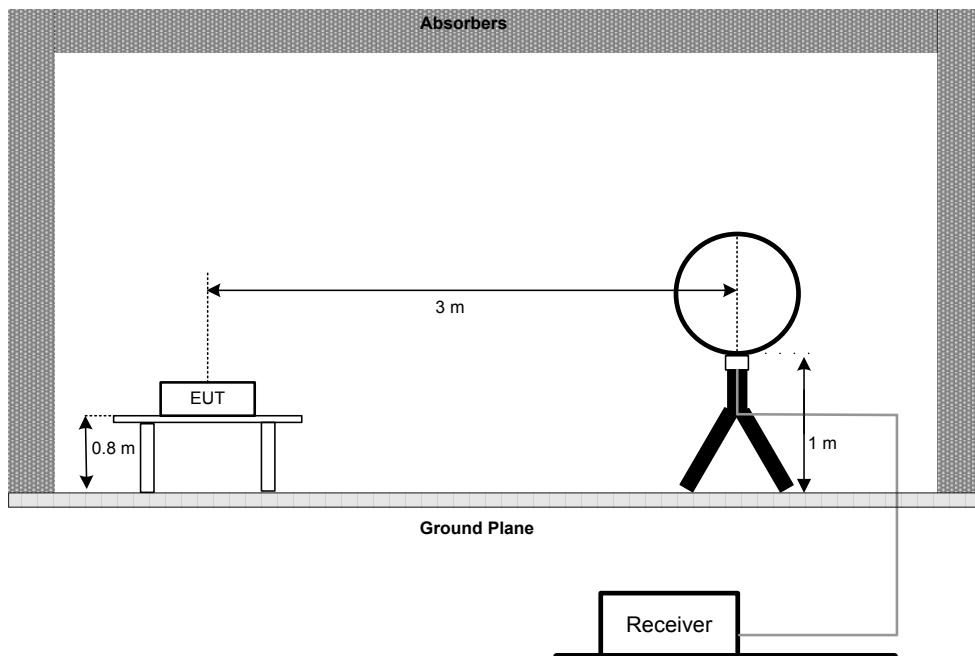


the antenna are set to make the measurement.

- d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- e) The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- f) The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g) All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- h) All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- i) For the actual test configuration, please refer to the related Item -EUT Test Photos.

### 3.2.3 Test Setup

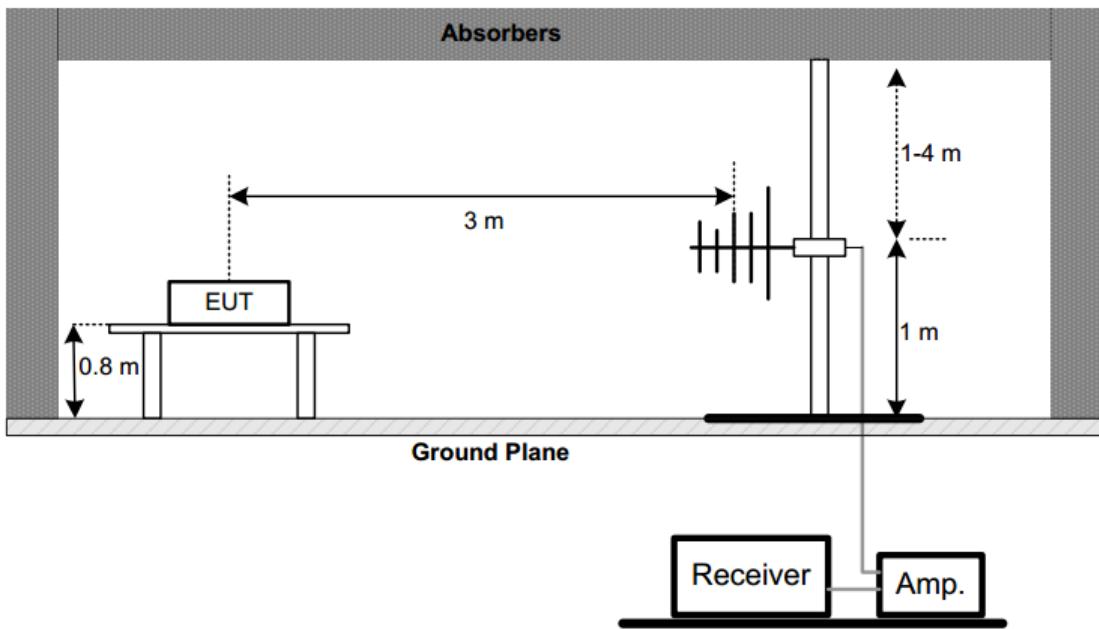
#### (A) Radiated Emission Test Set-Up Frequency Below 30MHz



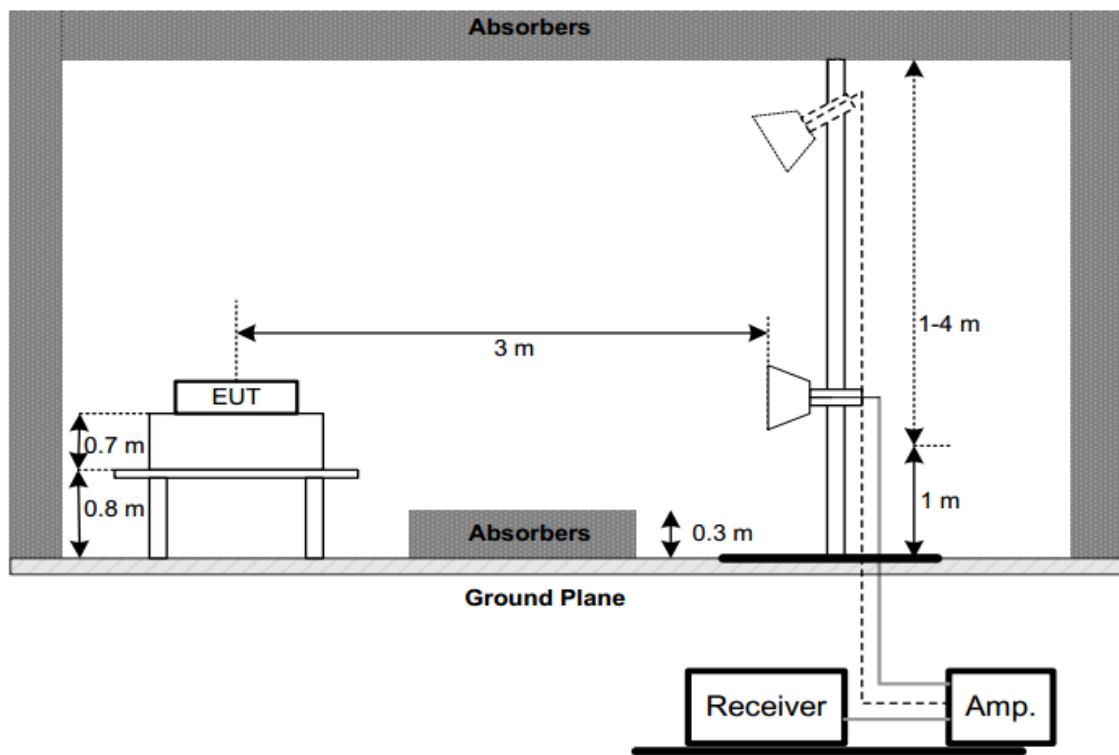


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HAIYUN

(B) Radiated Emission Test Set-Up Frequency 30 MHz-1000 MHz



(C) Radiated Emission Test Set-Up Frequency Above 1 GHz





### 3.2.4 Test Result

#### 1) Radiated emission: 9kHz-30MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not recorded in this report.

#### 2) Radiated emission: 30MHz-1G

##### Note:

1. Measurement = Reading + Correct Factor.
2. Over = Measurement – Limit

We only recorded the data of the worst mode. Please see the following:



Below 1G (30MHz~1GHz)

Worst Case Operating Mode: 11AX20MIMO Channel 11

VERTICAL

Radiated Emission



No.	Mk.	Reading Level	Correct Factor	Measure- ment	Limit	Over	Antenna Height	Table Degree	Comment	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1 !	31.6201	47.47	-10.90	36.57	40.00	-3.43	QP			
2 !	50.4090	45.49	-9.37	36.12	40.00	-3.88	QP			
3 !	74.1350	47.37	-12.47	34.90	40.00	-5.10	peak			
4	157.0072	39.48	-8.03	31.45	43.50	-12.05	peak			
5 !	413.2706	45.89	-5.54	40.35	46.00	-5.65	peak			
6 *	744.8660	41.78	1.12	42.90	46.00	-3.10	peak			

HORIZONTAL

Radiated Emission



No.	Mk.	Reading Level	Correct Factor	Measure- ment	Limit	Over	Antenna Height	Table Degree	Comment	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	51.6613	38.88	-9.23	29.65	40.00	-10.35	peak			
2	94.4282	44.51	-13.39	31.12	43.50	-12.38	peak			
3	179.3863	41.67	-10.53	31.14	43.50	-12.36	peak			
4	260.1444	44.33	-10.33	34.00	46.00	-12.00	peak			
5 *	413.2706	46.00	-5.54	40.46	46.00	-5.54	peak			
6 !	909.6666	37.17	3.27	40.44	46.00	-5.56	peak			

## Statement

1. The report is invalid without the official seal or special seal of Shenzhen Haiyun Standard Technology Co., Ltd. (hereinafter referred to as the unit).
2. The report is invalid without the signature of the approver.
3. The report is invalid if altered arbitrarily.
4. The report shall not be partially copied without the written approval of the unit.
5. The reported test results are only valid for the tested samples.
6. If there is any objection to the test report, it shall be submitted to the test unit within 15 days from the date of receiving the report, and the overdue shall not be accepted.

## Shenzhen Haiyun Standard Technology Co., Ltd.

Address: Room 110, 111, 112, 113, 115, 116, Block B, Jinyuan Business Building, No. 302, Xixiang Avenue, Labor Community, Xixiang Street, Baoan District, Shenzhen, China

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Email: [service@hy-lab.cn](mailto:service@hy-lab.cn)

## End of Test Report