FCC TEST REPORT

FCC ID: 2AYF3-BHP8000

On Behalf of

Xiamen Beca Energysaving Technology Co., Ltd

HEAT PUMP THERMOSTAT

Model No.: See model list on page 7

Prepared for	:	Xiamen Beca Energysaving Technology Co., Ltd
Address	:	Room 502, No.124, Hongtangtou 1st Road, Xike Town, Tongan District, Xiamen, China

Prepared By	:	Shenzhen Alpha Product Testing Co., Ltd.
Address	:	Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

Report Number	:	A2011063-C01-R01
Date of Receipt	:	December 4, 2020
Date of Test	:	December 10, 2020-January 11, 2021
Date of Report	:	January 11, 2021
Version Number	:	V0

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TEST REPORT DECLARATION

Applicant	:	Xiamen Beca Energysaving Technology Co., Ltd
Address	:	Room 502, No.124, Hongtangtou 1st Road, Xike Town, Tongan District, Xiamen, China
Manufacturer	:	Xiamen Beca Energysaving Technology Co., Ltd
Address	:	Room 502, No.124, Hongtangtou 1st Road, Xike Town, Tongan District, Xiamen, China
EUT Description	:	HEAT PUMP THERMOSTAT
		(A) Model No. : See model list on page 7
		(B) Trademark : /

Measurement Standard Used:

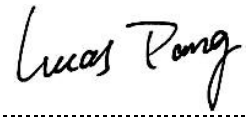
FCC Rules and Regulations Part 15 Subpart C Section 15.247

RSS-247 Issue 2, RSS-Gen Issue 5, ANSI C63.10:2013, CISPR 16-1-4

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....…..:	Lucas Pang Project Engineer	
Approved by (name + signature)…....:	Simple Guan Project Manager	
Date of issue…… ……..:	January 11, 2021	

Revision History

Revision	Issue Date	Revisions	Revised By
V0	January 11, 2021	Initial released Issue	Lucas Pang

1. SUMMARY OF STANDARDS AND RESULTS

1.1.Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Standards Paragraph	Result
Conducted Emission	FCC Part 15: 15.207 RSS-GEN(8.8) ANSI C63.10	P
6dB Bandwidth	FCC PART 15:15.247(a)(2) RSS-247(5.2 a) ANSI C63.10	P
Output Power	FCC Part 15: 15.247(b)(3) RSS-247(5.4 d) ANSI C63.10	P
Radiated Spurious Emission	FCC Part 15: 15.209 FCC Part 15: 15.247(d) RSS-Gen(8.9), RSS-247(5.5) ANSI C63.10	P
Conducted Spurious & Band Edge Emission	FCC Part 15: 15.247(d) RSS-Gen(8.9), RSS-247(5.5) ANSI C63.10	P
Power Spectral Density	FCC PART 15:15.247(e) RSS-247(5.2 b) ANSI C63.10	P
Radiated Band Edge Emission	FCC Part 15: 15.247(d) RSS-GEN(6.13) ANSI C63.10	P
Frequency stability	RSS-GEN(6.11)	N/A
Antenna Requirement	FCC Part 15: 15.203 RSS-GEN(6.8)	P
Note:	1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.	

2. GENERAL INFORMATION

2.1.Description of Device (EUT)

EUT Name	:	HEAT PUMP THERMOSTAT
Trademark	:	/
Model No.	:	BHP-8000WIFI, BHP-1000, BHP-1000WIFI, BHP-2000, BHP-2000WIFI, BHP-3000, BHP-3000WIFI, BHP-4000, BHP-4000WIFI, BHP-5000, BHP-5000WIFI, BHP-6000, BHP-6000WIFI, BHP-7000, BHP-7000WIFI, BHP-8000, BHP-9000, BHP-9000WIFI, BHP-001, BHP-001WIFI, BHP-002, BHP-002WIFI, BHP-003, BHP-003WIFI, BHP-004, BHP-004WIFI, BHP-005, BHP-005WIFI, BHP-006, BHP-006WIFI, BHP-007, BHP-007WIFI, BHP-008, BHP-009, BHP-009WIFI, BHP-1001, BHP-1001WIFI, BHP-1002, BHP-1002WIFI, BHP-1003, BHP-1003WIFI, BHP-1004, BHP-1004WIFI, BHP-1005, BHP-1005WIFI, BHP-1006, BHP-1006WIFI, BHP-1007, BHP-1007WIFI, BHP-1008, BHP-1008WIFI, BHP-1009, BHP-1009WIFI, BAC-1000, BAC-2000, BAC-3000, BAC-4000, BAC-5000, BAC-6000, BAC-7000, BAC-8000, BAC-9000, BAC-001, BAC-002, BAC-003, BAC-004, BAC-005, BAC-006, BAC-007, BAC-008, BAC-009
DIFF.	:	There is no difference except the name of the model. All tests are made with the BHP-8000WIFI model.
Power supply	:	AC 24V/60Hz
2.4G WIFI	:	
Operation frequency	:	2412MHz-2462MHz for IEEE 802.11 b, g. n/HT20
Channel No.	:	802.11b/802.11g /802.11n(HT20): 11CH
Modulation type	:	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)
Antenna Type	:	Internal antenna, Maximum Gain is 2dBi
Software version	:	V1.0
Hardware version	:	V1.0
Intend use environment	:	Residential, commercial and light industrial environment
Note	:	/

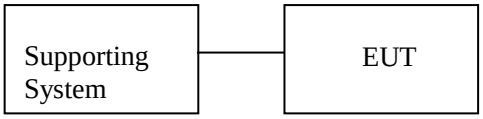
2.2.Accessories of Device (EUT)

Accessories 1	:	/
Manufacturer	:	/
Model	:	/
Input	:	/
Output	:	/

2.3.Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1	/	/	/	/	/

2.4.Block Diagram of connection between EUT and simulators



2.5.Test Mode Description

Duty cycle :100%Keeping TX			
Mode	**data rate (Mbps)(see Note)**	**Channel**	**Frequency (MHz)**
IEEE 802.11b	1	Low :CH1	2412
	1	Middle: CH6	2437
	1	High: CH11	2462
IEEE 802.11g	6	Low :CH1	2412
	6	Middle: CH6	2437
	6	High: CH11	2462
IEEE 802.11 n/HT20	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11 n/HT40	13	Low :CH3	/
	13	Middle: CH6	/
	13	High: CH9	/
Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.			

Channel list:					
For IEEE 802.11b, g, n/HT20					
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
CH1	2412	CH5	2432	CH9	2452
CH2	2417	CH6	2437	CH10	2457
CH3	2422	CH7	2442	CH11	2462
CH4	2427	CH8	2447		
For IEEE 802.11 n/HT40 with 2.4G					
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
CH1	/	CH5	/		
CH2	/	CH6	/		
CH3	/	CH7	/		
CH4	/				

Setting output power (Max)			
802.11b	802.11g	802.11n(HT20)	**802.11n(HT40)**
8±2dBm	8±2dBm	8±2dBm	/

2.6.Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

2.7.Test Facility

Shenzhen Alpha Product Testing Co., Ltd
Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293961
Designation Number: CN1236

July 15, 2019 Certificated by IC
Registration Number: 12135A

2.8.Measurement Uncertainty

(95% confidence levels, k=2)

Item	**Uncertainty**
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.13dB(Polarize: H)
	4.16dB(Polarize: V)
Uncertainty for radio frequency	5.4×10-8
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9.Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2019.09.06	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	102137	2020.09.02	1Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2020.09.02	1Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2020.09.02	1Year
Receiver	R&S	ESCI	101165	2020.09.02	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2020.04.12	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2019.09.07	2Year
Cable	Resenberger	N/A	No.1	2020.09.02	1Year
Cable	Resenberger	N/A	No.2	2020.09.02	1Year
Cable	Resenberger	N/A	No.3	2020.09.02	1Year
Pre-amplifier	HP	HP8347A	2834A00455	2020.09.02	1Year
Pre-amplifier	Agilent	8449B	3008A02664	2020.09.02	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2020.09.02	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2020.09.02	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2020.09.02	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	00946	2019.09.07	2 Year
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2020.09.02	1 Year
Power Meter	Agilent	E9300A	MY41496625	2020.09.02	1 Year
Temp. &Humid. Chamber	Weihuang	WHTH-1000-40-880	100631	2020.09.02	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2020.09.02	1 Year

3. SPURIOUS EMISSION

3.1.Test Limits

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

RSS-GEN Restricted frequency band

Table 7 – Restricted frequency bandsNote 1

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12

6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 – 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

15.209 Limit

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
0.009-0.490	300	2400/F(KHz)	/
0.490-1.705	30	24000/F(KHz)	/
1.705-30	30	30	29.5
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: The peak limit is 20 dB higher than the average limit			
Note 2: Peak limit applies (AVG limit + 20 dB) as well as RSS-247 Section 5.5			

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field strength (μV/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (μA/m)	Measurement distance (m)
9 - 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

3.2.Test Procedure

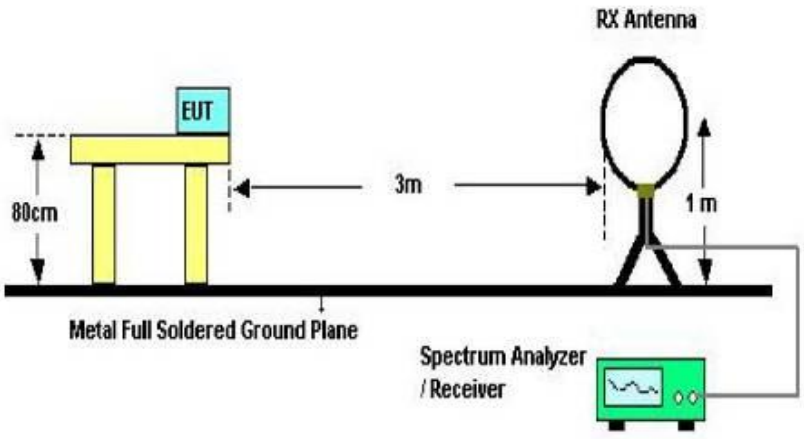
The measuring distance of 3m shall be used for measurements at frequency up to 1GH and above 1GHz. The EUT was placed on a rotating 0.8 m high above ground for below 1GHz and 1.5m high for above1GHz testing, the table was rotated 360 degrees to determine the position of the highest radiation

The Test antenna shall vary between 1m and 4m, both Horizontal and Vertical antenna are set of make measurement.

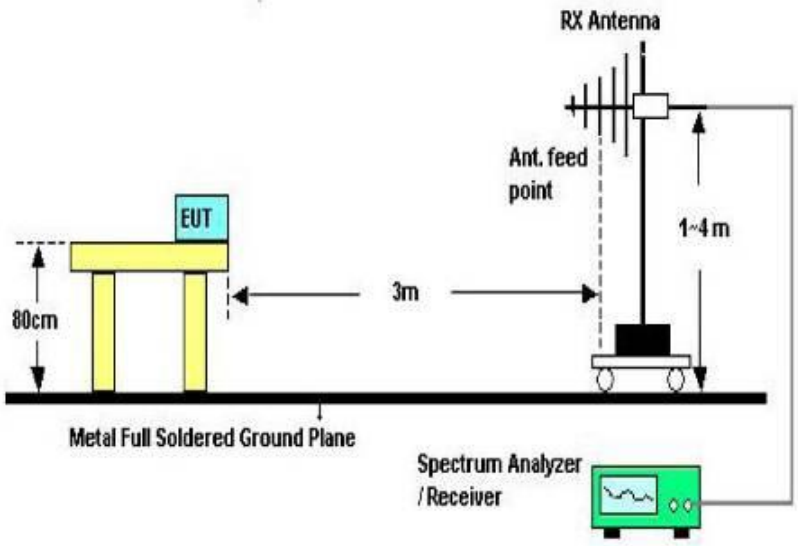
The initial step in collecting radiated emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Quasi Peak Detector mode premeasured

If Peak value comply with QP limit below 1GHz, the EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz. For the actual test configuration, please see the test setup photo.

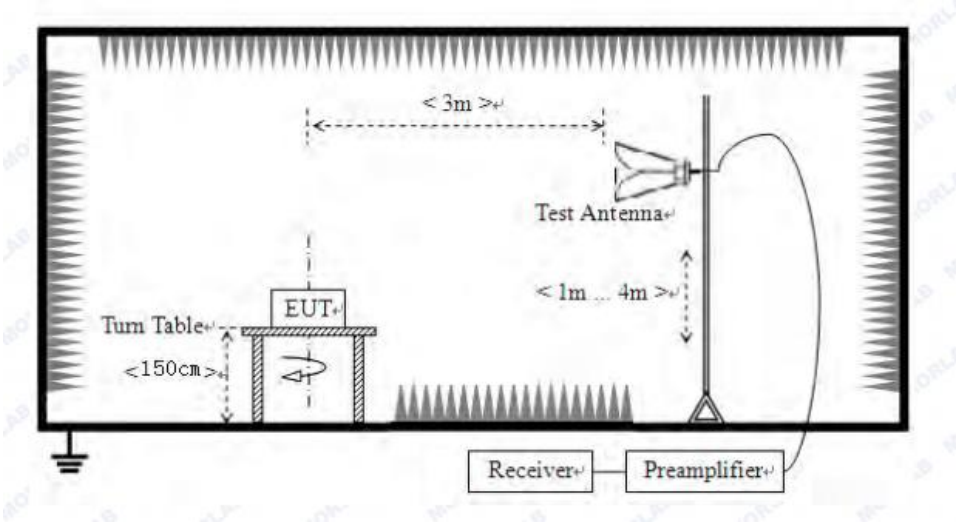
3.3.Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

3.4.Test Results

Test Condition
Continual Transmitting in maximum power.

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHZ~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

We have scanned the EUT from 9kHz up to the 10th harmonic of the fundamental.

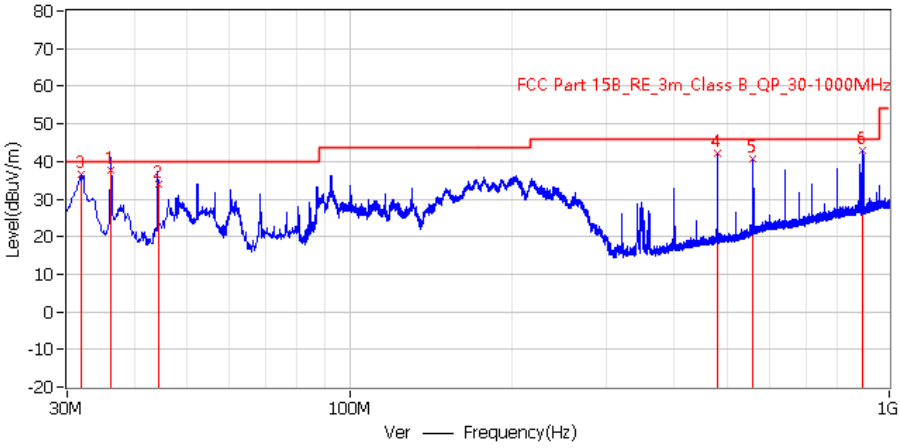
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: 1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

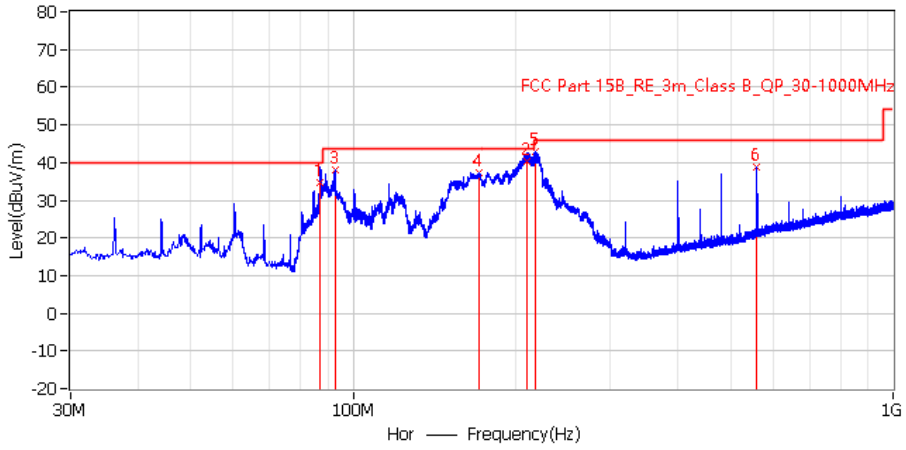
2.Only show the test data of the worst Channel in this report.

From 30MHz to 1000MHz: Conclusion: PASS			
EUT Description	HEAT PUMP THERMOSTAT	**Model No.**	BHP-8000WIFI
Temperature	24℃	**Humidity**	56%
Pol	Vertical	**Test mode**	802.11b 2412MHz
Test Voltage	AC 24V/60Hz		



No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Factor dB/m	Detector	Polar	Height cm	Angle deg
1	36.217 MHz	40.0	37.8	-2.2	16.1	QP	Ver	100.0	54.0
2	44.259 MHz	40.0	34.0	-6.0	16.4	QP	Ver	100.0	59.0
3*	31.819 MHz	40.0	36.5	-3.5	15.7	PK	Ver	100.0	234.0
4*	479.959 MHz	46.0	42.3	-3.7	18.9	PK	Ver	100.0	111.0
5*	559.984 MHz	46.0	40.7	-5.3	20.9	PK	Ver	100.0	28.0
6*	889.663 MHz	46.0	43.0	-3.0	26.1	PK	Ver	100.0	300.0

Pol	Horizontal



No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Factor dB/m	Detector	Polar	Height cm	Angle deg
1	86.986 MHz	40.0	34.8	-5.2	12.0	QP	Hor	200.0	41.0
2	209.519 MHz	43.5	40.2	-3.3	12.9	QP	Hor	200.0	15.0
3*	92.565 MHz	43.5	38.0	-5.5	12.2	PK	Hor	200.0	252.0
4*	170.650 MHz	43.5	37.2	-6.3	16.2	PK	Hor	200.0	257.0
5*	217.331 MHz	46.0	43.0	-3.0	13.0	PK	Hor	200.0	153.0
6*	559.984 MHz	46.0	38.9	-7.1	20.9	PK	Hor	200.0	119.0

Remark: All modes have been tested, and only worst data was listed in this report.

From 1G-25GHz

Test Mode: IEEE 802.11b TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824	43.91	V	33.98	10.22	34.25	53.86	74	20.14	PK
4824	35.60	V	33.98	10.22	34.25	45.55	54	8.45	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	45.82	H	33.98	10.22	34.25	55.77	74	18.23	PK
4824	34.65	H	33.98	10.22	34.25	44.60	54	9.40	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX Mid									
4874	43.91	V	33.98	10.22	34.25	53.86	74	20.14	PK
4874	35.13	V	33.98	10.22	34.25	45.08	54	8.92	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	45.73	H	33.98	10.22	34.25	55.68	74	18.32	PK
4874	34.10	H	33.98	10.22	34.25	44.05	54	9.95	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11b TX High									
4924	43.28	V	33.98	10.22	34.25	53.23	74	20.77	PK
4924	34.79	V	33.98	10.22	34.25	44.74	54	9.26	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	45.69	H	33.98	10.22	34.25	55.64	74	18.36	PK
4924	34.41	H	33.98	10.22	34.25	44.36	54	9.64	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/

Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Test Mode: IEEE 802.11g TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824	43.79	V	33.98	10.22	34.25	53.74	74	20.26	PK
4824	34.72	V	33.98	10.22	34.25	44.67	54	9.33	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	45.61	H	33.98	10.22	34.25	55.56	74	18.44	PK
4824	34.83	H	33.98	10.22	34.25	44.78	54	9.22	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX Mid									
4874	43.48	V	33.98	10.22	34.25	53.43	74	20.57	PK
4874	35.05	V	33.98	10.22	34.25	45.00	54	9.00	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	45.50	H	33.98	10.22	34.25	55.45	74	18.55	PK
4874	34.53	H	33.98	10.22	34.25	44.48	54	9.52	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11g TX High									
4924	44.13	V	33.98	10.22	34.25	54.08	74	19.92	PK
4924	35.43	V	33.98	10.22	34.25	45.38	54	8.62	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	45.67	H	33.98	10.22	34.25	55.62	74	18.38	PK
4924	34.43	H	33.98	10.22	34.25	44.38	54	9.62	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/

Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Test Mode: IEEE 802.11n HT20 TX Low									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824	43.65	V	33.98	10.22	34.25	53.60	74	20.40	PK
4824	35.30	V	33.98	10.22	34.25	45.25	54	8.75	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
4824	45.99	H	33.98	10.22	34.25	55.94	74	18.06	PK
4824	34.78	H	33.98	10.22	34.25	44.73	54	9.27	AV
7236	/	/	/	/	/	/	/	/	/
9648	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n HT20 TX Mid									
4874	43.37	V	33.98	10.22	34.25	53.32	74	20.68	PK
4874	34.85	V	33.98	10.22	34.25	44.80	54	9.20	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
4874	45.47	H	33.98	10.22	34.25	55.42	74	18.58	PK
4874	34.48	H	33.98	10.22	34.25	44.43	54	9.57	AV
7311	/	/	/	/	/	/	/	/	/
9748	/	/	/	/	/	/	/	/	/
Test Mode: IEEE 802.11n HT20 TX High									
4924	44.16	V	33.98	10.22	34.25	54.11	74	19.89	PK
4924	35.23	V	33.98	10.22	34.25	45.18	54	8.82	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/
4924	45.32	H	33.98	10.22	34.25	55.27	74	18.73	PK
4924	34.34	H	33.98	10.22	34.25	44.29	54	9.71	AV
7386	/	/	/	/	/	/	/	/	/
9848	/	/	/	/	/	/	/	/	/

Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

4. POWER LINE CONDUCTED EMISSION

4.1. Test Limits

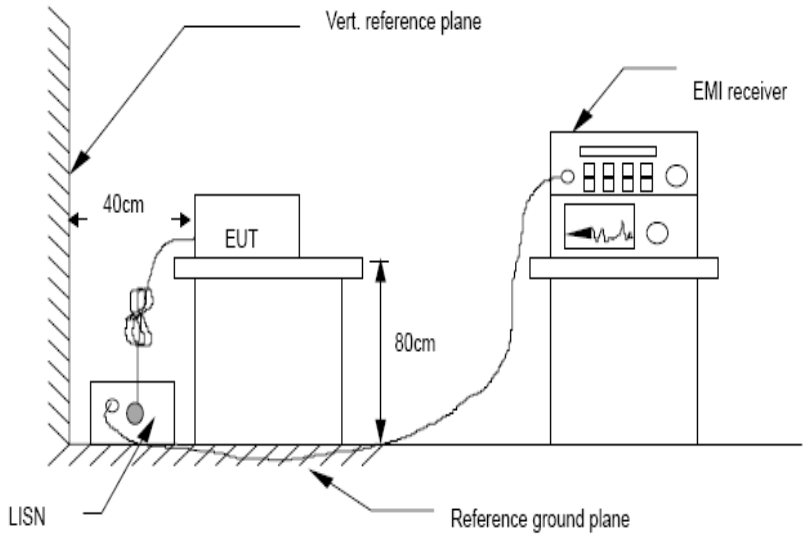
Frequency	Limits dB(μV)	
MHz	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.
3. The limit decreases in line with the logarithm of the frequency in the rang of 0.15 to 0.50 MHz.

4.2. Test Procedure

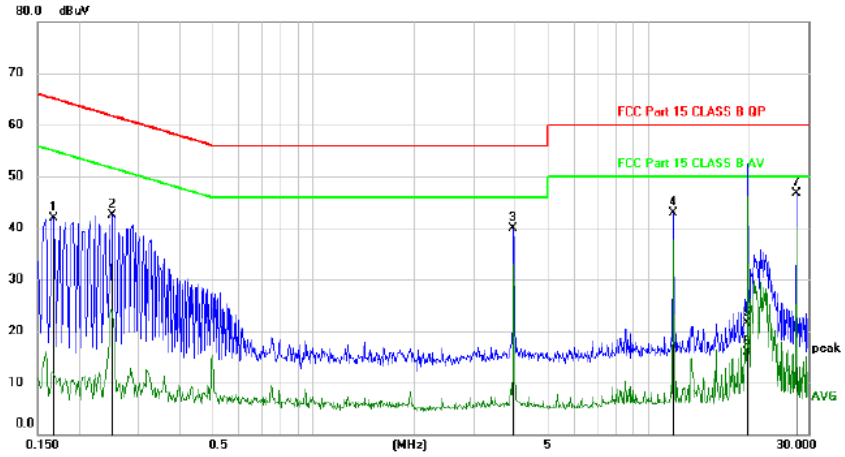
The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.
The bandwidth of test receiver is set at 9 kHz.

4.3.Test Setup



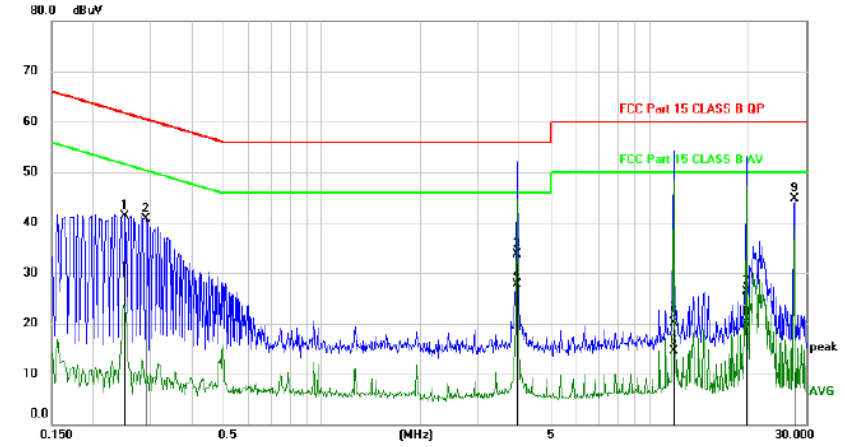
4.4.Test Results

EUT Description	HEAT PUMP THERMOSTAT	Model No.	BHP-8000WIFI
Temperature	24℃	Humidity	56%
Pol	Line	Test mode	802.11b 2412MHz
Test Voltage	AC 120V/60Hz		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1680	32.06	9.93	41.99	65.06	-23.07	peak	
2		0.2519	32.47	9.97	42.44	61.69	-19.25	peak	
3		3.9630	29.84	9.97	39.81	56.00	-16.19	peak	
4		11.8770	32.69	10.25	42.94	60.00	-17.06	peak	
5		19.7820	11.09	10.46	21.55	60.00	-38.45	QP	
6		19.7820	5.35	10.46	15.81	50.00	-34.19	AVG	
7	*	27.6780	36.13	10.56	46.69	60.00	-13.31	peak	

Pol	Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2519	31.39	9.97	41.36	61.69	-20.33	peak	
2		0.2910	30.85	9.93	40.78	60.50	-19.72	peak	
3		3.9420	23.67	9.96	33.63	56.00	-22.37	QP	
4		3.9420	17.81	9.96	27.77	46.00	-18.23	AVG	
5		11.8260	9.76	10.25	20.01	60.00	-39.99	QP	
6		11.8260	4.20	10.25	14.45	50.00	-35.55	AVG	
7		19.6980	15.78	10.46	26.24	60.00	-33.76	QP	
8		19.6980	9.71	10.46	20.17	50.00	-29.83	AVG	
9	*	27.5670	34.20	10.56	44.76	60.00	-15.24	peak	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

5. CONDUCTED MAXIMUM OUTPUT POWER

5.1.Test limits

Please refer RSS-247 & FCC PART 15: 15.247.

Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 1 W(30dBm)

5.2.Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

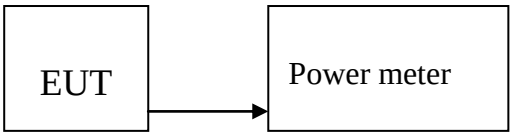
5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Connected the EUT's antenna port to peak power meter by 20dB attenuator.

5.2.3 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

5.3.Test Setup



5.4.Test Results

PASS

Detailed information please see the following page.

Mode	Frequency (MHz)	PK Output power(dBm)	Limit (dBm)	Result
IEEE 802.11 b	CH1: 2412	7.565	30	PASS
	CH6: 2437	6.743	30	PASS
	CH11: 2462	7.877	30	PASS
IEEE 802.11 g	CH1: 2412	8.556	30	PASS
	CH6: 2437	6.349	30	PASS
	CH11: 2462	**9.593**	30	PASS
IEEE 802.11 n/HT20	CH1: 2412	8.464	30	PASS
	CH6: 2437	6.089	30	PASS
	CH11: 2462	9.360	30	PASS
IEEE 802.11 n/HT40	CH3: 2422	/	30	/
	CH6: 2437	/	30	/
	CH9: 2452	/	30	/

6. PEAK POWER SPECTRAL DENSITY

6.1.Test limits

6.1.1 Please refer RSS-247 & FCC PART 15: 15.247.

6.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

6.2.Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

6.2.1 Place the EUT on the table and set it in transmitting mode.

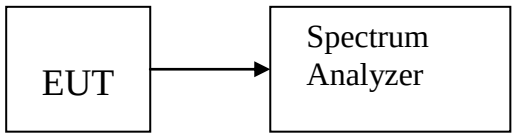
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as RBW = 3kHz(Set the RBW to: 3 kHz≤RBW≤100 kHz.), VBW = 10kHz(Set the VBW≥3×RBW), span≥1.5×DTS bandwidth., detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

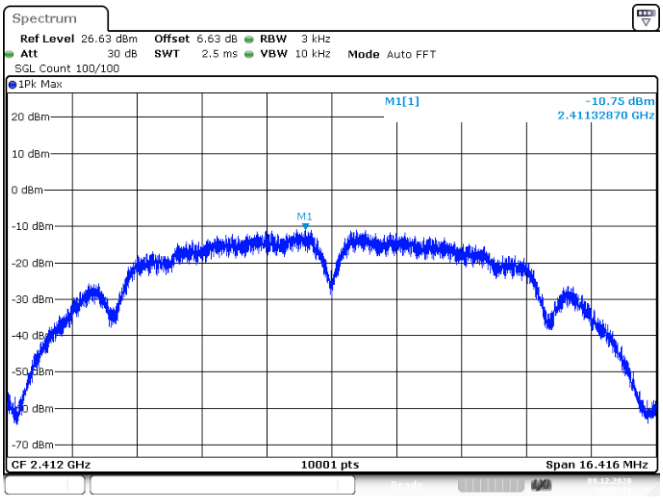
6.3.Test Setup



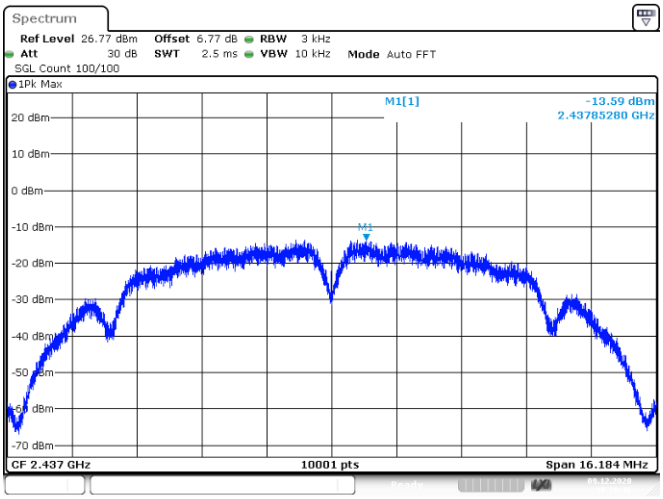
6.4.Test Results

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	802.11b	2412	Ant 1	-10.748	8	Pass
NVNT	802.11b	2437	Ant 1	-13.59	8	Pass
NVNT	802.11b	2462	Ant 1	-10.50	8	Pass
NVNT	802.11g	2412	Ant 1	-13.87	8	Pass
NVNT	802.11g	2437	Ant 1	-16.013	8	Pass
NVNT	802.11g	2462	Ant 1	-12.855	8	Pass
NVNT	802.11n(HT20)	2412	Ant 1	-14.127	8	Pass
NVNT	802.11n(HT20)	2437	Ant 1	-16.357	8	Pass
NVNT	802.11n(HT20)	2462	Ant 1	-13.212	8	Pass

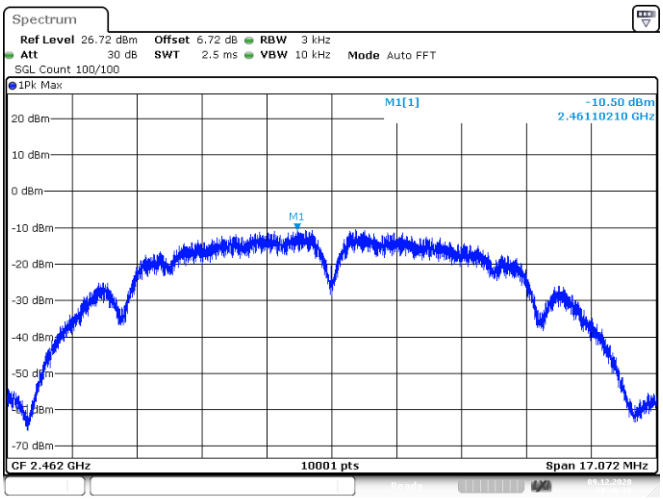
PSD NVNT 802.11b 2412MHz Ant1



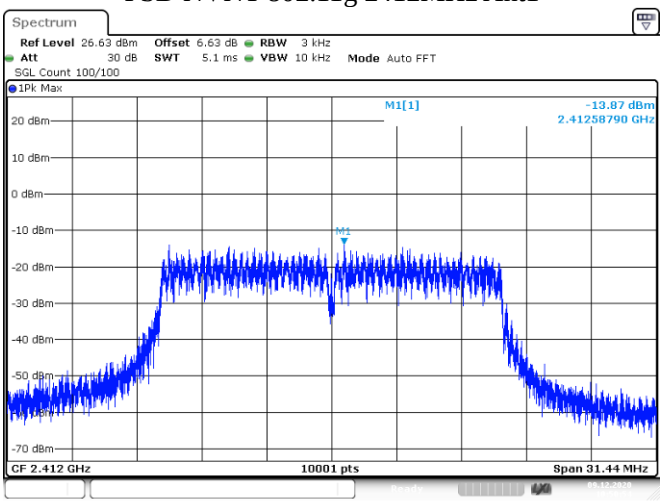
PSD NVNT 802.11b 2437MHz Ant1



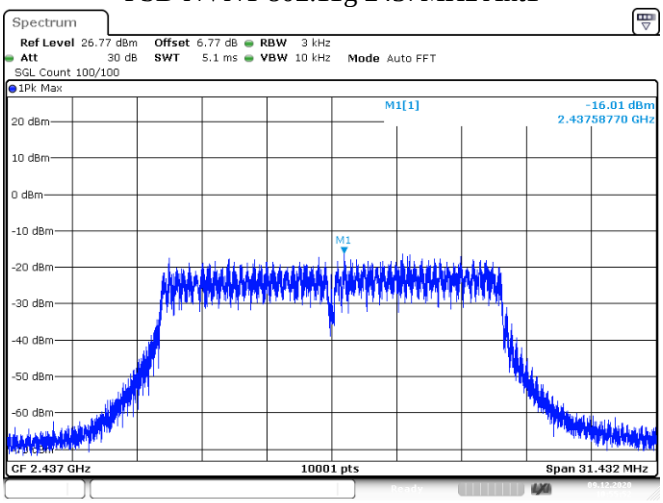
PSD NVNT 802.11b 2462MHz Ant1



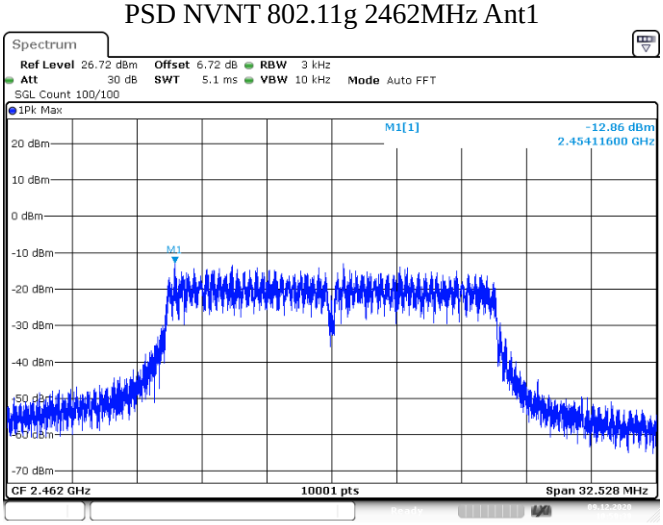
PSD NVNT 802.11g 2412MHz Ant1



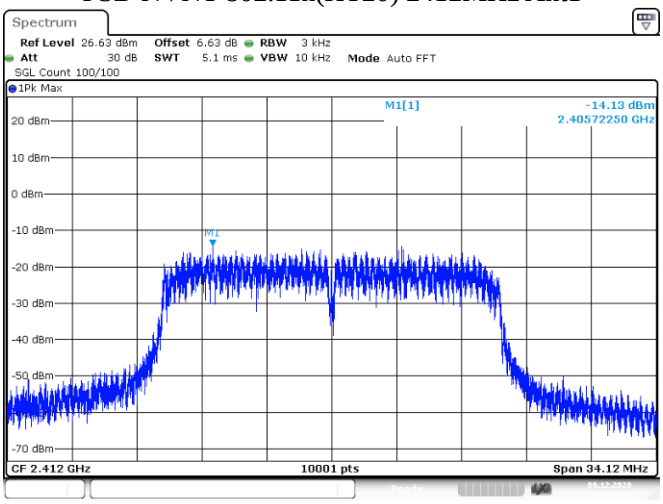
PSD NVNT 802.11g 2437MHz Ant1



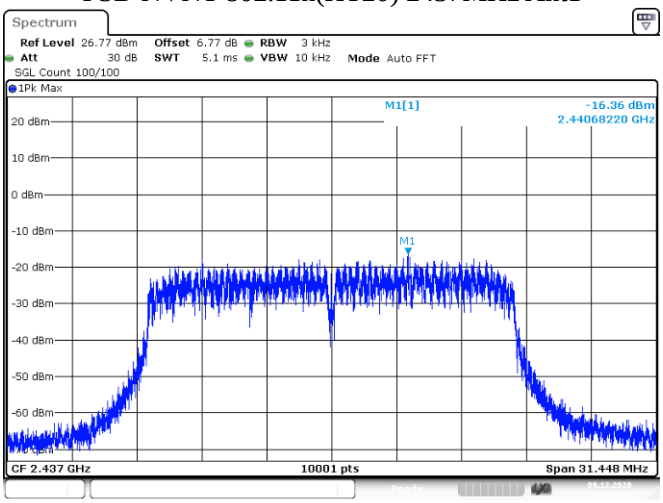
PSD NVNT 802.11g 2462MHz Ant1



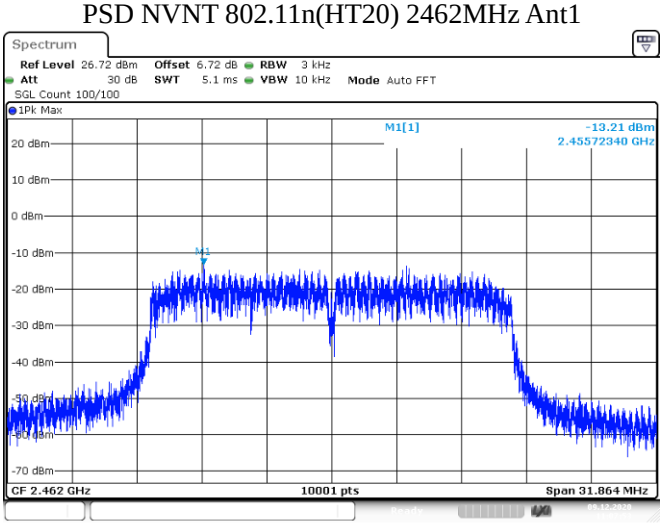
PSD NVNT 802.11n(HT20) 2412MHz Ant1



PSD NVNT 802.11n(HT20) 2437MHz Ant1



PSD NVNT 802.11n(HT20) 2462MHz Ant1



7. **BANDWIDTH**

7.1.Test limits

Please refer RSS-247 & FCC PART 15: 15.247
For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

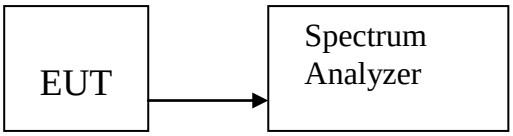
7.2.Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

a) The bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

b) The test receiver set RBW = 100kHz, VBW≥3*RBW =300kHz,, Peak Detector, Sweep time set auto, detail see the test plot.

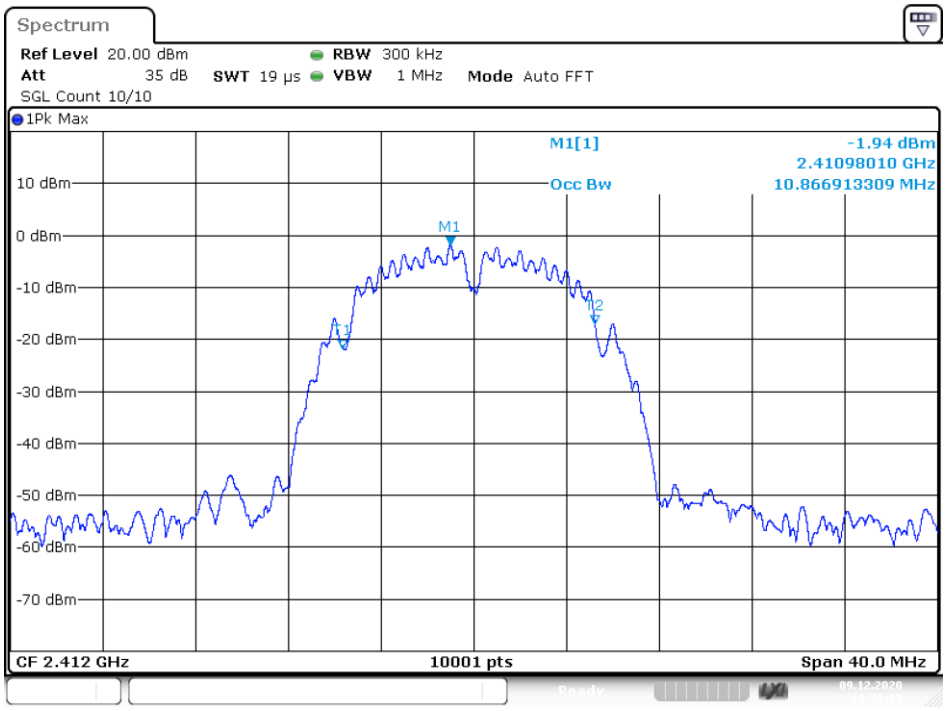
7.3.Test Setup



7.4.Test Results

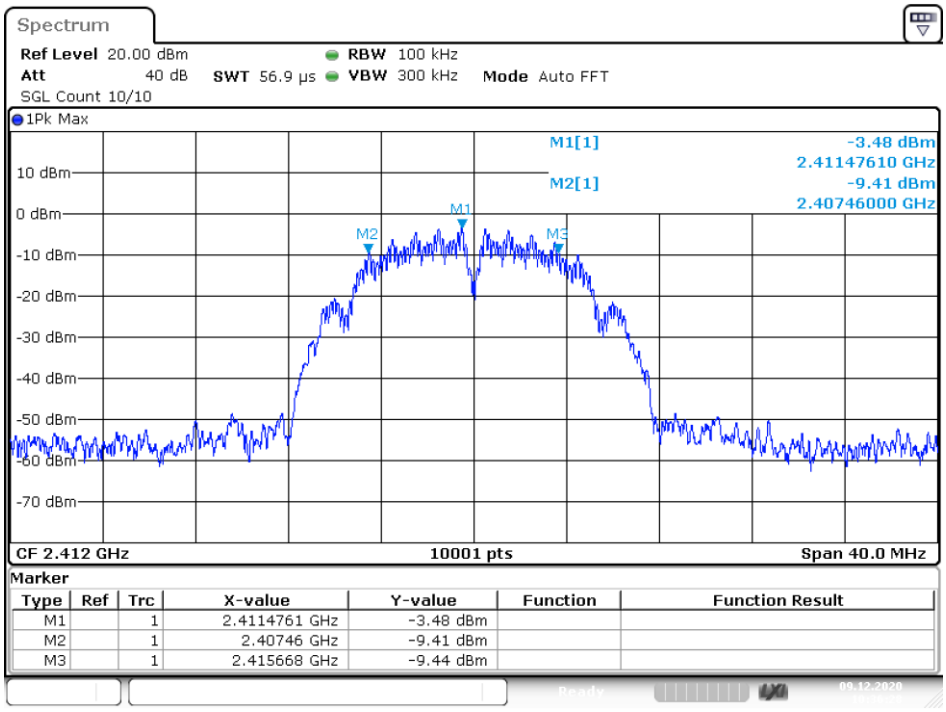
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	802.11b	2412	Ant 1	10.8669	8.208	0.5	Pass
NVNT	802.11b	2437	Ant 1	10.5269	8.092	0.5	Pass
NVNT	802.11b	2462	Ant 1	10.6109	8.536	0.5	Pass
NVNT	802.11g	2412	Ant 1	16.3984	15.72	0.5	Pass
NVNT	802.11g	2437	Ant 1	16.4464	15.716	0.5	Pass
NVNT	802.11g	2462	Ant 1	16.4544	16.264	0.5	Pass
NVNT	802.11n(HT20)	2412	Ant 1	17.3623	17.06	0.5	Pass
NVNT	802.11n(HT20)	2437	Ant 1	17.3703	15.724	0.5	Pass
NVNT	802.11n(HT20)	2462	Ant 1	17.4583	15.932	0.5	Pass

OBW NVNT 802.11b 2412MHz Ant1



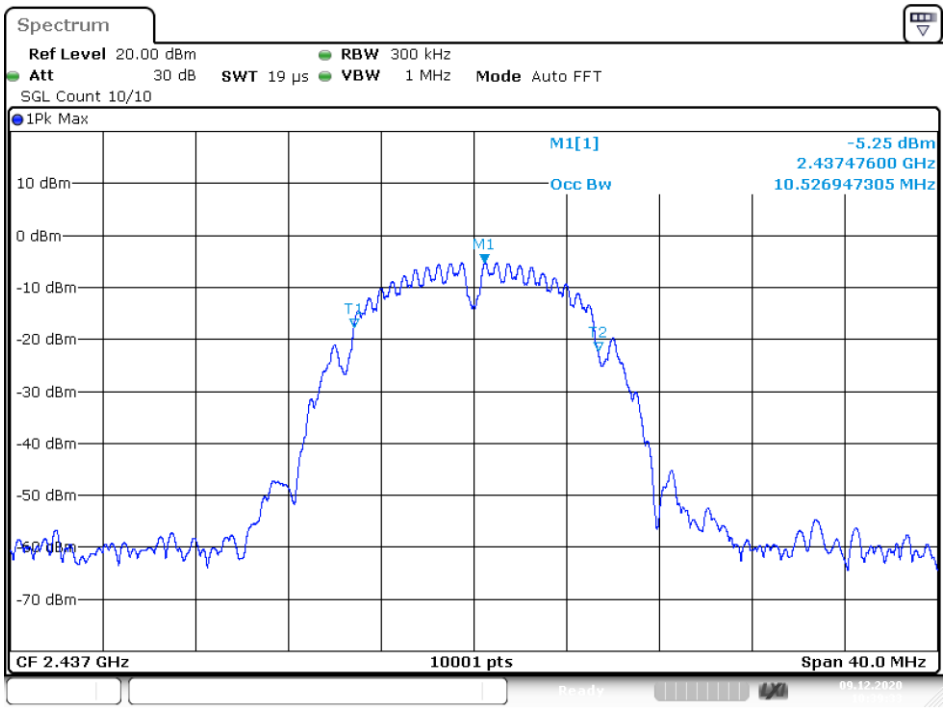
Date: 9.DEC.2020 10:36:25

-6 dB BW NVNT 802.11b 2412MHz Ant1



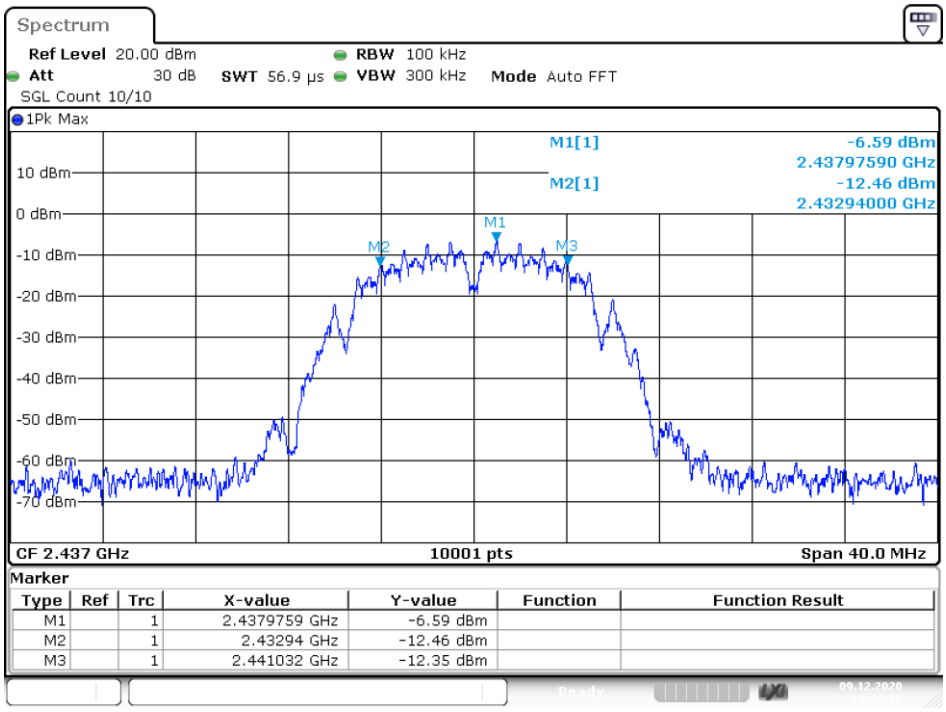
Date: 9.DEC.2020 10:36:27

OBW NVNT 802.11b 2437MHz Ant1



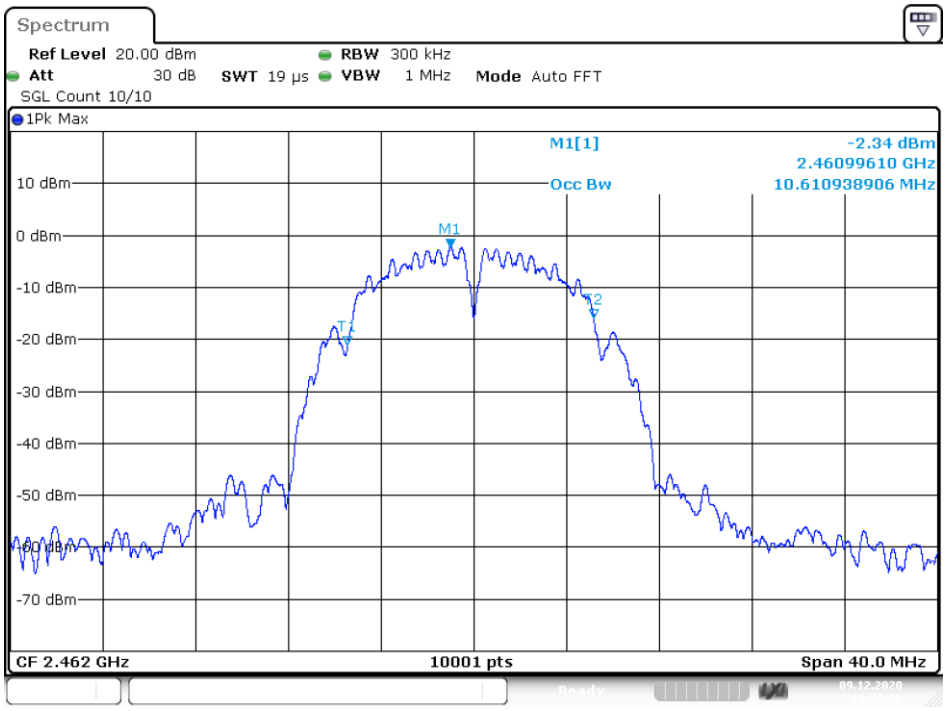
Date: 9.DEC.2020 10:39:33

-6 dB BW NVNT 802.11b 2437MHz Ant1



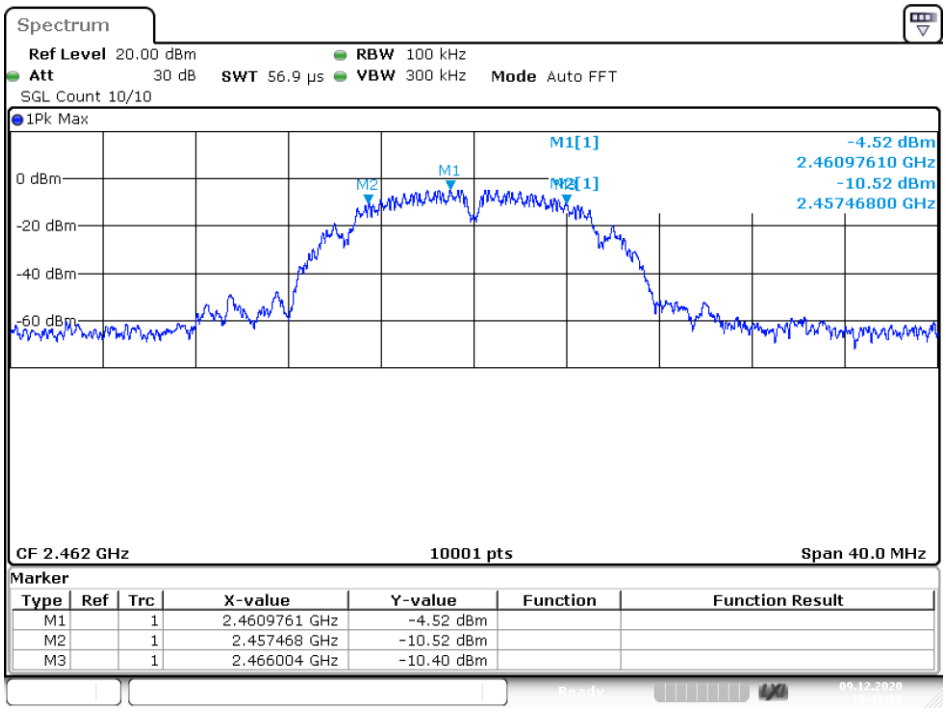
Date: 9.DEC.2020 10:39:35

OBW NVNT 802.11b 2462MHz Ant1



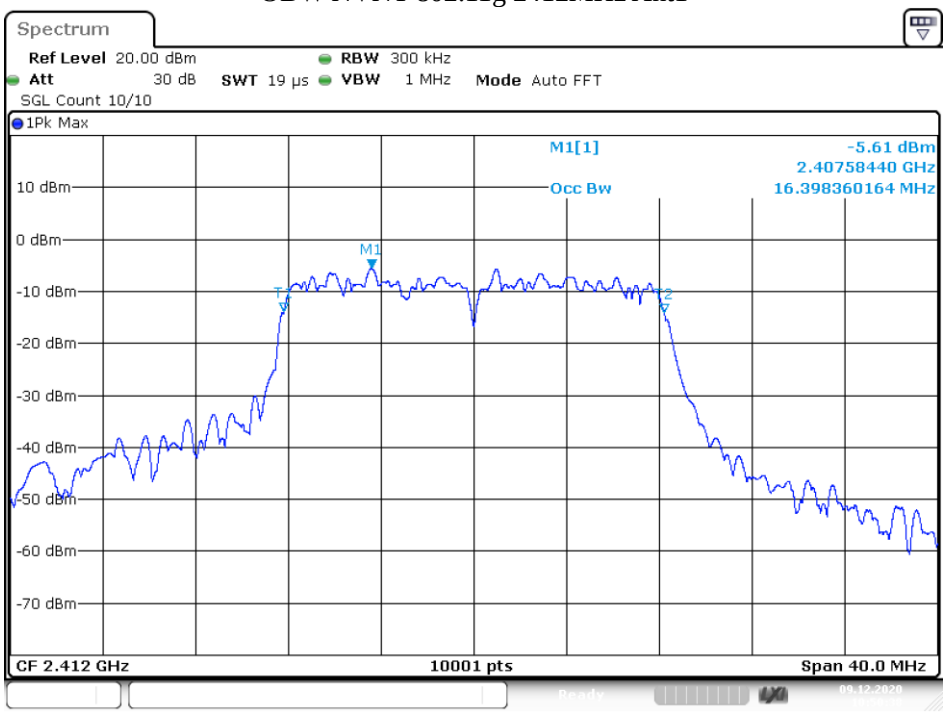
Date: 9.DEC.2020 10:48:36

-6 dB BW NVNT 802.11b 2462MHz Ant1



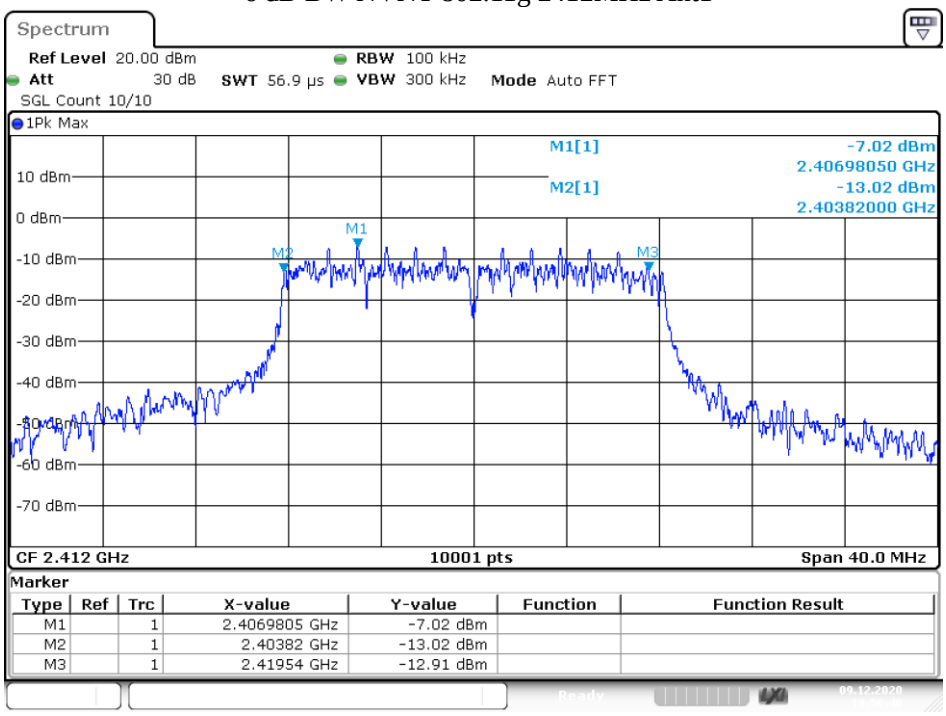
Date: 9.DEC.2020 10:48:38

OBW NVNT 802.11g 2412MHz Ant1



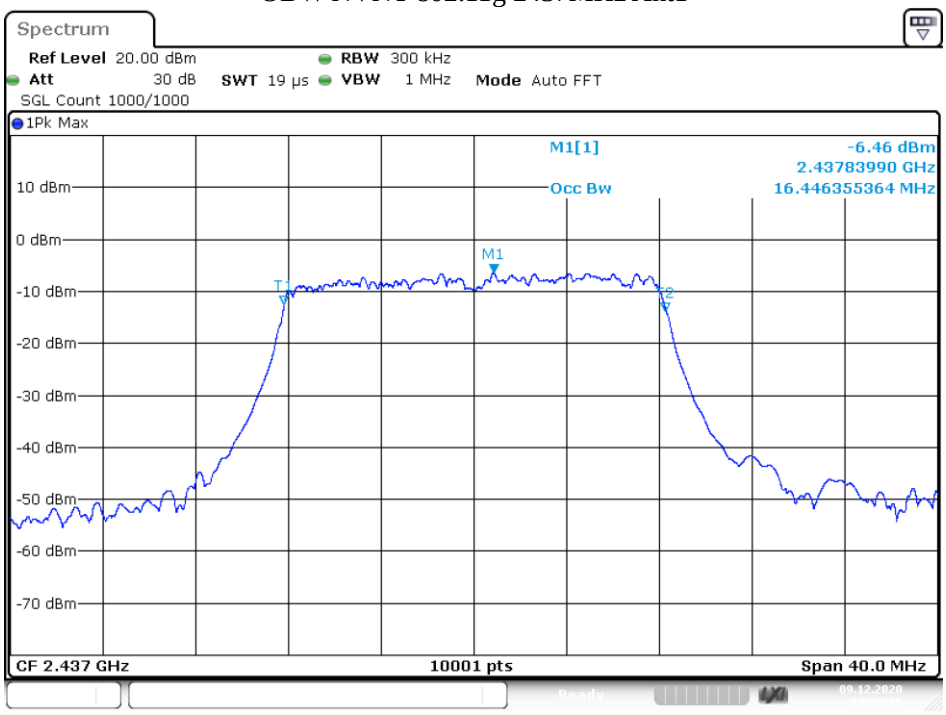
Date: 9.DEC.2020 10:50:38

-6 dB BW NVNT 802.11g 2412MHz Ant1



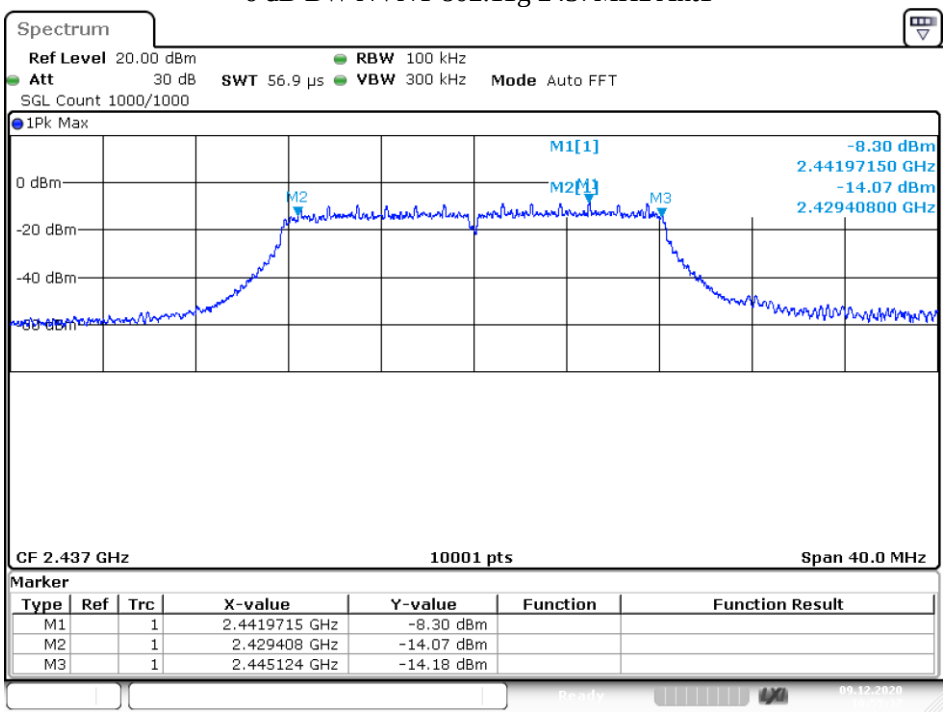
Date: 9.DEC.2020 10:50:40

OBW NVNT 802.11g 2437MHz Ant1



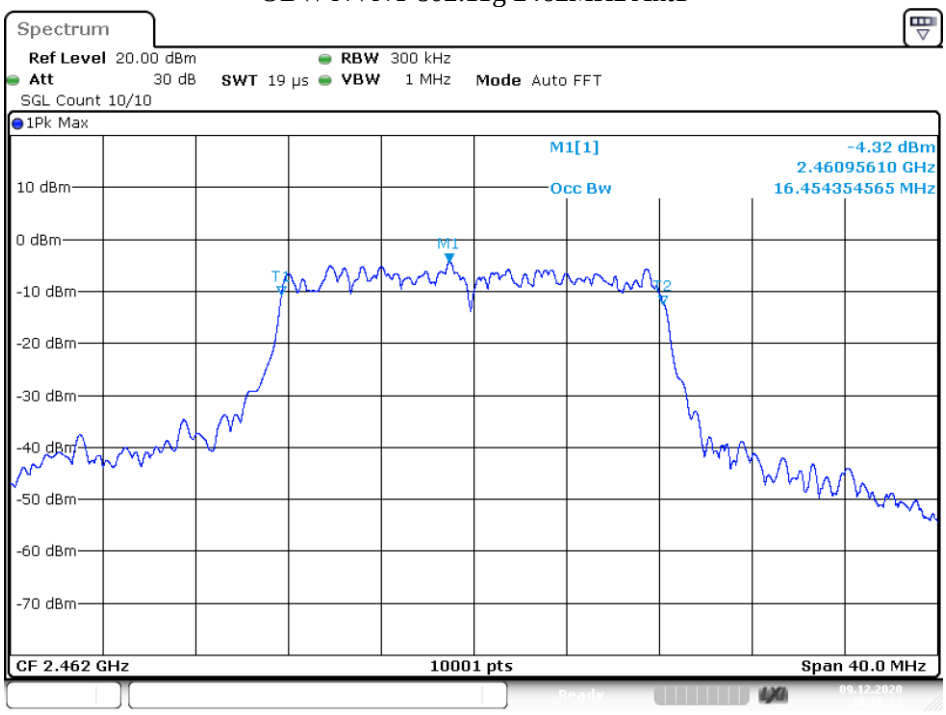
Date: 9.DEC.2020 10:55:15

-6 dB BW NVNT 802.11g 2437MHz Ant1



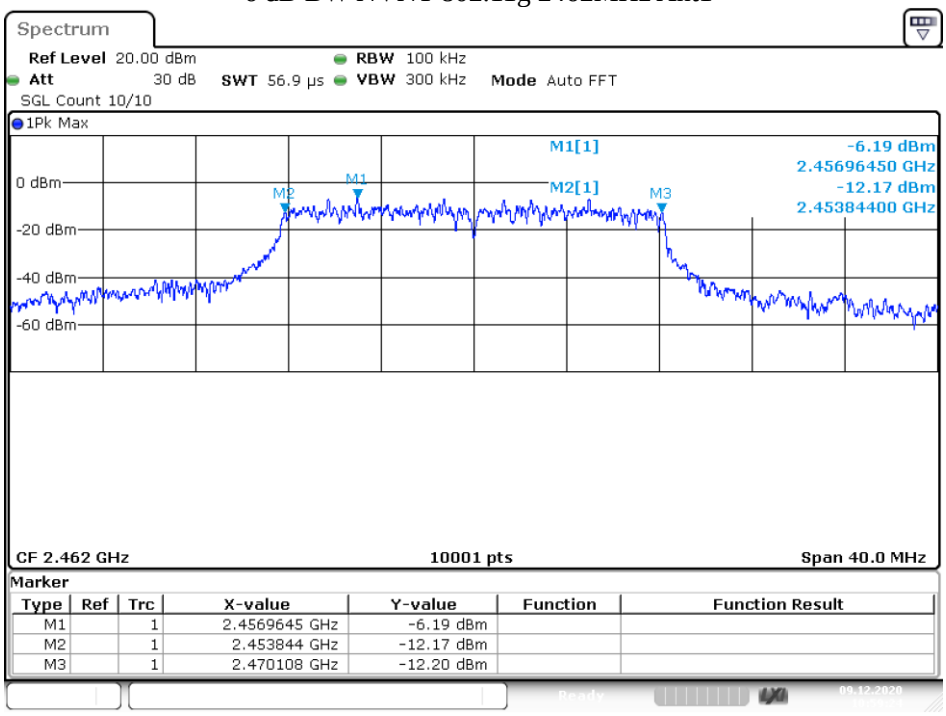
Date: 9.DEC.2020 10:55:38

OBW NVNT 802.11g 2462MHz Ant1



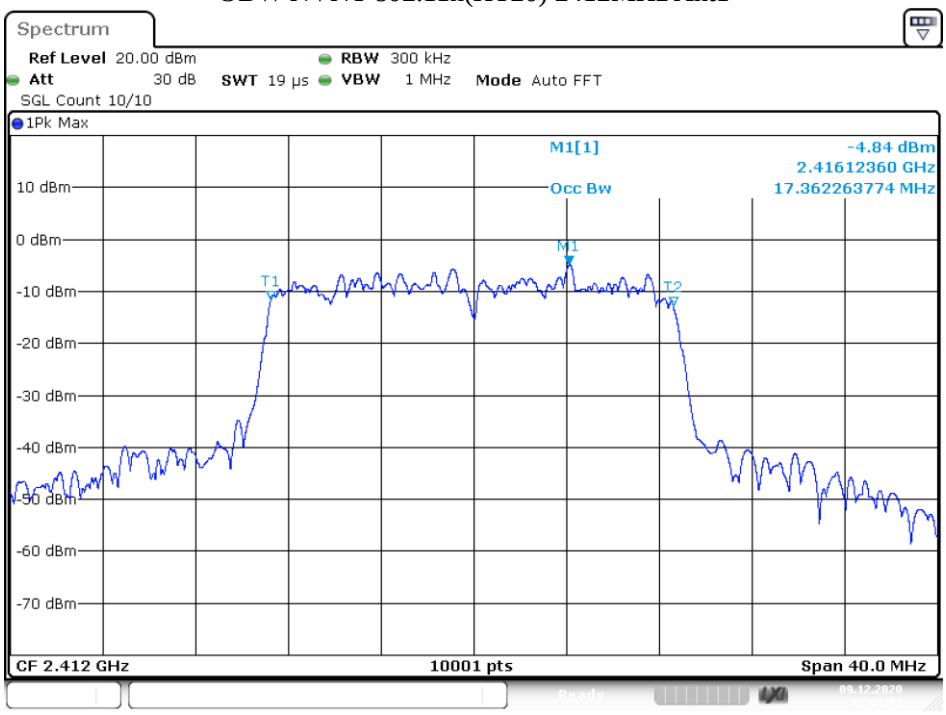
Date: 9.DEC.2020 10:59:21

-6 dB BW NVNT 802.11g 2462MHz Ant1



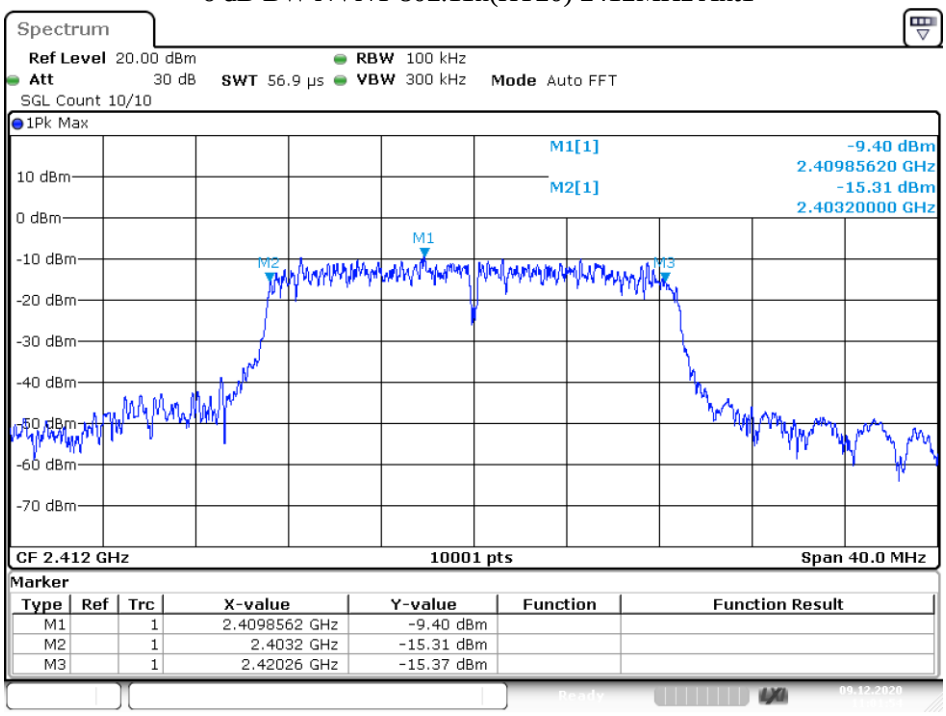
Date: 9.DEC.2020 10:59:24

OBW NVNT 802.11n(HT20) 2412MHz Ant1



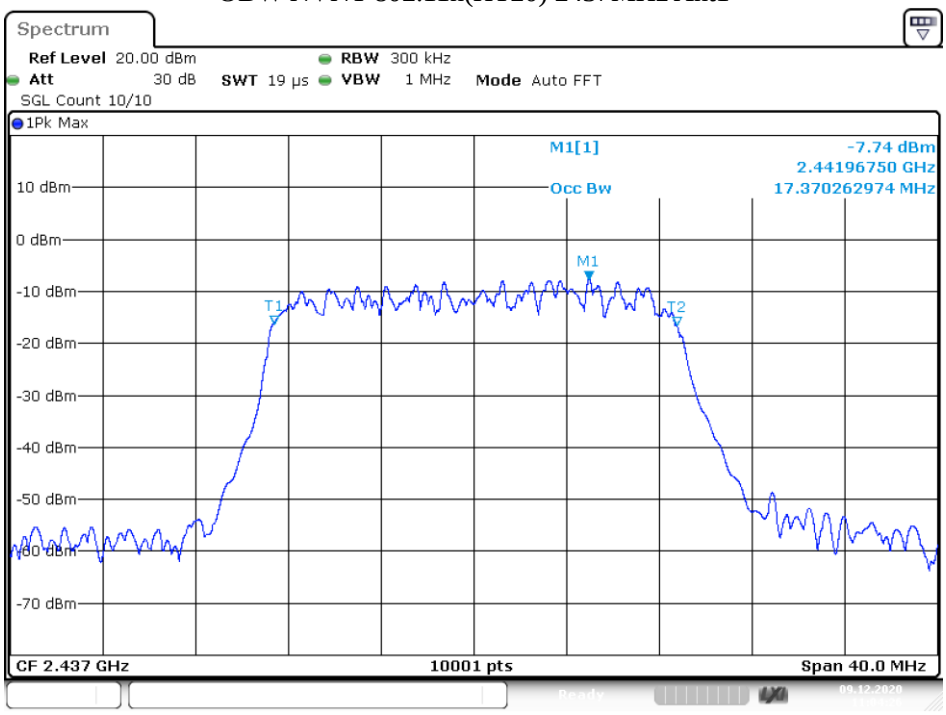
Date: 9.DEC.2020 11:01:52

-6 dB BW NVNT 802.11n(HT20) 2412MHz Ant1



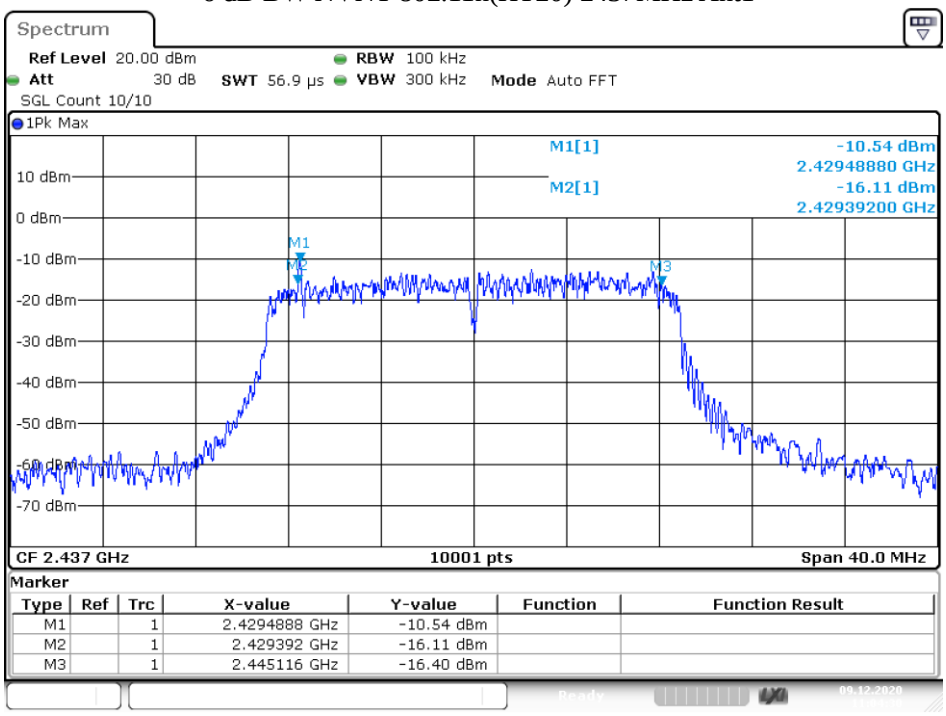
Date: 9.DEC.2020 11:01:54

OBW NVNT 802.11n(HT20) 2437MHz Ant1



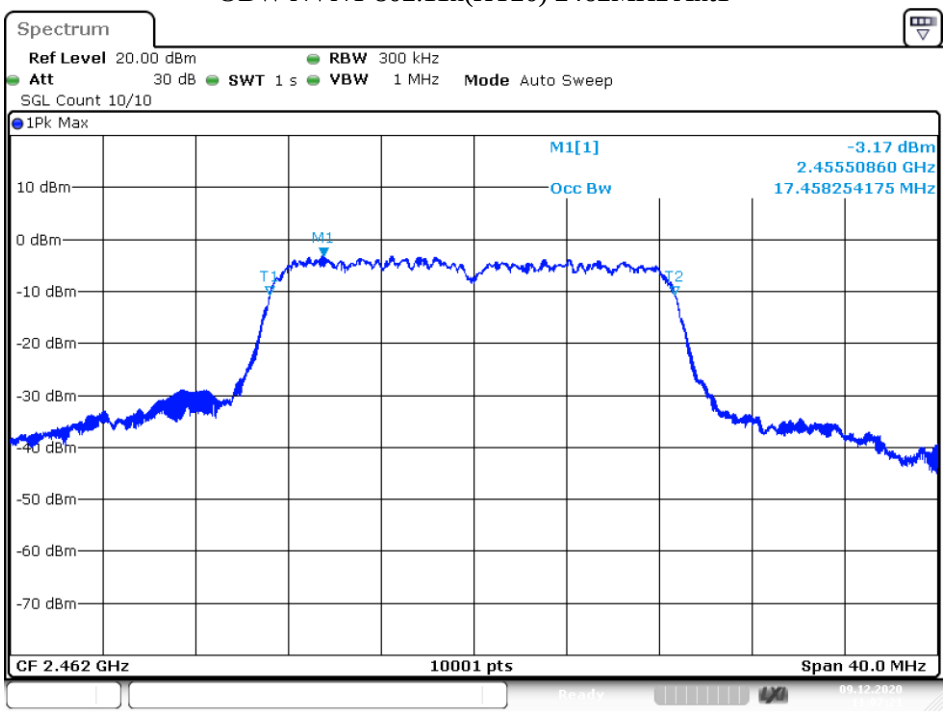
Date: 9.DEC.2020 11:04:26

-6 dB BW NVNT 802.11n(HT20) 2437MHz Ant1



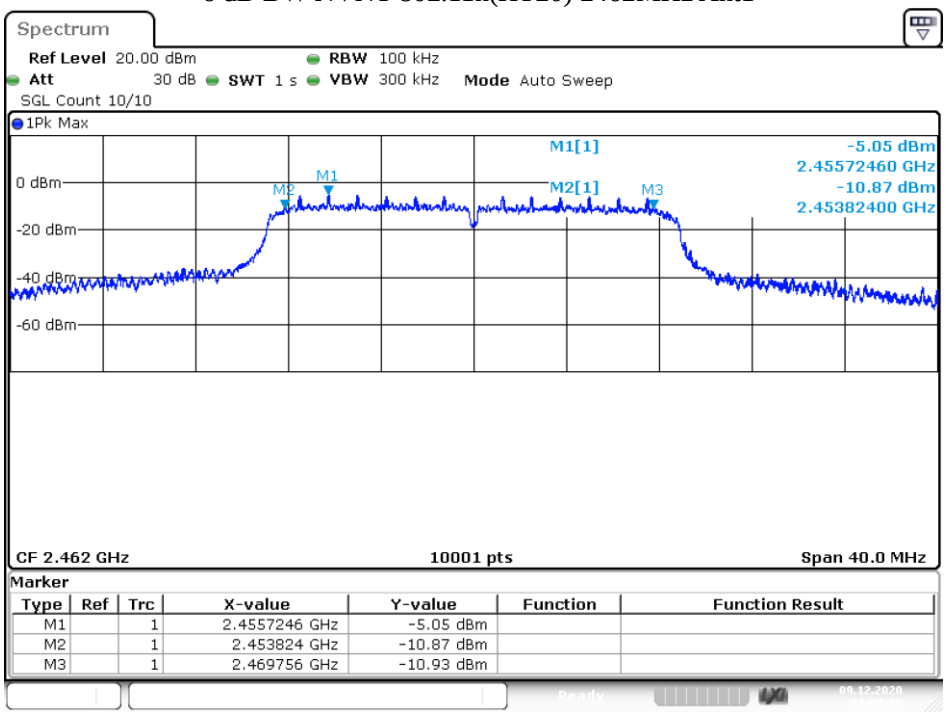
Date: 9.DEC.2020 11:04:29

OBW NVNT 802.11n(HT20) 2462MHz Ant1



Date: 9.DEC.2020 11:07:22

-6 dB BW NVNT 802.11n(HT20) 2462MHz Ant1



Date: 9.DEC.2020 11:07:36

8. BAND EDGE CHECK

8.1.Test limits

Please refer RSS-GEN & FCC PART 15: 15.247

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits and RSS-GEN limits.

8.2.Test Procedure

Details see the KDB558074 D01 Meas Guidance v05r02

8.2.1 Put the EUT on a 1.5m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value , RBW 1MHz ,VBW 10Hz , RMS detector for AV value.

8.3.Test Setup

Same as 5.2.2.

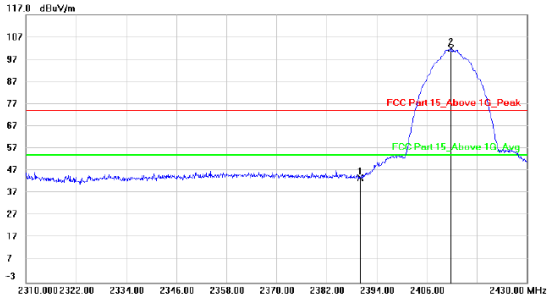
8.4.Test Results

PASS.

Detailed information please see the following page.

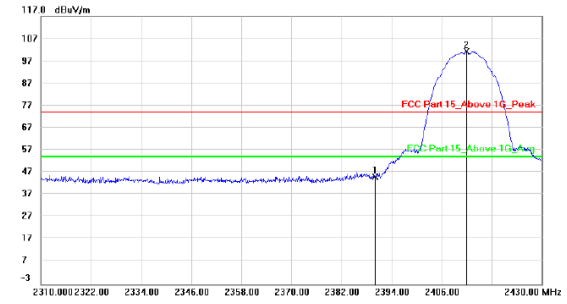
Test Mode: IEEE 802.11b-Low

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	47.40	-3.40	44.00	74.00	-30.00	peak			
2	*	2411.760	105.15	-3.40	101.75	74.00	27.75	peak			

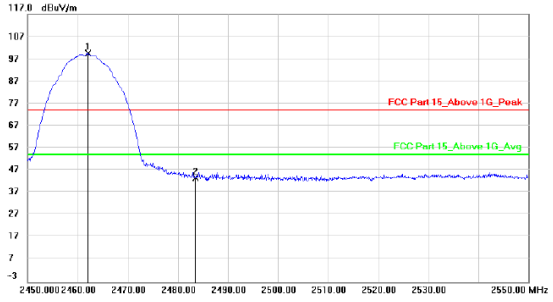
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	48.69	-3.40	45.29	74.00	-28.71	peak			
2	*	2412.000	104.52	-3.40	101.12	74.00	27.12	peak			

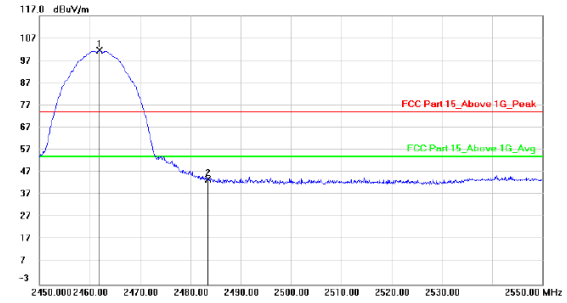
Test Mode: IEEE 802.11b-High

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2462.000	102.73	-3.40	99.33	74.00	25.33	peak			
2		2483.500	47.13	-3.38	43.75	74.00	-30.25	peak			

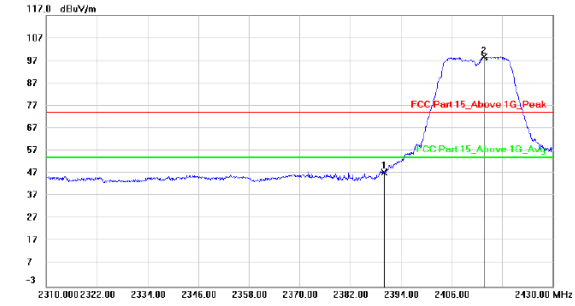
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2461.900	104.94	-3.40	101.54	74.00	27.54	peak			
2		2483.500	47.39	-3.38	44.01	74.00	-29.99	peak			

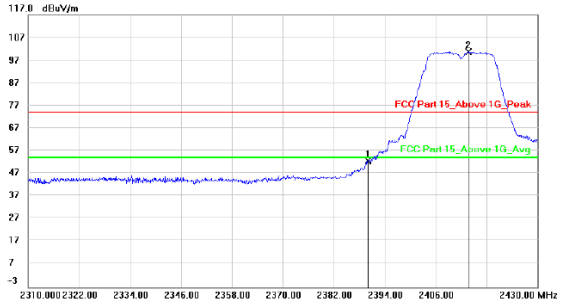
Test Mode: IEEE 802.11g-Low

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	51.05	-3.40	47.65	74.00	-26.35	peak			
2	*	2413.800	102.08	-3.41	98.67	74.00	24.67	peak			

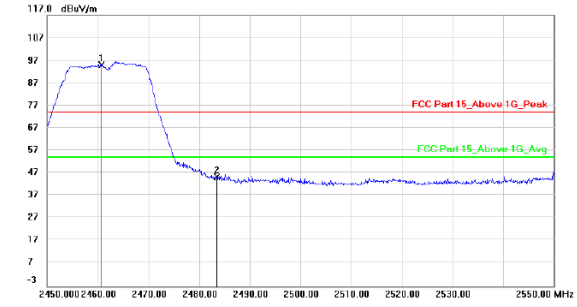
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	56.02	-3.40	52.62	74.00	-21.38	peak			
2	*	2413.680	104.16	-3.41	100.75	74.00	26.75	peak			

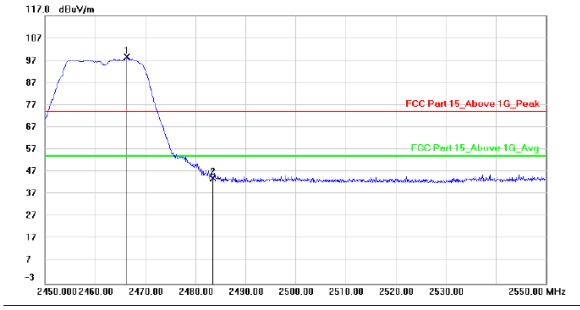
Test Mode: IEEE 802.11g-High

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2460.700	98.34	-3.39	94.95	74.00	20.95	peak			
2		2483.500	48.80	-3.38	45.42	74.00	-28.58	peak			

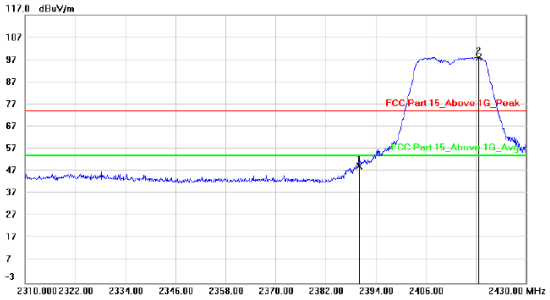
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2466.300	101.97	-3.39	98.58	74.00	24.58	peak			
2		2483.500	47.57	-3.38	44.19	74.00	-29.81	peak			

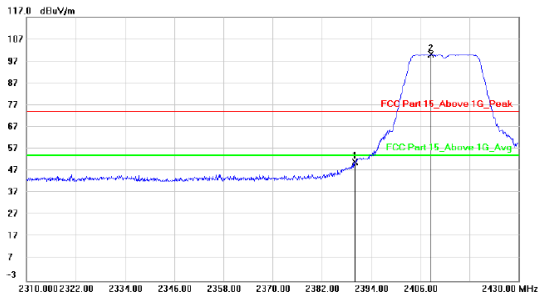
Test Mode: IEEE 802.11n20-Low

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	52.76	-3.40	49.36	74.00	-24.64	peak			
2	*	2418.720	101.46	-3.41	98.05	74.00	24.05	peak			

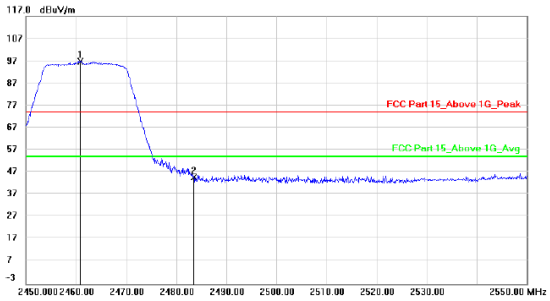
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2390.000	54.56	-3.40	51.16	74.00	-22.84	peak			
2	*	2408.640	103.56	-3.40	100.16	74.00	26.16	peak			

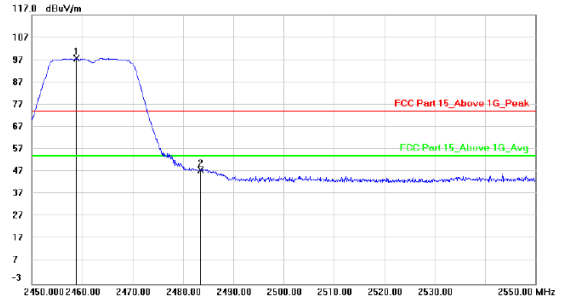
Test Mode: IEEE 802.11n20-High

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2460.900	100.20	-3.39	96.81	74.00	22.81	peak			
2		2483.500	48.27	-3.38	44.89	74.00	-29.11	peak			

Polarization: Horizontal

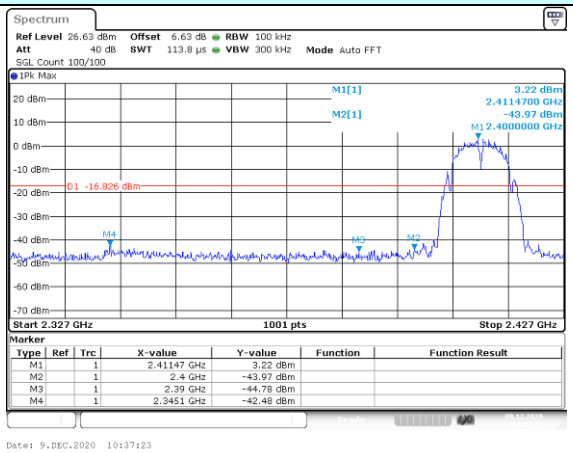


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2458.800	101.09	-3.39	97.70	74.00	23.70	peak			
2		2483.500	51.28	-3.38	47.90	74.00	-26.10	peak			

Note: 1. *:Maximum data; x:Over limit; !:over margin.

2. Measurement=Reading Level + Correct Factor; Correct Factor=Antenna Factor + Cable Loss.

Test mode: 802.11b

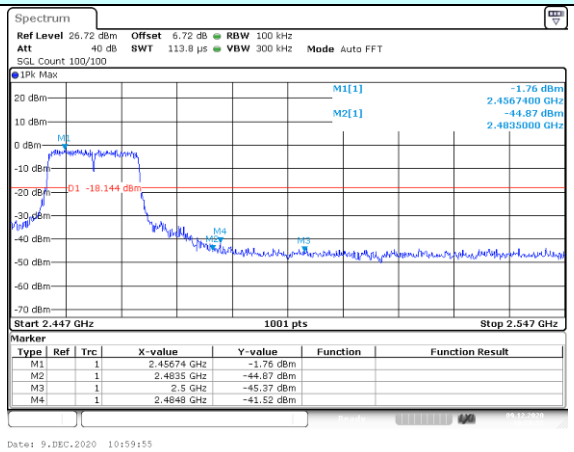


Lowest channel

Highest channel

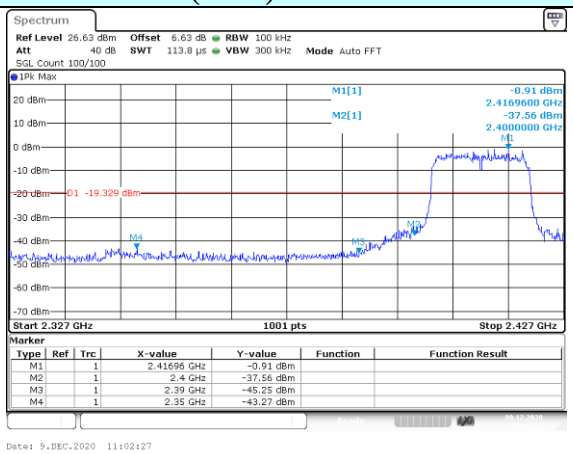
Test mode: 802.11g

Lowest channel

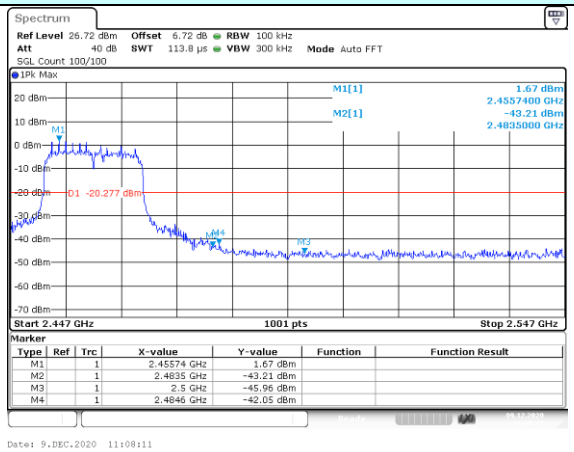


Highest channel

Test mode: 802.11n(HT20)



Lowest channel



Highest channel

9. FREQUENCY STABILITY

9.1.Test limit

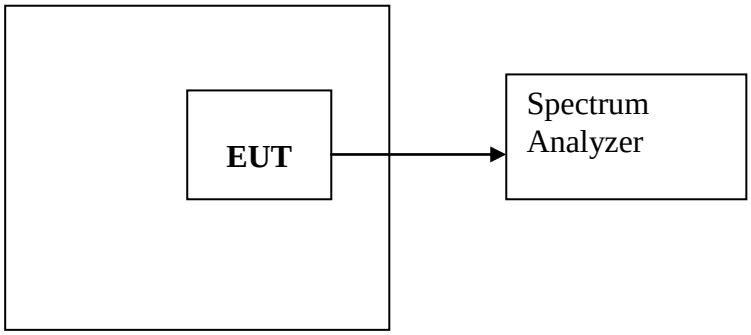
Please refer section RSS-Gen.

Regulation RSS-Gen If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation. In addition, its occupied bandwidth shall be entirely outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, and 470-602 MHz, unless otherwise indicated.

9.2.Test Procedure

The following equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.3.Test Setup



Temperature controller

9.4.Test Results

Not applicable.

10. ANTENNA REQUIREMENT

10.1. Standard Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

10.2. Antenna Connected Construction

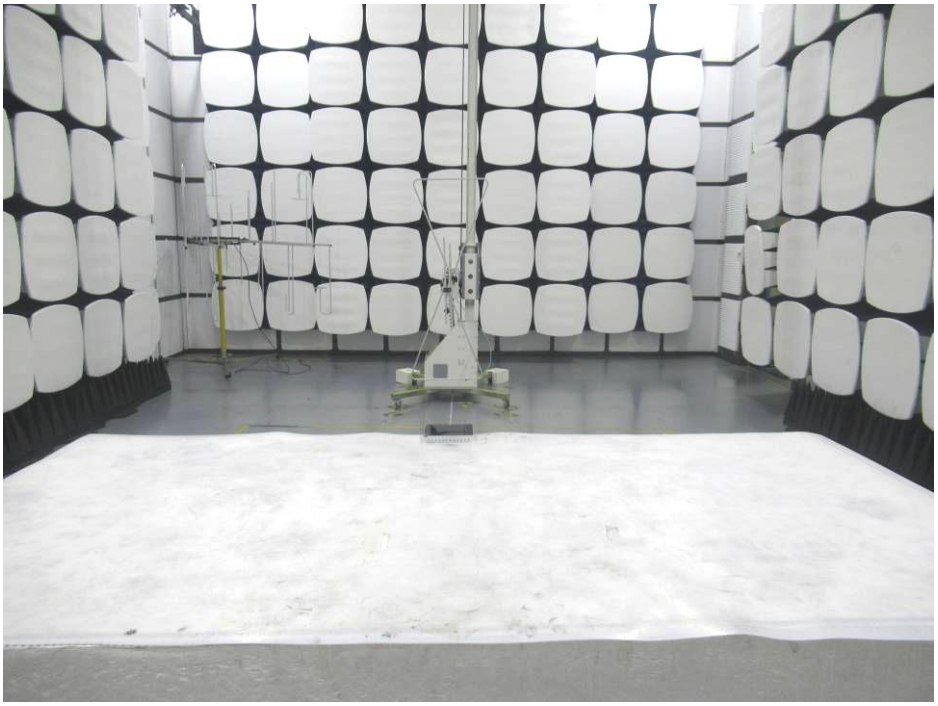
The antenna is PCB antenna and no consideration of replacement. Please see EUT photo for details.

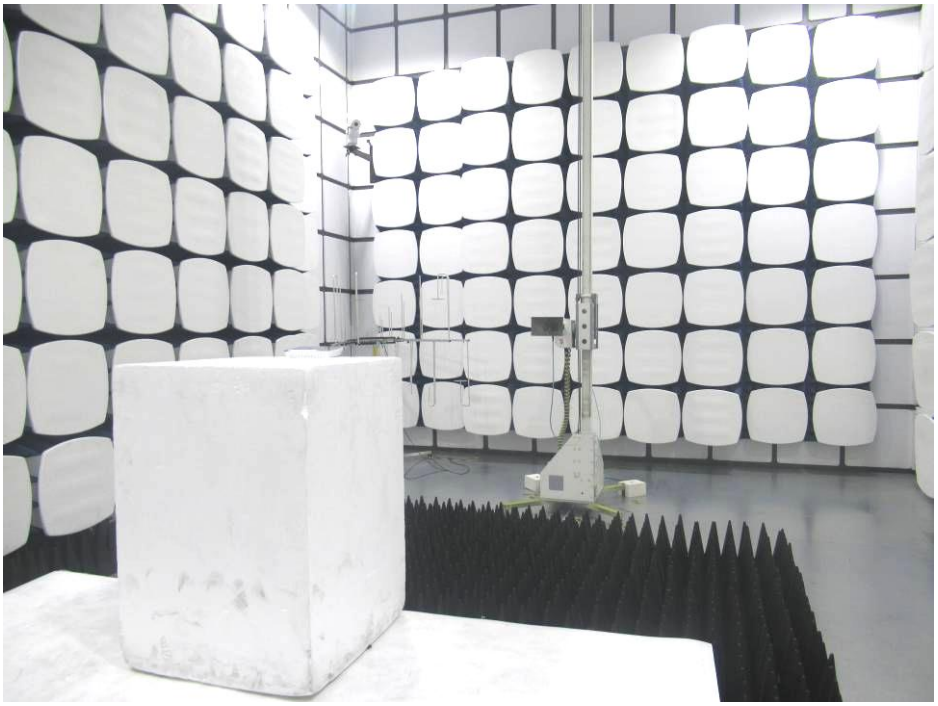
10.3. Results

The EUT antenna is PCB antenna. It complies with the standard requirement.

11. TEST SETUP PHOTO

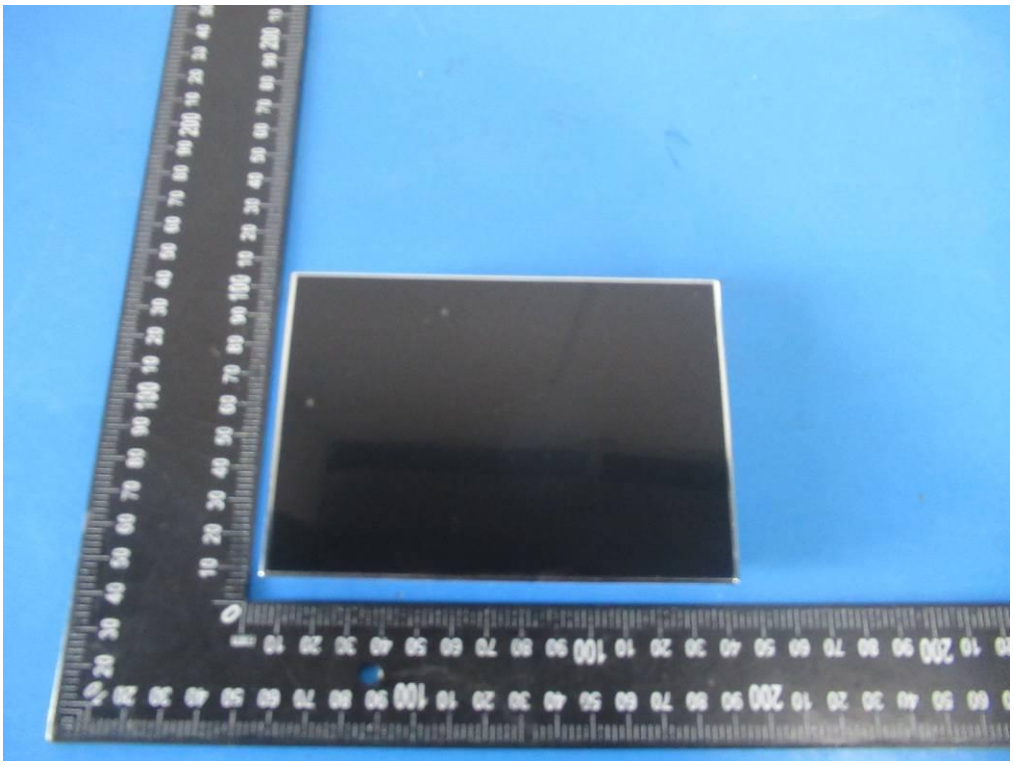
11.1. Photos of Radiated emission

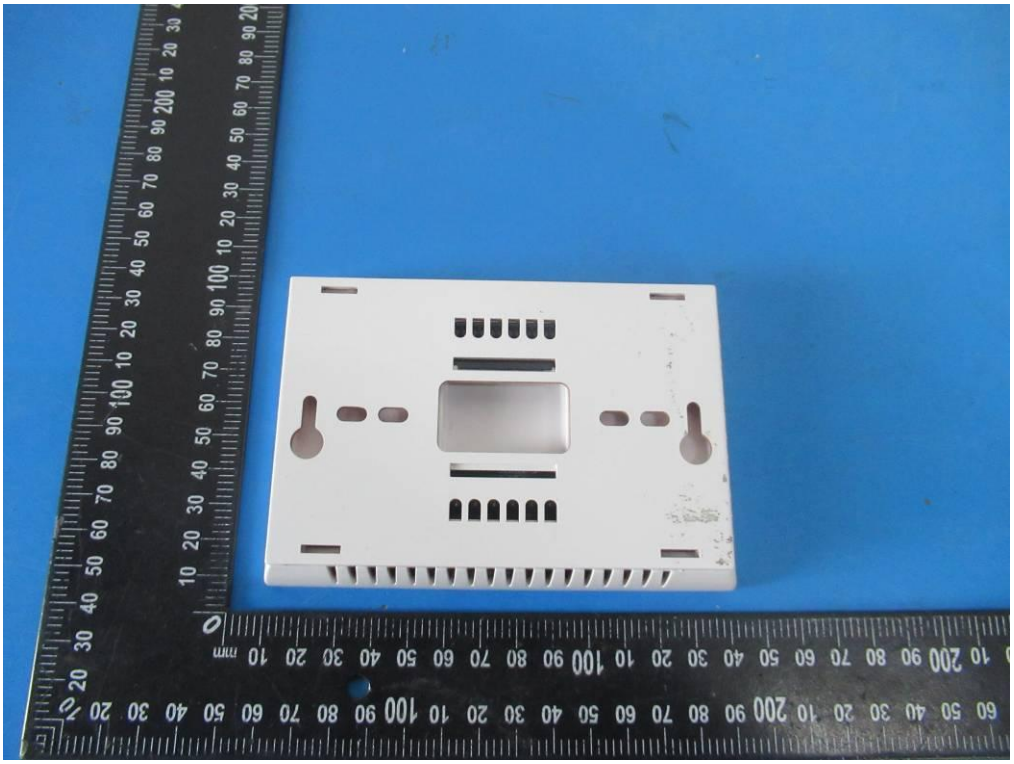


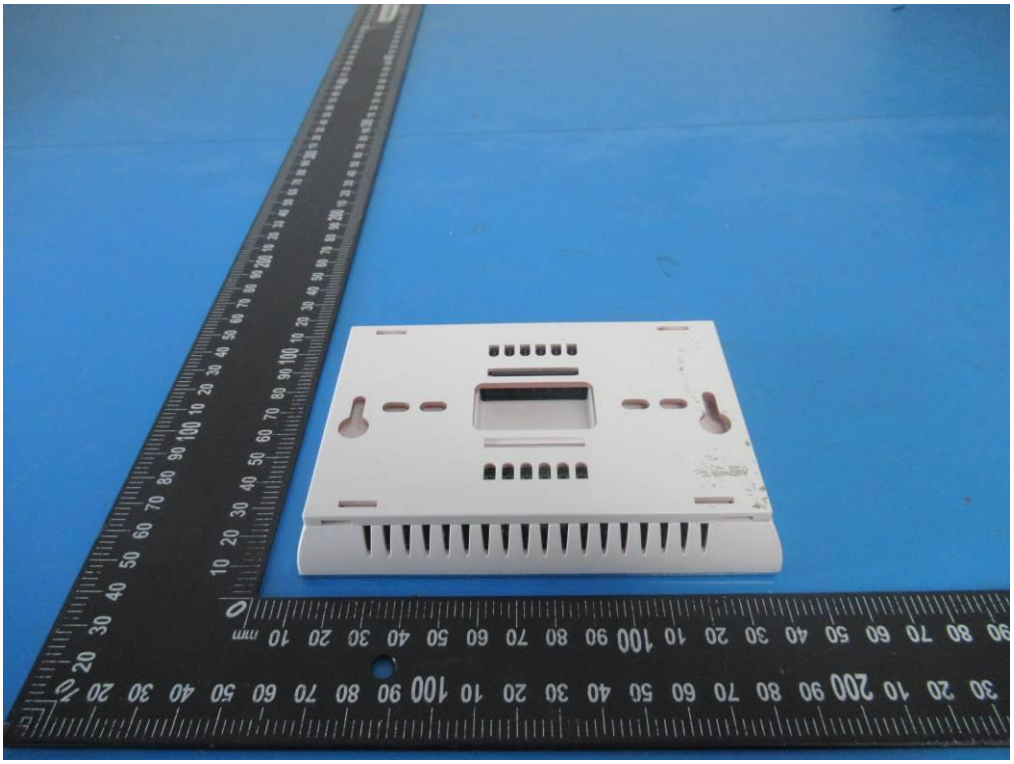


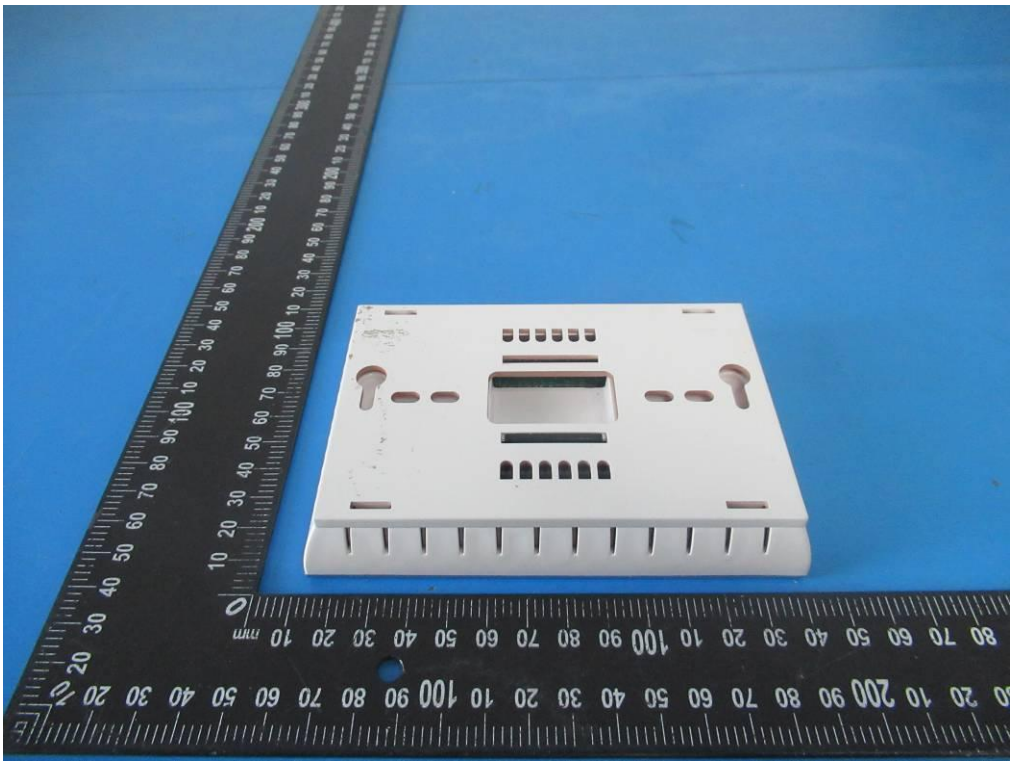
11.2.Photos of Power Line Conducted Emission Test

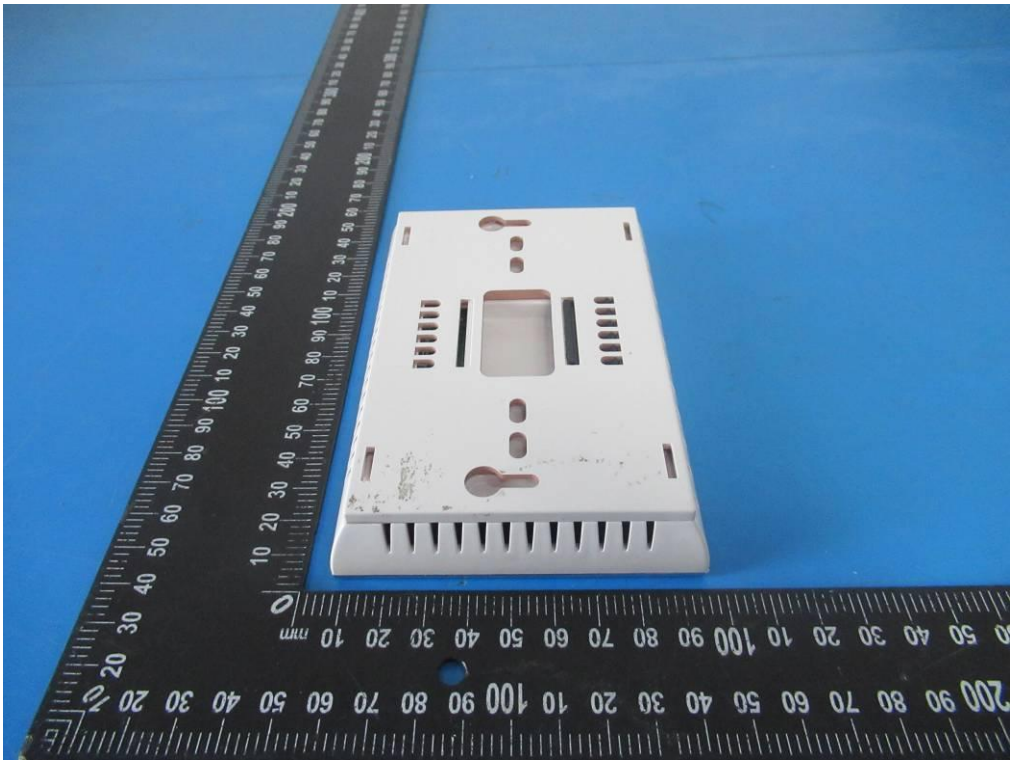
12. PHOTOS OF EUT

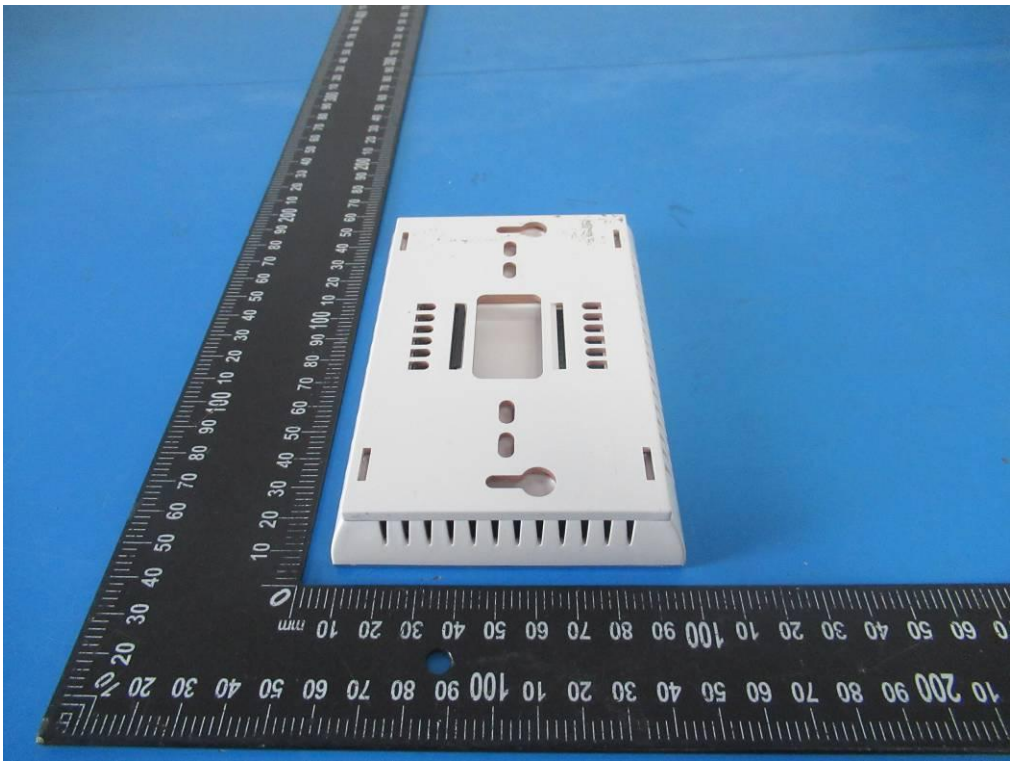


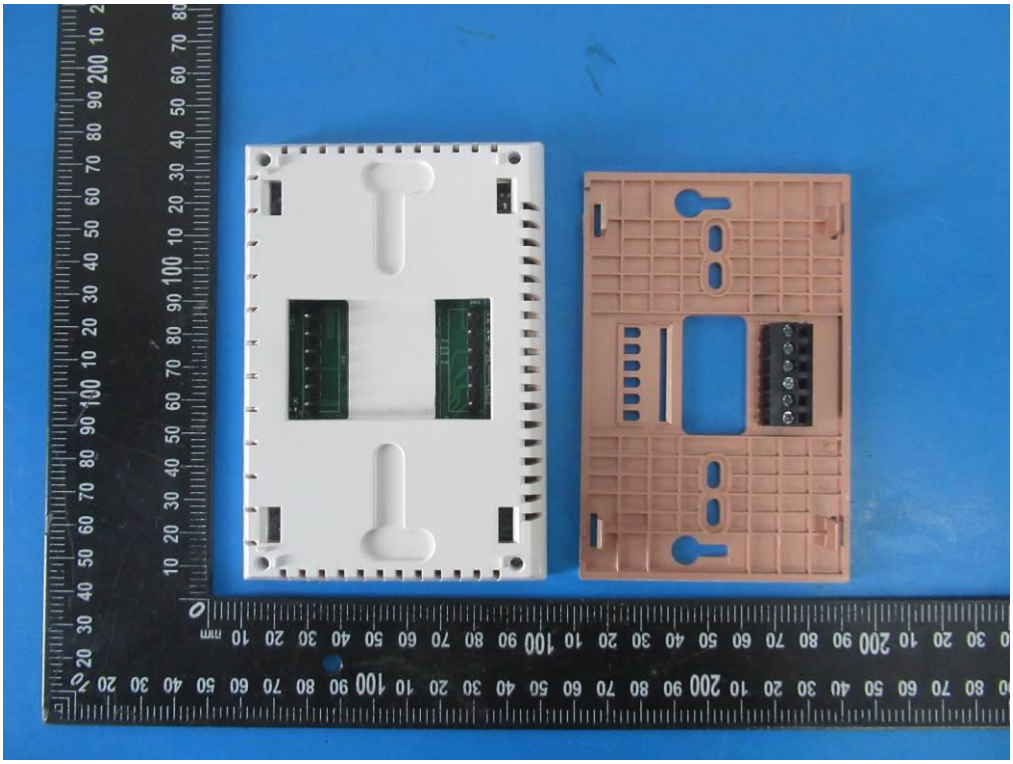


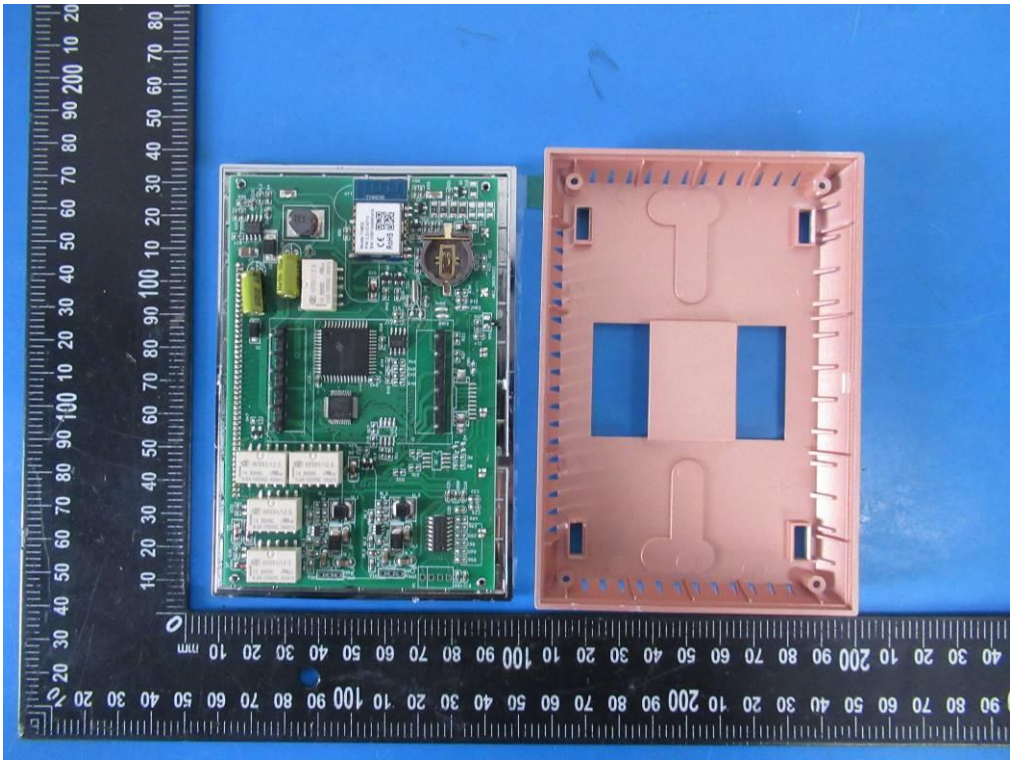


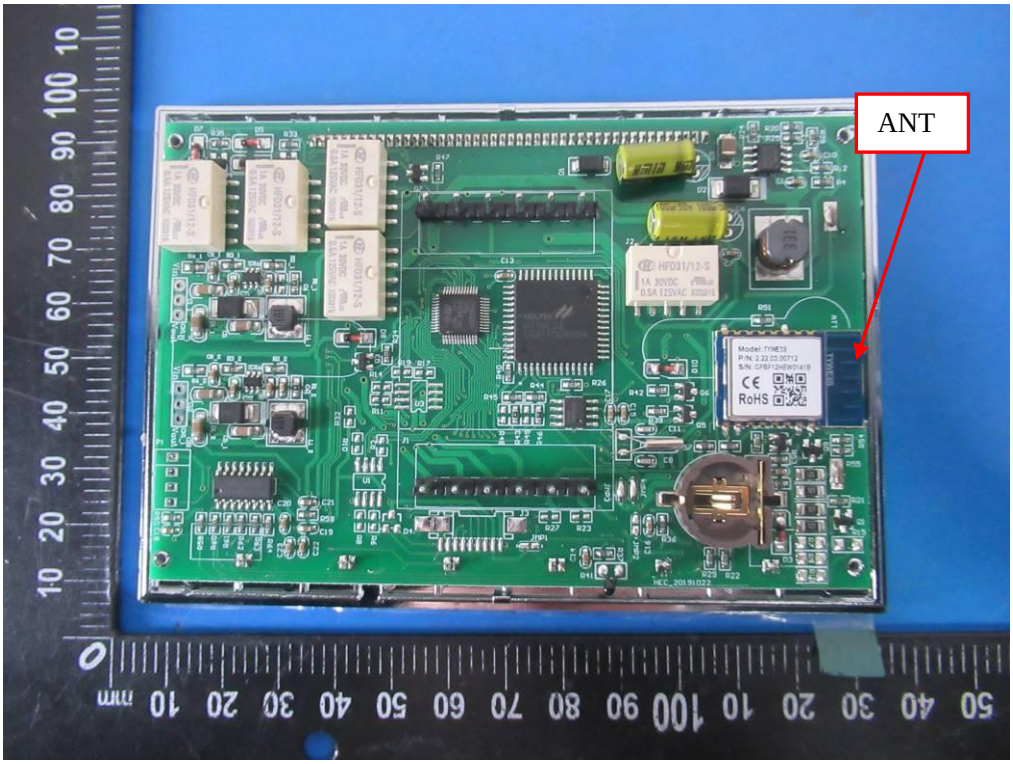




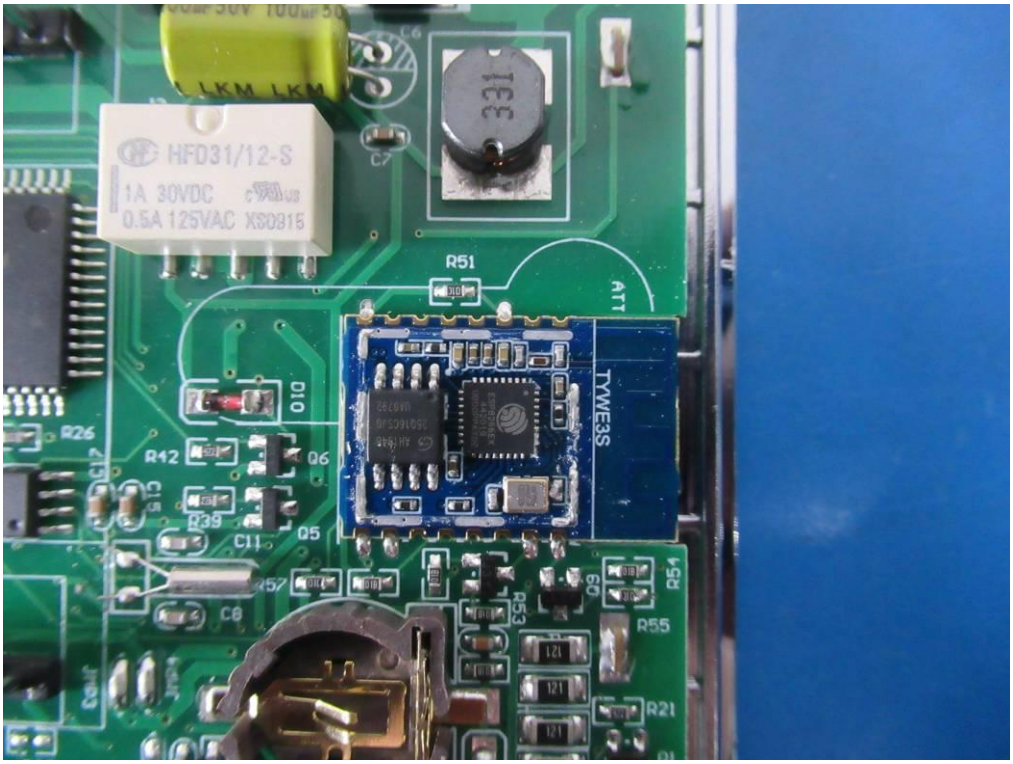


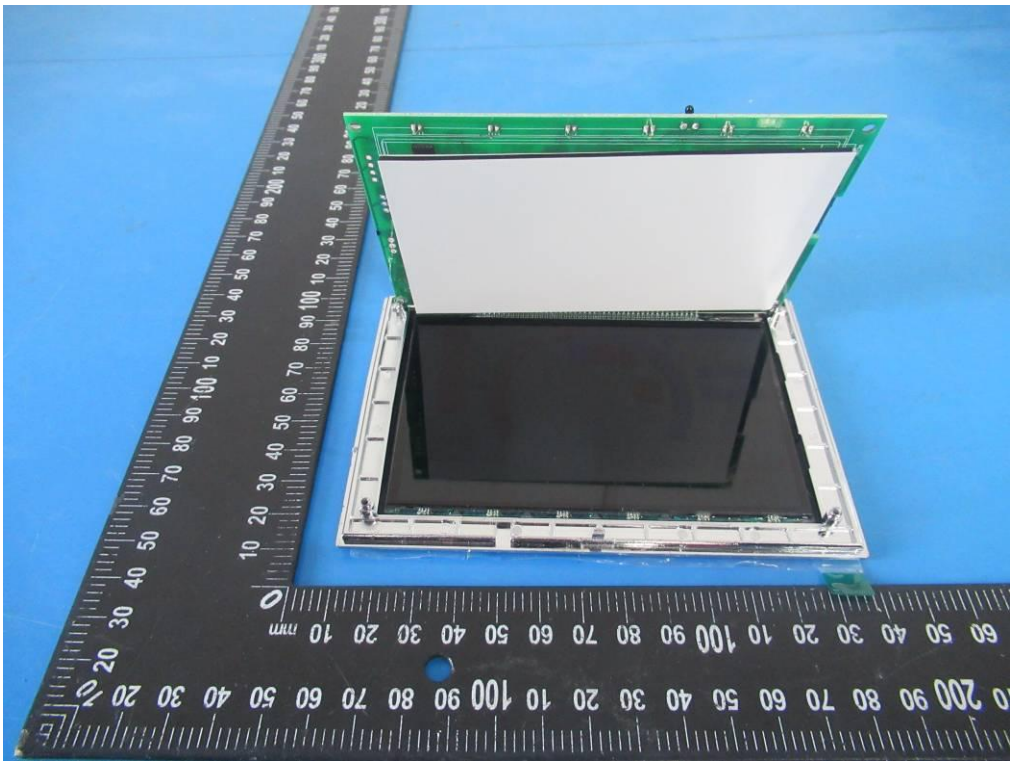


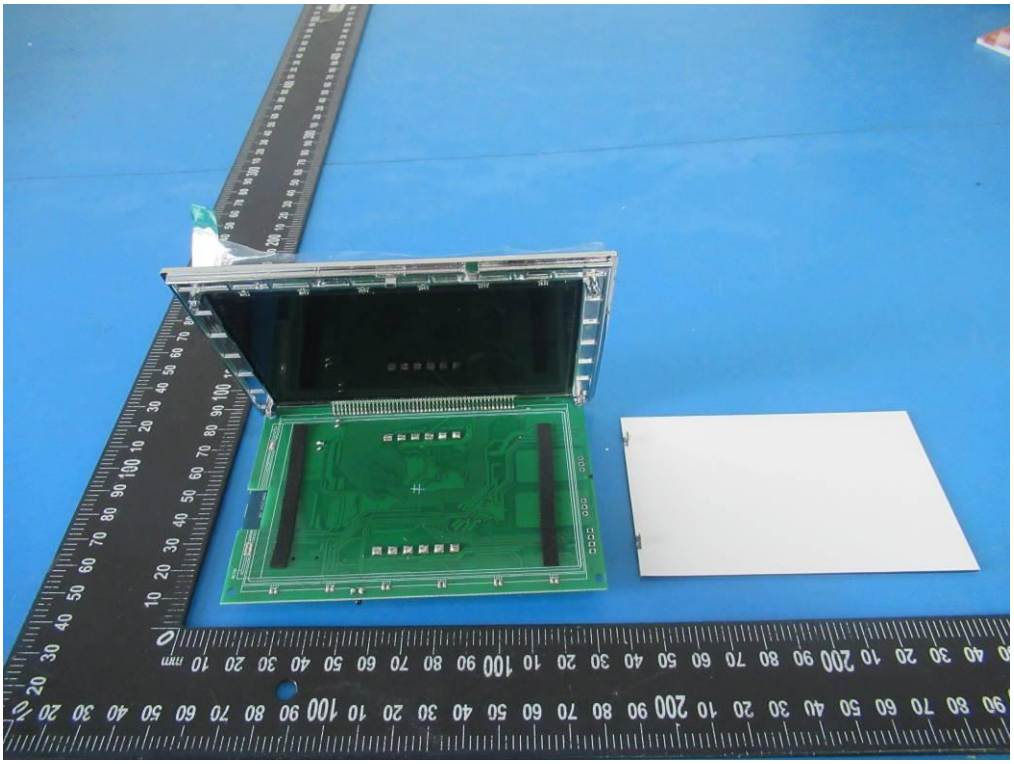


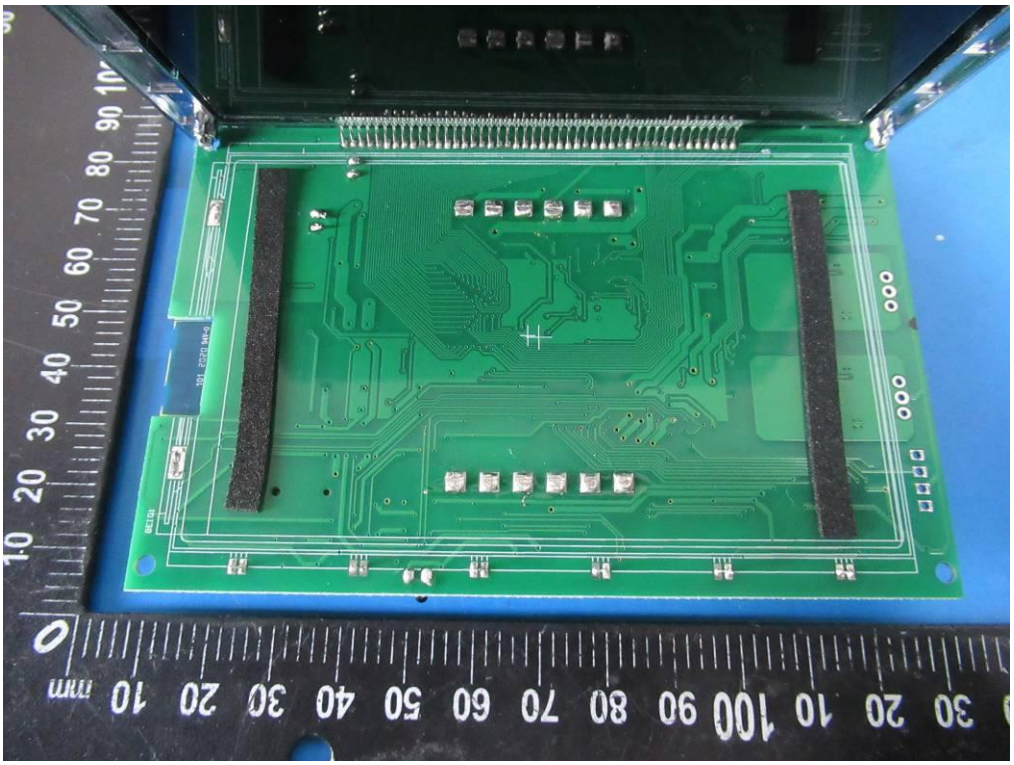

ANT


HFD31/12-S
R51
ANT
Model: TYWE3S
P/N: 2.22.03.00712
S/N: GPBF12HEW0141B
RoHS
TYWE3S
D10
R42
Q6
Q5
C11
C8
R54
R55
R53
R21


HFD31/12-S
1A 30VDC
0.5A 125VAC
R51
TYWE3S
R42
R39
R55
R21







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