

FCC TEST REPORT

Client Name : Shenzhen Hwellyi Technology Co., Ltd
Address : No.503-508, Block A, Area C Baoan Internet Industry
Base, Baoan District, Shenzhen, Guangdong, China
518101
Product Name : Intelligent Gateway Pro
Date : Jul. 09, 2019

Shenzhen Anbotech Compliance Laboratory Limited

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TEST REPORT

Applicant : Shenzhen Hwellyi Technology Co., Ltd

Manufacturer : Shenzhen Hwellyi Technology Co., Ltd

Product Name : Intelligent Gateway Pro

Model No. : H201-ST-SH00

Trade Mark :  HWELLYI

Rating(s) : Input: 100-240V ~ 50/60Hz, 50mA

Test Standard(s) : FCC Part15 Subpart C 2018, Section 15.247

Test Method(s) : ANSI C63.10: 2013, KDB558074 D01 DTS Meas Guidance v05
KDB662911 D01 Multiple Transmitter Output v02r01

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of Receipt

May 15, 2019

Date of Test

May 15~Jul. 02, 2019

Prepared By



Oliay Yang

(Engineer / Oliay Yang)

Reviewer

Snowy Meng

(Supervisor / Snowy Meng)

Approved & Authorized Signer

Sally Zhang

(Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	Shenzhen Hwellyi Technology Co., Ltd
Address	:	No.503-508, Block A, Area C Baoan Internet Industry Base, Baoan District, Shenzhen, Guangdong, China 518101
Manufacturer	:	Shenzhen Hwellyi Technology Co., Ltd
Address	:	No.503-508, Block A, Area C Baoan Internet Industry Base, Baoan District, Shenzhen, Guangdong, China 518101
Factory	:	Shenzhen Hwellyi Technology Co., Ltd
Address	:	No.503-508, Block A, Area C Baoan Internet Industry Base, Baoan District, Shenzhen, Guangdong, China 518101

1.2. Description of Device (EUT)

Product Name	:	Intelligent Gateway Pro
Model No.	:	H201-ST-SH00
Trade Mark	:	
Test Power Supply	:	AC 240V, 60Hz/ AC 120V, 60Hz
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Product Description	Operation Frequency:	Wifi 2.4G: 802.11b/ g/ n(HT20) 2412-2462MHz ZigBee: 2405-2480MHz
	Number of Channel:	Wifi 2.4G: 11 Channels for 802.11b/ g/ n(HT20) ZigBee: 16 Channels
	Modulation Type:	Wifi 2.4G: 802.11b CCK; 802.11g/n OFDM ZigBee: GFSK
	Antenna Type:	Wifi 2.4G & ZigBee: FPCB Antenna
	Antenna Gain(Peak):	Wifi 2.4G: 0 dBi ZigBee: 5 dBi
	The directional gain:	ZigBee: 8.01 dBi
Remark: 1)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) This report is for ZigBee module.		

1.3. Auxiliary Equipment Used During Test

N/A	
-----	--

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description	
Mode 1	CH11	Keeping TX+ Charging Mode/ TX Only
Mode 2	CH18	
Mode 3	CH26	

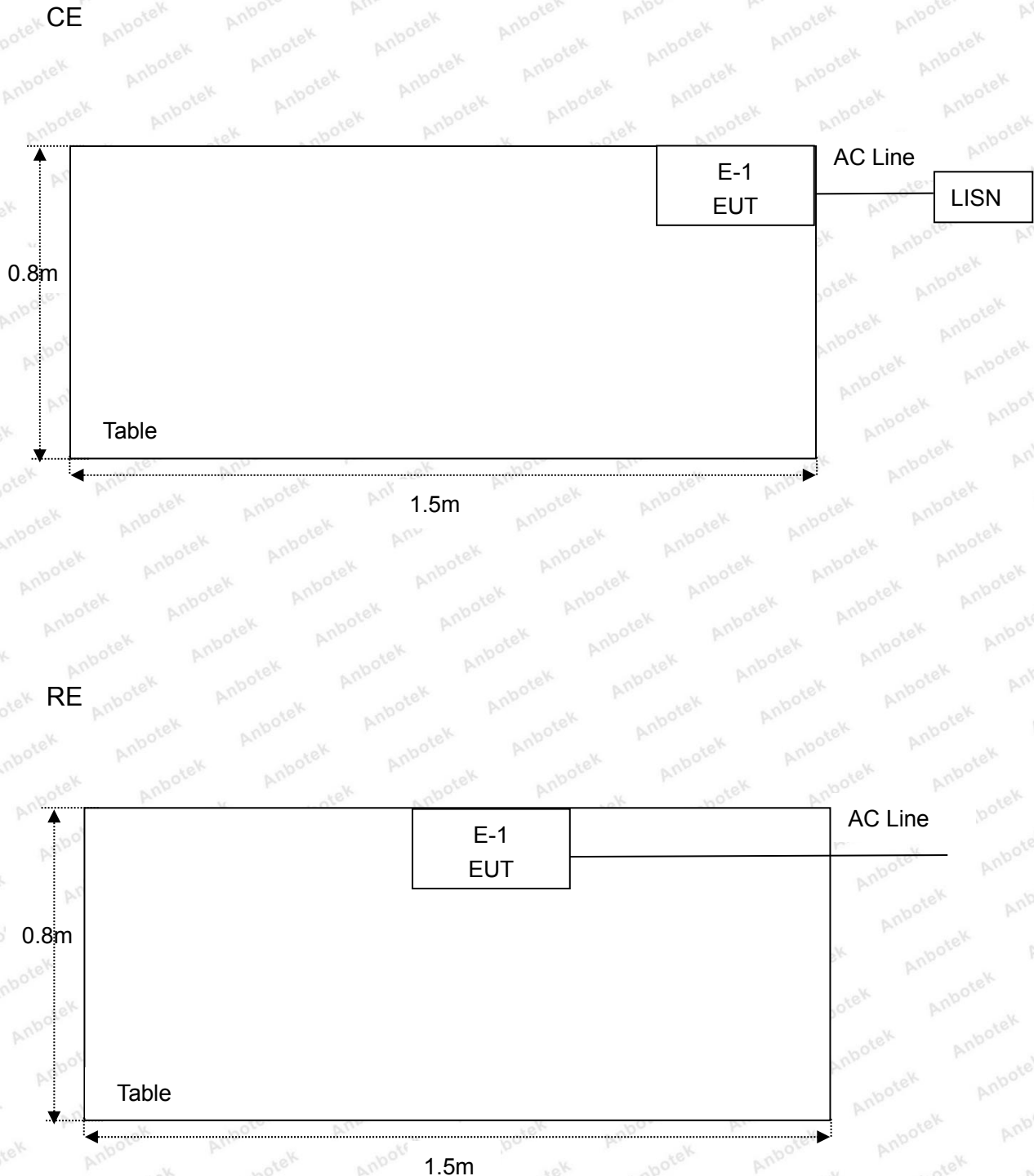
Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2)The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

1.5. List of channels

Channel	Freq. (MHz)	Channel	Freq. (MHz)
11	2405	21	2455
12	2410	22	2460
13	2415	23	2465
14	2420	24	2470
15	2425	25	2475
16	2430	26	2480
17	2435		
18	2440		
19	2445		
20	2450		

1.6. Description Of Test Setup



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 26, 2018	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI3	101604	Nov. 05, 2018	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 05, 2018	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 05, 2018	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 05, 2018	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 19, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 20, 2018	1 Year
10.	Horn Antenna	A-INFO	LB-180400-K F	J211060628	Nov. 20, 2018	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Nov. 05, 2018	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 05, 2018	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 05, 2018	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 05, 2018	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 05, 2018	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 05, 2018	1 Year
19.	DC Power Supply	LW	TPR-6420D	374470	Oct. 31, 2018	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Nov. 01, 2018	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

1.9. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotech Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

Shenzhen Anbotech Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.247(b)(3)	Maximum Peak Output Power	PASS
15.247(a)(2)	6dB Occupied Bandwidth	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Band Edge	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		



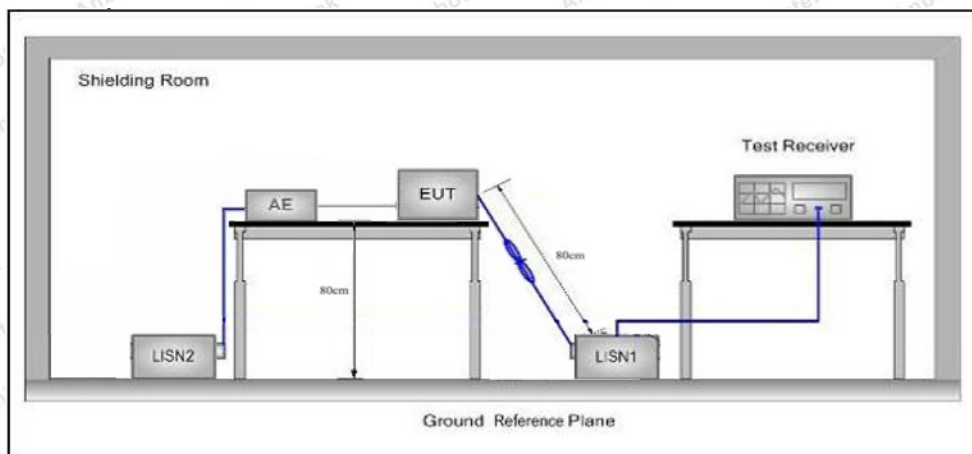
3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50

Remark: (1) *Decreasing linearly with logarithm of the frequency.
(2) The lower limit shall apply at the transition frequency.

3.2. Test Setup



3.3. Test Procedure

The EUT system 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 line 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 FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

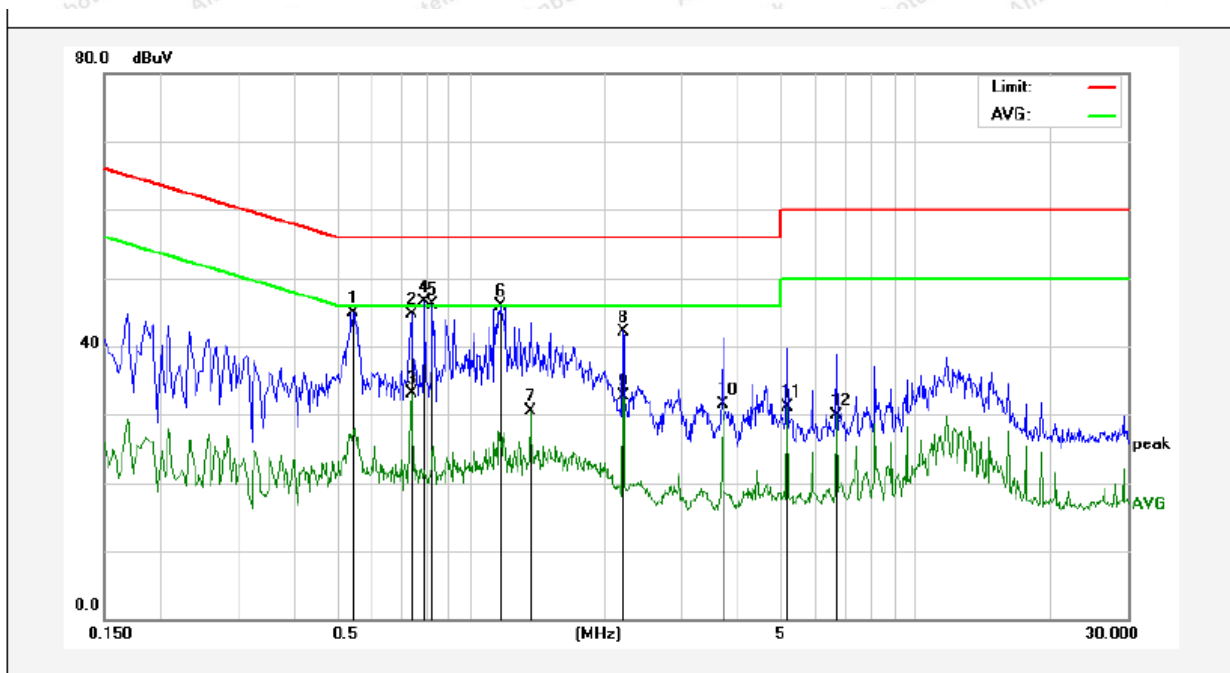
3.4. Test Data

During the test, pre-scan all the modes, and found Low channel(TX+Charging Mode) which is the worst case, only the worst case is recorded in the report.

Please to see the following pages.

Conducted Emission Test Data

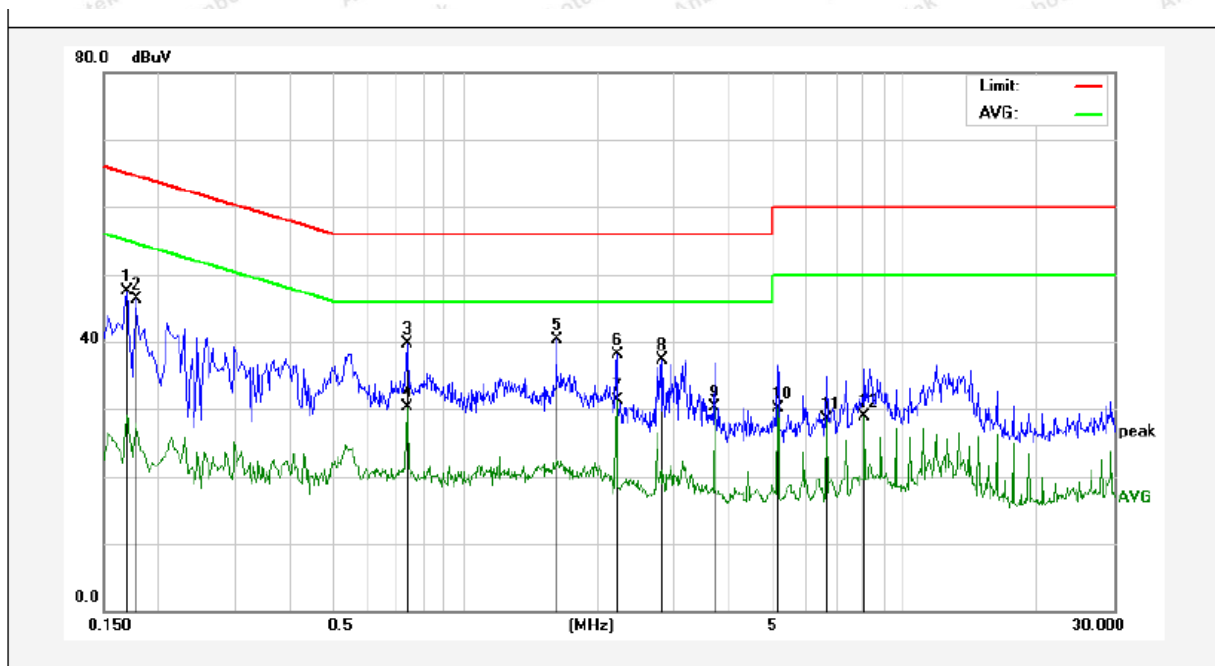
Test Site: 1# Shielded Room
Operating Condition: CH11
Test Specification: AC 240V, 60Hz
Comment: Live Line
Tem.: 21.9°C Hum.: 58%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.5460	24.91	19.99	44.90	56.00	-11.10	QP	
2	0.7380	24.62	20.05	44.67	56.00	-11.33	QP	
3	0.7380	13.09	20.05	33.14	46.00	-12.86	AVG	
4	0.7900	26.39	20.06	46.45	56.00	-9.55	QP	
5	0.8260	25.98	20.07	46.05	56.00	-9.95	QP	
6	1.1700	25.85	20.12	45.97	56.00	-10.03	QP	
7	1.3660	10.38	20.13	30.51	46.00	-15.49	AVG	
8	2.2100	22.06	20.14	42.20	56.00	-13.80	QP	
9	2.2100	12.56	20.14	32.70	46.00	-13.30	AVG	
10	3.6860	11.37	20.17	31.54	46.00	-14.46	AVG	
11	5.1579	10.96	20.21	31.17	50.00	-18.83	AVG	
12	6.6340	9.71	20.25	29.96	50.00	-20.04	AVG	

Conducted Emission Test Data

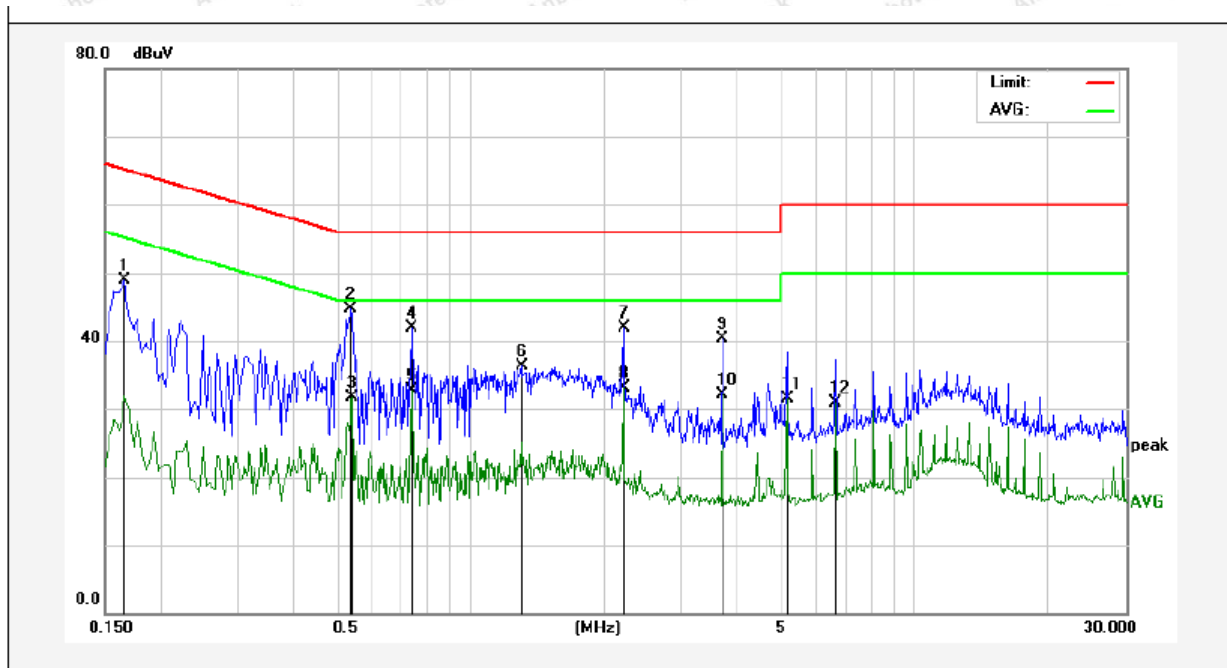
Test Site: 1# Shielded Room
Operating Condition: CH11
Test Specification: AC 240V, 60Hz
Comment: Neutral Line
Tem.: 21.9°C Hum.: 58%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1700	27.56	19.90	47.46	64.96	-17.50	QP	
2	0.1780	26.38	19.90	46.28	64.57	-18.29	QP	
3	0.7380	19.65	20.05	39.70	56.00	-16.30	QP	
4	0.7380	10.32	20.05	30.37	46.00	-15.63	AVG	
5	1.6140	20.23	20.13	40.36	56.00	-15.64	QP	
6	2.2139	17.91	20.14	38.05	56.00	-17.95	QP	
7	2.2139	11.20	20.14	31.34	46.00	-14.66	AVG	
8	2.8140	17.05	20.16	37.21	56.00	-18.79	QP	
9	3.6900	10.17	20.17	30.34	46.00	-15.66	AVG	
10	5.1660	9.98	20.21	30.19	50.00	-19.81	AVG	
11	6.6460	8.23	20.25	28.48	50.00	-21.52	AVG	
12	8.1220	8.64	20.29	28.93	50.00	-21.07	AVG	

Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: CH11
Test Specification: AC 120V, 60Hz for adapter
Comment: Live Line
Tem.: 21.9°C Hum.: 58%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1660	29.02	19.90	48.92	65.15	-16.23	QP	
2	0.5380	24.66	19.99	44.65	56.00	-11.35	QP	
3	0.5420	11.70	19.99	31.69	46.00	-14.31	AVG	
4	0.7380	21.82	20.05	41.87	56.00	-14.13	QP	
5	0.7380	12.75	20.05	32.80	46.00	-13.20	AVG	
6	1.3060	16.22	20.13	36.35	56.00	-19.65	QP	
7	2.2180	21.80	20.14	41.94	56.00	-14.06	QP	
8	2.2180	12.92	20.14	33.06	46.00	-12.94	AVG	
9	3.6940	20.21	20.17	40.38	56.00	-15.62	QP	
10	3.6940	12.01	20.17	32.18	46.00	-13.82	AVG	
11	5.1700	11.33	20.21	31.54	50.00	-18.46	AVG	
12	6.6500	10.72	20.25	30.97	50.00	-19.03	AVG	

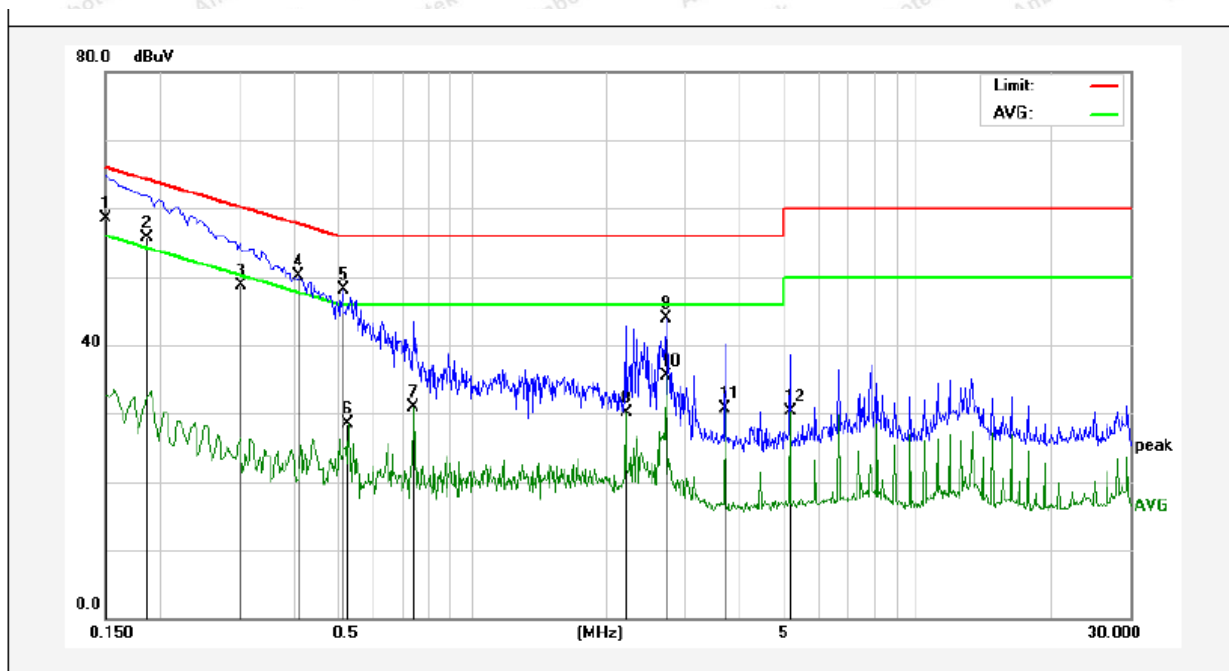
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Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: CH11
Test Specification: AC 120V, 60Hz for adapter
Comment: Neutral Line
Tem.: 21.9°C Hum.: 58%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1500	38.54	19.90	58.44	65.99	-7.55	QP	
2	0.1860	35.84	19.90	55.74	64.21	-8.47	QP	
3	0.3020	28.72	19.89	48.61	60.19	-11.58	QP	
4	0.4100	30.20	19.94	50.14	57.65	-7.51	QP	
5	0.5140	28.04	19.98	48.02	56.00	-7.98	QP	
6	0.5299	8.51	19.99	28.50	46.00	-17.50	AVG	
7	0.7420	10.79	20.05	30.84	46.00	-15.16	AVG	
8	2.2220	10.04	20.14	30.18	46.00	-15.82	AVG	
9	2.7300	23.77	20.15	43.92	56.00	-12.08	QP	
10	2.7300	15.39	20.15	35.54	46.00	-10.46	AVG	
11	3.7020	10.54	20.17	30.71	46.00	-15.29	AVG	
12	5.1779	10.00	20.21	30.21	50.00	-19.79	AVG	



4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

4.2. Test Setup

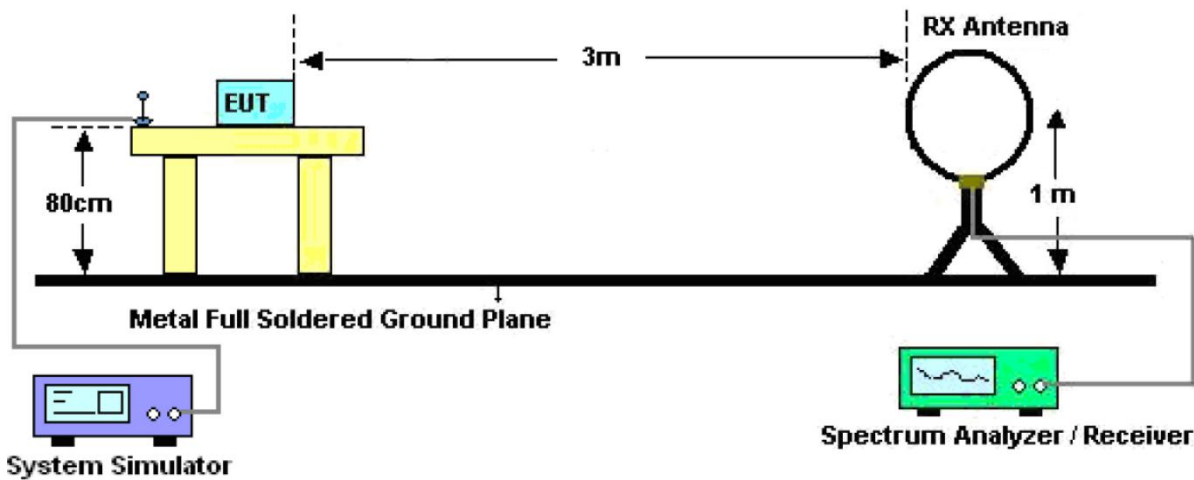


Figure 1. Below 30MHz

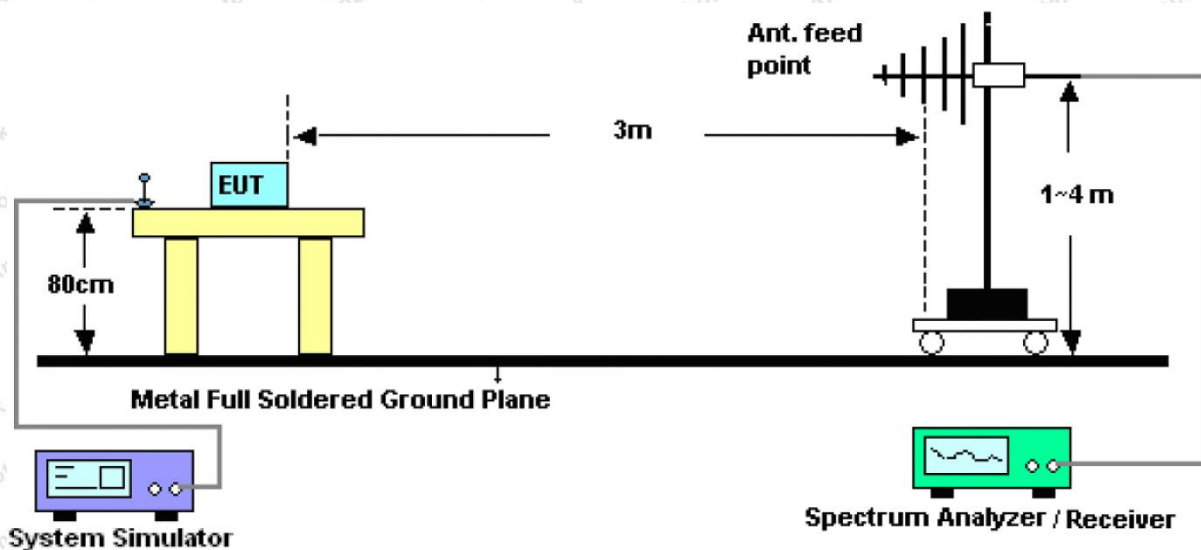


Figure 2. 30MHz to 1GHz

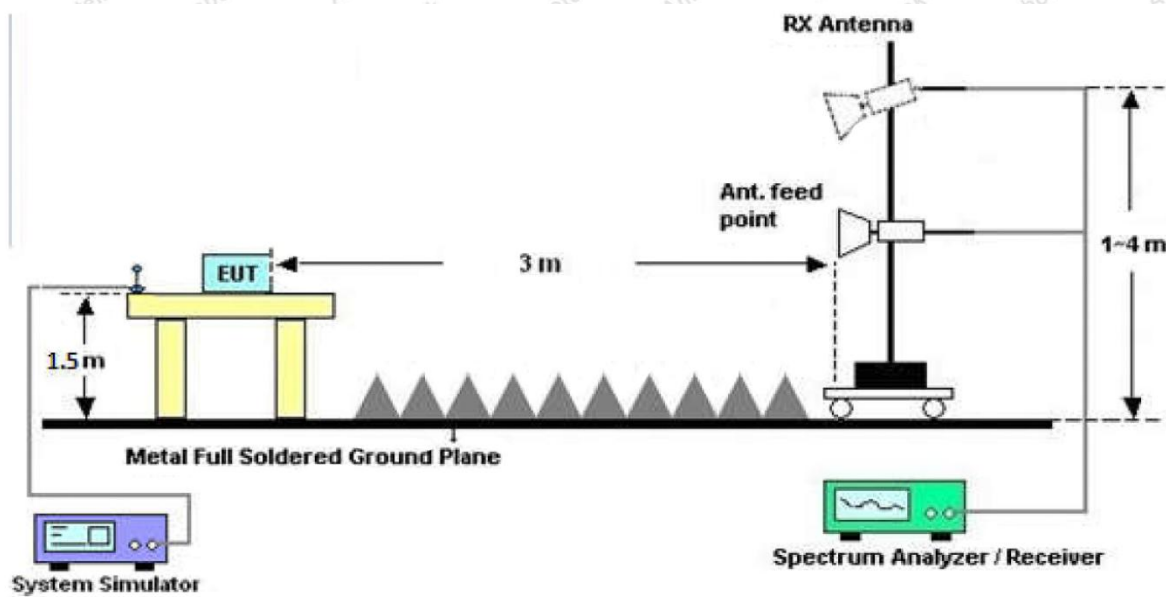


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW = 30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 100kHz, VBW = 300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz, Set the spectrum analyzer as:

RBW = 1MHz, VBW = 1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.

RBW = 1MHz, VBW = 10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

4.4. Test Data

PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz and above 18000MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

During the test, pre-scan the GFSK modulation, and found the GFSK modulation Low channel which is the worst case, only the worst case is recorded in the report.

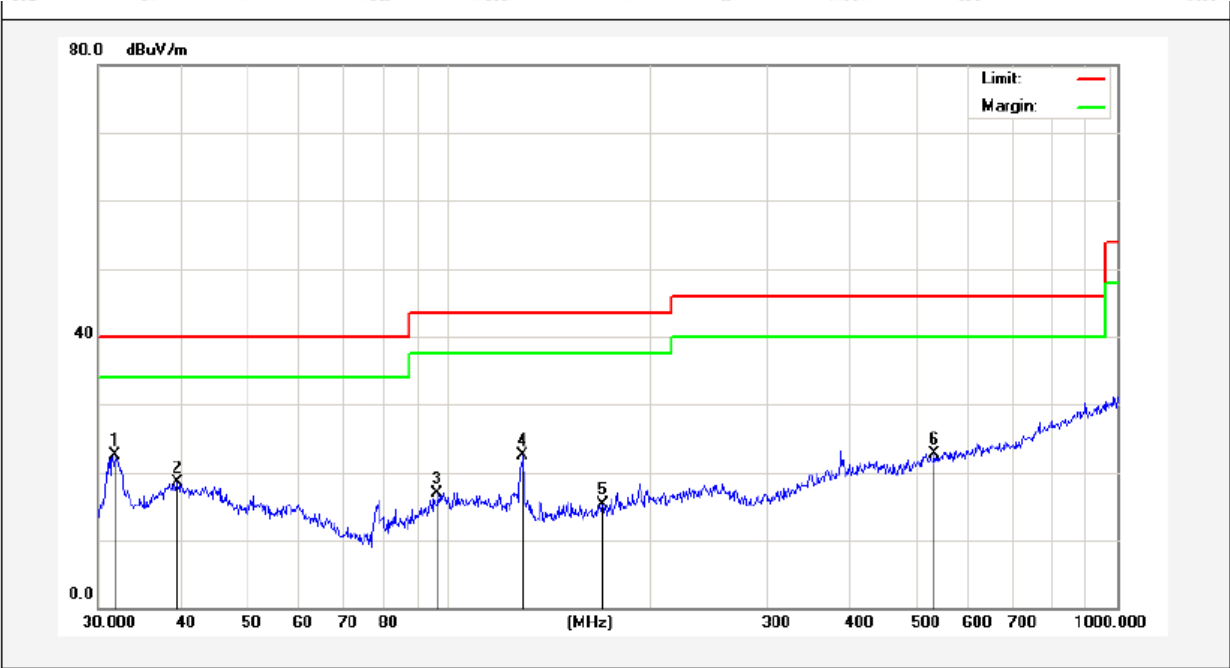
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Test Results (30~1000MHz)

Job No.: SZAWW190515011-02
 Temp.(°C)/Hum.(%RH): 22.2°C / 57%RH

Standard: FCC PART 15C
 Power Source: AC 240V, 60Hz

Test Mode: CH11
 Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	31.7313	40.47	-18.05	22.42	40.00	-17.58	QP	300	0	
2	39.4371	33.12	-14.67	18.45	40.00	-21.55	QP	300	88	
3	96.4362	39.04	-22.09	16.95	43.50	-26.55	QP	300	188	
4	129.4677	45.14	-22.69	22.45	43.50	-21.05	QP	300	277	
5	170.1948	35.83	-20.57	15.26	43.50	-28.24	QP	300	341	
6	531.9635	33.77	-11.04	22.73	46.00	-23.27	QP	300	360	

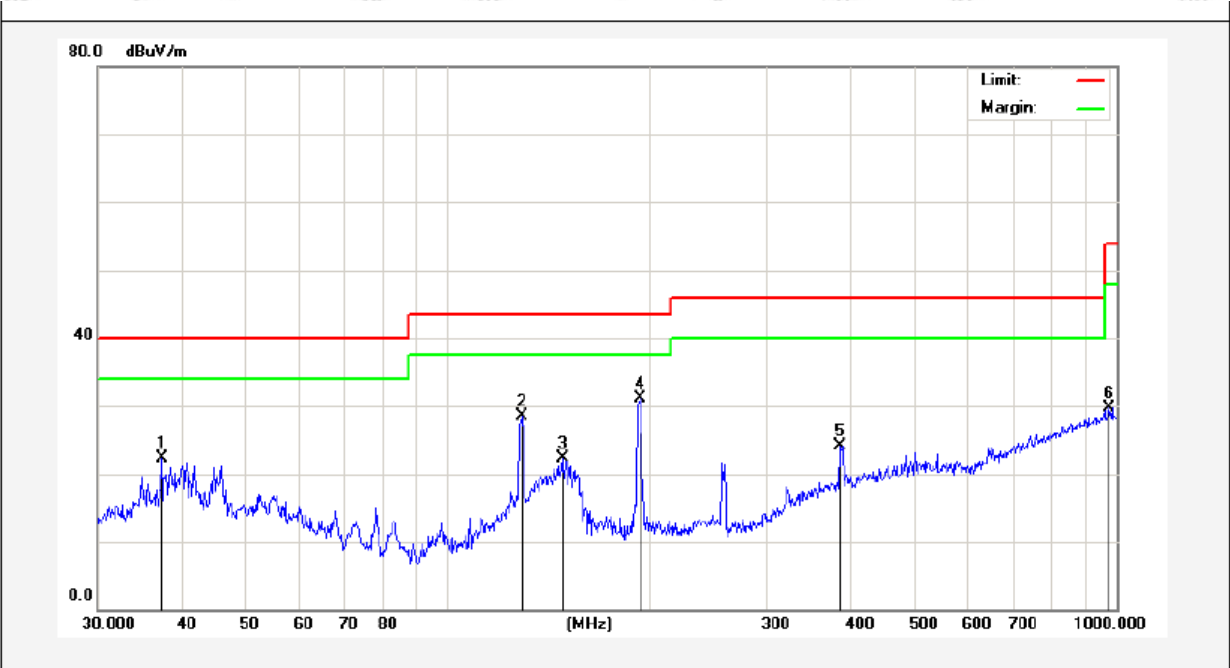
Report No.: SZAWW190515011-02
FCC ID: 2ATC3-H201STSH00
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Test Results (30~1000MHz)

Job No.: SZAWW190515011-02
Temp.(°C)/Hum.(%RH): 22.2°C / 57%RH

Standard: FCC PART 15C
Power Source: AC 240V, 60Hz

Test Mode: CH11
Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	37.4165	37.03	-14.77	22.26	40.00	-17.74	QP	300	0	
2	129.4677	46.18	-17.73	28.45	43.50	-15.05	QP	300	74	
3	148.4410	40.63	-18.36	22.27	43.50	-21.23	QP	300	124	
4	194.4534	47.04	-15.90	31.14	43.50	-12.36	QP	300	202	
5	386.6338	36.36	-12.27	24.09	46.00	-21.91	QP	300	300	
6	972.3374	32.28	-2.60	29.68	54.00	-24.32	QP	300	360	

Test Results (30~1000MHz)

Job No.: SZAWW190515011-02

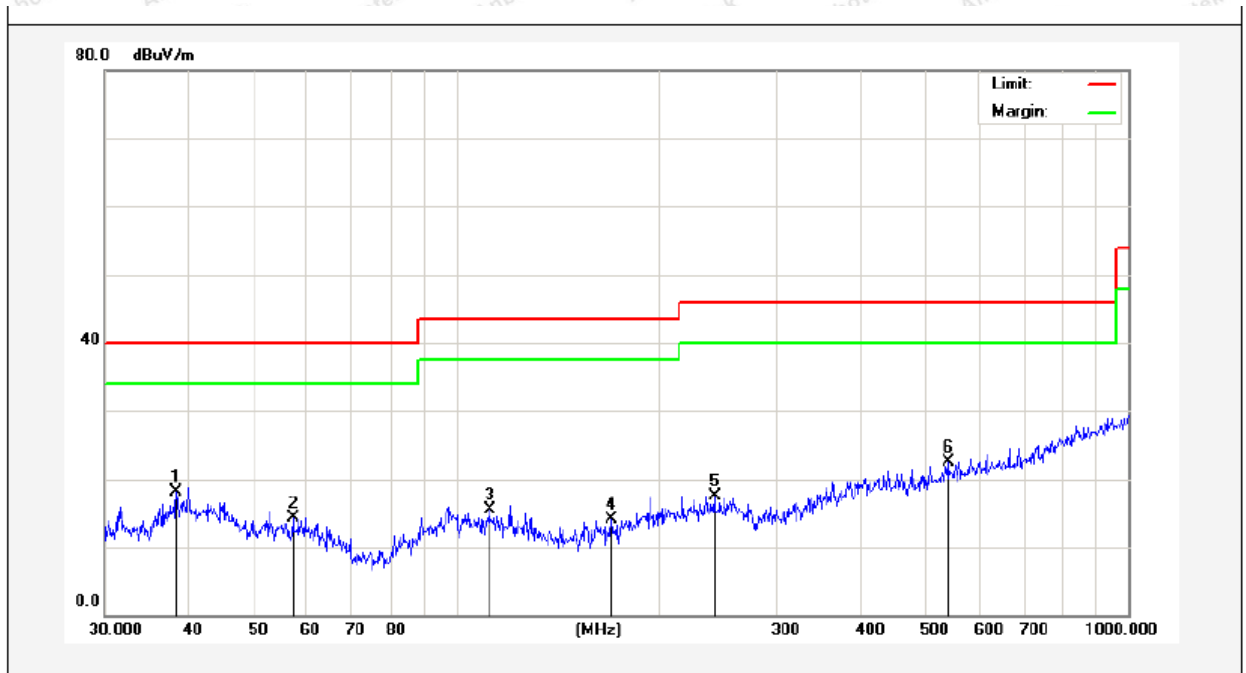
Temp.(°C)/Hum.(%RH): 22.2°C / 57%RH

Standard: FCC PART 15C

Power Source: AC 120V, 60Hz

Test Mode: CH11

Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	38.3462	33.35	-15.26	18.09	40.00	-21.91	QP	300	0	
2	57.1914	32.18	-17.84	14.34	40.00	-25.66	QP	300	77	
3	112.1305	37.31	-21.77	15.54	43.50	-27.96	QP	300	121	
4	170.1948	34.68	-20.57	14.11	43.50	-29.39	QP	300	252	
5	242.5253	36.19	-18.63	17.56	46.00	-28.44	QP	300	262	
6	539.4775	33.60	-11.07	22.53	46.00	-23.47	QP	300	360	

Report No.: SZAWW190515011-02
FCC ID: 2ATC3-H201STSH00
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Test Results (30~1000MHz)

Job No.: SZAWW190515011-02

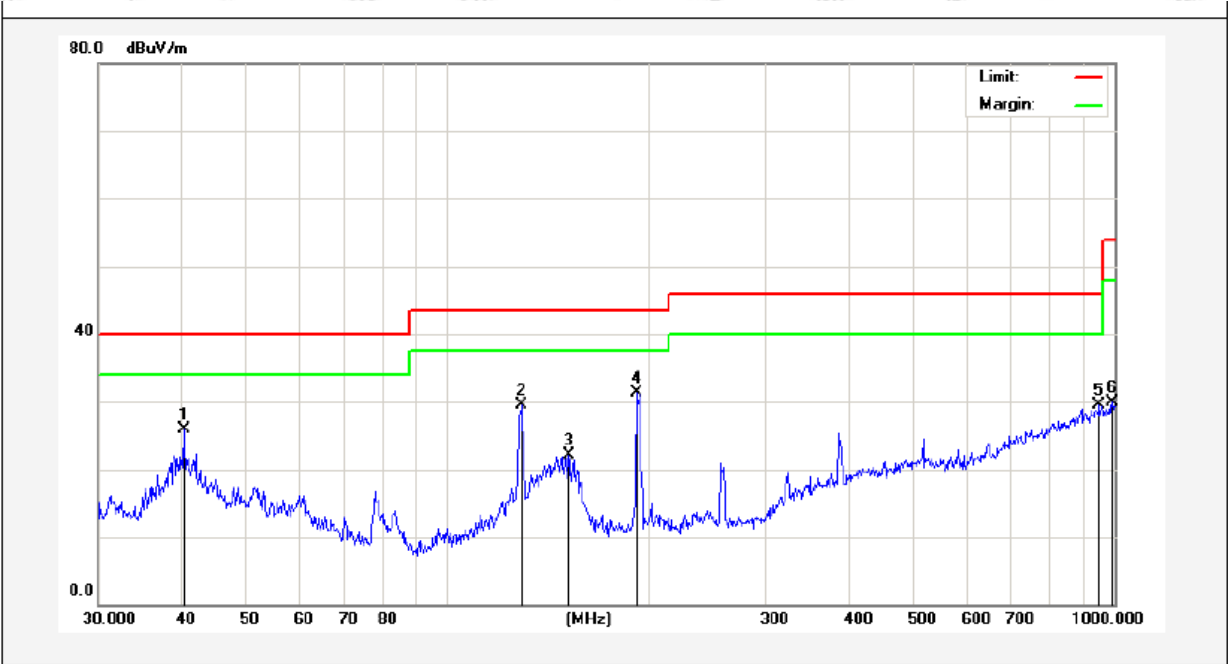
Standard: FCC PART 15C

Test Mode: CH11

Temp.(°C)/Hum.(%RH): 22.2°C / 57%RH

Power Source: AC 120V, 60Hz

Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	40.2757	39.38	-13.45	25.93	40.00	-14.07	QP	300	0	
2	129.4677	47.21	-17.73	29.48	43.50	-14.02	QP	300	14	
3	152.1297	40.33	-18.24	22.09	43.50	-21.41	QP	300	66	
4	192.4186	47.27	-15.91	31.36	43.50	-12.14	QP	300	188	
5	948.7610	32.41	-2.98	29.43	46.00	-16.57	QP	300	227	
6	993.0114	32.13	-2.26	29.87	54.00	-24.13	QP	300	360	

Test Results (Above 1000MHz)

Test Mode: CH11					Test channel: Lowest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4810.00	38.66	34.04	6.58	34.09	45.19	74.00	-28.81	V
7215.00	32.73	37.11	7.73	34.50	43.07	74.00	-30.93	V
9620.00	32.27	39.31	9.23	34.79	46.02	74.00	-27.98	V
12025.00	*					74.00		V
14430.00	*					74.00		V
4810.00	43.22	34.04	6.58	34.09	49.75	74.00	-24.25	H
7215.00	34.60	37.11	7.73	34.50	44.94	74.00	-29.06	H
9620.00	31.82	39.31	9.23	34.79	45.57	74.00	-28.43	H
12025.00	*					74.00		H
14430.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4810.00	27.21	34.04	6.58	34.09	33.74	54.00	-20.26	V
7215.00	21.26	37.11	7.73	34.50	31.60	54.00	-22.40	V
9620.00	20.25	39.31	9.23	34.79	34.00	54.00	-20.00	V
12025.00	*					54.00		V
14430.00	*					54.00		V
4810.00	31.59	34.04	6.58	34.09	38.12	54.00	-15.88	H
7215.00	23.52	37.11	7.73	34.50	33.86	54.00	-20.14	H
9620.00	20.09	39.31	9.23	34.79	33.84	54.00	-20.16	H
12025.00	*					54.00		H
14430.00	*					54.00		H

Test Results (Above 1000MHz)

Test Mode: CH18					Test channel: Middle			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4880.00	36.67	34.38	6.69	34.09	43.65	74.00	-30.35	V
7320.00	31.41	37.22	7.78	34.53	41.88	74.00	-32.12	V
9760.00	31.09	39.46	9.35	34.80	45.10	74.00	-28.90	V
12200.00	*					74.00		V
14640.00	*					74.00		V
4880.00	40.83	34.38	6.69	34.09	47.81	74.00	-26.19	H
7320.00	33.11	37.22	7.78	34.53	43.58	74.00	-30.42	H
9760.00	30.46	39.46	9.35	34.80	44.47	74.00	-29.53	H
12200.00	*					74.00		H
14640.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4880.00	25.61	34.38	6.69	34.09	32.59	54.00	-21.41	V
7320.00	20.17	37.22	7.78	34.53	30.64	54.00	-23.36	V
9760.00	19.29	39.46	9.35	34.80	33.30	54.00	-20.70	V
12200.00	*					54.00		V
14640.00	*					54.00		V
4880.00	29.77	34.38	6.69	34.09	36.75	54.00	-17.25	H
7320.00	22.31	37.22	7.78	34.53	32.78	54.00	-21.22	H
9760.00	18.97	39.46	9.35	34.80	32.98	54.00	-21.02	H
12200.00	*					54.00		H
14640.00	*					54.00		H

Test Results (Above 1000MHz)

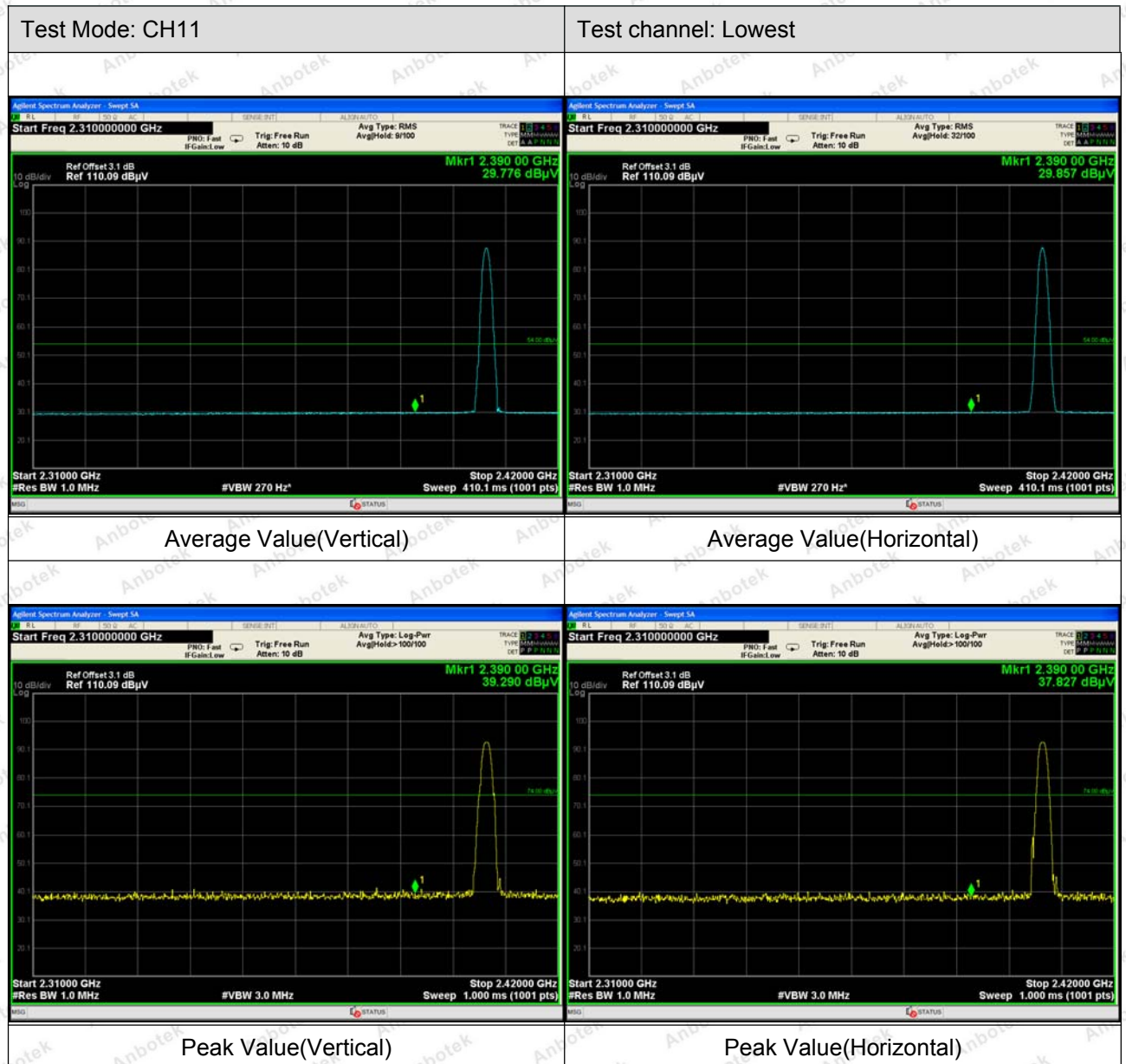
Test Mode: CH26					Test channel: Highest			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4960.00	37.06	34.72	6.79	34.09	44.48	74.00	-29.52	V
7440.00	31.67	37.34	7.82	34.57	42.26	74.00	-31.74	V
9920.00	31.33	39.62	9.46	34.81	45.60	74.00	-28.40	V
12400.00	*					74.00		V
14880.00	*					74.00		V
4960.00	41.30	34.72	6.79	34.09	48.72	74.00	-25.28	H
7440.00	33.40	37.34	7.82	34.57	43.99	74.00	-30.01	H
9920.00	30.72	39.62	9.46	34.81	44.99	74.00	-29.01	H
12400.00	*					74.00		H
14880.00	*					74.00		H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4960.00	26.00	34.72	6.79	34.09	33.42	54.00	-20.58	V
7440.00	20.44	37.34	7.82	34.57	31.03	54.00	-22.97	V
9920.00	19.52	39.62	9.46	34.81	33.79	54.00	-20.21	V
12400.00	*					54.00		V
14880.00	*					54.00		V
4960.00	30.21	34.72	6.79	34.09	37.63	54.00	-16.37	H
7440.00	22.60	37.34	7.82	34.57	33.19	54.00	-20.81	H
9920.00	19.24	39.62	9.46	34.81	33.51	54.00	-20.49	H
12400.00	*					54.00		H
14880.00	*					54.00		H

Remark:

1. Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is the too weak instrument of signal is unable to test.

Radiated Band Edge:

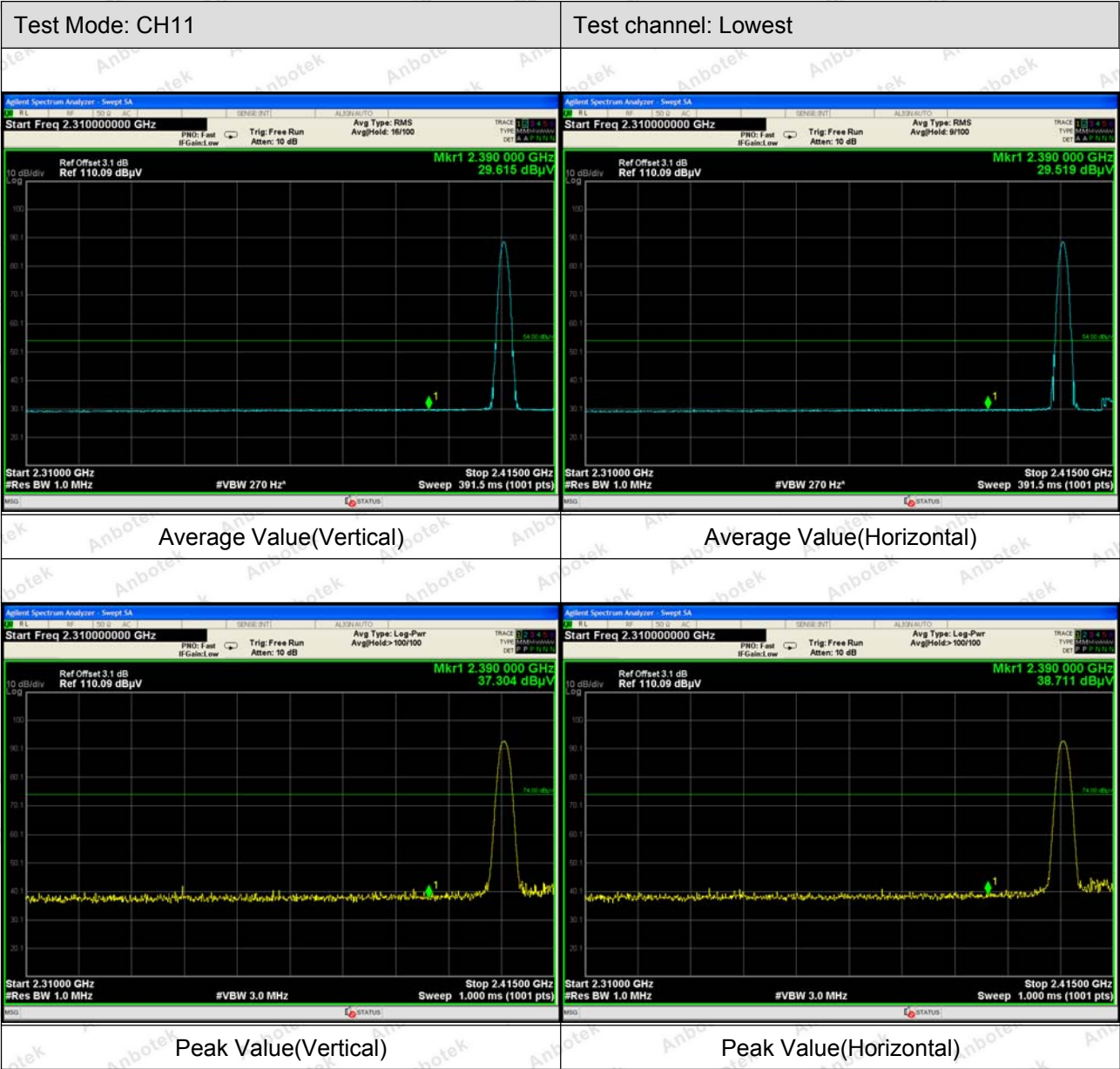
ANT A:

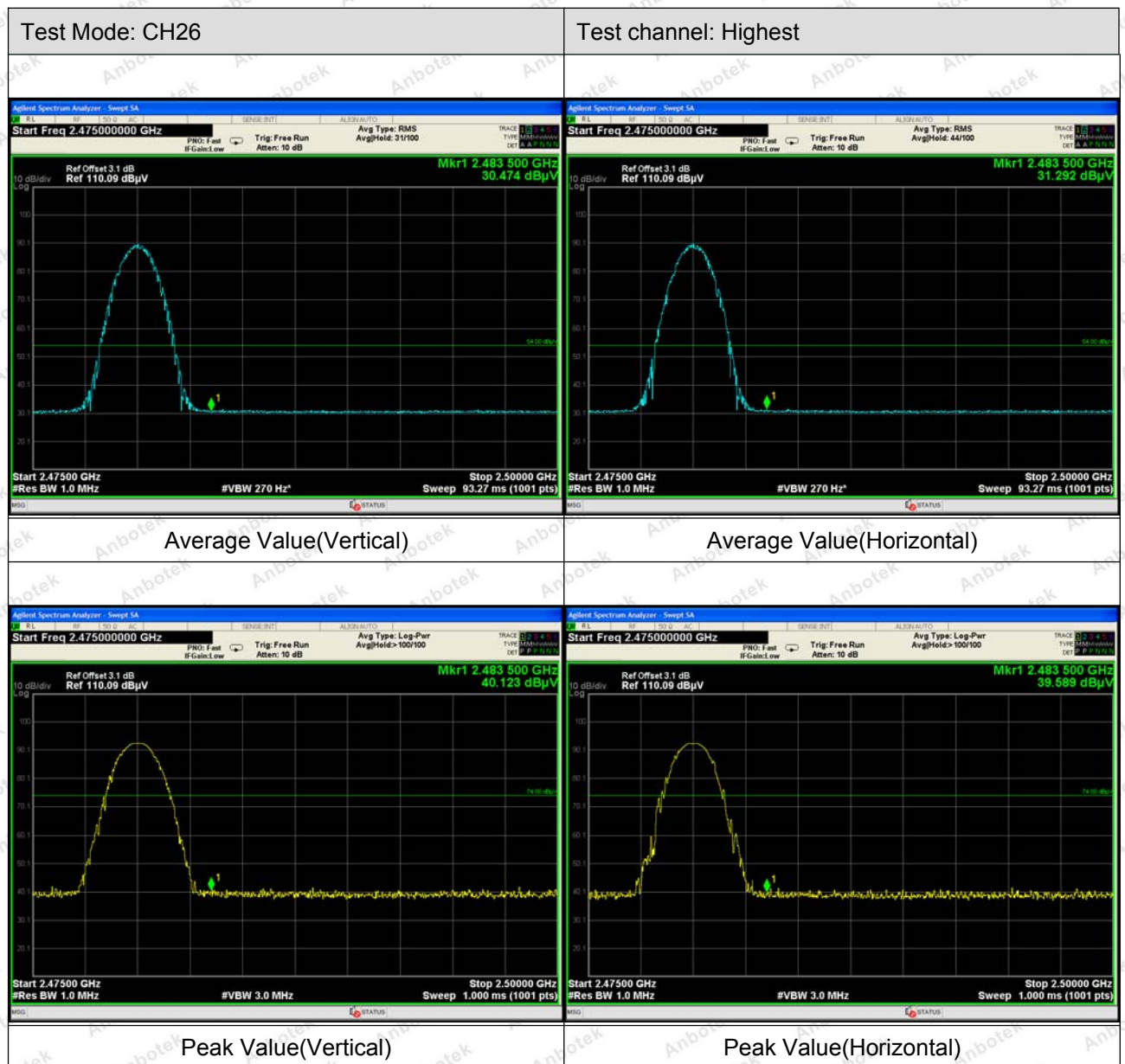




Remark:

1. Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor





Remark:

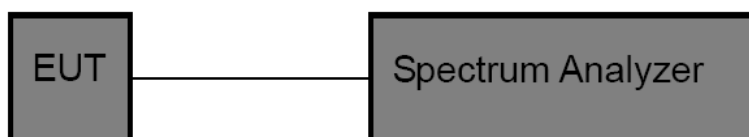
1. Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

5. Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(3)
Test Limit	30dBm

5.2. Test Setup



5.3. Test Procedure

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,
- Spectrum Setting:
 - RBW > the 20 dB bandwidth of the emission being measured
 - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
 - VBW ≥ RBW
 - Sweep = auto
 - Detector function = peak
 - Trace = max hold

5.4. Test Data

Test Item	:	Output power
Test Voltage	:	AC 120V, 60Hz
Test Result	:	PASS

Test Mode	:	CH Low ~ CH High
Temperature	:	24℃
Humidity	:	55%RH

ANT A:

Channel Frequency (MHz)	Maximum Power output(AV) (dBm)	Limit (dBm)	Results
2405	3.809	30	PASS
2440	2.465	30	PASS
2480	3.035	30	PASS

For power test the duty cycle is 100% in continous transmitting mode

ANT B:

Channel Frequency (MHz)	Maximum Power output(AV) (dBm)	Limit (dBm)	Results
2405	3.870	30	PASS
2440	2.409	30	PASS
2480	3.153	30	PASS

For power test the duty cycle is 100% in continous transmitting mode

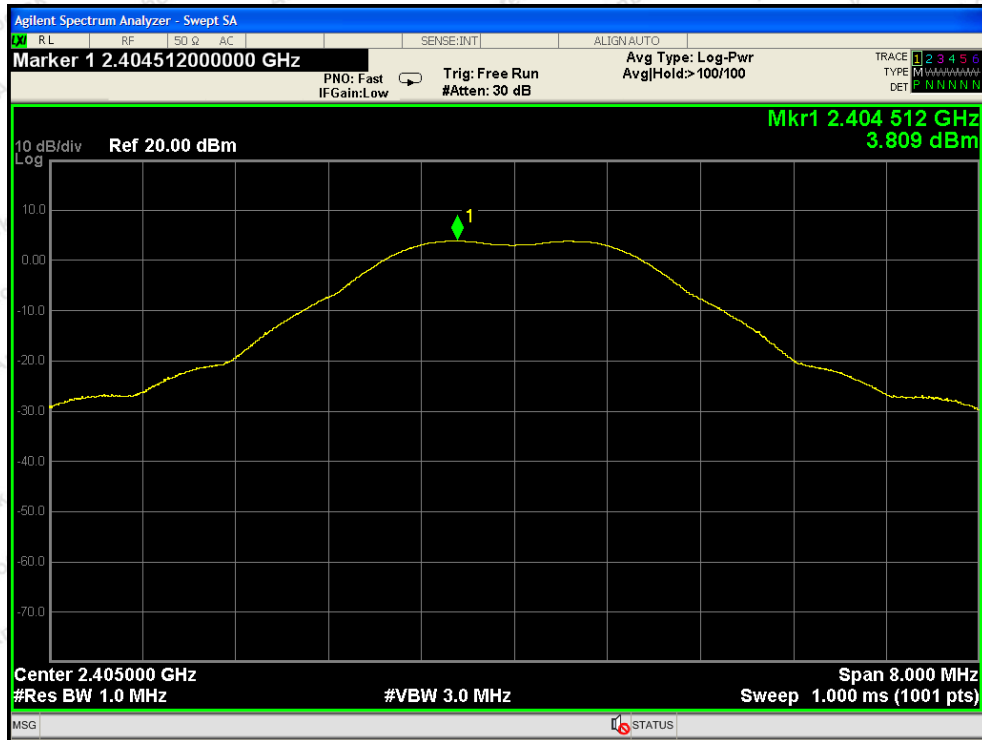
ANT A+ANT B:

Channel Frequency (MHz)	Maximum Power output(AV) (dBm)	Limit (dBm)	Results
2405	6.850	27.99	PASS
2440	5.447	27.99	PASS
2480	6.105	27.99	PASS

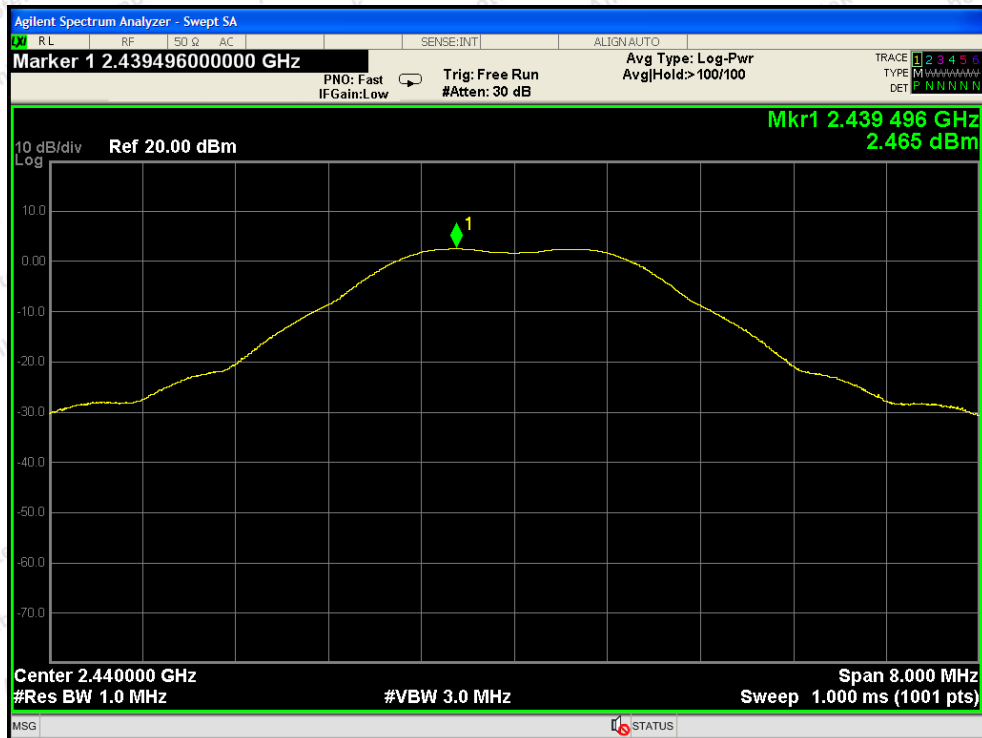
Remark: The Power Limit (dBm)=30-(The directional gain-6). The directional gain is 8.01 dBi.

For power test the duty cycle is 100% in continous transmitting mode

ANT A:

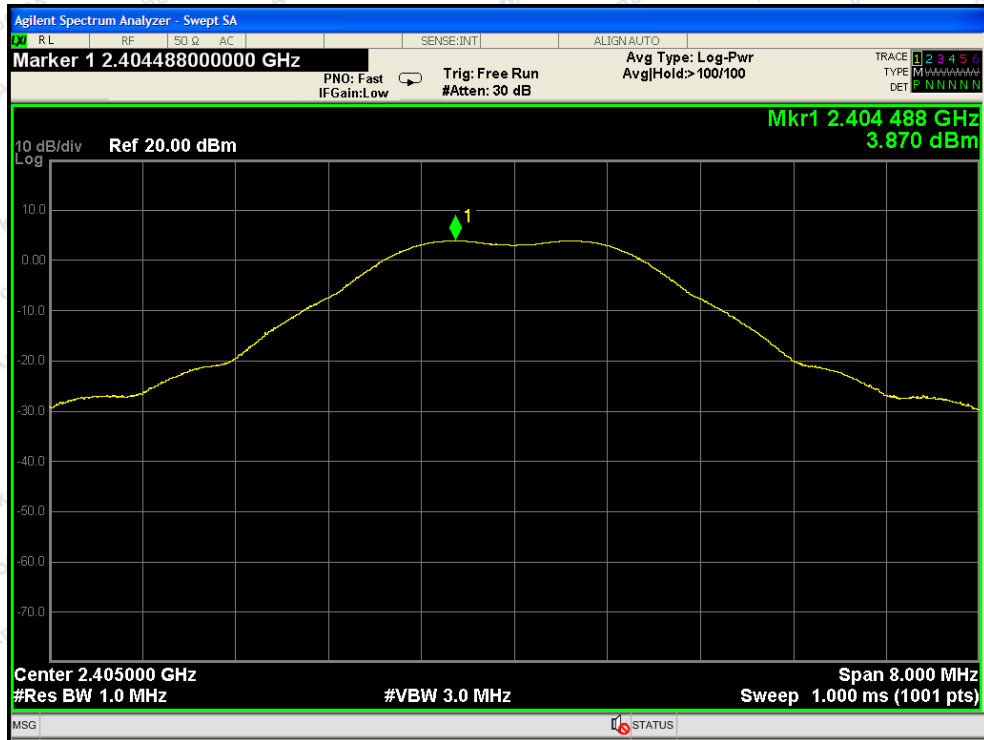


Test Mode: Low

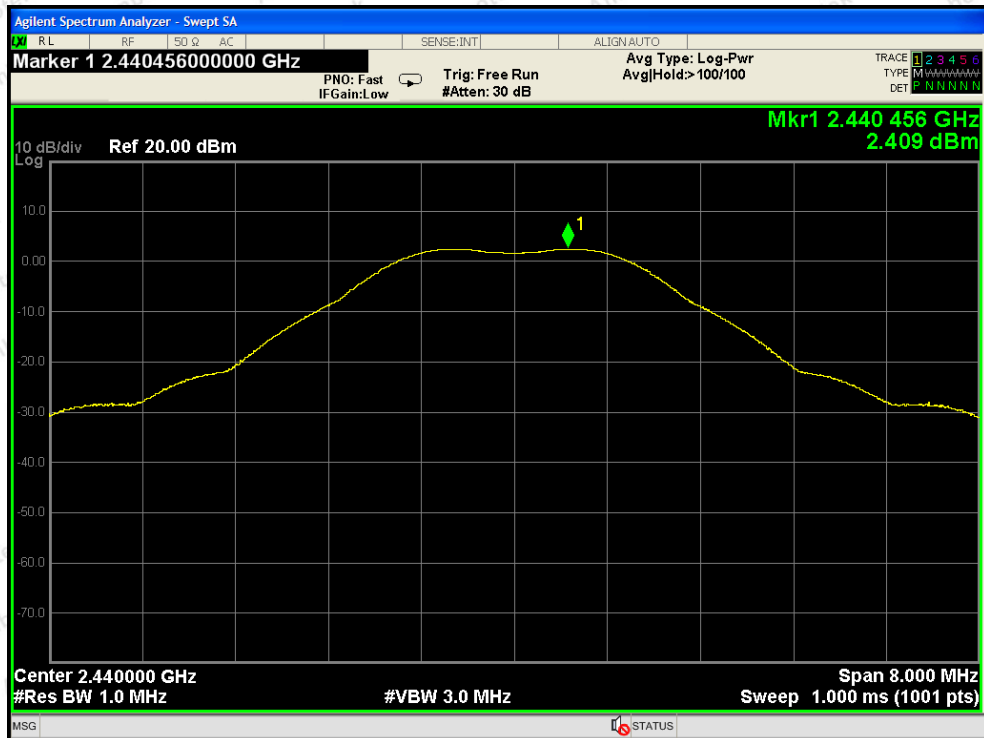


Test Mode: Middle

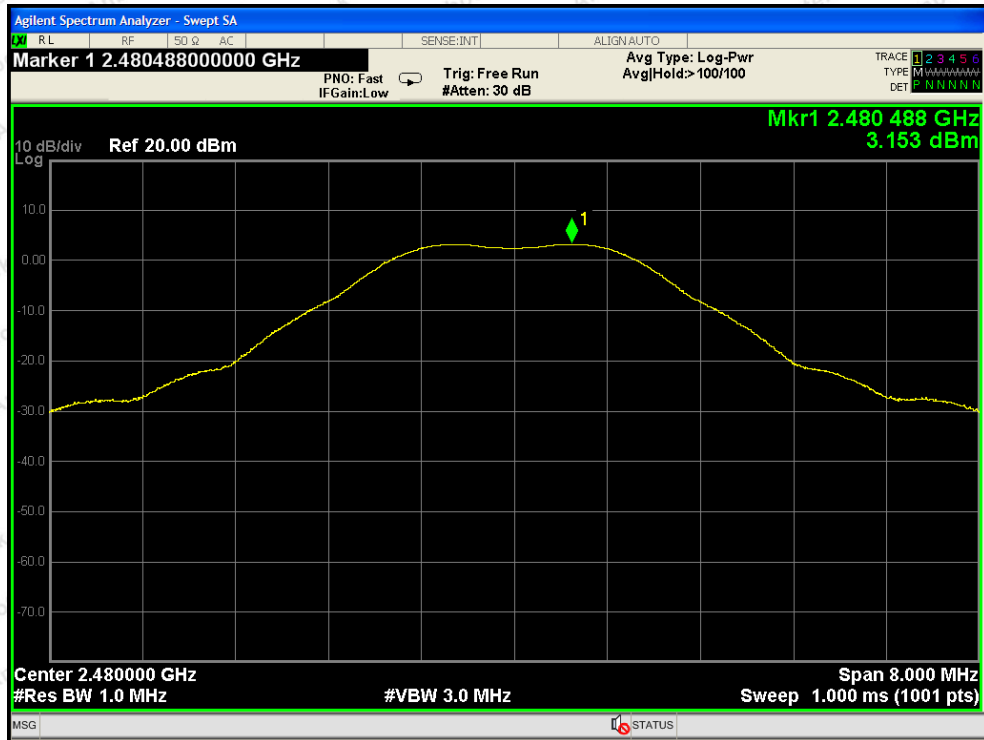
ANT B:



Test Mode: Low



Test Mode: Middle



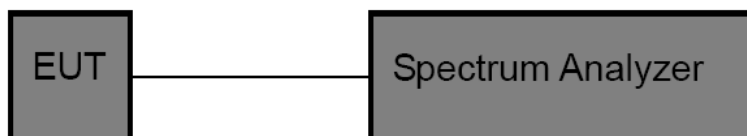
Test Mode: High

6. 6DB Occupy Bandwidth Test

6.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(2)
Test Limit	>500kHz

6.2. Test Setup



6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:
RBW = 100kHz, VBW≥3*RBW =300kHz,
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

6.4. Test Data

Test Item	:	6dB Bandwidth
Test Voltage	:	AC 120V, 60Hz
Test Result	:	PASS

Test Mode	:	CH Low ~ CH High
Temperature	:	24℃
Humidity	:	55%RH

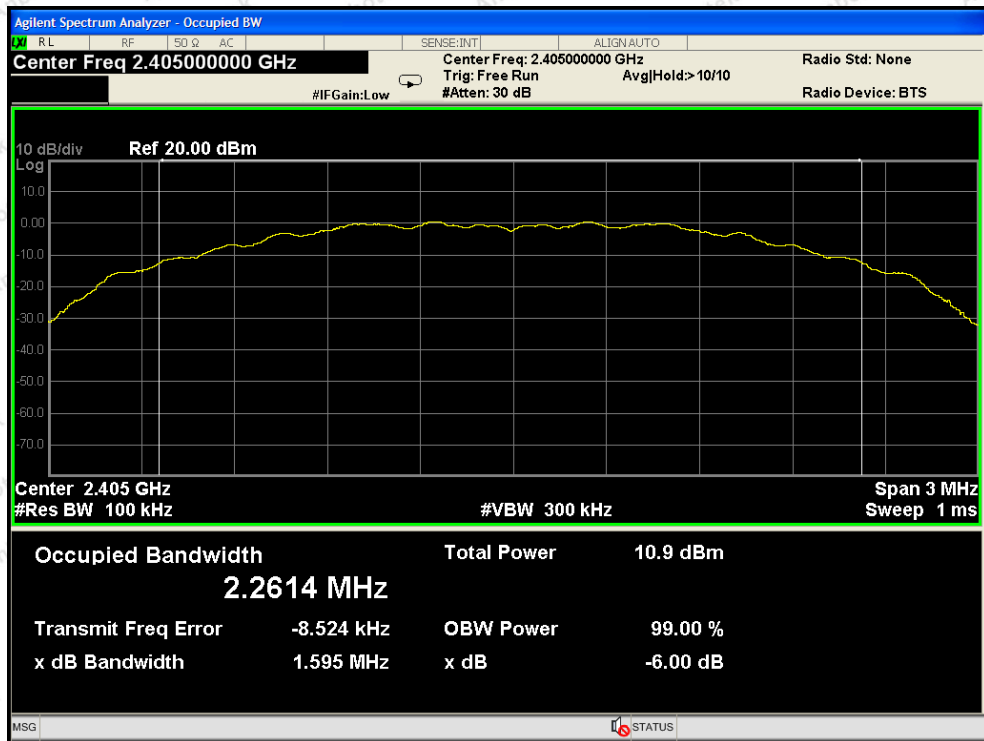
ANT A:

Channel	Frequency(MHz)	Bandwidth (kHz)	Limit (kHz)	Results
Low	2405	1595	>500	PASS
Middle	2440	1575		PASS
High	2480	1585		PASS

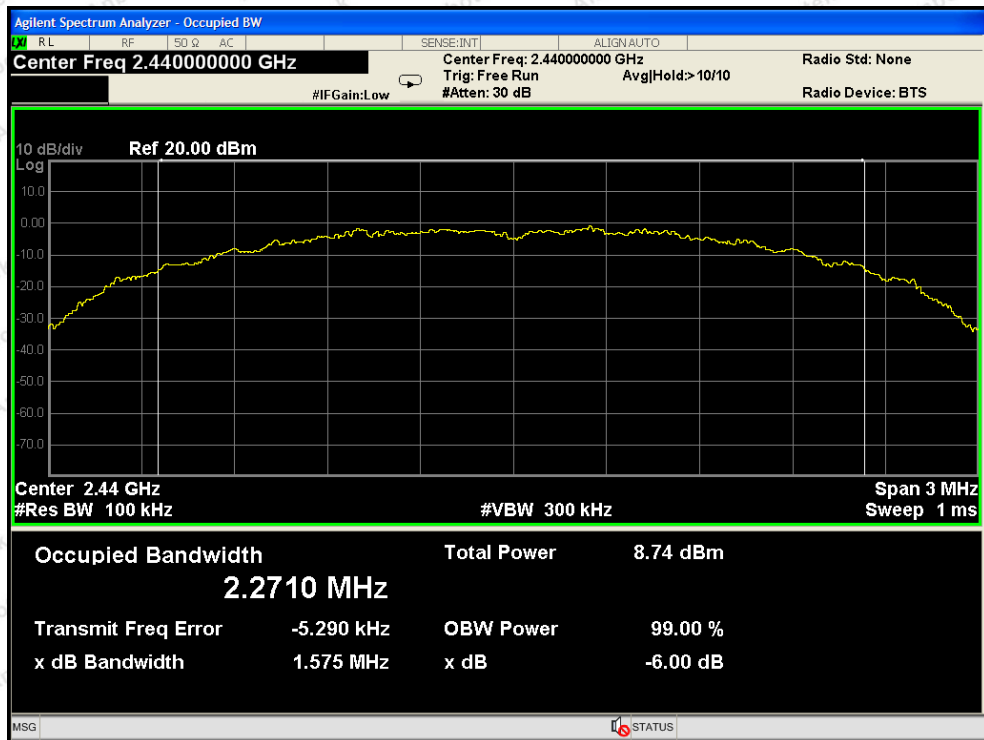
ANT B:

Channel	Frequency(MHz)	Bandwidth (kHz)	Limit (kHz)	Results
Low	2405	1583	>500	PASS
Middle	2440	1590		PASS
High	2480	1581		PASS

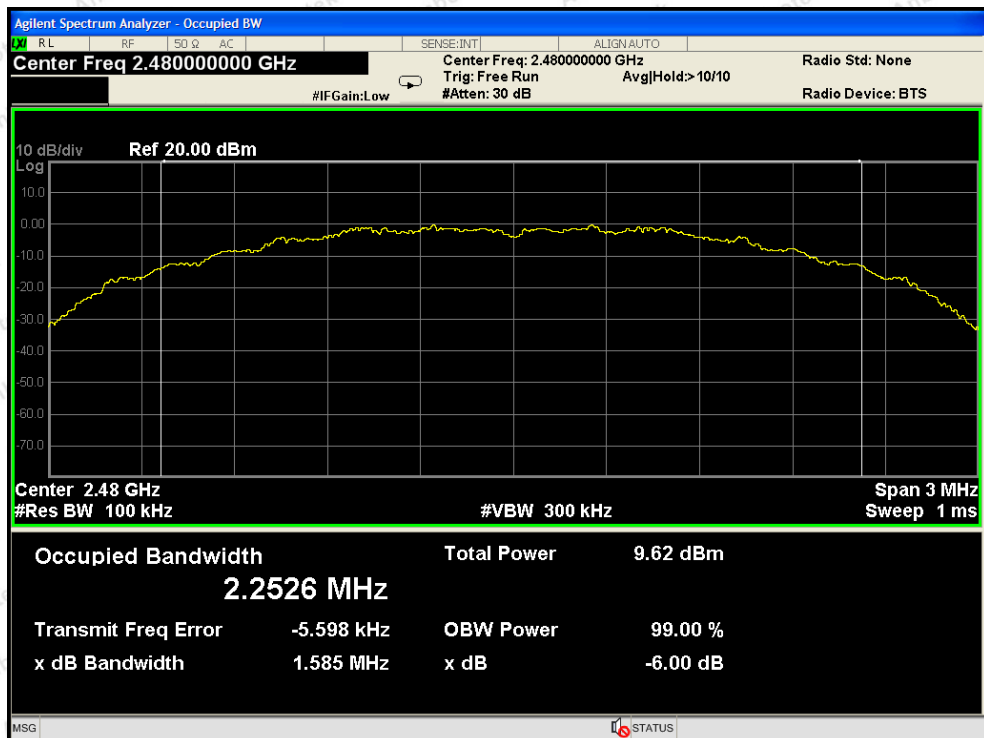
ANT A:



CH: Low

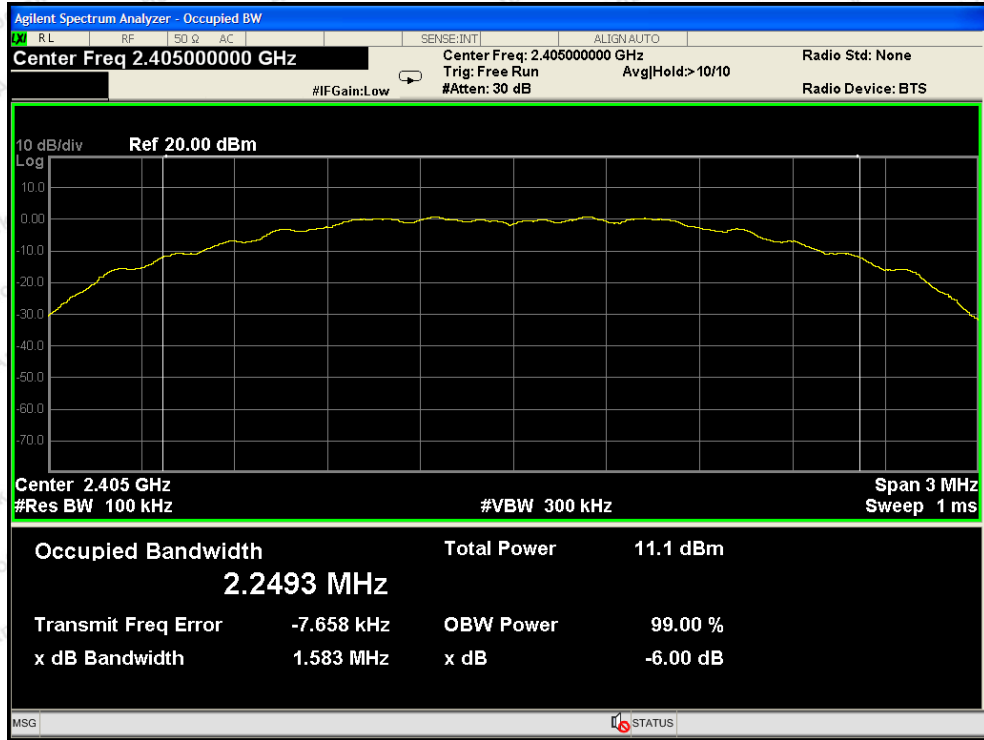


CH: Middle

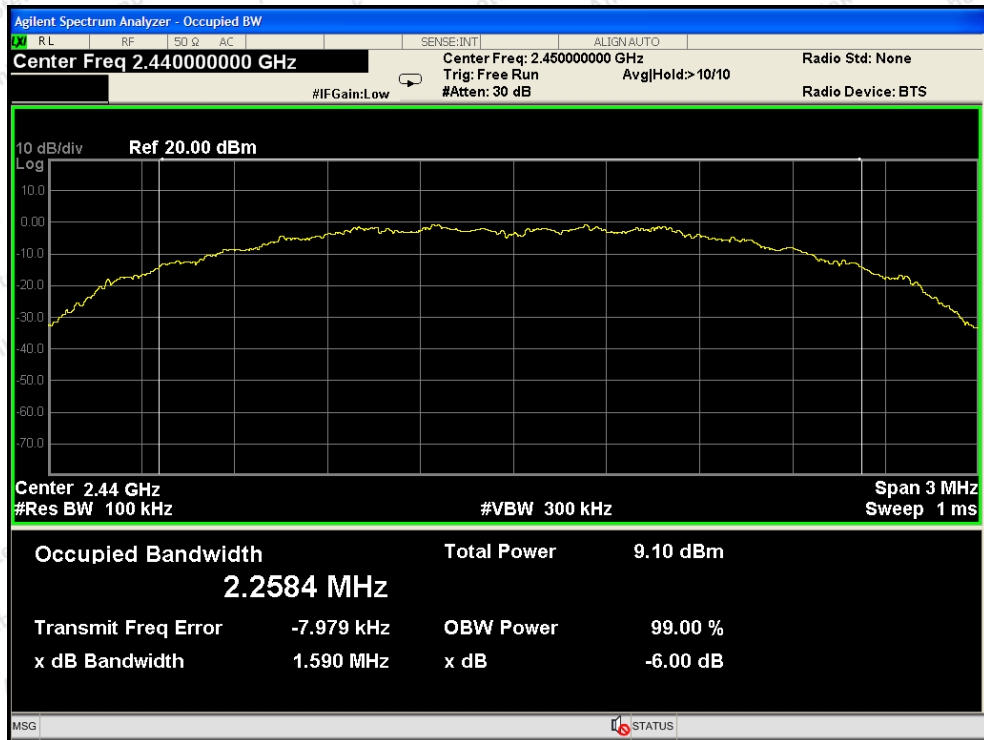


CH: High

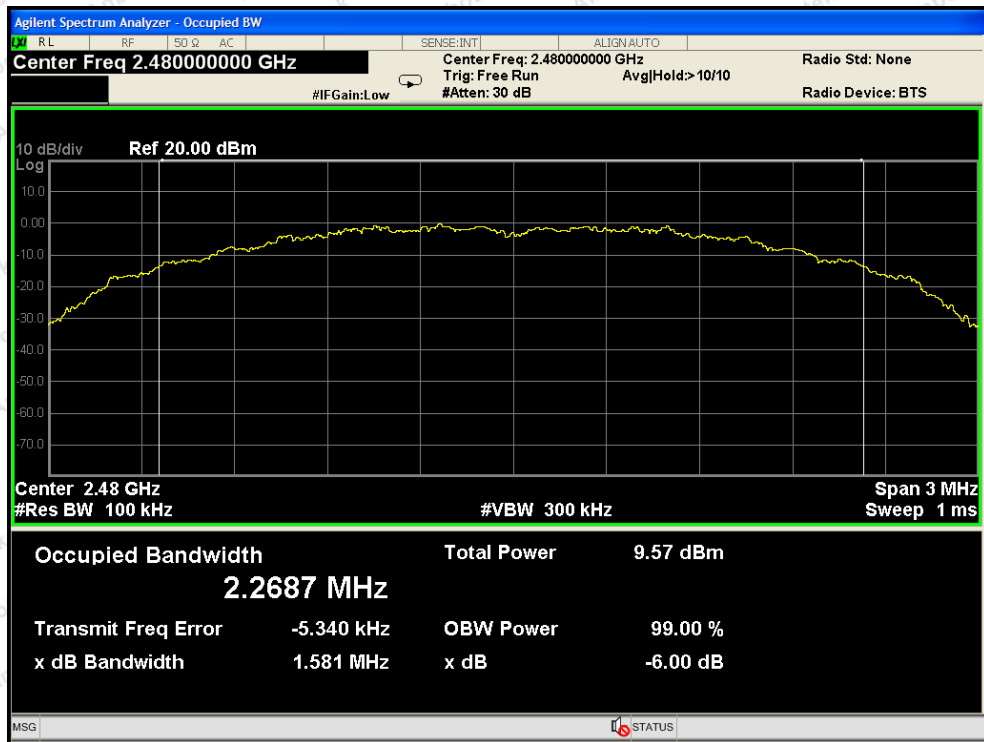
ANT B:



CH: Low



CH: Middle



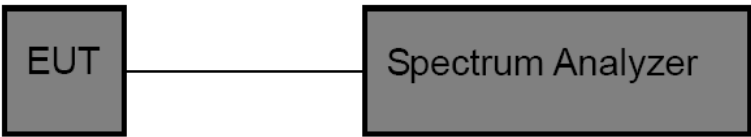
CH: High

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (e)
Test Limit	8dBm

7.2. Test Setup



7.3. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5xDTS BW
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

7.4. Test Data

Test Item	: Power Spectral Density	Test Mode	: CH Low ~ CH High
Test Voltage	: AC 120V, 60Hz	Temperature	: 24℃
Test Result	: PASS	Humidity	: 55%RH

ANT A:

Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Results
Low	2405	-11.824	8	PASS
Middle	2440	-12.517	8	PASS
High	2480	-12.332	8	PASS

ANT B:

Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Results
Low	2405	-10.975	8	PASS
Middle	2440	-13.484	8	PASS
High	2480	-12.430	8	PASS

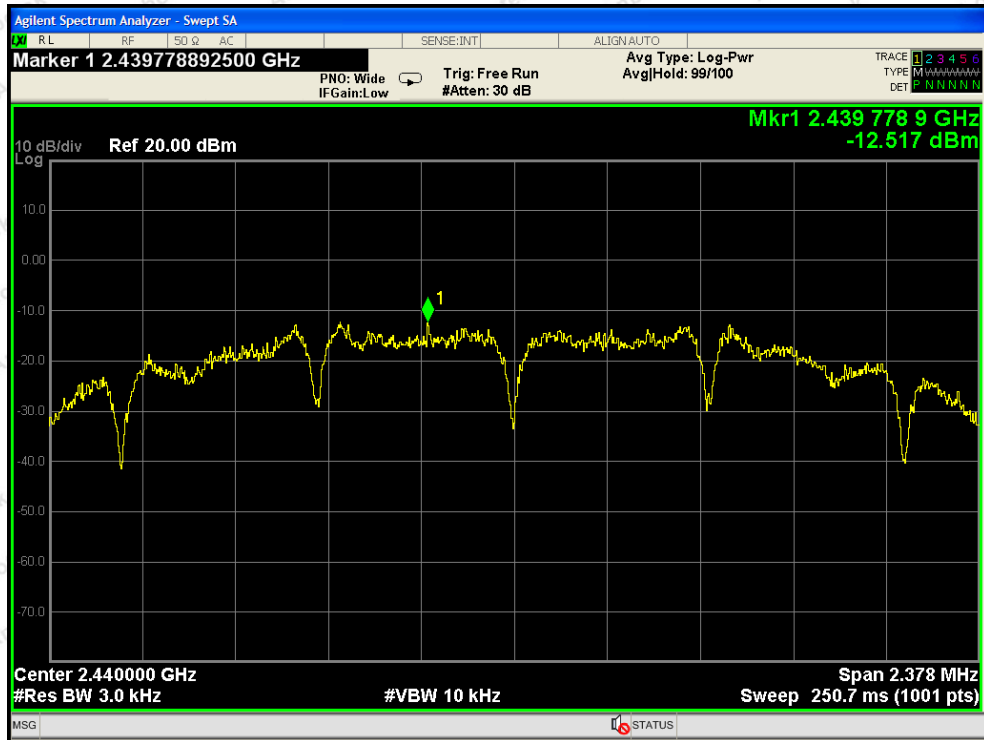
ANT A+ANT B:

Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Results
Low	2405	-8.368	5.99	PASS
Middle	2440	-9.963	5.99	PASS
High	2480	-9.370	5.99	PASS

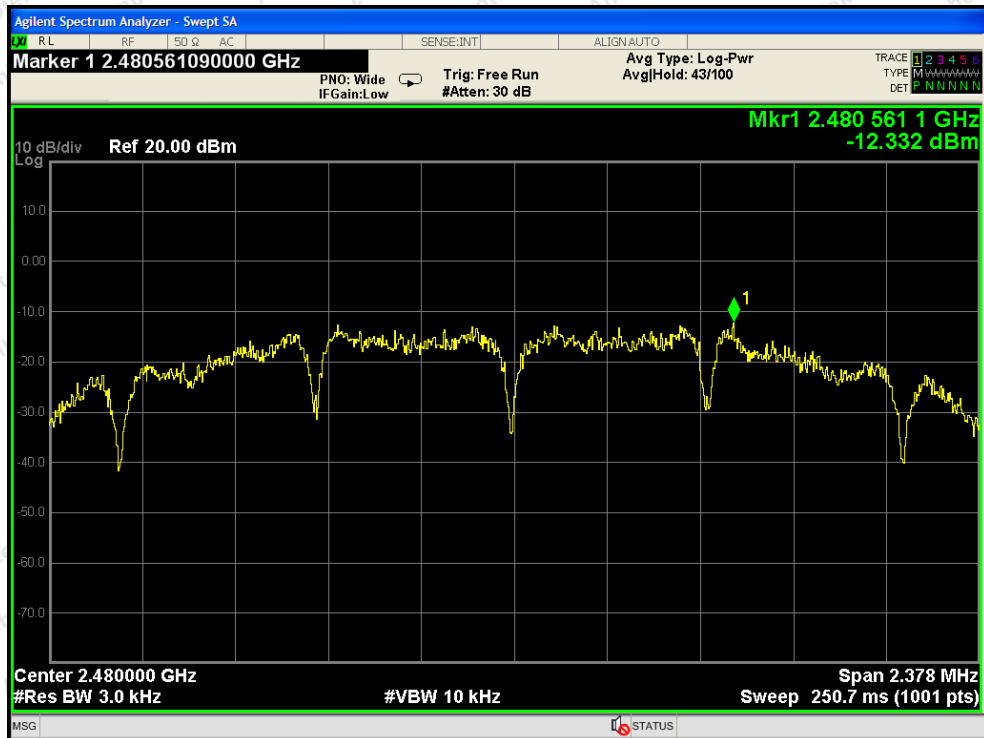
Remark: The PSD Limit (dBm/3KHz)=8-(The directional gain-6). The directional gain is 8.01 dBi.

ANT A:

CH: Low

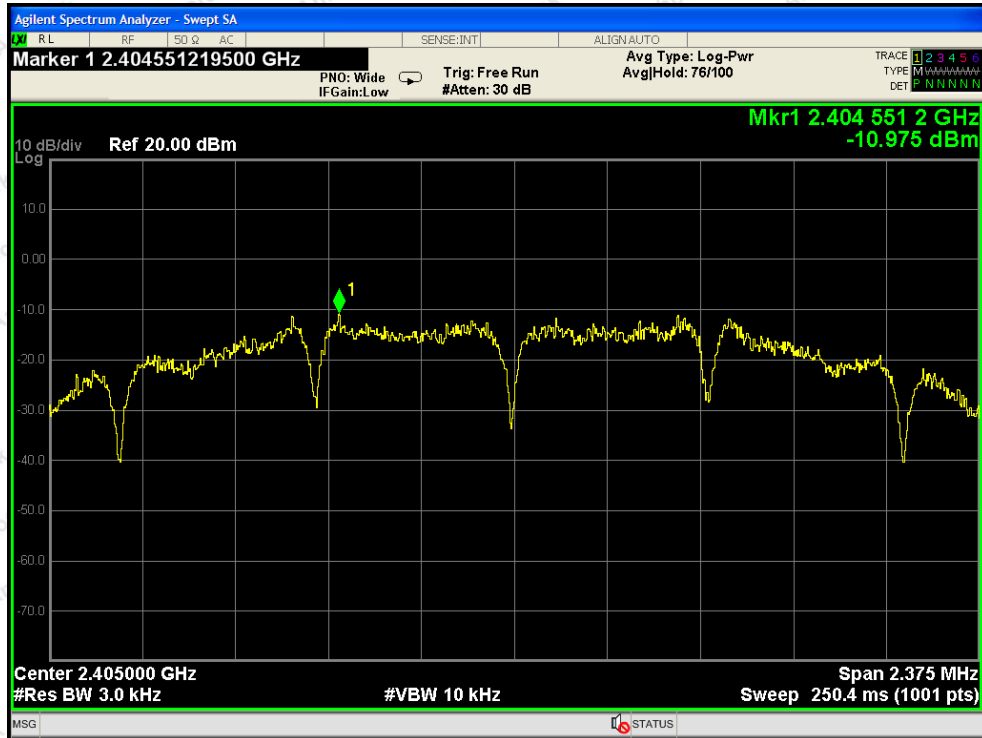


CH: Middle

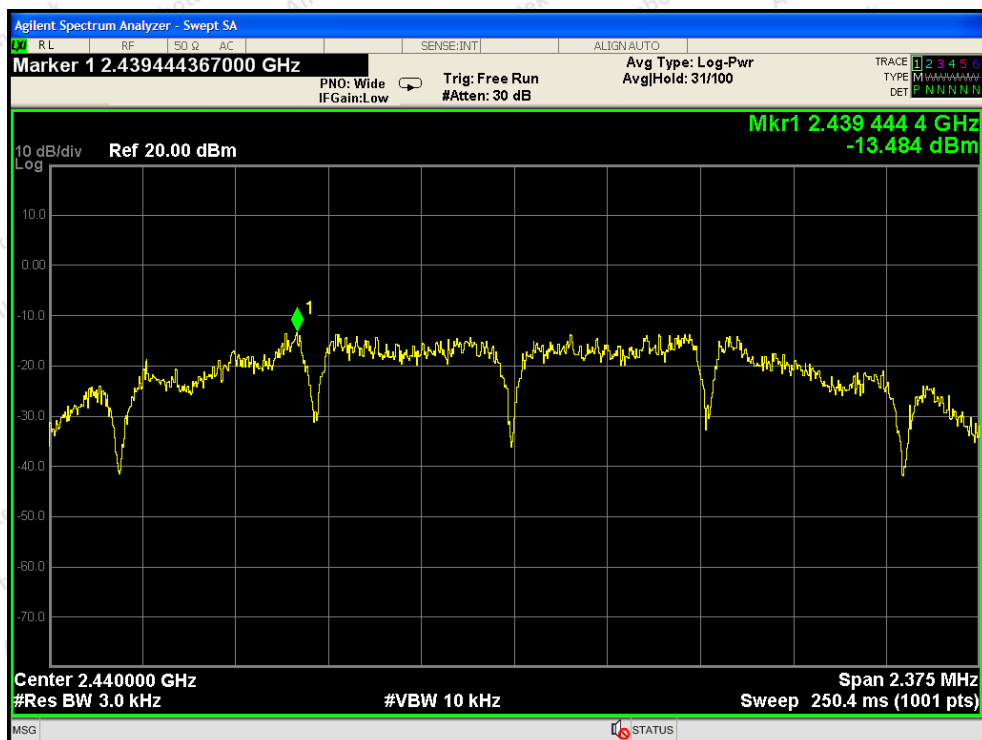


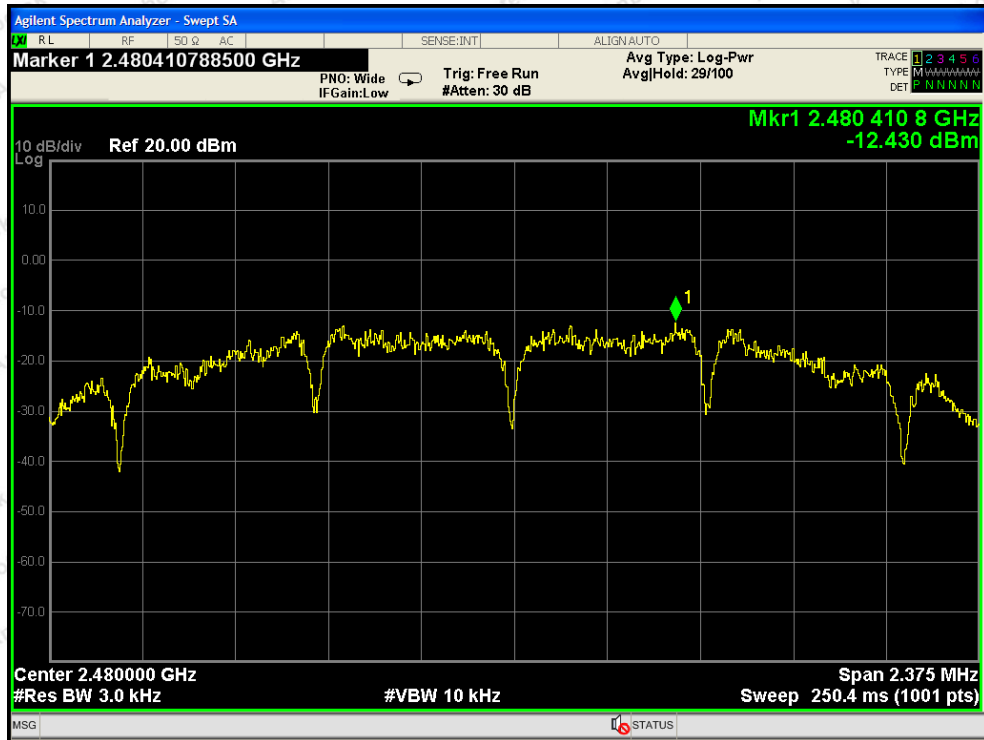
CH: High

ANT B:



CH: Low



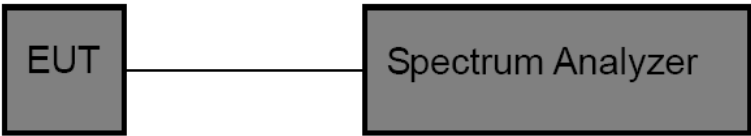


8. 100kHz Bandwidth of Frequency Band Edge Requirement

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

8.2. Test Setup



8.3. Test Procedure

Using the following spectrum analyzer setting:

- 1. Set the RBW = 100KHz.
- 2. Set the VBW = 300KHz.
- 3. Sweep time = auto couple.
- 4. Detector function = peak.
- 5. Trace mode = max hold.
- 6. Allow trace to fully stabilize.

8.4. Test Data

Test Item	: Band edge	Test Mode	: CH Low ~ CH High
Test Voltage	: AC 120V, 60Hz	Temperature	: 24℃
Test Result	: PASS	Humidity	: 55%RH

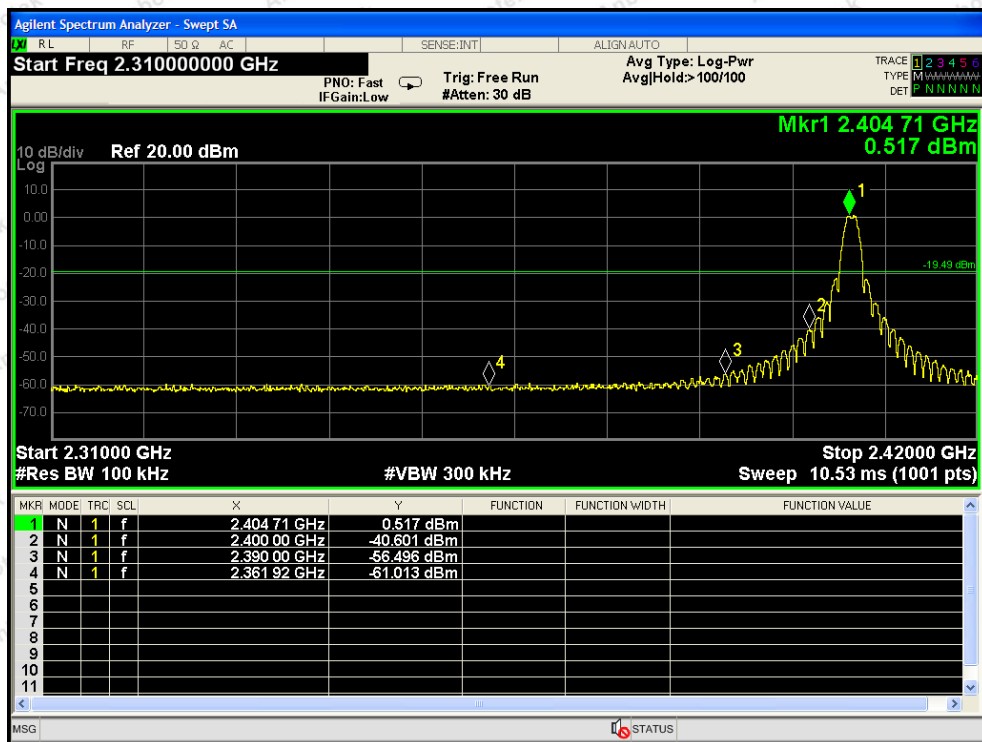
ANT A:

Frequency Band (MHz)	Delta Peak toBand Emission (dBc)	Limit (dBc)	Results
2405	41.118	>30	PASS
2483.5	46.250	>30	PASS

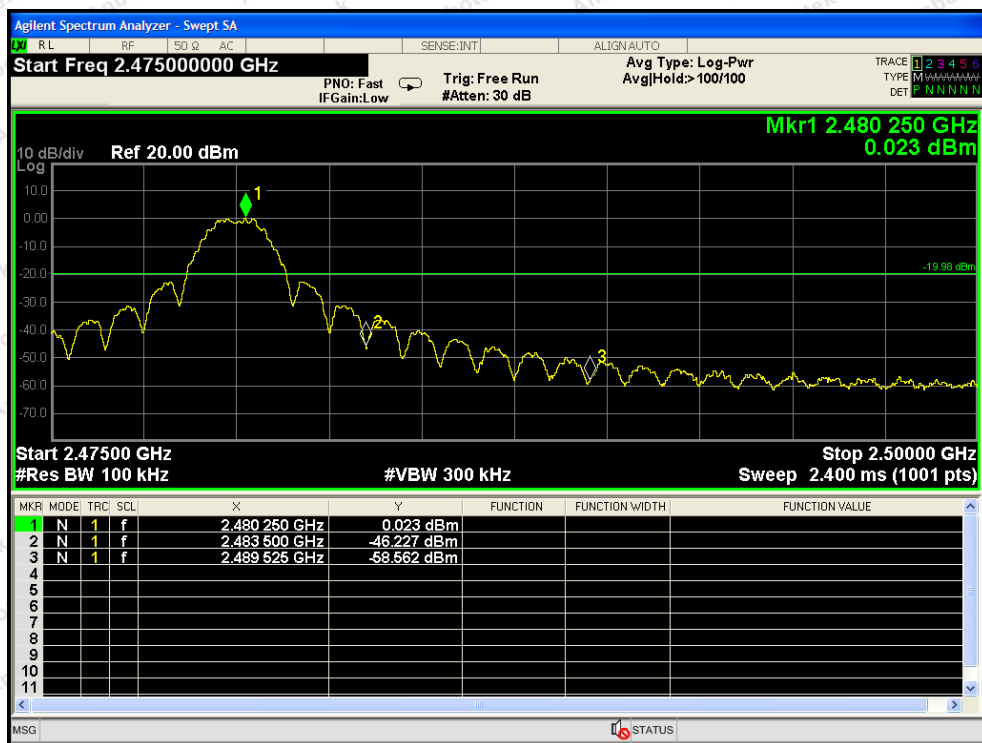
ANT B:

Frequency Band (MHz)	Delta Peak toBand Emission (dBc)	Limit (dBc)	Results
2405	40.552	>30	PASS
2483.5	47.000	>30	PASS

ANT A:

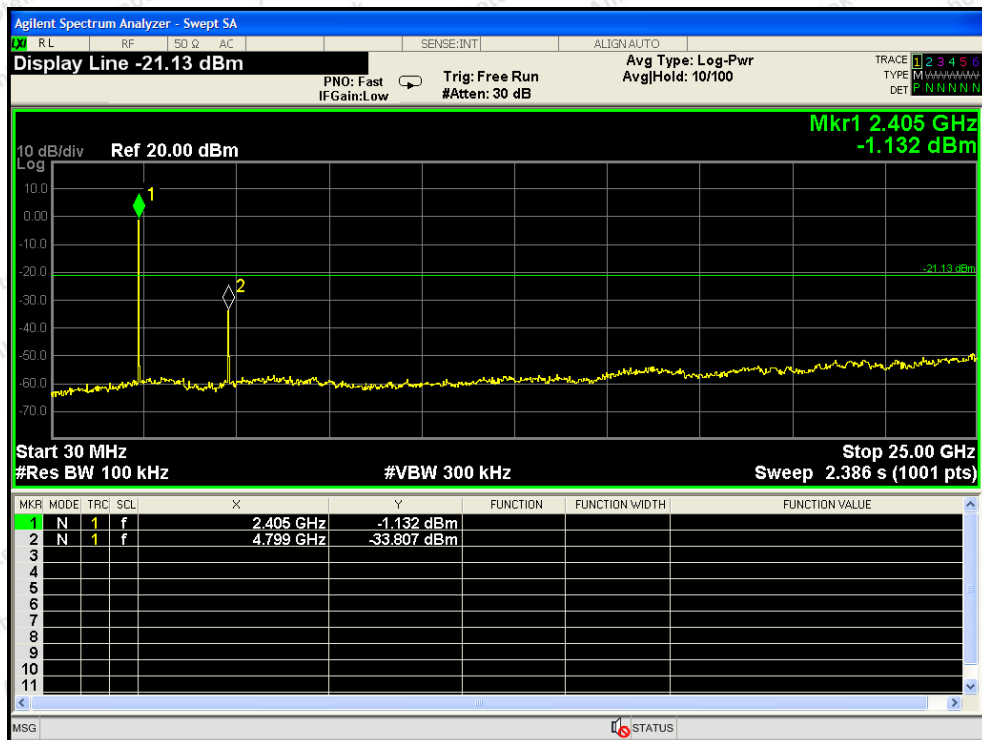


CH: Low

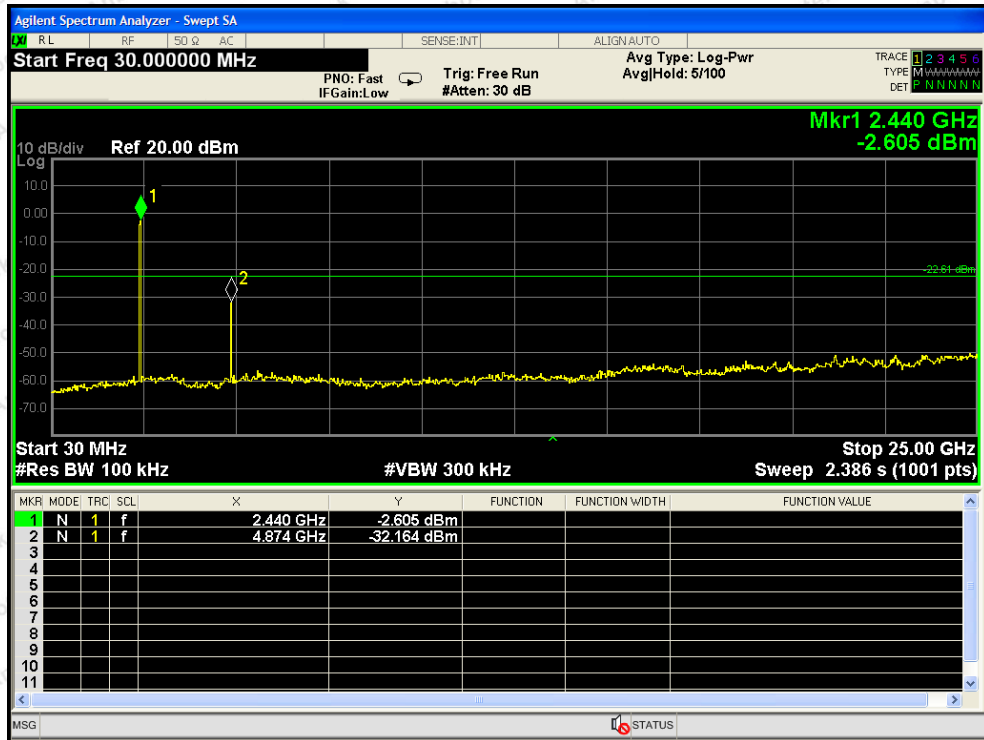


CH: High

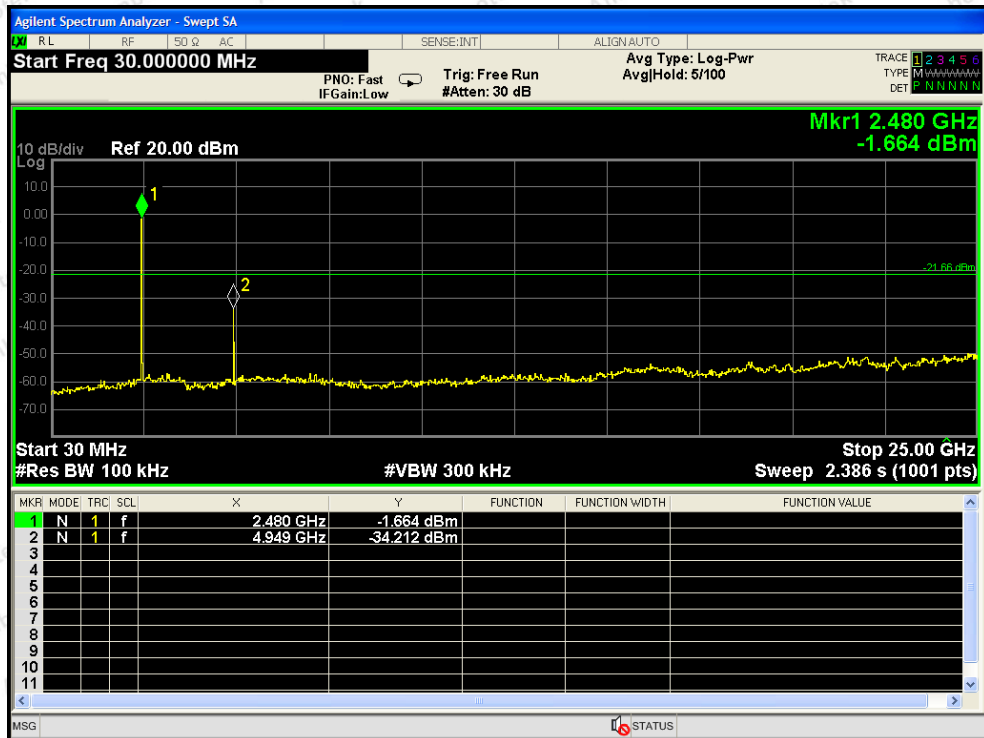
Conducted Emission Method



CH: Low

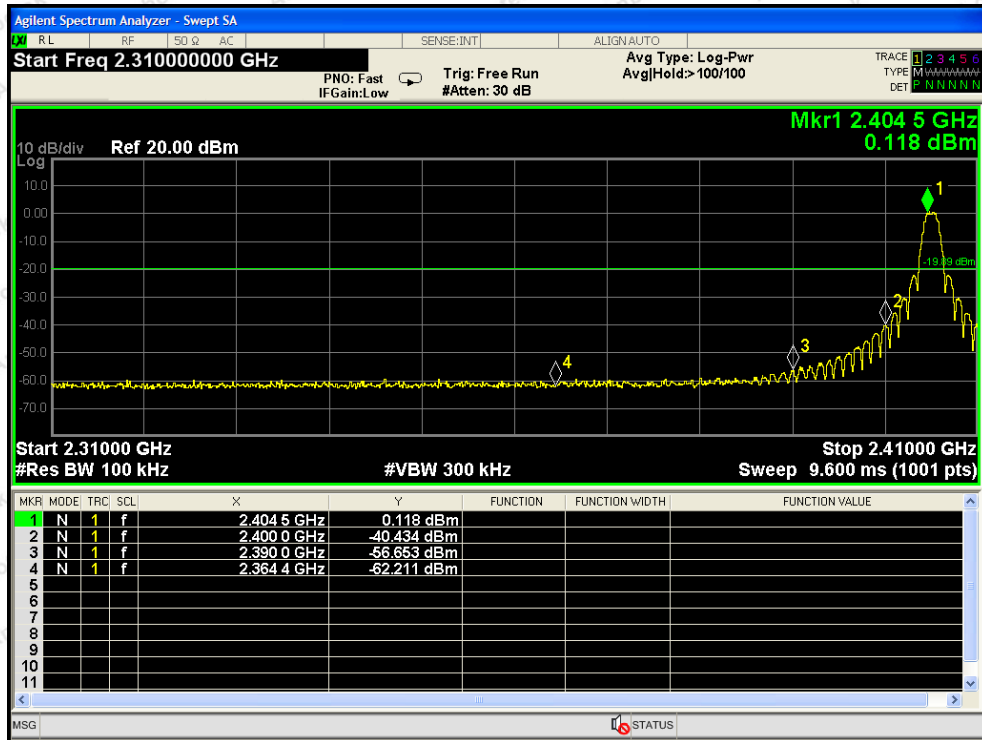


CH: Middle

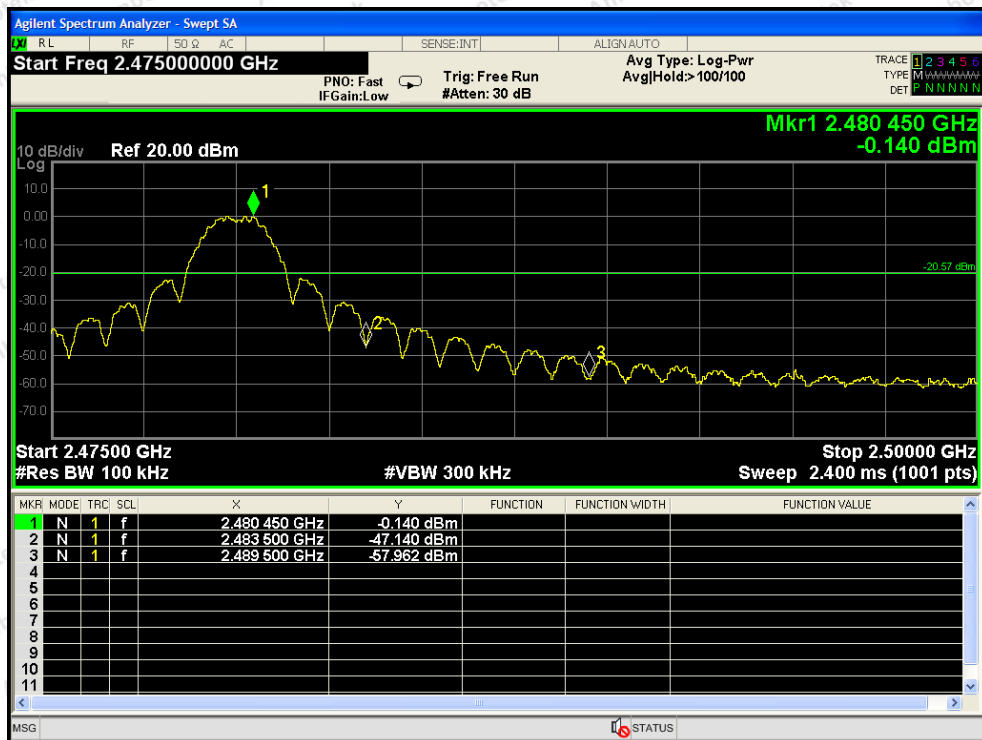


CH: High

ANT B:

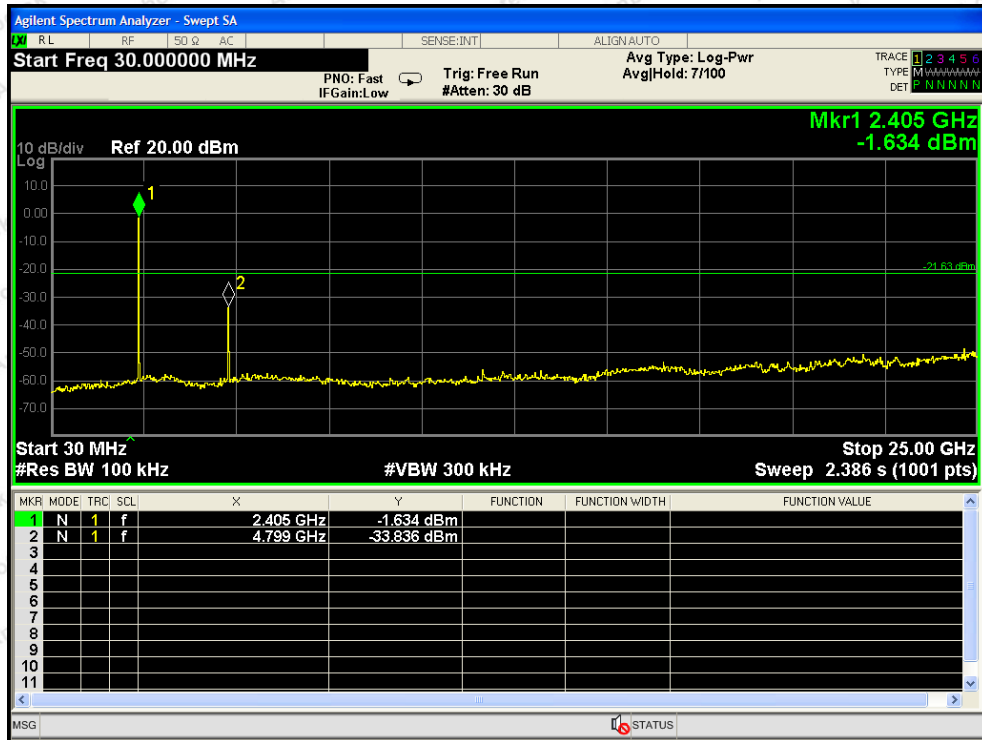


CH: Low

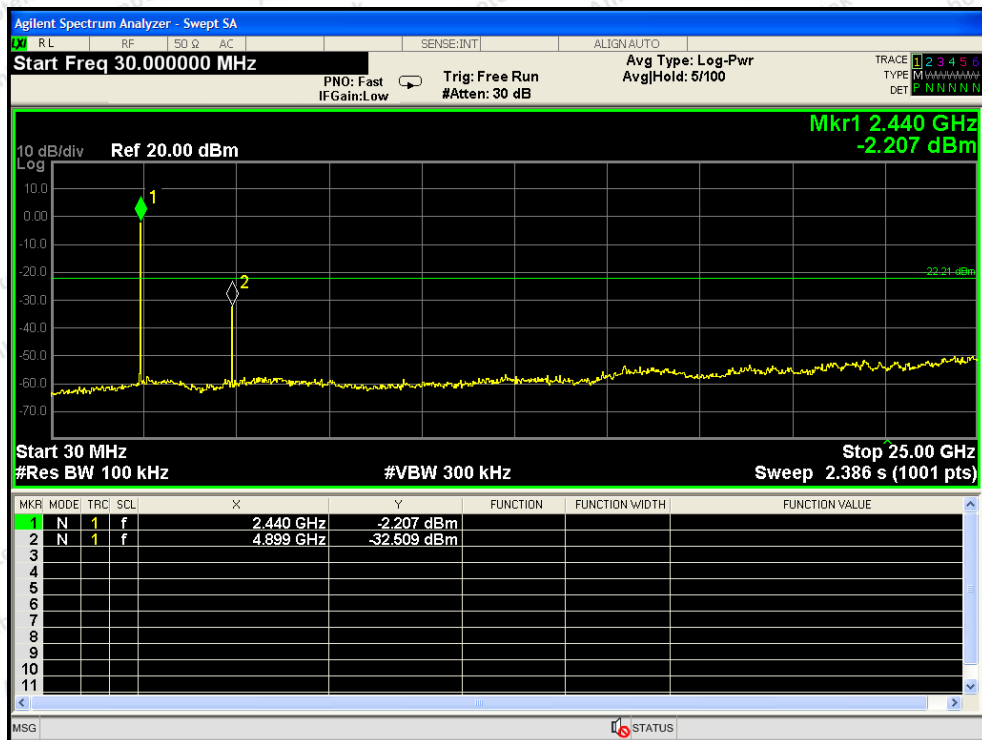


CH: High

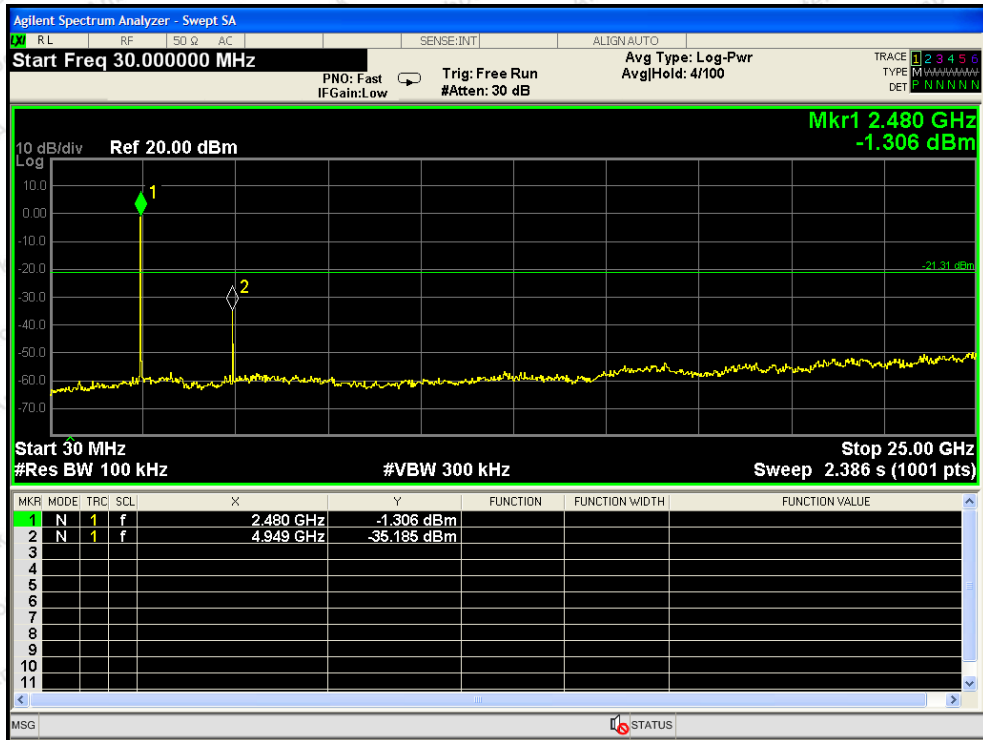
Conducted Emission Method



CH: Low



CH: Middle



CH: High

9. Antenna Requirement

9.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /247(c)
Requirement	1) 15.203 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, 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. 2) 15.247(c) (1)(i) requirement: Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

9.2. Antenna Connected Construction

The antenna is a PCB antenna which permanently attached, and the best case gain of the antenna is 5 dBi. It complies with the standard requirement.



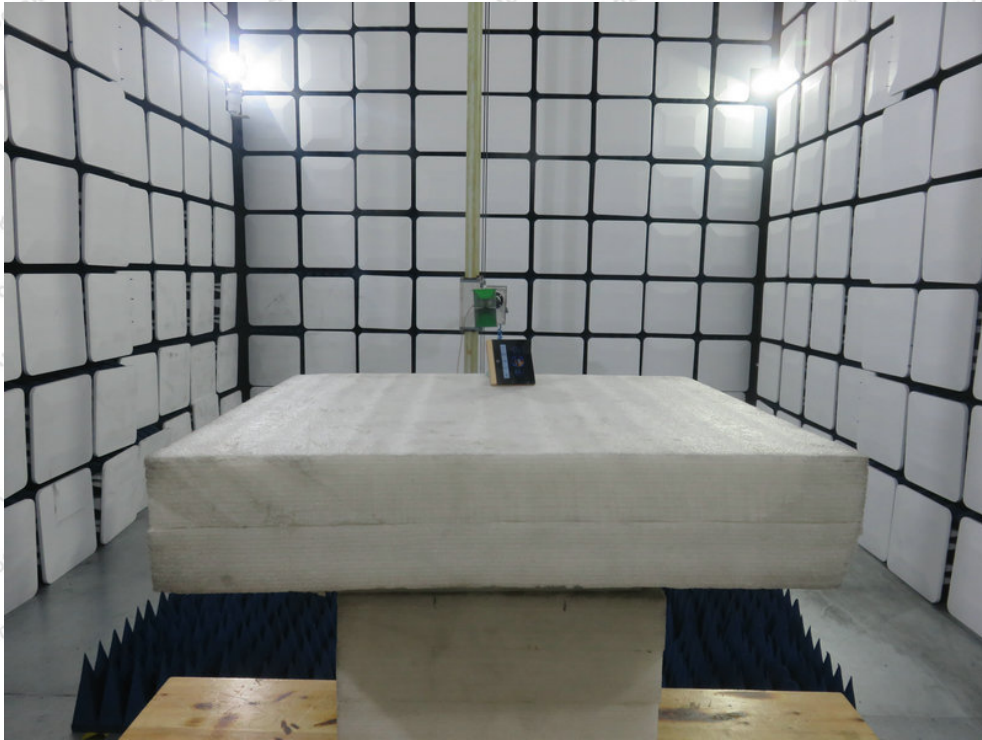
APPENDIX I -- TEST SETUP PHOTOGRAPH

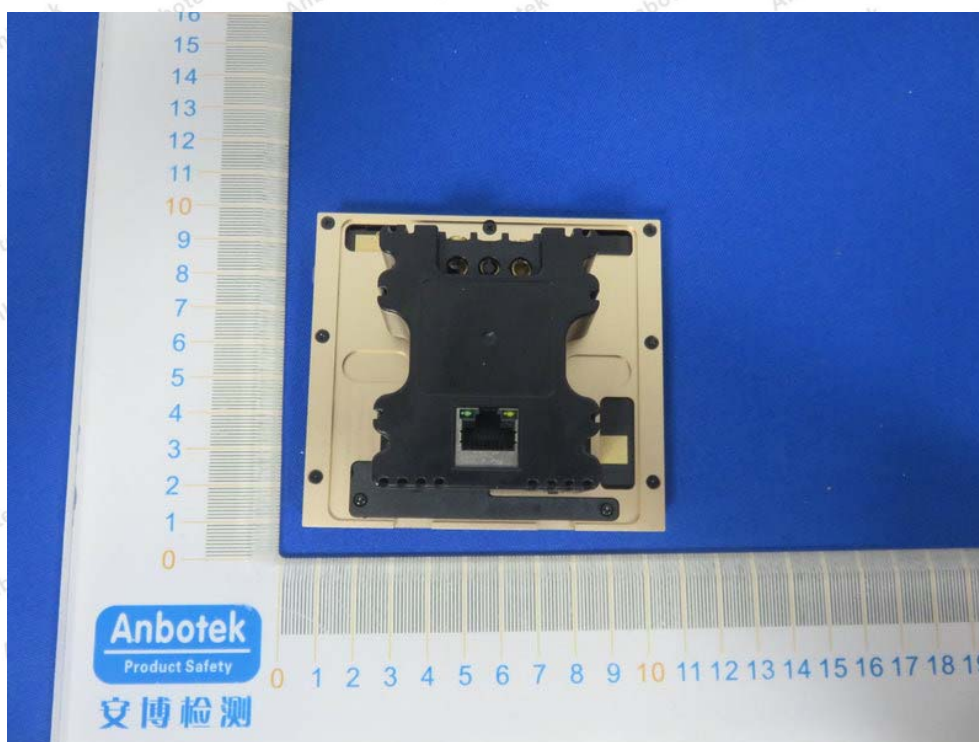
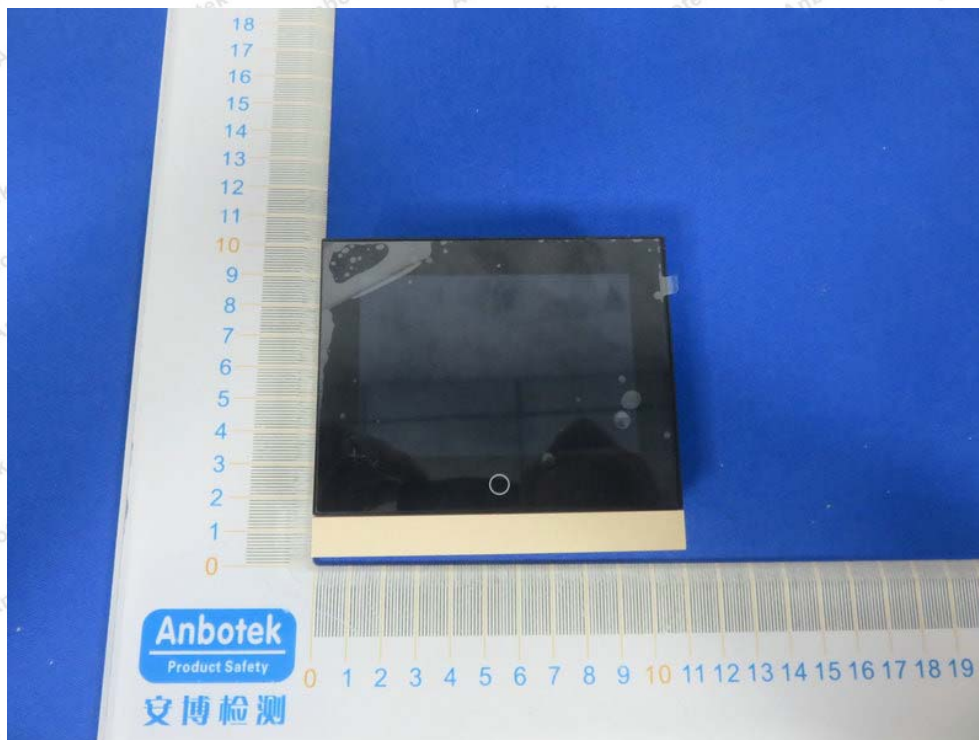
Photo of Power Line Conducted Emission Test

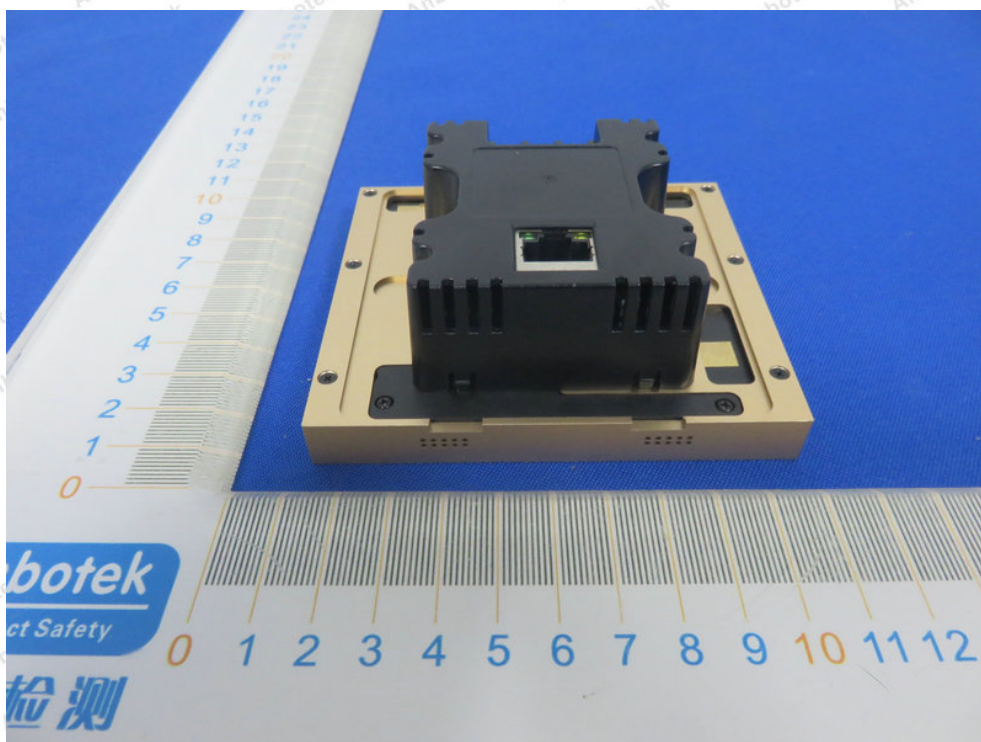
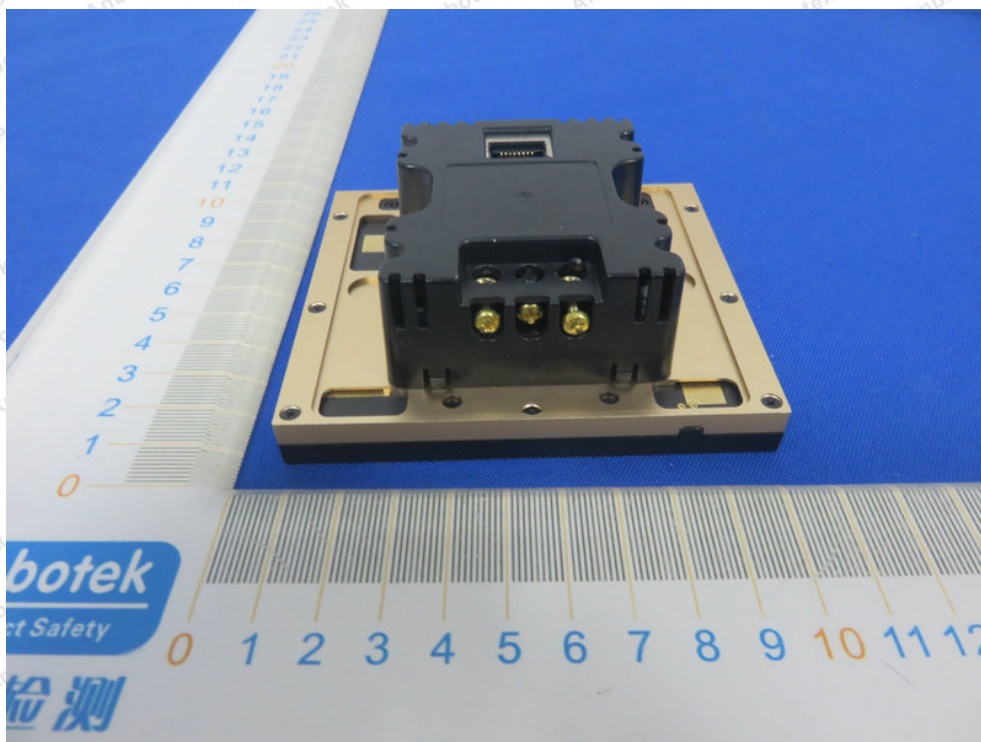


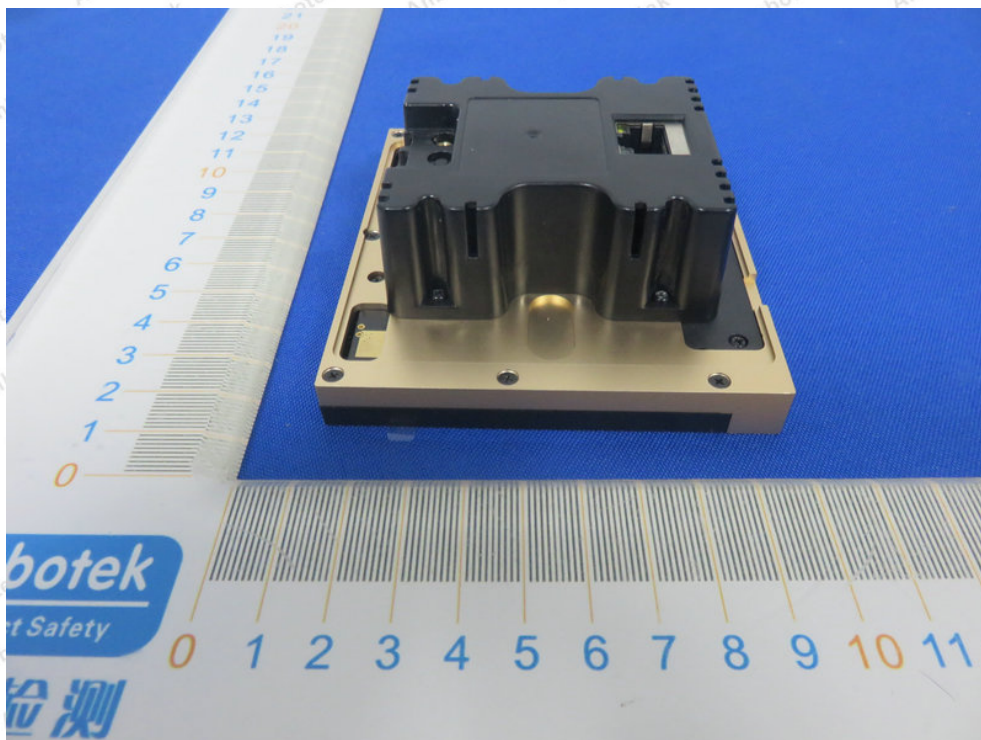
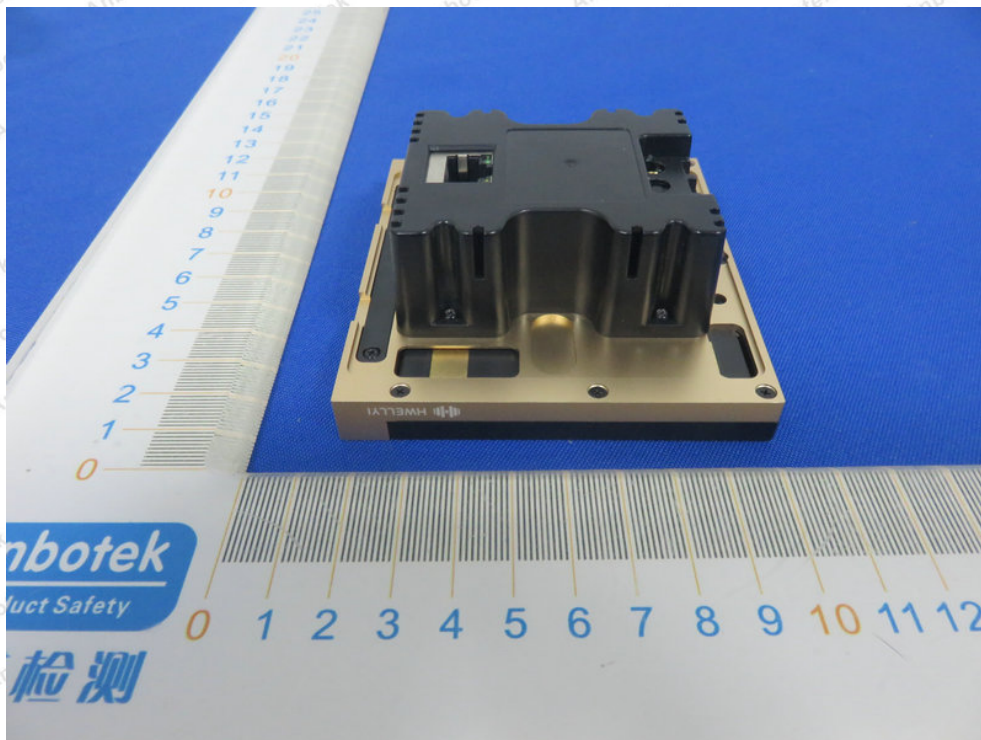
Photo of Radiation Emission Test

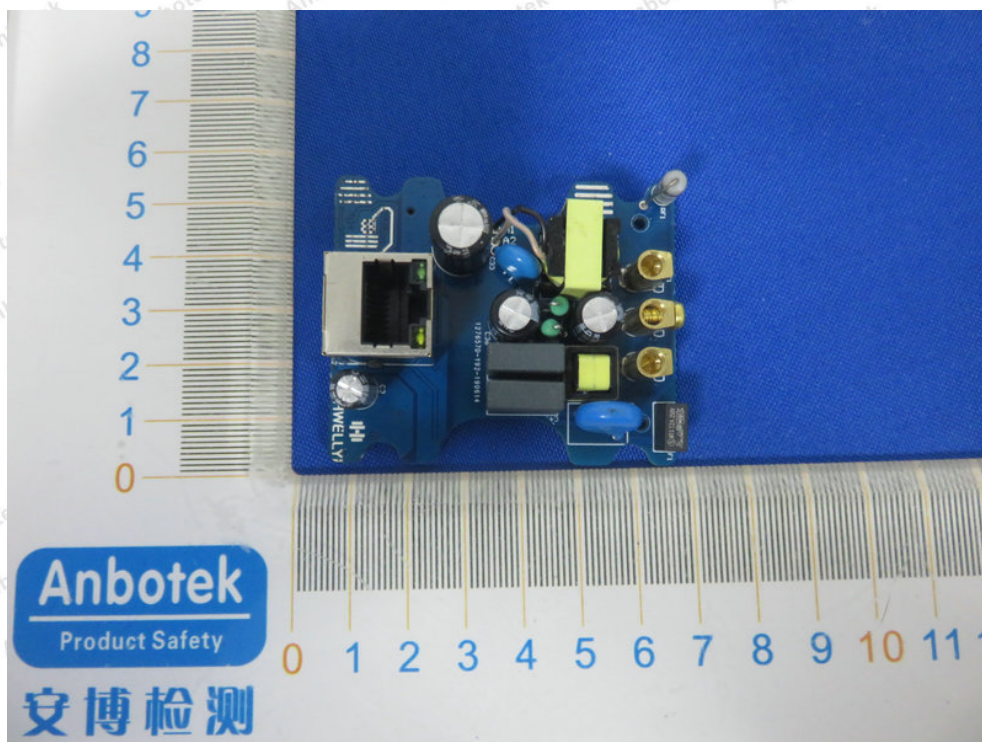
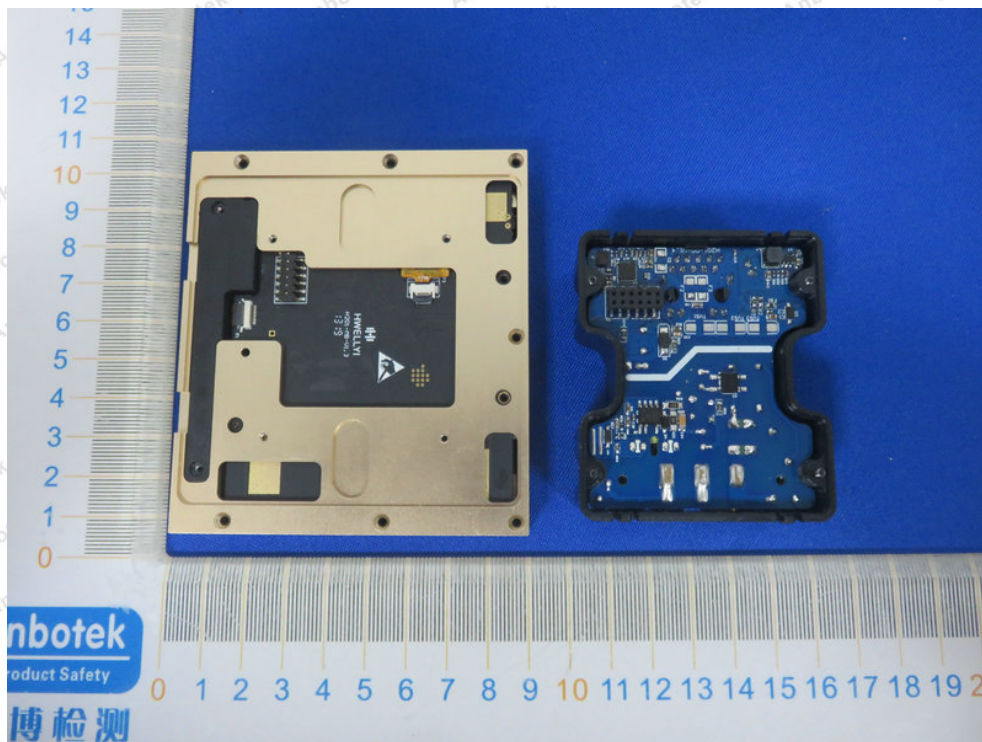


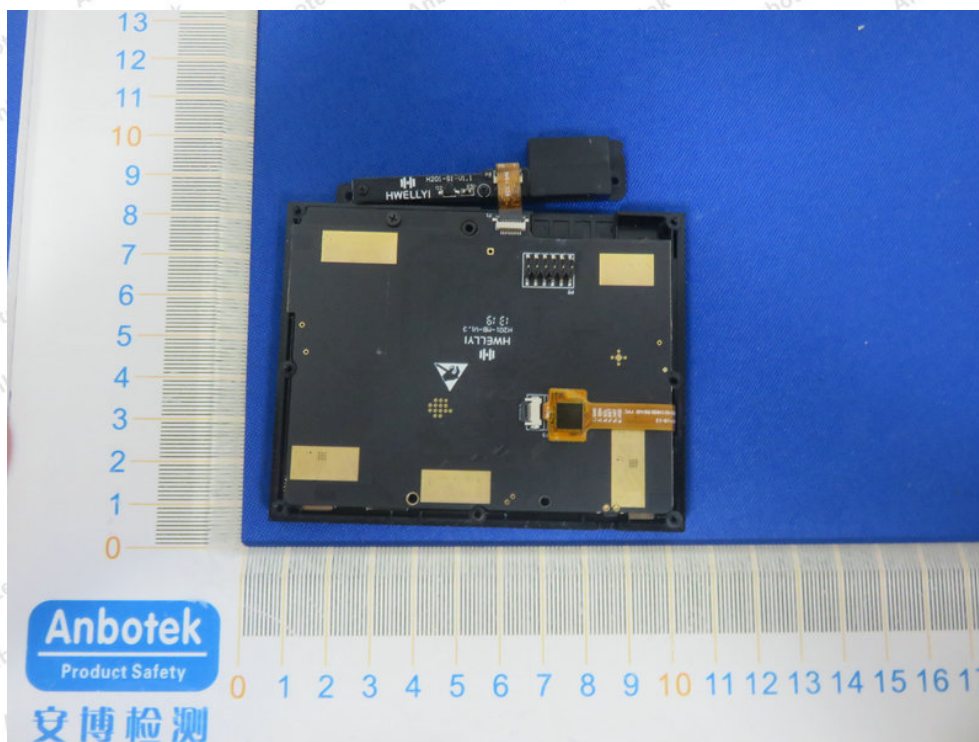
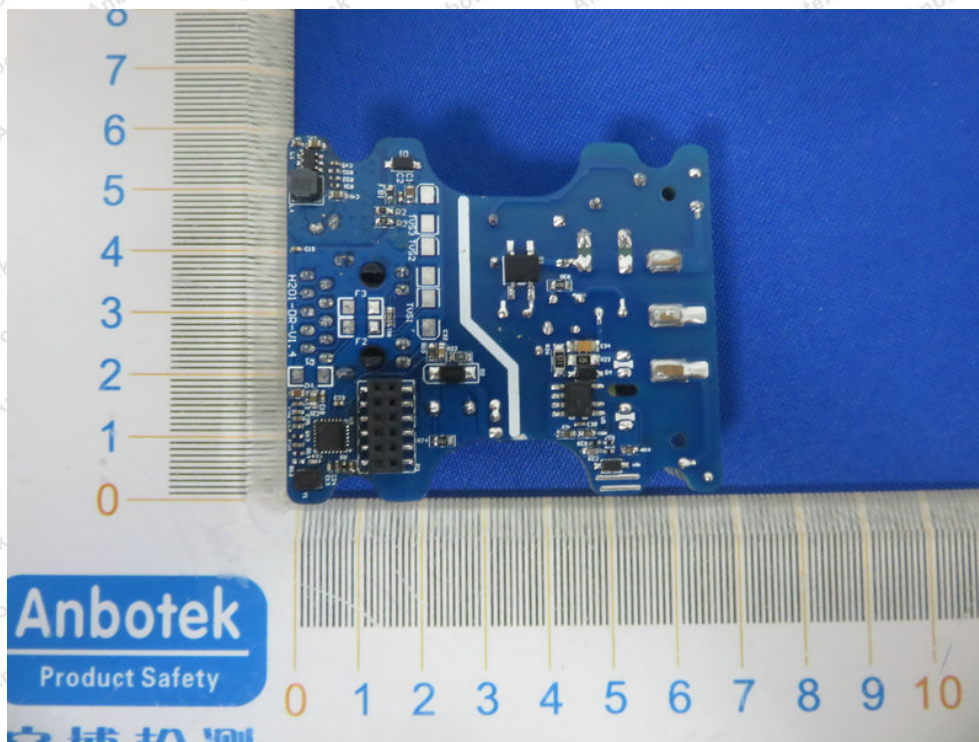


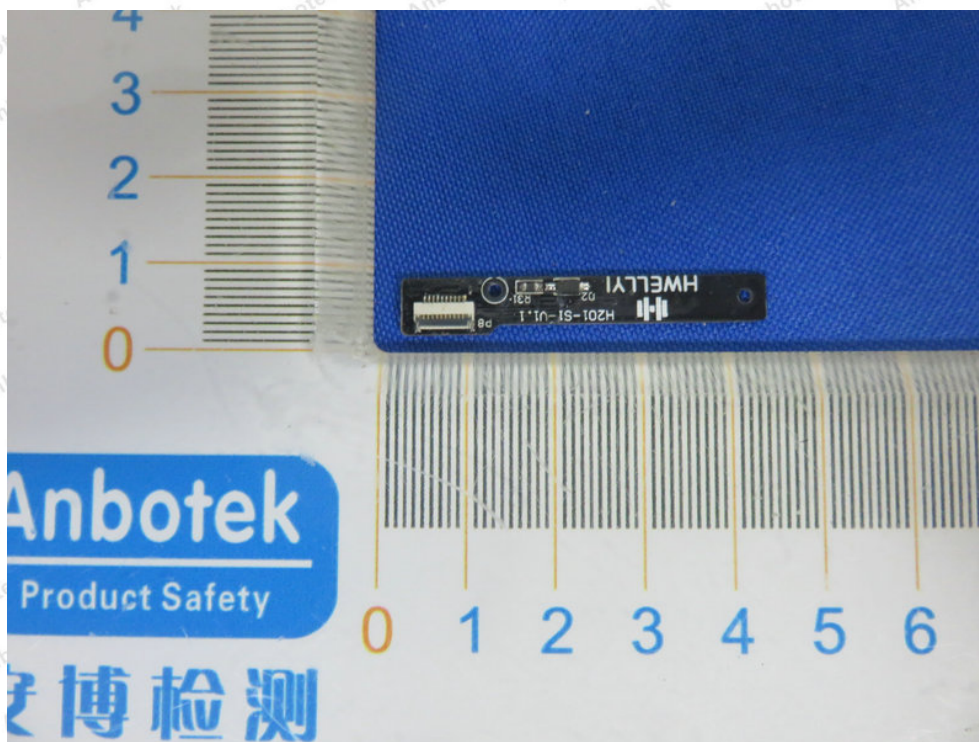
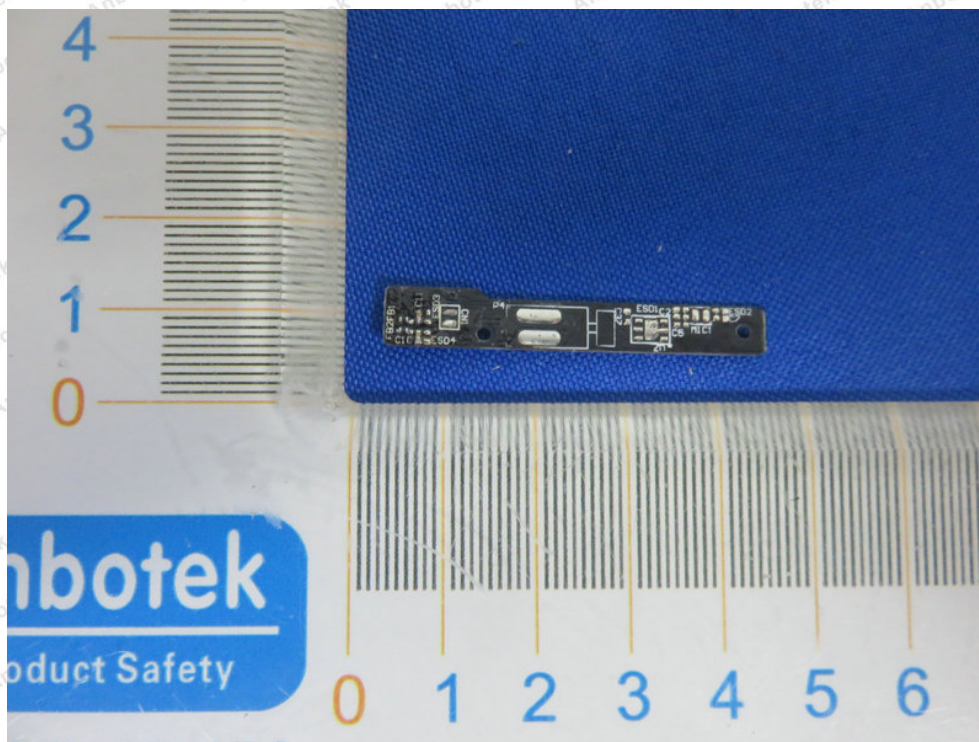
APPENDIX II -- EXTERNAL PHOTOGRAPH

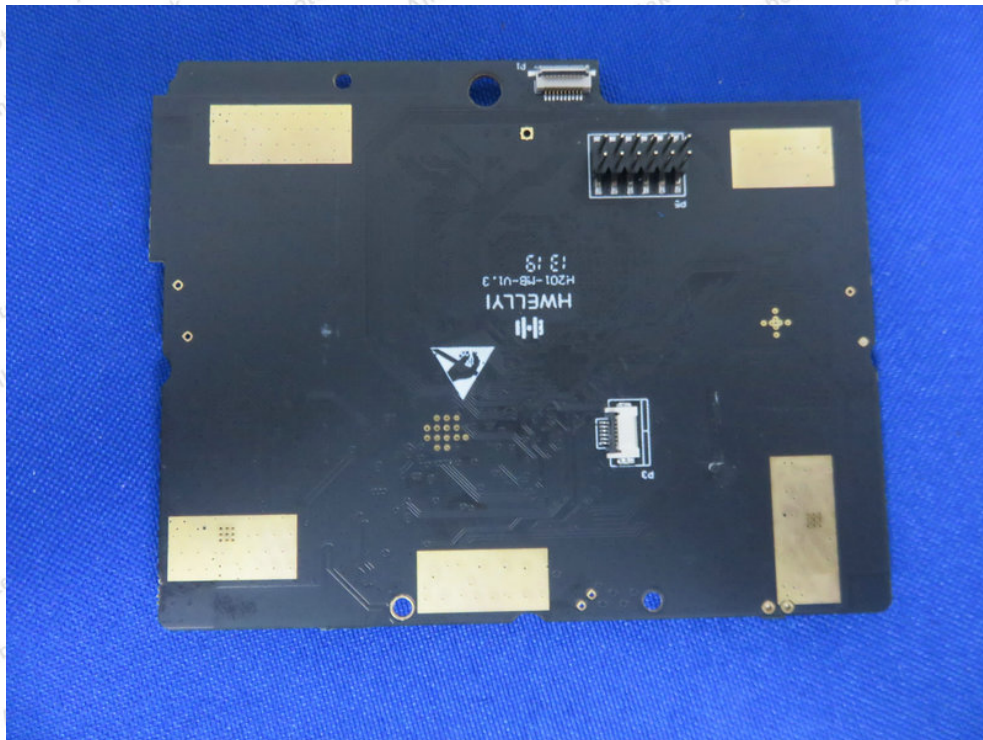


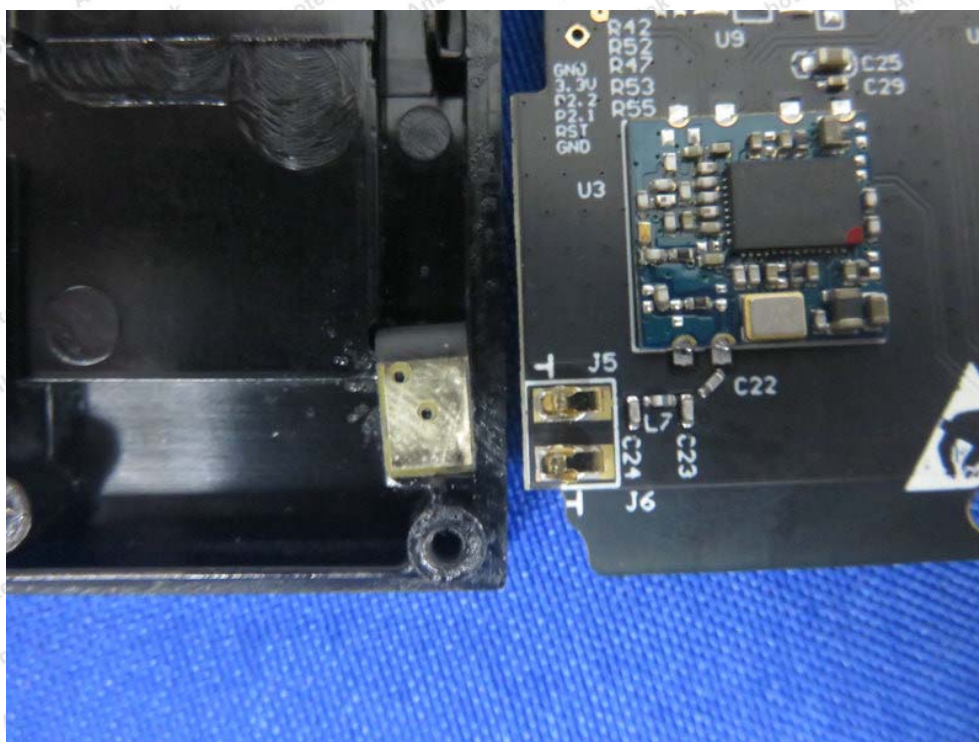
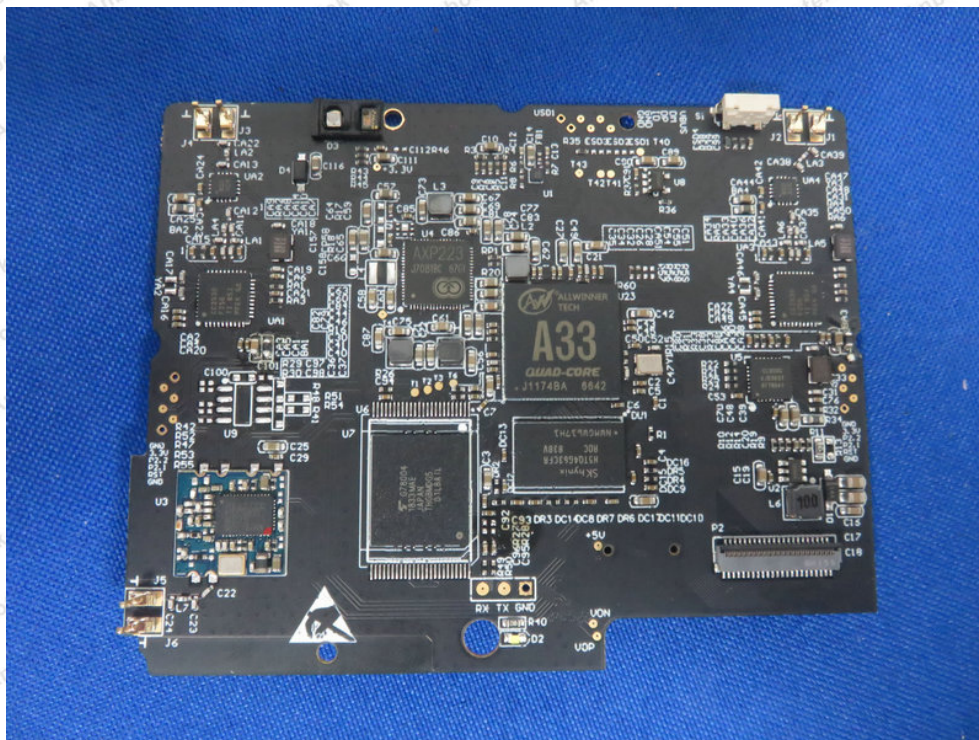


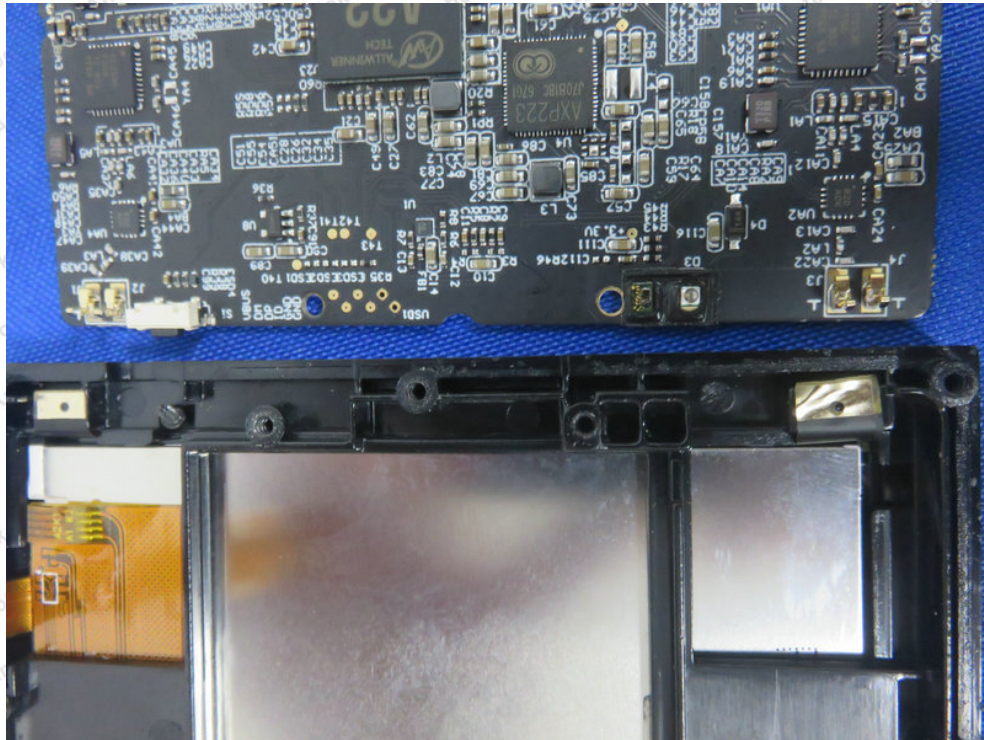
APPENDIX III -- INTERNAL PHOTOGRAPH











----- End of Report -----

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