FCC TEST REPORT

for

KATSUYAMA CORPORATION

MID

Model Number: KULA10116

FCC ID:2AJ3J-KULA10116

Prepared for	:	KATSUYAMA CORPORATION
Address	:	8C-02,6-9 KOYOCHONAKA, HIGASHINADA, KOBE 658-0032 JAPAN
Prepared by	:	Guangdong Keyway Testing Technology Co., Ltd.
Address	:	Baishun Industrial Zone, Zhangmutou Town, Dongguan, Guangdong, China
		Tel: 86-769-8718 2258
		Fax: 86-769-8718 1058

Report No.	:	16KWE104496F
Date of Test	:	Sep.28-Oct 17,2016
Date of Report	:	Oct.18, 2016

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Test Report Declaration Page

Guangdong Keyway Testing Technology Co., Ltd.

Applicant: **Address:**	KATSUYAMA CORPORATION 8C-02,6-9 KOYOCHONAKA, HIGASHINADA, KOBE 658-0032 JAPAN		
Manufacturer: **Address:**	SHENZHEN SAITU DIGITAL TECHNOLOGY CO.,LTD. GOTO Industry park, BuLan Road, Buji town, LongGang district, shenzhen, china		
E.U.T:	MID		
Model Number:	KULA10116		
Trade Name:	N/A	**Serial No.:**	------
Date of Receipt:	Sep.27,2016	**Date of Test:**	Sep.28-Oct 17,2016
Test Specification:	FCC Part 15, Subpart 15.407: 2015 ANSI C63.10:2013 KDB789033 D02 v01r03		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied.		

Issue Date: Oct. 18, 2016

Tested by:	Reviewed by:	Approved by:
Keven Wu / Engineer	Mike Xu / Supervisor	Andy Gao / Supervisor

Other Aspects:

None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Guangdong Keyway Testing Technology Co., Ltd.

1. TEST SUMMARY

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emissions	15.407(b)	PASS
26dB bandwidth and 99%dB Bandwidth	15.407 (a)	PASS
Power density	15.407 (a)	PASS
Maximum Peak Output Power	15.407 (a)	PASS
Emissions from out of band	15.407 (b)	PASS
Frequency Stability	15.407 (g)	PASS
Antenna Requirement	15.203	PASS

2. GENERAL PRODUCT INFORMATION

2.1 Product Function

Refer to Technical Construction Form and User Manual.

2.2 Description of Device (EUT)

Product Name:	MID
Model No.:	KULA10116
Operation Frequency:	5.15GHz ~ 5.24GHz
Channel numbers:	4 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40)
Modulation technology:	OFDM
Bit Rate of Transmitter	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n: 300/270/240/180/150/120/108/90/54Mbps
Antenna Type:	FPCB antenna
Antenna gain:	0.95dBi

2.3Test Supporting System

Adapter:	Model: JHD-AP012J-050200AA INPUT:100-120V~60Hz 0.35A OUTPUT:5V,2A

2.4Independent Operation Modes

The basic operation modes are:

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

For 5150~5250 MHz band:

802.11a,802.11n(HT20) mode Channel36: 5180MHz, Channel40:5200MHz, Channel48:5240MHz were tested.

802.11n40 mode Channel 5190MHz, 5230MHz were tested.

The software “RFTestTool” was used for testing, which was provided by manufacturer.

2.5 TEST SITES

Test Facilities

Lab Qualifications : Certificated by Industry Canada
Registration No.: 9868A
Date of registration: December 8, 2011

Certificated by FCC, USA
Registration No.: 370994
Date of registration: February 21, 2012

Certificated by CNAS China
Registration No.: CNAS L5783
Date of registration: August 8, 2012

2.6 List of Test and Measurement Instruments

For conducted emission at the mains terminals test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 27,16	Apr. 27,17
Artificial Mains Network	Rohde&Schwarz	ENV216	101315	Apr. 27,16	Apr. 27,17
Artificial Mains Network (AUX)	Rohde&Schwarz	ENV216	101314	Apr. 27,16	Apr. 27,17
RF Cable	FUJIKURA	3D-2W	944 Cable	Apr. 27,16	Apr. 27,17

For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 27,16	Apr. 27,17
System Simulator	Agilent	E5515C	GB43130245	Apr. 27,16	Apr. 27,17
Power Splitter	Weinschel	1506A	NW425	Apr. 27,16	Apr. 27,17
Bilog Antenna	ETS-LINDGREEN	3142D	135452	Apr. 27,16	Apr. 27,17
Spectrum Analyzer	Agilent	E4407B	MY4511304	Apr. 27,16	Apr. 27,17
Spectrum Analyzer	R&S	FSV40	132.1.3008K39 -100967	Apr. 27,16	Apr. 27,17
3m Semi-anechoic Chamber	ETS-LINDGREEN	966	KW01	Apr. 27,16	Apr. 27,17
Signal Amplifier	SONOMA	310	187016	Apr. 27,16	Apr. 27,17
Signal Amplifier	Agilent	8449B	3008A00251	Apr. 27,16	Apr. 27,17
RF Cable	IMRO	IMRO-400	966 Cable 1#	N/A	N/A
MULTI-DEVICE Controller	ETS-LINDGREEN	2090	126913	N/A	N/A
Horn Antenna	DAZE	ZN30701	11003	Apr. 27,16	Apr. 27,17
Horn Antenna	SCHWARZBECK	BBHA9170	9170-068	Apr. 27,16	Apr. 27,17
Spectrum Analyzer	Agilent	8593E	3911A04271	Apr. 27,16	Apr. 27,17
Spectrum Analyzer	Agilent	E4408B	MY44211125	Apr. 27,16	Apr. 27,17
Signal Amplifier	DAZE	ZN3380C	11001	Apr. 27,16	Apr. 27,17
High Pass filter	Micro	HPM50111	324216	Apr. 27,16	Apr. 27,17
Filter	COM-MW	ZBSF-C836.5-25-X	KW032	Apr. 27,16	Apr. 27,17
Filter	COM-MW	ZBSF-C1747.5-75-X2	KW035	Apr. 27,16	Apr. 27,17
Filter	COM-MW	ZBSF-C1880-60-X2	KW037	Apr. 27,16	Apr. 27,17
Constant temperature and humidity box	GF	GTH-800-40-1P	MAA9906-005	Apr. 27,16	Apr. 27,17
Splitter	Agilent	11636B	0025164	Apr. 27,16	Apr. 27,17
Power Meter	Anritsu	ML2495A	1204003	Apr. 24,16	Apr. 24,17
Power Sensor	Anritsu	MA2411B	1126150	Apr. 24,16	Apr. 24,17
Spectrum Analyzer	Agilent	N9020A	MY56070279	Jul.26,16	Jul.25,17

3. TEST SET-UP AND OPERATION MODES

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

3.2 Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators

(EUT: MID)

3.3 Special Accessories and Auxiliary Equipment

None.

3.4 Countermeasures to Achieve EMC Compliance

None.

4. EMISSION TEST RESULTS

4.1 Conducted Emission at the Mains Terminals Test

Limit 15.207 limits

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Test Setup

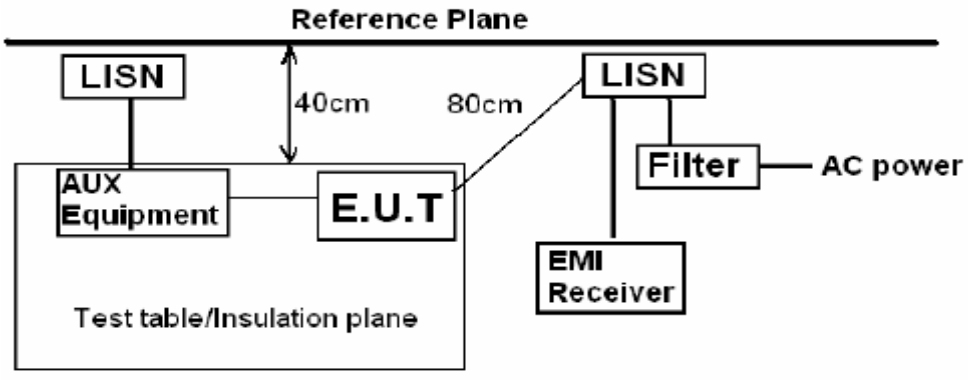
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 0.8 m, the excess was folded back and forth parallel to the cable at the centre so as to form a bundle no longer than 0.4 m.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

The frequency range from 150 kHz to 30 MHz was investigated.

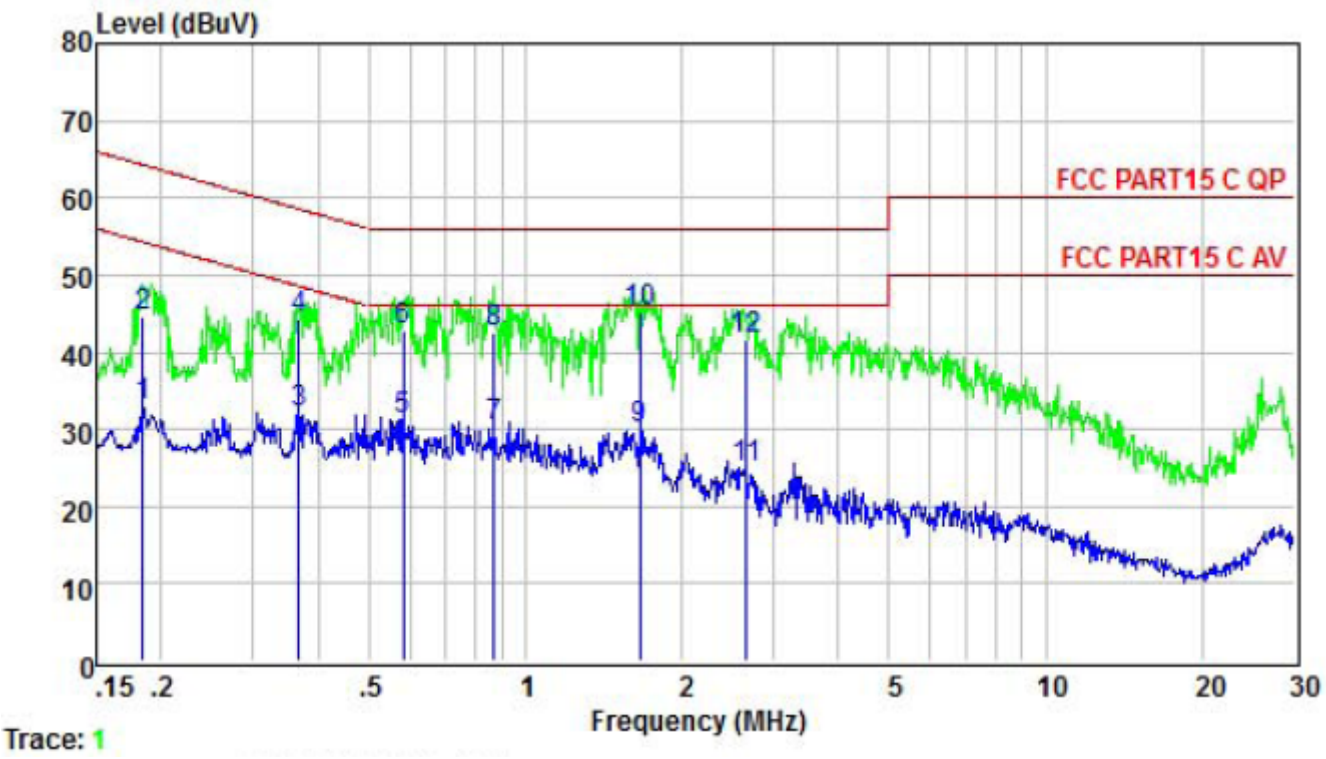
The bandwidth of the test receiver was set at 9 kHz.

Pretest for all mode, The test data of the worst case condition(s) was reported on the following page.



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

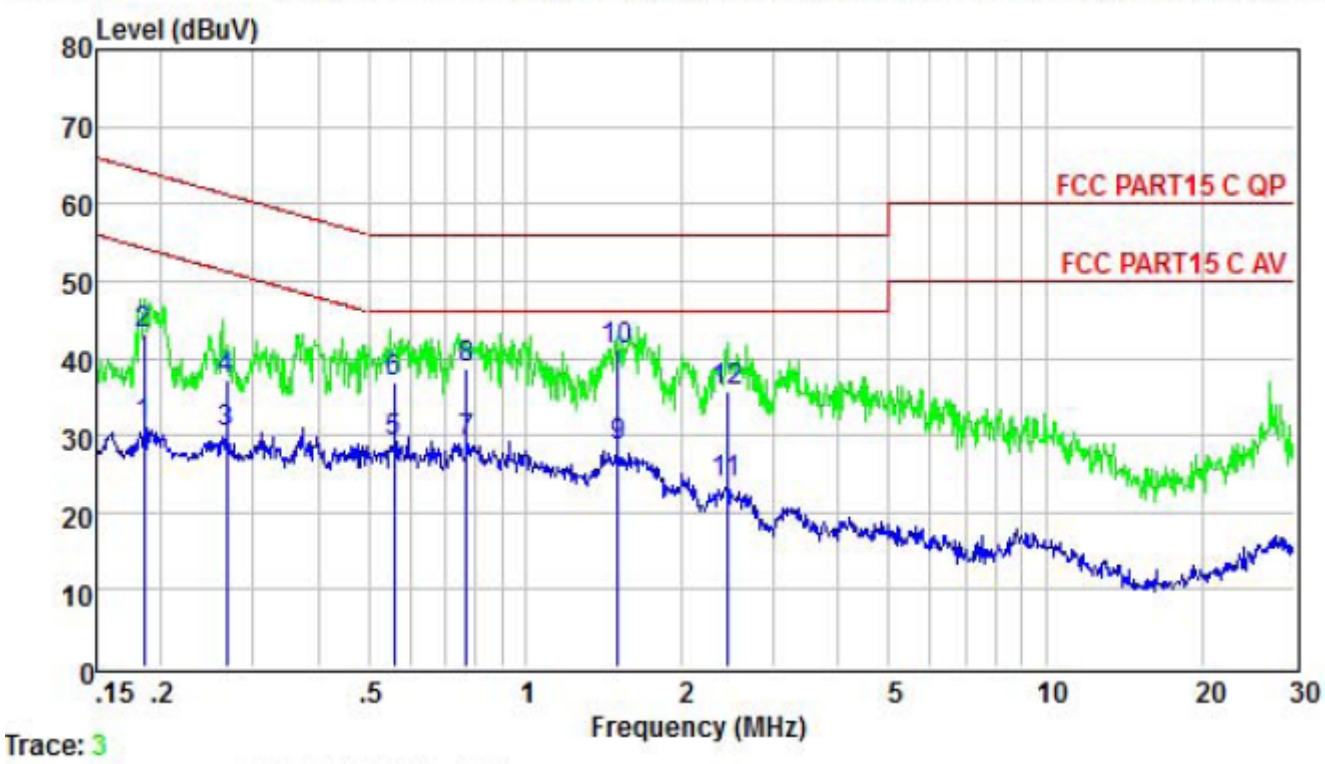
EUT：	MID	Model Name ：	KULA10116
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	DC 5.0V form Adapter AC 120V/60Hz	Test Mode：	Normal



Trace: 1

	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	
1	0.184	32.98	54.28	-21.30	Average
2	0.184	44.58	64.28	-19.70	QP
3	0.367	32.09	48.56	-16.47	Average
4	0.367	44.26	58.56	-14.30	QP
5	0.582	31.29	46.00	-14.71	Average
6	0.582	42.69	56.00	-13.31	QP
7	0.871	30.34	46.00	-15.66	Average
8	0.871	42.57	56.00	-13.43	QP
9	1.662	29.89	46.00	-16.11	Average
10	1.662	45.26	56.00	-10.74	QP
11	2.664	24.99	46.00	-21.01	Average
12	2.664	41.56	56.00	-14.44	QP

EUT：	MID	Model Name ：	KULA10116
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 5.0V form Adapter AC 120V/60Hz	Test Mode：	Normal



Trace: 3

	Freq	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	
1	0.185	31.18	54.24	-23.06	Average
2	0.185	43.07	64.24	-21.17	QP
3	0.267	30.20	51.20	-21.00	Average
4	0.267	37.12	61.20	-24.08	QP
5	0.561	29.24	46.00	-16.76	Average
6	0.561	36.85	56.00	-19.15	QP
7	0.771	29.02	46.00	-16.98	Average
8	0.771	38.52	56.00	-17.48	QP
9	1.503	28.48	46.00	-17.52	Average
10	1.503	41.16	56.00	-14.84	QP
11	2.435	23.76	46.00	-22.24	Average
12	2.435	35.74	56.00	-20.26	QP

4.2 Radiated Emission Test

Limit 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/m
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)	

Restricted bands of operation

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])

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.

Test setup

The EUT was placed on a turn table which was 0.8 m(above 1GHz, the high was 1.5m) above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz, Both PK and AV measure, PK detector is used.

The frequency range from 30MHz to 10^{th} harmonic are checked. and no any emissions were found from 18GHz to 40 GHz, So the radiated emissions from 18GHz to 40GHz were not record.

Notes: 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading-Preamp Factor.

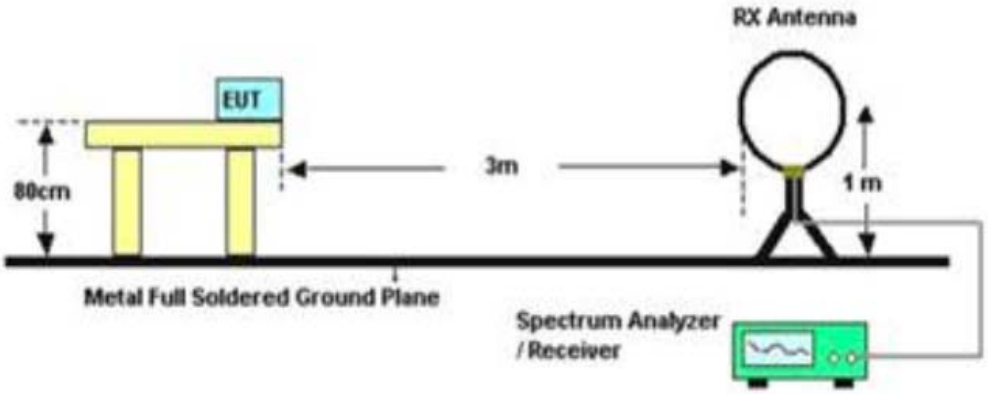
2. Measurement Uncertainty: ±3.2 dB at a level of confidence of 95%.

3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

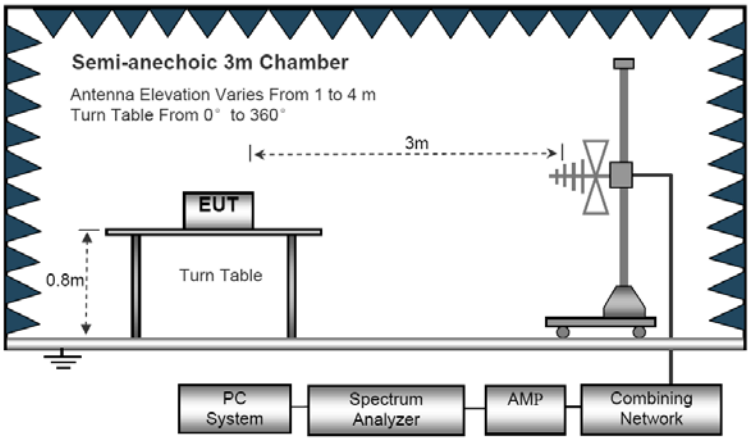
4. For emissions below 1GHz, pretest for all mode, The test data of the worst case condition(s) was reported on the following pages.

5. For Both PK and AV value above 1GHz, PK detector is used.

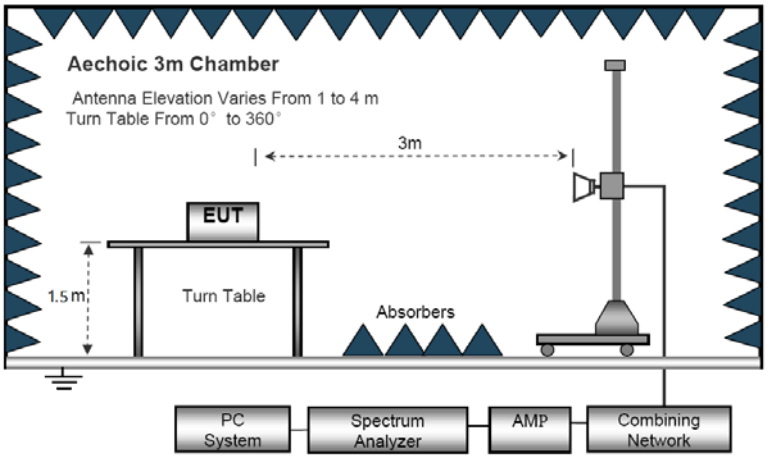
Radiated Emission Test-Up Frequency Below 30MHz



Below 1GHz



Above 1GHz



EUT：	MID	Model Name ：	KULA10116
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	TX
Test Voltage ：	DC5V from Adapter		

Below 30MHz

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P
--	--	--	--	P

Note:

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

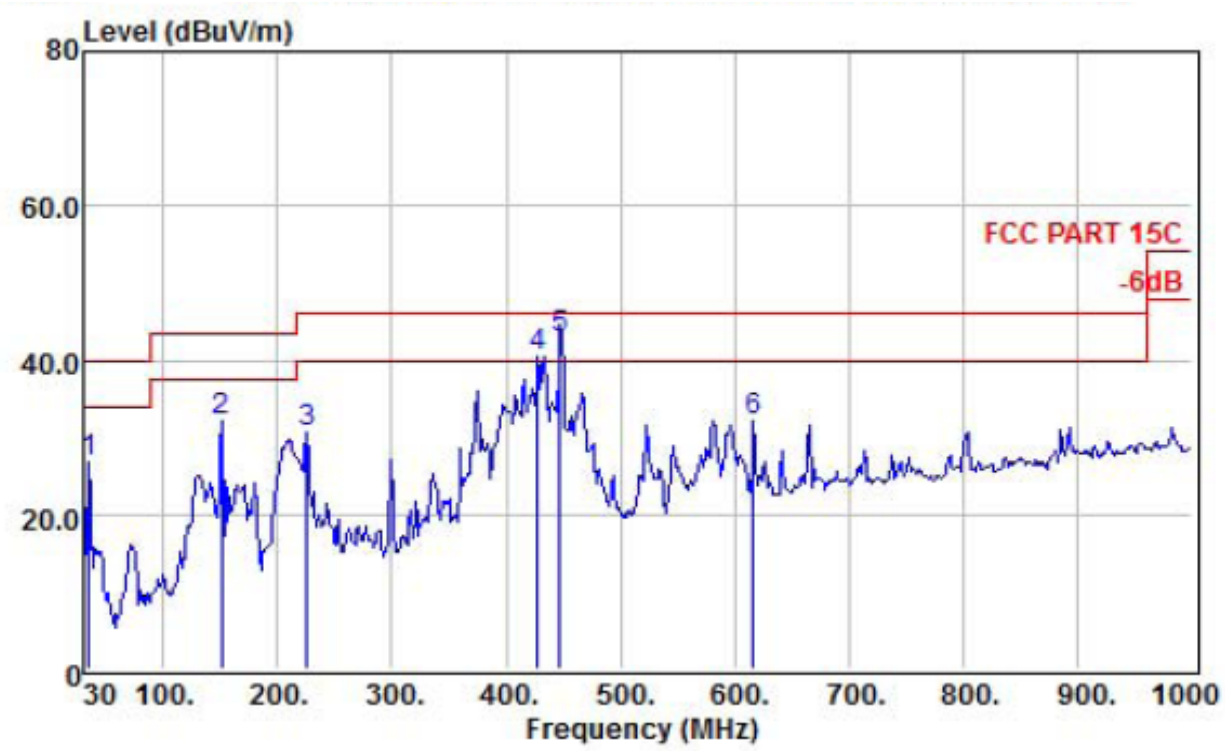
Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

Below 1GHz

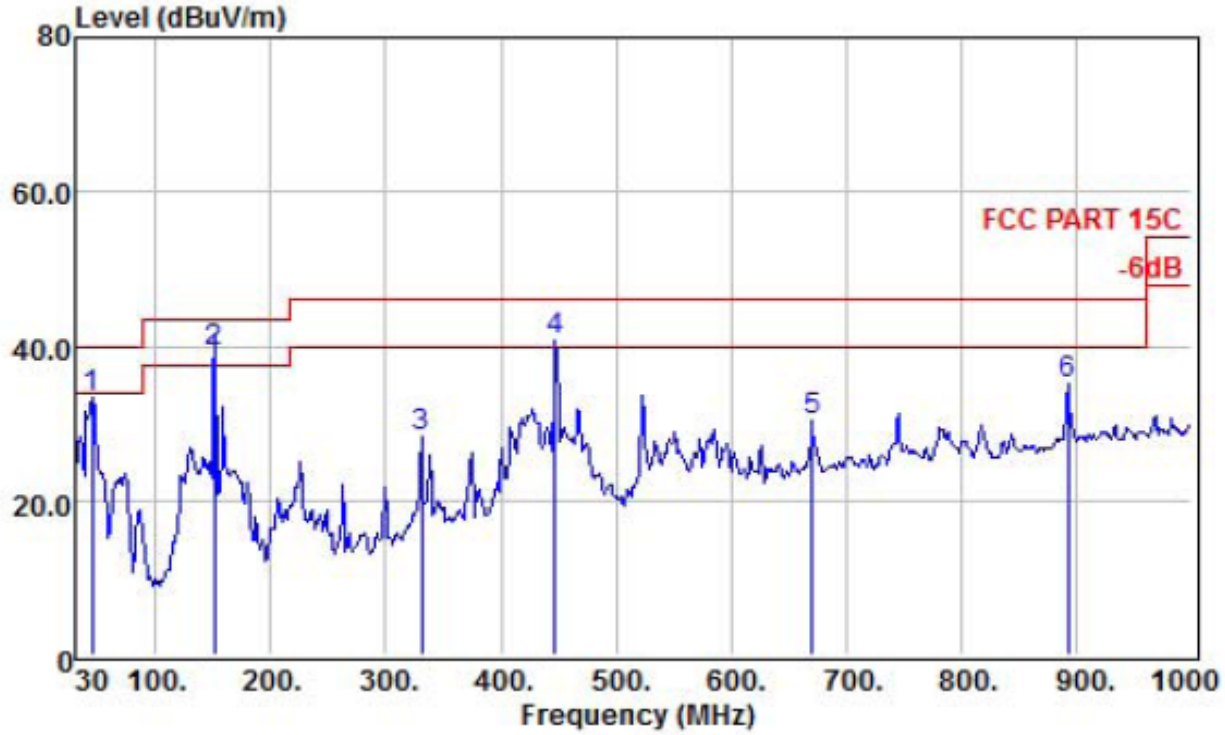
EUT：	MID	Model Name ：	KULA10116
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	TX
Test Voltage ：	DC 3.7V		

Horizontal



	Freq	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	34.85	41.54	31.38	15.94	0.56	26.66	40.00	-13.34	QP
2	151.25	53.16	31.25	9.02	1.22	32.15	43.50	-11.35	QP
3	225.94	47.89	30.94	12.23	1.53	30.71	46.00	-15.29	QP
4 !	427.70	51.36	30.63	17.15	2.55	40.43	46.00	-5.57	QP
5 !	447.10	53.20	30.61	17.54	2.62	42.75	46.00	-3.25	QP
6	616.85	38.20	30.64	21.07	3.38	32.01	46.00	-13.99	QP

Vertical



	Freq	Read Level	Preamp Factor	Antenna Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB/m	dB	dBuV/m	dBuV/m	dB	
1	44.55	53.24	31.40	11.03	0.56	33.43	40.00	-6.57	QP
2 !	151.25	60.32	31.25	9.02	1.22	39.31	43.50	-4.19	QP
3	330.70	42.33	30.78	14.73	2.02	28.30	46.00	-17.70	QP
4 !	447.10	51.18	30.61	17.54	2.62	40.73	46.00	-5.27	QP
5	670.20	35.51	30.79	21.88	3.69	30.29	46.00	-15.71	QP
6	893.30	36.63	30.10	23.87	4.84	35.24	46.00	-10.76	QP

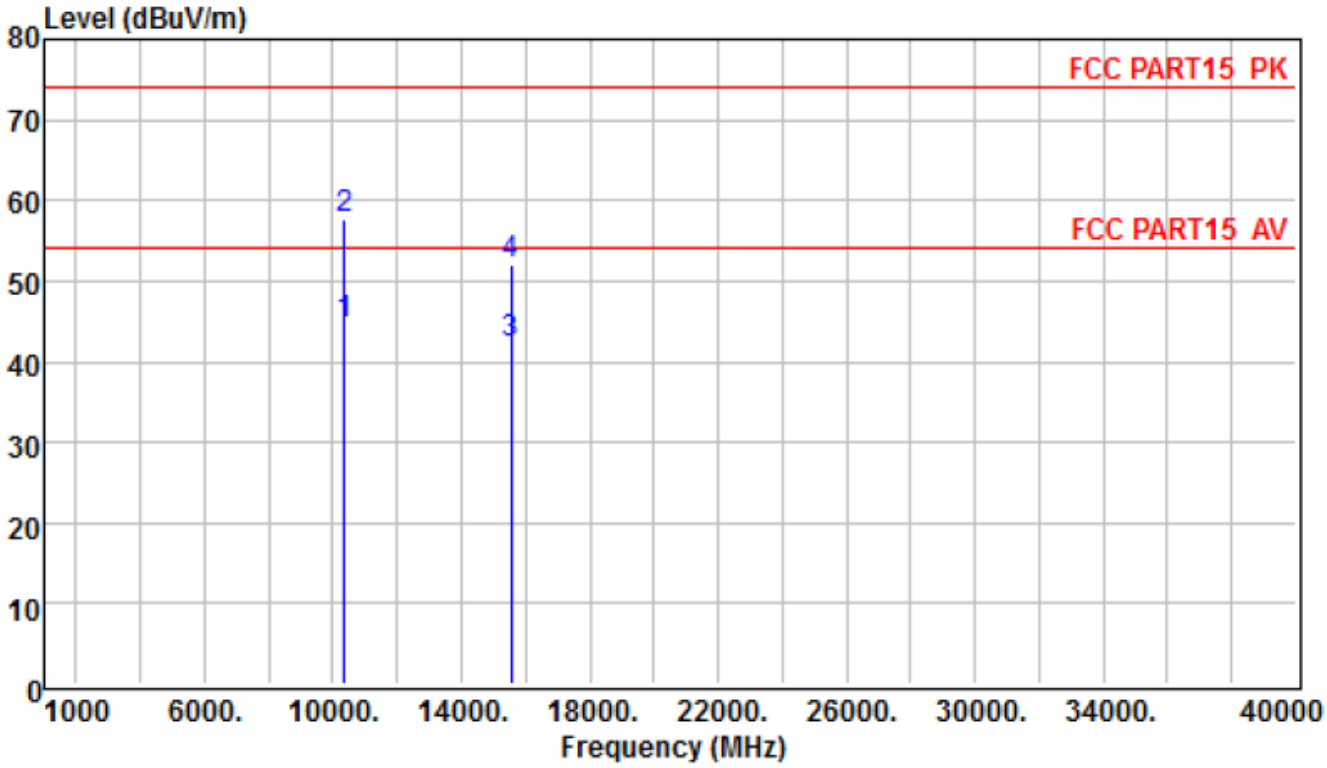
NOTE:

Absolute Level= ReadingLevel+antenna Factor+cable loss-preamp factor,
Over Limit= Absolute Level – Limit

Above 1GHz

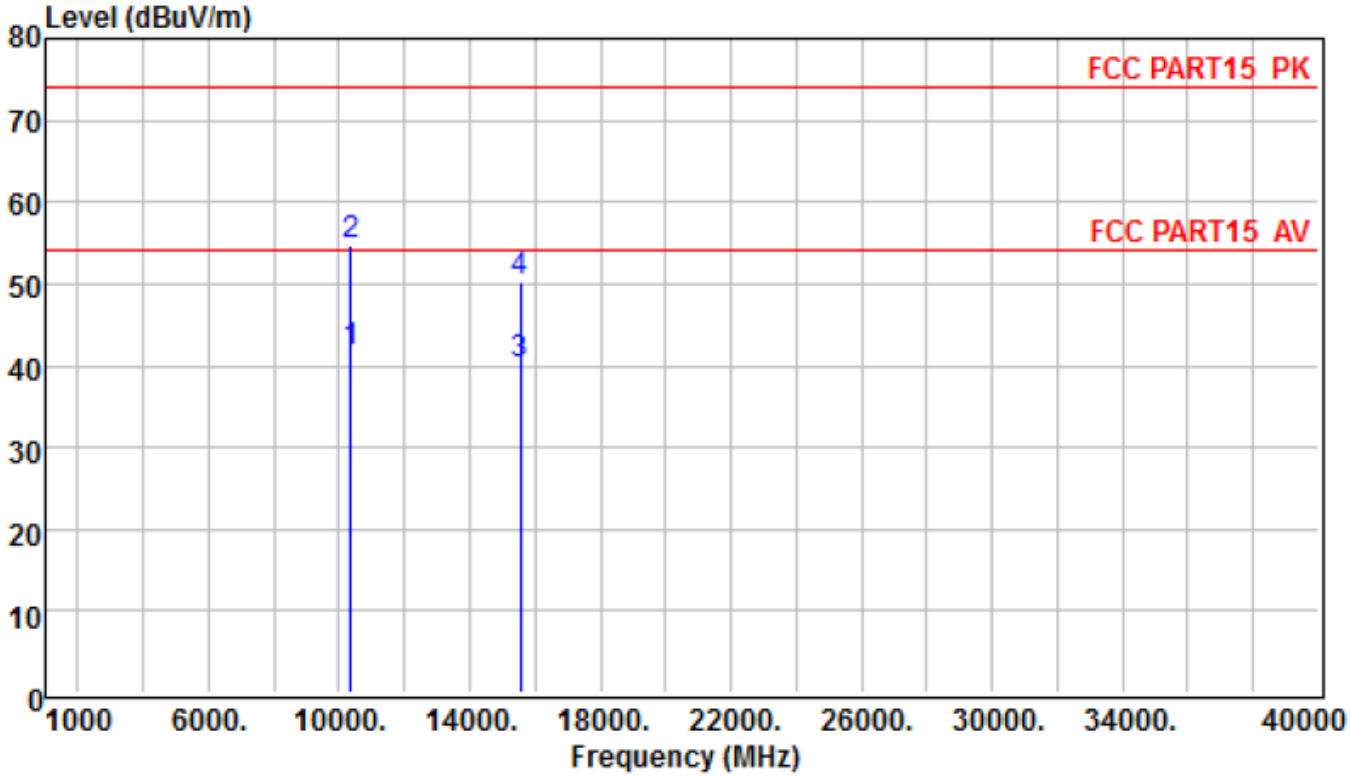
EUT：	MID	Model Name ：	KULA10116
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11a-5180
Test Voltage ：	DC 3.7V		

Vertical



	Freq	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB	
1	10360.000	32.54	28.84	17.04	23.99	44.73	54.00	-9.27	Average
2	10360.000	45.65	28.84	17.04	23.99	57.84	74.00	-16.16	Peak
3	15540.000	27.98	29.63	20.34	23.53	42.22	54.00	-11.78	Average
4	15540.000	37.78	29.63	20.34	23.53	52.02	74.00	-21.98	Peak

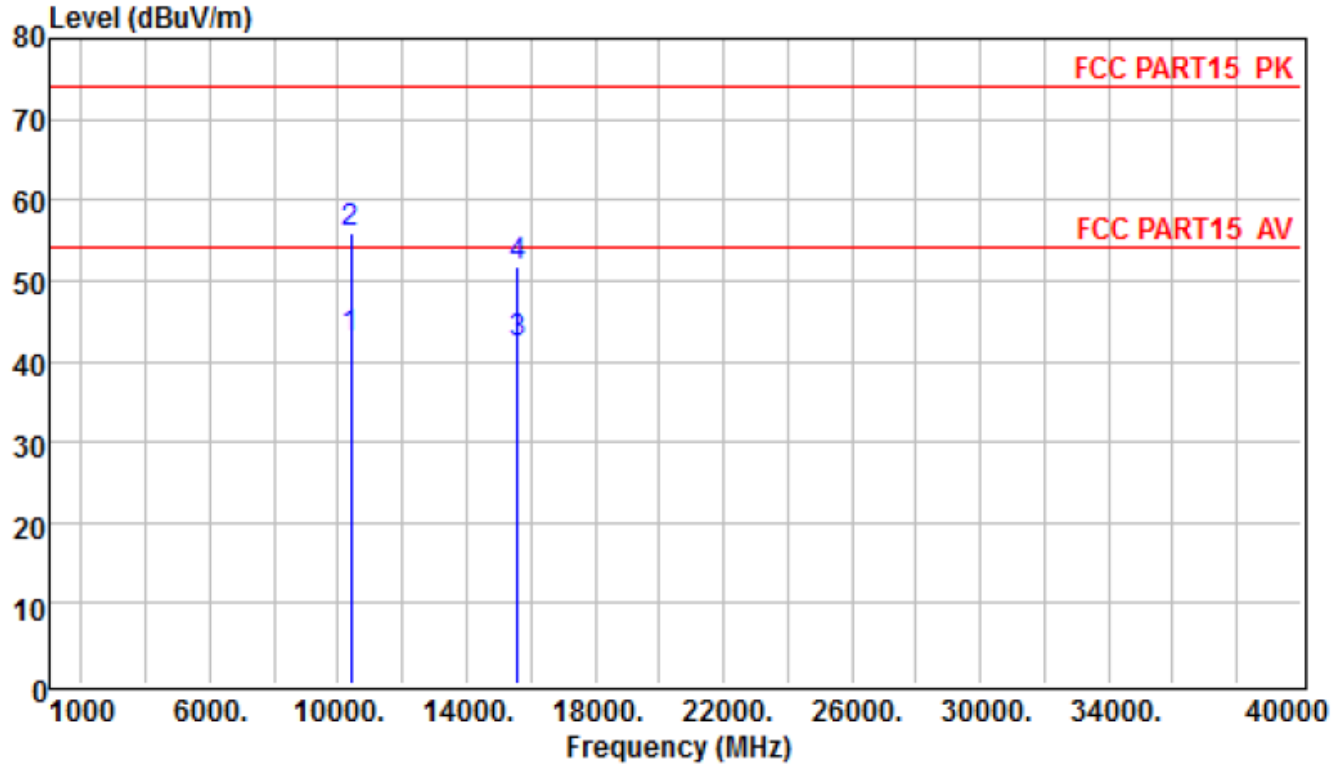
Horizontal



	Freq	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB	
1	10360.000	29.55	28.84	17.04	23.99	41.74	54.00	-12.26	Average
2	10360.000	42.65	28.84	17.04	23.99	54.84	74.00	-19.16	Peak
3	15540.000	25.95	29.63	20.34	23.53	40.19	54.00	-13.81	Average
4	15540.000	35.94	29.63	20.34	23.53	50.18	74.00	-23.82	Peak

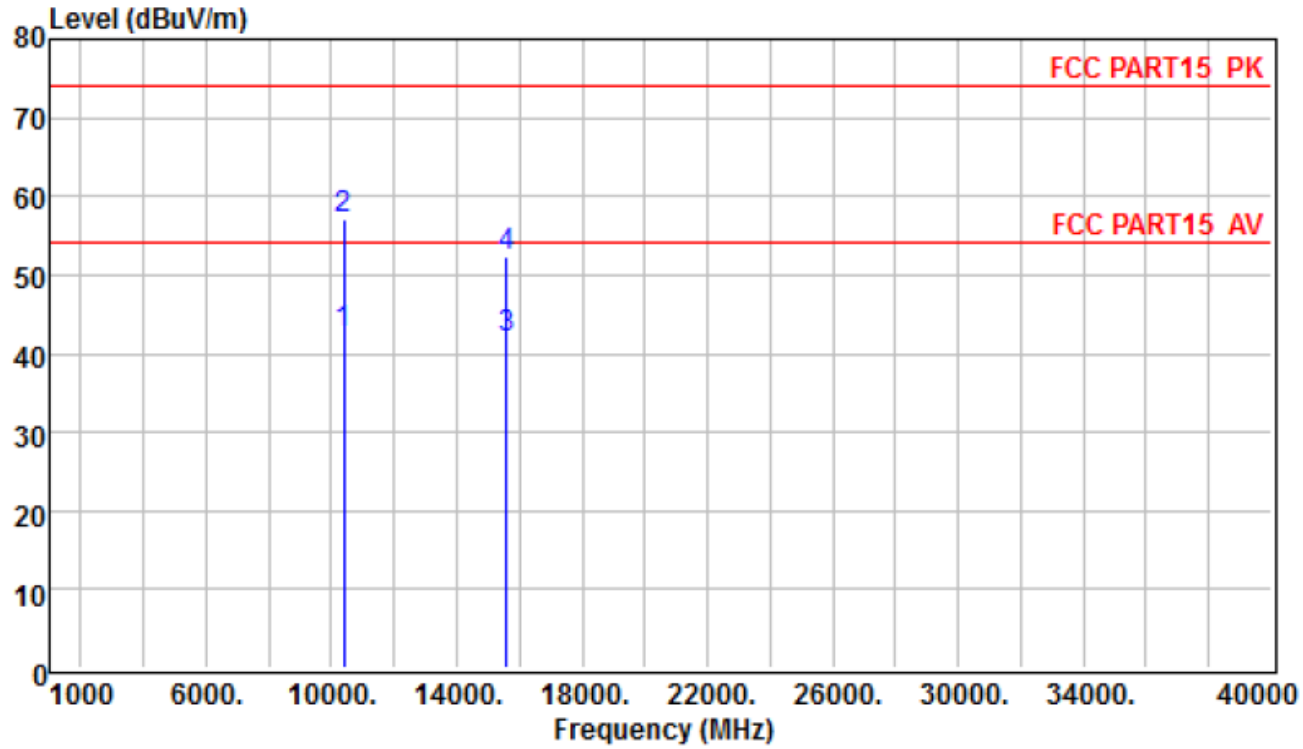
EUT：	MID	Model Name ：	KULA10116
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11a-5200
Test Voltage ：	DC 3.7V		

Vertical



	Freq	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB	
1	10400.000	30.54	28.84	17.04	24.04	42.78	54.00	-11.22	Average
2	10400.000	43.70	28.84	17.04	24.04	55.94	74.00	-18.06	Peak
3	15600.000	27.79	29.64	20.39	23.79	42.33	54.00	-11.67	Average
4	15600.000	37.26	29.64	20.39	23.79	51.80	74.00	-22.20	Peak

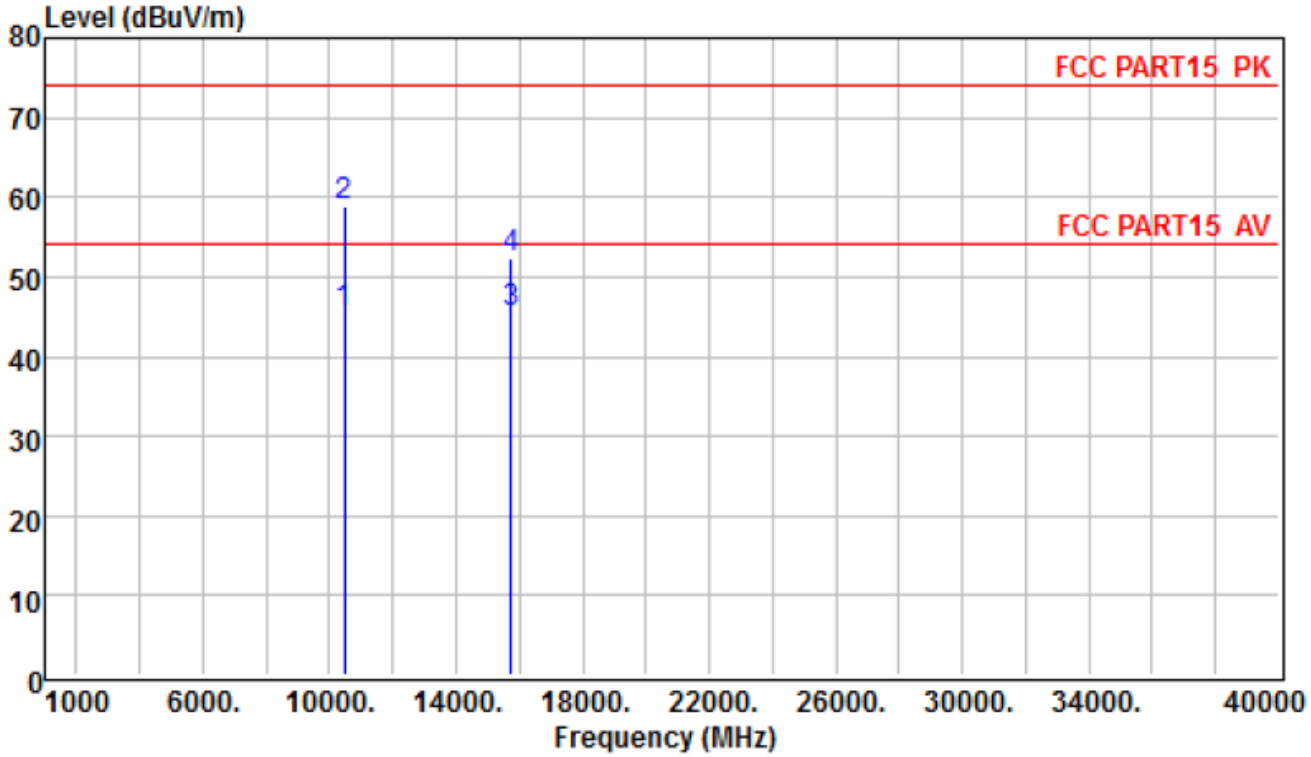
Horizontal



	Freq	Read Level	Preamp Factor	CableLoss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB	
1	10400.000	30.43	28.84	17.04	24.04	42.67	54.00	-11.33	Average
2	10400.000	44.98	28.84	17.04	24.04	57.22	74.00	-16.78	Peak
3	15600.000	27.45	29.64	20.39	23.79	41.99	54.00	-12.01	Average
4	15600.000	37.69	29.64	20.39	23.79	52.23	74.00	-21.77	Peak

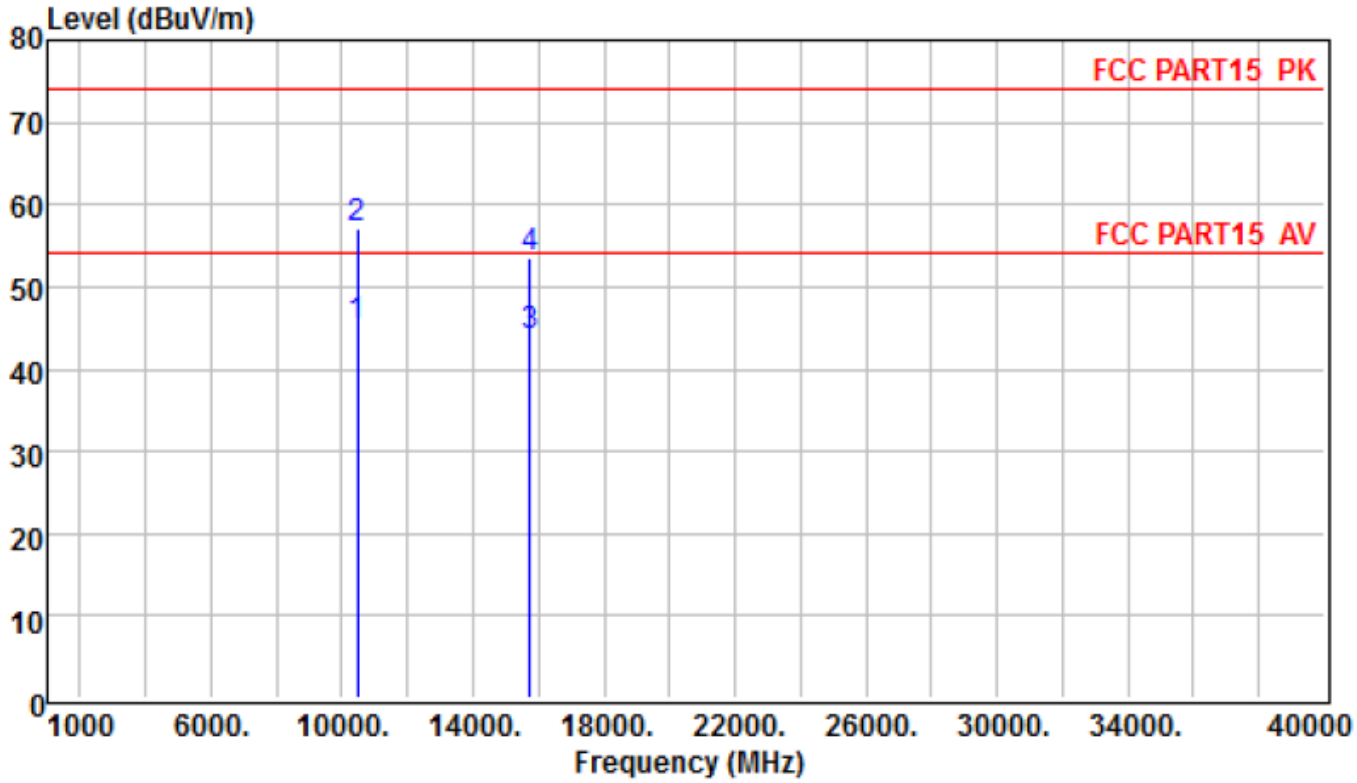
EUT：	MID	Model Name ：	KULA10116
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010hPa	Test Mode：	802.11a-5240
Test Voltage ：	DC 3.7V		

Vertical



	Freq	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB	
1	10480.000	32.12	28.85	17.06	25.17	45.50	54.00	-8.50	Average
2	10480.000	45.57	28.85	17.06	25.17	58.95	74.00	-15.05	Peak
3	15720.000	30.44	29.66	20.45	24.25	45.48	54.00	-8.52	Average
4	15720.000	37.29	29.66	20.45	24.25	52.33	74.00	-21.67	Peak

Horizontal



	Freq	Read Level	Preamp Factor	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB/m	dBuV/m	dBuV/m	dB	
1	10480.000	31.69	28.85	17.06	25.17	45.07	54.00	-8.93	Average
2	10480.000	43.59	28.85	17.06	25.17	56.97	74.00	-17.03	Peak
3	15720.000	28.88	29.66	20.45	24.25	43.92	54.00	-10.08	Average
4	15720.000	38.55	29.66	20.45	24.25	53.59	74.00	-20.41	Peak

Note:
Absolute Level= ReadingLevel+antenna Factor+cable loss-preamp factor,
Over Limit= Absolute Level – Limit
“802.11a” mode is the worst mode and show in the report.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has not to be reported.

5. BAND EDGE COMPLIANCE TEST

5.1 Limits

All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

5.2 Test setup

Test method: FCC KDB 789033 G)& Parts 15.407(b)(4) & 15.209(a)

Same as Clause 4.2.

5.3Test Data

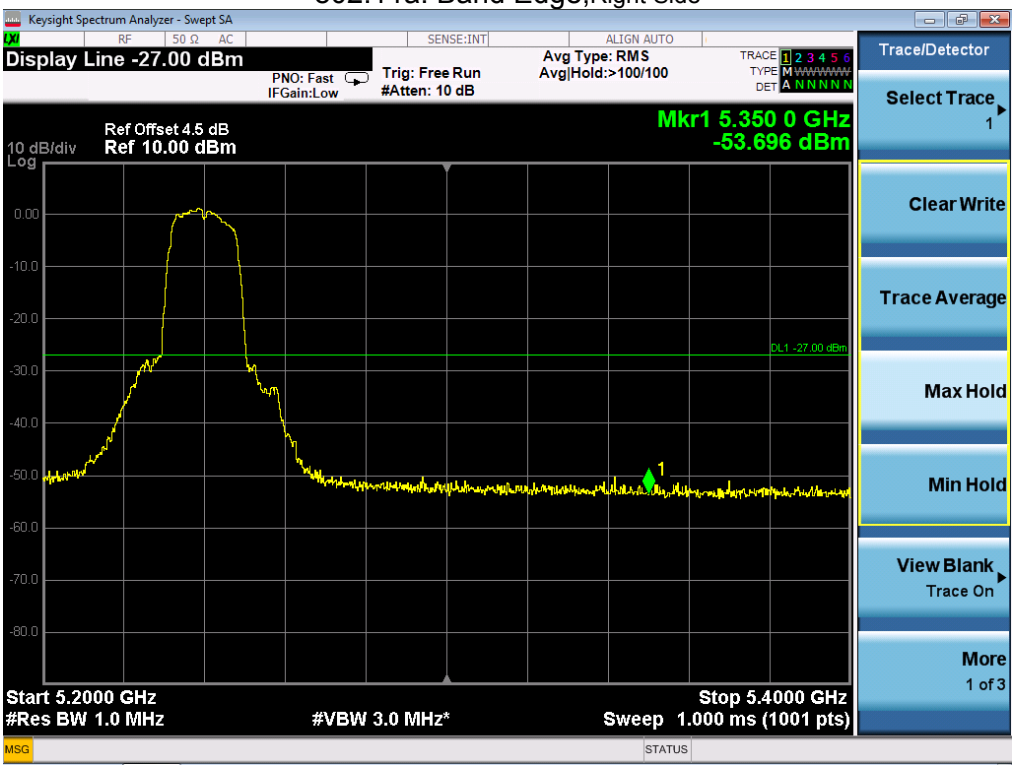
Frequency	Meter Reading	antenna Factor	cable loss	preamp factor	Emission Level	EIRP	Limit	Result	Comment
(MHz)	(dBμV)	(dB)	(dB)	(dB)	(dBμV/m)	[dBm]	[dBm]		
802.11a									
5180	35.12	28.66	12.93	27.62	49.09	-46.11	-27.00	Pass	Vertical
5240	35.55	28.73	13.09	27.62	49.75	-45.45	-27.00	Pass	Vertical
5180	31.75	27.63	15.16	27.67	46.87	-48.33	-27.00	Pass	Horizontal
5240	32.98	27.82	15.66	27.68	48.78	-46.42	-27.00	Pass	Horizontal
802.11n(HT20)									
5180	34.84	28.66	12.93	27.62	48.81	-46.39	-27.00	Pass	Vertical
5240	34.12	28.73	13.09	27.62	48.32	-46.88	-27.00	Pass	Vertical
5180	30.34	27.63	15.16	27.67	45.46	-49.74	-27.00	Pass	Horizontal
5240	31.65	27.82	15.66	27.68	47.45	-47.75	-27.00	Pass	Horizontal
802.11n(HT40)									
5190	34.12	28.66	12.93	27.62	48.09	-47.11	-27.00	Pass	Vertical
5230	34.35	28.73	13.09	27.62	48.55	-46.65	-27.00	Pass	Vertical
5190	30.74	27.63	15.16	27.67	45.86	-49.34	-27.00	Pass	Horizontal
5230	31.43	27.82	15.66	27.68	47.23	-47.97	-27.00	Pass	Horizontal

Remark: 1. According to KDB 789033 D02 section H) d) (iii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows: EIRP[dBm] = E[dBμV/m] - 95.2

For conducted test:

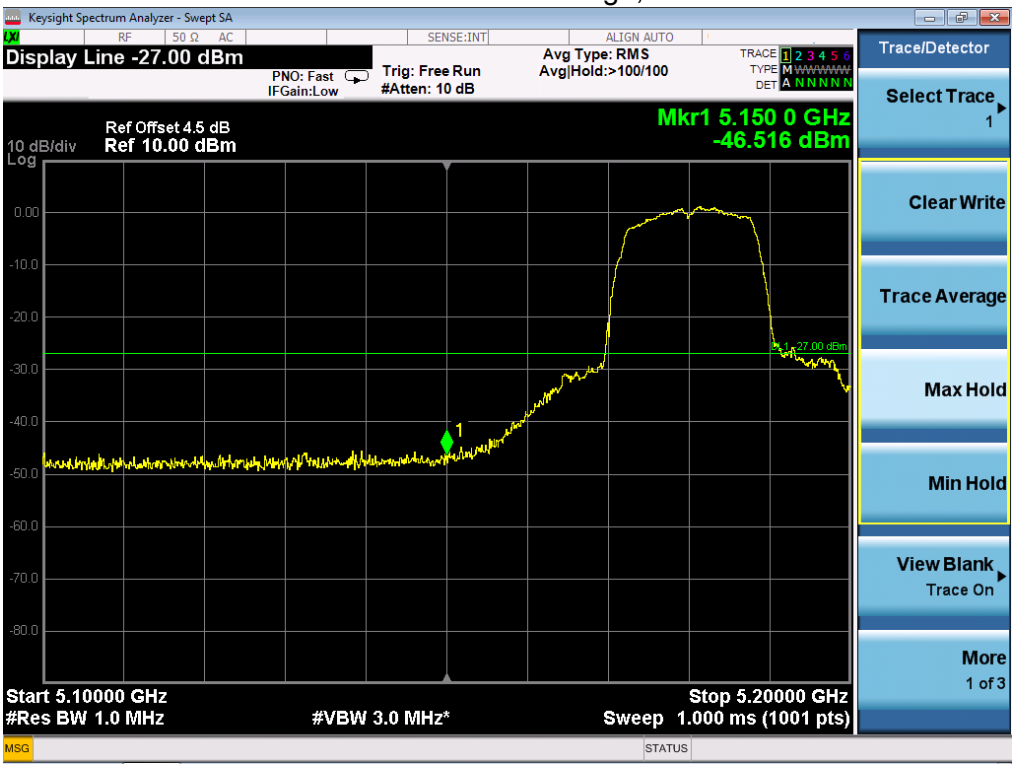
802.11a: Band Edge,Left Side

802.11a: Band Edge,Right Side

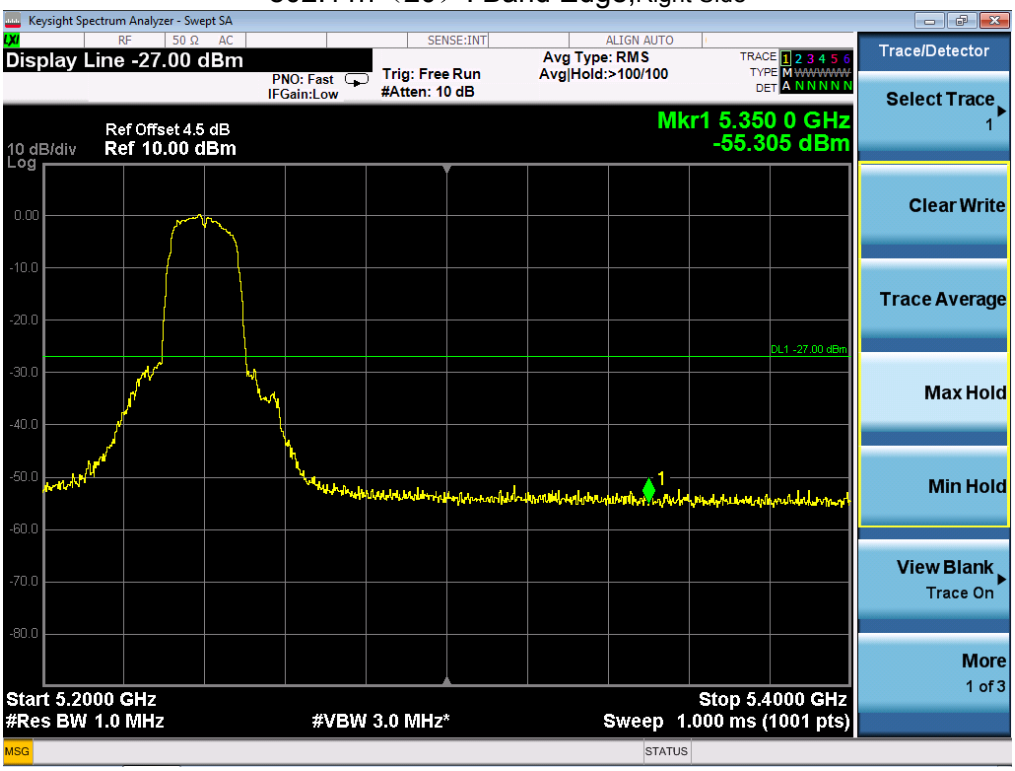


Note： EIRP BAND EDGE=Reading Level+antenna gain

802.11n（20）: Band Edge,Left Side

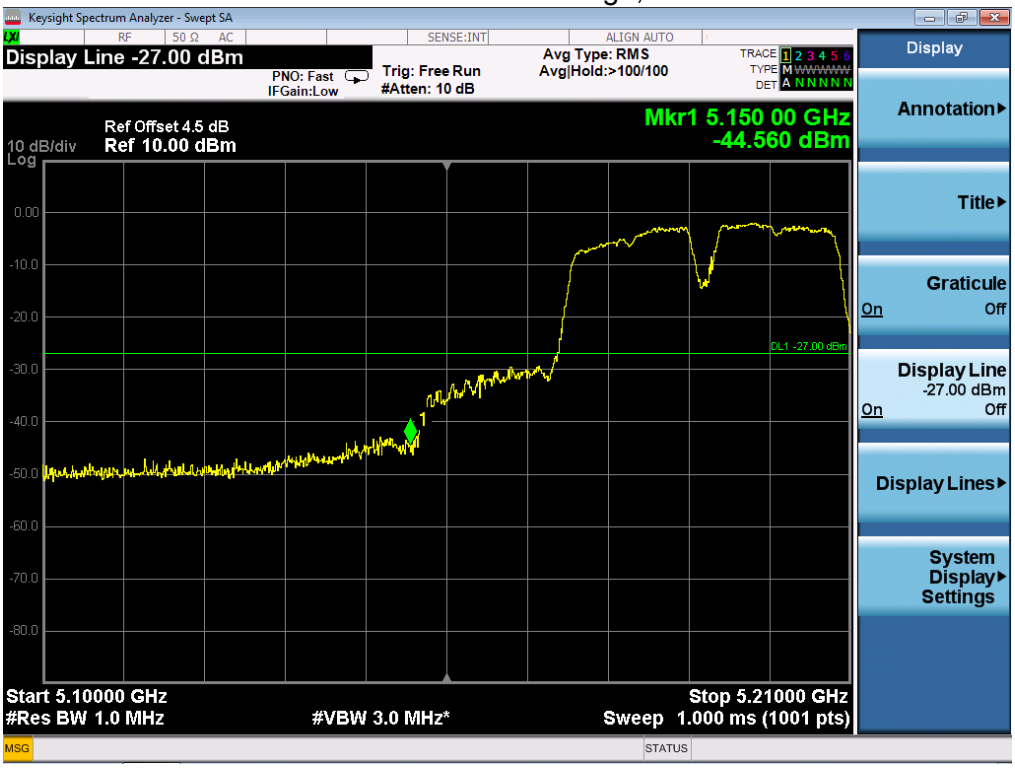


802.11n（20）: Band Edge,Right Side

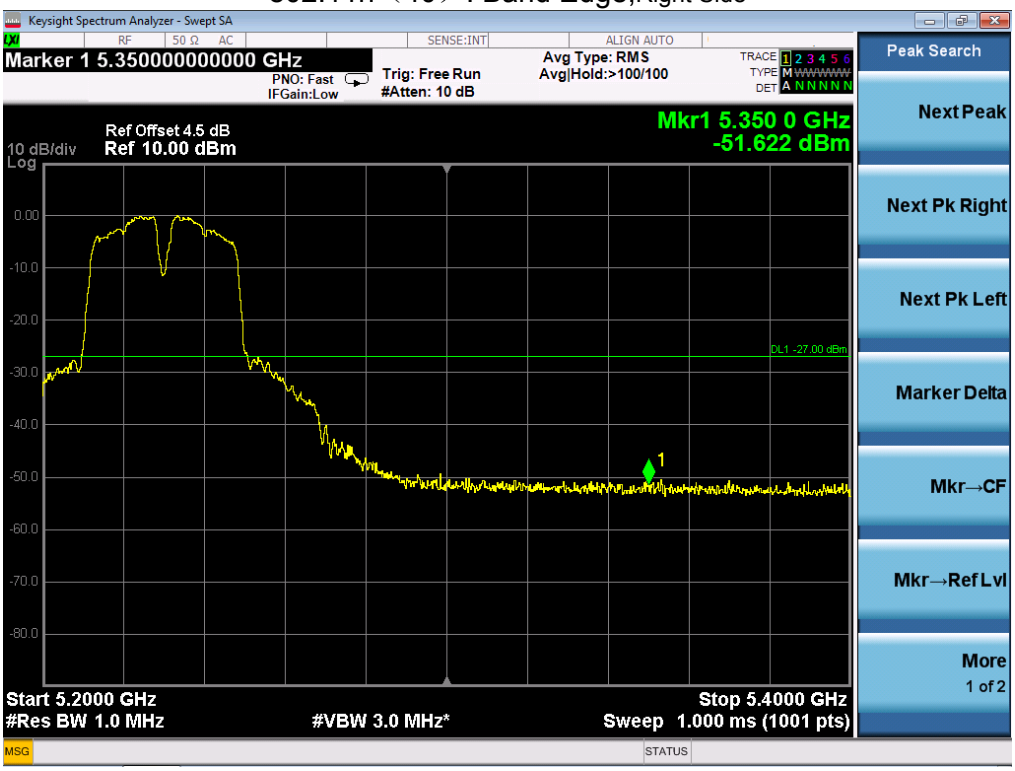


Note： EIRP BAND EDGE=Reading Level+antenna gain

802.11n（40）: Band Edge,Left Side



802.11n（40）: Band Edge,Right Side



Note： EIRP BAND EDGE=Reading Level+antenna gain

6. 26DB AND 6DB BANDWIDTH TEST

6.1 Applicable Standard

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum power control level, as defined in KDB 789033, at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26 dB bandwidth.

The 26 dB bandwidth is used to determine the conducted power limits.

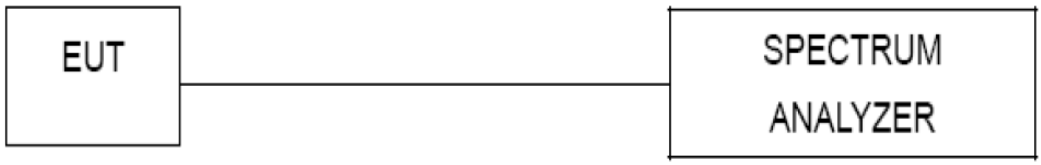
The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

6.2Test Procedure

1. Emission Bandwidth (EBW)

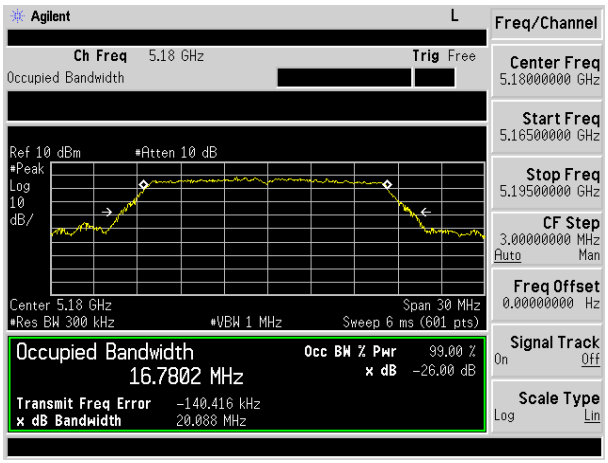
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

6.3 Test setup

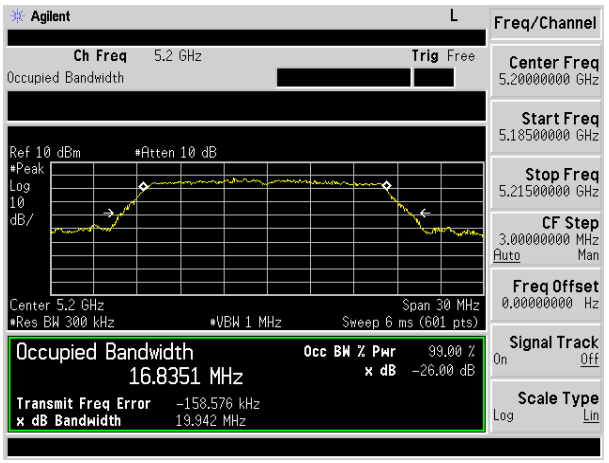


Mode	Channel number	Frequency (MHz)	26dB Bandwidth (MHz)
802.11a	36	5180	20.088
	40	5200	19.942
	48	5240	20.230
802.11n (HT20)	36	5180	20.311
	40	5200	20.276
	48	5240	20.326
802.11n (HT40)	38	5190	42.262
	46	5230	42.473

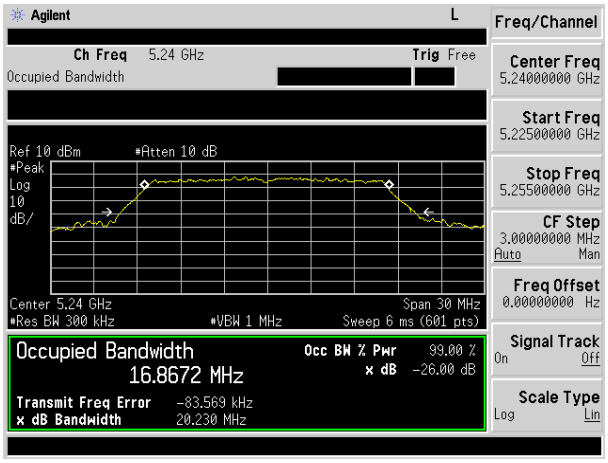
802.11a mode-ch36



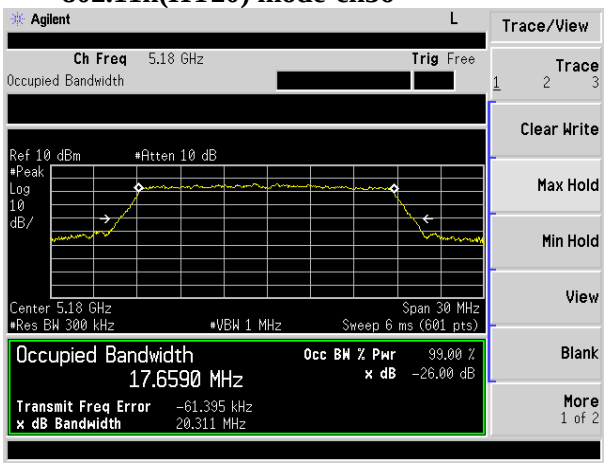
802.11a mode-ch40



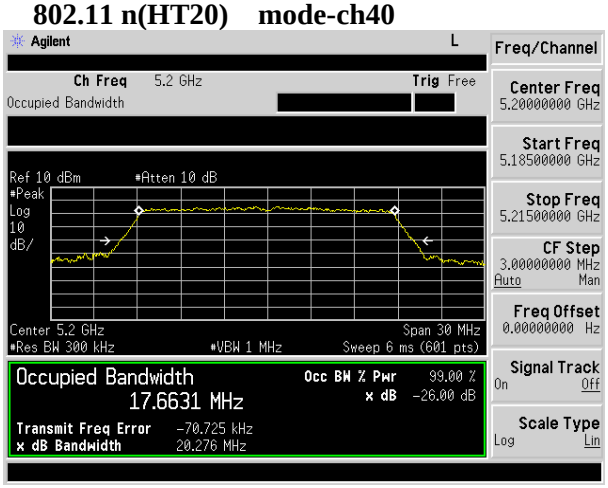
802.11a mode-ch48



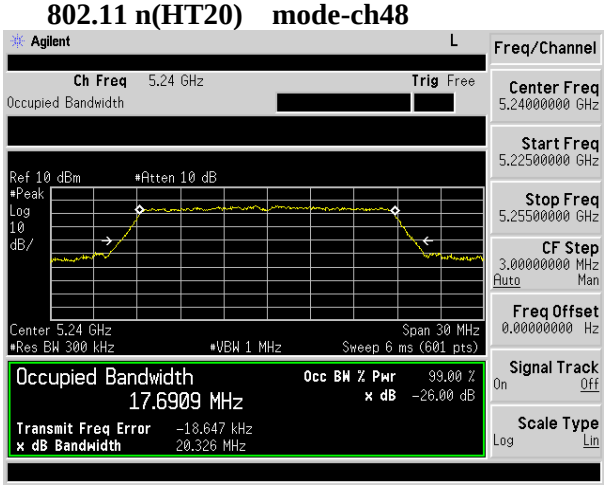
802.11n(HT20) mode-ch36



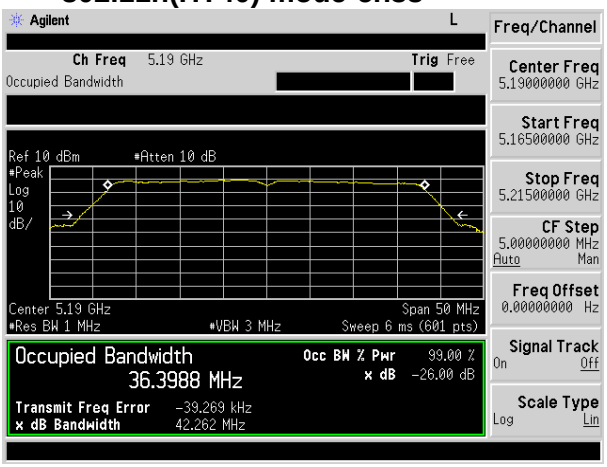
802.11 n(HT20) mode-ch40



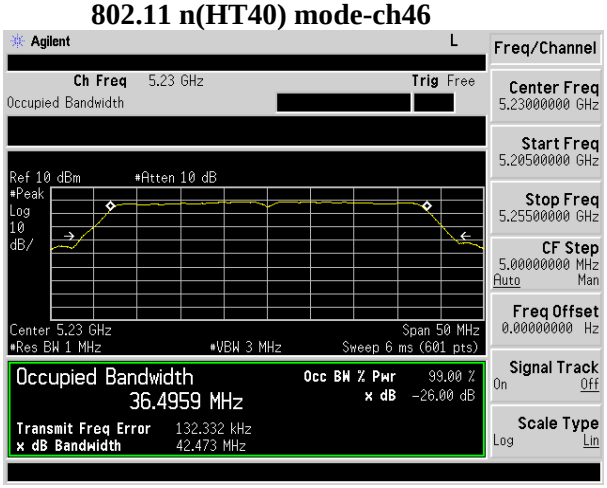
802.11 n(HT20) mode-ch48



802.11n(HT40) mode-ch38



802.11 n(HT40) mode-ch46



7. OUTPUT POWER TEST

7.1 Limits

Band 5.15-5.25GHz:

FCC: For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

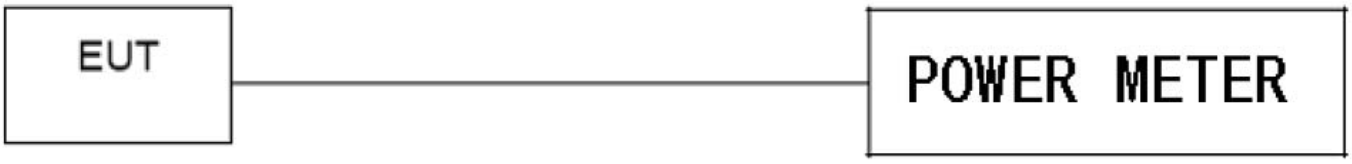
7.2 Test setup

1. The maximum average conducted output power can be measured using Method PM-G (Measurement using a gated RF average power meter):
2. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

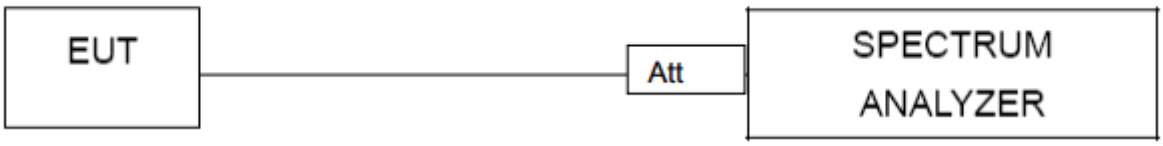
a. The Transmitter output (antenna port) was connected to the power meter.

b. Turn on the EUT and power meter and then record the power value.

c. Repeat above procedures on all channels needed to be tested.



Duty cycle



7.3Test result

	Frequency (MHz)	Average Output Power (dBm)	FCC Limit (dBm)	Result
802.11a	5180	11.56	24	Pass
	5200	10.74	24	Pass
	5240	11.23	24	Pass
802.11n (HT20)	5180	12.14	24	Pass
	5200	11.02	24	Pass
	5240	10.47	24	Pass
802.11n (HT40)	5190	9.78	24	Pass
	5230	11.35	24	Pass

NOTE: During the test the EUT is in 100% duty cycle transmitting.

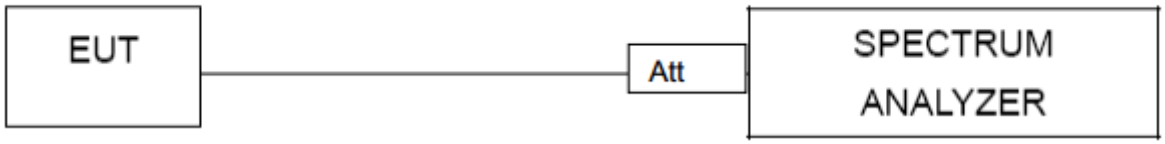
8. DUTY CYCLE

8.1Test Procedure

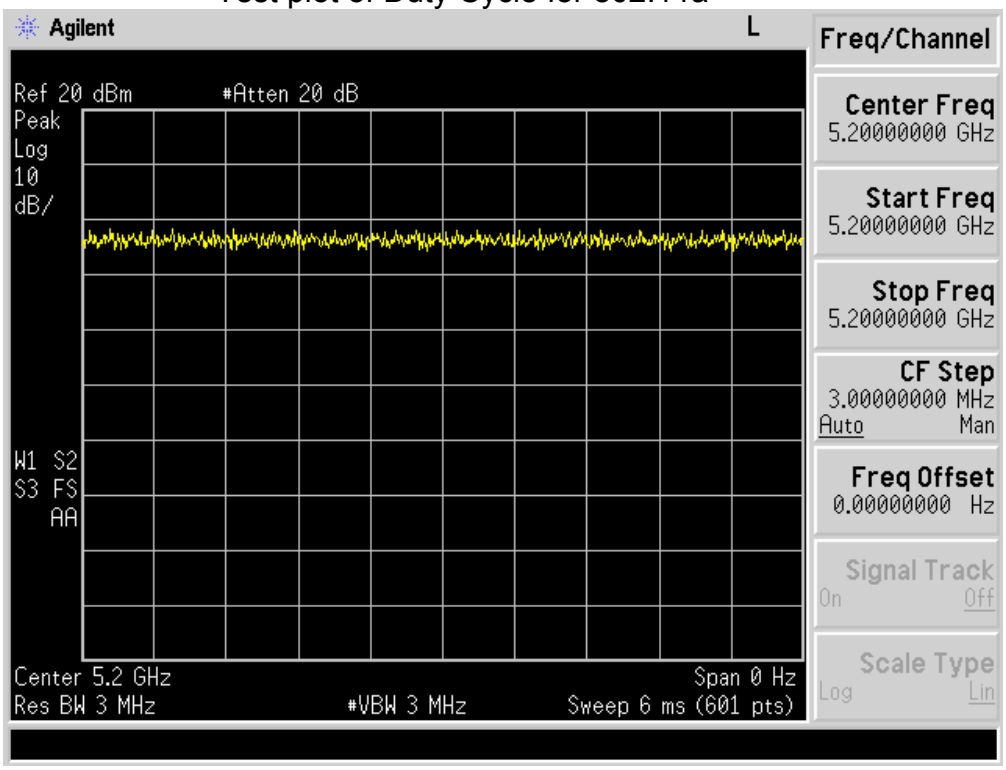
The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = Zero Span
RBW = 3MHz
VBW =3MHz
Number of points in Sweep >100
Detector function = peak
Trace = Clear write Measure T_{total} and T_{on}
Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor=10*log(1/Duty Cycle)

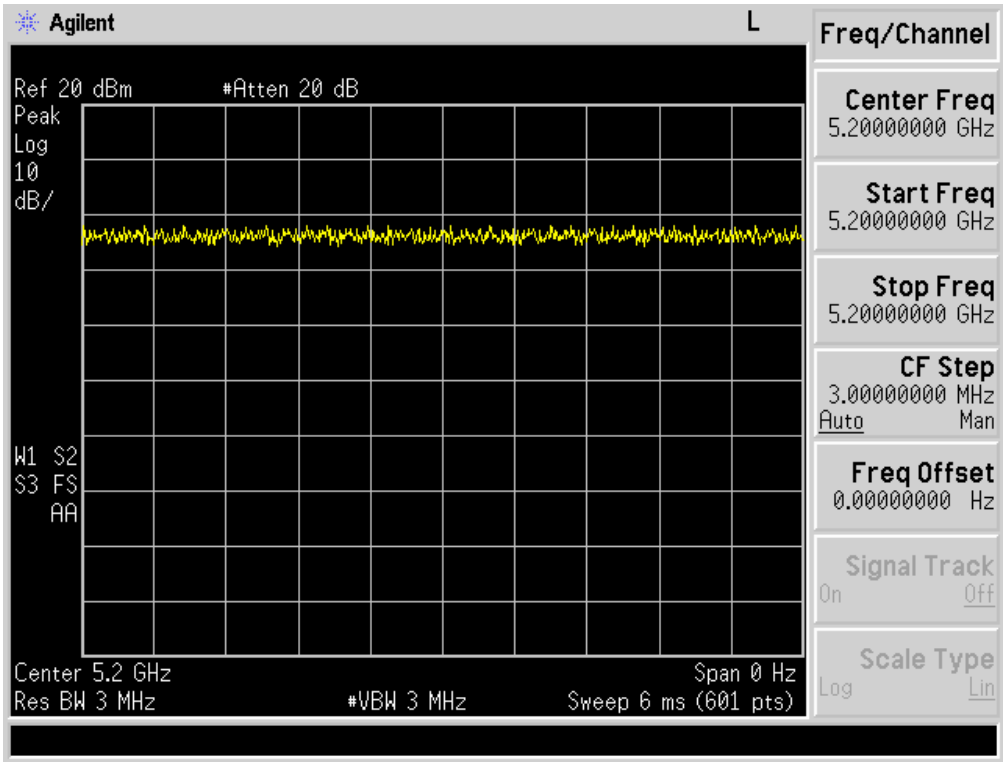
8.2TEST SETUP



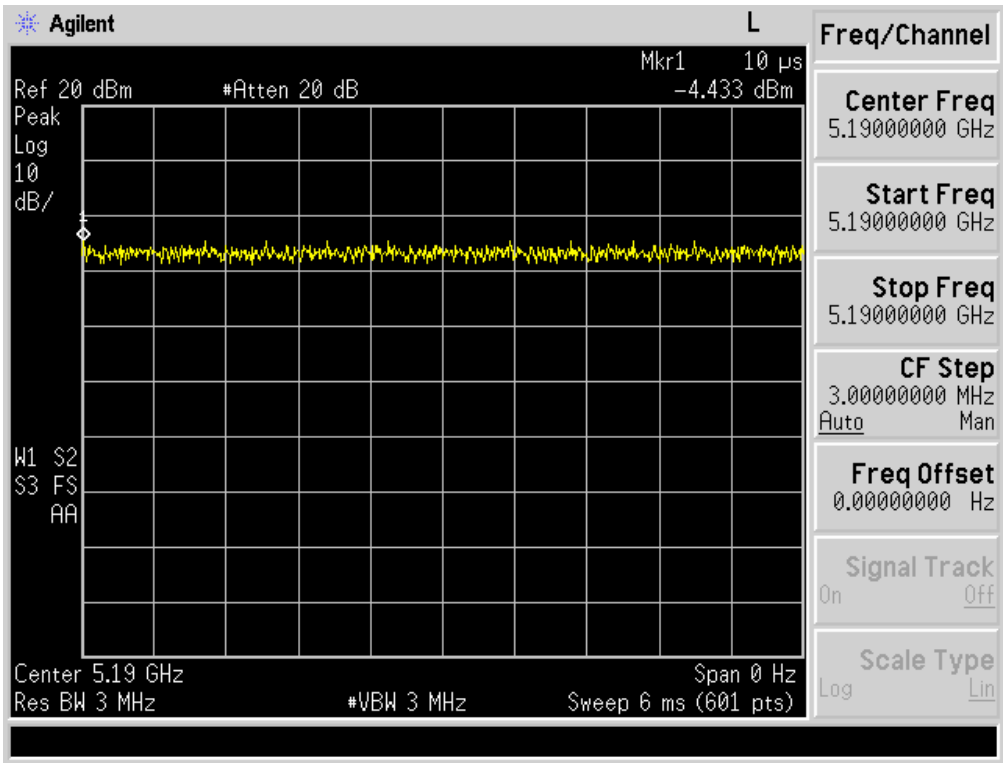
Test plot of Duty Cycle for 802.11a



Test plot of Duty Cycle for 802.11n(HT20)



Test plot of Duty Cycle for 802.11n(HT40)



9. PEAK POWER SPECTRAL DENSITY TEST

9.1 Limits

Band 5.15-5.25GHz:

FCC: In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

9.2 Test setup

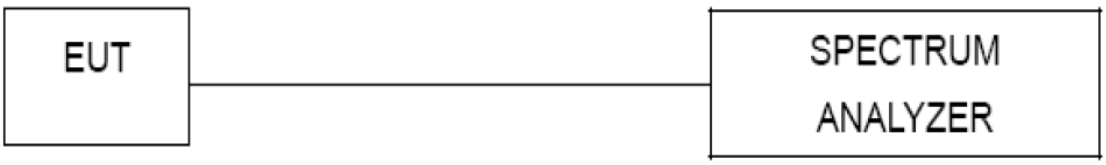
Methods refer to FCC KDB 789033

1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”.

2) Use the peak search function on the instrument to find the peak of the spectrum.

3) The result is the PPSD.

4) The above procedures make use of 1 MHz resolution bandwidth to satisfy the 1 MHz measurement bandwidth specified in the 15.407(a)(5). That rule section also permits use of resolution bandwidths less than 1 MHz “provided that the measured power is integrated to show the total power over the measurement bandwidth” (i.e., 1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated over 1 MHz bandwidth

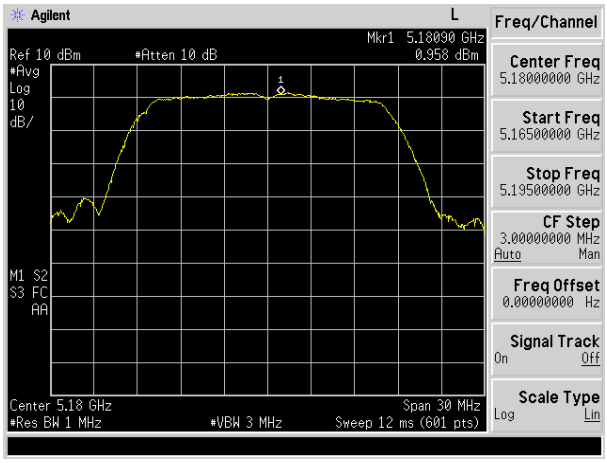


9.3 Test data

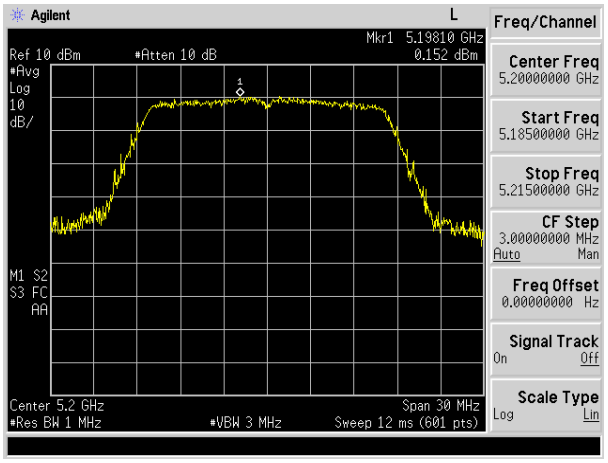
Test data as below

Mode	Frequency (MHz)	Power Density.	FCC Limit (dBm)
802.11a	5180	0.958	11
	5200	0.152	11
	5240	0.836	11
802.11n (HT20)	5180	1.514	11
	5200	0.47	11
	5240	-0.516	11
802.11n (HT40)	5190	-1.239	11
	5230	0.909	11

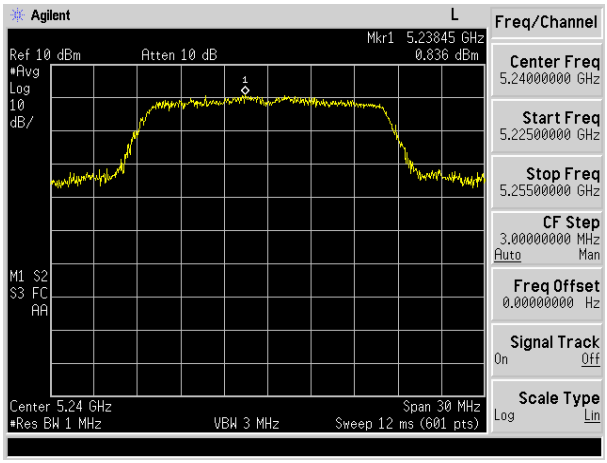
802.11a mode-ch36



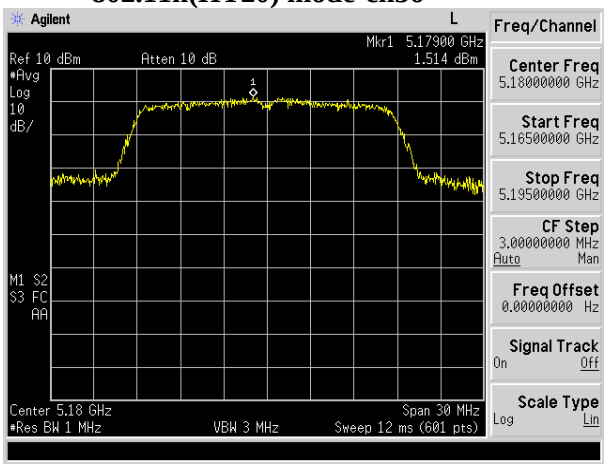
802.11a mode-ch40



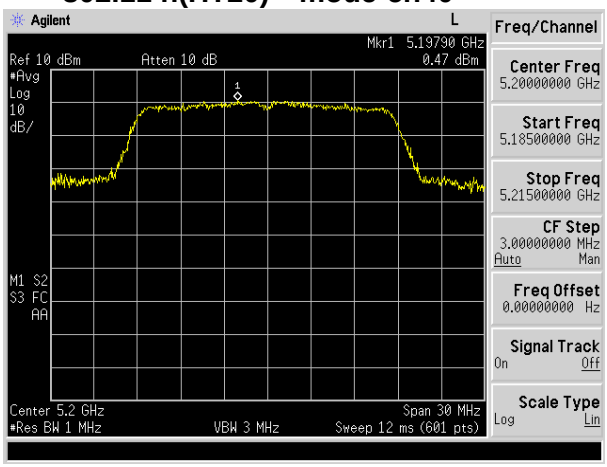
802.11a mode-ch48



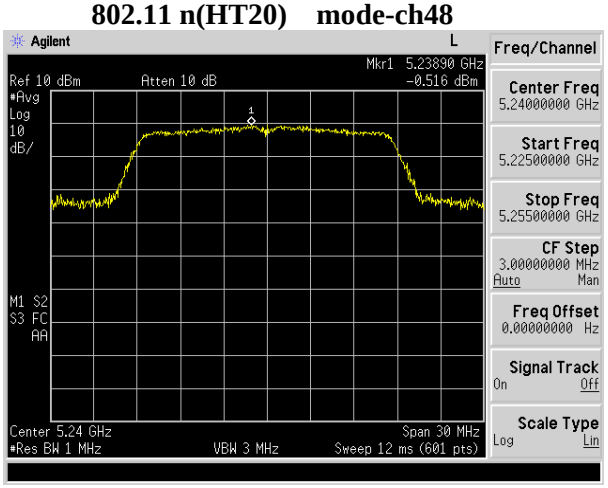
802.11n(HT20) mode-ch36



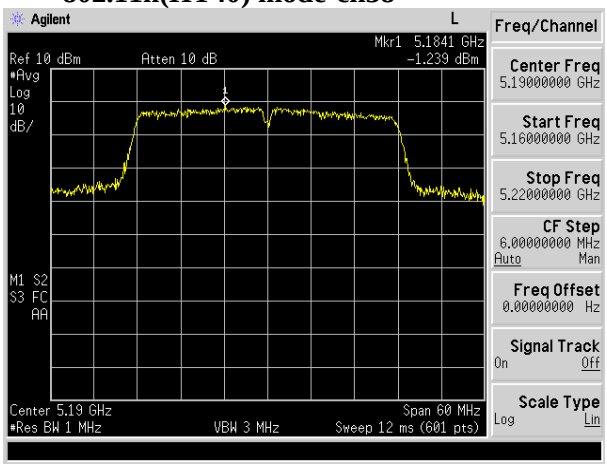
802.11 n(HT20) mode-ch40



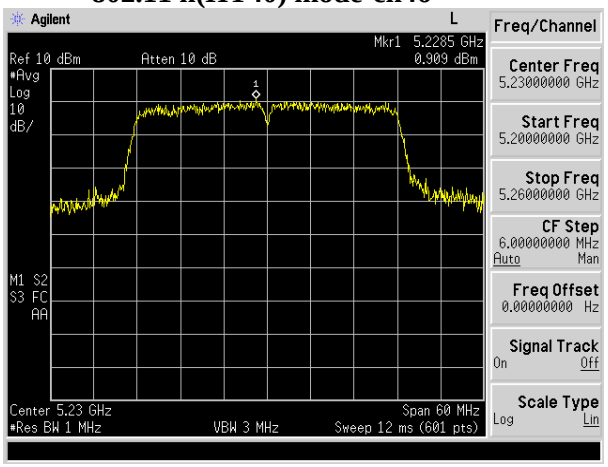
802.11 n(HT20) mode-ch48



802.11n(HT40) mode-ch38



802.11 n(HT40) mode-ch46

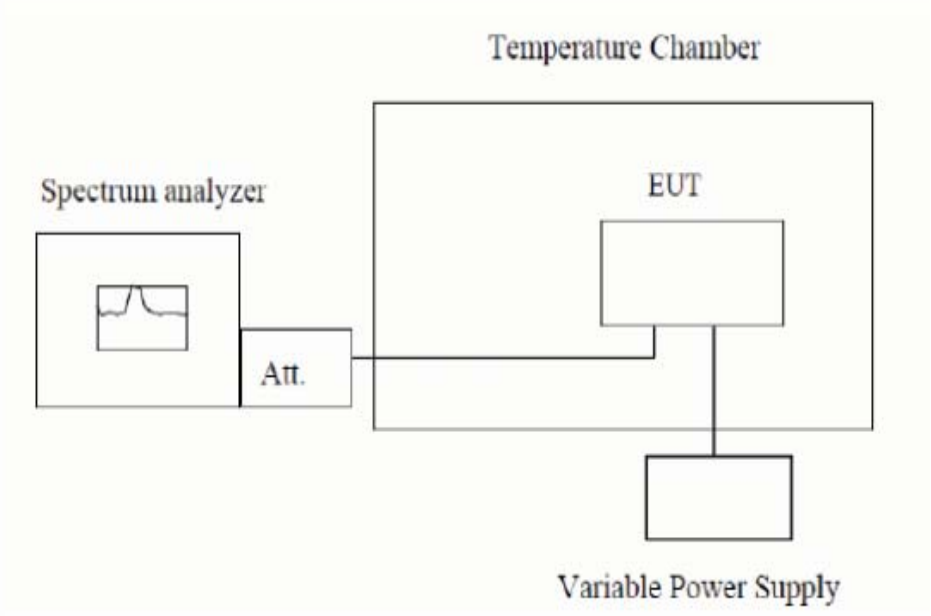


10. FREQUENCY STABILITY TEST

10.1.limit

According to §15.407(g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

10.2Test Configuration



10.3 test procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 106 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature rule is -30°C~50°C..

Test result

Measurement Data (the worst channel):

Frequency Stability under Temperature

Operating Frequency: 5180 MHz				
Environment Temperature (^{o}C)	**Voltage (V)**	**Measured Frequency (MHz)**	**Test Result (MHz)**	**Max. Deviation (ppm)**
50	3.7	5180	5180.0135	2.606
40	3.7	5180	5180.0103	1.988
30	3.7	5180	5180.0112	2.162
20	3.7	5180	5180.0117	2.258
10	3.7	5180	5180.0105	2.027
0	3.7	5180	5180.0143	2.761
-10	3.7	5180	5180.0112	2.162
-20	3.7	5180	5180.0133	2.568
-30	3.7	5180	5180.0124	2.394

Frequency Stability under Voltage

Operating Frequency: 5180 MHz			
DC Voltage (V)	**Measured Frequency (MHz)**	**Test Result (MHz)**	**Max. Deviation (ppm)**
3.33	5180	5180.0132	2.548
3.7	5180	5180.0238	4.595
4.07	5180	5180.0134	2.587

11. ANTENNA REQUIREMENTS

11.1 Limits

For intentional device, according to FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

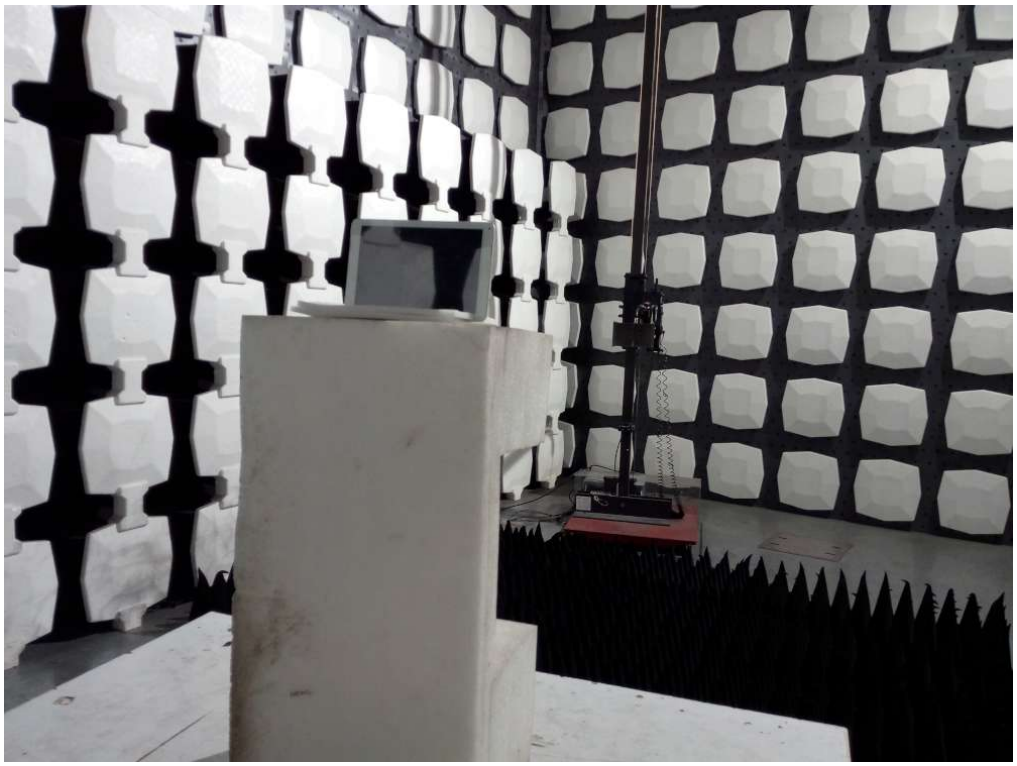
11.2 Result

The antenna used for this product is FPCB antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0.95dBi.

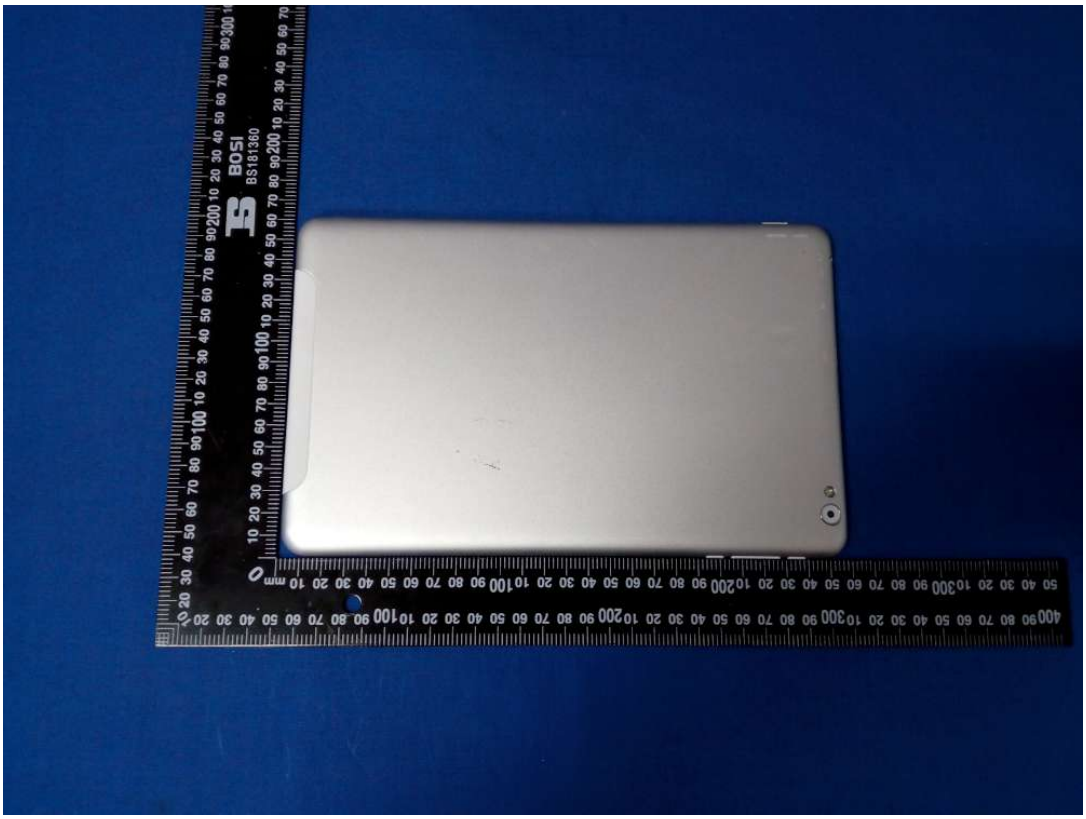
12.PHOTOGRAPHS OF TEST SET-UP

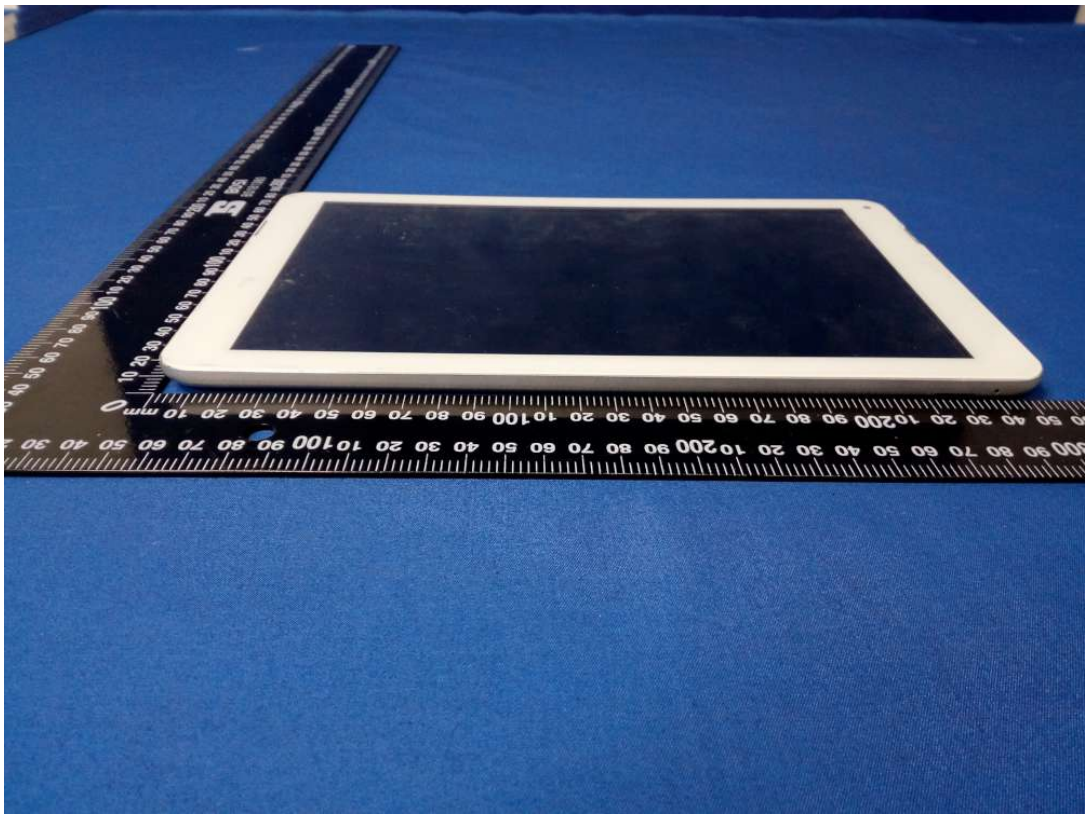
Conducted Emission

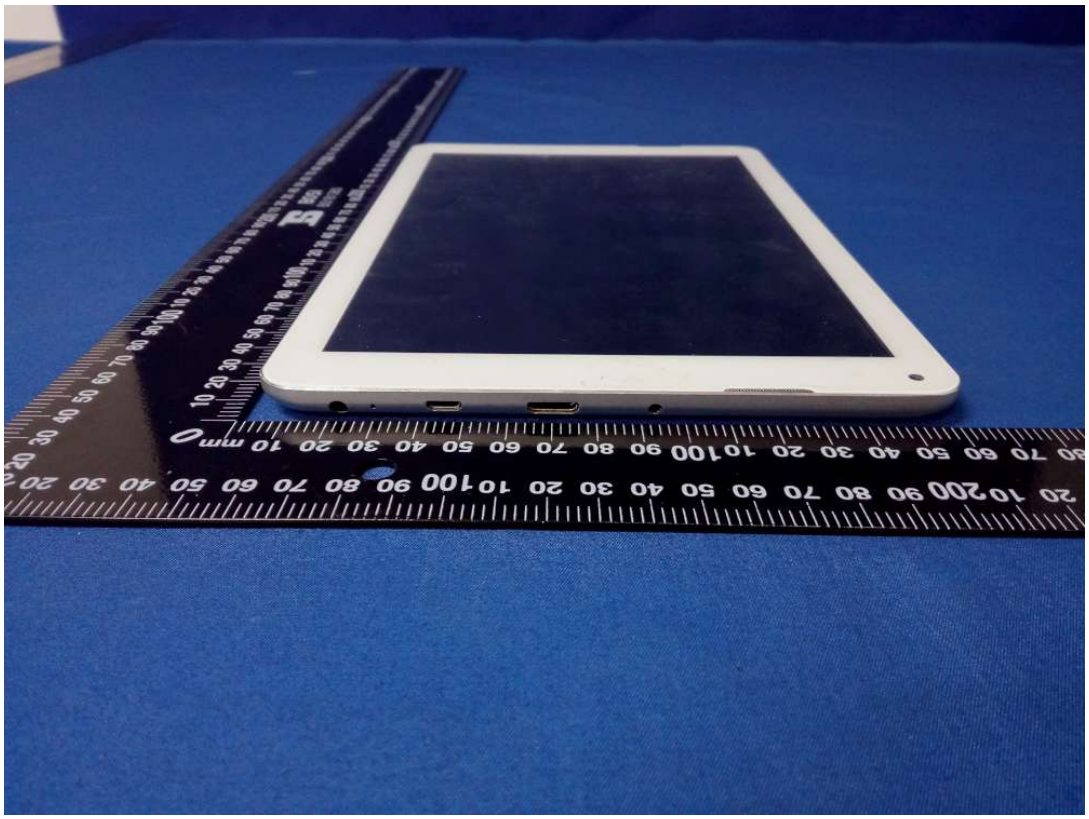
Radiated Emission Test

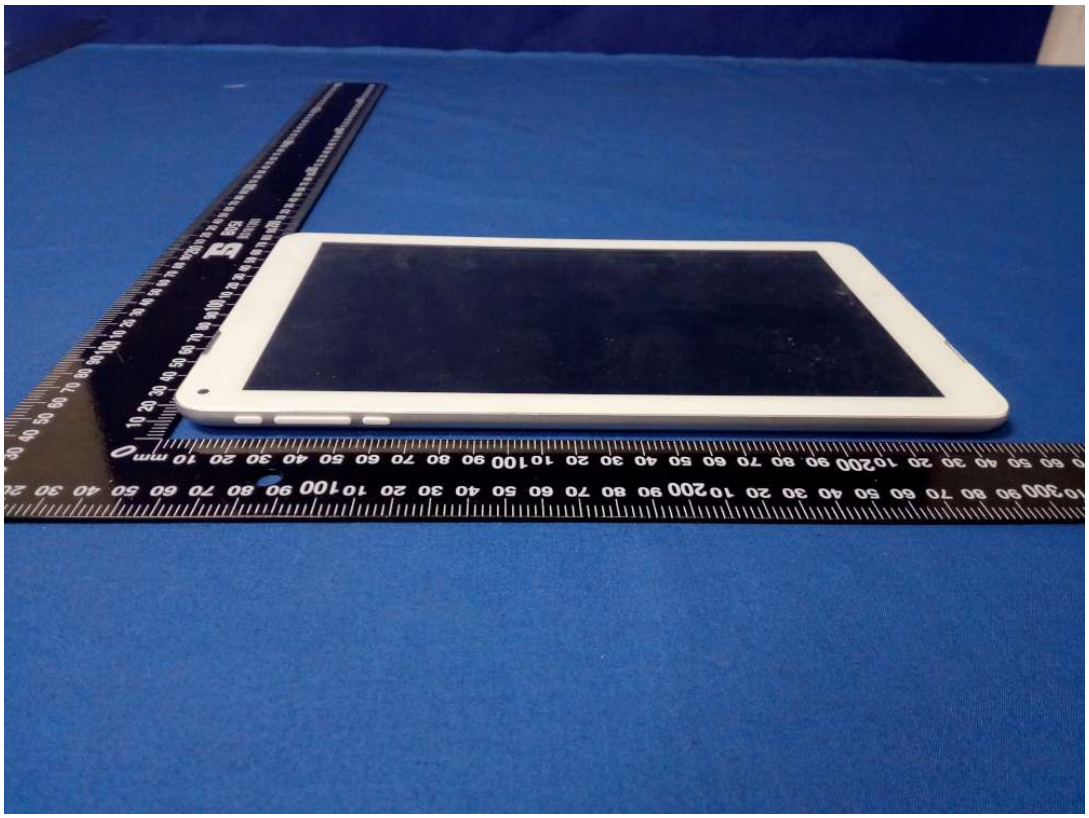


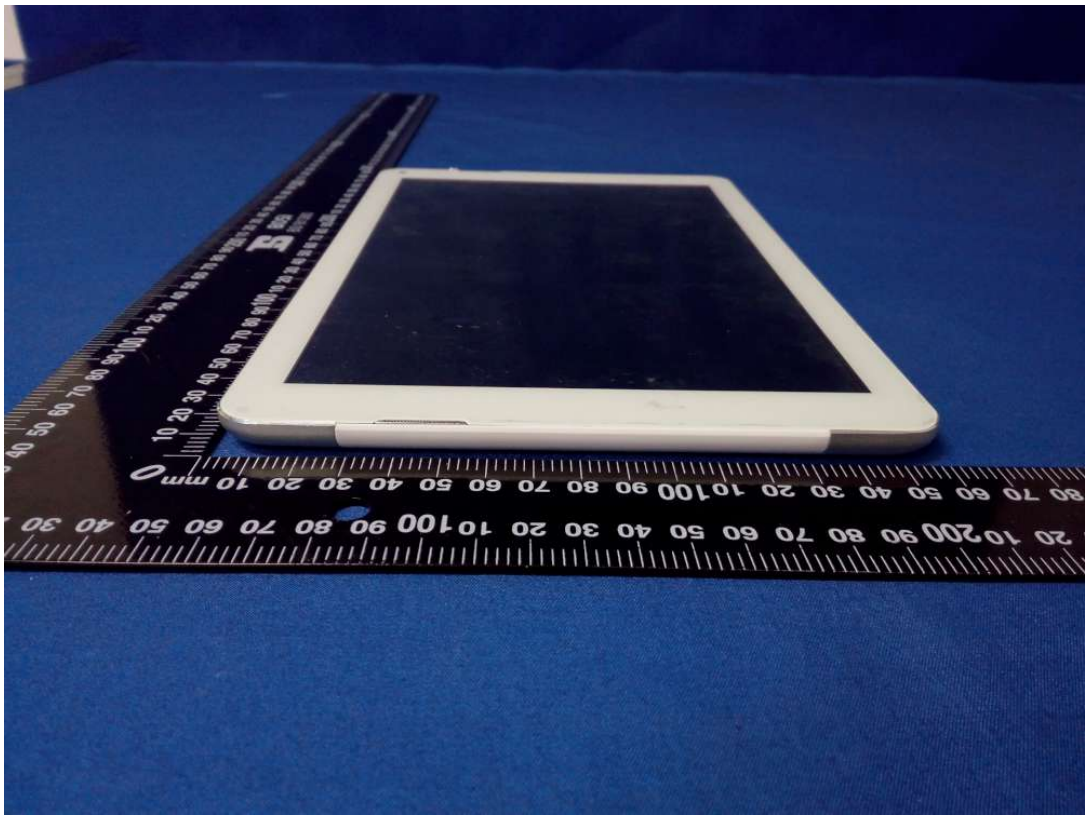
13.PHOTOGRAPHS OF THE EUT









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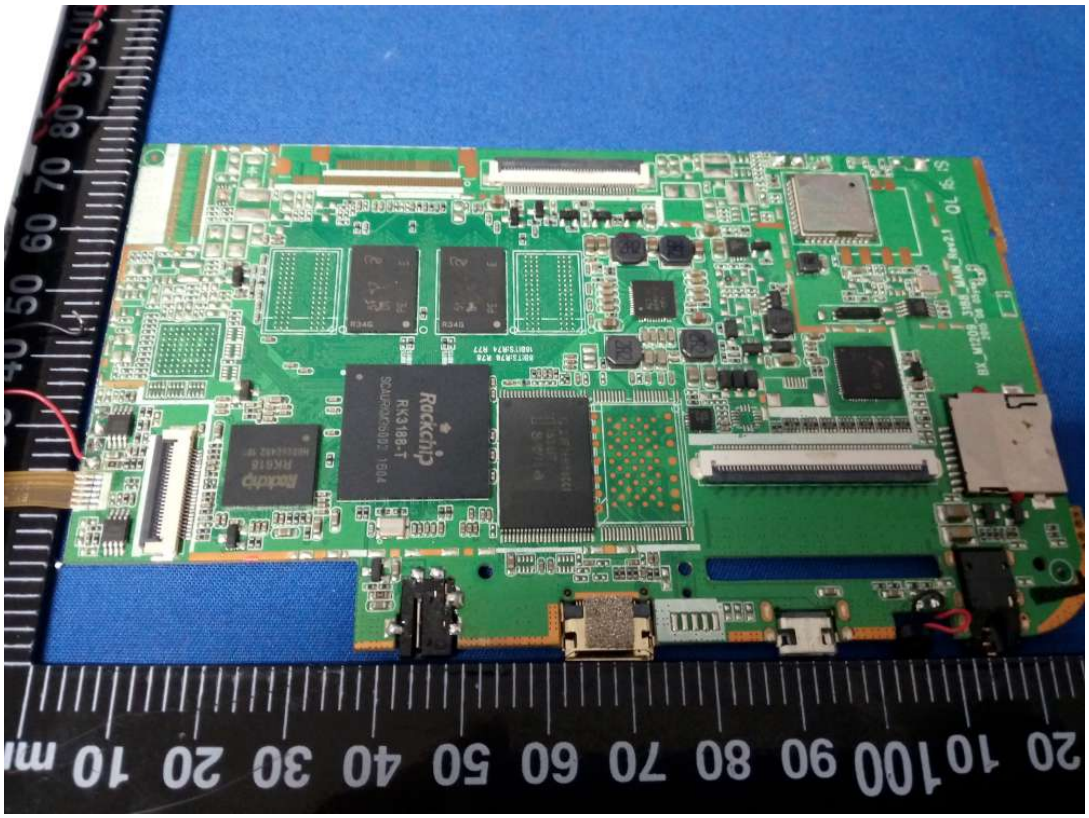
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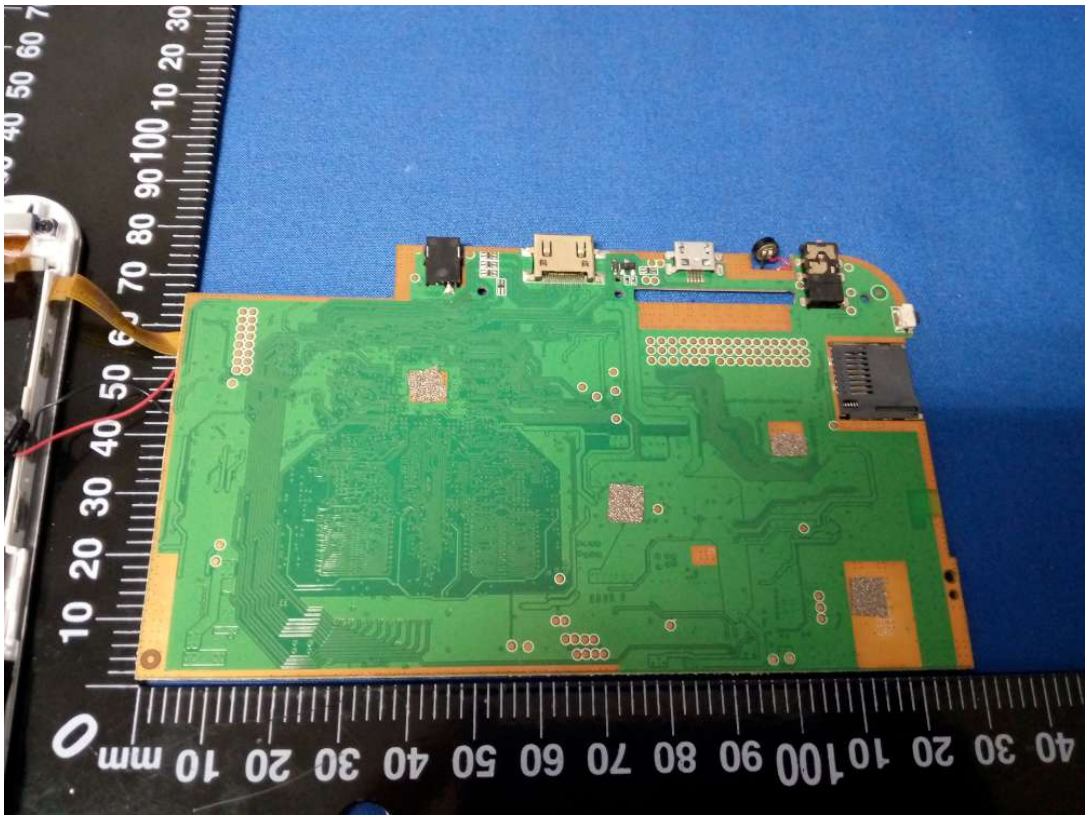
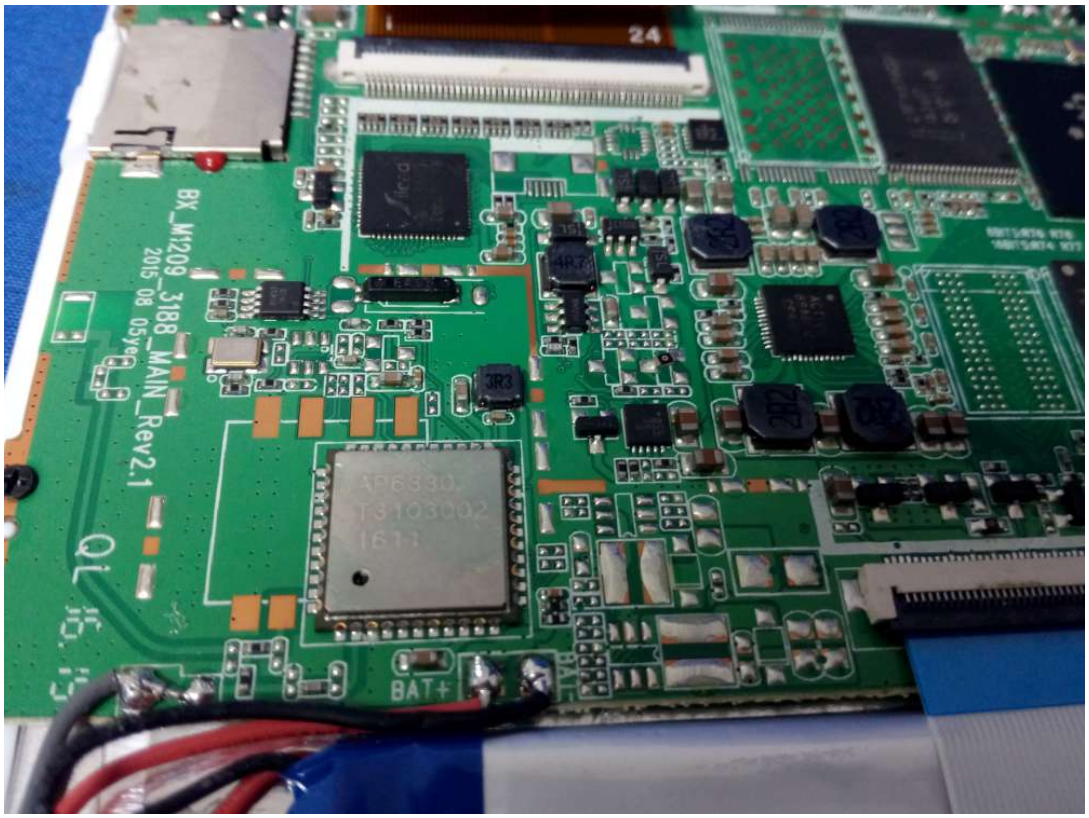
RK3188-T

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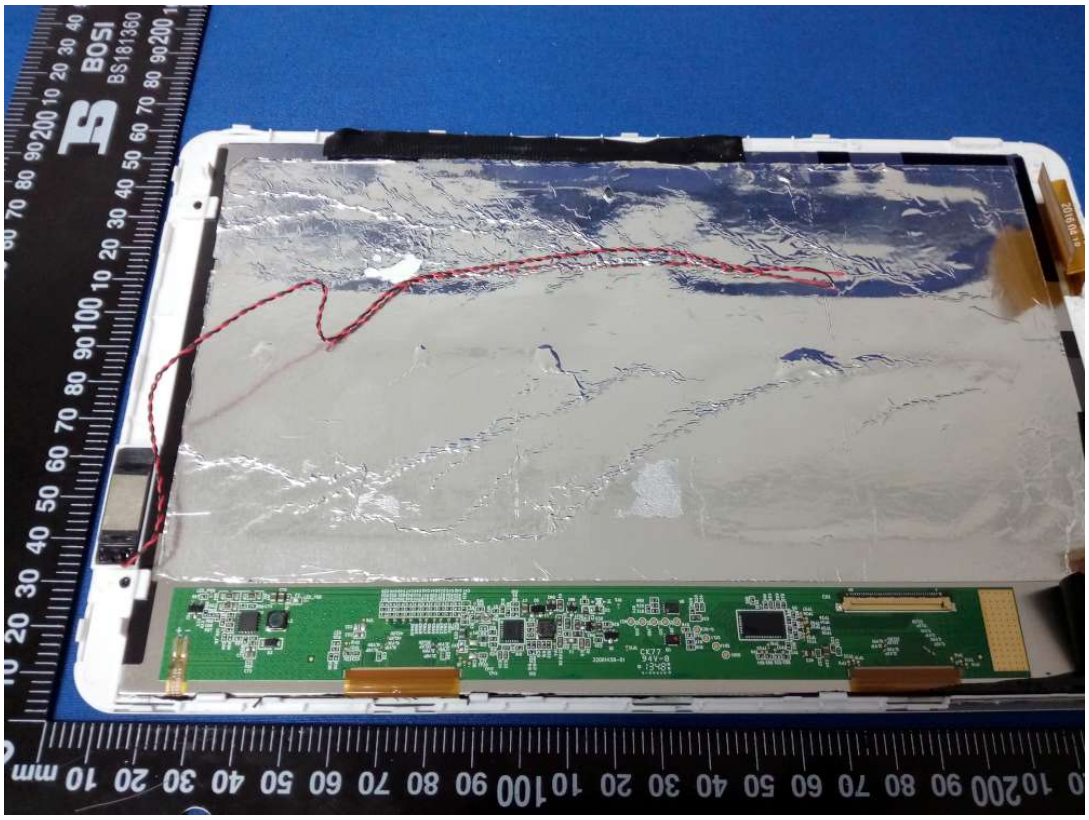
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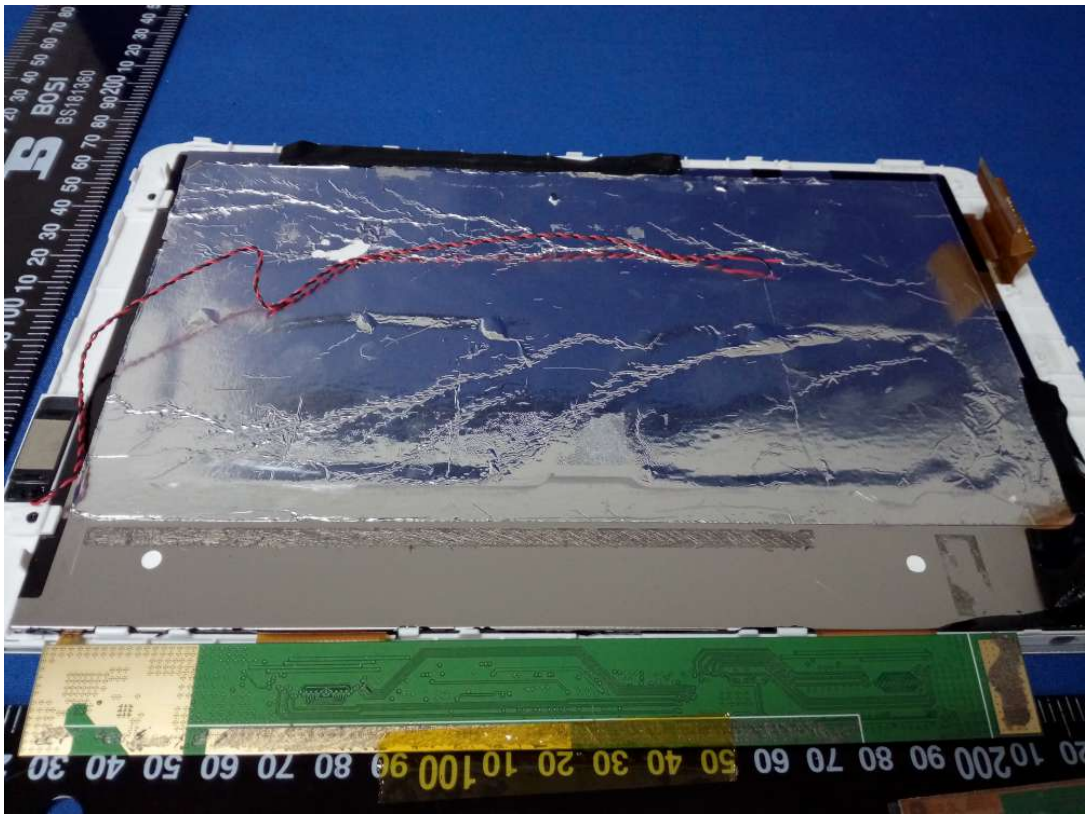

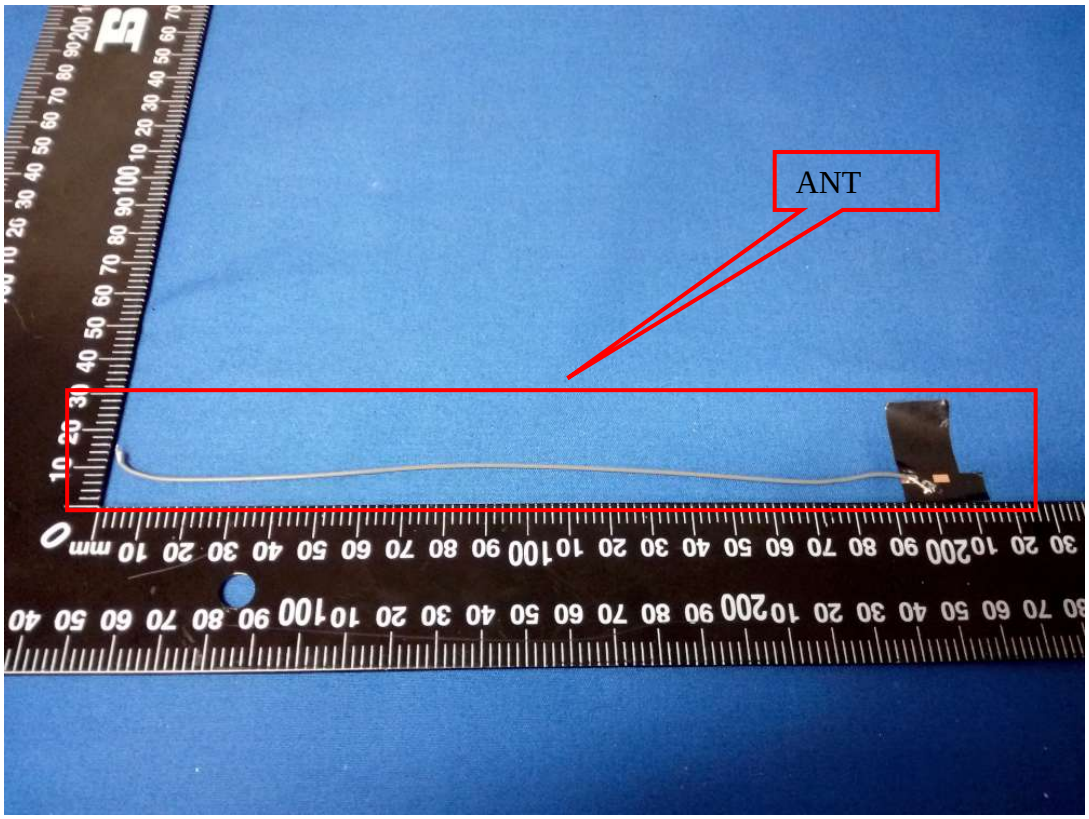
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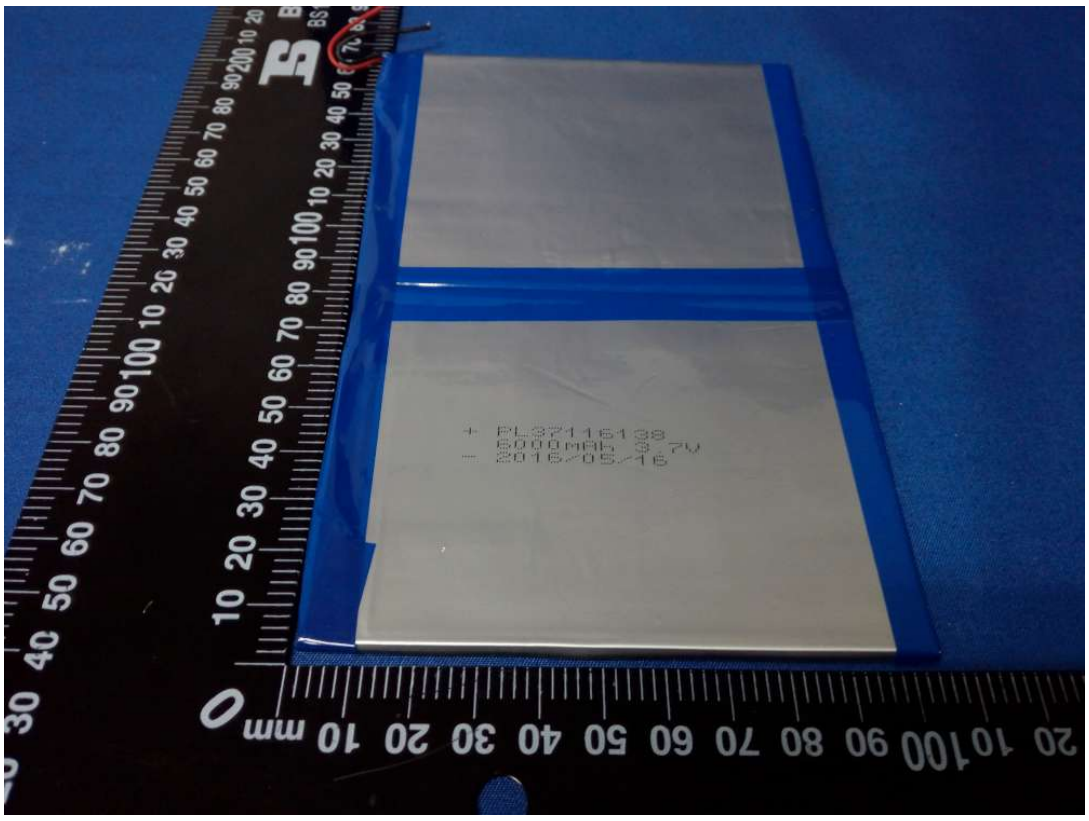

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