



FCC Part 15C Test Report

FCC ID: 2AKA79342

Product Name:	Modules of Image Transmission
Trademark:	VF
Model Name :	VF-9342 v2.0
Prepared For :	Shenzhen Vxfly Intelligent Information Technology Co., Ltd.
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Test Date:	Oct. 25 – Nov. 7, 2016
Date of Report :	Nov. 7, 2016
Report No.:	BCTC-160810293E



VERIFICATION OF COMPLIANCE

Applicant's name..... Shenzhen Vxfly Intelligent Information Technology Co., Ltd.

Address Room 307, Building A, Hua Chuang Da Central Business Building, Xinhua 1st Road, Bao'an 42th District, Shenzhen, China

Manufacture's Name Shenzhen Vxfly Intelligent Information Technology Co., Ltd.

Address Room 307, Building A, Hua Chuang Da Central Business Building, Xinhua 1st Road, Bao'an 42th District, Shenzhen, China

Product description

Product name..... : Modules of Image Transmission

Trademark : 

Model Name : VF-9342 v2.0

Test procedure : FCC Part15.407

ANSI C63.10-2013

Standards KDB789033 D02 General UNII Test Procedures New Rules v01r02

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Result

Pass

Testing Engineer :



Eric Yang

Reviewer :
(Supervisor)



Jade Yang

Authorized :
Signer(Manager)



Carson Zhang



TABLE OF CONTENTS

	Page
Test Report Declaration	
1. TEST SUMMARY	4
2. GENERAL PRODUCT INFORMATION	5
2.1. Product Function	5
2.2. Description of Device (EUT)	5
2.3. Test Supporting System	6
2.4. Independent Operation Modes	7
2.5. Test Sites	7
2.6. List of Test and Measurement Instruments	8
3. TEST SET-UP AND OPERATION MODES	9
3.1. Principle of Configuration Selection	9
3.2. Block Diagram of Test Set-up	9
3.3. Test Operation Mode and Test Software	9
3.4. Special Accessories and Auxiliary Equipment	9
3.5. Countermeasures to Achieve EMC Compliance	9
4. EMISSION TEST RESULTS	10
4.1. Conducted Emission Measurement	10
4.2. Radiated Emission Measurement	12
5. BAND EDGE COMPLIANCE TEST	23
5.1. Limits	23
5.2. TEST PROCEDURE	23
5.3. Test Data	23
6. 26DB AND 99% BANDWIDTH TEST	28
6.1. Measurement Procedure	28
7. OUTPUT POWER TEST	38
7.1. Limits	38
7.2. Test setup	38
7.3. Test result	39
8. PEAK POWER SPECTRAL DENSITY TEST	40
8.1. Limits	40
8.2. Test setup	40
8.3. Test data	41
9. DUTY CYCLE TEST SIGNAL	50
10. FREQUENCY STABILITY	52
10.1. Limits	52
10.2. Test setup	52
10.3. Test data	53
11. TRANSMISSION IN THE ABSENCE OF DATA	59
11.1. Limits	59
11.2. Test result	59
12. PHOTOGRAPHS OF TEST SET-UP	60
13. PHOTOGRAPHS OF THE EUT	61



1.TEST SUMMARY

Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A
Radiated Emissions	15.407(b), 15.209	PASS
26dB bandwidth and 99%dB Bandwidth	15.403(i) 15.407(e)	PASS
Power density	15.407 (a)	PASS
Maximum Peak Output Power	15.407 (a)	PASS
Emissions from out of band	15.407 (b)	PASS
Transmission in case of Absence of Information	15.407(c)	PASS
Frequency Stability	15.407(g)	PASS
Antenna Requirement	15.203	PASS

Note: N/A means not applicable.



2.GENERAL PRODUCT INFORMATION

2.1. Product Function

Refer to Technical Construction Form and User Manual.

2.2. Description of Device (EUT)

Product Name:	Modules of Image Transmission
Model No.:	VF-9342 v2.0
Trade Name:	N/A
Operation Frequency:	5180-5240, 5745-5825MHz(802.11a/n(HT20)) 5190-5230, 5755-5795MHz(802.11n(HT40))
Channel numbers:	See channel list
Modulation technology:	64QAM, 16QAM, QPSK, BPSK for OFDM
Data speed (IEEE 802.11a):	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps,54Mbps
Data speed (IEEE 802.11n):	Up to 300Mbps
Antenna Type:	External antenna*2
Antenna gain:	5.0dBi
Power supply:	DC 5V from host



Channel List for 802.11a/n(20)			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
40	5200	48	5240

Channel List for 802.11a/n(20)			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	161	5805
153	5765	165	5825
157	5785		

Channel List for 802.11n(40)			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	46	5230

Channel List for 802.11n(40)			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795

2.3. Test Supporting System

None.



2.4. Independent Operation Modes

The basic operation modes are:

These is Digital Transmission system (DTS) and have modulation OFDM, DSSS, DBPSK, DQPSK, CCK, 16QAM, 64QAM. According exploratory test, EUT will have maximum output power in those data rate (802.11a/n20: 6Mbps, (802.11n40: MCS0)), so those data rate were used for all test. The equipment enables high-speed access without wires to network assets. This adapter uses the IEEE 802.11 protocol to enable wireless communications between the host and Wireless router.

802.11a/n(20)

Frequency	Band 1	Band 4
Low	5180MHz	5745MHz
Middle	5200MHz	5785MHz
High	5240MHz	5825MHz

802.11n(40)

Frequency	Band 1	Band 4
Low	5190MHz	5755MHz
High	5230MHz	5795MHz

Note: for conducted emission test, we pretest all mode, the worst mode was 802.11a channel 36.

for radiated emissions test, we pretest all mode, the worst mode was 802.11a/n20

The worst mode's data was recording and show in the test report.

2.5. Test Sites

2.5.1. Test Facilities

Lab Qualifications : FCC Registration No.:187086



2.6. List of Test and Measurement Instruments

Conduction test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Test Receiver	R&S	ESCI	1166.5950K03-101165-ha	2016.08.27	2017.08.26
2	LISN	R&S	NSLK8126	8126466	2016.08.27	2017.08.26
3	LISN	R&S	NSLK8126	8126487	2016.08.27	2017.08.26
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2016.08.27	2017.08.26
5	RF cables	R&S	R204	R20X	2016.08.27	2017.08.26

Radiation test, Band-edge test and 6db bandwidth test equipment

Item	Kind of equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2016.08.27	2017.08.26
2	Test Receiver	R&S	ESPI	101318	2016.08.27	2017.08.26
3	Bilog Antenna	R&S	VULB 9168	VULB9168-438	2016.08.27	2017.08.26
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.08.27	2017.08.26
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2016.08.27	2017.08.26
6	Horn Antenna	R&S	HF906	10027	2016.08.29	2017.08.28
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2016.08.29	2017.08.28
8	Amplifier	R&S	BBV9743	9743-019	2016.08.29	2017.08.28
9	Loop Antenna	ARA	PLA-1030/B	1029	2016.08.29	2017.08.28
10	RF cables	R&S	R203	R20X	2016.07.06	2017.07.05
11	Antenna connector	Florida RFLabs	Lab-Fle	RF 01#	2016.08.27	2017.08.26
12	Power Metter	ANRITSU	ML2487A	6K00001568	2016.08.27	2017.08.26
13	Power Sensor (AV)	ANRITSU	ML2491A	030989	2016.08.27	2017.08.26
14	Signal Analyzer	Agilent	N9010A	MY48030494	2016.08.27	2017.08.26
15	966 chamber	ChengYu	966 Room	966	2016.08.27	2017.08.26

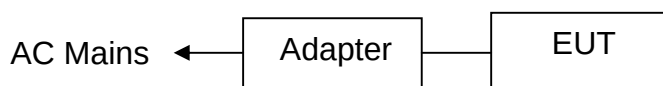
3. TEST SET-UP AND OPERATION MODES

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: Modules of Image Transmission)

3.3. Test Operation Mode and Test Software

None.

3.4. Special Accessories and Auxiliary Equipment

3.5. Countermeasures to Achieve EMC Compliance

None.



4. EMISSION TEST RESULTS

4.1. Conducted Emission Measurement

POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class B (dBuV)		Standard
	Quasi -peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

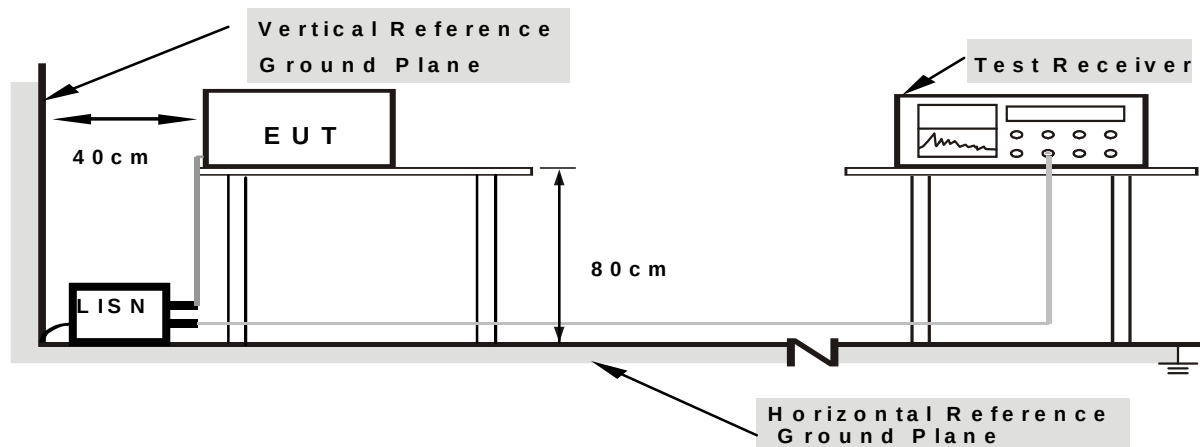
4.1.1. TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.2. DEVIATION FROM TEST STANDARD

No deviation

4.1.3. TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

4.1.4. EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

We pretest all adapter's emission, only the adapter 1's data was worst and the data was recording in the report.

The data only show the worst mode.

If peak level comply with Quasi-Peak limit, then the Quasi-Peak level is deemed to comply with Quasi-Peak limit.

We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

4.1.5. TEST RESULTS



4.2. Radiated Emission Measurement

4.2.1. Radiated Emission Limits (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower



Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2.2. TEST PROCEDURE

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter.
- Test the EUT in the lowest channel ,the middle channel ,the Highest channel

Note:

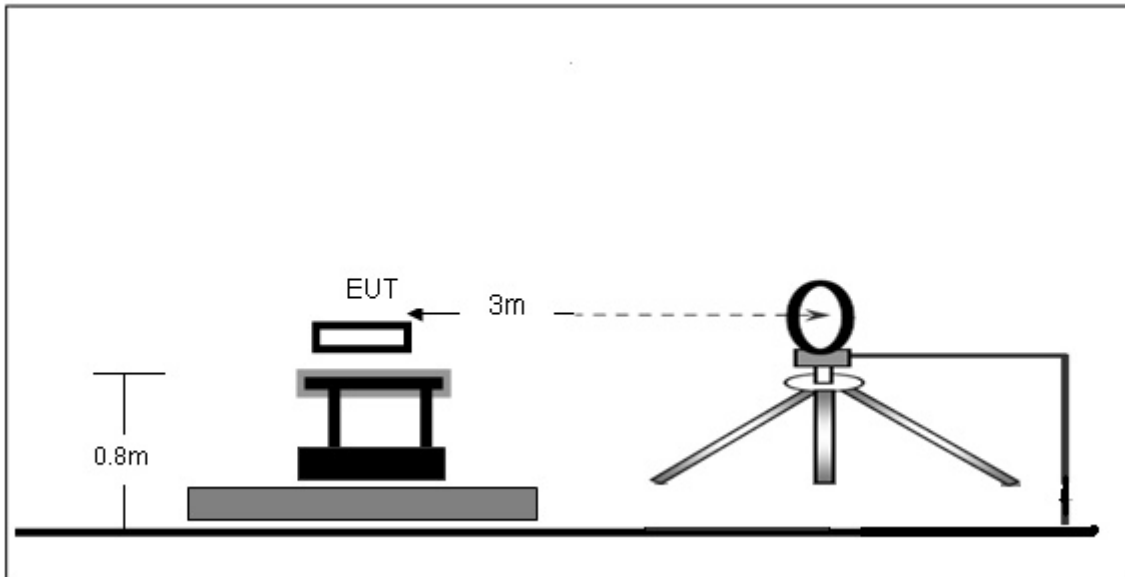
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

4.2.3. DEVIATION FROM TEST STANDARD

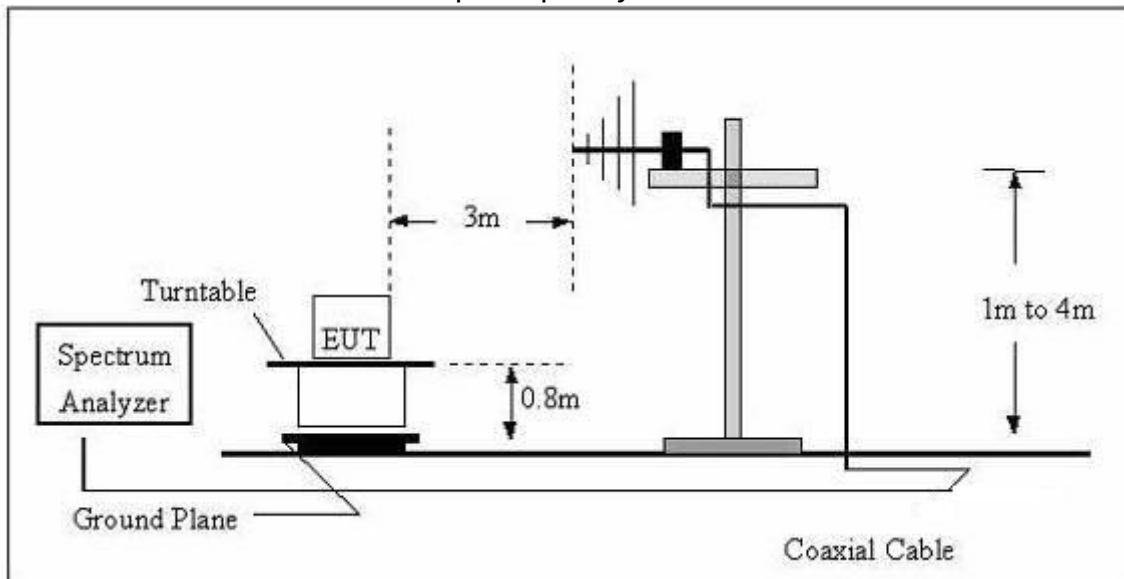
No deviation

4.2.4. TEST SETUP

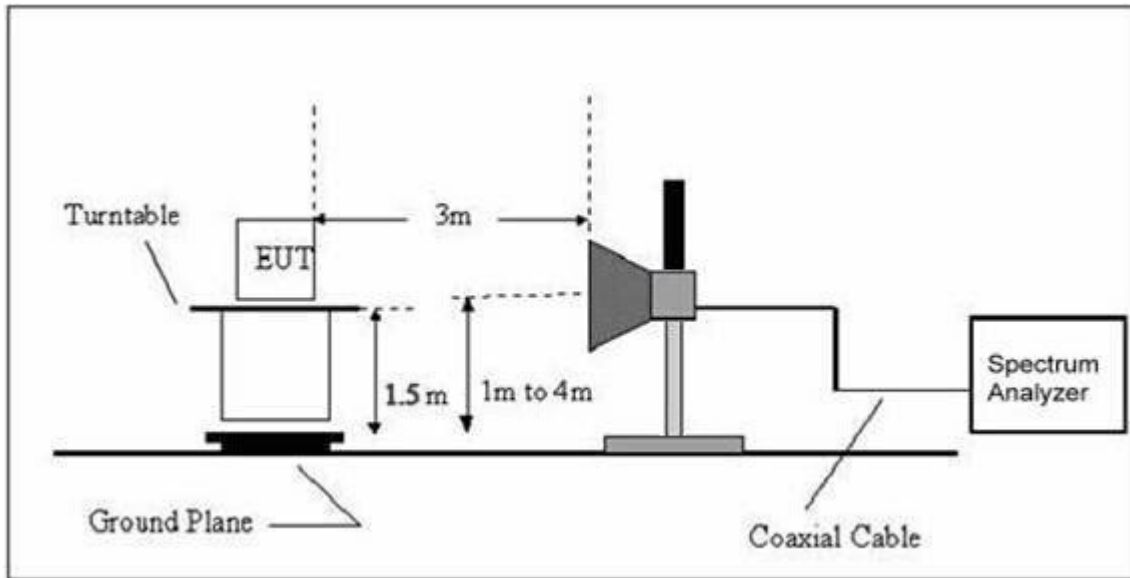
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



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



4.2.5. EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

We pretest all adapter's emission, only the adapter 1's data was worst and the data was recording in the report.

The data only show the worst mode.



Radiated Spurious Emission (Below 30MHz)

EUT :	Modules of Image Transmission	Model Name :	VF-9342 v2.0
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Polarization :	---
Test Voltage :	DC 5V from host		
Test Mode :	TX		

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

Note:

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

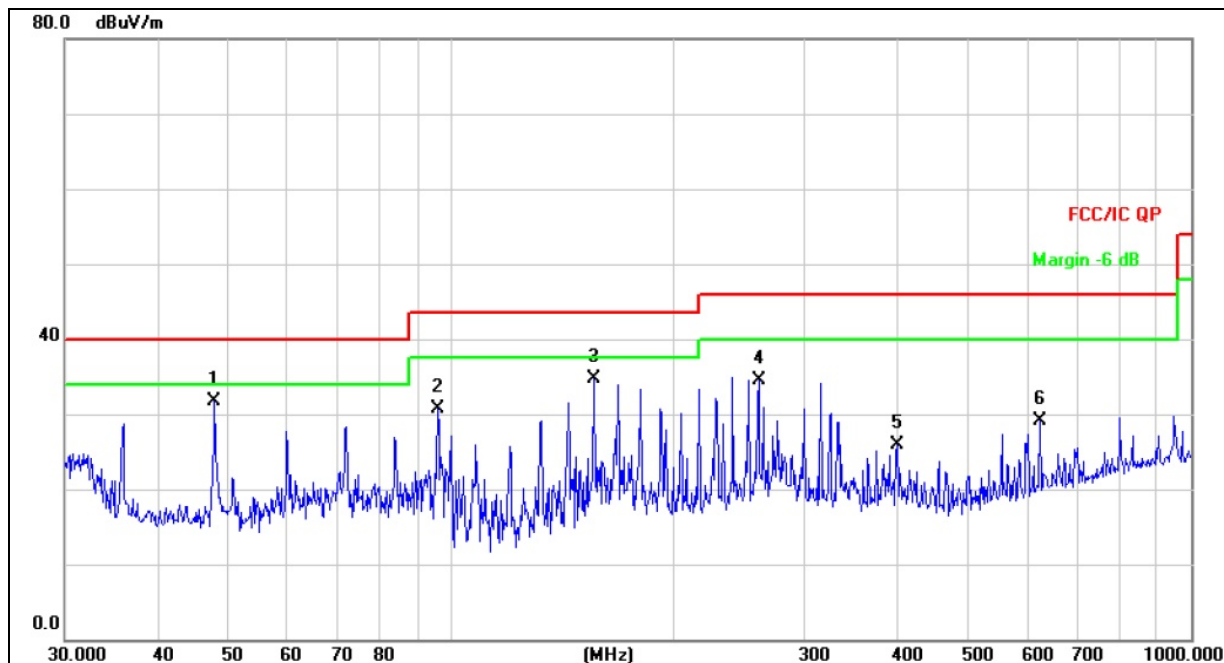
Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

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



Radiated Spurious Emission (Between 30MHz – 1GHz)

Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 5V from host		
Test Mode : (Worst)	Link Mode		



Remark:

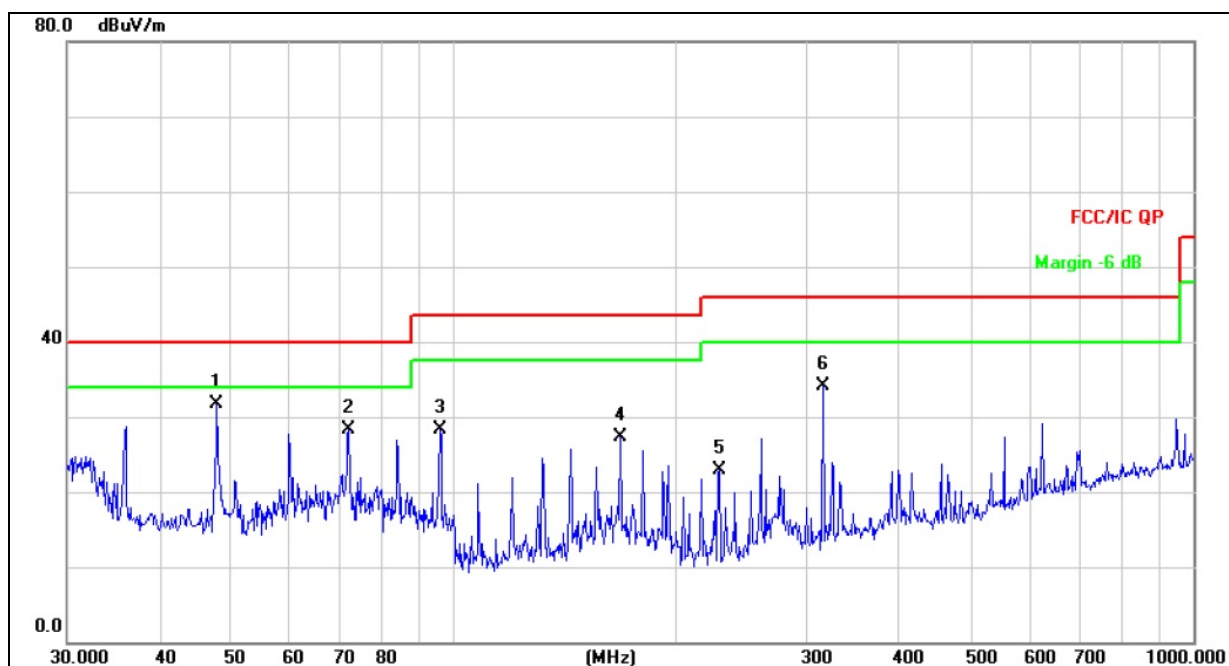
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

All interfaces was connected, and BT TX mode was link.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	47.8260	41.60	-9.94	31.66	40.00	-8.34	QP		
2		95.7622	47.59	-16.93	30.66	43.50	-12.84	QP		
3		155.9101	47.53	-12.87	34.66	43.50	-8.84	QP		
4		260.1444	48.50	-13.91	34.59	46.00	-11.41	QP		
5		400.4319	36.16	-10.17	25.99	46.00	-20.01	QP		
6		625.0780	34.63	-5.52	29.11	46.00	-16.89	QP		



Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 5V from host		
Test Mode : (Worst)	Link Mode		



Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

All interfaces was connected, and BT TX mode was link.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	47.8260	41.60	-9.94	31.66	40.00	-8.34	QP		
2		72.0843	43.64	-15.27	28.37	40.00	-11.63	QP		
3		95.7622	45.28	-16.93	28.35	43.50	-15.15	QP		
4		167.8243	40.68	-13.32	27.36	43.50	-16.14	QP		
5		228.4904	38.05	-15.14	22.91	46.00	-23.09	QP		
6		315.4808	46.28	-12.18	34.10	46.00	-11.90	QP		



Radiated Spurious Emission (Above 1GHz)

802.11a band 1

	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dBμV)	(PK/QP/Ave)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	
Lower Channel 5180MHz	10360.00	57.82	PK	H	2.19	60.01	74.00	Pass
	10360.00	47.79	Ave	H	2.19	49.98	54.00	Pass
	15540.00	59.47	PK	H	-2.05	57.42	74.00	Pass
	15540.00	48.76	Ave	H	-2.05	46.71	54.00	Pass
	10360.00	57.67	PK	V	2.19	59.86	74.00	Pass
	10360.00	48.61	Ave	V	2.19	50.80	54.00	Pass
	15540.00	58.89	PK	V	-2.05	56.84	74.00	Pass
	15540.00	48.97	Ave	V	-2.05	46.92	54.00	Pass
Middle Channel 5200MHz	10400.00	56.52	PK	H	2.38	58.90	74.00	Pass
	10400.00	47.53	Ave	H	2.38	49.91	54.00	Pass
	15600.00	59.03	PK	H	-2.21	56.82	74.00	Pass
	15600.00	47.54	Ave	H	-2.21	45.33	54.00	Pass
	10400.00	57.32	PK	V	2.38	59.70	74.00	Pass
	10400.00	48.51	Ave	V	2.38	50.89	54.00	Pass
	15600.00	58.78	PK	V	-2.21	56.57	74.00	Pass
	15600.00	47.83	Ave	V	-2.21	45.62	54.00	Pass
Upper Channel 5240MHz	10480.00	56.70	PK	H	2.43	59.13	74.00	Pass
	10480.00	47.35	Ave	H	2.43	49.78	54.00	Pass
	15720.00	59.02	PK	H	-2.37	56.65	74.00	Pass
	15720.00	47.84	Ave	H	-2.37	45.47	54.00	Pass
	10480.00	57.71	PK	V	2.43	60.14	74.00	Pass
	10480.00	47.16	Ave	V	2.43	49.59	54.00	Pass
	15720.00	59.06	PK	V	-2.37	56.69	74.00	Pass
	15720.00	47.99	Ave	V	-2.37	45.62	54.00	Pass

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Meter Reading + Factor

Margin = Emission Level - Limit

Other harmonics emissions are lower than 20dB below the allowable limit.



802.11a band 4

	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dBμV)	(PK/QP/Ave)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	
Lower Channel 5745MHz	11490.00	56.84	PK	H	2.32	59.16	74.00	Pass
	11490.00	47.81	Ave	H	2.32	50.13	54.00	Pass
	17235.00	58.52	PK	H	-2.15	56.37	74.00	Pass
	17235.00	47.75	Ave	H	-2.15	45.60	54.00	Pass
	11490.00	56.50	PK	V	2.32	58.82	74.00	Pass
	11490.00	47.64	Ave	V	2.32	49.96	54.00	Pass
	17235.00	58.76	PK	V	-2.15	56.61	74.00	Pass
	17235.00	47.95	Ave	V	-2.15	45.80	54.00	Pass
Middle Channel 5785MHz	11570.00	57.51	PK	H	2.54	60.05	74.00	Pass
	11570.00	48.05	Ave	H	2.54	50.59	54.00	Pass
	17355.00	58.12	PK	H	-1.98	56.14	74.00	Pass
	17355.00	48.52	Ave	H	-1.98	46.54	54.00	Pass
	11570.00	57.44	PK	V	2.54	59.98	74.00	Pass
	11570.00	47.83	Ave	V	2.54	50.37	54.00	Pass
	17355.00	59.01	PK	V	-1.98	57.03	74.00	Pass
	17355.00	47.57	Ave	V	-1.98	45.59	54.00	Pass
Upper Channel 5825MHz	11650.00	58.10	PK	H	2.68	60.78	74.00	Pass
	11650.00	48.04	Ave	H	2.68	50.72	54.00	Pass
	17475.00	59.77	PK	H	-1.27	58.50	74.00	Pass
	17475.00	48.00	Ave	H	-1.27	46.73	54.00	Pass
	11650.00	58.40	PK	V	2.68	61.08	74.00	Pass
	11650.00	48.91	Ave	V	2.68	51.59	54.00	Pass
	17475.00	59.21	PK	V	-1.27	57.94	74.00	Pass
	17475.00	48.24	Ave	V	-1.27	46.97	54.00	Pass

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Meter Reading + Factor

Margin = Emission Level - Limit

Other harmonics emissions are lower than 20dB below the allowable limit.



802.11n20 band 1

	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dBμV)	(PK/QP/Ave)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	
Lower Channel 5180MHz	10360.00	57.81	PK	H	2.19	60.00	74.00	Pass
	10360.00	47.78	Ave	H	2.19	49.97	54.00	Pass
	15540.00	59.46	PK	H	-2.05	57.41	74.00	Pass
	15540.00	48.75	Ave	H	-2.05	46.70	54.00	Pass
	10360.00	57.65	PK	V	2.19	59.84	74.00	Pass
	10360.00	48.60	Ave	V	2.19	50.79	54.00	Pass
	15540.00	58.87	PK	V	-2.05	56.82	74.00	Pass
	15540.00	48.96	Ave	V	-2.05	46.91	54.00	Pass
Middle Channel 5200MHz	10400.00	56.50	PK	H	2.38	58.88	74.00	Pass
	10400.00	47.52	Ave	H	2.38	49.90	54.00	Pass
	15600.00	59.01	PK	H	-2.21	56.80	74.00	Pass
	15600.00	47.53	Ave	H	-2.21	45.32	54.00	Pass
	10400.00	57.31	PK	V	2.38	59.69	74.00	Pass
	10400.00	48.50	Ave	V	2.38	50.88	54.00	Pass
	15600.00	58.77	PK	V	-2.21	56.56	74.00	Pass
	15600.00	47.82	Ave	V	-2.21	45.61	54.00	Pass
Upper Channel 5240MHz	10480.00	56.69	PK	H	2.43	59.12	74.00	Pass
	10480.00	47.34	Ave	H	2.43	49.77	54.00	Pass
	15720.00	59.00	PK	H	-2.37	56.63	74.00	Pass
	15720.00	47.83	Ave	H	-2.37	45.46	54.00	Pass
	10480.00	57.69	PK	V	2.43	60.12	74.00	Pass
	10480.00	47.15	Ave	V	2.43	49.58	54.00	Pass
	15720.00	59.05	PK	V	-2.37	56.68	74.00	Pass
	15720.00	47.98	Ave	V	-2.37	45.61	54.00	Pass

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Meter Reading + Factor

Margin = Emission Level - Limit

Other harmonics emissions are lower than 20dB below the allowable limit.



802.11n20 band 4

	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dBμV)	(PK/QP/Ave)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	
Lower Channel 5745MHz	11490.00	56.99	PK	H	2.32	59.31	74.00	Pass
	11490.00	47.94	Ave	H	2.32	50.26	54.00	Pass
	17235.00	58.68	PK	H	-2.15	56.53	74.00	Pass
	17235.00	47.88	Ave	H	-2.15	45.73	54.00	Pass
	11490.00	56.65	PK	V	2.32	58.97	74.00	Pass
	11490.00	47.77	Ave	V	2.32	50.09	54.00	Pass
	17235.00	58.92	PK	V	-2.15	56.77	74.00	Pass
	17235.00	48.07	Ave	V	-2.15	45.92	54.00	Pass
Middle Channel 5785MHz	11570.00	57.67	PK	H	2.54	60.21	74.00	Pass
	11570.00	48.17	Ave	H	2.54	50.71	54.00	Pass
	17355.00	58.28	PK	H	-1.98	56.30	74.00	Pass
	17355.00	48.65	Ave	H	-1.98	46.67	54.00	Pass
	11570.00	57.60	PK	V	2.54	60.14	74.00	Pass
	11570.00	47.96	Ave	V	2.54	50.50	54.00	Pass
	17355.00	59.17	PK	V	-1.98	57.19	74.00	Pass
	17355.00	47.70	Ave	V	-1.98	45.72	54.00	Pass
Upper Channel 5825MHz	11650.00	58.26	PK	H	2.68	60.94	74.00	Pass
	11650.00	48.16	Ave	H	2.68	50.84	54.00	Pass
	17475.00	59.93	PK	H	-1.27	58.66	74.00	Pass
	17475.00	48.12	Ave	H	-1.27	46.85	54.00	Pass
	11650.00	58.56	PK	V	2.68	61.24	74.00	Pass
	11650.00	49.04	Ave	V	2.68	51.72	54.00	Pass
	17475.00	59.37	PK	V	-1.27	58.10	74.00	Pass
	17475.00	48.37	Ave	V	-1.27	47.10	54.00	Pass

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Meter Reading + Factor

Margin = Emission Level - Limit

Other harmonics emissions are lower than 20dB below the allowable limit.



5. BAND EDGE COMPLIANCE TEST

5.1. Limits

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

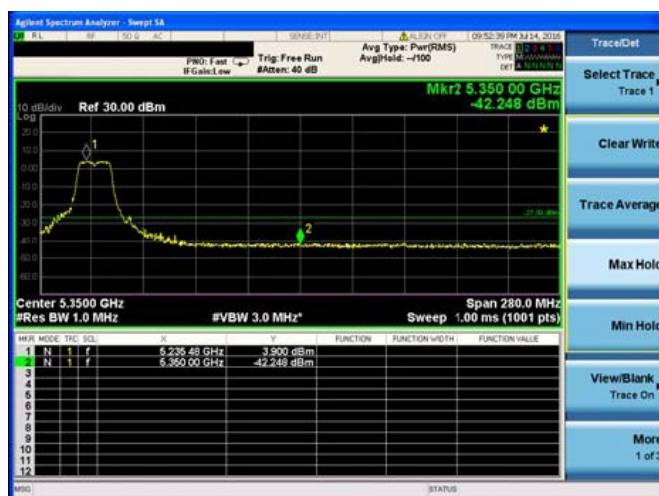
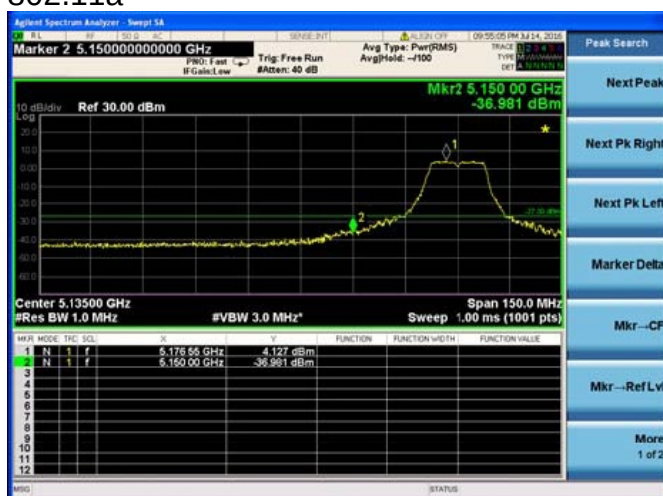
5.2. TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

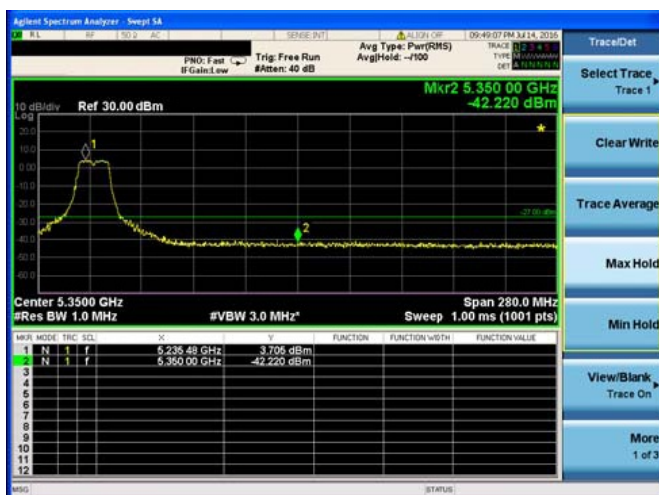
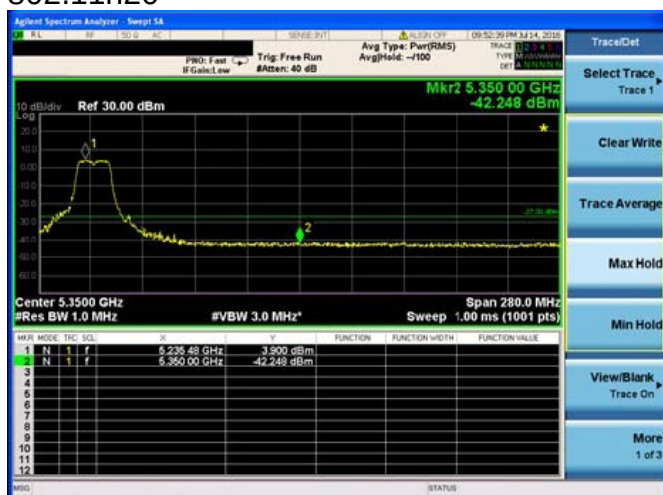
5.3. Test Data

Please see data as below:

Ant1 Band 1
802.11a

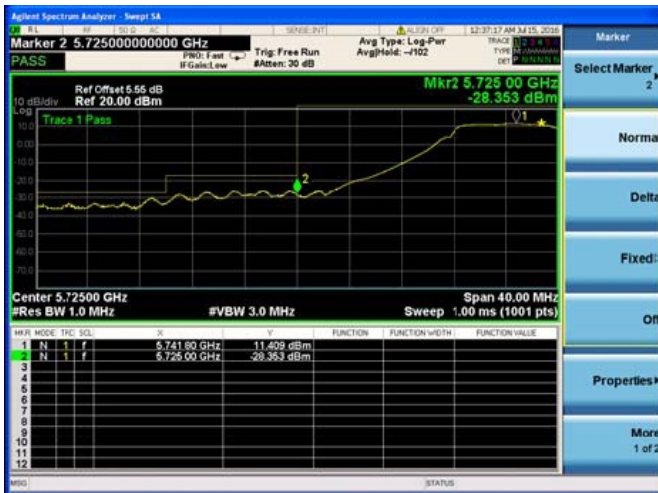


802.11n20



802.11n40



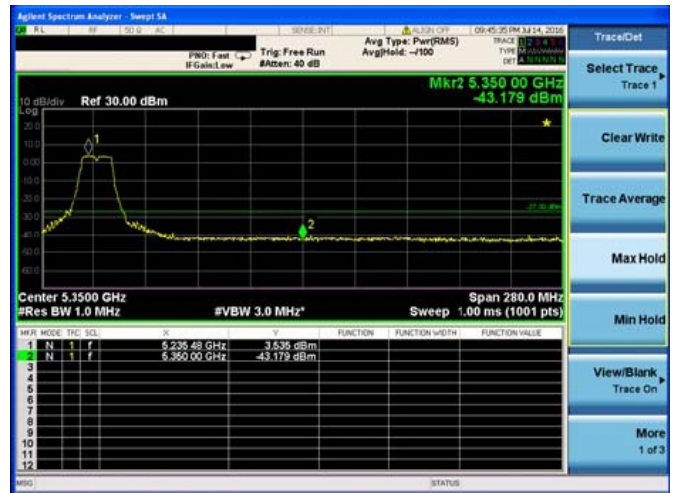
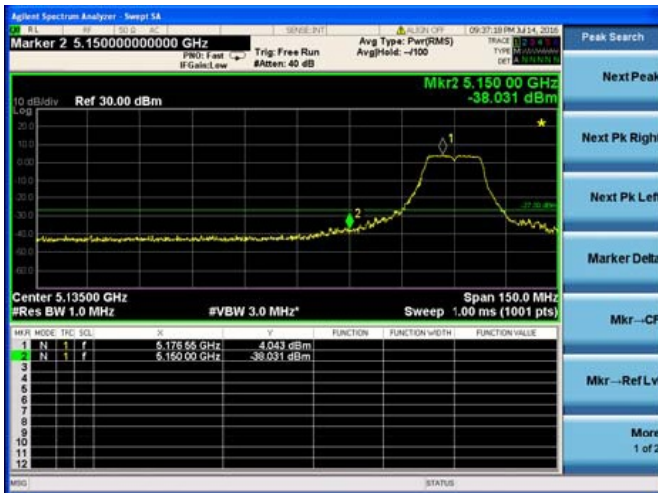
Ant1 Band 4
802.11a

802.11n20

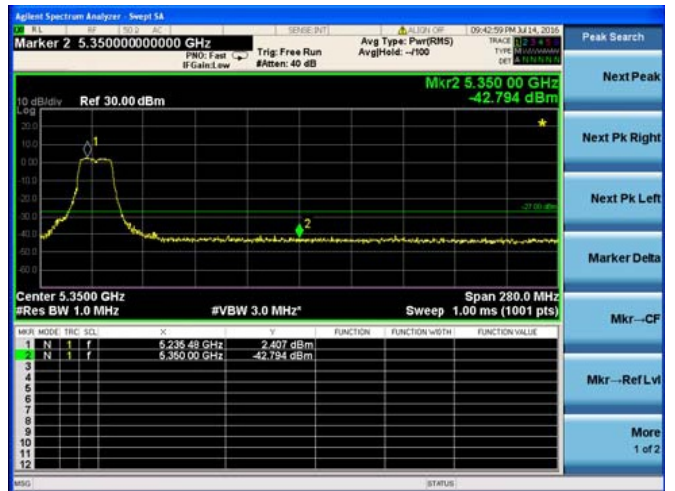
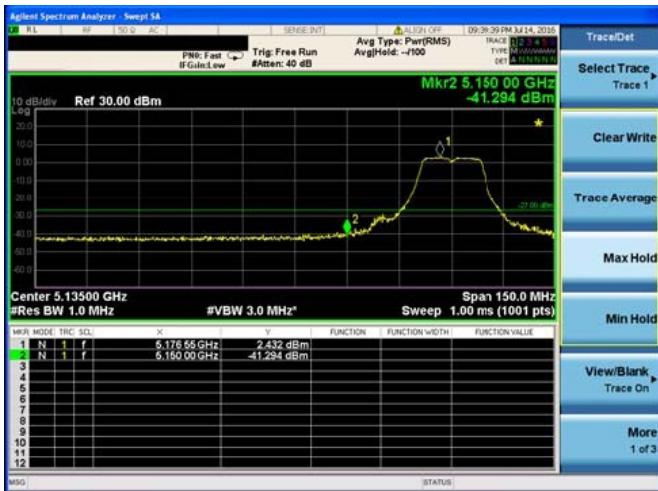


802.11n40

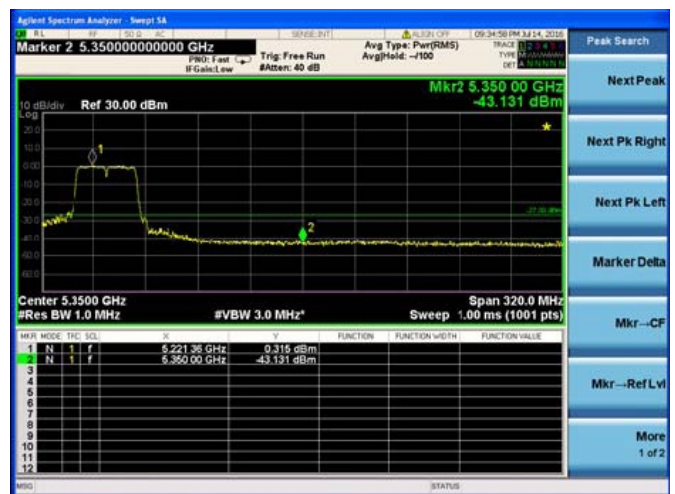


Ant2 Band 1
802.11a

802.11n20



802.11n40



Ant1 Band 4
802.11a

802.11n20



802.11n40





6. 26DB AND 99% BANDWIDTH TEST

6.1. Measurement Procedure

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.

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

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

we test all antennas, the antenna 1 was worst mode and the data recording in the report.



26dB bandwidth

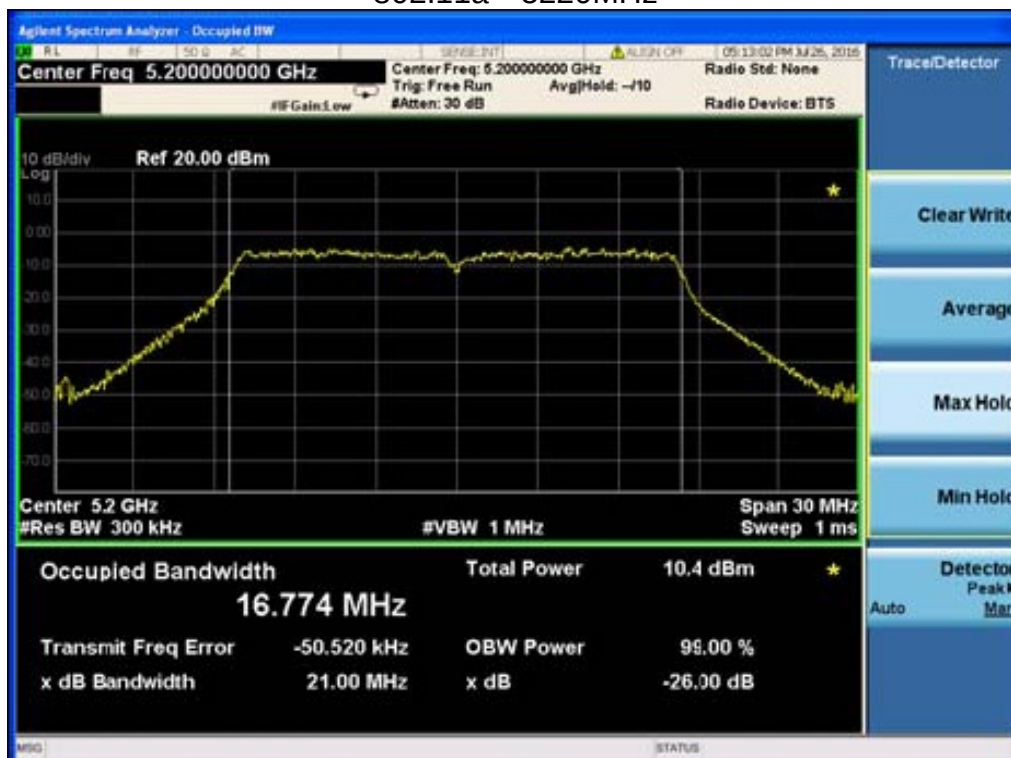
	Frequency (MHz)	26dB Bandwidth (MHz)		99% Bandwidth (MHz)	
		Ant 1	Ant 2	Ant 1	Ant 2
802.11a	5180	16.789	16.648	21.11	21.06
	5200	16.774	16.569	21.00	21.00
	5240	16.754	16.699	20.95	20.86
802.11n (HT20)	5180	17.840	17.674	21.79	21.74
	5200	17.829	17.784	21.82	21.81
	5240	17.824	17.816	21.73	21.75
802.11n (HT40)	5190	36.220	36.216	42.58	42.56
	5230	36.208	36.207	42.32	42.33

	Frequency (MHz)	-6dB Bandwidth (MHz)		99% Bandwidth (MHz)		Limit (MHz)
		Ant 1	Ant 2	Ant 1	Ant 2	
802.11a	5745	16.775	16.755	21.22	21.19	>0.5
	5785	16.776	16.762	21.10	21.04	>0.5
	5825	16.758	17.746	21.03	21.00	>0.5
802.11n (HT20)	5745	17.808	17.798	21.69	21.59	>0.5
	5785	17.810	17.803	21.60	21.75	>0.5
	5825	17.820	17.816	21.81	21.72	>0.5
802.11n (HT40)	5755	36.207	36.198	42.21	42.16	>0.5
	5795	36.199	36.186	42.42	42.35	>0.5

802.11a 5180MHz



802.11a 5220MHz





802.11a 5240MHz

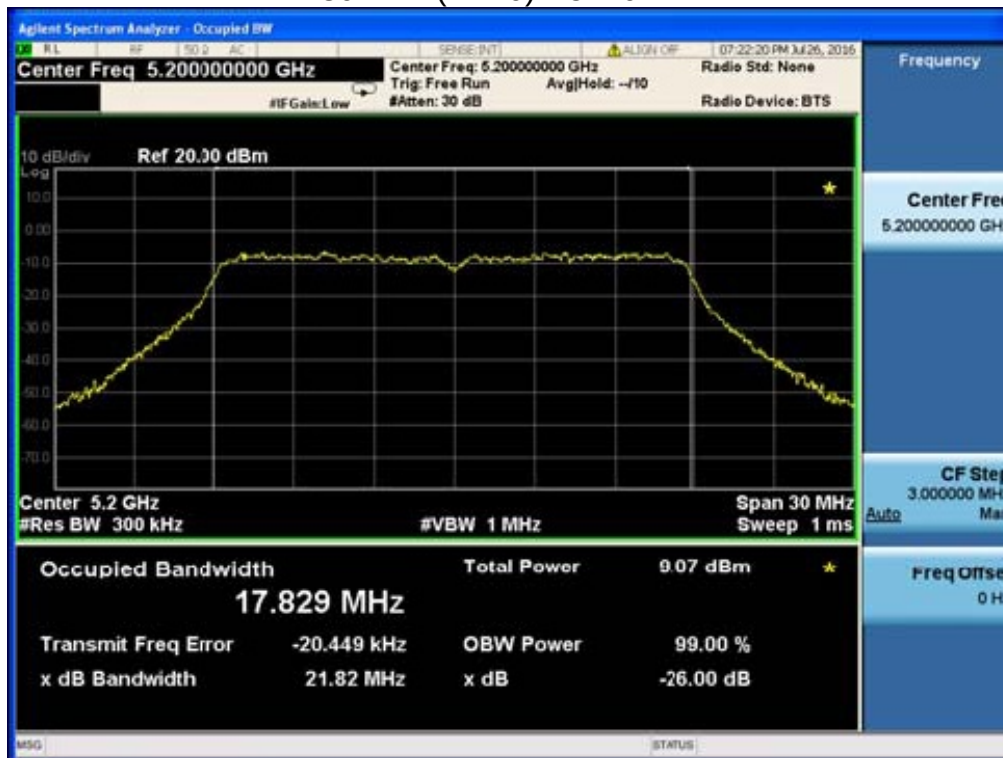


802.11n(HT20) 5180MHz





802.11n(HT20) 5220MHz

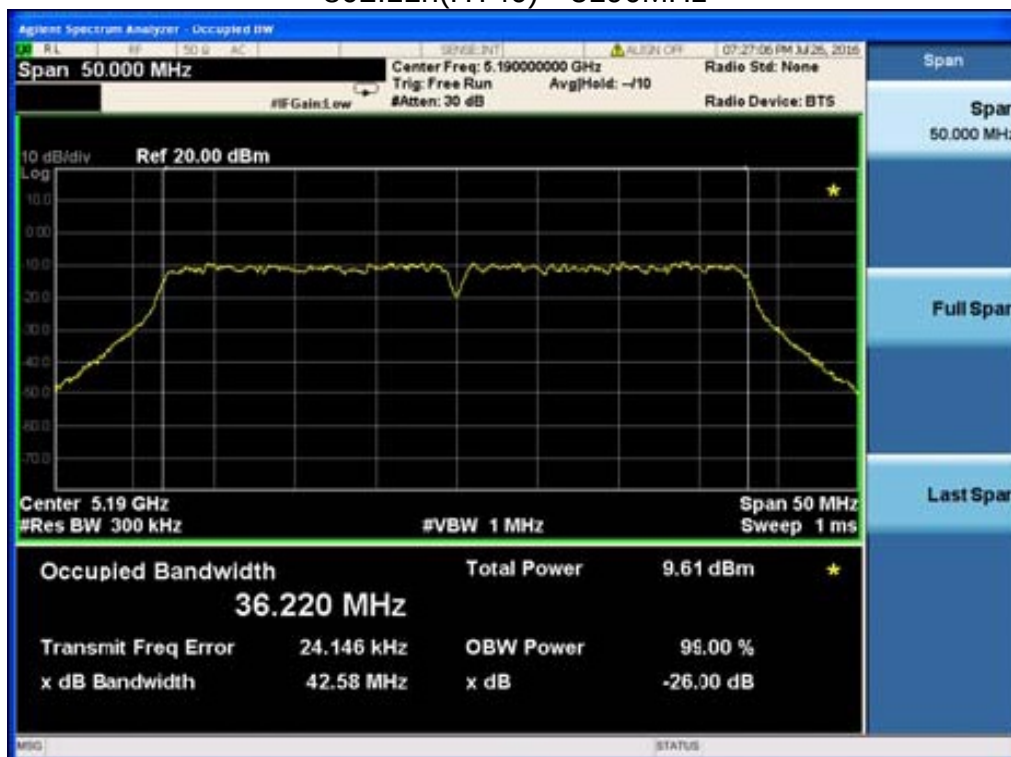


802.11n(HT20) 5240MHz





802.11n(HT40) 5190MHz



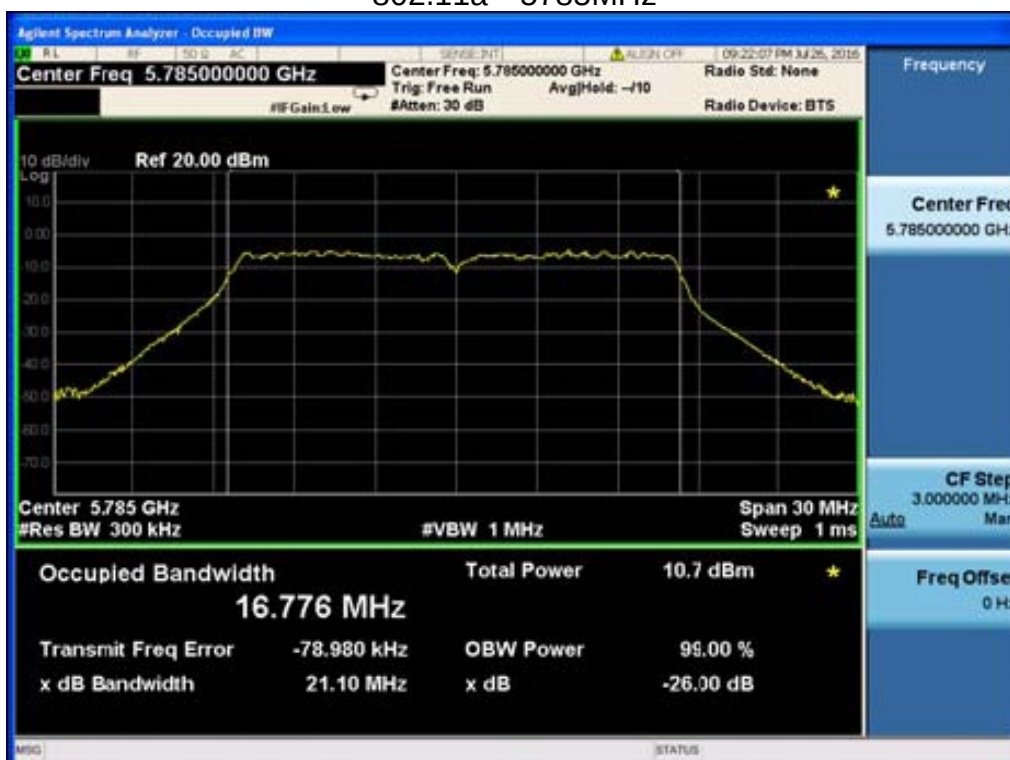
802.11n(HT40) 5230MHz



802.11a 5745MHz



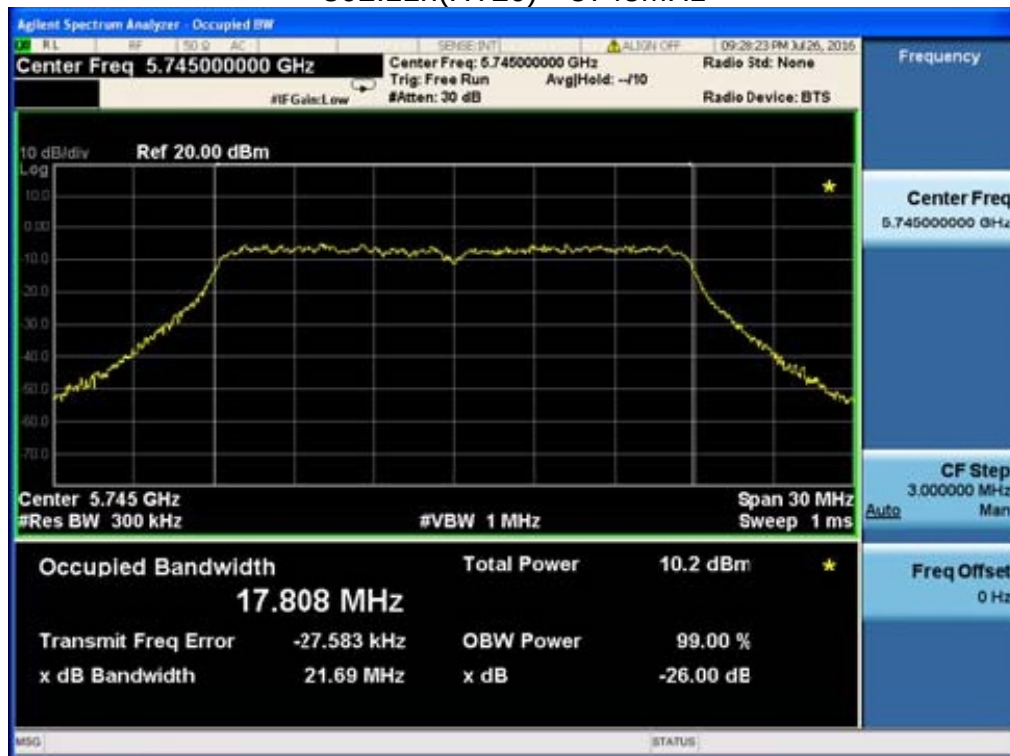
802.11a 5785MHz



802.11a 5825MHz

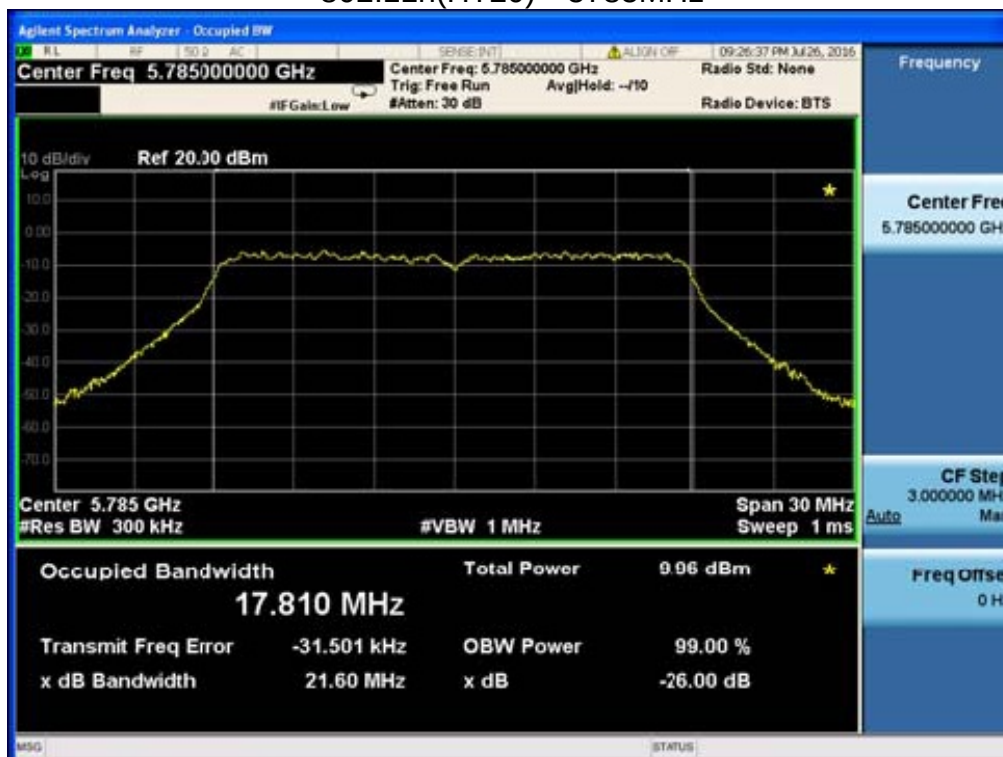


802.11n(HT20) 5745MHz





802.11n(HT20) 5785MHz



802.11n(HT20) 5825MHz

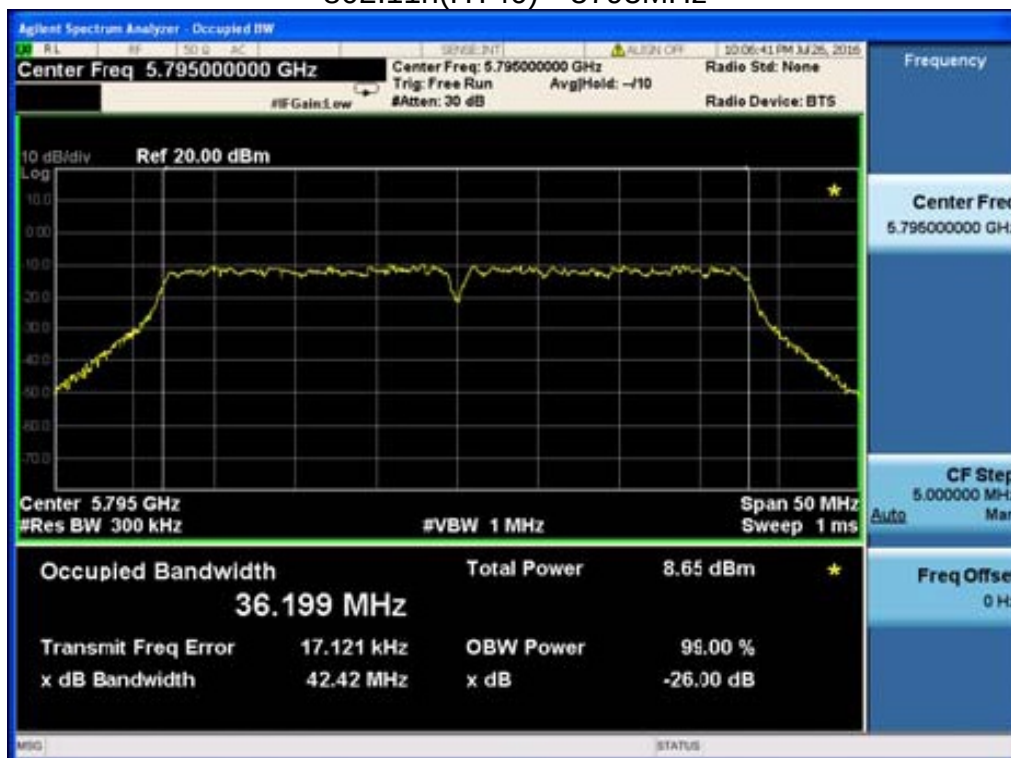




802.11n(HT40) 5755MHz



802.11n(HT40) 5795MHz



7. OUTPUT POWER TEST

7.1. Limits

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.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

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.
3. Note: the Directional Gain= $5\text{dBi}+10\log(2)=8\text{dBi}$, so the final limit=requirement limit-(8-6)



7.3. Test result

	Frequency (MHz)	Average Output Power(dBm)		Total Power (mW)	Total Power (dBm)	FCC Limit (dBm)	Result
		Ant.1	Ant.2				
802.11a	5180	17.84	17.74	120.24	20.80	21.98	Pass
	5220	17.66	17.56	115.36	20.62	21.98	Pass
	5240	17.67	17.57	115.63	20.63	21.98	Pass
	5745	16.75	16.66	93.66	19.72	28.00	Pass
	5785	16.67	16.58	91.95	19.64	28.00	Pass
	5825	16.62	16.53	90.90	19.59	28.00	Pass
802.11n (HT20)	5180	17.57	17.49	113.25	20.54	21.98	Pass
	5220	17.27	17.19	105.69	20.24	21.98	Pass
	5240	17.42	17.34	109.41	20.39	21.98	Pass
	5745	15.26	15.36	67.93	18.32	28.00	Pass
	5785	15.24	15.27	67.07	18.27	28.00	Pass
	5825	15.31	15.27	67.61	18.30	28.00	Pass
802.11n (HT40)	5190	16.79	16.71	94.63	19.76	21.98	Pass
	5230	16.34	16.26	85.32	19.31	21.98	Pass
	5755	15.18	15.11	65.39	18.16	28.00	Pass
	5795	15.27	15.20	66.76	18.25	28.00	Pass



8. PEAK POWER SPECTRAL DENSITY TEST

8.1. Limits

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

In addition, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band.

8.2. Test setup

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to

Spectrum.

4. For U-NII1, U-NII-2A, U-NII-2C Band:

Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)

For U-NII-3 Band:

Set RBW=510 kHz, VBW=3*RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)

5. User the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add $10 \log(1/\text{duty cycle})$.
7. the Directional Gain=5dBi+10log(2)=8dBi , so the final limit=requirement limit-(8-6)

we test all antennas, the antenna 1 was worst mode and the data recording in the report.



8.3. Test data

Test data as below

	Frequency (MHz)	Reading Level (dBm)		Duty factor (dB)	Duty factor 10 log (1MHz/ RBW)	PPSD (dBm)	FCC Limit (dBm)	Result
		ANT1	ANT2					
802.11a	5180	1.532	1.162	0.21	0.0	4.57	9.00	Pass
	5220	1.500	1.215	0.21	0.0	4.58	9.00	Pass
	5240	1.935	1.622	0.21	0.0	5.00	9.00	Pass
	5745	1.662	1.562	0.21	0.0	4.83	28.00	Pass
	5785	0.727	1.250	0.21	0.0	4.22	28.00	Pass
	5825	-0.121	-0.226	0.21	0.0	3.05	28.00	Pass
802.11n (HT20)	5180	1.235	1.034	0.44	0.0	4.59	9.00	Pass
	5220	1.178	1.151	0.44	0.0	4.61	9.00	Pass
	5240	1.778	1.268	0.44	0.0	4.98	9.00	Pass
	5745	1.568	1.316	0.44	0.0	4.89	28.00	Pass
	5785	1.029	1.006	0.44	0.0	4.47	28.00	Pass
	5825	0.071	1.032	0.44	0.0	4.03	28.00	Pass
802.11n (HT40)	5190	-2.749	-2.834	0.77	0.0	0.99	9.00	Pass
	5230	-4.170	-3.061	0.77	0.0	0.20	9.00	Pass
	5755	-3.637	-3.667	0.77	0.0	0.13	28.00	Pass
	5795	-4.170	-4.220	0.77	0.0	-0.41	28.00	Pass

802.11a 5180MHz



802.11a 5220MHz



802.11a 5240MHz



802.11a 5745MHz



802.11a 5785MHz



802.11a 5825MHz



802.11n(HT20) 5180MHz



802.11n(HT20) 5220MHz



802.11n(HT20) 5240MHz



802.11n(HT20) 5745MHz



802.11n(HT20) 5785MHz



802.11n(HT20) 5825MHz



802.11n(HT40) 5190MHz



802.11n(HT40) 5230MHz



802.11n(HT40) 5755MHz



802.11n(HT40) 5795MHz





9. DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

$$\text{Duty Cycle} = T_{\text{on}} / (T_{\text{on}} + T_{\text{off}})$$

Measurement Procedure:

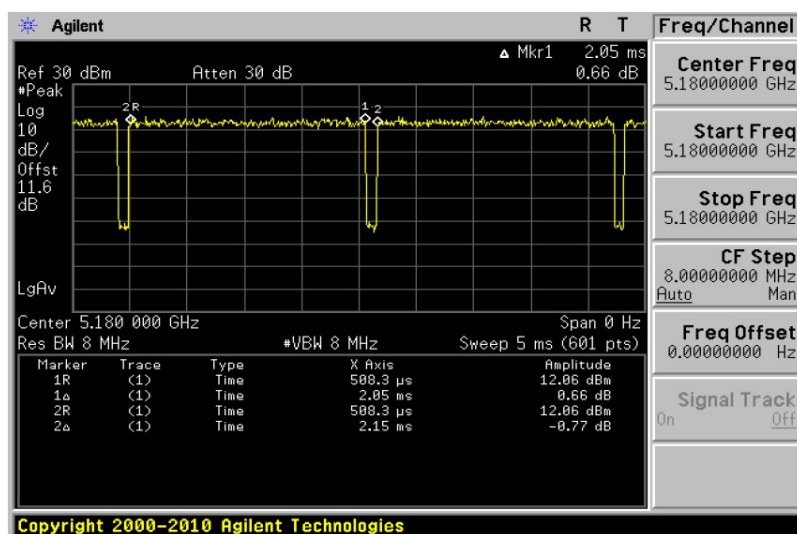
1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

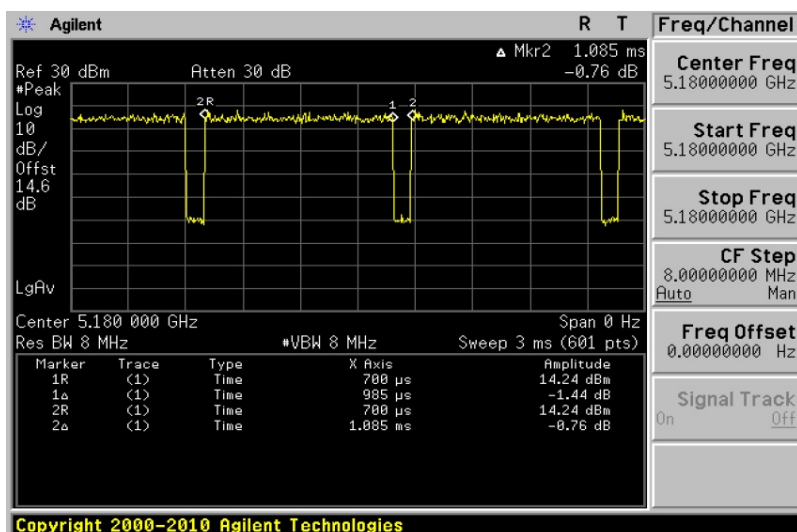
Operation Mode	Duty Cycle	Duty Fator (dB) 10 * log (1/ Duty cycle)
802.11a	95.35%	0.21
802.11n(HT20)	90.78%	0.42
802.11n(HT40)	83.76%	0.77



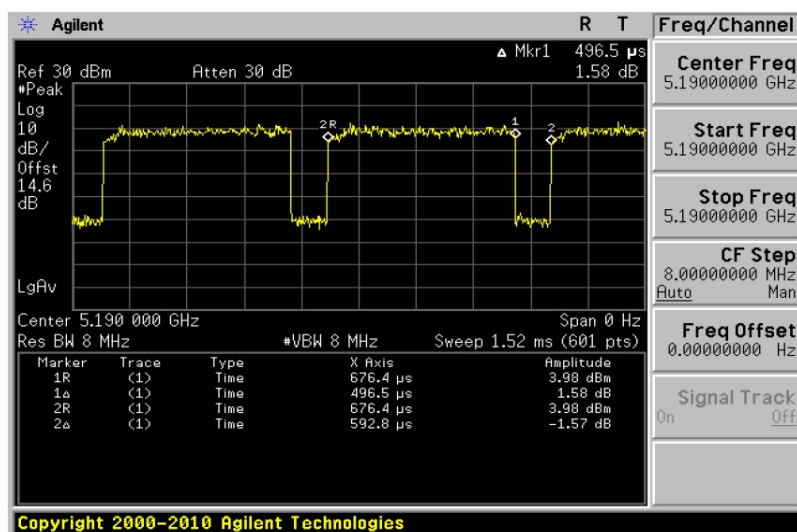
802.11a



802.11n(HT20)



802.11n(HT40)





10. FREQUENCY STABILITY

10.1. Limits

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.

10.2. Test setup

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.

we test all antennas, the antenna 1 was worst mode and the data recording in the report.



10.3. Test data

Test data as below

Ant 1

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
802.11a	4.255V	-20℃	5180.000	5180.0444	-0.0444
			5220.000	5220.0363	-0.0363
			5240.000	5240.0264	-0.0264
			5745.000	5745.0359	-0.0359
			5785.000	5785.0379	-0.0379
			5825.000	5825.0359	-0.0359
	3.145V		5180.000	5180.0264	-0.0264
			5220.000	5220.0334	-0.0334
			5240.000	5240.0292	-0.0292
			5745.000	5745.0311	-0.0311
			5785.000	5785.0364	-0.0364
			5825.000	5825.0435	-0.0435
	3.70V	25℃	5180.000	5180.0533	-0.0533
			5220.000	5220.0265	-0.0265
			5240.000	5240.0377	-0.0377
			5745.000	5745.0364	-0.0364
			5785.000	5785.0445	-0.0445
			5825.000	5825.0311	-0.0311
	4.255V	50℃	5180.000	5180.0363	-0.0363
			5220.000	5220.0280	-0.0280
			5240.000	5240.0334	-0.0334
			5745.000	5745.0631	-0.0631
			5785.000	5785.0435	-0.0435
			5825.000	5825.0628	-0.0628
	3.145V	50℃	5180.000	5180.0352	-0.0352
			5220.000	5220.0291	-0.0291
			5240.000	5240.0377	-0.0377
			5745.000	5745.0501	-0.0501
			5785.000	5785.0311	-0.0311
			5825.000	5825.0758	-0.0758



Ant 2

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
802.11a	4.255V	-20℃	5180.000	5180.0373	-0.0373
			5220.000	5220.0363	-0.0363
			5240.000	5240.0271	-0.0271
			5745.000	5745.0343	-0.0343
			5785.000	5785.0350	-0.0350
			5825.000	5825.0359	-0.0359
	3.145V		5180.000	5180.0290	-0.0290
			5220.000	5220.0341	-0.0341
			5240.000	5240.0270	-0.0270
			5745.000	5745.0278	-0.0278
			5785.000	5785.0360	-0.0360
			5825.000	5825.0446	-0.0446
	3.70V	25℃	5180.000	5180.0569	-0.0569
			5220.000	5220.0258	-0.0258
			5240.000	5240.0367	-0.0367
			5745.000	5745.0344	-0.0344
			5785.000	5785.0460	-0.0460
			5825.000	5825.0276	-0.0276
	4.255V	50℃	5180.000	5180.0373	-0.0373
			5220.000	5220.0277	-0.0277
			5240.000	5240.0342	-0.0342
			5745.000	5745.0659	-0.0659
			5785.000	5785.0478	-0.0478
			5825.000	5825.0659	-0.0659
	3.145V	50℃	5180.000	5180.0342	-0.0342
			5220.000	5220.0262	-0.0262
			5240.000	5240.0390	-0.0390
			5745.000	5745.0468	-0.0468
			5785.000	5785.0280	-0.0280
			5825.000	5825.0758	-0.0758



Ant 1

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
802.11n20	4.255V	-20℃	5180.000	5180.0434	-0.0434
			5220.000	5220.0380	-0.0380
			5240.000	5240.0285	-0.0285
			5745.000	5745.0691	-0.0691
			5785.000	5785.0266	-0.0266
			5825.000	5825.0354	-0.0354
	3.145V	-20℃	5180.000	5180.0305	-0.0305
			5220.000	5220.0535	-0.0535
			5240.000	5240.0363	-0.0363
			5745.000	5745.0444	-0.0444
			5785.000	5785.0445	-0.0445
			5825.000	5825.0235	-0.0235
	3.70V	25℃	5180.000	5180.0263	-0.0263
			5220.000	5220.0367	-0.0367
			5240.000	5240.0444	-0.0444
			5745.000	5745.0634	-0.0634
			5785.000	5785.0364	-0.0364
			5825.000	5825.0536	-0.0536
	4.255V	50℃	5180.000	5180.0283	-0.0283
			5220.000	5220.0330	-0.0330
			5240.000	5240.0532	-0.0532
			5745.000	5745.0341	-0.0341
			5785.000	5785.0631	-0.0631
			5825.000	5825.0304	-0.0304
	3.145V	50℃	5180.000	5180.0343	-0.0343
			5220.000	5220.0303	-0.0303
			5240.000	5240.0627	-0.0627
			5745.000	5745.0404	-0.0404
			5785.000	5785.0286	-0.0286
			5825.000	5825.0351	-0.0351



Ant 2

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
802.11n20	4.255V	-20℃	5180.000	5180.0438	-0.0438
			5220.000	5220.0390	-0.0390
			5240.000	5240.0232	-0.0232
			5745.000	5745.0669	-0.0669
			5785.000	5785.0253	-0.0253
			5825.000	5825.0361	-0.0361
	3.145V	-20℃	5180.000	5180.0290	-0.0290
			5220.000	5220.0542	-0.0542
			5240.000	5240.0357	-0.0357
			5745.000	5745.0451	-0.0451
			5785.000	5785.0443	-0.0443
			5825.000	5825.0245	-0.0245
	3.70V	25℃	5180.000	5180.0257	-0.0257
			5220.000	5220.0377	-0.0377
			5240.000	5240.0490	-0.0490
			5745.000	5745.0684	-0.0684
			5785.000	5785.0341	-0.0341
			5825.000	5825.0543	-0.0543
	4.255V	50℃	5180.000	5180.0259	-0.0259
			5220.000	5220.0377	-0.0377
			5240.000	5240.0574	-0.0574
			5745.000	5745.0369	-0.0369
			5785.000	5785.0691	-0.0691
			5825.000	5825.0243	-0.0243
	3.145V	50℃	5180.000	5180.0367	-0.0367
			5220.000	5220.0290	-0.0290
			5240.000	5240.0678	-0.0678
			5745.000	5745.0375	-0.0375
			5785.000	5785.0269	-0.0269
			5825.000	5825.0378	-0.0378



Ant 1

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
802.11n40	4.255V	-20℃	5190.000	5190.0284	-0.0284
			5230.000	5230.0380	-0.0380
			5755.000	5755.0534	-0.0534
			5795.000	5795.0658	-0.0658
	3.145V		5190.000	5190.0313	-0.0313
			5230.000	5230.0400	-0.0400
			5755.000	5755.0292	-0.0292
			5795.000	5795.0483	-0.0483
	3.70V	25℃	5190.000	5190.0274	-0.0274
			5230.000	5230.0634	-0.0634
			5755.000	5755.0285	-0.0285
			5795.000	5795.0534	-0.0534
	4.255V	50℃	5190.000	5190.0633	-0.0633
			5230.000	5230.0563	-0.0563
			5755.000	5755.0434	-0.0434
			5795.000	5795.0366	-0.0366
	3.145V	50℃	5190.000	5190.0537	-0.0537
			5230.000	5230.0345	-0.0345
			5755.000	5755.0354	-0.0354
			5795.000	5795.0436	-0.0436



Ant 2

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
802.11n40	4.255V	-20℃	5190.000	5190.0245	-0.0245
			5230.000	5230.0332	-0.0332
			5755.000	5755.0574	-0.0574
			5795.000	5795.0643	-0.0643
	3.145V		5190.000	5190.0247	-0.0247
			5230.000	5230.0373	-0.0373
			5755.000	5755.0233	-0.0233
			5795.000	5795.0441	-0.0441
	3.70V	25℃	5190.000	5190.0234	-0.0234
			5230.000	5230.0649	-0.0649
			5755.000	5755.0273	-0.0273
			5795.000	5795.0244	-0.0244
	4.255V	50℃	5190.000	5190.0644	-0.0644
			5230.000	5230.0559	-0.0559
			5755.000	5755.0464	-0.0464
			5795.000	5795.0373	-0.0373
	3.145V	50℃	5190.000	5190.0550	-0.0550
			5230.000	5230.0339	-0.0339
			5755.000	5755.0391	-0.0391
			5795.000	5795.0484	-0.0484



11. TRANSMISSION IN THE ABSENCE OF DATA

11.1. Limits

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

11.2. Test result

No non-compliance noted:

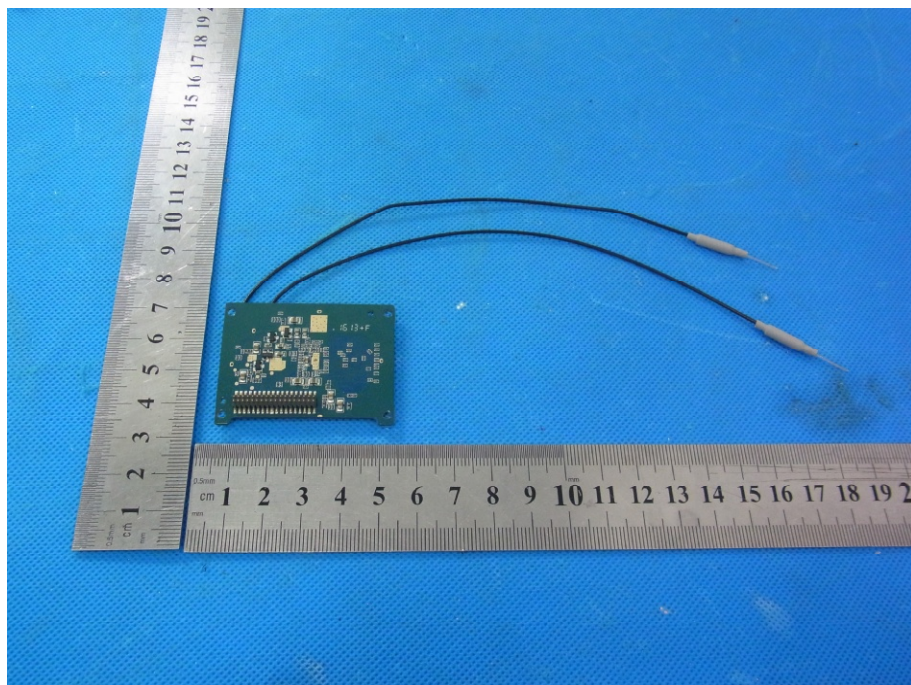
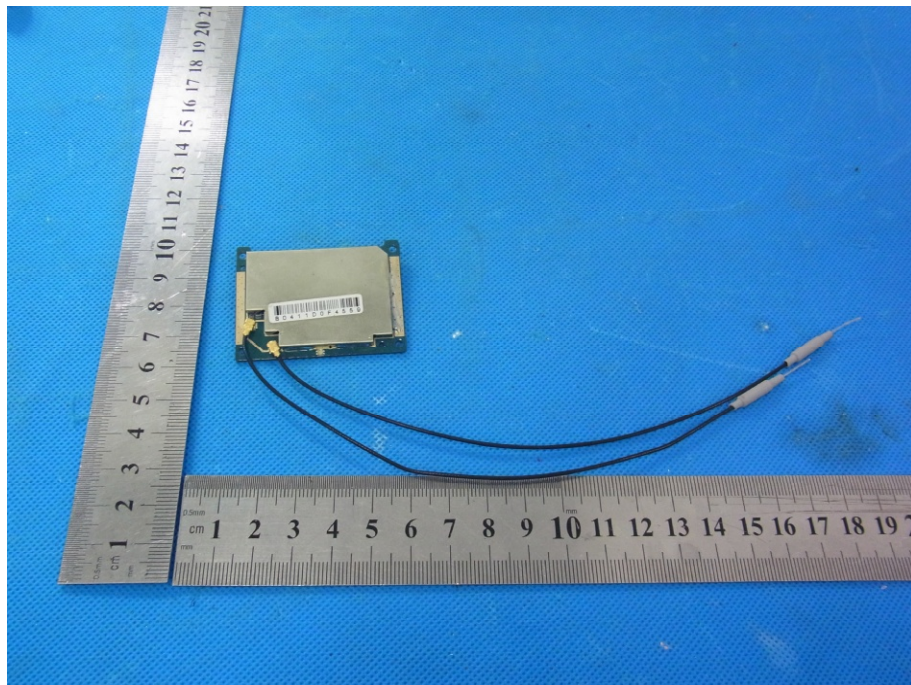
Refer to the theory of operation.

12. PHOTOGRAPHS OF TEST SET-UP

Radiated Emission Test



13. PHOTOGRAPHS OF THE EUT



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