TEST REPORT

Reference No.	:	WTS17S1196387E
FCC ID	:	2AIOC-DWS02W
Applicant	:	HANK ELECTRONICS CO., LTD.
Address	:	Floor 2nd-7th,A8,Hongye Industry City, Lezhujiao, Zhoushi Road, Baoan District，Shenzhen,Guangdong,518000, China.
Manufacturer	:	The same as above
Address	:	The same as above
Product	:	Door/Window Sensor
Model(s)	:	HKWL-DWS02W, EDW4-1001-WHT
Standards	:	FCC CFR47 Part 15 C Section 15.247:2016
Date of Receipt sample	:	2017-11-27
Date of Test	:	2017-11-28 to 2017-12-19
Date of Issue	:	2017-12-20
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.
The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
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Compiled by: Approved by:

Jack Wen / Test Engineer

Philo Zhong / Manager

2 Laboratories Introduction

Waltek Services Test Group Ltd. is one of the largest and the most comprehensive third party testing organizations in China, our headquarter located in Shenzhen (CNAS Registration No. L3110, A2LA Certificate Number: 4243.01) and have branches in Foshan (CNAS Registration No. L6478), Dongguan (CNAS Registration No. L9950), Zhongshan, Suzhou (CNAS Registration No. L7754), Ningbo and Hong Kong, Our test capability covered four large fields: safety test. Electronic Magnetic Compatibility(EMC), reliability and energy performance, Chemical test. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CPSC(Consumer Product Safety Commission), CEC(California energy efficiency), IC(Industry Canada) and ELI(Efficient Lighting Initiative). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as UL, Intertek(ETL-SEMKO), CSA, TÜV Rheinland, TÜV SÜD, etc. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

Waltek Services (Shenzhen) Co., Ltd.

A. Accreditations for Conformity Assessment (International)

Country/Region	Accreditation Body	Scope	Note
USA	**CNAS (Registration No.: L3110) A2LA (Certificate No.: 4243.01)**	FCC ID \ DOC \ VOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India	**International Services**	WPC	-
Thailand		NTC	-
Singapore		IDA	-
Note: 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. 2. IC Canada Registration No.: 7760A			

B. TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of …	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

3 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207(a)	PASS
Radiated Emissions	15.247 15.205(a) 15.209(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3),(4)	PASS
Power Spectral Density	15.247(e)	PASS
Band Edge	15.247(d)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

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5 General Information

5.1 General Description of E.U.T.

Product:	Door/Window Sensor
Model(s):	HKWL-DWS02W, EDW4-1001-WHT
Model Description:	Only the model names are different. Model HKWL-DWS02W is the test sample.
Operation Frequency:	802.11b/g/n HT20: 2412MHz ~ 2462MHz
The Lowest Oscillator:	26MHz
Antenna type	PCB printed antenna
Antenna Gain:	0dBi
Type of modulation:	IEEE 802.11b (CCK/QPSK/BPSK,11Mbps max.) IEEE 802.11g (BPSK/QPSK/16QAM/64QAM,54Mbps max.) IEEE 802.11n (BPSK/QPSK/16QAM/64QAM,HT20:72Mbps max.)

5.2 Details of E.U.T.

Technical Data: DC 3V power by batteries

5.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462	12	-

5.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
Power Spectral Density	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
6dB Bandwidth	802.11b	11 Mbps	1/11	TX
	802.11g	54 Mbps	1/11	TX
	802.11n HT20	108 Mbps	1/11	TX
Band Edge	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
Transmitter Spurious Emissions	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX

Note :Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

Table 2 Tests Carried Out Under FCC part 15.207 & FCC part 15.209

Test Item	Test Mode
Conduction Emission, 0.15MHz to 30MHz	Transmitting

6 Equipment Used during Test

6.1 Equipments List

Conducted Emissions Test Site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	100947	2017-09-15	2018-09-14
2.	LISN	R&S	ENV216	101215	2017-09-15	2018-09-14
3.	Cable	Top	TYPE16(3.5M)	-	2017-09-15	2018-09-14
Conducted Emissions Test Site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	101155	2017-09-15	2018-09-14
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2017-09-15	2018-09-14
3.	Limiter	York	MTS-IMP-136	261115-001-0024	2017-09-15	2018-09-14
4.	Cable	LARGE	RF300	-	2017-09-15	2018-09-14
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	Last Calibration Date	Calibration Due Date
1	EMC Analyzer	Agilent	E7405A	MY45114943	2017-09-15	2018-09-14
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2017-09-15	2018-09-14
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2017-04-08	2018-04-07
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2017-09-13	2018-09-12
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2017-09-15	2018-09-14
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2017-09-15	2018-09-14
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2017-09-15	2018-09-14
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2017-09-15	2018-09-14
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2017-09-15	2018-09-14
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2017-09-15	2018-09-14
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	2017-09-15	2018-09-14
4	Cable	HUBER+SUHNER	CBL2	525178	2017-09-15	2018-09-14

RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2017-09-15	2018-09-14
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2017-09-15	2018-09-14
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2017-09-15	2018-09-14

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

6.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (30M~1000MHz)
	± 5.47 dB (1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

6.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave,Tianhe District, Guangzhou, Guangdong, China .

7 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.10:2013
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz
	56 dBμV between 0.5MHz & 5MHz
	60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)

7.1 E.U.T. Operation

Operating Environment **:**

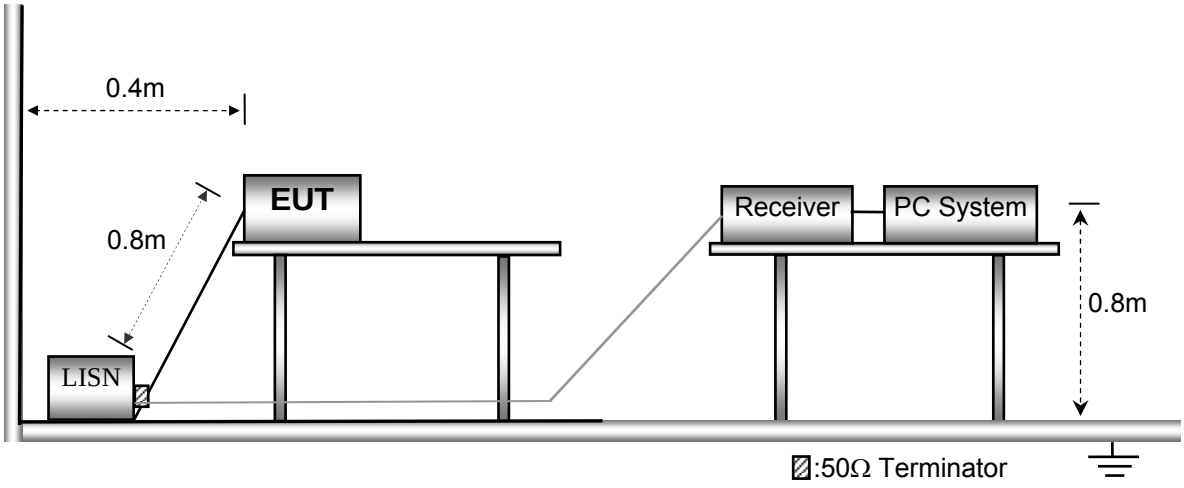
Temperature:	21.5 °C
Humidity:	51.9 % RH
Atmospheric Pressure:	101.2kPa

EUT Operation **:**

The test was performed in transmitting mode, the test data were shown in the report.

7.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10.



7.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

8.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

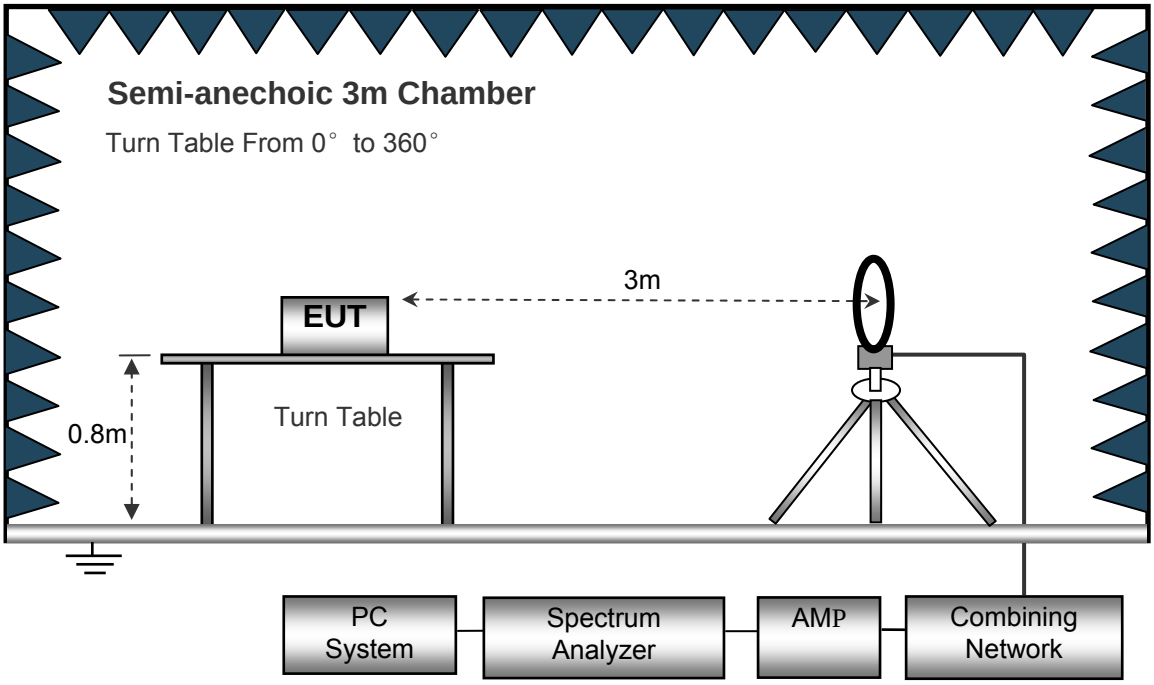
EUT Operation **:**

The test was performed in transmitting mode, the test data were shown in the report.

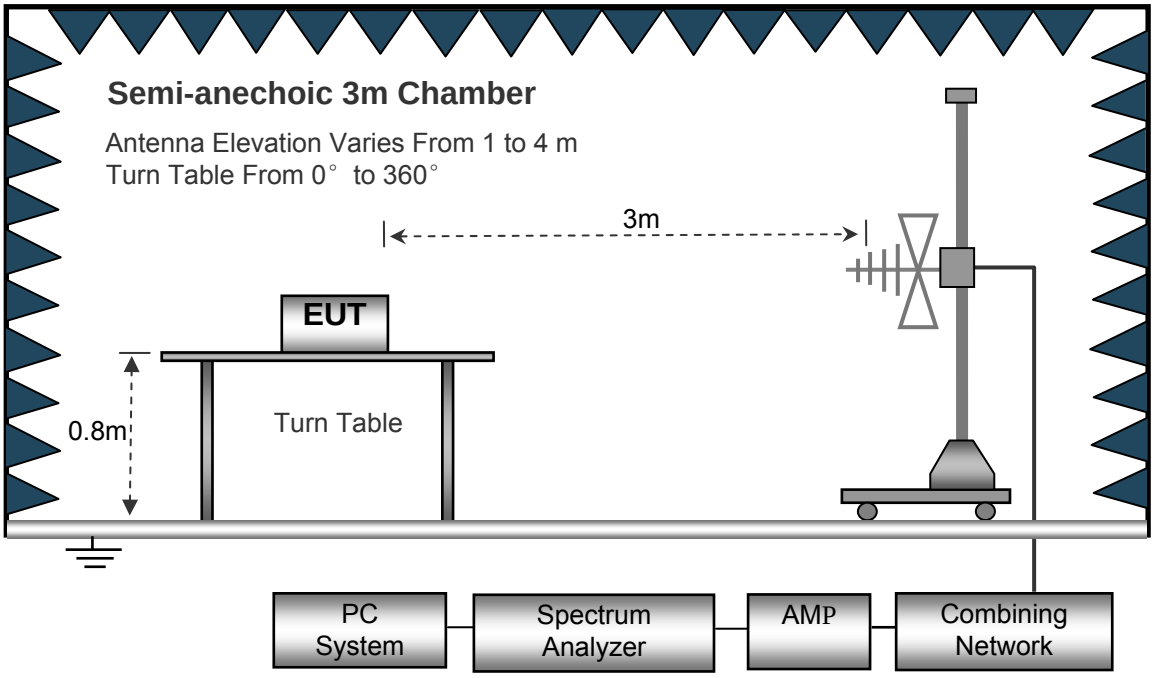
8.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.

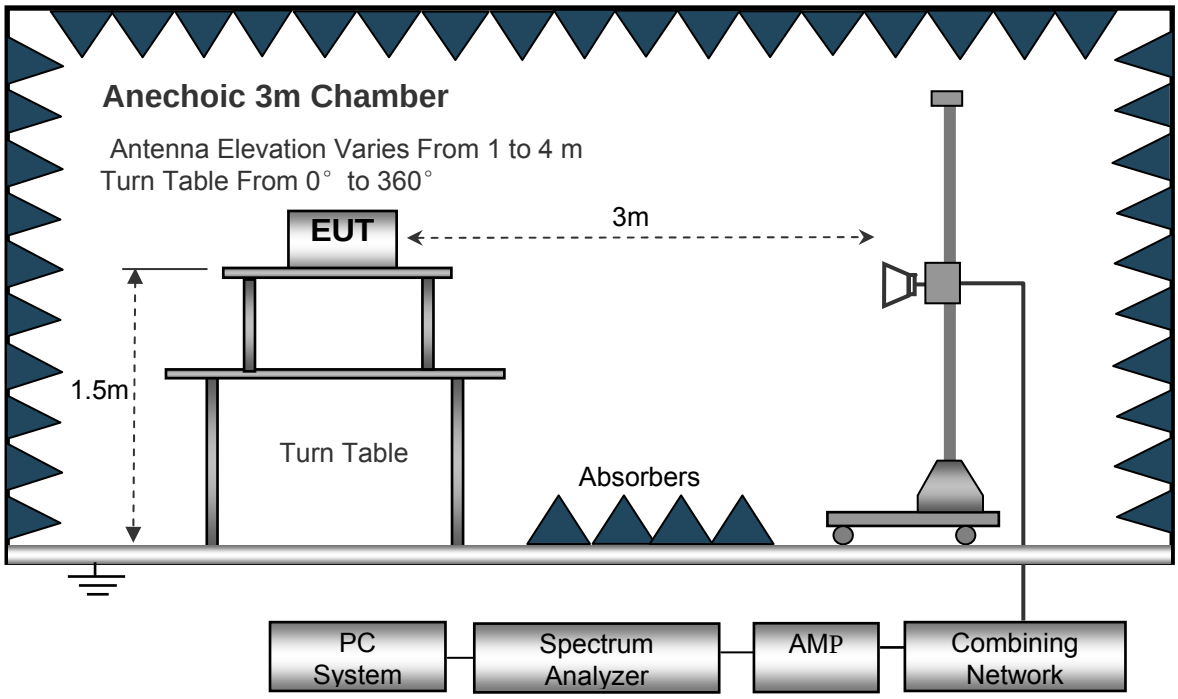
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz
Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz
Detector ..... Ave.
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 10Hz

8.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used druing radiated emissions above 1GHz measurement.

8.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

8.6 Summary of Test Results

Test Frequency: 26MHz~ 30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency : 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: Low Channel 2412MHz									
226.36	41.02	QP	278	1.3	H	-11.62	29.40	46.00	-16.60
226.36	36.29	QP	192	1.9	V	-11.62	24.67	46.00	-21.33
4824.00	50.12	PK	136	1.5	V	-1.06	49.06	74.00	-24.94
4824.00	46.28	Ave	136	1.5	V	-1.06	45.22	54.00	-8.78
7236.00	40.25	PK	326	1.1	H	1.33	41.58	74.00	-32.42
7236.00	41.09	Ave	326	1.1	H	1.33	42.42	54.00	-11.58
2330.63	46.59	PK	248	1.4	V	-13.19	33.40	74.00	-40.60
2330.63	37.42	Ave	248	1.4	V	-13.19	24.23	54.00	-29.77
2389.73	42.47	PK	287	1.5	H	-13.14	29.33	74.00	-44.67
2389.73	38.80	Ave	287	1.5	H	-13.14	25.66	54.00	-28.34
2493.10	44.40	PK	242	1.5	V	-13.08	31.32	74.00	-42.68
2493.10	38.89	Ave	242	1.5	V	-13.08	25.81	54.00	-28.19

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: Middle Channel 2437MHz									
226.36	41.72	QP	6	1.9	H	-11.62	30.10	46.00	-15.90
226.36	35.51	QP	60	2.0	V	-11.62	23.89	46.00	-22.11
4874.00	49.19	PK	358	1.9	V	-0.62	48.57	74.00	-25.43
4874.00	47.41	Ave	358	1.9	V	-0.62	46.79	54.00	-7.21
7311.00	39.57	PK	164	1.8	H	2.21	41.78	74.00	-32.22
7311.00	39.70	Ave	164	1.8	H	2.21	41.91	54.00	-12.09
2344.68	45.23	PK	268	1.6	V	-13.19	32.04	74.00	-41.96
2344.68	38.48	Ave	268	1.6	V	-13.19	25.29	54.00	-28.71
2351.09	44.75	PK	222	1.8	H	-13.14	31.61	74.00	-42.39
2351.09	38.08	Ave	222	1.8	H	-13.14	24.94	54.00	-29.06
2492.56	44.66	PK	183	1.3	V	-13.08	31.58	74.00	-42.42
2492.56	38.67	Ave	183	1.3	V	-13.08	25.59	54.00	-28.41

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: High Channel 2462MHz									
226.36	41.57	QP	255	1.0	H	-11.62	29.95	46.00	-16.05
226.36	35.84	QP	267	1.4	V	-11.62	24.22	46.00	-21.78
4924.00	49.75	PK	326	1.7	V	-0.24	49.51	74.00	-24.49
4924.00	47.00	Ave	326	1.7	V	-0.24	46.76	54.00	-7.24
7386.00	40.12	PK	243	1.9	H	2.84	42.96	74.00	-31.04
7386.00	40.57	Ave	243	1.9	H	2.84	43.41	54.00	-10.59
2329.06	46.42	PK	105	1.9	V	-13.19	33.23	74.00	-40.77
2329.06	38.80	Ave	105	1.9	V	-13.19	25.61	54.00	-28.39
2378.36	44.66	PK	25	1.2	H	-13.14	31.52	74.00	-42.48
2378.36	37.09	Ave	25	1.2	H	-13.14	23.95	54.00	-30.05
2491.33	44.40	PK	2	1.0	V	-13.08	31.32	74.00	-42.68
2491.33	36.69	Ave	2	1.0	V	-13.08	23.61	54.00	-30.39

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Low Channel 2412MHz									
226.36	42.66	QP	198	1.3	H	-11.62	31.04	46.00	-14.96
226.36	34.37	QP	121	1.6	V	-11.62	22.75	46.00	-23.25
4824.00	48.69	PK	359	1.5	V	-1.06	47.63	74.00	-26.37
4824.00	47.59	Ave	359	1.5	V	-1.06	46.53	54.00	-7.47
7236.00	41.43	PK	133	1.3	H	1.33	42.76	74.00	-31.24
7236.00	41.73	Ave	133	1.3	H	1.33	43.06	54.00	-10.94
2310.33	45.53	PK	196	1.8	V	-13.19	32.34	74.00	-41.66
2310.33	39.74	Ave	196	1.8	V	-13.19	26.55	54.00	-27.45
2377.47	43.31	PK	114	1.1	H	-13.14	30.17	74.00	-43.83
2377.47	36.40	Ave	114	1.1	H	-13.14	23.26	54.00	-30.74
2489.73	43.92	PK	236	1.7	V	-13.08	30.84	74.00	-43.16
2489.73	38.81	Ave	236	1.7	V	-13.08	25.73	54.00	-28.27

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Middle Channel 2437MHz									
226.36	43.87	QP	138	1.2	H	-11.62	32.25	46.00	-13.75
226.36	34.56	QP	314	1.5	V	-11.62	22.94	46.00	-23.06
4874.00	48.03	PK	280	1.2	V	-0.62	47.41	74.00	-26.59
4874.00	46.27	Ave	280	1.2	V	-0.62	45.65	54.00	-8.35
7311.00	41.93	PK	243	1.6	H	2.21	44.14	74.00	-29.86
7311.00	42.38	Ave	243	1.6	H	2.21	44.59	54.00	-9.41
2337.67	45.57	PK	329	1.6	V	-13.19	32.38	74.00	-41.62
2337.67	38.11	Ave	329	1.6	V	-13.19	24.92	54.00	-29.08
2369.05	42.44	PK	90	1.7	H	-13.14	29.30	74.00	-44.70
2369.05	36.89	Ave	90	1.7	H	-13.14	23.75	54.00	-30.25
2499.03	42.38	PK	4	1.5	V	-13.08	29.30	74.00	-44.70
2499.03	36.05	Ave	4	1.5	V	-13.08	22.97	54.00	-31.03

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: High Channel 2462MHz									
226.36	43.71	QP	266	1.6	H	-11.62	32.09	46.00	-13.91
226.36	34.74	QP	63	1.6	V	-11.62	23.12	46.00	-22.88
4924.00	47.56	PK	140	1.7	V	-0.24	47.32	74.00	-26.68
4924.00	45.11	Ave	140	1.7	V	-0.24	44.87	54.00	-9.13
7386.00	42.99	PK	11	1.9	H	2.84	45.83	74.00	-28.17
7386.00	41.18	Ave	11	1.9	H	2.84	44.02	54.00	-9.98
2332.62	46.30	PK	118	1.5	V	-13.19	33.11	74.00	-40.89
2332.62	39.36	Ave	118	1.5	V	-13.19	26.17	54.00	-27.83
2355.31	44.02	PK	9	1.1	H	-13.14	30.88	74.00	-43.12
2355.31	37.71	Ave	9	1.1	H	-13.14	24.57	54.00	-29.43
2493.70	44.54	PK	332	1.8	V	-13.08	31.46	74.00	-42.54
2493.70	38.28	Ave	332	1.8	V	-13.08	25.20	54.00	-28.80

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n HT20: Low Channel 2412MHz									
226.36	44.68	QP	309	1.8	H	-11.62	33.06	46.00	-12.94
226.36	33.67	QP	96	1.8	V	-11.62	22.05	46.00	-23.95
4824.00	48.60	PK	298	1.7	V	-1.06	47.54	74.00	-26.46
4824.00	43.65	Ave	298	1.7	V	-1.06	42.59	54.00	-11.41
7236.00	42.39	PK	221	1.3	H	1.33	43.72	74.00	-30.28
7236.00	41.34	Ave	221	1.3	H	1.33	42.67	54.00	-11.33
2347.36	46.14	PK	130	1.1	V	-13.19	32.95	74.00	-41.05
2347.36	38.93	Ave	130	1.1	V	-13.19	25.74	54.00	-28.26
2382.99	44.57	PK	295	1.7	H	-13.14	31.43	74.00	-42.57
2382.99	37.96	Ave	295	1.7	H	-13.14	24.82	54.00	-29.18
2488.56	43.99	PK	118	1.2	V	-13.08	30.91	74.00	-43.09
2488.56	38.32	Ave	118	1.2	V	-13.08	25.24	54.00	-28.76

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n HT20: Middle Channel 2437MHz									
226.36	45.84	QP	204	1.7	H	-11.62	34.22	46.00	-11.78
226.36	34.29	QP	223	1.9	V	-11.62	22.67	46.00	-23.33
4874.00	48.03	PK	346	1.1	V	-0.62	47.41	74.00	-26.59
4874.00	42.91	Ave	346	1.1	V	-0.62	42.29	54.00	-11.71
7311.00	43.83	PK	324	1.3	H	2.21	46.04	74.00	-27.96
7311.00	42.71	Ave	324	1.3	H	2.21	44.92	54.00	-9.08
2310.38	45.38	PK	316	1.9	V	-13.19	32.19	74.00	-41.81
2310.38	37.14	Ave	316	1.9	V	-13.19	23.95	54.00	-30.05
2359.66	43.97	PK	198	1.5	H	-13.14	30.83	74.00	-43.17
2359.66	38.48	Ave	198	1.5	H	-13.14	25.34	54.00	-28.66
2488.09	43.29	PK	126	1.1	V	-13.08	30.21	74.00	-43.79
2488.09	36.66	Ave	126	1.1	V	-13.08	23.58	54.00	-30.42

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n HT20: High Channel 2462MHz									
226.36	44.87	QP	352	1.6	H	-11.62	33.25	46.00	-12.75
226.36	35.76	QP	203	1.9	V	-11.62	24.14	46.00	-21.86
4924.00	46.86	PK	146	1.6	V	-0.24	46.62	74.00	-27.38
4924.00	41.99	Ave	146	1.6	V	-0.24	41.75	54.00	-12.25
7386.00	45.24	PK	108	1.5	H	2.84	48.08	74.00	-25.92
7386.00	43.78	Ave	108	1.5	H	2.84	46.62	54.00	-7.38
2349.09	46.31	PK	218	1.1	V	-13.19	33.12	74.00	-40.88
2349.09	38.45	Ave	218	1.1	V	-13.19	25.26	54.00	-28.74
2350.65	43.44	PK	260	1.8	H	-13.14	30.30	74.00	-43.70
2350.65	37.85	Ave	260	1.8	H	-13.14	24.71	54.00	-29.29
2490.12	43.04	PK	203	1.8	V	-13.08	29.96	74.00	-44.04
2490.12	37.13	Ave	203	1.8	V	-13.08	24.05	54.00	-29.95

Test Frequency: 18GHz~25GHz

The measurements were more than 20 dB below the limit and not reported.

9 Band Edge Measurement

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	KDB 558074 D01 DTS Meas Guidance v04
Test Limit:	Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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 in §15.209(a) (see §15.205(c)).
Test Mode:	Transmitting

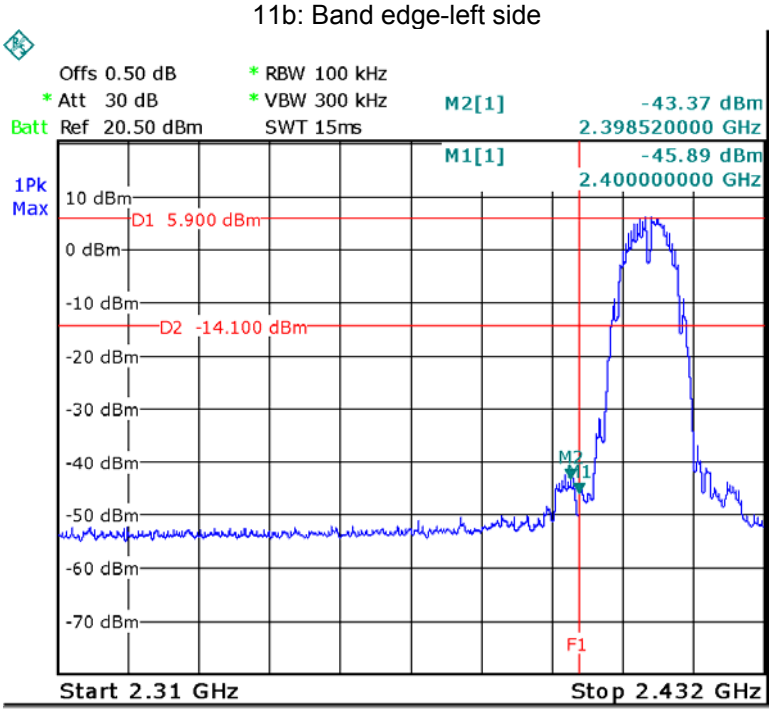
9.1 Test Produce

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 to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
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.

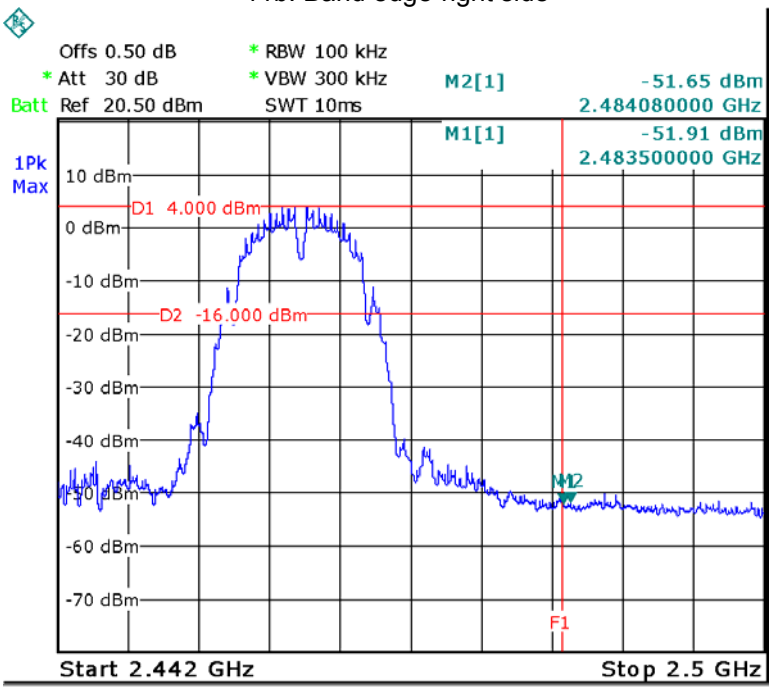
9.2 Test Result

Test result plots shown as follows:

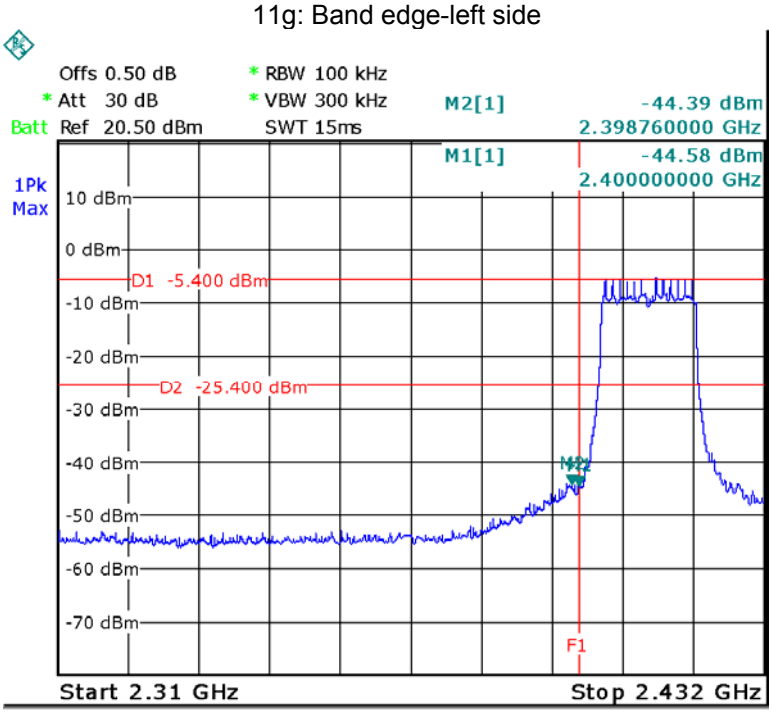
11b: Band edge-left side



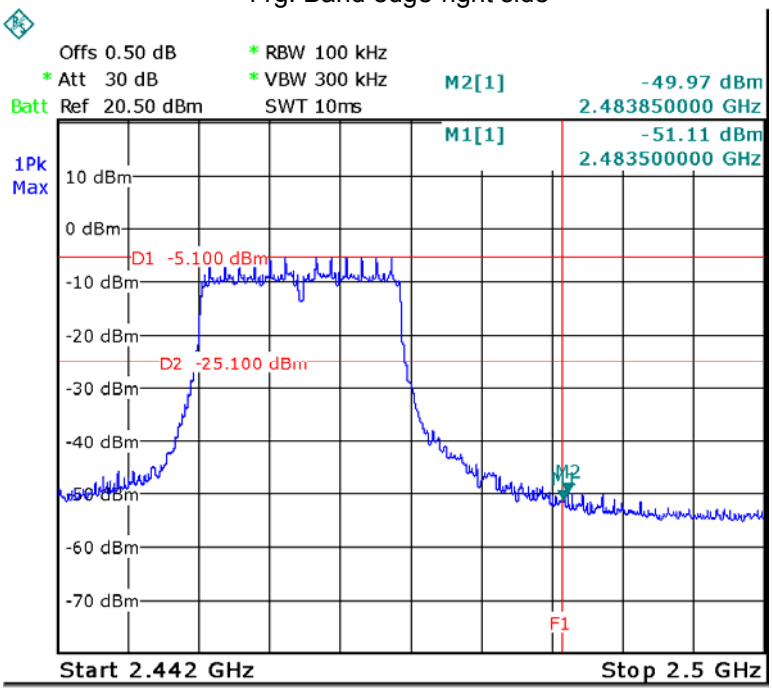
11b: Band edge-right side



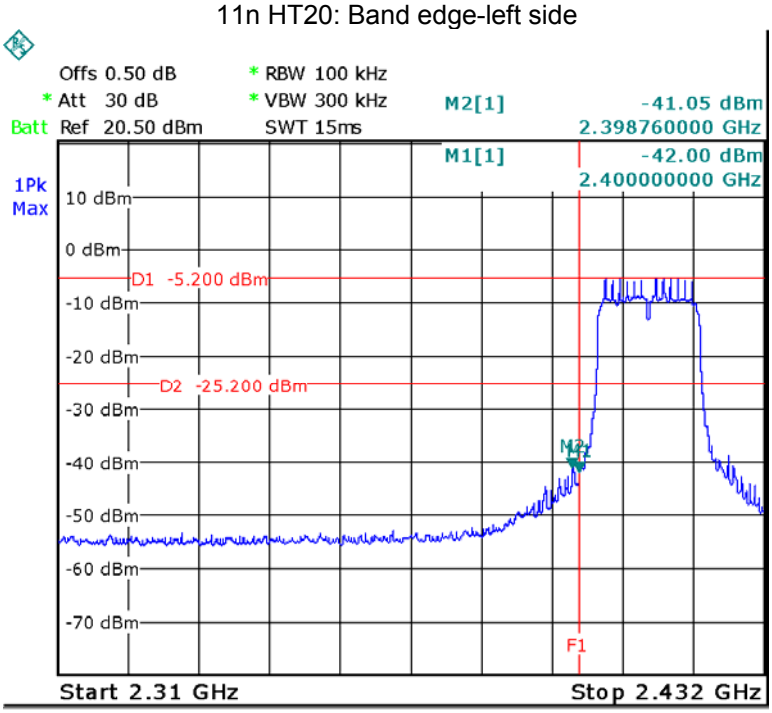
11g: Band edge-left side



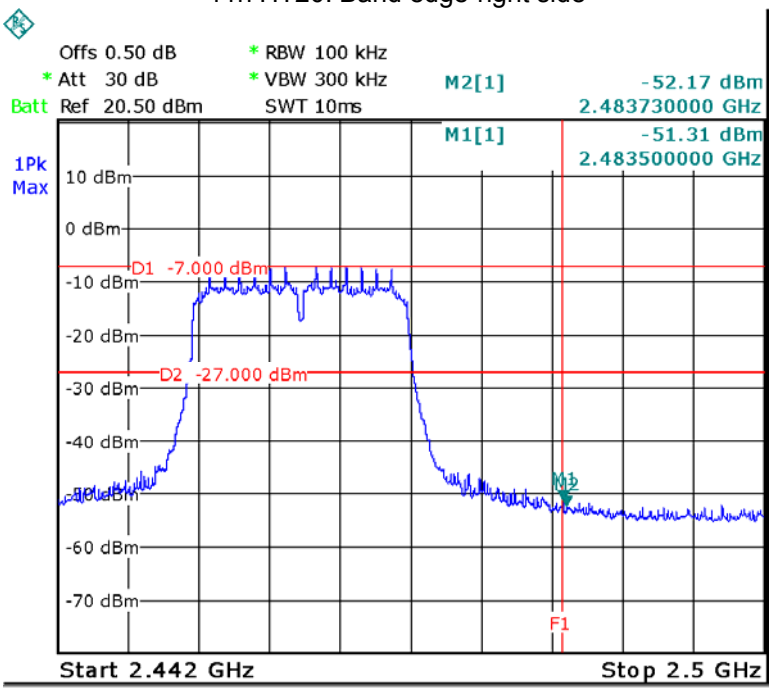
11g: Band edge-right side



11n HT20: Band edge-left side



11n HT20: Band edge-right side



10 6 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 DTS Meas Guidance v04

10.1 Test Procedure:

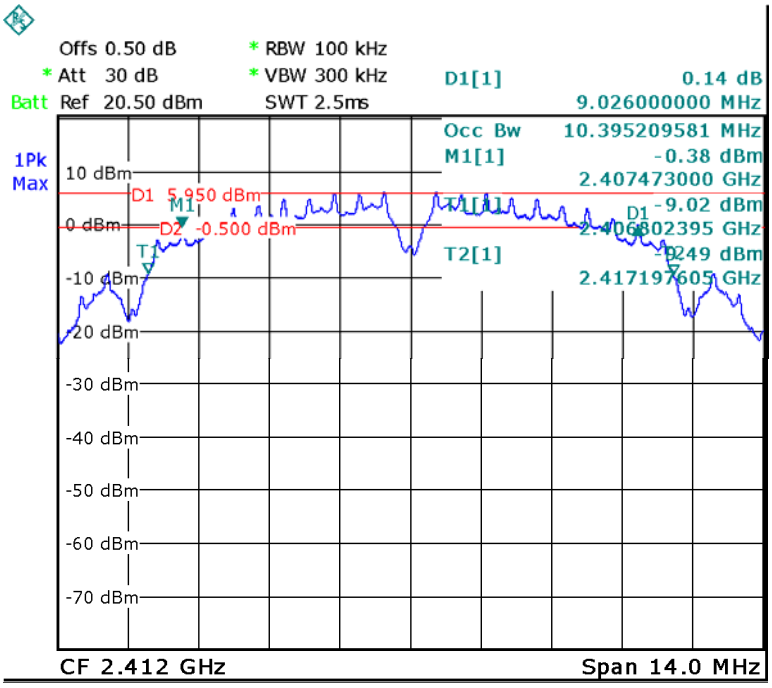
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

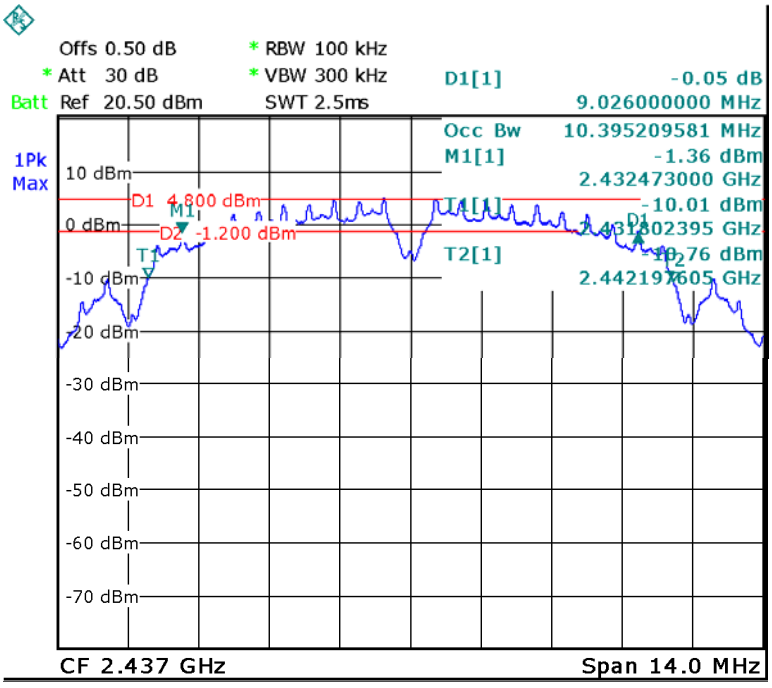
10.2 Test Result:

ANT	Operation mode	Bandwidth (MHz)		
		Low	Middle	High
ANT	11b	9.026	9.026	9.026
	11g	16.168	16.653	16.168
	11n HT20	16.653	16.653	16.653

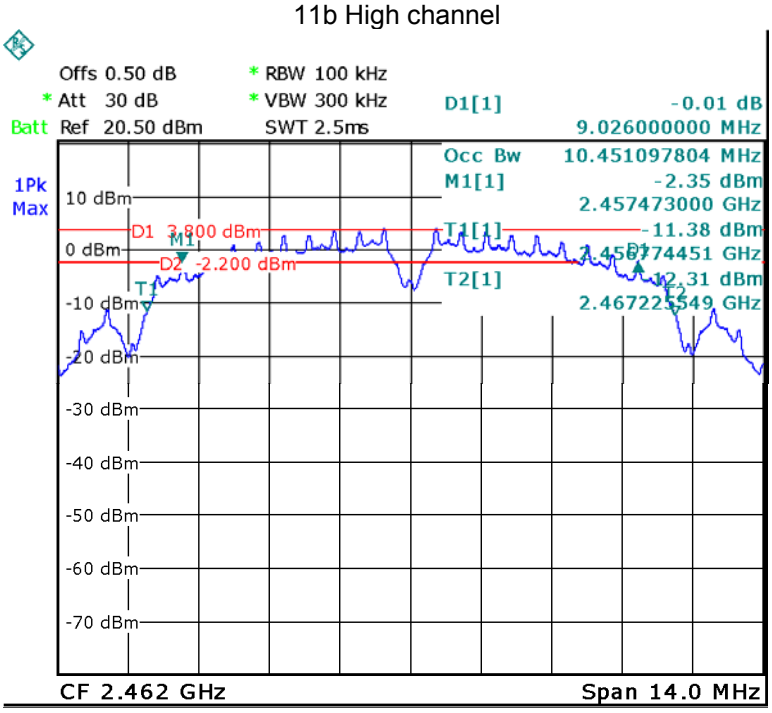
11b Low channel



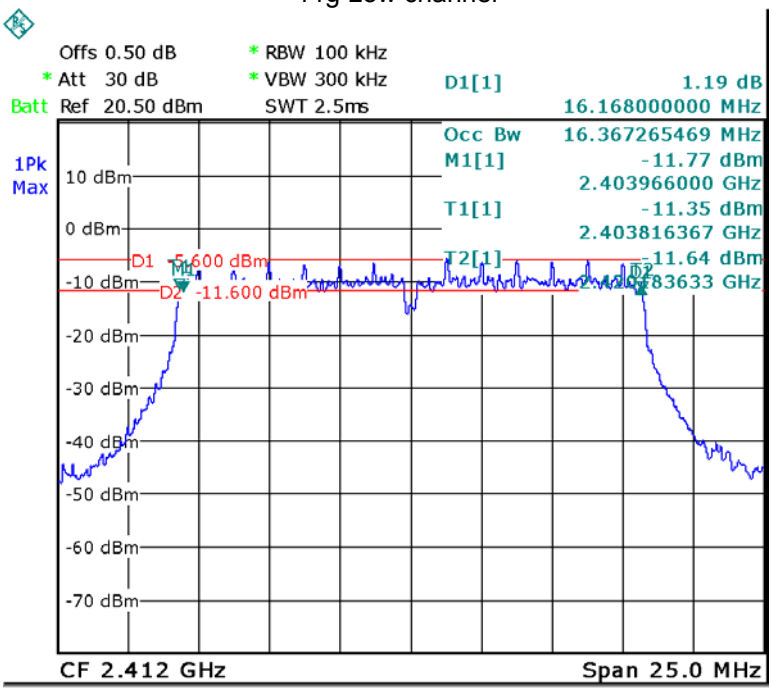
11b Middle channel



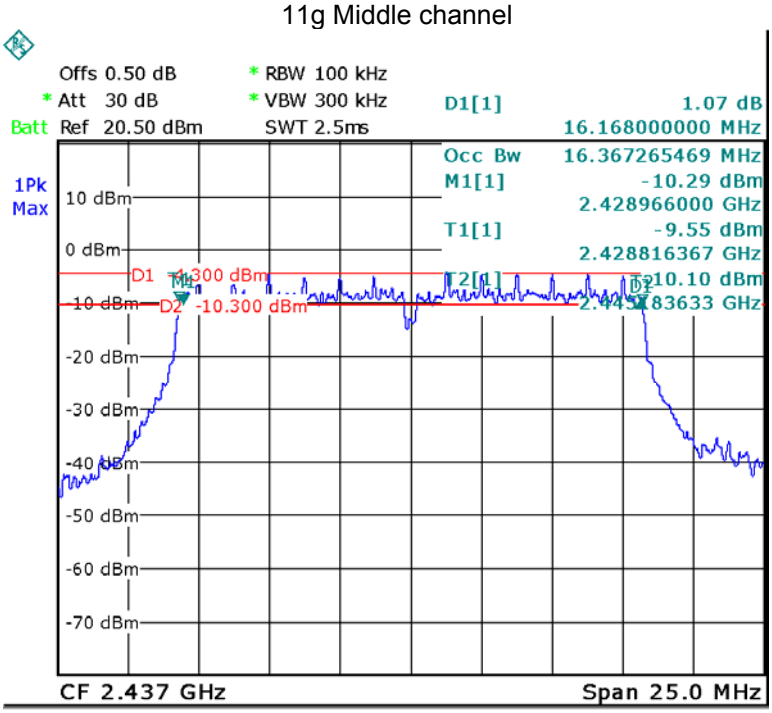
11b High channel



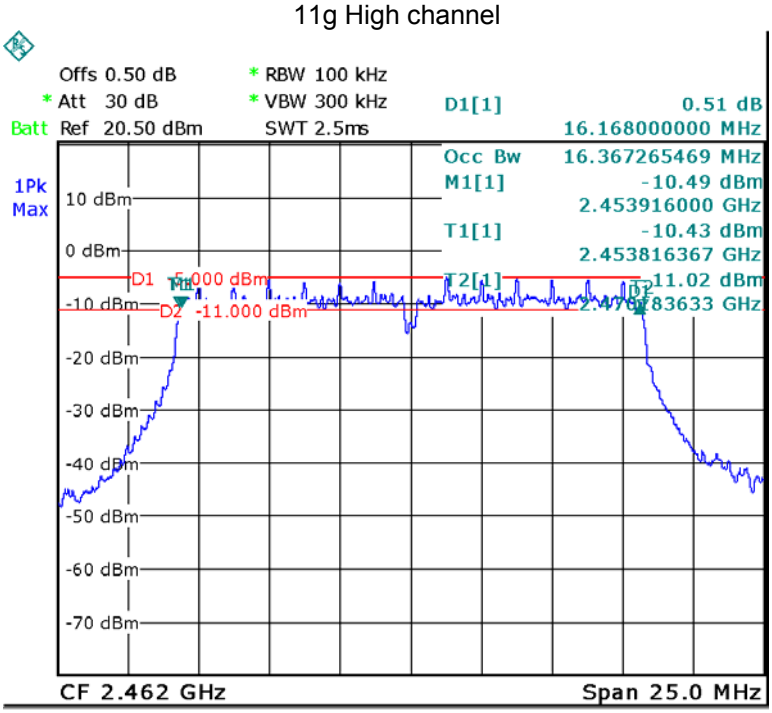
11g Low channel



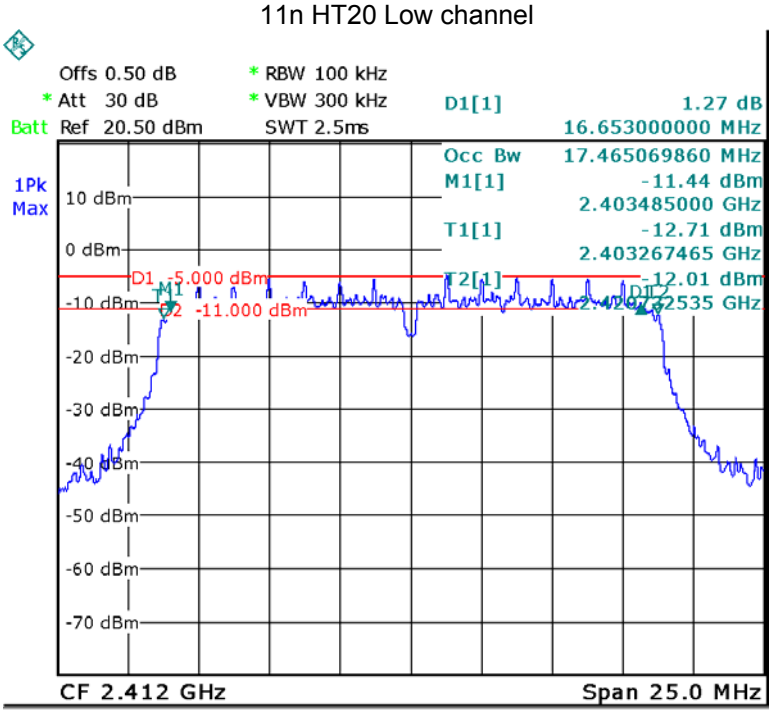
11g Middle channel



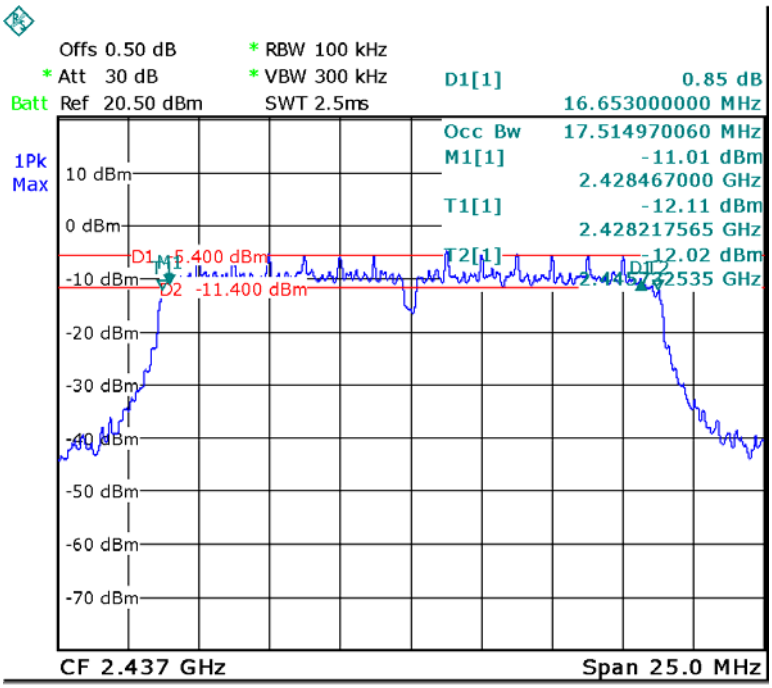
11g High channel



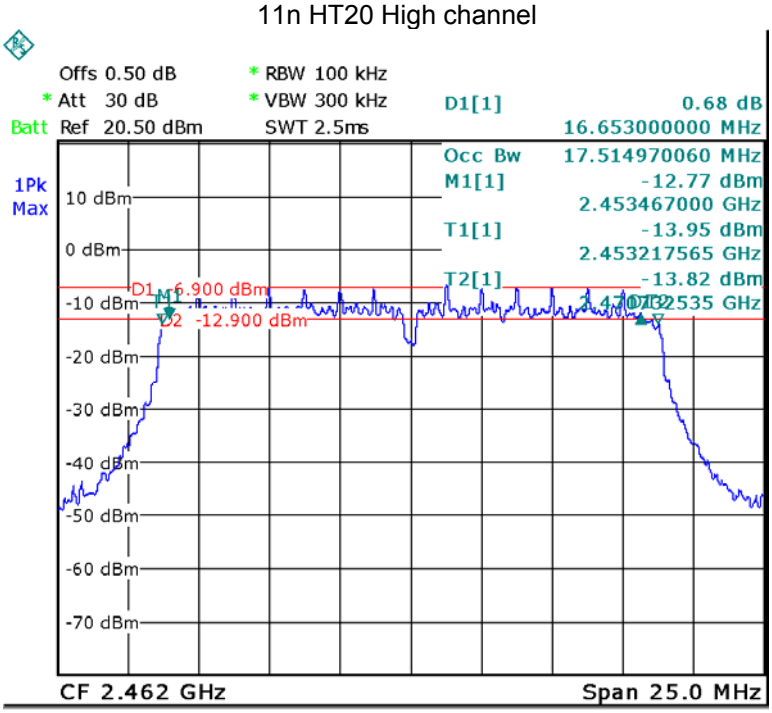
11n HT20 Low channel



11n HT20 Middle channel



11n HT20 High channel



11 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 DTS Meas Guidance v04

11.1 Test Procedure:

KDB 558074 D01 DTS Meas Guidance v03r04 section 9.1.2

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

11.2 Test Result:

Operation mode	ANT	Maximum Peak Output Power (dBm)		
		Low	Middle	High
11b	ANT	**16.98**	15.84	15.33
11g	ANT	13.89	14.73	13.77
11n HT20	ANT	13.58	13.85	11.90
Limit				
1W/30dBm				

12 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 DTS Meas Guidance v04

12.1 Test Procedure:

KDB 558074 D01 DTS Meas Guidance v03r04 section 10.2

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

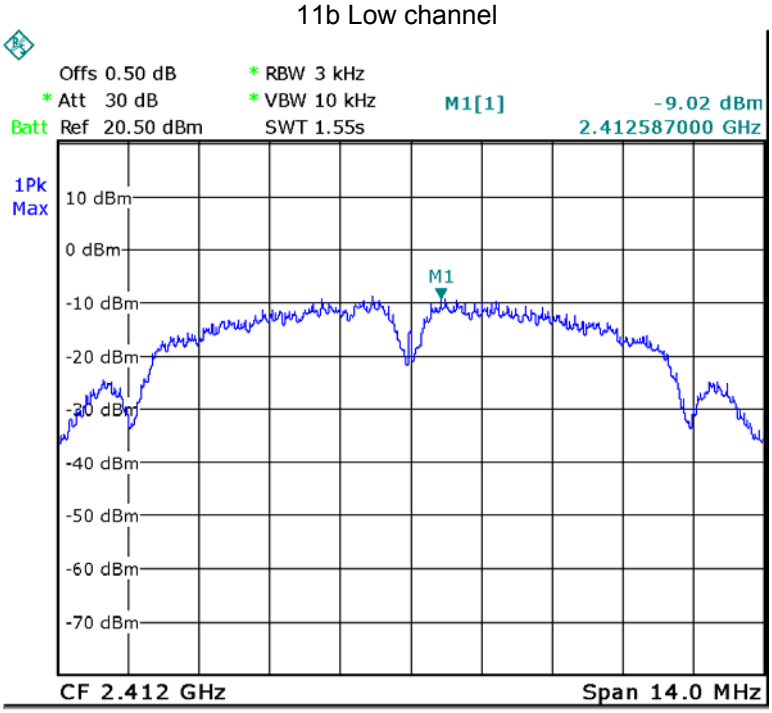
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

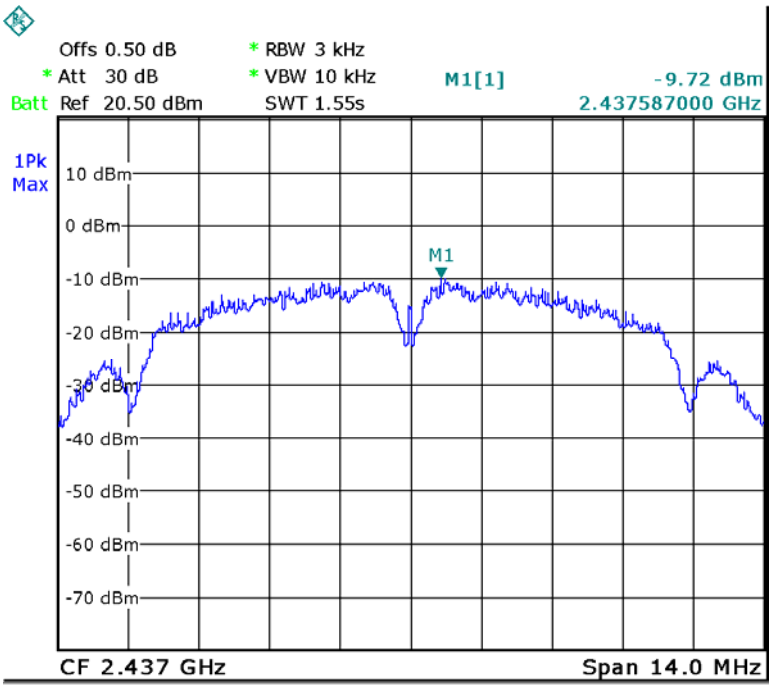
12.2 Test Result:

Operation mode	ANT	Maximum Peak Output Power (dBm per 3kHz)		
		Low	Middle	High
11b	ANT	-9.02	-9.72	-10.74
11g	ANT	-19.93	-19.30	-20.21
11n HT20	ANT	-20.46	-19.78	-22.06
Limit				
8dBm per 3kHz				

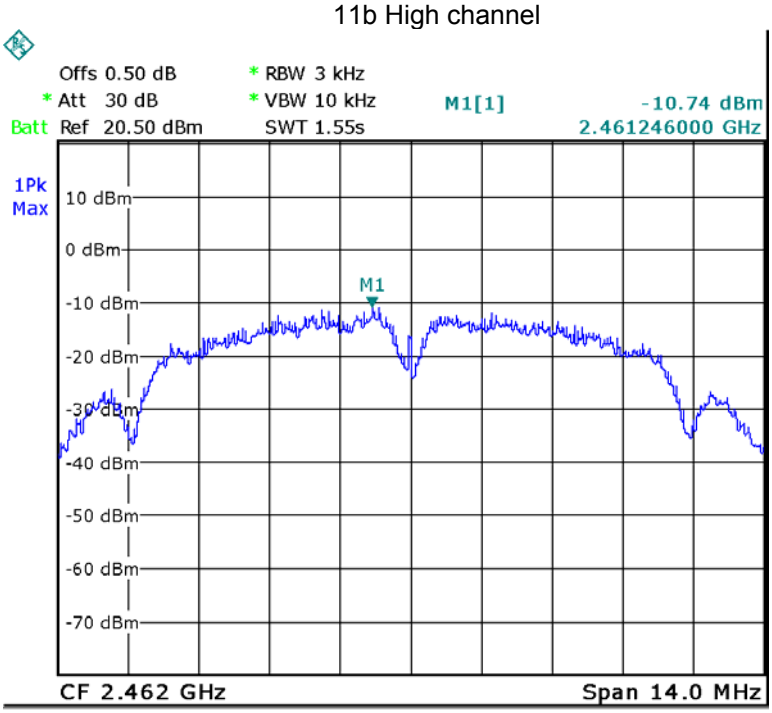
11b Low channel



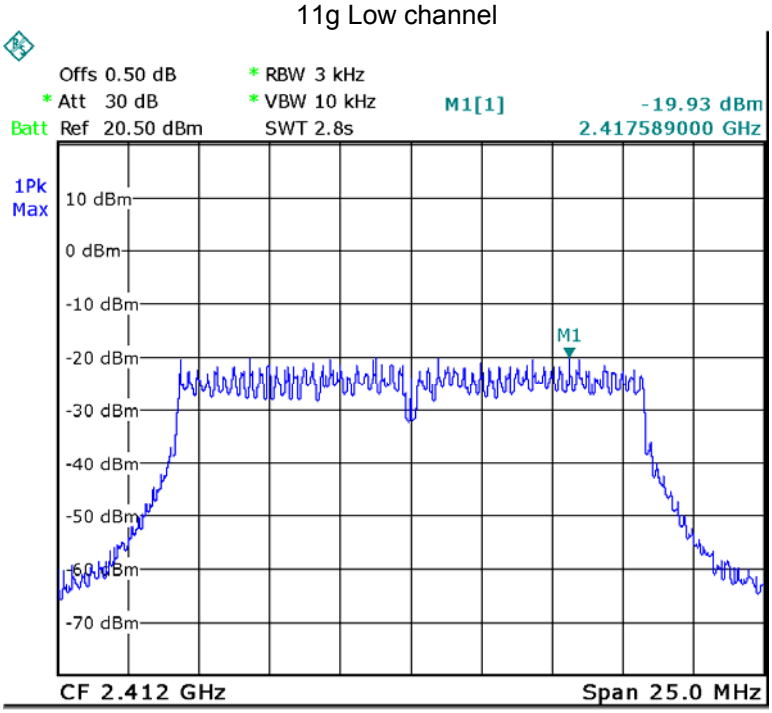
11b Middle channel



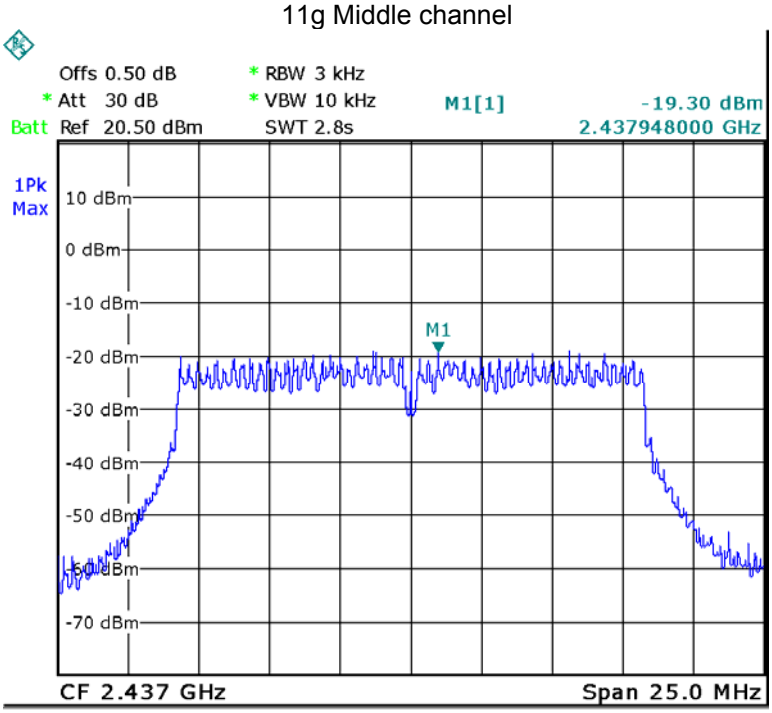
11b High channel



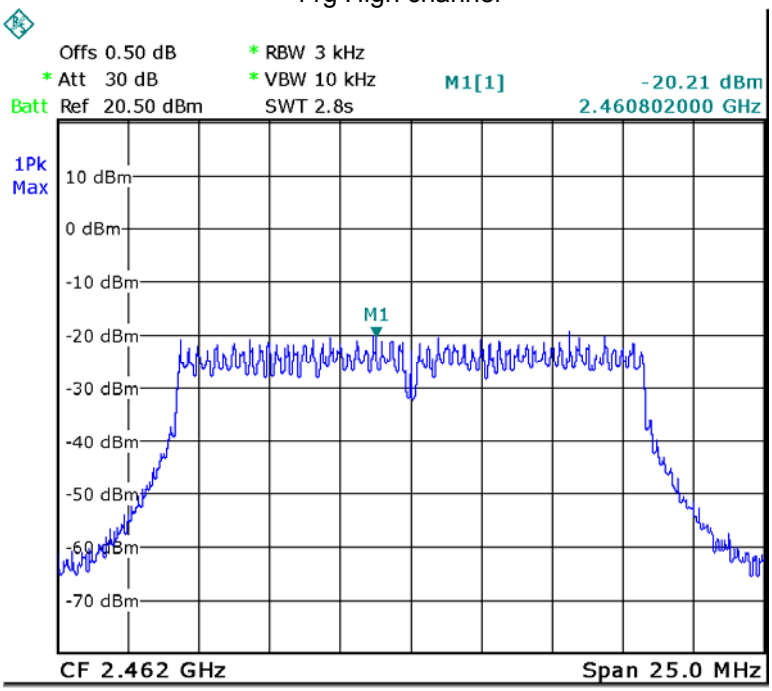
11g Low channel



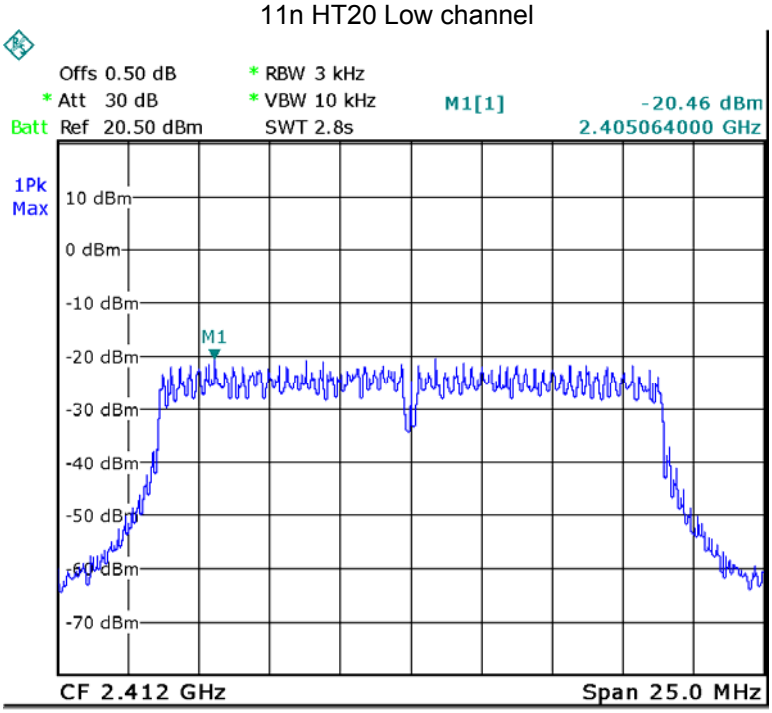
11g Middle channel



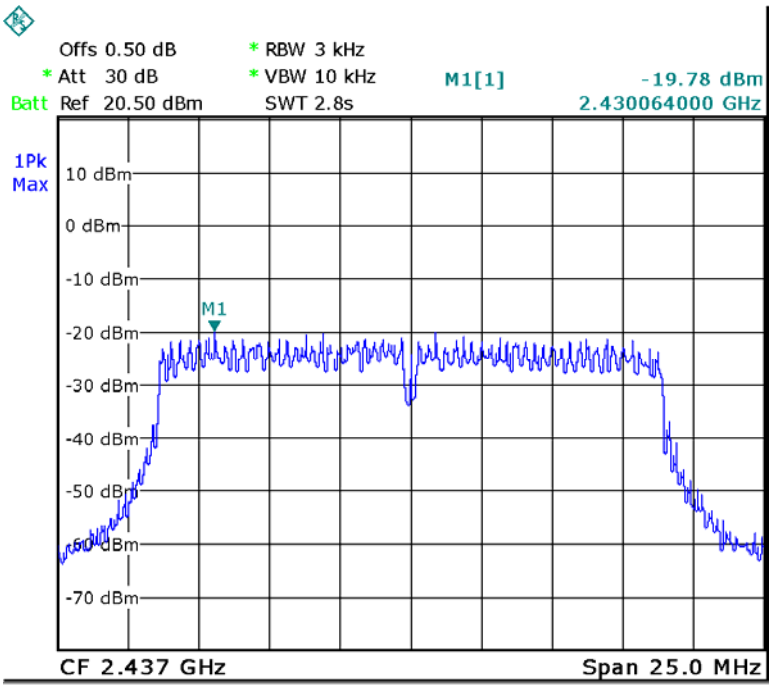
11g High channel



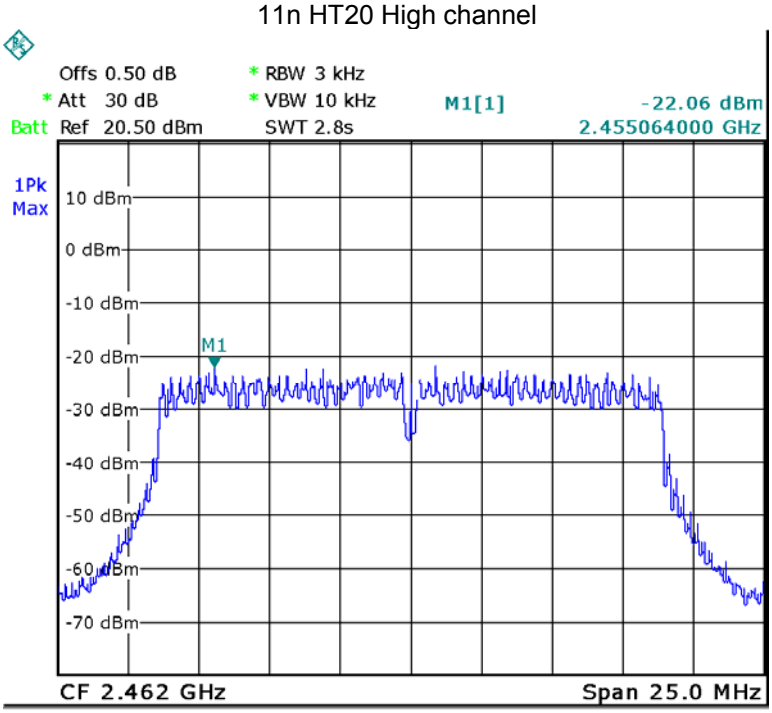
11n HT20 Low channel



11n HT20 Middle channel

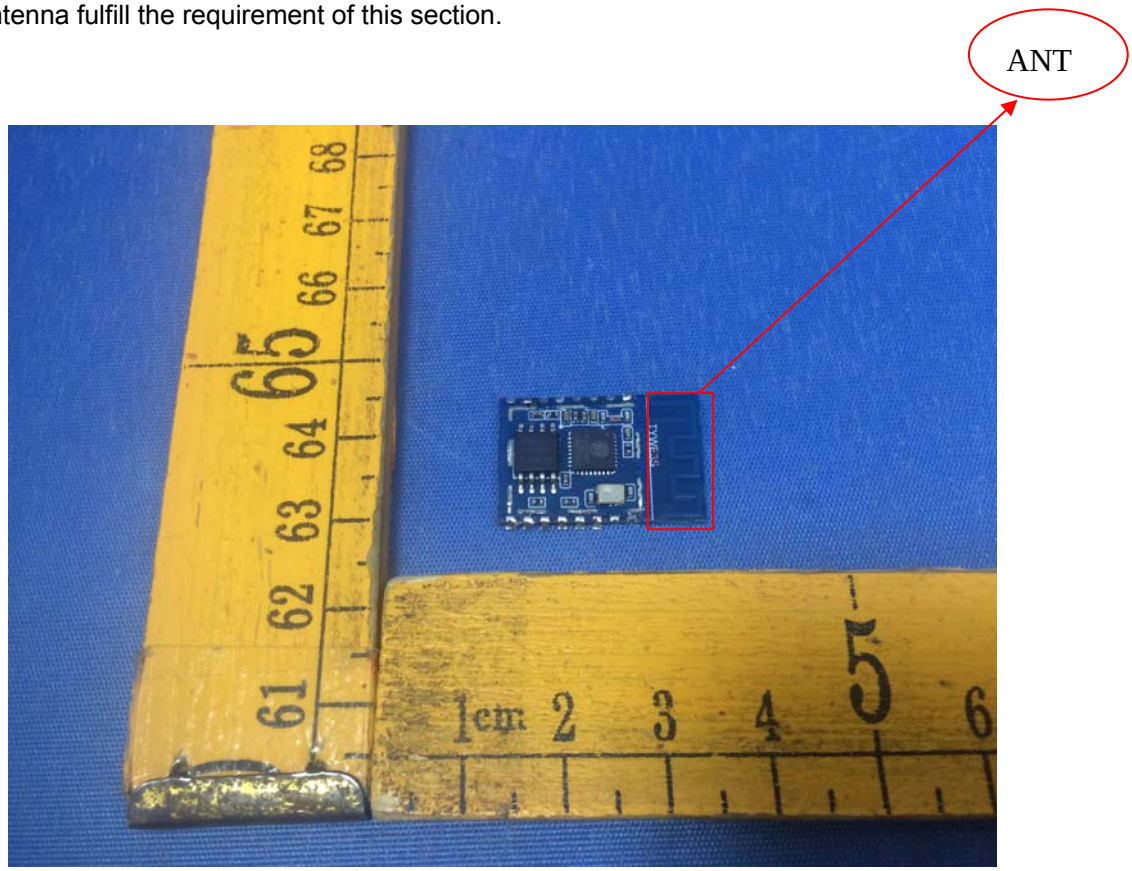


11n HT20 High channel



13 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a PCB printed antenna fulfill the requirement of this section.



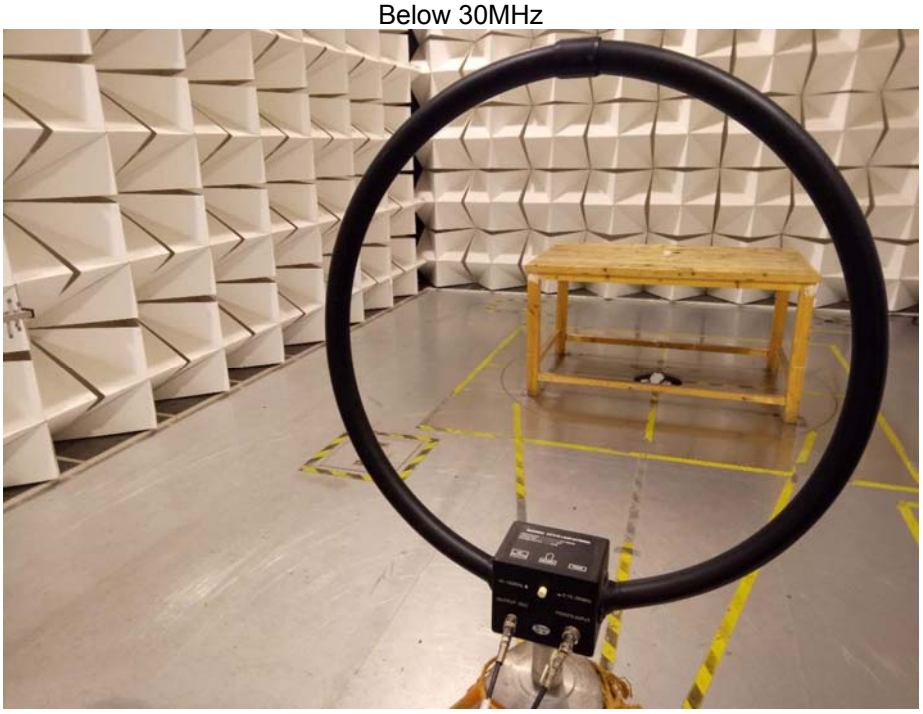
14 RF Exposure

Please refer to Maximum Permissible Exposure report.

15 Photographs –Test Setup

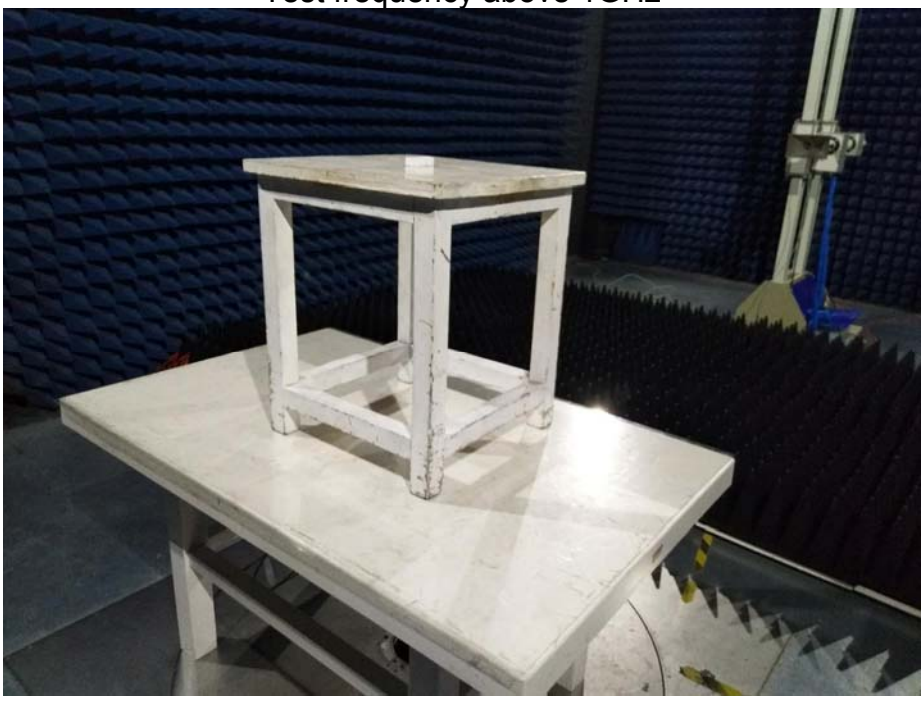
15.1 Radiated Emission

Below 30MHz



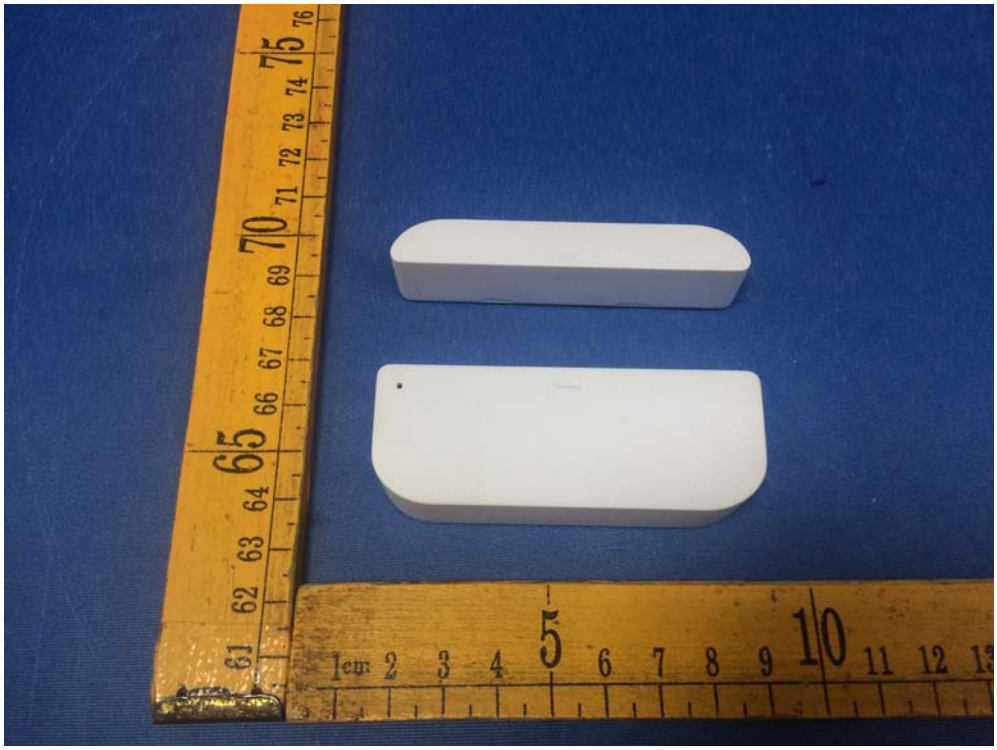
Test frequency for 30MHz~1GHz

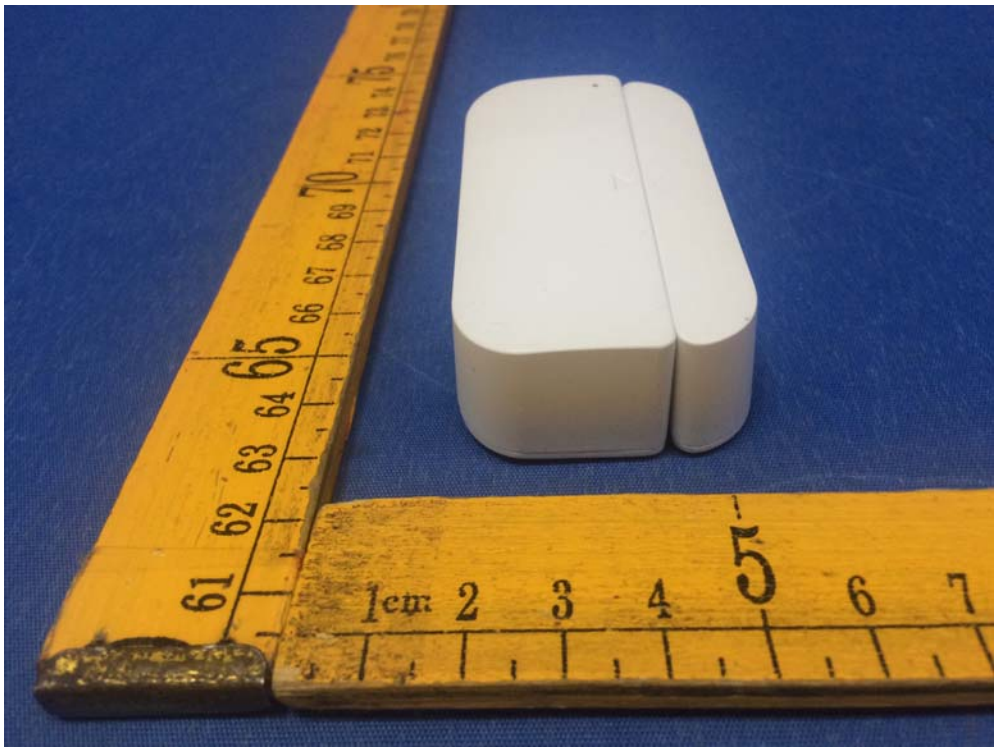
Test frequency above 1GHz



16 Photographs - Constructional Details

16.1 Model HKWL-DWS02W External View

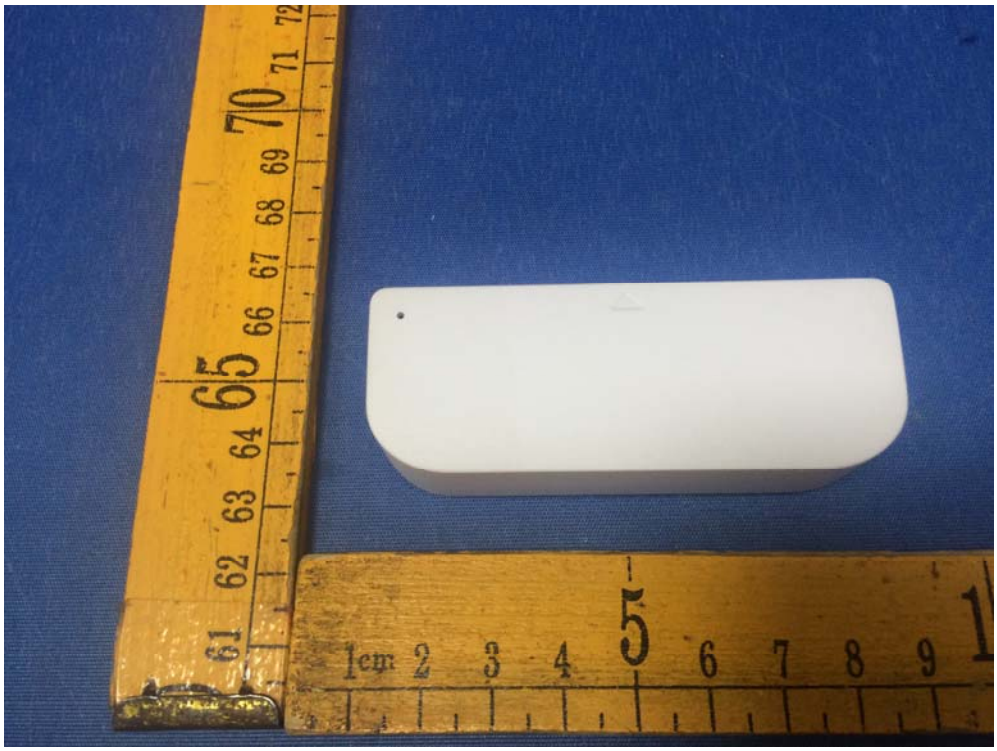



61 62 63 64 65 66 67 68 69 70
1cm 2 3 4 5 6 7

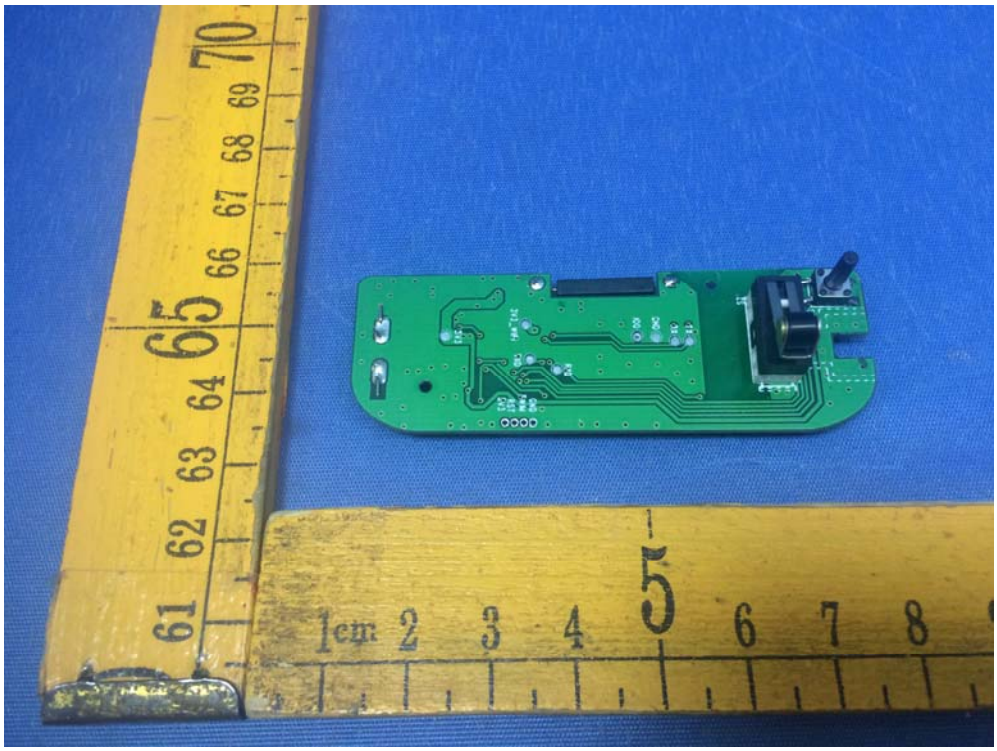

61 62 63 64 65 66 67 68 69 70
1cm 2 3 4 5 6 7

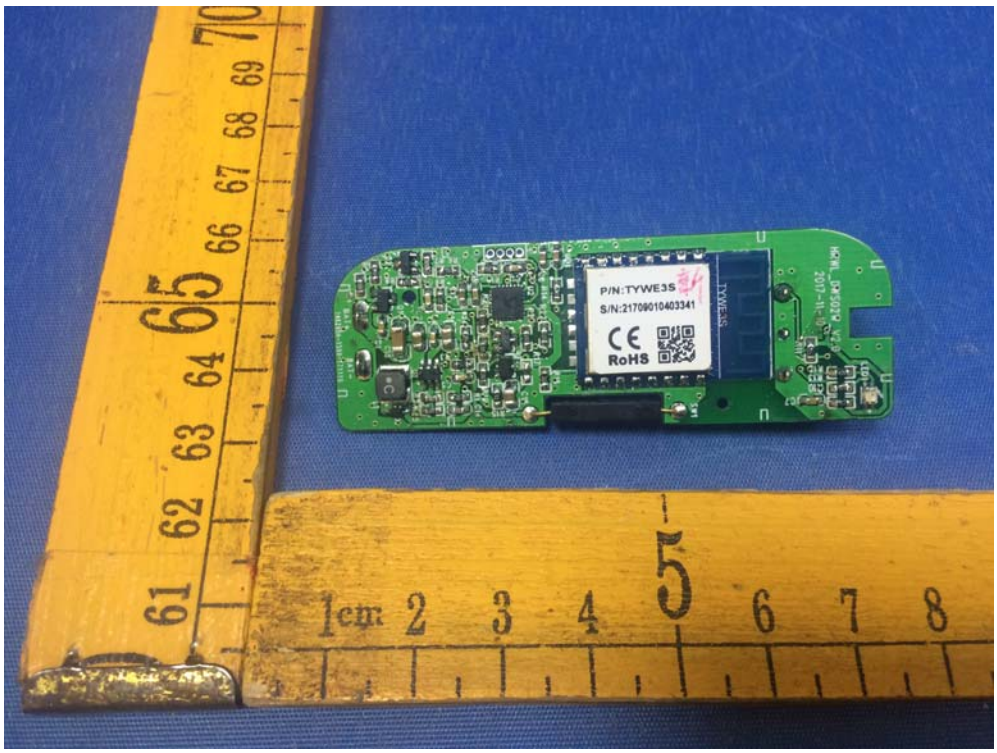

61 62 63 64 65 66 67 68 69 70 71 72 73 74 75
1cm 2 3 4 5 6 7 8


61 62 63 64 65 66 67 68 69 70 71 72 73 74 75
1cm 2 3 4 5 6 7 8


70
71
72
69
68
67
66
65
64
63
62
61
1cm
2
3
4
5
6
7
8
9

16.2 Model HKWL-DWS02W Internal View

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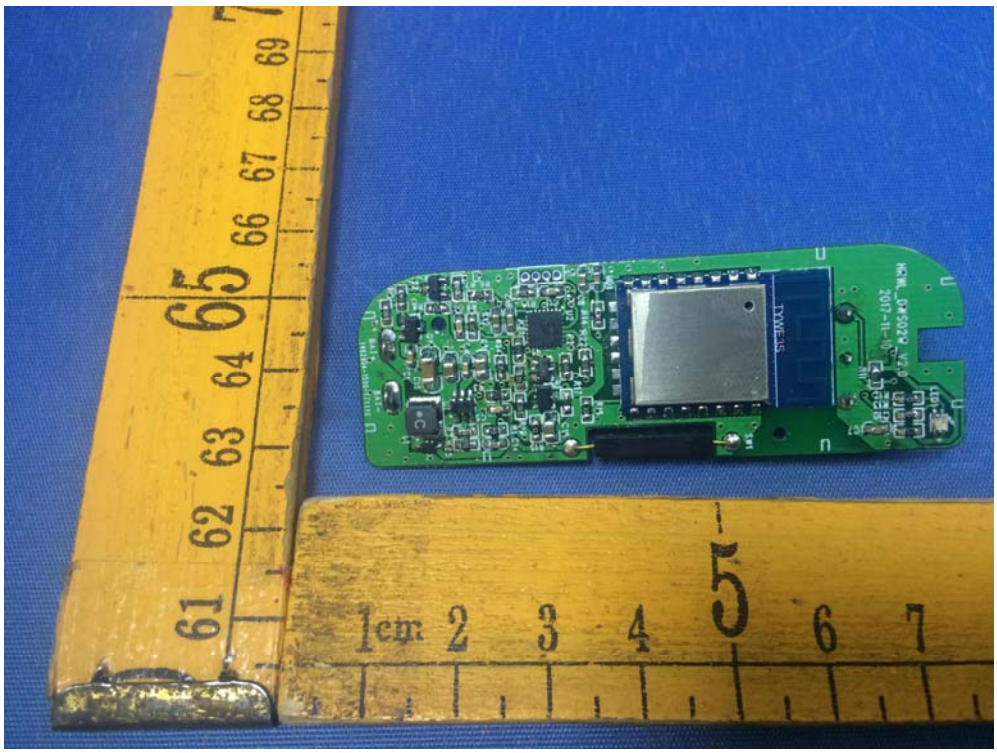
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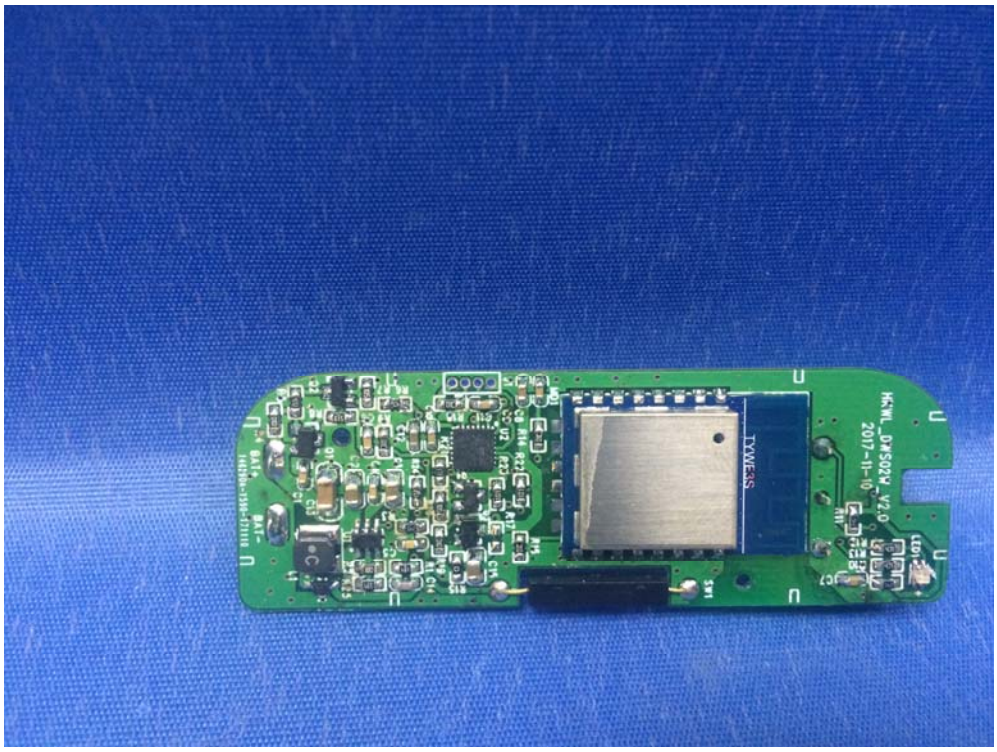
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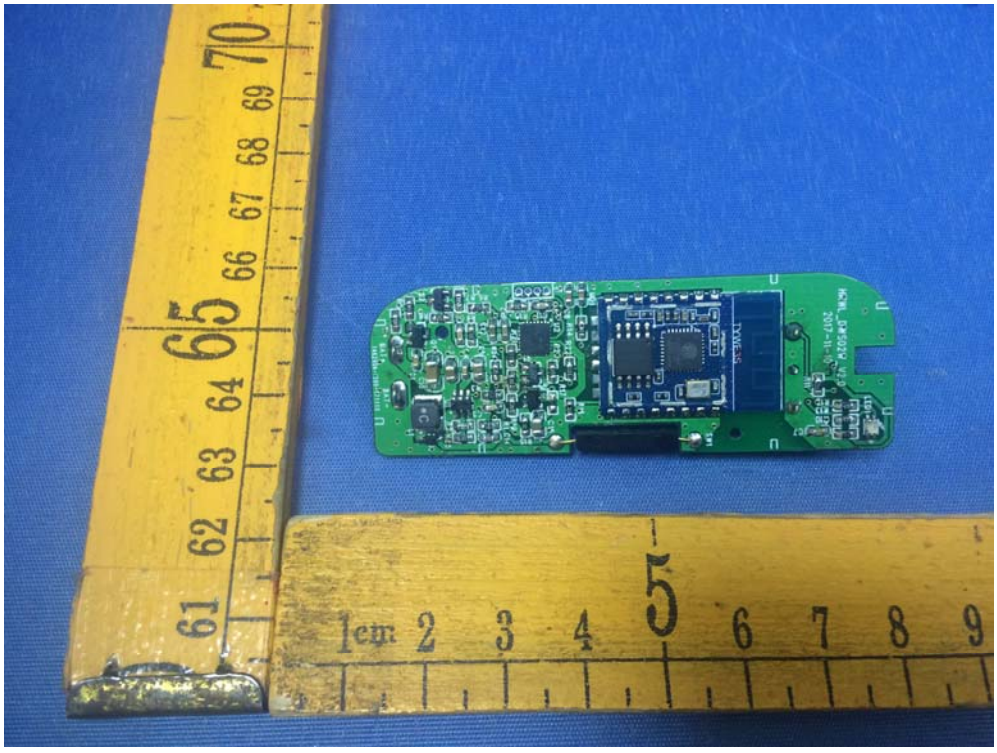
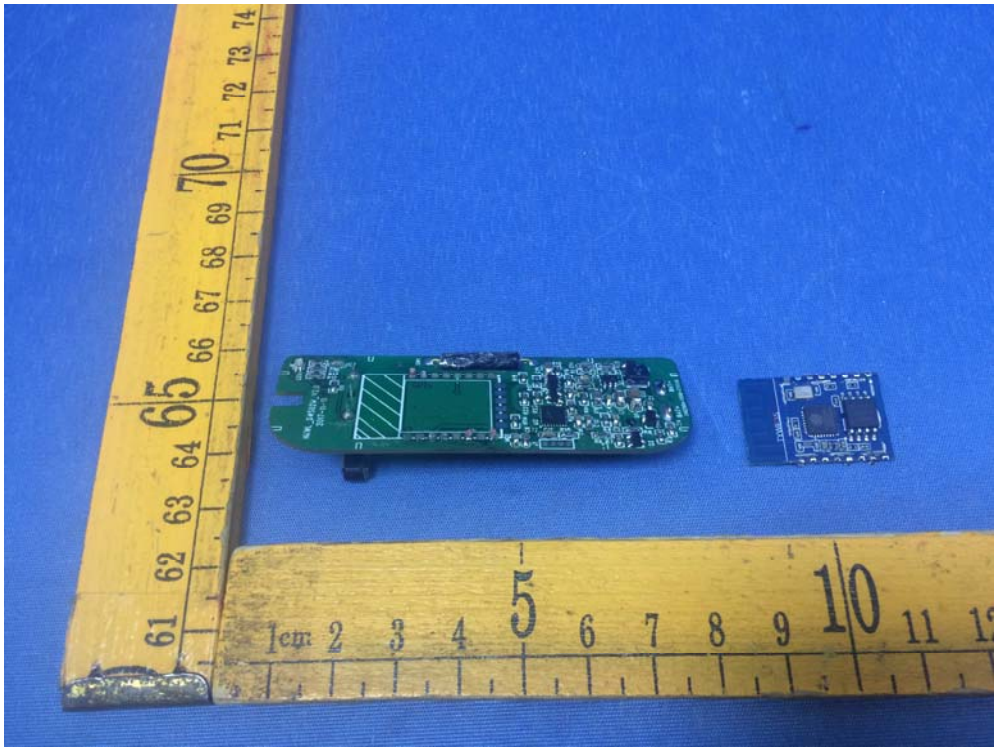
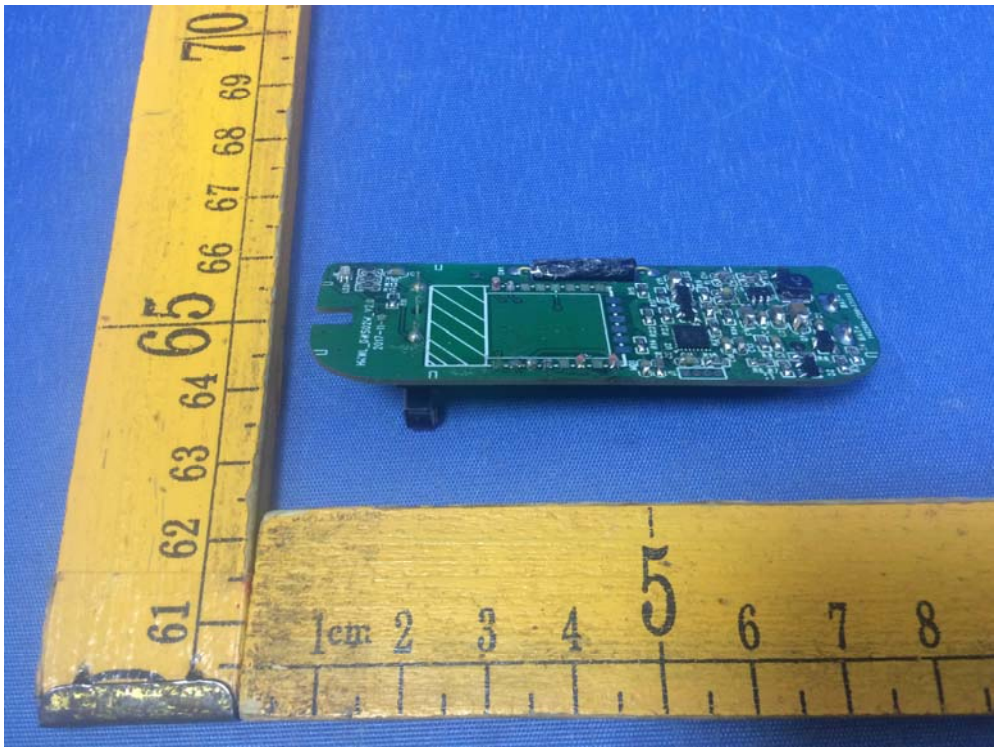
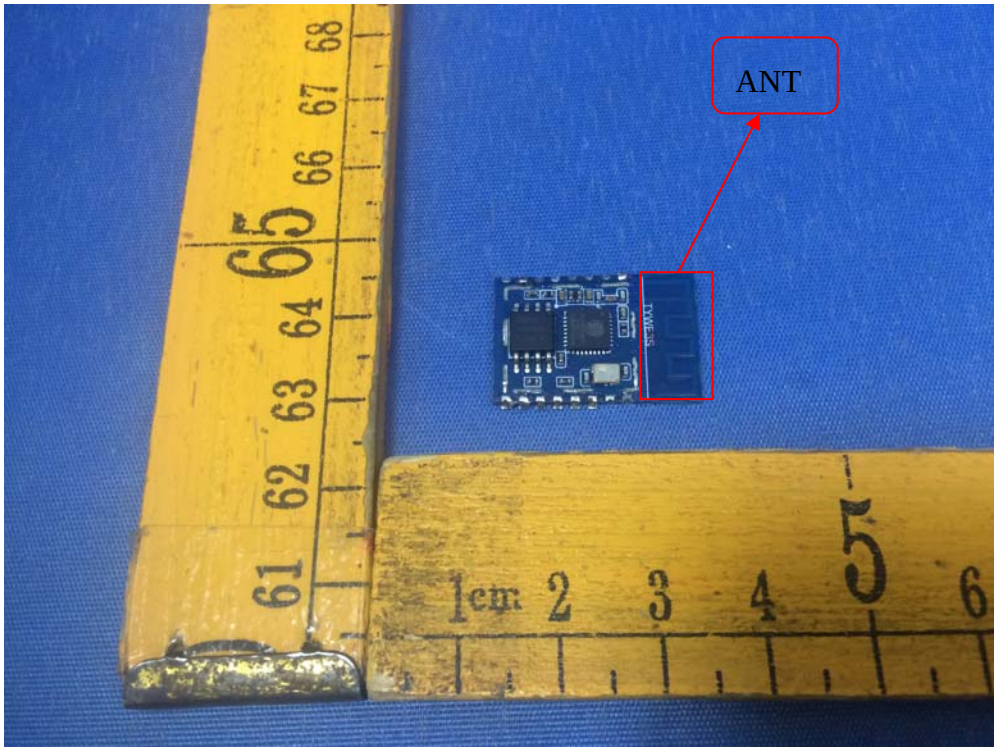

70
69
68
67
66
65
64
63
62
61
1cm 2 3 4 5 6 7 8 9
TXWE3S


HKWL_DWS02M V2.0
2017-11-10



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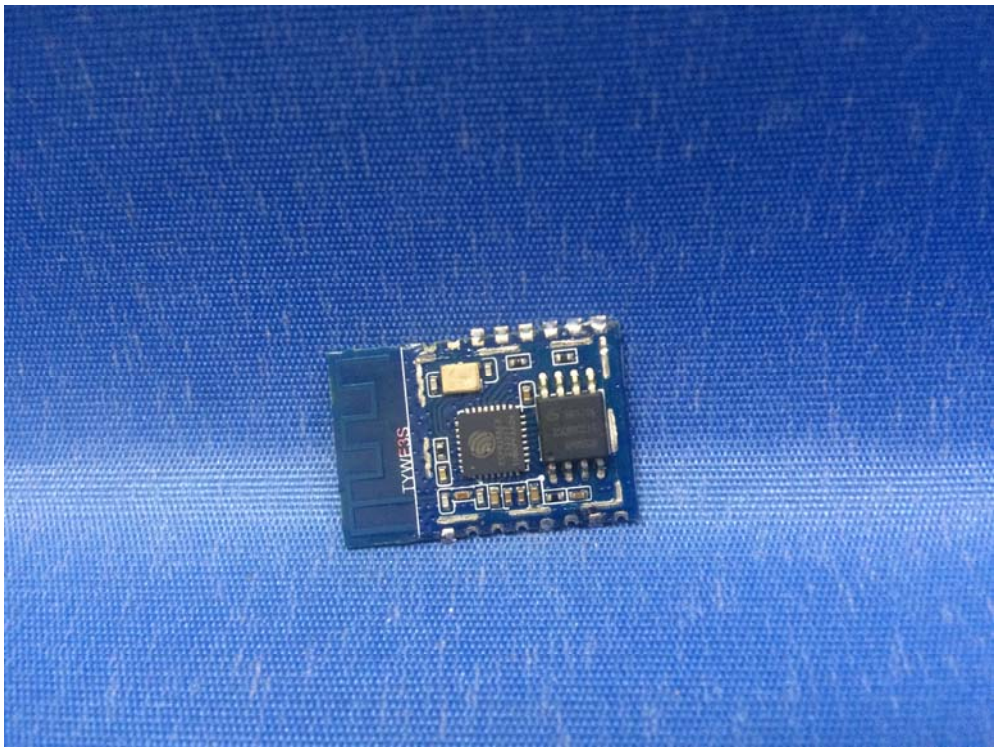
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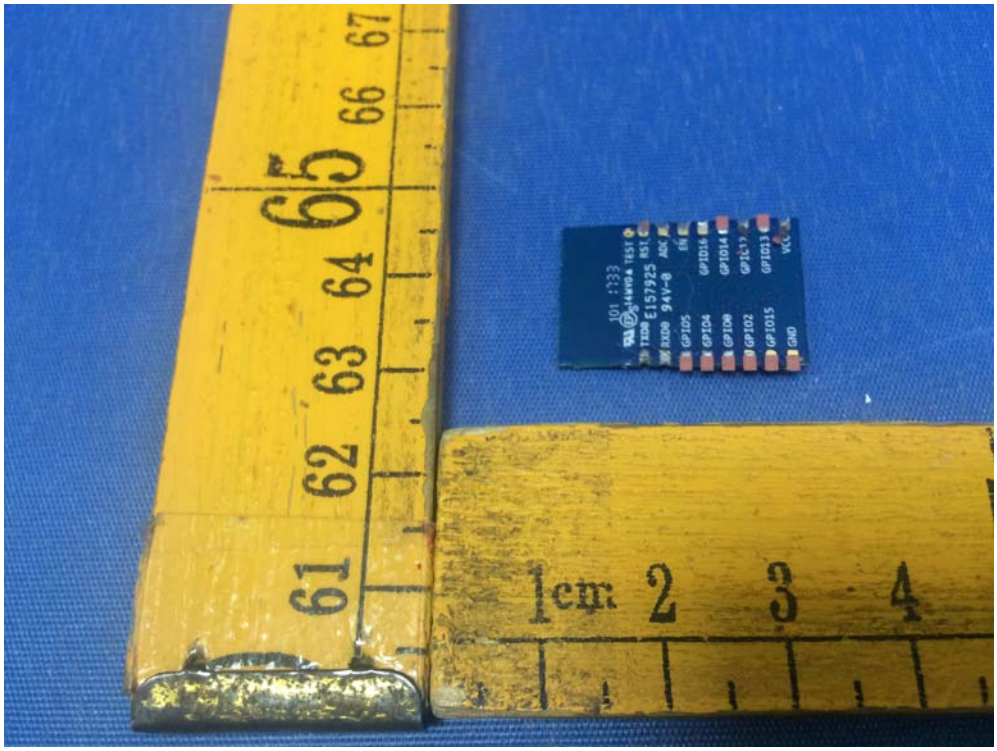
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62
63
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65
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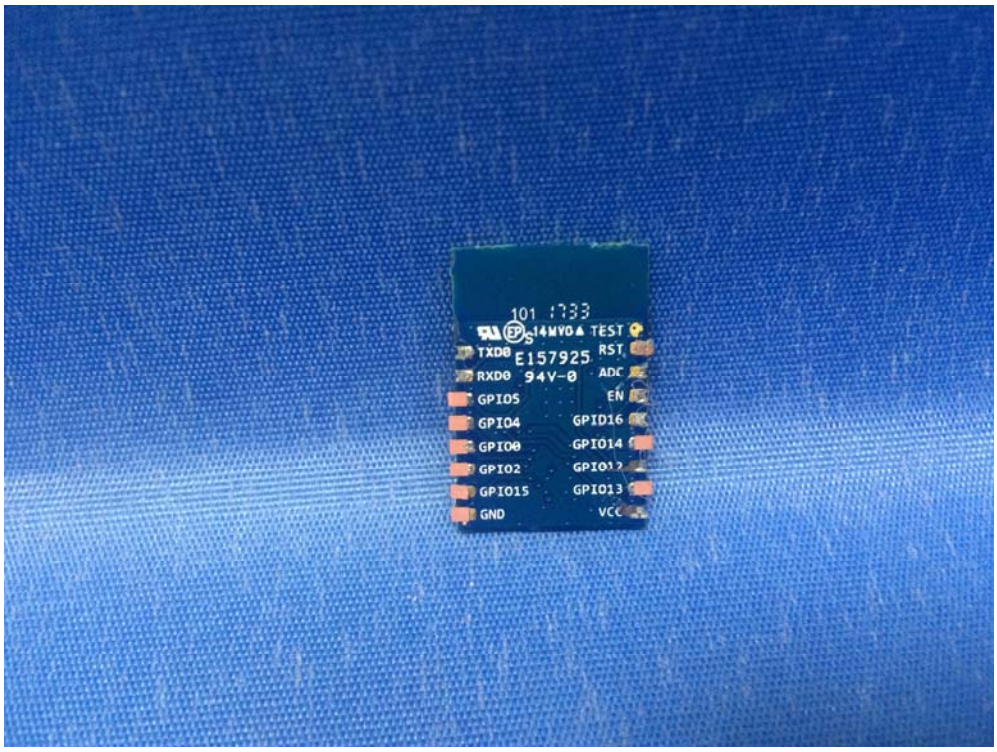
67
1cm
2
3
4



======End of Report======