ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

BACL
Bay Area Compliance Labs Corp.

FCC PART 15.247

TEST REPORT

For

Shenzhen HighGreat Innovation Technology Development Co., Ltd.

NO.6 Yuanlingzai Park, Henggang Town Longgang District Shenzhen City, Guangdong Province China

FCC ID: 2ALYRHG-F06

Report Type:	Product Type:
Original Report	MARK

Report Number:	RSZ180423011-00B
Report Date:	2018-06-19
Reviewed By:	Rocky Kang RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Shenzhen HighGreat Innovation Technology Development Co., Ltd.'s* product, model number: *HG-F06 (FCC ID: 2ALYRHG-F06)* or the "EUT" in this report is a *MARK*, which was measured approximately: 148 mm (L) x 73 mm (W) x 48 mm (H), rated with input voltage: DC 7.6 V.

Adapter Information:
Model: SOY-1200250US
Input: 100-240V ~ 50/60Hz 0.8A Max.
Output: 12V, 2.5A

**All measurement and test data in this report was gathered from production sample serial number: 1800656 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-04-23.*

Objective

This report is prepared on behalf of *Shenzhen HighGreat Innovation Technology Development Co., Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

Part 15.407 NII submissions with FCC ID: 2ALYRHG-F06.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 DTS Meas Guidance v04 .

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.5dB
RF conducted test with spectrum		±1.5dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±3℃
Humidity		±6%
Supply voltages		±0.4%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

For 802.11b, 802.11g and 802.11n-HT20 mode, 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	/	/
6	2437	/	/
7	2442	/	/

For 802.11b, 802.11g, 802.11n-HT20 mode, EUT was tested with Channel 1, 7 and 11.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

ADB command was used for wifi testing.

The worst case was performed as below:

Antenna 0:

Mode	Data rate	Power level		
		Low channel	Middle channel	High channel
802.11b	1 Mbps	10	10	10
802.11g	6 Mbps	10	10	10
802.11n-HT20	MCS0	10	10	10

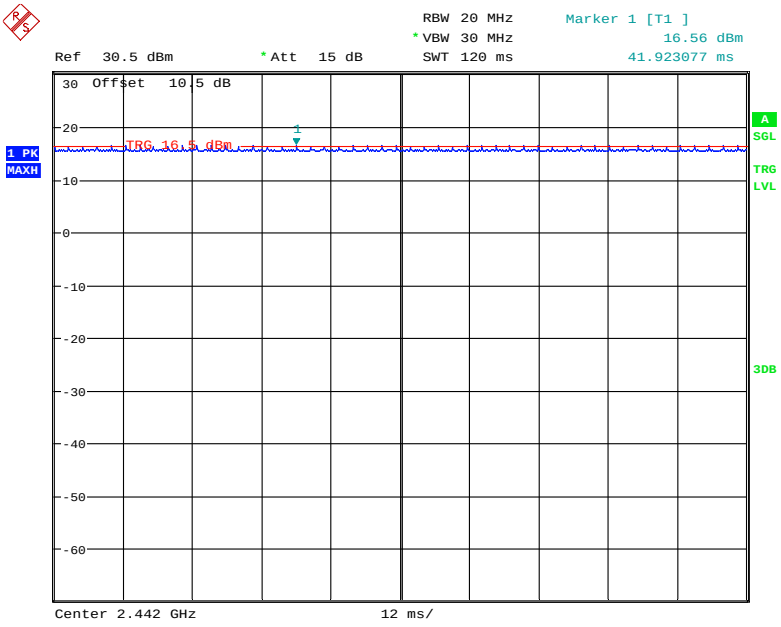
Antenna 1:

Mode	Data rate	Power level		
		Low channel	Middle channel	High channel
802.11b	1 Mbps	11	11	11
802.11g	6 Mbps	10	10	10
802.11n-HT20	MCS0	10	9	9

Pre-scan with all the data rates, the above data rate is the worst case for Wi-Fi test.

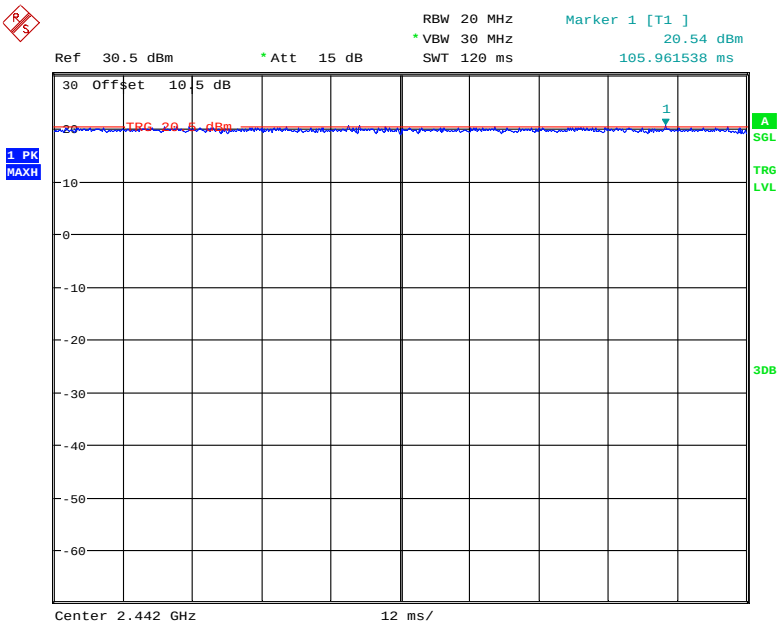
Duty cycle
Antenna 0:

802.11b mode



Date: 15.JUN.2018 16:29:34

802.11g mode



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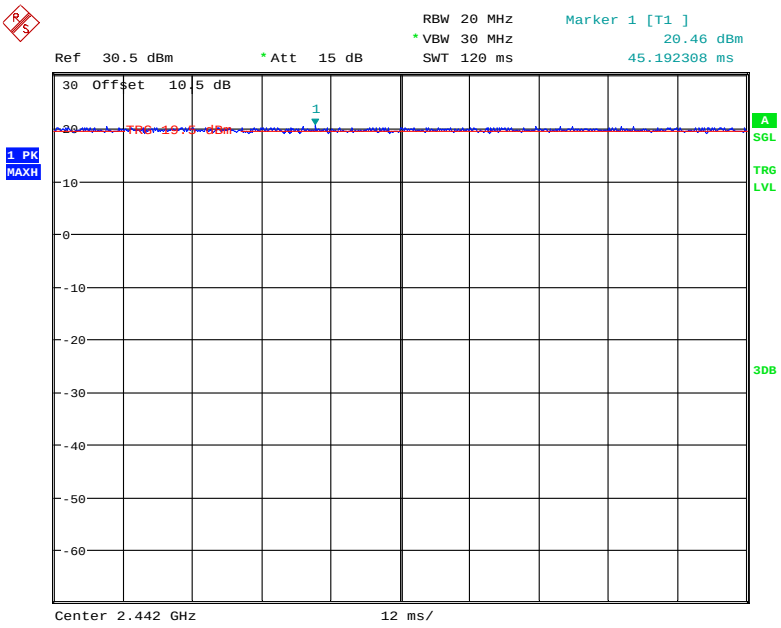
802.11n-HT20 Mode



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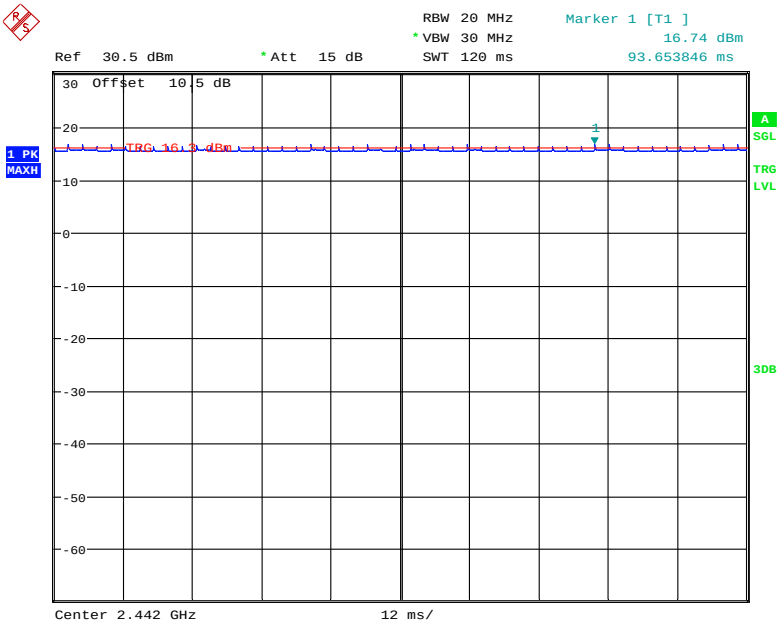
Antenna 1:

802.11b mode



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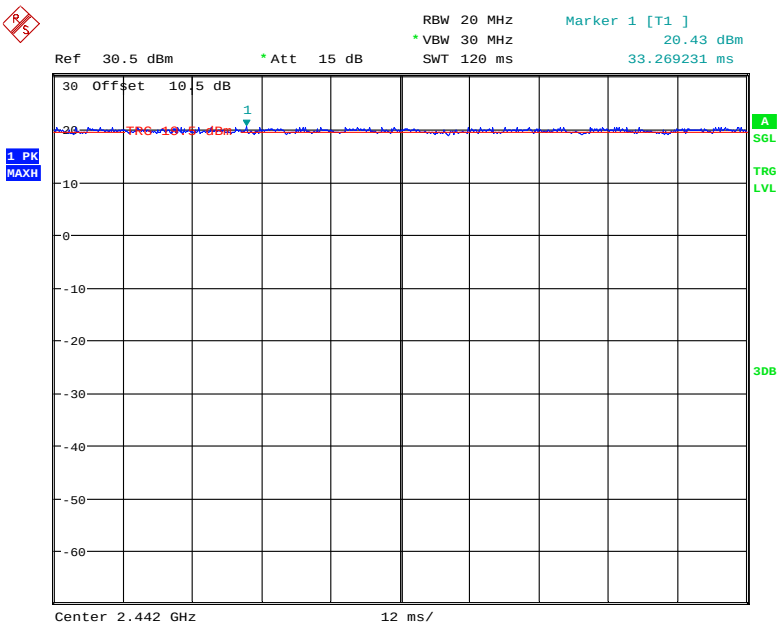
802.11g mode



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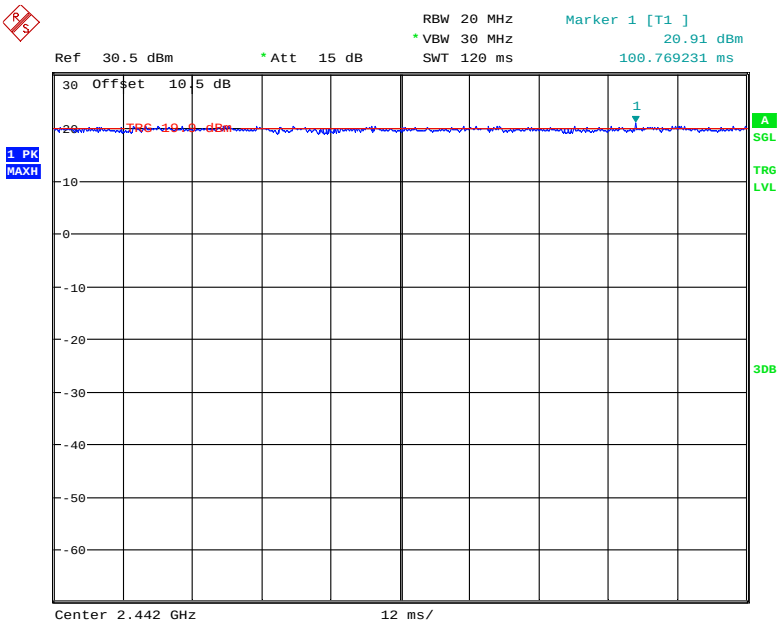
802.11n-HT20 Mode



Date: 15.JUN.2018 16:24:32

Antenna 0:

Mode	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	10log(1/ Duty Cycle)
802.11b	100	-	-	10Hz	-
802.11g	100	-	-	10Hz	-
802.11n-HT20	100	-	-	10Hz	-

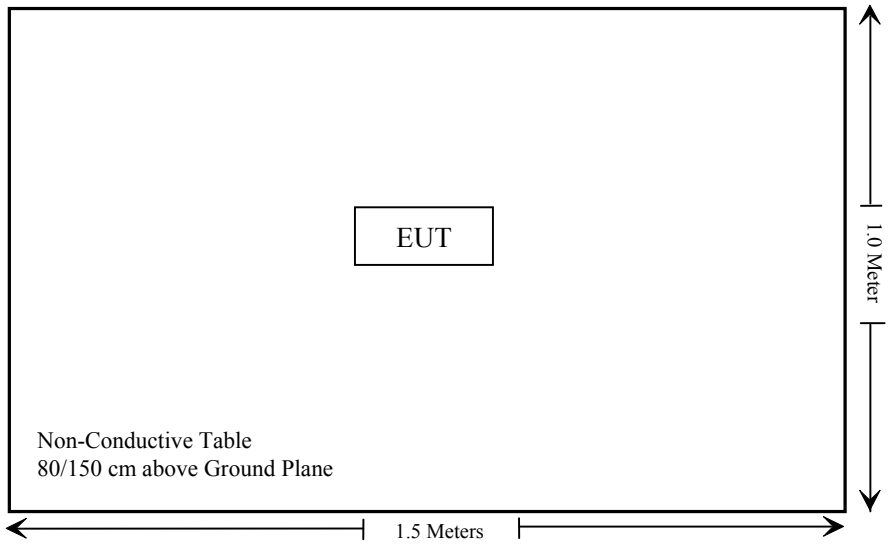
Antenna 1:

Mode	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	10log(1/ Duty Cycle)
802.11b	100	-	-	10Hz	-
802.11g	100	-	-	10Hz	-
802.11n-HT20	100	-	-	10Hz	-

External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	MaximuM Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Note:
Not Applicable: The EUT is powered by battery and the battery can be removed to a charger while it's charging

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
A.H.System	Horn Antenna	SAS-200/571	135	2015-08-18	2018-08-17
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-04-24	2019-04-24
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2018-05-21	2019-05-21
HP	Amplifier	HP8447E	1937A01046	2018-05-21	2018-11-19
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11
UTiFLEX MICRO-C0AX	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-04-01	2018-10-01
Ducommun technologies	RF Cable	104PEA	218124002	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	1	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	2	2018-05-22	2018-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2017-08-03	2018-08-03
Sinoscite	Notch Filter	BSF2402-2480MN-0898-001	N/A	2018-05-21	2019-05-21
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
RF Conducted Test					
Agilent	Wideband Power Sensor	U2021XA	MY54250003	2018-03-21	2019-03-21
WEINSCHEL	10dB Attenuator	5324	AU 3842	Each Time	
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2017-12-24	2018-12-24
Ducommun technologies	RF Cable	RG-214	3	Each Time	

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
2412-2462	2.27	1.69	22	158.49	20	0.05	1.0

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.
2.4G & 5G WIFI can't transmit simultaneously.

Result: The device meets MPE requirement for Devices Used by the General Public at 20 cm distance.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the 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 6 dBi.

Antenna Connector Construction

This product has two internal wifi antennas which were permanently attached and the antenna 0 with maximum gain 2.17 dBi and the antenna 1 with maximum gain 2.27dBi for 2.4G WIFI, fulfill the requirement of this section, and please refer to the EUT photos.

Result: Compliance.

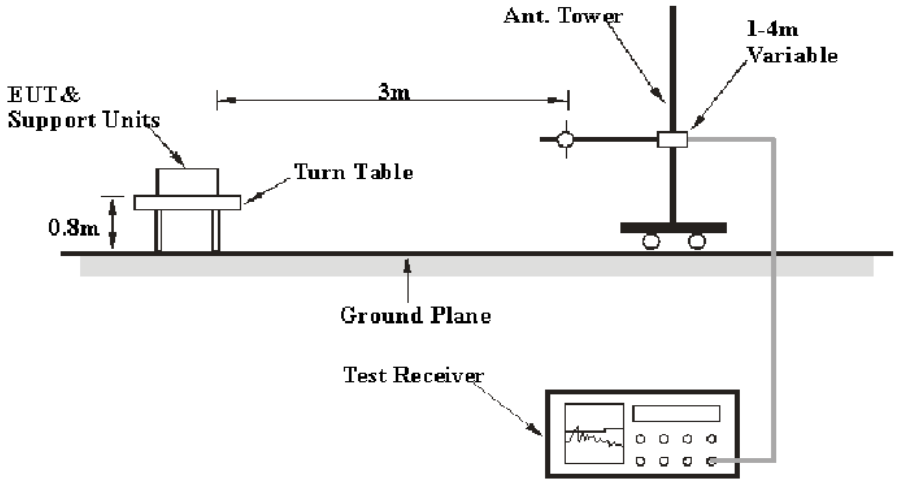
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

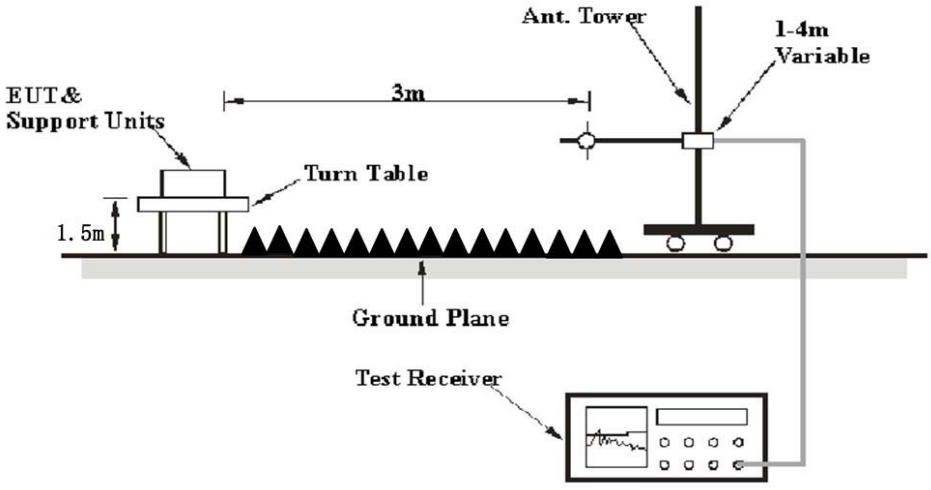
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Average
	1MHz	＞1/T Note 2	/	Average

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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 limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL, $U_{(Lm)}$ is less than U_{cispr}, if L_m is less than L_{lim}, it implies that the EUT complies with the limit.

Test Data

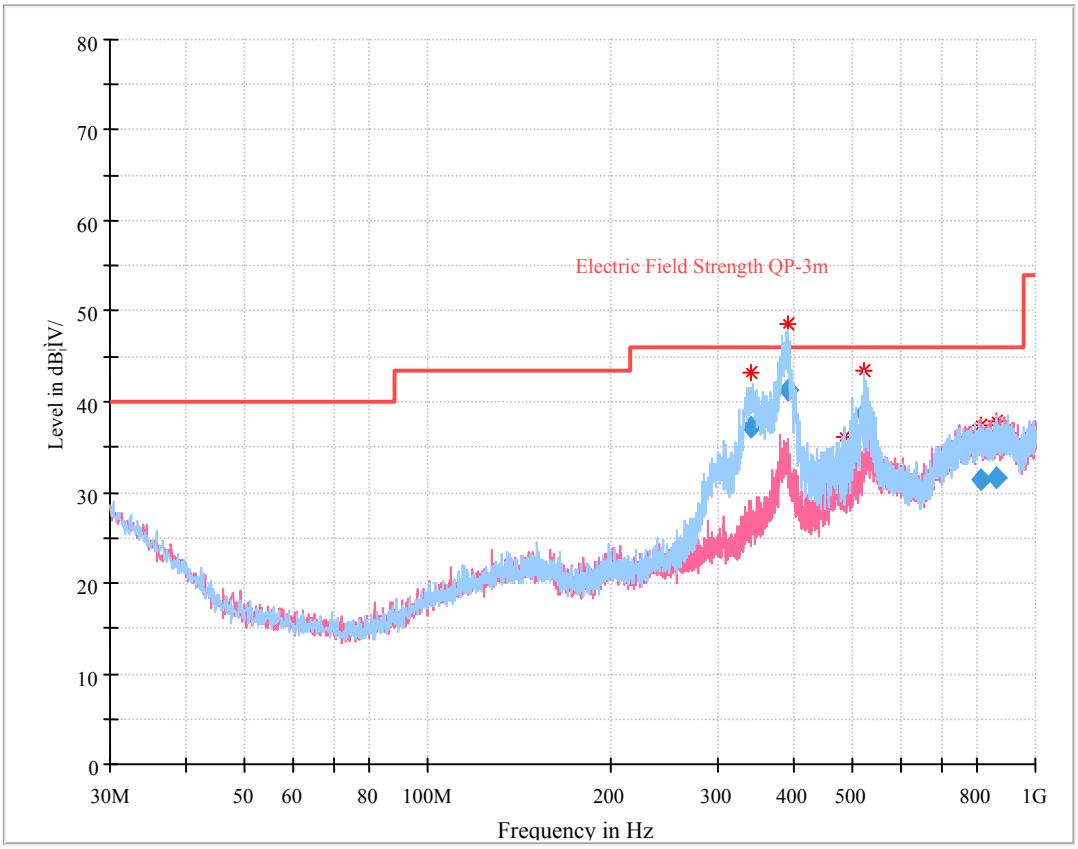
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Nancy Wang on 2018-05-30.

EUT operation mode: Transmitting

30 MHz~1 GHz:



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
341.466500	37.26	109.0	H	0.0	-1.9	46.00	8.74
390.643000	41.24	107.0	H	232.0	-0.5	46.00	4.76
485.498000	29.85	188.0	H	13.0	2.5	46.00	16.15
523.787000	38.80	171.0	H	0.0	4.3	46.00	7.20
814.385875	31.36	298.0	V	85.0	9.3	46.00	14.64
861.654500	31.61	114.0	H	276.0	9.7	46.00	14.39

1 GHz-25 GHz:

802.11b Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
2412.00	70.06	PK	132	1.0	H	33.92	103.98	/	/
2412.00	65.00	Ave.	132	1.0	H	33.92	98.92	/	/
2412.00	71.84	PK	146	1.2	V	33.92	105.76	/	/
2412.00	66.60	Ave.	146	1.2	V	33.92	100.52	/	/
2365.15	28.07	PK	107	1.2	V	33.92	61.99	74	12.01
2365.15	13.32	Ave.	107	1.2	V	33.92	47.24	54	6.76
2487.55	27.24	PK	205	1.9	V	34.08	61.32	74	12.68
2487.55	13.31	Ave.	205	1.9	V	34.08	47.39	54	6.61
4824.00	48.02	PK	95	1.5	V	5.84	53.86	74	20.14
4824.00	43.34	Ave.	95	1.5	V	5.84	49.18	54	4.82
Middle Channel (2442MHz)									
2442.00	70.29	PK	15	1.2	H	33.92	104.21	/	/
2442.00	65.67	Ave.	15	1.2	H	33.92	99.59	/	/
2442.00	70.34	PK	15	1.9	V	33.92	104.26	/	/
2442.00	65.43	Ave.	15	1.9	V	33.92	99.35	/	/
4884.00	47.41	PK	295	2.3	V	6.21	53.62	74	20.38
4884.00	42.01	Ave.	295	2.3	V	6.21	48.22	54	5.78
High Channel (2462 MHz)									
2462.00	72.89	PK	32	2.0	H	34.08	106.97	/	/
2462.00	67.84	Ave.	32	2.0	H	34.08	101.92	/	/
2462.00	73.58	PK	301	1.8	V	34.08	107.66	/	/
2462.00	68.22	Ave.	301	1.8	V	34.08	102.30	/	/
2356.98	26.54	PK	231	1.6	V	33.92	60.46	74	13.54
2356.98	13.32	Ave.	231	1.6	V	33.92	47.24	54	6.76
2483.69	26.94	PK	64	1.5	V	34.08	61.02	74	12.98
2483.69	13.41	Ave.	64	1.5	V	34.08	47.49	54	6.51
4924.00	48.64	PK	201	1.6	V	6.21	54.85	74	19.15
4924.00	43.77	Ave.	317	2.4	V	6.21	49.98	54	4.02

802.11g Mode:

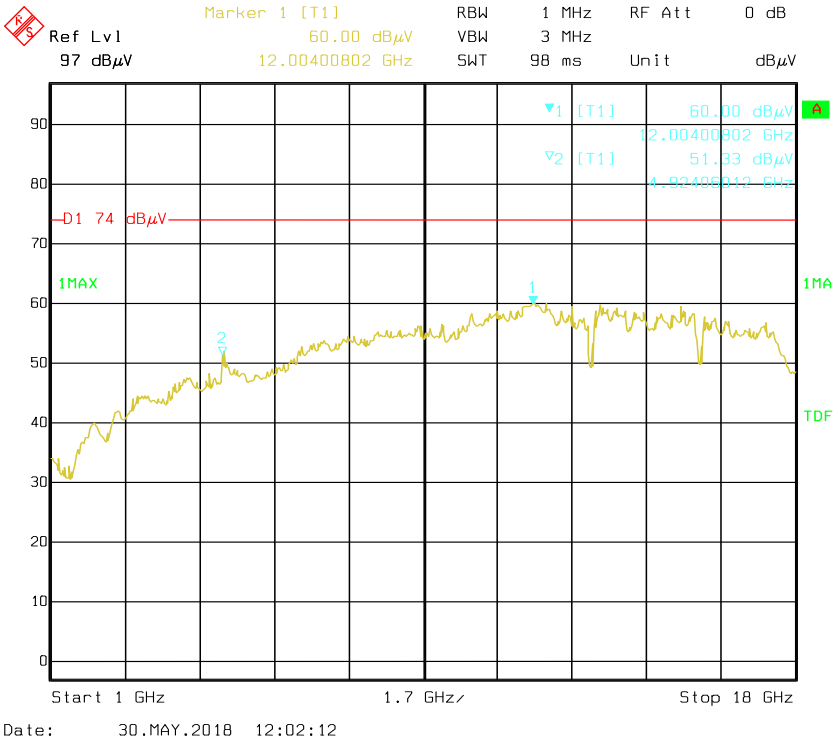
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
2412.00	69.72	PK	314	2.5	H	33.92	103.64	/	/
2412.00	59.02	Ave.	314	2.5	H	33.92	92.94	/	/
2412.00	73.22	PK	333	1.8	V	33.92	107.14	/	/
2412.00	61.92	Ave.	333	1.8	V	33.92	95.84	/	/
2390.00	32.97	PK	142	1.7	V	33.92	66.89	74	7.11
2390.00	15.53	Ave.	142	1.7	V	33.92	49.45	54	4.55
2483.66	26.74	PK	79	2.2	V	34.08	60.82	74	13.18
2483.66	13.32	Ave.	79	2.2	V	34.08	47.40	54	6.60
4824.00	44.85	PK	157	1.0	V	5.84	50.69	74	23.31
4824.00	30.05	Ave.	157	1.0	V	5.84	35.89	54	18.11
Middle Channel (2442MHz)									
2442.00	70.95	PK	44	1.1	H	33.92	104.87	/	/
2442.00	59.61	Ave.	44	1.1	H	33.92	93.53	/	/
2442.00	73.11	PK	236	1.2	V	33.92	107.03	/	/
2442.00	61.34	Ave.	236	1.2	V	33.92	95.26	/	/
4884.00	43.68	PK	56	2.5	V	6.21	49.89	74	24.11
4884.00	29.17	Ave.	56	2.5	V	6.21	35.38	54	18.62
High Channel (2462 MHz)									
2462.00	71.52	PK	335	1.9	H	34.08	105.60	/	/
2462.00	60.02	Ave.	335	1.9	H	34.08	94.10	/	/
2462.00	74.03	PK	9	1.5	V	34.08	108.11	/	/
2462.00	62.57	Ave.	9	1.5	V	34.08	96.65	/	/
2344.01	26.49	PK	117	1.7	V	33.83	60.32	74	13.68
2344.01	13.32	Ave.	117	1.7	V	33.83	47.15	54	6.85
2483.80	37.13	PK	46	1.6	V	34.08	71.21	74	2.79
2483.80	17.24	Ave.	46	1.6	V	34.08	51.32	54	2.68
4944.00	45.99	PK	17	1.8	V	6.21	52.20	74	21.80
4944.00	31.01	Ave.	17	1.8	V	6.21	37.22	54	16.78

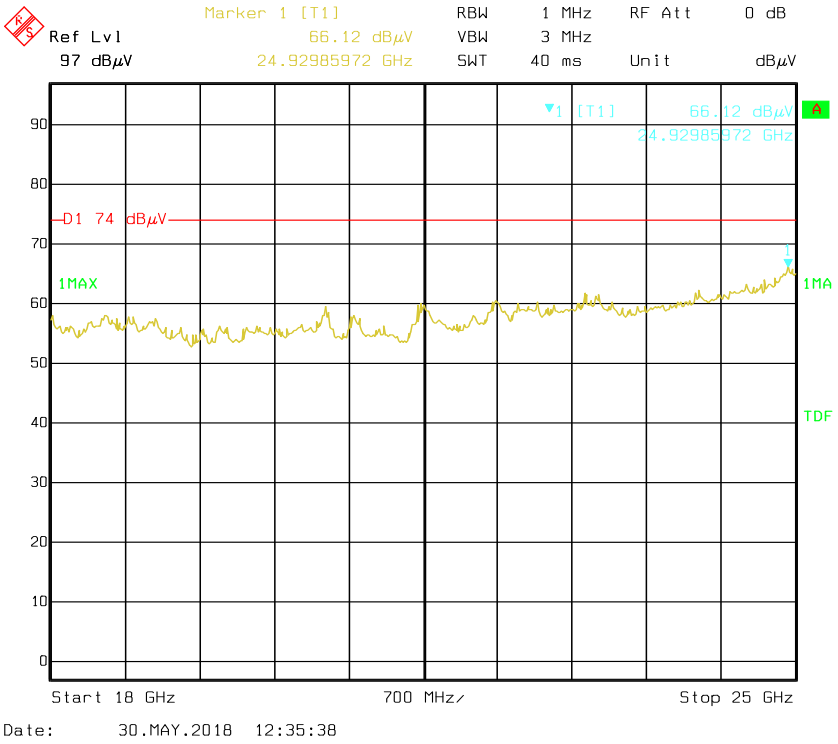
802.11n-HT20 Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
2412.00	70.54	PK	299	1.5	H	33.92	104.46	/	/
2412.00	59.65	Ave.	299	1.5	H	33.92	93.57	/	/
2412.00	74.35	PK	79	1.5	V	33.92	108.27	/	/
2412.00	62.12	Ave.	79	1.5	V	33.92	96.04	/	/
2390.00	37.54	PK	322	1.4	V	33.92	71.46	74	2.54
2390.00	16.20	Ave.	322	1.4	V	33.92	50.12	54	3.88
2487.52	26.44	PK	3	1.0	V	34.08	60.52	74	13.48
2487.52	13.32	Ave.	3	1.0	V	34.08	47.40	54	6.60
4824.00	45.93	PK	55	1.6	V	5.84	51.77	74	22.23
4824.00	30.24	Ave.	55	1.6	V	5.84	36.08	54	17.92
Middle Channel (2442MHz)									
2442.00	70.44	PK	190	2.3	H	33.92	104.36	/	/
2442.00	59.57	Ave.	190	2.3	H	33.92	93.49	/	/
2442.00	74.22	PK	256	2.4	V	33.92	108.14	/	/
2442.00	62.19	Ave.	256	2.4	V	33.92	96.11	/	/
4884.00	46.25	PK	315	1.7	V	6.21	52.46	74	21.54
4884.00	30.54	Ave.	315	1.7	V	6.21	36.75	54	17.25
High Channel (2462 MHz)									
2462.00	70.98	PK	155	2.4	H	34.08	105.06	/	/
2462.00	59.24	Ave.	155	2.4	H	34.08	93.32	/	/
2462.00	74.62	PK	45	1.9	V	34.08	108.70	/	/
2462.00	62.42	Ave.	45	1.9	V	34.08	96.50	/	/
2330.24	26.57	PK	336	2.1	V	33.83	60.40	74	13.60
2330.24	13.32	Ave.	336	2.1	V	33.83	47.15	54	6.85
2483.50	38.71	PK	174	2.1	V	34.08	72.79	74	1.21
2483.50	19.35	Ave.	174	2.1	V	34.08	53.43	54	0.57
4924.00	45.69	PK	94	2.4	V	6.21	51.90	74	22.10
4924.00	30.26	Ave.	94	2.4	V	6.21	36.47	54	17.53

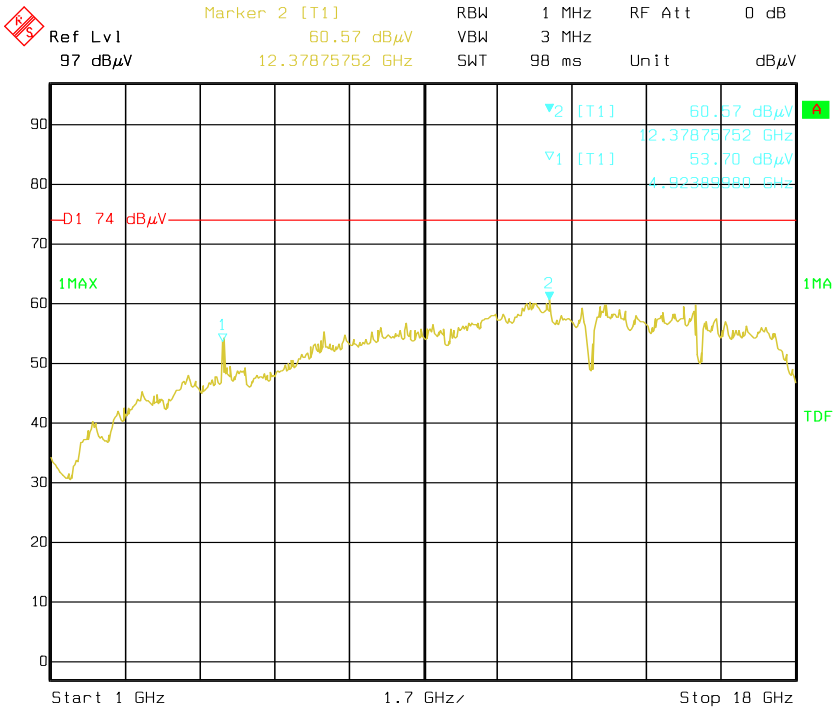
Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude
The other spurious emission which is 20dB to the limit was not recorded.
And for the pre-scan is performed with the 2400-2483.5MHz band filter.

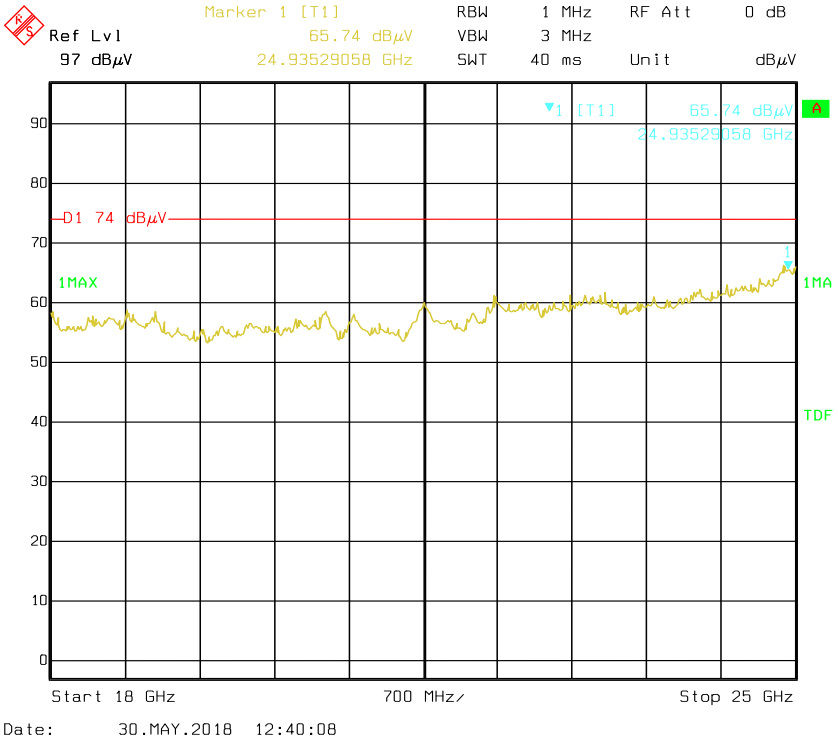
Pre-scan with 802.11b Mode, High channel
Horizontal



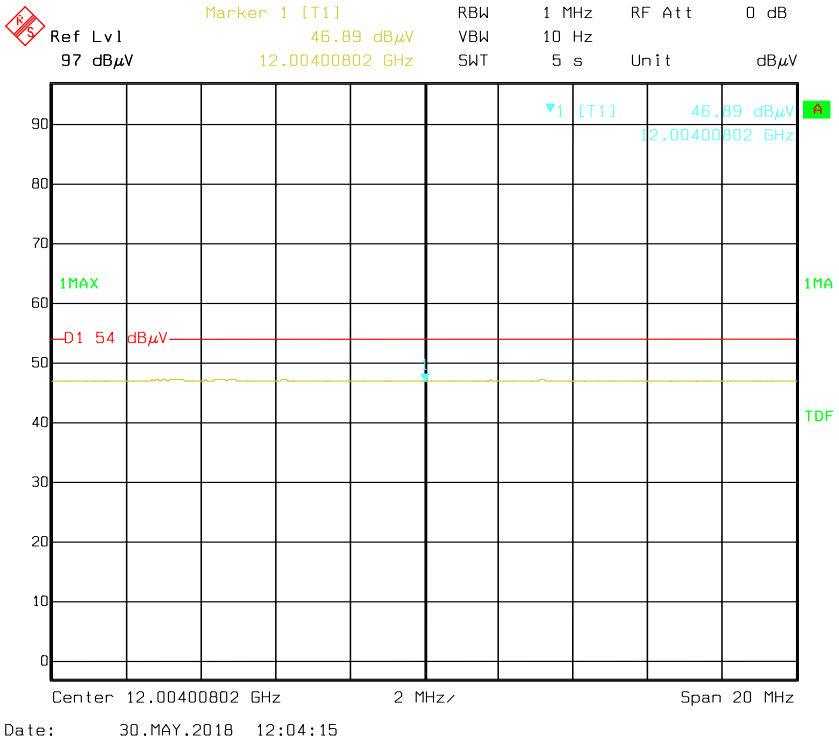


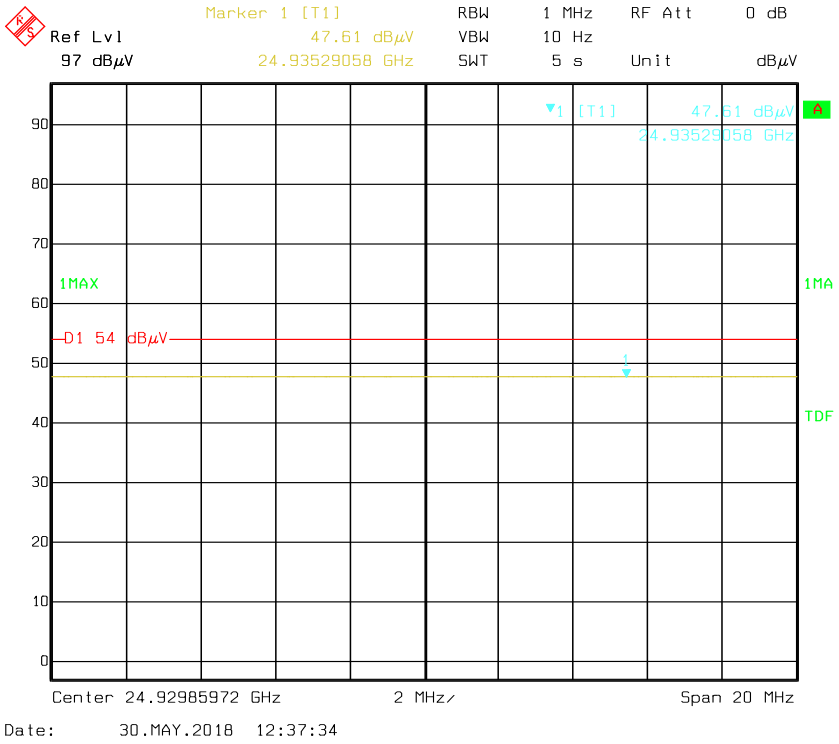
Vertical


Marker 2 [T1]
RBW 1 MHz
RF Att 0 dB
Ref Lvl
60.57 dBµV
VBW 3 MHz
97 dBµV
12.37875752 GHz
SWT 98 ms
Unit dBµV
▼2 [T1] 60.57 dBµV
12.37875752 GHz
▽1 [T1] 53.70 dBµV
D1 74 dBµV
1MAX
1MA
TDF
Start 1 GHz
1.7 GHz/
Stop 18 GHz
Date: 30.MAY.2018 11:53:17

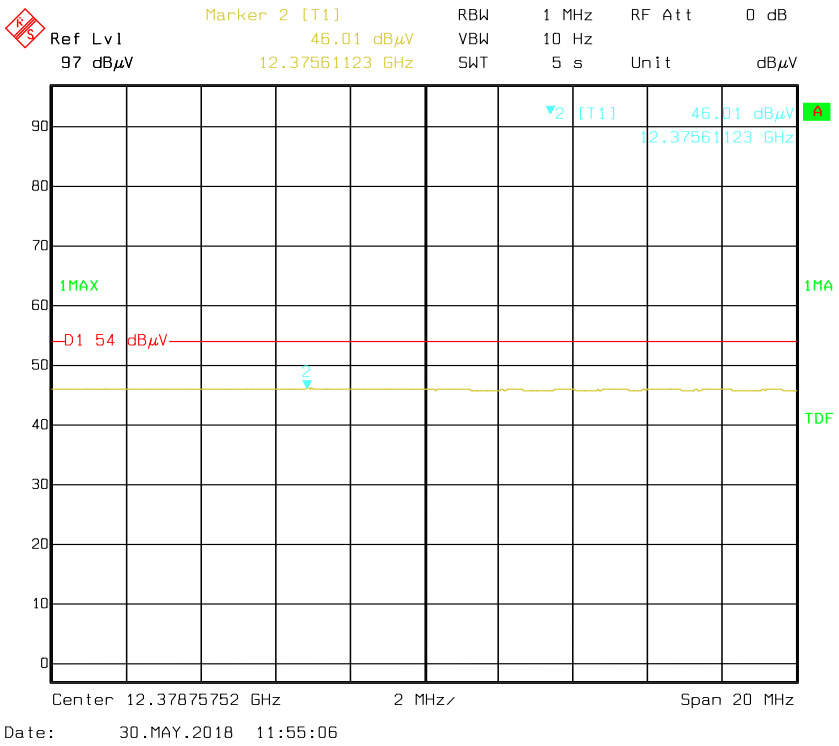

Marker 1 [T1]
RBW 1 MHz
RF Att 0 dB
Ref Lvl
65.74 dBµV
VBW 3 MHz
97 dBµV
24.93529058 GHz
SWT 40 ms
Unit dBµV
▼1 [T1] 65.74 dBµV
24.93529058 GHz
D1 74 dBµV
1MAX
1MA
TDF
Start 18 GHz
700 MHz/
Stop 25 GHz
Date: 30.MAY.2018 12:40:08

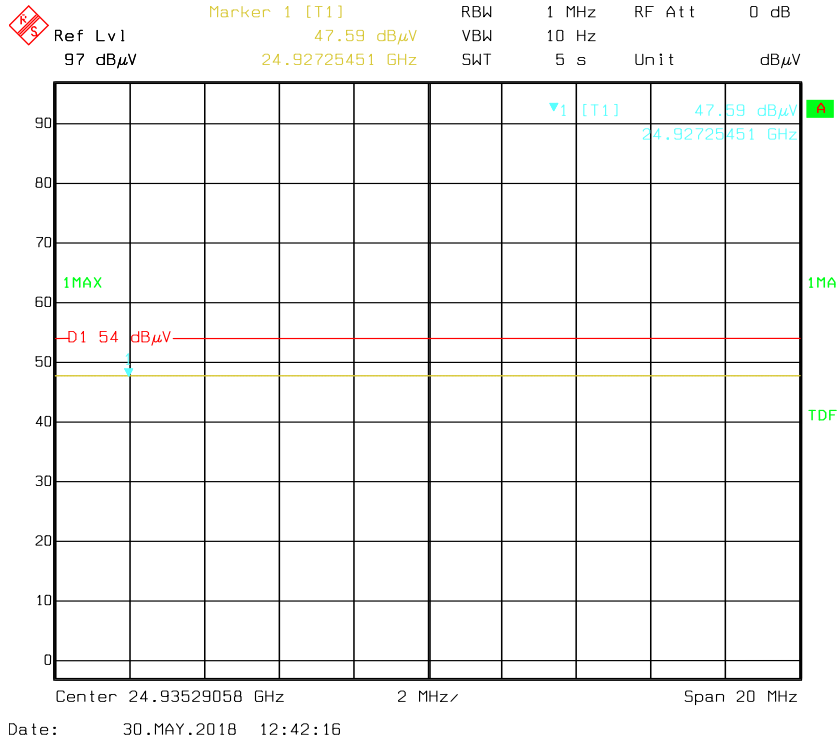
Pre-scan for Average
Horizontal





Vertical


Marker 2 [T1]
Ref Lvl
97 dBµV
46.01 dBµV
12.37561123 GHz
RBW 1 MHz
VBW 10 Hz
SWT 5 s
RF Att 0 dB
Unit dBµV
2 [T1]
46.01 dBµV
12.37561123 GHz
1MAX
D1 54 dBµV
1MA
TDF
Center 12.37875752 GHz
2 MHz/
Span 20 MHz
Date: 30.MAY.2018 11:55:06


Marker 1 [T1]
Ref Lvl
97 dBµV
47.59 dBµV
24.92725451 GHz
RBW 1 MHz
VBW 10 Hz
SWT 5 s
RF Att 0 dB
Unit dBµV
1 [T1]
47.59 dBµV
24.92725451 GHz
1MAX
D1 54 dBµV
1MA
TDF
Center 24.93529058 GHz
2 MHz/
Span 20 MHz
Date: 30.MAY.2018 12:42:16

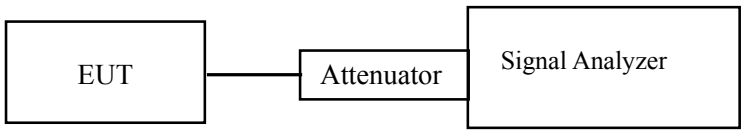
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	24~25 ℃
Relative Humidity:	50~52 %
ATM Pressure:	100.5~101.0 kPa

The testing was performed by Nancy Wang from 2018-05-02 to 2018-05-31.

Test Result: Pass.

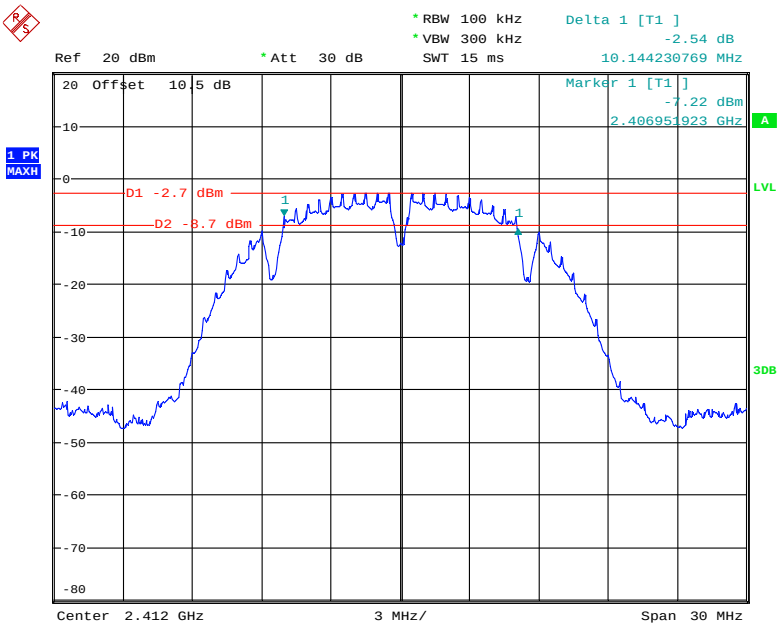
Please refer to the following table and plots.

EUT operation mode: Transmitting

Channel	Frequency (MHz)	Ant Port	6 dB Emission Bandwidth (MHz)	Limit (kHz)
802.11b mode				
Low	2412	Ant 0	10.144	≥500
		Ant 1	10.096	≥500
Middle	2442	Ant 0	10.096	≥500
		Ant 1	10.144	≥500
High	2462	Ant 0	10.096	≥500
		Ant 1	10.144	≥500
802.11g				
Low	2412	Ant 0	16.35	≥500
		Ant 1	16.058	≥500
Middle	2442	Ant 0	16.346	≥500
		Ant 1	16.058	≥500
High	2462	Ant 0	16.346	≥500
		Ant 1	16.346	≥500
802.11n-HT20 mode				
Low	2412	Ant 0	17.40	≥500
		Ant 1	16.875	≥500
Middle	2442	Ant 0	17.50	≥500
		Ant 1	17.115	≥500
High	2462	Ant 0	17.596	≥500
		Ant 1	17.596	≥500

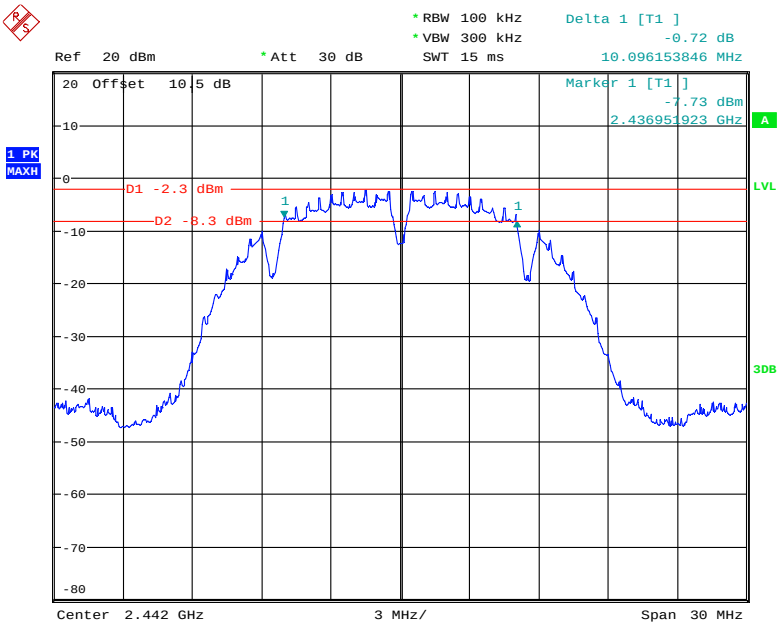
Antenna 0

802.11b Low Channel



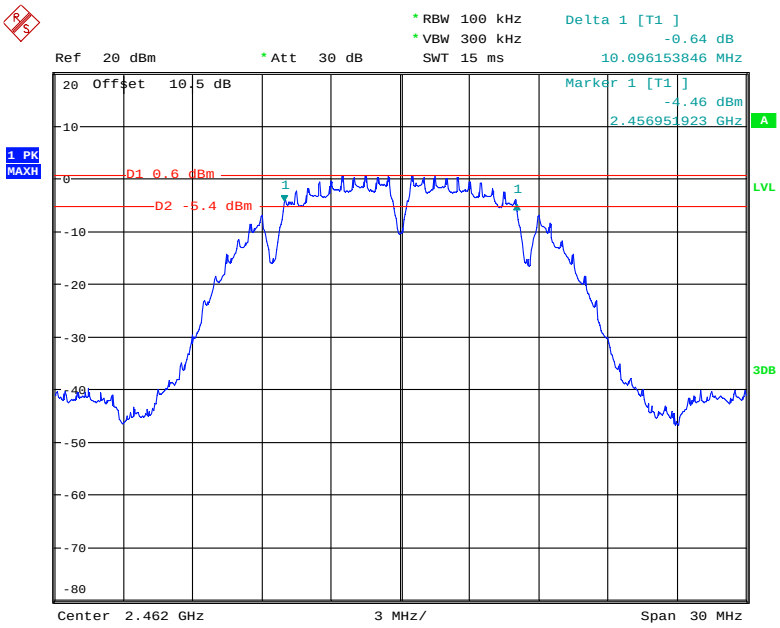
Date: 2.MAY.2018 17:27:09

802.11b Middle Channel



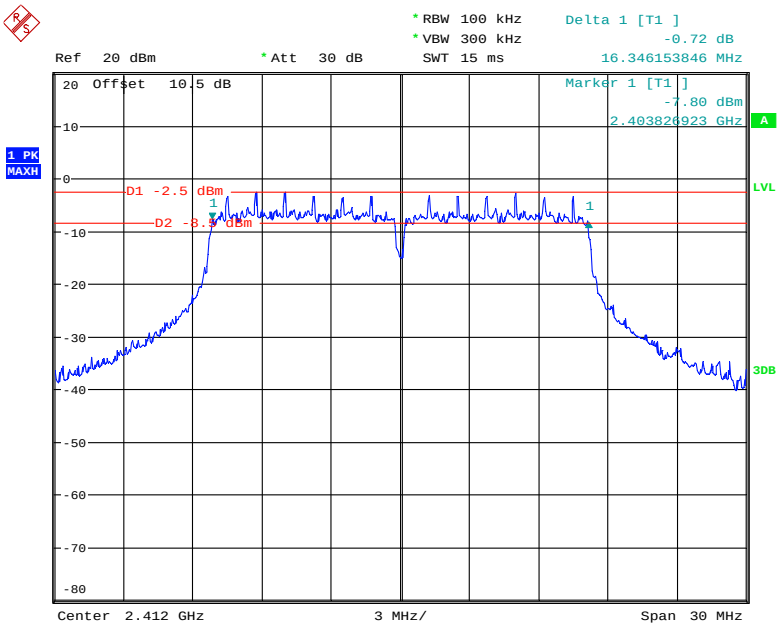
Date: 2.MAY.2018 17:31:03

802.11b High Channel



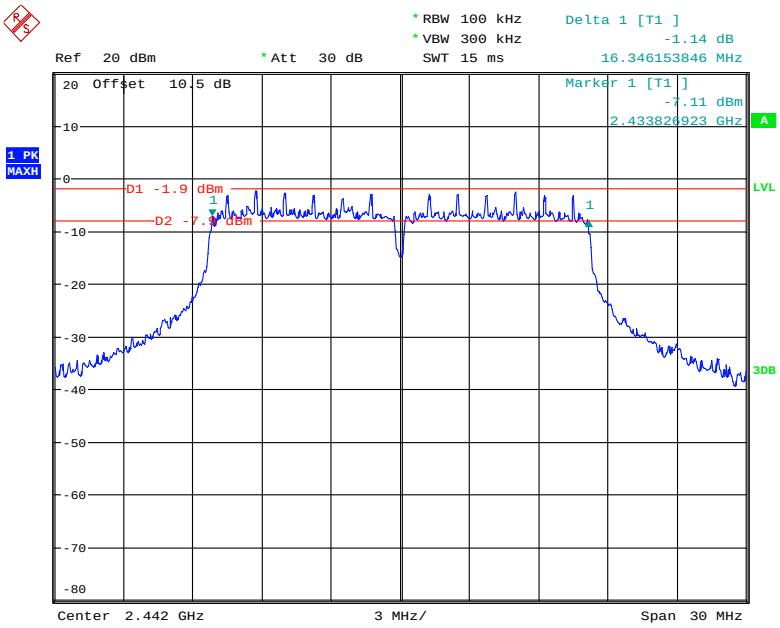
Date: 31.MAY.2018 09:59:33

802.11g Low Channel



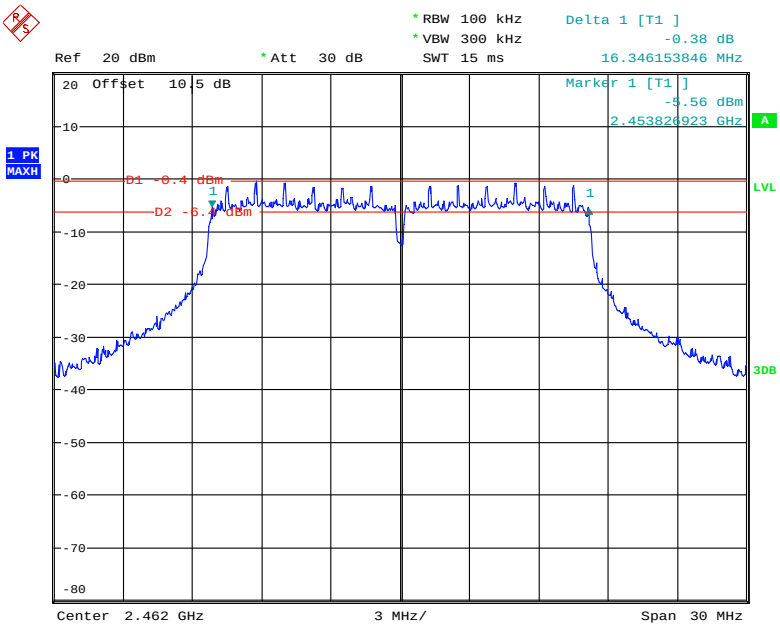
Date: 2.MAY.2018 15:46:47

802.11g Middle Channel



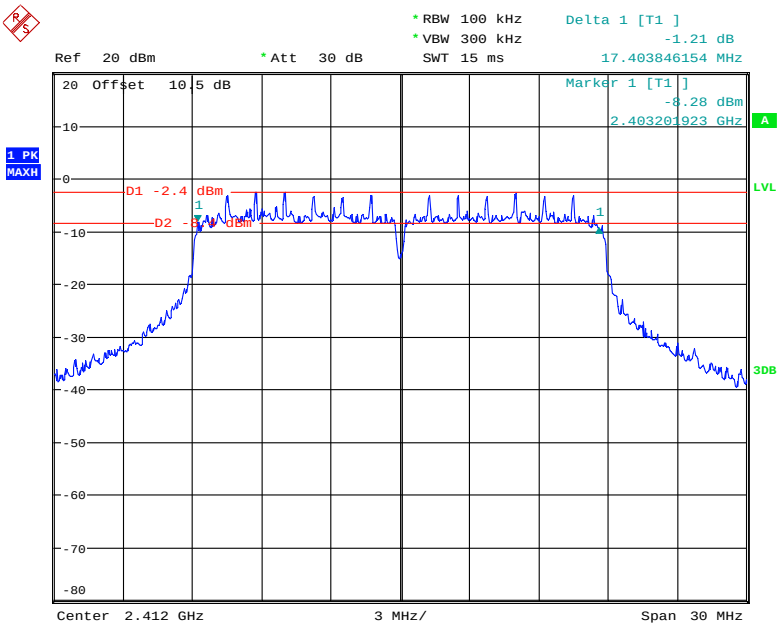
Date: 2.MAY.2018 15:51:18

802.11g High Channel



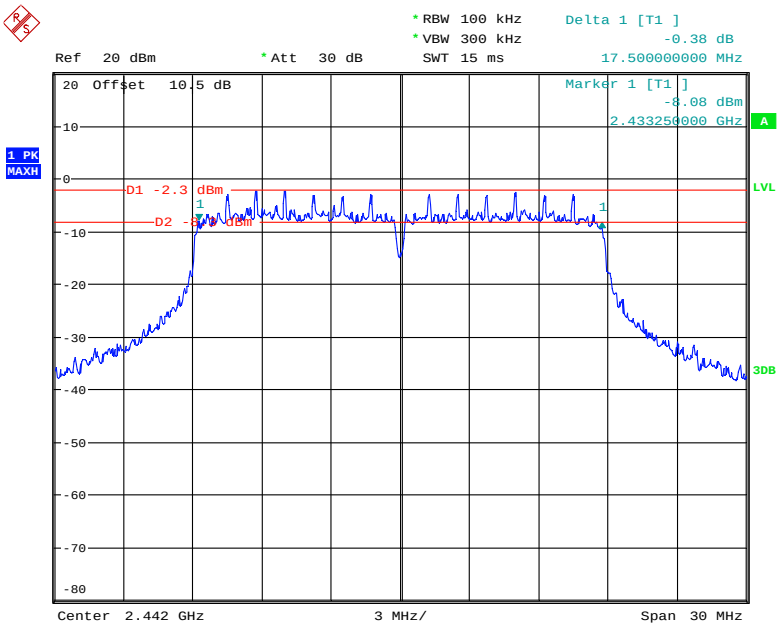
Date: 31.MAY.2018 10:05:30

802.11n-HT20 Low Channel



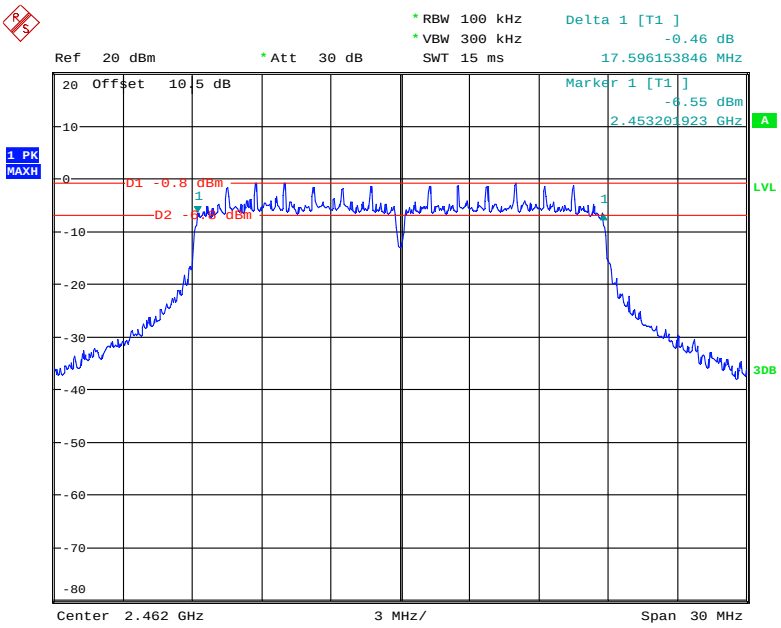
Date: 2.MAY.2018 15:43:41

802.11n-HT20 Middle Channel



Date: 2.MAY.2018 15:38:41

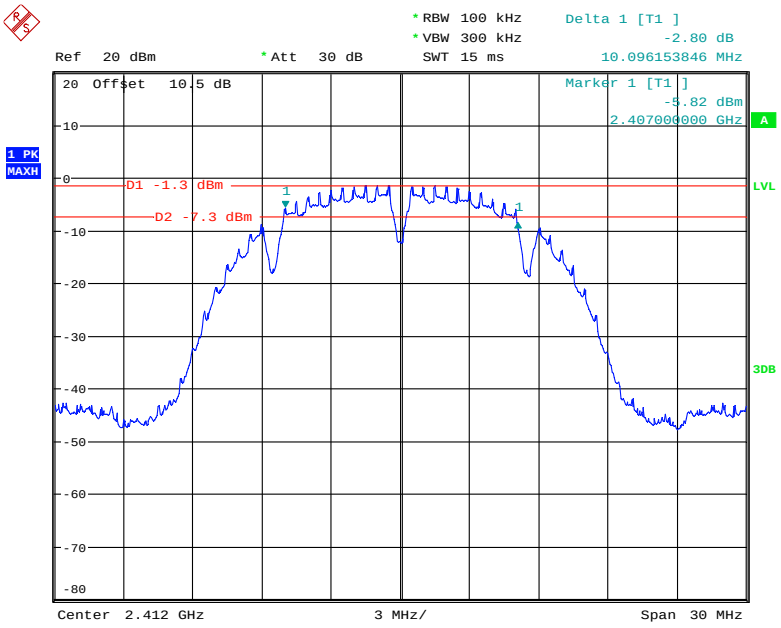
802.11n-HT20 High Channel



Date: 31.MAY.2018 10:08:06

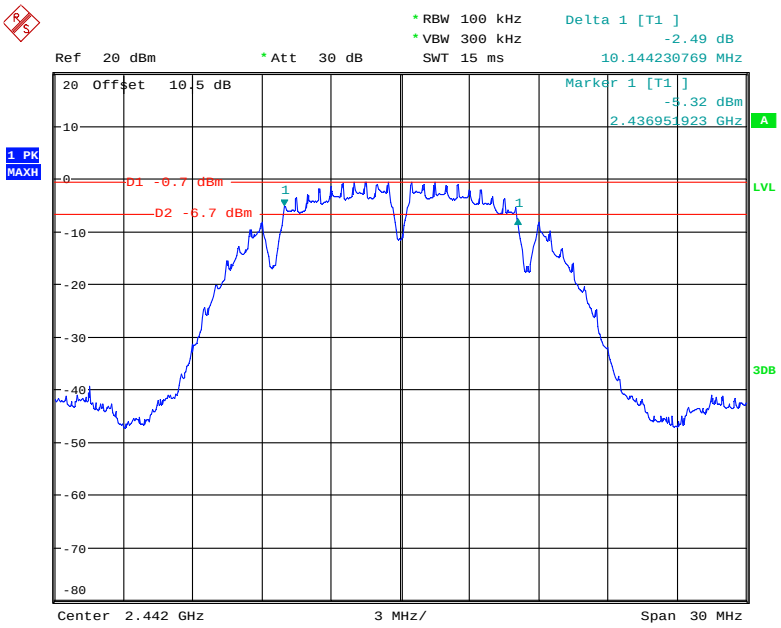
Antenna 1

802.11b Low Channel



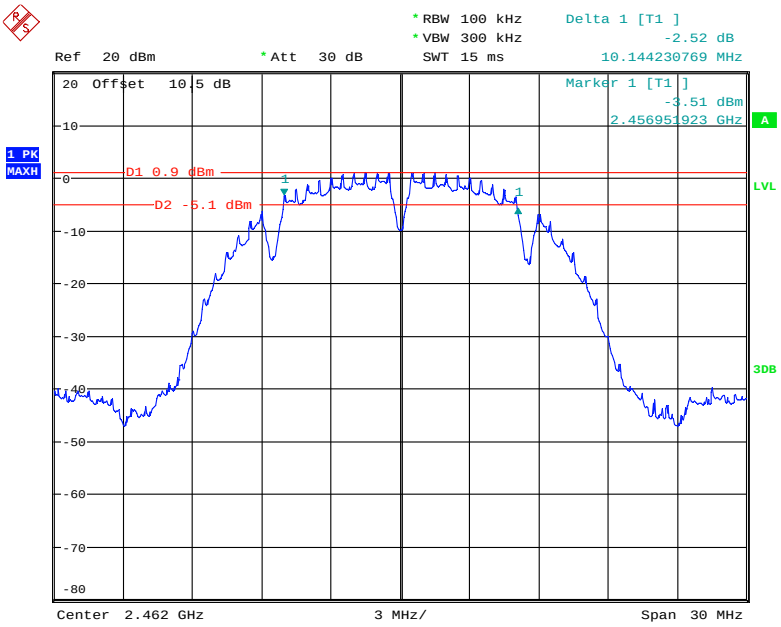
Date: 2.MAY.2018 16:25:22

802.11b Middle Channel



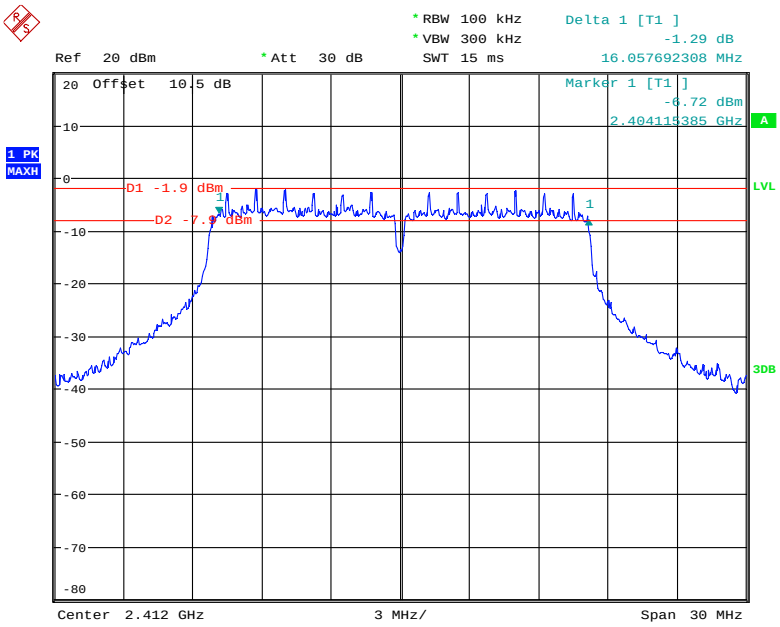
Date: 2.MAY.2018 16:20:48

802.11b High Channel



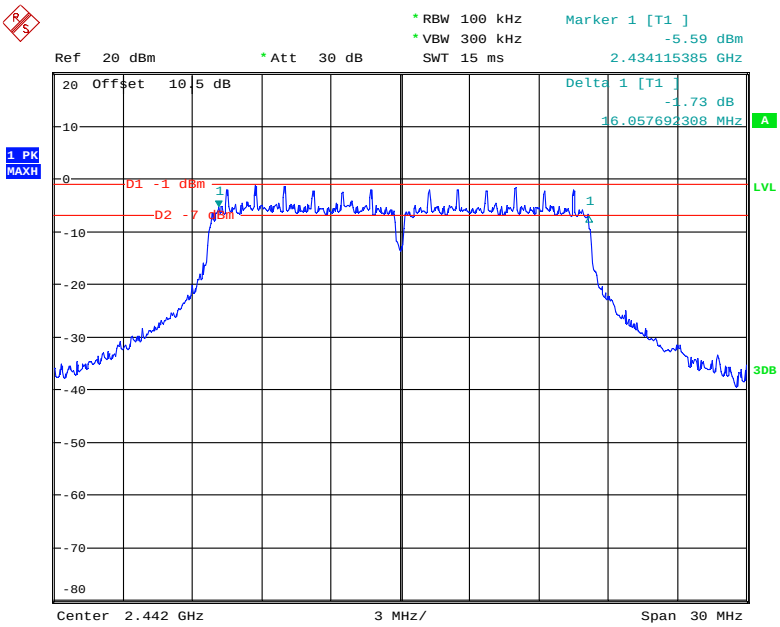
Date: 31.MAY.2018 11:01:21

802.11g Low Channel



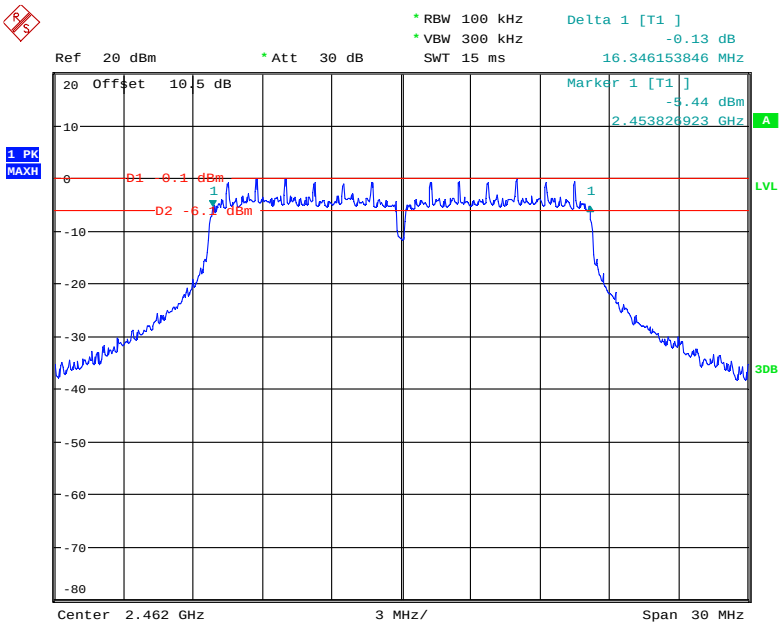
Date: 2.MAY.2018 16:40:25

802.11g Middle Channel



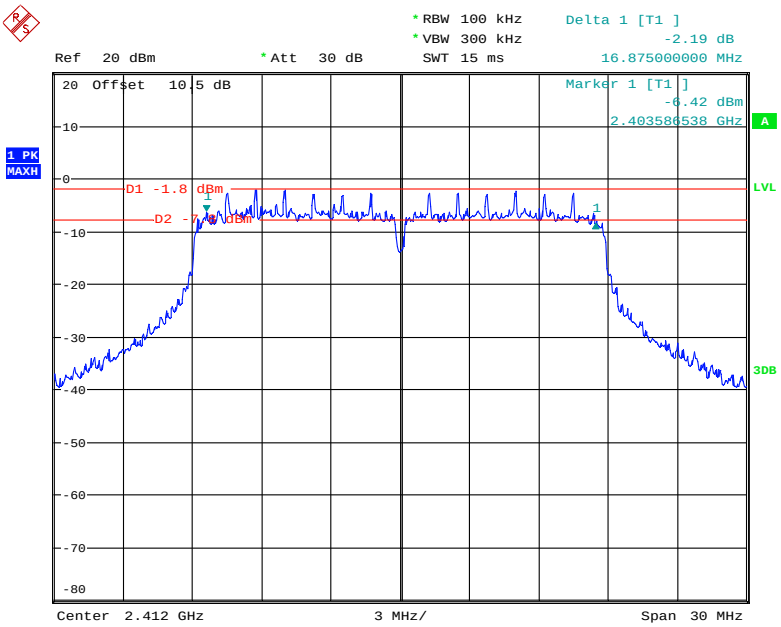
Date: 2.MAY.2018 16:38:11

802.11g High Channel



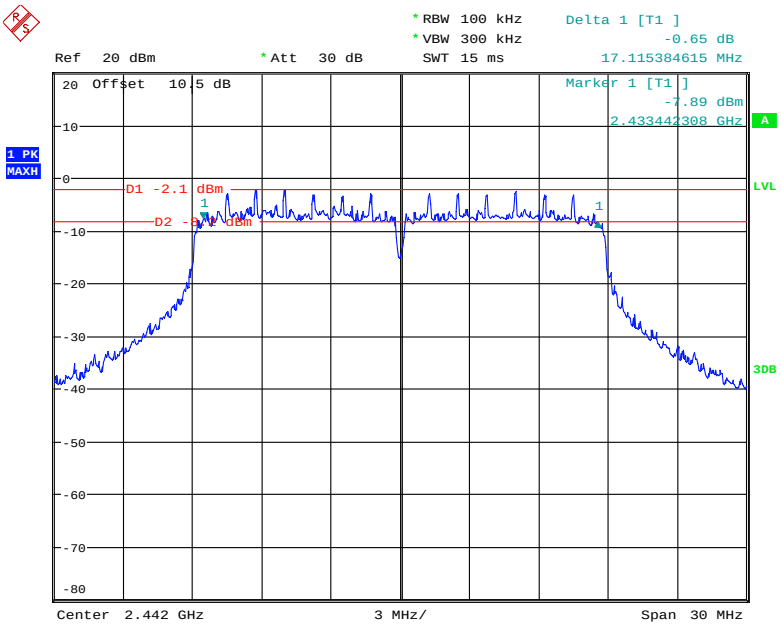
Date: 31.MAY.2018 10:59:28

802.11n-HT20 Low Channel



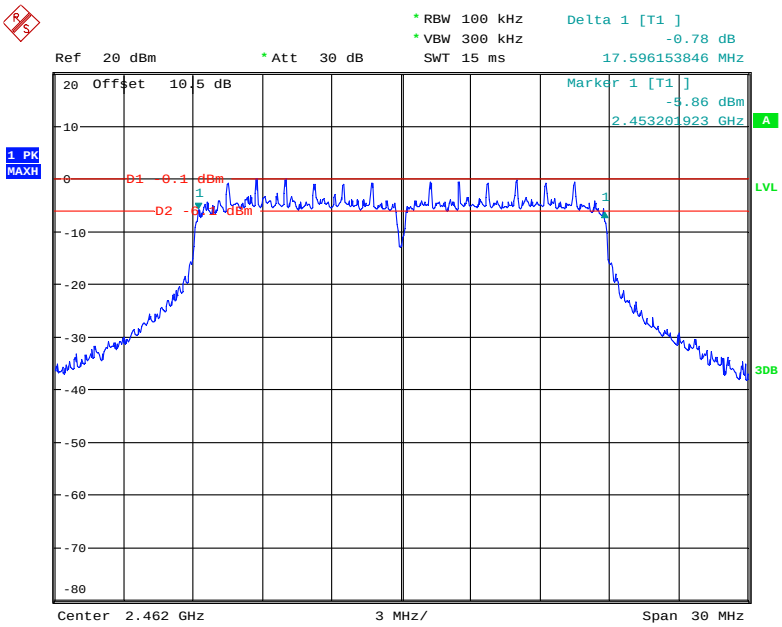
Date: 2.MAY.2018 16:42:52

802.11n-HT20 Middle Channel



Date: 2.MAY.2018 16:47:27

802.11n-HT20 High Channel



Date: 31.MAY.2018 10:57:26

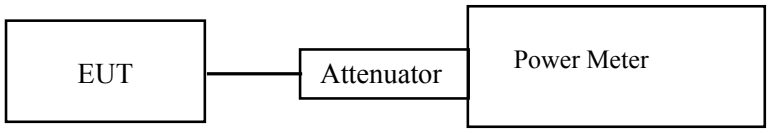
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

The testing was performed by Nancy Wang on 2018-05-31.

EUT operation mode: Transmitting

Wi-Fi mode

Channel	Frequency (MHz)	Ant Port	Max Conducted Peak Output Power (dBm)	Total Max Conducted Peak Output Power (dBm)	Limit (dBm)
802.11b					
Low	2412	Ant 0	12.82	15.64	30
		Ant 1	12.44		30
Middle	2442	Ant 0	13.16	16.39	30
		Ant 1	13.59		30
High	2462	Ant 0	14.79	17.98	30
		Ant 1	15.15		30
802.11g					
Low	2412	Ant 0	16.11	19.19	30
		Ant 1	16.24		30
Middle	2442	Ant 0	16.49	19.85	30
		Ant 1	17.16		30
High	2462	Ant 0	18.25	21.59	30
		Ant 1	18.88		30
802.11n-HT20					
Low	2412	Ant 0	16.08	19.27	30
		Ant 1	16.43		30
Middle	2442	Ant 0	16.27	19.27	30
		Ant 1	16.25		30
High	2462	Ant 0	18.40	21.72	30
		Ant 1	19.00		30

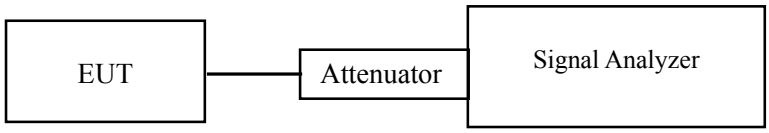
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

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 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 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.



Test Data

Environmental Conditions

Temperature:	24~25 ℃
Relative Humidity:	50~52 %
ATM Pressure:	100.5~101.0 kPa

The testing was performed by Nancy Wang from 2018-05-03 to 2018-05-31.

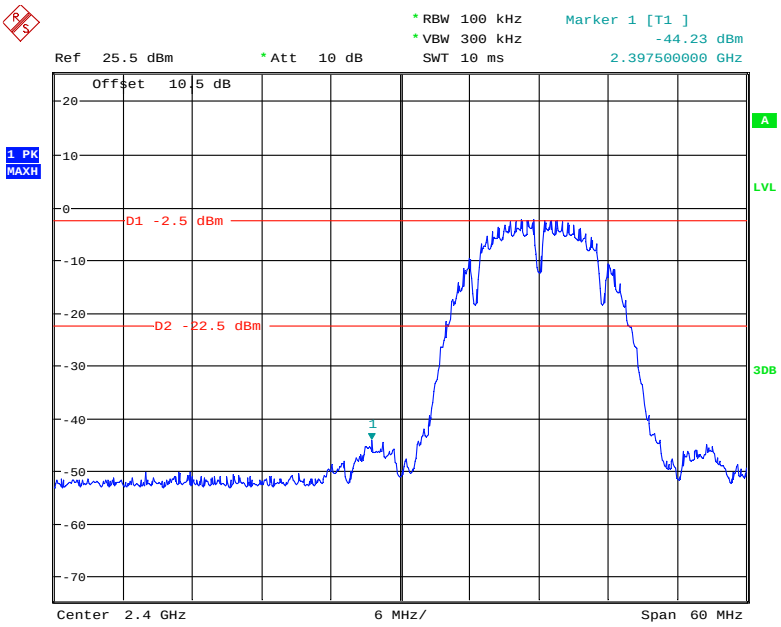
EUT operation mode: Transmitting

Test Result: Compliance

Please refer to the following plots.

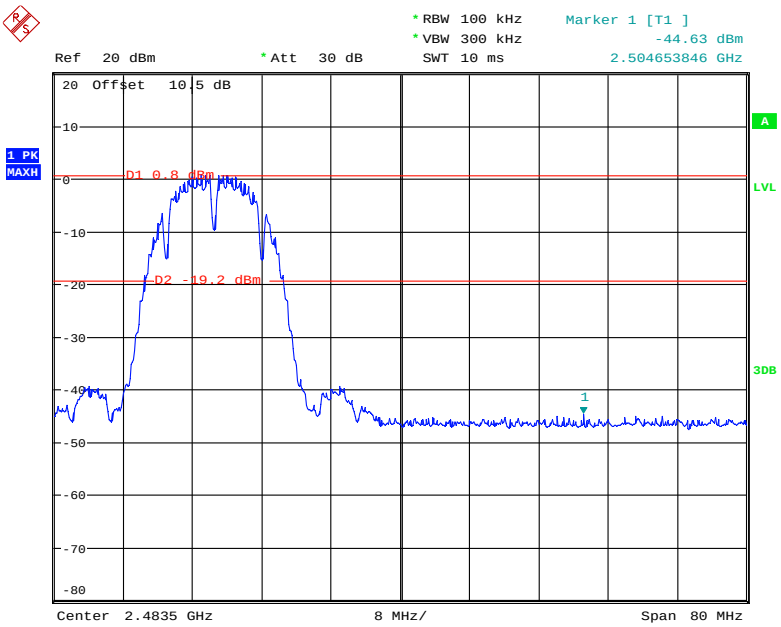
Antenna 0

802.11b: Band Edge, Left Side



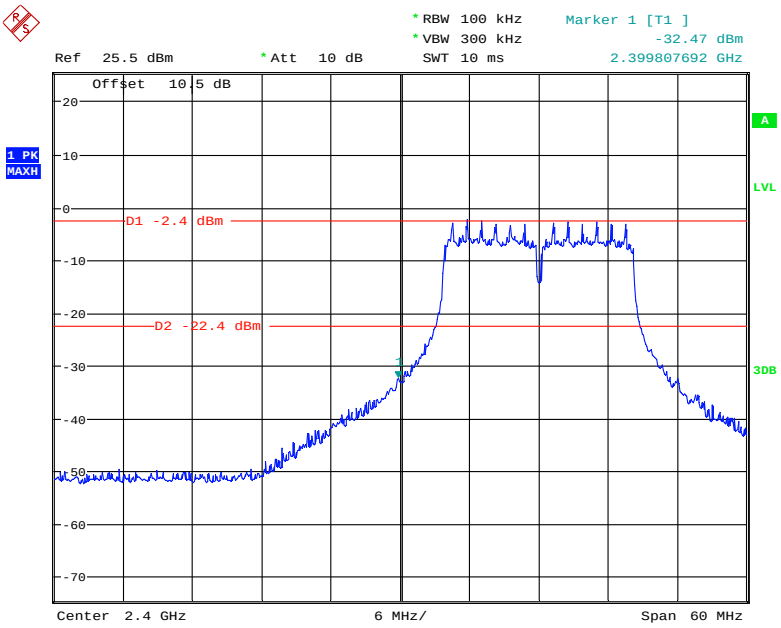
Date: 3.MAY.2018 10:23:21

802.11b: Band Edge, Right Side



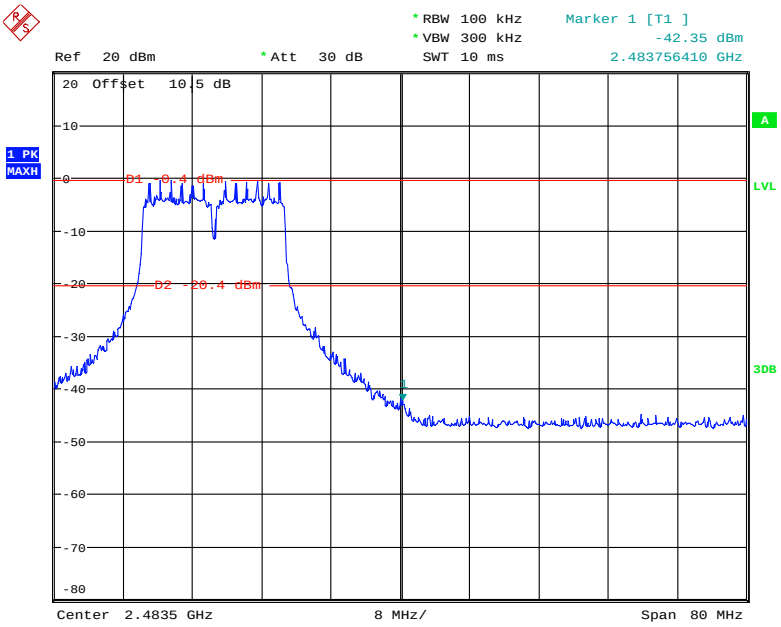
Date: 31.MAY.2018 10:46:27

802.11g: Band Edge, Left Side



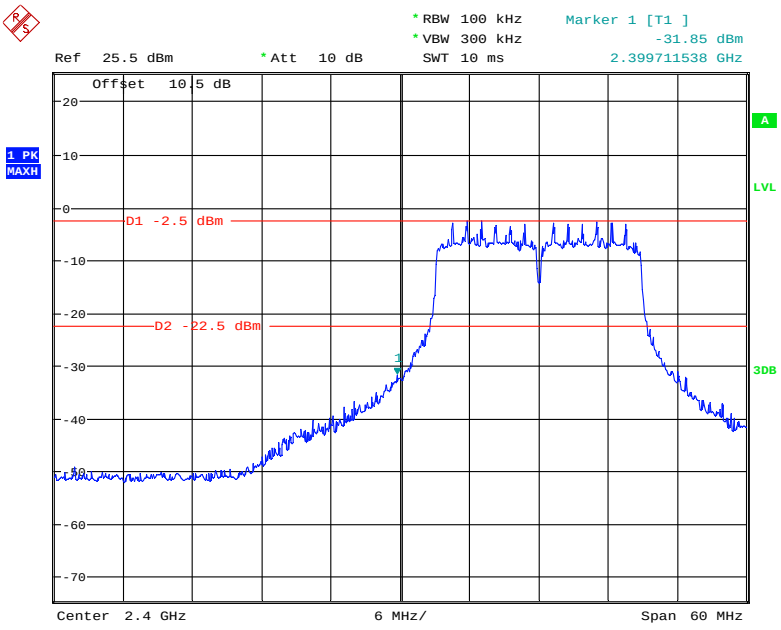
Date: 3.MAY.2018 10:17:22

802.11g: Band Edge, Right Side



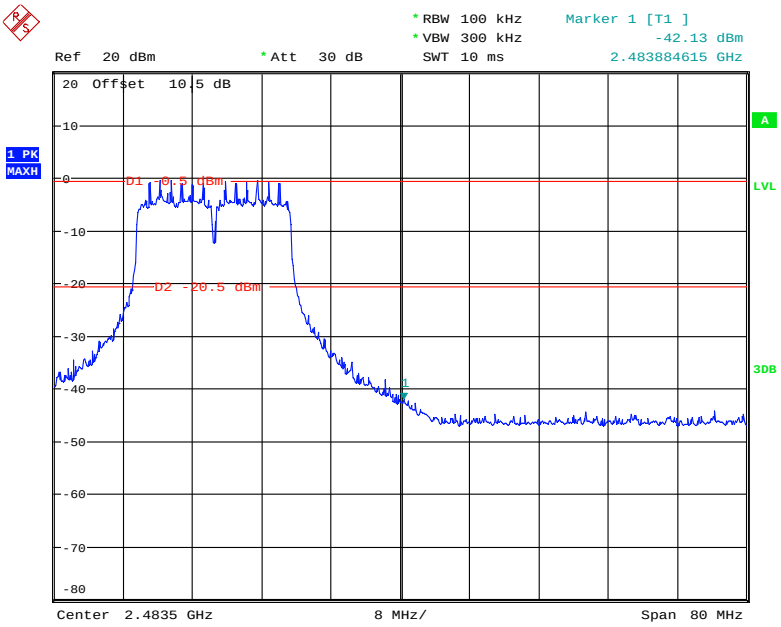
Date: 31.MAY.2018 10:43:05

802.11n-HT20: Band Edge, Left Side



Date: 3.MAY.2018 10:11:19

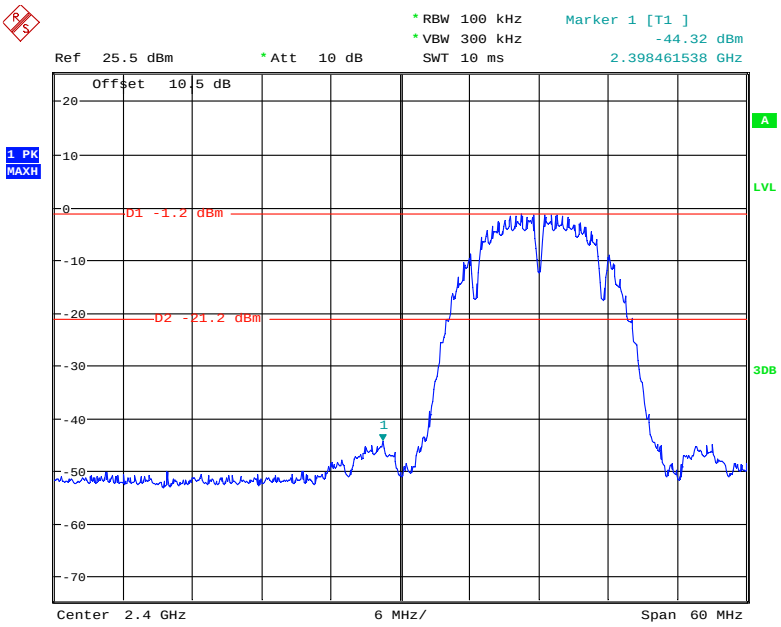
802.11n-HT20: Band Edge, Right Side



Date: 31.MAY.2018 10:40:24

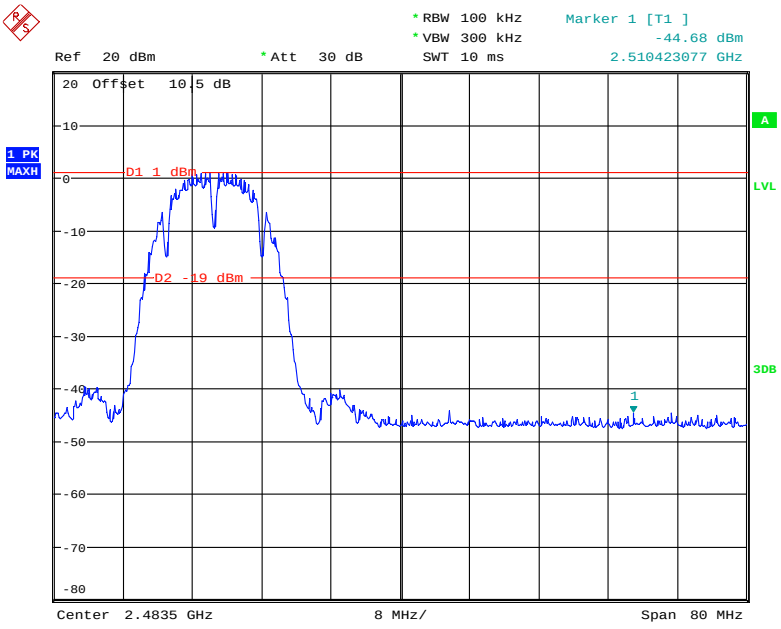
Antenna 1

802.11b: Band Edge, Left Side



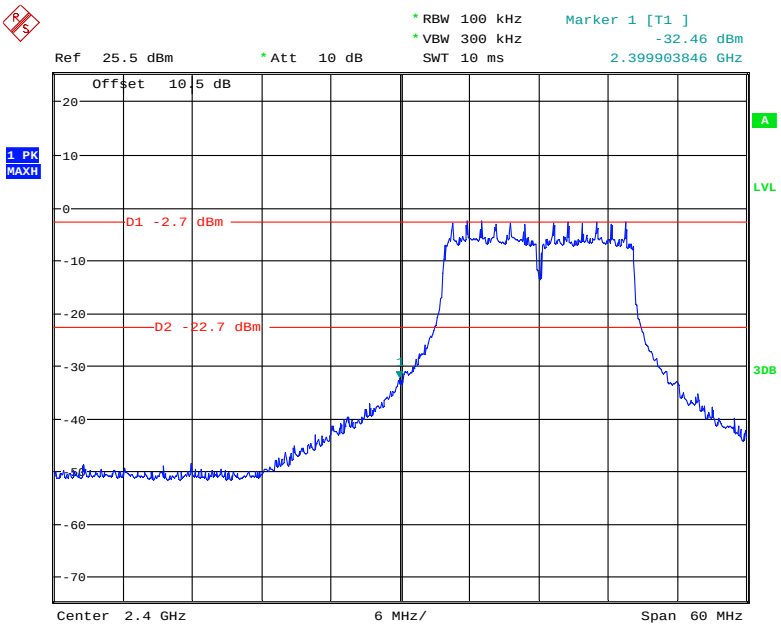
Date: 3.MAY.2018 09:44:44

802.11b: Band Edge, Right Side



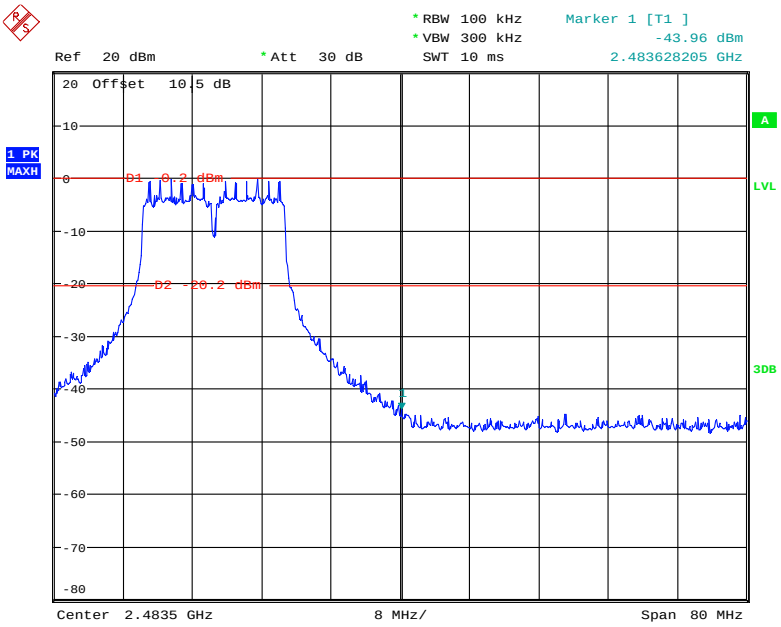
Date: 31.MAY.2018 11:16:56

802.11g: Band Edge, Left Side



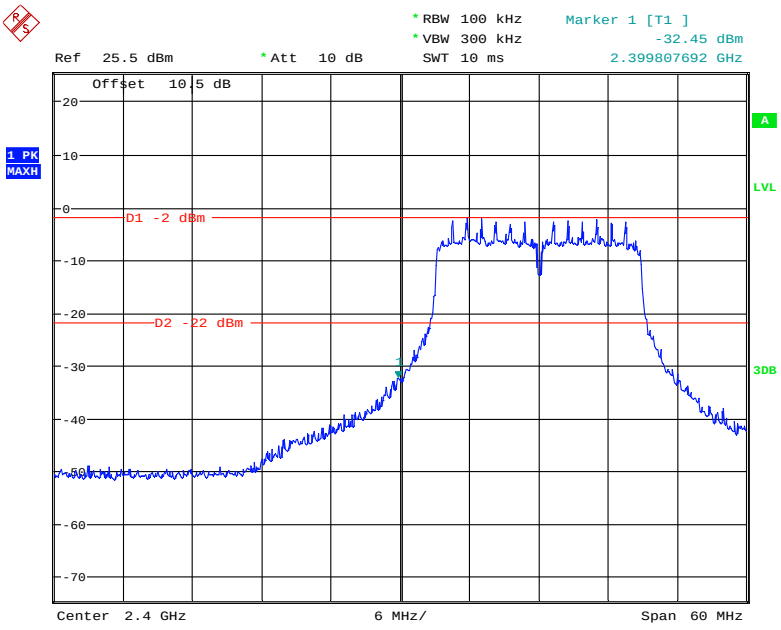
Date: 3.MAY.2018 09:52:23

802.11g: Band Edge, Right Side



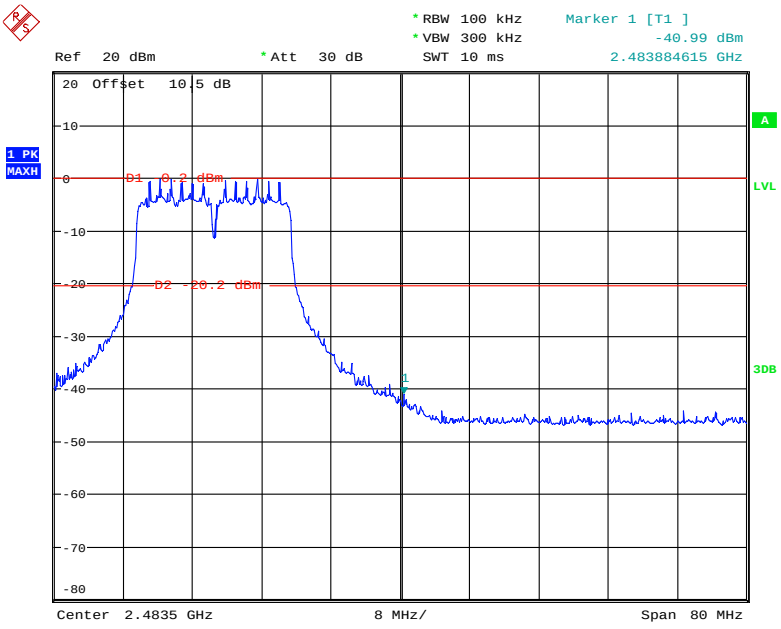
Date: 31.MAY.2018 11:15:02

802.11n-HT20: Band Edge, Left Side



Date: 3.MAY.2018 09:55:34

802.11n-HT20: Band Edge, Right Side



Date: 31.MAY.2018 11:13:36

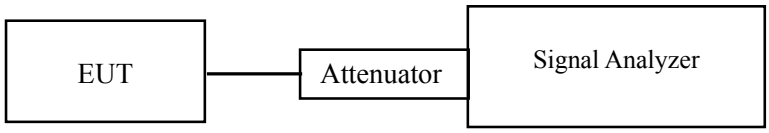
FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test Data

Environmental Conditions

Temperature:	24~25 ℃
Relative Humidity:	50~52 %
ATM Pressure:	100.5~101.0 kPa

The testing was performed by Nancy Wang from 2018-05-02 to 2018-06-15.

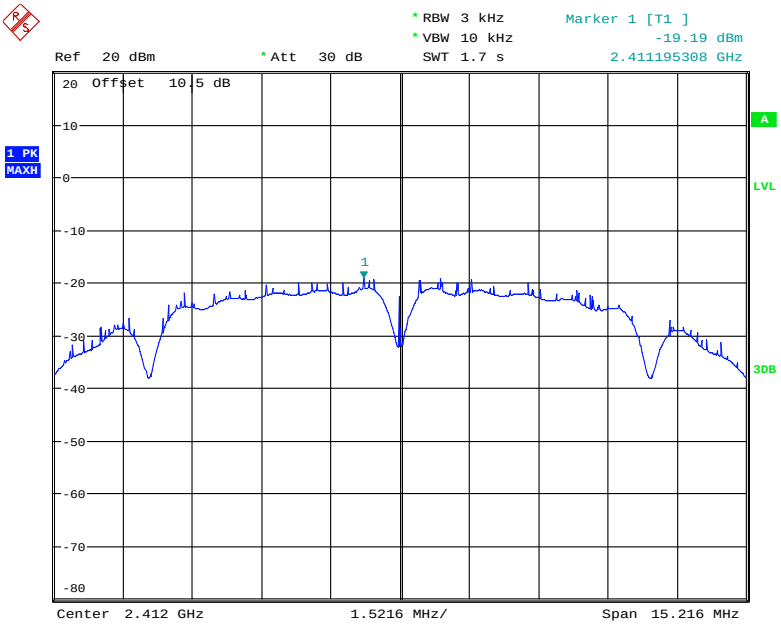
EUT operation mode: Transmitting

Test Result: Pass

Channel	Frequency (MHz)	Ant Port	PSD (dBm/3kHz)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode					
Low	2412	Ant 0	-19.19	-15.20	≤8
		Ant 1	-17.41		≤8
Middle	2442	Ant 0	-18.17	-14.52	≤8
		Ant 1	-16.98		≤8
High	2462	Ant 0	-14.82	-11.35	≤8
		Ant 1	-13.95		≤8
802.11g mode					
Low	2412	Ant 0	-18.38	-15.86	≤8
		Ant 1	-19.43		≤8
Middle	2442	Ant 0	-19.07	-15.17	≤8
		Ant 1	-17.45		≤8
High	2462	Ant 0	-16.95	-13.5	≤8
		Ant 1	-16.12		≤8
802.11n-HT20 mode					
Low	2412	Ant 0	-19.39	-15.92	≤8
		Ant 1	-18.51		≤8
Middle	2442	Ant 0	-18.16	-15.56	≤8
		Ant 1	-19.03		≤8
High	2462	Ant 0	-17.45	-14.36	≤8
		Ant 1	-17.30		≤8

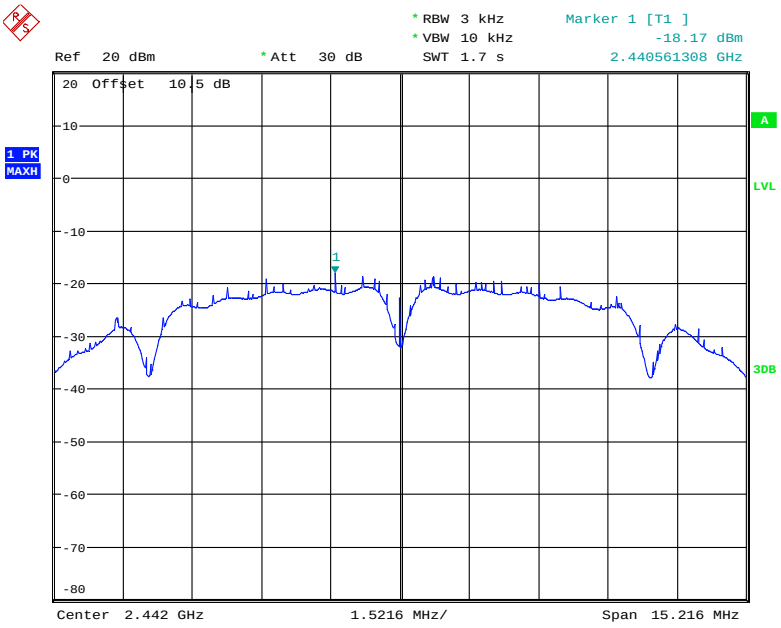
Antenna 0

Power Spectral Density, 802.11b Low Channel



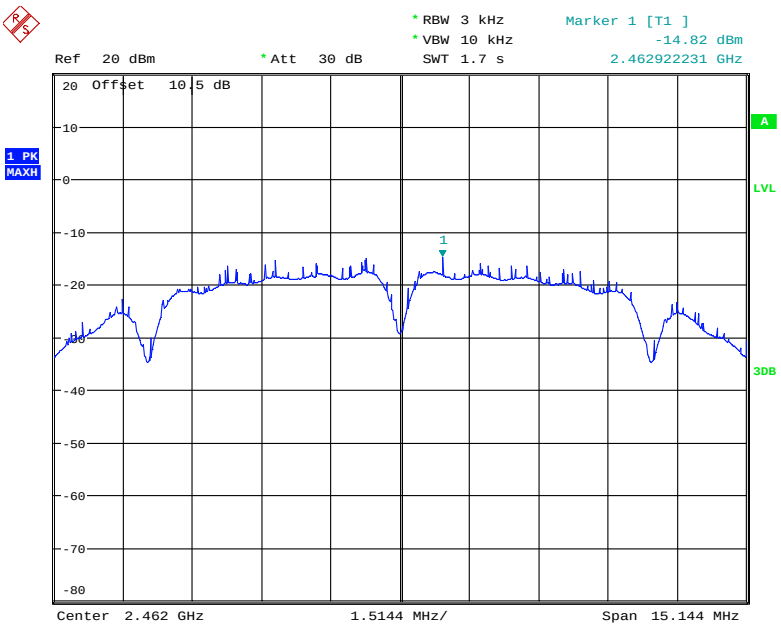
Date: 2.MAY.2018 17:34:22

Power Spectral Density, 802.11b Middle Channel



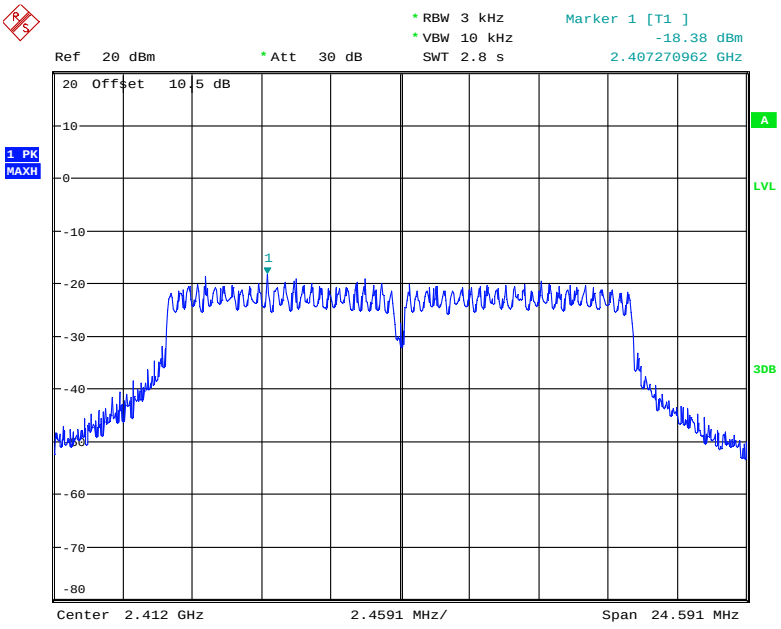
Date: 2.MAY.2018 17:33:02

Power Spectral Density, 802.11b High Channel



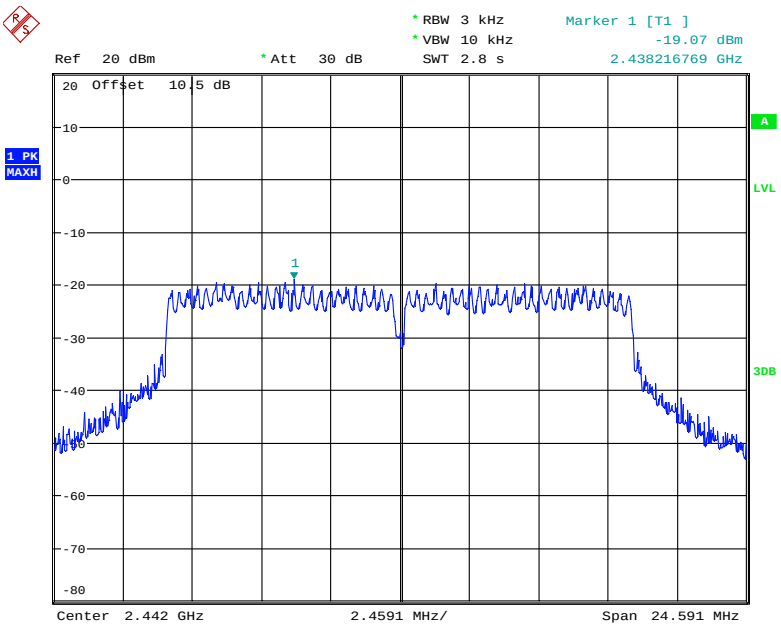
Date: 31.MAY.2018 10:28:42

Power Spectral Density, 802.11g Low Channel



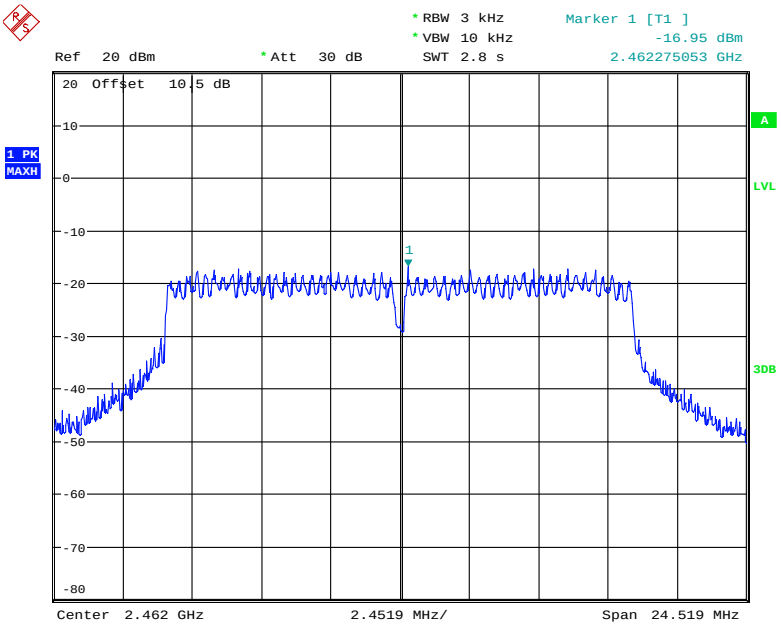
Date: 2.MAY.2018 17:36:49

Power Spectral Density, 802.11g Middle Channel



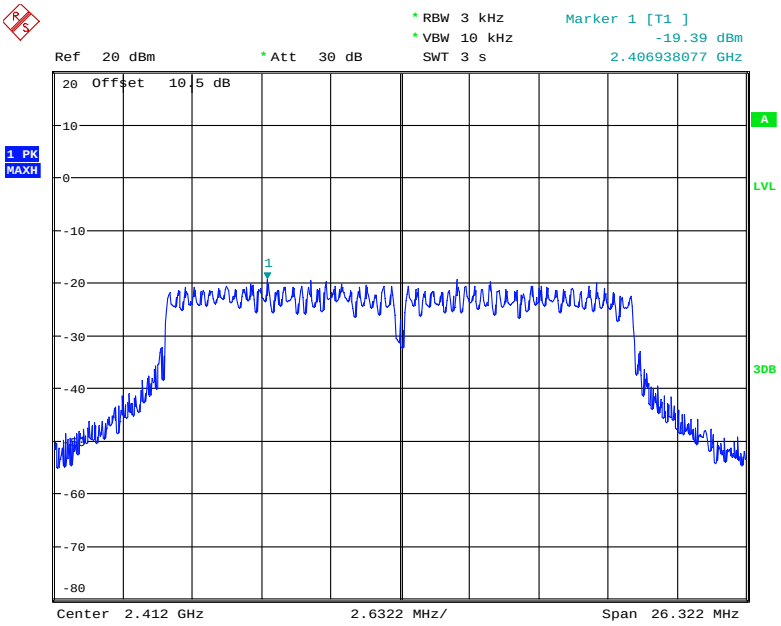
Date: 2.MAY.2018 17:36:08

Power Spectral Density, 802.11g High Channel



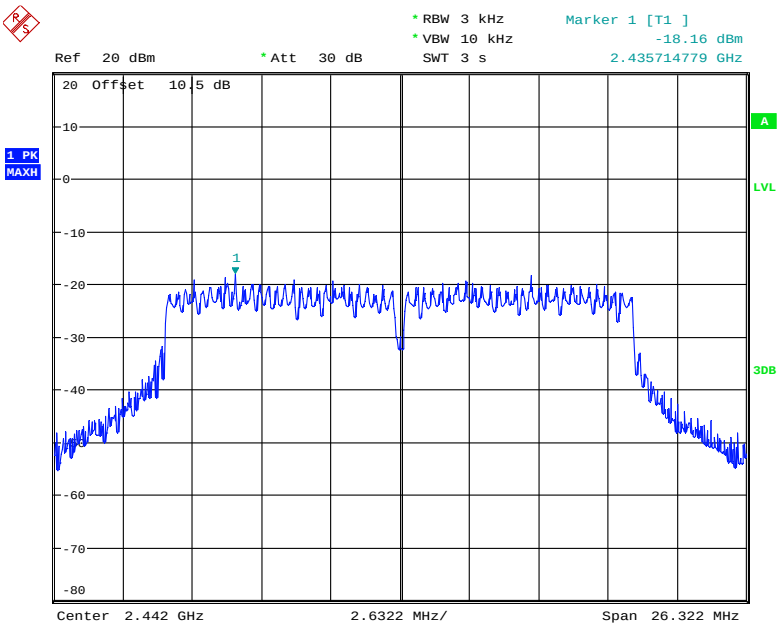
Date: 31.MAY.2018 10:31:31

Power Spectral Density, 802.11n-HT20 Low Channel



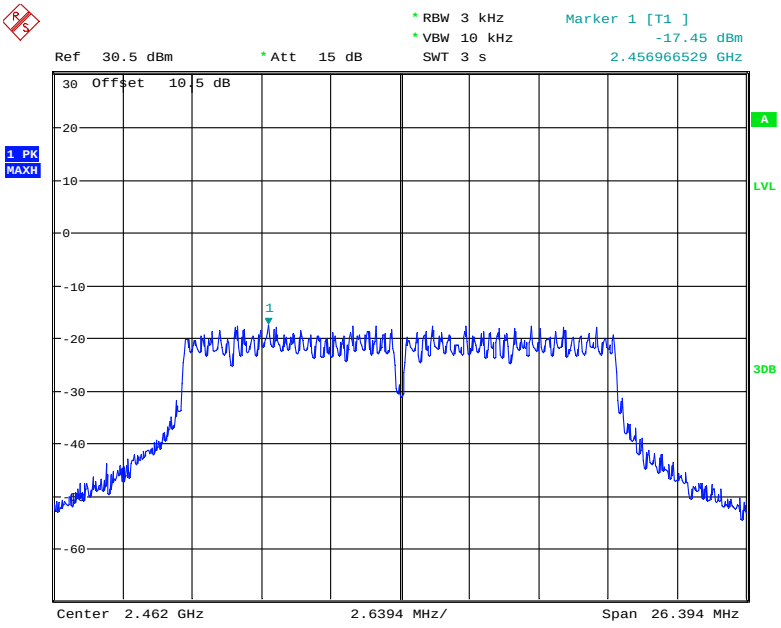
Date: 2.MAY.2018 17:38:07

Power Spectral Density, 802.11n-HT20 Middle Channel



Date: 2.MAY.2018 17:38:45

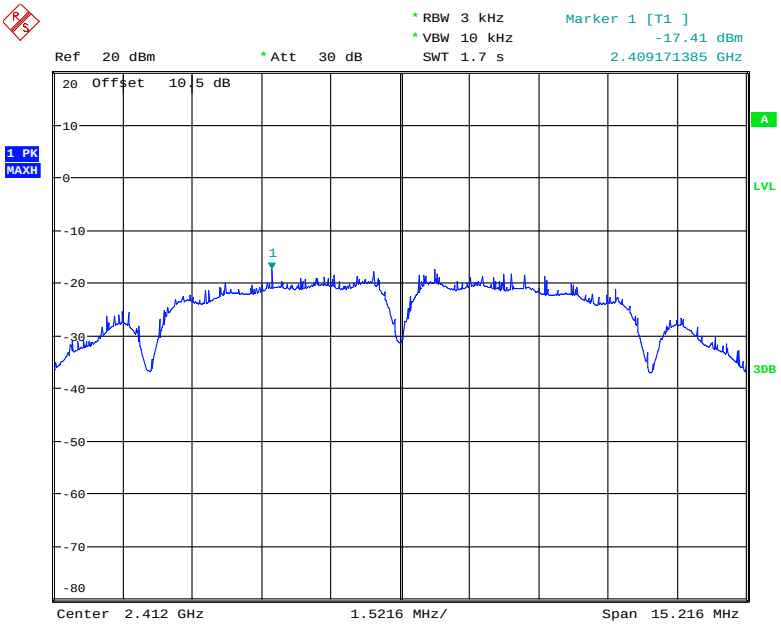
Power Spectral Density, 802.11n-HT20 High Channel



Date: 15.JUN.2018 16:35:40

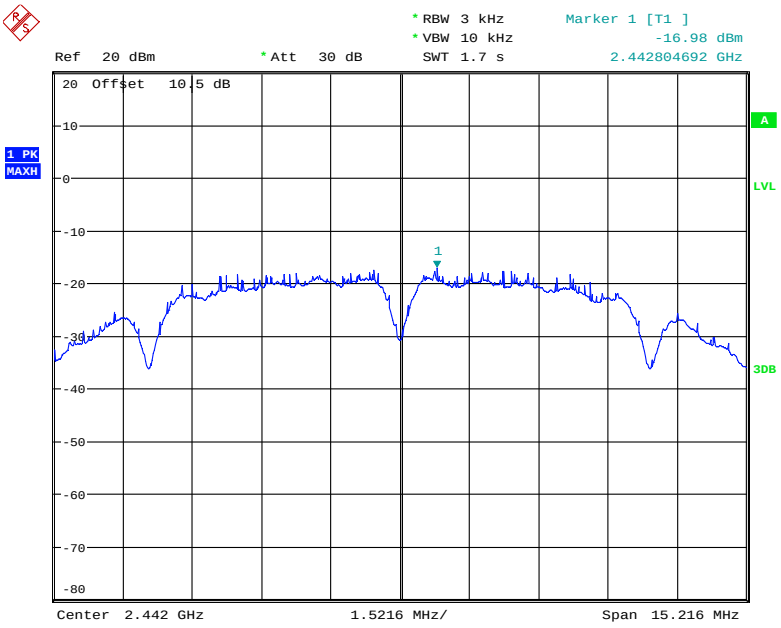
Antenna 1

Power Spectral Density, 802.11b Low Channel



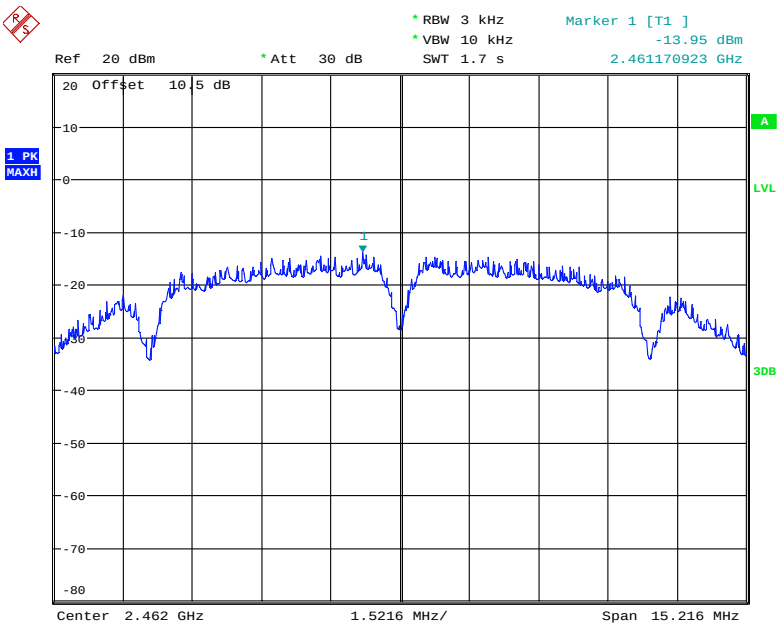
Date: 2.MAY.2018 17:53:14

Power Spectral Density, 802.11b Middle Channel



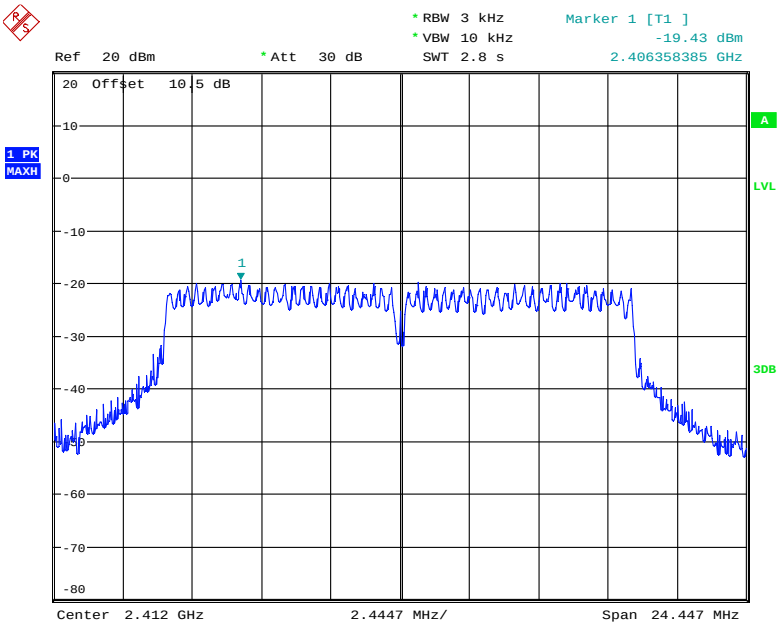
Date: 2.MAY.2018 17:52:11

Power Spectral Density, 802.11b High Channel



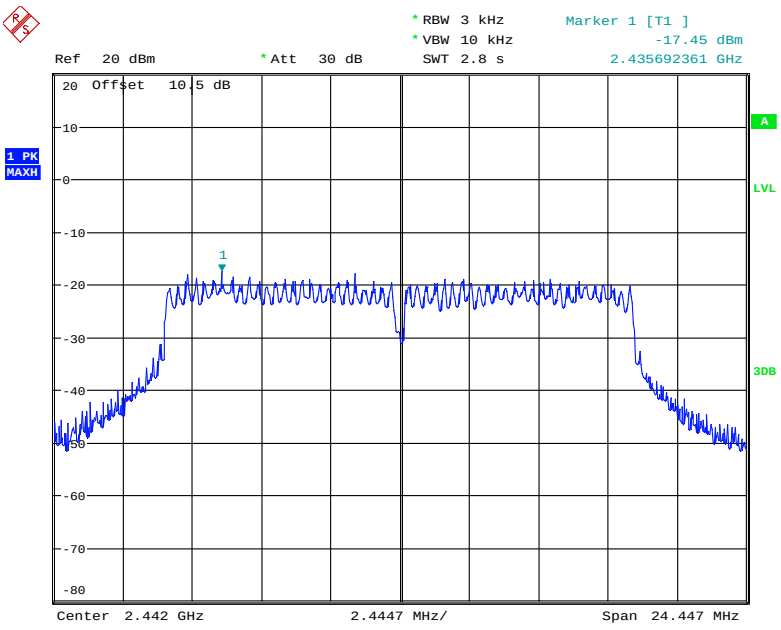
Date: 31.MAY.2018 11:05:30

Power Spectral Density, 802.11g Low Channel



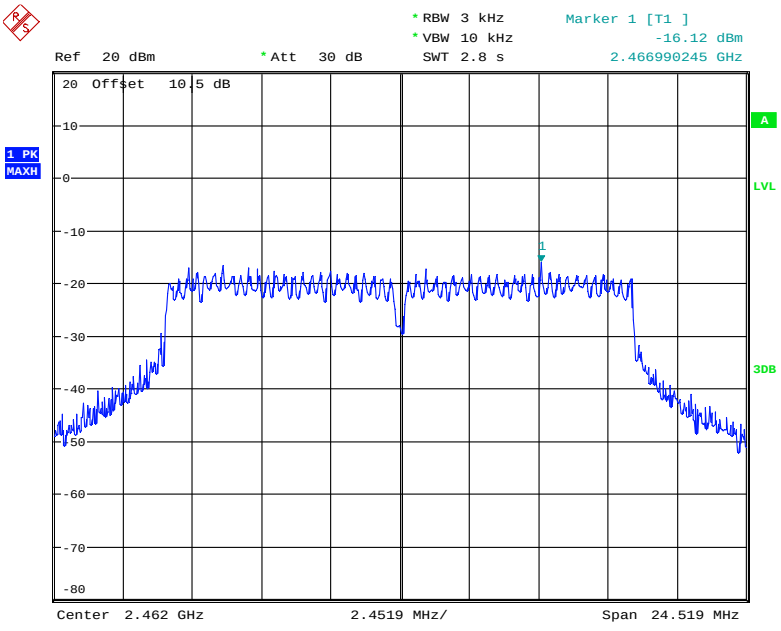
Date: 2.MAY.2018 17:47:45

Power Spectral Density, 802.11g Middle Channel



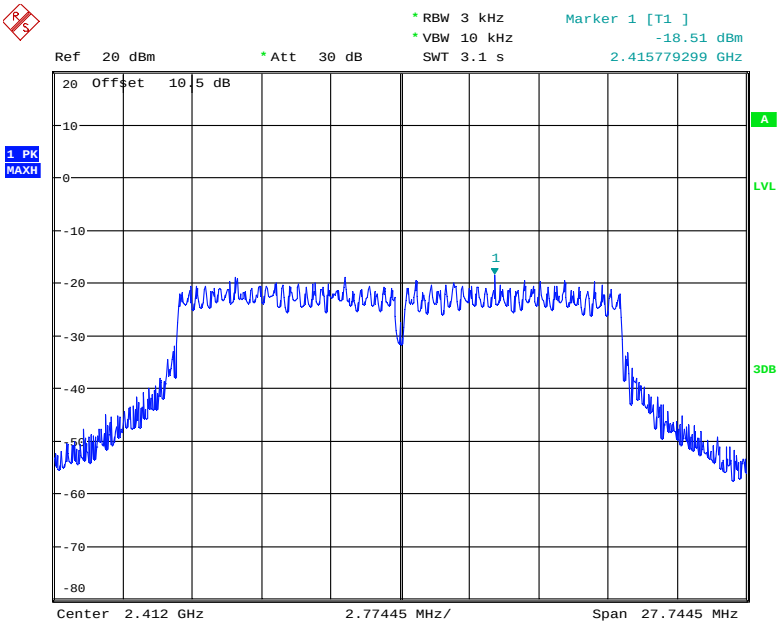
Date: 2.MAY.2018 17:46:51

Power Spectral Density, 802.11g High Channel



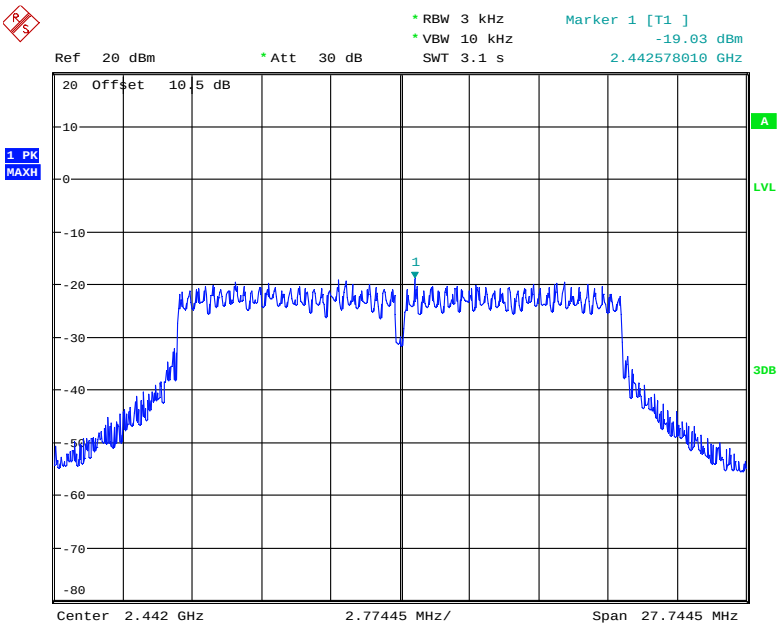
Date: 31.MAY.2018 11:07:23

Power Spectral Density, 802.11n-HT20 Low Channel



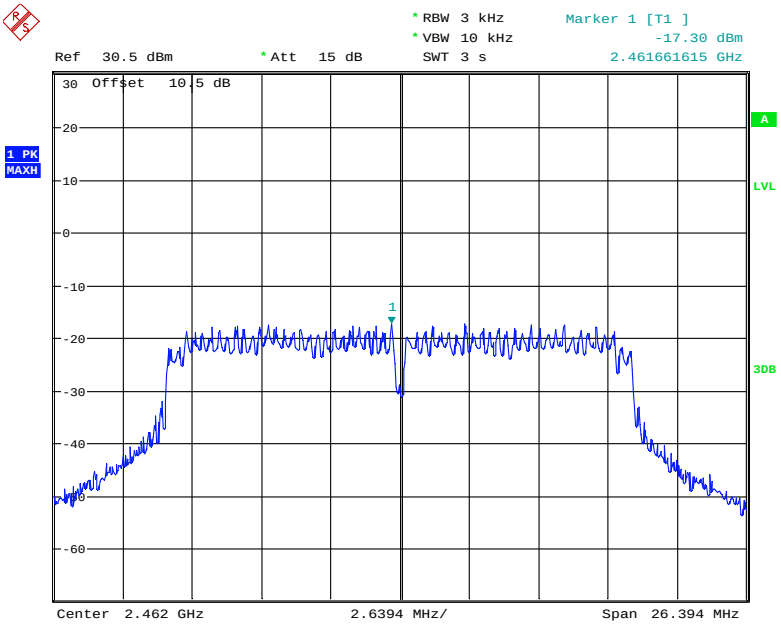
Date: 2.MAY.2018 17:43:54

Power Spectral Density, 802.11n-HT20 Middle Channel



Date: 2.MAY.2018 17:42:50

Power Spectral Density, 802.11n-HT20 High Channel



Date: 15.JUN.2018 16:37:10

******* END OF REPORT *******