



TESTING LABORATORY  
CERTIFICATE#4323.01



FCC PART 15.247

## TEST REPORT

For

**Pycom Ltd**

High Point 9 Sydenham Road, Guildford Surrey GU1 3RX, Surrey, United Kingdom

**FCC ID: 2AJMTFIPY01R**

<b>Report Type:</b> Original Report	<b>Product Type:</b> FiPy module
<b>Test Engineer:</b>	Max Min
<b>Report Number:</b>	RSHA180108012-00C
<b>Report Date:</b>	2018-06-19
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FINAL

## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Applicant	Pycom Ltd
Tested Model	Fipy 1.0
Product Type	FiPy Module
Dimension	55mm (L)* 20 mm (W)*3.5 mm(H)
Power Supply	DC 3.4-5.5V

*\*All measurement and test data in this report was gathered from production sample serial number: 20180108012.  
(Assigned by the BACL. The EUT supplied by the applicant was received on 2018-01-08)*

### Objective

This report is prepared on behalf of *Pycom Ltd* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine Compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

### Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS, 15.247 DTS, Part 15.249 DXX and Part 27 TNB submissions with FCC ID: 2AJMTFIPY01R.

### 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 FCC KDB558074 D01 DTS Meas Guidance v04.

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

**Measurement Uncertainty**

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0°C
Humidity		6%

**Test Facility**

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

Test channel list is as below:

For 802.11b, 802.11g and 802.11n-HT20 mode, EUT was tested with Channel 1, 6 and 11;

For 802.11n-HT40 mode, EUT was tested with Channel 3, 6 and 9.

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

For BLE mode, EUT was tested with channel 0, 19 and 39.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	...	...
...	...	...	...
...	...	...	...
18	2438	38	2478
19	2440	39	2480

### Equipment Modifications

No modification was made to the EUT tested.

**EUT Exercise Software**

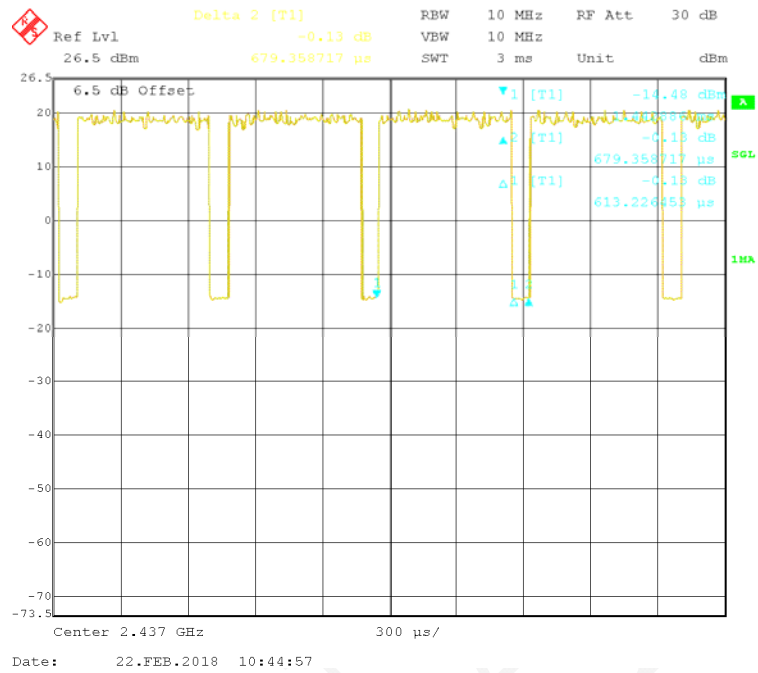
RF test tool: putty

Pre-scan with all the data rates, and the worst case was performed as below:

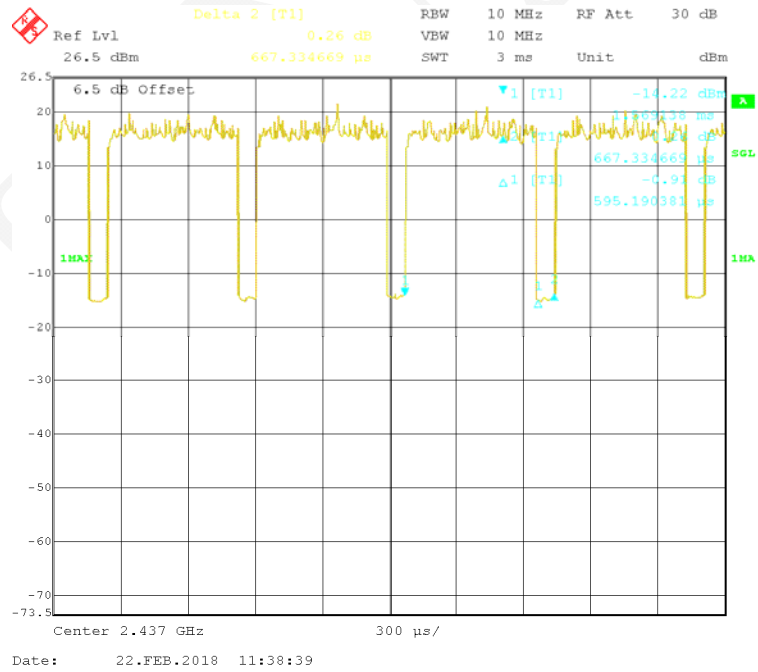
Mode	Data rate	Channel	Power level
802.11b	1 Mbps	Low	0
		Middle	0
		High	0
802.11g	6 Mbps	Low	0
		Middle	0
		High	2
802.11n-HT20	MCS0	Low	0
		Middle	0
		High	4
802.11n-HT40	MCS0	Low	0
		Middle	0
		High	14
BLE	/	/	5

**Duty Cycle:**

**802.11b Mode Middle Channel**

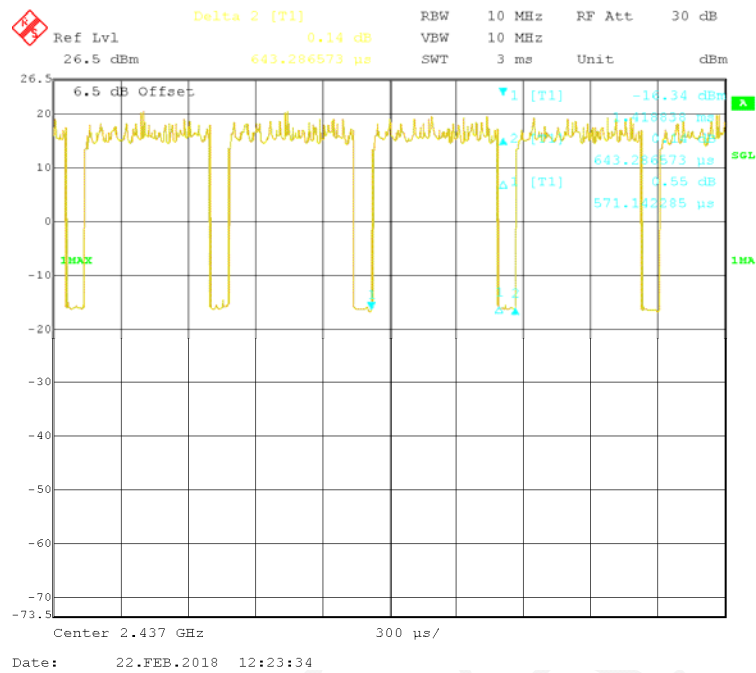


**802.11g Mode Middle Channel**

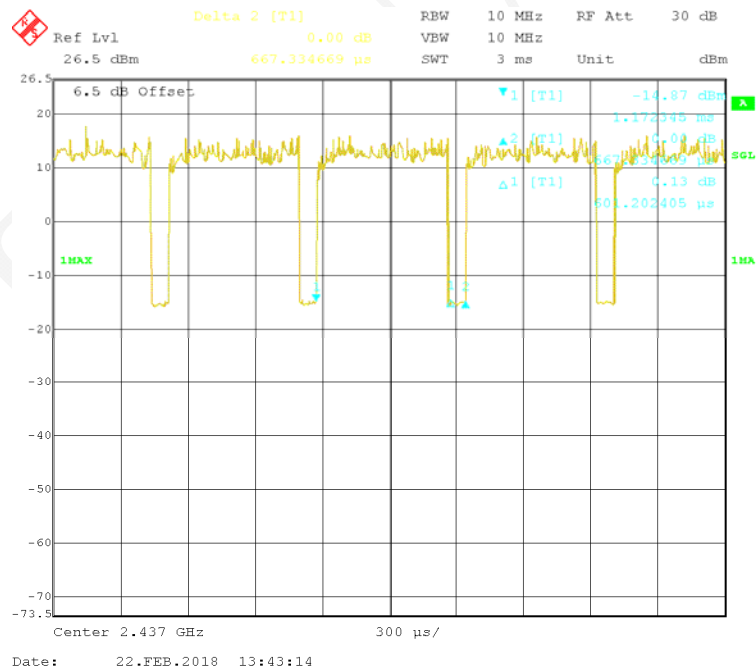




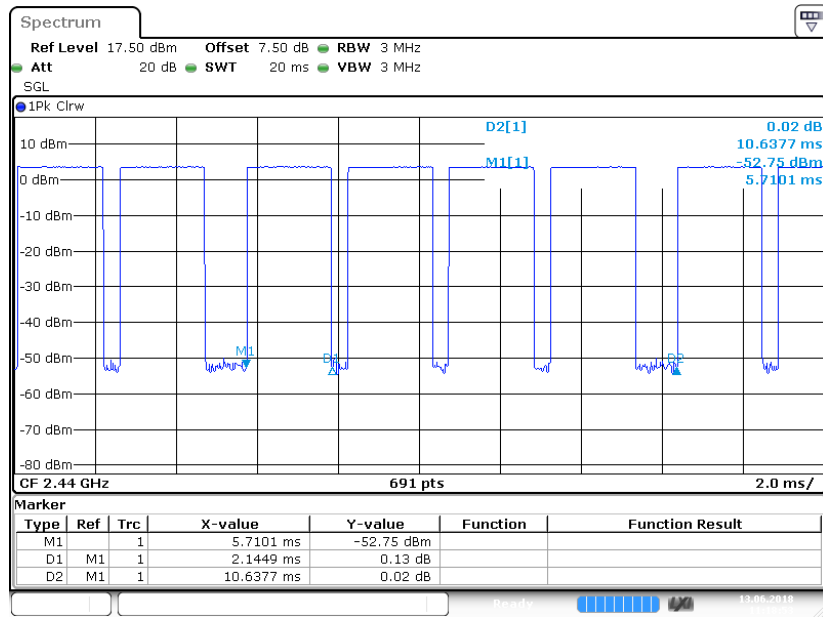
### 802.11n-HT20 Mode Middle Channel



### 802.11n-HT40 Mode Middle Channel



### BLE Mode Middle Channel



Date: 13 JUN 2018 11:18:53

Mode	Duty Cycle (%)	T(ms)	1/T(kHz)	10log(1/x)
802.11b	90.27	0.613	1.631	0.44
802.11g	89.19	0.595	1.681	0.50
802.11n-HT20	88.79	0.571	1.751	0.52
802.11n-HT40	90.09	0.601	1.664	0.45
BLE	80.65	8.580	0.117	0.93

**Note:** “x” means the Duty Cycle.

### Support Equipment List and Details

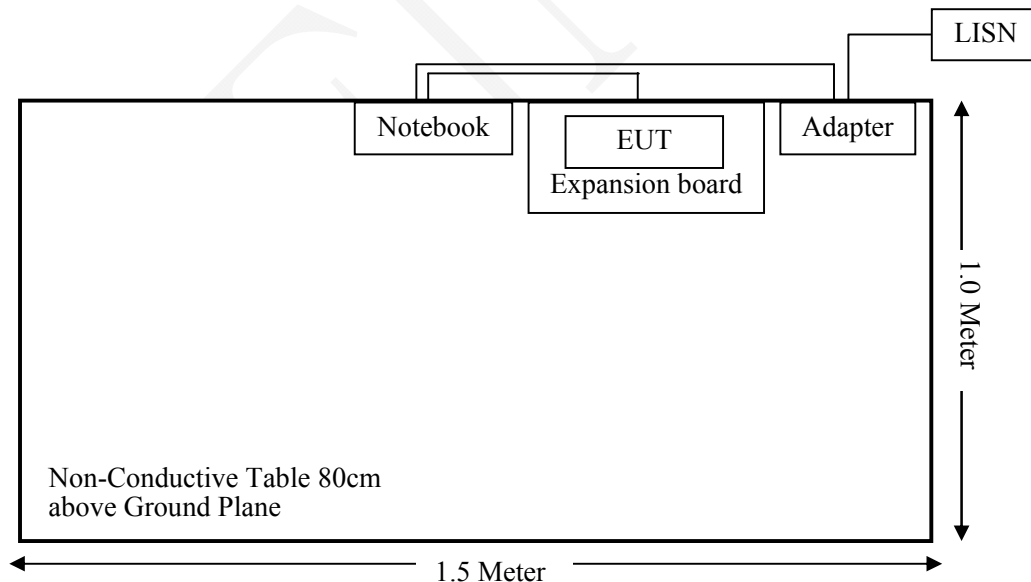
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
DELL	Adapter	LA65NS0-00	DF263
Pycom Ltd	Expansion board	V2.1A	1630000932

### External I/O Cable

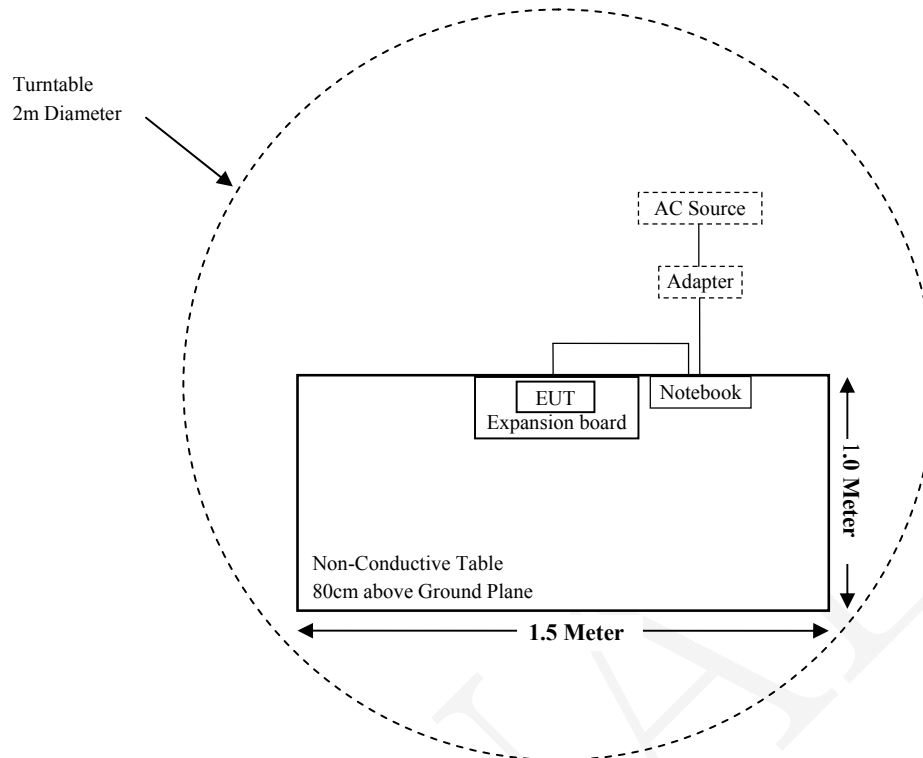
Cable Description	Length (m)	From Port	To
USB Cable	0.8	Expansion board	Notebook

### Block Diagram of Test Setup

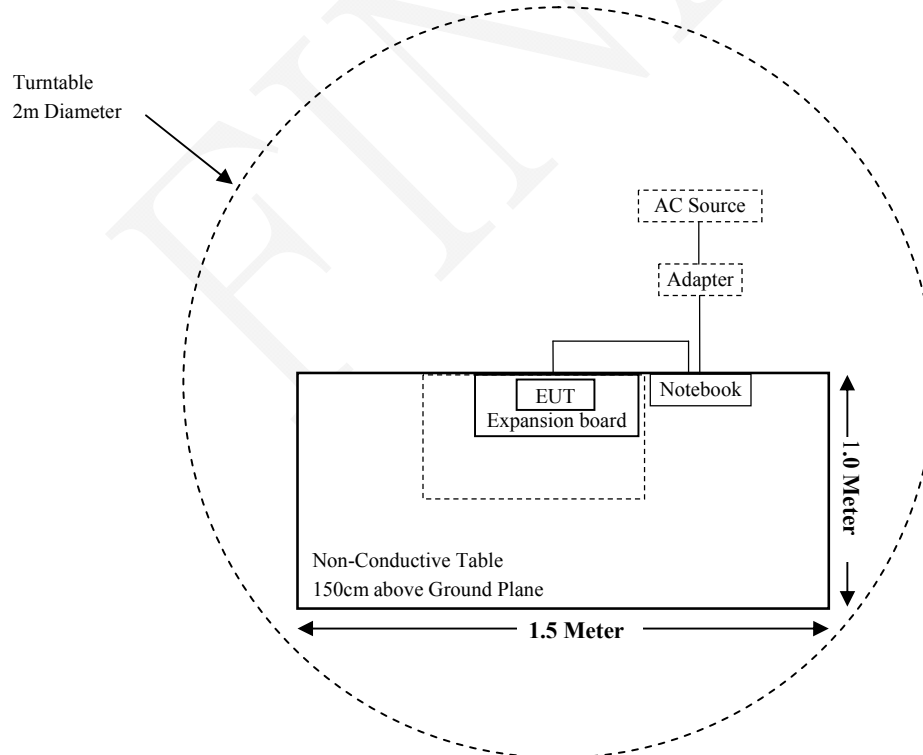
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§15.247(d)	Spurious Emissions at Antenna Port	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Conducted Output Power	Compliant
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

**TEST EQUIPMENT LIST**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test (Chamber 1#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2017-11-12	2018-11-11
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrument	Pre-amplifier	310N	171205	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2017-08-15	2018-08-14
<b>Radiated Emission Test (Chamber 2#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2017-08-27	2018-08-26
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Narda	Pre-amplifier	AFS42-00101800	2001270	2017-10-22	2018-10-21
QuinStar	Amplifier	QLW-18405536-J0	15964001009	2017-10-22	2018-10-21
MICRO-TRONICS	Band notch Filter	BRM50702	/	2017-08-05	2018-08-04
Narda	Attenuator/10dB	10dB	/	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2017-08-15	2018-08-14
<b>RF Conducted Test</b>					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2017-09-21	2018-09-20
Rohde & Schwarz	FSV40 Signal Analyzer	FSV40	101116	2017-07-22	2018-07-21
Agilent	Power Meter	N1912A	MY5000492	2017-11-18	2018-11-17
Agilent	Power Sensor	N1921A	MY54210024	2017-11-18	2018-11-17
Narda	Attenuator/6dB	10690812-2	26850-6	2018-01-10	2019-01-09
Pycom Ltd	RF Cable	/	/	Each Time	/
<b>Conducted Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2017-11-12	2018-11-11
Rohde & Schwarz	LISN	ENV216	3560655016	2017-11-15	2018-11-14
BACL	Auto test Software	BACL-EMC	CE001	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2018-01-10	2019-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2017-08-15	2018-08-14

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

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## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **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**

The EUT has a ceramic antenna for Wi-Fi & BLE, which the antenna gain is 1.3 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

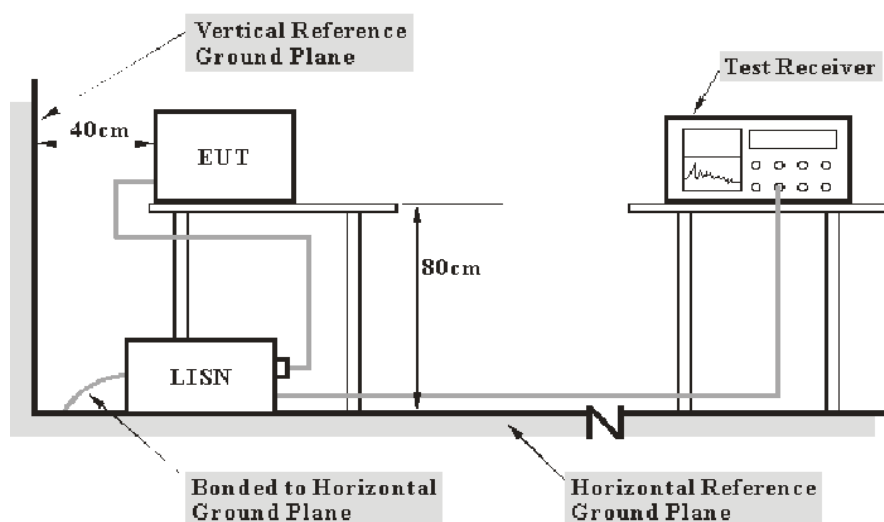
**Result:** Compliance.

## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

### Applicable Standard

FCC §15.207(a)

### EUT Setup



Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

### EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

### Test Procedure

ANSI C63.10-2013 clause 6.2

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.



### Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Corrected Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)}$$

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

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V)} - \text{Corrected Amplitude (dB}\mu\text{V)}$$

### Test Results Summary

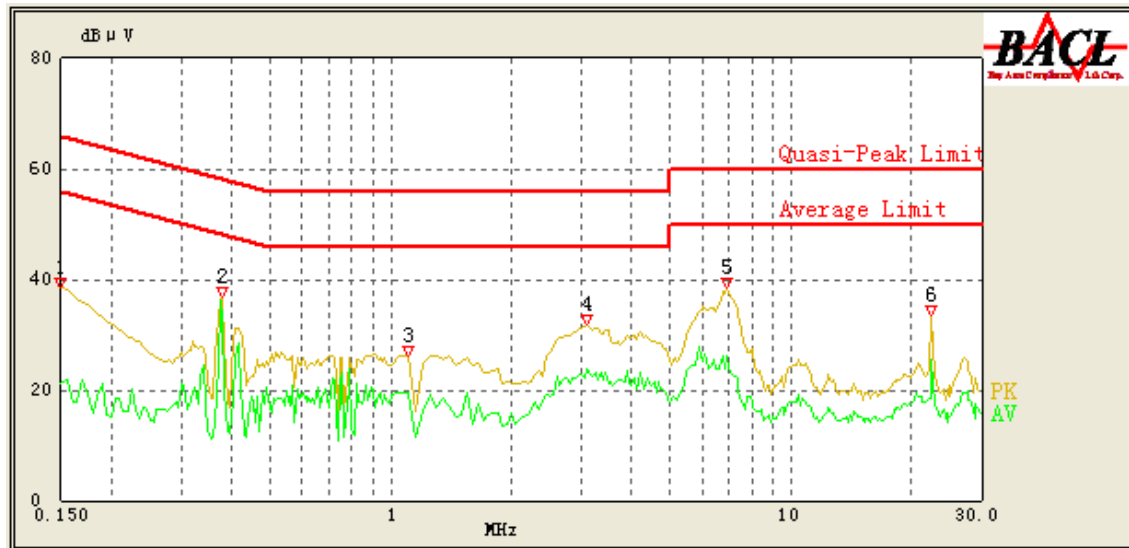
According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

#### Test Data

##### Environmental Conditions

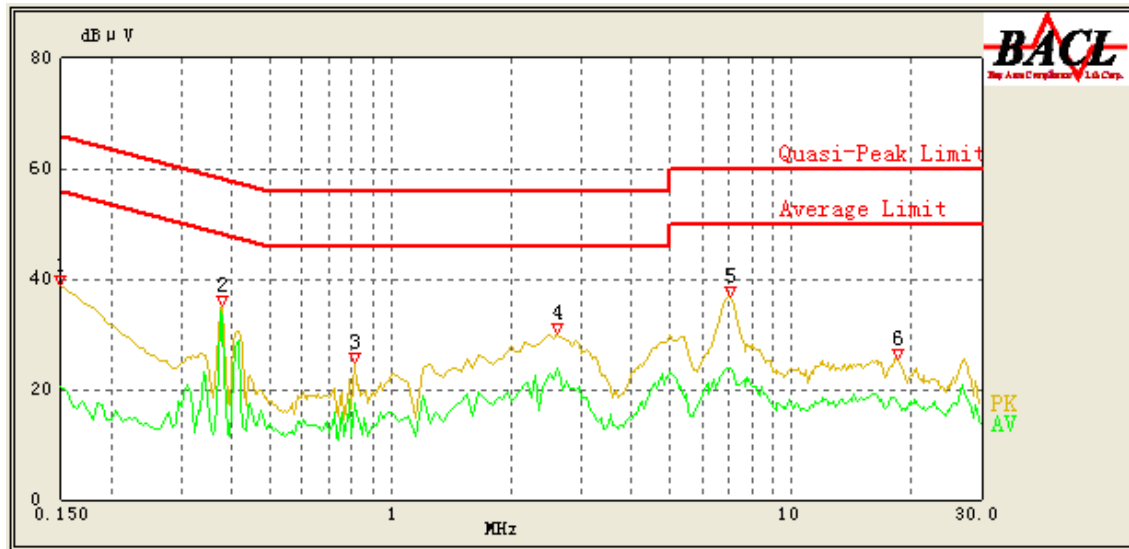
Temperature:	20.2 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

*The testing was performed by Max Min on 2018-02-22.*

**For Wi-Fi Mode:***EUT operation mode: Transmitting in 802.11b mode low channel (worst case)***AC 120V/60 Hz, Line**

Frequency (MHz)	Corrected Amplitude (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.150	38.48	QP	9.000	L1	16.06	66.00	27.52	Compliance
0.150	21.32	AV	9.000	L1	16.06	56.00	34.68	Compliance
0.380	36.86	QP	9.000	L1	16.05	59.43	22.57	Compliance
0.380	33.16	AV	9.000	L1	16.05	49.43	16.27	Compliance
1.100	26.32	QP	9.000	L1	15.88	56.00	29.68	Compliance
1.100	19.59	AV	9.000	L1	15.88	46.00	26.41	Compliance
3.100	31.86	QP	9.000	L1	15.85	56.00	24.14	Compliance
3.100	23.96	AV	9.000	L1	15.85	46.00	22.04	Compliance
6.900	38.50	QP	9.000	L1	15.97	60.00	21.50	Compliance
6.900	26.33	AV	9.000	L1	15.97	50.00	23.67	Compliance
22.450	33.42	QP	9.000	L1	16.45	60.00	26.58	Compliance
22.450	25.36	AV	9.000	L1	16.45	50.00	24.64	Compliance

## AC 120V/60 Hz, Neutral

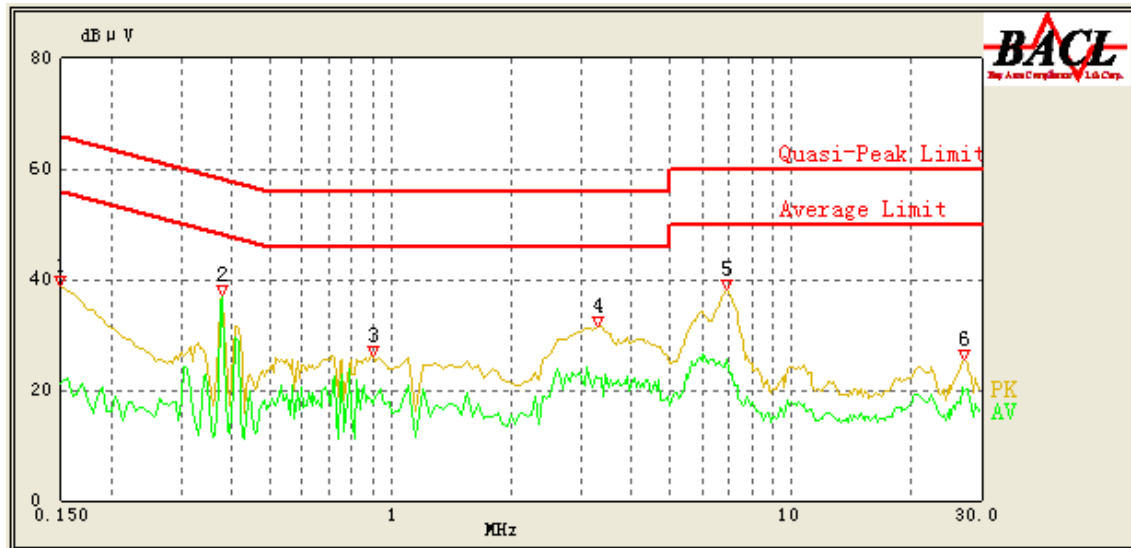


Frequency (MHz)	Corrected Amplitude (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.150	38.87	QP	9.000	N	16.06	66.00	27.13	Compliance
0.150	20.59	AV	9.000	N	16.06	56.00	35.41	Compliance
0.380	35.31	QP	9.000	N	16.09	59.43	24.12	Compliance
0.380	33.04	AV	9.000	N	16.09	49.43	16.39	Compliance
0.815	24.92	QP	9.000	N	15.97	56.00	31.08	Compliance
0.810	17.59	AV	9.000	N	15.97	46.00	28.41	Compliance
2.600	30.08	QP	9.000	N	15.90	56.00	25.92	Compliance
2.600	23.71	AV	9.000	N	15.90	46.00	22.29	Compliance
7.050	36.95	QP	9.000	N	15.92	60.00	23.05	Compliance
7.050	23.78	AV	9.000	N	15.92	50.00	26.22	Compliance
18.500	25.45	QP	9.000	N	16.11	60.00	34.55	Compliance
18.400	17.79	AV	9.000	N	16.11	50.00	32.21	Compliance

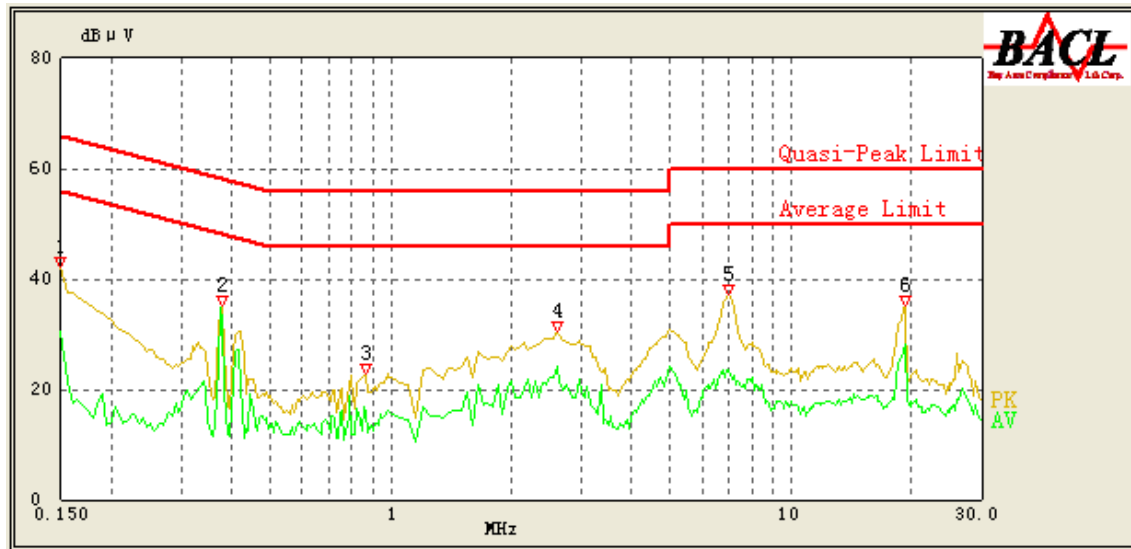
**Note:**

1) Corrected Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

2) Margin (dB) = Limit (dBμV) – Corrected Amplitude (dBμV)

**For BLE Mode:***EUT operation mode: Transmitting in high channel (worst case)***AC 120V/60 Hz, Line**

Frequency (MHz)	Corrected Amplitude (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.150	38.70	QP	9.000	L1	16.06	66.00	27.30	Compliance
0.150	21.22	AV	9.000	L1	16.06	56.00	34.78	Compliance
0.380	37.30	QP	9.000	L1	16.05	59.43	22.13	Compliance
0.380	36.79	AV	9.000	L1	16.05	49.43	12.64	Compliance
0.905	26.30	QP	9.000	L1	15.90	56.00	29.70	Compliance
0.905	17.65	AV	9.000	L1	15.90	46.00	28.35	Compliance
3.300	31.56	QP	9.000	L1	15.85	56.00	24.44	Compliance
3.300	22.22	AV	9.000	L1	15.85	46.00	23.78	Compliance
6.900	38.08	QP	9.000	L1	15.97	60.00	21.92	Compliance
6.900	25.45	AV	9.000	L1	15.97	50.00	24.55	Compliance
27.050	25.54	QP	9.000	L1	16.51	60.00	34.46	Compliance
27.050	19.92	AV	9.000	L1	16.51	50.00	30.08	Compliance

**AC 120V/60 Hz, Neutral**

Frequency (MHz)	Corrected Amplitude (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.150	42.29	QP	9.000	N	16.06	66.00	23.71	Compliance
0.150	30.60	AV	9.000	N	16.06	56.00	25.40	Compliance
0.380	35.10	QP	9.000	N	16.09	59.43	24.33	Compliance
0.380	32.65	AV	9.000	N	16.09	49.43	16.78	Compliance
0.865	22.69	QP	9.000	N	15.96	56.00	33.31	Compliance
0.865	16.00	AV	9.000	N	15.96	46.00	30.00	Compliance
2.600	30.46	QP	9.000	N	15.90	56.00	25.54	Compliance
2.600	24.15	AV	9.000	N	15.90	46.00	21.85	Compliance
7.000	37.15	QP	9.000	N	15.92	60.00	22.85	Compliance
7.000	23.65	AV	9.000	N	15.92	50.00	26.35	Compliance
19.300	35.16	QP	9.000	N	16.14	60.00	24.84	Compliance
19.300	28.25	AV	9.000	N	16.14	50.00	21.75	Compliance

**Note:**

- 1) Corrected Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
- 2) Margin (dB) = Limit (dBμV) – Corrected Amplitude (dBμV)

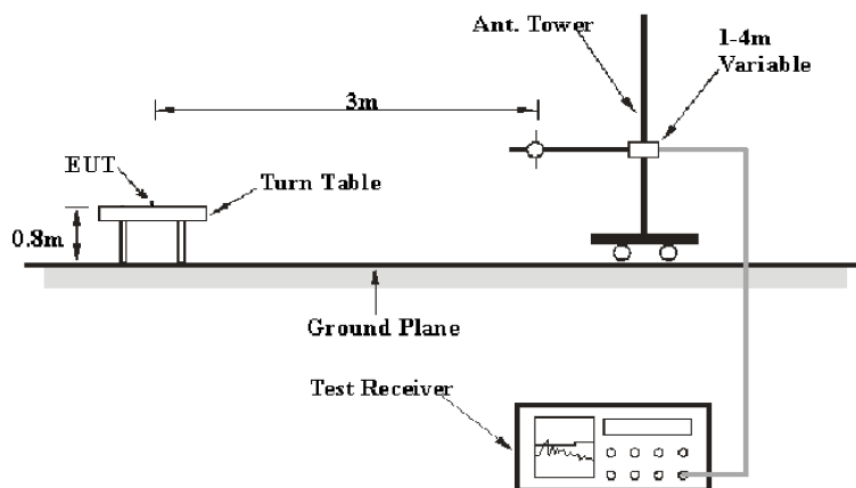
## FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

### Applicable Standard

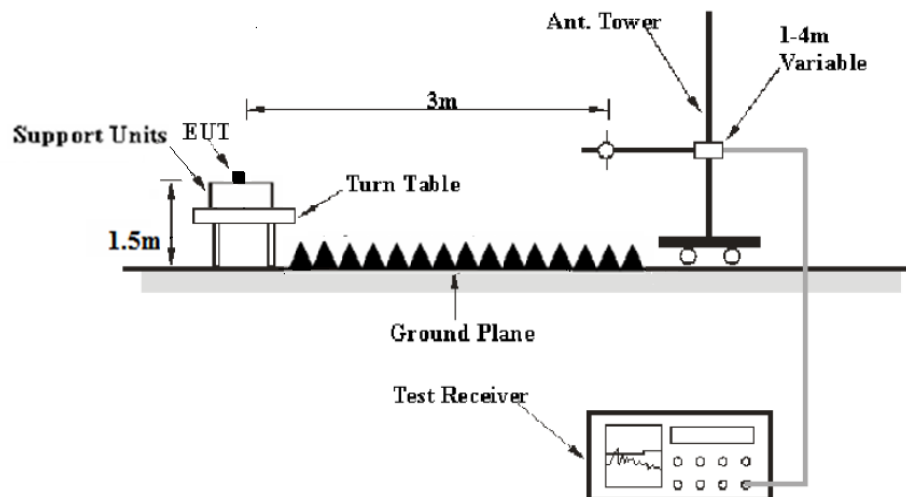
FCC §15.247 (d); §15.209; §15.205;

### 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 Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	PK
	1MHz	3 MHz	/	Ave.

### Test Procedure

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 12.1 and 12.2. and ANSI C63.10-2013 clause 6.5, 6.6 and 6.7.

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 mode 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:

$$\text{Corrected Amplitude (dB}\mu\text{V /m)} = \text{Meter Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)}$$

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:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V/m)} - \text{Corrected Amplitude (dB}\mu\text{V /m)}$$

### 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.

**Test Data****Environmental Conditions**

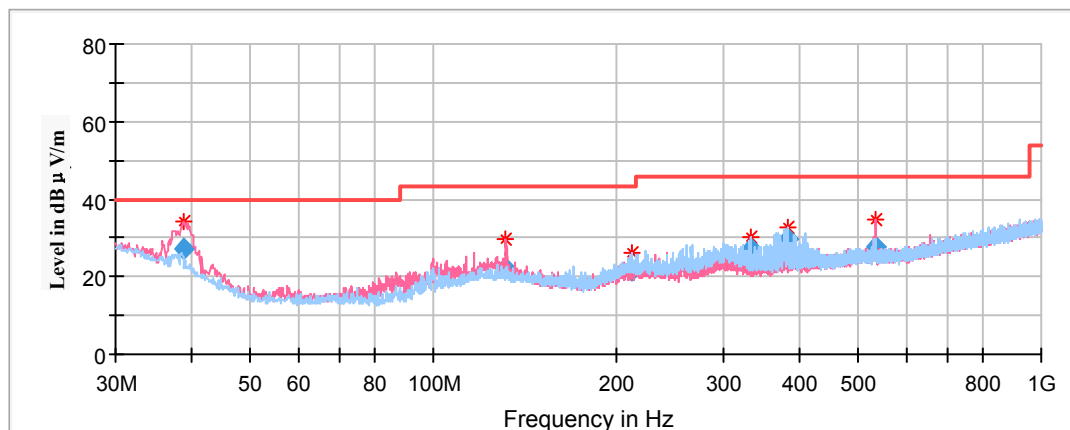
<b>Temperature:</b>	24.1 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.2kPa

The testing was performed by Max Min on 2018-02-22 to 2018-06-13.

EUT operation mode: Transmitting

**For Wi-Fi Mode:****Spurious Emission Test:****30MHz-1GHz:**

Pre-scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **low channel of 802.11b mode in X-axis of orientation** was recorded



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	QuasiPeak (dBμV/m)	Height (cm)	Polar (H/V)				
38.851250	27.04	101.0	V	299.0	-10.4	40.00	12.96
131.728750	22.36	101.0	V	253.0	-12.1	43.50	21.14
211.996250	21.42	101.0	H	64.0	-12.7	43.50	22.08
333.003750	26.97	199.0	V	189.0	-10.2	46.00	19.03
383.322500	29.73	101.0	H	187.0	-9.0	46.00	16.27
532.945000	27.54	101.0	V	47.0	-5.9	46.00	18.46



**1GHz-18GHz:****802.11b Mode:**

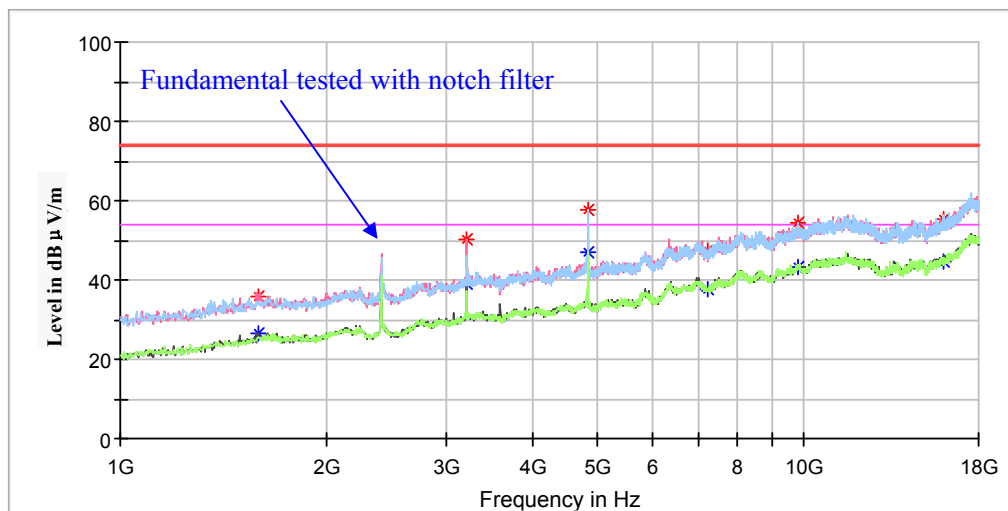
(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)

Note:

1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)  
 Corrected Amplitude (dB $\mu$ V /m) = Corrected Factor (dB/m) + Reading (dB $\mu$ V)  
 Margin (dB) = Limit (dB $\mu$ V/m) – Corrected Amplitude (dB $\mu$ V /m)

**Low Channel: 2412MHz**

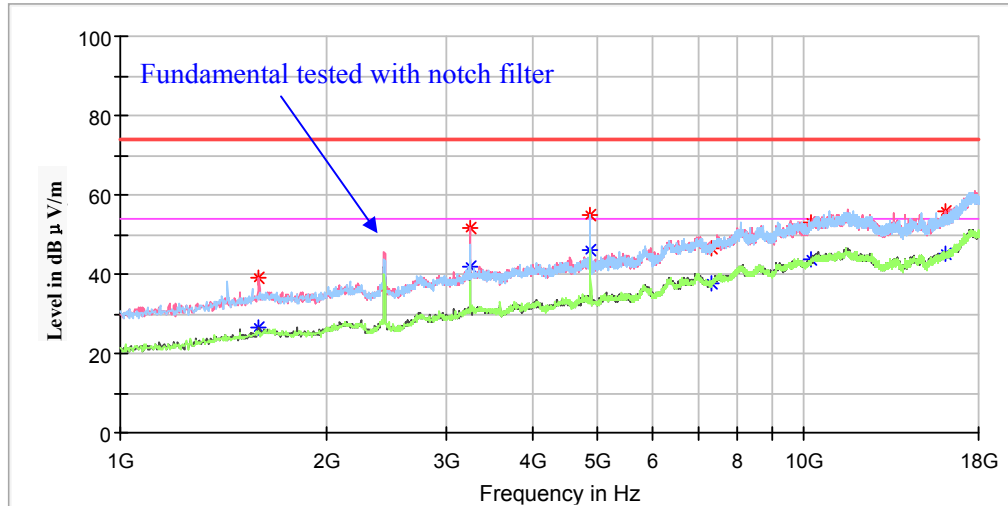
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1591.600000	---	26.70	200.0	V	194.0	-7.6	54.00	27.30
1591.600000	36.01	---	200.0	V	194.0	-7.6	74.00	37.99
3213.400000	---	39.25	150.0	V	181.0	-1.5	54.00	14.75
3213.400000	50.38	---	150.0	V	181.0	-1.5	74.00	23.62
4824.000000	---	47.16	200.0	H	203.0	2.5	54.00	6.84
4824.000000	57.56	---	200.0	H	203.0	2.5	74.00	16.44
7236.000000	---	37.48	100.0	V	228.0	9.8	54.00	16.52
7236.000000	47.49	---	100.0	V	228.0	9.8	74.00	26.51
9802.600000	---	43.14	150.0	V	212.0	14.9	54.00	10.86
9802.600000	54.37	---	150.0	V	212.0	14.9	74.00	19.63
15960.000000	---	44.80	150.0	V	101.0	17.6	54.00	9.20
15960.000000	55.47	---	150.0	V	101.0	17.6	74.00	18.53

**Middle Channel: 2437MHz**

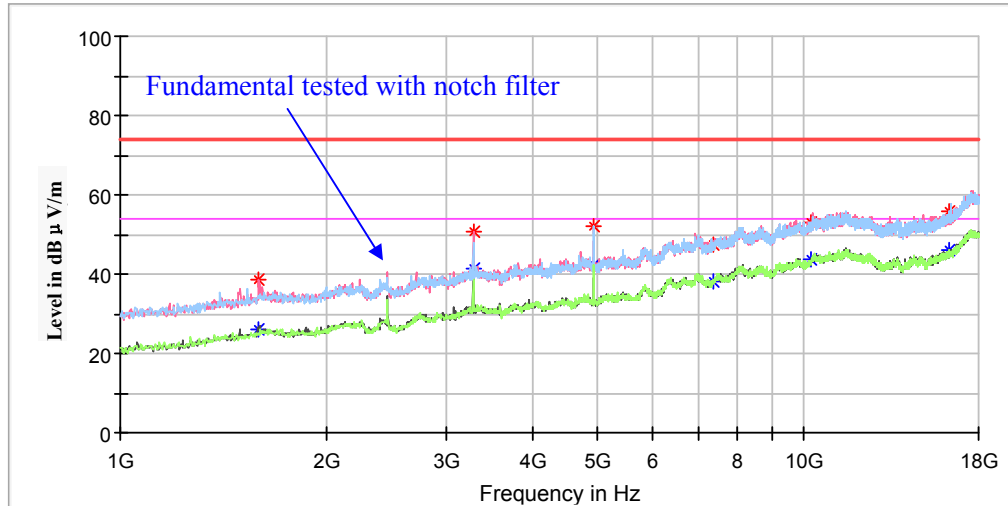
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1595.000000	---	26.33	150.0	V	132.0	-7.6	54.00	27.67
1595.000000	39.02	---	150.0	V	132.0	-7.6	74.00	34.98
3247.400000	---	42.06	150.0	V	227.0	-1.5	54.00	11.94
3247.400000	51.72	---	150.0	V	227.0	-1.5	74.00	22.28
4874.000000	---	46.16	100.0	H	211.0	2.6	54.00	7.84
4874.000000	54.72	---	100.0	H	211.0	2.6	74.00	19.28
7311.000000	---	37.55	200.0	V	22.0	10.0	54.00	16.45
7311.000000	46.40	---	200.0	V	22.0	10.0	74.00	27.60
10237.800000	---	43.77	150.0	H	259.0	15.9	54.00	10.23
10237.800000	53.07	---	150.0	H	259.0	15.9	74.00	20.93
16058.600000	---	44.97	150.0	V	180.0	17.8	54.00	9.03
16058.600000	55.91	---	150.0	V	180.0	17.8	74.00	18.09

**High Channel: 2462MHz**

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1595.000000	---	26.06	150.0	V	149.0	-7.6	54.00	27.94
1595.000000	38.41	---	150.0	V	149.0	-7.6	74.00	35.59
3281.400000	---	41.47	150.0	V	228.0	-1.4	54.00	12.53
3281.400000	50.88	---	150.0	V	228.0	-1.4	74.00	23.12
4924.000000	---	42.50	100.0	H	195.0	2.7	54.00	11.50
4924.000000	51.95	---	100.0	H	195.0	2.7	74.00	22.05
7386.000000	---	38.23	150.0	H	54.0	10.1	54.00	15.77
7386.000000	47.40	---	150.0	H	54.0	10.1	74.00	26.60
10261.600000	---	43.53	150.0	V	0.0	16.0	54.00	10.47
10261.600000	52.96	---	150.0	V	0.0	16.0	74.00	21.04
16306.800000	---	46.27	200.0	H	52.0	18.3	54.00	7.73
16306.800000	55.79	---	200.0	H	52.0	18.3	74.00	18.21

**802.11g Mode:**

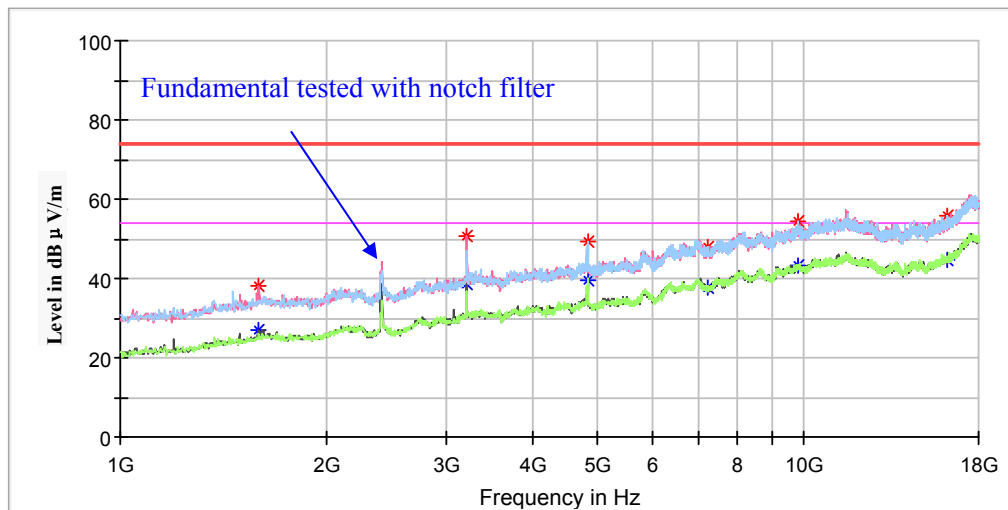
(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)

Note:

1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)  
 Corrected Amplitude (dB $\mu$ V /m) = Corrected Factor (dB/m) + Reading (dB $\mu$ V)  
 Margin (dB) = Limit (dB $\mu$ V/m) – Corrected Amplitude (dB $\mu$ V /m)

**Low Channel: 2412MHz**

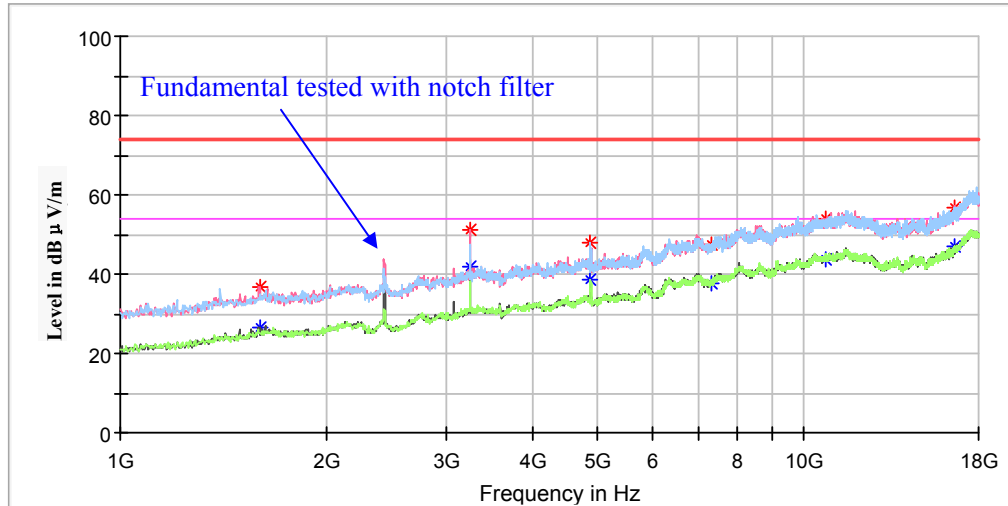
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1595.000000	---	26.75	150.0	V	181.0	-7.6	54.00	27.25
1595.000000	38.20	---	150.0	V	181.0	-7.6	74.00	35.80
3213.400000	---	38.83	150.0	V	181.0	-1.5	54.00	15.17
3213.400000	50.65	---	150.0	V	181.0	-1.5	74.00	23.35
4824.000000	---	39.48	200.0	H	196.0	2.5	54.00	14.52
4824.000000	49.09	---	200.0	H	196.0	2.5	74.00	24.91
7236.000000	---	37.75	150.0	H	0.0	9.8	54.00	16.25
7236.000000	47.72	---	150.0	H	0.0	9.8	74.00	26.28
9806.000000	---	43.36	200.0	H	337.0	14.9	54.00	10.64
9806.000000	54.37	---	200.0	H	337.0	14.9	74.00	19.63
16245.600000	---	44.80	150.0	V	322.0	18.2	54.00	9.20
16245.600000	55.75	---	150.0	V	322.0	18.2	74.00	18.25

**Middle Channel: 2437MHz**

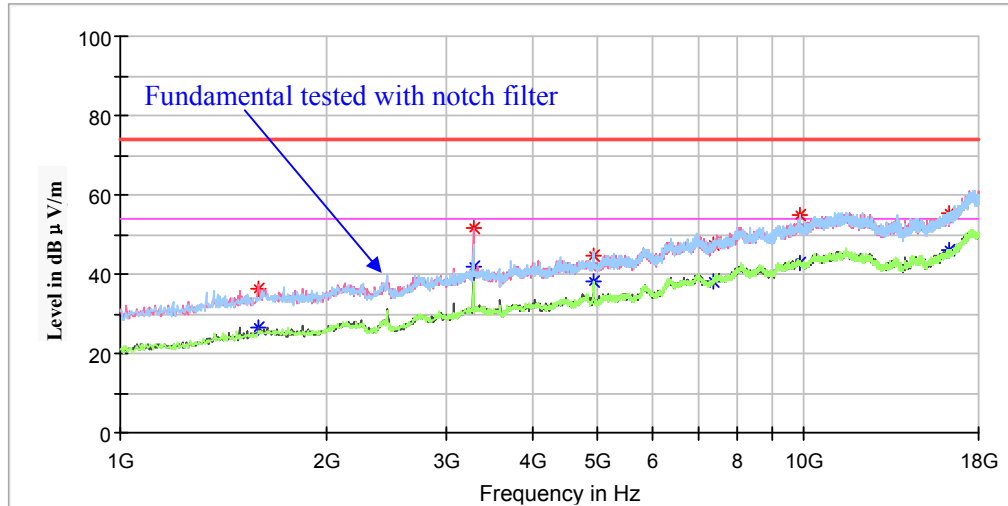
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1598.400000	---	26.39	150.0	V	181.0	-7.6	54.00	27.61
1598.400000	36.69	---	150.0	V	181.0	-7.6	74.00	37.31
3247.400000	---	41.72	150.0	V	228.0	-1.5	54.00	12.28
3247.400000	51.35	---	150.0	V	228.0	-1.5	74.00	22.65
4874.000000	---	38.60	200.0	H	180.0	2.6	54.00	15.40
4874.000000	47.71	---	200.0	H	180.0	2.6	74.00	26.29
7311.000000	---	37.82	150.0	H	54.0	10.0	54.00	16.18
7311.000000	47.30	---	150.0	H	54.0	10.0	74.00	26.70
10775.000000	---	43.68	100.0	V	306.0	17.1	54.00	10.32
10775.000000	53.83	---	100.0	V	306.0	17.1	74.00	20.17
16606.000000	---	47.12	150.0	H	308.0	19.1	54.00	6.88
16606.000000	56.90	---	150.0	H	308.0	19.1	74.00	17.10

**High Channel: 2462MHz**

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1595.000000	---	26.37	150.0	V	196.0	-7.6	54.00	27.63
1595.000000	36.51	---	150.0	V	196.0	-7.6	74.00	37.49
3281.400000	---	41.69	150.0	V	228.0	-1.4	54.00	12.31
3281.400000	51.78	---	150.0	V	228.0	-1.4	74.00	22.22
4924.000000	---	38.15	150.0	H	211.0	2.7	54.00	15.85
4924.000000	44.71	---	150.0	H	211.0	2.7	74.00	29.29
7386.000000	---	38.16	200.0	H	356.0	10.1	54.00	15.84
7386.000000	47.50	---	200.0	H	356.0	10.1	74.00	26.50
9836.600000	---	42.80	150.0	H	125.0	14.9	54.00	11.20
9836.600000	54.71	---	150.0	H	125.0	14.9	74.00	19.29
16313.600000	---	46.24	200.0	H	94.0	18.3	54.00	7.76
16313.600000	55.46	---	200.0	H	94.0	18.3	74.00	18.54

**802.11n-HT20 Mode:**

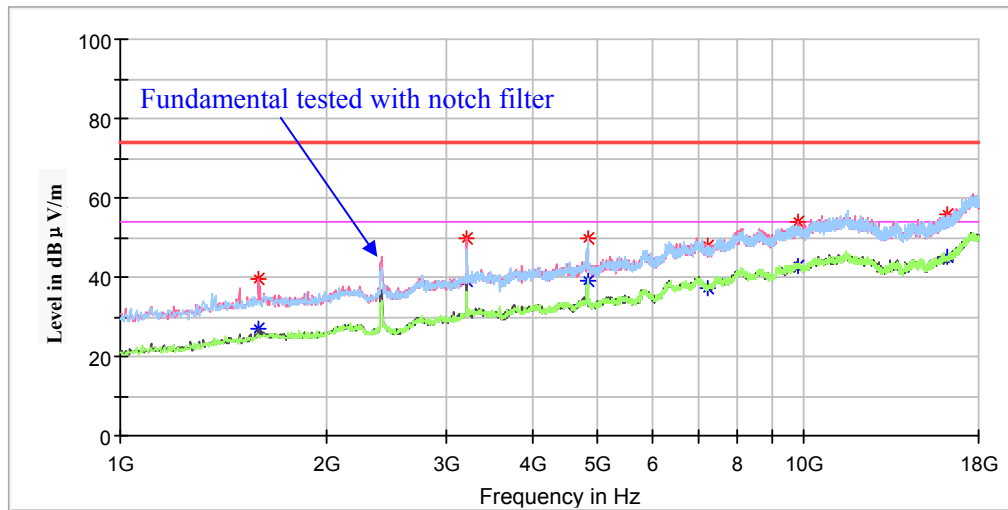
(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)

Note:

1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)  
 Corrected Amplitude (dB $\mu$ V /m) = Corrected Factor (dB/m) + Reading (dB $\mu$ V)  
 Margin (dB) = Limit (dB $\mu$ V/m) – Corrected Amplitude (dB $\mu$ V /m)

**Low Channel: 2412MHz**

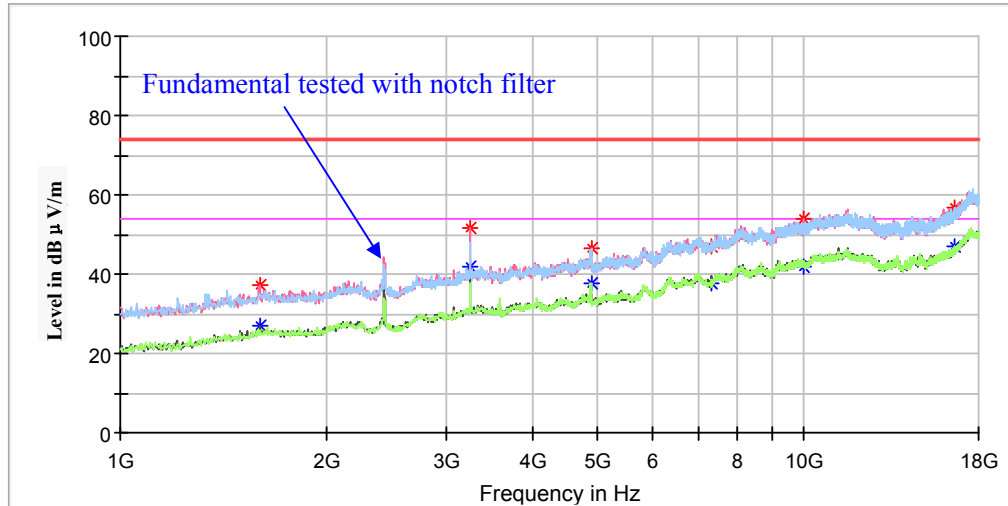
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1591.600000	---	27.02	150.0	V	133.0	-7.6	54.00	26.98
1591.600000	39.36	---	150.0	V	133.0	-7.6	74.00	34.64
3213.400000	---	39.12	150.0	V	180.0	-1.5	54.00	14.88
3213.400000	49.71	---	150.0	V	180.0	-1.5	74.00	24.29
4824.000000	---	38.96	200.0	H	52.0	2.5	54.00	15.04
4824.000000	49.58	---	200.0	H	52.0	2.5	74.00	24.42
7236.000000	---	37.25	200.0	H	0.0	9.8	54.00	16.75
7236.000000	47.79	---	200.0	H	0.0	9.8	74.00	26.21
9782.200000	---	42.84	150.0	V	24.0	14.9	54.00	11.16
9782.200000	53.95	---	150.0	V	24.0	14.9	74.00	20.05
16204.800000	---	45.14	200.0	V	325.0	18.1	54.00	8.86
16204.800000	55.78	---	200.0	V	325.0	18.1	74.00	18.22

**Middle Channel: 2437MHz**

Full Spectrum

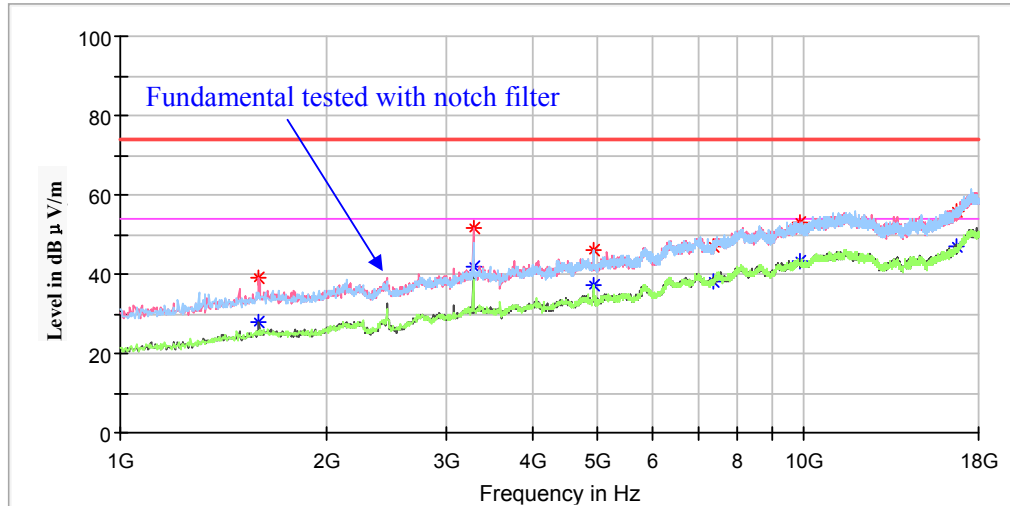


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1598.400000	---	27.20	200.0	V	158.0	-7.6	54.00	26.80
1598.400000	37.18	---	200.0	V	158.0	-7.6	74.00	36.82
3247.400000	51.80	---	200.0	V	236.0	-1.5	74.00	22.20
3247.400000	---	42.03	200.0	V	236.0	-1.5	54.00	11.97
4874.000000	46.63	---	200.0	H	196.0	2.6	74.00	27.37
4874.000000	---	37.66	200.0	H	196.0	2.6	54.00	16.34
7311.000000	47.14	---	200.0	H	274.0	10.0	74.00	26.86
7311.000000	---	37.79	200.0	V	274.0	10.0	54.00	16.21
9986.200000	53.77	---	150.0	V	358.0	14.9	74.00	20.23
9986.200000	---	41.93	150.0	V	358.0	14.9	54.00	12.07
16589.000000	---	46.77	200.0	H	321.0	19.0	54.00	7.23
16589.000000	56.72	---	200.0	H	321.0	19.0	74.00	17.28



**High Channel: 2462MHz**

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1595.000000	---	27.87	200.0	V	164.0	-7.6	54.00	26.13
1595.000000	39.13	---	200.0	V	164.0	-7.6	74.00	34.87
3281.400000	51.54	---	150.0	V	228.0	-1.4	74.00	22.46
3281.400000	---	42.03	150.0	V	228.0	-1.4	54.00	11.97
4924.000000	46.10	---	200.0	H	195.0	2.8	74.00	27.90
4924.000000	---	37.32	200.0	H	195.0	2.8	54.00	16.68
7386.000000	---	37.97	150.0	H	226.0	10.1	54.00	16.03
7386.000000	46.99	---	150.0	H	226.0	10.1	74.00	27.01
9836.600000	---	43.37	150.0	V	356.0	14.9	54.00	10.63
9836.600000	52.97	---	150.0	V	356.0	14.9	74.00	21.03
16687.600000	---	46.76	200.0	V	195.0	19.5	54.00	7.24
16687.600000	55.88	---	200.0	V	195.0	19.5	74.00	18.12

**802.11n-HT40 Mode:**

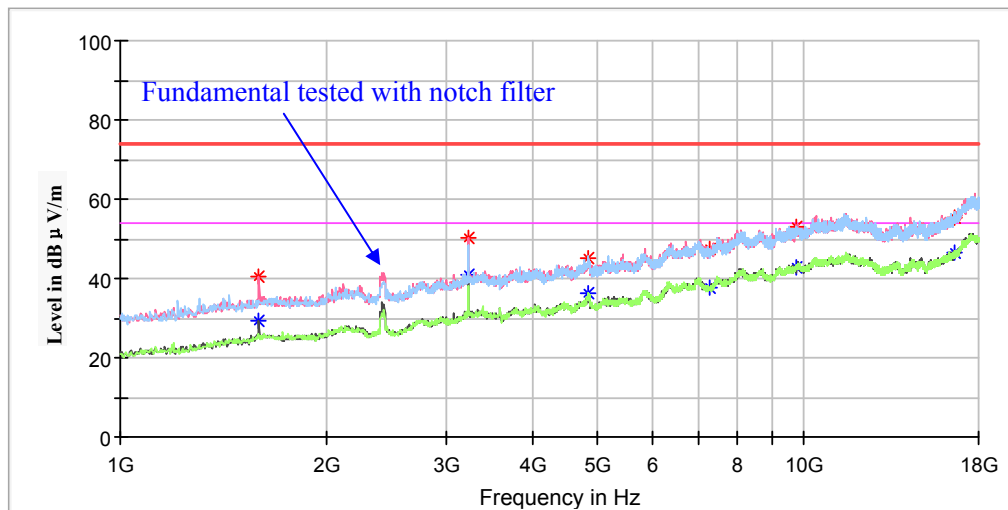
(Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)

Note:

1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)  
 Corrected Amplitude (dB $\mu$ V /m) = Corrected Factor (dB/m) + Reading (dB $\mu$ V)  
 Margin (dB) = Limit (dB $\mu$ V/m) – Corrected Amplitude (dB $\mu$ V /m)

**Low Channel: 2422MHz**

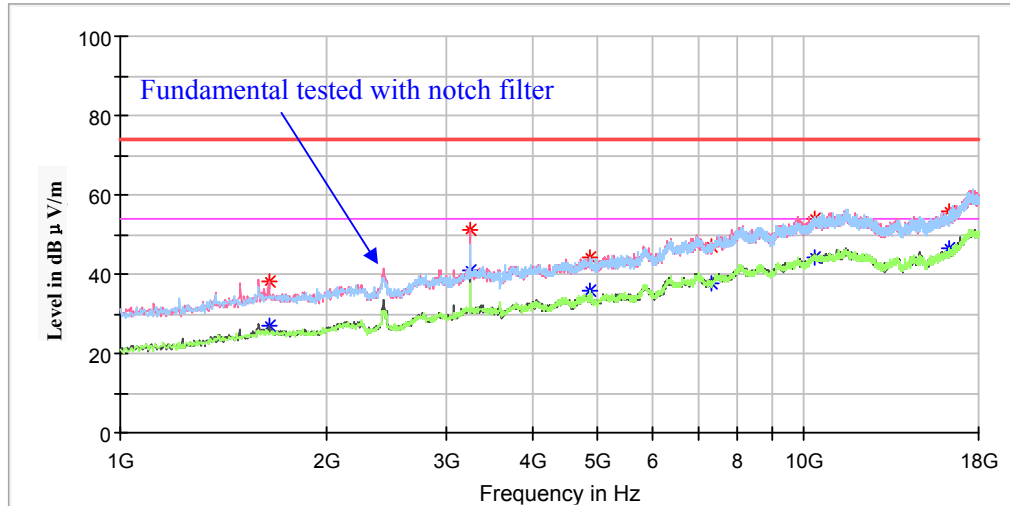
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1595.000000	---	29.11	200.0	V	179.0	-7.6	54.00	24.89
1595.000000	40.26	---	200.0	V	179.0	-7.6	74.00	33.74
3227.000000	---	40.93	150.0	V	228.0	-1.5	54.00	13.07
3227.000000	50.40	---	150.0	V	228.0	-1.5	74.00	23.60
4844.000000	---	36.44	200.0	H	163.0	2.6	54.00	17.56
4844.000000	45.16	---	200.0	H	163.0	2.6	74.00	28.84
7266.000000	---	37.52	150.0	H	337.0	9.9	54.00	16.48
7266.000000	47.24	---	150.0	H	337.0	9.9	74.00	26.76
9758.400000	---	42.88	150.0	H	47.0	14.9	54.00	11.12
9758.400000	53.16	---	150.0	H	47.0	14.9	74.00	20.84
16565.200000	---	46.33	200.0	H	273.0	18.9	54.00	7.67
16565.200000	55.34	---	200.0	H	273.0	18.9	74.00	18.66

**Middle Channel: 2437MHz**

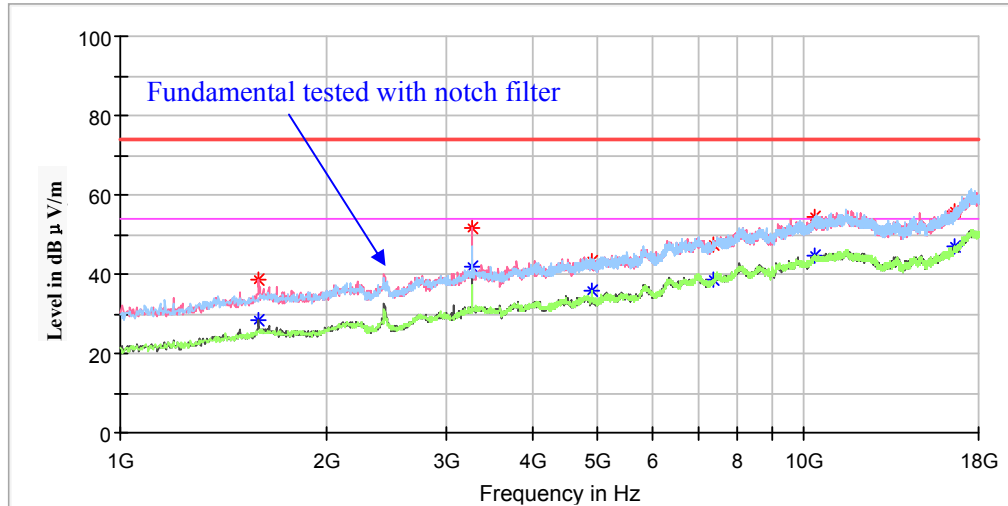
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1649.400000	---	27.10	150.0	V	260.0	-7.4	54.00	26.90
1649.400000	38.02	---	150.0	V	260.0	-7.4	74.00	35.98
3247.400000	---	40.98	150.0	V	228.0	-1.5	54.00	13.02
3247.400000	51.07	---	150.0	V	228.0	-1.5	74.00	22.93
4874.000000	---	35.89	200.0	H	210.0	2.6	54.00	18.11
4874.000000	44.07	---	200.0	H	210.0	2.6	74.00	29.93
7311.000000	---	37.59	150.0	V	0.0	10.0	54.00	16.41
7311.000000	47.01	---	150.0	V	0.0	10.0	74.00	26.99
10387.400000	---	44.17	150.0	V	150.0	16.5	54.00	9.83
10387.400000	54.14	---	150.0	V	150.0	16.5	74.00	19.86
16306.800000	---	46.60	150.0	H	38.0	18.3	54.00	7.40
16306.800000	55.63	---	150.0	H	38.0	18.3	74.00	18.37

**High Channel: 2452MHz**

Full Spectrum

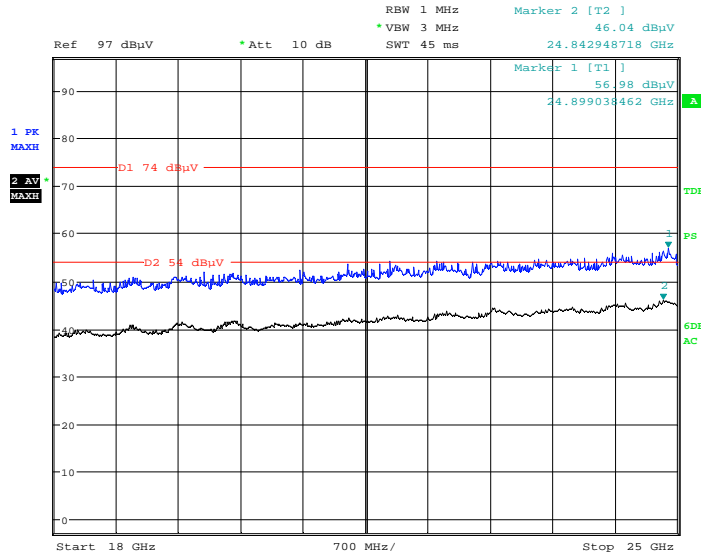


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1591.600000	---	28.59	200.0	V	188.0	-7.6	54.00	25.41
1591.600000	38.76	---	200.0	V	188.0	-7.6	74.00	35.24
3267.800000	---	41.70	200.0	V	236.0	-1.4	54.00	12.30
3267.800000	51.71	---	200.0	V	236.0	-1.4	74.00	22.29
4904.000000	---	35.67	150.0	H	210.0	2.7	54.00	18.33
4904.000000	43.39	---	150.0	H	210.0	2.7	74.00	30.61
7356.000000	---	38.38	150.0	V	265.0	10.0	54.00	15.62
7356.000000	47.32	---	150.0	V	265.0	10.0	74.00	26.68
10353.400000	---	44.76	150.0	H	0.0	16.4	54.00	9.24
10353.400000	54.52	---	150.0	H	0.0	16.4	74.00	19.48
16599.200000	---	47.08	150.0	V	281.0	19.1	54.00	6.92
16599.200000	55.82	---	150.0	V	281.0	19.1	74.00	18.18

# 18GHz-25GHz:

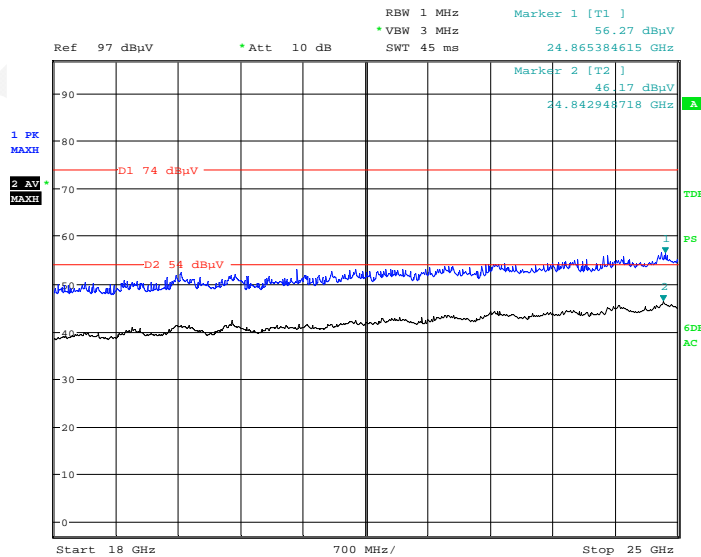
Pre-scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **low channel of 802.11b mode in X-axis of orientation** was recorded

## Horizontal



Date: 13.JUN.2018 21:20:40

## Vertical



Date: 13.JUN.2018 21:30:19

**Fundamental Test & Restricted Bands Emissions Test:**

Note:

1. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)

Corrected Amplitude (dB $\mu$ V /m) = Corrected Factor (dB/m) + Reading (dB $\mu$ V)Margin (dB) = Limit (dB $\mu$ V/m) – Corrected Amplitude (dB $\mu$ V /m)**802.11b Mode:** (Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412.000000	109.25	---	100.0	V	75.0	5.1	/	/
2412.000000	---	102.46	100.0	V	75.0	5.1	/	/
2412.000000	106.63	---	150.0	H	179.0	5.1	/	/
2412.000000	---	99.72	150.0	H	179.0	5.1	/	/
2390.000000	49.98	---	200.0	V	288.0	5.1	74.00	24.02
2390.000000	---	39.48	200.0	V	288.0	5.1	54.00	14.52
Middle Channel: 2437MHz								
2437.000000	108.58	---	200.0	V	230.0	5.2	/	/
2437.000000	---	101.74	200.0	V	230.0	5.2	/	/
2437.000000	105.06	---	200.0	H	37.0	5.2	/	/
2437.000000	---	98.25	200.0	H	37.0	5.2	/	/
High Channel: 2462MHz								
2462.000000	108.36	---	200.0	V	95.0	5.2	/	/
2462.000000	---	101.76	200.0	V	95.0	5.2	/	/
2462.000000	105.75	---	250.0	H	253.0	5.2	/	/
2462.000000	---	98.44	250.0	H	253.0	5.2	/	/
2483.500000	53.71	---	250.0	V	128.0	5.3	74.00	20.29
2483.500000	---	44.41	250.0	V	128.0	5.3	54.00	9.59

**802.11g Mode:** (Pre-scan in the X, Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412.000000	104.25	---	150.0	V	193.0	5.1	/	/
2412.000000	---	97.89	150.0	V	193.0	5.1	/	/
2412.000000	101.48	---	150.0	H	118.0	5.1	/	/
2412.000000	---	94.35	150.0	H	118.0	5.1	/	/
2390.000000	52.99	---	200.0	V	22.0	5.1	74.00	21.01
2390.000000	---	41.08	200.0	V	22.0	5.1	54.00	12.92
Middle Channel: 2437MHz								
2437.000000	104.08	---	200.0	V	190.0	5.2	/	/
2437.000000	---	96.46	200.0	V	190.0	5.2	/	/
2437.000000	101.65	---	100.0	H	219.0	5.2	/	/
2437.000000	---	93.15	100.0	H	219.0	5.2	/	/
High Channel: 2462MHz								
2462.000000	103.27	---	100.0	V	110.0	5.3	/	/
2462.000000	---	96.56	100.0	V	110.0	5.3	/	/
2462.000000	100.58	---	100.0	H	287.0	5.3	/	/
2462.000000	---	93.28	100.0	H	287.0	5.3	/	/
2483.500000	61.36	---	250.0	V	293.0	5.3	74.00	12.64
2483.500000	---	48.75	250.0	V	293.0	5.3	54.00	5.25

**802.11n-HT20 Mode:** (Pre-scan in the X, Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2412MHz								
2412.000000	104.68	---	250.0	V	18.0	5.1	/	/
2412.000000	---	97.46	250.0	V	18.0	5.1	/	/
2412.000000	101.26	---	200.0	H	95.0	5.1	/	/
2412.000000	---	94.09	200.0	H	95.0	5.1	/	/
2390.000000	51.20	---	200.0	V	88.0	5.1	74.00	22.80
2390.000000	---	40.30	200.0	V	88.0	5.1	54.00	13.70
Middle Channel: 2437MHz								
2437.000000	104.85	---	500.0	V	352.0	5.2	/	/
2437.000000	---	97.46	500.0	V	352.0	5.2	/	/
2437.000000	101.35	---	150.0	H	308.0	5.2	/	/
2437.000000	---	94.18	150.0	H	308.0	5.2	/	/
High Channel: 2462MHz								
2462.000000	102.86	---	100.0	V	143.0	5.3	/	/
2462.000000	---	95.79	100.0	V	143.0	5.3	/	/
2462.000000	99.46	---	200.0	H	82.0	5.3	/	/
2462.000000	---	92.64	200.0	H	82.0	5.3	/	/
2483.500000	61.07	---	150.0	V	335.0	5.3	74.00	12.93
2483.500000	---	50.46	150.0	V	335.0	5.3	54.00	3.54

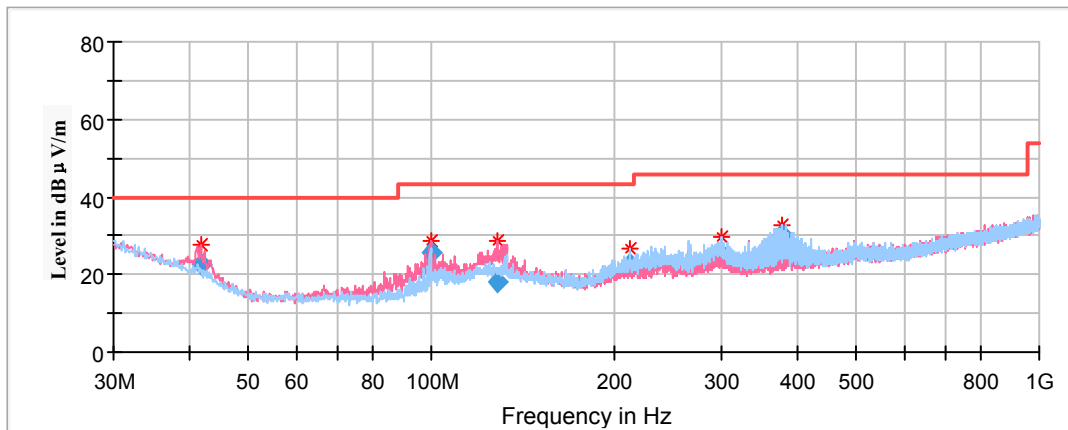


**802.11n-HT40 Mode:** (Pre-scan in the X, Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2422MHz								
2422.000000	101.58	---	100.0	V	266.0	5.1	/	/
2422.000000	---	94.34	100.0	V	266.0	5.1	/	/
2422.000000	98.46	---	100.0	H	149.0	5.1	/	/
2422.000000	---	91.35	100.0	H	149.0	5.1	/	/
2390.000000	50.56	---	200.0	V	98.0	5.1	74.00	23.44
2390.000000	---	41.39	200.0	V	98.0	5.1	54.00	12.61
Middle Channel: 2437MHz								
2437.000000	101.35	---	250.0	V	213.0	5.2	/	/
2437.000000	---	93.76	250.0	V	213.0	5.2	/	/
2437.000000	98.88	---	150.0	H	311.0	5.2	/	/
2437.000000	---	90.32	150.0	H	311.0	5.2	/	/
High Channel: 2452MHz								
2452.000000	100.55	---	200.0	V	255.0	5.3	/	/
2452.000000	---	93.31	200.0	V	255.0	5.3	/	/
2452.000000	97.38	---	150.0	H	358.0	5.3	/	/
2452.000000	---	90.09	150.0	H	358.0	5.3	/	/
2483.500000	52.63	---	200.0	V	197.0	5.3	74.00	21.37
2483.500000	---	43.58	200.0	V	197.0	5.3	54.00	10.42

**For BLE Mode:****Spurious Emission Test:****30MHz-1GHz**

(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **high** channel of operation in the X axis of orientation was recorded)



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	QuasiPeak (dB μ V/m)	Height (cm)	Polar (H/V)				
41.761250	22.61	101.0	V	307.0	-12.4	40.00	17.39
99.840000	25.54	101.0	V	48.0	-15.4	43.50	17.96
128.697500	18.23	198.0	V	175.0	-12.0	43.50	25.27
211.875000	22.39	199.0	H	260.0	-12.7	43.50	21.11
299.296250	24.94	101.0	H	261.0	-11.0	46.00	21.06
377.866250	30.23	101.0	H	174.0	-9.1	46.00	15.77

**1GHz-18GHz**

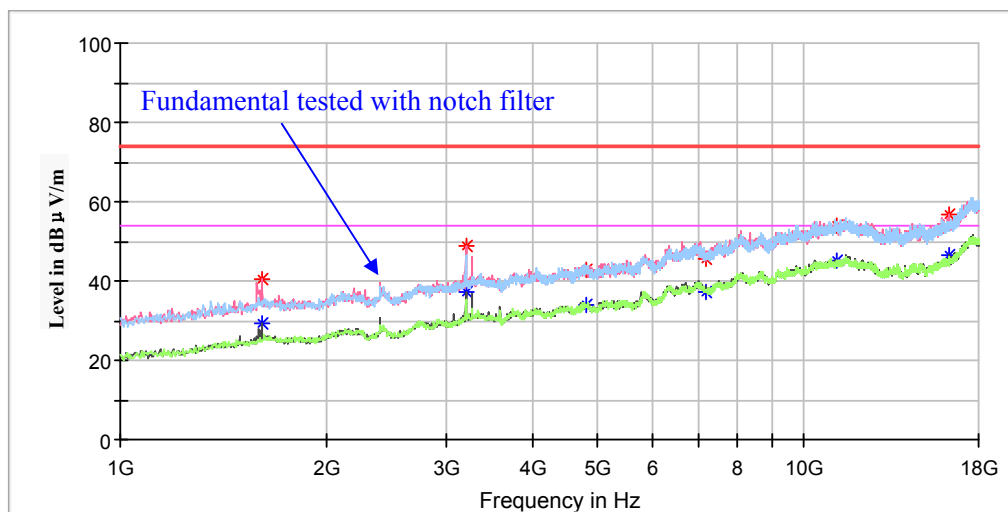
(Pre-scan in the X, Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded)

Note:

1. This test was performed with the 2.4-2.5GHz notch filter.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)  
 Corrected Amplitude (dB $\mu$ V /m) = Corrected Factor (dB/m) + Reading (dB $\mu$ V)  
 Margin (dB) = Limit (dB $\mu$ V/m) – Corrected Amplitude (dB $\mu$ V /m)

**Low Channel: 2402MHz**

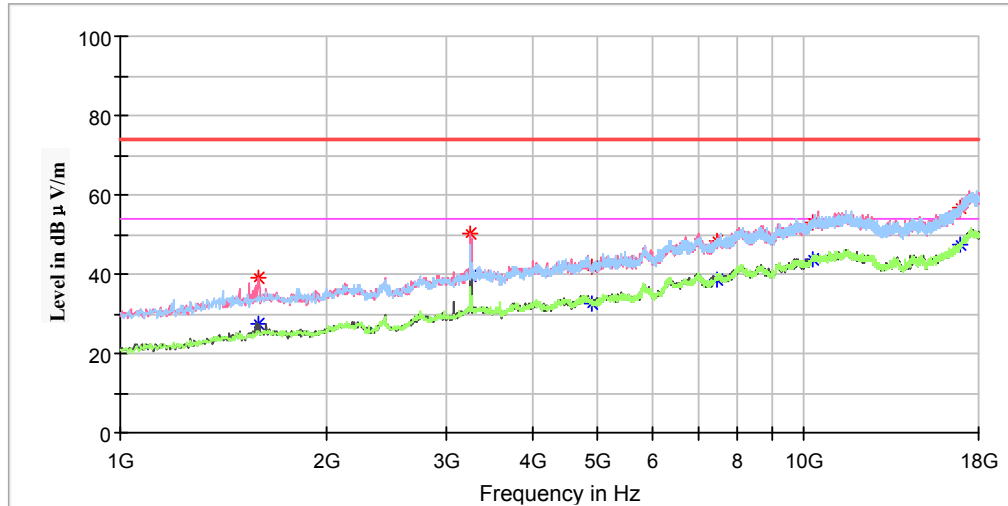
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1612.000000	---	29.15	200.0	V	136.0	-7.5	54.00	24.85
1612.000000	40.49	---	200.0	V	136.0	-7.5	74.00	33.51
3199.800000	---	37.10	150.0	V	198.0	-1.6	54.00	16.90
3199.800000	48.68	---	150.0	V	198.0	-1.6	74.00	25.32
4804.000000	---	33.99	150.0	V	55.0	2.5	54.00	20.01
4804.000000	42.63	---	150.0	V	55.0	2.5	74.00	31.37
7206.000000	---	37.11	150.0	H	250.0	9.8	54.00	16.89
7206.000000	45.47	---	150.0	H	250.0	9.8	74.00	28.53
11179.600000	---	45.30	200.0	V	2.0	17.6	54.00	8.70
11179.600000	53.94	---	200.0	V	2.0	17.6	74.00	20.06
16306.800000	---	46.39	200.0	V	292.0	18.3	54.00	7.61
16306.800000	56.80	---	200.0	V	292.0	18.3	74.00	17.20

**Middle Channel: 2440MHz**

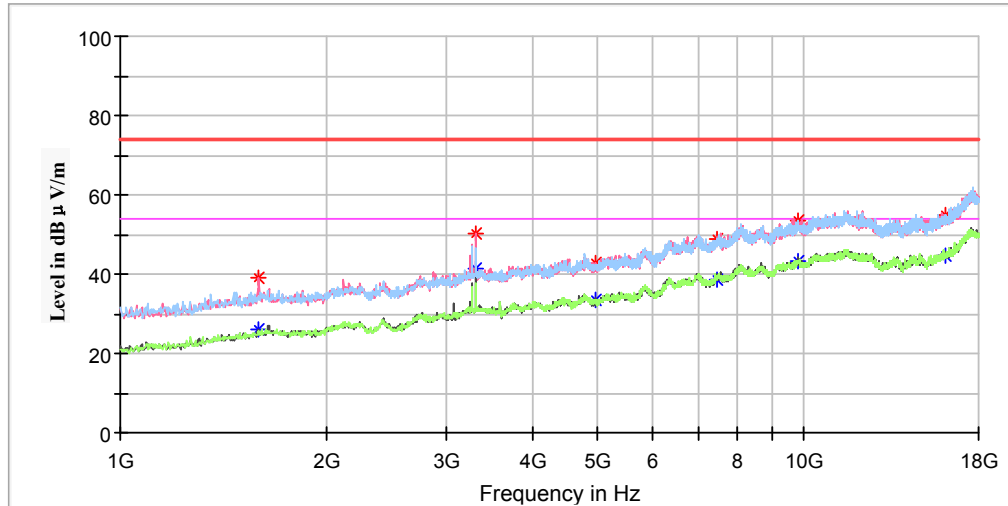
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1595.000000	---	27.48	200.0	V	149.0	-7.6	54.00	26.52
1595.000000	38.86	---	200.0	V	149.0	-7.6	74.00	35.14
3250.800000	50.08	---	150.0	V	195.0	-1.5	74.00	23.92
3250.800000	---	39.57	150.0	V	195.0	-1.5	54.00	14.43
4880.000000	---	32.54	200.0	H	78.0	2.6	54.00	21.46
4880.000000	42.09	---	200.0	H	78.0	2.6	74.00	31.91
7320.000000	---	38.81	150.0	V	148.0	10.1	54.00	15.19
7320.000000	48.34	---	150.0	V	148.0	10.1	74.00	25.66
10268.400000	---	43.89	150.0	V	4.0	16.0	54.00	10.11
10268.400000	52.88	---	150.0	V	4.0	16.0	74.00	21.12
16867.800000	---	47.27	150.0	H	352.0	20.4	54.00	6.73
16867.800000	56.66	---	150.0	H	352.0	20.4	74.00	17.34

**High Channel: 2480MHz**

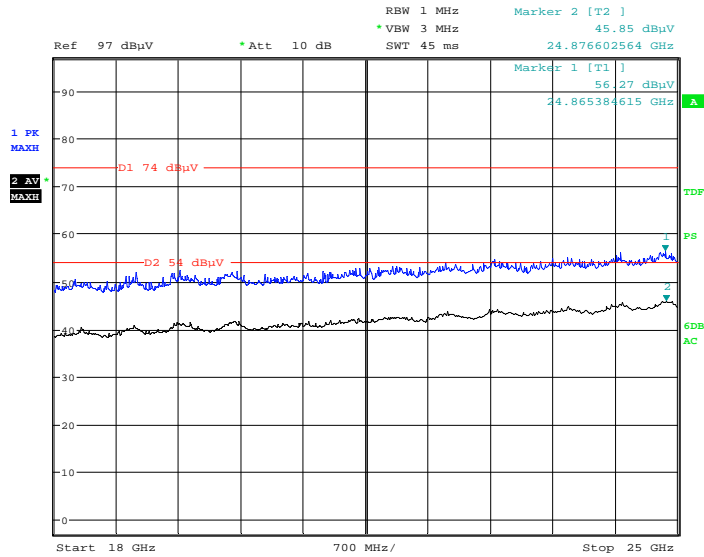
Full Spectrum



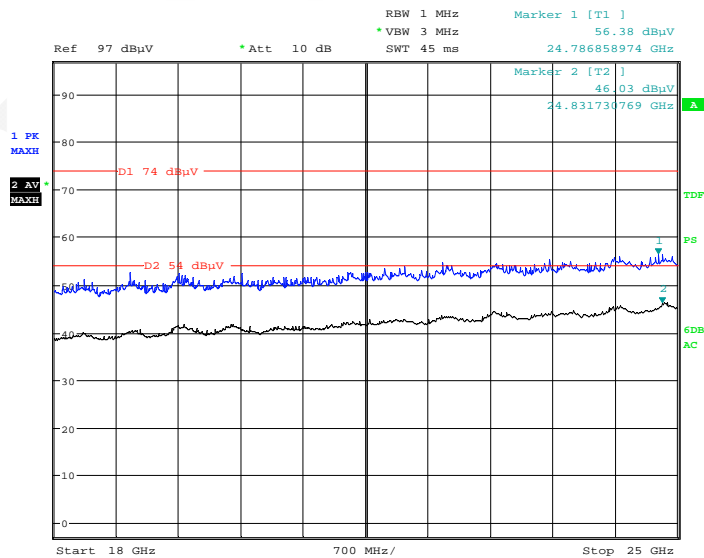
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dB $\mu$ V/m)	Margin (dB)
	MaxPeak (dB $\mu$ V /m)	Average (dB $\mu$ V /m)	Height (cm)	Polar (H/V)				
1595.000000	---	26.23	200.0	V	156.0	-7.6	54.00	27.77
1595.000000	38.94	---	200.0	V	156.0	-7.6	74.00	35.06
3305.200000	---	41.45	150.0	V	189.0	-1.3	54.00	12.55
3305.200000	50.46	---	150.0	V	189.0	-1.3	74.00	23.54
4960.000000	---	33.26	200.0	V	358.0	2.8	54.00	20.74
4960.000000	42.56	---	200.0	V	358.0	2.8	74.00	31.44
7440.000000	---	38.65	200.0	V	352.0	10.1	54.00	15.35
7440.000000	49.05	---	200.0	V	352.0	10.1	74.00	24.95
9792.400000	---	43.34	150.0	H	275.0	14.9	54.00	10.66
9792.400000	53.71	---	150.0	H	275.0	14.9	74.00	20.29
16092.600000	---	44.77	200.0	V	140.0	17.9	54.00	9.23
16092.600000	54.65	---	200.0	V	140.0	17.9	74.00	19.35

**18GHz-25GHz**

(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **high** channel of operation in the X axis of orientation was recorded)

**Horizontal Plot**

Date: 13.JUN.2018 21:40:55

**Vertical Plot**

Date: 13.JUN.2018 21:50:33

**Fundamental Test & Restricted Bands Emissions Test:***(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)*

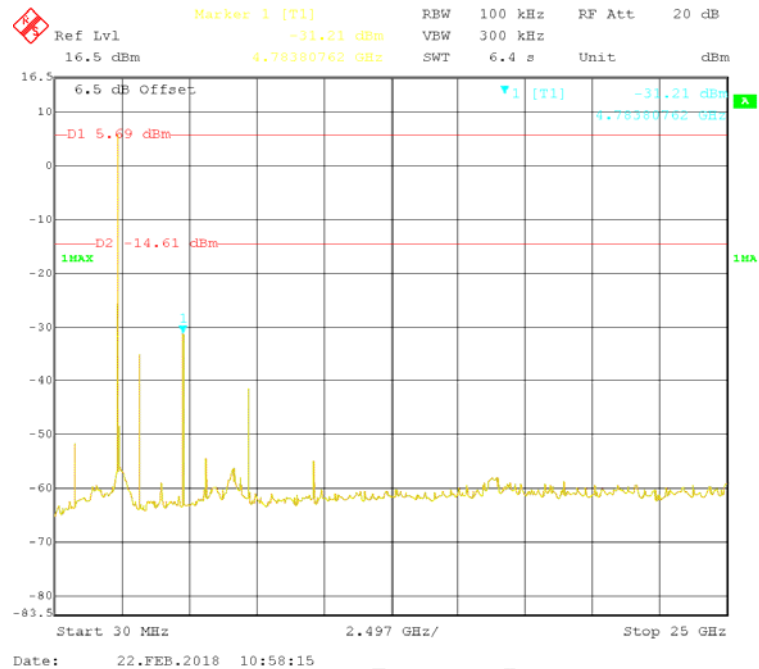
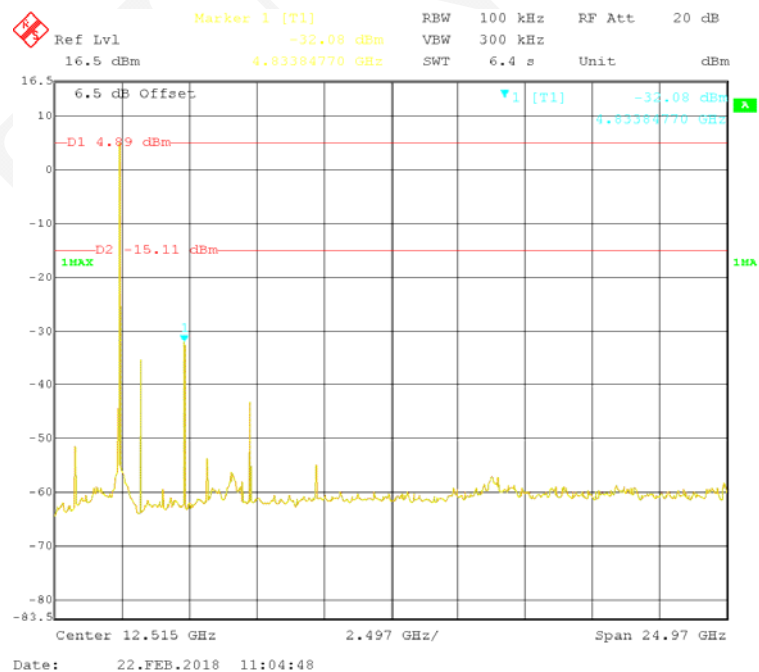
Note:

1. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB)

Corrected Amplitude (dBμV /m) = Corrected Factor (dB/m) + Reading (dBμV)

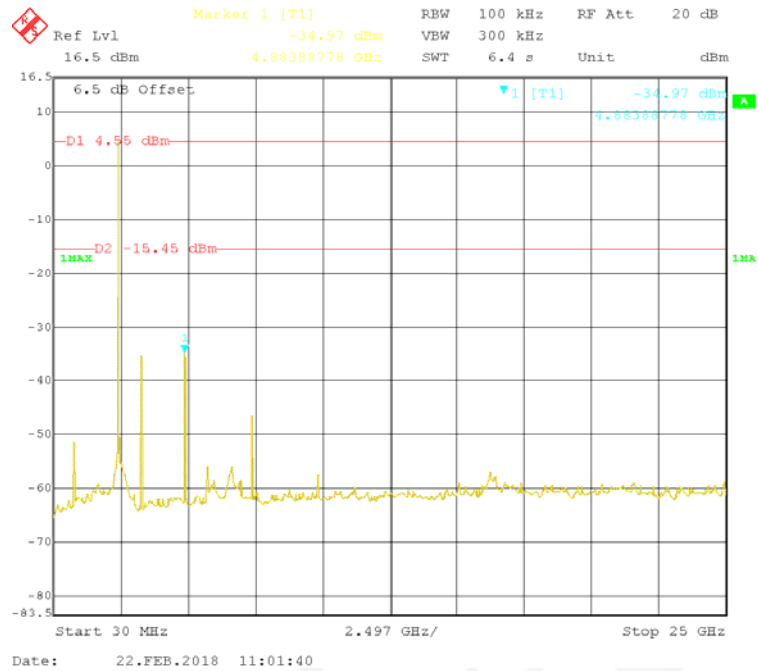
Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV /m)

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
Low Channel: 2402MHz								
2402.000000	97.58	---	250.0	V	192.0	5.1	/	/
2402.000000	---	96.76	250.0	V	192.0	5.1	/	/
2402.000000	94.35	---	250.0	H	321.0	5.1	/	/
2402.000000	---	93.42	250.0	H	321.0	5.1	/	/
2390.000000	49.56	---	200.0	V	179.0	5.1	74.00	24.44
2390.000000	---	40.33	200.0	V	179.0	5.1	54.00	13.67
Middle Channel: 2440MHz								
2440.000000	97.85	---	150.0	V	260.0	5.2	/	/
2440.000000	---	96.33	150.0	V	260.0	5.2	/	/
2440.000000	94.70	---	150.0	H	268.0	5.2	/	/
2440.000000	---	93.82	150.0	H	268.0	5.2	/	/
High Channel: 2480MHz								
2480.000000	97.88	---	250.0	V	224.0	5.3	/	/
2480.000000	---	96.93	250.0	V	224.0	5.3	/	/
2480.000000	94.72	---	200.0	H	283.0	5.3	/	/
2480.000000	---	93.85	200.0	H	283.0	5.3	/	/
2483.500000	50.60	---	100.0	V	153.0	5.3	74.00	23.40
2483.500000	---	40.30	100.0	V	153.0	5.3	54.00	13.70

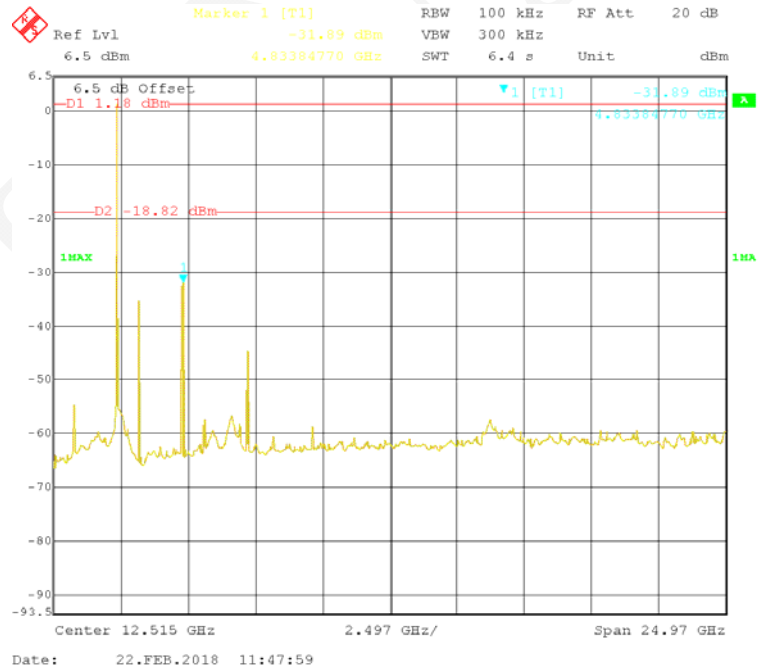
**Conducted Spurious Emissions at Antenna Port****802.11b Mode Low Channel****802.11b Mode Middle Channel**



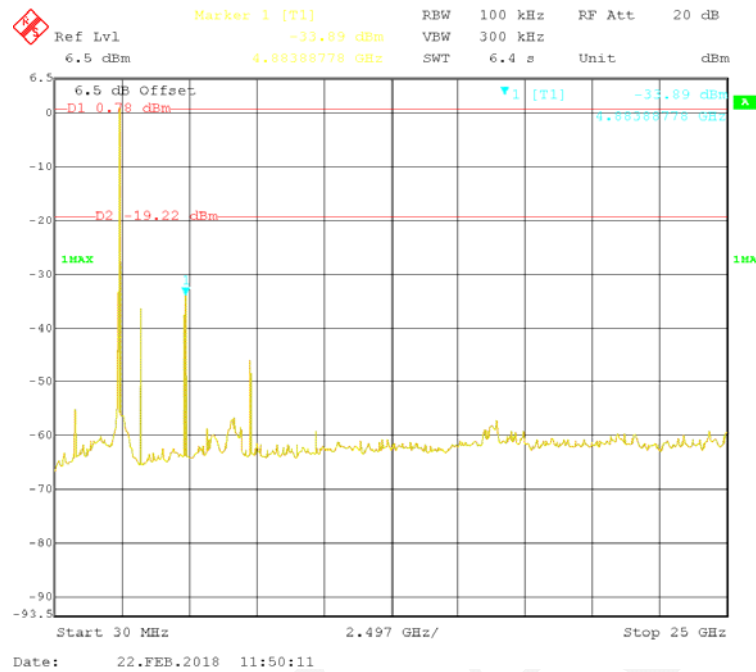
### 802.11b Mode High Channel



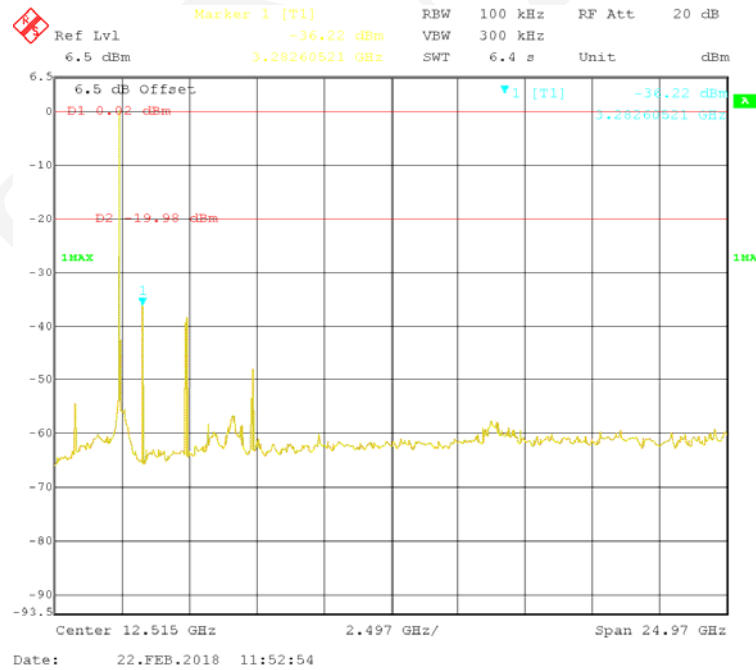
### 802.11g Mode Low Channel

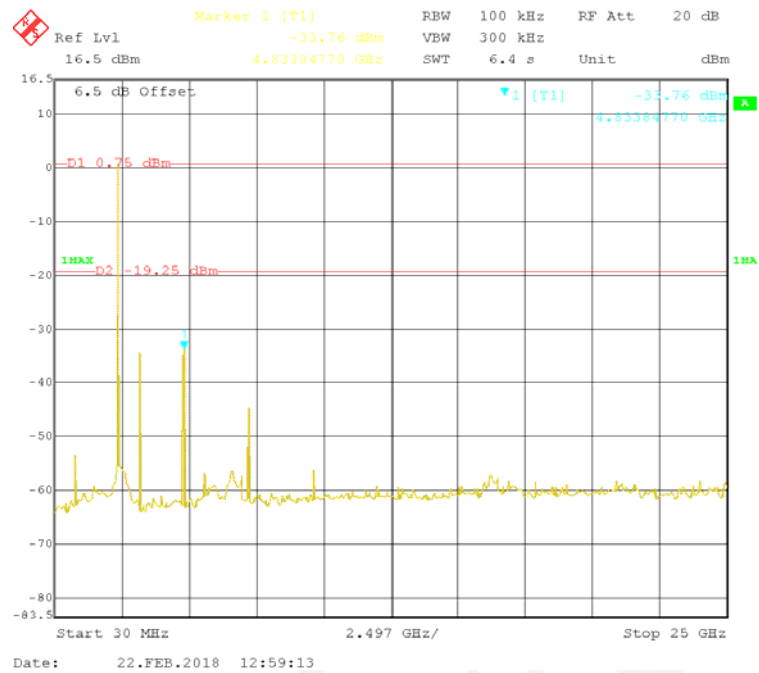
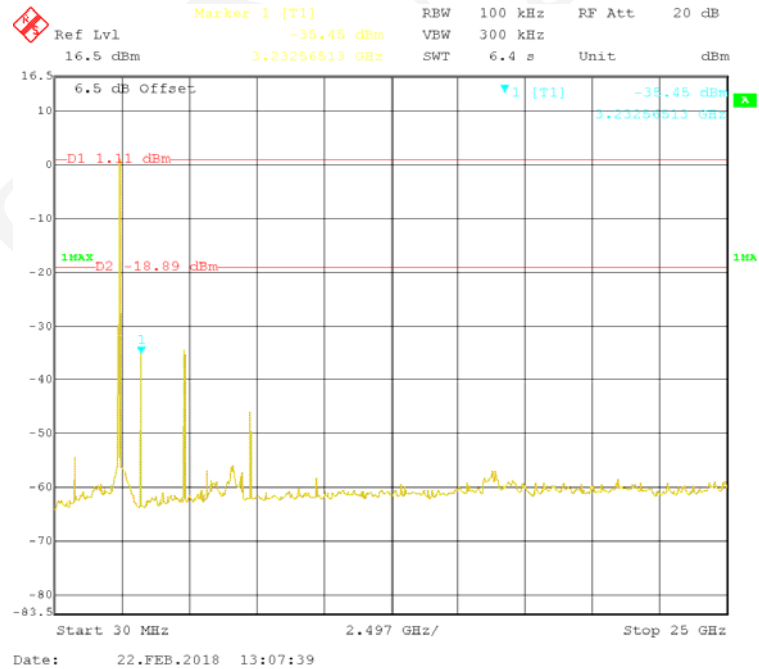


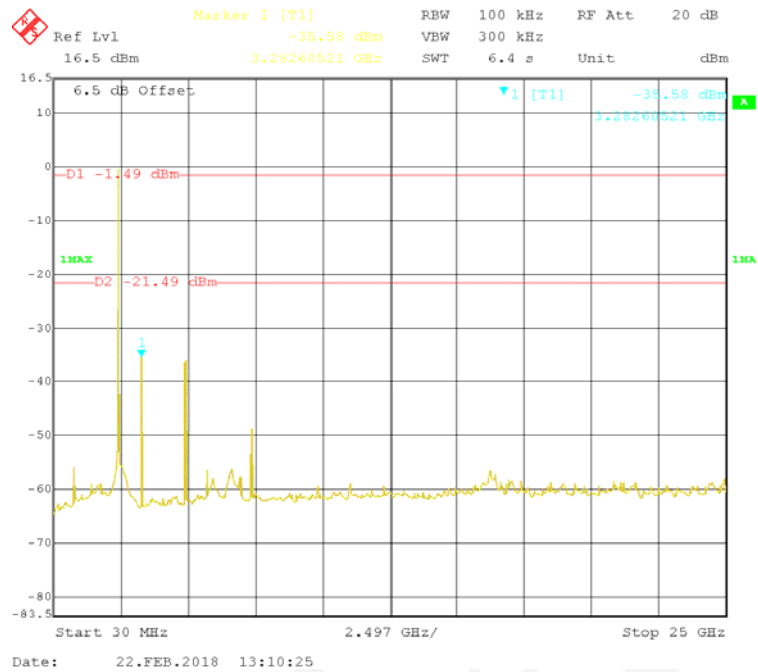
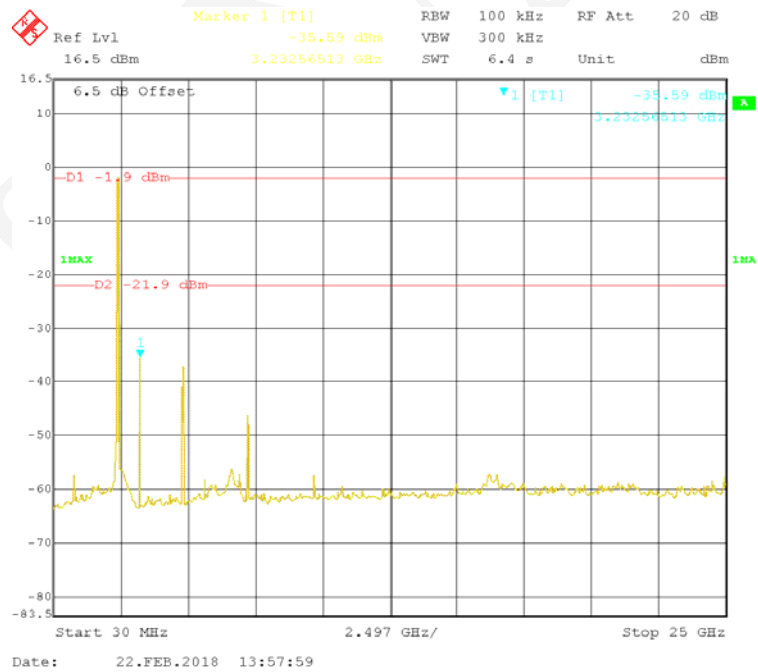
### 802.11g Mode Middle Channel



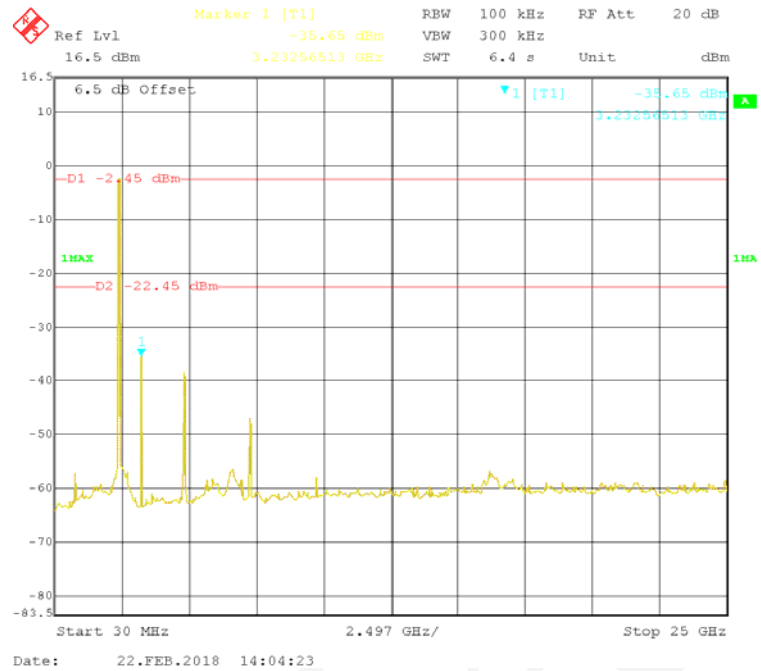
### 802.11g Mode High Channel



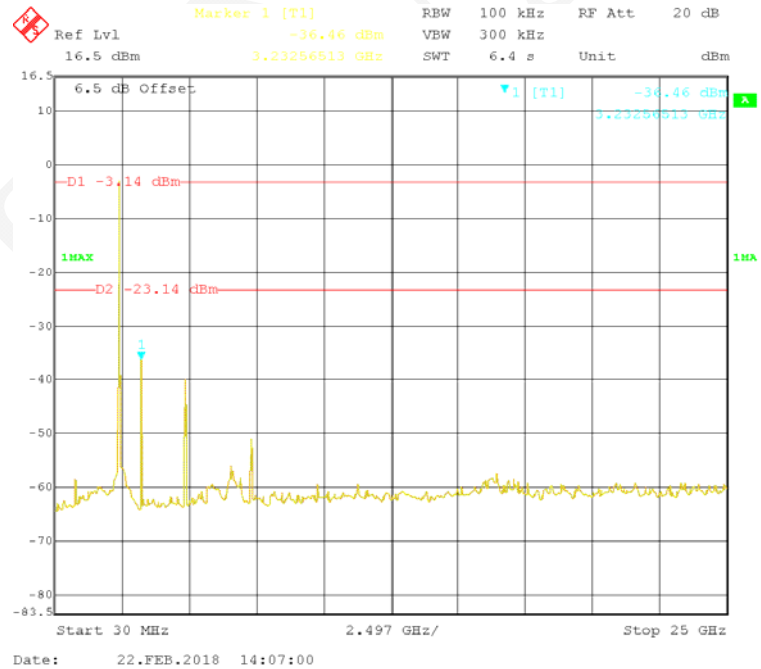
**802.11n-HT20 Mode Low Channel****802.11n-HT20 Mode Middle Channel**

**802.11n-HT20 Mode High Channel****802.11n-HT40 Mode Low Channel**

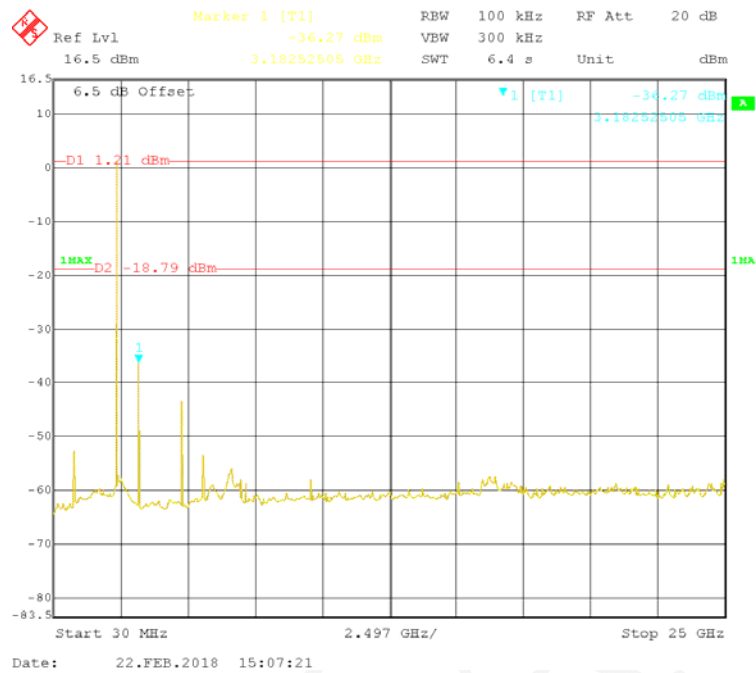
### 802.11n-HT40 Mode Middle Channel



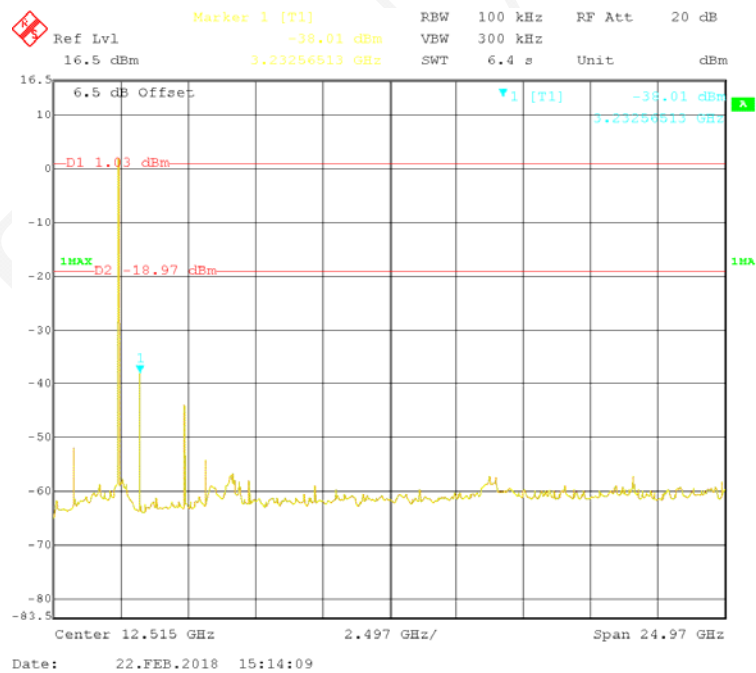
### 802.11n-HT40 Mode High Channel



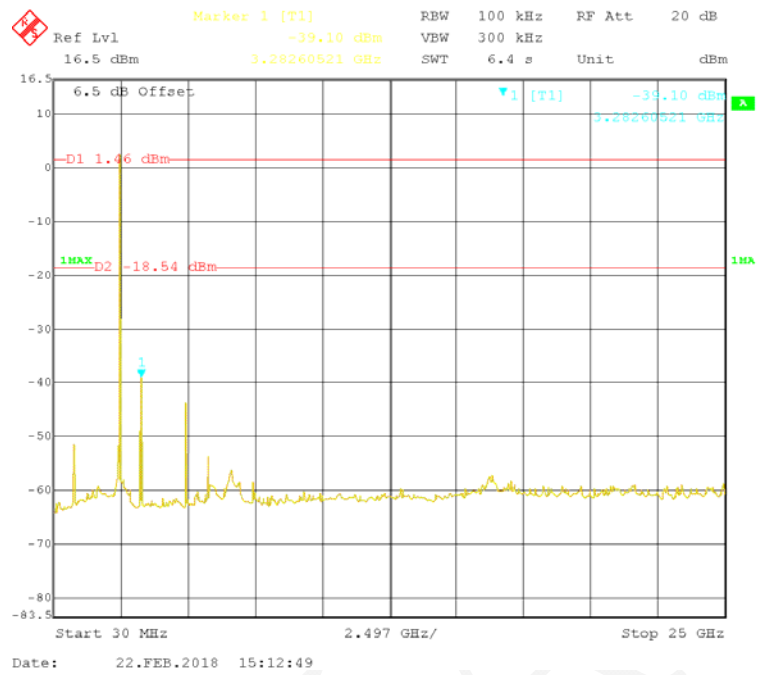
### BLE Mode Low Channel



### BLE Mode Middle Channel



### BLE Mode High Channel



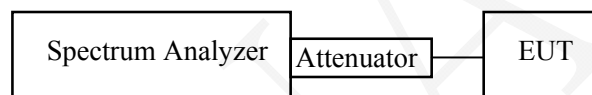
**FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH****Applicable Standard**

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**

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 8.1

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3 * \text{RBW}$ .
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

**Test Data****Environmental Conditions**

Temperature:	24 °C
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

*The testing was performed by Max Min on 2018-02-22.*

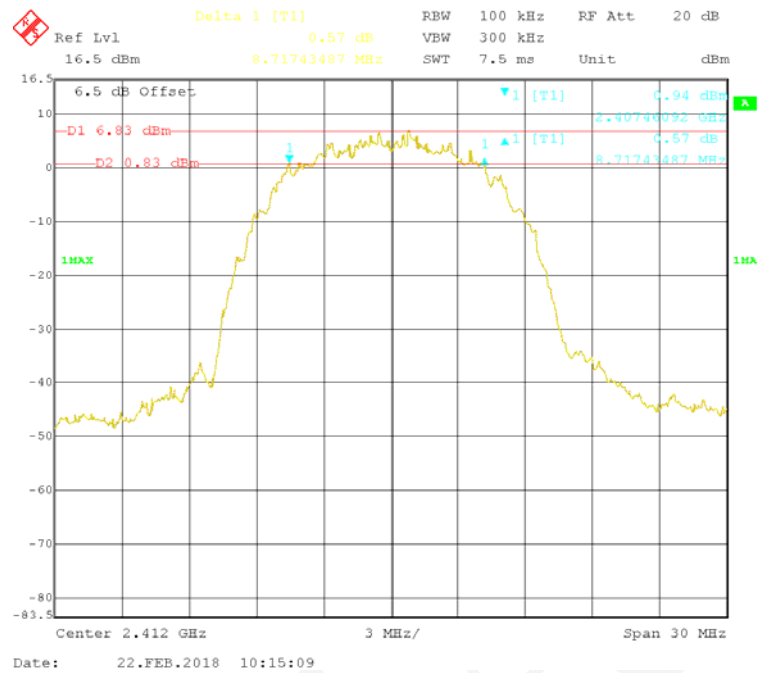
*EUT operation mode: Transmitting*

**Test Result:** Pass

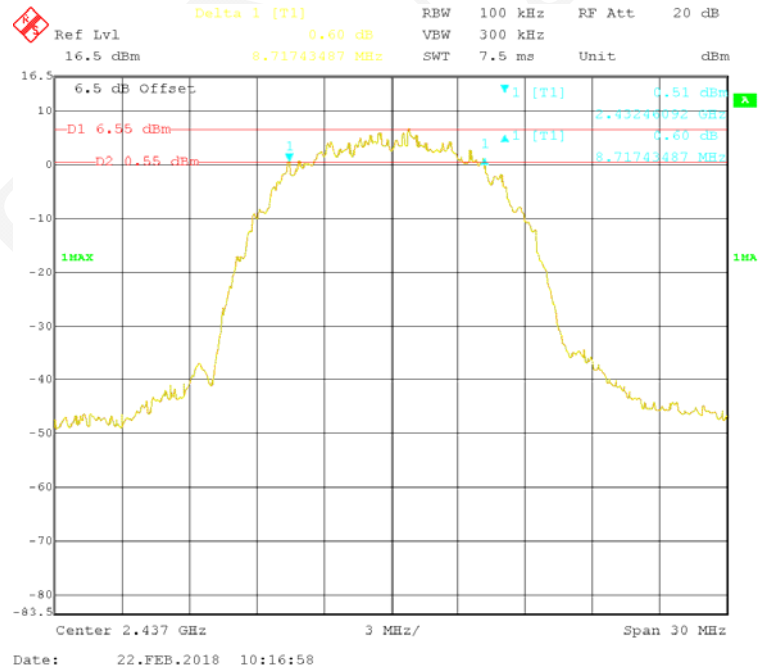


Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b Mode			
Low	2412	8.717	$\geq 0.5$
Middle	2437	8.717	$\geq 0.5$
High	2462	8.717	$\geq 0.5$
802.11g Mode			
Low	2412	16.232	$\geq 0.5$
Middle	2437	16.413	$\geq 0.5$
High	2462	16.413	$\geq 0.5$
802.11n-HT20 Mode			
Low	2412	17.435	$\geq 0.5$
Middle	2437	17.495	$\geq 0.5$
High	2462	17.495	$\geq 0.5$
802.11n-HT40 Mode			
Low	2422	36.313	$\geq 0.5$
Middle	2437	36.072	$\geq 0.5$
High	2452	36.222	$\geq 0.5$
BLE Mode			
Low	2402	0.691	$\geq 0.5$
Middle	2440	0.691	$\geq 0.5$
High	2480	0.697	$\geq 0.5$

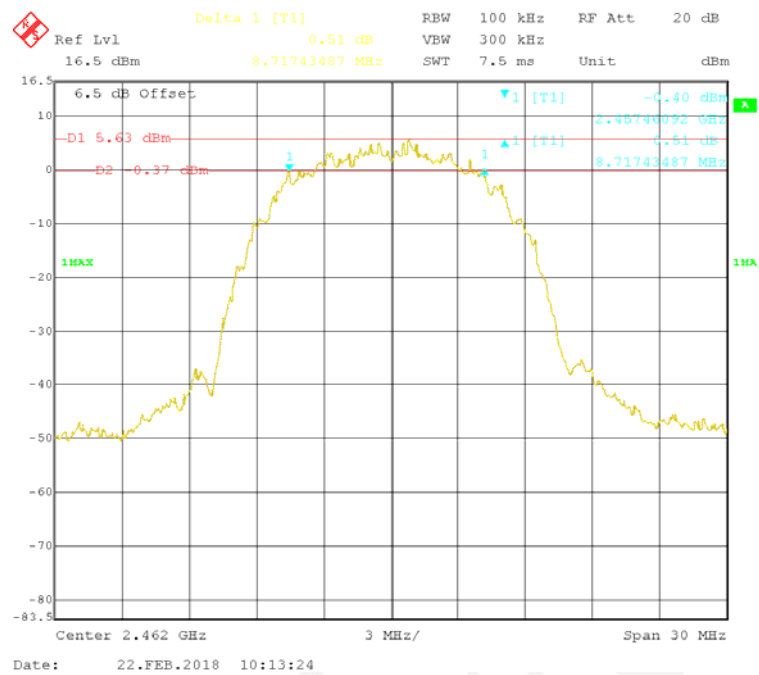
## 802.11b Mode Low Channel



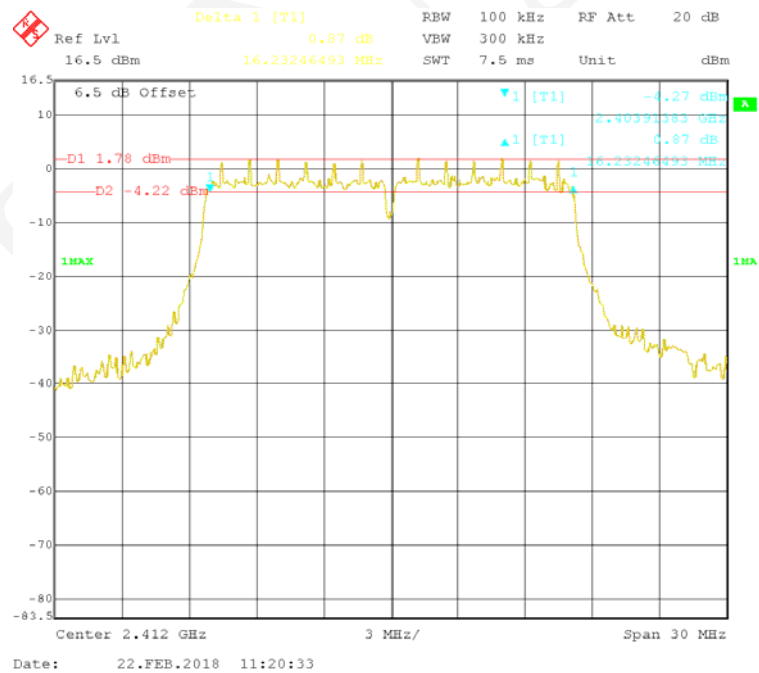
## 802.11b Mode Middle Channel



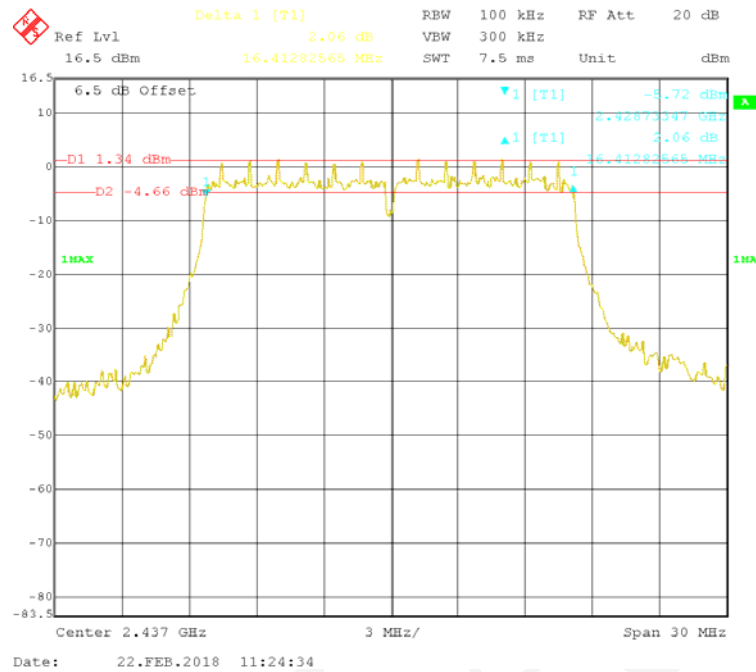
## 802.11b Mode High Channel



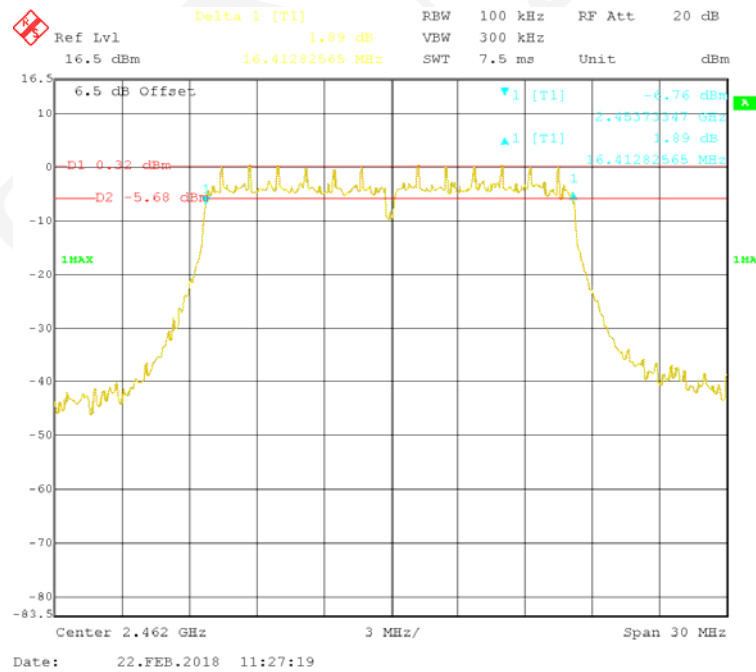
## 802.11g Mode Low Channel



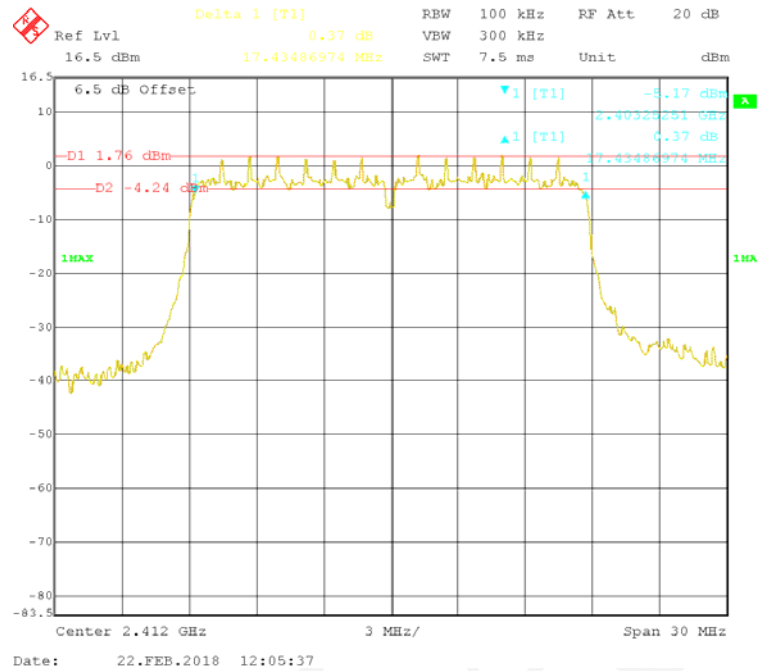
### 802.11g Mode Middle Channel



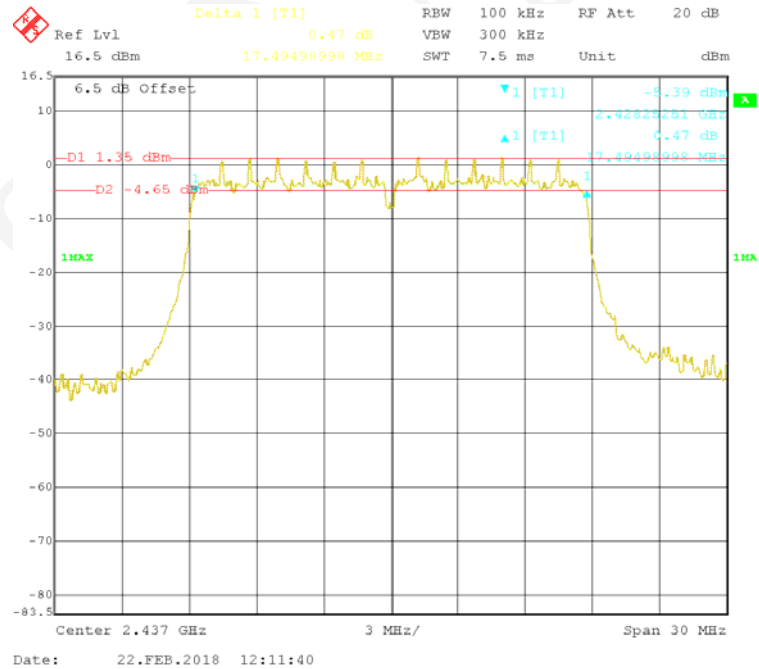
### 802.11g Mode High Channel



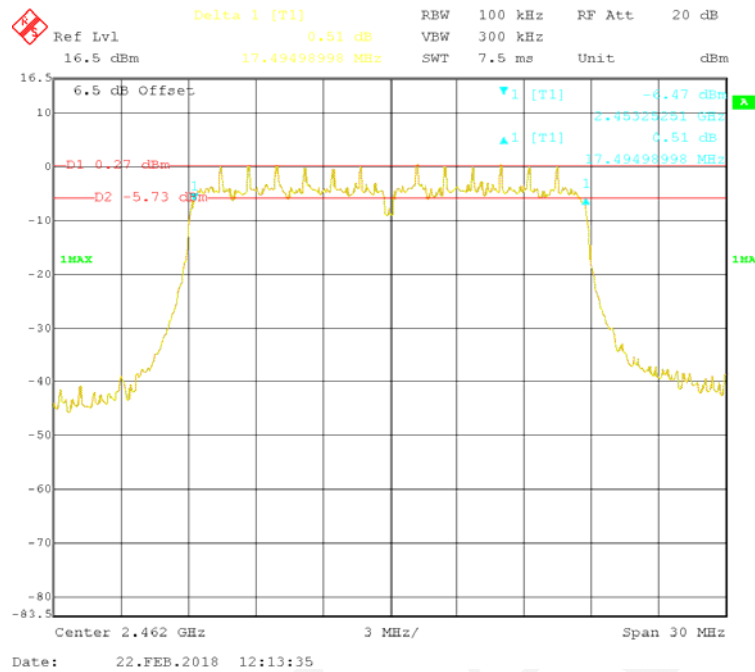
### 802.11n-HT20 Mode Low Channel



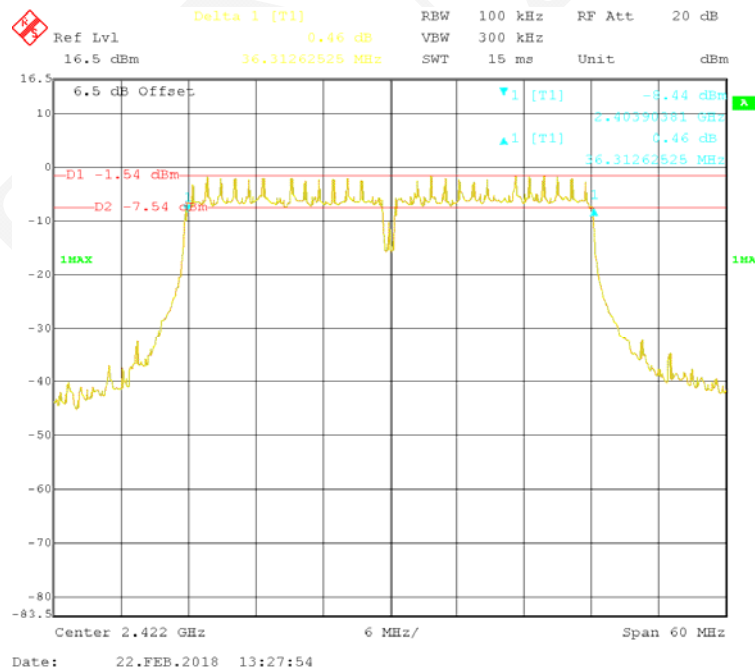
### 802.11n-HT20 Mode Middle Channel



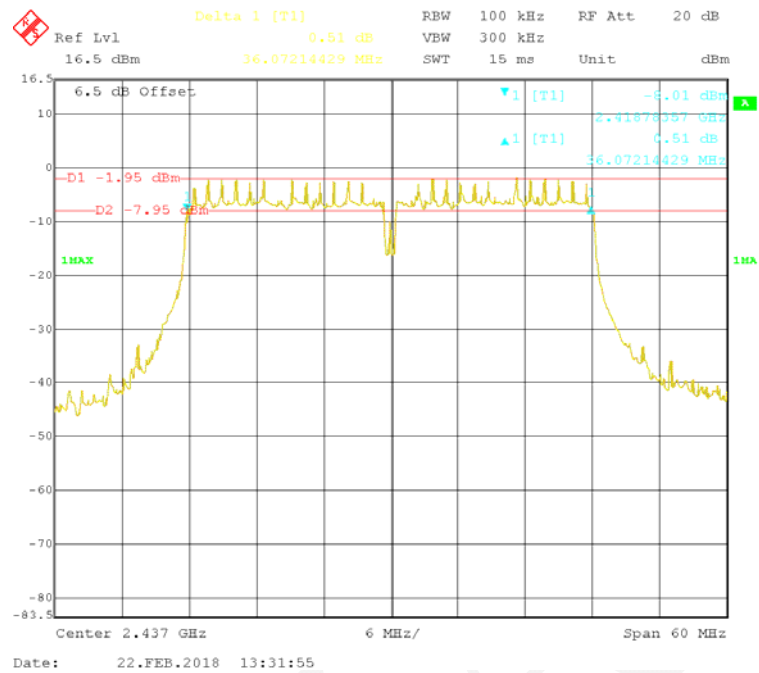
### 802.11n-HT20 Mode High Channel



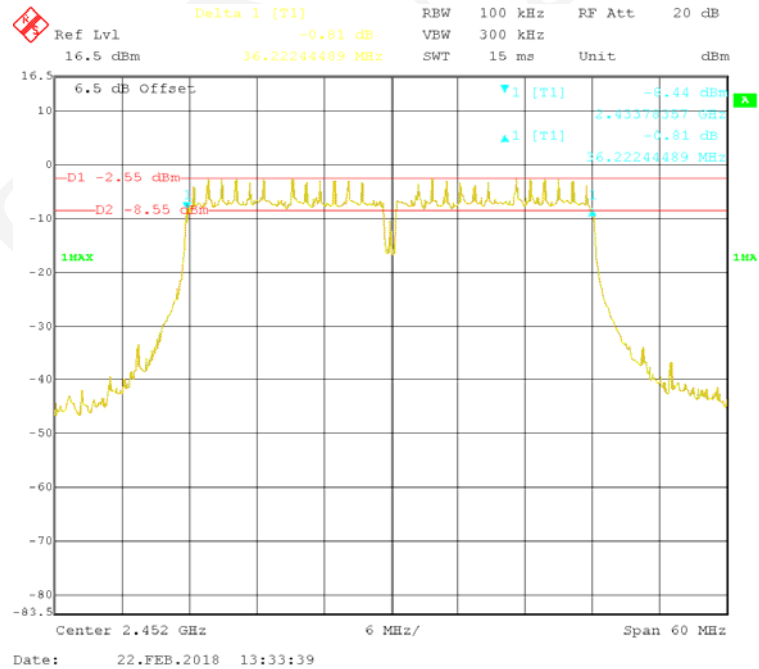
### 802.11n-HT40 Mode Low Channel



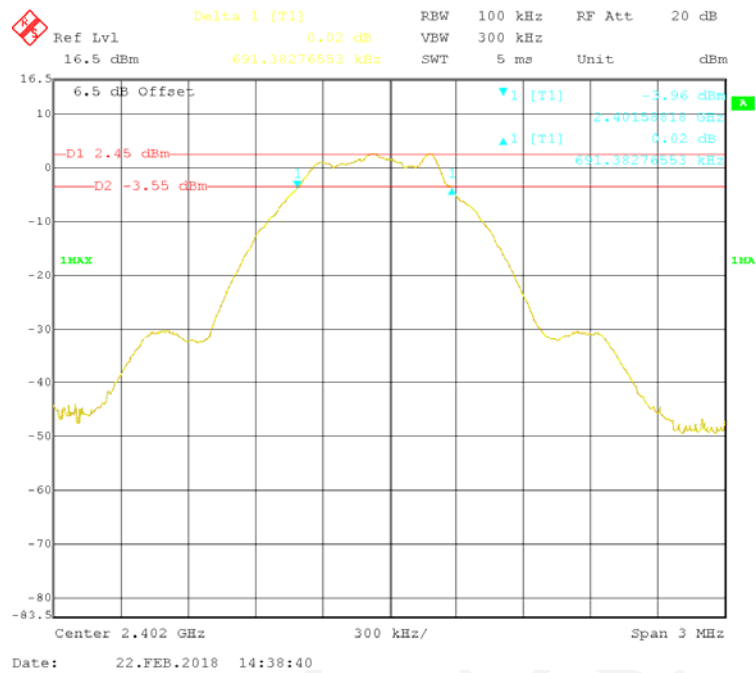
### 802.11n-HT40 Mode Middle Channel



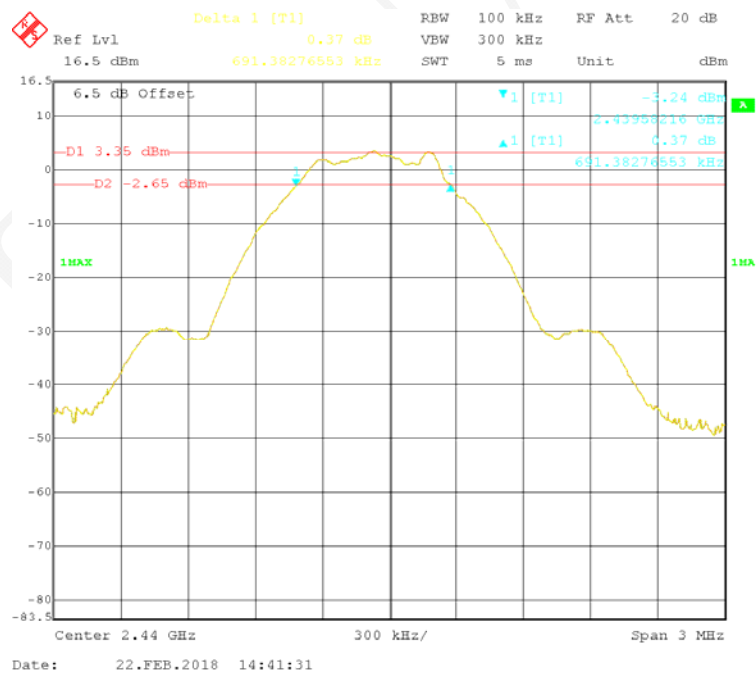
### 802.11n-HT40 Mode High Channel



### BLE Mode Low Channel

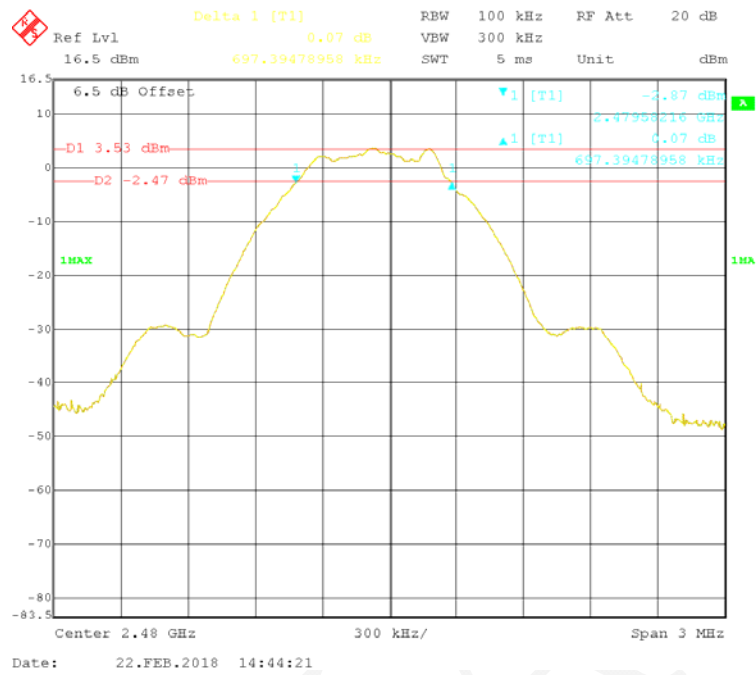


### BLE Mode Middle Channel





### BLE Mode High Channel



## **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**

According to KDB558074 D01 DTS Meas Guidance v04

#### **For Wi-Fi:**

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

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.



#### **For BLE:**

1. Set the RBW  $\geq$  DTS bandwidth.
2. Set VBW  $\geq 3 \times$  RBW.
3. Set span  $\geq 3 \times$  RBW
4. Sweep time = auto couple.
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.



**Test Data****Environmental Conditions**

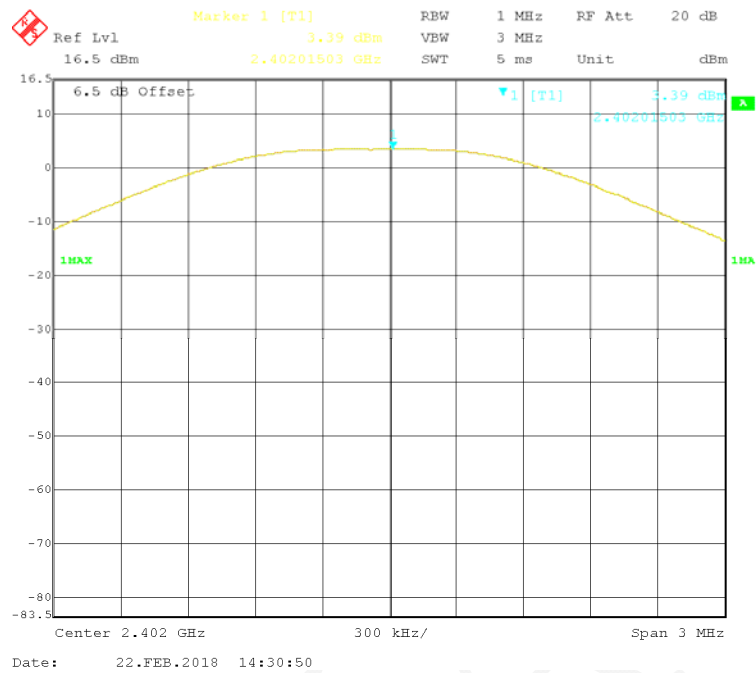
<b>Temperature:</b>	23.8°C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.2 kPa

The testing was performed by Max Min on 2018-02-22.

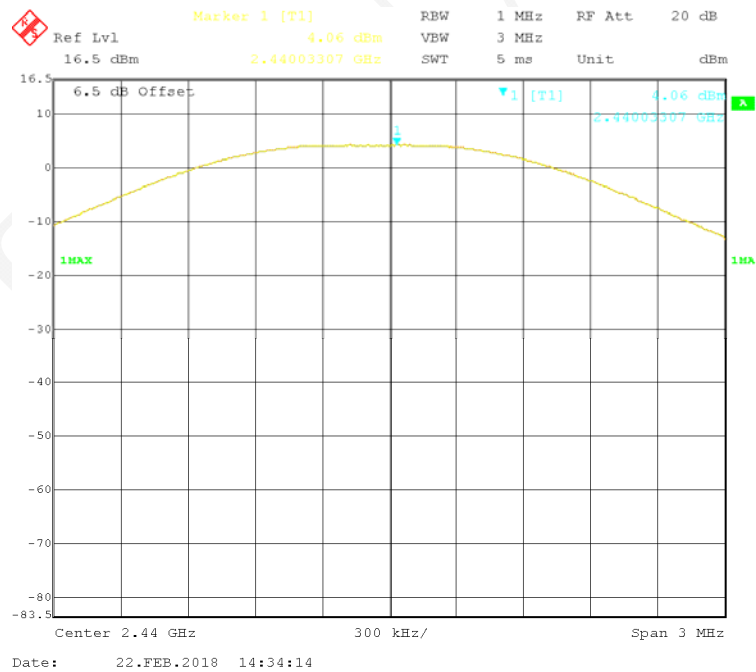
EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
802.11b Mode				
Low	2412	22.25	30	Pass
Middle	2437	21.51	30	Pass
High	2462	20.61	30	Pass
802.11g Mode				
Low	2412	20.35	30	Pass
Middle	2437	20.01	30	Pass
High	2462	19.12	30	Pass
802.11n-HT20 Mode				
Low	2412	20.55	30	Pass
Middle	2437	20.23	30	Pass
High	2462	19.23	30	Pass
802.11n-HT40 Mode				
Low	2422	20.29	30	Pass
Middle	2437	19.91	30	Pass
High	2452	19.35	30	Pass
BLE Mode				
Low	2402	3.39	30	Pass
Middle	2440	4.06	30	Pass
High	2480	4.31	30	Pass

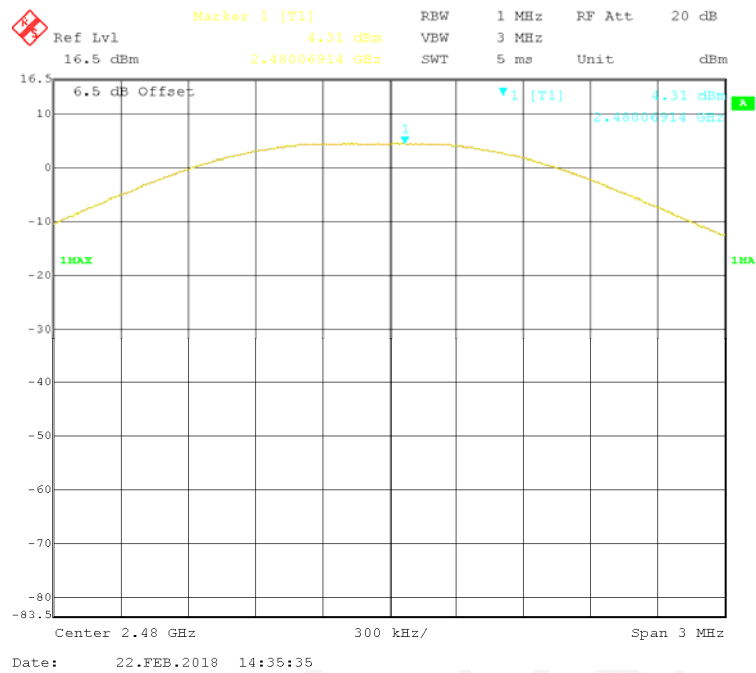
### BLE Mode Low Channel



### BLE Mode Middle Channel



### BLE Mode High Channel



**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**

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 13.2 and ANSI C63.10-2013 clause 6.10.

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**

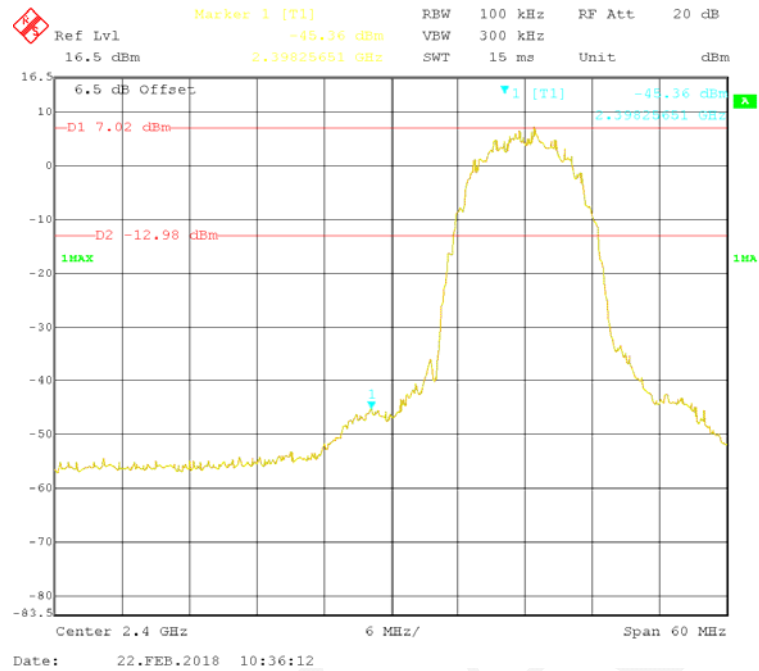
<b>Temperature:</b>	24.3 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	101.3 kPa

*The testing was performed by Max Min on 2018-02-22 to 2018-06-13.*

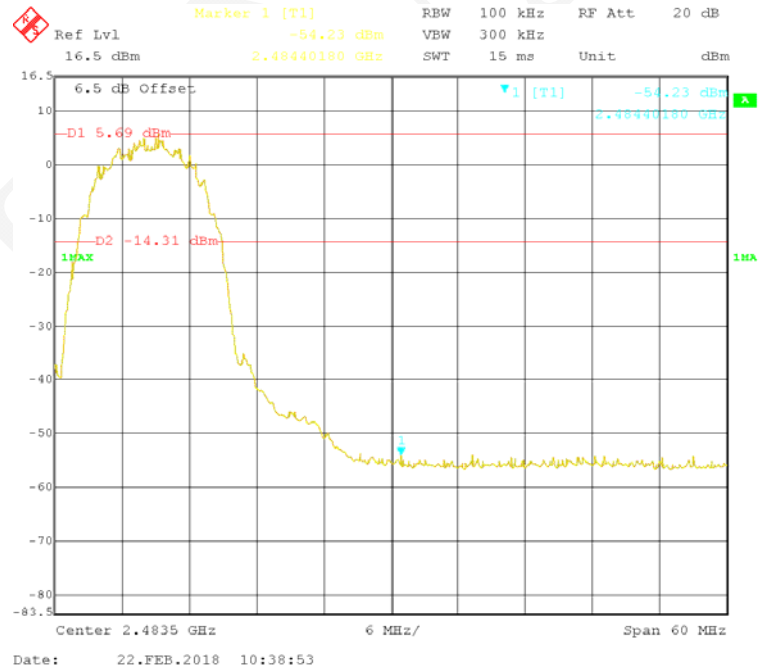
*EUT operation mode: Transmitting*

**Test Result:** Compliance

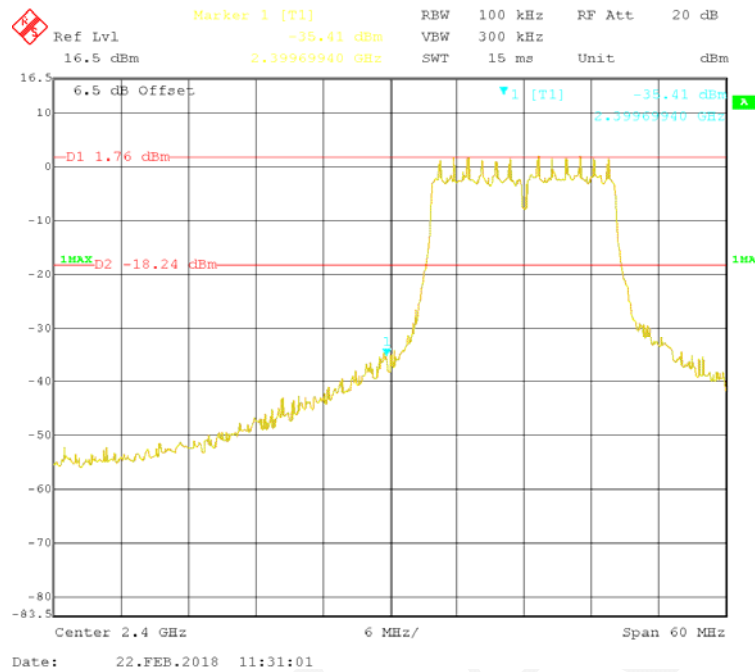
### 802.11b Mode Left Side



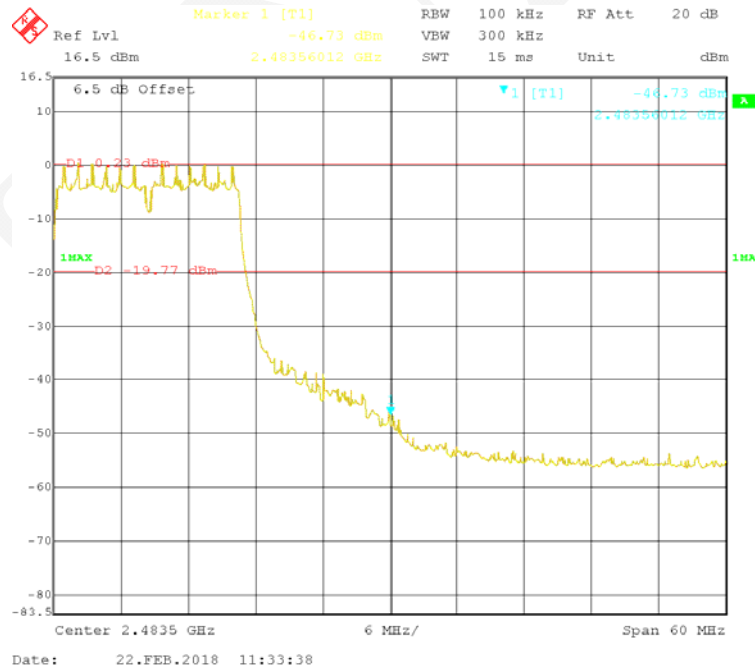
### 802.11b Mode Right Side



### 802.11g Mode Left Side

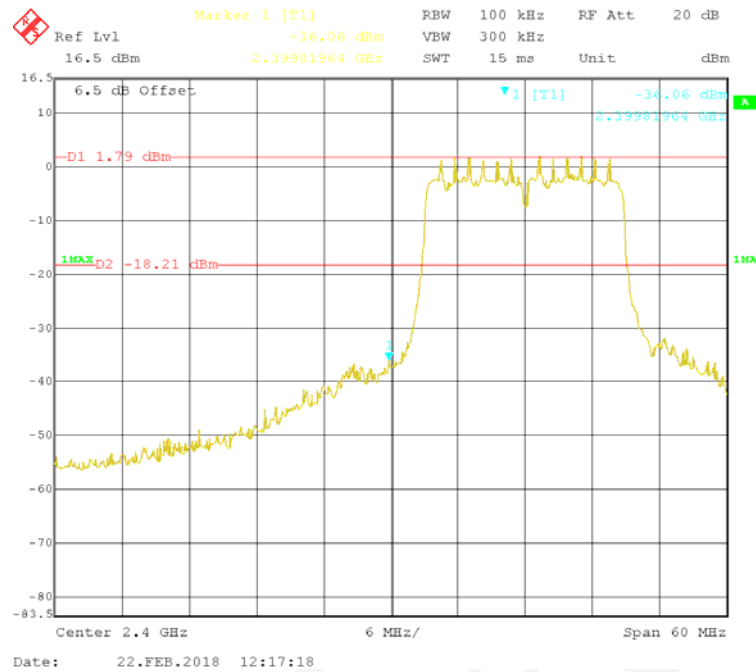


### 802.11g Mode Right Side

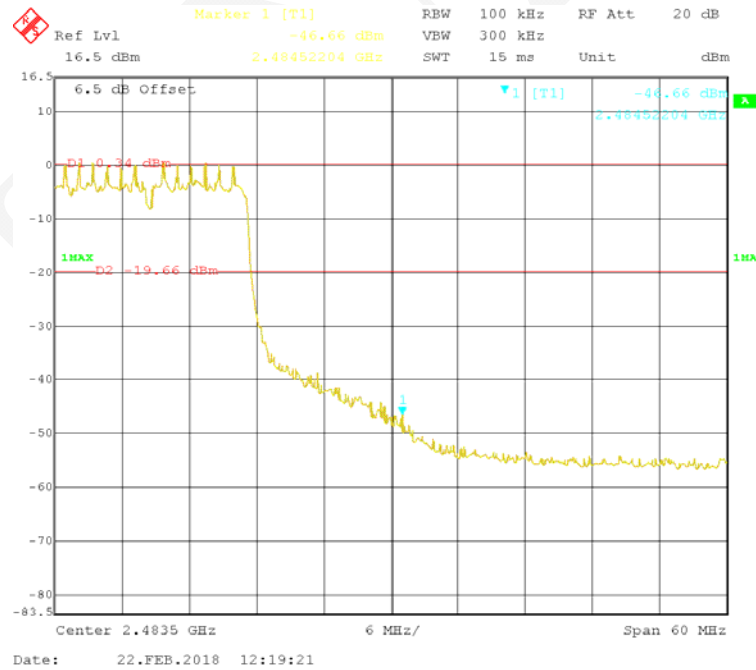


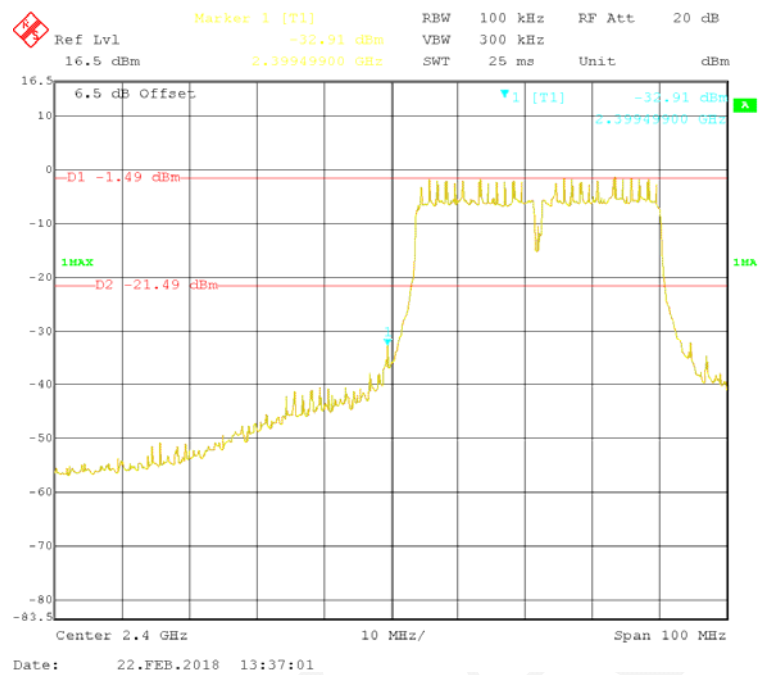
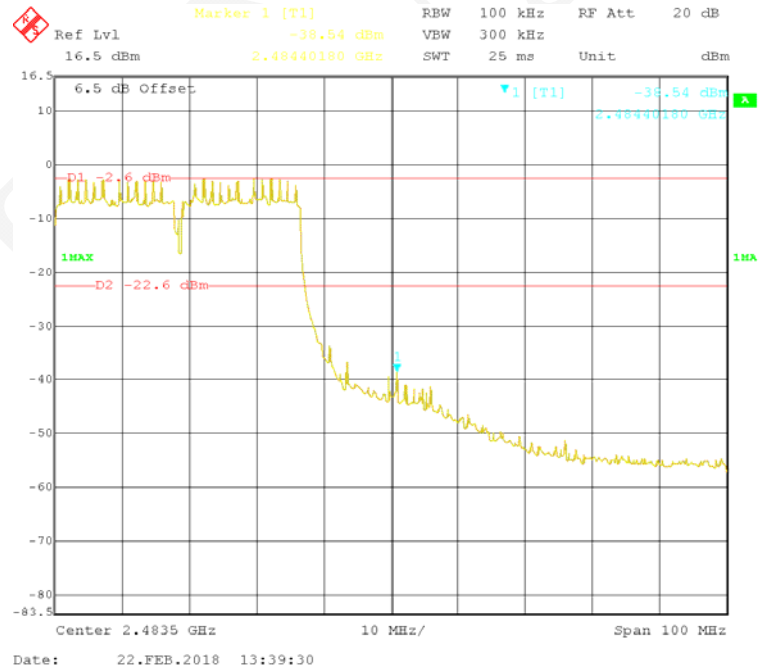


### 802.11n-HT20 Mode Left Side

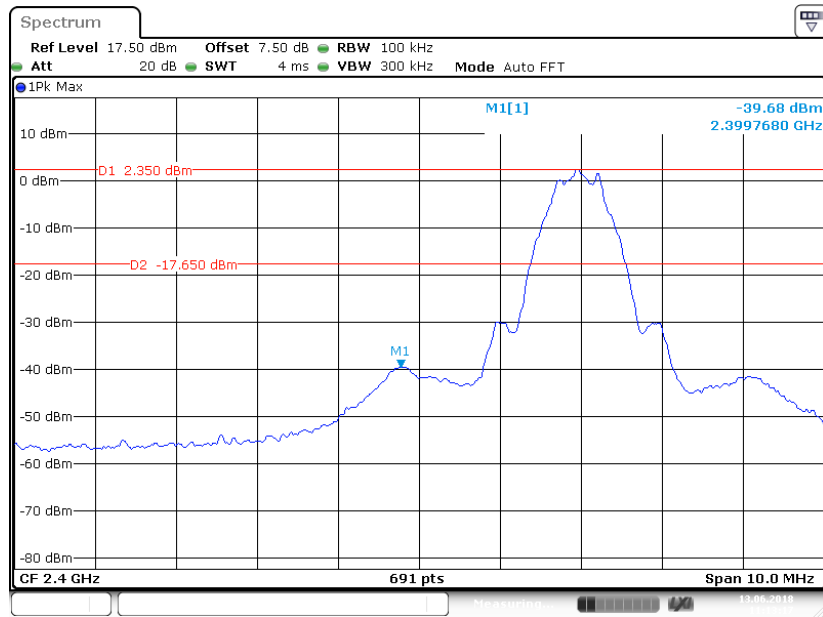


### 802.11n-HT20 Mode Right Side



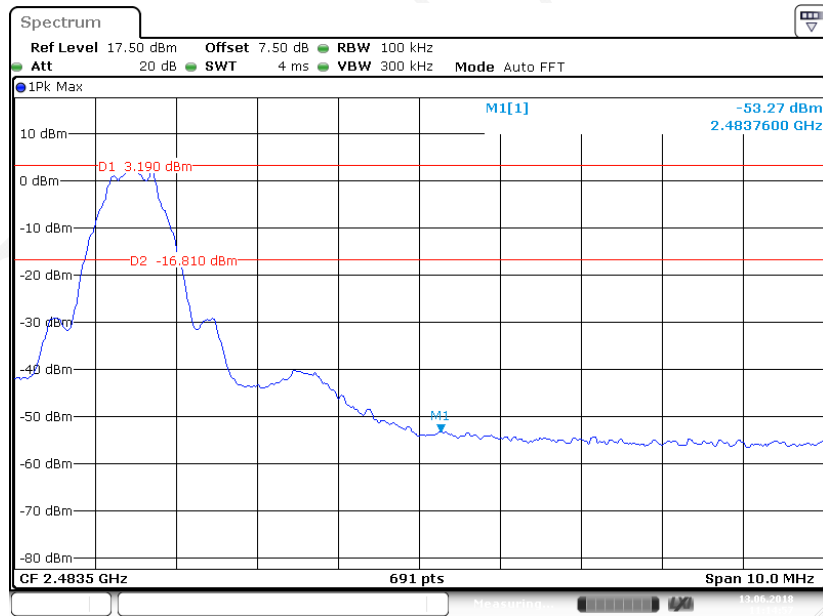
**802.11n-HT40 Mode Left Side****802.11n-HT40 Mode Right Side**

### BLE Mode Left Side



Date:13 JUN 2018 11:13:17

### BLE Mode Right Side



Date:13 JUN 2018 11:14:58

## **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**

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 10.2

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:  $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
3. Set the VBW  $\geq 3 \times \text{RBW}$ .
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**

<b>Temperature:</b>	24.1 °C
<b>Relative Humidity:</b>	50%
<b>ATM Pressure:</b>	101.3 kPa

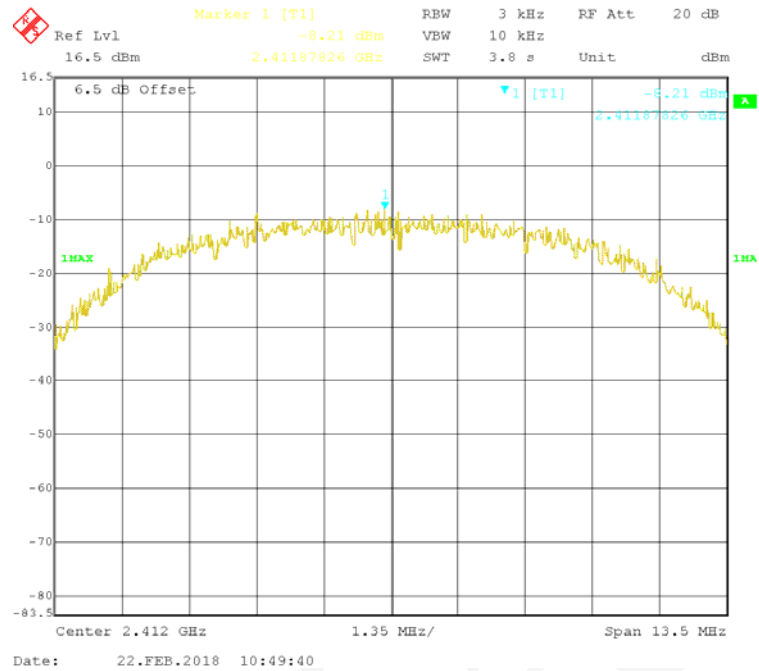
*The testing was performed by Max Min on 2018-02-22.*

*EUT operation mode: Transmitting*

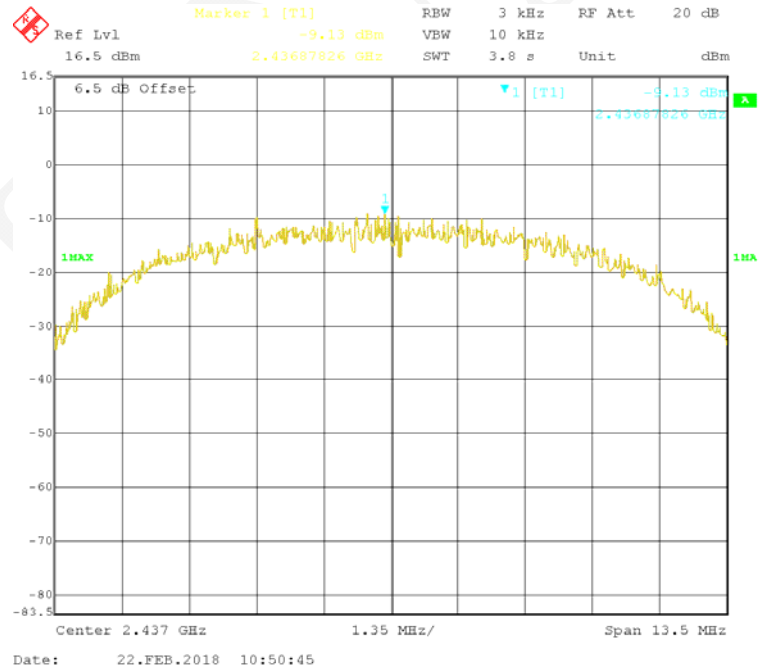
**Test Result:** Pass

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b Mode			
Low	2412	-8.21	$\leq 8$
Middle	2437	-9.13	$\leq 8$
High	2462	-9.97	$\leq 8$
802.11g Mode			
Low	2412	-11.97	$\leq 8$
Middle	2437	-13.76	$\leq 8$
High	2462	-14.01	$\leq 8$
802.11n-HT20 mode			
Low	2412	-13.04	$\leq 8$
Middle	2437	-13.48	$\leq 8$
High	2462	-14.11	$\leq 8$
802.11n-HT40 Mode			
Low	2422	-13.51	$\leq 8$
Middle	2437	-13.58	$\leq 8$
High	2452	-13.05	$\leq 8$
BLE Mode			
Low	2402	-10.71	$\leq 8$
Middle	2440	-9.47	$\leq 8$
High	2480	-9.15	$\leq 8$

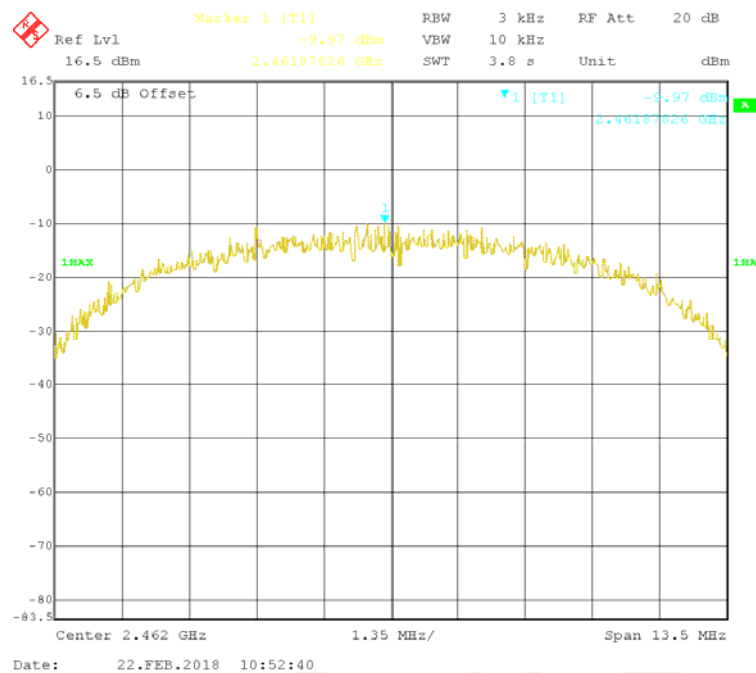
### 802.11b Mode Low Channel



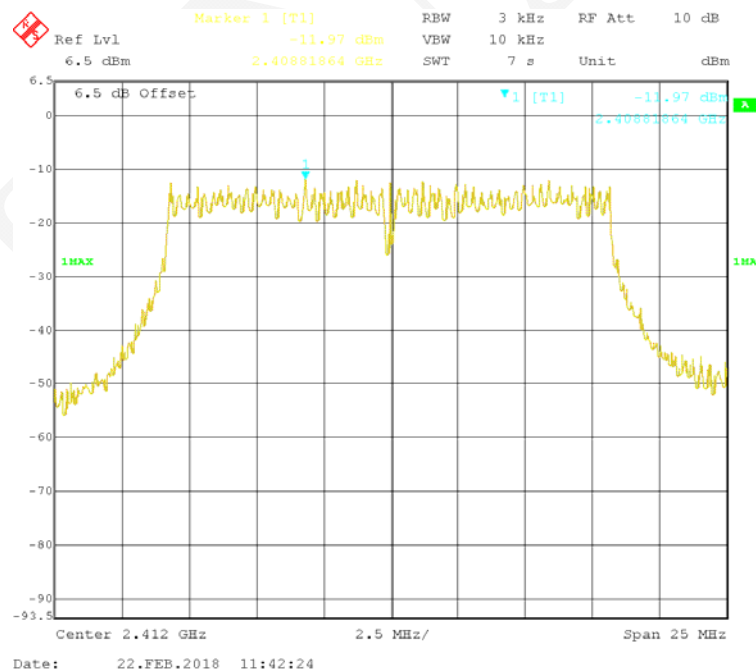
### 802.11b Mode Middle Channel



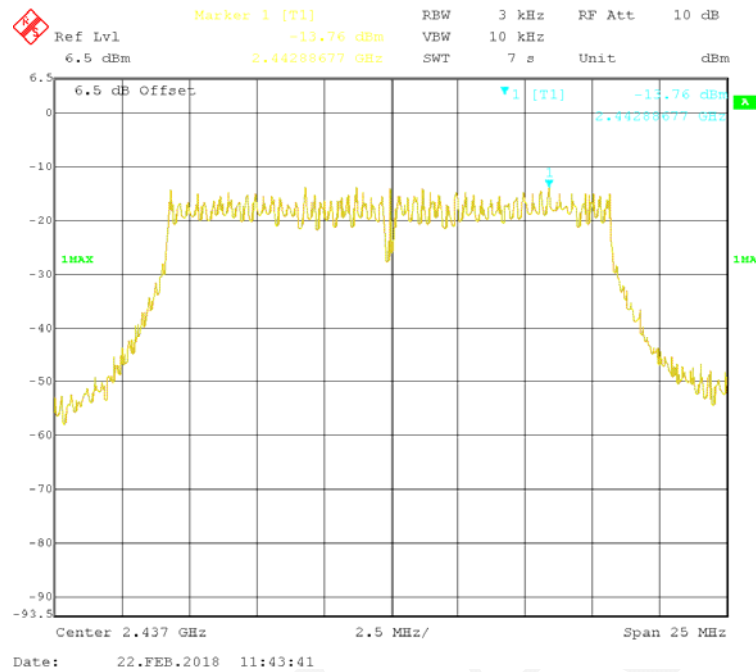
### 802.11b Mode High Channel



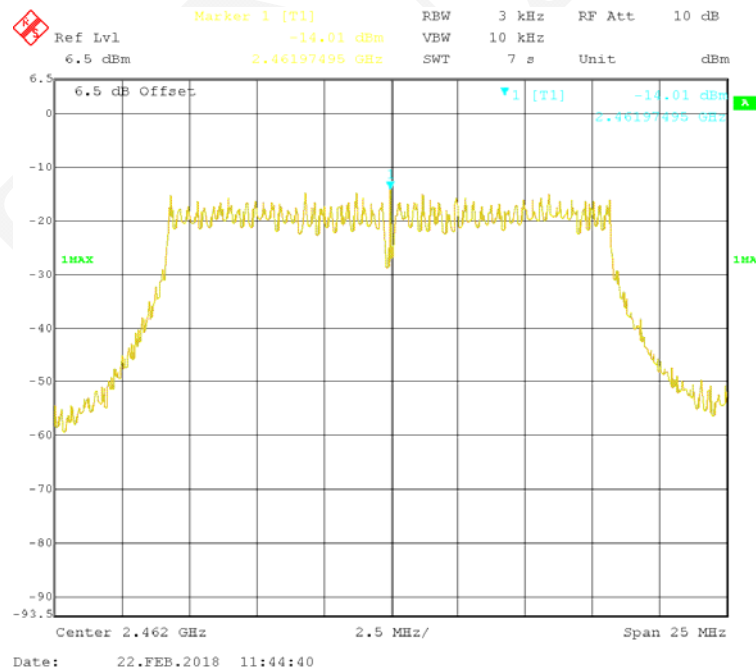
### 802.11g Mode Low Channel



### 802.11g Mode Middle Channel

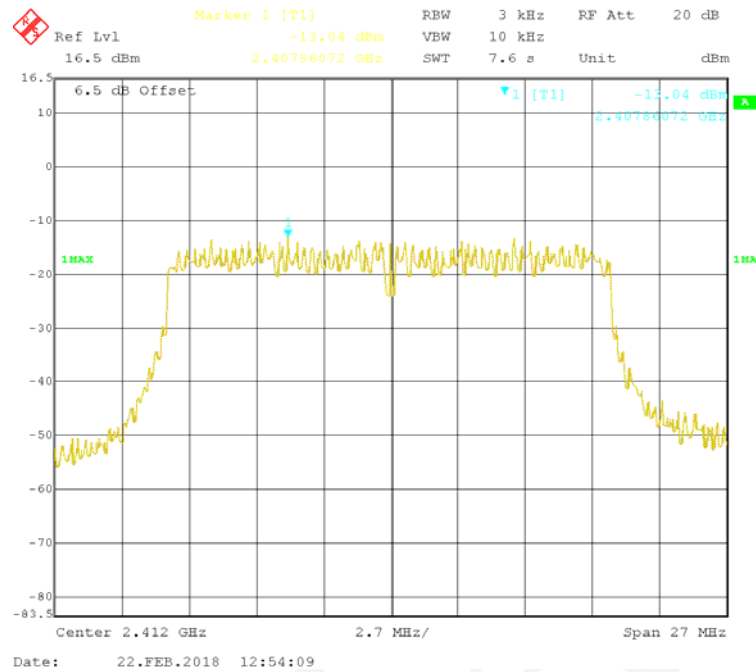


### 802.11g Mode High Channel

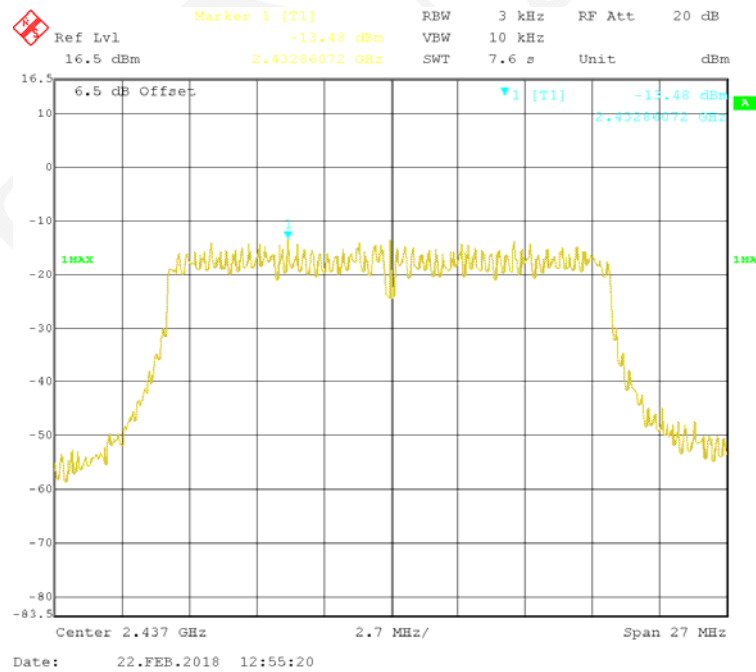




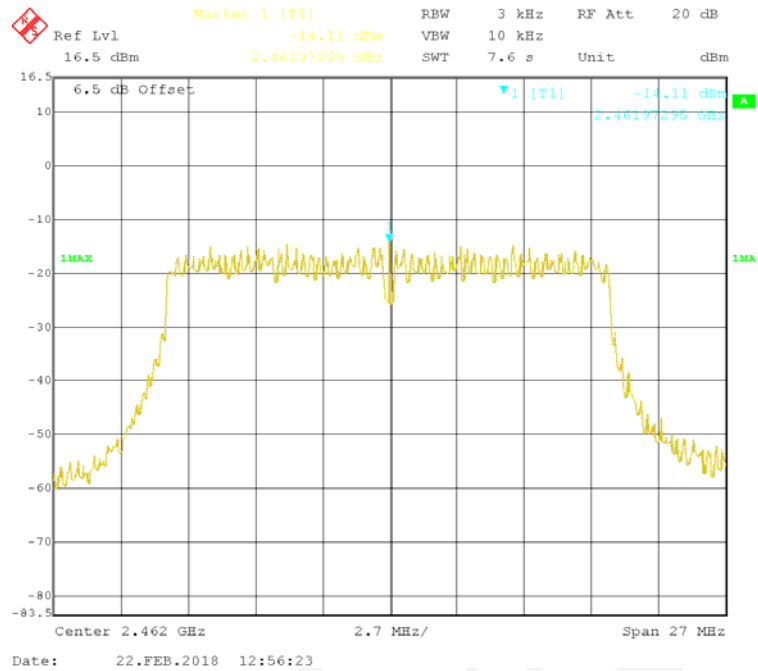
### 802.11n-HT20 Mode Low Channel



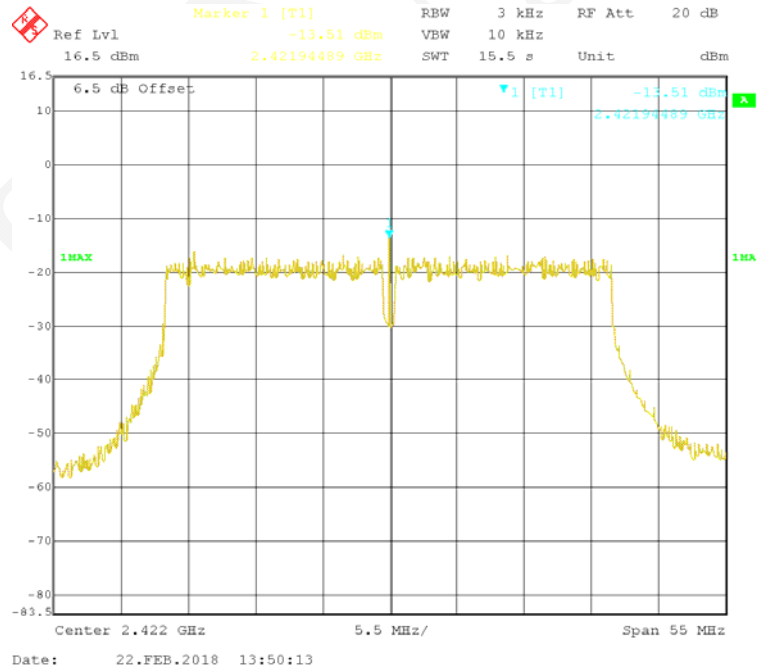
### 802.11n-HT20 Mode Middle Channel



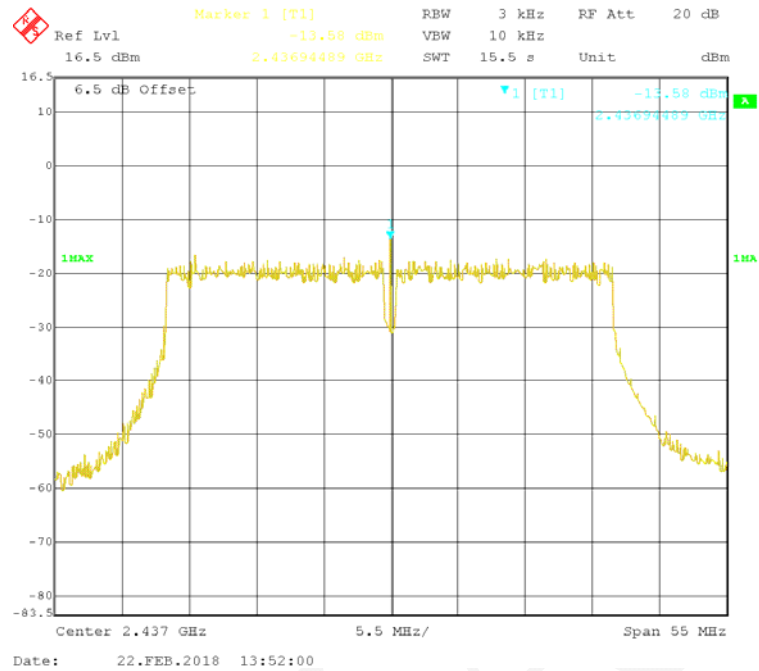
### 802.11n-HT20 Mode High Channel



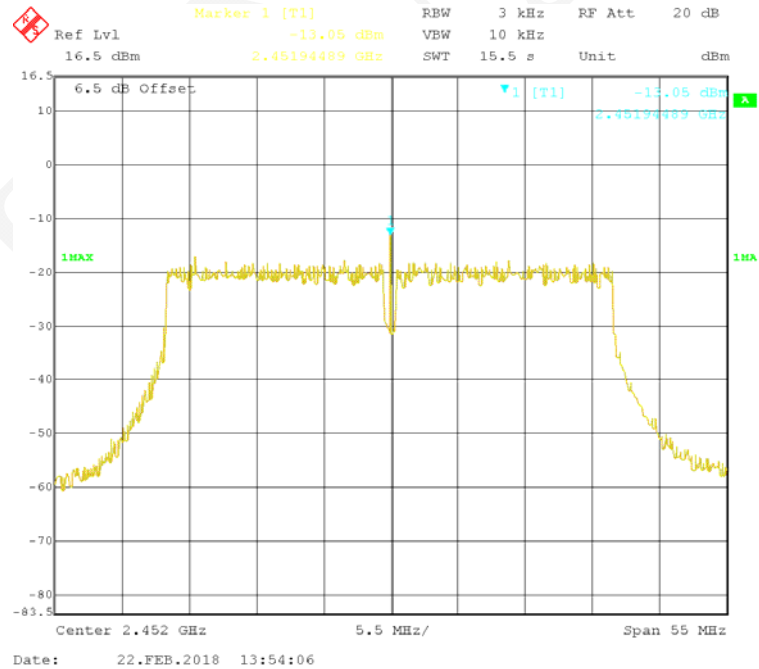
### 802.11n-HT40 Mode Low Channel



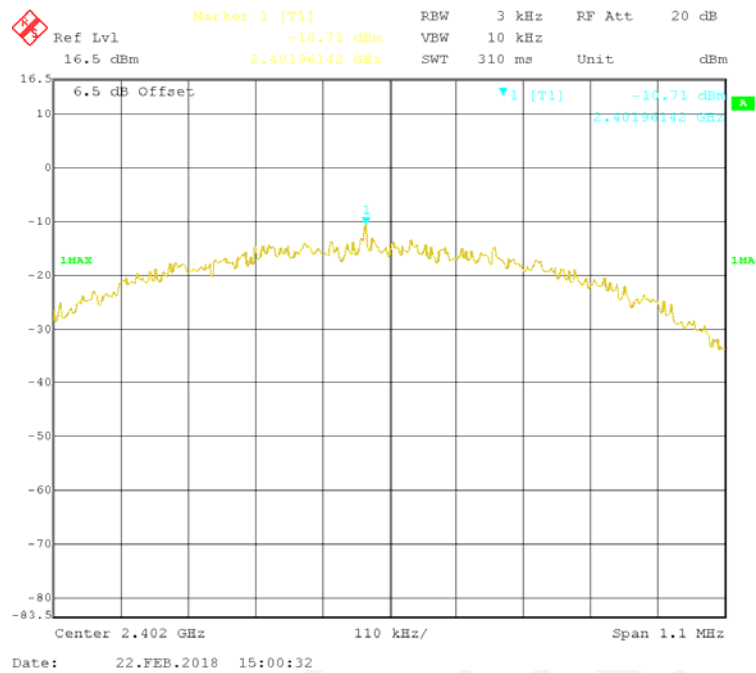
### 802.11n-HT40 Mode Middle Channel



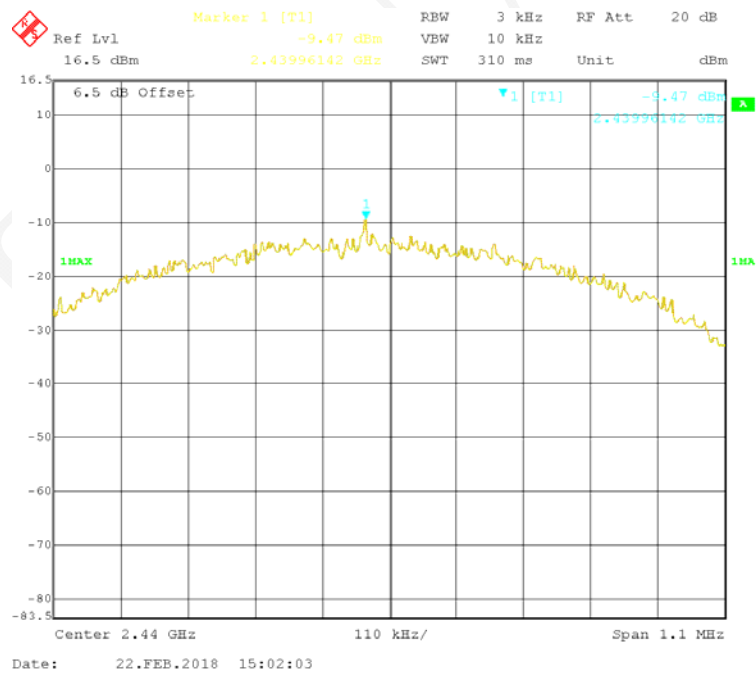
### 802.11n-HT40 Mode High Channel



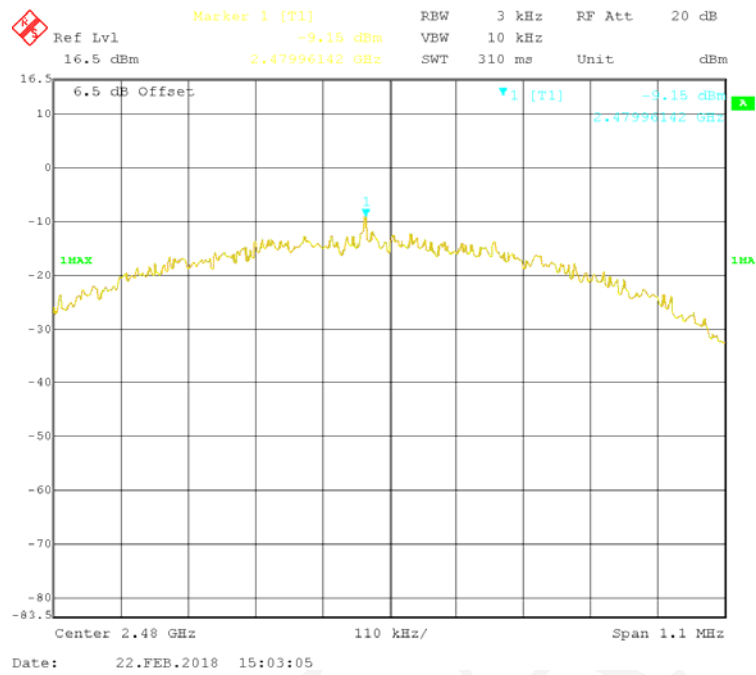
### BLE Mode Low Channel



### BLE Mode Middle Channel



### BLE Mode High Channel



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