



TESTING LABORATORY
CERTIFICATE#4323.01



FCC PART 15.247

TEST REPORT

For

Hangzhou Tuya Information Technology Co.,Ltd

Room701,Building3,More Center,No.87 GuDun Road,Hangzhou,Zhejiang,China

FCC ID: 2ANDL-WR1

Report Type: CIIPC Report	Product Type: Wi-Fi Module
Test Engineer: Max Min	<i>Max Min</i>
Report Number: RSHD190704002-00A	
Report Date: 2019-07-29	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Hangzhou Tuya Information Technology Co.,Ltd
Tested Model:	WR1-IPEX
Product Type:	Wi-Fi Module
Dimension:	23.5 mm (L)*18.0 mm (W)*3.1 mm(H)
Power Supply:	DC 3.3V
Type of Modulation:	DSSS,OFDM

**All measurement and test data in this report was gathered from production sample serial number: 20190704002. (Assigned by the BACL). The EUT supplied by the applicant was received on 2019-07-04.*

Objective

This report is prepared on behalf of *Hangzhou Tuya Information Technology Co.,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, 15.209 and 15.247 rules.

This is a CIIPC report base on the original report RSHA180525002-00A with FCC ID: 2ANDL-WR1 which was granted on 2018-07-30, the differences between the original device and the current one are as follows:

1. Different antenna types and this change will affect radiation spurious testing, for additional reference to the original report

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

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 558074 D01 15.247 Meas Guidance v05r02.

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%

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

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 and CAB identifier CN0004 under the ISED requirement. 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	/	/

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

RF test tool: UI_mptool

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	40
		Middle	40
		High	40
802.11g	6 Mbps	Low	40
		Middle	40
		High	40
802.11n-HT20	MCS0	Low	40
		Middle	40
		High	40
802.11n-HT40	MCS0	Low	40
		Middle	40
		High	40

Support Equipment List and Details

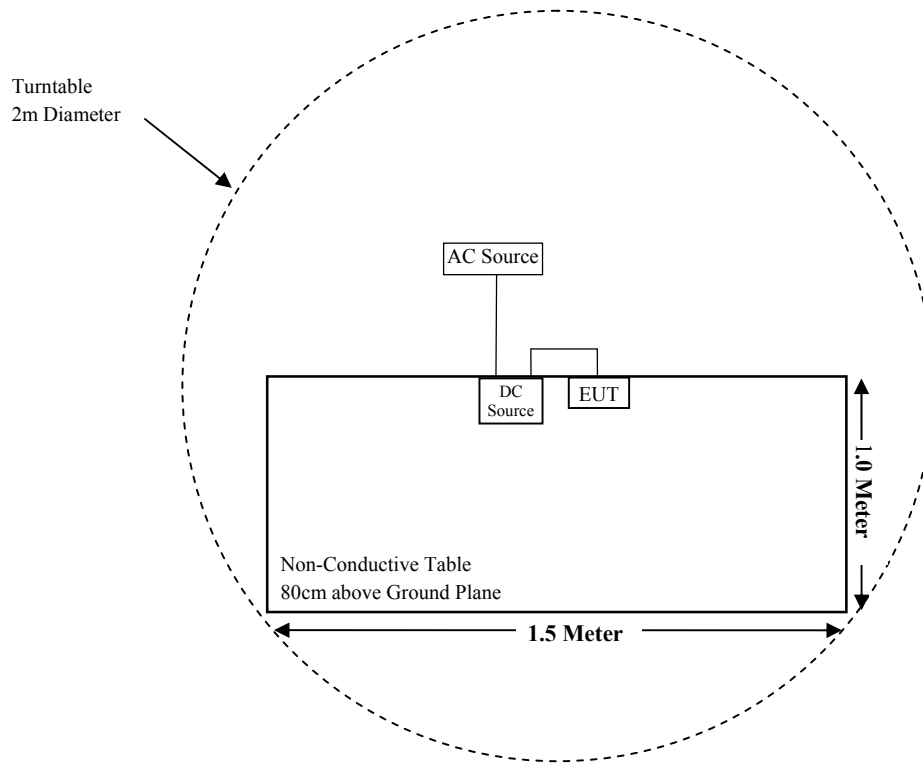
Manufacturer	Description	Model	Serial Number
ZHAOXIN	DC Source	RXN-605D	DC002

External I/O Cable

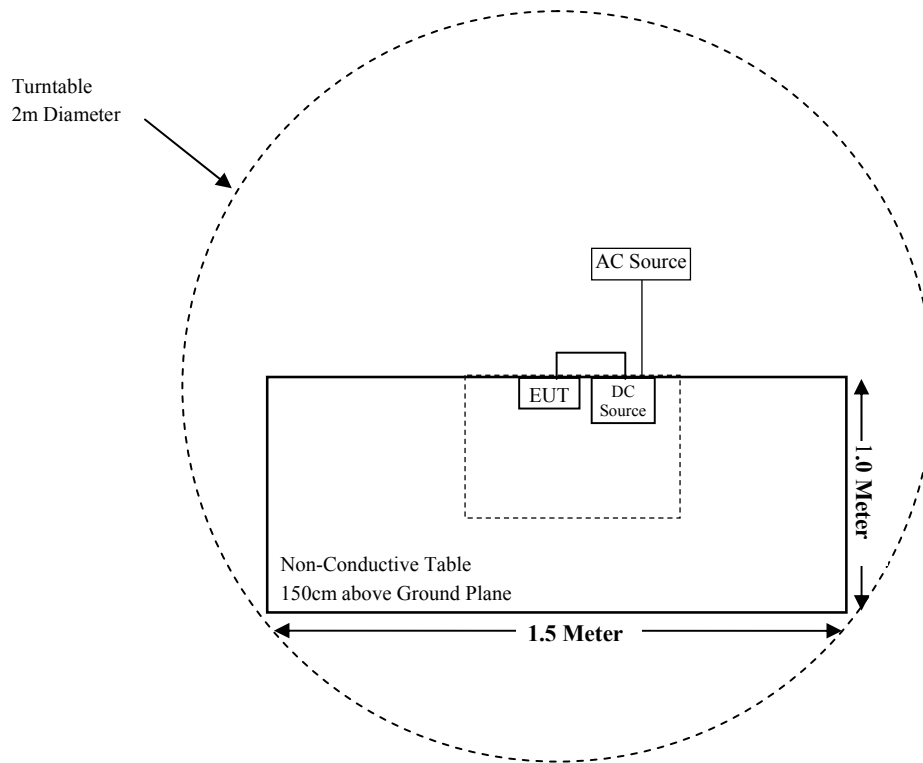
Cable Description	Length (m)	From Port	To
DC Cable	0.5	EUT	DC Source

Block Diagram of Test Setup

For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310 & §2.1091	MAXIMUM PERMISSIBLE EXPOSURE (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliance*
§15.247(d)	Spurious Emissions at Antenna Port	Compliance*
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliant
§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*

Compliance*: Please refer to the original report RSHA180525002-00A with FCC ID: 2ANDL-WR1 (granted on 2018-07-30), which was tested by Mark Yu, Bay Area Compliance Laboratories Corp. (Kunshan).

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test (Chamber 1#)					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2018-11-12	2019-11-11
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrument	Pre-amplifier	310N	171205	2018-08-14	2019-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2018-08-15	2019-08-14
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2018-11-30	2019-11-29
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-12-12	2019-12-11
A.H.Systems, inc	Amplifier	2641-1	491	2019-02-20	2020-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2019-03-22	2020-03-21
MICRO-TRONICS	Band Reject Filter	BRM50702	G024	2018-08-05	2019-08-04
Narda	Attenuator	10dB	010	2018-08-15	2019-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	N/A	N/A
MICRO-COAX	Coaxial Cable	Cable-6	006	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2018-08-15	2019-08-14

* **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).

FCC §1.1310 & §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart §2.1091 and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission’s guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	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;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

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);

Calculated Data:

Mode	Frequency Range (MHz)	Antenna Gain		Target Output Power		Evaluation Distance (cm)	Power Density (mW/cm²)	MPE Limit (mW/cm²)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2412~2462	2.50	1.78	22.00	158.49	20	0.0561	1.0
802.11g		2.50	1.78	22.00	158.49	20	0.0561	1.0
802.11 n-HT20		2.50	1.78	22.00	158.49	20	0.0561	1.0
802.11 n-HT40	2422~2452	2.50	1.78	21.00	125.89	20	0.0446	1.0

Note: The target output power was declared by the manufacturer.

Conclusion: The EUT meets exemption requirement - RF exposure evaluation greater than 20cm distance specified in § 2.1091. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by § 2.1093.

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

The EUT has an FPC antenna for Wi-Fi and the antenna gain is 2.5 dBi, which was permanently attached, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

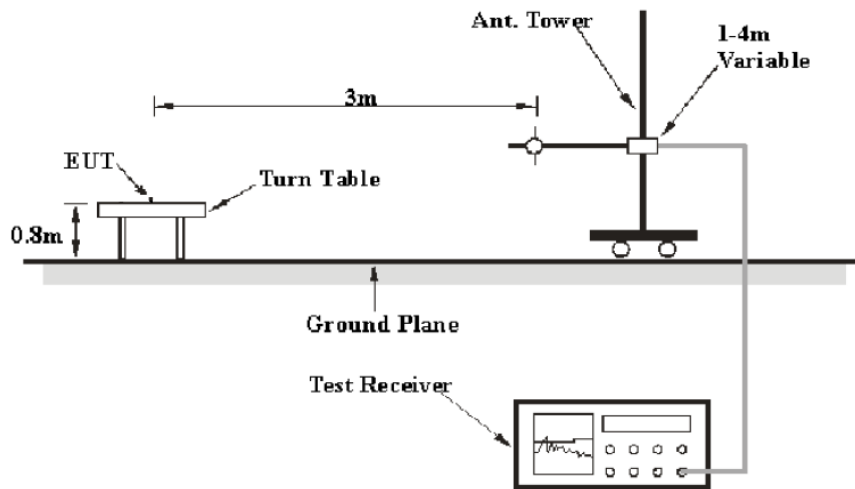
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

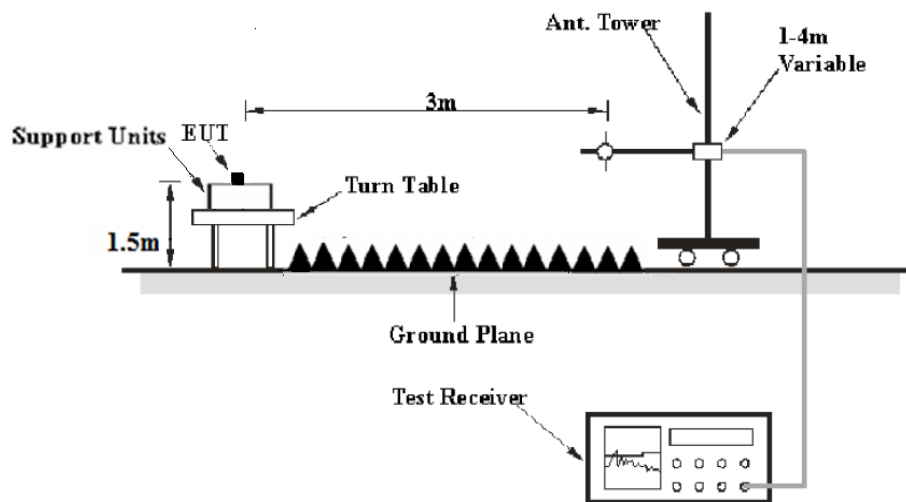
FCC §15.247 (d); §15.209; §15.205;

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	Duty Cycle	Detector	IF B/W	Measurement
30 MHz –1000 MHz	120 kHz	/	/	QP	120 kHz	QP
1 GHz-18 GHz	1 MHz	3 MHz	/	PK	/	PK
	1 MHz	10 Hz	≥98%	PK	/	Ave.
	1 MHz	1/T	<98%	PK	/	Ave.
18 GHz-25 GHz	1 MHz	3 MHz	/	PK	/	PK
	1 MHz	3 MHz	/	Ave.	/	Ave.

Test Procedure

According to 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 30MHz - 1GHz, 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

Temperature:	23.2~25.0°C
Relative Humidity:	48~50 %
ATM Pressure:	100.1~100.3kPa

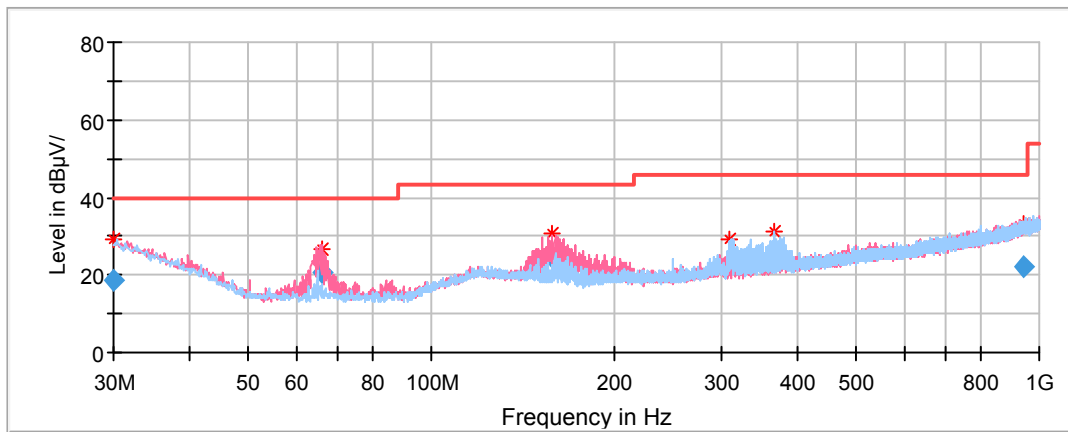
The testing was performed by Max Min from 2019-07-18 to 2019-07-29.

EUT operation mode: Transmitting

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 **middle 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)				
30.058836	18.66	101.0	H	254.0	-4.0	40.00	21.34
66.172450	20.40	101.0	V	226.0	-17.5	40.00	19.60
157.957600	24.54	101.0	V	57.0	-12.6	43.50	18.96
310.177550	22.87	101.0	H	311.0	-10.3	46.00	23.13
367.539600	24.86	101.0	H	56.0	-8.9	46.00	21.14
946.078200	22.04	101.0	H	41.0	1.2	46.00	23.96

1GHz-18GHz:

802.11b Mode:

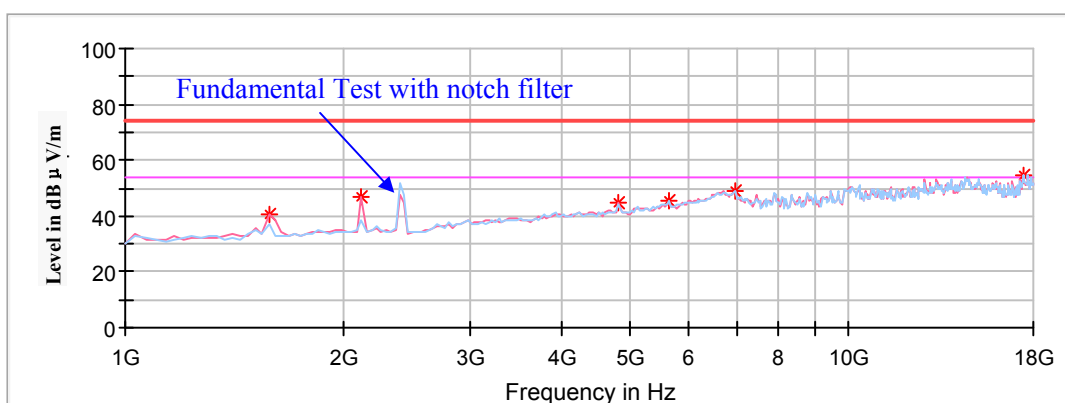
(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

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

Low Channel: 2412MHz

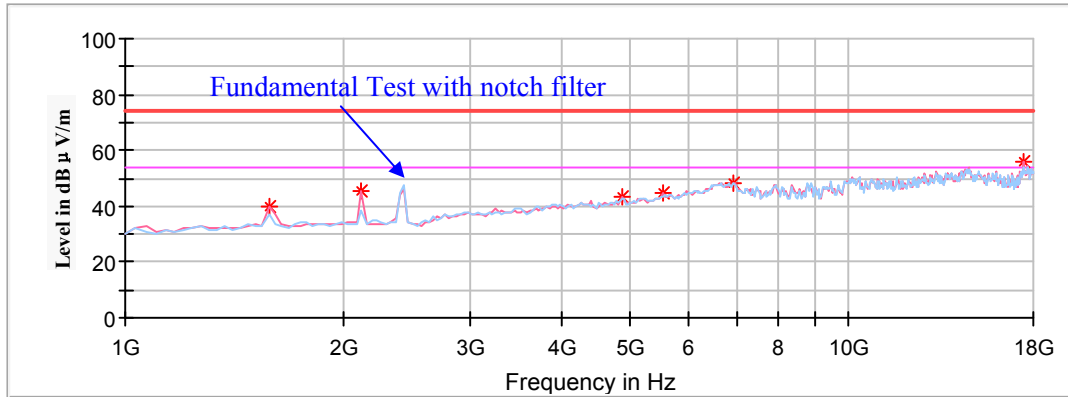
Full Spectrum



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)				
1579.16	---	31.44	250	V	226	-9.7	54	22.56
1579.16	40.75	---	250	V	226	-9.7	74	33.25
2124.25	---	36.89	250	V	297	-7.9	54	17.11
2124.25	46.79	---	250	V	297	-7.9	74	27.21
4824.00	---	43.39	200	V	294	-0.5	54	10.61
4824.00	44.88	---	200	V	294	-0.5	74	29.12
5633.27	---	35.16	100	H	87	1.6	54	18.84
5633.27	45.53	---	100	H	87	1.6	74	28.47
6961.92	---	36.51	200	V	48	5.3	54	17.49
6961.92	48.67	---	200	V	48	5.3	74	25.33
17454.91	---	45.78	100	H	317	14.0	54	8.22
17454.91	54.69	---	100	H	317	14.0	74	19.31

Middle Channel: 2437MHz

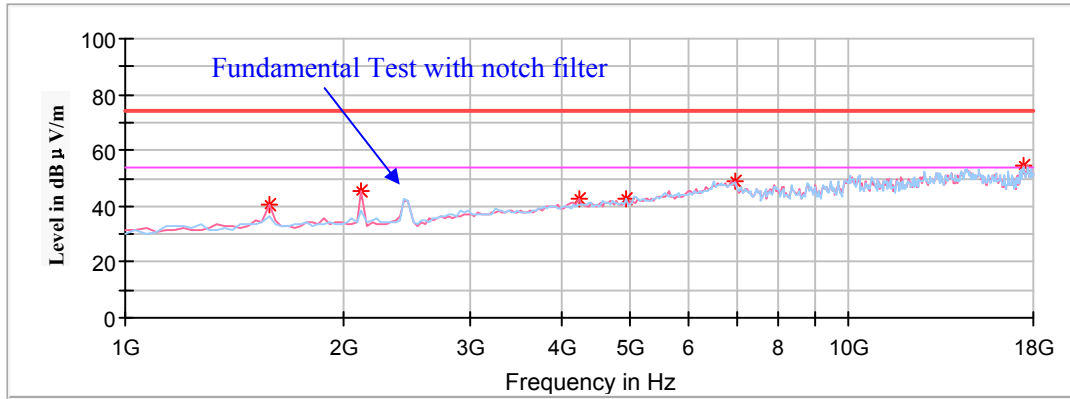
Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	Max Peak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1579.16	---	31.05	200	V	92	-9.7	54	22.95
1579.16	40.07	---	200	V	92	-9.7	74	33.93
2124.25	---	35.98	200	V	323	-7.9	54	18.02
2124.25	45.72	---	200	V	323	-7.9	74	28.28
4874.00	---	41.22	150	V	213	-0.5	54	12.78
4874.00	43.21	---	150	V	213	-0.5	74	30.79
5531.06	---	35.01	150	V	39	1.5	54	18.99
5531.06	44.74	---	150	V	39	1.5	74	29.26
6927.86	---	38.97	100	H	187	5.2	54	15.03
6927.86	48.59	---	100	H	187	5.2	74	25.41
17454.91	---	46.04	200	V	357	14.0	54	7.96
17454.91	55.90	---	200	V	357	14.0	74	18.10

High Channel: 2462MHz

Full Spectrum



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	Max Peak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1579.16	---	31.53	200	V	64	-9.7	54	22.47
1579.16	40.67	---	200	V	64	-9.7	74	33.33
2124.25	---	35.87	200	V	27	-7.9	54	18.13
2124.25	45.20	---	200	V	27	-7.9	74	28.80
4236.47	---	33.14	150	V	174	-1.4	54	20.86
4236.47	42.60	---	150	V	174	-1.4	74	31.40
4924.00	---	40.34	200	H	73	-0.4	54	13.66
4924.00	42.97	---	200	H	73	-0.4	74	31.03
6961.92	---	39.14	150	V	143	5.3	54	14.86
6961.92	48.75	---	150	V	143	5.3	74	25.25
17420.84	---	45.49	150	V	166	13.9	54	8.51
17420.84	54.24	---	150	V	166	13.9	74	19.76

802.11g Mode:

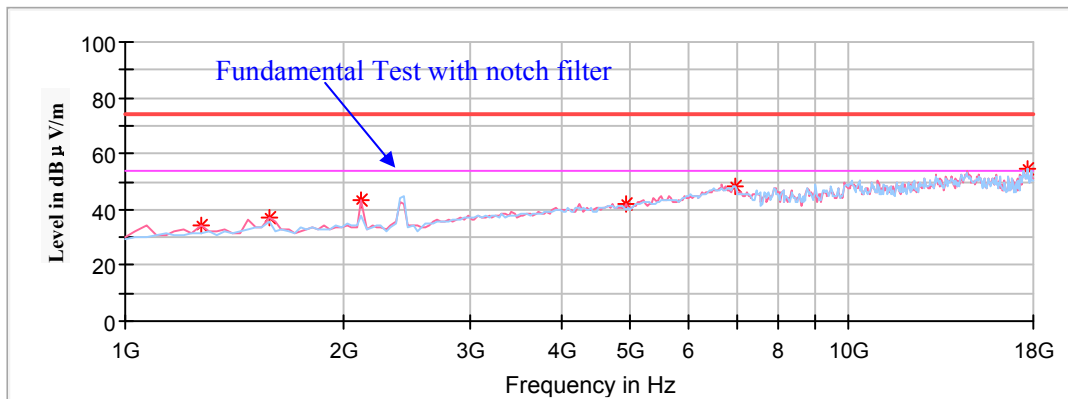
(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

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

Low Channel: 2412MHz

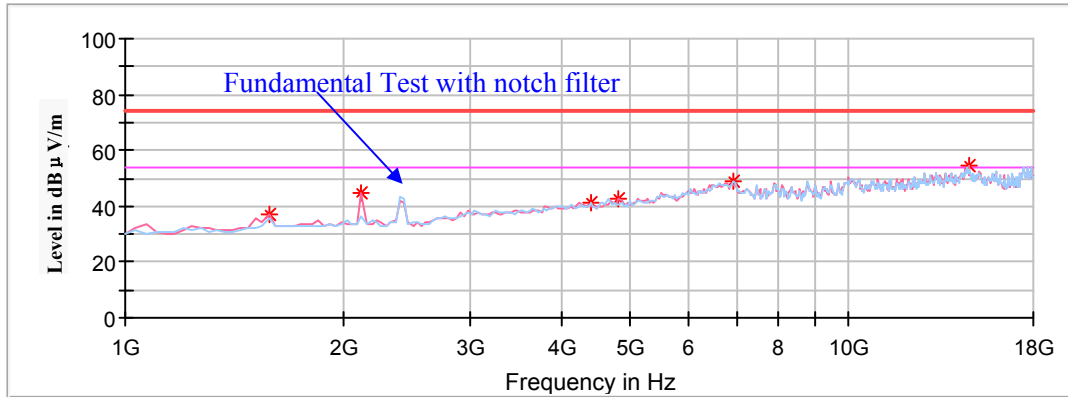
Full Spectrum



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)				
1272.55	---	24.57	150	V	87	-11.2	54	29.43
1272.55	34.00	---	150	V	87	-11.2	74	40.00
1579.16	---	28.11	250	V	201	-9.7	54	25.89
1579.16	37.34	---	250	V	201	-9.7	74	36.66
2124.25	---	34.89	150	V	235	-7.9	54	19.11
2124.25	43.45	---	150	V	235	-7.9	74	30.55
4824.00	---	33.57	200	V	328	-0.5	54	20.43
4824.00	41.94	---	200	V	328	-0.5	74	32.06
6961.92	---	39.56	200	H	235	5.3	54	14.44
6961.92	48.24	---	200	H	235	5.3	74	25.76
17659.32	---	45.11	150	H	94	14.0	54	8.89
17659.32	54.48	---	150	H	94	14.0	74	19.52

Middle Channel: 2437MHz

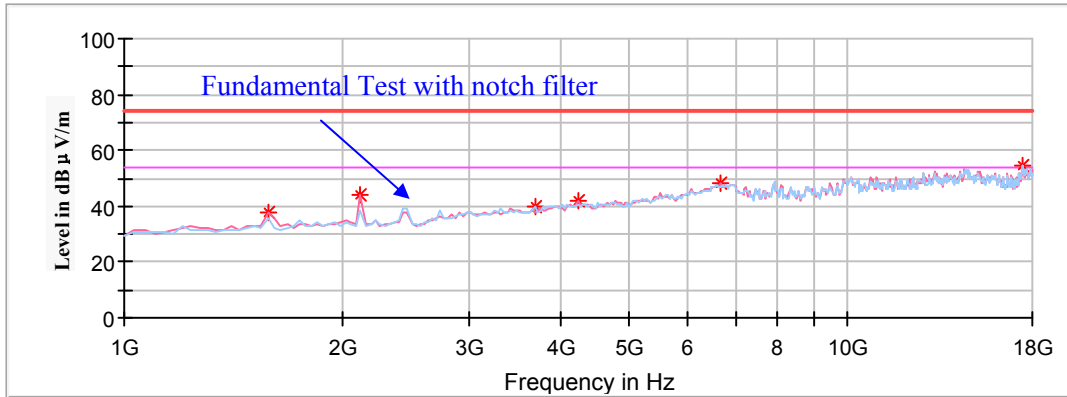
Full Spectrum



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)				
1579.16	---	27.56	150	V	132	-1.0	54	26.44
1579.16	37.16	---	150	V	132	-1.0	74	36.84
2124.25	---	34.98	200	V	270	-7.9	54	19.02
2124.25	44.51	---	200	V	270	-7.9	74	29.49
4406.81	---	31.41	100	H	30	-1.1	54	22.59
4406.81	40.94	---	100	H	30	-1.1	74	33.06
4815.63	---	32.51	150	H	42	-0.5	54	21.49
4815.63	42.92	---	150	H	42	-0.5	74	31.08
6927.86	---	38.99	150	V	82	5.2	54	15.01
6927.86	48.62	---	150	V	82	5.2	74	25.38
14627.25	---	44.85	250	H	187	12.4	54	9.15
14627.25	54.28	---	250	H	187	12.4	74	19.72

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)				
1579.16	---	28.24	100	V	347	-9.7	54	25.76
1579.16	37.60	---	100	V	347	-9.7	74	36.40
2124.25	---	24.24	250	H	26	-7.9	54	29.76
2124.25	43.79	---	250	H	26	-7.9	74	30.21
3691.38	---	30.42	150	V	359	-2.9	54	23.58
3691.38	39.51	---	150	V	359	-2.9	74	34.49
4236.47	---	32.24	150	V	85	-1.4	54	21.76
4236.47	41.92	---	150	V	85	-1.4	74	32.08
6689.38	---	38.98	250	V	159	4.8	54	15.02
6689.38	48.32	---	250	V	159	4.8	74	25.68
17454.91	---	44.98	100	H	214	14.0	54	9.02
17454.91	54.49	---	100	H	214	14.0	74	19.51

802.11n-HT20 Mode:

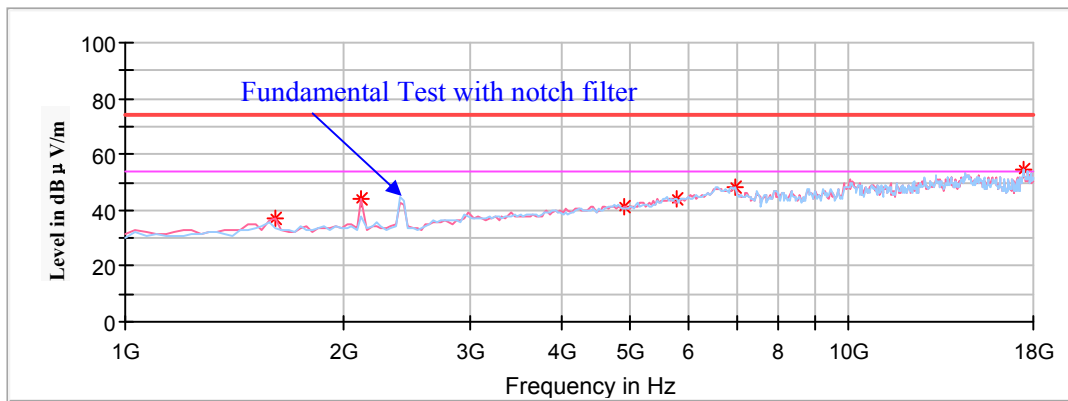
(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

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

Low Channel : 2412MHz

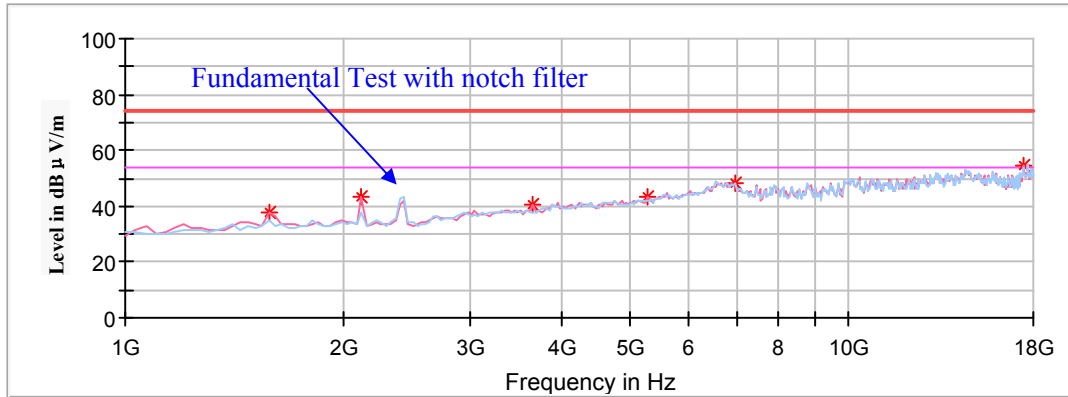
Full Spectrum



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)				
1613.23	---	28.67	100	V	209	-9.5	54	25.33
1613.23	37.37	---	100	V	209	-9.5	74	36.63
2124.25	---	35.89	250	V	154	-7.9	54	18.11
2124.25	44.24	---	250	V	154	-7.9	74	29.76
4883.77	---	31.99	150	V	313	-0.4	54	22.01
4883.77	41.51	---	150	V	313	-0.4	74	32.49
5769.54	---	34.86	200	H	169	1.9	54	19.14
5769.54	44.18	---	200	H	169	1.9	74	29.82
5769.54	---	38.97	200	H	244	5.3	54	15.03
5769.54	48.53	---	200	H	244	5.3	74	25.47
17454.91	---	45.11	150	H	100	14.0	54	8.89
17454.91	54.67	---	150	H	100	14.0	74	19.33

Middle Channel: 2437MHz

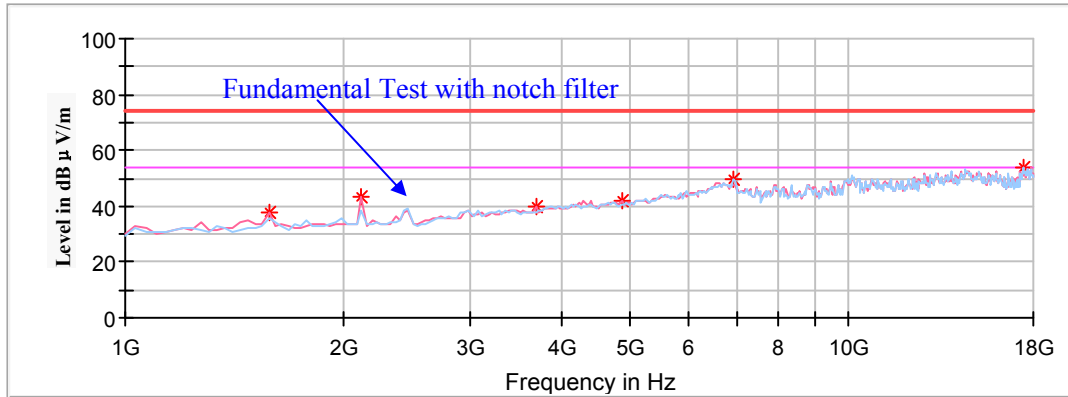
Full Spectrum



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)				
1579.16	---	28.51	100	V	53	-9.7	54	25.49
1579.16	37.74	---	100	V	53	-9.7	74	36.26
2124.25	---	34.11	250	V	350	-7.9	54	19.89
2124.25	43.39	---	250	V	350	-7.9	74	30.61
3657.31	---	31.02	100	V	6	-3.0	54	22.98
3657.31	40.34	---	100	V	6	-3.0	74	33.66
5258.52	---	34.11	150	V	167	0.6	54	19.89
5258.52	43.65	---	150	V	167	0.6	74	30.35
6961.92	---	38.54	150	H	166	5.3	54	15.46
6961.92	47.98	---	150	H	166	5.3	74	26.02
17454.91	---	45.11	100	V	305	14.0	54	8.89
17454.91	54.60	---	100	V	305	14.0	74	19.40

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)				
1579.16	---	28.11	150	V	76	-9.7	54	25.89
1579.16	37.45	---	150	V	76	-9.7	74	36.55
2124.25	---	34.01	100	V	273	-7.9	54	19.99
2124.25	43.62	---	100	V	273	-7.9	74	30.38
3691.38	---	30.04	250	V	10	-2.9	54	23.96
3691.38	39.90	---	250	V	10	-2.9	74	34.10
4849.70	---	32.01	200	V	5	-0.5	54	21.99
4849.70	41.62	---	200	V	5	-0.5	74	32.38
6927.86	---	40.14	150	H	347	5.2	54	13.86
6927.86	49.45	---	150	H	347	5.2	74	24.55
17420.84	---	44.59	250	H	182	13.9	54	9.41
17420.84	54.03	---	250	H	182	13.9	74	19.97

802.11n-HT40 Mode:

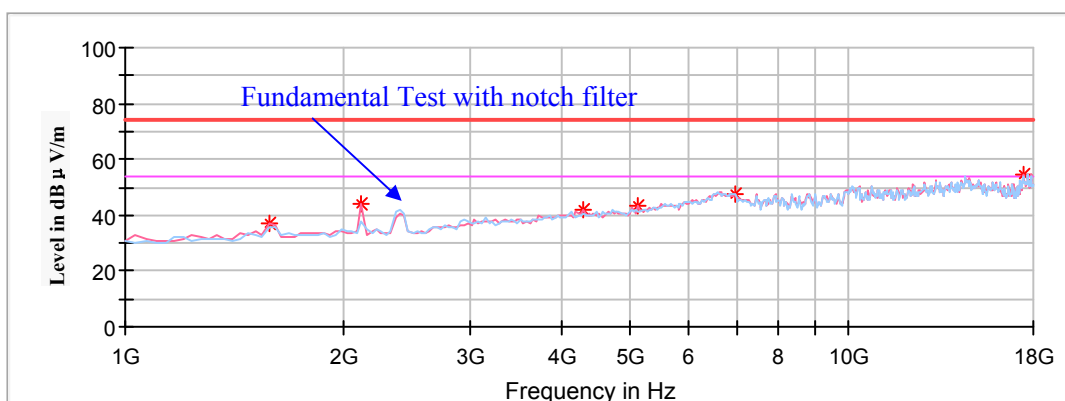
(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded)

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

Low Channel : 2422MHz

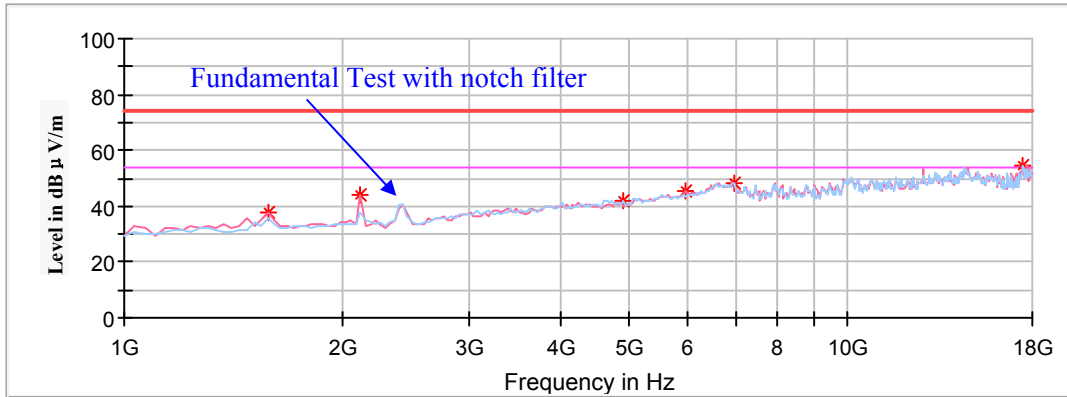
Full Spectrum



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)				
1579.16	---	27.67	100	V	211	-9.7	54	26.33
1579.16	37.00	---	100	V	211	-9.7	74	37.00
2124.25	---	34.59	250	V	35	-7.9	54	19.41
2124.25	44.06	---	250	V	35	-7.9	74	29.94
4304.61	---	32.54	150	V	60	-1.3	54	21.46
4304.61	41.83	---	150	V	60	-1.3	74	32.17
5122.24	---	33.69	250	H	30	0.1	54	20.31
5122.24	43.23	---	250	H	30	0.1	74	30.77
6961.92	---	38.14	200	V	252	5.3	54	15.86
6961.92	47.74	---	200	V	252	5.3	74	26.26
17420.84	---	45.34	150	V	217	13.9	54	8.66
17420.84	54.89	---	150	V	217	13.9	74	19.11

Middle Channel: 2437MHz

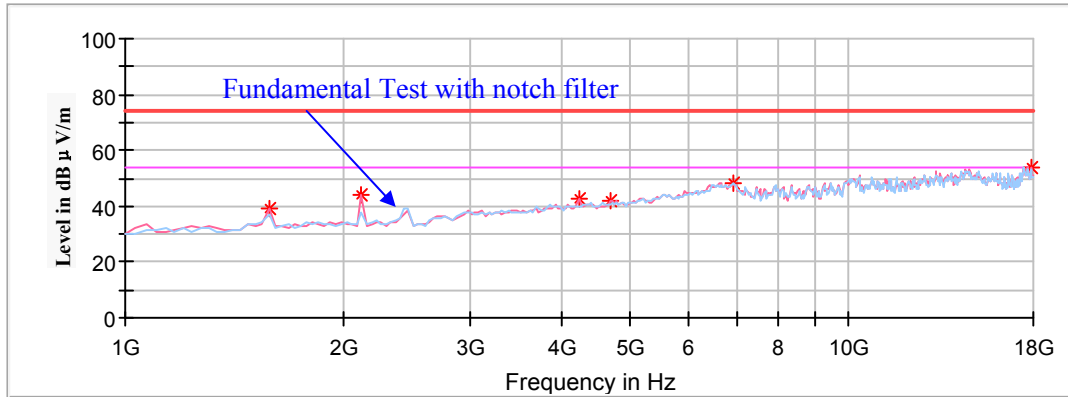
Full Spectrum



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)				
1579.16	---	28.67	100	V	142	-9.7	54	25.33
1579.16	38.06	---	100	V	142	-9.7	74	35.94
2124.25	---	34.41	250	V	34	-7.9	54	19.59
2124.25	43.90	---	250	V	34	-7.9	74	30.10
4883.77	---	32.14	150	V	18	-0.4	54	21.86
4883.77	41.74	---	150	V	18	-0.4	74	32.26
5973.95	---	36.47	200	H	194	2.2	54	17.53
5973.95	45.72	---	200	H	194	2.2	74	28.28
6961.92	---	38.97	200	V	130	5.3	54	15.03
6961.92	48.27	---	200	V	130	5.3	74	25.73
17454.91	---	35.11	250	H	324	14.0	54	18.89
17454.91	54.60	---	250	H	324	14.0	74	19.40

High Channel : 2452MHz

Full Spectrum

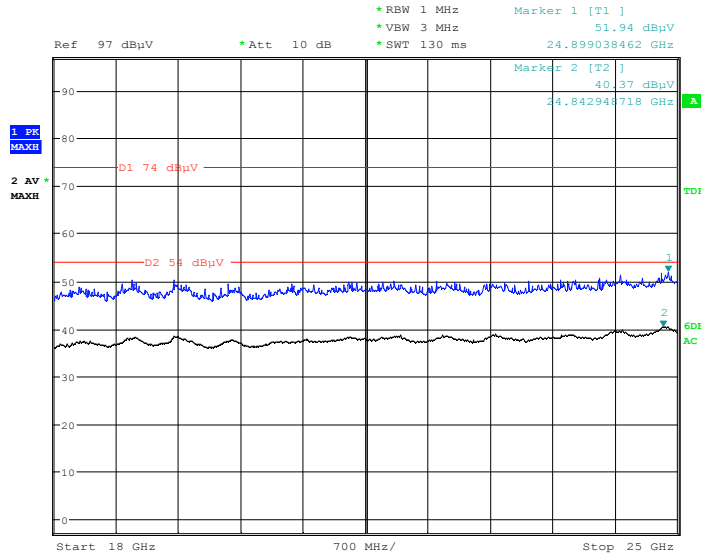


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1579.16	---	30.11	100	V	321	-9.7	54	23.89
1579.16	39.05	---	100	V	321	-9.7	74	34.95
2124.25	---	34.14	250	V	49	-7.9	54	19.86
2124.25	43.81	---	250	V	49	-7.9	74	30.19
4236.47	---	32.97	150	V	272	-1.4	54	21.03
4236.47	42.42	---	150	V	272	-1.4	74	31.58
4679.36	---	32.76	200	V	151	-0.7	54	21.24
4679.36	42.16	---	200	V	151	-0.7	74	31.84
6927.86	---	38.67	200	V	145	5.2	54	15.33
6927.86	48.11	---	200	V	145	5.2	74	25.89
17897.80	---	44.56	250	H	154	13.6	54	9.44
17897.80	53.96	---	250	H	154	13.6	74	20.04

18GHz-25GHz:

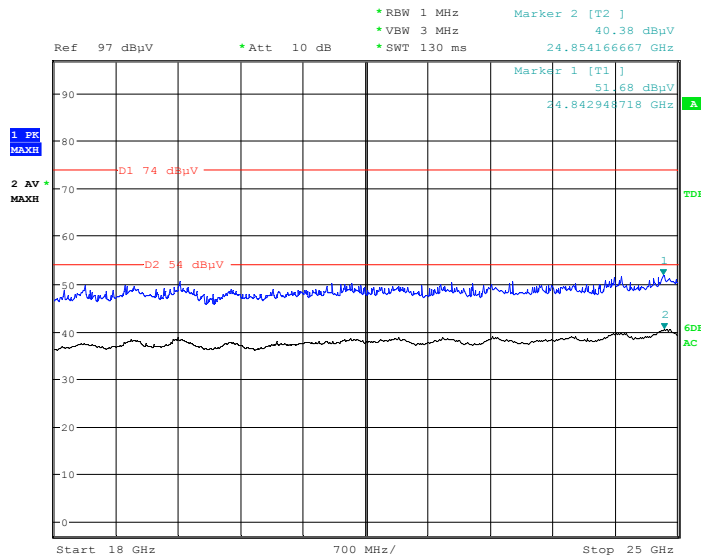
Pre-scan with 802.11b, 802.11g, 802.11n-HT20 and 802.11n-HT40 modes of operation in the X,Y and Z axes of orientation, the worst case **high channel of 802.11n20 mode in X-axis of orientation** was recorded

Horizontal



Date: 25.JUL.2019 17:12:46

Vertical



Date: 25.JUL.2019 17:46:27

Restricted Bands Emissions Test:

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)

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								
2390.000000	---	39.99	100	H	219	2.8	54	14.01
2390.000000	48.21	---	100	H	219	2.8	74	25.79
High Channel: 2462MHz								
2483.500000	---	40.45	100	H	276	3.0	54	13.55
2483.500000	48.63	---	100	H	276	3.0	74	25.37

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								
2390.000000	---	40.17	100	H	170	2.8	54	13.83
2390.000000	47.98	---	100	H	170	2.8	74	26.02
High Channel: 2462MHz								
2483.500000	---	40.73	100	H	273	3.0	54	13.27
2483.500000	47.66	---	100	H	273	3.0	74	26.34

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								
2390.000000	---	40.18	100	H	27	2.8	54	13.82
2390.000000	48.77	---	100	H	27	2.8	74	25.23
High Channel: 2462MHz								
2483.500000	---	41.16	100	H	352	3.0	54	12.84
2483.500000	49.34	---	100	H	352	3.0	74	24.66

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								
2390.000000	---	41.37	100	H	14	2.8	54	12.63
2390.000000	49.56	---	100	H	14	2.8	74	24.44
High Channel: 2452MHz								
2483.500000	---	42.03	100	H	247	3.0	54	11.97
2483.500000	50.26	---	100	H	247	3.0	74	23.74

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