



FCC PART 15.407 TEST REPORT

For

Thundercomm Technology Co., Ltd

4F, Taixiang Building, 1A Longxiang Rd Haidian Dist, Beijing, China,100191

FCC ID: 2AOHHTURBOXSOMD820

Report Type: Class II Permissive Change	Product Type: Thundersoft TurboX-D820-SoM
Report Number: RSZ190131004-00DA1	
Report Date: 2019-03-01	
Reviewed By: RF Engineer	Rocky Kang <i>Rocky Kang</i>
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Thundersoft TurboX-D820-SoM
Tested Model	TurboX-D820
Multiple Model [#]	TurboX
Frequency Range	5G WI-FI: 5150-5250 MHz; 5725-5850 MHz
Transmit Power	5150-5250 MHz: 12.09dBm (802.11a), 12.42dBm(802.11n20), 12.31 dBm(802.11n40), 12.09dBm (802.11ac20), 12.42dBm(802.11 ac40), 12.31 dBm(802.11 ac80) 5725-5850 MHz 12.09dBm (802.11a), 12.42dBm(802.11n20), 12.31 dBm(802.11n40), 12.09dBm (802.11ac20), 12.42dBm(802.11 ac40), 12.31 dBm(802.11 ac80)
Modulation Technique	WIFI: DSSS, OFDM
Antenna Specification	IPEX3, 2 dBi
Voltage Range	DC 4.0V
Date of Test	Feb 21, 2019
Sample serial number	190131004
Received date	2019-01-31
Sample/EUT Status	Good condition

Notes: This series products model: TurboX and TurboX-D820 are electrically identical; the differences between them are the model number. Model TurboX-D820 was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

Objective

This type approval report is prepared on behalf of *Thundercomm Technology Co., Ltd* in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

This is a CIIPC application of the device; the differences between the original device and the current one are as follows:

1. Change some capacitance in main board which don't effect RF characteristic.
2. Adding an BT&WIFI antenna, change the antenna type to FPC.

For the change made to the device, the test item "Spurious Emissions" were performed.

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS&DSS submissions with FCC ID: 2AOHHTURBOXSOMD820.

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

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

Measurement Uncertainty

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

Note: 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. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer.

The device support 802.11a/n20/n40/ac20/ac40/ac80 modes.

For 5150-5250MHz Band, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220
38	5190	46	5230
40	5200	48	5240
42	5210	/	/

For 5725-5850MHz Band, 8 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	157	5785
151	5755	159	5795
153	5765	161	5805
155	5775	165	5825

The EUT 802.11a mode only support SISO mode,the others mode can support SISO and MIMO mode, pre-scan the output power of both modes, the result of both modes was almost identical, so the MIMO mode was chosen for testing.

EUT Exercise Software

“QRCT” software was used. Test frequencies and power level were configured as below:

U-NII	Mode	Channel Number	Frequency (MHz)	Rate (Mbps)	Power Level
5150 – 5250MHz	802.11 a	CH36	5180	6	12
		CH40	5200	6	12
		CH48	5240	6	12
	802.11 n20	CH36	5180	MCS0	12
		CH40	5200	MCS0	12
		CH48	5240	MCS0	12
	802.11 n40	CH38	5190	MCS0	11
		CH46	5230	MCS0	11
	802.11 ac20	CH36	5180	MCS0	12
		CH40	5200	MCS0	12
		CH48	5240	MCS0	12
	802.11 ac40	CH38	5190	MCS0	11
		CH46	5230	MCS0	11
	802.11 ac80	CH42	5210	MCS0	11
5725 – 5850MHz	802.11 a	CH149	5745	6	12
		CH157	5785	6	12
		CH165	5825	6	12
	802.11 n20	CH149	5745	MCS0	12
		CH157	5785	MCS0	12
		CH165	5825	MCS0	12
	802.11 n40	CH151	5755	MCS0	11
		CH159	5795	MCS0	11
	802.11 ac20	CH149	5745	MCS0	12
		CH157	5785	MCS0	12
		CH165	5825	MCS0	12
	802.11 ac40	CH151	5755	MCS0	11
		CH159	5795	MCS0	11
	802.11 ac80	CH155	5775	MCS0	11

Equipment Modifications

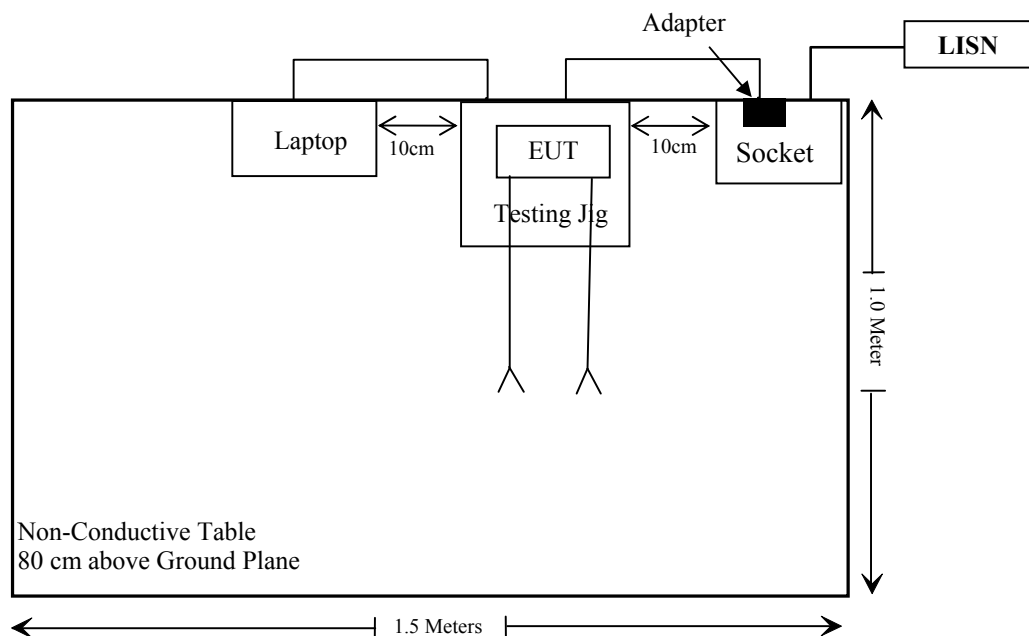
No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Thundersoft	Testing Jig	N/A	N/A
STH	Adapter	P24120200	N/A
BULL	Socket	GN-415K	5503290068073
Compaq	Laptop	CQ45	CND9524JMW
N/A	Antenna 0	N/A	N/A
N/A	Antenna 1	N/A	N/A

External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded un-detachable AC cable	1.2	Socket	mains
Unshielded un-detachable DC cable	1.4	Adapter	Testing Jig
Unshielded un-detachable DC cable	1.4	Testing Jig	Laptop

Block Diagram of Test Setup

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b) (1) & §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Compliance*
§15.205& §15.209 &§15.407(b) (1), (4),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(b) (1),(4)	Out Of Band Emission	Compliance*
§15.407(a) (1), (5),(e)	26 dB Emission Bandwidth & 6dB Bandwidth	Compliance*
§15.407(a)(1),(3)	Conducted Transmitter Output Power	Compliance*
§15.407 (a)(1),(3)	Power Spectral Density	Compliance*

Compliance*: Please referred to FCC ID: 2AOHHTURBOXSOMD820 granted on 2018-09-19. Report No.: RSZ180710003-00D, which was tested by Bay Area Compliance Laboratories Corp. (Shenzhen).

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2019-01-11	2020-01-11
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
Sonoma instrument	Amplifier	310N	186238	2018-11-12	2019-11-12
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-06-23	2019-06-23
COM-POWER	Pre-amplifier	PA-122	181919	2018-11-12	2019-11-12
A.H. System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
UTiFLEX MICRO-C0AX	RF Cable	UFA147A-2362- 100100	MFR64639 231029-003	2018-07-11	2021-07-10
Ducommun technologies	RF Cable	104PEA	218124002	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	RG-214	1	2018-11-19	2019-05-21
Ducommun technologies	RF Cable	RG-214	2	2018-11-12	2019-11-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Heatsink Required	Amplifier	QLW-18405536- J0	15964001002	2018-11-12	2019-11-12
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-03	2017-12-29	2020-12-28
Agilent	Spectrum Analyzer	8564E	3943A01781	2019-01-04	2020-01-04
Sinoscite	Band Reject Filter	BSF2402- 2480MN-0898- 001	99632	2018-11-12	2019-11-12
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR

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

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

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

Limits for General Population/Uncontrolled Exposure

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

Result**Calculated Formulary:**

Predication of MPE limit at a given distance

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

S = power density (in appropriate units, e.g. mW/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)

Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm²)	MPE Limit (mW/cm²)
	(dBi)	(numeric)	(dBm)	(mW)			
5150-5250	2	1.58	13.5	22.39	20	0.007	1.0
5725-5850	2	1.58	13.5	22.39	20	0.007	1.0

Simultaneous transmitting consideration: (referring to the DSS report, the highest MPE for Bluetooth is 0.004mW/cm²)

The ratio=MPE/limit_{DSS}+MPE/limit_{NII}=0.004+0.007=0.011 < 1.0, simultaneous exposure is not required.

Note:

1) The conducted power is the tune-up power of the Max Conducted Output Power.

2) 2.4GHz and 5GHz WiFi can't transmit simultaneously for this device.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance

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 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has two FPC antennas arrangement, which were connected to board with an unique connector and the antenna gain is 2 dBi, one for Bluetooth and wifi(antenna 0), the other for wifi only(antenna 1), fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliance.

§15.205 & §15.209 & §15.407(B) (1), (4), (6), (7) – UNDESIRABLE EMISSION**Applicable Standard**

FCC §15.407 (b) (1), (4), (6), (7); §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

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

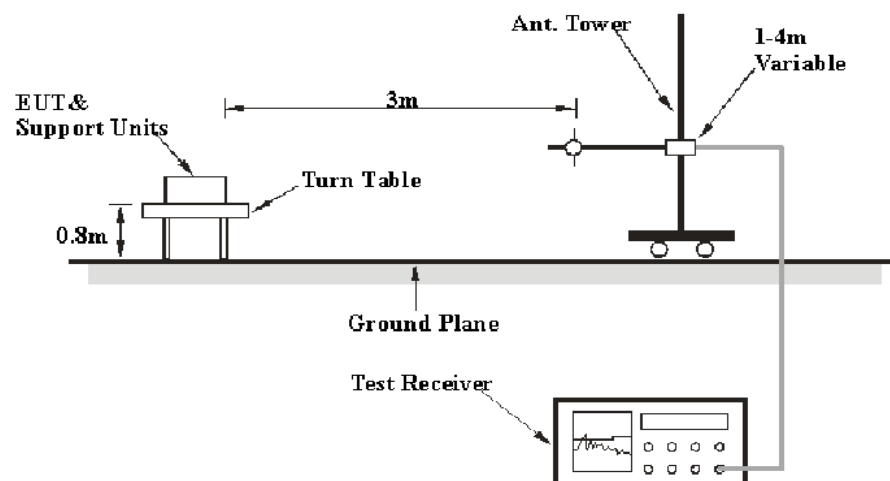
(4) For transmitters operating in the 5.725-5.85 GHz band:

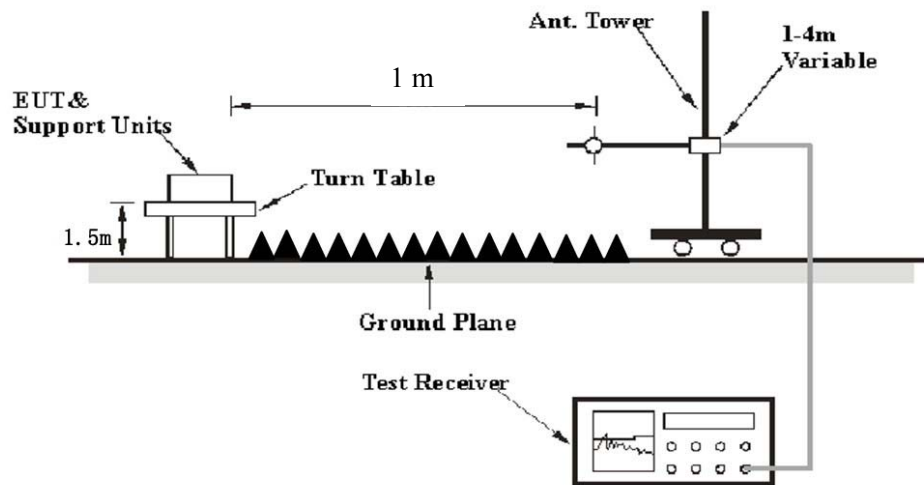
(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

EUT Setup

Below 1 GHz:



Above 1 GHz:

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

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

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

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

Note 2: when duty cycle is less than 98%

Test Procedure**Radiated Spurious Emission**

During the radiated emission test, the adapter was connected to the AC floor outlet.

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

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

According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified, extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\text{SpecLimit}} = E_{\text{Meas}} + 20 \log \left(\frac{d_{\text{Meas}}}{d_{\text{SpecLimit}}} \right)$$

where

$E_{\text{SpecLimit}}$	is the field strength of the emission at the distance specified by the limit, in dB μ V/m
E_{Meas}	is the field strength of the emission at the measurement distance, in dB μ V/m
d_{Meas}	is the measurement distance, in m
$d_{\text{SpecLimit}}$	is the distance specified by the limit, in m

So the extrapolation factor of 1m is $20 \cdot \log(1/3) = -9.5$ dB

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

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

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

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

Test Data

Environmental Conditions

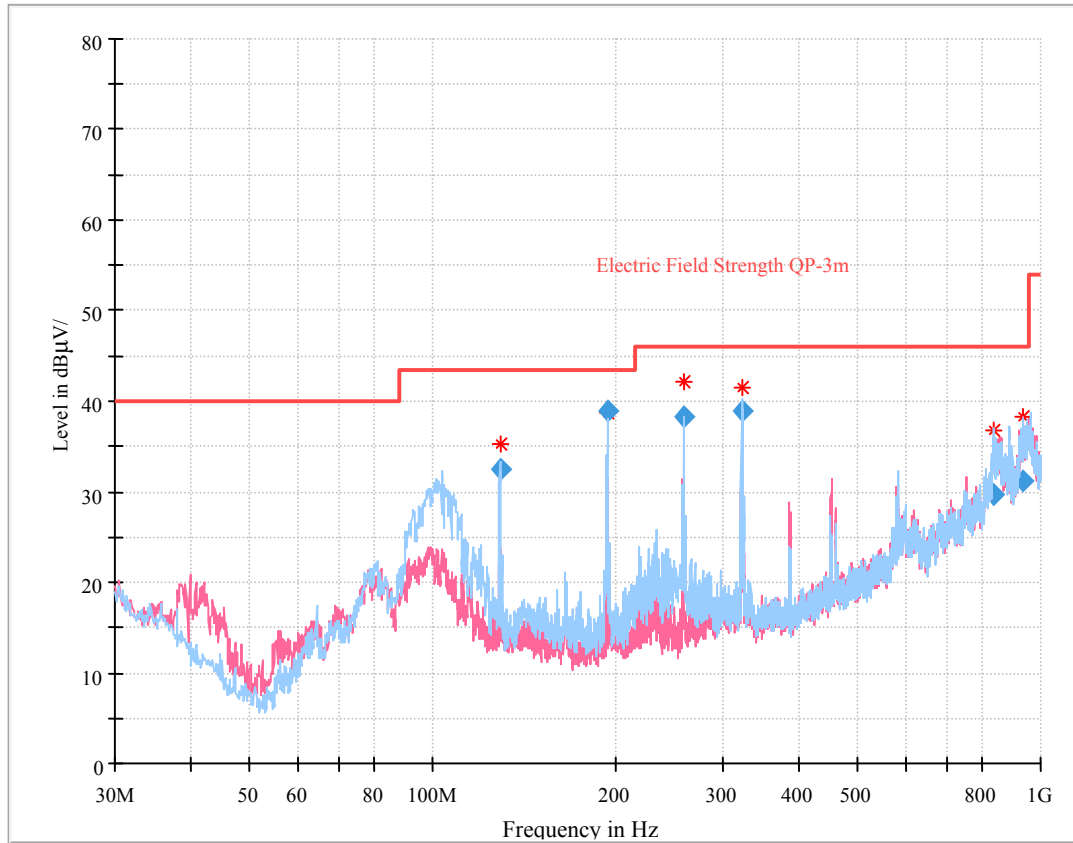
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Baston Chen on 2019-02-21.

EUT operation mode: Transmitting

Note: For wifi 802.11a mode, the worst case is antenna 1, for others mode, the two antennas transmitting simultaneously.

30 MHz – 1 GHz: (worst case is 802.11a mode 5180 MHz)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
129.133000	32.47	163.0	H	102.0	-13.7	43.50	11.03
193.580875	38.92	111.0	H	99.0	-14.7	43.50	4.58
258.302875	38.37	102.0	H	95.0	-13.5	46.00	7.63
322.549750	39.00	109.0	H	77.0	-10.7	46.00	7.00
839.387750	29.72	276.0	H	161.0	5.9	46.00	16.28
937.050000	31.11	259.0	V	161.0	8.5	46.00	14.89

30 MHz ~ 40 GHz:**5150-5250 MHz:**

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m) @1m	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBμV/m) @1m	Margin (dB)
802.11a									
5180 MHz									
5150.00	27.80	PK	293	1.6	H	41.43	69.23	83.5	14.27
5150.00	13.54	Ave.	293	1.6	H	41.43	54.97	63.5	8.53
5350.00	27.35	PK	331	1.8	H	42.06	69.41	83.5	14.09
5350.00	13.26	Ave.	331	1.8	H	42.06	55.32	63.5	8.18
10360.00	38.29	PK	295	1.6	H	21.69	59.98	77.7	17.72
5200 MHz									
10400.00	38.57	PK	106	1.7	H	21.79	60.36	77.7	17.34
5240 MHz									
5150.00	27.84	PK	289	1.7	H	41.43	69.27	83.5	14.23
5150.00	13.69	Ave.	289	1.7	H	41.43	55.12	63.5	8.38
5350.00	27.40	PK	109	1.8	H	42.06	69.46	83.5	14.04
5350.00	13.96	Ave.	109	1.8	H	42.06	56.02	63.5	7.48
10480.00	38.05	PK	297	1.4	H	21.49	59.54	77.7	18.16
802.11n20									
5180 MHz									
5150.00	27.35	PK	175	2.4	H	41.43	68.78	83.5	14.72
5150.00	13.84	Ave.	175	2.4	H	41.43	55.27	63.5	8.23
5150.00	27.60	PK	3	1.7	H	41.43	69.03	83.5	14.47
5150.00	13.78	Ave.	3	1.7	H	41.43	55.21	63.5	8.29
10360.00	38.46	PK	217	2.2	H	21.69	60.15	77.7	17.55
5200 MHz									
10400.00	39.05	PK	182	2.5	H	21.79	60.84	77.7	16.86
5240 MHz									
5149.00	27.46	PK	321	2.2	H	41.60	69.06	83.5	14.44
5149.00	13.87	Ave.	321	2.2	H	41.60	55.47	63.5	8.03
5351.00	27.80	PK	195	2.4	H	42.06	69.86	83.5	13.64
5351.00	13.92	Ave.	195	2.4	H	42.06	55.98	63.5	7.52
10480.00	39.16	PK	40	1.0	H	21.49	60.65	77.7	17.05
802.11n40									
5190 MHz									
5149.00	27.50	PK	251	1.5	H	41.60	69.10	83.5	14.40
5149.00	13.48	Ave.	251	1.5	H	41.60	55.08	63.5	8.42
5351.00	27.60	PK	215	2.0	H	42.06	69.66	83.5	13.84
5351.00	13.59	Ave.	215	2.0	H	42.06	55.65	63.5	7.85
10380.00	38.26	PK	5	1.5	H	21.69	59.95	77.7	17.75
5230 MHz									
5150.00	27.84	PK	154	1.9	H	41.43	69.27	83.5	14.23
5150.00	13.62	Ave.	154	1.9	H	41.43	55.05	63.5	8.45
5150.00	27.60	PK	240	1.8	H	41.43	69.03	83.5	14.47
5150.00	13.55	Ave.	240	1.8	H	41.43	54.98	63.5	8.52
10460.00	38.44	PK	5	2.3	H	21.39	59.83	77.7	17.87

Frequency (MHz)	Receiver		Turntable	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m) @1m	FCC Part 15.407/205/209	
	Reading (dBµV)	PK/QP/Ave.	Degree	Height (m)	Polar (H / V)			Limit (dBµV/m @1m)	Margin (dB)
802.11ac20									
5180 MHz									
5149.00	27.85	PK	91	2.2	H	41.60	69.45	83.5	14.05
5149.00	13.70	Ave.	91	2.2	H	41.60	55.30	63.5	8.20
5351.00	27.45	PK	167	2.2	H	42.06	69.51	83.5	13.99
5351.00	13.60	Ave.	167	2.2	H	42.06	55.66	63.5	7.84
10360.00	38.22	PK	178	2.3	H	21.69	59.91	77.7	17.79
5200 MHz									
10400.00	38.46	PK	109	1.4	H	21.79	60.25	77.7	17.45
5240 MHz									
5150.00	27.48	PK	170	1.7	H	41.43	68.91	83.5	14.59
5150.00	13.60	Ave.	170	1.7	H	41.43	55.03	63.5	8.47
5351.00	27.70	PK	239	2.0	H	42.06	69.76	83.5	13.74
5351.00	13.77	Ave.	239	2.0	H	42.06	55.83	63.5	7.67
10480.00	39.46	PK	119	1.5	H	21.49	60.95	77.7	16.75
802.11ac40									
5190 MHz									
5150.00	27.80	PK	168	1.1	H	41.43	69.23	83.5	14.27
5150.00	13.65	Ave.	168	1.1	H	41.43	55.08	63.5	8.42
5351.00	27.48	PK	315	1.8	H	42.06	69.54	83.5	13.96
5351.00	13.60	Ave.	315	1.8	H	42.06	55.66	63.5	7.84
10380.00	38.50	PK	132	1.2	H	21.69	60.19	77.7	17.51
5230 MHz									
5150.00	27.84	PK	304	1.3	H	41.43	69.27	83.5	14.23
5150.00	13.65	Ave.	304	1.3	H	41.43	55.08	63.5	8.42
5150.00	13.29	PK	218	2.4	H	41.43	54.72	83.5	28.78
5150.00	13.34	Ave.	218	2.4	H	41.43	54.77	63.5	8.73
10460.00	39.70	PK	87	2.2	H	21.39	61.09	77.7	16.61
802.11ac80									
5210 MHz									
5150.00	27.64	PK	75	1.8	H	41.43	69.07	83.5	14.43
5150.00	13.70	Ave.	75	1.8	H	41.43	55.13	63.5	8.37
5150.00	27.45	PK	57	1.2	H	41.43	68.88	83.5	14.62
5150.00	13.55	Ave.	57	1.2	H	41.43	54.98	63.5	8.52
10420.00	39.06	PK	166	2.0	H	21.79	60.85	77.7	16.85

Note: For the band edge of 5150-5250MHz band testing, the amplifier had been use.

5745-5850 MHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m) @1m	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m) @1m	Margin (dB)
802.11a									
5745 MHz									
5725.00	28.96	PK	25	1.7	H	42.15	71.11	122.2	51.09
5720.00	28.67	PK	25	1.7	H	42.15	70.82	110.8	39.98
5700.00	27.54	PK	322	2.3	H	42.15	69.69	105.2	35.51
5850.00	27.69	PK	322	2.3	H	42.55	70.24	122.2	51.96
11490.00	40.21	PK	47	2.3	H	24.17	64.38	83.5	19.12
11490.00	26.03	Ave.	47	2.3	H	24.17	50.20	63.5	13.30
5785 MHz									
11570.00	38.41	PK	65	1.4	H	23.10	61.51	83.5	21.99
11570.00	25.50	Ave.	65	1.4	H	23.10	48.60	63.5	14.90
5825 MHz									
5850.00	28.97	PK	301	1.4	H	42.55	71.52	122.2	50.68
5855.00	28.45	PK	301	1.4	H	42.55	71.00	110.8	39.80
5875.00	27.95	PK	237	2.1	H	42.55	70.50	105.2	34.70
5725.00	27.96	PK	237	2.1	H	42.15	70.11	122.2	52.09
11650.00	39.26	PK	297	1.2	H	22.37	61.63	83.5	21.87
11650.00	26.50	Ave.	297	1.2	H	22.37	48.87	63.5	14.63
802.11n20									
5745 MHz									
5725.00	28.79	PK	238	2.2	H	42.15	70.94	122.2	51.26
5720.00	28.26	PK	238	2.2	H	42.15	70.41	110.8	40.39
5700.00	28.05	PK	269	2.2	H	42.15	70.20	105.2	35.00
5850.00	28.11	PK	269	2.2	H	42.55	70.66	122.2	51.54
11490.00	39.50	PK	188	1.0	H	24.17	63.67	83.5	19.83
11490.00	25.60	Ave.	188	1.0	H	24.17	49.77	63.5	13.73
5785 MHz									
11570.00	38.66	PK	88	1.3	H	23.10	61.76	83.5	21.74
11570.00	26.03	Ave.	88	1.3	H	23.10	49.13	63.5	14.37
5825 MHz									
5850.00	28.87	PK	330	2.2	H	42.55	71.42	122.2	50.96
5855.00	28.46	PK	330	2.2	H	42.55	71.01	110.8	39.79
5875.00	28.19	PK	234	1.8	H	42.55	70.74	105.2	34.46
5725.00	28.32	PK	234	1.8	H	42.15	70.47	122.2	51.91
11650.00	38.97	PK	275	1.1	H	22.37	61.34	83.5	22.16
11650.00	26.05	Ave.	275	1.1	H	22.37	48.42	63.5	15.08

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m) @1m	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m) @1m	Margin (dB)
802.11n40									
5755 MHz									
5721.00	28.89	PK	98	1.3	H	42.15	71.04	122.2	51.16
5720.00	28.57	PK	98	1.3	H	42.15	70.72	110.8	40.08
5700.00	28.41	PK	140	2.1	H	42.15	70.56	105.2	34.64
5850.00	28.31	PK	140	2.1	H	42.55	70.86	122.2	51.34
11510.00	39.46	PK	317	2.2	H	24.17	63.63	83.5	19.87
11510.00	26.72	Ave.	317	2.2	H	24.17	50.89	63.5	12.61
5795 MHz									
5850.00	29.60	PK	10	2.3	H	42.55	72.15	122.2	50.05
5855.00	28.46	PK	296	1.9	H	42.55	71.01	110.8	39.79
5875.00	28.51	PK	116	1.6	H	42.55	71.06	105.2	34.14
5725.00	28.42	PK	311	1.5	H	42.15	70.57	122.2	51.63
11590.00	39.20	PK	131	2.4	H	23.10	62.30	83.5	21.20
11590.00	26.05	Ave.	131	2.4	H	23.10	49.15	63.5	14.35
802.11ac20									
5745 MHz									
5725.00	28.74	PK	79	1.9	H	42.15	70.89	122.2	51.31
5720.00	28.46	PK	79	1.9	H	42.15	70.61	110.8	40.19
5700.00	28.50	PK	310	1.2	H	42.15	70.65	105.2	34.55
5850.00	28.39	PK	310	1.2	H	42.55	70.94	122.2	51.26
11490.00	38.79	PK	198	1.1	H	24.17	62.96	83.5	20.54
11490.00	25.64	Ave.	198	1.1	H	24.17	49.81	63.5	13.69
5785 MHz									
11570.00	38.55	PK	330	1.6	H	23.10	61.65	83.5	21.85
11570.00	26.13	Ave.	330	1.6	H	23.10	49.23	63.5	14.27
5850.00	28.40	PK	162	2.5	H	42.55	70.95	122.2	51.25
5855.00	28.53	PK	162	2.5	H	42.55	71.08	110.8	39.72
5875.00	28.26	PK	200	1.6	H	42.55	70.81	105.2	34.39
5725.00	28.31	PK	200	1.6	H	42.15	70.46	122.2	51.74
11650.00	39.12	PK	27	1.6	H	22.37	61.49	83.5	22.01
11650.00	25.89	Ave.	27	1.6	H	22.37	48.26	63.5	15.24

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m) @1m	FCC Part 15.407/205/209	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m) @1m	Margin (dB)
802.11ac40									
5755 MHz									
5725.00	28.66	PK	25	1.9	H	42.15	70.81	122.2	51.39
5720.00	28.54	PK	25	1.9	H	42.15	70.69	110.8	40.11
5700.00	28.39	PK	143	1.9	H	42.15	70.54	105.2	34.66
5850.00	28.42	PK	143	1.9	H	42.55	70.97	122.2	51.23
11510.00	38.64	PK	41	1.9	H	24.17	62.81	83.5	20.69
11510.00	25.33	Ave.	41	1.9	H	24.17	49.50	63.5	14.00
5795 MHz									
5850.00	28.74	PK	306	1.4	H	42.55	71.29	122.2	50.91
5855.00	28.55	PK	306	1.4	H	42.55	71.10	110.8	39.70
5875.00	28.46	PK	306	1.6	H	42.55	71.01	105.2	34.19
5725.00	28.41	PK	306	1.6	H	42.15	70.56	122.2	51.64
11590.00	38.27	PK	33	1.6	H	23.10	61.37	83.5	22.13
11590.00	25.99	Ave.	33	1.6	H	23.10	49.09	63.5	14.41
802.11ac80									
5775 MHz									
5850.00	28.19	PK	128	1.8	H	42.55	70.74	122.2	51.46
5855.00	28.32	PK	128	1.8	H	42.55	70.87	110.8	39.93
5875.00	28.16	PK	81	1.1	H	42.55	70.71	105.2	34.49
5725.00	28.46	PK	268	2.2	H	42.15	70.61	122.2	51.59
5720.00	28.39	PK	268	2.2	H	42.15	70.54	110.8	40.26
5700.00	28.51	PK	248	1.7	H	42.15	70.66	105.2	34.54
11550.00	38.96	PK	355	2.1	H	23.10	62.06	83.5	21.44
11550.00	25.70	Ave.	355	2.1	H	23.10	48.80	63.5	14.70

Note:

Corrected Amplitude = Corrected Factor + Reading

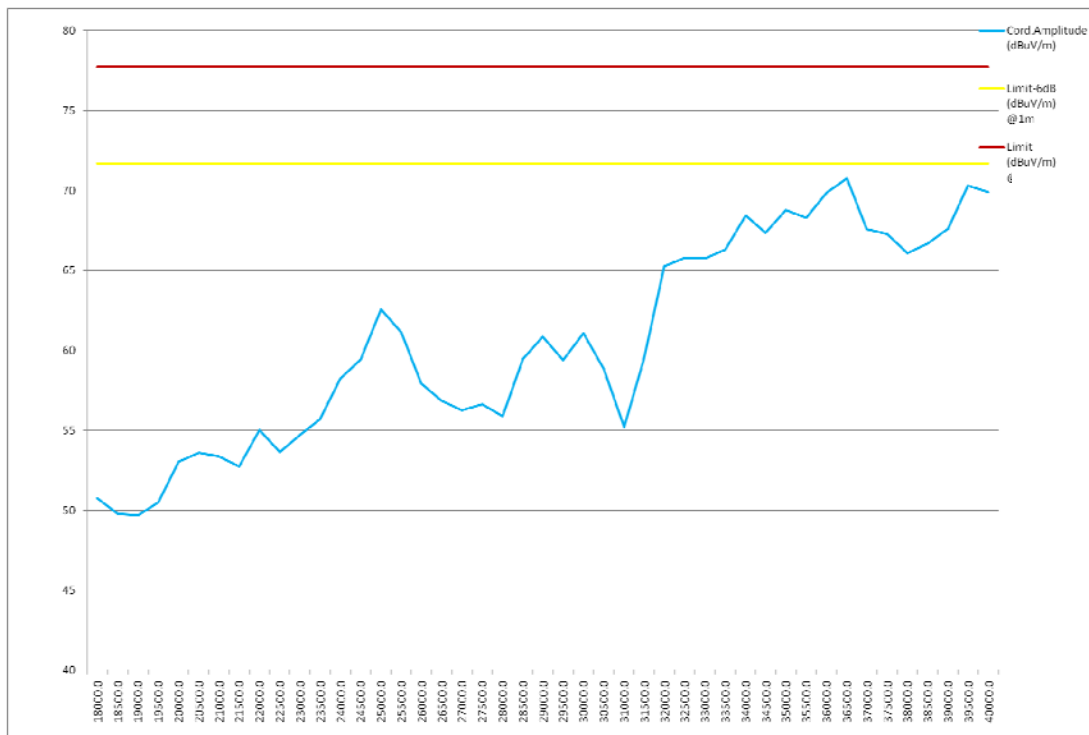
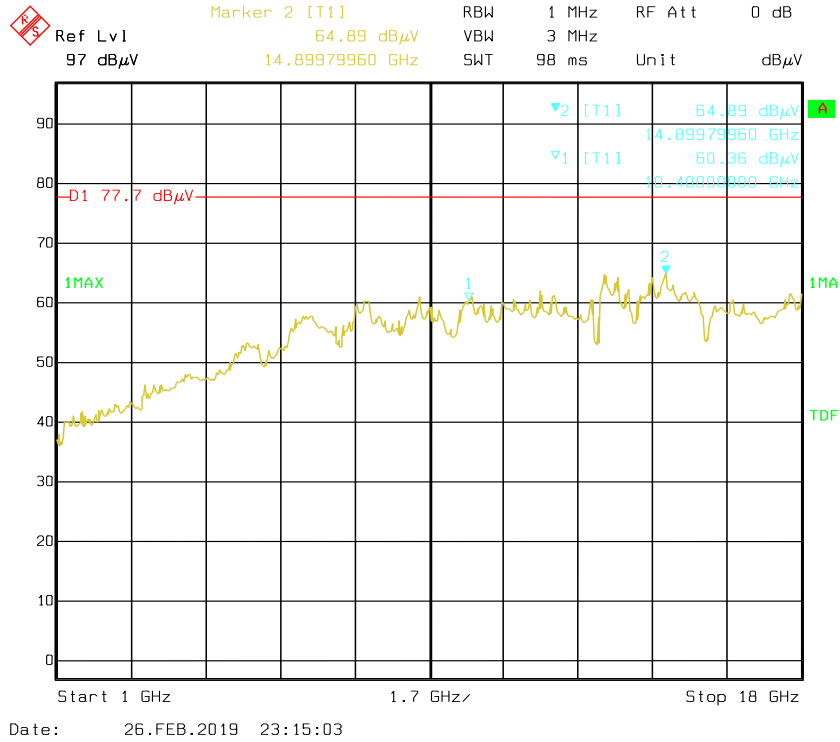
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

Margin = Limit- Corr. Amplitude

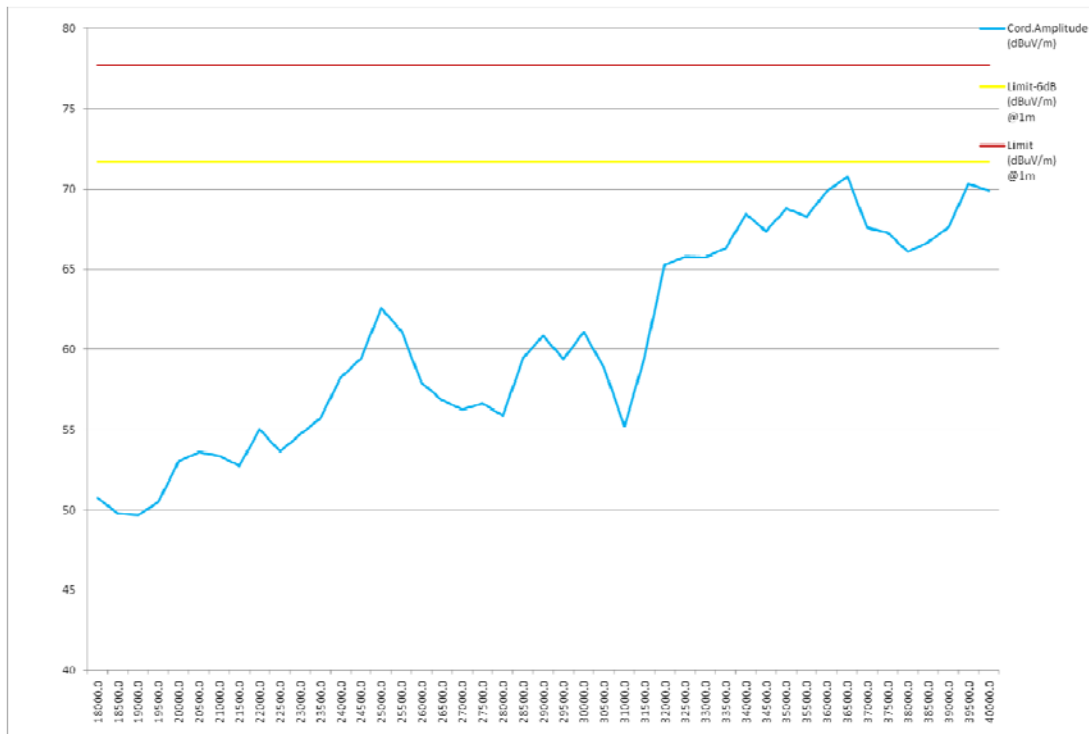
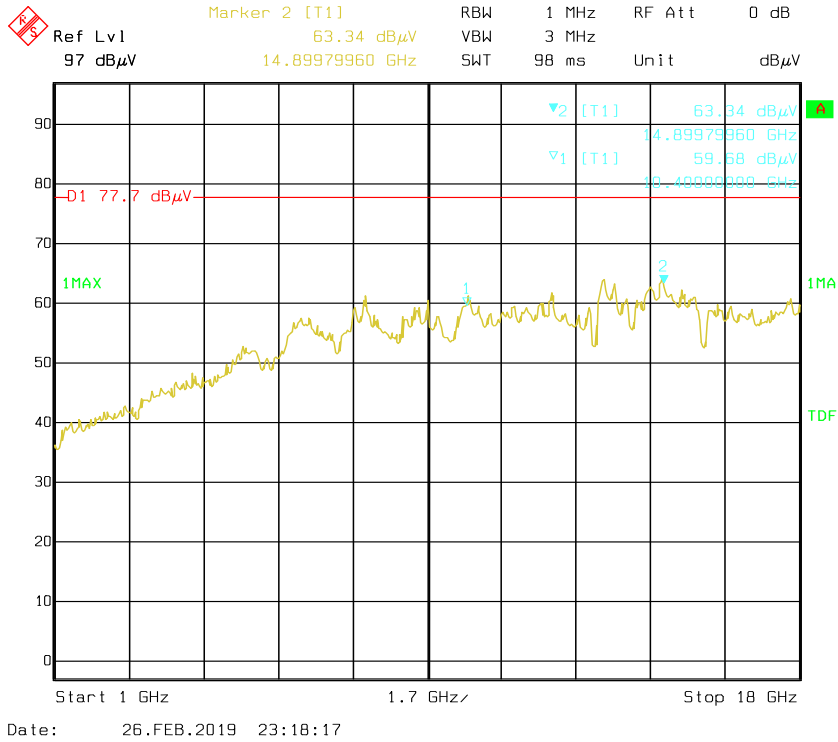
All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

Peak

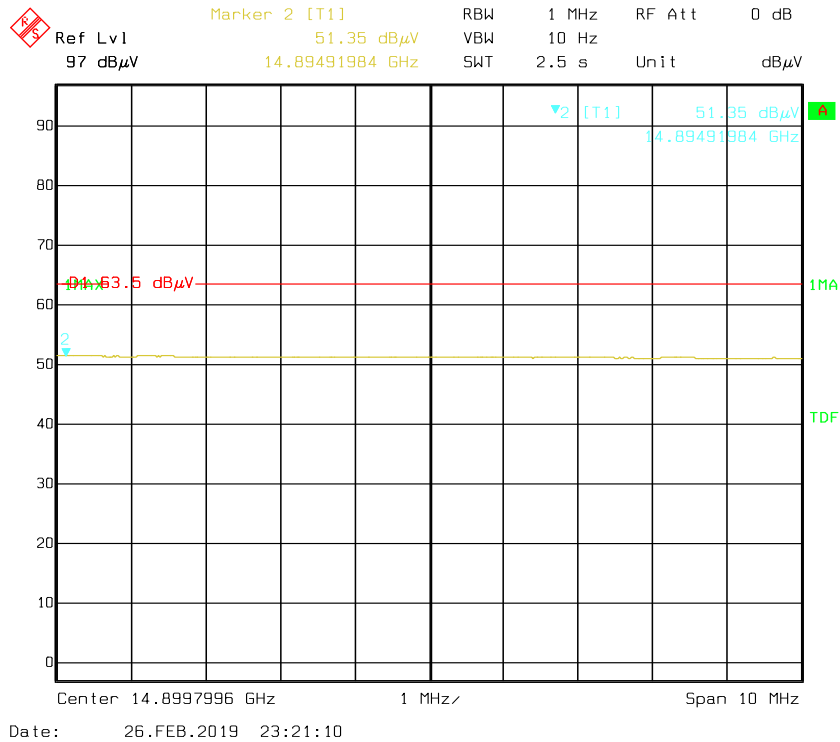
Pre-scan with 802.11a 5745MHz
Horizontal



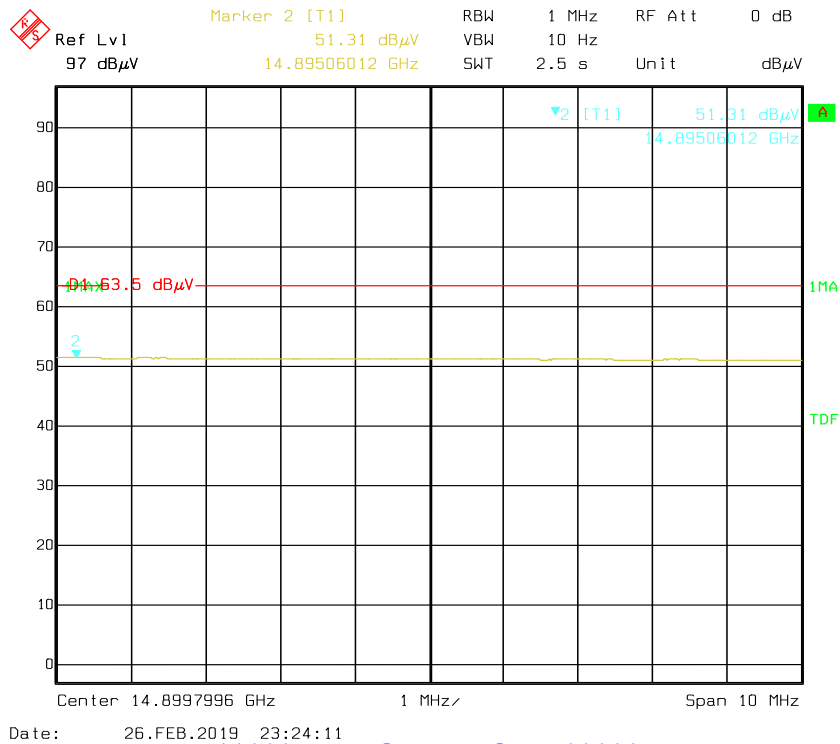
Vertical



Average Horizontal



Vertical



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