

FCC PART 15.249

TEST REPORT

For

OKIN Refined Electric Technology Co., Ltd.

Plant 4, No. 410, Xinyonglian Road, Wangjiangjing Development Zone, Jiaxing, Zhejiang, China

FCC ID: PCU-CB3332

Report Type: Class II Permissive Change	Product Type: Control Box
Test Engineer: HopeDD Zhang	HopeDD Zhang
Report Number: RSHA180622001-00B	
Report Date: 2018-06-26	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	OKIN Refined Electric Technology Co., Ltd.
Model Names	CB3332, CB.33.32.01
Model Difference	Model name
Product Type	Control Box
Dimension	150mm(L)*85mm(W)*35mm(H)
Power Supply	DC 29V

**All measurement and test data in this report was gathered from production sample serial number: 20180622001. (Assigned by BACL, Kunshan). The EUT was received on 2018-06-22.*

Objective

This type approval report is prepared on behalf of OKIN Refined Electric Technology Co., Ltd. in accordance with Part 2-Subpart J, and 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 15.205, 15.207, 15.209 and 15.249 rules.

This is a CIIPC report, which is identical to the previously certified except for the changes as below for details.

Items	Original	CIIPC
Model Name	CB.33.32.02	CB3332, CB.33.32.01
Difference	/	The following components have been removed from the PCB: C34, C40, C32, C36, C39, C41, D9, D17, F2, F3, J3, N6, N7, N10, N11, Q1, Q2, R46, R53, R60, R64, R72, R82, R57, R76, R51, R68, R59, R79, R47, R65, R54, R73

The above changes will affect “part of tests”, all test data were presented in this report, and other data were referred to the report RSHA180525004-00B.

Related Submittal(s)/Grant(s)

FCC Part15.247 DTS submission with FCC ID: PCU-CB3332.

FCC Part15.249 DXX grant with FCC ID: PCU-RF2512

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 radiated and conducted emissions measurement was performed at Bay Area Compliance Lab 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		3.19 dB
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

Justification

The system was configured in testing mode which was provided by manufacturer, below is the channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2403	40	2442
2	2404	...	...
3	2405	...	...
...	...	...	...
...	...	77	2479
39	2441	78	2480

EUT was tested with Channel 1, 40 and 78.

EUT Exercise Software

RF test tool: nRF Studio

Power Level: 0

Support Equipment List and Details

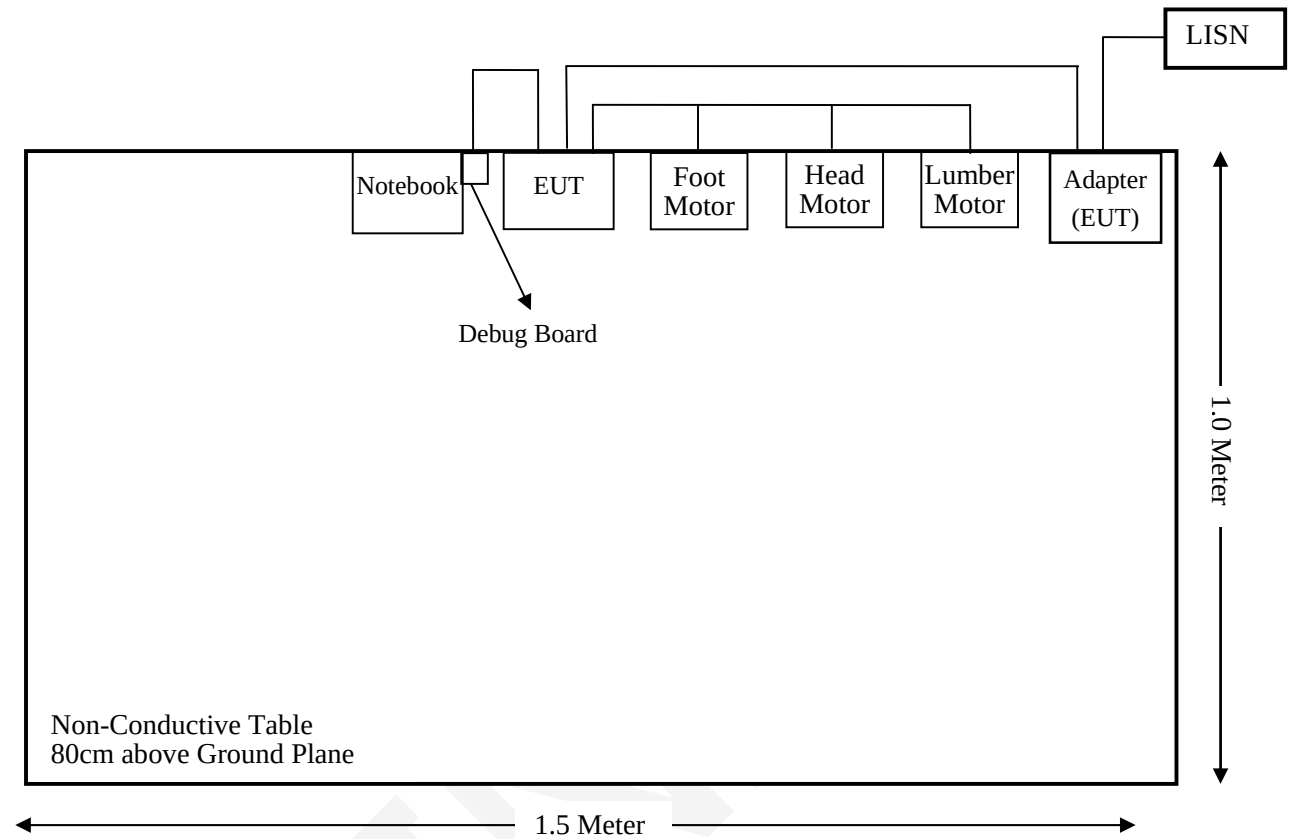
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
OKIN Refined	Adapter	09-290018	JLDP.10.023.000
OKIN Refined	Head Motor	ADZ5-315-95	E10228
OKIN Refined	Foot Motor	ADZ5-315-120	E10180
OKIN Refined	Lumber Motor	ADZ5-230-50	E10182

External I/O Cable

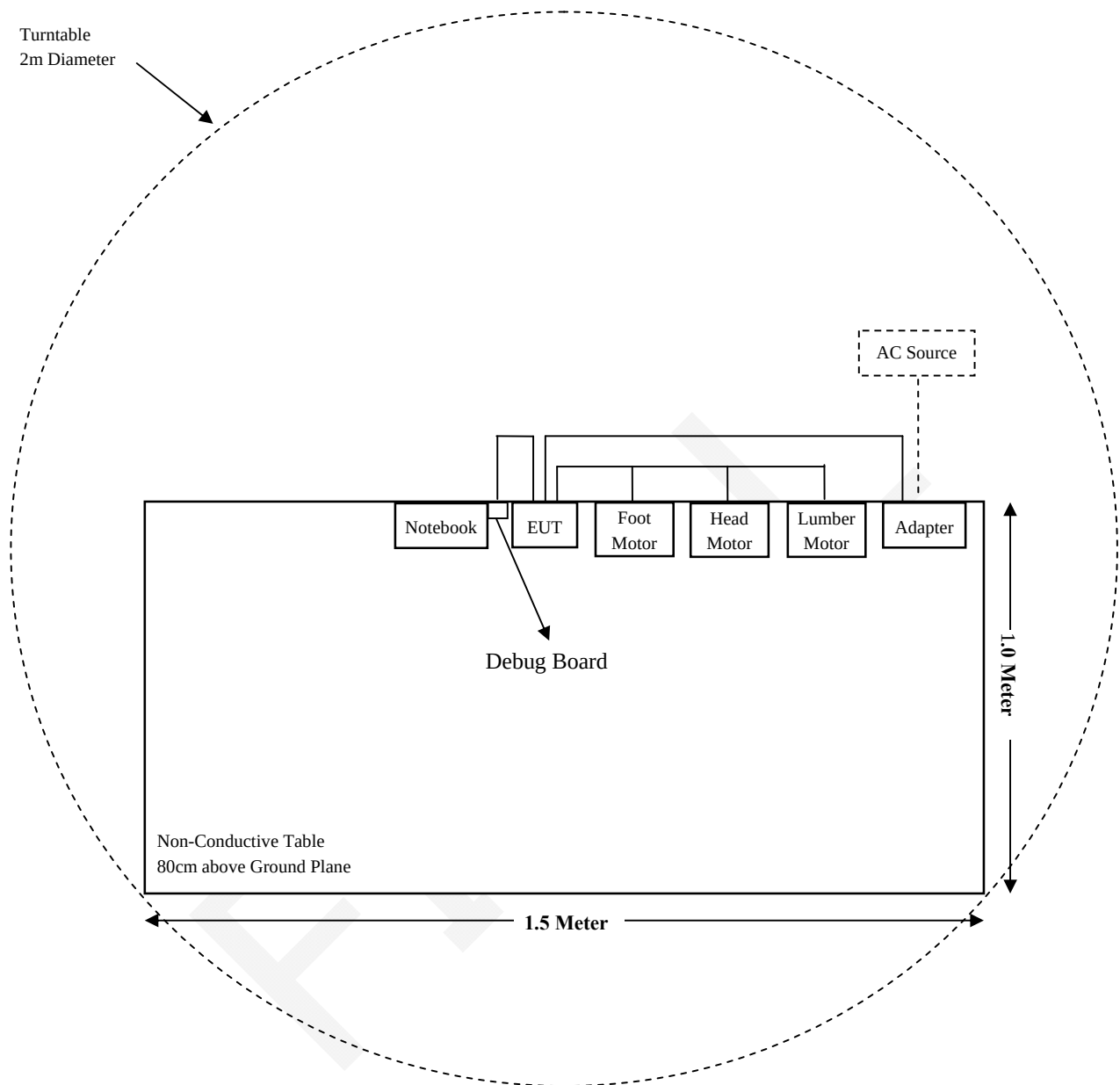
Cable Description	Length (m)	From Port	To
Head Motor Cable	0.6	EUT	Head Motor
Foot Motor Cable	0.6	EUT	Foot Motor
Lumber Motor Cable	0.6	EUT	Lumber Motor
Debug Board Cable	0.2	EUT	Debug Board
Extension Cable	0.6	EUT	Adapter
Power Cable	1.0	Adapter	AC Source

Block Diagram of Test Setup

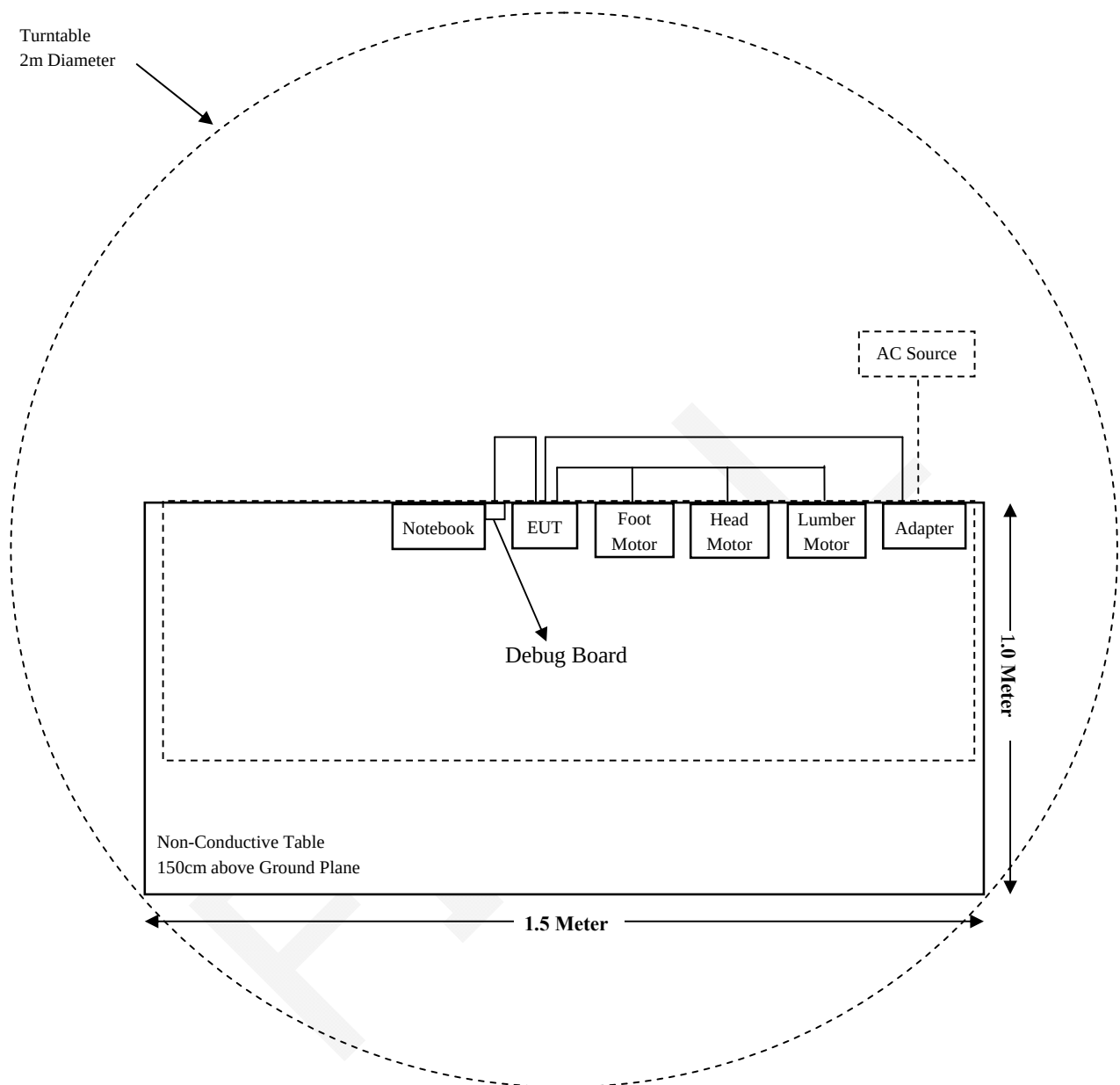
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.207(a)	Conduction Emissions	Compliant
15.205, §15.209, §15.249	Radiated Emissions& Out of Band Emission	Compliant

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	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
Radiated Emission Test (Chamber 2#)					
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
MICRO-TRONICS	Notch filter	BRM50702	/	2017-08-05	2018-08-04
Mini-Circuits	Amplifier	ZVA-183W-S+	220701818	2018-05-20	2019-05-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2018-03-22	2019-03-21
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
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2017-11-12	2018-11-11
Rohde & Schwarz	LISN	ENV216	3560655016	2017-11-12	2018-11-11
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

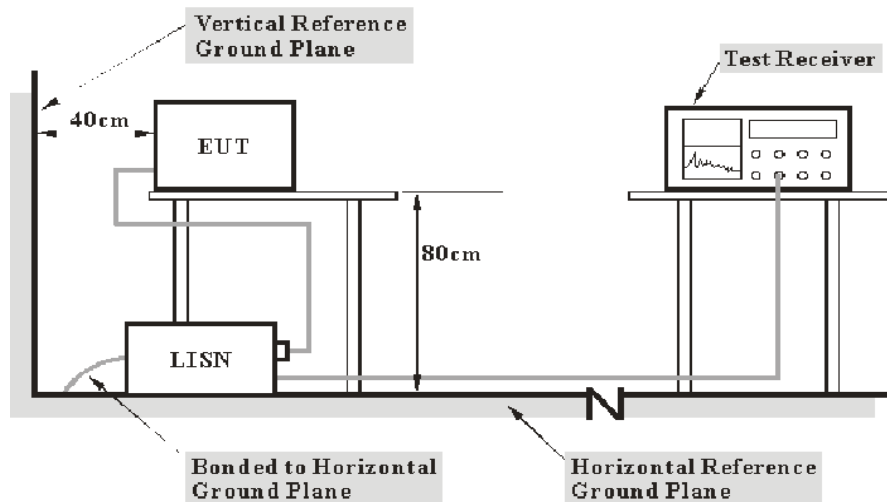
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

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 setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

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

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 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:

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

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:

$$\text{Margin} = \text{Limit} - \text{Reading}$$

Test Results Summary

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

Test Data

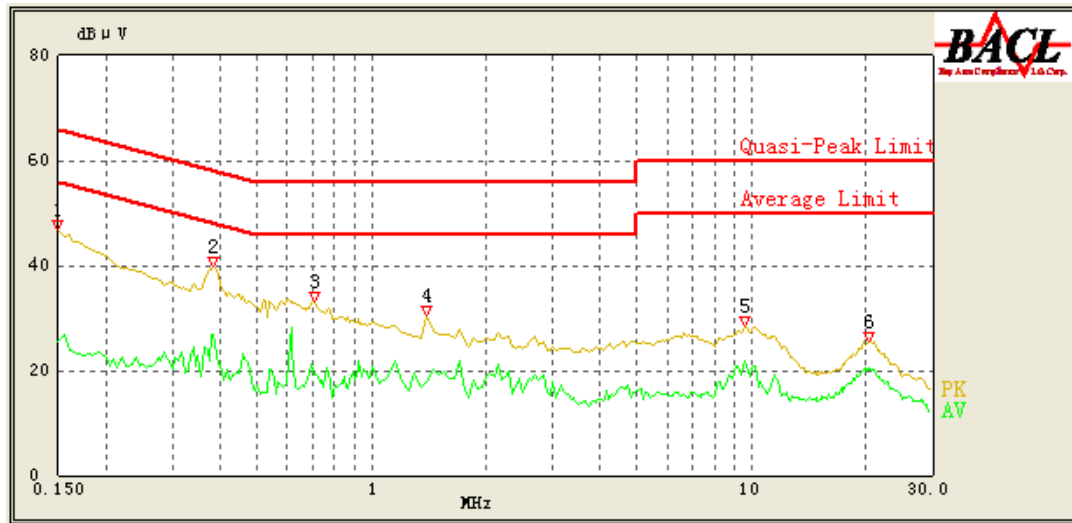
Environmental Conditions

Temperature:	25.0°C
Relative Humidity:	48 %
ATM Pressure:	101.2 kPa

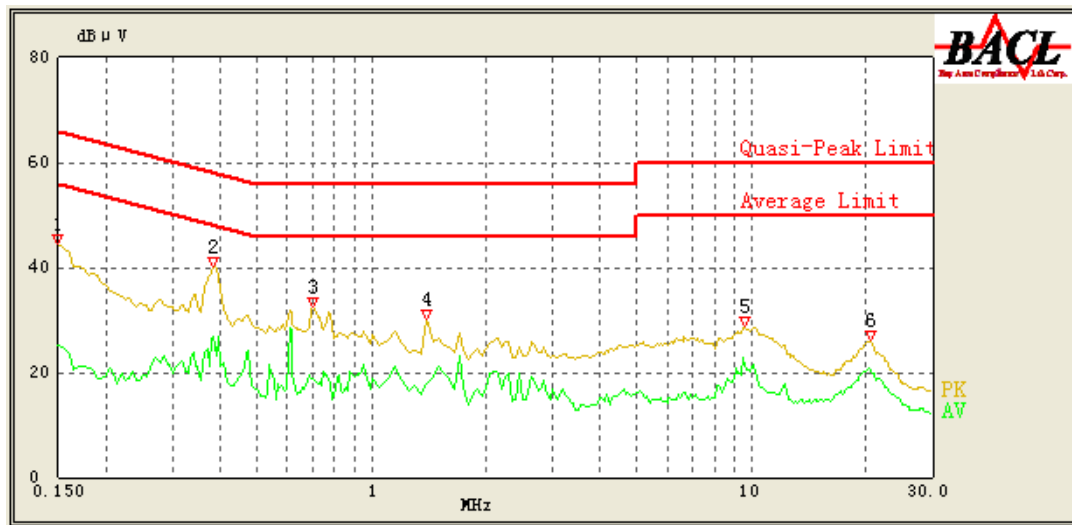
The testing was performed by HopeDD Zhang on 2018-06-25.

EUT operation mode: Transmitting in low channel (worst case)

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.150	46.98	QP	9.000	L1	16.06	66.00	19.02	Compliant
0.150	25.42	AV	9.000	L1	16.06	56.00	30.58	Compliant
0.385	39.67	QP	9.000	L1	16.05	59.29	19.62	Compliant
0.385	26.67	AV	9.000	L1	16.05	49.29	22.62	Compliant
0.710	33.20	QP	9.000	L1	15.95	56.00	22.80	Compliant
0.710	19.06	AV	9.000	L1	15.95	46.00	26.94	Compliant
1.400	30.56	QP	9.000	L1	15.87	56.00	25.44	Compliant
1.400	17.86	AV	9.000	L1	15.87	46.00	28.14	Compliant
9.650	28.50	QP	9.000	L1	16.05	60.00	31.50	Compliant
9.650	21.77	AV	9.000	L1	16.05	50.00	28.23	Compliant
20.400	25.56	QP	9.000	L1	16.44	60.00	34.44	Compliant
20.400	20.61	AV	9.000	L1	16.44	50.00	29.39	Compliant

AC 120V/60 Hz, Neutral

Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Limit (dBμV)	Margin (dB)	Comment
0.150	44.37	QP	9.000	N	16.06	66.00	21.63	Compliant
0.150	25.04	AV	9.000	N	16.06	56.00	30.96	Compliant
0.385	40.05	QP	9.000	N	16.09	59.29	19.24	Compliant
0.385	26.92	AV	9.000	N	16.09	49.29	22.37	Compliant
0.700	32.54	QP	9.000	N	15.99	56.00	23.46	Compliant
0.700	18.98	AV	9.000	N	15.99	46.00	27.02	Compliant
1.400	30.26	QP	9.000	N	15.93	56.00	25.74	Compliant
1.400	17.92	AV	9.000	N	15.93	46.00	28.08	Compliant
9.650	28.98	QP	9.000	N	15.98	60.00	31.02	Compliant
9.650	21.66	AV	9.000	N	15.98	50.00	28.34	Compliant
20.500	26.03	QP	9.000	N	16.17	60.00	33.97	Compliant
20.500	20.67	AV	9.000	N	16.17	50.00	29.33	Compliant

Note:

- Corrected Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation
Margin = Limit – Reading

FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS& OUT OF BAND EMISSION

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

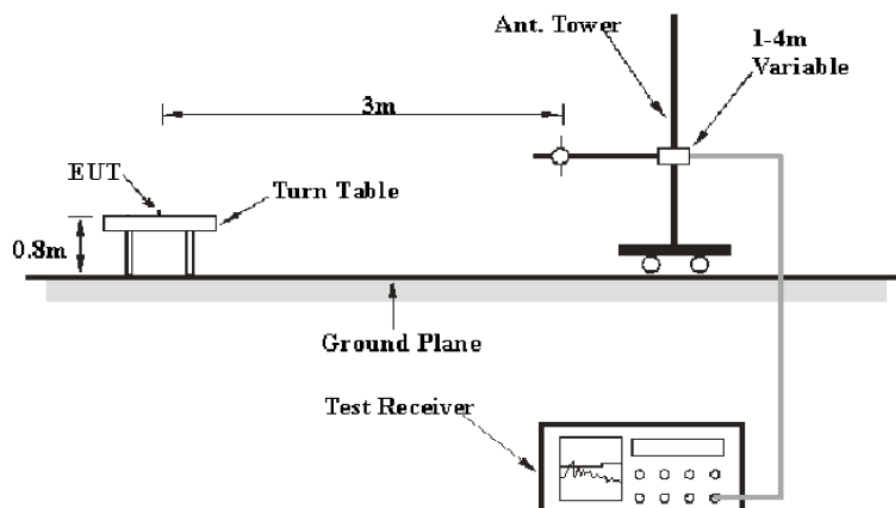
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

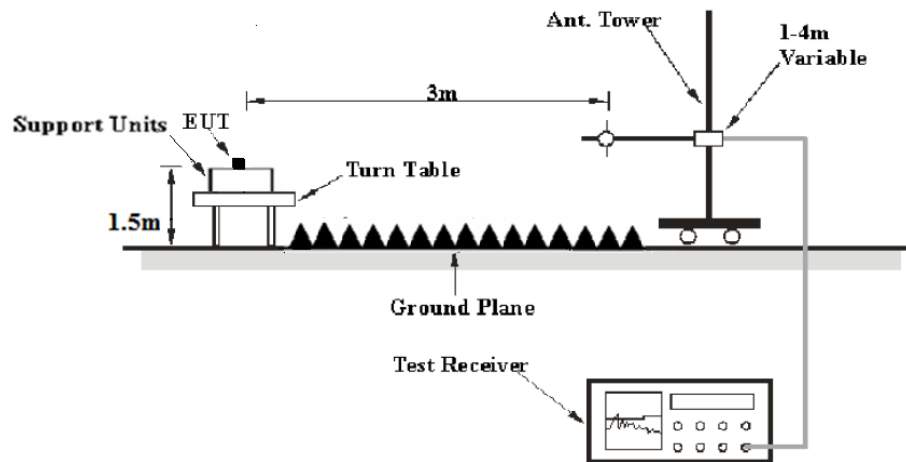
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

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

Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver 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

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

All data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode 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:

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

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

According to the data in the following table, the EUT complied with the FCC Part 15.209 &15.205 & 15.249.

Test Data

Environmental Conditions

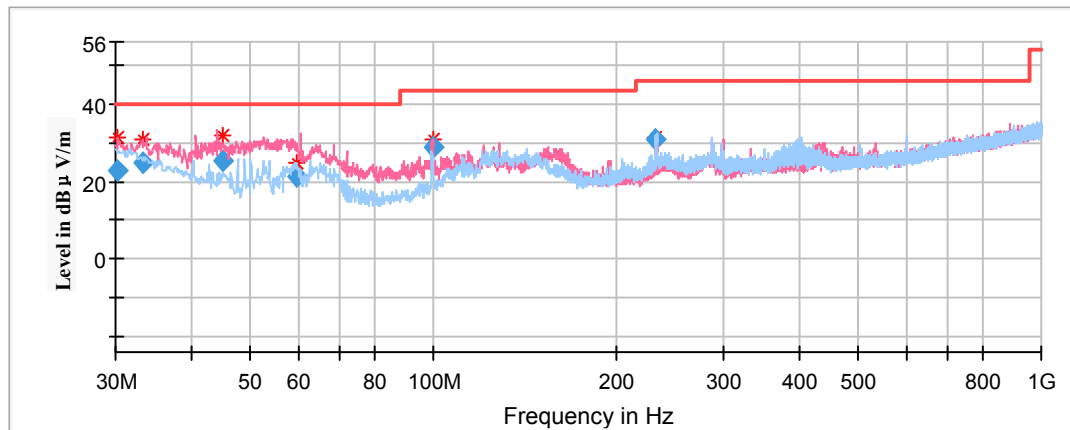
Temperature:	24.6°C
Relative Humidity:	52%
ATM Pressure:	101.2 kPa

The testing was performed by HopeDD Zhang on 2018-06-22 & 2018-06-25.

Test Mode: Transmitting

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 **low channel of operation in X-axis of orientation** was recorded)



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	Quasi-peak (dBμV/m)	Height (cm)	Polar (H/V)				
30.139201	22.63	101.0	V	53.0	-4.5	40.00	17.37
33.315050	24.59	101.0	V	0.0	-6.6	40.00	15.41
44.979150	25.49	101.0	V	17.0	-14.6	40.00	14.51
59.624100	21.11	199.0	V	78.0	-18.4	40.00	18.89
99.603000	28.76	101.0	V	121.0	-15.5	43.50	14.74
232.339300	30.64	199.0	H	292.0	-12.6	46.00	15.36

1GHz-18GHz

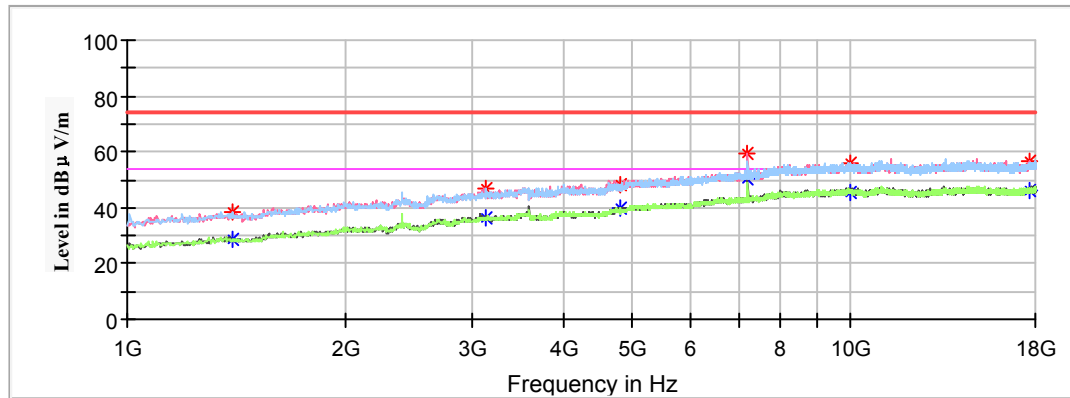
(Pre-scan in the X, Y and Z axes of orientation, the worst case **X-axis of orientation** were recorded.)

Note:

1. This test was performed with the 2.4-2.4835GHz notch filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit – Corrected. Amplitude

Low Channel: 2403MHz

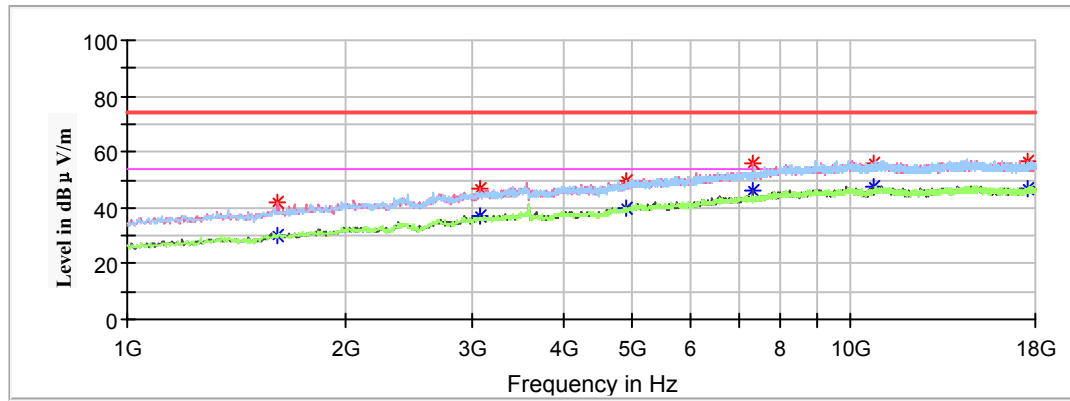
Full Spectrum



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)				
1401.200000	---	28.41	100.0	V	124.0	-1.8	54.00	25.59
1401.200000	38.72	---	100.0	V	124.0	-1.8	74.00	35.28
3125.000000	---	36.18	100.0	H	251.0	6.3	54.00	17.82
3125.000000	46.62	---	100.0	H	251.0	6.3	74.00	27.38
4806.000000	---	39.99	250.0	V	83.0	10.7	54.00	14.01
4806.000000	48.53	---	250.0	V	83.0	10.7	74.00	25.47
7209.000000	---	50.69	150.0	V	333.0	15.2	54.00	3.31
7209.000000	59.72	---	150.0	V	333.0	15.2	74.00	14.28
10010.000000	---	45.63	250.0	H	324.0	18.3	54.00	8.37
10010.000000	55.68	---	250.0	H	324.0	18.3	74.00	18.32
17660.000000	---	45.94	100.0	V	286.0	18.7	54.00	8.06
17660.000000	56.95	---	100.0	V	286.0	18.7	74.00	17.05

Middle Channel: 2442MHz

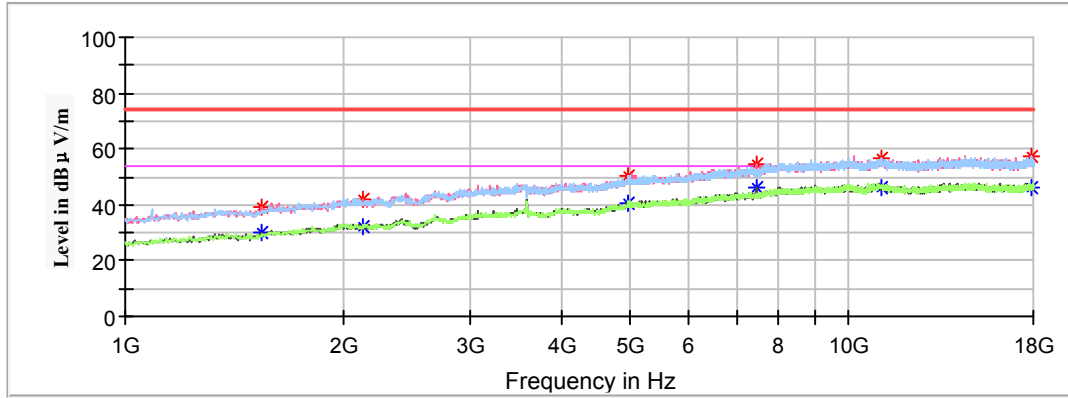
Full Spectrum



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)				
1615.400000	---	30.13	100.0	V	117.0	-0.4	54.00	23.87
1615.400000	41.90	---	100.0	V	117.0	-0.4	74.00	32.10
3070.600000	---	37.20	100.0	V	290.0	6.2	54.00	16.80
3070.600000	46.71	---	100.0	V	290.0	6.2	74.00	27.29
4884.000000	---	39.56	250.0	V	76.0	11.1	54.00	14.44
4884.000000	49.33	---	250.0	V	76.0	11.1	74.00	24.67
7326.000000	---	46.47	100.0	V	260.0	15.4	54.00	7.53
7326.000000	55.99	---	100.0	V	260.0	15.4	74.00	18.01
10741.000000	---	47.87	250.0	V	173.0	18.4	54.00	6.13
10741.000000	56.18	---	250.0	V	173.0	18.4	74.00	17.82
17598.800000	---	46.53	100.0	V	329.0	18.6	54.00	7.47
17598.800000	56.32	---	100.0	V	329.0	18.6	74.00	17.68

High Channel: 2480MHz

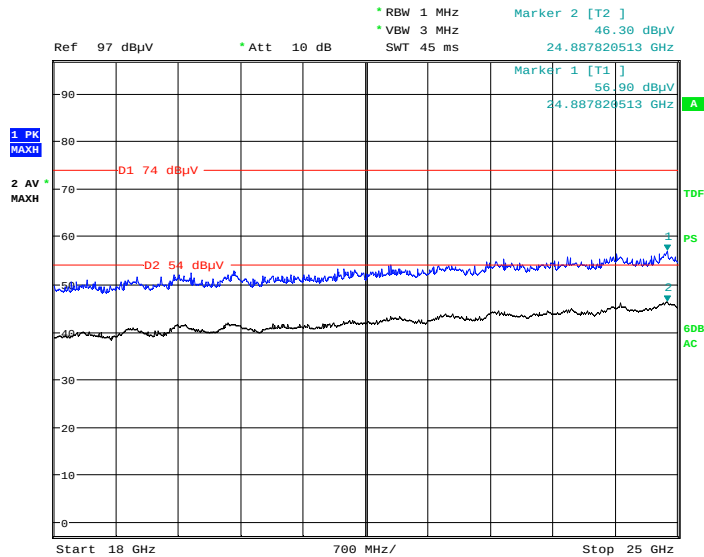
Full Spectrum



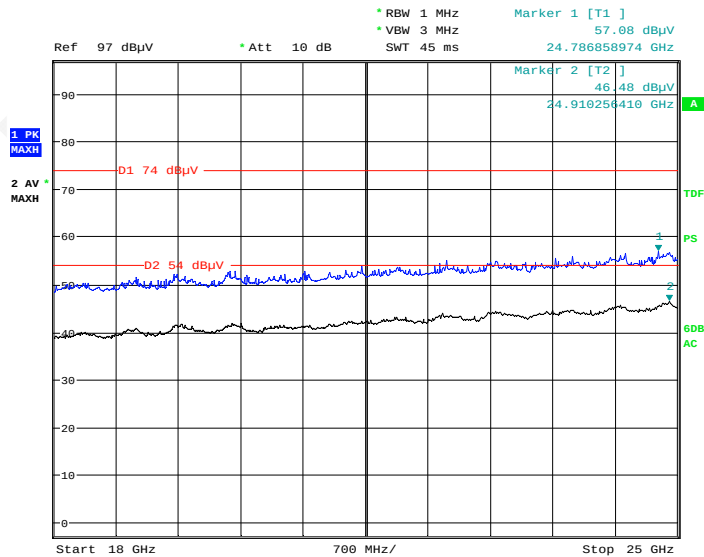
Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1544.000000	---	29.81	100.0	V	312.0	-0.9	54.00	24.19
1544.000000	39.30	---	100.0	V	312.0	-0.9	74.00	34.70
2128.800000	---	32.49	150.0	V	149.0	2.3	54.00	21.51
2128.800000	42.20	---	150.0	V	149.0	2.3	74.00	31.80
4960.000000	---	40.36	200.0	V	104.0	11.5	54.00	13.64
4960.000000	50.60	---	200.0	V	104.0	11.5	74.00	23.40
7440.000000	---	46.47	100.0	V	45.0	15.6	54.00	7.53
7440.000000	54.55	---	100.0	V	45.0	15.6	74.00	19.45
11074.200000	---	45.96	250.0	H	296.0	19.0	54.00	8.04
11074.200000	56.58	---	250.0	H	296.0	19.0	74.00	17.42
17921.800000	---	46.14	100.0	H	277.0	19.1	54.00	7.86
17921.800000	57.19	---	100.0	H	277.0	19.1	74.00	16.81

18GHz-25GHz

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

Horizontal

Date: 22.JUN.2018 09:37:53

Vertical

Date: 22.JUN.2018 09:49:02

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

Note:

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

Corrected Amplitude = Corrected Factor + Reading

Margin = Limit - Corrected. Amplitude

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: 2403MHz								
2400.00	---	36.28	143.0	V	205.0	2.8	54.00	17.72
2400.00	51.22	---	143.0	V	205.0	2.8	74.00	22.78
2403.00	94.02	---	220.0	H	128.0	2.9	114.00	19.98
2403.00	---	91.66	220.0	H	128.0	2.9	94.00	2.34
2403.00	90.88	---	186.0	V	210.0	2.9	114.00	23.12
2403.00	---	88.03	186.0	V	210.0	2.9	94.00	5.97
Middle Channel: 2442MHz								
2442.00	93.59	---	220.0	H	231.0	2.9	114.00	20.41
2442.00	---	91.32	220.0	H	231.0	2.9	94.00	2.68
2442.00	90.31	---	183.0	V	263.0	2.9	114.00	23.69
2442.00	---	88.20	183.0	V	263.0	2.9	94.00	5.80
High Channel: 2480MHz								
2480.00	91.88	---	251.0	V	50.0	3.0	114.00	22.12
2480.00	---	89.59	251.0	V	50.0	3.0	94.00	4.41
2480.00	88.72	---	168.0	H	184.0	3.0	114.00	25.28
2480.00	---	86.46	168.0	H	184.0	3.0	94.00	7.54
2483.50	---	46.61	243.0	V	166.0	3.0	54.00	7.39
2483.50	58.91	---	243.0	V	166.0	3.0	74.00	15.09

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