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TEST REPORT

Report No.: 22061212HKG-004

Qmax Systems India Private Limited

Application For Original Grant of 47 CFR Part 15 Certification

Android OTT BOX

FCC ID: 2APD6TEKTDD001

Transceiver – 5GHz WLAN Wi-Fi

This report contains the data of 5GHz W-iFi portion only.

Prepared and Checked by:	**Approved by:**
Signed on File Leung Chun Ning, Peter Assistant Engineer	Digitally signed by Kenneth Wong Location: Intertek Testing Services Hong Kong Limited Wong Kwok Yeung, Kenneth Assistant Supervisor Date: March 10, 2023

TEST REPORT

GENERAL INFORMATION

Grantee:	Qmax Systems India Private Limited
Grantee Address:	795, Trunk Road, Poonamallee, Chennai, India.
FCC Specification Standard:	FCC Part 15, October 1, 2021 Edition
FCC ID:	2APD6TEKTDD001
FCC Model(s):	TDD001
Type of EUT:	Unlicensed National Information Infrastructure Transmitter
Description of EUT:	Android OTT BOX
Brand Name:	Tekion – Display Device
Serial Number:	N/A
Sample Receipt Date:	February 10, 2023
Date of Test:	February 15, 2023 to March 03, 2023
Report Date:	March 10, 2023
Environmental Conditions:	Temperature: +10 to 40°C Relative Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 Certification.

TEST REPORT

SUMMARY OF TEST RESULT

Test Items	FCC Part 15 Section	Results
Antenna Requirement	15.203	Complied
Max. Conducted Output Power (Average)	15.407(a)	Complied
Transmit Power Control (TPC)	15.407(h)	Not Applicable
Min. 6dB RF Bandwidth	15.407(e)	Complied
Max. Power Density (Average)	15.407(a)	Complied
Out of Band Antenna Conducted Emission	15.407(b)	Complied
Radiated Emission in Restricted Bands and Spurious Emissions	15.407(b), 15.209 & 15.109	Complied
AC Power Line Conducted Emission	15.207 & 15.107	Complied
Dynamic Frequency Selection (DFS)	15.407	Not Applicable

Remark: Not Applicable if the EUT is <500mW (27dBm)

Note: Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

The equipment under test is found to be complying with the following standards:

FCC Part 15, October 1, 2021 Edition

TEST REPORT

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TEST REPORT

EXHIBIT 1 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT) that is an Android OTT BOX which operating at 2.4GHz Bluetooth, BLE, 2.4GHz & 5GHz (UNII-1 & UNII-3) WiFi respectively. The EUT is powered by AC/DC Adaptor (Input: AC100 – 240V 50/60Hz Output: 12V 2000mA). It is used typically with TVs in the Customer Lounge of various Business to display tailored content.

For 2.4GHz ISM Band:

- For IEEE 802.11b mode, it operates at frequency range of 2.412GHz to 2.462GHz with 11 Channels. It transmits via DQPSK, DBPSK and CCK. Maximum bit rate can be up to 11Mbps.
- For IEEE 802.11g mode, it operates at frequency range of 2.412GHz to 2.462GHz with 11 Channels. It transmits via OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to 54Mbps.
- For IEEE 802.11n mode (With 20MHz Bandwidth), it operates at frequency range of 2.412GHz to 2.462GHz with 11 Channels. It transmits via OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS7 65Mbps.

For 5.15GHz to 5.25GHz Band:

The module operates at Frequency range of 5.18GHz to 5.24GHz with 4 channels.

- For IEEE 802.11a mode, it operates at frequency range of 5.18GHz to 5.24GHz with 4 channels. It transmits via OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to 54Mbps.
- For IEEE 802.11n mode (20 MHz Bandwidth), it operates at frequency range of 5.18GHz to 5.24GHz with 4 channels. It transmits via OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS7 65Mbps.
- For IEEE 802.11n mode (40 MHz Bandwidth), it operates at frequency range of 5.19GHz to 5.23GHz with 2 channels. It transmits via OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS7 135Mbps.
- For IEEE 802.11ac mode (20 MHz Bandwidth), it operates at frequency range of 5.18GHz to 5.24GHz with 4 channels. It transmits via OFDM/256-QAM, OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS8 78Mbps.
- For IEEE 802.11ac mode (40 MHz Bandwidth), it operates at frequency range of 5.18GHz to 5.24GHz with 2 channels. It transmits via OFDM/256-QAM, OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS9 162Mbps.

TEST REPORT

1.1 Product Description (Cont'd)

For 5.725GHz to 5.85GHz Band:

The module operates at Frequency range of 5.745GHz to 5.825GHz with 4 channels.

- For IEEE 802.11a mode, it operates at frequency range of 5.745GHz to 5.825GHz with 4 channels. It transmits via OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to 54Mbps.
- For IEEE 802.11n mode (20 MHz Bandwidth), it operates at frequency range of 5.745GHz to 5.825GHz with 4 channels. It transmits via OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS7 65Mbps.
- For IEEE 802.11n mode (40 MHz Bandwidth), it operates at frequency range of 5.755GHz to 5.795GHz with 2 channels. It transmits via OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS7 135Mbps.
- For IEEE 802.11ac mode (20 MHz Bandwidth), it operates at frequency range of 5.745GHz to 5.825GHz with 4 channels. It transmits via OFDM/256-QAM, OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS8 78Mbps.
- For IEEE 802.11ac mode (40 MHz Bandwidth), it operates at frequency range of 5.755GHz to 5.795GHz with 2 channels. It transmits via OFDM/256-QAM, OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS9 162Mbps.
- For IEEE 802.11ac mode (80 MHz Bandwidth), it operates at 5775MHz with 1 channel. It transmits via OFDM/256-QAM, OFDM/64-QAM, 16-QAM, QPSK and BPSK. Maximum bit rate can be up to MCS9 390Mbps.

The device can be transmitted in MIMO mode (2T2R) on 802.11n 20MHz & 40MHz and 802.11ac 20MHz, 40MHz & 80MHz.

Antenna Information:

WLAN 802.11 a/b/g/n/ac
For operating frequency of 2.4GHz, maximum gain of 5.0 dBi for each of Antenna
For operating frequency of 5GHz WiFi, maximum gain of 5.0 dBi for each of Antenna
2 x External dedicated detachable Antennas

The circuit description is saved with filename: descri.pdf.

TEST REPORT

1.2 Test Methodology

Both AC power line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in radiated emission test sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.
Antenna port conducted measurements were performed according to ANSI C63.10 (2013) and KDB Publication No. 558074 D01 v05r02 (April 02, 2019) All other measurements were made in accordance with the procedures in 47 CFR Part 2.

1.3 Test Facility

The radiated emission test site and antenna port conducted measurement facility used to collect the radiated data and conductive data are at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China. This test facility and site measurement data have been fully placed on file with the FCC.

1.4 Related Submittal(s) Grants

This is a single application for certification of a transceiver (5GHz Wi-Fi portion only).

TEST REPORT

EXHIBIT 2 SYSTEM TEST CONFIGURATION

2.1 Justification

For radiated emissions testing, the equipment under test (EUT) was setup to transmit / receive continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst case emissions.

The EUT is powered by AC/DC Adaptor (Input: AC100 – 240V 50/60Hz Output: 12V 2000mA).

For the measurements, the EUT was attached to a plastic stand if necessary and placed on the wooden turntable. If the base unit attached to peripherals, they were connected and operational (as typical as possible).

The signal was maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization were varied during the search for maximum signal level. The antenna height was varied from 1 to 4 meters. Radiated emissions were taken at three meters unless the signal level was too low for measurement at that distance. If necessary, a pre-amplifier was used and/or the test was conducted at a closer distance.

For any intentional radiator powered by AC power line, measurements of the radiated signal level of the fundamental frequency component of the emission was performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Radiated emission measurement for transmitter were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Emission that are directly caused by digital circuits in the transmit path and transmitter portion were measured, and the limit are according to FCC Part 15 Section 15.209. Digital circuitries used to control additional functions other than the operation of the transmitter are subject to FCC Part 15 Section 15.109 Limits.

TEST REPORT

2.1 Justification (Cont'd)

Detector function for radiated emissions was in peak mode. Average readings, when required, were taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.8.3.

Determination of pulse desensitization was made according to *Hewlett Packard Application Note 150-2, Spectrum Analysis... Pulsed RF.* The effective period (Teff) was referred to Exhibit 4.8.3. With the resolution bandwidth 1MHz and spectrum analyzer IF bandwidth 3dB, the pulse desensitization factor was 0dB.

For AC power line-conducted emission test, the EUT along with its peripherals were placed on a 1.0m(W)x1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50ohm coupling impedance for measuring instrument. The LISN housing, measuring instrument case, reference ground plane, and vertical ground plane were bounded together. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were manipulated to find the maximum emission.

All relevant operation modes have been tested, and the worst case data is included in this report.

For simultaneous transmission, both WiFi and Bluetooth portions are also switched on when taking radiated emission for determining worst-case spurious emission.

The transmission of Antenna 1 and Antenna 2 are also measured and considered individually. The worse case of test data is shown on report.

2.2 EUT Exercising Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

TEST REPORT

2.3 Details of EUT and Description of Accessories

Details of EUT:

The EUT is powered by AC/DC Adaptor (Input: AC100 – 240V 50/60Hz Output: 12V 2000mA).

Description of Accessories:

Description	Remark
AC/DC USB adaptor Input: 100-240VAC 50/60Hz; Output: 12.0VDC 2000mA; Model: L6R24-120	Provided by Applicant
2 x 2m length Belkin HDMI cable	Provided by Intertek
1 x IR EXT with 1.5m cable	Provided by Intertek
1 x 2m length LAN cable	Provided by Intertek

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test at a level of confidence of 95% has been considered. The values of the Measurement uncertainty:

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

Decision Rule for compliance: For FCC/IC standard, the measured value must be within the limits of applicable standard without accounting for the measurement uncertainty. For EN/IEC/HKTA/HKTC standard, conformity rules will be used as per standard directly excepted EN/IEC 61000-3-2, EN/IEC 61000-3-3, HKTA1004, HKCA1008, HKTA1019, HKTA1020, HKTA1041 and HKTA1044. For these excepted or not mentioned standards, Cl 4.2.2 of ILAC-G8:09/2019 decision rules will be reference and guard band will be equal to our measurement uncertainty with 95% confidence level (k=2). In case, the measured value is within guard band region, undetermined decision will be used. The values of the Measurement uncertainty for radiated emission test, AC line conducted emission test and RF conducted test, frequency stability and timing jitter are ± 5.3dB, ± 4.2dB, ±1dB, ±23Hz, 0.1µs respectively.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

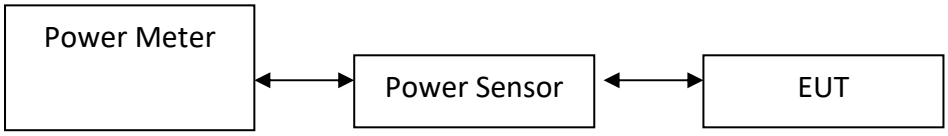
TEST REPORT

EXHIBIT 3 TEST RESULTS

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals

RF Conduct Measurement Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



The antenna port of the EUT was connected to the input of a spectrum analyzer.

☒ The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to the obtain power at the EUT antenna terminals. The measurement procedure E.3.A (789033 D02 General UNII Test Procedures New Rules v02r01) was used.

☐ The EUT should be configured to transmit continuously (at a minimum duty cycle of 98%) at full power over the measurement duration. The measurement procedure AVG1 was used.

IEEE 802.11ac (20MHz) (MCS0) Antenna Gain = 5 dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5180	8.625	7.286
5200	8.342	6.827
5240	8.997	7.938
5745	6.776	4.760
5785	5.533	3.575
5825	5.845	3.841

IEEE 802.11ac (20MHz) (MCS0) Antenna Gain = 5 dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5180	7.392	5.485
5200	7.063	5.085
5240	8.290	6.745
5745	6.576	4.546
5785	7.180	5.224
5825	7.579	5.727

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

IEEE 802.11ac (40MHz) (MCS0) Antenna Gain = 5 dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5190	8.935	7.825
5230	9.244	8.402
5755	6.934	4.936
5795	6.076	4.051

IEEE 802.11ac (40MHz) (MCS0) Antenna Gain = 5 dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5190	7.573	5.719
5230	8.520	7.112
5755	5.422	3.485
5795	7.323	5.399

IEEE 802.11ac (80MHz) (MCS0) Antenna Gain = 5 dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5210	8.734	7.471
5775	5.894	3.885

IEEE 802.11ac (80MHz) (MCS0) Antenna Gain = 5 dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5210	7.613	5.772
5775	6.577	4.547

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

IEEE 802.11a (20MHz) (OFDM, 6 Mbps) Antenna Gain = 5.0dBi (Antenna 1 / Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5180	8.705	7.422
5200	8.528	7.125
5240	9.146	8.215
5745	6.780	4.764
5785	6.381	4.346
5825	6.111	4.084

IEEE 802.11n (20MHz) (OFDM, MCS0) Antenna Gain = 5.0dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5180	8.673	7.367
5200	8.407	6.929
5240	8.965	7.880
5745	6.807	4.794
5785	5.195	3.308
5825	5.242	3.343

IEEE 802.11n (20MHz) (OFDM, MCS0) Antenna Gain = 5.0dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5180	7.433	5.537
5200	7.005	5.018
5240	8.517	7.107
5745	6.774	4.758
5785	7.205	5.254
5825	7.525	5.656

IEEE 802.11n (40MHz) (OFDM, MCS0) Antenna Gain = 5.0dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5190	8.765	7.525
5230	9.284	8.480
5755	7.050	5.070
5795	5.803	3.805

IEEE 802.11n (40MHz) (OFDM, MCS0) Antenna Gain = 5.0dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	Conducted Output Power in mWatt
5190	7.512	5.639
5230	8.760	7.516
5755	6.696	4.673
5795	7.457	5.568

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

For Maximum e.i.r.p

IEEE 802.11ac (20MHz) (MCS0) Antenna Gain = 5.0dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5180	8.625	13.625	23.041
5220	8.342	13.342	21.587
5240	8.997	13.997	25.102
5745	6.776	11.776	15.052
5785	5.533	10.533	11.306
5825	5.845	10.845	12.148

IEEE 802.11ac (20MHz) (MCS0) Antenna Gain = 5.0dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5180	7.392	12.392	17.346
5220	7.063	12.063	16.081
5240	8.290	13.290	21.330
5745	6.576	11.576	14.374
5785	7.180	12.180	16.520
5825	7.579	12.579	18.109

IEEE 802.11ac (40MHz) (MCS0) Antenna Gain = 5.0dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5190	8.935	13.935	24.746
5230	9.244	14.244	26.571
5755	6.934	11.934	15.610
5795	6.076	11.076	12.812

IEEE 802.11ac (40MHz) (MCS0) Antenna Gain = 5.0dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5190	7.573	12.573	18.084
5230	8.520	13.520	22.491
5755	5.422	10.422	11.020
5795	7.323	12.323	17.073

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

For Maximum e.i.r.p

IEEE 802.11ac (80MHz) (MCS0) Antenna Gain = 5.0dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5210	8.734	13.734	23.627
5775	5.894	10.894	12.286

IEEE 802.11ac (80MHz) (MCS0) Antenna Gain = 5.0dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5210	7.613	12.613	18.252
5775	6.577	11.577	14.378

IEEE 802.11a (20MHz) (OFDM, 6 Mbps) Antenna Gain = 5.0dBi (Antenna 1 / Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5180	8.705	13.705	23.469
5220	8.528	13.528	22.532
5240	9.146	14.146	25.978
5745	6.780	11.780	15.066
5785	6.381	11.381	13.744
5825	6.111	11.111	12.915

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

For Maximum e.i.r.p

IEEE 802.11n (20MHz) (OFDM, MCS0) Antenna Gain = 5.0dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5180	7.433	13.673	23.297
5220	7.005	13.407	21.913
5240	8.517	13.965	24.917
5745	6.774	11.807	15.160
5785	7.205	10.195	10.459
5825	7.525	10.242	10.573

IEEE 802.11n (20MHz) (OFDM, MCS0) Antenna Gain = 5.0dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5180	7.433	12.433	17.511
5220	7.005	12.005	15.867
5240	8.517	13.517	22.475
5745	6.774	11.774	15.045
5785	7.205	12.205	16.615
5825	7.525	12.525	17.885

IEEE 802.11n (40MHz) (OFDM, MCS0) Antenna Gain = 5.0dBi (Antenna 1)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5190	8.765	13.765	23.796
5230	9.284	14.284	26.816
5755	7.050	12.050	16.032
5795	5.803	10.803	12.031

IEEE 802.11n (40MHz) (OFDM, MCS0) Antenna Gain = 5.0dBi (Antenna 2)

Frequency (MHz)	Conducted Output Power in dBm	EIRP in dBm	EIRP in mWatt
5190	7.512	12.512	17.832
5230	8.760	13.760	23.768
5755	6.696	11.696	14.777
5795	7.457	12.457	17.608

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

Cable loss: 1.0dB External Attenuation: 10dB

Cable loss, external attenuation: ☒ included in OFFSET function
☐ added to SA raw reading

IEEE 802.11ac (20MHz) (OFDM, MCS0)
Max. Conducted (Average) Output Level = 8.997dBm

IEEE 802.11ac (40MHz) (OFDM, MCS0)
Max. Conducted (Average) Output Level = 9.244dBm

IEEE 802.11ac (80MHz) (OFDM, MCS0)
Max. Conducted (Average) Output Level = 8.734dBm

IEEE 802.11a (20MHz) (OFDM, 6 Mbps)
Max. Conducted (Average) Output Level = 9.146dBm

IEEE 802.11n (20MHz) (OFDM, MCS0)
Max. Conducted (Average) Output Level = 8.965dBm

IEEE 802.11n (40MHz) (OFDM, MCS0)
Max. Conducted (Average) Output Level = 9.284dBm

Remark:

1. Maximum e.i.r.p = Maximum conducted output power + Duty Cycle Factor + Antenna Gain
2. Maximum conducted output power = Conducted output power + Duty Cycle Factor
3. Duty cycle= On Time/ Period;
   Duty Cycle factor = 10 * log(1/ Duty cycle);
   Average factor = 20 log10 Duty Cycle.
4. Limits for FCC:
   - 5150-5250MHz: 250mW (24dBm) for antennas with gains of 6dBi or less. (Client device)
   - 5250-5350MHz: 250mW (24dBm)
   - 5470-5725MHz: 250mW (24dBm)
   - 5725-5850MHz: 1W (30dBm) for antennas with gains of 6dBi or less.
5. Limits for RSS:
   - 5150-5250MHz: 200mW (23dBm) for antennas with gains of 6dBi or less.
   - 5250-5350MHz: 250mW (24dBm)
   - 5470-5725MHz: 250mW (24dBm)
   - 5725-5850MHz: 1W (30dBm) for antennas with gains of 6dBi or less.

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

According to KDB 662911 D01 Multiple Transmitter Output v02r01, the MIMO transmission measurement shall be considered as below;

In-Band Power Measurements for MIMO mode
The measure-and-sum technique shall be used for measuring in-band transmit power of a device. Total power is the sum of the conducted power levels measured at the various output ports as described in section E)1) of KDB 662911 D01 v02r01

Total Conducted Power = Sum of Antenna 1 + Antenna 2. Also regarding to directional gain calculation, the following equation is used for transmit signals are correlated with each other;

$$\text{Directional Gain} = G_{ANT} + 10 \log (N_{ANT}) \text{ dBi} = 8\text{dBi}$$

IEEE 802.11ac (20MHz) (MCS0) Directional Gain = 8.0dBi (Antenna 1 + Antenna 2)

Frequency (MHz)	Total Conducted Output Power in dBm	Total Conducted Output Power in mWatt	EIRP in dBm	EIRP in mWatt
5180	7.696	5.883	15.696	37.121
5200	7.380	5.470	15.380	34.511
5240	8.582	7.214	16.582	45.519
5745	9.687	9.306	17.687	58.714
5785	9.444	8.799	17.444	55.519
5825	9.808	9.568	17.808	60.371

IEEE 802.11ac (40MHz) (MCS0) Directional Gain = 8.0dBi (Antenna 1 + Antenna 2)

Frequency (MHz)	Total Conducted Output Power in dBm	Total Conducted Output Power in mWatt	EIRP in dBm	EIRP in mWatt
5190	11.317	13.544	19.317	85.457
5230	11.907	15.514	19.907	97.890
5755	9.254	8.421	17.254	53.135
5795	9.754	9.450	17.754	59.627

IEEE 802.11ac (80MHz) (MCS0) Directional Gain = 8.0dBi (Antenna 1 + Antenna 2)

Frequency (MHz)	Total Conducted Output Power in dBm	Total Conducted Output Power in mWatt	EIRP in dBm	EIRP in mWatt
5210	11.220	13.243	19.220	83.558
5775	9.259	8.432	17.259	53.201

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

According to KDB 662911 D01 Multiple Transmitter Output v02r01, the MIMO transmission measurement shall be considered as below;

In-Band Power Measurements for MIMO mode
The measure-and-sum technique shall be used for measuring in-band transmit power of a device. Total power is the sum of the conducted power levels measured at the various output ports as described in section E)1) of KDB 662911 D01 v02r01

Total Conducted Power = Sum of Antenna 1 + Antenna 2. Also regarding to directional gain calculation, the following equation is used for transmit signals are correlated with each other;

$$\text{Directional Gain} = G_{ANT} + 10 \log (N_{ANT}) \text{ dBi} = 8\text{dBi}$$

IEEE 802.11n (20MHz) (OFDM, MCS0) Directional Gain = 8.0dBi (Antenna 1 + Antenna 2)

Frequency (MHz)	Total Conducted Output Power in dBm	Total Conducted Output Power in mWatt	EIRP in dBm	EIRP in mWatt
5180	11.107	12.904	19.107	81.422
5200	10.773	11.947	18.773	75.381
5240	11.757	14.987	19.757	94.560
5745	9.801	9.552	17.801	60.267
5785	9.326	8.562	17.326	54.020
5825	9.542	8.999	17.542	56.782

IEEE 802.11n (40MHz) (OFDM, MCS0) Directional Gain = 8.0dBi (Antenna 1 + Antenna 2)

Frequency (MHz)	Total Conducted Output Power in dBm	Total Conducted Output Power in mWatt	EIRP in dBm	EIRP in mWatt
5190	11.194	13.164	19.194	83.058
5230	12.040	15.996	20.040	100.930
5755	9.887	9.743	17.887	61.474
5795	9.719	9.373	17.719	59.137

TEST REPORT

3.1 Maximum Conducted (Average) Output Power at Antenna Terminals (Cont'd)

IEEE 802.11ac (20MHz) (OFDM, MCS0)
Max. EIRP Level = 17.808dBm

IEEE 802.11ac (40MHz) (OFDM, MCS0)
Max. EIRP Level = 19.907dBm

IEEE 802.11ac (80MHz) (OFDM, MCS0)
Max. EIRP Level = 19.220dBm

IEEE 802.11n (20MHz) (OFDM, MCS0)
Max. EIRP Level = 19.757dBm

IEEE 802.11n (40MHz) (OFDM, MCS0)
Max. EIRP Level = 20.040dBm

Directional Gain Calculations for In-Band Measurements as described in section F)2)a)i) of KDB 66291 D01 v02r01
Basic methodology with N_{ANT} transmit antennas, each with the same directional gain G_{ANT} dBi, being driven by N_{ANT} transmitter outputs of equal power. Directional gain is to be computed as follows:

transmit signals are correlated with each other, Directional gain = $G_{ANT} + 10 \log(N_{ANT})$ dBi

Direction gain = 5 + 3dBi = 8dBi

Directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Limit: 5150-5250MHz: 158.489mW (22dBm) for antennas with gains more than 6dBi. (Client device)
5725-5850MHz: 630.957mW (28dBm) for antennas with gains more than 6dBi

Remark:
1. Maximum e.i.r.p = Maximum conducted output power + Duty Cycle Factor + Antenna Gain
2. Maximum conducted output power = Conducted output power + Duty Cycle Factor
3. Duty cycle= On Time/ Period;
   Duty Cycle factor = 10 * log (1/ Duty cycle);
   Average factor = 20 log10 Duty Cycle.

TEST REPORT

3.2 Minimum 6dB RF Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. The EBW measurement procedure was used. A PEAK output reading was taken, a DISPLAY line was drawn 6dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

IEEE 802.11ac (20MHz) (MCS0)

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
5180	17.8	18.0
5200	17.8	18.0
5240	17.8	18.0
5745	17.8	18.0
5785	17.8	18.0
5825	17.8	18.0

IEEE 802.11ac (40MHz) (MCS0)

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
5190	36.5	36.3
5230	36.5	36.6
5755	36.5	36.3
5795	36.5	36.6

IEEE 802.11ac (80MHz) (MCS0)

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
5210	76.6	76.5
5775	75.9	76.0

IEEE 802.11a (20MHz) (OFDM, 6Mbps)

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
5180	16.5	16.8
5200	16.5	16.8
5240	16.5	16.8
5745	16.5	16.8
5785	16.5	16.8
5825	16.5	17.0

TEST REPORT

3.2 Minimum 6dB RF Bandwidth (Cont'd)

IEEE 802.11n (20MHz) (OFDM, MCS0)

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
5180	17.8	18.0
5200	17.8	18.0
5240	17.8	18.0
5745	17.8	18.0
5785	17.8	18.0
5825	17.8	18.0

IEEE 802.11n (40MHz) (OFDM, MCS0)

Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
5190	36.5	36.3
5230	36.2	36.6
5755	36.5	36.3
5795	36.5	36.6

Limits:

For 5725-5850MHz: 6 dB bandwidth shall be at least 500kHz

The plots of 6 dB RF bandwidth and occupied bandwidth are saved with filename:
UNII-1&2 test data.pdf

TEST REPORT

3.3 26 dB Bandwidth & Occupied Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. The EBW measurement procedure was used. A PEAK output reading was taken, a DISPLAY line was drawn 26dB lower than PEAK level. The 26dB bandwidth was determined from where the channel output spectrum intersected the display line.

IEEE 802.11ac (20MHz) (MCS0)

Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
5180	22.2	18.0
5200	22.4	18.0
5240	22.2	18.0
5745	22.4	18.0
5785	22.2	18.0
5825	22.4	18.0

IEEE 802.11ac (40MHz) (MCS0)

Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
5190	41.0	36.3
5230	40.4	36.6
5755	40.7	36.3
5795	40.7	36.6

IEEE 802.11ac (80MHz) (MCS0)

Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
5210	85.0	76.5
5775	85.0	76.0

IEEE 802.11a (20MHz) (OFDM, 6Mbps)

Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
5180	21.8	16.8
5200	22.0	16.8
5240	22.0	16.8
5745	22.0	16.8
5785	22.0	16.8
5825	22.0	17.0

TEST REPORT

3.3 26 dB Bandwidth & Occupied Bandwidth (Cont'd)

IEEE 802.11n (20MHz) (OFDM, MCS0)

Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
5180	22.2	18.0
5200	22.4	18.0
5240	22.0	18.0
5745	22.2	18.0
5785	22.2	18.0
5825	22.2	18.0

IEEE 802.11n (40MHz) (OFDM, MCS0)

Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
5190	40.7	36.3
5230	40.1	36.6
5755	41.0	36.3
5795	40.4	36.6

Limits:

For 5725-5850MHz: 6 dB bandwidth shall be at least 500kHz

The plots of 26 dB RF bandwidth and occupied bandwidth are saved with filename:
UNII-1&2 test data.pdf

TEST REPORT

3.4 Maximum Power Spectral Density

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer.

Spectrum analyser according to the following Settings:

For U-NII-1, U-NII-2A, U-NII-2C band:
Using method SA-2

a) Set span to encompass the entire emission bandwidth (EBW) of the signal.
b) Set RBW = 1 MHz, Set VBW ≥ 3 RBW, Detector = RMS
c) Sweep time = auto, trigger set to “free run”.
d) Trace average at least 100 traces in power averaging mode.
e) Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

a) Set span to encompass the entire emission bandwidth (EBW) of the signal.
b) Set RBW = 500 kHz, Set VBW ≥ 3 RBW, Detector = RMS
c) Use the peak marker function to determine the maximum power level in any 500 kHz band segment within the fundamental EBW.
d) Sweep time = auto, trigger set to “free run”.
e) Trace average at least 100 traces in power averaging mode.
f) Record the max value and add 10 log (1/duty cycle)

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

TEST REPORT

3.4 Maximum Power Spectral Density (Cont'd)

IEEE 802.11ac (20MHz) (MCS0) (Antenna 1)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5180	-4.002	0.998
5200	-4.150	0.850
5240	-3.288	1.712
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5745	-8.505	-3.505
5785	-9.150	-4.150
5825	-9.581	-4.581

IEEE 802.11ac (20MHz) (MCS0) (Antenna 2)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5180	-5.093	-0.093
5200	-5.422	-0.422
5240	-4.045	0.955
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5745	-8.515	-3.505
5785	-8.334	-3.334
5825	-8.218	-3.218

IEEE 802.11ac (40MHz) (MCS0) (Antenna 1)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5190	-6.358	-1.358
5230	-5.929	-0.929
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5755	-10.805	-5.805
5795	-11.453	-6.453

IEEE 802.11ac (40MHz) (MCS0) (Antenna 2)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5190	-7.585	-2.585
5230	-6.807	-1.807
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5755	-10.498	-5.498
5795	-11.016	-6.016

TEST REPORT

3.4 Maximum Power Spectral Density (Cont'd)

IEEE 802.11ac (80MHz) (MCS0) (Antenna 1)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5210	-9.406	-4.406
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5775	-14.579	-9.579

IEEE 802.11ac (80MHz) (MCS0) (Antenna 2)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5210	-10.9	-5.90
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5775	-13.925	-8.925

IEEE 802.11a (20MHz) (OFDM, 6 Mbps) (Antenna 1 / Antenna 2)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5180	-3.456	1.544
5200	-3.677	1.323
5240	-3.140	1.860
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5745	-8.173	3.173
5785	-7.903	2.903
5825	-7.972	2.972

TEST REPORT

3.4 Maximum Power Spectral Density (Cont'd)

IEEE 802.11n (20MHz) (OFDM, MCS0) (Antenna 1)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5180	-1.643	3.357
5200	-2.242	2.758
5240	-2.115	2.885
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5745	-8.912	-3.912
5785	-9.140	-4.140
5825	-9.555	-4.555

IEEE 802.11n (20MHz) (OFDM, MCS0) (Antenna 2)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5180	-5.082	-0.082
5200	-5.451	-0.451
5240	-3.936	1.064
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5745	-8.527	-3.527
5785	-8.248	-3.248
5825	-8.113	-3.113

IEEE 802.11n (40MHz) (OFDM, MCS0) (Antenna 1)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5190	-6.247	-1.247
5230	-5.895	-0.895
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5755	-10.96	-5.96
5795	-11.458	-6.458

IEEE 802.11n (40MHz) (OFDM, MCS0) (Antenna 2)

Frequency (MHz)	Conducted PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5190	-7.282	-2.282
5230	-6.487	-1.487
Frequency (MHz)	**Conducted PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5755	-10.285	-5.285
5795	-10.807	-5.807

TEST REPORT

3.4 Maximum Power Spectral Density (Cont'd)

According to KDB 662911 D01 Multiple Transmitter Output v02r01, the MIMO transmission measurement shall be considered as below;

In-Band Power Spectral Density (PSD) measurement as described as KDB 662911 D01 Section E) 2) a)

Total PSD = Sum of Antenna 1 + Antenna 2. Also regarding to directional gain calculation, the following equation is used for transmit signals are correlated with each other;

Directional Gain = G_{ANT} + 10 log (N_{ANT}) dBi = 8dBi

IEEE 802.11n (20MHz) (OFDM, MCS0)

Frequency (MHz)	Antenna 1 PSD in 1MHz (dBm)	Antenna 2 PSD in 1MHz (dBm)	Antenna 1 + Antenna 2 PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5180	-1.643	-5.082	-0.020	7.980
5200	-2.242	-5.451	-0.546	7.454
5240	-2.115	-3.936	0.080	8.080
Frequency (MHz)	**Antenna 1 PSD in 500kHz (dBm)**	**Antenna 2 PSD in 500kHz (dBm)**	**Antenna 1 + Antenna 2 PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5745	-8.912	-8.527	-5.705	2.295
5785	-9.140	-8.248	-5.661	2.339
5825	-9.555	-8.113	-5.764	2.236

IEEE 802.11n (40MHz) (OFDM, MCS0)

Frequency (MHz)	Antenna 1 PSD in 1MHz (dBm)	Antenna 2 PSD in 1MHz (dBm)	Antenna 1 + Antenna 2 PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5190	-6.247	-7.282	-3.723	4.277
5230	-5.895	-6.487	-3.171	4.829
Frequency (MHz)	**Antenna 1 PSD in 500kHz (dBm)**	**Antenna 2 PSD in 500kHz (dBm)**	**Antenna 1 + Antenna 2 PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5755	-10.96	-10.285	-7.599	0.401
5795	-11.458	-10.807	-8.110	-0.110

TEST REPORT

3.4 Maximum Power Spectral Density (Cont'd)

IEEE 802.11ac (20MHz) (OFDM, MCS0)

Frequency (MHz)	Antenna 1 PSD in 1MHz (dBm)	Antenna 2 PSD in 1MHz (dBm)	Antenna 1 + Antenna 2 PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5180	-4.002	-5.093	-1.503	6.497
5200	-4.150	-5.422	-1.729	6.271
5240	-3.288	-4.045	-0.640	7.360
Frequency (MHz)	**Antenna 1 PSD in 500kHz (dBm)**	**Antenna 2 PSD in 500kHz (dBm)**	**Antenna 1 + Antenna 2 PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5745	-8.505	-8.515	-5.500	2.500
5785	-9.150	-8.334	-5.713	2.287
5825	-9.581	-8.218	-5.836	2.164

IEEE 802.11ac (40MHz) (OFDM, MCS0)

Frequency (MHz)	Antenna 1 PSD in 1MHz (dBm)	Antenna 2 PSD in 1MHz (dBm)	Antenna 1 + Antenna 2 PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5190	-6.358	-7.585	-3.918	4.082
5230	-5.929	-6.807	-3.336	4.664
Frequency (MHz)	**Antenna 1 PSD in 500kHz (dBm)**	**Antenna 2 PSD in 500kHz (dBm)**	**Antenna 1 + Antenna 2 PSD in 500kHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5755	-10.805	-10.498	-7.638	0.362
5795	-11.453	-11.016	-8.219	-0.219

IEEE 802.11ac (80MHz) (OFDM, MCS0)

Frequency (MHz)	Antenna 1 PSD in 1MHz (dBm)	Antenna 2 PSD in 1MHz (dBm)	Antenna 1 + Antenna 2 PSD in 1MHz (dBm)	EIRP PSD in 1MHz (dBm)
5210	-9.406	-10.9	-7.079	-11.229
Frequency (MHz)	**Antenna 1 PSD in 500kHz (dBm)**	**Antenna 2 PSD in 500kHz (dBm)**	**Antenna 1 + Antenna 2 PSD in 1MHz (dBm)**	**EIRP PSD in 500kHz (dBm)**
5775	-14.579	-13.925	0.921	-3.229

TEST REPORT

3.4 Maximum Power Spectral Density (Cont'd)

Directional Gain Calculations for In-Band Measurements as described in section F)2)a)i) of KDB 66291 D01 v02r01
Basic methodology with N_{ANT} transmit antennas, each with the same directional gain G_{ANT} dBi, being driven by N_{ANT} transmitter outputs of equal power. Directional gain is to be computed as follows:

transmit signals are correlated with each other, Directional gain = $G_{ANT} + 10 \log(N_{ANT})$ dBi

Direction gain = 5 + 3dBi = 8dBi

Directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Thus, the Limits:

For U-NII-1:
☒ (11.0dBm -2dB) = 9dBm/MHz for mobile/portable device.
For U-NII-3: in 3kHz
☒ (30dBm – 2dB) = 28dBm/500kHz

Remark:

1. Cable Loss: 1.0dB
2. e.i.r.p. spectral density = Power spectral density + Duty Cycle Factor + Antenna Gain
3. Power spectral density = Conducted power spectral density + Duty Cycle Factor
4. Duty cycle = On Time/ Period;
   Duty Cycle factor = 10 * log(1/ Duty cycle);
   Average factor = 20 log10 Duty Cycle.

The test data are saved with filename:
N20 - Test data 01.pdf
N40 – test data 02.pdf
A - Test data 03.pdf
AC20 – Test data 04.pdf
AC40 – Test data 05.pdf
AC80 – test data 06.pdf

TEST REPORT

3.5 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

Where
FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflects the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Example:

Assume a receiver reading of 62.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29.0 dB is subtracted. The pulse desensitization factor of the spectrum analyzer is 0.0 dB, and the resultant average factor is -10.0 dB. The net field strength for comparison to the appropriate emission limit is 32.0 dBµV/m. This value in dBµV/m is converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0.0 dB
AV = -10.0 dB
FS = 62.0 + 7.4 + 1.6 – 29.0 + 0.0 + -10.0) = 32.0 dBµV/m

Level in µV/m = Common Antilogarithm [(32.0 dBµV/m)/20] = 39.8 µV/m

TEST REPORT

3.6 Transmitter Radiated Emissions in Restricted Bands and Spurious Emissions

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

3.6.1 Radiated Emission Configuration Photograph

Worst Case Restricted Band Radiated Emission at 5150 MHz and 17475 MHz.

The worst case radiated emission configuration photographs are saved with filename:
config photos.pdf

3.6.2 Radiated Emission Data

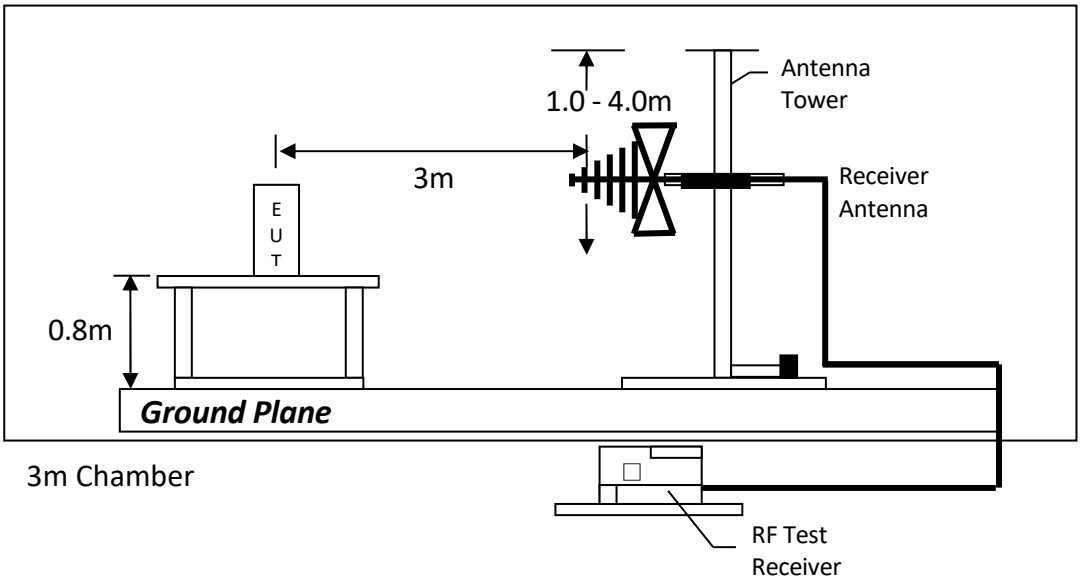
The data in below tables list the significant emission frequencies, the limit and the margin of compliance.

Judgement – Passed by 0.5 dB margin

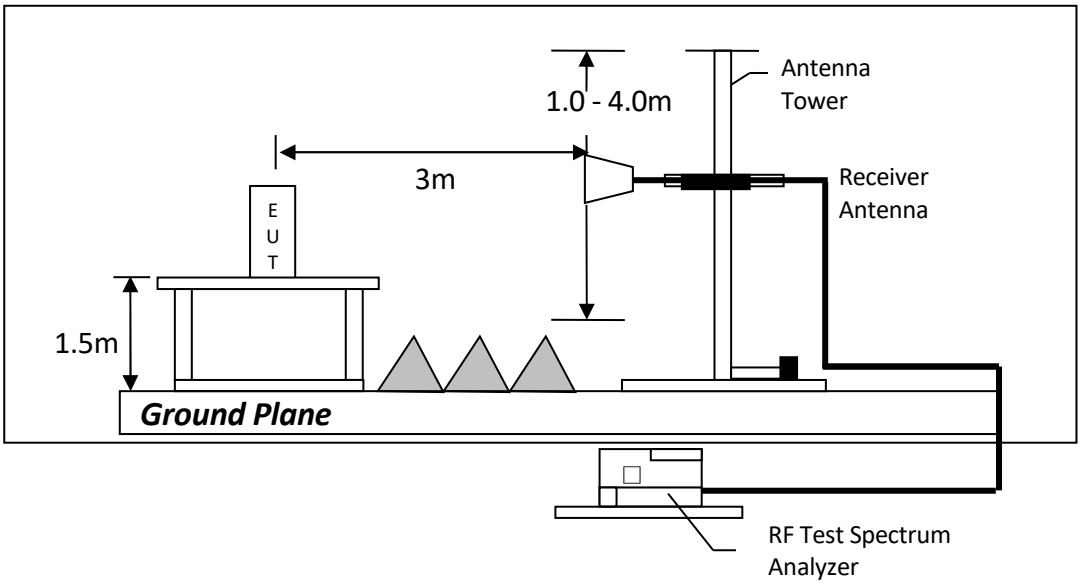
TEST REPORT

3.6.3 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11a (20MHz) (OFDM, 6MBs)

5180MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m -Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	26.5	33	35.7	53.5	54.0	-0.5
H	10360.000	32.7	33	40.5	36.2	54.0	-17.8
H	15540.000	28.0	33	37.7	45.1	54.0	-8.9
H	20720.000	26.5	33	37.7	38.2	54.0	-15.8
H	25900.000	32.7	33	39.3	37.7	54.0	-16.3
H	31080.000	28.0	33	42.1	43.3	54.0	-10.7

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	52.7	33	35.7	68.2	74.0	-5.8
H	10360.000	65.8	33	40.5	49.5	68.0	-18.5
H	15540.000	60.6	33	37.7	58.5	68.0	-9.5
H	20720.000	47.1	33	37.7	45.4	74.0	-28.6
H	25900.000	39.3	33	39.3	42.0	68.0	-26.0
H	31080.000	32.8	33	42.1	50.5	68.0	-17.5

5200MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	10400.000	33.2	33	40.5	40.7	54.0	-13.3
V	15600.000	44.9	33	37.7	49.6	54.0	-4.4
V	20800.000	29.8	33	37.7	34.5	54.0	-19.5
H	26000.000	29.7	33	39.2	35.9	54.0	-18.1
V	31200.000	34.6	33	42.1	43.7	54.0	-10.3

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	10400.000	46.5	33	40.5	54.0	68.0	-14.0
V	15600.000	58.3	33	37.7	63.0	74.0	-11.0
V	20800.000	45.1	33	37.7	49.8	74.0	-24.2
H	26000.000	38.1	33	39.2	44.3	68.0	-23.7
V	31200.000	34.6	33	42.1	43.7	74.0	-30.3

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11a (20MHz) (OFDM, 6MBs)

5240MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	10480.000	30.9	33	40.5	38.4	54.0	-15.6
H	15720.000	42.6	33	37.7	47.3	54.0	-6.7
H	20960.000	35.2	33	37.7	39.9	54.0	-14.1
V	26200.000	35.6	33	39.2	41.8	54.0	-12.2
H	31440.000	34.8	33	42.1	43.9	54.0	-10.1

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	10480.000	50.6	33	40.5	51.8	68.0	-16.2
H	15720.000	56.1	33	37.7	60.8	74.0	-13.2
H	20960.000	63.4	33	37.7	51.3	74.0	-22.7
V	26200.000	49.7	33	39.2	48.1	68.0	-19.9
H	31440.000	44.3	33	42.1	44.2	74.0	-29.8

5745MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	11490.000	35.1	33	40.8	42.9	54.0	-11.1
V	22980.000	33.3	33	38.3	38.6	54.0	-15.4
H	28725.000	35.7	33	40.1	42.8	54.0	-11.2
H	34470.000	38.6	33	41.1	46.7	54.0	-7.3

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	11490.000	48.5	33	40.8	56.3	74.0	-17.7
V	22980.000	37.9	33	38.3	43.2	74.0	-30.8
H	28725.000	39.1	33	40.1	46.2	68.0	-21.8
H	34470.000	44.0	33	41.1	52.1	68.0	-15.9

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11a (20MHz) (OFDM, 6MBs)

5785MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	11570.000	33.2	33	40.5	40.7	54.0	-13.3
V	23140.000	39.6	33	38.6	45.2	54.0	-8.8
H	28925.000	40.9	33	40.1	48.0	54.0	-6.0
H	34710.000	39.7	33	41.3	48.0	54.0	-6.0

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	11570.000	46.5	33	40.5	54.0	74.0	-20.0
V	23140.000	39.7	33	38.6	45.3	68.0	-22.7
H	28925.000	40.9	33	40.1	48.0	68.0	-20.0
H	34710.000	44.5	33	41.3	52.8	68.0	-15.2

5825MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	11650.000	37.6	33	40.5	45.1	54.0	-8.9
V	23300.000	31.1	33	38.6	36.7	54.0	-17.3
H	29125.000	40.5	33	40.0	47.5	54.0	-6.5
H	34950.000	42.1	33	41.3	50.4	54.0	-3.6

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	11650.000	51.0	33	40.5	58.5	74.0	-15.5
V	23300.000	39.1	33	38.6	44.7	68.0	-23.3
H	29125.000	40.9	33	40.0	47.9	68.0	-20.1
H	34950.000	45.1	33	41.3	53.4	68.0	-14.6

Notes:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.
9. Average detector is used according to ANSI C63.10 for average measurement.

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11n (20MHz) (OFDM, MCS0) – Both Antennas

5180MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m -Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	26.5	33	35.7	53.3	54.0	-0.7
H	10360.000	32.7	33	40.5	36.4	54.0	-17.6
H	15540.000	28.0	33	37.7	45.1	54.0	-8.9
H	20720.000	26.5	33	37.7	38.2	54.0	-15.8
H	25900.000	32.7	33	39.3	37.7	54.0	-16.3
H	31080.000	28.0	33	42.1	43.3	54.0	-10.7

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	52.7	33	35.7	69.5	74.0	-4.5
H	10360.000	65.8	33	40.5	50.3	68.0	-17.7
H	15540.000	60.6	33	37.7	58.6	68.0	-9.4
H	20720.000	47.1	33	37.7	45.4	74.0	-28.6
H	25900.000	39.3	33	39.3	42.0	68.0	-26.0
H	31080.000	32.8	33	42.1	50.5	68.0	-17.5

5200MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	10400.000	33.3	33	40.5	40.8	54.0	-13.2
V	15600.000	44.8	33	37.7	49.5	54.0	-4.5
V	20800.000	29.8	33	37.7	34.5	54.0	-19.5
H	26000.000	29.7	33	39.2	35.9	54.0	-18.1
V	31200.000	34.6	33	42.1	43.7	54.0	-10.3

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11n (20MHz) (OFDM, MCS0) – Both Antennas

5240MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	10480.000	31.1	33	40.5	38.6	54.0	-15.4
H	15720.000	42.6	33	37.7	47.3	54.0	-6.7
H	20960.000	35.2	33	37.7	39.9	54.0	-14.1
V	26200.000	35.6	33	39.2	41.8	54.0	-12.2
H	31440.000	34.8	33	42.1	43.9	54.0	-10.1

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	10480.000	50.6	33	40.5	52.4	68.0	-15.6
H	15720.000	56.0	33	37.7	60.7	74.0	-13.3
H	20960.000	63.4	33	37.7	51.3	74.0	-22.7
V	26200.000	49.7	33	39.2	48.1	68.0	-19.9
H	31440.000	44.3	33	42.1	44.2	74.0	-29.8

5745MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	11490.000	35.1	33	40.8	42.9	54.0	-11.1
V	22980.000	33.3	33	38.3	38.6	54.0	-15.4
H	28725.000	35.7	33	40.1	42.8	54.0	-11.2
H	34470.000	38.6	33	41.1	46.7	54.0	-7.3

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	11490.000	48.7	33	40.8	56.5	74.0	-17.5
V	22980.000	37.9	33	38.3	43.2	74.0	-30.8
H	28725.000	39.1	33	40.1	46.2	68.0	-21.8
H	34470.000	44.0	33	41.1	52.1	68.0	-15.9

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11n (20MHz) (OFDM, MCS0) – Both Antennas

5785MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	11570.000	33.3	33	40.5	40.8	54.0	-13.2
V	23140.000	39.6	33	38.6	45.2	54.0	-8.8
H	28925.000	40.7	33	40.1	47.8	54.0	-6.2
H	34710.000	39.5	33	41.3	47.8	54.0	-6.2

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	11570.000	47.0	33	40.5	54.5	74.0	-19.5
V	23140.000	39.7	33	38.6	45.3	68.0	-22.7
H	28925.000	40.9	33	40.1	48.0	68.0	-20.0
H	34710.000	44.5	33	41.3	52.8	68.0	-15.2

5825MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	11650.000	37.6	33	40.5	45.1	54.0	-8.9
V	23300.000	31.1	33	38.6	36.7	54.0	-17.3
H	29125.000	40.5	33	40.0	47.5	54.0	-6.5
H	34950.000	39.5	33	41.3	47.8	54.0	-6.2

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	11650.000	51.1	33	40.5	58.6	74.0	-15.4
V	23300.000	39.1	33	38.6	44.7	68.0	-23.3
H	29125.000	40.9	33	40.0	47.9	68.0	-20.1
H	34950.000	45.1	33	41.3	53.4	68.0	-14.6

Notes:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.
9. Average detector is used according to ANSI C63.10 for average measurement.

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11n (40MHz) (MCS0) – Both Antennas

5190MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	50.8	33	35.7	53.5	54.0	-0.5
H	10380.000	28.9	33	40.5	36.4	54.0	-17.6
H	15570.000	40.8	33	37.7	45.5	54.0	-8.5
V	20760.000	32.7	33	37.7	37.4	54.0	-16.6
H	25950.000	36.2	33	39.3	42.5	54.0	-11.5
H	31140.000	37.2	33	42.1	46.3	54.0	-7.7

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	66.8	33	35.7	69.5	74.0	-4.5
H	10380.000	42.7	33	40.5	50.2	68.0	-17.8
H	15570.000	53.9	33	37.7	58.6	74.0	-15.4
V	20760.000	40.2	33	37.7	44.9	74.0	-29.1
H	25950.000	38.4	33	39.3	44.7	68.0	-23.3
H	31140.000	39.4	33	42.1	48.5	68.0	-19.5

5230MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	10460.000	31.2	33	40.5	38.7	54.0	-15.3
V	15690.000	43.1	33	37.7	47.8	54.0	-6.2
H	20920.000	31.8	33	37.7	36.5	54.0	-17.5
V	26150.000	34.2	33	39.2	40.4	54.0	-13.6
H	31380.000	33.7	33	42.1	42.8	54.0	-11.2

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	10460.000	44.8	33	40.5	52.3	68.0	-15.7
V	15690.000	56.0	33	37.7	60.7	74.0	-13.3
H	20920.000	37.0	33	37.7	41.7	74.0	-32.4
V	26150.000	43.6	33	39.2	49.8	68.0	-18.2
H	31380.000	36.1	33	42.1	45.2	74.0	-28.8

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11n (40MHz) (MCS0) – Both Antennas

5755MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	11510.000	35.7	33	40.5	43.2	54.0	-10.8
V	23020.000	35.8	33	38.6	41.4	54.0	-12.6
V	28775.000	35.7	33	40.1	42.8	54.0	-11.2
H	34530.000	40.2	33	41.3	48.5	54.0	-5.5

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	11510.000	49.0	33	40.5	56.5	74.0	-17.5
V	23020.000	38.2	33	38.6	43.8	74.0	-30.2
V	28775.000	38.2	33	40.1	45.3	68.0	-22.7
H	34530.000	42.6	33	41.3	50.9	68.0	-17.2

5795MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	11590.000	33.5	33	40.5	41.0	54.0	-13.0
V	23180.000	34.8	33	38.6	40.4	54.0	-13.6
H	28975.000	36.6	33	40.1	43.7	54.0	-10.3
H	34770.000	39.3	33	41.3	47.6	54.0	-6.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	11590.000	46.9	33	40.5	54.4	74.0	-19.6
V	23180.000	37.5	33	38.6	43.1	68.0	-24.9
H	28975.000	37.6	33	40.1	44.7	68.0	-23.3
H	34770.000	42.0	33	41.3	50.3	68.0	-17.7

Notes:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.
9. Average detector is used according to ANSI C63.10 for average measurement.

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11ac (20MHz) (MCS0) – Both Antennas

5180MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m -Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	26.5	33	35.7	52.9	54.0	-1.1
H	10360.000	32.7	33	40.5	36.3	54.0	-17.7
V	15540.000	28.0	33	37.7	45.1	54.0	-8.9
H	20720.000	26.5	33	37.7	38.2	54.0	-15.8
H	25900.000	32.7	33	39.3	37.7	54.0	-16.3
H	31080.000	28.0	33	42.1	43.3	54.0	-10.7

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	52.7	33	35.7	71.8	74.0	-2.2
H	10360.000	65.8	33	40.5	49.5	68.0	-18.5
V	15540.000	60.6	33	37.7	58.9	68.0	-9.1
H	20720.000	47.1	33	37.7	45.4	74.0	-28.6
H	25900.000	39.3	33	39.3	42.0	68.0	-26.0
H	31080.000	32.8	33	42.1	50.5	68.0	-17.5

5200MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	10400.000	33.2	33	40.5	40.7	54.0	-13.3
H	15600.000	44.8	33	37.7	49.5	54.0	-4.5
V	20800.000	29.8	33	37.7	34.5	54.0	-19.5
H	26000.000	29.7	33	39.2	35.9	54.0	-18.1
V	31200.000	34.6	33	42.1	43.7	54.0	-10.3

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	10400.000	46.7	33	40.5	54.2	68.0	-13.8
H	15600.000	58.9	33	37.7	63.6	74.0	-10.4
V	20800.000	45.1	33	37.7	49.8	74.0	-24.2
H	26000.000	38.1	33	39.2	44.3	68.0	-23.7
V	31200.000	34.6	33	42.1	43.7	74.0	-30.3

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11ac (20MHz) (MCS0) – Both Antennas

5240MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	10480.000	31.0	33	40.5	38.5	54.0	-15.5
V	15720.000	42.6	33	37.7	47.3	54.0	-6.7
H	20960.000	35.2	33	37.7	39.9	54.0	-14.1
V	26200.000	35.6	33	39.2	41.8	54.0	-12.2
H	31440.000	34.8	33	42.1	43.9	54.0	-10.1

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	10480.000	50.6	33	40.5	51.9	68.0	-16.1
V	15720.000	56.6	33	37.7	61.3	74.0	-12.7
H	20960.000	63.4	33	37.7	51.3	74.0	-22.7
V	26200.000	49.7	33	39.2	48.1	68.0	-19.9
H	31440.000	44.3	33	42.1	44.2	74.0	-29.8

5745MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	11490.000	35.1	33	40.8	42.9	54.0	-11.1
V	22980.000	33.3	33	38.3	38.6	54.0	-15.4
H	28725.000	35.7	33	40.1	42.8	54.0	-11.2
H	34470.000	38.6	33	41.1	46.7	54.0	-7.3

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	11490.000	48.8	33	40.8	56.6	74.0	-17.4
V	22980.000	37.9	33	38.3	43.2	74.0	-30.8
H	28725.000	39.1	33	40.1	46.2	68.0	-21.8
H	34470.000	44.0	33	41.1	52.1	68.0	-15.9

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11ac (20MHz) (MCS0) – Both Antennas

5785MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	11570.000	33.2	33	40.5	40.7	54.0	-13.3
V	23140.000	39.6	33	38.6	45.2	54.0	-8.8
H	28925.000	39.6	33	40.1	46.7	54.0	-7.3
H	34710.000	39.3	33	41.3	47.6	54.0	-6.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	11570.000	46.7	33	40.5	54.2	74.0	-19.8
V	23140.000	39.7	33	38.6	45.3	68.0	-22.7
H	28925.000	40.9	33	40.1	48.0	68.0	-20.0
H	34710.000	44.5	33	41.3	52.8	68.0	-15.2

5825MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	11650.000	37.6	33	40.5	45.1	54.0	-8.9
V	23300.000	31.1	33	38.6	36.7	54.0	-17.3
H	29125.000	40.5	33	40.0	47.5	54.0	-6.5
H	34950.000	39.1	33	41.3	47.4	54.0	-6.6

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	11650.000	51.4	33	40.5	58.9	74.0	-15.1
V	23300.000	39.1	33	38.6	44.7	68.0	-23.3
H	29125.000	40.9	33	40.0	47.9	68.0	-20.1
H	34950.000	45.1	33	41.3	53.4	68.0	-14.6

Notes:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.
9. Average detector is used according to ANSI C63.10 for average measurement.

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11ac (40MHz) (MCS0) – Both Antennas

5190MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	50.8	33	35.7	53.5	54.0	-0.5
H	10380.000	28.9	33	40.5	36.4	54.0	-17.6
H	15570.000	40.8	33	37.7	45.5	54.0	-8.5
V	20760.000	32.7	33	37.7	37.4	54.0	-16.6
H	25950.000	36.2	33	39.3	42.5	54.0	-11.5
H	31140.000	37.2	33	42.1	46.3	54.0	-7.7

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	66.1	33	35.7	68.8	74.0	-5.2
H	10380.000	42.8	33	40.5	50.3	68.0	-17.7
H	15570.000	54.2	33	37.7	58.9	74.0	-15.1
V	20760.000	40.2	33	37.7	44.9	74.0	-29.1
H	25950.000	38.4	33	39.3	44.7	68.0	-23.3
H	31140.000	39.4	33	42.1	48.5	68.0	-19.5

5230MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	10460.000	31.1	33	40.5	38.6	54.0	-15.4
H	15690.000	42.4	33	37.7	47.1	54.0	-6.9
H	20920.000	31.8	33	37.7	36.5	54.0	-17.5
V	26150.000	34.2	33	39.2	40.4	54.0	-13.6
H	31380.000	33.7	33	42.1	42.8	54.0	-11.2

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	10460.000	45.0	33	40.5	52.5	68.0	-15.5
H	15690.000	56.4	33	37.7	61.1	74.0	-12.9
H	20920.000	37.0	33	37.7	41.7	74.0	-32.4
V	26150.000	43.6	33	39.2	49.8	68.0	-18.2
H	31380.000	36.1	33	42.1	45.2	74.0	-28.8

TEST REPORT

RADIATED EMISSION DATA

IEEE 802.11ac (40MHz) (MCS0) – Both Antennas

5755MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	11510.000	35.4	33	40.5	42.9	54.0	-11.1
V	23020.000	35.8	33	38.6	41.4	54.0	-12.6
V	28775.000	35.7	33	40.1	42.8	54.0	-11.2
H	34530.000	40.2	33	41.3	48.5	54.0	-5.5

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	11510.000	49.3	33	40.5	56.8	74.0	-17.2
V	23020.000	38.2	33	38.6	43.8	74.0	-30.2
V	28775.000	38.2	33	40.1	45.3	68.0	-22.7
H	34530.000	42.6	33	41.3	50.9	68.0	-17.2

5795MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	11590.000	33.3	33	40.5	40.8	54.0	-13.2
V	23180.000	34.8	33	38.6	40.4	54.0	-13.6
H	28975.000	36.6	33	40.1	43.7	54.0	-10.3
H	34770.000	39.3	33	41.3	47.6	54.0	-6.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	11590.000	47.1	33	40.5	54.6	74.0	-19.4
V	23180.000	37.5	33	38.6	43.1	68.0	-24.9
H	28975.000	37.6	33	40.1	44.7	68.0	-23.3
H	34770.000	42.0	33	41.3	50.3	68.0	-17.7

Notes:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.
9. Average detector is used according to ANSI C63.10 for average measurement.

TEST REPORT

RADIATED EMISSION DATA

ADIATED EMISSION DATA (CONT'D)

IEEE 802.11ac (80MHz) (MCS0) – Both Antennas

5210MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	50.8	33	35.7	53.5	54.0	-0.5
H	10420.000	29.1	33	40.5	36.6	54.0	-17.4
H	15630.000	40.8	33	37.7	45.5	54.0	-8.5
H	20840.000	33.1	33	37.7	37.8	54.0	-16.2
V	26050.000	33.4	33	39.2	39.6	54.0	-14.4
H	31260.000	32.3	33	42.1	41.4	54.0	-12.6

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	5150.000	66.2	33	35.7	68.9	74.0	-5.1
H	10420.000	42.1	33	40.5	49.6	68.0	-18.4
H	15630.000	54.7	33	37.7	59.4	74.0	-14.6
H	20840.000	39.4	33	37.7	44.1	74.0	-30.0
V	26050.000	35.4	33	39.2	41.6	68.0	-26.4
H	31260.000	36.0	33	42.1	45.1	74.0	-28.9

TEST REPORT

RADIATED EMISSION DATA (CONT'D)

IEEE 802.11ac (80MHz) (MCS0) – Both Antennas

5775MHz

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	11550.000	35.8	33	40.5	43.3	54.0	-10.7
H	23100.000	34.5	33	38.6	40.1	54.0	-13.9
H	28875.000	40.2	33	40.1	47.3	54.0	-6.7
V	34650.000	32.9	33	41.3	41.2	54.0	-12.8

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	11550.000	49.5	33	40.5	57.0	74.0	-17.0
H	23100.000	40.6	33	38.6	46.2	74.0	-27.9
H	28875.000	42.5	33	40.1	49.6	68.0	-18.4
V	36680.000	36.2	33	41.7	44.9	68.0	-23.1

Notes:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.
7. For the measurement of radiated emission, summation method was used which numerical integrating (in terms of linear power) over the transmitter occupied bandwidth.
8. For the linear power measurement, data in 1MHz spacing was collected by spectrum analyzer with 1MHz resolution bandwidth.
9. Average detector is used according to ANSI C63.10 for average measurement.

TEST REPORT

RADIATED EMISSION DATA (CONT'D)

Worst Case: Transmitting

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
H	124.999	40.9	16	14.0	38.9	43.5	-4.6
H	148.499	42.6	16	14.0	40.6	43.5	-2.9
H	249.998	40.6	16	20.0	44.6	46.0	-1.4
H	371.203	29.9	16	24.0	37.9	46.0	-8.1
V	749.995	30.4	16	30.0	44.4	46.0	-1.6
H	874.994	27.1	16	32.0	43.1	46.0	-2.9

NOTES:
1. Peak detector is used unless otherwise stated.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.
4. Emissions within the restricted band meets the requirement of FCC Part 15 Section 15.205.
5. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

3.7 AC Power Line Conducted Emission

☐ Not Applicable – EUT is only powered by battery for operation.

☒ EUT connects to AC power line. Emission Data is listed in following pages.

☐ Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

3.7.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration at 0.483 MHz.

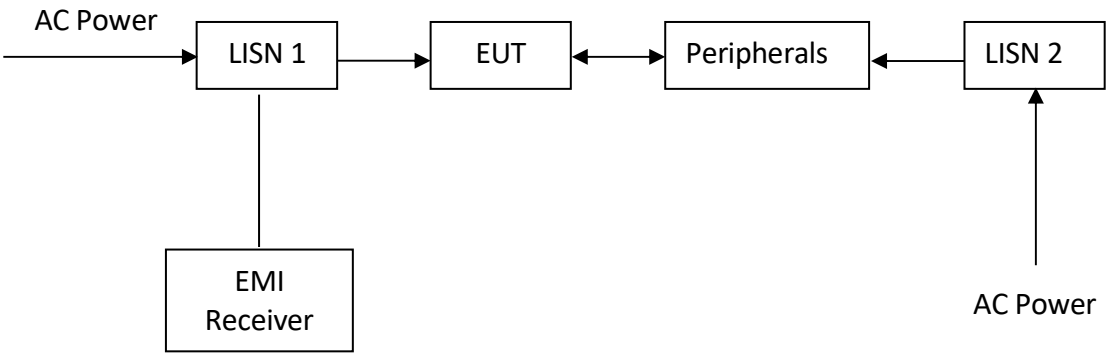
The worst case line conducted configuration photographs are attached in the Appendix and saved with filename: config photos.pdf.

3.7.2 AC Power Line Conducted Emission Data

The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by 6.03 dB margin compare with Quasi-peak limit.

3.7.3 Conducted Emission Test Setup



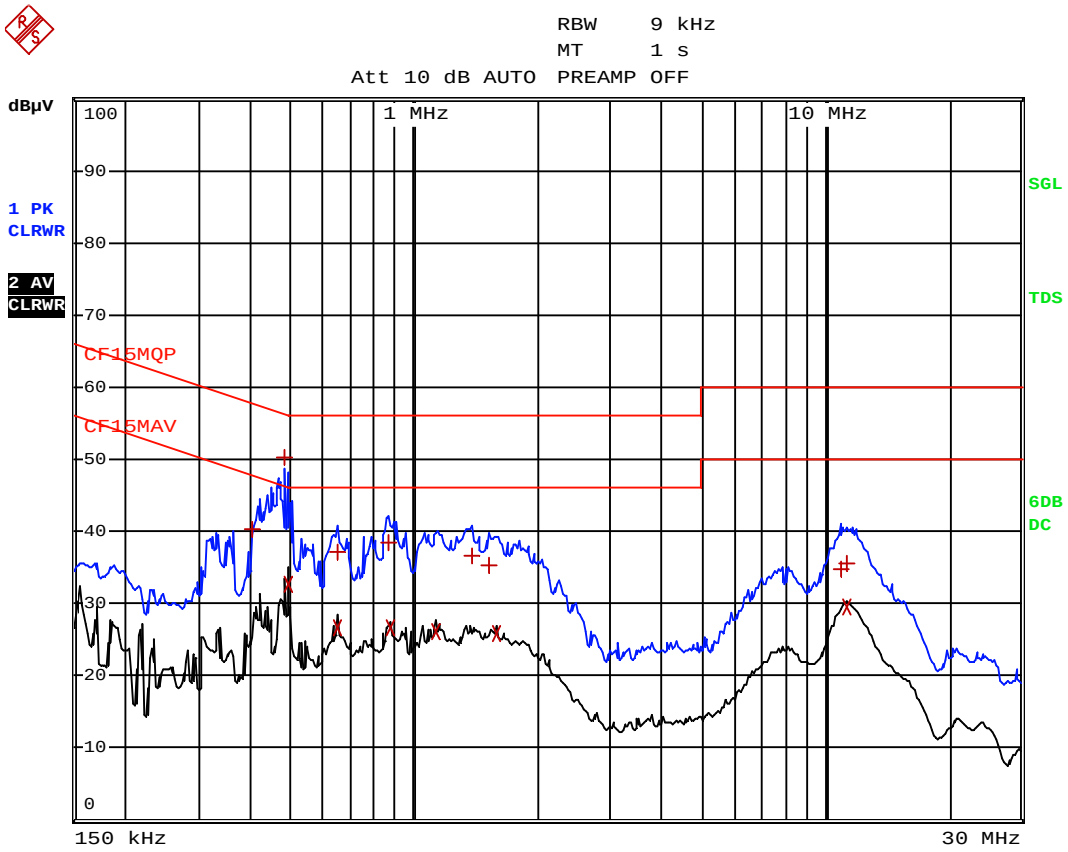
The EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

TEST REPORT

AC POWER LINE CONDUCTED EMISSION

Worst Case: Operating Mode



TEST REPORT

AC POWER LINE CONDUCTED EMISSION

Worst Case: Operating Mode

EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	402 kHz	40.36	N	-17.44
1	Quasi Peak	483 kHz	50.25	N	-6.03
2	CISPR Average	492 kHz	32.71	N	-13.42
1	Quasi Peak	649.5 kHz	37.26	L1	-18.73
2	CISPR Average	649.5 kHz	26.73	N	-19.26
1	Quasi Peak	870 kHz	38.44	L1	-17.55
2	CISPR Average	879 kHz	26.75	N	-19.24
2	CISPR Average	1.1355 MHz	25.99	L1	-20.00
1	Quasi Peak	1.383 MHz	36.56	L1	-19.43
1	Quasi Peak	1.527 MHz	35.38	L1	-20.61
2	CISPR Average	1.5945 MHz	25.81	L1	-20.18
1	Quasi Peak	10.968 MHz	34.74	L1	-25.25
2	CISPR Average	11.346 MHz	29.59	L1	-20.40
1	Quasi Peak	11.3595 MHz	35.61	L1	-24.38

TEST REPORT

EXHIBIT 4 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	Spectrum Analyzer (10Hz to 40GHz)	Biconical Antenna (30MHz to 300MHz)
Registration No.	EW-3016	EW-3241
Manufacturer	ROHDESCHWARZ	EMCO
Model No.	FSV40	3110C
Calibration Date	December 13, 2022	May 26, 2021
Calibration Due Date	December 13, 2023	May 26, 2023

Equipment	Log Periodic Antenna	Double Ridged Guide Antenna	Active Loop H-field (9kHz to 30MHz)
Registration No.	EW-3243	EW-1133	EW-3302
Manufacturer	EMCO	EMCO	EMCO
Model No.	3148B	3115	6502
Calibration Date	June 03, 2021	May 26, 2021	December 13, 2021
Calibration Due Date	March 30, 2023	May 26, 2023	June 13, 2023

Equipment	RF Preamplifier (9kHz to 6000MHz)	2.4GHz Notch Filter	14m Double Shield RF Cable (9kHz - 6GHz)
Registration No.	EW-3006b	EW-3435	EW-2376
Manufacturer	SCHWARZBECK	MICROWAVE	RADIALL
Model No.	BBV9718	N0324413	n m/br56/bnc m 14m
Calibration Date	February 15, 2022	June 16, 2022	January 26, 2022
Calibration Due Date	May 15, 2023	June 16, 2023	April 26, 2023

Equipment	Pyramidal Horn Antenna
Registration No.	EW-0905
Manufacturer	EMCO
Model No.	3160-09
Calibration Date	July 20, 2021
Calibration Due Date	April 20, 2023

TEST REPORT

4.0 EQUIPMENT LIST (CONT'D)

2) Conducted Emissions Test

Equipment	RF Cable 80cm (RG142) (9kHz to 30MHz)	Artificial Mains Network	EMI Test Receiver (9kHz to 26.5GHz)
Registration No.	EW-2451	EW-2501	EW-3156
Manufacturer	RADIALL	ROHDESCHWARZ	ROHDESCHWARZ
Model No.	bnc m st / 142 / bnc m st 80cm	ENV-216	ESR26
Calibration Date	May 06, 2022	November 09, 2021	September 26, 2022
Calibration Due Date	May 06, 2023	May 09, 2023	September 26, 2023

3) Bandedge Measurement

Equipment	EMI Test Receiver (9kHz to 26.5GHz)	5m RF Cable (40GHz)
Registration No.	EW-3156	EW-2701
Manufacturer	ROHDESCHWARZ	RADIALL
Model No.	ESR26	Sma m-m 5m 40G
Calibration Date	September 26, 2022	November 24, 2021
Calibration Due Date	September 26, 2023	May 24, 2023

4) Conductive Measurement Test

Equipment	RF Cable (40GHz)	RF Power Meter with Power Sensor (NRP-Z81)	Signal and Spectrum Analyzer (10Hz to 40GHz)
Registration No.	EW-3271	EW-3309	EW-3016
Manufacturer	GREATBILLION	ROHDESCHWARZ	ROHDESCHWARZ
Model No.	sma m-m 5m 40G	NRP-Z81	FSV40
Calibration Date	November 24, 2021	December 01, 2021	October 29, 2021
Calibration Due Date	May 24, 2023	March 01, 2023	April 26, 2023

5) Bandedge & Bandwidth Measurement

Equipment	5m RF Cable (40GHz)	EMI Test Receiver (9kHz to 26.5GHz)
Registration No.	EW-2701	EW-3156
Manufacturer	RADIALL	ROHDESCHWARZ
Model No.	sma m-m 5m 40G	ESR26
Calibration Date	November 24, 2021	September 26, 2022
Calibration Due Date	May 24, 2023	September 26, 2023

6) Control Software for Radiated Emission

Software Information	
Software Name	EMC32
Manufacturer	ROHDESCHWARZ
Software version	10.50.40

END OF TEST REPORT