



FCC RF Test Report

APPLICANT : Lenovo(Shanghai) Electronics
Technology Co., Ltd.
EQUIPMENT : Portable Tablet Computer
BRAND NAME : Lenovo
MODEL NAME : Lenovo TB-8304F1
FCC ID : O57TB8304F1
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

This is a data re-used report which is only valid together with the original test report. The product was received on Jan. 09, 2018 and testing was completed on Mar. 28, 2018. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.



Approved by: James Huang / Manager

Sporton International (Kunshan) Inc.

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China**



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SUMMARY OF TEST RESULT

| Report Section | FCC Rule | Description | Limit | Result | Remark |
|----------------|--------------------|--|-----------------------|--------|-------------------------------------|
| 3.1 | 15.247(b) | Power Output Measurement | ≤ 30dBm | Pass | - |
| 0 | 15.247(d) | Radiated Band Edges and Radiated Spurious Emission | 15.209(a) & 15.247(d) | Pass | Under limit 3.01 dB at 2389.820 MHz |
| 3.3 | 15.203 & 15.247(b) | Antenna Requirement | N/A | Pass | - |



1 General Description

1.1 Applicant

Lenovo(Shanghai) Electronics Technology Co., Ltd.

NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

1.2 Manufacturer

Lenovo PC HK Limited

23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

1.3 Product Feature of Equipment Under Test

| Product Feature | |
|---------------------------------|---|
| Equipment | Portable Tablet Computer |
| Brand Name | Lenovo |
| Model Name | Lenovo TB-8304F1 |
| FCC ID | O57TB8304F1 |
| EUT supports Radios application | WLAN 2.4GHz 802.11b/g/n HT20 WLAN 5GHz 802.11a/n HT20/HT40 Bluetooth v3.0+EDR/ Bluetooth v4.0 LE/ Bluetooth v4.1 LE/ Bluetooth v4.2 LE |
| HW Version | Lenovo Tablet TB-8304F1 |
| SW Version | TB-8304F1_RF01_180208 |
| EUT Stage | Identical Prototype |

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

| Standards-related Product Specification | |
|---|---|
| Tx/Rx Channel Frequency Range | 2412 MHz ~ 2462 MHz |
| Maximum (Peak) Output Power to antenna | 802.11b : 18.08 dBm (0.0643 W) 802.11g : 22.12 dBm (0.1629 W) 802.11n HT20 : 21.88 dBm (0.1542 W) |
| Antenna Type / Gain | IFA Antenna with gain 1.27 dBi |
| Type of Modulation | 802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) |



1.5 Component List

There are four samples under test, the differences of four samples are shown in the table below.

Based on the similarity of four samples, only choose sample 1 to perform full test.

| Object | Sample 1 | Sample 2 |
|--------------|--|--|
| LPDDR3 EMCP | Samsung: KMQE60013M-B318 (2+16G) | Hynix: H9TQ17ABJTBCUR-KUM (2+16G) |
| PCB | CEE: A5e5b_MainboardPCB | Huashen: A5e5b_Mainboard PCB |
| Battery | Sunwoda: L16D1P34 | SCUD: L16D1P34 |
| speakerBox1 | Xichundz: ZA2060AAA601USAA_Speaker Box_1511_FPC_Xichundz | Keysound: ZA2060AAA601USAA_Speaker Box_1511_FPC_Keysound |
| LCM | TXD: TXDT800CXPA-36 | Starry: 2081080BH8021006-51F |
| Camera_Back | JSL: HS6283A1D-0P0J0 | JSL: HS6283A1D-0P0J0 |
| Camera_Front | C&T: V20672 V0 | Brodsands: B02SF0319 |
| Object | Sample 3 | Sample 4 |
| LPDDR3 EMCP | Samsung: KMFE60012M-B214 (1+16G) | Samsung: KMFE60012M-B214 (1+16G) |
| PCB | CEE: A5e5b_MainboardPCB | Huashen: A5e5b_Mainboard PCB |
| Battery | Sunwoda: L16D1P34 | SCUD: L16D1P34 |
| speakerBox1 | Xichundz: ZA2060AAA601USAA_Speaker Box_1511_FPC_Xichundz | Keysound: ZA2060AAA601USAA_Speaker Box_1511_FPC_Keysound |
| LCM | TXD: TXDT800CXPA-36 | Starry: 2081080BH8021006-51F |
| Camera_Back | JSL: HS6283A1D-0P0J0 | JSL: HS6283A1D-0P0J0 |
| Camera_Front | C&T: V20672 V0 | Brodsands: B02SF0319 |

1.6 Modification of EUT

No modifications are made to the EUT during all test items.



1.7 Re-use of Measured Data

1.7.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: Lenovo TB-8304F1, FCC ID: O57TB8304F1) is electrically identical to the reference device (Model: Lenovo TB-8304F, FCC ID: O57TB8304F) for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 178919 D01.

1.7.2 Difference Section

For details concerning the similarity with respect to component placement, mechanical/electrical design etc., please refer to Product Equality Declaration..

The re-used RF data includes the following bands provided in Appendix D (Sporton RF Report No. FR810906C for the reference device Model: Lenovo TB-8304F, FCC ID: O57TB8304F)

1.7.3 Spot Check Verification Data Section

In order to confirm hardware similarity of the subject device with the reference device, spot check measurements were performed on the subject device for conducted power and radiated spurious emission, the test result were consistent with FCC ID: O57TB8304F.

Assertions concerning the similarity of these devices are based on representations by the applicant. The applicant accepts full responsibility for the validity of the similarity claim, and for the determination that verification test data are sufficient to support it.

1.7.4 Reference detail Section:

| Equipment Class | Reference FCC ID | Folder Test/RF Exposure | Report Title/Section |
|-----------------|------------------|-------------------------|--|
| DSS | O57TB8304F | Part15C(FR810906A) | All sections (except the conducted power and worse case of RSE) applicable |
| DTS (BLE) | O57TB8304F | Part15C(FR810906B) | All sections (except the conducted power and worse case of RSE) applicable |
| DTS (WLAN) | O57TB8304F | Part15C(FR810906C) | All sections (except the conducted power and worse case of RSE) applicable |



1.8 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0) and the FCC designation No. is CN5013.

| | | | |
|---------------------------|---|-----------|---------------------------------------|
| Test Site | Sporton International (Kunshan) Inc. | | |
| Test Site Location | No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL : +86-512-57900158 FAX : +86-512-57900958 | | |
| Test Site No. | Sporton Site No. | | FCC Test Firm Registration No. |
| | TH01-KS | 03CH03-KS | 630927 |

Note: The test site complies with ANSI C63.4 2014 requirement.

1.9 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases were recorded in this report.

2.1 Carrier Frequency and Channel

| Frequency Band | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------|---------|-------------|---------|-------------|
| 2400-2483.5 MHz | 1 | 2412 | 7 | 2442 |
| | 2 | 2417 | 8 | 2447 |
| | 3 | 2422 | 9 | 2452 |
| | 4 | 2427 | 10 | 2457 |
| | 5 | 2432 | 11 | 2462 |
| | 6 | 2437 | - | - |



2.2 Test Mode

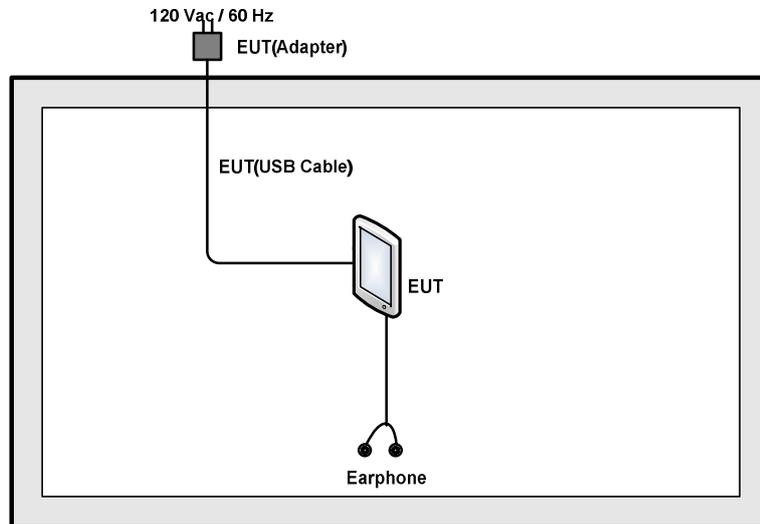
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

| Modulation | Data Rate |
|--------------|-----------|
| 802.11n HT20 | MCS0 |

Remark: For Radiated TCs, The tests were performed with Adapter 1, Earphone and USB Cable 1.

2.3 Connection Diagram of Test System

<WLAN Tx Mode>



2.4 Support Unit used in test configuration and system

| Item | Equipment | Trade Name | Model Name | FCC ID | Data Cable | Power Cord |
|------|-----------|------------|------------|--------|------------------|------------|
| 1. | Earphone | Lenovo | P121 | N/A | Unshielded, 1.2m | N/A |

2.5 EUT Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

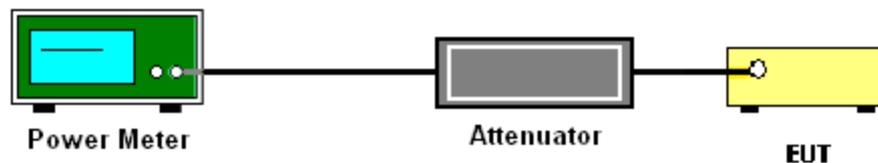
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup





3.1.5 Test Result of Peak Output Power

| 2.4GHz Band | | | | | | | | | | |
|-------------|-----------|-----|-----|-------------|----------------------------|-----------------------------|----------|------------------|------------------------|------------|
| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Peak Conducted Power (dBm) | Conducted Power Limit (dBm) | DG (dBi) | EIRP Power (dBm) | EIRP Power Limit (dBm) | Pass /Fail |
| 11b | 1Mbps | 1 | 1 | 2412 | 17.78 | 30.00 | 1.27 | 19.05 | 36.00 | Pass |
| 11b | 1Mbps | 1 | 6 | 2437 | 18.08 | 30.00 | 1.27 | 19.35 | 36.00 | Pass |
| 11b | 1Mbps | 1 | 11 | 2462 | 18.03 | 30.00 | 1.27 | 19.30 | 36.00 | Pass |
| 11g | 6Mbps | 1 | 1 | 2412 | 22.03 | 30.00 | 1.27 | 23.30 | 36.00 | Pass |
| 11g | 6Mbps | 1 | 6 | 2437 | 22.12 | 30.00 | 1.27 | 23.39 | 36.00 | Pass |
| 11g | 6Mbps | 1 | 11 | 2462 | 21.95 | 30.00 | 1.27 | 23.22 | 36.00 | Pass |
| HT20 | MCS0 | 1 | 1 | 2412 | 21.73 | 30.00 | 1.27 | 23.00 | 36.00 | Pass |
| HT20 | MCS0 | 1 | 6 | 2437 | 21.88 | 30.00 | 1.27 | 23.15 | 36.00 | Pass |
| HT20 | MCS0 | 1 | 11 | 2462 | 21.81 | 30.00 | 1.27 | 23.08 | 36.00 | Pass |



3.1.6 Test Result of Average output Power (Reporting Only)

| 2.4GHz Band | | | | | | |
|-------------|-----------|-----|-----|-------------|------------------|-------------------------------|
| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Duty Factor (dB) | Average Conducted Power (dBm) |
| 11b | 1Mbps | 1 | 1 | 2412 | 0.00 | 14.81 |
| 11b | 1Mbps | 1 | 6 | 2437 | 0.00 | 15.01 |
| 11b | 1Mbps | 1 | 11 | 2462 | 0.00 | 14.97 |
| 11g | 6Mbps | 1 | 1 | 2412 | 0.11 | 14.82 |
| 11g | 6Mbps | 1 | 6 | 2437 | 0.11 | 14.87 |
| 11g | 6Mbps | 1 | 11 | 2462 | 0.11 | 14.68 |
| HT20 | MCS0 | 1 | 1 | 2412 | 0.12 | 12.83 |
| HT20 | MCS0 | 1 | 6 | 2437 | 0.12 | 13.88 |
| HT20 | MCS0 | 1 | 11 | 2462 | 0.12 | 13.69 |



3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 – 88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



3.2.3 Test Procedures

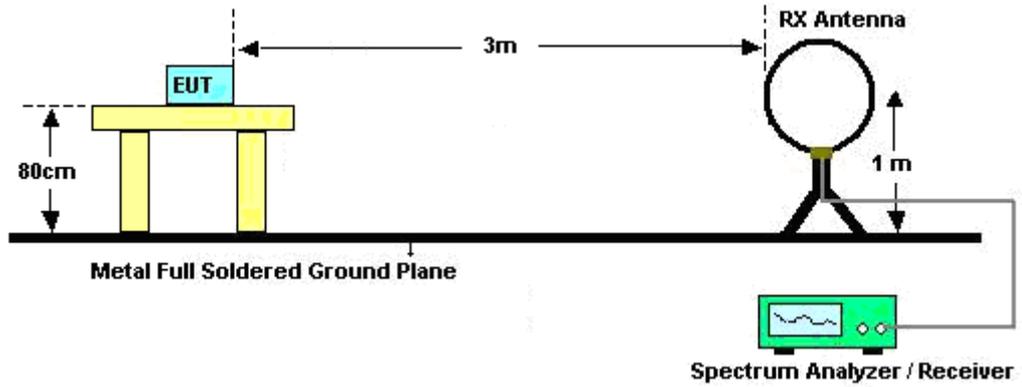
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

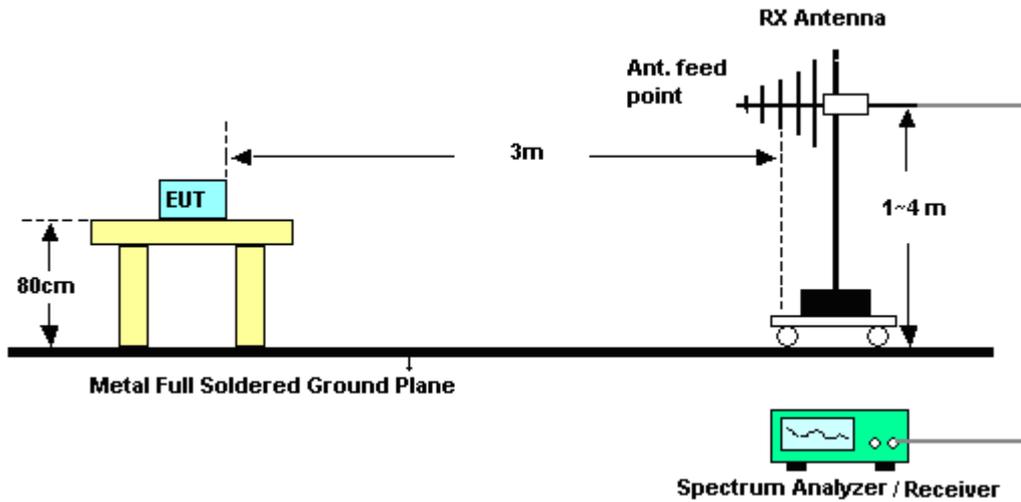
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.2.4 Test Setup

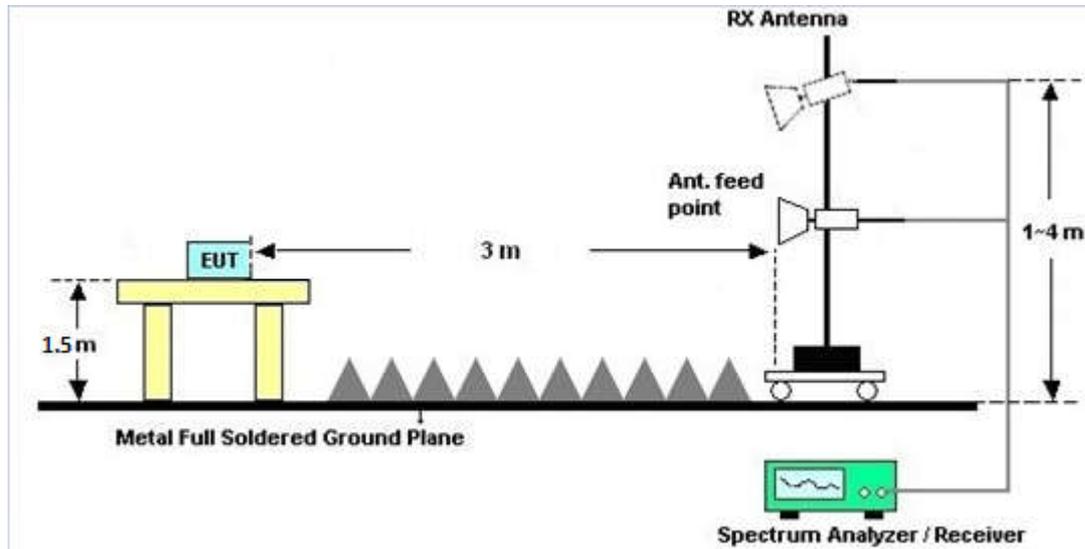
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

3.2.7 Duty Cycle

Please refer to Appendix B.

3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix A.



3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|-----------------------|--------------|----------------------------|------------|-----------------------|------------------|---------------|---------------|-----------------------|
| Pulse Power Sensor | Anritsu | MA2411B | 0917070 | 300MHz~40GHz | Jan. 18, 2018 | Mar. 28, 2018 | Jan. 17, 2019 | Conducted (TH01-KS) |
| Power Meter | Anritsu | ML2495A | 1005002 | 50MHz Bandwidth | Jan. 18, 2018 | Mar. 28, 2018 | Jan. 17, 2019 | Conducted (TH01-KS) |
| EMI Test Receiver | Keysight | N9038A | MY56400004 | 3Hz~8.5GHz; Max 30dBm | Oct. 19, 2017 | Mar. 15, 2018 | Oct. 18, 2018 | Radiation (03CH03-KS) |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55150244 | 10Hz~44GHz | Apr. 18, 2017 | Mar. 15, 2018 | Apr. 17, 2018 | Radiation (03CH03-KS) |
| Loop Antenna | R&S | HFH2-Z2 | 100321 | 9kHz~30MHz | Oct. 22, 2017 | Mar. 15, 2018 | Oct. 21, 2018 | Radiation (03CH03-KS) |
| Bilog Antenna | TeseQ | CBL6112D | 35406 | 25MHz~2GHz | Apr. 22, 2017 | Mar. 15, 2018 | Apr. 21, 2018 | Radiation (03CH03-KS) |
| Horn Antenna | Schwarzbeck | BBHA9120D | 9120D-1356 | 1GHz~18GHz | Apr. 22, 2017 | Mar. 15, 2018 | Apr. 21, 2018 | Radiation (03CH03-KS) |
| SHF-EHF Horn | Schwarzbeck | BBHA 9170 | BBHA170249 | 15GHz~40GHz | Feb. 14, 2018 | Mar. 15, 2018 | Feb. 13, 2019 | Radiation (03CH03-KS) |
| Amplifier | com-power | PA-103A | 161069 | 1MHz~1000MHz / 32 dB | Apr. 18, 2017 | Mar. 15, 2018 | Apr. 17, 2018 | Radiation (03CH03-KS) |
| Amplifier | MITEQ | TTA1840-35-HG | 1887435 | 18GHz~40GHz | Oct. 12, 2017 | Mar. 15, 2018 | Oct. 11, 2018 | Radiation (03CH03-KS) |
| high gain Amplifier | MITEQ | AMF-7D-0010 1800-30-10P | 2025788 | 1GHz~18GHz | Apr. 18, 2017 | Mar. 15, 2018 | Apr. 17, 2018 | Radiation (03CH03-KS) |
| Amplifier | Agilent | 8449B | 3008A02370 | 1GHz~26.5GHz | Oct. 12, 2017 | Mar. 15, 2018 | Oct. 11, 2018 | Radiation (03CH03-KS) |
| AC Power Source | Chroma | 61601 | F104090004 | N/A | NCR | Mar. 15, 2018 | NCR | Radiation (03CH03-KS) |
| Turn Table | ChamPro | EM 1000-T | 060762-T | 0~360 degree | NCR | Mar. 15, 2018 | NCR | Radiation (03CH03-KS) |

NCR: No Calibration Required



5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

| | |
|---|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 4.6dB |
|---|-------|

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

| | |
|---|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 4.5dB |
|---|-------|

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

| | |
|---|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 4.5dB |
|---|-------|



Appendix A. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|-------------------------------------|---|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|-------|-------|
| Ant. | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| 1 | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| 802.11n HT20 CH 01 2412MHz | | 2389.95 | 65.15 | -8.85 | 74 | 62.34 | 31.3 | 5.65 | 34.14 | 104 | 125 | P | H |
| | | 2389.82 | 50.99 | -3.01 | 54 | 48.18 | 31.3 | 5.65 | 34.14 | 104 | 125 | A | H |
| | * | 2410 | 103.36 | - | - | 100.52 | 31.33 | 5.67 | 34.16 | 104 | 125 | P | H |
| | * | 2410 | 96.28 | - | - | 93.44 | 31.33 | 5.67 | 34.16 | 104 | 125 | A | H |
| | | 2389.95 | 62.58 | -11.42 | 74 | 59.77 | 31.3 | 5.65 | 34.14 | 294 | 84 | P | V |
| | | 2389.95 | 48.14 | -5.86 | 54 | 45.33 | 31.3 | 5.65 | 34.14 | 294 | 84 | A | V |
| | * | 2410 | 103.18 | - | - | 100.34 | 31.33 | 5.67 | 34.16 | 294 | 84 | P | V |
| | * | 2412 | 95.83 | - | - | 92.99 | 31.33 | 5.67 | 34.16 | 294 | 84 | A | V |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 1, Note, Frequency (MHz), Level (dBµV/m), Over Limit (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Cable Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include test data for 802.11n HT20 CH 01 at 2412MHz and a Remark section.



Emission below 1GHz

2.4GHz WIFI 802.11n HT20 (LF)

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|---------------------------------|--|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant. | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| 1 | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| 2.4GHz 802.11n HT20 LF | | 30 | 23.24 | -16.76 | 40 | 29.7 | 25 | 0.57 | 32.03 | 100 | 0 | P | H |
| | | 108.57 | 18.23 | -25.27 | 43.5 | 31.29 | 17.79 | 1.06 | 31.91 | - | - | P | H |
| | | 377.26 | 20.59 | -25.41 | 46 | 28.32 | 21.07 | 2 | 30.8 | - | - | P | H |
| | | 581.93 | 25.32 | -20.68 | 46 | 27.79 | 24.71 | 2.6 | 29.78 | - | - | P | H |
| | | 731.31 | 25.5 | -20.5 | 46 | 26 | 25.44 | 2.8 | 28.74 | - | - | P | H |
| | | 850.62 | 26.84 | -19.16 | 46 | 25.39 | 26.31 | 3.05 | 27.91 | - | - | P | H |
| | | 31.94 | 30.12 | -9.88 | 40 | 37.67 | 23.88 | 0.6 | 32.03 | - | - | P | V |
| | | 45.52 | 32.74 | -7.26 | 40 | 48.23 | 15.95 | 0.67 | 32.11 | 100 | 0 | P | V |
| | | 89.17 | 24.46 | -19.04 | 43.5 | 40.8 | 14.72 | 0.97 | 32.03 | - | - | P | V |
| | | 107.6 | 25.82 | -17.68 | 43.5 | 39.01 | 17.68 | 1.05 | 31.92 | - | - | P | V |
| | | 751.68 | 26.19 | -19.81 | 46 | 26.32 | 25.71 | 2.81 | 28.65 | - | - | P | V |
| | 995.15 | 27.17 | -26.83 | 54 | 23.48 | 27.35 | 3.24 | 26.9 | - | - | P | V | |
| Remark | 1. No other spurious found. 2. All results are PASS against limit line. | | | | | | | | | | | | |



Note symbol

| | |
|-----|--|
| * | Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| ! | Test result is not under limit 6dB |
| P/A | Peak or Average |
| H/V | Horizontal or Vertical |



A calculation example for radiated spurious emission is shown as below:

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|---------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant. | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| 2 | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| 802.11b | | 2390 | 55.45 | -18.55 | 74 | 54.51 | 32.22 | 4.58 | 35.86 | 103 | 308 | P | H |
| CH 01 | | | | | | | | | | | | | |
| 2412MHz | | 2390 | 43.54 | -10.46 | 54 | 42.6 | 32.22 | 4.58 | 35.86 | 103 | 308 | A | H |

- Level(dBμV/m) =
Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

- Level(dBμV/m)
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

- Level(dBμV/m)
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

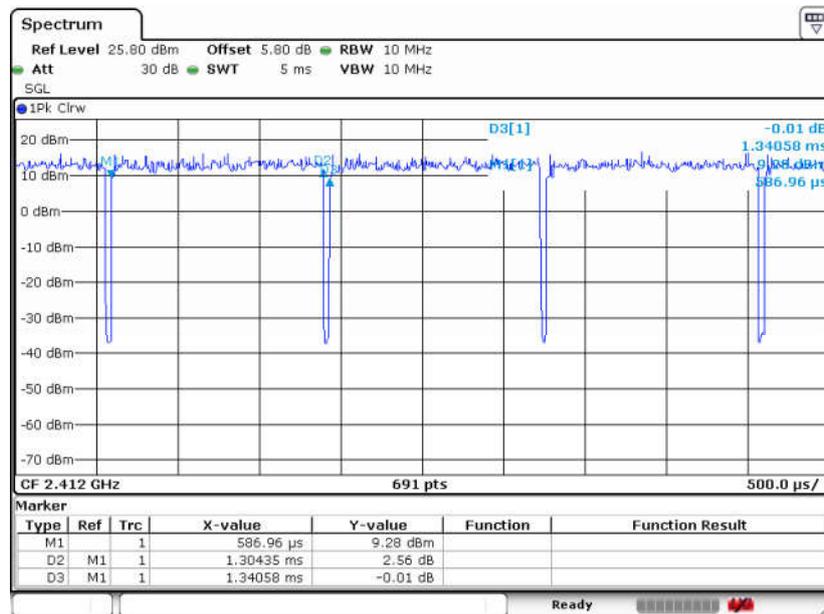
Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix B. Duty Cycle Plots

| Band | Duty Cycle(%) | T(ms) | 1/T(kHz) | VBW Setting |
|--------------|---------------|-------|----------|-------------|
| 802.11n HT20 | 97.30 | 1.304 | 0.767 | 1kHz |

802.11n HT20





Appendix D. Reference Report

Please refer to Sporton report number FR810906C which is issued separately.