Testing Laboratory
3023

Test Report No:
2420336R-RFUSV15S-A

# Test Result for Inspection
## (Class II Permissive Change For FCC)
## (Class IV Permissive Change For ISED)

| | |
|---|---|
| Product Name | Tightening production tool |
| Brand Name | rexroth |
| Model No. | NX_-A, NX_-P |
| FCC ID | 2BFYU-NEXO |
| IC | 32342-NEXO |
| Applicant´s Name / Address | Bosch Rexroth AG<br>Fornsbacher Str. 92, 71540 Murrhardt, Germany |
| Manufacturer's Name | Bosch Rexroth AG |
| Test Method Requested, Standard | FCC CFR Title 47 Part 15 Subpart C Section 15.247<br>FCC CFR Title 47 Part 15 Subpart E Section 15.407<br>RSS-247 Issue 3 (Aug. 2023)<br>ANSI C63.10-2013 |
| Verdict Summary | IN COMPLIANCE |
| Documented By Genie Chang | Genie Chang |
| Tested By Ivan Chuang | Ivan Chuang |
| Approved By Alan Chen | Alan Chen |
| Date of Receipt | 2024/02/22 |
| Date of Issue | 2024/07/17 |
| Report Version | V1.0 |

# INDEX

## Competences and Guarantees

DEKRA is a testing laboratory competent to carry out the tests described in this report.
In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.



## General Conditions

1. The test results relate only to the samples tested.
2. The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
3. This report must not be used to claim product endorsement by TAF or any agency of the government.
4. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
5. Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

## Revision History

| Version | Description | Issued Date |
|---|---|---|
| V1.0 | Initial issue of report | 2024/07/17 |

## Permissive Change

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| 2420336R-RFUSV15S-A | V1.0 | This is to request a Class II permissive change for FCC and Class IV permissive change for ISED.<br>The major change filed under this application is:<br>Change #1: Additional chassis added, Bosch AG, Model Number NX_-A, and NX_-P.<br>Change #2: Add one antenna to WLAN Module which antenna's type is PCB, and each antenna gain is lower. The original application was certified with a 2 dBi. The C2PC and C4PC is to add a lower gain -2.91 dBi for 2.4 GHz, 0.80 dBi for 5 GHz.<br>Change #3: Reduce the output power through firmware, and SAR measurement were evaluated. (Only reduce Wi-Fi output power).<br>Change #4: BT function is disable though firmware. | 2024/07/17 |

## Summary of Test Result

| Report Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|
| 3 | Maximum Conducted Output Power | PASS | - |
| 4 | Radiated Emission | PASS | - |

| Comments and Explanations |
|---|
| The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification. |

# 1. General Information

## 1.1. EUT Description

| | | |
|---|---|---|
| Frequency Range | 2400 ~ 2483.5 MHz | |
| Operating Frequency / Channel Number | IEEE 802.11b/g/n/ax (20 MHz) | 2412 ~ 2462 MHz / 11 Channels |
| | IEEE 802.11n/ax (40 MHz) | 2422 ~ 2452 MHz / 7 Channels |
| Type of Modulation | IEEE 802.11b | DSSS-DBPSK, DQPSK, CCK |
| | IEEE 802.11g/n | OFDM-BPSK, QPSK, 16QAM, 64QAM |
| | IEEE 802.11ax | OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM |

| | | |
|---|---|---|
| Frequency Range | 5150 ~ 5250 MHz<br>5250 ~ 5350 MHz<br>5470 ~ 5725 MHz<br>5725 ~ 5850 MHz | |
| Operating Frequency / Channel Number (FCC) | IEEE 802.11a/n/ac/ax (20 MHz) | 5180 ~ 5240 MHz / 4 Channels<br>5260 ~ 5320 MHz / 4 Channels<br>5500 ~ 5720 MHz / 12 Channels<br>5745 ~ 5825 MHz / 5 Channels |
| | IEEE 802.11n/ac/ax (40 MHz) | 5190 ~ 5230 MHz / 2 Channels<br>5270 ~ 5310 MHz / 2 Channels<br>5510 ~ 5710 MHz / 6 Channels<br>5755 ~ 5795 MHz / 2 Channels |
| | IEEE 802.11ac/ax (80 MHz) | 5210 MHz / 1 Channel<br>5290 MHz / 1 Channel<br>5530 ~ 5690 MHz / 3 Channels<br>5775 MHz / 1 Channel |
| Operating Frequency / Channel Number (ISED) | IEEE 802.11a/n/ac/ax (20 MHz) | 5180 ~ 5240 MHz / 4 Channels<br>5260 ~ 5320 MHz / 4 Channels<br>5500 ~ 5720 MHz / 9 Channels<br>5745 ~ 5825 MHz / 5 Channels |
| | IEEE 802.11n/ac/ax (40 MHz) | 5190 ~ 5230 MHz / 2 Channels<br>5270 ~ 5310 MHz / 2 Channels<br>5510 ~ 5710 MHz / 4 Channels<br>5755 ~ 5795 MHz / 2 Channels |
| | IEEE 802.11ac/ax (80 MHz) | 5210 MHz / 1 Channel<br>5290 MHz / 1 Channel<br>5530 ~ 5690 MHz / 2 Channels<br>5775 MHz / 1 Channel |
| Type of Modulation | IEEE 802.11a/n | OFDM-BPSK, QPSK, 16QAM, 64QAM |
| | IEEE 802.11ac | OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM |
| | IEEE 802.11ax | OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM |

The difference for each model is shown as below:

| Model No. | Description |
|---|---|
| NX_-P | pistol grip nutrunner |
| NX_-A | angular nutrunner |

The manufacturer has declared that all models are electrically identical, with different model names used for appearance variations. The test sample is identified as NX_-P.

| Antenna Information | | | | |
|---|---|---|---|---|
| Item. | Brand Name | Model No. | Type | Antenna Gain (dBi) |
| 1 | Synzen Precision Technology | CZ0031(BT + Wi-Fi) | PCB | -3.41 dBi for 2400 MHz<br>0.28 dBi for 5150~5850 MHz |
| | | CZ0031(Wi-Fi) | | 0.80 dBi for 5150~5850 MHz |

**2.4 GHz**

For IEEE 802.11b/g/n/ax Mode: (1TX, 1RX)

Only Ant. 0 can be used as transmitting/receiving antenna.

**5 GHz**

For IEEE 802.11a Mode: (1TX, 1RX)

Only Ant. 0 can be used as transmitting/receiving antenna.

For IEEE 802.11n/ac/ax Mode: (2TX, 2RX)

Both Ant. 0 and Ant. 1 can be used as transmitting/receiving antennas.

## 1.2. EUT Information

| | | | | |
|---|---|---|---|---|
| EUT Power Type | From Battery | | | |
| EUT Function | ☒ | Point-to-multipoint | ☐ | Point-to-point |
| TPC Function | ☒ | With TPC Function | ☐ | Without TPC Function |
| Weather Band (5600 ~ 5650 MHz) | ☒ | With 5600 ~ 5650 MHz | ☐ | Without 5600 ~ 5650 MHz |
| Beamforming Function | ☐ | With beamforming | ☒ | Without beamforming |
| Resource Unit of 802.11ax | ☒ | Full RU | ☐ | Partial RU |

Note: ISED does not support the 5600 MHz ~ 5650 MHz weather band.

## 1.3. Testing Location Information

| | |
|---|---|
| USA | FCC Designation Number: TW0033 |
| Canada | CAB Identifier Number: TW3023 / Company Number: 26930 |

| | |
|---|---|
| Site Description | Accredited by TAF |
| | Accredited Number: 3023 |

| | |
|---|---|
| Test Laboratory | DEKRA Testing and Certification Co., Ltd. |
| | Linkou Laboratory |
| Address | No.5-22, Ruishukeng Linkou District, New Taipei City, 24451, Taiwan, R.O.C. |
| Performed Location | No. 26, Huaya 1st Rd., Guishan Dist.,Taoyuan City 333411, Taiwan, R.O.C. |
| Phone Number | +886-3-275-7255 |
| Fax Number | +886-3-327-8031 |

Ambient conditions in the laboratory:

| Performed Item | Items | Required | Actual | Test Date |
|---|---|---|---|---|
| Radiated Emission | Temperature (°C) | 10~40 °C | 22.7 ℃ | 2024/03/24~2024/07/12 |
| | Humidity (%RH) | 10~90 % | 52.5 % | |
| RF Conducted Emission | Temperature (°C) | 10~40 °C | 23.9 ℃ | 2024/03/05~2024/07/16 |
| | Humidity (%RH) | 10~90 % | 60.1 % | |

## 1.4. Measurement Uncertainty

Uncertainties have been calculated according to the DEKRA internal document.

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

| Test Item | Uncertainty |
|---|---|
| Maximum Conducted Output Power | Spectrum Analyzer: ±2.13 dB<br>Power Meter: ±1.07 dB |
| Radiated Emission | 9 kHz~30 MHz: ±3.30 dB<br>30 MHz~1 GHz: ±4.79 dB<br>1 GHz~18 GHz: ±4.17 dB<br>18 GHz~40 GHz: ±3.32 dB |

## 1.5. List of Test Equipment

For Conducted Measurements / HY-SR02

| | Equipment | Manufacturer | Model No. | Serial No. | Cal. Date | Due Date |
|---|---|---|---|---|---|---|
| V | Spectrum Analyzer | R&S | FSV30 | 103466 | 2024/01/05 | 2025/01/04 |
| V | Spectrum Analyzer | KEYSIGHT | N9010A | MY53470892 | 2023/11/09 | 2024/11/08 |
| V | Peak Power Analyzer | KEYSIGHT | 8990B | MY51000539 | 2024/05/07 | 2025/05/06 |
| V | Wideband Power Sensor | KEYSIGHT | N1923A | MY59240002 | 2024/05/08 | 2025/05/07 |
| V | Wideband Power Sensor | KEYSIGHT | N1923A | MY59240003 | 2024/05/08 | 2025/05/07 |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “V” are used to measure the final test results.
3. Test Software Version: RF Conducted Test Tools R3 V3.0.1.14.

For Radiated Measurements /HY-CB02

| | Equipment | Manufacturer | Model No. | Serial No. | Cal. Date | Due. Date |
|---|---|---|---|---|---|---|
| V | Loop Antenna | TESEQ | HLA6121 | 49611 | 2024/02/23 | 2025/02/22 |
| V | Bi-Log Antenna | SCHWARZBECK | VULB9168 | 9168-0675 | 2023/08/09 | 2025/08/08 |
| V | Horn Antenna | RF SPIN | DRH18-E | 210503A18ES | 2024/02/29 | 2025/02/28 |
| V | Horn Antenna | Com-Power | AH-840 | 101100 | 2023/10/02 | 2025/10/01 |
| V | Pre-Amplifier | SGH | SGH0301-9 | 20211007-8 | 2024/01/10 | 2025/01/09 |
| V | Pre-Amplifier | SGH | SGH118-HS | 20211102-1 | 2024/01/10 | 2025/01/09 |
| V | Pre-Amplifier | EMCI | EMC05820SE | 980285 | 2024/01/10 | 2025/01/09 |
| V | Pre-Amplifier | EMCI | EMC184045SE | 980369 | 2024/01/10 | 2025/01/09 |
| V | Coaxial Cable | EMCI | EMC102-KM-KM-600 | 1160314 | 2024/01/10 | 2025/01/09 |
| V | Coaxial Cable | EMCI | EMC102-KM-KM-7000 | 170242 | 2024/01/10 | 2025/01/09 |
| V | Filter | MICRO TRONICS | BRM50702 | G249 | 2024/01/05 | 2025/01/04 |
| V | Filter | MICRO TRONICS | BRM50716 | G067 | 2024/01/05 | 2025/01/04 |
| V | EMI Test Receiver | R&S | ESR3 | 102793 | 2023/12/11 | 2024/12/10 |
| V | Spectrum Analyzer | R&S | FSV3044 | 101113 | 2024/02/05 | 2025/02/04 |
| V | Coaxial Cable | SGH | HA800 | GD20110223-2 | 2024/01/10 | 2025/01/09 |
| V | Coaxial Cable | SGH | HA800 | GD20110222-4 | 2024/01/10 | 2025/01/09 |
| V | Coaxial Cable | SGH | SGH18 | 202108-5 | 2024/01/10 | 2025/01/09 |
| V | Coaxial Cable | SGH | SGH18 | 202212-2 | 2023/11/27 | 2024/11/26 |

Note:

1. Bi-Log Antenna and Horn Antenna(AH-840) is calibrated every two years, the other equipments are calibrated every one year.
2. The test instruments marked with “V” are used to measure the final test results.
3. Test Software Version: e3 230303 dekra V9.

# 2. Test Configuration of EUT

## 2.1. Test Condition

| EUT Operational Condition | |
|---|---|
| Testing Voltage | DC 18V By Battery |

## 2.2. Test Frequency Mode

| Test Software Version | Dut labtool / Version: 2.0.0.89 |
|---|---|

| Modulation | Frequency (MHz) | Power Setting |
|---|---|---|
| 802.11b | 2412 | 16.5 |
| | 2437 | 16 |
| | 2462 | 18 |
| 802.11g | 2412 | 14.5 |
| | 2437 | 16 |
| | 2462 | 12.5 |
| 802.11n (20 MHz) | 2412 | 14 |
| | 2437 | 16 |
| | 2462 | 12.5 |
| 802.11n (40 MHz) | 2422 | 13 |
| | 2437 | 13 |
| | 2452 | 12 |
| 802.11ax (20 MHz) | 2412 | 13.5 |
| | 2437 | 16 |
| | 2462 | 11 |
| 802.11ax (40 MHz) | 2422 | 13.5 |
| | 2437 | 13.5 |
| | 2452 | 13.5 |

| Modulation | Frequency (MHz) | Power Setting |
|---|---|---|
| 802.11a | 5180 | 13 |
| | 5220 | 13 |
| | 5240 | 13 |
| | 5260 | 13.5 |
| | 5300 | 13.5 |
| | 5320 | 13.5 |
| | 5500 | 14 |
| | 5580 | 15 |
| | 5700 | 14 |
| | 5720 | 14 |
| | 5745 | 14 |
| | 5785 | 15.5 |
| | 5825 | 16.5 |
| 802.11ac (20 MHz) | 5180 | 14 |
| | 5220 | 14 |
| | 5240 | 13.75 |
| | 5260 | 14.25 |
| | 5300 | 14.25 |
| | 5320 | 14.25 |
| | 5500 | 14.75 |
| | 5580 | 15.75 |
| | 5700 | 15 |
| | 5720 | 15 |
| | 5745 | 15 |
| | 5785 | 16.25 |
| | 5825 | 17.5 |
| 802.11ac (40 MHz) | 5190 | 13.75 |
| | 5230 | 13.75 |
| | 5270 | 14.25 |
| | 5310 | 14.25 |
| | 5510 | 14.25 |
| | 5550 | 14.75 |
| | 5670 | 15.25 |
| | 5710 | 15 |
| | 5755 | 15.25 |
| | 5795 | 16.5 |
| 802.11ac (80 MHz) | 5210 | 13.75 |
| | 5290 | 14.25 |
| | 5530 | 14.75 |
| | 5610 | 14.75 |
| | 5690 | 14.75 |
| | 5775 | 16 |

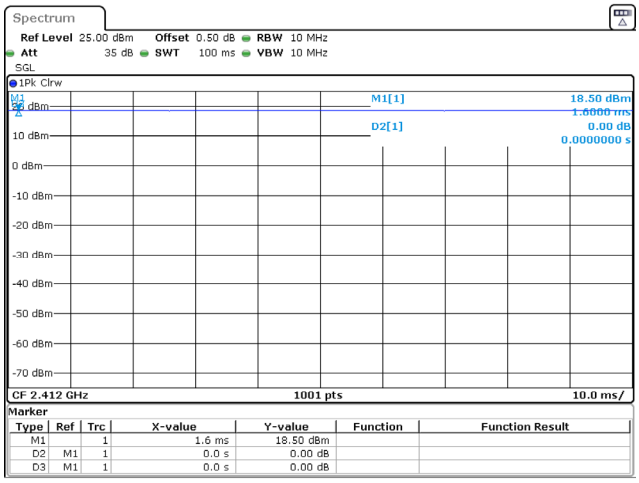
| | | |
|---|---|---|
| 802.11ax (20 MHz) | 5180 | 14 |
| | 5220 | 14 |
| | 5240 | 13.75 |
| | 5260 | 14.25 |
| | 5300 | 14.25 |
| | 5320 | 14.25 |
| | 5500 | 14.75 |
| | 5580 | 15.75 |
| | 5700 | 15 |
| | 5720 | 15 |
| | 5745 | 15 |
| | 5785 | 16.25 |
| | 5825 | 17.5 |
| 802.11ax (40 MHz) | 5190 | 13.75 |
| | 5230 | 13.75 |
| | 5270 | 14.25 |
| | 5310 | 14.25 |
| | 5510 | 14.25 |
| | 5550 | 14.75 |
| | 5670 | 15.25 |
| | 5710 | 15 |
| | 5755 | 15.25 |
| | 5795 | 16.5 |
| 802.11ax (80 MHz) | 5210 | 13.75 |
| | 5290 | 14.25 |
| | 5530 | 14.75 |
| | 5610 | 14.75 |
| | 5690 | 14.75 |
| | 5775 | 16 |

## 2.3. Duty Cycle

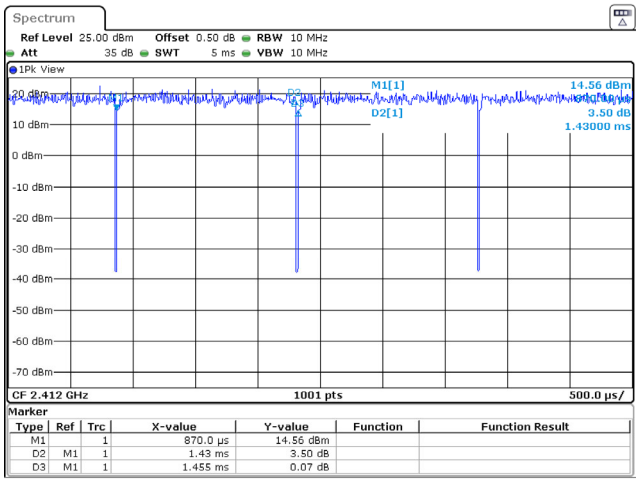
### 2.4 GHz

| Modulation | On Time (ms) | On+Off Time (ms) | Duty Cycle (%) | Duty Factor (dB) | VBW (Hz) |
|---|---|---|---|---|---|
| 802.11 b | - | - | 100.00 | 0.00 | 10 |
| 802.11 g | 1.4300 | 1.4550 | 98.28 | 0.08 | 10 |
| 802.11n (20 MHz) | 1.3400 | 1.3600 | 98.53 | 0.06 | 10 |
| 802.11n (40 MHz) | 0.6600 | 0.6810 | 96.92 | 0.14 | 2000 |
| 802.11ax (20 MHz) | 1.0440 | 1.0620 | 98.31 | 0.07 | 10 |
| 802.11ax (40 MHz) | 0.5490 | 0.5670 | 96.83 | 0.14 | 2000 |

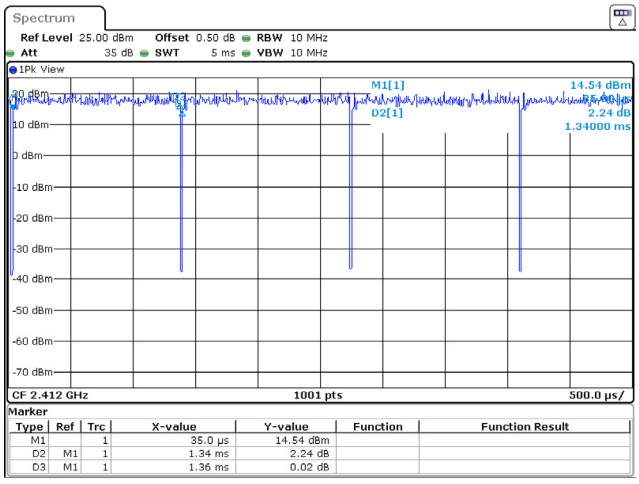
**802.11b**



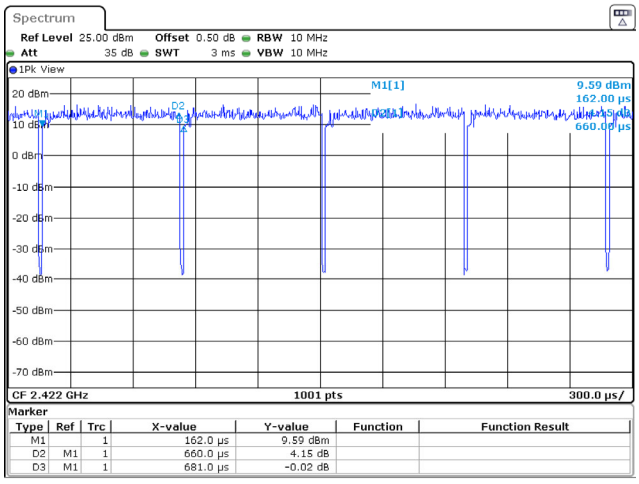

**802.11g**

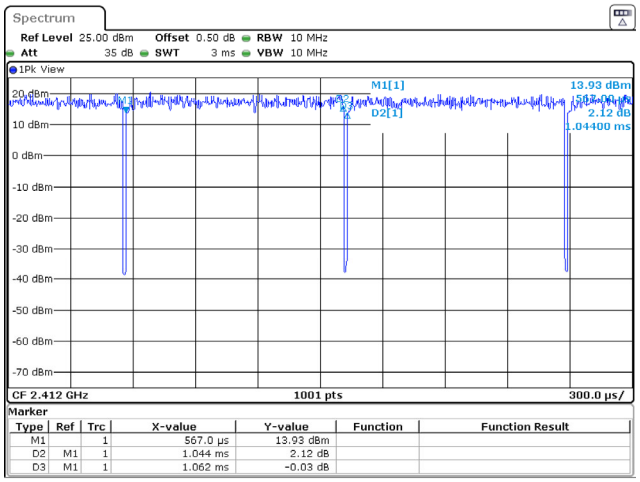
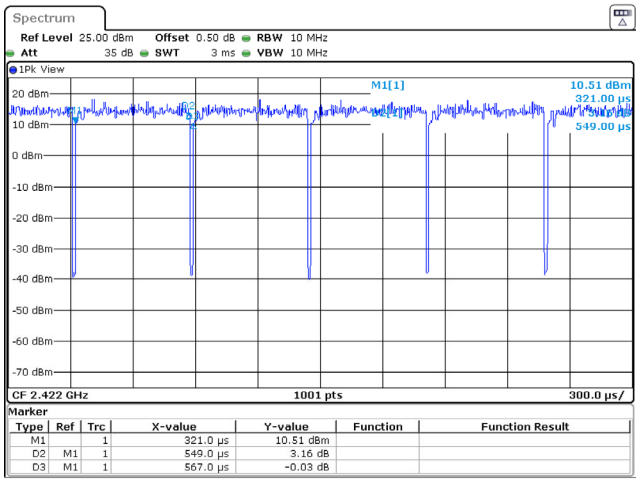



**802.11n (20 MHz)**




**802.11n (40 MHz)**

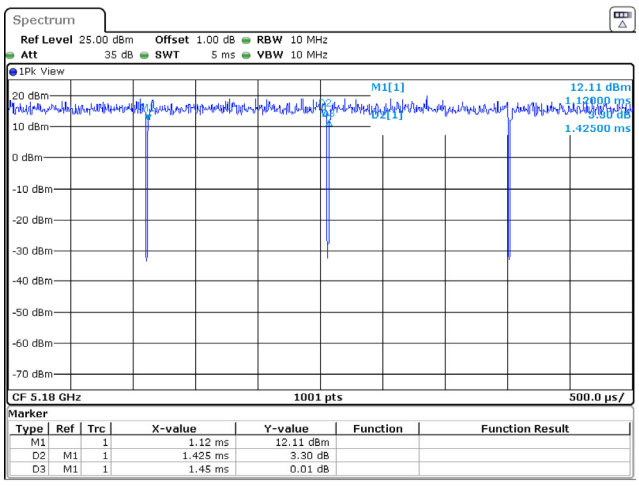


| 802.11ax (20 MHz) | 802.11ax (40 MHz) |
|---|---|
|  |  |

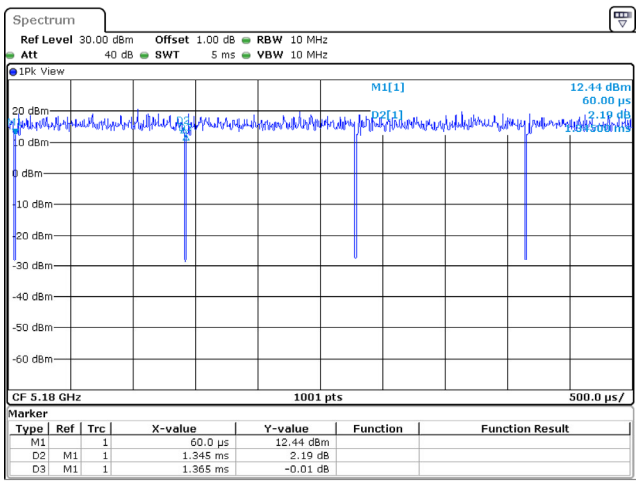
## 5 GHz

| Modulation | On Time (ms) | On+Off Time (ms) | Duty Cycle (%) | Duty Factor (dB) | VBW (Hz) |
|---|---|---|---|---|---|
| 802.11a | 1.4250 | 1.4500 | 98.28 | 0.08 | 10 |
| 802.11ac (20 MHz) | 1.3450 | 1.3650 | 98.53 | 0.06 | 10 |
| 802.11ac (40 MHz) | 0.6700 | 0.6875 | 97.45 | 0.11 | 2000 |
| 802.11ac (80 MHz) | 0.3300 | 0.3480 | 94.83 | 0.23 | 5000 |
| 802.11ax (20 MHz) | 1.0400 | 1.0600 | 98.11 | 0.08 | 10 |
| 802.11ax (40 MHz) | 0.5475 | 0.5675 | 96.48 | 0.16 | 2000 |
| 802.11ax (80 MHz) | 0.2916 | 0.3084 | 94.55 | 0.24 | 5000 |

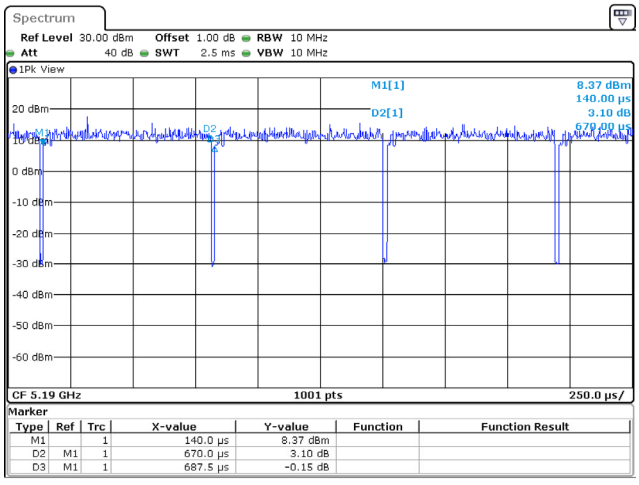
**802.11a**



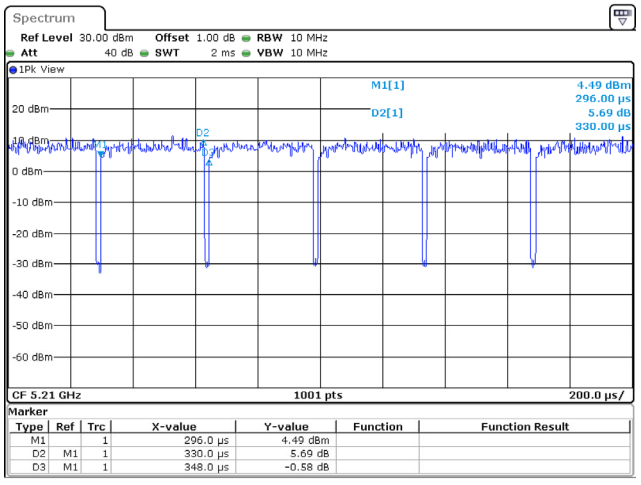

**802.11ac (20 MHz)**



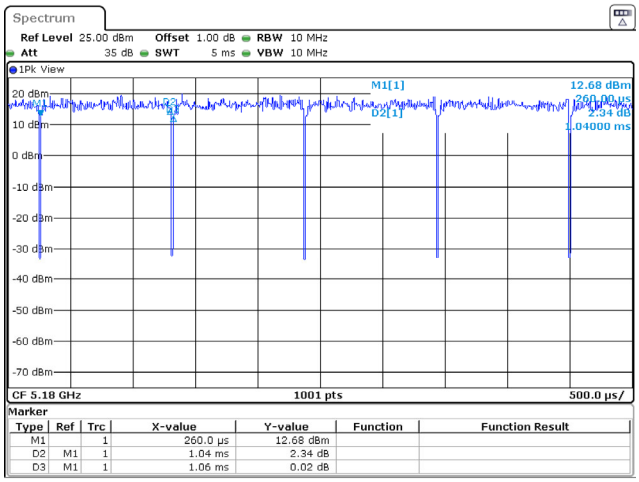

**802.11ac (40 MHz)**




**802.11ac (80 MHz)**

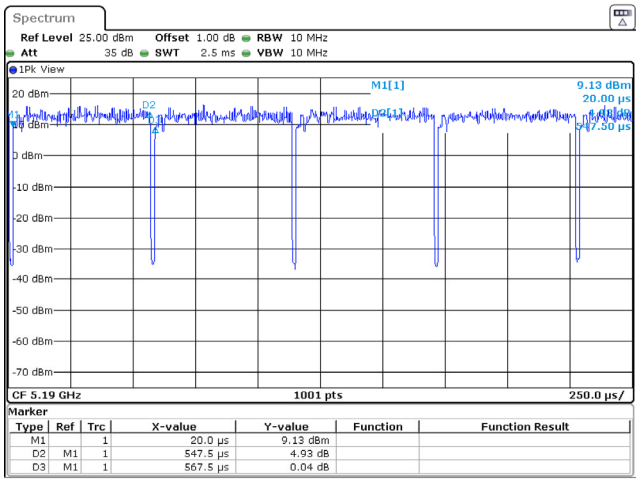


## 802.11ax (20 MHz)



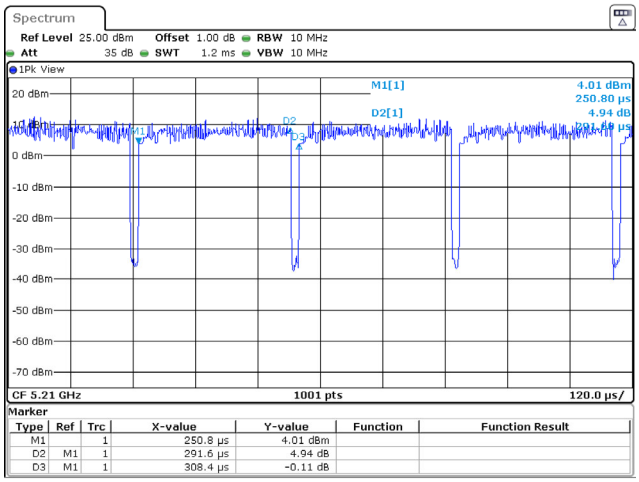

Date: 21.MAR.2024 09:42:49

## 802.11ax (40 MHz)




Date: 21.MAR.2024 10:10:12

## 802.11ax (80 MHz)




Date: 21.MAR.2024 10:29:58

## 2.4. Measurement Configuration

**2.4GHz**

| | | |
|---|---|---|
| Test Mode | Mode 1 (Transmit) | 802.11b |
| | | 802.11g |
| | | 802.11n-20 MHz |
| | | 802.11n-40 MHz |
| | | 802.11ax-20 MHz |
| | | 802.11ax-40 MHz |

**5 GHz:**

| | | |
|---|---|---|
| Test Mode | Mode 1 (Transmit) | 802.11a |
| | | 802.11ac-20 MHz |
| | | 802.11ac-40 MHz |
| | | 802.11ac-80 MHz |
| | | 802.11ax-20 MHz |
| | | 802.11ax-40 MHz |
| | | 802.11ax-80 MHz |

Note:

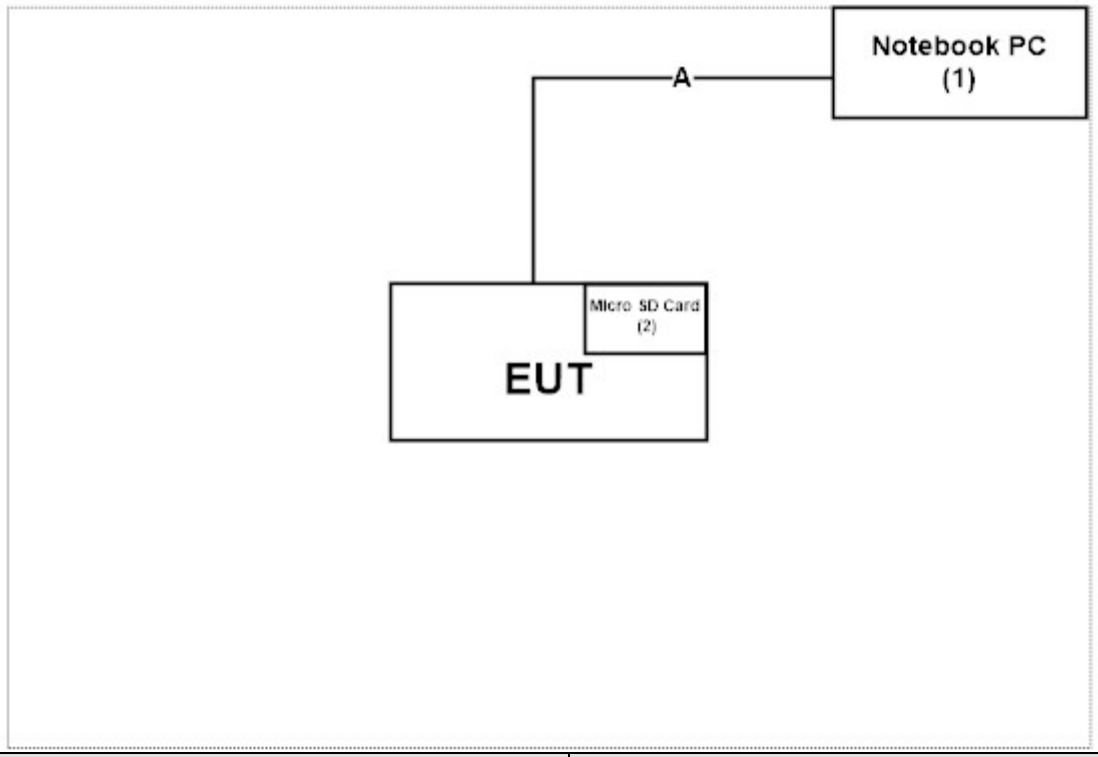
1. Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. For radiated emission below 1 GHz have performed all modes of operation were investigated and the worst-case emissions are reported.
3. The spectrum plot against conducted item only shows the worst case.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
5. Lowest data rates are tested in each mode. Only worst case is shown in the report.
   (802.11b is 1Mbps, 802.11a is 6Mbps, 802.11g is 6Mbps, 802.11n is HT0, 802.11ac is MCS0, 802.11ax is MCS0)
6. The modulation and bandwidth of 5 GHz are similar for the 802.11n mode for 20MHz/40MHz and the 802.11ac mode for 20MHz/40MHz/80MHz. Therefore, the worst case was investigated to represent the mode (802.11ac) in the test report.
7. The CDD mode is presented in the power output test item. For other test items, CDD mode is the worst case for the final test and shown in this report.

## 2.5. Tested System Details

| No. | Equipment | Brand Name | Model No. | Serial No. | Power Cord |
|---|---|---|---|---|---|
| 1 | Notebook PC | Lenovo | TP00135A | RF-3ZD0E9 | N/A |
| 2 | Micro SD Card | Kingston | Kingston 16GB | N/A | N/A |

## 2.6. Configuration of Tested System

Connection Diagram




| Signal Cable Type | | Signal cable Description |
|---|---|---|
| A | USB Cable | Shielded, 1.8m |

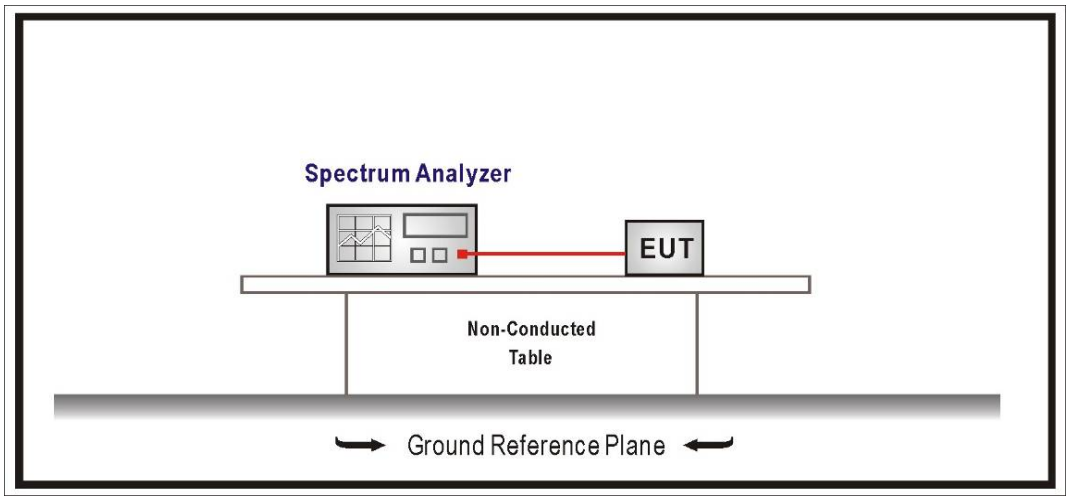
## 2.7. EUT Operating Procedures

| | |
|---|---|
| 1 | Setup the EUT as shown in Section 2.6. |
| 2 | Execute software “Dut labtool / Version: 2.0.0.89” on the Notebook PC. |
| 3 | Configure the test mode, the test channel, and the data rate. |
| 4 | Verify that the EUT works properly. |

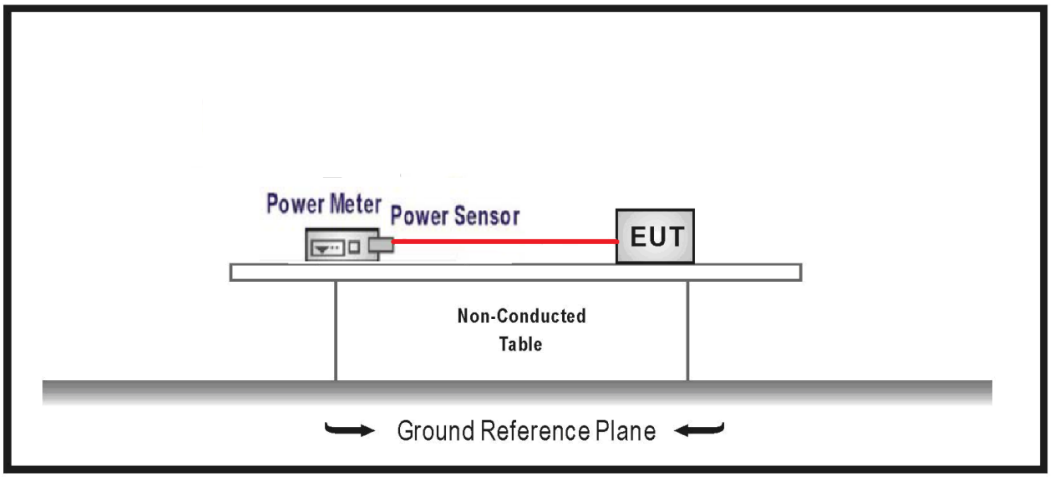
# 3. Maximum Conducted Output Power

## 3.1. Test Setup

For straddle channels:




For othes channels:




## 3.2. Test Limit

**2.4 GHz FCC:**

The maximum conducted output power shall be less 30 dBm (1 Watt).

**2.4 GHz ISED:**

The maximum conducted output power shall be less 30 dBm (1 Watt).

The maximum e.i.r.p. power shall be less 36 dBm (4 Watt).

**5 GHz FCC:**

1. For an outdoor access point and an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of 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. For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of 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.
2. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of 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.
3. For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of 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.

**5 GHz ISED:**

1. The frequency band 5.15 ~ 5.25 GHz:

   For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 $\log_{10}$B, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW. For other devices, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 $\log_{10}$B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

2. The frequency band 5.25 ~ 5.35 GHz:

   For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 $\log_{10}$B, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

   Devices, other than devices installed in vehicles, shall comply with the following:

   a. The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less.

   b. The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

3. The frequency band 5.47 ~ 5.6 GHz and 5.65 ~ 5.725 GHz:

   The maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

4. The frequency band 5.725 ~ 5.85 GHz:

   The maximum conducted output power shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the output power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications and multiple collocated transmitters transmitting the same information.

## 3.3. Test Procedures

**2.4 GHz:**

The EUT was setup according to ANSI C63.10: 2013; tested according to DTS test procedure of KDB 558074 and RSS-247 Issue 3.

**5 GHz:**

The EUT was setup according to ANSI C63.10: 2013; tested according to U-NII test procedure of 789033 and RSS-247 Issue 3.

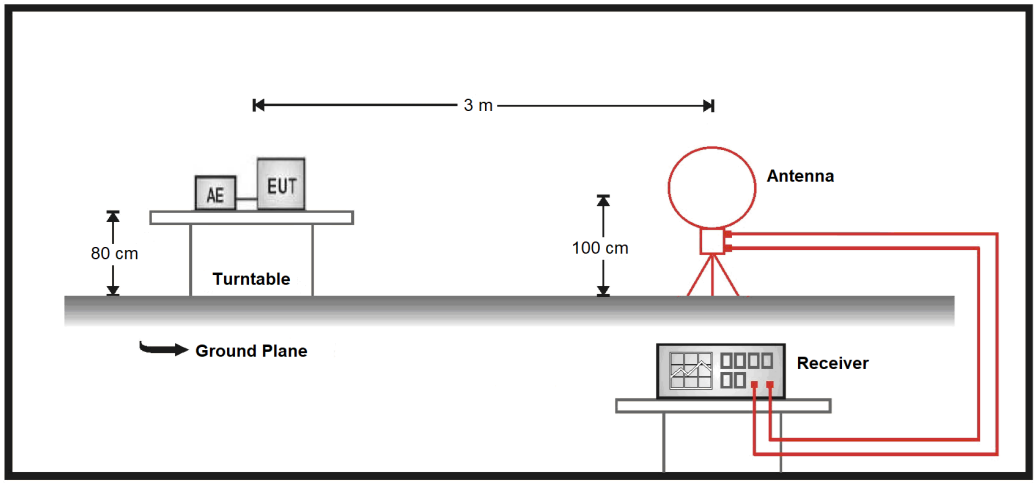
## 3.4. Test Result of Maximum Conducted Output Power

Refer as Appendix A

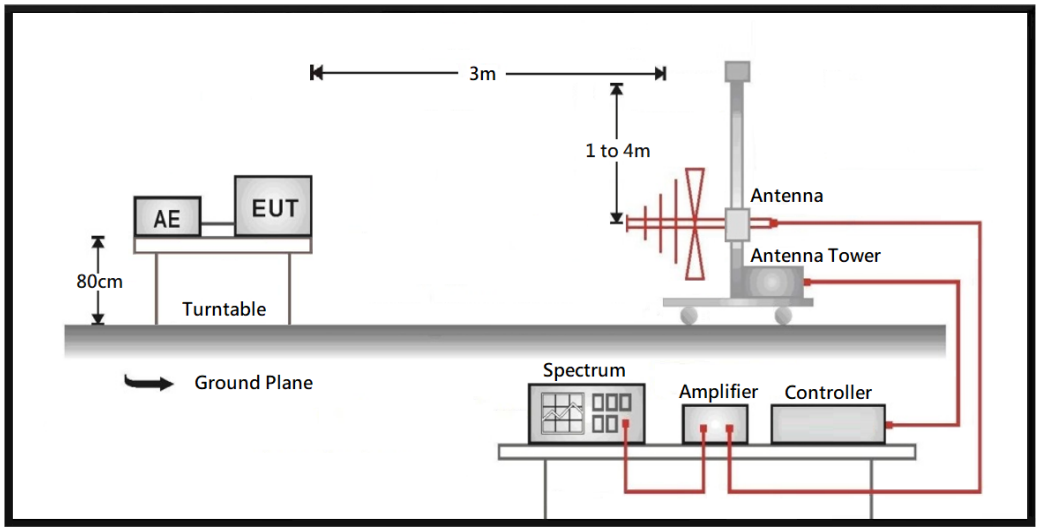
# 4. Radiated Emission

## 4.1. Test Setup

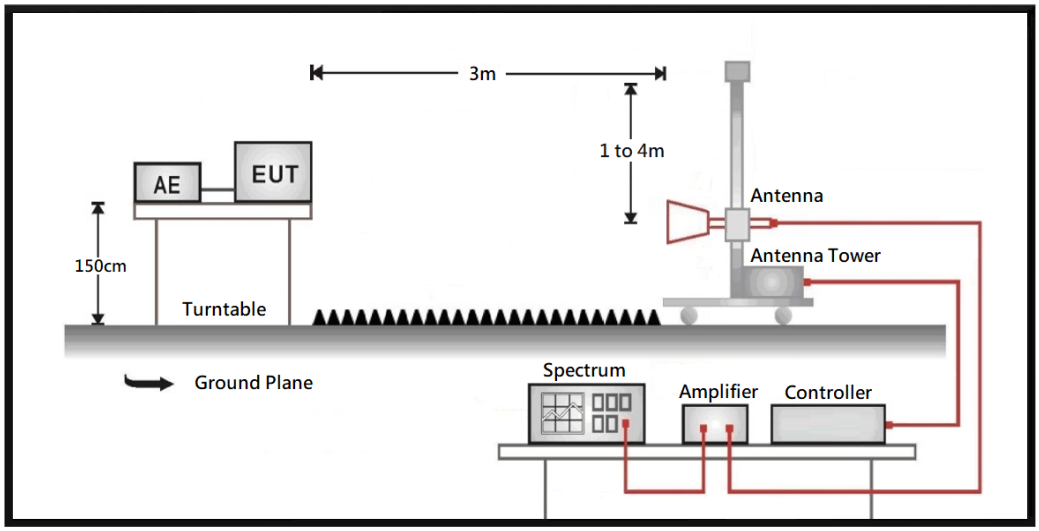
9 kHz ~ 30 MHz




30 MHz ~ 1 GHz




Above 1 GHz



## 4.2. Test Limit

| Frequency (MHz) | Field strength (uV/m) | Field strength (dBuV/m) | Measurement distance (m) |
|---|---|---|---|
| 0.009 – 0.490 | 2400/F(kHz) | 20 log (2400/F(kHz)) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 20 log (24000/F(kHz)) | 30 |
| 1.705 - 30 | 30 | 29.5 | 30 |
| 30 - 88 | 100 | 40 | 3 |
| 88 - 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

Remarks:

1. Field strength (dBuV/m) = 20 log Field strength (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

**Unwanted Emission out of the restricted bands Test Limit**

| Frequency (MHz) | EIRP Limit (dBm/MHz) | Equivalent Field Strength (dBuV/m@3m) |
|---|---|---|
| 5150 – 5250 | -27 | 68.2 |
| 5250 – 5350 | -27 | 68.2 |
| 5470 – 5725 | -27 | 68.2 |
| 5725 – 5850 | -27 *1 | 68.2 *1 |
| | 10 *2 | 105.2 *2 |
| | 15.6 *3 | 110.8 *3 |
| | 27 *4 | 122.2 *4 |

*1 beyond 75 MHz or more above of the band edge.
*2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.
*3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above.
*4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Remark:

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$E = \frac{1000000\sqrt{30P}}{3}$ uV/m, where P is the eirp (Watts).

## 4.3. Test Procedure

**2.4 GHz:**

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB 558074 and RSS-247 Issue 3.

The EUT and its simulators are placed on a turn table which is 0.8 or 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

On any frequency or frequencies form 9 kHz(inculde The the lowest oscillator frequency generated within the device up to the 10th harmonic) to 1000 MHz, the limit shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limit shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

The bandwidth below 1 GHz setting on the field strength meter is 120 kHz and above 1 GHz is 1 MHz.

**5 GHz:**

The EUT and its simulators are placed on a turn table which is 0.8 or 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The additional latch filter below 1 GHz was used to measure the level of harmonics radiated emission during field dtrength of harmonics measurement.

The bandwidth below 1 GHz setting on the field strength meter is 120 kHz, above 1 GHz are 1 MHz.

The frequency range from 9 kHz to 10th harmonics and included The frequency range from the lowest oscillator frequency generated within the device up to the 10th harmonic was checked is checked.

## 4.4. Test Result of Radiated Emission

Refer as Appendix B