

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                              |                                                            |                                                                     |                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Prüfbericht-Nr.:</b><br>Test report no.:                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>NN22J890 002</b>                                                                                                                                                                                                                          | <b>Auftrags-Nr.:</b><br>Order no.:                         | <b>168365112</b>                                                    | <b>Seite 1 von 22</b><br>Page 1 of 22                                                 |
| <b>Kunden-Referenz-Nr.:</b><br>Client reference no.:                                                                                                                                                                                                                                                                                                                                                                                                                | <b>N/A</b>                                                                                                                                                                                                                                   | <b>Auftragsdatum:</b><br>Order date:                       | <b>2022-03-24</b>                                                   |                                                                                       |
| <b>Auftraggeber:</b><br>Client:                                                                                                                                                                                                                                                                                                                                                                                                                                     | Hui Zhou Gaoshengda Technology Co.,LTD<br>No.75 Zhongkai Development Area, Huizhou, Guangdong, China                                                                                                                                         |                                                            |                                                                     |                                                                                       |
| <b>Prüfgegenstand:</b><br>Test item:                                                                                                                                                                                                                                                                                                                                                                                                                                | WIFI+BT module                                                                                                                                                                                                                               |                                                            |                                                                     |                                                                                       |
| <b>Bezeichnung / Typ-Nr.:</b><br>Identification / Type no.:                                                                                                                                                                                                                                                                                                                                                                                                         | DCT2VM2511<br>(Trademark: GSD)                                                                                                                                                                                                               |                                                            |                                                                     |                                                                                       |
| <b>Auftrags-Inhalt:</b><br>Order content:                                                                                                                                                                                                                                                                                                                                                                                                                           | Test Report                                                                                                                                                                                                                                  |                                                            |                                                                     |                                                                                       |
| <b>Prüfgrundlage:</b><br>Test specification:                                                                                                                                                                                                                                                                                                                                                                                                                        | CFR47 FCC Part 15: Subpart C Section 15.247<br>FCC KDB 558074 D01 15.247 Meas Guidance v05r02<br>FCC KDB 662911 D01 Multiple Transmitter Output v02r01<br>RSS-247 Issue 2 February 2017<br>RSS-Gen Issue 5 February 2021<br>ANSI C63.10:2013 |                                                            |                                                                     |                                                                                       |
| <b>Wareneingangsdatum:</b><br>Date of sample receipt:                                                                                                                                                                                                                                                                                                                                                                                                               | 2022-03-30                                                                                                                                                                                                                                   | Please refer to Photo Document                             |                                                                     |                                                                                       |
| <b>Prüfmuster-Nr.:</b><br>Test sample no.:                                                                                                                                                                                                                                                                                                                                                                                                                          | A003224451-001--005                                                                                                                                                                                                                          |                                                            |                                                                     |                                                                                       |
| <b>Prüfzeitraum:</b><br>Testing period:                                                                                                                                                                                                                                                                                                                                                                                                                             | 2022-03-30 - 2022-04-19                                                                                                                                                                                                                      |                                                            |                                                                     |                                                                                       |
| <b>Ort der Prüfung:</b><br>Place of testing:                                                                                                                                                                                                                                                                                                                                                                                                                        | TÜV Rheinland (Shenzhen)<br>Co., Ltd.                                                                                                                                                                                                        |                                                            |                                                                     |                                                                                       |
| <b>Prüflaboratorium:</b><br>Testing laboratory:                                                                                                                                                                                                                                                                                                                                                                                                                     | TÜV Rheinland (Shenzhen)<br>Co., Ltd.                                                                                                                                                                                                        |                                                            |                                                                     |                                                                                       |
| <b>Prüfergebnis*:</b><br>Test result*:                                                                                                                                                                                                                                                                                                                                                                                                                              | Pass                                                                                                                                                                                                                                         |                                                            |                                                                     |                                                                                       |
| <b>geprüft von:</b><br>tested by:                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                           |                                                            | <b>genehmigt von:</b><br>authorized by:                             |  |
| <b>Datum:</b><br>Date:                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2022-06-22                                                                                                                                                                                                                                   | 签署者: Breeze Jiang                                          | <b>Ausstellungsdatum:</b><br>Issue date:                            | 2022-06-22<br>Signed by: Lin Lin                                                      |
| <b>Stellung / Position:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | Assistant Project Manager                                                                                                                                                                                                                    |                                                            | <b>Stellung / Position:</b>                                         | Reviewer                                                                              |
| <b>Sonstiges / Other:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           | FCC ID: 2AC23-DCT2V<br>IC: 12290A-DCT2V<br>HVIN: DCT2VM2511                                                                                                                                                                                  |                                                            |                                                                     |                                                                                       |
| <b>Zustand des Prüfgegenstandes bei Anlieferung:</b><br>Condition of the test item at delivery:                                                                                                                                                                                                                                                                                                                                                                     | Prüfmuster vollständig und unbeschädigt<br>Test item complete and undamaged                                                                                                                                                                  |                                                            |                                                                     |                                                                                       |
| <b>* Legende:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 = sehr gut<br>P(ass) = entspricht o.g. Prüfgrundlage(n)                                                                                                                                                                                    | 2 = gut<br>F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | 3 = befriedigend<br>F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | 4 = ausreichend<br>N/A = nicht anwendbar<br>N/T = nicht getestet                      |
| <b>* Legend:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 = very good<br>P(ass) = passed a.m. test specification(s)                                                                                                                                                                                  | 2 = good<br>F(ail) = failed a.m. test specification(s)     | 3 = satisfactory<br>F(ail) = failed a.m. test specification(s)      | 4 = sufficient<br>N/A = not applicable<br>N/T = not tested                            |
| <p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b><br/> <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p> |                                                                                                                                                                                                                                              |                                                            |                                                                     |                                                                                       |

**Prüfbericht - Nr.:**  
Test Report No.:

**NN22J89O 002**

Seite 2 von 22  
Page 2 of 22

## ***Test Summary***

**5.1.1 ANTENNA REQUIREMENT**

*RESULT: Pass*

**5.1.2 MAXIMUM CONDUCTED OUTPUT POWER**

*RESULT: Pass*

**5.1.3 CONDUCTED POWER SPECTRAL DENSITY**

*RESULT: Pass*

**5.1.4 6dB BANDWIDTH**

*RESULT: Pass*

**5.1.5 99% BANDWIDTH**

*RESULT: Pass*

**5.1.6 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHz BANDWIDTH**

*RESULT: Pass*

**5.1.7 RADIATED SPURIOUS EMISSION**

*RESULT: Pass*

**5.1.8 CONDUCTED EMISSION ON AC MAINS**

*RESULT: Pass*

## **Contents**

|              |                                                                         |           |
|--------------|-------------------------------------------------------------------------|-----------|
| <b>1</b>     | <b>GENERAL REMARKS .....</b>                                            | <b>4</b>  |
| <b>1.1</b>   | <b>COMPLEMENTARY MATERIALS .....</b>                                    | <b>4</b>  |
| <b>2</b>     | <b>TEST SITES .....</b>                                                 | <b>4</b>  |
| <b>2.1</b>   | <b>TEST FACILITIES .....</b>                                            | <b>4</b>  |
| <b>2.2</b>   | <b>LIST OF TEST AND MEASUREMENT INSTRUMENTS.....</b>                    | <b>5</b>  |
| <b>2.3</b>   | <b>TRACEABILITY .....</b>                                               | <b>6</b>  |
| <b>2.4</b>   | <b>CALIBRATION .....</b>                                                | <b>6</b>  |
| <b>2.5</b>   | <b>MEASUREMENT UNCERTAINTY.....</b>                                     | <b>6</b>  |
| <b>2.6</b>   | <b>LOCATION OF ORIGINAL DATA.....</b>                                   | <b>6</b>  |
| <b>2.7</b>   | <b>STATUS OF FACILITY USED FOR TESTING.....</b>                         | <b>6</b>  |
| <b>3</b>     | <b>GENERAL PRODUCT INFORMATION .....</b>                                | <b>7</b>  |
| <b>3.1</b>   | <b>PRODUCT FUNCTION AND INTENDED USE.....</b>                           | <b>7</b>  |
| <b>3.2</b>   | <b>RATINGS AND SYSTEM DETAILS .....</b>                                 | <b>7</b>  |
| <b>3.3</b>   | <b>INDEPENDENT OPERATION MODES .....</b>                                | <b>9</b>  |
| <b>3.4</b>   | <b>NOISE GENERATING AND NOISE SUPPRESSING PARTS .....</b>               | <b>9</b>  |
| <b>3.5</b>   | <b>SUBMITTED DOCUMENTS.....</b>                                         | <b>9</b>  |
| <b>4</b>     | <b>TEST SET-UP AND OPERATION MODES .....</b>                            | <b>10</b> |
| <b>4.1</b>   | <b>PRINCIPLE OF CONFIGURATION SELECTION .....</b>                       | <b>10</b> |
| <b>4.2</b>   | <b>TEST OPERATION AND TEST SOFTWARE .....</b>                           | <b>10</b> |
| <b>4.3</b>   | <b>SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....</b>                | <b>10</b> |
| <b>4.4</b>   | <b>COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE .....</b>                  | <b>10</b> |
| <b>4.5</b>   | <b>TEST SETUP DIAGRAM .....</b>                                         | <b>11</b> |
| <b>5</b>     | <b>TEST RESULTS .....</b>                                               | <b>13</b> |
| <b>5.1</b>   | <b>TRANSMITTER REQUIREMENT &amp; TEST SUITES .....</b>                  | <b>13</b> |
| <b>5.1.1</b> | <i>Antenna Requirement .....</i>                                        | <i>13</i> |
| <b>5.1.2</b> | <i>Maximum Conducted Output Power .....</i>                             | <i>14</i> |
| <b>5.1.3</b> | <i>Conducted Power Spectral Density .....</i>                           | <i>16</i> |
| <b>5.1.4</b> | <i>6dB Bandwidth .....</i>                                              | <i>17</i> |
| <b>5.1.5</b> | <i>99% Bandwidth .....</i>                                              | <i>18</i> |
| <b>5.1.6</b> | <i>Conducted Spurious Emissions Measured in 100 kHz Bandwidth .....</i> | <i>19</i> |
| <b>5.1.7</b> | <i>Radiated Spurious Emission .....</i>                                 | <i>20</i> |
| <b>5.1.8</b> | <i>Conducted Emission on AC Mains.....</i>                              | <i>21</i> |
| <b>6</b>     | <b>PHOTOGRAPHS OF THE TEST SET-UP .....</b>                             | <b>22</b> |
| <b>7</b>     | <b>LIST OF TABLES.....</b>                                              | <b>22</b> |

**Prüfbericht - Nr.:** **NN22J89O 002**  
*Test Report No.:*

Seite 4 von 22  
Page 4 of 22

# 1 General Remarks

## 1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:  
Appendix A: Test Results of Wi-Fi 802.11 b/g/n

# 2 Test Sites

## 2.1 Test Facilities

**TÜV Rheinland (Shenzhen) Co., Ltd.**

No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China.

FCC Registration No.: 694916

ISED wireless device testing laboratory: 25069

## 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

| <b>Radio Spectrum Testing (SRD-Tonscend)</b>   |                     |                   |                   |                   |
|------------------------------------------------|---------------------|-------------------|-------------------|-------------------|
| <b>Equipment</b>                               | <b>Manufacturer</b> | <b>Model</b>      | <b>Serial No.</b> | <b>Cal. until</b> |
| EXA Signal Analyzer, Multi-touch               | Keysight            | N9010B            | MY60241175        | 2022-09-28        |
| MXG X-Series RF Vector Signal Generator        | Keysight            | N5182B            | MY61250137        | 2022-09-28        |
| EXG X-Series Microwave Analog Signal Generator | Keysight            | N5173B            | MY61250141        | 2022-09-28        |
| DC power supply                                | Keysight            | E3642A            | MY61276100        | 2022-09-28        |
| Power Control Unit                             | Tonscend            | JS0806-4ADC       | N/A               | 2022-09-28        |
| Automation Control Unit                        | Tonscend            | JS0806-2          | 21C8060396        | 2022-09-28        |
| Test Software                                  | Tonscend            | JS1120-3          | N/A               | N/A               |
| Control PC                                     | Lenovo              | TianYi510S-071MB  | YLX23JMF          | N/A               |
| Shielding Room 8#                              | Albatross           | SR8               | APC17151-SR8      | 2024-06-22        |
| <b>Unwanted Emission Testing (TS9975)</b>      |                     |                   |                   |                   |
| <b>Equipment</b>                               | <b>Manufacturer</b> | <b>Model</b>      | <b>Serial No.</b> | <b>Cal. until</b> |
| EMI Test Receiver                              | R&S                 | ESR 7             | 102021            | 2022-08-10        |
| Signal Analyzer                                | R&S                 | FSV 40            | 101439            | 2022-08-09        |
| System Controller Interface                    | R&S                 | SCI-100           | S10010038         | N/A               |
| Filterbank                                     | R&S                 | Wlan              | 100759            | 2022-08-09        |
| OSP                                            | R&S                 | OSP 120           | 102040            | N/A               |
| Pre-amplifier                                  | R&S                 | SCU08F1           | 08320031          | 2022-08-09        |
| Amplifier                                      | R&S                 | SCU-18F           | 180070            | 2022-08-09        |
| Amplifier                                      | R&S                 | SCU40A            | 100475            | 2022-08-09        |
| Trilog Broadband Antenna (30 MHz - 7 GHz)      | Schwarzbeck         | VULB 9162         | 193               | 2022-08-08        |
| Double-Ridged Antenna (1 -18 GHz)              | ETS-LINDGREN        | 3117              | 00218717          | 2022-08-08        |
| Wideband Ridged Horn Antenna (18-40 GHz)       | Steatite            | QMS-00880         | 19067             | 2022-08-08        |
| Active Loop Antenna                            | Schwarzbeck         | FMZB 1513         | 302               | 2022-09-13        |
| Test software                                  | R&S                 | EMC32 (V10.60.10) | N/A               | N/A               |
| Control PC                                     | Dell                | OptiPlex 7050     | 36NV9P2           | N/A               |
| 3m Semi-Anechoic Chamber                       | Albatross           | SAC-3m            | APC17151-SAC      | 2024-06-22        |

| <b>Conducted Emission</b> |                     |                     |                   |                   |
|---------------------------|---------------------|---------------------|-------------------|-------------------|
| <b>Equipment</b>          | <b>Manufacturer</b> | <b>Model No.</b>    | <b>Serial No.</b> | <b>Cal. Until</b> |
| EMI Test Receiver         | R&S                 | ESR3                | 102428            | 2022-08-10        |
| Artificial Mains Network  | R&S                 | ENV216              | 102333            | 2022-08-10        |
| Artificial Mains Network  | R&S                 | ENV432              | 101411            | 2022-08-10        |
| EMC32 test software       | R&S                 | EMC32(Ver.10.50.00) | N/A               | N/A               |

## 2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

| Parameter                                              | Uncertainty                   |
|--------------------------------------------------------|-------------------------------|
| Radio Frequency                                        | $\pm 1 \times 10^{-7}$        |
| RF Power (conducted)                                   | $\pm 2.5$ dB                  |
| Radiated Emission of Transmitter, valid up to 26.5 GHz | $\pm 6$ dB                    |
| Radiated Emission of Receiver, valid up to 26.5 GHz    | $\pm 6$ dB                    |
| Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz) | $\pm 3.70$ dB / $\pm 3.30$ dB |
| Temperature                                            | $\pm 1$ °C                    |
| Humidity                                               | $\pm 5$ %                     |
| Voltage (DC)                                           | $\pm 1$ %                     |
| Voltage (AC, <10kHz)                                   | $\pm 2$ %                     |

## 2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

## 2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China. is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

## 3 General Product Information

### 3.1 Product Function and Intended Use

The EUT is a WIFI+BT module, which supports Bluetooth (dual mode), 2.4GHz Wi-Fi 802.11 b/g/n and 5GHz Wi-Fi 802.11a/n/ac wireless technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

### 3.2 Ratings and System Details

**Table 2: Technical Specification of EUT**

| General Information of EUT                                                                                                                              | Value                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Kind of Equipment:                                                                                                                                      | WIFI+BT module                                                             |
| Type Designation:                                                                                                                                       | DCT2VM2511                                                                 |
| Trademark:                                                                                                                                              | GSD                                                                        |
| FCC ID:                                                                                                                                                 | 2AC23-DCT                                                                  |
| Operating Voltage:                                                                                                                                      | DC 3.3V                                                                    |
| Testing Voltage:                                                                                                                                        | DC 5V                                                                      |
| <b>Technical Specification of Bluetooth (dual mode)</b>                                                                                                 |                                                                            |
| Operating Frequency:                                                                                                                                    | 2402 MHz to 2480 MHz                                                       |
| Type of Modulation:                                                                                                                                     | GFSK, $\pi/4$ -DQPSK, 8DPSK                                                |
| Channel Number:                                                                                                                                         | BDR & EDR mode:79 channels, Low Energy mode:40 channels                    |
| Channel Separation:                                                                                                                                     | BDR & EDR mode: 1MHz, Low Energy mode: 2MHz                                |
| Data Rate:                                                                                                                                              | BDR & EDR mode: 1Mbps, 3Mbps<br>Low Energy mode: 1Mbps                     |
| Antenna Type:                                                                                                                                           | PCB layout Antenna                                                         |
| Antenna Gain of Bluetooth:                                                                                                                              | 2.0 dBi                                                                    |
| <b>Technical Specification of Wi-Fi 802.11 b/g/n</b>                                                                                                    |                                                                            |
| Operating Frequency:                                                                                                                                    | 2412 - 2462 MHz for 802.11b/g/n(HT20)<br>2422 - 2452 MHz for 802.11n(HT40) |
| Type of Modulation:                                                                                                                                     | DSSS(DBPSK/DQPSK/CCK)<br>OFDM(BPSK/QPSK/16QAM/64QAM)                       |
| Data Rate:                                                                                                                                              | 6/9/12/18/24/36/48/54 Mbps for 802.11g<br>MCS0 ~ MCS7 for 802.11n          |
| Channel Number:                                                                                                                                         | 11 channels for 802.11b/g/n(HT20)<br>7 channels for 802.11n(HT40)          |
| Channel Separation:                                                                                                                                     | 5 MHz                                                                      |
| Antenna Type:                                                                                                                                           | PCB layout Antenna                                                         |
| Number of Antenna:                                                                                                                                      | 2                                                                          |
| Antenna Gain 1:                                                                                                                                         | 3.0 dBi                                                                    |
| Antenna Gain 2:                                                                                                                                         | 3.0 dBi                                                                    |
| Note:                                                                                                                                                   |                                                                            |
| 1. The EUT supports MIMO 2*2, any transmit signals are correlated with each other, so<br>Directional gain = $G_{ANT} + 10 \log(N_{ANT})$ dBi=6.01dBi≈6; |                                                                            |

|                                                                                           |                                                                                                             |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| The limit of output power is 30-(6.01-6) ≈30<br>The limit of power spectral density is 8. |                                                                                                             |
| <b>Technical Specification of Wi-Fi 802.11 a/n/ac</b>                                     |                                                                                                             |
| Operating Frequency:                                                                      | 5180-5240MHz, 5745-5825MHz                                                                                  |
| Type of Modulation:                                                                       | OFDM(BPSK/QPSK/16QAM/64QAM/256QAM)                                                                          |
| Channel Number:                                                                           | 5180-5240MHz, 14CHs, 802.11 a/n20/n40/ac20/ac40/ac80<br>5745-5825MHz, 8CHs, 802.11 a/n20/n40/ac20/ac40/ac80 |
| Channel Separation                                                                        | 5 MHz                                                                                                       |
| Antenna Type:                                                                             | PCB layout Antenna                                                                                          |
| Number of Antenna:                                                                        | 2                                                                                                           |
| Antenna Gain 1:                                                                           | 4.0 dBi                                                                                                     |
| Antenna Gain 2:                                                                           | 4.0 dBi                                                                                                     |

**Table 3: RF Channel and Frequency of Wi-Fi 802.11 b/g/n**

| RF Channel | 802.11 b/g/n(HT20) | 802.11 n(HT40)  |
|------------|--------------------|-----------------|
|            | Frequency (MHz)    | Frequency (MHz) |
| <b>01</b>  | <b>2412</b>        | /               |
| 02         | 2417               | /               |
| <b>03</b>  | 2422               | <b>2422</b>     |
| 04         | 2427               | 2427            |
| 05         | 2432               | 2432            |
| <b>06</b>  | <b>2437</b>        | <b>2437</b>     |
| 07         | 2442               | 2442            |
| 08         | 2447               | 2447            |
| <b>09</b>  | 2452               | <b>2452</b>     |
| 10         | 2457               | /               |
| <b>11</b>  | <b>2462</b>        | /               |

Test frequencies are lowest channel: 2412 MHz, middle channel: 2437 MHz and highest channel: 2462 MHz for 802.11b/g/n(HT20)

Test frequencies are lowest channel: 2422 MHz, middle channel: 2437 MHz and highest channel: 2452 MHz for 802.11n(HT40)



### 3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Wi-Fi 802.11 b/g/n wireless transmitting mode
  - 1) Low Channel
  - 2) Middle Channel
  - 3) High Channel
- B. On, Normal operation (Wi-Fi Link)
- C. Off

### 3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

### 3.5 Submitted Documents

- |                         |                 |
|-------------------------|-----------------|
| - Application Form      | - User Manual   |
| - Operation Description | - Block Diagram |
| - Schematics            | - Rating Label  |
| - PCB Layout            | - Parts List    |

## 4 Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

**Radio Spectrum:** The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### 4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model DCT2VM2511 in this report.

### 4.3 Special Accessories and Auxiliary Equipment

Table 4: Auxiliary Equipment Used during Test

| Description | Manufacturer | Model | S/N      |
|-------------|--------------|-------|----------|
| Laptop      | Lenovo       | T480  | 10Q67059 |

### 4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

## 4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

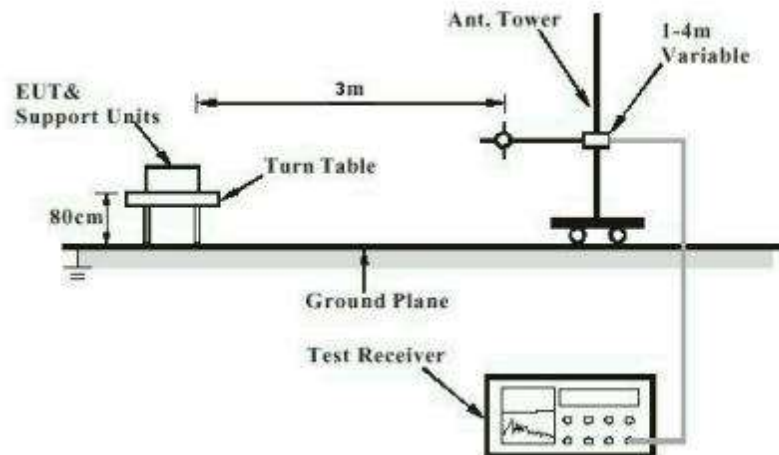
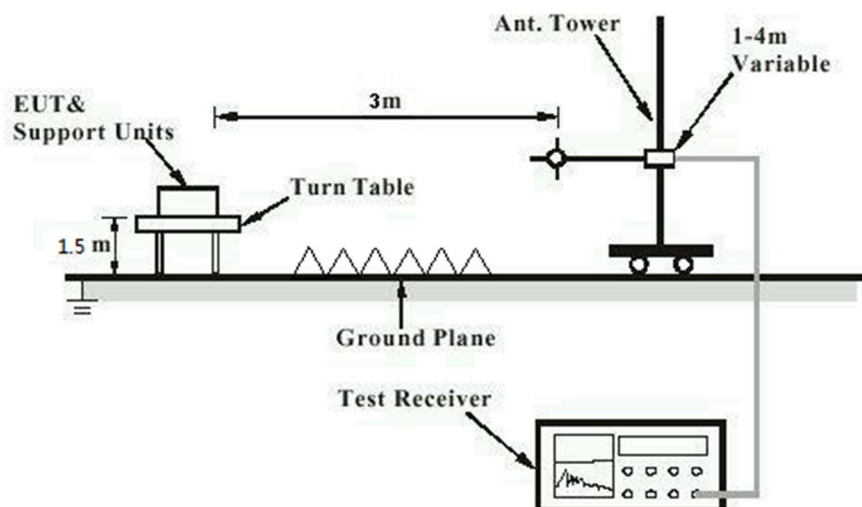
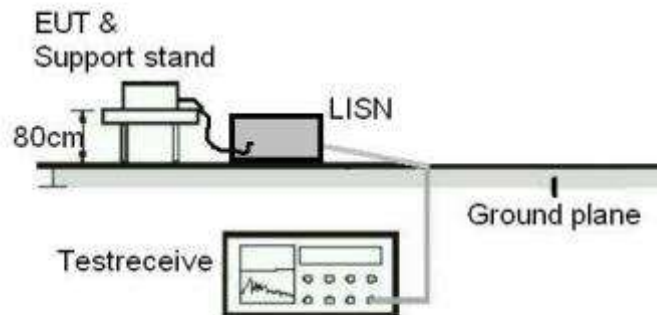


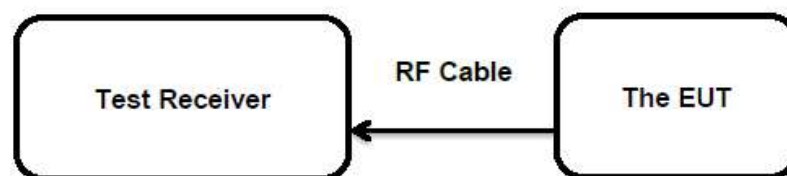
Diagram of Measurement Configuration for Radiation Test (Above 1GHz)



**Diagram of Measurement Configuration for Mains Conduction Measurement**



**Diagram of Measurement Configuration for Conducted Transmitter Measurement**



## 5 Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Antenna Requirement

**RESULT:****Pass****Test Specification**

Test standard : FCC Part 15.247(b)(4) and Part 15.203

According to the manufacturer declared, the EUT have two internal antennas, Each antenna has a Max. antenna gain of 3 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

## 5.1.2 Maximum Conducted Output Power

**RESULT:**
**Pass**
**Test Specification**

Test standard : FCC Part 15.247(b)(3)  
 Basic standard : ANSI C63.10: 2013  
 Limits : 1.0 Watts  
 Kind of test site : Shielded Room

**Test Setup**

Date of testing : 2022-04-08  
 Input voltage : AC 120V, 60Hz  
 Operation mode : A  
 Test channel : Low / Middle / High  
 Ambient temperature : 24.8 °C  
 Relative humidity : 55 %  
 Atmospheric pressure : 101 kPa

**Table 5: Test Result of Maximum Conducted Output Power, SISO mode (Ant1)**

| Test Mode              | Data Rate | Test Channel (MHz) | Measured Peak Power |        | Limit (W) |
|------------------------|-----------|--------------------|---------------------|--------|-----------|
|                        |           |                    | (dBm)               | (W)    |           |
| 802.11b                | 1 Mbps    | 2412               | 15.98               | 0.0396 | < 1.0     |
|                        |           | 2437               | 16.70               | 0.0468 |           |
|                        |           | 2462               | 16.41               | 0.0438 |           |
| 802.11g                | 6 Mbps    | 2412               | 22.47               | 0.1766 |           |
|                        |           | 2437               | 22.55               | 0.1799 |           |
|                        |           | 2462               | 22.71               | 0.1866 |           |
| 802.11n (HT20)         | MCS0      | 2412               | 21.54               | 0.1426 |           |
|                        |           | 2437               | 21.64               | 0.1459 |           |
|                        |           | 2462               | 21.56               | 0.1432 |           |
| 802.11n (HT40)         | MCS0      | 2422               | 21.95               | 0.1567 |           |
|                        |           | 2437               | 22.05               | 0.1603 |           |
|                        |           | 2452               | 21.95               | 0.1567 |           |
| Maximum Measured Value |           |                    | 22.71               | 0.1866 |           |

**Table 6: Test Result of Maximum Conducted Output Power, SISO mode (Ant2)**

| Test Mode              | Data Rate | Test Channel (MHz) | Measured Peak Power |        | Limit (W) |
|------------------------|-----------|--------------------|---------------------|--------|-----------|
|                        |           |                    | (dBm)               | (W)    |           |
| 802.11b                | 1 Mbps    | 2412               | 15.65               | 0.0367 | < 1.0     |
|                        |           | 2437               | 16.62               | 0.0459 |           |
|                        |           | 2462               | 16.37               | 0.0434 |           |
| 802.11g                | 6 Mbps    | 2412               | 21.68               | 0.1472 |           |
|                        |           | 2437               | 22.43               | 0.1750 |           |
|                        |           | 2462               | 22.87               | 0.1936 |           |
| 802.11n (HT20)         | MCS0      | 2412               | 20.41               | 0.1099 |           |
|                        |           | 2437               | 21.31               | 0.1352 |           |
|                        |           | 2462               | 21.31               | 0.1352 |           |
| 802.11n (HT40)         | MCS0      | 2422               | 21.22               | 0.1324 |           |
|                        |           | 2437               | 21.25               | 0.1334 |           |
|                        |           | 2452               | 21.62               | 0.1452 |           |
| Maximum Measured Value |           |                    | 22.87               | 0.1936 |           |

**Table 7: Test Result of Maximum Conducted Output Power, MIMO mode (Ant1+2)**

| Test Mode              | Data Rate | Test Channel (MHz) | Measured Peak Power |        | Limit (W) |
|------------------------|-----------|--------------------|---------------------|--------|-----------|
|                        |           |                    | (dBm)               | (W)    |           |
| 802.11n (HT20)         | MCS0      | 2412               | 24.02               | 0.2523 | < 1.0     |
|                        |           | 2437               | 24.49               | 0.2812 |           |
|                        |           | 2462               | 24.45               | 0.2786 |           |
| 802.11n (HT40)         | MCS0      | 2422               | 24.61               | 0.2891 |           |
|                        |           | 2437               | 24.68               | 0.2938 |           |
|                        |           | 2452               | 24.80               | 0.3020 |           |
| Maximum Measured Value |           |                    | 24.80               | 0.3020 |           |

Note:

- 1) The cable loss is taken into account in results.
- 2) Antenna gain(G) 1: 3.0 dBi
- 3) Antenna gain(G) 2: 3.0 dBi
- 4) Directional gain(G)= $G_{ANT} + 10 \log(N_{ANT})$  dBi=6.01 dBi

**Prüfbericht - Nr.:** NN22J89O 002  
*Test Report No.:*Seite 16 von 22  
Page 16 of 22

### 5.1.3 Conducted Power Spectral Density

**RESULT:****Pass****Test Specification**

|                   |                      |
|-------------------|----------------------|
| Test standard     | : FCC Part 15.247(e) |
| Basic standard    | : ANSI C63.10: 2013  |
| Limits            | : < 8 dBm / 3kHz     |
| Kind of test site | : Shielded Room      |

**Test Setup**

|                      |                       |
|----------------------|-----------------------|
| Date of testing      | : 2022-04-08          |
| Input voltage        | : AC 120V, 60Hz       |
| Operation mode       | : A                   |
| Test channel         | : Low / Middle / High |
| Ambient temperature  | : 24.8 °C             |
| Relative humidity    | : 55 %                |
| Atmospheric pressure | : 101 kPa             |

For the measurement records, refer to the appendix A.



**Prüfbericht - Nr.:****NN22J89O 002**

Test Report No.:

Seite 17 von 22

Page 17 of 22

### 5.1.4 6dB Bandwidth

**RESULT:****Pass****Test Specification**

|                   |                         |
|-------------------|-------------------------|
| Test standard     | : FCC Part 15.247(a)(2) |
| Basic standard    | : ANSI C63.10: 2013     |
| Limits            | : > 500 kHz             |
| Kind of test site | : Shielded Room         |

**Test Setup**

|                      |                       |
|----------------------|-----------------------|
| Date of testing      | : 2022-04-08          |
| Input voltage        | : AC 120V, 60Hz       |
| Operation mode       | : A                   |
| Test channel         | : Low / Middle / High |
| Ambient temperature  | : 24.8 °C             |
| Relative humidity    | : 55 %                |
| Atmospheric pressure | : 101 kPa             |

For the measurement records, refer to the appendix A.

**Prüfbericht - Nr.:****NN22J89O 002**

Test Report No.:

Seite 18 von 22

Page 18 of 22

**5.1.5 99% Bandwidth****RESULT:****Pass****Test Specification**

|                   |                      |
|-------------------|----------------------|
| Test standard     | : FCC Part 15.247(a) |
| Basic standard    | : ANSI C63.10: 2013  |
| Kind of test site | : Shielded Room      |

**Test Setup**

|                      |                       |
|----------------------|-----------------------|
| Date of testing      | : 2022-04-08          |
| Input voltage        | : AC 120V, 60Hz       |
| Operation mode       | : A                   |
| Test channel         | : Low / Middle / High |
| Ambient temperature  | : 24.8 °C             |
| Relative humidity    | : 55 %                |
| Atmospheric pressure | : 101 kPa             |

For the measurement records, refer to the appendix A.

**Prüfbericht - Nr.:****NN22J89O 002**

Test Report No.:

Seite 19 von 22

Page 19 of 22

**5.1.6 Conducted Spurious Emissions Measured in 100 kHz Bandwidth****RESULT:****Pass****Test Specification**

|                   |                                                                                                                                                                                                                                                                    |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test standard     | : FCC Part 15.247(d)                                                                                                                                                                                                                                               |
| Basic standard    | : ANSI C63.10: 2013                                                                                                                                                                                                                                                |
| Limits            | : 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power);<br>In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a) |
| Kind of test site | : Shielded Room                                                                                                                                                                                                                                                    |

**Test Setup**

|                      |                       |
|----------------------|-----------------------|
| Date of testing      | : 2022-04-08          |
| Input voltage        | : AC 120V, 60Hz       |
| Operation mode       | : A                   |
| Test channel         | : Low / Middle / High |
| Ambient temperature  | : 24.8 °C             |
| Relative humidity    | : 55 %                |
| Atmospheric pressure | : 101 kPa             |

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix A.

**Prüfbericht - Nr.:** NN22J89O 002

Test Report No.:

Seite 20 von 22

Page 20 of 22

### 5.1.7 Radiated Spurious Emission

**RESULT:****Pass****Test Specification**

|                   |                                            |
|-------------------|--------------------------------------------|
| Test standard     | : FCC Part 15.247(d) & FCC Part 15.205     |
| Basic standard    | : ANSI C63.10: 2013                        |
| Limits            | : Refer to 15.209(a) of FCC part 15.247(d) |
| Kind of test site | : 3m Semi-anechoic Chamber                 |

**Test Setup**

|                      |                            |
|----------------------|----------------------------|
| Date of testing      | : 2022-04-10 to 2022-04-12 |
| Input voltage        | : AC 120V, 60Hz            |
| Operation mode       | : A                        |
| Test channel         | : Low / Middle / High      |
| Ambient temperature  | : Refer to test result     |
| Relative humidity    | : Refer to test result     |
| Atmospheric pressure | : 101 kPa                  |

**Remark:**

Testing was carried out within frequency range 9kHz to the tenth harmonics. All configurations tested for both MIMO and SISO, only worst-case mode data reported.

For the measurement records, refer to the appendix A.

**Prüfbericht - Nr.:** NN22J89O 002  
*Test Report No.:*Seite 21 von 22  
Page 21 of 22

### 5.1.8 Conducted Emission on AC Mains

**RESULT:****Pass****Test Specification**

|                   |                      |
|-------------------|----------------------|
| Test standard     | : FCC Part 15.207(a) |
| Basic standard    | : ANSI C63.10: 2013  |
| Frequency range   | : 0.15 – 30MHz       |
| Limits            | : FCC Part 15.207(a) |
| Kind of test site | : Shielded Room      |

**Test Setup**

|                      |                 |
|----------------------|-----------------|
| Date of testing      | : 2022-04-16    |
| Input voltage        | : AC 120V, 60Hz |
| Operation mode       | : B             |
| Earthing             | : Not connected |
| Ambient temperature  | : 23.1 °C       |
| Relative humidity    | : 52 %          |
| Atmospheric pressure | : 101 kPa       |

For the measurement records, refer to the appendix A.

## 6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix C.

## 7 List of Tables

|                                                                                 |    |
|---------------------------------------------------------------------------------|----|
| Table 1: List of Test and Measurement Equipment.....                            | 5  |
| Table 2: Technical Specification of EUT .....                                   | 7  |
| Table 3: RF Channel and Frequency of Wi-Fi 802.11 b/g/n .....                   | 8  |
| Table 4: Auxiliary Equipment Used during Test .....                             | 10 |
| Table 5: Test Result of Maximum Conducted Output Power, SISO mode (Ant1).....   | 14 |
| Table 6: Test Result of Maximum Conducted Output Power, SISO mode (Ant2).....   | 15 |
| Table 7: Test Result of Maximum Conducted Output Power, MIMO mode (Ant1+2)..... | 15 |