| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.:* | **CN224AD0 004** | **Auftrags-Nr.:** *Order no.*: | **168367617** | **Seite 1 von 10** *Page 1 of 10* |
| **Kunden-Referenz-Nr.:** *Client reference no.:* | **N/A** | **Auftragsdatum:** *Order date:* | 2022-04-20 | |
| **Auftraggeber:** *Client:* | **Vestel Elektronik Sanayi ve Ticaret A.S.** Organize Sanayi Bolgesi, 45030 Manisa TURKEY | | | |
| **Prüfgegenstand:** *Test item:* | 17WFM26 WI-FI + BT combo module | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type no.:* | V1.0 | | | |
| **Auftrags-Inhalt:** *Order content*: | Test Report | | | |
| **Prüfgrundlage:** *Test specification:* | 47 CFR FCC Part 2.1091 | | RSS-102 Issue 5 | |

| | | |
|---|---|---|
| **Wareneingangsdatum:** *Date of sample receipt:* | 2022-04-20 | Please refer to Photo Document |
| **Prüfmuster-Nr.:** *Test sample no:* | A003240432-001~008<br>A003234567-001 | |
| **Prüfzeitraum:** *Testing period:* | 2022-04-21 - 2022-05-20 | |
| **Ort der Prüfung:** *Place of testing:* | TÜV Rheinland (Shenzhen) Co., Ltd. | |
| **Prüflaboratorium:** *Testing laboratory:* | TÜV Rheinland (Shenzhen) Co., Ltd. | |
| **Prüfergebnis*:** *Test result*:* | Pass | |

| | | | |
|---|---|---|---|
| **geprüft von:** *tested by:* | x Bell Hu<br>Signed by: Bell Hu | **genehmigt von:** *authorized by:* | X Lin Lin<br>Signed by: Lin Lin |
| **Datum:** *Date:* 2022-07-04 | | **Ausstellungsdatum:** *Issue date:* 2022-07-04 | |
| **Stellung** / *Position:* | Project Manager | **Stellung** / *Position:* | Reviewer |

**Sonstiges** / *Other:* FCC ID: 2AVQS-17WFM26, IC: 25888-17WFM26, HVIN: V1.0, PMN: 17WFM26 WI-FI + BT combo module

**Zustand des Prüfgegenstandes bei Anlieferung:** Prüfmuster vollständig und unbeschädigt
*Condition of the test item at delivery:* *Test item complete and undamaged*

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhaft |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| ** Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specification(s)* | | *F(ail) = failed a.m. test specification(s)* | *N/A = not applicable* | *N/T = not tested* |

# TEST SUMMARY

### 3.1.1 RF EXPOSURE COMPLIANCE

*RESULT: Pass*

# CONTENTS

# 1. TEST SITES

## 1.1 TEST FACILITIES

TÜV Rheinland (Shenzhen) Co., Ltd.

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

FCC Registration No.: 694916

ISED Wireless Device Testing Laboratory: 25069

## 1.2 LIST OF TEST AND MEASUREMENT INSTRUMENTS

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

| **Radio Spectrum Testing** | | | | |
|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial No.** | **Cal. until** |
| Wireless Connectivity Tester | R&S | CMW270 | 101375 | 2022-08-09 |
| Signal Analyzer | R&S | FSV 40 | 101441 | 2022-08-09 |

## 1.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

## 1.4 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 basics using in house standards or comparisons.

## 1.5 Location of Original Data

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

## 1.6 Status of Facility Used for Testing

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

# 2. GENERAL PRODUCT INFORMATION

## 2.1 GENERAL DESCRIPTION

The Product is WI-FI + BT combo module, which supports Bluetooth, 2.4GHz Wi-Fi 802.11 b/g/n and 5GHz Wi-Fi 802.11a/b/g/n/ac wireless technology.

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

## 2.2 RATING AND SYSTEM DETAILS

**Table 2: Rating of EUT**

| **General Information of EUT** | **Value** |
|---|---|
| Kind of Equipment: | 17WFM26 WI-FI + BT combo module |
| Type Designation: | V1.0 |
| FCC ID: | 2AVQS-17WFM26 |
| IC: | 25888-17WFM26 |
| Operating Voltage: | DC 5V |
| Antenna Type: | Integral Antennas |
| Antenna Gain: | **Wi-Fi Antenna 1#:**<br>Max gain 3.4dBi for 2.4GHz Wi-Fi<br>Max gain 3.69dBi for 5GHz Wi-Fi<br>**Wi-Fi Antenna 2#:**<br>Max gain 2.14dBi for 2.4GHz Wi-Fi<br>Max gain 3.68dBi for 5GHz Wi-Fi<br>**BT Antenna 3#:**<br>Max gain 0.29dBi for Bluetooth<br><br>As for MIMO mode for Antenna 0# and Antenna 1#, Cyclic Delay Diversity mode Employed. |
| **Technical Specification of** Bluetooth (Dual Mode) | |
| Operating Frequency: | 2402 MHz to 2480 MHz |
| Type of Modulation: | GFSK, π/4-DQPSK, 8DPSK |
| Channel Number: | 79 channels, BDR & EDR<br>40 channels, BLE |
| Channel Separation: | 1MHz (for EDR & BDR), 2MHz (for BLE) |
| **Technical Specification of Wi-Fi 802.11 b/g/n** | |
| 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: | 1/2/5.5/11 Mbps for 802.11b<br>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 |
| MIMO and SISO mode: | SISO for 802.11b/g, MIMO and SISO for 802.11n. |
| **Technical Specification of Wi-Fi 802.11 a/n/ac** | |
| Operating Frequency: | 5180-5320MHz, 5500-5720MHz |
| Type of Modulation: | OFDM(BPSK/QPSK/16QAM/64QAM/256QAM) |
| Channels: | 5180-5320MHz, 802.11 a/n20/n40/ac20/ac40/ac80<br>5500-5720MHz, 802.11 a/n20/n40/ac20/ac40/ac80 |
| Channel Separation | 5 MHz |
| MIMO and SISO mode: | SISO for 802.11a, MIMO and SISO for 802.11n/ac, no beamforming. |
| DFS: | Slave without DFS Detection |

# 3. Test Results

## 3.1 Transmitter Requirements & Test Suites

### 3.1.1 RF Exposure Compliance

**RESULT:** **Pass**

| | | |
|---|---|---|
| Test standard | : | RSS-102 Issue 5<br>FCC Part 1.1091 |
| Limit | : | Table 1 of 47 CFR FCC Part 1.1310<br>Section 2.5.2 of RSS-102 Issue 5 |
| Kind of test site | : | Shielded room |

This device is mobile device, and the applicant declares that the minimum separation distance is greater than 20cm. Therefore MPE measurement or computational modelling should be used to determine compliance.

MPE Calculation is based on the conducted power, and considering maximum power and Antenna gain. The following formula is used to MPE evaluation.

$$Pd = \frac{Pout * G}{4R^2\pi}$$

Where
$P_d$ = power density in $mW/cm^2$ or $W/m^2$
$P_{out}$ = output power to antenna in mW or W
$G_{num}$ = Antenna gain in numeric
π = 3.14159
R = Distance between observation point and the center of radiator in cm or m

### 3.1.1.1 FCC Part 1.1310, Part 2.1091

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| **(A) Limits for Occupational/Controlled Exposures** | | | | |
| 0.3-3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0-30 | 1842/f | 4.89/f | *(900/f2) | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | | | f/300 | 6 |
| 1500-100,000 | | | 5 | 6 |
| **(B) Limits for General Population/Uncontrolled Exposure** | | | | |
| 0.3-1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34-30 | 824/f | 2.19/f | *(180/f2) | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | | | f/1500 | 30 |
| 1500-100,000 | | | 1.0 | 30 |

**Table 3: Test Results of RF Exposure Calculations for FCC, Stand-alone mode**

| Operating Mode | Max. EIRP incl. tune-up (dBm) | Distance (cm) | MPE ($mW/cm^2$) | Limit ($mW/cm^2$) | Verdict |
|---|---|---|---|---|---|
| Bluetooth | 8.19 | 20 | 0.0013 | 1.0 | Pass |
| 2.4GHz Wi-Fi | 27.88 | 20 | 0.1222 | 1.0 | Pass |
| 5GHz Wi-Fi | 20.68 | 20 | 0.0233 | 1.0 | Pass |

**Table 4: Test Results of RF Exposure Calculations for FCC, Simultaneous mode**

| Co-location Mode | Sum of the MPE ratios | Limit | Verdict |
|---|---|---|---|
| 2.4GHz Wi-Fi+ Bluetooth | 0.1222/1+0.0013/1<1.0 | 1.0 | Pass |
| 5GHz Wi-Fi+ Bluetooth | 0.0233/1+0.0013/1<1.0 | 1.0 | Pass |

### 3.1.1.2 RSS-102 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz6 and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 4.49/$f$0.5 W (adjusted for tune-up tolerance), where $f$ is in MHz;

- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);

- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 $f$0.6834 W (adjusted for tune-up tolerance), where $f$ is in MHz;

- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

**Table 5: Test Results of RF Exposure Calculations for ISED, Stand-alone**

| Operating Mode | Max. EIRP incl. tune-up (dBm) | Distance (cm) | Maximum EIRP (W) | Threshold power (W) | Verdict |
|---|---|---|---|---|---|
| Bluetooth | 8.19 | 20 | 0.0066 | 2.68 | Pass |
| 2.4GHz Wi-Fi | 27.88 | 20 | 0.614 | 2.70 | Pass |
| 5GHz Wi-Fi | 20.68 | 20 | 0.117 | 4.52 | Pass |
| Note: The maximum EIRP much lower than the threshold power in section 2.5.2, thus compliant. | | | | | |

**Table 6: Test Results of RF Exposure Calculations for ISED, Simultaneous mode**

| Co-location Mode | Sum of the ratios | Limit | Verdict |
|---|---|---|---|
| 2.4GHz Wi-Fi+ Bluetooth | 0.614/2.70+0.0066/2.68<1.0 | 1.0 | Pass |
| 5GHz Wi-Fi+ Bluetooth | 0.117/4.52+0.0066/2.68<1.0 | 1.0 | Pass |

# 4. List of Tables