

TEST REPORT

of

RE Directive (2014/53/EU) EN50566: 2017 / EN50663: 2017

Product : Bluetooth 5.1 Module

Brand Name: Fanstel

Model: BT40; BT40F; BT40E

Model Difference: Antenna difference

Applicant: Fanstel Corporation, Taipei

Address: 10F-10, No. 79, Sec. 1, Hsin Tai Wu Rd.,
Hsi-Chih, New Taipei City 221 Taiwan

Test Performed by:

International Standards Laboratory Corp.

<LT Lab.>

*Address:

No. 120, Lane 180, Hsin Ho Rd.,

Lung-Tan Dist., Tao Yuan City 325, Taiwan

*Tel : +886-3-263-8888 ; Fax: +886-3-263-8899

Report No.: **ISL-21LR066EMPE**

Issue Date : **2021/04/09**

Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

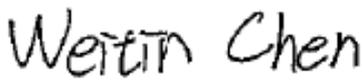
This test report shall not be reproduced except in full, without the written approval of International Standards Laboratory Corp.

VERIFICATION OF COMPLIANCE

Applicant: Fanstel Corporation, Taipei
Equipment Under Test: Bluetooth 5.1 Module
Brand Name: Fanstel
Model Number: BT40; BT40F; BT40E
Model Different: Antenna difference
Date of Test: 2021/03/05 ~ 2021/04/08
Date of EUT Received: 2021/03/05

| APPLICABLE STANDARDS | |
|--------------------------------|-------------|
| STANDARD | TEST RESULT |
| EN50566: 2017 EN50663: 2017 | Complied |

The above equipment was tested by International Standards Laboratory Corp.. for compliance with the requirements set forth in the European Standard EN 50566: 2017 and EN 50663: 2017 under 3.1 (a) of RE Directive 2014/53/EU. The results of in this report apply to the product system that was used only.

| | | | |
|---------------------|--|--------------|------------|
| <i>Test By:</i> |  <hr style="border: 0.5px solid black;"/> <i>Weitin Chen / Sr. Engineer</i> | <i>Date:</i> | 2021/04/09 |
| <i>Prepared By:</i> |  <hr style="border: 0.5px solid black;"/> <i>Gigi Yeh / Senior Engineer</i> | <i>Date:</i> | 2021/04/09 |
| <i>Approved By:</i> |  <hr style="border: 0.5px solid black;"/> <i>Jerry Liu / Assistant Manager</i> | <i>Date:</i> | 2021/04/09 |

Version

| Version No. | Date | Description |
|-------------|------------|------------------------------|
| 00 | 2021/04/09 | Initial creation of document |
| | | |

TABLE OF CONTENTS

| | | |
|----|---|----|
| 1. | Description of Equipment under Test (EUT) | 5 |
| 2. | Description of Test Modes | 7 |
| 3. | General Description of Applied Standards..... | 7 |
| 4. | RF Exposure Evaluations | 8 |
| | Photographs of EUT | 11 |

1. Description of Equipment under Test (EUT)

General:

| | |
|-----------------------------|-----------------------|
| Product Name: | Bluetooth 5.1 Module |
| Brand Name: | Fanstel |
| Model Name: | BT40; BT40F; BT40E |
| Model Difference: | Antenna difference |
| Type of Equipment: | Stand-alone equipment |
| Temperature Range: | -40°C to +105°C |
| Simultaneous transmissions: | Yes |
| Geo-location capability: | No |
| Power Supply | 5Vdc by USB port |

Model Summaries:

| module | BT40F | BT40 | BT40E |
|-----------------------------------|-----------------|------------------|-----------------|
| SoC | nRF5340 QKAA | nRF5340 QKAA | nRF5340 QKAA |
| Size | 15x20.8x1.9mm | 14x16x1.9mm | 14x16x1.9mm |
| 32 MHz and 32.768 kHz crystals | Integrated | Integrated | Integrated |
| DC converter inductors, VDD, VDDH | Integrated | Integrated | Integrated |
| BT Antenna | PCB ANT 0.88dBi | PCB ANT -3.37dBi | Dipole ANT 6dBi |
| Max TX | | | |
| Operating temp. | -40°C to +105°C | -40°C to +105°C | -40°C to +105°C |
| Availability | Sample | Sample 1Q21 | Sample |

BT:

| | |
|----------------------------|--|
| Bluetooth Version | BT 5.1 |
| Frequency Range: | 2402 – 2480MHz |
| Channel number: | 40 channels |
| Modulation type: | Wide band Modulation |
| Transmit Power (EIRP): | 8.10 dBm |
| Dwell Time | N/A |
| Operating Mode | Point-to-Point |
| Adaptive/ Non-Adaptive | Non-Adaptive |
| LBT (Listen Before Talk) | Yes |
| | <input checked="" type="checkbox"/> Adaptive Frequency Hopping using LBT based DAA <input type="checkbox"/> Adaptive Frequency Hopping using other forms of DAA (non-LBT based) <input type="checkbox"/> Short Control Signaling Transmissions |
| Occupied Channel Bandwidth | Within 2400-2483.5MHz |
| Duty Cycle | N/A |
| Antenna Beam forming | No |
| Antenna Designation: | BT40E: Dipole Antenna, 6dBi BT40F: PCB Antenna, 0.88dBi BT40: PCB Antenna, -3.37dBi |

2. Description of Test Modes

The EUT has been tested under Operating condition. And used to control the EUT for staying in continuous transmitting mode is programmed. Channel low, mid, and High for each modulation type are chosen for testing.

3. General Description of Applied Standards

The EUT According to the Specifications, it must comply with the requirements of the following standards:

EN 50566:2017 – Product standard to demonstrate the compliance of wireless communication devices with the basic restrictions and exposure limit values related to human exposure to electromagnetic fields in the frequency range from 30 MHz to 6 GHz: hand-held and body mounted devices in close proximity to the human body

EN 50663:2017 – Generic standard for assessment of low power electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (10 MHz - 300 GHz)

EN 62311:2008 – Generic standard to demonstrate the compliance of electrical apparatus with the basic restrictions related to human exposure to electromagnetic fields (0Hz-300GHz)

EN 62479:2010 – Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10MHz to 300GHz)

4. RF Exposure Evaluations

4.1. Standards:

According to section 4.2 Low-power exclusion level (P_{max}) of EN 62479: 2010 and Annex A, Table A.1 – Example values of SAR-based P_{max} for some cases described by ICNIRP, IEEE Std C95.1-1999 and IEEE Std C95.1-2005

Table A.1 – Example values of SAR-based P_{max} for some cases described by ICNIRP, IEEE Std C95.1-1999 and IEEE Std C95.1-2005

| Guideline / Standard | SAR limit, SAR_{max} W/kg | Averaging mass, m g | P_{max} mW | Exposure tier ^a | Region of body ^a |
|-------------------------|--------------------------------|--------------------------|-----------------|----------------------------|------------------------------------|
| ICNIRP [1] | 2 | 10 | 20 | General public | Head and trunk |
| | 4 | 10 | 40 | General public | Limbs |
| | 10 | 10 | 100 | Occupational | Head and trunk |
| | 20 | 10 | 200 | Occupational | Limbs |
| IEEE Std C95.1-1999 [2] | 1,6 | 1 | 1,6 | Uncontrolled environment | Head, trunk, arms, legs |
| | 4 | 10 | 40 | Uncontrolled environment | Hands, wrists, feet and ankles |
| | 8 | 1 | 8 | Controlled environment | Head, trunk, arms, legs |
| | 20 | 10 | 200 | Controlled environment | Hands, wrists, feet and ankles |
| IEEE Std C95.1-2005 [3] | 2 | 10 | 20 | Action level | Body except extremities and pinnae |
| | 4 | 10 | 40 | Action level | Extremities and pinnae |
| | 10 | 10 | 100 | Controlled environment | Body except extremities and pinnae |
| | 20 | 10 | 200 | Controlled environment | Extremities and pinnae |

^a Consult the appropriate standard for more information and definitions of terms.

4.2. Classification of the assessment method:

The antenna of the product, under normal use condition is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20 cm separation distance and the prohibition of operating to a person has been printed on the user's manual. So, this product under normal use is located on electromagnetic far field between the human body.

Far Field Calculation Formula

$$E = \frac{\sqrt{30PG(\theta, \phi)}}{r}$$

G = antenna gain relative to an isotropic antenna
 θ, ϕ = elevation and azimuth angles to point of investigation
 r = distance from observation point to the antenna

4.3. EUT operating condition:

The software provided by Manufacturer enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.4. Test Results:

E-Field Strength Calculation: EN 62311: 2008

| Mode | Frequency (MHz) | EIRP (dBm) | EIRP (mW) | E-Field Strength (V/m) | Limit (V/m) | Result |
|------|-----------------|------------|-----------|------------------------|-------------|--------|
| BLE | 2402 - 2480 | 8.1 | 0.00646 | 2.201 | 61 | Pass |

Evaluation Results:

Pass, the calculation of E-Field Strength is less than EN 62311 E-Field Strength limit 61V/m.

APPENDIX 1

Photographs of EUT

Refer to ISL-21LR066P

~ End of Report ~