

TEST REPORT

of

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

Product : Bluetooth 5.1 Module

Brand Name: Fanstel

Model: BC40C; BC40M; BC40P

Model Difference: Antenna difference

Applicant: Fanstel Corporation, Taipei

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Test Performed by:



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Report No.: **ISL-21LR119EMPE**

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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. The uncertainty of the measurement does not include in consideration of the test result unless the customer required the determination of uncertainty via the agreement, regulation or standard document specification. 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: BC40C; BC40M; BC40P
Model Different: Antenna difference
Date of Test: 2021/06/28 ~ 2021/07/14
Date of EUT Received: 2021/06/28

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.

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Version

Version No.	Date	Description
00	2021/07/15	Initial creation of document

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1. Description of Equipment under Test (EUT)

Product Name:	Bluetooth 5.1 Module
Brand Name:	Fanstel
Model Name:	BC40C; BC40M; BC40P
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 from USB (JIG)

Model Summaries:

module	BC40C	BC40M	BC40P
SoC	nRF5340 CLAA	nRF5340 CLAA	nRF5340 CLAA
Size	8.4x11.5x1.5 mm	8.4(10.1)x12.7x1.5mm	8.4x9x1.5mm
32 MHz and 32.768 kHz crystals	Integrated	Integrated	Integrated
DC converter inductors, VDD, VDDH	Integrated	Integrated	Integrated
BT Antenna	Chip	PCB trace	Pads for external
Max TX			
Operating temp.	-40°C to +105°C	-40°C to +105°C	-40°C to +105°C
Availability	Sample 05/2021	Sample 05/2021	Sample 06/2021

BT:

Bluetooth Version	BT 5.1
Frequency Range:	2402 – 2480MHz
Channel number:	40 channels
Modulation type:	Wide band Modulation
Transmit Power (EIRP):	2.73 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:	BC40C: Chip Antenna, 1dBi BC40M: PCB trace Antenna, 1.53dBi BC40P: Pads for external Antenna, 0.54dBi

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.					

According to EN 62311: 2008, the criteria listed in the bellowing table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified 1999/519/EC.

Reference levels for electric, magnetic and electromagnetic fields
(0 Hz to 300 GHz, unperturbed rms values)

Frequency Range	E-field Strength (V/m)	H-Field Strength (A/m)	B-field (uT)	Equivalent plane wave power density S (W/m ²)
0-1 Hz	--	3.2×10^4	4×10^4	--
1-8 Hz	10000	$3.2 \times 10^4 / f^2$	$4 \times 10^4 / f^2$	--
8-25 Hz	10000	$4000/f$	$5000/f$	--
0.025-0.8kHz	$250/f$	$4/f$	$5/f$	--
0.8-3kHz	$250/f$	5	6.25	--
3-150kHz	87	5	6.25	--
0.15-1MHz	87	$0.73/f$	$0.92/f$	--
1-10MHz	$87/f^{1/2}$	$0.073/f$	$0.92/f$	--
10-400MHz	28	0.073	0.092	2
400-2000MHz	$1.375 f^{1/2}$	$0.0037 f^{1/2}$	$0.0046 f^{1/2}$	$f/200$
2-300GHz	61	0.16	0.20	1.0

Notes:

1. f as indicated in the frequency range column.

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	2.73	0.00187	1.186	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-21LR190P

~ End of Report ~