Test report no.: *Prüfbericht-Nr.:*	**CN24ZHFF 001**	**Order No.:** *Auftragsnr.:*	**168493181**	**Page 1 of 16** *Seite 1 von 16*
Client reference no.: *Kunden-Referenz-Nr.:*	N/A	**Order date:** *Auftragsdatum:*	2024-07-08	
Client: *Auftraggeber:*	**Shining 3D Tech Co., Ltd.** NO.1398 Xiangbin Road, Wenyan, Xiaoshan, Hangzhou, Zhejiang, China			
Test item: *Prüfgegenstand:*	Wi-Fi & Bluetooth Module			
Identification / Type no.: *Bezeichnung / Typ-Nr.:*	FCE863R			
Order content: *Auftrags-Inhalt*:	Test Report			
Test specification *Prüfgrundlage:*	CFR47 FCC Part 15: Subpart C Section 15.247 RSS-247 Issue 3 August 2023			
Date of sample receipt: *Wareneingangsdatum:*	2024-07-08	Please refer to Photo Document		
Test sample no: *Prüfmuster-Nr.:*	A003763530-001 A003763537-001			
Testing period: *Prüfzeitraum:*	2024-07-08 - 2024-08-05			
Place of testing: *Ort der Prüfung:*	Refer to section 2.1			
Testing laboratory: *Prüflaboratorium:*	TÜV Rheinland (Shenzhen) Co., Ltd.			
Test result*: *Prüfergebnis*:*	Pass			

tested by: *geprüft von:*	x Bell Hu Signed by: Bell Hu	**authorized by:** *genehmigt von:*	x Hardy Suo Signed by: Hardy Suo
Date: 2024-08-18 *Datum:*		**Issue date:** 2024-08-18 *Ausstellungsdatum:*	
Position / *Stellung*:	Expert/Sachverständige(r)	**Position** / *Stellung*:	Expert/Sachverständige(r)

Other: *Sonstiges:*	FCC ID: 2AMG4-EINSTAR3, IC: 24652-EINSTAR3, HVIN: FCE863R, PMN: FCE863R, HMN: 3D Scanner . This report is under FCC C2PC and ISED C4PC application for the module integration into the Host (Product:3D Scanner, Model: Einstar Vega, Manufacturer: Shining 3D Tech Co., Ltd.), the antennas changed and RSE re-tested.
Condition of the test item at delivery: *Zustand des Prüfgegenstandes bei Anlieferung:*	Test item complete and undamaged Prüfmuster vollständig und unbeschädigt

* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet

V05

Remarks
Anmerkungen

1	The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request. *Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben.* *Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.*
2	As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. *Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.*
3	Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report. *Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.*
4	The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the “Zero Guard Band Rule” and “Simple Acceptance” in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019. *Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.*

Test Summary

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 RADIATED SPURIOUS EMISSION
RESULT: Pass

5.1.3 AC CONDUCTED EMISSION
RESULT: Pass

Contents

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: Photographs of Test Set-up

Appendix B: Test Results of BR/EDR mode

Appendix C: Test Results of BLE mode

2 Test Sites

2.1 Test Facilities

Shenzhen PSI Testing Co., Ltd.
1-2F, Building 5, Yudafu Industrial Park, No. 10, Xingye West Road, Shajing Street, Bao'an District, Shenzhen, Guangdong, China 518104
A2LA Certificate Number: 6975.01
CNAS Registration Number: CNAS L19010

The tests at the test sites have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing				
Description	**Manufacturer**	**Model**	**Serial No.**	**Calibrated until (DD.MM.YYYY)**
RF Control Unit	Tachoy	TR1029-1	20220428C008	2024.12.18
RF Sensor Unit	Tachoy	TR1029-2	20220428P008	2024.12.18
Spectrum Analyzer	Agilent	N9020A	MY51281067	2024.12.18
Vector Signal Generator	Agilent	N5182A	MY47420724	2024.12.18
Analog signal generator	Agilent	N5181A	MY50145363	2024.12.18
Comprehensive Test Instrument	Rohde&Schwarz	CMW 500	145266	2024.12.18
Unwanted Emission Testing				
Description	**Manufacturer**	**Model**	**Serial No.**	**Calibrated until (DD.MM.YYYY)**
Loop Antenna	Schwarzbeck	FMZB 1519B	00128	2025.04.02
Bilog Antenna	Schwarzbeck	VULB 9168	01448	2024.12.25
Horn Antenna	Schwarzbeck	BBHA 9120 D	02706	2024.12.25
Horn Antenna	Schwarzbeck	BBHA 9170	00946	2024.12.25
Test Receiver	Rohde&Schwarz	ESCI 7	101032/003	2024.12.18
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101648	2024.12.18
Preamplifier	SKET	LNPA_0118G-50	SK2022032901	2024.12.18
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2024.12.18
Conducted Emission				
Description	**Manufacturer**	**Model**	**Serial No.**	**Calibrated until (DD.MM.YYYY)**
Test Receiver	Rohde&Schwarz	ESCI 7	101032/003	2024.12.29
L.I.S.N.	Rohde&Schwarz	ENV 216	102282	2024.12.29
L.I.S.N.	RFT	NNB111	13835240	2025.05.03

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 basics 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 (k=2)
RF output power, conducted	± 0.41dB
Occupied Channel Bandwidth	± 2.08 %
RF power density, conducted	± 0.39 dB
Unwanted Emissions, conducted	± 0.59 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	± 4.82 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	± 4.82 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B&C 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 362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of 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 product is Wi-Fi & Bluetooth module which supports Bluetooth, 2.4GHz Wi-Fi and 5GHz Wi-Fi functions.

This report is under FCC C2PC and ISED C4PC application for the module integration into the Host (Product:3D Scanner, Model: Einstar Vega, Manufacturer: Shining 3D Tech Co., Ltd.).

This change establishes portable category SAR conditions with antennas modified when the module integrated into the 3D Scanner.

The antenna changed to accommodate the module into the product, details as below

Items	Antenna information	Remark
Wi-Fi & Bluetooth Module (FCE863R)	Antenna 1/2 : (Refer to the module reports) 2400 MHz ~ 2483.5 MHz: 0.2 dBi 5150 MHz ~ 5250 MHz: -0.7 dBi 5725 MHz ~ 5850 MHz: -1.5 dBi	1. It verified that, except for the antennas, there is no other change made on the module when it installed into the 3D scanner. There are no evident variations on RF conducted signals, the conducted power kept in matching with original module. 2. Comparing with the module antennas, the maximum gains for all current antennas get lower, thus the final EIRP will be less than the module as well. 3. To guarantee the compliance, the RSE and SAR re-tested. 4. The U-NII-2A and U-NII-2C were blocked, and not open to public when integrated into the host.
3D Scanner (The host product)	Antenna 1: (provided by the client) 2400 MHz ~ 2483.5 MHz: -3.26 dBi 5150 MHz ~ 5250 MHz: -8.41dBi 5725 MHz ~ 5850 MHz: -8.41dBi Antenna 1: (provided by the client) 2400 MHz ~ 2483.5 MHz: -1.72dBi 5150 MHz ~ 5250 MHz: -1.88dBi 5725 MHz ~ 5850 MHz: -1.88dBi	

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:	Wi-Fi & Bluetooth Module
Type Designation:	FCE863R
FCC ID:	2AMG4-EINSTAR3
IC:	24652-EINSTAR3
PMN:	FCE863R
HVIN:	FCE863R
Operating Voltage:	3.3 V
Antenna Type:	Integral Antennas
Antenna Gain:	Antenna 1: (provided by the client) 2400 MHz ~ 2483.5 MHz: -3.26 dBi

	5150 MHz ~ 5250 MHz: -8.41dBi 5725 MHz ~ 5850 MHz: -8.41dBi Antenna 1: (provided by the client) 2400 MHz ~ 2483.5 MHz: -1.72dBi 5150 MHz ~ 5250 MHz: -1.88dBi 5725 MHz ~ 5850 MHz: -1.88dBi
Technical Specification of Bluetooth	
Operating Frequency:	2402 MHz to 2480 MHz
Type of Modulation:	GFSK, π/4-DQPSK, 8DPSK
Channel Number:	BDR/EDR:79 channels; BLE:40 Channels
Channel Separation:	BDR/EDR: 1MHz; BLE: 2MHz
Antenna Type:	Integral Antennas
Antenna number:	2 (only SISO mode supported)
Antenna Gain:	Antenna 1#: -3.26dBi (Provided by the Client) Antenna 1#: -1.72dBi (Provided by the Client)
Technical Specification of Wi-Fi 802.11 b/g/n/ax	
Operating Frequency:	2412 - 2462 MHz for 802.11b/g/n(HT20) 2422 - 2452 MHz for 802.11n(HT40)
Type of Modulation:	DSSS(DBPSK/DQPSK/CCK) OFDM, OFDMA(BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM)
Data Rate:	1/2/5.5/11 Mbps for 802.11b 6/9/12/18/24/36/48/54 Mbps for 802.11g MCS0~MCS 7 for 802.11n(HT20/40) MCS0~MCS11 for 802.11ax(HE20/40) (All data rates considered, only the Worst-cases reported)
Channel Number:	11 channels for 802.11b/g/n(HT20)/ax(HE20) 7 channels for 802.11n(HT40)/ax(HE40)
Channel Separation:	5 MHz
Antenna Type:	Integral Antennas
Number of Antenna:	2 (SISO and MIMO supported), no beamforming
Antenna Gain:	Antenna 1#: -3.26dBi (Provided by the Client) Antenna 1#: -1.72dBi (Provided by the Client)
RU Mode for 802.11ax	☒Full RU, ☒ Partial RU (Single RU)
Technical Specification of Wi-Fi 802.11 a/n/ac/ax	
Operating Frequency:	5180-5240MHz, 5745-5825MHz* *(The DFS bands 5250-5350MHz and 5470-5725MHz were blocked when it integrated into the host 3D Scanner)
Type of Modulation:	OFDM, OFDMA
Protocol:	802.11 a/n20/n40/ac20/ac40/ac80/ ax20/ax40/ax80
Data Rate:	6/9/12/18/24/36/48/54 Mbps for 802.11a MCS0~MCS 7 for 802.11n MCS0~MCS9 for 802.11ac MCS0~MCS11 for 802.11ax (All data rates considered, only the Worst-cases reported)
Antenna Type:	Integral Antennas
Number of Antenna:	2 (SISO and MIMO supported), no beamforming
Antenna Gain:	Antenna 1#: -3.26dBi (Provided by the Client) Antenna 1#: -1.72dBi (Provided by the Client)
RU Mode for 802.11ax	☒Full RU, ☒ Partial RU (Single RU)

Antenna Gain:	Ant 1: -8.41dBi (Provided by the Client) Ant 2: -1.88dBi (Provided by the Client)

Table 3: Technical Specification of Host

General Information of EUT	Description
Kind of Equipment:	3D Scanner
Type Designation:	Einstar Vega
Operating Voltage:	DC 11V from the adapter or DC 3.7V battery
Testing Voltage:	DC 11V from the adapter or DC 3.7V battery
Operating Temperature Range:	-10 °C ~ +40 °C
Adapter	Manufacturer: MOSO POWER SUPPLY TECHNOLOGY CO.,LTD Model: P30T-V3250U200-065I0-US

3.3 Independent Operation Modes

The basic operation modes are:

A. On, Bluetooth transmitting mode (BR & EDR mode)
   1) Low Channel
   2) Middle Channel
   3) High Channel

B. On, Bluetooth Transmitting on Hopping channel (BR & EDR mode)

C. On, BLE transmitting mode (1M bps & 2Mbps)
   1) Low Channel
   2) Middle Channel
   3) High Channel

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- Block Diagram
- User Manual
- Operation Description

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 in this report.

Table 4: Test environments

Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
NTNV	24.6°C	Normal	Ambient

Table 5: Test channel and frequency

Mode	Test Channels
BR & EDR	L: 2402MHz; M: 2441MHz; H: 2480MHz
BLE	L: 2402MHz; M: 2440MHz; H: 2480MHz

4.3 Special Accessories and Auxiliary Equipment

Table 6: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N	Rating
Laptop	Lenovo	T480	PF-16A6N8	N/A

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)

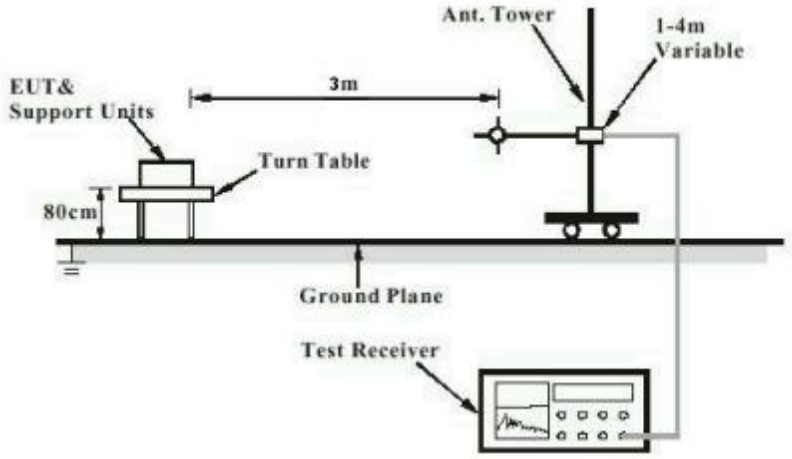


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

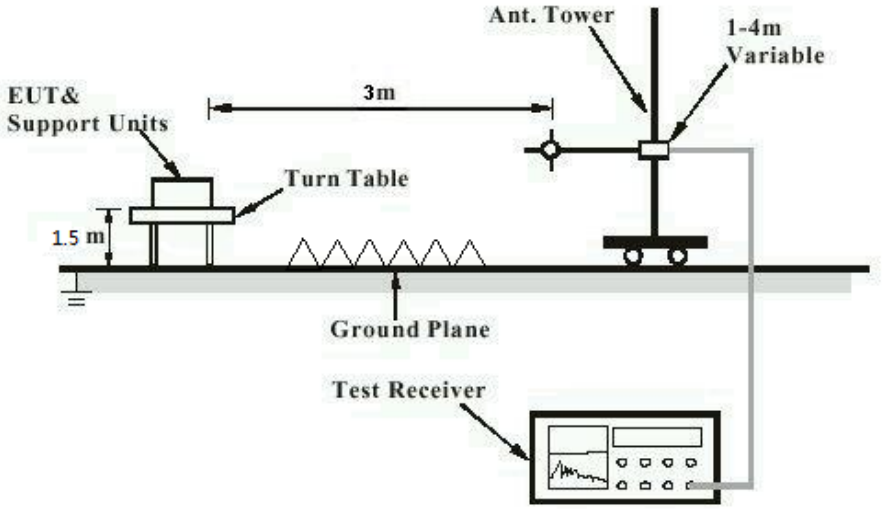
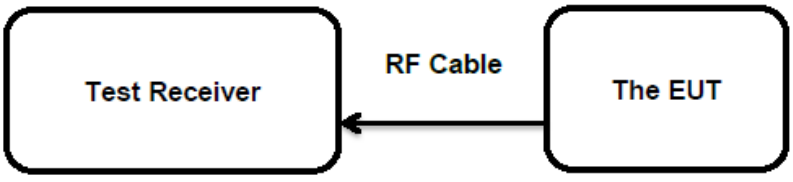


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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
RSS-Gen Clause 6.8

The EUT has an integral antennas with a unique connector, which is designed with permanent attachment and no consideration of replacement. The maximum antenna gain is -1.72 dBi.

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

Refer to EUT Photo for further details.

5.1.2 Radiated Spurious Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(d) & FCC Part 15.205 RSS-247 Clause 3.3
Basic standard	:	ANSI C63.10: 2013
Limits	:	Refer to 15.209(a) of FCC part 15.247(d) RSS-Gen Table 5
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	2024-07-13 ~2024-08-15
Input voltage	:	DC 3.7V Battery
Operation mode	:	A, C
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. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendixes B &C.

5.1.3 AC Conducted Emission

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) RSS-Gen Table 4
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2024-07-11
Input voltage	:	120V/60Hz
Operation mode	:	B, C
Ambient temperature	:	Refer to test result
Relative humidity	:	Refer to test result
Atmospheric pressure	:	101 kPa

6 Photographs of the Test Set-Up

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

7 List of Tables