

Prüfbericht-Nr.: <i>Test report no.:</i>	CN23NVJW 001	Auftrags-Nr.: <i>Order no.:</i>	48222869	Seite 1 von 13 Page 1 of 13
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2023-08-17	
Auftraggeber: <i>Client:</i>	EnGenius Technologies 1580 Scenic Ave, Costa Mesa, CA 92626, USA			
Prüfgegenstand: <i>Test item:</i>	Outdoor6 2x2 CPE			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	EOC655, EOC655-C18, EOC655-C23 and EOC655-B18			
Auftrags-Inhalt: <i>Order content:</i>	FCC Certification			
Prüfgrundlage: <i>Test specification:</i>	IEEE Std C95.1 47 CFR §2.1091 47 CFR §1.1310 KDB 447498 D04			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-08-01			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003541866-006			
Prüfzeitraum: <i>Testing period:</i>	2023-09-07 - 2023-12-06			
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Taipei Testing Site			
Prüflaboratorium: <i>Testing laboratory:</i>	Taipei Testing Laboratories			
Prüfergebnis*: <i>Test result*:</i>	Pass			
überprüft von: <i>compiled by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2023-12-20	 Ethan Shao	Ausstellungsdatum: <i>Issue date:</i> 2023-12-20	 Brenda Chen	
Stellung / Position:	Assistant Project Engineer	Stellung / Position:	Senior Project Manager	
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
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. <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>				

Prüfbericht-Nr.:
Test report no.:

CN23NVJW 001

Seite 2 von 13
Page 2 of 13

Anmerkungen
Remarks

1	<p>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.</p> <p><i>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.</i></p>
2	<p>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. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature</p> <p><i>As contractually agreed, this document has been signed digitally only. TÜV 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, TÜV 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. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature</i></p>
3	<p>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.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described 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.</i></p>
4	<p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen 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 bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>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.</i></p>

Contents

HISTORY OF THIS TEST REPORT	4
1 GENERAL REMARKS	5
1.1 COMPLEMENTARY MATERIALS.....	5
1.2 DECISION RULE OF CONFORMITY	5
2 TEST SITES	6
2.1 TEST LABORATORY	6
2.2 TEST FACILITY.....	6
3 GENERAL PRODUCT INFORMATION.....	7
3.1 PRODUCT FUNCTION AND INTENDED USE	7
3.2 RATINGS AND SYSTEM DETAILS.....	7
4 MAXIMUM PERMISSIBLE EXPOSURE EVALUATION.....	9
4.1 INTRODUCTION	9
4.2 REFERENCE LEVELS	9
4.3 CLASSIFICATION OF THE ASSESSMENT METHODS.....	11
5 TEST RESULTS	12
5.1 MPE-BASED EXEMPTION.....	12

APPENDIX EP - PHOTOGRAPHS OF EUT

Prüfbericht - Nr.: **CN23NVJW 001**
Test Report No.

Seite 4 von 13
Page 4 of 13

HISTORY OF THIS TEST REPORT

Revision	Description	Date Issued
R01	Original Release	2023-12-20

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix EP - Photographs of EUT

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2 Test Sites

2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)

3 General Product Information

3.1 Product Function and Intended Use

The EUT is Outdoor6 2x2 CPE. It contains Bluetooth and WLAN compatible module enabling the user to communicate data through Wireless interface.

For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 Ratings and System Details

Basic Information of EUT

Item	EUT Information
Kind of Equipment/Test Item	Outdoor6 2x2 CPE
Type Identification	EOC655, EOC655-C18, EOC655-C23 and EOC655-B18
FCC ID	A8J-EOC655

Technical Specification of EUT

Item	EUT Information
Operating Frequency	WLAN 2.4G: 2412 ~ 2462 MHz WLAN 5G: Band 1: 5180 MHz ~ 5250 MHz Band 2: 5250 MHz ~ 5320 MHz Band 3: 5500 MHz ~ 5700 MHz Band 4: 5745 MHz ~ 5825 MHz Bluetooth: 2402 ~ 2480 MHz
Modulation	WLAN: DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM) OFDMA (1024QAM) Bluetooth: GFSK
Operation Voltage	48 Vdc
Antenna Information	Refer to note as below

Note:

1. All models are listed as below.

Main Model (Tested Model)	Series Model	Difference
EOC655	EOC655-C23	All models use the same main board, but different types of 5G antennas. Please see the chart as below.
	EOC655-C18	
	EOC655-B18	

Model	Bluetooth	2.4GHz	5GHz	
			Spruce	PINE
EOC655	PIFA	Ant 1: PIFA Ant 2: Dipole	1. 23 dBi N-type panel ant. (MT465039/NVH) 2. Omni 10 dBi ant. (DFS) (MT463036/NVH)	1. Sector 18 dBi ant. (MT055S17VHN) 2. 2 foot 30 dBi Dish ant. (TM55L-DPDISH-30) 3. Omni 10 dBi ant. (MT-463036/NVH)
EOC655-C23			23 dBi MMCX panel ant. (MT-465039/CVH/F)	
EOC655-C18			18 dBi Embedded panel ant. (C18, same antenna type as 23 dBi ant.)	
EOC655-B18			23 dBi N-type panel ant. (MT465039/NVH)	Sector 18 dBi ant. (MT055S17VHN)

2. All models are listed as below.

Mode		Gain (dBi)							
		Bluetooth	WLAN 2.4GHz		WLAN 5GHz				
			Ant 1	Ant 2	Spruce		PINE		
Antenna Type		PIFA	PIFA	Dipole	Panel	Omni	Sector	Dish	Omni
EOC655 (Main test)		3.4	3.7	3.4	23	10	18	30	10
EOC655-C23					23	-			
EOC655-C18					18	-			
EOC655-B18					23	-			
Max Peak Gain		3.4	3.7	3.4	23	10	18	30	10
CDD Mode	Power Directional Gain	-	3.7		23	10	18	30	10
	PSD Directional Gain	-	6.56		26.01	13.01	21.01	33.01	13.01
BF Mode	Power Directional Gain	-	6.56		26.01	13.01	21.01	33.01	13.01
	PSD Directional Gain	-	6.56		26.01	13.01	21.01	33.01	13.01

 Note: PSD Directional Gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$

4 Maximum Permissible Exposure Evaluation

4.1 Introduction

This Standard specifies requirements for, and provides guidance on, assessing compliance with the exposure limits of radiofrequency (RF) safety standards such as IEEE Std C95.1. This includes methodologies for making an assessment (by measurement or computation) of human exposure to ambient RF fields and induced body currents in the frequency range of 0 kHz to 300 GHz.

This Standard may also be used as a guide for making low-level environmental exposure assessments in areas around RF sources listed above, as well as other sources such as Wi-Fi devices.

4.2 Reference Levels

Where appropriate, the reference levels are derived from the basic restrictions by mathematical modelling and by extrapolation from the results of laboratory investigations at specific frequencies. They are given for the condition of maximum coupling of the field to the exposed individual, thereby providing maximum protection.

According to FCC 1.1310, the criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

The FCC MPE limits from 47 CFR §1.1310 are shown in the table below

Frequency Range [MHz]	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm ²]	Average Time [minutes]
(A) Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	*100	6
3.0 – 30	1842/f	4.89/f	*900/f ²	6
30 – 300	61.4	0.163	1.0	6
300 – 1500			f/300	6
1500 – 100000			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/f ²	30
30 – 300	27.5	0.073	0.2	30
300 – 1500			f/1500	30
1500 – 100000			1.0	30

NOTE –

- (1) f is the frequency in MHz.
- (2) Provided that basic restrictions are met and adverse indirect effects can be excluded, field strength values can be exceeded. For the specific case of occupational exposures at frequencies up to 100 kHz, the derived electric fields can be increased by a factor of 2 under conditions in which adverse indirect effects from contact with electrically charged conductors can be excluded.
- (3) For frequencies between 100 kHz and 10 GHz, the quantities S_{eq} , E_2 and H_2 are averages over any 6 minutes.
- (4) For frequencies exceeding 10 GHz, S_{eq} , the quantities E_2 and H_2 are averages over any $68/f$ 1.05 minutes (f in GHz).

4.3 Classification of the Assessment Methods

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm 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.

MPE Calculation Method according to KDB 447498 D04 Interim General RF Exposure Guidance v01

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 of § 1.1307(b)(1)(i)(C) to support an exemption from further evaluation from 300 kHz through 100 GHz.

The table applies to any RF source (i.e., single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least $\lambda/2\pi$. The thresholds are based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES
 SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R ²
1.34	–	30	35.6 m	–	1.6 m	3,450 R ² /f ²
30	–	300	1.6 m	–	159 mm	3.83 R ²
300	–	1,500	159 mm	–	31.8 mm	0.0128 R ² f
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R ²

Subscripts L and H are low and high; λ is wavelength.
 From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.

5 Test Results

5.1 MPE-based Exemption

The Calculated at a distance of 250 cm are shown as below:

<Bluetooth>

Mode	Frequency (MHz)	Average Output Power (dBm)	Tune Up Power (dBm)	Tune Up Power (mW)	Antenna Gain (dBi)	ERP (mW)	ERP Limit (mW)	Pass / Fail
Bluetooth	2440	12.86	13.00	19.95	3.40	26.61	120000	Pass

<WLAN 2.4GHz>

Mode	Frequency (MHz)	Average Output Power (dBm)	Tune Up Power (dBm)	Tune Up Power (mW)	Antenna Gain (dBi)	ERP (mW)	ERP Limit (mW)	Pass / Fail
CDD	2437	29.56	30.00	1000.00	3.70	1428.89	120000	Pass
Beamforming	2437	26.43	26.50	446.68	6.56	1233.10	120000	Pass

<WLAN 5GHz>

Antenna	Mode	Frequency (MHz)	Average Output Power (dBm)	Tune Up Power (dBm)	Tune Up Power (mW)	Antenna Gain (dBi)	ERP (mW)	ERP Limit (mW)	Pass / Fail
Spruce_Panel	CDD	5775	21.79	22.00	158.49	23.00	19275.25	120000	Pass
	Beamforming	5775	18.78	19.00	79.43	26.01	19319.68	120000	Pass
Spruce_Omni	CDD	5775	21.79	22.00	158.49	10.00	966.05	120000	Pass
	Beamforming	5775	18.78	19.00	79.43	13.01	968.28	120000	Pass
PINE_Sector	CDD	5745	17.96	18.00	63.10	18.00	2426.61	120000	Pass
	Beamforming	5795	14.93	15.00	31.62	21.01	2432.20	120000	Pass
PINE_Dish	CDD	5755	21.66	22.00	158.49	30.00	96605.09	120000	Pass
	Beamforming	5755	18.65	19.00	79.43	33.01	96827.79	120000	Pass
PINE_Omni	CDD	5785	25.97	26.00	398.11	10.00	2426.61	120000	Pass
	Beamforming	5785	22.94	23.00	199.53	13.01	2432.20	120000	Pass

Conclusion

The device complies with the FCC exposure requirements since the maximum transmitter power density is below the FCC limit.

Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR shall be used to determine exemption for simultaneous transmission according to Formula repeated from § 1.1307(b)(3)(ii)(B)

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 +etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Bluetooth + WLAN 2.4GHz + WLAN 5GHz

= 26.61/120000 + 1428.89/120000 + 96827.79/120000 = 0.819

Therefore the maximum calculations of above situations are less than the "1" limit.