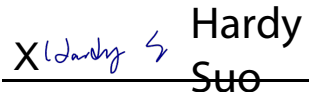


Prüfbericht-Nr.: <i>Test report no.:</i>	CN24QLIU 005	Auftrags-Nr.: <i>Order no.:</i>	168500420	Seite 1 von 10 Page 1 of 10
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2024-08-20	
Auftraggeber: <i>Client:</i>	ECARX (Hubei) Tech Co., Ltd B1336, Taizi Lake Industry Park, No 18 ShenLong AVE, WH, China			
Prüfgegenstand: <i>Test item:</i>	ECU-Display Head Unit			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	EEBABCDE1			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 2: Section 2.1091 CFR47 FCC Part 1: Section 1.1310 RSS-102 Issue 6 December 2023			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-09-02	Please refer to Photo Document		
Prüfmuster-Nr.: <i>Test sample no.:</i>	S202409024250-ZJA01/2 S202409024250-ZJA02/2			
Prüfzeitraum: <i>Testing period:</i>	2024-09-02 - 2024-09-28			
Ort der Prüfung: <i>Place of testing:</i>	Refer to section 2.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	 Hardy Suo		genehmigt von: <i>authorized by:</i>	 Lin Lin
Datum: <i>Date:</i>	2024-10-12		Ausstellungsdatum: <i>Issue date:</i>	2024-10-12
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position:	Sachverständige(r)/Expert
Sonstiges / <i>Other:</i>	FCC ID: 2BD49-EEBABCDE1 IC: 31788-EEBABCDE1, HVIN: EEBABCDE1			
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:	P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet <i>* 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</i>			
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 above mentioned 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>				

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Test report no.:

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Anmerkungen
Remarks

1	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. <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>
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3	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. <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>
4	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. <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>

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Test Report No.:

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Test Summary

3.1.1 RF EXPOSURE COMPLIANCE
RESULT: Pass

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1. Test Sites

1.1 Test Facilities

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

FCC Accreditation Designation No.: CN1194

ISED CAB identifier: CN0032

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

1.2 Traceability

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

1.3 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 basis using in house standards or comparisons.

1.4 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.

1.5 Status of Facility Used for Testing

The Shenzhen UnionTrust Quality and Technology Co., Ltd. Test facility located at Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, 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 EUT is an ECU-Display Head Unit intended to be assembled into automotive environment, which supports FM, GNSS, Bluetooth (dual mode), 2.4G Wi-Fi and 5.2G/5.8G Wi-Fi technologies.

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

2.2 Rating and System details

Table 1: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	ECU-Display Head Unit
Type Designation:	EEBABCDE1
FCC ID:	2BD49-EEBABCDE1
IC:	31788-EEBABCDE1
HVIN:	EEBABCDE1
Operating Voltage:	DC 9-16V
Testing Voltage:	DC 12V
Operating Temperature Range:	-40 °C ~ +75 °C
Operating Frequency Mode:	Bluetooth: Classic BR, EDR + BLE 2.4G Wi-Fi: 802.11 b/g/n20/n40/ax20/ax40 5.2G/5.8G Wi-Fi: 802.11 a/n20/n40/ac20/ac40/ac80/ax20/ax40/ax80 FM: 88-108MHz GNSS (1559-1610MHz): BDS, Galileo, GLONASS, GPS, SBAS
Technical Specification of Bluetooth (dual mode)	
Operating Frequency:	2402 MHz to 2480 MHz
Type of Modulation:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Channel Number:	BR & EDR mode:79 channels, Low Energy mode:40 channels
Channel Separation:	BR & EDR mode:1MHz, Low Energy mode:2MHz
Data Rate:	BR & EDR mode: 1Mbps, 2Mbps, 3Mbps Low Energy mode: 1Mbps, 2Mbps
Antenna Type:	Integral Antenna
Antenna Gain:	3.6 dBi Max. (declared by client)
Technical Specification of 2.4GHz Wi-Fi	
Operating Frequency:	2412 - 2462MHz for 802.11b/g/n(HT20)/ax(HE)20 2422 - 2452MHz for 802.11n(HT40)/ax(HE40)
Type of Modulation:	DSSS(DBPSK/DQPSK/CCK) OFDM(BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM) 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 ~ MCS7 for 802.11n MCS0~MCS11 for 802.11ax

Channel Number:	11 channels for 802.11b/g/n(HT20)/ax(HE)20 7 channels for 802.11n(HT40)/ax(HE40)
Channel Separation:	5 MHz
Antenna Type:	Integral Antenna
Antenna Number:	1Tx1Rx Note: EEBABCDE1 has two Wi- Fi Antennas (ANT1 and ANT2), and ANT2 disabled by client via firmware and cannot works.
Antenna Gain:	3.6 dBi Max. (declared by client)
Technical Specification of 5.2GHz Wi-Fi	
Operating Frequency:	5180 - 5240MHz, 802.11 a/n20/n40/ac20/ac40/ac80/ax20/ax40/ax80
Type of Modulation:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) OFDMA (BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM)
Data Rate:	6/9/12/18/24/36/48/54 Mbps for 802.11a MCS0~MCS15 for 802.11n/ac MCS0~MCS11 for 802.11ax
Channel Number:	7 channels
Channel Separation:	20MHz, 40MHz, 80MHz
Antenna Type:	Integral Antenna
Antenna Number:	1Tx1Rx Note: EEBABCDE1 has two Wi- Fi Antennas (ANT1 and ANT2), and ANT2 disabled by client via firmware and cannot works.
Antenna Gain:	5.9 dBi Max. (Provided by the Client)
Technical Specification of 5.8GHz Wi-Fi	
Operating Frequency:	5745 - 5825MHz, 802.11 a/n20/n40/ac20/ac40/ac80/ax20/ax40/ax80
Type of Modulation:	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM) OFDMA (BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM)
Data Rate:	6/9/12/18/24/36/48/54 Mbps for 802.11a MCS0~MCS15 for 802.11n/ac MCS0~MCS11 for 802.11ax
Channel Number:	8 channels
Channel Separation:	20MHz, 40MHz, 80MHz
Antenna Type:	Integral Antenna
Antenna Number:	1Tx1Rx Note: EEBABCDE1 has two Wi- Fi Antennas (ANT1 and ANT2), and ANT2 disabled by client via firmware and cannot works.
Antenna Gain:	7.6 dBi Max. (declared by client)

3. Test Results

3.1 RF Exposure Evaluation

3.1.1 RF Exposure Compliance

RESULT:
Pass

Test standard : 47 CFR FCC Part 2.1091
RSS-102 Issue 5

Limit : Table 1 of 47 CFR FCC Part 1.1310
Section 6.6 of RSS-102 Issue 6

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.

Antenna Gain: 3.6dBi for Bluetooth, 3.6dBi for 2.4GHz Wi-Fi, 7.6dBi for 5GHz Wi-Fi

3.1.1.1 RF Exposure Compliance Requirement

a) Radio Frequency Exposure Limit

For FCC:

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)
300-1,500	--	--	f/1500
1,500-100,000	--	--	1.0

For IC:

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ f ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ f ^{0.25}	0.1540/ f ^{0.25}	8.944/ f ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ f ^{1.2}
150000-300000	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/ f ^{1.2}

Note: f is frequency in MHz.

*Based on nerve stimulation (NS).

** Based on specific absorption rate (SAR).

b) Radio Frequency Exposure Calculation Formula

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (in appropriate units, e.g. mW/cm²)
P = power input to the antenna (in appropriate units, e.g., mW)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

or:

$$S = \frac{EIRP}{4\pi R^2}$$

where: EIRP = equivalent (or effective) isotropically radiated power

c) RF Exposure Calculation, stand-alone mode

Mode	Measured RF Output Power (dBm)	Max. EIRP (dBm)	Distance (cm)	Power Density (mW/cm ²)	FCC Limit (mW/cm ²)	Power Density (W/m ²)	IC Limit (W/m ²)
Bluetooth	9.57	13.17	20	0.004	1.0	0.041	5.3
2.4GHz Wi-Fi	21.70	25.30	20	0.067	1.0	0.674	5.3
5GHz Wi-Fi	11.40	19.00	20	0.026	1.0	0.158	9.7

Note1: The 2.4GHz / 5GHz Wi-Fi cannot transmit simultaneously because they share the same antennas.

Note2: Refer to test report CN24QLIU 002, CN24QLIU 003 and CN24QLIU 004 for output power of Bluetooth, 2.4GHz Wi-Fi and 5GHz Wi-Fi.

d) Simultaneous transmission MPE

The product has multiple transmitters, the Simultaneous Transmission possibilities are listing below:

No.	Simultaneous transmission Scenarios
1	Bluetooth + 2.4GHz Wi-Fi
2	Bluetooth + 5GHz Wi-Fi

Per KDB 447498 D01 v06, simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density, is ≤ 1.0.

For FCC

No.	Operating Mode	Calculation (mW/cm ²)	FCC Limit (mW/cm ²)	Calculation	Limit	Verdict
1	Bluetooth	0.004	1.0	0.071	1	Pass
	2.4GHz Wi-Fi	0.067	1.0			
2	Bluetooth	0.004	1.0	0.020	1	Pass
	5GHz Wi-Fi	0.016	1.0			

For IC

No.	Operating Mode	Calculation (mW/cm ²)	FCC Limit (mW/cm ²)	Calculation	Limit	Verdict
1	Bluetooth	0.004	5.3	0.013	1	Pass
	2.4GHz Wi-Fi	0.067	5.3			
2	Bluetooth	0.004	5.3	0.002	1	Pass
	5GHz Wi-Fi	0.016	9.7			

As the sum of MPE ratios for all simultaneous transmitting antennas is ≤ 1.0 , simultaneous transmission MPE test exclusion will be applied.

e) Conclusion

Therefore the maximum calculations result of above are meet the requirement of Radio Frequency Exposure (MPE) limit. This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.