

Prüfbericht-Nr.: <i>Test report no.:</i>	CN24VIXO 001	Auftrags-Nr.: <i>Order no.:</i>	168454302	Seite 1 von 20 <i>Page 1 of 20</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2023-11-28	
Auftraggeber: <i>Client:</i>	Teledyne FLIR Commercial Systems Inc.,Taiwan Branch 10F, No. 57, Zhouzi Street, NeiHu District, Taipei city, Taiwan			
Prüfgegenstand: <i>Test item:</i>	Wireless Borescope			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	BR450W-D (Trademark: Extech)			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-11-23	Please refer to Photo Document		
Prüfmuster-Nr.: <i>Test sample no:</i>	2311-5893			
Prüfzeitraum: <i>Testing period:</i>	2023-11-25 - 2024-02-20			
Ort der Prüfung: <i>Place of testing:</i>	Dongguan NTC Co., Ltd. (NTC)			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i> 2024-04-01	Ausstellungsdatum: <i>Issue date:</i> 2024-04-01			
Stellung / Position:	Sachverständige(r)/Expert	Stellung / Position:	Sachverständige(r)/Expert	
Sonstiges / Other:	FCC ID: 2BEEI-BR450W-D			
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 * 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				
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Anmerkungen

Remarks

- | | |
|----------|---|
| 1 | <p>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.</p> <p>Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</p> <p><i>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.</i></p> <p><i>Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</i></p> |
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| 4 | <p>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.</p> <p><i>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 bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</i></p> |

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Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

RESULT: Pass

5.1.3 CONDUCTED POWER SPECTRAL DENSITY

RESULT: Pass

5.1.4 6dB BANDWIDTH

RESULT: Pass

5.1.5 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 kHz BANDWIDTH

RESULT: Pass

5.1.6 RADIATED SPURIOUS EMISSION

RESULT: Pass

5.1.7 CONDUCTED EMISSION ON AC MAINS

RESULT: Pass

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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: Test Results of 2.4GHz Wi-Fi.

Appendix B: Photographs of the Test Set-up.

2 Test Sites

2.1 Test Facilities

Dongguan NTC Co., Ltd. (NTC)

Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China

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

FCC Accreditation Designation No.: 907417

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Description	Manufacturer	Model	Serial No.	Cal. Until
Test Receiver	Rohde & Schwarz	ESCI7	100837	2024-03-13
Antenna	Schwarzbeck	VULB9162	9162-010	2024-03-23
Spectrum Analyzer	Rohde & Schwarz	N9010B	200409/026	2024-03-13
Spectrum Analyzer	Keysight	N9020A	MY54200831	2024-03-13
Horn Antenna + Pre-Amplifier	COM-Power	AH-840	10100020	2024-09-01
Power Sensor	DARE	RPR3006W	15I00041SNO64	2024-03-13
Horn Antenna	COM-Power	AH-118	071078	2024-03-23
Pre-Amplifier	HP	HP 8449B	3008A00964	2024-03-22
Pre-Amplifier	HP	HP 8447D	1145A00203	2024-03-13
Loop Antenna	Schwarzbeck	FMZB 1513	1513-272	2024-03-13
Test Receiver	Rohde & Schwarz	ESCI	101152	2024-03-13
L.I.S.N	Rohde & Schwarz	ENV 216	101317	2024-03-13
RF Switching Unit	Compliance Direction Systems Inc.	RSU-M2	38311	2024-03-13
Temporary antenna connector	TESCOM	SS402	N/A	2024-03-13
Test Software	EZ	EZ EMC NTC-3A1.1	N/A	N/A

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 basis 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.

Table 2: Measurement Uncertainty

Parameter	Uncertainty
RF frequency	$\pm 0.9 \times 10^{-7}$
RF power, conducted	± 1.18 dB
Temperature	± 0.8 °C
Humidity	± 3.2 %
Radiated Emission (3m SAC) (9KHz to 30MHz)	± 5.66 dB
Radiated Emission (3m SAC) (30MHz to 1000MHz)	± 5.66 dB
Radiated Emission (3m SAC) (above 1000MHz)	± 5.19 dB
Conducted Emission	2.52 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The **Dongguan NTC Co., Ltd. (NTC)** Test facility located at Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, 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 EUT is **Wireless Borescope**, which supports Wi-Fi 802.11 b/g/n wireless technology.

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

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	Class B
Type Designation:	DTS
Trademark:	Extech
FCC ID:	2BEEI-BR450W-D
Operating Voltage:	DC 5V 3A from USB Port or DC 3.7V from internal battery
Testing Voltage:	AC 120V 60Hz from Adapter, DC 3.7V from internal battery
Technical Specification of Wi-Fi 802.11 b/g/n	
Operating Frequency:	2412 - 2462 MHz for 802.11b/g/n(HT20)
Type of Modulation:	DSSS(DBPSK/DQPSK/CCK) OFDM(BPSK/QPSK/16QAM/64QAM)
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
Channel Number:	11 channels for 802.11b/g/n(HT20)
Channel Separation:	5 MHz
Antenna Type:	Integral Antenna
Antenna Gain:	0.07 dBi (Provided by the Client)

Table 4: RF Channel and Frequency of Wi-Fi 802.11 b/g/n

RF Channel	802.11 b/g/n(HT20)
	Frequency (MHz)
01	2412
02	2417
03	2422
04	2427
05	2432
06	2437
07	2442
08	2447
09	2452
10	2457
11	2462

Test frequencies are lowest channel: 2412 MHz, middle channel: 2437 MHz and highest channel: 2462 MHz for 802.11b/g/n(HT20)

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Wi-Fi transmitting mode
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. On, Charging and Wi-Fi Link
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- User Manual
- ID Label and Location Info
- 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 testing were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model BR450W-D in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 5: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Laptop	DELL	VOSTR03400	H3K2XA01
Adapter	HUAWEI	HW-050200C01	---

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)

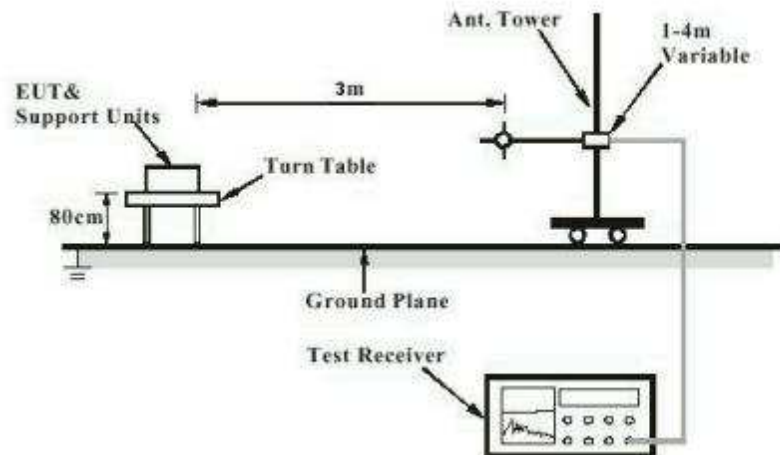


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

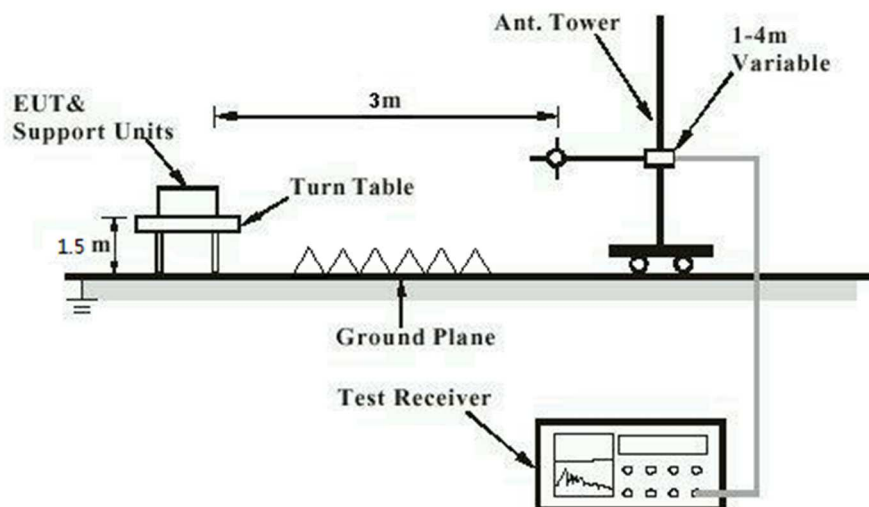


Diagram of Measurement Configuration for Mains Conduction Measurement

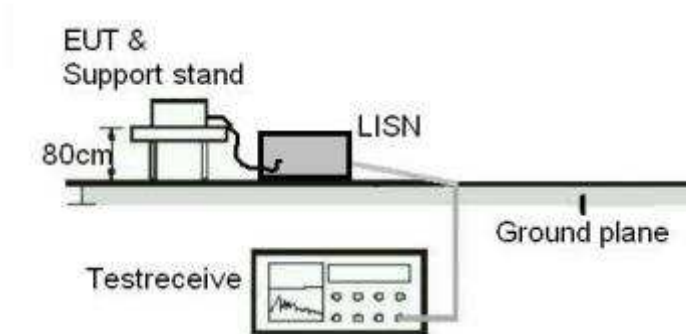
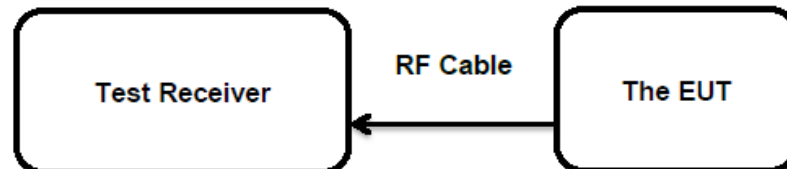


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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

Limit : the use of antennas with directional gains that do not exceed 6 dBi

According to the manufacturer declared, the EUT has a Integral Antenna, the directional gain of antenna is 0.07 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement.

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

Refer to Antenna Specification for further details.

5.1.2 Maximum Peak Conducted Output Power

RESULT:
Pass
Test Specification

Test standard	: FCC Part 15.247(b)(3)
Basic standard	: ANSI C63.10: 2013
Limits	: < 1 W (Maximum Conducted Peak Power) e.i.r.p. <4W
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2023-11-30
Input voltage	: Fully charged battery
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 26.4 °C
Relative humidity	: 42 %
Atmospheric pressure	: 101 kPa

For details refer to following test result.

Table 6: Test Result of Maximum Peak Conducted Output Power

Test Mode	Data Rate	Test Channel (MHz)	Measured Peak Power		Limit (W)
			(dBm)	(W)	
802.11b	1 Mbps	2412	17.705	0.0589	< 1.0
		2437	17.545	0.0568	
		2462	17.055	0.0508	
802.11g	6 Mbps	2412	18.133	0.0651	
		2437	17.522	0.0565	
		2462	18.136	0.0651	
802.11n (HT20)	MCS0	2412	18.174	0.0657	
		2437	18.100	0.0646	
		2462	17.724	0.05921	
Maximum Measured Value					
Max. e.i.r.p.= 18.104dBm+0.07dBi=18.174dBm, which is less than 36dBm=4W.					

Note:

- 1) The cable loss is taken into account in results.
- 2) Antenna gain(G): 0.07dBi

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5.1.3 Conducted Power Spectral Density

RESULT:**Pass****Test Specification**

Test standard : FCC Part 15.247(e)

Basic standard : ANSI C63.10: 2013

Limits : 8 dBm / 3kHz

Kind of test site : Shielded Room

Test Setup

Date of testing : 2023-11-30

Input voltage : Fully charged battery

Operation mode : A

Test channel : Low / Middle / High

Ambient temperature : 26.4 °C

Relative humidity : 42 %

Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.

5.1.4 6dB Bandwidth

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(a)(2)
Basic standard	: ANSI C63.10: 2013
Limits	: > 500 KHz
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2023-11-30
Input voltage	: Fully charged battery
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 26.4 °C
Relative humidity	: 42 %
Atmospheric pressure	: 101 kPa

For the measurement records, refer to the appendix A.

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5.1.5 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(d)
Basic standard	: ANSI C63.10: 2013
Limits	: 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2023-11-30
Input voltage	: Fully charged battery
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 26.4 °C
Relative humidity	: 42 %
Atmospheric pressure	: 101 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix A.

5.1.6 Radiated Spurious Emission

RESULT:**Pass****Test Specification**

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

Test Setup

Date of testing	: 2023-11-30 to 2023-12-01
Input voltage	: Fully charged battery
Operation mode	: A
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 appendix A.

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5.1.7 Conducted Emission on AC Mains

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)

Kind of test site : Shielded Room

Test Setup

Date of testing : 2023-12-01

Input voltage : AC 120V 60Hz form power adapter

Operation mode : B

Earthing : Not connected

Ambient temperature : 22 °C

Relative humidity : 52 %

Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.

6 Photographs of the Test Set-Up

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

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