

FCC Co-Location Test Report

FCC ID : IPH-03616

Equipment : LinkBox Model No. : LYWW20 **Brand Name** : GARMIN

: Garmin International, Inc. Applicant

Address : 1200 E. 151st Street Olathe, KS 66062 United States

: 47 CFR FCC Part 15.247 Standard

47 CFR FCC Part 15.407

: Jun. 03, 2021 **Received Date**

Tested Date : Jun. 10 ~ Jun. 15, 2021

We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: Approved by:

Along Chei Assistant Manager

Testing Laboratory

Report No.: FR9D2401-02CO Report Version: Rev. 01



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Release Record

Report No.	Version	Description	Issued Date
FR9D2401-02CO	Rev. 01	Initial issue	Jul. 01, 2021

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Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.407(b) 15.209	Radiated Emissions	[dBuV/m at 3m]: 49.40MHz 36.05 (Margin -3.95dB) - PK	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

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1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

WLAN	VLAN					
Operating Frequency	802.11a/n/ac: 5745 MHz ~ 5825 MHz					
Antenna Type	Chip antenna					
Modulation Type	802.11a/n/ac: OFDM/OFDMA (BPSK/QPSK/16QAM/64QAM/256QAM)					
Bluetooth						
Operating Frequency	2402 MHz ~ 2480 MHz					
Antenna Type	Chip antenna					
Modulation Type	Bluetooth LE: GFSK Bluetooth BR(1Mbps): GFSK Bluetooth EDR (2Mbps): π/4-DQPSK Bluetooth EDR (3Mbps): 8-DPSK					

1.1.2 Antenna Details

WLAN 5G

Ant. No.	Brand Name	Model Name	Туре	Connector	Antenna Gain (dBi)
1	INPAQ TECH CO LTD	VGAP-CLB-AS-A1	Chip	N/A	3.24

Antenna for Radio chip 1_ Single chip

Ant. No.	Brand Name	Model Name	Туре	Connector	Gain (dBi)
1	INPAQ TECH CO LTD	VGAP-CLA-AS-A1	Chip	No	1.76

Antenna for Radio chip 2_ Combo chip

Ant. No.	Brand Name	Model Name	Туре	Connector	Gain (dBi)
1	INPAQ TECH CO LTD	VGAP-CLB-AS-A1	Chip	No	2.93

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from battery
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1.2 The Equipment List

Test Item	Radiated Emission					
Test Site	966 chamber1 / (03Cl	966 chamber1 / (03CH01-WS)				
Test Date	Jun. 10, 2021					
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until	
Receiver	R&S	ESR3	101657	Mar. 12, 2021	Mar. 11, 2022	
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2020	Dec. 03, 2021	
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 17, 2020	Nov. 16, 2021	
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 10, 2020	Jul. 09, 2021	
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 11, 2020	Dec. 10, 2021	
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 06, 2020	Nov. 05, 2021	
Preamplifier	EMC	EMC02325	980225	Jul. 03, 2020	Jul. 02, 2021	
Preamplifier	Agilent	83017A	MY39501308	Sep. 26, 2020	Sep. 25, 2021	
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021	
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 06, 2020	Oct. 05, 2021	
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 06, 2020	Oct. 05, 2021	
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 06, 2020	Oct. 05, 2021	
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 06, 2020	Oct. 05, 2021	
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 06, 2020	Oct. 05, 2021	
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 06, 2020	Oct. 05, 2021	
Measurement Software	AUDIX	e3	6.120210g	NA	NA	
Note: Calibration Inter	val of instruments liste	d above is one year.				

Test Item	RF Conducted	F Conducted					
Test Site	(TH01-WS)	TH01-WS)					
Test Date	Jun. 15, 2021						
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until		
Spectrum Analyzer	R&S	FSV40	101063	Apr. 19, 2021	Apr. 18, 2022		
Power Meter	Anritsu	ML2495A	1241002	Nov. 04, 2020	Nov. 03, 2021		
Power Sensor	Anritsu	MA2411B	1207366	Nov. 04, 2020	Nov. 03, 2021		
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	May 25, 2021	May 24, 2022		
DC POWER SOURCE	GW INSTEK	GPC-6030D	GES855395	Nov. 09, 2020	Nov. 08, 2021		
Measurement Software	-	SENSE-15407_NII	V5.10	NA	NA		
Note: Calibration Interval of instruments listed above is one year.							

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1.3 Test Standards

47 CFR FCC Part 15.247 47 CFR FCC Part 15.407 ANSI C63.10-2013

1.4 Reference Guidance

FCC KDB 412172 D01 Determining ERP and EIRP v01r01 FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

1.5 Deviation from Test Standard and Measurement Procedure

None

1.6 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty				
Parameters	Uncertainty			
Radiated emission ≤ 1GHz	±3.41 dB			
Radiated emission > 1GHz	±4.59 dB			

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2 Test Configuration

2.1 Testing Facility

Test Laboratory International Certification Corporation					
Test Site	03CH01-WS, TH01-WS				
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)				

FCC Designation No.: TW2732FCC site registration No.: 181692

➤ ISED#: 10807A

➤ CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Test Mode			
Radiated Emissions	802.11 ac VHT20 CH165 + BT EDR GFSK CH00+ BT LE CH39			
NOTE: The selected channel is the maximum power channel of Wi-Fi mode & BT mode.				

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3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit						
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)			
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300			
0.490~1.705	24000/F(kHz)	33.8 - 23	30			
1.705~30.0	30	29	30			
30~88	100	40	3			
88~216	150	43.5	3			
216~960	200	46	3			
Above 960	500	54	3			

Note 1:

Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

- Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m.
- 2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
- 3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

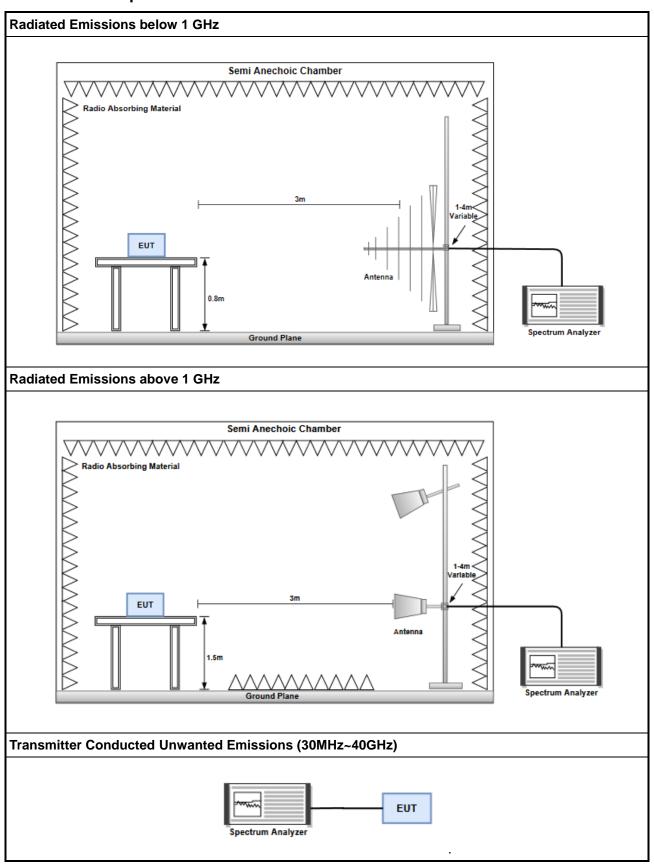
Note:

- 1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
- RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
- 3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

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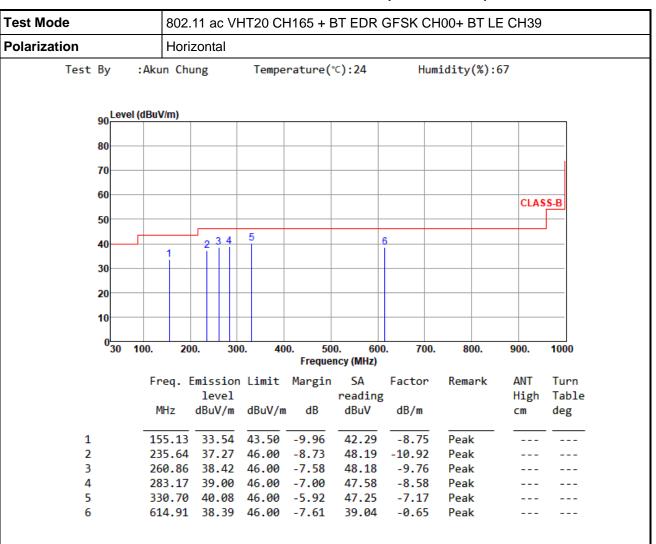
3.1.3 Test Setup



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3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)



Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

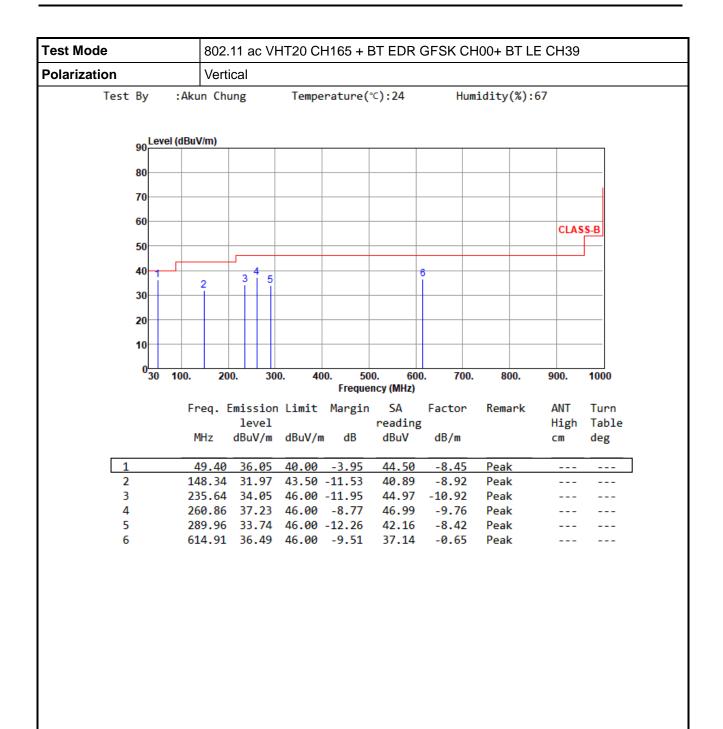
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

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Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor, cable loss and amplifier gain

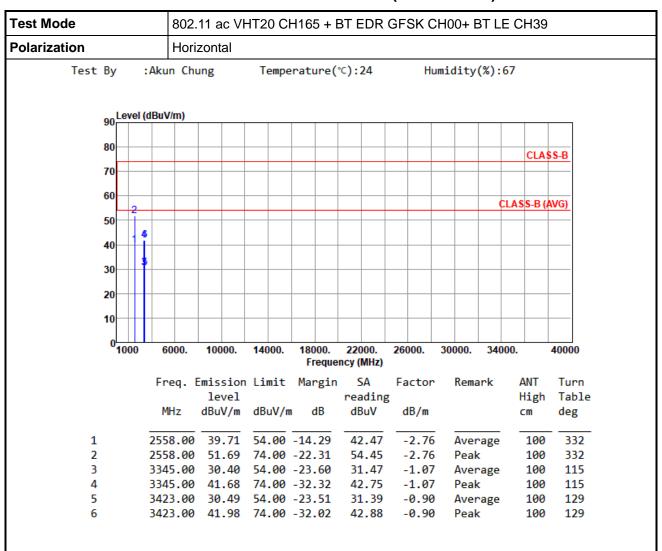
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

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3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)



Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

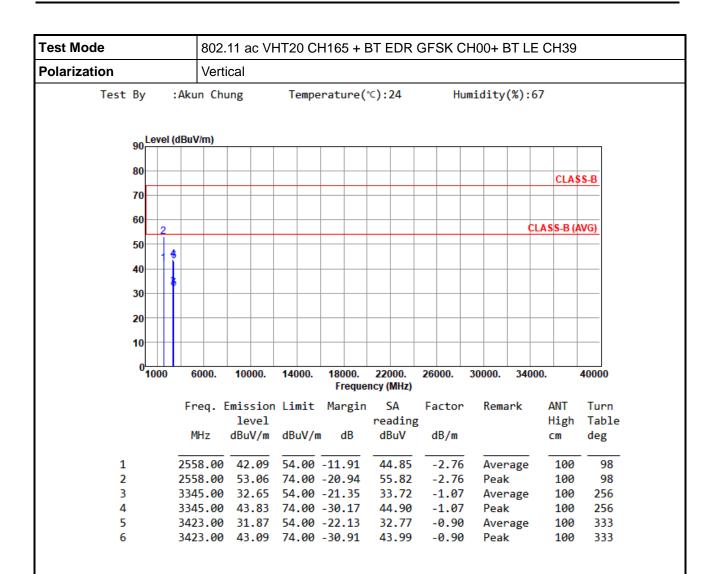
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

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Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor, cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

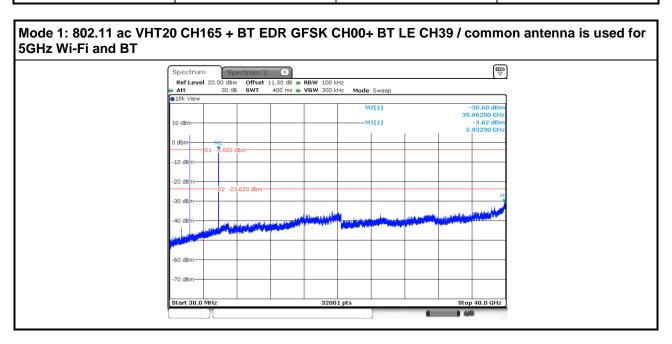
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

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3.1.6 Conducted Emissions (30MHz~40GHz)

Ambient Condition	24°C / 67%	Tested By	Aska Huang
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4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corporation (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou

Tel: 886-2-2601-1640 No.30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan (R.O.C.)

Kwei Shan

Tel: 886-3-271-8666

No.3-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666 Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

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