

EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 1 of 35 FCC ID: 2BARH-ULTRACRAFT

TEST REPORT

Application No.:	GZCR2408000923AT
Applicant:	GUANGZHOU HEYGEARS IMC. INC
Address of Applicant:	BLOCK B2, 501, 601, ENTERPRISE ACCELERATOR, KAIFA DISTRICT, GUANGZHOU, GUANGDONG, CHINA
Manufacturer:	GUANGZHOU HEYGEARS IMC. INC
Address of Manufacturer:	BLOCK B2, 501, 601, ENTERPRISE ACCELERATOR, KAIFA DISTRICT, GUANGZHOU, GUANGDONG, CHINA
Factory:	GUANGZHOU HEYGEARS IMC. INC
Address of Factory:	BLOCK B2, 501, 601, ENTERPRISE ACCELERATOR, KAIFA DISTRICT, GUANGZHOU, GUANGDONG, CHINA
Product Name:	ULtraCraft Rapid Production System
Model No.:	UltraCraft A2D HD
Trade Mark:	HEYGEARS
Standard(s) :	47 CFR Part 15, Subpart E 15.407 (h)(2)
Date of Receipt:	2024-08-06
Date of Test:	2024-08-22 to 2024-10-30
Date of Issue:	2024-11-15
Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards specified above.

Ridey Lin

Ricky Liu Manager



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 2 of 35

	Revision Record				
Version	Report No.	Date	Remark		
01	GZCR240800092304	2024-11-15	Original		

Authorized for issue by:		
	Jamon. Gum	
	Damon Guan/Project Engineer	
	vivo cui	
	Vico Cui/Reviewer	



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 3 of 35

Test Summary 2

Radio Spectrum Matter Part					
ltem	Standard	Method	Requirement	Result	
Non-occupancy period		KDB 905462 D02 Section 7.8.3	KDB 905462 D02 Section 5.1	Pass	
Channel Move Time	47 CFR Part 15, Subpart E 15.407(h)(2)	KDB 905462 D02 Section 7.8.3	KDB 905462 D02 Section 5.1	Pass	
Channel Closing Transmission Time	10.407(11)(2)	KDB 905462 D02 Section 7.8.3	KDB 905462 D02 Section 5.1	Pass	

Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 4 of 35

3 **Contents**

	Pa	age
1	Cover Page	1
2	Test Summary	3
3	Contents	4
•		
4	General Information	5
4	1 Details of E.U.T.	5
4.		-
4.		
4.	4 Test Facility	6
4.		
4.	6 Abnormalities from Standard Conditions	6
5	Equipment List	7
6	Radio Spectrum Technical Requirement	8
6.		
0.	6.1.1 E.U.T. Operation	
	6.1.2 Test Mode Description	
	6.1.3 Test Setup Diagram	
	6.1.4 Measurement Procedure and Data	
6.	2 Channel Move Time	.11
	6.2.1 E.U.T. Operation	.11
	6.2.2 Test Mode Description	
	6.2.3 Test Setup Diagram	
-	6.2.4 Measurement Procedure and Data	
6.	· · · · · · · · · · · · · · · · · · ·	
	6.3.1 E.U.T. Operation	
	6.3.2 Test Mode Description	
	6.3.3 Test Setup Diagram	
	6.3.4 Measurement Procedure and Data	
7	EUT Constructional Details (EUT Photos)	.17
8	Appendix	.18



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 5 of 35

General Information 4

4.1 Details of E.U.T.

Power supply:	AC 100-240V, 50/60Hz, 340W		
Cable(s):	About 1.6m x 3 wires unscreened AC mains cable.		
	USB Port x2		
	RJ45 Port x1		
	4 Pin DC output Port x1(Reserved only, function not developed)		
Test Voltage:	AC 120 V, 60 Hz		
Operation Frequency/Number of channels (20MHz):	U-NII-1: 5180-5240MHz; U-NII-2A: 5260-5320MHz; U-NII-2C: 5500- 5700MHz; U-NII-3: 5745-5825MHz		
Operation Frequency/Number of channels/(40MHz):	U-NII-1: 5190-5230MHz; U-NII-2A: 5270-5310MHz; U-NII-2C: 5510- 5670MHz; U-NII-3: 5755-5795MHz		
Operation Frequency/Number of channels (80MHz):	U-NII-1: 5210MHz; U-NII-2A: 5290MHz; U-NII-2C: 5530-5610MHz; U-NII-3: 5775MHz		
Modulation Type:	802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK); 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM); 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)		
Channel Spacing:	802.11a/n(HT20)/ac(HT20): 20MHz; 802.11n(HT40)/ac(HT40): 40MHz; 802.11ac(HT80): 80MHz		
DFS Function:	Slave without Radar detection		
TPC Function:	Without TPC function		
Antenna Number:	1		
Antenna Type:	FPC Antenna		
Antenna Gain:	2.48 dBi according to antenna specification		
Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.			

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Note Book Computer	LENOVO	ThinkPad T490	PF1D1MVJ
Wireless Router	Honor	HiRouter-CD30	AWTEQ20C04001295



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 6 of 35

4.3 Test Location

All tests were performed at: SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory, No.198, Kezhu Road, Science City, Economic & Technological Development Area, Guangzhou, Guangdong, China 510663 Tel: +86 20 82155555 No tests were sub-contracted.

4.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• ACMA

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

• SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

• FCC Recognized Accredited Test Firm(Registration No.: 486818)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

• ISED (Registration No.: 4620B, CAB identifier: CN0052)

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

• VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

• CBTL (Lab Code: TL129)

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

4.5 Deviation from Standards

None

4.6 Abnormalities from Standard Conditions

None



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 7 of 35

Equipment List 5

Non-occupancy period					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2024-08-19	2025-08-18
MXG Vector Signal Generator	Keysight	N5182B	EMC2216	2024-10-14	2025-10-13
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2024-08-19	2025-08-18
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Channel Move Time					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2024-08-19	2025-08-18
MXG Vector Signal Generator	Keysight	N5182B	EMC2216	2024-10-14	2025-10-13
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2024-08-19	2025-08-18
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Channel Closing Transmission Time					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MI CABLE	SGS-EMC	0.8M	EMC2137	2023-11-02	2025-11-01
EXA Signal Analyzer (10Hz-44GHz)	Keysight	N9010A	EMC2138	2024-08-19	2025-08-18
MXG Vector Signal Generator	Keysight	N5182B	EMC2216	2024-10-14	2025-10-13
4X4 Power sensor Unit	TST	TSPS2023R	EMC2226	2024-08-19	2025-08-18
Test Software	TST	V2.0	GZE100-78	N/A	N/A

General used equipmen	t				
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2024-06-13	2025-06-12



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 8 of 35

6 Radio Spectrum Technical Requirement

6.1 Non-occupancy period

Test Requirement	KDB 905462 D02 Section 5.1
Test Method:	KDB 905462 D02 Section 7.8.3

Limit:

		Applic	ability	
Test item	Limit	Master Device or client with Radar Detection	Client without Radar Detection	
Non-occupancy period	cupancy period Minimum 30 minutes		Not required	
Channel Availability Check Time	60 seconds	Yes	Not required	
Channel Move Time	10 seconds	Yes	Yes	
	See Note 1.	165	165	
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.	Yes Yes		
	See Notes 1 and 2.			
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.	Yes	Not required	

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

6.1.1 E.U.T. Operation

Operating Environment:

Temperature:	Humidity:	53.9 % RH	Atmospheric Pressure:	1013	mbar

6.1.2 Test Mode Description

- -

Pre-scan / Final test	Mode Code	Description
Final test	05	Normal operating_Keep the EUT communication with the companion device.

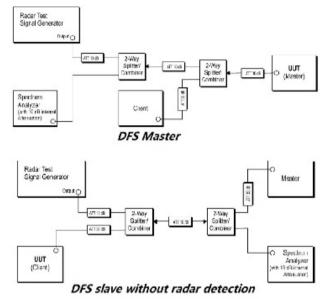
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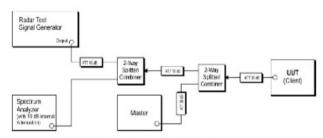
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EMC-TRF-01 Rev 1.1 Report No.: GZCR240800092304 Page: 9 of 35

6.1.3 Test Setup Diagram





DFS slave with radar detection



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 10 of 35

6.1.4 Measurement Procedure and Data

1) The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.

2) The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device.

3) A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.

4) EUT will associate with the master at channel. The file "iperf.exe" specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Media Player Classic Ver. 6.4.8.6 in order to properly load the network for the entire period of the test.

5) When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.

6) Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type.

7) Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) = S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms)= N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.

8) Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

Please Refer to Appendix for Details



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Report No.: GZCR240800092304 Page: 11 of 35

6.2 Channel Move Time

Test Requirement	KDB 905462 D02 Section 5.1
Test Method:	KDB 905462 D02 Section 7.8.3
Limit:	

		Applica	bility
Test item	Limit	Master Device or client with Radar Detection	Client without Radar Detection
Non-occupancy period	Minimum 30 minutes	Yes	Not required
Channel Availability Check Time	60 seconds	Yes	Not required
Channel Move Time	10 seconds See Note 1.	Yes	Yes
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.	Yes	Yes
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.	Yes	Not required

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

6.2.1 E.U.T. Operation

Operating Environment:

Temperature:	20.3 °C	Humidity:	53.9 % RH	Atmospheric Pressure:	1013	mbar
6.2.2 Test Mode Desc	ription					
Pre-scan / M00	de					

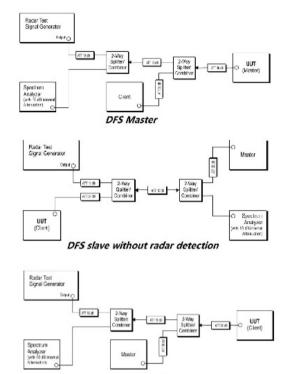
Final test	Code	Description
Final test	05	Normal operating_Keep the EUT communication with the companion device.





EMC-TRF-01 Rev 1.1 Report No.: GZCR240800092304 Page: 12 of 35

6.2.3 Test Setup Diagram



DFS slave with radar detection



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 13 of 35

6.2.4 Measurement Procedure and Data

1) The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.

2) The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device.

3) A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.

4) EUT will associate with the master at channel. The file "iperf.exe" specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Media Player Classic Ver. 6.4.8.6 in order to properly load the network for the entire period of the test.

5) When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.

6) Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type.

7) Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) = S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms)= N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.

8) Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

Please Refer to Appendix for Details



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Report No.: GZCR240800092304 Page: 14 of 35

6.3 Channel Closing Transmission Time

Test RequirementKDB 905462 D02 Section 5.1Test Method:KDB 905462 D02 Section 7.8.3

Limit:

		Applica	bility
Test item	Limit	Master Device or client with Radar Detection	Client without Radar Detection
Non-occupancy period	Minimum 30 minutes	Yes	Not required
Channel Availability Check Time	60 seconds	Yes	Not required
Channel Move Time	10 seconds See Note 1.	Yes	Yes
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.	Yes	Yes
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.	Yes	Not required

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

6.3.1 E.U.T. Operation

Operating Environment:

Temperature:	20.3 °C	Humidity:	53.9 % RH	Atmospheric Pressure:	1013	mbar

6.3.2 Test Mode Description

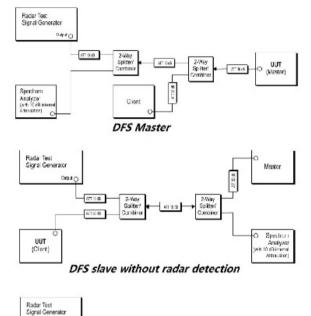
Pre-scan / Final test	Mode Code	Description
Final test	05	Normal operating_Keep the EUT communication with the companion device.

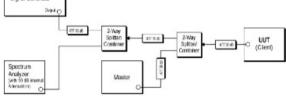




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6.3.3 Test Setup Diagram





DFS slave with radar detection



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Report No.: GZCR240800092304 Page: 16 of 35

6.3.4 Measurement Procedure and Data

1) The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.

2) The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device.

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8) Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

Please Refer to Appendix for Details



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EMC-TRF-01 Rev 1.1

Report No.: GZCR240800092304 Page: 17 of 35

EUT Constructional Details (EUT Photos) 7

Refer to Appendix - External and Internal Photos for GZCR2408000923AT



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Report No.: GZCR240800092304 Page: 18 of 35

8 Appendix

1. Signal Calibration

1.1 Test Result

1.1.1 SC

Band: 2A							
Mada	Bandwidth	Frequency	Rada	r Signal	Signal Calib	Signal Calibration	
Mode	(MHz)	(MHz)	Туре	Trial Id	Result	Limit	Verdict
			0	0	Refer To Tes	t Graph	Pass
		1	0	Refer To Test Graph		Pass	
		2	0	Refer To Test Graph		Pass	
802.11ac (VHT20)	802.11ac 20	5260	3	0	Refer To Tes	t Graph	Pass
(1120)		4	0	Refer To Tes	t Graph	Pass	
		5	0	Refer To Test Graph		Pass	
			6	0	Refer To Tes	t Graph	Pass

1.1.2 SC

Band: 2C							
Mode	Bandwidth	Frequency	Rada	r Signal	Signal Calib	Signal Calibration	
wode	(MHz)	(MHz)	Туре	Trial Id	Result	Limit	Verdict
			0	0	Refer To Tes	t Graph	Pass
802.11ac (VHT20) 20	5500	1	0	Refer To Test Graph		Pass	
		2	0	Refer To Test Graph		Pass	
		3	0	Refer To Tes	Refer To Test Graph		
		4	0	Refer To Tes	Refer To Test Graph		
		5	0	Refer To Test Graph		Pass	
		6	0	Refer To Test Graph		Pass	



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EMC-TRF-01 Rev 1.1 Report No.: GZCR240800092304 19 of 35 Page:

1.2 Test Graph

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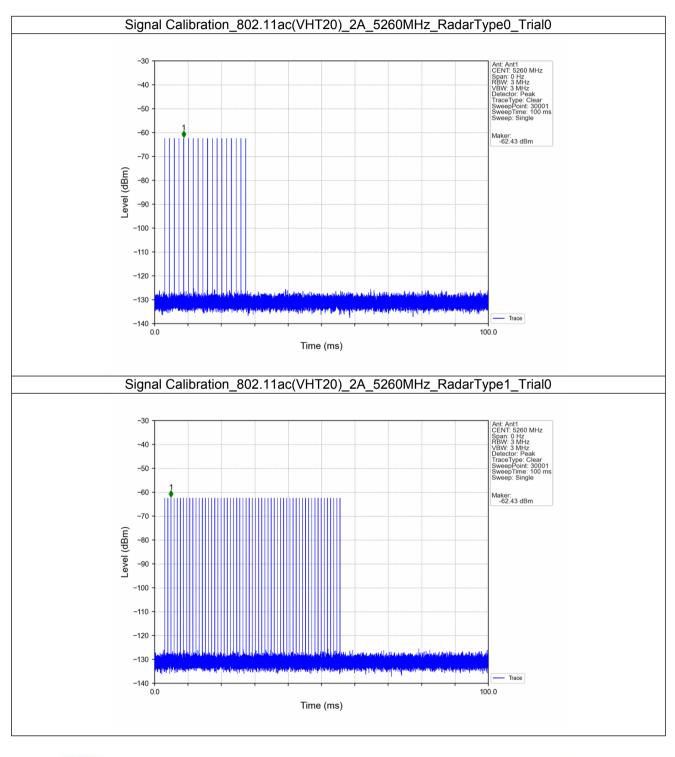
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1.2.1 SC



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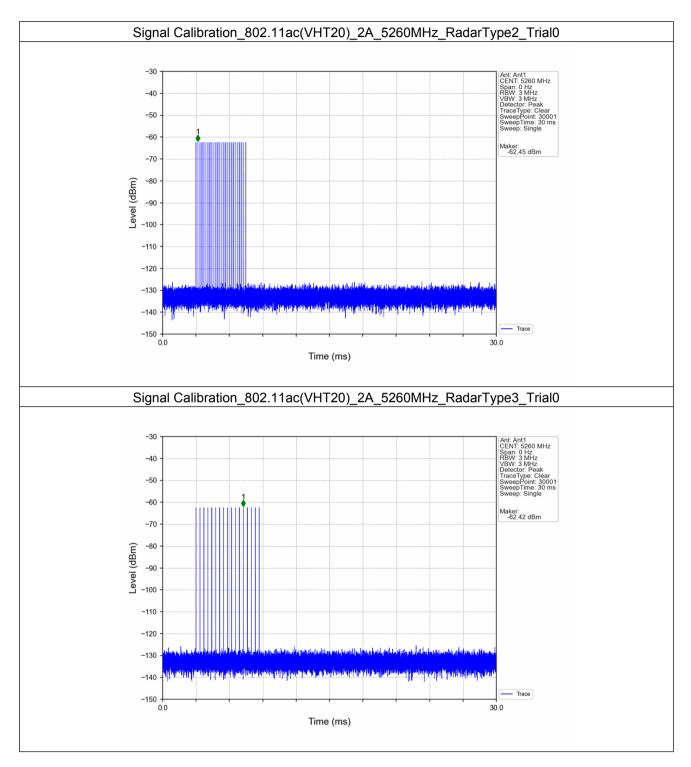
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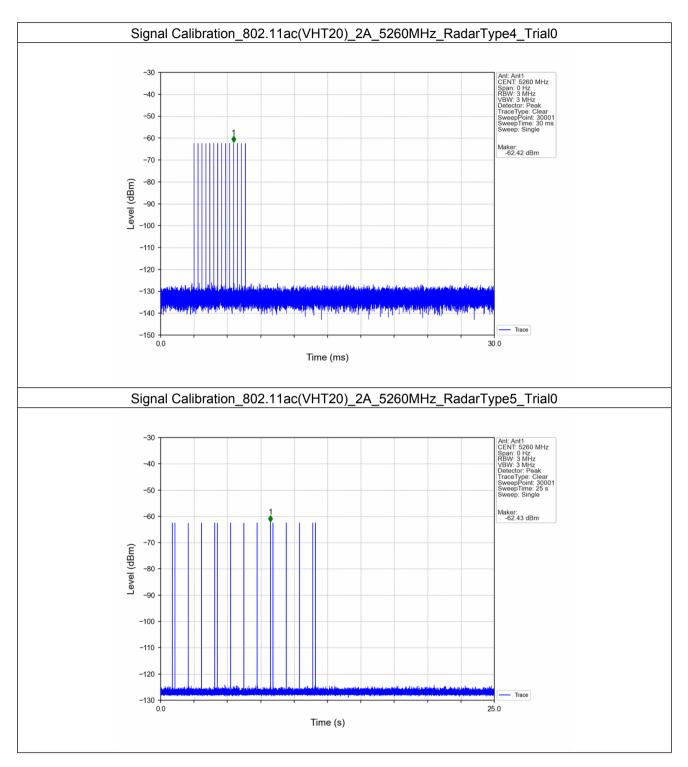
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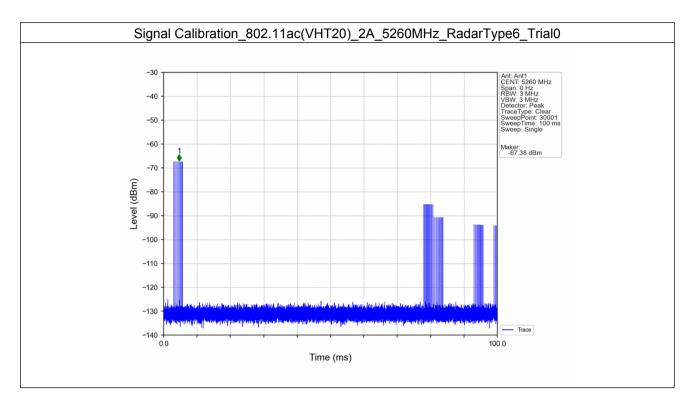
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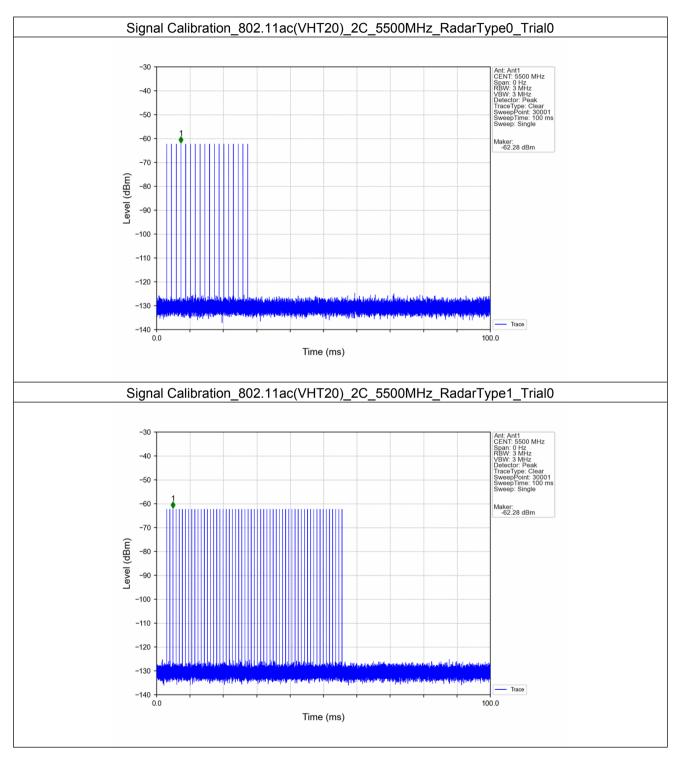
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1.2.2 SC



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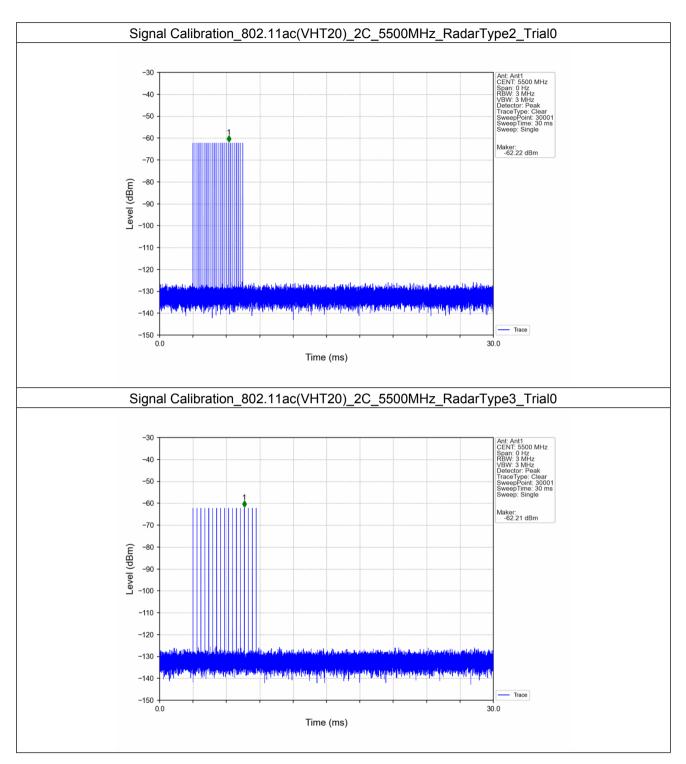
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C Laboratory.

Guangzhou

Report No.: GZCR240800092304 Page: 24 of 35



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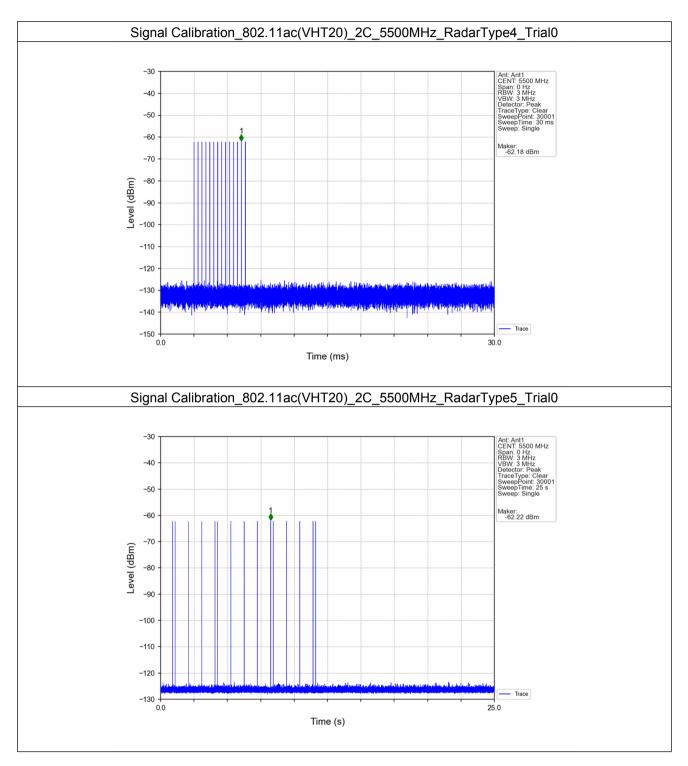
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Report No.: GZCR240800092304 Page: 25 of 35



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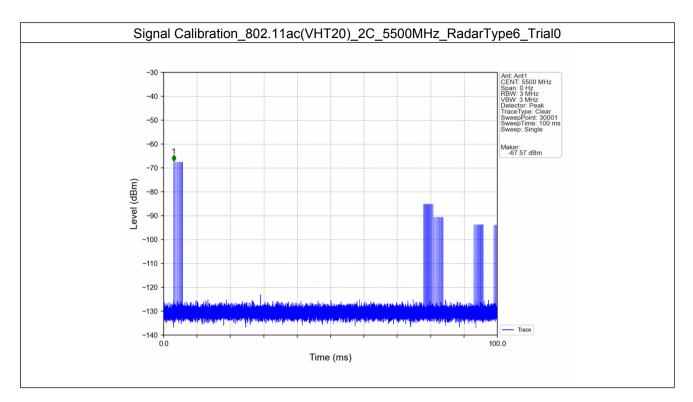
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Report No.: GZCR240800092304 Page: 27 of 35

2. Channel Loading (Payload)

2.1 Test Result

2.1.1 Payload

Band: 2A						
Mode	Bandwidth	Frequency (MHz)	Channel Loading (Payload) (%)		Vardiat	
	(MHz)		Result	Limit	Verdict	
802.11ac (VHT20)	20	5260	35.69	>=17	Pass	

2.1.2 Payload

Band: 2C						
Mode	Bandwidth Fi (MHz)	Frequency	Channel Loading (Payload) (%)		Vordiat	
		(MHz)	Result	Limit	Verdict	
802.11ac (VHT20)	20	5500	34.97	>=17	Pass	



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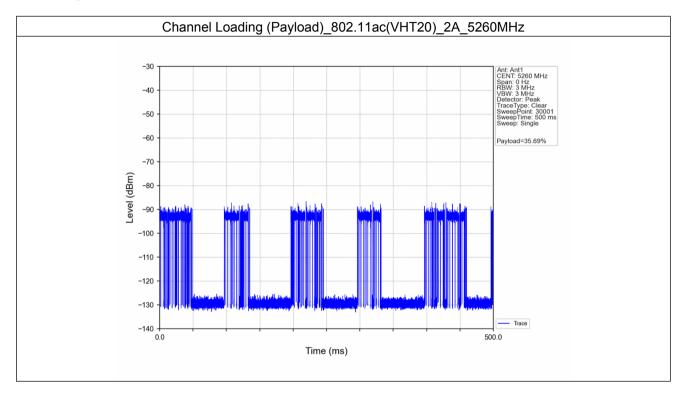
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2.2 Test Graph

2.2.1 Payload





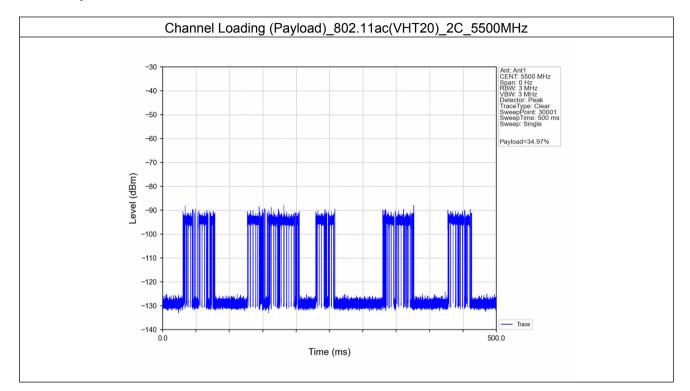
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2.2.2 Payload





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Report No.: GZCR240800092304 Page: 30 of 35

3. Channel Move Time and Closing Transmission Time

3.1 Test Result

3.1.1 CMT CTT

Band: 2A						
Mode Bandwidth (MHz)	Bandwidth	Frequency	Channel Move Time and		Verdict	
	(MHz)	Result	Limit			
802.11ac (VHT20) 20			0.508 s	<=10 s	Pass	
	20	5000	Closing Trans	smission Time	Vardiat	
	20	20 5260	Result	Limit	Verdict	
			152.500 ms	<=60 ms	Pass	

3.1.2 CMT_CTT

Band: 2C						
Mode Bandwidth (MHz)	Bandwidth	Frequency	Channel Move Time and		Verdict	
	(MHz)	Result	Limit			
802.11ac (VHT20) 20			0.684 s	<=10 s	Pass	
	20	5500	Closing Trans	smission Time	Vardiat	
	20 5500	Result	Limit	Verdict		
			152.500 ms	<=60 ms	Pass	



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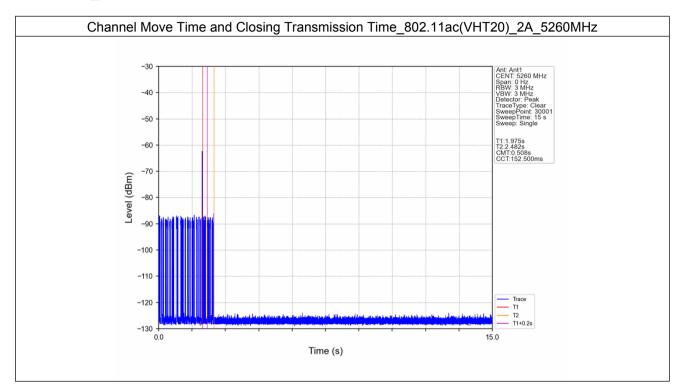
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3.2 Test Graph

3.2.1 CMT CTT





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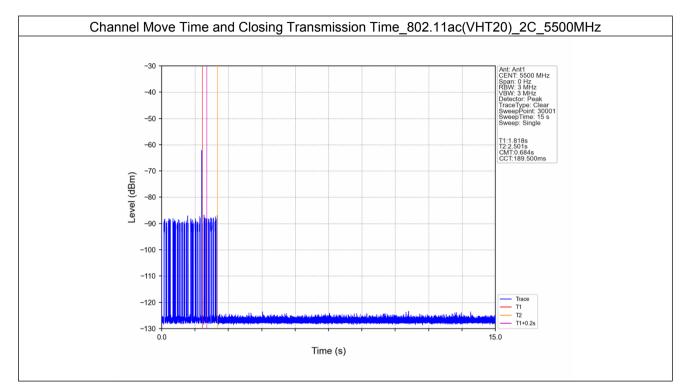
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3.2.2 CMT CTT





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Report No.: GZCR240800092304 Page: 33 of 35

4. Non-Occupancy Period

4.1 Test Result

4.1.1 Period

Band: 2A						
Mode	Bandwidth	Frequency (MHz)	Non-Occupancy Period		Vardiat	
	(MHz)		Result	Limit	Verdict	
802.11ac (VHT20)	20	5260	1800 s	>=1800 s	Pass	

4.1.2 Period

Band: 2C						
Mode	Bandwidth	Frequency	Non-Occupancy Period		Vardiat	
	(MHz)	(MHz)	Result	Limit	Verdict	
802.11ac (VHT20)	20	5500	1800 s	>=1800 s	Pass	



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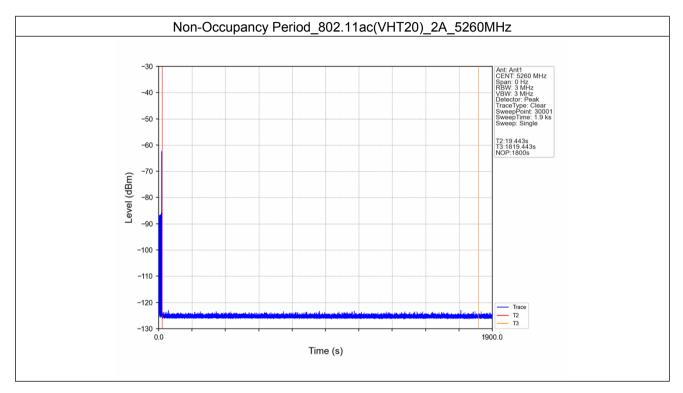


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4.2 Test Graph

4.2.1 Period





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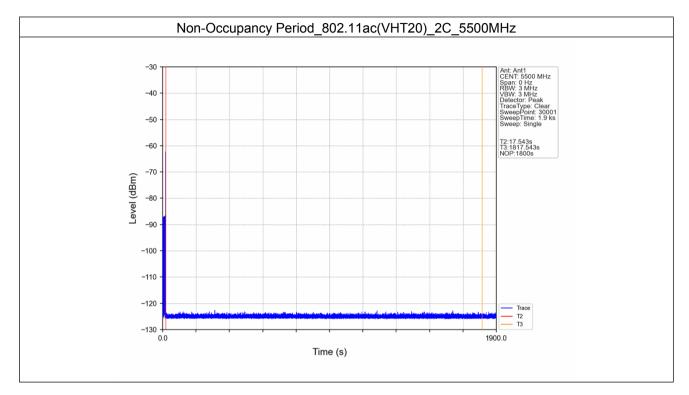
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4.2.2 Period



- End of the Report -



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