

Report No.: GZCR210802080402

Page: 1 of 183 FCC ID: 2AOHHEB5

TEST REPORT

Application No.: GZCR2108020804AT

Applicant: Thundercomm Technology Co.,Ltd

Address of Applicant: Building 4, No. 99, Data Valley Middle Road, Xiantao District, Yubei District,

Chongging, China.

Manufacturer: Thundercomm Technology Co.,Ltd

Address of Manufacturer: Building 4, No. 99, Middle Road, Xiantao Data, Yubei District, Chongging

Factory: ZEGNA DAIDONG LIMITED CORPORATION

Address of Factory: No. 41 Gangjian Road, Changping Town, Dongguan City, Guangdong

Province, China.

Equipment Under Test (EUT):

EUT Name: EB5 Edge Al Box

Model No.: EB5

Standard(s): 47 CFR Part 15, Subpart C 15.247

Date of Receipt: 2021-08-02

Date of Test: 2021-08-02 to 2021-08-13

Date of Issue: 2021-08-26

Test Result: Pass*

Kobe Jian EMC Laboratory Manager

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



Report No.: GZCR210802080402

Page: 2 of 183

	Revision Record							
Version	Version Chapter Date Modifier Remark							
01		2021-08-27		Original				

Authorized for issue by		
	Coly knong	
	Lily Kuang/Project Engineer	
	Riday Liu	
	Ricky Liu/Reviewer	



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Report No.: GZCR210802080402

Page: 3 of 183

2 Test Summary

Radio Spectrum Technical Requirement						
Item Standard Method Requirement Result						
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass		

Radio Spectrum Matter Part							
Item	Standard	Method	Requirement	Result			
Conducted Emissions at AC Power Line (150kHz-30MHz)		ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass			
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass			
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass			
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass			
Conducted Band Edges Measurement	47 CFR Part 15,	ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass			
Conducted Spurious Emissions	Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass			
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5 & 11.12.1	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			
Radiated Spurious Emissions (Below 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6 & 11.12.1	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass			
Radiated Spurious Emissions (Above 1GHz)		ANSI C63.10 (2013) Section 6.4,6.5,6.6 & 11.12.1	47 CFR Part 15, Subpart C 15.205 & 15.209	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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Report No.: GZCR210802080402

Page: 4 of 183

3 Contents

			Page
1	Cover	Page	1
_			_
2	Test S	Summary	3
3	Conte	nts	4
•	Conto		
4	Gener	al Information	ε
	4.1 C	Details of E.U.T	6
		Description of Support Units	
	4.3 N	Measurement Uncertainty	7
	4.4 T	Test Location	7
	4.5 T	est Facility	8
		Deviation from Standards	
	4.7 A	Abnormalities from Standard Conditions	8
5	Equip	ment List	g
6	Radio	Spectrum Technical Requirement	12
	6.1 A	Antenna Requirement	12
	6.1.1	Test Requirement:	12
	6.1.2	Conclusion	12
7	Radio	Spectrum Matter Test Results	13
		Conducted Emissions at AC Power Line (150kHz-30MHz)	
	7.1.1	E.U.T. Operation	
	7.1.2	Test Mode Description	
	7.1.2	Test Setup Diagram	
	7.1.4	Measurement Procedure and Data	
		Minimum 6dB Bandwidth	
	7.2.1	E.U.T. Operation	
	7.2.2	Test Mode Description	17
	7.2.3	Test Setup Diagram	17
	7.2.4	Measurement Procedure and Data	
		Conducted Peak Output Power	
	7.3.1	E.U.T. Operation	
		Test Mode Description	
	7.3.3	Test Setup Diagram	
	7.3.4	Measurement Procedure and Data	
	7.4 F 7.4.1	Power Spectrum Density	
	7.4.1 7.4.2	E.U.T. Operation Test Mode Description	
	7.4.2	Test Setup Diagram	
	7.4.3 7.4.4	Measurement Procedure and Data	
		Conducted Band Edges Measurement	
	7.5.1	E.U.T. Operation	
	7.5.2	Test Mode Description	
	7.5.3	Test Setup Diagram	
	7.5.4	Measurement Procedure and Data	



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Report No.: GZCR210802080402

Page: 5 of 183

7.8.4 7.9 R 7.9.1 7.9.2	Measurement Procedure and Data	55 55
'.9 R	adiated Spurious Emissions (Above 1GHz)	55
	Management Dragaders and Data	
7.8.3	Test Setup Diagram	52
7.8.2	·	
•		
7.7.2	·	
7.7.1		
'.7 R		
7.6.4		
_		
	7.6.1 7.6.2 7.6.3 7.6.4 7.7.1 7.7.2 7.7.3 7.7.4 7.8.1 7.8.1 7.8.2 7.8.3	7.6.2 Test Mode Description 7.6.3 Test Setup Diagram 7.6.4 Measurement Procedure and Data 7.7 Radiated Emissions which fall in the restricted bands 7.7.1 E.U.T. Operation 7.7.2 Test Mode Description 7.7.3 Test Setup Diagram 7.7.4 Measurement Procedure and Data 8 Radiated Spurious Emissions (Below 1GHz) 7.8.1 E.U.T. Operation 7.8.2 Test Mode Description 7.8.3 Test Setup Diagram



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Report No.: GZCR210802080402

Page: 6 of 183

4 General Information

4.1 Details of E.U.T.

Adapter

Model: HKA09019047-6U

Power supply: Input: AC 100-240V, 50/60Hz, 1.5A

Output: DC 19.0V, 4.74A, 90.06W AC 120V, 60Hz or AC 240V, 50Hz

Test voltage: Note: Both nominal AC 120V, 60Hz and AC 240 V, 50Hz are required for

testing in accordance with FCC KDB174176, this report only shows the

results of the worst test result(AC 120V, 60Hz);

Cable(s): DC cable:145cm with a ferrite core

AC cable:137cm unshielded

Internal source: More than 108MHz

802.11b: DSSS (CCK, DQPSK, DBPSK)

802.11g: OFDM (BPSK, QPSK, 16QAM, 64QAM)

Type of Modulation: 802.11n (HT20/HT40): OFDM (BPSK, QPSK, 16QAM, 64QAM)

802.11ax(HT20 and HT40): OFDM (BPSK, QPSK, 16QAM, 64QAM,

256QAM, 1024QAM)

Operating Frequency: 802.11b/g/n/ax(HT20): 2412MHz to 2462MHz

802.11n/ax(HT40): 2422MHz to 2452MHz

Channel Number: 802.11b/g/11n/ax(HT20): 11 Channels

802.11n/ax(HT40): 7 Channels

Channels Step: Channels with 5MHz step

Sample Type: Fixed devices

Antenna Type: Monopole antenna

Antenna1/Antenna2: 3.46dBi

Antenna Gain: Note: Two antennas can simultaneous transmission.

This Devices transmitting with Cyclic Delay Diversity (CDD).

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.			
The EUT has been tested as an independent unit.						



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Report No.: GZCR210802080402

Page: 7 of 183

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty	
Conducted Emissions at AC Power Line (150kHz- 30MHz)	±3.12dB	
Minimum 6dB Bandwidth	± 3%	
Conducted Peak Output Power	± 0.75dB	
Power Spectrum Density	± 2.84dB	
Conducted Band Edges Measurement	± 0.75dB	
Conducted Spurious Emissions	± 0.75dB	
Radiated Emissions which fall in the restricted bands	±5.08dB (1GHz-6GHz);±5.14dB(above 6GHz)	
Radiated Spurious Emissions (Below 1GHz)	±5.06dB (3m); ±4.46dB (10m)	
Radiated Spurious Emissions (Above 1GHz)	±5.08dB (1GHz-6GHz);±5.14dB(above 6GHz)	

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory, 198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.





Report No.: GZCR210802080402

Page: 8 of 183

4.5 Test Facility

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

• NVLAP (Lab Code: 200611-0)

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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.

CNAS (Lab Code: L0167)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

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.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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Report No.: GZCR210802080402

Page: 9 of 183

5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	N/A	N/A		
Two-Line V-Network	Rohde & Schwarz	ENV216	EMC0118	2021-01-08	2022-01-06		
Two-Line V-Network-GZ	Rohde & Schwarz	ENV216	EMC2135	2020-09-25	2021-09-24		
Coaxial Cable	HangTianXing	2m	EMC0107	2020-09-09	2022-09-08		
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A		
EMI Test Receiver(9kHz-3.6GHz)	Rohde & Schwarz	ESR4	EMC2221	2021-06-01	2022-05-31		

Minimum 6dB Bandwidth						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01	

Conducted Peak Output Power						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2021-05-19	2022-05-18	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01	

Power Spectrum Density						
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date	
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16	
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14	
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A	
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01	



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Report No.: GZCR210802080402

Page: 10 of 183

Conducted Band Edges Measurement							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16		
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14		
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A		
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01		

Conducted Spurious Emissions							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16		
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14		
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A		
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01		

Equipment	Manufacturer	Model No	Model No Inventory No		Cal Due Date
EMI Test Receiver(20Hz- 26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna(1GHz- 18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent 8449B FMC0521		2021-01-08	2022-01-07	
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter	Mico-Tronics	BRM50716	EMC2168	2020-07-31	2021-07-30
(5150-5880)	IVIICO-TTOTIICS	DKIVIOU7 10	EIVIC2100	2021-07-29	2022-07-28
Horn Antenna(14- 40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2020-09-09	2021-09-08



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Report No.: GZCR210802080402

Page: 11 of 183

Radiated Spurious Emissions (Below 1GHz)							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08		
Trilog Broadband Antenna(25MHz-1GHz)- Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22		
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18		
Active Loop Antenna- RED	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26		
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19		
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A		
EMI Test Receiver(1Hz- 8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021/5/26	2022/5/25		

Radiated Spurious Emissions (Above 1GHz)							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020/9/9	2022/9/8		
Horn Antenna(1GHz- 18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24		
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07		
High Pass Filter (915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2021-01-08	2022-01-07		
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07		
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19		
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12		
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16		
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A		
Notch Filter	Mico Tropico	BRM50716	EMC2168	2020-07-31	2021-07-30		
(5150-5880)	Mico-Tronics	DI IUCIVIAO	EIVICZ 108	2021-07-29	2022-07-28		
Horn Antenna(14- 40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27		

General used equipment							
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date		
DMM	Fluke	73	EMC0006	2021-07-05	2022-07-05		
DMM	Fluke	73	EMC0007	2021-07-05	2022-07-05		



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Report No.: GZCR210802080402

Page: 12 of 183

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

15.203 Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna connector is a RP-SMA type that comply with Part15.203, the best case gain of the antenna1/antenna2/ is 3.46dBi.

Please refer to internal photos.



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Report No.: GZCR210802080402

Page: 13 of 183

7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207 Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Fraguency of amission/MU=)	Conducted limit(dBµV)				
Frequency of emission(MHz)	Quasi-peak	Average			
0.15-0.5	66 to 56*	56 to 46*			
0.5-5	56	46			
5-30 60 50					
*Decreases with the logarithm of the frequency.					
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz					

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C Humidity: 61.4 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Mode Final test Code

Description

Final test 01

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.



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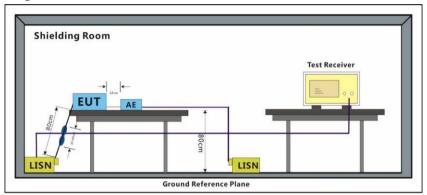
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Report No.: GZCR210802080402

Page: 14 of 183

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50µH + 50hm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: Measured Level=Read Level+ Cable Loss+ LISN Factor



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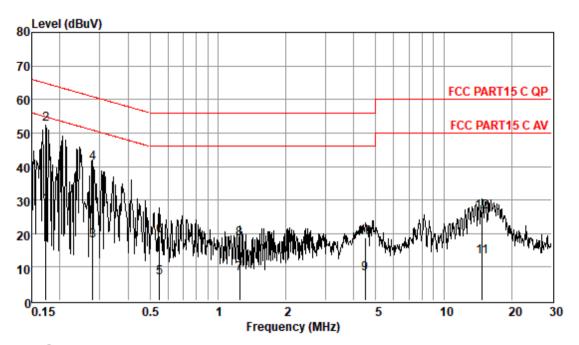
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Report No.: GZCR210802080402

Page: 15 of 183

Test Mode: 01; Line: Live line;



Pol :LINE Mode : Model :

Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.47	40.07	0.00	0.60	20.65	F4 04	26.46	
0.17	18.97	0.06	9.62	28.65	54.81	-26.16	Average
0.17	43.00	0.06	9.62	52.68	64.81	-12.13	QP
0.28	8.29	0.06	9.62	17.97	50.85	-32.88	Average
0.28	31.47	0.06	9.62	41.15	60.85	-19.70	QP
0.55	-2.72	0.07	9.63	6.98	46.00	-39.02	Average
0.55	9.75	0.07	9.63	19.45	56.00	-36.55	QP
1.25	-1.58	0.09	9.61	8.12	46.00	-37.88	Average
1.25	8.73	0.09	9.61	18.43	56.00	-37.57	QP
4.48	-1.72	0.17	9.64	8.09	46.00	-37.91	Average
4.48	9.01	0.17	9.64	18.82	56.00	-37.18	QP
14.75	2.94	0.31	9.74	12.99	50.00	-37.01	Average
14.75	16.52	0.31	9.74	26.57	60.00	-33.43	QP



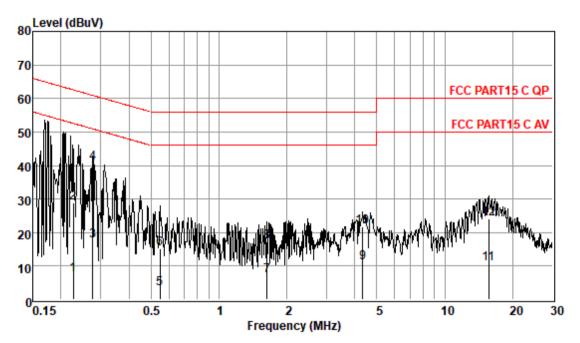
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Report No.: GZCR210802080402

Page: 16 of 183

Test Mode: 01; Line: Neutral Line;



Pol :NEUTRAL

Mode : Model :

Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.23	-2.27	0.06	9.55	7.34	52.57	-45.23	Average
0.23	19.17	0.06	9.55	28.78	62.57	-33.79	QP
0.28	7.95	0.06	9.54	17.55	50.94	-33.39	Average
0.28	31.15	0.06	9.54	40.75	60.94	-20.19	QP
0.55	-6.19	0.07	9.54	3.42	46.00	-42.58	Average
0.55	5.67	0.07	9.54	15.28	56.00	-40.72	QP
1.64	-2.66	0.10	9.55	6.99	46.00	-39.01	Average
1.64	7.46	0.10	9.55	17.11	56.00	-38.89	QP
4.34	1.15	0.17	9.56	10.88	46.00	-35.12	Average
4.34	11.95	0.17	9.56	21.68	56.00	-34.32	QP
15.63	0.67	0.32	9.64	10.63	50.00	-39.37	Average
15.63	14.19	0.32	9.64	24.15	60.00	-35.85	QP



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Page: 17 of 183

7.2 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)
Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit: ≥500 kHz

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24.7 °C Humidity: 46.3 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Mode Final test Code

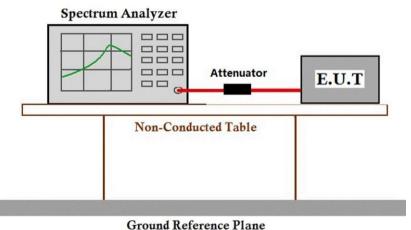
01

Description

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.

7.2.3 Test Setup Diagram

Final test



Ground Reference F12

7.2.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR210802080402

Page: 18 of 183

7.3 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method: ANSI C63.10 (2013) Section 11.9.1.3

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
	1 for ≥50 hopping channels
902-928	0.25 for 25≤ hopping channels <50
	1 for digital modulation
	1 for ≥75 non-overlapping hopping channels
2400-2483.5	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 24.7 °C Humidity: 46.3 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Mode Final test Code

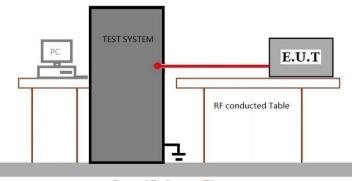
01

Description

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.

7.3.3 Test Setup Diagram

Final test



Ground Reference Plane



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Page: 19 of 183

7.3.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR210802080402

Page: 20 of 183

7.4 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)
Test Method: ANSI C63.10 (2013) Section 11.10.2

Limit: ≤8dBm in any 3 kHz band during any time interval of continuous

transmission

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 24.7 °C Humidity: 46.3 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

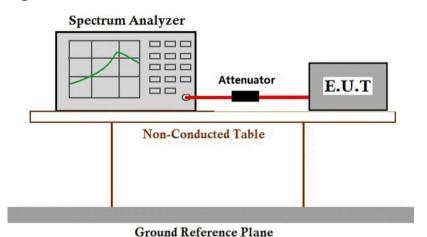
Pre-scan / Mode Final test Code

Description

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.

Final test 01

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR210802080402

Page: 21 of 183

7.5 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 11.13.3.2

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 24.7 °C Humidity: 46.3 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

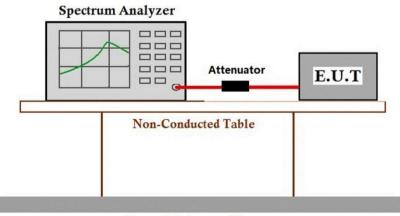
Pre-scan / Mode Final test Code

Description

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.

Final test 01

7.5.3 Test Setup Diagram



Ground Reference Plane



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Report No.: GZCR210802080402

Page: 22 of 183

7.5.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR210802080402

Page: 23 of 183

7.6 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)
Test Method: ANSI C63.10 (2013) Section 11.11

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 24.7 °C Humidity: 46.3 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Mode Final test Code

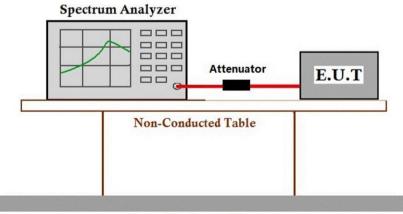
01

Description

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.

Final test

7.6.3 Test Setup Diagram



Ground Reference Plane



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Report No.: GZCR210802080402

Page: 24 of 183

7.6.4 Measurement Procedure and Data

cable loss=0.9dB

Please Refer to Appendix for Details



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Report No.: GZCR210802080402

Page: 25 of 183

7.7 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 21.5 °C Humidity: 54.2 % RH Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Mode Final test Code

Description

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.

Final test 01



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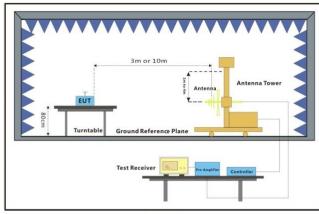
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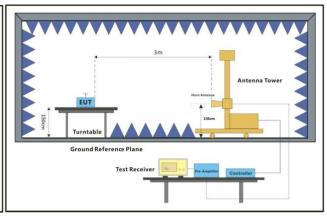


Report No.: GZCR210802080402

Page: 26 of 183

7.7.3 Test Setup Diagram





30MHz-1GHz Above 1GHz

7.7.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.
- Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Note: All average values corresponding to peaks are measured, only the frequency of the maximum average is recorded in the report;



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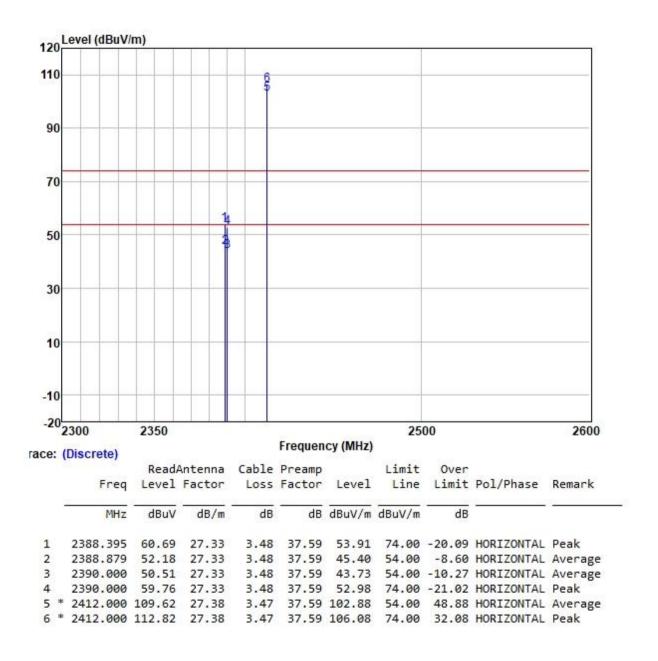
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Report No.: GZCR210802080402

Page: 27 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:Low





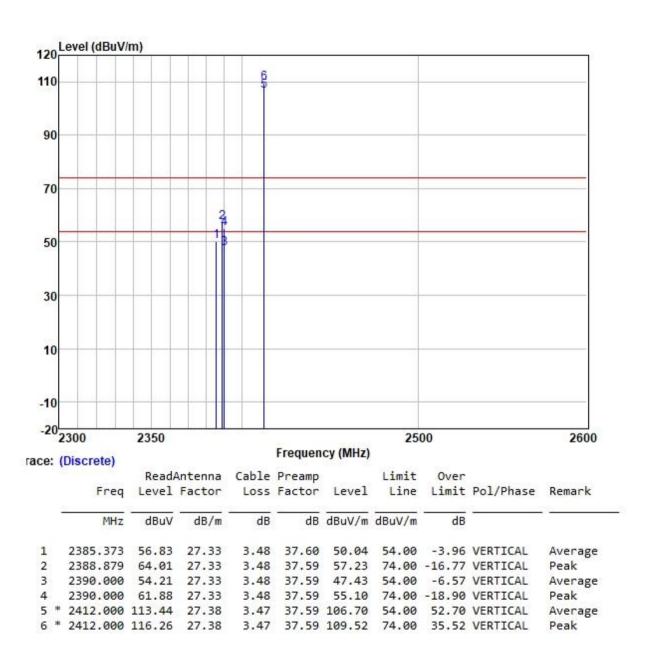
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Page: 28 of 183

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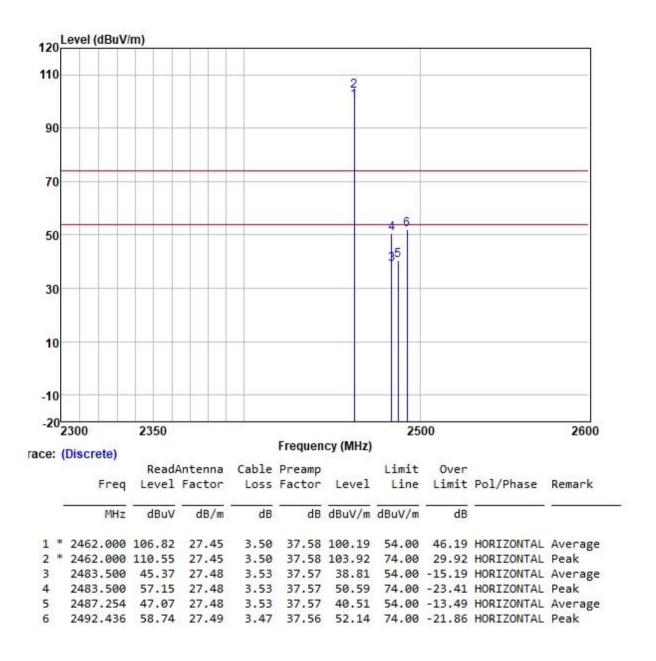
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Report No.: GZCR210802080402

Page: 29 of 183

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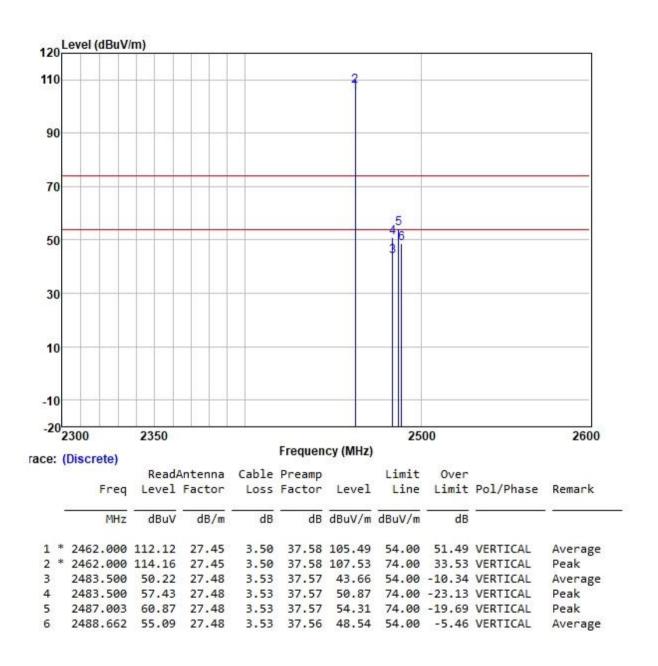
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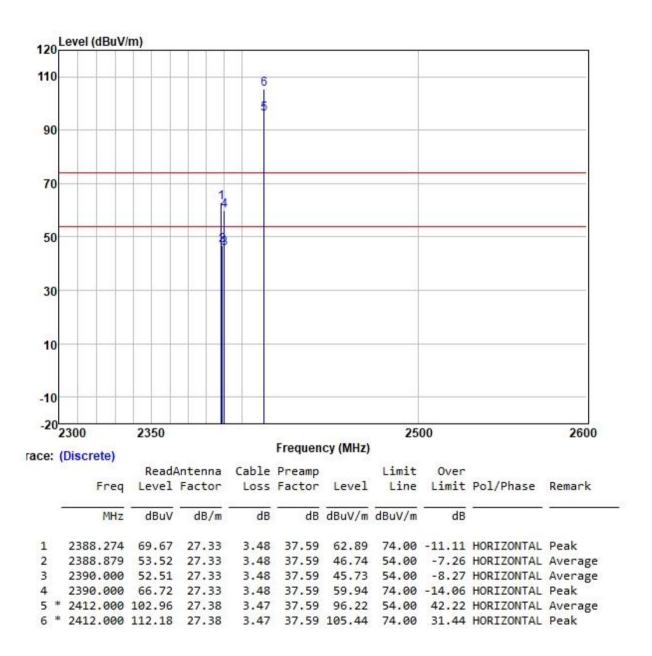
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Page: 31 of 183

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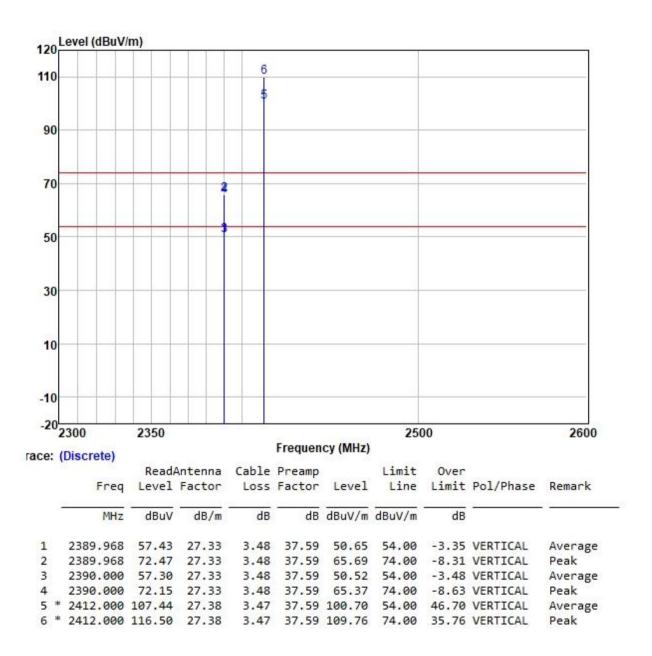
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Report No.: GZCR210802080402

Page: 32 of 183

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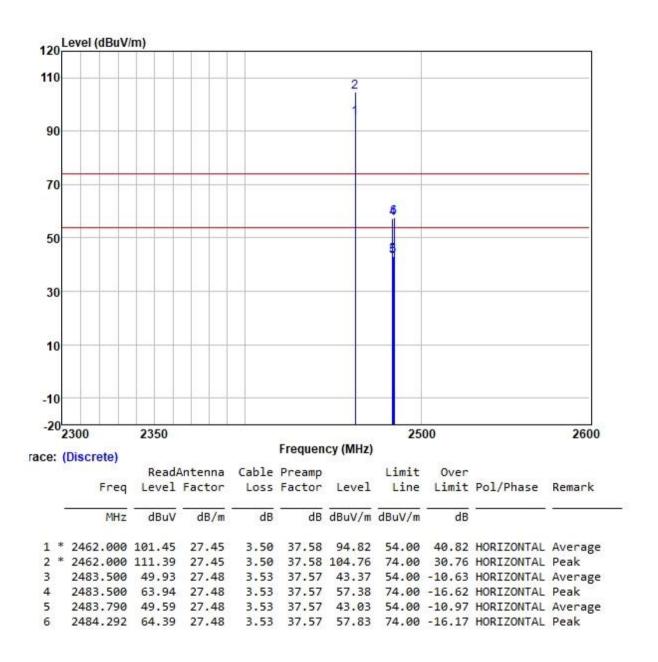
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Report No.: GZCR210802080402

Page: 33 of 183

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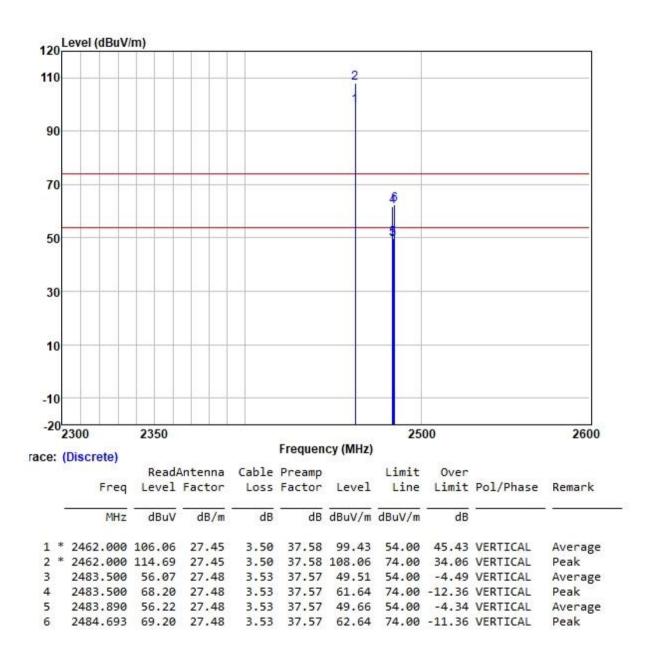
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Report No.: GZCR210802080402

Page: 34 of 183

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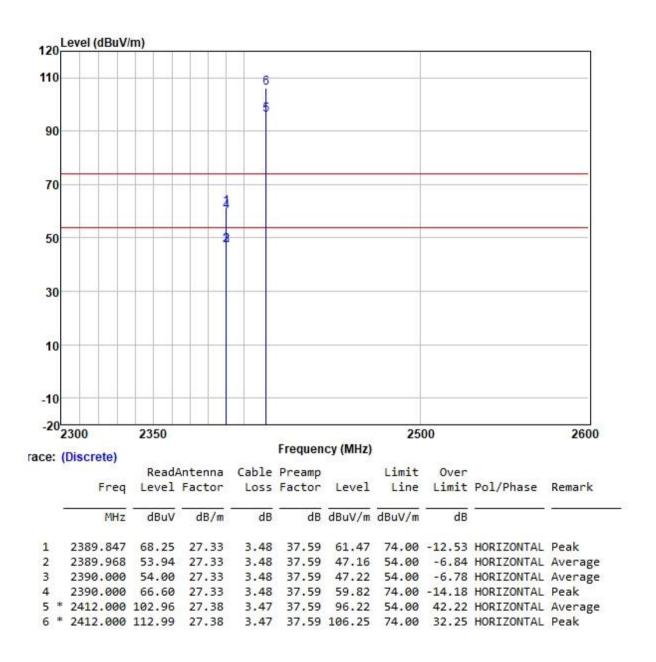
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Page: 35 of 183

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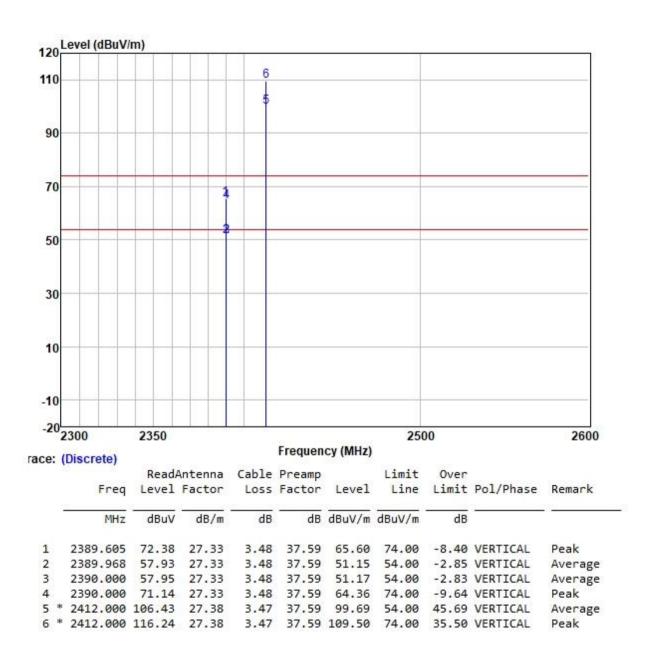
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Report No.: GZCR210802080402

Page: 36 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:Low





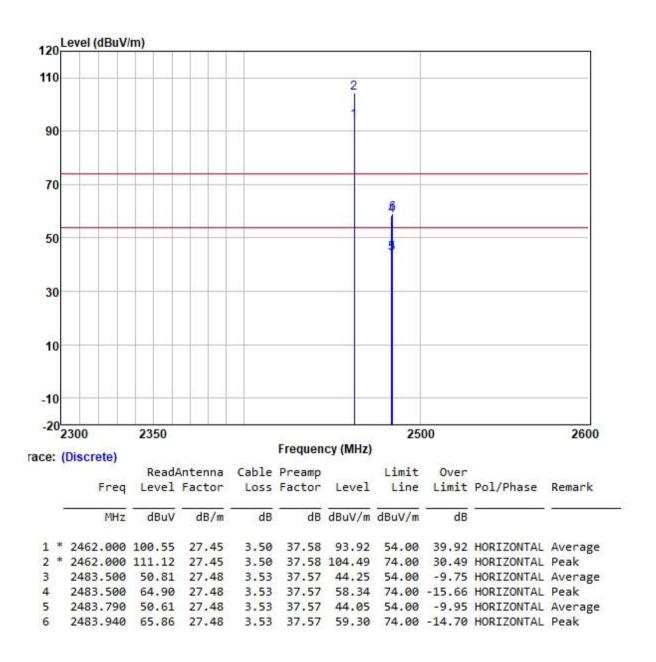
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Report No.: GZCR210802080402

Page: 37 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:High





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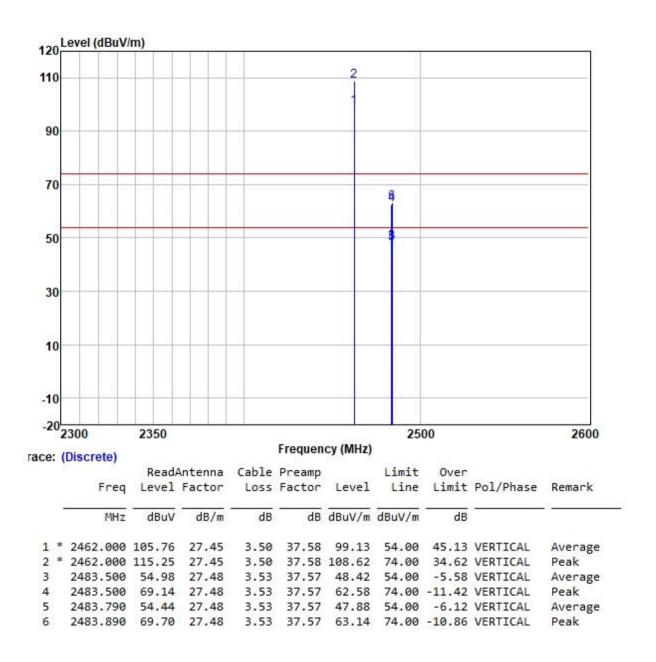
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Report No.: GZCR210802080402

Page: 38 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:High





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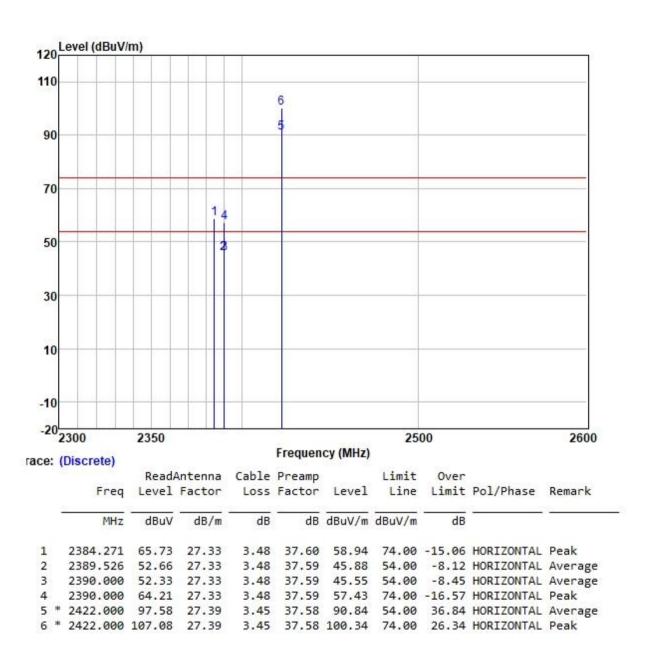
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Report No.: GZCR210802080402

Page: 39 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



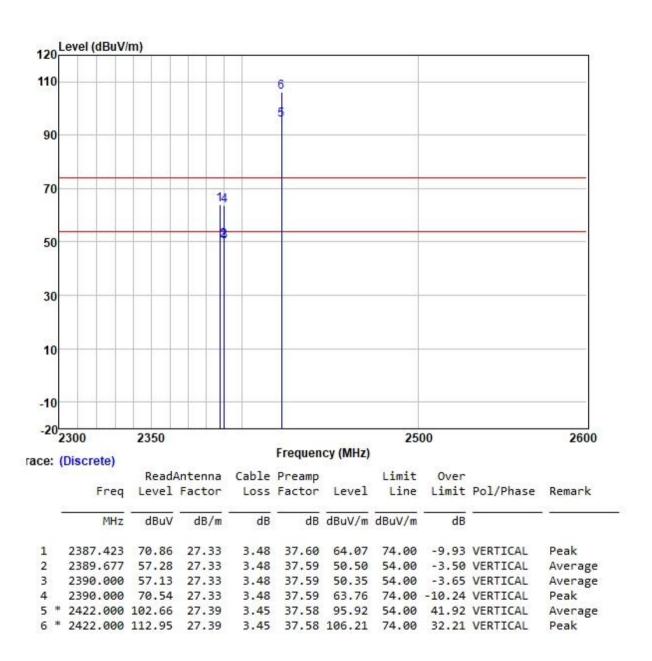




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Page: 40 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:Low





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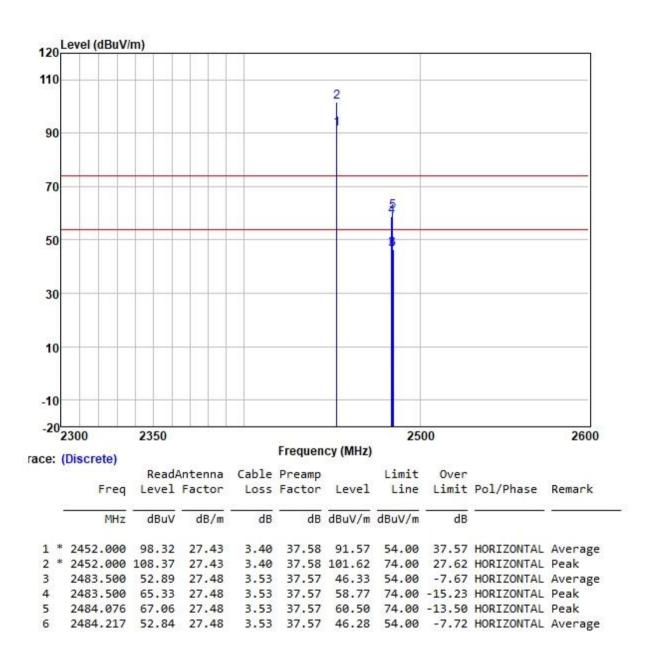
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Report No.: GZCR210802080402

Page: 41 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:High





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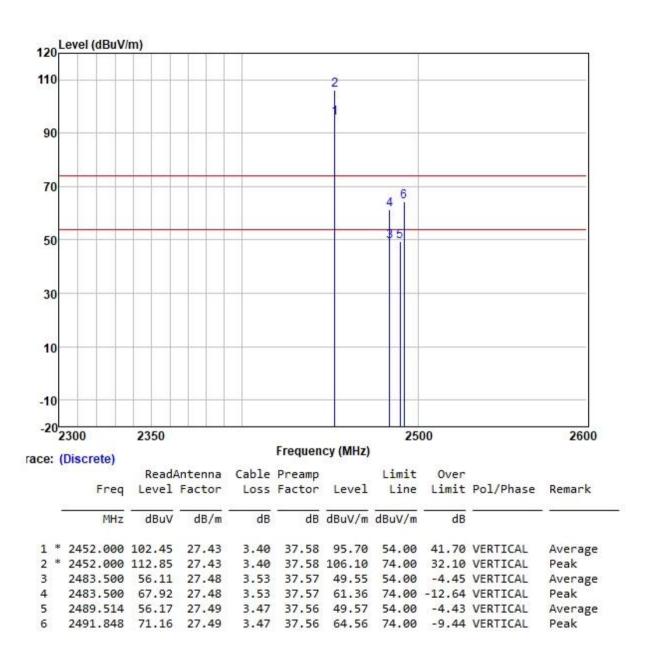
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Report No.: GZCR210802080402

Page: 42 of 183

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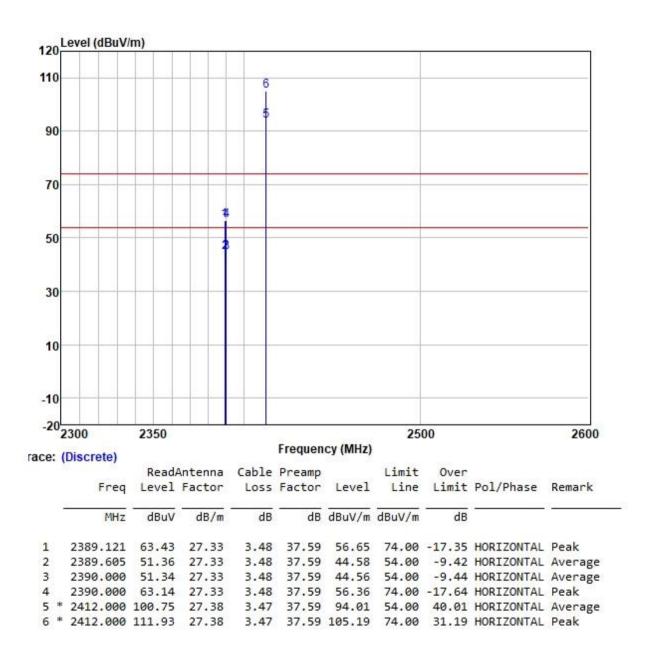
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Page: 43 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11ax; Bandwidth:20MHz; Channel:Low



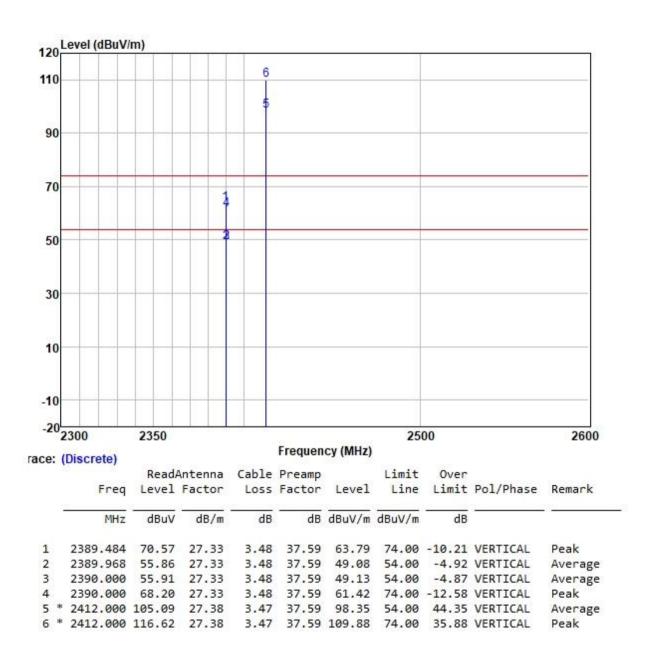




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Page: 44 of 183

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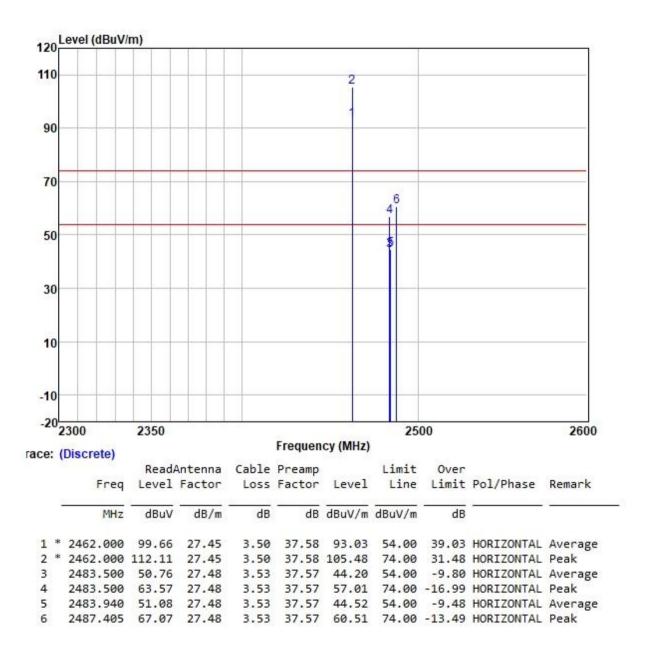
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Page: 45 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11ax; Bandwidth:20MHz; Channel:High





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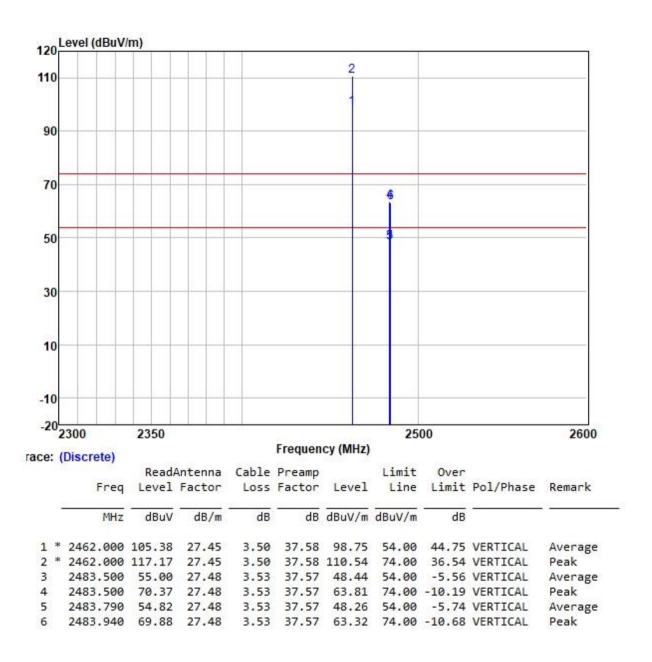
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Report No.: GZCR210802080402

Page: 46 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11ax; Bandwidth:20MHz; Channel:High



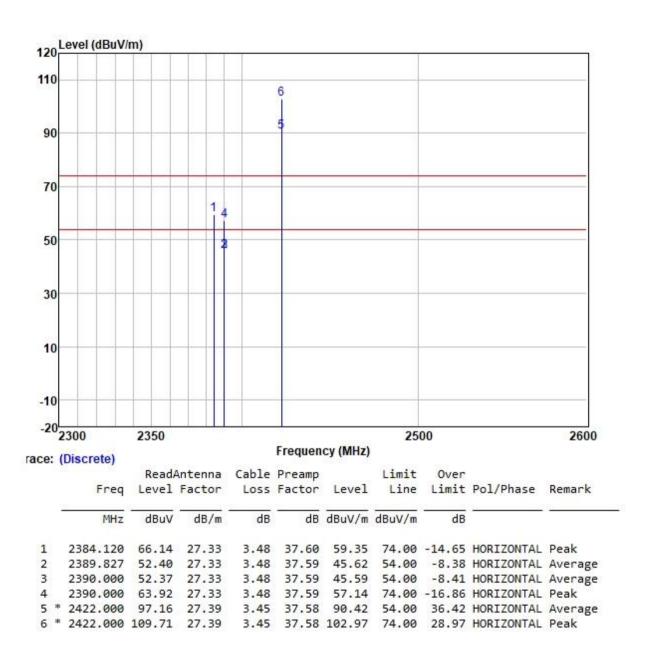




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Page: 47 of 183

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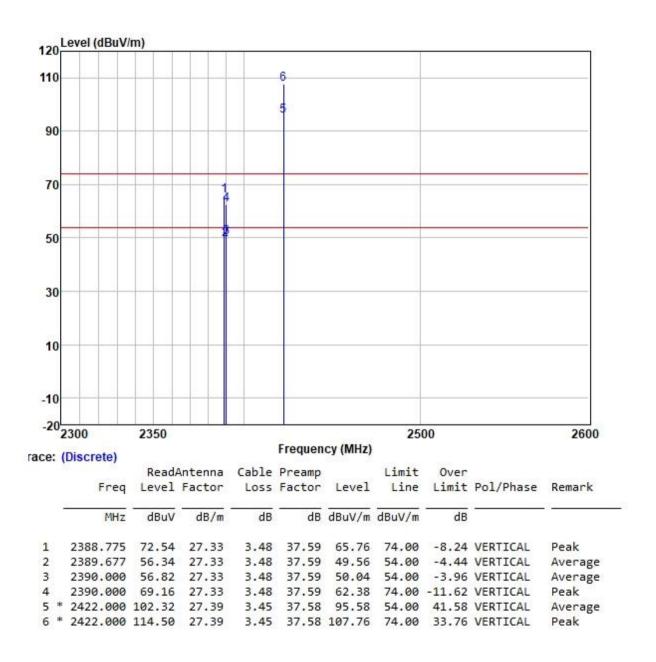
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Page: 48 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11ax; Bandwidth:40MHz; Channel:Low





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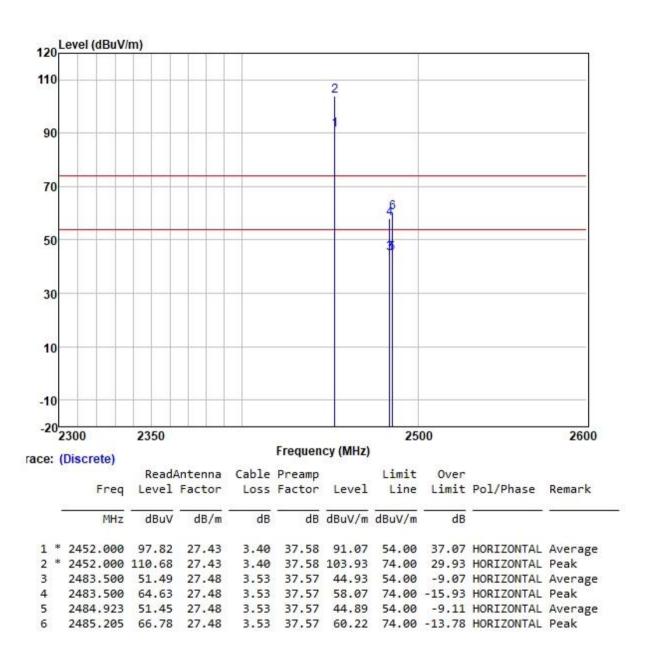
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Test Mode: 01; Polarity: Horizontal; Modulation:802.11ax; Bandwidth:40MHz; Channel:High



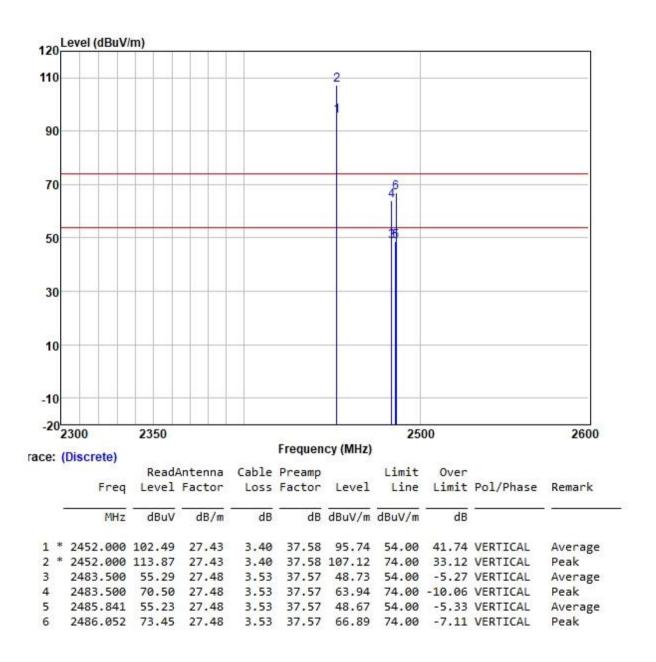




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Page: 50 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11ax; Bandwidth:40MHz; Channel:High





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Report No.: GZCR210802080402

Page: 51 of 183

7.8 Radiated Spurious Emissions (Below 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 25.8 °C Humidity: 63.2 % RH Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Mode Final test Code Description

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.

Final test 01



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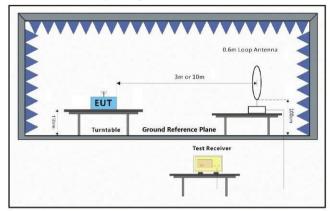
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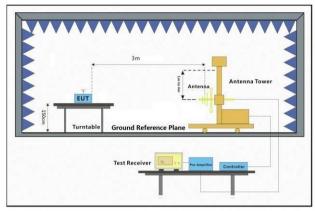


Report No.: GZCR210802080402

Page: 52 of 183

7.8.3 Test Setup Diagram





7.8.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

- 1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

3) Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.



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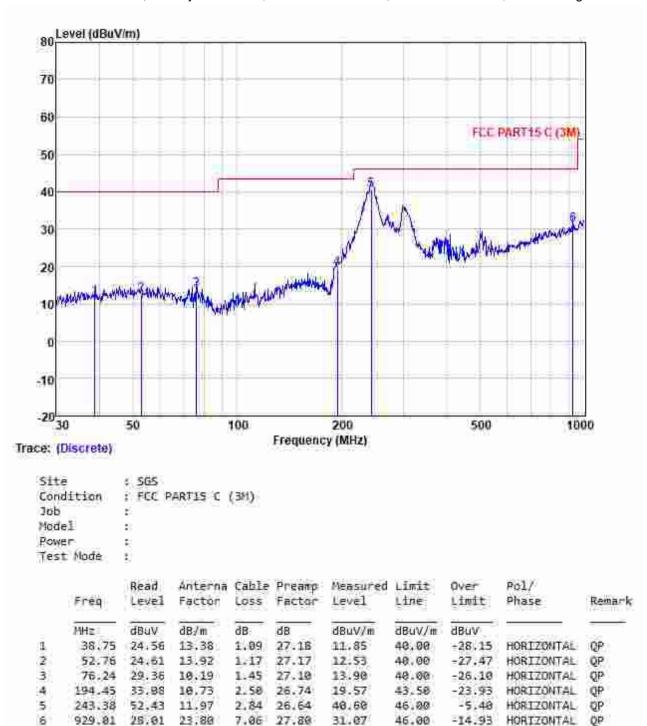
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Report No.: GZCR210802080402

Page: 53 of 183

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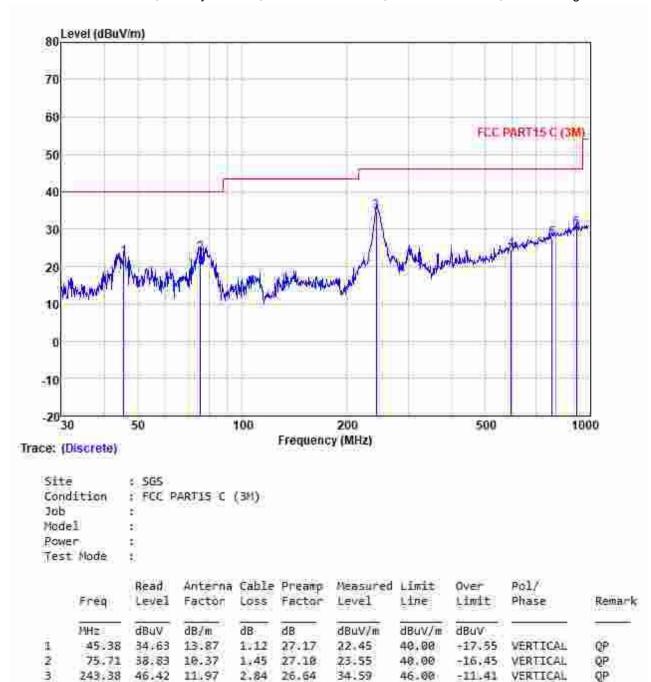
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Report No.: GZCR210802080402

Page: 54 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High





4

5

595,13

782.35

919.29

27,83

27.13

27.25

19.79

22,35

23,68

5.10

6.11

7.01

28.28

28.05

27.82

24.45

27.54

30.04

46.00

46.00

46.00

-21.57

-18.46

-15.96

VERTICAL

VERTICAL

VERTICAL

QP

QP

QP.



Report No.: GZCR210802080402

Page: 55 of 183

7.9 Radiated Spurious Emissions (Above 1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 21.5 °C Humidity: 54.2 % RH Atmospheric Pressure: 1010 mbar

7.9.2 Test Mode Description

Pre-scan / Mode Final test Code Description

TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20); data rate @ 13.5Mbps is the worst case of IEEE 802.11n(HT40); data rate @ 8Mbps is the worst case of IEEE 802.11ax(HE20); data rate@16Mbps is the worst case of IEEE 802.11ax(HE40). Only the data of worst case is recorded in the report.

Final test 01



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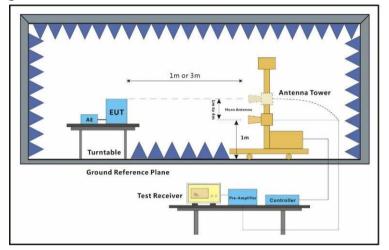
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Report No.: GZCR210802080402

Page: 56 of 183

7.9.3 Test Setup Diagram





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Report No.: GZCR210802080402

Page: 57 of 183

7.9.4 Measurement Procedure and Data

- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

- 2) Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) The field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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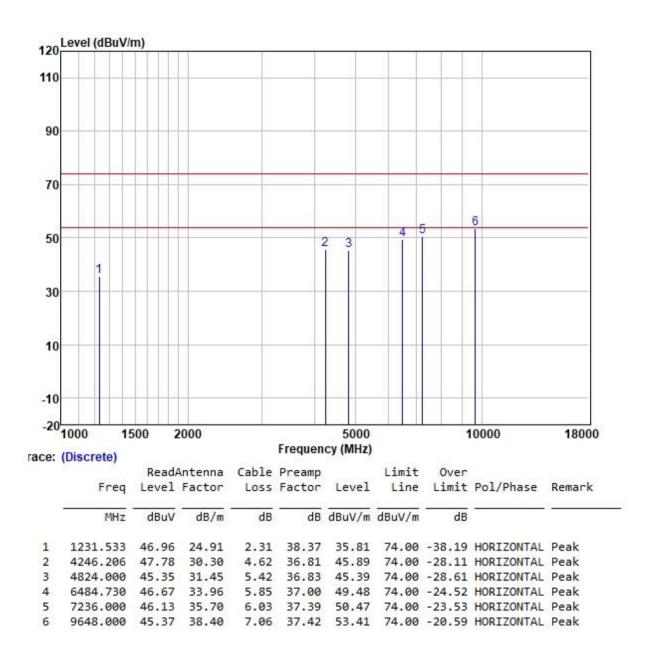
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Report No.: GZCR210802080402

Page: 58 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



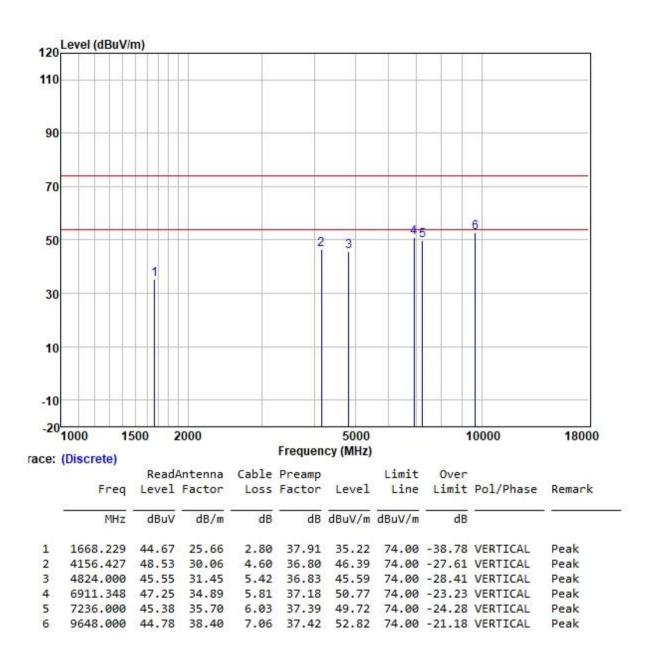




Report No.: GZCR210802080402

Page: 59 of 183

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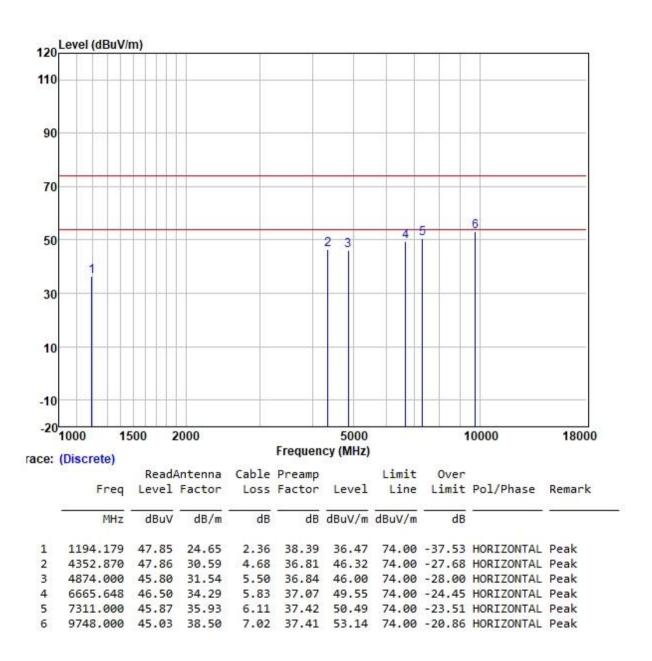
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Report No.: GZCR210802080402

Page: 60 of 183

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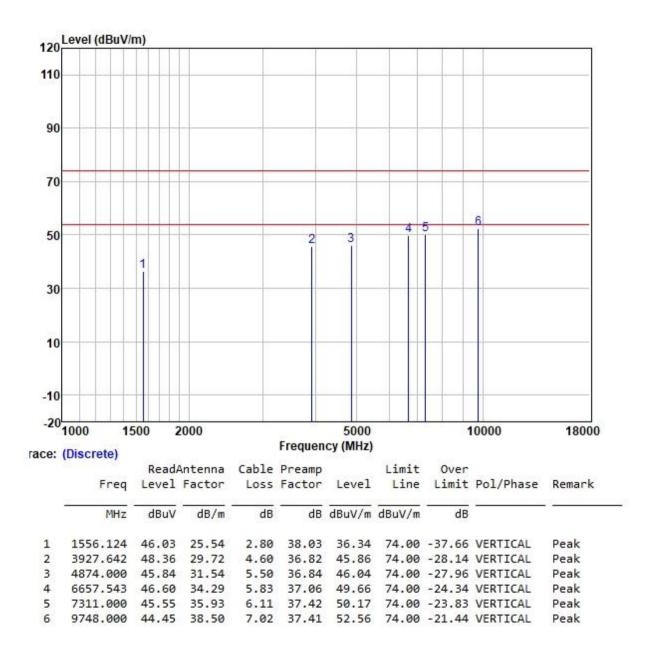
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Report No.: GZCR210802080402

Page: 61 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:middle



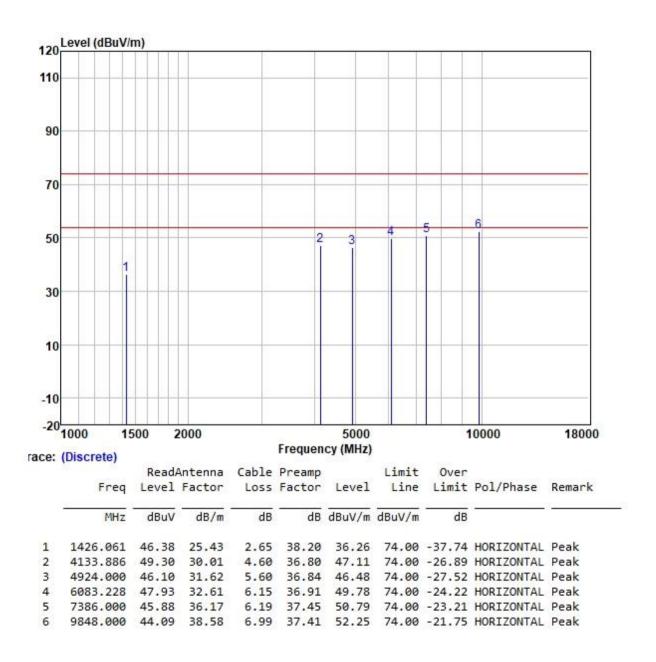




Report No.: GZCR210802080402

Page: 62 of 183

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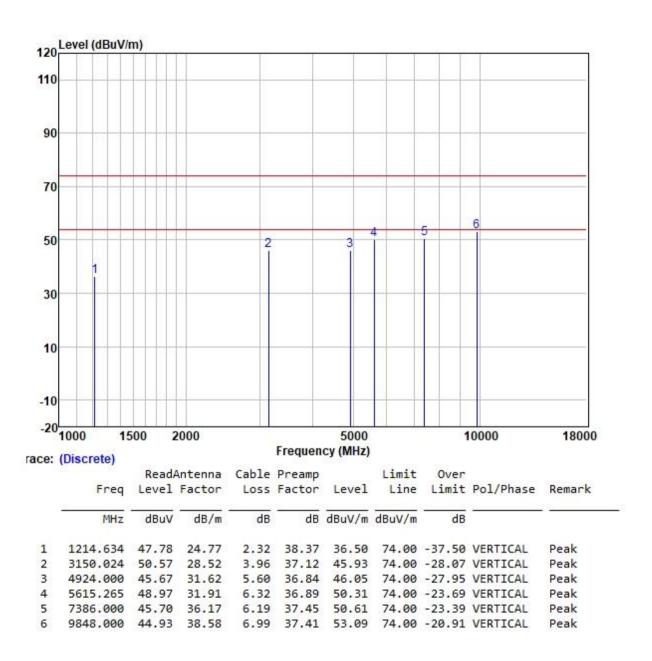
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Report No.: GZCR210802080402

Page: 63 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High



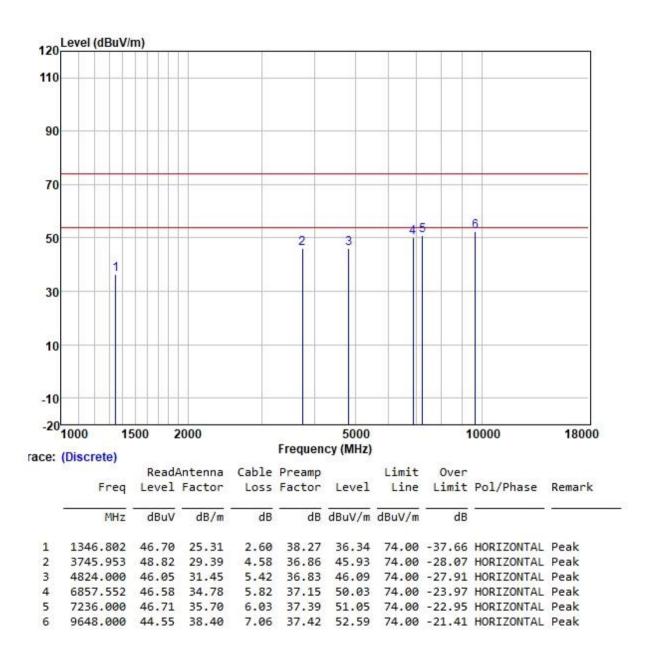




Report No.: GZCR210802080402

Page: 64 of 183

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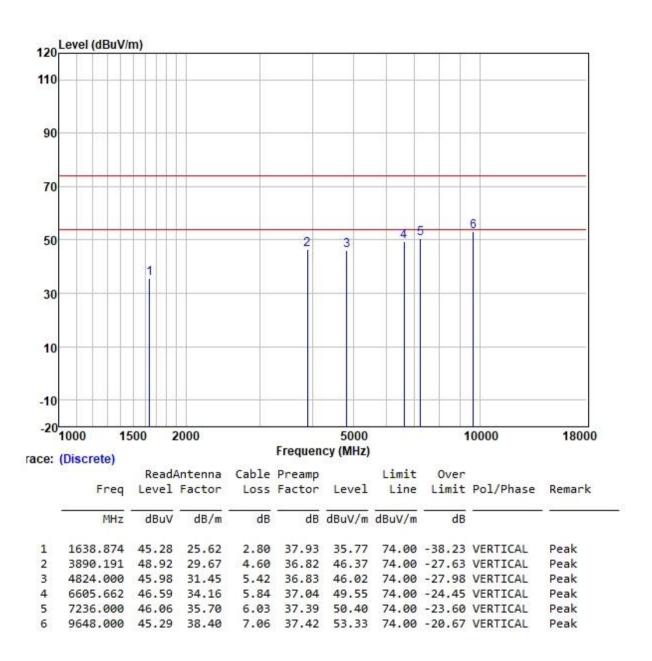




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Page: 65 of 183

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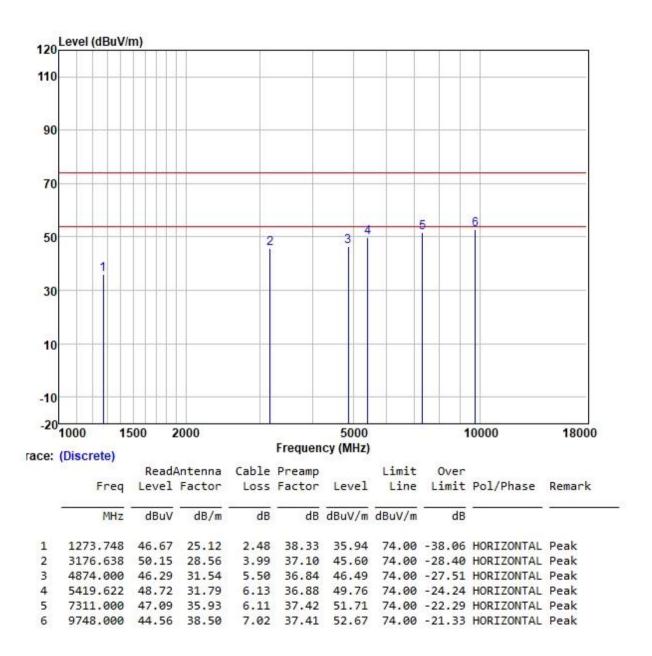
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Report No.: GZCR210802080402

Page: 66 of 183

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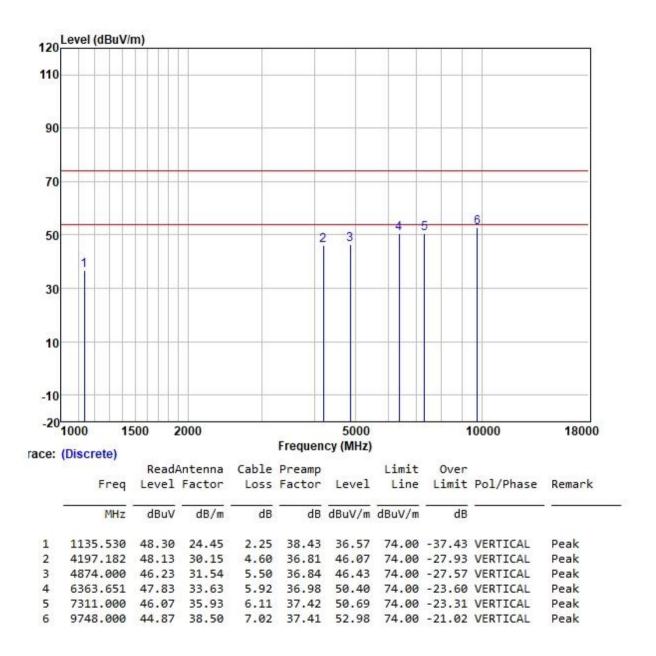
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Report No.: GZCR210802080402

Page: 67 of 183

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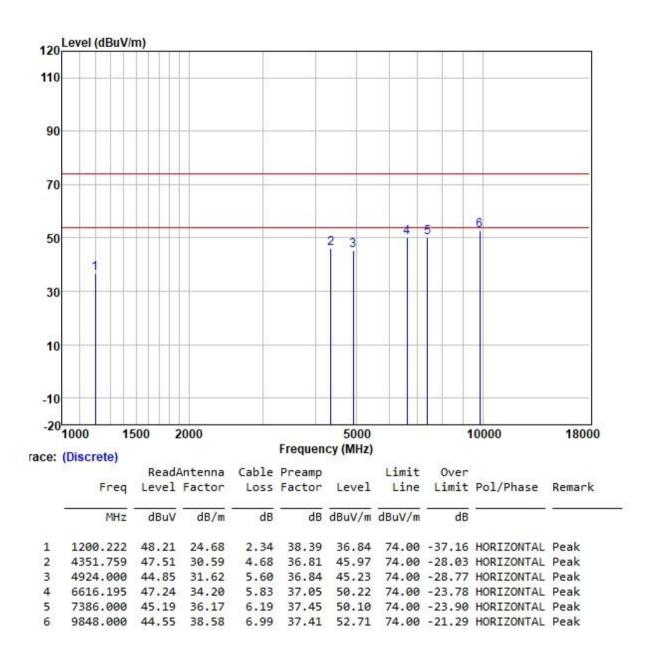
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Page: 68 of 183

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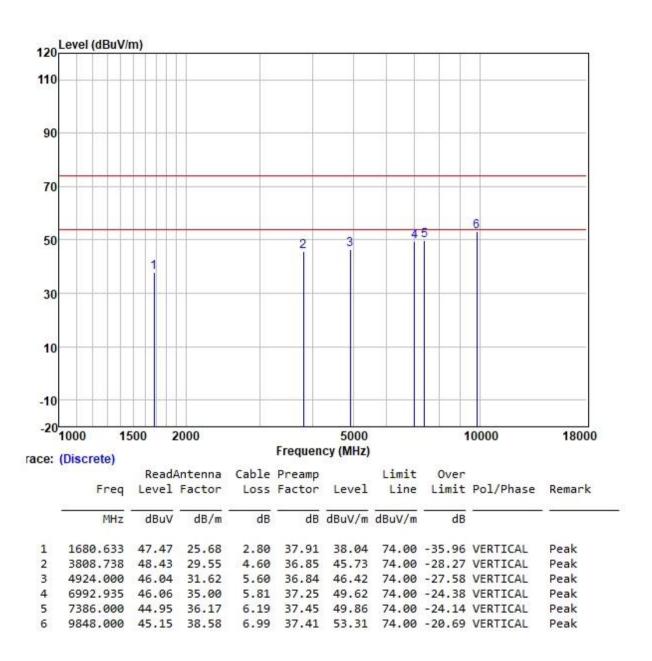
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Report No.: GZCR210802080402

Page: 69 of 183

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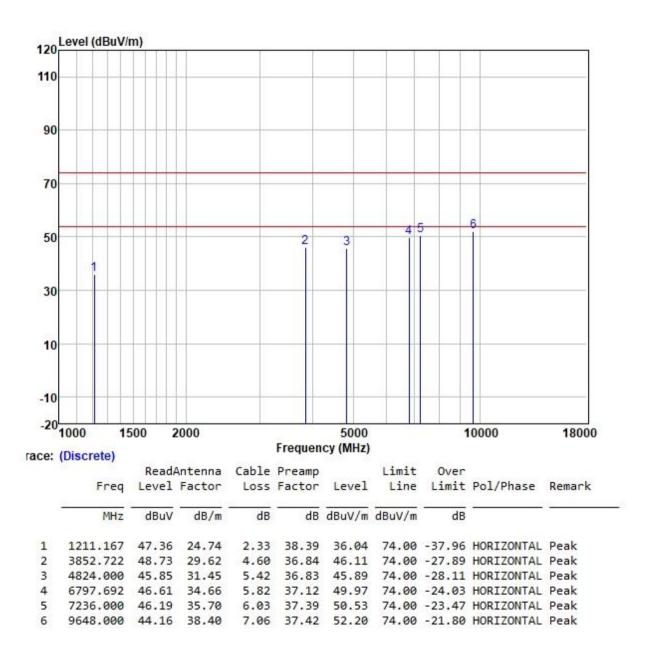
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Page: 70 of 183

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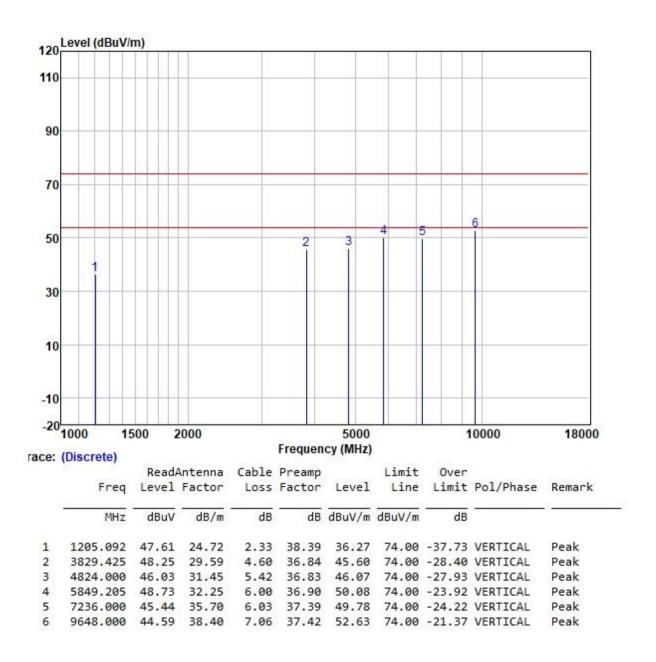
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Report No.: GZCR210802080402

Page: 71 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



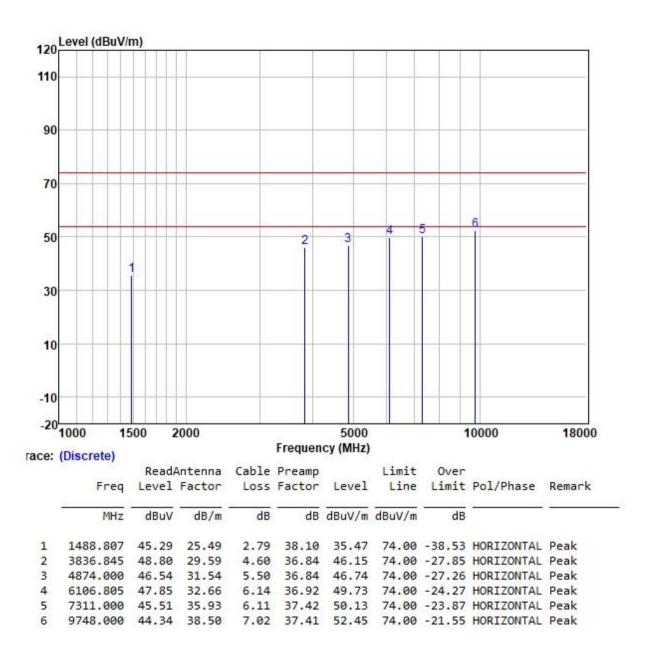




Report No.: GZCR210802080402

Page: 72 of 183

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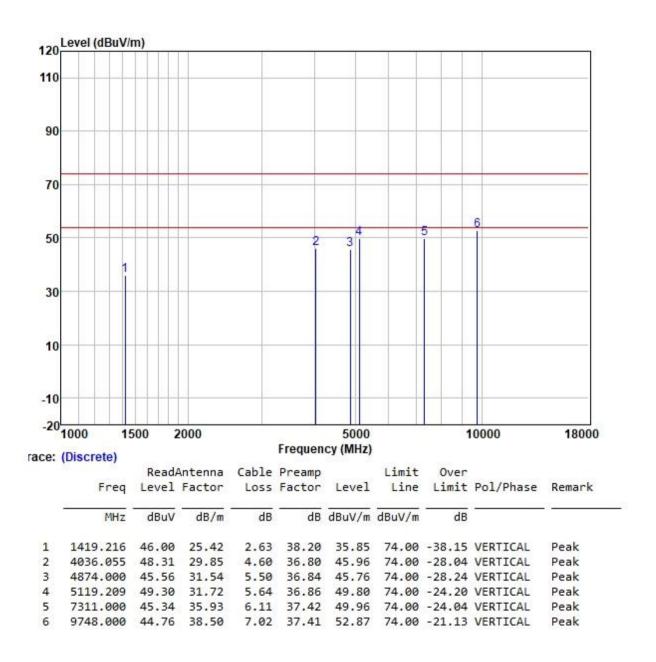
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Page: 73 of 183

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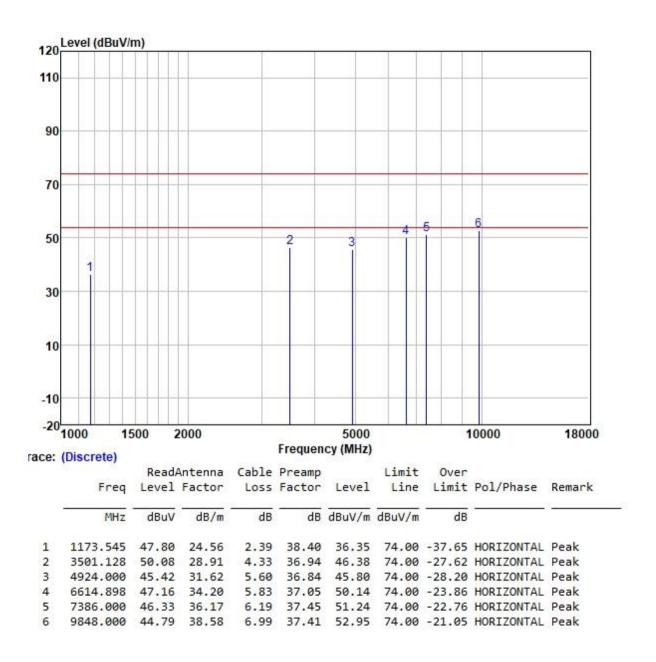
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Page: 74 of 183

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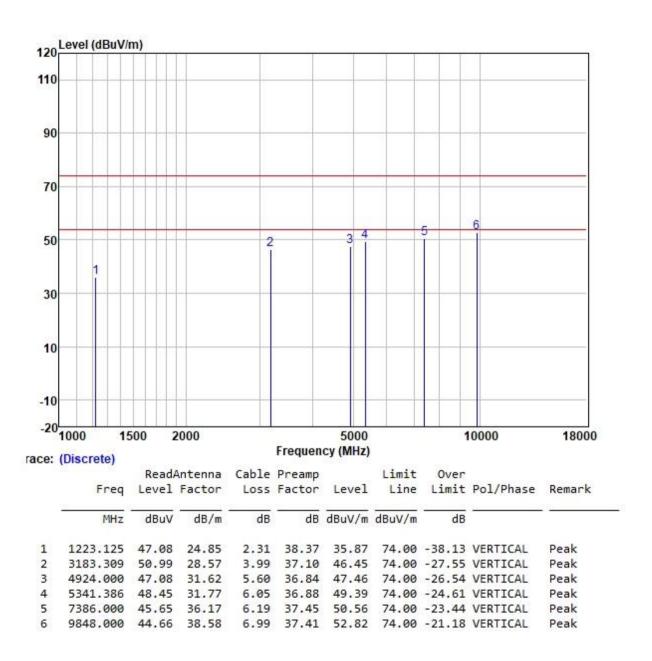
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Report No.: GZCR210802080402

Page: 75 of 183

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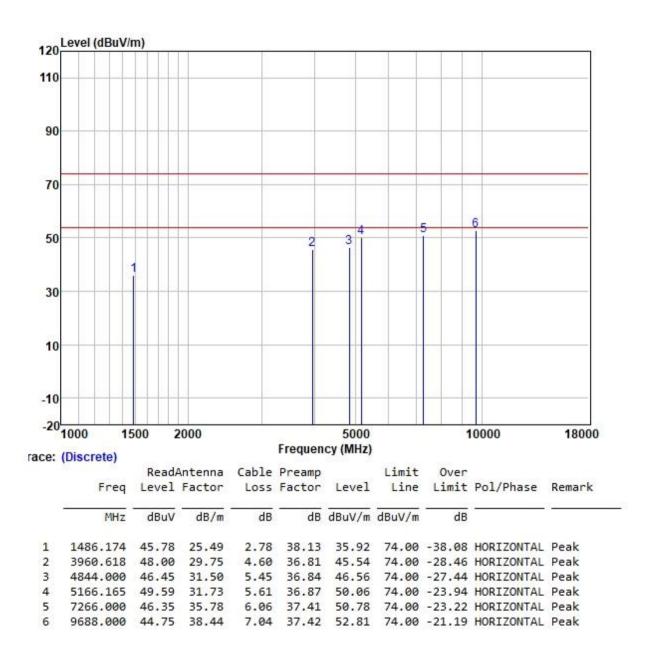
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Page: 76 of 183

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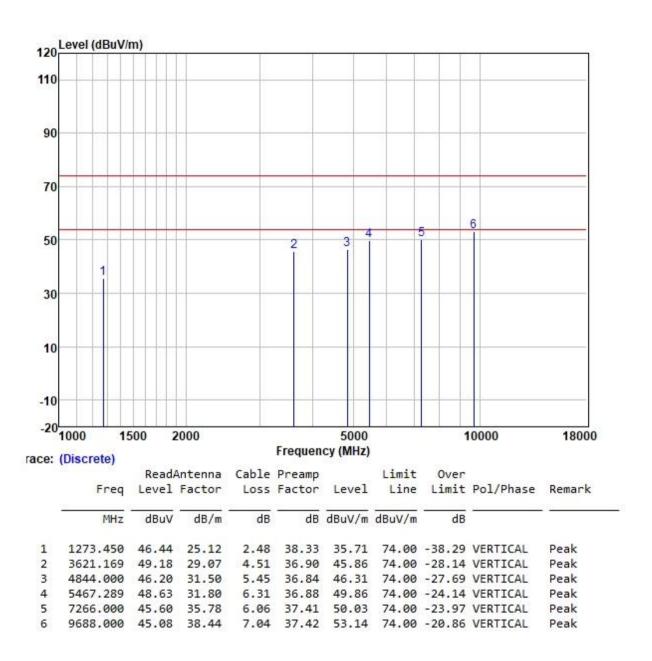
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Page: 77 of 183

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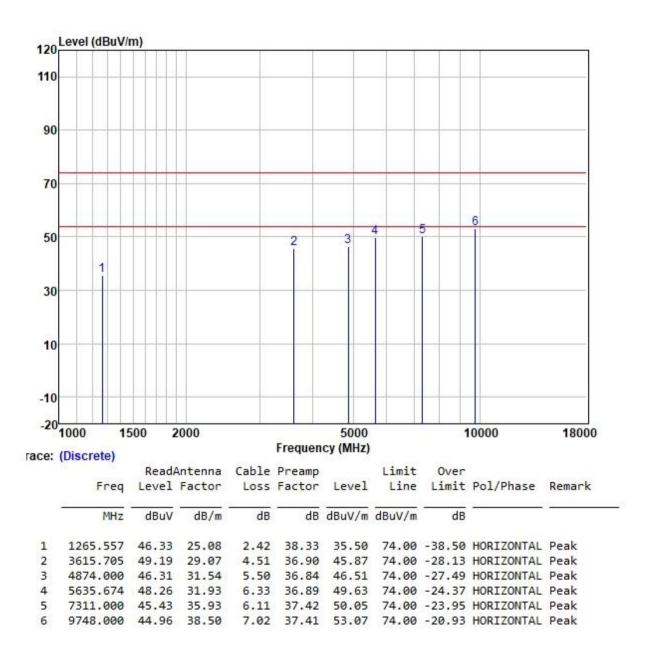
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Report No.: GZCR210802080402

Page: 78 of 183

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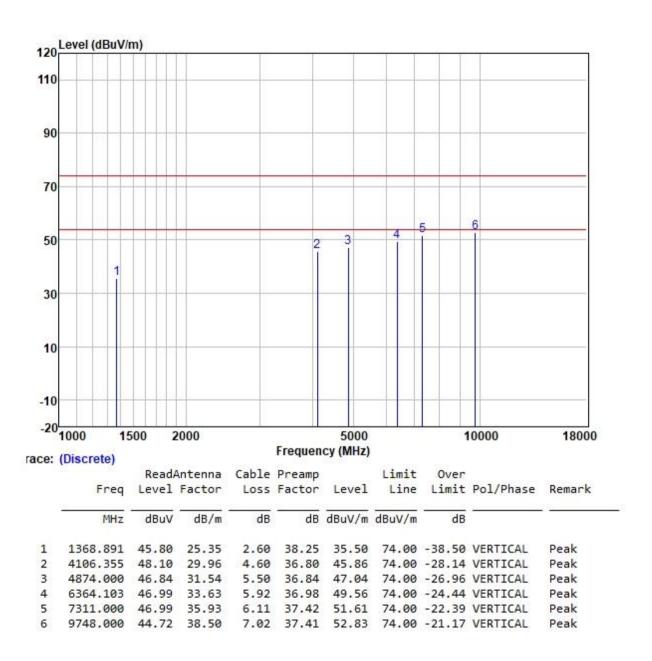
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Report No.: GZCR210802080402

Page: 79 of 183

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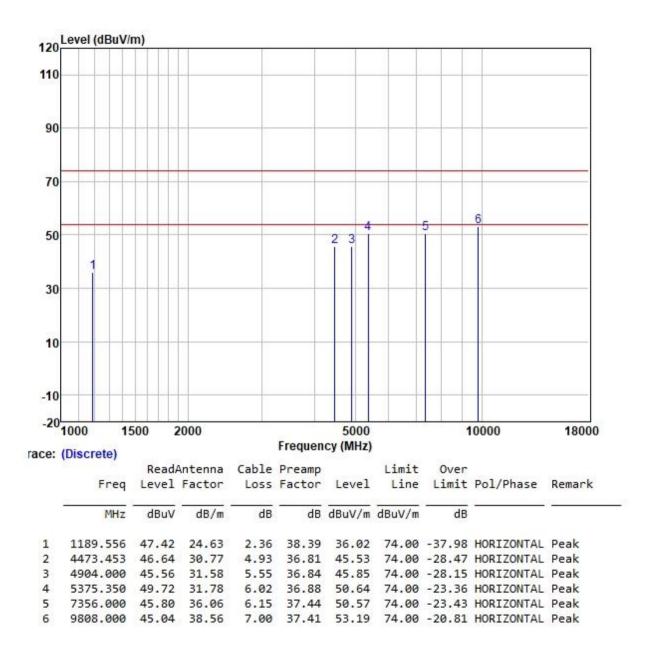
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Report No.: GZCR210802080402

Page: 80 of 183

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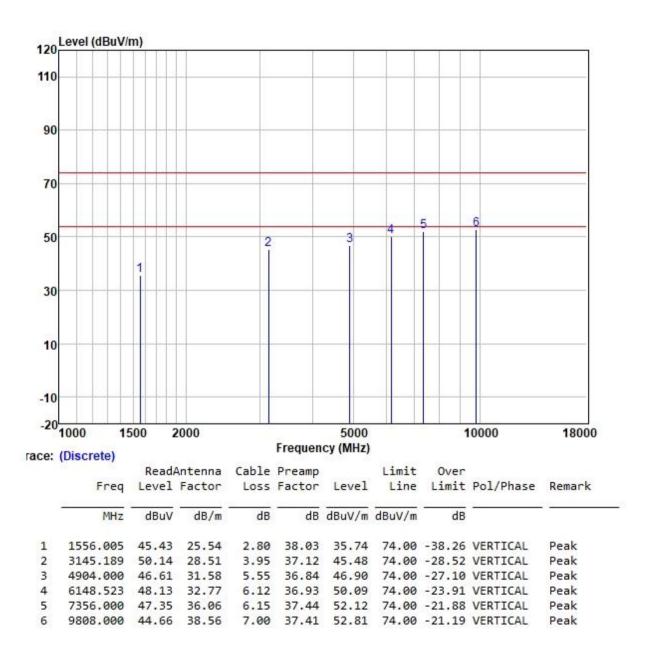
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Report No.: GZCR210802080402

Page: 81 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:High





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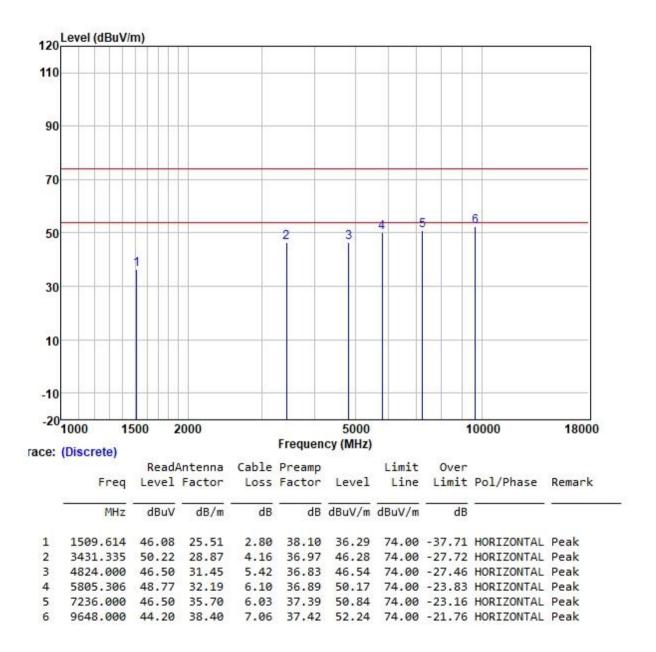
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Report No.: GZCR210802080402

Page: 82 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11ax; Bandwidth:20MHz; Channel:Low





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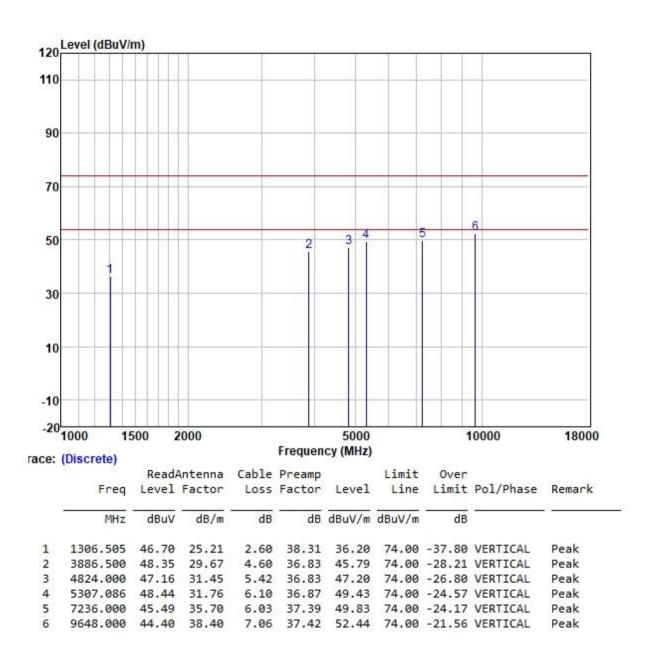
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Report No.: GZCR210802080402

Page: 83 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11ax; Bandwidth:20MHz; Channel:Low





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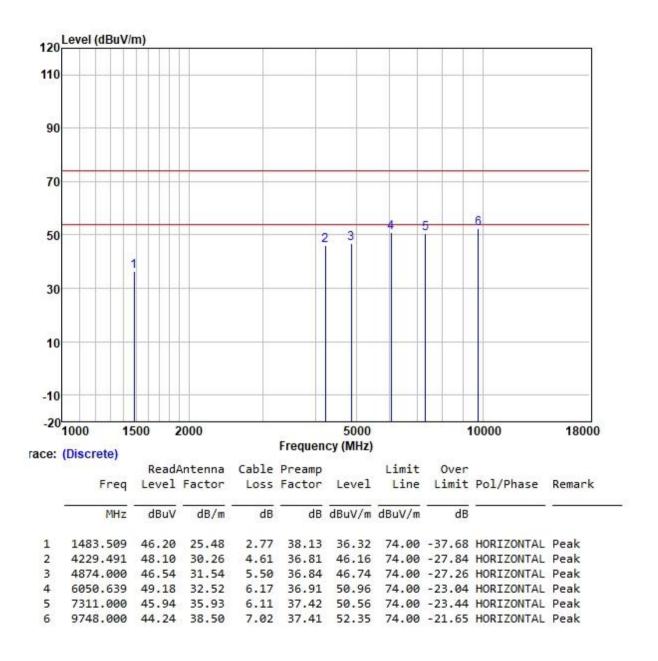
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Report No.: GZCR210802080402

Page: 84 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11ax; Bandwidth:20MHz; Channel:middle





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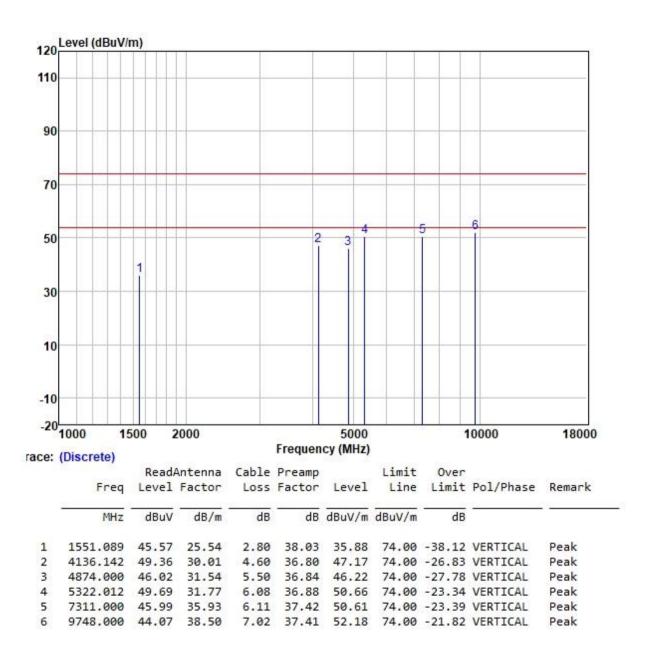
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Report No.: GZCR210802080402

Page: 85 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11ax; Bandwidth:20MHz; Channel:middle





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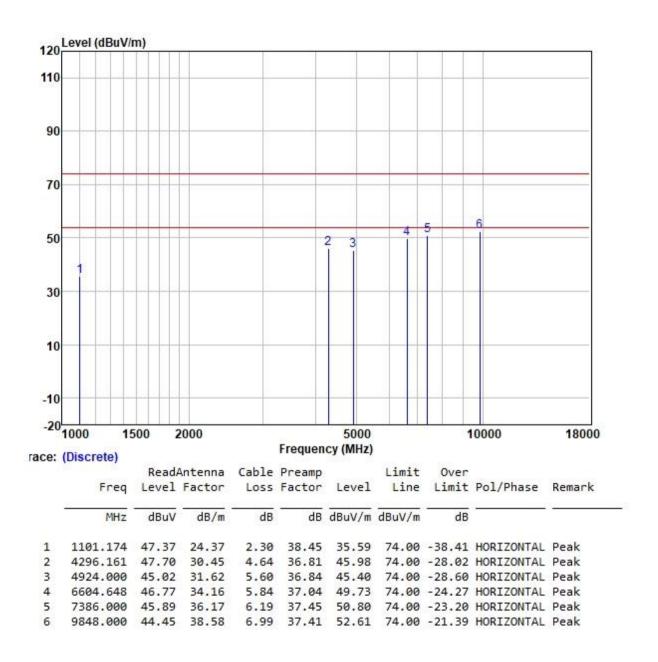
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Report No.: GZCR210802080402

Page: 86 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11ax; Bandwidth:20MHz; Channel:High





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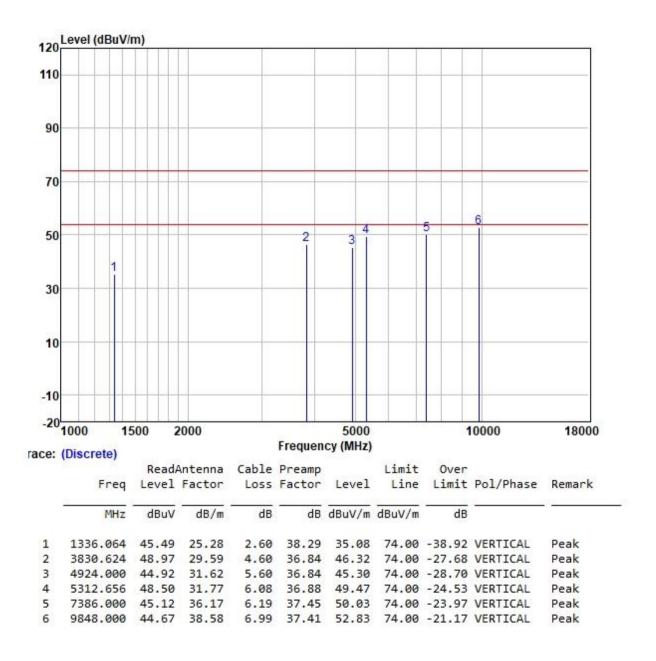
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Report No.: GZCR210802080402

Page: 87 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11ax; Bandwidth:20MHz; Channel:High





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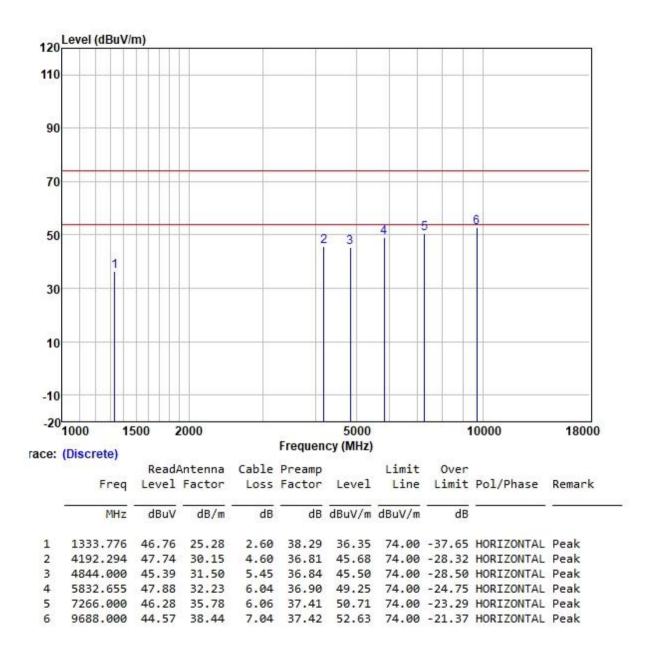
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Page: 88 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11ax; Bandwidth:40MHz; Channel:Low





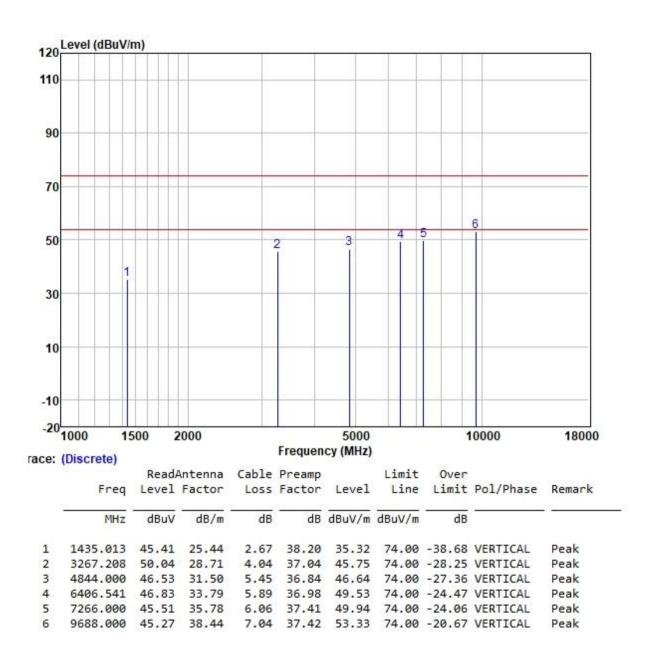
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Report No.: GZCR210802080402

Page: 89 of 183

Test Mode: 01; Polarity: Vertical; Modulation:802.11ax; Bandwidth:40MHz; Channel:Low





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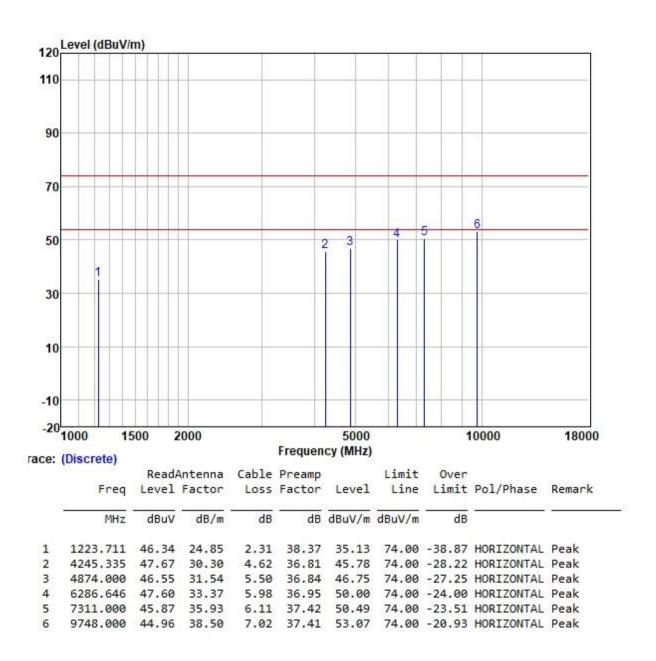
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Report No.: GZCR210802080402

Page: 90 of 183

Test Mode: 01; Polarity: Horizontal; Modulation:802.11ax; Bandwidth:40MHz; Channel:middle





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