TEST REPORT

Application No.:	GZCR2109021038AT
Applicant:	APEMAN INTERNATIONAL CO., LIMITED.
Address of Applicant:	Room 126, Building 11, Huanan Avenue No.1 Huanan City International Printing paper packaging, Shenzhen, China
Manufacturer:	APEMAN INTERNATIONAL CO., LIMITED.
Address of Manufacturer:	Room 126, Building 11, Huanan Avenue No.1 Huanan City International Printing paper packaging, Shenzhen, China
Factory:	Sky Light Electronic (Shenzhen) Limited
Address of Factory:	No. 8 & 9 Building, Antuoshan High-tech Industrial Park, Xinsha Road, Shajing, Bao'An, Shenzhen, Guangdong, China
Equipment Under Test (EUT):	
EUT Name:	SEEKER Action Camera
Model No.:	SEEKER ONE
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2021-09-01
Date of Test:	2021-09-02 to 2021-09-08
Date of Issue:	2021-09-09
Test Result:	**Pass***

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

Kobe Jian
EMC Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		*2021-09-09*		*Original*

Authorized for issue by				
		Curry Wu /Project Engineer		
		Ricky Liu/Reviewer		

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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)	47 CFR Part 15, Subpart C 15.247	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 11.9.1.3	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		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		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	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	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	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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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 3.85V 1200mAh rechargeable Li-ion battery (to be charged from Type C port)
Test Voltage:	AC 120V, 60Hz
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz; 802.11n(HT40): 2422MHz to 2452MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK); 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11; 802.11n(HT40):7
Channel Spacing:	5MHz
Antenna Type:	Integral Antenna
Antenna Gain:	2.0dBi

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	Apple	A1443	N/A
Type-C Cable	SGS	N/A	N/A

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	±3.12dB
Conducted Peak Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 3%
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)
Remark: The U_{lab} (lab Uncertainty) is less than U_{cispr} (CISPR Uncertainty), so the test results – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.	

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4.4 Test Location

All tests were performed at:

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

No tests were sub-contracted.

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.

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4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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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

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
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

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
Measurement Software	TST	TST PASS V1.0.5	N/A	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
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

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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
Measurement Software	TST	TST PASS V1.0.5	N/A	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
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**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	EMC0521	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
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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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	2021-05-26	2022-05-25

Radiated Spurious Emissions (Above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**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	EMC0521	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
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

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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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

Standard Requirement:

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

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 is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.0 dBi.

Please refer to internal photos.

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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:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	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: 25.0 °C Humidity: 50.3 % RH Atmospheric Pressure: 1008 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge + TX mode_Keep the EUT in charging and 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). Only the data of worst case is recorded in the report.

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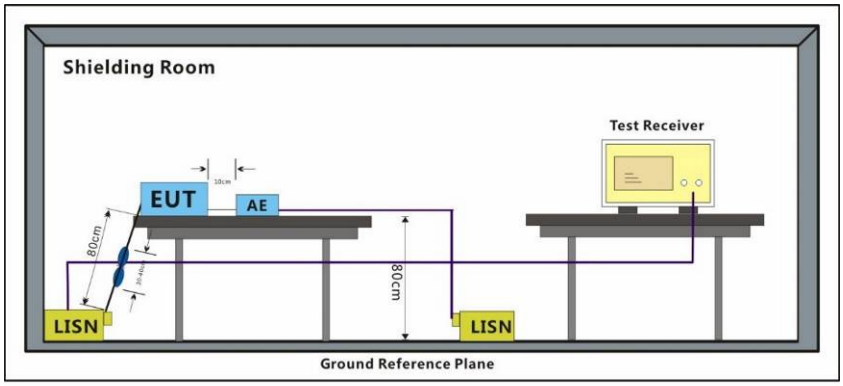
7.1.3 Test Setup Diagram



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 + 5ohm 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: LISN=Read Level+ Cable Loss+ LISN Factor

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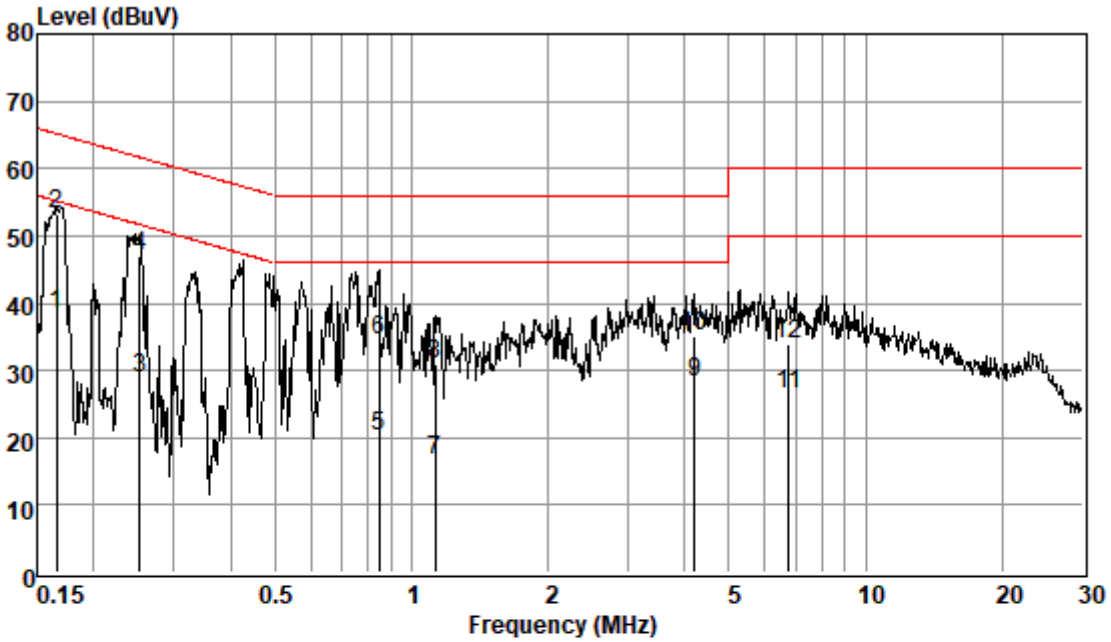
Test Mode: 02; Line: Live line ; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



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
0.17	28.67	0.06	9.62	38.35	55.16	-16.81	Average
0.17	43.47	0.06	9.62	53.15	65.16	-12.01	QP
0.25	19.31	0.06	9.62	28.99	51.69	-22.70	Average
0.25	37.30	0.06	9.62	46.98	61.69	-14.71	QP
0.85	10.65	0.07	9.63	20.35	46.00	-25.65	Average
0.85	24.71	0.07	9.63	34.41	56.00	-21.59	QP
1.13	6.90	0.08	9.61	16.59	46.00	-29.41	Average
1.13	21.18	0.08	9.61	30.87	56.00	-25.13	QP
4.20	18.53	0.17	9.63	28.33	46.00	-17.67	Average
4.20	25.39	0.17	9.63	35.19	56.00	-20.81	QP
6.77	16.50	0.20	9.67	26.37	50.00	-23.63	Average
6.77	24.17	0.20	9.67	34.04	60.00	-25.96	QP

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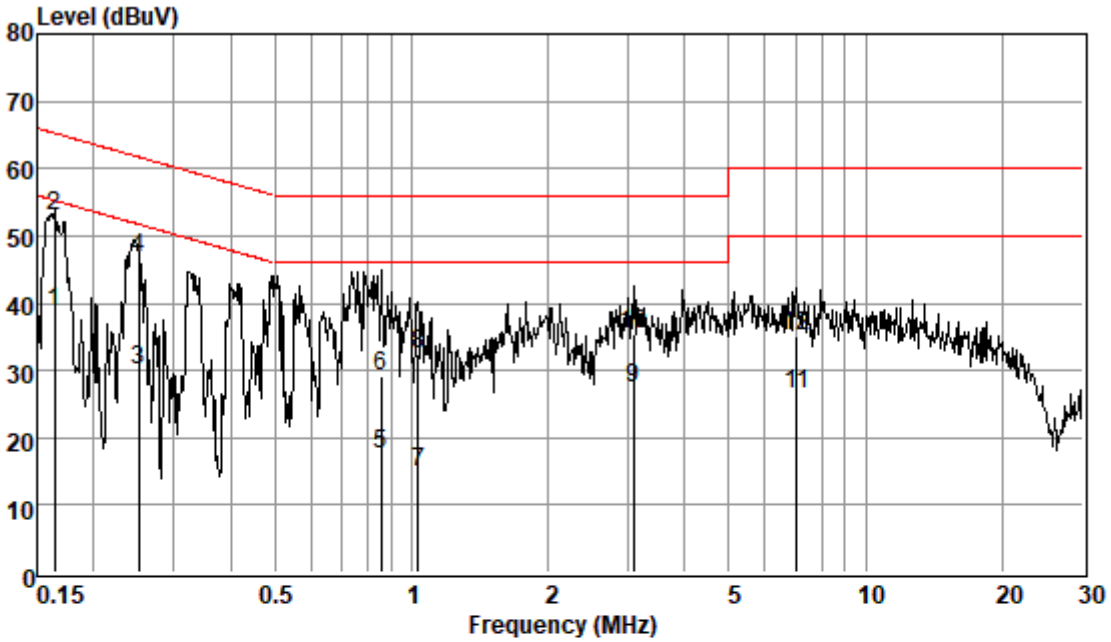
Test Mode: 02; Line: Neutral Line ; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



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
0.16	29.09	0.06	9.55	38.70	55.25	-16.55	Average
0.16	43.18	0.06	9.55	52.79	65.25	-12.46	QP
0.25	20.56	0.06	9.55	30.17	51.73	-21.56	Average
0.25	37.16	0.06	9.55	46.77	61.73	-14.96	QP
0.86	8.00	0.07	9.55	17.62	46.00	-28.38	Average
0.86	19.62	0.07	9.55	29.24	56.00	-26.76	QP
1.03	5.12	0.07	9.55	14.74	46.00	-31.26	Average
1.03	22.65	0.07	9.55	32.27	56.00	-23.73	QP
3.07	17.59	0.15	9.56	27.30	46.00	-18.70	Average
3.07	25.54	0.15	9.56	35.25	56.00	-20.75	QP
7.06	16.56	0.21	9.58	26.35	50.00	-23.65	Average
7.06	25.39	0.21	9.58	35.18	60.00	-24.82	QP

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7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method: ANSI C63.10 (2013) Section 11.9.2.3
Limit:

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

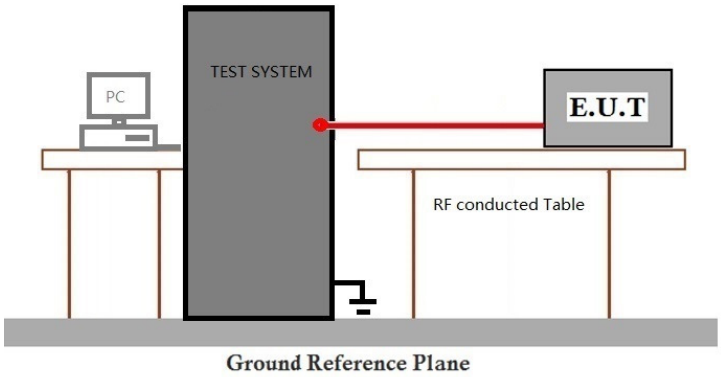
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 25.2 °C Humidity: 55.4 % RH Atmospheric Pressure: 1008 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	03	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). Only the data of worst case is recorded in the report.

7.2.3 Test Setup Diagram



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7.2.4 Measurement Procedure and Data

cable loss=0.9dB

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7.3 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

7.3.1 E.U.T. Operation

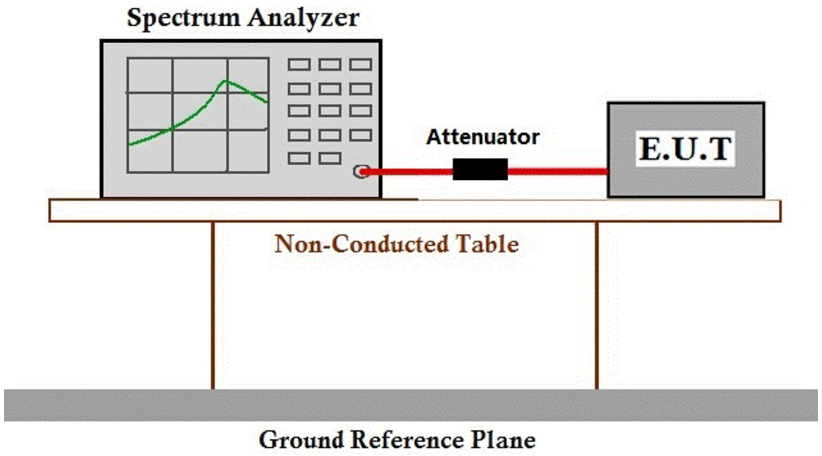
Operating Environment:

Temperature: 25.2 °C Humidity: 55.4 % RH Atmospheric Pressure: 1008 mbar

7.3.1 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	03	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). Only the data of worst case is recorded in the report.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

cable loss=0.9dB

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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

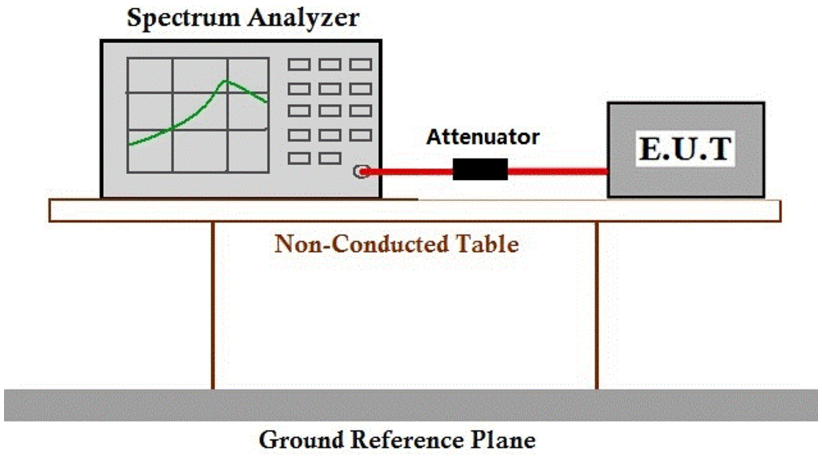
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 25.2 °C Humidity: 55.4 % RH Atmospheric Pressure: 1008 mbar

7.4.1 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	03	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). Only the data of worst case is recorded in the report.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

cable loss=0.9dB

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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

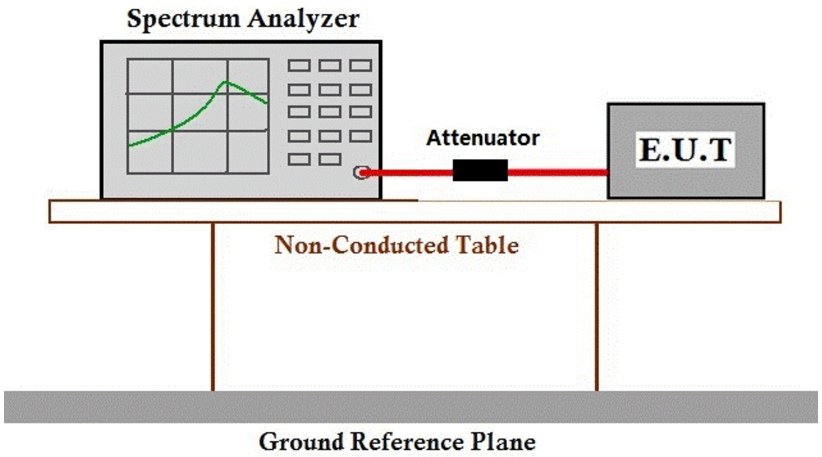
Operating Environment:

Temperature: 25.2 °C Humidity: 55.4 % RH Atmospheric Pressure: 1008 mbar

7.5.1 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	03	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). Only the data of worst case is recorded in the report.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

cable loss=0.9dB

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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

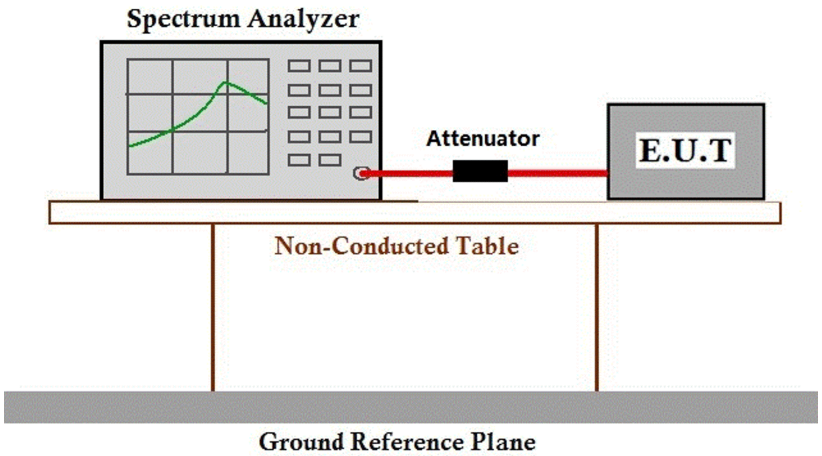
Operating Environment:

Temperature: 25.2 °C Humidity: 55.4 % RH Atmospheric Pressure: 1008 mbar

7.6.1 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	03	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). Only the data of worst case is recorded in the report.

7.6.2 Test Setup Diagram



7.6.3 Measurement Procedure and Data

cable loss=0.9dB

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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: 22.7 °C Humidity: 52.5 % RH Atmospheric Pressure: 1008 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge + TX mode_Keep the EUT in charging and 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). Only the data of worst case is recorded in the report.
Pre-scan	03	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). Only the data of worst case is recorded in the report.

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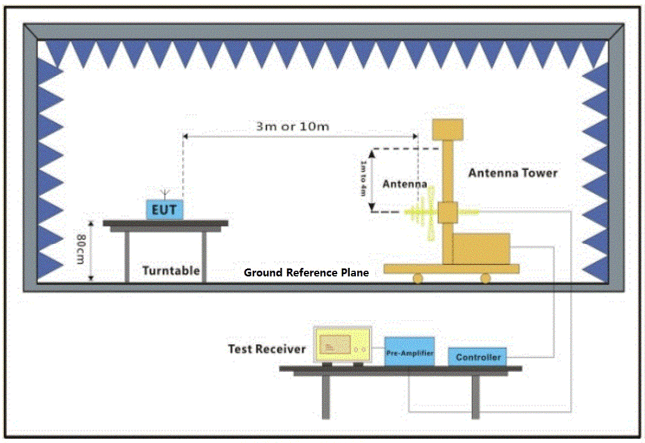
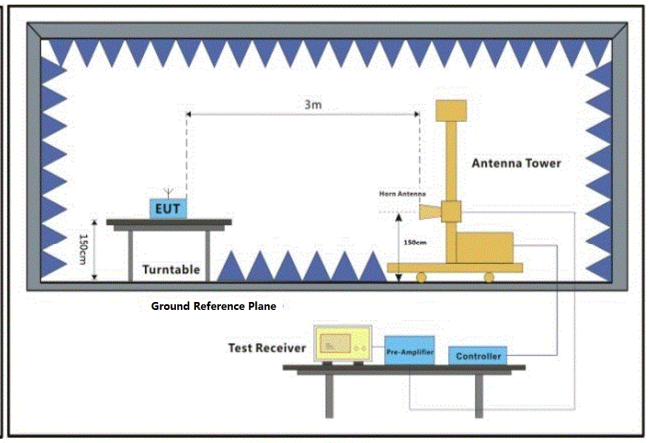
7.7.3 Test Setup Diagram



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.

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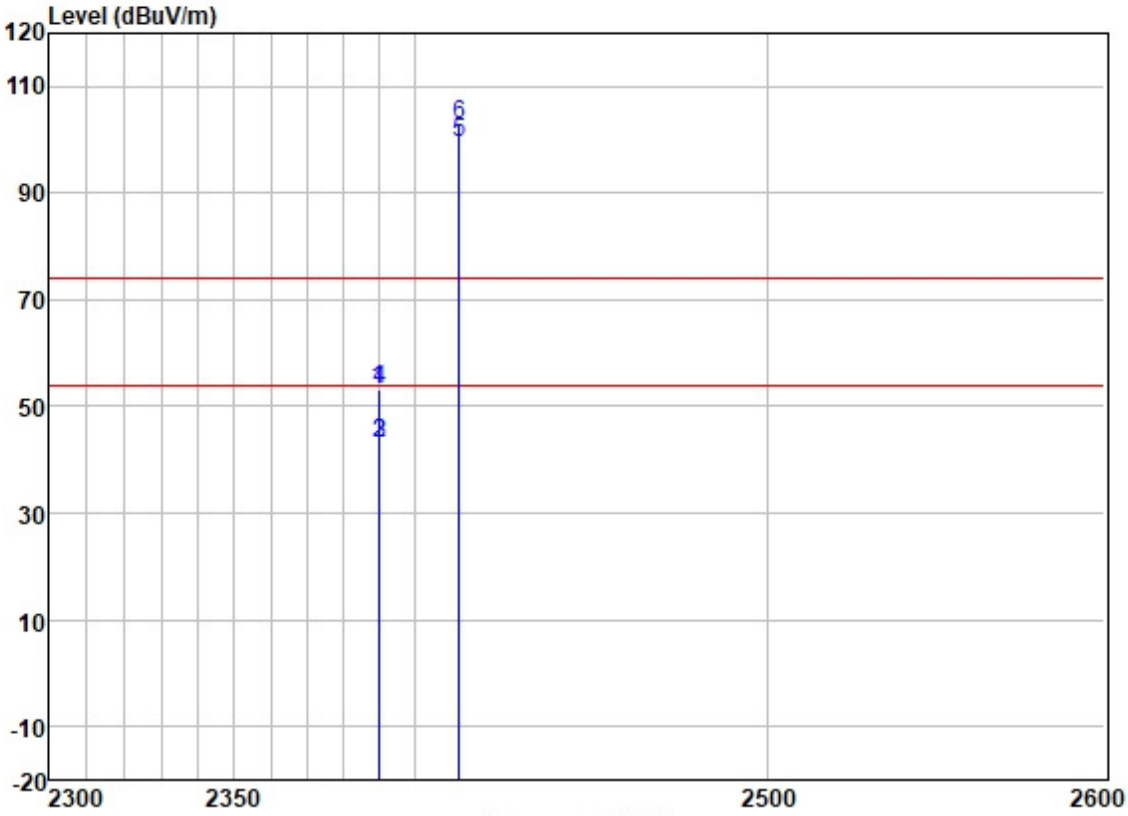
Test Mode: 02; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2389.605	60.01	27.33	3.48	37.59	53.23	74.00	-20.77	HORIZONTAL	Peak
2		2389.968	49.76	27.33	3.48	37.59	42.98	54.00	-11.02	HORIZONTAL	Average
3		2390.000	49.76	27.33	3.48	37.59	42.98	54.00	-11.02	HORIZONTAL	Average
4		2390.000	59.97	27.33	3.48	37.59	53.19	74.00	-20.81	HORIZONTAL	Peak
5	*	2412.000	106.22	27.38	3.47	37.59	99.48	54.00	45.48	HORIZONTAL	Average
6	*	2412.000	109.53	27.38	3.47	37.59	102.79	74.00	28.79	HORIZONTAL	Peak

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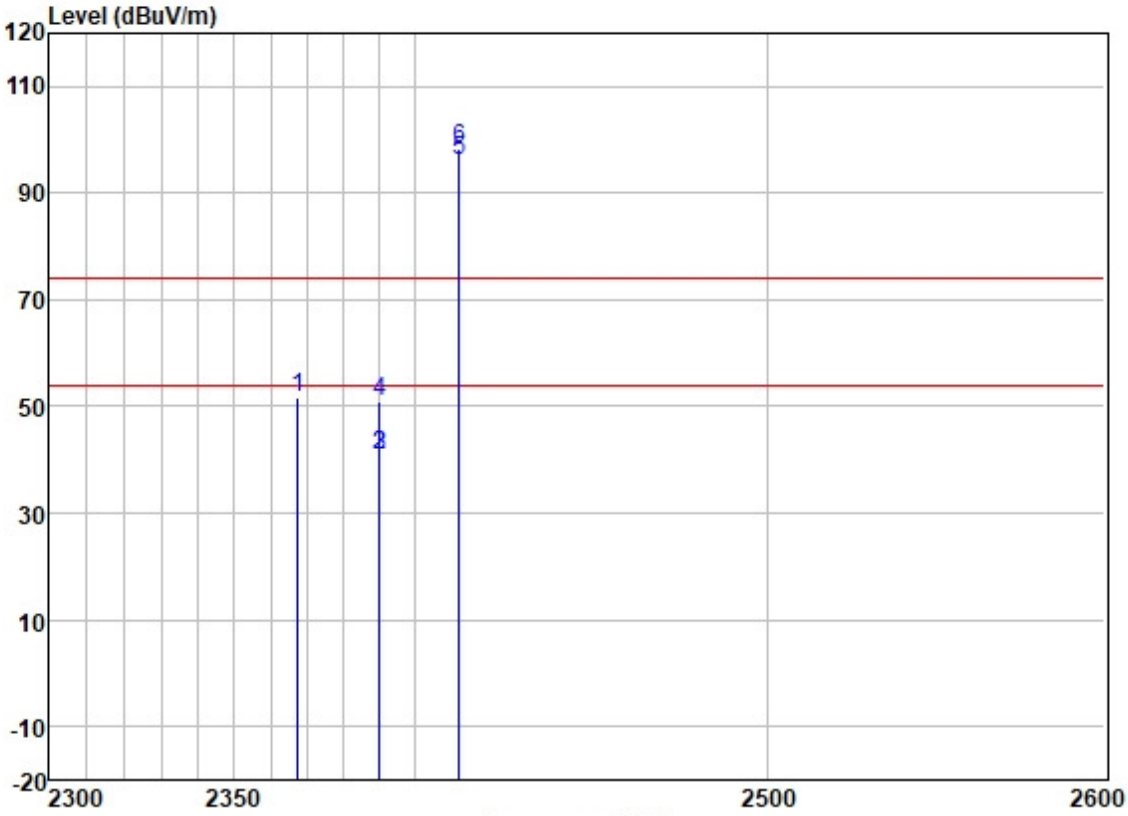
Test Mode: 02; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2367.321	58.64	27.28	3.43	37.60	51.75	74.00	-22.25	VERTICAL	Peak
2		2389.968	47.61	27.33	3.48	37.59	40.83	54.00	-13.17	VERTICAL	Average
3		2390.000	47.61	27.33	3.48	37.59	40.83	54.00	-13.17	VERTICAL	Average
4		2390.000	57.58	27.33	3.48	37.59	50.80	74.00	-23.20	VERTICAL	Peak
5	*	2412.000	102.73	27.38	3.47	37.59	95.99	54.00	41.99	VERTICAL	Average
6	*	2412.000	105.26	27.38	3.47	37.59	98.52	74.00	24.52	VERTICAL	Peak

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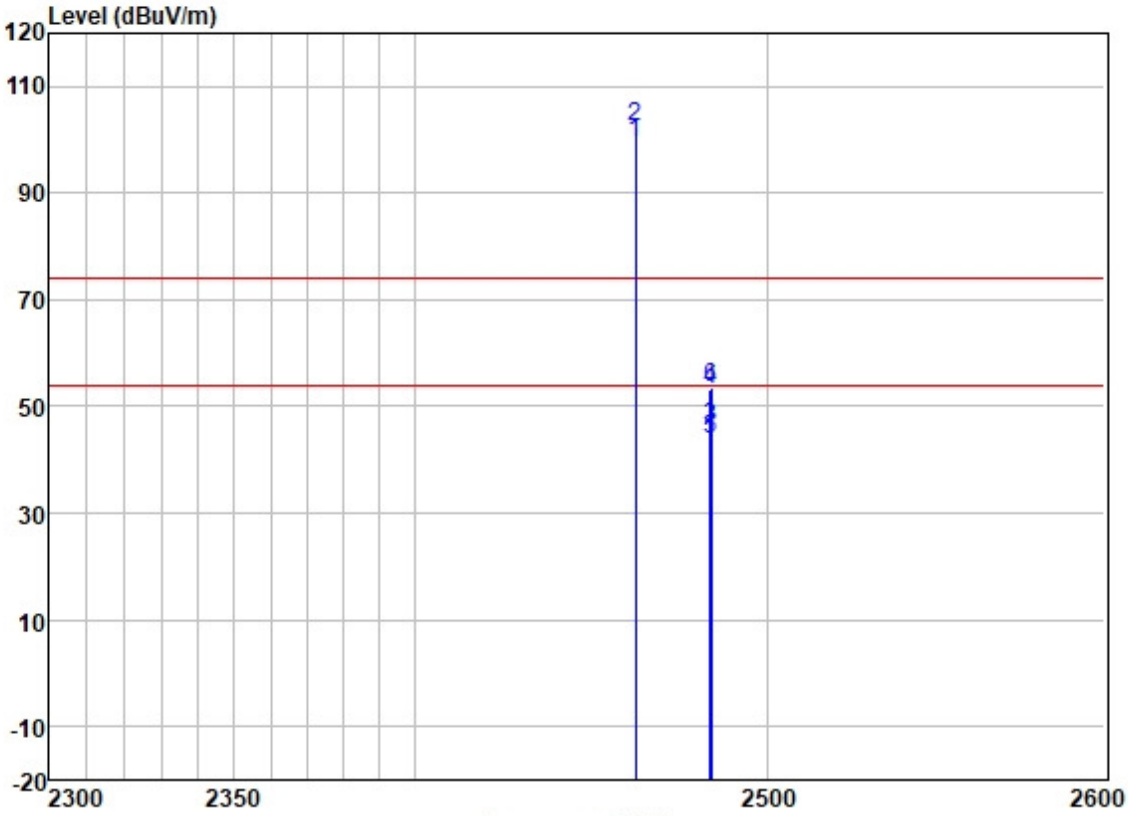
Test Mode: 02; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:High



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	*	2462.000	105.98	27.45	3.50	37.58	99.35	54.00	45.35	HORIZONTAL	Average
2	*	2462.000	109.15	27.45	3.50	37.58	102.52	74.00	28.52	HORIZONTAL	Peak
3		2483.500	52.80	27.48	3.53	37.57	46.24	54.00	-7.76	HORIZONTAL	Average
4		2483.500	59.67	27.48	3.53	37.57	53.11	74.00	-20.89	HORIZONTAL	Peak
5		2483.790	50.36	27.48	3.53	37.57	43.80	54.00	-10.20	HORIZONTAL	Average
6		2483.890	59.95	27.48	3.53	37.57	53.39	74.00	-20.61	HORIZONTAL	Peak

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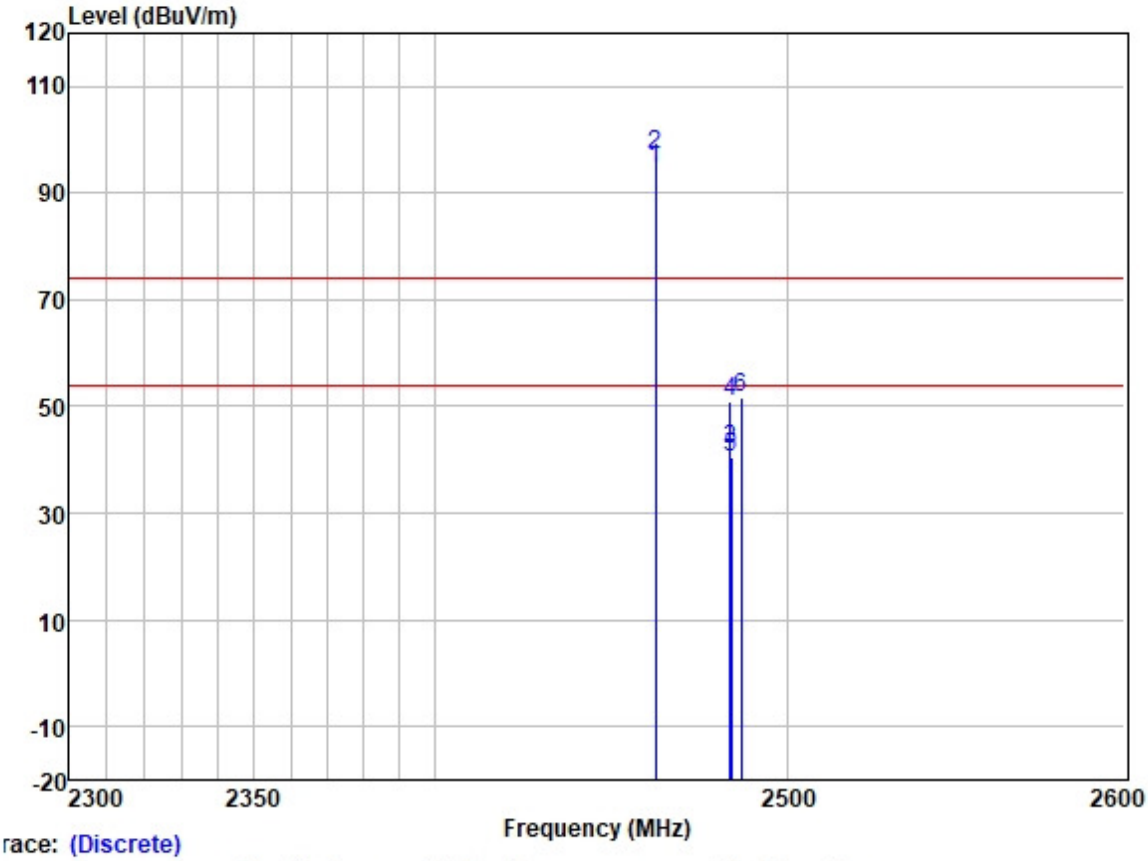
Test Mode: 02; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	*	2462.000	101.38	27.45	3.50	37.58	94.75	54.00	40.75	VERTICAL	Average
2	*	2462.000	103.86	27.45	3.50	37.58	97.23	74.00	23.23	VERTICAL	Peak
3		2483.500	48.57	27.48	3.53	37.57	42.01	54.00	-11.99	VERTICAL	Average
4		2483.500	57.66	27.48	3.53	37.57	51.10	74.00	-22.90	VERTICAL	Peak
5		2483.790	47.05	27.48	3.53	37.57	40.49	54.00	-13.51	VERTICAL	Average
6		2486.601	58.23	27.48	3.53	37.57	51.67	74.00	-22.33	VERTICAL	Peak

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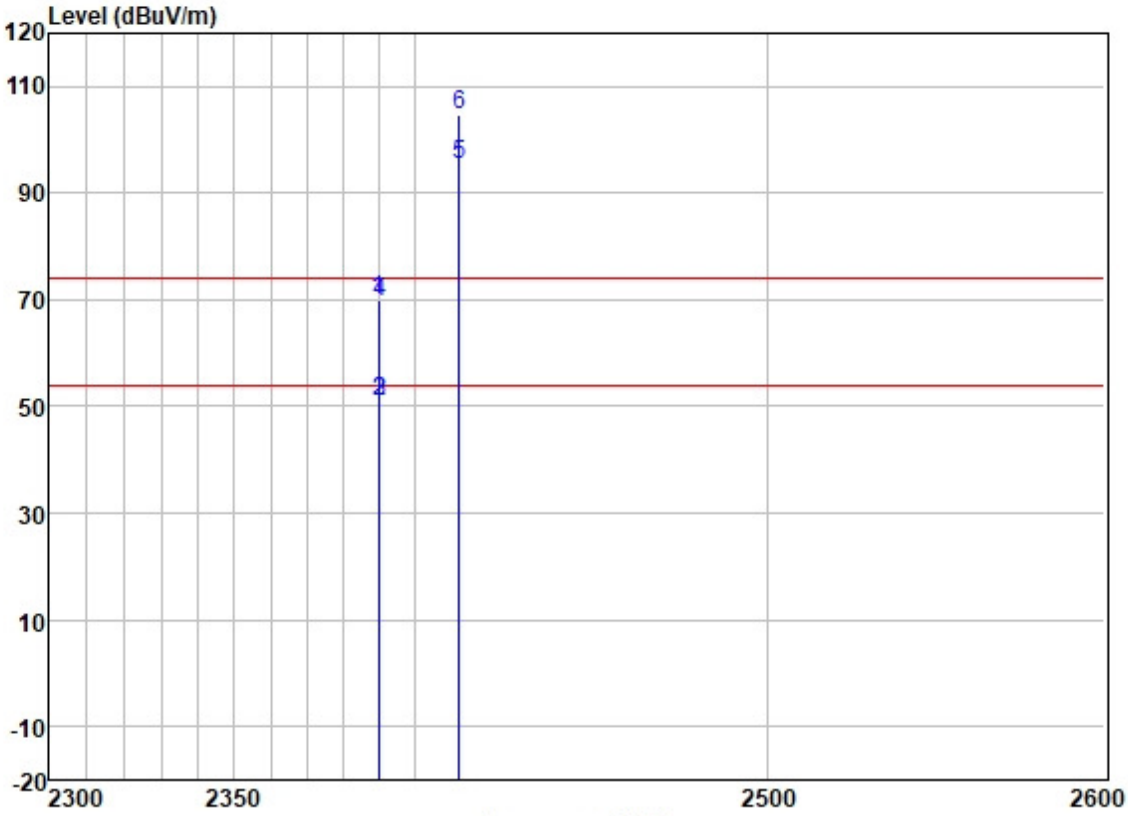
Test Mode: 02; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2389.726	76.83	27.33	3.48	37.59	70.05	74.00	-3.95	HORIZONTAL	Peak
2		2389.968	57.75	27.33	3.48	37.59	50.97	54.00	-3.03	HORIZONTAL	Average
3		2390.000	57.75	27.33	3.48	37.59	50.97	54.00	-3.03	HORIZONTAL	Average
4		2390.000	76.26	27.33	3.48	37.59	69.48	74.00	-4.52	HORIZONTAL	Peak
5	*	2412.000	102.03	27.38	3.47	37.59	95.29	54.00	41.29	HORIZONTAL	Average
6	*	2412.000	111.36	27.38	3.47	37.59	104.62	74.00	30.62	HORIZONTAL	Peak

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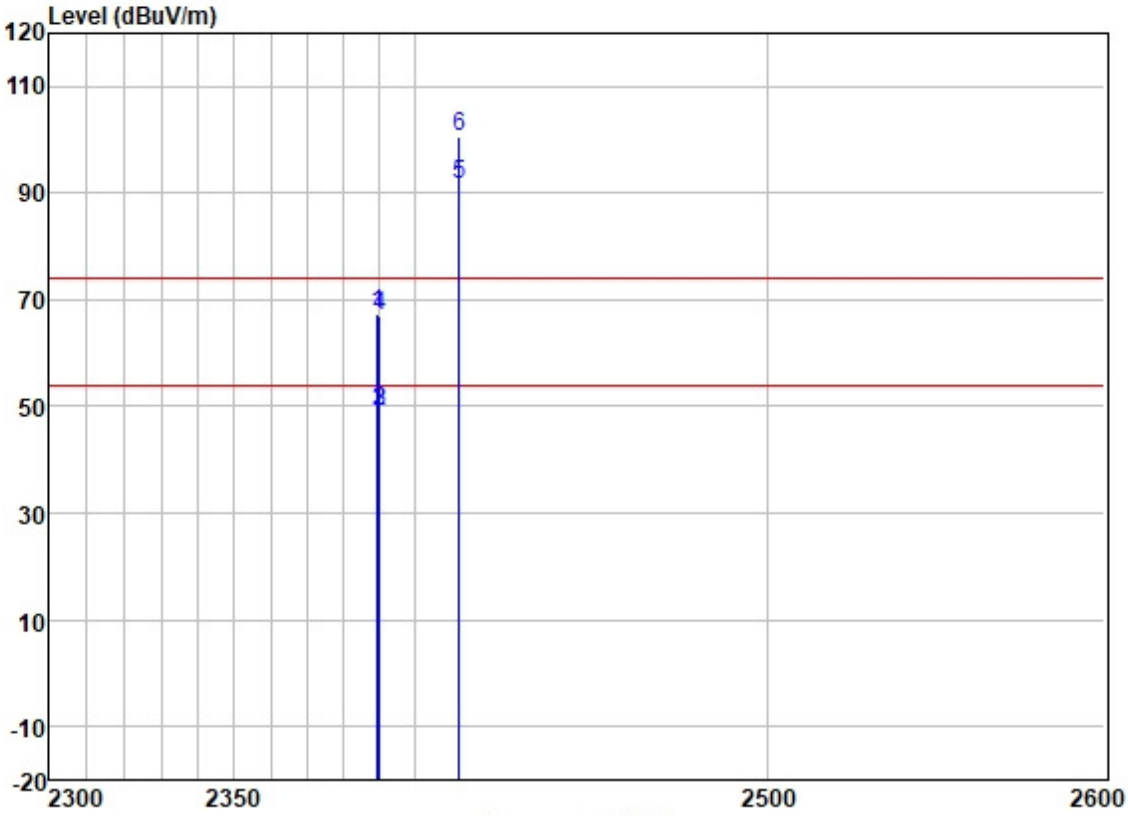
Test Mode: 02; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2389.363	74.09	27.33	3.48	37.59	67.31	74.00	-6.69	VERTICAL	Peak
2		2389.968	55.83	27.33	3.48	37.59	49.05	54.00	-4.95	VERTICAL	Average
3		2390.000	55.83	27.33	3.48	37.59	49.05	54.00	-4.95	VERTICAL	Average
4		2390.000	73.77	27.33	3.48	37.59	66.99	74.00	-7.01	VERTICAL	Peak
5	*	2412.000	98.34	27.38	3.47	37.59	91.60	54.00	37.60	VERTICAL	Average
6	*	2412.000	107.29	27.38	3.47	37.59	100.55	74.00	26.55	VERTICAL	Peak

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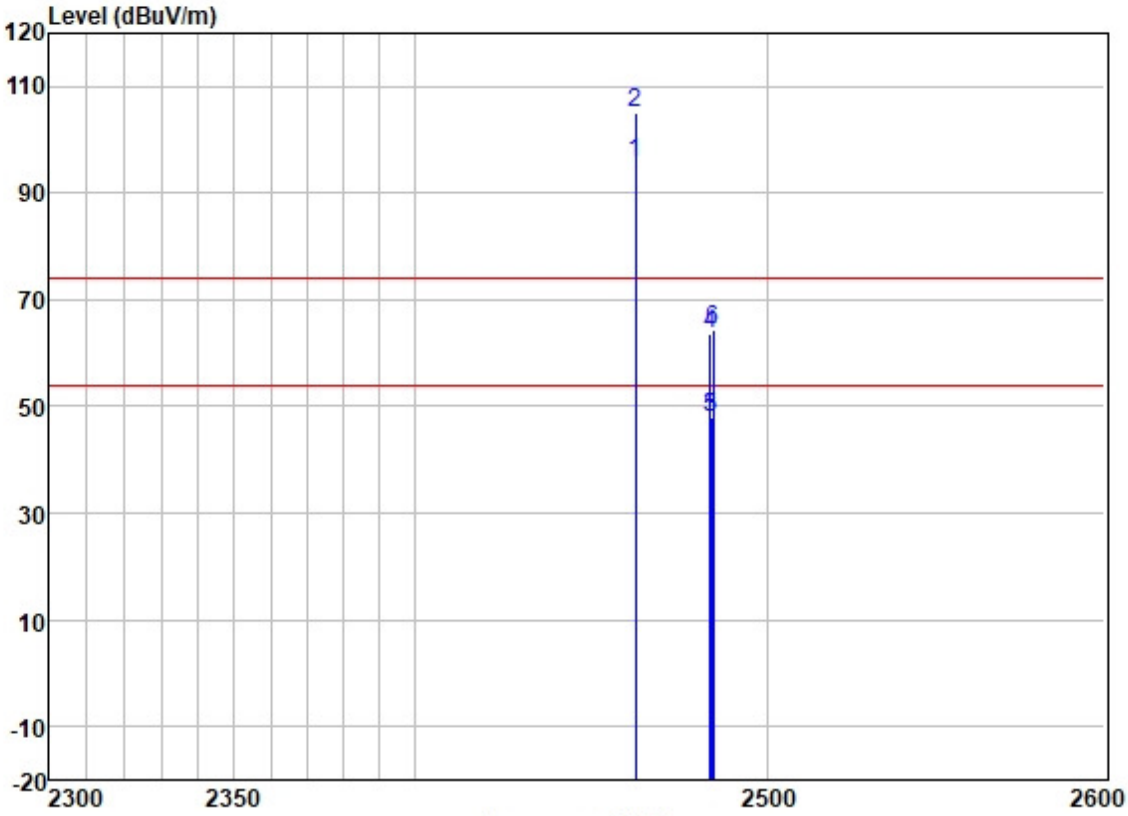
Test Mode: 02; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:High



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	*	2462.000	102.38	27.45	3.50	37.58	95.75	54.00	41.75	HORIZONTAL	Average
2	*	2462.000	111.82	27.45	3.50	37.58	105.19	74.00	31.19	HORIZONTAL	Peak
3		2483.500	54.51	27.48	3.53	37.57	47.95	54.00	-6.05	HORIZONTAL	Average
4		2483.500	70.18	27.48	3.53	37.57	63.62	74.00	-10.38	HORIZONTAL	Peak
5		2483.790	54.60	27.48	3.53	37.57	48.04	54.00	-5.96	HORIZONTAL	Average
6		2484.392	70.75	27.48	3.53	37.57	64.19	74.00	-9.81	HORIZONTAL	Peak

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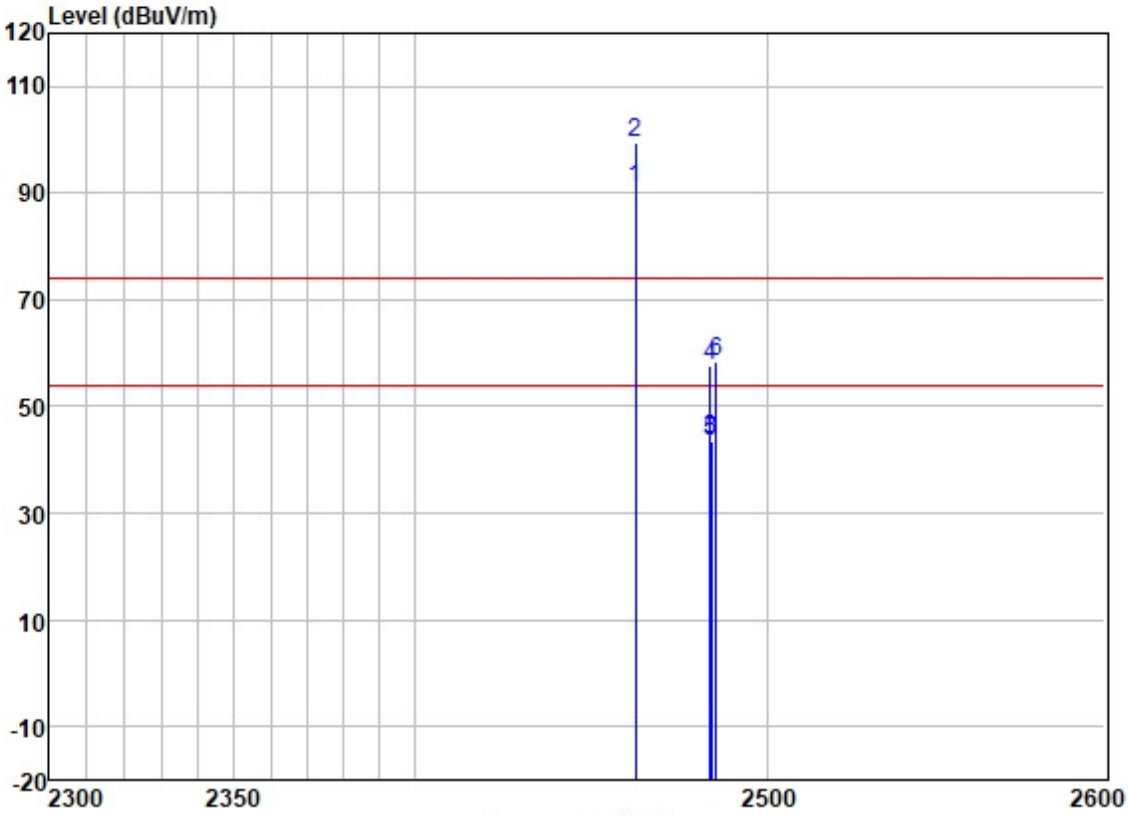
Test Mode: 02; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:High



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	*	2462.000	97.60	27.45	3.50	37.58	90.97	54.00	36.97	VERTICAL	Average
2	*	2462.000	106.22	27.45	3.50	37.58	99.59	74.00	25.59	VERTICAL	Peak
3		2483.500	50.26	27.48	3.53	37.57	43.70	54.00	-10.30	VERTICAL	Average
4		2483.500	64.37	27.48	3.53	37.57	57.81	74.00	-16.19	VERTICAL	Peak
5		2483.790	50.19	27.48	3.53	37.57	43.63	54.00	-10.37	VERTICAL	Average
6		2485.095	64.99	27.48	3.53	37.57	58.43	74.00	-15.57	VERTICAL	Peak

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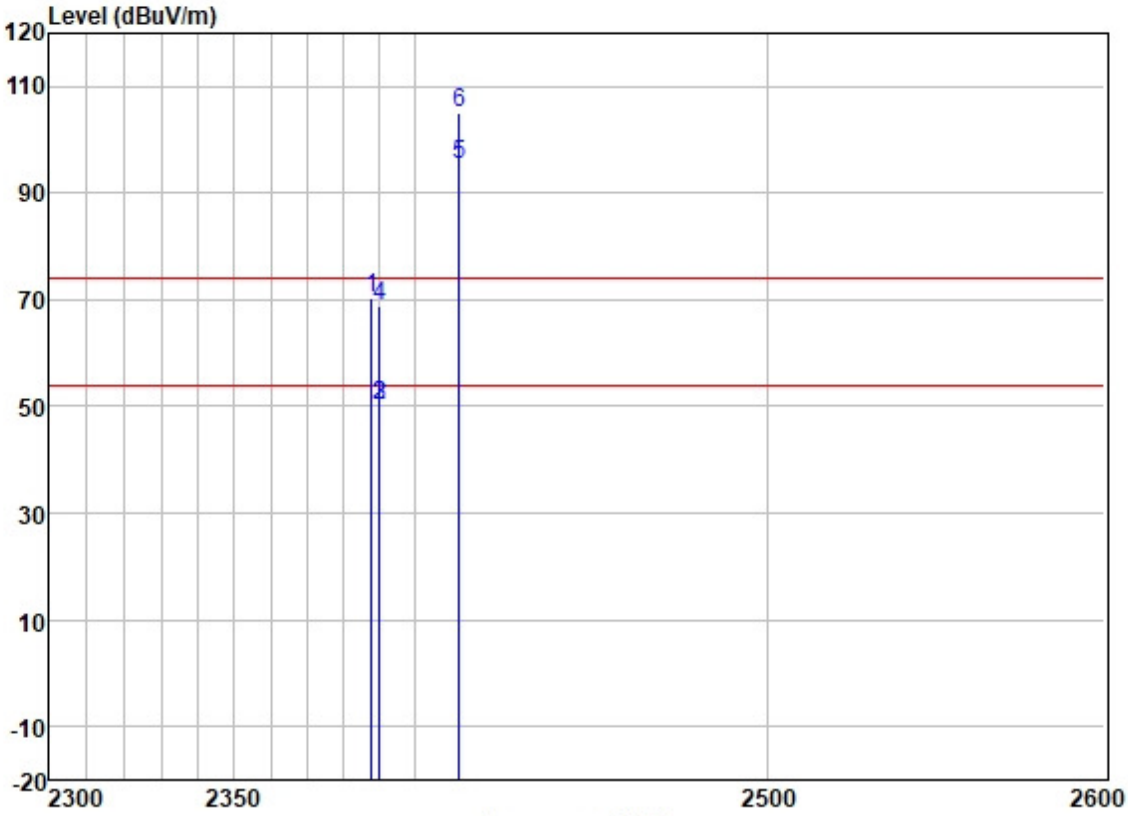
Test Mode: 02; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2387.791	77.13	27.33	3.48	37.59	70.35	74.00	-3.65	HORIZONTAL	Peak
2		2389.968	57.05	27.33	3.48	37.59	50.27	54.00	-3.73	HORIZONTAL	Average
3		2390.000	57.05	27.33	3.48	37.59	50.27	54.00	-3.73	HORIZONTAL	Average
4		2390.000	75.79	27.33	3.48	37.59	69.01	74.00	-4.99	HORIZONTAL	Peak
5	*	2412.000	102.26	27.38	3.47	37.59	95.52	54.00	41.52	HORIZONTAL	Average
6	*	2412.000	111.88	27.38	3.47	37.59	105.14	74.00	31.14	HORIZONTAL	Peak

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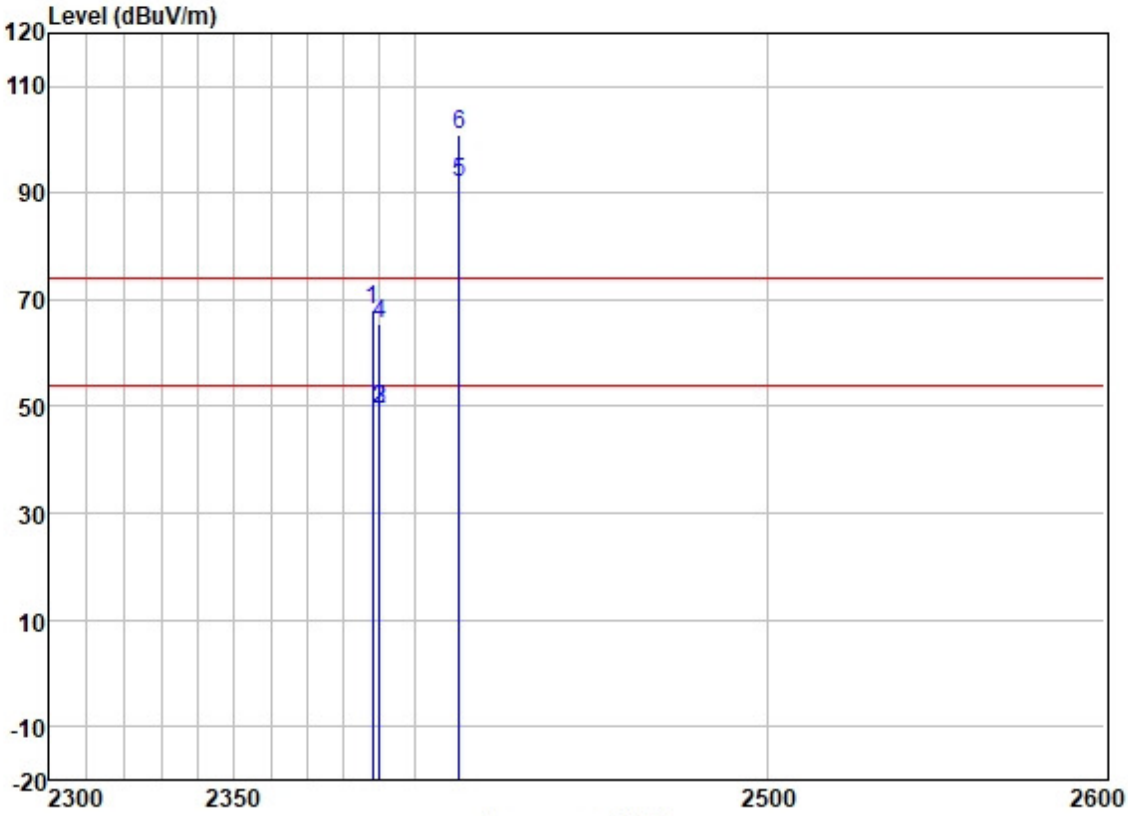
Test Mode: 02; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2387.912	75.01	27.33	3.48	37.59	68.23	74.00	-5.77	VERTICAL	Peak
2		2389.968	56.24	27.33	3.48	37.59	49.46	54.00	-4.54	VERTICAL	Average
3		2390.000	56.24	27.33	3.48	37.59	49.46	54.00	-4.54	VERTICAL	Average
4		2390.000	72.13	27.33	3.48	37.59	65.35	74.00	-8.65	VERTICAL	Peak
5	*	2412.000	98.64	27.38	3.47	37.59	91.90	54.00	37.90	VERTICAL	Average
6	*	2412.000	107.85	27.38	3.47	37.59	101.11	74.00	27.11	VERTICAL	Peak

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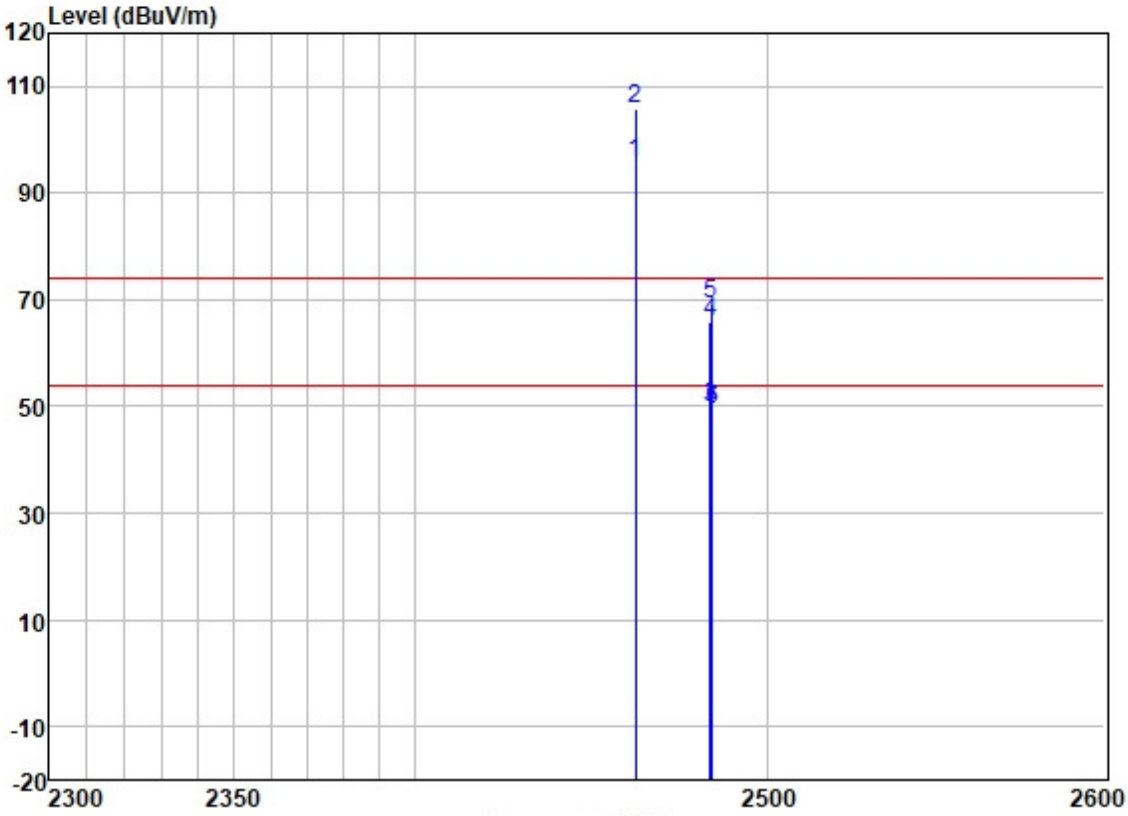
Test Mode: 02; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:High



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	*	2462.000	102.46	27.45	3.50	37.58	95.83	54.00	41.83	HORIZONTAL	Average
2	*	2462.000	112.27	27.45	3.50	37.58	105.64	74.00	31.64	HORIZONTAL	Peak
3		2483.500	56.30	27.48	3.53	37.57	49.74	54.00	-4.26	HORIZONTAL	Average
4		2483.500	72.38	27.48	3.53	37.57	65.82	74.00	-8.18	HORIZONTAL	Peak
5		2483.840	75.65	27.48	3.53	37.57	69.09	74.00	-4.91	HORIZONTAL	Peak
6		2483.940	56.14	27.48	3.53	37.57	49.58	54.00	-4.42	HORIZONTAL	Average

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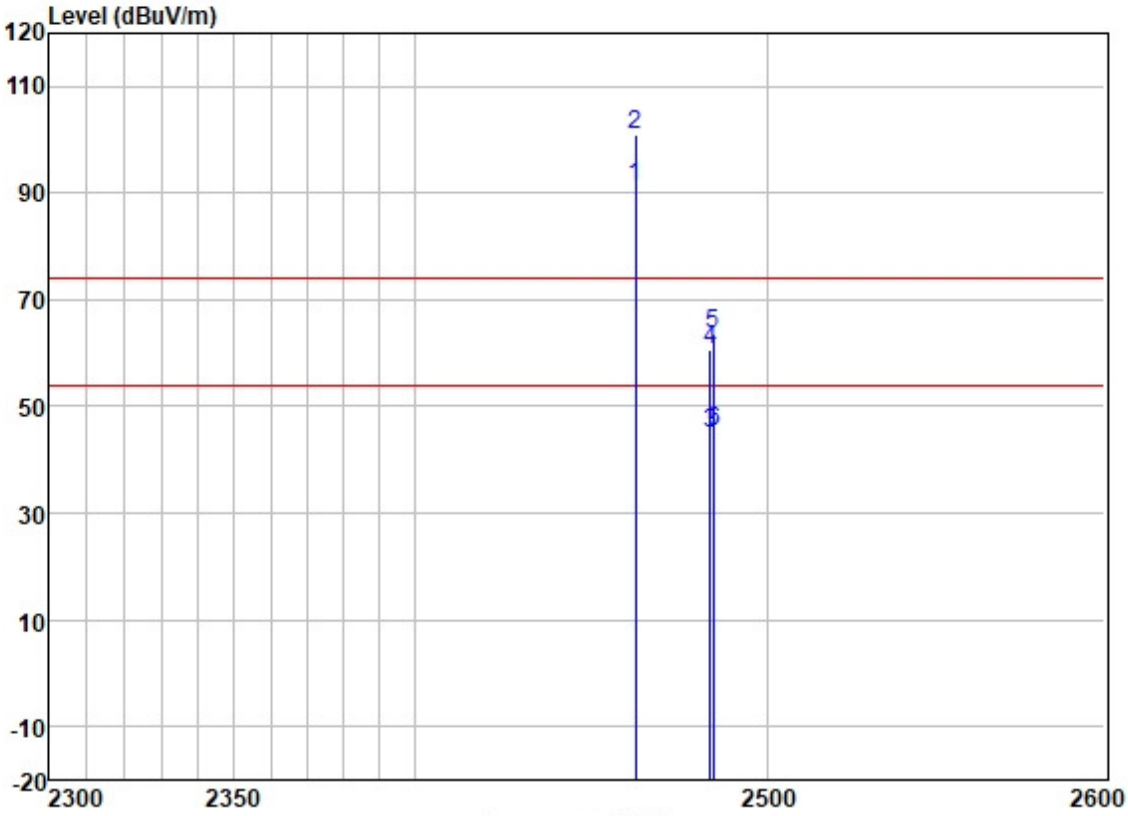
Test Mode: 02; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:High



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	*	2462.000	97.71	27.45	3.50	37.58	91.08	54.00	37.08	VERTICAL	Average
2	*	2462.000	107.45	27.45	3.50	37.58	100.82	74.00	26.82	VERTICAL	Peak
3		2483.500	51.65	27.48	3.53	37.57	45.09	54.00	-8.91	VERTICAL	Average
4		2483.500	67.12	27.48	3.53	37.57	60.56	74.00	-13.44	VERTICAL	Peak
5		2484.442	70.03	27.48	3.53	37.57	63.47	74.00	-10.53	VERTICAL	Peak
6		2484.643	51.88	27.48	3.53	37.57	45.32	54.00	-8.68	VERTICAL	Average

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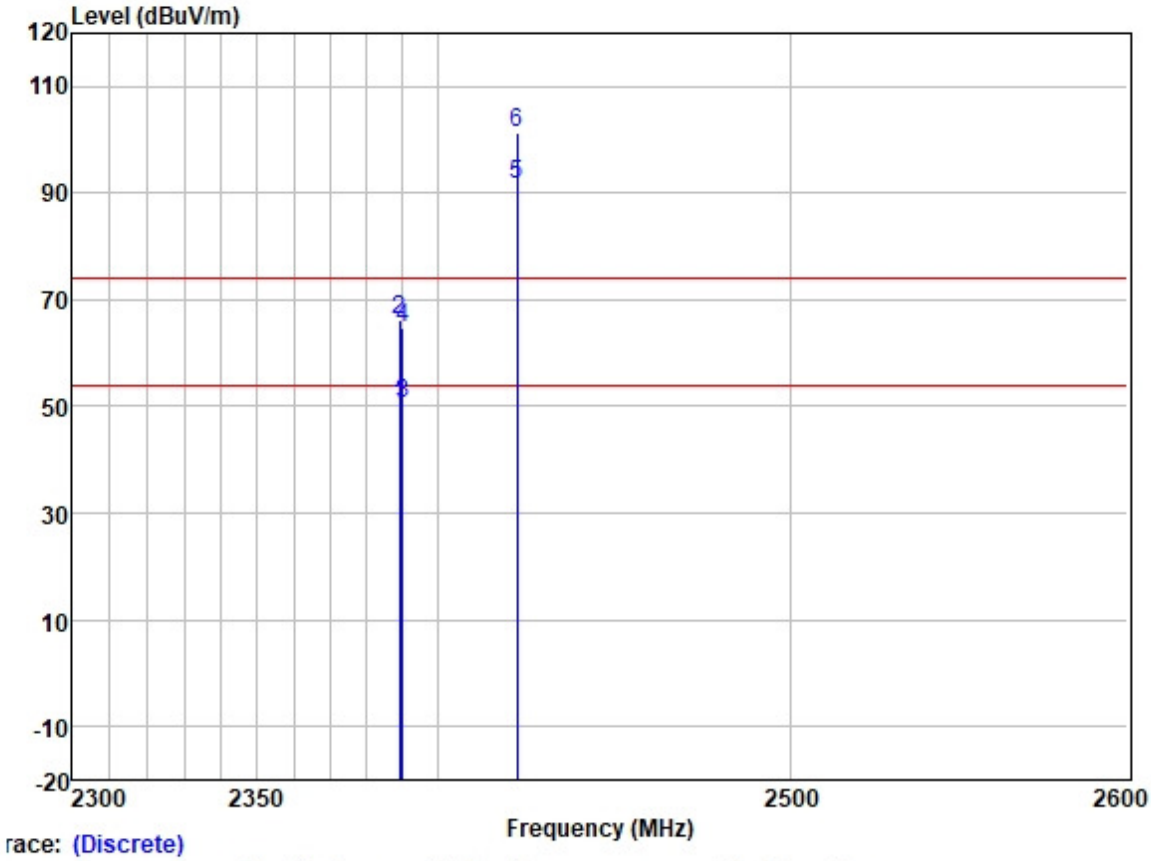
Test Mode: 02; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2389.075	57.06	27.33	3.48	37.59	50.28	54.00	-3.72	HORIZONTAL	Average
2		2389.075	72.90	27.33	3.48	37.59	66.12	74.00	-7.88	HORIZONTAL	Peak
3		2390.000	57.52	27.33	3.48	37.59	50.74	54.00	-3.26	HORIZONTAL	Average
4		2390.000	71.39	27.33	3.48	37.59	64.61	74.00	-9.39	HORIZONTAL	Peak
5	*	2422.000	98.40	27.39	3.45	37.58	91.66	54.00	37.66	HORIZONTAL	Average
6	*	2422.000	107.97	27.39	3.45	37.58	101.23	74.00	27.23	HORIZONTAL	Peak

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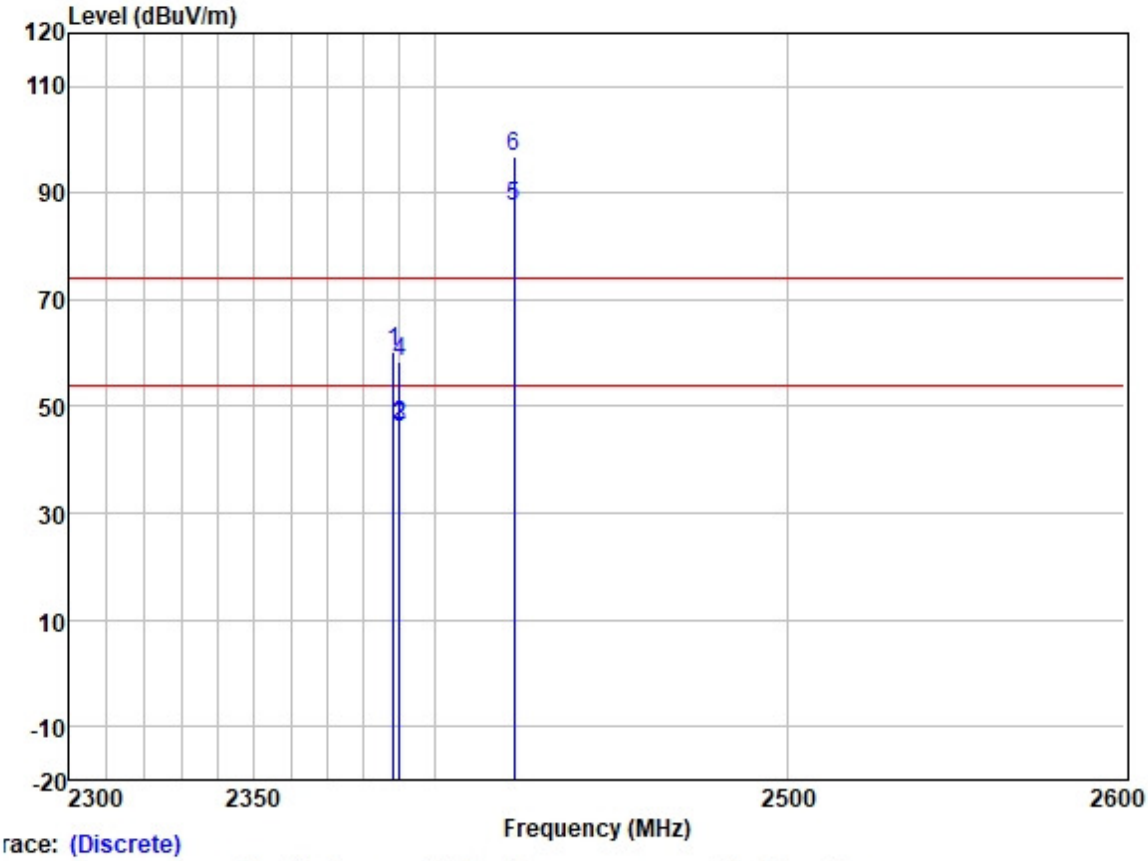
Test Mode: 02; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:Low



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1		2388.324	67.14	27.33	3.48	37.59	60.36	74.00	-13.64	VERTICAL	Peak
2		2389.827	53.10	27.33	3.48	37.59	46.32	54.00	-7.68	VERTICAL	Average
3		2390.000	52.96	27.33	3.48	37.59	46.18	54.00	-7.82	VERTICAL	Average
4		2390.000	65.21	27.33	3.48	37.59	58.43	74.00	-15.57	VERTICAL	Peak
5	*	2422.000	94.31	27.39	3.45	37.58	87.57	54.00	33.57	VERTICAL	Average
6	*	2422.000	103.41	27.39	3.45	37.58	96.67	74.00	22.67	VERTICAL	Peak

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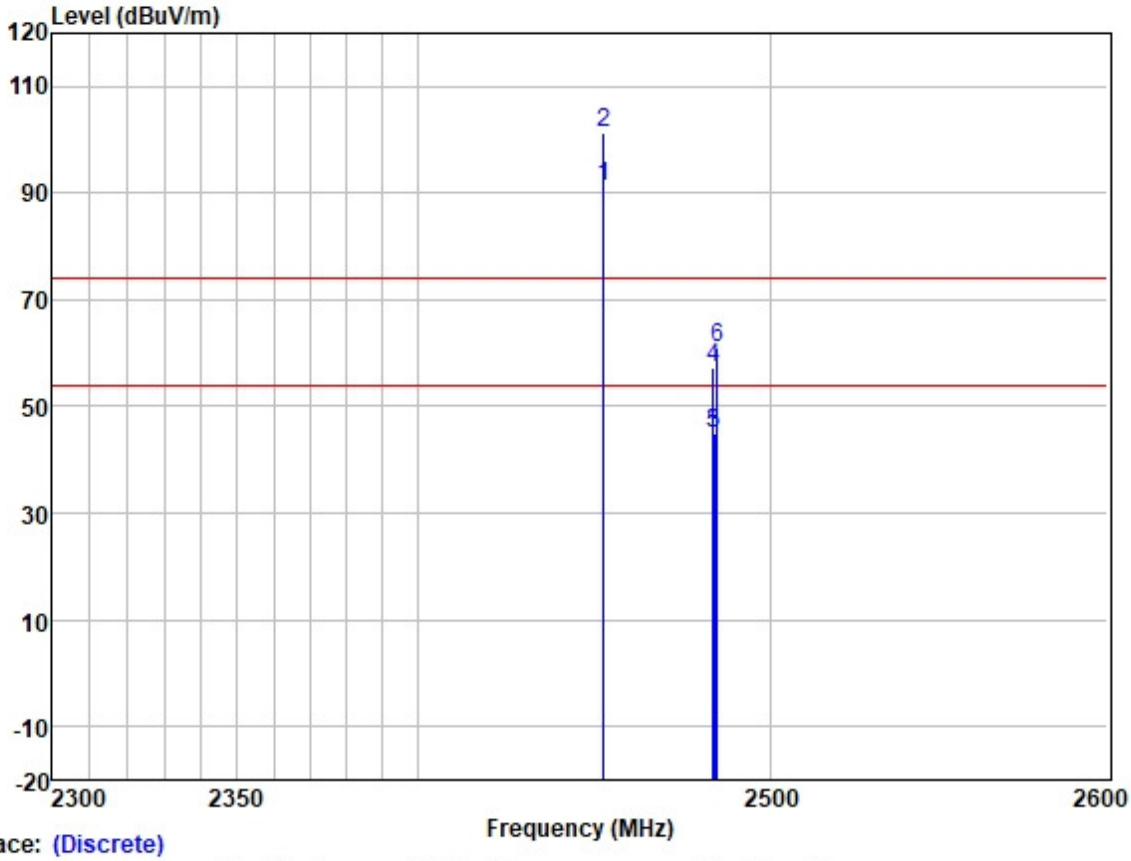
Test Mode: 02; Polarity: Horizontal; Modulation:802.11n; Bandwidth:40MHz; Channel:High



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	*	2452.000	98.02	27.43	3.40	37.58	91.27	54.00	37.27	HORIZONTAL	Average
2	*	2452.000	107.99	27.43	3.40	37.58	101.24	74.00	27.24	HORIZONTAL	Peak
3		2483.500	51.59	27.48	3.53	37.57	45.03	54.00	-8.97	HORIZONTAL	Average
4		2483.500	63.83	27.48	3.53	37.57	57.27	74.00	-16.73	HORIZONTAL	Peak
5		2483.865	51.51	27.48	3.53	37.57	44.95	54.00	-9.05	HORIZONTAL	Average
6		2484.641	67.74	27.48	3.53	37.57	61.18	74.00	-12.82	HORIZONTAL	Peak

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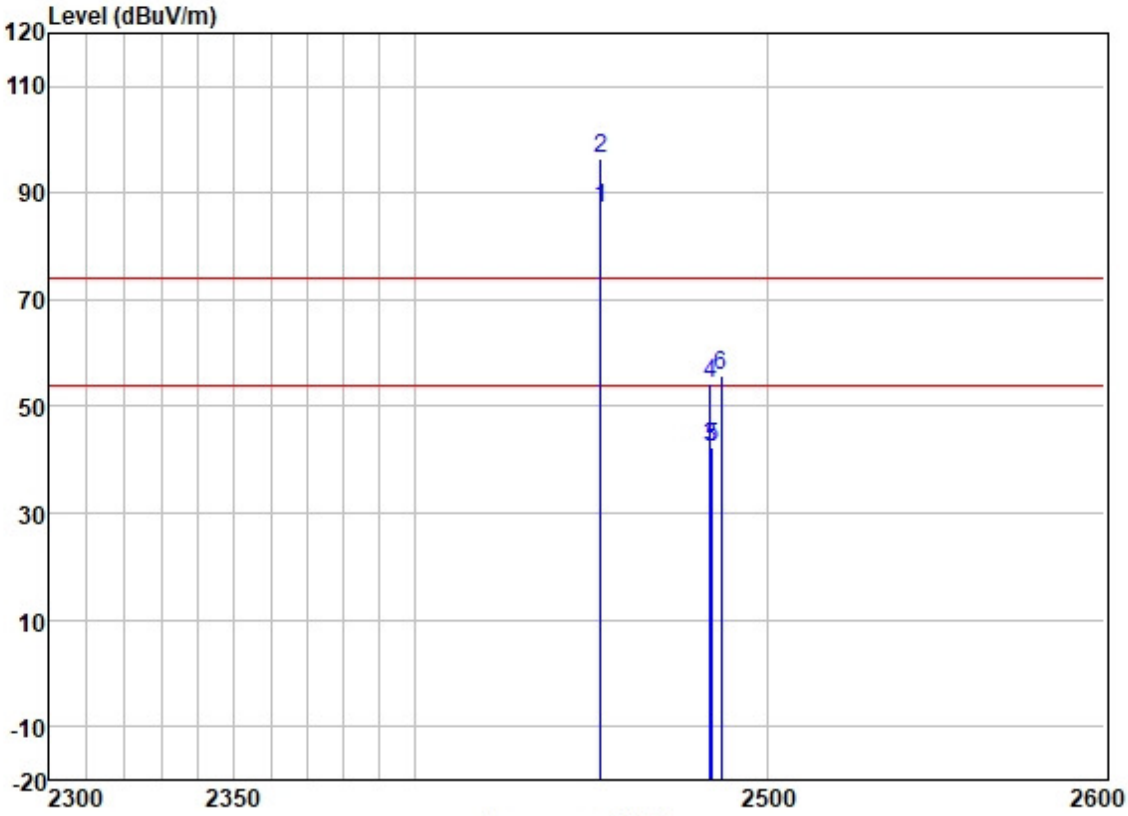
Test Mode: 02; Polarity: Vertical; Modulation:802.11n; Bandwidth:40MHz; Channel:High



race: (Discrete)

		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	*	2452.000	93.74	27.43	3.40	37.58	86.99	54.00	32.99	VERTICAL	Average
2	*	2452.000	103.36	27.43	3.40	37.58	96.61	74.00	22.61	VERTICAL	Peak
3		2483.500	48.74	27.48	3.53	37.57	42.18	54.00	-11.82	VERTICAL	Average
4		2483.500	60.68	27.48	3.53	37.57	54.12	74.00	-19.88	VERTICAL	Peak
5		2484.076	48.99	27.48	3.53	37.57	42.43	54.00	-11.57	VERTICAL	Average
6		2486.688	62.32	27.48	3.53	37.57	55.76	74.00	-18.24	VERTICAL	Peak

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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: 25.1 °C Humidity: 54.2 % RH Atmospheric Pressure: 1008 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge + TX mode_Keep the EUT in charging and 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). Only the data of worst case is recorded in the report.
Pre-scan	03	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). Only the data of worst case is recorded in the report.

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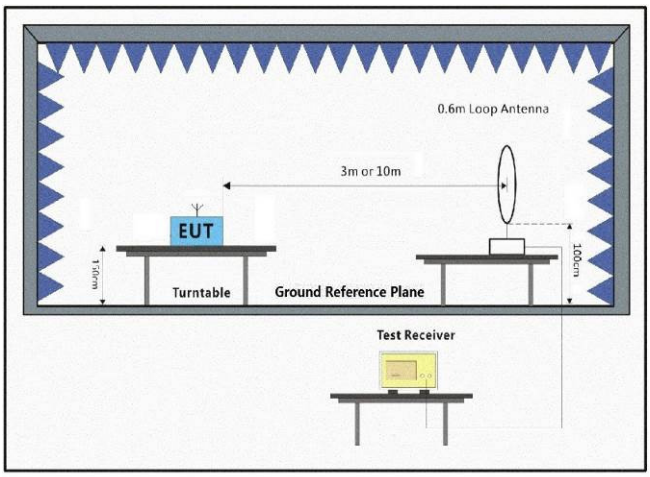
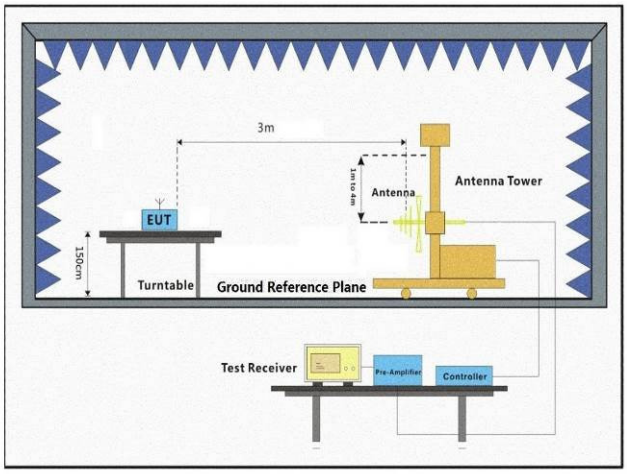
7.8.3 Test Setup Diagram





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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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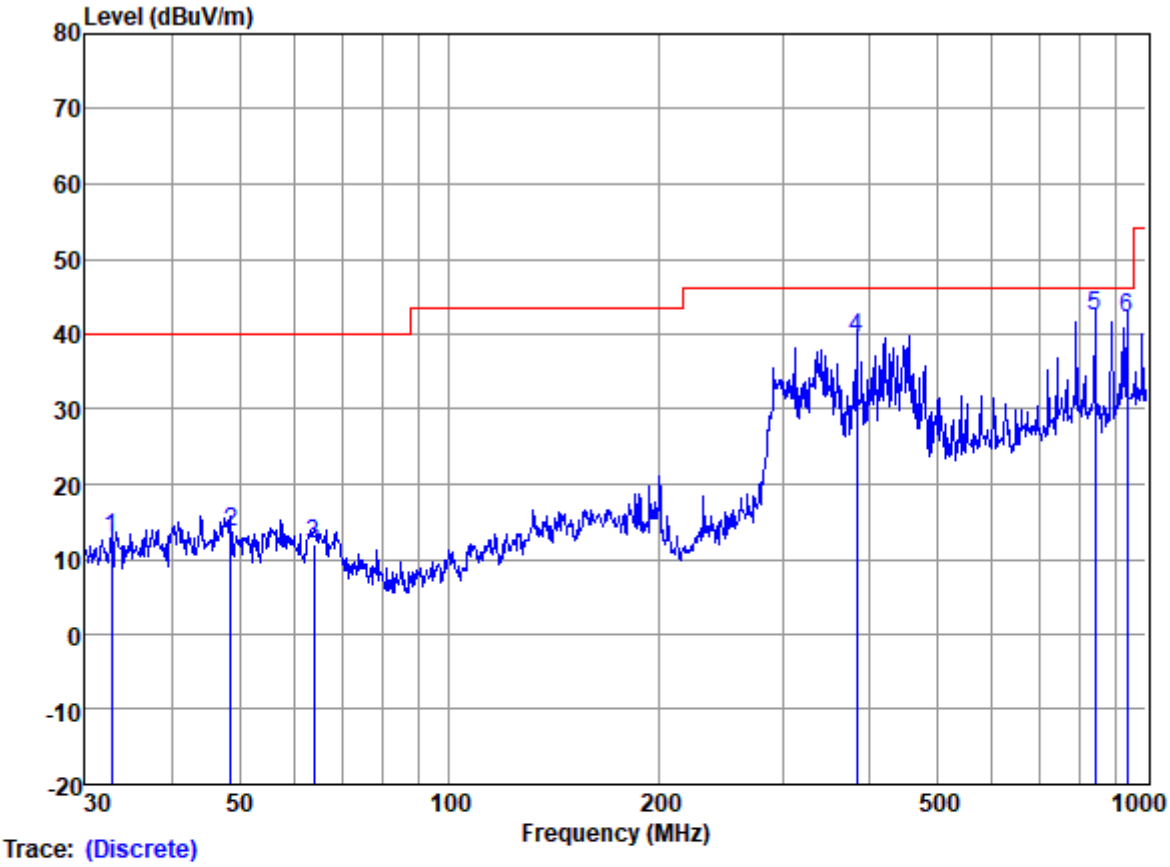
Test Mode: 02; Polarity: Vertical ; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	32.75	26.12	12.74	1.05	27.19	12.72	40.00	-27.28	VERTICAL	
2	48.50	25.67	13.98	1.14	27.17	13.62	40.00	-26.38	VERTICAL	
3	63.98	24.97	12.90	1.32	27.15	12.04	40.00	-27.96	VERTICAL	
4	383.93	47.36	15.50	3.87	27.26	39.47	46.00	-6.53	VERTICAL	
5	842.13	41.29	22.72	6.46	27.96	42.51	46.00	-3.49	VERTICAL	
6	938.83	39.02	23.80	7.12	27.78	42.16	46.00	-3.84	VERTICAL	

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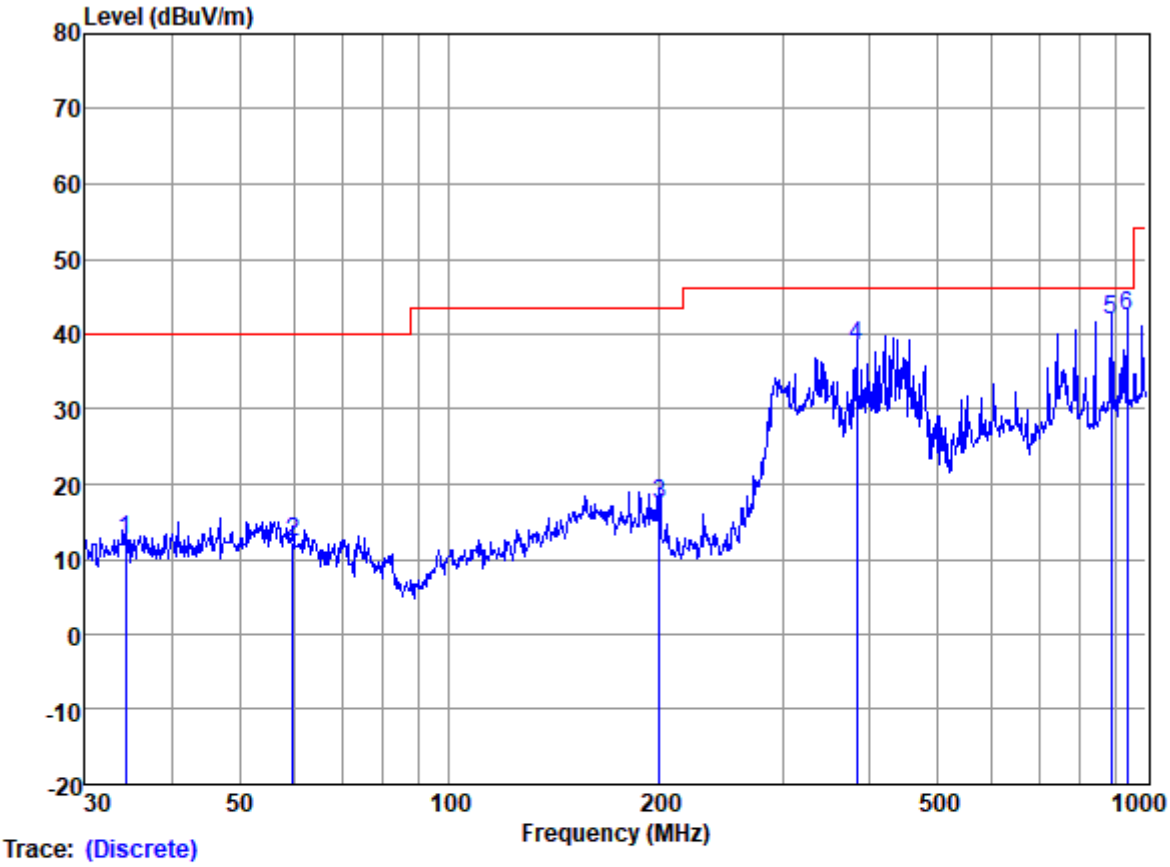
Test Mode: 02: Polarity: Horizontal ; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



Site : SGS
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	34.28	25.81	12.82	1.06	27.18	12.51	40.00	-27.49	HORIZONTAL	
2	59.65	24.77	13.44	1.25	27.16	12.30	40.00	-27.70	HORIZONTAL	
3	199.99	31.38	10.20	2.52	26.73	17.37	43.50	-26.13	HORIZONTAL	
4	383.93	46.19	15.50	3.87	27.26	38.30	46.00	-7.70	HORIZONTAL	
5	890.73	39.86	23.10	6.86	27.86	41.96	46.00	-4.04	HORIZONTAL	
6	938.83	39.16	23.80	7.12	27.78	42.30	46.00	-3.70	HORIZONTAL	

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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: 22.7 °C Humidity: 52.5 % RH Atmospheric Pressure: 1008 mbar

7.9.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Charge + TX mode_Keep the EUT in charging and 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). Only the data of worst case is recorded in the report.
Pre-scan	03	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). Only the data of worst case is recorded in the report.

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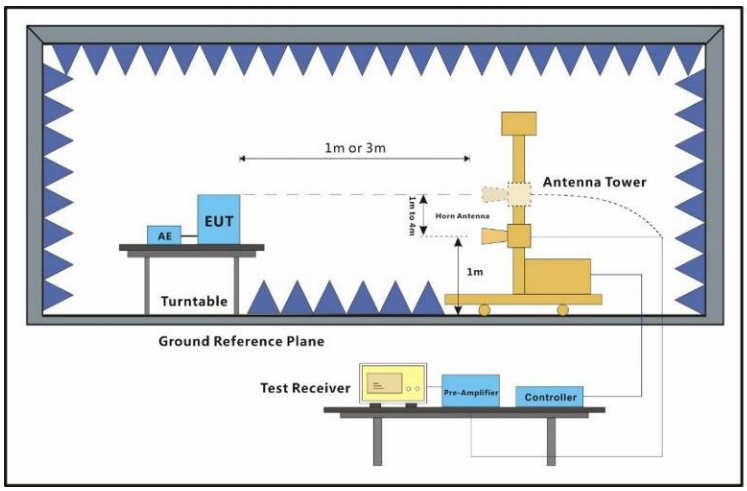
7.9.3 Test Setup Diagram



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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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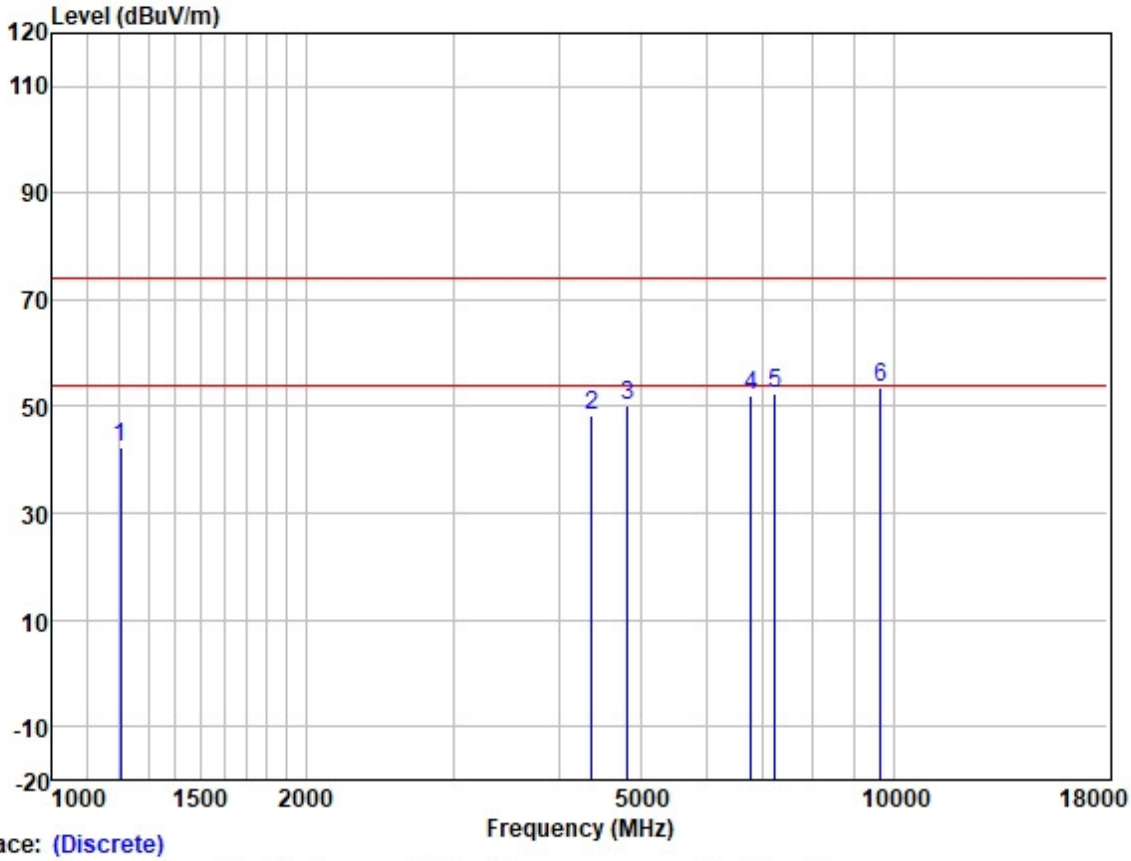
Test Mode: 02; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1206.682	53.67	24.72	2.33	38.39	42.33	74.00	-31.67	HORIZONTAL	Peak
2	4379.699	49.95	30.64	4.69	36.81	48.47	74.00	-25.53	HORIZONTAL	Peak
3	4824.000	50.17	31.45	5.42	36.83	50.21	74.00	-23.79	HORIZONTAL	Peak
4	6776.265	48.73	34.61	5.82	37.11	52.05	74.00	-21.95	HORIZONTAL	Peak
5	7236.000	47.96	35.70	6.03	37.39	52.30	74.00	-21.70	HORIZONTAL	Peak
6	9648.000	45.47	38.40	7.06	37.42	53.51	74.00	-20.49	HORIZONTAL	Peak

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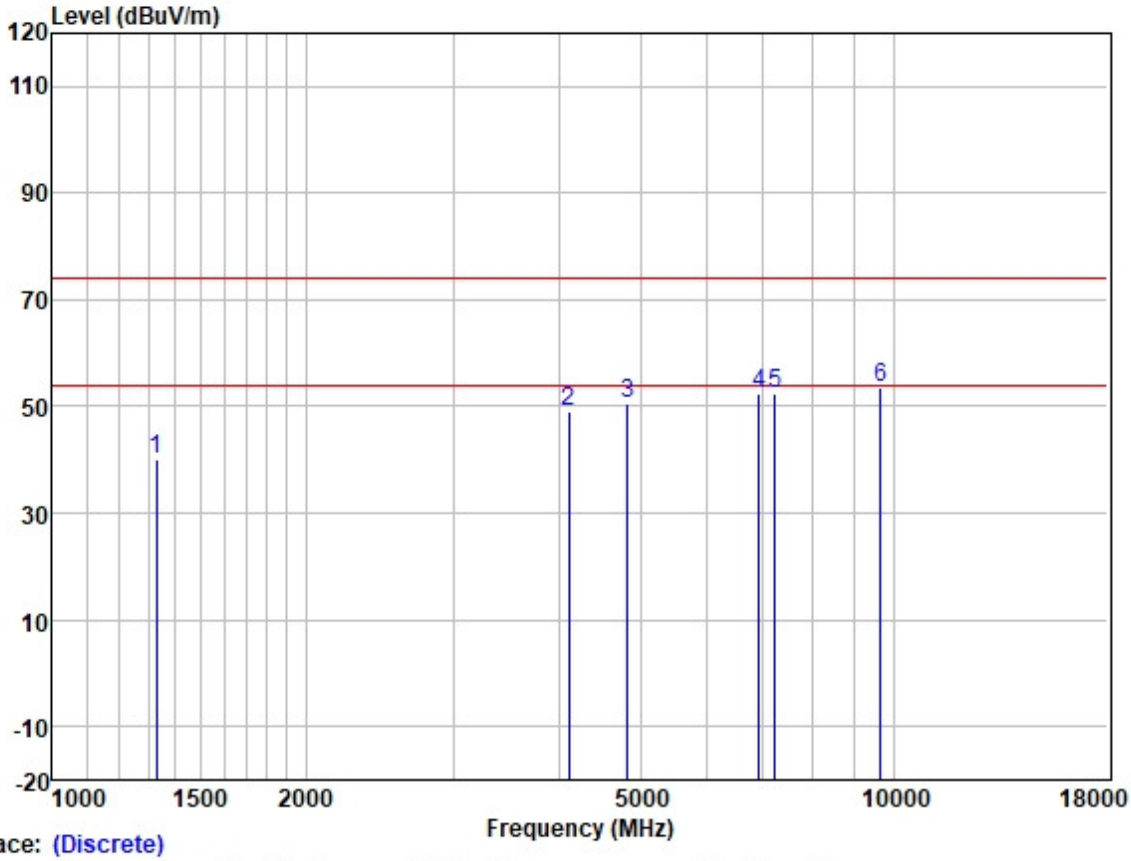
Member of the SGS Group (SGS SA)

Test Mode: 02; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1331.288	50.34	25.28	2.60	38.29	39.93	74.00	-34.07	VERTICAL	Peak
2	4109.872	51.36	29.96	4.60	36.80	49.12	74.00	-24.88	VERTICAL	Peak
3	4824.000	50.37	31.45	5.42	36.83	50.41	74.00	-23.59	VERTICAL	Peak
4	6914.763	48.79	34.89	5.81	37.19	52.30	74.00	-21.70	VERTICAL	Peak
5	7236.000	48.14	35.70	6.03	37.39	52.48	74.00	-21.52	VERTICAL	Peak
6	9648.000	45.60	38.40	7.06	37.42	53.64	74.00	-20.36	VERTICAL	Peak

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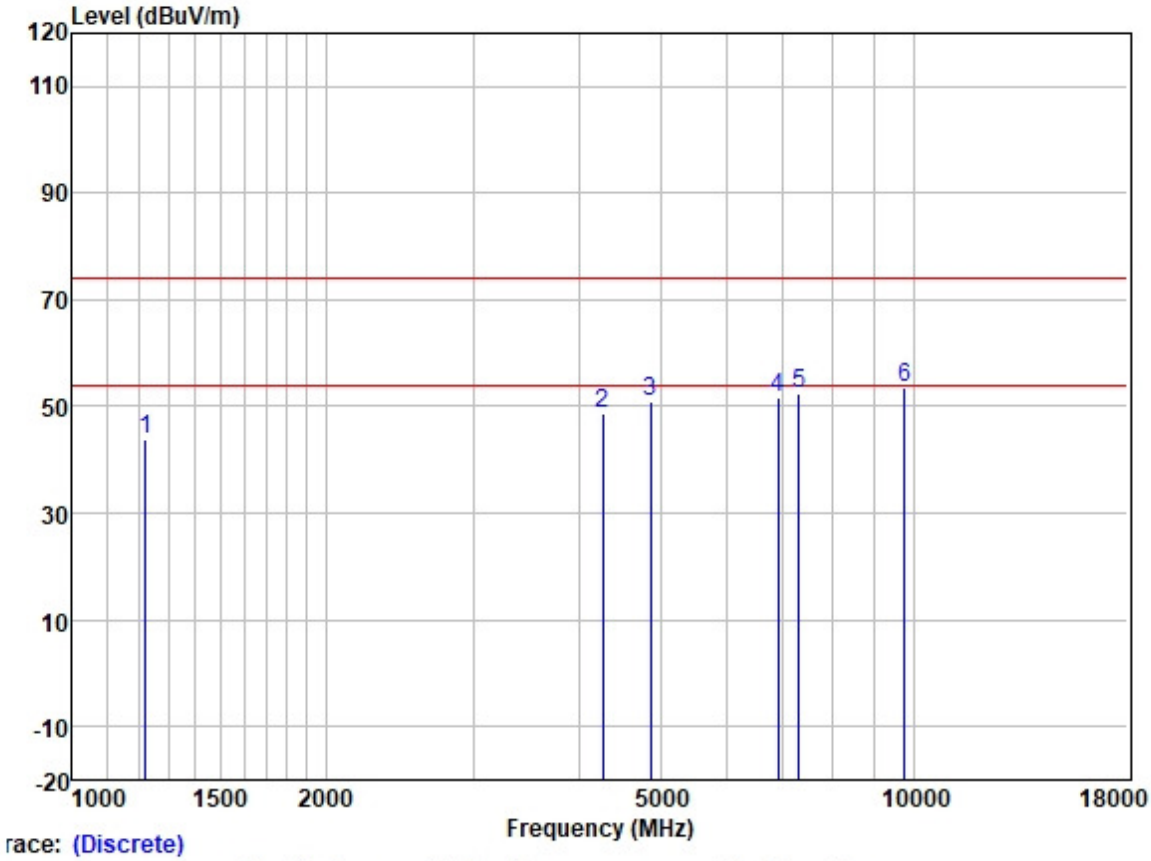
Test Mode: 02; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:middle



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1220.714	54.91	24.82	2.32	38.37	43.68	74.00	-30.32	HORIZONTAL	Peak
2	4267.237	50.43	30.38	4.63	36.81	48.63	74.00	-25.37	HORIZONTAL	Peak
3	4874.000	50.74	31.54	5.50	36.84	50.94	74.00	-23.06	HORIZONTAL	Peak
4	6894.806	48.38	34.85	5.81	37.18	51.86	74.00	-22.14	HORIZONTAL	Peak
5	7311.000	47.96	35.93	6.11	37.42	52.58	74.00	-21.42	HORIZONTAL	Peak
6	9748.000	45.36	38.50	7.02	37.41	53.47	74.00	-20.53	HORIZONTAL	Peak

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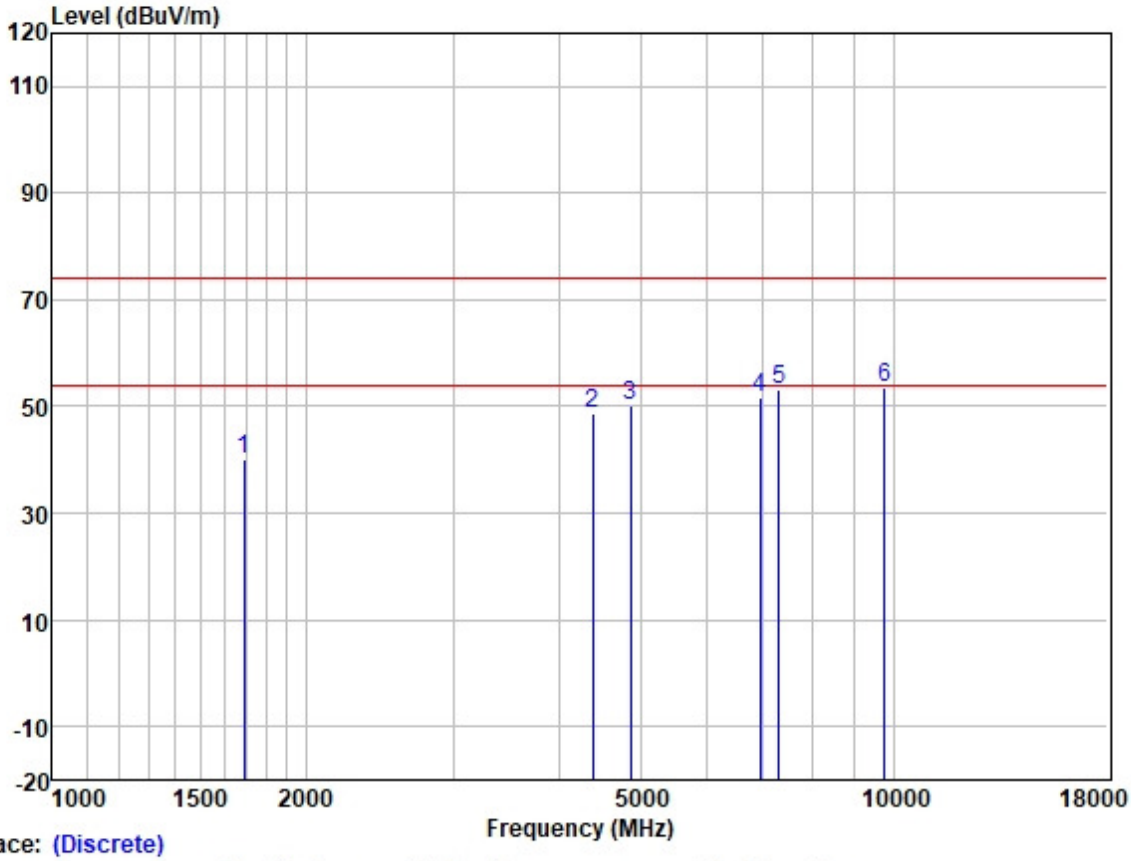
Test Mode: 02; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:middle



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1692.231	49.46	25.70	2.80	37.89	40.07	74.00	-33.93	VERTICAL	Peak
2	4392.376	50.17	30.66	4.70	36.81	48.72	74.00	-25.28	VERTICAL	Peak
3	4874.000	49.81	31.54	5.50	36.84	50.01	74.00	-23.99	VERTICAL	Peak
4	6934.778	48.00	34.92	5.81	37.19	51.54	74.00	-22.46	VERTICAL	Peak
5	7311.000	48.73	35.93	6.11	37.42	53.35	74.00	-20.65	VERTICAL	Peak
6	9748.000	45.41	38.50	7.02	37.41	53.52	74.00	-20.48	VERTICAL	Peak

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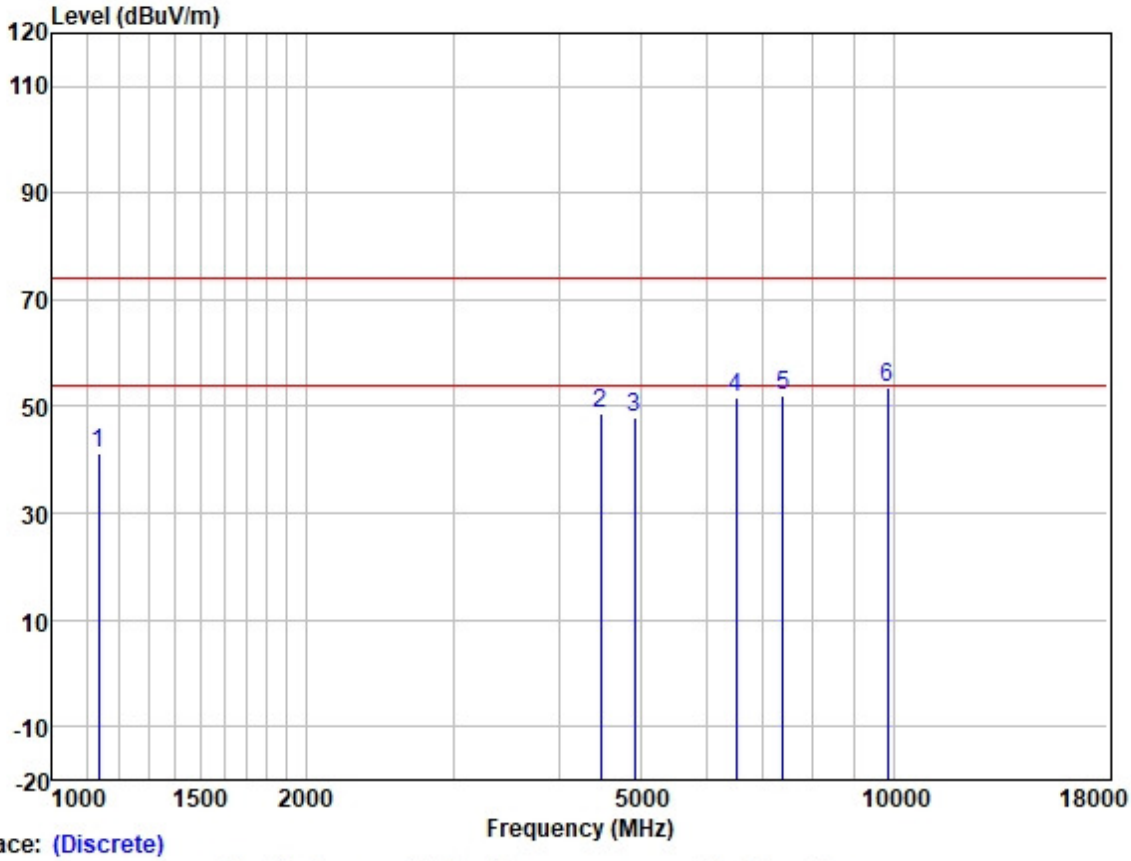
Test Mode: 02; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1135.617	53.00	24.45	2.25	38.43	41.27	74.00	-32.73	HORIZONTAL	Peak
2	4482.150	49.70	30.78	4.99	36.81	48.66	74.00	-25.34	HORIZONTAL	Peak
3	4924.000	47.75	31.62	5.60	36.84	48.13	74.00	-25.87	HORIZONTAL	Peak
4	6507.536	48.91	34.00	5.84	37.01	51.74	74.00	-22.26	HORIZONTAL	Peak
5	7386.000	47.18	36.17	6.19	37.45	52.09	74.00	-21.91	HORIZONTAL	Peak
6	9848.000	45.55	38.58	6.99	37.41	53.71	74.00	-20.29	HORIZONTAL	Peak

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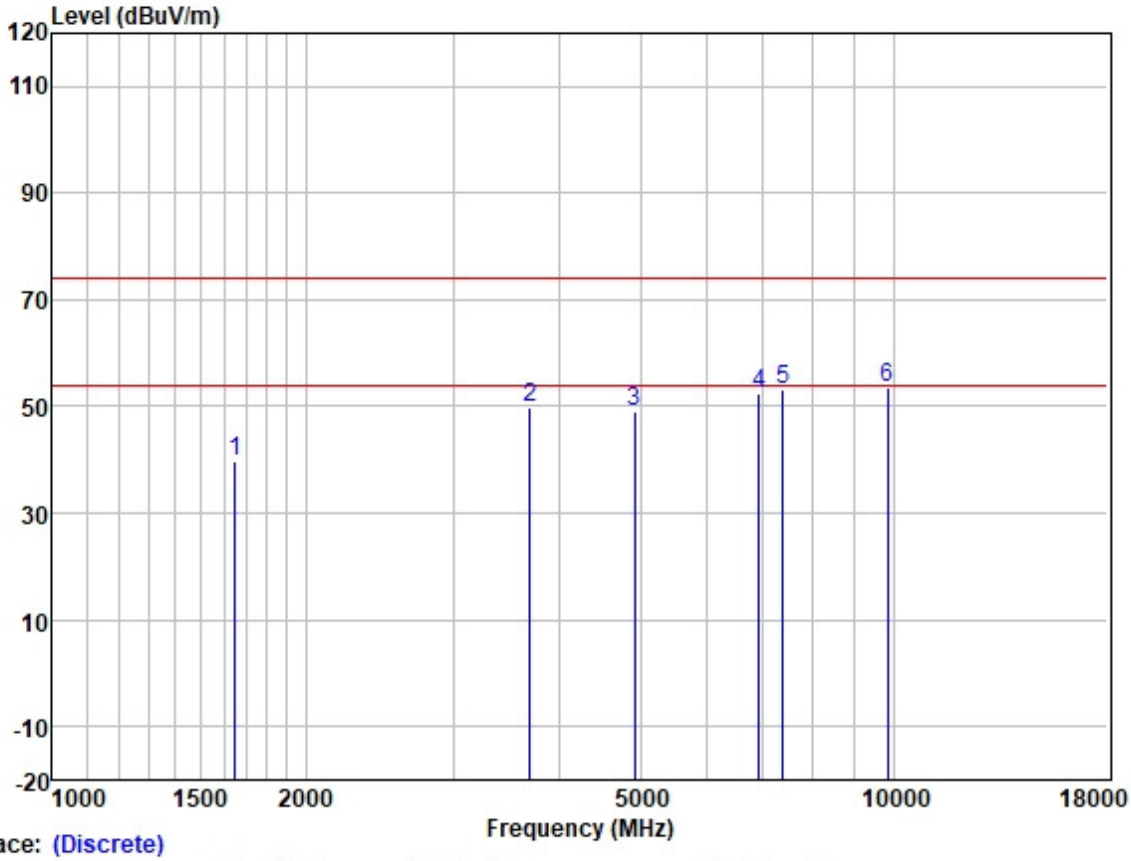
Test Mode: 02; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1648.778	49.30	25.63	2.80	37.93	39.80	74.00	-34.20	VERTICAL	Peak
2	3693.033	52.95	29.22	4.55	36.88	49.84	74.00	-24.16	VERTICAL	Peak
3	4924.000	48.57	31.62	5.60	36.84	48.95	74.00	-25.05	VERTICAL	Peak
4	6914.763	48.92	34.89	5.81	37.19	52.43	74.00	-21.57	VERTICAL	Peak
5	7386.000	48.17	36.17	6.19	37.45	53.08	74.00	-20.92	VERTICAL	Peak
6	9848.000	45.30	38.58	6.99	37.41	53.46	74.00	-20.54	VERTICAL	Peak

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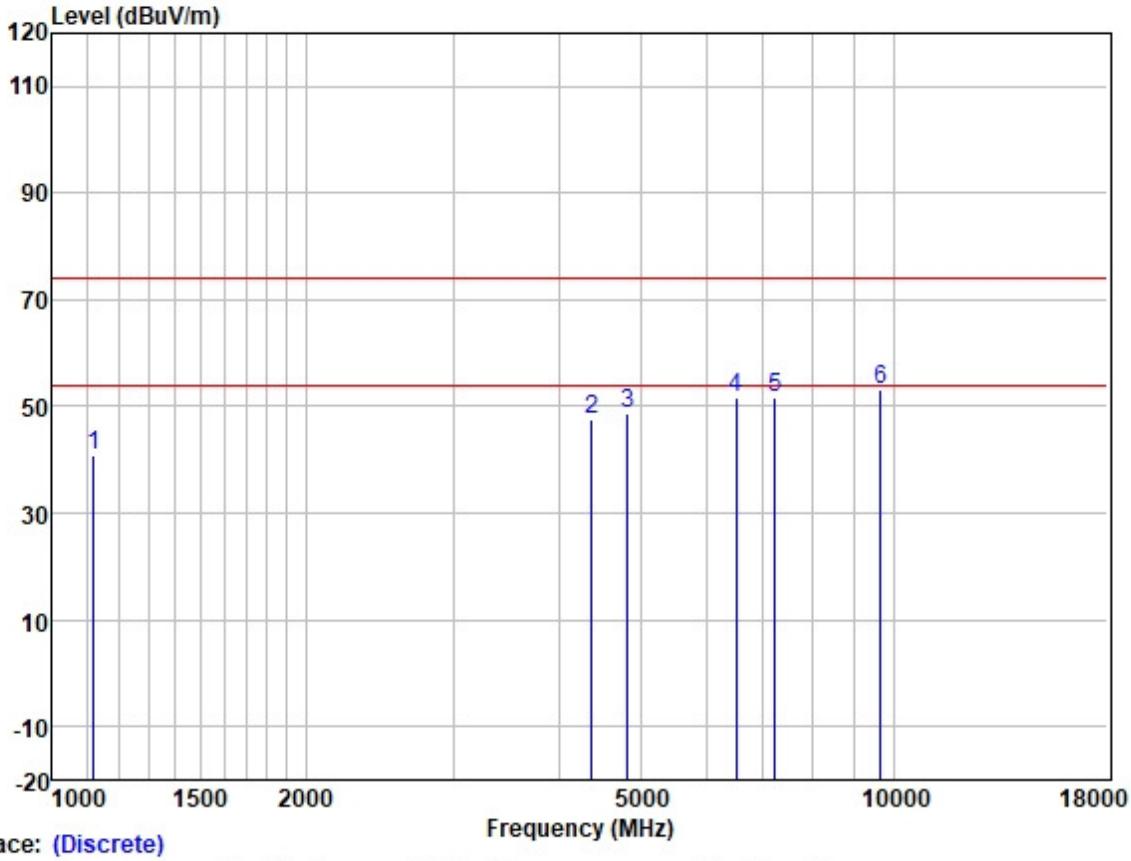
Test Mode: 02; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:Low



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1119.323	52.72	24.41	2.24	38.43	40.94	74.00	-33.06	HORIZONTAL	Peak
2	4379.699	49.14	30.64	4.69	36.81	47.66	74.00	-26.34	HORIZONTAL	Peak
3	4824.000	48.57	31.45	5.42	36.83	48.61	74.00	-25.39	HORIZONTAL	Peak
4	6507.536	48.91	34.00	5.84	37.01	51.74	74.00	-22.26	HORIZONTAL	Peak
5	7236.000	47.48	35.70	6.03	37.39	51.82	74.00	-22.18	HORIZONTAL	Peak
6	9648.000	45.22	38.40	7.06	37.42	53.26	74.00	-20.74	HORIZONTAL	Peak

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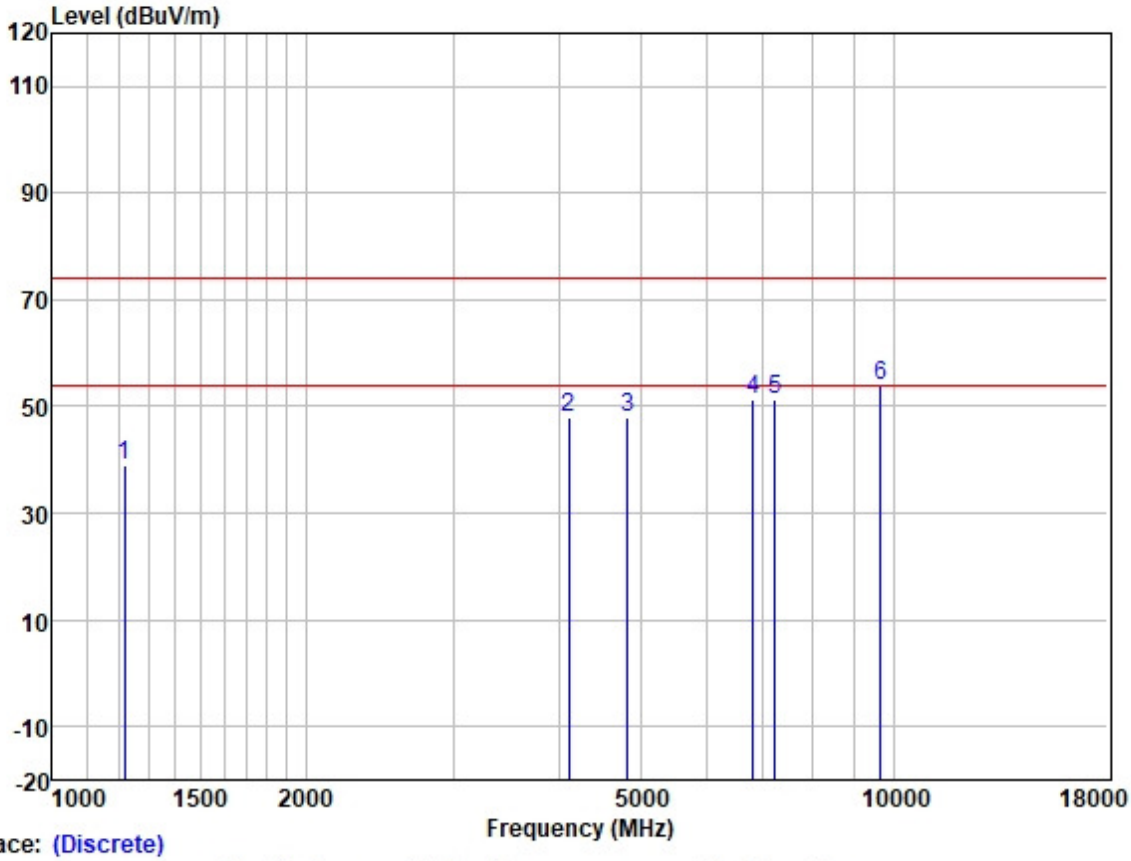
Test Mode: 02; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:Low



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1217.190	50.41	24.79	2.32	38.37	39.15	74.00	-34.85	VERTICAL	Peak
2	4109.872	50.24	29.96	4.60	36.80	48.00	74.00	-26.00	VERTICAL	Peak
3	4824.000	47.95	31.45	5.42	36.83	47.99	74.00	-26.01	VERTICAL	Peak
4	6815.551	48.01	34.70	5.82	37.13	51.40	74.00	-22.60	VERTICAL	Peak
5	7236.000	46.83	35.70	6.03	37.39	51.17	74.00	-22.83	VERTICAL	Peak
6	9648.000	45.88	38.40	7.06	37.42	53.92	74.00	-20.08	VERTICAL	Peak

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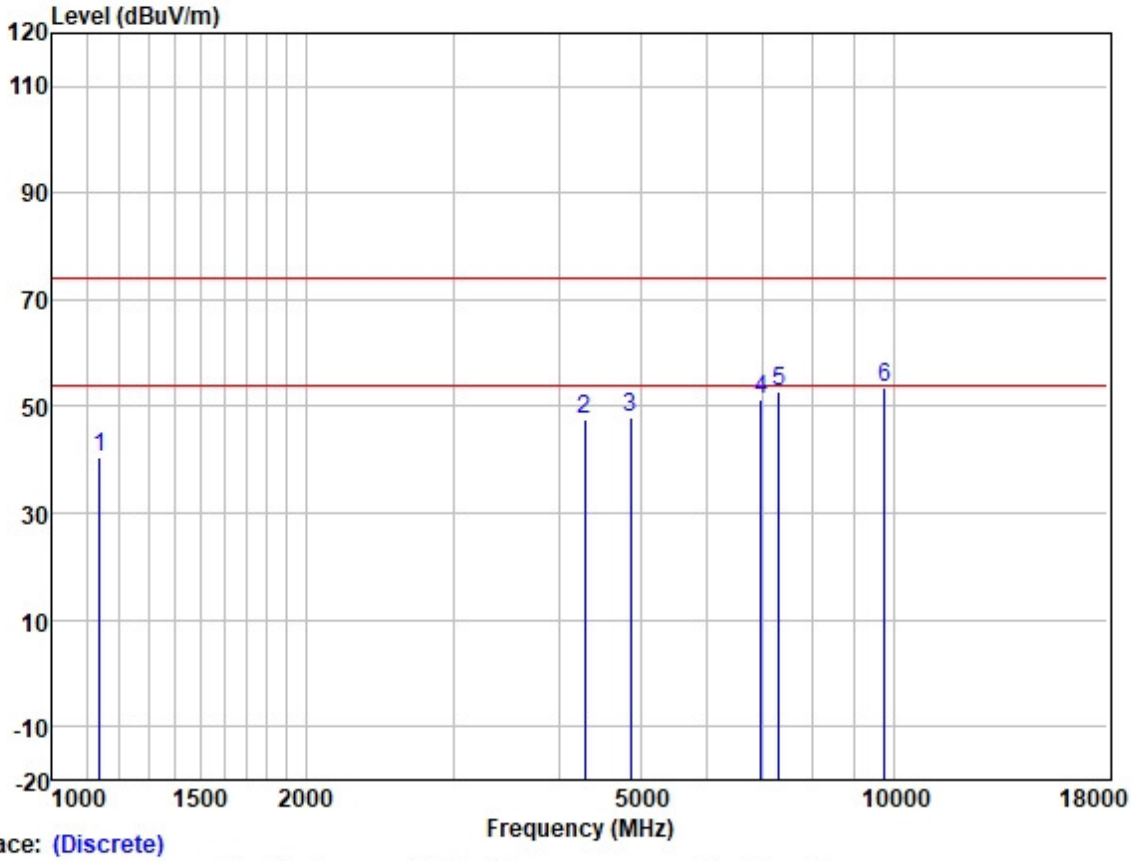
Test Mode: 02; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:middle



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1138.904	52.21	24.46	2.27	38.42	40.52	74.00	-33.48	HORIZONTAL	Peak
2	4291.977	49.17	30.45	4.64	36.81	47.45	74.00	-26.55	HORIZONTAL	Peak
3	4874.000	47.59	31.54	5.50	36.84	47.79	74.00	-26.21	HORIZONTAL	Peak
4	6954.852	47.82	34.95	5.81	37.21	51.37	74.00	-22.63	HORIZONTAL	Peak
5	7311.000	48.19	35.93	6.11	37.42	52.81	74.00	-21.19	HORIZONTAL	Peak
6	9748.000	45.47	38.50	7.02	37.41	53.58	74.00	-20.42	HORIZONTAL	Peak

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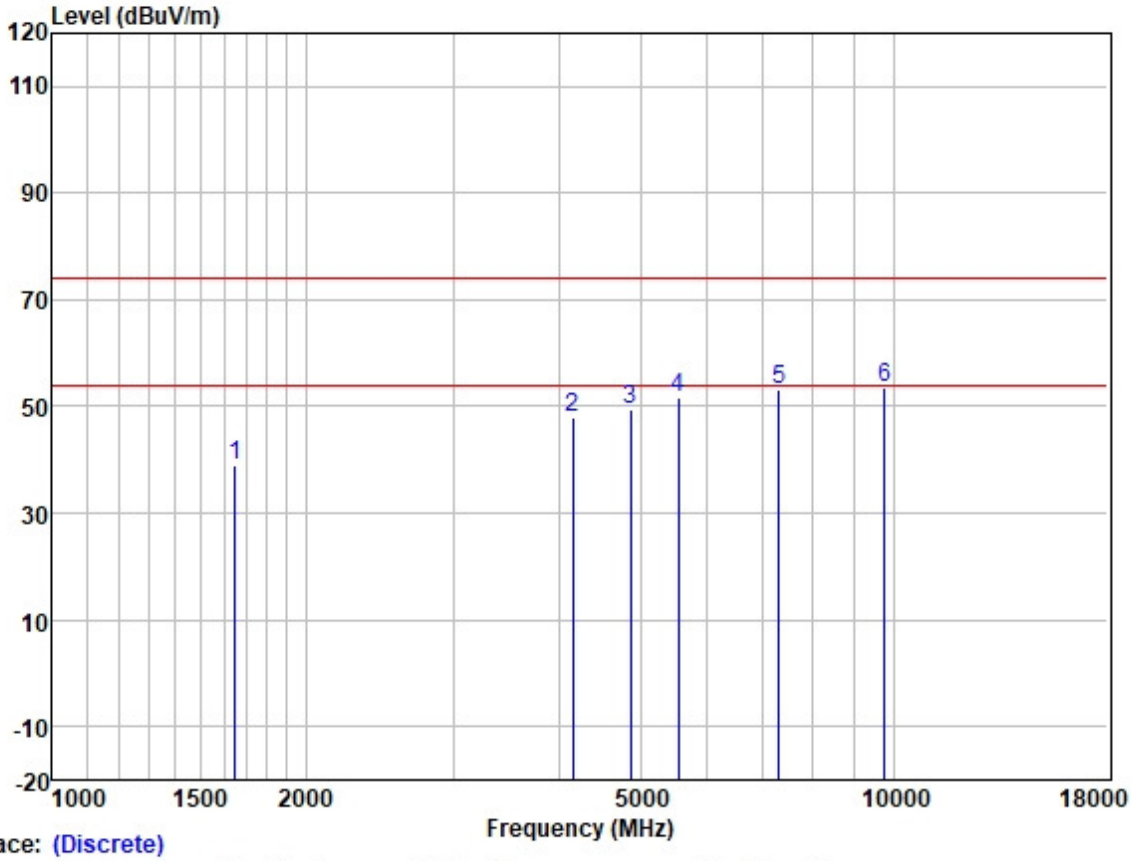
Test Mode: 02; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:middle



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1648.778	48.32	25.63	2.80	37.93	38.82	74.00	-35.18	VERTICAL	Peak
2	4157.664	50.06	30.06	4.60	36.80	47.92	74.00	-26.08	VERTICAL	Peak
3	4874.000	49.20	31.54	5.50	36.84	49.40	74.00	-24.60	VERTICAL	Peak
4	5551.069	50.43	31.84	6.35	36.89	51.73	74.00	-22.27	VERTICAL	Peak
5	7311.000	48.42	35.93	6.11	37.42	53.04	74.00	-20.96	VERTICAL	Peak
6	9748.000	45.52	38.50	7.02	37.41	53.63	74.00	-20.37	VERTICAL	Peak

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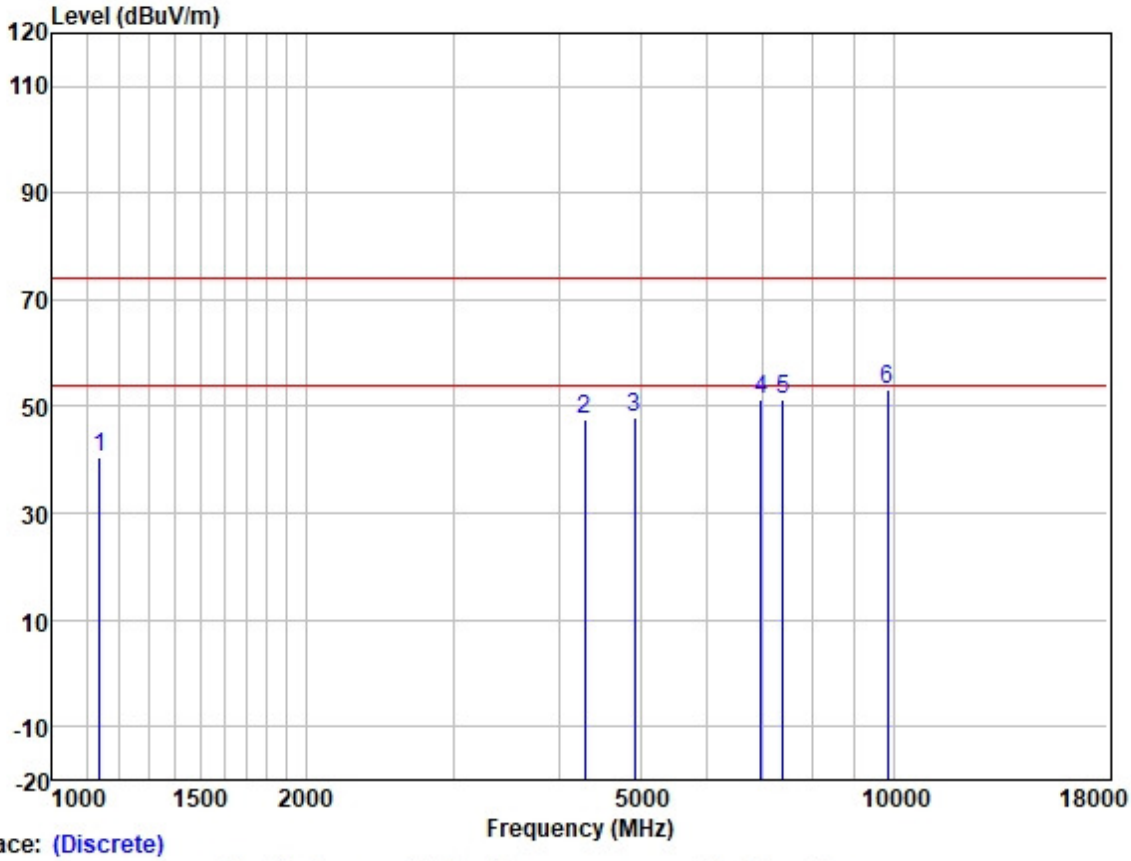
Test Mode: 02; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1138.904	52.21	24.46	2.27	38.42	40.52	74.00	-33.48	HORIZONTAL	Peak
2	4291.977	49.17	30.45	4.64	36.81	47.45	74.00	-26.55	HORIZONTAL	Peak
3	4924.000	47.70	31.62	5.60	36.84	48.08	74.00	-25.92	HORIZONTAL	Peak
4	6954.852	47.82	34.95	5.81	37.21	51.37	74.00	-22.63	HORIZONTAL	Peak
5	7386.000	46.39	36.17	6.19	37.45	51.30	74.00	-22.70	HORIZONTAL	Peak
6	9848.000	45.10	38.58	6.99	37.41	53.26	74.00	-20.74	HORIZONTAL	Peak

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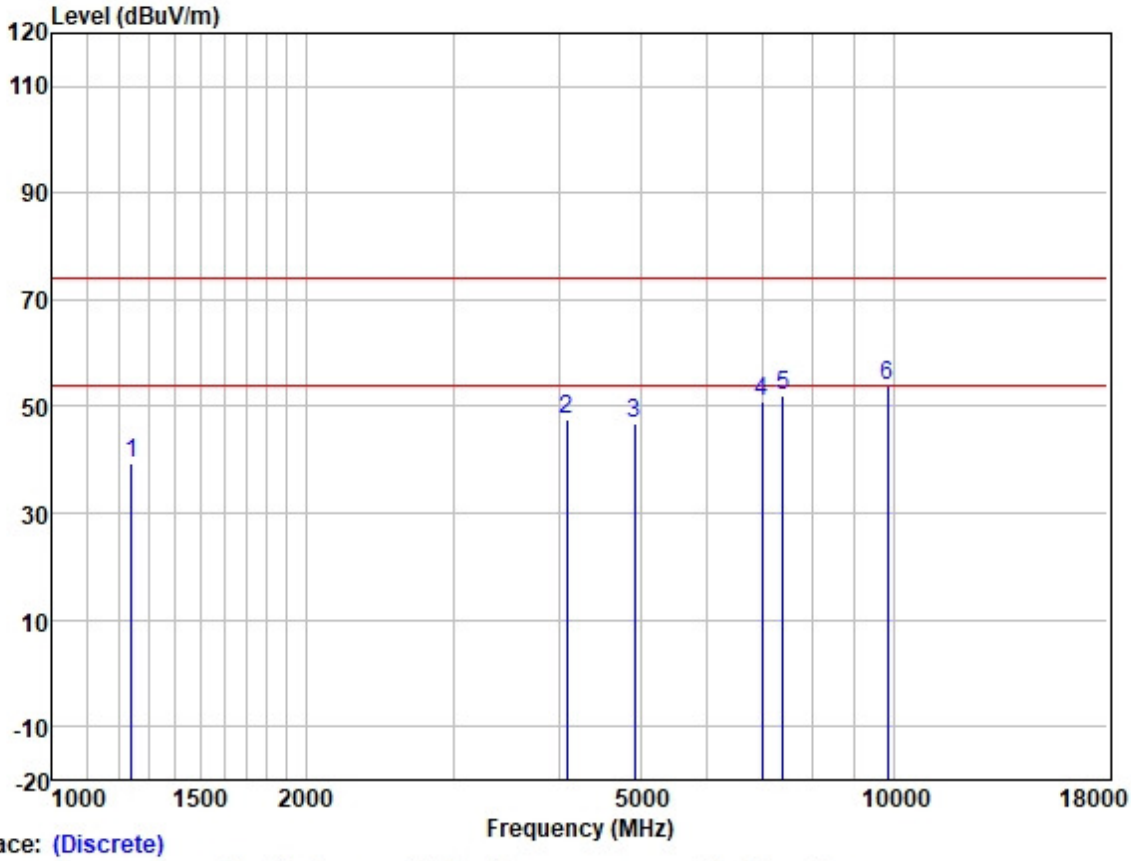
Test Mode: 02; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:High



race: (Discrete)

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1242.068	50.26	24.98	2.31	38.35	39.20	74.00	-34.80	VERTICAL	Peak
2	4086.182	49.69	29.92	4.60	36.80	47.41	74.00	-26.59	VERTICAL	Peak
3	4924.000	46.53	31.62	5.60	36.84	46.91	74.00	-27.09	VERTICAL	Peak
4	6974.982	47.41	34.97	5.81	37.23	50.96	74.00	-23.04	VERTICAL	Peak
5	7386.000	47.23	36.17	6.19	37.45	52.14	74.00	-21.86	VERTICAL	Peak
6	9848.000	45.66	38.58	6.99	37.41	53.82	74.00	-20.18	VERTICAL	Peak

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