TEST REPORT

Application No.:	GZCR2110021203AT
Applicant:	KanDao Technology Co., Ltd.
Address of Applicant:	201 Sino-Steel building, Maqueling Industrial District, Maling Area, Yuehai Street, Nanshan, Shenzhen, China
Manufacturer:	KanDao Technology Co., Ltd.
Address of Manufacturer:	201 Sino-Steel building, Maqueling Industrial District, Maling Area, Yuehai Street, Nanshan, Shenzhen, China
Factory:	SKY LIGHT ELECTRONIC (SHENZHEN) LIMITED
Address of Factory:	1F-2F OF NO.9, 1F-5F OF NO.8, ANTUOSHAN HIGH-TECH. INDUSTRIAL PARK, SHAER COMMUNITY, SHAJING STREET, BAO'AN DISTRICT, SHENZHEN CITY, GUANGDONG PROVINCE, CHINA
Equipment Under Test (EUT):	
EUT Name:	Kandao Obsidian Pro
Model No.:	OSP0415
Trade Mark:	KanDao
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2021-10-18
Date of Test:	2021-10-18 to 2021-10-28
Date of Issue:	2021-10-29
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		*2021-10-29*		*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 20V powered by an adapter. Adapter Model: GST220A20 Input: AC 100-240V, 50/60Hz, 4.0A Output: DC 20V 11A.
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz
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
Channel Spacing:	5MHz
Antenna Type:	Dipole Antenna
Antenna Gain:	ANT1: 5.0dBi; ANT2: 5.0dBi;

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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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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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	2021-09-24	2022-09-23
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
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Minimum 6dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Power Spectrum Density					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Conducted Band Edges Measurement					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14

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MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Conducted Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

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	2021-09-16	2022-09-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	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	2021-09-08	2022-09-07

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

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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	2021-09-16	2022-09-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	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	2021-09-08	2022-09-07

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

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 port is integrated on the main PCB and it Connect to the RP-SMA connector through the RF cable, the EUT use a Non-standard connector dipole antenna, it can be replaced by user, and the user should use the antenna provided by the manufacturer.

The best case gain of the Antenna 1: 5.0dBi; Antenna 2: 5.0dBi;

For MIMO, Directional Gain = G_{ANT_Max} + 10log(2/1) = 8.01dBi

Antenna location: Refer to external photo.

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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: 22.5 °C Humidity: 53.4 % RH Atmospheric Pressure: 1003 mbar

7.1.2 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). Only the data of worst case is recorded in the report.

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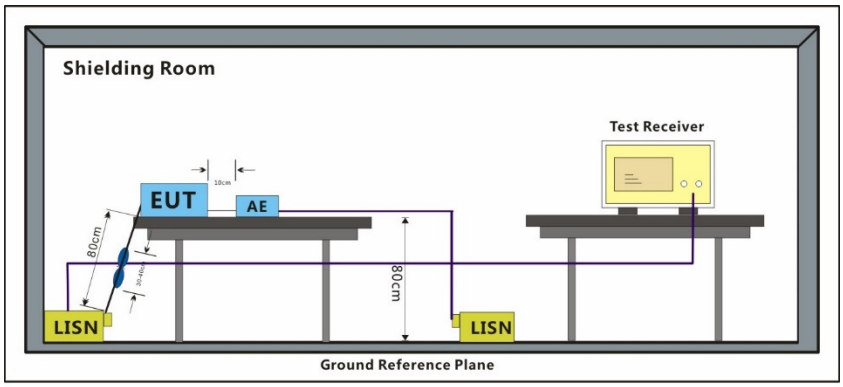
7.1.3 Test Setup Diagram



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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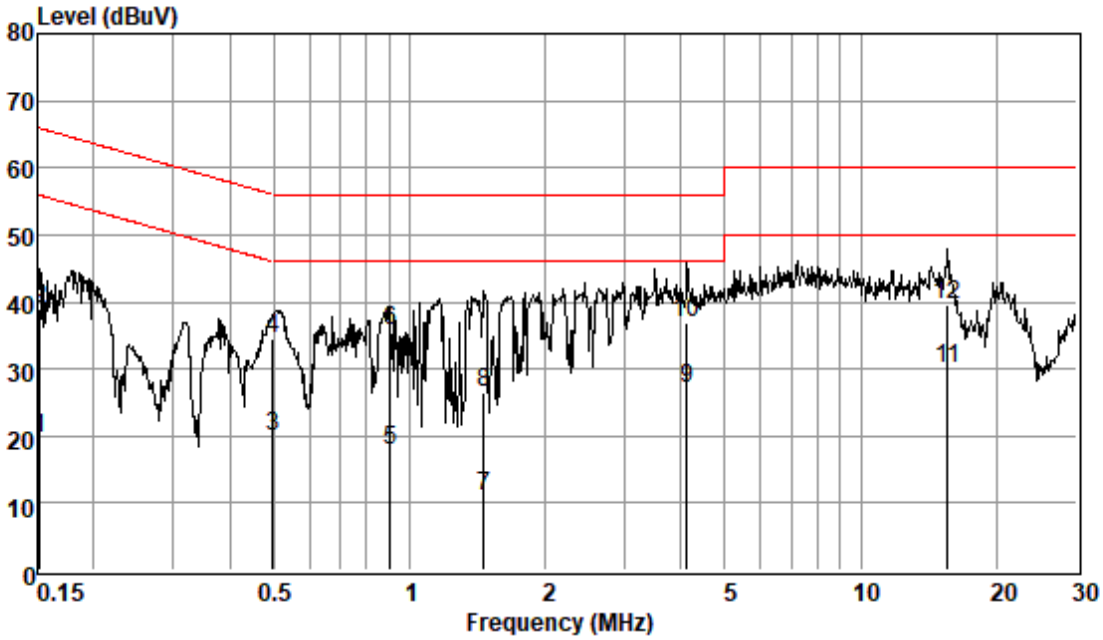
Test Mode: 03; Polarity: Neutral; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



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
0.15	9.95	0.06	9.55	19.56	55.91	-36.35	Average
0.15	29.48	0.06	9.55	39.09	65.91	-26.82	QP
0.50	10.26	0.07	9.55	19.88	46.01	-26.13	Average
0.50	24.91	0.07	9.55	34.53	56.01	-21.48	QP
0.91	8.26	0.07	9.55	17.88	46.00	-28.12	Average
0.91	26.17	0.07	9.55	35.79	56.00	-20.21	QP
1.46	1.21	0.10	9.55	10.86	46.00	-35.14	Average
1.46	16.85	0.10	9.55	26.50	56.00	-29.50	QP
4.11	17.34	0.17	9.56	27.07	46.00	-18.93	Average
4.11	27.01	0.17	9.56	36.74	56.00	-19.26	QP
15.55	20.04	0.32	9.64	30.00	50.00	-20.00	Average
15.55	29.51	0.32	9.64	39.47	60.00	-20.53	QP

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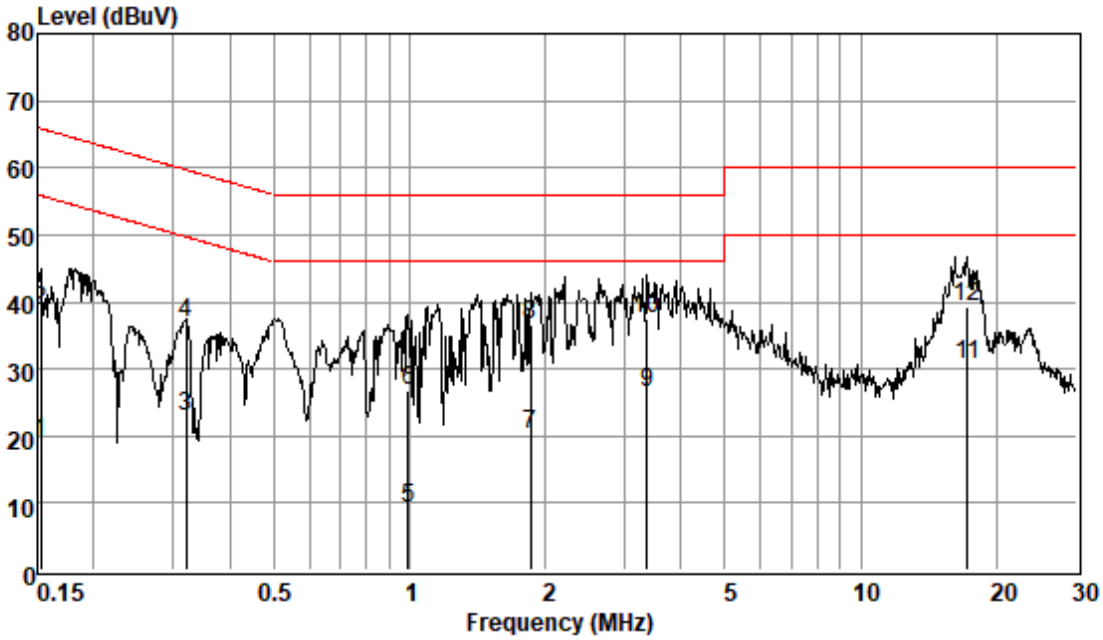
Test Mode: 03; Polarity: Line; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



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
0.15	9.46	0.06	9.62	19.14	55.87	-36.73	Average
0.15	28.96	0.06	9.62	38.64	65.87	-27.23	QP
0.32	13.20	0.06	9.62	22.88	49.71	-26.83	Average
0.32	27.17	0.06	9.62	36.85	59.71	-22.86	QP
0.99	-0.56	0.07	9.62	9.13	46.00	-36.87	Average
0.99	16.98	0.07	9.62	26.67	56.00	-29.33	QP
1.86	10.58	0.11	9.62	20.31	46.00	-25.69	Average
1.86	26.83	0.11	9.62	36.56	56.00	-19.44	QP
3.36	16.74	0.15	9.62	26.51	46.00	-19.49	Average
3.36	27.83	0.15	9.62	37.60	56.00	-18.40	QP
17.20	20.48	0.33	9.75	30.56	50.00	-19.44	Average
17.20	29.08	0.33	9.75	39.16	60.00	-20.84	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 11.9.1.3
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

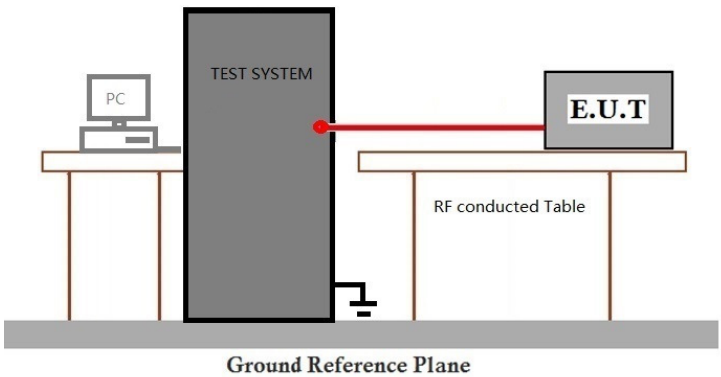
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 21.6 °C Humidity: 51.8 % RH Atmospheric Pressure: 1003 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). 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

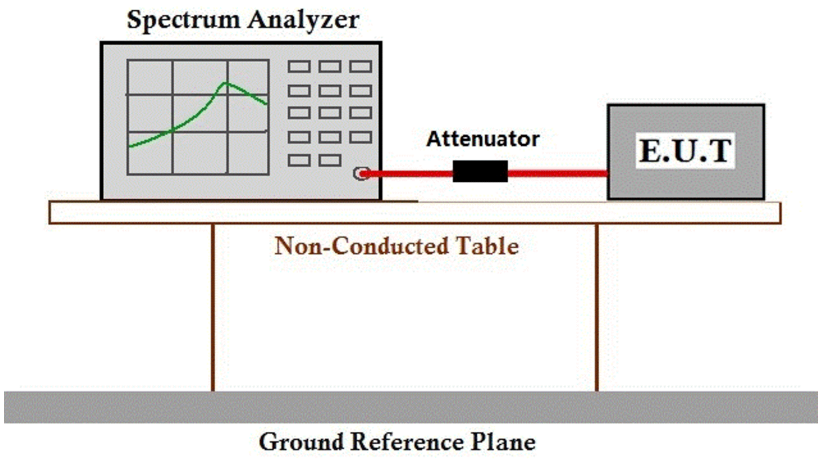
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 21.6 °C Humidity: 51.8 % RH Atmospheric Pressure: 1003 mbar

7.3.2 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). Only the data of worst case is recorded in the report.

7.3.3 Test Setup Diagram



7.3.4 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

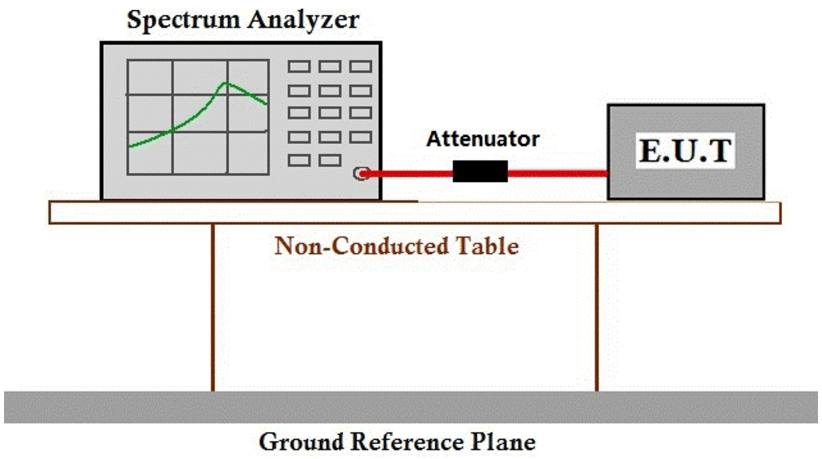
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 21.6 °C Humidity: 51.8 % RH Atmospheric Pressure: 1003 mbar

7.4.2 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). Only the data of worst case is recorded in the report.

7.4.3 Test Setup Diagram



7.4.4 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

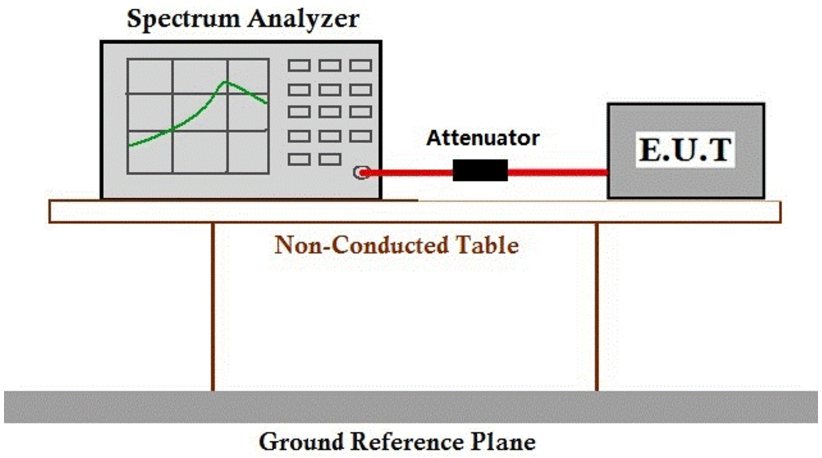
Operating Environment:

Temperature: 21.6 °C Humidity: 51.8 % RH Atmospheric Pressure: 1003 mbar

7.5.2 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). Only the data of worst case is recorded in the report.

7.5.3 Test Setup Diagram



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7.5.4 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

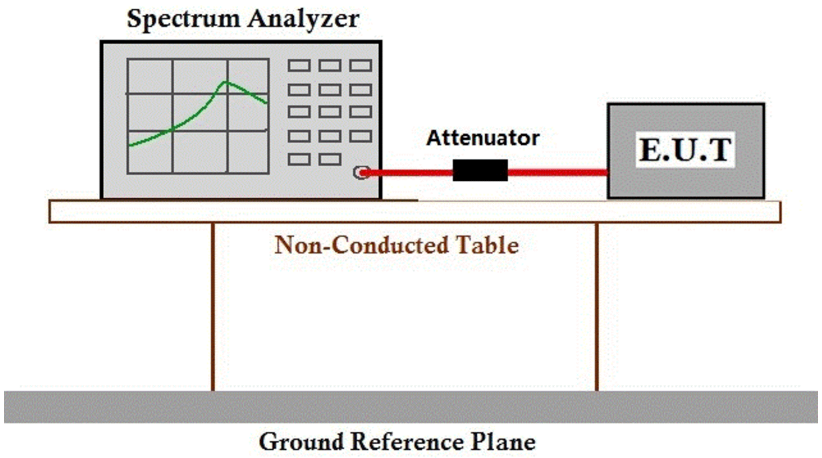
Operating Environment:

Temperature: 21.6 °C Humidity: 51.8 % RH Atmospheric Pressure: 1003 mbar

7.6.2 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). Only the data of worst case is recorded in the report.

7.6.3 Test Setup Diagram



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7.6.4 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: 22.3 °C Humidity: 51.4 % RH Atmospheric Pressure: 1003 mbar

7.7.2 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). Only the data of worst case is recorded in the report.

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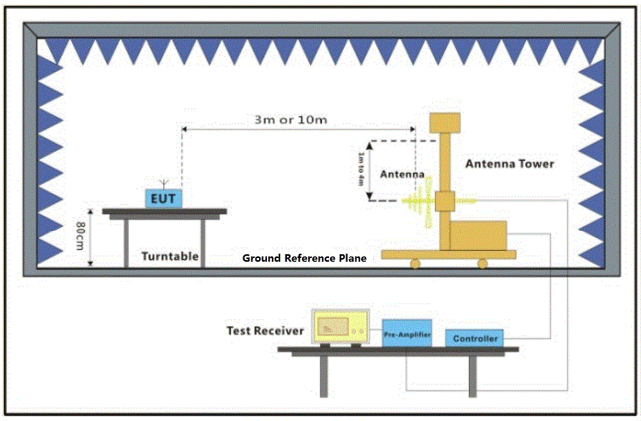
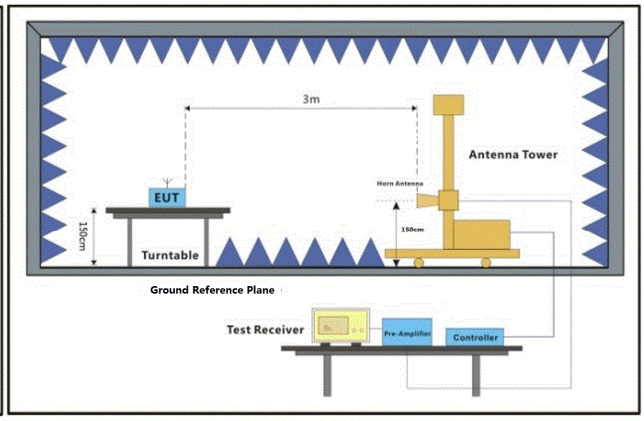
7.7.3 Test Setup Diagram



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: 03; 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	2387.428	47.91	27.33	3.48	37.60	41.12	54.00	-12.88	HORIZONTAL	Average
2	2387.428	61.14	27.33	3.48	37.60	54.35	74.00	-19.65	HORIZONTAL	Peak
3	2390.000	47.40	27.33	3.48	37.59	40.62	54.00	-13.38	HORIZONTAL	Average
4	2390.000	59.21	27.33	3.48	37.59	52.43	74.00	-21.57	HORIZONTAL	Peak
5 *	2412.000	102.63	27.38	3.47	37.59	95.89	54.00	41.89	HORIZONTAL	Average
6 *	2412.000	105.96	27.38	3.47	37.59	99.22	74.00	25.22	HORIZONTAL	Peak

通标标准技术服务有限公司广州分公司
检验检测专用章
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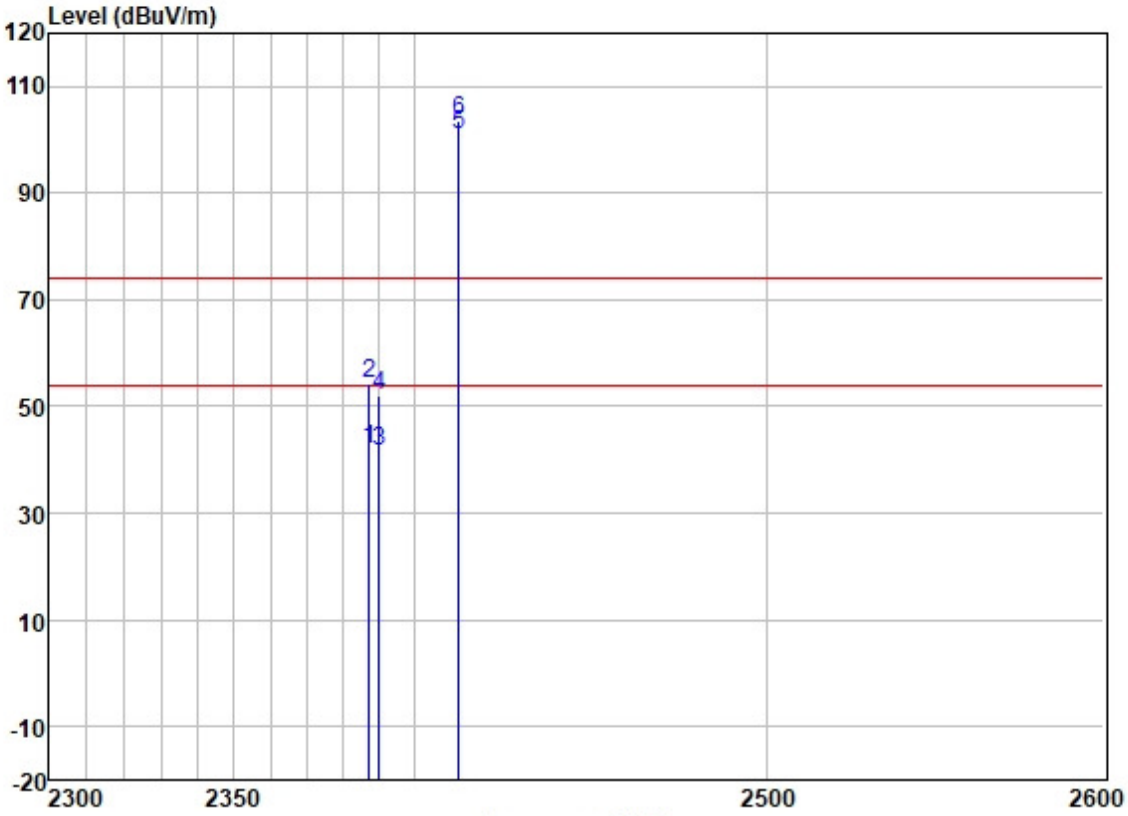
Test Mode: 03; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



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		2387.065	48.69	27.33	3.48	37.60	41.90	54.00	-12.10	VERTICAL	Average
2		2387.065	60.98	27.33	3.48	37.60	54.19	74.00	-19.81	VERTICAL	Peak
3		2390.000	48.40	27.33	3.48	37.59	41.62	54.00	-12.38	VERTICAL	Average
4		2390.000	58.91	27.33	3.48	37.59	52.13	74.00	-21.87	VERTICAL	Peak
5	*	2412.000	107.62	27.38	3.47	37.59	100.88	54.00	46.88	VERTICAL	Average
6	*	2412.000	110.20	27.38	3.47	37.59	103.46	74.00	29.46	VERTICAL	Peak

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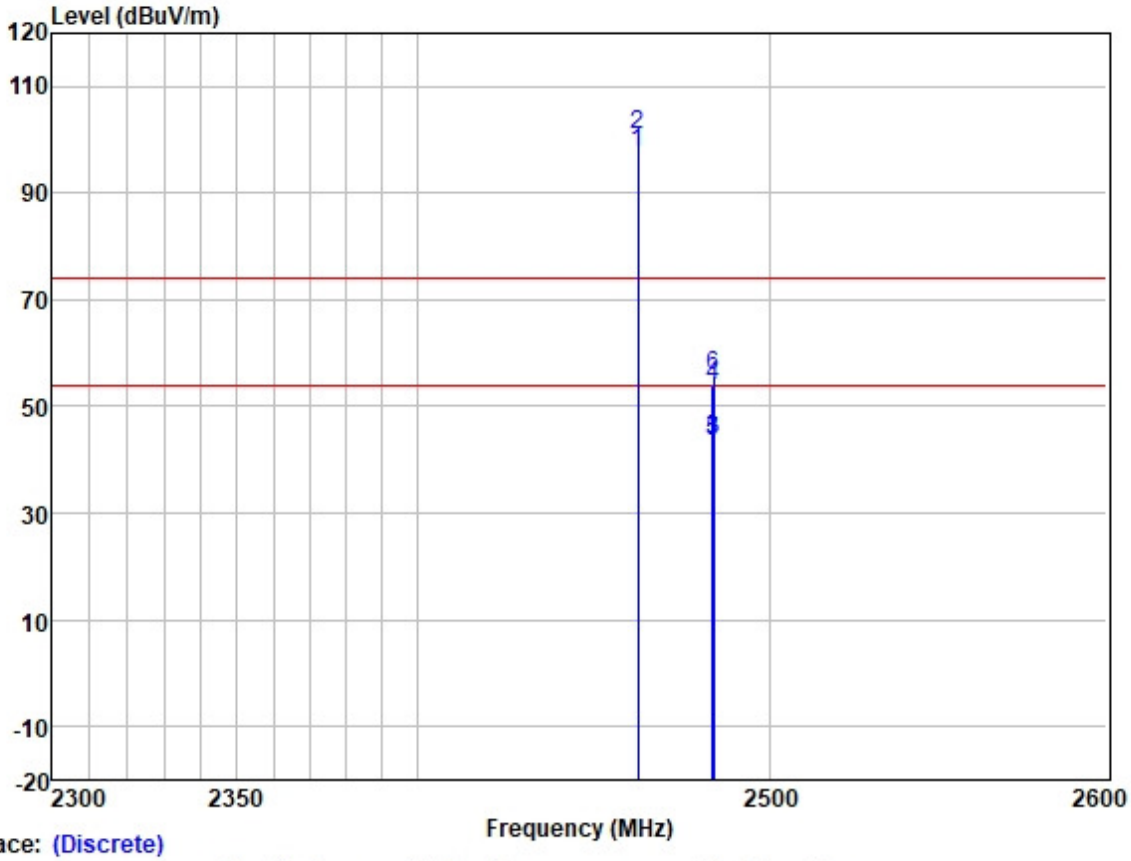
Test Mode: 03; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:High



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	104.06	27.45	3.50	37.58	97.43	54.00	43.43	HORIZONTAL	Average
2	*	2462.000	107.64	27.45	3.50	37.58	101.01	74.00	27.01	HORIZONTAL	Peak
3		2483.500	50.58	27.48	3.53	37.57	44.02	54.00	-9.98	HORIZONTAL	Average
4		2483.500	60.50	27.48	3.53	37.57	53.94	74.00	-20.06	HORIZONTAL	Peak
5		2483.790	49.97	27.48	3.53	37.57	43.41	54.00	-10.59	HORIZONTAL	Average
6		2483.790	62.42	27.48	3.53	37.57	55.86	74.00	-18.14	HORIZONTAL	Peak

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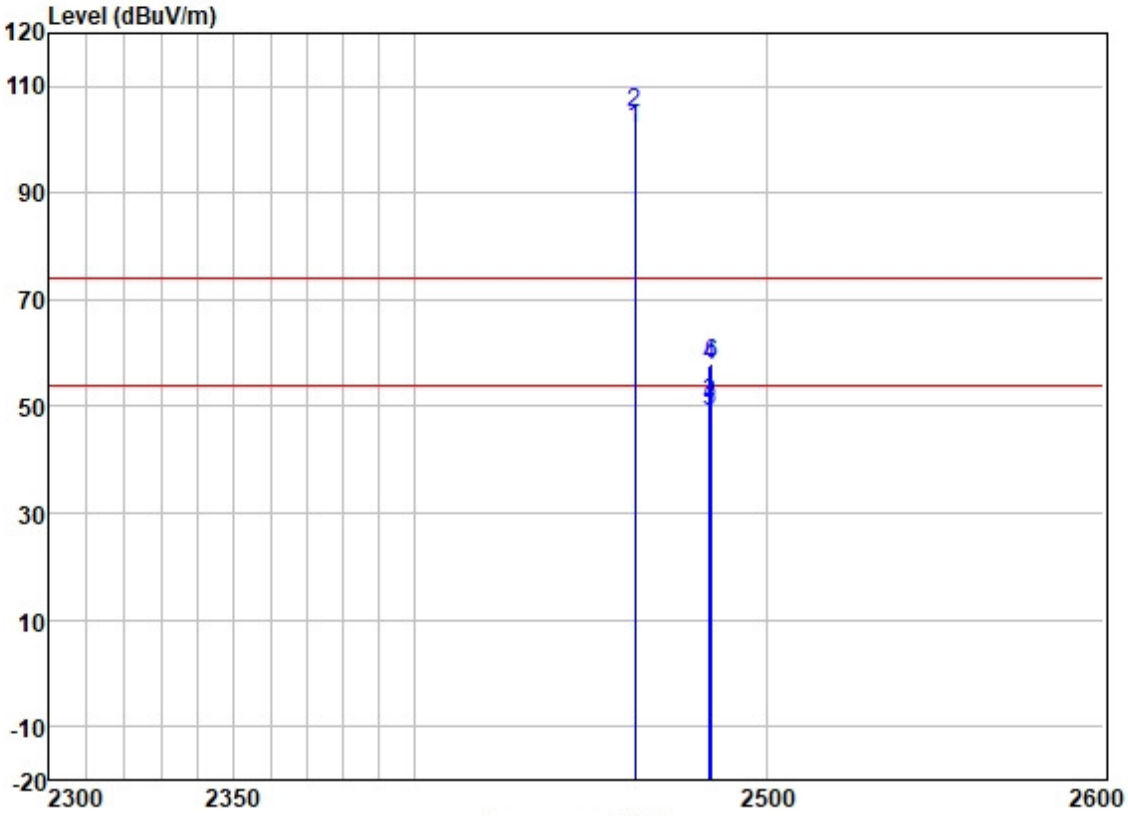
Test Mode: 03; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High



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	108.85	27.45	3.50	37.58	102.22	54.00	48.22	VERTICAL	Average
2	*	2462.000	111.63	27.45	3.50	37.58	105.00	74.00	31.00	VERTICAL	Peak
3		2483.500	57.29	27.48	3.53	37.57	50.73	54.00	-3.27	VERTICAL	Average
4		2483.500	64.15	27.48	3.53	37.57	57.59	74.00	-16.41	VERTICAL	Peak
5		2483.790	55.68	27.48	3.53	37.57	49.12	54.00	-4.88	VERTICAL	Average
6		2484.041	64.41	27.48	3.53	37.57	57.85	74.00	-16.15	VERTICAL	Peak

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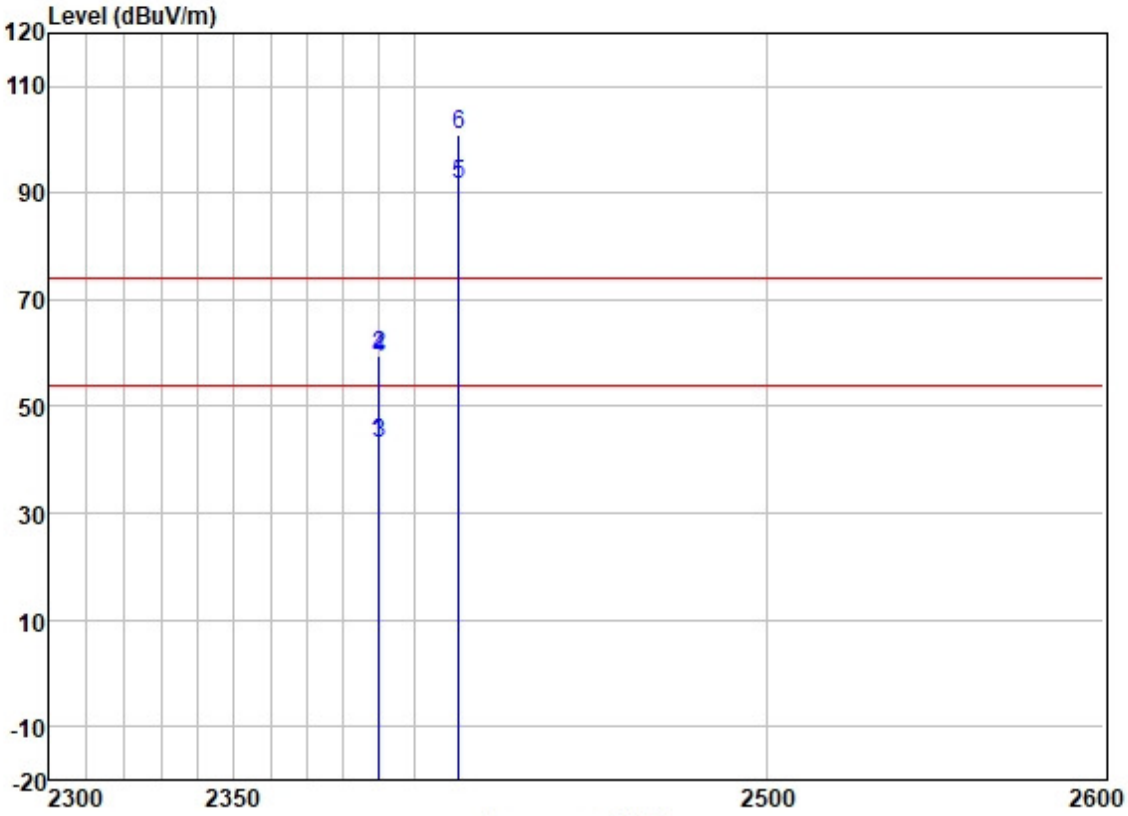
Test Mode: 03; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:Low



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		2389.605	49.87	27.33	3.48	37.59	43.09	54.00	-10.91	HORIZONTAL	Average
2		2389.847	66.38	27.33	3.48	37.59	59.60	74.00	-14.40	HORIZONTAL	Peak
3		2390.000	49.87	27.33	3.48	37.59	43.09	54.00	-10.91	HORIZONTAL	Average
4		2390.000	65.94	27.33	3.48	37.59	59.16	74.00	-14.84	HORIZONTAL	Peak
5	*	2412.000	98.35	27.38	3.47	37.59	91.61	54.00	37.61	HORIZONTAL	Average
6	*	2412.000	107.71	27.38	3.47	37.59	100.97	74.00	26.97	HORIZONTAL	Peak

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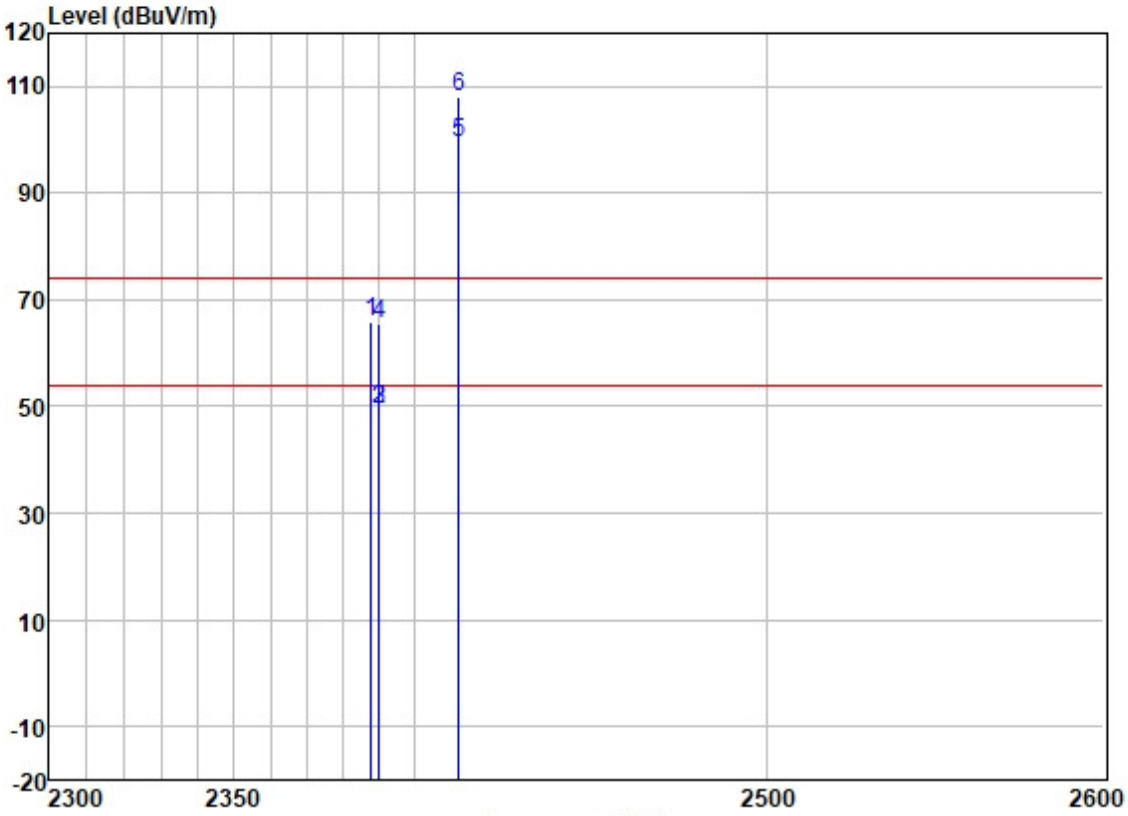
Test Mode: 03; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:Low



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		2387.791	72.57	27.33	3.48	37.59	65.79	74.00	-8.21	VERTICAL	Peak
2		2389.968	56.30	27.33	3.48	37.59	49.52	54.00	-4.48	VERTICAL	Average
3		2390.000	56.30	27.33	3.48	37.59	49.52	54.00	-4.48	VERTICAL	Average
4		2390.000	72.28	27.33	3.48	37.59	65.50	74.00	-8.50	VERTICAL	Peak
5	*	2412.000	106.21	27.38	3.47	37.59	99.47	54.00	45.47	VERTICAL	Average
6	*	2412.000	114.66	27.38	3.47	37.59	107.92	74.00	33.92	VERTICAL	Peak

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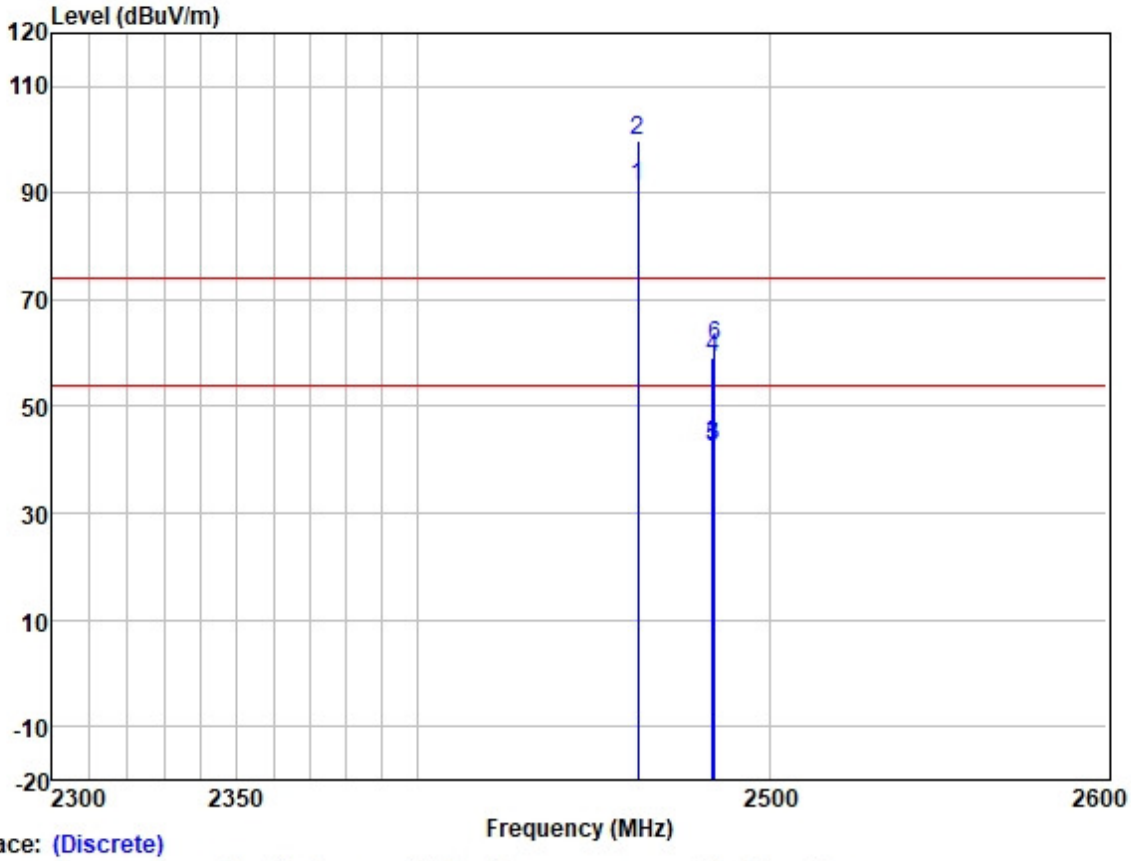
Test Mode: 03; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:High



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	97.75	27.45	3.50	37.58	91.12	54.00	37.12	HORIZONTAL	Average
2	*	2462.000	106.58	27.45	3.50	37.58	99.95	74.00	25.95	HORIZONTAL	Peak
3		2483.500	49.13	27.48	3.53	37.57	42.57	54.00	-11.43	HORIZONTAL	Average
4		2483.500	65.55	27.48	3.53	37.57	58.99	74.00	-15.01	HORIZONTAL	Peak
5		2483.790	48.73	27.48	3.53	37.57	42.17	54.00	-11.83	HORIZONTAL	Average
6		2484.041	68.10	27.48	3.53	37.57	61.54	74.00	-12.46	HORIZONTAL	Peak

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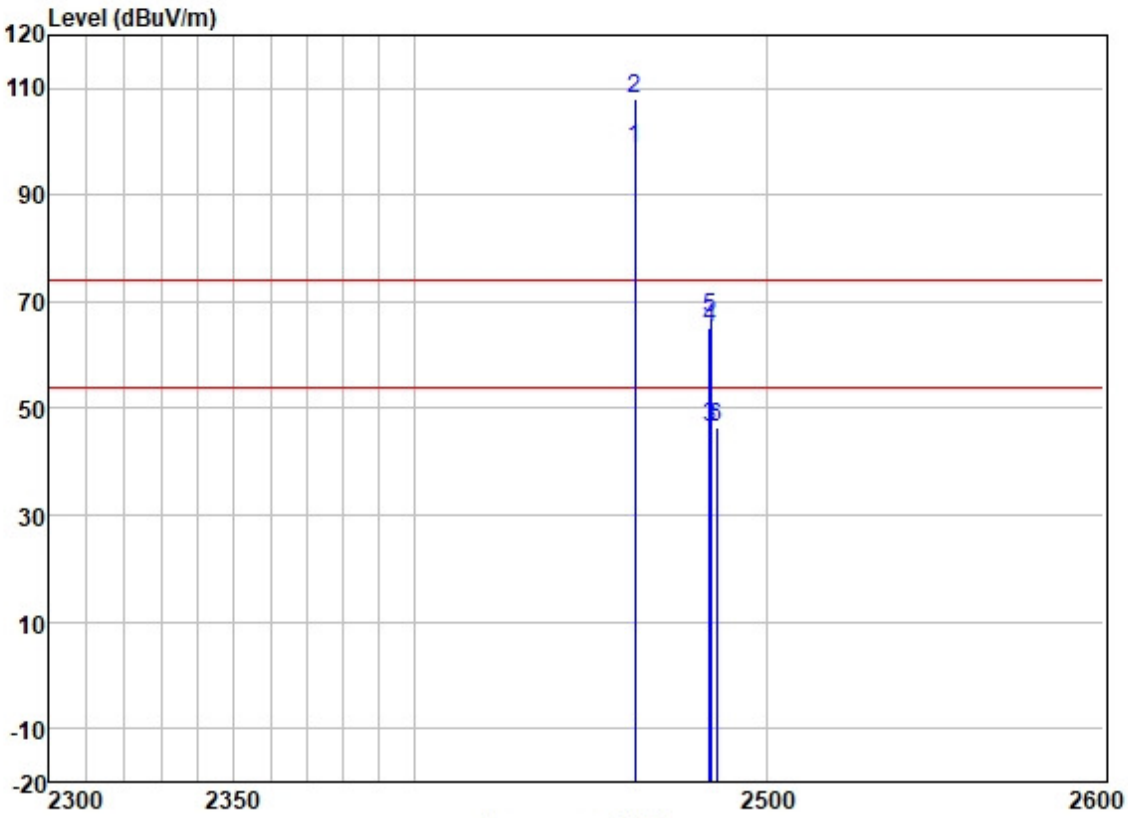

race: (Discrete)

		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	105.27	27.45	3.50	37.58	98.64	54.00	44.64	VERTICAL	Average
2	*	2462.000	114.70	27.45	3.50	37.58	108.07	74.00	34.07	VERTICAL	Peak
3		2483.500	53.12	27.48	3.53	37.57	46.56	54.00	-7.44	VERTICAL	Average
4		2483.500	71.65	27.48	3.53	37.57	65.09	74.00	-8.91	VERTICAL	Peak
5		2483.790	73.47	27.48	3.53	37.57	66.91	74.00	-7.09	VERTICAL	Peak
6		2485.496	53.12	27.48	3.53	37.57	46.56	54.00	-7.44	VERTICAL	Average

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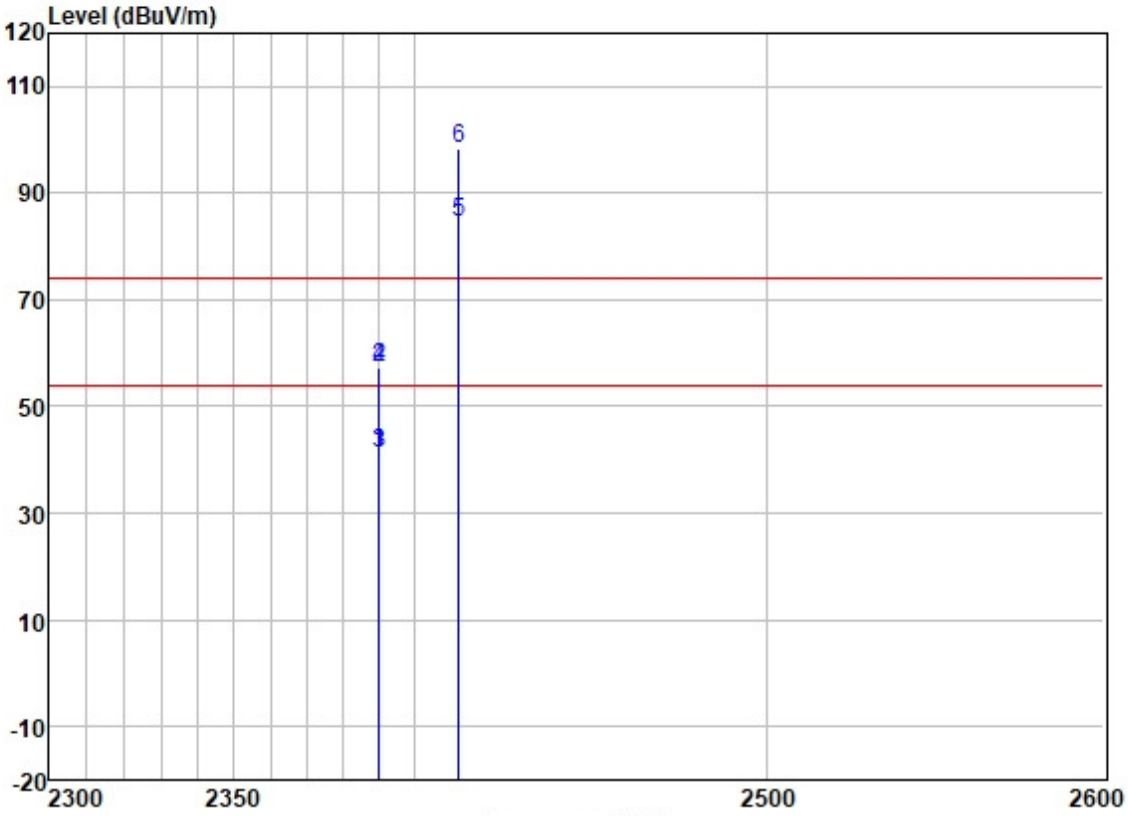
Test Mode: 03; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



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		2389.968	47.87	27.33	3.48	37.59	41.09	54.00	-12.91	HORIZONTAL	Average
2		2389.968	64.05	27.33	3.48	37.59	57.27	74.00	-16.73	HORIZONTAL	Peak
3		2390.000	47.87	27.33	3.48	37.59	41.09	54.00	-12.91	HORIZONTAL	Average
4		2390.000	64.05	27.33	3.48	37.59	57.27	74.00	-16.73	HORIZONTAL	Peak
5	*	2412.000	91.41	27.38	3.47	37.59	84.67	54.00	30.67	HORIZONTAL	Average
6	*	2412.000	105.03	27.38	3.47	37.59	98.29	74.00	24.29	HORIZONTAL	Peak

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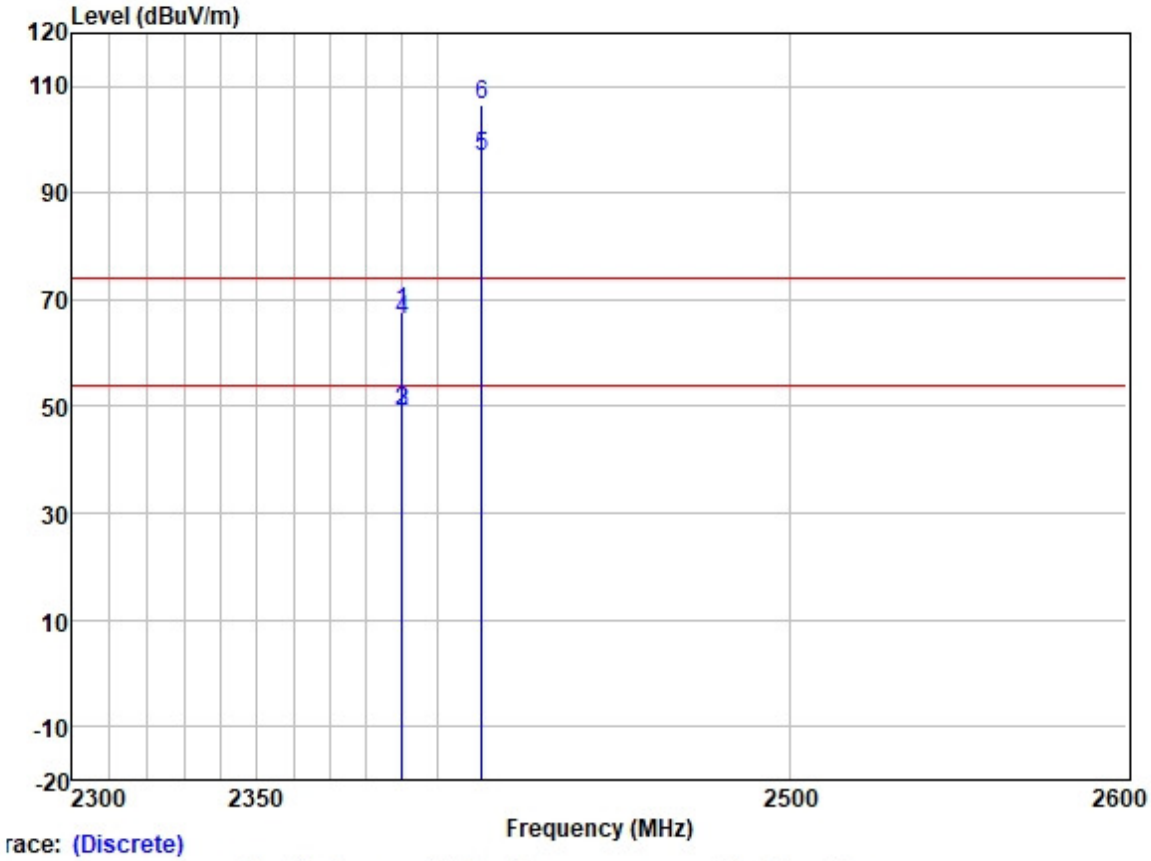
Test Mode: 03; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



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		2389.847	74.59	27.33	3.48	37.59	67.81	74.00	-6.19	VERTICAL	Peak
2		2389.968	55.80	27.33	3.48	37.59	49.02	54.00	-4.98	VERTICAL	Average
3		2390.000	55.80	27.33	3.48	37.59	49.02	54.00	-4.98	VERTICAL	Average
4		2390.000	72.94	27.33	3.48	37.59	66.16	74.00	-7.84	VERTICAL	Peak
5	*	2412.000	103.65	27.38	3.47	37.59	96.91	54.00	42.91	VERTICAL	Average
6	*	2412.000	113.35	27.38	3.47	37.59	106.61	74.00	32.61	VERTICAL	Peak

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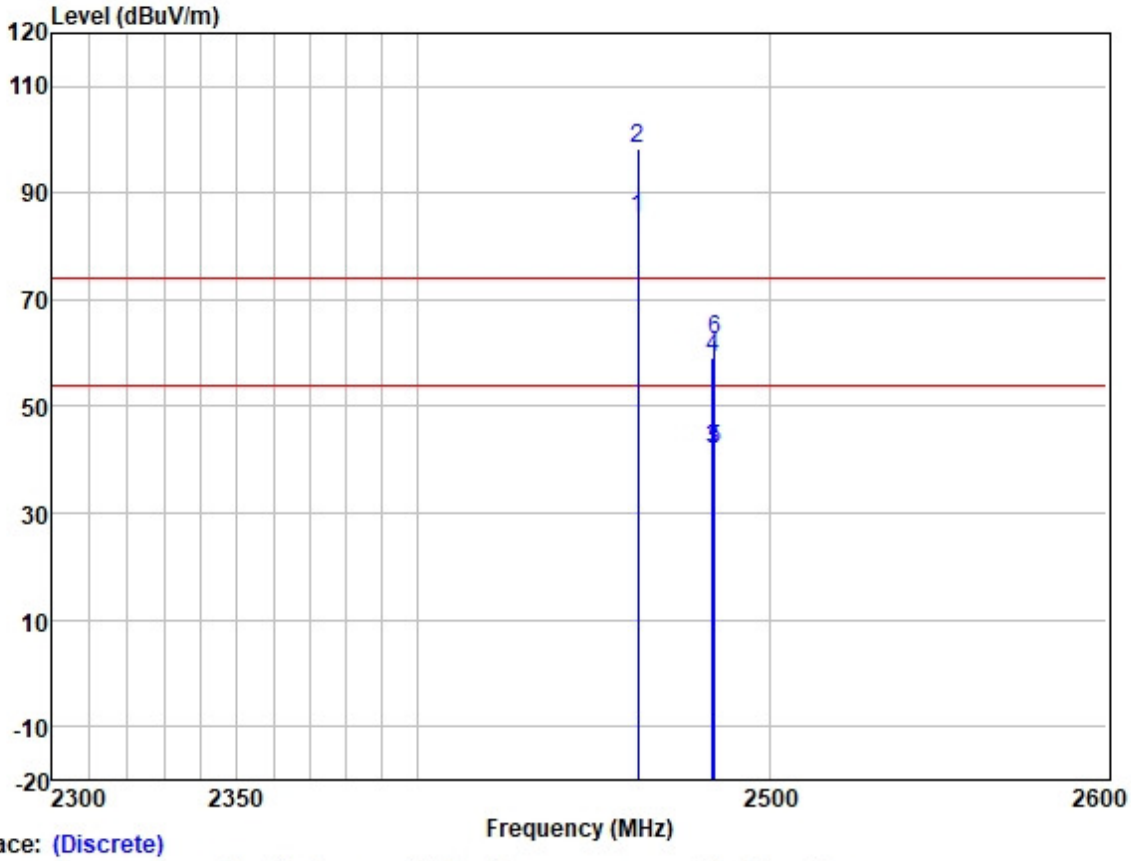
Test Mode: 03; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:High



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	92.07	27.45	3.50	37.58	85.44	54.00	31.44	HORIZONTAL	Average
2 *	2462.000	104.88	27.45	3.50	37.58	98.25	74.00	24.25	HORIZONTAL	Peak
3	2483.500	48.42	27.48	3.53	37.57	41.86	54.00	-12.14	HORIZONTAL	Average
4	2483.500	65.65	27.48	3.53	37.57	59.09	74.00	-14.91	HORIZONTAL	Peak
5	2484.041	48.66	27.48	3.53	37.57	42.10	54.00	-11.90	HORIZONTAL	Average
6	2484.091	69.12	27.48	3.53	37.57	62.56	74.00	-11.44	HORIZONTAL	Peak

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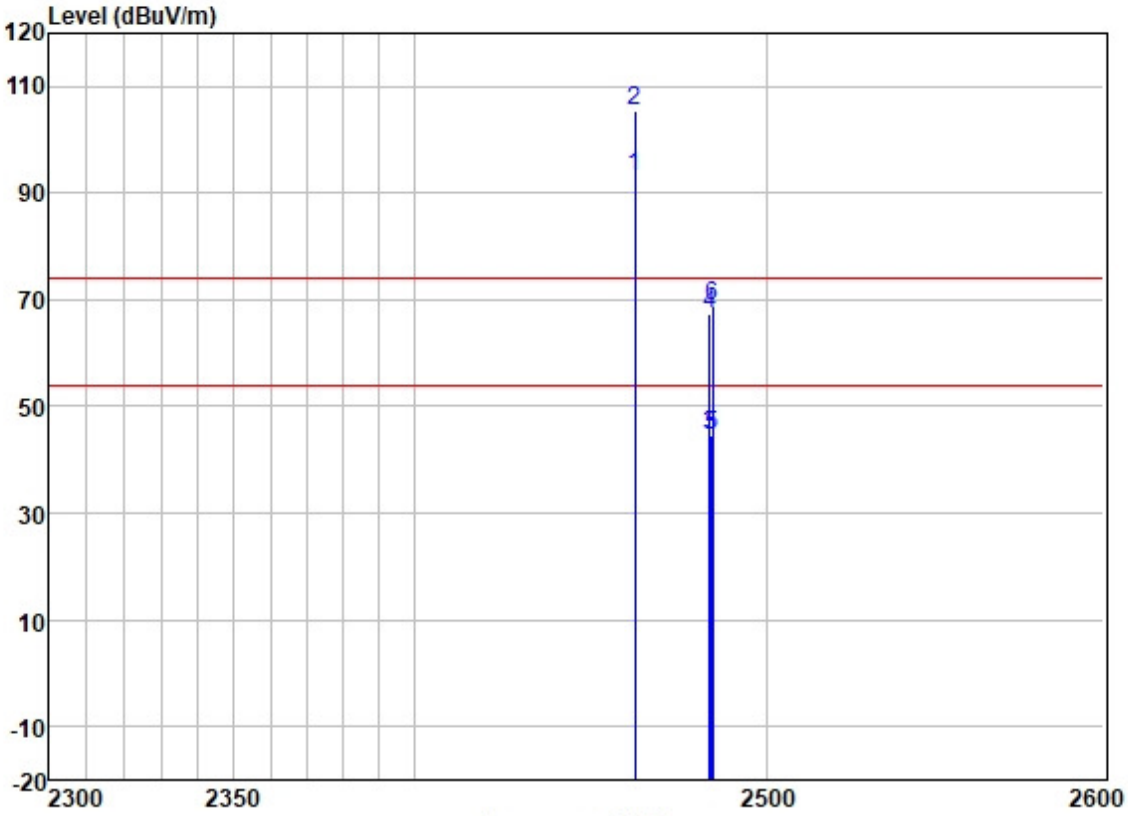
Test Mode: 03; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:High



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	99.60	27.45	3.50	37.58	92.97	54.00	38.97	VERTICAL	Average
2 *	2462.000	112.02	27.45	3.50	37.58	105.39	74.00	31.39	VERTICAL	Peak
3	2483.500	51.28	27.48	3.53	37.57	44.72	54.00	-9.28	VERTICAL	Average
4	2483.500	73.77	27.48	3.53	37.57	67.21	74.00	-6.79	VERTICAL	Peak
5	2483.990	51.33	27.48	3.53	37.57	44.77	54.00	-9.23	VERTICAL	Average
6	2484.392	75.44	27.48	3.53	37.57	68.88	74.00	-5.12	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: 21.7 °C Humidity: 52.8 % RH Atmospheric Pressure: 1003 mbar

7.8.2 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). Only the data of worst case is recorded in the report.

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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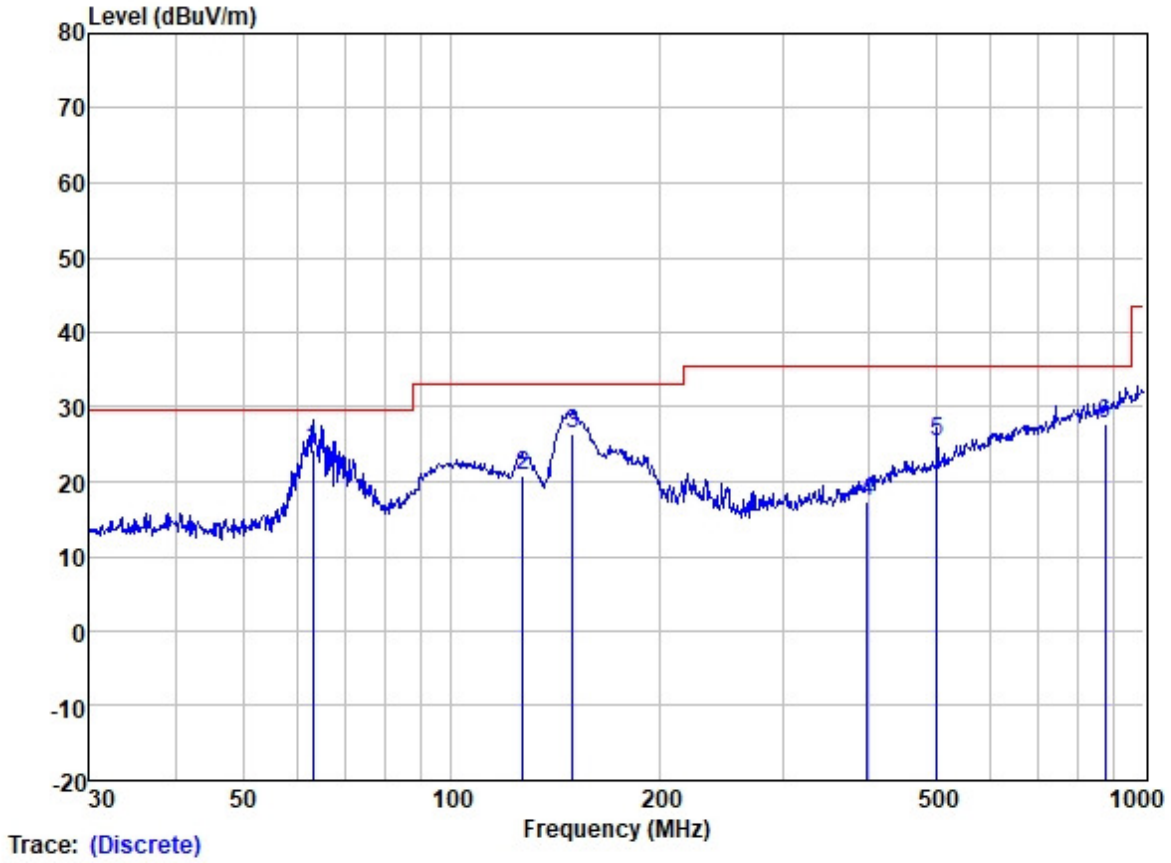

Site : SGS
Job :
Model :
Power :
Test Mode : 2.4G WI-FI

	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	63.09	37.20	13.00	1.31	27.15	24.36	29.50	-5.14	VERTICAL	QP
2	126.77	34.12	11.66	1.93	27.01	20.70	33.10	-12.40	VERTICAL	QP
3	149.49	37.28	13.78	2.22	26.84	26.44	33.10	-6.66	VERTICAL	QP
4	397.63	25.01	15.65	3.93	27.32	17.27	35.60	-18.33	VERTICAL	QP
5	501.18	30.90	17.93	4.43	27.98	25.28	35.60	-10.32	VERTICAL	QP
6	878.32	25.83	22.98	6.79	27.88	27.72	35.60	-7.88	VERTICAL	QP

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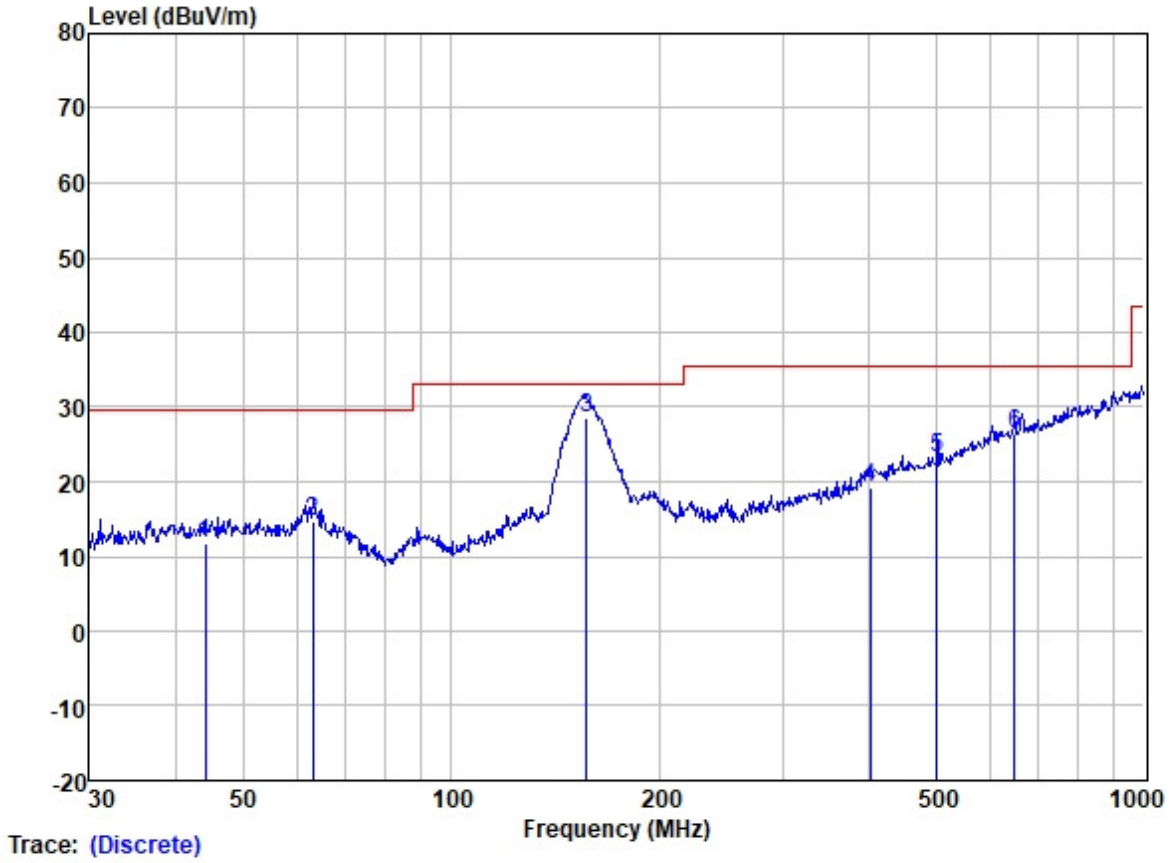

Site : SGS
Job :
Model :
Power :
Test Mode : 2.4G WI-FI

	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	44.12	24.08	13.81	1.12	27.17	11.84	29.50	-17.66	HORIZONTAL	QP
2	63.09	27.39	13.00	1.31	27.15	14.55	29.50	-14.95	HORIZONTAL	QP
3	156.46	39.30	13.70	2.30	26.81	28.49	33.10	-4.61	HORIZONTAL	QP
4	401.84	26.92	15.73	3.95	27.34	19.26	35.60	-16.34	HORIZONTAL	QP
5	501.18	28.78	17.93	4.43	27.98	23.16	35.60	-12.44	HORIZONTAL	QP
6	649.66	28.54	20.50	5.51	28.18	26.37	35.60	-9.23	HORIZONTAL	QP

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Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
63.09	24.36	16.52	55.07	34.82	40.00	-5.18	V
126.77	20.70	10.84	36.13	31.16	43.50	-12.34	V
149.49	26.84	21.98	73.26	37.30	43.50	-6.20	V
397.63	17.27	7.30	24.34	27.73	46.00	-18.27	V
501.18	25.28	18.37	61.22	35.74	46.00	-10.26	V
878.32	27.72	24.32	81.07	38.18	46.00	-7.82	V
44.12	11.84	3.91	13.03	22.30	40.00	-17.70	H
63.09	14.55	5.34	17.80	25.01	40.00	-14.99	H
156.46	28.49	26.58	88.59	38.95	43.50	-4.55	H
401.84	19.26	9.18	30.61	29.72	46.00	-16.28	H
501.18	23.16	14.39	47.96	33.62	46.00	-12.38	H
649.66	26.37	20.82	69.40	36.83	46.00	-9.17	H

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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: 22.3 °C Humidity: 51.4 % RH Atmospheric Pressure: 1003 mbar

7.9.2 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). Only the data of worst case is recorded in the report.

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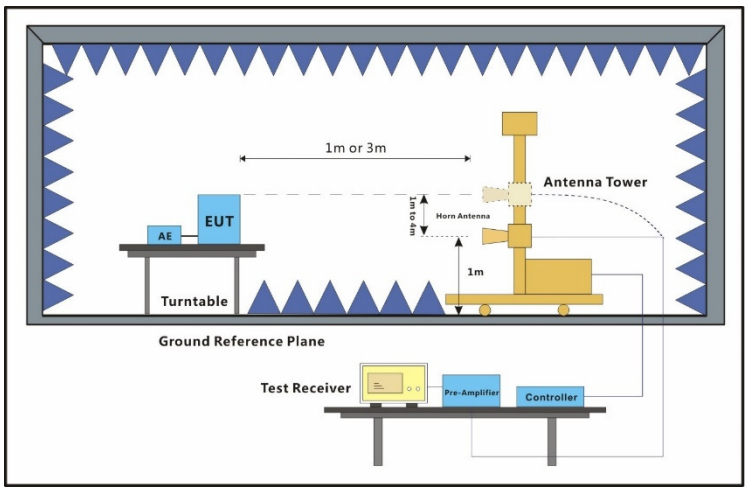
7.9.3 Test Setup Diagram



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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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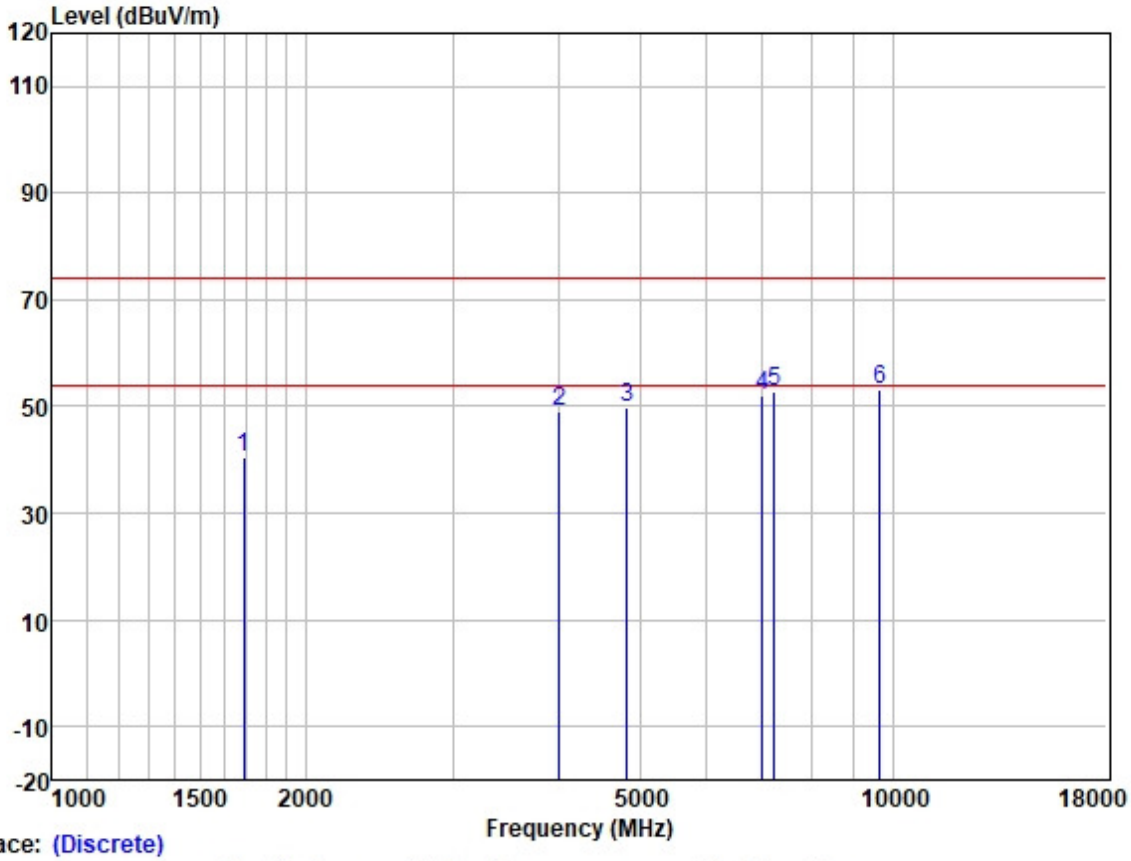
Test Mode: 03; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



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	1692.231	49.92	25.70	2.80	37.89	40.53	74.00	-33.47	HORIZONTAL	Peak
2	4015.929	51.50	29.82	4.60	36.80	49.12	74.00	-24.88	HORIZONTAL	Peak
3	4824.000	49.67	31.45	5.42	36.83	49.71	74.00	-24.29	HORIZONTAL	Peak
4	6995.172	48.56	35.00	5.81	37.25	52.12	74.00	-21.88	HORIZONTAL	Peak
5	7236.000	48.57	35.70	6.03	37.39	52.91	74.00	-21.09	HORIZONTAL	Peak
6	9648.000	45.04	38.40	7.06	37.42	53.08	74.00	-20.92	HORIZONTAL	Peak

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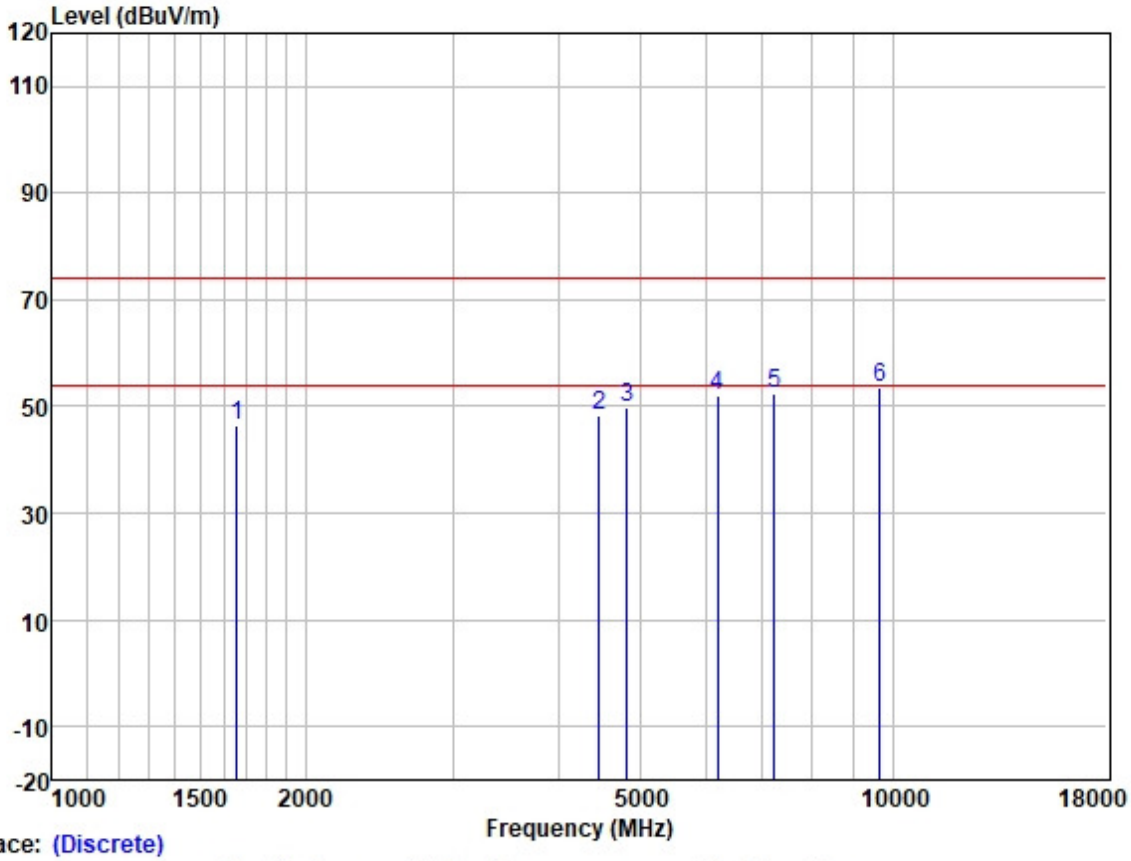
Test Mode: 03; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:Low



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	1658.337	56.11	25.65	2.80	37.93	46.63	74.00	-27.37	VERTICAL	Peak
2	4469.214	49.54	30.77	4.93	36.81	48.43	74.00	-25.57	VERTICAL	Peak
3	4824.000	49.89	31.45	5.42	36.83	49.93	74.00	-24.07	VERTICAL	Peak
4	6195.508	50.04	32.96	6.07	36.94	52.13	74.00	-21.87	VERTICAL	Peak
5	7236.000	48.21	35.70	6.03	37.39	52.55	74.00	-21.45	VERTICAL	Peak
6	9648.000	45.44	38.40	7.06	37.42	53.48	74.00	-20.52	VERTICAL	Peak

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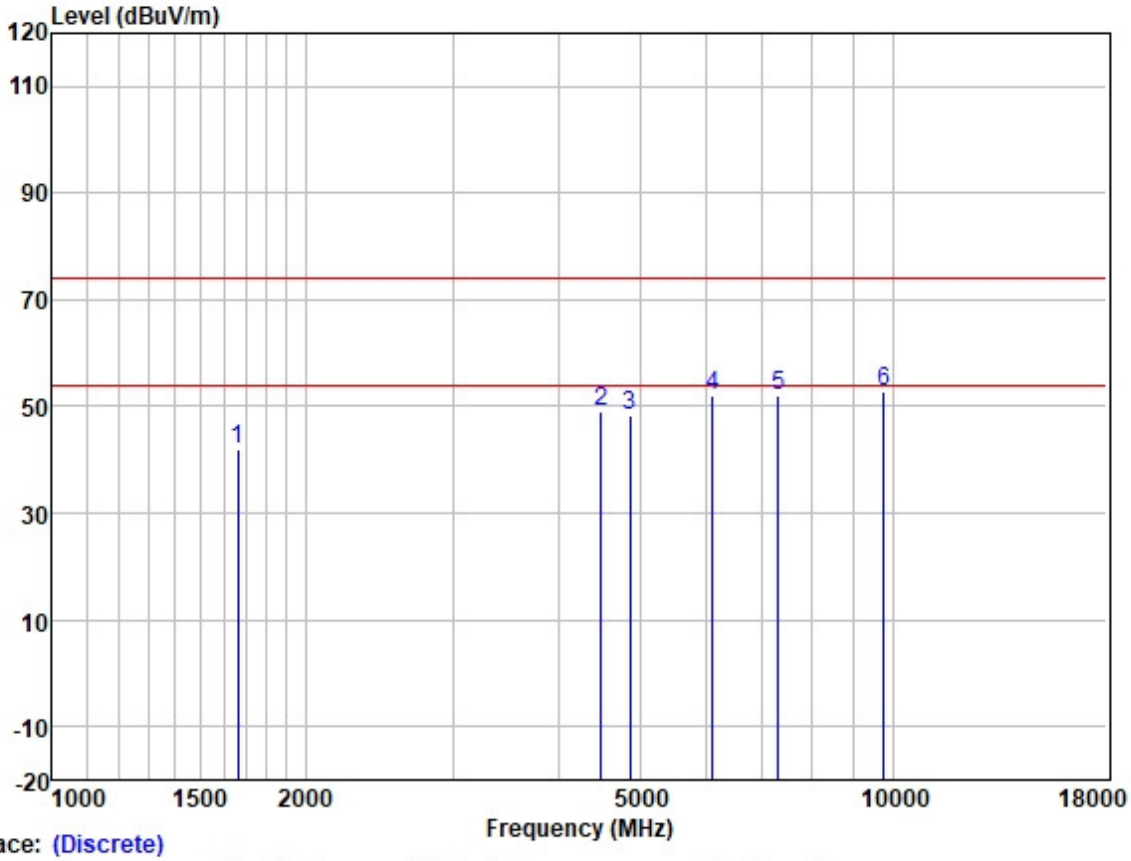
Test Mode: 03; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:middle



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	1663.137	51.32	25.65	2.80	37.91	41.86	74.00	-32.14	HORIZONTAL	Peak
2	4495.125	50.08	30.80	5.05	36.82	49.11	74.00	-24.89	HORIZONTAL	Peak
3	4874.000	48.00	31.54	5.50	36.84	48.20	74.00	-25.80	HORIZONTAL	Peak
4	6106.616	50.18	32.66	6.14	36.92	52.06	74.00	-21.94	HORIZONTAL	Peak
5	7311.000	47.46	35.93	6.11	37.42	52.08	74.00	-21.92	HORIZONTAL	Peak
6	9748.000	44.67	38.50	7.02	37.41	52.78	74.00	-21.22	HORIZONTAL	Peak

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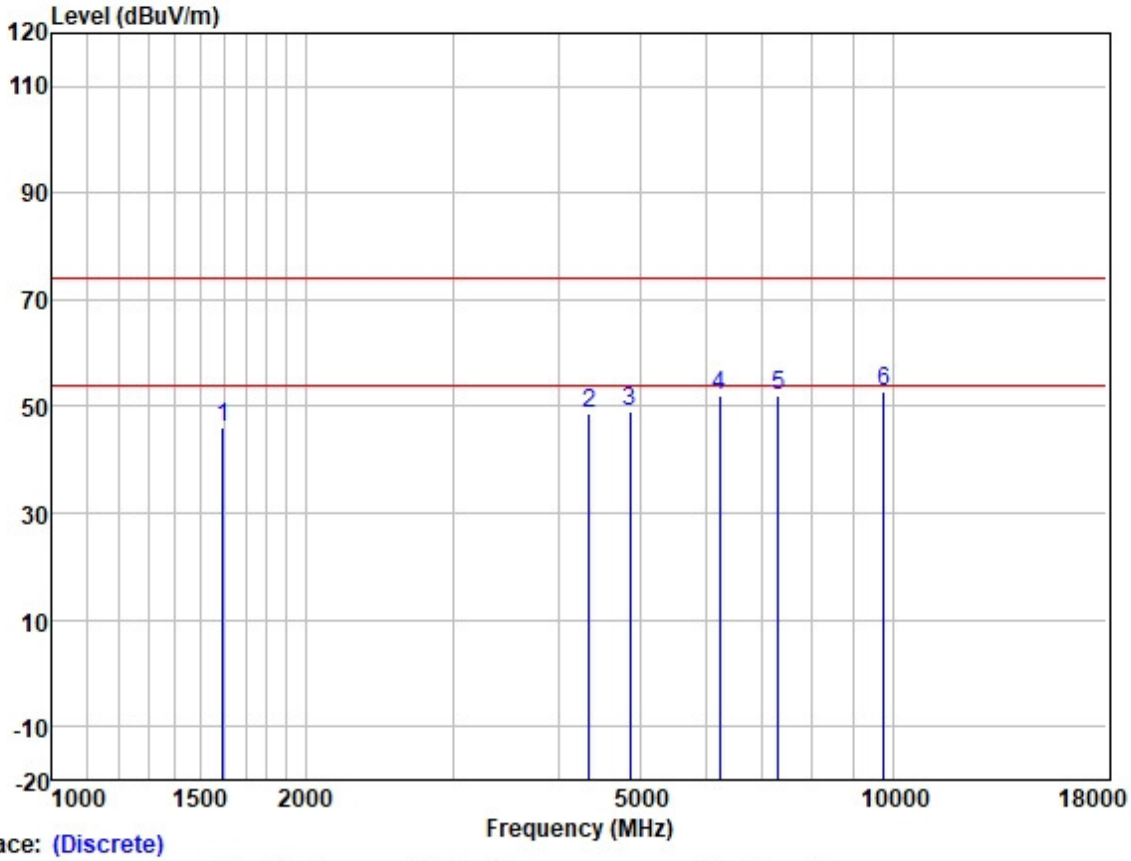
Test Mode: 03; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:middle



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	1597.181	55.51	25.58	2.80	37.98	45.91	74.00	-28.09	VERTICAL	Peak
2	4354.454	50.18	30.59	4.68	36.81	48.64	74.00	-25.36	VERTICAL	Peak
3	4874.000	49.05	31.54	5.50	36.84	49.25	74.00	-24.75	VERTICAL	Peak
4	6231.427	49.72	33.11	6.04	36.94	51.93	74.00	-22.07	VERTICAL	Peak
5	7311.000	47.57	35.93	6.11	37.42	52.19	74.00	-21.81	VERTICAL	Peak
6	9748.000	44.52	38.50	7.02	37.41	52.63	74.00	-21.37	VERTICAL	Peak

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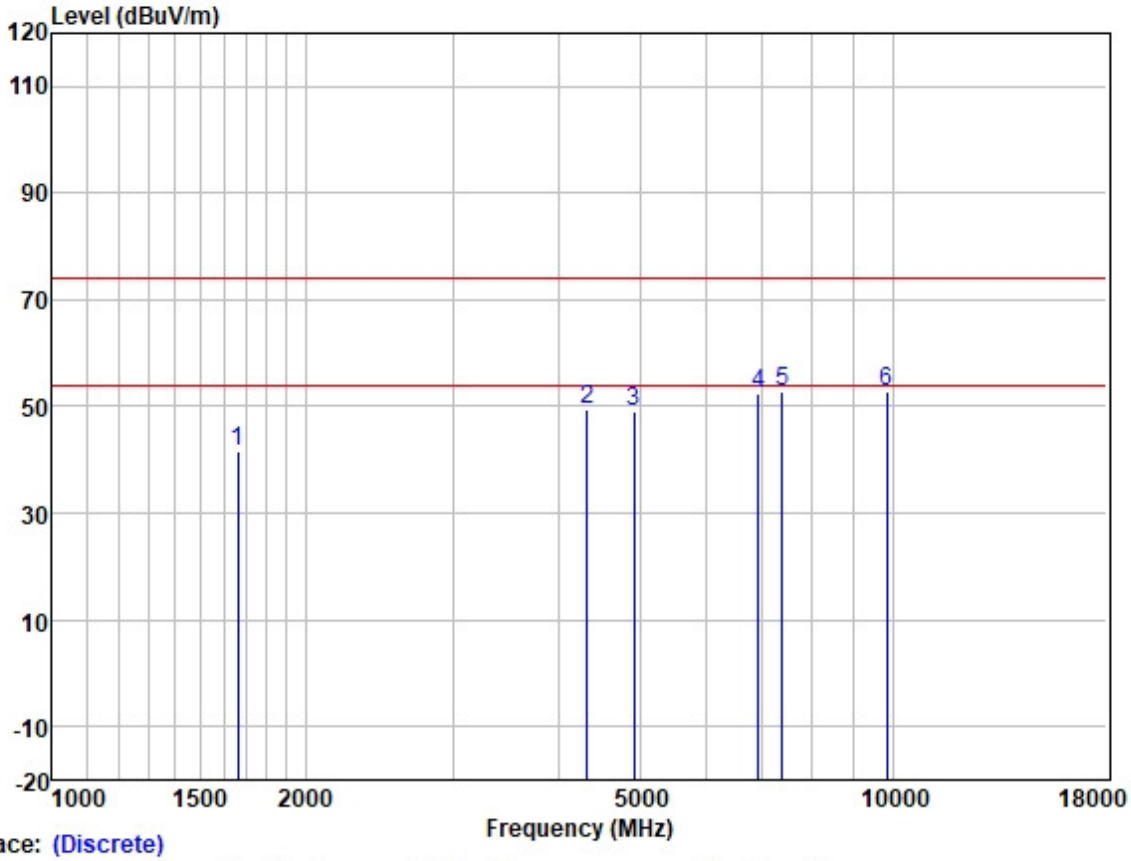
Test Mode: 03; Polarity: Horizontal; Modulation:802.11b; Bandwidth:20MHz; Channel:High



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	1663.137	50.93	25.65	2.80	37.91	41.47	74.00	-32.53	HORIZONTAL	Peak
2	4329.354	50.88	30.54	4.67	36.81	49.28	74.00	-24.72	HORIZONTAL	Peak
3	4924.000	48.83	31.62	5.60	36.84	49.21	74.00	-24.79	HORIZONTAL	Peak
4	6914.763	49.09	34.89	5.81	37.19	52.60	74.00	-21.40	HORIZONTAL	Peak
5	7386.000	47.76	36.17	6.19	37.45	52.67	74.00	-21.33	HORIZONTAL	Peak
6	9848.000	44.78	38.58	6.99	37.41	52.94	74.00	-21.06	HORIZONTAL	Peak

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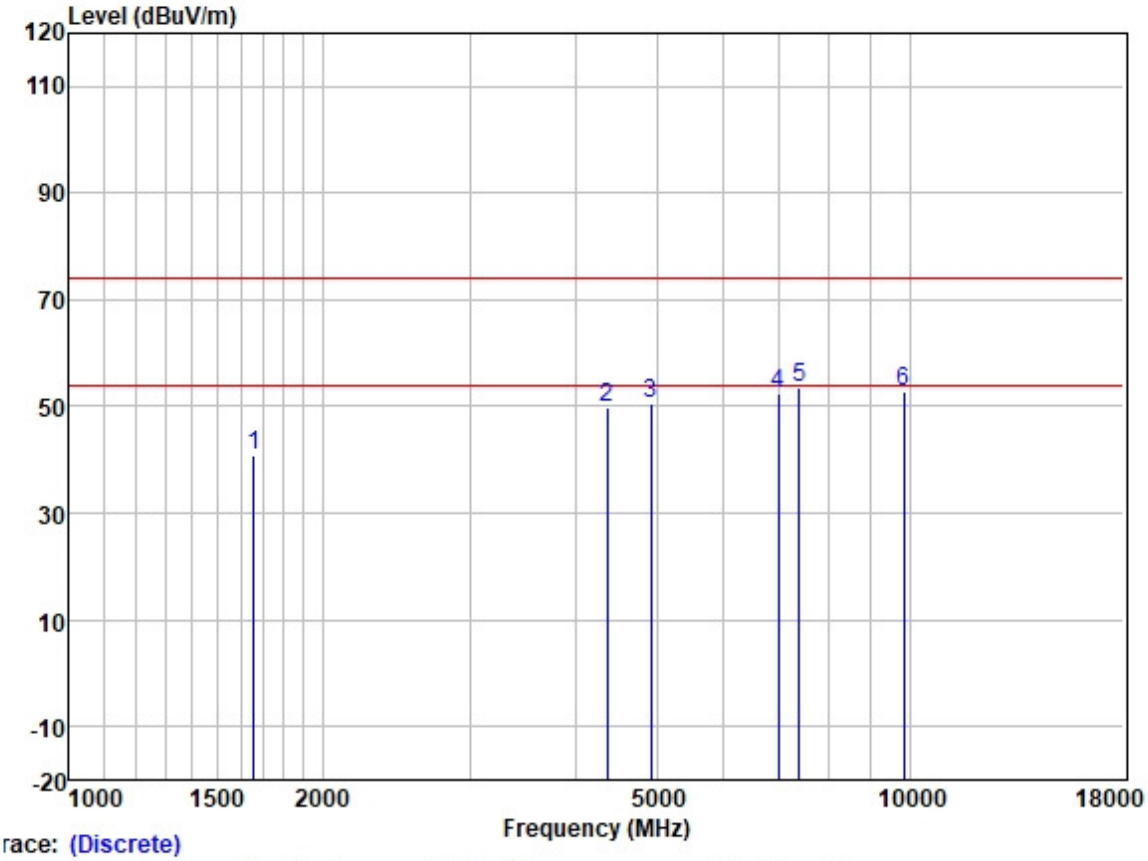
Test Mode: 03; Polarity: Vertical; Modulation:802.11b; Bandwidth:20MHz; Channel:High



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	1658.337	50.24	25.65	2.80	37.93	40.76	74.00	-33.24	VERTICAL	Peak
2	4367.058	51.24	30.62	4.68	36.81	49.73	74.00	-24.27	VERTICAL	Peak
3	4924.000	50.06	31.62	5.60	36.84	50.44	74.00	-23.56	VERTICAL	Peak
4	6974.982	49.04	34.97	5.81	37.23	52.59	74.00	-21.41	VERTICAL	Peak
5	7386.000	48.54	36.17	6.19	37.45	53.45	74.00	-20.55	VERTICAL	Peak
6	9848.000	44.68	38.58	6.99	37.41	52.84	74.00	-21.16	VERTICAL	Peak

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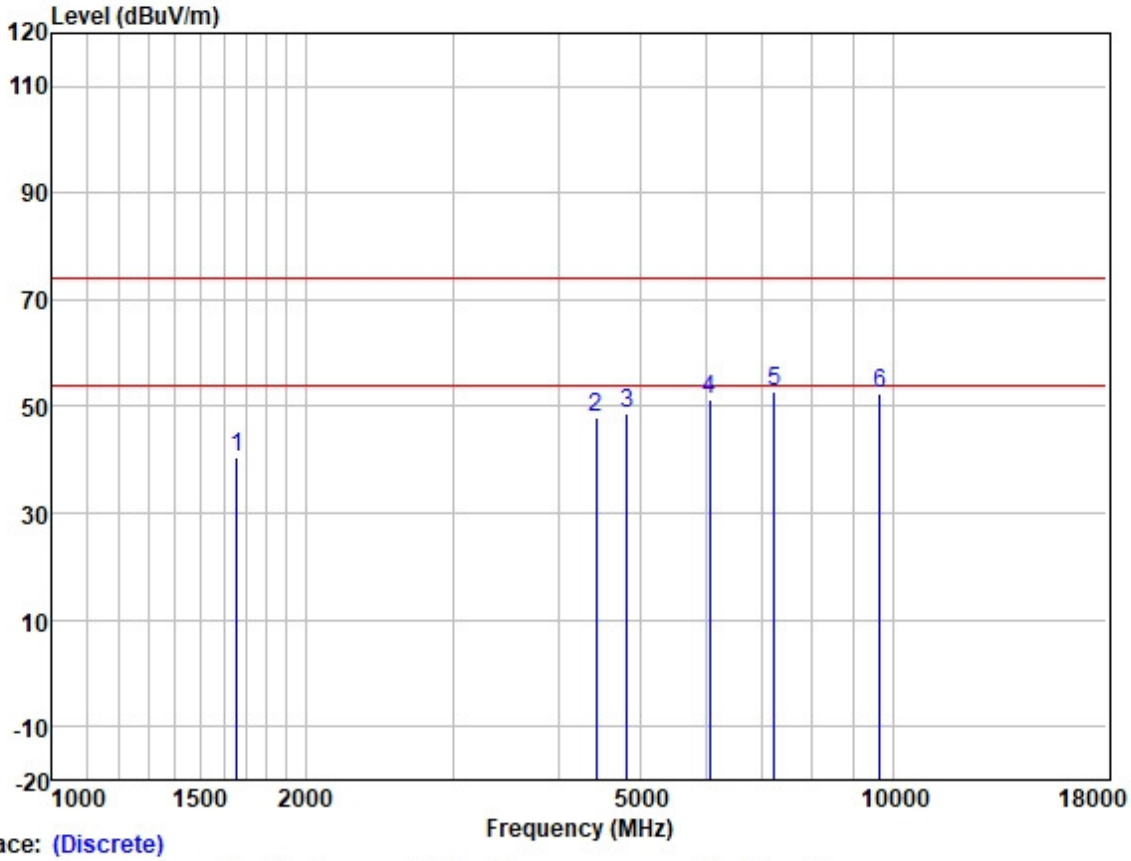
Test Mode: 03; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:Low



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	1658.337	49.78	25.65	2.80	37.93	40.30	74.00	-33.70	HORIZONTAL	Peak
2	4443.453	49.29	30.73	4.83	36.81	48.04	74.00	-25.96	HORIZONTAL	Peak
3	4824.000	48.65	31.45	5.42	36.83	48.69	74.00	-25.31	HORIZONTAL	Peak
4	6053.894	49.68	32.52	6.17	36.91	51.46	74.00	-22.54	HORIZONTAL	Peak
5	7236.000	48.41	35.70	6.03	37.39	52.75	74.00	-21.25	HORIZONTAL	Peak
6	9648.000	44.49	38.40	7.06	37.42	52.53	74.00	-21.47	HORIZONTAL	Peak

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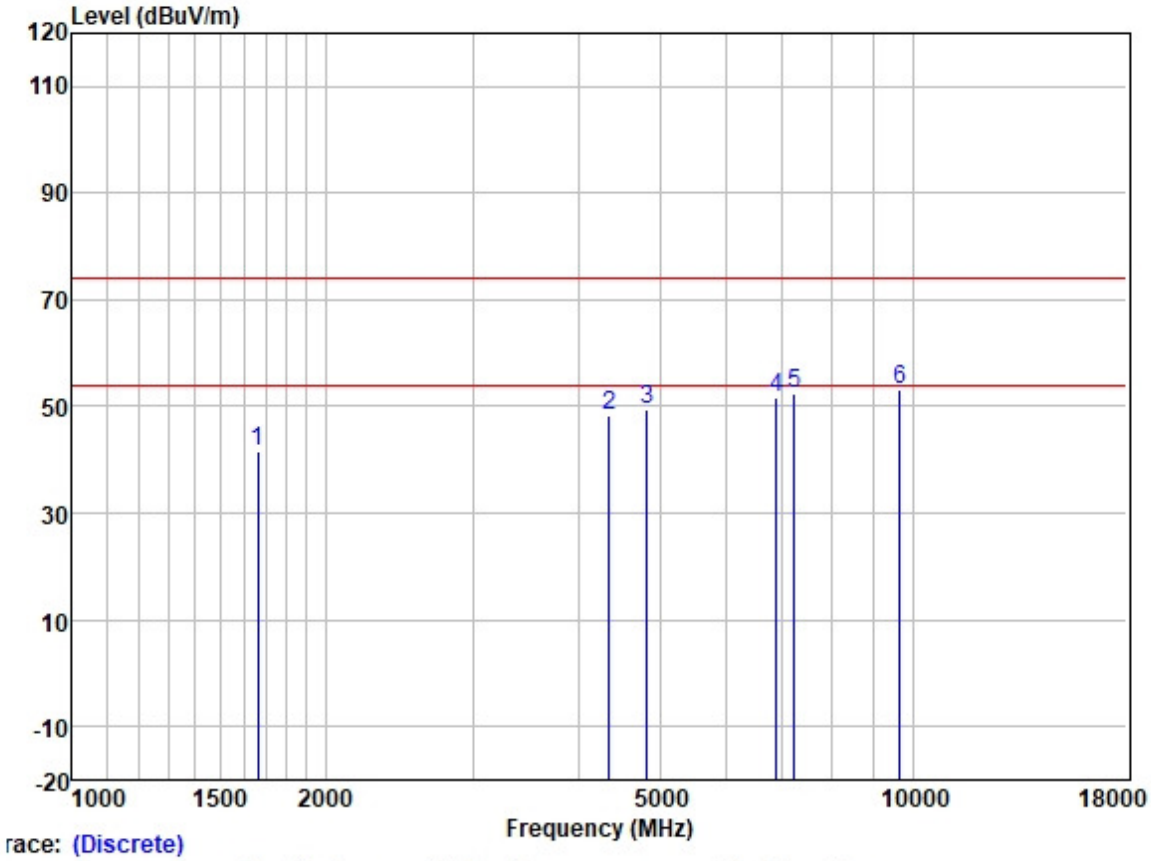
Test Mode: 03; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:Low



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	1663.137	51.08	25.65	2.80	37.91	41.62	74.00	-32.38	VERTICAL	Peak
2	4354.454	50.03	30.59	4.68	36.81	48.49	74.00	-25.51	VERTICAL	Peak
3	4824.000	49.24	31.45	5.42	36.83	49.28	74.00	-24.72	VERTICAL	Peak
4	6874.906	48.30	34.82	5.82	37.16	51.78	74.00	-22.22	VERTICAL	Peak
5	7236.000	48.15	35.70	6.03	37.39	52.49	74.00	-21.51	VERTICAL	Peak
6	9648.000	45.08	38.40	7.06	37.42	53.12	74.00	-20.88	VERTICAL	Peak

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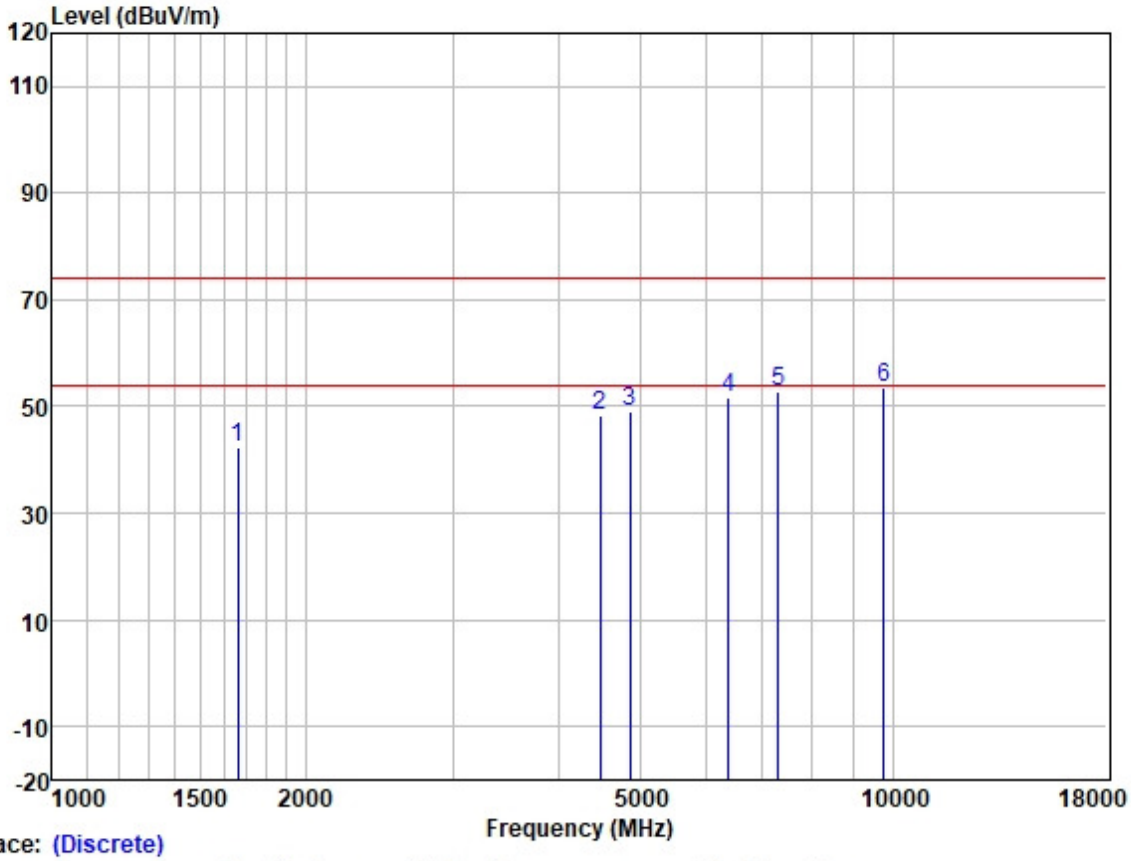
Test Mode: 03; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:middle



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	1663.137	51.92	25.65	2.80	37.91	42.46	74.00	-31.54	HORIZONTAL	Peak
2	4482.150	49.42	30.78	4.99	36.81	48.38	74.00	-25.62	HORIZONTAL	Peak
3	4874.000	48.95	31.54	5.50	36.84	49.15	74.00	-24.85	HORIZONTAL	Peak
4	6377.195	49.01	33.68	5.91	36.98	51.62	74.00	-22.38	HORIZONTAL	Peak
5	7311.000	48.21	35.93	6.11	37.42	52.83	74.00	-21.17	HORIZONTAL	Peak
6	9748.000	45.39	38.50	7.02	37.41	53.50	74.00	-20.50	HORIZONTAL	Peak

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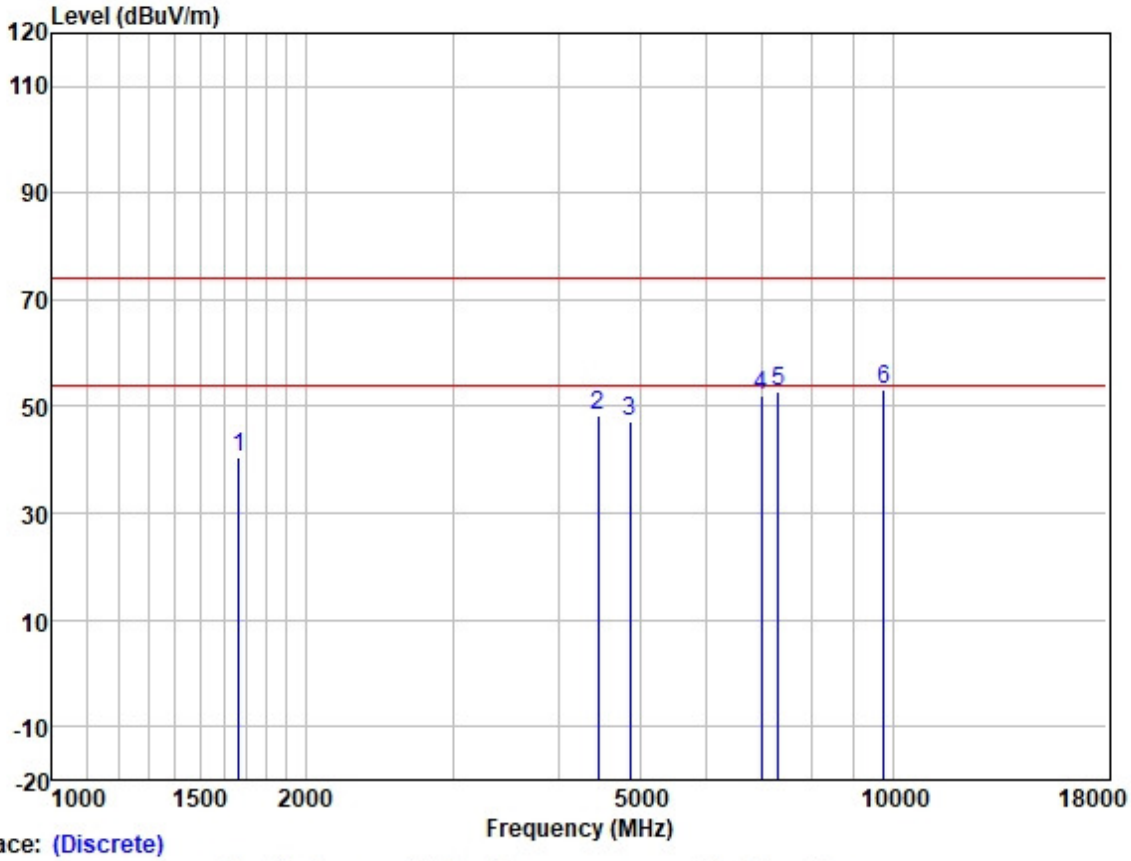
Test Mode: 03; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:middle



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	1667.951	49.76	25.66	2.80	37.91	40.31	74.00	-33.69	VERTICAL	Peak
2	4456.315	49.37	30.75	4.88	36.81	48.19	74.00	-25.81	VERTICAL	Peak
3	4874.000	46.96	31.54	5.50	36.84	47.16	74.00	-26.84	VERTICAL	Peak
4	6974.982	48.39	34.97	5.81	37.23	51.94	74.00	-22.06	VERTICAL	Peak
5	7311.000	48.31	35.93	6.11	37.42	52.93	74.00	-21.07	VERTICAL	Peak
6	9748.000	45.03	38.50	7.02	37.41	53.14	74.00	-20.86	VERTICAL	Peak

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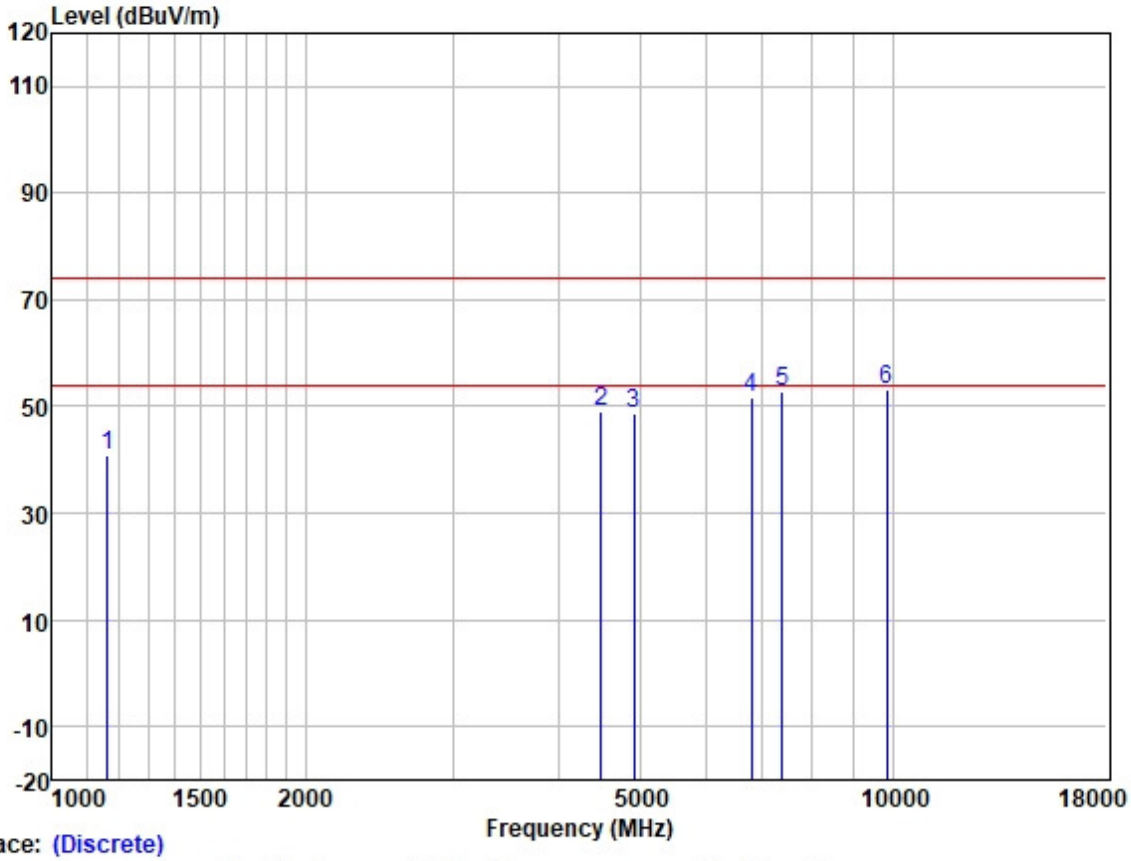
Test Mode: 03; Polarity: Horizontal; Modulation:802.11g; Bandwidth:20MHz; Channel:High



Trace: (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	1162.182	52.27	24.53	2.40	38.42	40.78	74.00	-33.22	HORIZONTAL	Peak
2	4495.125	50.00	30.80	5.05	36.82	49.03	74.00	-24.97	HORIZONTAL	Peak
3	4924.000	48.22	31.62	5.60	36.84	48.60	74.00	-25.40	HORIZONTAL	Peak
4	6795.879	48.37	34.66	5.82	37.12	51.73	74.00	-22.27	HORIZONTAL	Peak
5	7386.000	47.96	36.17	6.19	37.45	52.87	74.00	-21.13	HORIZONTAL	Peak
6	9848.000	45.08	38.58	6.99	37.41	53.24	74.00	-20.76	HORIZONTAL	Peak

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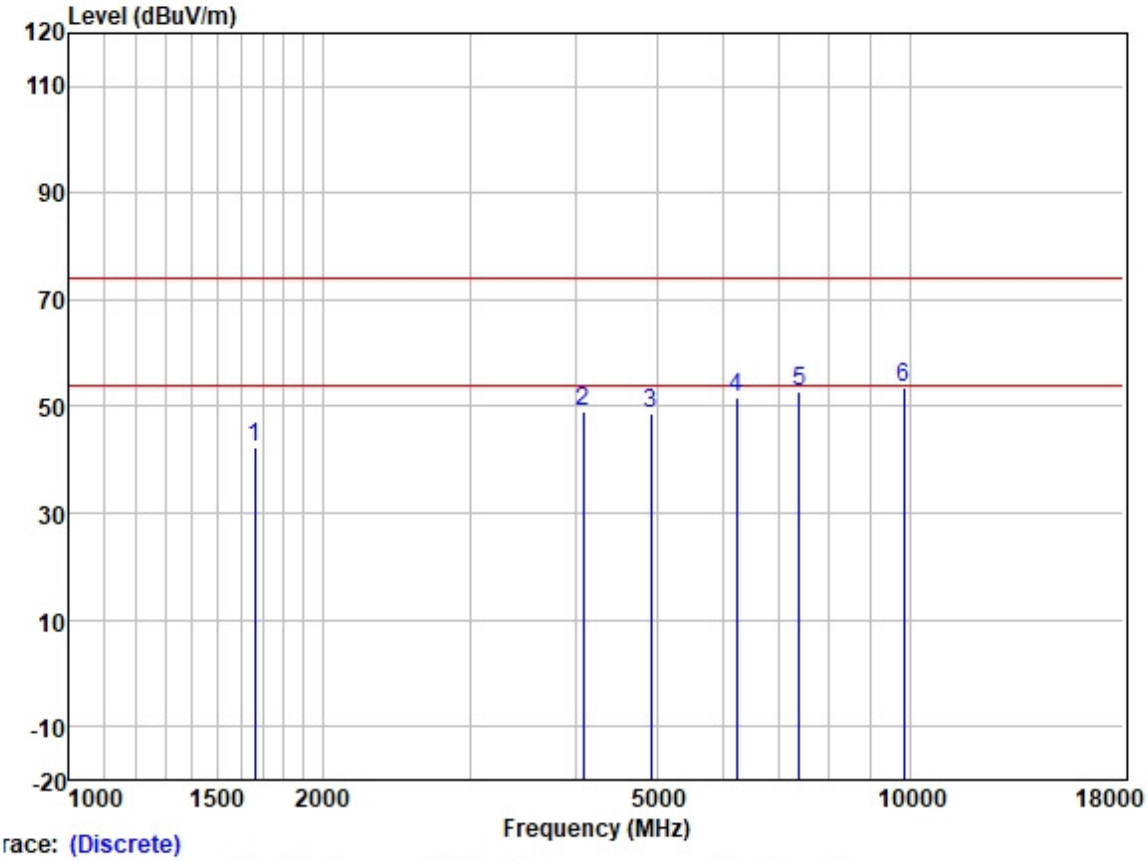
Test Mode: 03; Polarity: Vertical; Modulation:802.11g; Bandwidth:20MHz; Channel:High



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	1663.137	51.90	25.65	2.80	37.91	42.44	74.00	-31.56	VERTICAL	Peak
2	4086.182	51.22	29.92	4.60	36.80	48.94	74.00	-25.06	VERTICAL	Peak
3	4924.000	48.49	31.62	5.60	36.84	48.87	74.00	-25.13	VERTICAL	Peak
4	6231.427	49.58	33.11	6.04	36.94	51.79	74.00	-22.21	VERTICAL	Peak
5	7386.000	47.96	36.17	6.19	37.45	52.87	74.00	-21.13	VERTICAL	Peak
6	9848.000	45.35	38.58	6.99	37.41	53.51	74.00	-20.49	VERTICAL	Peak

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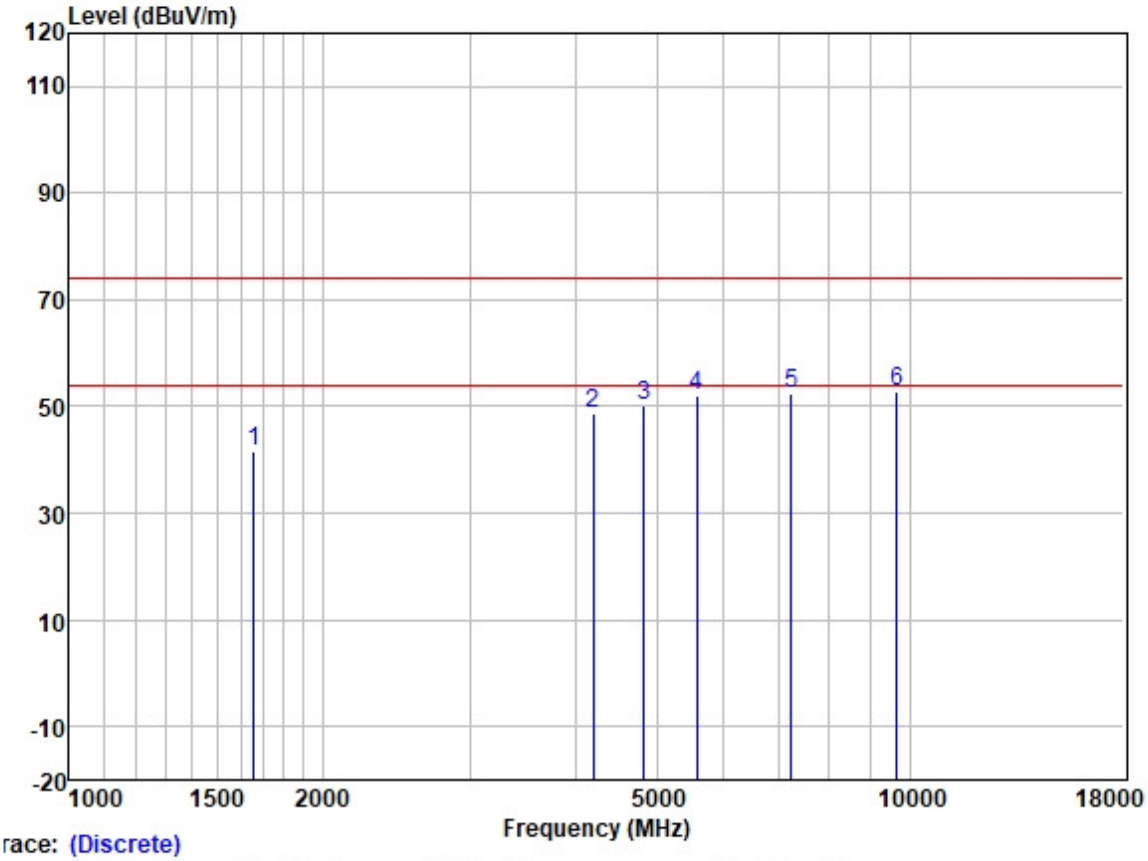
Test Mode: 03; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



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	1658.337	51.23	25.65	2.80	37.93	41.75	74.00	-32.25	HORIZONTAL	Peak
2	4206.011	50.62	30.18	4.60	36.81	48.59	74.00	-25.41	HORIZONTAL	Peak
3	4824.000	50.09	31.45	5.42	36.83	50.13	74.00	-23.87	HORIZONTAL	Peak
4	5583.251	50.87	31.87	6.32	36.89	52.17	74.00	-21.83	HORIZONTAL	Peak
5	7236.000	48.18	35.70	6.03	37.39	52.52	74.00	-21.48	HORIZONTAL	Peak
6	9648.000	44.61	38.40	7.06	37.42	52.65	74.00	-21.35	HORIZONTAL	Peak

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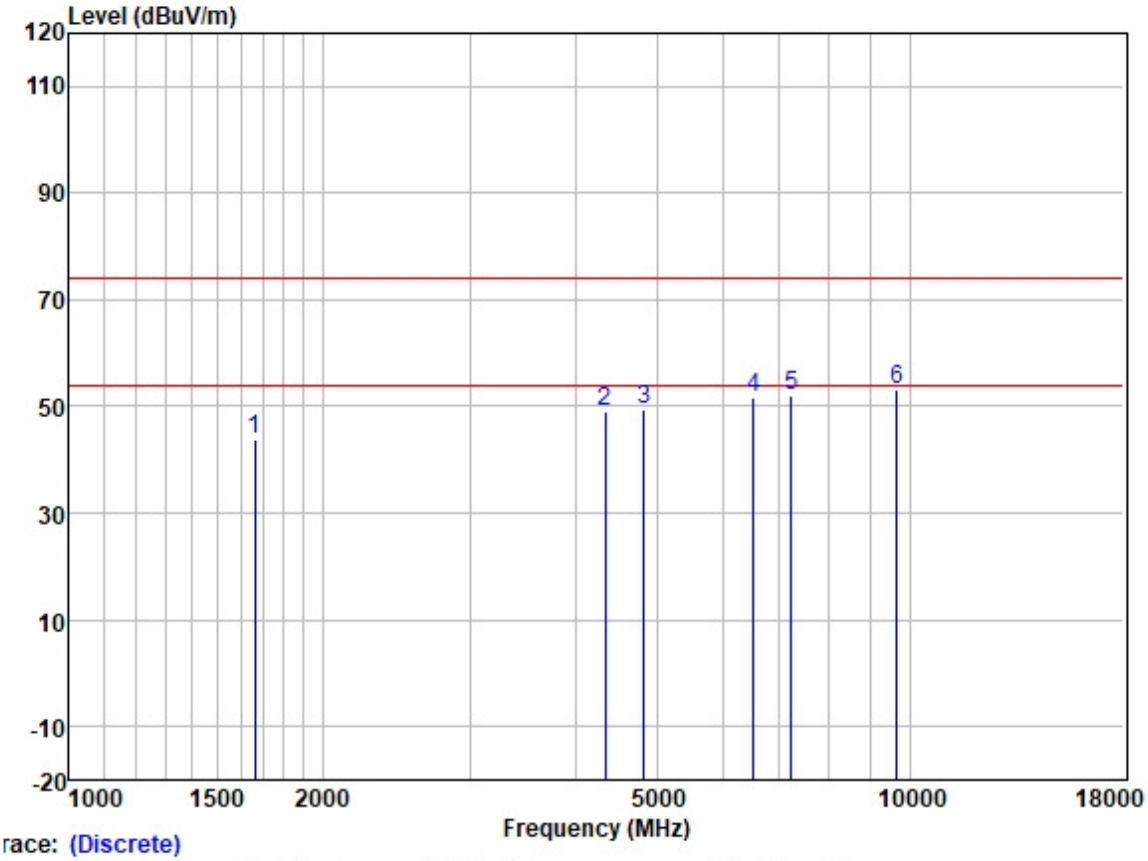
Test Mode: 03; Polarity: Vertical; Modulation:802.11n; Bandwidth:20MHz; Channel:Low



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	1663.137	53.45	25.65	2.80	37.91	43.99	74.00	-30.01	VERTICAL	Peak
2	4341.886	50.78	30.57	4.67	36.81	49.21	74.00	-24.79	VERTICAL	Peak
3	4824.000	49.46	31.45	5.42	36.83	49.50	74.00	-24.50	VERTICAL	Peak
4	6526.373	48.72	34.03	5.84	37.02	51.57	74.00	-22.43	VERTICAL	Peak
5	7236.000	47.82	35.70	6.03	37.39	52.16	74.00	-21.84	VERTICAL	Peak
6	9648.000	45.28	38.40	7.06	37.42	53.32	74.00	-20.68	VERTICAL	Peak

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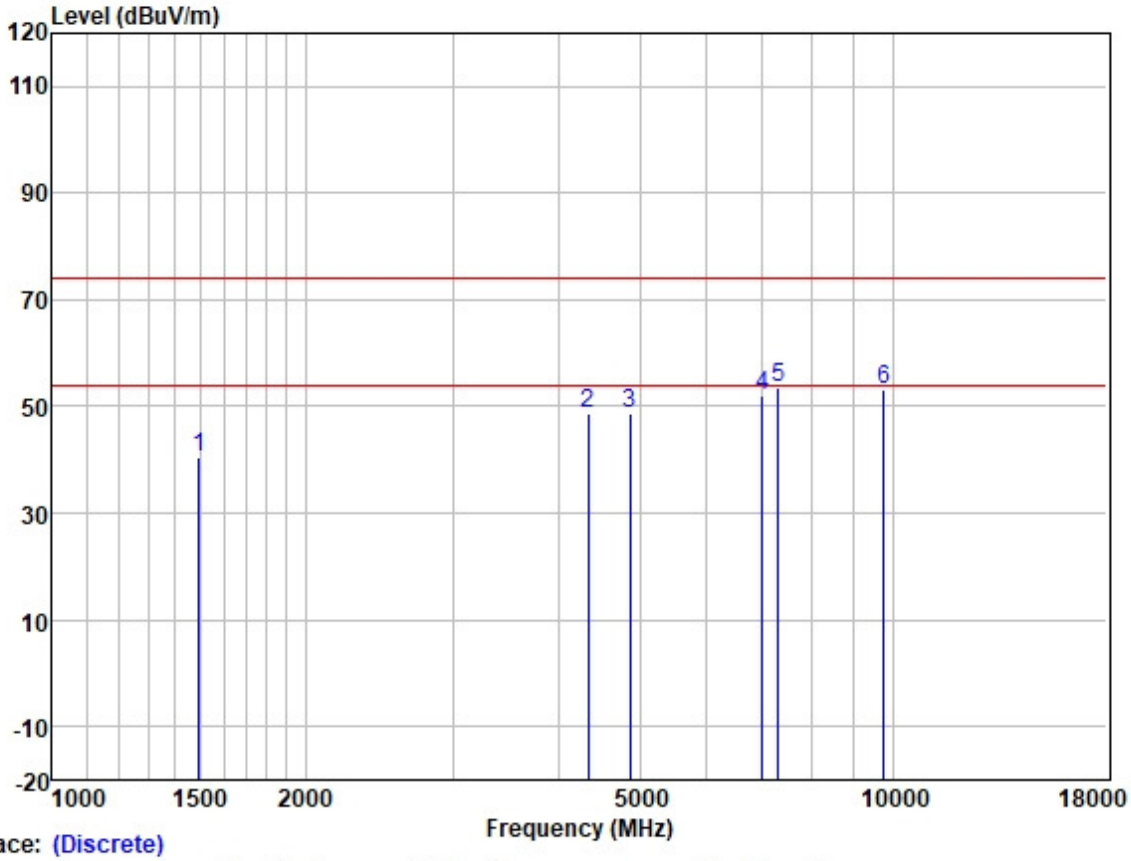
Test Mode: 03; Polarity: Horizontal; Modulation:802.11n; Bandwidth:20MHz; Channel:middle



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	1494.455	50.28	25.50	2.79	38.10	40.47	74.00	-33.53	HORIZONTAL	Peak
2	4341.886	50.16	30.57	4.67	36.81	48.59	74.00	-25.41	HORIZONTAL	Peak
3	4874.000	48.45	31.54	5.50	36.84	48.65	74.00	-25.35	HORIZONTAL	Peak
4	6995.172	48.46	35.00	5.81	37.25	52.02	74.00	-21.98	HORIZONTAL	Peak
5	7311.000	48.79	35.93	6.11	37.42	53.41	74.00	-20.59	HORIZONTAL	Peak
6	9748.000	44.98	38.50	7.02	37.41	53.09	74.00	-20.91	HORIZONTAL	Peak

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