TEST REPORT

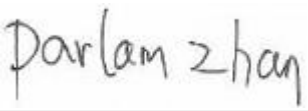
Application No.:	SHEM2007005869CR
FCC ID:	2APV2-CSDB2C
Applicant:	Hangzhou Ezviz Software Co., Ltd.
Address of Applicant:	Room 302,Unit B,Building 2,399 Danfeng Road,Binjiang District,Hangzhou,Zhejiang
Manufacturer:	Hangzhou Ezviz Software Co., Ltd.
Address of Manufacturer:	Room 302,Unit B,Building 2,399 Danfeng Road,Binjiang District,Hangzhou,Zhejiang
Equipment Under Test (EUT):	
EUT Name:	Wire-Free Video Doorbell
Model No.:	CS-DB2C
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2020-07-22
Date of Test:	2020-07-22 to 2020-07-29
Date of Issue:	2020-08-01
Test Result:	**Pass***

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

Parlam Zhan
E&E Section Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2020-08-01	/

Authorized for issue by:				
				
		Micheal Niu / Project Engineer		
				
		Parlam Zhan / Reviewer		

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
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 5V by adapter
	DC 3.7V by Rechargeable Lithium ion Battery Pack
	Battery Model:HIK6010H
	Nominal Voltage:3.7V
	Nominal Capacity:5200mAh
	Rated Capacity:5100mAh/18.87Wh
	Charging limited Voltage:4.2V
Test voltage:	AC 120V/60Hz
Antenna Gain:	2dBi
Antenna Type:	PIFA Antenna
Channel Spacing:	5MHz
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
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz

4.2 Power level setting using in test:

Channel	802.11b	802.11g	802.11n(HT20)
1	16	16	16
6	16	16	16
11	16	16	16

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	ThinkPad X100e	/
SecureCRT	VanDyke	V 6.2.0	/
Serial port adapter plate	/	Test Plate 3	/
Adapter	Apple	/	/

4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4 x 10-8
2	Timeout	2s
3	Duty Cycle	0.4%
4	Occupied Bandwidth	3%
5	RF Conducted Power	0.6dB
6	RF Power Density	2.9dB
7	Conducted Spurious Emissions	0.75dB
8	RF Radiated Power	5.1dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-6GHz)
		5.4dB (6GHz-18GHz)
10	Temperature Test	1°C
11	Humidity Test	3%
12	Supply Voltages	1.5%
13	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.5 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

4.6 Test Facility

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

- **CNAS (No. CNAS L4354)**

CNAS has accredited Compliance Certification Services (Kunshan) Inc. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 2541.01)**

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

- **FCC (Designation Number: CN1172)**

Compliance Certification Services Inc. has been recognized as an accredited testing laboratory.

Designation Number: CN1172.

- **ISED (CAB identifier: CN0072)**

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory.

CAB Identifier: CN0072.

- **VCCI (Member No.: 1938)**

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-1600, C-1707, T-1499, G-10216 respectively.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

5 Equipment List

Item	Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal. Due Date
Conducted Emission at Mains Terminals (150kHz-30MHz)						
1	EMI Test Receive	R&S	ESCI	100781	02/24/2020	02/23/2021
2	LISN	R&S	ENV216	101604	10/24/2019	10/23/2020
3	LISN	Schwarzbeck	NNLK 8129	8129-143	10/24/2019	10/23/2020
4	Pulse Limiter	R&S	ESH3-Z2	100609	02/24/2020	02/23/2021
5	CE test Cable	Thermax	/	14	02/24/2020	02/23/2021
RF Conducted Test						
1	Spectrum Analyzer	Agilent	E4446A	MY44020154	04/22/2020	04/21/2021
2	Spectrum Analyzer	Keysight	N9020A	MY55370209	12/19/2019	12/18/2020
3	Signal Generator	Agilent	E8257C	MY43321570	10/24/2019	10/23/2020
4	Vector Signal Generator	R&S	SMU 200A	102744	02/24/2020	02/23/2021
5	Universal Radio Communication Tester	R&S	CMU200	109525	12/19/2019	12/18/2020
6	Universal Radio Communication Tester	R&S	CMW500	159275	12/19/2019	12/18/2020
7	Power Meter	Anritsu	ML2495A	1445010	04/21/2020	04/20/2021
8	Switcher	CCSRF	FY562	KS301219	12/20/2019	12/19/2020
9	AC Power Source	EXTECH	6605	1570106	N.C.R	N.C.R
10	DC Power Supply	Aglient	E3632A	MY50340053	N.C.R	N.C.R
11	6dB Attenuator	Mini-Circuits	NAT-6-2W	15542-1	N.C.R	N.C.R
12	Power Divider	AISI	IOWOPE2068	PE2068	N.C.R	N.C.R
13	Filter	MICRO-TRONICS	BRM50701	5	N.C.R	N.C.R
14	Conducted test cable	/	RF01-RF04	/	04/21/2020	04/22/2021
15	Temp. / Humidity Chamber	TERCHY	MHK-120AK	X30109	04/21/2020	04/20/2021
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	101493	01/08/2020	01/07/2021
2	Signal Generator	Agilent	E8257C	MY43321570	10/24/2019	10/23/2020
3	Loop Antenna	Schwarzbeck	HXYZ9170	9170-108	02/24/2020	02/23/2021
4	Bilog Antenna	TESEQ	CBL 6112D	35403	06/22/2019	06/21/2021
5	Bilog Antenna	SCHWARZBECK	VULB9160	9160-3342	04/29/2019	04/28/2021
6	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	267	11/04/2018	11/03/2020
7	Horn-antenna(1-18GHz)	ETS-LINDGREN	3117	00143290	02/25/2019	02/24/2021
8	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	BBHA9170171	02/27/2018	02/26/2021
9	Pre-Amplifier(30MHz~18GHz)	CCSRF	AMP1277	1	12/19/2019	12/18/2020
10	Pre-Amplifier(0.1~26.5GHz)	EMCI	EMC012645	980060	04/21/2020	04/20/2021
11	Low Pass Filter	MICRO-TRONICS	VLFX-950	RV142900829	N.C.R	N.C.R
12	High Pass Filter	Mini-Circuits	VHF-1200	15542	N.C.R	N.C.R
13	Filter (5450MHz～5770 MHz）	MICRO-TRONICS	BRC50704-01	2	N.C.R	N.C.R
14	Filter (5690 MHz～5930 MHz）	MICRO-TRONICS	BRC50705-01	4	N.C.R	N.C.R
15	Filter (5150 MHz～5350 MHz）	MICRO-TRONICS	BRC50703-01	2	N.C.R	N.C.R
16	Filter (885 MHz～915 MHz）	MICRO-TRONICS	BRM14698	1	N.C.R	N.C.R
17	Filter (815 MHz～860 MHz）	MICRO-TRONICS	BRM14697	1	N.C.R	N.C.R
18	Filter (1745 MHz～1910 MHz)	MICRO-TRONICS	BRM14700	1	N.C.R	N.C.R
19	Filter (1922 MHz～1977 MHz)	MICRO-TRONICS	BRM50715	1	N.C.R	N.C.R
20	Filter (2550 MHz)	MICRO-TRONICS	HPM13362	5	N.C.R	N.C.R
21	Filter (1532 MHz～1845 MHz)	MICRO-TRONICS	BRM50713	1	N.C.R	N.C.R
22	Filter (2.4GHz)	MICRO-TRONICS	BRM50701	5	N.C.R	N.C.R
23	RE test cable	/	RE01-RE04	/	04/21/2020	04/22/2021

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:

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, 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.

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 PIFA antenna on the main PCB and no consideration of replacement. The best case gain of the antenna is 2dBi.

Antenna location: Refer to Appendix (Internal Photos)

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.		

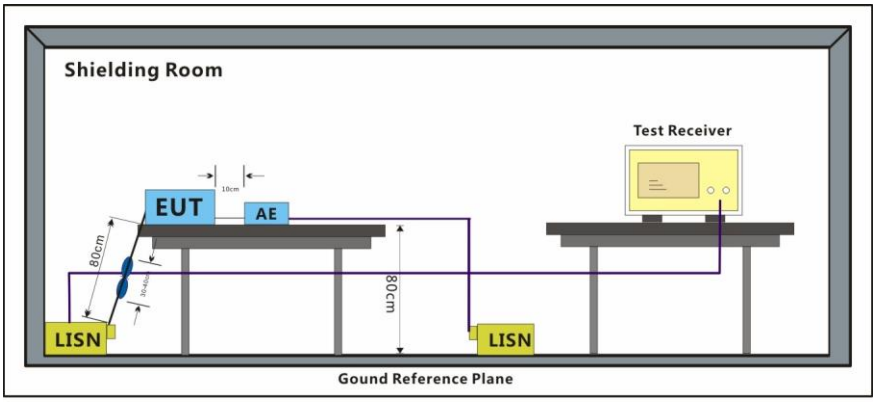
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 24 °C Humidity: 48 % RH Atmospheric Pressure: 1010 mbar

Test mode a:Charging+TX mode_Keep EUT charging and 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.

7.1.2 Test Setup Diagram



7.1.3 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.

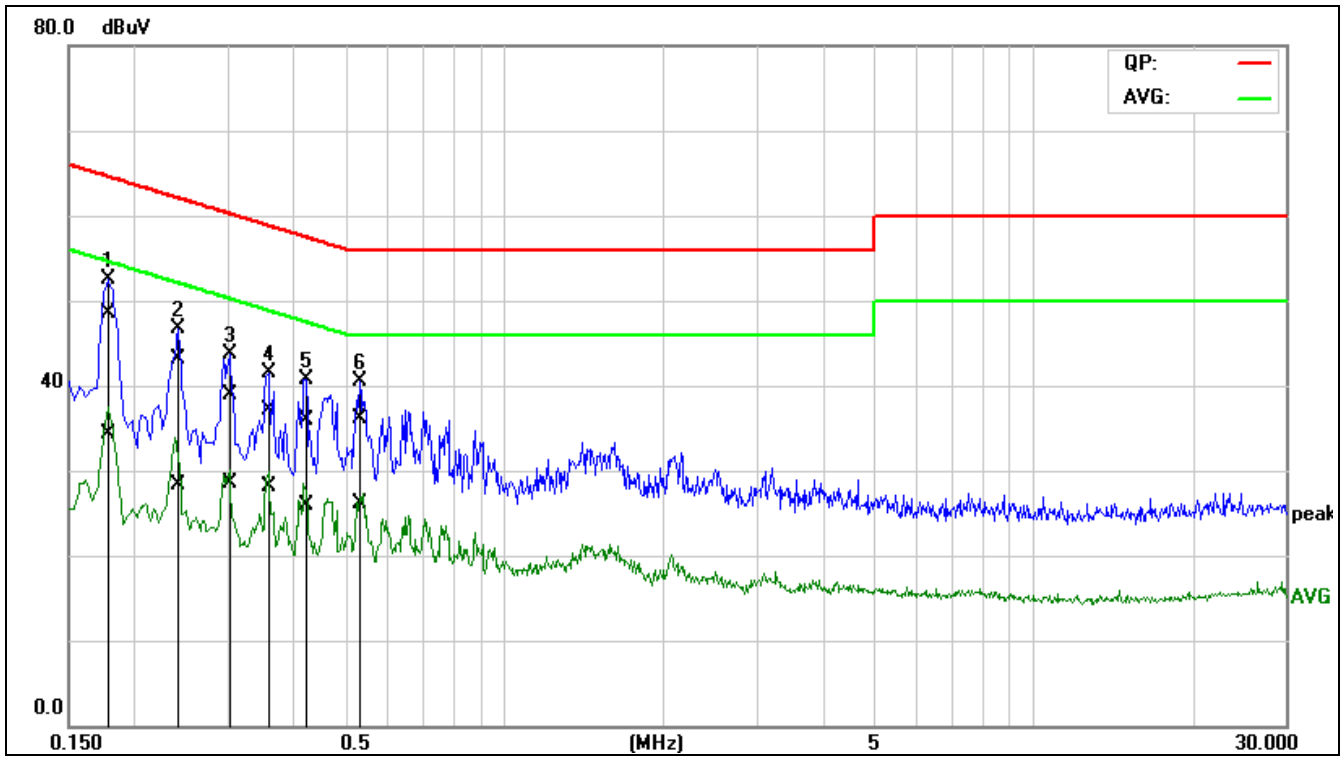
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

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.

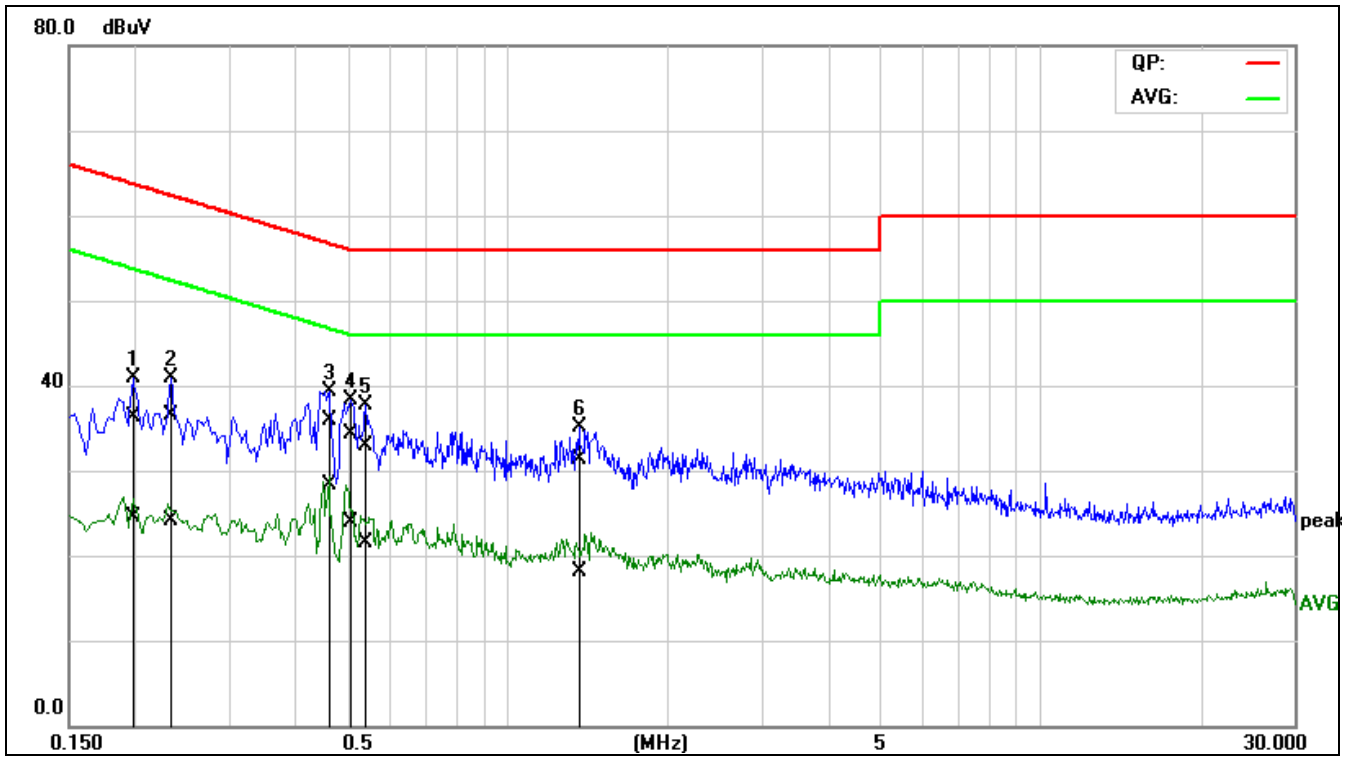
Remark: LISN=Read Level+ Cable Loss+ LISN Factor

Mode:a; Line:Live Line



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1*	0.1780	29.08	14.78	19.44	48.52	34.22	64.58	54.58	-16.06	-20.36	Pass
2	0.2420	23.64	8.92	19.41	43.05	28.33	62.03	52.03	-18.98	-23.70	Pass
3	0.3020	19.53	9.04	19.38	38.91	28.42	60.19	50.19	-21.28	-21.77	Pass
4	0.3580	17.79	8.62	19.41	37.20	28.03	58.77	48.77	-21.57	-20.74	Pass
5	0.4220	16.55	6.57	19.43	35.98	26.00	57.41	47.41	-21.43	-21.41	Pass
6	0.5340	16.62	6.64	19.47	36.09	26.11	56.00	46.00	-19.91	-19.89	Pass

Mode:a; Line:Neutral Line



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1980	16.82	5.17	19.39	36.21	24.56	63.69	53.69	-27.48	-29.13	Pass
2	0.2340	17.13	4.70	19.39	36.52	24.09	62.31	52.31	-25.79	-28.22	Pass
3*	0.4620	16.43	8.94	19.39	35.82	28.33	56.66	46.66	-20.84	-18.33	Pass
4	0.5100	14.89	4.61	19.39	34.28	24.00	56.00	46.00	-21.72	-22.00	Pass
5	0.5420	13.41	2.03	19.40	32.81	21.43	56.00	46.00	-23.19	-24.57	Pass
6	1.3620	11.69	-1.55	19.59	31.28	18.04	56.00	46.00	-24.72	-27.96	Pass

7.2 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)
Test Method: ANSI C63.10 (2013) Section 11.8.1
Limit: ≥500 kHz

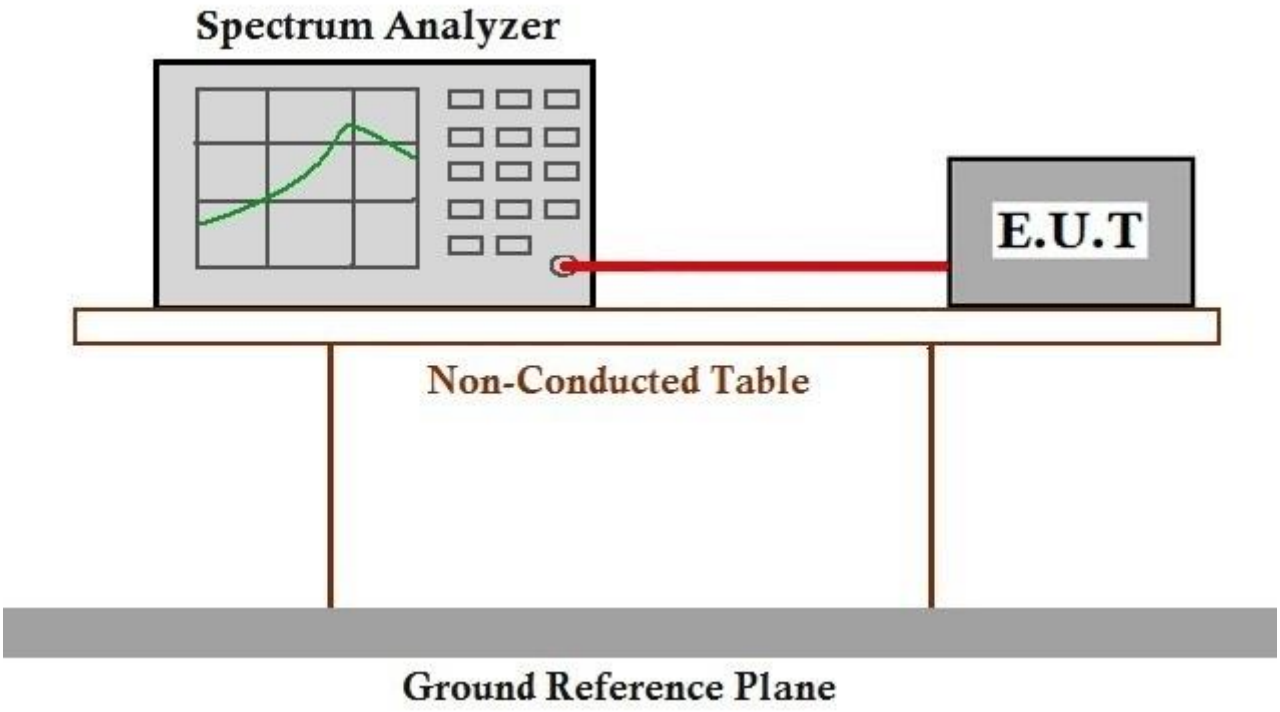
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a:Charging+TX mode_Keep EUT charging and Keep the EUT in continuously tran smitting 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.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM200700586901

7.3 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method: ANSI C63.10 (2013) Section 11.9.1
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

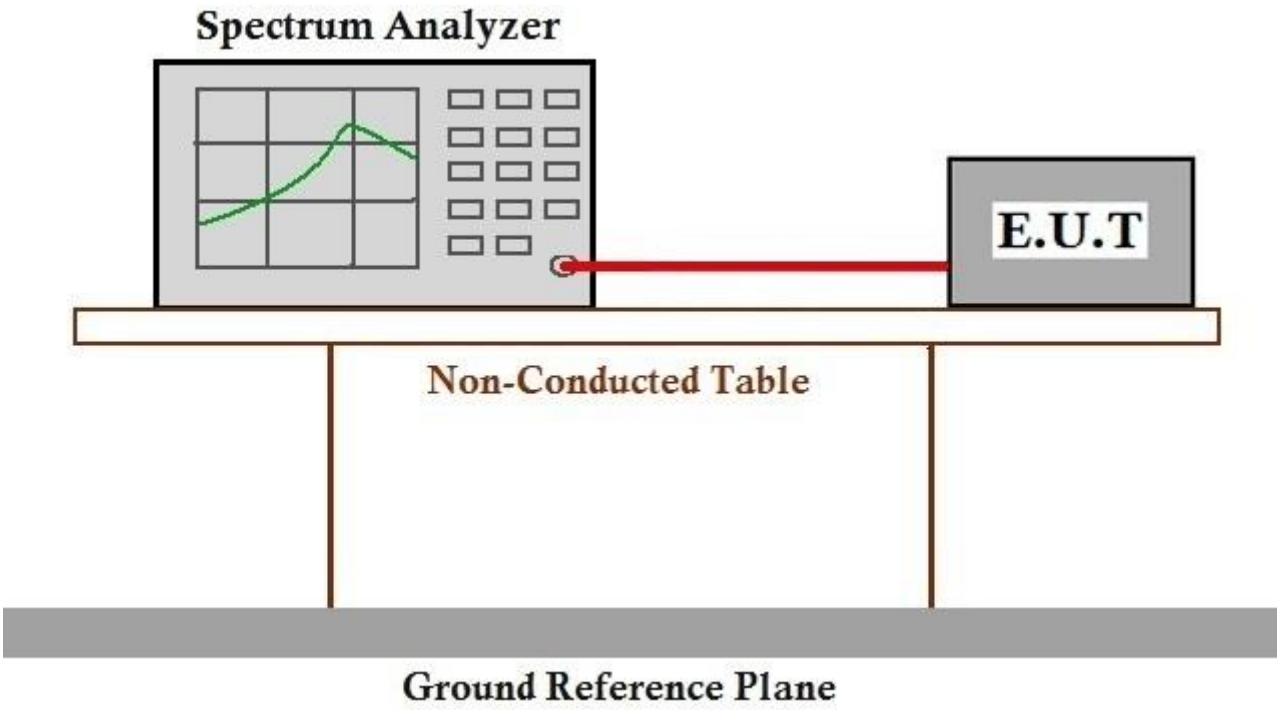
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a:Charging+TX mode_Keep EUT charging and Keep the EUT in continuously tran smitting 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.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM200700586901

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

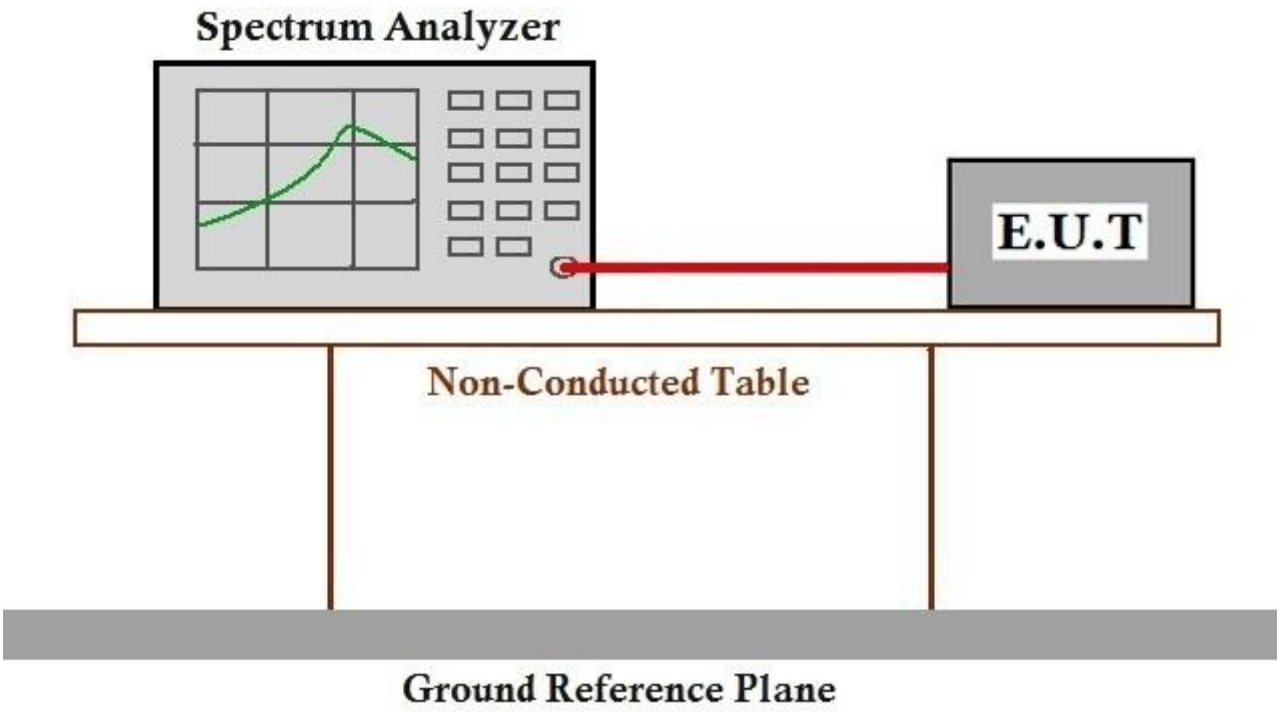
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a:Charging+TX mode_Keep EUT charging and Keep the EUT in continuously tran smitting 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.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM200700586901

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)

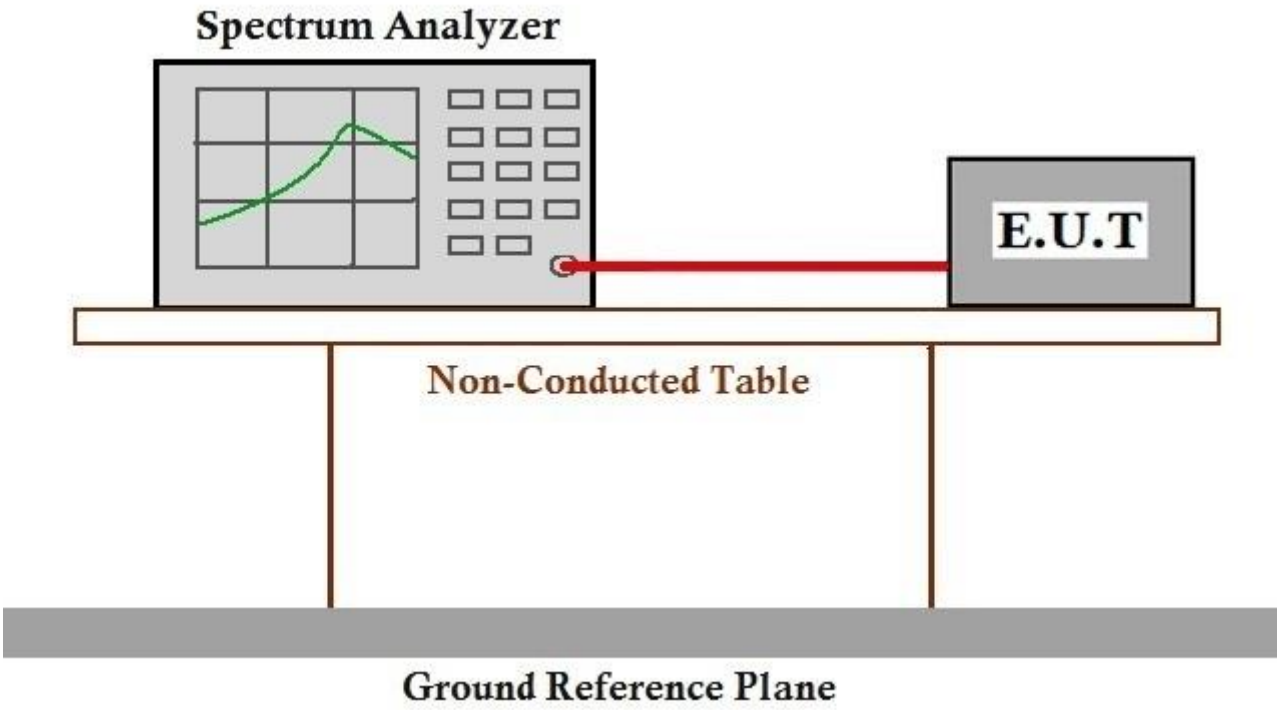
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a: Charging+TX mode_Keep EUT charging and 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.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM200700586901

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)

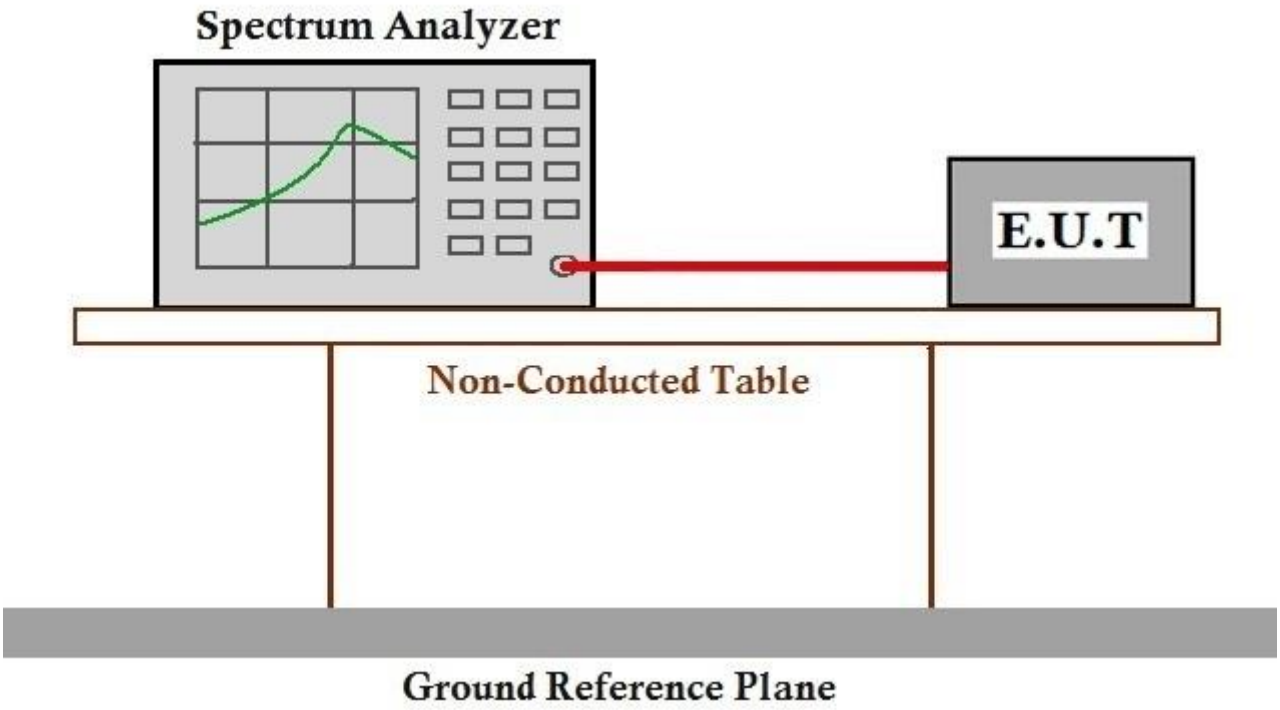
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a: Charging+TX mode_Keep EUT charging and 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.

7.6.2 Test Setup Diagram



7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM200700586901

7.7 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.247(d)

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.		

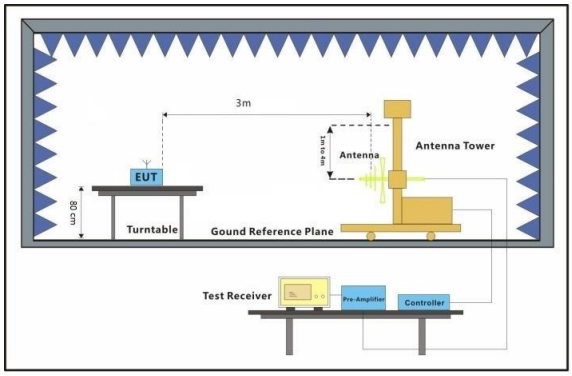
7.7.1 E.U.T. Operation

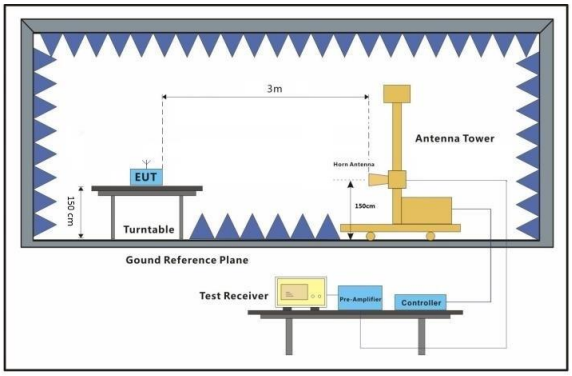
Operating Environment:

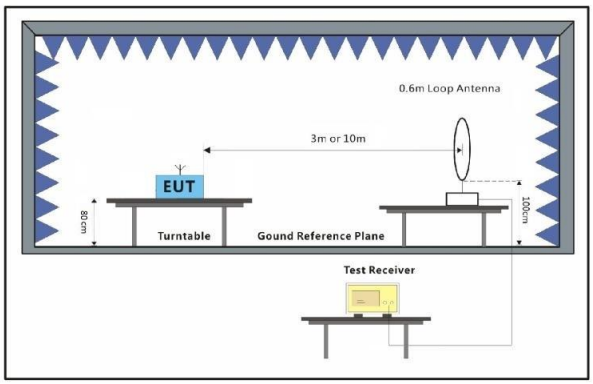
Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a: Charging+TX mode_Keep EUT charging and 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.

7.7.2 Test Setup Diagram







7.7.3 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 middle channel, the Highest channel.

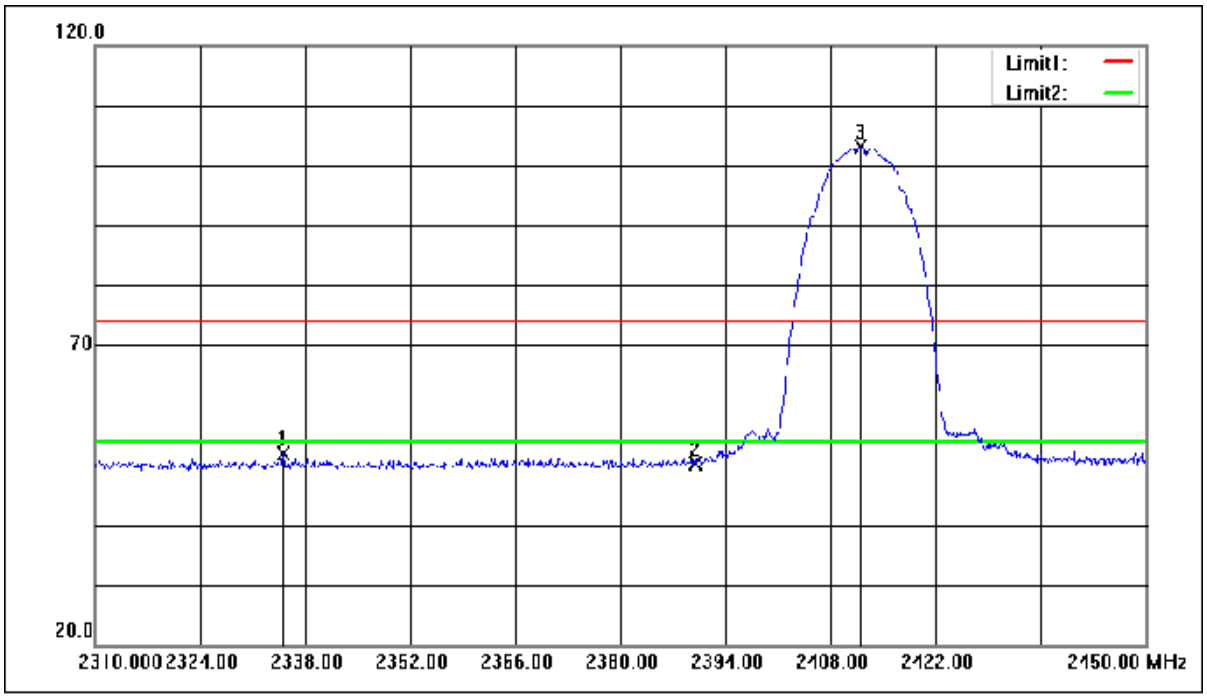
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

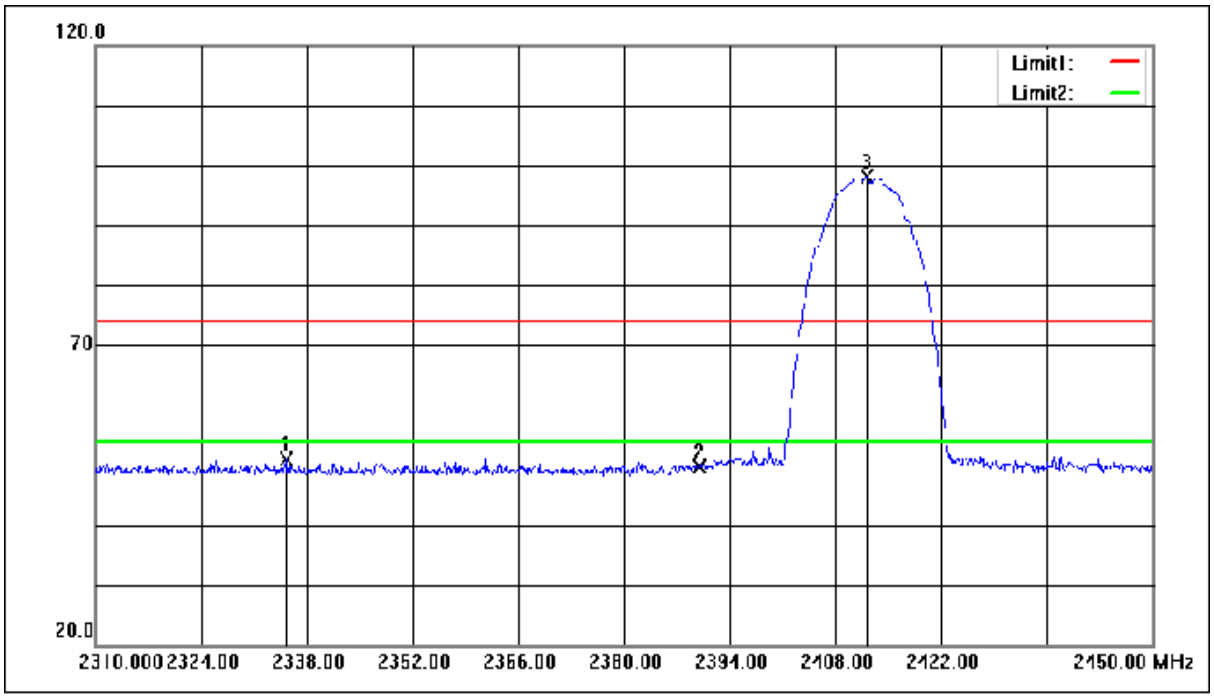
Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level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

Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:Low



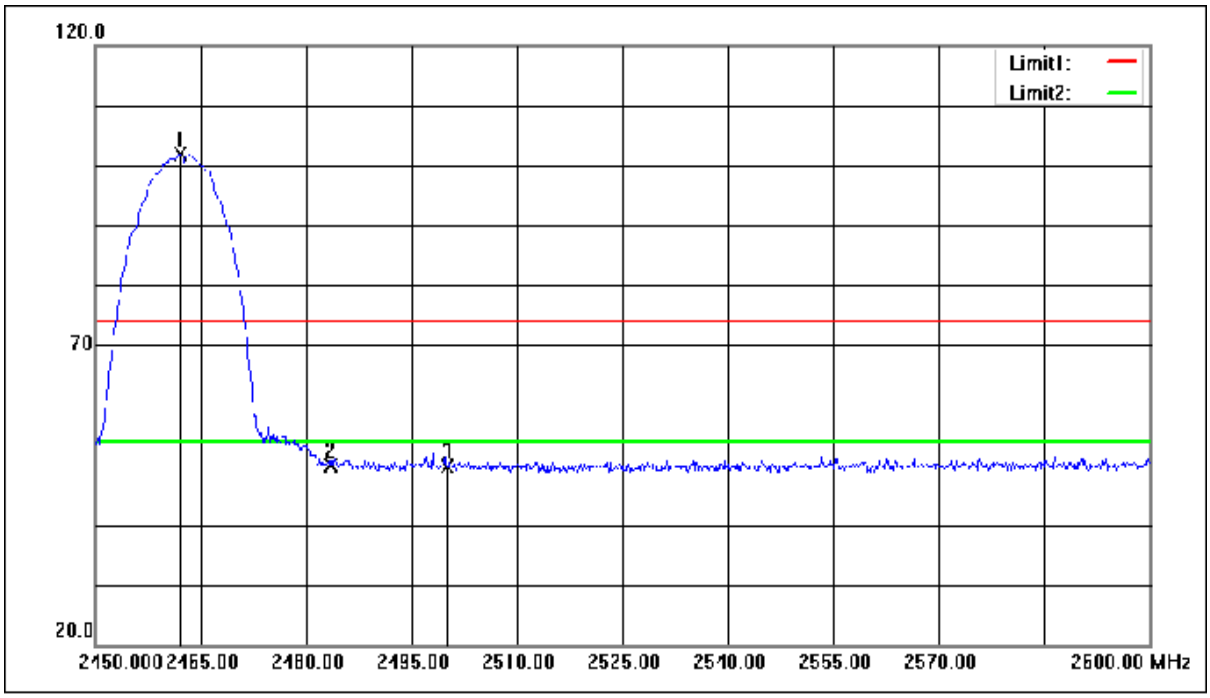
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2335.060	56.28	-4.39	51.89	74.00	-22.11	peak
2	2390.000	54.38	-4.24	50.14	74.00	-23.86	peak
3	2412.060	107.36	-4.19	103.17	74.00	29.17	peak

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:Low



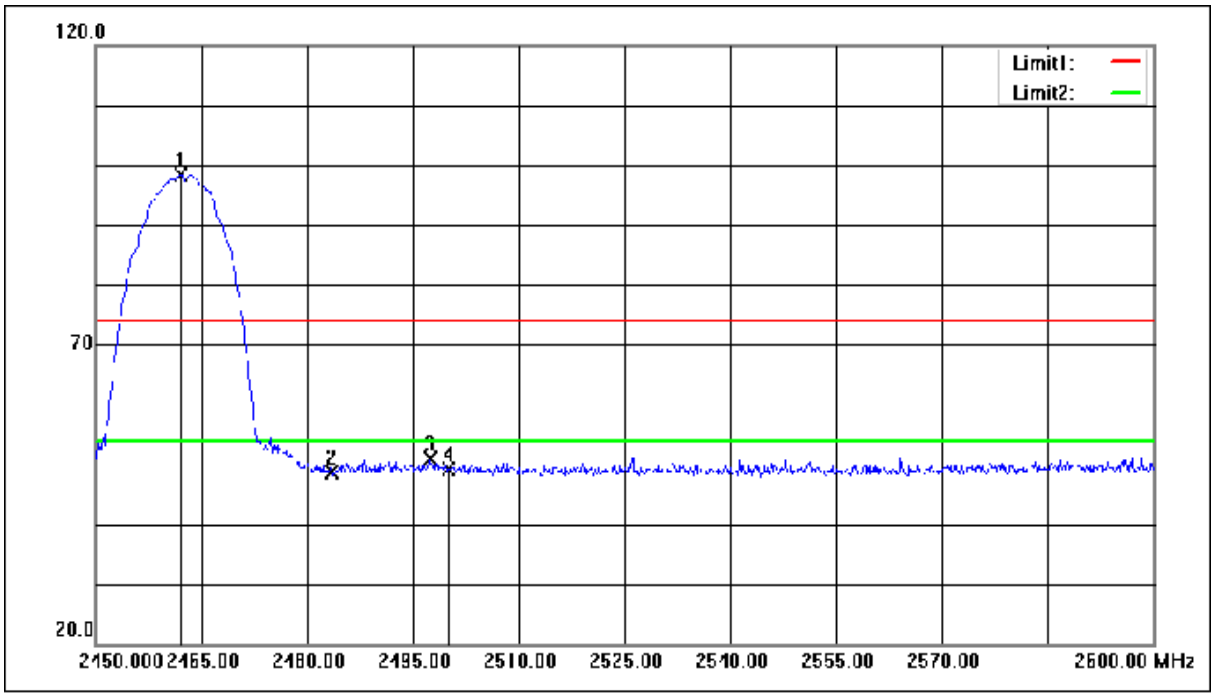
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2335.200	55.30	-4.39	50.91	74.00	-23.09	peak
2	2390.000	53.77	-4.24	49.53	74.00	-24.47	peak
3	2412.200	102.39	-4.19	98.20	74.00	24.20	peak

Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:High



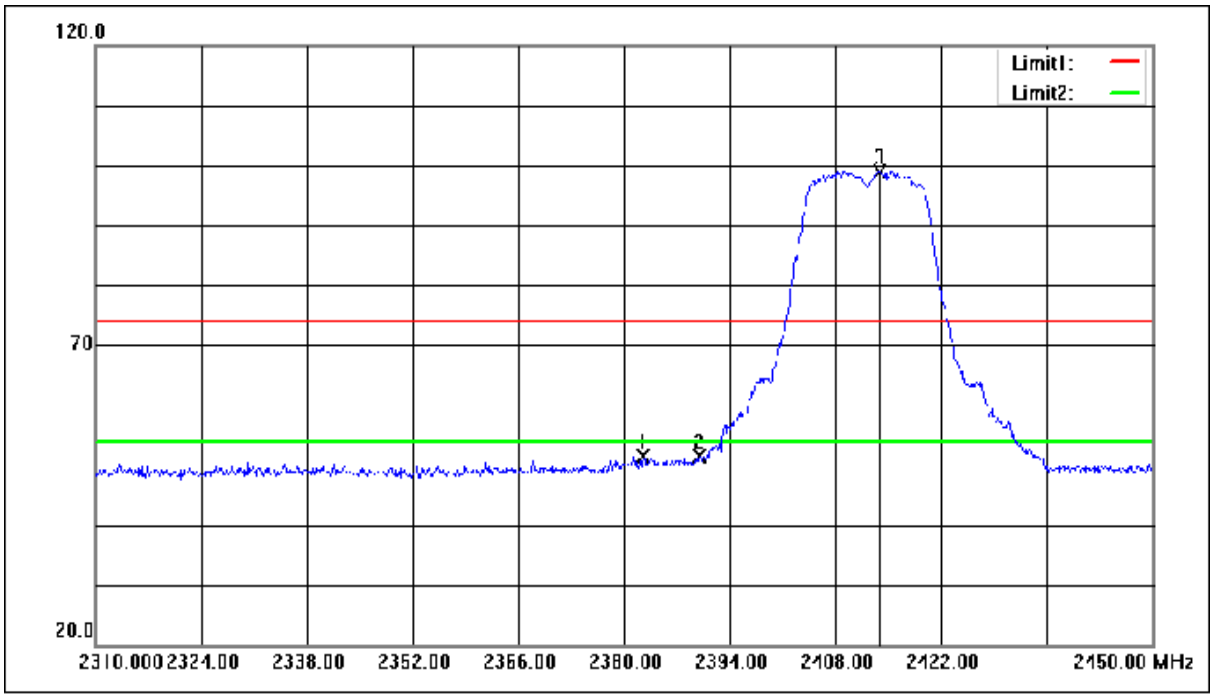
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2462.000	105.95	-4.06	101.89	74.00	27.89	peak
2	2483.500	53.80	-4.00	49.80	74.00	-24.20	peak
3	2500.000	53.68	-3.96	49.72	74.00	-24.28	peak

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:High



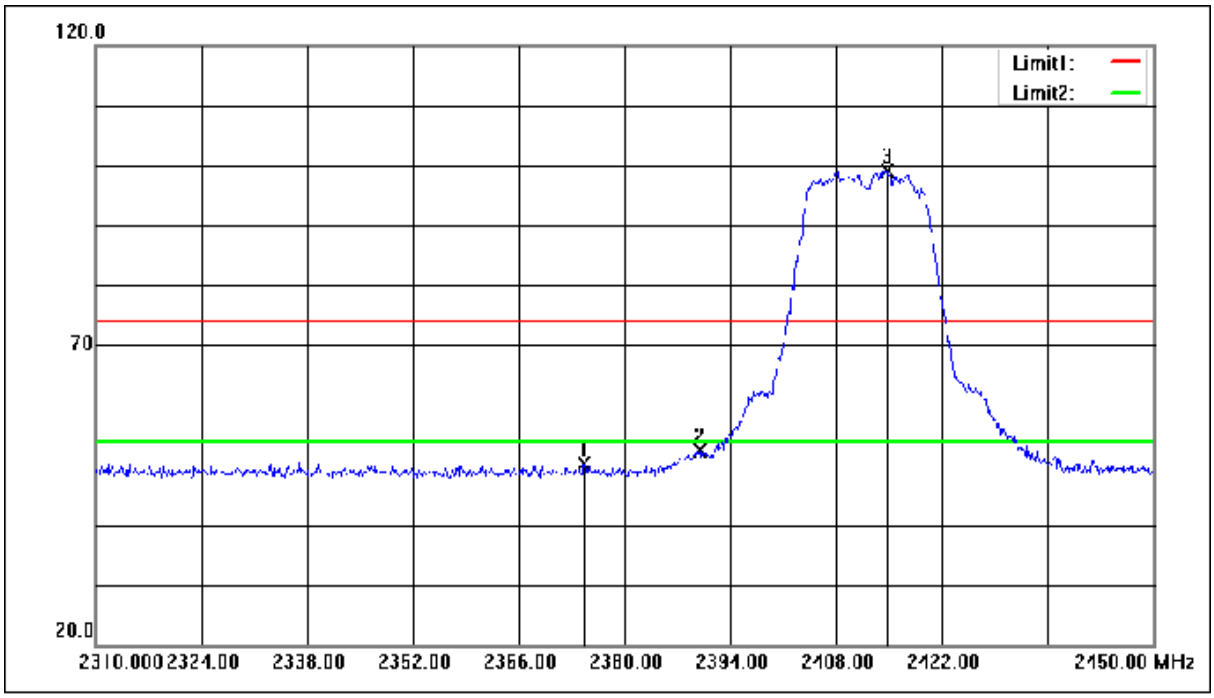
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2462.150	102.44	-4.06	98.38	74.00	24.38	peak
2	2483.500	52.59	-4.00	48.59	74.00	-25.41	peak
3	2497.400	54.79	-3.97	50.82	74.00	-23.18	peak
4	2500.000	53.17	-3.96	49.21	74.00	-24.79	peak

Mode:a; Polarization:Horizontal; Modulation:g; bandwidth:20MHz; Channel:Low



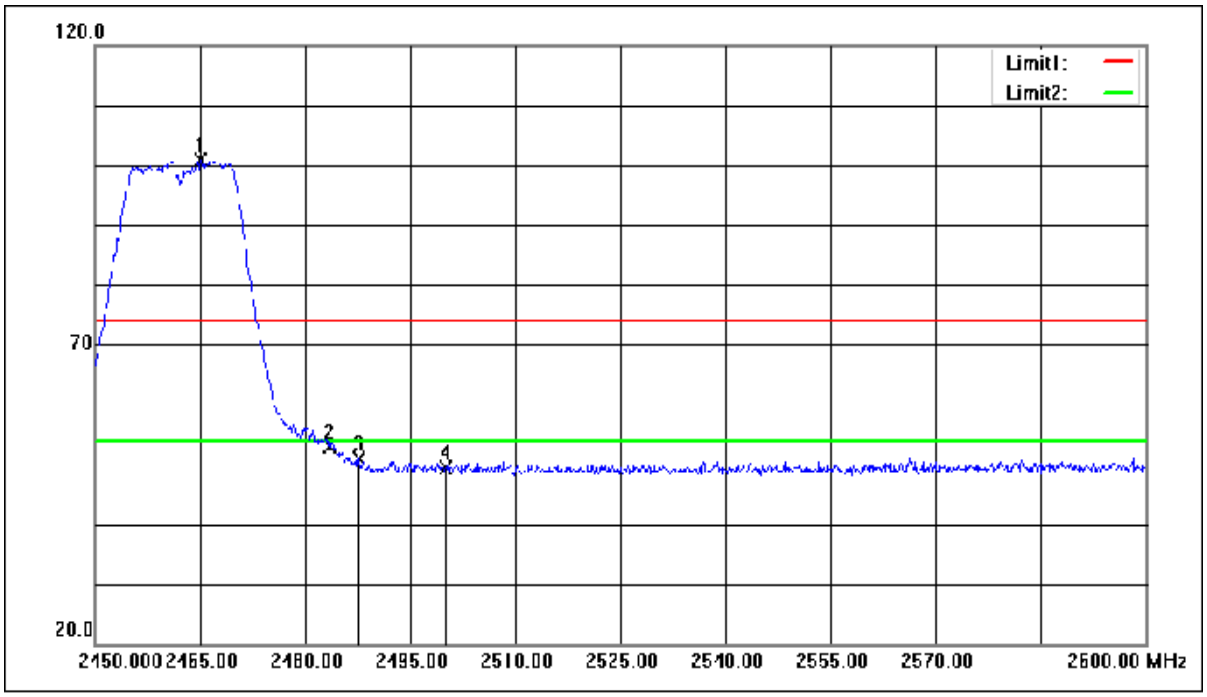
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2382.520	55.62	-4.26	51.36	74.00	-22.64	peak
2	2390.000	55.69	-4.24	51.45	74.00	-22.55	peak
3	2413.880	103.13	-4.18	98.95	74.00	24.95	peak

Mode:a; Polarization:Vertical; Modulation:g; bandwidth:20MHz; Channel:Low



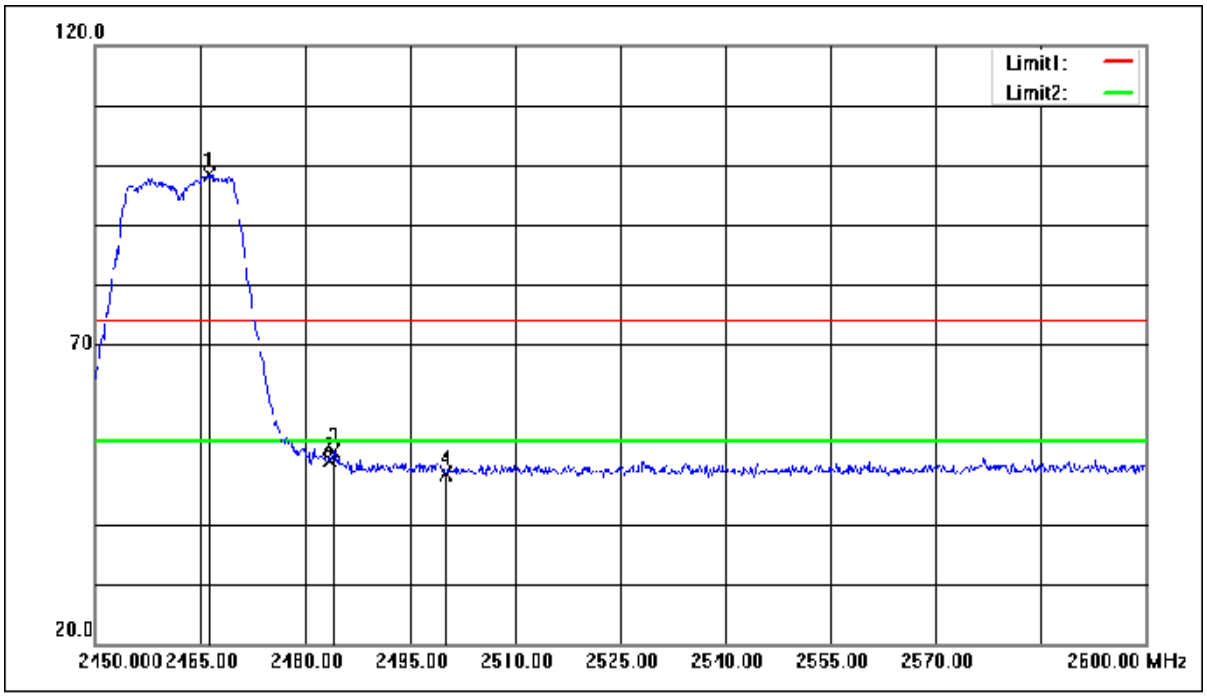
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2374.680	54.33	-4.28	50.05	74.00	-23.95	peak
2	2390.000	56.55	-4.24	52.31	74.00	-21.69	peak
3	2414.720	103.25	-4.18	99.07	74.00	25.07	peak

Mode:a; Polarization:Horizontal; Modulation:g; bandwidth:20MHz; Channel:High



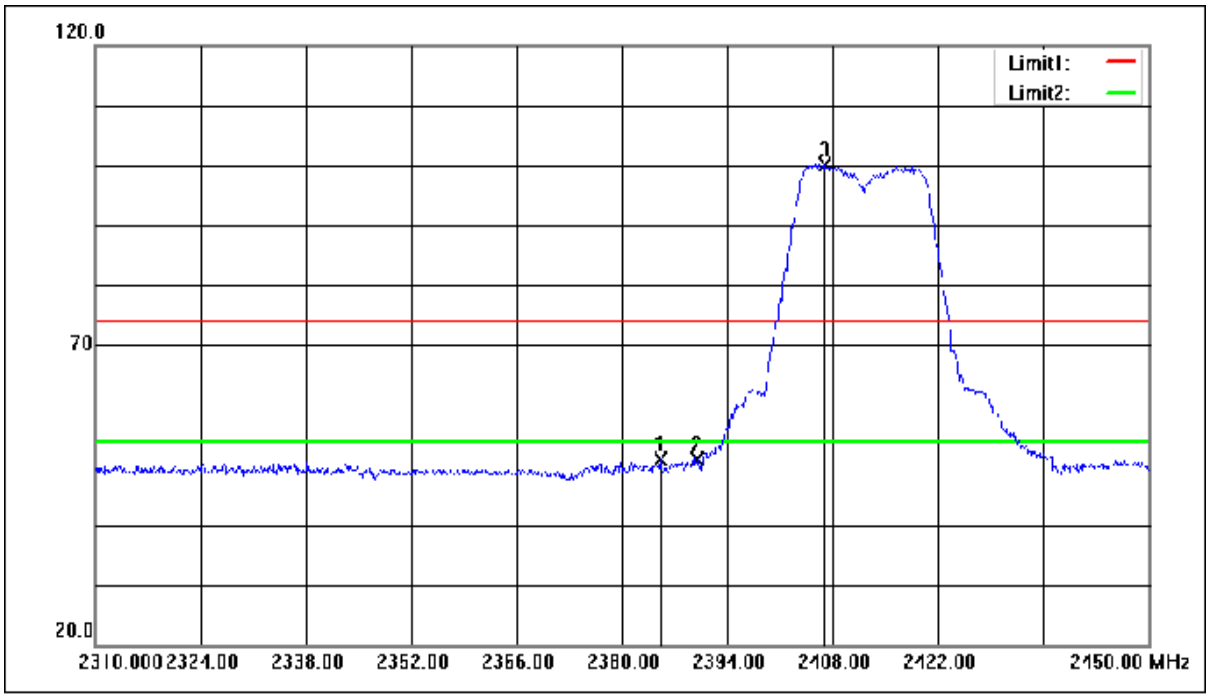
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2465.150	104.83	-4.05	100.78	74.00	26.78	peak
2	2483.500	56.90	-4.00	52.90	74.00	-21.10	peak
3	2487.650	54.96	-3.99	50.97	74.00	-23.03	peak
4	2500.000	53.29	-3.96	49.33	74.00	-24.67	peak

Mode:a; Polarization:Vertical; Modulation:g; bandwidth:20MHz; Channel:High



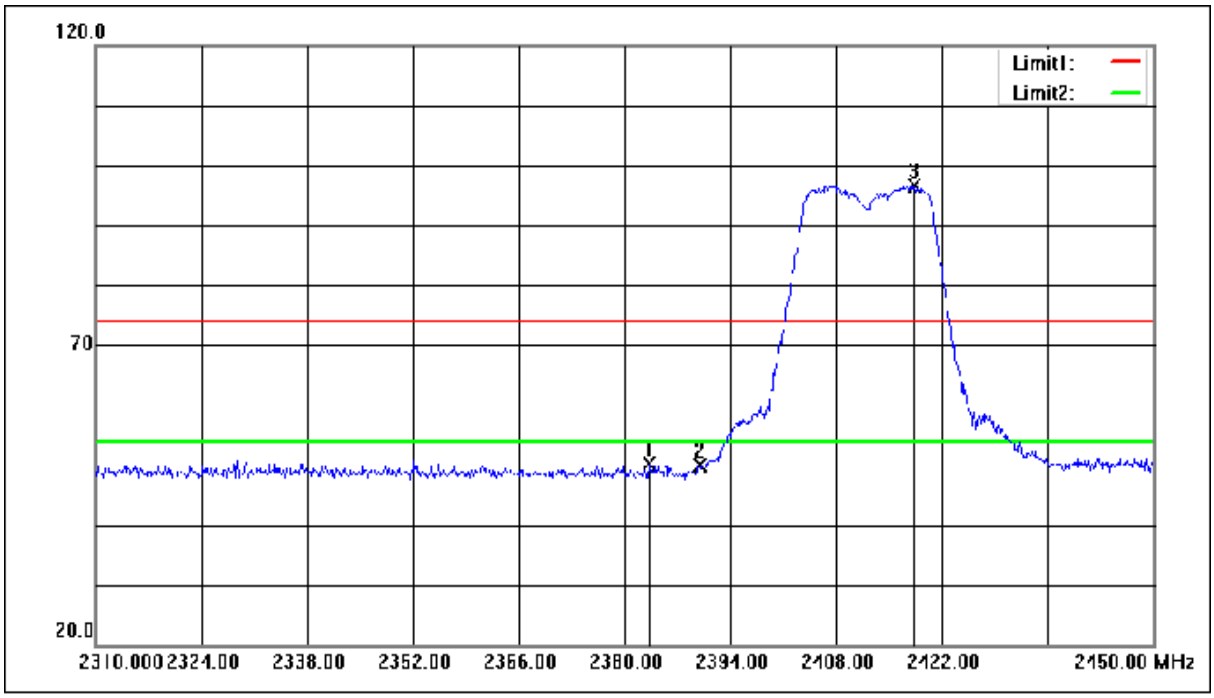
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2466.200	102.48	-4.05	98.43	74.00	24.43	peak
2	2483.500	54.58	-4.00	50.58	74.00	-23.42	peak
3	2484.050	56.22	-4.00	52.22	74.00	-21.78	peak
4	2500.000	52.24	-3.96	48.28	74.00	-25.72	peak

Mode:a; Polarization:Horizontal; Modulation:n; bandwidth:20MHz; Channel:Low



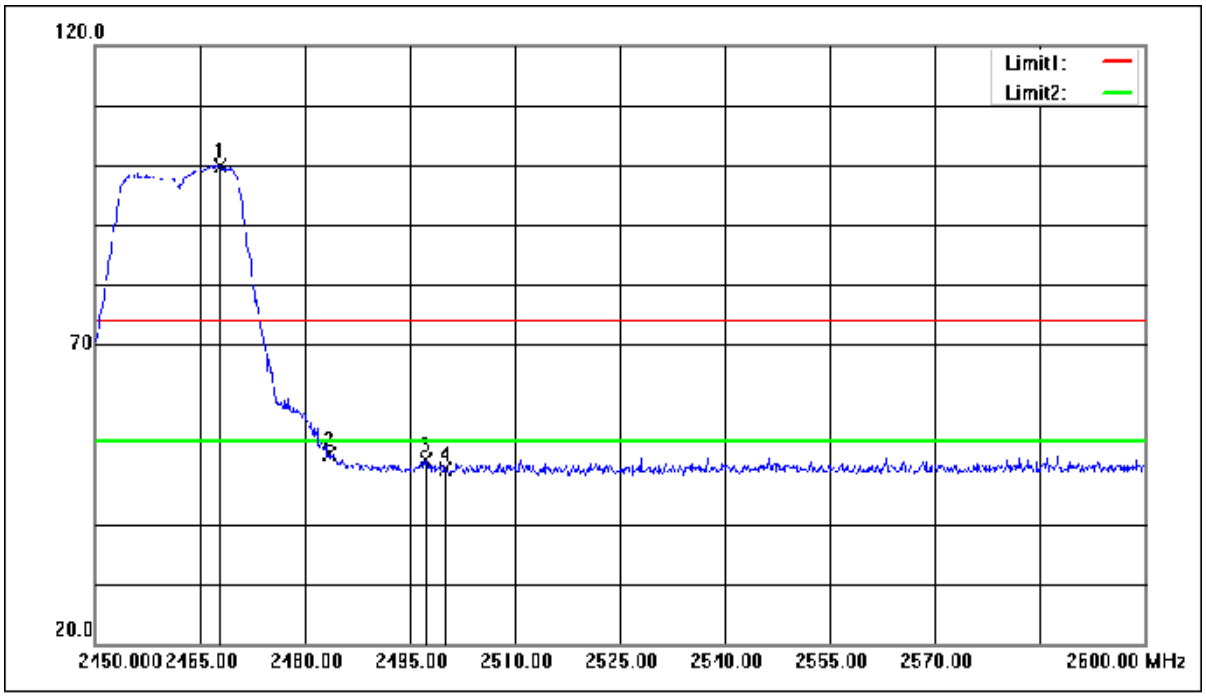
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2385.040	55.20	-4.26	50.94	74.00	-23.06	peak
2	2390.000	55.17	-4.24	50.93	74.00	-23.07	peak
3	2407.020	104.34	-4.20	100.14	74.00	26.14	peak

Mode:a; Polarization:Vertical; Modulation:n; bandwidth:20MHz; Channel:Low



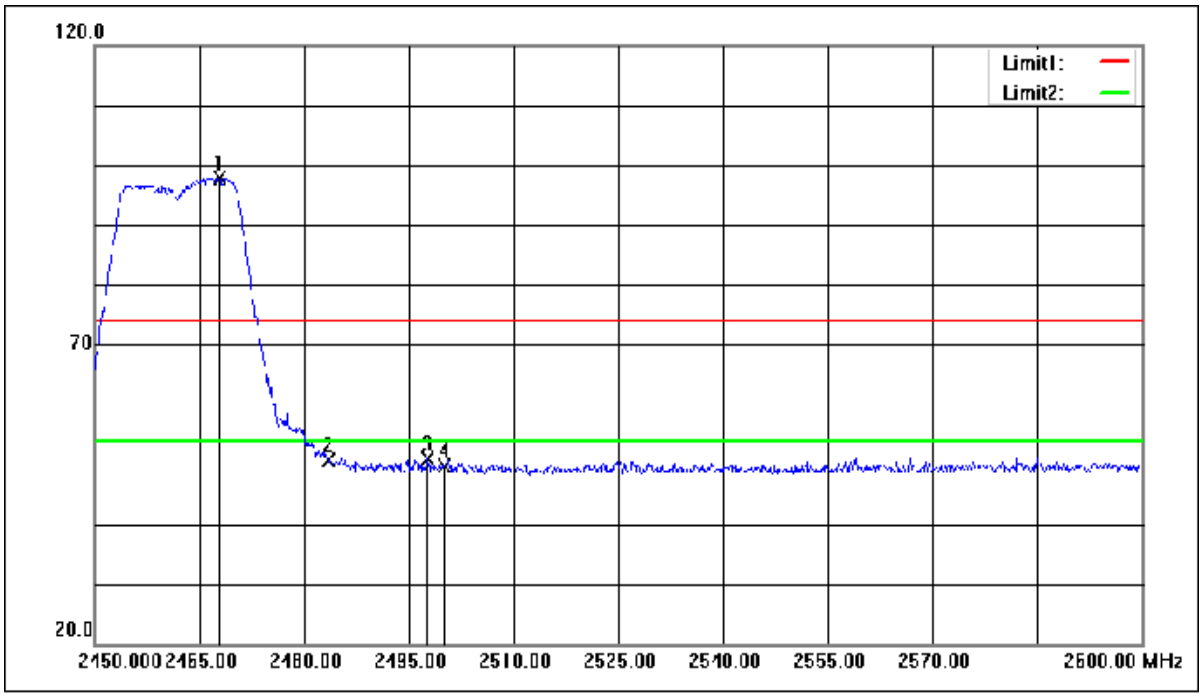
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2383.220	54.49	-4.26	50.23	74.00	-23.77	peak
2	2390.000	54.16	-4.24	49.92	74.00	-24.08	peak
3	2418.360	100.84	-4.17	96.67	74.00	22.67	peak

Mode:a; Polarization:Horizontal; Modulation:n; bandwidth:20MHz; Channel:High



No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2467.850	104.03	-4.04	99.99	74.00	25.99	peak
2	2483.500	55.60	-4.00	51.60	74.00	-22.40	peak
3	2497.250	54.56	-3.97	50.59	74.00	-23.41	peak
4	2500.000	53.07	-3.96	49.11	74.00	-24.89	peak

Mode:a; Polarization:Vertical; Modulation:n; bandwidth:20MHz; Channel:High



No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	2467.850	102.01	-4.04	97.97	74.00	23.97	peak
2	2483.500	54.53	-4.00	50.53	74.00	-23.47	peak
3	2497.700	54.87	-3.97	50.90	74.00	-23.10	peak
4	2500.000	53.52	-3.96	49.56	74.00	-24.44	peak

7.8 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.247(d)
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.		

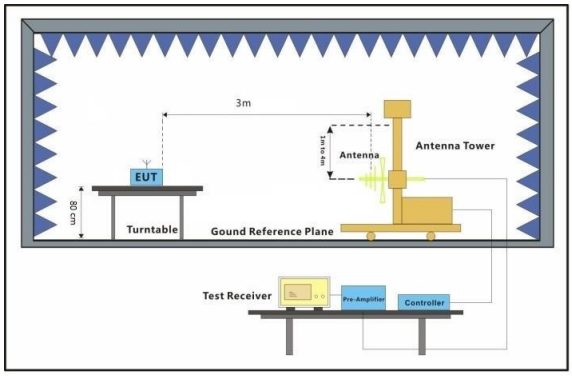
7.8.1 E.U.T. Operation

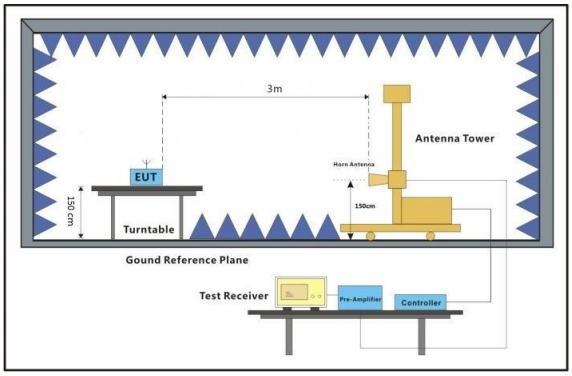
Operating Environment:

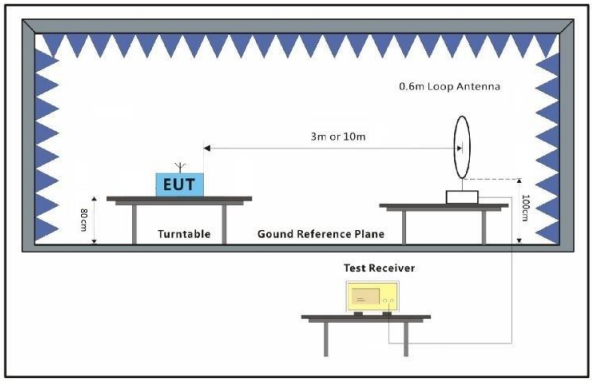
Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a: Charging+TX mode_Keep EUT charging and 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.

7.8.2 Test Setup Diagram







7.8.3 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 middle 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) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

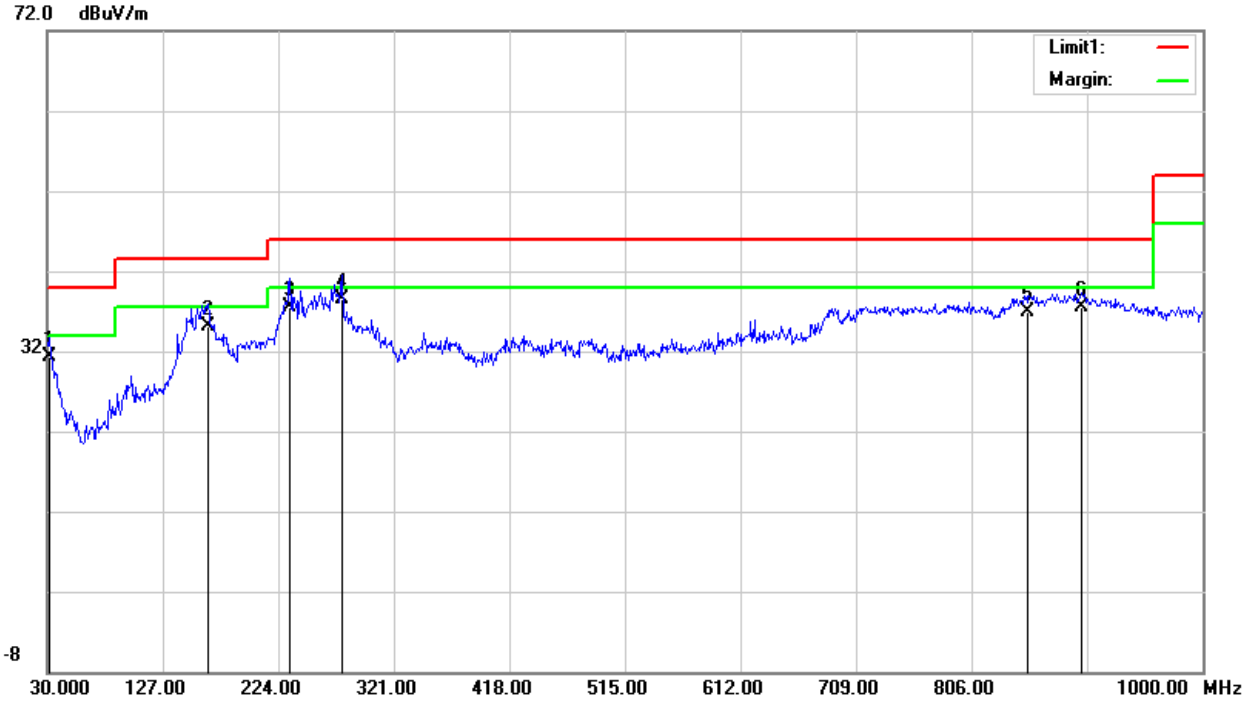
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

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

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and 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.

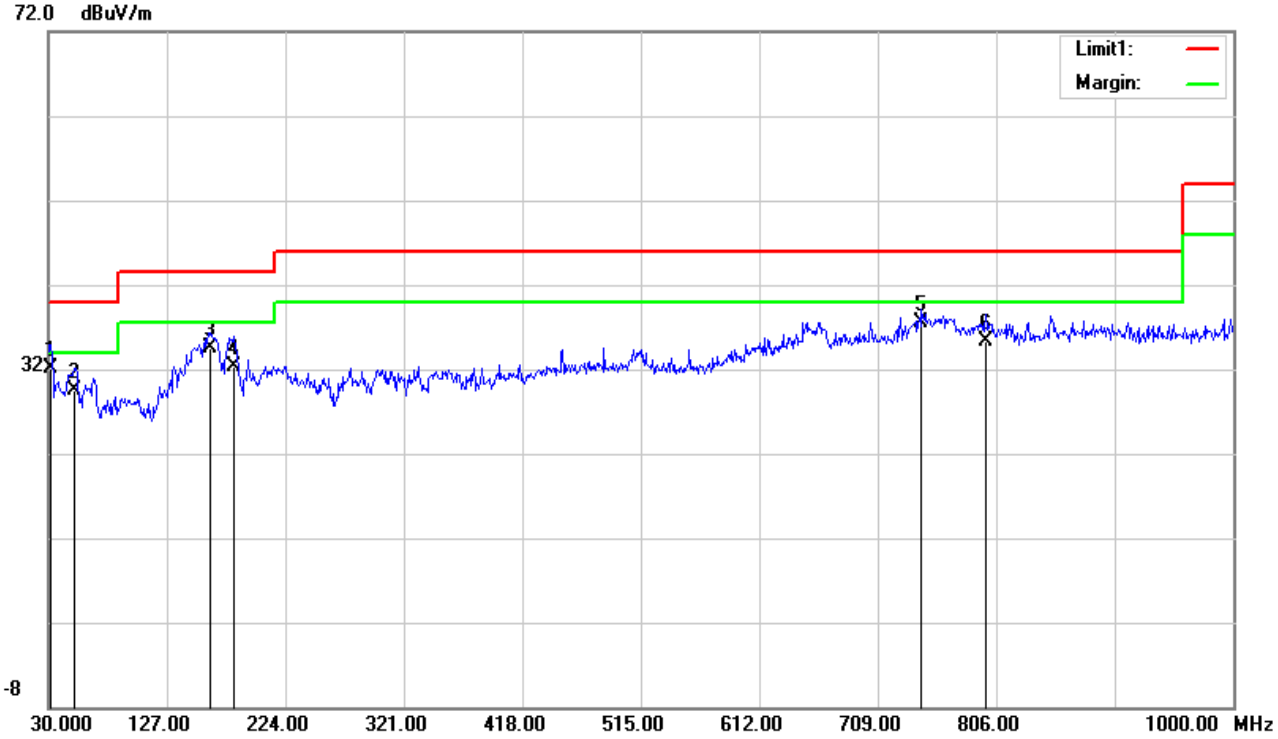
4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower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

Below 1GHz:
Mode:a; Polarization:Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	31.9400	6.33	24.92	31.25	40.00	-8.75	200	192	QP
2	164.8300	16.10	19.06	35.16	43.50	-8.34	200	144	QP
3	233.7000	19.15	18.44	37.59	46.00	-8.41	100	106	QP
4	277.3500	18.45	20.11	38.56	46.00	-7.44	100	283	QP
5	853.5300	8.50	28.50	37.00	46.00	-9.00	100	177	QP
6	898.1500	8.69	28.73	37.42	46.00	-8.58	100	171	QP

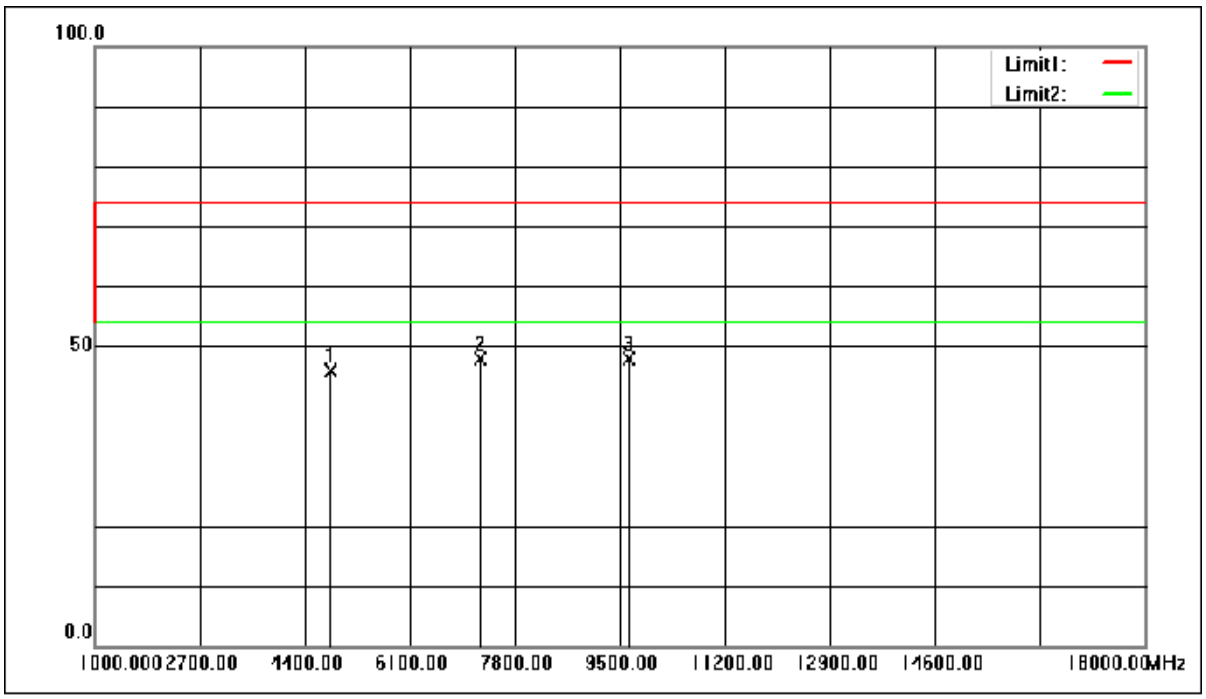
Mode:a; Polarization:Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	31.9400	7.24	24.92	32.16	40.00	-7.84	100	25	QP
2	51.3400	15.12	14.33	29.45	40.00	-10.55	200	165	QP
3	162.8900	15.35	19.21	34.56	43.50	-8.94	100	231	QP
4	181.3200	14.47	17.79	32.26	43.50	-11.24	100	147	QP
5	744.8900	9.65	27.87	37.52	46.00	-8.48	200	252	QP
6	797.2700	7.08	28.18	35.26	46.00	-10.74	200	178	QP

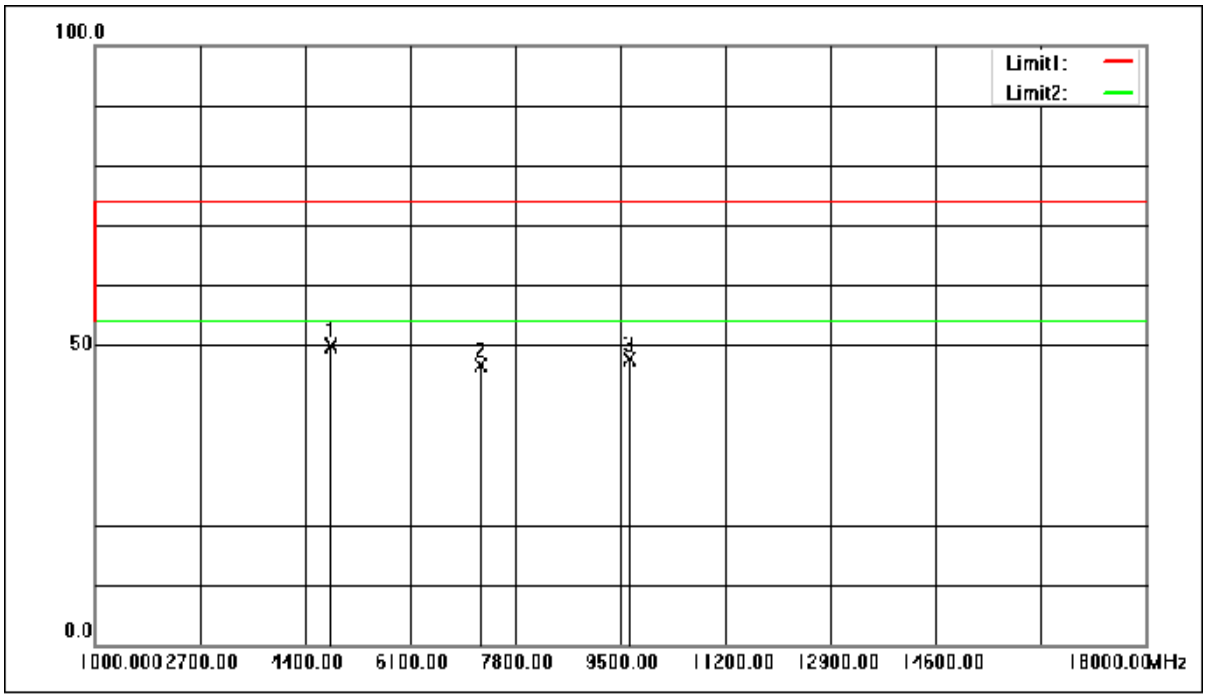
Above 1GHz

Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:Low



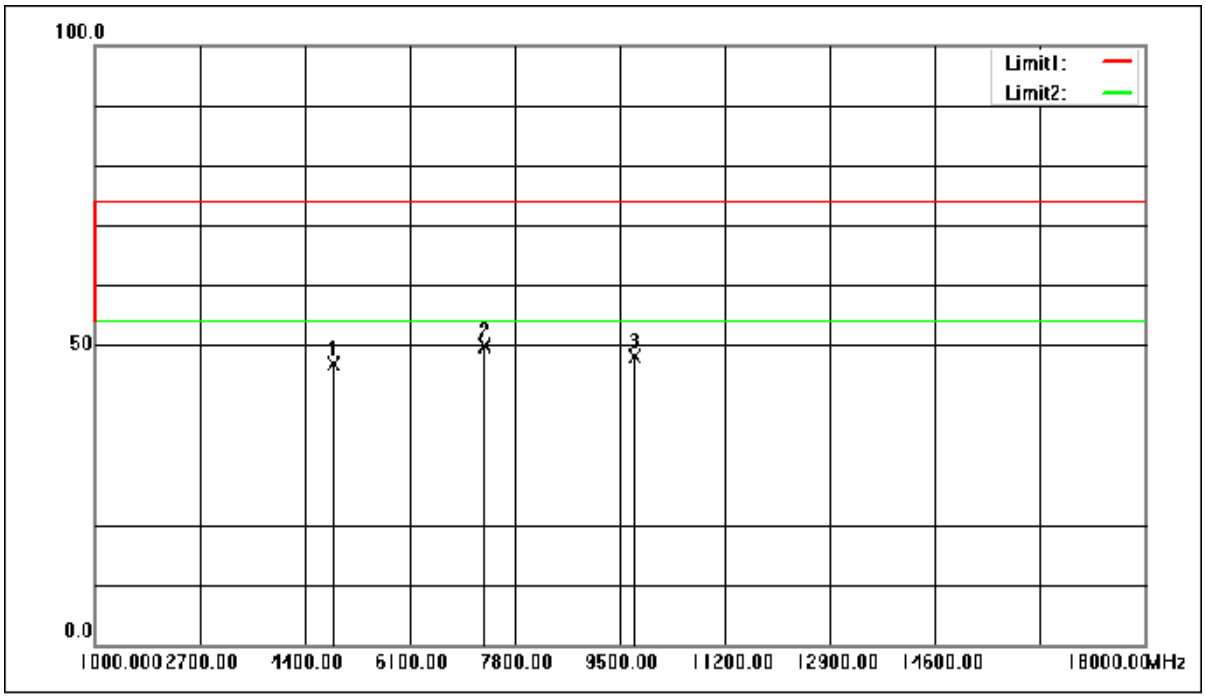
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4824.000	56.09	-10.21	45.88	74.00	-28.12	peak
2	7236.000	54.86	-7.05	47.81	74.00	-26.19	peak
3	9648.000	52.63	-4.77	47.86	74.00	-26.14	peak

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:Low



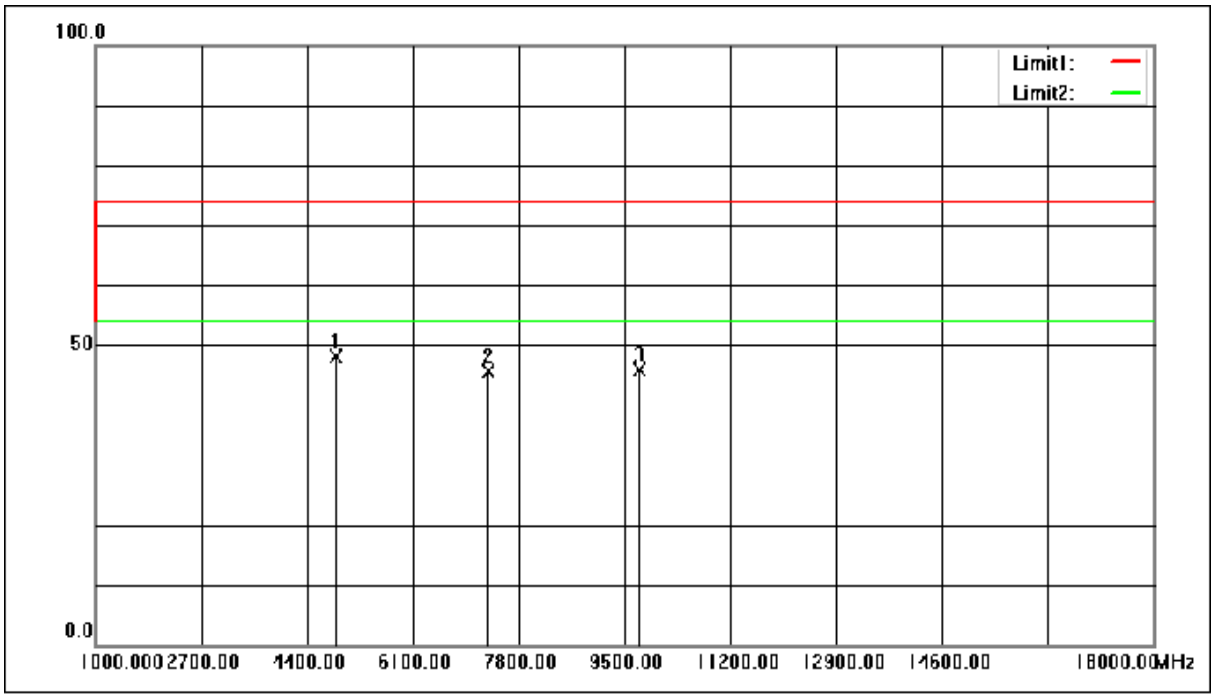
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4824.000	60.11	-10.21	49.90	74.00	-24.10	peak
2	7236.000	53.58	-7.05	46.53	74.00	-27.47	peak
3	9648.000	52.39	-4.77	47.62	74.00	-26.38	peak

Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:middle



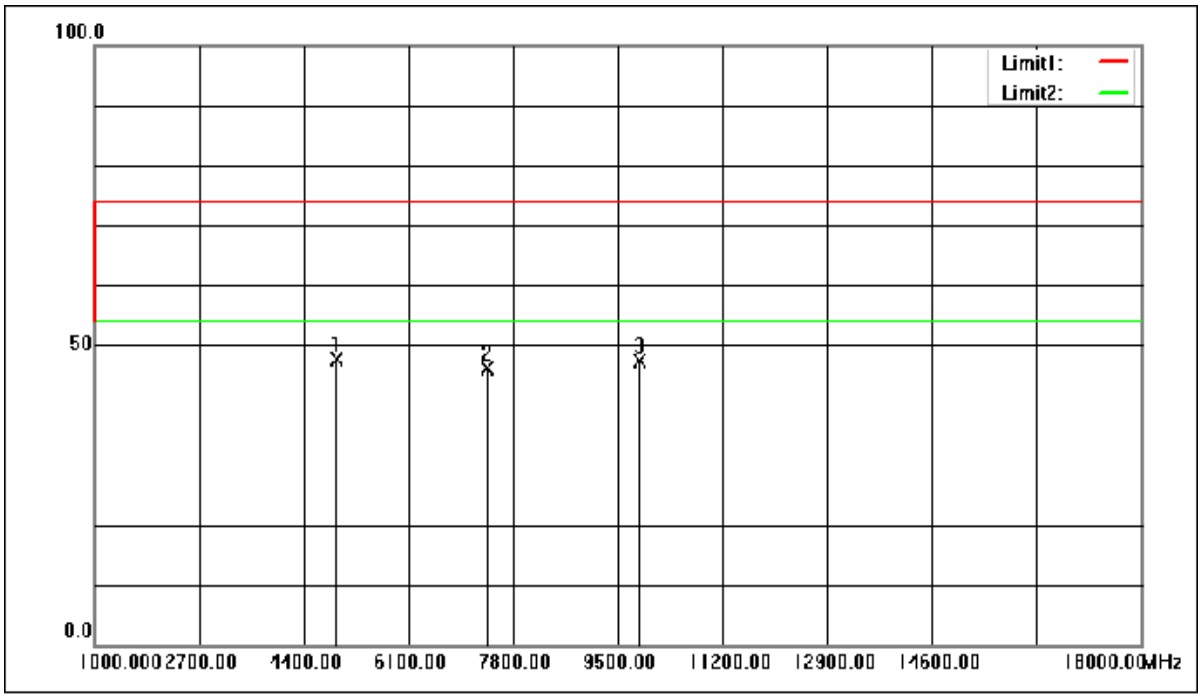
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4874.000	56.84	-10.01	46.83	74.00	-27.17	peak
2	7311.000	56.87	-6.93	49.94	74.00	-24.06	peak
3	9748.000	52.53	-4.30	48.23	74.00	-25.77	peak

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:middle



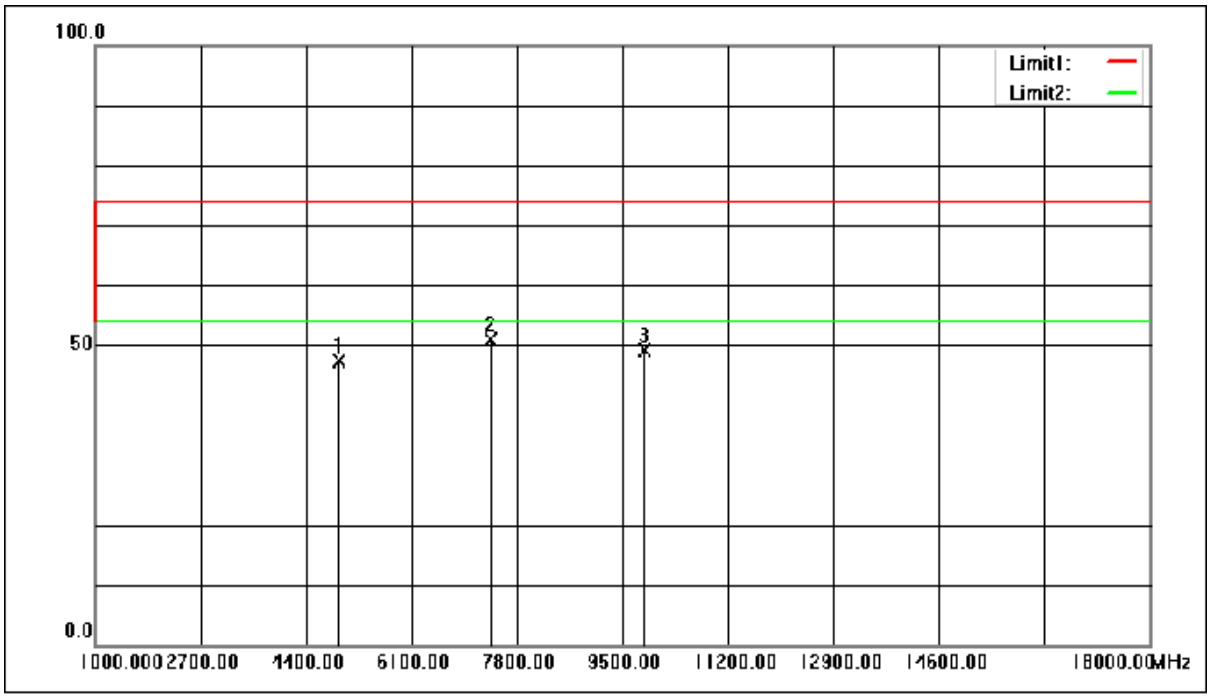
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4874.000	58.12	-10.01	48.11	74.00	-25.89	peak
2	7311.000	52.61	-6.93	45.68	74.00	-28.32	peak
3	9748.000	50.23	-4.30	45.93	74.00	-28.07	peak

Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:High



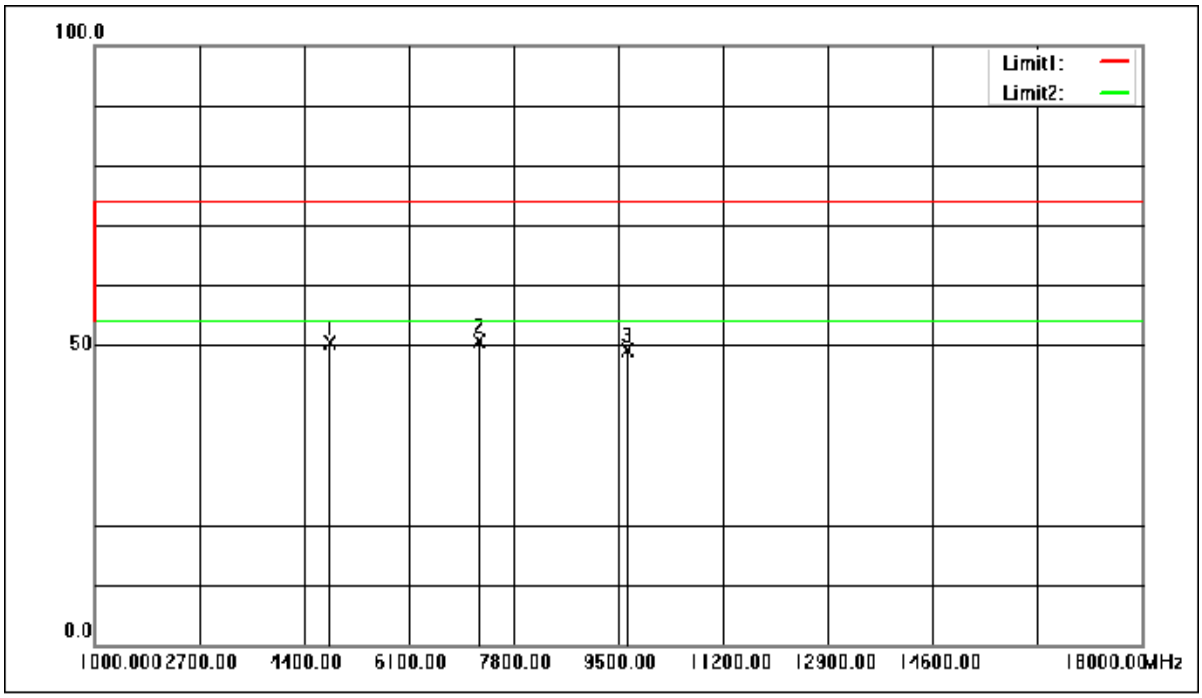
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4924.000	57.52	-9.82	47.70	74.00	-26.30	peak
2	7386.000	52.89	-6.80	46.09	74.00	-27.91	peak
3	9848.000	51.22	-3.84	47.38	74.00	-26.62	peak

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:High



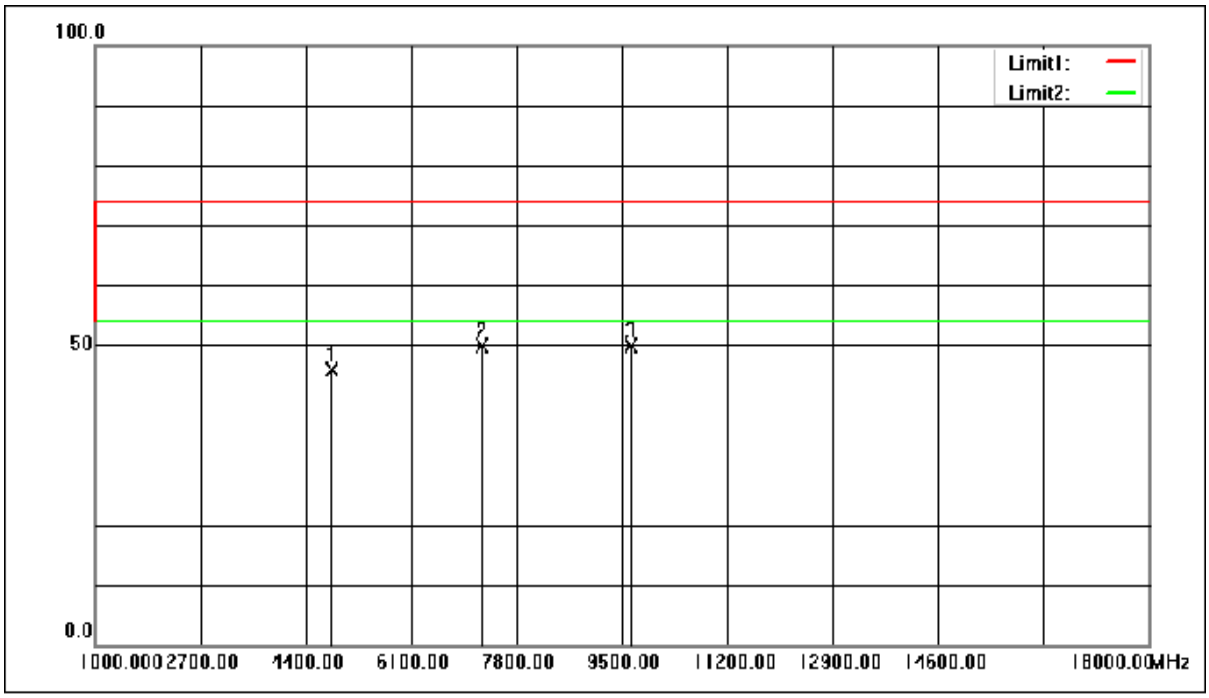
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4924.000	57.15	-9.82	47.33	74.00	-26.67	peak
2	7386.000	57.56	-6.80	50.76	74.00	-23.24	peak
3	9848.000	53.02	-3.84	49.18	74.00	-24.82	peak

Mode:a; Polarization:Horizontal; Modulation:g; bandwidth:20MHz; Channel:Low



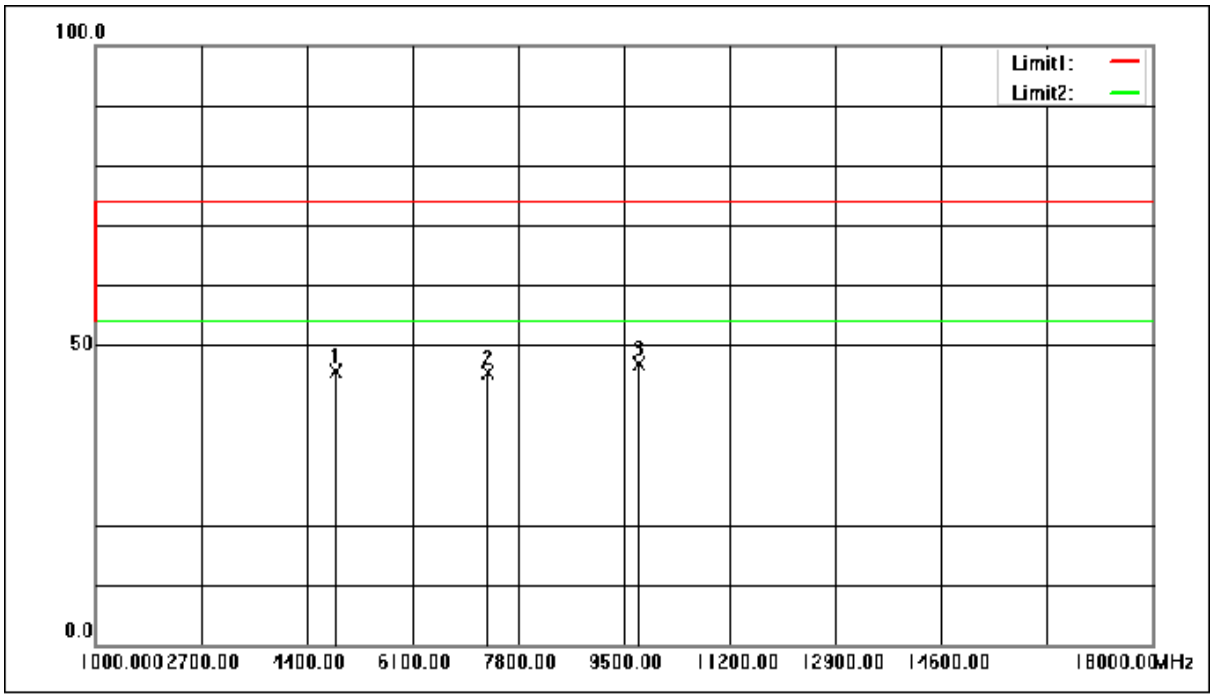
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4824.000	60.62	-10.21	50.41	74.00	-23.59	peak
2	7236.000	57.75	-7.05	50.70	74.00	-23.30	peak
3	9648.000	53.86	-4.77	49.09	74.00	-24.91	peak

Mode:a; Polarization:Vertical; Modulation:g; bandwidth:20MHz; Channel:Low



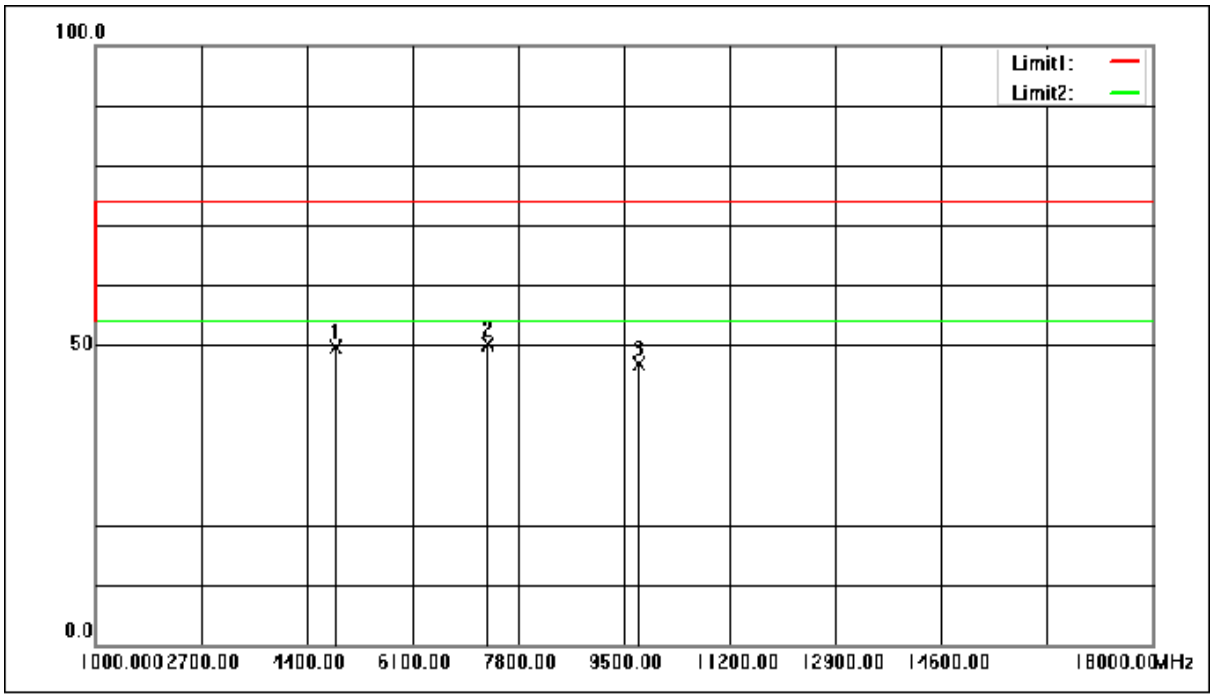
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4824.000	56.17	-10.21	45.96	74.00	-28.04	peak
2	7236.000	56.81	-7.05	49.76	74.00	-24.24	peak
3	9648.000	54.68	-4.77	49.91	74.00	-24.09	peak

Mode:a; Polarization:Horizontal; Modulation:g; bandwidth:20MHz; Channel:middle



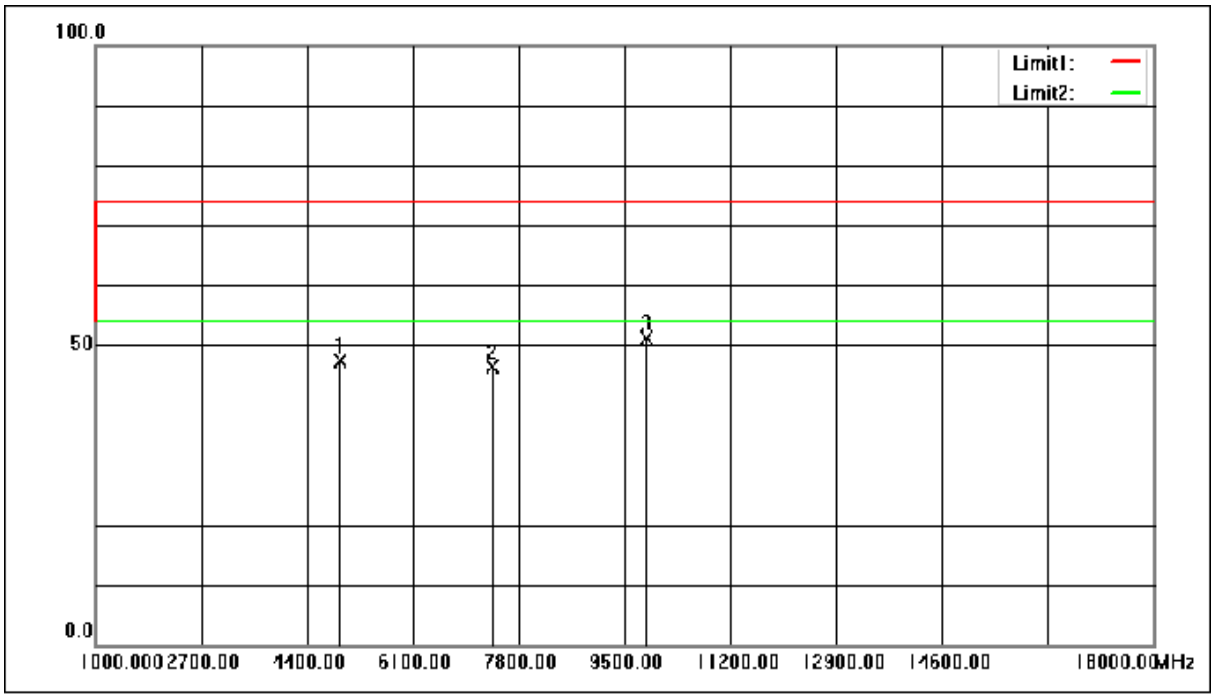
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4874.000	55.58	-10.01	45.57	74.00	-28.43	peak
2	7311.000	52.27	-6.93	45.34	74.00	-28.66	peak
3	9748.000	51.09	-4.30	46.79	74.00	-27.21	peak

Mode:a; Polarization:Vertical; Modulation:g; bandwidth:20MHz; Channel:middle



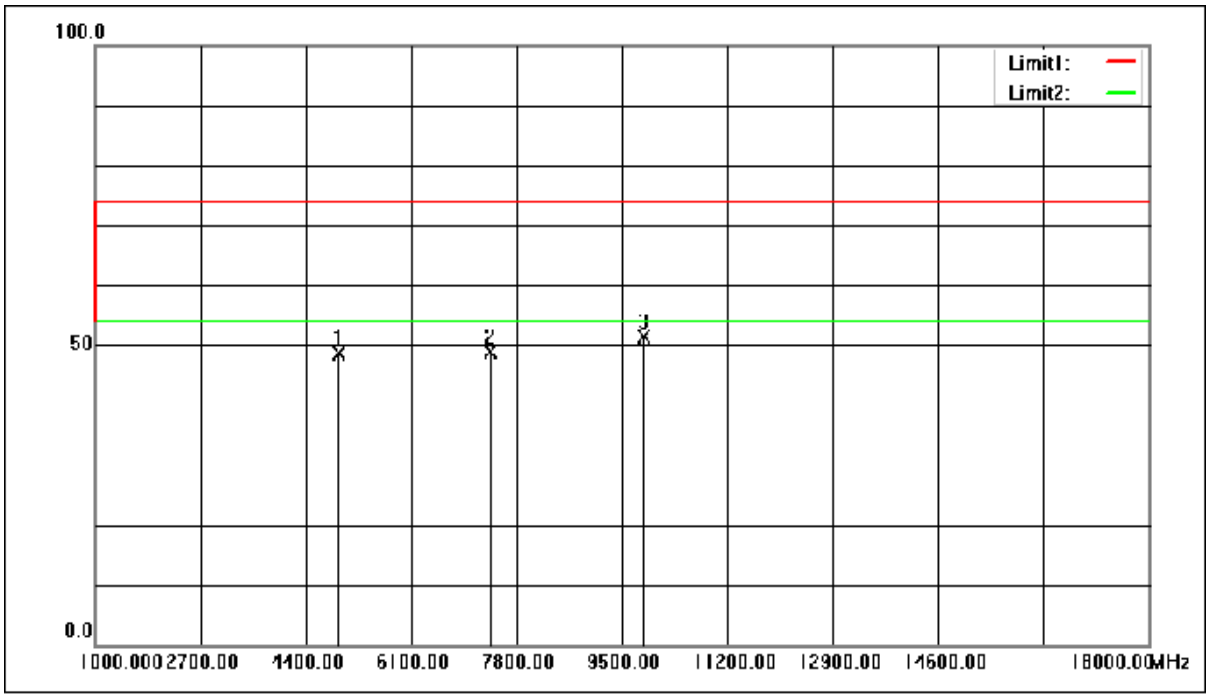
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4874.000	59.74	-10.01	49.73	74.00	-24.27	peak
2	7311.000	56.95	-6.93	50.02	74.00	-23.98	peak
3	9748.000	51.11	-4.30	46.81	74.00	-27.19	peak

Mode:a; Polarization:Horizontal; Modulation:g; bandwidth:20MHz; Channel:High



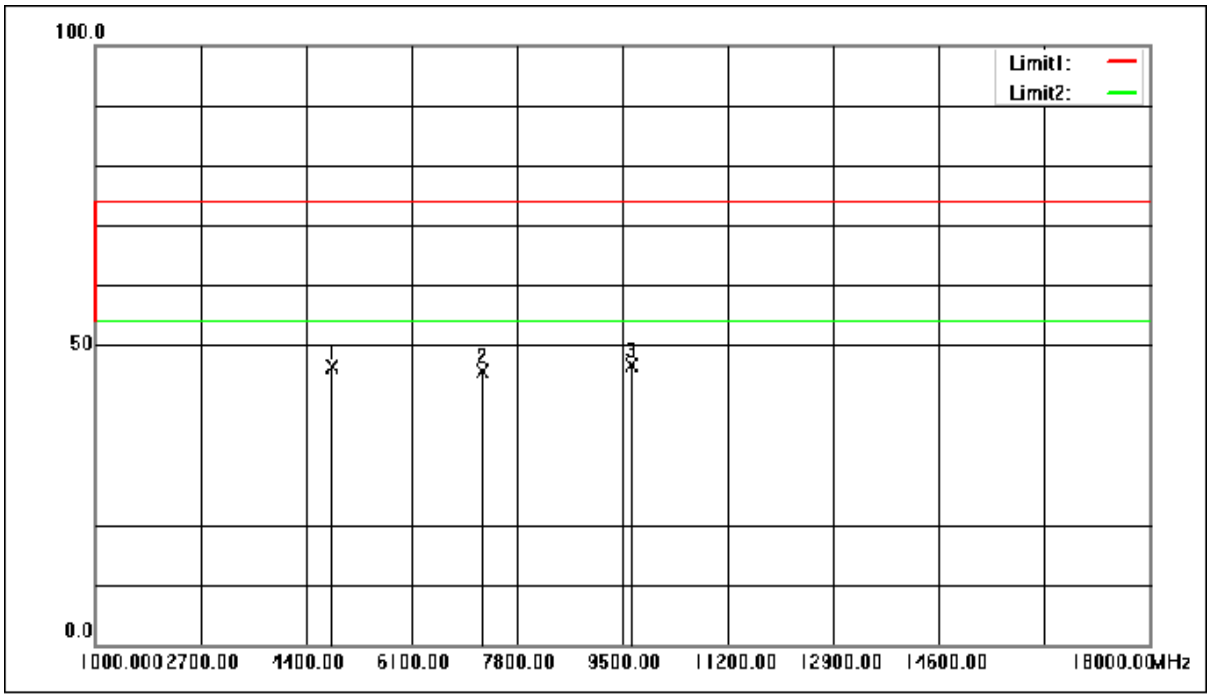
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4924.000	57.14	-9.82	47.32	74.00	-26.68	peak
2	7386.000	53.26	-6.80	46.46	74.00	-27.54	peak
3	9848.000	54.93	-3.84	51.09	74.00	-22.91	peak

Mode:a; Polarization:Vertical; Modulation:g; bandwidth:20MHz; Channel:High



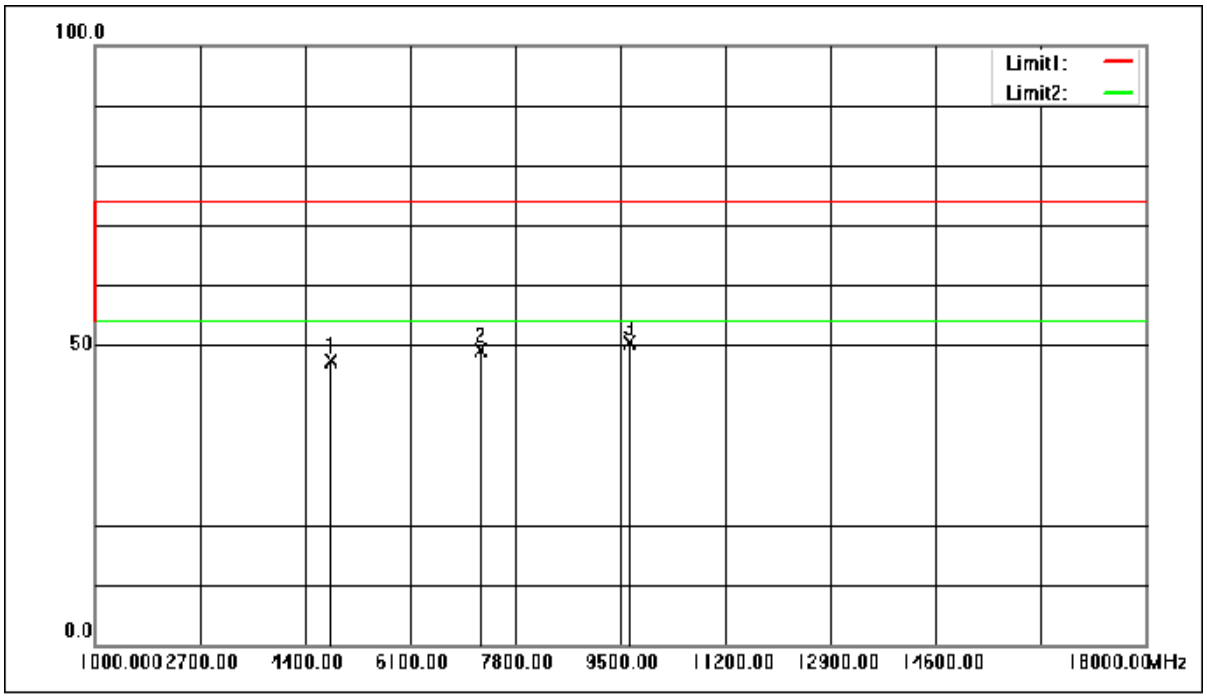
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4924.000	58.34	-9.82	48.52	74.00	-25.48	peak
2	7386.000	55.68	-6.80	48.88	74.00	-25.12	peak
3	9848.000	55.20	-3.84	51.36	74.00	-22.64	peak

Mode:a; Polarization:Horizontal; Modulation:n; bandwidth:20MHz; Channel:Low



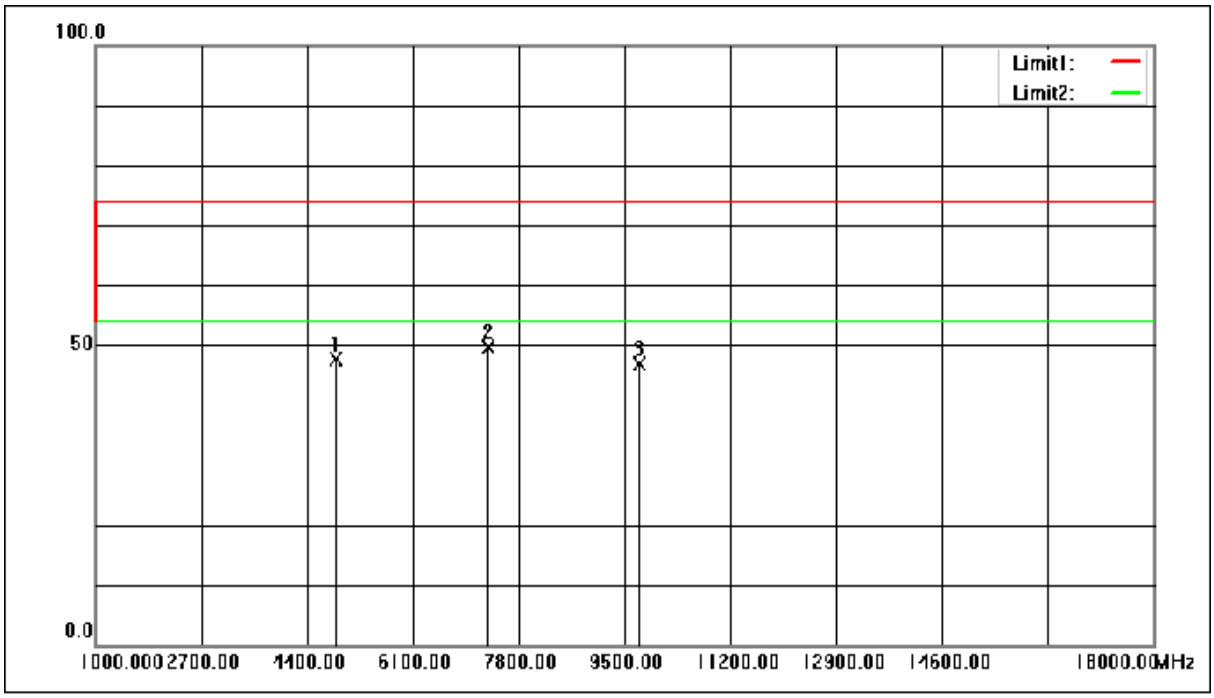
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4824.000	56.64	-10.21	46.43	74.00	-27.57	peak
2	7236.000	52.74	-7.05	45.69	74.00	-28.31	peak
3	9648.000	51.43	-4.77	46.66	74.00	-27.34	peak

Mode:a; Polarization:Vertical; Modulation:n; bandwidth:20MHz; Channel:Low



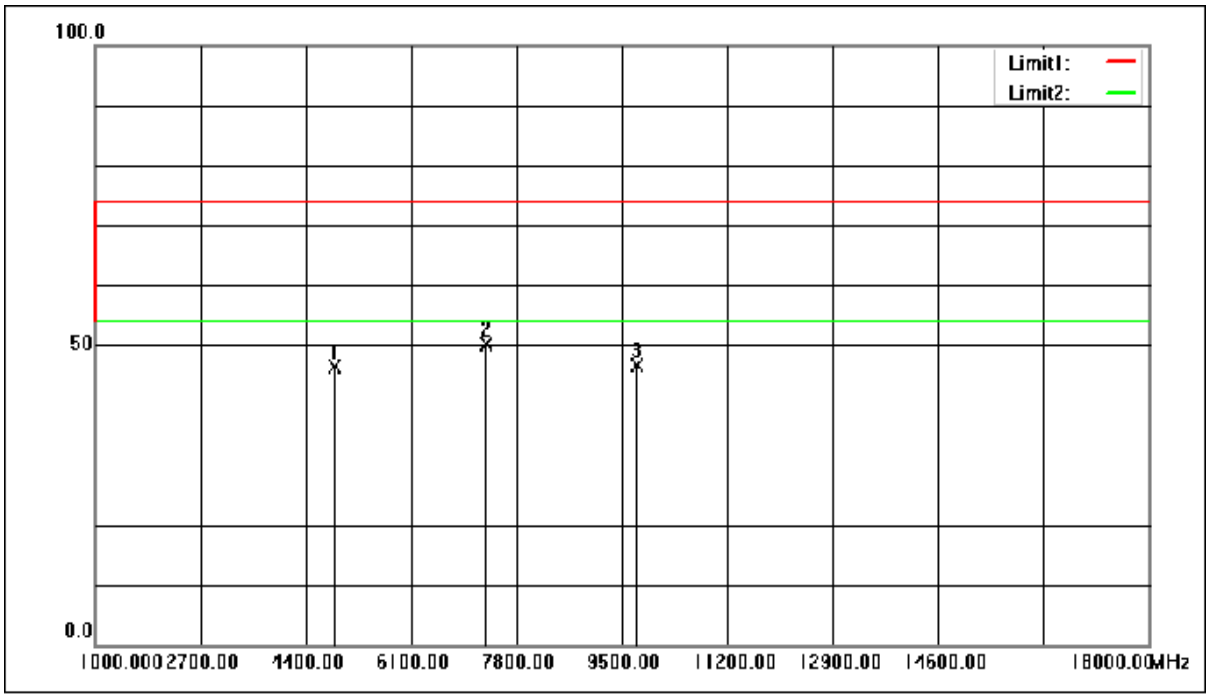
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4824.000	57.50	-10.21	47.29	74.00	-26.71	peak
2	7236.000	56.19	-7.05	49.14	74.00	-24.86	peak
3	9648.000	55.18	-4.77	50.41	74.00	-23.59	peak

Mode:a; Polarization:Horizontal; Modulation:n; bandwidth:20MHz; Channel:middle



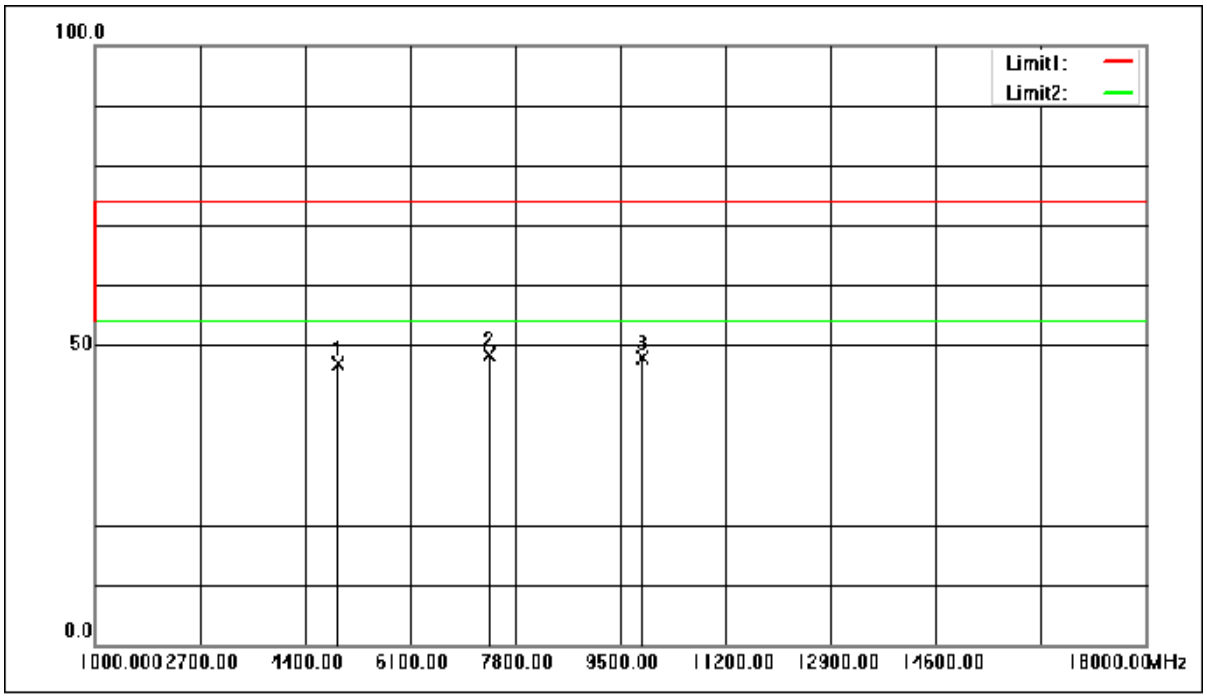
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4874.000	57.73	-10.01	47.72	74.00	-26.28	peak
2	7311.000	56.66	-6.93	49.73	74.00	-24.27	peak
3	9748.000	51.19	-4.30	46.89	74.00	-27.11	peak

Mode:a; Polarization:Vertical; Modulation:n; bandwidth:20MHz; Channel:middle



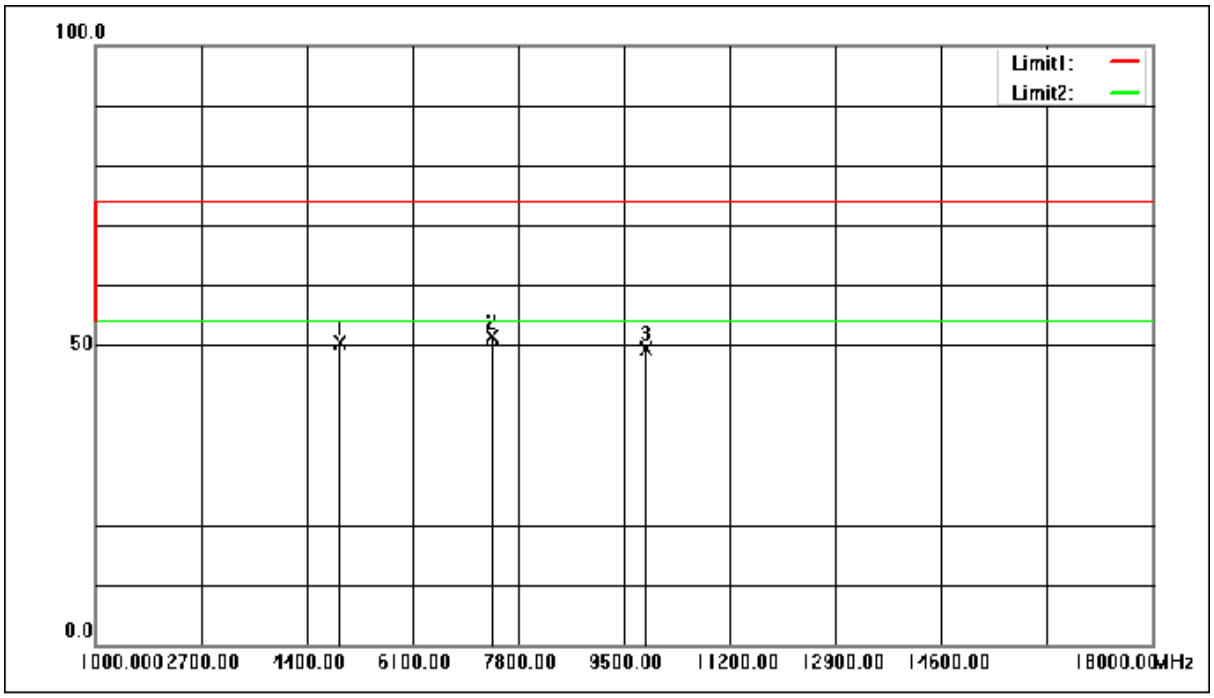
No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4874.000	56.27	-10.01	46.26	74.00	-27.74	peak
2	7311.000	57.02	-6.93	50.09	74.00	-23.91	peak
3	9748.000	50.92	-4.30	46.62	74.00	-27.38	peak

Mode:a; Polarization:Horizontal; Modulation:n; bandwidth:20MHz; Channel:High



No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4924.000	56.63	-9.82	46.81	74.00	-27.19	peak
2	7386.000	55.21	-6.80	48.41	74.00	-25.59	peak
3	9848.000	51.75	-3.84	47.91	74.00	-26.09	peak

Mode:a; Polarization:Vertical; Modulation:n; bandwidth:20MHz; Channel:High



No.	Frequency (MHz)	Reading ()	Correction factor()	Result ()	Limit ()	Margin (dB)	Remark
1	4924.000	60.18	-9.82	50.36	74.00	-23.64	peak
2	7386.000	58.09	-6.80	51.29	74.00	-22.71	peak
3	9848.000	53.25	-3.84	49.41	74.00	-24.59	peak

8 Photographs

Refer to the < Test Setup photos-FCC>.

9 EUT Constructional Details

Refer to the < External Photos > & < Internal Photos >.

- End of the Report -