

TEST REPORT

Application No.: SHEM2108009697CR
FCC ID: 2APV2-CSL2S
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: Smart Fingerprint Lock
Model No.: CS-L2-11FCP, CS-L2-C, CS-L2-P, CS-L2-CP, CS-L2S-11FCP
 Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade mark: EZVIZ
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2021-08-20
Date of Test: 2021-09-26 to 2021-09-27
Date of Issue: 2021-09-28

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan

Parlam Zhan
Laboratory 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.



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Revision Record			
Version	Description	Date	Remark
00	Original	2021-09-28	/

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



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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
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 Average Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.2	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

Declaration of EUT Family Grouping:

There are series models mentioned in this report and they are the similar in electrical and electronic characters. Only the model CS-L2-11FCP was tested since their differences are model number, trade name and appearance.



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4 General Information

4.1 Details of E.U.T.

Power supply:	DC 6V by Alkaline batteries*4
Test voltage:	DC 6V
Antenna Gain:	3.61dBi(Provided by the manufacturer)
Antenna Type:	PIFA antenna
Channel Spacing:	5MHz
Modulation Type:	O-QPSK
Number of Channels:	16
Operation Frequency:	2405MHz to 2480MHz

4.2 Power level setting using in test

Channel	Zigbee
	Ant 1
11	10
18	10
25	10
26	3

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	Lenovo	E400	N/A



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4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4×10^{-8}
2	Timeout	2s
3	Duty Cycle	0.37%
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	5.2dB (Below 1GHz)
		5.9dB (Above 1GHz)
9	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 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.



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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.

Company Number: 2324E

• 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-20134, R-11600, C-11707, T-11499, G-10216 respectively.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None



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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	02/01/2021	01/31/2022
2	LISN	R&S	ENV216	101604	10/19/2020	10/18/2021
3	LISN	Schwarzbeck	NNLK 8129	8129-143	10/19/2020	10/18/2021
4	Pulse Limiter	R&S	ESH3-Z2	100609	02/01/2021	01/31/2022
5	CE test Cable	Thermax	/	14	10/17/2020	10/16/2021
6	Test Software	Farad	EZ-EMC	CCS-03A1	N.C.R	N.C.R
RF Conducted Test						
1	Spectrum Analyzer	Agilent	E4446A	MY44020154	04/16/2021	04/15/2022
2	Spectrum Analyzer	Keysight	N9020A	MY55370209	12/02/2020	12/01/2021
3	Spectrum Analyzer	Keysight	N9010A	MY56480443	02/01/2021	01/31/2022
4	Signal Generator	Agilent	N5182A	MY50142015	08/27/2021	08/26/2022
5	Radio Communication Test Station	Anritsu	MT8000A	6262012849	N/A	N/A
6	Radio Communication Analyzer	Anritsu	MT8821C	6201692222	N/A	N/A
7	Universal Radio Communication Tester	R&S	CMW500	159275	10/19/2020	10/18/2021
8	Universal Radio Communication Tester	R&S	CMW500	167239	04/16/2021	04/15/2022
9	Power Meter	Anritsu	ML2495A	1445010	04/15/2021	04/14/2022
10	Switcher	CCSRF	FY562	KUS2001M001-3	10/19/2020	10/18/2021
11	AC Power Source	EXTECH	6605	1570106	N.C.R	N.C.R
12	DC Power Supply	Aglient	E3632A	MY50340053	N.C.R	N.C.R
13	6dB Attenuator	Mini-Circuits	NAT-6-2W	15542-1	N.C.R	N.C.R
14	Power Divider	AI SI	IOWOPE2068	PE2068	N.C.R	N.C.R
15	Filter	MICRO-TRONICS	BRM50701	5	N.C.R	N.C.R
16	Conducted test cable	/	RF01-RF04	/	04/15/2021	04/14/2022
17	Software	BST	TST-PASS	N/A	N/A	N/A
18	Temp. / Humidity Chamber	TERCHY	MHK-120AK	X30109	04/15/2021	04/14/2022
19	Thermometer	Anymetre	TH603	CCS007	10/16/2020	10/15/2021
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	101493	10/19/2020	10/18/2021
2	Signal Generator	Agilent	E8257C	MY43321570	10/19/2020	10/18/2021
3	Loop Antenna	Schwarzbeck	HXYZ9170	9170-108	02/22/2021	02/21/2022
4	Bilog Antenna	TESEQ	CBL 6112D	35403	06/21/2021	06/20/2023
5	Bilog Antenna	SCHWARZBECK	VULB9160	9160-3342	04/13/2021	04/12/2023
6	Horn-antenna(1-18GHz)	Schwarzbeck	BBHA9120D	267	10/26/2020	10/25/2022
7	Horn-antenna(1-18GHz)	ETS-LINDGREN	3117	00143290	02/22/2021	02/21/2023
8	Horn Antenna(18-40GHz)	Schwarzbeck	BBHA9170	BBHA9170171	02/22/2021	02/21/2022
9	Pre-Amplifier(30MHz~18GHz)	LNA	/	/	04/15/2021	04/14/2022
10	Amplifier(18~40GHz)	COM-POWER	PAM-840A	461332	10/23/2020	10/22/2021
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



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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	/	04/15/2021	04/14/2022
24	Software	Faratronic	EZ EMC-v 3A1	N/A	N/A	N/A



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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

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

6.1.2 Conclusion

Standard Requirement:

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 and no consideration of replacement. The best case gain of the antenna is 3.61dBi.

Antenna location: Refer to Appendix (Internal Photos)



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7 Radio Spectrum Matter Test Results

7.1 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

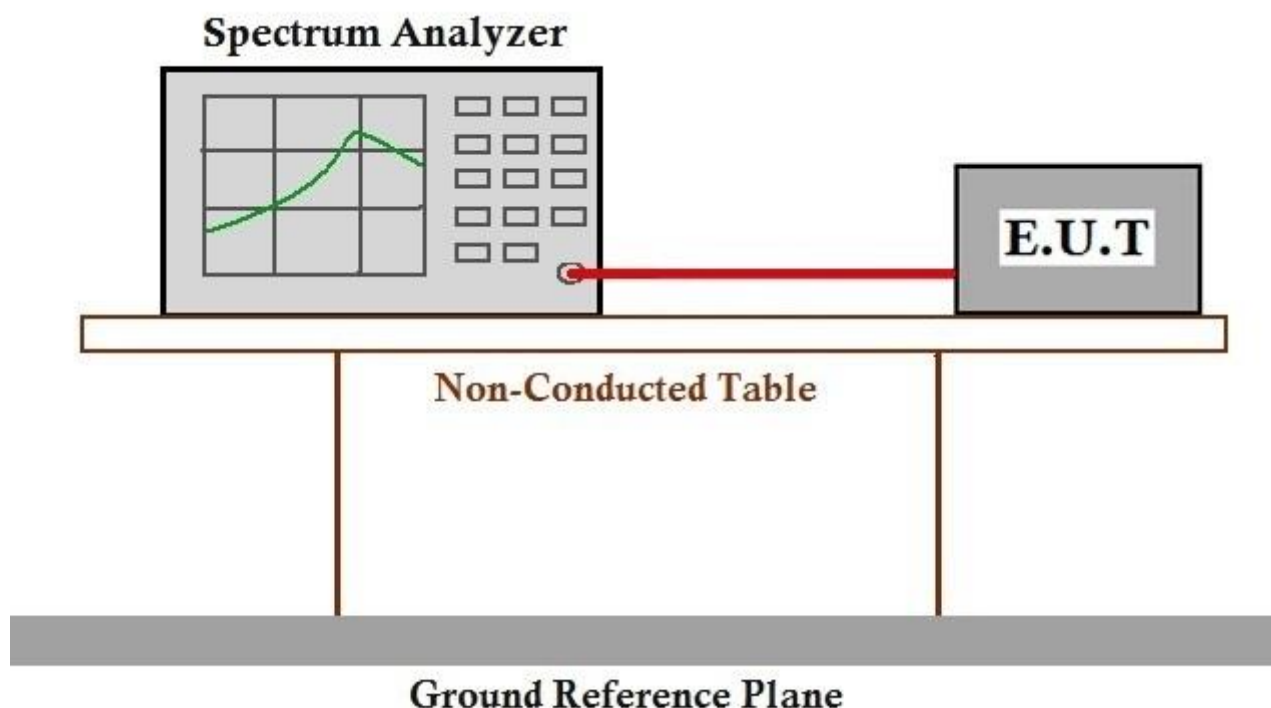
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 48 % RH Atmospheric Pressure: 1008 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210800969701

7.2 Conducted Average Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.2

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ 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



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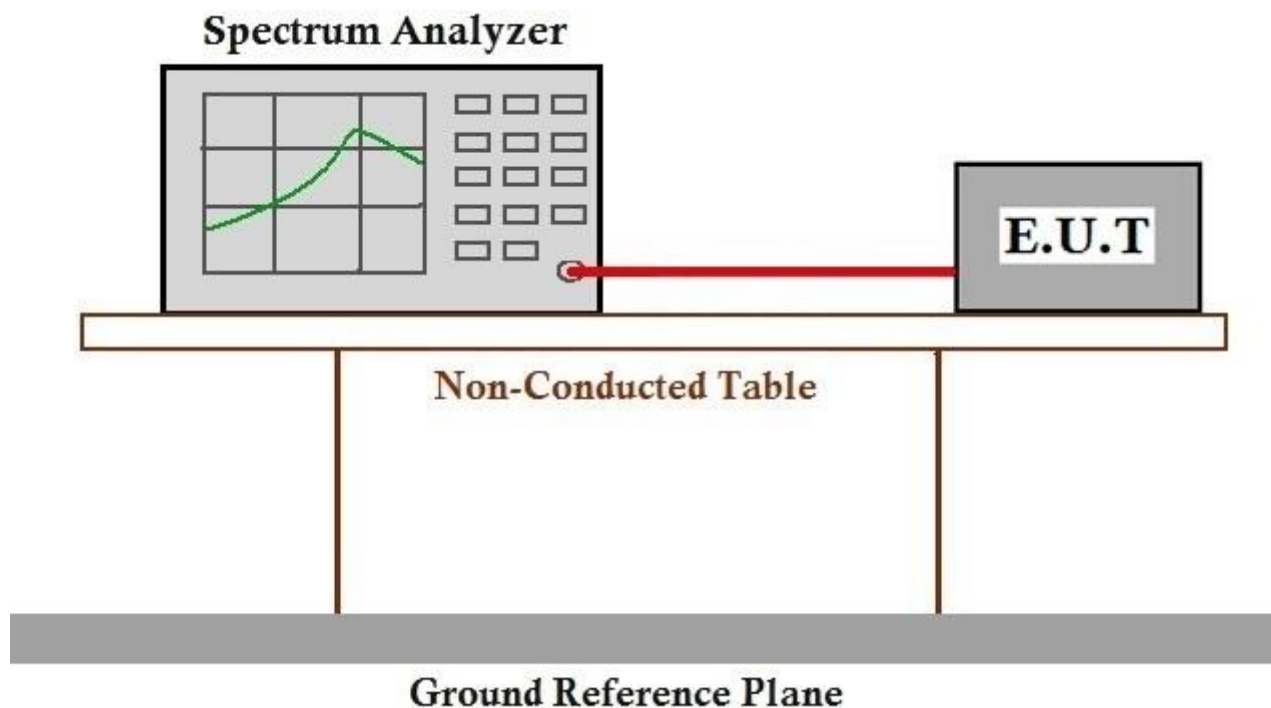
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 48 % RH Atmospheric Pressure: 1008 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210800969701



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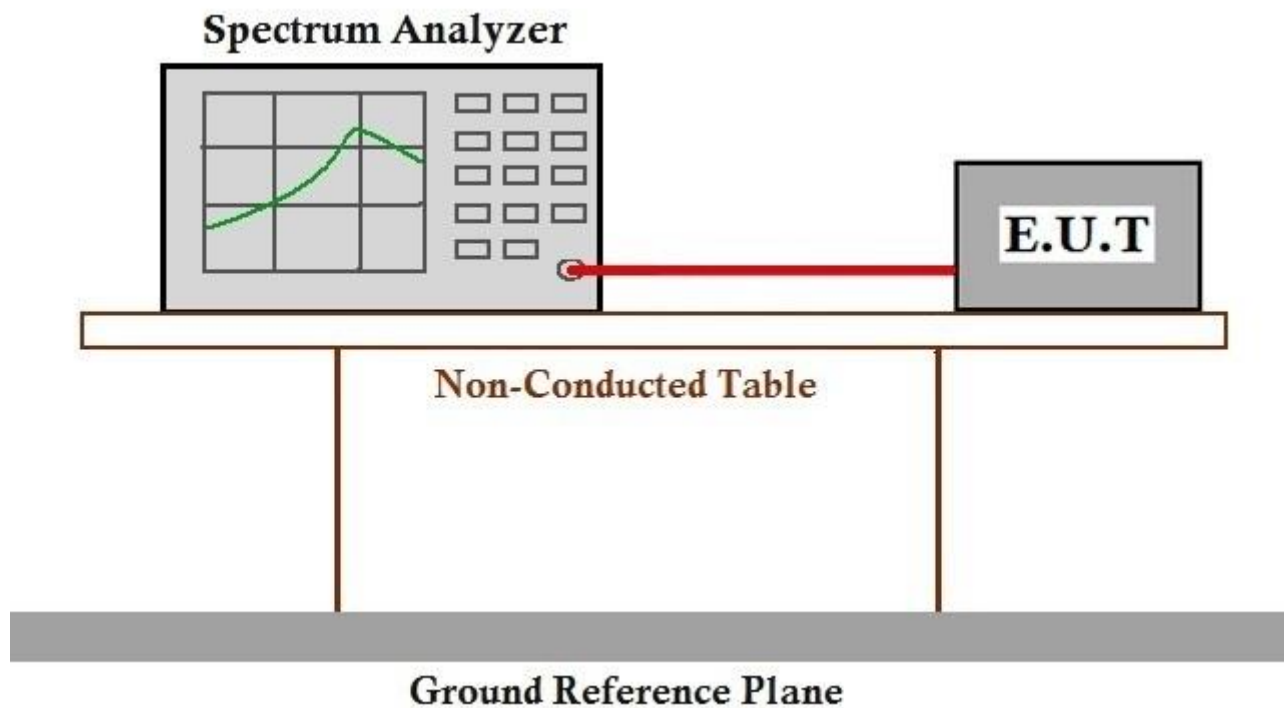
7.3 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)
 Test Method: ANSI C63.10 (2013) Section 11.10.2
 Limit: $\leq 8\text{dBm}$ in any 3 kHz band during any time interval of continuous transmission

7.3.1 E.U.T. Operation

Operating Environment:
 Temperature: 25 °C Humidity: 48 % RH Atmospheric Pressure: 1008 mbar
 Test mode a: TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210800969701



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7.4 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))



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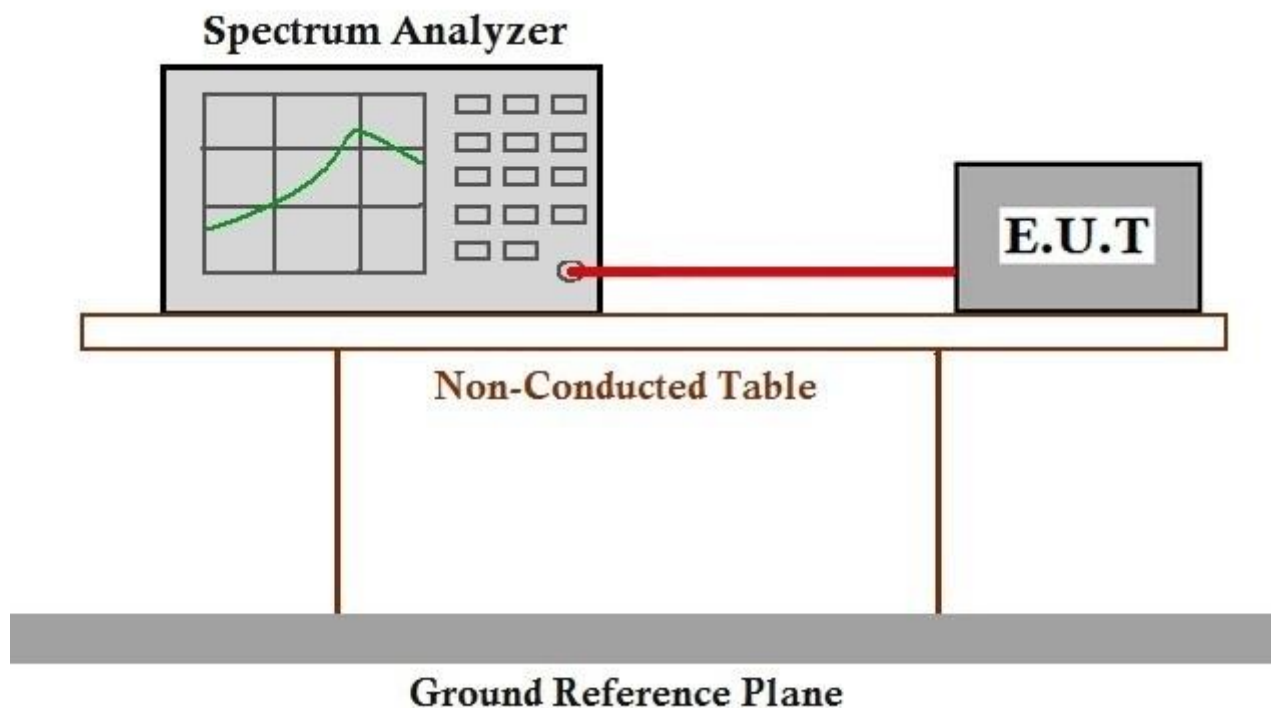
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 48 % RH Atmospheric Pressure: 1008 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210800969701



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7.5 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))



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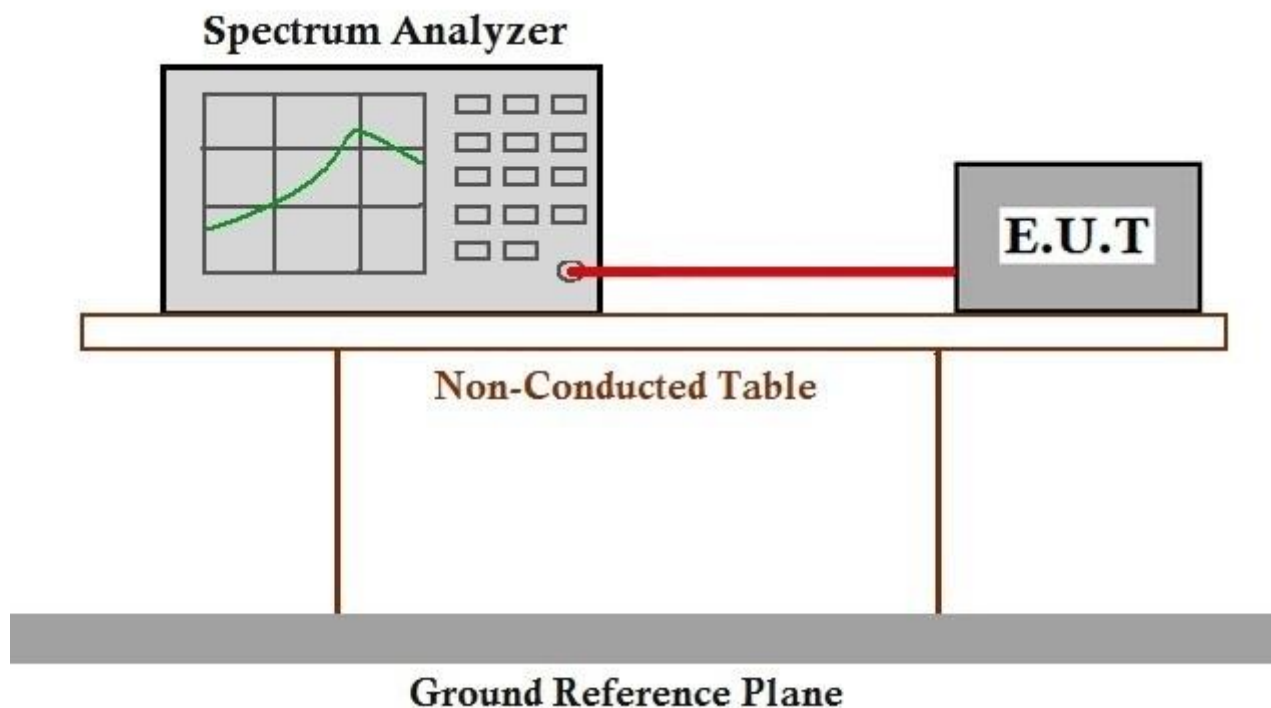
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 48 % RH Atmospheric Pressure: 1008 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix A for SHEM210800969701



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7.6 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.



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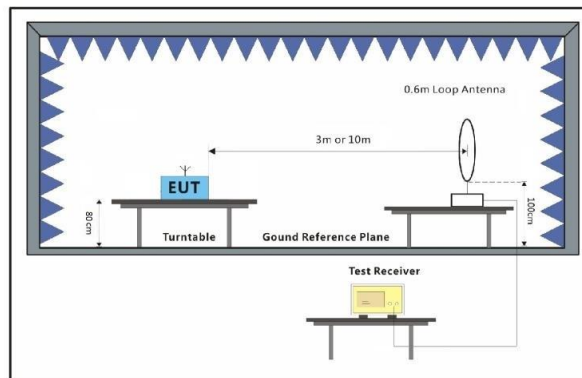
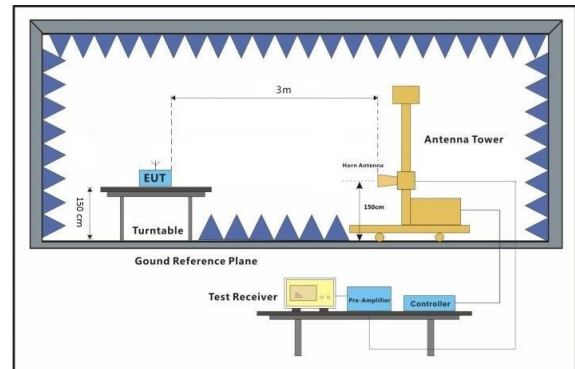
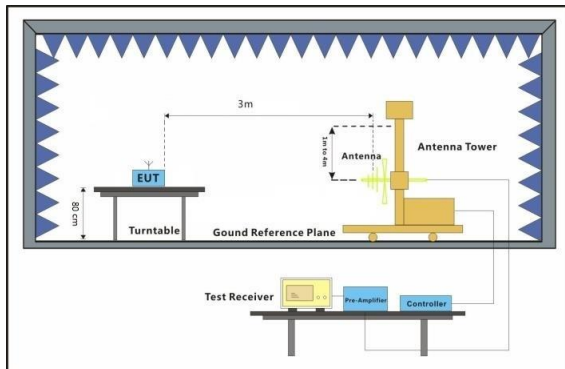
7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 48 % RH Atmospheric Pressure: 1008 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.6.2 Test Setup Diagram



7.6.3 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.



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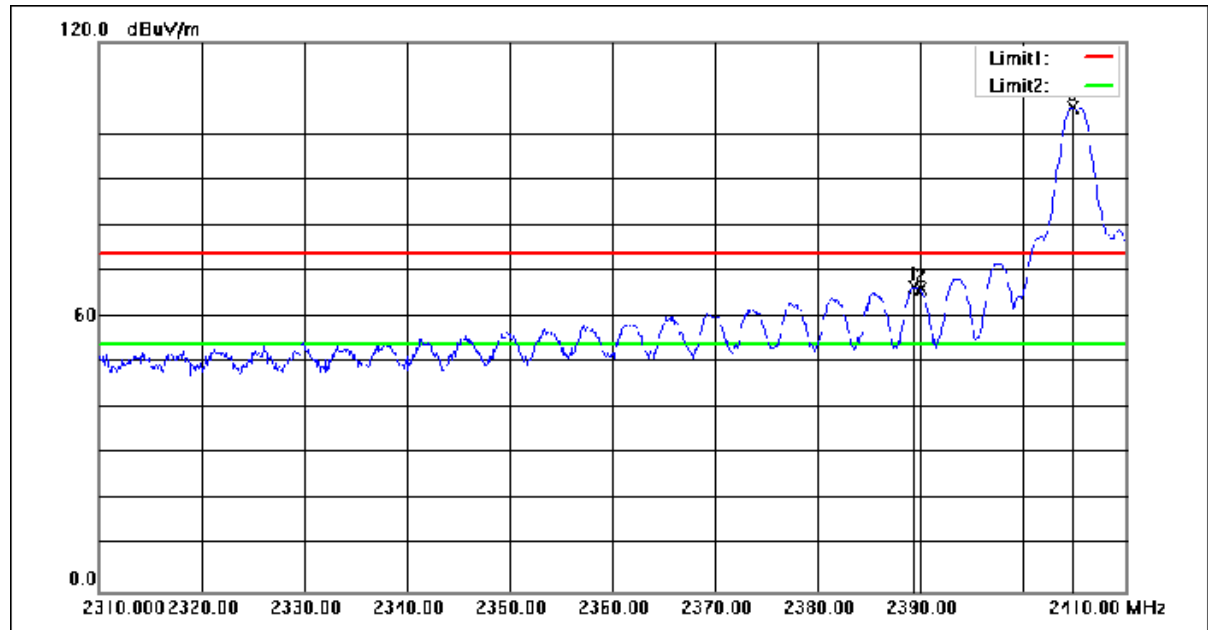
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Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2405MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.400	80.54	-14.01	66.53	74.00	-7.47	peak
2	2390.000	80.02	-14.01	66.01	74.00	-7.99	peak
3	2404.800	119.79	-13.97	105.82	74.00	31.82	peak



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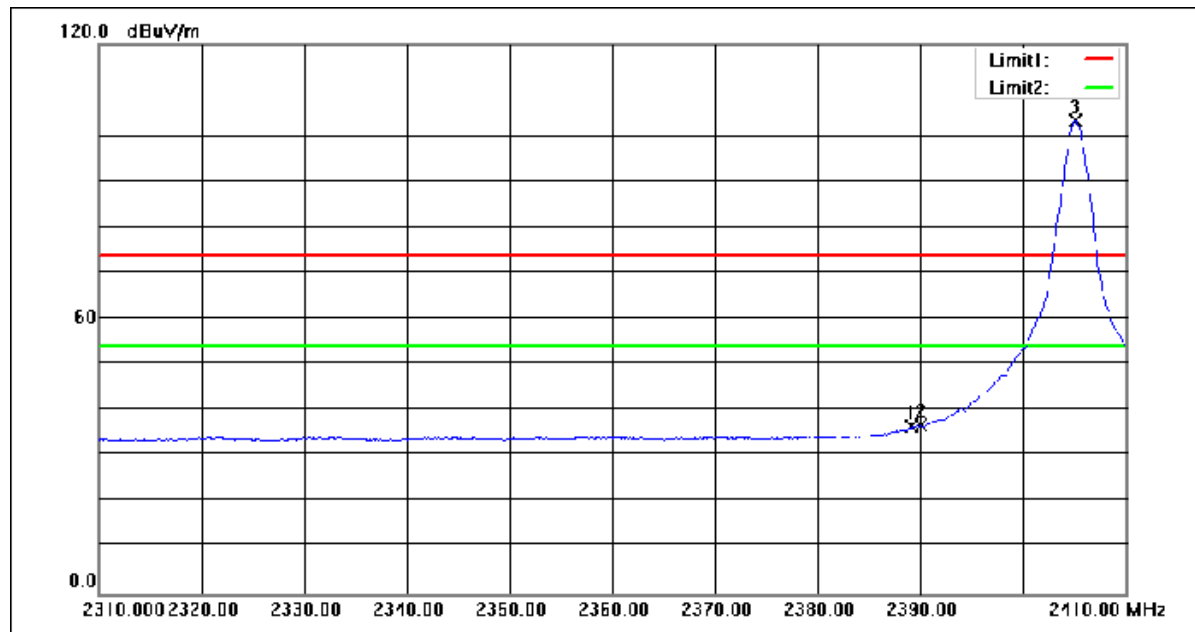
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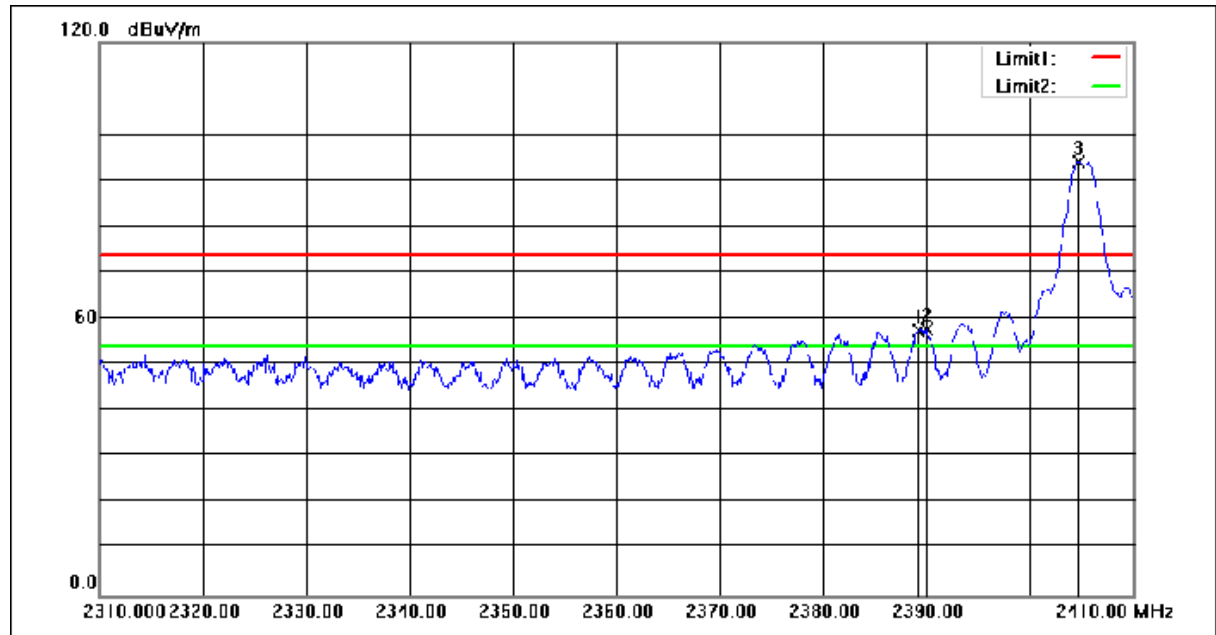
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Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2405MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.100	50.39	-14.01	36.38	54.00	-17.62	AVG
2	2390.000	50.71	-14.01	36.70	54.00	-17.30	AVG
3	2405.100	117.25	-13.97	103.28	54.00	49.28	AVG

Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2405MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.300	71.59	-14.01	57.58	74.00	-16.42	peak
2	2390.000	71.69	-14.01	57.68	74.00	-16.32	peak
3	2404.700	108.03	-13.97	94.06	74.00	20.06	peak



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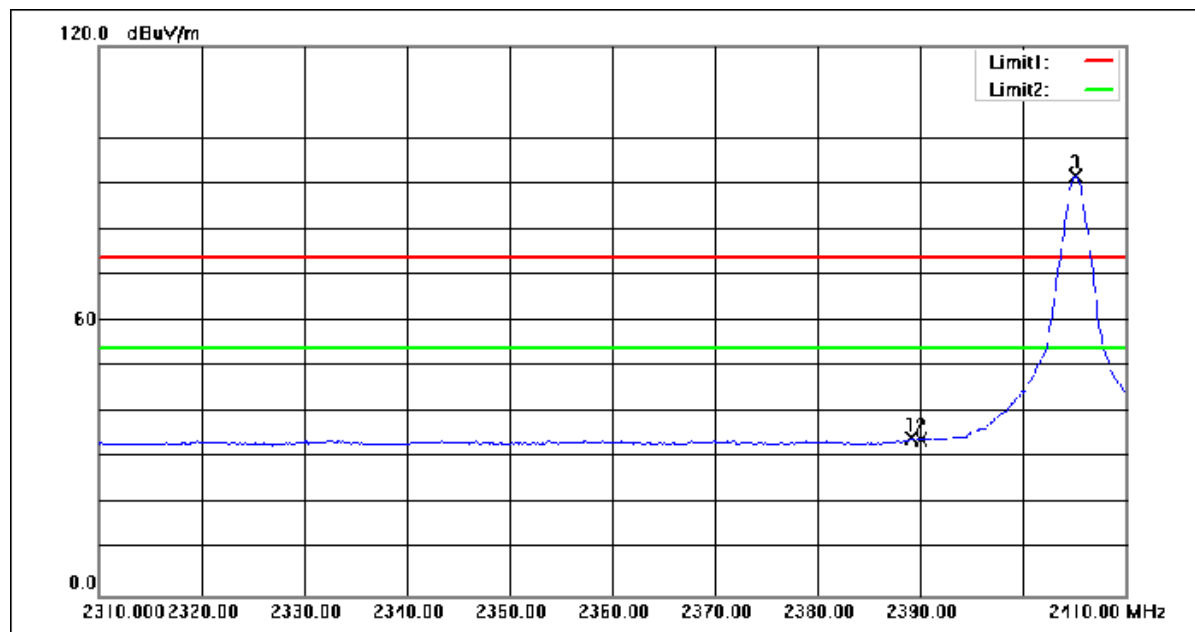
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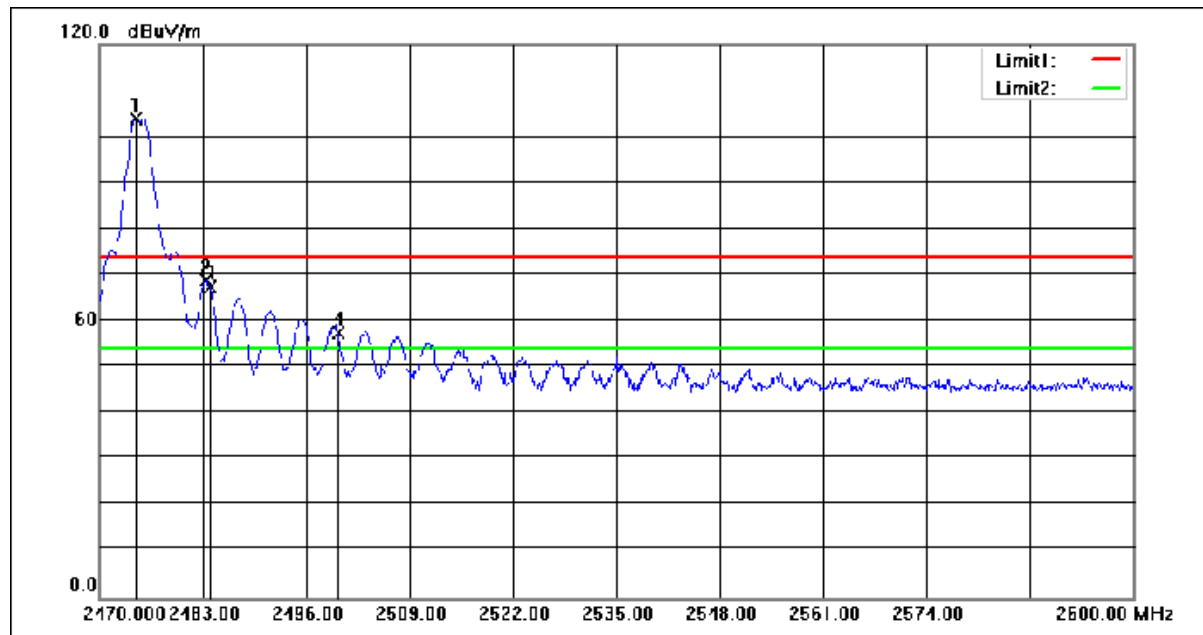
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Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2405MHz



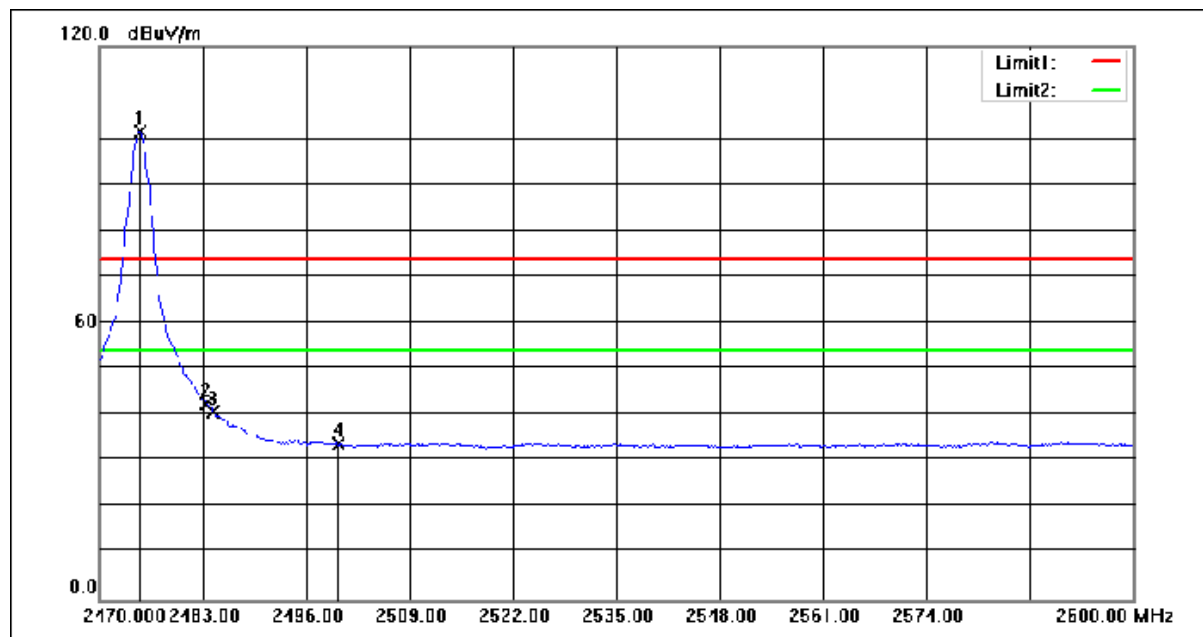
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.100	48.35	-14.01	34.34	54.00	-19.66	AVG
2	2390.000	48.05	-14.01	34.04	54.00	-19.96	AVG
3	2405.100	105.54	-13.97	91.57	54.00	37.57	AVG

Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2475MHz



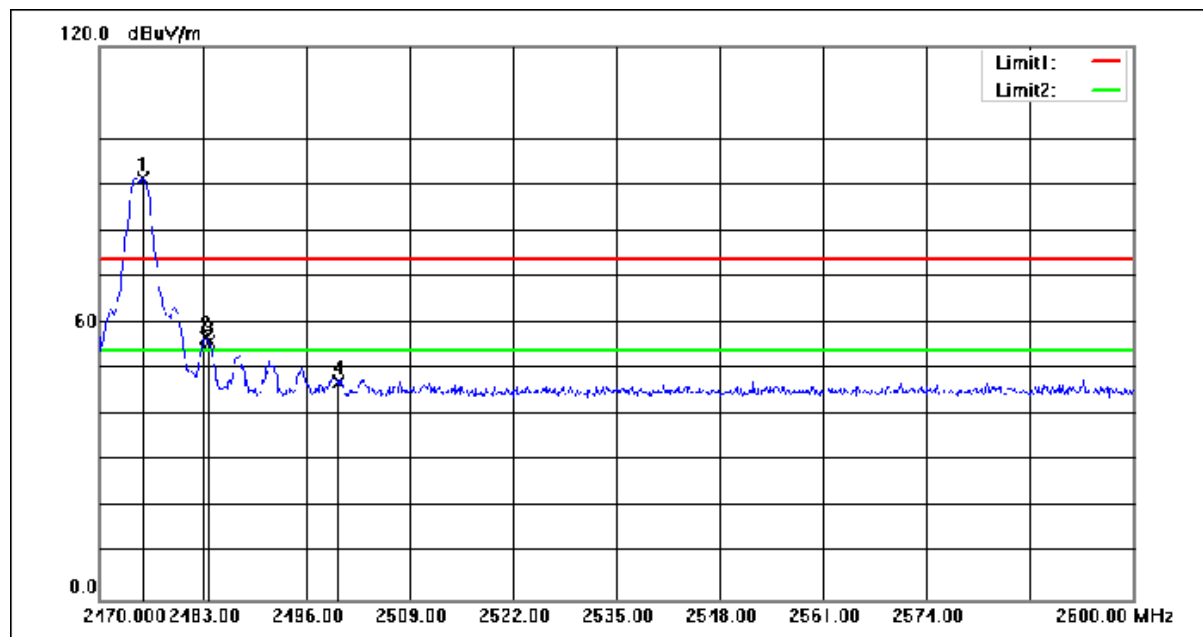
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2474.550	117.72	-13.74	103.98	74.00	29.98	peak
2	2483.500	82.52	-13.71	68.81	74.00	-5.19	peak
3	2483.910	80.94	-13.70	67.24	74.00	-6.76	peak
4	2500.000	71.05	-13.64	57.41	74.00	-16.59	peak

Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2475MHz



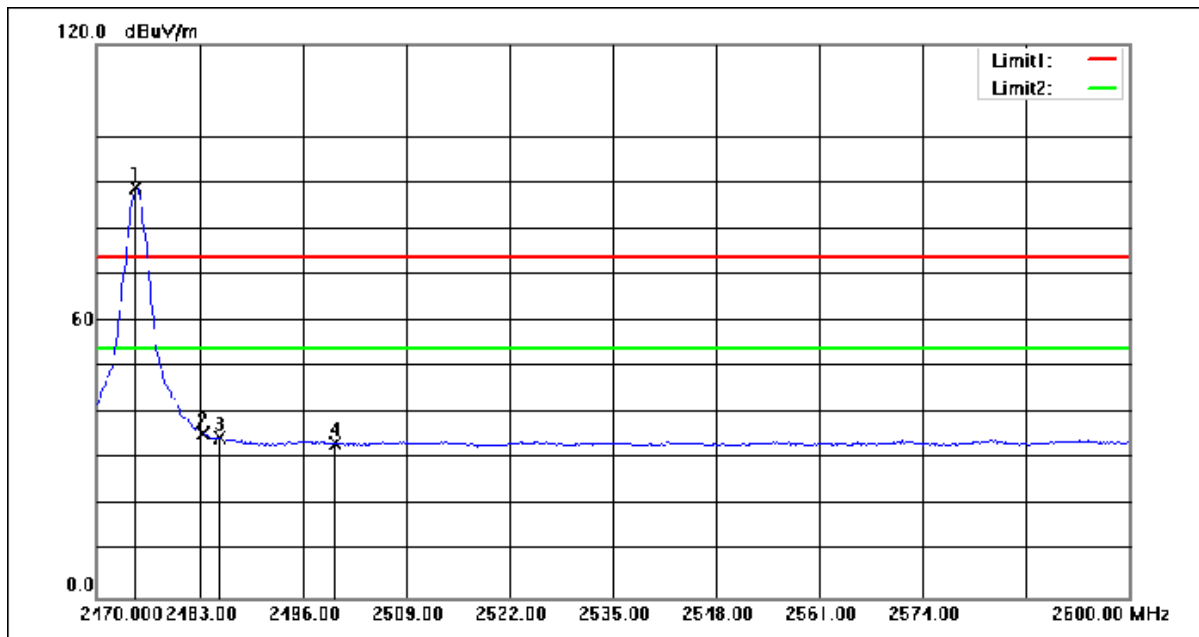
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2475.070	115.24	-13.74	101.50	54.00	47.50	AVG
2	2483.500	56.13	-13.71	42.42	54.00	-11.58	AVG
3	2484.300	54.50	-13.70	40.80	54.00	-13.20	AVG
4	2500.000	47.24	-13.64	33.60	54.00	-20.40	AVG

Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2475MHz



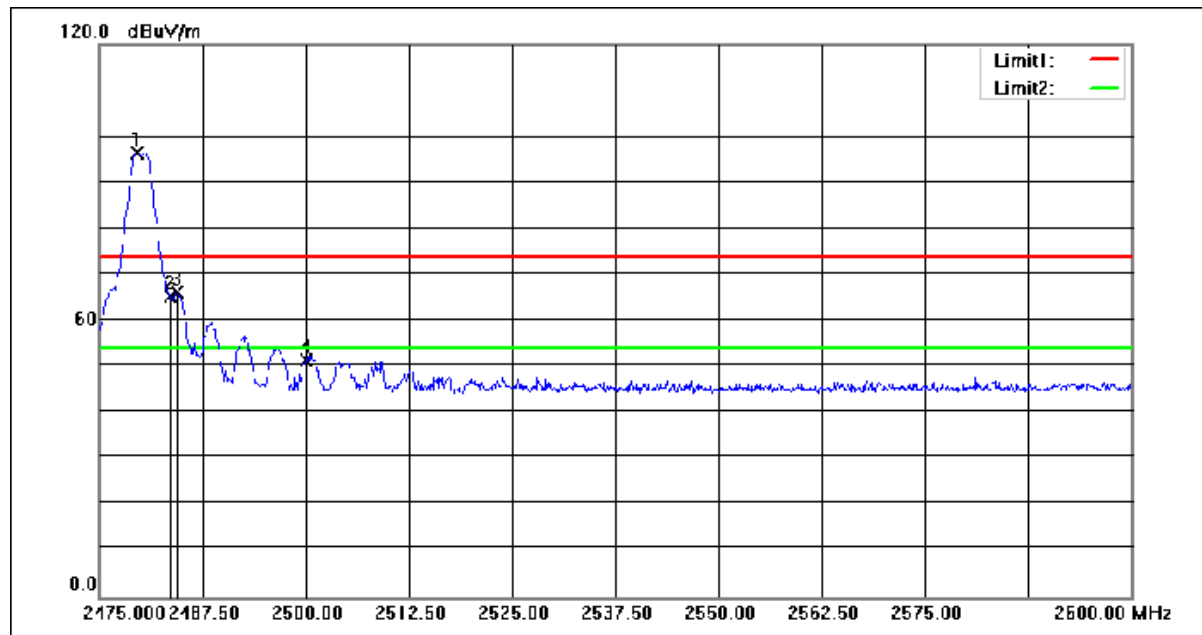
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2475.460	105.16	-13.74	91.42	74.00	17.42	peak
2	2483.500	70.44	-13.71	56.73	74.00	-17.27	peak
3	2483.780	69.71	-13.70	56.01	74.00	-17.99	peak
4	2500.000	60.87	-13.64	47.23	74.00	-26.77	peak

Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2475MHz



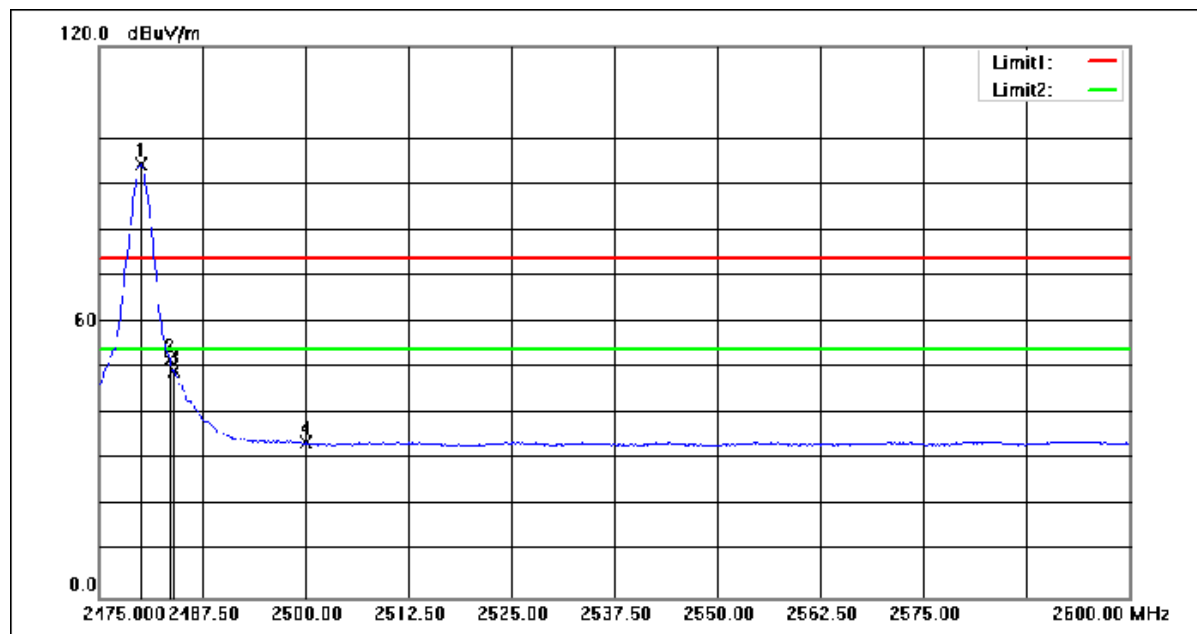
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2474.940	102.77	-13.74	89.03	54.00	35.03	AVG
2	2483.500	49.34	-13.71	35.63	54.00	-18.37	AVG
3	2485.470	48.35	-13.70	34.65	54.00	-19.35	AVG
4	2500.000	47.21	-13.64	33.57	54.00	-20.43	AVG

Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2480MHz



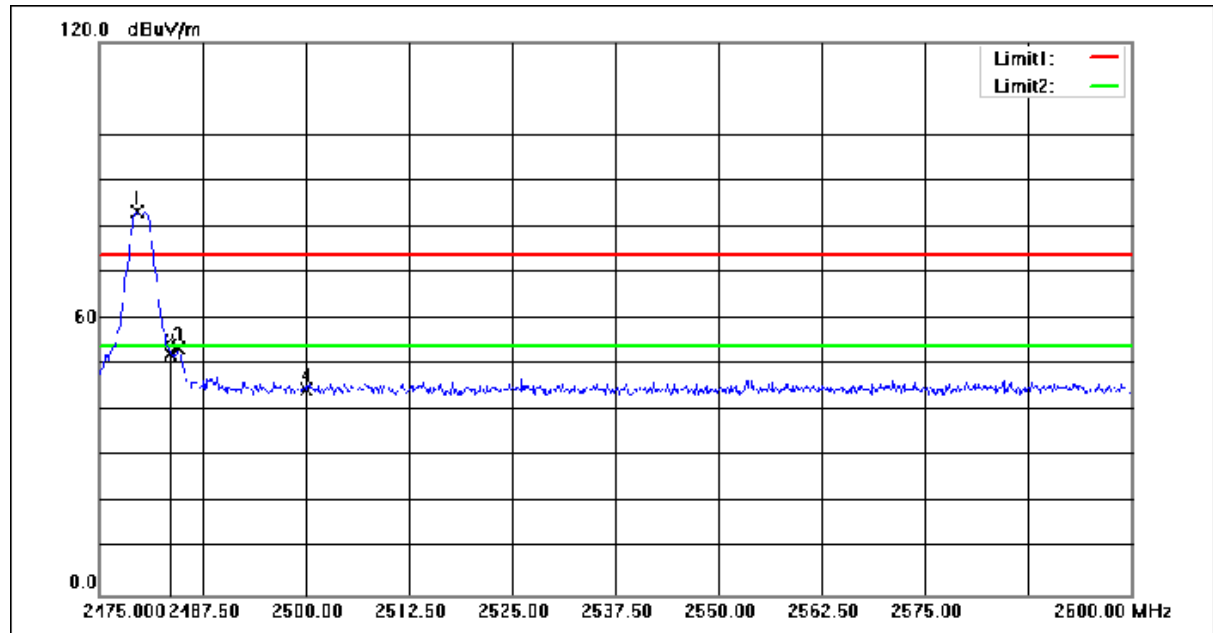
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.500	110.28	-13.72	96.56	74.00	22.56	peak
2	2483.500	78.84	-13.71	65.13	74.00	-8.87	peak
3	2484.375	79.76	-13.70	66.06	74.00	-7.94	peak
4	2500.000	65.24	-13.64	51.60	74.00	-22.40	peak

Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	107.94	-13.71	94.23	54.00	40.23	AVG
2	2483.500	65.49	-13.71	51.78	54.00	-2.22	AVG
3	2484.125	62.92	-13.70	49.22	54.00	-4.78	AVG
4	2500.000	47.28	-13.64	33.64	54.00	-20.36	AVG

Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.500	96.96	-13.72	83.24	74.00	9.24	peak
2	2483.500	66.07	-13.71	52.36	74.00	-21.64	peak
3	2484.500	67.27	-13.70	53.57	74.00	-20.43	peak
4	2500.000	58.26	-13.64	44.62	74.00	-29.38	peak



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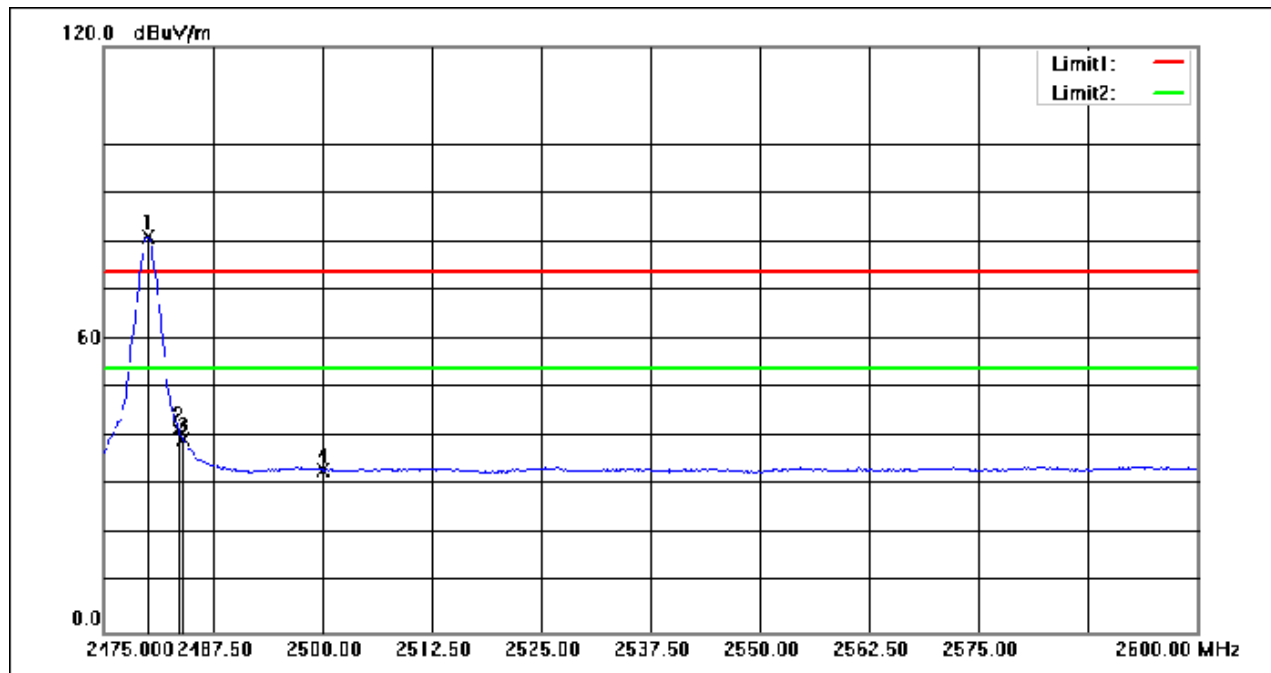
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Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.000	94.74	-13.71	81.03	54.00	27.03	AVG
2	2483.500	55.28	-13.71	41.57	54.00	-12.43	AVG
3	2484.125	53.13	-13.70	39.43	54.00	-14.57	AVG
4	2500.000	46.92	-13.64	33.28	54.00	-20.72	AVG



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7.7 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.



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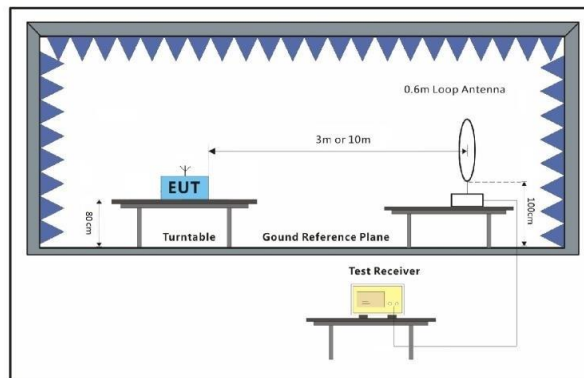
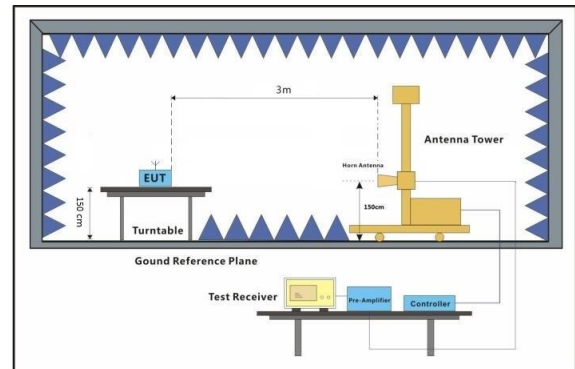
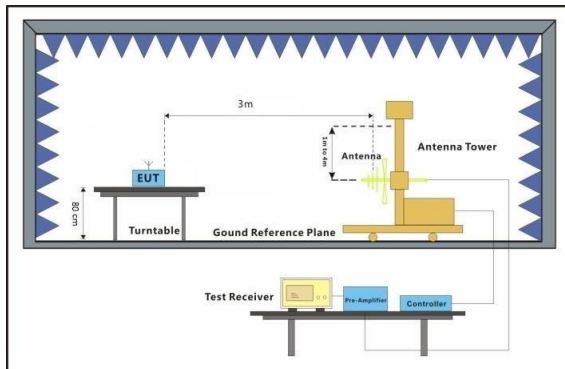
7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 48 % RH Atmospheric Pressure: 1008 mbar

Test mode a: TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

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) 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.



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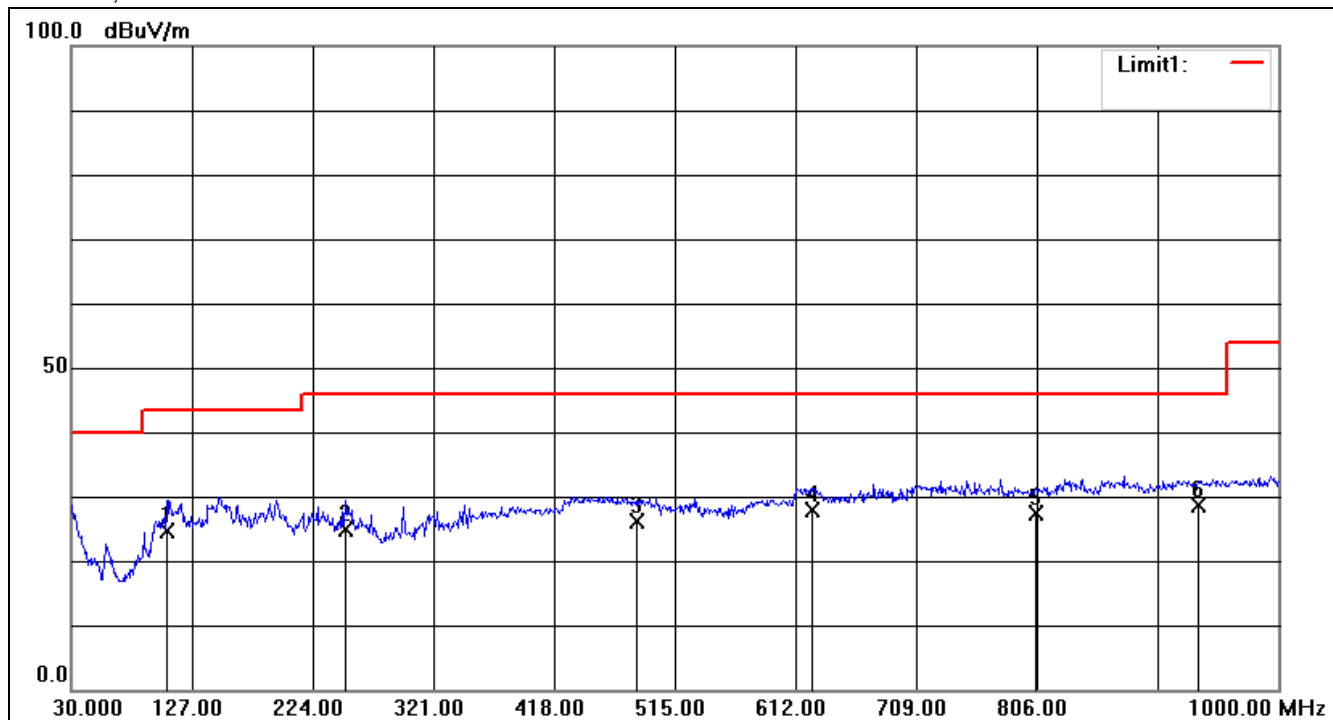
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Below 1GHz

Mode:a; Polarization:Horizontal.



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	106.6300	5.88	18.73	24.61	43.50	-18.89	100	202	QP
2	250.1900	5.65	19.32	24.97	46.00	-21.03	100	180	QP
3	483.9600	1.20	24.94	26.14	46.00	-19.86	100	57	QP
4	625.5800	1.07	26.82	27.89	46.00	-18.11	100	101	QP
5	805.0300	-0.37	27.86	27.49	46.00	-18.51	100	332	QP
6	935.9800	-0.45	29.12	28.67	46.00	-17.33	100	39	QP



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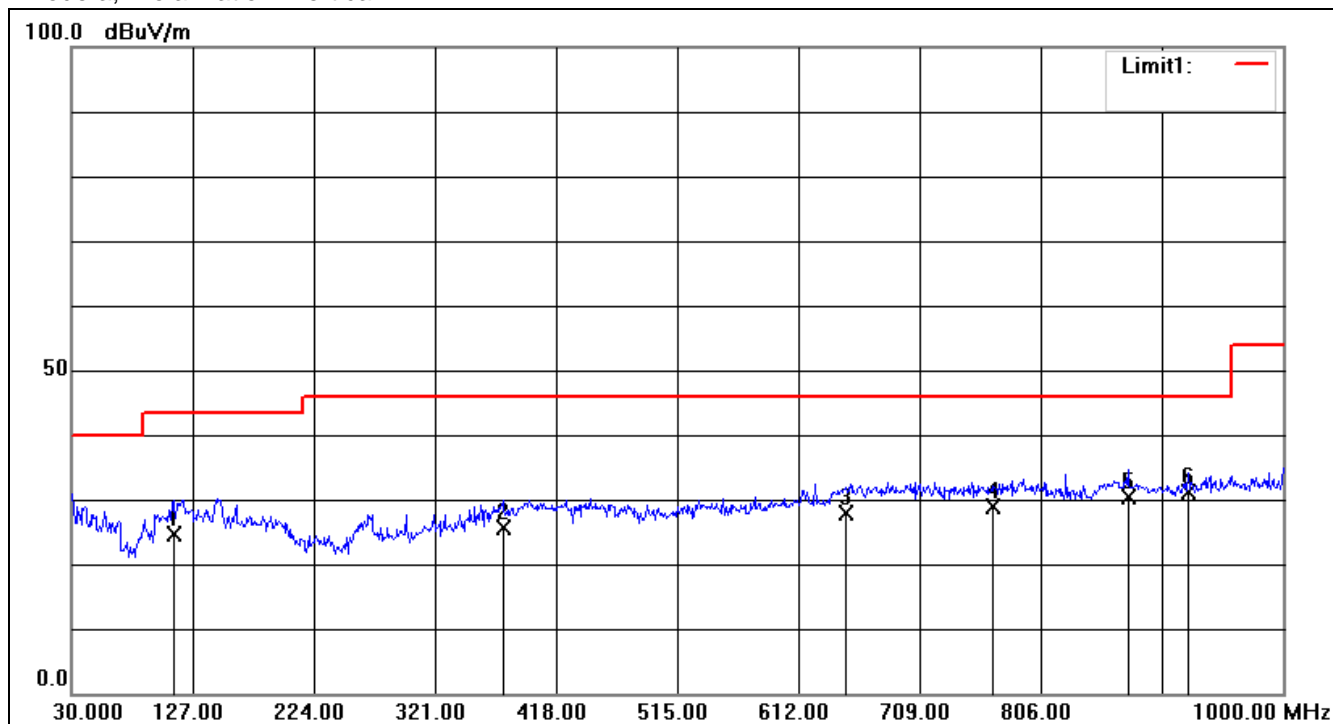
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Mode:a; Polarization: Vertical.



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	111.4800	5.71	18.88	24.59	43.50	-18.91	100	38	QP
2	375.3200	2.68	22.99	25.67	46.00	-20.33	100	201	QP
3	649.8300	0.77	27.11	27.88	46.00	-18.12	100	47	QP
4	767.2000	1.33	27.60	28.93	46.00	-17.07	100	188	QP
5	875.8400	2.09	28.38	30.47	46.00	-15.53	100	306	QP
6	924.3400	2.10	28.98	31.08	46.00	-14.92	100	74	QP



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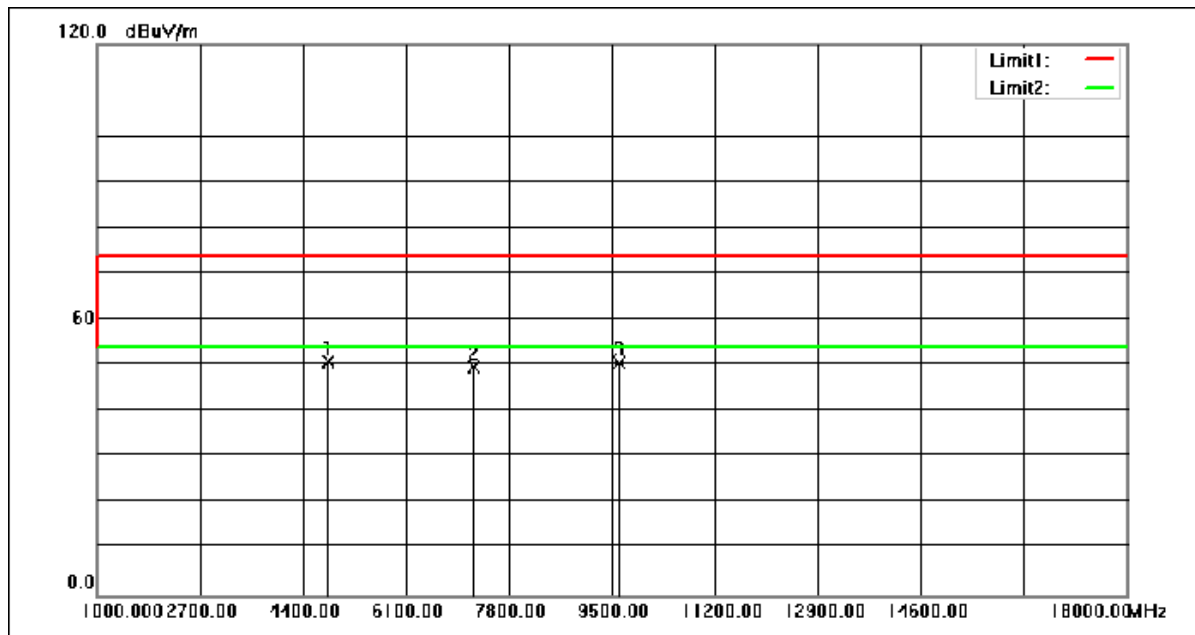
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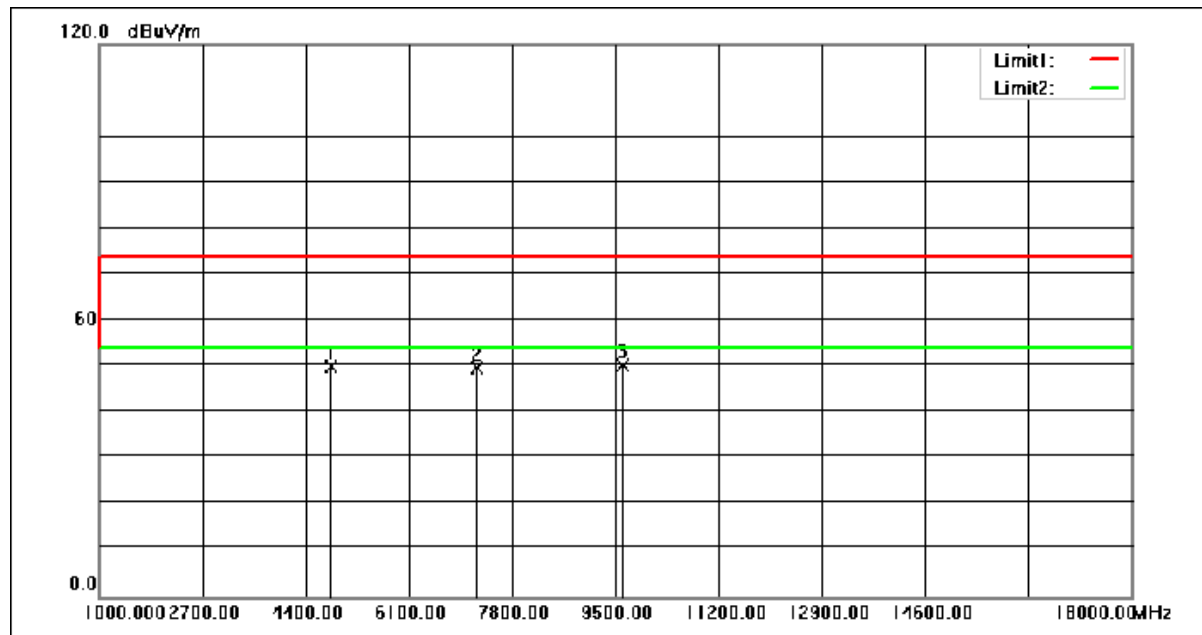
Above 1GHz

Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2405MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4810.000	59.65	-8.84	50.81	74.00	-23.19	peak
2	7215.000	55.64	-5.89	49.75	74.00	-24.25	peak
3	9620.000	51.93	-1.28	50.65	74.00	-23.35	peak

Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2405MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4810.000	58.68	-8.84	49.84	74.00	-24.16	peak
2	7215.000	55.44	-5.89	49.55	74.00	-24.45	peak
3	9620.000	51.65	-1.28	50.37	74.00	-23.63	peak



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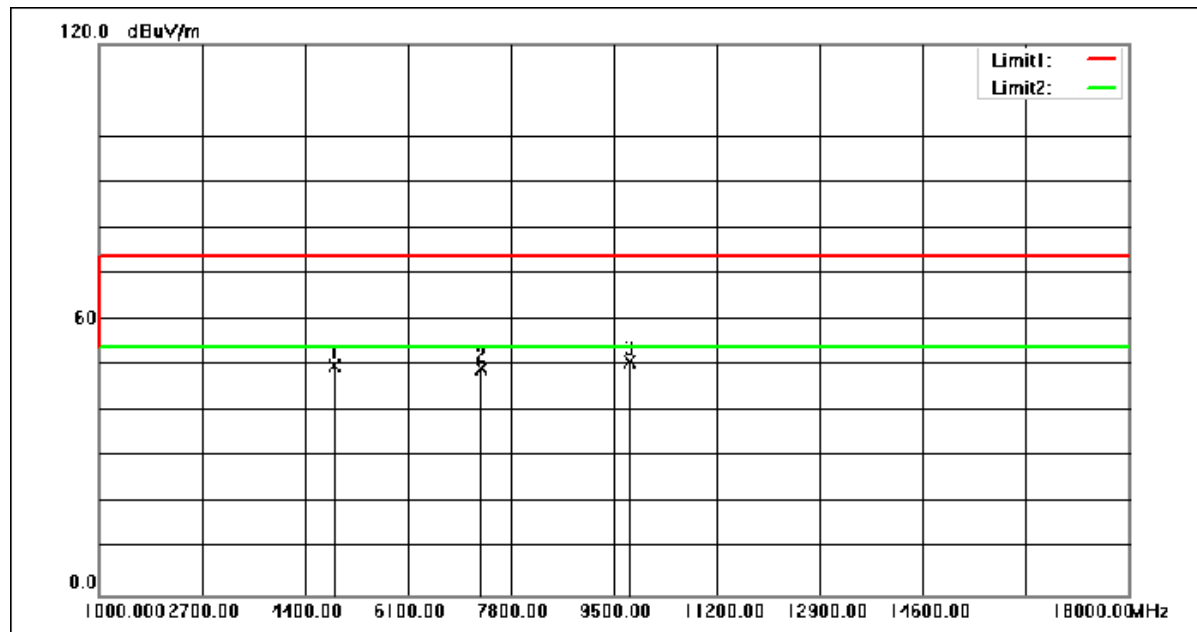
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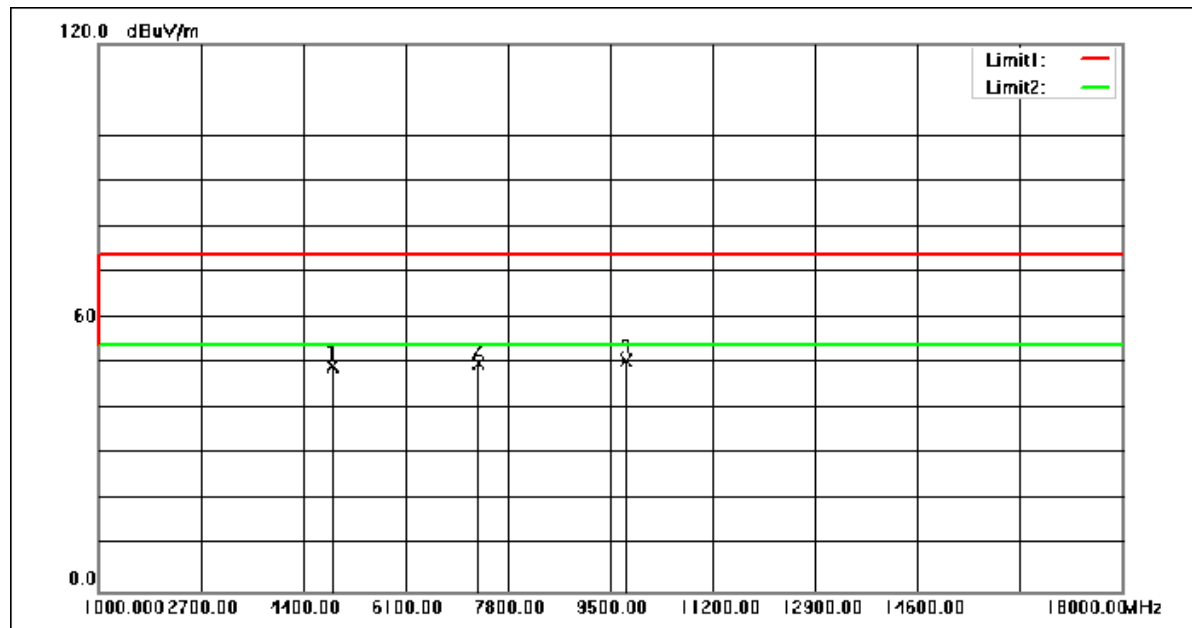
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Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2440MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.000	58.50	-8.60	49.90	74.00	-24.10	peak
2	7320.000	55.21	-5.77	49.44	74.00	-24.56	peak
3	9760.000	52.19	-1.45	50.74	74.00	-23.26	peak

Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2440MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4880.000	57.97	-8.60	49.37	74.00	-24.63	peak
2	7320.000	55.63	-5.77	49.86	74.00	-24.14	peak
3	9760.000	51.96	-1.45	50.51	74.00	-23.49	peak



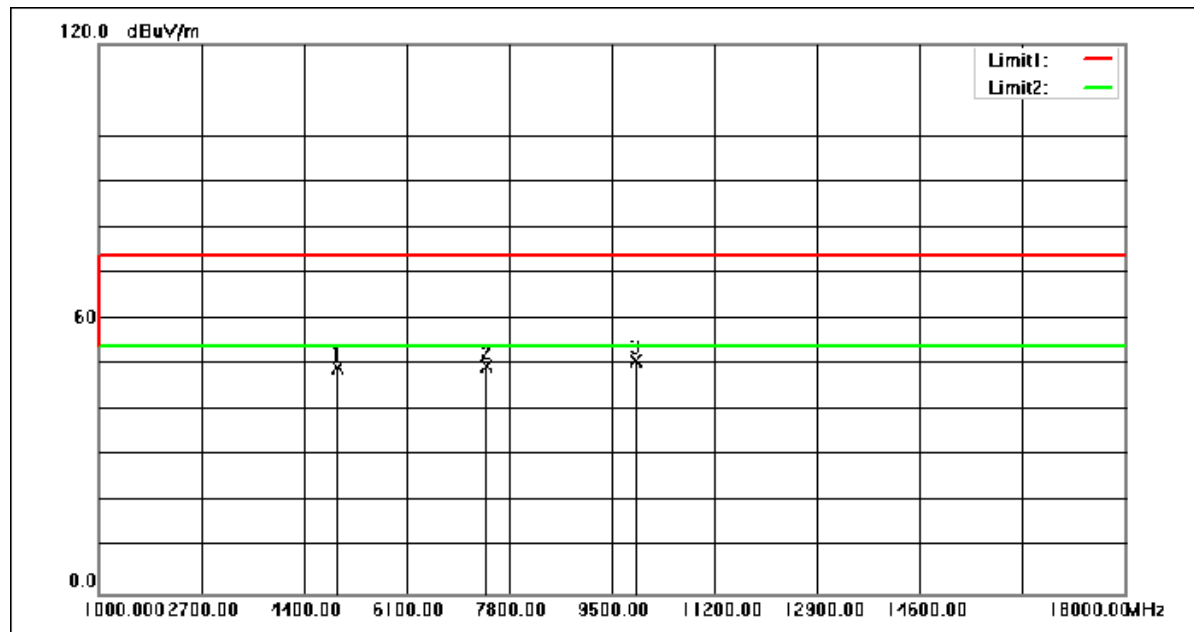
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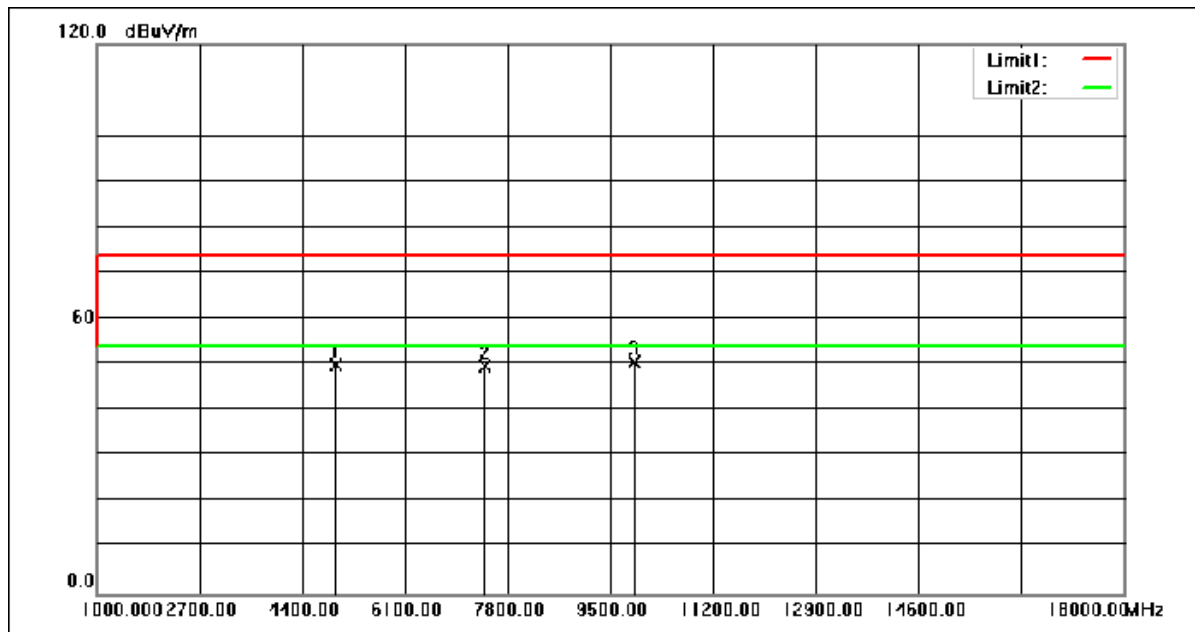
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Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2475MHz



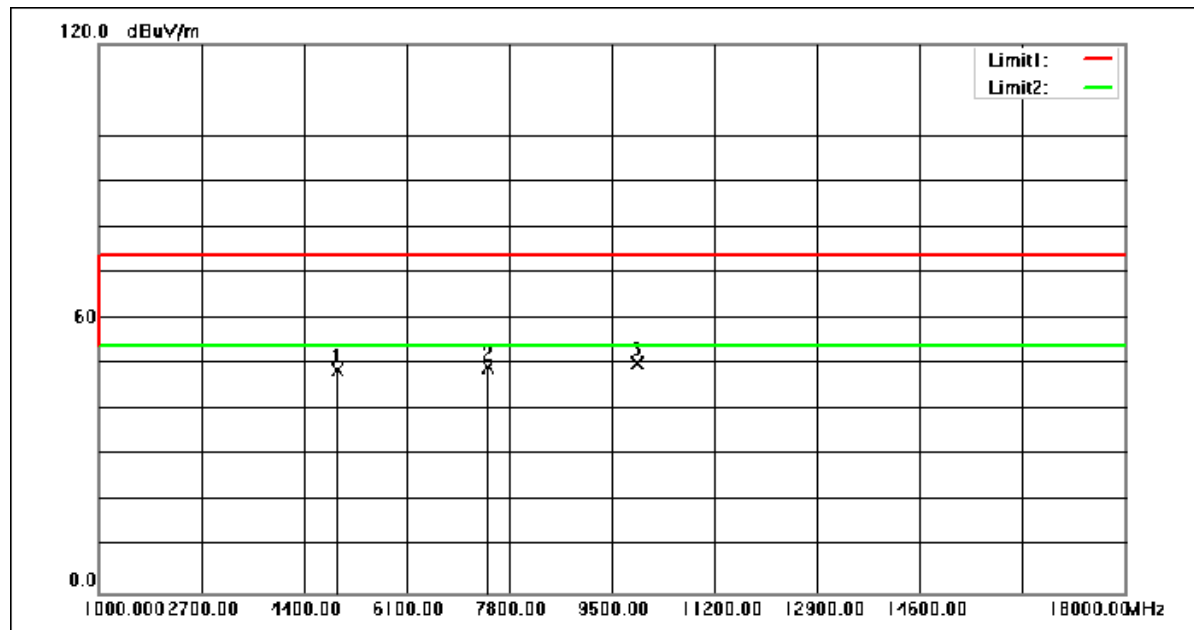
No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4950.000	57.77	-8.35	49.42	74.00	-24.58	peak
2	7425.000	55.19	-5.65	49.54	74.00	-24.46	peak
3	9900.000	51.85	-1.03	50.82	74.00	-23.18	peak

Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2475MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4950.000	58.31	-8.35	49.96	74.00	-24.04	peak
2	7425.000	55.35	-5.65	49.70	74.00	-24.30	peak
3	9900.000	51.46	-1.03	50.43	74.00	-23.57	peak

Mode:a; Polarization:Horizontal; Modulation:O-QPSK; ; Channel:2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	57.10	-8.32	48.78	74.00	-25.22	peak
2	7440.000	55.13	-5.63	49.50	74.00	-24.50	peak
3	9920.000	51.23	-0.94	50.29	74.00	-23.71	peak



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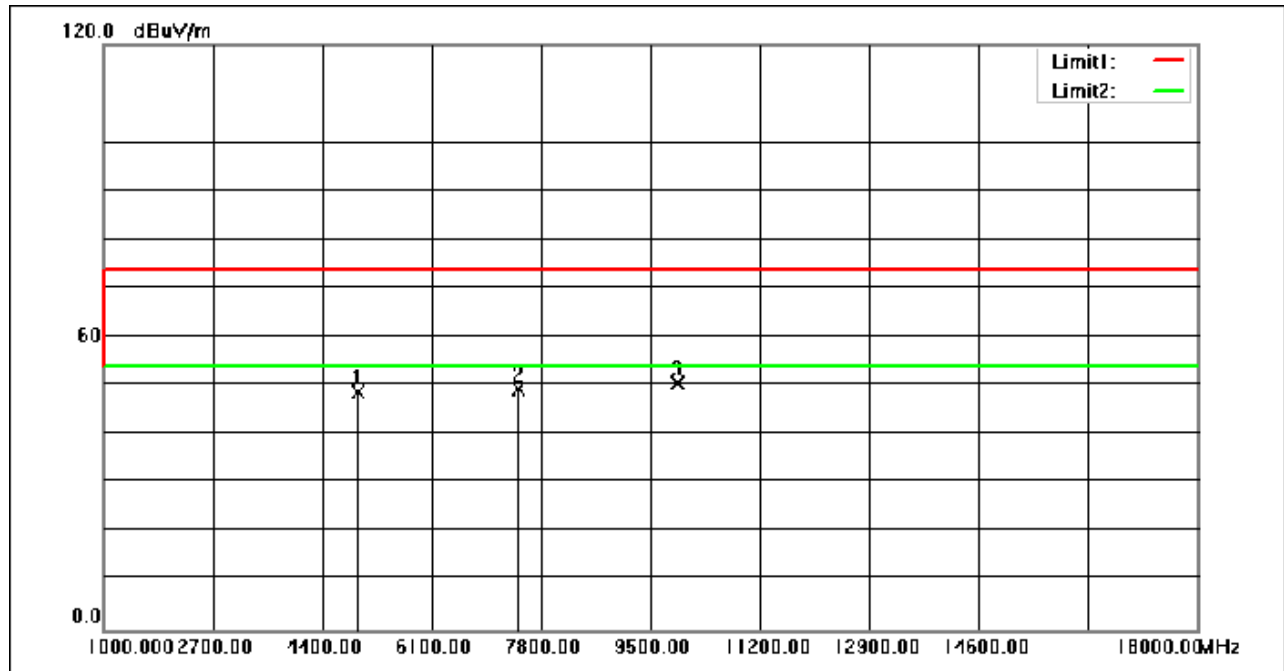
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Mode:a; Polarization:Vertical; Modulation:O-QPSK; ; Channel:2480MHz



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4960.000	56.99	-8.32	48.67	74.00	-25.33	peak
2	7440.000	54.91	-5.63	49.28	74.00	-24.72	peak
3	9920.000	51.39	-0.94	50.45	74.00	-23.55	peak



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8 Test Setup Photographs

Refer to the < Test Setup photos-FCC>.

9 EUT Constructional Details

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

- End of the Report -



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