

TEST REPORT

Application No.: SHCR2203000544AT
FCC ID: 2APV2-CSW2HS8B
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 Home Camera Base Station
Model No.: CS-W2HS
Trade Mark: EZVIZ
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2022-03-11
Date of Test: 2022-03-30 to 2022-04-24
Date of Issue: 2022-04-25

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

Parlan Zhan

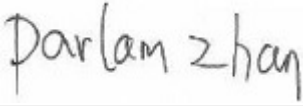
Parlan Zhan
EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2022-04-25		Original

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



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2 Test Summary

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

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.2	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Spurious Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4,6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass



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4 General Information

4.1 Details of E.U.T.

Power supply:	DC12V,1A
Test Voltage:	AC120V/60Hz
Operation Frequency:	903.5-926.5MHz for 1MHz bandwidth 905-925MHz for 2MHz bandwidth 906-926MHz for 4MHz bandwidth 908-924MHz for 8MHz bandwidth
Number of Channels	24 for 1MHz bandwidth 11 for 2MHz bandwidth 6 for 4MHz bandwidth 3 for 8MHz bandwidth
Bandwidth	1MHz,2MHz,4MHz,8MHz
Modulation Type:	OFDM
Data rate:	1MHz: 150Kbps-4Mbps 2MHz: 650Kbps-7.8Mbps 4MHz: 1.35Mbps-18Mbps 8MHz: 2.9Mbps-39Mbps
Antenna Type:	PIFA Antenna
Antenna Gain:	1.5dBi (Provided by the manufacturer)

4.2 Power level setting using in test

Bandwidth	Frequency (MHz)	Setting	Bandwidth	Frequency (MHz)	Setting
1M	903.5	-5	2M	905	0
	914.5	-5		915	0
	926.5	-5		925	0
Bandwidth	Frequency (MHz)	Setting	Bandwidth	Frequency (MHz)	Setting
4M	906	0	8M	908	0
	914	0		916	0
	926	0		924	0

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Notebook	Lenovo	/	/
AC Adapter	DVE	/	/



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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 (Kunshan) 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.

None

4.7 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	01/22/2022	01/21/2023
2	LISN	R&S	ENV216	101604	10/12/2021	10/11/2022
3	LISN	Schwarzbeck	NNLK 8129	8129-143	10/12/2021	10/11/2022
4	Pulse Limiter	R&S	ESH3-Z2	100609	01/22/2022	01/21/2023
5	CE test Cable	Thermax	/	14	10/16/2021	10/15/2022
6	Test Software	Faratronic	EZ-EMC	CCS-03A1	N.C.R	N.C.R
RF Conducted Test						
1	Spectrum Analyzer	Agilent	E4446A	MY44020154	04/13/2021	04/12/2023
2	Spectrum Analyzer	Keysight	N9020A	MY55370209	10/11/2021	10/10/2022
4	Signal Generator	Agilent	N5182A	MY50142015	08/27/2021	08/26/2022
5	Spectrum Analyzer	Keysight	N9030B	MY61330164	01/22/2022	01/21/2023
6	Vector Signal Generator	R&S	SMW200A	110074	10/12/2021	10/11/2022
7	Radio Communication Test Station	Anritsu	MT8000A	6262012849	09/23/2021	09/22/2022
8	Radio Communication Analyzer	Anritsu	MT8821C	6201692222	09/23/2021	09/22/2022
9	Universal Radio Communication Tester	R&S	CMW500	159275	10/12/2021	10/11/2022
10	Universal Radio Communication Tester	R&S	CMW500	167239	04/13/2021	04/12/2023
11	Power Meter	Anritsu	ML2495A	1445010	04/13/2021	04/12/2023
12	Switcher	CCSRF	FY562	KUS2001M001-3	10/12/2021	10/11/2022
13	AC Power Source	EXTECH	6605	1570106	N.C.R	N.C.R
14	DC Power Supply	Aglient	E3632A	MY50340053	N.C.R	N.C.R
15	6dB Attenuator	Mini-Circuits	NAT-6-2W	15542-1	N.C.R	N.C.R
16	Power Divider	AISI	IOWOPE2068	PE2068	N.C.R	N.C.R
17	Filter	MICRO-TRONICS	BRM50701	5	N.C.R	N.C.R
18	Conducted Test Cable	/	RF01-RF04	/	04/13/2021	04/12/2023
19	Software	BST	TST-PASS	N/A	N/A	N/A
20	Temp. / Humidity Chamber	TERCHY	MHK-120AK	X30109	04/13/2021	04/12/2023
21	Thermometer	Anymetre	TH603	CCS007	10/14/2021	10/13/2022
RF Radiated Test						
1	Spectrum Analyzer	R&S	FSV40	101493	10/11/2021	10/10/2022
2	Signal Generator	Agilent	E8257C	MY43321570	10/18/2021	10/17/2022
3	Loop Antenna	Com-Power	AL-130R	10160008	04/13/2021	04/12/2023
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	02/20/2022	02/19/2023
9	Pre-Amplifier(30MHz~18GHz)	LNA	/	/	04/13/2021	04/12/2023
10	Amplifier(18~40GHz)	COM-POWER	PAM-840A	461332	10/18/2021	10/17/2022
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



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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	/	04/13/2021	04/12/2023
24	Software	Faratronic	EZ EMC	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 1.5dBi.

Antenna location: Refer to internal photo.



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7 Radio Spectrum Matter Test Results

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

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

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

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C

Humidity: 54 % RH

Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Prescan mode	00	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 1M bandwidth.
	01	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 2M bandwidth.
	02	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 4M bandwidth.
	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.
Final test	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.



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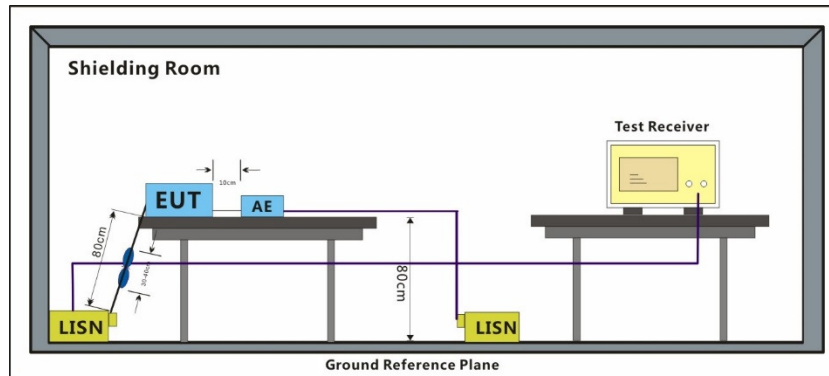
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7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

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

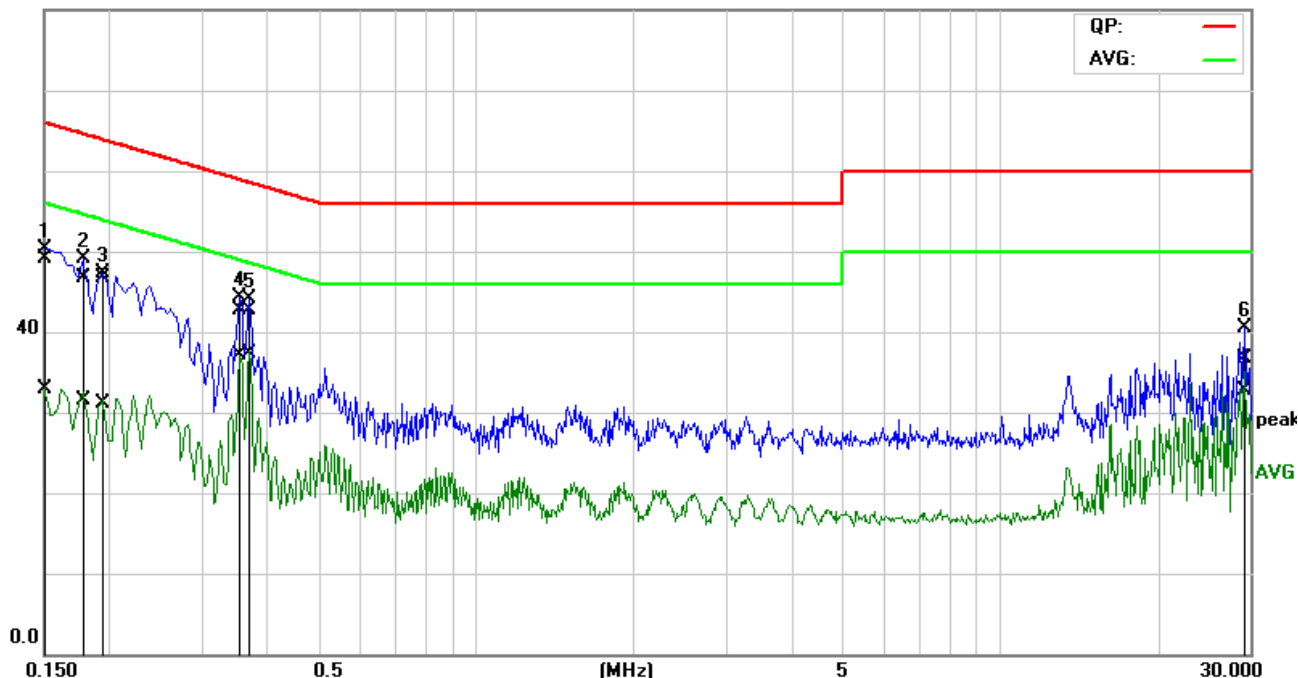
Remark: Level=Read Level+ Cable Loss+ LISN Factor



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Test Mode:03; Line: Live line

80.0 dBuV



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	0.1500	29.68	13.39	19.48	49.16	32.87	66.00	56.00	-16.84	-23.13	Pass
2	0.1755	27.29	12.07	19.49	46.78	31.56	64.70	54.70	-17.92	-23.14	Pass
3	0.1926	27.19	11.70	19.49	46.68	31.19	63.92	53.92	-17.24	-22.73	Pass
4	0.3544	23.21	17.64	19.51	42.72	37.15	58.86	48.86	-16.14	-11.71	Pass
5*	0.3693	23.13	17.80	19.52	42.65	37.32	58.52	48.52	-15.87	-11.20	Pass
6	29.2323	16.32	12.51	20.29	36.61	32.80	60.00	50.00	-23.39	-17.20	Pass



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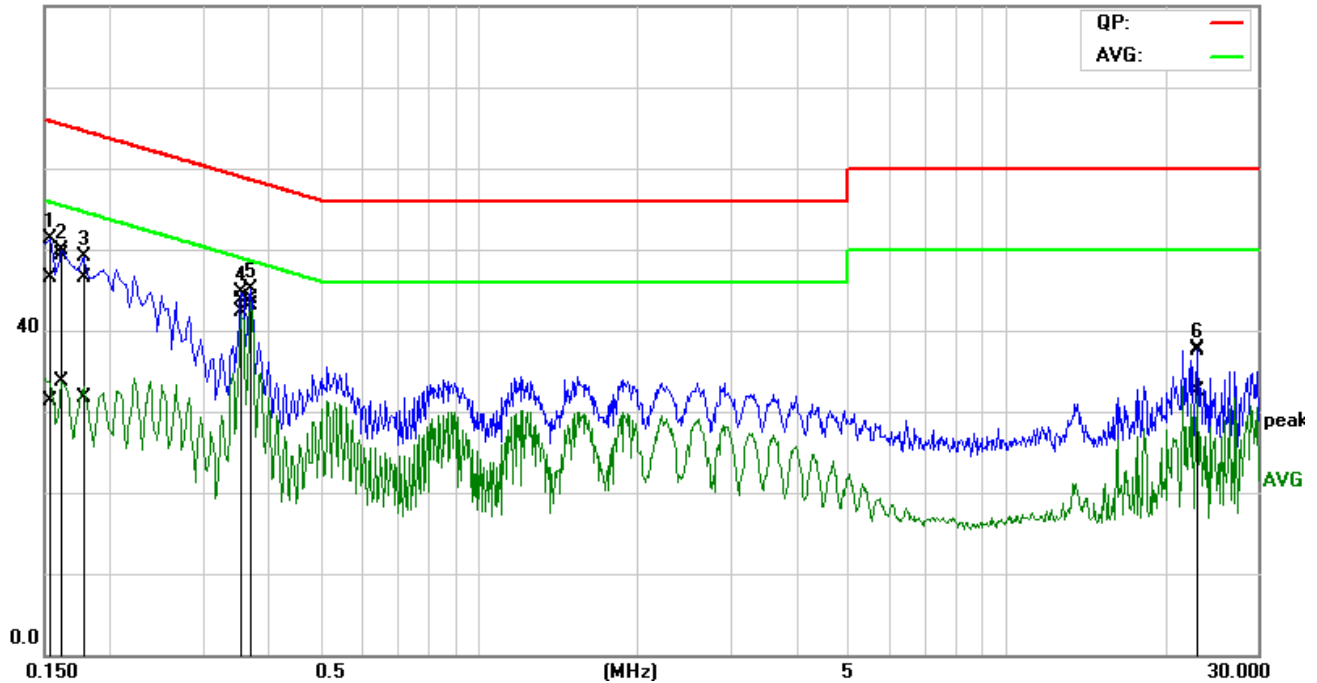
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Test Mode:03; Line: Neutral Line

80.0 dBuV



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	0.1521	27.01	11.85	19.46	46.47	31.31	65.88	55.88	-19.41	-24.57	Pass
2	0.1629	29.81	14.25	19.46	49.27	33.71	65.31	55.31	-16.04	-21.60	Pass
3	0.1753	27.09	12.32	19.46	46.55	31.78	64.71	54.71	-18.16	-22.93	Pass
4	0.3560	24.19	22.91	19.47	43.66	42.38	58.82	48.82	-15.16	-6.44	Pass
5*	0.3700	24.51	23.62	19.47	43.98	43.09	58.50	48.50	-14.52	-5.41	Pass
6	23.1272	17.78	12.70	19.77	37.55	32.47	60.00	50.00	-22.45	-17.53	Pass



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7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)
Test Method: ANSI C63.10 (2013) Section 11.9.2
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

7.2.1 E.U.T. Operation

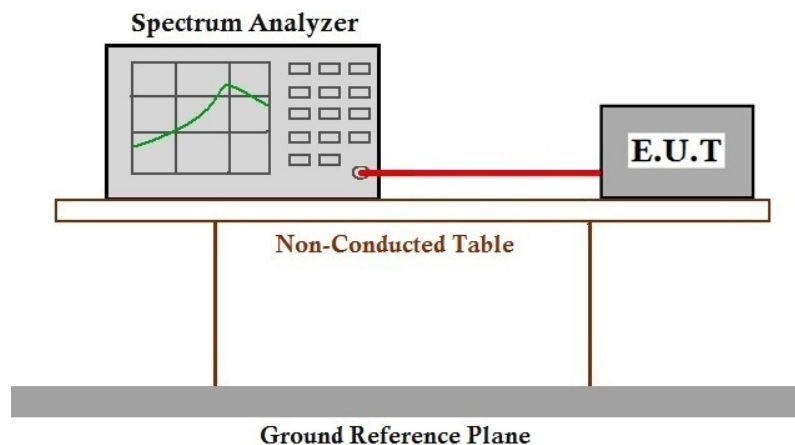
Operating Environment:

Temperature: 25 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 1M bandwidth.
	01	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 2M bandwidth.
	02	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 4M bandwidth.
	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer to Appendix A for SHCR220300054401-FCC-1M

Appendix B for SHCR220300054401-FCC-2M

Appendix C for SHCR220300054401-FCC-4M

Appendix D for SHCR220300054401-FCC-8M



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7.3 Minimum 6dB Bandwidth

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

≥500 kHz

7.3.1 E.U.T. Operation

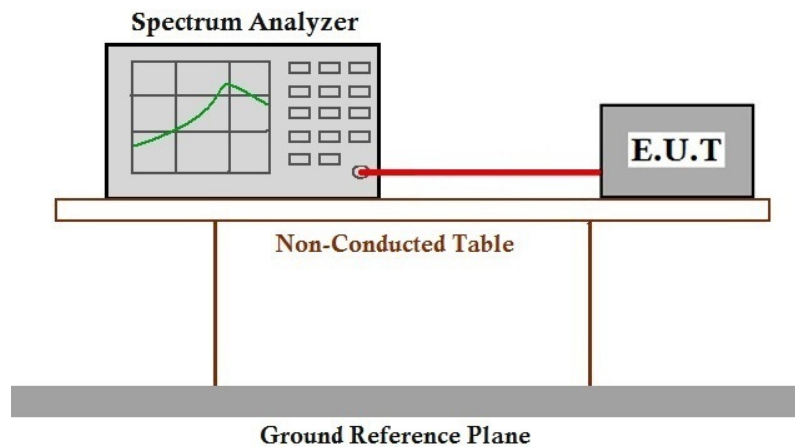
Operating Environment:

Temperature: 25 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 1M bandwidth.
	01	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 2M bandwidth.
	02	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 4M bandwidth.
	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer to Appendix A for SHCR220300054401-FCC-1M

Appendix B for SHCR220300054401-FCC-2M

Appendix C for SHCR220300054401-FCC-4M

Appendix D for SHCR220300054401-FCC-8M



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7.4 Power Spectrum Density

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

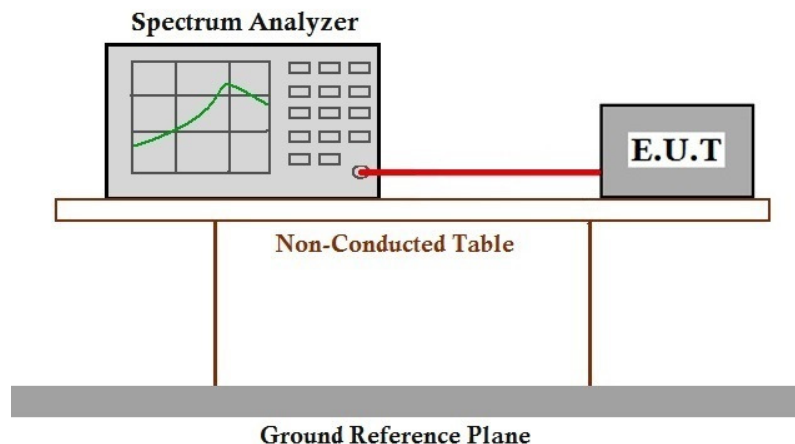
7.4.1 E.U.T. Operation

Operating Environment:
 Temperature: 25 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 1M bandwidth.
	01	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 2M bandwidth.
	02	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 4M bandwidth.
	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer to Appendix A for SHCR220300054401-FCC-1M
 Appendix B for SHCR220300054401-FCC-2M
 Appendix C for SHCR220300054401-FCC-4M
 Appendix D for SHCR220300054401-FCC-8M



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7.5 Conducted Band Edges Measurement

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

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

7.5.1 E.U.T. Operation

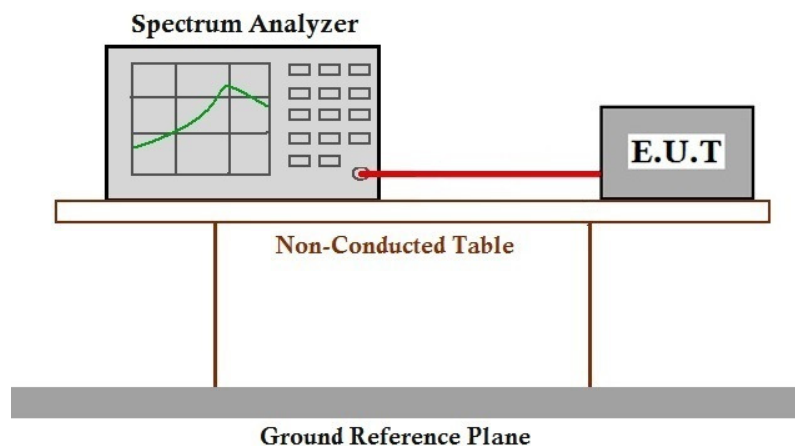
Operating Environment:

Temperature: 25 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 1M bandwidth.
	01	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 2M bandwidth.
	02	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 4M bandwidth.
	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.

7.5.3 Test Setup Diagram



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7.5.4 Measurement Procedure and Data

Please Refer to Appendix A for SHCR220300054401-FCC-1M

Appendix B for SHCR220300054401-FCC-2M

Appendix C for SHCR220300054401-FCC-4M

Appendix D for SHCR220300054401-FCC-8M



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7.6 Conducted Spurious Emissions

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

Test Method: ANSI C63.10 (2013) Section 11.11

Limit:

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

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C

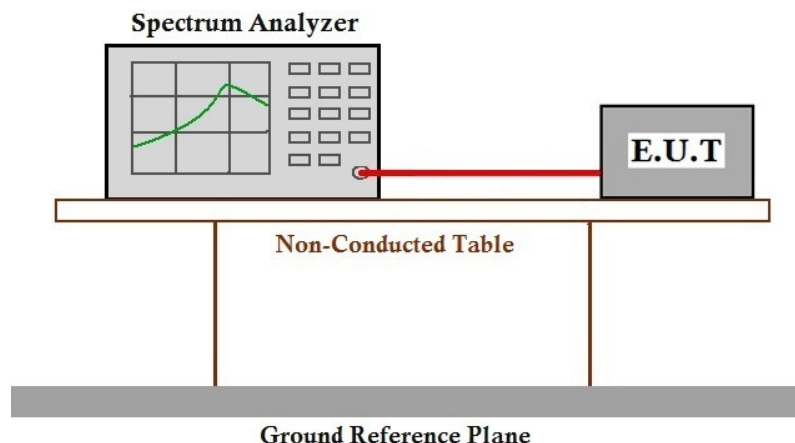
Humidity: 54 % RH

Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 1M bandwidth.
	01	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 2M bandwidth.
	02	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 4M bandwidth.
	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.

7.6.3 Test Setup Diagram



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7.6.4 Measurement Procedure and Data

Please Refer to Appendix A for SHCR220300054401-FCC-1M

Appendix B for SHCR220300054401-FCC-2M

Appendix C for SHCR220300054401-FCC-4M

Appendix D for SHCR220300054401-FCC-8M



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7.7 Radiated Spurious Emissions Below 1GHz

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

Test Method: ANSI C63.10 (2013) Section 6.4,6.5

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
960-1000	500	3

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C

Humidity: 54 % RH

Atmospheric Pressure: 1010 mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Prescan mode	00	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 1M bandwidth.
	01	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 2M bandwidth.
	02	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 4M bandwidth.
	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.
Final test	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.



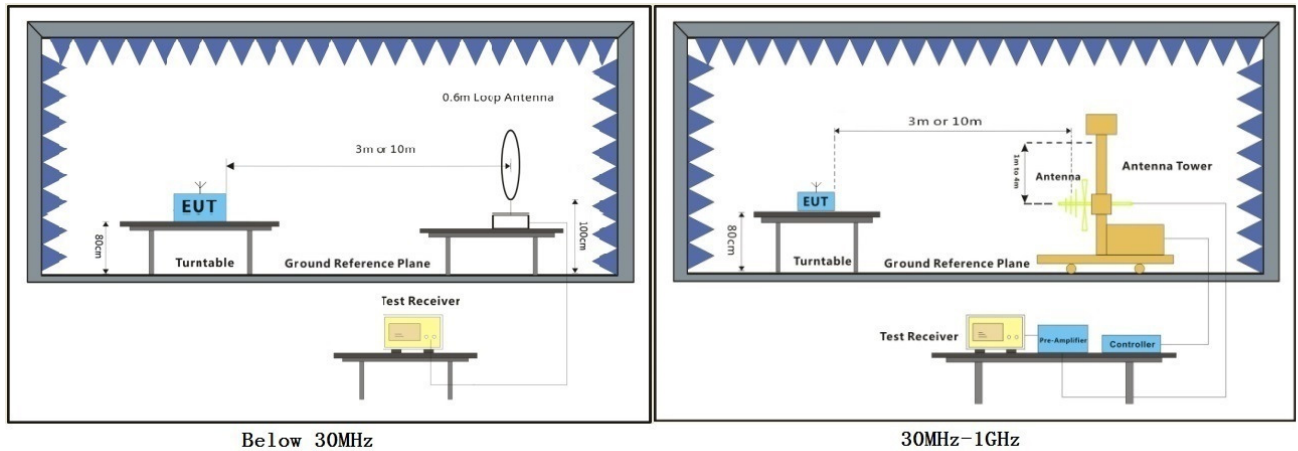
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7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

- 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.
- 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.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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 quasi-peak method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the middle channel, the Highest channel.
- 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.
- Repeat above procedures until all frequencies measured was complete.

Remark:

- Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
- Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



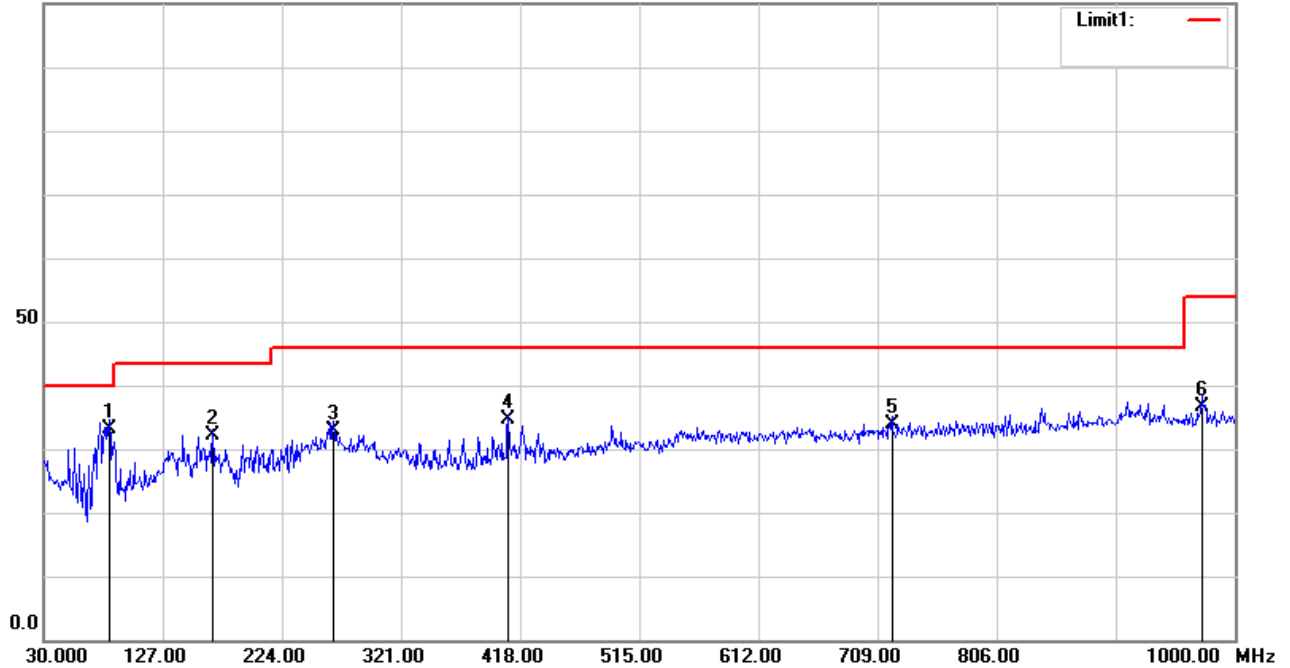
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908MHz

Test Mode:03

Horizontal

100.0 dBuV/m



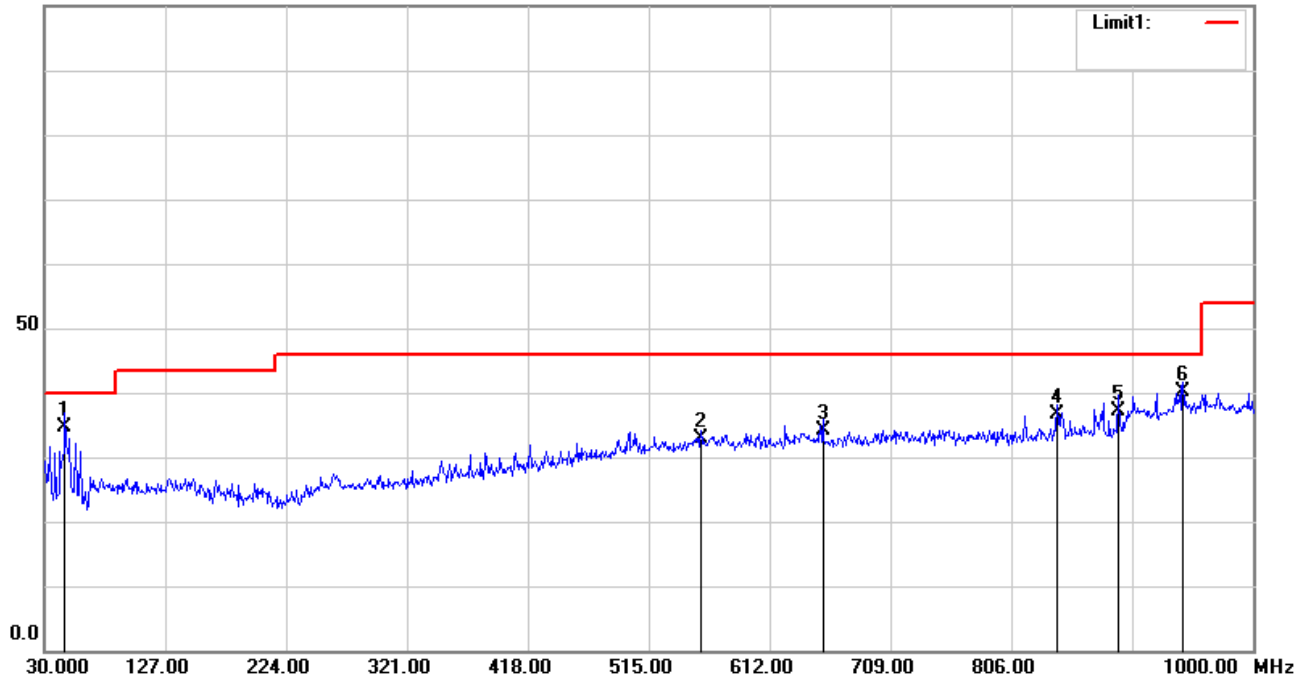
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	83.3500	19.11	14.05	33.16	40.00	-6.84	QP
2	167.7400	14.95	17.10	32.05	43.50	-11.45	QP
3	265.7100	11.87	20.92	32.79	46.00	-13.21	QP
4	408.3000	10.82	23.69	34.51	46.00	-11.49	QP
5	720.6400	31.35	2.43	33.78	46.00	-12.22	QP
6	972.8400	34.02	2.50	36.52	54.00	-17.48	QP



Test Mode:03

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	46.4900	15.49	19.17	34.66	40.00	-5.34	QP
2	556.7100	5.52	27.24	32.76	46.00	-13.24	QP
3	654.6800	6.67	27.49	34.16	46.00	-11.84	QP
4	842.8600	34.40	2.15	36.55	46.00	-9.45	QP
5	891.3600	34.74	2.39	37.13	46.00	-8.87	QP
6	943.7400	37.51	2.61	40.12	46.00	-5.88	QP



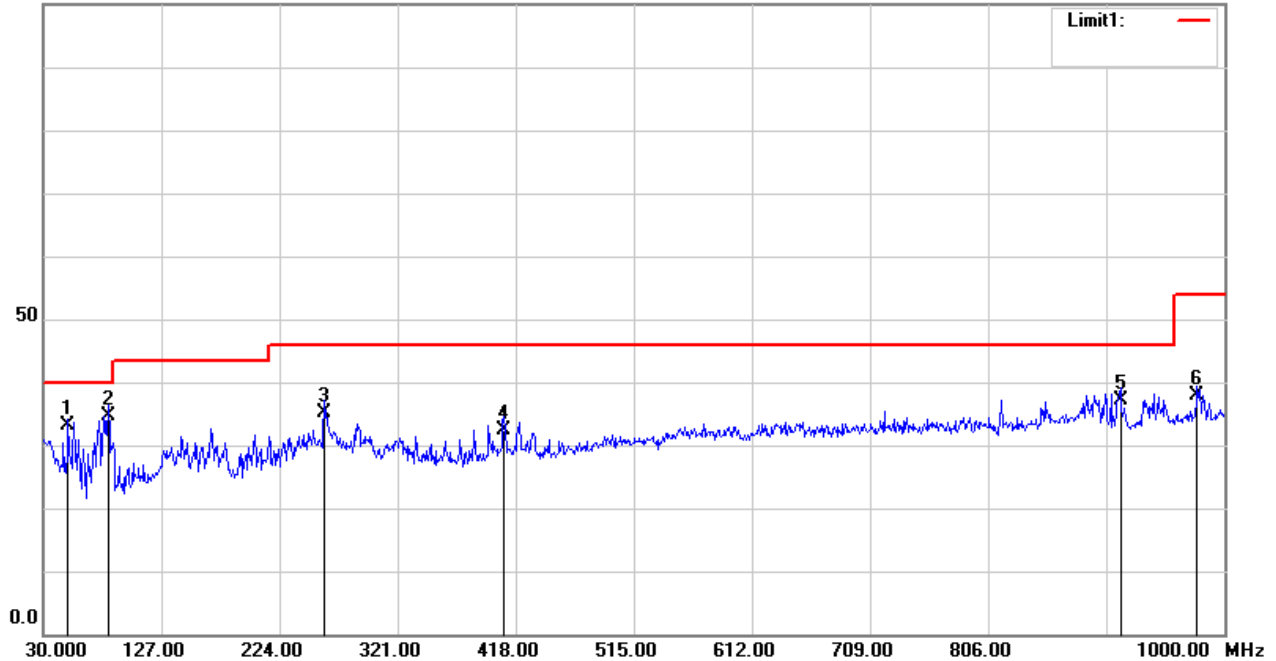
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916MHz

Test Mode:03

Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	50.3700	15.45	17.61	33.06	40.00	-6.94	QP
2	83.3500	20.51	14.05	34.56	40.00	-5.44	QP
3	260.8600	14.21	20.97	35.18	46.00	-10.82	QP
4	408.3000	8.73	23.69	32.42	46.00	-13.58	QP
5	914.6400	34.59	2.50	37.09	46.00	-8.91	QP
6	977.6900	35.38	2.47	37.85	54.00	-16.15	QP

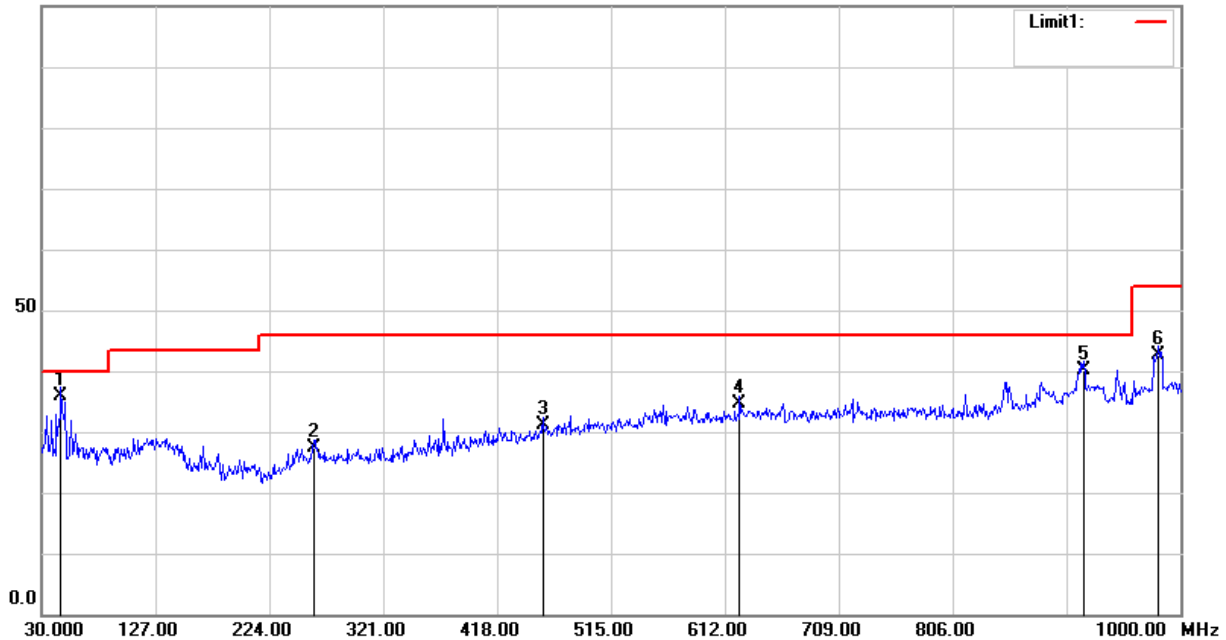


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Test Mode:03

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	46.4900	16.83	19.17	36.00	40.00	-4.00	QP
2	261.8300	6.32	21.03	27.35	46.00	-18.65	QP
3	456.8000	6.47	24.62	31.09	46.00	-14.91	QP
4	624.6100	7.24	27.31	34.55	46.00	-11.45	QP
5	917.5500	37.60	2.51	40.11	46.00	-5.89	QP
6	981.5700	40.22	2.45	42.67	54.00	-11.33	QP



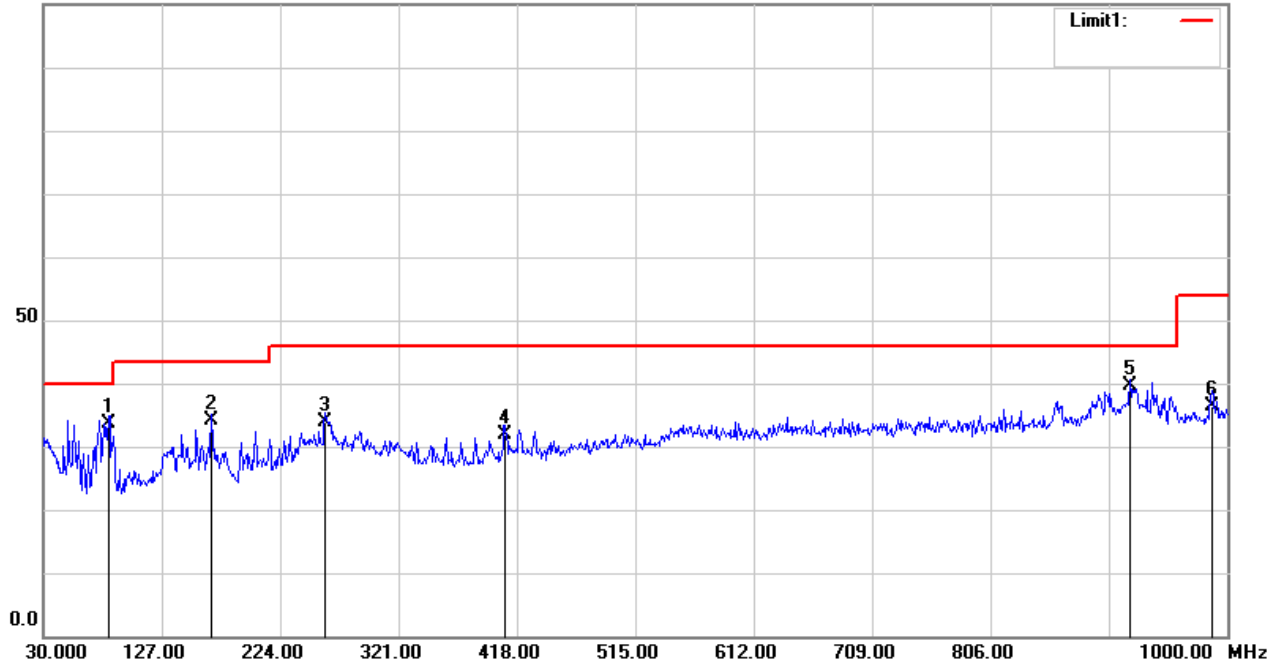
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924MHz

Test Mode:03

Horizontal

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	83.3500	19.51	14.05	33.56	40.00	-6.44	QP
2	167.7400	16.91	17.10	34.01	43.50	-9.49	QP
3	260.8600	12.88	20.97	33.85	46.00	-12.15	QP
4	408.3000	8.27	23.69	31.96	46.00	-14.04	QP
5	920.4600	37.03	2.52	39.55	46.00	-6.45	QP
6	987.3900	33.85	2.42	36.27	54.00	-17.73	QP

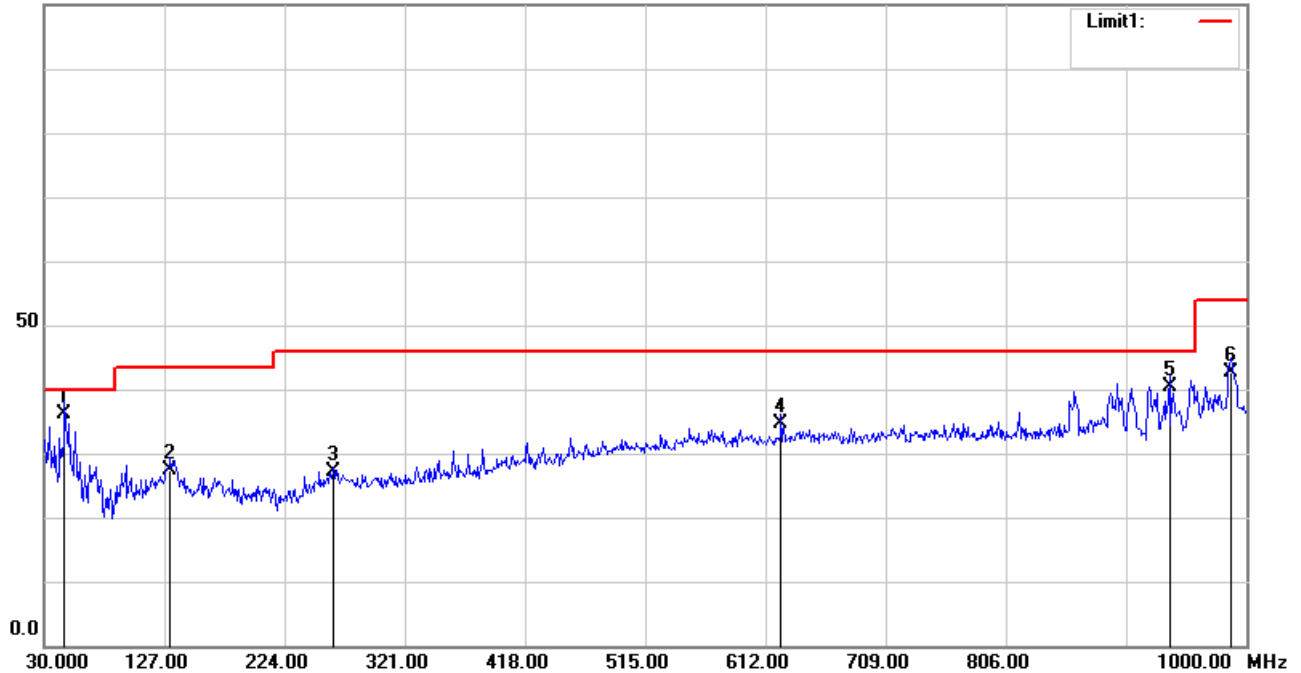


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Test Mode:03

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	46.4900	16.92	19.17	36.09	40.00	-3.91	QP
2	131.8500	8.08	19.30	27.38	43.50	-16.12	QP
3	263.7700	6.13	21.02	27.15	46.00	-18.85	QP
4	624.6100	7.31	27.31	34.62	46.00	-11.38	QP
5	937.9200	37.79	2.59	40.38	46.00	-5.62	QP
6	987.3900	40.14	2.42	42.56	54.00	-11.44	QP



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7.8 Radiated Spurious Emissions Above 1GHz

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

Test Method: ANSI C63.10 (2013) Section 6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C

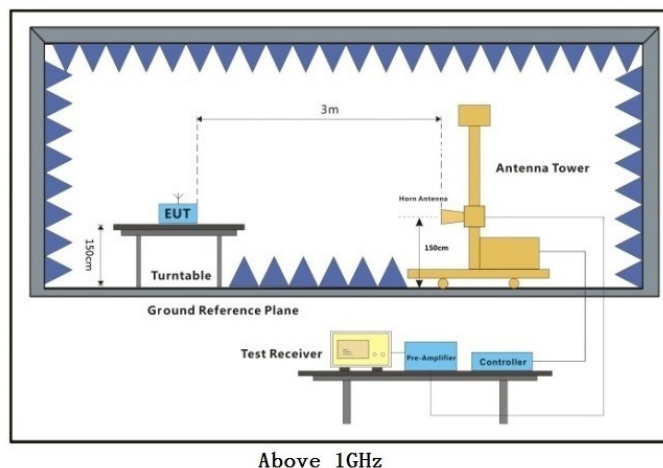
Humidity: 54 % RH

Atmospheric Pressure: 1010 mbar

7.8.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Prescan mode	00	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 1M bandwidth.
	01	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 2M bandwidth.
	02	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 4M bandwidth.
	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.
Final test	03	TX mode_Keep the EUT in continuously transmitting mode with OFDM modulation by 8M bandwidth.

7.8.3 Test Setup Diagram



7.8.4 Measurement Procedure and Data

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

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
3. As shown in this section, 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.

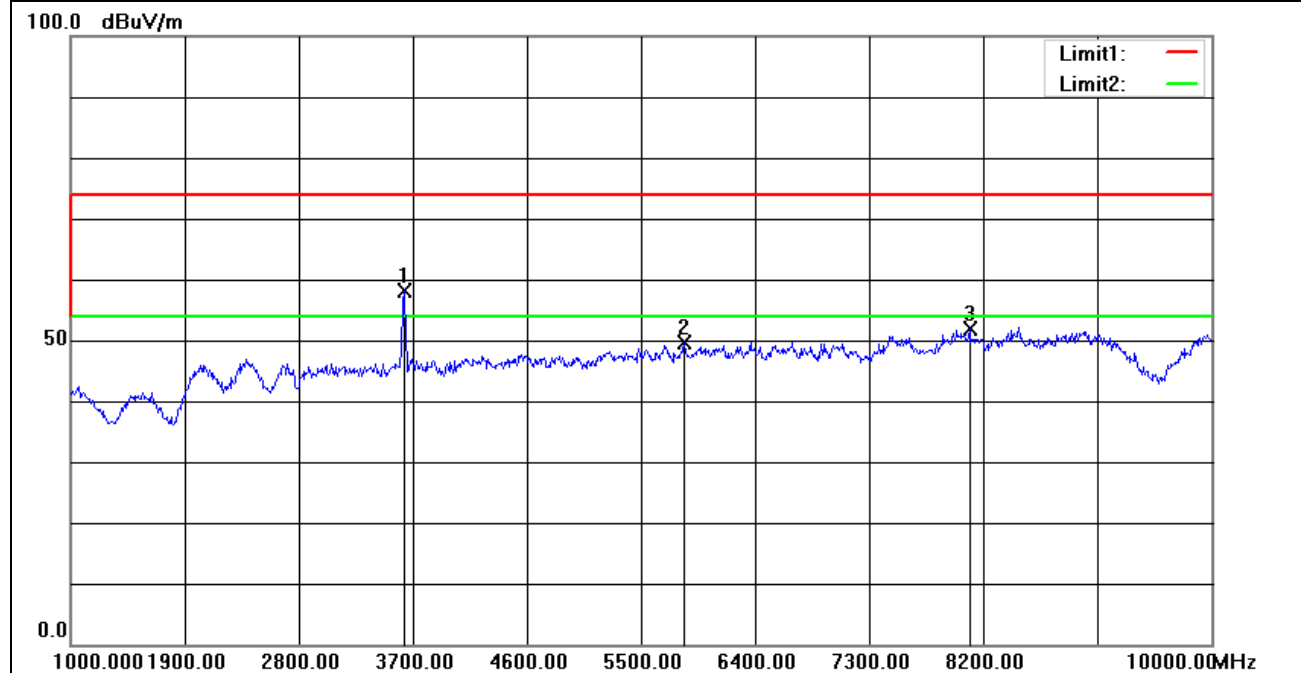


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908MHz

Test Mode:03

Horizontal



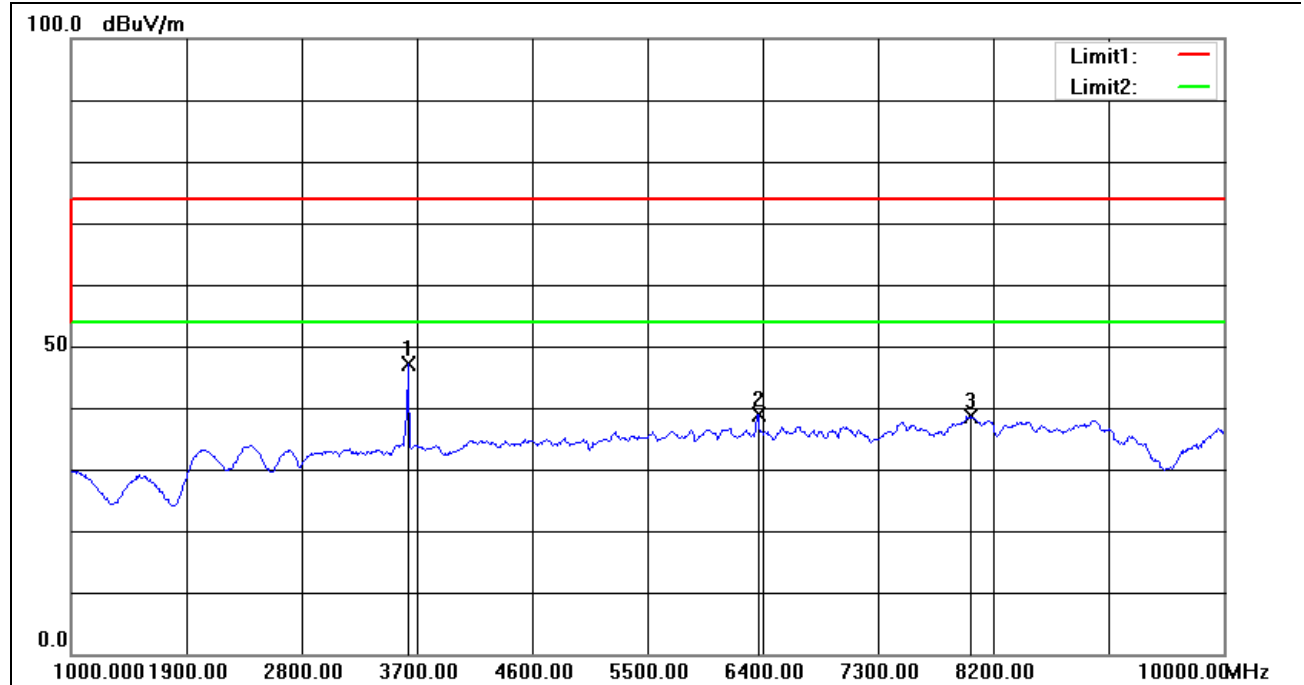
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/ m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3628.000	68.25	-10.16	58.09	74.00	-15.91	peak
2	5842.000	55.74	-6.23	49.51	74.00	-24.49	peak
3	8092.000	56.42	-4.59	51.83	74.00	-22.17	peak



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Test Mode:03

Horizontal



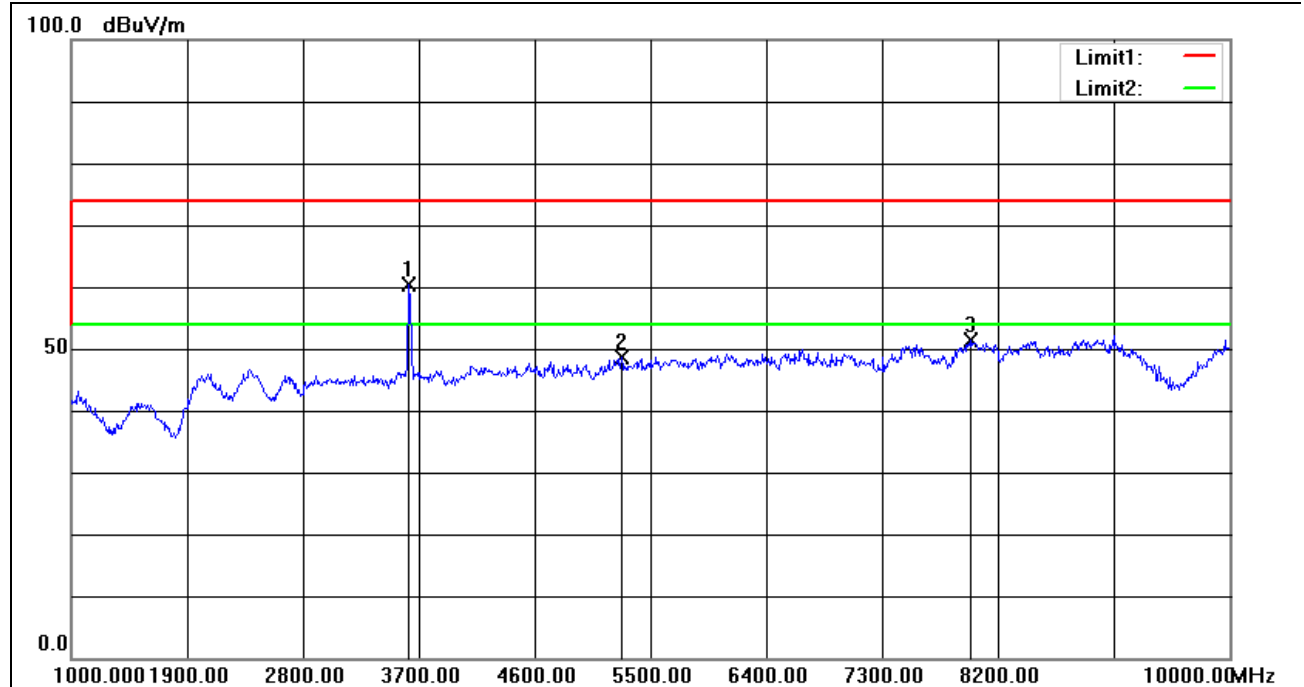
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/ m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3628.000	57.39	-10.16	47.23	54.00	-6.77	AVG
2	6364.000	44.32	-5.38	38.94	54.00	-15.06	AVG
3	8029.000	43.08	-4.54	38.54	54.00	-15.46	AVG



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Test Mode:03

Vertical



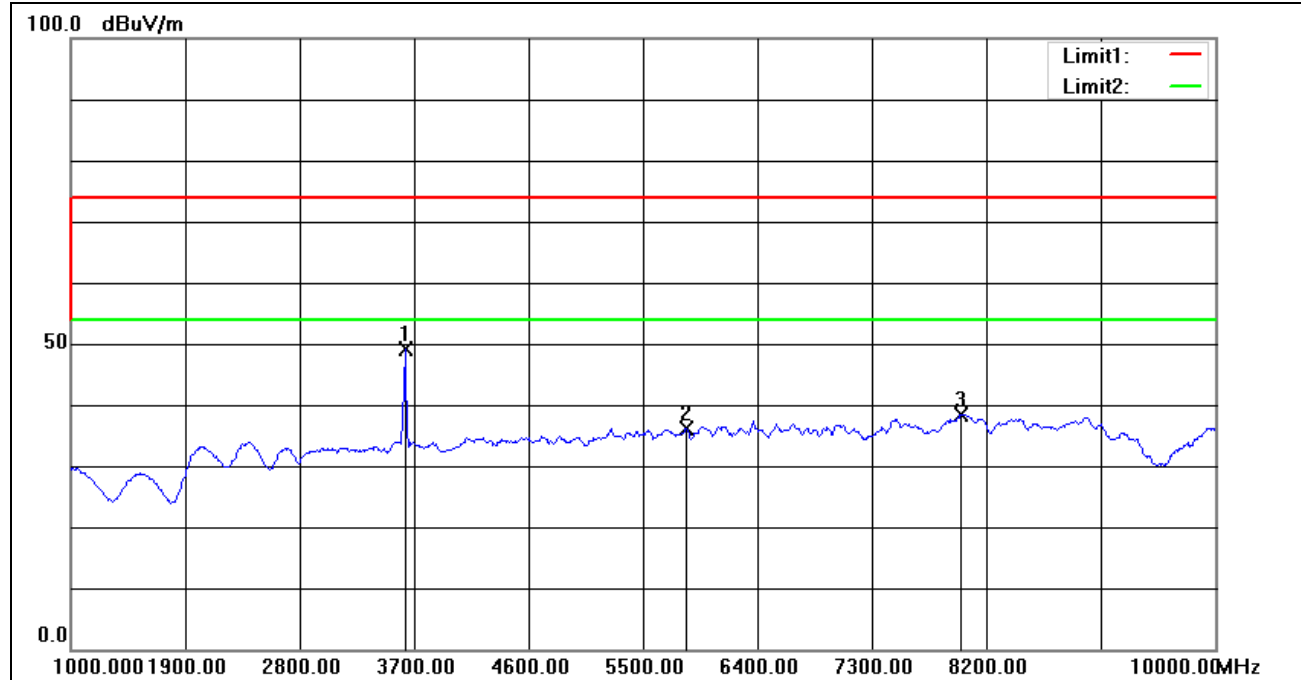
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/ m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3619.000	70.49	-10.18	60.31	74.00	-13.69	peak
2	5275.000	56.07	-7.44	48.63	74.00	-25.37	peak
3	7993.000	55.87	-4.54	51.33	74.00	-22.67	peak



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Test Mode:03

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/ m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3628.000	59.37	-10.16	49.21	54.00	-4.79	AVG
2	5842.000	42.40	-6.23	36.17	54.00	-17.83	AVG
3	8002.000	42.96	-4.52	38.44	54.00	-15.56	AVG

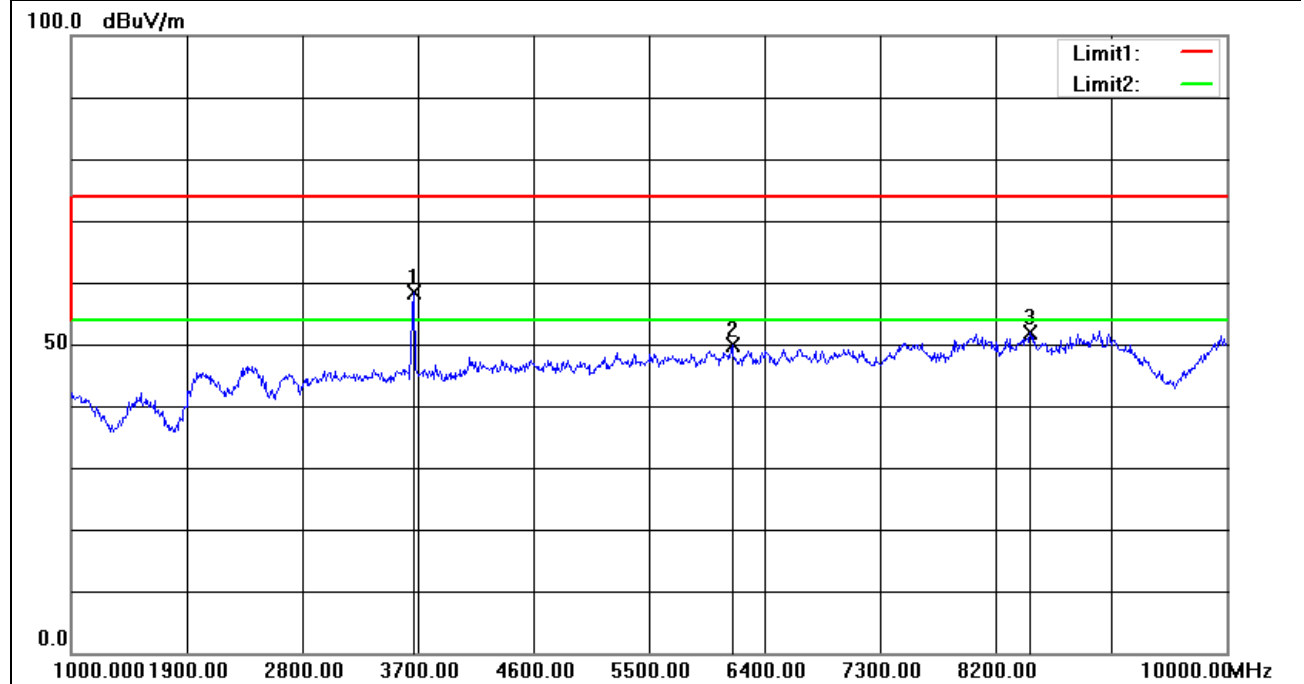


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916MHz

Test Mode:03

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/ m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3673.000	68.45	-10.03	58.42	74.00	-15.58	peak
2	6148.000	55.18	-5.20	49.98	74.00	-24.02	peak
3	8470.000	56.10	-4.28	51.82	74.00	-22.18	peak

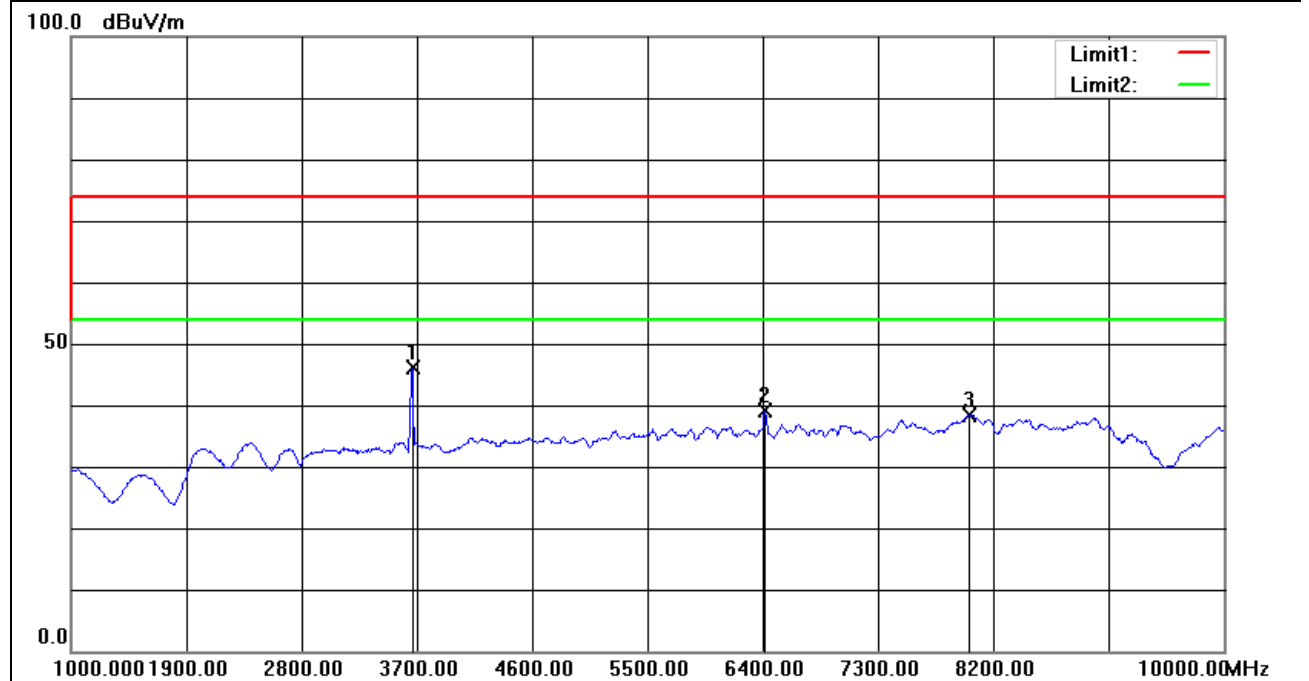


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Test Mode:03

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/ m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3664.000	56.12	-10.05	46.07	54.00	-7.93	AVG
2	6418.000	44.39	-5.35	39.04	54.00	-14.96	AVG
3	8011.000	42.99	-4.52	38.47	54.00	-15.53	AVG

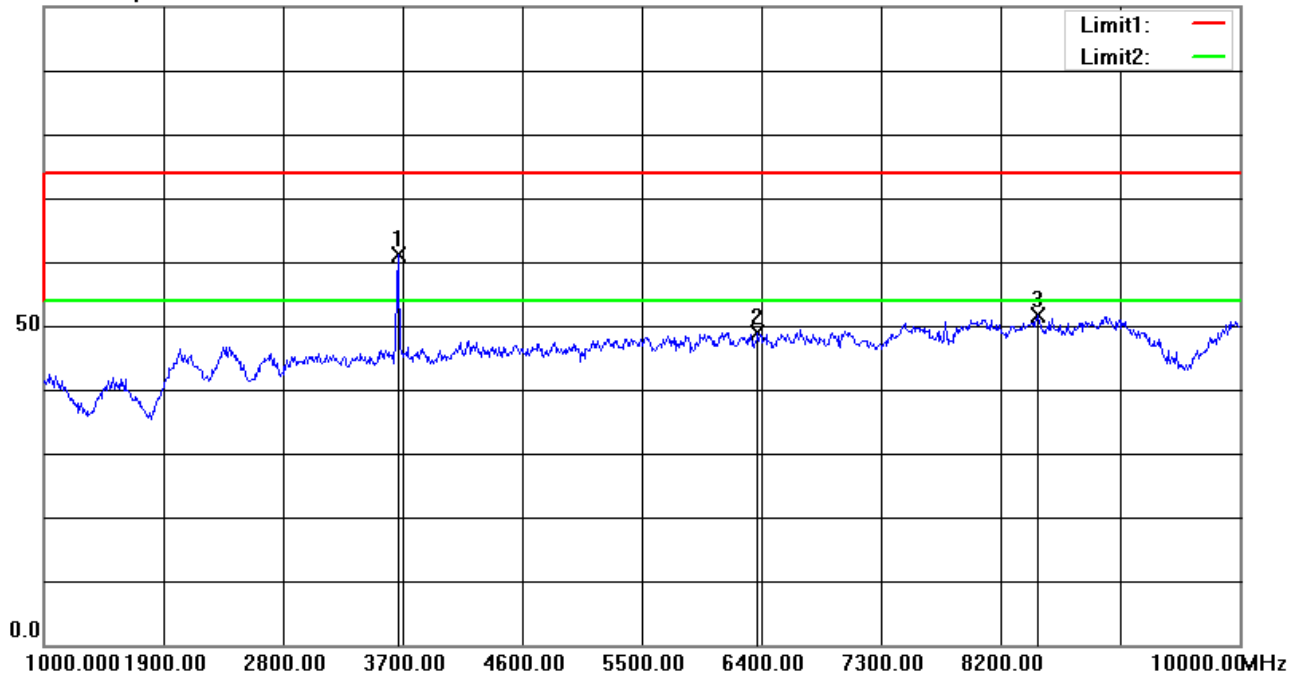


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Test Mode:03

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3664.000	71.21	-10.05	61.16	74.00	-12.84	peak
2	6373.000	54.37	-5.40	48.97	74.00	-25.03	peak
3	8479.000	55.81	-4.26	51.55	74.00	-22.45	peak

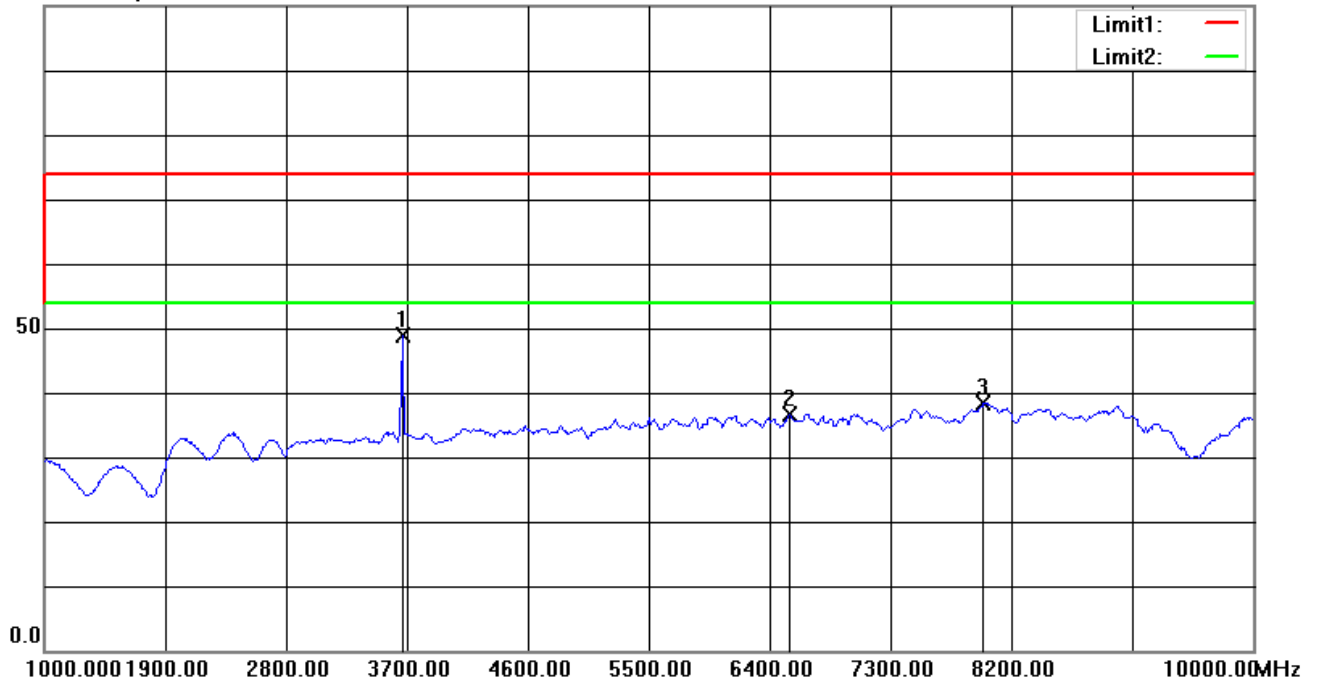


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Test Mode:03

Vertical

100.0 dBuV/m

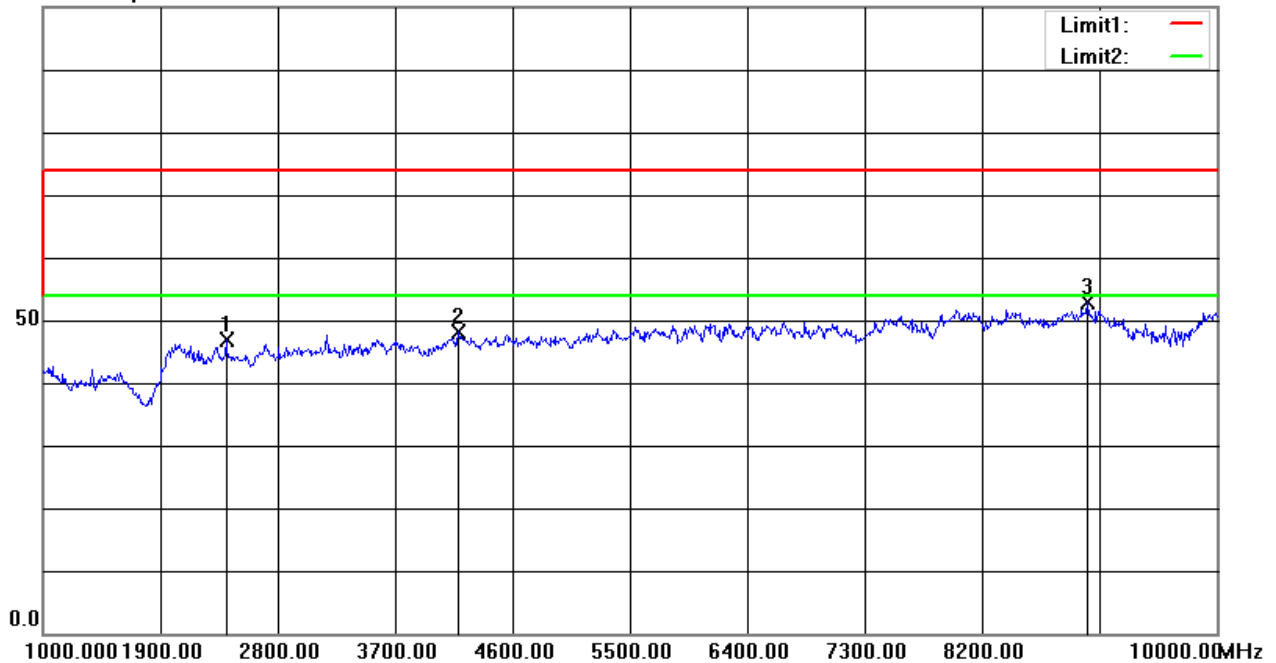


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3664.000	58.96	-10.05	48.91	54.00	-5.09	AVG
2	6553.000	41.37	-4.69	36.68	54.00	-17.32	AVG
3	7993.000	42.87	-4.54	38.33	54.00	-15.67	AVG



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924MHz
Test Mode:03
Horizontal
100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2404.000	60.80	-13.97	46.83	74.00	-27.17	peak
2	4186.000	57.22	-9.17	48.05	74.00	-25.95	peak
3	9010.000	54.93	-2.06	52.87	74.00	-21.13	peak

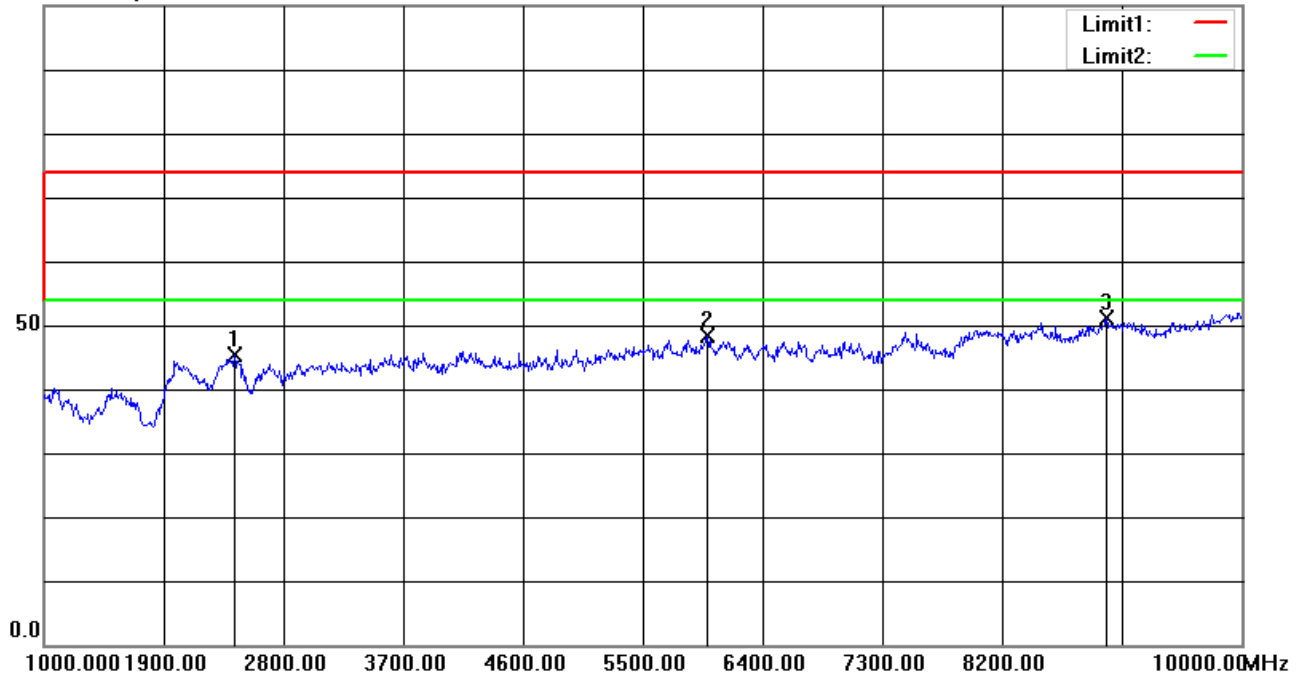


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Test Mode:03

Vertical

100.0 dBuV/m



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2431.000	59.28	-13.87	45.41	74.00	-28.59	peak
2	5986.000	53.79	-5.43	48.36	74.00	-25.64	peak
3	8983.000	53.13	-2.08	51.05	74.00	-22.95	peak



8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SHCR2203000544AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of External Photo for SHCR2203000544AT

Refer to Appendix - Photographs of Internal Photo for SHCR2203000544AT

- End of the Report -



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