

# TEST REPORT

**Application No.:** SHCR2110000535AT  
**FCC ID:** 2AZ6I-ML601  
**Applicant:** HyECO Smart Tech Co.,Ltd.  
**Address of Applicant:** 12 Beiqian Lane,Industrial Park,Suzhou,Jiangsu 215000,China  
**Manufacturer:** HyECO Smart Tech Co.,Ltd.  
**Address of Manufacturer:** 12 Beiqian Lane,Industrial Park,Suzhou,Jiangsu 215000,China  
**Equipment Under Test (EUT):**

**EUT Name:** ML601,ML611 Module

**Model No.:** ML601,ML611

Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.

**Standard(s) :** 47 CFR Part 15, Subpart C 15.249

**Date of Receipt:** 2021-10-28

**Date of Test:** 2021-11-01 to 2022-01-05

**Date of Issue:** 2022-01-06

<b>Test Result:</b>	<b>Pass*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan

Parlam Zhan  
E&E Section Manager



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Revision Record			
Version	Description	Date	Remark
00	Original	2022-01-06	/

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 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Field Strength of the Fundamental Signal (15.249(a))	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(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 ML611 was tested since their differences were the model number, trade name, Color and appearance.



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## 4 General Information

### 4.1 Details of E.U.T.

Power supply: DC 3.3V  
Test voltage: DC 3.3V  
Antenna Gain: 3.0dBi (Provided by manufacturer)  
Antenna Type: Spiral Antenna  
Modulation Type: FSK  
Channel Spacing: 200KHz/1.6MHz  
Operation Frequency: 125KHz: 902.3-914.9MHz  
500KHz: 903.0-914.2MHz

### 4.2 Channel list

125KHz

Channel 0	902.3 MHz	Channel 1	902.5 MHz	Channel 2	902.7 MHz	Channel 3	902.9 MHz
Channel 4	903.1 MHz	Channel 5	903.3 MHz	Channel 6	903.5 MHz	Channel 7	903.7 MHz
Channel 8	903.9 MHz	Channel 9	904.1 MHz	Channel 10	904.3 MHz	Channel 11	904.5 MHz
Channel 12	904.7 MHz	Channel 13	904.9 MHz	Channel 14	905.1 MHz	Channel 15	905.3 MHz
Channel 16	905.5 MHz	Channel 17	905.7 MHz	Channel 18	905.9 MHz	Channel 19	906.1 MHz
Channel 20	906.3 MHz	Channel 21	906.5 MHz	Channel 22	906.7 MHz	Channel 23	906.9 MHz
Channel 24	907.1 MHz	Channel 25	907.3 MHz	Channel 26	907.5 MHz	Channel 27	907.7 MHz
Channel 28	907.9 MHz	Channel 29	908.1 MHz	Channel 30	908.3 MHz	Channel 31	908.5 MHz
Channel 32	908.7 MHz	Channel 33	908.9 MHz	Channel 34	909.1 MHz	Channel 35	909.3 MHz
Channel 36	909.5 MHz	Channel 37	909.7 MHz	Channel 38	909.9 MHz	Channel 39	910.1 MHz
Channel 40	910.3 MHz	Channel 41	910.5 MHz	Channel 42	910.7 MHz	Channel 43	910.9 MHz
Channel 44	911.1 MHz	Channel 45	911.3 MHz	Channel 46	911.5 MHz	Channel 47	911.7 MHz
Channel 48	911.9 MHz	Channel 49	912.1 MHz	Channel 50	912.3 MHz	Channel 51	912.5 MHz
Channel 52	912.7 MHz	Channel 53	912.9 MHz	Channel 54	913.1 MHz	Channel 55	913.3 MHz
Channel 56	913.5 MHz	Channel 57	913.7 MHz	Channel 58	913.9 MHz	Channel 59	914.1 MHz
Channel 60	914.3 MHz	Channel 61	914.5 MHz	Channel 62	914.7 MHz	Channel 63	914.9 MHz

500KHz

Channel 64	903.0MHz	Channel 65	904.6MHz	Channel 66	906.2MHz	Channel 67	907.8MHz
Channel 68	909.4MHz	Channel 69	911.0MHz	Channel 70	912.6MHz	Channel 71	914.2MHz

### 4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	ThinkPad X100e	/
Serial port adapter plate	/	Test Plate 3	/
SSCOM	/	/	/



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#### 4.4 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$8.4 \times 10^{-8}$
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
<b>Conducted Emission at Mains Terminals (150kHz-30MHz)</b>						
1	EMI Test Receive	R&S	ESCI	100781	02/01/2021	01/31/2022
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	02/01/2021	01/31/2022
5	CE test Cable	Thermax	/	14	10/16/2021	10/15/2022
6	Test Software	Farad	EZ-EMC	CCS-03A1	N.C.R	N.C.R
<b>RF Conducted Test</b>						
1	Spectrum Analyzer	Agilent	E4446A	MY44020154	04/16/2021	04/15/2022
2	Spectrum Analyzer	Keysight	N9020A	MY55370209	10/11/2021	10/10/2022
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	10/12/2021	10/11/2022
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	10/12/2021	10/11/2022
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	AISI	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	10/14/2021	10/13/2022
<b>RF Radiated Test</b>						
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	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	10/18/2021	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
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

Limit:

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.

#### 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.

EUT Antenna:

The antenna is Spiral Antenna and no consideration of replacement. The gain of the antenna is 3dBi.

Antenna location: Refer to Appendix (Internal Photos)



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## 7 Radio Spectrum Matter Test Results

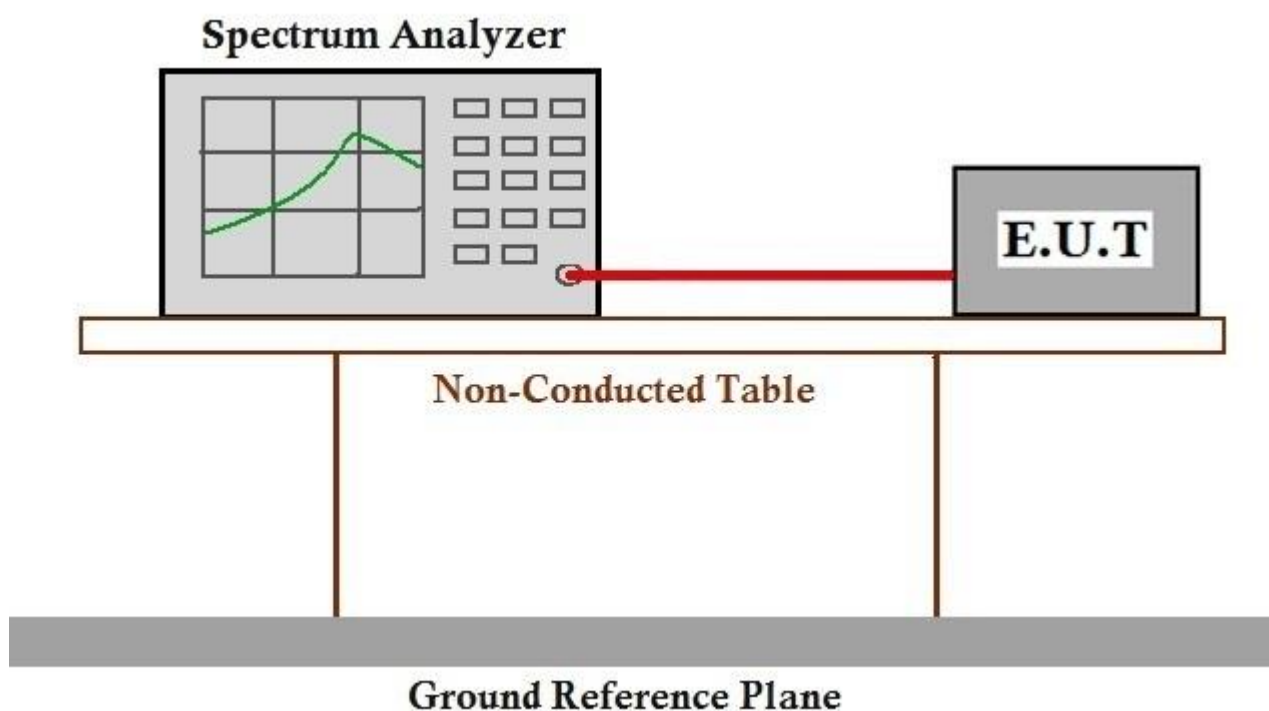
### 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215  
 Test Method: ANSI C63.10 (2013) Section 6.9  
 Limit: N/A

#### 7.1.1 E.U.T. Operation

Operating Environment:  
 Temperature: 25 °C Humidity: 49 % RH Atmospheric Pressure: 1006 mbar  
 Test mode a:TX mode\_Keep the EUT in continuously transmitting mode with FSK modulation

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data

Frequency (MHz)	Bandwidth (kHz)	Result
902.3(125KHz)	139.0	PASS
908.5(125KHz)	139.5	PASS
914.9(125kHz)	140.0	PASS
903.0(500KHz)	554.0	PASS
907.8(500KHz)	553.0	PASS
914.2(500KHz)	556.0	PASS



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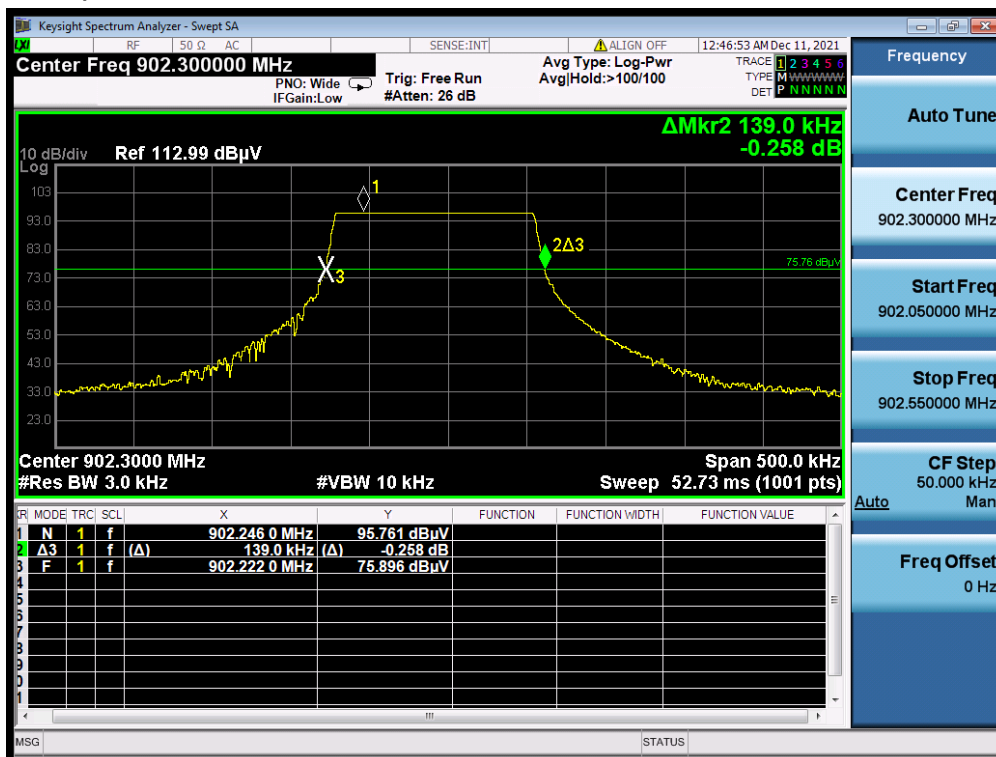
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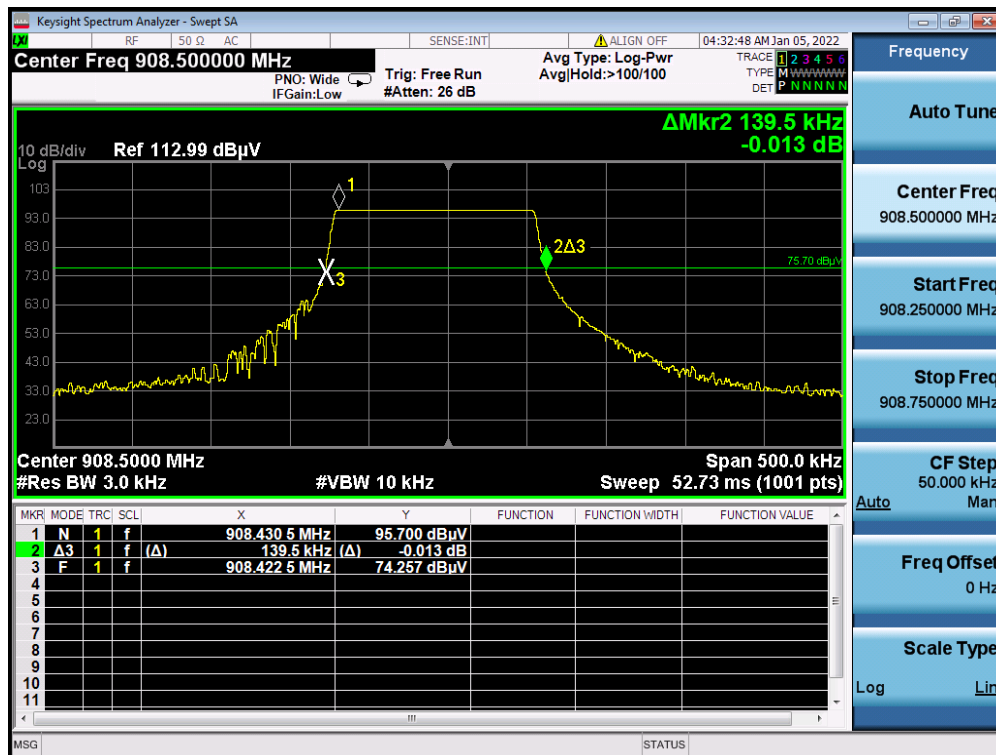
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### 902.3MHz(125KHz)



### 908.5MHz(125KHz)



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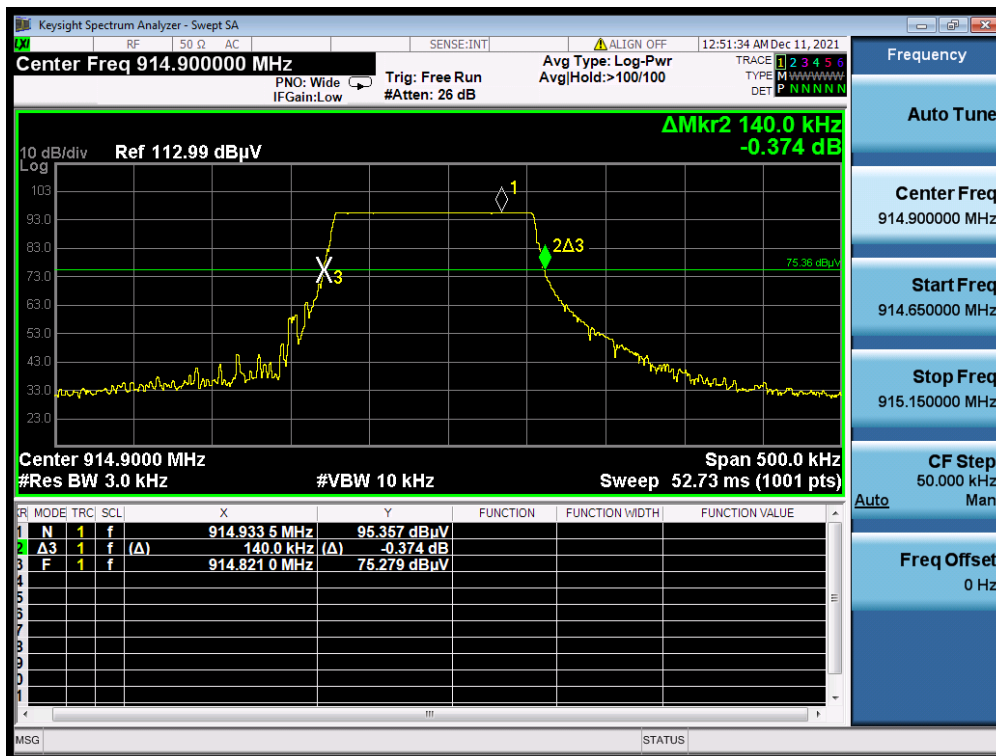
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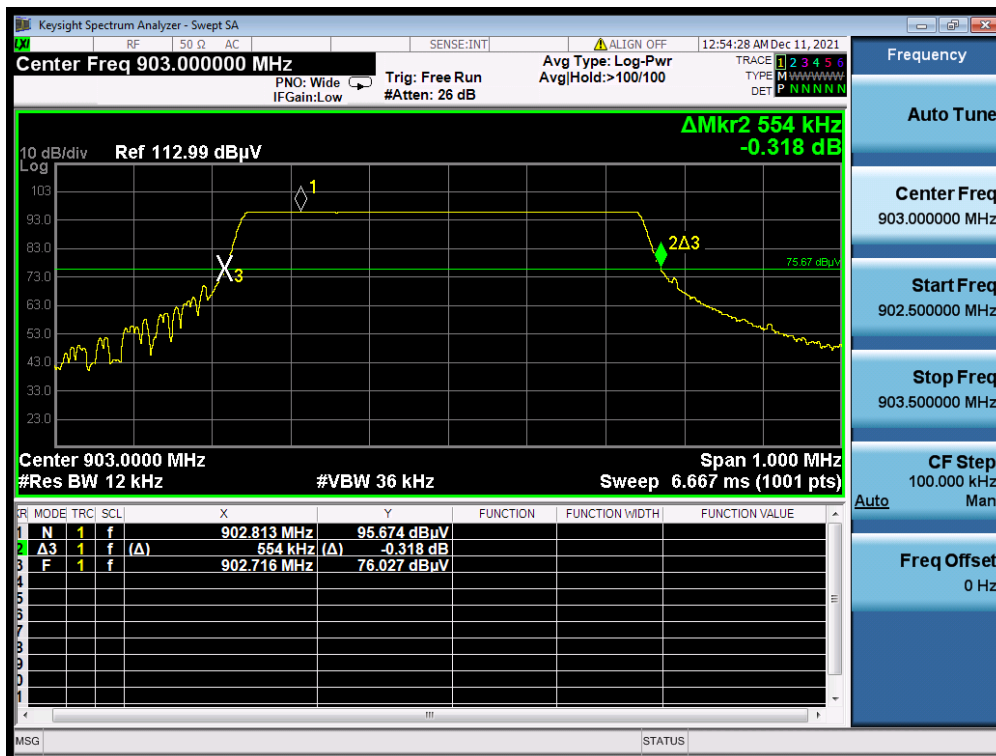
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### 914.9MHz(125kHz)



### 903.0MHz(500kHz)



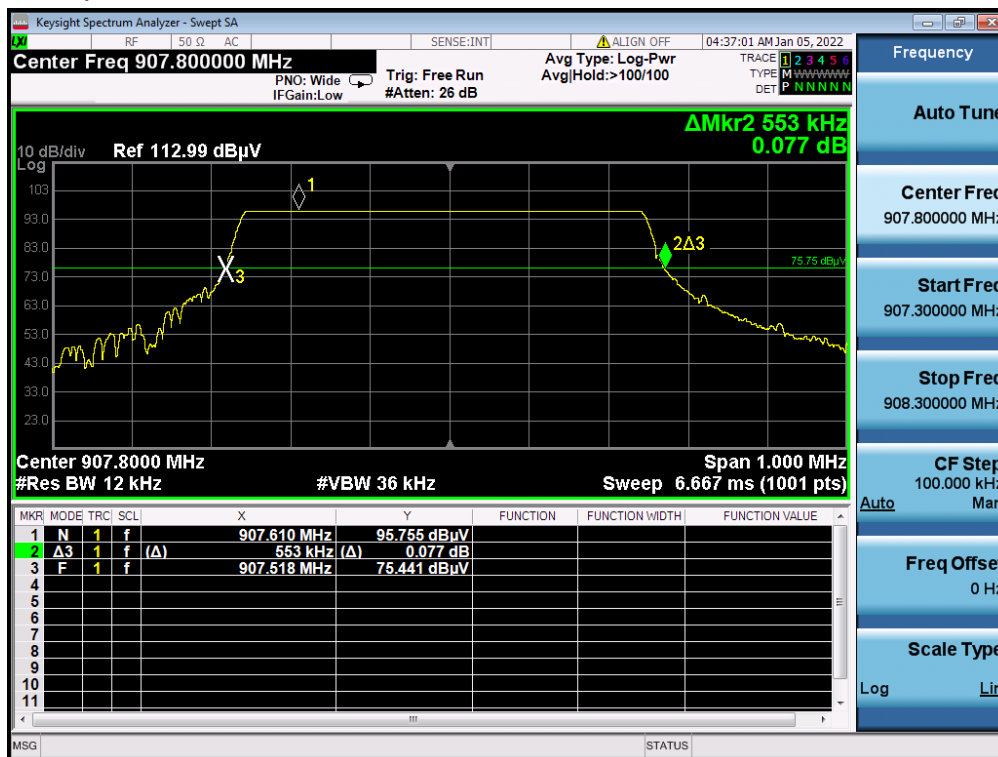
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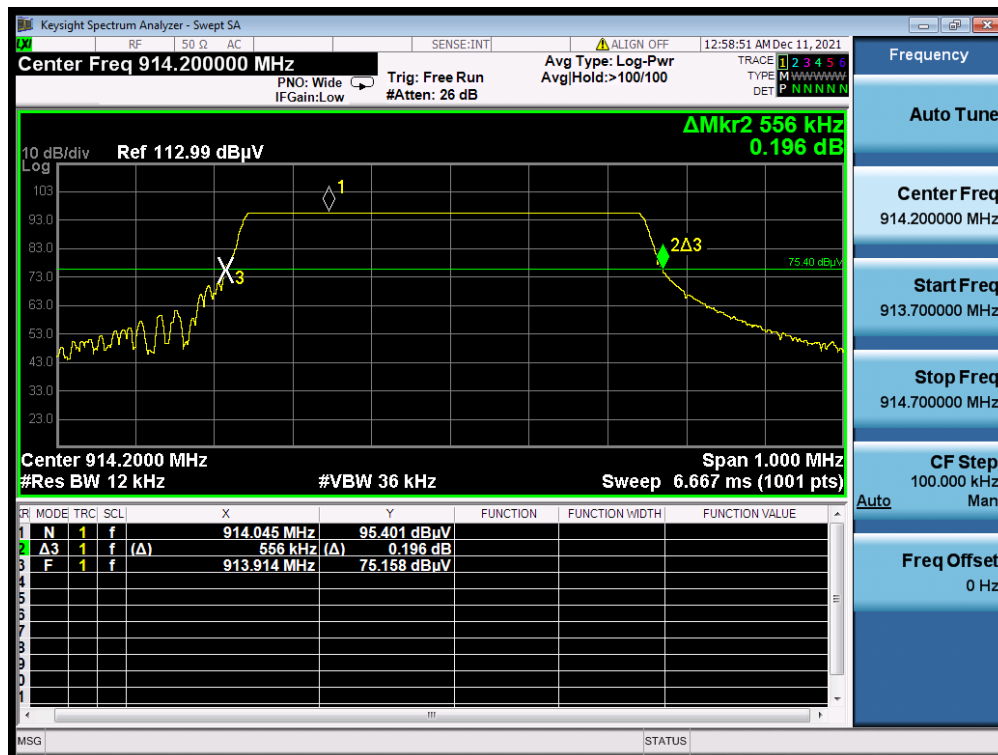
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907.8MHz(500KHz)



914.2MHz(500KHz)



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## 7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)

Test Method: ANSI C63.10 (2013) Section 6.5&6.6

Limit:

Fundamental frequency(MHz)	Field strength of fundamental(millivolts/meter)	Field strength of harmonics(microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Remark: The frequencies above 1000MHz 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 fundamental frequency in "902-928MHz", the field strength of fundamental is based on Quasi-Peak.



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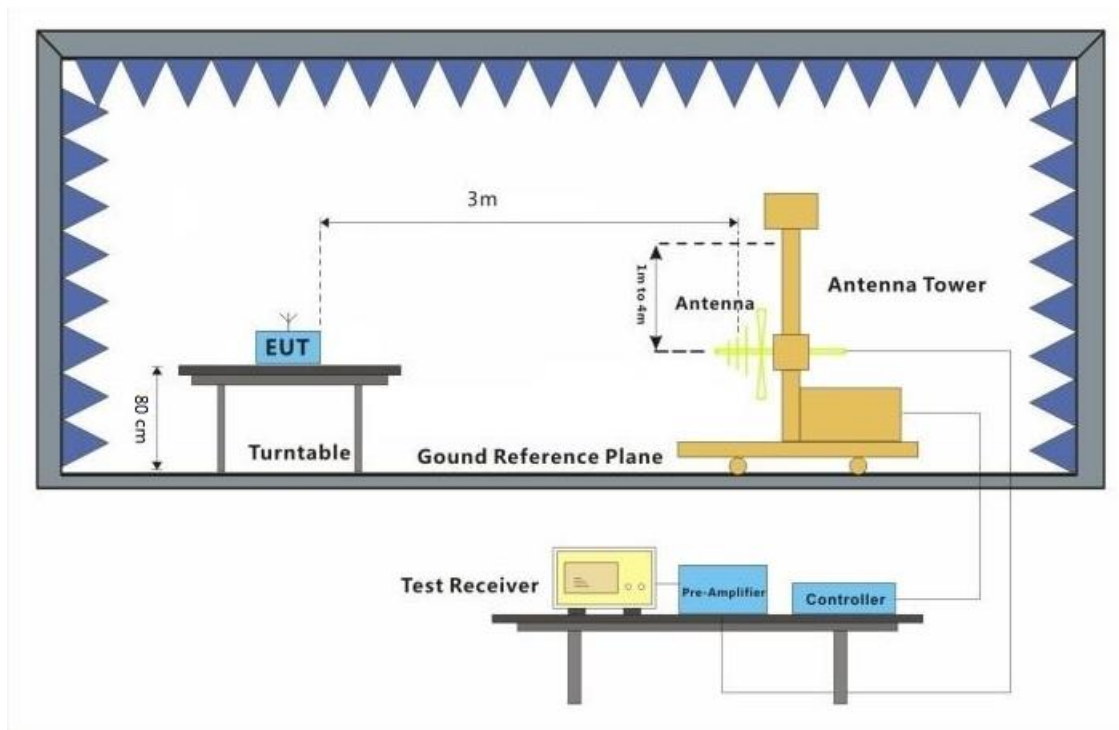
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 49 % RH Atmospheric Pressure: 1007 mbar

Test mode a:TX mode\_Keep the EUT in continuously transmitting mode with FSK modulation

### 7.2.2 Test Setup Diagram





### 7.2.3 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: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
902.3MHz(125KHz)	64.88	28.71	93.59	94.00	-0.41	QP	Horizontal
	58.00	28.71	86.71	94.00	-7.29	QP	Vertical
903.0MHz(500KHz)	62.63	28.70	91.33	94.00	-2.67	QP	Horizontal
	56.65	28.70	85.35	94.00	-8.65	QP	Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
908.5MHz(125KHz)	64.43	28.78	93.21	94.00	-0.79	QP	Horizontal
	57.41	28.78	86.19	94.00	-7.81	QP	Vertical
907.8MHz(500KHz)	65.15	28.78	93.93	94.00	-0.07	QP	Horizontal
	57.15	28.78	85.93	94.00	-8.07	QP	Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
914.9MHz(125KHz)	64.64	28.86	93.50	94.00	-0.50	QP	Horizontal
	56.81	28.86	85.67	94.00	-8.33	QP	Vertical
914.2MHz(500KHz)	64.66	28.85	93.51	94.00	-0.49	QP	Horizontal
	57.15	28.85	86.00	94.00	-8.00	QP	Vertical

Remark:

- 1) The basic equation with a sample calculation is as follows: Level = Read Level + Factor.
- 2) (The Factor is calculated by adding the Antenna Factor, Cable Loss and Preamplifier Factor)



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### 7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
Above 1GHz	74.0	Peak Value

Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.



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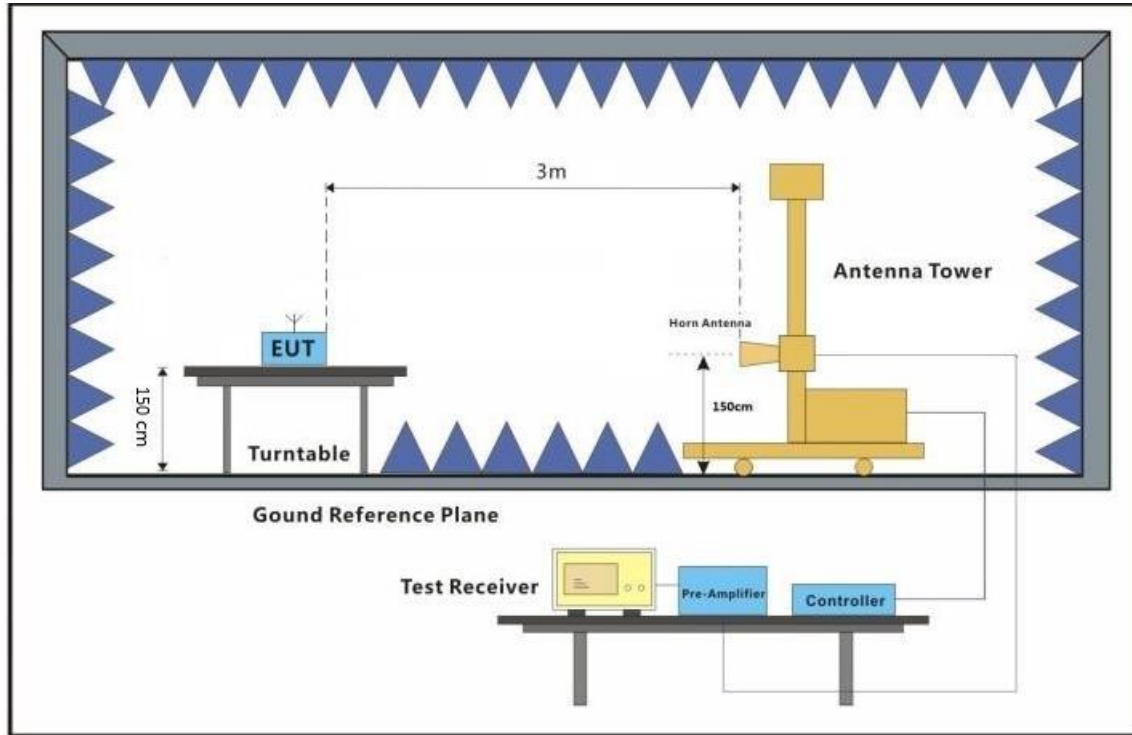
### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 49 % RH Atmospheric Pressure: 1007 mbar

Test mode a:TX mode\_Keep the EUT in continuously transmitting mode with FSK modulation

### 7.3.2 Test Setup Diagram





### 7.3.3 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: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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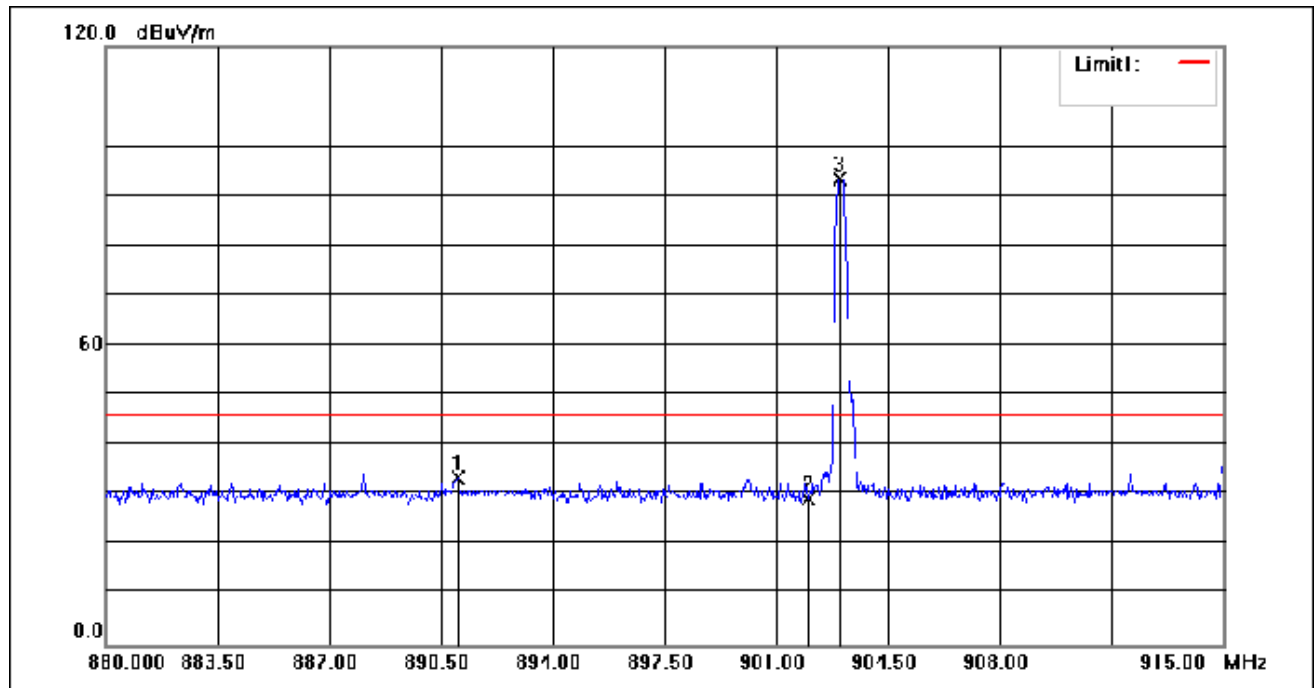
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902.3MHz(125KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	891.0250	4.80	28.56	33.36	46.00	-12.64	QP
2	902.0000	0.42	28.70	29.12	46.00	-16.88	QP
3	902.9950	64.88	28.71	93.59	46.00	47.59	QP



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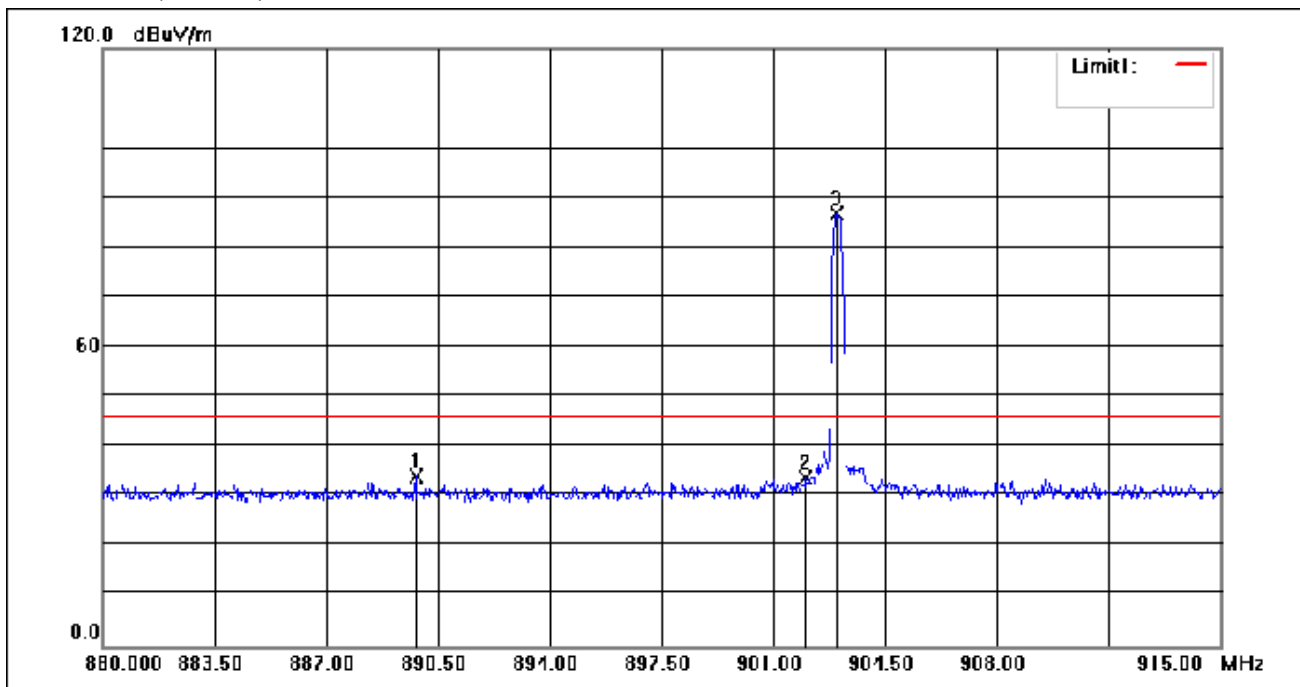
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902.3MHz(125KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	889.8000	5.52	28.55	34.07	46.00	-11.93	QP
2	902.0000	4.99	28.70	33.69	46.00	-12.31	QP
3	902.9600	58.00	28.71	86.71	46.00	40.71	QP



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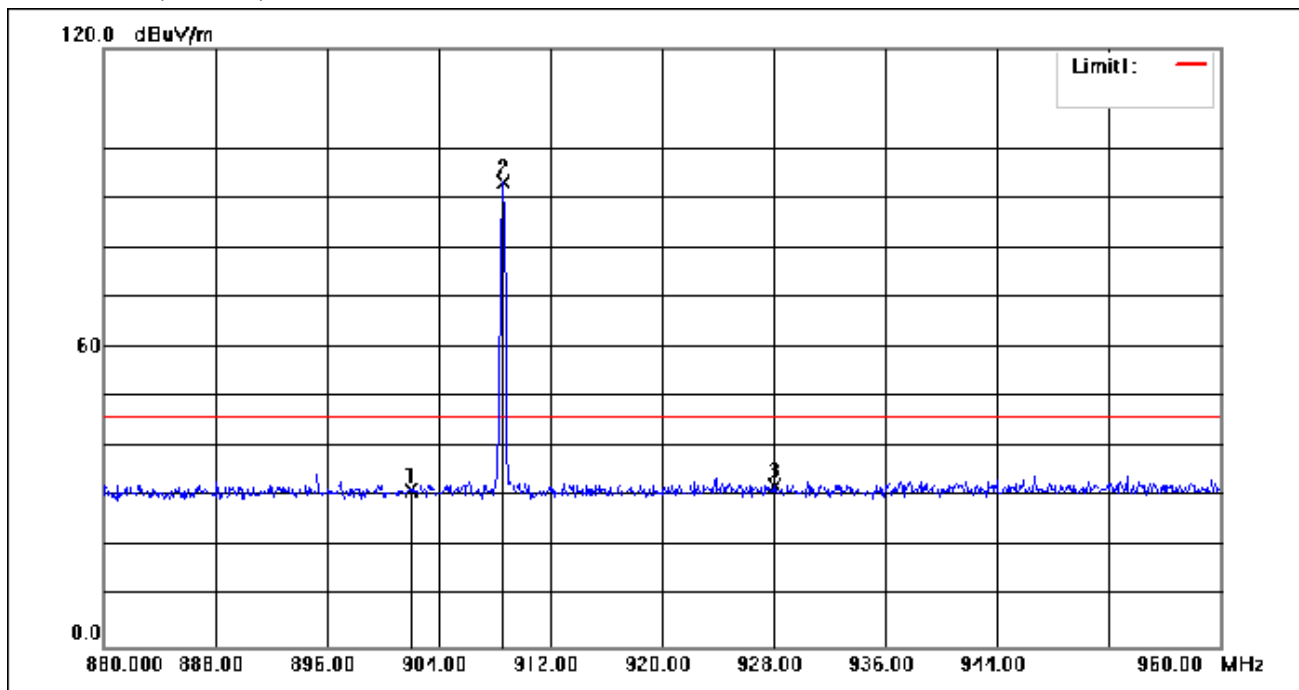
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908.5MHz(125KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	902.0000	2.71	28.70	31.41	46.00	-14.59	QP
2	908.5400	64.43	28.78	93.21	46.00	47.21	QP
3	928.0000	3.12	29.02	32.14	46.00	-13.86	QP



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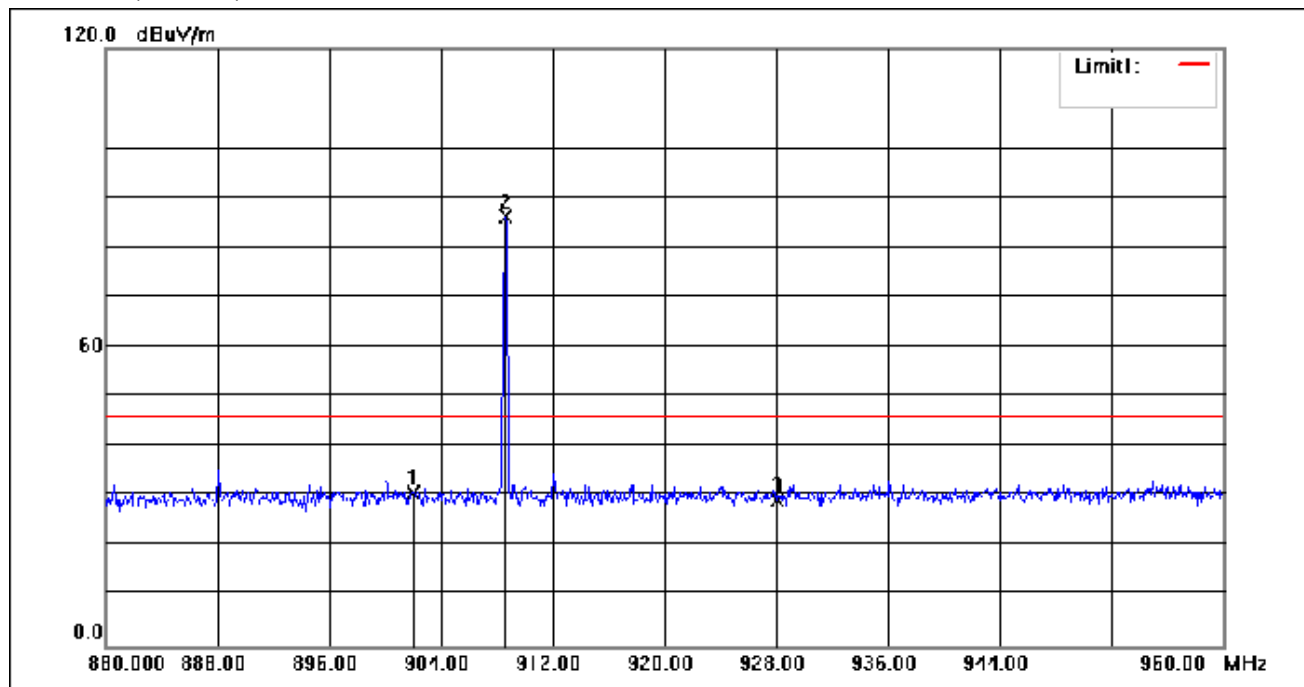
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908.5MHz(125KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	902.0000	1.95	28.70	30.65	46.00	-15.35	QP
2	908.5400	57.41	28.78	86.19	46.00	40.19	QP
3	928.0000	0.16	29.02	29.18	46.00	-16.82	QP



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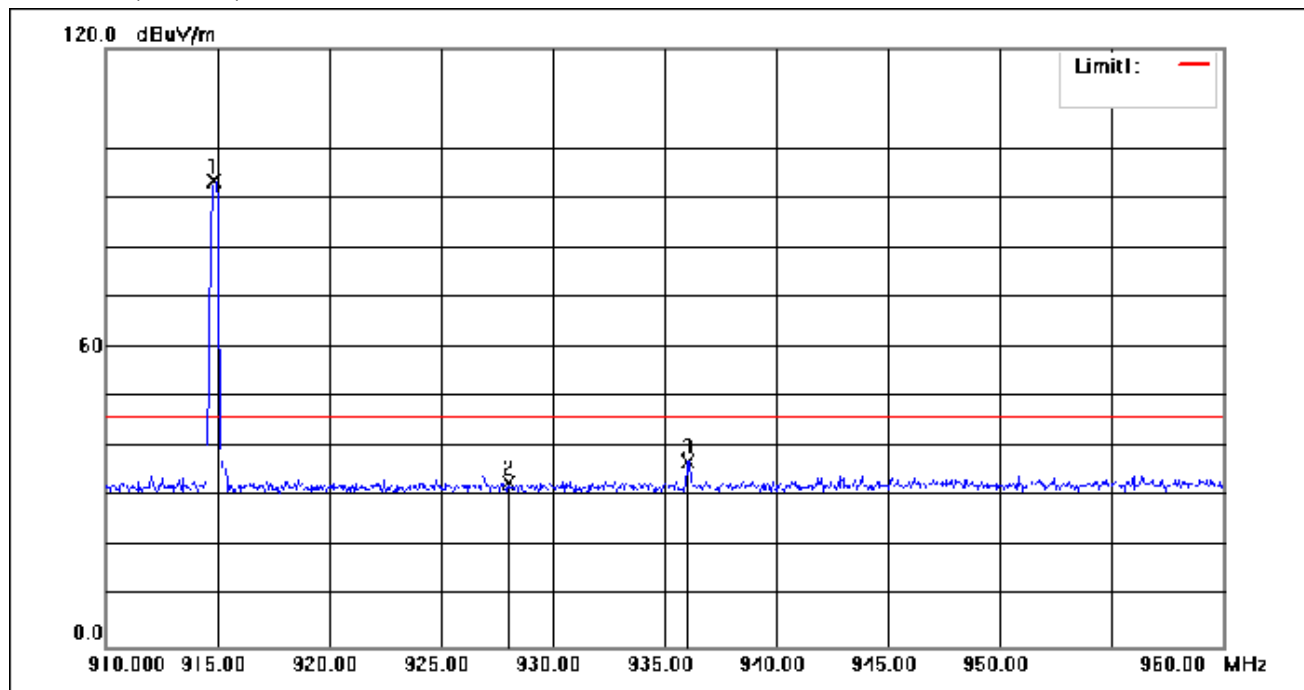
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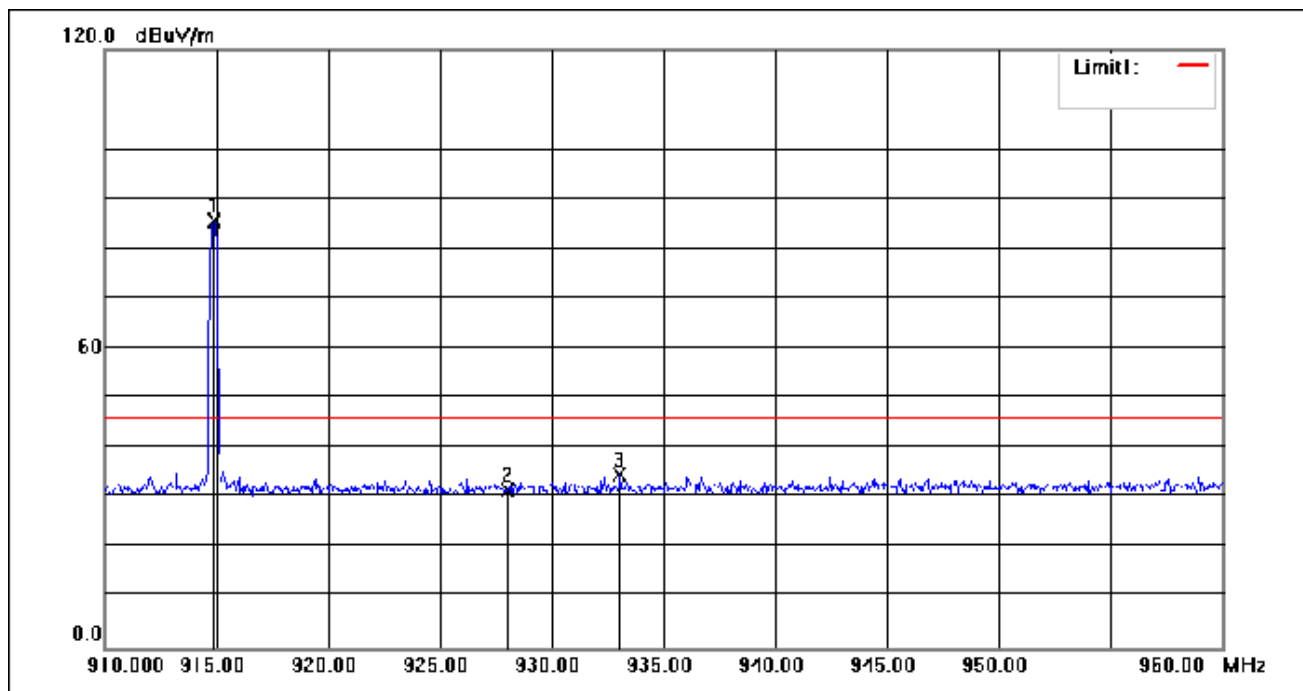
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914.9MHz(125KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	914.8500	64.64	28.86	93.50	46.00	47.50	QP
2	928.0000	3.68	29.02	32.70	46.00	-13.30	QP
3	936.0500	8.04	29.12	37.16	46.00	-8.84	QP

914.9MHz(125KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	914.9000	56.81	28.86	85.67	46.00	39.67	QP
2	928.0000	2.71	29.02	31.73	46.00	-14.27	QP
3	933.0500	5.44	29.09	34.53	46.00	-11.47	QP



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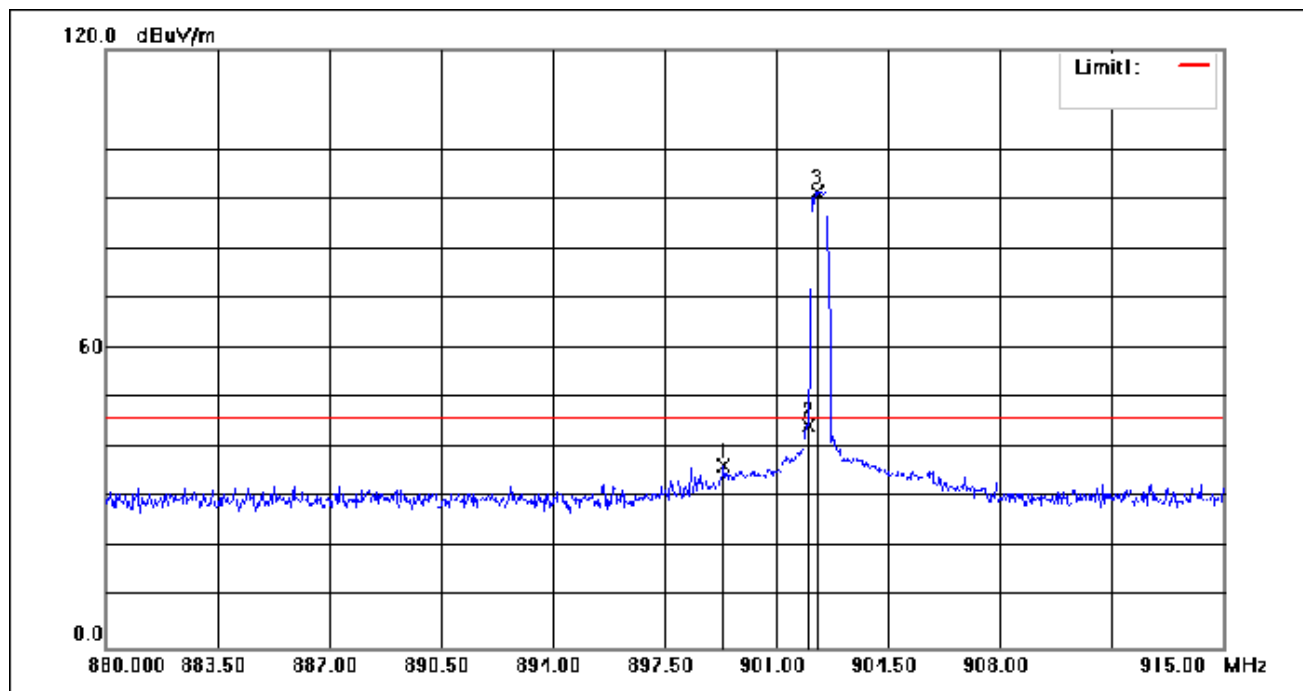
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903MHz(500KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	899.3550	7.78	28.66	36.44	46.00	-9.56	QP
2	902.0000	15.79	28.70	44.49	46.00	-1.51	QP
3	902.2950	62.63	28.70	91.33	46.00	45.33	QP



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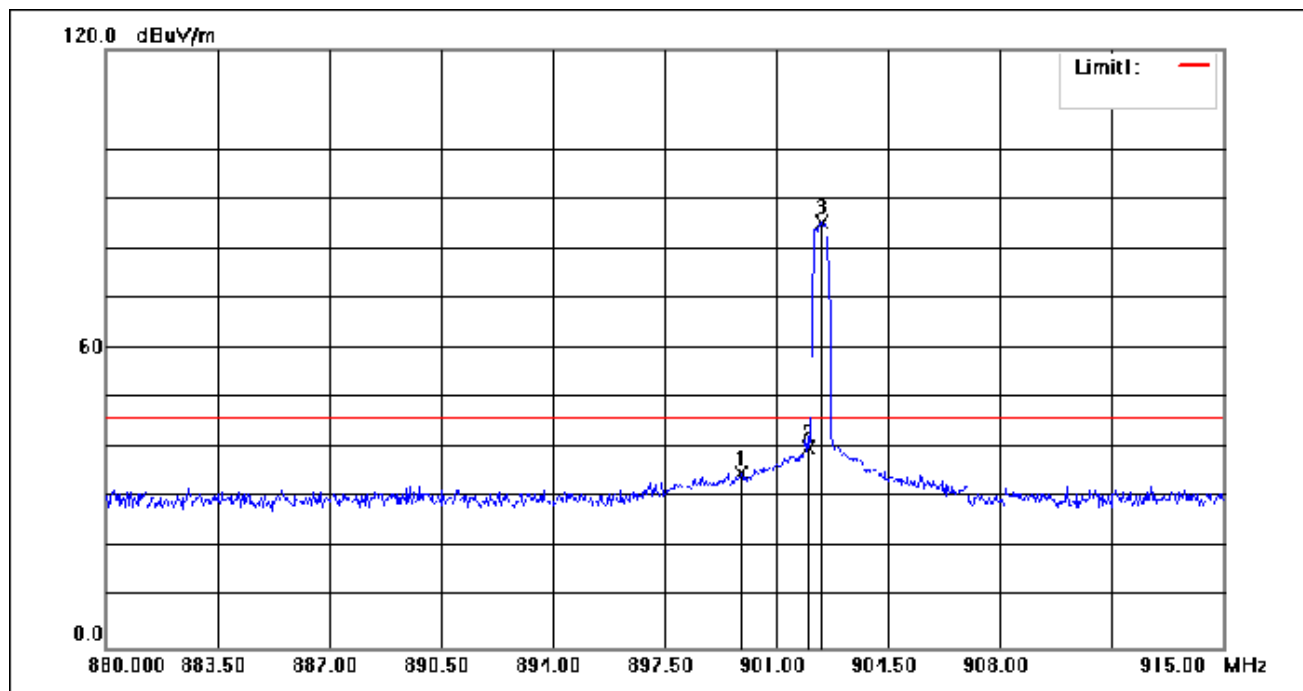
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903MHz(500KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	899.9150	6.30	28.67	34.97	46.00	-11.03	QP
2	902.0000	11.24	28.70	39.94	46.00	-6.06	QP
3	902.4000	56.65	28.70	85.35	46.00	39.35	QP



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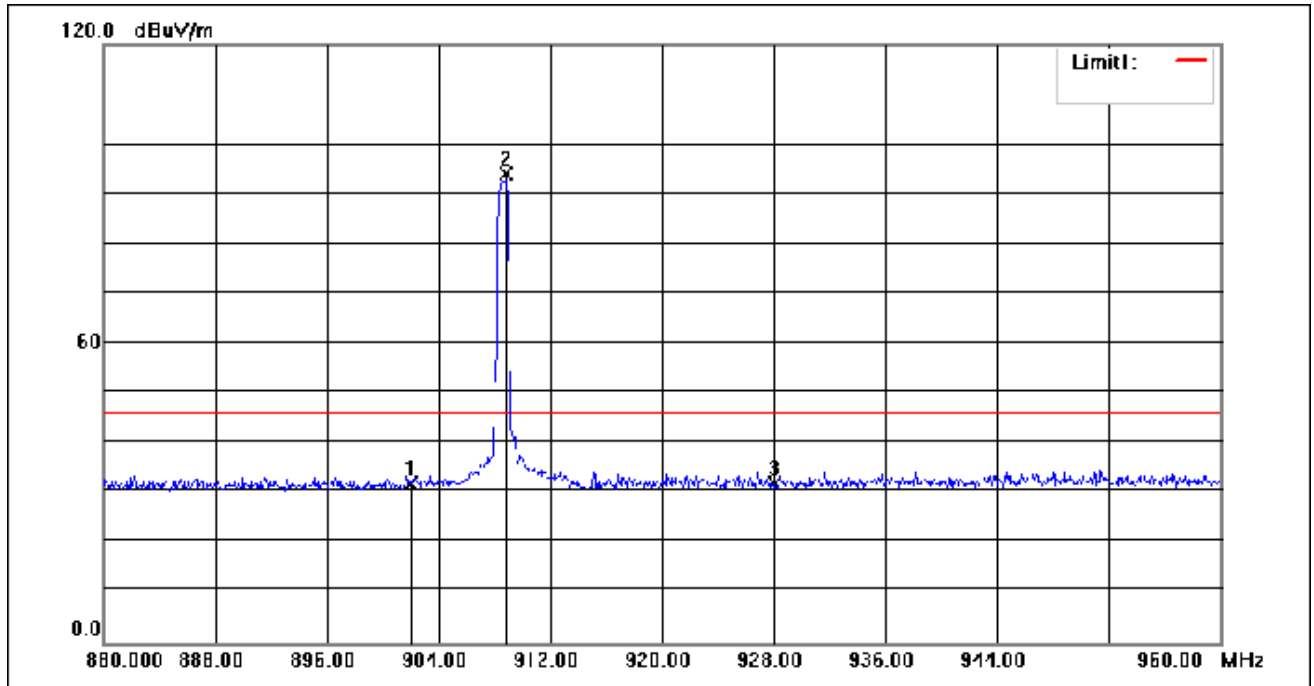
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907.8MHz(500KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	902.0000	3.19	28.70	31.89	46.00	-14.11	QP
2	907.8800	65.15	28.78	93.93	46.00	47.93	QP
3	928.0000	2.86	29.02	31.88	46.00	-14.12	QP



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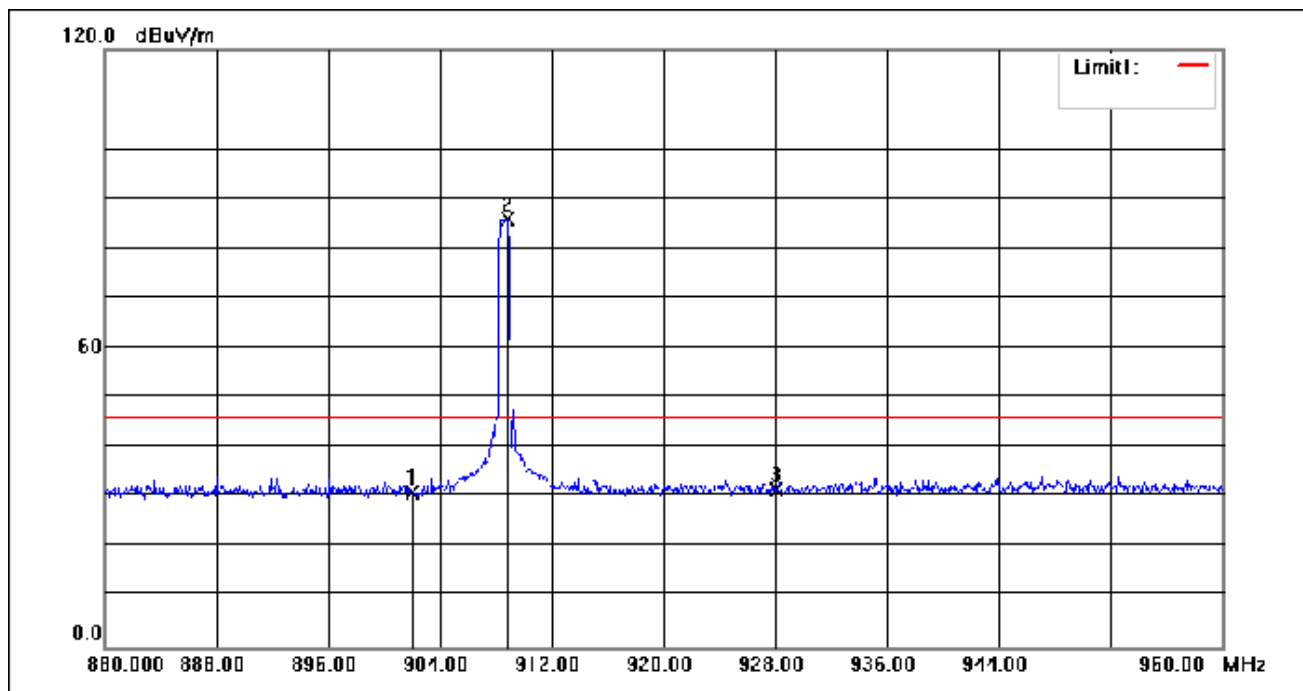
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907.8MHz(500KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	902.0000	2.48	28.70	31.18	46.00	-14.82	QP
2	907.8000	57.15	28.78	85.93	46.00	39.93	QP
3	928.0000	2.63	29.02	31.65	46.00	-14.35	QP



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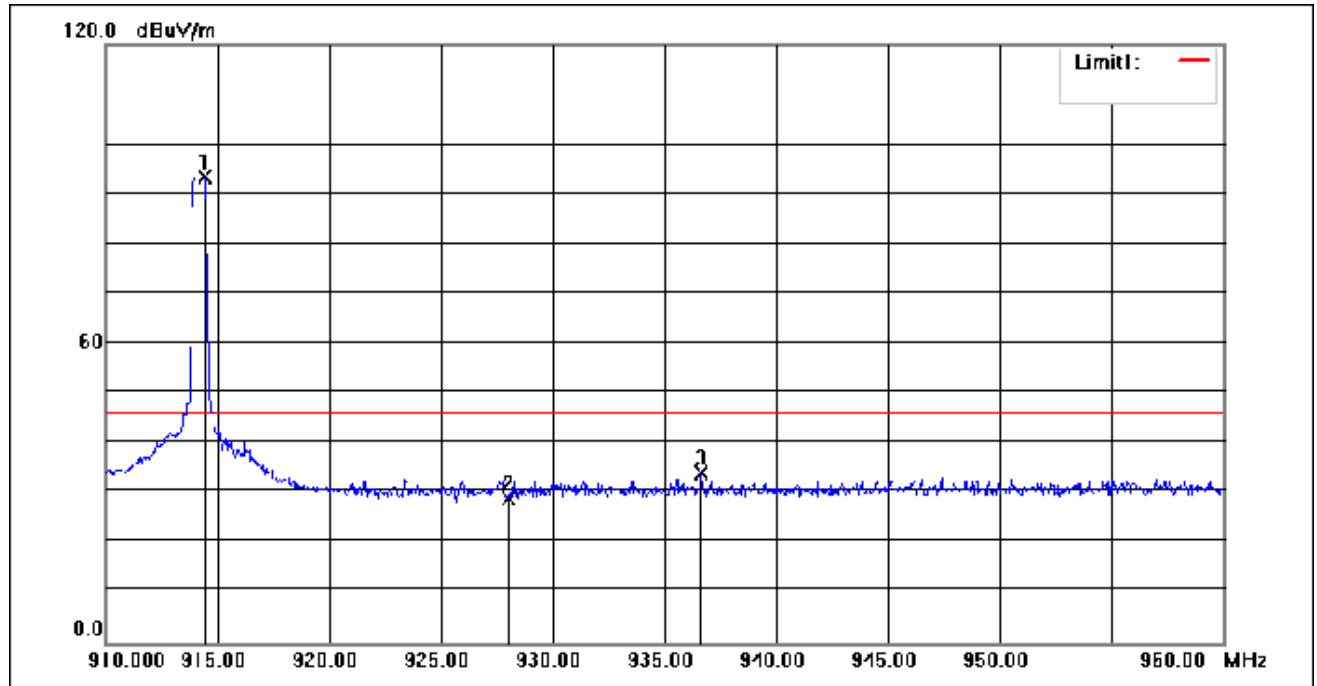
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914.2MHz(500KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	914.4000	64.66	28.85	93.51	46.00	47.51	QP
2	928.0000	-0.08	29.02	28.94	46.00	-17.06	QP
3	936.6000	5.00	29.13	34.13	46.00	-11.87	QP



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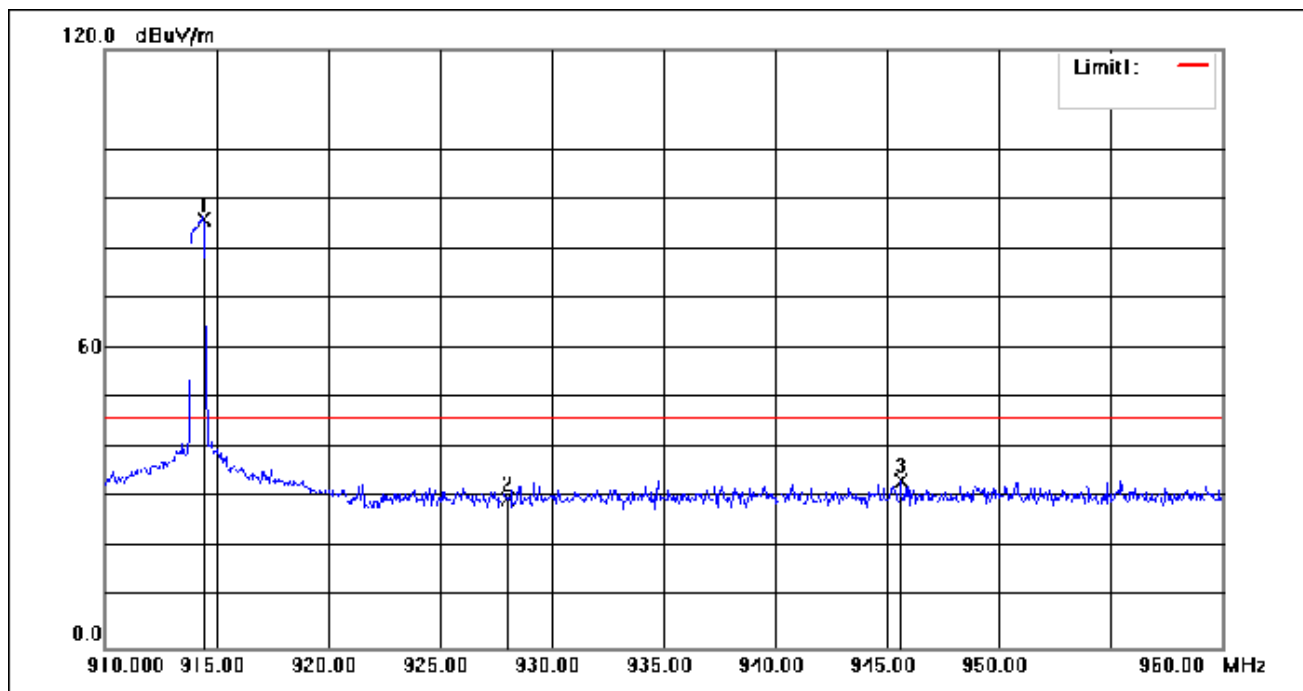
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914.2MHz(500KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	914.4000	57.15	28.85	86.00	46.00	40.00	QP
2	928.0000	0.71	29.02	29.73	46.00	-16.27	QP
3	945.6000	4.22	29.24	33.46	46.00	-12.54	QP



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## 7.4 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 &amp; 15.249 (a),(d)

Test Method: ANSI C63.10 (2013) Section 6.4&amp;6.5&amp;6.6

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 49 % RH Atmospheric Pressure: 1007 mbar

Test mode a:TX mode\_Keep the EUT in continuously transmitting mode with FSK modulation



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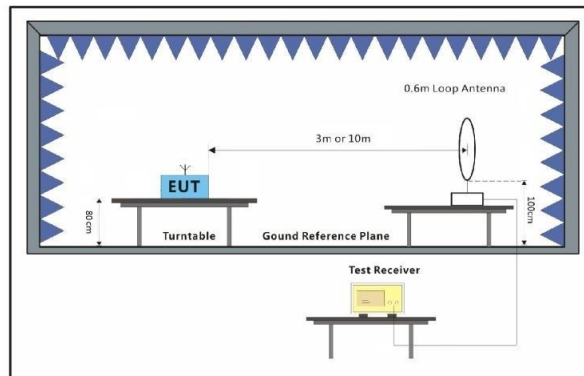
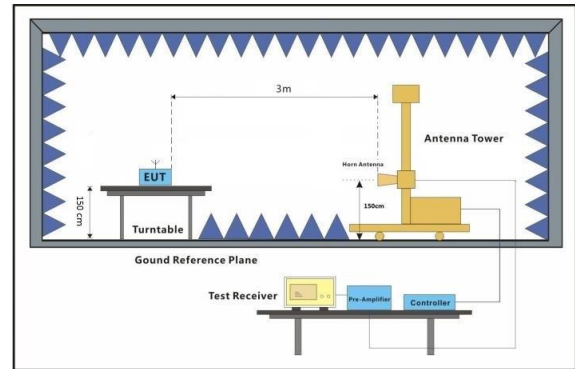
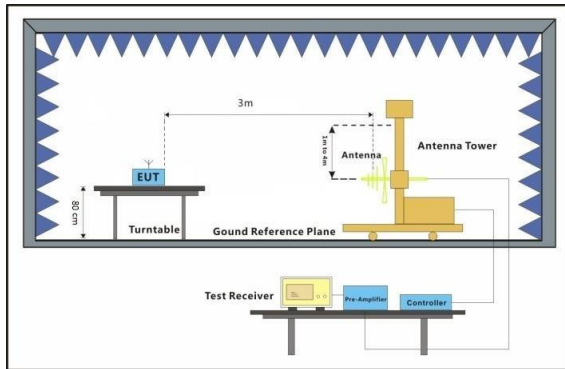
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#### 7.4.2 Test Setup Diagram



#### 7.4.3 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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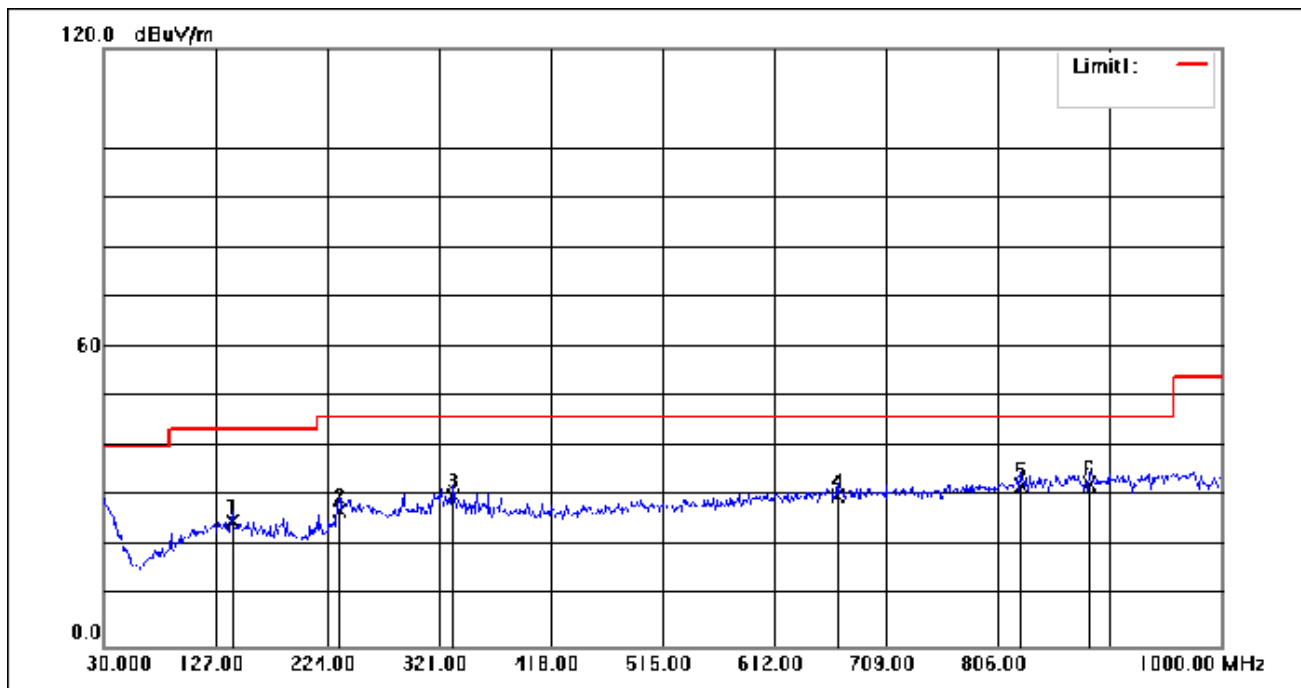
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30MHz-1GHz:

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	141.5500	5.11	19.86	24.97	43.50	-18.53	QP
2	234.6700	8.65	18.38	27.03	46.00	-18.97	QP
3	333.6100	8.30	21.80	30.10	46.00	-15.90	QP
4	666.3200	2.81	27.24	30.05	46.00	-15.95	QP
5	825.4000	4.22	27.96	32.18	46.00	-13.82	QP
6	885.5400	4.01	28.50	32.51	46.00	-13.49	QP



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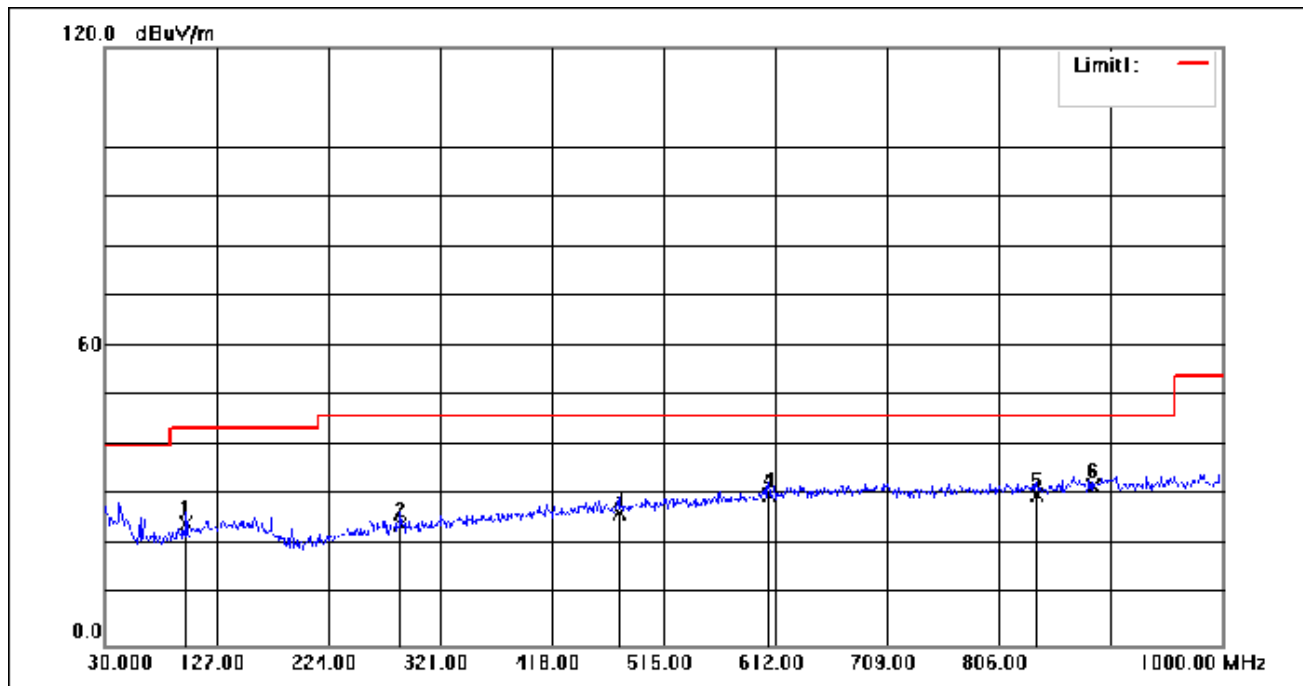
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Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	100.8100	5.99	18.54	24.53	43.50	-18.97	QP
2	287.0500	3.88	20.28	24.16	46.00	-21.84	QP
3	476.2000	1.79	24.80	26.59	46.00	-19.41	QP
4	606.1800	3.49	26.58	30.07	46.00	-15.93	QP
5	838.9800	2.22	28.02	30.24	46.00	-15.76	QP
6	887.4800	3.36	28.52	31.88	46.00	-14.12	QP



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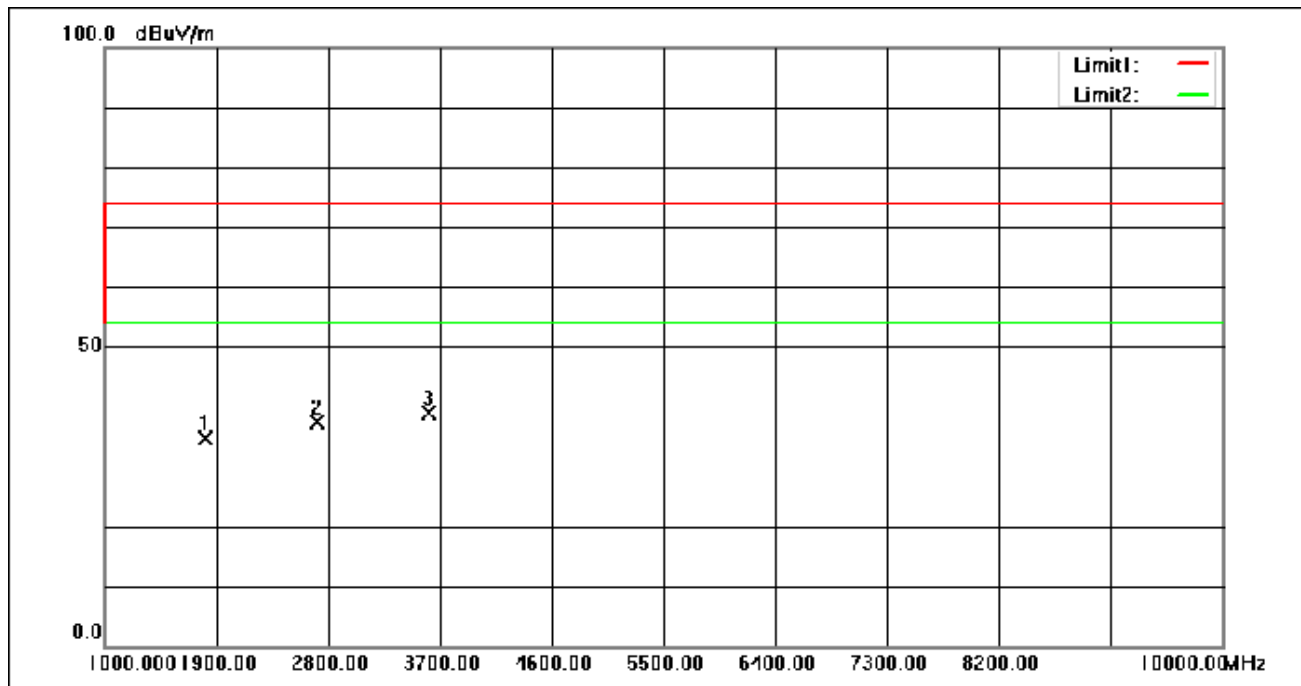
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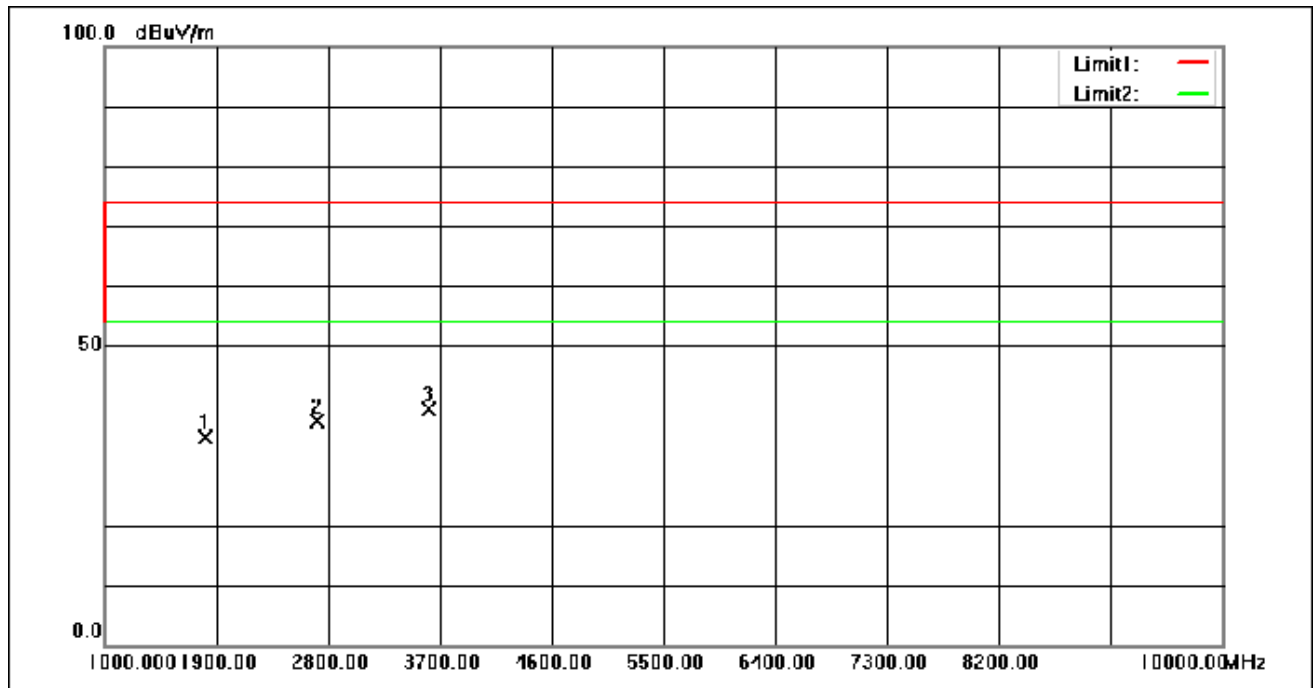
Above 1GHz:

902.3MHz(125KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1804.600	47.42	-12.84	34.58	74.00	-39.42	peak
2	2706.900	46.92	-9.46	37.46	74.00	-36.54	peak
3	3609.200	46.77	-7.77	39.00	74.00	-35.00	peak

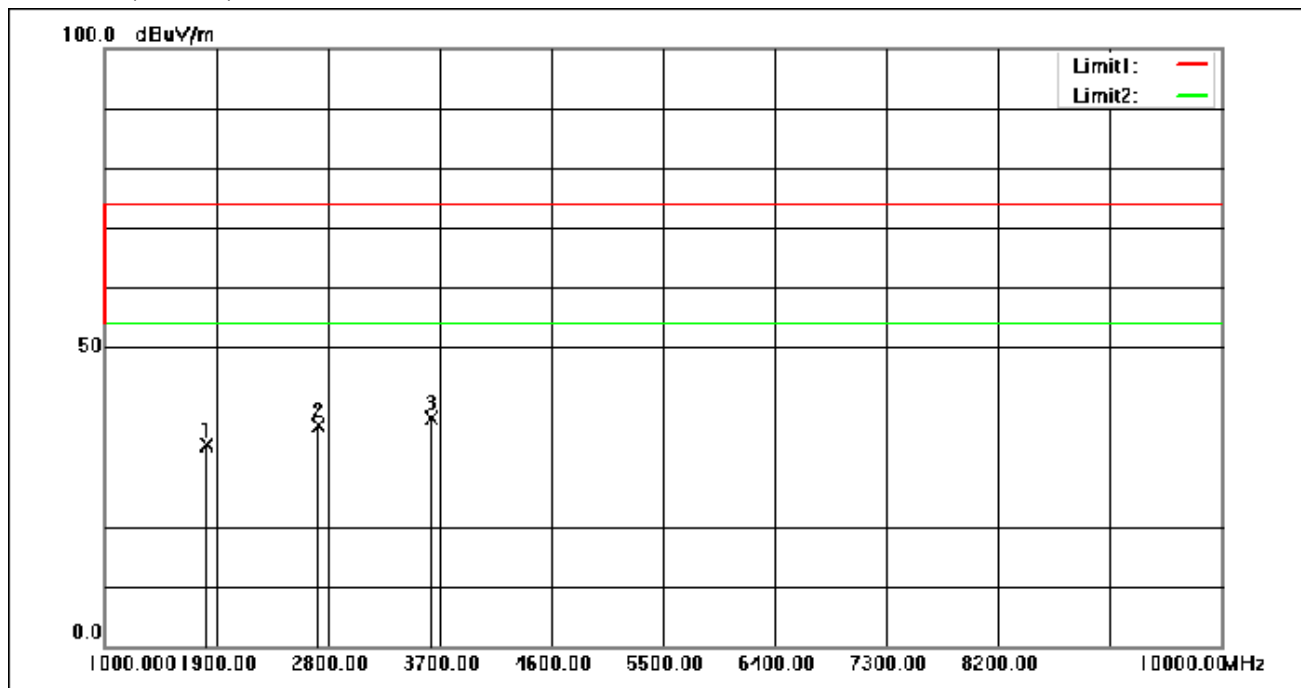
## 902.3MHz(125KHz) Vertical



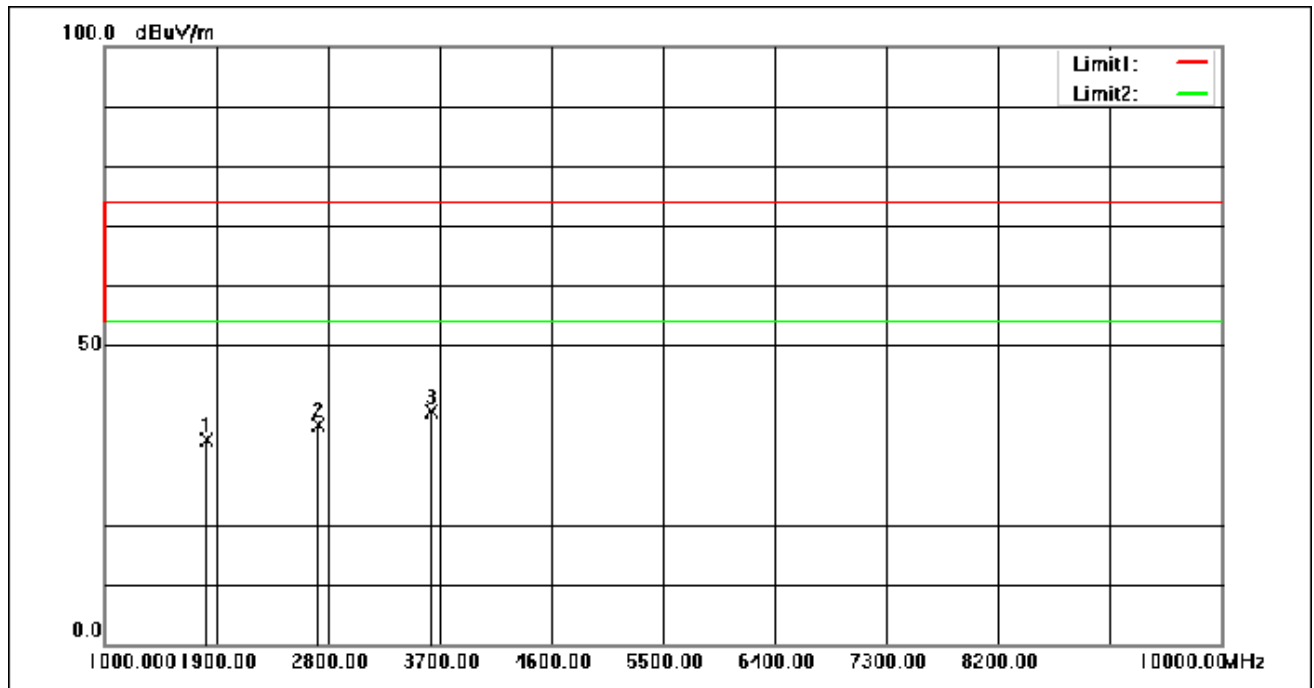
No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1804.600	47.40	-12.84	34.56	74.00	-39.44	peak
2	2706.900	46.80	-9.46	37.34	74.00	-36.66	peak
3	3609.200	47.20	-7.77	39.43	74.00	-34.57	peak



908.5MHz(125kHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1817.000	46.47	-12.82	33.65	74.00	-40.35	peak
2	2725.500	46.31	-9.41	36.90	74.00	-37.10	peak
3	3634.000	45.72	-7.66	38.06	74.00	-35.94	peak

**908.5MHz(125kHz) Vertical**


No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1817.000	46.91	-12.82	34.09	74.00	-39.91	peak
2	2725.500	46.07	-9.41	36.66	74.00	-37.34	peak
3	3634.000	46.50	-7.66	38.84	74.00	-35.16	peak



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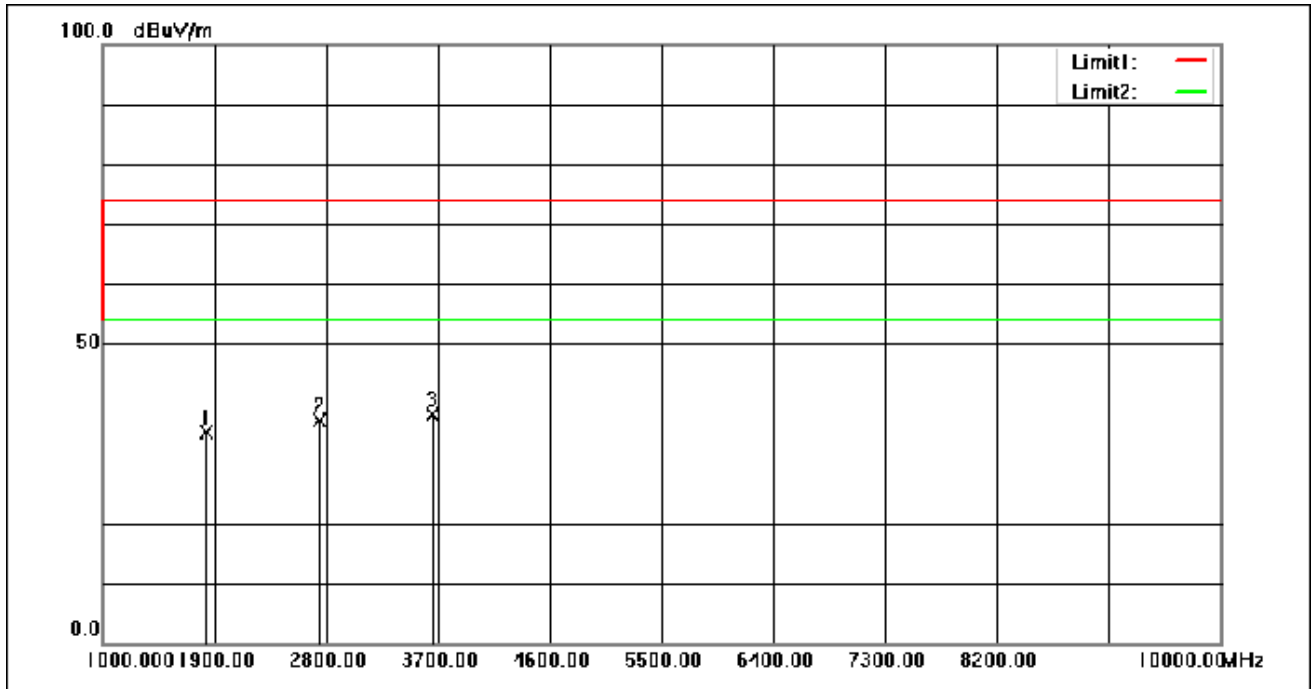
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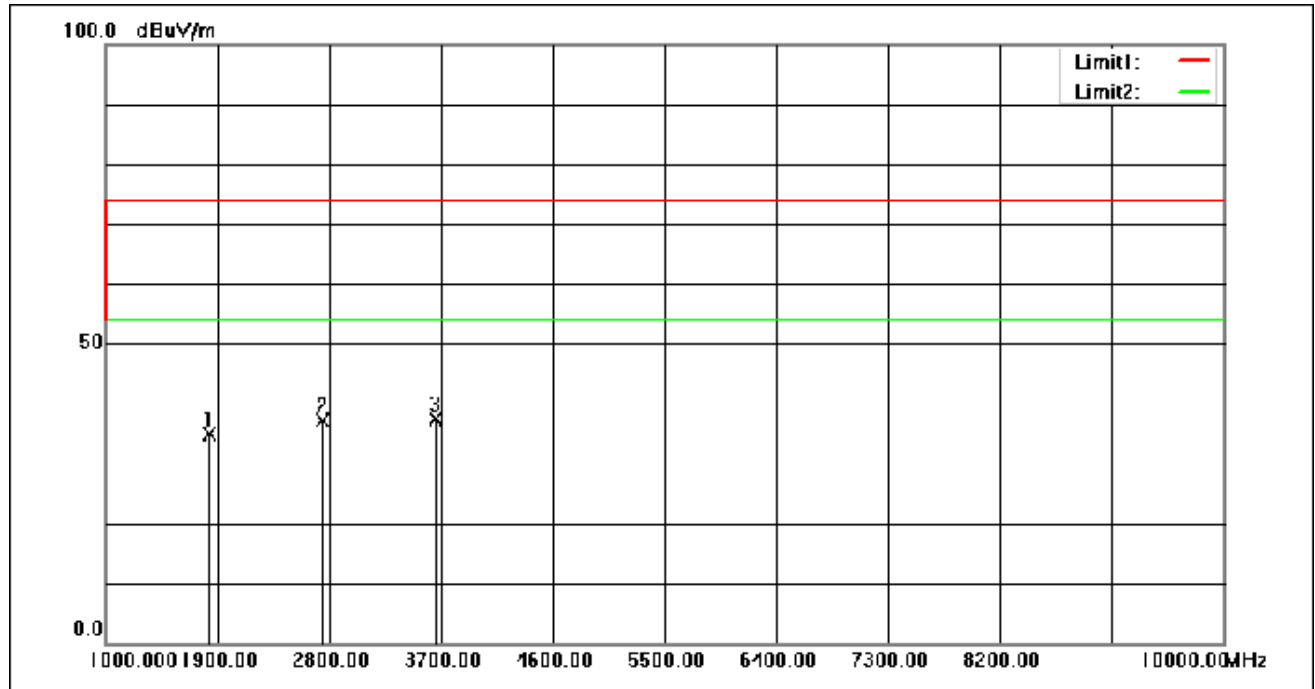
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914.9MHz(125KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1829.800	48.02	-12.79	35.23	74.00	-38.77	peak
2	2744.700	46.57	-9.36	37.21	74.00	-36.79	peak
3	3659.600	45.57	-7.55	38.02	74.00	-35.98	peak

914.9MHz(125KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1829.800	47.56	-12.79	34.77	74.00	-39.23	peak
2	2744.700	46.39	-9.36	37.03	74.00	-36.97	peak
3	3659.600	44.95	-7.55	37.40	74.00	-36.60	peak



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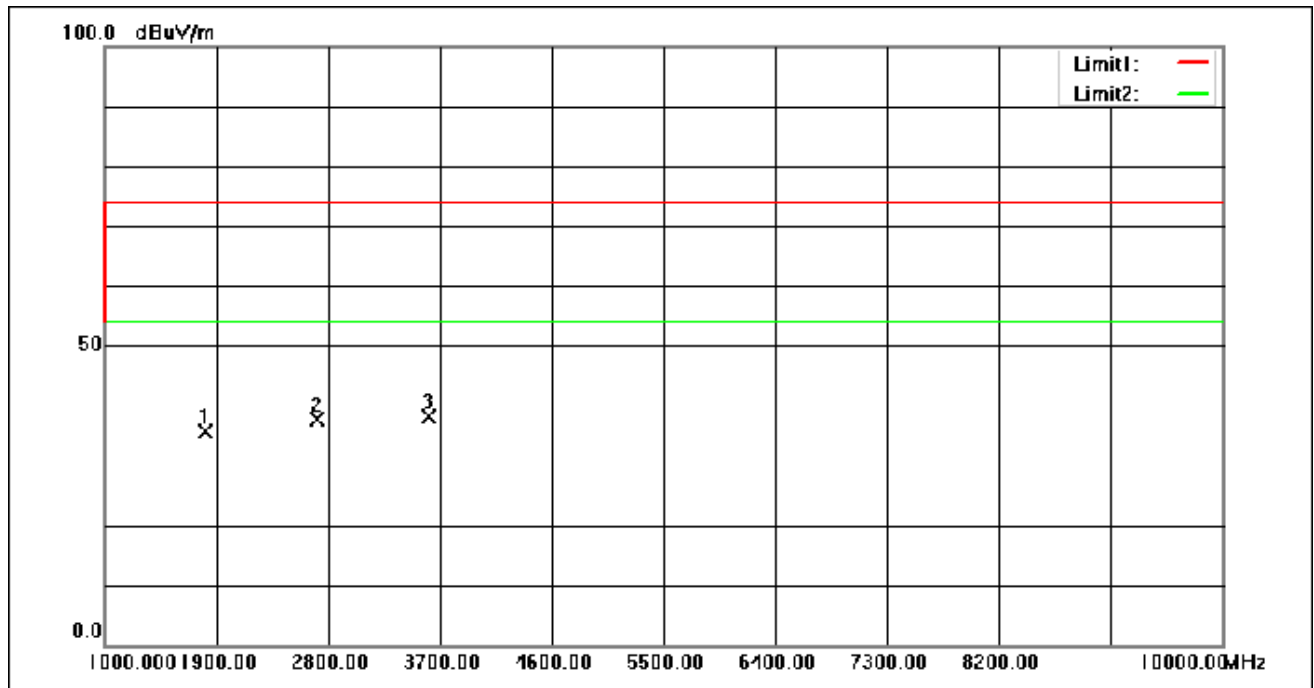
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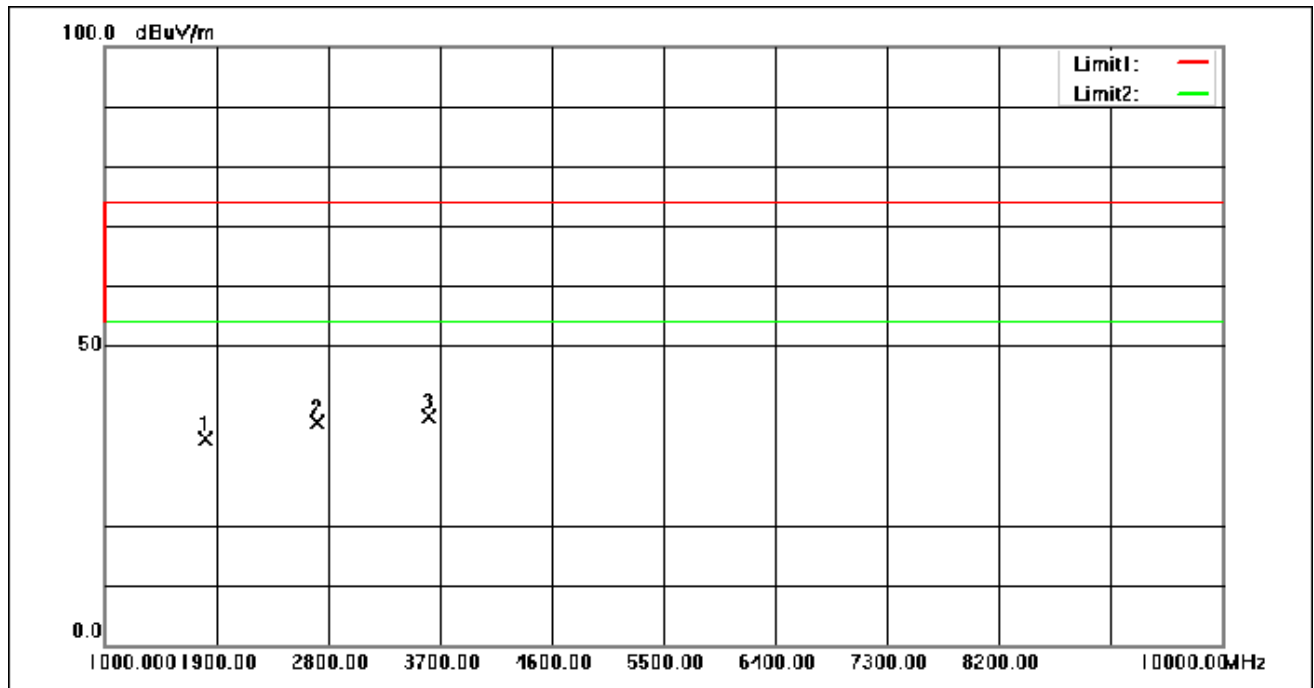
## 903MHz(500KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1806.000	48.48	-12.84	35.64	74.00	-38.36	peak
2	2709.000	47.19	-9.46	37.73	74.00	-36.27	peak
3	3612.000	45.92	-7.76	38.16	74.00	-35.84	peak



## 903MHz(500KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1806.000	47.21	-12.84	34.37	74.00	-39.63	peak
2	2709.000	46.64	-9.46	37.18	74.00	-36.82	peak
3	3612.000	45.90	-7.76	38.14	74.00	-35.86	peak



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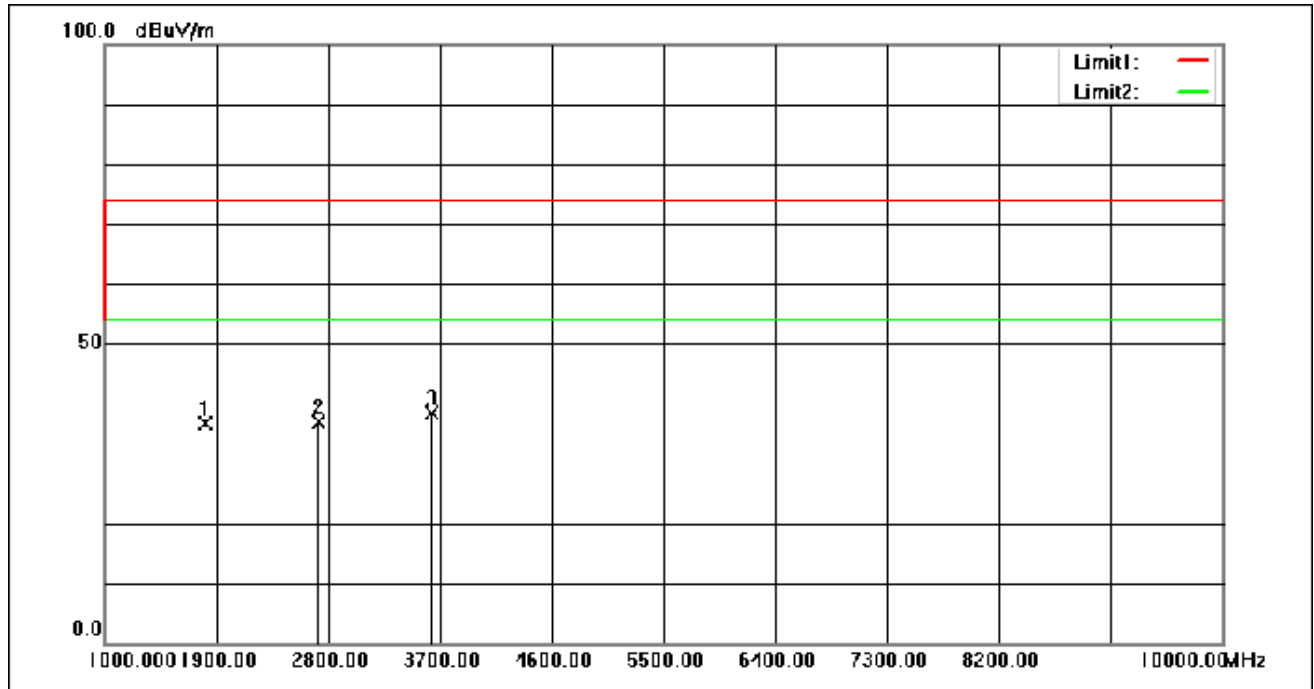
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907.8MHz(500KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1815.600	49.37	-12.82	36.55	74.00	-37.45	peak
2	2723.400	46.33	-9.42	36.91	74.00	-37.09	peak
3	3631.200	46.08	-7.68	38.40	74.00	-35.60	peak



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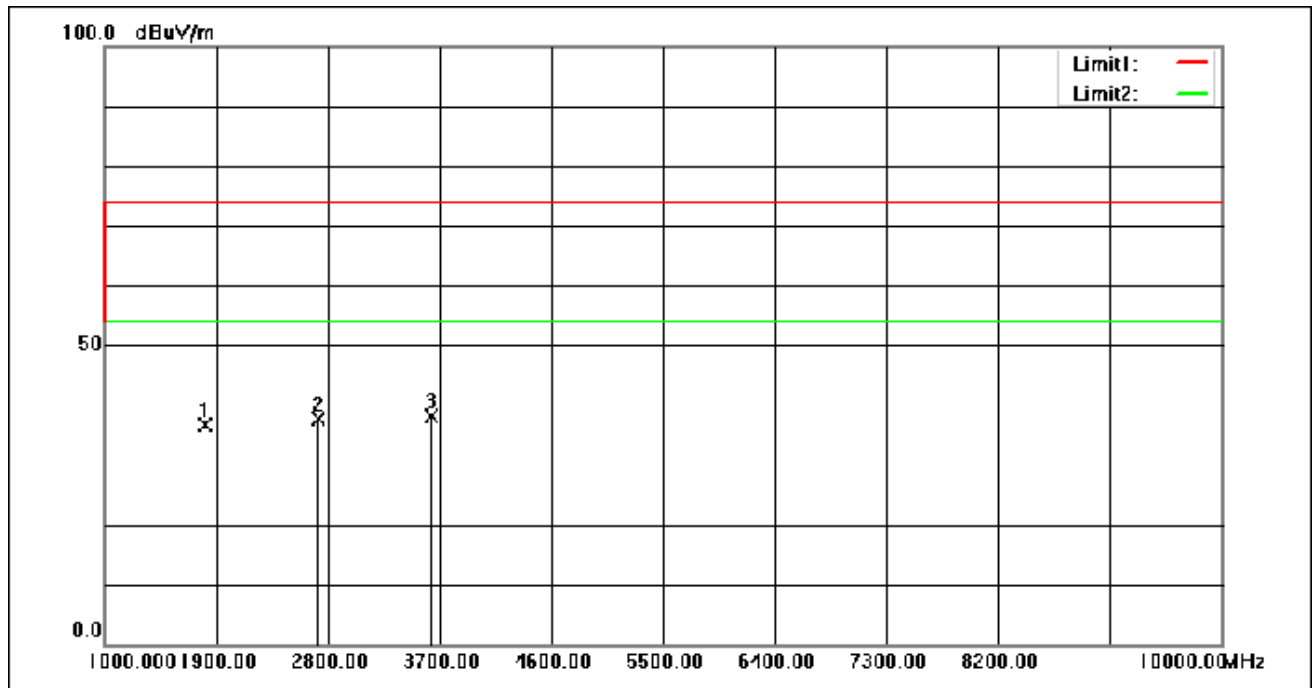
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907.8MHz(500kHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1815.600	49.51	-12.82	36.69	74.00	-37.31	peak
2	2723.400	47.00	-9.42	37.58	74.00	-36.42	peak
3	3631.200	45.71	-7.68	38.03	74.00	-35.97	peak



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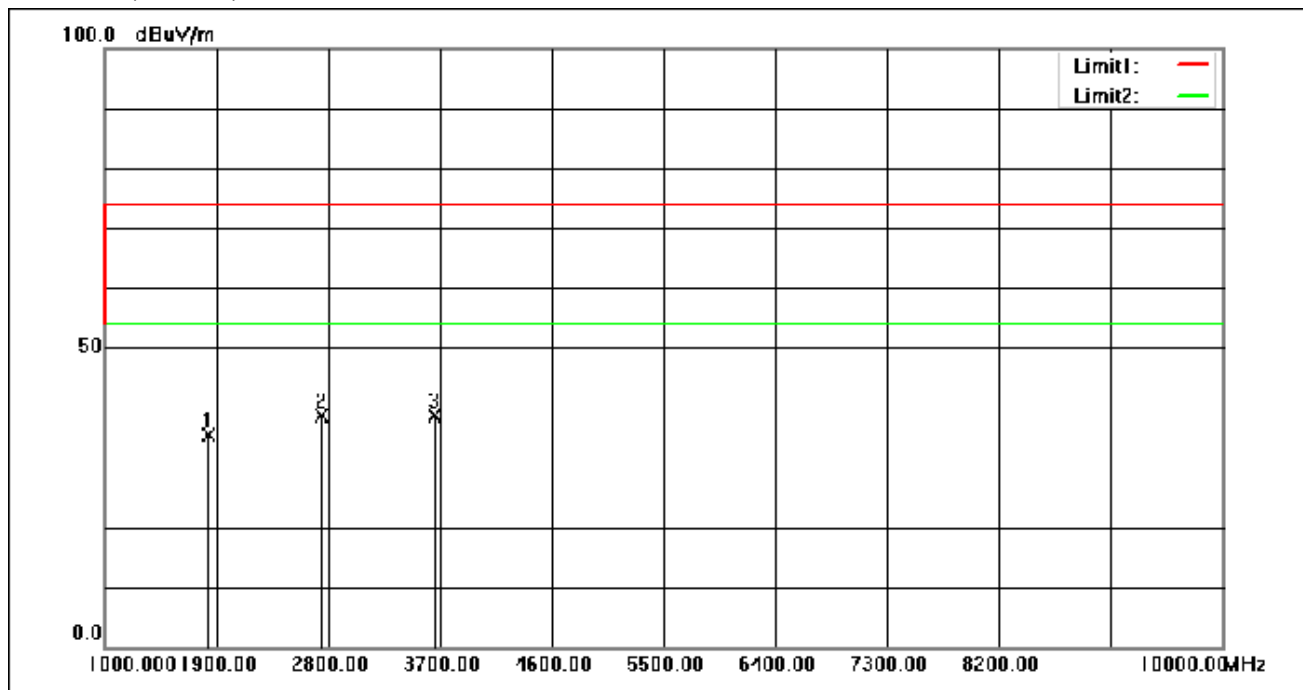
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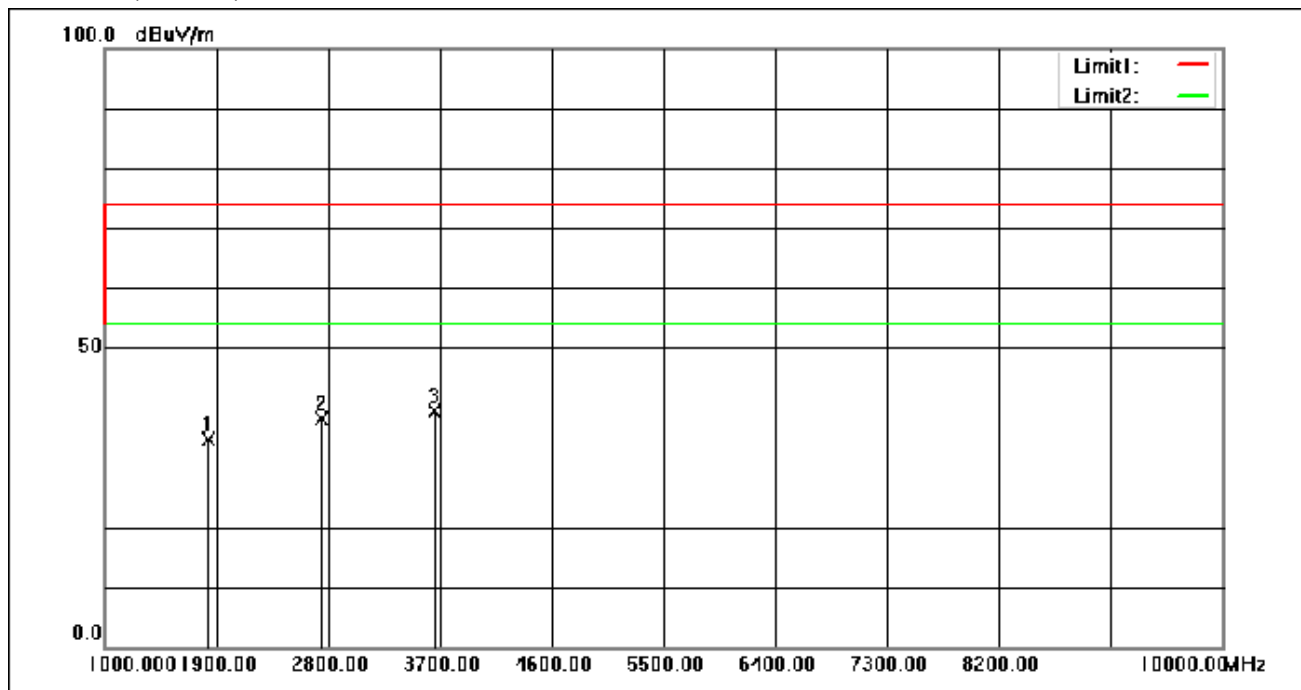
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914.2MHz(500KHz) Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1828.400	48.17	-12.80	35.37	74.00	-38.63	peak
2	2742.600	47.91	-9.36	38.55	74.00	-35.45	peak
3	3656.800	46.15	-7.56	38.59	74.00	-35.41	peak

914.2MHz(500KHz) Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1828.400	47.36	-12.80	34.56	74.00	-39.44	peak
2	2742.600	47.60	-9.36	38.24	74.00	-35.76	peak
3	3656.800	46.96	-7.56	39.40	74.00	-34.60	peak

Remark: 1. Test Level = Receiver Reading + Antenna Factor + Cable Loss- Preamplifier Factor

2. No any other emission which falls in restricted bands can be detected and be reported.

3. If the Peak value below the AV Limit, the AV test doesn't perform for this submission.

All frequencies within the "Restricted bands" have been evaluated to compliance. Section 15.205 Restricted bands of operation.



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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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