

FCC Test Report

for

Contactless Smart Card Reader Module

Trade Name : Uniform
Model Number : UIC680CLB
FCC ID : TFJ680CLB
Report Number : RF-U010-1210-065
Date of Receipt : October 5, 2012
Date of Report : October 24, 2012

Prepared for

Uniform Industrial Corp.

47436 Fremont Blvd., Fremont, CA 94538-6512, USA

Prepared by



Central Research Technology Co.

EMC Test Laboratory

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NVLAP LAB CODE 200575-0

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Certification

Equipment under Test : Contactless Smart Card Reader Module
Model No. : UIC680CLB
FCC ID : TFJ680CLB
Manufacturer : Uniform Industrial Corp.
Applicant : Uniform Industrial Corp.
Address : 47436 Fremont Blvd., Fremont, CA 94538-6512, USA
Date of Testing : October 12~17, 2012
Applicable Standards : 47 CFR part 15, Subpart C
Deviation : N/A
Condition of Test Sample : Mass Production



We, **Central Research Technology Co.**, hereby certify that one sample of the designated product was tested in our facility during the period mentioned above. The test records, data evaluation and Equipment Under Test (EUT) configurations shown in the present report are true and accurate representation of the measurements of the sample's RF characteristics under the conditions herein specified.

The test results show that the EUT as described in the present report is in compliance with the requirements set forth in the standards mentioned above and apply to the tested sample identified in the present report only. The test report shall not be reproduced, except in its entirety, without the written approval of Central Research Technology Co.

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Attachment 3 – Internal Photographs of EUT

1 General Description

1.1 General Description of EUT

Equipment under Test: Contactless Smart Card Reader Module

Model No. : UIC680CLB

Power in : 5Vdc by the power adaptor

Test Voltage : 120Vac/60Hz to the power adaptor

Manufacturer : Uniform Industrial Corp.

Channel Numbers : 1

Frequency Range : 13.56MHz

Function Modulation : ASK

Function Description :

The EUT is used to transmit and receive signal both. Please refer to the user's manual for the details.

According to the X, Y, Z Axis preliminary test, it was found that the X Axis was the worst. It was taken as the representative condition for testing and its data are recorded in the present document.

1.2 Test Mode

There are two test modes as the specification of manufacturer and which are shown as below.

Test Mode	PCB LED Type
Mode 1	Stand LED
Mode 2	Smile LED

According to the preliminary test, It was found that the Mode 1 is worse. It was taken as the representative condition for test and its data are recorded in the present document.

1.3 Test Methodology

For this E.U.T., the radiated emissions and conducted emission measurement performed according to the procedures illustrated in ANSI C63.4:2003 and other required were illustrated in separate sections of this test report for detail.

1.4 Requirement for Compliance

(1) Field strength of Fundametal

According to 15.225(a), the field strength of any emissions within the band 13.553 - 13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(2) Band Edge

According to 15.225(b), Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. According to 15.225(c), Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(3) Radiation emission

According to 15.225(d), the field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

(4) Frequency tolerance

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(5) Radiated emission limits, general requirements.

According to 15.209, except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(6) 20dB Bandwidth

According to 15.215(c) requires the device must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates.

(7) Restricted Band

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
² 1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(2)
13.36 - 13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(8) Conduction Emission Requirement

For intentional device, according to §15.207(a) line conduction emission limit is as below table.

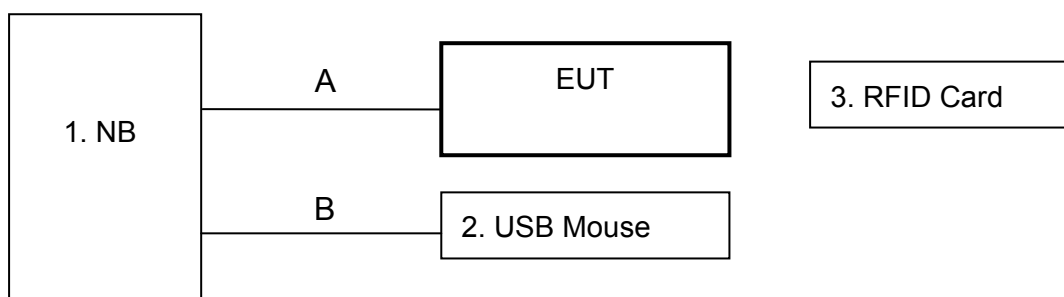
Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.

1.5 The Support Units

No.	Unit	Model No.	FCC ID	Trade Name	Power Cord	Supported by lab.
1	Notebook	LATITUDE D400	DoC	DELL	0.8m	✓
2	USB Mouse	N12ROU	DoC	ACER	N/A	✓
3	RFID Card	N/A	N/A	N/A	N/A	

1.6 Layout of Setup



No.	Cable	Length	Shielded	Core	Shielded Backshell	Supported by lab.	Note
A	RS232 Cable	1.8m	✓				
B	USB Mouse Cable	1.8m	✓			✓	

Justification:

For both conducted and radiated emission below 1GHz, the system was configured for typical fashion as a customer could use it normally.

For radiated emission, measurement of radiated emission from digital circuit is performed with normal transmitting.

1.7 Test Capability

Test Facility

The test facility used for evaluating the conformance of the EUT with each standard in the present report meets what required in CISPR16-1-4, CISPR16-2-3 and ANSI C63.4:2003.

Test Room	Type of Test Room	Descriptions
TR1	10m semi-anechoic chamber (23m×14m×9m)	Complying with the NSA requirements in documents CISPR 22 and ANSI C63.4:2003. For the radiated emission measurement.
TR11	3m semi-anechoic chamber (9m × 6m × 6m)	
TR300	3m fully-anechoic chamber (8m × 5m × 5m)	
TR13	Test site	For the RF conducted emission measurement.
TR5	Shielding Room (8m×5m×4m)	For the conducted emission measurement.

Test Laboratory Competence Information

Central Research Technology Co. has been accredited/filed/authorized by the agencies listed in the following table.

Certificate	Nation	Agency	Code	Mark
Accreditation Certificate	USA	NVLAP	200575-0	ISO/IEC 17025
	R.O.C. (Taiwan)	TAF	0905	ISO/IEC 17025
	R.O.C. (Taiwan)	BSMI	SL2-IN-E-0033, SL2-IS-E-0033, SL2-R1/R2-E-0033, SL2-A1-E-0033 SL2-L1-E-0033	ISO/IEC 17025
Site Filing Document	USA	FCC	474046, TW1053	Test facility list & NSA Data
	Canada	IC	4699A-1,-3	Test facility list & NSA Data
	Japan	VCCI	R-1527,C-1609,T-1441,G-10	Test facility list & NSA Data
Authorization Certificate	Germany	TUV	10021687	ISO/IEC 17025
	Norway	Nemko	ELA212	ISO/IEC 17025

The copy of each certificate can be downloaded from our web site: www.crc-lab.com

1.8 Measurement Uncertainty

The assessed measurement uncertainty with a suitable coverage factor K to ensure 95% confidence level for the normal distribution are shown as below, the values are less than U_{cispr} in table 1 of CISPR 16-4-2

Test Item	Measurement Uncertainty
Radiated Emission (30MHz~1GHz)	Horizontal 5.8dB ; Vertical 5.8dB

2 Field Strength of fundamental

Result: Pass

2.1 Applied Standard

According to 15.225(a), The field strength of any emissions within the band 13.553 - 13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

According to 15.225(b), Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

According to 15.225(c), Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

2.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESCI/ 100019	June 6, 2012	June 6, 2013
Loop Antenna	EMCO	6502/ 20558	Aug. 11, 2011	Aug. 11, 2013
TR11 Semi – anechoic Chamber	ETS. LINDGREN	TR11/ 906-A	April 22, 2012	April 22, 2013

Note:

1. The calibrations are traceable to NML/ROC.
2. The calibration date of the semi-anechoic chamber listed above is the date of NSA measurement.

Instrument Setting

RBW	VBW	Detector	Trace	Comment
9kHz	N/A	Quasi-Peak	Maxhold	

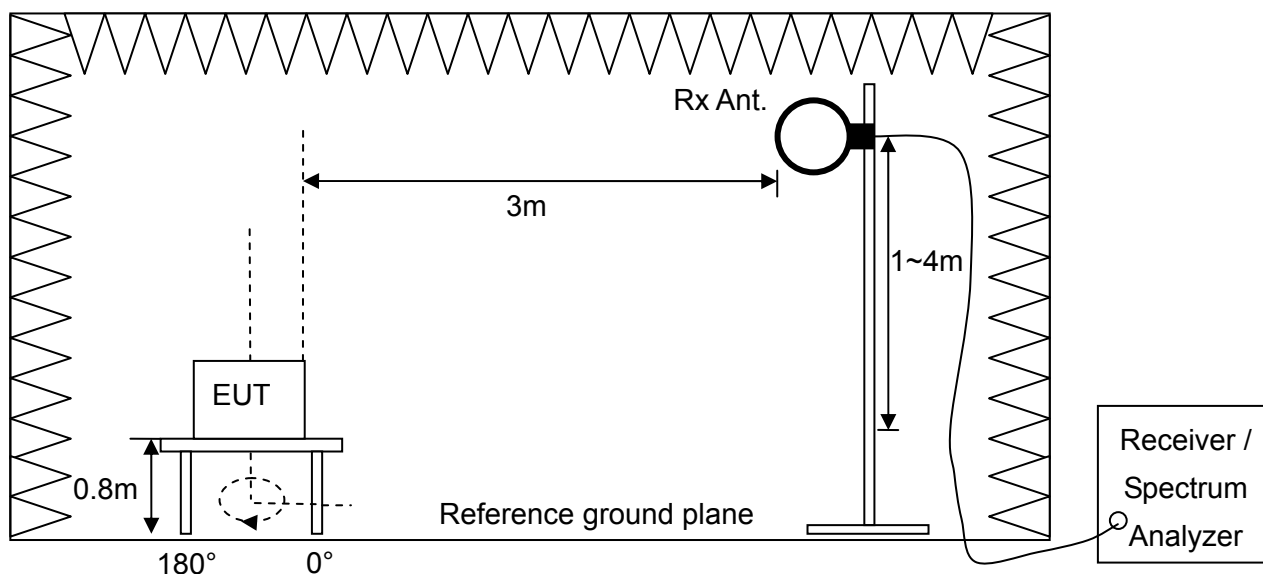
Climatic Condition

Ambient Temperature : 25°C; Relative Humidity : 55%

2.3 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it should be placed on a wooden table with a height of 0.8 meters above the reference ground plane in the semi-anechoic chamber. If the EUT is floor-standing equipment, it should be placed on a non-conducted support with a height of 12 millimeters above the reference ground plane in the semi-anechoic chamber.
- c. The EUT is set at 3m away from the receiving antenna.
- d. Rapidly sweep the signal in the test frequency range by using the spectrum through the Maximum-peak detector.
- e. Rotate the EUT from 0° to 360° and position the receiving loop antenna at 1~4 meters above the reference ground plane to determine the fundamental frequency and record them.
- f. Finely turn the turntable and the antenna is be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response and recorded position of fundamental frequency found from step e.
- g. Record and compare the maximum level with the required limit.
- h. Change the receiving antenna to another polarization to measure Field Strength of fundamental by following step e. to g. again.

2.4 Test Configuration



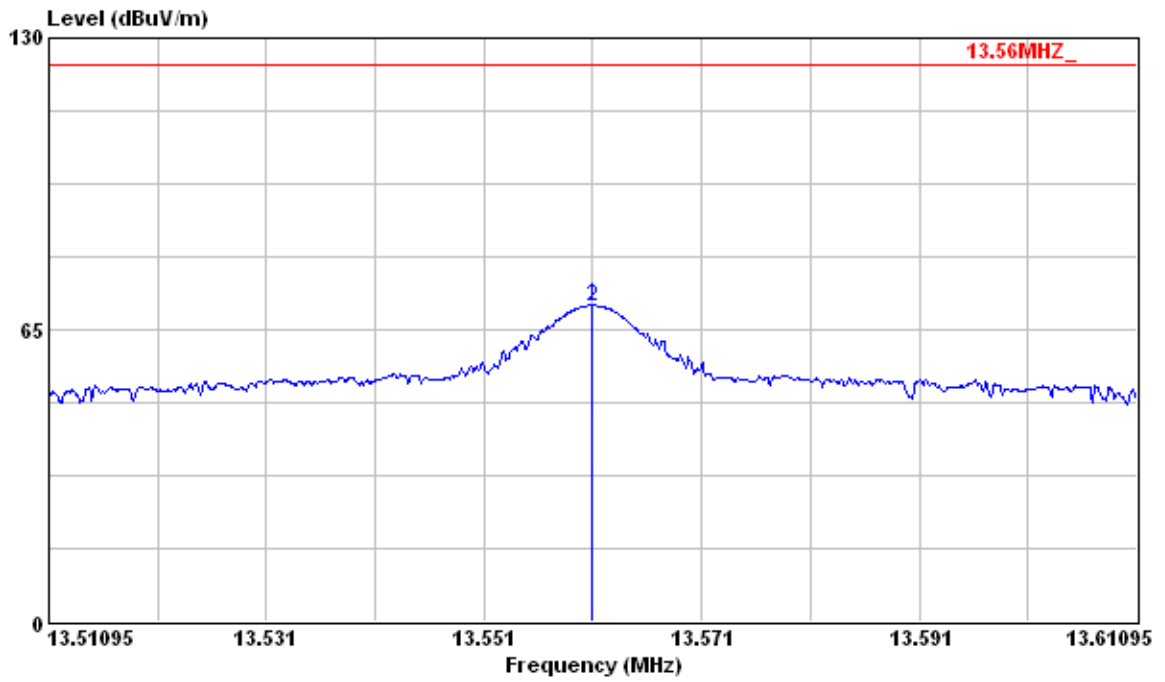
2.5 Test Data**Field strength of fundamental****Test Mode : Mode 1, Continuous Transmitting****Tester : Liu**

Freq. (MHz)	Polarization	Reading Data (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
13.56	H	55.80	14.26	70.06	124	53.94
13.56	V	57.45	14.26	71.71	124	52.29

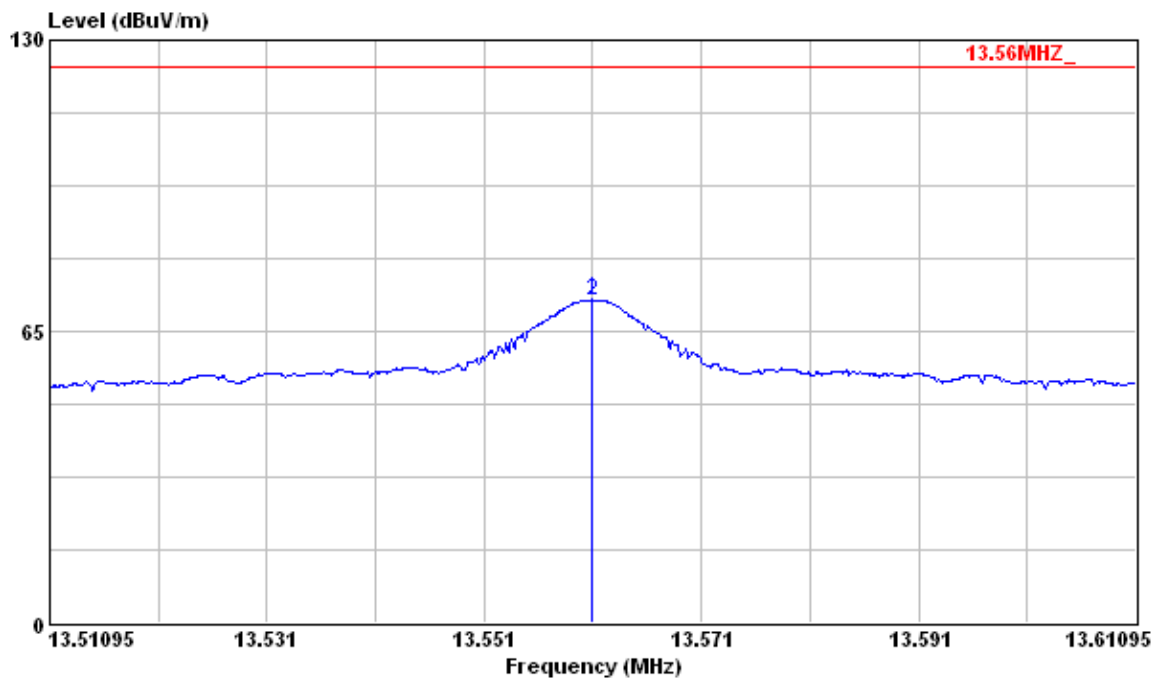
Note :

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor
2. Output Field Strength (dBuV/m) = Reading Data + Correction Factor
3. The limit is 15848 (uV/m)=84dBuV/m @ 30 m , for main frequency < 30MHz, the formula transfers the limit at 30 m to 3m is $L_{30}(\text{dBuV/m}) + 40 = 124 \text{ dBuV/m}$
4. Margin (dB) = Limit – Output Field Strength

H Polarization



V Polarization



Band Edge

Test Mode : Mode 1, Continuous Transmitting

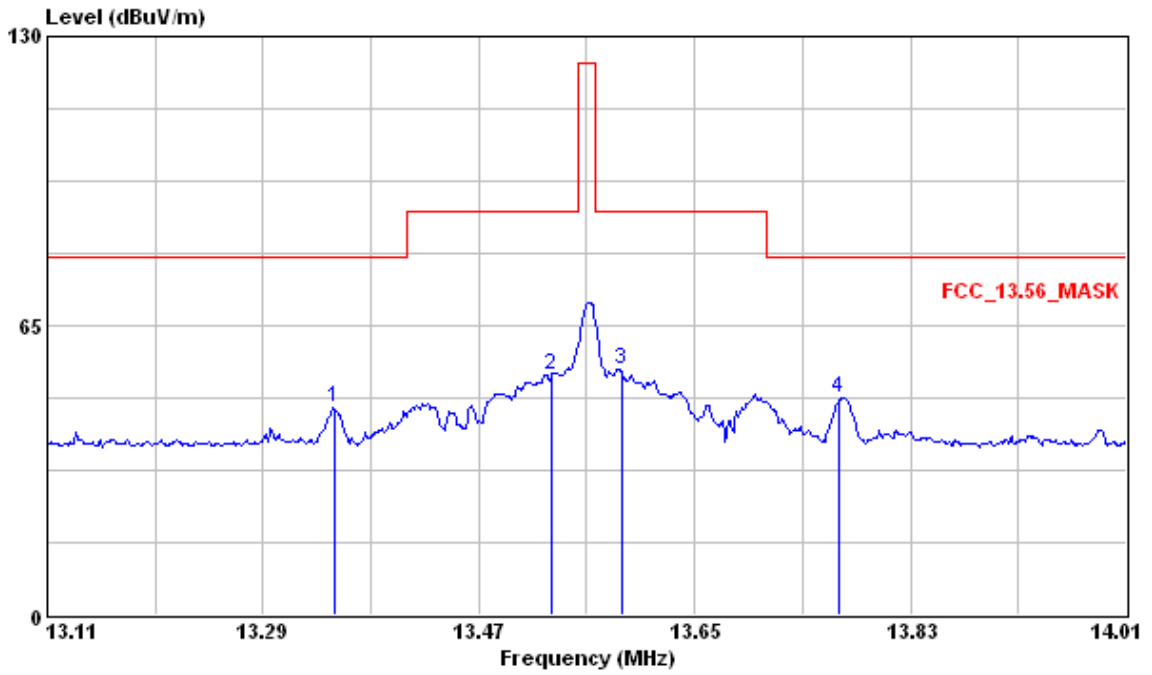
Tester : Liu

Emission Freq. (MHz)	Polarizortal	Reading Data (dBuV)	Correction Factor (dB/m)	Maximum Emission within the band (dBuV/m)	Limit (dBuV/m)	Margin (dB)
13.35	H	32.41	14.28	46.69	80.51	33.82
13.35	V	32.89	14.28	47.17	80.51	33.34
13.53	H	39.80	14.26	54.06	90.47	36.41
13.54	V	42.51	14.27	56.78	90.47	33.69
13.59	H	41.06	14.26	55.32	90.47	35.15
13.59	V	41.96	14.26	56.22	90.47	34.25
13.77	H	34.67	14.25	48.92	80.51	31.59
13.77	V	35.99	14.25	50.24	80.51	30.27

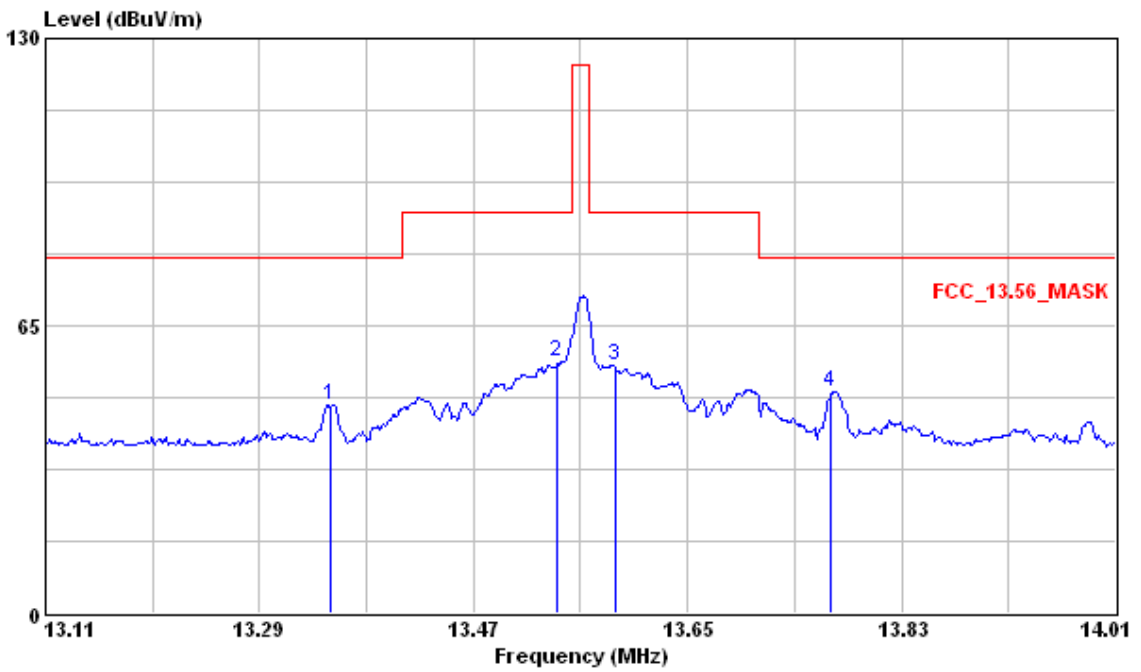
Note :

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor
2. Output Field Strength (dBuV/m) = Reading Data + Correction Factor
3. For main frequency < 30MHz, the formula transfers the limit at 30 m to 3m is $L_{30}(\text{dBuV/m}) + 40$
4. Margin (dB) = Limit – Output Field Strength

H Polarization



V Polarization



3 Radiated Emission

Result: Pass

3.1 Applied Standard

According to 15.225(d), The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

3.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESCI/ 100019	June 6, 2012	June 6, 2013
Spectrum Analyzer	Agilent	E4407B/ MY45106795	May 4, 2012	May 4, 2013
Loop Antenna	EMCO	6502/ 20558	Aug. 11, 2011	Aug. 11, 2013
Bi-Log Antenna	EMCO	3142C/ 52088	May 22, 2012	May 22, 2013
Pre-Amplifier	Mini-circuit	ZKL-2/ 004	Aug. 5, 2012	Feb. 5, 2013
RF Cable	N/A	N/A/ C0080	Aug. 5, 2012	Feb. 5, 2013
TR11 Semi - anechoic Chamber	ETS. LINDGREN	TR11/ 906-A	April 22, 2012	April 22, 2013

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR:No Calibration Required.

Instrument Setting

RBW	VBW	Detector	Trace	Comment
9kHz	N/A	Quasi-Peak	Maxhold	Below 30MHz
120kHz	N/A	Quasi-Peak	Maxhold	Below 1GHz

Climatic Condition

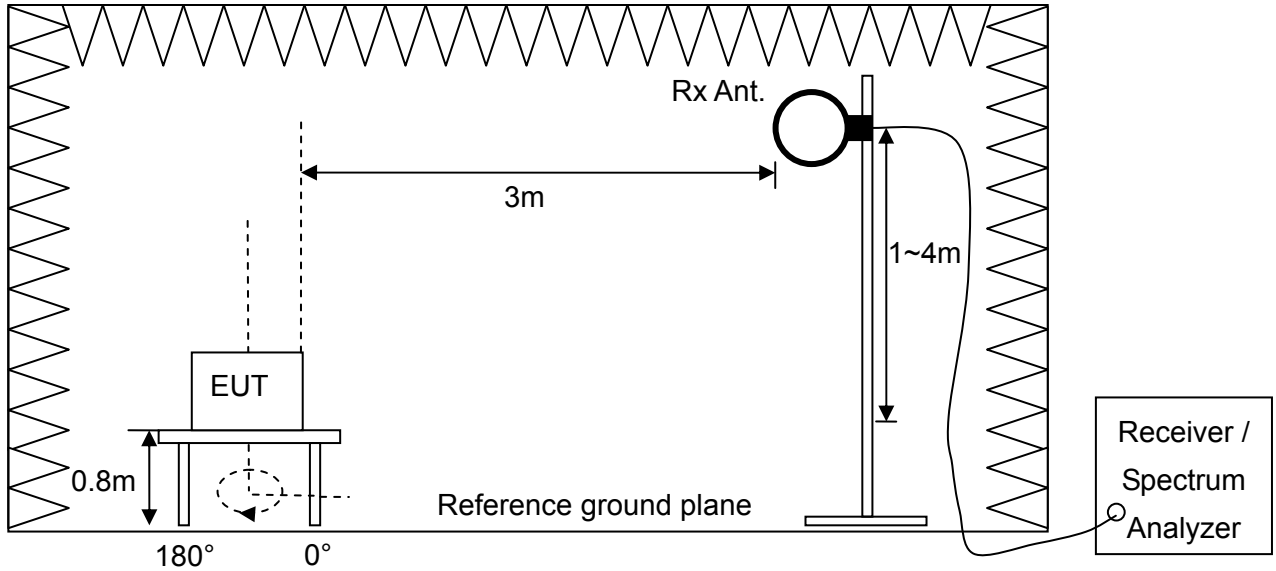
Ambient Temperature : 25°C; Relative Humidity : 55%

3.3 Measurement Procedure

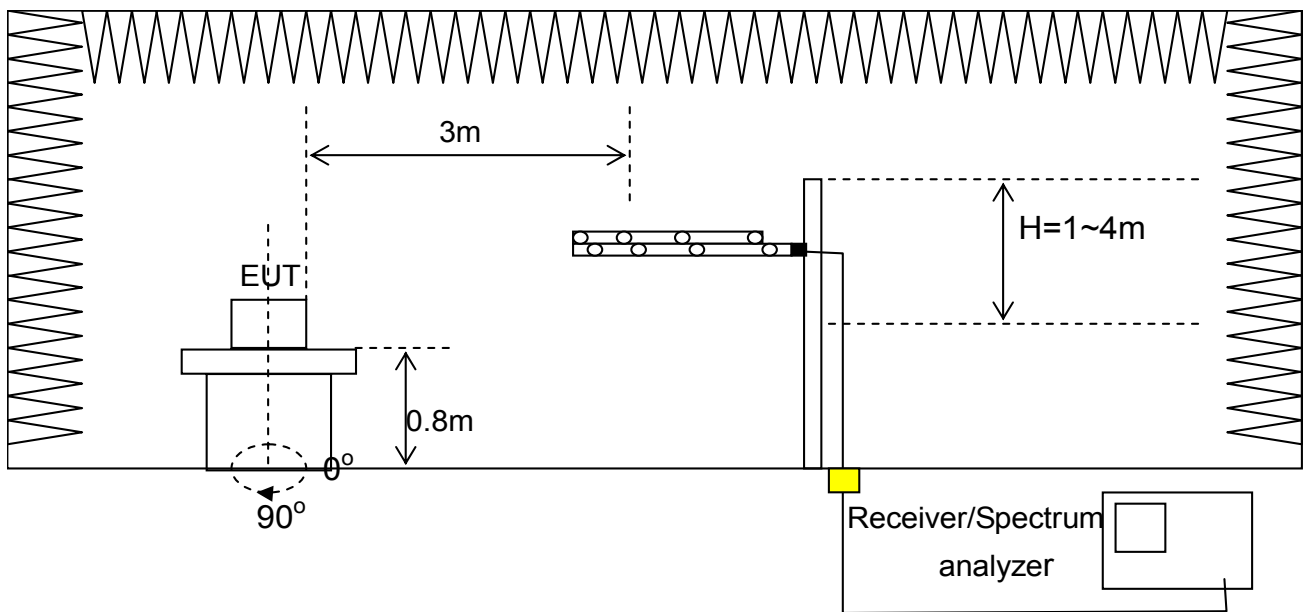
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. A software provided by client enabled the EUT to transmit and receive data at specified channel frequencies individually.
- c. If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 meters above the reference ground plane in the semi-anechoic chamber. If the EUT is floor-standing equipment, it was placed on a non-conducted support with a height of 12 millimeters above the reference ground plane in the semi-anechoic chamber.
- d. The EUT was set 3m away from the interference receiving antenna.
- e. Rapidly sweep the signal in the test frequency range by using the spectrum through the Maximum-peak detector.
- f. Rotate the EUT from 0° to 360° and position the receiving antenna at heights from 1 to 4 meters above the reference ground plane continuously to determine at least six frequencies associated with higher emission levels and record them.
- g. Then measure each frequency found from step f. by using the spectrum with rotating the EUT and positioning the receiving antenna height to determine the maximum level.
- h. Record frequency, azimuth angle of the turntable, height, and polarization of the receiving antenna and compare the maximum level with the required limit.
- i. Change the receiving antenna to another polarization to measure radiated emission by following step e. to h. again.
- j. If the peak emission level measured from step f. is 4dB lower than the limit specified, then the emission values presented will be the peak value only. Otherwise, accurate Q.P. value will be measured and presented.

3.4 Test Configuration

Below 30MHz



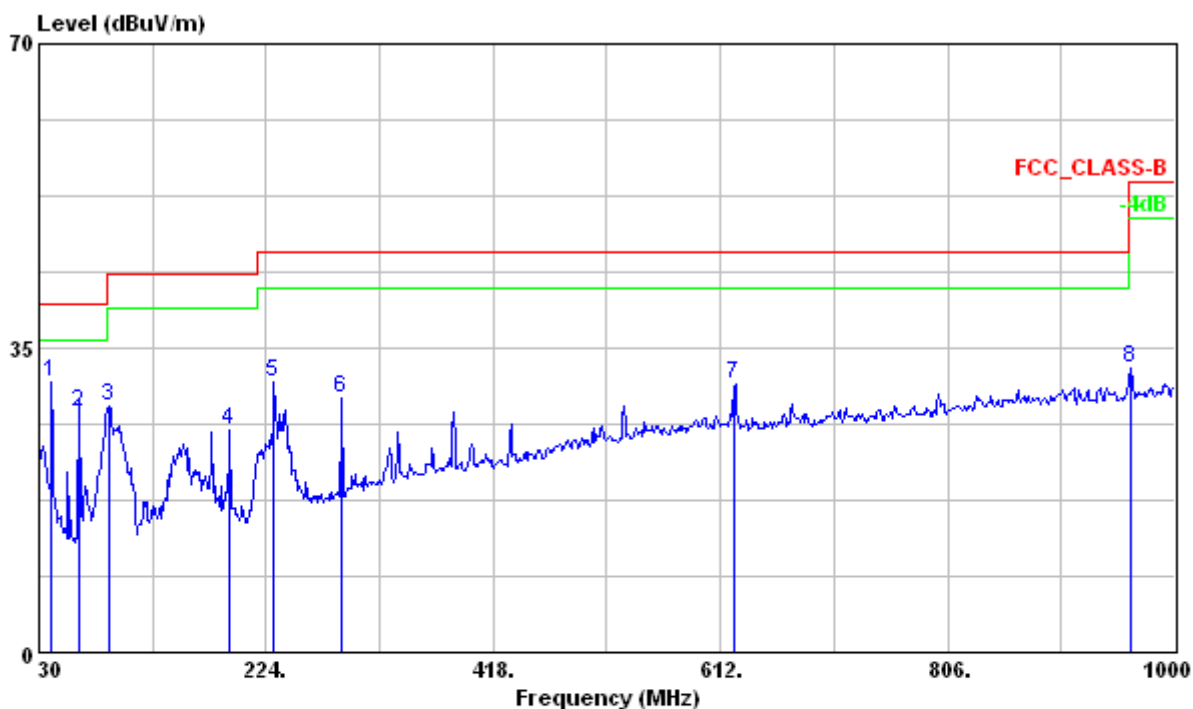
Above 30MHz



■ : Pre-amplifier

3.5 Test Data

Test Mode : Mode 1, Continuous Transmitting
 Tester : Liu Frequency Range : 9kHz~1GHz
 Polarization : Horizontal



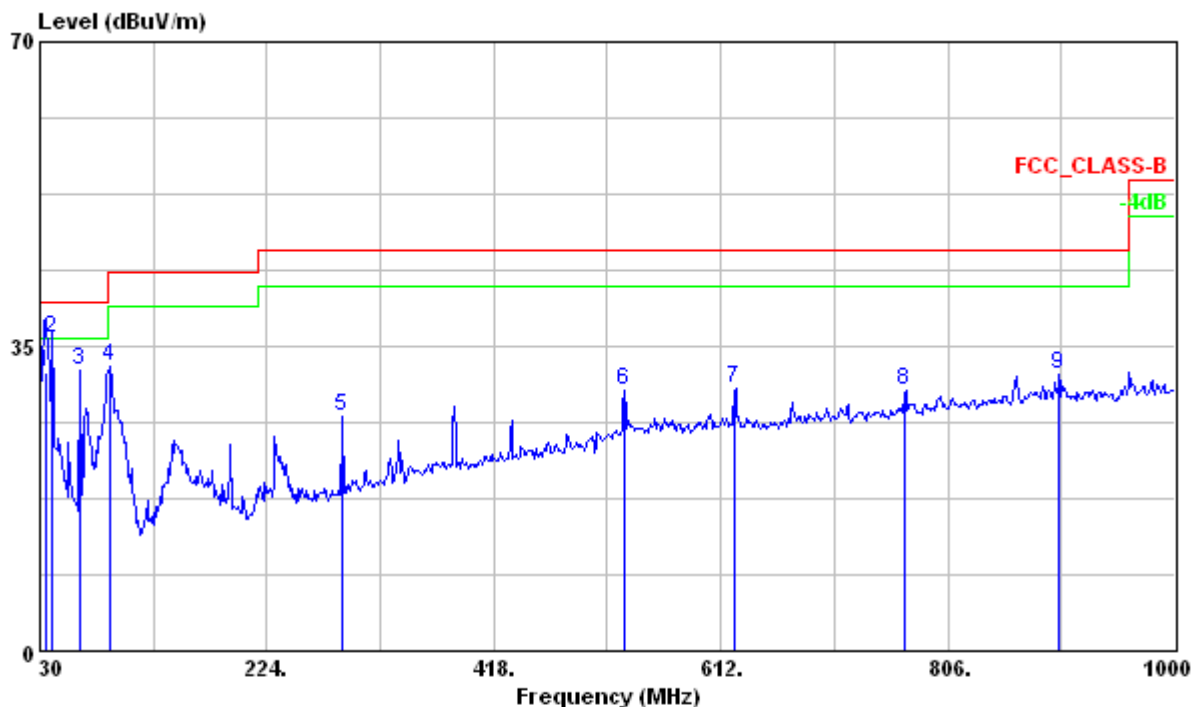
	Freq	Level	Read Level	Limit	Over	Ant	Table			
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	Pos	Pos	Pol/Phase	Remark
1	40.530	31.13	44.97	-13.84	40.00	-8.87	390	288	HORIZONTAL	QP
2	64.076	27.71	46.73	-19.02	40.00	-12.29	292	218	HORIZONTAL	QP
3	89.400	28.37	47.27	-18.90	43.50	-15.13	---	---	HORIZONTAL	Peak
4	192.270	25.45	40.87	-15.42	43.50	-18.05	---	---	HORIZONTAL	Peak
5	230.880	31.01	45.46	-14.45	46.00	-14.99	---	---	HORIZONTAL	Peak
6	288.390	29.14	41.90	-12.76	46.00	-16.86	---	---	HORIZONTAL	Peak
7	624.100	30.93	35.34	-4.41	46.00	-15.07	---	---	HORIZONTAL	Peak
8	962.900	32.81	33.06	-0.25	54.00	-21.19	---	---	HORIZONTAL	Peak

Note :

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preampfier
2. Emission Level (dBuV/m) = Reading Data + Correction Factor

No signal can be detected from 9kHz to 30MHz, so the graphs are omitted below 30MHz.

Test Mode : Mode 1, Continuous Transmitting
 Tester : Liu Frequency Range : 9kHz~1GHz
 Polarization : Vertical



	Freq	Level	Read Level	Limit	Over	Ant	Table	Table	Table	Table	Table
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg	Pol/Phase	Remark	
1	35.230	32.05	43.24	-11.19	40.00	-7.95	100	201	VERTICAL	QP	
2	40.530	35.88	49.72	-13.84	40.00	-4.12	100	211	VERTICAL	QP	
3	64.020	32.15	51.17	-19.02	40.00	-7.85	---	---	VERTICAL	Peak	
4	89.940	32.65	51.51	-18.86	43.50	-10.85	---	---	VERTICAL	Peak	
5	288.390	26.99	39.75	-12.76	46.00	-19.01	---	---	VERTICAL	Peak	
6	529.600	30.00	36.09	-6.09	46.00	-16.00	---	---	VERTICAL	Peak	
7	624.100	30.13	34.54	-4.41	46.00	-15.87	---	---	VERTICAL	Peak	
8	769.700	29.90	32.52	-2.62	46.00	-16.10	---	---	VERTICAL	Peak	
9	901.300	31.81	32.35	-0.54	46.00	-14.19	---	---	VERTICAL	Peak	

Note :

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier
2. Emission Level (dBuV/m) = Reading Data + Correction Factor

No signal can be detected from 9kHz to 30MHz, so the graphs are omitted below 30MHz.

4 Frequency Tolerance

Result: Pass

4.1 Applied Standard

According to 15.225(e), the frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
Spectrum Analyzer	Agilent	E4405B/ MY45106706	March 29, 2012	March 29, 2013
Temperature Chamber	Terchy	MHG-800LF/ 920224	Aug. 13, 2012	Aug. 13, 2013
Adjustable AC Power Supply	EXTECH	6110/1102108	NCR	NCR
Test Site	N.A.	TR13	NCR	NCR

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR:No Calibration Required.

Instrument Setting

RBW	VBW	Detector	Trace	Comment
300Hz	1kHz	Peak	Maxhold	

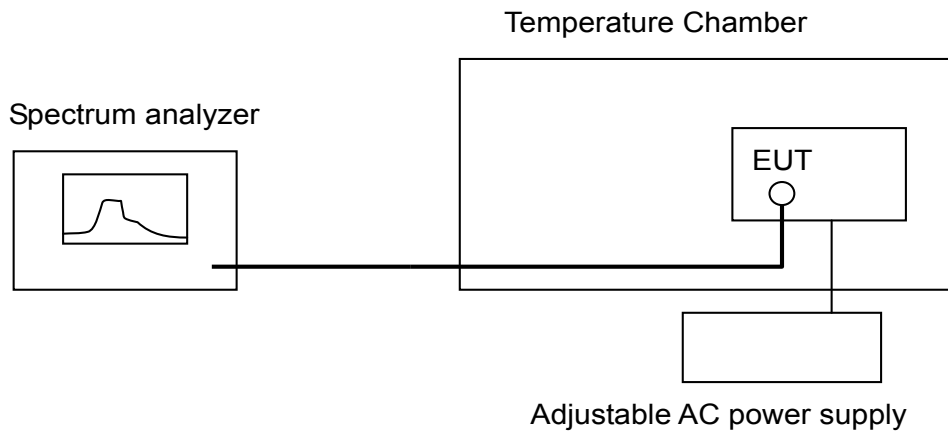
Climatic Condition

Ambient Temperature : 24°C; Relative Humidity : 55%

4.3 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage described in the user's manual supported by the manufacturer in test site TR13.
- b. Measure the frequency tolerance by using the spectrum analyzer and following the test conditions described in FCC 15.225(e) to perform the normal and extreme conditions test.
- c. Record the value and compare with the required limit.

4.4 Test Configuration



4.5 Test Data

Test Mode : Mode 1, Continuous Transmitting

Tester : Jun

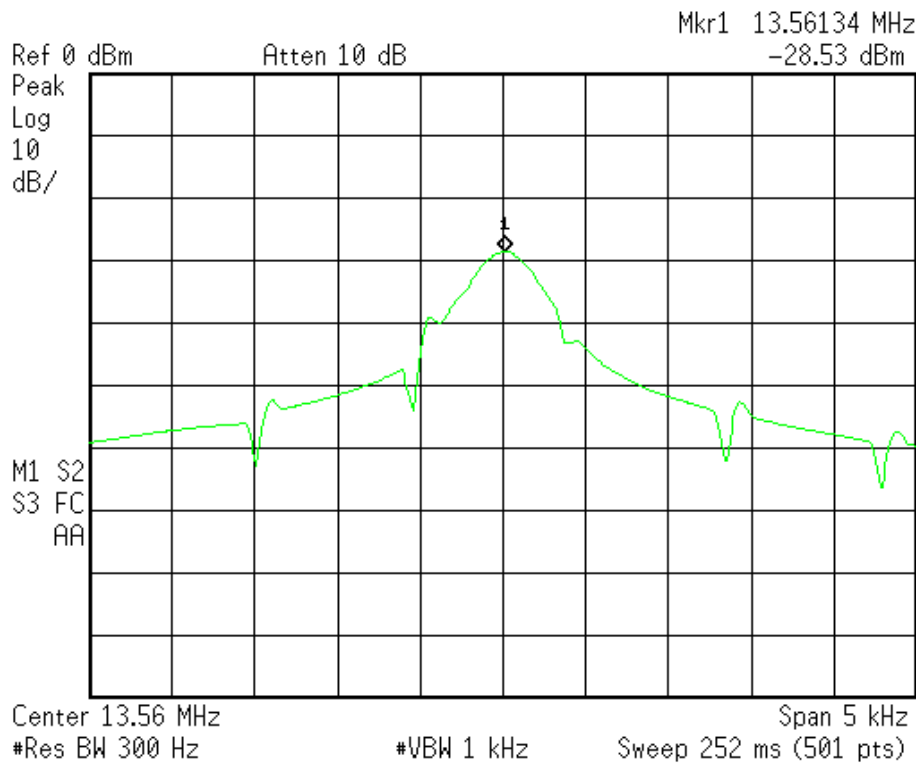
Temperature (°C)	AC Voltage (Volt)	Meas. Frequency (MHz)	Deviation (kHz)	Limit (kHz)	Margin (kHz)
20°C	120	13.56134	NA	1.356	NA
	138	13.56135	0.006	1.356	1.35
	102	13.56136	0.016	1.356	1.34
-20°C	120	13.56135	0.006	1.356	1.35
50°C	120	13.56135	0.006	1.356	1.35

Note:

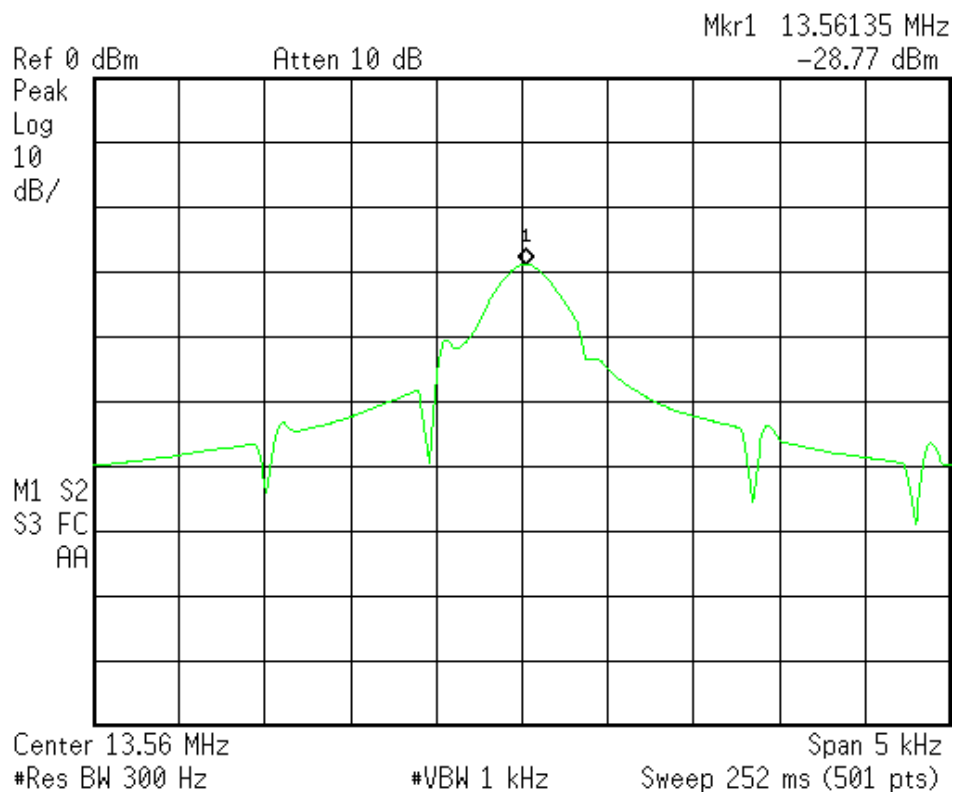
1. Deviation(kHz) = | Meas. Frequency – Meas. Frequency @20°C/120Vac |

2. Margin (kHz)= Limit – Deviation

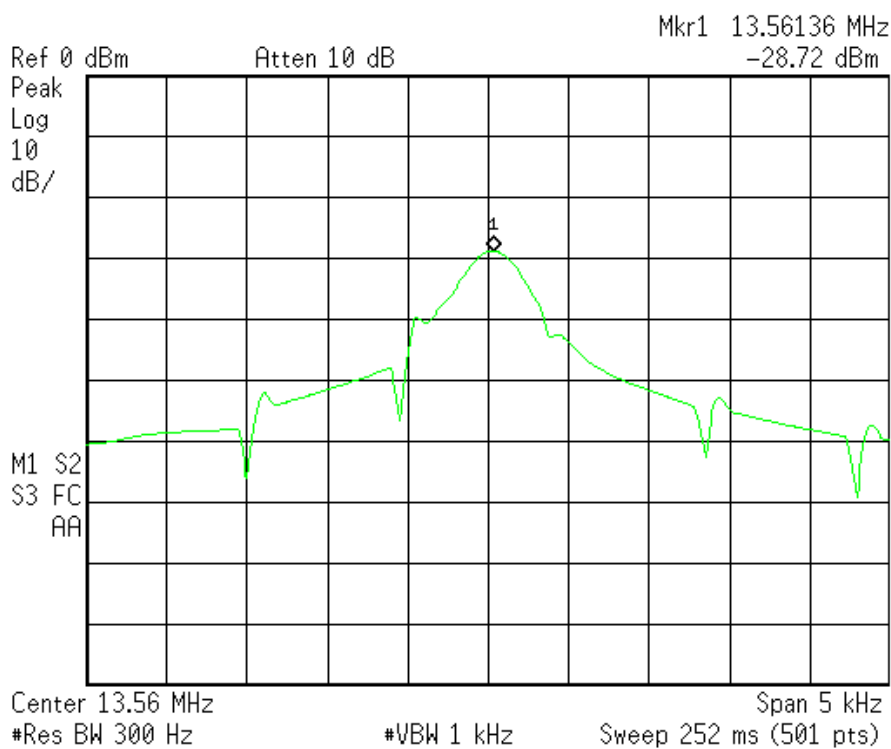
20°C, 120Vac



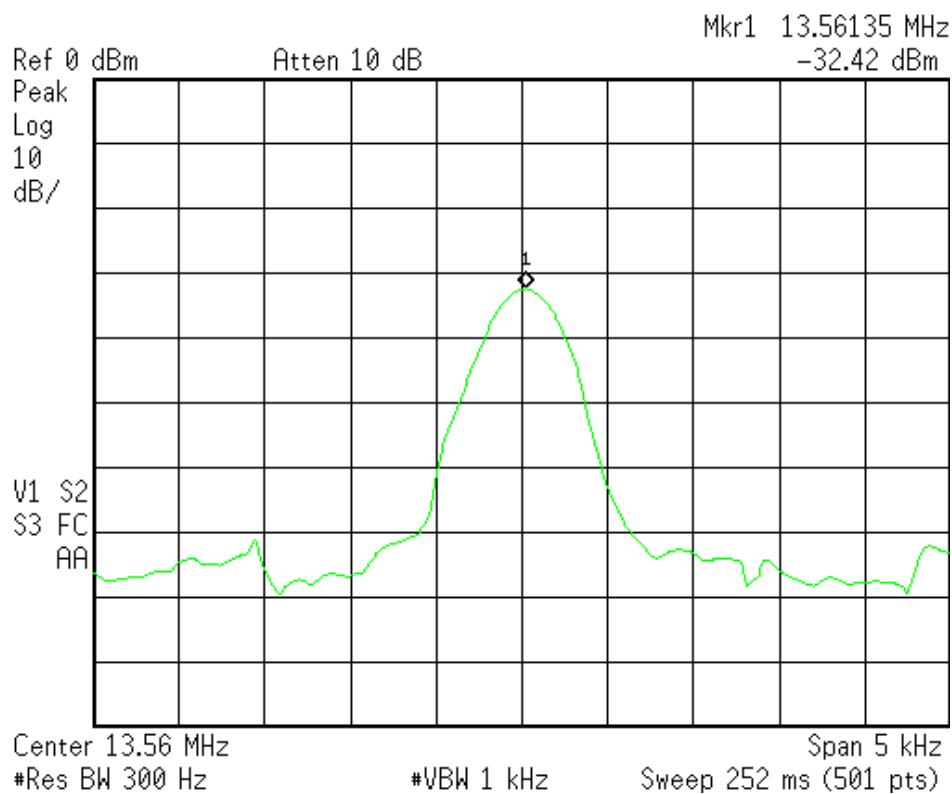
20°C, 138Vac



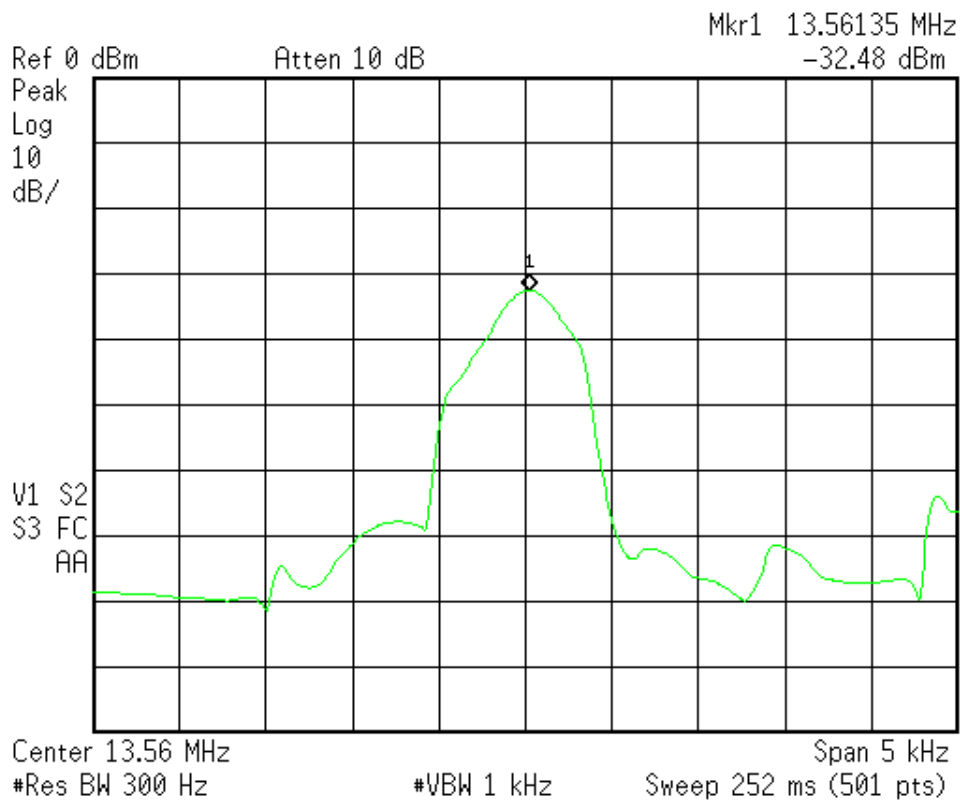
20°C, 102Vac



-20°C, 120Vac



50°C, 120Vac



5 20dB Bandwidth

Result: Pass

5.1 Applied Standard

According to 15.215(c) requires the device must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates.

According to 15.225, Operation should within the band 13.110 – 14.010 MHz.

5.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
Spectrum Analyzer	Agilent	E4405B/ MY45106706	March 29, 2012	March 29, 2013
Test Site	N.A.	TR13	NCR	NCR

Note:

- 1.The calibrations are traceable to NML/ROC.
- 2.NCR : No Calibration Required.

Instrument Setting

RBW	VBW	Detector	Trace	Comment
300Hz	1kHz	Peak	Maxhold	

Climatic Condition

Ambient Temperature : 24°C; Relative Humidity : 55%

5.3 Measurement Procedure

- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage described in the user's manual supported by the manufacturer in test site TR13.
- b. Measure the 20dB bandwidth by using the spectrum analyzer and following the test conditions described in FCC 15.215.
- c. Record the frequency and compare with the required limit.

5.4 Test Configuration

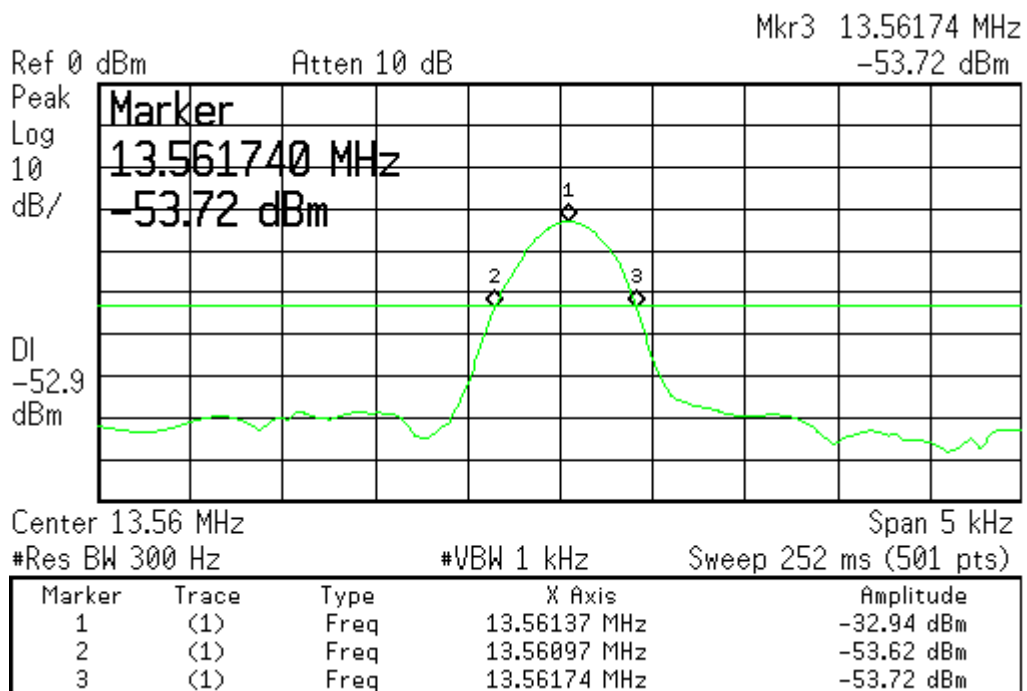


5.5 Test Data

Test Mode : Mode 1, Continuous Transmitting

Tester : Jun

Operating Frequency (MHz)	The lowest frequency (MHz)	The highest frequency (MHz)	Limit (MHz)
13.56	13.56097	13.56174	13.110~14.01



6 Conducted Emission Measurement

Test Data: Pass

6.1 Limits for Emission Measurement

For intentional device, according to §15.207(a) line conduction emission limit is as below table.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	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.

Note:

For a device with a permanent antenna operating at or below 30 MHz, the FCC will accept measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions: (1) perform the AC line conducted tests with the permanent antenna to determine compliance with the Section 15.207 limits outside the transmitter's fundamental emission band; (2) retest with a dummy load in lieu of the permanent antenna to determine compliance with the Section 15.207 limits within the transmitter's fundamental emission band.

6.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
Test Receiver	R&S	ESCS 30/ 836858/021	Jan. 11, 2012	Jan. 11, 2013
LISN	R&S	ESH2-Z5/ 836613/001	June 5, 2012	June 5, 2013
2 nd LISN	R&S	ENV4200/ 833209/010	Jan. 14, 2012	Jan. 14, 2013
50Ω terminator	N/A	N/A/ 001	Aug. 20, 2012	Aug. 20, 2013
RF Switch	N/A	RSU28/ 338965/002	Aug. 20, 2012	Feb. 20, 2013
RF Cable	N/A	N/A/ C0052 ~ 56	Aug. 20, 2012	Feb. 20, 2013
Test Software	Audix	e3/ Ver. 5.2004-2-19k	NCR	NCR
TR5 shielded room	ETS LINDGREN	TR5/ 15353-F	NCR	NCR

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.

Instrument Setting

IF BW	Measurement Time	Detector	Trace	Comment
9kHz	1 second	Quasi-Peak / Average	Maxhold	

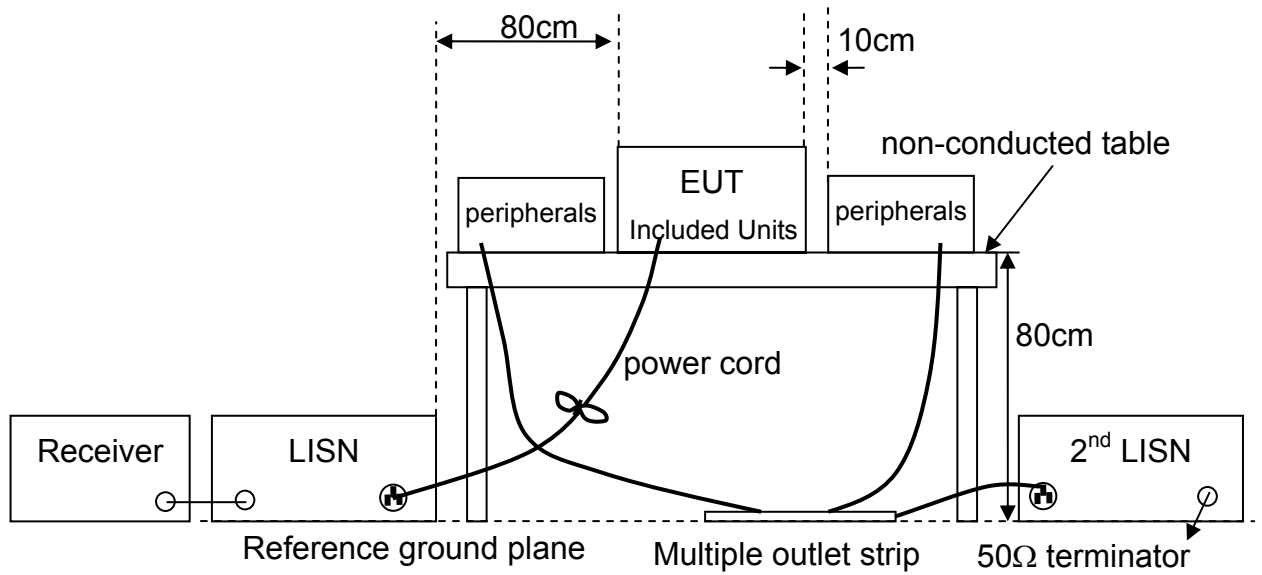
Climatic Condition

Ambient Temperature : 28°C; Relative Humidity : 74%

6.3 Test Procedures

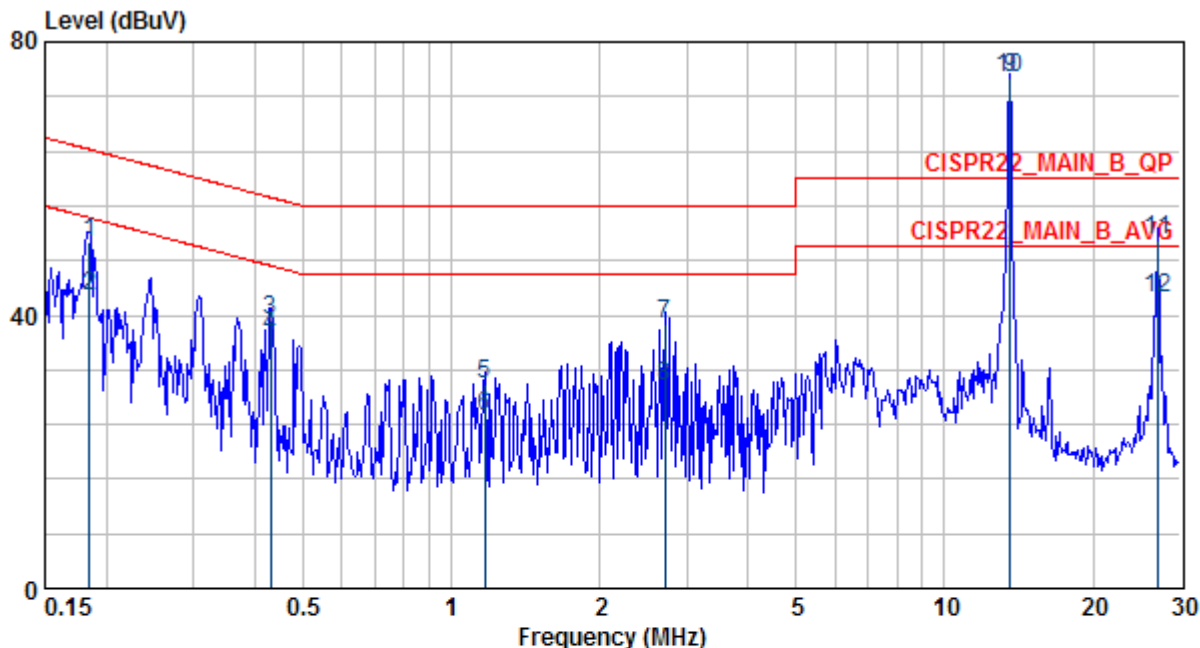
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a non-conducted table with a height of 0.8 meters above the reference ground plane and 0.4 meters from the conducting wall of the shielded room. Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height of 12 millimeters above the reference ground plane.
- c. Connect the EUT's power source to the appropriate power mains through the LISN.
- d. All the other peripherals are connected to the 2nd LISN, if any.
- e. The LISN was placed 0.8 meters from the EUT and at least 0.8 meters from other units and other metal planes.
- f. Measure the conducted emissions on each power line (Neutral Line and Line 1 – Hot side) of the EUT's power source by using the test receiver connected to the coupling RF output port of LISN.
- g. Rapidly scan the signal from 150kHz to 30MHz by using the receiver through the Maximum-Peak detector to determine those frequencies associated with higher emission levels for each measured line.
- h. Then measure the maximum level of conducted disturbance for each frequency found from step g. by using the receiver through the Quasi-Peak and Average detectors per CISPR 16-1.
- i. Record the level for each frequency and compare with the required limit.

6.4 Test Configurations



6.5 Test Data

Test Mode : Mode 1, Continuous Transmitting, with antenna
 Tester : Kent Frequency Range : 150kHz~30MHz
 Phase : Line

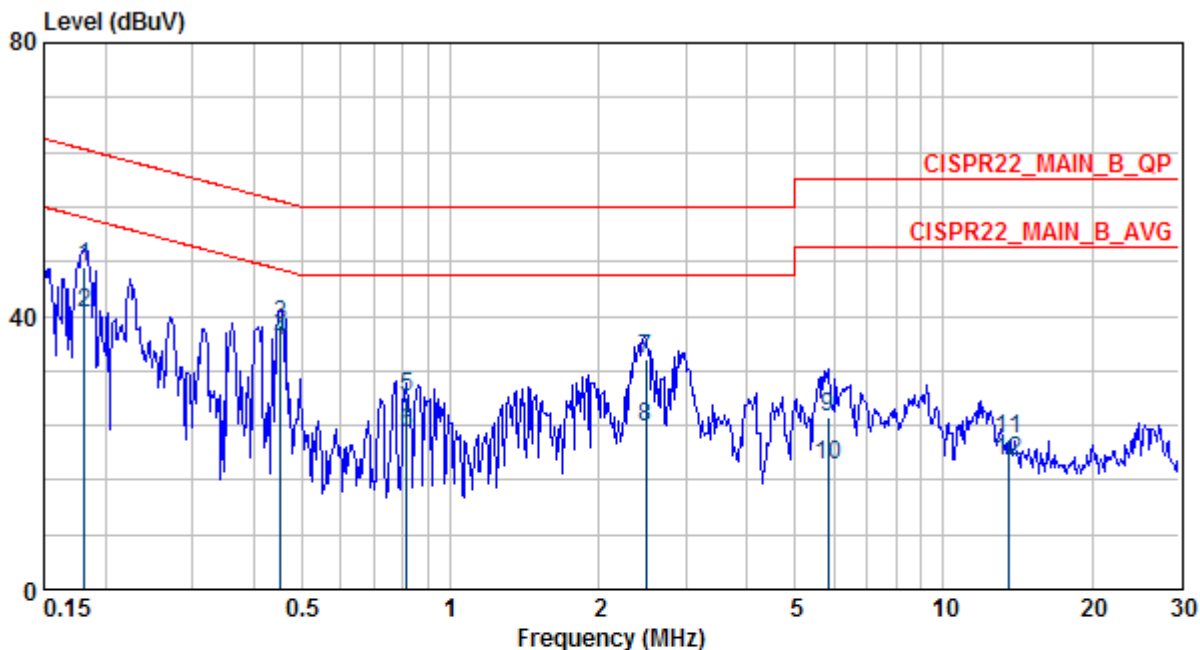


	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB		
1 @	0.184	50.61	0.27	50.34	64.28	-13.68	LINE	QP
2 @	0.184	42.93	0.27	42.66	54.28	-11.36	LINE	AVERAGE
3 @	0.431	39.33	0.31	39.02	57.24	-17.91	LINE	QP
4 @	0.431	37.07	0.31	36.76	47.24	-10.17	LINE	AVERAGE
5	1.170	29.83	0.35	29.48	56.00	-26.17	LINE	QP
6	1.170	25.10	0.35	24.75	46.00	-20.90	LINE	AVERAGE
7 @	2.707	38.69	0.44	38.25	56.00	-17.31	LINE	QP
8 @	2.707	29.54	0.44	29.10	46.00	-16.46	LINE	AVERAGE
9 @	13.561	74.63	0.68	73.95	60.00	14.63	LINE	QP
10 @	13.561	74.60	0.68	73.92	50.00	24.60	LINE	AVERAGE
11 @	26.997	50.89	0.35	50.54	60.00	-9.11	LINE	QP
12 @	26.997	42.61	0.35	42.26	50.00	-7.39	LINE	AVERAGE

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.
4. Tx Fundamental(markered 9, 10), for reference only. Please refer to next page.

Test Mode : Mode 1, Continuous Transmitting, with dummy load
 Tester : Kent Frequency Range : 150kHz~30MHz
 Phase : Line

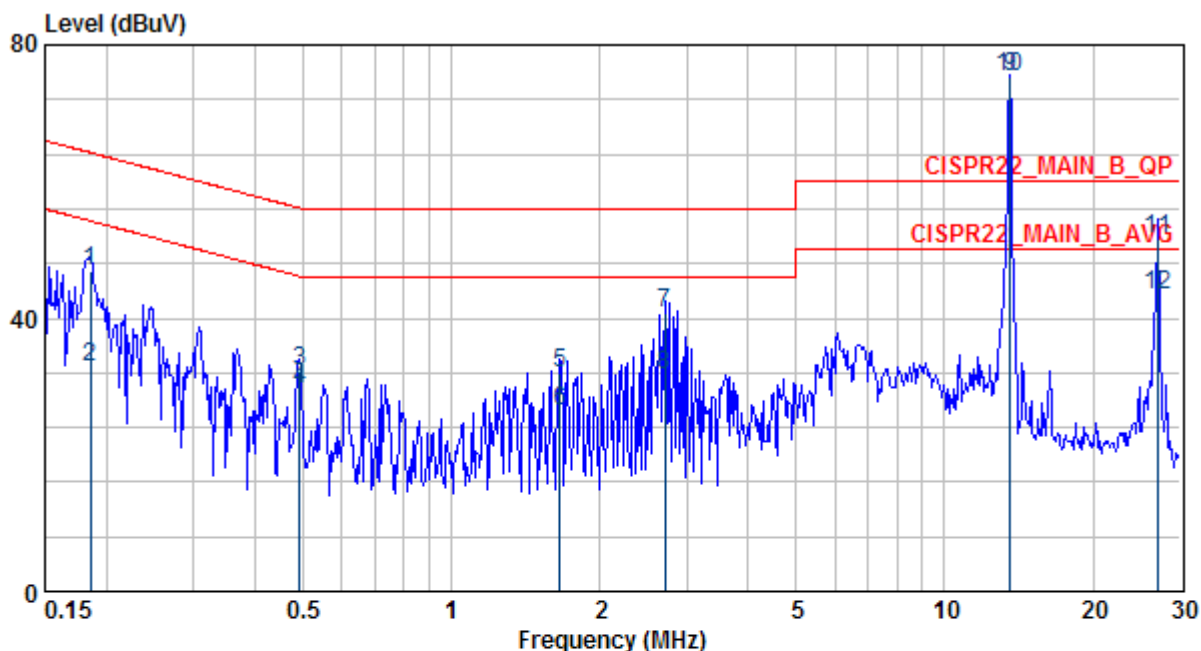


	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.181	47.15	0.27	46.88	64.42	-17.27	LINE	QP
2	0.181	40.34	0.27	40.07	54.42	-14.08	LINE	AVERAGE
3	0.453	38.63	0.31	38.32	56.82	-18.19	LINE	QP
4	0.453	36.40	0.31	36.09	46.82	-10.42	LINE	AVERAGE
5	0.816	28.04	0.33	27.71	56.00	-27.96	LINE	QP
6	0.816	22.97	0.33	22.64	46.00	-23.03	LINE	AVERAGE
7	2.491	33.58	0.43	33.15	56.00	-22.42	LINE	QP
8	2.491	23.75	0.43	23.32	46.00	-22.25	LINE	AVERAGE
9	5.836	25.13	0.53	24.60	60.00	-34.87	LINE	QP
10	5.836	18.22	0.53	17.69	50.00	-31.78	LINE	AVERAGE
11	13.560	21.87	0.68	21.19	60.00	-38.13	LINE	QP
12	13.560	18.88	0.68	18.20	50.00	-31.12	LINE	AVERAGE

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.

Test Mode : Mode 1, Continuous Transmitting, with antenna
 Tester : Kent Frequency Range : 150kHz~30MHz
 Phase : Neutral

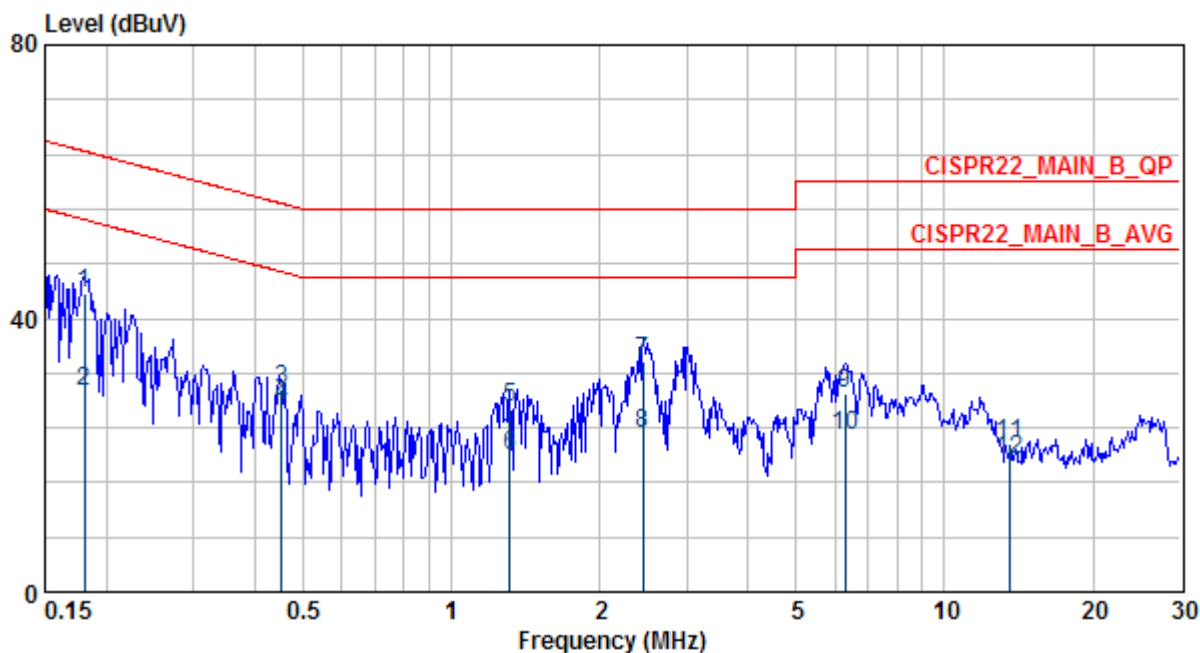


	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.185	46.97	0.16	46.81	64.24	-17.27	NEUTRAL	QP
2	0.185	32.90	0.16	32.74	54.24	-21.34	NEUTRAL	AVERAGE
3	0.491	32.38	0.19	32.19	56.14	-23.76	NEUTRAL	QP
4	0.491	29.46	0.19	29.27	46.14	-16.68	NEUTRAL	AVERAGE
5	1.661	31.94	0.27	31.67	56.00	-24.06	NEUTRAL	QP
6	1.661	26.42	0.27	26.15	46.00	-19.58	NEUTRAL	AVERAGE
7	2.707	40.79	0.33	40.46	56.00	-15.21	NEUTRAL	QP
8	2.707	31.77	0.33	31.44	46.00	-14.23	NEUTRAL	AVERAGE
9	13.561	75.30	0.86	74.44	60.00	15.30	NEUTRAL	QP
10	13.561	75.24	0.86	74.38	50.00	25.24	NEUTRAL	AVERAGE
11	26.999	51.66	1.27	50.39	60.00	-8.34	NEUTRAL	QP
12	26.999	43.41	1.27	42.14	50.00	-6.59	NEUTRAL	AVERAGE

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.
4. Tx Fundamental(markered 9, 10), for reference only. Please refer to next page.

Test Mode : Mode 1, Continuous Transmitting, with dummy load
 Tester : Kent Frequency Range : 150kHz~30MHz
 Phase : Neutral



	Freq	Level	Factor	Read	Limit	Over	Pol/Phase	Remark
				Level	Line	Limit		
	MHz	dBuV	dB	dBuV	dBuV	dB		
1	0.181	43.66	0.16	43.50	64.46	-20.80	NEUTRAL	QP
2	0.181	29.23	0.16	29.07	54.46	-25.23	NEUTRAL	AVERAGE
3	0.452	29.71	0.19	29.52	56.84	-27.13	NEUTRAL	QP
4	0.452	27.26	0.19	27.07	46.84	-19.58	NEUTRAL	AVERAGE
5	1.312	27.05	0.25	26.80	56.00	-28.95	NEUTRAL	QP
6	1.312	20.02	0.25	19.77	46.00	-25.98	NEUTRAL	AVERAGE
7	2.444	33.64	0.31	33.33	56.00	-22.36	NEUTRAL	QP
8	2.444	23.16	0.31	22.85	46.00	-22.84	NEUTRAL	AVERAGE
9	6.285	28.95	0.49	28.46	60.00	-31.05	NEUTRAL	QP
10	6.285	22.98	0.49	22.49	50.00	-27.02	NEUTRAL	AVERAGE
11	13.560	21.77	0.86	20.91	60.00	-38.23	NEUTRAL	QP
12	13.560	19.29	0.86	18.43	50.00	-30.71	NEUTRAL	AVERAGE

Note:

1. Emission Level = reading value + correction factor.
2. Correction factor = cable loss + insertion loss of LISN.
3. Q.P. is abbreviation of quasi-peak.