

FCC Test Report

for

POS Terminal

Trade Name : VeriFone
Model Number : VX820
P/N : M282-XXX-XX-XXX-X; M282-XXX-XX-X-X
FCC ID : B32VX820CTLS
Report Number : RF-V040-1006-182
Date of Receipt : July 20, 2010
Date of Report : Aug. 10, 2010

Prepared for

VeriFone Inc.

1400 West Stanford Ranch Road Suite 200 Rocklin, CA 95765 USA.

Prepared by



Central Research Technology Co.

EMC Test Laboratory

No.11, Lane41, Fushuen St., Jungshan Chiu, Taipei, Taiwan, 104, R.O.C.



NVLAP LAB CODE 200575-0

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Certification

Equipment under Test : POS Terminal
Model No. : VX820
P/N : M282-XXX-XX-XXX-X; M282-XXX-XX-X-X
FCC ID : B32VX820CTLS
Manufacturer : Inventec Appliacnes(Pudong) Co., Ltd.
VeriFone Inc.
Sanmina-SCI Systems(Kunshan) Co., Ltd.

Applicant : VeriFone Inc.
Address : 1400 West Stanford Ranch Road Suite 200 Rocklin, CA
95765 USA
Date of Testing : July 28, 2010
Applicable Standards : 47 CFR part 15, Subpart C
Deviation : N/A
Condition of Test Sample : Enigneering Sample



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.

PREPARED BY : Cathy Chen , DATE : Aug. 10, 2010
(Cathy Chen/Technical Manager)

APPROVED BY : J. Y. Shih , DATE : Aug. 10, 2010
(Tsun-Yu Shih/General Manager)

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Attachment 1 – Photographs of the Test Configurations

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Attachment 3 – Internal Photographs of EUT

1 General Description

1.1 General Description of EUT

Equipment under Test: POS Terminal

Model No. : VX820

P/N : M282-XXX-XX-XXX-X; M282-XXX-XX-X-X

Test Voltage : 120Vac/ 60Hz to the adapter

Manufacturer :

Company	Address
Inventec Appliacnes(Pudong) Co., Ltd.	No. 789, Pu Xing Road, Shanghai, China
VeriFone Inc.	1401, Aviation Blvd, Lincoln CA 95648, United States
Sanmina-SCI Systems(Kunshan) Co., Ltd.	312, Qing Yang South Road, Economics and Technical Development Zone, Kunshan, Jiangsu Province, China 215300

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.

1.2 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.

1.3 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			

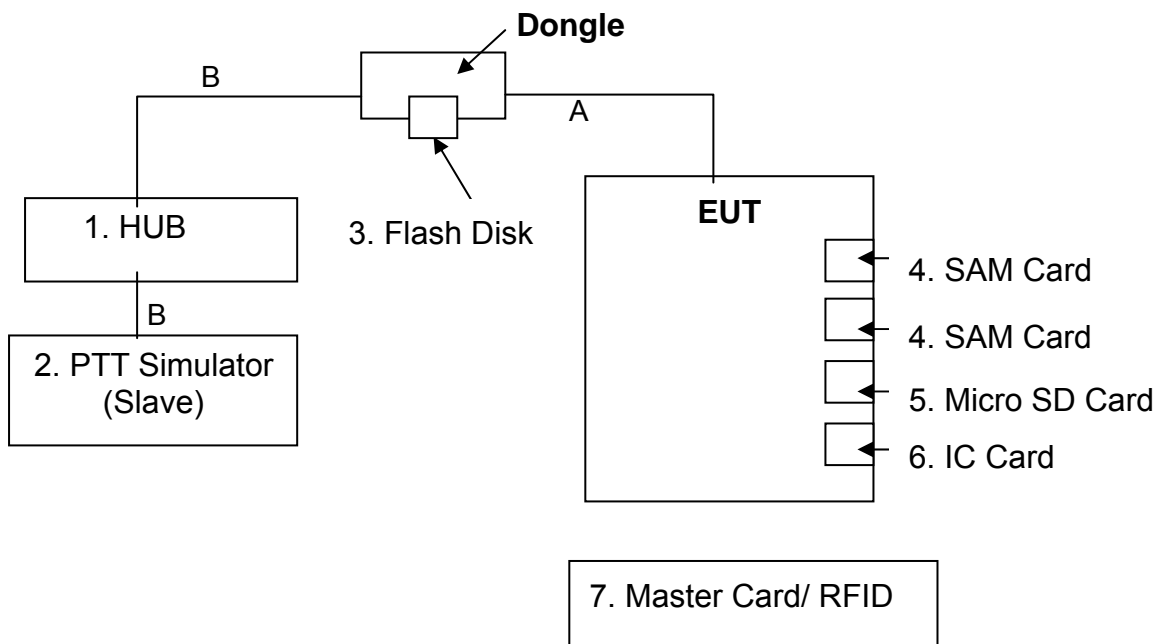
¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

1.4 The Support Units

No.	Unit	Model No./ Serial No.	FCC ID	Trade Name	Power Cord	Supported by lab.
1	HUB	PowerConnect 2724/ CN-0YJ297-28298- 897-0012	N/A	DELL	1.8m	✓
2	PTT Simulator (Slave)	VX810	N/A	VeriFone	1.8m	
3	Flash Disk (2GB)	N/A	N/A	Sandisk	N/A	
4	SAM Card	N/A	N/A	N/A	N/A	
5	Micro SD Card (64MB)	N/A	N/A	Sandisk	N/A	
6	IC Card	N/A	N/A	N/A	N/A	
7	Master Card/ RFID	N/A	N/A	N/A	N/A	

1.1 Layout of Setup



Connecting Cables

No.	Cable	Length	Shielded	Core	Shielded Backshell	Supported by lab.	Note
A	EUT Connected Cable	0.1m					
B	RJ 45Cable	>3m				✓	

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.

1.5 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.
TR10	3m semi-anechoic chamber (9m × 6m × 6m)	
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/registered/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	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-131,T-1441, G-10	Test facility list & NSA Data
Authorization Certificate	Germany	TUV	10021687-2010	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

1.6 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
Frequency error	4.2Hz
Radiated Emission: (30MHz~200MHz)	Horizontal: 2.8dB ; Vertical: 3.5dB
Radiated Emission: (200MHz~1GHz)	Horizontal: 3.4dB ; Vertical: 2.8dB

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
Test Receiver	R&S	ESCI/100019	2009/11/30	2010/11/29
Antenna	EMCO	6502/20558	2008/8/4	2011/8/3
RF Cable	N/A	N/A/C0083+C0071	2010/5/28	2011/5/27
Semi - anechoic Chamber	ETS. LINDGREN	TR11/ 906-A	2010/4/20	2011/4/19

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	

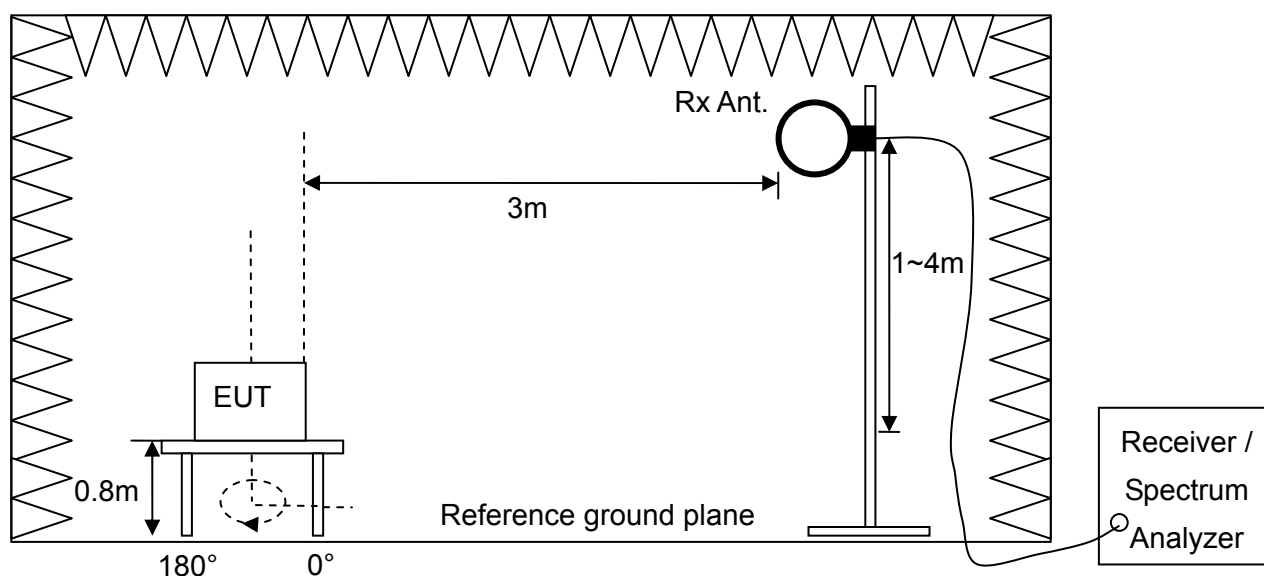
Climatic Condition

Ambient Temperature : 24°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 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.
- c. The EUT was set 3m away from the interference 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 : Continuous Transmitting

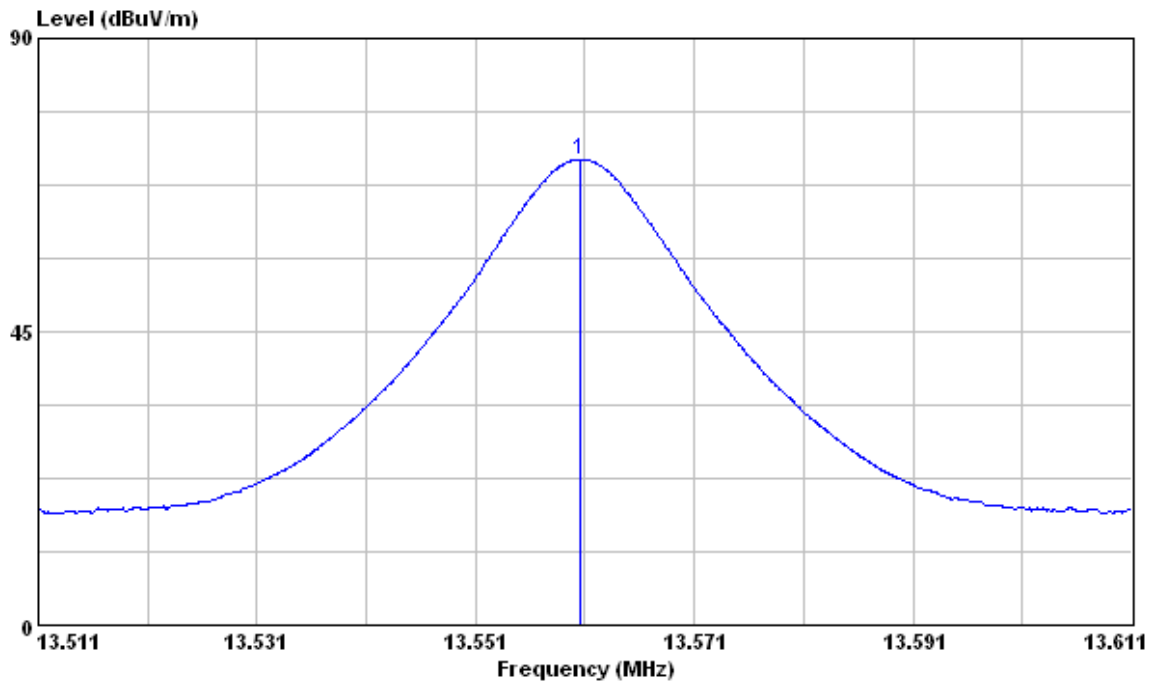
Test Distance : 3m Tester : Jacky

Freq. (MHz)	Polarization	Reading Data (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
13.56	V	57.39	14.03	71.41	124	52.59
13.56	H	52.14	14.03	66.17	124	57.83

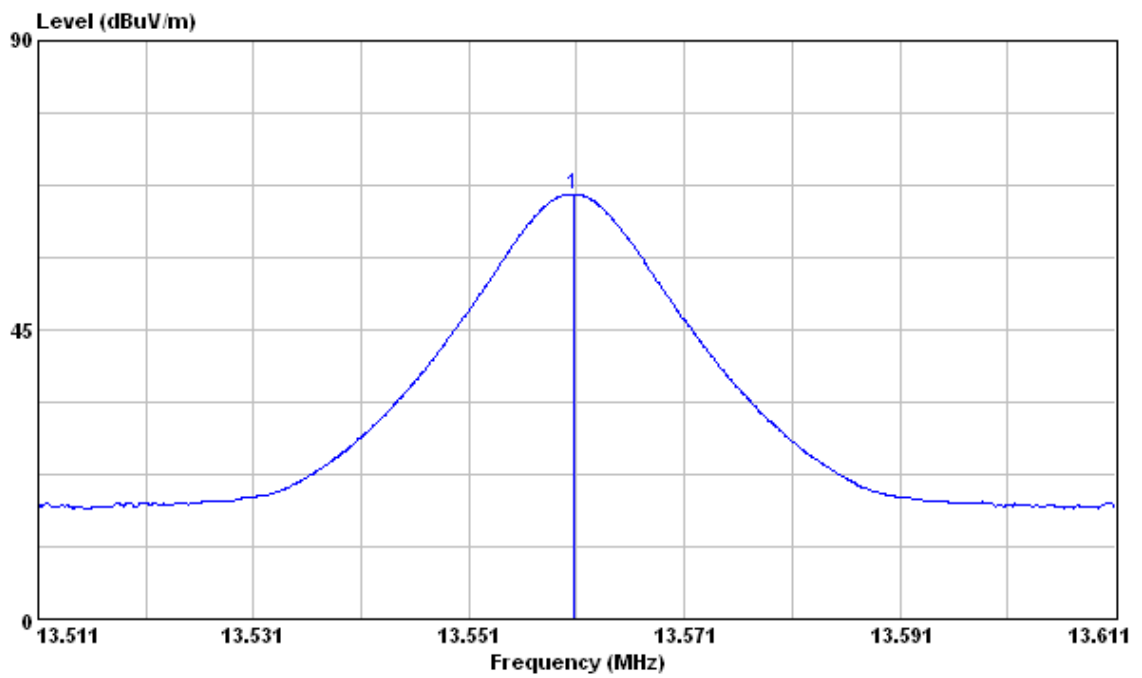
Note :

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

V Polarization



H Polarization



Band Edge

Test Mode : Continuous Transmitting

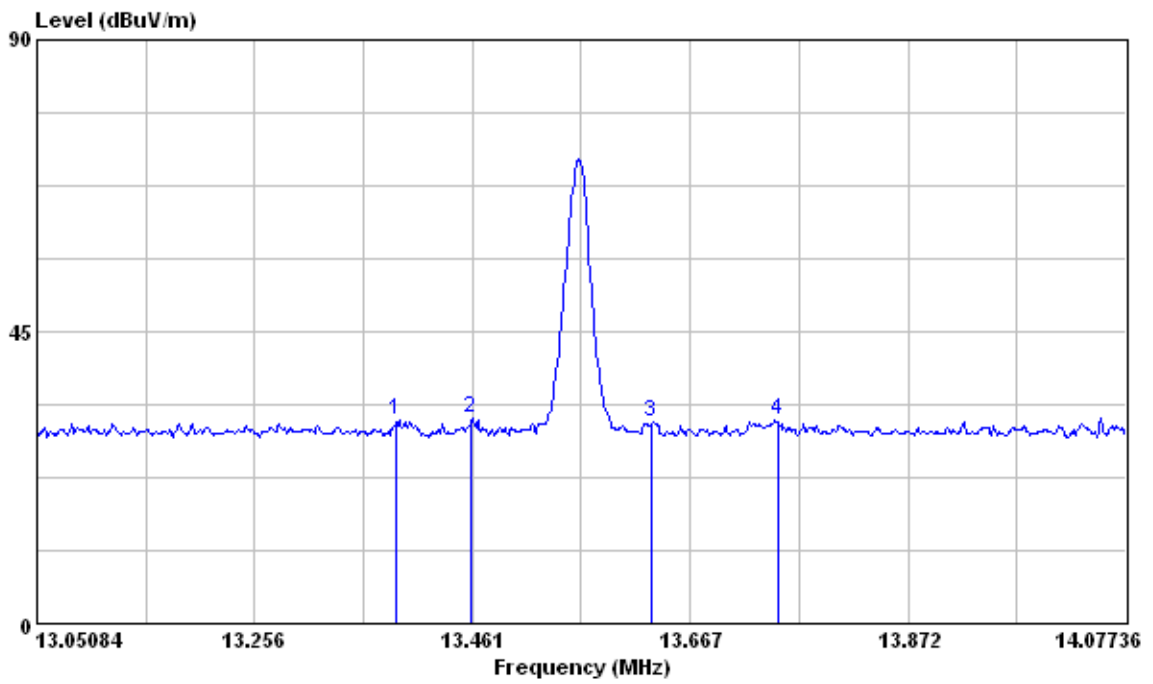
Test Distance : 3m Tester : Jacky

Emission Freq. (MHz)	Polarizortal	Reading Data (dBuV)	Correction Factor (dB/m)	Maximum Emission within the band (dBuV/m)	Limit (dBuV/m)	Margin (dB)
13.460	V	17.55	14.03	31.58	90.47	58.89
13.490	H	17.24	14.03	31.27	90.47	59.2
13.630	V	17.08	14.02	31.1	90.47	59.37
13.660	H	16.97	14.02	30.99	90.47	59.48
13.390	V	17.23	14.03	31.26	80.51	49.25
13.390	H	17.52	14.03	31.55	80.51	48.96
13.750	V	17.33	14.02	31.35	80.51	49.16
13.780	H	16.87	14.02	30.89	80.51	49.62

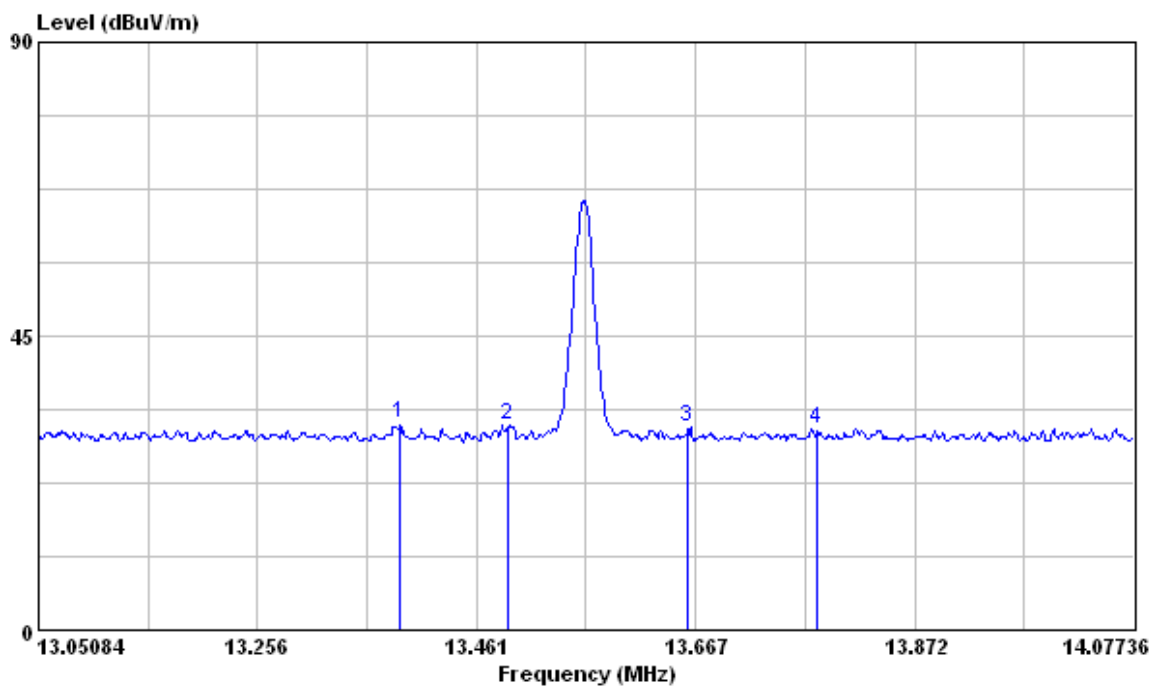
Note :

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

V Polarization



H 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
Test Receiver	R&S	ESCI/100019	2009/11/30	2010/11/29
Spectrum Analyzer	Agilent	E4407B/ MY45106795	2010/5/2	2011/5/3
Antenna	EMCO	6502/20558	2008/8/4	2011/8/3
Broadband Antenna	EMCO	3142C/52088	2010/5/18	2011/5/17
Pre-Amplifier	Mini-circuit	ZKL-2/009	NCR	NCR
Semi - anechoic Chamber	ETS. LINDGREN	TR11/ 906-A	2010/4/20	2011/4/19

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

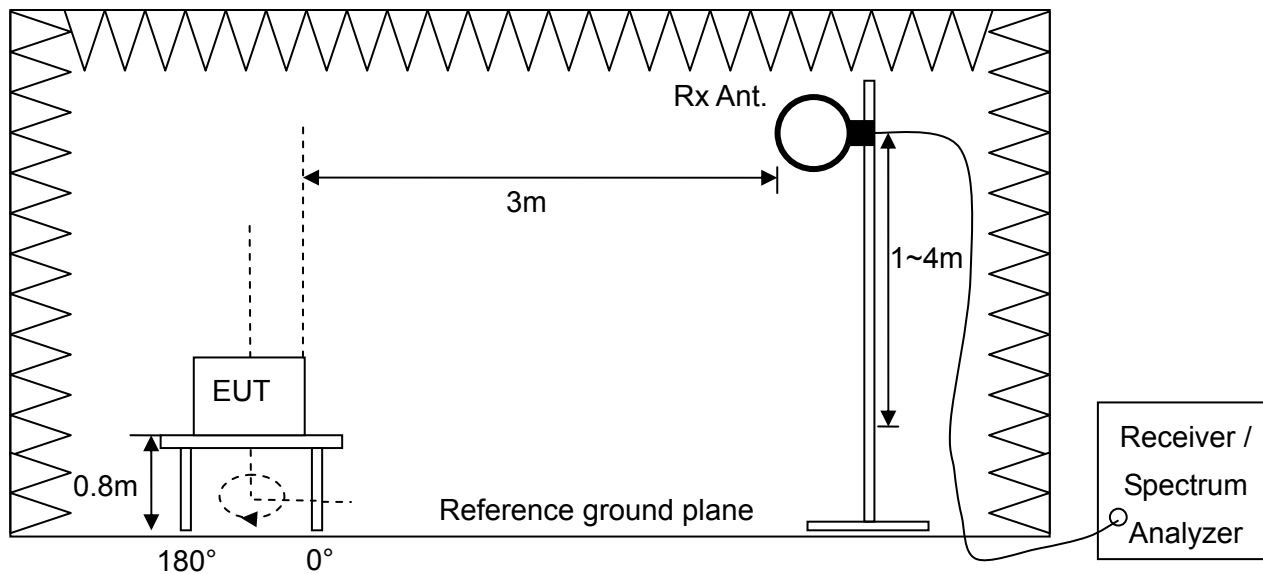
Ambient Temperature : 24°C; Relative Humidity : 55%

3.3 Measurement Procedure

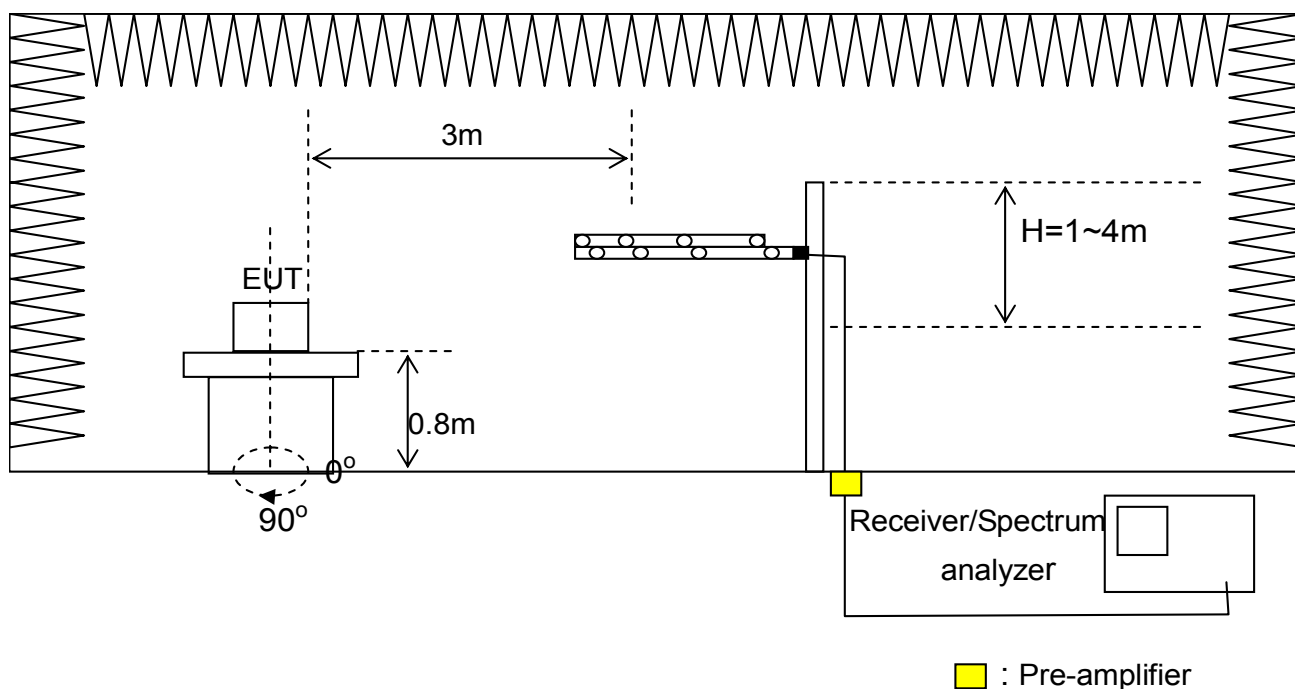
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. A software provided by client enabled the EUT to transmit and receive data at specified channel frequencies individually.
- c. If the EUT is tabletop 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



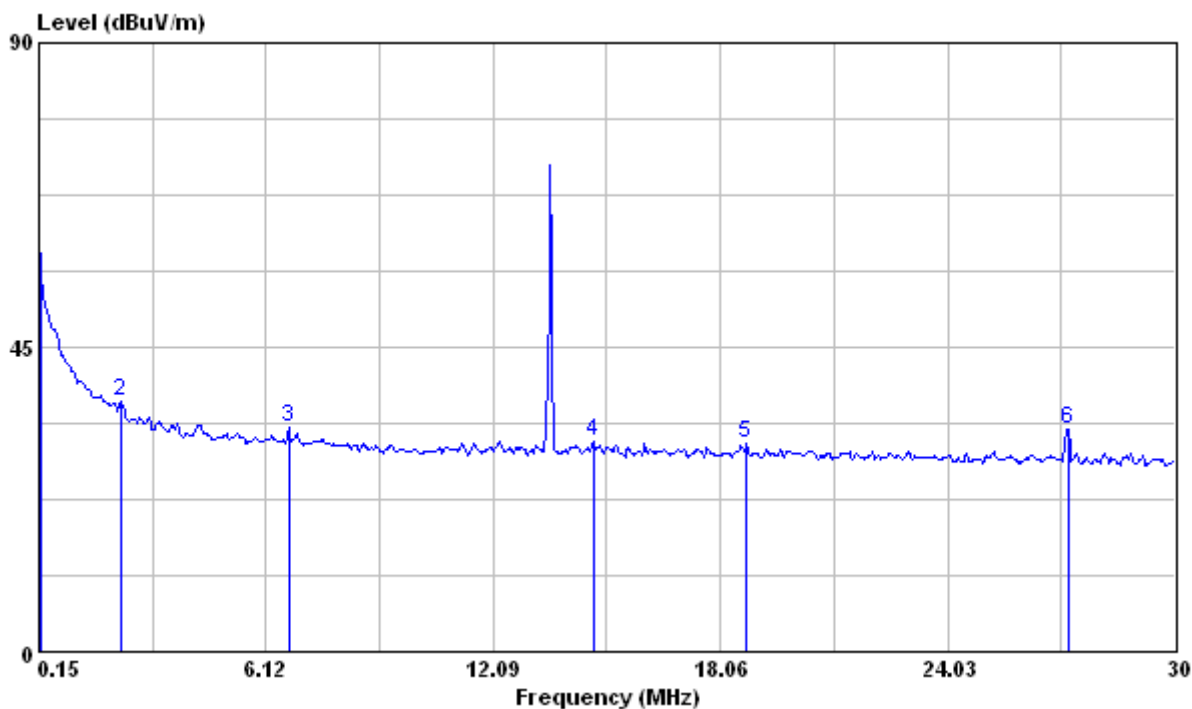
3.5 Test Data

Test Mode : Continuous Transmitting
Test Distance : 3m **Tester** : Jacky
Polarization : Vertical **Frequency Range** : 9kHz~30MHz

	Freq. (MHz)	Reading Data (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	0.21	39.83	15.12	54.95	69.54	14.59
2	2.30	22.34	14.58	36.92	69.54	32.62
3	6.72	18.9	14.28	33.18	69.54	36.36
4	14.72	17.1	13.99	31.09	69.54	38.45
5	18.75	16.9	13.82	30.72	69.54	38.82
6	27.22	20.08	12.83	32.91	69.54	36.63

Note:

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



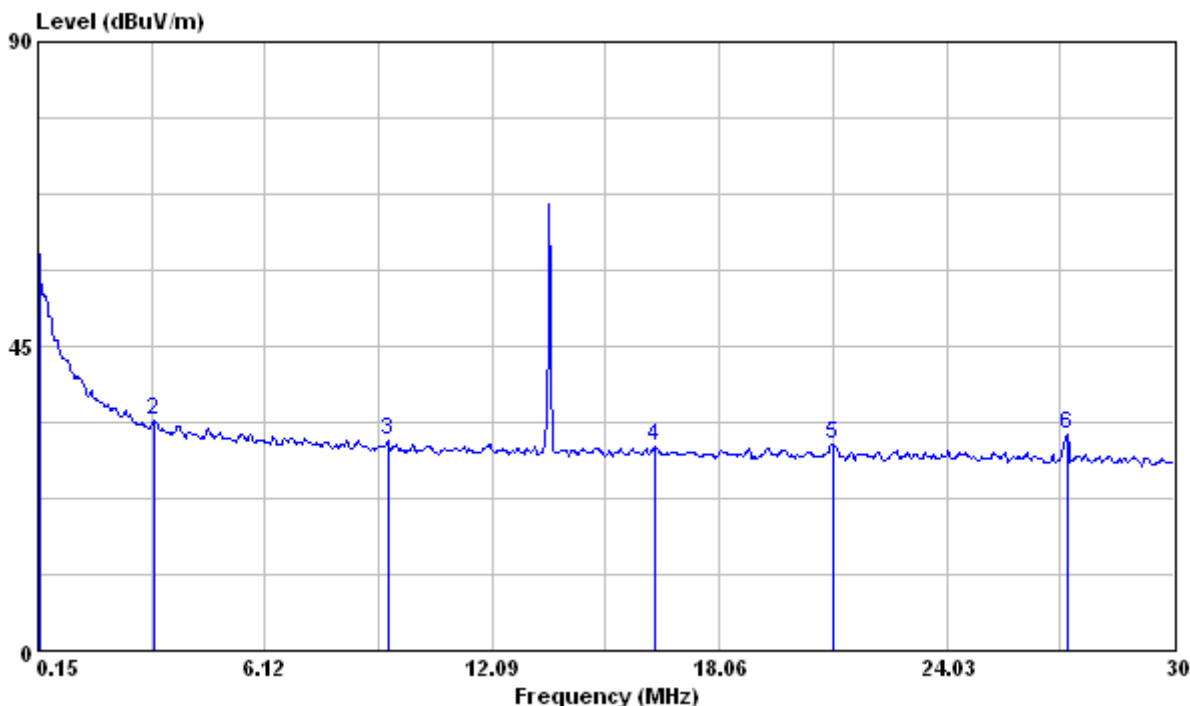
No signal can be detected from 9kHz to 150kHz, so the graphs are omitted below 150kHz.

Test Mode : Continuous Transmitting
Test Distance :3m **Tester** : Jacky
Polarization : Horizontal **Frequency Range** : 9kHz~30MHz

	Freq. (MHz)	Reading Data (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	0.21	40.07	15.12	55.19	69.54	14.35
2	3.19	19.5	14.49	33.99	69.54	35.55
3	9.34	17.02	14.18	31.20	69.54	38.34
4	16.36	16.16	13.92	30.08	69.54	39.46
5	21.07	16.76	13.65	30.41	69.54	39.13
6	27.22	19.00	12.83	31.83	69.54	37.71

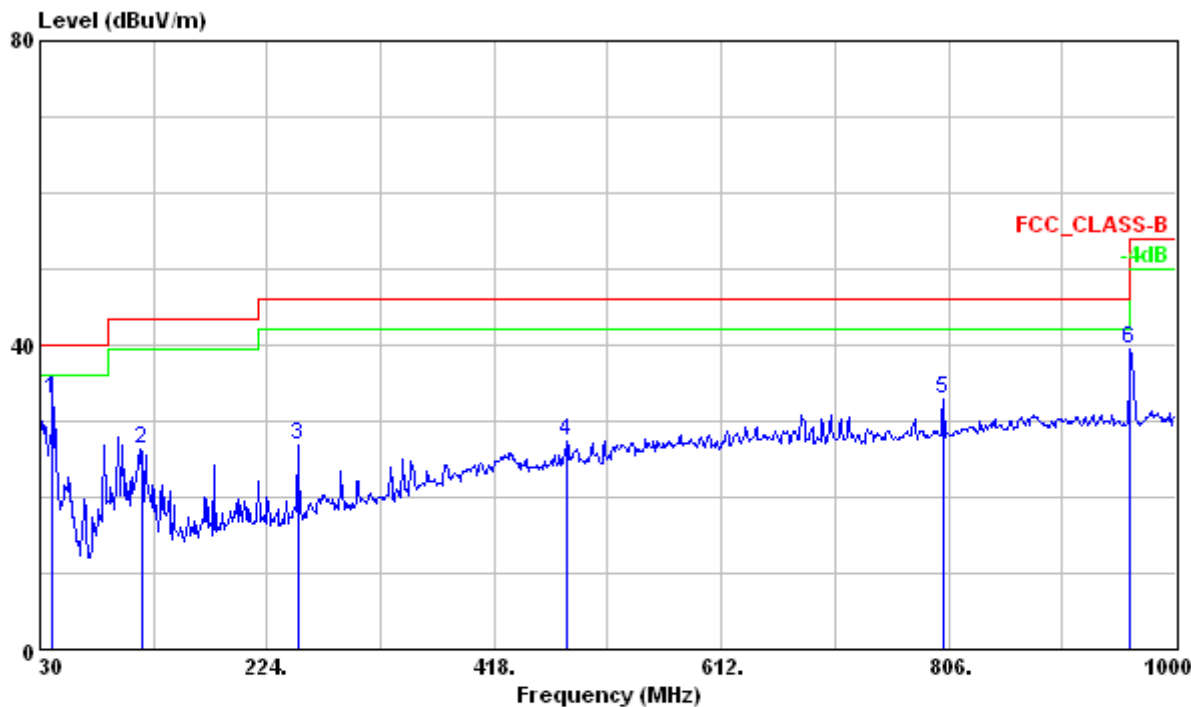
Note:

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



No signal can be detected from 9kHz to 150kHz, so the graphs are omitted below 150kHz.

Test Mode : Continuous Transmitting
Test Distance : 3m **Tester** : Jacky
Polarization : Vertical **Frequency Range** : 30MHz~1000MHz

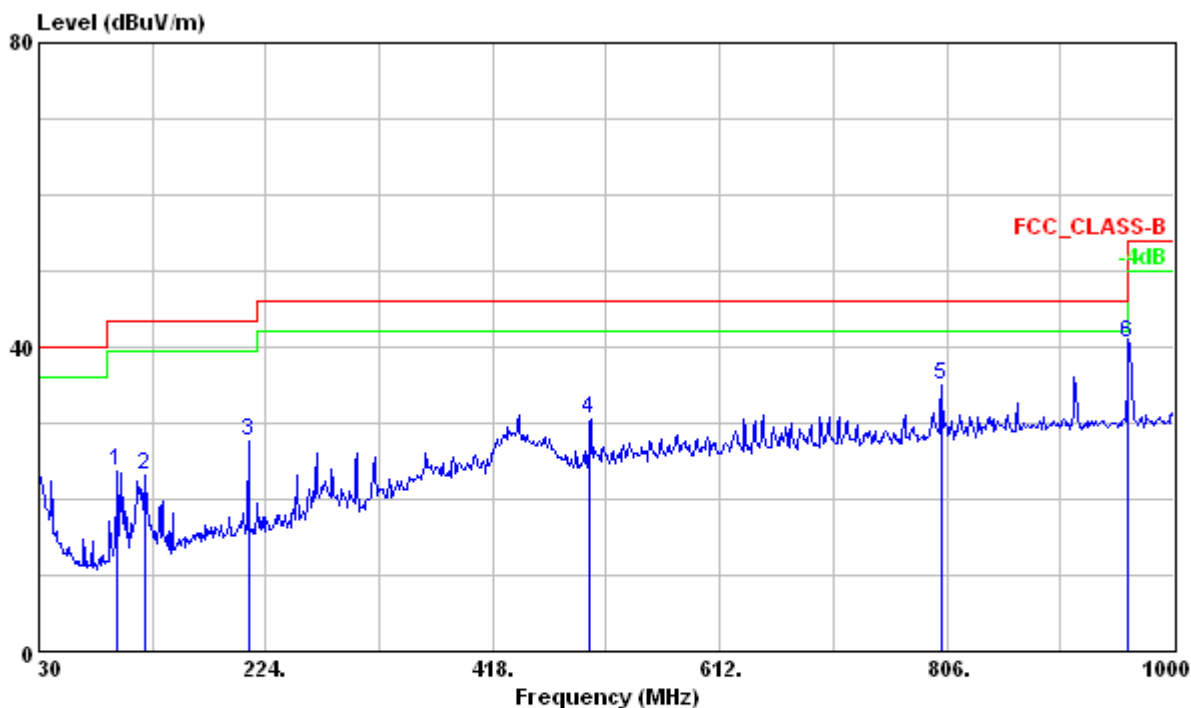


	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Ant Pos	Table Pos	Pol/Phase	Remark
	MHz	dBuV/m	dB/m	dBuV	dBuV/m	dB	cm	deg		
1	40.695	32.95	-14.45	47.40	40.00	-7.05	124	312	VERTICAL	QP
2	116.400	26.29	-19.29	45.58	43.50	-17.21	---	---	VERTICAL	Peak
3	250.320	26.95	-14.00	40.95	46.00	-19.05	---	---	VERTICAL	Peak
4	479.900	27.40	-7.53	34.93	46.00	-18.60	---	---	VERTICAL	Peak
5	801.200	32.82	-2.31	35.13	46.00	-13.18	---	---	VERTICAL	Peak
6	960.800	39.58	-0.48	40.06	54.00	-14.42	---	---	VERTICAL	Peak

Note :

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

Test Mode : Continuous Transmitting
 Test Distance :3m Tester : Jacky
 Polarization : Horizontal Frequency Range : 30MHz~1000MHz



	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Ant Pos	Table Pos	Pol/Phase	Remark
	MHz	dBUV/m	dB/m	dBuV	dBUV/m	dB	cm	deg		
1	96.150	23.77	-18.94	42.71	43.50	-19.73	---	---	HORIZONTAL	Peak
2	119.910	23.14	-19.46	42.60	43.50	-20.36	---	---	HORIZONTAL	Peak
3	209.010	27.74	-15.53	43.27	43.50	-15.76	---	---	HORIZONTAL	Peak
4	500.900	30.42	-7.15	37.57	46.00	-15.58	---	---	HORIZONTAL	Peak
5	801.200	35.12	-2.31	37.43	46.00	-10.88	---	---	HORIZONTAL	Peak
6	959.995	40.55	-0.49	41.04	46.00	-5.45	100	120	HORIZONTAL	QP

Note :

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

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	2010/3/25	2011/3/24
Temperature Chamber	Terchy	MHG-800LF/ 920224	2009/8/17	2010/8/16
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	

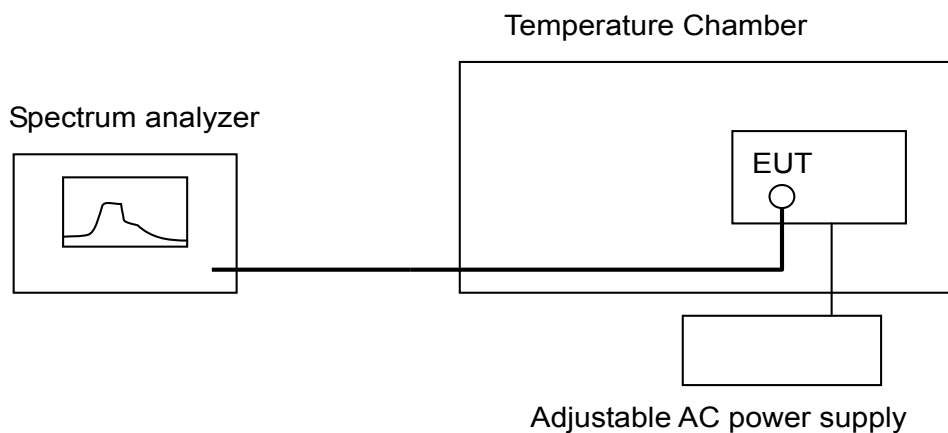
Climatic Condition

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

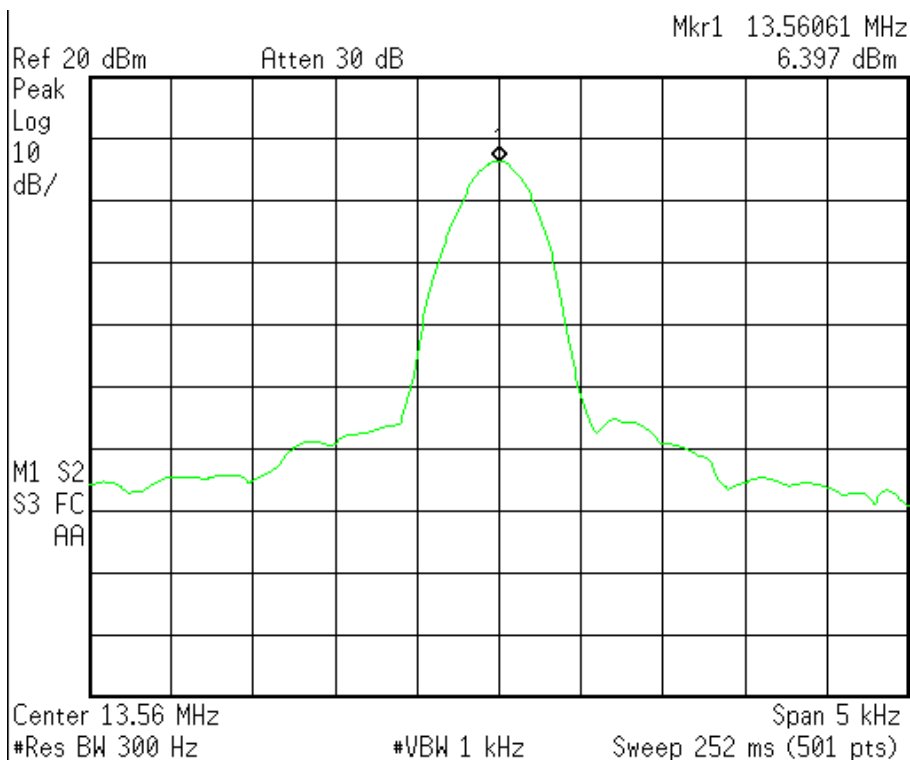
Test Mode : Continuous Transmitting
Tester : Bill

Temperature (°C)	AC Voltage (Volt)	Meas. Frequency (MHz)	Deviation (kHz)	Limit (kHz)	Margin (kHz)
20°C	120	13.56061	NA	1.356	NA
	138	13.56061	0.00	1.356	1.356
	102	13.56061	0.00	1.356	1.356
-20°C	120	13.56066	0.05	1.356	1.306
50°C	120	13.56061	0.00	1.356	1.356

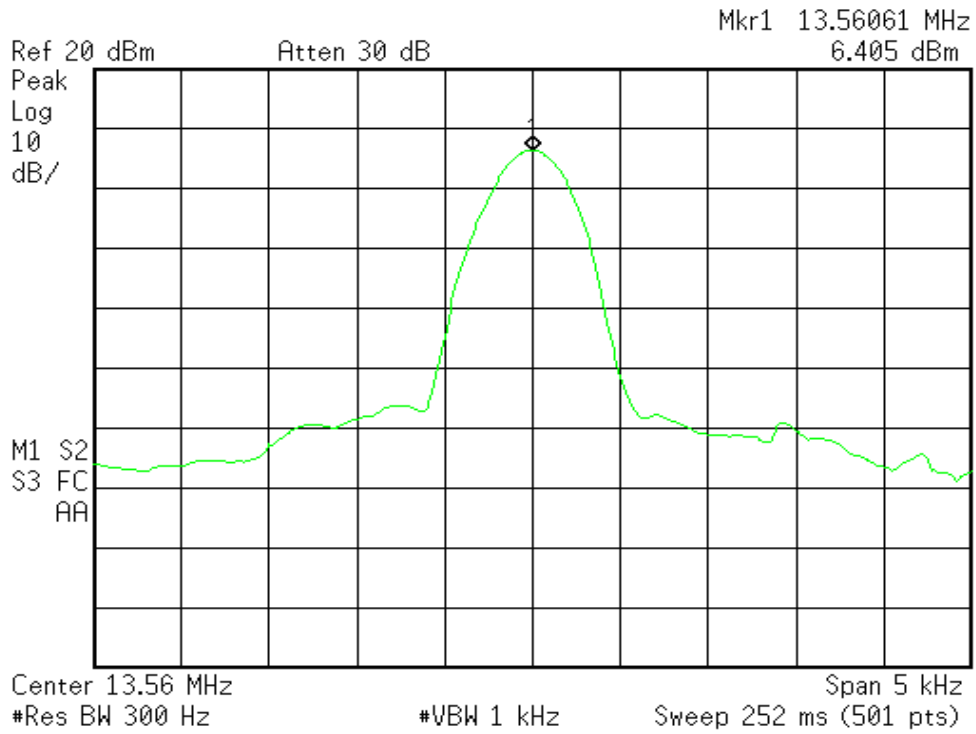
Note:

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

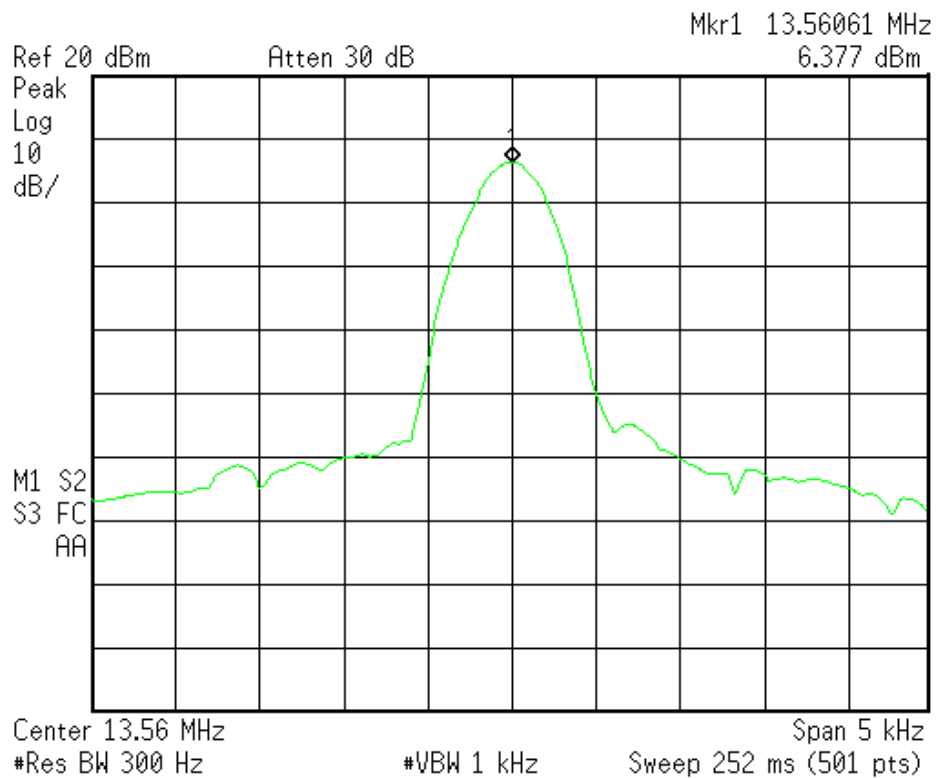
20°C, 120Vac



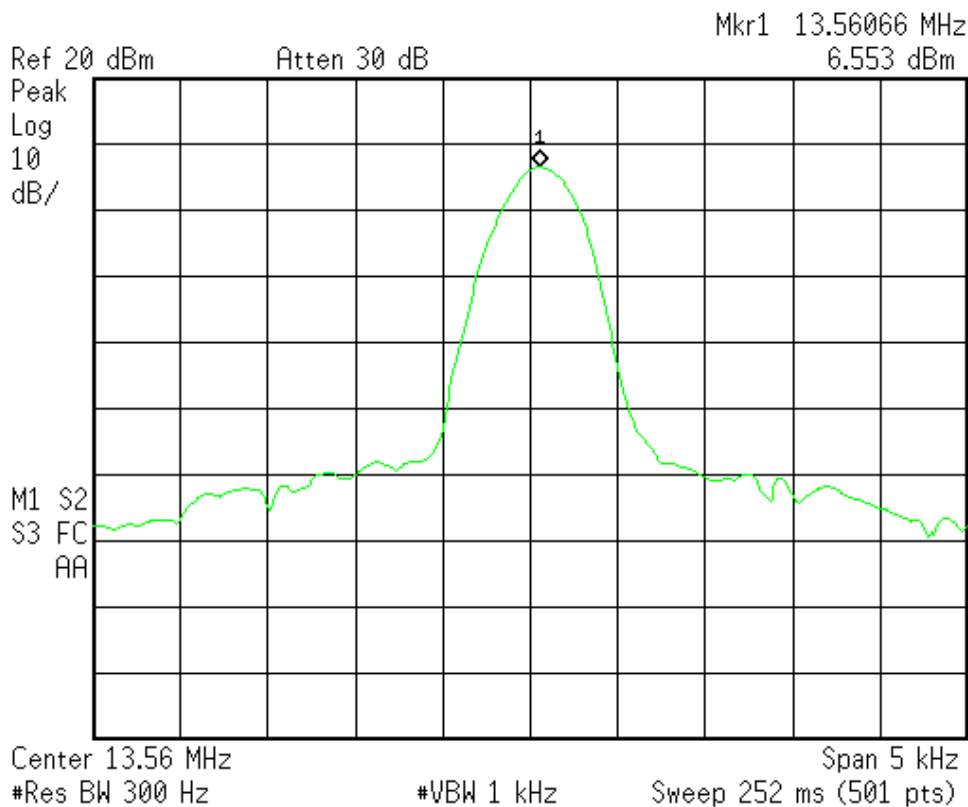
20°C, 138Vac



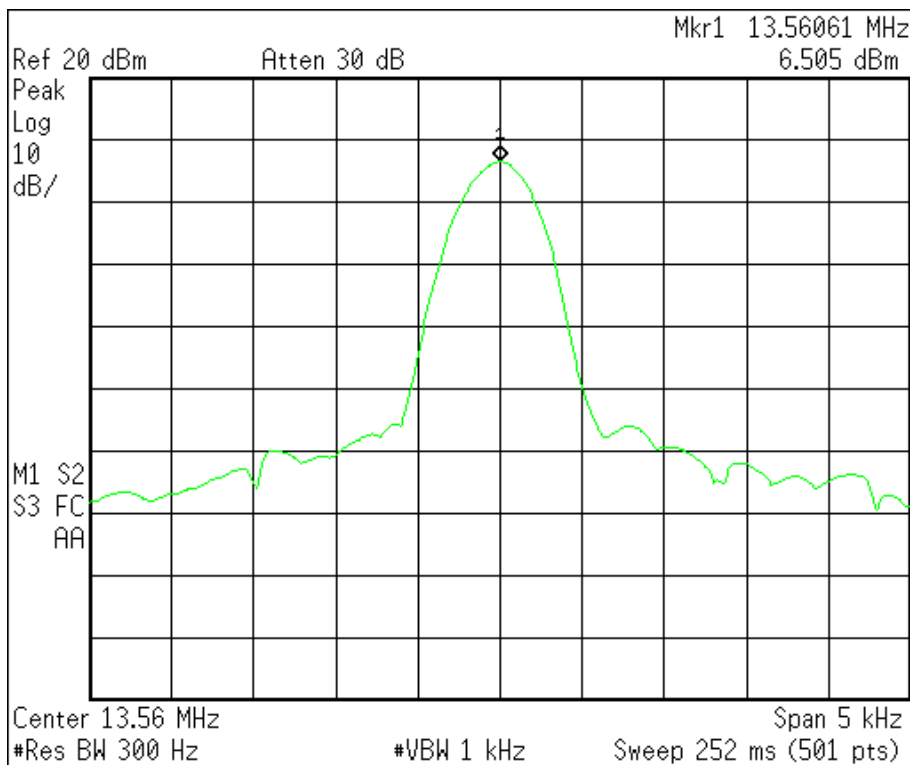
20°C, 102Vac



-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 Data
Spectrum Analyzer	Agilent	E4405B/ MY45106706	2010/3/25	2011/3/24
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	Sample	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

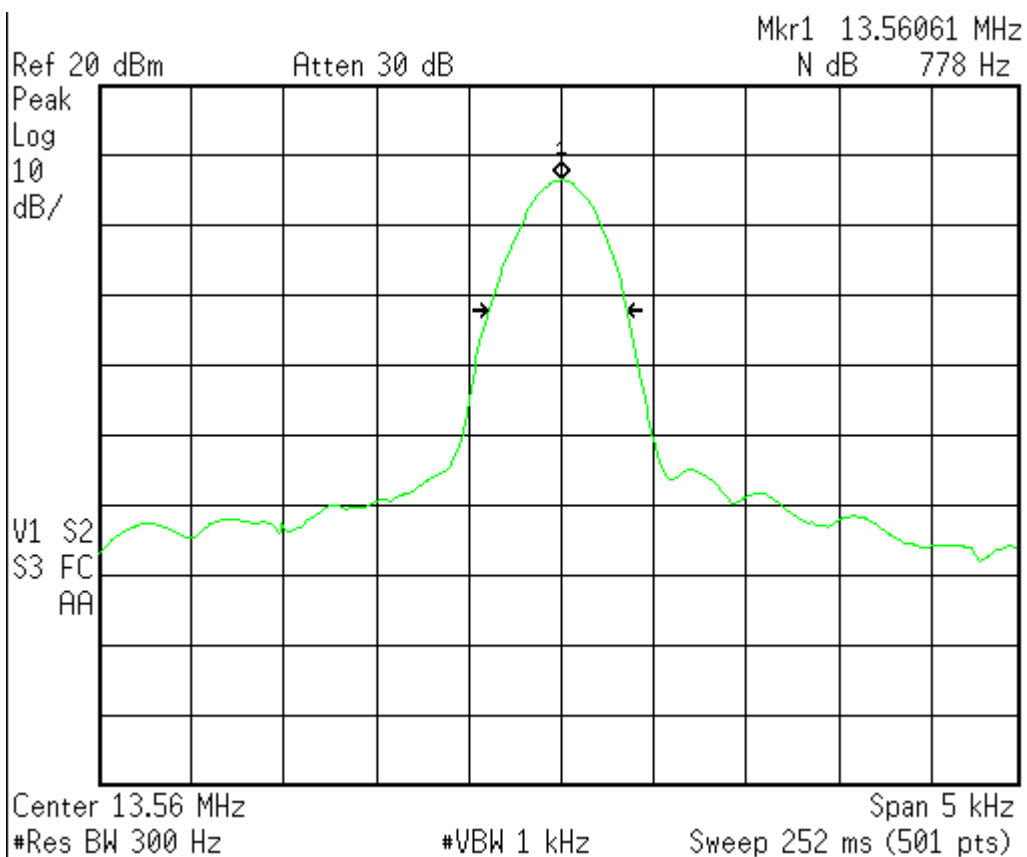


5.5 Test Data

Test Mode : Continuous Transmitting

Tester : Bill

Operating Frequency (MHz)	The lowest frequency (MHz)	The highest frequency (MHz)	Limit (MHz)
13.56	13.171	13.949	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	2010/1/10	2011/1/11
LISN	R&S	ESH2-Z5/ 836613/001	2009/8/14	2010/8/13
2 nd LISN	R&S	ENV4200/ 833209/010	2010/1/10	2011/1/11
50Ω terminator	N/A	N/A/ 001	2009/8/26	2010/8/25
RF Switch	N/A	RSU28/ 338965/002	2010/6/6	2011/6/5
RF Cable	N/A	N/A/ C0052 ~ 56	2010/3/3	2011/3/2
Test Software	Audix	e3/ Ver. 5.4.219.f	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	

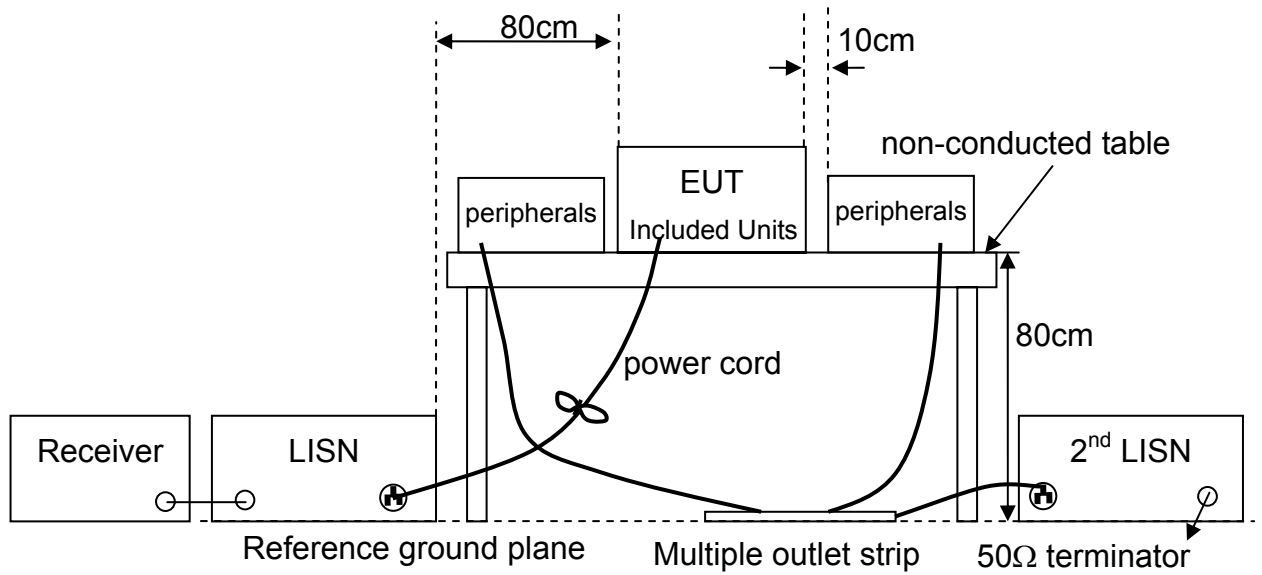
Climatic Condition

Ambient Temperature : 27°C; Relative Humidity : 65%

6.3 Test Procedures

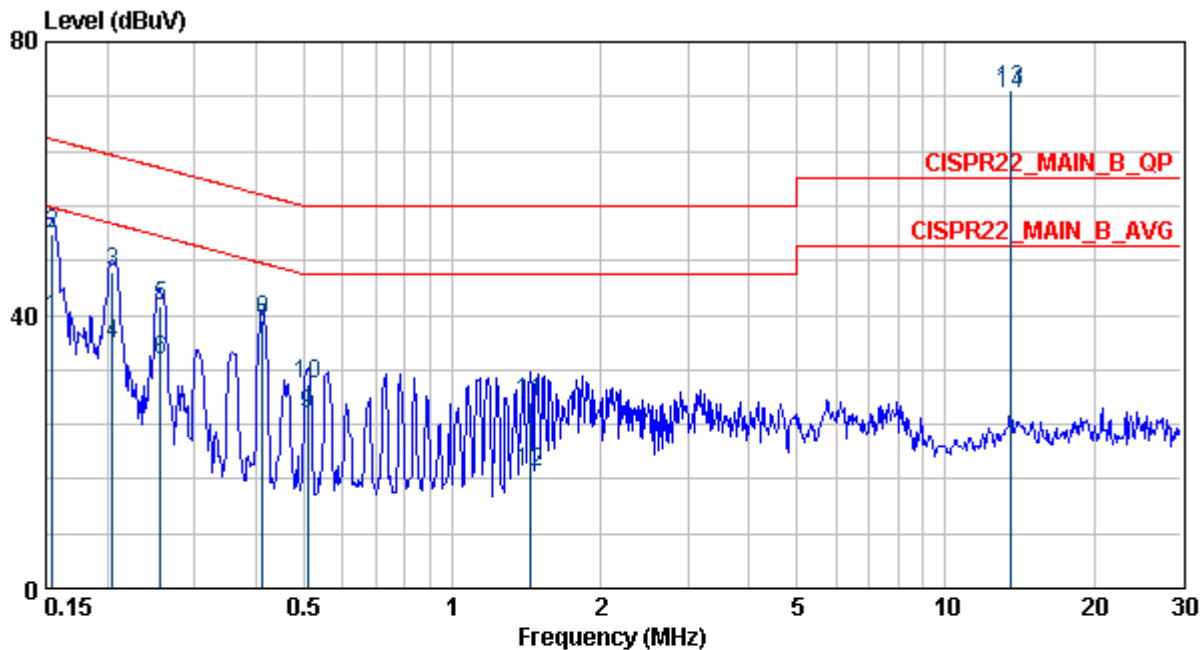
- a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
- b. If the EUT is tabletop equipment, it was placed on a non-conducted table with a height of 0.8 meters above the reference ground plane and 0.4 meters 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 : Continuous Transmitting, with antenna
 Tester : CDC Frequency Range : 150kHz~30MHz
 Phase : Line

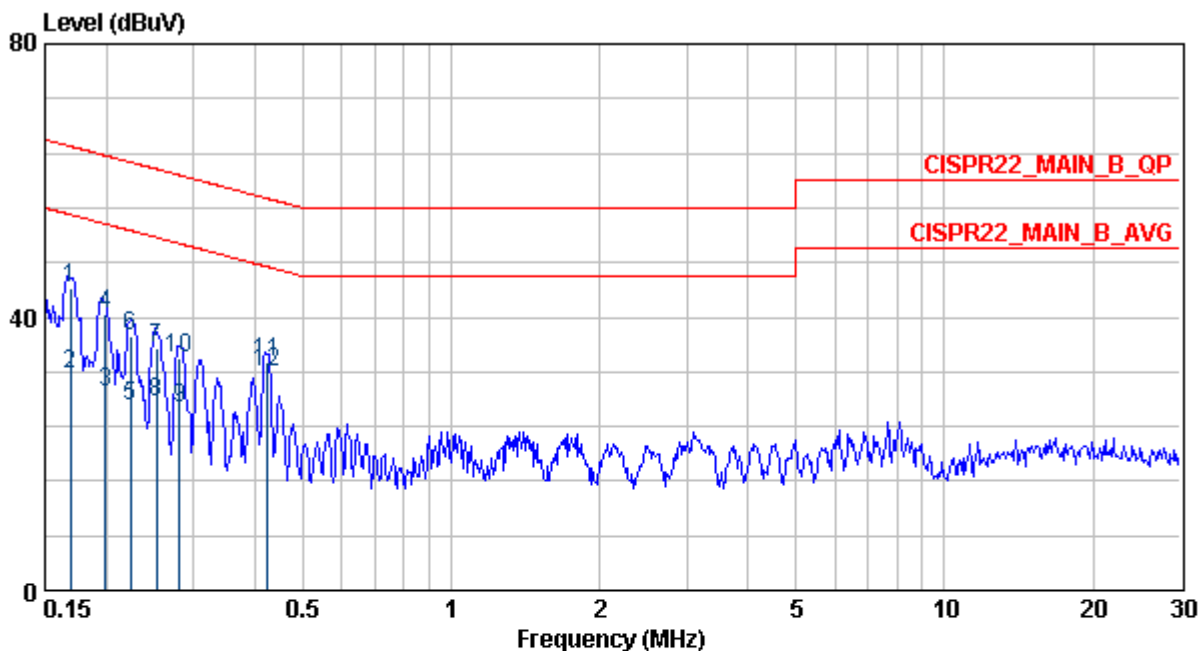


	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Ant Pos	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	cm		
1	0.155	39.70	0.16	39.54	55.74	-16.03	---	LINE	AVERAGE
2	0.155	51.80	0.16	51.64	65.74	-13.93	---	LINE	QP
3	0.205	46.25	0.17	46.08	63.40	-17.15	---	LINE	QP
4	0.205	35.81	0.17	35.64	53.40	-17.59	---	LINE	AVERAGE
5	0.256	41.45	0.18	41.27	61.55	-20.10	---	LINE	QP
6	0.256	33.32	0.18	33.14	51.55	-18.23	---	LINE	AVERAGE
7	0.413	38.06	0.20	37.86	47.59	-9.53	---	LINE	AVERAGE
8	0.413	39.16	0.20	38.96	57.59	-18.43	---	LINE	QP
9	0.510	25.54	0.22	25.32	46.00	-20.46	---	LINE	AVERAGE
10	0.510	29.93	0.22	29.71	56.00	-26.07	---	LINE	QP
11	1.441	27.18	0.31	26.87	56.00	-28.82	---	LINE	QP
12	1.441	16.85	0.31	16.54	46.00	-29.15	---	LINE	AVERAGE
13 X	13.560	72.92	1.15	71.77	60.00	12.92	---	LINE	QP
14 @	13.560	72.50	1.15	71.35	50.00	22.50	---	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 13, 14), for reference only. Please refer to next page.

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

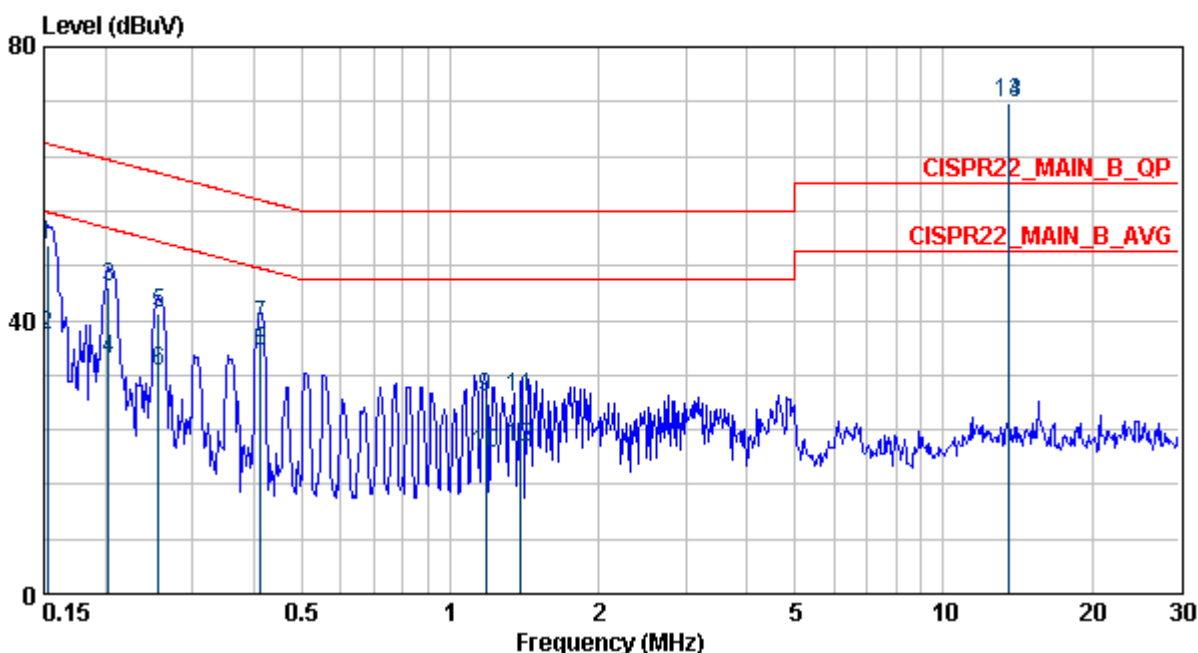


	Freq	Level	Factor	Read	Limit	Over	Ant		Remark
				Level	Line	Limit	Pos	Pol/Phase	
	MHz	dBuV	dB	dBuV	dBuV	dB	cm		
1	0.169	44.22	0.16	44.06	65.02	-20.79	---	LINE	QP
2	0.169	31.75	0.16	31.59	55.02	-23.26	---	LINE	AVERAGE
3	0.199	29.04	0.17	28.87	53.67	-24.63	---	LINE	AVERAGE
4	0.199	40.38	0.17	40.21	63.67	-23.29	---	LINE	QP
5	0.223	26.83	0.17	26.66	52.70	-25.87	---	LINE	AVERAGE
6	0.223	37.11	0.17	36.94	62.70	-25.59	---	LINE	QP
7	0.253	35.47	0.18	35.29	61.67	-26.20	---	LINE	QP
8	0.253	27.59	0.18	27.41	51.67	-24.08	---	LINE	AVERAGE
9	0.282	26.80	0.18	26.62	50.76	-23.96	---	LINE	AVERAGE
10	0.282	33.87	0.18	33.69	60.76	-26.89	---	LINE	QP
11	0.423	33.29	0.20	33.09	57.38	-24.09	---	LINE	QP
12 B	0.423	31.87	0.20	31.67	47.38	-15.51	---	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 : Continuous Transmitting, with antenna
 Tester : CDC Frequency Range : 150kHz~30MHz
 Phase : Neutral

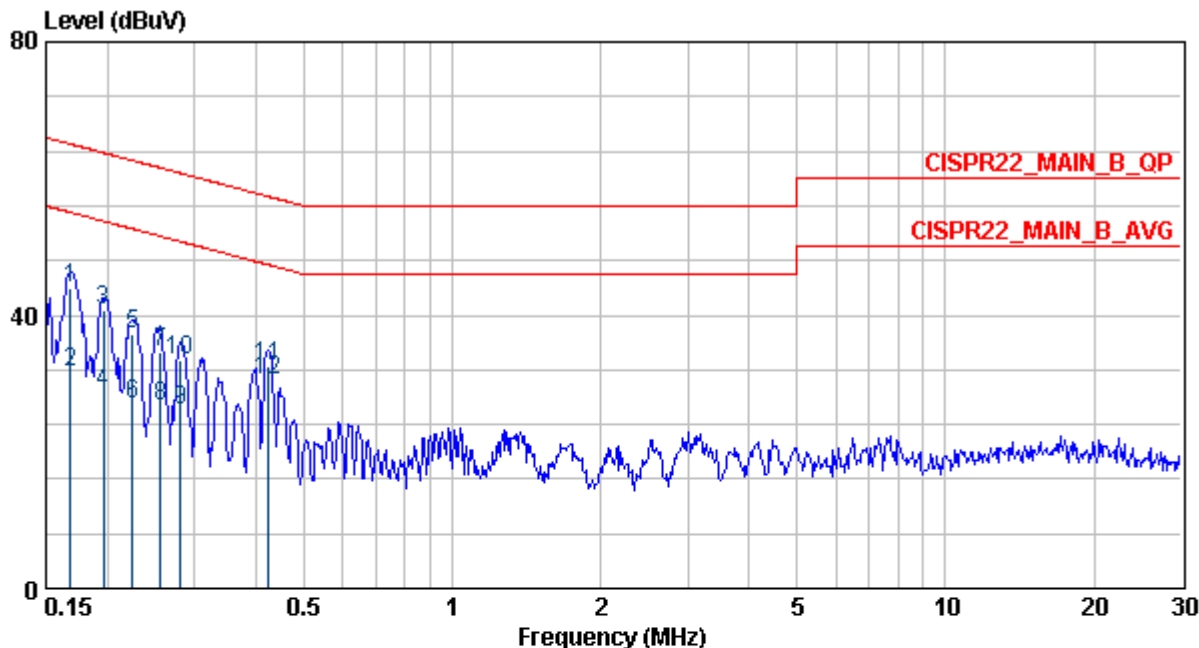


	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Ant Pos	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	cm		
1	0.152	51.04	0.22	50.82	65.87	-14.83	---	NEUTRAL	QP
2	0.152	37.73	0.22	37.51	55.87	-18.14	---	NEUTRAL	AVERAGE
3	0.203	44.85	0.22	44.63	63.49	-18.64	---	NEUTRAL	QP
4	0.203	34.36	0.22	34.14	53.49	-19.13	---	NEUTRAL	AVERAGE
5	0.256	41.14	0.23	40.91	61.56	-20.41	---	NEUTRAL	QP
6	0.256	32.59	0.23	32.36	51.56	-18.96	---	NEUTRAL	AVERAGE
7	0.413	39.14	0.26	38.88	57.59	-18.45	---	NEUTRAL	QP
8	0.413	35.46	0.26	35.20	47.59	-12.13	---	NEUTRAL	AVERAGE
9	1.179	28.61	0.35	28.26	56.00	-27.39	---	NEUTRAL	QP
10	1.179	20.39	0.35	20.04	46.00	-25.61	---	NEUTRAL	AVERAGE
11	1.390	28.61	0.36	28.25	56.00	-27.39	---	NEUTRAL	QP
12	1.390	21.51	0.36	21.15	46.00	-24.49	---	NEUTRAL	AVERAGE
13 X	13.560	71.89	0.88	71.01	60.00	11.89	---	NEUTRAL	QP
14 ☺	13.560	71.81	0.88	70.93	50.00	21.81	---	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 13, 14), for reference only. Please refer to next page.

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



	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Ant Pos	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	cm		
1	0.169	43.98	0.22	43.76	65.03	-21.05	---	NEUTRAL	QP
2	0.169	31.61	0.22	31.39	55.03	-23.42	---	NEUTRAL	AVERAGE
3	0.197	40.61	0.22	40.39	63.76	-23.15	---	NEUTRAL	QP
4	0.197	28.58	0.22	28.36	53.76	-25.18	---	NEUTRAL	AVERAGE
5	0.224	37.33	0.23	37.10	62.66	-25.33	---	NEUTRAL	QP
6	0.224	26.93	0.23	26.70	52.66	-25.73	---	NEUTRAL	AVERAGE
7	0.256	34.47	0.23	34.24	61.56	-27.08	---	NEUTRAL	QP
8	0.256	26.58	0.23	26.35	51.56	-24.97	---	NEUTRAL	AVERAGE
9	0.282	26.10	0.24	25.86	50.76	-24.67	---	NEUTRAL	AVERAGE
10	0.282	33.48	0.24	33.24	60.76	-27.29	---	NEUTRAL	QP
11	0.421	32.38	0.26	32.12	57.42	-25.03	---	NEUTRAL	QP
12	0.421	30.41	0.26	30.15	47.42	-17.00	---	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.