

**FCC CFR47 PART 15 CERTIFICATION**



**TEST REPORT**

***FOR***

**2.4GHZ SPREAD SPECTRUM STATION RADIO**

**MODEL: 2411EZLink-E**

**FCC ID: MKZ2411EZYLINK-E**

**REPORT NUMBER: 01U1006-1**

**ISSUE DATE: OCTOBER 2, 2001**

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**NVLAP<sup>®</sup>**  
**LAB CODE:200065-0**

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## 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** OTC WIRELESS, INC.  
48507 MILMONT DRIVE  
FREMONT, CA 94538 USA

**CONTACT PERSON:** YAN ZHENG / ENGINEER

**TELEPHONE NO:** 510-490-8288

**EUT DESCRIPTION:** 2.4GHZ STATION RADIO

**MODEM NAME:** 2411EZLINK-E

**DATE TESTED:** OCTOBER 12, 2001

TYPE OF EQUIPMENT	INTENTIONAL RADIATOR
EQUIPMENT TYPE	2.4GHz TRANSCEIVER
MEASUREMENT PROCEDURE	ANSI 63.4 / 1992, TIA/EIA 603
PROCEDURE	CERTIFICATION
FCC RULE	CFR 47 PART 15.247

Compliance Certification Services, Inc. tested the above equipment for compliance with the requirement set forth in CFR 47, PART 15.247. The equipment in the configuration described in this report, shows the measured emission levels emanating from the equipment do not exceed the specified limit.

**Note:** This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved & Released For CCS By:

Tested By:



STEVE CHENG  
EMC ENGINEERING MANAGER  
COMPLIANCE CERTIFICATION SERVICES

HUE LY VANG  
ASSOCIATE EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. EUT DESCRIPTION

2411EZYLINK-E is a point-to multiple-points wireless data networking system. It can be used by internet service providers as a means of last-mile connection to the users. It can also be used to form a campus network. Its data-transmitting burst rate is 11Mbps.

Crystal

Broad Name	Crystal (MHz)
Main Unit	9.6MHz , 32.768MHz
Handset Unit	9.6MHz , 32.768MHz

## 3. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.





## 4. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

## 5. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT (1300F2))

### 5.1. Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	FCC Part 15, CISPR 22, AS/NZS 3548, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, CNS 13438	 200065-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	 R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	 ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	 ELA-171
Taiwan	BSMI	CNS 13438	 SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	 IC2324 A,B,C, and F

\*No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government

## 6. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

TEST EQUIPMENTS LIST				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Spectrum Analyzer	HP100Hz - 22GHz	8566B	2140A01296	5/4/02
Spectrum Display	HP	85662A	2152A03066	4/10/02
Quasi-Peak Detector	HP9K - 1GHz	85650A	2811A01155	5/4/02
Pre-Amplifier, 25 dB	HP 0.1 - 1300MHz	8447D (P_1M)	2944A06833	11/21/01
Antenna, BiLog	Chase 30 - 2000MHz	CBL6112	2049	12/11/01
LISN	Fisher Cus. Comm.	LISN-50/250-25-2	2023	8/5/02
EMI Test Receiver	Rohde & Schwarz	ESHS 20	827129/006	2/28/02
EMC Receiver (9K-26.5GHz)	HP	8593EM	3710A00205	6/20/02
Horn Antenna(1 - 18GHz)	EMCO	3115	2238	6/20/02
Horn Antenna,(18 - 26GHz)	Antenna Research Associate	MWH 1826/B	1013	7/26/02
Power Meter	HP	436A	2709A29209	2/8/02
High pass filter	FSM Microwave	HM 4570-9SS	3	N.C.R.

### 6.1. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Radiated Emission	
30MHz – 200 MHz	+/- 3.3dB
200MHz – 1000MHz	+4.5/-2.9dB
1000MHz – 2000MHz	+4.6/-2.2dB
Power Line Conducted Emission	
150kHz – 30MHz	+/-2.9

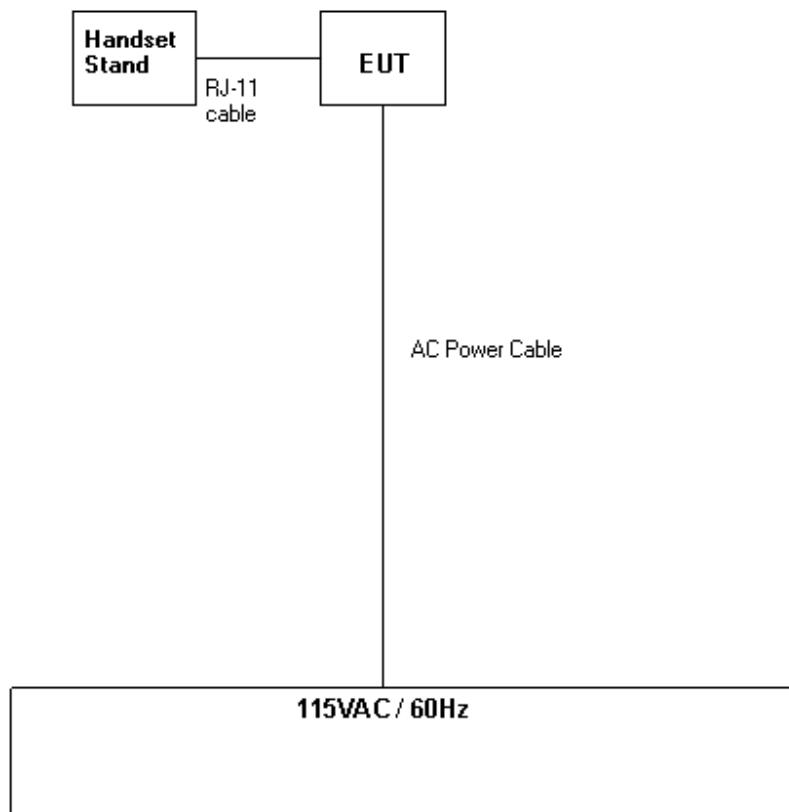
Any results falling within the above values are deemed to be marginal.

## 7. SUPPORT EQUIPMENT / TEST DIAGRAM

### Support Equipment

During Radiated Emission testing, no support equipment was used.

### Test Diagram



## 8. APPLICABLE RULES AND BRIEF TEST RESULT

### §15.247- POWER LIMIT

(b) The maximum peak output power of the intentional radiator shall not exceed the following:

(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, all frequency hopping systems in the 5725-5850 MHz band, and all direct sequence systems: 1 watt.

*Spec limit: As specified above, 1W maximum.*

*Test result: No non-compliance noted.*

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>Output Power(watts)</i>
<i>1</i>	<i>2412</i>	<i>162.76mWatt (22.1dBm)</i>
<i>7</i>	<i>2442</i>	<i>100.38mWatt (20.01dBm)</i>
<i>11</i>	<i>2462</i>	<i>99.52mWatt (19.99dBm)</i>

### §14.407- BANDWIDTH LIMITATION

(2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

*Spec limit: > 500 kHz.*

*Test result: No non-compliance noted.*

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>Bandwidth(MHz)</i>
<i>1</i>	<i>2412</i>	<i>13.15</i>
<i>7</i>	<i>2442</i>	<i>12.8</i>
<i>11</i>	<i>2462</i>	<i>12.65</i>



**§15.247- PEAK POWER SPECTRAL DENSITY**

(d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

*Spec limit: < 8dBm.*  
*Test result: No non-compliance noted.*

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>PPSD(dBm)</i>
<i>1</i>	<i>2412</i>	<i>-12.9</i>
<i>7</i>	<i>2442</i>	<i>-14.7</i>
<i>11</i>	<i>2462</i>	<i>-14.2</i>

**§15.247- PROCESS GAIN**

(e) The processing gain of a direct sequence system shall be at least 10 dB. The processing gain represents the improvement to the received signal-to-noise ratio, after filtering to the information bandwidth, from the spreading/despreading function.

*Spec limit: >10dBm.*  
*Test result: No non-compliance noted.*

**§15.205- RESTRICTED BANDS OF OPERATIONS**

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 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	2655 - 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	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

***Spec limit: As specified above.***

***Test result: No non-compliance noted. See section 9.7 Radiated Emission.***

**§90.209- RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS**

(a) 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 (microvolts/meter)	Measurement Distance (meters)
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.

(b) In the emission table above, the tighter limit applies at the band edges.

**FCC PART 15 CLASS A**

MEASURING DISTANCE OF 10 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	90	39.1
88-216	150	43.5
216-960	210	46.4
Above 960	300	49.5

**FCC PART 15 CLASS B**

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

***Spec limit: As specified above.***

***Test result: No non-compliance noted.***

**§15.207- CONDUCTED LIMITS**

(a) For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

FCC CLASS A

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV)/QP
450kHz-1.705MHz	1000	60
1.705MHz - 30MHz	3000	69.54

FCC CLASS B

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV)/QP
450kHz-30MHz	250	48

***Spec limit: As specified above.***

***Test result: No non-compliance noted. No radiated emissions were detected other than the fundamental frequency and harmonics. Line conducted emissions comply.***

## 9. MODIFICATIONS

To achieve compliance modifications were made to the EUT.

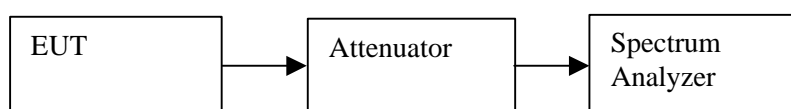
1. Added ferrite core (Fair-Rite brand, part #:0444164181) onto RJ-45 with one turn at EUT end.
2. Added ferrite core (Fair- Rite brand, part #:0443164151) onto DC power Line with two turns at EUT end.
3. Replaced the R75 (0 ohm) and R76 (0 ohm) with ferrite bead.

## 10. TEST SETUP, PROCEDURE AND RESULT

### 10.1. CONDUCTED POWER

#### Summations method

#### TEST SETUP



Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> 3 MHz	<input checked="" type="checkbox"/> 3 MHz

#### TEST PROCEDURE

The EUT is configured on a test bench as shown above in a continuously transmitting / receiving mode. While the transceiver started, the analyzer MAX HOLD function is used to capture the emissions.

A signal at every 3 MHz from the center is taken. The number is converted into watts and then added up.

To Convert from dB to Watts used this formula:  $10 \log (x)dB$

To convert from Watts to dB use this formula:  $\text{Anti log} ((X)\text{Watts}/10)$

Channel:1 (Fo=2412)

Frequency	dBm	mWatts
2422	2.1	1.23
2419	12.4	17.38
2116	15.5	37.15
2413	17..2	50.12
2410	16.10	40.84
2407	11.5	14.13

2404	2.8	1.91
------	-----	------

Total = 162.76mWatts  
 162.76mWatts = **22.1dBm**

Channel:7 (Fo=2442)

Frequency	dBm	mWatts
2452	-1.8	.66
2449	8.6	7.24
2146	12.7	18.62
2443	15	31.62
2440	14.4	27.54
2437	10.9	12.3
2434	3.8	2.4

Total = 100.38mWatts  
 100.38mWatts = **20.01dBm**

Channel:1 (Fo=2462)

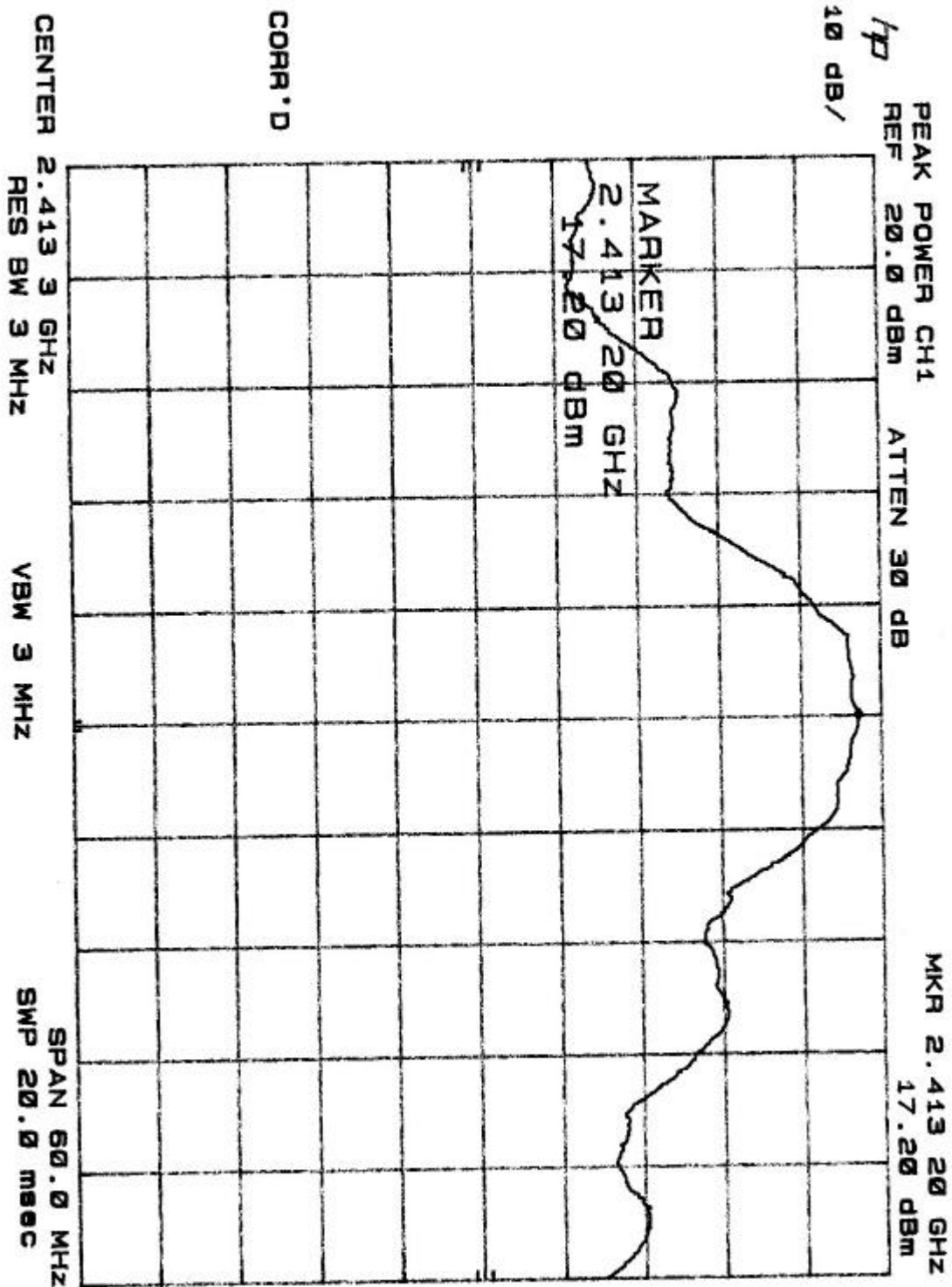
Frequency	dBm	Mwatts
2472	-.8	.16
2469	8.8	7.59
2466	13	19.95
2463	15.1	32.36
2460	14.3	26.92
2457	10.3	10.72
2454	2.6	1.82

Total = 99.52.mWatts  
 99.52mWatts = **19.99dBm**

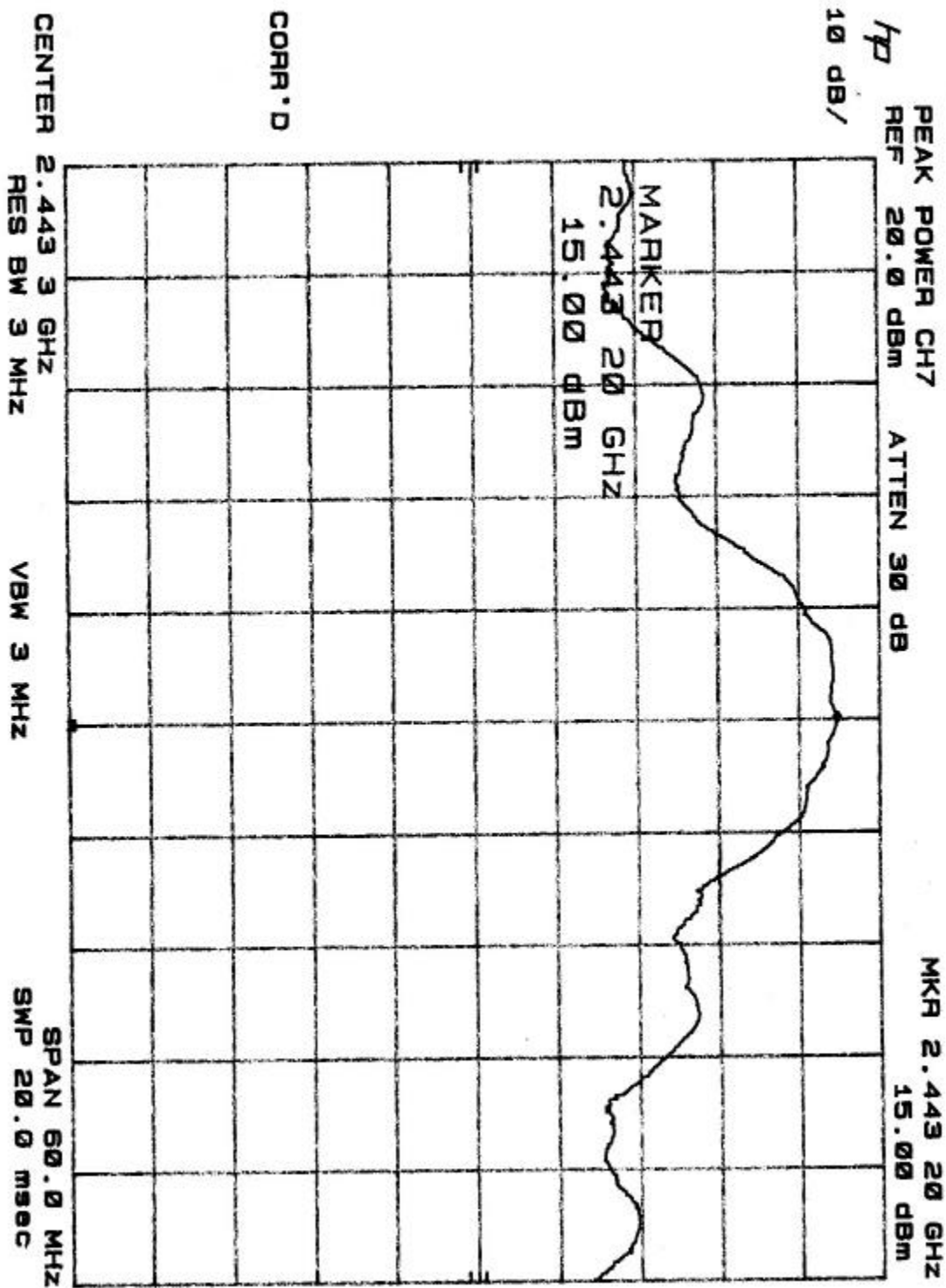
**RESULT**

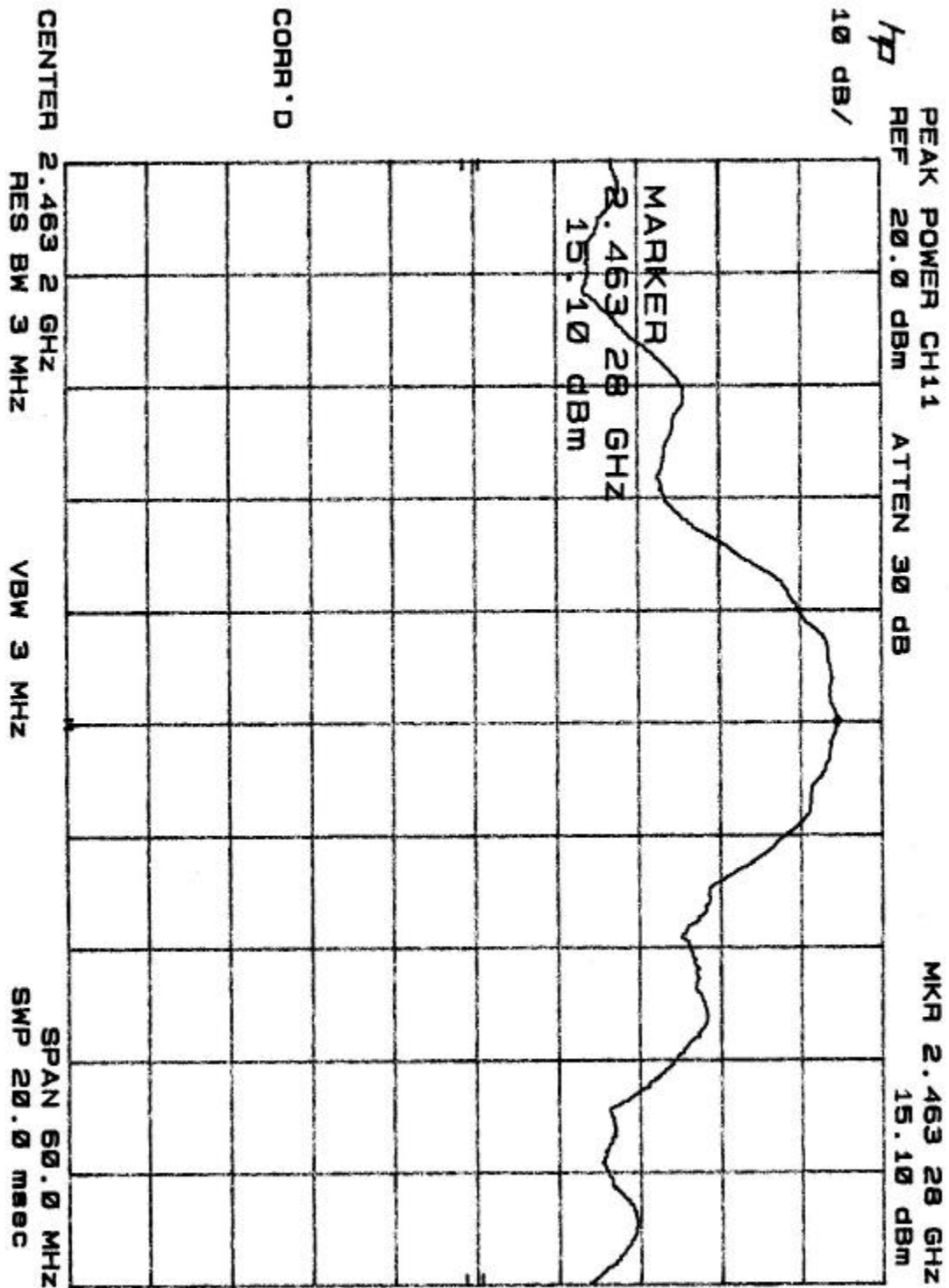
*No non-compliance noted.*

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>Output Power (Watts)</i>
<i>1</i>	<i>2412</i>	<i>162.76mWatt (22.1dBm)</i>
<i>7</i>	<i>2442</i>	<i>100.38mWatt (20.01dBm)</i>
<i>11</i>	<i>2462</i>	<i>99.52mWatt (19.99dBm)</i>







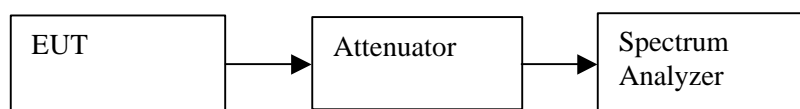


## 10.2. 6 dB BANDWIDTH MEASUREMENT

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	<input checked="" type="checkbox"/> Peak <input type="checkbox"/> Average	<input checked="" type="checkbox"/> 100 kHz <input type="checkbox"/> 1 MHz	<input checked="" type="checkbox"/> 100 kHz <input type="checkbox"/> 1 MHz

### TEST SETUP



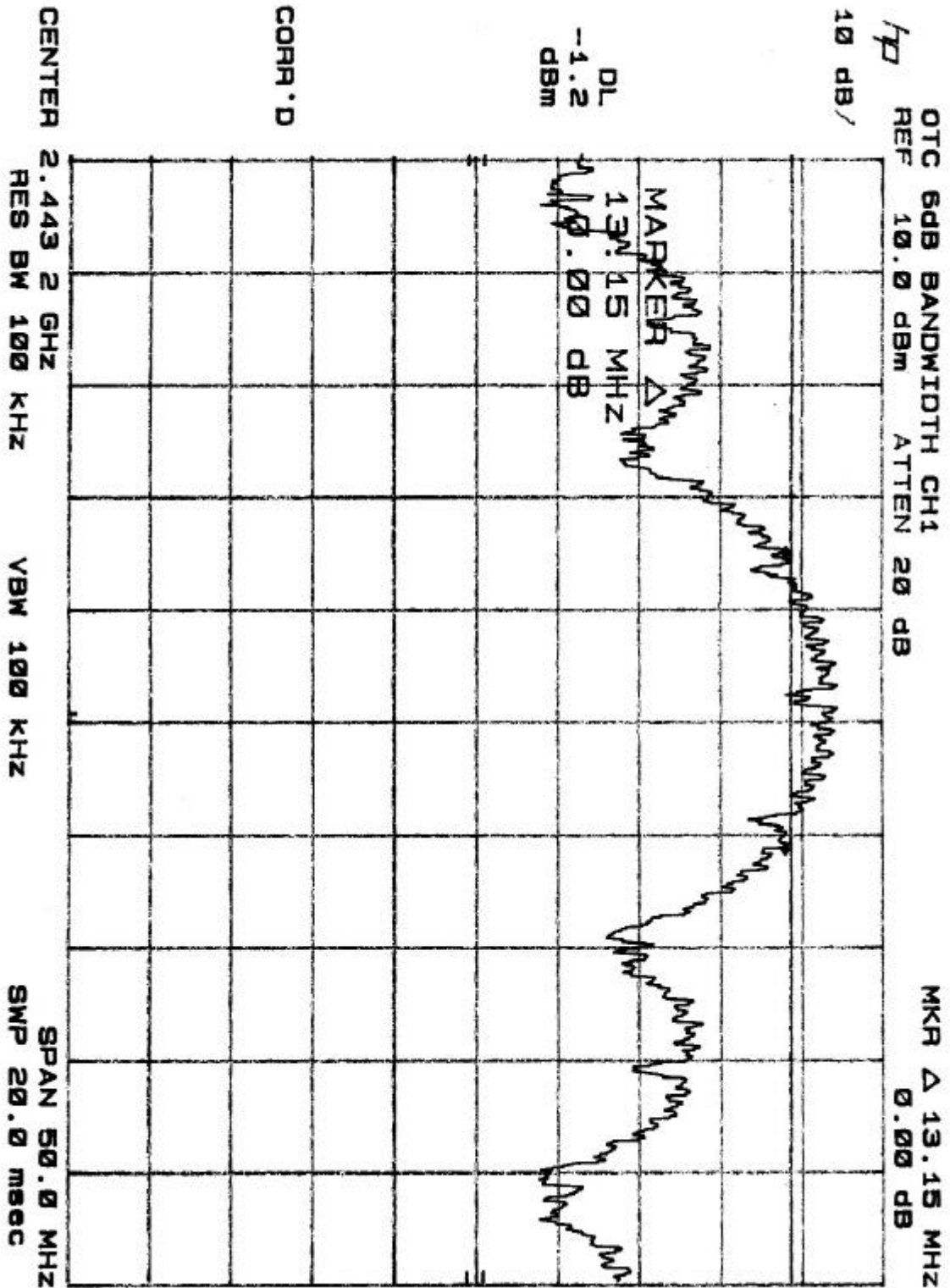
### TEST PROCEDURE

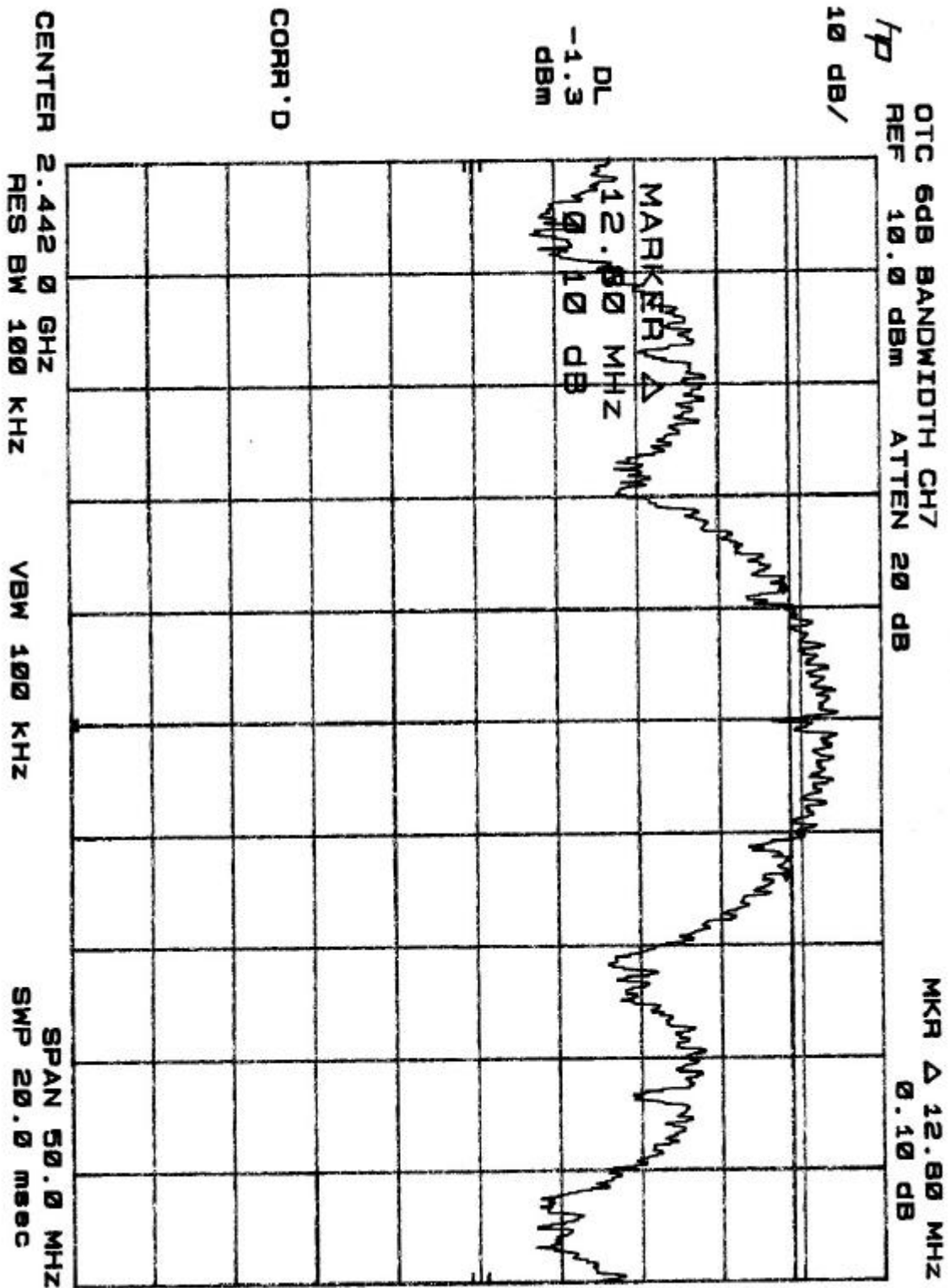
The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 100 kHz VBW. The 6 dB bandwidth is defined as the total spectrum the poweroff which is higher than peak power minus 6 dB.

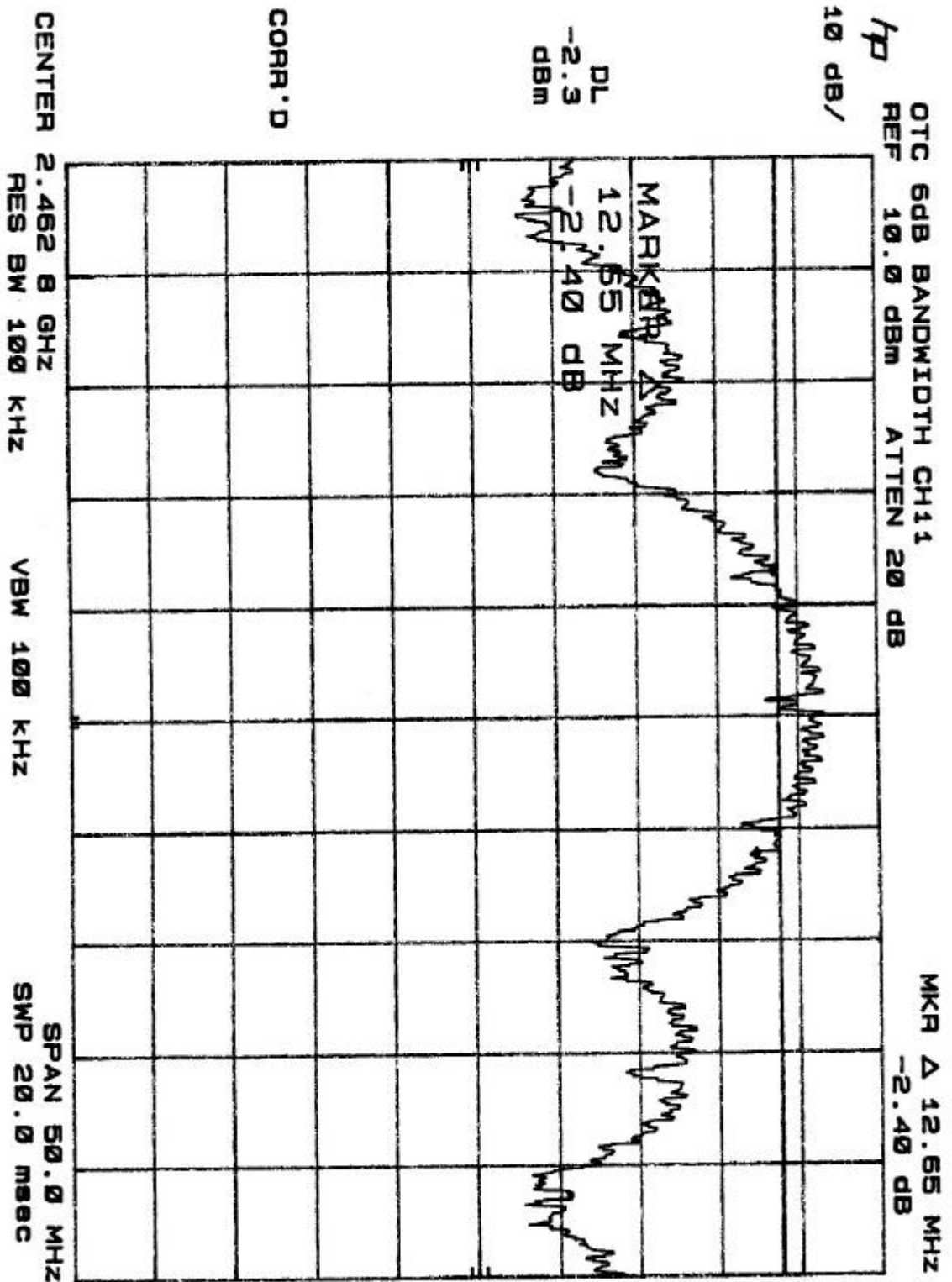
### RESULT

*No non-compliance noted.*

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>Bandwidth(MHz)</i>
<b>1</b>	<b>2412</b>	<b>13.15</b>
<b>7</b>	<b>2442</b>	<b>12.8</b>
<b>11</b>	<b>2462</b>	<b>12.65</b>





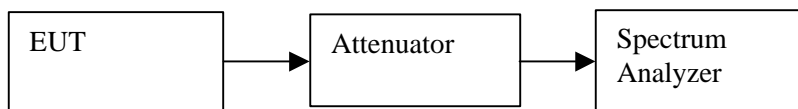


### 10.3. CONDUCTED SPURIOUS EMISSION

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Below 1000	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> 100 kHz	<input checked="" type="checkbox"/> 100 kHz
	<input type="checkbox"/> Average	<input type="checkbox"/> 1 MHz	<input type="checkbox"/> 10 Hz
Above 1000	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> 100 kHz	<input checked="" type="checkbox"/> 100 kHz
	<input type="checkbox"/> Average	<input type="checkbox"/> 1 MHz	<input type="checkbox"/> 10 Hz

#### TEST SETUP

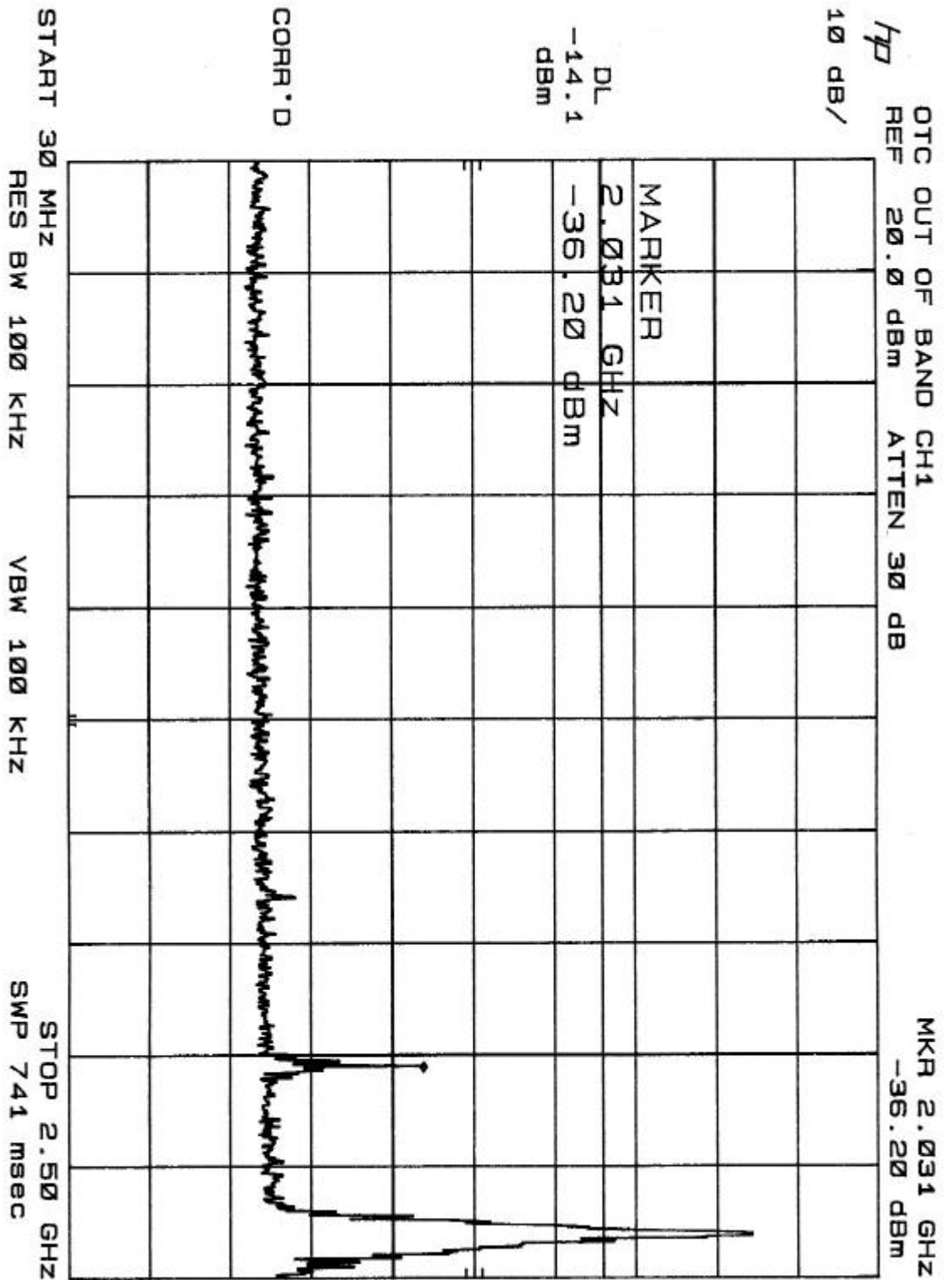


#### TEST PROCEDURE

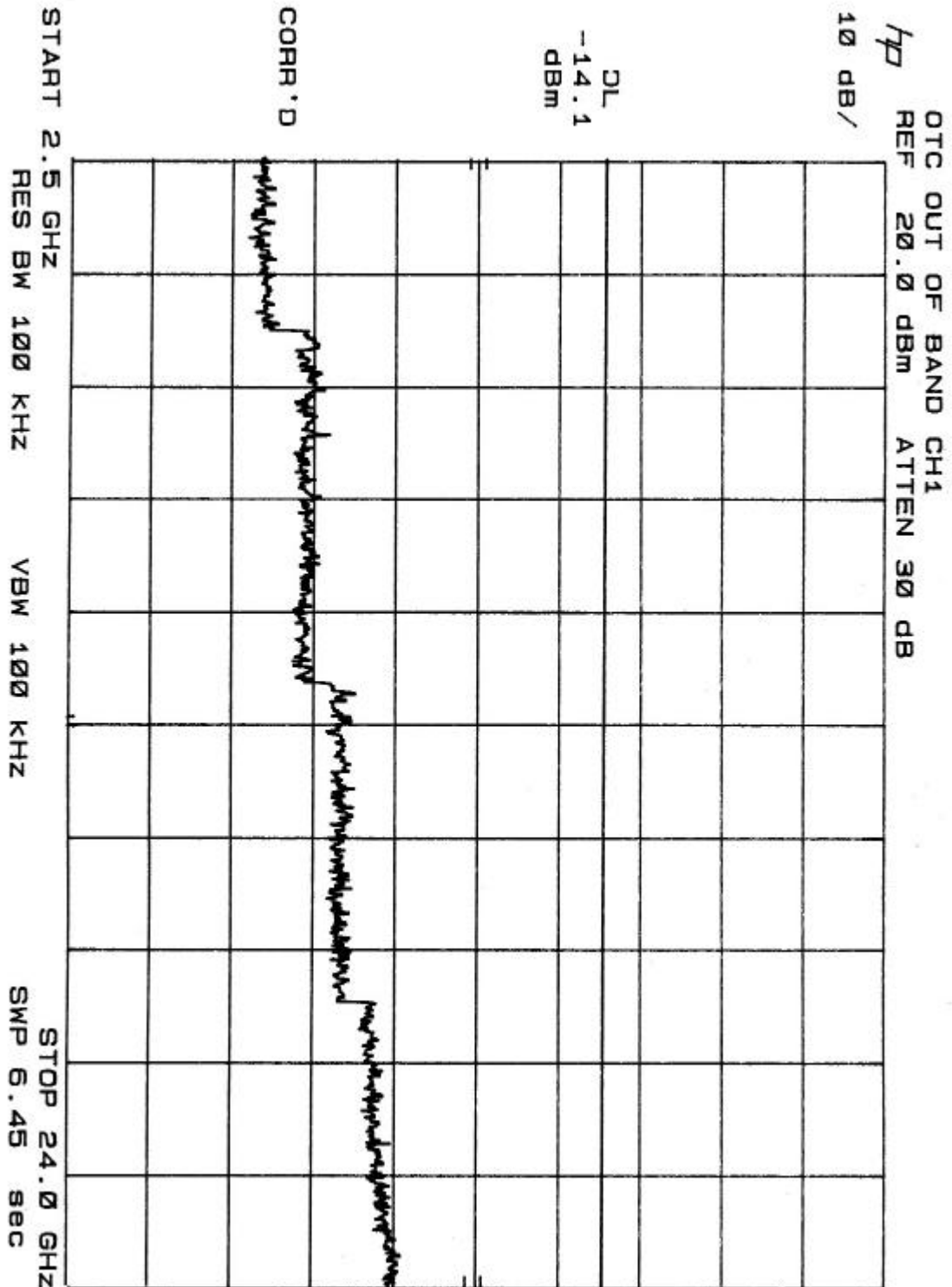
Connect the Eut's antenna port to the Spectrum Analyzer's input put.  
 Investigate the entire frequency of the carrier frequency, up to the tenth harmonic.

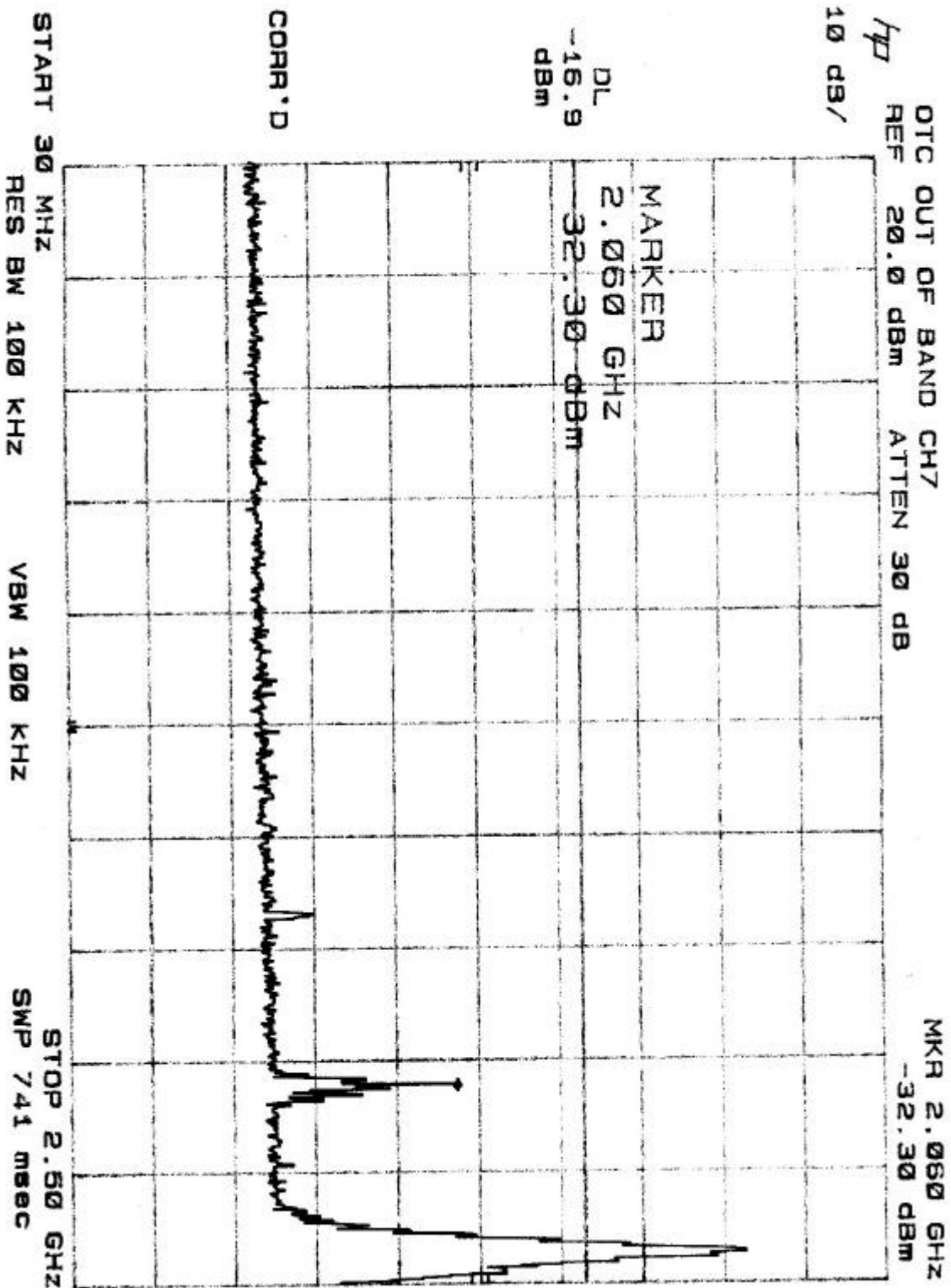
#### RESULT

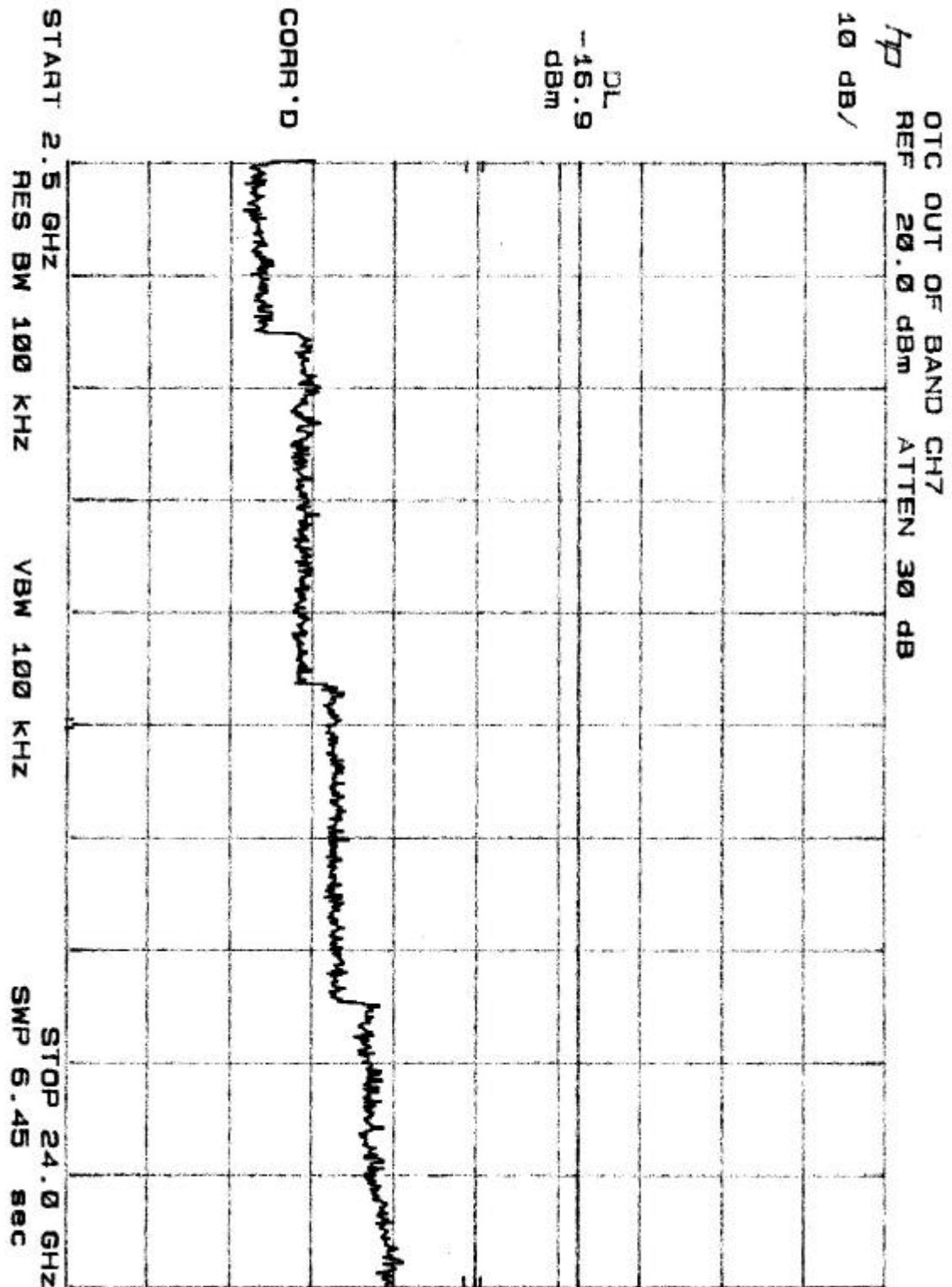
*No non-compliance noted.*

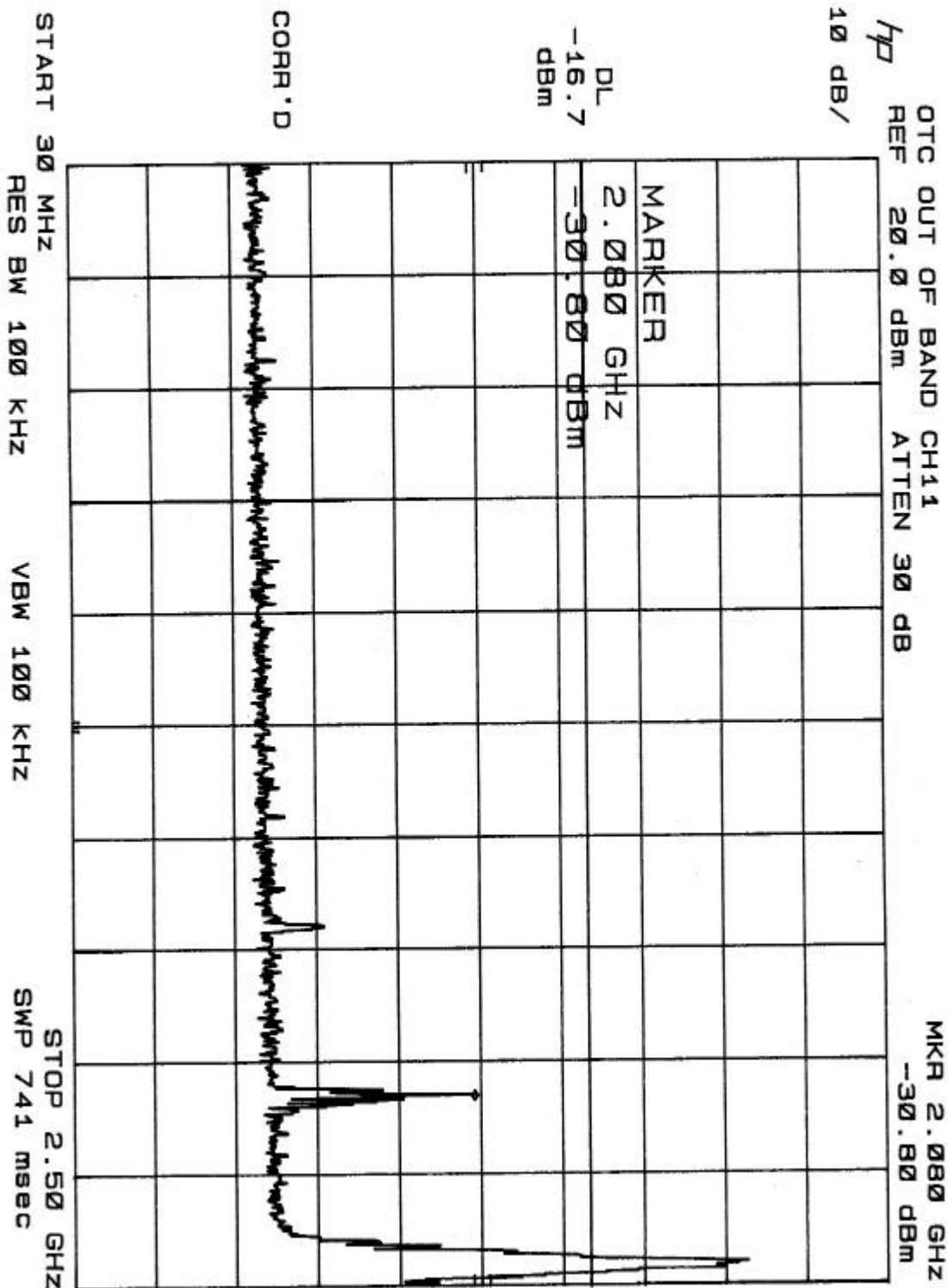


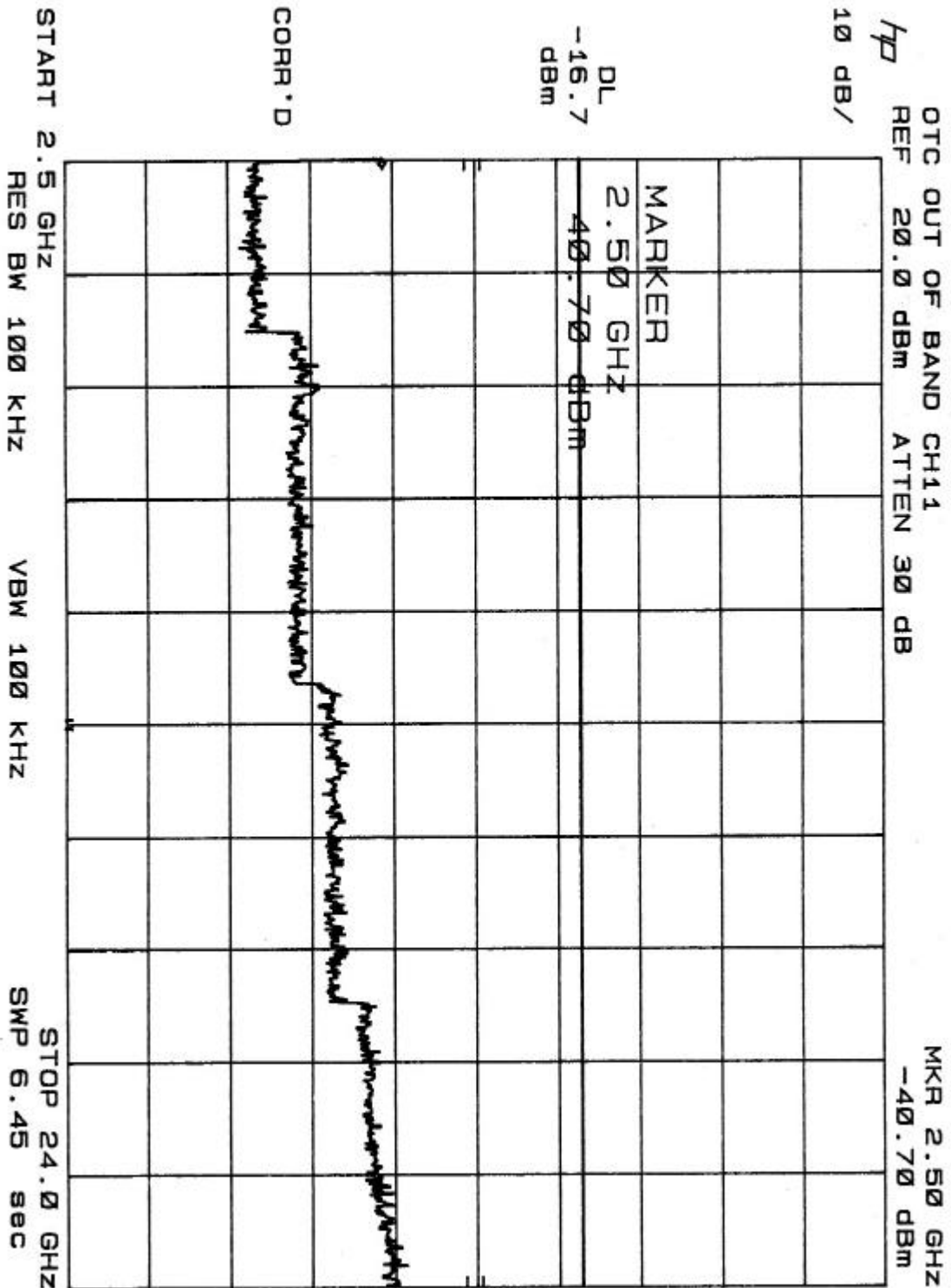










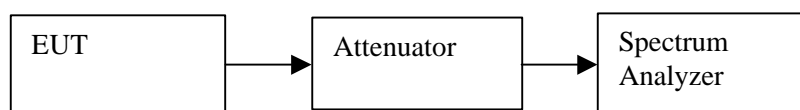


### 9.3.1 Conducted Bandedge

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Below 1000	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> 100 kHz	<input checked="" type="checkbox"/> 100 kHz
	<input type="checkbox"/> Average	<input type="checkbox"/> 1 MHz	<input type="checkbox"/> 10 Hz
Above 1000	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> 100 kHz	<input checked="" type="checkbox"/> 100 kHz
	<input type="checkbox"/> Average	<input type="checkbox"/> 1 MHz	<input type="checkbox"/> 10 Hz

#### TEST SETUP

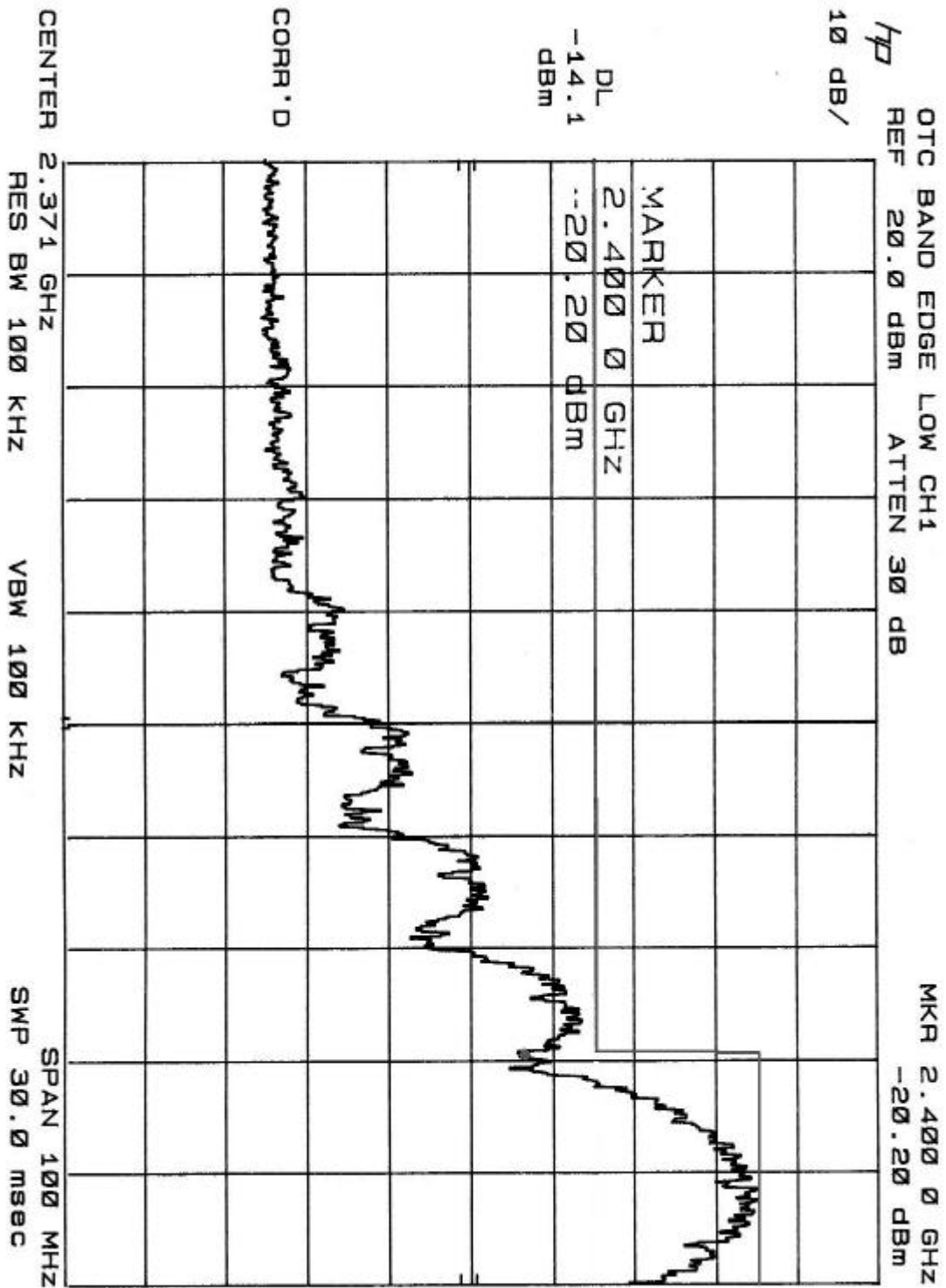


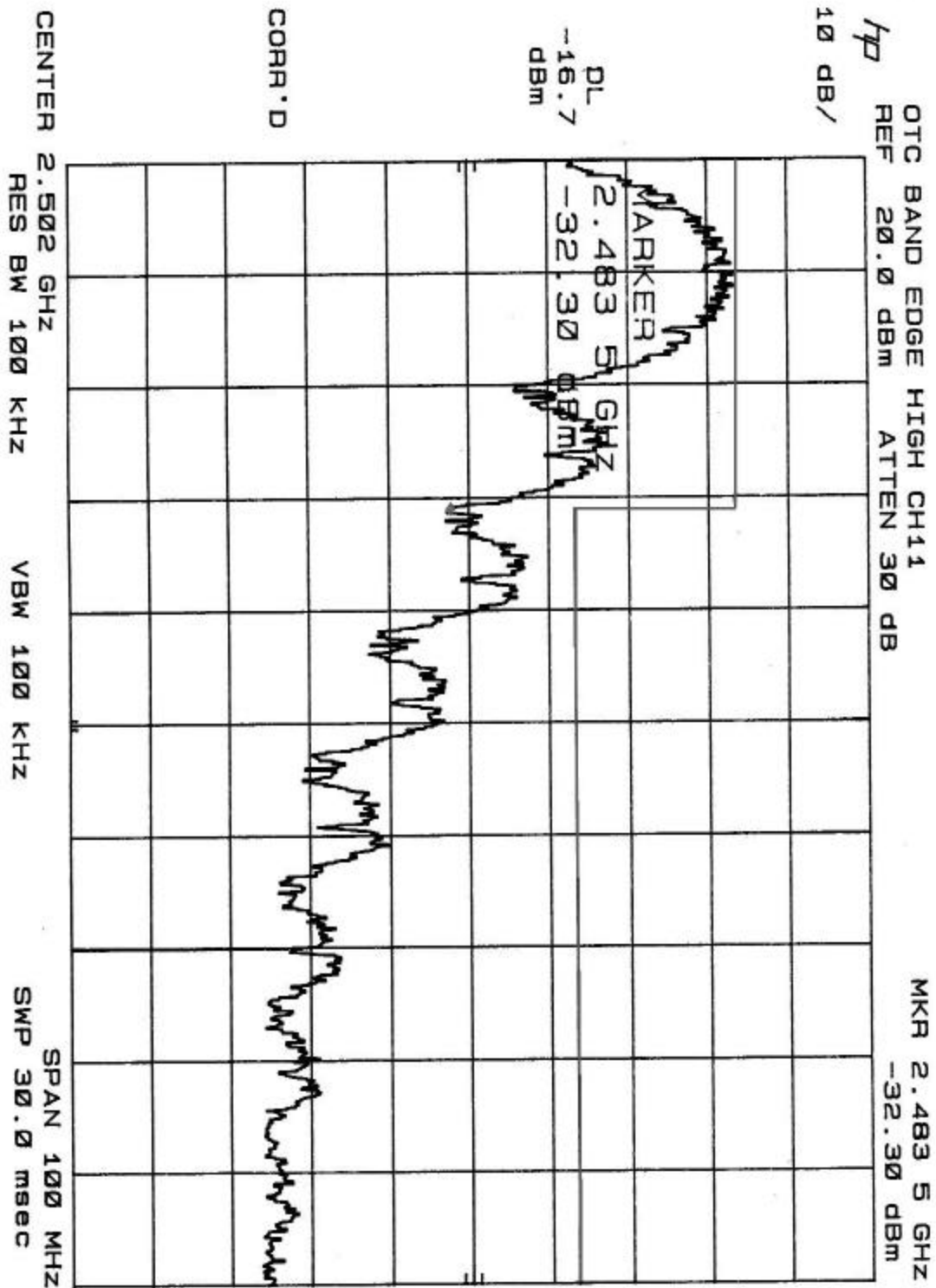
#### TEST PROCEDURE

Connect the Eut's antenna port to the Spectrum Analyzer's input put.  
 Using peak search get the peak from the carrier frequency. Subtract 20 from the peak to get the limit.  
 The carrier frequency should not go out of it's band of operations. Investigate the lowest and highest channel at the band edge to see if they pass the conducted spurious limit.

#### RESULT

*No non-compliance noted.*





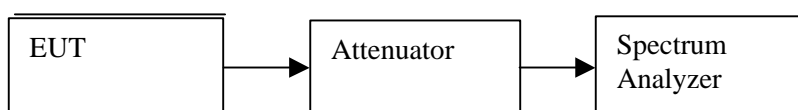


### 10.4. PEAK POWER SPECTRAL DENSITY

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	<input checked="" type="checkbox"/> Peak <input type="checkbox"/> Average	<input checked="" type="checkbox"/> 3 kHz <input type="checkbox"/> 1 MHz	<input checked="" type="checkbox"/> 3 kHz <input type="checkbox"/> 10 Hz

#### TEST SETUP



#### TEST PROCEDURE

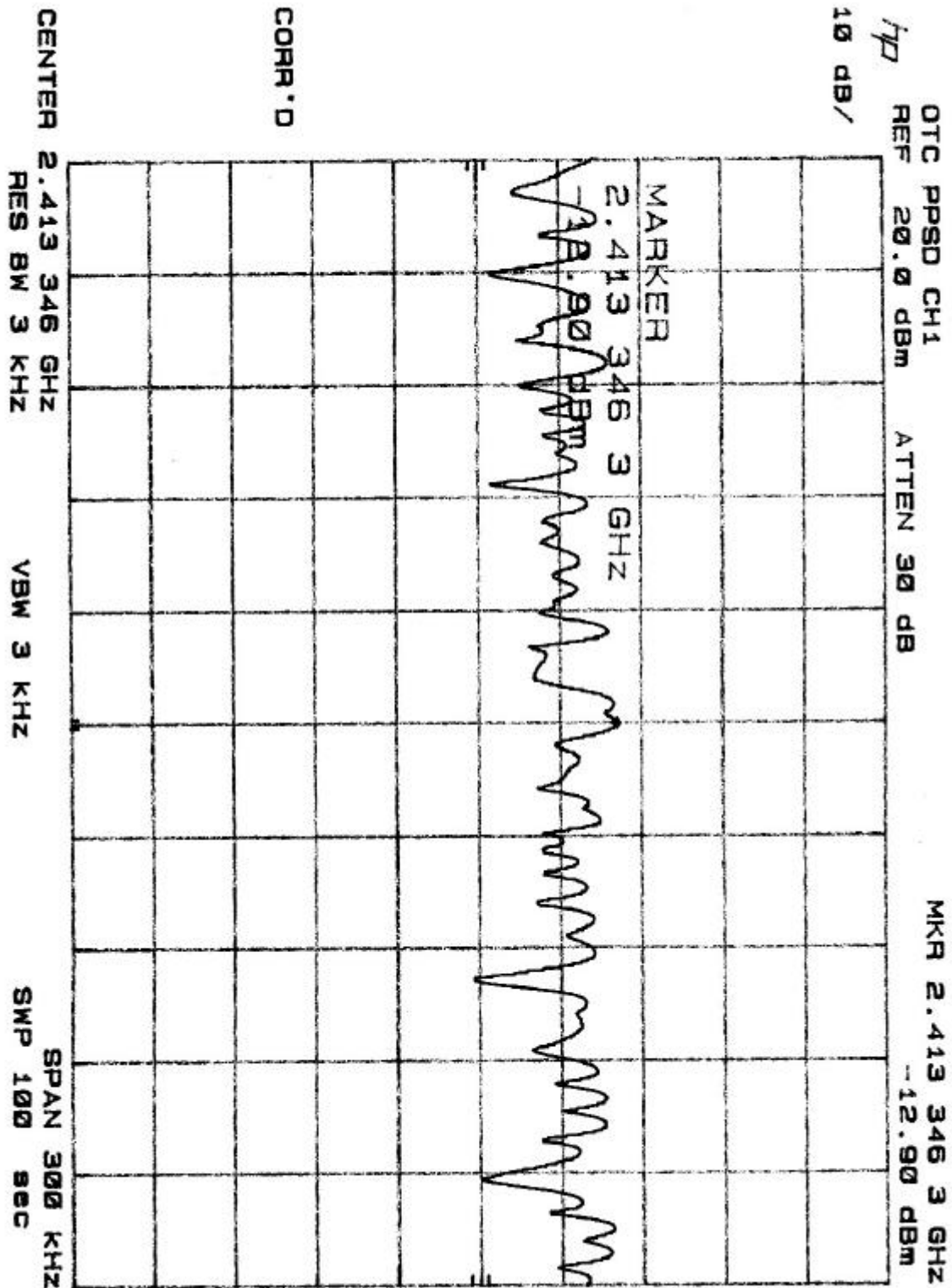
The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, set sweep time=span/3kHz. The power spectral density was measured and recorded.

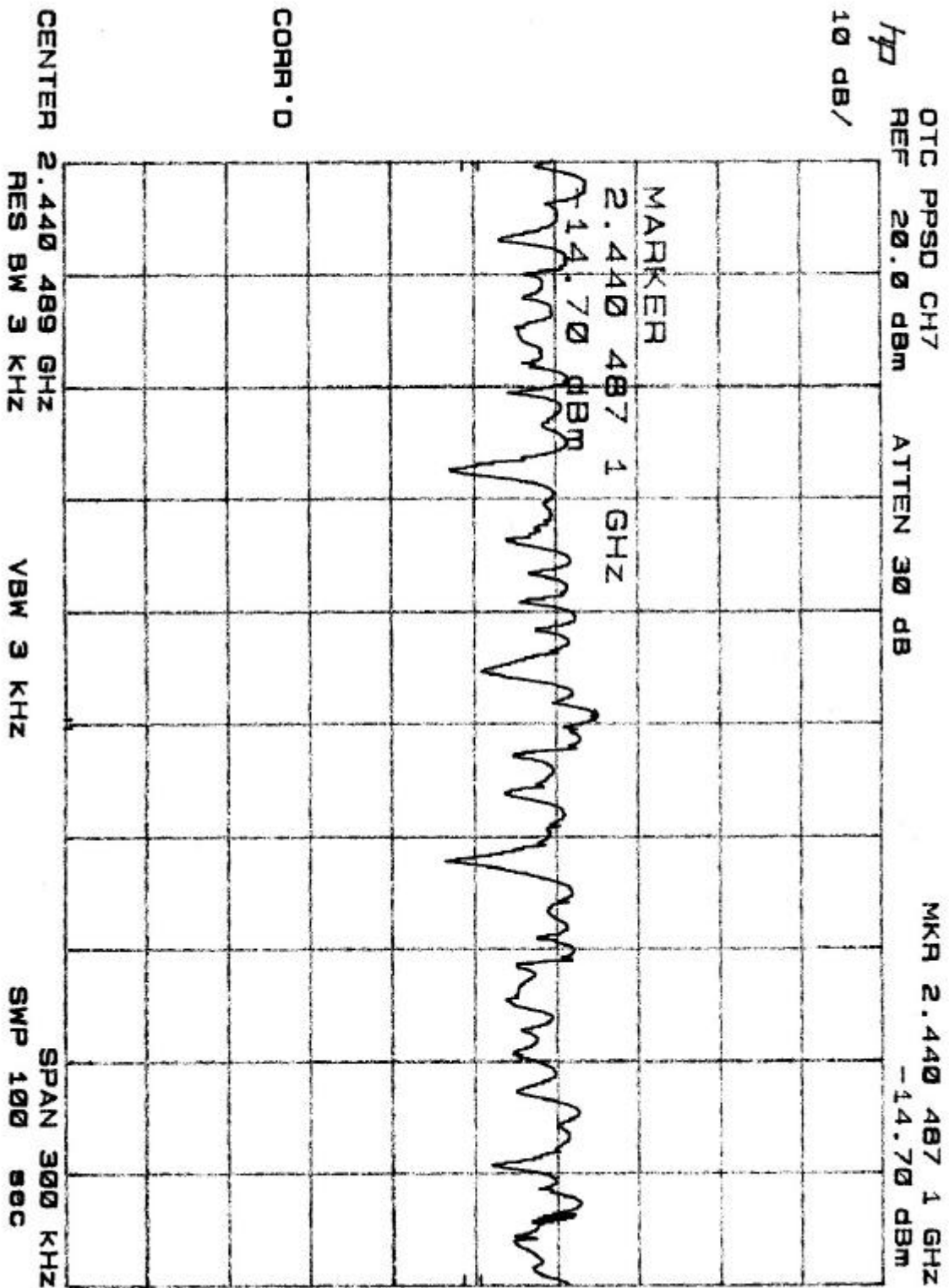
The sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

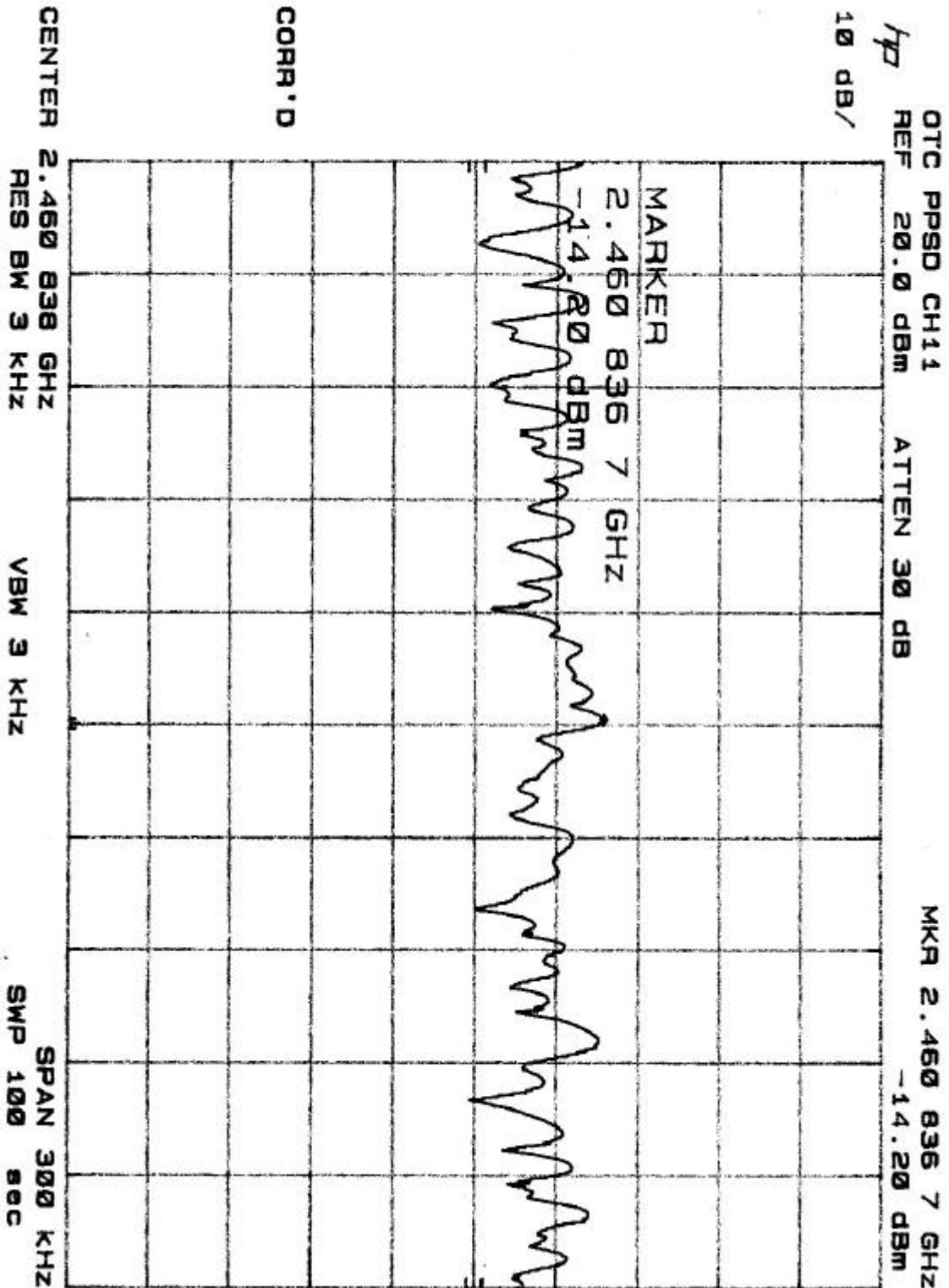
#### Result:

No non-compliance noted. See plots:

Channel	Frequency (MHz)	PPSD(dBm)
1	2412	-12.9
7	2442	-14.7
11	2462	-14.2







## 10.6. RESTRICTED BAND EDGE MEASUREMENT

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	<input checked="" type="checkbox"/> Peak <input type="checkbox"/> Average	<input checked="" type="checkbox"/> 1 MHz <input type="checkbox"/> 1 MHz	<input checked="" type="checkbox"/> 1 MHz <input type="checkbox"/> 10 Hz

### TEST SETUP

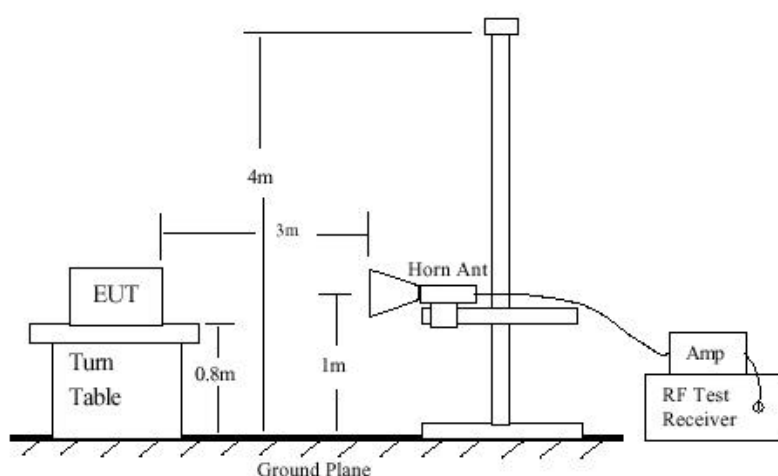


Fig 2: Radiated Emission Above 1000 MHz

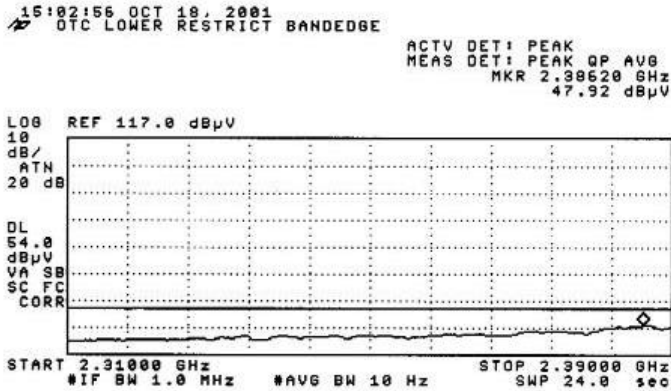
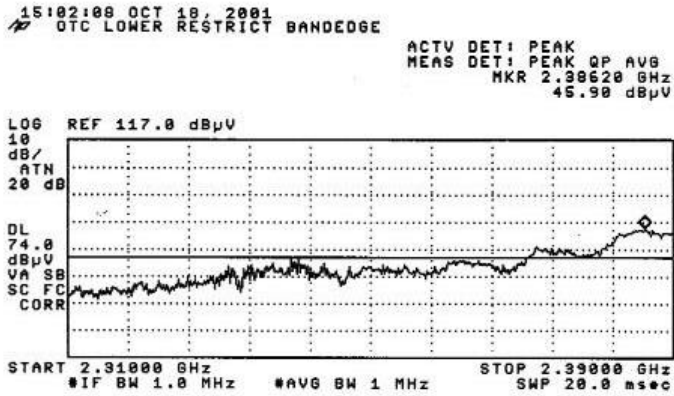
### TEST PROCEDURE

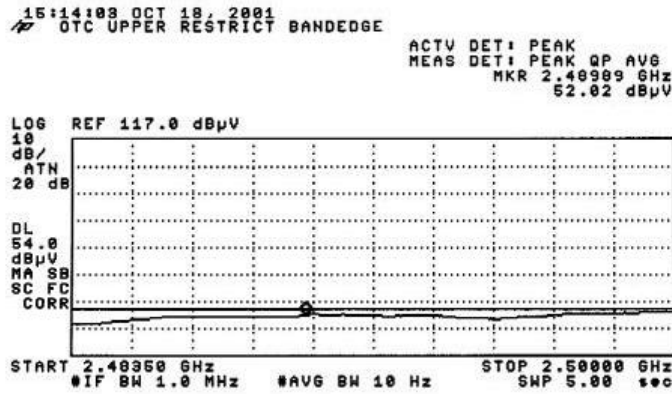
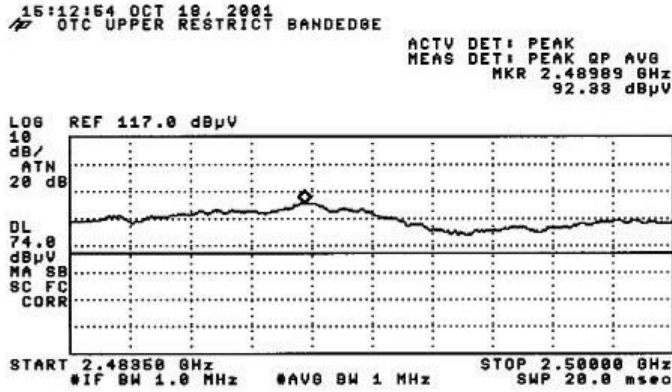
1. The Lower and upper were investigated, due to two restricted band located close to the passband.
2. The EUT was placed on the turn table 0.8 meter above ground in 3 meter open area test site.
3. Shift the interference-receiving antenna located in antenna tower upwards and downwards between 1 and 4 meters above ground and find out the local peak emission on frequency domain.
4. Rotate the turn table and stop at the angle where the measurement device has maximum reading

RESULT

*No non-compliance noted. See plots:*

Freq. (MHz)	Reading (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Dist dB	Other dB	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (P/A)
2386	45.90	29.20	3.40	42.00	9.50	0.00	27.00	74.0	-47.00	P
2386	47.92	29.20	3.40	42.00	9.50	0.00	29.02	54.0	-24.98	A
2489	92.33	29.20	3.40	42.00	9.50	0.00	73.43	74.0	-0.57	P
2489	54.86	29.20	3.40	42.00	9.50	0.00	35.96	54.0	-18.04	A







### 10.7. RADIATED EMISSION

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> 100 KHz	<input checked="" type="checkbox"/> 100 KHz
	<input type="checkbox"/> Quasi Peak	<input type="checkbox"/> 120 KHz	<input type="checkbox"/> 120 KHz
Above 1000	<input checked="" type="checkbox"/> Peak	<input checked="" type="checkbox"/> 1 MHz	<input checked="" type="checkbox"/> 1 MHz
	<input type="checkbox"/> Average	<input type="checkbox"/> 1 MHz	<input type="checkbox"/> 10 Hz

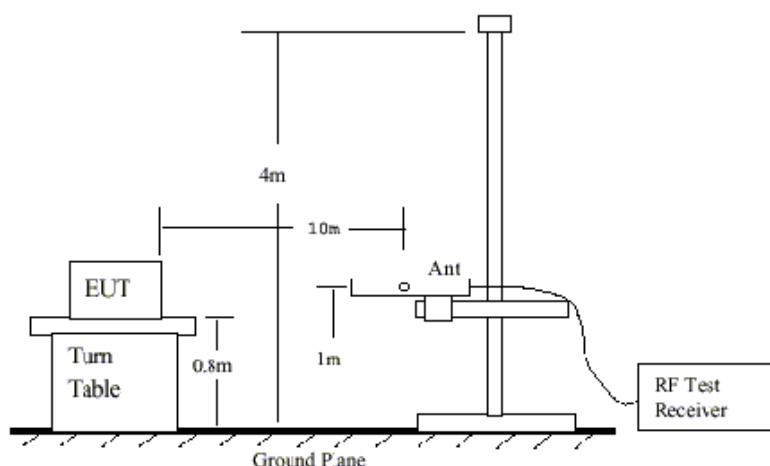


Fig 1: Radiated Emission Measurement 30 to 1000 MHz

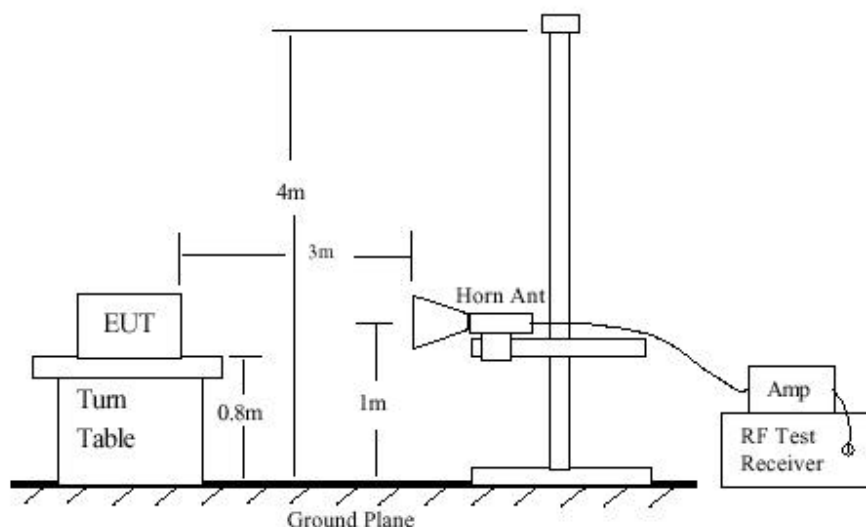


Fig 2: Radiated Emission Above 1000 MHz


### **TEST SETUP & PROCEDURE**

1. The EUT was placed on the turn table 0.8 meter above ground in 3 meter open area test site.
2. Set the resolution bandwidth to 120KHz in the test receiver and select Peak function to scan the frequency below 1 GHz.
3. Shift the interference-receiving antenna located in antenna tower upwards and downwards between 1 and 4 meters above ground and find out the local peak emission on frequency domain.
4. Locate the interference-receiving antenna at the position where the local peak reach the maximum emission.
5. Rotate the turn table and stop at the angle where the measurement device has maximum reading
6. Shift the interference-receiving antenna again to detect the maximum emission of the local peak
7. If the reading of the local peak under Peak function is lower than limit by 6dB, then Quasi Peak detection is not needed and this reading should be recorded. And if it is higher than Peak limit, then the test is fail. Others, switch the receiver to Quasi Peak function, set the resolution bandwidth to 100kHz and repeat the procedures C ~ F. If the reading is lower than limit, this reading should be recorded, otherwise, the test is fail.
8. Set the resolution and video bandwidth of the spectrum analyzer to 1MHz and repeat procedures C ~ F for frequency band from 1 GHz to 10 times carrier frequency.

9. If the reading for the local peak is lower than the Average limit, no further testing is needed in this local peak and this reading should be recorded. If it is higher than Average limit but lower than Peak limit, then set the resolution bandwidth to 1MHz and video bandwidth to 300Hz. Repeat procedures C ~ F. If the maximum reading is lower than Average limit, then this reading should be recorded. If it is higher, then the test is fail.

**RESULT**

*No non-compliance noted, as shown below.*



*Project #:* 01U1006-1  
*Report #:* 011018B1  
*Date & Time:* 10/18/01 9:59 AM  
*Test Engr:* KERWIN CORPUZ

FCC, VCCI, CISPR, CE, AUSTEL, NZ  
 UL, CSA, TUV, BSMI, DHHS, NVLAP

561F MONTEREY ROAD, SAN JOSE, CA 95037-9001  
 PHONE: (408) 463-0885 FAX: (408) 463-0888

*Company:* OTC WIRELESS, INC.  
*EUT Description:* 2.4GHz STATION RADIO (M/N: 2411EZLink-E)  
*Test Configuration :* EUT ONLY  
*Type of Test:* VCCI CLASS B  
*Mode of Operation:* TX

[<< Main Sheet](#)

Freq.	Reading	AF	Clos	Pre-amp	Level	Limit	Margin	Pol	Az	Height	Mark
(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	EN B	(dB)	(H/V)	(Deg)	(Meter)	(P/Q/A)
176.00	43.20	9.39	2.94	29.29	26.23	30.00	-3.77	10mV	0.00	1.00	P
220.00	40.50	11.37	3.32	29.05	26.14	30.00	-3.86	10mV	0.00	1.00	P
352.00	42.10	14.34	4.28	29.09	31.64	37.00	-5.36	10mV	315.00	1.00	P
264.00	44.00	12.50	3.66	28.89	31.27	37.00	-5.73	10mV	0.00	1.00	P
528.00	34.90	18.06	5.46	29.75	28.67	37.00	-8.33	10mV	315.00	1.00	P
308.00	39.50	12.72	3.98	28.86	27.34	37.00	-9.66	10mV	0.00	1.00	P
6 Worst Data											

Harmonic Emissions														
OTC Wireless											10/18/01			
Channel 1 : 2412 GHz											Hue Vang			
											A site (1.0 Meter)			
F(MHz)	READING		AF	CL	AMP	DIST	HPF	TOTAL		LIMIT		MARGIN		POL
	(dBuV)							(dBuV/m)		(dBuV/m)		(dB)		
	Pk	Avg	Pk	Avg	Pk	Avg	Pk	Avg	Pk	Avg				
4824	60.2	33.48	33	5.44	41	9.5	1	49.14	22.42	74	54	-24.9	-31.6	H
7237	47.36	33.52	37	6.29	41.43	9.5	1	40.72	26.88	74	54	-33.3	-27.1	H
9648	50.9	34.4	38.1	7.31	39.3	9.5	1	48.51	32.01	74	54	-25.5	-22	H
12060	45.84	34.61	39	8.5	39.5	9.5	1	45.34	34.11	74	54	-28.7	-19.9	H
14472	48.32	37.59	41.3	9.69	42.5	9.5	1	48.31	37.58	74	54	-25.7	-16.4	H
16884	49.63	37.75	43.2	11.05	44.03	9.5	1	51.35	39.47	74	54	-22.7	-14.5	H
4824	64.88	34.05	33	5.44	41	9.5	1	53.82	22.99	74	54	-20.2	-31	V
7237	52.83	34.56	37	6.29	41.43	9.5	1	46.19	27.92	74	54	-27.8	-26.1	V
9648	49.15	34.04	38.1	7.31	39.3	9.5	1	46.76	31.65	74	54	-27.2	-22.4	V
12060	47.41	34.5	39	8.5	39.5	9.5	1	46.91	34	74	54	-27.1	-20	V
14472	48.88	37.6	41.3	9.69	42.5	9.5	1	48.87	37.59	74	54	-25.1	-16.4	V
16884	50.03	38.72	43.2	11.05	44.03	9.5	1	51.75	40.44	74	54	-22.3	-13.6	V
<b>NOTE: ALL READINGS MEASURED AT 1 METER.</b>														
DIST: Correction to extrapolate reading to 3m specification distance														
										<b>ANALYZER SETTINGS</b>				
AF: Antenna Factor										PEAK(Pk):		Res bw		Avg. bw
AMP: Pre-amp gain												1MHz		1MHz
CL: Cable loss										AVG(Pk):		Res bw		Avg. bw
HPF: High pass filter insertion loss												1MHz		10Hz

<b>COMPLIANCE ENGINEERING SERVICES, INC.</b>														
Harmonic Emissions														
OTC Wireless														
Channel 7 : 2442 MHz														
10/18/01														
Hue Vang														
A site (1.0 Meter)														
F(MHz)	READING		AF	CL	AMP	DIST	HPF	TOTAL		LIMIT		MARGIN		POL
	(dBuV)		(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)		(dBuV/m)		(dB)		(H/V)
	<b>Pk</b>	<b>Avg</b>						<b>Pk</b>	<b>Avg</b>	<b>Pk</b>	<b>Avg</b>	<b>Pk</b>	<b>Avg</b>	
4884	61.33	33.87	33	5.44	41	9.5	1	50.27	22.81	74	54	-23.7	-31.2	H
7327	49.12	34	37	6.29	41.43	9.5	1	42.48	27.36	74	54	-31.5	-26.6	H
9768	48.9	32.86	38.1	7.31	39.3	9.5	1	46.51	30.47	74	54	-27.5	-23.5	H
12209	46.35	34.28	39	8.5	39.5	9.5	1	45.85	33.78	74	54	-28.2	-20.2	H
14652	50.35	37.78	41.3	9.69	42.5	9.5	1	50.34	37.77	74	54	-23.7	-16.2	H
17094	50.35	38.66	43.2	11.05	44.03	9.5	1	52.07	40.38	74	54	-21.9	-13.6	H
4884	66.38	34.46	33	5.44	41	9.5	1	55.32	23.4	74	54	-18.7	-30.6	V
7327	49.81	33.96	37	6.29	41.43	9.5	1	43.17	27.32	74	54	-30.8	-26.7	V
9768	47.07	32.95	38.1	7.31	39.3	9.5	1	44.68	30.56	74	54	-29.3	-23.4	V
12209	46	34.5	39	8.5	39.5	9.5	1	45.5	34	74	54	-28.5	-20	V
14652	49.63	37.9	41.3	9.69	42.5	9.5	1	49.62	37.89	74	54	-24.4	-16.1	V
17094	48.61	38.73	43.2	11.05	44.03	9.5	1	50.33	40.45	74	54	-23.7	-13.6	V
<b>NOTE: ALL READINGS MEASURED AT 1 METER.</b>														
<b>DIST:</b> Correction to extrapolate reading to 3m specification distance														
<b>ANALYZER SETTINGS</b>														
<b>AF:</b> Antenna Factor										<b>PEAK(Pk):</b>		Res bw		Avg. bw
<b>AMP:</b> Pre-amp gain												<b>1MHz</b>		<b>1MHz</b>
<b>CL:</b> Cable loss										<b>AVG(Pk):</b>		Res bw		Avg. bw
<b>HPF:</b> High pass filter insertion loss												<b>1MHz</b>		<b>10Hz</b>

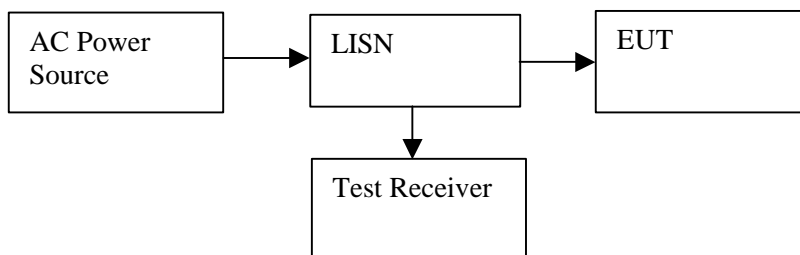
<b>COMPLIANCE ENGINEERING SERVICES, INC.</b>														
Harmonic Emissions														
OTC														
Channel 11 : 2462 MHz														
A site (1.0 Meter)														
F(MHz)	READING		AF	CL	AMP	DIST	HPF	TOTAL		LIMIT		MARGIN		POL
	(dBuV)							(dB)	(dB)	(dB)	(dB)	(dBuV/m)		
	Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg	
4922	59	42.9	33	5.44	41	9.5	1	47.94	31.84	74	54	-26.1	-22.2	H
7388	46	32	37	6.29	41.43	9.5	1	39.36	25.36	74	54	-34.6	-28.6	H
9846	48	34	38.1	7.31	39.3	9.5	1	45.61	31.61	74	54	-28.4	-22.4	H
12308	46	34.5	39	8.5	39.5	9.5	1	45.5	34	74	54	-28.5	-20	H
14770	50	37.5	41.3	9.69	42.5	9.5	1	49.99	37.49	74	54	-24	-16.5	H
17232	50.4	38.5	43.2	11.05	44.03	9.5	1	52.12	40.22	74	54	-21.9	-13.8	H
4922	66.6	34.52	33	5.44	41	9.5	1	55.54	23.46	74	54	-18.5	-30.5	V
7388	47	36.21	37	6.29	41.43	9.5	1	40.36	29.57	74	54	-33.6	-24.4	V
9846	48	35.85	38.1	7.31	39.3	9.5	1	45.61	33.46	74	54	-28.4	-20.5	V
12308	48.4	36.28	39	8.5	39.5	9.5	1	47.9	35.78	74	54	-26.1	-18.2	V
14770	49.4	38.5	41.3	9.69	42.5	9.5	1	49.39	38.49	74	54	-24.6	-15.5	V
17232	41.77	39.9	43.2	11.05	44.03	9.5	1	43.49	41.62	74	54	-30.5	-12.4	V
<b>NOTE: ALL READINGS MEASURED AT 1 METER.</b>														
<b>DIST:</b> Correction to extrapolate reading to 3m specification distance														
										<b>ANALYZER SETTINGS</b>				
<b>AF:</b> Antenna Factor										<b>PEAK(Pk):</b>		Res bw		Avg. bw
<b>AMP:</b> Pre-amp gain												1MHz	1MHz	
<b>CL:</b> Cable loss										<b>AVG(Pk):</b>		Res bw		Avg. bw
<b>HPF:</b> High pass filter insertion loss												1MHz	10Hz	

### 10.8. POWER LINE CONDUCTED EMISSION

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
450 KHz to 30 MHz	<input checked="" type="checkbox"/> Peak <input type="checkbox"/> CISPR Quasi Peak	<input checked="" type="checkbox"/> 9 KHz	<input checked="" type="checkbox"/> 9 KHz

#### TEST SETUP



#### TEST PROCEDURE

1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor. The EUT was set to transmit in a continuous mode.
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

#### RESULT

No non-compliance noted. See plot Line Conduction.



With DC injector.

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Closs (dB)	Limit OP	EN B AV	Margin		Remark L1 / L2
	PK (dBuV)	OP (dBuV)	AV (dBuV)				OP (dB)	AV (dB)	
0.15	54.29	--	--	0.00	66.00	56.00	-11.71	-1.71	L1
0.81	38.42	--	--	0.00	56.00	46.00	-17.58	-7.58	L1
1.18	38.45	--	--	0.00	56.00	46.00	-17.55	-7.55	L1
0.15	53.27	--	--	0.00	66.00	56.00	-12.73	-2.73	L2
0.81	38.71	--	--	0.00	56.00	46.00	-17.29	-7.29	L2
1.18	38.63	--	--	0.00	56.00	46.00	-17.37	-7.37	L2
6 Worst Data									

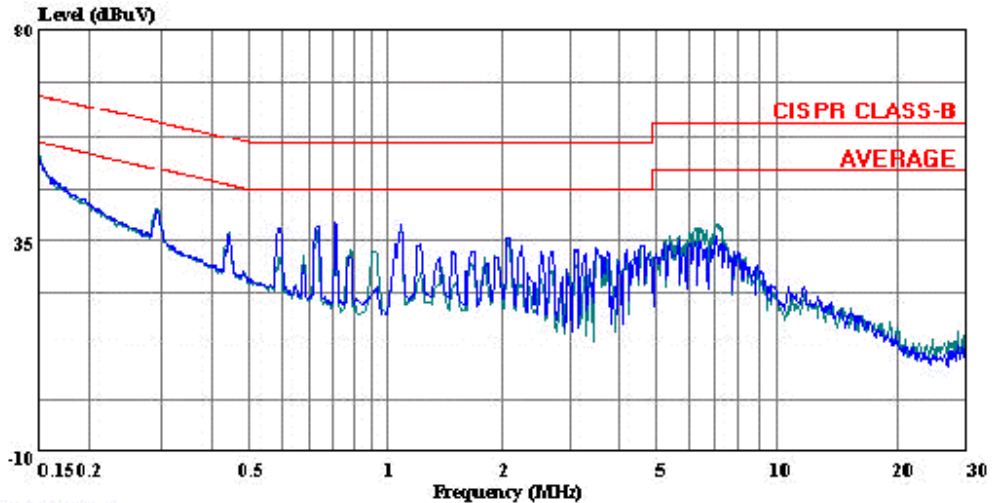
With Out DC Injector.

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Closs (dB)	Limit OP	EN B AV	Margin		Remark L1 / L2
	PK (dBuV)	OP (dBuV)	AV (dBuV)				OP (dB)	AV (dB)	
0.20	59.92	--	44.21	0.00	64.51	54.51	-4.59	-10.30	L1
0.61	48.06	--	39.69	0.00	56.00	46.00	-7.94	-6.31	L1
1.38	48.71	--	37.86	0.00	56.00	46.00	-7.29	-8.14	L1
0.20	54.62	--	41.14	0.00	64.46	54.46	-9.84	-13.32	L2
0.62	47.66	--	38.90	0.00	56.00	46.00	-8.34	-7.10	L2
1.44	49.07	--	37.40	0.00	56.00	46.00	-6.93	-8.60	L2
6 Worst Data									



561F Monterey Road,  
Morgan Hill, CA 95037  
Tel: (408) 463-0885  
Fax: (408) 463-0888

Data#: 7 File#: 01U0986B.EMI Date: 10-18-2001 Time: 17:57:46



(Auxiliary ATC)

Trace: 3

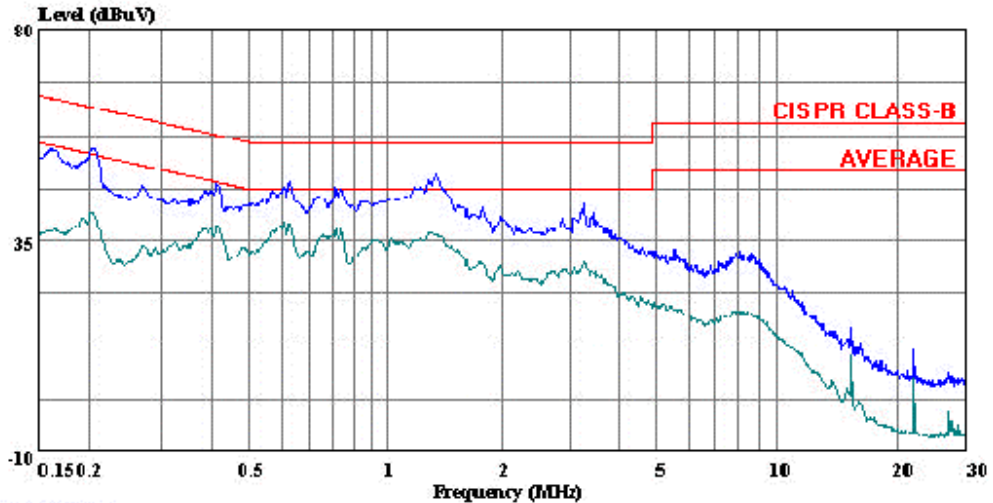
Ref Trace:

Report : 011018LC  
Project# : 01U1006-1  
Tested By : KERWIN CORPUZ  
Manufacture : OTC WIRELESS, INC.  
EUT Description : 2.4GHz STATION RADIO (M/N: 2411EZLink-E)  
Test Config. : EUT with DC Injector and power supply  
: M/N: ADP-9EB A  
Test Target : EN55022 CLASS B  
Mode of Operation: TX  
: PEAK: L1 (blue), L2 (green)  
: 115Vac, 60Hz



561F Monterey Road,  
Morgan Hill, CA 95037  
Tel: (408) 463-0885  
Fax: (408) 463-0888

Data#: 29 File#: 01u0986a.EMI Date: 10-18-2001 Time: 17:21:43



(Auxiliary ATC)

Trace: 27

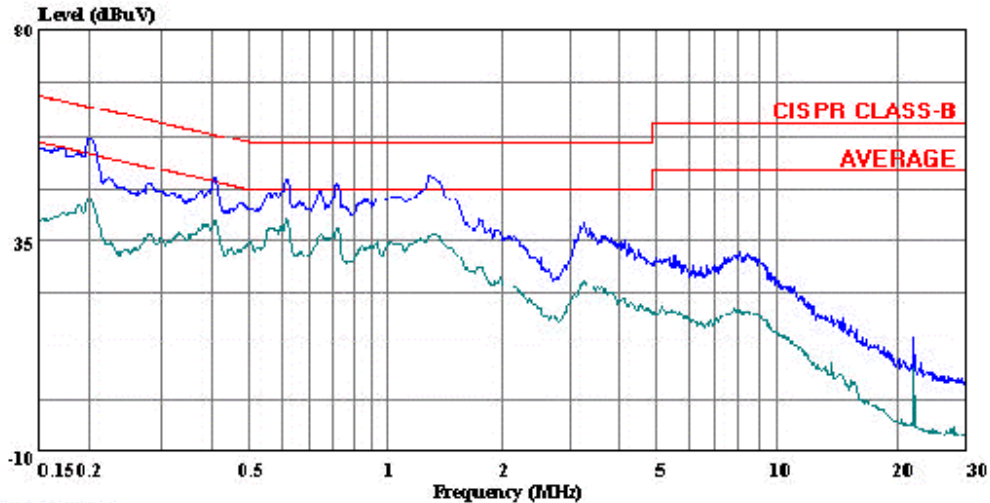
Ref Trace:

Report : 011018LC  
Project# : 01U1006-1  
Tested By : KERWIN CORPUZ  
Manufacture : OTC WIRELESS, INC.  
EUT Description : 2.4GHz STATION RADIO (M/N: 2411EZLink-E)  
Test Config. : EUT with power supply M/N: A10D1-05MP  
Test Target : EN55022 CLASS B  
Mode of Operation: TX  
                  : L2: Peak (blue), Average (green)  
                  : 115Vac, 60Hz



561F Monterey Road,  
Morgan Hill, CA 95037  
Tel: (408) 463-0885  
Fax: (408) 463-0888

Data#: 22 File#: 01u0986a.EMI Date: 10-18-2001 Time: 17:05:28



(Auxiliary ATC)

Trace: 20

Ref Trace:

Report : 011018LC  
Project# : 01U1006-1  
Tested By : KERWIN CORPUZ  
Manufacture : OTC WIRELESS, INC.  
EUT Description : 2.4GHz STATION RADIO (M/N: 2411EZLink-E)  
Test Config. : EUT with power supply M/N: A10D1-05MP  
Test Target : EN55022 CLASS B  
Mode of Operation: TX  
: L1: Peak (blue), Average (green)  
: 115Vac, 60Hz