



# CONFORMANCE TEST REPORT FOR FCC 47 CFR, Part 15 Subpart C

Report No.: **ET93S-12-237-01**

Client: Kwok's Winty Manufacturing Ltd.  
Product: Play  
Model: SO-60101  
FCC ID: OGN60101TX2400  
Manufacturer/supplier: Kwok's Winty Manufacturing Ltd.

Date test item received: 2004/12/30  
Date test campaign completed: 2005/01/03  
Date of issue: 2005/01/10




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Manufacturer : Kwok's Winty Manufacturing Ltd.  
Address : 45 Kut Shing St., 12/F., Block A Shing King Industrial Bldg., Chai Wan, Hong Kong  
EUT : Play  
Trade name : CYCLOPS  
Model No. : SO-60101  
Power Source : 9.6VDC Ni-Cd 600mA  
Regulations applied : FCC 47 CFR, Part 15 Subpart C (2004)

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## 1. GENERAL INFORMATION

### 1.1 Product Description

- a) Type of EUT : Play
- b) Model No. : SO-60101
- c) Serial No. : ----
- d) FCC ID : OGN60101TX2400
- e) Working Frequency : CH1: 2413.4 MHz, CH2: 2454.4 MHz
- f) Power Supply : 9.6VDC Ni-Cd 600mA

### 1.2 Characteristics of Device:

The EUT is a toy car with 2.4 GHz wireless C-MOS camera. The car will receive the 27 MHz control signal (two channels A/B, both are 27.145 MHz but with difference coding) and transmit 2.4 GHz audio and video signal to the receiver. There are two channels to transmit: Channel 1: 2413.4 MHz, Channel 2: 2454.4 MHz.

### 1.3 Test Methodology

Radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4.

The device under test was operated continuously in its normal operating mode for the purpose of the measurements. In order to secure the continuous operation of the device under test, rewiring in the circuit was done by the manufacturer so as to affect its intended operation.

The receiving antenna was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the device under test. The hand-held or body-worn devices rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relatives to the limit.

### 1.4 Test Facility

The semi-anechoic chamber and conducted measurement facility used to collect the radiated and conducted data are located inside the Building at No.8, Lane 29, Wen-ming Road, Lo-shan Tsun, Kweishan Hsiang, Taoyuan, Taiwan, R.O.C.

This site has been accreditation as a FCC filing site.

## 2. DEFINITION AND LIMITS

### 2.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

### 2.2 Restricted Bands of Operation

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	4.5-5.25
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	Above 38.6
13.36-13.41			

Remark “\*\*”: Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

### 2.3 Limitation

#### (1) Conducted Emission Limits:

For an intentional radiator, which is designed to be connected to the public utility (AC) power line, the conducted limit is the following:

Frequency MHz	Quasi Peak dB $\mu$ V	Average dB $\mu$ V
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

\*Decreases with the logarithm of the frequency.

**(2) Radiated Emission Limits:**

According to 15.249, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Frequency Band (MHz)	Field strength of Fundamental (mV/m)	Field strength of Harmonics (uV/m)
902 – 928	50	500
2400 – 2483.5	50	500
5725 – 5875	50	500
24.0 – 24.25 GHz	250	2500

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limits in 15.209, as following table(whichever is the lesser attenuation):

Other Frequencies (MHz)	Field Strength of Fundamental	
	$\mu\text{V}/\text{meter}$	$\text{dB}\mu\text{V}/\text{meter}$
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

## **2.4 Labeling Requirement**

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## **2.5 User Information**

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### 3. RADIATED EMISSION MEASUREMENT

#### 3.1 Applicable Standard

For periodic operation intentional radiator, the radiated emission shall comply with § 15.249 and 15.209.

#### 3.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions and then each selected frequency is precisely measured. As the same purpose, for emission measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission measured below and above 1 GHz, set the spectrum analyzer on a 120 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies that need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.



Figure 1: Frequencies measured below 1 GHz configuration

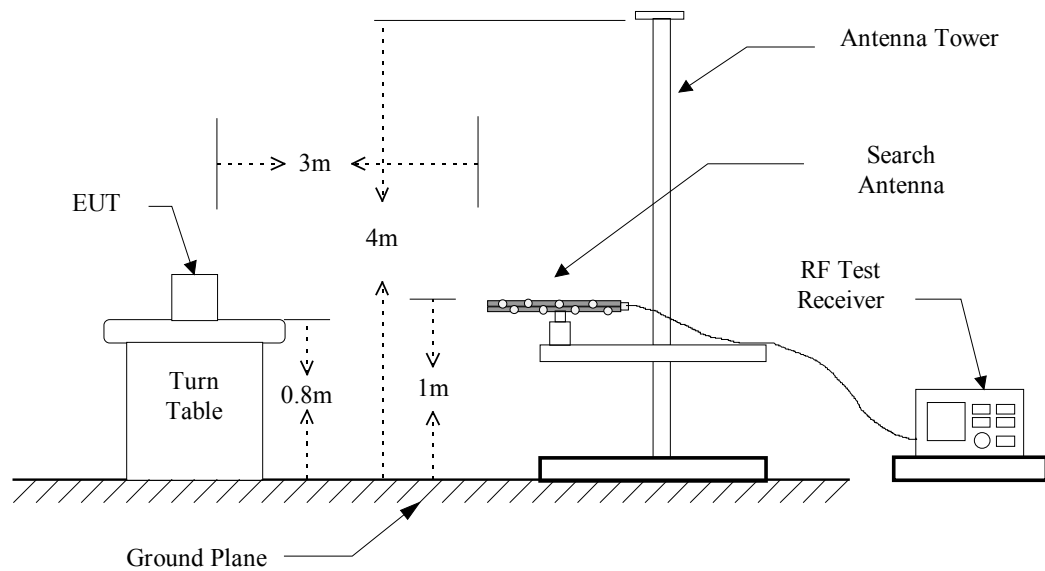
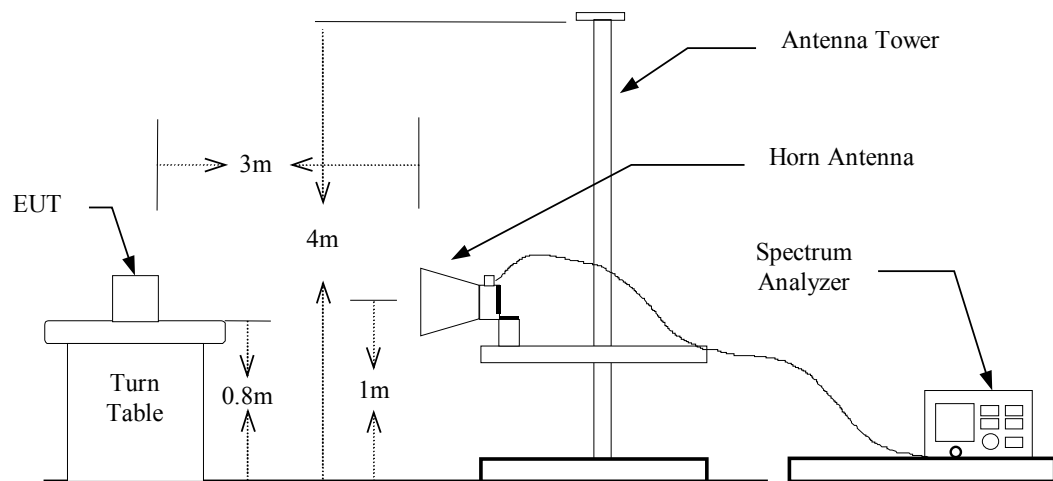


Figure 2: Frequencies measured above 1 GHz configuration



### 3.3 Test Data

#### 3.3.1

Operated mode : Channel 1Test Date : Jan. 03, 2004 Temperature : 15 °C Humidity : 75 %

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Correct Factor (dB)	Result @3m (dBuV/m) Peak	Limit @3m (dBuV/m) QP
Fundamental					
2413.400	H	80.3	-9.2	71.1	94.0
2413.400	V	79.1	-9.2	69.9	94.0
Harmonics					
-	-	-	-	-	-

Operated mode : Channel 2

Frequency (MHz)	Ant Pol H/V	Reading (dBuV) Peak	Correct Factor (dB)	Result @3m (dBuV/m) Peak	Limit @3m (dBuV/m) QP
Fundamental					
2454.400	H	81.3	-9.2	72.1	94.0
2454.400	V	79.8	-9.2	70.6	94.0
Harmonics					
-	-	-	-	-	-

Note:

1. Limit on the field strength of fundamental (Average)  
 $50\text{mV/m} = 20 / \log(50000) = 94.0 \text{ dB } \mu \text{ V/m}$
2. Limit on the field strength of Harmonics (Average)  
 $500 \mu \text{ V/m} = 20 / \log(500) = 54.0 \text{ dB } \mu \text{ V/m}$
3. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.
4. If the data table appeared symbol of “\*\*\*\*” means the value is too low to be measured.
5. The system amplitude accuracy of the measurement made during the radiated emission tests was  $\pm 4.2\text{dB}$ .

**3.3.2 Data 2: Other emissions**

## 3.3.2.1

Operated mode : Transmitting (Channel 1)Test Date : Jan. 03, 2004      Temperature : 15 °C      Humidity : 75 %

Emission Frequency ( MHz )	Meter Reading ( dBuV )		CORR'd Factor ( dB )	Results ( dBuV/m )		Limit (3m) (dBuV/m)	Margins ( dB )	Table Degree (deg)		Ant. High (m)	
	HOR.	VERT.		HOR.	VERT.			HOR.	VERT.	HOR.	VERT.
138.640	8.4	***	15.1	23.5	***	43.5	-20.0	10	***	1.1	***
172.590	***	13.2	15.4	***	28.6	43.5	-14.9	***	130	***	1.3
198.780	***	15.9	13.0	***	28.9	43.5	-14.6	***	248	***	1.1
290.930	***	11.9	16.8	***	28.7	46.0	-17.3	***	78	***	1.4
313.240	11.4	***	17.5	28.9	***	46.0	-17.1	160	***	1.4	***
322.940	***	11.6	17.5	***	29.1	46.0	-16.9	***	320	***	1.1
395.690	13.3	***	19.4	32.7	***	46.0	-13.3	300	***	1.3	***
417.030	11.7	***	20.1	31.8	***	46.0	-14.2	223	***	1.3	***
431.580	10.5	***	20.1	30.6	***	46.0	-15.4	334	***	1.2	***
492.690	***	7.8	21.5	***	29.3	46.0	-16.7	***	340	***	1.2
834.130	***	4.4	27.8	***	32.2	46.0	-13.8	***	130	***	1.2
843.830	4.6	***	28.0	32.6	***	46.0	-13.4	90	***	1.2	***

Note :

1. Place of Measurement: Measuring site of the ETC.
2. Remark “\*\*\*” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. Please refer to page 15 to page 30 for chart

## 3.3.2.2

Operated mode : Transmitting (Channel 2)Test Date : Jan. 03, 2004Temperature : 15 °CHumidity : 75 %

Emission Frequency ( MHz )	Meter Reading ( dBuV )		CORR'd Factor ( dB )	Results ( dBuV/m )		Limit (3m) (dBuV/m)	Margins ( dB )	Table Degree (deg)		Ant. High (m)	
	HOR.	VERT.		HOR.	VERT.			HOR.	VERT.	HOR.	VERT.
150.280	***	6.6	15.1	***	21.7	43.5	-21.8	***	135	***	1.2
153.190	7.1	***	15.1	22.2	***	43.5	-21.3	18	***	1.3	***
266.680	7.1	***	15.7	22.8	***	46.0	-23.2	130	***	1.4	***
305.480	***	8.5	16.8	***	25.3	46.0	-20.7	***	140	***	1.3
320.030	8.4	***	17.5	25.9	***	46.0	-20.1	155	***	1.1	***
327.790	***	7.3	17.5	***	24.8	46.0	-21.2	***	261	***	1.1
402.480	6.8	***	19.4	26.2	***	46.0	-19.8	235	***	1.1	***
494.630	***	6.4	21.5	***	27.9	46.0	-18.1	***	300	***	1.2
703.180	6.3	***	26.1	32.4	***	46.0	-13.6	328	***	1.2	***
703.180	***	5.7	26.1	***	31.8	46.0	-14.2	***	235	***	1.1
732.280	***	4.2	26.6	***	30.8	46.0	-15.2	***	80	***	1.2
960.230	5.0	***	29.9	34.9	***	54.0	-19.1	147	***	1.2	***

Note :

1. Place of Measurement: Measuring site of the ETC.
2. Remark “\*\*\*” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. Please refer to page 15 to page 30 for chart

## 3.3.2.3

Operated mode : Receiver (Channel A)Test Date : Jan. 03, 2004Temperature : 15 °CHumidity : 75 %

Emission Frequency ( MHz )	Meter Reading ( dB $\mu$ V )		Corr'd Factor ( dB )	Results ( dB $\mu$ V/m )		AH ( m )		DRT degree		Limit @3m (dB $\mu$ V/m)	Margin ( dB )
	Hor.	Ver.		Hor.	Ver.	Hor.	Ver.	Hor.	Ver.		
133.790	***	13.0	14.6	***	27.6	***	1.2	***	215	43.5	-15.9
237.580	17.9	14.6	13.7	31.6	28.3	1.1	1.2	36	73	46.0	-14.4
293.840	18.2	11.9	16.8	35.0	28.7	1.2	1.1	175	330	46.0	-11.0
300.630	19.4	***	16.8	36.2	***	1.2	***	314	***	46.0	-9.8
318.090	17.5	***	17.5	35.0	***	1.3	***	226	***	46.0	-11.0
400.540	14.4	***	19.4	33.8	***	1.1	***	85	***	46.0	-12.2
439.340	***	10.9	20.7	***	31.6	***	1.4	***	260	46.0	-14.4
497.540	***	10.0	21.5	***	31.5	***	1.2	***	345	46.0	-14.5
618.790	***	15.4	21.5	***	36.9	***	1.1	***	48	46.0	-9.1
902.030	8.9	***	29.0	37.9	***	1.2	***	310	***	46.0	-8.1

Note :

1. Place of Measurement: Measuring site of the ETC.
2. Remark “\*\*\*” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. Please refer to page 15 to page 30 for chart

## 3.3.2.4

Operated mode : Receiver (Channel B)Test Date : Jan. 03, 2004 Temperature : 15 °C Humidity : 75 %

Emission Frequency ( MHz )	Meter Reading ( dB $\mu$ V )		Corr'd Factor ( dB )	Results ( dB $\mu$ V/m )		AH ( m )		DRT degree		Limit @3m (dB $\mu$ V/m)	Margin ( dB )
	Hor.	Ver.		Hor.	Ver.	Hor.	Ver.	Hor.	Ver.		
133.790	***	13.7	14.6	***	28.3	***	1.3	***	168	43.5	-15.2
227.880	***	13.7	13.7	***	27.4	***	1.1	***	55	46.0	-18.6
237.580	***	14.8	13.7	***	28.5	***	1.2	***	343	46.0	-17.5
245.340	16.3	***	14.6	30.9	***	1.2	***	26	***	46.0	-15.1
269.590	***	11.6	15.7	***	27.3	***	1.1	***	80	46.0	-18.7
293.840	18.1	***	16.8	34.9	***	1.1	***	235	***	46.0	-11.1
310.330	18.8	***	16.8	35.6	***	1.1	***	307	***	46.0	-10.4
318.090	17.8	***	17.5	35.3	***	1.1	***	343	***	46.0	-10.7
400.540	13.2	***	19.4	32.6	***	1.3	***	161	***	46.0	-13.4
415.090	***	10.0	20.1	***	30.1	***	1.2	***	94	46.0	-15.9
526.640	***	8.5	22.3	***	30.8	***	1.2	***	110	46.0	-15.2
773.990	9.5	***	27.2	36.7	***	1.2	***	330	***	46.0	-9.3

Note :

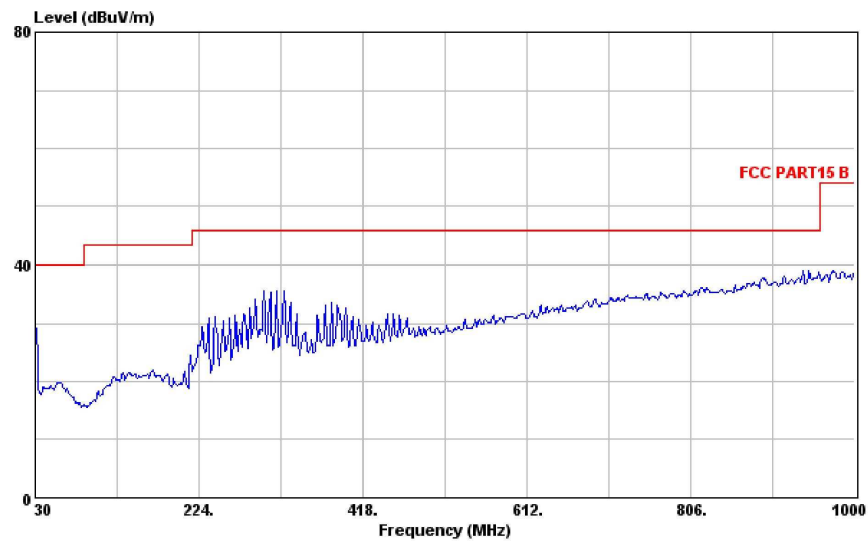
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2. Remark “\*\*\*” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. Please refer to page 15 to page 30 for chart

## Horizontal



ETC TEST LABORTARY

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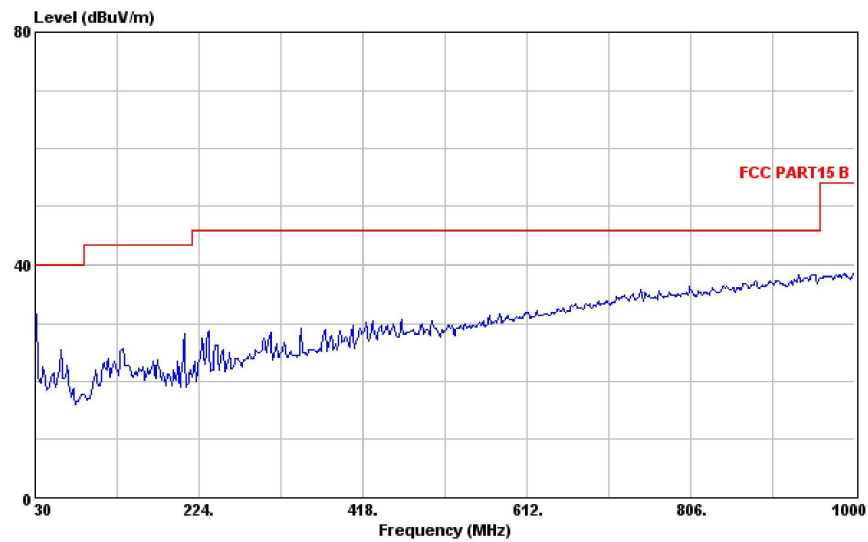
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EUT :  
Model :  
Memo : 2.4GHz\_Tx\_ch01

## Vertical



ETC TEST LABORTARY

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Model :  
Memo : 2.4GHz\_Tx\_ch01

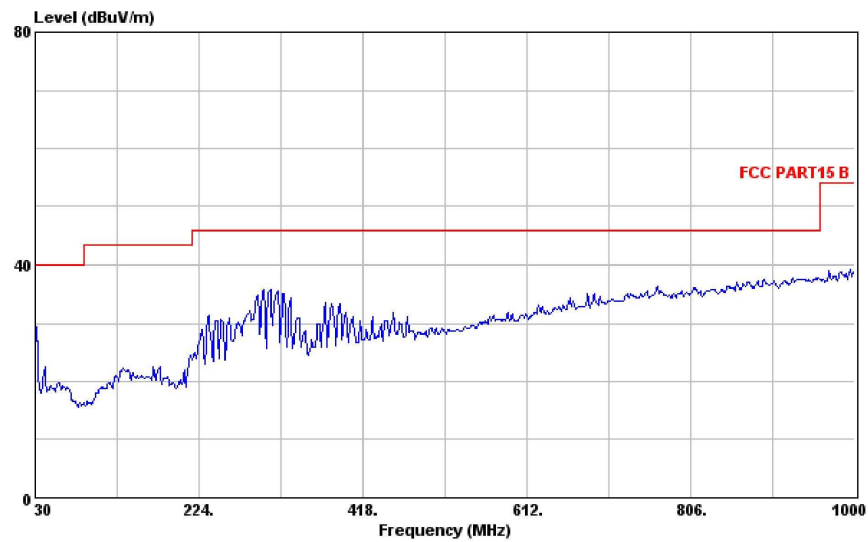


## Horizontal



ETC TEST LABORTARY

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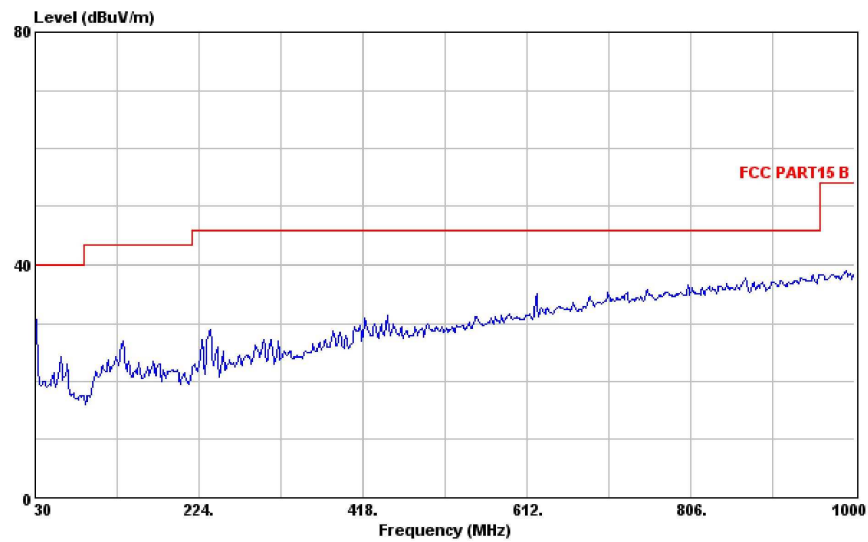
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## Vertical



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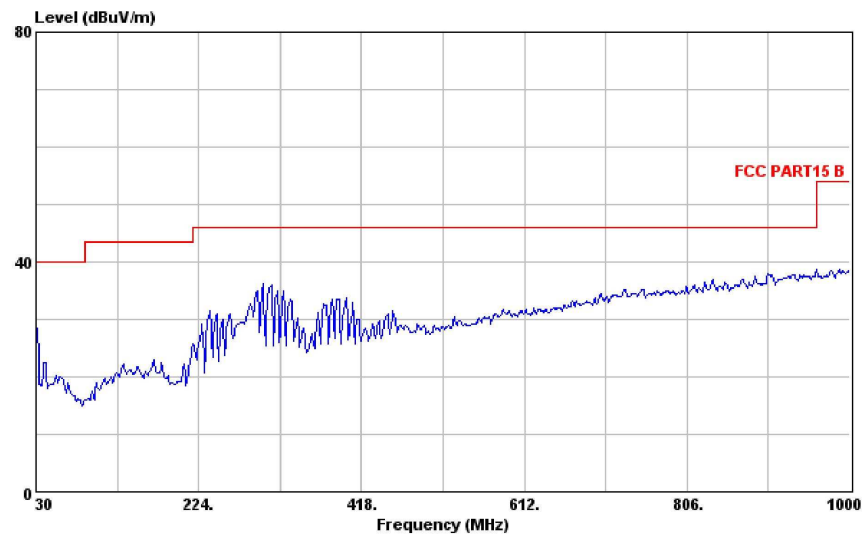
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Model :  
Memo : 2.4GHz\_Tx\_ch02

## Horizontal



ETC TEST LABORTARY

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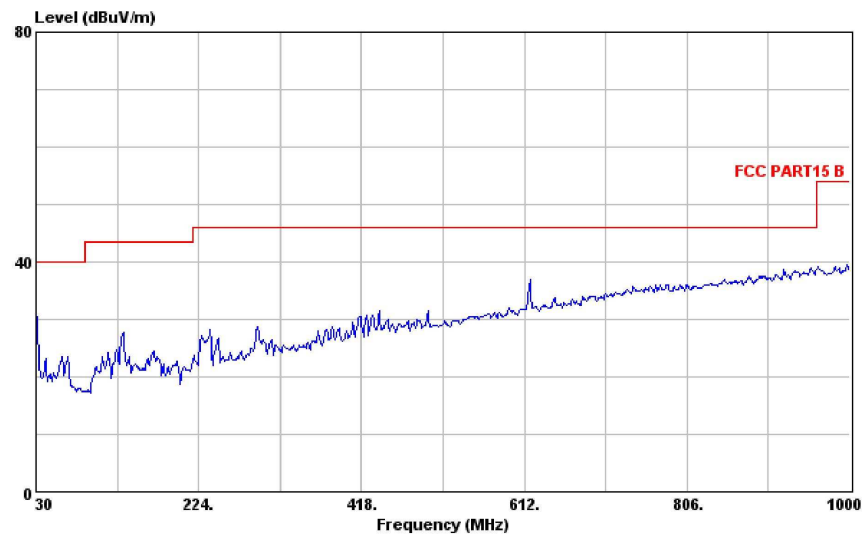
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## Vertical



ETC TEST LABORTARY

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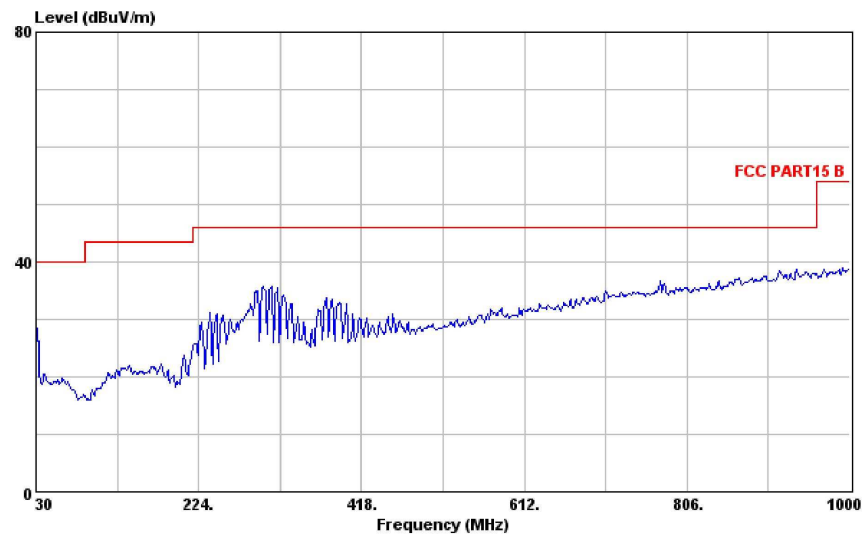
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Model :  
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## Horizontal



ETC TEST LABORTARY

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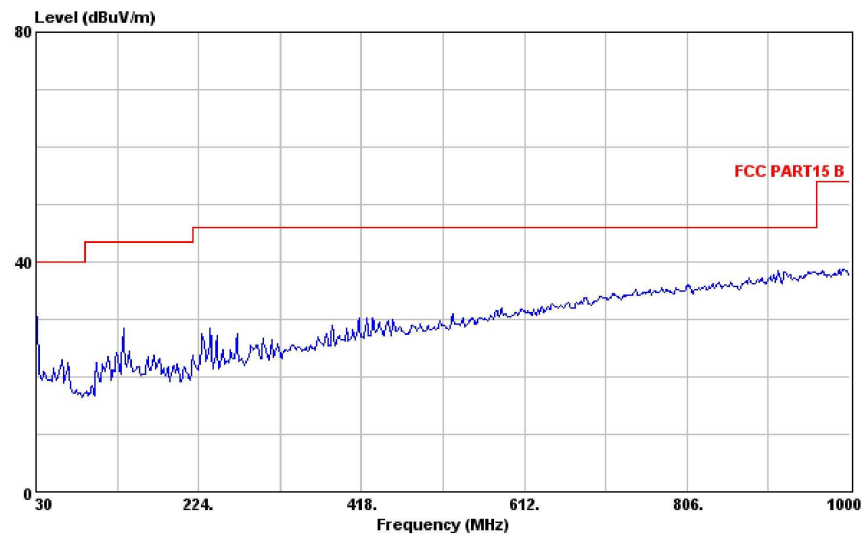
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EUT :  
Model :  
Memo : 27MHz\_Rx\_chB

## Vertical



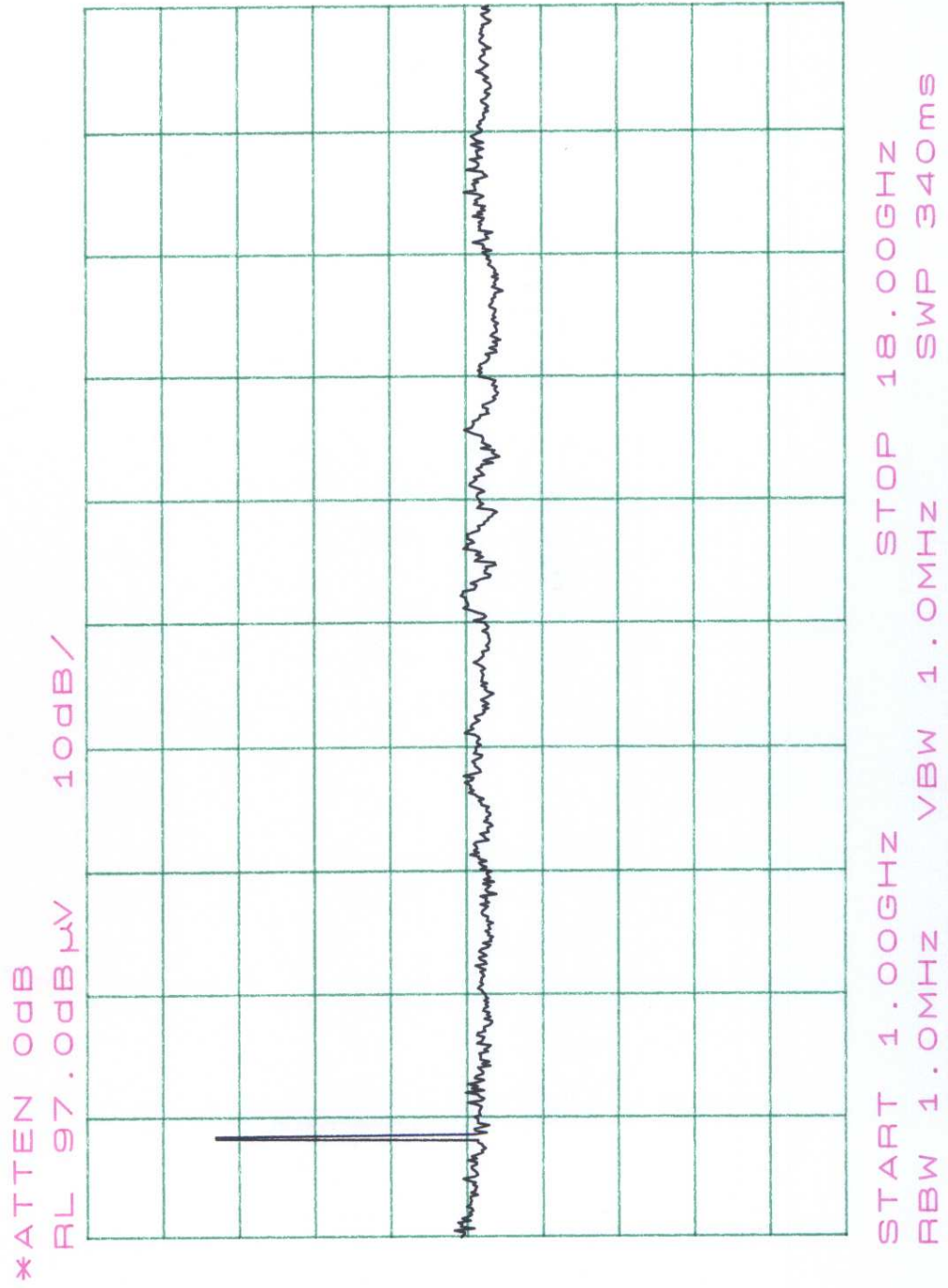
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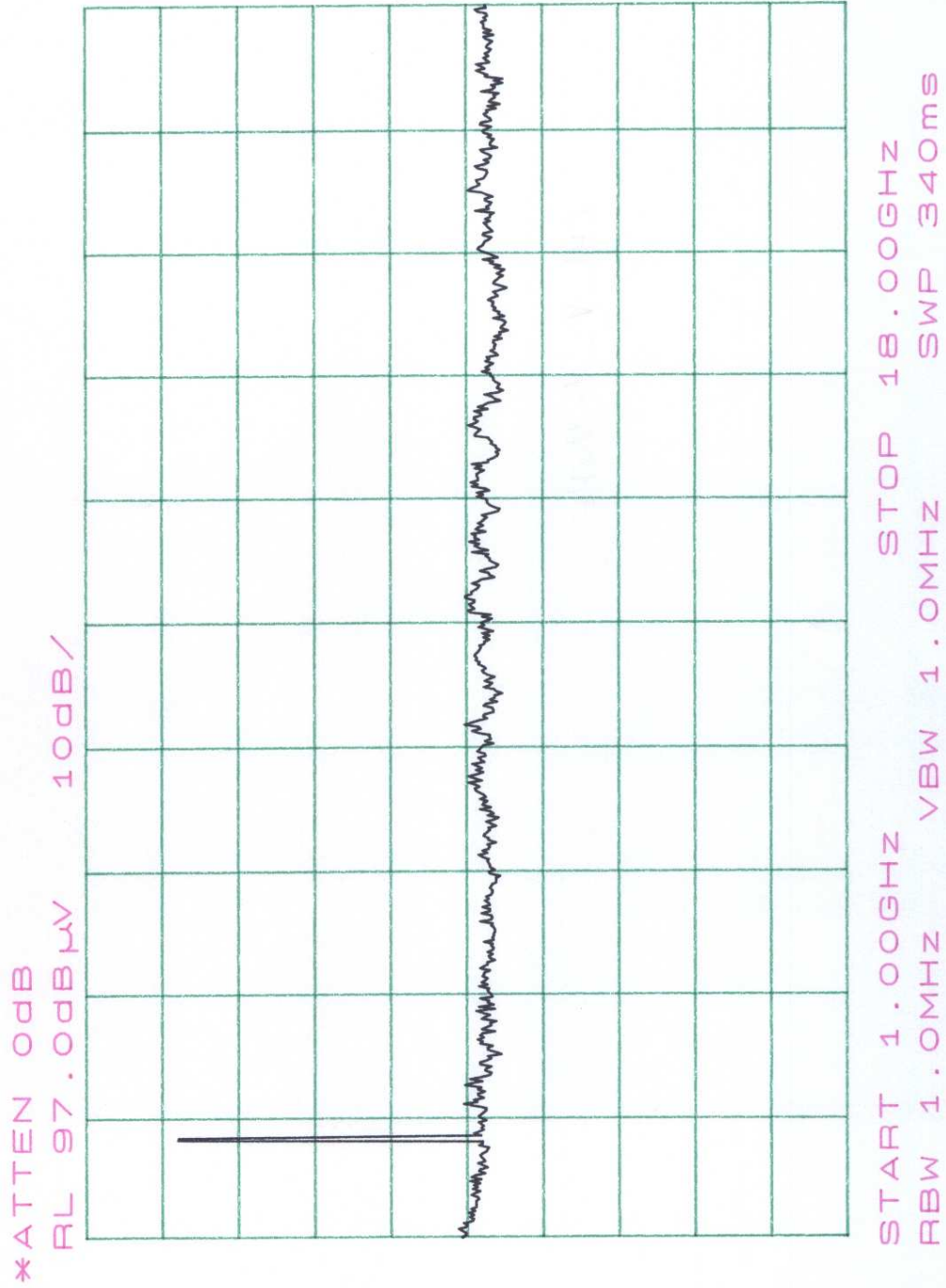


Site : M00 SITE  
Condition : FCC PART15 B 3m VERTICAL  
EUT :  
Model :  
Memo : 27MHz\_Rx\_chB

Channel 1  
Horizontal

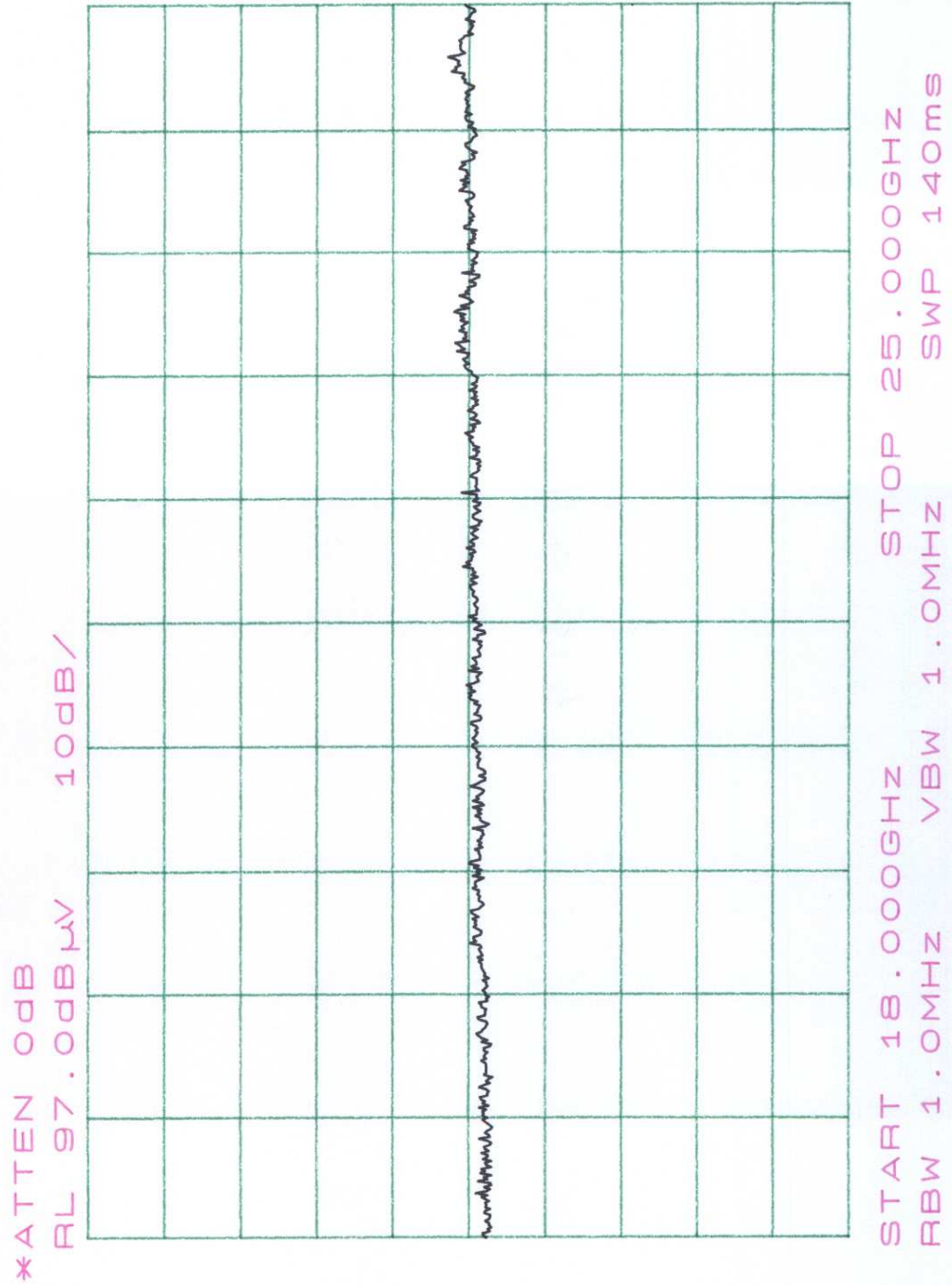


Vertical



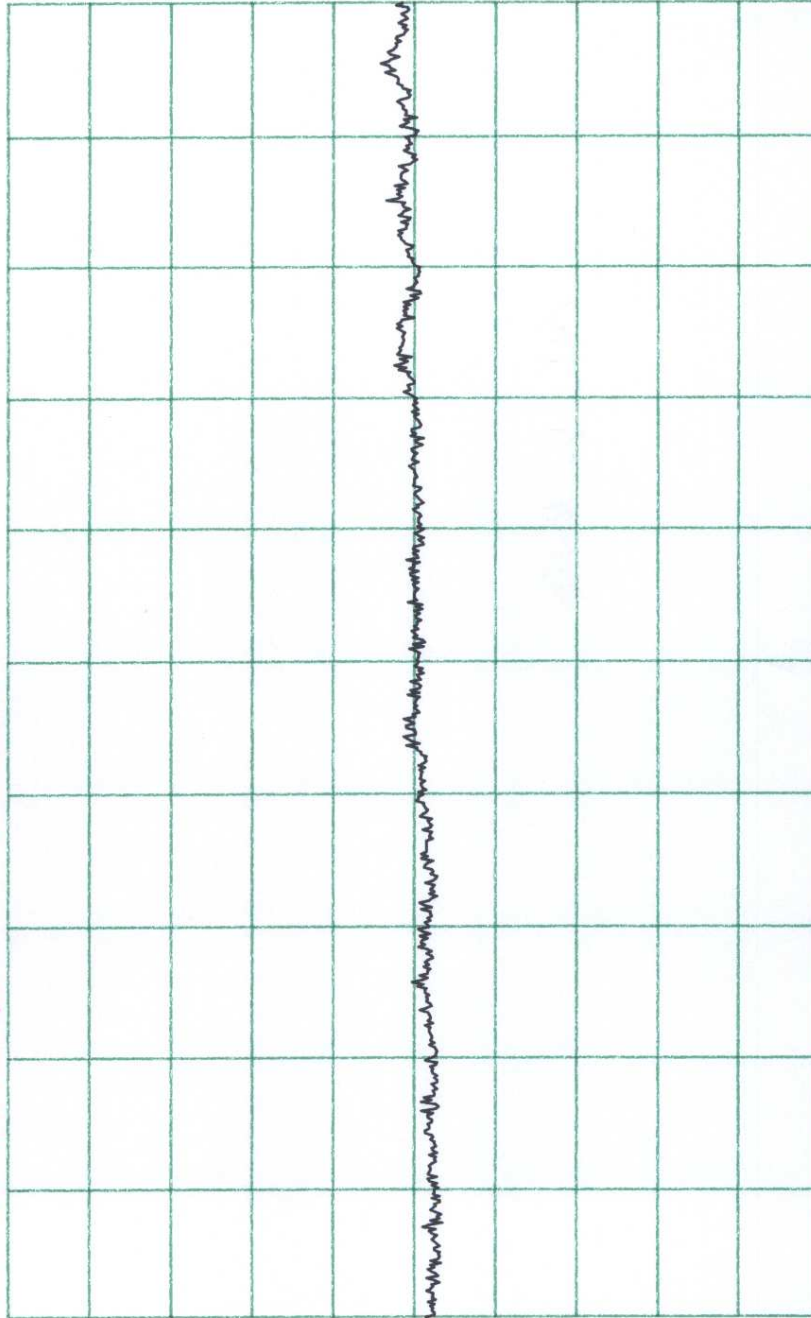


Horizontal



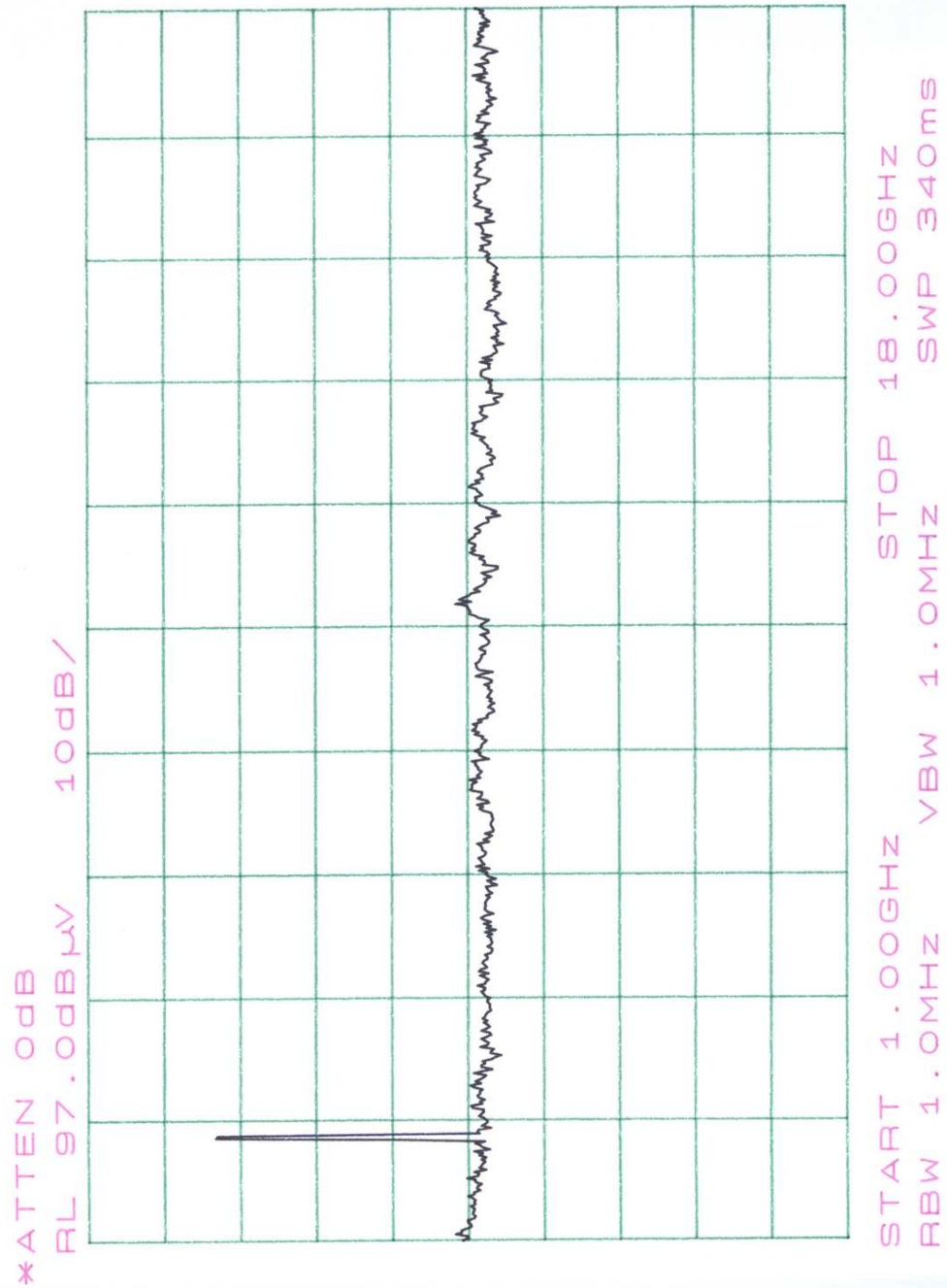
Vertical

\*ATTEN 0dB  
RL 97.0dBμV 10dB/

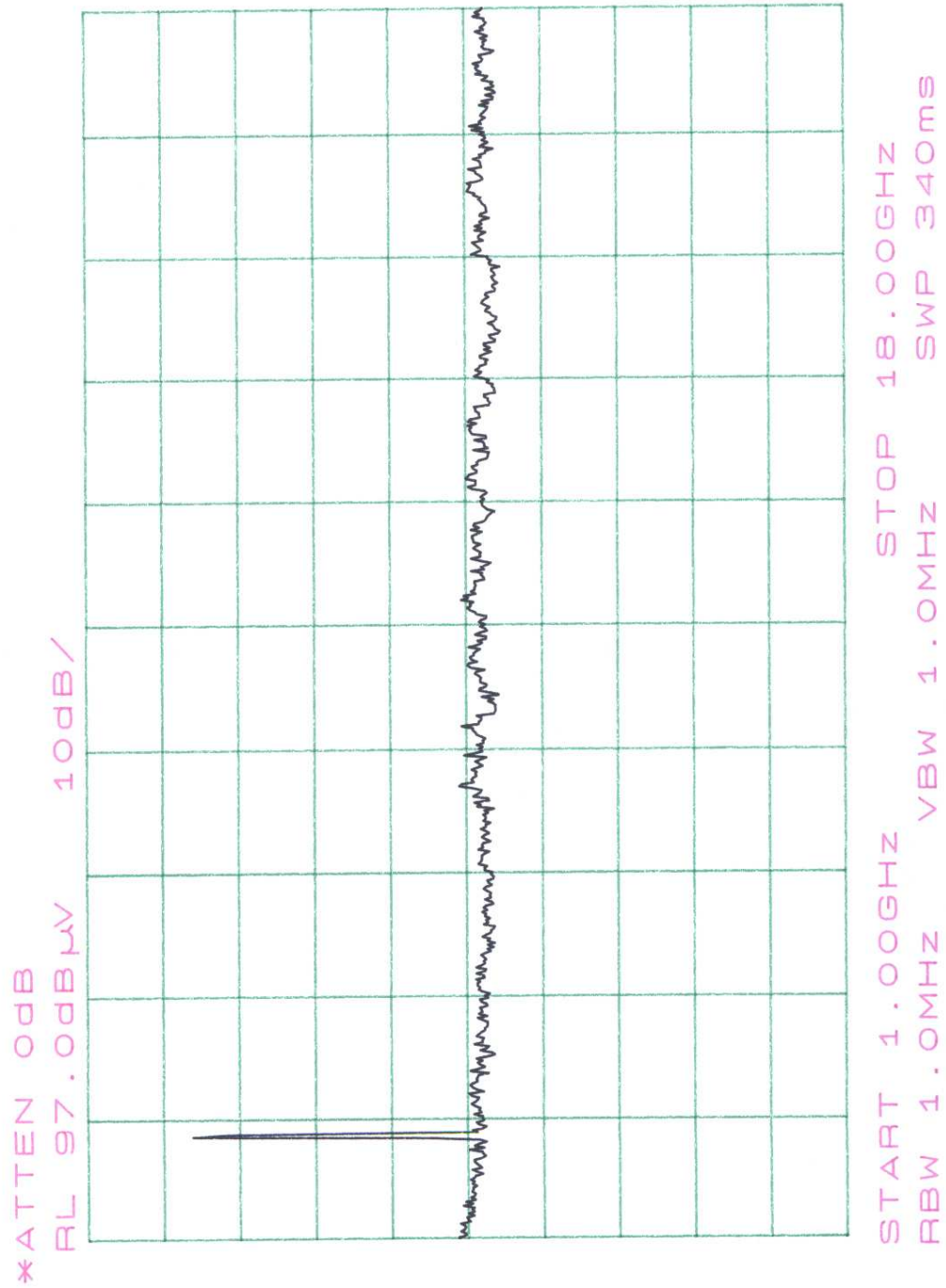


START 18.000GHZ STOP 25.000GHZ  
RBW 1.0MHZ VBW 1.0MHZ SWP 140ms

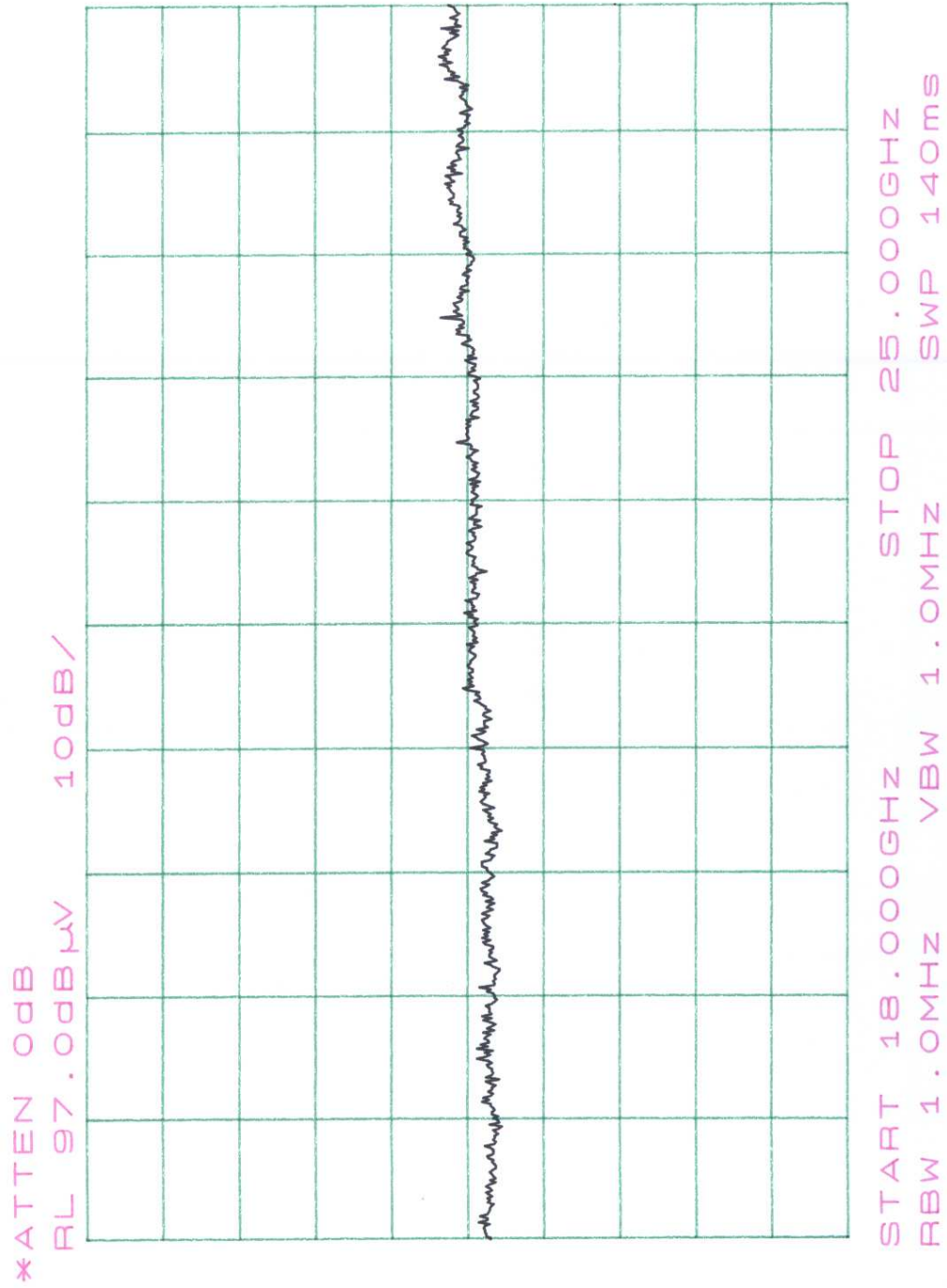
Channel 2  
Horizontal



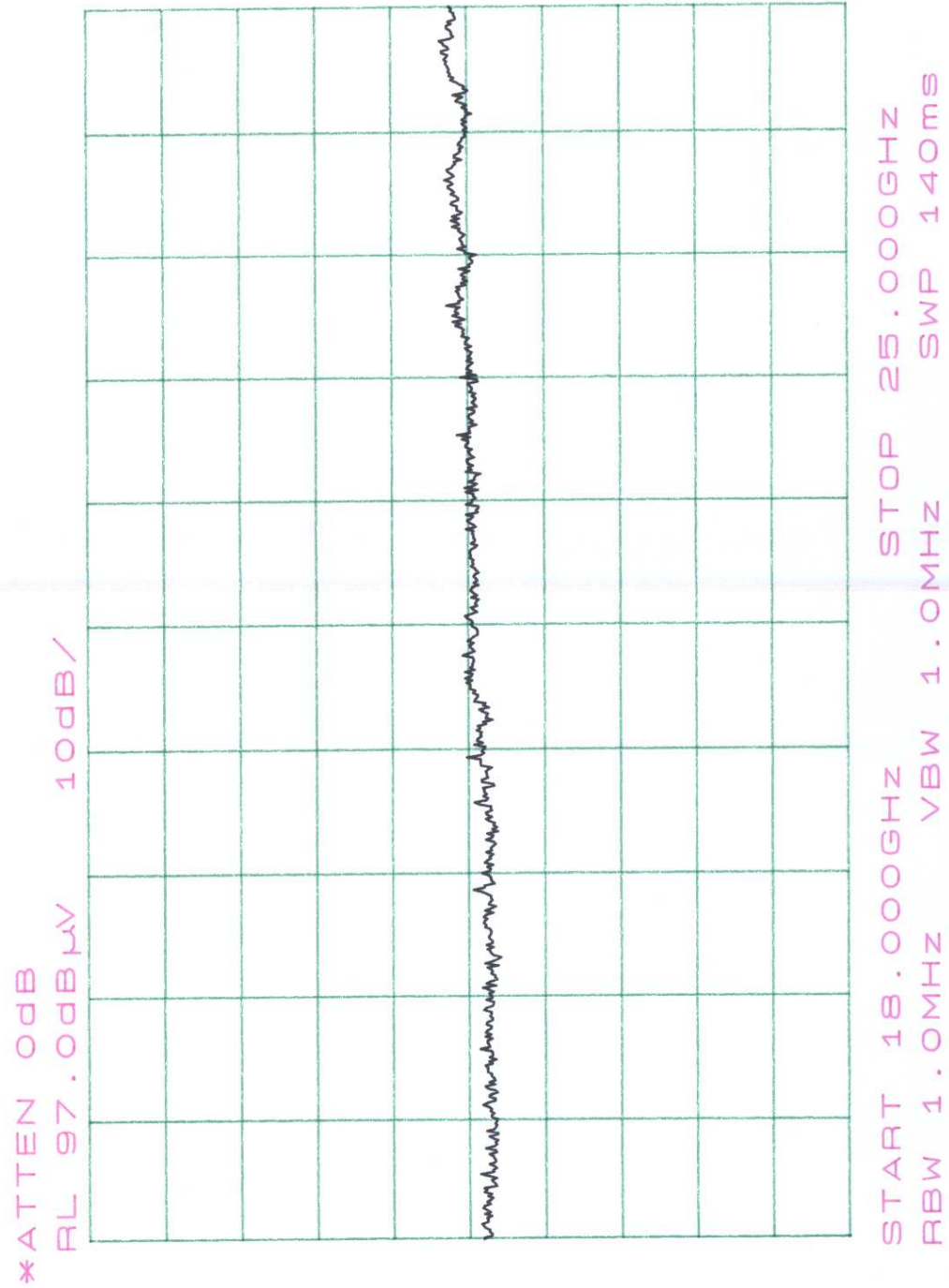
Vertical



Horizontal



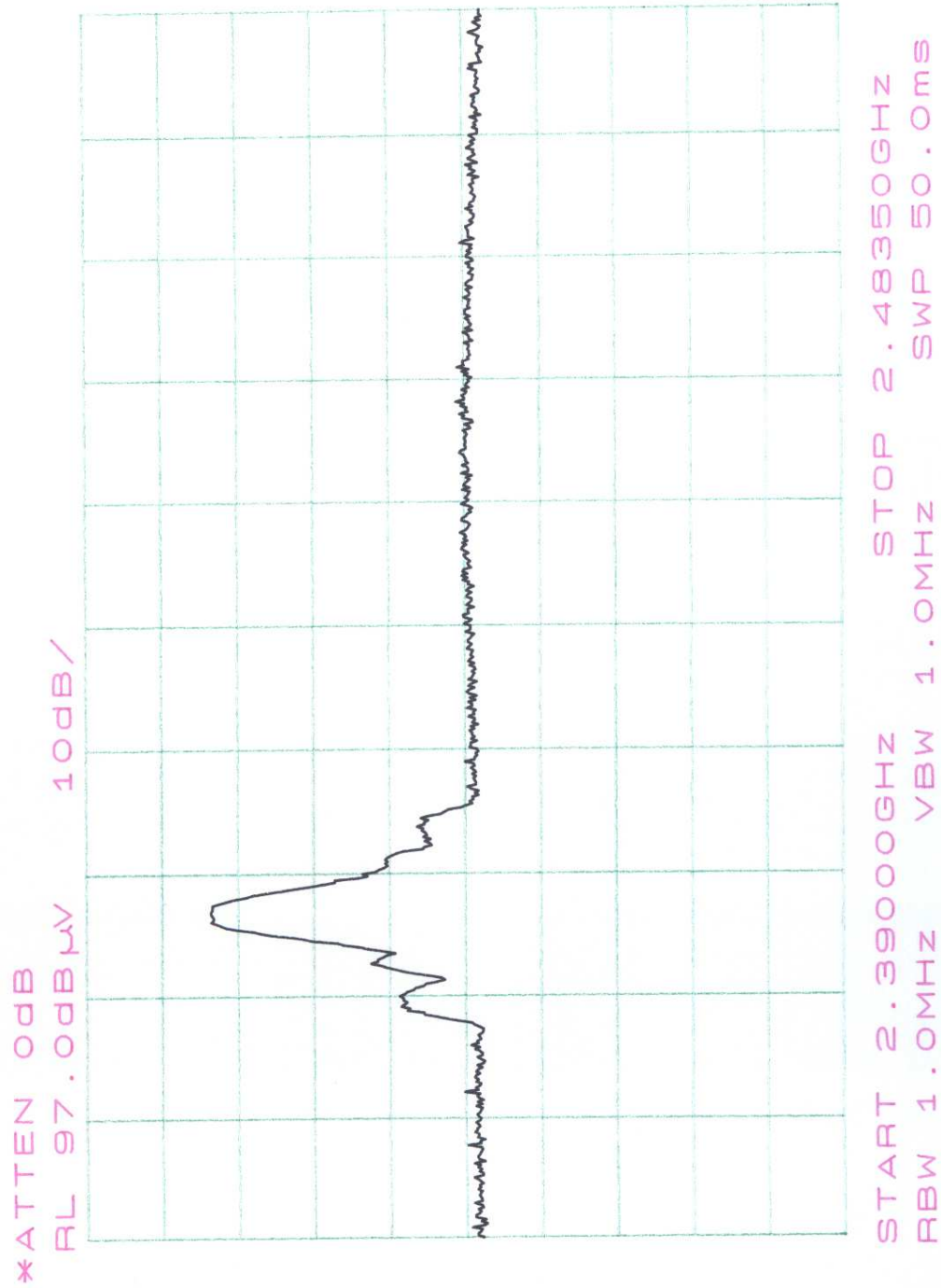
Vertical





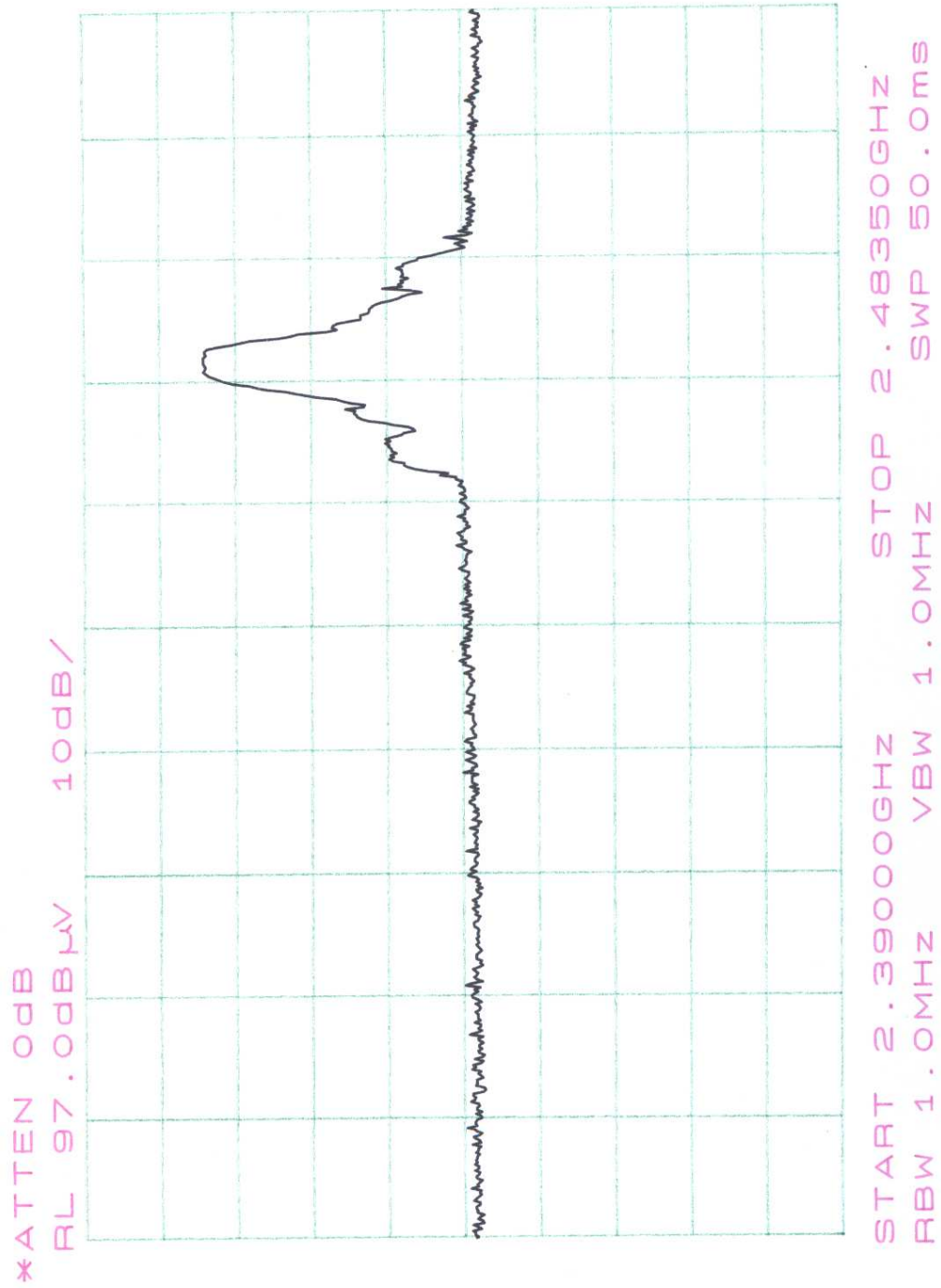
BANDEDGE COMPLIANCE MEASUREMENT (Channel 1)

ch 1



BANDEDGE COMPLIANCE MEASUREMENT (Channel 2)

CH2





### 3.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\text{RESULT} = \text{READING} + \text{CORR. FACTOR}$$

where CORR. FACTOR = Antenna FACTOR + Cable FACTOR

Assume a receiver reading of 22.5 dB  $\mu$  V is obtained. The Antenna Factor of 14.5 and a Cable Factor of 1.5 is added. The total of field strength is 38.5 dB  $\mu$  V/m.

$$\text{RESULT} = 22.5 + 14.5 + 1.5 = 38.5 \text{ dB } \mu \text{ V/m}$$

$$\begin{aligned} \text{Level in } \mu \text{ V/m} &= \text{Common Antilogarithm}[(38.5 \text{ dB } \mu \text{ V/m})/20] \\ &= 84.14 \mu \text{ V/m} \end{aligned}$$

### 3.5 Radiated Test Equipment

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Next Cal. Due
EMI Test Receiver	Hewlett-Packard	8546A	09/06/2005
Horn Antenna	EMCO	3115	06/04/2005
LogBicone Antenna	Schwarzbeck	9160	10/26/2005
Horn Antenna	EMCO	3116	07/19/2005
Preamplifier	Hewlett-Packard	8449B	09/16/2005
Spectrum Analyzer	Hewlett-Packard	8564EC	09/15/2005

Note: The standards used to perform this calibration are traceable to NML/ROC, NIST/USA and NPL.

### 3.6 Measuring Instrument Setup

Measuring instrument setup in measured frequency band when specified detector function is used:

Frequency Band (MHz)	Instrument	Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	Auto

#### **4. CONDUCTED EMISSION MEASUREMENT**

This EUT is excused from investigation of conducted emission, for it is powered by battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.