



# FCC TEST REPORT

**REPORT NO.:** RF910218R02

**MODEL NO.:** WF2H (for Brand: Quanta)

**OEM MODEL NO.:** Celsius Mobile H  
(for Brand: Fujitsu, Fujitsu Siemens)

**RECEIVED:** Feb. 18, 2002

**TESTED:** Feb. 27 ~ March 20, 2002

**APPLICANT:** QUANTA COMPUTER INC.

**ADDRESS:** 7F, No. 116, Hou Kang St., Shih Lin, Taipei,  
Taiwan, R.O.C.

**ISSUED BY:** Advance Data Technology Corporation

**LAB LOCATION:** 47 14th Lin, Chiapau Tsun, Linko, Taipei,  
Taiwan, R.O.C.

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0528  
ILAC MRA



Lab Code: 200102-0



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## 1 CERTIFICATION

**PRODUCT :** Notebook PC  
**BRAND NAME :** Quanta  
**MODEL NO. :** WF2H  
**OEM BRAND NAME :** Fujitsu, Fujitsu Siemens  
**OEM MODEL NO. :** Celsius Mobile H  
**APPLICANT :** QUANTA COMPUTER INC.  
**STANDARDS :** 47 CFR Part 15, Subpart C (Section 15.247),  
ANSI C63.4-1992, Canada RSS 210,  
New Zealand RFS 29

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility from Feb. 27, 2002 to March 20, 2002, The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions herein specified.

TESTED BY : Gary Chang , DATE: Mar. 21, 2002  
Gary Chang

CHECKED BY : Emily Lu , DATE: Mar. 21, 2002  
Emily Lu

APPROVED BY : Alan Lane , DATE: Mar. 21, 2002  
Dr. Alan Lane, Manager

## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

<b>APPLIED STANDARD: 47 CFR Part 15, Subpart C</b>			
<b>Standard Section</b>	<b>Test Type and Limit</b>	<b>Result</b>	<b>REMARK</b>
15.207	AC Power Conducted Emission Limit: 48dBuV	PASS	Meet the requirement of limit Minimum passing margin is -13.36dBuV at 0.4578MHz
15.247(a)(1)(I)-(ii)	Number of Hopping Frequency Used Spec.: At least 75 channels	PASS	Meet the requirement of limit
15.247(a)(1)(ii)	Dwell Time on Each Channel Spec. : Max. 0.4 second within 30 second	PASS	Meet the requirement of limit
15.247(a)(1)(I)-(ii)	Hopping Channel Separation Spec. : Min. 25 kHz or 20 dB bandwidth	PASS	Meet the requirement of limit
15.247(a)(2)	Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System Spec.: Max. 1 MHz	PASS	Meet the requirement of limit
15.247(b)	Maximum Peak Output Power Spec.: max. 30dBm	PASS	Meet the requirement of limit
15.247(c)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -5.1dBuV at 567.40MHz
15.247(c)	Band Edge Measurement	PASS	Meet the requirement of limit

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	Notebook PC
<b>MODEL NO.</b>	WF2H
<b>POWER SUPPLY</b>	3.3VDC from Notebook 3.3VDC from batteries for Keyboard
<b>MODULATION TYPE</b>	GFSK
<b>FREQUENCY RANGE</b>	2402MHz ~ 2480MHz
<b>NUMBER OF CHANNEL</b>	79
<b>OUTPUT POWER</b>	7.7dBm
<b>ANTENNA TYPE</b>	Micro strip antenna
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	NA
<b>ASSOCIATED DEVICES</b>	NA

**NOTE:** 1. The EUT is a notebook PC with a detachable keyboard.

2. Bluetooth technology is used for the EUT, both on host notebook and keyboard.

3. For more detailed feature description of the EUT, please refer to user's manual.

### **3.2 DESCRIPTION OF TEST MODES**

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually. Test result (A) is for Notebook with a bluetooth transceiver inside and test result (B) is for Bluetooth keyboard.

### **3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is a Notebook PC. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC CFR 47 Part 15, Subpart C. (15.247)**

**ANSI C63.4 : 1992, Canada RSS 210, New Zealand RFS 29**

All tests have been performed and recorded as per the above standards.

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.



### 3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	PRINTER	HP	2225C+	3123S97230	DSI6XU2225
2	MODEM	ACEEX	1414	980020510	IFAXDM1414

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.2m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core.
2	1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core.

**NOTE:** All power cords of the above support units are non shielded (1.8m).



## 4 TEST PROCEDURES AND RESULTS

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.45 – 30	48	-	48	-

#### Notes:

1. The lower limit shall apply at the transition frequencies.
1. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### 4.1.2 TEST INSTRUMENTS

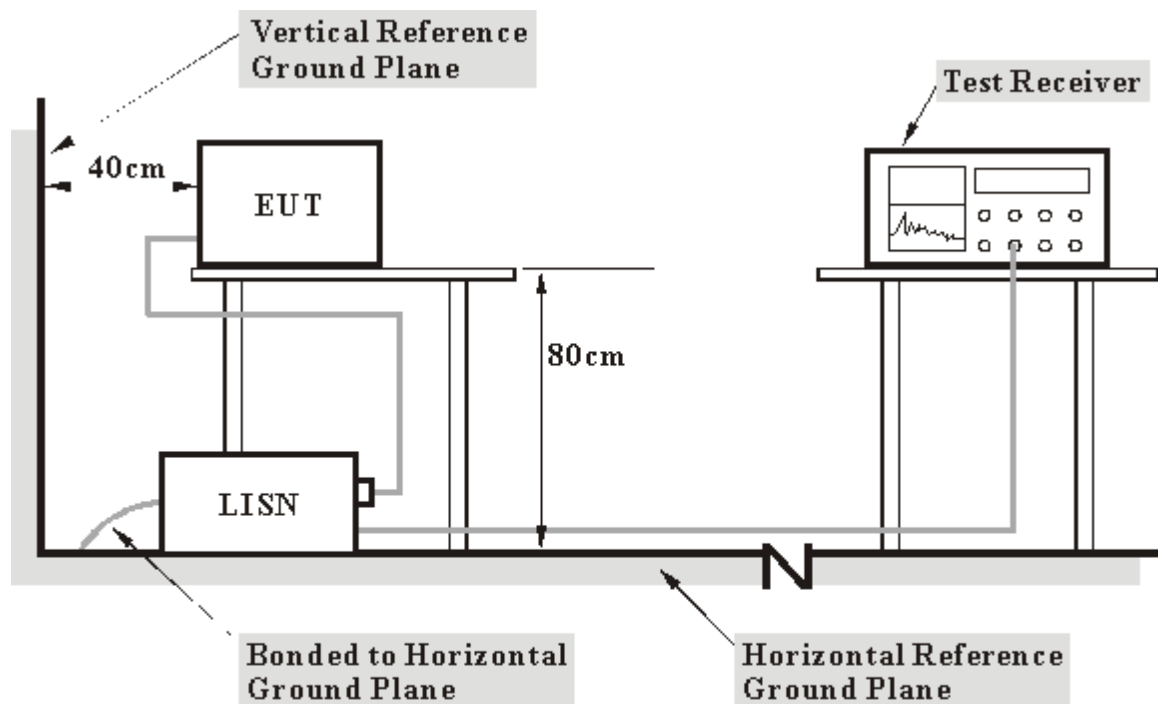
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS30	834115/016	Mar. 3, 2003
ROHDE & SCHWARZ Artificial Mains Network (For EUT)	ESH3-Z5	847265/023	Jan. 10, 2003
* ROHDE & SCHWARZ 4-wire ISN	ENY41	838119/028	Dec. 10, 2002
* ROHDE & SCHWARZ 2-wire ISN	ENY22	837497/018	Dec. 10, 2002
EMCO L.I.S.N. (For peripherals)	3825/2	9504-2359	July 10, 2002
Software	Cond-V2L	NA	NA
RF cable (JYEBAO)	5D-FB	Cable-C03.01	July 11, 2002
Terminator (For EMCO LISN)	NA	E1-01-300	Feb. 20, 2003
Terminator (For EMCO LISN)	NA	E1-01-301	Feb. 20, 2003
Shielded Room	Site 3	ADT-C03	NA
VCCI Site Registration No.	Site 3	C-274	NA

- NOTE: 1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  3. “\*”: These equipment are used for conducted telecom port test only (if tested).

#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 450 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

#### 4.1.4 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
  2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



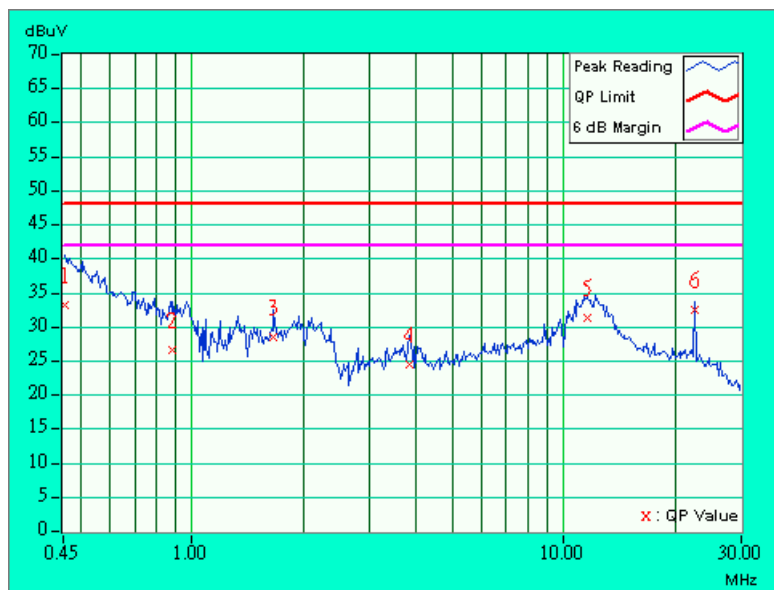
### 4.1.5 TEST RESULTS (A)

<b>EUT</b>	Notebook PC	<b>MODEL</b>	WF2H
<b>MODE</b>	Channel 0	<b>6dB BANDWIDTH</b>	10 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Line (L)
<b>ENVIRONMENTAL CONDITIONS</b>	20 deg. C, 50%RH, 1005 hPa	<b>TESTED BY:</b> Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.454	0.10	32.27	-	32.37	-	48.00	-	-15.63	-
2	0.888	0.10	25.70	-	25.80	-	48.00	-	-22.20	-
3	1.660	0.10	27.47	-	27.57	-	48.00	-	-20.43	-
4	3.828	0.28	23.51	-	23.79	-	48.00	-	-24.21	-
5	11.590	0.60	30.28	-	30.88	-	48.00	-	-17.12	-
6	22.570	1.00	31.54	-	32.54	-	48.00	-	-15.46	-

**NOTE:**

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.



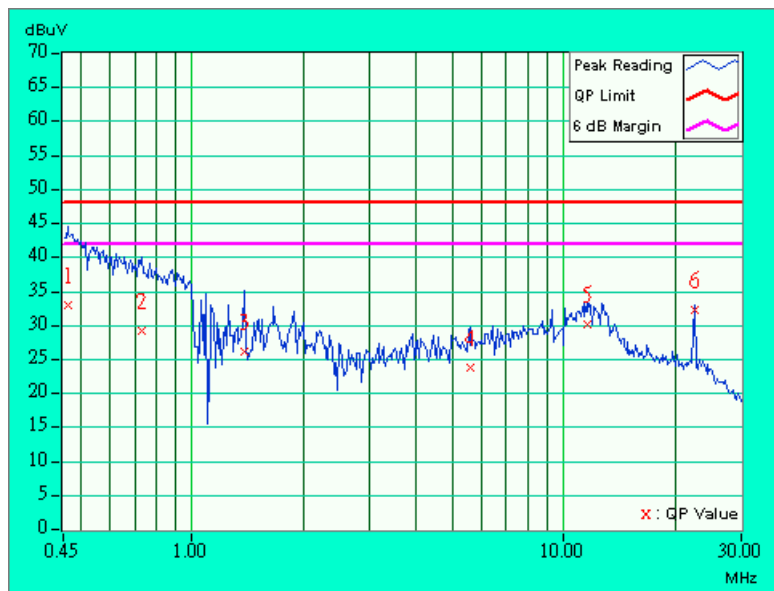


<b>EUT</b>	Notebook PC	<b>MODEL</b>	WF2H
<b>MODE</b>	Channel 0	<b>6dB BANDWIDTH</b>	10 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Neutral (N)
<b>ENVIRONMENTAL CONDITIONS</b>	20deg. C, 50%RH, 1005 hPa	<b>TESTED BY:</b> Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.
1	0.466	0.10	32.30	-	32.40	-	48.00	-	-15.60	-
2	0.731	0.10	28.38	-	28.48	-	48.00	-	-19.52	-
3	1.383	0.10	25.42	-	25.52	-	48.00	-	-22.48	-
4	5.578	0.33	23.00	-	23.33	-	48.00	-	-24.67	-
5	11.516	0.46	29.41	-	29.87	-	48.00	-	-18.13	-
6	22.570	0.75	31.46	-	32.21	-	48.00	-	-15.79	-

**NOTE:**

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.



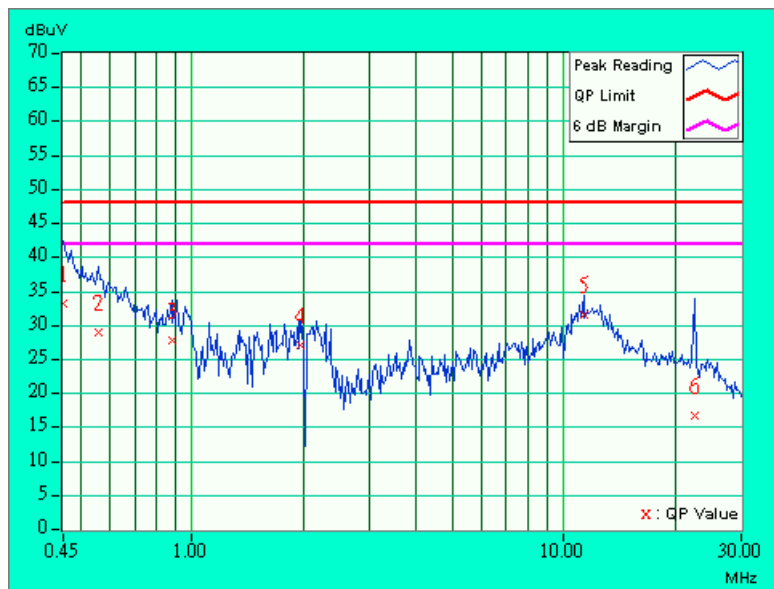


<b>EUT</b>	Notebook PC	<b>MODEL</b>	WF2H
<b>MODE</b>	Channel 39	<b>6dB BANDWIDTH</b>	10 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Line (L)
<b>ENVIRONMENTAL CONDITIONS</b>	20 deg. C, 50%RH, 1005 hPa	<b>TESTED BY:</b> Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.450	0.10	32.17	-	32.27	-	48.00	-	-15.73	-
2	0.559	0.10	28.02	-	28.12	-	48.00	-	-19.88	-
3	0.880	0.10	26.75	-	26.85	-	48.00	-	-21.15	-
4	1.957	0.10	26.21	-	26.31	-	48.00	-	-21.69	-
5	11.289	0.58	30.55	-	31.13	-	48.00	-	-16.87	-
6	22.570	1.00	15.72	-	16.72	-	48.00	-	-31.28	-

**NOTE:**

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.



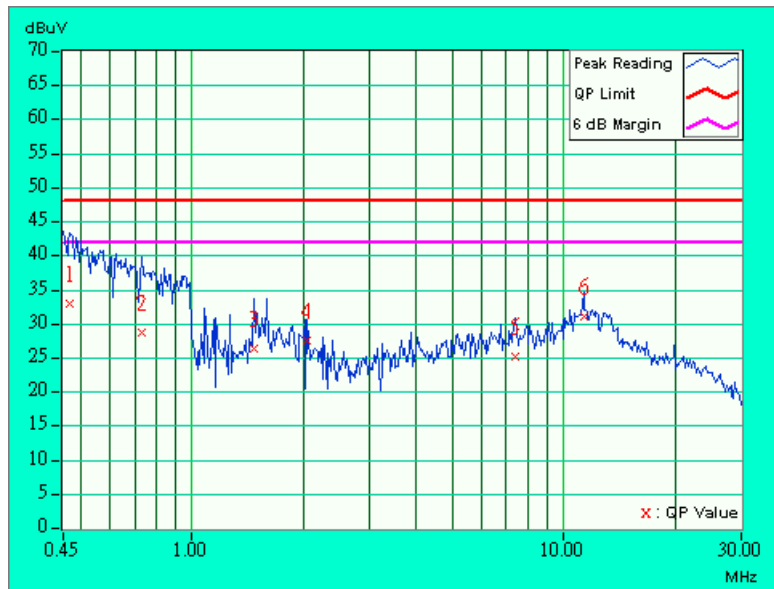


<b>EUT</b>	Notebook PC	<b>MODEL</b>	WF2H
<b>MODE</b>	Channel 39	<b>6dB BANDWIDTH</b>	10 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Neutral (N)
<b>ENVIRONMENTAL CONDITIONS</b>	20 deg. C, 50%RH, 1005 hPa	<b>TESTED BY:</b> Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (Uv)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.
1	0.470	0.10	32.61	-	32.71	-	48.00	-	-15.29	-
2	0.735	0.10	28.22	-	28.32	-	48.00	-	-19.68	-
3	1.461	0.10	25.97	-	26.07	-	48.00	-	-21.93	-
4	2.043	0.10	27.04	-	27.14	-	48.00	-	-20.86	-
5	7.391	0.36	24.65	-	25.01	-	48.00	-	-22.99	-
6	11.289	0.45	30.55	-	31.00	-	48.00	-	-17.00	-

**NOTE:**

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.



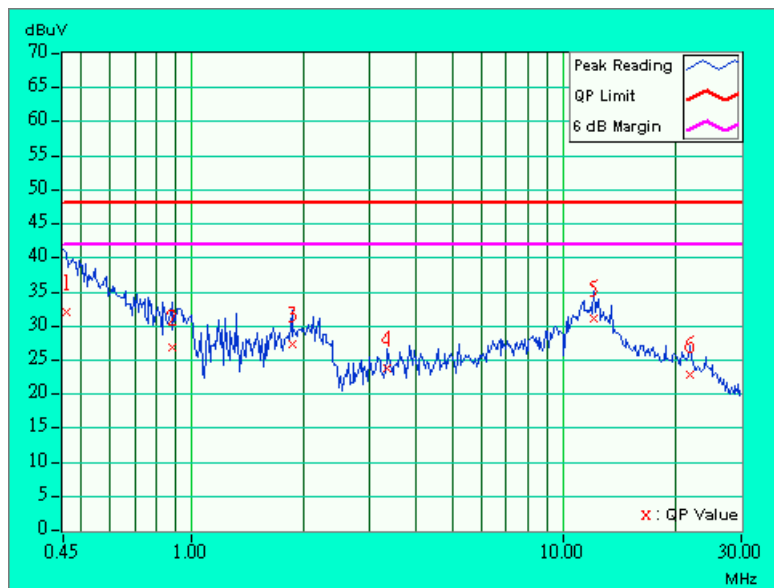


<b>EUT</b>	Notebook PC	<b>MODEL</b>	WF2H
<b>MODE</b>	Channel 78	<b>6dB BANDWIDTH</b>	10 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Line (L)
<b>ENVIRONMENTAL CONDITIONS</b>	20 deg. C, 50%RH, 1005 hPa	<b>TESTED BY:</b> Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.
1	0.458	0.10	31.11	-	31.21	-	48.00	-	-16.79	-
2	0.880	0.10	25.94	-	26.04	-	48.00	-	-21.96	-
3	1.855	0.10	26.36	-	26.46	-	48.00	-	-21.54	-
4	3.355	0.24	22.73	-	22.97	-	48.00	-	-25.03	-
5	12.039	0.62	30.11	-	30.73	-	48.00	-	-17.27	-
6	21.754	0.97	21.90	-	22.87	-	48.00	-	-25.13	-

**NOTE:**

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.



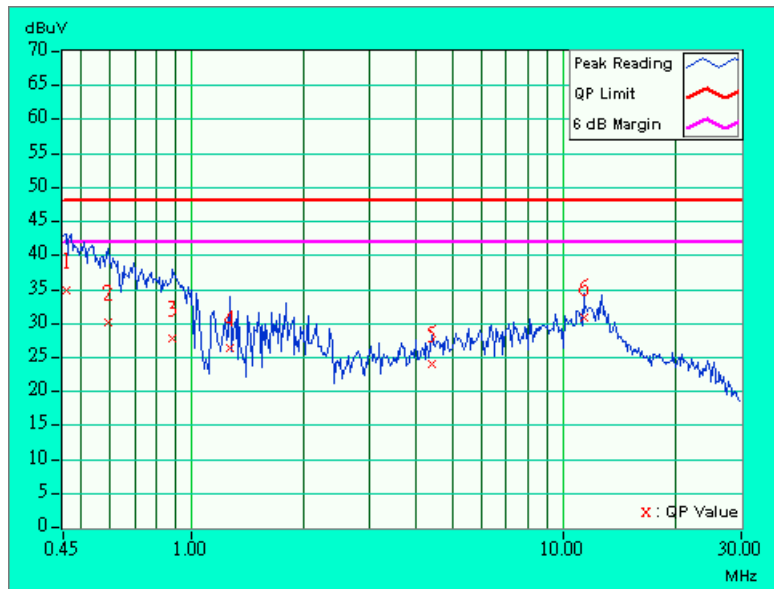


<b>EUT</b>	Notebook PC	<b>MODEL</b>	WF2H
<b>MODE</b>	Channel 78	<b>6dB BANDWIDTH</b>	10 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Netural (N)
<b>ENVIRONMENTAL CONDITIONS</b>	20 deg. C, 50%RH, 1005 hPa	<b>TESTED BY:</b> Bruce Shiau	

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.
1	0.458	0.10	34.54	-	34.64	-	48.00	-	-13.36	-
2	0.595	0.10	29.62	-	29.72	-	48.00	-	-18.28	-
3	0.884	0.10	27.41	-	27.51	-	48.00	-	-20.49	-
4	1.270	0.10	25.99	-	26.09	-	48.00	-	-21.91	-
5	4.398	0.31	23.63	-	23.94	-	48.00	-	-24.06	-
6	11.289	0.45	30.49	-	30.94	-	48.00	-	-17.06	-

**NOTE:**

1. QP. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Reading Value + Correction Factor.





## 4.2 NUMBER OF HOPPING FREQUENCY USED

### 4.2.1 LIMIT OF HOPPING FREQUENCY USED

At least 75 hopping frequencies, and should be equally spaced.

### 4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK30	100049	July 17, 2002

**NOTE:**

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
- 2.The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.2.3 TEST PROCEDURES

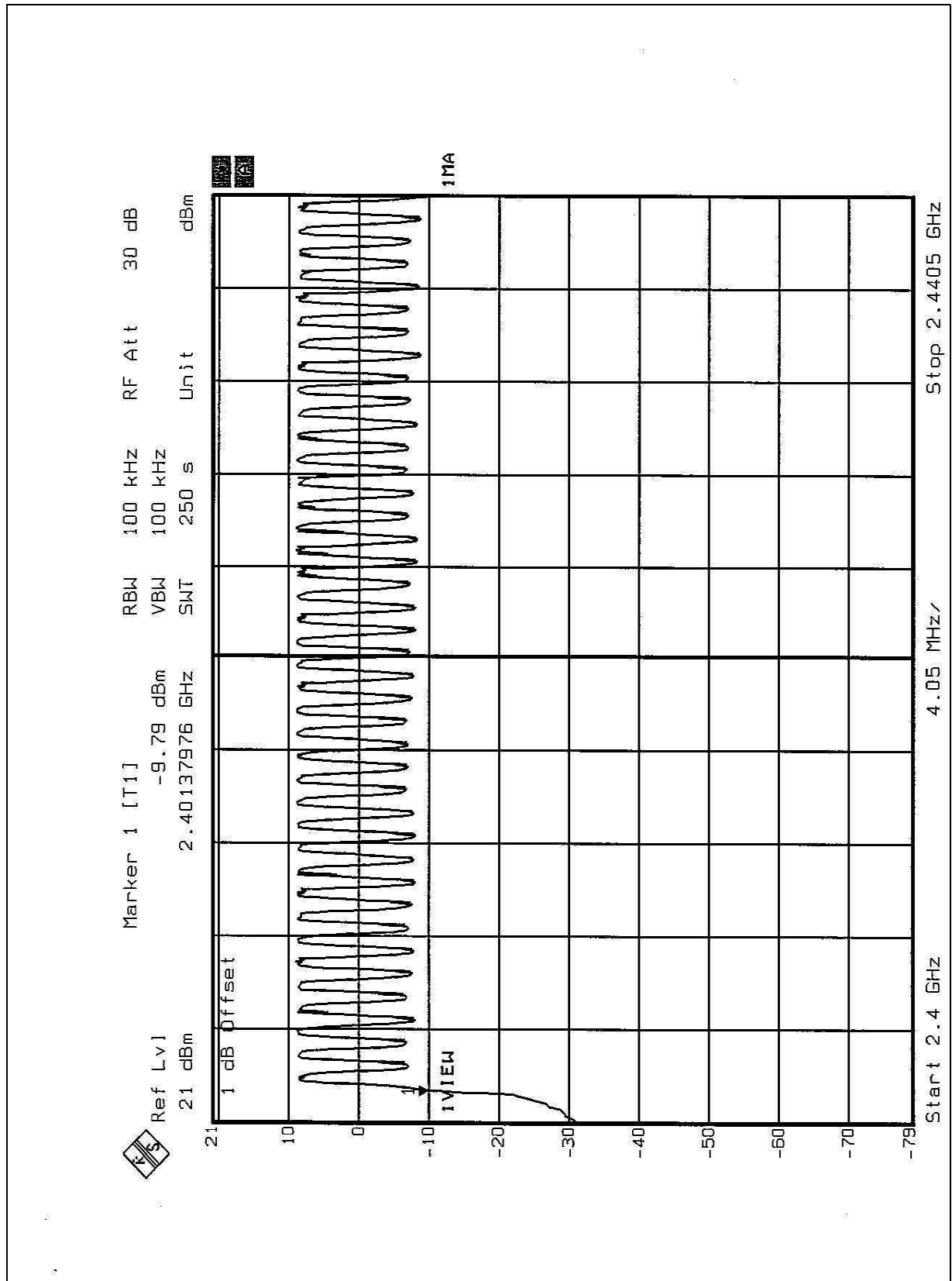
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

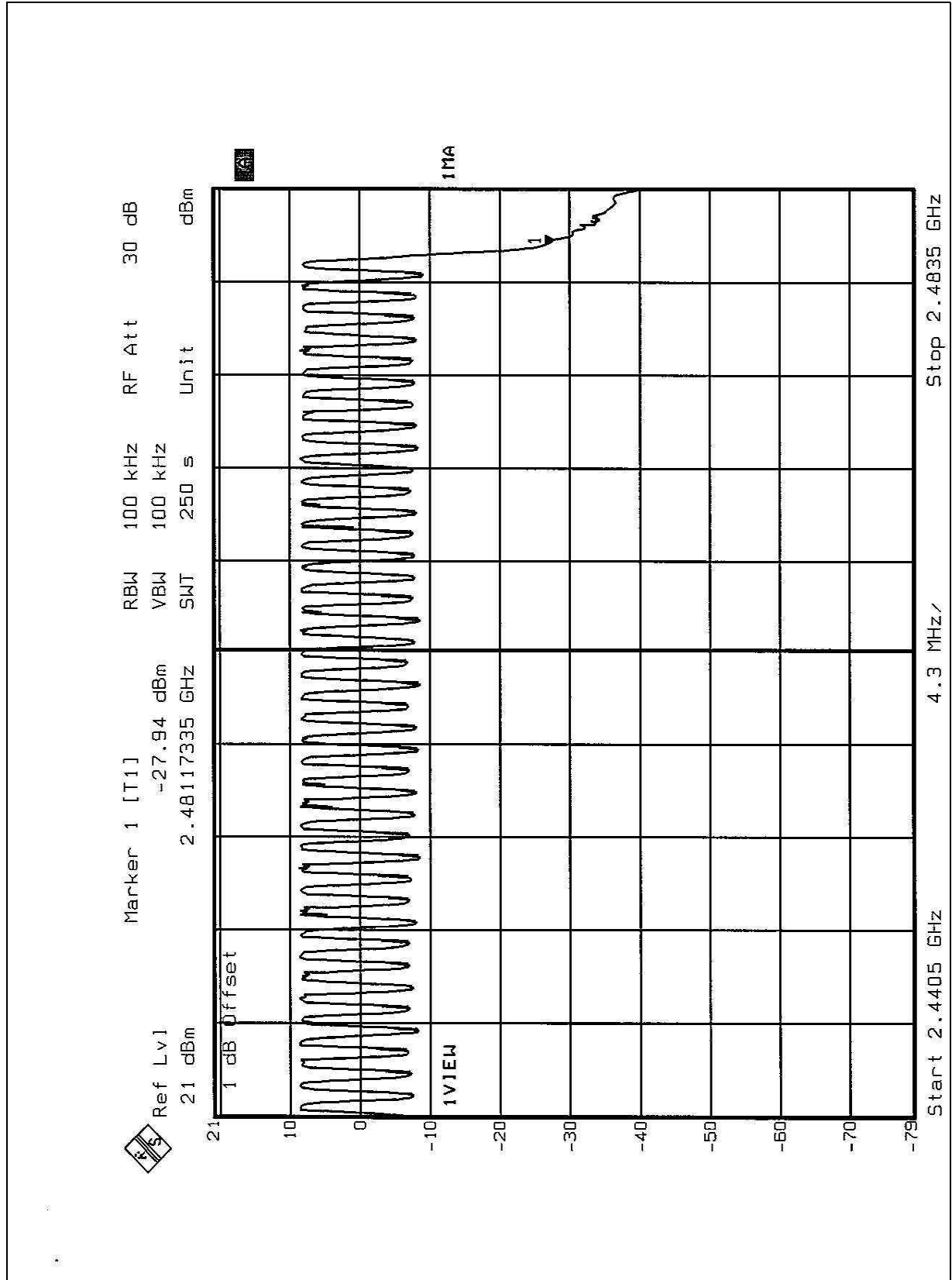
#### 4.2.4 TEST SETUP



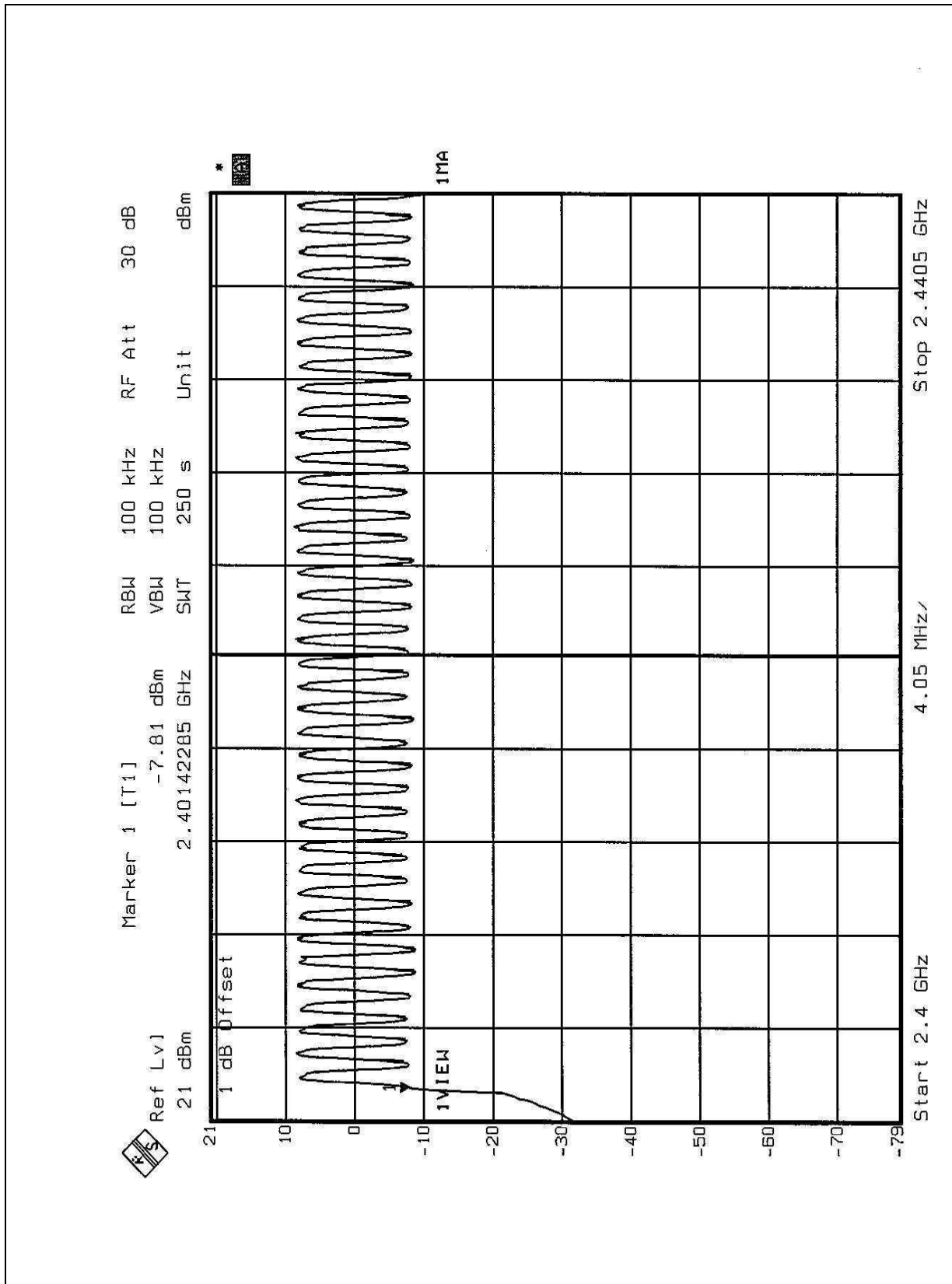
#### 4.2.5 TEST RESULTS (A)

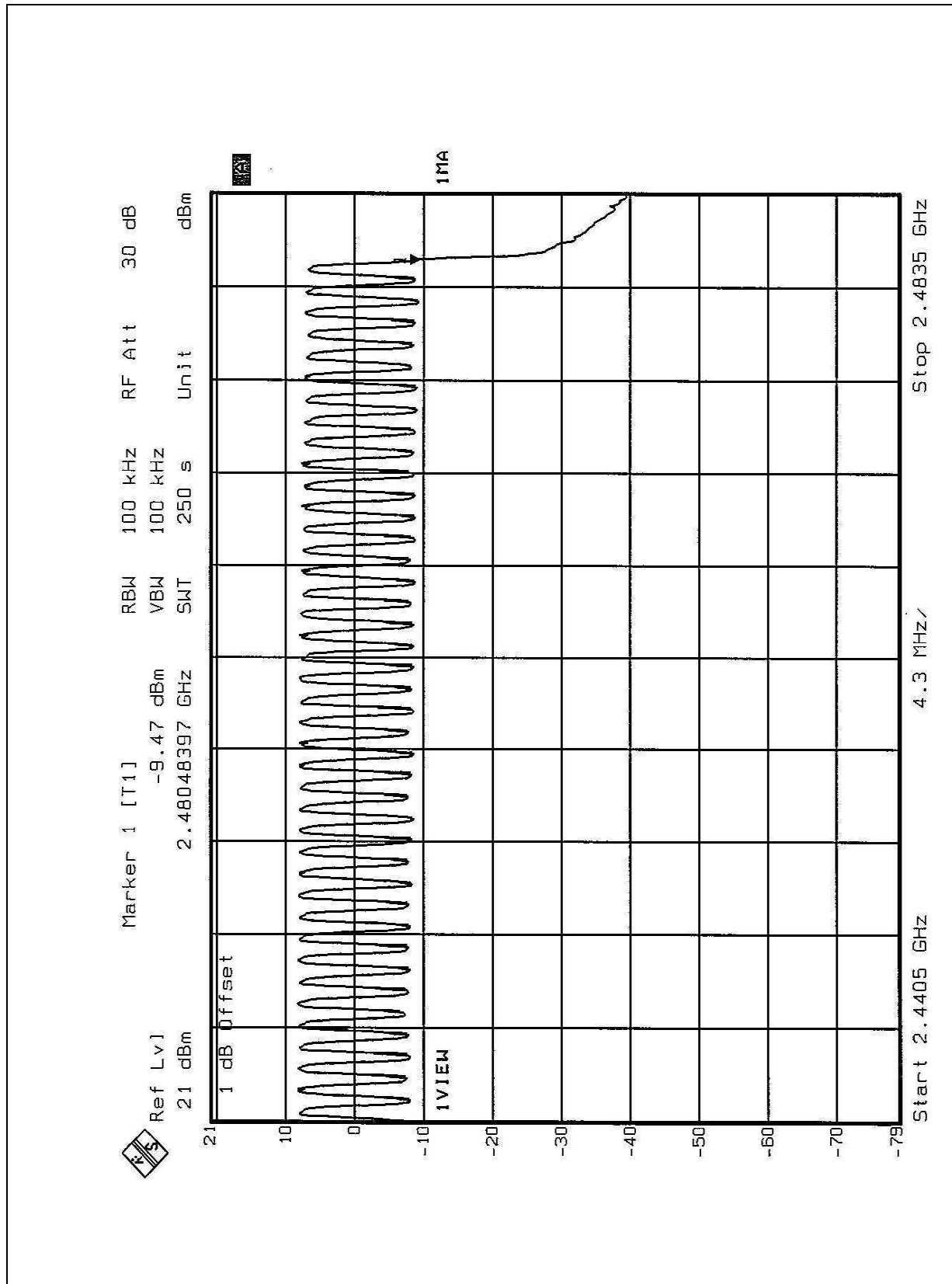
There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.





### 4.2.6 TEST RESULTS (B)





### 4.3 DWELL TIME ON EACH CHANNEL

#### 4.3.1 LIMIT OF DWELL TIME USED

For FHSS, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period. For hybrid systems, the average time of occupancy on any frequency should not exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

#### 4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK30	100049	July 17, 2002

#### NOTES:

- 1.The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
- 2.The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

### 4.3.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

### 4.3.4 TEST SETUP







#### 4.3.5 TEST RESULTS (A)

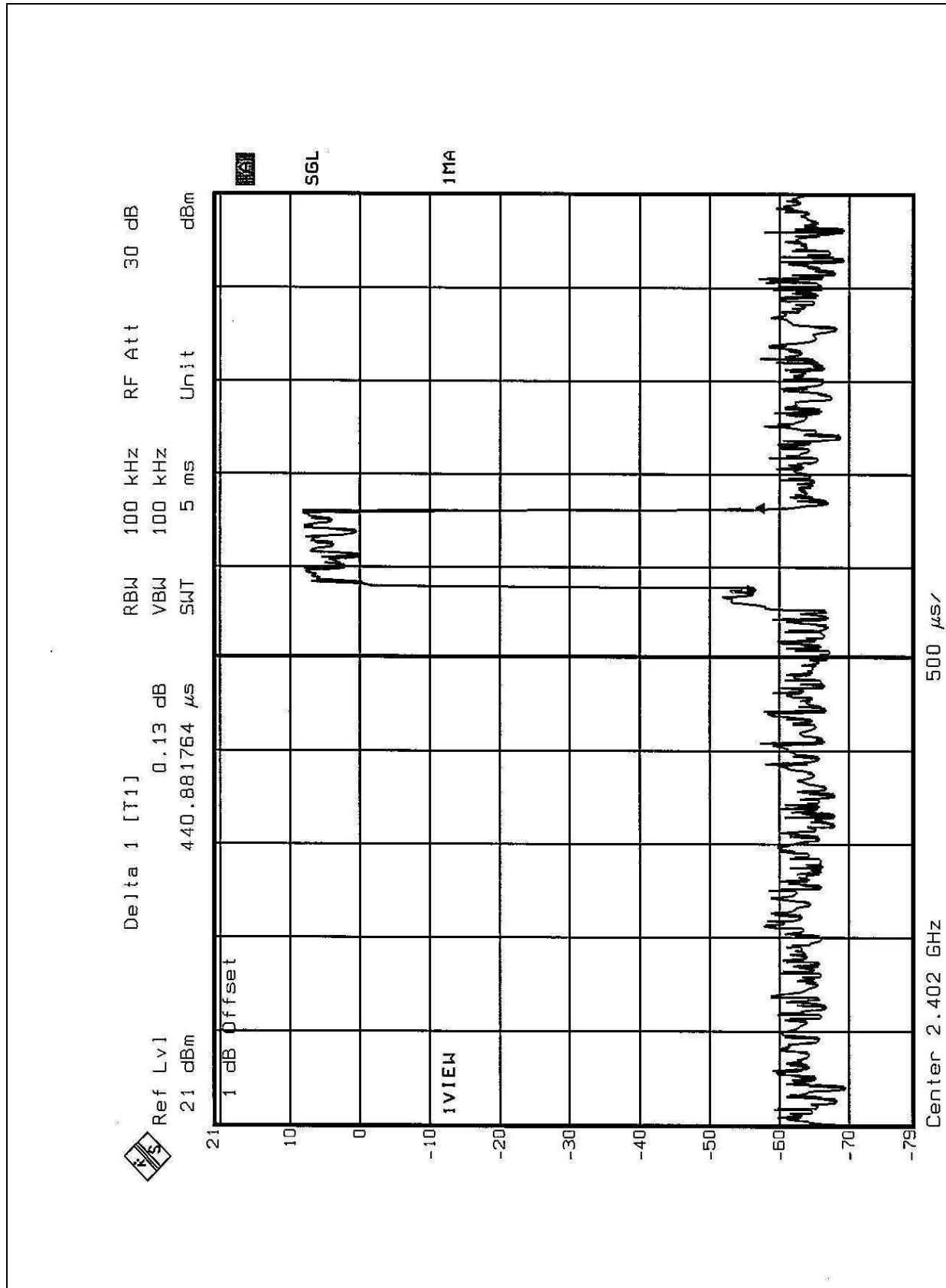
CHANNEL	DWELL TIME
0	267.88ms
39	328.76ms
78	322.67ms

Note : This product is averagely hopped on 79 frequencies. The maximum hopping rate is 500 hops/sec. The longest pulse duration is 541.08 $\mu$ sec.

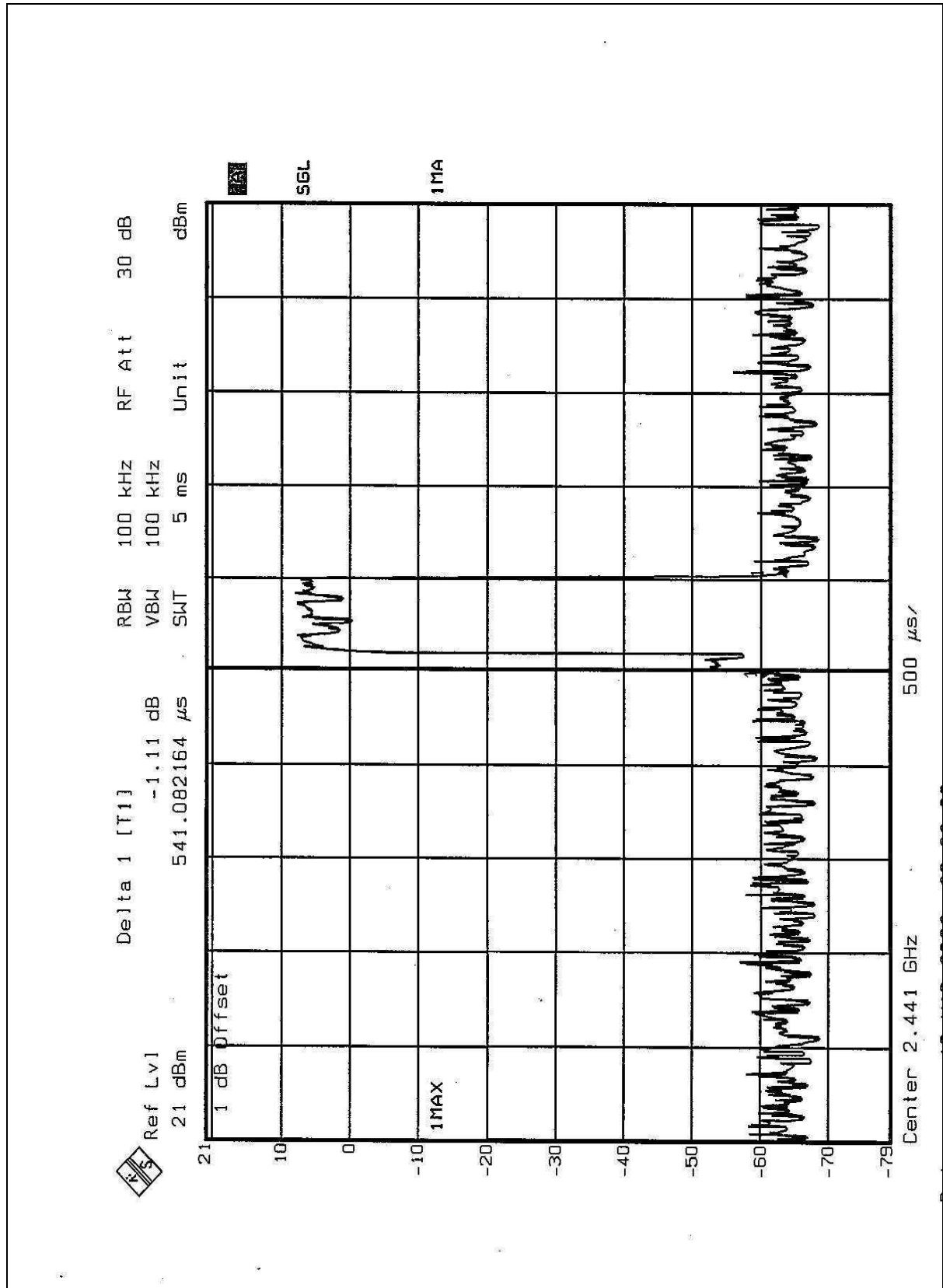
So, the longest Dwell Time =  $541.08 \mu \text{ sec} \times 1600 \div 79 \times 30 = 328.76 \text{ msec}$ . which is smaller than 0.4sec.

Test plots of the transmitting time slot are shown on next three pages.

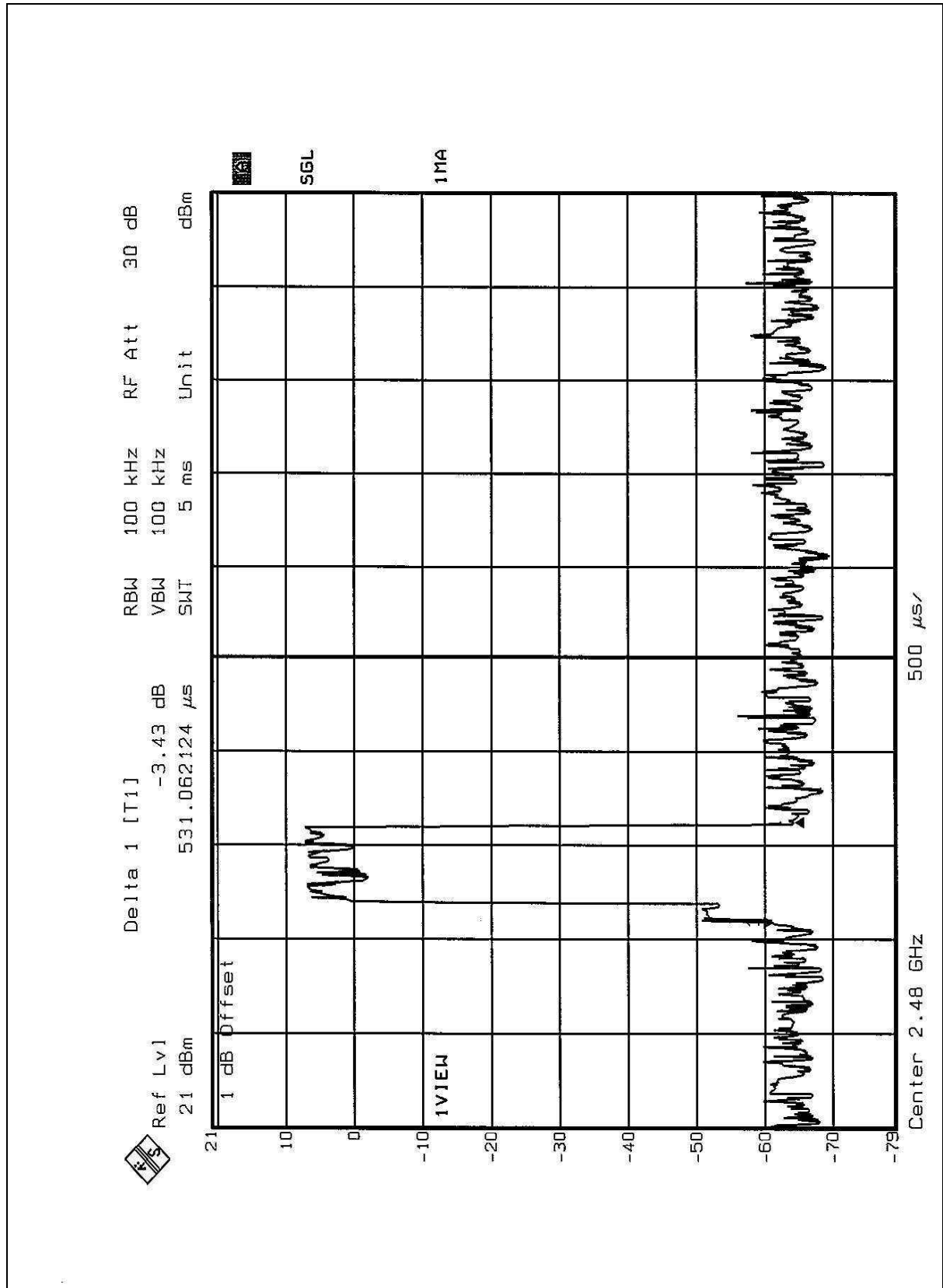
Channel 0



Channel 39



Channel 78





#### 4.3.6 TEST RESULTS (B)

CHANNEL	DWELL TIME
0	267.88ms
39	334.85ms
78	334.85ms

Note : This product is averagely hopped on 79 frequencies. The maximum hopping rate is 500 hops/sec. The longest pulse duration is 551.10 $\mu$ sec.

So, the longest Dwell Time =  $551.10 \mu \text{ sec} \times 1600 \div 79 \times 30 = 334.85 \text{ msec}$ . which is smaller than 0.4sec.

Test plots of the transmitting time slot are shown on next three pages.

Channel 0

