



# FCC TEST REPORT

**REPORT NO.:** RF920311H02

**MODEL NO.:** MDCBTSC

**RECEIVED:** Mar. 11, 2003

**TESTED:** Apr. 16 to 24, 2003

**APPLICANT:** BILLIONTON SYSTEMS INC

**ADDRESS:** No.21, Sui-Lih Rd., Hsin-Chu, 300, Taiwan

**ISSUED BY:** Advance Data Technology Corporation

**LAB LOCATION:** No. 81-1, Lu Liao Keng, 9 Ling, Wu Lung Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien,  
Taiwan, R.O.C.

This test report consists of 67 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CNLA, NVLAP or any government agencies. The test results in the report only apply to the tested sample.



Lab Code: 200376-0



# TABLE OF CONTENTS

1	CERTIFICATION.....	4
2	SUMMARY OF TEST RESULTS.....	5
3	GENERAL INFORMATION.....	6
3.1	GENERAL DESCRIPTION OF EUT.....	6
3.2	DESCRIPTION OF TEST MODES.....	7
3.3	GENERAL DESCRIPTION OF APPLIED STANDARDS.....	7
3.4	DESCRIPTION OF SUPPORT UNITS.....	8
4	TEST PROCEDURES AND RESULTS.....	10
4.1	CONDUCTED EMISSION MEASUREMENT.....	10
4.1.1	LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	10
4.1.2	TEST INSTRUMENTS.....	10
4.1.3	TEST PROCEDURES.....	11
4.1.4	DEVIATION FROM TEST STANDARD.....	11
4.1.5	TEST SETUP.....	12
4.1.6	EUT OPERATING CONDITIONS.....	12
4.1.7	TEST RESULTS.....	13
4.2	NUMBER OF HOPPING FREQUENCY USED.....	19
4.2.1	LIMIT OF HOPPING FREQUENCY USED.....	19
4.2.2	TEST INSTRUMENTS.....	19
4.2.3	TEST PROCEDURES.....	20
4.2.4	DEVIATION FROM TEST STANDARD.....	20
4.2.5	TEST SETUP.....	21
4.2.6	TEST RESULTS.....	21
4.3	DWELL TIME ON EACH CHANNEL.....	24
4.3.1	LIMIT OF DWELL TIME USED.....	24
4.3.2	TEST INSTRUMENTS.....	24
4.3.3	TEST PROCEDURES.....	25
4.3.4	DEVIATION FROM TEST STANDARD.....	25
4.3.5	TEST SETUP.....	25
4.3.6	TEST RESULTS.....	26
4.4	CHANNEL BANDWIDTH.....	33
4.4.1	LIMITS OF CHANNEL BANDWIDTH.....	33
4.4.2	TEST INSTRUMENTS.....	33
4.4.3	TEST PROCEDURE.....	34
4.4.4	DEVIATION FROM TEST STANDARD.....	34
4.4.5	TEST SETUP.....	34
4.4.6	EUT OPERATING CONDITION.....	34
4.4.7	TEST RESULTS.....	35
4.5	HOPPING CHANNEL SEPARATION.....	39
4.5.1	LIMIT OF HOPPING CHANNEL SEPARATION.....	39



4.5.2	TEST INSTRUMENTS.....	39
4.5.3	TEST PROCEDURES.....	40
4.5.4	DEVIATION FROM TEST STANDARD.....	40
4.5.5	TEST SETUP.....	40
4.5.6	TEST RESULTS.....	41
4.6	MAXIMUM PEAK OUTPUT POWER –USING SPECTRUM ANALYZER.....	45
4.6.1	LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT.....	45
4.6.2	INSTRUMENTS.....	45
4.6.3	TEST PROCEDURES.....	46
4.6.4	DEVIATION FROM TEST STANDARD.....	46
4.6.5	TEST SETUP.....	47
4.6.6	EUT OPERATING CONDITION.....	47
4.6.7	TEST RESULTS.....	48
4.7	RADIATED EMISSION MEASUREMENT.....	52
4.7.1	LIMITS OF RADIATED EMISSION MEASUREMENT.....	52
4.7.2	TEST INSTRUMENTS.....	53
4.7.3	TEST PROCEDURES.....	54
4.7.4	DEVIATION FROM TEST STANDARD.....	54
4.7.5	TEST SETUP.....	55
4.7.6	TEST RESULTS.....	56
4.7.7	TEST RESULTS.....	57
4.8	BAND EDGES MEASUREMENT.....	60
4.8.1	LIMITS OF BAND EDGES MEASUREMENT.....	60
4.8.2	TEST INSTRUMENTS.....	60
4.8.3	TEST PROCEDURE.....	60
4.8.4	DEVIATION FROM TEST STANDARD.....	60
4.8.5	EUT OPERATING CONDITION.....	61
4.8.6	TEST RESULTS.....	61
4.9	ANTENNA REQUIREMENT.....	64
4.9.1	STANDARD APPLICABLE.....	64
4.9.2	ANTENNA CONNECTED CONSTRUCTION.....	64
5	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	65
6	INFORMATION ON THE TESTING LABORATORIES.....	67



## 1 CERTIFICATION

**PRODUCT :** Bluetooth\Modem Combo Card  
**BRAND NAME :** Billionton  
**MODEL NO. :** MDCBTSC  
**APPLICANT :** BILLIONTON SYSTEMS INC  
**STANDARDS :** 47 CFR Part 15, Subpart C (Section 15.247),  
ANSI C63.4-1992

We, **Advance Data Technology Corporation**, hereby certify that one sample of the designation has been tested in our facility from Apr. 16 to 24, 2003. 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.

**CHECKED BY:** *Amanda Chu*, **DATE:** *May 15, 2003*  
( Amanda Chu )

**APPROVED BY:** *Eric Lin*, **DATE:** *May 15, 2003*  
( Eric Lin, 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	PASS	Meet the requirement of limit Minimum passing margin is -14.14dBuV at 2.459 MHz
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 -14.0dBuV at 651.26MHz
15.247(c)	Band Edge Measurement	PASS	Meet the requirement of limit

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	Bluetooth\Modem Combo Card
<b>MODEL NO.</b>	MDCBTSC
<b>POWER SUPPLY</b>	3-3.6VDC from host equipment
<b>MODULATION TYPE</b>	FHSS (GFSK)
<b>FREQUENCY RANGE</b>	2402MHz ~ 2480MHz
<b>NUMBER OF CHANNEL</b>	79
<b>OUTPUT POWER</b>	5.13dBm
<b>ANTENNA TYPE</b>	Inverted F Antenna
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	RJ 11 port x 1
<b>ASSOCIATED DEVICES</b>	NA

**NOTE:**

1. There is one Notebook Computer provided to this EUT and sold together with the EUT:

<b>Product:</b>	Notebook Computer
<b>Brand:</b>	COMPAL
<b>Model No.:</b>	CL50-3

2. For a more detailed features description, please refer to the manufacturer's specifications or 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.

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

The EUT is a Bluetooth\Modem Combo Card. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 15, Subpart C. (15.247)**  
**ANSI C63.4 : 1992**

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

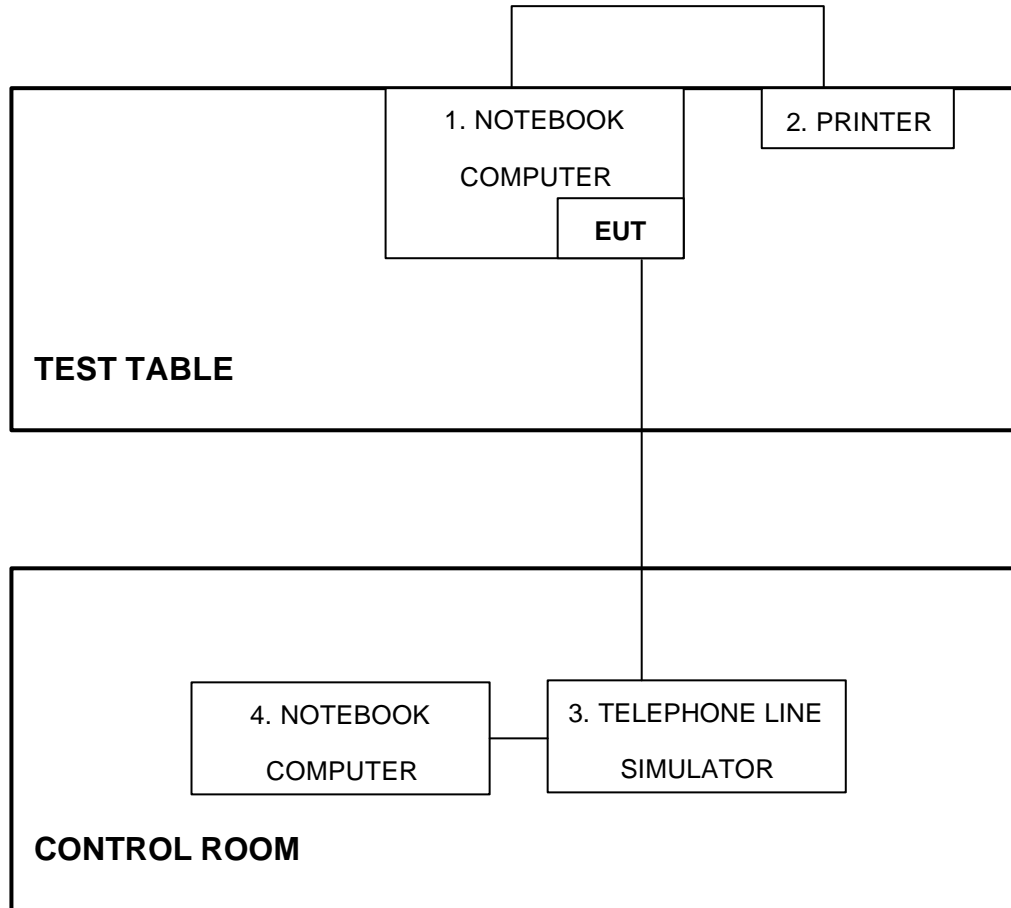
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	COMPAL	CL50-3	NA	NA
1	NOTEBOOK COMPUTER	Compaq	N800C	470048-515	FCC DoC
2	PRINTER	HP	C2642A	MY7961C1FQ	B94C2642X
4	TELEPHONE LINE SIMULATOR	TELTONE	TLS-4A-1	099856	NA

No.	Signal cable description
1	NA
2	1.8 m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core.
3	NA
4	NA

Note: 1. All power cords of the above support units are unshielded (1.8m).





**NOTE:** 1. Please refer to the photos of test configuration in Item 5 also.

## 4 TEST PROCEDURES AND RESULTS

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Notes:

1. The lower limit shall apply at the transition frequencies.
2. 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	ESCS 30	847124/029	Nov. 17, 2003
ROHDE & SCHWARZ LISN (for EUT)	ESHS-Z5	848773/004	Nov. 13, 2003
KYORITSU LISN (for peripheral)	KNW-407	8/1395/12	Jul. 23, 2003
RF Cable (JETBAO)	RG233/U	Cable_CA_01	Jul. 03, 2003
Terminator(for KYORITSU)	50	3	Apr. 11, 2004
Software	Cond-V2e	NA	NA

- NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. The test was performed in ADT Shielded Room No. A.  
 3. The VCCI Con A Registration No. is C-817.



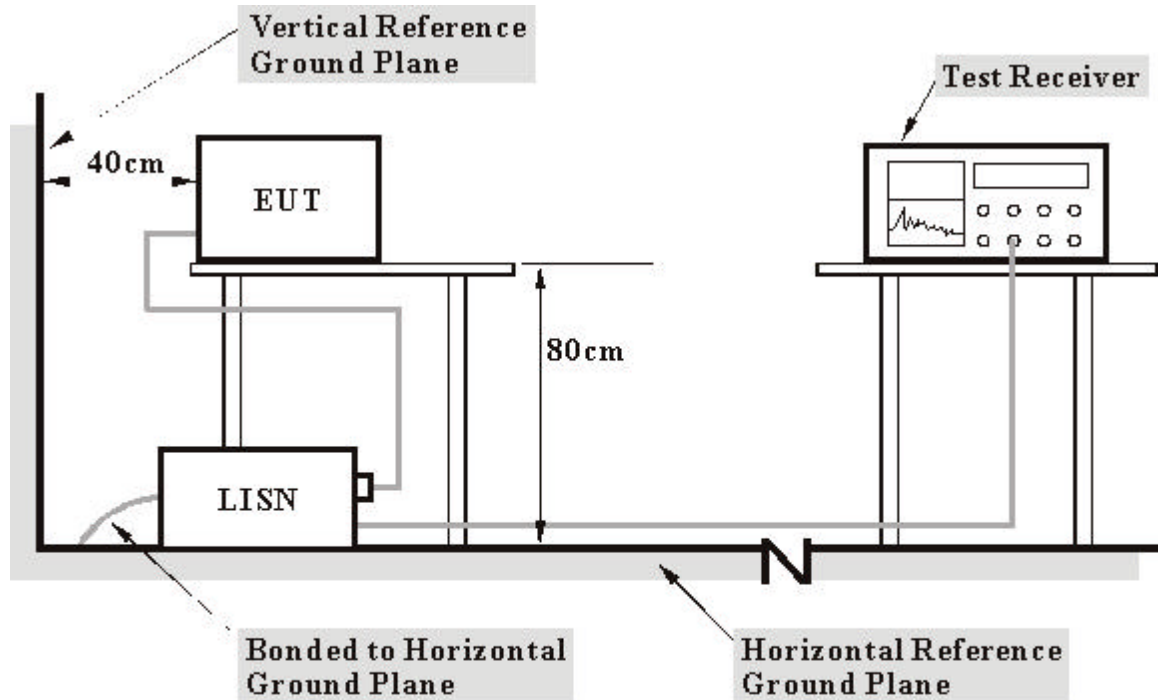
#### 4.1.3 TEST PROCEDURES

- 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 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.5 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.

#### 4.1.6 EUT OPERATING CONDITIONS

- a. Plug the EUT into the support unit 1 (Notebook computer) which placed on a testing table.
- b. The support unit 1 (Notebook computer) and CLENT PC ran a test program to enable EUT under transmission condition continuously at specific channel frequency.

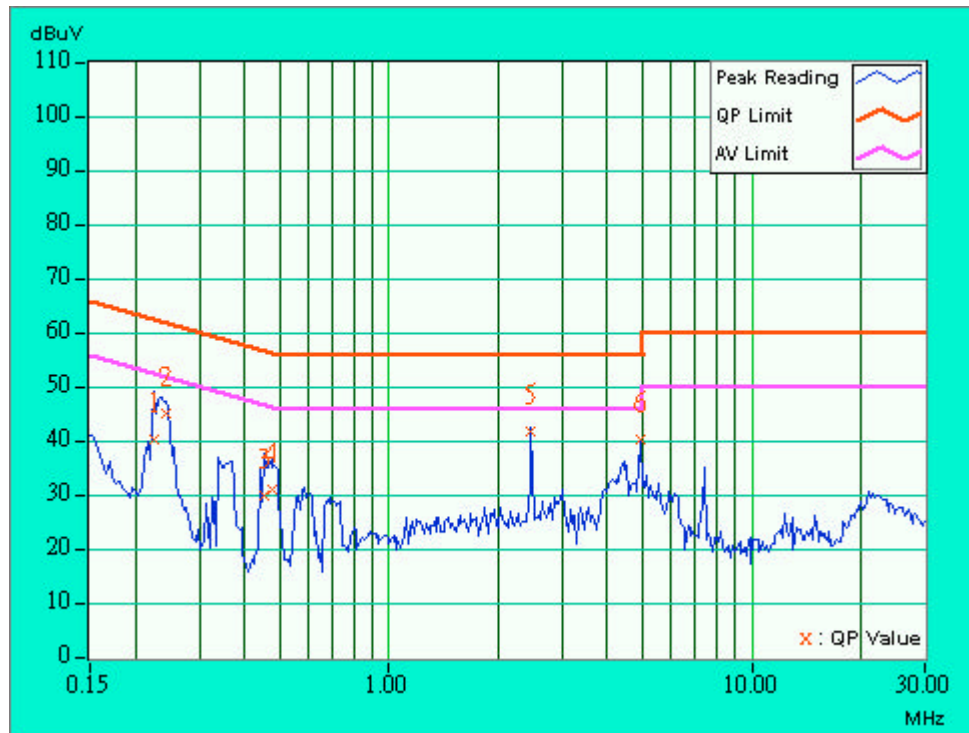


4.1.7 TEST RESULTS

<b>EUT</b>	Bluetooth Modem Combo Card	<b>MODEL</b>	MDCBTSC
<b>MODE</b>	Channel 0	<b>6dB BANDWIDTH</b>	9 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Line (L)
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 64%RH, 988 hPa	<b>TESTED BY</b>	Tony Chen

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.224	0.10	40.00	-	40.10	-	62.66	52.66	-22.56	-
2	0.244	0.10	44.96	-	45.06	-	61.97	51.97	-16.91	-
3	0.451	0.10	29.77	-	29.87	-	56.86	46.86	-26.99	-
4	0.474	0.10	30.86	-	30.96	-	56.44	46.44	-25.48	-
5	2.459	0.12	41.54	-	41.66	-	56.00	46.00	-14.34	-
6	4.914	0.32	39.94	-	40.26	-	56.00	46.00	-15.74	-

- NOTES: (1) "-": Undetectable  
 (2) Q.P. and AV. are abbreviations of quasi-peak and average.  
 (3) "-": The Quasi-peak reading value also meets an average limit, thus measurement with the average detector is unnecessary.  
 (4) The emission levels of other frequencies were very low against the limit.  
 (5) Correction Factor = Insertion loss + Cable loss  
 (6) Margin value = Emission level - Limit value

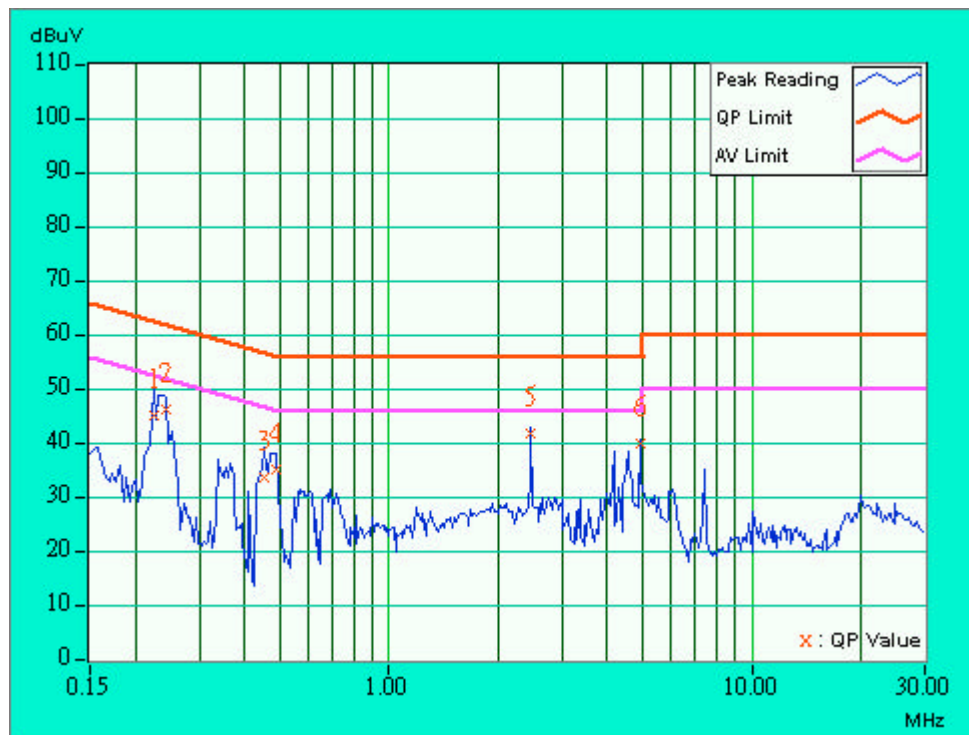




<b>EUT</b>	Bluetooth Modem Combo Card	<b>MODEL</b>	MDCBTSC
<b>MODE</b>	Channel 0	<b>6dB BANDWIDTH</b>	9 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Neutral (N)
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 64%RH, 988 hPa	<b>TESTED BY</b>	Tony Chen

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.224	0.10	44.89	-	44.99	-	62.66	52.66	-17.67	-
2	0.244	0.10	46.15	-	46.25	-	61.97	51.97	-15.72	-
3	0.451	0.10	33.47	-	33.57	-	56.86	46.86	-23.29	-
4	0.490	0.10	34.83	-	34.93	-	56.17	46.17	-21.24	-
5	2.459	0.12	41.64	-	41.76	-	56.00	46.00	-14.24	-
6	4.914	0.31	39.74	-	40.05	-	56.00	46.00	-15.95	-

- NOTES: (1) "\*\*": Undetectable  
 (2) Q.P. and AV. are abbreviations of quasi-peak and average.  
 (3) "-": The Quasi-peak reading value also meets an average limit, thus measurement with the average detector is unnecessary.  
 (4) The emission levels of other frequencies were very low against the limit.  
 (5) Correction Factor = Insertion loss + Cable loss  
 (6) Margin value = Emission level - Limit value

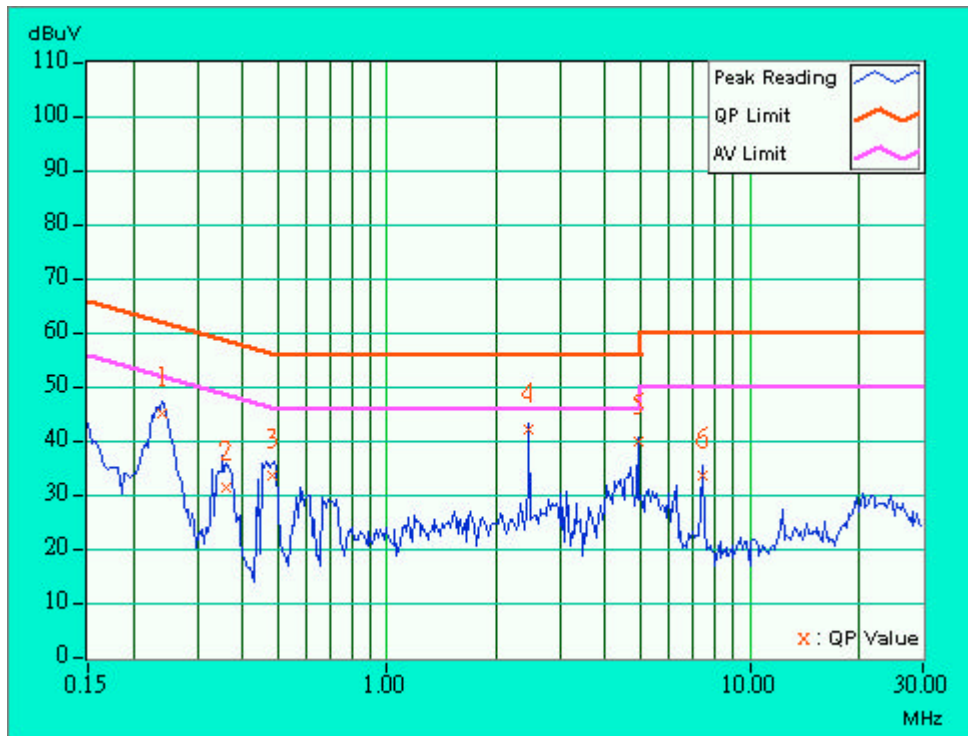




<b>EUT</b>	Bluetooth Modem Combo Card	<b>MODEL</b>	MDCBTSC
<b>MODE</b>	Channel 39	<b>6dB BANDWIDTH</b>	9 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Line (L)
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 64%RH, 988 hPa	<b>TESTED BY</b>	Tony Chen

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.240	0.10	44.68	-	44.78	-	62.10	52.10	-17.32	-
2	0.359	0.10	30.82	-	30.92	-	58.74	48.74	-27.82	-
3	0.485	0.10	33.40	-	33.50	-	56.24	46.24	-22.74	-
4	2.459	0.12	41.66	-	41.78	-	56.00	46.00	-14.22	-
5	4.914	0.32	39.42	-	39.74	-	56.00	46.00	-16.26	-
6	7.375	0.48	33.38	-	33.86	-	60.00	50.00	-26.14	-

- NOTES: (1) "\*" : Undetectable  
 (2) Q.P. and AV. are abbreviations of quasi-peak and average.  
 (3) "-": The Quasi-peak reading value also meets an average limit, thus measurement with the average detector is unnecessary.  
 (4) The emission levels of other frequencies were very low against the limit.  
 (5) Correction Factor = Insertion loss + Cable loss  
 (6) Margin value = Emission level - Limit value

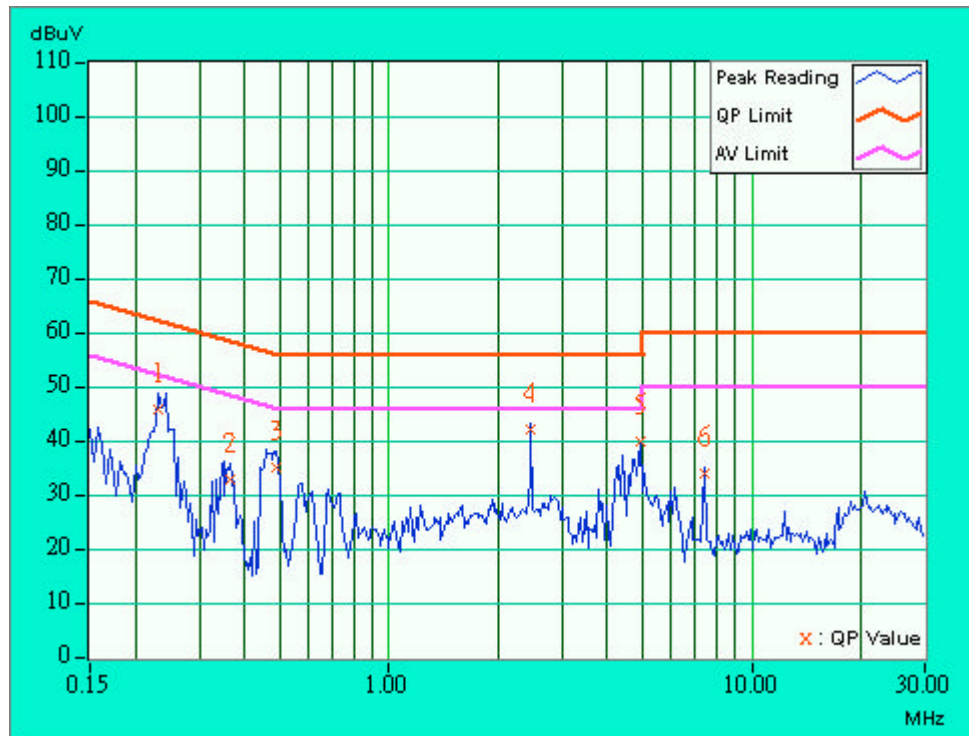




<b>EUT</b>	Bluetooth Modem Combo Card	<b>MODEL</b>	MDCBTSC
<b>MODE</b>	Channel 39	<b>6dB BANDWIDTH</b>	9 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Neutral (N)
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 64%RH, 988 hPa	<b>TESTED BY</b>	Tony Chen

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.232	0.10	45.58	-	45.68	-	62.38	52.38	-16.70	-
2	0.365	0.10	32.61	-	32.71	-	58.62	48.62	-25.91	-
3	0.491	0.10	34.71	-	34.81	-	56.15	46.15	-21.34	-
<b>4</b>	<b>2.459</b>	<b>0.12</b>	<b>41.74</b>	-	<b>41.86</b>	-	<b>56.00</b>	<b>46.00</b>	<b>-14.14</b>	-
5	4.914	0.31	39.66	-	39.97	-	56.00	46.00	-16.03	-
6	7.375	0.42	33.50	-	33.92	-	60.00	50.00	-26.08	-

- NOTES: (1) "": Undetectable  
 (2) Q.P. and AV. are abbreviations of quasi-peak and average.  
 (3) "-": The Quasi-peak reading value also meets an average limit, thus measurement with the average detector is unnecessary.  
 (4) The emission levels of other frequencies were very low against the limit.  
 (5) Correction Factor = Insertion loss + Cable loss  
 (6) Margin value = Emission level - Limit value



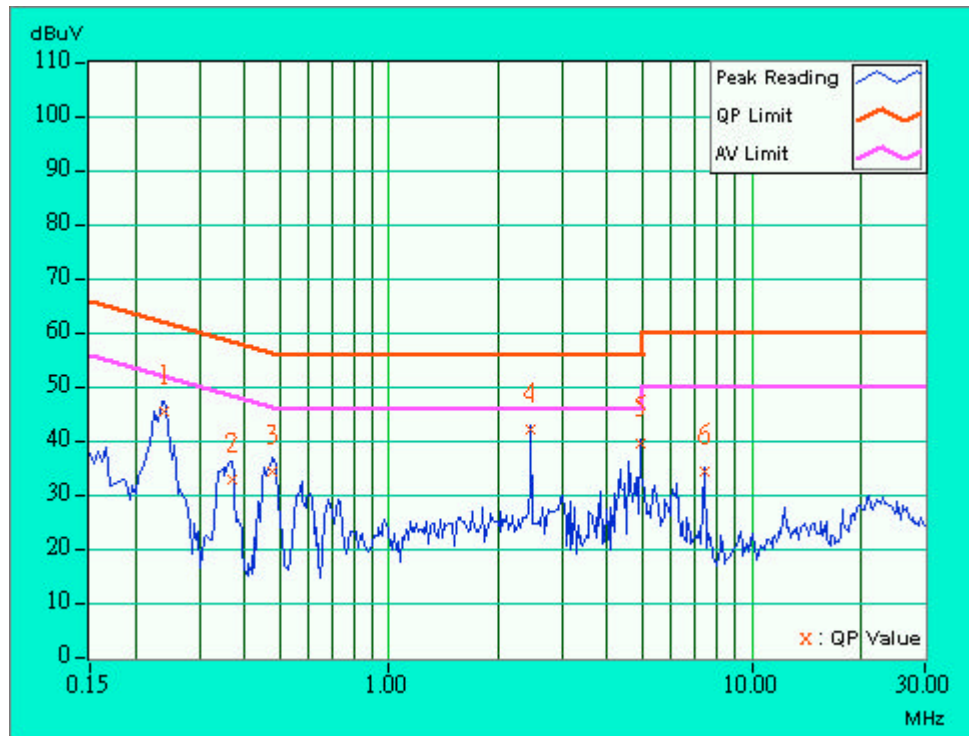




<b>EUT</b>	Bluetooth Modem Combo Card	<b>MODEL</b>	MDCBTSC
<b>MODE</b>	Channel 78	<b>6dB BANDWIDTH</b>	9 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Line (L)
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 64%RH, 988 hPa	<b>TESTED BY</b>	Tony Chen

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.240	0.10	44.98	-	45.08	-	62.10	52.10	-17.02	-
2	0.369	0.10	32.45	-	32.55	-	58.53	48.53	-25.98	-
3	0.478	0.10	34.11	-	34.21	-	56.37	46.37	-22.16	-
4	2.459	0.12	41.70	-	41.82	-	56.00	46.00	-14.18	-
5	4.917	0.32	39.06	-	39.38	-	56.00	46.00	-16.62	-
6	7.371	0.48	33.88	-	34.36	-	60.00	50.00	-25.64	-

- NOTES: (1) "": Undetectable  
 (2) Q.P. and AV. are abbreviations of quasi-peak and average.  
 (3) "-": The Quasi-peak reading value also meets an average limit, thus measurement with the average detector is unnecessary.  
 (4) The emission levels of other frequencies were very low against the limit.  
 (5) Correction Factor = Insertion loss + Cable loss  
 (6) Margin value = Emission level - Limit value

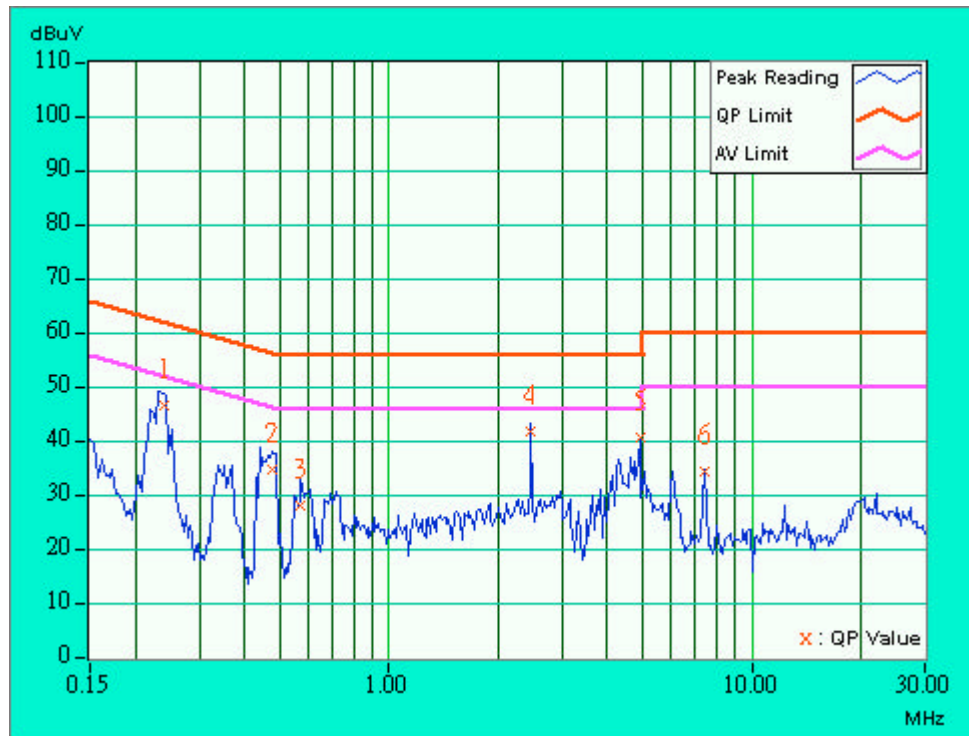




<b>EUT</b>	Bluetooth Modem Combo Card	<b>MODEL</b>	MDCBTSC
<b>MODE</b>	Channel 78	<b>6dB BANDWIDTH</b>	9 kHz
<b>INPUT POWER (SYSTEM)</b>	120Vac, 60 Hz	<b>PHASE</b>	Neurral (N)
<b>ENVIRONMENTAL CONDITIONS</b>	24 deg. C, 64%RH, 988 hPa	<b>TESTED BY</b>	Tony Chen

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.240	0.10	46.25	-	46.35	-	62.11	52.11	-15.76	-
2	0.477	0.10	34.53	-	34.63	-	56.39	46.39	-21.76	-
3	0.572	0.10	27.80	-	27.90	-	56.00	46.00	-28.10	-
4	2.459	0.12	41.58	-	41.70	-	56.00	46.00	-14.30	-
5	4.914	0.31	40.20	-	40.51	-	56.00	46.00	-15.49	-
6	7.371	0.42	33.85	-	34.27	-	60.00	50.00	-25.73	-

- NOTES: (1) "x": Undetectable  
 (2) Q.P. and AV. are abbreviations of quasi-peak and average.  
 (3) "-": The Quasi-peak reading value also meets an average limit, thus measurement with the average detector is unnecessary.  
 (4) The emission levels of other frequencies were very low against the limit.  
 (5) Correction Factor = Insertion loss + Cable loss  
 (6) Margin value = Emission level - Limit value



## 4.2 NUMBER OF HOPPING FREQUENCY USED

### 4.2.1 LIMIT OF HOPPING FREQUENCY USED

At least 15 hopping frequencies, and should be equally spaced.

### 4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP	1093.4495.30	Dec. 19, 2003

**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.



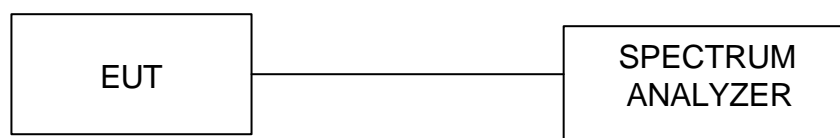
#### 4.2.3 TEST PROCEDURES

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 DEVIATION FROM TEST STANDARD

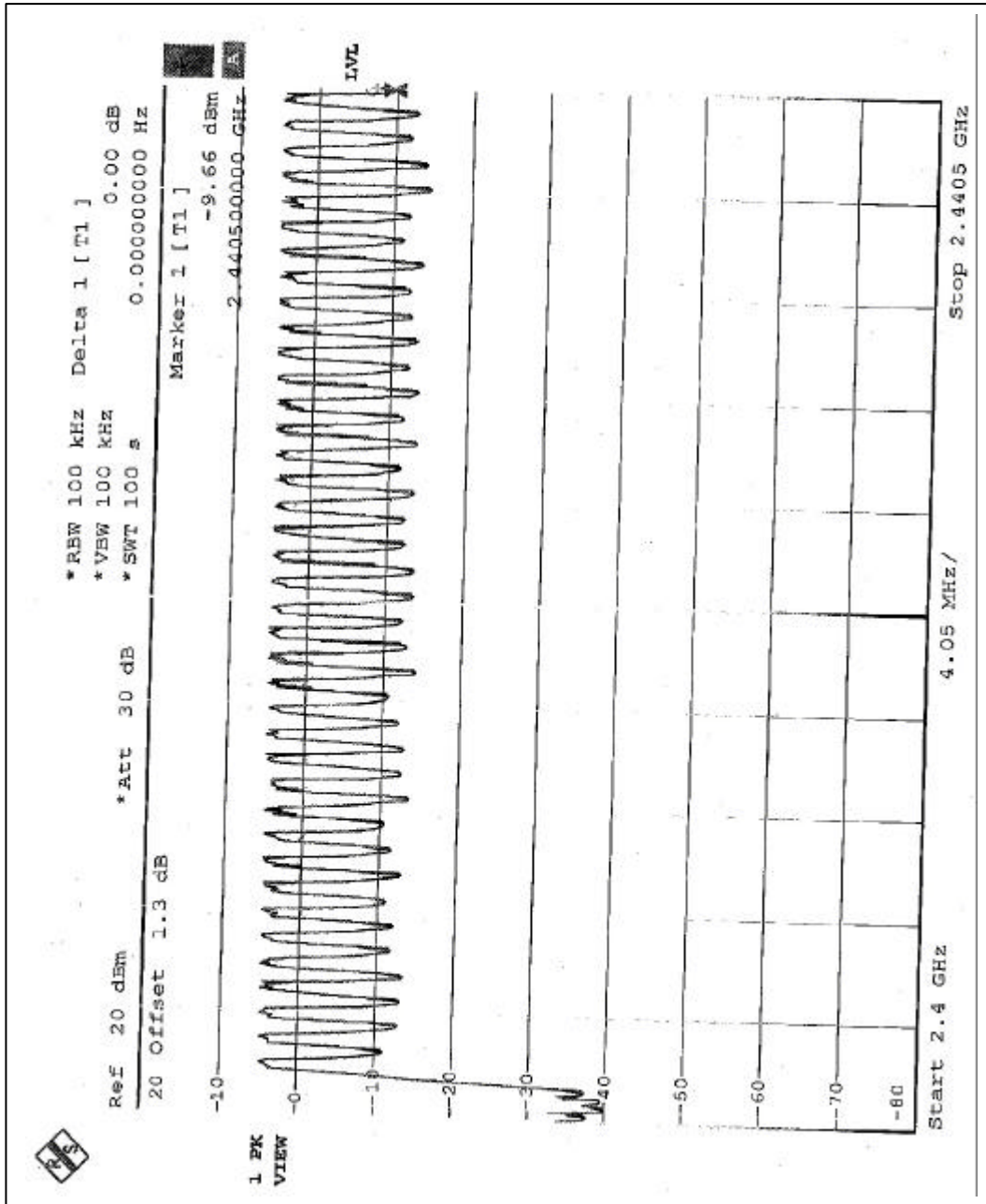
No deviation

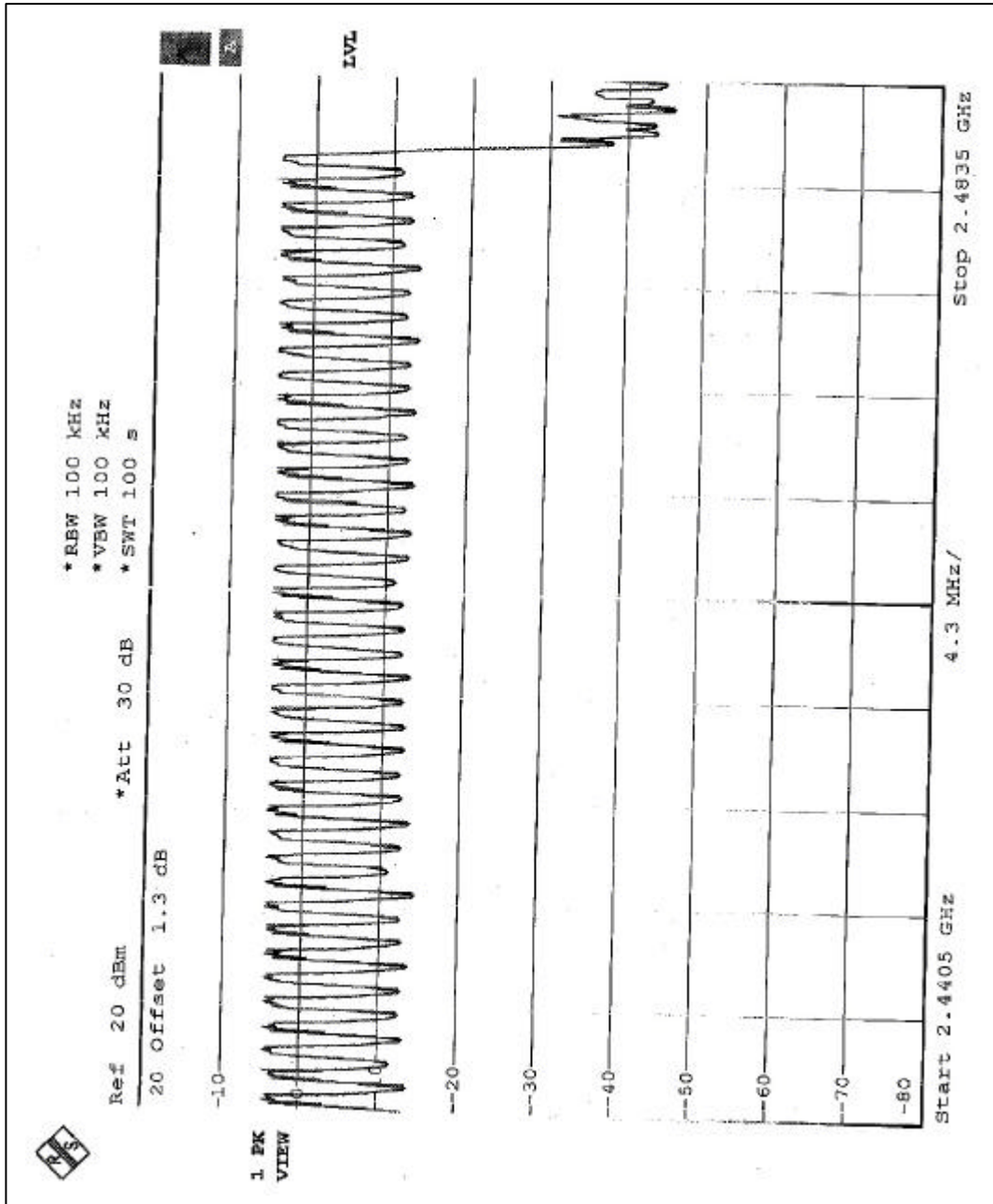
#### 4.2.5 TEST SETUP



#### 4.2.6 TEST RESULTS

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.





### 4.3 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 31.6 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
R&S SPECTRUM ANALYZER	FSP	1093.4495.30	Dec. 19, 2003

**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.



#### 4.3.3 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 DEVIATION FROM TEST STANDARD

No deviation

#### 4.3.5 TEST SETUP



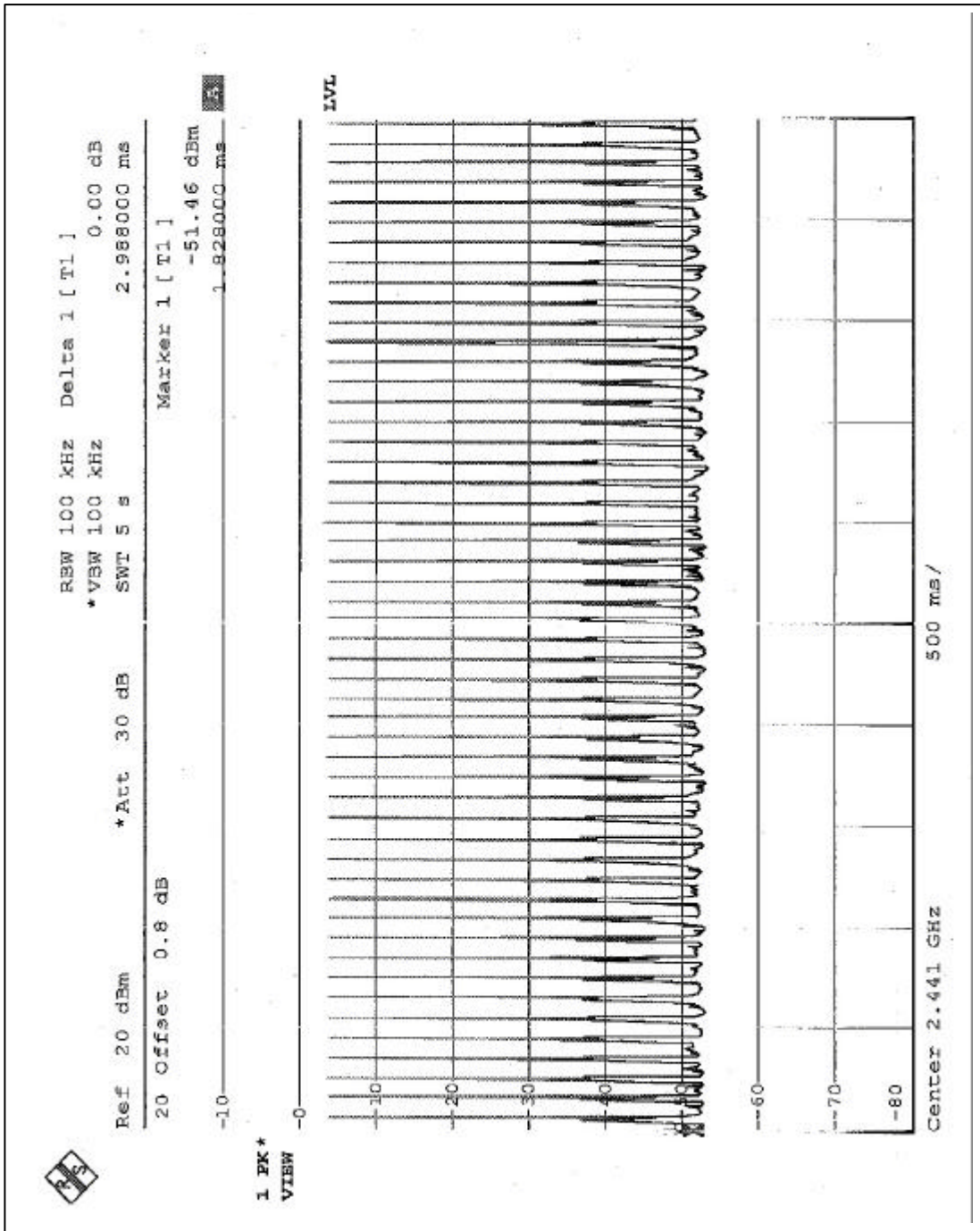
## 4.3.6 TEST RESULTS

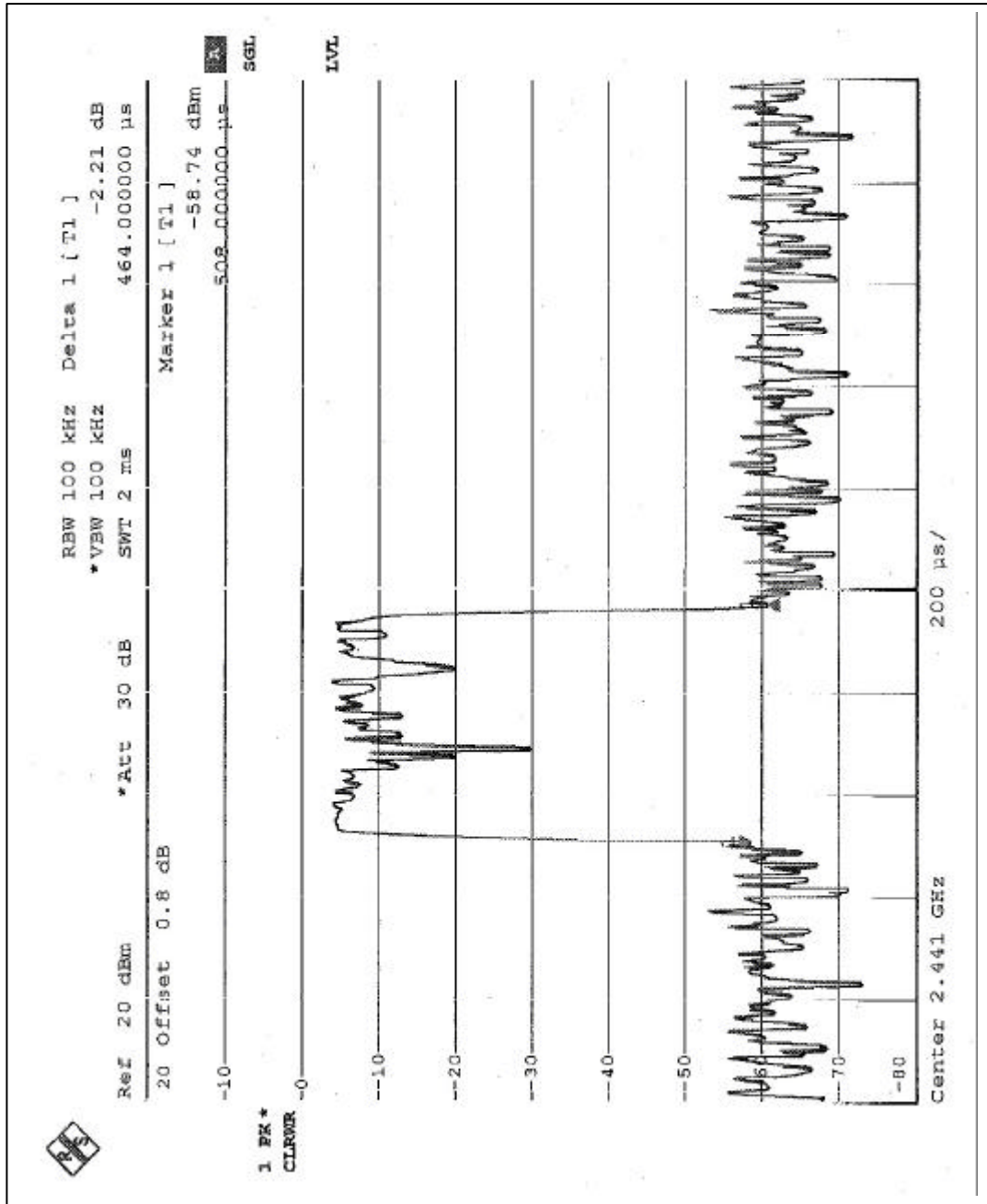
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	51 times / 5 sec *6.32=322.32 times	0.464	149.56	400
DH3	25 times / 5 sec *6.32=158.00 times	1.74	274.92	400
DH5	17 times / 5 sec *6.32=107.44 times	2.992	321.46	400

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



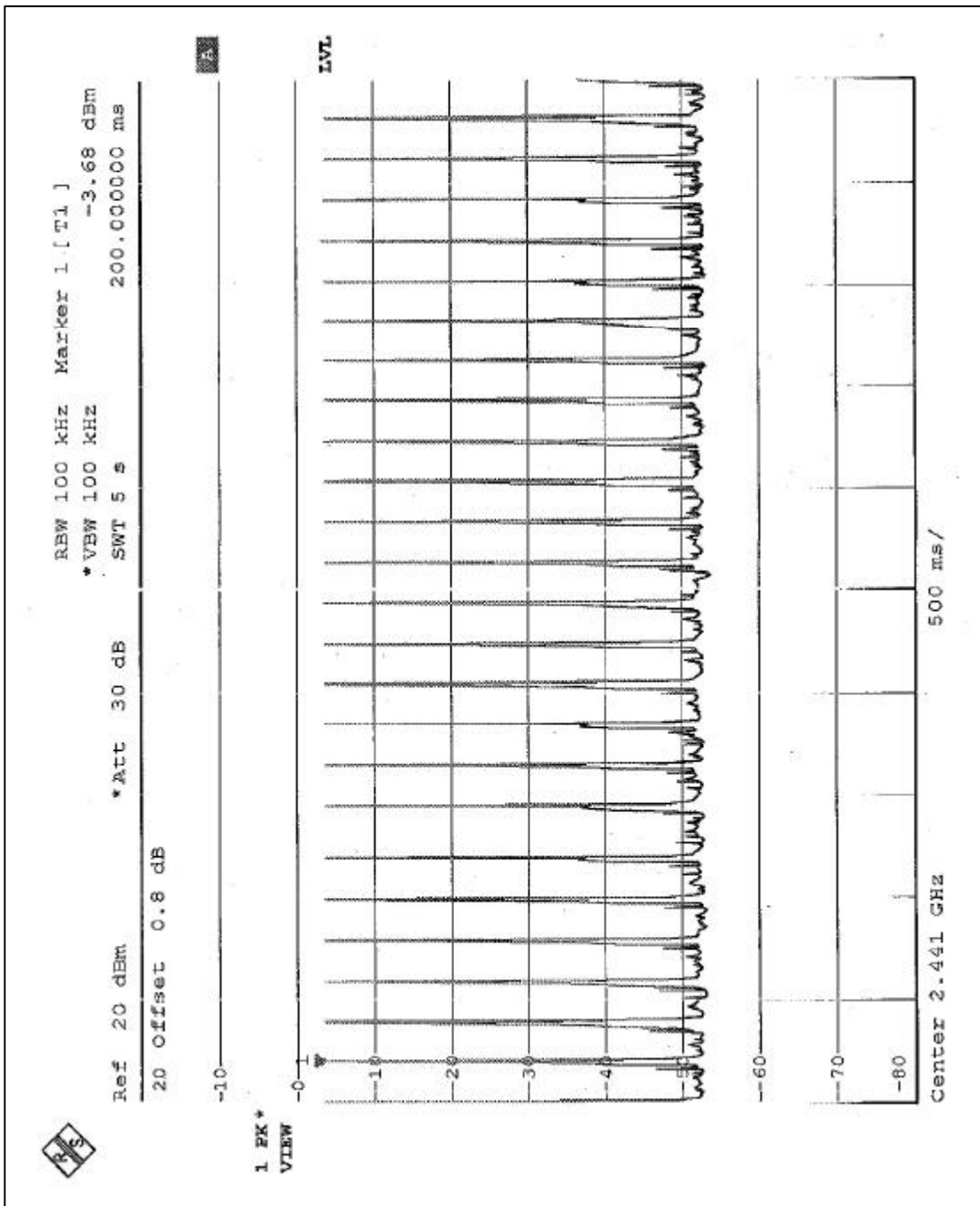
DH1

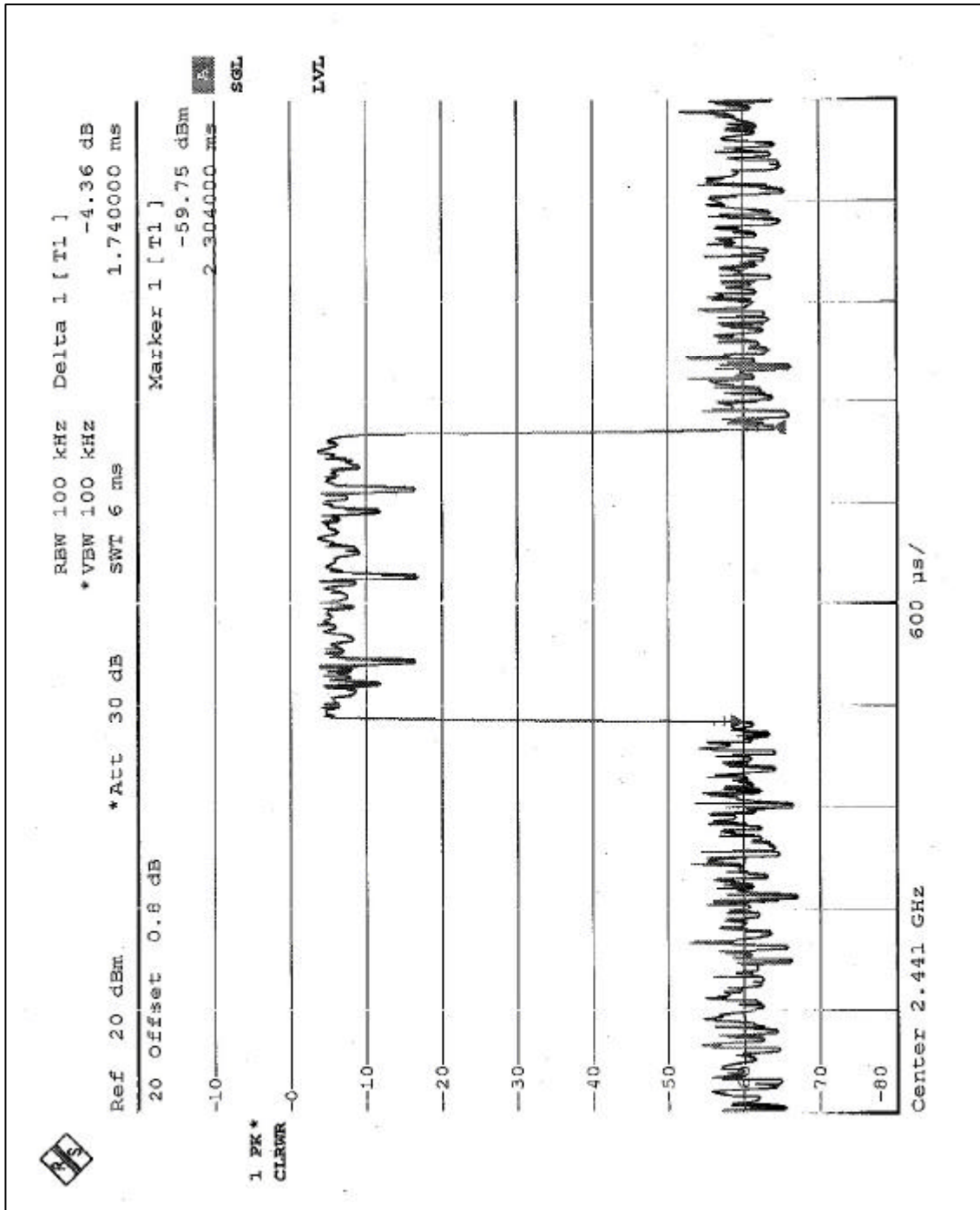






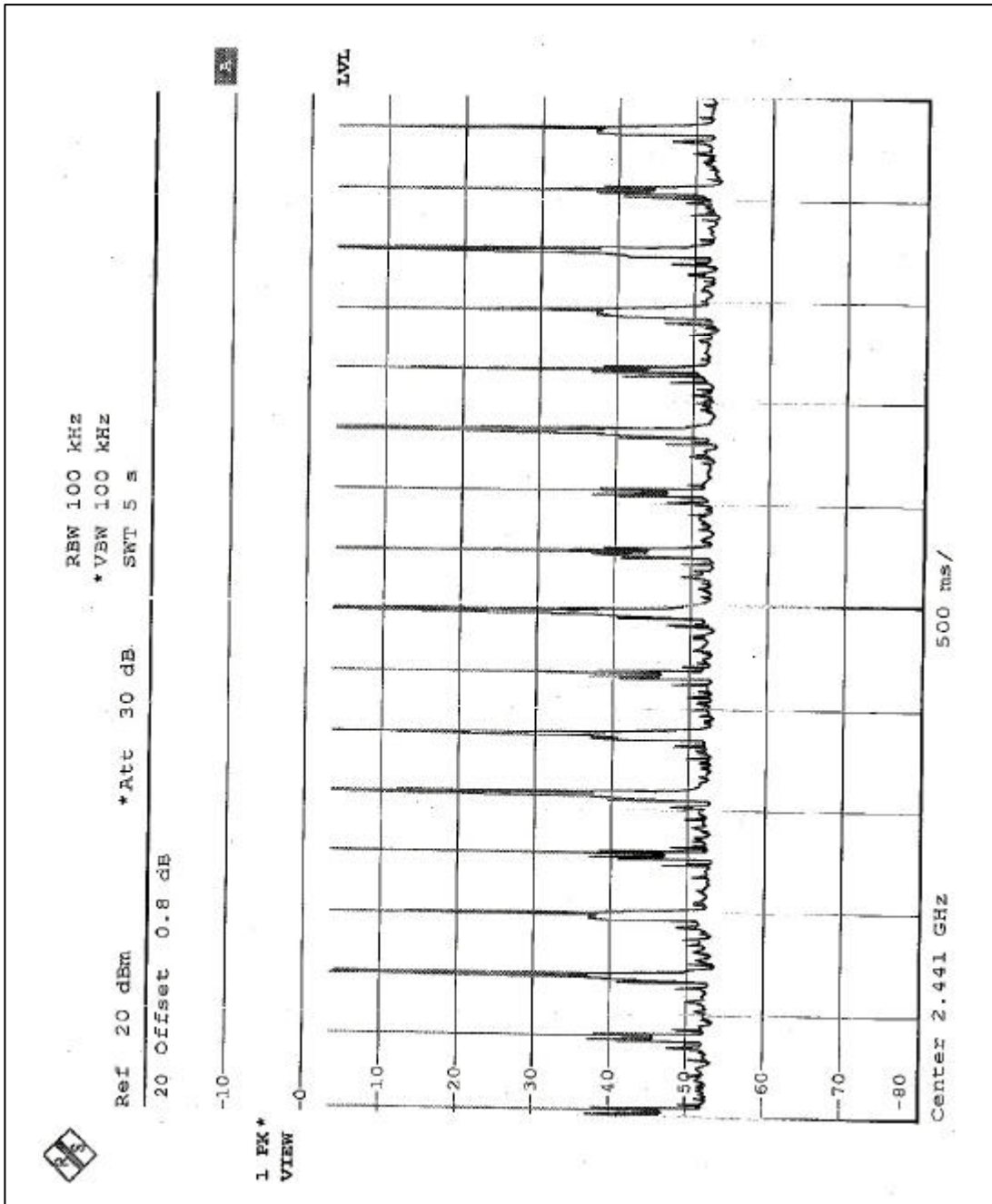
DH3



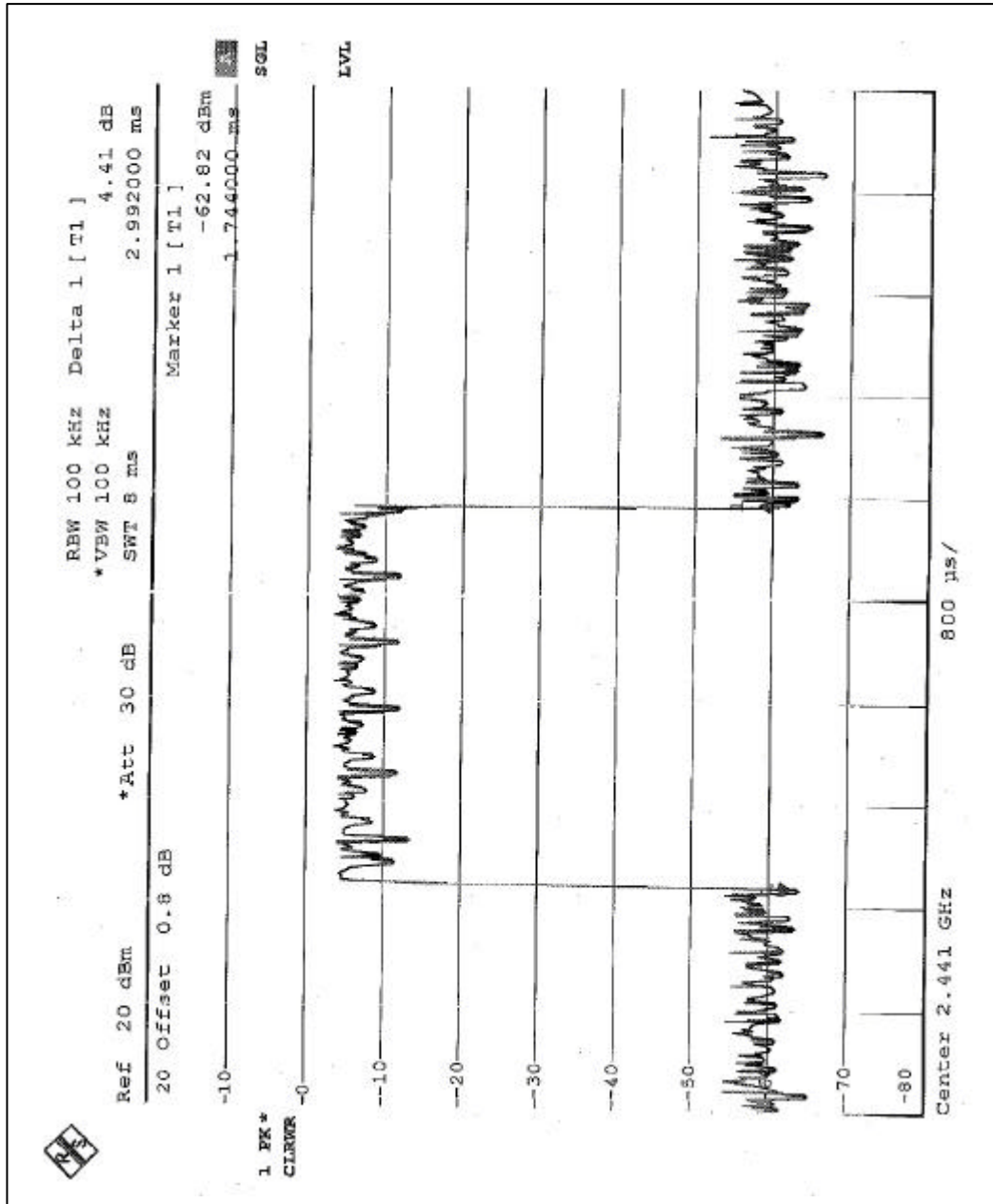




DH5









#### 4.4 CHANNEL BANDWIDTH

##### 4.4.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5 MHz and 5725-5850 MHz bands, the maximum 20 dB bandwidth of the hopping channel is 1 MHz.

##### 4.4.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP	1093.4495.30	Dec. 19, 2003

**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.



#### 4.4.3 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

#### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.4.5 TEST SETUP



#### 4.4.6 EUT OPERATING CONDITION

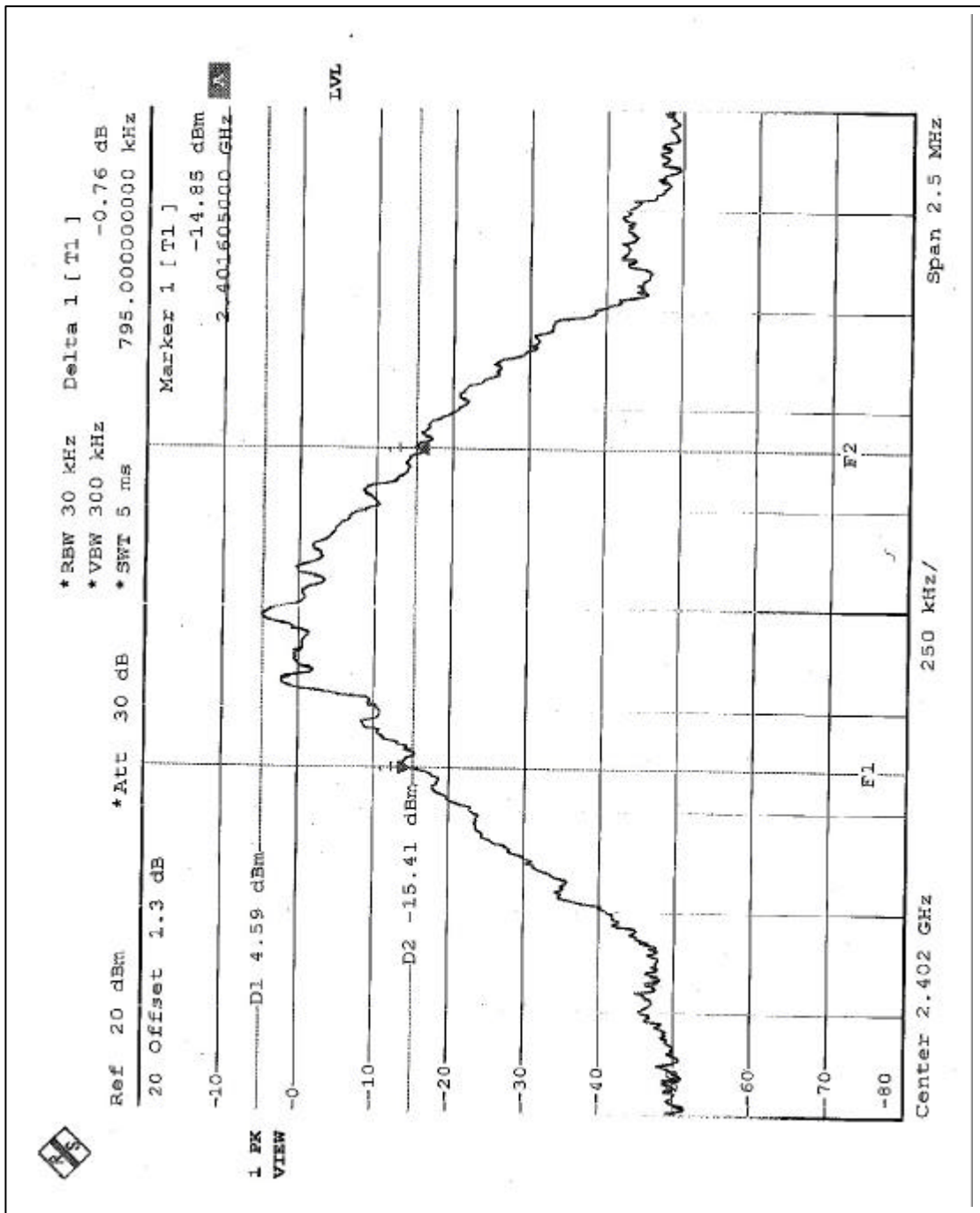
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

## 4.4.7 TEST RESULTS

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (kHz)	MAXIMUM LIMIT (MHz)	PASS/FAIL
0	2402	0.795	1	PASS
39	2441	0.810	1	PASS
78	2480	0.800	1	PASS

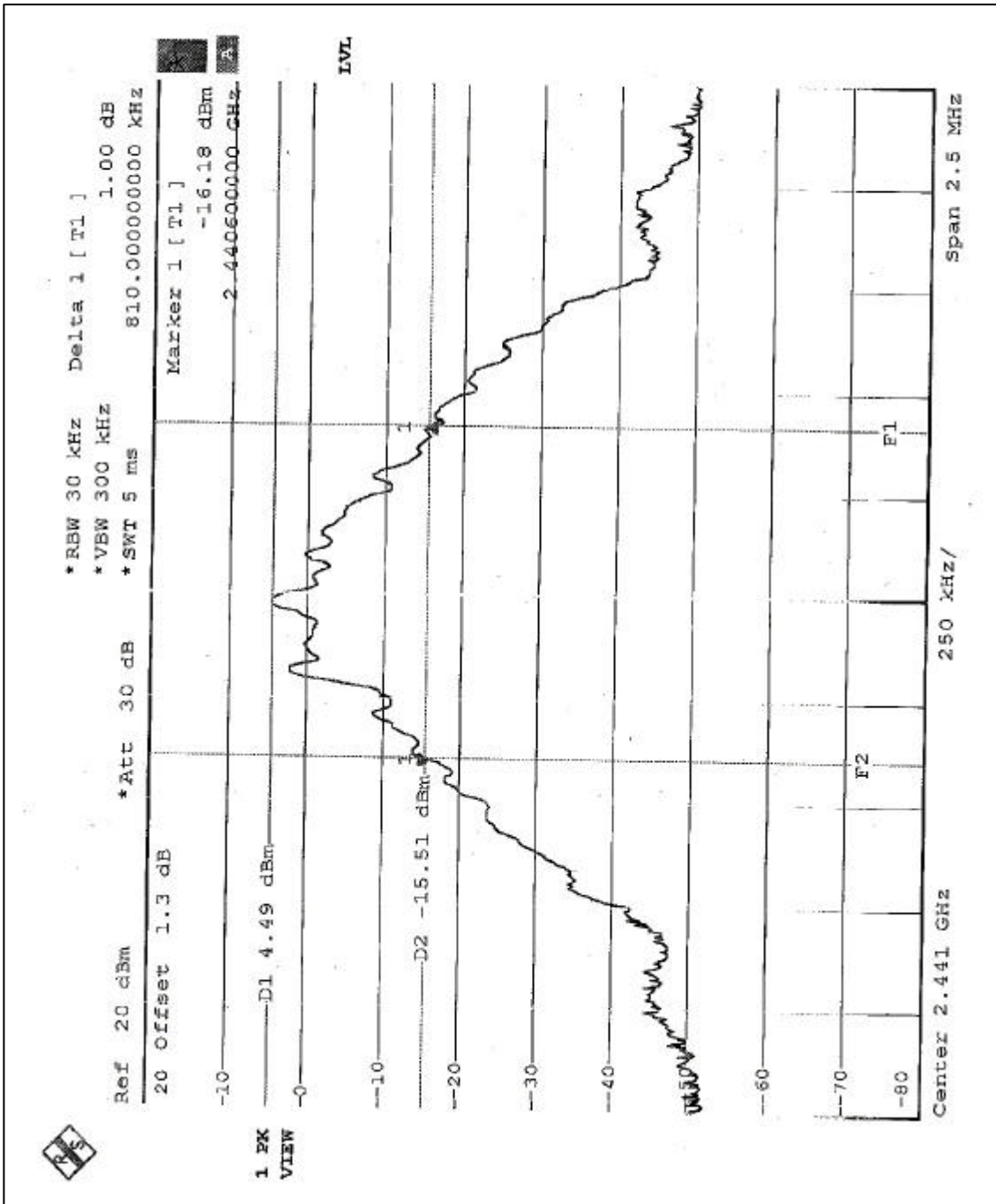


Channel 0



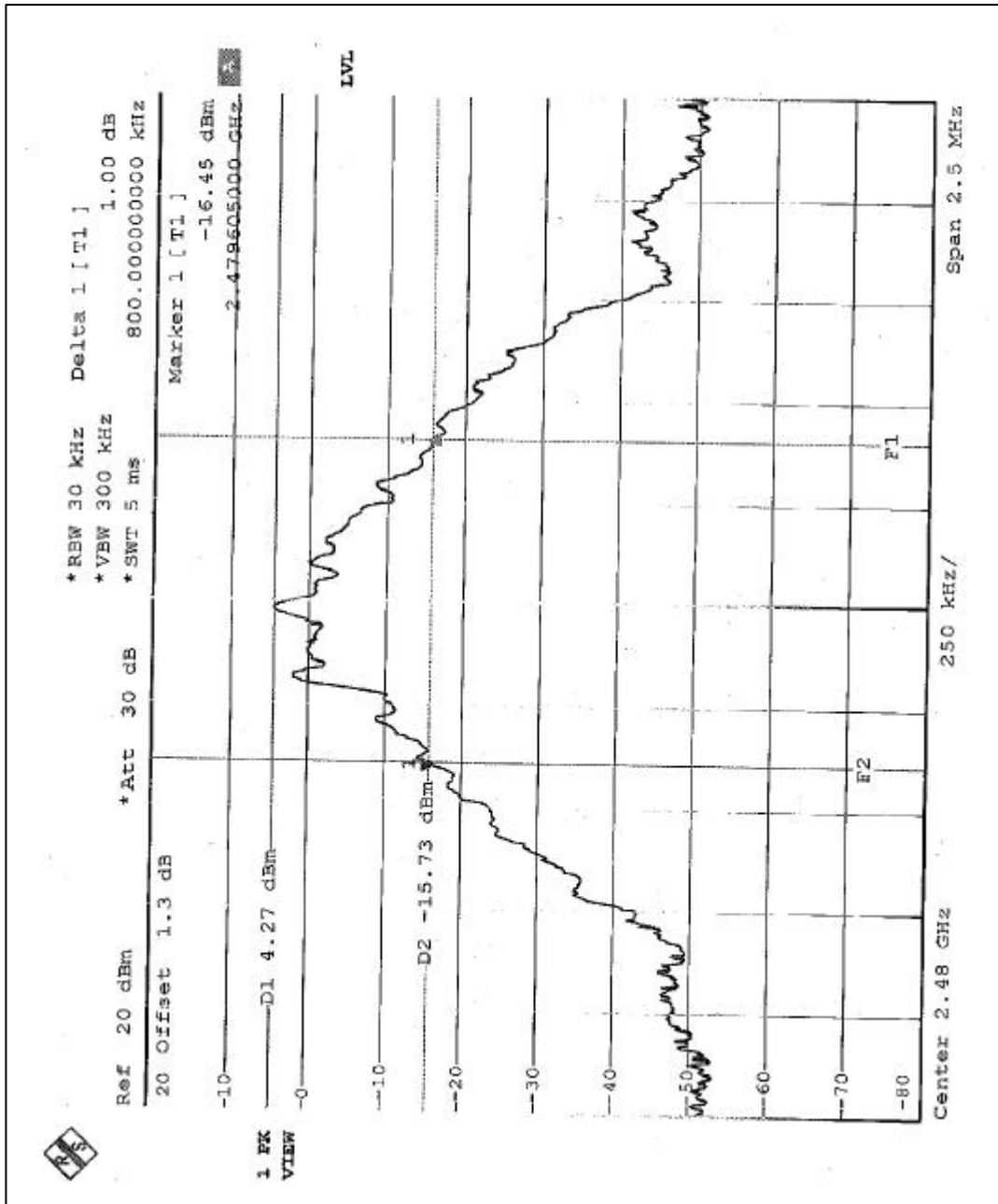


Channel 39





Channel 78



## 4.5 HOPPING CHANNEL SEPARATION

### 4.5.1 LIMIT OF HOPPING CHANNEL SEPARATION

At least 25KHz or 20dB bandwidth (whichever is greater).

### 4.5.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
R&S SPECTRUM ANALYZER	FSP	1093.4495.30	Dec. 19, 2003

**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.

### 4.5.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.5.5 TEST SETUP

