FCC TEST REPORT

REPORT NO.: RF930112A02B

MODEL NO.: DT-X5M30UR

SERIES MODEL NO.: Refer to page 8 for the details

RECEIVED: Oct. 18, 2004

TESTED: Jan. 12 ~ 17, 2004 (for original test
Oct. 19, 2004 for the Radiation
Emission Test Below 1GHz)

APPLICANT: Casio Computer Co., Ltd.

ADDRESS: 2951-5, Ishikawa-cho, Hachioji-shi,
Tokyo 192-8556, Japan

ISSUED BY: Advance Data Technology Corporation

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang 244, Taipei Hsien, Taiwan, R.O.C.

0528
ILAC MRA

ACCREDITED
No. 2177-01

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1 CERTIFICATION

PRODUCT:	Handheld Terminal
BRAND NAME:	CASIO
MODEL NO:	DT-X5M30UR
SERIES MODEL NO.:	Refer to page 8 for the details
TEST SAMPLE:	ENGINEERING SAMPLE
APPLICANT:	Casio Computer Co., Ltd.
STANDARDS:	FCC Part 15, Subpart C (Section 15.247) ANSI C63.4-2003

The above equipment (Model: DT-X5M30UR) has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Windy Chou , **DATE:** Nov. 17, 2004
(Windy Chou)

TECHNICAL ACCEPTANCE : Gary Chang , **DATE:** Nov. 17, 2004
Responsible for RF (Gary Chang)

APPROVED BY : Jeff Chuang for , **DATE:** Nov. 17, 2004
(Gody Chang, Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

For modulating type DSSS:

APPLIED STANDARD: FCC Part 15, Subpart C			
Standard Section	**Test Type and Limit**	**Result**	**REMARK**
15.207	AC Power Conducted Emission	N/A	Power supply is 5Vdc from batteries
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit: min. 500kHz	PASS	Meet the requirement of limit
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	PASS	Meet the requirement of limit
15.247(d)	Transmitter Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is –8.12dB at 99.98MHz
15.247(e)	Power Spectral Density Limit: max. 8dBm	PASS	Meet the requirement of limit
15.247(d)	Band Edge Measurement Limit: 20 dB less than the peak value of fundamental frequency	PASS	Meet the requirement of limit

For modulating type FHSS:

APPLIED STANDARD: FCC Part 15, Subpart C			
Standard Section	**Test Type and Limit**	**Result**	**REMARK**
15.207	AC Power Conducted Emission	N/A	Power supply is 5Vdc from batteries
15.247(a)(1)(iii)	Number of Hopping Frequency Used Spec.: At least 15 channels	PASS	Meet the requirement of limit
15.247(a)(1)(iii)	Dwell Time on Each Channel Spec. : Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit
15.247(a)(1)	Hopping Channel Separation Spec. : Min. 25 kHz or 20 dB bandwidth, which ever is greater	PASS	Meet the requirement of limit
15.247(a)(1)	Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	NA	NA
15.247(b)	Maximum Peak Output Power Spec.: max. 30dBm	PASS	Meet the requirement of limit
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is –3.70dB at 4804.00MHz
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4:

Measurement	Frequency	Uncertainty
Radiated emissions	30MHz ~ 200MHz (Hor)	3.706 dB
	30MHz ~ 200MHz (Ver)	3.849 dB
	200MHz ~1GHz (Hor)	3.864 dB
	200MHz ~1GHz (Ver)	3.851 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Handheld Terminal
MODEL NO.	DT-X5M30UR
POWER SUPPLY	DC 1.1A/3~5V from rechargeable Lithium battery (built-in)
MODULATION TYPE	FHSS, DSSS
MODULATION TECHNOLOGY	GFSK, BPSK, QPSK, CCK
TRANSFER RATE	DSSS: 1/2/5.5/11Mbps FHSS: 723Kbps
FREQUENCY RANGE	For FHSS: 2402MHz ~ 2480MHz For CCK:2412MHz ~ 2462MHz
NUMBER OF CHANNEL	11 for DSSS 79 for FHSS
OUTPUT POWER	DSSS: 30.200mW FHSS: 0.575 mW
ANTENNA TYPE	DSSS: IFA antenna with 1.92dBi gain FHSS: multi-layer ceramic antenna with 2.66dBi gain
DATA CABLE	NA
I/O PORTS	IR port (non-contact), Power contacts
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT is a Handheld Terminal with C-mos scanner version. The EUT uses two wireless technology for communication: Bluetooth and 802.11b standards.
2. The WLAN module manufactured by SyChip Inc., model: WLAN6065EBC2 and Bluetooth module P/N: LBMA49BAE3-TEMP.
3. The EUT operates in the 2.4GHz frequency spectrum and complies with FHSS & DSSS techniques.
4. The EUT provides hardware/physical signaling between Bluetooth and 802.11b functional block when they function at the same time.
5. There are three serials models provided to this EUT and identical to each other except for their model name and technology for communication due to marketing requirement.

Model	Remark
DT-X5M30U	Bluetooth Function only
DT-X5M20U	Bluetooth Function only
DT-X5M20UR	Bluetooth Function + Wireless Function

6. This device containing two transmitters that transmitted simultaneously under all test modes.
7. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

The EUT was pre-tested with the following condition:

1. The EUT wireless modules can functioned at the same time, therefore this function has been pre-tested. The pre-test data found to be similar with the test result for the EUT tested on separate function (Bluetooth and WLAN). Therefore for the final test, both function was tested under DSSS and FHSS modulation techniques.
2. Since the EUT is considered a portable unit, it was pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane. Therefore only the test data of this X-plane was used for **Radiated test**.

Eleven channels were provided to the EUT for DSSS modulation type:

Channel	Frequency	Channel	Frequency
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

NOTE:

1. Below 1 GHz, the channel 1, 6, and 11 were pre-tested in chamber. The channel 11, worst case one, was chosen for final test.
2. Above 1 GHz, the channel 1, 6, and 11 were tested individually.
3. From our experience and technical viewpoint, we have chosen data rates 11Mbps for CCK technique as the worst case for the test among other data rates.

Seventy-nine channels were provided to the EUT for FHSS modulation type:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

NOTE:

1. Below 1 GHz, the channel 0, 39, and 78 were pre-tested in chamber. The channel 78, worst case one, was chosen for final test.
2. Above 1 GHz, the channel 0, 39, and 78 were tested individually.

3.3 DESCRIPTION OF APPLIED STANDARDS

The EUT is a Handheld Terminal, which uses Bluetooth and 802.11b wireless standards, according to the specifications of the manufacturers, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C. (15.247)
ANSI C63.4: 2003

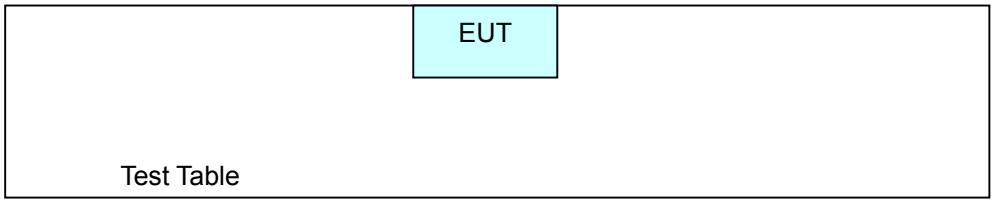
The EUT uses battery power, Conducted test was not performed.

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

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

3.5 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST TYPES AND RESULTS (FOR WIRELESS FUNCTION)

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as the following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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 20dB under any condition of modulation.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* HP Spectrum Analyzer	8593E	3911A07465	Jun. 27, 2005
* HP Preamplifier	8447D	2432A03504	Jun. 03, 2005
* HP Preamplifier	8449B	3008A01292	Aug. 29, 2005
SCHAFFNER Tunable Dipole Antenna	VHBA 9123	459	May 25, 2005
SCHWARZBECK Tunable Dipole Antenna	UHA 9105	977	
* ROHDE & SCHWARZ Test Receiver	ESI7	838496/016	Feb. 08, 2005
* Schwarzbeck Antenna	VULB9168	137	Feb. 27, 2005
* SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	Jun. 14, 2005
* ADT. Turn Table	TT100	0306	NA
* ADT. Tower	AT100	0306	NA
* Software	ADT_Radiated_V5.14	NA	NA
* TIMES RF cable	LL142	CABLE-CH6-01	Apr. 16, 2005

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. "*" = These equipment are used for the final measurement.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The test was performed in ADT Chamber No. 6.

4.1.3 TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

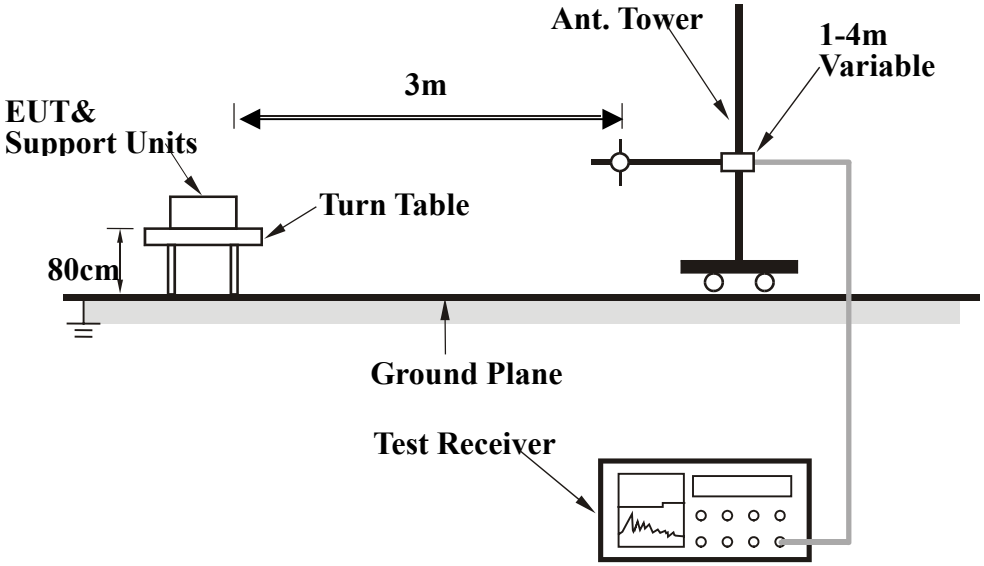
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for Average detection (AV) at frequency above 1GHz.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



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

4.1.6 EUT OPERATING CONDITIONS

Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.

4.1.7 TEST RESULTS

EUT	Handheld Terminal	**MODEL**	DT-X5M30UR
MODE	Channel 11	**FREQUENCY RANGE**	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**DETECTOR FUNCTION**	Quasi-Peak
ENVIRONMENTAL CONDITIONS	22 deg. C, 65% RH, 991 hPa	**TESTED BY**: Jamison Chan	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	527.64	34.94 QP	46.00	-11.06	1.40 H	217	14.53	20.41
2	638.44	35.09 QP	46.00	-10.91	1.00 H	223	12.88	22.21
3	757.01	30.92 QP	46.00	-15.08	1.20 H	253	6.13	24.78
4	809.50	32.38 QP	46.00	-13.62	1.20 H	100	7.38	25.00
5	863.93	30.64 QP	46.00	-15.36	1.00 H	115	5.01	25.63
6	918.36	27.15 QP	46.00	-18.85	1.00 H	226	1.07	26.08

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**99.98**	**31.88 QP**	**40.00**	**-8.12**	**1.00 V**	**28**	**23.00**	**8.88**
2	199.12	27.04 QP	40.00	-12.96	1.40 V	247	16.38	10.67
3	218.56	27.04 QP	40.00	-12.96	1.80 V	187	15.85	11.19
4	259.38	30.07 QP	47.00	-16.93	1.20 V	187	17.76	12.32
5	416.83	32.77 QP	47.00	-14.23	1.40 V	190	14.87	17.90
6	704.53	36.54 QP	47.00	-10.46	1.20 V	205	13.20	23.34

REMARKS: 1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

EUT	Handheld Terminal	**MODEL**	DT-X5M30UR
MODE	Channel 01	**FREQUENCY RANGE**	1 ~25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60% RH, 1005 hPa	**TESTED BY**: Steven Lu	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	43.07 PK	74.00	-30.93	1.11 H	334	12.77	30.30
2	*2412.00	101.24 PK			1.41 H	23	71.00	30.24
2	*2412.00	96.24 AV			1.41 H	23	66.00	30.24
3	4824.00	42.33 PK	74.00	-31.67	1.22 H	264	5.80	36.53

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	46.57 PK	74.00	-27.43	1.11 V	334	16.27	30.30
2	*2412.00	108.90 PK			1.25 V	348	78.66	30.24
2	*2412.00	100.74 AV			1.25 V	348	70.50	30.24
3	4824.00	43.43 PK	74.00	-30.57	1.00 V	95	6.90	36.53
4	7236.00	49.51 PK	74.00	-24.49	1.00 V	300	8.11	41.41

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency

EUT	Handheld Terminal	MODEL	DT-X5M30UR
MODE	Channel 06	FREQUENCY RANGE	1 ~25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60% RH, 1005 hPa	TESTED BY: Steven Lu	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	101.61 PK			1.13 H	354	71.30	30.31
1	*2437.00	93.98 AV			1.13 H	354	63.67	30.31
2	4874.00	42.29 PK	74.00	-31.71	1.24 H	156	5.60	36.69
3	7310.00	47.96 PK	74.00	-26.04	1.10 H	165	6.48	41.48

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2437.00	109.20 PK			1.00 V	249	78.89	30.31
1	*2437.00	101.40 AV			1.00 V	249	71.09	30.31
2	4874.00	42.49 PK	74.00	-31.51	1.00 V	165	5.80	36.69
3	7312.00	47.46 PK	74.00	-26.54	1.21 V	174	5.98	41.49

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency

EUT	Handheld Terminal	MODEL	DT-X5M30UR
MODE	Channel 11	FREQUENCY RANGE	1 ~25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60% RH, 1005 hPa	TESTED BY: Steven Lu	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	99.97 PK			1.16 H	10	69.60	30.37
1	*2462.00	95.87 AV			1.16 H	10	65.50	30.37
2	2483.50	40.81 PK	74.00	-33.19	1.16 H	10	10.38	30.43
3	4924.00	41.95 PK	74.00	-32.05	1.17 H	27	5.10	36.85
4	7387.00	47.61 PK	74.00	-26.39	1.26 H	41	5.95	41.66

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	108.50 PK			1.00 V	335	78.13	30.37
1	*2462.00	100.20 AV			1.00 V	335	69.83	30.37
2	2483.00	39.81 PK	74.00	-34.19	1.00 V	335	9.38	30.43
3	4924.00	42.15 PK	74.00	-31.85	1.00 V	214	5.30	36.85
4	7387.00	46.21 PK	74.00	-27.79	1.05 V	214	4.55	41.66

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency

4.2 6dB BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

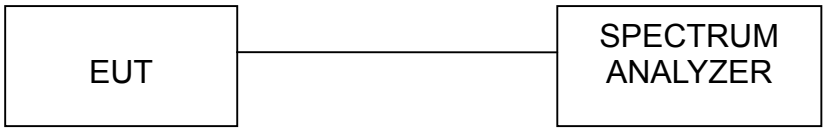
4.2.3 TEST PROCEDURE

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

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



4.2.6 EUT OPERATING CONDITION

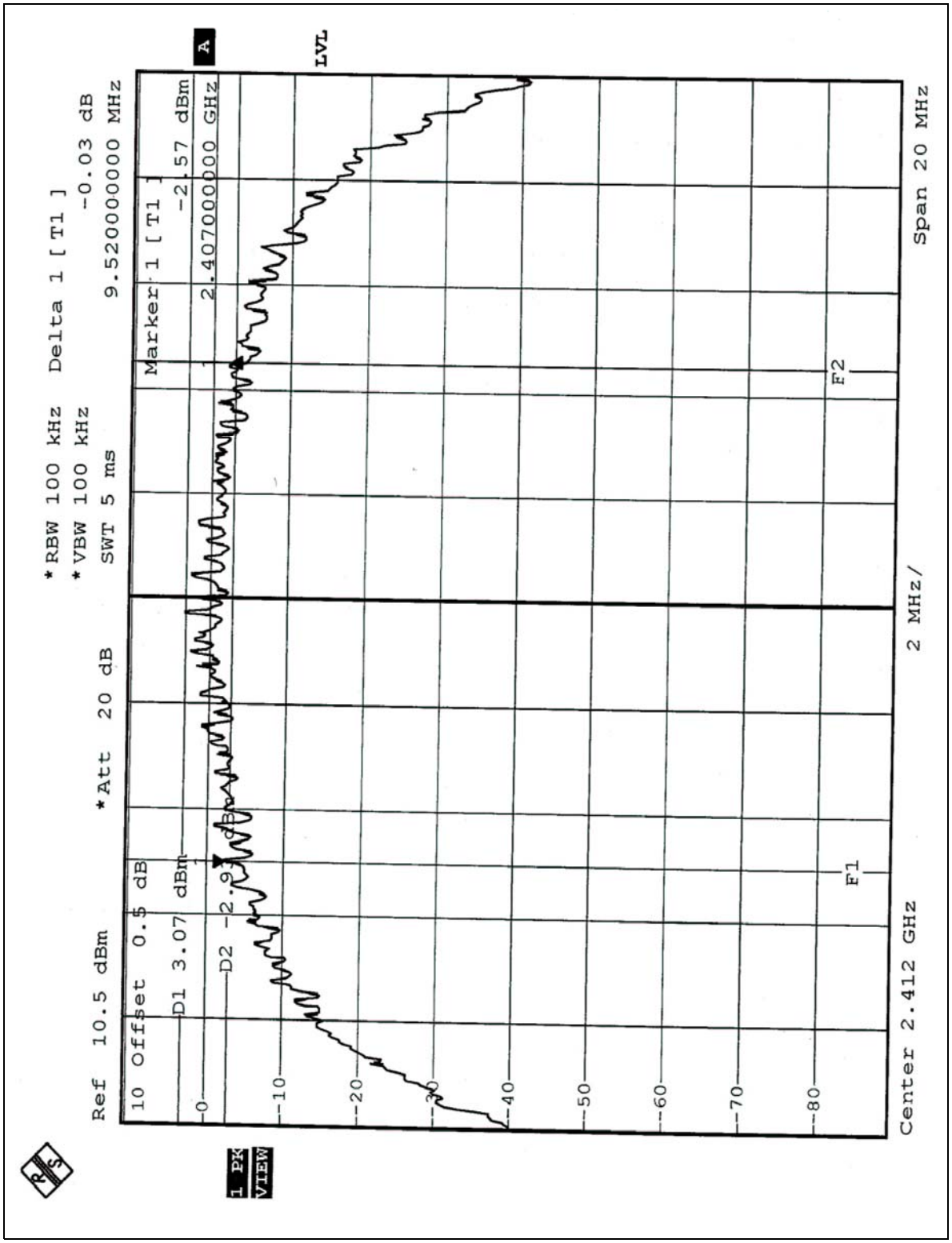
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.2.7 TEST RESULTS

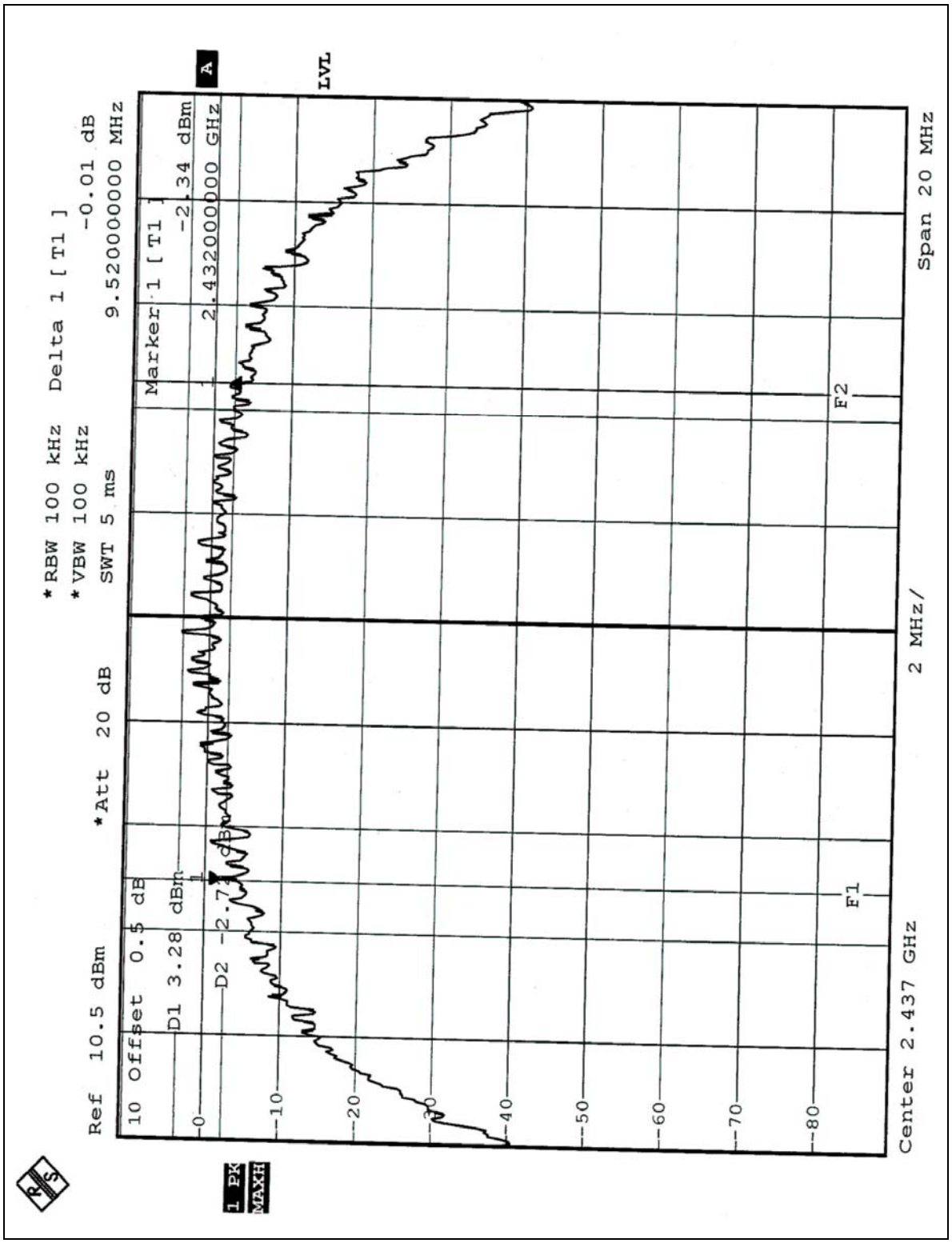
EUT	Handheld Terminal	MODEL	DT-X5M30UR
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH, 1005hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY: Steven Lu			

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
1	2412	9.52	0.5	PASS
6	2437	9.52	0.5	PASS
11	2462	9.48	0.5	PASS

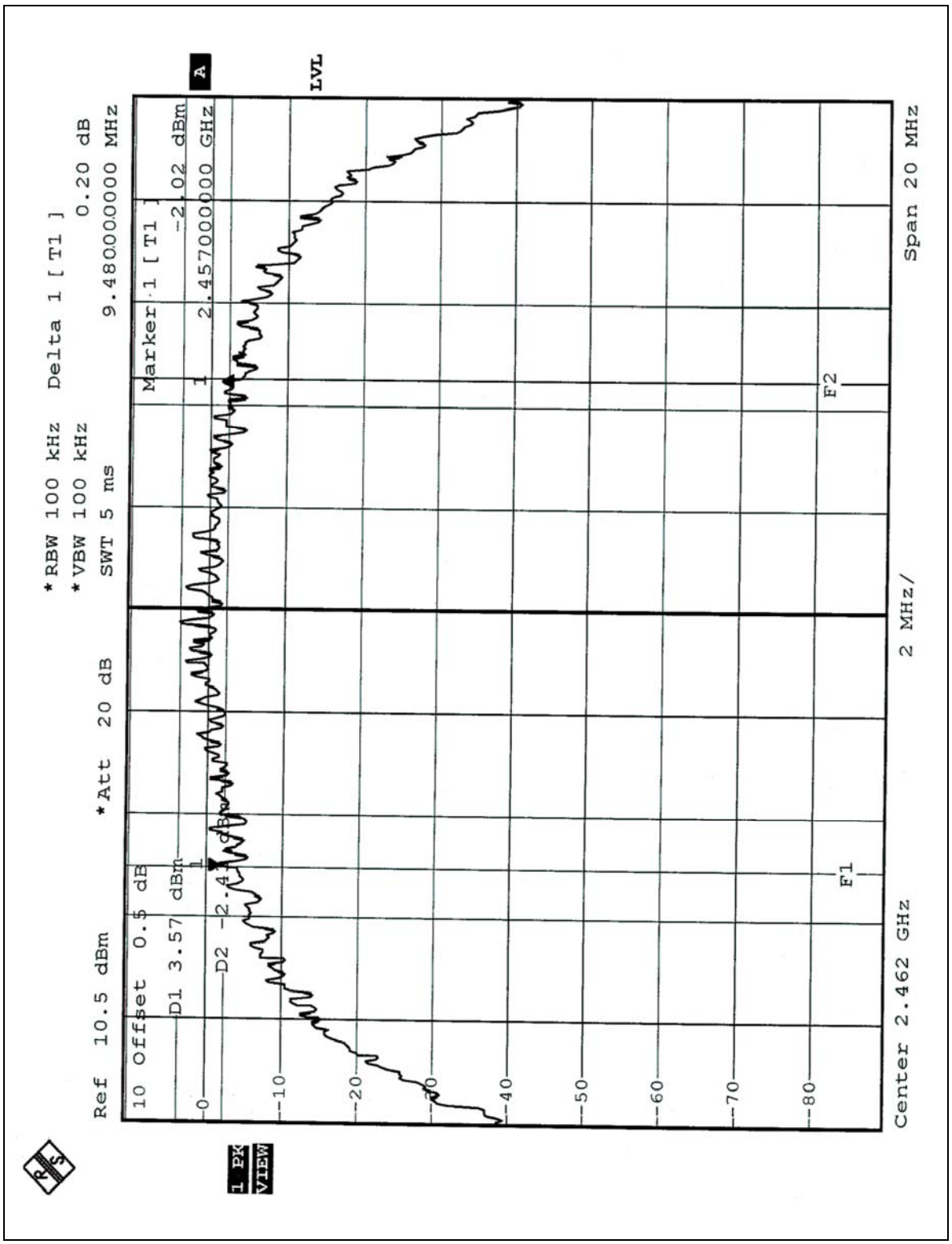
CH1


RBW 100 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
-0.03 dB
9.520000000 MHz
Marker 1 [T1]
-2.57 dBm
2.407000000 GHz
Ref 10.5 dBm
Offset 0.5 dB
Att 20 dB
D1 3.07 dBm
D2 -2.9 dBm
Center 2.412 GHz
2 MHz/
Span 20 MHz
F1
F2
LVL
1 PK VIEW

CH6


RBW 100 kHz
VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
-0.01 dB
9.520000000 MHz
Marker 1 [T1]
-2.34 dBm
2.432000000 GHz
Ref 10.5 dBm
Offset 0.5 dB
Att 20 dB
D1 3.28 dBm
D2 -2.72 dBm
LVL
Span 20 MHz
2 MHz/
Center 2.437 GHz
F1
F2
1 PK
MAXH

CH11


Ref 10.5 dBm
10 Offset 0.5 dB
D1 3.57 dBm
D2 -2.43 dBm
*Att 20 dB
*RBW 100 kHz
*VBW 100 kHz
SWT 5 ms
Delta 1 [T1]
0.20 dB
9.480000000 MHz
Marker 1 [T1]
-2.02 dBm
2.457000000 GHz
LVL
A
1 PK VIEW
F1
F2
Center 2.462 GHz
2 MHz/
Span 20 MHz

4.3 MAXIMUM PEAK OUTPUT POWER

4.3.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
ROHDE & SCHWARZ Spectrum Analyzer	FSP 40	100036	Mar. 18. 2005
ROHDE & SCHWARZ Signal Generator	SMR40	100231	Mar. 17. 2005
Tektronix Oscilloscope	TDS1012	C019167	Feb. 01. 2005
Narda Detector	4503A	FSCM99899	NA

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

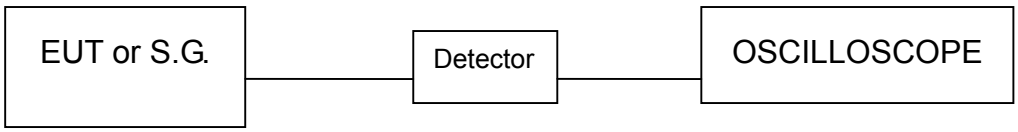
4.3.3 TEST PROCEDURE

1. A detector was used on the output port of the EUT. An oscilloscope was used to read the peak response of the detector.
2. Replaced the EUT by the signal generator. The center frequency of the S.G. was adjusted to the center frequency of the measured channel.
3. Adjusted the power to have the same peak reading on oscilloscope. Record the power level.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITION

Same as Item 4.1.6.

4.3.7 TEST RESULTS

EUT	Handheld Terminal	MODEL	DT-X5M30UR
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH, 1005hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY: Steven Lu			

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	2412	28.840	14.60	30	PASS
6	2437	30.200	14.80	30	PASS
11	2462	29.648	14.72	30	PASS

4.4 POWER SPECTRAL DENSITY MEASUREMENT

4.4.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.4.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: 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

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 3kHz RBW and 30kHz 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.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

4.4.5 TEST SETUP

4.4.6 EUT OPERATING CONDITION

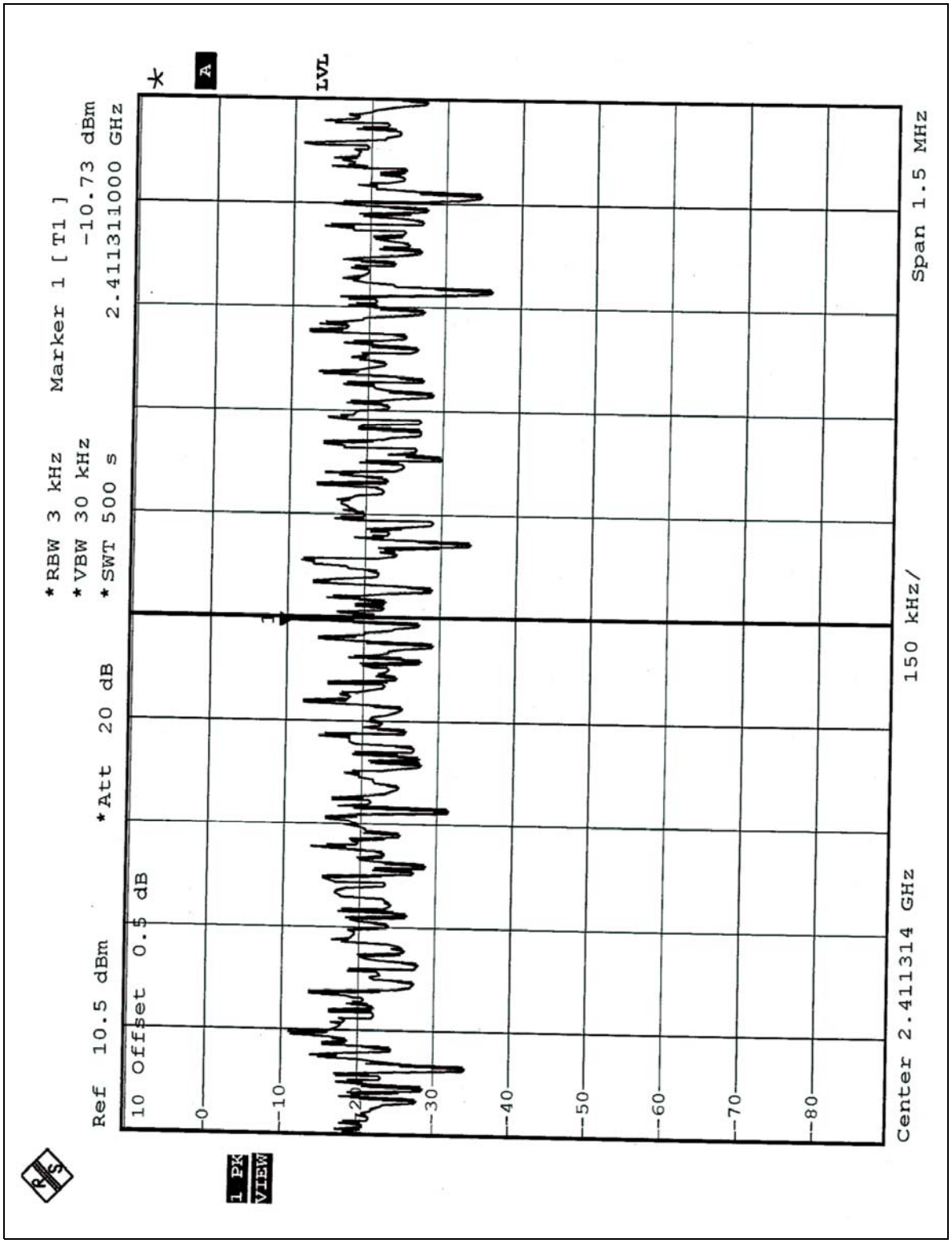
Same as Item 4.1.6.

4.4.7 TEST RESULTS

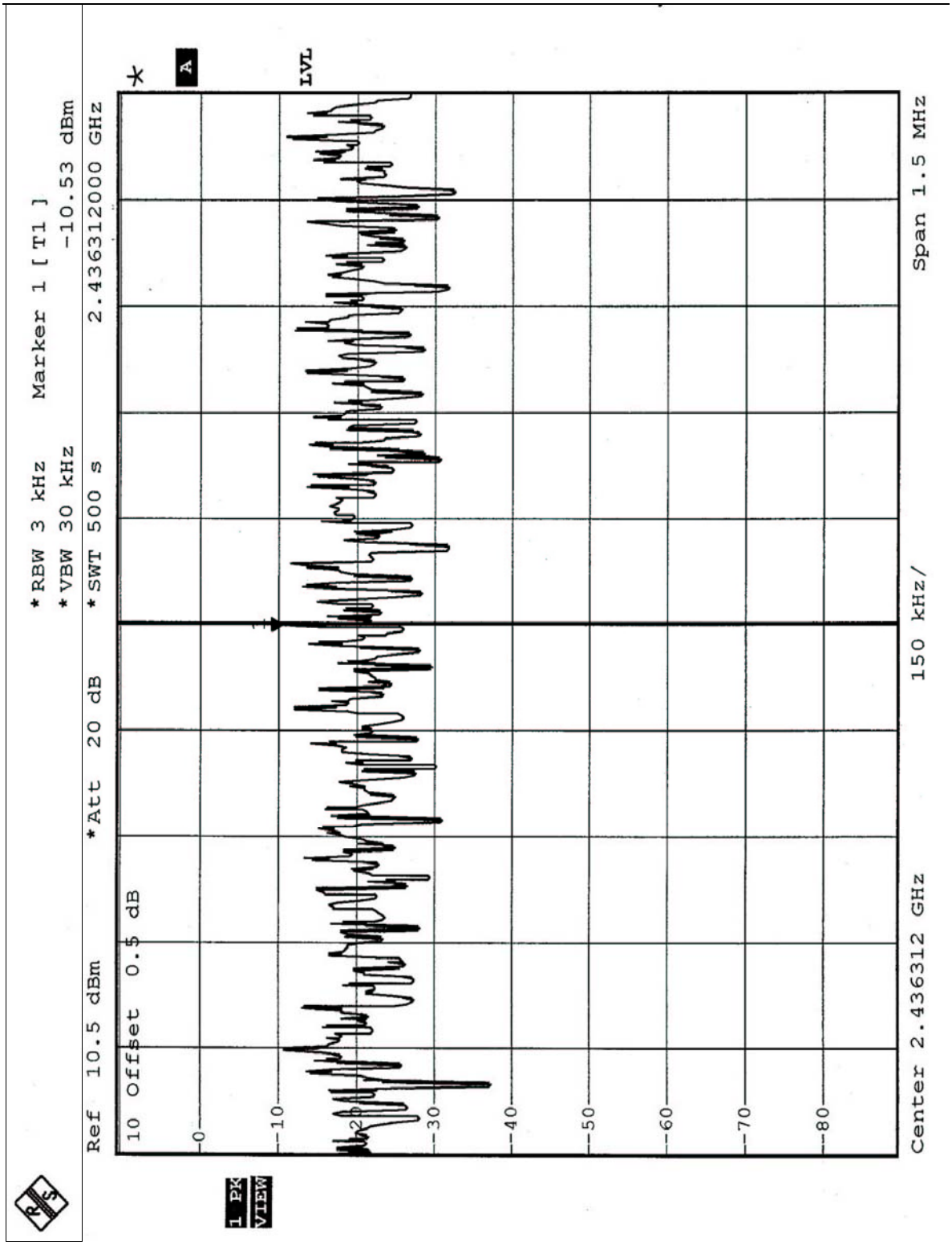
EUT	Handheld Terminal	MODEL	DT-X5M30UR
ENVIRONMENTAL CONDITIONS	22deg. C, 68%RH, 1005hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY: Steven Lu			

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	2412	-10.73	8	PASS
6	2437	-10.53	8	PASS
11	2462	-10.53	8	PASS

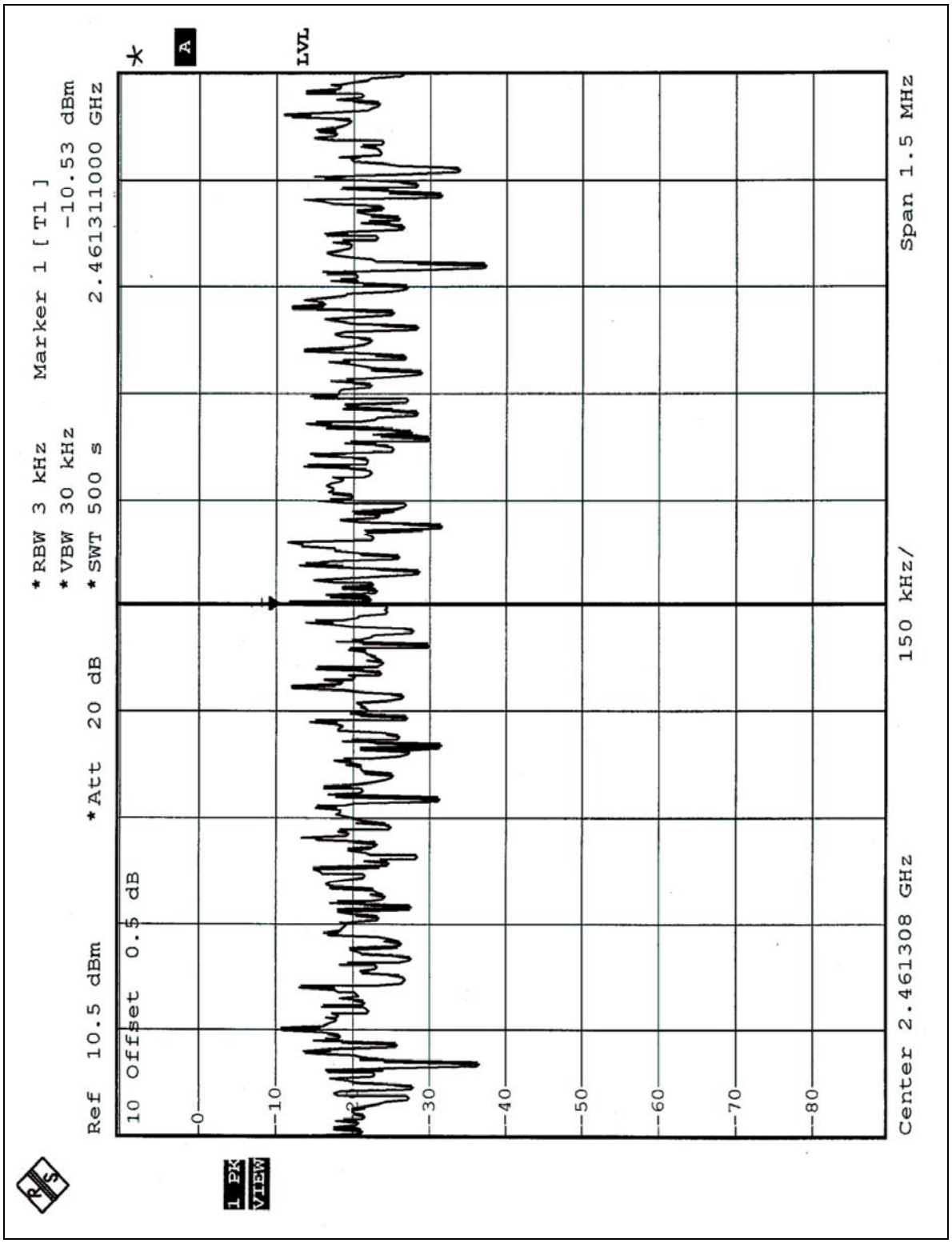
CH1


Ref 10.5 dBm
10 Offset 0.5 dB
*Att 20 dB
*RBW 3 kHz
*VBW 30 kHz
*SWT 500 s
Marker 1 [T1]
-10.73 dBm
2.411311000 GHz
Center 2.411314 GHz
150 kHz/
Span 1.5 MHz
LVL
1 PK VIEW

CH6


*RBW 3 kHz
*VBW 30 kHz
Marker 1 [T1]
-10.53 dBm
*SWT 500 s
2.436312000 GHz
*Att 20 dB
Ref 10.5 dBm
10 Offset 0.5 dB
LVL
A
1 PK
VIEW
Center 2.436312 GHz
150 kHz/
Span 1.5 MHz

CH11


Marker 1 [T1]
-10.53 dBm
2.461311000 GHz
*RBW 3 kHz
*VBW 30 kHz
*SWT 500 s
*Att 20 dB
Ref 10.5 dBm
10 Offset 0.5 dB
Center 2.461308 GHz
150 kHz/
Span 1.5 MHz
LVL
A
1 PK VIEW

4.5 BAND EDGES MEASUREMENT

4.5.1 LIMITS OF BAND EDGES MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.5.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: 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 PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100MHz bandwidth from band edge. The band edges was measured and recorded.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation.

4.5.5 EUT OPERATING CONDITION

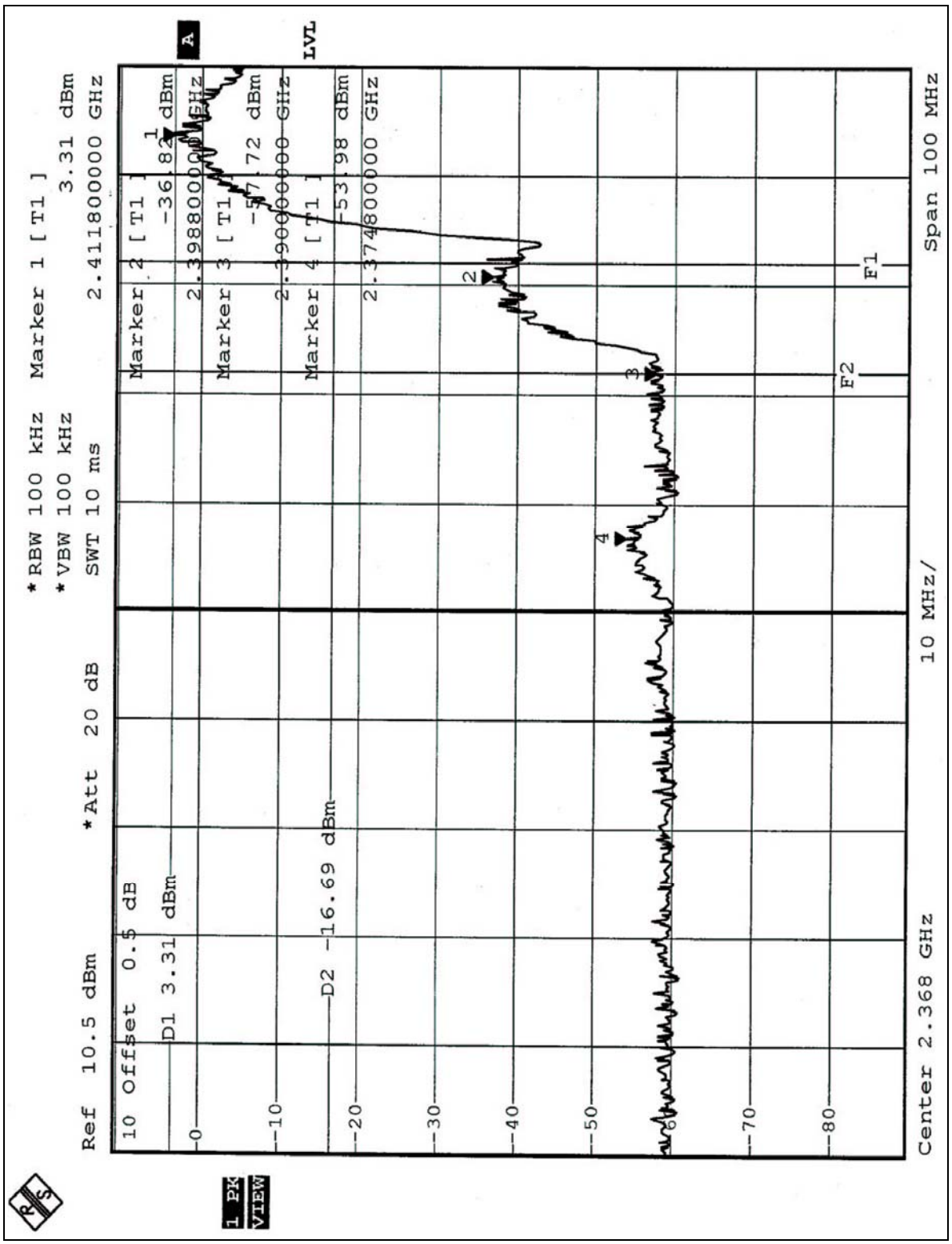
Same as Item 4.1.6.

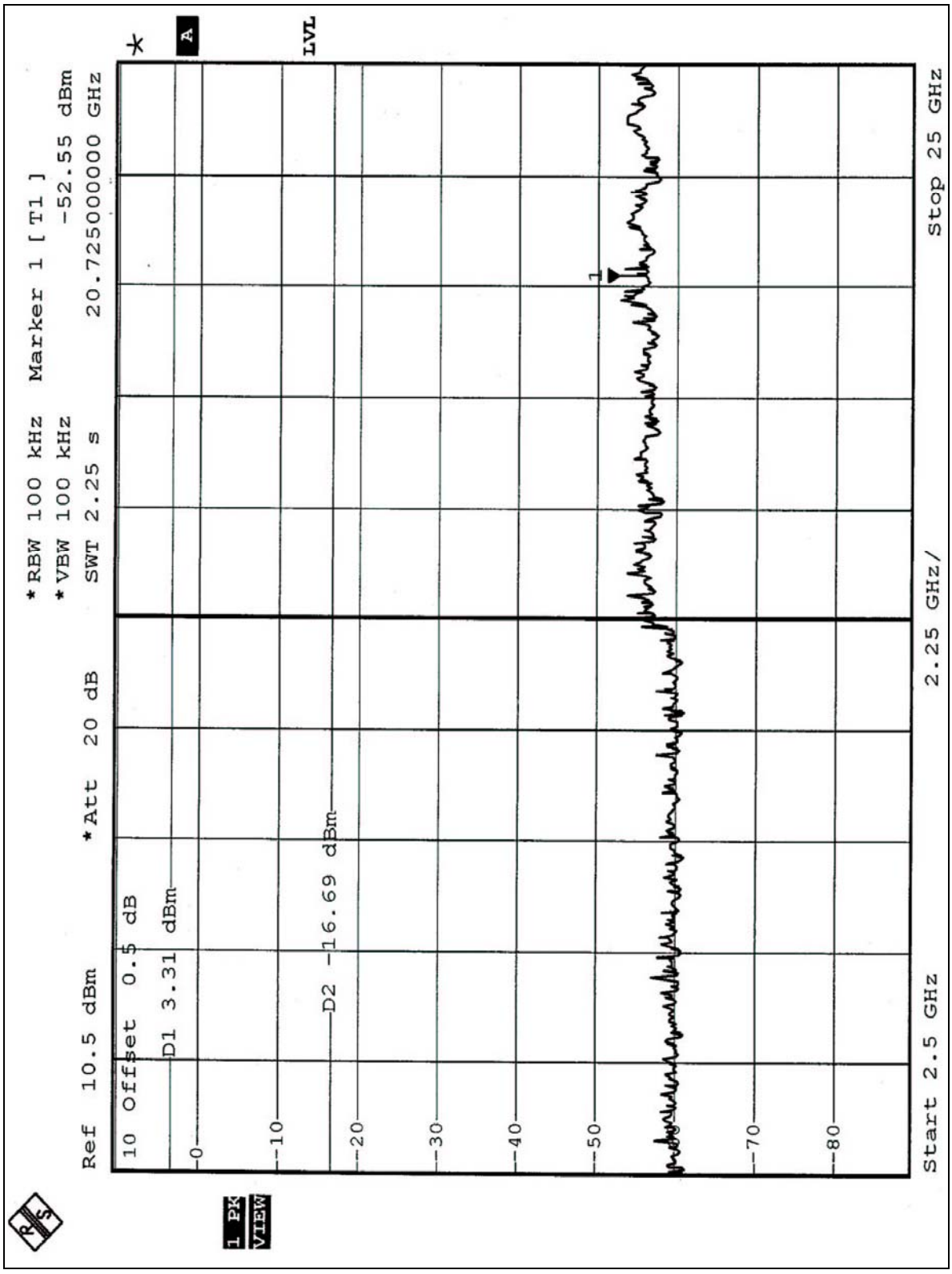
4.5.6 TEST RESULTS

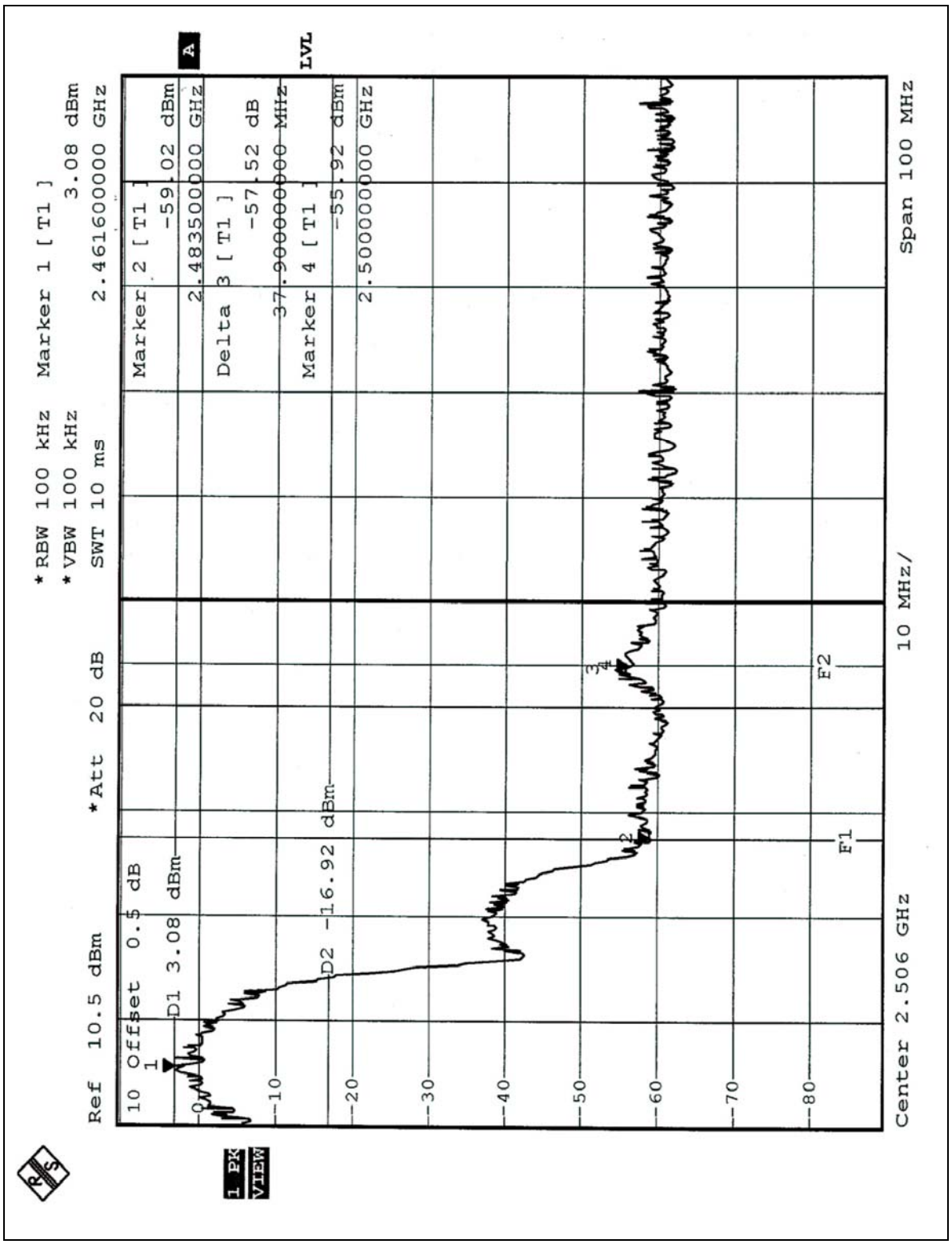
The spectrum plots are attached on the following 4 pages. D2 line indicates the highest level, D1 line indicates the 20dB offset below D2. It shows compliance with the requirement in part 15.247(d).

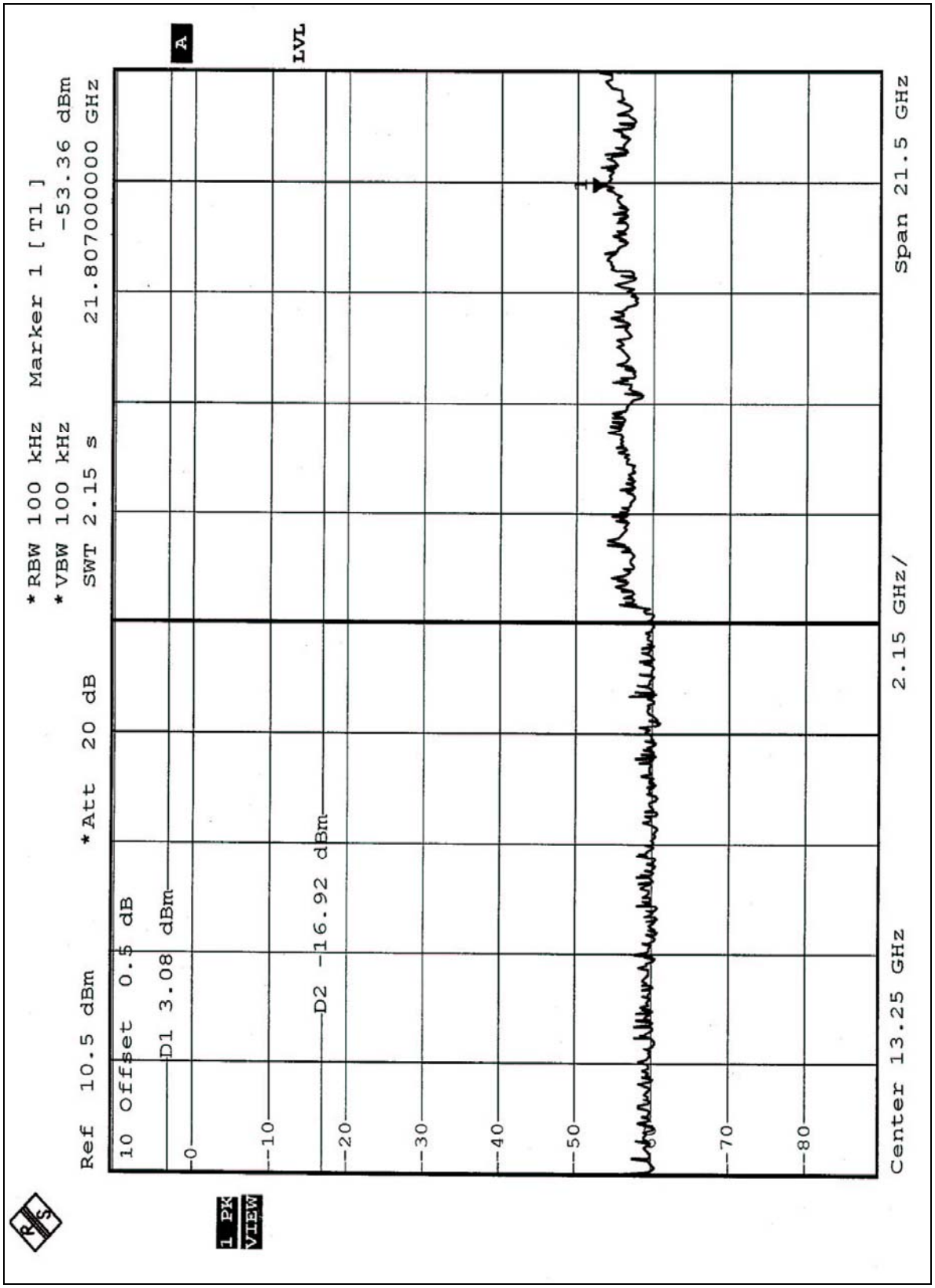
NOTE 1: The band edge emission plot on the following first page shows 57.29dB delta between carrier maximum power and local maximum emission in restrict band (2.3656GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.2.7 is 100.74dBuV/m, so the maximum field strength in restrict band is 100.74-57.29=43.45dBuV/m which is under 54dBuV/m limit.

NOTE 2: The band edge emission plot on the following second page shows 59.00dB delta between carrier maximum power and local maximum emission in restrict band (2.5000Hz). The emission of carrier strength list in the test result of channel 11 at the item 4.2.7 is 100.20dBuV/m, so the maximum field strength in restrict band is 100.20-59.00=41.20dBuV/m which is under 54dBuV/m limit.


*RBW 100 kHz
*VBW 100 kHz
SWT 10 ms
Marker 1 [T1]
3.31 dBm
2.411800000 GHz
Ref 10.5 dBm
*Att 20 dB
10 Offset 0.5 dB
D1 3.31 dBm
D2 -16.69 dBm
Marker 2 [T1]
-36.82 dBm
2.398800000 GHz
Marker 3 [T1]
-57.72 dBm
2.390000000 GHz
Marker 4 [T1]
-53.98 dBm
2.374800000 GHz
LVL
A
F1
F2
1 PK VIEW
Center 2.368 GHz
10 MHz/
Span 100 MHz


Ref 10.5 dBm
*Att 20 dB
*VBW 100 kHz
SWT 2.25 s
*RBW 100 kHz
Marker 1 [T1]
-52.55 dBm
20.725000000 GHz
10 Offset 0.5 dB
D1 3.31 dBm
D2 -16.69 dBm
1 PK VIEW
Start 2.5 GHz
2.25 GHz/
Stop 25 GHz


*RBW 100 kHz
*VBW 100 kHz
SWT 10 ms
Marker 1 [T1]
3.08 dBm
2.461600000 GHz
Ref 10.5 dBm
*Att 20 dB
10 Offset 0.5 dB
D1 3.08 dBm
D2 -16.92 dBm
Marker 2 [T1]
-59.02 dBm
2.483500000 GHz
Delta 3 [T1]
-57.52 dB
37.900000000 MHz
Marker 4 [T1]
-55.92 dBm
2.500000000 GHz
LVL
A
1 PK VIEW
Center 2.506 GHz
10 MHz/
Span 100 MHz
F1
F2


RBW 100 kHz
VBW 100 kHz
SWT 2.15 s
Marker 1 [T1]
-53.36 dBm
21.807000000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
D1 3.08 dBm
D2 -16.92 dBm
LVL
A
1 PK VIEW
Center 13.25 GHz
2.15 GHz/
Span 21.5 GHz

4.6 ANTENNA REQUIREMENT

4.6.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.6.2 ANTENNA CONNECTED CONSTRUCTION

For 802.11b, the antenna type used in this product is IFA antenna with UFL antenna connect from Walsin Technology Corp. The maximum Gain of this antenna is 1.92dBi.

5 TEST TYPES AND RESULTS (FOR BLUETOOTH FUNCTION)

5.1 NUMBER OF HOPPING FREQUENCY USED

5.1.1 LIMITS OF HOPPING FREQUENCY USED

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

5.1.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

5.1.3 TEST PROCEDURE

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.

5.1.4 DEVIATION FROM TEST STANDARD

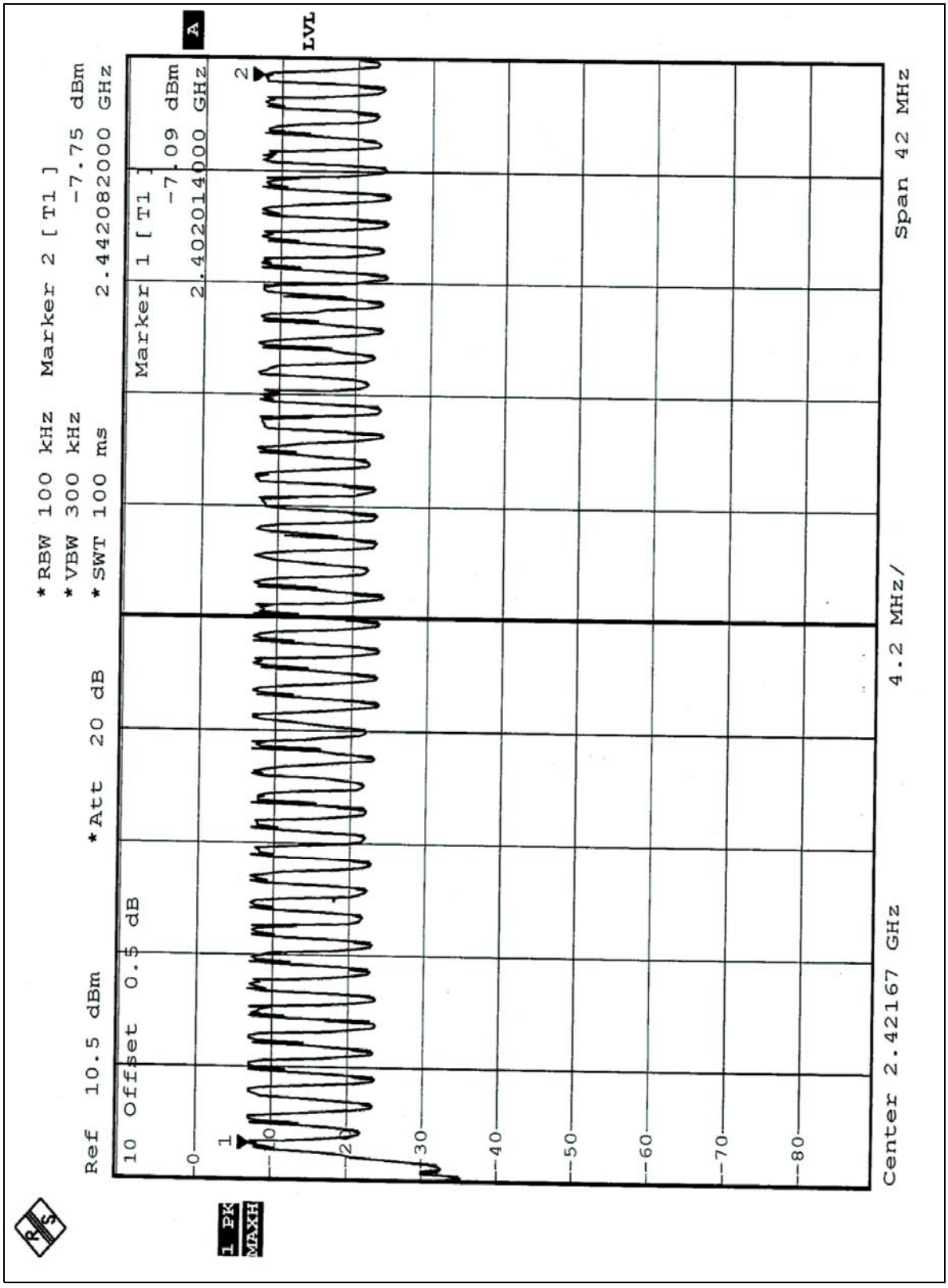
No deviation

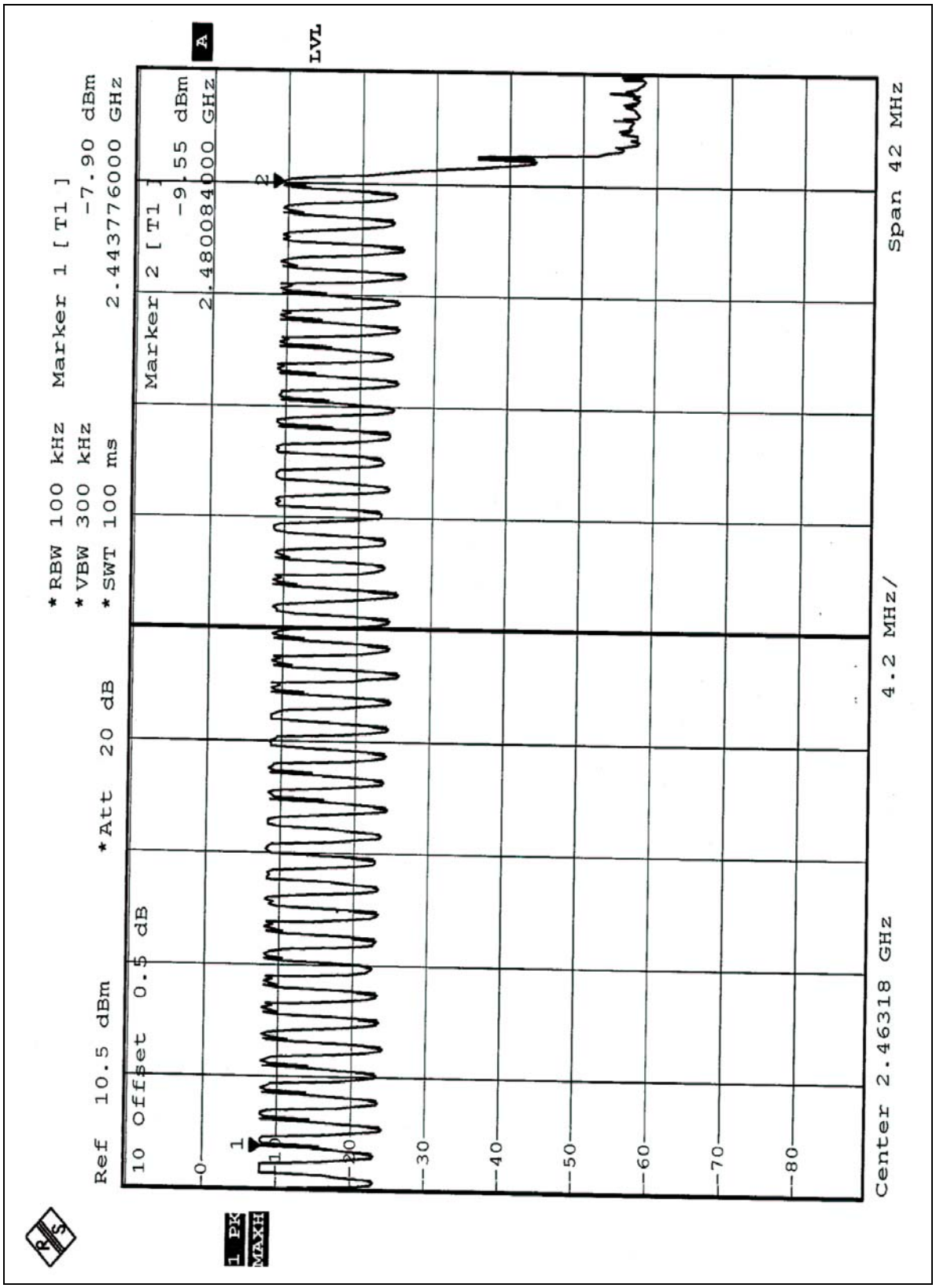
5.1.5 TEST SETUP

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

5.1.6 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 hopping frequencies are equally spaced.


Ref 10.5 dBm
10 Offset 0.5 dB
*RBW 100 kHz
*VBW 300 kHz
*SWT 100 ms
*Att 20 dB
Marker 2 [T1]
-7.75 dBm
2.442082000 GHz
Marker 1 [T1]
-7.09 dBm
2.402014000 GHz
A
LVL
1 PK MAXH
Center 2.42167 GHz
4.2 MHz/
Span 42 MHz


Ref 10.5 dBm
10 Offset 0.5 dB
*Att 20 dB
*RBW 100 kHz
*VBW 300 kHz
*SWT 100 ms
Marker 1 [T1]
-7.90 dBm
2.443776000 GHz
Marker 2 [T1]
-9.55 dBm
2.480084000 GHz
LVL
A
1 PK
MAXH
Center 2.46318 GHz
4.2 MHz/
Span 42 MHz

5.2 DWELL TIME ON EACH CHANNEL

5.2.1 LIMITS 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

5.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

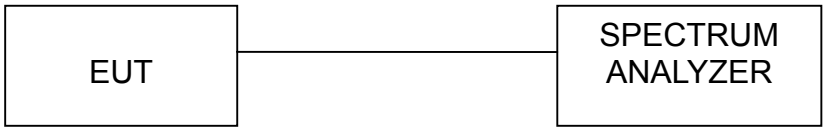
5.2.3 TEST PROCEDURE

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.

5.2.4 DEVIATION FROM TEST STANDARD

No deviation

5.2.5 TEST SETUP



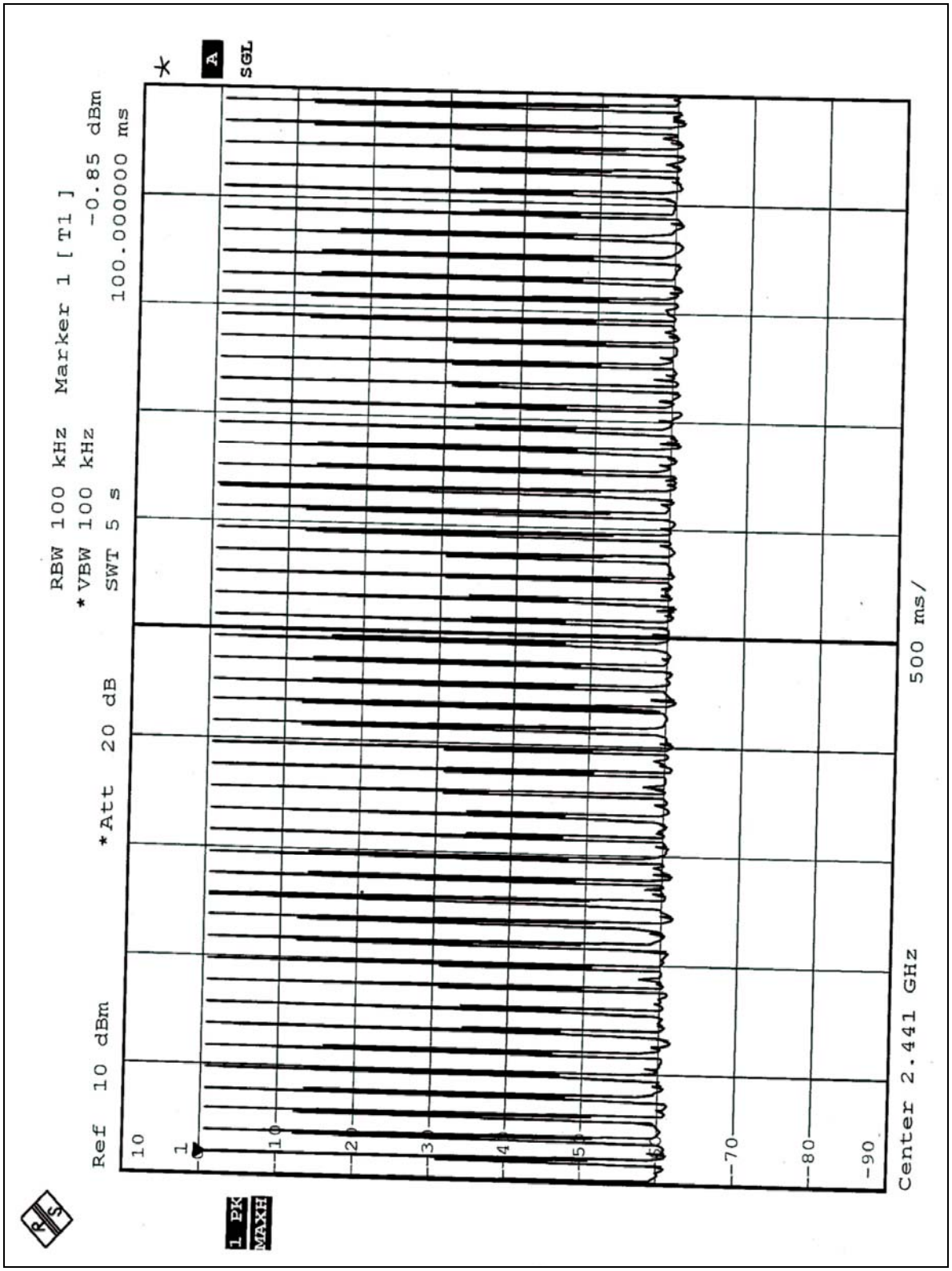
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

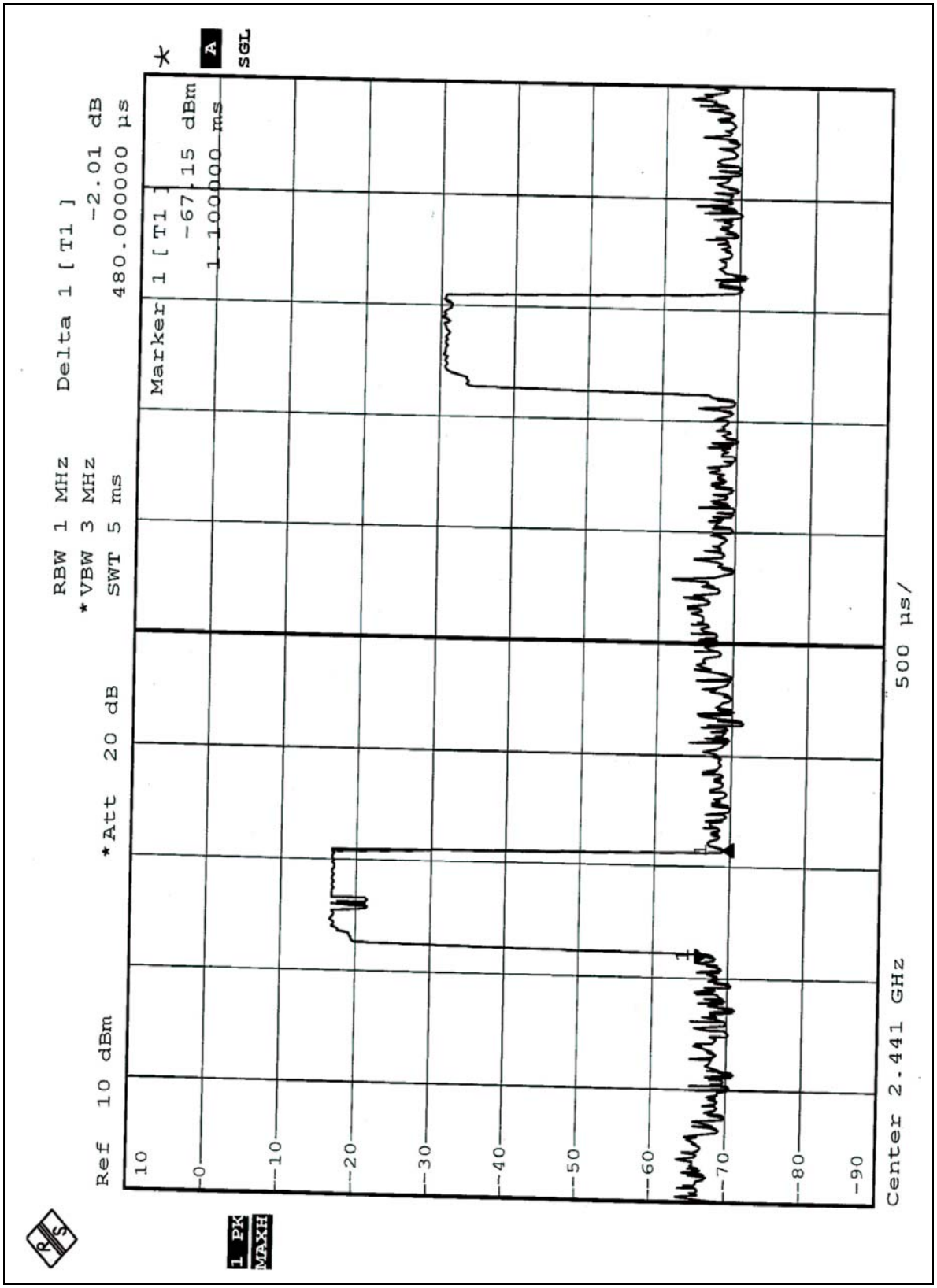
5.2.6 TEST RESULTS

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) *6.32= 316.00 times	0.48	151.68	400
DH3	25 (times / 5 sec) *6.32= 158.00 times	1.78	281.24	400
DH5	17 (times / 5 sec) *6.32= 107.44 times	3.10	333.06	400

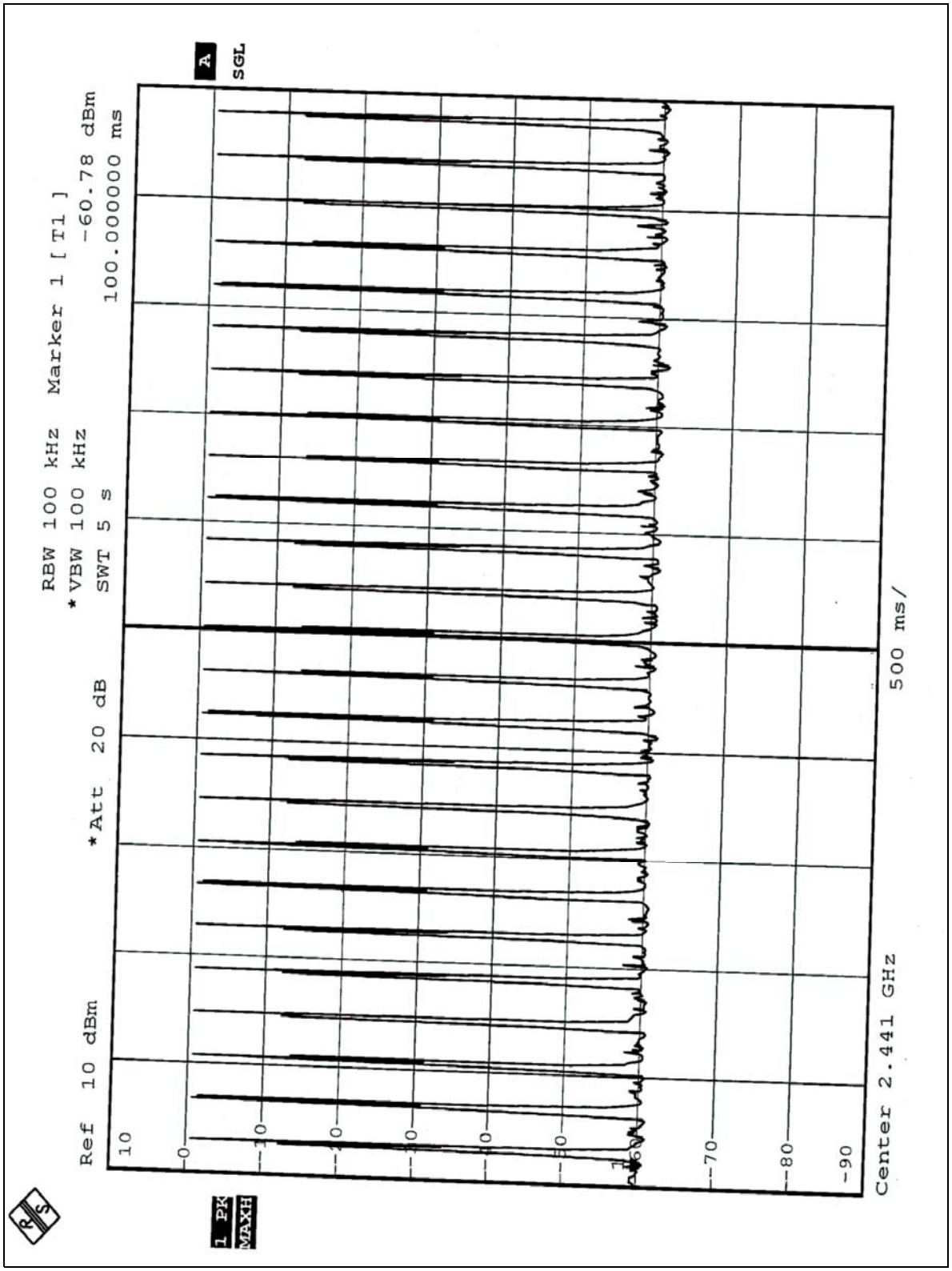
Test plots of the transmitting time slot are shown on next six pages.

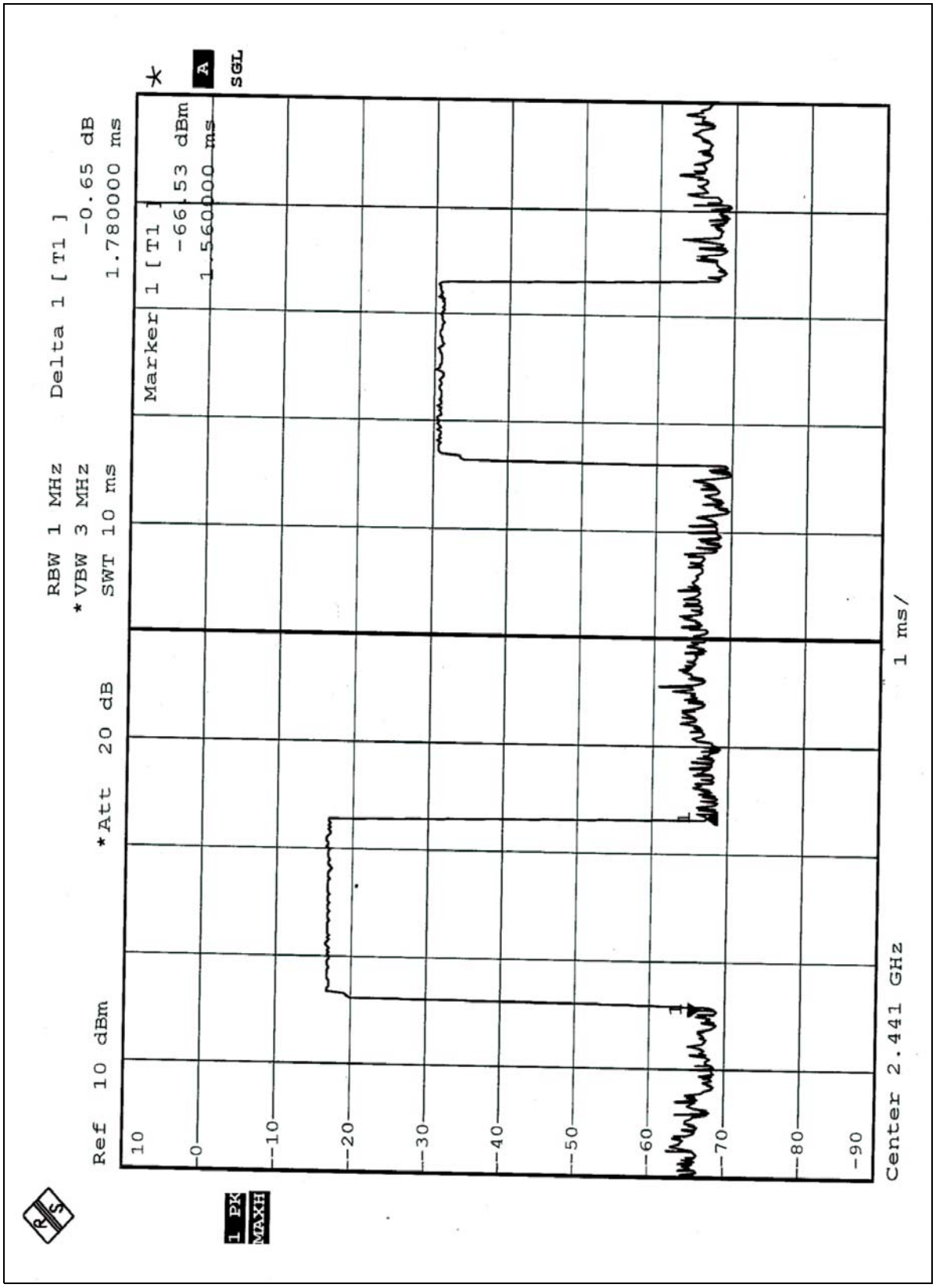
DH1


A
SGL
RBW 100 kHz
*VBW 100 kHz
SWT 5 s
Marker 1 [T1]
-0.85 dBm
100.000000 ms
Ref 10 dBm
*Att 20 dB
500 ms/
Center 2.441 GHz
1 PK
MAXH

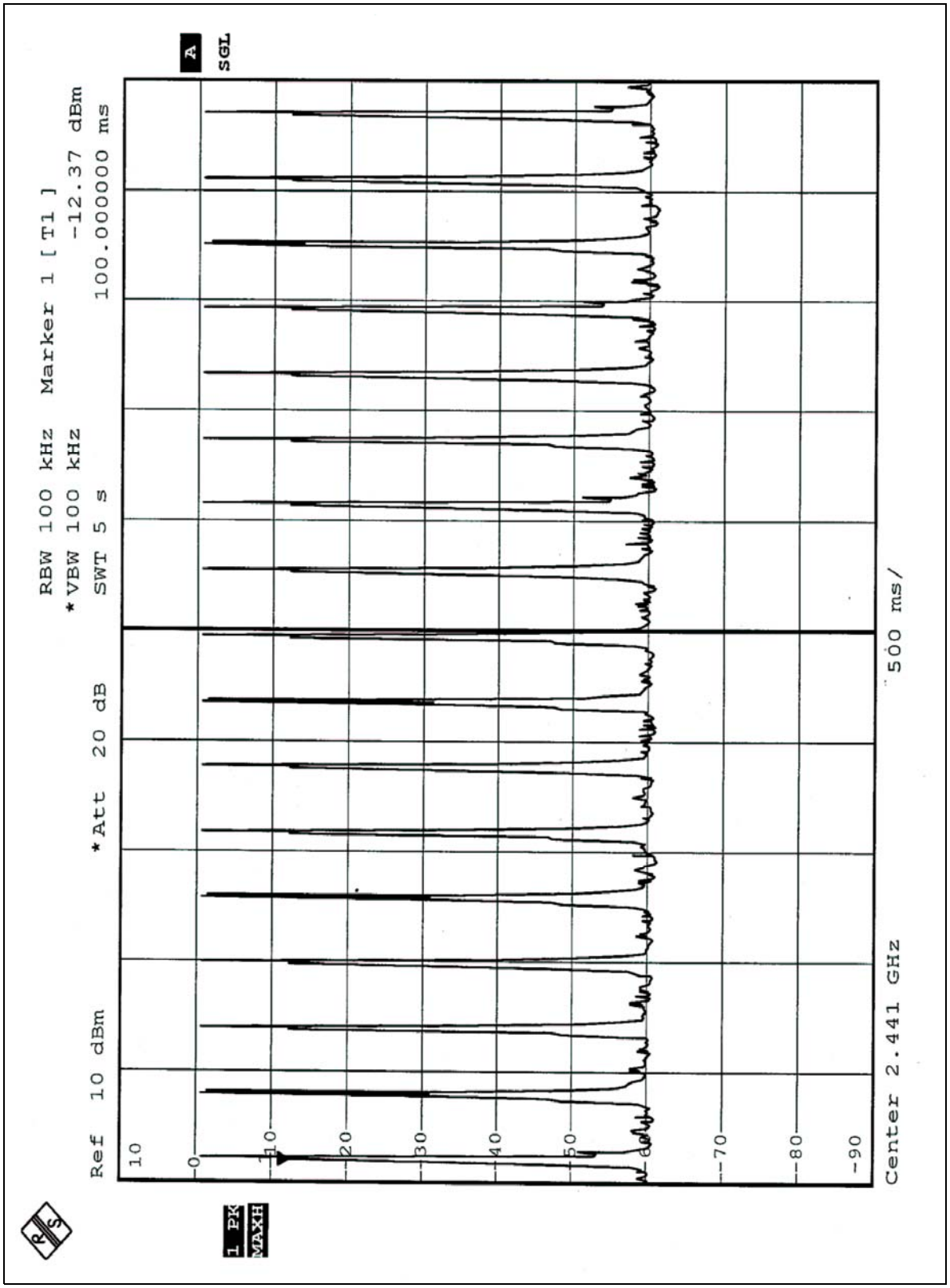

Ref 10 dBm
*Att 20 dB
*VBW 3 MHz
SWT 5 ms
RBW 1 MHz
Delta 1 [T1]
-2.01 dB
480.000000 µs
Marker 1 [T1]
-67.15 dBm
1.100000 ms
A
SGL
1 PK
MAXH
Center 2.441 GHz
500 µs/

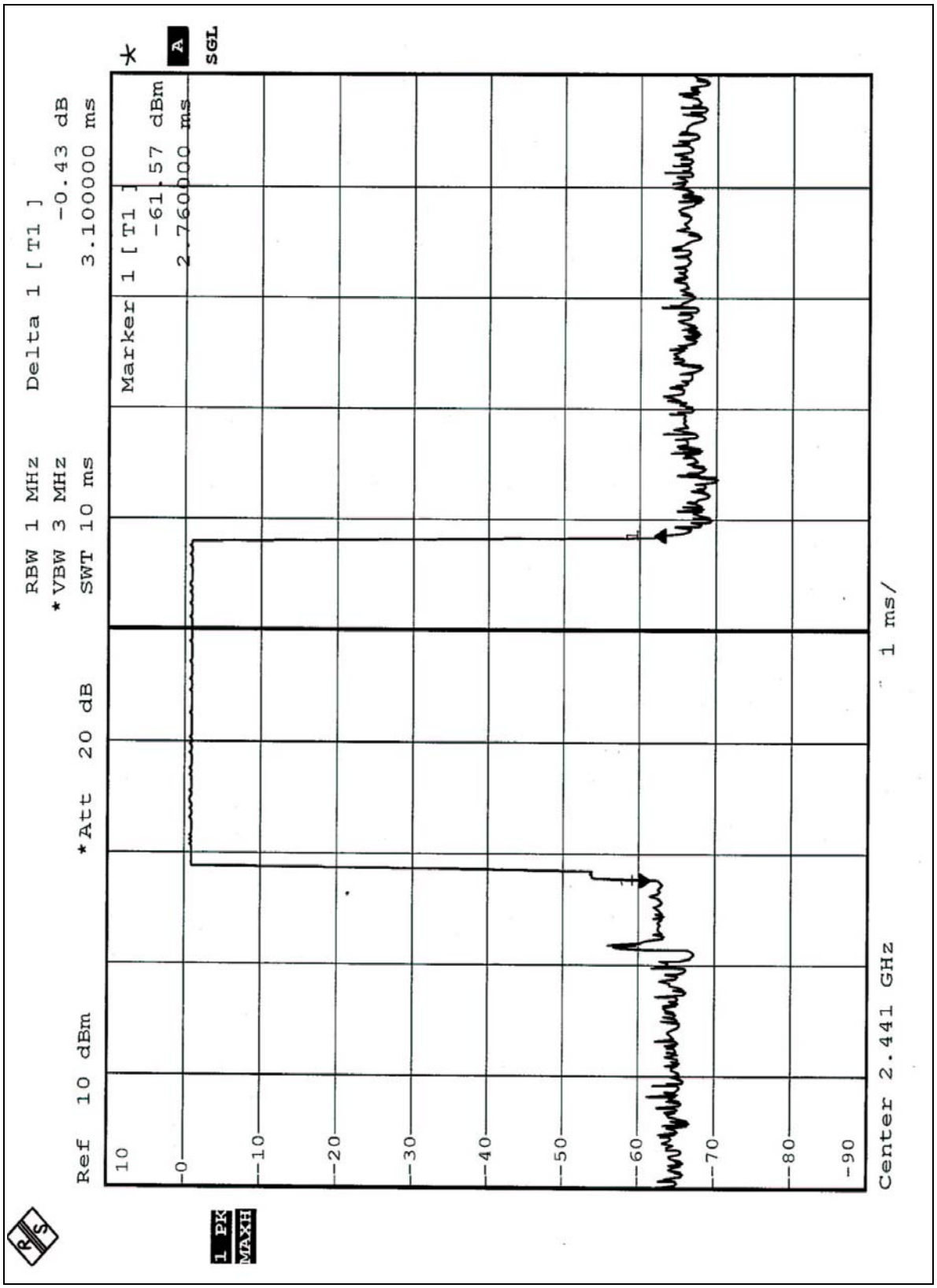
DH3


A
SGL
RBW 100 kHz
*VBW 100 kHz
SWT 5 s
Marker 1 [T1]
-60.78 dBm
100.000000 ms
Ref 10 dBm
*Att 20 dB
500 ms/
Center 2.441 GHz
1 PK
MAXH


RBW 1 MHz
*VBW 3 MHz
SWT 10 ms
Delta 1 [T1]
-0.65 dB
1.780000 ms
Marker 1 [T1]
-66.53 dBm
1.560000 ms
SGL
Ref 10 dBm
*Att 20 dB
1 PK
MAXH
Center 2.441 GHz
1 ms/

DH5


A
SGL
RBW 100 kHz
*VBW 100 kHz
SWT 5 s
*Att 20 dB
Ref 10 dBm
Marker 1 [T1]
-12.37 dBm
100.000000 ms
500 ms/
Center 2.441 GHz
1 PK
MAXH


RBW 1 MHz
*VBW 3 MHz
Ref 10 dBm
*Att 20 dB
SWT 10 ms
Delta 1 [T1]
-0.43 dB
3.100000 ms
Marker 1 [T1]
-61.57 dBm
2.760000 ms
SGL
1 PK MAXH
Center 2.441 GHz
1 ms/

5.3 CHANNEL BANDWIDTH

5.3.1 LIMITS OF CHANNEL BANDWIDTH

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

5.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

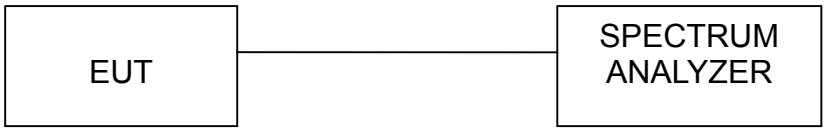
5.3.3 TEST PROCEDURE

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.

5.3.4 DEVIATION FROM TEST STANDARD

No deviation.

5.3.5 TEST SETUP



5.3.6 EUT OPERATING CONDITION

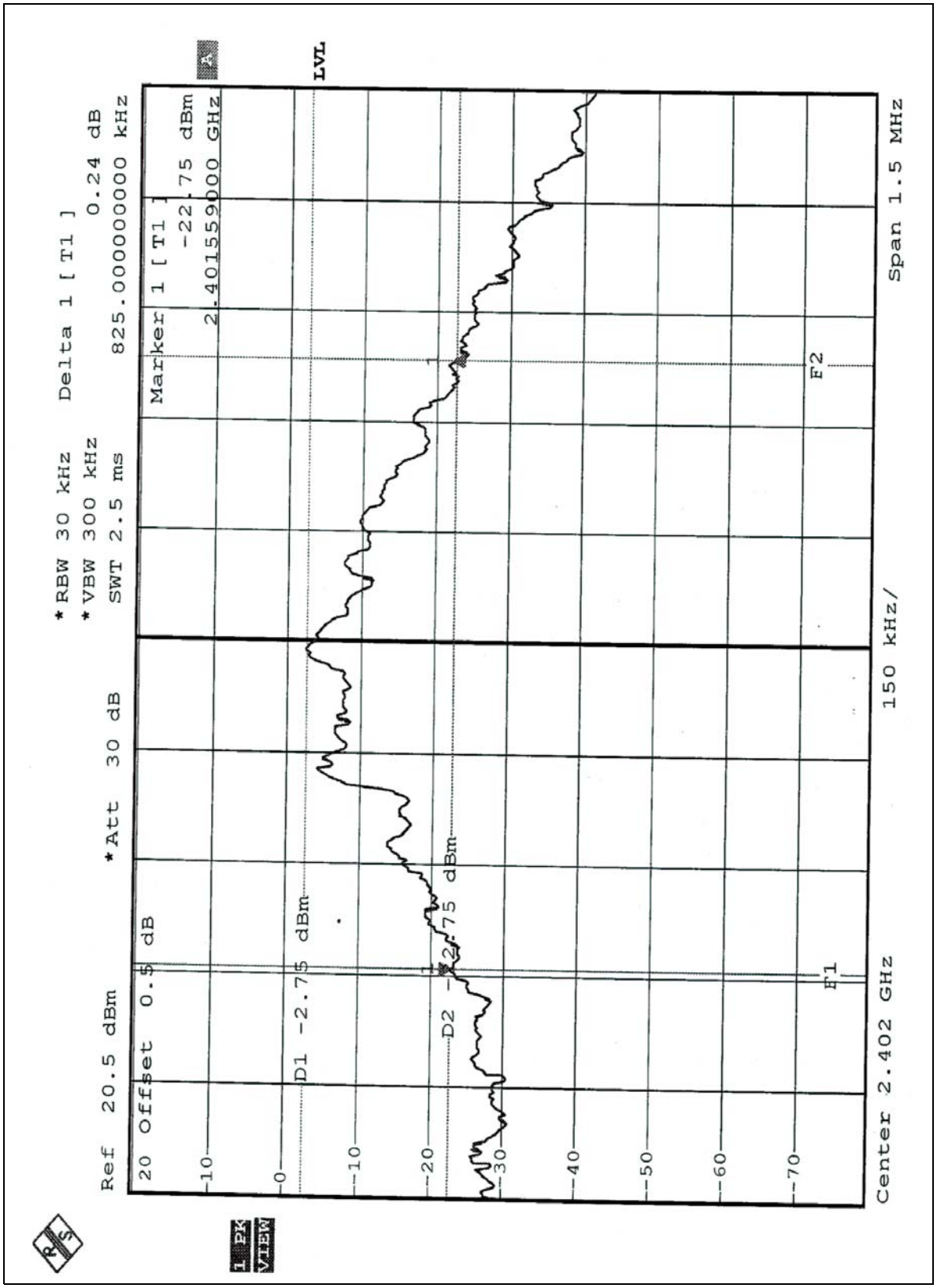
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

5.3.7 TEST RESULTS

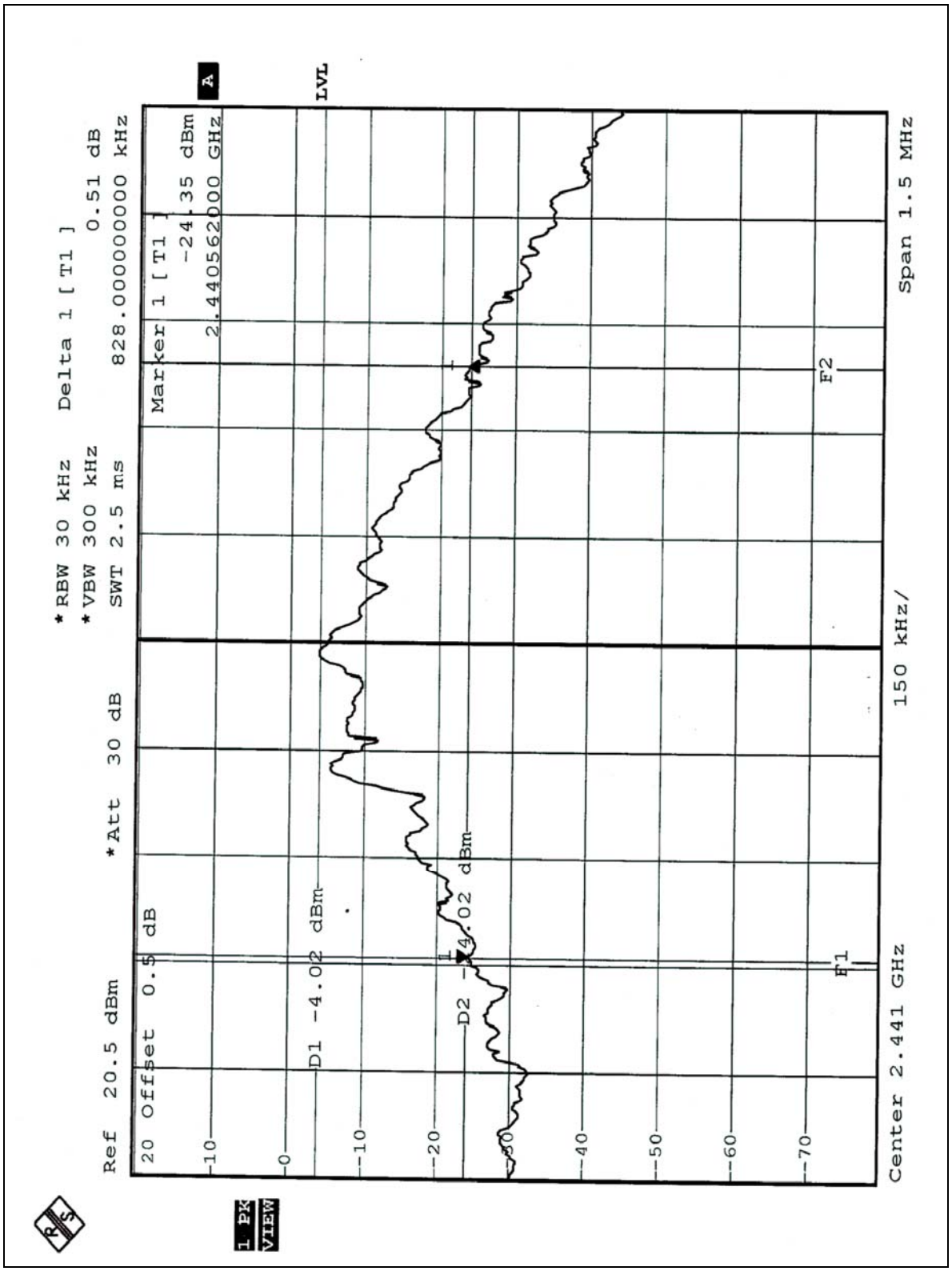
EUT	Handheld Terminal	MODEL	DT-X5M30UR
ENVIRONMENTAL CONDITIONS	24deg. C, 62%RH, 1005hPa	INPUT POWER (SYSTEM)	120Vac, 60 Hz
TESTED BY: Steven Lu			

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (kHz)	MAXIMUM LIMIT (MHz)	PASS/FAIL
0	2402	825	1	PASS
39	2441	828	1	PASS
78	2480	825	1	PASS

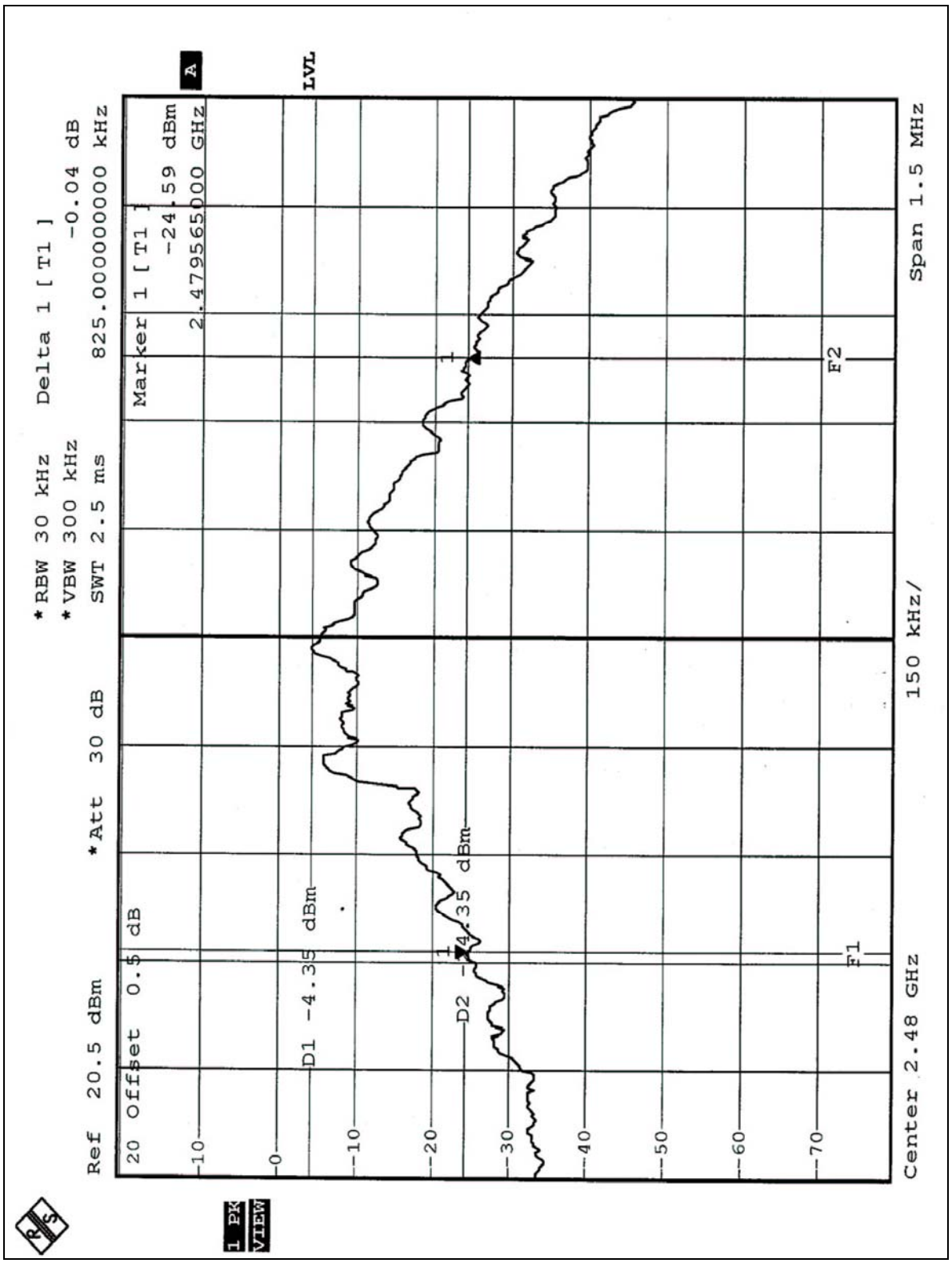
CH0


RBW 30 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
0.24 dB
825.000000000 kHz
Marker 1 [T1]
-22.75 dBm
2.401559000 GHz
Ref 20.5 dBm
Offset 0.5 dB
Att 30 dB
LVL
D1 -2.75 dBm
D2 -22.75 dBm
F1
F2
Center 2.402 GHz
150 kHz/
Span 1.5 MHz
1 PK VIEW

CH39


Ref 20.5 dBm
20 Offset 0.5 dB
*Att 30 dB
*RBW 30 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
0.51 dB
828.000000000 kHz
Marker 1 [T1]
-24.35 dBm
2.440562000 GHz
LVL
D1 -4.02 dBm
D2 -4.02 dBm
F1
F2
Center 2.441 GHz
150 kHz/
Span 1.5 MHz
1 Pk
VIEW

CH78


RBW 30 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.04 dB
825.000000000 kHz
Marker 1 [T1]
-24.59 dBm
2.479565000 GHz
Ref 20.5 dBm
Offset 0.5 dB
Att 30 dB
LVL
D1 -4.35 dBm
D2 -4.35 dBm
F1
F2
Center 2.48 GHz
150 kHz/
Span 1.5 MHz
1 PK VIEW

5.4 HOPPING CHANNEL SEPARATION

5.4.1 LIMITS OF HOPPING CHANNEL SEPARATION

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

5.4.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

5.4.3 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.
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.

5.4.4 DEVIATION FROM TEST STANDARD

No deviation

5.4.5 TEST SETUP

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

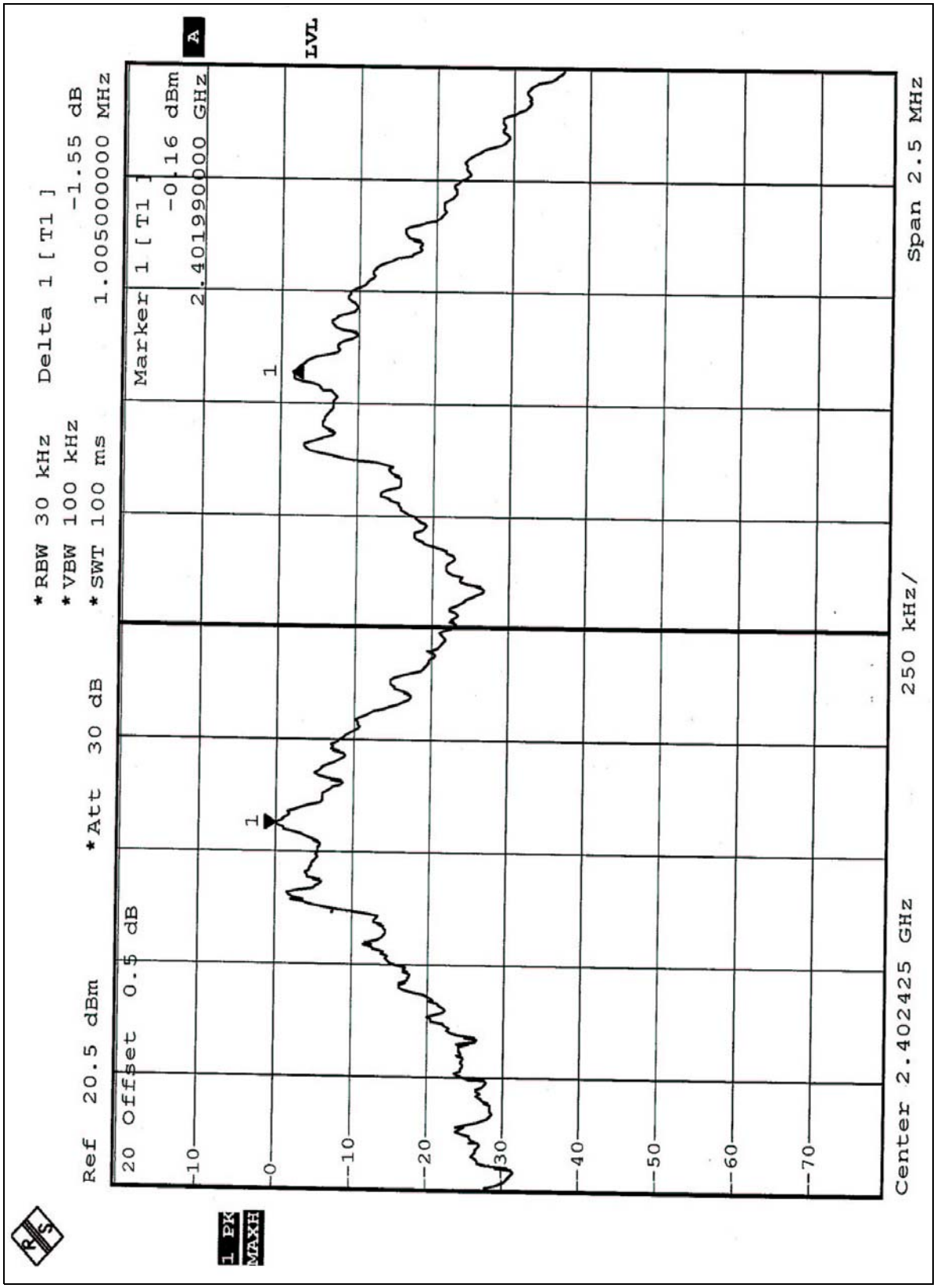
5.4.6 TEST RESULTS

EUT	Handheld Terminal	**MODEL**	DT-X5M30UR
ENVIRONMENTAL CONDITIONS	24deg. C, 62%RH, 1005hPa	**INPUT POWER (SYSTEM)**	120Vac, 60 Hz
TESTED BY: Steven Lu			

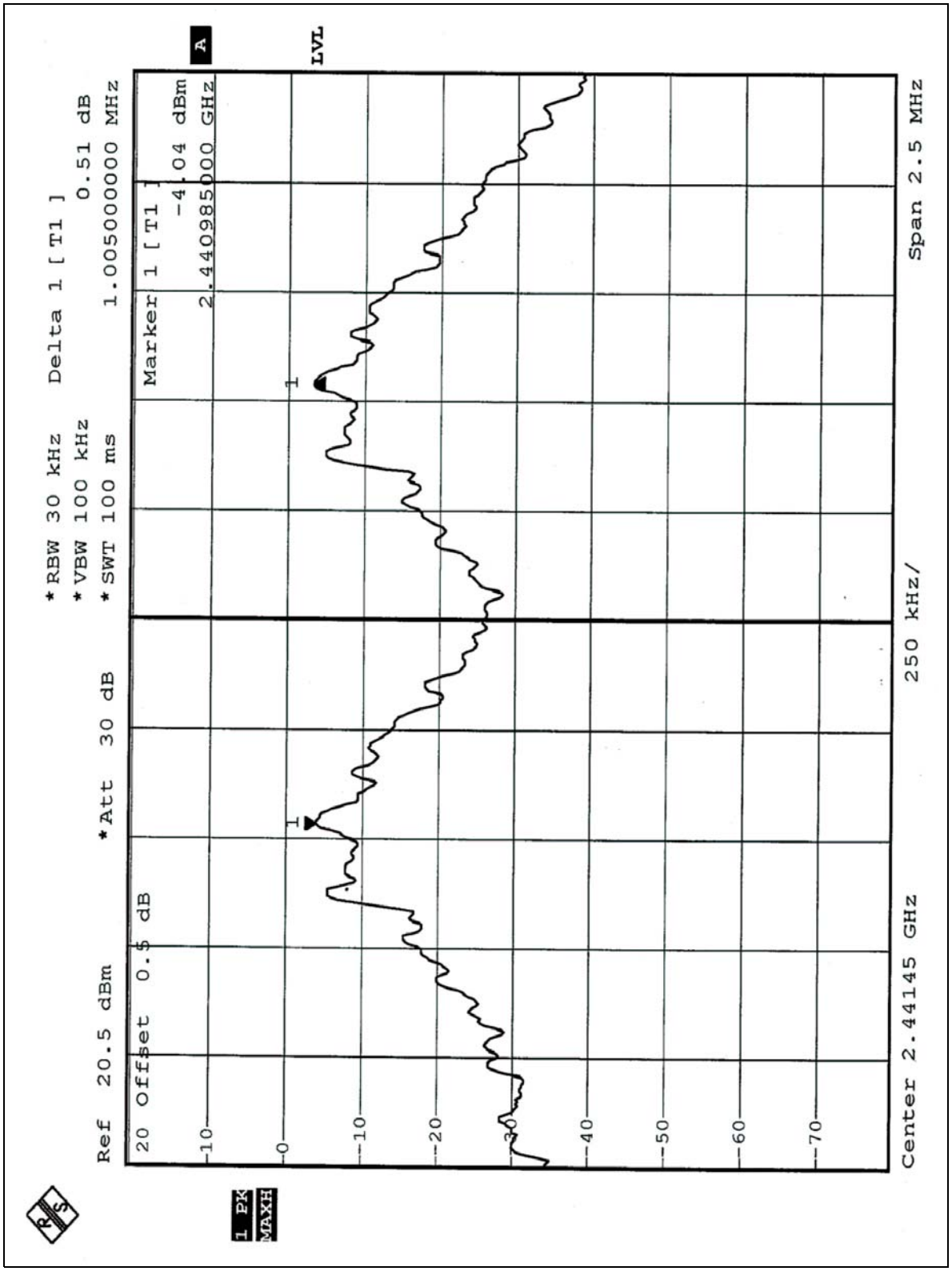
CHANNEL	FREQUENCY (MHz)	Adjacent Channel Separation	MINIMUM LIMIT (kHz)	PASS/FAIL
0	2402	1.005MHz	825	PASS
39	2441	1.005MHz	828	PASS
78	2480	1.005MHz	825	PASS

The minimum limit is 20dB bandwidth. Test results please refer to next three pages.

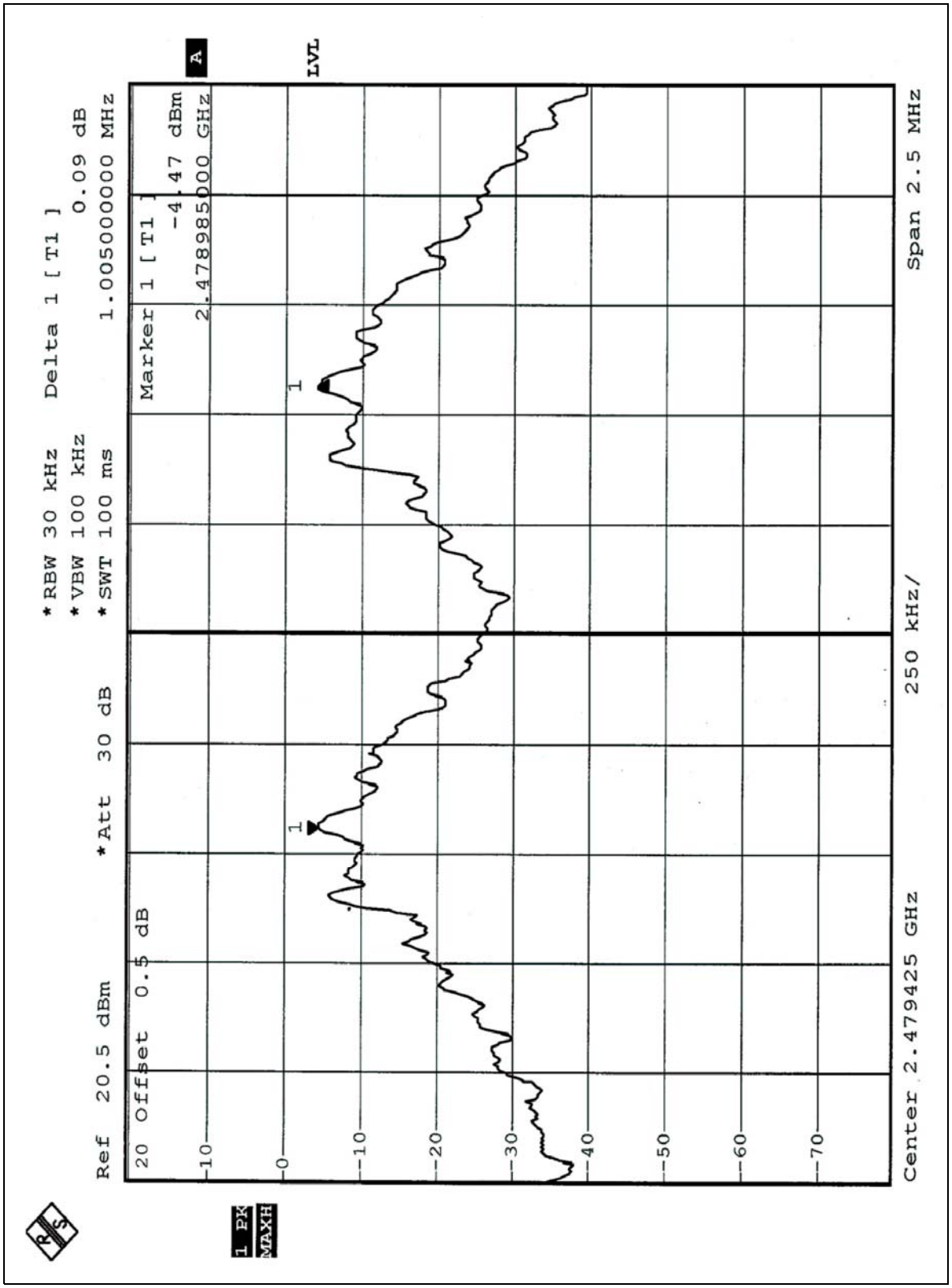
CH0


RBW 30 kHz
VBW 100 kHz
SWT 100 ms
Delta 1 [T1]
-1.55 dB
1.005000000 MHz
Marker 1 [T1]
-0.16 dBm
2.401990000 GHz
Att 30 dB
Ref 20.5 dBm
Offset 0.5 dB
LVL
A
Center 2.402425 GHz
250 kHz/
Span 2.5 MHz
1 PK MAXH

CH39


RBW 30 kHz
VBW 100 kHz
SWT 100 ms
Delta 1 [T1]
0.51 dB
1.00500000 MHz
Marker 1 [T1]
-4.04 dBm
2.44098500 GHz
Ref 20.5 dBm
Offset 0.5 dB
Att 30 dB
LVL
Center 2.44145 GHz
250 kHz/
Span 2.5 MHz
1 PK MAXH

CH78


RBW 30 kHz
VBW 100 kHz
SWT 100 ms
Delta 1 [T1]
0.09 dB
1.005000000 MHz
Marker 1 [T1]
-4.47 dBm
2.478985000 GHz
Ref 20.5 dBm
Offset 0.5 dB
Att 30 dB
LVL
Center 2.479425 GHz
250 kHz/
Span 2.5 MHz
1 PK MAXH

5.5 MAXIMUM PEAK OUTPUT POWER

5.5.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The limit of Maximum Peak Output Power Measurement is 30dBm.

5.5.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

5.5.3 TEST PROCEDURE

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 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. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 3 MHz VBW.
4. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
5. Repeat above procedures until all frequencies measured were complete.

5.5.4 DEVIATION FROM TEST STANDARD

No deviation

5.5.5 TEST SETUP

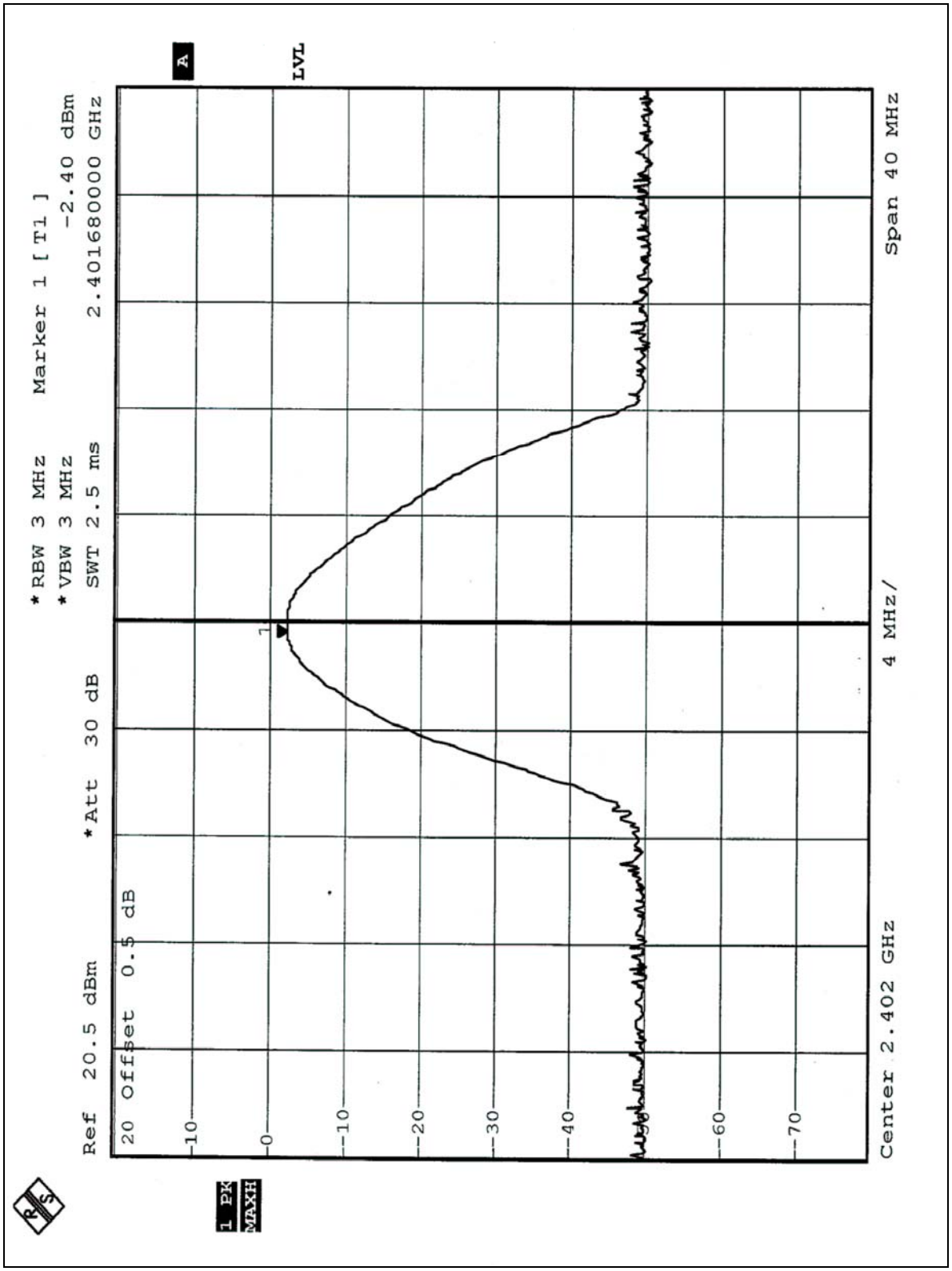
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

5.5.6 TEST RESULTS

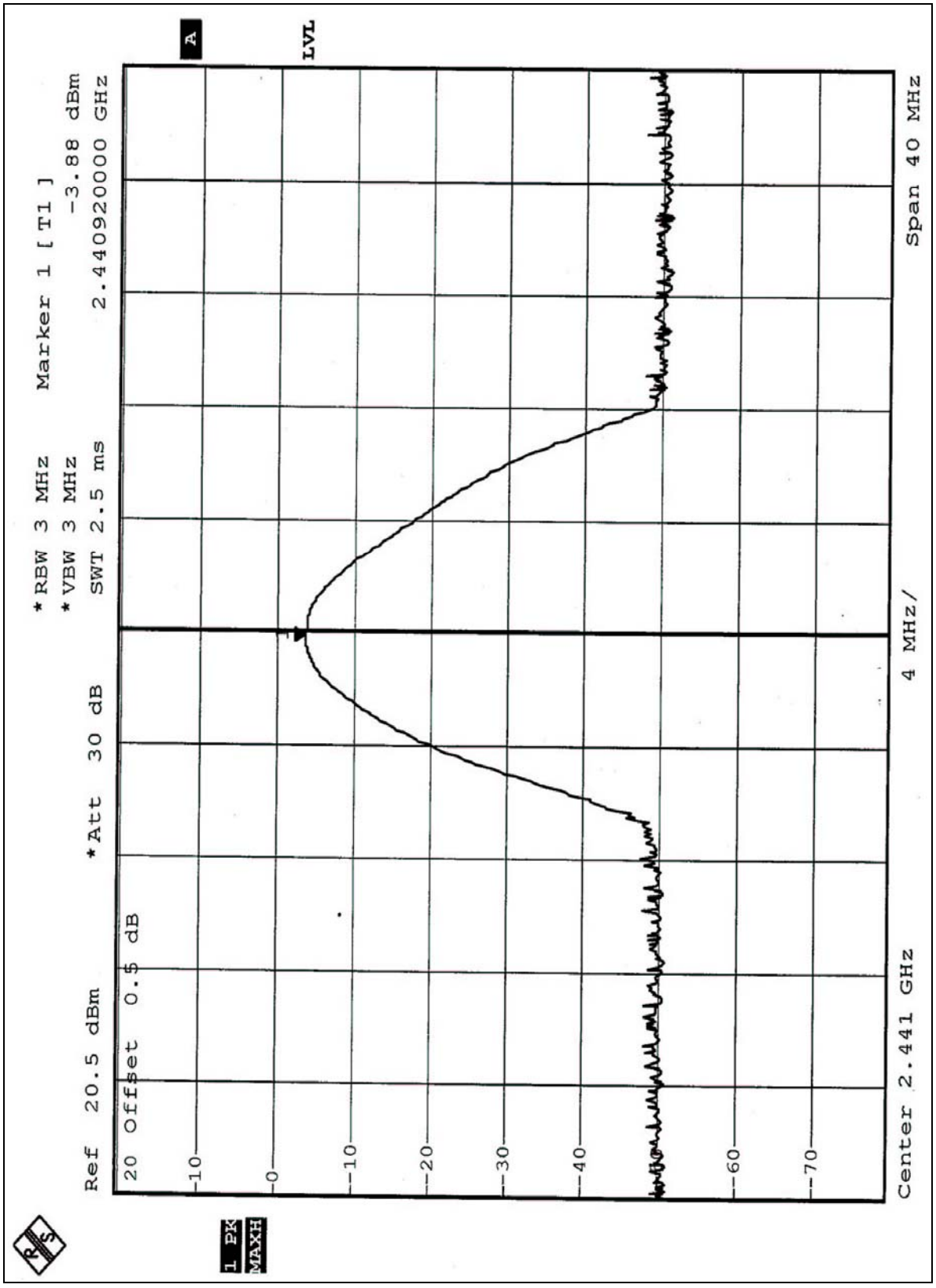
EUT	Handheld Terminal	**MODEL**	DT-X5M30UR
ENVIRONMENTAL CONDITIONS	24deg. C, 62%RH, 1005hPa	**INPUT POWER (SYSTEM)**	120Vac, 60 Hz
TESTED BY: Steven Lu			

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
0	2402	0.575	-2.40	30	PASS
39	2441	0.409	-3.88	30	PASS
78	2480	0.356	-4.48	30	PASS

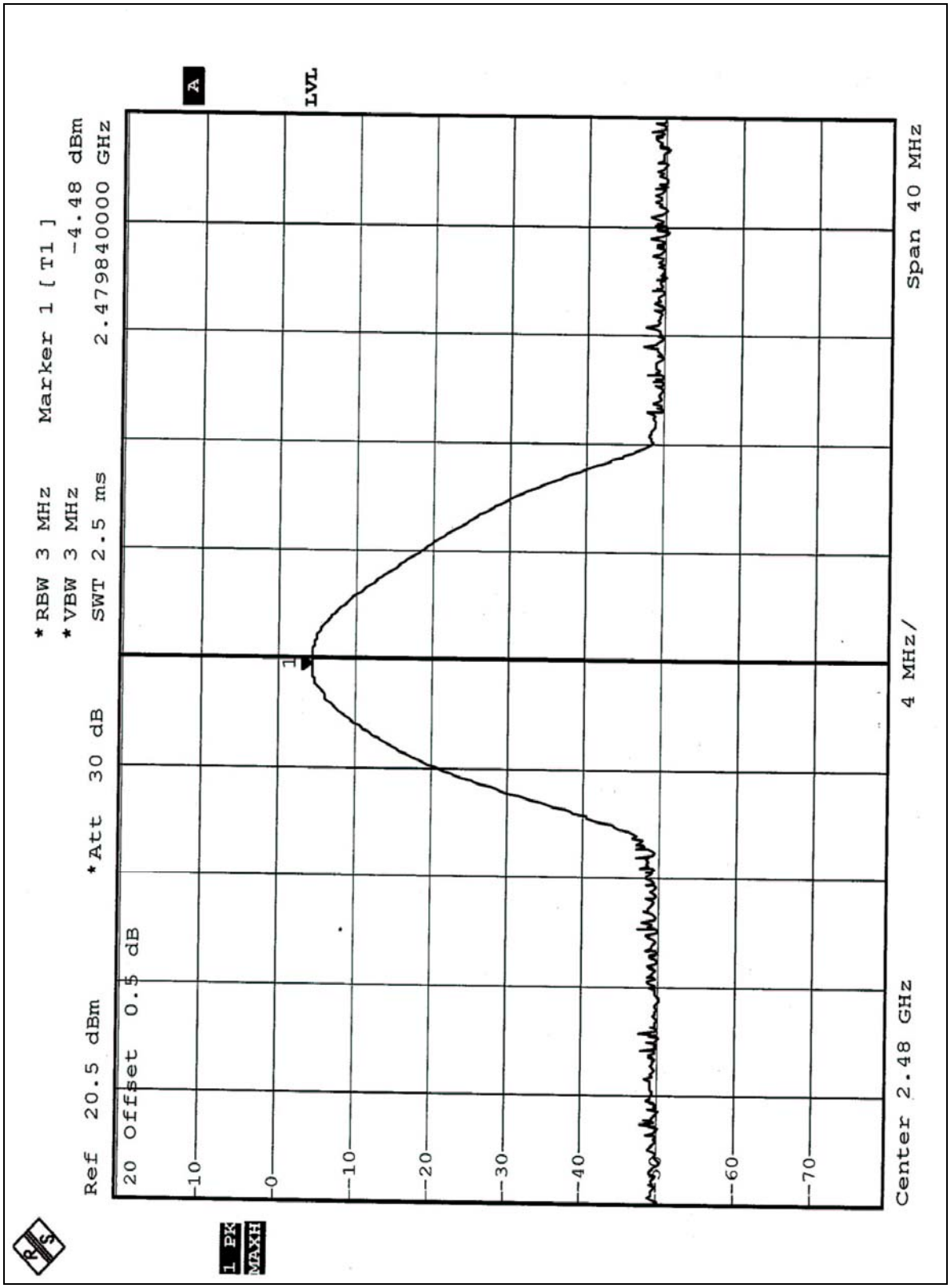
CH0


Ref 20.5 dBm
20 Offset 0.5 dB
*Att 30 dB
*RBW 3 MHz
*VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
-2.40 dBm
2.401680000 GHz
A
LVL
1 PK
MAXH
Center 2.402 GHz
4 MHz/
Span 40 MHz

CH39


A
LVL
Marker 1 [T1]
-3.88 dBm
2.440920000 GHz
*RBW 3 MHz
*VBW 3 MHz
SWT 2.5 ms
Span 40 MHz
*Att 30 dB
Ref 20.5 dBm
20 Offset 0.5 dB
4 MHz/
Center 2.441 GHz
1 PK
MAXH

CH78


A
LVL
Marker 1 [T1]
-4.48 dBm
2.47984000 GHz
*RBW 3 MHz
*VBW 3 MHz
SWT 2.5 ms
Span 40 MHz
Ref 20.5 dBm
*Att 30 dB
Offset 0.5 dB
4 MHz/
Center 2.48 GHz
1 PK
MAXH

5.6 RADIATED EMISSION MEASUREMENT

5.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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 20dB under any condition of modulation.

5.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED UNTIL
* HP Spectrum Analyzer	8593E	3911A07465	June 27, 2005
* HP Preamplifier	8447D	2432A03504	June 03, 2005
* HP Preamplifier	8449B	3008A01292	Aug. 29, 2005
SCHAFFNER Tunable Dipole Antenna	VHBA 9123	459	May 25, 2005
SCHWARZBECK Tunable Dipole Antenna	UHA 9105	977	
* ROHDE & SCHWARZ Test Receiver	ESI7	838496/016	Feb. 08, 2005
* Schwarzbeck Antenna	VULB9168	137	Feb. 27, 2005
* SCHWARZBECK Horn Antenna	BBHA9120-D1	D130	June 14, 2005
* ADT. Turn Table	TT100	0306	NA
* ADT. Tower	AT100	0306	NA
* Software	ADT_Radiated_V5.14	NA	NA
* TIMES RF cable	LL142	CABLE-CH6-01	Apr. 16, 2005

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. "*" = These equipment are used for the final measurement.
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The test was performed in ADT Chamber No. 6.

5.6.3 TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.

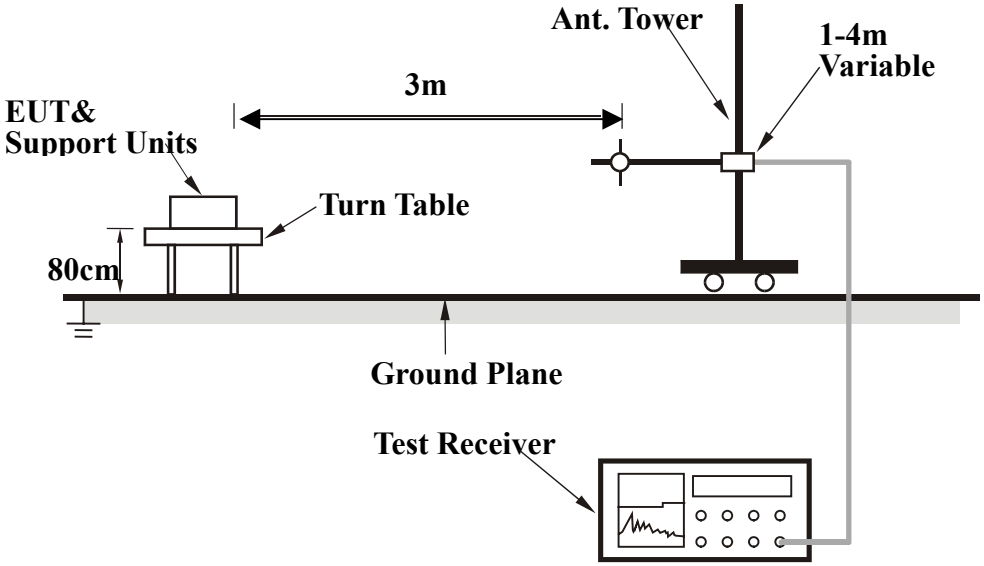
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.

3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for Average detection (AV) at frequency above 1GHz.

5.6.4 DEVIATION FROM TEST STANDARD

No deviation

5.6.5 TEST SETUP



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

5.6.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

5.6.7 TEST RESULTS

EUT	Handheld Terminal	MODEL	DT-X5M30UR
MODE	Channel 78	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	22 deg. C, 65% RH, 1005 hPa	TESTED BY: Jamison Chan	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	119.42	38.71 QP	43.50	-4.79	1.60 H	337	27.15	11.56
2	313.81	36.11 QP	46.00	-9.89	1.60 H	259	20.49	15.62
3	364.35	37.27 QP	46.00	-8.73	1.60 H	334	20.66	16.61
4	720.08	34.09 QP	46.00	-11.91	1.20 H	331	10.26	23.83
5	807.56	38.14 QP	46.00	-7.86	1.20 H	259	13.16	24.97
6	906.69	33.78 QP	46.00	-12.22	1.20 H	334	7.93	25.86

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	76.65	24.98 QP	40.00	-15.02	1.60 V	340	14.97	10.02
2	173.85	32.76 QP	43.50	-10.74	1.20 V	337	20.00	12.75
3	430.44	37.01 QP	46.00	-8.99	1.60 V	256	18.84	18.17
4	519.86	33.63 QP	46.00	-12.37	1.60 V	256	13.35	20.27
5	764.79	32.00 QP	46.00	-14.00	1.80 V	328	7.20	24.80
6	918.36	37.92 QP	46.00	-8.08	1.60 V	340	11.85	26.08

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

EUT	Handheld Terminal	MODEL	DT-X5M30UR
MODE	Channel 0	FREQUENCY RANGE	1 ~25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60% RH, 1005 hPa	TESTED BY: Steven Lu	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	25.47 PK	74.00	-48.53	1.94 H	296	-6.01	31.48
2	*2402.00	87.74 PK			1.94 H	296	56.25	31.49
2	*2402.00	57.74 AV			1.94 H	296	26.25	31.49
3	4804.00	56.12 PK	74.00	-17.88	1.93 H	324	18.30	37.83
3	4804.00	26.12 AV	54.00	-27.88	1.93 H	324	-11.71	37.83

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	27.64 PK	74.00	-46.36	1.04 V	188	-3.84	31.48
2	*2402.00	94.90 PK			1.04 V	188	63.41	31.49
2	*2402.00	64.90 AV			1.04 V	188	33.41	31.49
3	4804.00	55.30 PK	74.00	-18.70	1.01 V	225	17.48	37.83
3	4804.00	25.30 AV	54.00	-28.70	1.01 V	225	-12.53	37.83

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625*5 per 274 ms per channel. Therefore the duty cycle be equal to: 20log(3.125/100)= -30dB
7. Average value = peak reading –20log(duty cycle)

EUT	Handheld Terminal	MODEL	DT-X5M30UR
MODE	Channel 39	FREQUENCY RANGE	1 ~25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60% RH, 1005 hPa	TESTED BY: Steven Lu	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	84.08 PK			1.03 H	166	52.54	31.54
1	*2441.00	54.08 AV			1.03 H	166	22.54	31.54
2	4882.00	51.08 PK	74.00	-22.92	1.01 H	264	13.13	37.95
2	4882.00	21.08 AV	54.00	-32.92	1.01 H	264	-16.87	37.95

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	94.20 PK			1.04 V	189	62.66	31.54
1	*2441.00	64.20 AV			1.04 V	189	32.66	31.54
2	4882.00	52.34 PK	74.00	-21.66	1.04 V	189	14.39	37.95
2	4882.00	22.34 AV	54.00	-31.66	1.04 V	189	-15.61	37.95

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625*5 per 274 ms per channel. Therefore the duty cycle be equal to: 20log(3.125/100)= -30dB
7. Average value = peak reading –20log(duty cycle)

EUT	Handheld Terminal	MODEL	DT-X5M30UR
MODE	Channel 78	FREQUENCY RANGE	1 ~25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	20 deg. C, 60% RH, 1005 hPa	TESTED BY: Steven Lu	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	83.72 PK			1.33 H	158	52.13	31.59
1	*2480.00	53.72 AV			1.33 H	158	22.13	31.59
2	2484.00	37.43 PK	74.00	-36.57	1.33 H	158	5.83	31.60
3	4960.00	50.40 PK	74.00	-23.60	1.24 H	110	12.32	38.08
3	4960.00	20.40 AV	54.00	-33.60	1.24 H	110	-17.68	38.08

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	93.80 PK			1.00 V	186	62.21	31.59
1	*2480.00	63.80 AV			1.00 V	186	32.21	31.59
2	2484.00	36.76 PK	74.00	-37.24	1.00 V	186	5.16	31.60
3	4960.00	50.34 PK	74.00	-23.66	1.03 V	237	12.26	38.08
3	4960.00	20.34 AV	54.00	-33.66	1.24 H	110	-17.74	38.08

REMARKS:
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625*5 per 274 ms per channel. Therefore the duty cycle be equal to: 20log(3.125/100)= -30dB
7. Average value = peak reading –20log(duty cycle)

5.7 BAND EDGES MEASUREMENT

5.7.1 LIMITS OF BAND EDGES MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

5.7.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSP 40	100035	Apr. 19, 2005

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

5.7.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100MHz bandwidth from band edge. The band edges was measured and recorded.

5.7.4 DEVIATION FROM TEST STANDARD

No deviation.

5.7.5 EUT OPERATING CONDITION

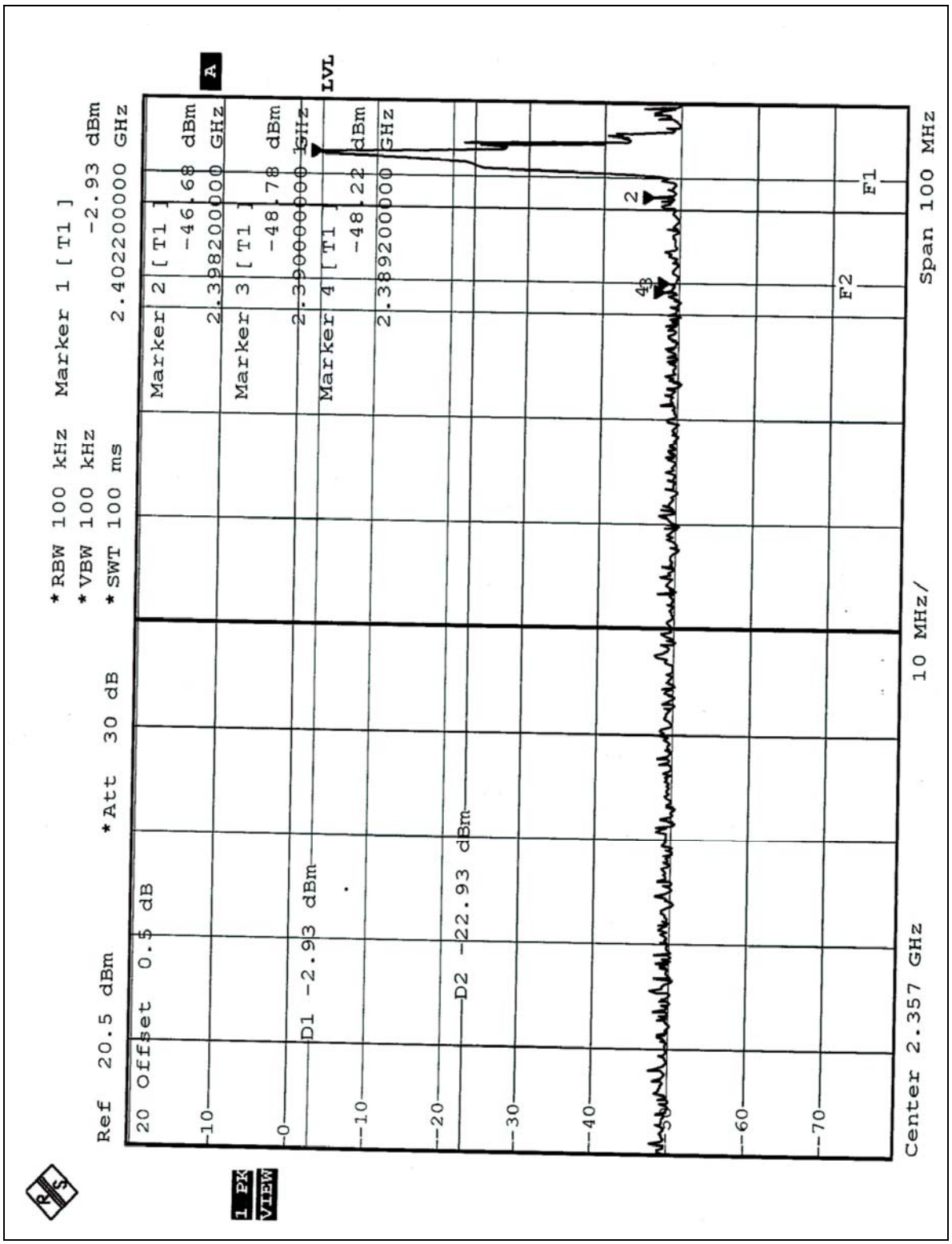
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

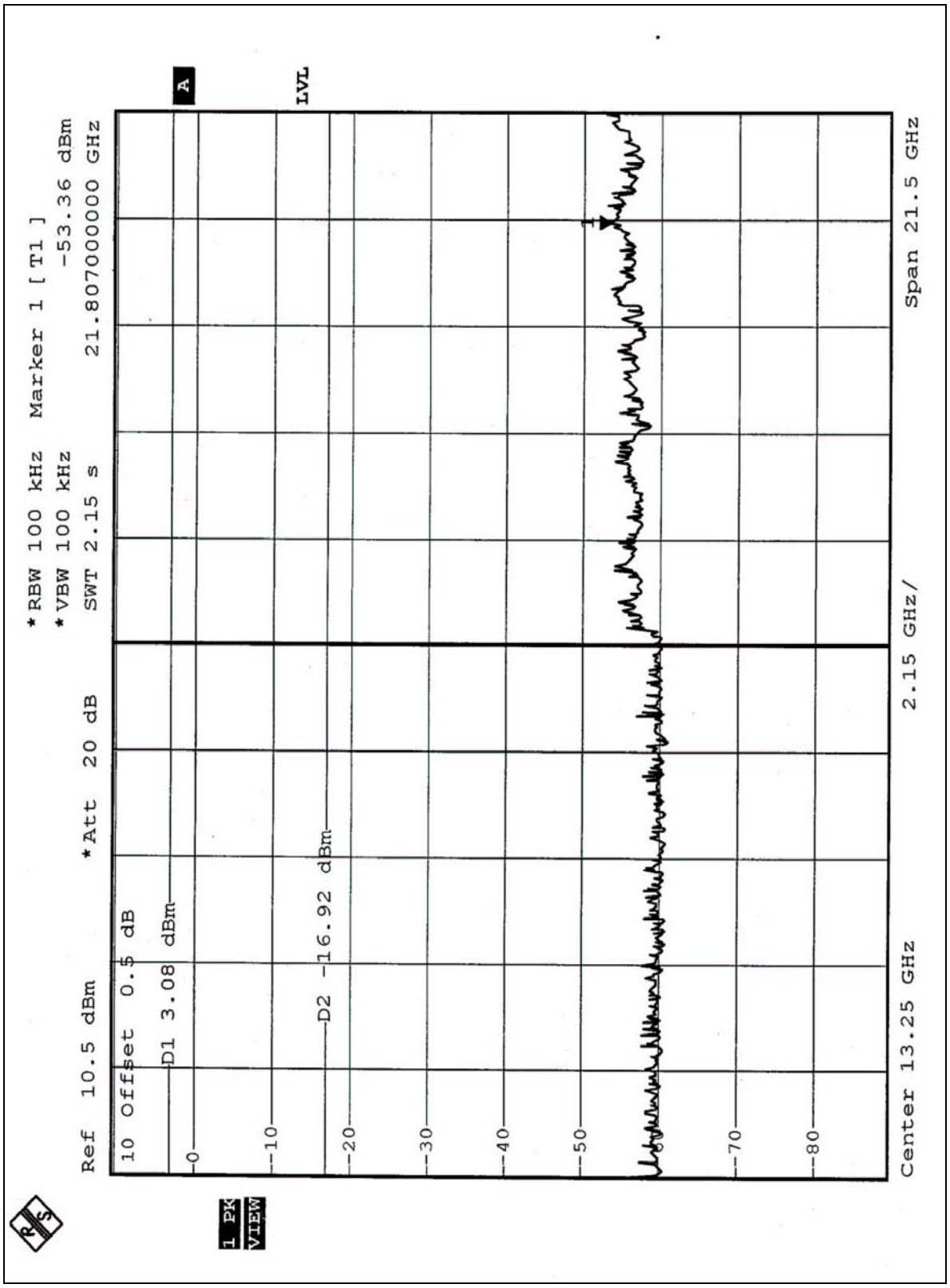
5.7.6 TEST RESULTS

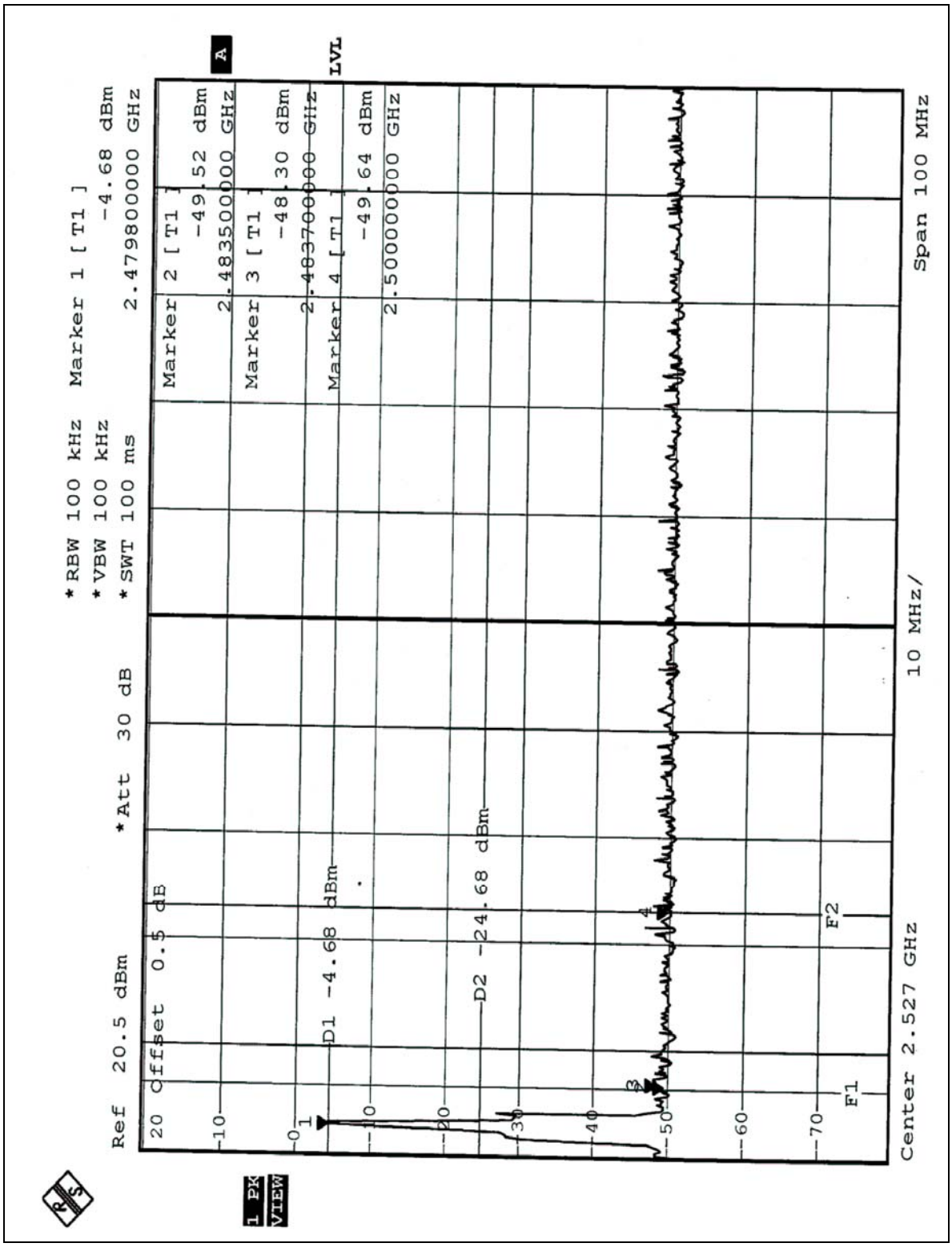
The spectrum plots are attached on the following 2 pages. D2 line indicates the highest level, D1 line indicates the 20dB offset below D2. It shows compliance with the requirement in part 15.247(d).

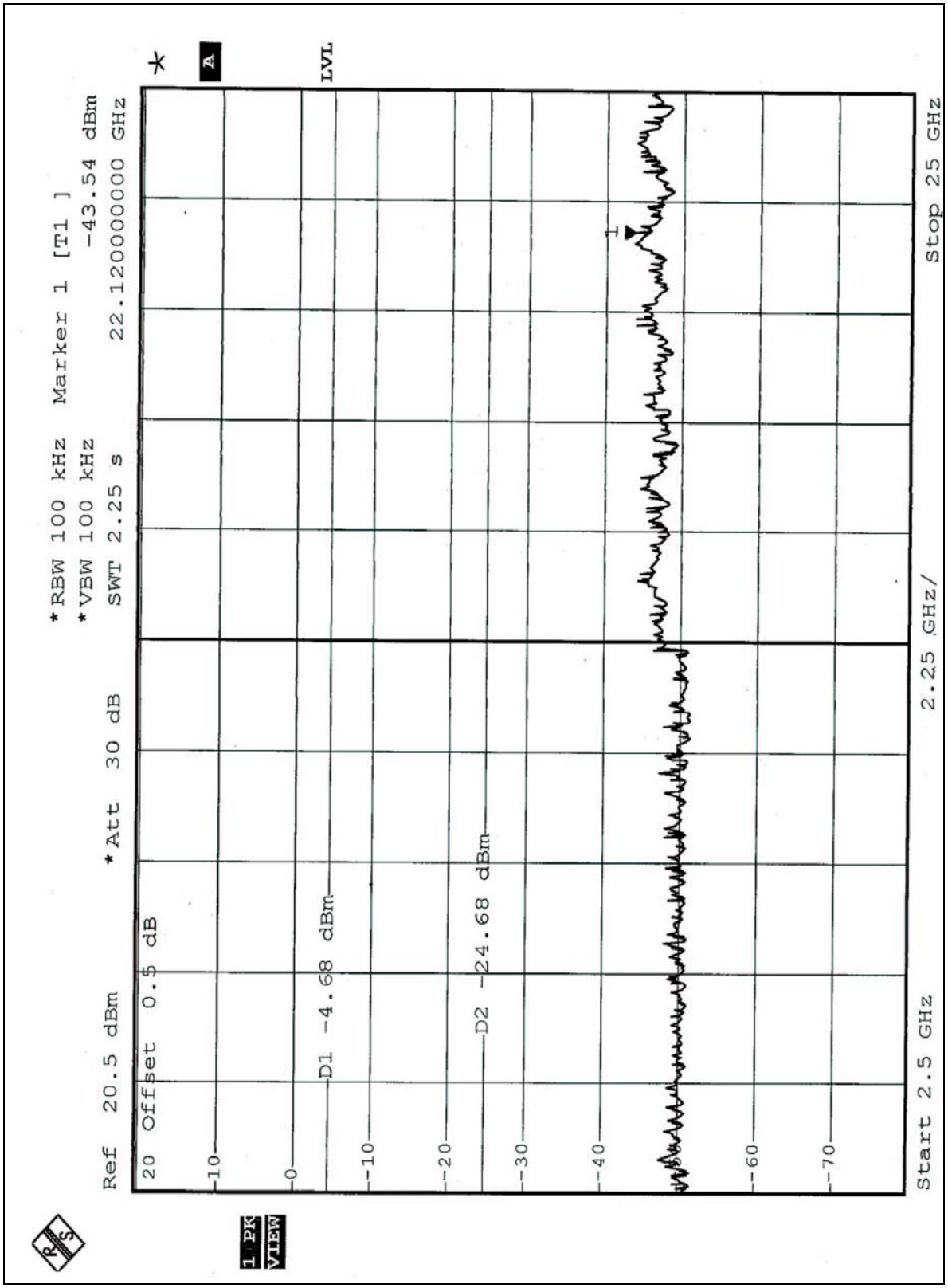
NOTE 1: The band edge emission plot on the following first page shows 45.29dB delta between carrier maximum power and local maximum emission in restrict band (2.3892GHz). The emission of carrier strength list in the test result of channel 0 at the item 4.2.7 is 64.90BuV/m, so the maximum field strength in restrict band is 64.90-45.29=19.61dBuV/m which is under 54dBuV/m limit.

NOTE 2: The band edge emission plot on the following second page shows 43.62dB delta between carrier maximum power and local maximum emission in restrict band (2.4837Hz). The emission of carrier strength list in the test result of channel 78 at the item 4.2.7 is 63.80dBuV/m, so the maximum field strength in restrict band is 63.80-43.62=20.18BuV/m which is under 54dBuV/m limit.


Ref 20.5 dBm
20 Offset 0.5 dB
*Att 30 dB
*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-2.93 dBm
2.402200000 GHz
Marker 2 [T1]
-46.68 dBm
2.398200000 GHz
Marker 3 [T1]
-48.78 dBm
2.390000000 GHz
Marker 4 [T1]
-48.22 dBm
2.389200000 GHz
D1 -2.93 dBm
D2 -22.93 dBm
LVL
A
1 PK VIEW
Center 2.357 GHz
10 MHz/
Span 100 MHz
F1
F2


*RBW 100 kHz
*VBW 100 kHz
SWT 2.15 s
Marker 1 [T1]
-53.36 dBm
21.807000000 GHz
Ref 10.5 dBm
10 Offset 0.5 dB
*Att 20 dB
D1 3.08 dBm
D2 -16.92 dBm
A
LVL
1 PK VIEW
Center 13.25 GHz
2.15 GHz/
Span 21.5 GHz


RBW 100 kHz
VBW 100 kHz
SWT 100 ms
Marker 1 [T1]
-4.68 dBm
2.479800000 GHz
Att 30 dB
Ref 20.5 dBm
Offset 0.5 dB
Marker 2 [T1]
-49.52 dBm
2.483500000 GHz
Marker 3 [T1]
-48.30 dBm
2.483700000 GHz
Marker 4 [T1]
-49.64 dBm
2.500000000 GHz
LVL
A
D1 -4.68 dBm
D2 -24.68 dBm
F1
F2
1 PK VIEW
Center 2.527 GHz
10 MHz/
Span 100 MHz


Ref 20.5 dBm
20 Offset 0.5 dB
*Att 30 dB
*RBW 100 kHz
*VBW 100 kHz
SWT 2.25 s
Marker 1 [T1]
-43.54 dBm
22.120000000 GHz
D1 -4.68 dBm
D2 -24.68 dBm
Start 2.5 GHz
2.25 GHz/
Stop 25 GHz
1 PK VIEW

5.8 ANTENNA REQUIREMENT

5.8.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.8.2 ANTENNA CONNECTED CONSTRUCTION

For Bluetooth, the antenna type used in this product is multi-layer ceramic embedded antenna from Walsin Technology Corp. The maximum Gain of this antenna is 4.26dBi.

6 PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST

7 INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025, Guide 25 or EN 45001:

USA	FCC, NVLAP, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	CNLA, BSMI, DGT
Netherlands	Telefication
Singapore	PSB , GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml.
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The address and road map of all our labs can be found in our web site also.

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