

FCC Part 15 EMI TEST REPORT of

E.U.T. : Bluetooth Device

MODEL : Bluemate-630

FCC ID. : RLM-Bluemate-630

for

APPLICANT : Hi-Pro International R&D Co., Ltd.

ADDRESS : 7F, NO. 295, RUI GUANG RD, NEI HU, TAIPEI
TAIWAN

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN

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Report Number : ET93S-04-050

TEST REPORT CERTIFICATION

Applicant : Hi-Pro International R&D Co., Ltd.
7F, NO. 295, RUI GUANG RD, NEI HU, TAIPEI TAIWAN

Manufacturer : Hi-Pro International R&D Co., Ltd.
7F, NO. 295, RUI GUANG RD, NEI HU, TAIPEI TAIWAN

Description of EUT :

- a) Type of EUT : Bluetooth Device
- b) Trade Name : Bluemate
- c) Model No. : Bluemate-630
- d) Power Supply : 3.7VDC (Rechargeable Battery)
AC Adaptor (Sunfone/ACGN-03)
Input: 100-240VAC, 50/60Hz, 0.2A ; Output: 5.0VDC, 1A

Regulation Applied : FCC Rules and Regulations Part 15 Subpart B & C (2003)

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of ETC.

Issued Date : May 21, 2004

Test Engineer : 

Approve & Authorized Signer : 

Signature

Win-Po Tsai

Manager of EMC Testing Department

Electronics Testing Center, Taiwan

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1 GENERAL INFORMATION

1.1 Product Description

- a) Type of EUT : Bluetooth Device
- b) Trade Name : Bluemate
- c) Model No. : Bluemate-630
- d) Power Supply : 3.7VDC (Rechargeable Battery)
AC Adaptor (Sunfone/ACGN-03)
Input: 100-240VAC, 50/60Hz, 0.2A ; Output: 5.0VDC, 1A

1.2 Characteristics of Device

The EUT is a Bluetooth Device based on the Bluetooth technology. Bluetooth is a short-range radio link intended to be a cable replacement between portable or fixed electronic devices. Bluetooth operates in the unlicensed ISM Band at 2.4GHz. In this band, 79 RF channels spaced 1MHz apart are defined.

1.3 Test Methodology

Both Conducted and radiated testing were performed according to the procedures documented on ANSI C63.4 and FCC CFR 47 Part 2 and Part 15.

1.4 Modification List of EUT

N/A

1.5 Test Facility

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

2 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:

A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:

A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :

A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:

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

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following:

| Frequency MHz | Quasi Peak dB μ V | Average dB μ V |
|------------------|--------------------------|-----------------------|
| 0.15 - 0.5 | 66-56* | 56-46* |
| 0.5 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

*Decreases with the logarithm of the frequency.

For intentional device, according to § 15.207(a) Line Conducted Emission Limits is same as above table.

(2) Radiated Emission Requirement

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency MHz | Distance Meters | Radiated dB μ V/m | Radiated μ V/m |
|------------------|--------------------|--------------------------|-----------------------|
| 30 - 88 | 3 | 40.0 | 100 |
| 88 - 216 | 3 | 43.5 | 150 |
| 216 - 960 | 3 | 46.0 | 200 |
| above 960 | 3 | 54.0 | 500 |

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

(3) Antenna Requirement

For intentional device, according to § 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.

(4) 20dB Bandwidth Requirement

For frequency hopping systems, according to 15.247(a)(1), hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

(5) Output Power Requirement

For frequency hopping systems, according to 15.247(1), operating in the 2400-2483.5MHz band employing at least 75 hopping channels. The maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(6) 100 kHz Bandwidth of Frequency Band Edges Requirement

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a), whichever results in the lesser attenuation.

(7) Number of Hopping Channels

According to 15.247(b)(1), for frequency hopping systems, operating in the 2400-2483.5MHz band employing at least 75 hopping channels.

(8) Channel Carrier Frequencies Separation

According to 15.247(a)(1)(iii), the frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

(9) Dwell Time

According to 15.247(a)(1)(iii), frequency hopping system in the 2400-2483.5MHz band employing at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 second multiplied by the number of hopping channels employed.

(10) Power Spectral Density

According to 15.247(d), for bluetooth device, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below :

| MHz | MHz | MHz | GHz |
|-------------------|-----------------------|---------------|-------------|
| 0.090 - 0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.25 |
| 0.495 - 0.505 ** | 16.69475 - 16.69525 | 608-614 | 5.35-5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475 - 156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2655-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | | | |

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

2.4 Labeling Requirement

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

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

2.5 User Information

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

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

3. SYSTEM TEST CONFIGURATION

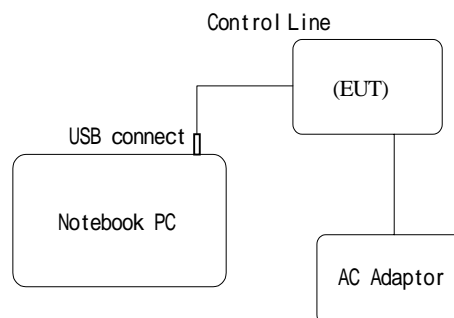
3.1 Justification

For the purposes of this test report ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT during the test. Notebook PC was used to control the RF channel under the highest, middle and lowest frequency and transmit the maximum RF power. Customer would not use it. But never the less ancillary equipment can influence the test results..

3.2 Devices for Tested System

| Device | Manufacture | Model | Cable Description |
|-------------------|------------------------------------|--------------|---|
| *Bluetooth Device | Hi-Pro International R&D Co., Ltd. | Bluemate-630 | 0.05m, Unshielded Control Line |
| Adapter | Sunfone | ACGN-03 | 1.5m, Unshielded Line |
| Notebook PC | ASUS | S1300 | 3.3m, Unshielded Power Line (Adaptor) 0.05m, Unshielded Control Line |
| Control line | ---- | ---- | 0.01m, Unshielded Control Line |

Remark “*” means equipment under test.



Note: During both conducted and radiated testing, the Notebook PC would take off the system after every setting were completed.

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For unintentional radiator, the radiated emission shall comply with § 15.109(a).

For intentional radiators, according to § 15.247 (a), operation under this provision is limited to frequency hopping and frequency hopping spread spectrum, and the out band emission shall be comply with § 15.247 (c)

4.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, it is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions. For emission frequencies measured above 1 GHz, a pre-scan be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

Note : A band pass filter was used to avoid pre-amplifier saturated when measure TX operation mode in frequency band above 1 GHz.

5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the datarate, placement of ANT. cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

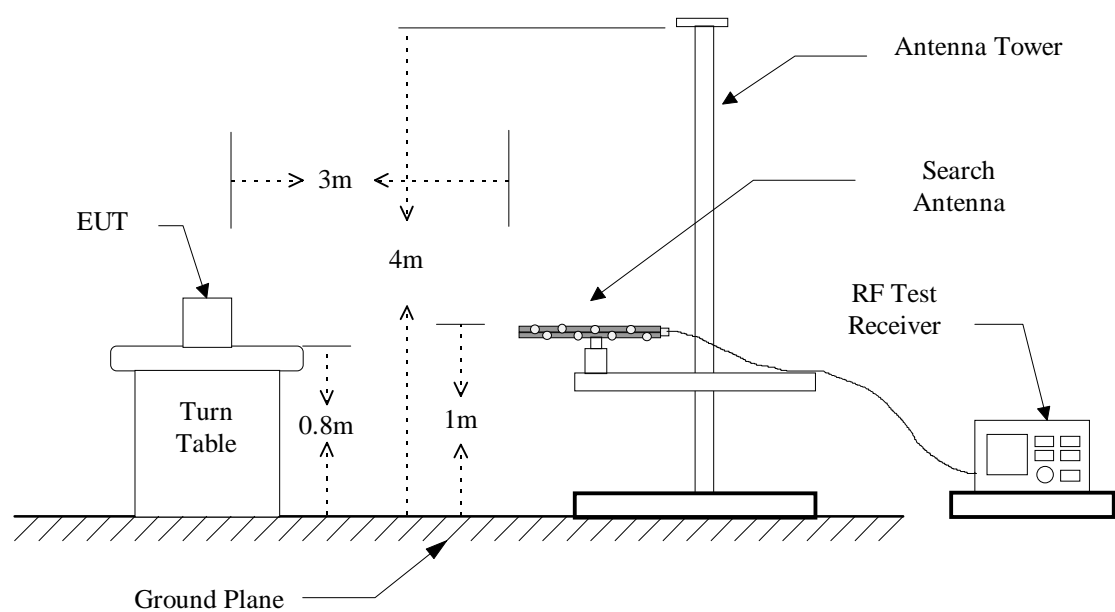
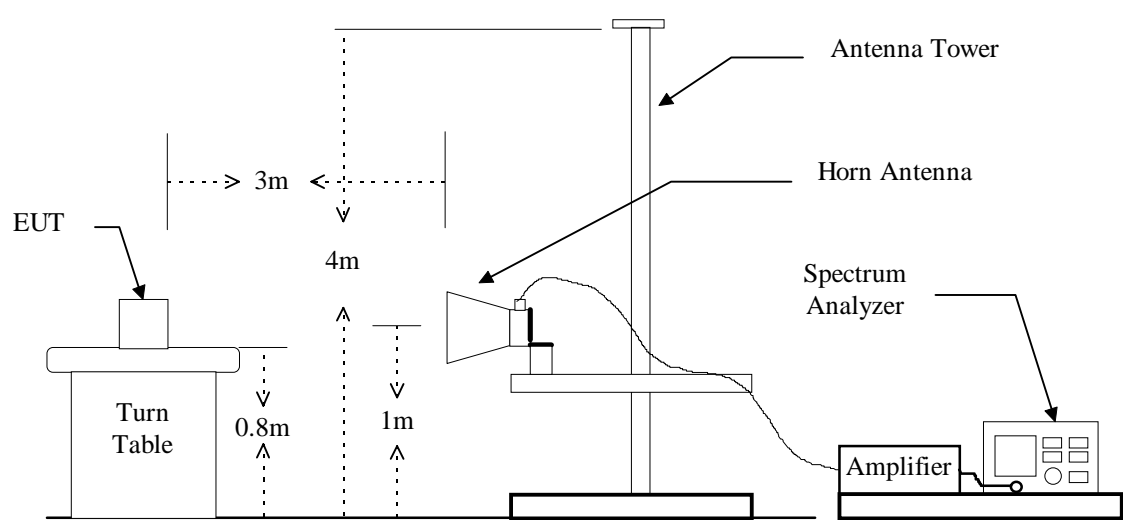


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement :

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| EMI Test Receiver | Hewlett-Packard | 8546A | 08/27/2004 |
| Horn Antenna | EMCO | 3115 | 06/05/2004 |
| LogBicone Antenna | Schwarzbeck | 9160 | 10/28/2004 |
| Horn Antenna | EMCO | 3116 | 06/28/2004 |
| Preamplifier | Hewlett-Packard | 8449B | 09/04/2004 |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

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

| Frequency Band (MHz) | Instrument | Function | Resolution bandwidth | Video Bandwidth |
|----------------------|-------------------|------------|----------------------|-----------------|
| 30 to 1000 | RF Test Receiver | Quasi-Peak | 120 kHz | N/A |
| | Spectrum Analyzer | Peak | 100 kHz | 100 kHz |
| Above 1000 | Spectrum Analyzer | Peak | 1 MHz | 1 MHz |
| | Spectrum Analyzer | Average | 1 MHz | 10 Hz |

4.4 Radiated Emission Data

4.4.1 RF Portion

a) Channel 0

EUT azimuth : x axis

Operation Mode : Transmitting

Fundamental Frequency : 2402 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) Peak Ave (H/V Max.) | | Limit @3m (dBuV/m) Peak Ave. | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|--------------------|----------------|----------|-----------|----------|-------------------------|--|------|------------------------------------|------|----------------|-------------------------|---------------------|
| | H Peak | V Ave | H Peak | V Ave | | | | | | | | |
| 4804.000 | 56.2 | 40.2 | 56.0 | 41.0 | -4.6 | 51.6 | 36.4 | 74.0 | 54.0 | -17.6 | 234 | 1.0 |
| 12010.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 16216.000 | --- | --- | --- | --- | 3.8 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

EUT azimuth : y axis

Operation Mode : Transmitting

Fundamental Frequency : 2402 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBUV) | | | | Factor (dB) Corr. | Result @3m (dBUV/m) | | Limit @3m (dBUV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|--------------------|----------------|----------|-----------|----------|-------------------------|------------------------|-------------------|-----------------------|------|----------------|-------------------------|---------------------|
| | H Peak | V Ave | H Peak | V Ave | | Peak | Ave (H/V Max.) | Peak | Ave. | | | |
| 4804.000 | 55.2 | 40.9 | 56.0 | 41.2 | -4.6 | 51.4 | 36.6 | 74.0 | 54.0 | -17.4 | 136 | 1.0 |
| 12010.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 16216.000 | --- | --- | --- | --- | 3.8 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

EUT azimuth : z axis

Operation Mode : Transmitting

Fundamental Frequency : 2402 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) Peak Ave (H/V Max.) | | Limit @3m (dBuV/m) Peak Ave. | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|--------------------|----------------|----------|-----------|----------|-------------------------|--|------|------------------------------------|------|----------------|-------------------------|---------------------|
| | H Peak | V Ave | H Peak | V Ave | | | | | | | | |
| 4804.000 | 55.9 | 40.1 | 56.2 | 40.7 | -4.6 | 51.6 | 36.1 | 74.0 | 54.0 | -17.9 | 232 | 1.0 |
| 12010.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 16216.000 | --- | --- | --- | --- | 3.8 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

b) Channel 39

EUT azimuth : x axis

Operation Mode : Transmitting

Fundamental Frequency : 2441 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|--------------------|----------------|----------|-----------|----------|-------------------------|------------------------|-------------------|-----------------------|------|----------------|-------------------------|---------------------|
| | H Peak | V Ave | H Peak | V Ave | | Peak | Ave (H/V Max.) | Peak | Ave. | | | |
| 4882.000 | 55.5 | 40.7 | 54.8 | 40.3 | -4.6 | 50.9 | 36.1 | 74.0 | 54.0 | -17.9 | 138 | 1.0 |
| 7323.000 | --- | --- | --- | --- | -1.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 12205.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 19528.000 | --- | --- | --- | --- | 4.5 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

EUT azimuth : y axis

Operation Mode : Transmitting

Fundamental Frequency : 2441 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|--------------------|----------------|----------|-----------|----------|-------------------------|------------------------|-------------------|-----------------------|------|----------------|-------------------------|---------------------|
| | H Peak | V Ave | H Peak | V Ave | | Peak | Ave (H/V Max.) | Peak | Ave. | | | |
| 4882.000 | 55.6 | 40.2 | 54.8 | 40.2 | -4.6 | 51.0 | 35.6 | 74.0 | 54.0 | -18.4 | 246 | 1.0 |
| 7323.000 | --- | --- | --- | --- | -1.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 12205.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 19528.000 | --- | --- | --- | --- | 4.5 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

EUT azimuth : z axis

Operation Mode : Transmitting

Fundamental Frequency : 2441 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|------------------------|----------------|------|------|------|-----------------------------|------------------------|------|-----------------------|------|----------------|-------------------------|---------------------|
| | H | | V | | | Peak | Ave | Peak | Ave. | | | |
| | Peak | Ave | Peak | Ave | | | | | | | | |
| 4882.000 | 55.9 | 40.8 | 55.2 | 41.0 | -4.6 | 51.3 | 36.4 | 74.0 | 54.0 | -17.6 | 312 | 1.0 |
| 7323.000 | --- | --- | --- | --- | -1.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 12205.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 19528.000 | --- | --- | --- | --- | 4.5 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

c) Channel 78

EUT azimuth : x axis

Operation Mode : Transmitting

Fundamental Frequency : 2480 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) Peak Ave (H/V Max.) | | Limit @3m (dBuV/m) Peak Ave. | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|--------------------|----------------|----------|-----------|----------|-------------------------|--|------|------------------------------------|------|----------------|-------------------------|---------------------|
| | H Peak | V Ave | H Peak | V Ave | | | | | | | | |
| 4960.000 | 55.7 | 40.7 | 55.7 | 41.0 | -4.6 | 51.1 | 36.4 | 74.0 | 54.0 | -17.6 | 148 | 1.0 |
| 7440.000 | --- | --- | --- | --- | -1.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 12400.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 19840.000 | --- | --- | --- | --- | 4.5 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 22320.000 | --- | --- | --- | --- | 1.3 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

EUT azimuth : y axis

Operation Mode : Transmitting

Fundamental Frequency : 2480 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|--------------------|----------------|------|-----------|------|-------------------------|------------------------|-------------------|-----------------------|------|----------------|-------------------------|---------------------|
| | H Peak | Ave | V Peak | Ave | | Peak | Ave (H/V Max.) | Peak | Ave. | | | |
| 4960.000 | 56.0 | 39.8 | 56.5 | 41.2 | -4.6 | 51.9 | 36.6 | 74.0 | 54.0 | -17.4 | 214 | 1.0 |
| 7440.000 | --- | --- | --- | --- | -1.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 12400.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 19840.000 | --- | --- | --- | --- | 4.5 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 22320.000 | --- | --- | --- | --- | 1.3 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

EUT azimuth : z axis

Operation Mode : Transmitting

Fundamental Frequency : 2480 MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|--------------------|----------------|----------|-----------|----------|-------------------------|------------------------|-------------------|-----------------------|------|----------------|-------------------------|---------------------|
| | H Peak | H Ave | V Peak | V Ave | | Peak | Ave (H/V Max.) | Peak | Ave. | | | |
| 4960.000 | 55.8 | 40.8 | 56.0 | 40.8 | -4.6 | 51.4 | 36.2 | 74.0 | 54.0 | -17.8 | 306 | 1.0 |
| 7440.000 | --- | --- | --- | --- | -1.0 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 12400.000 | --- | --- | --- | --- | 2.9 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 19840.000 | --- | --- | --- | --- | 4.5 | --- | --- | 74.0 | 54.0 | --- | --- | --- |
| 22320.000 | --- | --- | --- | --- | 1.3 | --- | --- | 74.0 | 54.0 | --- | --- | --- |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “---” means that the emissions level is too low to be measured.
3. Item “Margin” referred to Average limit while there is only peak result.
4. The radiation emissions have been measured to beyond the tenth harmonic of the fundamental frequency and show the significant frequencies, other means the value is too low to be detected.

4.4.2 Other Emission

a) Operation Mode: Charge Mode

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Emission Frequency (MHz) | Meter Reading (dBuV) | | CORR'd Factor (dB) | Results (dBuV/m) | | Limit (3m) (dBuV/m) | Margins (dB) | Table Degree (deg) | | Ant. High (m) | |
|----------------------------------|---------------------------|-------|----------------------------|-----------------------|-------|---------------------------|-------------------|-----------------------|-------|------------------|-------|
| | HOR. | VERT. | | HOR. | VERT. | | | HOR. | VERT. | HOR. | VERT. |
| 34.580 | 14.1 | *** | 13.1 | 27.2 | *** | 40.0 | -12.8 | 83 | *** | 1.0 | *** |
| 36.840 | *** | 18.9 | 13.2 | *** | 32.1 | 40.0 | -7.9 | *** | 96 | *** | 1.0 |
| 48.460 | *** | 20.8 | 13.6 | *** | 34.4 | 40.0 | -5.6 | *** | 224 | *** | 1.0 |
| 67.830 | *** | 21.1 | 11.6 | *** | 32.7 | 40.0 | -7.3 | *** | 213 | *** | 1.0 |
| 86.320 | 16.8 | *** | 10.1 | 26.9 | *** | 40.0 | -13.1 | 176 | *** | 1.0 | *** |
| 107.920 | *** | 19.2 | 12.5 | *** | 31.7 | 43.5 | -11.8 | *** | 31 | *** | 1.0 |
| 146.890 | 12.2 | *** | 15.1 | 27.3 | *** | 43.5 | -16.2 | 196 | *** | 1.0 | *** |
| 185.320 | *** | 17.7 | 13.1 | *** | 30.8 | 43.5 | -12.7 | *** | 168 | *** | 1.0 |
| 198.320 | 15.3 | *** | 13.0 | 28.3 | *** | 43.5 | -15.2 | 76 | *** | 1.0 | *** |
| 224.930 | *** | 15.7 | 13.7 | *** | 29.4 | 46.0 | -16.6 | *** | 320 | *** | 1.0 |
| 249.580 | 14.8 | *** | 14.6 | 29.4 | *** | 46.0 | -16.6 | 312 | *** | 1.0 | *** |
| 306.940 | 12.5 | *** | 16.8 | 29.3 | *** | 46.0 | -16.7 | 253 | *** | 1.0 | *** |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “***” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. The EUT is a body worn device. In order to get the worse data, EUT direction (X, Y, Z axes) were adjusted during the prescan measurement. For final measurement, EUT was setup under the maximum emission direction.

b) Operation Mode: 2402MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Emission Frequency (MHz) | Meter Reading (dBuV) | | CORR'd Factor (dB) | Results (dBuV/m) | | Limit (3m) (dBuV/m) | Margins (dB) | Table Degree (deg) | | Ant. High (m) | |
|----------------------------------|---------------------------|-------|----------------------------|-----------------------|-------|---------------------------|-------------------|-----------------------|-------|------------------|-------|
| | HOR. | VERT. | | HOR. | VERT. | | | HOR. | VERT. | HOR. | VERT. |
| 35.890 | 13.1 | *** | 13.2 | 26.3 | *** | 40.0 | -13.7 | 231 | *** | 1.0 | *** |
| 37.140 | *** | 19.6 | 13.2 | *** | 32.8 | 40.0 | -7.2 | *** | 306 | *** | 1.0 |
| 48.920 | *** | 21.0 | 13.6 | *** | 34.6 | 40.0 | -5.4 | *** | 184 | *** | 1.0 |
| 85.940 | 17.2 | *** | 10.1 | 27.3 | *** | 40.0 | -12.7 | 167 | *** | 1.0 | *** |
| 93.260 | *** | -72.1 | 101.0 | *** | 28.9 | 43.5 | -14.6 | *** | 106 | *** | 1.0 |
| 108.960 | *** | 19.5 | 12.5 | *** | 32.0 | 43.5 | -11.5 | *** | 231 | *** | 1.0 |
| 146.920 | 13.2 | *** | 15.1 | 28.3 | *** | 43.5 | -15.2 | 45 | *** | 1.0 | *** |
| 185.320 | *** | 15.8 | 13.1 | *** | 28.9 | 43.5 | -14.6 | *** | 68 | *** | 1.0 |
| 196.210 | 14.9 | *** | 13.0 | 27.9 | *** | 43.5 | -15.6 | 305 | *** | 1.0 | *** |
| 235.840 | 14.1 | *** | 13.7 | 27.8 | *** | 46.0 | -18.2 | 276 | *** | 1.0 | *** |
| 248.920 | *** | 14.7 | 14.6 | *** | 29.3 | 46.0 | -16.7 | *** | 247 | *** | 1.0 |
| 284.210 | 12.9 | *** | 15.7 | 28.6 | *** | 46.0 | -17.4 | 196 | *** | 1.0 | *** |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “***” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. The EUT is a body worn device. In order to get the worse data, EUT direction (X, Y, Z axes) were adjusted during the prescan measurement. For final measurement, EUT was setup under the maximum emission direction.

c) Operation Mode: 2441MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Emission Frequency (MHz) | Meter Reading (dBuV) | | CORR'd Factor (dB) | Results (dBuV/m) | | Limit (3m) (dBuV/m) | Margins (dB) | Table Degree (deg) | | Ant. High (m) | |
|----------------------------------|---------------------------|-------|----------------------------|-----------------------|-------|---------------------------|-------------------|-----------------------|-------|------------------|-------|
| | HOR. | VERT. | | HOR. | VERT. | | | HOR. | VERT. | HOR. | VERT. |
| 35.890 | 12.9 | *** | 13.2 | 26.1 | *** | 40.0 | -13.9 | 78 | *** | 1.0 | *** |
| 37.890 | *** | 19.0 | 13.2 | *** | 32.2 | 40.0 | -7.8 | *** | 185 | *** | 1.0 |
| 48.420 | *** | 20.8 | 13.6 | *** | 34.4 | 40.0 | -5.6 | *** | 134 | *** | 1.0 |
| 68.490 | *** | 21.2 | 11.6 | *** | 32.8 | 40.0 | -7.2 | *** | 67 | *** | 1.0 |
| 79.320 | 17.0 | *** | 9.9 | 26.9 | *** | 40.0 | -13.1 | 96 | *** | 1.0 | *** |
| 107.320 | *** | 19.4 | 12.5 | *** | 31.9 | 43.5 | -11.6 | *** | 96 | *** | 1.0 |
| 138.920 | 13.7 | *** | 15.1 | 28.8 | *** | 43.5 | -14.7 | 312 | *** | 1.0 | *** |
| 184.320 | *** | 15.1 | 14.1 | *** | 29.2 | 43.5 | -14.3 | *** | 302 | *** | 1.0 |
| 195.930 | 13.2 | *** | 13.0 | 26.2 | *** | 43.5 | -17.3 | 243 | *** | 1.0 | *** |
| 239.420 | 11.2 | *** | 14.6 | 25.8 | *** | 46.0 | -20.2 | 172 | *** | 1.0 | *** |
| 245.890 | *** | 14.0 | 14.6 | *** | 28.6 | 46.0 | -17.4 | *** | 248 | *** | 1.0 |
| 296.730 | 11.0 | *** | 16.8 | 27.8 | *** | 46.0 | -18.2 | 213 | *** | 1.0 | *** |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “***” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. The EUT is a body worn device. In order to get the worse data, EUT direction (X, Y, Z axes) were adjusted during the prescan measurement. For final measurement, EUT was setup under the maximum emission direction.

d) Operation Mode: 2480MHz

Test Date : May 17, 2004

Temperature : 20

Humidity : 68%

| Emission Frequency (MHz) | Meter Reading (dBuV) | | CORR'd Factor (dB) | Results (dBuV/m) | | Limit (3m) (dBuV/m) | Margins (dB) | Table Degree (deg) | | Ant. High (m) | |
|----------------------------------|---------------------------|-------|----------------------------|-----------------------|-------|---------------------------|-------------------|-----------------------|-------|------------------|-------|
| | HOR. | VERT. | | HOR. | VERT. | | | HOR. | VERT. | HOR. | VERT. |
| 33.890 | 13.1 | *** | 13.1 | 26.2 | *** | 40.0 | -13.8 | 96 | *** | 1.0 | *** |
| 36.890 | *** | 18.8 | 13.2 | *** | 32.0 | 40.0 | -8.0 | *** | 89 | *** | 1.0 |
| 47.940 | *** | 20.1 | 13.6 | *** | 33.7 | 40.0 | -6.3 | *** | 214 | *** | 1.0 |
| 67.790 | *** | 21.3 | 11.6 | *** | 32.9 | 40.0 | -7.1 | *** | 312 | *** | 1.0 |
| 80.140 | 16.0 | *** | 9.9 | 25.9 | *** | 40.0 | -14.1 | 254 | *** | 1.0 | *** |
| 123.890 | *** | 15.9 | 13.5 | *** | 29.4 | 43.5 | -14.1 | *** | 131 | *** | 1.0 |
| 138.320 | 13.1 | *** | 15.1 | 28.2 | *** | 43.5 | -15.3 | 132 | *** | 1.0 | *** |
| 185.420 | *** | 15.2 | 13.1 | *** | 28.3 | 43.5 | -15.2 | *** | 46 | *** | 1.0 |
| 186.720 | 12.3 | *** | 13.1 | 25.4 | *** | 43.5 | -18.1 | 169 | *** | 1.0 | *** |
| 231.920 | *** | 15.5 | 13.7 | *** | 29.2 | 46.0 | -16.8 | *** | 98 | *** | 1.0 |
| 238.760 | 11.6 | *** | 14.6 | 26.2 | *** | 46.0 | -19.8 | 312 | *** | 1.0 | *** |
| 279.210 | 10.1 | *** | 15.7 | 25.8 | *** | 46.0 | -20.2 | 243 | *** | 1.0 | *** |

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark “***” means that the emissions level is too low to be measured.
3. Remark “#” means the noise was low, so record the peak value.
4. Item “Margin” referred to Q.P. limit while there is only peak result.
5. *The EUT is a body worn device. In order to get the worse data, EUT direction (X, Y, Z axes) were adjusted during the prescan measurement. For final measurement, EUT was setup under the maximum emission direction.*

4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

where

$$\text{Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$

4.6 Photos of Radiation Measuring Setup



5 CONDUCTED EMISSION MEASUREMENT

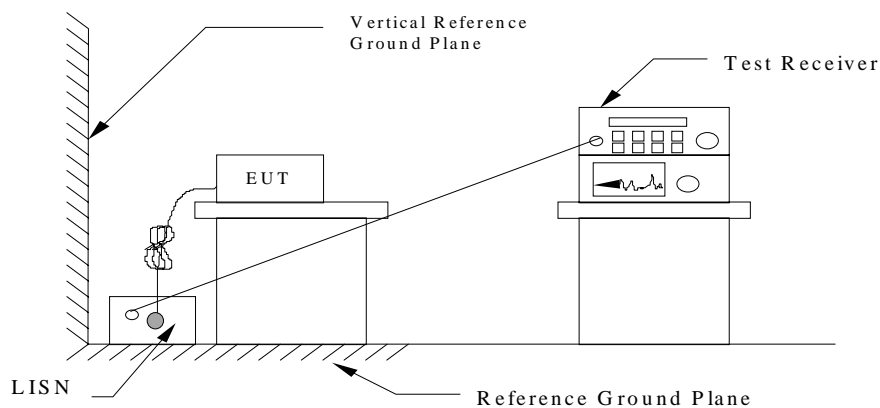
5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and § 15.207(a) respectively. Both Limits are identical specification.

5.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



5.3 Conducted Emission Data

a) Operation Mode: Charge Mode

Test Date: May 17, 2004

Temperature: 20

Humidity: 68%

| Freq. (MHz) | Meter Reading (dBuV) | | | | Factor (dB) | Result (dBuV) | | | | Limit (dBuV) | | Margins (dB) |
|----------------|-------------------------|------|------------|------|----------------|------------------|------|------------|------|-----------------|---------------|-----------------|
| | Q.P Value | | AVG. Value | | | Q.P Value | | AVG. Value | | Q.P Value | AVG. Value | Q.P. or AVG. |
| | L1 | L2 | L1 | L2 | | L1 | L2 | L1 | L2 | | | |
| 0.181 | 39.1 | *** | ---- | ---- | 0.2 | 39.3 | *** | ---- | ---- | 64.4 | 54.4 | -25.1 |
| 0.185 | *** | 41.8 | ---- | ---- | 0.2 | *** | 42.0 | ---- | ---- | 64.3 | 54.3 | -22.3 |
| 0.247 | 47.0 | *** | ---- | ---- | 0.2 | 47.2 | *** | ---- | ---- | 61.9 | 51.9 | -14.7 |
| 0.249 | *** | 43.3 | ---- | ---- | 0.2 | *** | 43.5 | ---- | ---- | 61.8 | 51.8 | -18.3 |
| 0.309 | *** | 42.1 | ---- | ---- | 0.2 | *** | 42.3 | ---- | ---- | 60.0 | 50.0 | -17.7 |
| 0.310 | 43.2 | *** | ---- | ---- | 0.2 | 43.4 | *** | ---- | ---- | 60.0 | 50.0 | -16.6 |
| 0.372 | 44.7 | *** | ---- | ---- | 0.2 | 44.9 | *** | ---- | ---- | 58.5 | 48.5 | -13.6 |
| 0.432 | *** | 47.7 | ---- | ---- | 0.2 | *** | 47.9 | ---- | ---- | 57.2 | 47.2 | -9.3 |
| 0.492 | 49.7 | *** | 40.3 | ---- | 0.2 | 49.9 | *** | 40.5 | ---- | 56.1 | 46.1 | -5.6 |
| 0.493 | *** | 48.3 | ---- | 37.6 | 0.2 | *** | 48.5 | ---- | 37.8 | 56.1 | 46.1 | -7.6 |
| 0.555 | 50.1 | *** | 40.6 | ---- | 0.2 | 50.3 | *** | 40.8 | ---- | 56.0 | 46.0 | -5.2 |
| 0.614 | *** | 44.1 | ---- | ---- | 0.2 | *** | 44.3 | ---- | ---- | 56.0 | 46.0 | -11.7 |
| 0.677 | 43.5 | *** | ---- | ---- | 0.2 | 43.7 | *** | ---- | ---- | 56.0 | 46.0 | -12.3 |

Note:

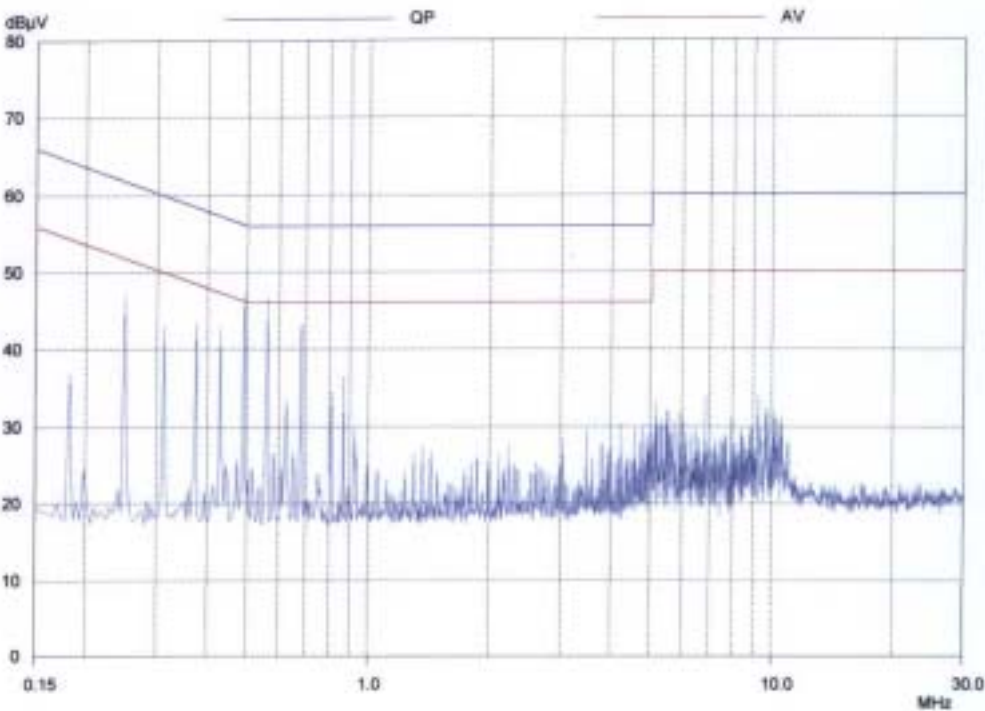
1. The full frequency range scanning test data is shown in appendix 2 pages.
2. "****" means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit for AVG. so, the AVG. value doesn't need to be measured.
4. The estimated measurement uncertainty of the result measurement is $\pm 2.5\text{dB}$.

Note : Please see next pages for Ploted Datas

Conducted Emission
Peak Value

EUT: BLOEMATE-630
Manuf:
Op Cond: CHARGING MODE
Operator: MARK
Test Spec: FCC PART15 B
Comment: L1

Prescan Measurement: Detector: X PK
 Meas Time: see scan settings
 Peaks: 8
 Acc Margin: 25 dB

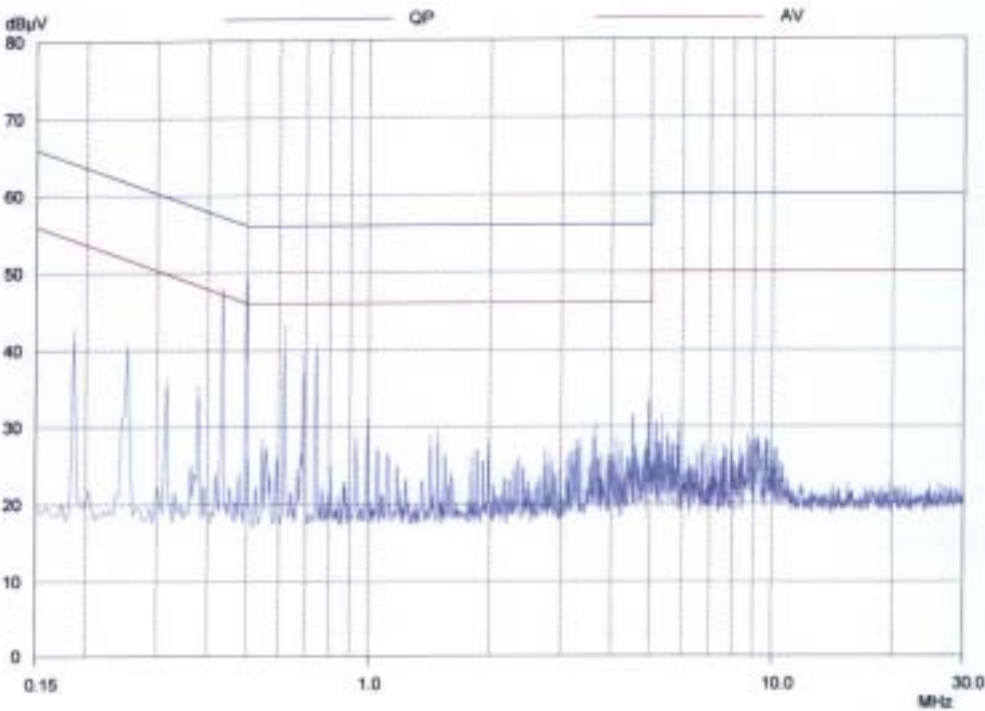


Conducted Emission

Peak Value

EUT: BLOEMATE-630
Manuf:
Op Cond: CHARGING MODE
Operator: MARK
Test Spec: FCC PART15 B
Comment: L2

Prescan Measurement: Detector: X PK
Meas Time: see scan settings
Peaks: 8
Acc Margin: 25 dB



b) Operation Mode: 2402MHz

Test Date: May 17, 2004

Temperature: 20

Humidity: 68%

| Freq. (MHz) | Meter Reading (dBuV) | | | | Factor (dB) | Result (dBuV) | | | | Limit (dBuV) | | Margins (dB) |
|----------------|-------------------------|------|------------|------|----------------|------------------|------|------------|------|-----------------|---------------|-----------------|
| | Q.P Value | | AVG. Value | | | Q.P Value | | AVG. Value | | Q.P Value | AVG. Value | Q.P. or AVG. |
| | L1 | L2 | L1 | L2 | | L1 | L2 | L1 | L2 | | | |
| 0.185 | 40.4 | 44.3 | ---- | ---- | 0.2 | 40.6 | 44.5 | ---- | ---- | 64.3 | 54.3 | -19.8 |
| 0.247 | 50.7 | *** | 43.7 | ---- | 0.2 | 50.9 | *** | 43.9 | ---- | 61.9 | 51.9 | -8.0 |
| 0.248 | *** | 50.2 | ---- | ---- | 0.2 | *** | 50.4 | ---- | ---- | 61.8 | 51.8 | -11.4 |
| 0.368 | 46.4 | *** | 37.8 | ---- | 0.2 | 46.6 | *** | 38.0 | ---- | 58.5 | 48.5 | -10.5 |
| 0.430 | 46.8 | *** | 39.3 | ---- | 0.2 | 47.0 | *** | 39.5 | ---- | 57.3 | 47.3 | -7.8 |
| 0.431 | *** | 51.0 | ---- | 43.1 | 0.2 | *** | 51.2 | ---- | 43.3 | 57.2 | 47.2 | -3.9 |
| 0.491 | *** | 46.9 | ---- | 37.2 | 0.2 | *** | 47.1 | ---- | 37.4 | 56.2 | 46.2 | -8.8 |
| 0.553 | 49.4 | *** | 41.1 | ---- | 0.2 | 49.6 | *** | 41.3 | ---- | 56.0 | 46.0 | -4.7 |
| 0.554 | *** | 47.9 | ---- | 40.3 | 0.2 | *** | 48.1 | ---- | 40.5 | 56.0 | 46.0 | -5.5 |
| 0.614 | *** | 41.8 | ---- | 35.4 | 0.2 | *** | 42.0 | ---- | 35.6 | 56.0 | 46.0 | -10.4 |
| 0.615 | 48.5 | *** | 40.9 | ---- | 0.2 | 48.7 | *** | 41.1 | ---- | 56.0 | 46.0 | -4.9 |

Note:

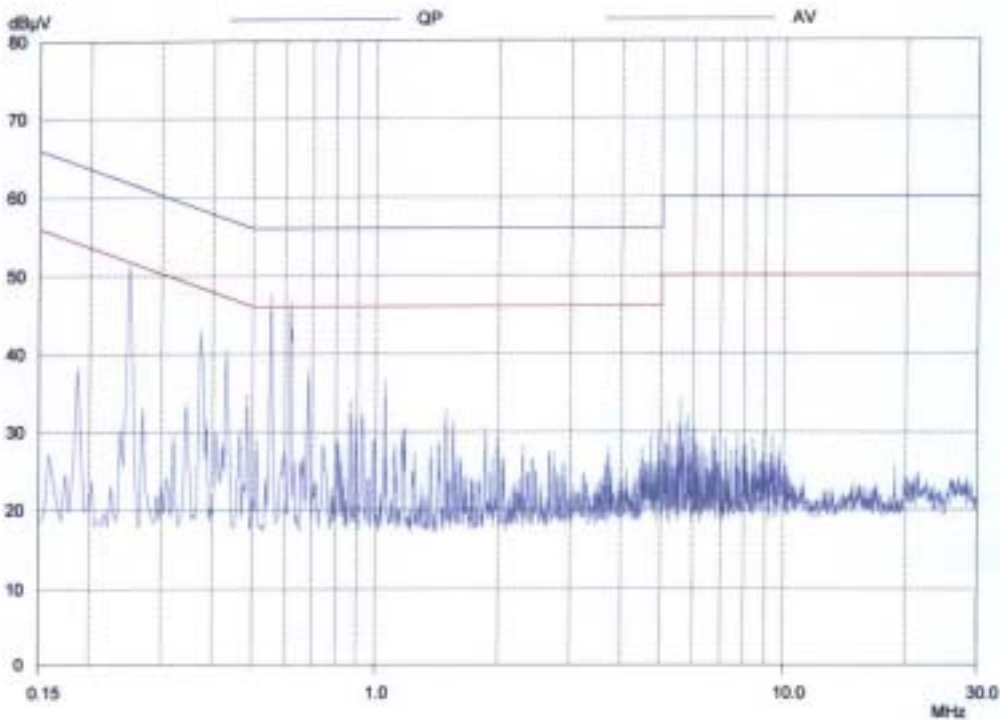
1. The full frequency range scanning test data is shown in appendix 2 pages.
2. “***” means the value was too low to be measured.
3. If the data table appeared symbol of “----” means the Q.P. value is under the limit for AVG. so, the AVG. value doesn't need to be measured.
4. The estimated measurement uncertainty of the result measurement is $\pm 2.5\text{dB}$.

Note : Please see next pages for Ploted Datas

Conducted Emission
Peak Value

EUT: BLOEMATE-630
Manuf:
Op Cond: 2402MHz
Operator: MARK
Test Spec: FCC PART15 B
Comment: L1

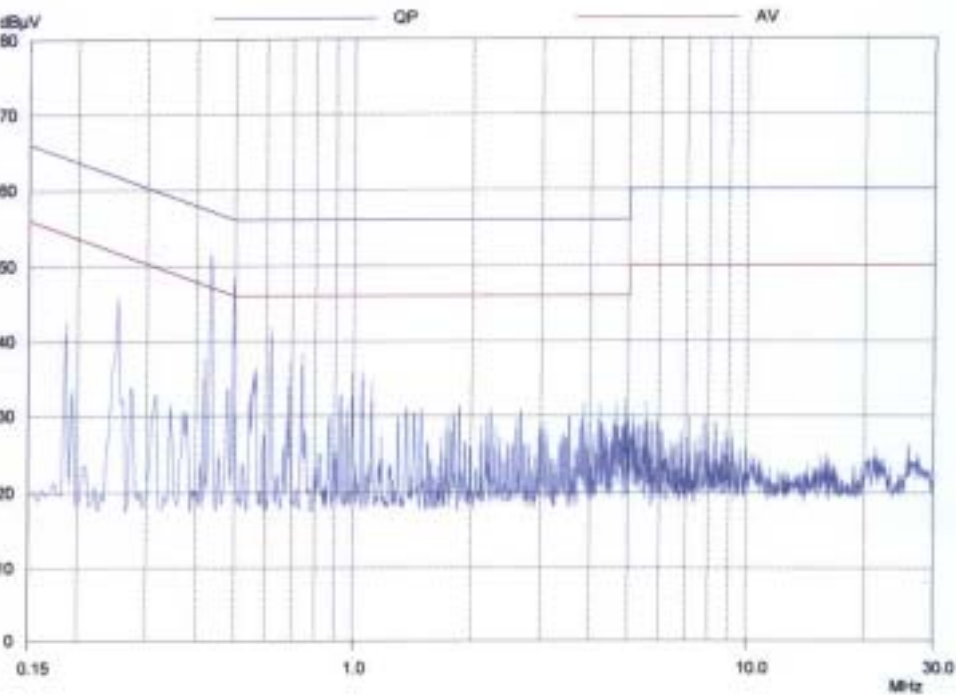
Prescan Measurement: Detector: X PK
 Meas Time: see scan settings
 Peaks: 8
 Acc Margin: 25 dB



Conducted Emission
Peak Value

EUT: BLOEMATE-630
Manuf:
Op Cond: 2402MHz
Operator: MARK
Test Spec: FCC PART15 B
Comment: L2

Prescan Measurement: Detector: X PK
 Noise Time: see scan settings
 Peaks: 5
 Ave Margin: 25 dB



c) Operation Mode: 2441MHz

Test Date: May 17, 2004

Temperature: 20

Humidity: 68%

| Freq. (MHz) | Meter Reading (dBuV) | | | | Factor (dB) | Result (dBuV) | | | | Limit (dBuV) | | Margins (dB) |
|----------------|-------------------------|------|------------|------|----------------|------------------|------|------------|------|-----------------|---------------|-----------------|
| | Q.P Value | | AVG. Value | | | Q.P Value | | AVG. Value | | Q.P Value | AVG. Value | Q.P. or AVG. |
| | L1 | L2 | L1 | L2 | | L1 | L2 | L1 | L2 | | | |
| 0.187 | *** | 43.3 | ---- | 0.0 | 0.2 | *** | 43.5 | ---- | ---- | 64.2 | 54.2 | -20.7 |
| 0.247 | 50.0 | 48.2 | 43.2 | 41.6 | 0.2 | 50.2 | 48.4 | 43.4 | 41.8 | 61.9 | 51.9 | -8.5 |
| 0.308 | *** | 45.8 | ---- | 36.9 | 0.2 | *** | 46.0 | ---- | 37.1 | 60.0 | 50.0 | -12.9 |
| 0.366 | 42.8 | *** | ---- | 0.0 | 0.2 | 43.0 | *** | ---- | ---- | 58.6 | 48.6 | -15.6 |
| 0.431 | *** | 42.2 | ---- | ---- | 0.2 | *** | 42.4 | ---- | ---- | 57.2 | 47.2 | -14.8 |
| 0.433 | 48.0 | *** | 39.9 | 0.0 | 0.2 | 48.2 | *** | 40.1 | ---- | 57.2 | 47.2 | -7.1 |
| 0.493 | 45.2 | *** | 37.5 | 0.0 | 0.2 | 45.4 | *** | 37.7 | ---- | 56.1 | 46.1 | -8.4 |
| 0.494 | *** | 48.3 | ---- | 39.5 | 0.2 | *** | 48.5 | ---- | 39.7 | 56.1 | 46.1 | -6.4 |
| 0.554 | *** | 42.7 | ---- | ---- | 0.2 | *** | 42.9 | ---- | ---- | 56.0 | 46.0 | -13.1 |
| 0.618 | 47.8 | *** | 40.3 | 0.0 | 0.2 | 48.0 | *** | 40.5 | ---- | 56.0 | 46.0 | -5.5 |
| 0.683 | 42.8 | *** | ---- | 0.0 | 0.2 | 43.0 | *** | ---- | ---- | 56.0 | 46.0 | -13.0 |

Note:

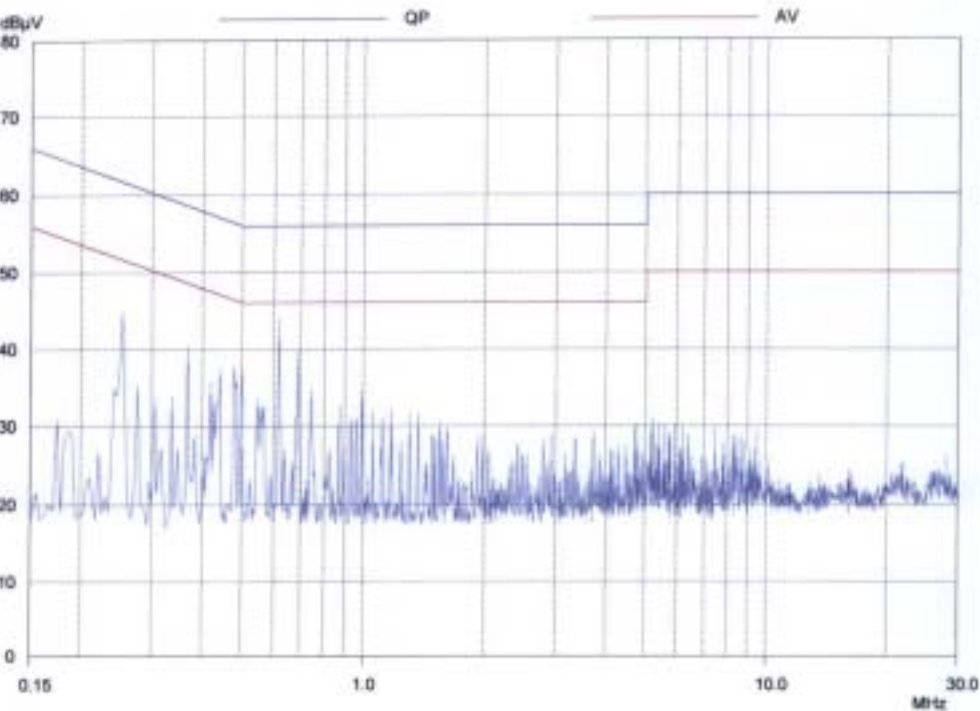
1. The full frequency range scanning test data is shown in appendix 2 pages.
2. “***” means the value was too low to be measured.
3. If the data table appeared symbol of “----” means the Q.P. value is under the limit for AVG. so, the AVG. value doesn't need to be measured.
4. The estimated measurement uncertainty of the result measurement is $\pm 2.5\text{dB}$.

Note : Please see next pages for Ploted Datas

Conducted Emission
Peak Value

EUT: BLOEMATE-630
Manuf:
Op Cond: 2441MHz
Operator: MARK
Test Spec: FCC PART15 B
Comment: L1

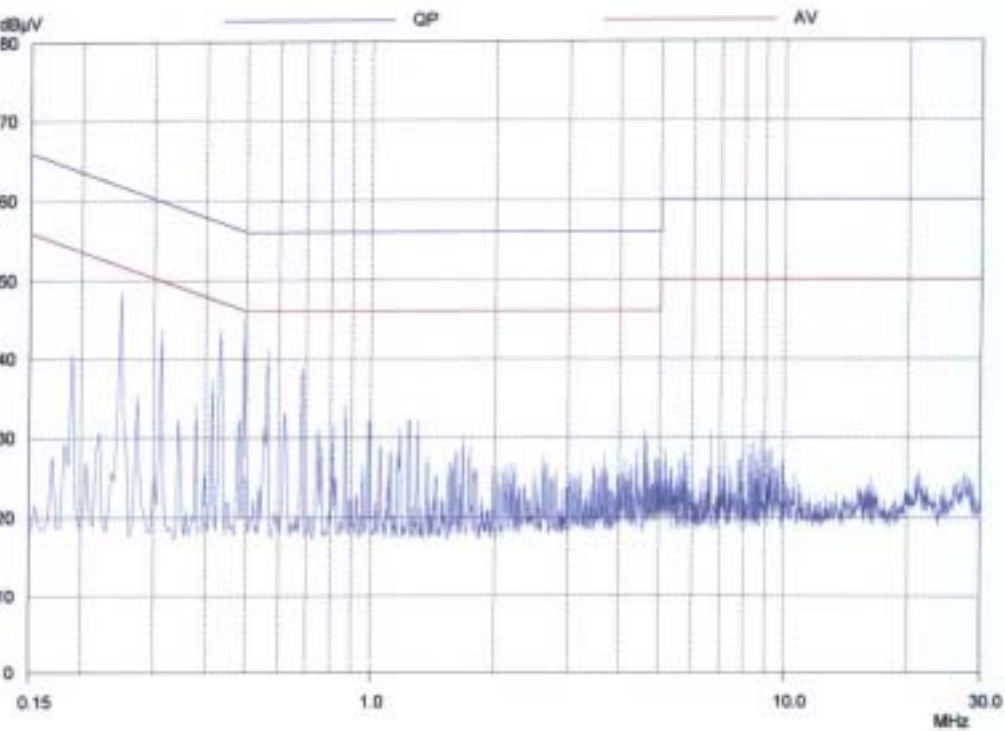
PreScan Measurement: Detector: X PK
Meas Time: see scan settings
Peaks: 8
Acc Margin: 25 dB



Conducted Emission
Peak Value

EUT: BLOEMATE-630
Manuf:
Op Cond: 2441MHz
Operator: MARK
Test Spec: FCC PART15 B
Comment: L2

Prescan Measurement: Detector: X PK
Mass Time: see scan settings
Peaks: 8
Acc Margin: 25 dB



d) Operation Mode: 2480MHz

Test Date: May 17, 2004

Temperature: 20

Humidity: 68%

| Freq. (MHz) | Meter Reading (dBuV) | | | | Factor (dB) | Result (dBuV) | | | | Limit (dBuV) | | Margins (dB) |
|----------------|-------------------------|------|------------|------|----------------|------------------|------|------------|------|-----------------|---------------|-----------------|
| | Q.P Value | | AVG. Value | | | Q.P Value | | AVG. Value | | Q.P Value | AVG. Value | Q.P. or AVG. |
| | L1 | L2 | L1 | L2 | | L1 | L2 | L1 | L2 | | | |
| 0.185 | 45.0 | 45.6 | ---- | 38.4 | 0.2 | 45.2 | 45.8 | ---- | 38.6 | 64.3 | 54.3 | -15.7 |
| 0.245 | 47.7 | 46.7 | 41.1 | 40.0 | 0.2 | 47.9 | 46.9 | 41.3 | 40.2 | 61.9 | 51.9 | -10.6 |
| 0.307 | *** | 46.7 | ---- | 38.0 | 0.2 | *** | 46.9 | ---- | 38.2 | 60.1 | 50.1 | -11.9 |
| 0.369 | *** | 45.1 | ---- | ---- | 0.2 | *** | 45.3 | ---- | ---- | 58.5 | 48.5 | -13.2 |
| 0.411 | 42.1 | *** | ---- | ---- | 0.2 | 42.3 | *** | ---- | ---- | 57.6 | 47.6 | -15.3 |
| 0.431 | 48.5 | *** | 41.1 | ---- | 0.2 | 48.7 | *** | 41.3 | ---- | 57.2 | 47.2 | -5.9 |
| 0.489 | *** | 42.2 | ---- | ---- | 0.2 | *** | 42.4 | ---- | ---- | 56.2 | 46.2 | -13.8 |
| 0.493 | 46.0 | *** | 38.4 | ---- | 0.2 | 46.2 | *** | 38.6 | ---- | 56.1 | 46.1 | -7.5 |
| 0.553 | *** | 41.4 | ---- | ---- | 0.2 | *** | 41.6 | ---- | ---- | 56.0 | 46.0 | -14.4 |
| 0.613 | 41.2 | *** | ---- | ---- | 0.2 | 41.4 | *** | ---- | ---- | 56.0 | 46.0 | -14.6 |

Note:

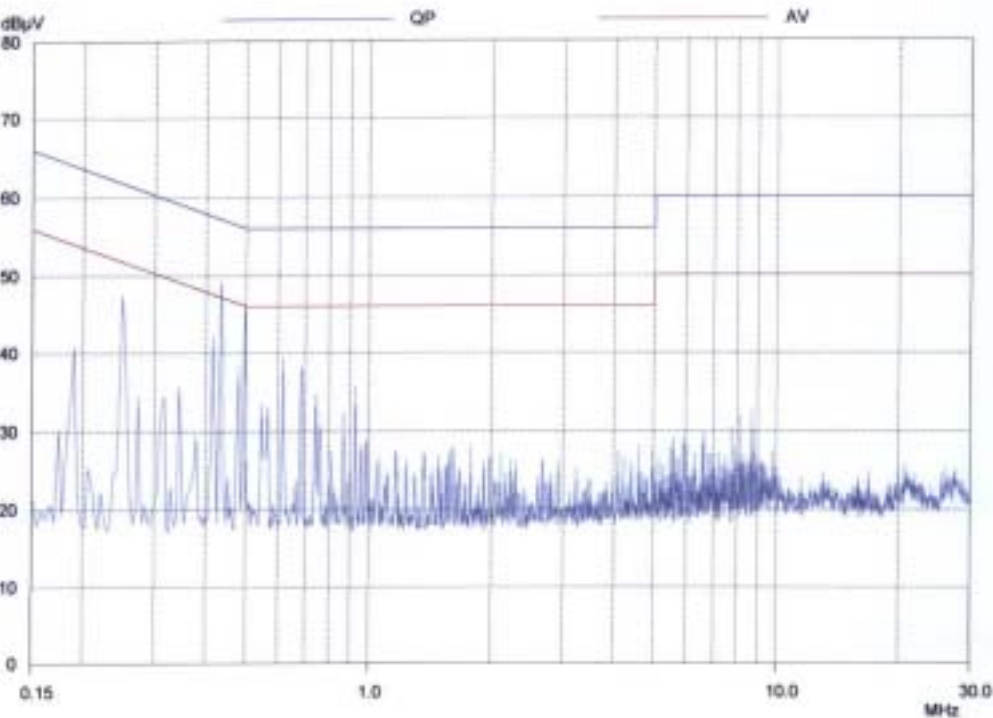
1. The full frequency range scanning test data is shown in appendix 2 pages.
2. "****" means the value was too low to be measured.
3. If the data table appeared symbol of "----" means the Q.P. value is under the limit for AVG. so, the AVG. value doesn't need to be measured.
4. The estimated measurement uncertainty of the result measurement is ± 2.5 dB.

Note : Please see next pages for Ploted Datas

Conducted Emission
Peak Value

EUT: BLOEMATE-630
Manuf:
Op Cond: 2480MHz
Operator: MARK
Test Spec: FCC PART15 B
Comment: L1

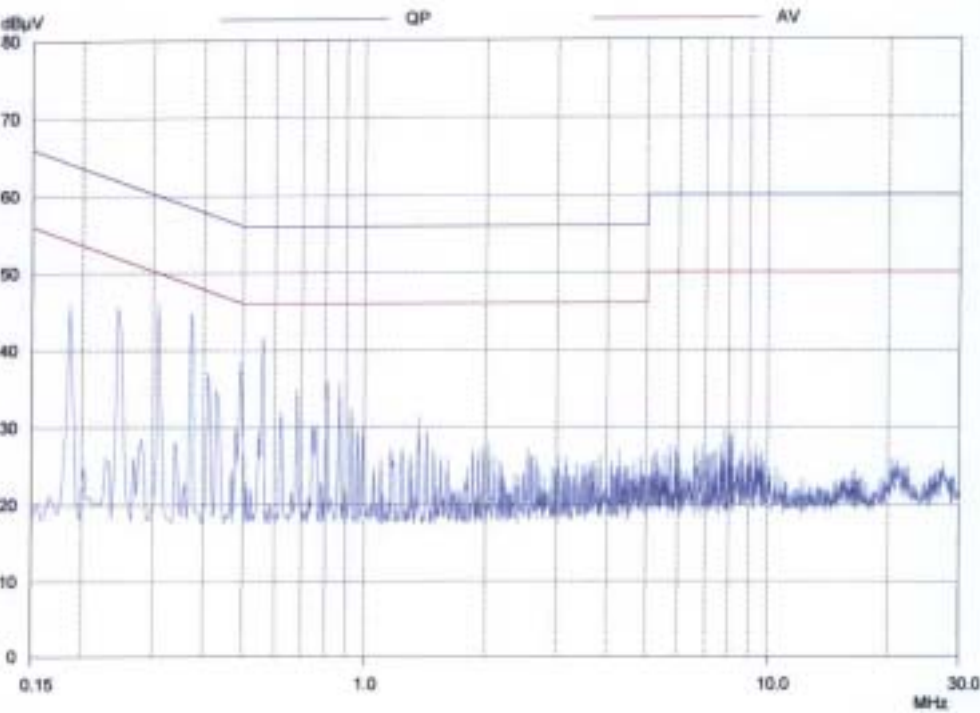
Pre-scan Measurement: Detector: X PK
Meas Time: see scan settings
Peaks: 8
Acc Margin: 25 dB



Conducted Emission
Peak Value

EUT: BLOEMATE-630
Manuf:
Op Cond: 2480MHz
Operator: MARK
Test Spec: FCC PART15 B
Comment: L2

Prescan Measurement: Detector: X PK
Meas Time: see scan settings
Peaks: 8
Acc Margin: 25 dB



5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

$$\text{RESULT} = \text{READING} + \text{LISN FACTOR (Included Cable Loss)}$$

Assume a receiver reading of 22.5 dB μ V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μ V.

$$\text{RESULT} = 22.5 + 0.1 = 22.6 \text{ dB } \mu \text{ V}$$

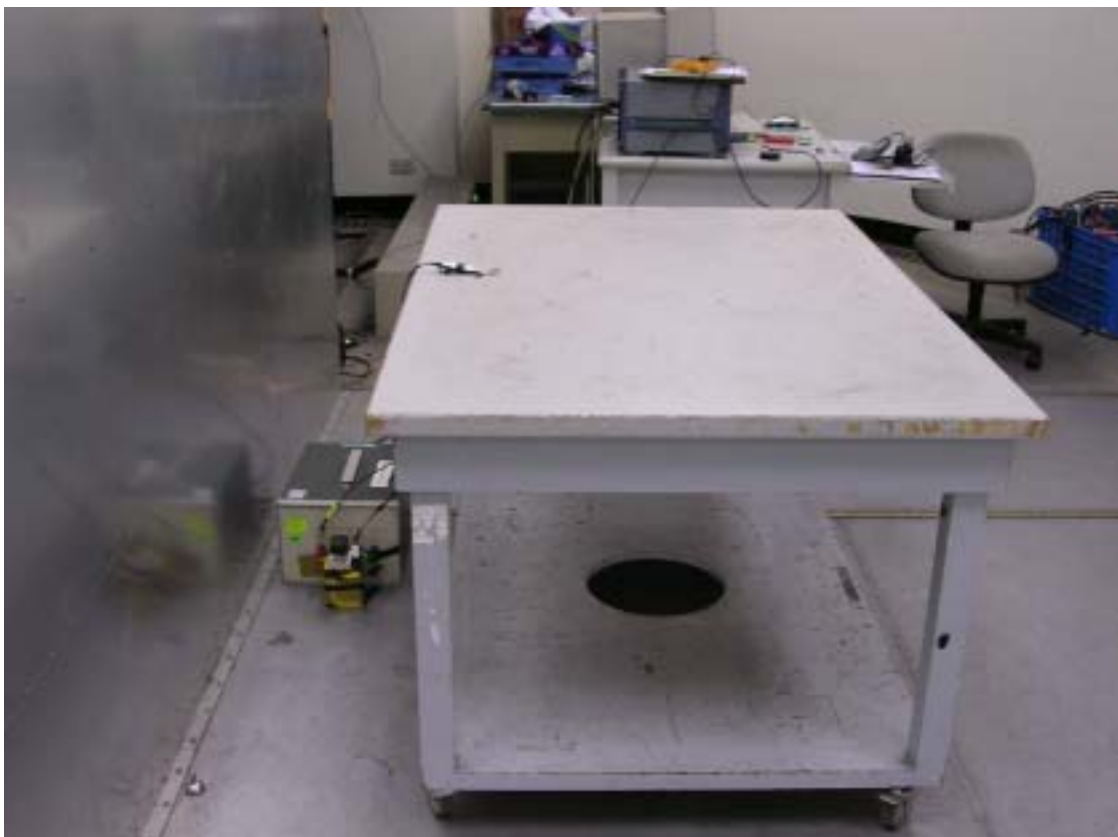
$$\begin{aligned} \text{Level in } \mu \text{ V} &= \text{Common Antilogarithm}[(22.6 \text{ dB } \mu \text{ V})/20] \\ &= 13.48 \text{ } \mu \text{ V} \end{aligned}$$

5.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test.

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|--------------------------------------|-------------------|-----------|---------------|
| RF Test Receiver | Rohde and Schwarz | ESCS30 | 09/18/2004 |
| Line Impedance Stabilization network | Telemeter | NNB-4/32T | 03/27/2005 |
| Line Impedance Stabilization network | Rolf Heine | NNB-2/16Z | 04/04/2005 |

5.6 Photos of Conduction Measuring Setup



6 ANTENNA REQUIREMENT

6.1 Standard Applicable

For intentional device, according to § 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 § 15.247 (b), if Receiving antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.2 Antenna Construction and Directional Gain

Highly efficient special antennas fix on the PCB. The directional gain of antenna used for Receiving is typical 0dBi.

7 20dB EMISSION BANDWIDTH MEASUREMENT

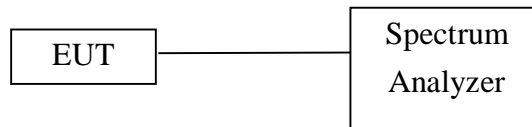
7.1 Standard Applicable

According to 15.247(a)(1), for frequency hopping systems, hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect it to measurement instrument. Then set it to any 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 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Figure 4: Emission bandwidth measurement configuration.



7.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| Plotter | Hewlett-Packard | 7550A | N/A |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

7.4 Measurement Data

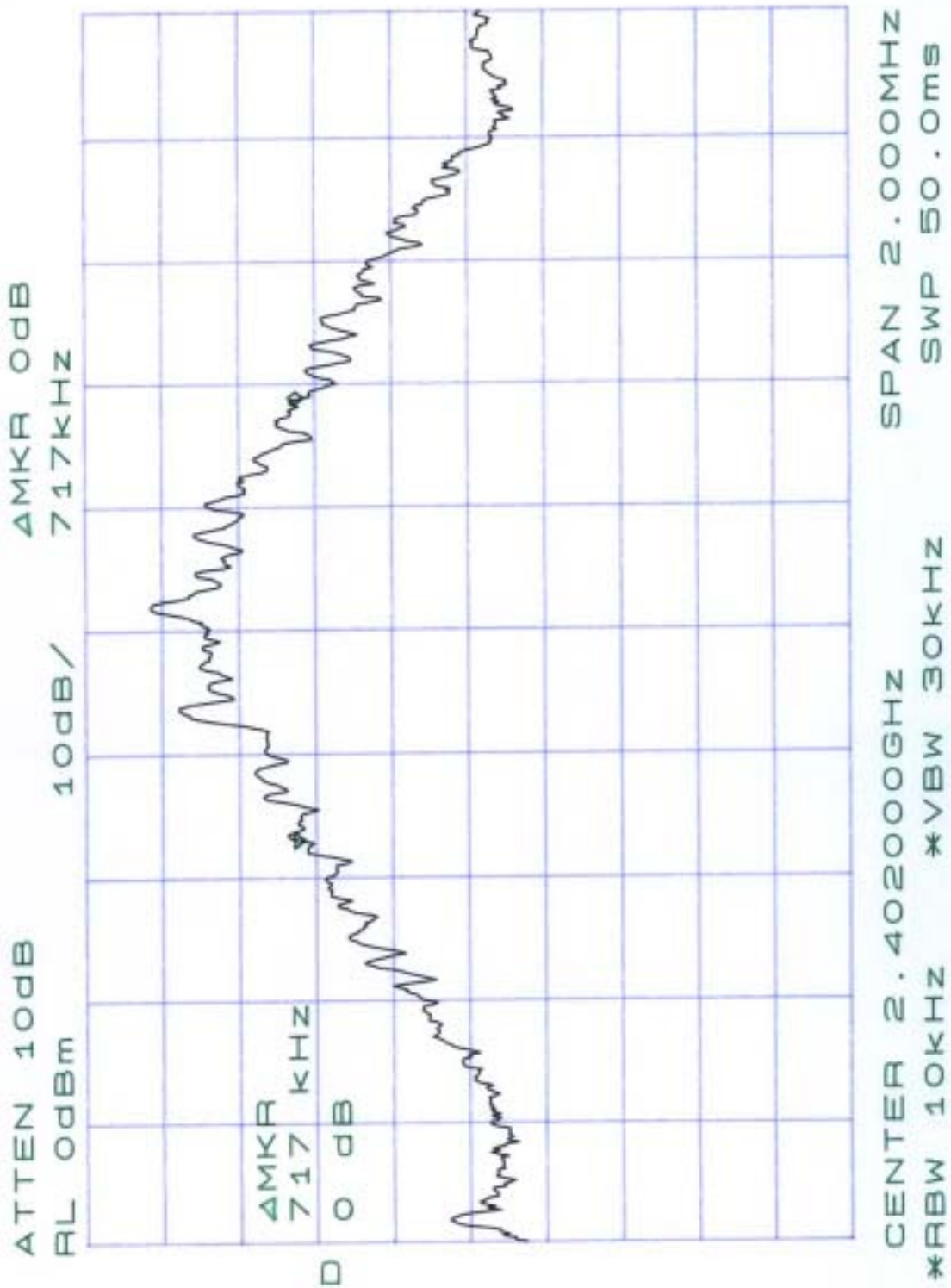
Test Date : May 11, 2004

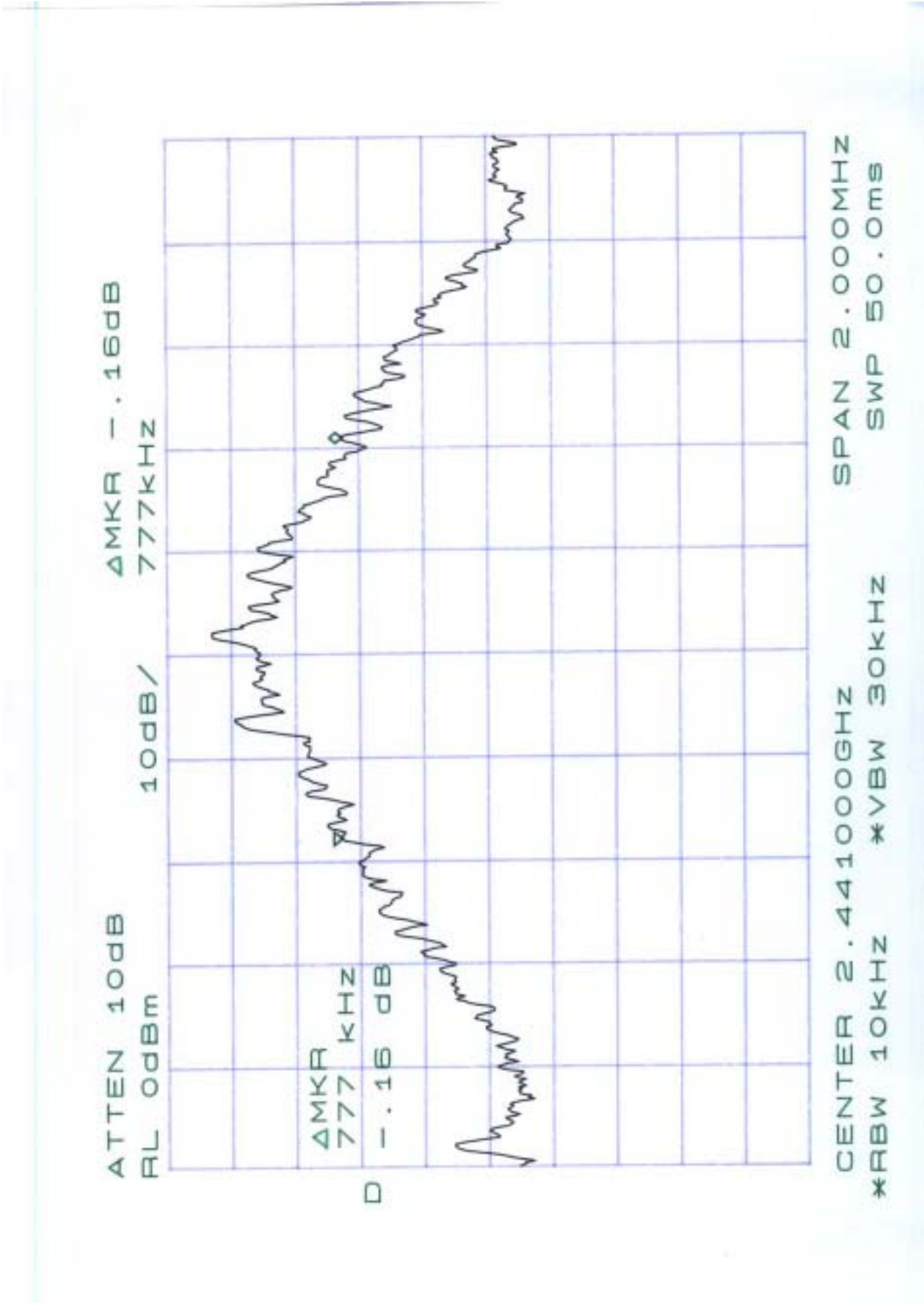
Temperature : 18

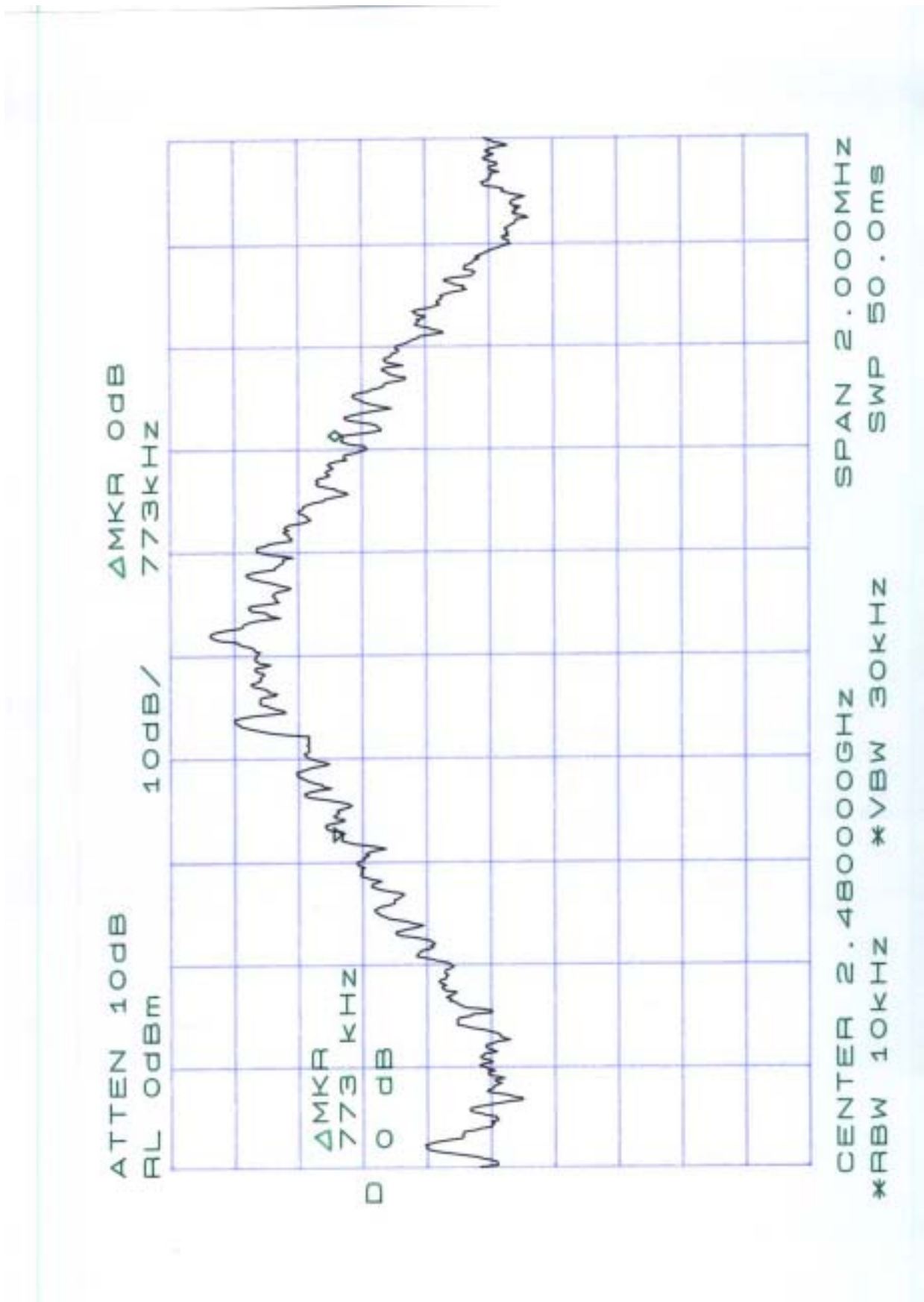
Humidity: 67%

- a) Channel 0 : 20 dB Emission Bandwidth is 717KHz
- b) Channel 39 : 20 dB Emission Bandwidth is 777 KHz
- c) Channel 78 : 20 dB Emission Bandwidth is 773 KHz

Note: Please see Next pages for plotted datas







8 OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

For frequency hopping system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If Receiving antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz and VBW to 3 MHz.
4. Measure the highest amplitude appearing on spectral display and record the level to calculate result data.
5. Repeat above procedures until all frequencies measured were complete.

8.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| Plotter | Hewlett-Packard | 7550A | N/A |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

8.4 Measurement Data

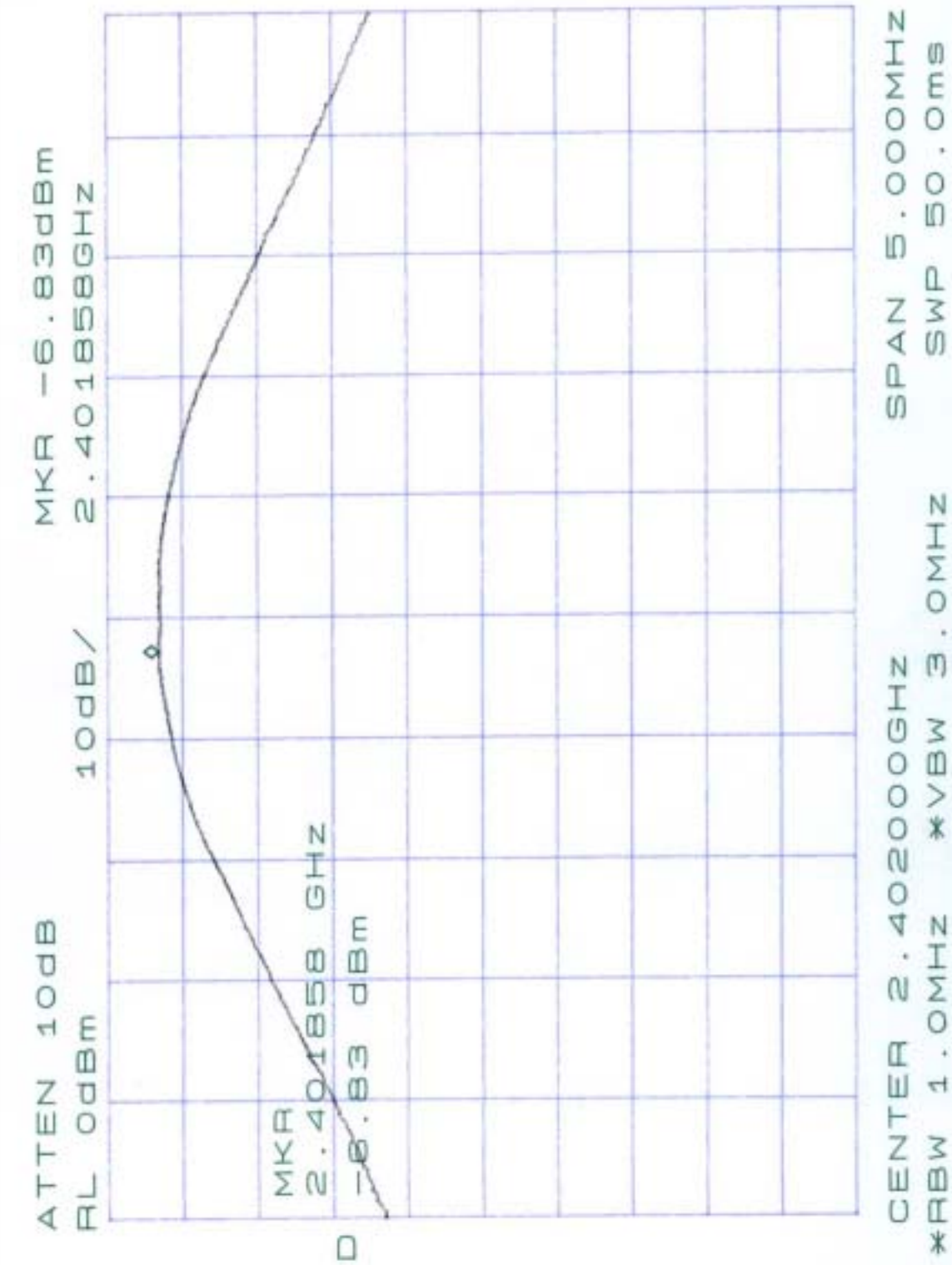
Test Date : May 11, 2004

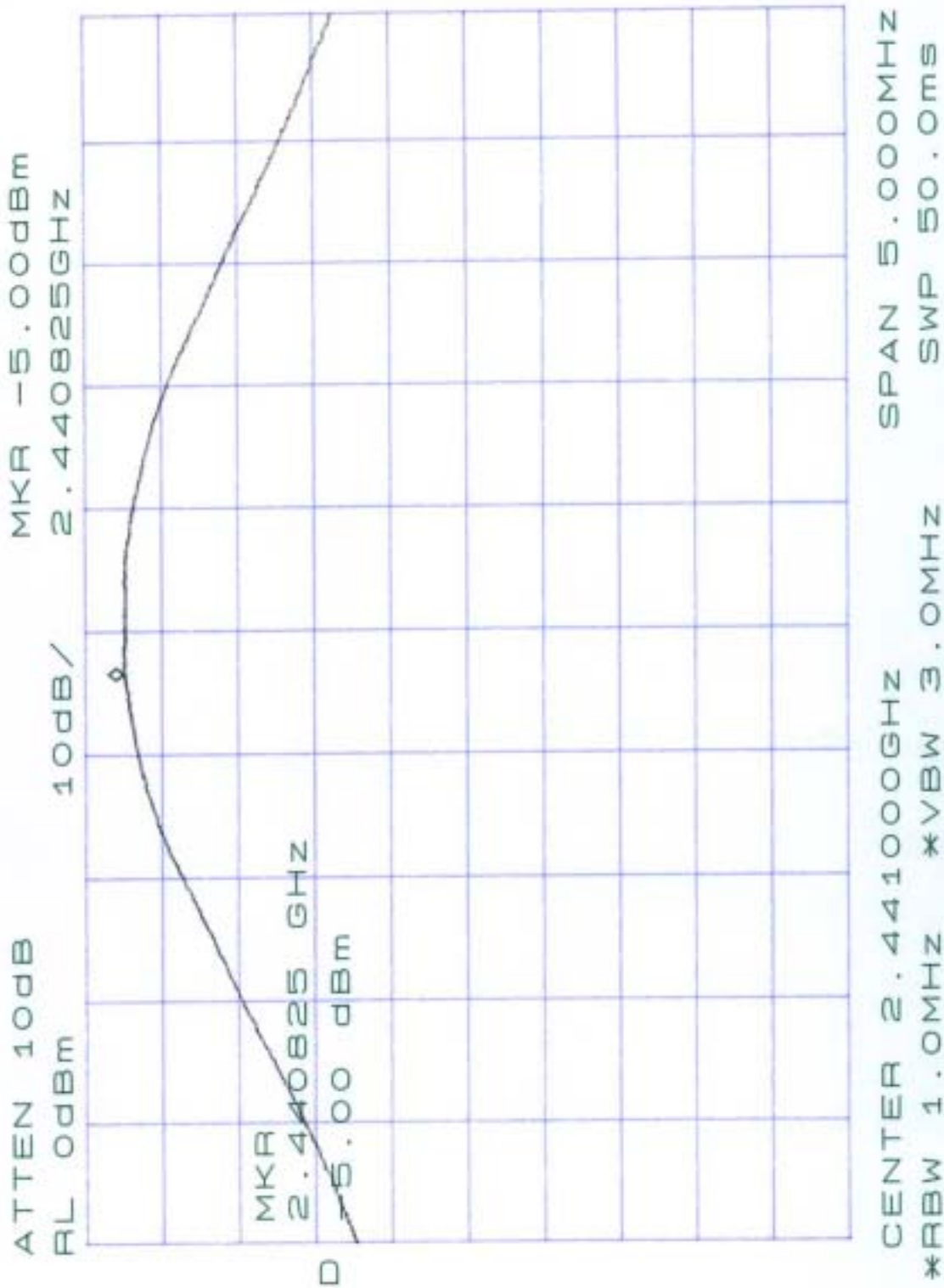
Temperature : 18

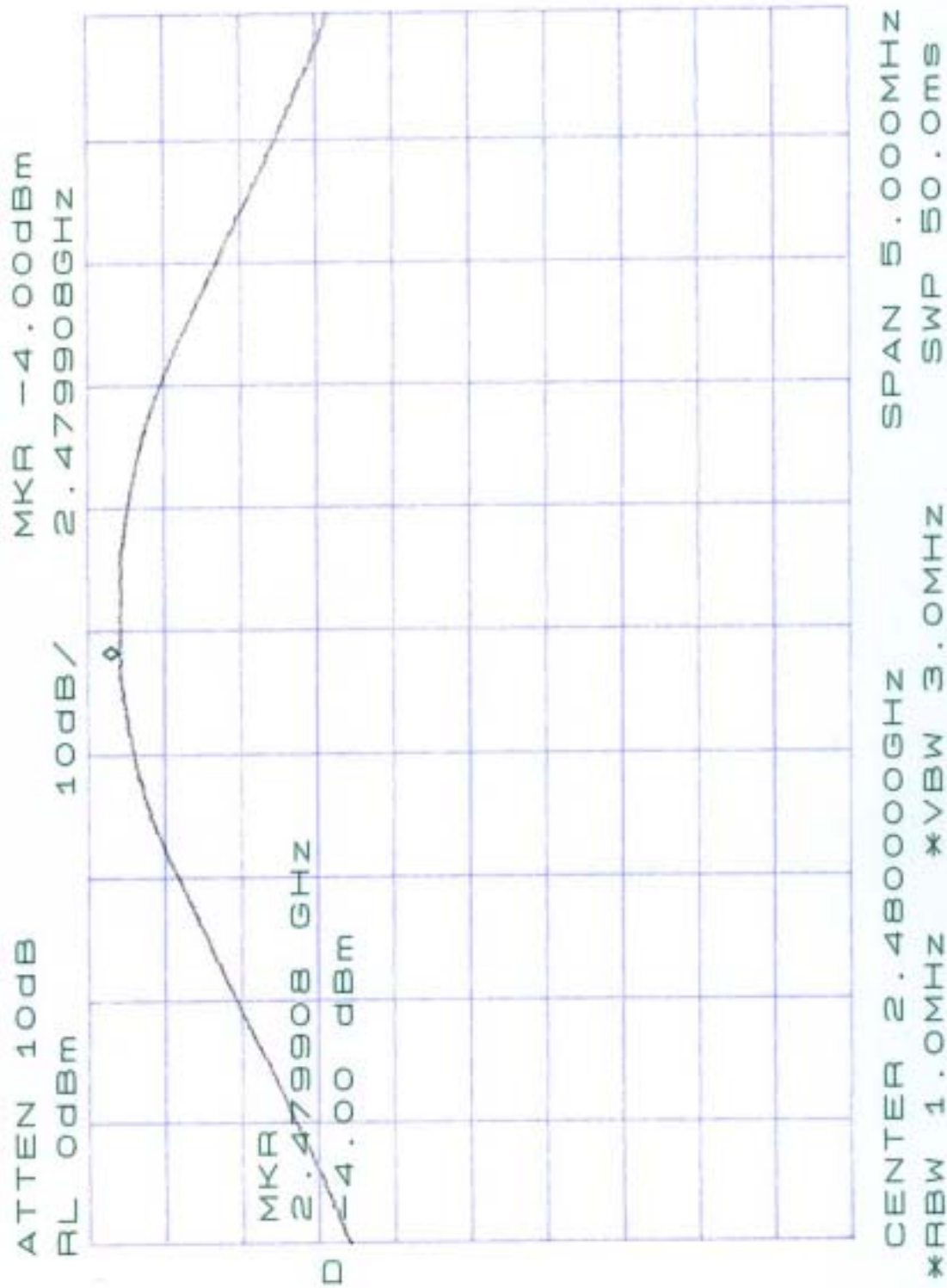
Humidity: 67%

- a) Channel 0 : Output Peak Power is -6.83dBm or 0.21 mW
- b) Channel 39 : Output Peak Power is -5.00 dBm or 0.32 mW
- c) Channel 78 : Output Peak Power is -4.00 dBm or 0.40 mW

Note: Please see Next pages for plotted datas







9 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

9.1 Standard Applicable

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a), whichever results in the lesser attenuation.

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

9.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| Plotter | Hewlett-Packard | 7550A | N/A |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

9.4 Measurement Data

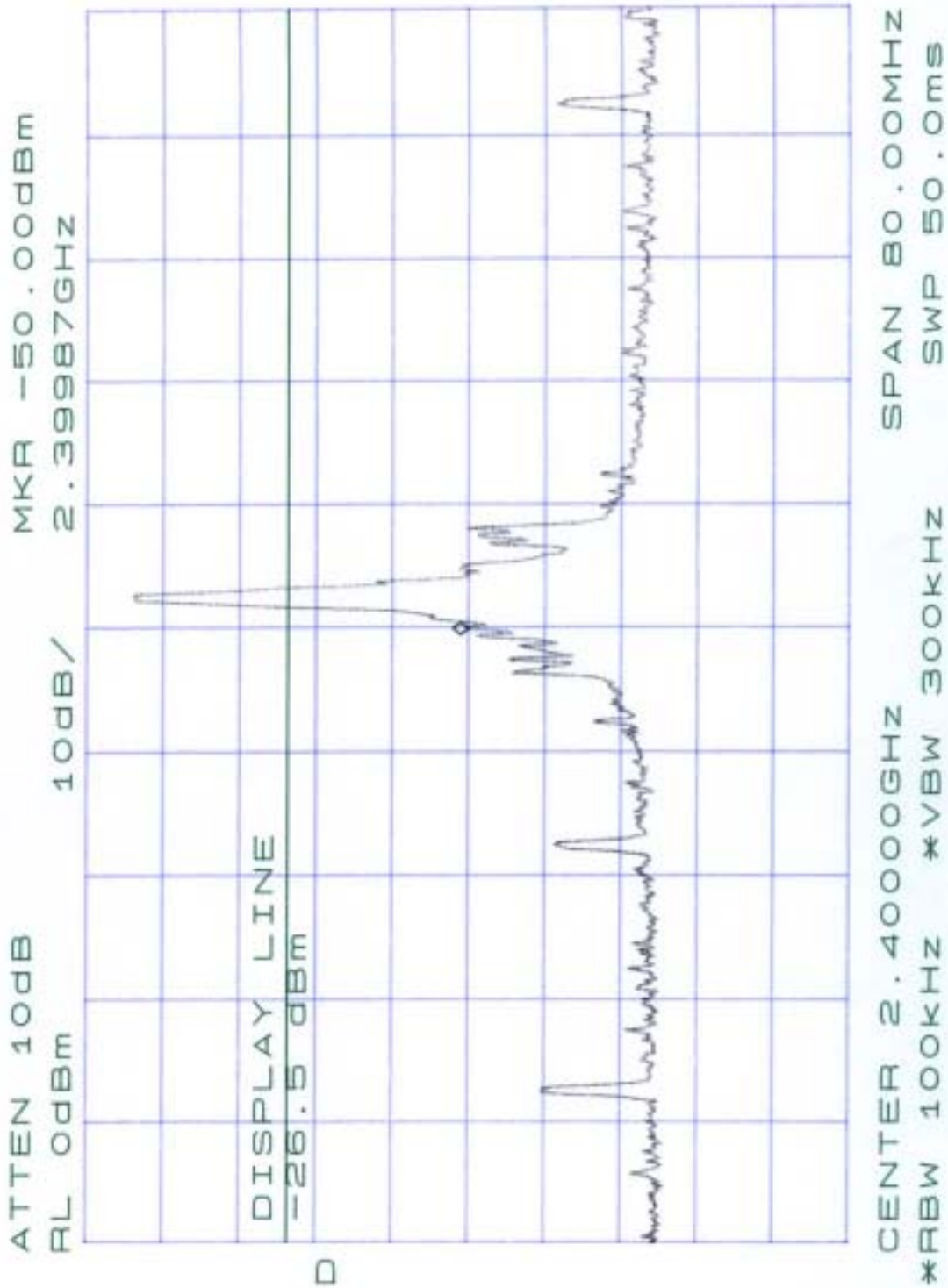
Test Date : May 11, 2004

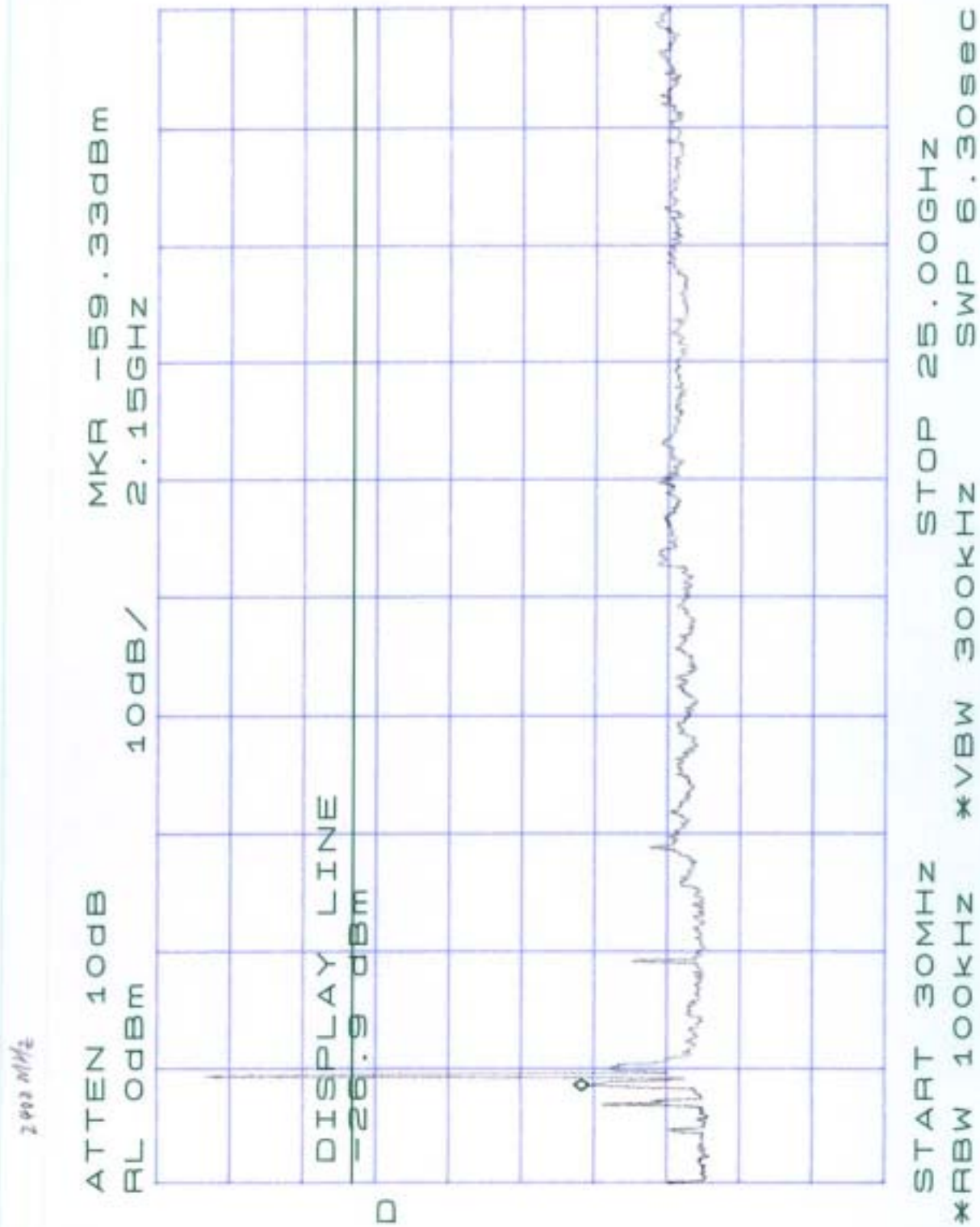
Temperature : 18

Humidity: 67%

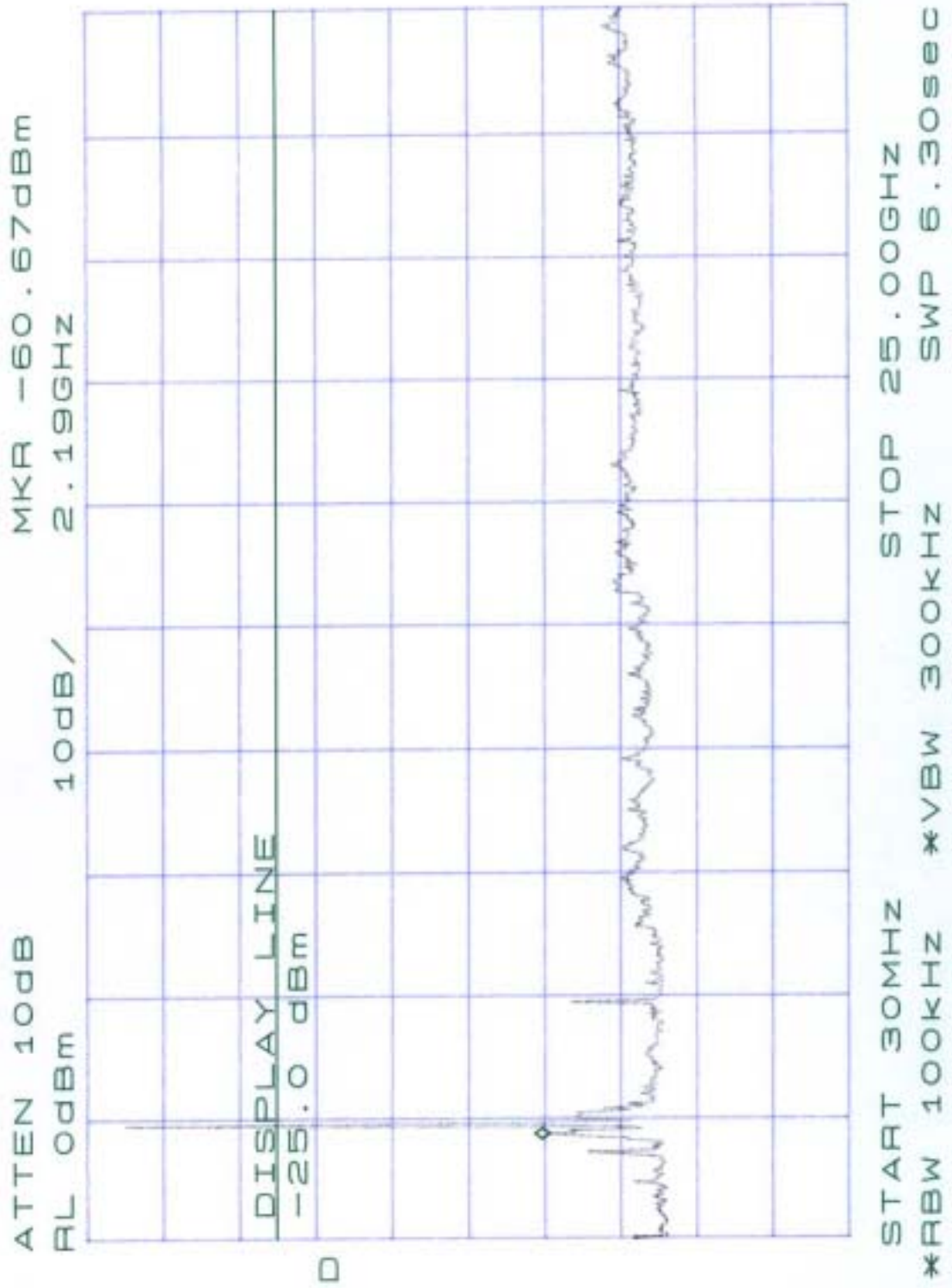
- a) Lower Band Edge : maximum value is -49.83 dBm that is attenuated more than 20dB
- b) Upper Band Edge : maximum value is -50.00 dBm that is attenuated more than 20dB

Note: Please see Next pages for plotted datas

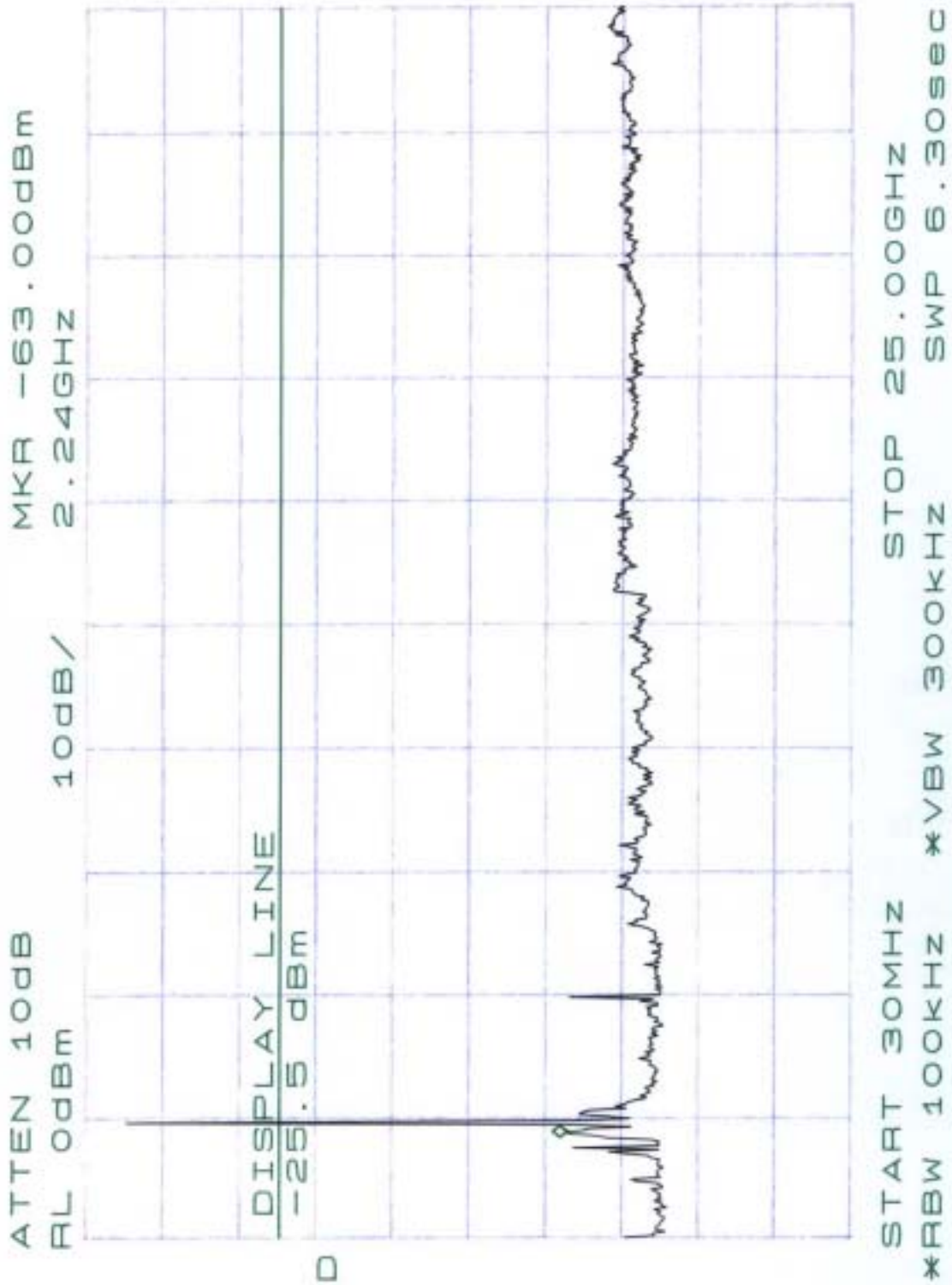


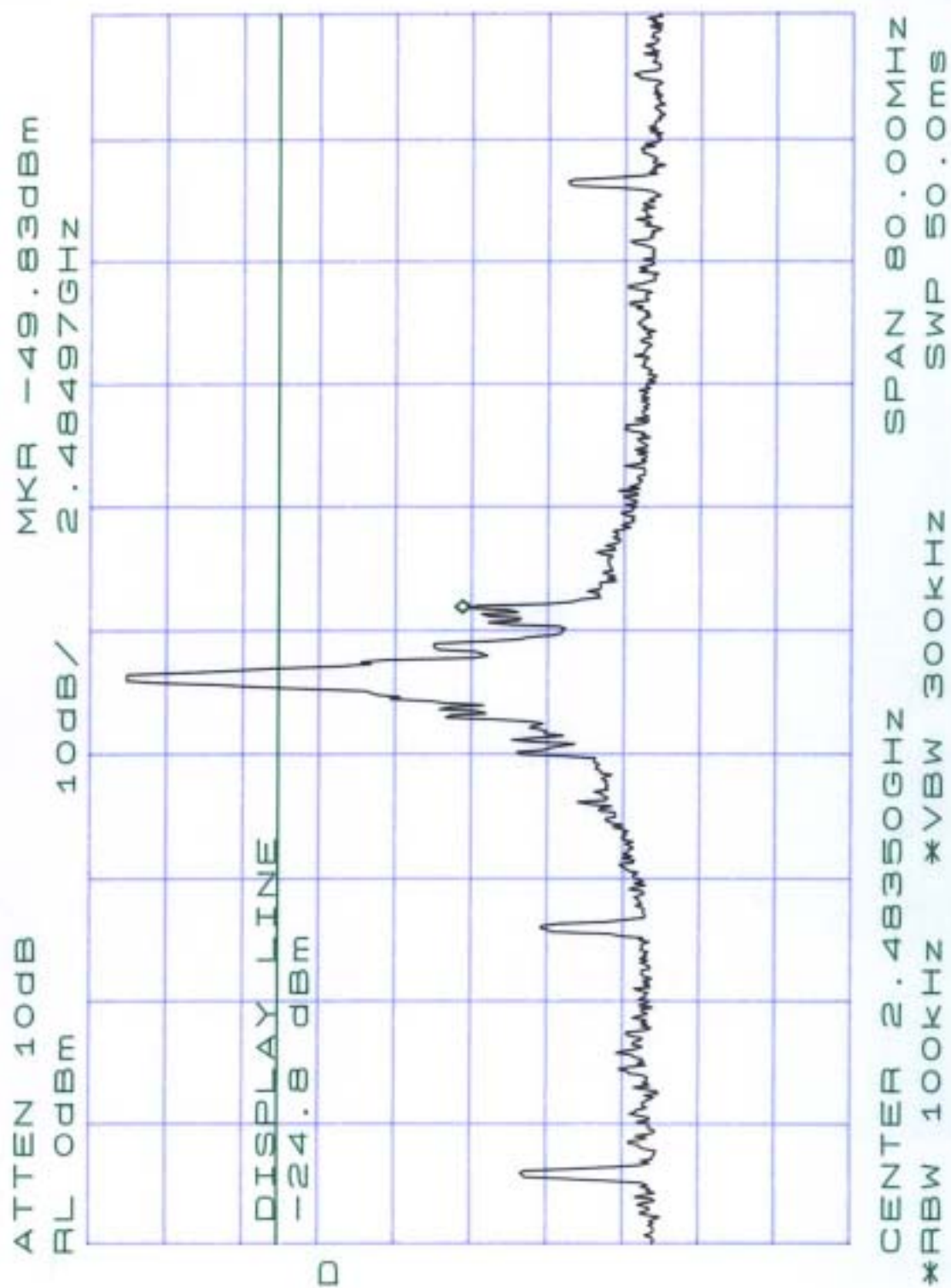


2441 MHz



2430414





10 RADIATED MEASUREMENT AT BANDEDGE WITH FUNDAMENTAL FREQUENCIES

10.1 Standard Applicable

According to 15.247(c), radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a).

10.2 Measurement Procedure

1. The setup of testing was shown in figure 2.
2. Set the spectrum analyzer on 1MHz resolution bandwidth for each frequency measured.
3. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the antenna at the height when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Measurement applied to channel 10, 39, 78, recorded the result.

10.3 Measuring Instrument

The following instrument are used for radiated emissions measurement :

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| EMI Test Receiver | Hewlett-Packard | 8546A | 08/27/2004 |
| Horn Antenna | EMCO | 3115 | 06/05/2004 |
| LogBicone Antenna | Schwarzbeck | 9160 | 10/28/2004 |
| Horn Antenna | EMCO | 3116 | 06/28/2004 |
| Preamplifier | Hewlett-Packard | 8449B | 09/04/2004 |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

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

| Frequency Band (MHz) | Instrument | Function | Resolution bandwidth | Video Bandwidth |
|-------------------------|-------------------|----------|-------------------------|--------------------|
| 2390 & 2483.5 | Spectrum Analyzer | Peak | 1 MHz | 1 MHz |
| | Spectrum Analyzer | Average | 1 MHz | 10 Hz |

10.4 Radiated Emission Data

a) Channel 0

Operation Mode : Transmitting /Receiving

Fundamental Frequency : 2402 MHz

Test Date : May 17, 2004Temperature : 20Humidity: 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|------------------------|----------------|------|------|------|-----------------------------|------------------------|------|-----------------------|------|----------------|-------------------------|---------------------|
| | H | | V | | | Peak | Ave | Peak | Ave. | | | |
| | Peak | Ave | Peak | Ave | | | | | | | | |
| 2390.000 | 29.2 | 19.3 | 29.4 | 19.3 | 28.3 | 57.7 | 47.6 | 74.0 | 54.0 | -6.4 | 32 | 1.0 |
| 2483.500 | 30.4 | 19.7 | 30.1 | 19.7 | 28.3 | 58.7 | 48.0 | 74.0 | 54.0 | -6.0 | 232 | 1.0 |

b) Channel 39

Operation Mode : Transmitting / Receiving

Fundamental Frequency : 2441MHz

Test Date : May 17, 2004Temperature : 20Humidity: 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|------------------------|----------------|------|------|------|-----------------------------|------------------------|------|-----------------------|------|----------------|-------------------------|---------------------|
| | H | | V | | | Peak | Ave | Peak | Ave. | | | |
| | Peak | Ave | Peak | Ave | | | | | | | | |
| 2390.000 | 29.6 | 19.5 | 29.3 | 19.3 | 28.3 | 57.9 | 47.8 | 74.0 | 54.0 | -6.2 | 196 | 1.0 |
| 2483.500 | 30.2 | 19.7 | 30.1 | 19.7 | 28.3 | 58.5 | 48.0 | 74.0 | 54.0 | -6.0 | 247 | 1.0 |

c) Channel 78

Operation Mode : Transmitting / Receiving

Fundamental Frequency : 2480 MHz

Test Date : May 17, 2004Temperature : 20Humidity: 68%

| Frequency (MHz) | Reading (dBuV) | | | | Factor (dB) Corr. | Result @3m (dBuV/m) | | Limit @3m (dBuV/m) | | Margin (dB) | Table Deg. (Deg.) | Ant. High (m) |
|------------------------|----------------|------|------|------|-----------------------------|------------------------|------|-----------------------|------|----------------|-------------------------|---------------------|
| | H | | V | | | Peak | Ave | Peak | Ave. | | | |
| | Peak | Ave | Peak | Ave | | | | | | | | |
| 2390.500 | 29.6 | 19.3 | 29.3 | 19.3 | 28.3 | 57.9 | 47.6 | 74.0 | 54.0 | -6.4 | 83 | 1.0 |
| 2483.500 | 30.1 | 19.7 | 30.1 | 19.7 | 28.3 | 58.4 | 48.0 | 74.0 | 54.0 | -6.0 | 232 | 1.0 |

11 Number of Hopping Channels

11.1 Standard Applicable

According to 15.247(b)(1), for frequency hopping systems, operating in the 2400-2483.5MHz band employing at least 75 hopping channels

11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to hopping operating mode and set spectrum analyzer maximum to measure the number of hopping channels.

11.3 Measurement Equipment

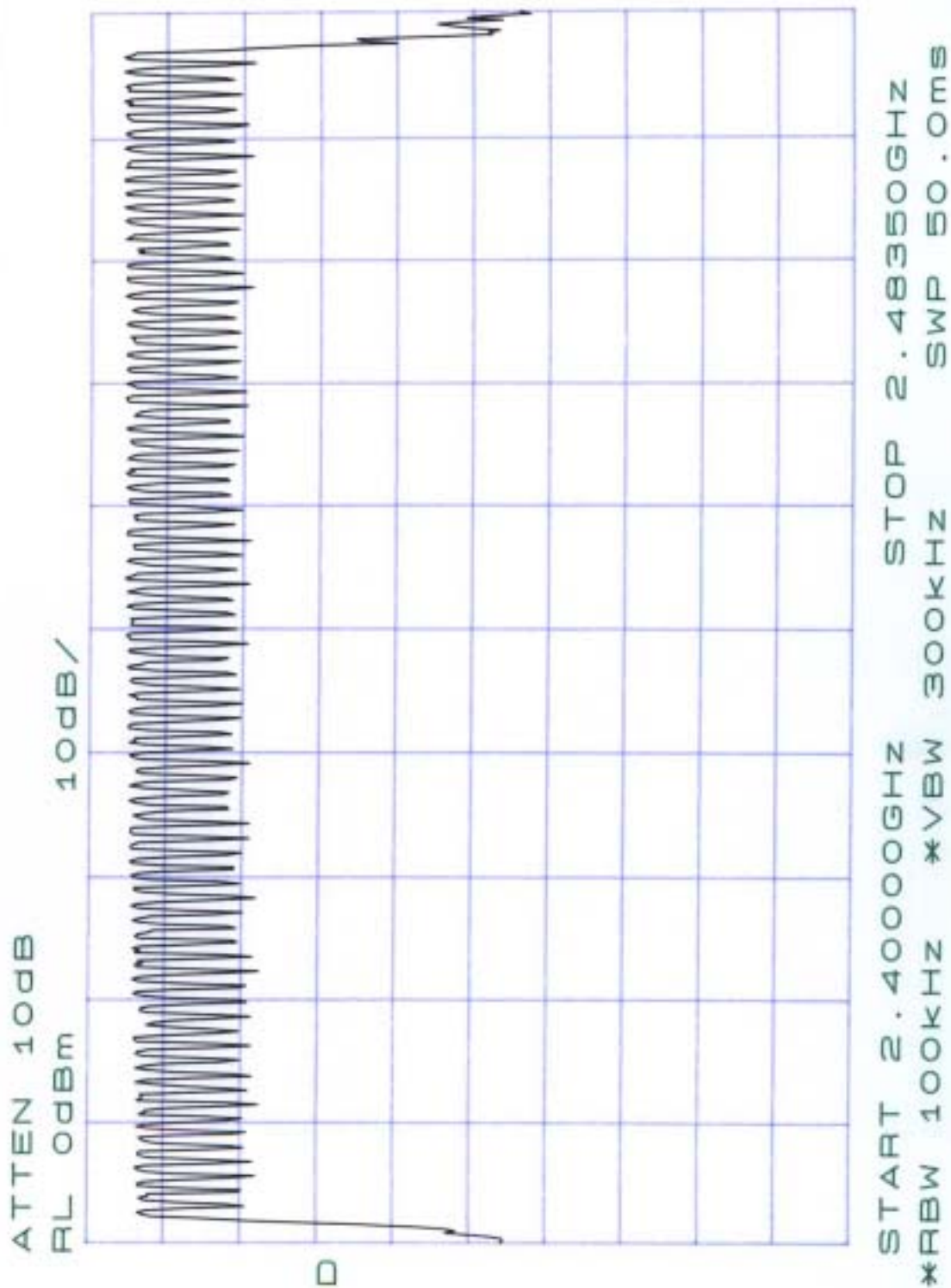
| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| Plotter | Hewlett-Packard | 7440A | N/A |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

11.4 Measurement Data

Test Date : May 11, 2004 Temperature : 18 Humidity: 67%

Number of hopping channels = 79 channels

Note: Please see next page for plotted datas



12 Channel Carrier Frequencies Separation

12.1 Standard Applicable

According to 15.247(a)(1), the frequency hopping system shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

12.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any measurement frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set spectrum analyzer maximum hold to measure channel carrier frequency, then adjust channel carrier frequency to adjacent channel.
4. Repeat above procedure until all measured frequencies were complete.

12.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| Plotter | Hewlett-Packard | 7550A | N/A |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

12.4 Measurement Data

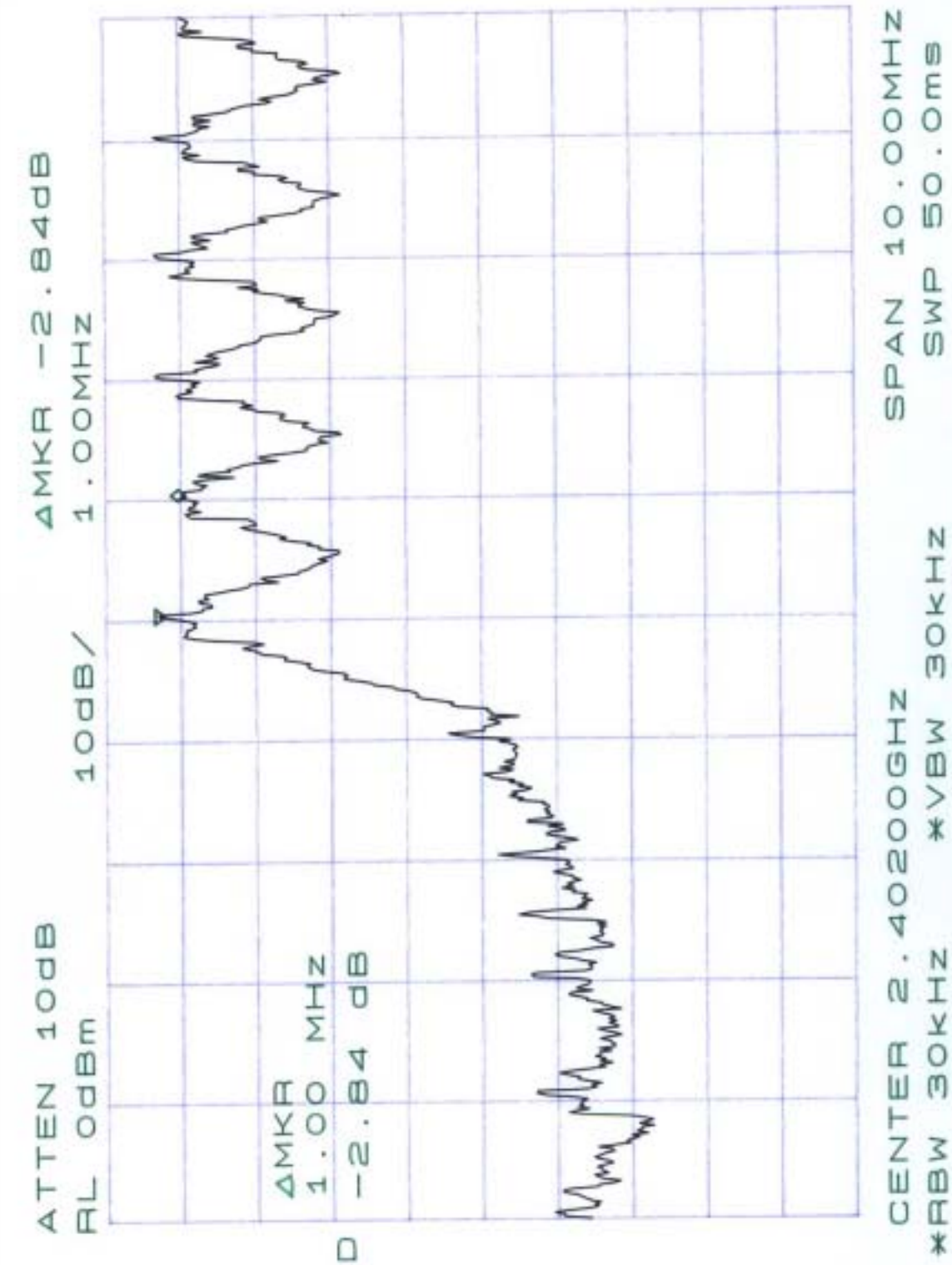
Test Date : May 11, 2004

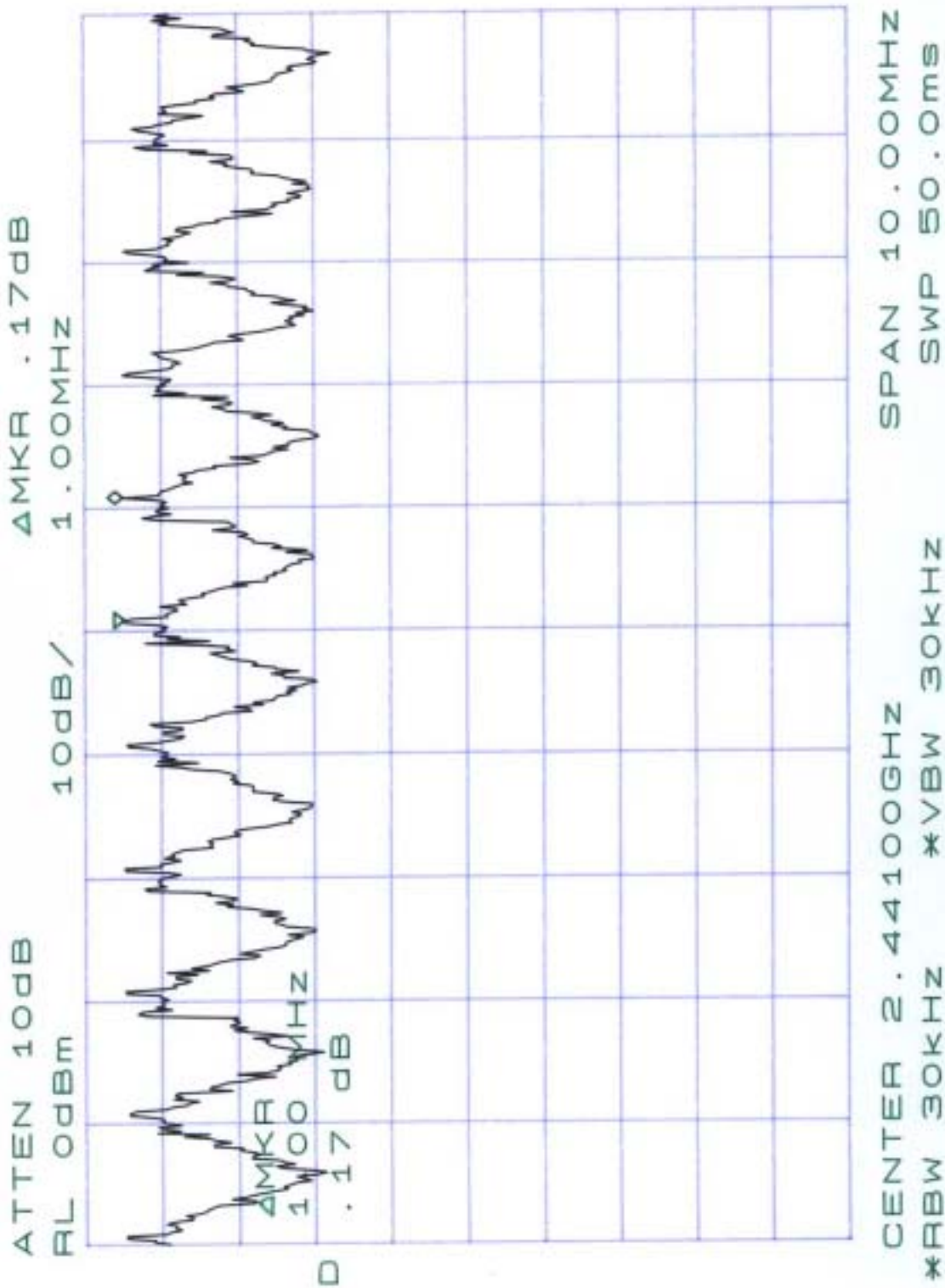
Temperature : 18

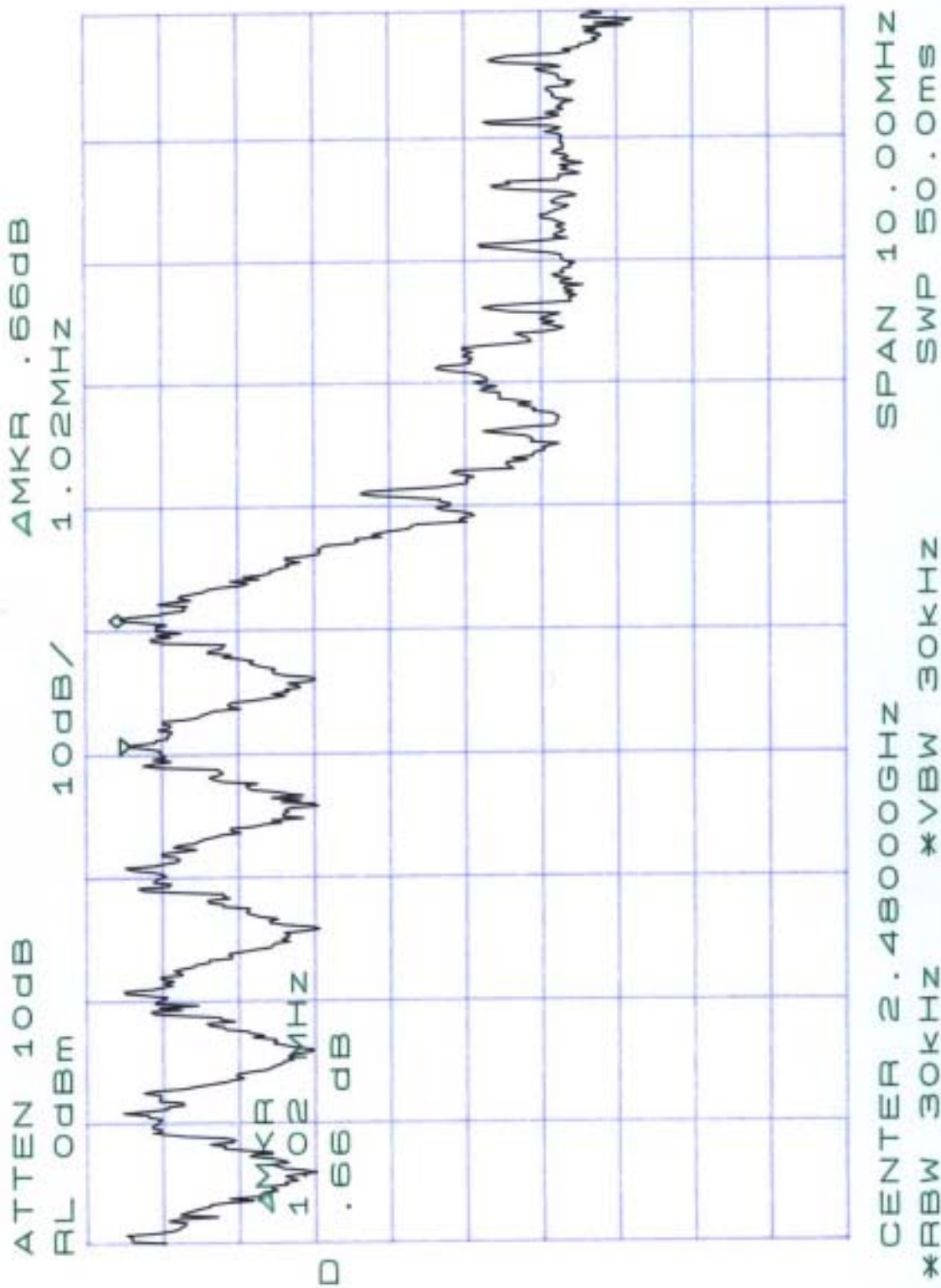
Humidity: 67%

- a) 2402MHz channel separation is 1MHz
- b) 2441MHz channel separation is 1MHz
- c) 2480MHz channel separation is 1.02MHz

Note: Please see next pages for plotted datas







13 POWER SPECTRAL DENSITY

13.1 Standard Applicable

According to 15.247(d), for bluetooth device, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

13.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 3kHz, VBW to 30 kHz, sweep 300kHz and sweep time 100 sec.
4. Measure the highest amplitude appearing on spectral display and record the level to calculate result data.
5. Repeat above procedures until all frequencies measured were complete.

13.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| Plotter | Hewlett-Packard | 7550A | N/A |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

13.4 Measurement Data

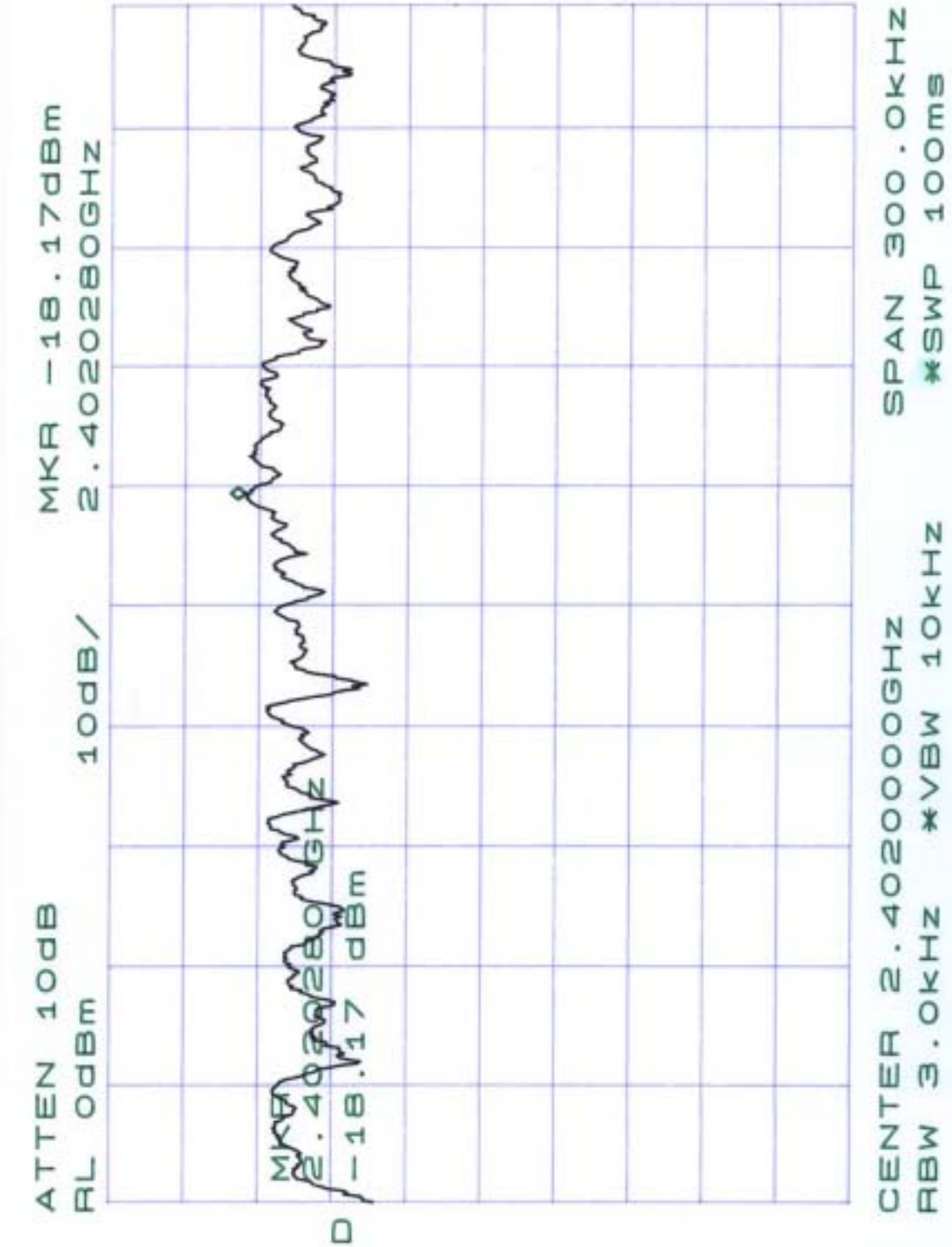
Test Date : May 11, 2004

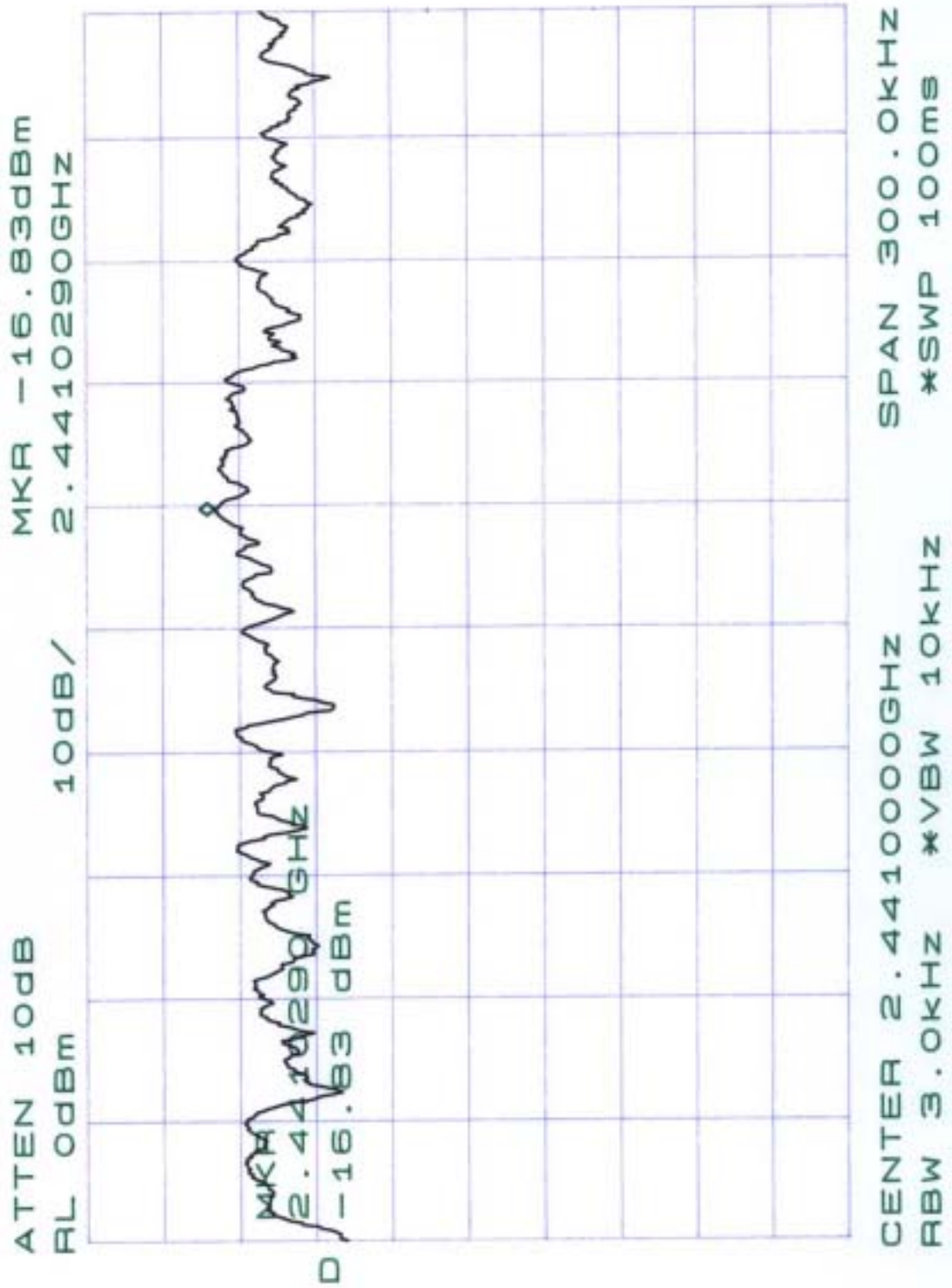
Temperature : 18

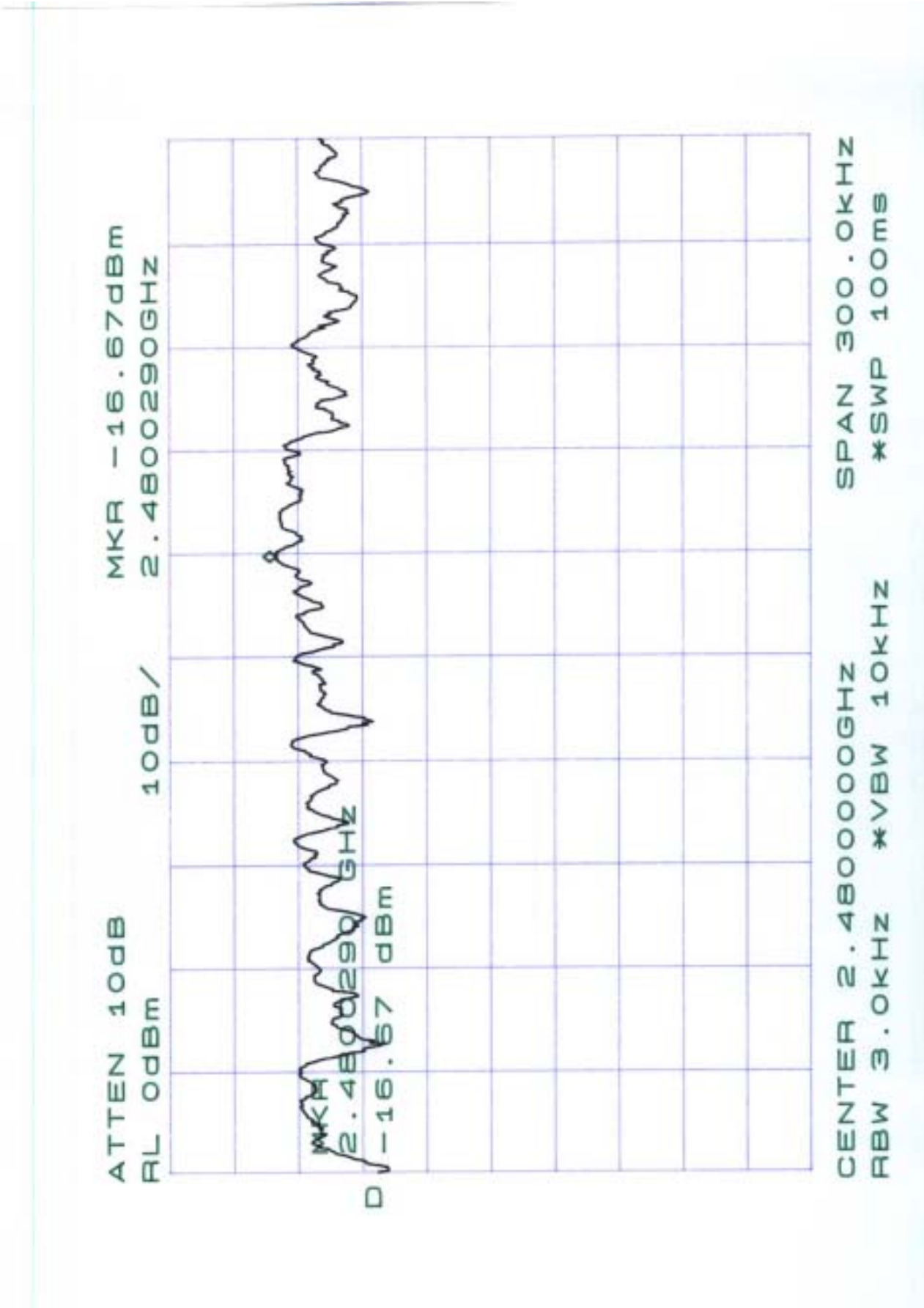
Humidity: 67%

- a) Channel 0 : Power Spectral Density is -18.17 dBm
- b) Channel 39 : Power Spectral Density is -16.83 dBm
- c) Channel 78 : Power Spectral Density is -16.67 dBm

Note: Please see next pages for plotted datas







14 Dwell Time

14.1 Standard Applicable

According to 15.247(a)(1)(iii), frequency hopping system in the 2400-2483.5MHz band employing at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 second multiplied by the number of hopping channels employed.

14.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The setup of the EUT as shown in figure 4.

14.3 Measurement Equipment

| Equipment | Manufacturer | Model No. | Next Cal. Due |
|-------------------|-----------------|-----------|---------------|
| Plotter | Hewlett-Packard | 7550A | N/A |
| Spectrum Analyzer | Hewlett-Packard | 8564EC | 09/10/2004 |

14.4 Measurement Data

Test Date : May 11, 2004

Temperature : 18

Humidity: 67%

Test period=0.4(second/channel)×79 channel=31.6sec

- a) 2402MHz dwell time= $0.4233\text{ms} \times \frac{800}{79} \times 31.6 = 135.456\text{ms}$
- b) 2441MHz dwell time= $0.4250\text{ms} \times \frac{800}{79} \times 31.6 = 136.000\text{ms}$
- c) 2480MHz dwell time= $0.4250\text{ms} \times \frac{800}{79} \times 31.6 = 136.000\text{ms}$

Note: Please see next pages for plotted datas

