FCC PART 15 SUBPART C

EMI MEASUREMENT AND TEST REPORT

For

Actiontec Electronics, Inc.

760 N. Mary Ave.
Sunnyvale, CA 94086

FCC ID: LNQBTM200

February 26, 2003

This Report Concerns:	**Equipment Type:**
☒ Original Report	USB Bluetooth Wireless Module

Test Engineer:	Jerry Wang
Report No.:	R0302101
Test Date:	February 12, 2003
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Actiontec Electonics, Inc's* product, model no.:BTM200 or the "EUT" as referred to this report is a USB Bluetooth Wireless Module which is measured approximately1 1"L x 0.5"W x 0.2"H. The EUT is a standalone complete Bluetooth module with an built-in antenna on it. The module is capable of receiving FCC Part15 Unlicensed Modular Transmitter approval as a standalone transmitter. It has its own metal shield to cover the RF transmitter. There is an internal regulator to supply power for the transmitter for this purpose.

** The test data gathered is from typical production samples provided by the manufacturer.*

1.2 Objective

This type approval report is prepared on behalf of *Actiontec Electronics, Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with C108.8 & RSS-210 rules for the bluetooth transmitter:

- Maximum Peak Output Power
- Hopping Channel Separation
- Number of Hopping Frequency Used
- 20 dB Bandwidth
- Dwell Time on Each Channel
- 100 kHz Bandwidth of Band Edge
- Conducted Emission
- Spurious Emission
- Radiated Emission
- Antenna Requirement
- RF Exposure Limit

1.3 Related Submittal(s)/Grant(s)

No Related Submittals.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at BACL. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 1997: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2610A02165	12/6/03
HP	Spectrum Analyzer	8593B	2919A00242	12/20/03
HP	Amplifier	8349B	2644A02662	12/20/03
HP	Quasi-Peak Adapter	85650A	917059	12/6/03
HP	Amplifier	8447E	1937A01046	12/6/03
A.H. System	Horn Antenna	SAS0200/571	261	12/27/03
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/03
Com-Power	Biconical Antenna	AB-100	14012	11/2/03
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/03
Com-Power	LISN	LI-200	12208	12/20/03
Com-Power	LISN	LI-200	12005	12/20/03
BACL	Data Entry Software	DES1	0001	12/20/03

*** Statement of Traceability: Bay Area Compliance Laboratory Corp.** certifies that all calibration has been performed using suitable standards traceable to the NIST.

1.7 Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
SamSung	Notebook PC	Sapphine	J2N1500S1182	DOC

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Cable	1.0	DC Port/ EUT	DC/AC Adapter
USB Cable	0.15	EUT	Notebook

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The host system was configured for testing in a typical fashion (as a normally used by a typical user).

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, bluetest, provided by the customer, is started the Windows 98 terminal program under the Windows 98 operating system. Once started, select USB from “choose a protocol”, select TXDATA1 from “bluetest” then click execute. The process is continuous throughout all tests.

2.3 Special Accessories

As shown in section 2.7, all interface cables used for compliance testing are shielded as normally supplied by their respective support equipment manufacturers.

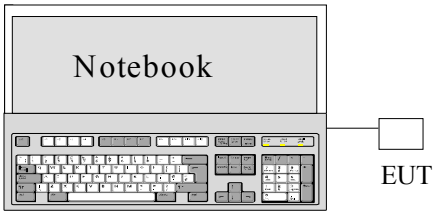
2.4 Schematics / Block Diagram

Please refer to Exhibit D.

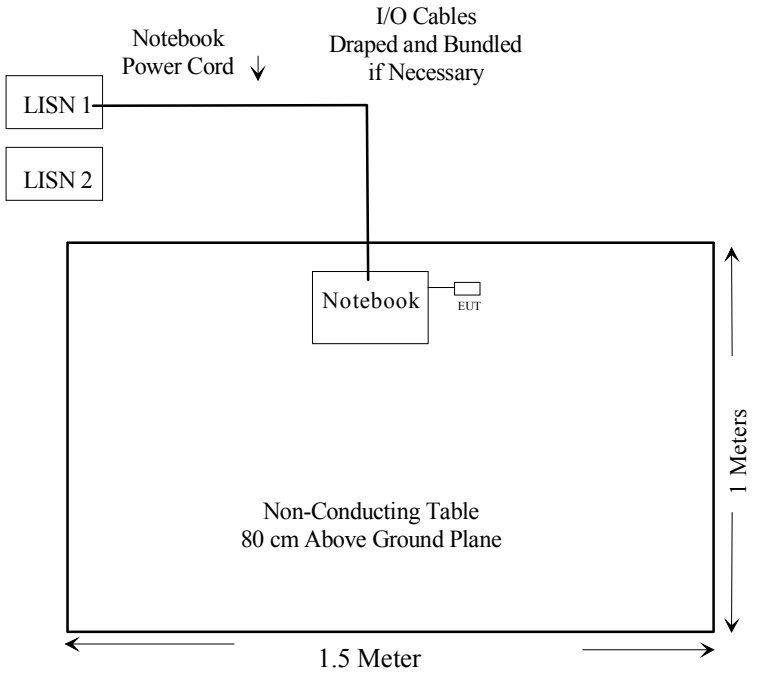
2.5 Equipment Modifications

No modifications were made by BACL Corporation to ensure the EUT to comply with the applicable limits and requirements.

2.6 Configuration of Test System



2.7 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT	REFERENCE
§ 2.1093	RF Safety Requirements	Compliant	User Manual
§15.203	Antenna Requirement	Compliant	Section 13
§15.207 (a)	Conducted Emission	Compliant	Section 12
§ 15.205	Restricted Bands	Compliant	Section 11
§15.247 (a) (1) (iii)	Number of Hopping Frequencies Used	Compliant	Section 6
§15.209	Radiated Emission	Compliant	Section 11
§15.247 (a) (1)	Hopping Channel Separation	Compliant	Section 7
§15.247 (a) (1) (iii)	Dwell Time of Each Frequency within a 10 Second Period of time (0.4 x Number of Channel)	Compliant	Section 9
§15.247 (a) (1) (iii)	20dB Bandwidth	Compliant	Section 5
§15.247 (b) (1)	Maximum Peak Output Power	Compliant	Section 4
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	Compliant	Section 8
§ 15.247 (g)	Full and complete compliance with applicable requirements for FHSS. Compliance with the definition of frequency hopping system, distribute transmission over minimum number of hopping channel	Compliant	Technical Manual
§ 15.247 (h)	Limitation on avoidance on hopping on occupied channel	Compliant	Technical Manual

4 - MAXIMUM PEAK OUTPUT POWER

4.1 Standard Applicable

According to §15.247(b) (1), for frequency hopping systems in the 2400-2483.5MHz band employing at least 75 hopping channels, and all direct sequence systems, the maximum peak output power of the transmitter shall not exceed 1 Watt.

4.2 Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

4.3 Test Equipment

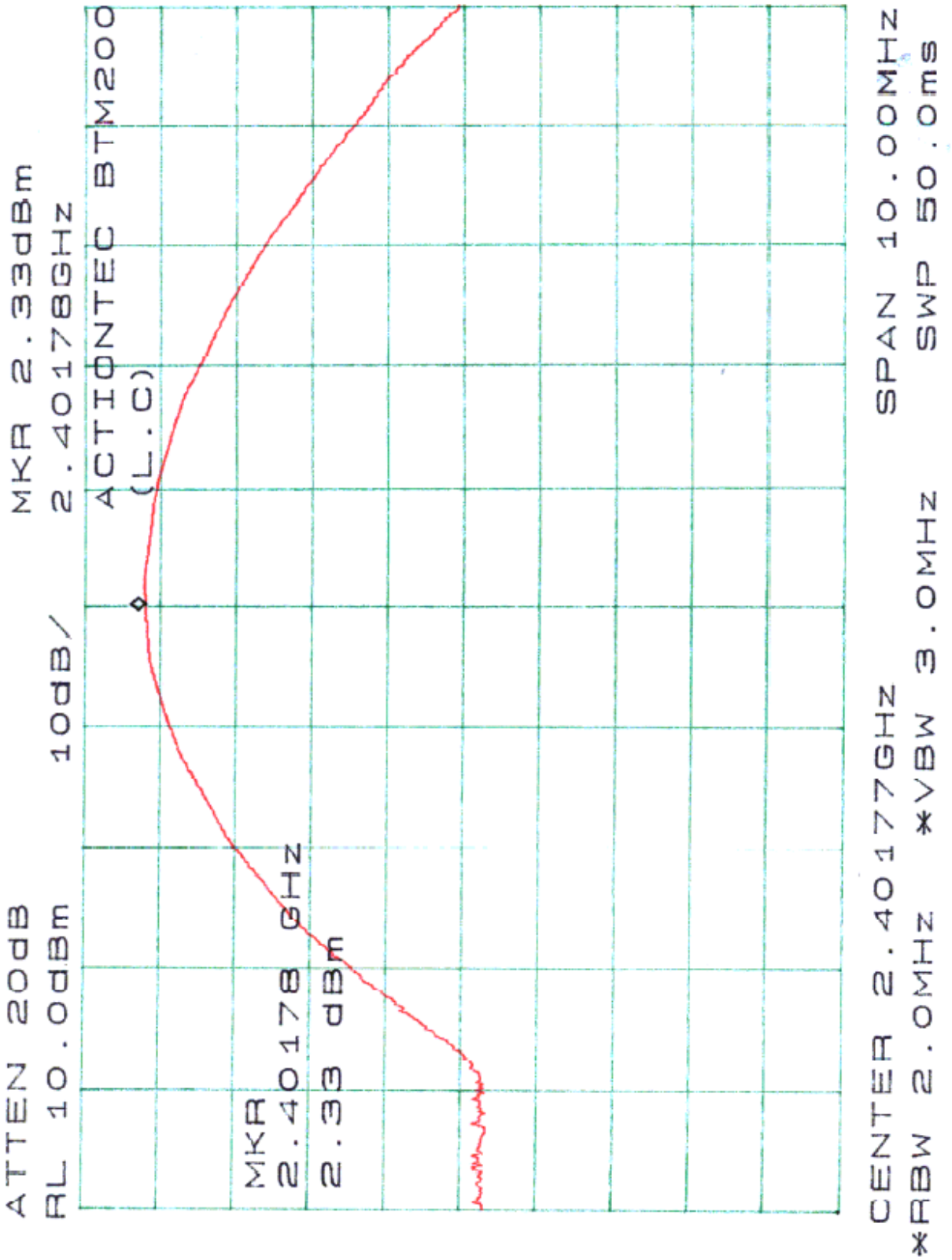
Manufacturer	Model No.	Serial No.	Calibration Due Date
Agilent	8565EC	648492	5/3/03

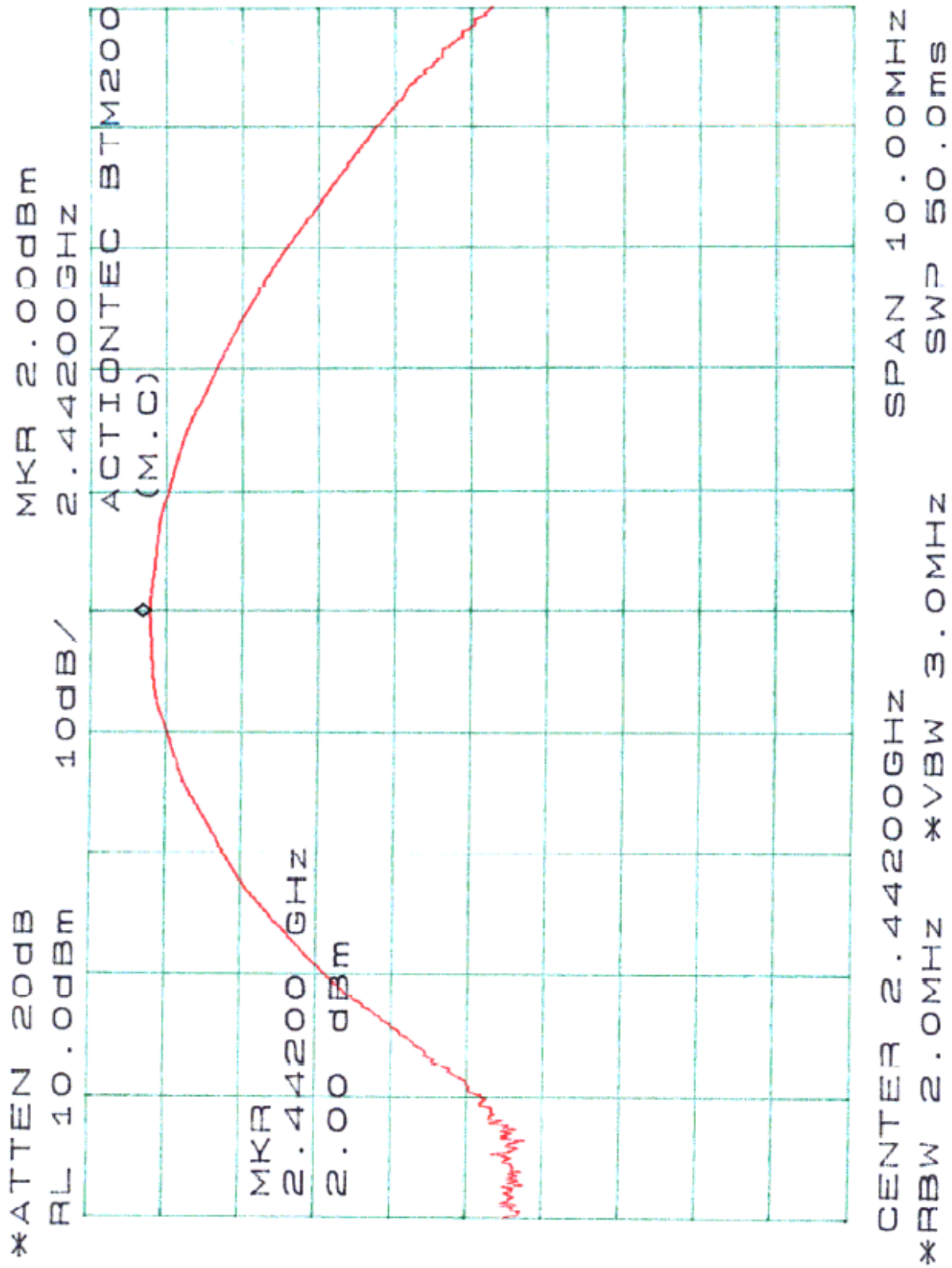
4.4 Measurement Result

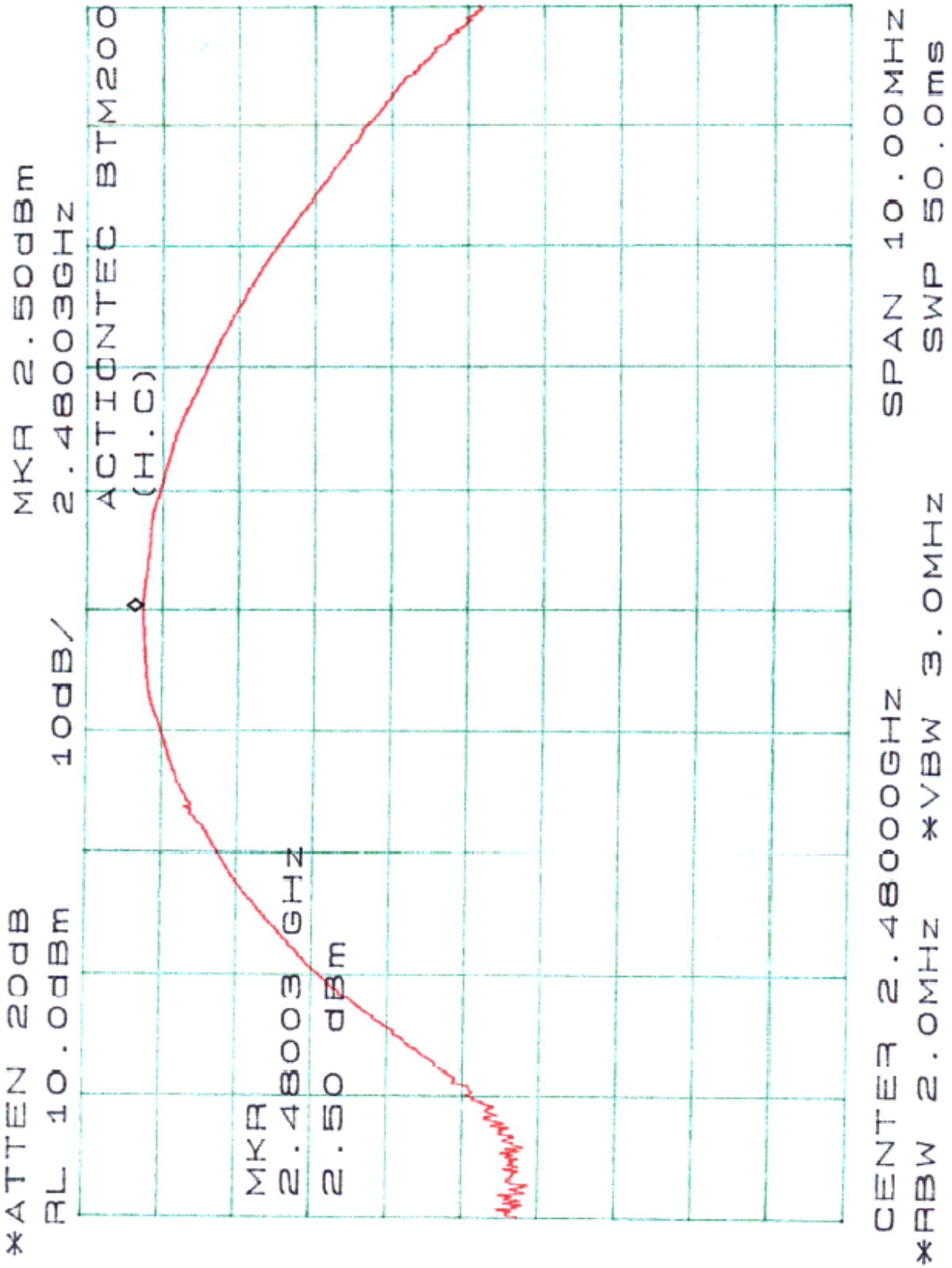
Frequency	Output Power in dBm	Output Power in mW	Standard	Result
Low	2.33	1.71	≤ 1W	Compliant
Middle	2.00	1.58	≤ 1W	Compliant
High	2.50	1.78	≤ 1W	Compliant

4.5 Plots of Maximum Peak Output Power

Please refer to following plots.


ATTEN 20dB
RL 10.00dBm
10dB/
MKR 2.33dBm
2.401789GHz
ACTIONTEC BTM200
(L.C)
MKR
2.401778 GHz
2.33 dBm
CENTER 2.401776GHz
*RBW 2.0MHz
*VBW 3.0MHz
SPAN 10.00MHz
SWP 50.0ms


*ATTEN 20dB
RL 10.0dBm
10dB/
MKR 2.442003Hz
ACTIONTEC BTM200
(M.C)
MKR 2.44200 GHz
2.00 dBm
CENTER 2.44200GHz
*RBW 2.0MHz
*VBW 3.0MHz
SPAN 10.00MHz
SWP 50.0ms


*ATTEN 20dB
RL 10.0dBm
10dB/
MKR 2.500dBm
2.48003GHz
ACTIONTEC BTM200
(H.C)
MKR
2.48003 GHz
2.50 dBm
CENTER 2.48000GHz
SPAN 10.00MHz
*RBW 2.0MHz
*VBW 3.0MHz
SWP 50.0ms

5 - CHANNEL BANDWIDTH

5.1 Standard Applicable

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

5.2 Measurement Procedure

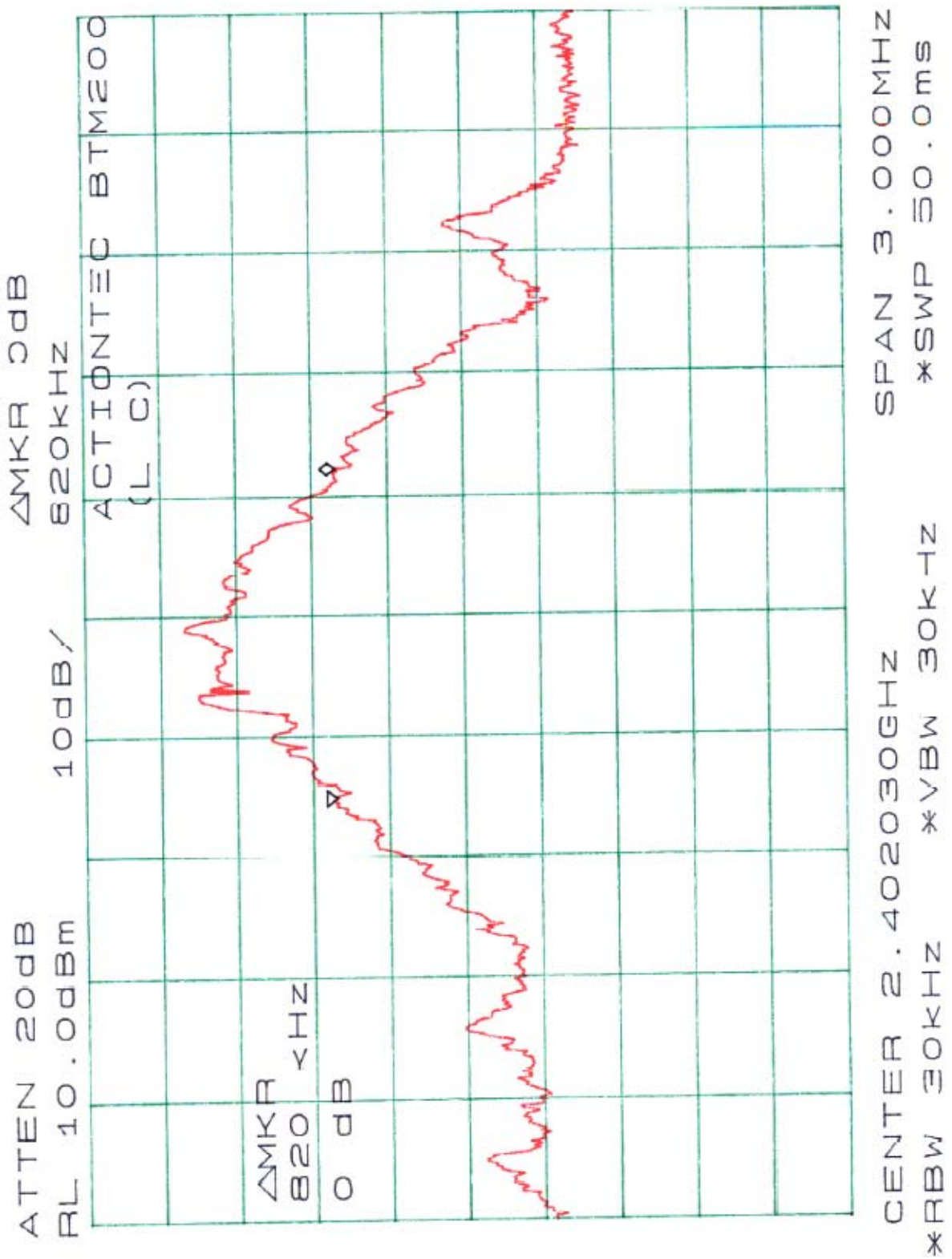
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency 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 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

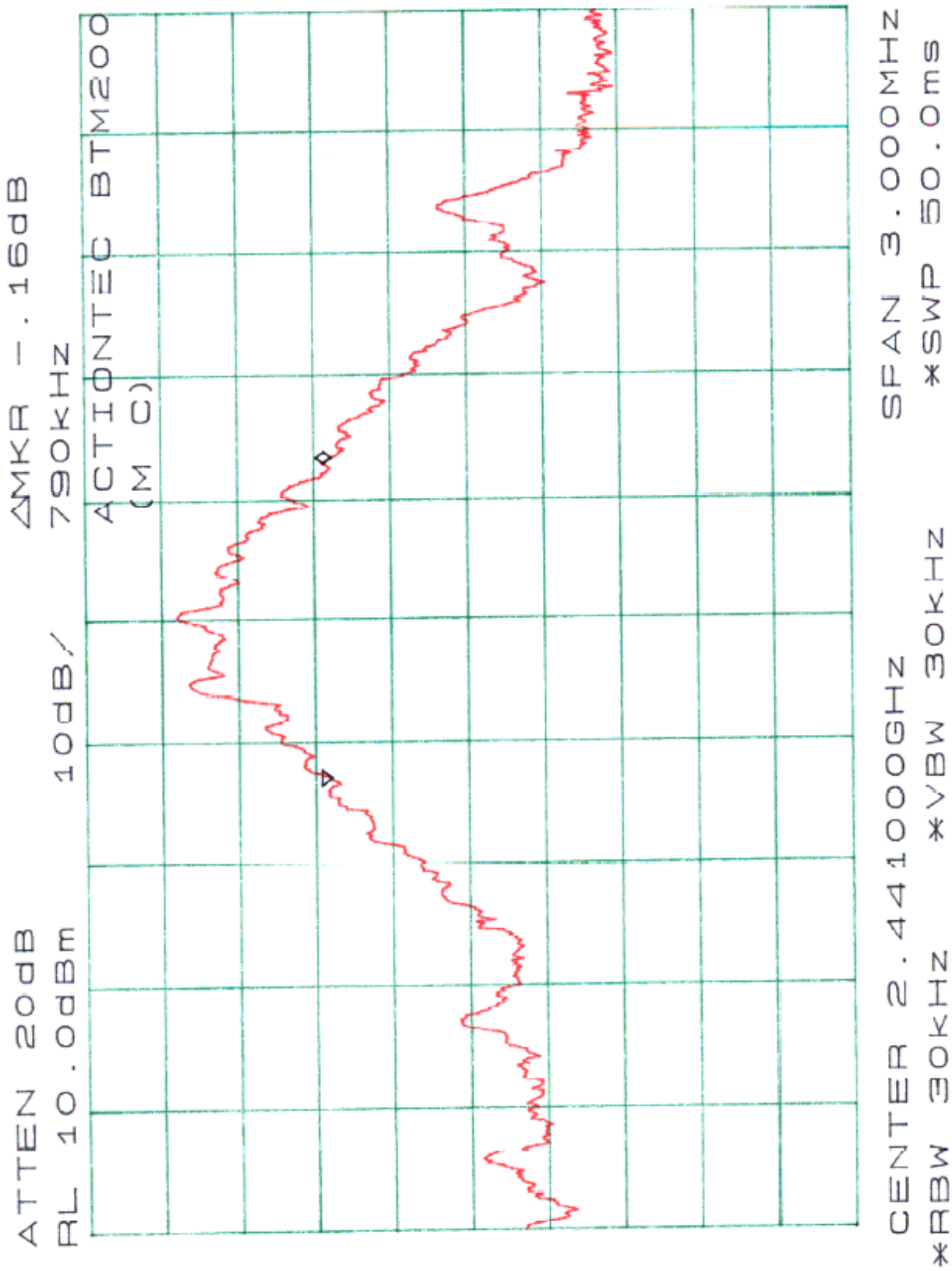
5.3 Measurement Result

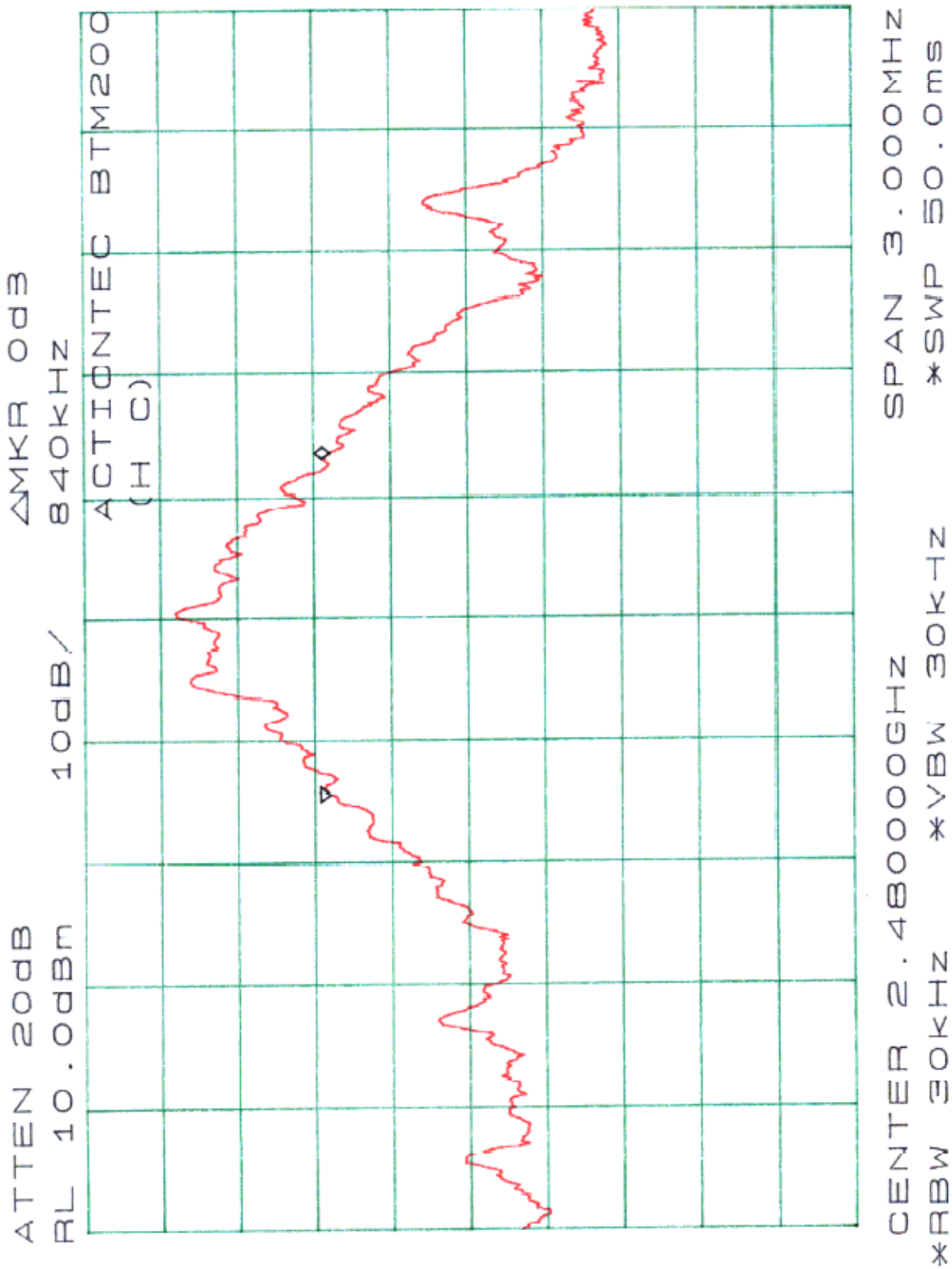
Frequency	Measurement (kHz)	Standard	Result
Low	820	≤ 1MHz	Compliant
Middle	790	≤ 1MHz	Compliant
High	840	≤ 1MHz	Compliant

5.4 Plot of Channel Bandwidth

Please refer to following plots.


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR 0dB
820kHz
ACTIONTEC BTM200
(L C)
ΔMKR
820 kHz
0 dB
CENTER 2.402030GHz
SPAN 3.000MHz
*RBW 30kHz
*VBW 30kHz
*SWP 50.0ms


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR -.16dB
790kHz
ACTIONTEC BTM200
(M C)
CENTER 2.441000GHz
*RBW 30kHz
*VBW 30kHz
SPAN 3.000MHz
*SWP 50.0ms


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR 0dB
840kHz
ACTIONTEC BTM200
(H C)
CENTER 2.480000GHz
*RBW 30kHz
*VBW 30kHz
SPAN 3.000MHz
*SWP 50.0ms

6 - NUMBER OF HOPPING FREQUENCY USED

6.1 Standard Applicable

According to §15.247(a)(1)(iii), frequency hopping systems operating in the 2400-2483.5Mhz band shall use at least 75 hopping frequencies.

6.2 Measurement Procedure

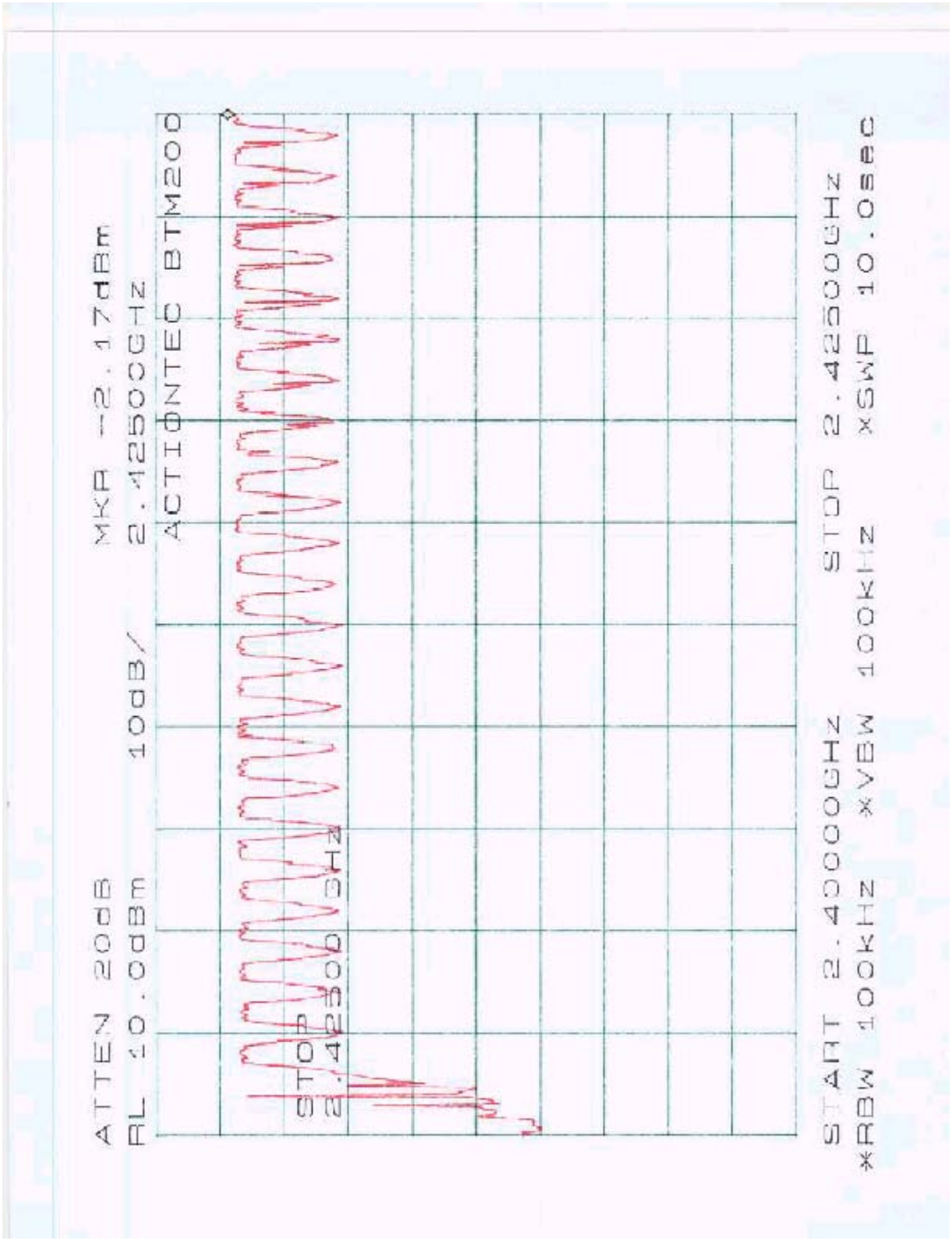
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the bench without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low 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 Max-Hold 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.

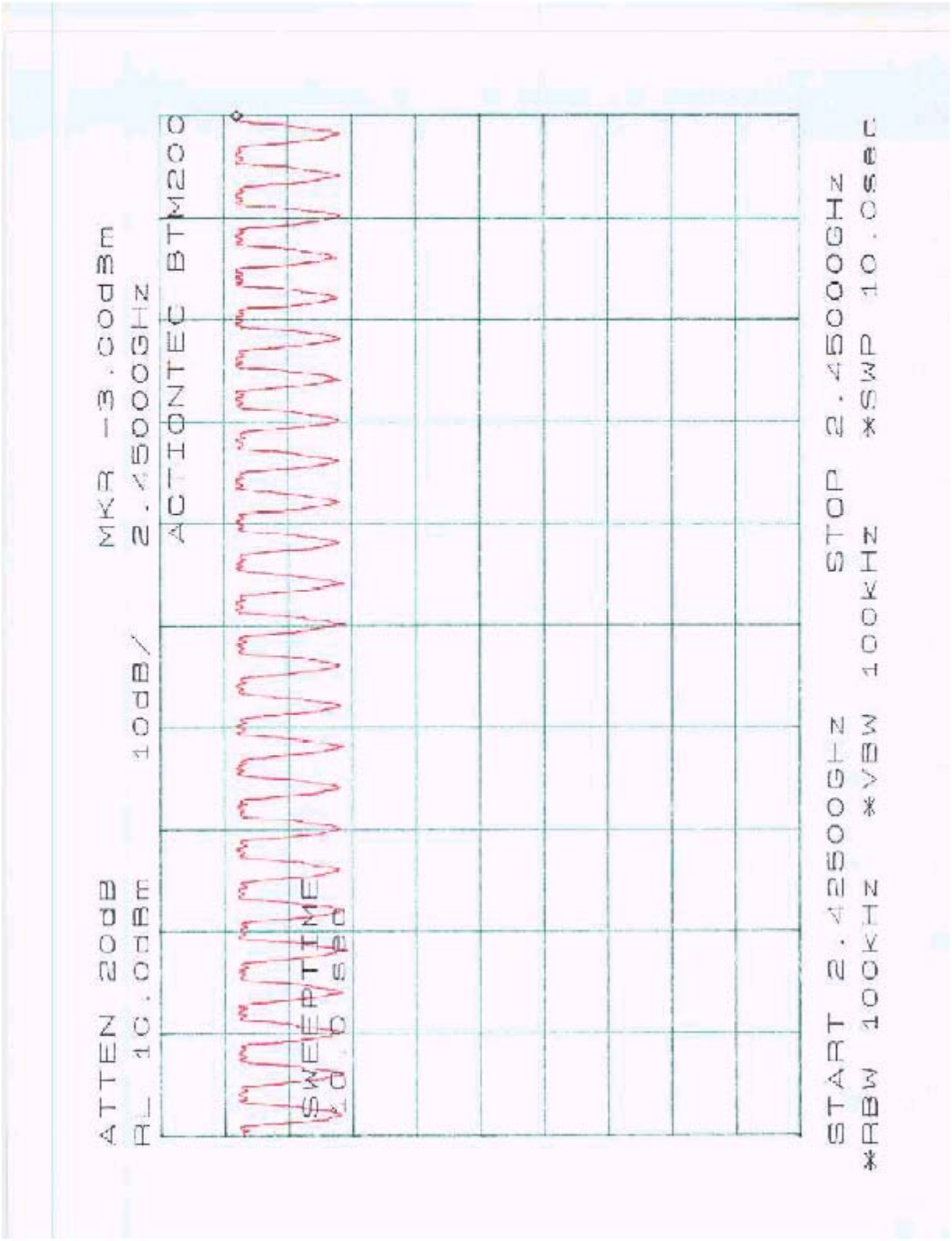
6.3 Measurement Procedure

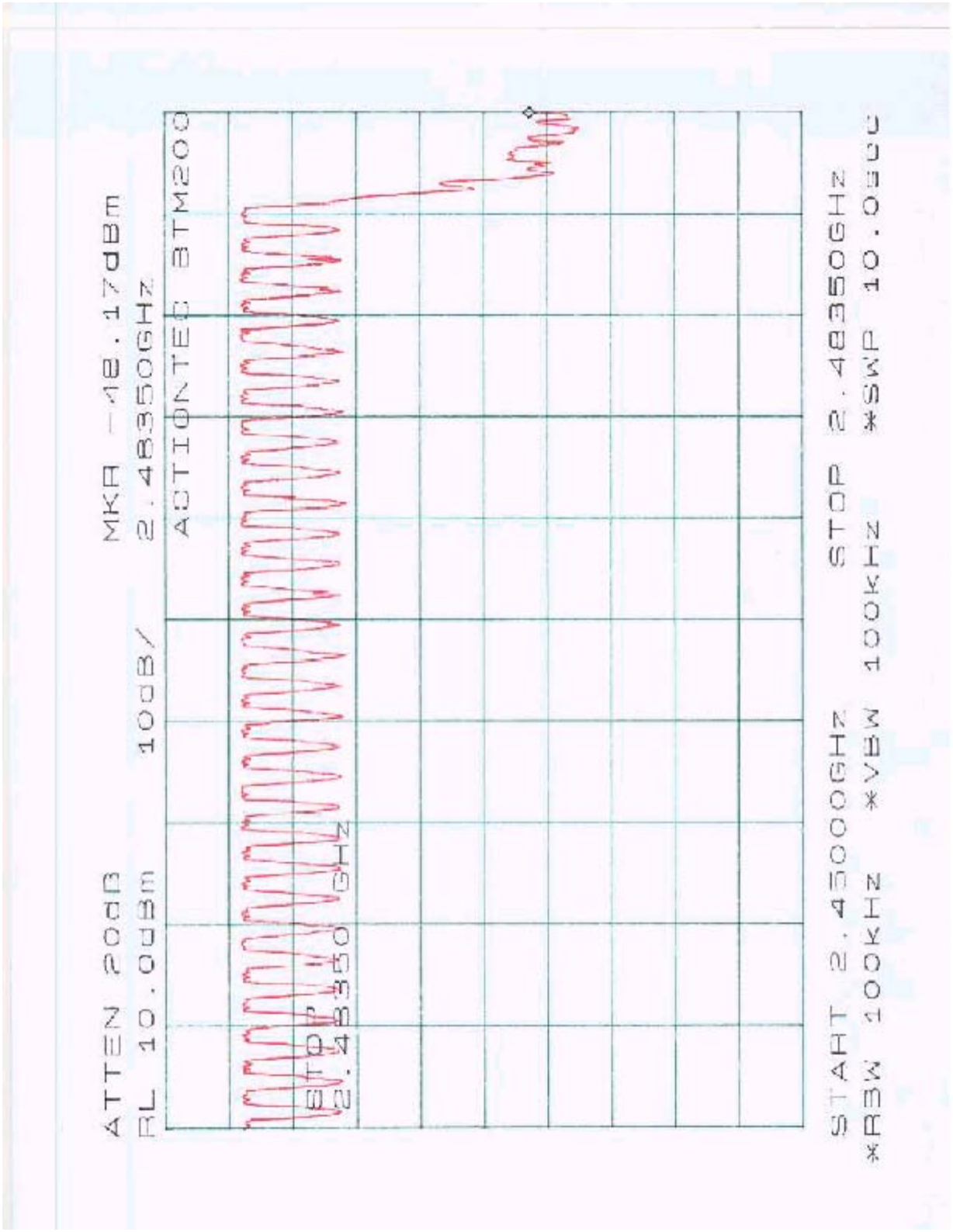
Measurement	Standard	Result
79	75	Compliant

6.4 Plots of Number of Hopping Frequency

Please refer to the attached plots.


ATTEN 20dB
RL 10.0dBm
10dB/
MKR -2.17dBm
2.412500GHz
ACTIONTEC BTM200
STOP
2.423500 GHz
START 2.400000GHz
*RBW 100kHz
*VBW 100kHz
STOP 2.425000GHz
SWP 10.0sec


ATTEN 20dB
RL 10.00dBm
10dB/
MKR -3.60dBm
2.450000GHz
ACTIONTEC BTM200
SWEEP TIME
100 sec
START 2.425000GHz
*RBW 100KHz
*VBW 100KHz
STOP 2.450000GHz
*SWP 10.0sec


ATTEN 20dB
RL 10.00dBm
10dB/
MKR -12.17dBm
2.483500GHz
ACTIONTEC BTM200
STOP 2.483500GHz
*SWP 10.00sec
START 2.450000GHz
*VBW 100KHz
*RBW 100KHz

7 - HOPPING CHANNEL SEPARATION

7.1 Standard Applicable

According to §15.247(a)(1), frequency hopping system shall have, hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies.

7.2 Measurement Procedure

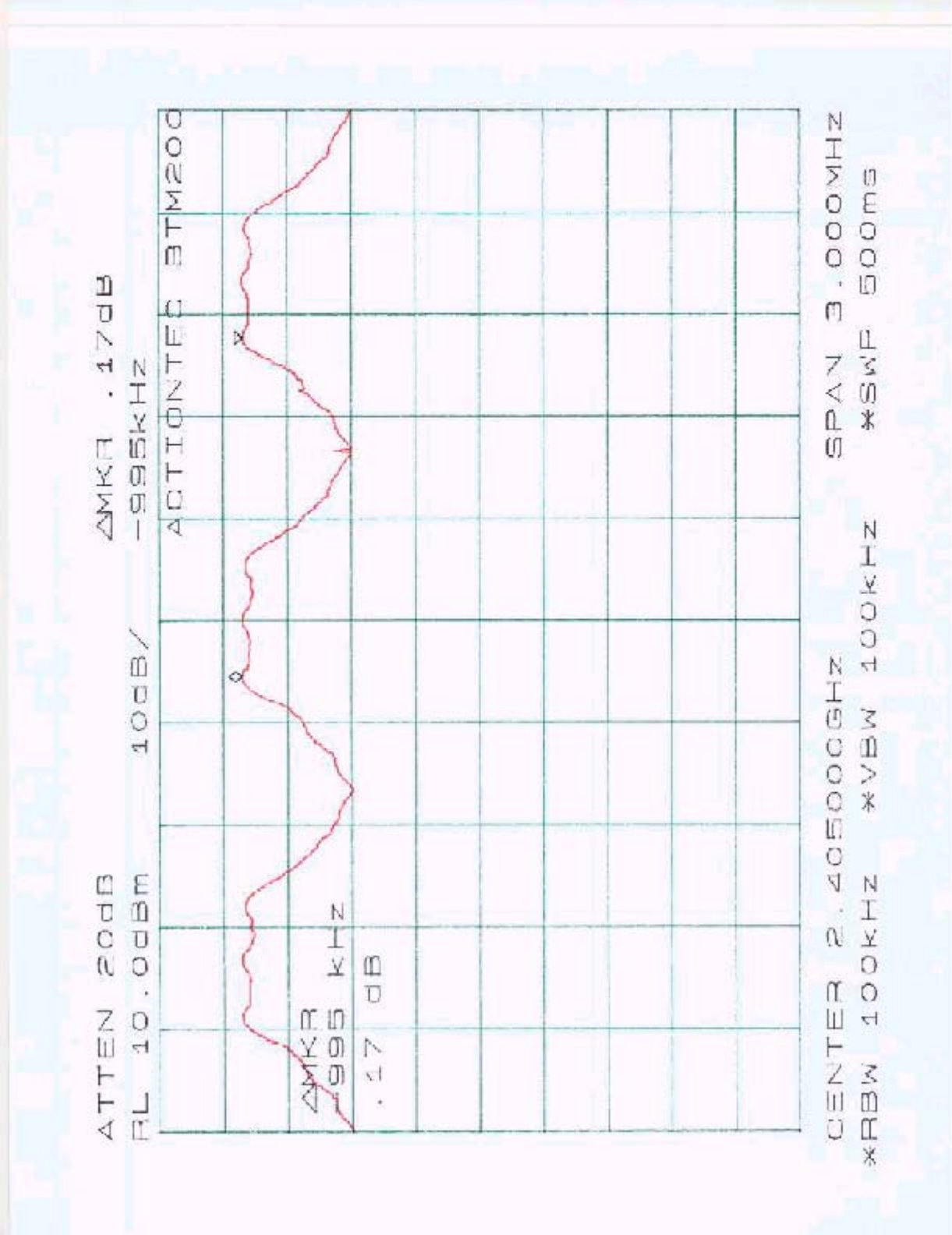
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on a bench without connection to measurement instrument Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the Max-Hold 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.

7.3 Measurement Results

Measurement (kHz)	Result
995	Compliant

7.4 Plots of Hopping Channel Separation

Please refer to the following plots.


ATTEN 20dB
RL 10.00dBm
10dB/
ΔMKR -995kHz
.17dB
ACTIONTEC BTM200
ΔMKR
995 kHz
.17 dB
CENTER 2.4650000GHz
SPAN 3.000MHz
*RBW 100kHz
*VBW 100kHz
*SWP 500ms

8 - 100 KHZ BANDWIDTH OF BAND EDGES

8.1 Standard Applicable

According to §15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required.

8.2 Measurement Procedure

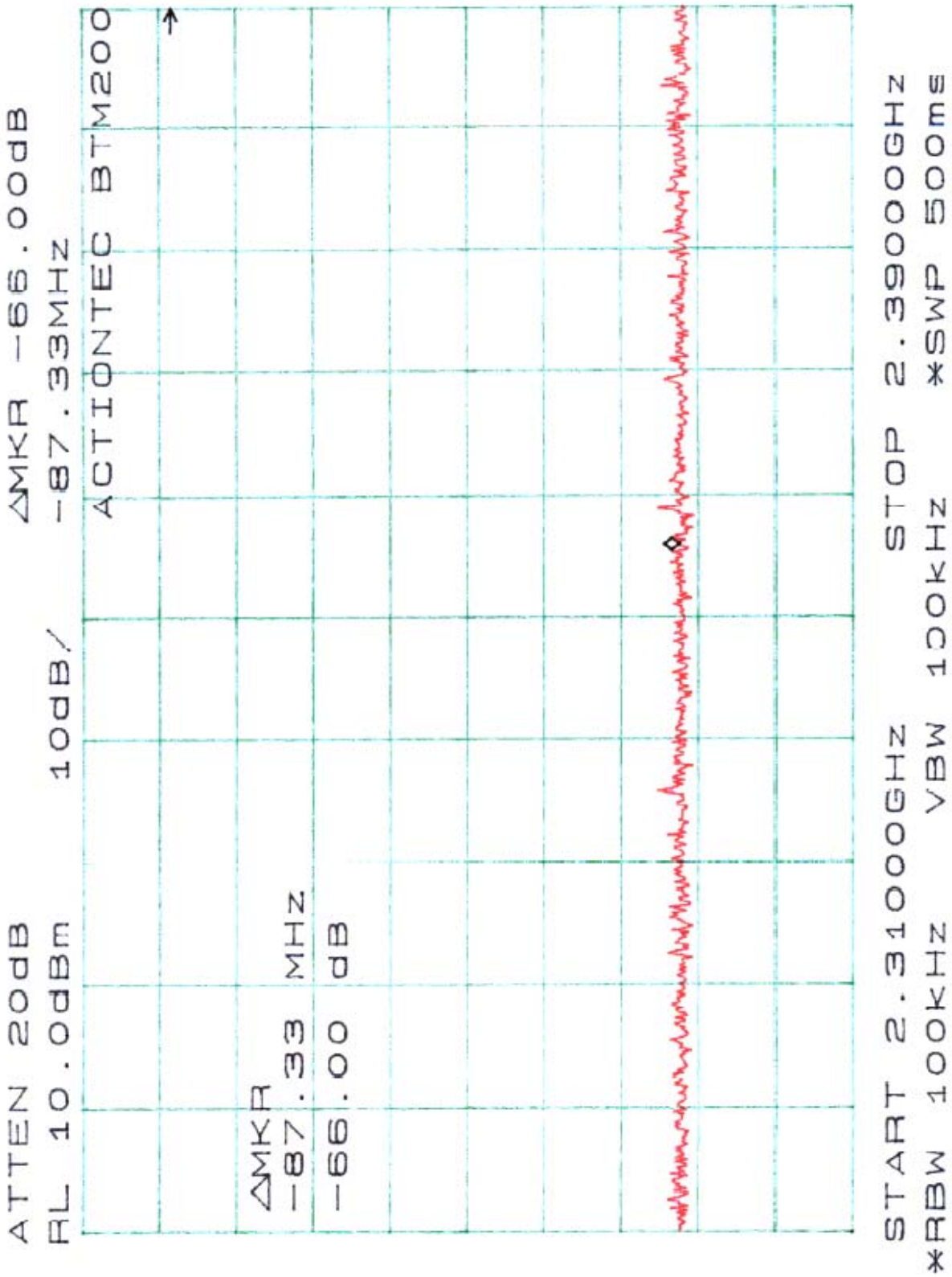
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 300 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.

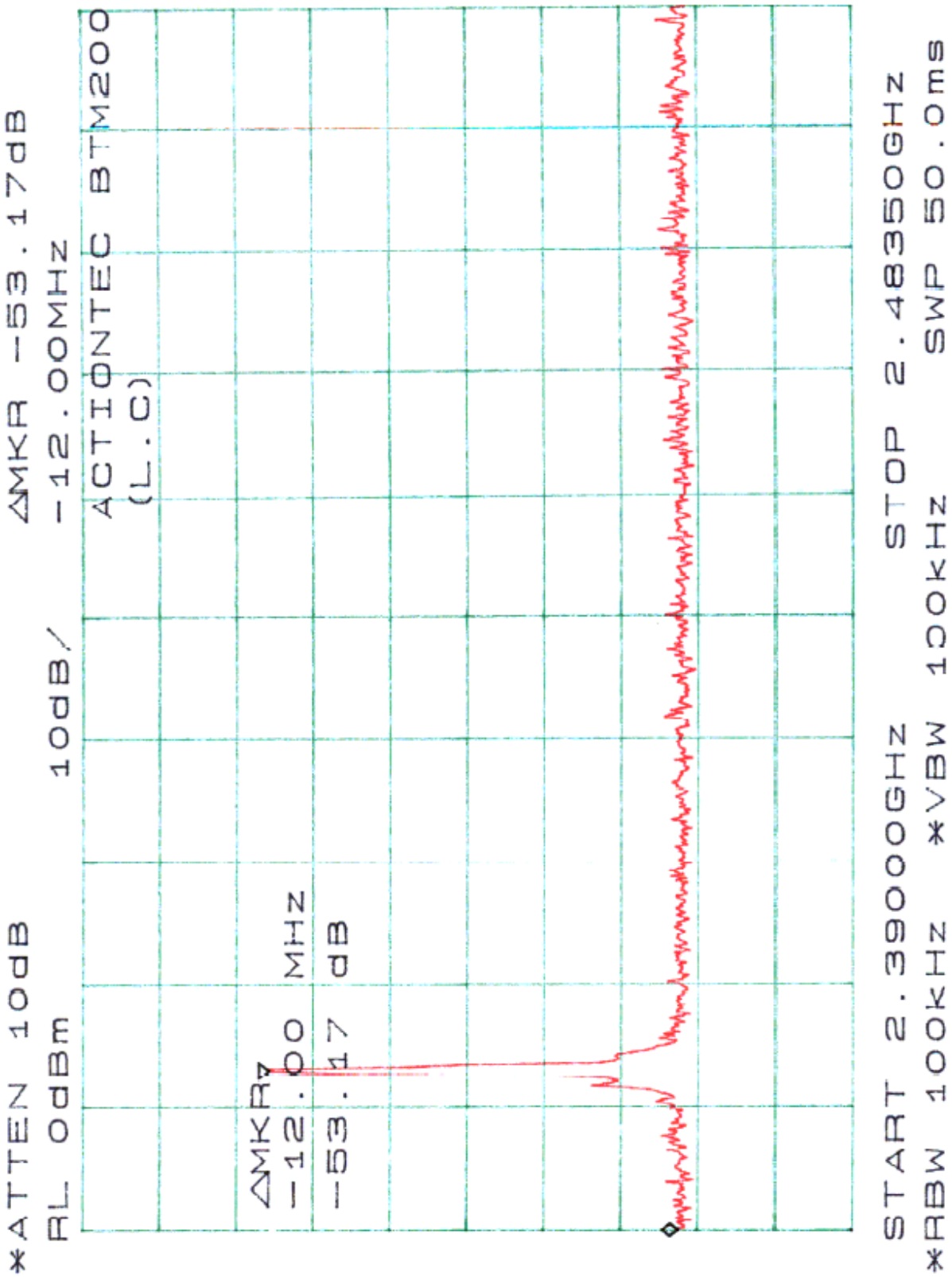
8.3 Measurement Results

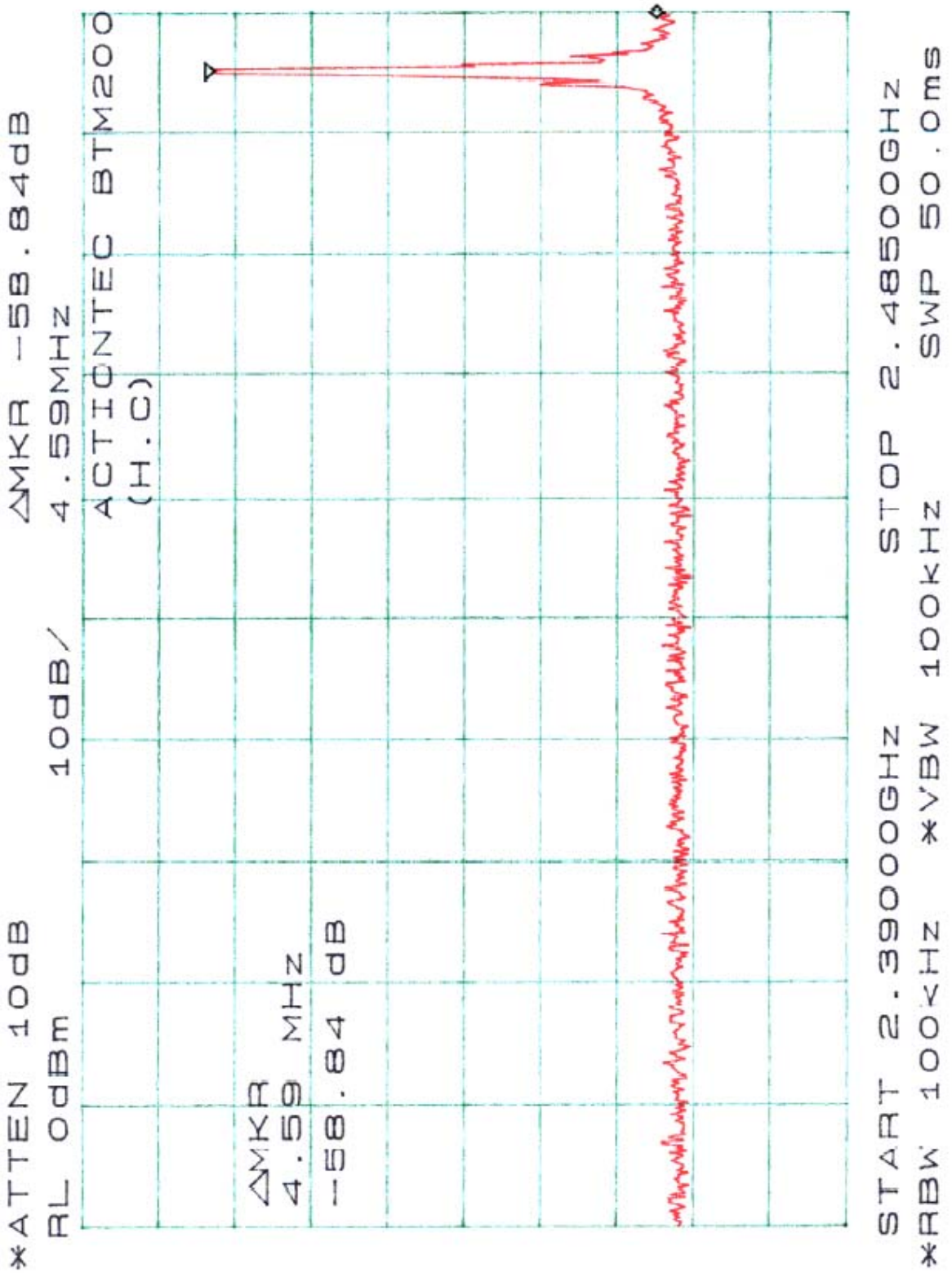
Frequency	Measurement (dBm)	Standard	Result
Low	53.17	≥ 20dB	Compliant
High	58.84	≥ 20dB	Compliant

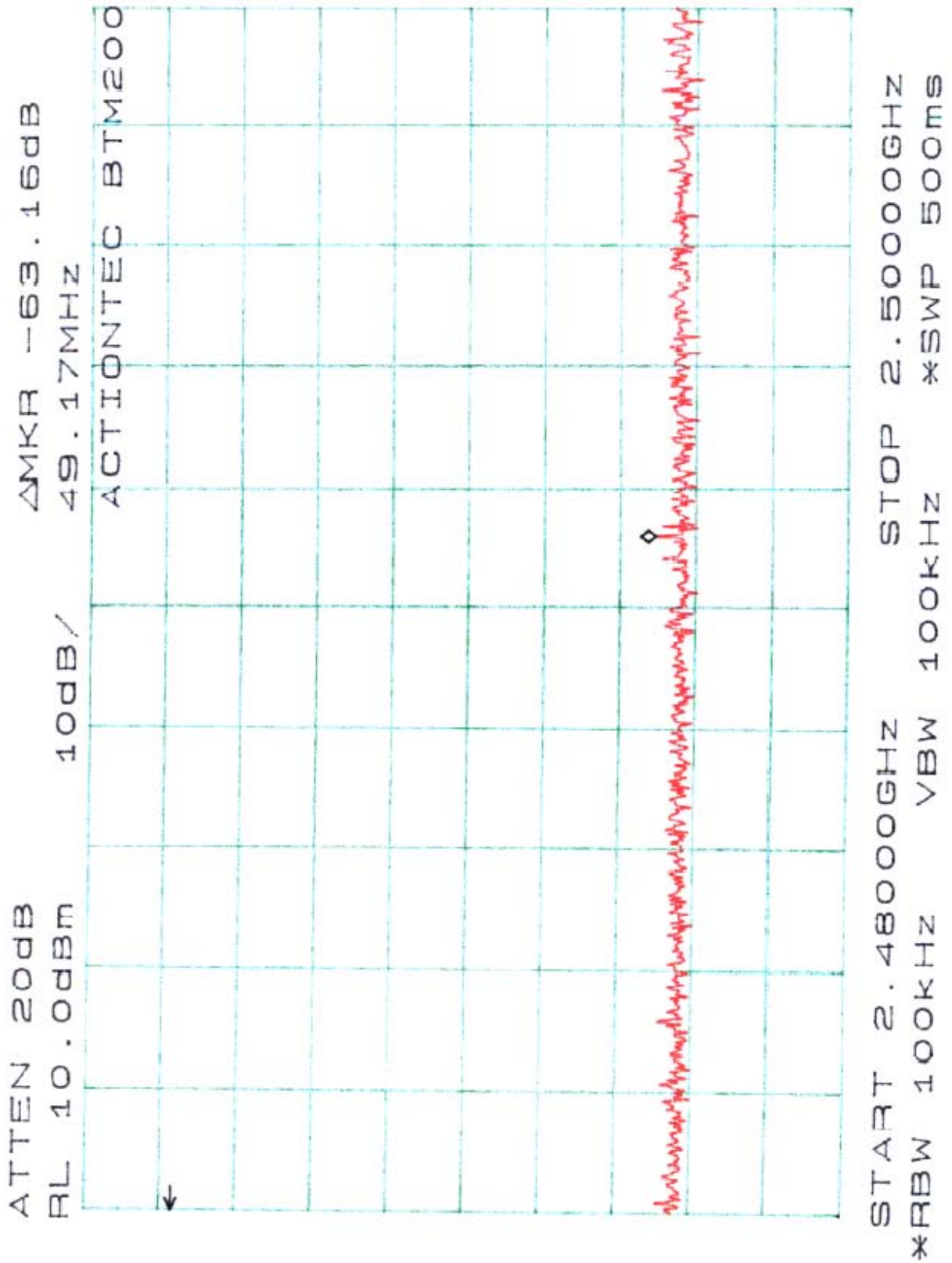
8.4 Plots of 100kHz Bandwidth of Band Edge

Please refer the following plots.


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR -66.00dB
-87.33MHz
ACTIONTEC BTM200
ΔMKR
-87.33 MHz
-66.00 dB
START 2.31000GHz
*RBW 100KHz
VBW 100KHz
STOP 2.39000GHz
*SWP 500ms


*ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -53.17dB
-12.00MHz
ACTIONTEC BTM200
(L.C)
ΔMKR2
-12.00 MHz
-53.17 dB
START 2.39000GHz
*RBW 100kHz
*VBW 100kHz
STOP 2.48350GHz
SWP 50.0ms


*ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -58.84dB
4.59MHz
ACTIONTEC BTM200
(H.C)
ΔMKR
4.59 MHz
-58.84 dB
START 2.39000GHz
*RBW 100KHz
*VBW 100KHz
STOP 2.48500GHz
SWP 50.0ms


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR -63.16dB
49.17MHz
ACTIONTEC BTM200
START 2.48000GHz
*RBW 100kHz
VBW 100kHz
STOP 2.50000GHz
*SWP 500ms

9 - DWELL TIME

9.1 Standard Applicable

According to §15.247 (a)(1)(iii), the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

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. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument 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.

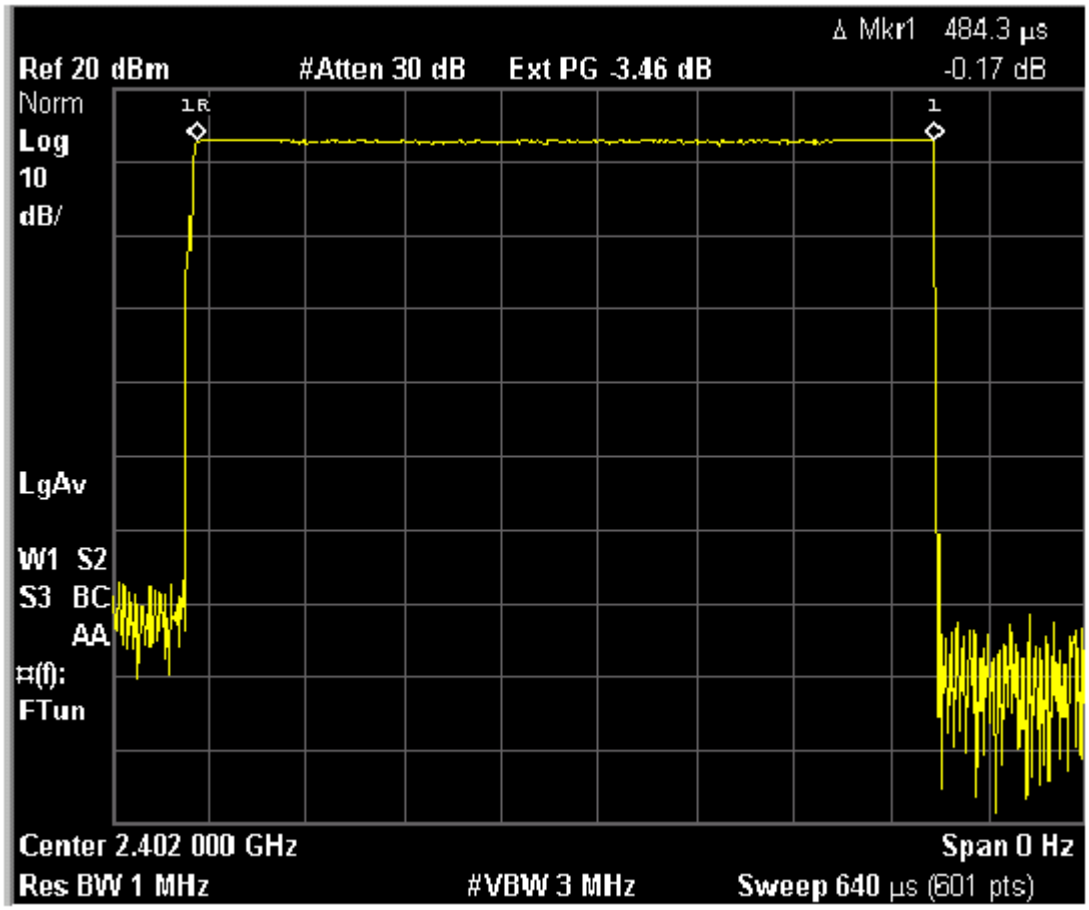
9.3 Measurement Results

The worst case dwell time is (DH5 packet) (4 x 2.952 ms) (dwell time in 1 sec) x 30 seconds = 354.24 ms <0.4 x 79

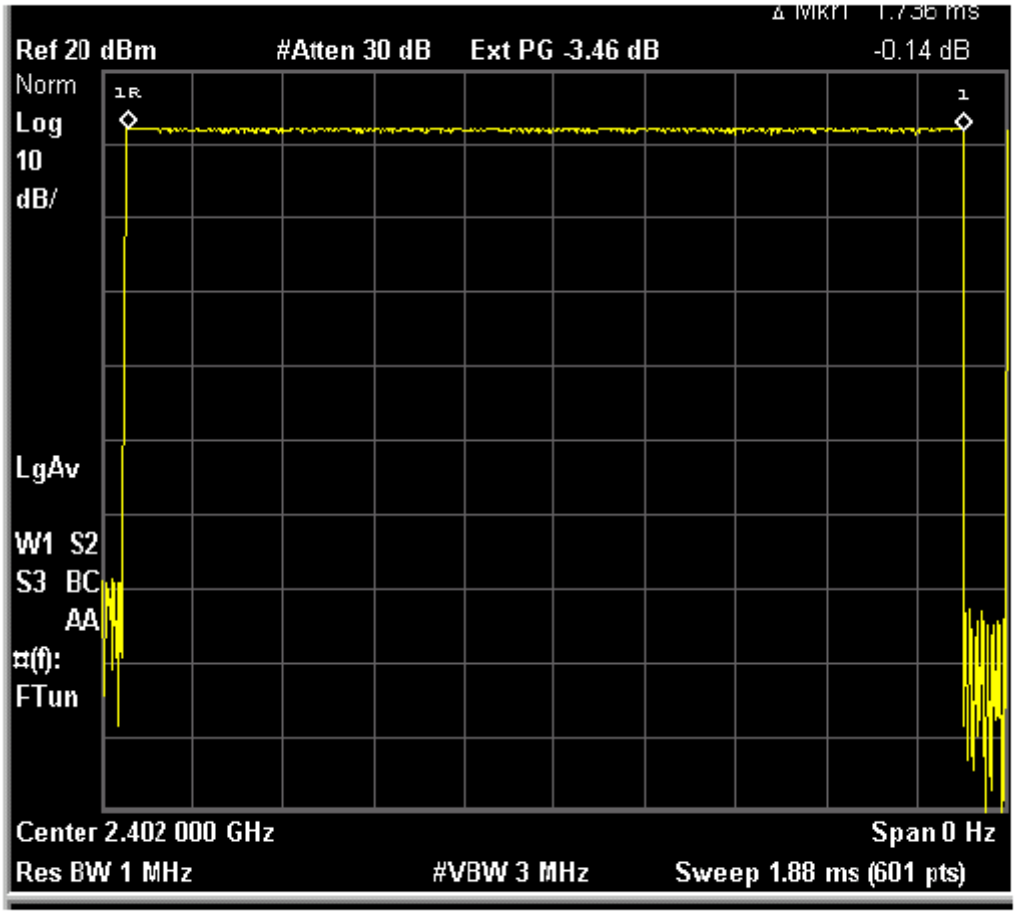
9.4 Plots of Dwell Time

Please refer the following plots.

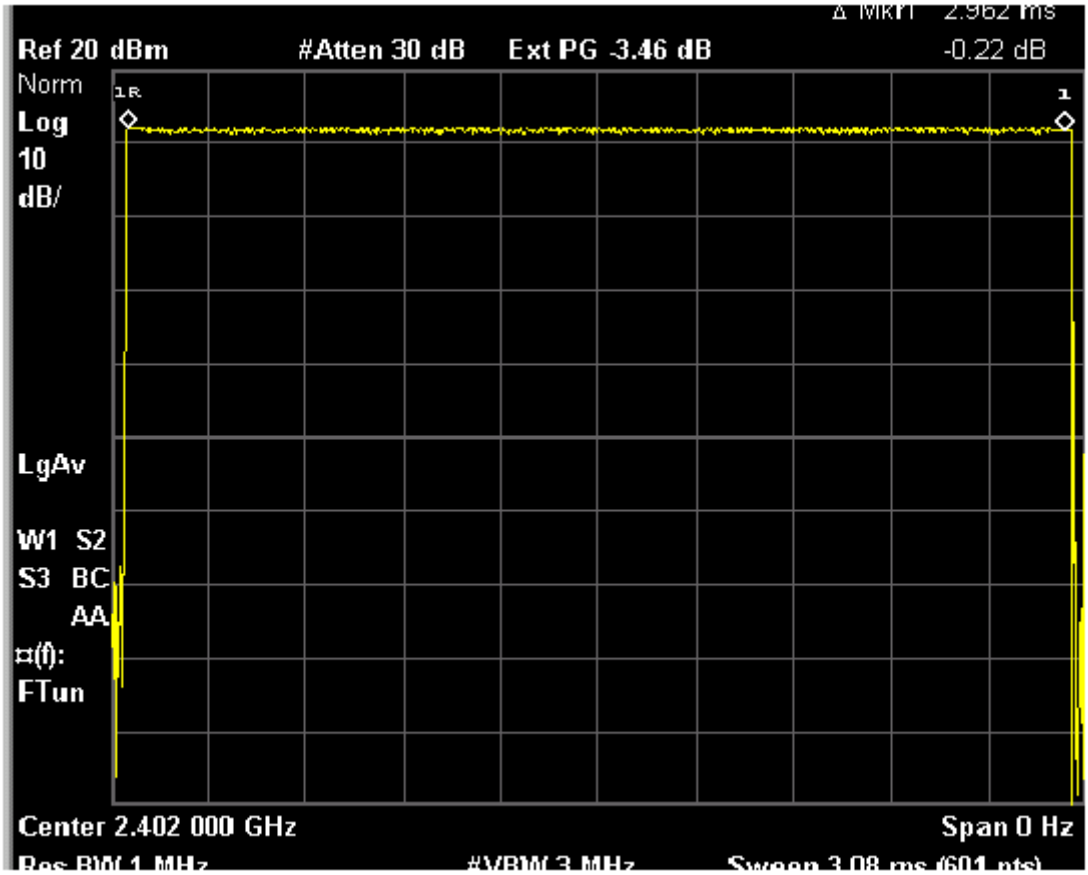
DH1 Mode Dwell Time: DH1 Data Packet – Dwell Time = 484.3 µsec



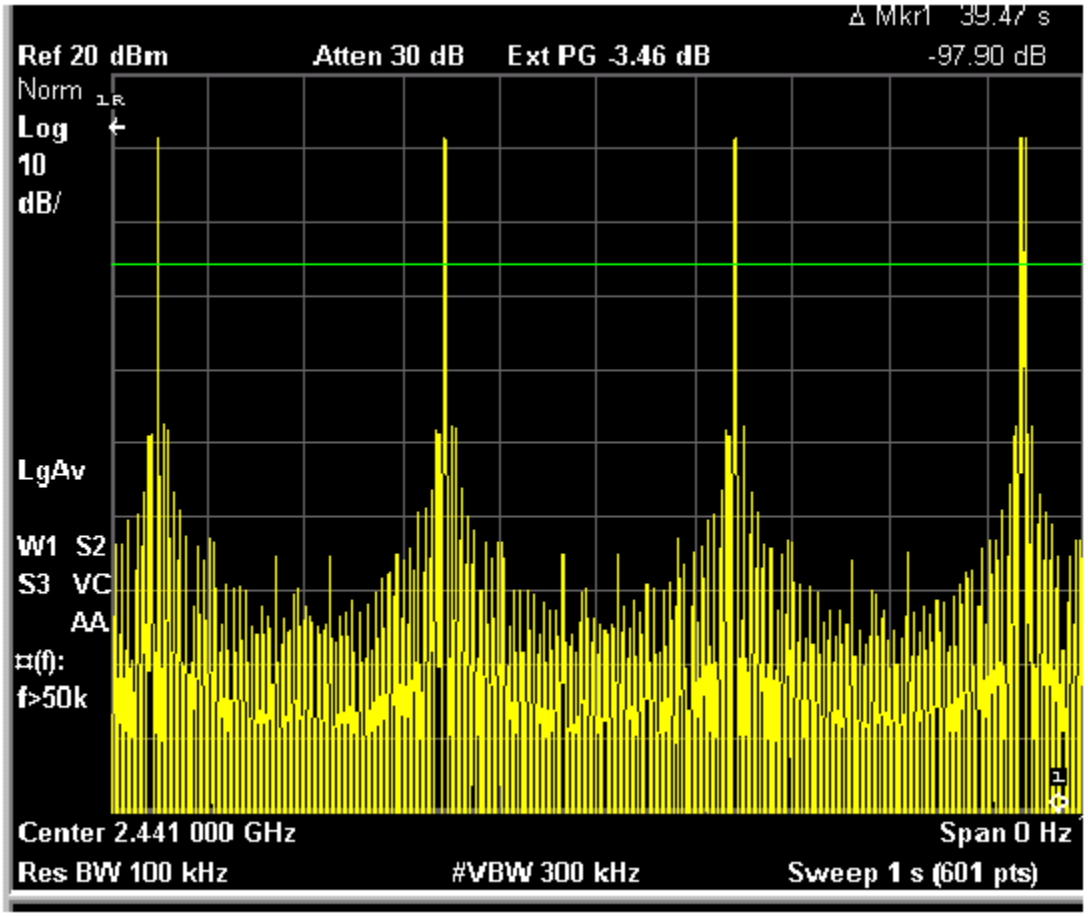
DH3 Mode Dwell Time: DH3 Data Packet – Dwell Time = 1.736 msec



DH5 Mode Dwell Time: DH5 Data Packet – Dwell Time = 2.952 msec



Plot Showing numbers of pulses in 1 second in DH5 Mode: 4 peaks of DH5 packets in 1 second



10 - SPURIOUS EMISSION AT ANTENNA PORT

10.1 Standard Applicable

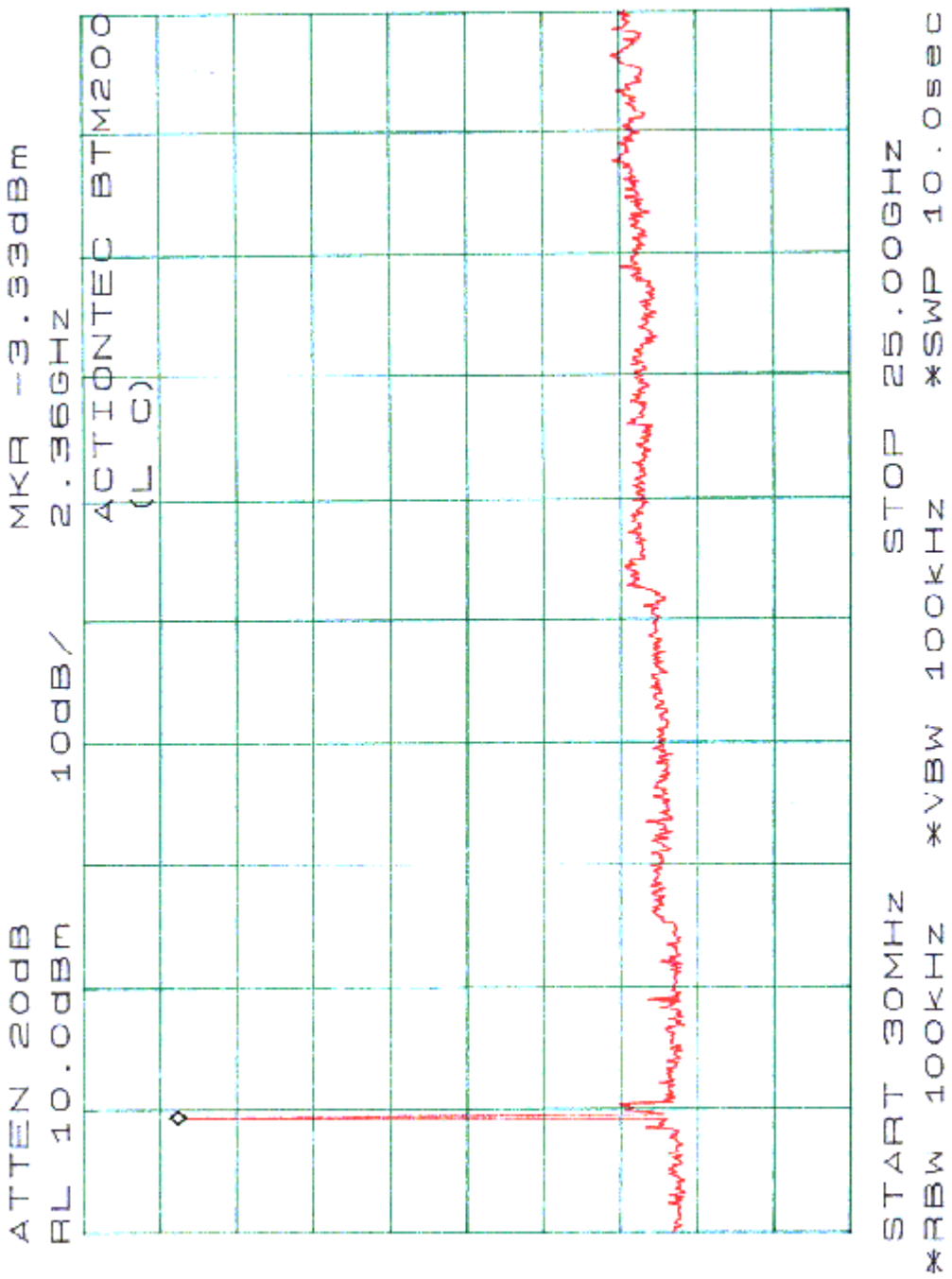
According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation f a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit.

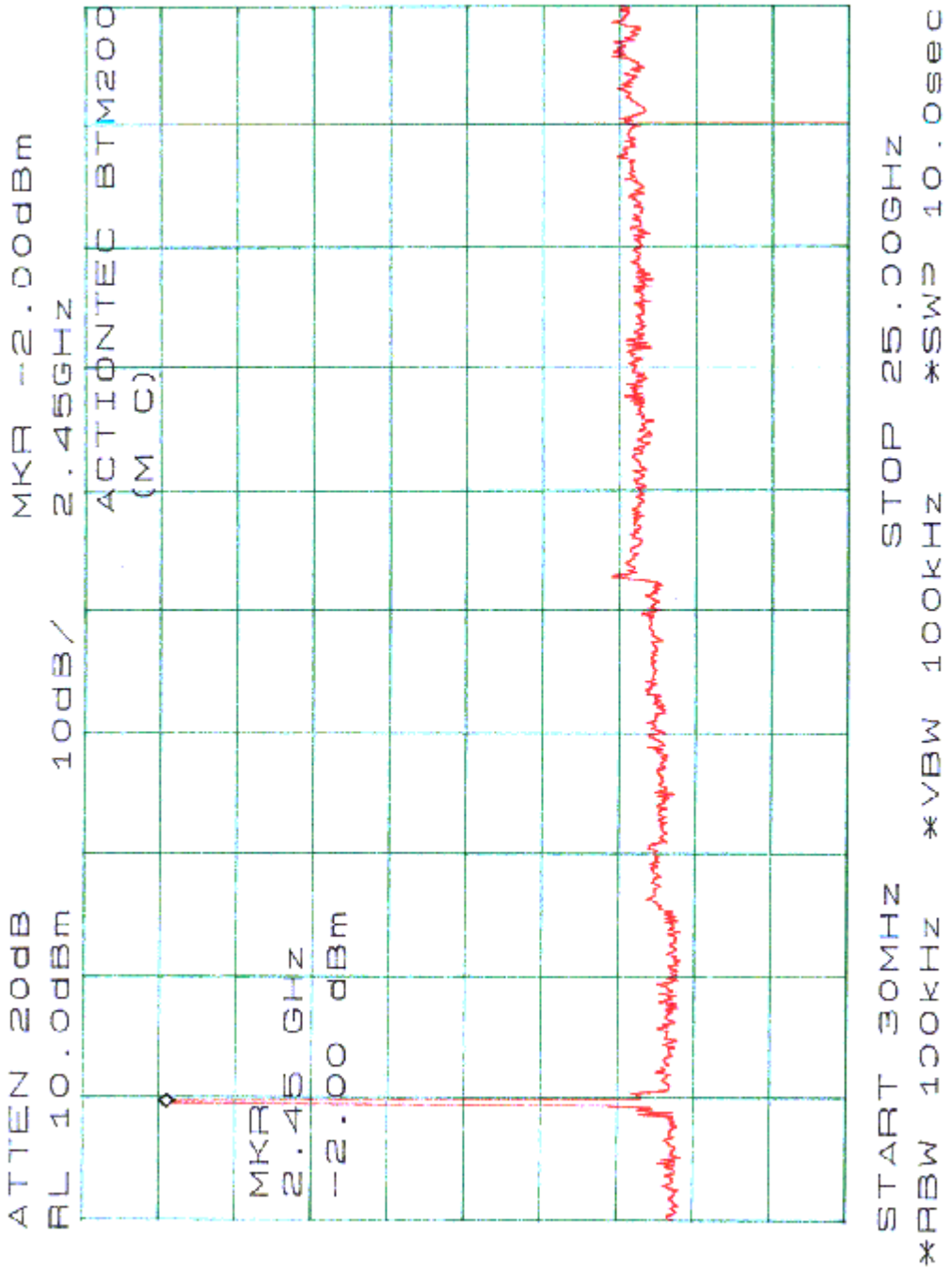
10.2 Measurement Procedure

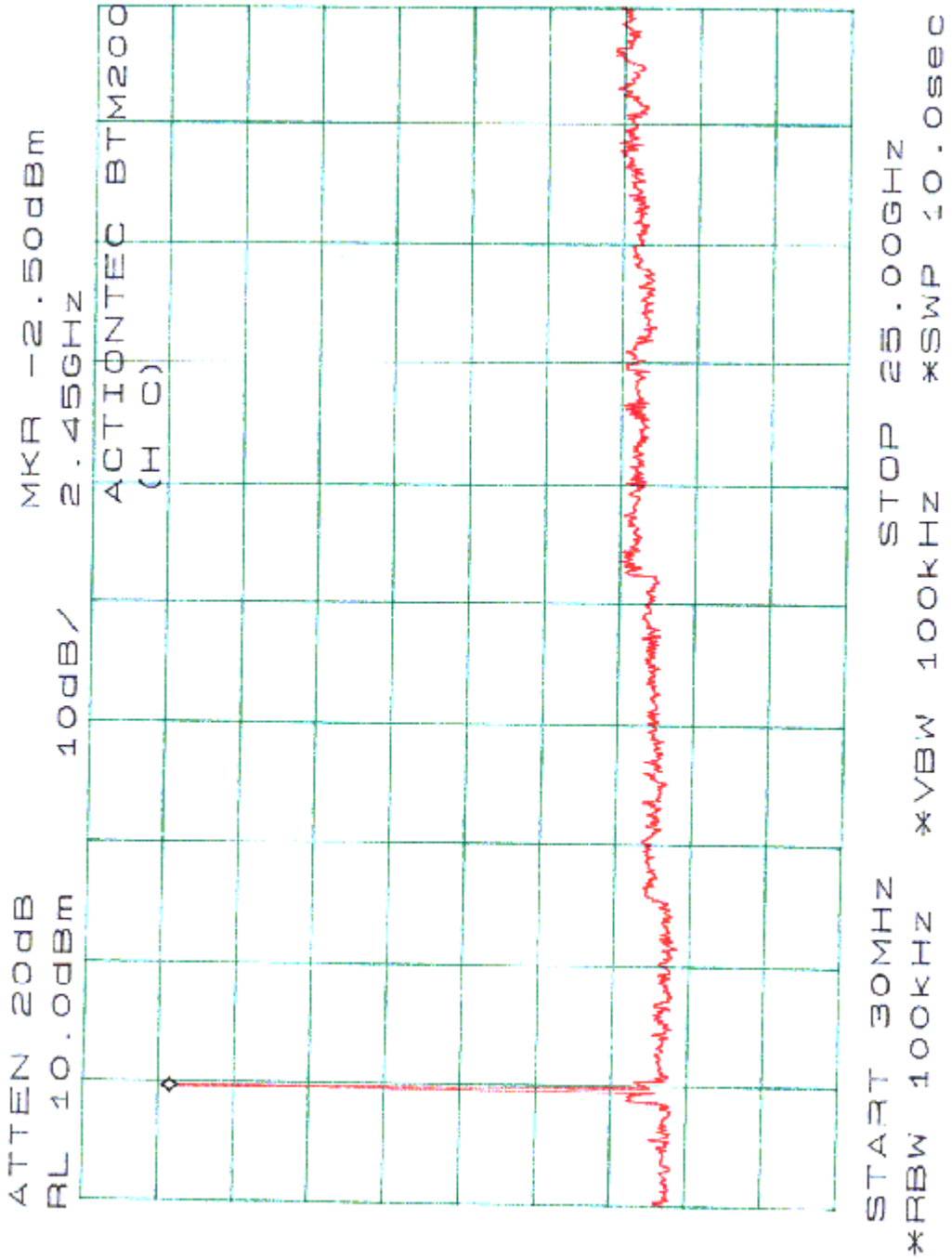
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on a bench without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low 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 Max-Hold Mode, and then keep the EUT in transmitting 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.

10.3 Measurement Results

Please refer to the following plots.


ATTEN 20dB
RL 10.0dBm
10dB/
MKR -3.33dBm
2.396GHz
ACTIONTEC BTM200
(L C)
START 30MHz
*RBW 100kHz
*VBW 100kHz
STOP 25.00GHz
*SWP 10.0sec


ATTEN 20dB
RL 10.0dBm
10dB/
MKR -2.00dBm
2.45GHz
ACTIONTEC BTM200
(M C)
MKR
2.45 GHz
-2.00 dBm
START 30MHz
*RBW 100kHz
*VBW 100kHz
STOP 25.00GHz
*SWP 10.0sec


ATTEN 20dB
RL 10.0dBm
10dB/
MKR -2.50dBm
2.45GHz
ACTIONTEC BTM200
(H C)
START 30MHz
*RBW 100kHz
*VBW 100kHz
STOP 25.00GHz
*SWP 10.0sec

11 - RADIATED EMISSION

11.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

11.2 Test Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4-1992. The specification used was the FCC 15 Subpart C limits.

The laptop notebook was placed on the center of the back edge on the test table with the EUT connected to its right.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The laptop was connected with 120Vac/60Hz power source.

11.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 25000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency	30 MHz
Stop Frequency	25000 MHz
Sweep Speed	Auto
IF Bandwidth	1 MHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

11.4 Test Procedure

For the radiated emissions test, both the laptop and all peripheral power cords were connected to the AC floor outlet since the power supply used in the laptop did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBµV of specification limits), and are distinguished with a "**Qp**" in the data table.

11.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBµV means the emission is 7dBµV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B Limit

11.6 Summary of Test Results

According to the data in section 11.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.247, and had the worst margin of:

-9.6 dB at **7206 MHz** in the **Horizontal** polarization, Low Channel.

-9.4 dB at **7323 MHz** in the **Vertical** polarization, Middle Channel.

-9.4dB at **7440 MHz** in the **Horizontal** polarization, High Channel.

-6.7 dB at **389.80 MHz** in the **Horizontal** polarization, Unintentional Emission

11.7 Radiated Emission Test Data

30MHz ~ 25 GHz, 3 Meters

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Mode
MHz	dBμV/m	Degree	Meter	H/V	dBμV/m	dBμV/m	dB	dBμV/m	dBμV/m	dB	
Low Channel											
2402.00	91.7	250	1.2	V	28.1	3.4	30	93.1			PEAK, FUND
2402.00	90.2	250	1.2	V	28.1	3.4	30	91.6			AVE, FUND
2402.00	95.5	180	1.5	H	28.1	3.4	30	96.9			PEAK, FUND
2402.00	94.7	180	1.5	H	28.1	3.4	30	96.1			AVE, FUND
7206.00	33.7	200	1.5	H	35.1	5.6	30	44.4	54.0	-9.6	AVE
7206.00	33.5	90	1.2	V	35.1	5.6	30	44.2	54.0	-9.8	AVE
4804.00	32.5	180	1.5	H	32.5	4.9	30	39.9	54.0	-14.1	AVE
4804.00	31.6	270	1.2	V	32.5	4.9	30	39.0	54.0	-15.0	AVE
7206.00	45.0	200	1.5	H	35.1	5.6	30	55.7	74.0	-18.3	PEAK
7206.00	44.7	90	1.2	V	35.1	5.6	30	55.4	74.0	-18.6	PEAK
4804.00	43.3	180	1.5	H	32.5	4.9	30	50.7	74.0	-23.3	PEAK
4804.00	42.7	270	1.2	V	32.5	4.9	30	50.1	74.0	-23.9	PEAK
Middle Channel											
2441.00	97.5	180	1.8	H	28.1	3.4	30	98.9			PEAK, FUND
2441.00	94.7	180	1.8	H	28.1	3.4	30	96.1			AVE, FUND
2441.00	98.3	120	1.2	V	28.1	3.4	30	99.8			PEAK, FUND
2441.00	97.3	120	1.2	V	28.1	3.4	30	98.8			AVE, FUND
7323.00	33.8	330	1.5	V	35.1	5.6	30	44.6	54.0	-9.4	AVE
7323.00	33.7	0	1.2	H	35.1	5.6	30	44.4	54.0	-9.6	AVE
4882.00	32.2	200	1.5	H	32.5	4.9	30	39.6	54.0	-14.4	AVE
4882.00	30.8	30	2.0	V	32.5	4.9	30	38.2	54.0	-15.8	AVE
1079.00	39.3	280	2.0	V	23.7	4.2	30	37.2	54.0	-16.8	AVE
1079.00	39.3	270	1.8	H	23.7	4.2	30	37.2	54.0	-16.8	AVE
7323.00	45.0	0	1.2	H	35.1	5.6	30	55.7	74.0	-18.3	PEAK
7323.00	45.0	330	1.5	V	35.1	5.6	30	55.7	74.0	-18.3	PEAK
4882.00	43.7	200	1.5	H	32.5	4.9	30	51.1	74.0	-22.9	PEAK
4882.00	42.2	30	2.0	V	32.5	4.9	30	49.6	74.0	-24.4	PEAK

30MHz ~ 25 GHz, 3 Meters (Continued)

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart C		
Freqency MHz	Ampl. dBμV/m	Direction Degree	Height Meter	Polar H/V	Antenna dBμV/m	Cable Loss dBμV/m	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB	Mode
High Channel											
2480.00	97.5	120	1.8	V	28.1	3.4	30	98.9			PEAK, FUND
2480.00	93.8	120	1.8	V	28.1	3.4	30	95.3			AVE, FUND
2480.00	92.7	90	1.5	H	28.1	3.4	30	94.1			PEAK, FUND
2480.00	92.3	90	1.5	H	28.1	3.4	30	93.8			AVE, FUND
7440.00	33.9	300	1.5	H	35.1	5.7	30	44.6	54	-9.4	AVE
7440.00	33.9	200	1.5	V	35.1	5.7	30	44.6	54	-9.4	AVE
4960.00	31.0	330	1.5	V	32.5	4.9	30	38.4	54	-15.6	AVE
4960.00	30.8	270	1.2	H	32.5	4.9	30	38.2	54	-15.8	AVE
1230.50	39.8	270	1.8	H	23.7	4.1	30	37.7	54	-16.3	AVE
7440.00	44.8	200	1.5	V	35.1	5.6	30	55.6	74	-18.4	PEAK
7440.00	44.8	300	1.5	H	35.1	5.6	30	55.6	74	-18.4	PEAK
4960.00	42.7	270	1.2	H	32.5	4.9	30	50.1	74	-23.9	PEAK
4960.00	42.0	330	1.5	V	32.5	4.9	30	49.4	74	-24.6	PEAK

Unintentional Emission

Indicated			Table	Antenna		Correction Factor			FCC 15 Subpart C	
Frequency MHz	Ampl. dBμV/m	Direction Degree	Height Meter	Polar H/V	Antenna dBμV/m	Cable Loss dBμV/m	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
389.80	46.3	120	2.5	H	15.6	2.4	25	39.3	46.0	-6.7
663.24	40.2	0	3	H	20.8	3.0	25	39.0	46.0	-7.0
240.00	47.8	270	2	H	13.8	2.2	25	38.8	46.0	-7.2
389.83	44.7	330	2.0	V	15.6	2.4	25	37.7	46.0	-8.3
60.04	45.7	180	1.2	V	9.4	1.3	25	31.5	40.0	-8.5
572.73	39.8	270	2.5	H	19.3	3.0	25	37.2	46.0	-8.8
670.60	36.9	30	2.0	H	21.2	3.2	25	36.3	46.0	-9.7
389.84	42.5	90	2	V	15.6	2.4	25	35.5	46.0	-10.5
663.24	36.5	330	2	V	20.8	3.0	25	35.3	46.0	-10.7
120.09	44.2	30	2	H	11.7	1.6	25	32.5	43.5	-11.0
389.84	40.9	300	1.5	H	15.6	2.4	25	33.9	46.0	-12.1
80.03	42.1	300	1.2	V	9.5	1.2	25	27.8	40.0	-12.2
300.07	42.1	90	1.2	V	14.4	2.3	25	33.8	46.0	-12.2
840.00	31.8	30	1.2	V	22.7	3.8	25	33.3	46.0	-12.7
572.73	35.9	90	1.2	V	19.3	3.0	25	33.2	46.0	-12.8
220.17	42.8	0	2.0	H	11.8	2.1	25	31.8	46.0	-14.2
250.00	41.0	270	1.2	V	13.3	2.2	25	31.5	46.0	-14.5

12 - CONDUCTED EMISSION

12.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ±2.4 dB.

12.2 Test Setup

The laptop notebook was placed on the center of the back edge on the test table with the EUT connected to its right.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The laptop was connected with 120Vac/60Hz power source.

12.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conduction test:

Start Frequency	150 kHz
Stop Frequency	30 MHz
Sweep Speed	Auto
IF Bandwidth	10 kHz
Video Bandwidth	10 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Quasi-Peak Adapter Mode	Normal

12.4 Test Procedure

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dBμV of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

12.5 Summary of Test Results

According to the data in section 12.6, the EUT complied with the FCC Conducted margin for a Class B device, with the *worst* margin reading of:

-1.2 dBµV at 3.460 MHz in the Line mode

12.6 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dBµV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBµV	Margin dB
3.460	54.8	QP	Line	56	-1.2
0.810	42.1	Ave	Line	46	-3.9
0.215	54.4	QP	Neutral	63	-8.6
3.460	37.4	Ave	Line	46	-8.6
0.810	45.3	QP	LIne	56	-10.7
0.150	54.3	QP	Line	66	-11.7
0.810	40.8	QP	Neutral	56	-15.2
0.150	39.6	Ave	Line	56	-16.4
0.810	39.4	Ave	Neutral	56	-16.6
10.080	41.2	QP	Neutral	60	-18.8
0.215	40.8	Ave	Neutral	63	-22.2
10.080	36.4	Ave	Neutral	60	-23.6

12.7 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented in the following page as reference.

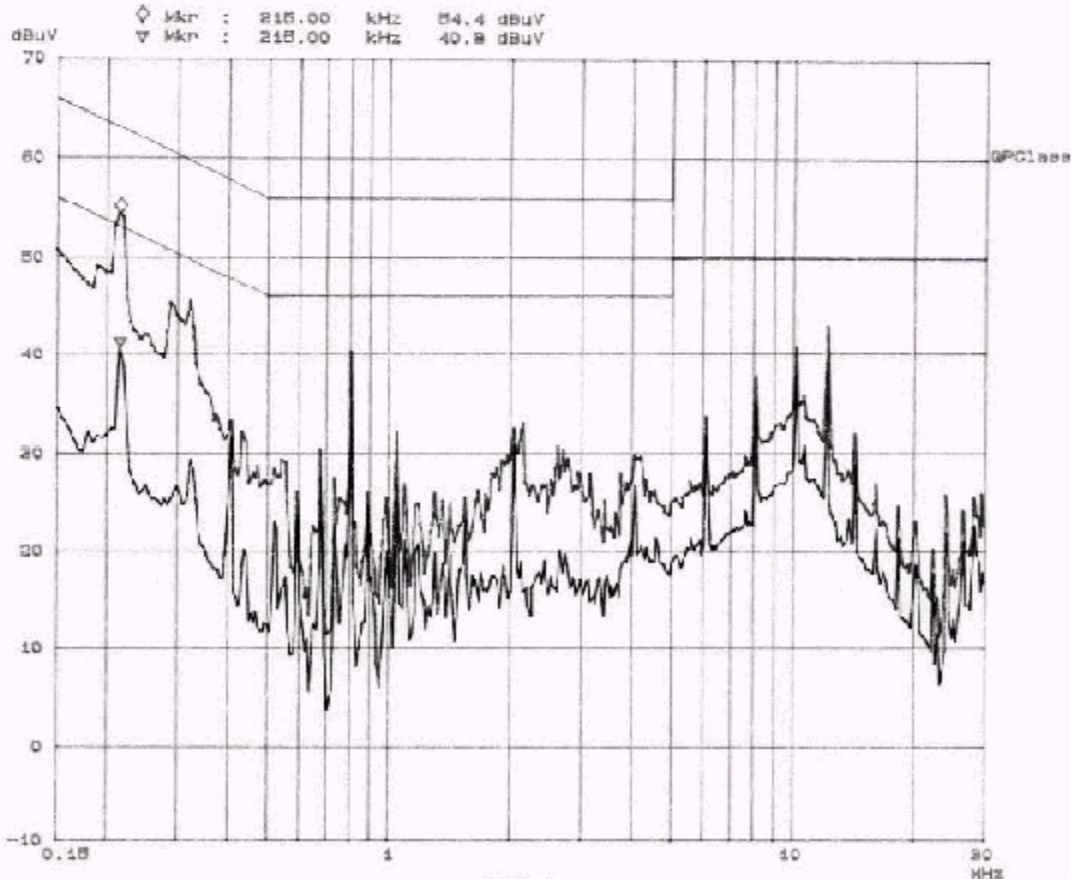
Bay Area Compliance Corporation 18. Apr 09 09:49
CISPR CLASS B

EUT: BTM200
Manuf: ACTIONTEC
Op Cond: Normal
Operator: JERRY
Comment: NEUTRAL
File name: ACTIONTC.RS3

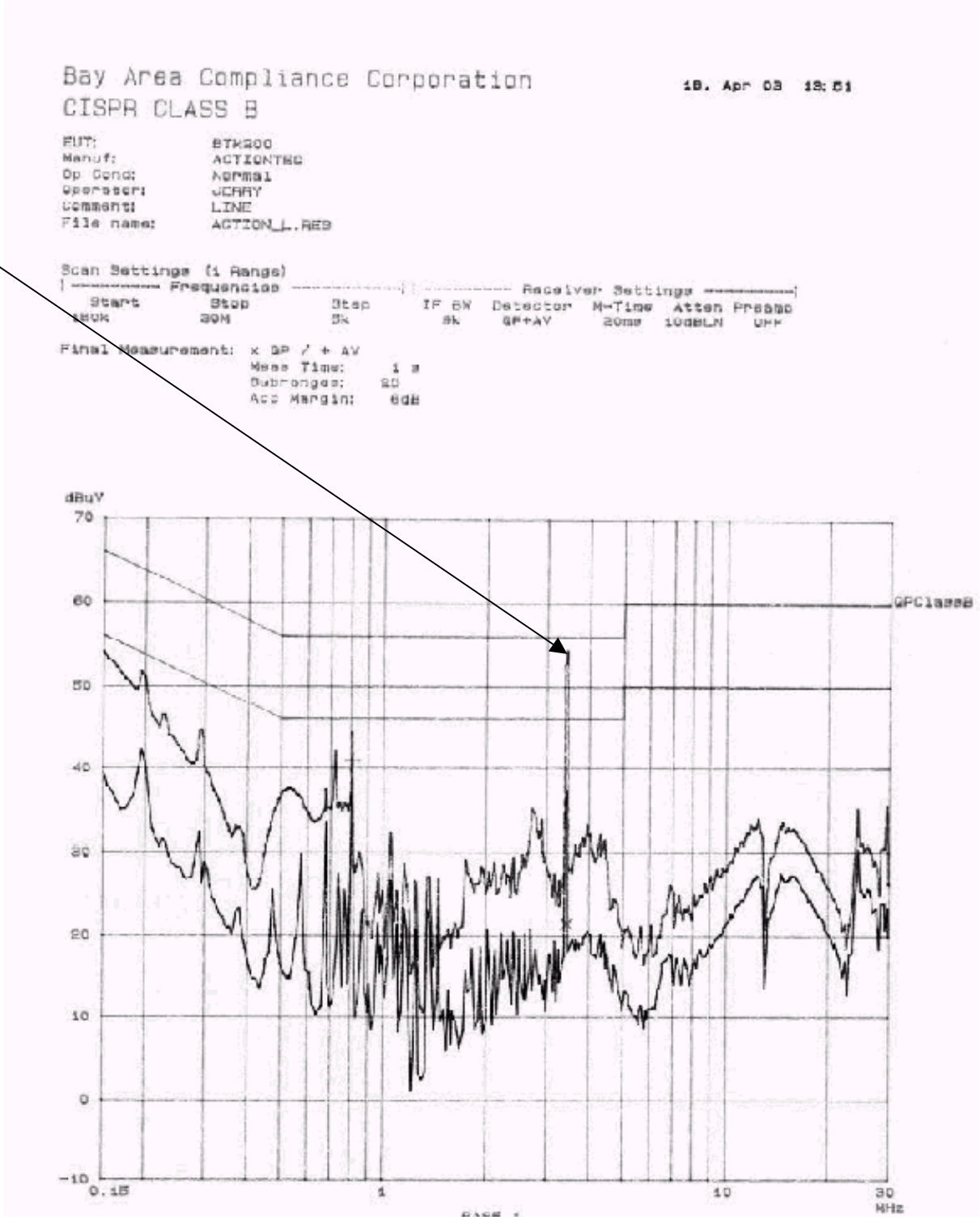
Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150K	30M	5K	9K	QP+AV	20ms	10dBLN	OFF

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 20
Acc Margin: 6dB



Ambient


Bay Area Compliance Corporation
CISPR CLASS B
18. Apr 03 13:51
EUT: BTM200
Manuf: ACTIONTEC
Op Cond: Normal
Operator: JCRAY
Comment: LINE
File name: ACTION_L.RES
Scan Settings (1 Range)
Frequencies
Start Stop Step
150K 30M 5k
Receiver Settings
IF BW Detector M-Time Atten Preamp
9k QP+AV 20ms 10dBLN OFF
Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 20
Acc Margin: 6dB
dBuV
70
60
50
40
30
20
10
0
-10
0.15
1
10
30
MHz
QPClassB

13 - ANTENNA REQUIREMENT

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 (1), 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.

The gain of antenna used for transmitting is 1 dBi by default, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

EXHIBIT A - FCC ID LABEL INFORMATION

Proposed FCC ID Label

FCC ID: LNQBTM200
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.

2.1875”L x 1.0”W

Proposed Label Location on EUT

Solder Side of EUT/FCC ID Label

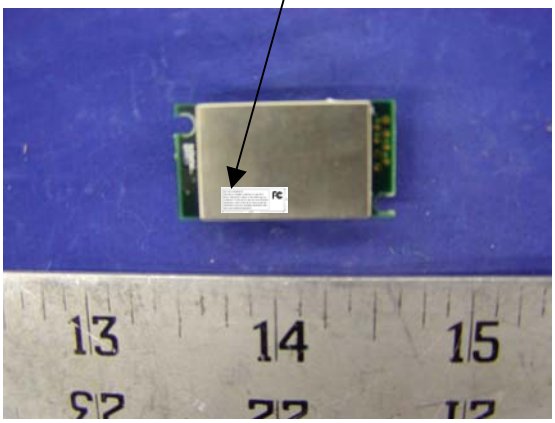


EXHIBIT B - TEST SETUP PHOTOGRAPHS

Conducted Emission - Front View

Conducted Emission - Rear View

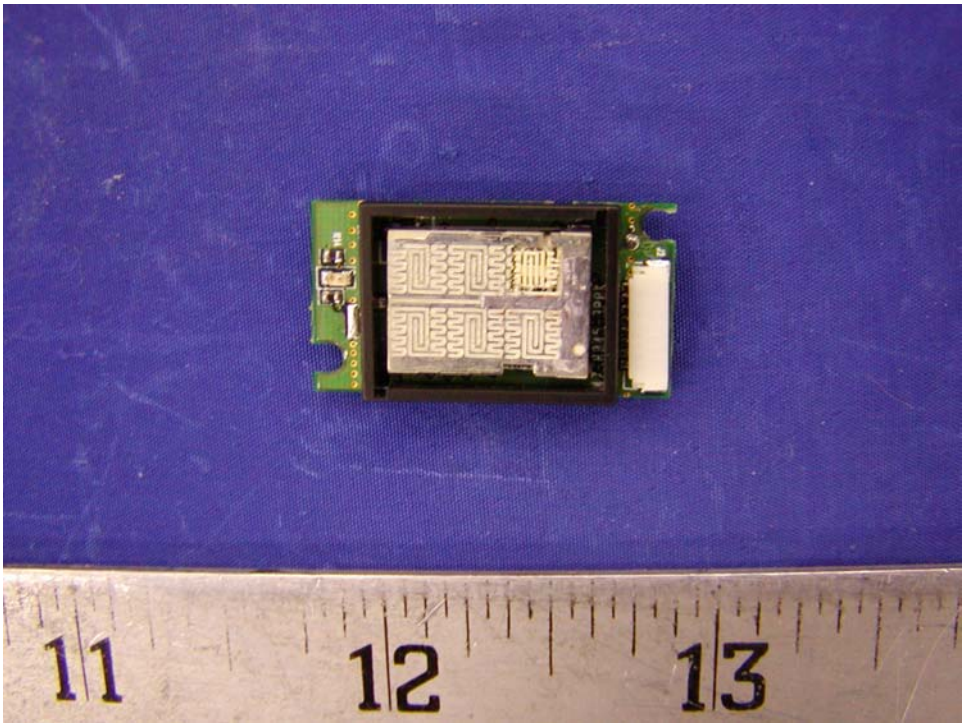
Radiated Emission - Front View

Radiated Emission - Rear View

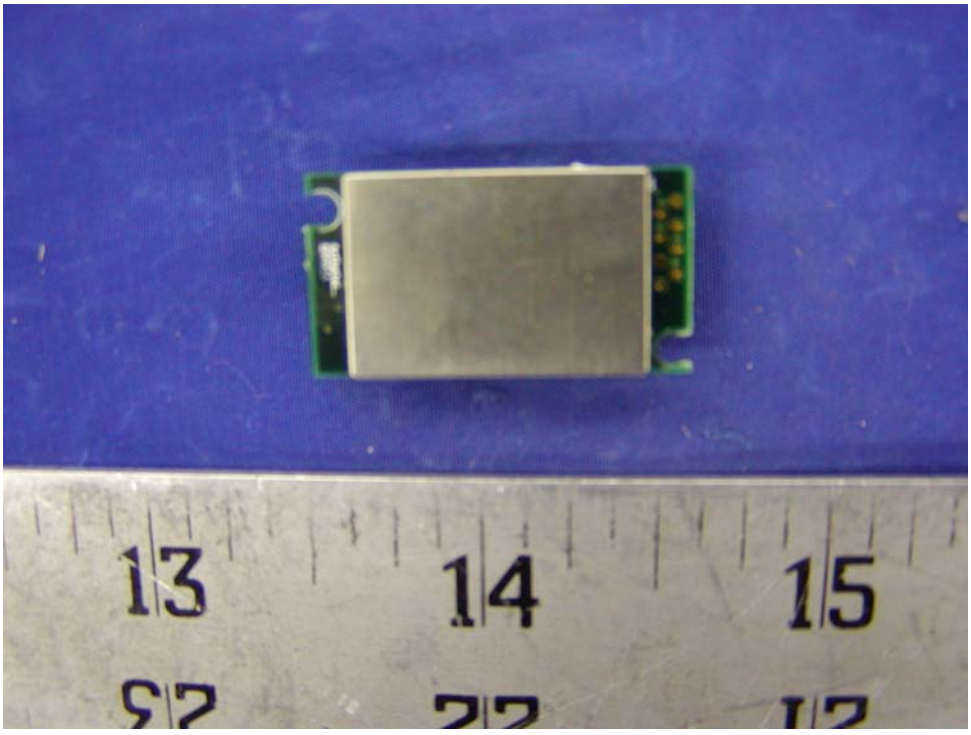
Radiated Emission - Rear View 2

EXHIBIT C - EUT PHOTOGRAPHS

EUT – Front View



EUT – Rear View



EUT – Component View

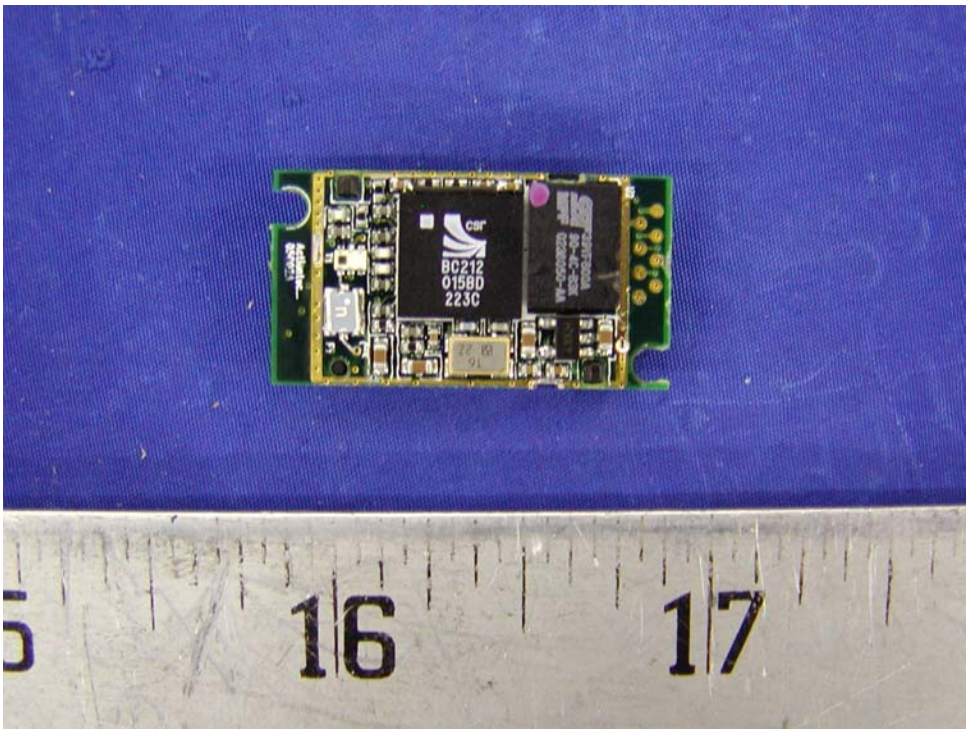


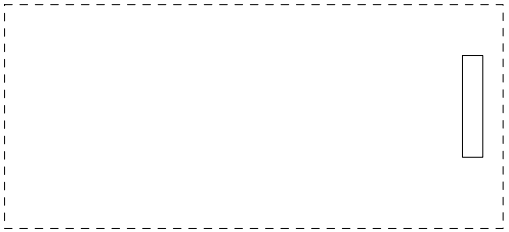
EXHIBIT D - BLOCK DIAGRAM /SCHEMATICS

REVISION HISTORY

REV. 1A 11/06/02
REV. 2A 01/06/03
- ADD C21 2.2UF FOR VDD_VCO
- ADD SPARE C20 FOR ANTENNA MATCHING
- ADD TEST POINT FOR MANUFACTURING TESTING
- CONNECT U1.E1 TO GROUND FROM BETTER ISOLATION
- ADD 3 SPARE CAP FOR 1.8V

Actiontec Bluetooth Module

- Customized Form Factor
- CSR BlueCore2 Chipset
- Antenna Attached

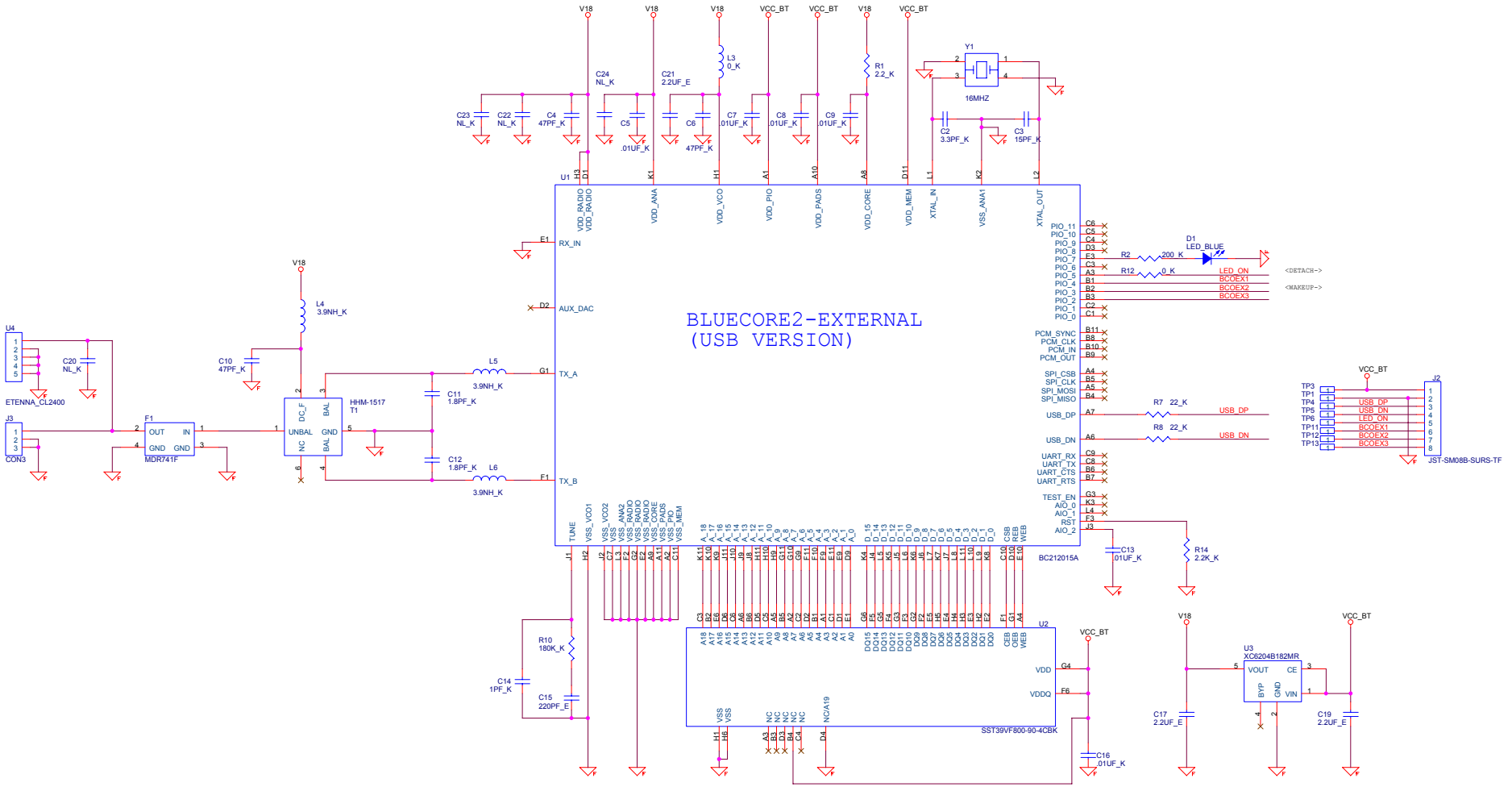


Component Suffix Table

_A: CASE A
_B: CASE B
_C: CASE C
_D: CASE D
_E: 0603
_F: 0805
_G: 1206
_H: 1210
_I: 1812
_J: 2010
_K: 0402
_L: 1808
_NI: NOT INSTALL

Actiontec Electronics, Inc.

Title	BTM 0500	
Size C	Document Number COVER PAGE	Rev 2A
Date: Thursday, January 09, 2003	Sheet 1 of 2	



Title	0500 BTM		
Size C	Document Number BLUETOOTH		Rev 2A
Date: Thursday, January 09, 2003	Sheet 2 of 2		

EXHIBIT E - OPERATIONAL DESCRIPTION

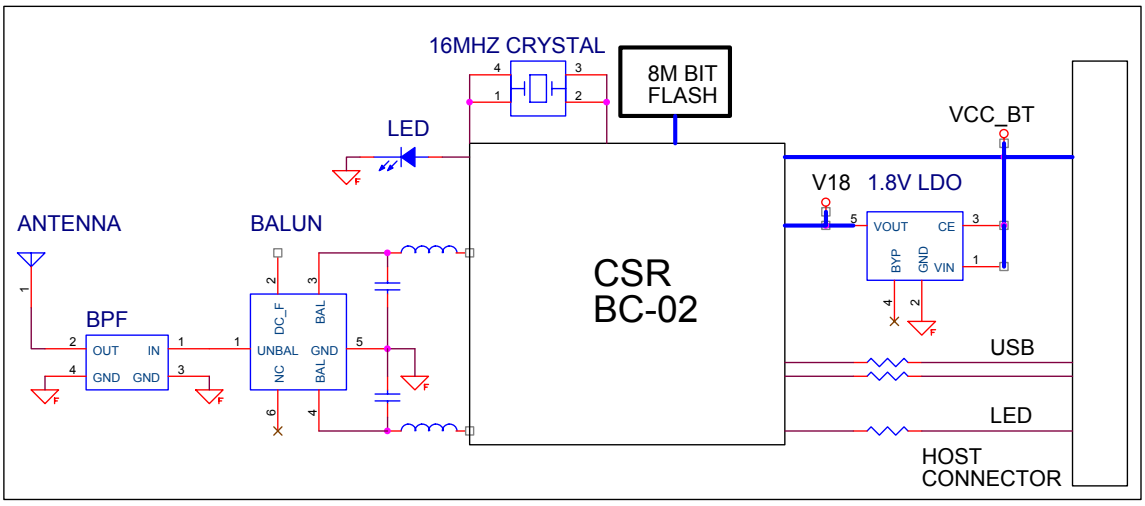
Basic Operation Theory of Actiontec Bluetooth Module BTM200

Actiontec Electronics, Inc. 2/15/03

Actiontec BTM200 is using BlueCore 2 (CSR BC-02) of Cambridge Silicon Radio as its main chip set. It is actually a combination of 2.4GHz ISM Band Tranceiver, Baseband & Logic plus Microcontroller. The module is fully compliant with Bluetooth Standard v.1.1. Basically it is FHSS (Frequency Hopping Spread Spectrum), which is 1600 hops/s, and the modulation of RF carriers is GFSK (Gaussian Frequency Shift Keying).

The antenna on this module is from Etenna CL2400.

System Block Diagram



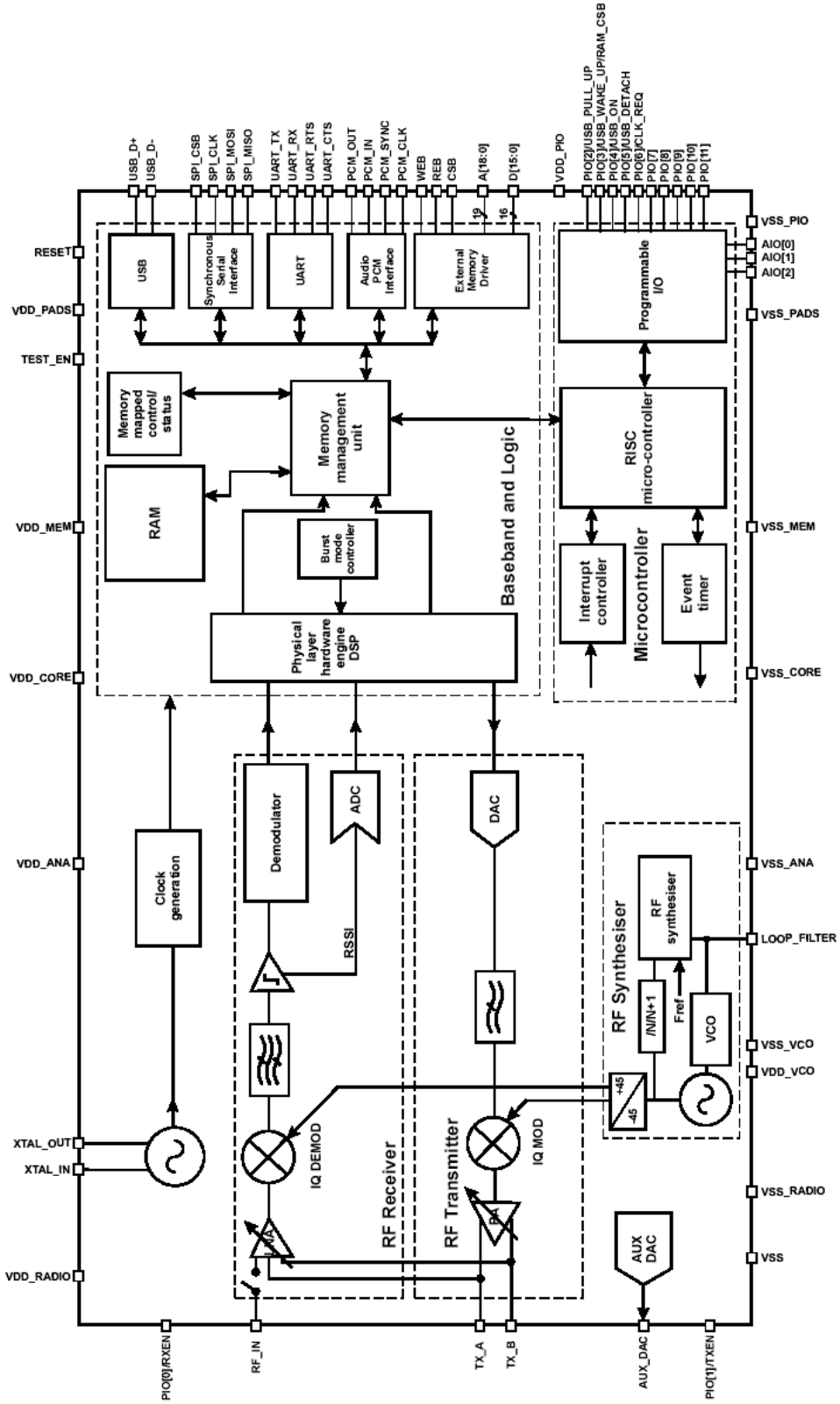
Transmitter Path

Refer to the Device Diagram (on page 3) and System Block Diagram (on page 1). The transmitter output power is Bluetooth Class 2, or 4dBm maximum. The module interface format is USB (Universal Serial Bus). So the BTM200 module acts as a USB peripheral, responding to requests from a master host controller such as a PC.

The having processed data coming from Baseband & Logic is fed to a D/A converter, then to a digital baseband transmit filter which provides the required spectral shaping. A multiplier plays a role of direct I/Q modulator to fulfill GFSK modulation with a controlled modulation index. The chip built-in PA has a maximum output power of +4dBm allowing transmitter to meet Bluetooth Class 2 without using external PA. The RF Synthesizer has been integrated into the chip set so that there is no need to add external components such as VCO (Voltage Controlled Oscillator), tuning diode but a simple RC loop filter. Frequency Hopping function is done through RF Synthesizer too.

The PA output from the chip set is differential to reduce common mode noise. An external Balun transformer converts the differential to single ended signal which then passes through a BPF (Band Pass Filter) blocking all unwanted out of band emissions.

Device Diagram



Receiver Path

The receiver path is basically a reverse process to transmitter. The off air signal passes through BPF and Balun to a chip built-in LNA (Low Noise Amplifier). A receive multiplier down converts the channel signal to a near-zero IF (Intermediate Frequency) which is then filtered out and fed to a FSK discriminator. The data stream coming out from the discriminator goes to the Baseband & Logic for further processing. This architecture allows the filters to be integrated into the chip set. Sufficient out of band blocking specification at LNA input allows the radio to be used in close proximity to GSM Mobile Communications and WCDMA cellular phone transmitters without being interfered. The excellent performance in the noise presence of Actiontec BTM200 allows the system to exceed the Bluetooth requirements for co-channel and adjacent channel rejection.

A RSSI (Received Signal Strength Indication) line is internally hooked up to an A/D converter. This constructs a part of AGC loop for the receiver. The rest of the circuitry is within the Baseband & Logic and comes back to the gain control of the LNA.

Microcontroller, Baseband & Logic

The microcontroller, interrupt controller and event timer run the Bluetooth software stack, which is loaded in a 8Mbit flash, and control the radio and host interfaces. Two terminals of the Programmable I/O ports are currently used for LED indication.

The Memory Management Unit (MMU) provides a number of dynamically allocated ring buffers that hold the data which is in transit between the host and the air or vice versa. The dynamic allocation of memory ensures efficient use of the available RAM and is performed by a hardware MMU to minimize the overheads on the processor during data transfer.

The Physical Layer Hardware Engine DSP is dedicated to perform: Forward error correction, Header error control, Cyclic redundancy check, Encryption, Data whitening, Access code correlation and Audio transcoding.

During radio transmission, Burst Mode Controller (BMC) constructs a packet from header information previously loaded into memory-mapped registers by the software and payload data/voice taken from the appropriate ring buffer in RAM. During radio reception, the BMC stores the packet header in memory-mapped registers and the payload data in the appropriate ring buffer in RAM. This architecture minimizes the intervention required by the processor during transmission and reception.

End

EXHIBIT F - USERS MANUAL

Bluetooth
BTM200

OEM Installation Manual

Contents

2. Introduction

Thank you for purchasing Actiontec USB Bluetooth Wireless Module. This manual will assist you with the installation procedure.

The package you have received should contain the following items:

- USB Bluetooth Wireless Module
- OEM Installation Manual
- Wireless LAN Management utility and driver software.

Note: if anything is missing, please contact your vendor

The diskette contains drivers and utility software; this is used for managing the Bluetooth and needed components.

The Bluetooth is designed to provide Bluetooth wireless function on a customized form factor.

The Bluetooth wireless function is based on CSR BlueCore-02 chip, which is fully compliant with Bluetooth version 1.1 standard. It has an USB interface to the host.

3. Wireless Bluetooth Basics

Wireless Bluetooth systems offer a great number of advantages over a traditional, wired system. Wireless Bluetooth are more flexible, easier to setup and manage and often more cost effective than their wired equivalence.

Using radio frequency (RF) technology. Bluetooth transmits and receives data over the air, minimizing the need for wired connections. Thus, Bluetooth combines data connectivity with user mobility, and, through simplified configuration, enable movable LANs.

With wireless Bluetooth, users can access shared information without looking for a place to plug in and network managers can set up or augment networks without installing or moving wires. Wireless Bluetooth offers the following productivity, convenience and cost advantages over traditional wired networks.

- Mobility – Wireless Bluetooth systems can provide LAN users with access to real-time information anywhere in their organization. This mobility supports productivity and service opportunities not possible with wired networks.

- Installation Speed and Simplicity – Installing a wireless Bluetooth system can be fast and easy and can eliminate the need to pull cable through walls and ceilings.

- Installation Flexibility – wireless technology allows the network to go where wires cannot go.

- Reduced Cost-of-Ownership – While the initial investment required for wireless Bluetooth hardware might be higher than the cost of wired LAN hardware, overall installation expenses and life-cycle costs will be significantly lower. Long- term cost benefits are greatest in dynamic environments requiring frequent moves, adds, and changes.

- Scalability – Wireless Bluetooth systems can be configured in a variety of topologies to meet the needs of specific applications and installations. Configurations are easily changed and range from peer-to-peer networks suitable for a small number of users to full infrastructure networks of thousands of users that allow roaming over a broad area.

4. OEM Installation Procedures of Bluetooth

Please follow the below steps one by one to install the utility and driver software successfully.

1. Take JST connector to plug into the 8-pin connector located on the same side of the PCB as antenna.
2. Power on your PC and allow Windows to load fully.
3. Windows first time detects the USB device (Bluetooth by HP); click “cancel”.
4. Insert the given Installation diskette and then double click the setup.exe file to run setup.
5. Click “Next” in the welcome window.
6. Click the option for to accept the terms in the license agreement, then click “Next”.
7. Click “Next” to install to this folder, or click “Change” to install to a different folder.
8. Click “Install” to begin installation of WIDCOMM Bluetooth Software.
9. Click “OK” to disable unsigned deriver warnings.
10. Click “Finish” to complete the installation.
11. Recommended to select “Yes” to restart your PC to make the changes effective when screen message pop up.
12. If the software dose not fix device’s driver, manually install driver from specific location when the notice pop up.
13. Select “Advance” and click next to continue; browse the driver location
    C:\Program Files\WIDCOMM\Bluetooth Software\bin
    Then, finish the software installing.
14. Double click the icon of My Bluetooth Places, and place some options of features on the computer before to begin using Bluetooth, then click “Next”.
15. Select a name for your computer and indicate what type of computer it is.
16. Click “Next” to configure the Bluetooth services; otherwise, click “Skip”. Go to step 18.
17. To enable a service, place a check in the box next to the service name.
    To display the properties panel for a service, click “Configure”.
18. If you have another Bluetooth device and you want to configure the way this computer will use its services, click “Next”. Otherwise click “Skip”.
19. Select a device that must be in discoverable mode for your computer to find them, then click “Next”.
20. To begin the paring process, enter the PIN code and click “Initiate Paring”. Otherwise click “Skip”.
21. Select available service through the selected Bluetooth device, and click “Next”.
22. Repeat step 16, or click “Skip”.
23. Click “Finish” for the completion of basic Bluetooth configuration.
24. Check “Entire Bluetooth Neighborhood” to search any other available Bluetooth device for communication.

5. Troubleshooting

USB Bluetooth Wireless Module

If you still encounter some problems while installing the Bluetooth utility and driver software or you want to confirm whether your software is installed properly or not, we have listed the procedure for checking the various components after you have installed the software. In section below, we have listed the various problems that you may encounter during the installation and have also listed the possible solution.

Procedure to check the various properties of card after installation under Windows:
Please check the followings if you encounter some problem while installing the Bluetooth utility and driver software.

Right click on My Computer and the select Properties. Select the Device Manager and expand the Universal Serial Bus controllers. You will find USB Bluetooth Wireless Module (Bluetooth by HP) without yellow band if it is installed successfully. If you see the yellow band on the Bluetooth by HP, you may reinstall the driver and make sure specific the right location of driver.

6. Technical Specification of Bluetooth

Hardware compatibility

- IBM-compatible computers

Driver support

- Windows 95
- Windows 98
- Windows NT4.0
- Windows 2000
- Windows Me

Standards supported

- Bluetooth spec. 1.1
- USB version 1.1

Environmental

Operating temperature:

- 0 degree Celsius to 70 degree Celsius (Operating) –20 to 85 (storing)
- Max. Humidity 95 % Non-condensing

Power specifications

Operating voltage:

- +5 V, +3.3V DC +- 5 %

Radio specifications

Range:

- per cell indoors approx. 3-50 meters or more
- per cell outdoors up to 100 meters

Frequency range:

- 2.4 – 2.4835 GHz, frequency hopping spread spectrum

Number of Channels:

- Europe: 79
- US: 79
- France: 23

Mobility:

- Seamless roaming across cell boundaries with handover

Data encryption:

- 40 bit WEP Encryption, 128-bit key length

Utility software:

- Link Config User setup & diagnostics tool

Physical Dimensions

- 26 x 14 x 5.7mm

IO Connector

- Hose Interface Connector: 40 Pin Hirose DF12-40DS-0.5V(89) connector to the host
- Bluetooth RF Connector: SMT Ultra Miniature coax RF connector, Hirose U.FL-R-SMT

Regulation

- FCC Part 15 Class B
- FCC CFR 47 Part 15.247
- Canada RSS210
- Europe ETSI 300 328-2 V.1.1.1: July 2000
  ETSI 301 489-17 V.1.1.1: Sept. 2000
- Japan TELEC ARIB STD T66
- Other Upon Request

Regulatory Compliance Notices Class B Equipment

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 instructions, may cause harmful interference to radio communications. 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 or television technician for help.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Actiontec Electronics, Inc may void the user's authority to operate the equipment.

Declaration of conformity for products marked with the FCC logo – United States only

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry of Canada. 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.

"IMPORTANT NOTE: The radiated output power of this internal wireless radio is far below the FCC radio frequency exposure limits. The internal wireless radio operates within guidelines found in radio frequency safety standards and recommendations, which reflect the consensus of the scientific community. The level of energy emitted is far less than the electromagnetic energy emitted by wireless devices such as mobile phones. However, the use of wireless radios may be restricted in some situtations of environments, such as aboard airplanes. If you are unsure of restructions you are encouraged to ask for authorziation before turning on the wireless radio."
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