Ecom Sertech Corp.
Rm. 258, Bldg. 17, NO.195, Sec. 4 Chung Hsing Rd., ChuTung Chen, Hsinchu, Taiwan 310, R.O.C
TEL:886-3-5918012 FAX : 886-3-5825720

TEST REPORT

Product Name : Bluetooth USB Dongle
Model Number : UBTC1
Brand Name : BILLIONTON

Applicant : BILLIONTON SYSTEMS INC.
Address : No. 21. Sui-Lih Rd., Hsin-Chu, 300, Taiwan

Received Date : Feb. 23 ~ Mar. 12, 2004
Tested Date : Feb. 23 ~ Mar. 12, 2004

Notes :
1. This report will be invalid if duplicated or photocopied in part.
2. This report refers only to the specimen(s) submitted to testing, and be invalid as seperately used.
3. This report is invalid without examination stamp and signature of this institute.
4. The tested specimen(s) will be preserved for thirty days from the data issued.
5. The report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

0240
ILAC MRA
NVLAP LAB CODE 200110-0

Test Report Certification

Product Name : Bluetooth USB Dongle

Model Number : UBTC1

Applicant : BILLIONTON SYSTEMS INC.

Measurement Standard :

FCC 47 C.F.R. Part 15, Subpart B and Subpart C (2003),
ANSI C63.4 (2001)

Tested By	:	(Stan Peng)	Date : Apr. 12, 2004
Reviewed By	:	(Roger Sheng)	Date : Apr. 12, 2004
Approved By	:	(Chieh-De Tsai ,Manager)	Date : Apr. 12, 2004

WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.

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1. GENERAL INFORMATION

1.1 Description of EUT & Power

MANUFACTURER	: BILLIONTON SYSTEMS INC.
SAMPLE NAME	: Bluetooth USB Dongle
MODEL NO	: UBTC1
EUT DESCRIPTION	: 2.4GHz Frequency Hopping Spread Spectrum Data Transceiver for Bluetooth USB Dongle
FREQUENCY RANGE	: 2402 MHz to 2480MHz
CHANNEL NUMBER	: 79
CHANNEL Spacing	: 1MHz
AIR DATA RATE	: 723Kbps
TYPE OF MODULATION	: Frequency Hopping Spread Spectrum
FEQUENCY SELECTION	: BY SOFTWARE
ANTENNA TYPE	: 1/2λ Dipole Antenna , Antenna Gain : 1.2dBi.
POWER SOURCE	: 5VDC (From USB interface of PC)

Data Applies to :

(1)		
Company Name	:	DSG Retail Ltd.
Sample Name	:	Class1 USB Bluetooth
Model Name	:	UBTC1-N-DX
Address	:	Dixons House, 200 The Campus, Maylands Avenue, Hemel Hempstead, Hertfordshire, HP2 71G, United Kingdom.
(2)		
Company Name	:	Cables Direct Limited
Sample Name	:	Class1 USB Bluetooth
Model Name	:	UBTC1-N-CDL
Address	:	Unit C, Heage Road Industrial Estate, Heage Road, Ripley, Derbyshire, DE5 3GH, United Kingdom.
(3)		
Company Name	:	2L INTERNATIONAL
Sample Name	:	UBTC1-N-2L2
Model Name	:	Class 1 USB Bluetooth
Address	:	DATABANKWEG 7-3821 AL AMERSFOORT PO BOX 150-3800 AD AMERSFOORT,NE
(4)		
Company Name	:	CARECA SPA
Sample Name	:	UBTC1-N-HA
Model Name	:	Class 1 USB Bluetooth
Address	:	VIA BORSELLINO, 14 42010 ARCETO DI SCANDIANO REGGIO EMILLA 42019 IT
(5)		
Company Name	:	INTERDISCOUNT AG
Sample Name	:	UBTC1-N-SM
MODEL NAME	:	Class 1 USB Bluetooth
Address	:	BERNSTRASSE 90, CH-3303 JEGENSTORF,SWITZERLAND
(6)		
Company Name	:	SCM PC-CARD GmbH
Sample Name	:	UBTC1-B-SCM
Model Name	:	Class 1 USB Bluetooth
Address	:	SPERL RING 4 HETTENHAUSEN 85276 PFAFFENHOFEN ILM GERMANY

(7)		
Company Name	:	MEDION AKTIEGESELLSCHAFT-GERMANY
Sample Name	:	UBTC1-N-MD
Model Name	:	Class 1 USB Bluetooth
Address	:	GANSEMARKT 16-18 ESSEN GM 45127 GERMANY
(8)		
Company Name	:	MAXDATA SYSTEME GMBH
Sample Name	:	UBTC1-N-MAX
Model Name	:	Class 1 USB Bluetooth
Address	:	Elbestrasse 12-16 D-45768 Marl Germany
(9)		
Company Name	:	GERICOM AG
Sample Name	:	UBTC1-N-GE
Model Name	:	Class 1 USB Bluetooth
Address	:	INDUSTRIEZEILE 35,LINZ,A-4020 AUSTRIA
(10)		
Company Name	:	PIROX INTERNATIONAL B.V.
Sample Name	:	UBTC1-B-PR
Model Name	:	Class 1 USB Bluetooth
Address	:	SEVILLAWEG 81 ROTTERDAM 3047 AL NETHERLANDS
(11)		
Company Name	:	SITECOM EUROPE B.V.
Sample Name	:	UBTC1-B-SC
Model Name	:	Class 1 USB Bluetooth
Address	:	LICHTENAUERLAAN 222, BRAINPARK 2, ROTTERDAM, 3062ME NETHERLANDS
(12)		
Company Name	:	HAMA GMBH AND CO.KG
Sample Name	:	UBTC1-N-HM
Model Name	:	Class 1 USB Bluetooth
Address	:	DRESDNERSTRASSE 9 MONHEIM 86653 GERMANY

(13)		
Company Name	:	ANUBIS INTL CO., LTD.
Sample Name	:	UBTC1-N-AN
Model Name	:	Class 1 USB Bluetooh
Address	:	SUITE 504,EMPIRE CENTRE,68 MODY RD.,TSIM SHA TSUI, KOWLOON, HONG KONG
(14)		
Company Name	:	COM ONE
Sample Name	:	UBTC1-N-COM
Model Name	:	Class 1 USB Bluetooh
Address	:	11 PARC DE MARTICOT, 33610 CESTAS,FRANCE
(15)		
Company Name	:	DATAMATIC S.P.A.
Sample Name	:	UBTC1-N-DM
Model Name	:	Class 1 USB Bluetooth
Address	:	VIA AGORDAT,34 MILANO MI 20124 ITALY
(16)		
Company Name	:	Prosonic Technology Corp.
Sample Name	:	UBTC1-N-PS
Model Name	:	Class 1 USB Bluetooth
Address	:	2F-1, No.148, Jian Guo N. Rd.,Sec.3, Taipei, Taiwan, R.O.C.
(17)		
Company Name	:	Citycom Technology Ltd.
Sample Name	:	UBTC1-N-CTC
Model Name	:	Class 1 USB Bluetooh
Address	:	3F-1, No. 755, Zhong Zheng Rd., Zhong He, Taipei, Taiwan, R.O.C.
(18)		
Company Name	:	SMC Networks, Inc.
Sample Name	:	EZ Connect Wireless Bluetooth USB Adapter
Model Name	:	SMCBTUSB, SMCBTUSB-CA & SMCBTUSB EU
Address	:	38 Tesla Irvine CA 92618 USA

1.2 Description of Peripherals

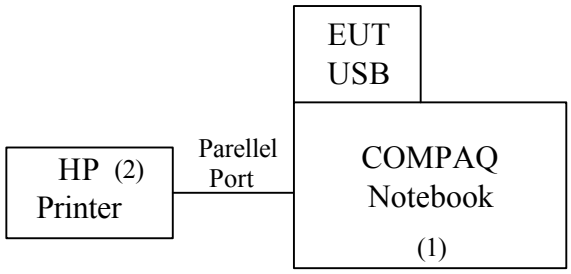
（1）Notebook PC

MANUFACTURER	：COMPAQ CORP.
MODEL NUMBER	：N800V
SERIAL NUMBER	：5Y33KSQZM0W41YR
FCC	：DOC
INPUT POWER	：18.5VDC, 65W, 3.5A
POWER CORD	：Unshielded, Detachable, 1.8m

（2）Printer

MANUFACTURER	：HP CORP.
MODEL NUMBER	：C6431D
SERIAL NUMBER	：CN19T6S011
FCC ID	：DOC
POWER SOURCE	：100~240VAC,50/60Hz,0.7A
SIGNAL CABLE	：Shielded , Undetachable , 1.8m

1.3 EUT & Peripherals Setup Diagram



The indicated numbers (1)(2)…..,please refer to item 1.2

1.4 EUT Operating Procedure

1. Turn on the power of all equipment.
2. PC runs a test program “Blue dongle.exe” to set the channel.
3. The EUT will trasceiver automatically in that channel.
4. The EUT transmits DH1 packets with PRBS9 as payload.

1.5 Description of Test Site

SITE DESCRIPTION

FCC Certificate NO. : 90585

BSMI Certificate NO. : SL2-IN-E-0002

NVLAP Lab code : 200118-0

CNLA Certificate NO. : CNLA-ZL97018

VCCI Certificate NO. : R-1189, C-1250

TÜV Certificate NO. : 10008375

NAME OF SITE : Ecom Sertech Corp. Hsin-chu Lab
(Spin-off from ITRI / ERSO on Apr. 01, 2003)

SITE LOCATION : Rm.258, Bldg.17, NO.195 , Sec. 4, Chung Hsing Rd.,
Chu-Tung Chen. Hsin-Chu, Taiwan 310 R.O.C.

1.6 Summary of Test Results

The EUT has been tested according to the following specifications :

APPLIED STANDARD： FCC 47 C.F.R. Part 15, Subpart B and Subpart C			
Standard Section	Test Type and Limit	Result	REMARK
15.107 15.207	AC Power Conducted Emission Limit : Sec1.5.107	PASS	Meet the requirement of limit
15.109 15.205 15.209	Transmitter Radiated Emissions Limit : Table 15.209	PASS	Meet the requirement of limit
15.247(a) (1)(i)-(ii)	Transmitter 20dB Bandwidth Limit < 1MHz	PASS	Meet the requirement of limit
15.247(b)(1)	Maximum Peak Output Power Limit : max. 30dBm	PASS	Meet the requirement of limit
15.247(a)(1)	Carrier Frequency Separation	PASS	Meet the requirement of limit
15.247(a) (1)(ii)	Number of Hopping Frequency	PASS	Meet the requirement of limit
15.247(a) (1)(ii)	Time of Occupancy (dwell time)	PASS	Meet the requirement of limit
15.247(c)	Band Edge Compliens	PASS	Meet the requirement of limit
15.247(c)	Out of Band Measurements	PASS	Meet the requirement of limit

2. CONDUCTED POWERLINE TEST

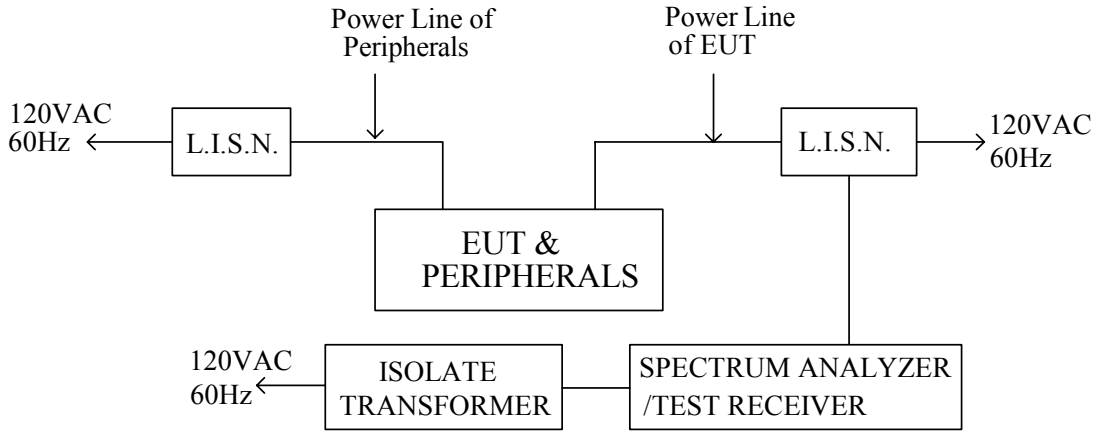
For intentional device, according to § 15.207(a) Line Conducted Emission Limit is required to verify the EUT.

2.1 Test Equipments

The following test equipments are used during the conducted powerline tests：

Manufacturer or Type	Model No.	Serial No.	Date of Calibration	Calibration Period	Remark
HP SPECTRUM ANALYZER & DISPLAY	8568A	2235A02320	NOV. 14, 2003	1 Year	PRETEST
HP QUASI-PEAK ADAPTER	85650 A	2341A00672	NOV. 14, 2003	1 Year	PRETEST
SOLAR ISOLATION TRANSFORMER	7032-1	N/A	N/A	N/A	FINAL
EMCO L.I.S.N.	3850/2	9311-1025 9401-1028	JAN. 08, 2004 For Characteristic impedance MAY. 18, 2003 For Insertion loss	1 Year	FINAL
R & S TEST RECEIVER	ESHS 30	838550/003	FEB. 11, 2004	1 Year	FINAL
KEENE SHIELDED ROOM	5983	No.1	N/A	N/A	FINAL
R & S PULSE LIMIT	EHS3Z2	357.8810.52	JUL. 10, 2003	1 Year	FINAL
N TYPE COAXIAL CABLE	----------	----------	JUL. 10, 2003	1 Year	FINAL
50Ω TERMINATOR	----------	----------	JUL. 10, 2003	1 Year	FINAL

2.2 Test Setup



2.3 Conducted Power Line Emission Limit

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

Frequency (MHz)	Maximum RF Line Voltage (dBμv)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56	56-46
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

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

2.4 Test Procedure

The test procedure is performed in a 12ft×12ft×8ft(L×W×H) shielded room.
the EUT along with its peripherals were placed on a 1.0m(W)× 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chasis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chasis ground also bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

2.5 Uncertainty of Conducted Emission

The uncertainty of conducted emission is ±1.36dB.

2.6 Line Conducted RF Voltage Measurement

The frequency spectrum from 0.15 MHz to 30 MHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits.

Temperature：26 ℃ Humidity：65 % RH

Frequency (MHz)	Loss(dB)		Measurewment				L1 Emission (dBμV)		L2 Emission (dBμV)		Limits (dBμV)	
			L1(dBμV)		L2(dBμV)							
	L1	L2	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.
0.150	0.10	0.20	*	*	*	*	*	*	*	*	66.00	56.00
0.267	0.10	0.20	37.10	*	34.10	*	37.20	*	34.30	*	61.21	51.21
0.468	0.10	0.20	36.50	*	34.50	*	36.60	*	34.70	*	56.55	46.55
0.600	0.10	0.20	32.70	*	31.70	*	32.80	*	31.90	*	56.00	46.00
2.070	0.11	0.20	29.70	*	*	*	29.81	*	*	*	56.00	46.00
2.076	0.11	0.20	*	*	22.50	*	*	*	22.70	*	56.00	46.00
2.745	0.17	0.20	24.10	*	*	*	24.27	*	*	*	56.00	46.00
3.024	0.20	0.20	*	*	17.70	*	*	*	17.90	*	56.00	46.00
4.542	0.20	0.20	29.00	*	*	*	29.20	*	*	*	56.00	46.00
4.875	0.20	0.20	*	*	28.20	*	*	*	28.40	*	56.00	46.00
12.990	0.50	0.50	26.50	*	*	*	27.00	*	*	*	60.00	50.00
14.724	0.57	0.60	*	*	30.20	*	*	*	30.80	*	60.00	50.00
15.900	0.69	0.69	*	*	29.00	*	*	*	29.69	*	60.00	50.00
16.005	0.70	0.70	28.40	*	*	*	29.10	*	*	*	60.00	50.00
30.000	1.40	1.80	*	*	*	*	*	*	*	*	60.00	50.00

REMARKS ：1. ＊ Undetectable or the Q.P. value is lower than the limits of Ave.

2. The EUT can be operated in transmitting, stand-by and receiving mode. After preliminary scan, EUT in transmitting mode has highest emission. The EUT was set in transmitting mode at finial test to get the worst case test results.

2.7 Photos of Conduction Test

3. 20dB Bandwidth for hopping

Test Requirement: 15.247(a)(1)(ii)

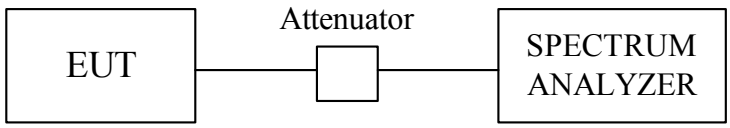
3.1 Test Equipments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	JUN. 17, 2003
HP ATTENUATOR	8496B	3247A18505	Cal. on use
HP PLOTTER	7750A	725A 852141	N/A

NOTE：

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

3.2 Test Setup



3.3 Limits of 20db Bandwidth Measurement

Limit: 20dB band width < 1MHz

3.4 Test Procedure

The 20dB band width was measured with a spectrum analyzer connected to RF antenna connector(conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency.
The analyzer center frequency was set to the EUT carrier frequency, using the analyzer. Display Line and Marker Delta functions, the 20dB band width of the emission was determined.

3.5 Uncertainty of Conducted Emission

The uncertainty of conducted emission is ± 10KHz.

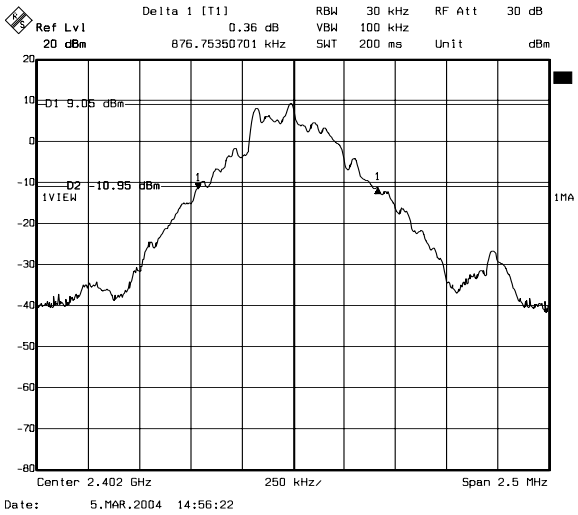
3.6 Test Results

Refer to attached spectrum analyzer data chart.

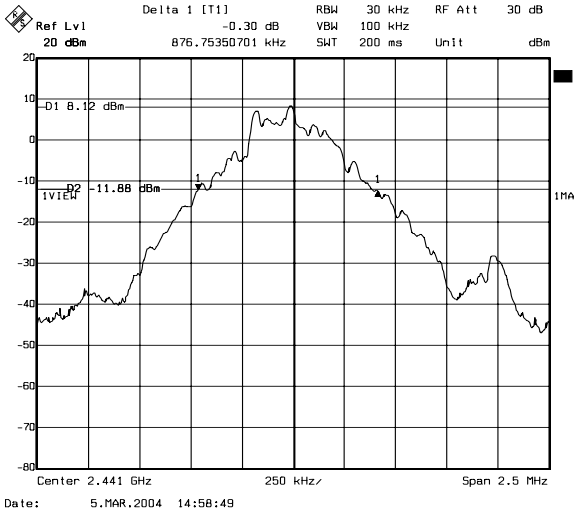
Input Power (System)	5VDC (From USB interface of PC)	**Environmental Conditions**	14.6℃, 73%RH
Tested By	Stan Peng		

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Maximum Limit (MHz)	Pass / Fail
01（Low）	2402	0.876	＜1	PASS
40（Mid）	2441	0.876	＜1	PASS
79（High）	2480	0.841	＜1	PASS

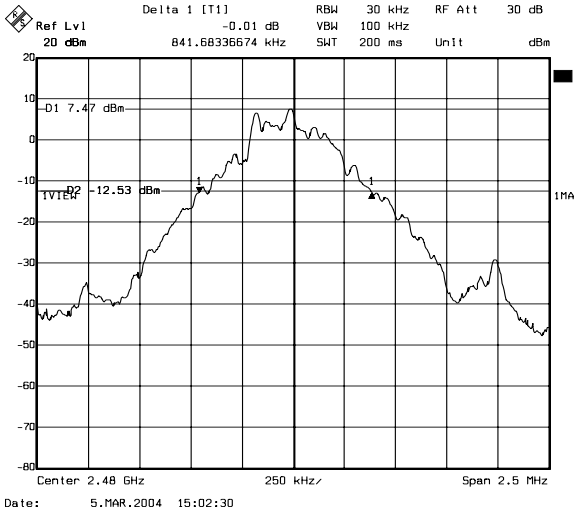
3.7 Photo of 20db Bandwidth Measurement



Channel Low



Channel Middle



Channel High

4. MAXIMUM PEAK OUTPUT POWER

Test Requirement: 15.247(b)(1)

4.1 Test Equipments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	JUN. 17, 2003
HP ATTENUATOR	8496B	3247A18505	Cal. on use
HP PLOTTER	7750A	725A 852141	N/A

NOTE：

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

4.2 Test Setup

4.3 Limits of Maximum Peak Output Power

The Maximum Peak Output Power Measurement is 1W(30dBm) for frequency hopping systems operating in 2400~2483.5 MHz employing at least 75 hopping channels.

4.4 Test Procedure

The RF power output was measured with a Power meter connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal see 4.7 for the measurement set up.

4.5 Uncertainty of Conducted Emission

The uncertainty of conducted emission is ± 1.82dB.

4.6 Test Results

Input Power (System)	5VDC (From USB interface of PC)	**Environmental Conditions**	14.6℃, 73%RH
Tested By	Stan Peng		

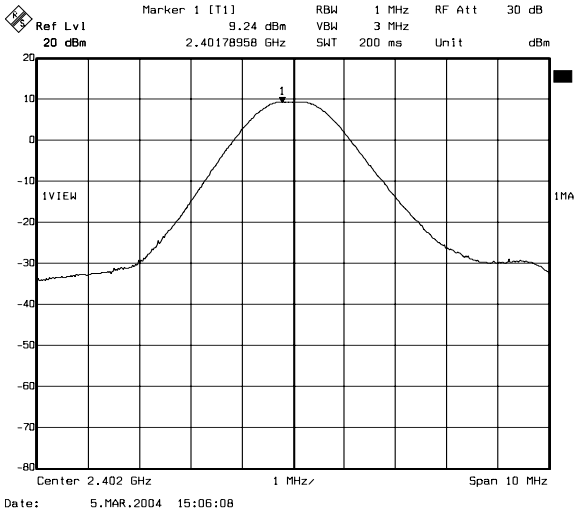
Cable loss = 0.5dB

Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
01（Low）	2402	9.74	30	PASS
40（Mid）	2441	8.88	30	PASS
79（High）	2480	8.20	30	PASS

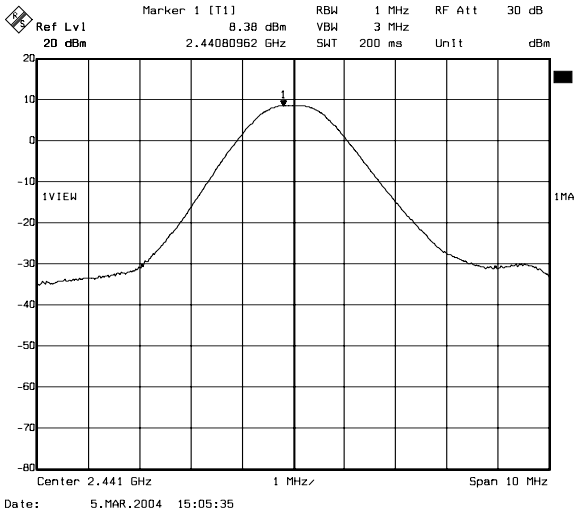
Note : 1. At finial test to get the worst-case emission at 1Mbps.
2.The result was calculated as follow :
Peak Power Output = Peak Power Reading + Cable loss

.

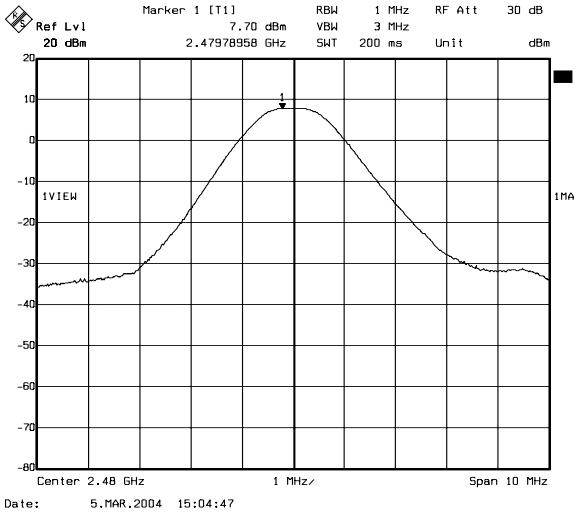
4.7 Photo of Maximum Peak Output Power



Channel Low



Channel Middle



Channel High

5. HOPPING CHANNEL SEPARATION

Test Requirement: 15.247(a)(1)

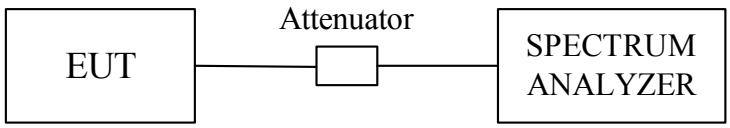
5.1 Test Equipments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	JUN. 17, 2003
HP ATTENUATOR	8496B	3247A18505	Cal. on use
HP PLOTTER	7750A	725A 852141	N/A

NOTE：

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

5.2 Test Setup



5.3 Limits of Hopping Channel Separation

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

5.4 Test 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 as shown in test setup 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. Because of the property of test software and hardware, the TX signal can not be modulated while test.
4. By using the MaxHold function record the separation of adjacent channels.
5. Measure the frequency difference of these two adjacent channels by spectrum analyzer MARK function. And then plot the result on spectrum analyzer screen.

Repeat above procedures until all frequencies measured were complete.

5.5 Uncertainty of Conducted Emission

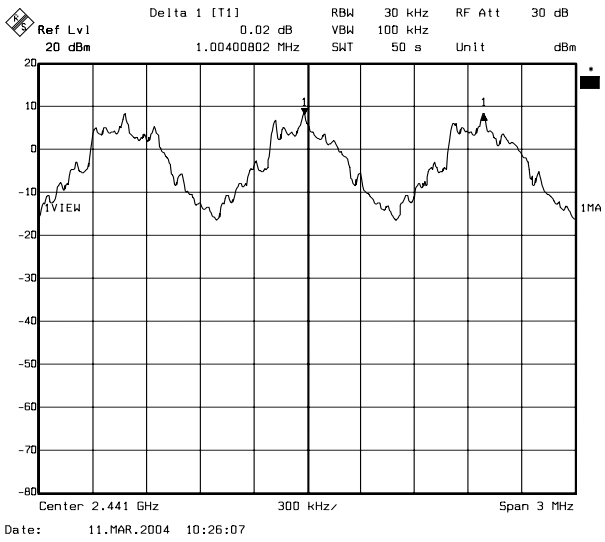
The uncertainty of conducted emission is ± 10KHz.

5.6 Test Results

Refer to section 3, 20dB bandwidth measurement, the measured channel separation should be greater than 20dB bandwidth or Minimum bandwidth.

Channel	Adjacent Hopping Channel Separation (kHz)	20dB bandwidth (kHz)	Minimum Bandwidth	Result
2441MHz (Mid)	1004 kHz	876 kHz	25 kHz	Pass

5.7 Photo of Hopping Channel Separation



Channel (Mid)

6. NUMBER OF HOPPING FREQUENCY USED

Test Requirement: 15.247(a)(1)(ii)

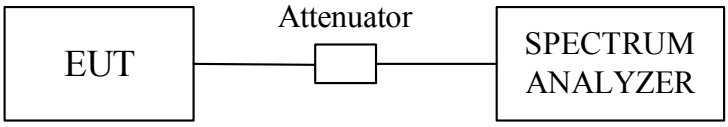
6.1 Test Equipments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	JUN. 17, 2003
HP ATTENUATOR	8496B	3247A18505	Cal. on use
HP PLOTTER	7750A	725A 852141	N/A

NOTE：

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

6.2 Test Setup



6.3 Limits of Number of Hopping Frequency Used

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5MHz and 5725-5850 MHz bands shall use at least 75 hopping frequencies

6.4 Test Procedure

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup 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 spectrum analyzer on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the spectrum analyzer on View mode and then plot the result on spectrum analyzer screen.
5. Repeat above procedures until all frequencies measured were complete.

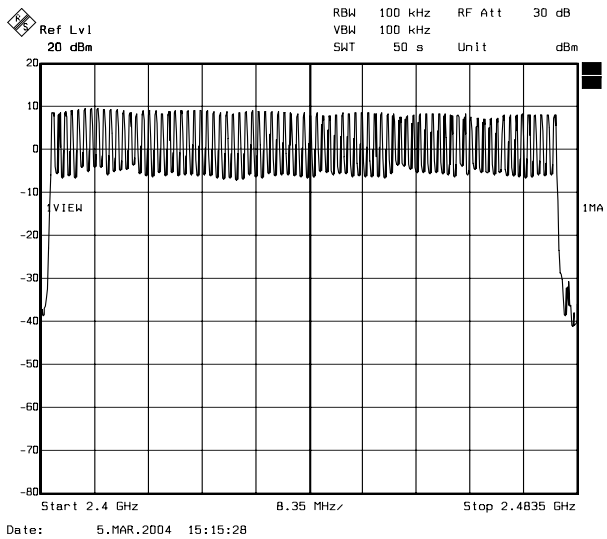
6.5 Uncertainty of Conducted Emission

The uncertainty is not applicable.

6.6 Test Results

Refer to the attached graph.
There are 79 hopping frequencies in a hopping sequence.

6.7 Photo of Number of Hopping Frequency Used



7. DWELL TIME ON EACH CHANNEL

Test Requirement: 15.247(a)(1)(ii)

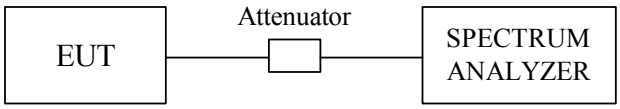
7.1 Test Equipments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	JUN. 17, 2003
HP ATTENUATOR	8496B	3247A18505	Cal. on use
HP PLOTTER	7750A	725A 852141	N/A

NOTE：

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

7.2 Test Setup



7.3 Limits of Dwell Time on Each Channel

According to 15.247(a)(1)(ii), for frequency hopping system operating in the 2400-2483.5MHz and 5725-5850 MHz band, the average time of occupancy on any frequency shall not be greater than **0.4** second within a 30-second period

7.4 Test 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 as shown in test setup 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 spectrum analyzer on any frequency be measured and set spectrum analyzer 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.
6. The Bluetooth USB Dongle has 3 type of payload, DH1. The hopping rate is 1600 per second. The longer the payload is, the slower the hopping rate is.

7.5 Uncertainty of Conducted Emission

The uncertainty of time is ± 5.25ms.

7.6 Test Results

Time of occupancy on the TX channel in 30sec = time domain slot length × hop rate ÷ number of hop per channel × 30

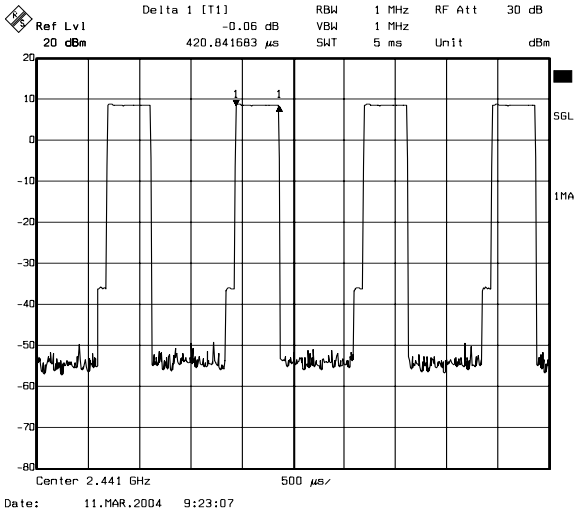
Refer to the attached graph.

The hopping rates of Bluetooth devices change with different types of payload. The longer the payload is, the slower the hopping rate. The hopping rate scenario is defined in Bluetooth core specification.

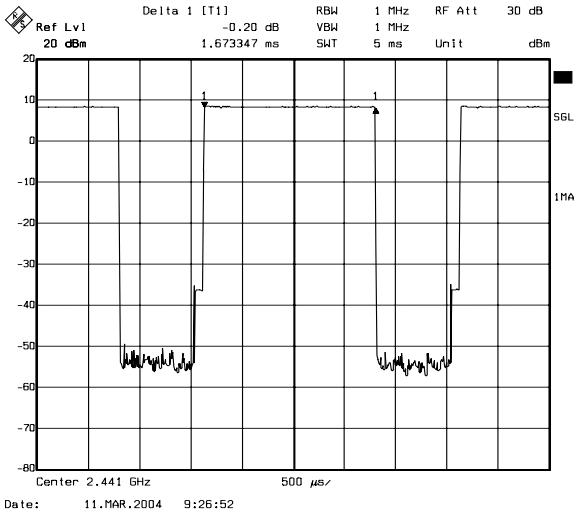
Transmitting Frequency	Packet type	Dwell time (ms)	Time of occupancy on the TX channel in 30sec (ms)	Limit for Time of occupancy on the TX channel in 30sec (ms)	Results
2441MHz	DH1	0.420	255.18	400	Pass
2441MHz	DH3	1.673	338.83	400	Pass
2441MHz	DH5	2.254	273.90	400	Pass

DH1 Dwell time = 0.420ms × 1600 ÷ 79 × 30 = 255.18 (ms)
DH3 Dwell time = 1.673 ms ×（1600÷3）÷ 79 × 30 = 338.83 (ms)
DH5 Dwell time = 2.254 ms ×（1600÷5）÷ 79 × 30 = 273.90 (ms)

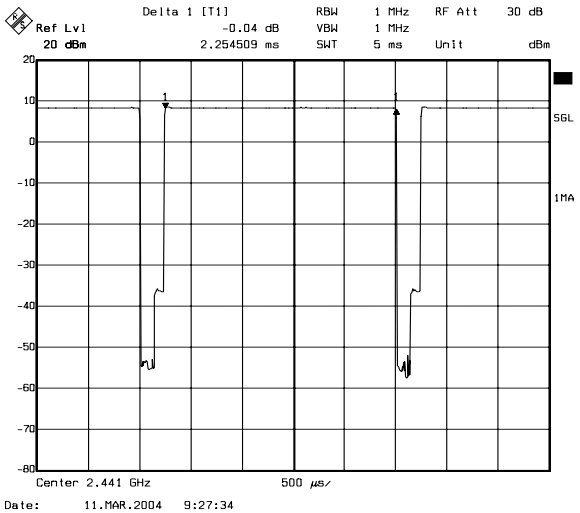
7.7 Photo of Dwell Time on Each Channel



DH1 2441MHz



DH3 2441MHz



DH5 2441MHz

8. BAND EDGE SPURIOUS EMISSIONS

Test Requirement: 15.247(c)

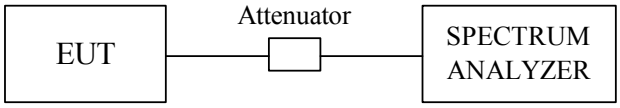
8.1 Test Equipments

Description & Manufacturer	Model No.	Serial No.	Date Of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	JUN. 17, 2003
HP ATTENUATOR	8496B	3247A18505	Cal. on use
HP PLOTTER	7750A	725A 852141	N/A

Note：

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

8.2 Test Setup



8.3 Limits of Band edge Measurements

1. Below –20dB of the highest emission level of operating band (in 100KHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

8.4 Test Procedure

Section 15.247(c): Spurious emissions. The following tests are required:
Set the span wide enough to capture the peak level of the emission operating on the channel closest to the band edge. Set the RBW and VBW and maxhold the trace. Allow the trace to stabilize. Enable the marker-delta function, then use the marker-delta value function to move the marker to the peak of the in-band emission submit the plot.

8.5 Uncertainty of Conducted Emission

The uncertainty of Frequency : ± 100kHz.
The uncertainty of Amplitude : ± 2dB.

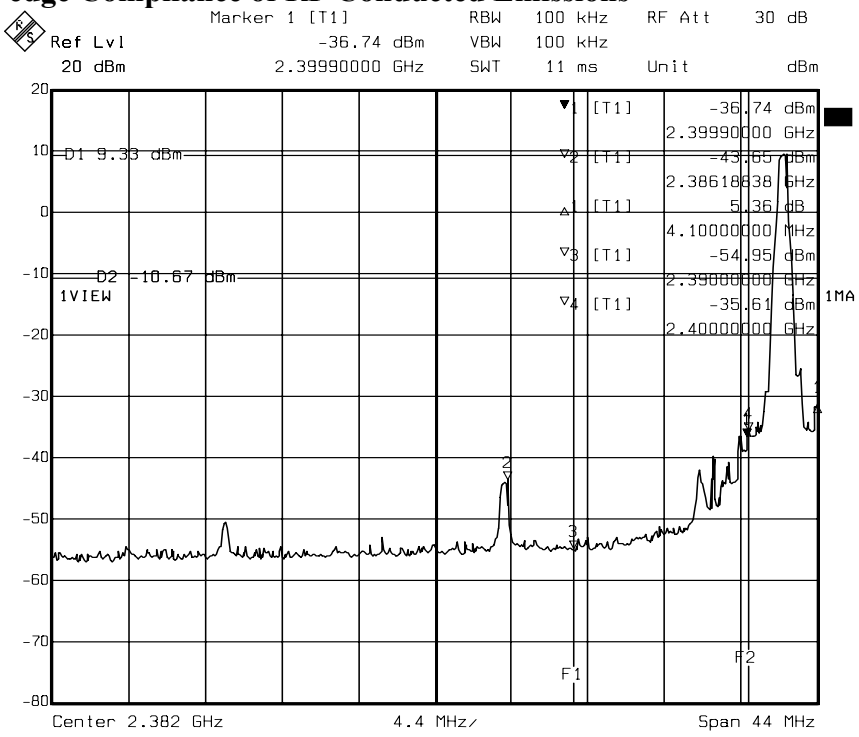
8.6 Test Results

Band edge		Measured radiated band edge field strength (dBuV/m)		Radiated band edge field strength limit (dBuV/m)		Test result
		Horizontal	Vertical	Horizontal	Vertical	
2399.97	PK	53.96	61.14	80.03	87.21	Pass
	AVG	43.37	50.15	69.44	76.22	
2483.65	PK	52.91	58.03	74.00	74.00	Pass
	AVG	45.01	47.22	54.00	54.00	

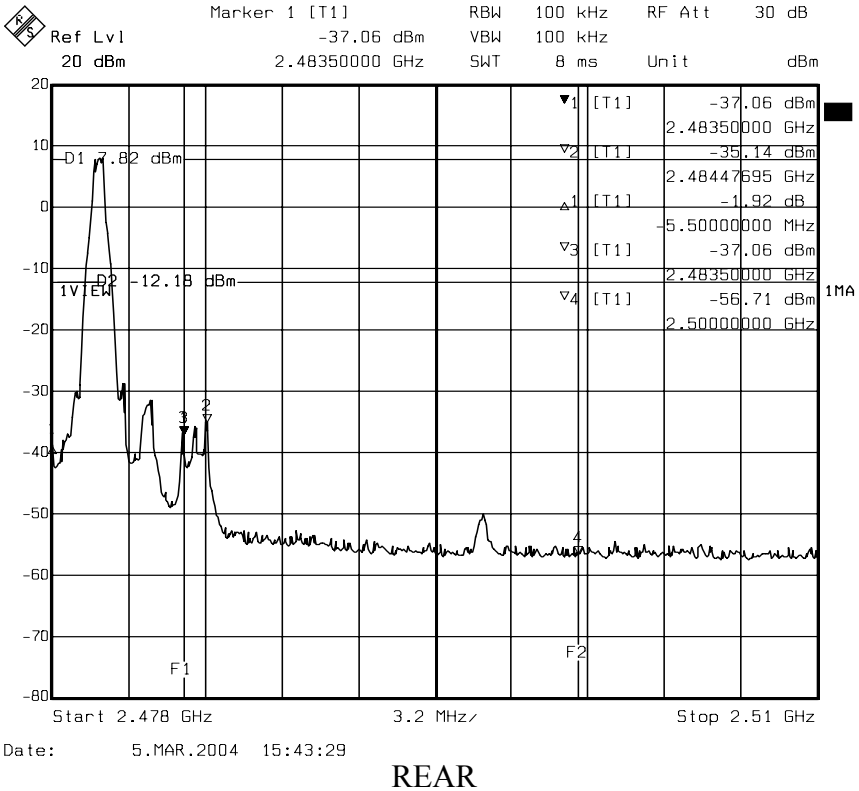
Note : 1. Radiated band edge field strength is measured with mark-delta method.
2. Measured radiated band edge field strength Test Results = Radiated fundamental emission field strength - DELTA.
3. DELTA = Relative measurement between conducted measured peak level of fundamental emission and relevant band edge emission. Please refer to 8.7 photo of band edge Measurement.

8.7 Photo of Band edge Measurement

Band edge Compliance of RF Conducted Emissions

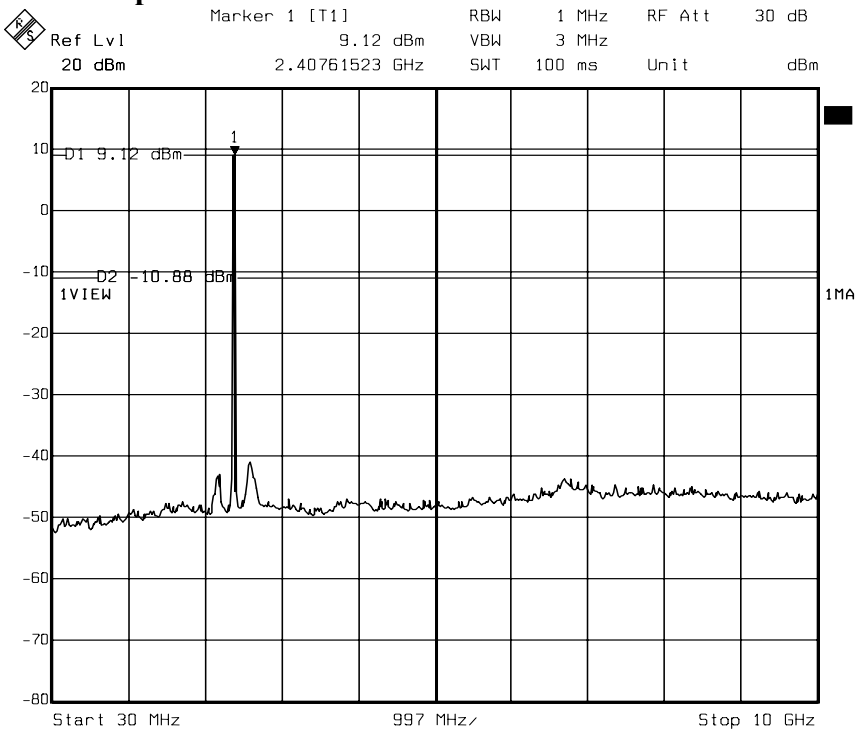


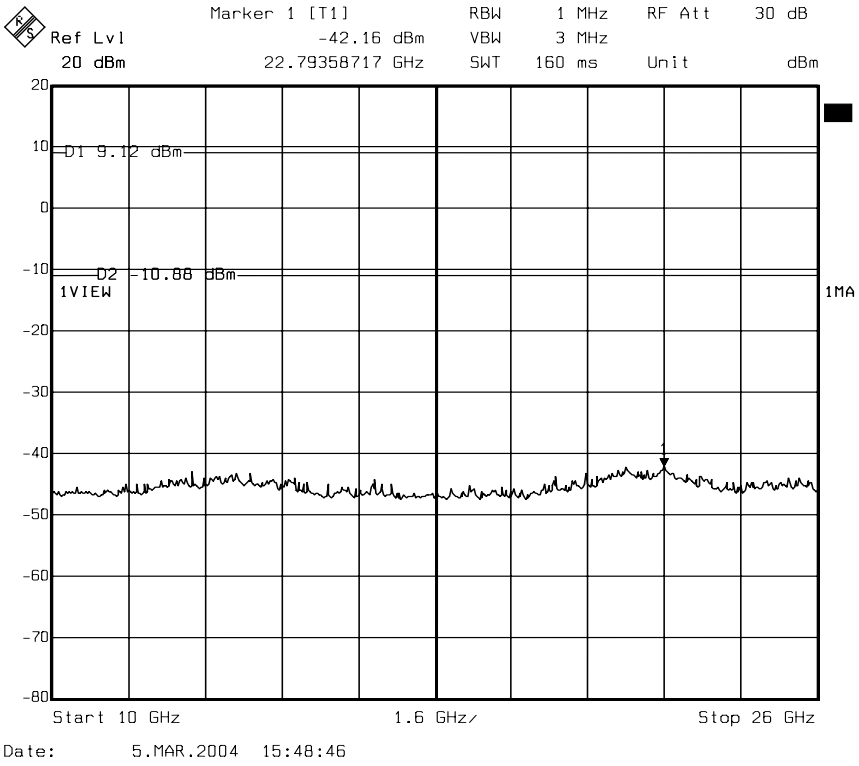
FRONT



REAR

Out-of-band Spurious Emissions-conducted measurement





9. OUT OF BAND SPURIOUS EMISSIONS -RADIATED MEASUREMENTS

Test Requirement: 15.247(c)

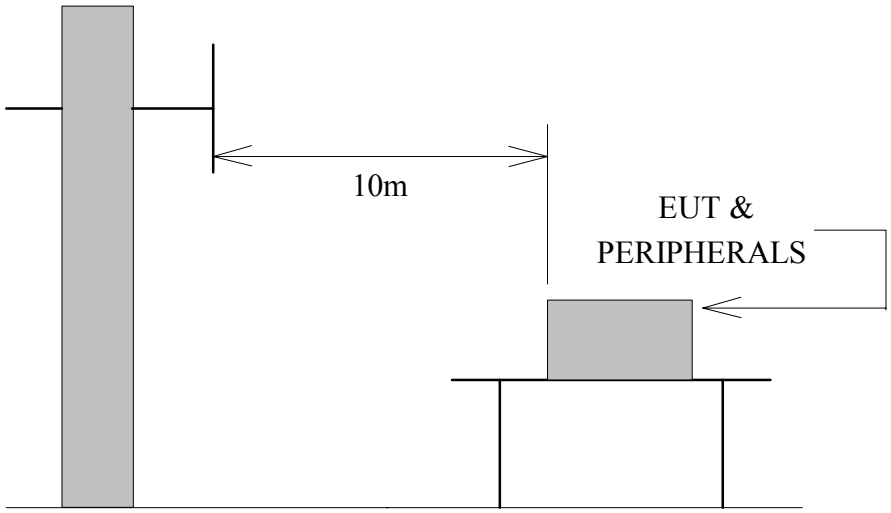
9.1 Test Equipments

The following test equipments are utilized in making the measurements contained in this report.

Manufacturer or Type	Model No	Serial No	Date of Calibration	Calibration Period	Remark
CHASE BI-LOG ANTENNA	CBL6112B	2421	MAY. 07, 2003	1 Year	FINAL
R/S SPECTRUM ANALYZER	FSEK30	835253/002	JUN. 17, 2003	1 Year	FINAL
OPEN SITE	----------	No.2	MAY. 09, 2003	1 Year	FINAL
N TYPE COAXIAL CABLE	CHA9525	4	JUL. 13, 2003	1 Year	FINAL
Horn Antenna	AH-118	10089	FEB. 25, 2004	1 Year	FINAL
HP Pre-amplifier	8449B	3008A01471	OCT. 11, 2003	1 Year	FINAL
HP High pass filter	84300/80038	011	cal. on use	1 Year	FINAL
Horn Antenna	AH-840	03077	FEB. 25, 2004	1 Year	FINAL

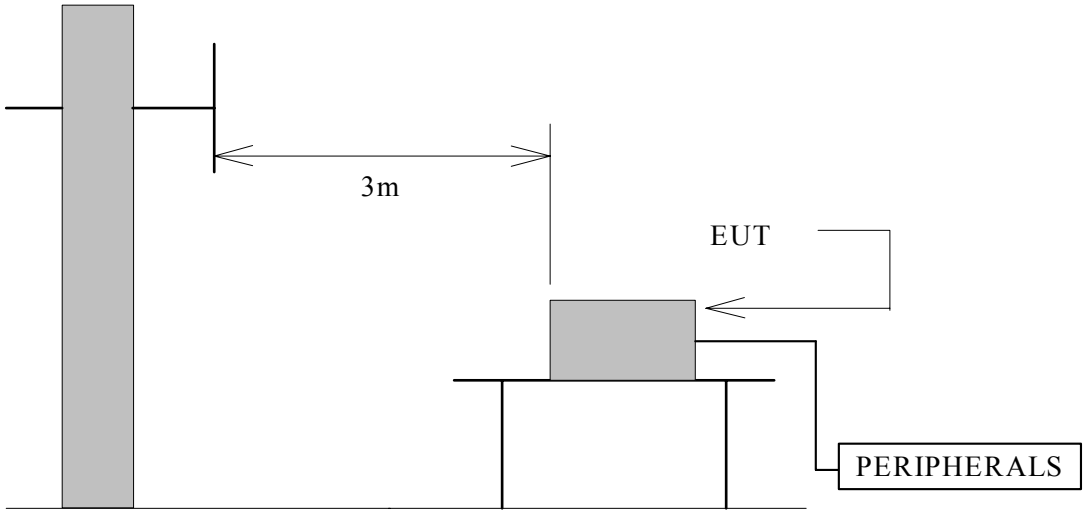
9.2 Test Setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 to 1GHz.



Antenna Elevation Variable

The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



Antenna Elevation Variable

9.3 Radiation Limit

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)	Field Strengths(dBμV/m)	
		CLASS A	CLASS B
30－230	10	40	30
230－1000	10	47	37

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.

9.4 Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. During performing radiated emission below 1GHz, the EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna.

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

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

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

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

NOTE：

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

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

3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

9.5 Uncertainty of Radiated Emission

The uncertainty of radiated emission is ±2.72dB.

9.6 Radiated RF Noise Measurement

Test Requirement: 15.109, 15.209
The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.
All readings are quasi-peak values.

Temperature：21.4 ℃ Humidity：58 % RH

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Meter Reading at 10m(dBμV/M)		Limits at 10m (dBμV/M)	Emission Level at 10m(dBμV/M)	
			Horizontal	Vertical		Horizontal	Vertical
30.00	17.98	0.90	*	*	30.00	*	*
149.99	11.48	2.30	6.80	7.20	30.00	20.58	20.98
247.26	12.86	3.18	13.30	12.80	37.00	29.34	28.84
431.00	17.12	4.42	6.90	6.30	37.00	28.44	27.84
481.97	17.76	4.77	6.50	6.40	37.00	29.04	28.94
523.09	18.28	5.02	11.00	6.80	37.00	34.30	30.10
800.02	20.75	6.40	6.80	5.90	37.00	33.95	33.05
1000.00	21.30	7.00	*	*	37.00	*	*

REMARKS：1. ＊Undetectable

2. Emission level (dB μ V/M) =Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dB μ V).
3. According to technical experience, all spurious emission at channel 1, 40 and 79 are almost the same below 1GHz, so the spurious emission test result of the channel 1 was chosen as representative in finial test.

Test Requirement: 15.205
The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

Company	BILLIONTON SYSTEMS INC.	Test Date :	2004/03/05
Product Name	Bluetooth USB Dongle	Test By:	Stan Peng
Model Name	UBTC1	Temp& Humidity :	14.3℃ , 59%

CH01 (2402 MHz) TX (Low)				Measurement Distance at 1m Horizontal polarity							
Freq.	Reading	AF	Cable	Pre-amp	Dist	Filter	Level	Limit	Margin	Mark	Height
(MHz)	(dBμV)	(dBμV)	(dB)	(dB)	dB	dB	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)	(Meter)
* 2386.22	28.09	31.81	3.86	0.00	9.50	0.00	54.27	74	-19.73	P	1.00
* 2386.22	17.00	31.81	3.86	0.00	9.50	0.00	43.18	54	-10.82	A	1.00
2402.08	73.99	31.80	3.74	0.00	9.50	0.00	100.03	Fundamental Frequency		P	1.00
2402.08	63.40	31.80	3.74	0.00	9.50	0.00	89.44			A	1.00
* 4803.90	43.33	34.31	2.85	35.14	9.50	2.08	37.93	74	-36.07	P	1.00
* 4803.90	31.91	34.31	2.85	35.14	9.50	2.08	26.51	54	-27.49	A	1.00
7205.80	42.16	39.82	4.78	35.66	9.50	2.00	43.60	74	-30.40	P	1.00
7205.80	32.74	39.82	4.78	35.66	9.50	2.00	34.18	54	-19.82	A	1.00
9607.98	42.87	38.54	5.90	36.37	9.50	0.64	42.07	74	-31.93	P	1.00
9607.98	33.07	38.54	5.90	36.37	9.50	0.64	32.27	54	-21.73	A	1.00
* 12009.40	------	------	------	------	9.50	0.80	------	------	------	------	1.00
14411.28	------	------	------	------	9.50	0.59	------	------	------	------	1.00
16813.16	------	------	------	------	9.50	0.63	------	------	------	------	1.00
* 19215.04	------	------	------	------	9.50	2.42	------	------	------	------	1.00
21616.92	------	------	------	------	9.50	0.70	------	------	------	------	1.00
24018.80	------	------	------	------	9.50	2.27	------	------	------	------	1.00

Note :
1. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter : High Pass Filter Insertion Loss (3.5GHz).
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. Remark "*" means that Restricted band.
5. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB.
6. The result basic equation calculation is as follow:
   Level=Reading+AF+Closs-Preamp+Filter-Dist,Margin=Level-Limit.
7. The other emission levels were very low against the limit.
8. The test limit distance is 3M limit.

Test Requirement: 15.205
The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

Company	BILLIONTON SYSTEMS INC.	Test Date :	2004/03/05
Product Name	Bluetooth USB Dongle	Test By:	Stan Peng
Model Name	UBTC1	Temp& Humidity :	14.3℃ , 59%

CH01 (2402 MHz) TX (Low)				Measurement Distance at 1m			Vertical polarity				
Freq.	Reading	AF	Cable	Pre-amp	Dist	Filter	Level	Limit	Margin	Mark	Height
(MHz)	(dBμV)	(dBμV)	(dB)	(dB)	dB	dB	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)	(Meter)
* 2385.98	31.95	31.81	3.87	0.00	9.50	0.00	58.13	74	-15.87	P	1.00
* 2385.98	24.36	31.81	3.87	0.00	9.50	0.00	50.54	54	-3.46	A	1.00
2402.13	81.17	31.80	3.74	0.00	9.50	0.00	107.21	Fundamental Frequency		P	1.00
2402.13	70.18	31.80	3.74	0.00	9.50	0.00	96.22			A	1.00
* 4804.17	48.42	34.31	2.85	35.14	9.50	2.08	43.02	74	-30.98	P	1.00
* 4804.17	43.78	34.31	2.85	35.14	9.50	2.08	38.38	54	-15.62	A	1.00
7206.02	42.04	39.82	4.78	35.66	9.50	2.00	43.48	74	-30.52	P	1.00
7206.02	31.86	39.82	4.78	35.66	9.50	2.00	33.30	54	-20.70	A	1.00
9607.79	42.97	38.54	5.90	36.37	9.50	0.64	42.17	74	-31.83	P	1.00
9607.79	32.50	38.54	5.90	36.37	9.50	0.64	31.70	54	-22.30	A	1.00
* 12008.95	------	------	------	------	9.50	0.80	------	------	------	------	1.00
14410.74	------	------	------	------	9.50	0.59	------	------	------	------	1.00
16812.53	------	------	------	------	9.50	0.63	------	------	------	------	1.00
* 19214.32	------	------	------	------	9.50	2.41	------	------	------	------	1.00
21616.11	------	------	------	------	9.50	0.70	------	------	------	------	1.00
24017.90	------	------	------	------	9.50	2.27	------	------	------	------	1.00

Note :
1. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter : High Pass Filter Insertion Loss (3.5GHz).
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. Remark "*" means that Restricted band.
5. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB.
6. The result basic equation calculation is as follow:
   Level=Reading+AF+Closs-Preamp+Filter-Dist,Margin=Level-Limit.
7. The other emission levels were very low against the limit.
8. The test limit distance is 3M limit.

Test Requirement: 15.205
The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

Company	BILLIONTON SYSTEMS INC.	Test Date :	2004/03/05
Product Name	Bluetooth USB Dongle	Test By:	Stan Peng
Model Name	UBTC1	Temp& Humidity :	14.3℃ , 59%

CH40 (2441 MHz) TX (Mid)				Measurement Distance at 1m Horizontal polarity							
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist dB	Filter dB	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)	Height (Meter)
2441.08	72.90	31.76	3.45	0.00	9.50	0.00	98.61	Fundamental Frequency		P	1.00
2441.08	62.46	31.76	3.45	0.00	9.50	0.00	88.17			A	1.00
* 4882.08	45.05	34.82	2.71	35.21	9.50	1.77	39.65	74	-34.35	P	1.00
* 4882.08	37.92	34.82	2.71	35.21	9.50	1.77	32.52	54	-21.48	A	1.00
* 7322.02	42.37	39.77	4.83	35.64	9.50	2.00	43.83	74	-30.17	P	1.00
* 7322.02	32.84	39.77	4.83	35.64	9.50	2.00	34.30	54	-19.70	A	1.00
9764.85	43.25	38.52	5.90	36.62	9.50	0.54	42.09	74	-31.91	P	1.00
9764.85	33.08	38.52	5.90	36.62	9.50	0.54	31.92	54	-22.08	A	1.00
* 12204.05	------	------	------	------	9.50	0.80	------	------	------	------	1.00
14644.86	------	------	------	------	9.50	0.58	------	------	------	------	1.00
17085.67	------	------	------	------	9.50	0.77	------	------	------	------	1.00
* 19526.48	------	------	------	------	9.50	2.87	------	------	------	------	1.00
21967.29	------	------	------	------	9.50	0.70	------	------	------	------	1.00
24408.10	------	------	------	------	9.50	1.73	------	------	------	------	1.00

Note :
1. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter : High Pass Filter Insertion Loss (3.5GHz).
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. Remark "*" means that Restricted band.
5. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB.
6. The result basic equation calculation is as follow:
   Level=Reading+AF+Closs-Preamp+Filter-Dist,Margin=Level-Limit.
7. The other emission levels were very low against the limit.
8. The test limit distance is 3M limit.

Test Requirement: 15.205
The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

Company	BILLIONTON SYSTEMS INC.	Test Date :	2004/03/05
Product Name	Bluetooth USB Dongle	Test By:	Stan Peng
Model Name	UBTC1	Temp& Humidity :	14.3℃ , 59%

CH40 (2441 MHz) TX (Mid)				Measurement Distance at 1m				Vertical polarity			
Freq.	Reading	AF	Cable	Pre-amp	Dist	Filter	Level	Limit	Margin	Mark	Height
(MHz)	(dBμV)	(dBμV)	(dB)	(dB)	dB	dB	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)	(Meter)
2441.13	79.28	31.76	3.45	0.00	9.50	0.00	104.99	Fundamental Frequency		P	1.00
2441.13	68.23	31.76	3.45	0.00	9.50	0.00	93.94			A	1.00
* 4881.54	56.22	34.82	2.71	35.21	9.50	1.77	50.82	74	-23.18	P	1.00
* 4881.54	53.65	34.82	2.71	35.21	9.50	1.77	48.25	54	-5.75	A	1.00
* 7322.96	42.43	39.77	4.83	35.64	9.50	2.00	43.89	74	-30.11	P	1.00
* 7322.96	32.12	39.77	4.83	35.64	9.50	2.00	33.58	54	-20.42	A	1.00
9764.02	42.53	38.52	5.90	36.62	9.50	0.54	41.37	74	-32.63	P	1.00
9764.02	32.72	38.52	5.90	36.62	9.50	0.54	31.56	54	-22.44	A	1.00
* 12204.20	------	------	------	------	9.50	0.80	------	------	------	------	1.00
14645.04	------	------	------	------	9.50	0.58	------	------	------	------	1.00
17085.88	------	------	------	------	9.50	0.77	------	------	------	------	1.00
* 19526.72	------	------	------	------	9.50	2.87	------	------	------	------	1.00
21967.56	------	------	------	------	9.50	0.70	------	------	------	------	1.00
24408.40	------	------	------	------	9.50	1.73	------	------	------	------	1.00

Note :
1. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter : High Pass Filter Insertion Loss (3.5GHz).
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. Remark "*" means that Restricted band.
5. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB.
6. The result basic equation calculation is as follow:
   Level=Reading+AF+Closs-Preamp+Filter-Dist,Margin=Level-Limit.
7. The other emission levels were very low against the limit.
8. The test limit distance is 3M limit.

Test Requirement: 15.205
The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

Company	BILLIONTON SYSTEMS INC.	Test Date :	2004/03/05
Product Name	Bluetooth USB Dongle	Test By:	Stan Peng
Model Name	UBTC1	Temp& Humidity :	14.3℃ , 59%

CH79 (2480 MHz) TX (High)				Measurement Distance at 1m			Horizontal polarity				
Freq.	Reading	AF	Cable	Pre-amp	Dist	Filter	Level	Limit	Margin	Mark	Height
(MHz)	(dBμV)	(dBμV)	(dB)	(dB)	dB	dB	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)	(Meter)
2480.12	72.42	31.72	3.15	0.00	9.50	0.00	97.79	Fundamental Frequency		P	1.00
2480.12	61.52	31.72	3.15	0.00	9.50	0.00	86.89			A	1.00
* 2484.47	31.44	31.72	3.12	0.00	9.50	0.00	56.77	74	-17.23	P	1.00
* 2484.47	21.94	31.72	3.12	0.00	9.50	0.00	47.27	54	-6.73	A	1.00
* 4959.98	44.48	35.34	2.57	35.27	9.50	1.46	39.08	74	-34.92	P	1.00
* 4959.98	35.69	35.34	2.57	35.27	9.50	1.46	30.29	54	-23.71	A	1.00
* 7439.98	42.67	39.72	4.88	35.61	9.50	2.00	44.16	74	-29.84	P	1.00
* 7439.98	32.21	39.72	4.88	35.61	9.50	2.00	33.70	54	-20.30	A	1.00
9920.05	42.58	38.51	5.90	36.87	9.50	0.45	41.06	74	-32.94	P	1.00
9920.05	33.04	38.51	5.90	36.87	9.50	0.45	31.52	54	-22.48	A	1.00
* 12399.20	------	------	------	------	9.50	0.80	------	------	------	------	1.00
14879.04	------	------	------	------	9.50	0.40	------	------	------	------	1.00
17358.88	------	------	------	------	9.50	0.99	------	------	------	------	1.00
* 19838.72	------	------	------	------	9.50	4.90	------	------	------	------	1.00
* 22318.56	------	------	------	------	9.50	0.70	------	------	------	------	1.00
24798.40	------	------	------	------	9.50	1.54	------	------	------	------	1.00

Note :
1. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter : High Pass Filter Insertion Loss (3.5GHz).
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. Remark "*" means that Restricted band.
5. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB.
6. The result basic equation calculation is as follow:
   Level=Reading+AF+Closs-Preamp+Filter-Dist,Margin=Level-Limit.
7. The other emission levels were very low against the limit.
8. The test limit distance is 3M limit.

Test Requirement: 15.205
The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

Company	BILLIONTON SYSTEMS INC.	Test Date :	2004/03/05
Product Name	Bluetooth USB Dongle	Test By:	Stan Peng
Model Name	UBTC1	Temp& Humidity :	14.3℃ , 59%

CH79 (2480 MHz) TX (High)				Measurement Distance at 1m			Vertical polarity				
Freq.	Reading	AF	Cable	Pre-amp	Dist	Filter	Level	Limit	Margin	Mark	Height
(MHz)	(dBμV)	(dBμV)	(dB)	(dB)	dB	dB	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)	(Meter)
2480.11	77.54	31.72	3.15	0.00	9.50	0.00	102.91	Fundamental Frequency		P	1.00
2480.11	66.73	31.72	3.15	0.00	9.50	0.00	92.10			A	1.00
* 2484.47	35.08	31.72	3.12	0.00	9.50	0.00	60.41	74	-13.59	P	1.00
* 2484.47	26.42	31.72	3.12	0.00	9.50	0.00	51.75	54	-2.25	A	1.00
* 4959.63	53.93	35.33	2.57	35.27	9.50	1.46	48.53	74	-25.47	P	1.00
* 4959.63	50.90	35.33	2.57	35.27	9.50	1.46	45.50	54	-8.50	A	1.00
* 7440.05	42.16	39.72	4.88	35.61	9.50	2.00	43.65	74	-30.35	P	1.00
* 7440.05	32.87	39.72	4.88	35.61	9.50	2.00	34.36	54	-19.64	A	1.00
9920.01	42.85	38.51	5.90	36.87	9.50	0.45	41.33	74	-32.67	P	1.00
9920.01	33.21	38.51	5.90	36.87	9.50	0.45	31.69	54	-22.31	A	1.00
* 12399.10	------	------	------	------	9.50	0.80	------	------	------	------	1.00
14878.92	------	------	------	------	9.50	0.40	------	------	------	------	1.00
17358.74	------	------	------	------	9.50	0.99	------	------	------	------	1.00
* 19838.56	------	------	------	------	9.50	4.90	------	------	------	------	1.00
* 22318.38	------	------	------	------	9.50	0.70	------	------	------	------	1.00
24798.20	------	------	------	------	9.50	1.54	------	------	------	------	1.00

Note :
1. The measurement was searched to 10th harmonic, Remark "---" means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter : High Pass Filter Insertion Loss (3.5GHz).
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. Remark "*" means that Restricted band.
5. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB.
6. The result basic equation calculation is as follow:
   Level=Reading+AF+Closs-Preamp+Filter-Dist,Margin=Level-Limit.
7. The other emission levels were very low against the limit.
8. The test limit distance is 3M limit.
9. The test data marked in gray background means the EUT emission data is located in the margin uncertainty range of emission limits.

9.7 Photos of Open Site

10. ANTENNA REQUIREMENT

10.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2 Antenna Connected Construction

The antenna used in this product is 1/2λ Dipole antenna. The maximum Gain of this antenna is only 1.2dBi.