Intentional Radiator Test Report

Test Standards:
FCC Part 15 (Subpart C – Intentional Radiators)
Industry Canada RSS-210

Prepared For:

Plantronics, Inc.
345 Encinal Street
Santa Cruz, CA 95060

Equipment Under Test:
Bluetooth Dongle

Model:
BLUEMAX
M/N: BUA-100

Prepared by:

44366 S. Grimmer Blvd.
Fremont, CA 94538
USA

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1.0 CUSTOMER INFORMATION

Test Laboratory:	EMCE Engineering 44366 S. Grimmer Blvd. Fremont, CA 94538 USA Tel: 510-490-4307 Fax: 510-490-3441 bob@universalcompliance.com
FCC registration number	0007198120
Customer:	Plantronics, Inc. 345 Encinal Street Santa Cruz, CA Tel: 831-426-5858 Fax: 831-426-6098
Contact Person:	Myhassan Bakrim
Receipt of EUT:	3/5/06
Test plan reference:	FCC Part 2, 15 (15.247) / IC RSS-210
FCC ID:	AL8BUA-100
IC#:	457A-BUA-100
Date of testing:	3/5/06 – 3/27/06
Date of Report:	3/27/06

The tests listed in this report have been completed to demonstrate compliance to the CFR 47 Section 15.247, as well as Industry Canada Radio Standard RSS-210, Issue 5.

Contents approved:


Name: Bob Cole Title: President

2.0 EUT AND ACCESSORY INFORMATION

EUT description

The EUT is a Plantronics, Inc. **BLUEMAX Bluetooth Dongle**, **M/N: BUA-100**

EUT and accessories

The table below lists all EUTs and accessories used in the tests. Later in this report, only numbers in the last column are used to refer to the devices in each test.

Software

The computers were equipped with test software provided by the customer. The software was used to control the EUT in the tests.

	Name	Type	S/N	Number
EUT	**BLUEMAX**	**BUA-100 USB Dongle**	N/A	E0001
Accessories	Laptop Computer	Compaq Presario M/N: 1694	3882A744	S0001
Software	CSR Bluesuite 1.20	Bluetest, BlueChat	N/A	N/A

EUT Information

Product Specification	Description
Model Name	BLUEMAX
Model Number	BUA-100
Type of Modulation	Frequency Hopping Spread Spectrum (FHSS)
Number of Hopping Channels	79
Operating Frequency Range	2480 – 2483.5 MHz
Type of Equipment	Combined, Battery Powered
Extreme Operating Temperature Range	-20 C – 55 C
Extreme Operating Voltage Range	Fully Charged Battery
Type of Antenna	Integral
Antenna Gain (dBi)	0.0 dB [nominal]
Transmitter Method of Frequency Generation	Synthesized
Transmitter Aggregate Data Rate	>250kbps
Transmitter Duty Type	Intermittant
Transmitter Duty Cycle	Tx ON: .326 ms, Tx OFF: .924 ms: Duty Cycle = .261
Continuous Operation for Testing Purposes?	Yes
Transmit Emissions Designator	1M00 Q1D

3.0 SUMMARY OF TEST RESULTS

Section in CFR 47	Section in RSS-210	Description	Results
15.245 (b)(1)	6.2.2(o) (a2)	Peak output power (Radiated Emissions)	***PASSED***
15.247 (a)(1)	6.2.2(o) (a3)	CF Separation	***PASSED***
15.247 (a)(1)(ii)	6.2.2(o) (a3)	Number of Hopping Frequencies	***PASSED***
15.247 (a)(1)(ii)	6.2.2(o) (a3)	Dwell Time	***PASSED***
15.247 (a)(1)(ii)	6.2.2(o) (a3)	20 dB Bandwidth	***PASSED***
15.247, c	6.2.2(o) (e1)	Band-edge compliance of RF Radiated emission	***PASSED***
15.247, c	6.2.2(o) (e1)	Restricted Band (Radiated Emissions)	***PASSED***
15.247(d)	6.2.2(o) (e1)	Spurious radiated emissions	***PASSED***
15.247(d)	6.2.2(o) (e1)	Spurious Antenna Conducted emissions	***PASSED***

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.

4.0 STANDARDS AND MEASUREMENT METHODS

The tests were performed in guidance of CFR 47 section 15.247, FCC Public Notice DA 00-705 (March 30, 2000), FCC Report & Order 97-114 (April 10, 1997),and ANSI C63.4 (2003). Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method". For the test equipment, see device list in the end of this test.

4.1 Selection of operation mode for tests

Before tests, several operation modes, and modulation patterns were tried. The worst case was selected for each test and those results reported.

5.0 TEST SETUPS

To fulfill all requirements for the radio parameter testing, total of two different test setups were used. One EUT was used, unmodified for radiated tests.

SMA connector added in place of internal antenna for Antenna Conducted measurements.

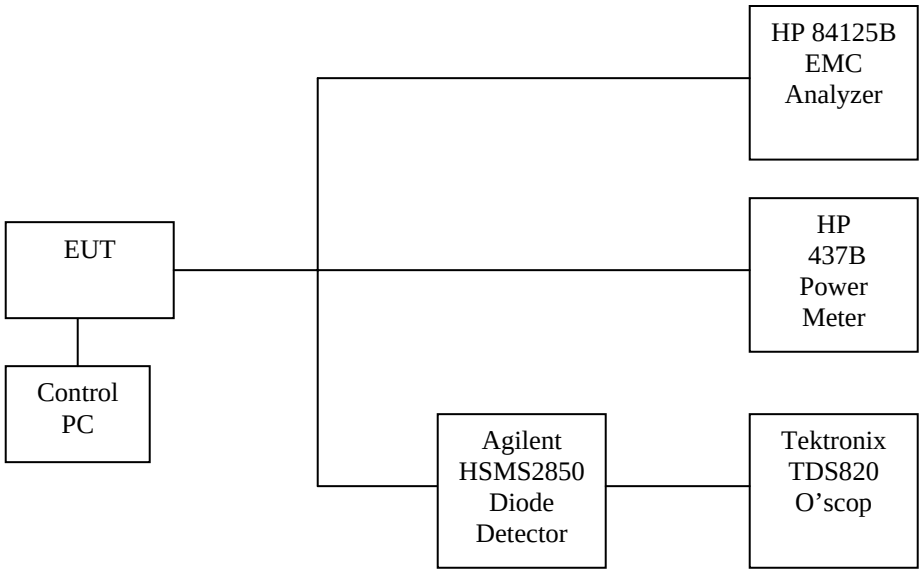
Setup A (Antenna Conducted measurements)

Operational description

ANTENNA CONDUCTED EMISSIONS MEASUREMENTS

The EUT was connected to the Laptop Computer through the serial port (COM1), the antenna bypassed and the SMA Cable connected to the Spectrum Analyzer. This setup was used for the ***PEAK POWER OUTPUT, CF SEPARATION, NUMBER OF HOPPING FREQUENCIES, 20 dB BW, BAND-EDGE, and RESTRICTED BAND*** measurements.

Block Diagram



The solid lines are coaxial cables and the dashed lines are either EUT insertion to the test board or control cables between test setup devices. The measurement results were adjusted with the attenuation of the coaxial cable.

Setup B (Radiated measurements)

Operational description

RADIATED EMISSIONS MEASUREMENTS

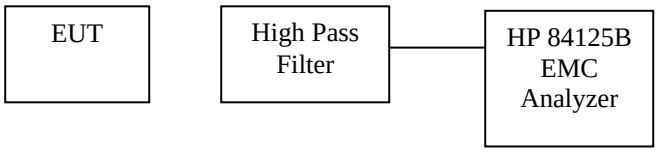
This setup was used in radiated emissions measurements with hopping enabled.

The EUT was tested in 3 orthogonal orientations.

Worst case data is presented.

THIS SETUP USED FOR ***RADIATED SPURIOUS EMISSIONS***

Block diagram



Note: The high –pass filter is used for the Radiated Spurious emissions above 2.4835 GHz. A pass-thru connector is used for Radiated Spurious emissions measurements from 30 MHz – 2.4 GHz.

The solid lines are coaxial cables and the dashed lines are either EUT insertion to the test board or control cables between test setup devices.

6.0 TEST RESULTS

The measurement results were adjusted for the attenuation of the cable between the EUT connector and receiver.

PEAK OUTPUT POWER

Peak Output Power [CFR 47, 15.247(b)(1) and RSS-210 6.2.2(o)]

EUT	**BLUEMAX**
Test setup	A (conducted – hopping DISABLED)
Temp, Humidity, Air Pressure	64º F, 30.45
Date of Measurement	3/12/06
Measured by	Bob Cole
Result	PASSED

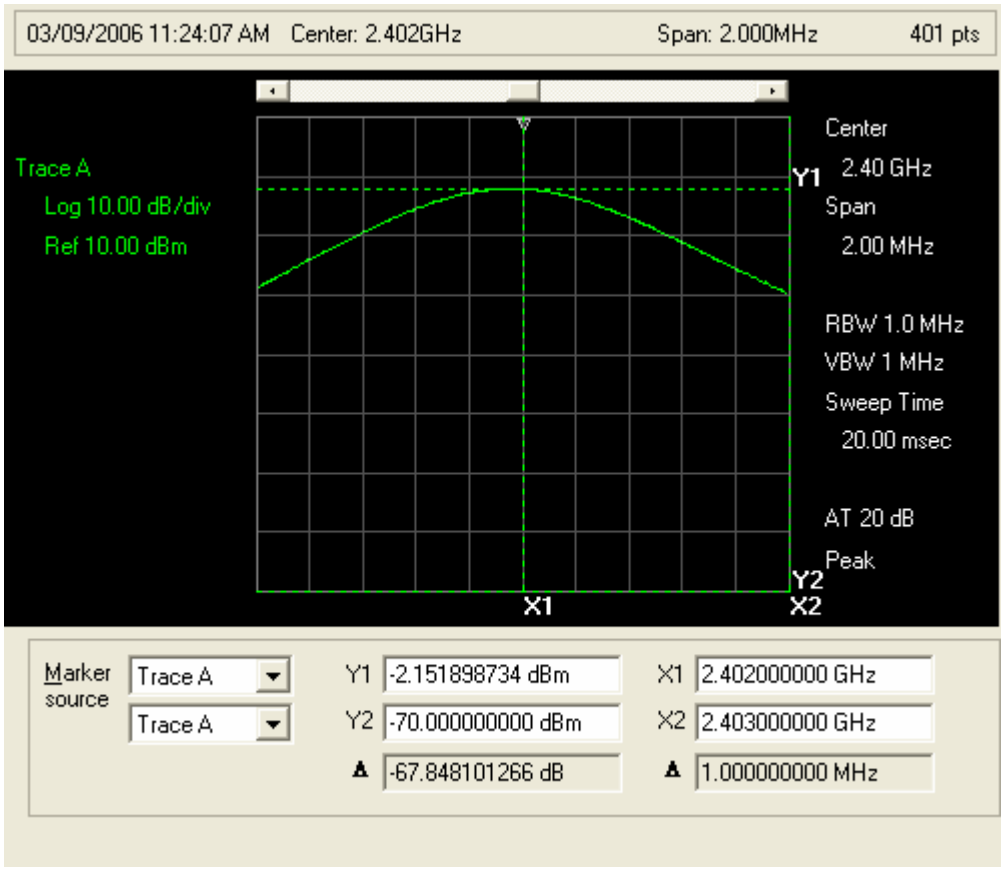
Limits and results

PEAK OUTPUT POWER

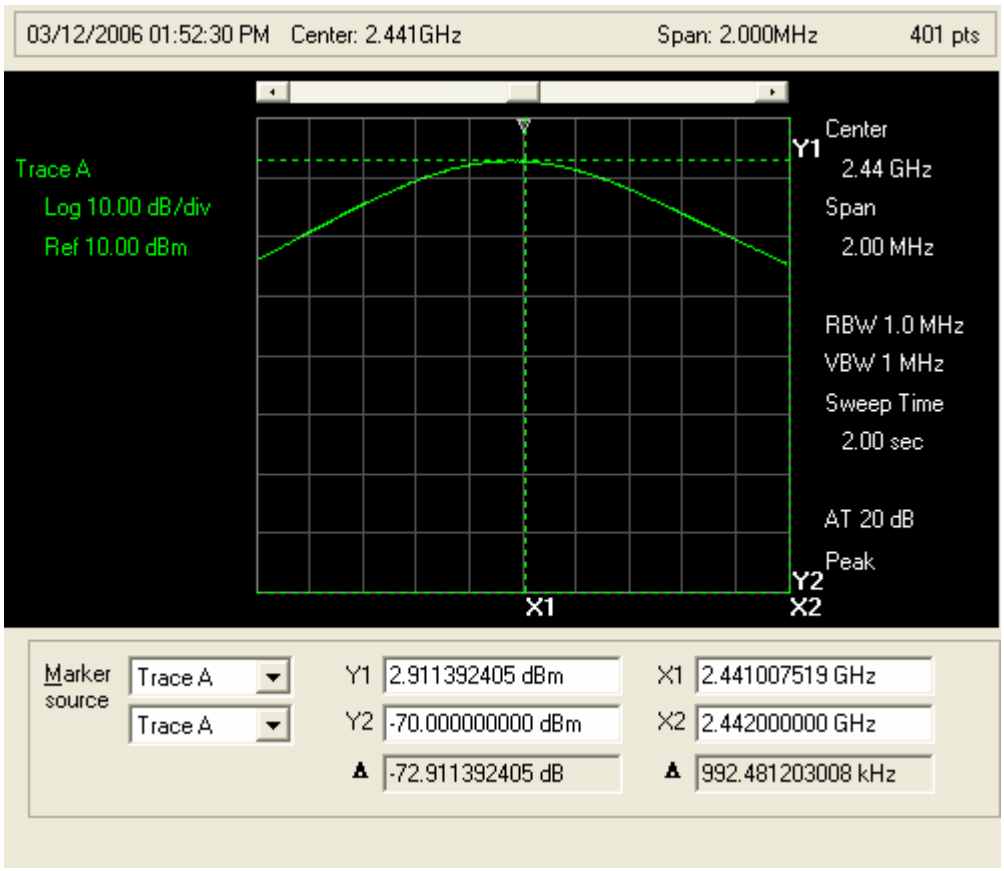
EUT Channel	Limit (dBm)	Test results (dBm)
2	30.0	-2.15
40	30.0	2.91
80	30.0	2.57

Screen shots

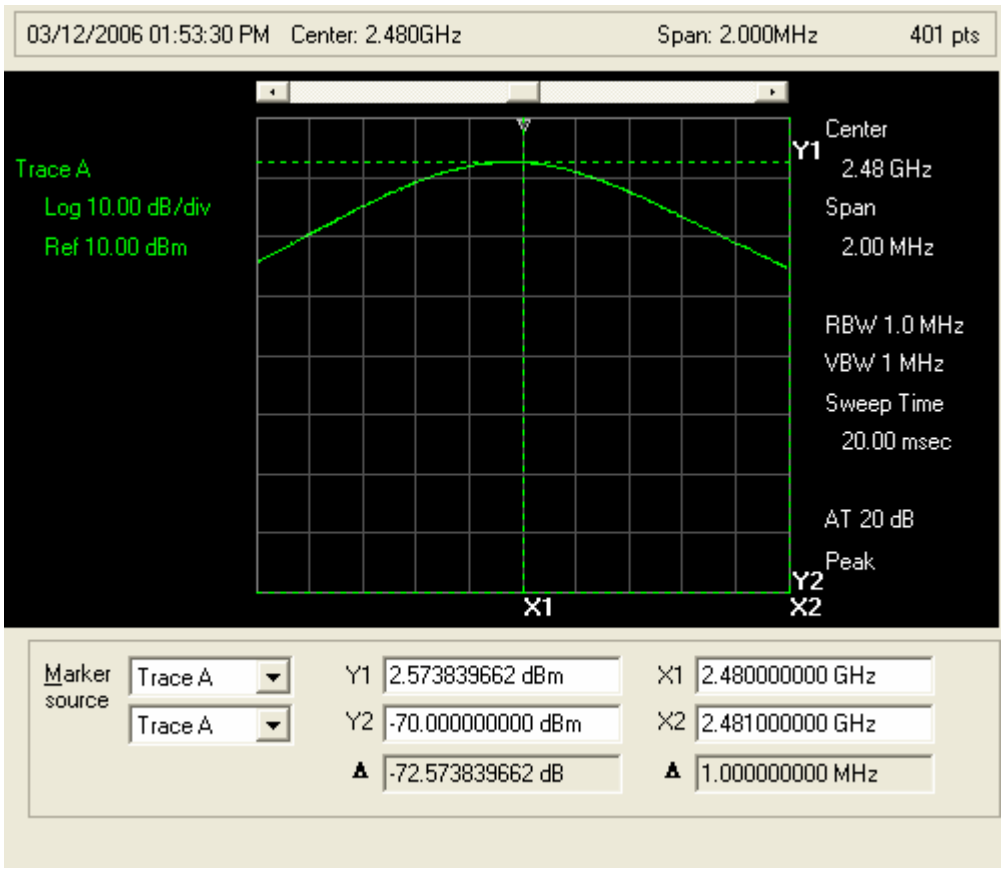
Plot 1: Peak output power 2402 MHz



Plot 2: Peak output power 2441 MHz



Plot 3: Peak output power 2480 MHz



CENTER FREQUENCY SEPARATION

CF Separation [CFR 47, 15.247 (a)(1) and RSS-210 6.2.2(o)]

EUT	**BLUEMAX**
Test setup	A (conducted – hopping enabled)
Temp, Humidity, Air Pressure	64º F, 30.45
Date of Measurement	3/12/06
Measured by	Bob Cole
Result	PASSED

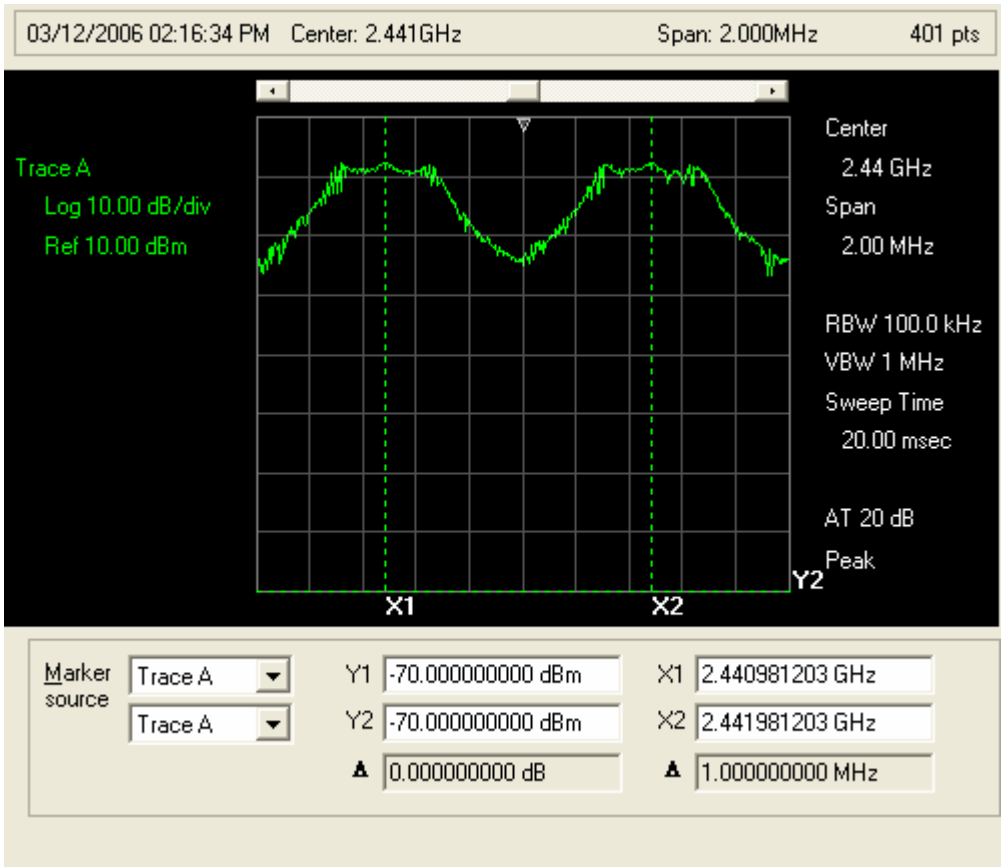
Limits and results

CENTER FREQUENCY SEPARATION

EUT Channel	Limit (MHz)	Test results (MHz)
41-42	</= 1.0	1.000

Screen Shot:

Plot 4: CF separation



NUMBER OF HOPPING FREQUENCIES

Number of Hopping Frequencies [CFR 47, 15.247 (a)(1)(ii) and RSS-210 6.2.2(o)]

EUT	**BLUEMAX**
Test setup	A (conducted – hopping enabled)
Temp, Humidity, Air Pressure	64º F, 30.45
Date of Measurement	3/12/06
Measured by	Bob Cole
Result	PASSED

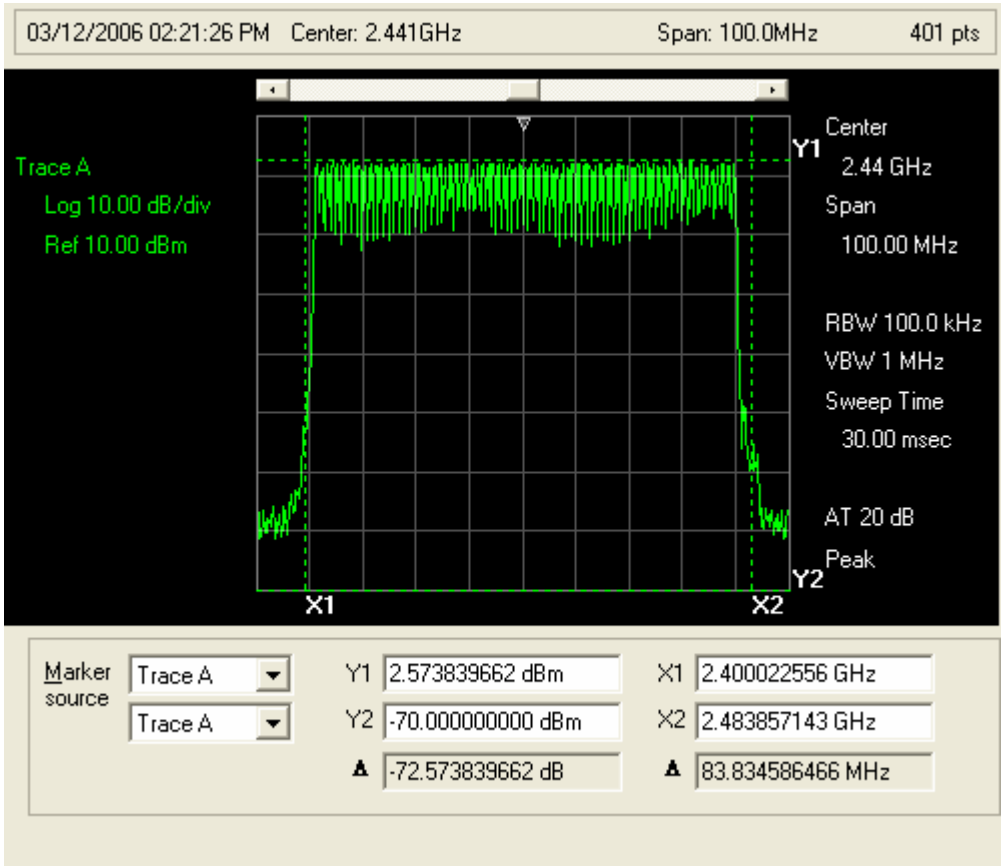
Limits and results

NUMBER OF HOPPING FREQUENCIES

EUT Channel	Limit (MHz)	Test results (MHz)
2-80	<= 75	79

Screen Shot:

Plot 5: Number of Hopping Frequencies



DWELL TIME

Dwell Time

EUT	**BLUEMAX**
Test setup	N/A
Temp, Humidity, Air Pressure	N/A
Date of Measurement	N/A
Measured by	Bob Cole
Result	PASSED – see Bluetooth Specification below

Limits and results

DWELL TIME

EUT Channel	Limit	Test results
2	400 ms per 30 second of operation	PASSED *See description that follows*

There are five hopping sequences (section 11, Bluetooth Spec. 1.1):

1) A **page hopping sequence** with 32 unique wake-up frequencies distributed equally over the 79 MHz, with a period length of 32; The basic slot time can be 312.5 uS or 625 uS. Min. hop repeat rate = 32*.3125mS = 10mS.
2) A **page response sequence (page scan)** covering 32 unique response frequencies that all are in a one-to-one correspondence to the current page hopping sequence. The master and slave use different rules to obtain the same sequence. The basic slot time can be 312.5 uS or 625 uS and the period is 1.28s.
3) An **inquiry sequence** with 32 unique wake-up frequencies distributed equally over the 79 MHz, with a period length of 32; The basic slot time can be 312.5 uS or 625 uS. Min. hop repeat rate = 32*.3125mS = 10mS.
4) An **inquiry response sequence (inquiry scan)** covering 32 unique response frequencies that all are in a one-to-one correspondence to the current inquiry hopping sequence. The basic slot time can be 312.5 uS or 625 uS and the period is 1.28s.
5) A **channel hopping sequence** which has a very long period length, which does not show repetitive patterns over a short time interval, but which distributes the hop frequencies equally over the 79 MHz during a short time interval; The basic slot time is 625 uS.

Worst case dwell times (largest dwell value) would be found with #5, the Channel Hopping (or data) sequence. The other hopping sequences may short shorter time sequences; however they are not repeated as often and hence have a lower overall dwell or duty cycle.

In normal transactions one may see occasional short periods between a chosen frequency due to inquiry and page scans possibly be interleaved during data transactions. It's my understanding that this would not create a dwell cycle result worse than the Channel hopping or data sequence.

Channel Hopping Sequence (Data sequence) Dwell Calculation

Cycle time for complete hopping sequence of a 79 hop cycle (data transmission mode) =

(1.1) Time slot period * 79 slots = 625uS * 79 = 49.375 mS

See page below from Bluetooth spec. Rev 1.1, section 2, for a depiction of the hopping sequence versus packet size. Figure 2.1 shows a DH1 cycle. Figure 2.2 shows a DH1, DH3 and DH5 sequence (resp.).

Every time slot has a frequency assignment, and the frequency used for a packet remains the same as the slot it started in, if the packet is longer than one time slot.

For a DH1 packet this does not have an impact. The channel selector steps thru the entire list of 79 pseudo-random channels and then start over from the beginning.

For a DH5 (5 Slot packet), the starting frequency will be used for all 5 time slots (f(k) in this example), and 4 following frequencies will not be used during that hopping cycle. Therefore instead of stepping sequential thru the 79 frequency channel list, only every 5th channel is used. Each time the 79 frequency channel list is started, is it a new randomized list of 79 channels. The probability that it will use the same frequency channel in the next list is 1/5.

Therefore even though the DH5 is at one frequency for 5 times longer than a DH1 packet, it repeats itself 1/5 as often, with the effective dwell time (averaged over a long period over a long period of time – for instance the 30 sec FCC dwell test) being the same.

For the "duty cycle correction factor", my "read" of the FCC doc says that one should take the "worst" 100mS period found, in contrast to the average 30 sec dwell time just mentioned. As a result the DH1 and DH5 numbers for the 100 mS dwell case will be different. For a worst case DH5 packet sequence, the same frequency channel could appear in two successive 79 channel sequences.

DH1 calculation: DH1 uses 1 time slot of 0.625 mS per hopping cycle.

Dwell time per 100mS – since one 79 hop sequence is approx 50mS, there will be approx. two hop sequences in 100 mS (more accurately 100/49.375).

(1.2) DH1 dwell time = 0.625 mS * (100ms/49.375mS) = 1.26 mS (per 100 mS)

DH5 calculation: DH5 uses 5 time slots of 0.625 mS per hopping cycle.

Dwell time per 100mS – since one 79 hop sequence is approx 50mS and there could be two appearances of a frequency channel in 100 mS (more accurately 100mms/49.375ms).

(1.3) DH5 dwell time =5* 0.625 mS * (100ms/49.375mS) = 6.3 mS (per 100 mS)

Using the FCC duty cycle correction factor:

(1.4) DH1 Dwell correction =
20 log (DH1 dwell time/100mS) = 20 log (0.0126) = -38 dB

(1.5) DH5 Dwell correction =
20 log (DH5 dwell time/100mS) = 20 log (0.0633) = -24 dB

Therefore the worst case duty cycle adjustment condition will be for the DH5 packet.

The calculation shows us that we can subtract 24 dB from our 2nd harmonic measurement to compensate for this duty cycle adjustment.

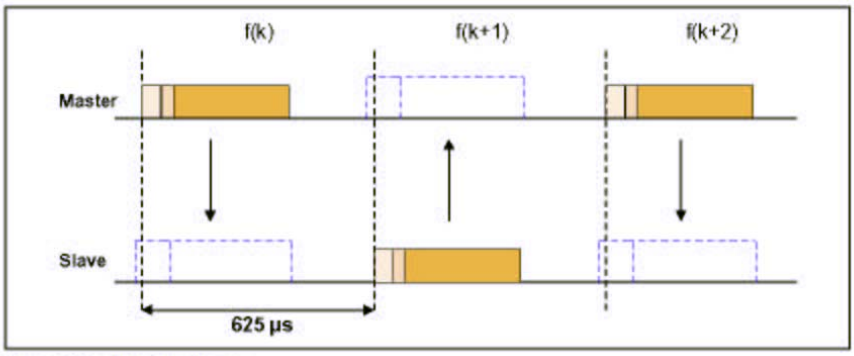


Figure 2.1: TDD and timing

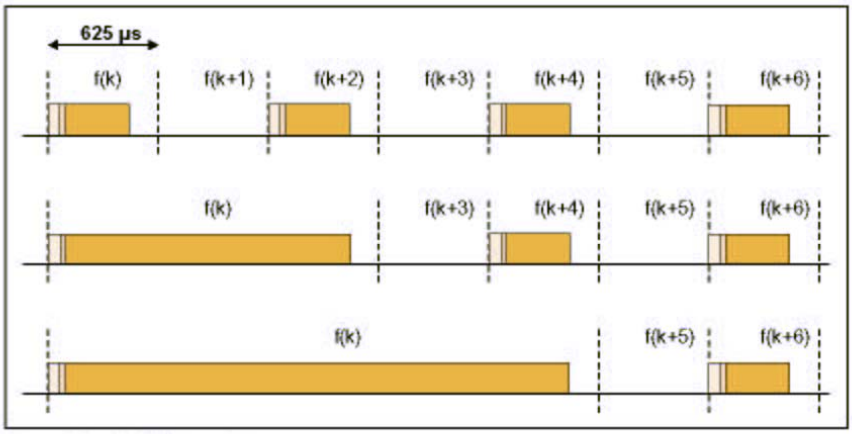


Figure 2.2: Multi-slot packets

20 dB Bandwidth

20 dB Bandwidth [CFR 47 15.247 (a)(1)(ii) and RSS-210 6.2.2(o)]

EUT	**BLUEMAX**
Test setup	A (conducted – hopping ENABLED)
Temp, Humidity, Air Pressure	64º F, 30.45
Date of Measurement	3/12/06
Measured by	Bob Cole
Result	PASSED

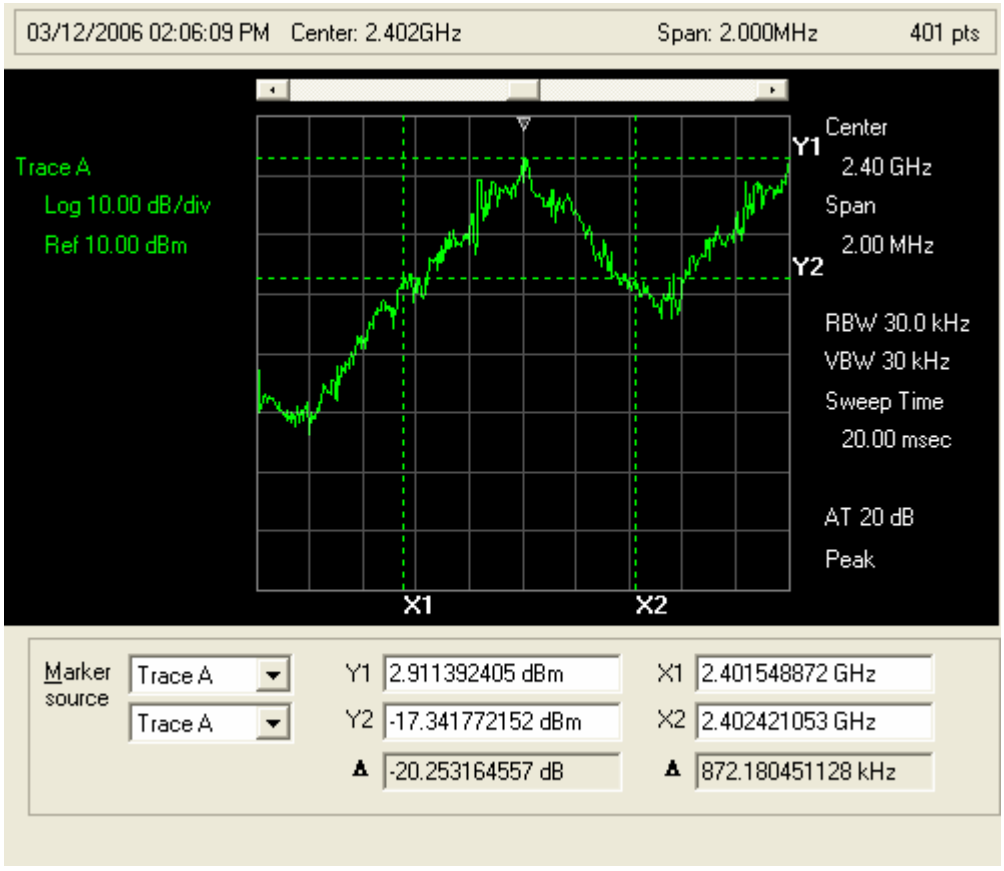
Limits and Results

20 dB BANDWIDTH

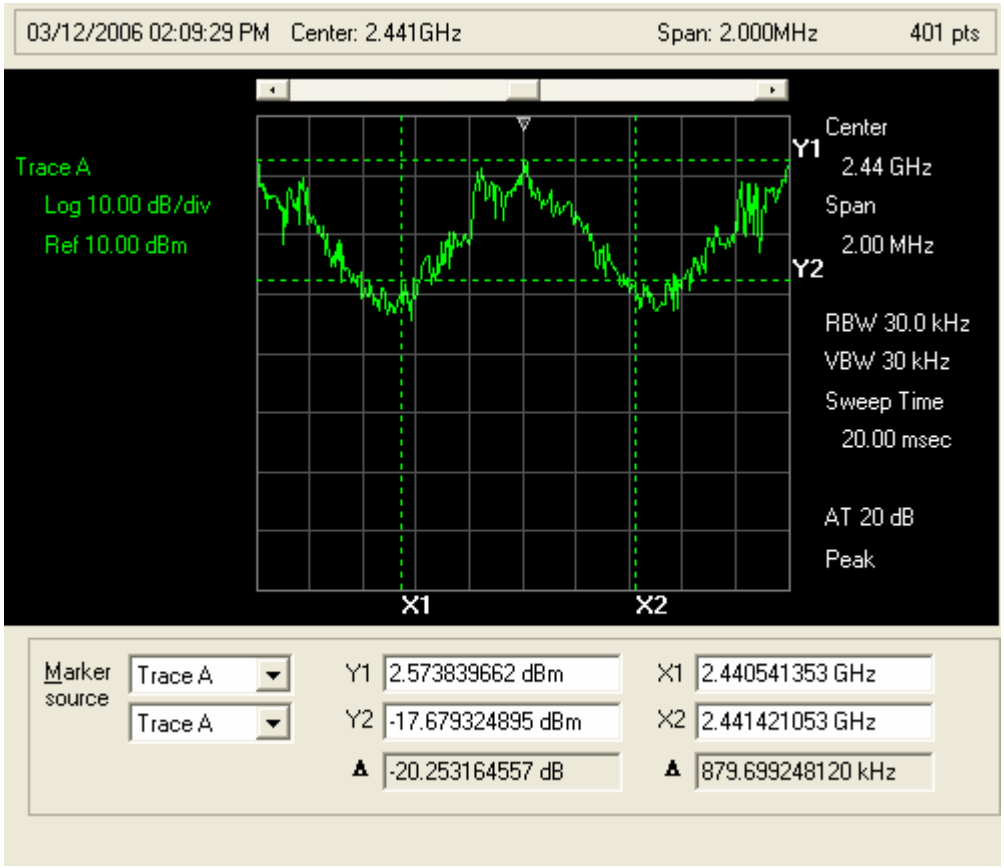
EUT Channel	Limit (MHz)	Test results (MHz)
2	</= 1.0	0.872
40	</= 1.0	0.879
80	</= 1.0	0.954

Screen Shots

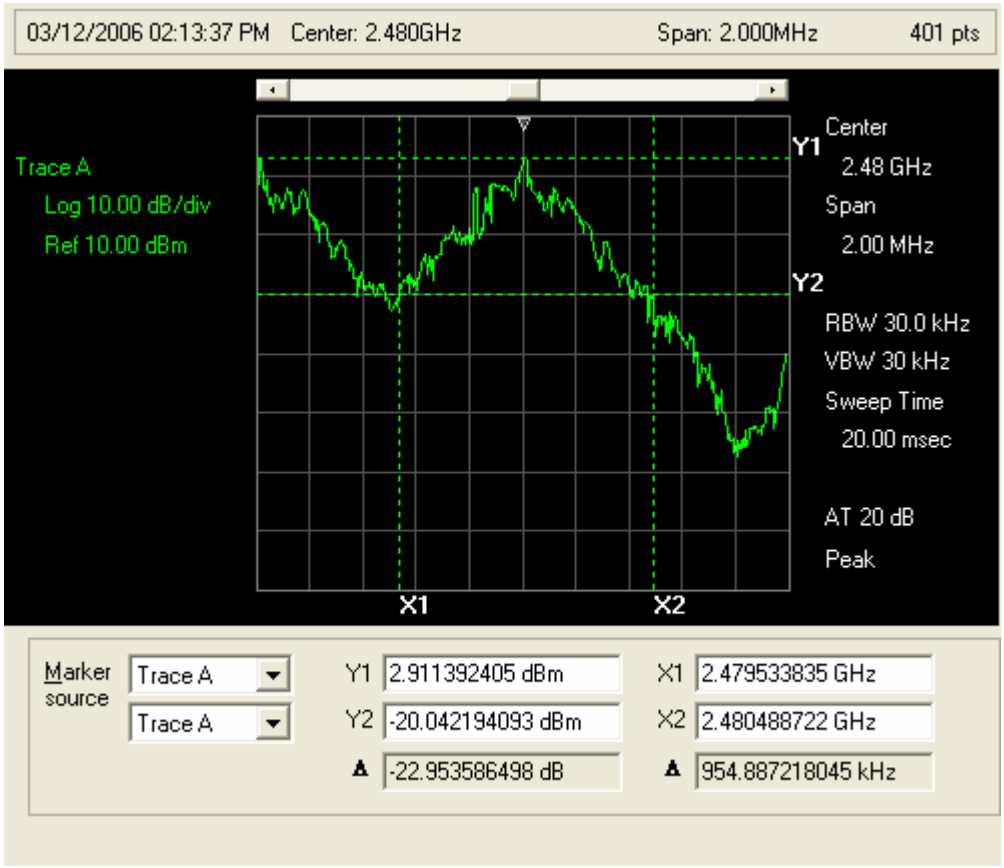
Plot 6: 20 dB BW 2402 MHz



Plot 7: 20 dB BW 2441 MHz



Plot 8: 20 dB BW 2480 MHz



BAND-EDGE COMPLIANCE

Band-edge compliance of RF Radiated emissions [CFR 47, 15.247c(1) and RSS-210 6.2.2(o)]

EUT	**BLUEMAX**
Test setup	A (conducted – hopping enabled & Disabled)
Temp, Humidity, Air Pressure	64º F, 30.45
Date of Measurement	3/12/06
Measured by	Bob Cole
Result	PASSED

EUT operation mode

EUT operation mode	Hopping Enabled / Disabled
EUT channel	2, 80
EUT TX power level	Maximum

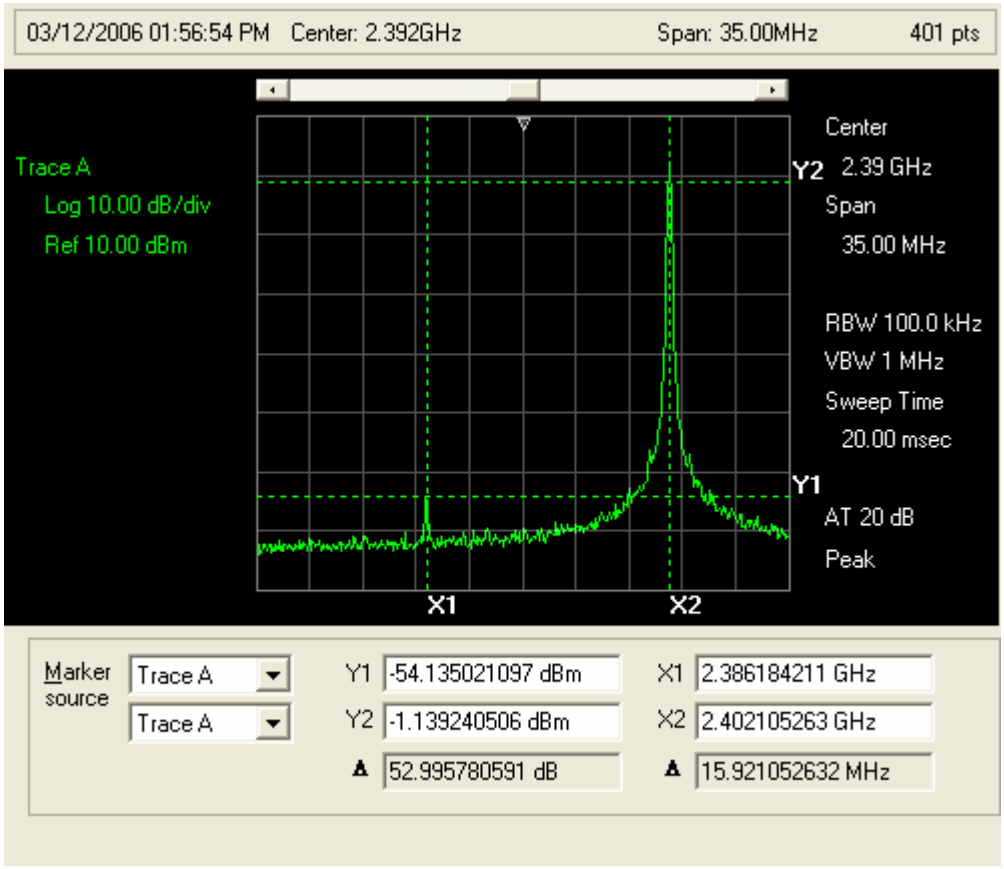
Limits and results

BAND-EDGE COMPLIANCE

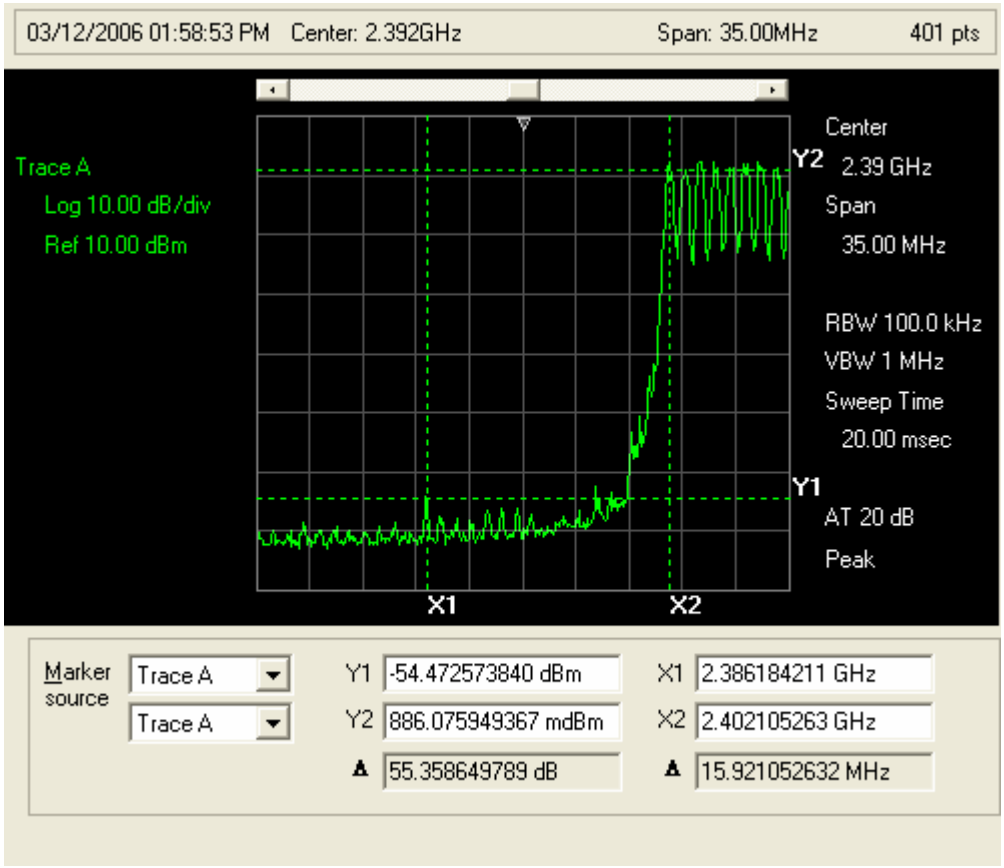
Channel	Limit (dBuV)	Results (dBuV)
2	-6.0	-54.13
80	-6.0	-53.12

Screen shots:

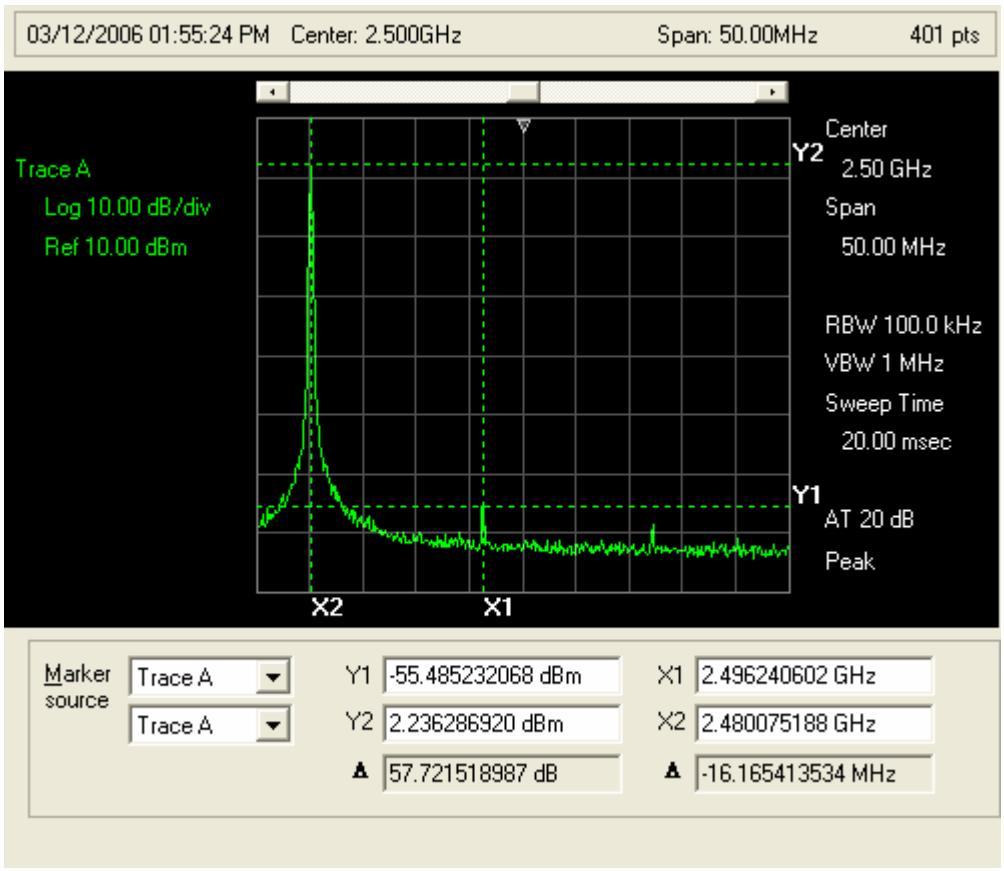
Plot 9: Band-edge Compliance, Lower Band-edge (Hopping Disabled)



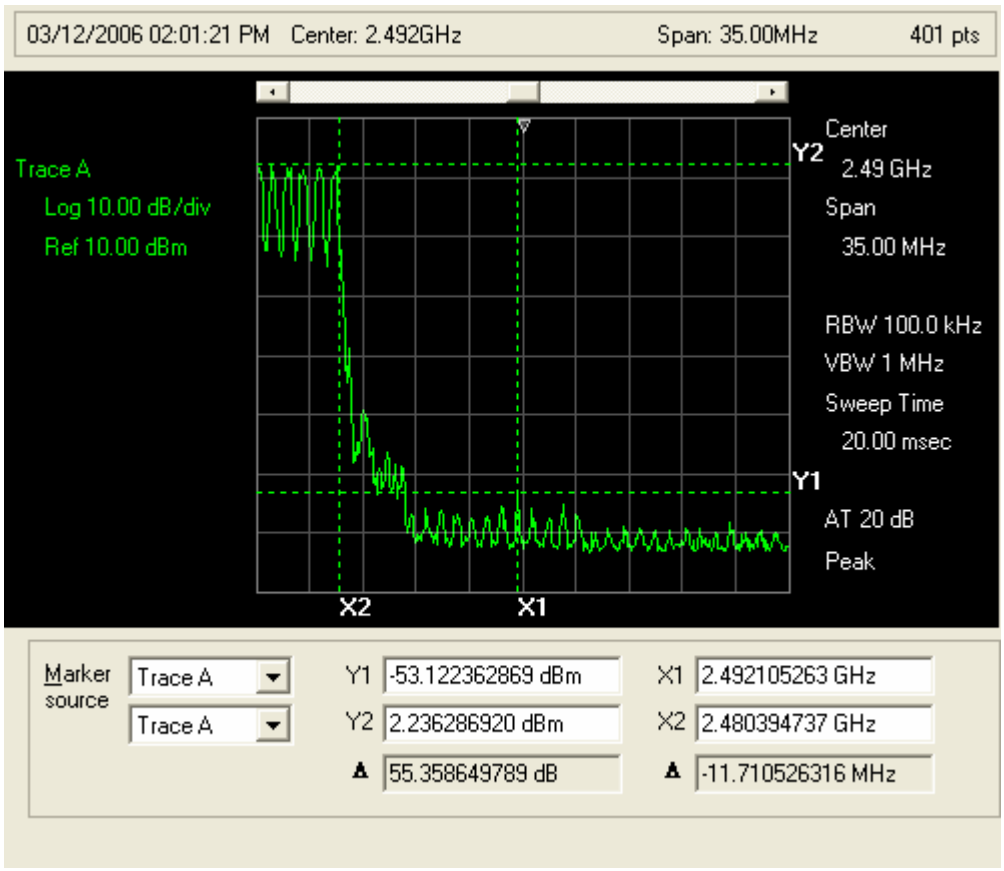
Plot 10: Band-edge Compliance, Lower Band-edge (Hopping Enabled)



Plot 11: Band-edge compliance, Upper Band-edge (Hopping Disabled)



Plot 12: Band-edge Compliance, Upper Band-edge (Hopping Enabled)



RESTRICTED BAND MEASUREMENTS

Restricted Band Measurements [CFR 47, 15.247(c) and RSS-210 6.2.2(o)]

EUT	**BLUEMAX**
Test setup	B (Radiated – hopping enabled)
Temp, Humidity, Air Pressure	58º F, 30.92
Date of Measurement	3/16/06
Measured by	Bob Cole
Result	PASSED

Limits and results

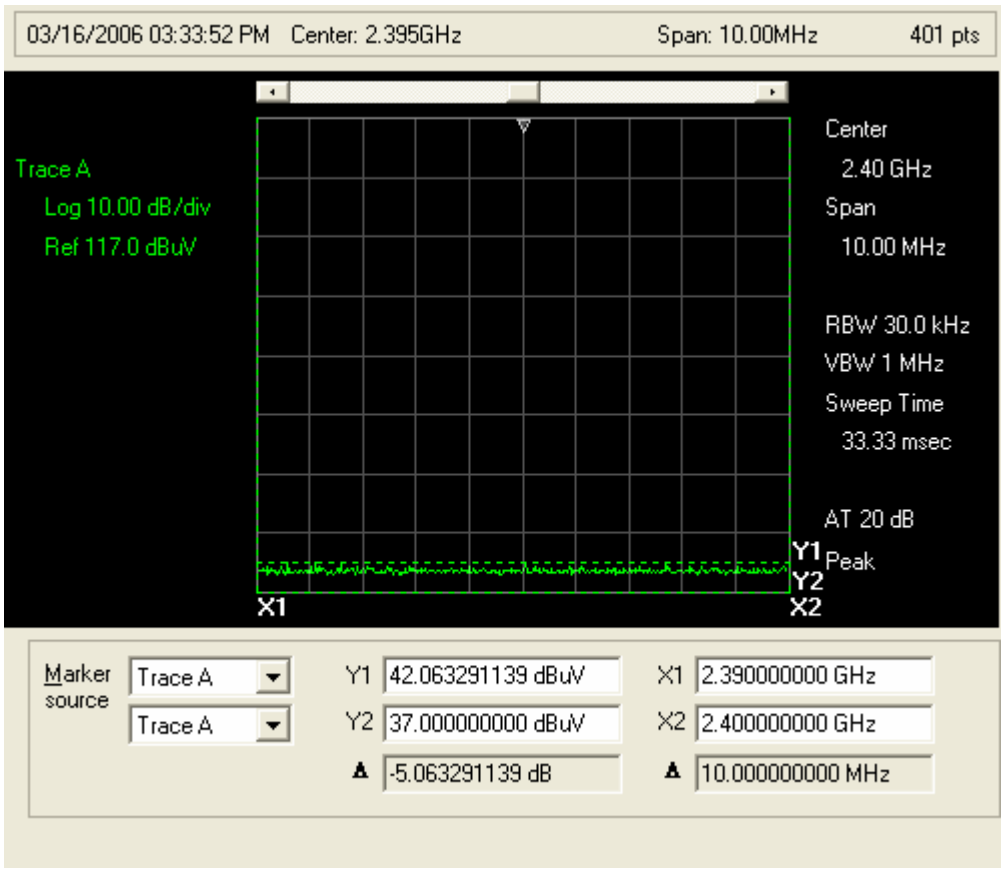
RESTRICTED BANDS

Frequency (MHz)	Limit (dBuV)	Results (dBuV)
2310 - 2390	101	37.00
2483.5-2500	101	37.00

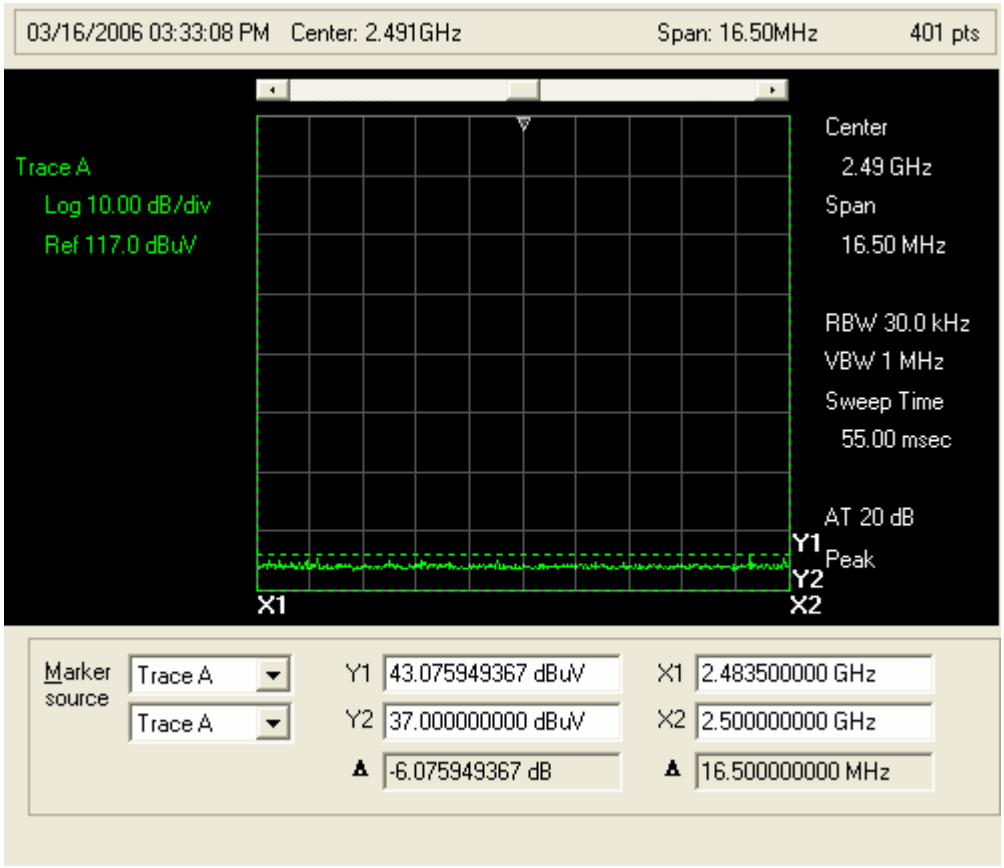
NOTE: 0 dBm = 107 dBuV

Note: All restricted Bands from 30 MHz to 18 GHz were examined.

Plot 13: 2310 - 2390 MHz Restricted Band



Plot 14: 2483.5 – 2500 MHz Restricted Band



SPURIOUS RF RADIATED EMISSIONS

Spurious RF Radiated Emissions [CFR 47, 15.247c1) and RSS-210 6.2.2(o)]

EUT	**BLUEMAX**
Test setup	B (Radiated – hopping enabled)
Temp, Humidity, Air Pressure	54º F, 30.52
Date of Measurement	3/24/06
Measured by	Bob Cole
Result	PASSED

CLASS B LIMIT (10M MEASURING DISTANCE)

Frequency Band (MHz)	Limit (dBµV/m)	Detector
30-88	40	Q-Peak
88-230	43.5	Q-Peak
230-960	46	Q-Peak
960-1000	54	Q-Peak
1000-25000	54	Average

Emission measurement data, 30 MHz – 1GHz

The measurement results were obtained as described below.

E[uV/m]- URX + ACABLE + AF – GPREAMP

Where:

U_{RX}	receiver reading
A_{CABLE}	Attenuation of the cable
AF	Antenna Factor
G_{PREAMP}	Gain of the preamplifier

RADIATED EMISSIONS, 30-1000 MHz (3 meter Measurement Distance)
CFR 47, 15.209 Limits

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **Plantronics**
Specification: **EN55022B RADIATED**
Work Order #: **2495** Date: 3/28/2006
Test Type: **Radiated Scan** Time: 11:01:49 AM
Equipment: **USB BT Dongle** Sequence#: 6
Manufacturer: Plantronics Tested By: Bob Cole
Model: BlueMax
S/N: N/A

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:

Function	Manufacturer	Model #	S/N

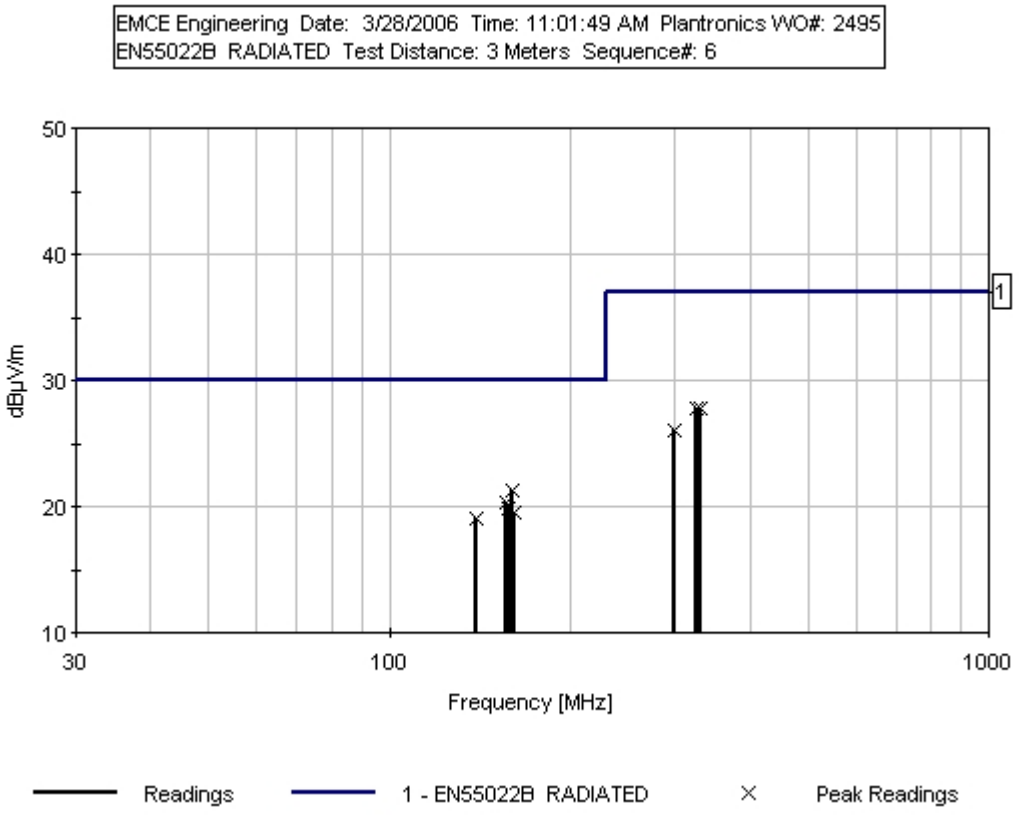
Test Conditions / Notes:

Transducer Legend:

T1=Chamber Receive Cable	T2=EMCO BIA30 Biconical S/N 4084
T3=EMCO LPA-30 Log Periodic 1 meter	T4=8447 Pre-Amp

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	160.774M	41.8	+1.4	+14.6	+0.0	+26.6	-10.0	21.2	30.0	-8.8	Vert
2	325.505M	45.2	+2.3	+0.0	+17.1	+26.8	-10.0	27.8	37.0	-9.2	Vert
3	329.588M	45.3	+2.3	+0.0	+17.0	+26.8	-10.0	27.8	37.0	-9.2	Horiz
4	156.944M	41.0	+1.4	+14.5	+0.0	+26.6	-10.0	20.3	30.0	-9.7	Vert
5	158.083M	40.4	+1.4	+14.6	+0.0	+26.6	-10.0	19.8	30.0	-10.2	Horiz
6	162.016M	40.0	+1.5	+14.7	+0.0	+26.6	-10.0	19.6	30.0	-10.4	Vert
7	139.556M	40.9	+1.3	+13.4	+0.0	+26.6	-10.0	19.0	30.0	-11.0	Vert
8	298.962M	44.5	+2.2	+0.0	+16.0	+26.7	-10.0	26.0	37.0	-11.0	Horiz


EMCE Engineering Date: 3/28/2006 Time: 11:01:49 AM Plantronics WO#: 2495
EN55022B RADIATED Test Distance: 3 Meters Sequence#: 6
50
40
30
20
10
dBµV/m
30
100
1000
Frequency [MHz]
1
Readings
1 - EN55022B RADIATED
Peak Readings

1.0 - 2.4835 GHz Test Data

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **Plantronics**
Specification: **BT FCC 95 dBuV Radiated 1--2.4 GHz**
Work Order #:
Test Type: **Radiated Scan**
Equipment: **USB BT Dongle**
Manufacturer: Plantronics
Model: BlueMax
S/N: N/A

Date: 3/16/2006
Time: 11:33:58 AM
Sequence#: 1
Tested By: Bob Cole

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:

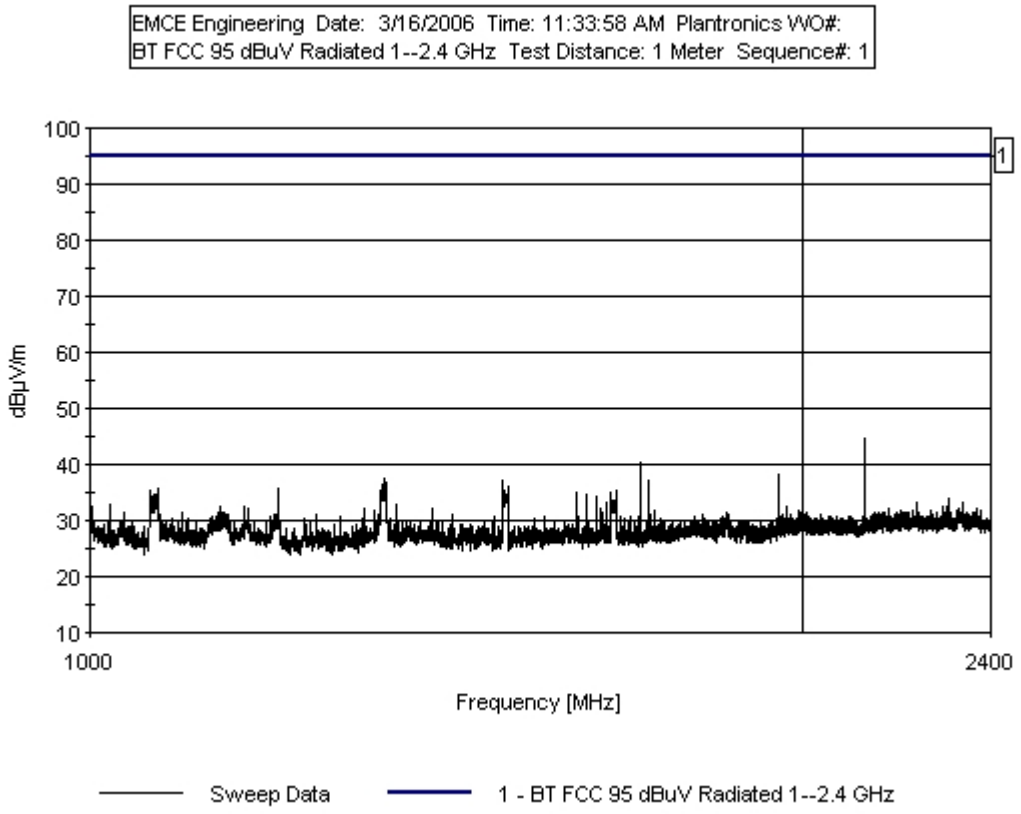
Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Transducer Legend:

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	2123.622M	44.6					+0.0	44.6	95.0	-50.4	Vert
2	1708.207M	40.3					+0.0	40.3	95.0	-54.7	Vert
3	1000.250M	38.2					+0.0	38.2	95.0	-56.8	Vert
4	1953.202M	38.1					+0.0	38.1	95.0	-56.9	Vert
5	1331.831M	37.6					+0.0	37.6	95.0	-57.4	Vert
6	1720.219M	37.3					+0.0	37.3	95.0	-57.7	Vert
7	1493.743M	37.2					+0.0	37.2	95.0	-57.8	Vert
8	1200.200M	35.8					+0.0	35.8	95.0	-59.2	Vert
9	1067.568M	35.6					+0.0	35.6	95.0	-59.4	Vert
10	1060.560M	35.4					+0.0	35.4	95.0	-59.6	Vert


EMCE Engineering Date: 3/16/2006 Time: 11:33:58 AM Plantronics WO#:
BT FCC 95 dBuV Radiated 1--2.4 GHz Test Distance: 1 Meter Sequence#: 1
100
90
80
70
60
50
40
30
20
10
dBµV/m
1
1000
2400
Frequency [MHz]
Sweep Data
1 - BT FCC 95 dBuV Radiated 1--2.4 GHz

2.4835 – 25 GHz Test Data

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **Plantronics**
Specification: **BT FCC (95 dBuV) Radiated 2483-12750 MHz**
Work Order #: Date: 3/16/2006
Test Type: **Radiated Scan** Time: 1:31:24 PM
Equipment: **USB BT Dongle** Sequence#: 4
Manufacturer: Plantronics Tested By: Bob Cole
Model: BlueMax
S/N: N/A

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:

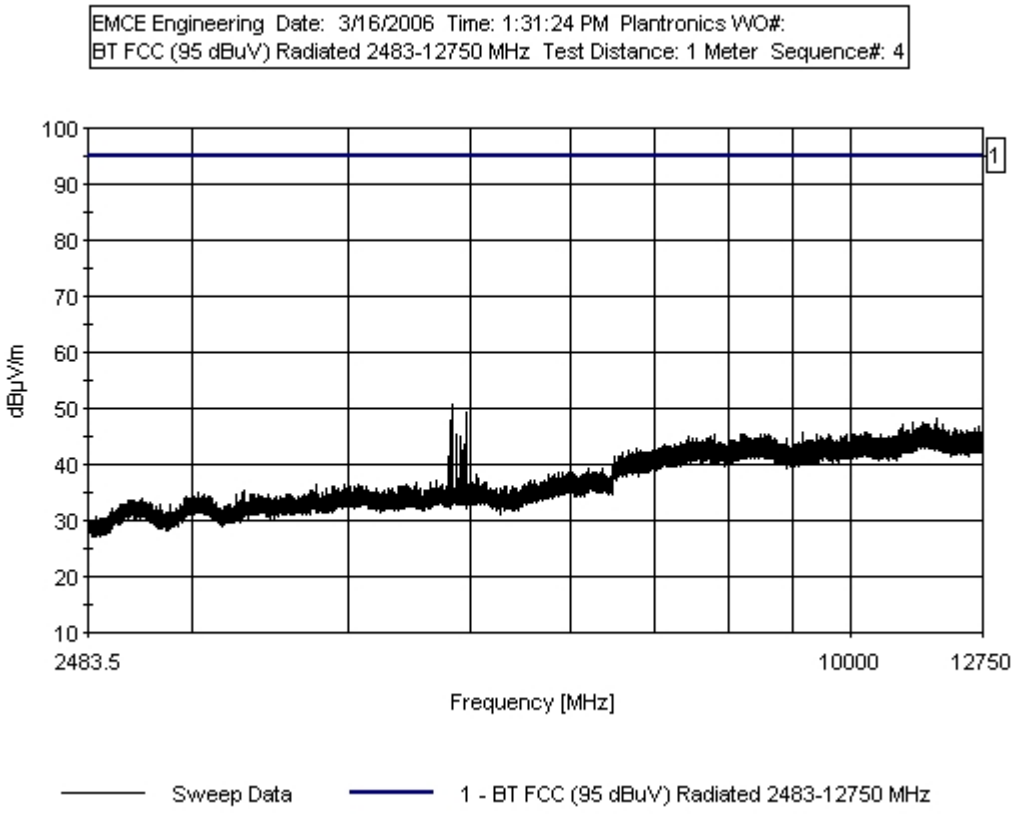
Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Transducer Legend:

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	4830.597M	50.7					+0.0	50.7	95.0	-44.3	Vert
2	4960.477M	49.4					+0.0	49.4	95.0	-45.6	Vert
3	4841.858M	49.3					+0.0	49.3	95.0	-45.7	Vert
4	11731.230M	48.1					+0.0	48.1	95.0	-46.9	Vert
5	4807.824M	47.7					+0.0	47.7	95.0	-47.3	Vert
6	11206.460M	47.6					+0.0	47.6	95.0	-47.4	Vert
7	11422.420M	47.5					+0.0	47.5	95.0	-47.5	Vert
8	11554.300M	47.3					+0.0	47.3	95.0	-47.7	Vert
9	11663.910M	47.2					+0.0	47.2	95.0	-47.8	Vert
10	11857.610M	47.1					+0.0	47.1	95.0	-47.9	Vert


EMCE Engineering Date: 3/16/2006 Time: 1:31:24 PM Plantronics WO#:
BT FCC (95 dBuV) Radiated 2483-12750 MHz Test Distance: 1 Meter Sequence#: 4
100
90
80
70
60
50
40
30
20
10
dBµV/m
1
2483.5
10000
12750
Frequency [MHz]
Sweep Data
1 - BT FCC (95 dBuV) Radiated 2483-12750 MHz

RECEIVER SPURIOUS RADIATED EMISSIONS

Spurious RF Radiated Emissions [CFR 47, 15.247c1) and RSS-210 6.2.2(o)]

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **Plantronics**
Specification: **BT RX Radiated 1000-12750**
Work Order #:
Test Type: **Radiated Scan**
Equipment: **USB BT Dongle**
Manufacturer: Plantronics
Model: BlueMax
S/N: N/A

Date: 3/16/2006
Time: 1:48:48 PM
Sequence#: 6
Tested By: Bob Cole

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:

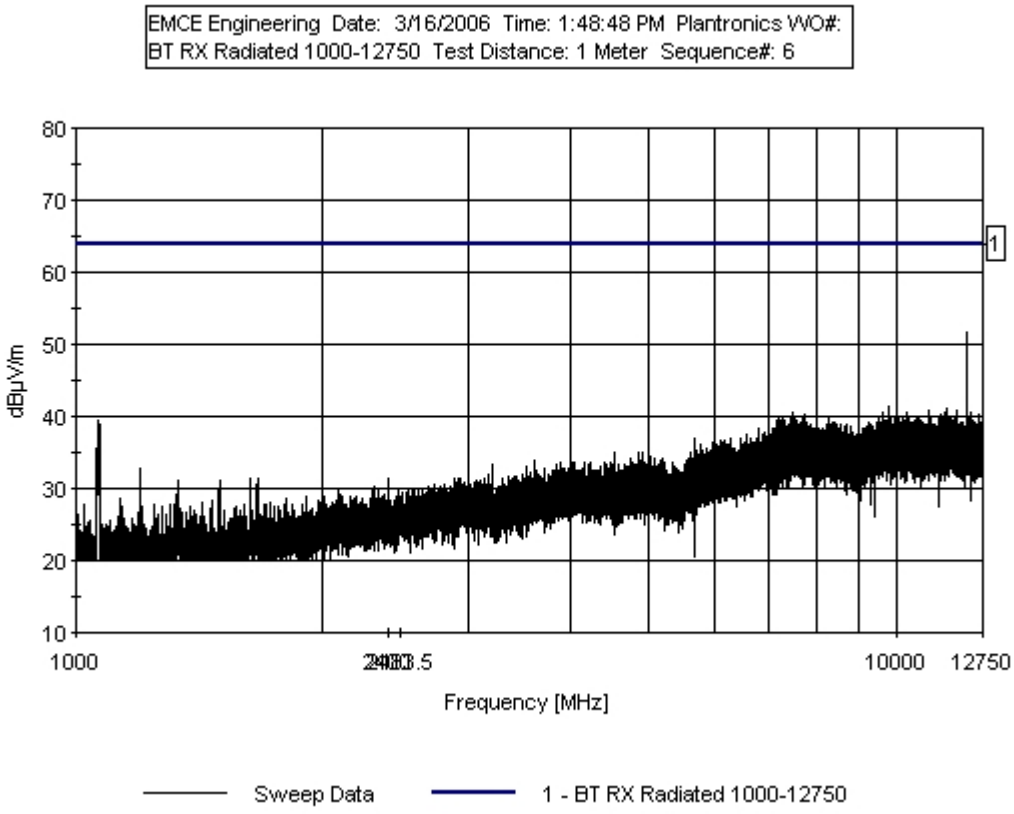
Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Transducer Legend:

Measurement Data: Reading listed by margin. Test Distance: 1 Meter

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	12212.190 M	51.8					+0.0	51.8	64.0	-12.2	Vert
2	12212.940 M	50.7					+0.0	50.7	64.0	-13.3	Vert


EMCE Engineering Date: 3/16/2006 Time: 1:48:48 PM Plantronics WO#:
BT RX Radiated 1000-12750 Test Distance: 1 Meter Sequence#: 6
80
70
60
50
40
30
20
10
dBµV/m
1
1000
10000
12750
Frequency [MHz]
Sweep Data
1 - BT RX Radiated 1000-12750

TRANSMITTER SPURIOUS CONDUCTED EMISSIONS

Spurious Conducted Emissions 30 MHz - 18 GHz – Worst Case Emission

Spurious Antenna Conducted Emissions 30 MHz – 2.4 GHz

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **Plantronics**
Specification: **BT Spurious Cond. 1 - 2.4GHz**
Work Order #: Date: 3/16/2006
Test Type: **Conducted Emissions** Time: 4:05:42 PM
Equipment: **USB BT Dongle** Sequence#: 1
Manufacturer: Plantronics Tested By: Bob Cole
Model: BlueMax 120V 60Hz
S/N: N/A

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:

Function	Manufacturer	Model #	S/N

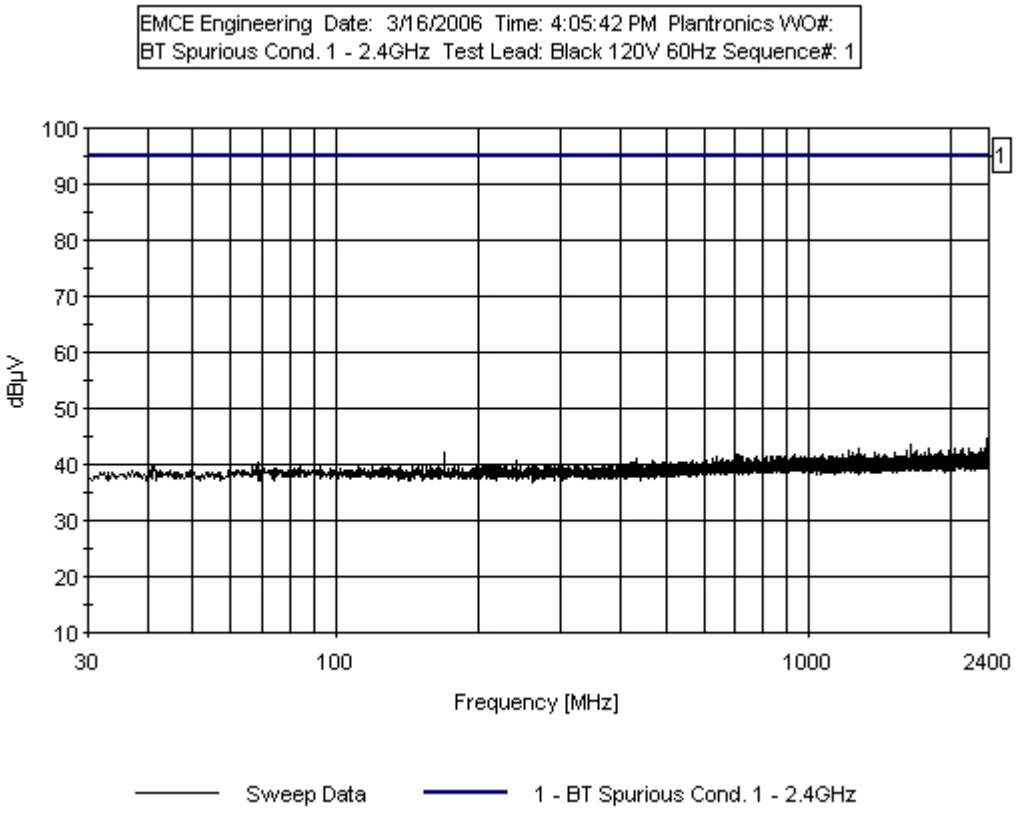
Test Conditions / Notes:

Transducer Legend:

Measurement Data: Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2389.390M	47.4					+0.0	47.4	95.0	-47.6	Black
2	2391.364M	46.7					+0.0	46.7	95.0	-48.3	Black
3	2399.753M	46.6					+0.0	46.6	95.0	-48.4	Black
4	2399.013M	46.4					+0.0	46.4	95.0	-48.6	Black
5	2393.584M	46.0					+0.0	46.0	95.0	-49.0	Black
6	2395.559M	45.5					+0.0	45.5	95.0	-49.5	Black
7	2387.416M	44.7					+0.0	44.7	95.0	-50.3	Black
8	1648.898M	43.4					+0.0	43.4	95.0	-51.6	Black
9	2369.403M	43.4					+0.0	43.4	95.0	-51.6	Black

10	1789.289M	43.0			+0.0	43.0	95.0	-52.0	Black



Spurious Antenna Conducted Emissions 2.4835-18 GHz

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer:	**Customer**		
Specification:	**BT Ant Spur Cond Upper**		
Work Order #:		Date:	3/17/2006
Test Type:	**Conducted Emissions**	Time:	10:57:24 AM
Equipment:	**USB BT Dongle**	Sequence#:	2
Manufacturer:	Plantronics	Tested By:	Test Engineer
Model:	BlueMax		120V 60Hz
S/N:	N/A		

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:

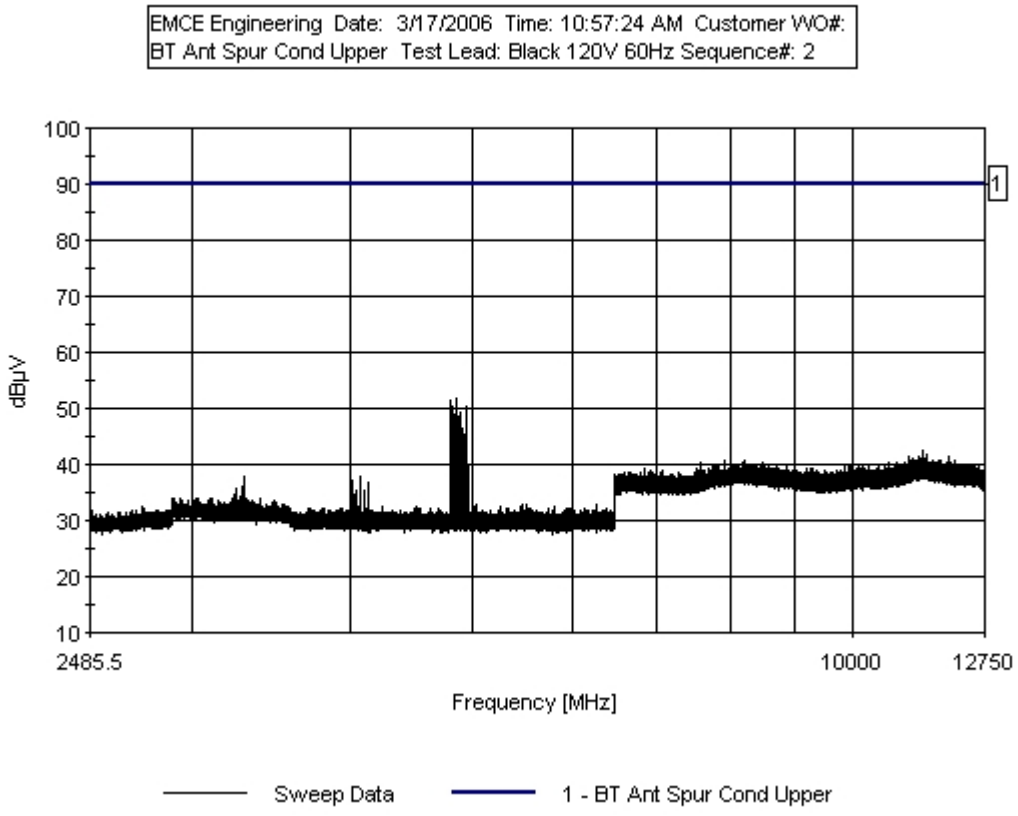
Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Transducer Legend:

Measurement Data: Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	4852.367M	51.8					+0.0	51.8	90.0	-38.2	Black
2	4810.074M	51.5					+0.0	51.5	90.0	-38.5	Black
3	4825.840M	50.5					+0.0	50.5	90.0	-39.5	Black
4	4948.212M	50.2					+0.0	50.2	90.0	-39.8	Black
5	4883.898M	49.4					+0.0	49.4	90.0	-40.6	Black
6	4820.585M	48.9					+0.0	48.9	90.0	-41.1	Black
7	4836.351M	48.8					+0.0	48.8	90.0	-41.2	Black
8	4878.643M	48.5					+0.0	48.5	90.0	-41.5	Black
9	4868.132M	46.7					+0.0	46.7	90.0	-43.3	Black
10	4905.920M	46.4					+0.0	46.4	90.0	-43.6	Black


EMCE Engineering Date: 3/17/2006 Time: 10:57:24 AM Customer WO#:
BT Ant Spur Cond Upper Test Lead: Black 120V 60Hz Sequence#: 2
100
90
80
70
60
50
40
30
20
10
dBµV
1
2485.5
10000
12750
Frequency [MHz]
Sweep Data
1 - BT Ant Spur Cond Upper

RECEIVER CONDUCTED EMISSIONS

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer: **Plantronics**
Specification: **BT RX Conducted 30M-12.75G**
Work Order #:
Test Type: **Conducted Emissions**
Equipment: **USB BT Dongle**
Manufacturer: Plantronics
Model: BlueMax
S/N: N/A

Date: 3/17/2006
Time: 11:20:41 AM
Sequence#: 3
Tested By: Bob Cole
120V 60Hz

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

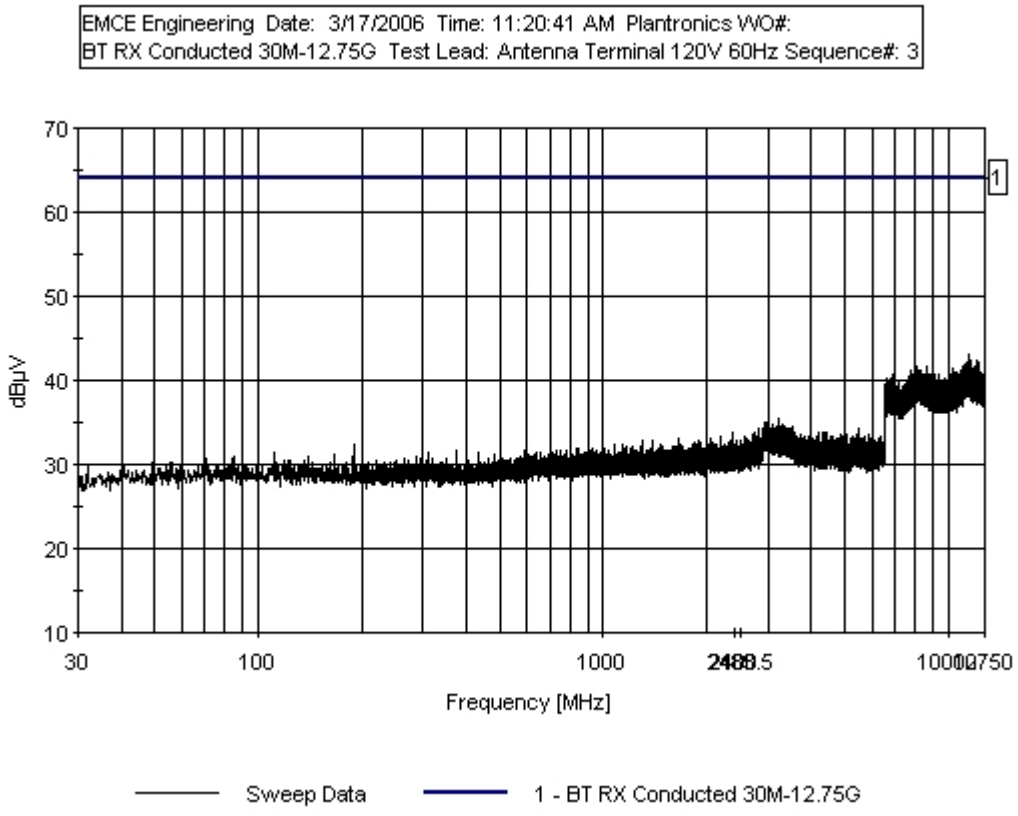
Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:
Function• Manufacturer• Model #• S/N• •
Test Conditions / Notes:

Transducer Legend:

Measurement Data: Reading listed by margin. Test Lead: Antenna Terminal

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	11482.960M	43.0					+0.0	43.0	90.0	-47.0	Anten
2	11576.560M	42.4					+0.0	42.4	90.0	-47.6	Anten
3	12039.520M	42.3					+0.0	42.3	90.0	-47.7	Anten
4	11241.720M	42.2					+0.0	42.2	90.0	-47.8	Anten
5	12222.950M	42.2					+0.0	42.2	90.0	-47.8	Anten
6	11377.110M	42.0					+0.0	42.0	90.0	-48.0	Anten
7	11083.560M	41.9					+0.0	41.9	90.0	-48.1	Anten
8	11171.650M	41.6					+0.0	41.6	90.0	-48.4	Anten
9	11656.640M	41.6					+0.0	41.6	90.0	-48.4	Anten
10	11897.630M	41.6					+0.0	41.6	90.0	-48.4	Anten


EMCE Engineering Date: 3/17/2006 Time: 11:20:41 AM Plantronics WO#:
BT RX Conducted 30M-12.75G Test Lead: Antenna Terminal 120V 60Hz Sequence#: 3
70
60
50
40
30
20
10
dBµV
1
30
100
1000
2488.5
10000
12750
Frequency [MHz]
Sweep Data
1 - BT RX Conducted 30M-12.75G

AC LINE CONDUCTED EMISSIONS MEASUREMENT

AC Line Conducted Emissions Measurement 150 kHz – 30 MHz

EUT	**BLUEMAX**
Test setup	C (conducted – hopping enabled)
Temp, Humidity, Air Pressure	54º F, 30.69
Date of Measurement	3/27/06
Measured by	Bob Cole
Result	PASSED

CLASS B LIMIT

Frequency Band (MHz)	EN 55022 B Limit (dBµV/m)	Detector
0.15 – 0.5	66 to 56	QP
0.5 – 5.0	56	QP
5.0 – 30.0	60	QP

EUT operation mode

EUT operation mode	Hopping Enabled
EUT channel	Hopping
EUT TX power level	Maximum
EUT operation voltage	120 VAC

LINE CONDUCTED EMISSIONS, .15 - 30 MHz
EN 55022 Class B Limits

LINE 1 - HOT

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer:	**Plantronics**		
Specification:	**EN55022 B COND [AVE]**		
Work Order #:	**2495**	Date:	3/27/2006
Test Type:	**Conducted Emissions**	Time:	3:31:17 PM
Equipment:	**USB BT Dongle**	Sequence#:	2
Manufacturer:	Plantronics	Tested By:	Bob Cole
Model:	BlueMax		120V 60Hz
S/N:	N/A		

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:

Function	Manufacturer	Model #	S/N

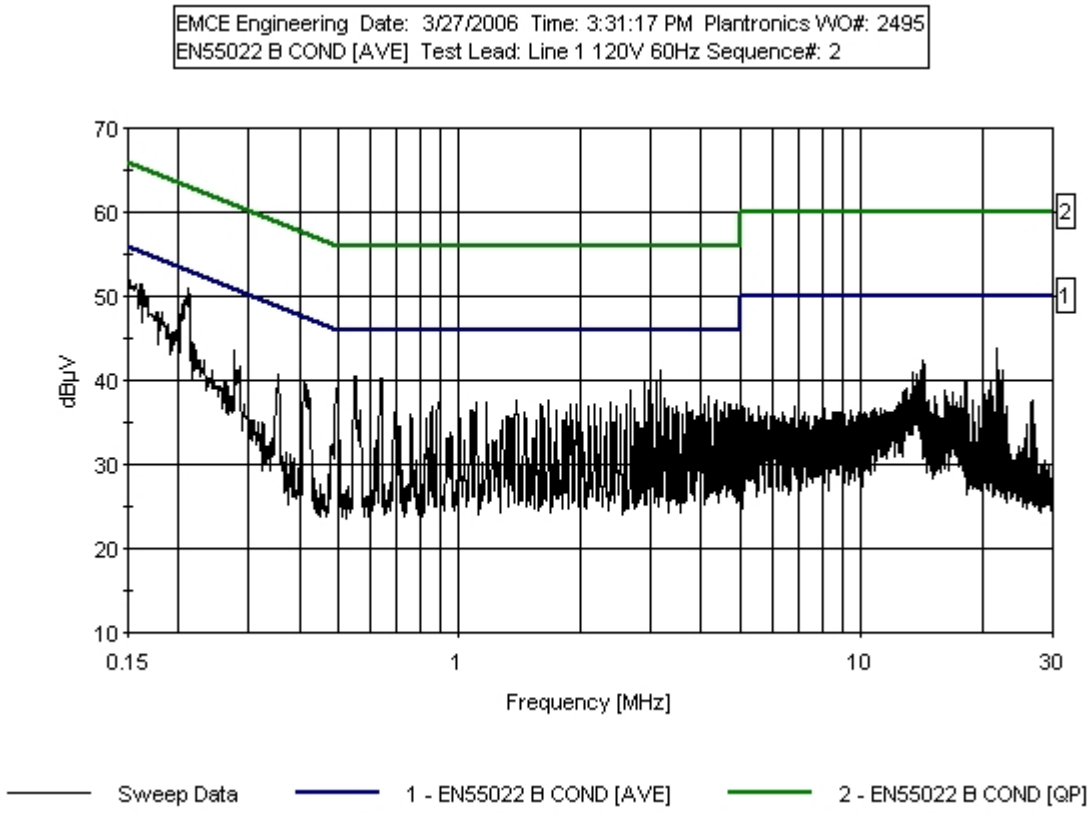
Test Conditions / Notes:

Transducer Legend:

T1=Chamber Receive Cable	T2=HP 11947A Transient Limiter

Measurement Data: Reading listed by margin. Test Lead: Line 1

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	211.085k	40.7	+0.4	+9.9			+0.0	51.0	53.2	-2.2	Line
2	151.454k	41.5	+0.4	+9.9			+0.0	51.8	55.9	-4.1	Line
3	164.544k	40.5	+0.4	+9.9			+0.0	50.8	55.2	-4.4	Line
4	3.174M	30.8	+0.5	+10.0			+0.0	41.3	46.0	-4.7	Line
5	550.687k	30.1	+0.4	+10.0			+0.0	40.5	46.0	-5.5	Line
6	639.406k	29.8	+0.4	+10.0			+0.0	40.2	46.0	-5.8	Line
7	21.667M	32.9	+0.9	+10.1			+0.0	43.9	50.0	-6.1	Line
8	2.889M	29.2	+0.5	+10.0			+0.0	39.7	46.0	-6.3	Line
9	3.101M	29.2	+0.5	+10.0			+0.0	39.7	46.0	-6.3	Line
10	181.270k	37.7	+0.4	+9.9			+0.0	48.0	54.4	-6.4	Line


EMCE Engineering Date: 3/27/2006 Time: 3:31:17 PM Plantronics WO#: 2495
EN55022 B COND [AVE] Test Lead: Line 1 120V 60Hz Sequence#: 2
70
60
50
40
30
20
10
dBµV
0.15
1
10
30
Frequency [MHz]
2
1
Sweep Data
1 - EN55022 B COND [AVE]
2 - EN55022 B COND [QP]

LINE CONDUCTED EMISSIONS, .15 - 30 MHz
EN 55022 Class B Limits

LINE 2 – Neutral

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 • 510-490-4307

Customer:	**Plantronics**		
Specification:	**EN55022 B COND [AVE]**		
Work Order #:	**2495**	Date:	3/27/2006
Test Type:	**Conducted Emissions**	Time:	3:34:37 PM
Equipment:	**USB BT Dongle**	Sequence#:	3
Manufacturer:	Plantronics	Tested By:	Bob Cole
Model:	BlueMax		120V 60Hz
S/N:	N/A		

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
USB BT Dongle*	Plantronics	BlueMax	N/A

Support Devices:

Function	Manufacturer	Model #	S/N

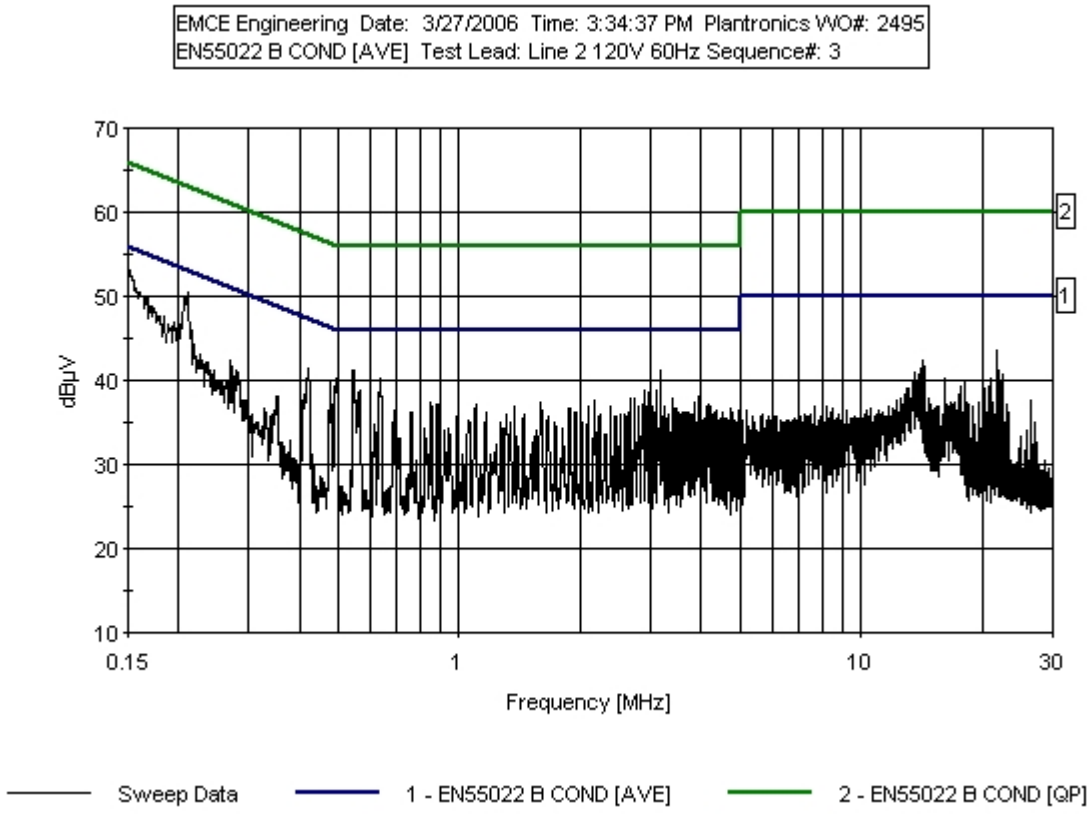
Test Conditions / Notes:

Transducer Legend:

T1=Chamber Receive Cable	T2=HP 11947A Transient Limiter

Measurement Data: Reading listed by margin. Test Lead: Line 2

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	151.454k	42.8	+0.4	+9.9			+0.0	53.1	55.9	-2.8	Line
2	544.870k	30.8	+0.4	+10.0			+0.0	41.2	46.0	-4.8	Line
3	3.161M	30.7	+0.5	+10.0			+0.0	41.2	46.0	-4.8	Line
4	637.224k	29.9	+0.4	+10.0			+0.0	40.3	46.0	-5.7	Line
5	421.246k	31.1	+0.4	+10.0			+0.0	41.5	47.4	-5.9	Line
6	496.874k	29.8	+0.4	+10.0			+0.0	40.2	46.1	-5.9	Line
7	21.687M	32.5	+0.9	+10.1			+0.0	43.5	50.0	-6.5	Line
8	477.967k	29.3	+0.4	+10.0			+0.0	39.7	46.4	-6.7	Line
9	2.876M	28.4	+0.5	+10.0			+0.0	38.9	46.0	-7.1	Line
10	3.089M	28.4	+0.5	+10.0			+0.0	38.9	46.0	-7.1	Line


EMCE Engineering Date: 3/27/2006 Time: 3:34:37 PM Plantronics WO#: 2495
EN55022 B COND [AVE] Test Lead: Line 2 120V 60Hz Sequence#: 3
70
60
50
40
30
20
10
dBµV
0.15
1
10
30
Frequency [MHz]
2
1
Sweep Data
1 - EN55022 B COND [AVE]
2 - EN55022 B COND [QP]

7.0 TEST EQUIPMENT

Antenna Conducted Measurements:

Equipment	Type	Manufacturer	Device Number
EMI Analyzer	84125B	Hewlett-Packard	E01
Oscilloscope	TDS820	Tektronix	E02
Coaxial cable	SMA Male – Reverse SMA Male (Length = 20 cm)	Own	C1

Spurious RF radiated emissions:

Equipment	Type	Manufacturer	Device Number
EMI Analyzer System	84125B	Hewlett-Packard	E01
Pre-Amp	83051A	Hewlett-Packard	E01
Pre-Amp	83017A	Hewlett-Packard	E01
High Pass Filter	9701	CMT	E01
Horn Antenna	3115	EMCO	E01
Cable		Hewlett Packard	E01

Note: The HP 84125B EMC Analyzer System is calibrated as a system, including the analyzer, pre-amps, filters, and cable.

EN 55022 (AC powerline conducted emissions)

Equipment	Type	Manufacturer	Device number
EMI Analyzer System	84125B	Hewlett-Packard	E01
LISN	3810/2	EMCO	E03
Coaxial cable	N Type – BNC (5 Meters)	Own	C2