

# **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 Headset**

**Model:  
EXPLORER  
M/N: 330 / 340 / 350**

**Prepared by:**



**44366 S. Grimmer Blvd.  
Fremont, CA 94538  
USA**

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## 1.0 CUSTOMER INFORMATION

<b>Test Laboratory:</b>	EMCE Engineering 44366 S. Grimmer Blvd. Fremont, CA 94538 USA  Tel: 510-490-4307 Fax: 510-490-3441 bob@universalcompliance.com
<b>FCC registration number</b>	0007198120
<b>Customer:</b>	Plantronics, Inc. 345 Encinal Street Santa Cruz, CA  Tel: 831-426-5858 Fax: 831-426-6098
<b>Contact Person:</b>	Myhassan Bakrim
<b>Receipt of EUT:</b>	5/20/06
<b>Test plan reference:</b>	FCC Part 2, 15 (15.247) / IC RSS-210
<b>Date of testing:</b>	5/20/06 – 6/1/06
<b>Date of Report:</b>	6/27/06

*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. **EXPLORER Bluetooth Headset, M/N: 330 / 340 / 350**

### 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
<b>EUT</b>	<b>EXPLORER</b>	<b>330 / 340 / 350 USB Headset</b>	N/A	E0001
<b>Accessories</b>	Laptop Computer	Compaq Presario M/N: 1694	3882A744	S0001
<b>Software</b>	CSR Bluesuite 1.20	Bluetest, BlueChat	N/A	N/A

### EUT Information

Product Specification	Description
Model Name	EXPLORER
Model Number	330 / 340 / 350
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)	<b><i>PASSED</i></b>
15.247 (a)(1)	6.2.2(o) (a3)	CF Separation	<b><i>PASSED</i></b>
15.247 (a)(1)(ii)	6.2.2(o) (a3)	Number of Hopping Frequencies	<b><i>PASSED</i></b>
15.247 (a)(1)(ii)	6.2.2(o) (a3)	Dwell Time	<b><i>PASSED</i></b>
15.247 (a)(1)(ii)	6.2.2(o) (a3)	20 dB Bandwidth	<b><i>PASSED</i></b>
15.247, c	6.2.2(o) (e1)	Band-edge compliance of RF Radiated emission	<b><i>PASSED</i></b>
15.247, c	6.2.2(o) (e1)	Restricted Band (Radiated Emissions)	<b><i>PASSED</i></b>
15.247(d)	6.2.2(o) (e1)	Spurious radiated emissions	<b><i>PASSED</i></b>
15.247(d)	6.2.2(o) (e1)	Spurious Antenna Conducted emissions	<b><i>PASSED</i></b>

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.

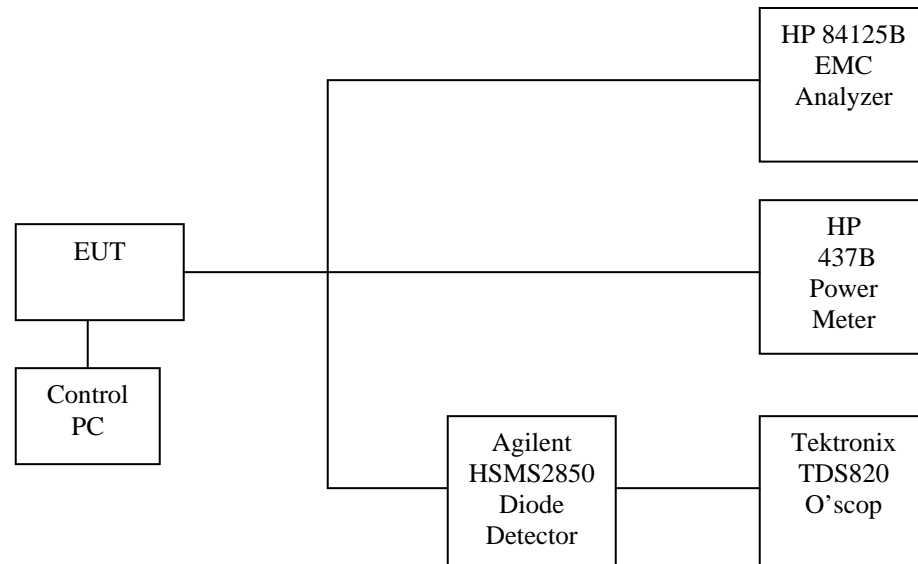
### Setup A (Antenna Conducted measurements)

#### 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**

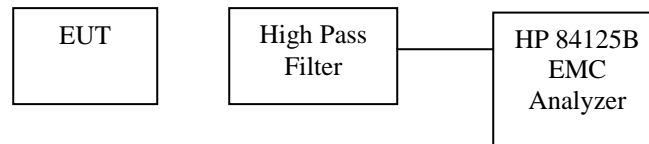
This setup was used in radiated emissions measurements with hopping disabled.

The EUT was tested in 3 orthogonal orientations.

Worst case data is presented.

**THIS SETUP USED FOR *RADIATED SPURIOUS EMISSIONS – RESTRICTED BAND MEASUREMENTS***

### *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)]

<b>EUT</b>	<b>EXPLORER</b>
<b>Test setup</b>	A (conducted – hopping DISABLED)
<b>Temp, Humidity, Air Pressure</b>	74° F, 30.45
<b>Date of Measurement</b>	5/24/06
<b>Measured by</b>	Bob Cole
<b>Result</b>	PASSED

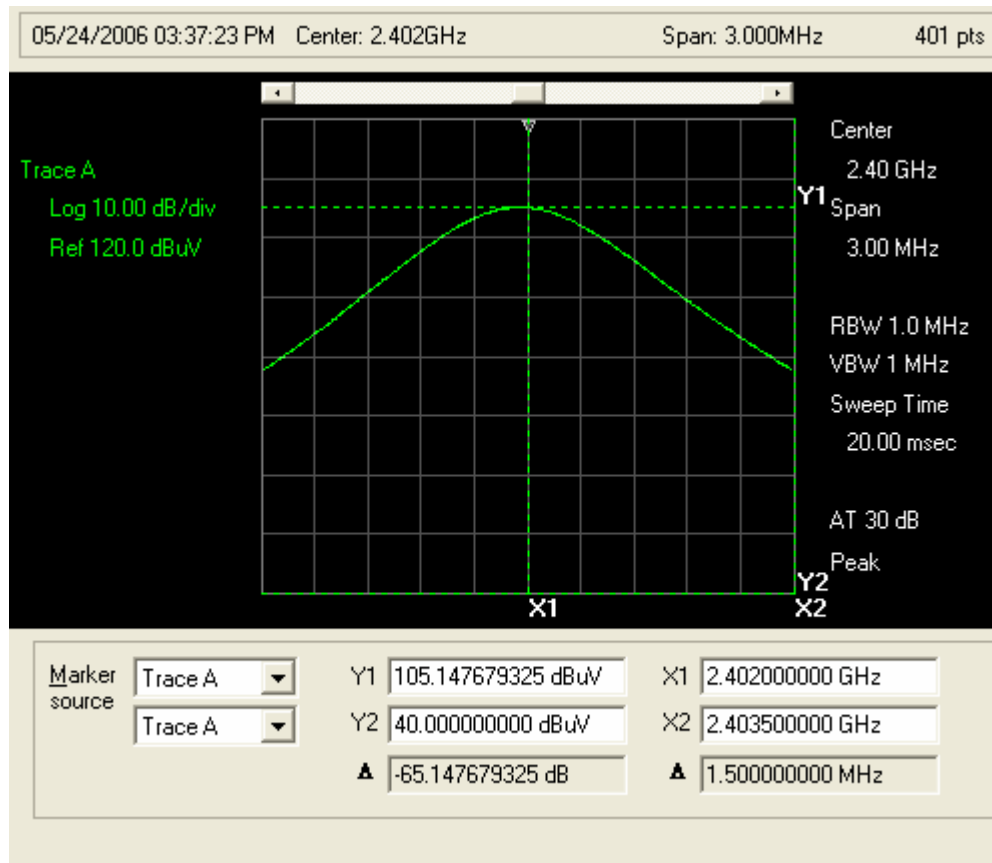
Limits and results

### PEAK OUTPUT POWER

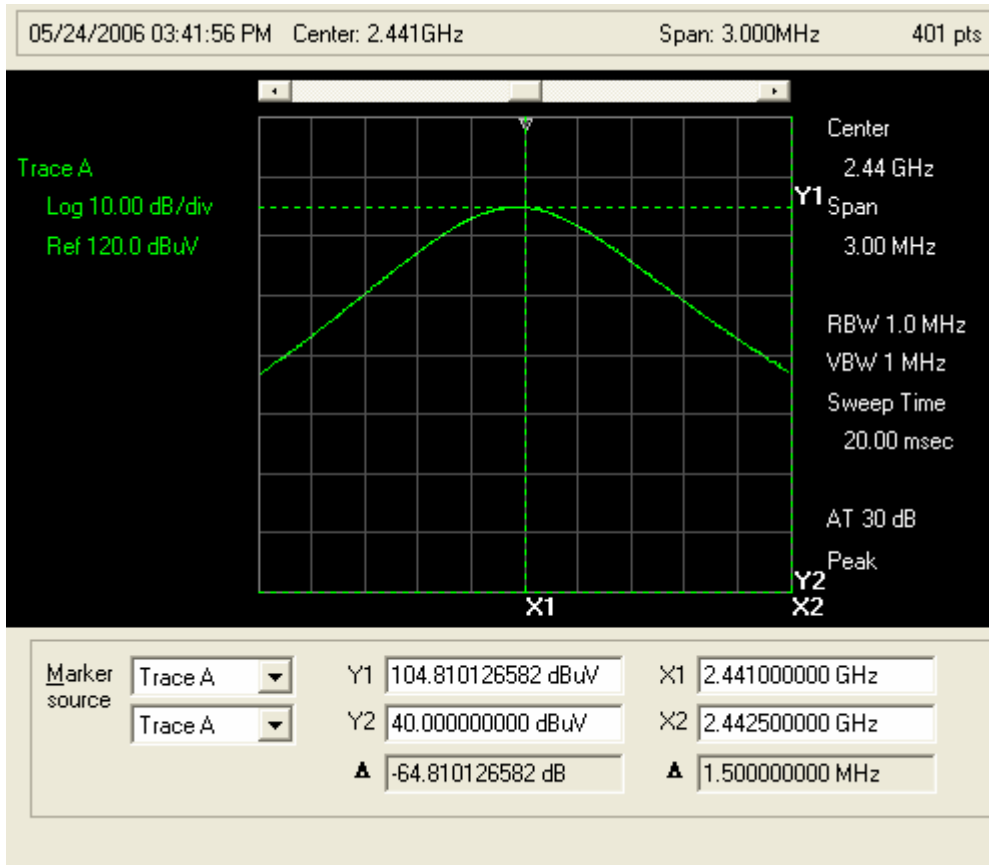
EUT Channel	Limit (dBm)	Test results (dBm)
2	30.0	-1.86
40	30.0	-2.19
80	30.0	-2.53

### Screen shots

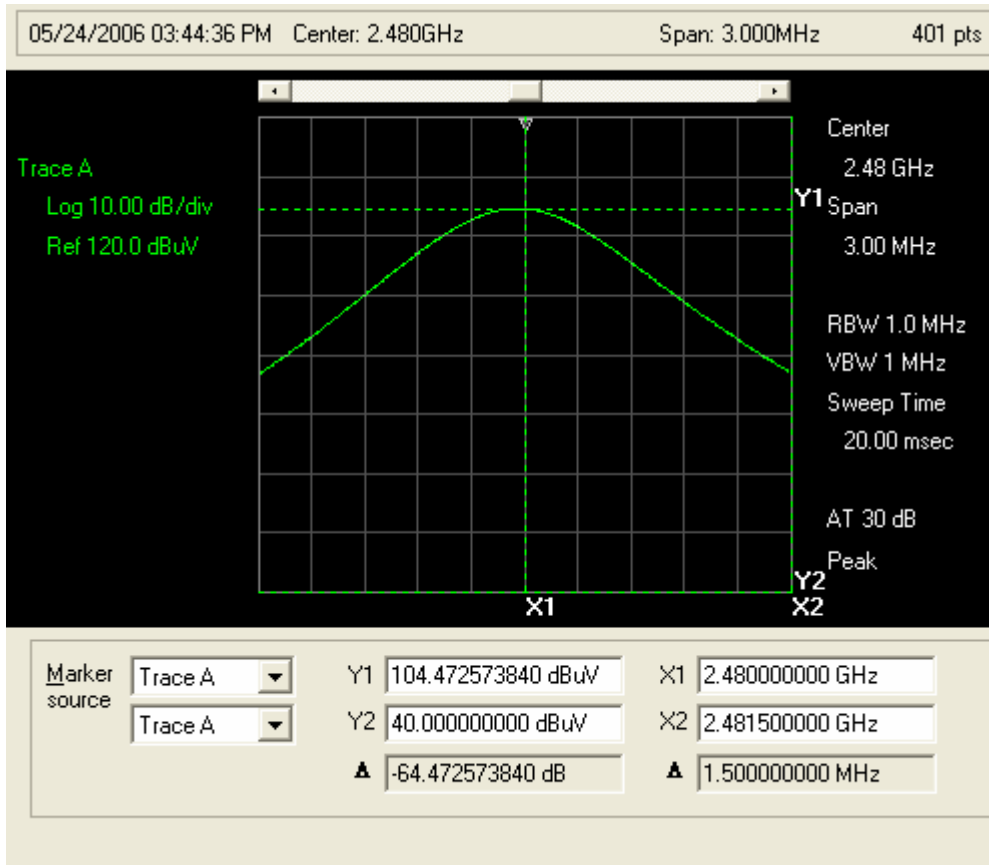
**Plot 1: Peak output power 2402 MHz**



### 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	EXPLORER
Test setup	A (conducted – hopping enabled)
Temp, Humidity, Air Pressure	74° F, 30.45
Date of Measurement	5/24/06
Measured by	Bob Cole
Result	PASSED

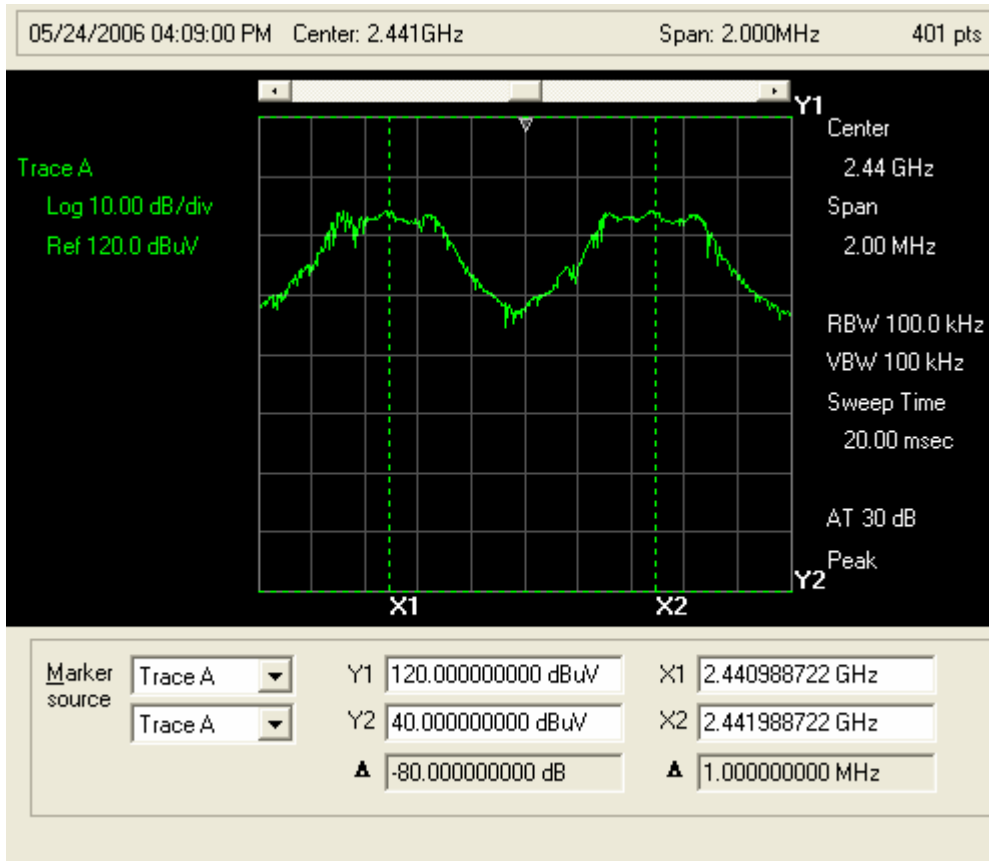
### Limits and results

#### 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)]

<b>EUT</b>	<b>EXPLORER</b>
<b>Test setup</b>	A (conducted – hopping enabled)
<b>Temp, Humidity, Air Pressure</b>	74° F, 30.45
<b>Date of Measurement</b>	5/24/06
<b>Measured by</b>	Bob Cole
<b>Result</b>	PASSED

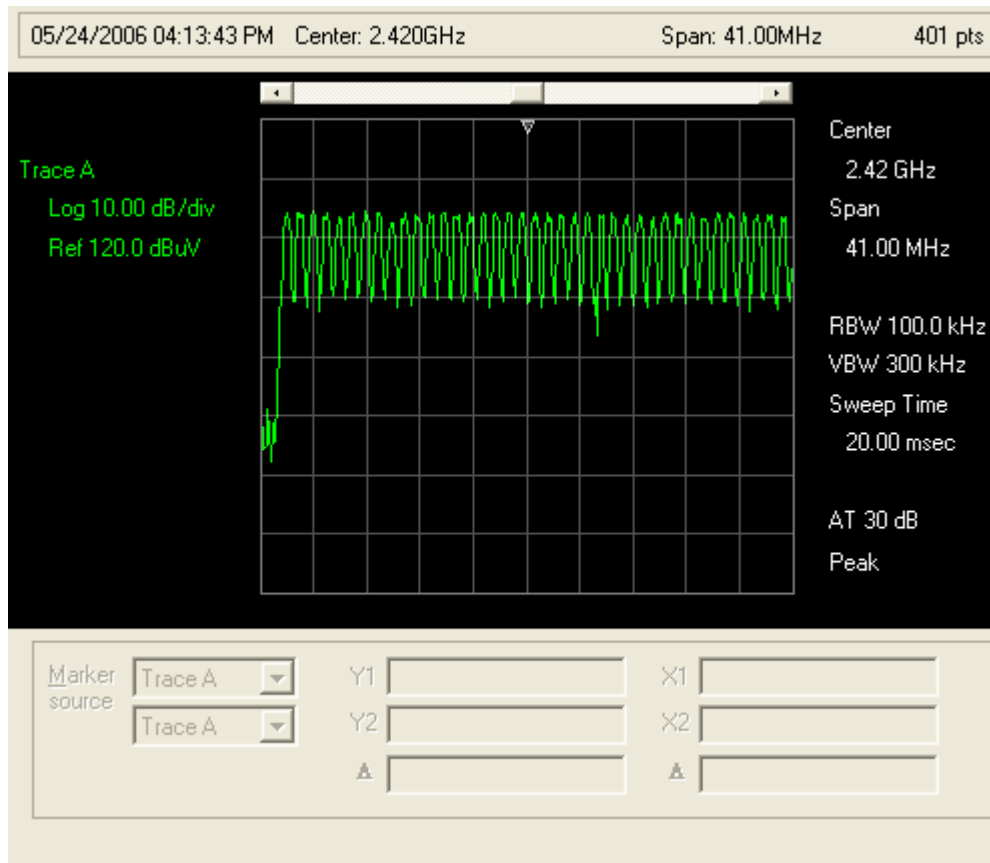
**Limits and results**

### NUMBER OF HOPPING FREQUENCIES

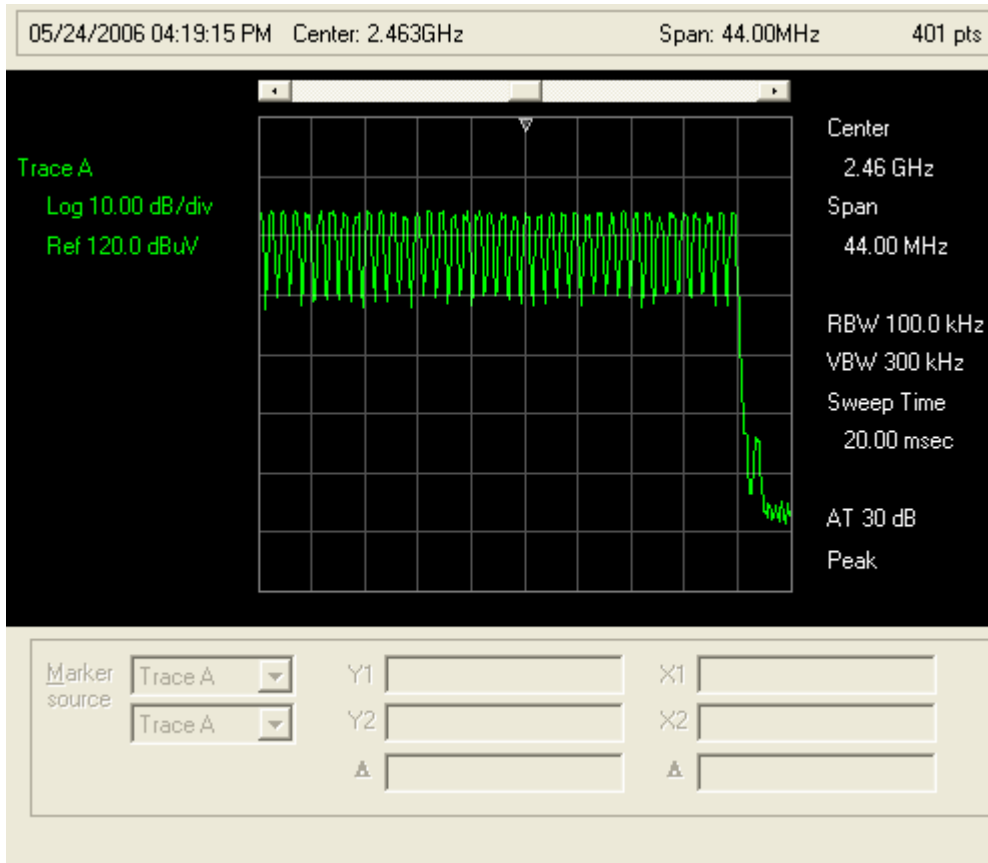
EUT Channel	Limit (MHz)	Test results (MHz)
2-80	<= 75	79

**Screen Shot:**

**Plot 5: Number of Hopping Frequencies (1)**



### Plot 6: Number of Hopping Frequencies (2)



## DWELL TIME

### Dwell Time

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

### Limits and results

#### DWELL TIME

EUT Channel	Limit	Test results
2	400 ms per 30 second of operation	PASSED <i>See description that follows</i>

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 =  $32 \cdot 312.5\text{mS} = 10\text{mS}$ .
- 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 =  $32 \cdot 312.5\text{mS} = 10\text{mS}$ .
- 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) =

$$(1.1) \text{ Time slot period} * 79 \text{ slots} = 625\mu\text{S} * 79 = 49.375 \text{ mS}$$

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 5<sup>th</sup> 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).

$$(1.2) \text{ DH1 dwell time} = 0.625 \text{ mS} * (100\text{ms}/49.375\text{mS}) = 1.26 \text{ mS (per 100 mS)}$$

### **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).

$$(1.3) \text{ DH5 dwell time} = 5 * 0.625 \text{ mS} * (100\text{ms}/49.375\text{mS}) = 6.3 \text{ mS (per 100 mS)}$$

### **Using the FCC duty cycle correction factor:**

$$(1.4) \text{ DH1 Dwell correction} = 20 \log (\text{DH1 dwell time}/100\text{mS}) = 20 \log (0.0126) = -38 \text{ dB}$$

$$(1.5) \text{ DH5 Dwell correction} = 20 \log (\text{DH5 dwell time}/100\text{mS}) = 20 \log (0.0633) = -24 \text{ dB}$$

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 2<sup>nd</sup> harmonic measurement to compensate for this duty cycle adjustment.

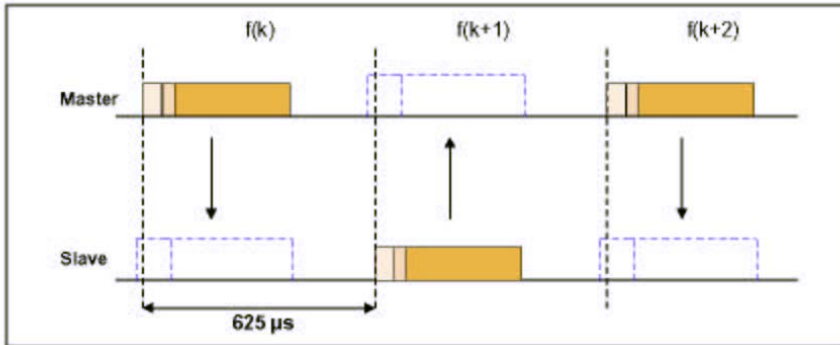


Figure 2.1: TDD and timing

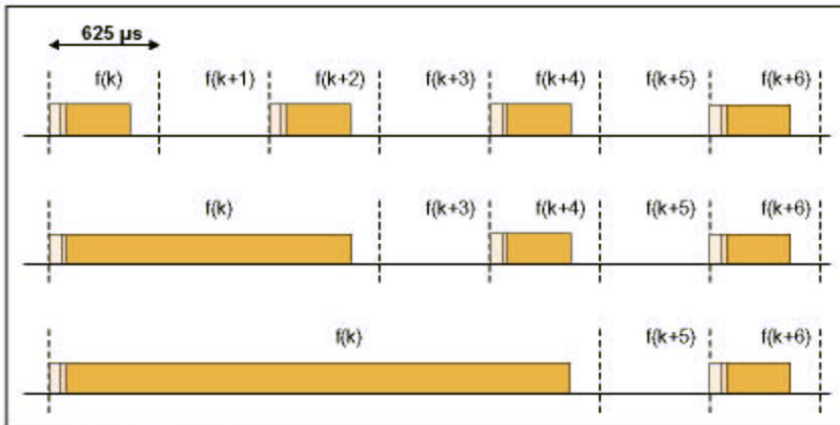


Figure 2.2: Multi-slot packets

## 20 dB Bandwidth

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

<b>EUT</b>	<b>EXPLORER</b>
<b>Test setup</b>	A (conducted)
<b>Temp, Humidity, Air Pressure</b>	74° F, 30.45
<b>Date of Measurement</b>	5/24/06
<b>Measured by</b>	Bob Cole
<b>Result</b>	PASSED

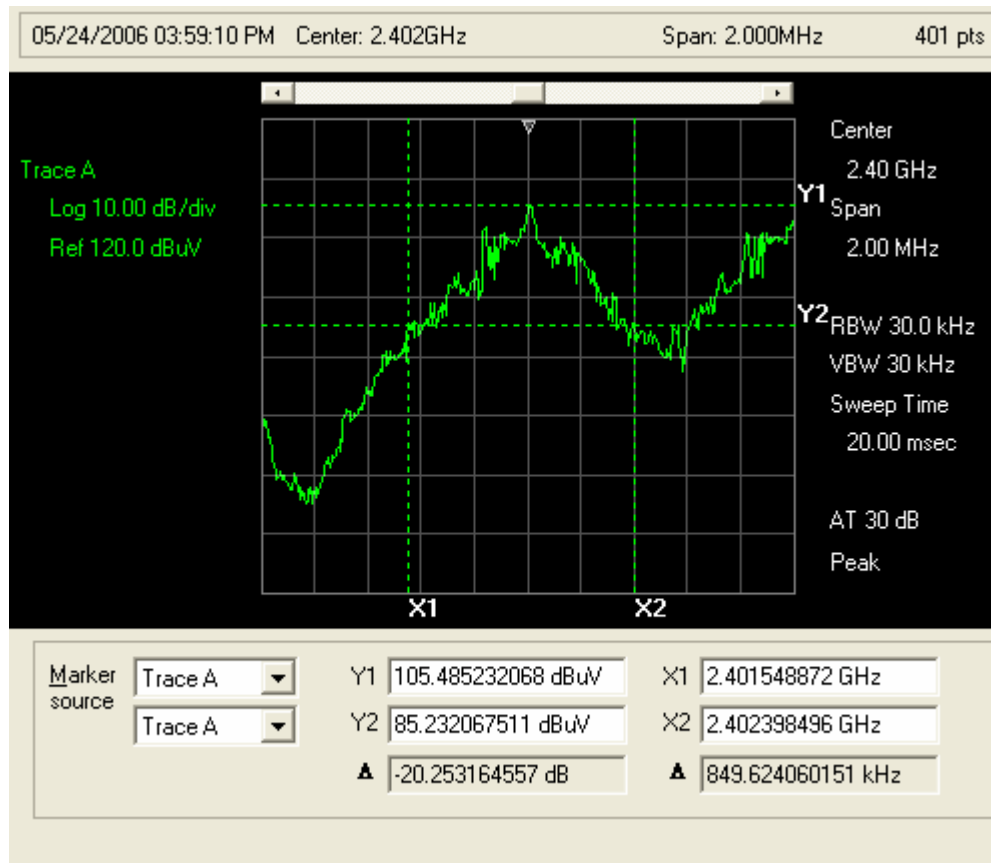
### Limits and Results

#### 20 dB BANDWIDTH

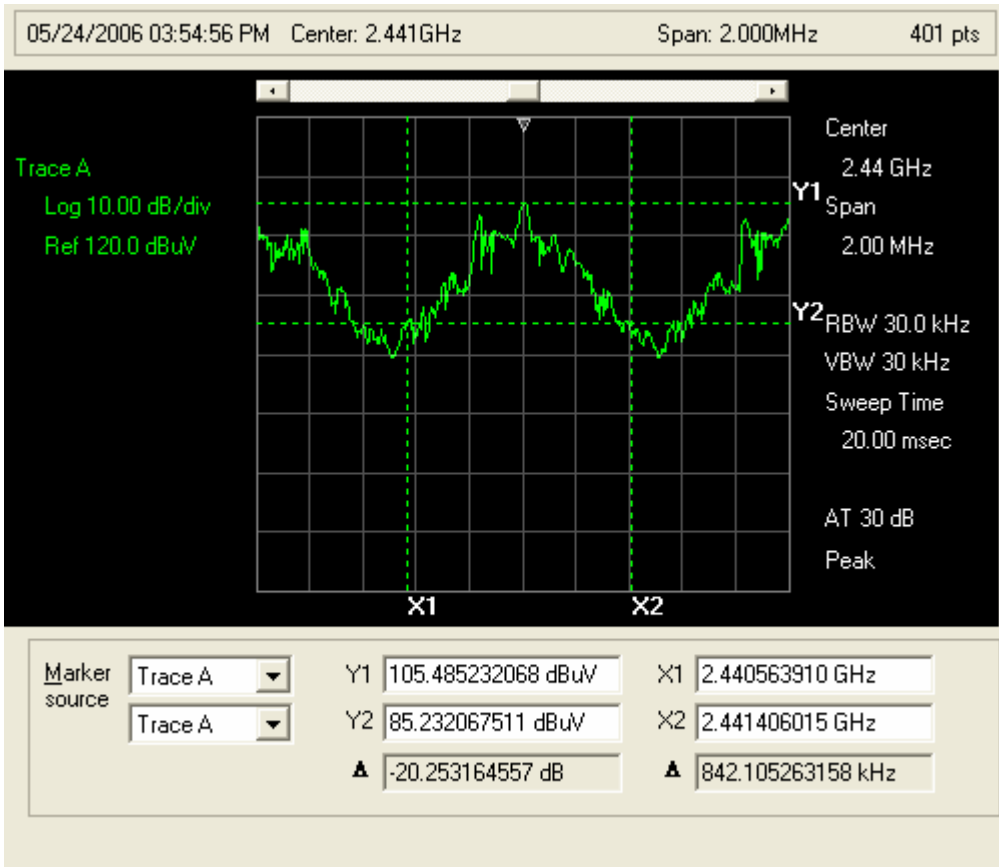
EUT Channel	Limit (MHz)	Test results (MHz)
2	≤ 1.0	0.849
40	≤ 1.0	0.842
80	≤ 1.0	0.827

### Screen Shots

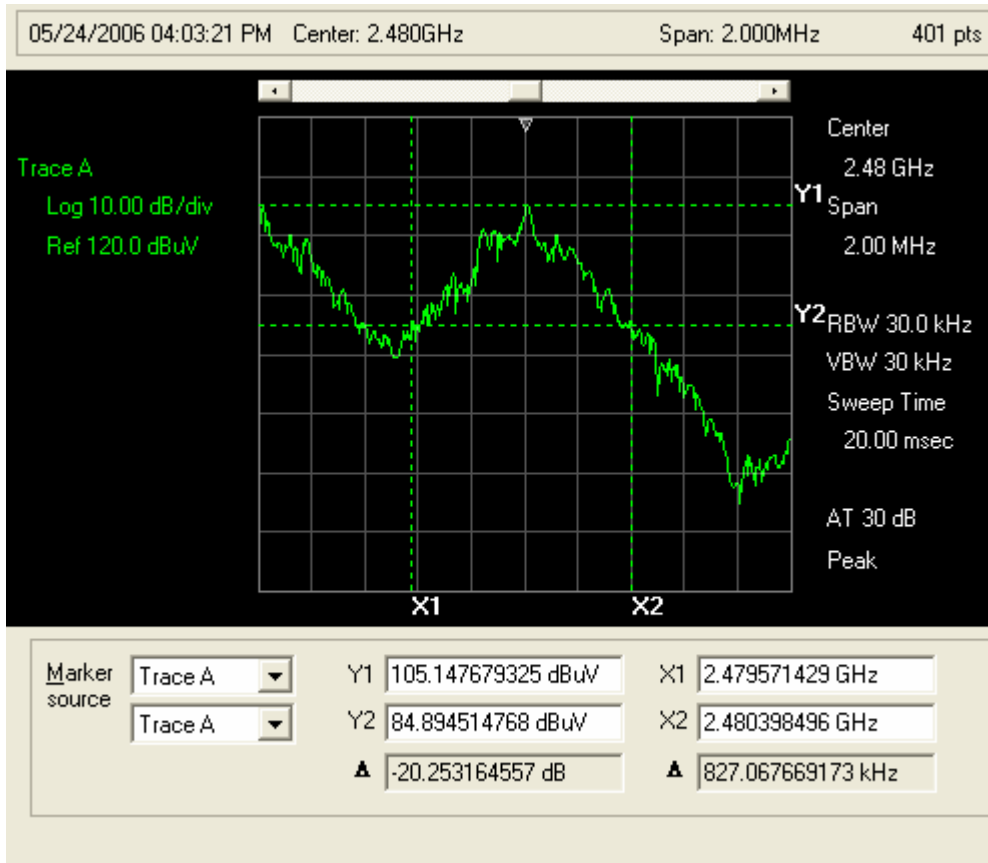
#### Plot 6: 20 dB BW 2402 MHz



**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)]**

<b>EUT</b>	<b>EXPLORER</b>
<b>Test setup</b>	A (conducted)
<b>Temp, Humidity, Air Pressure</b>	64° F, 30.45
<b>Date of Measurement</b>	3/12/06
<b>Measured by</b>	Bob Cole
<b>Result</b>	PASSED

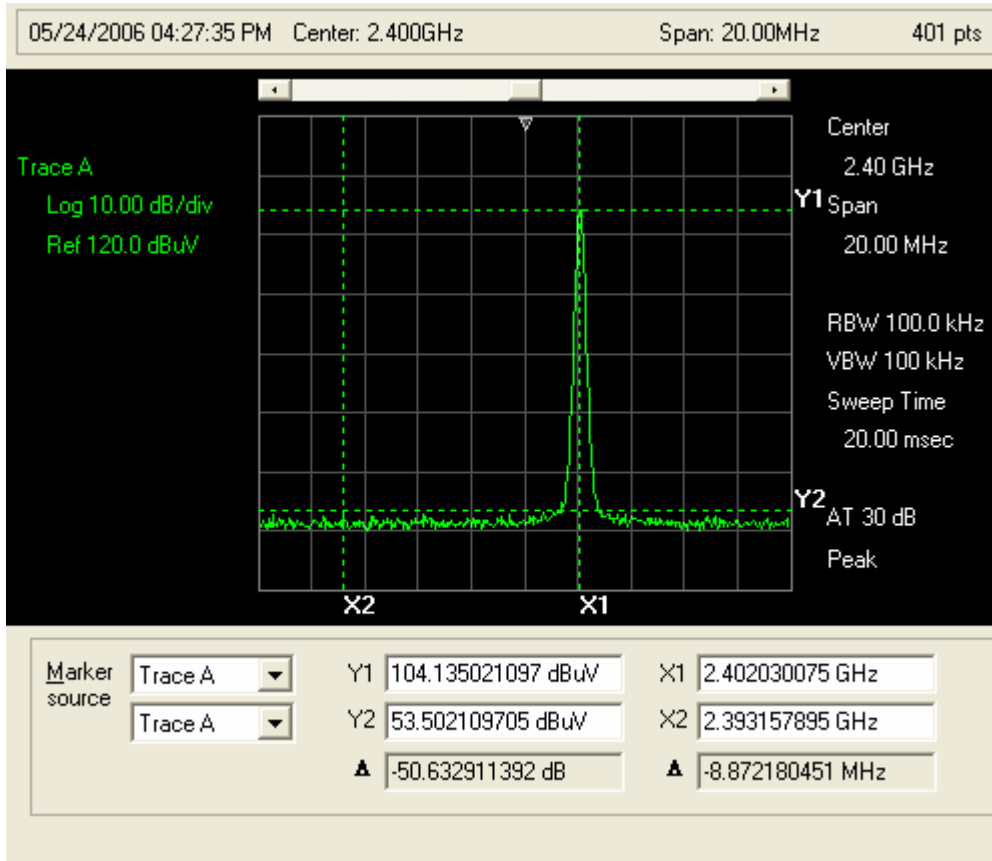
### Limits and results

#### **BAND-EDGE COMPLIANCE**

<b>Channel</b>	<b>Limit (dBuV)</b>	<b>Results (dBuV)</b>
2	85	68.35
80	85	54.51

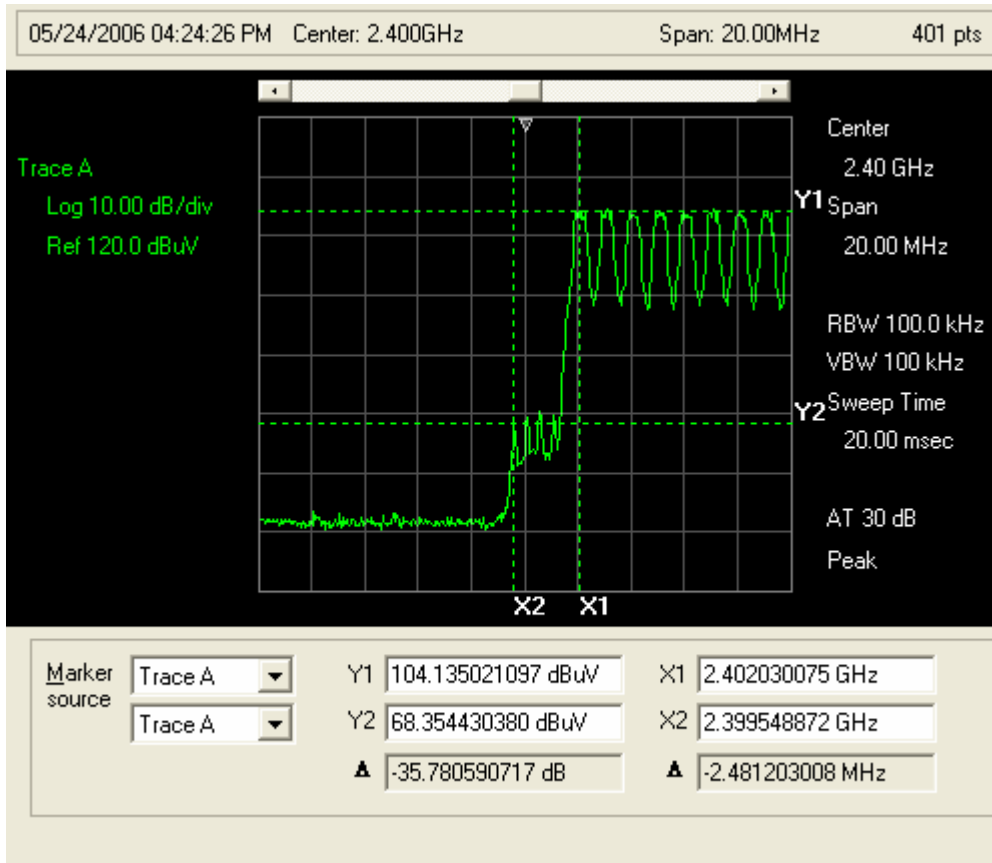
Screen shots:

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

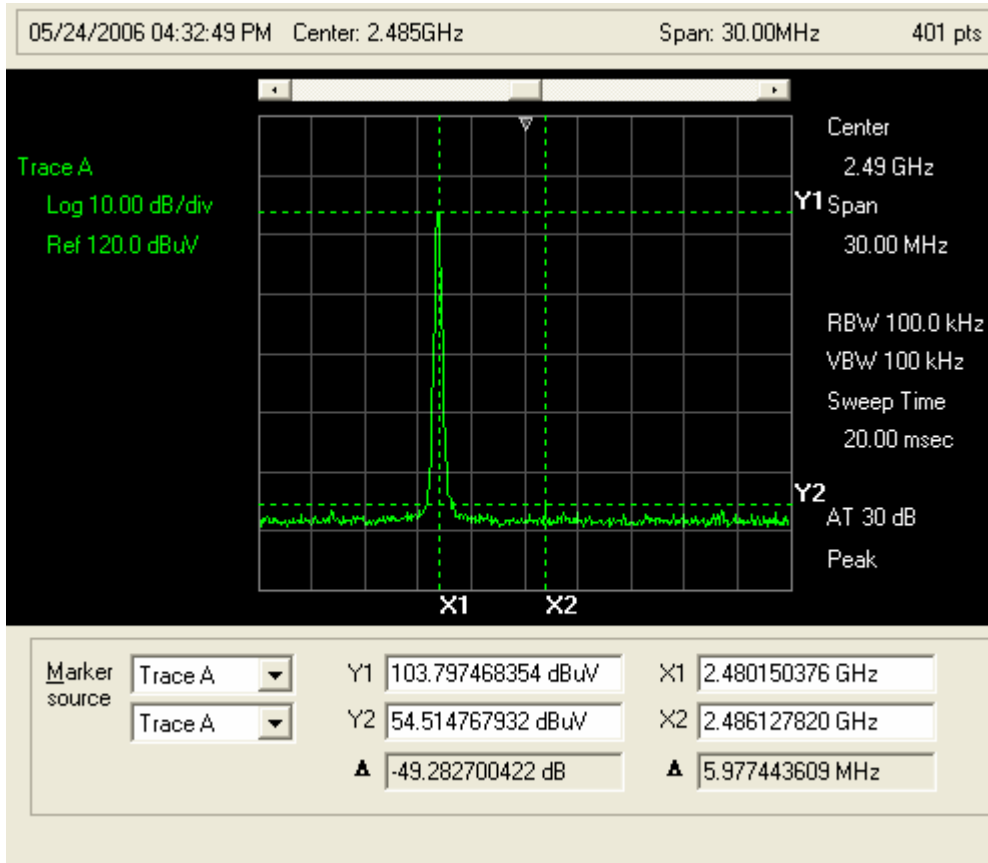




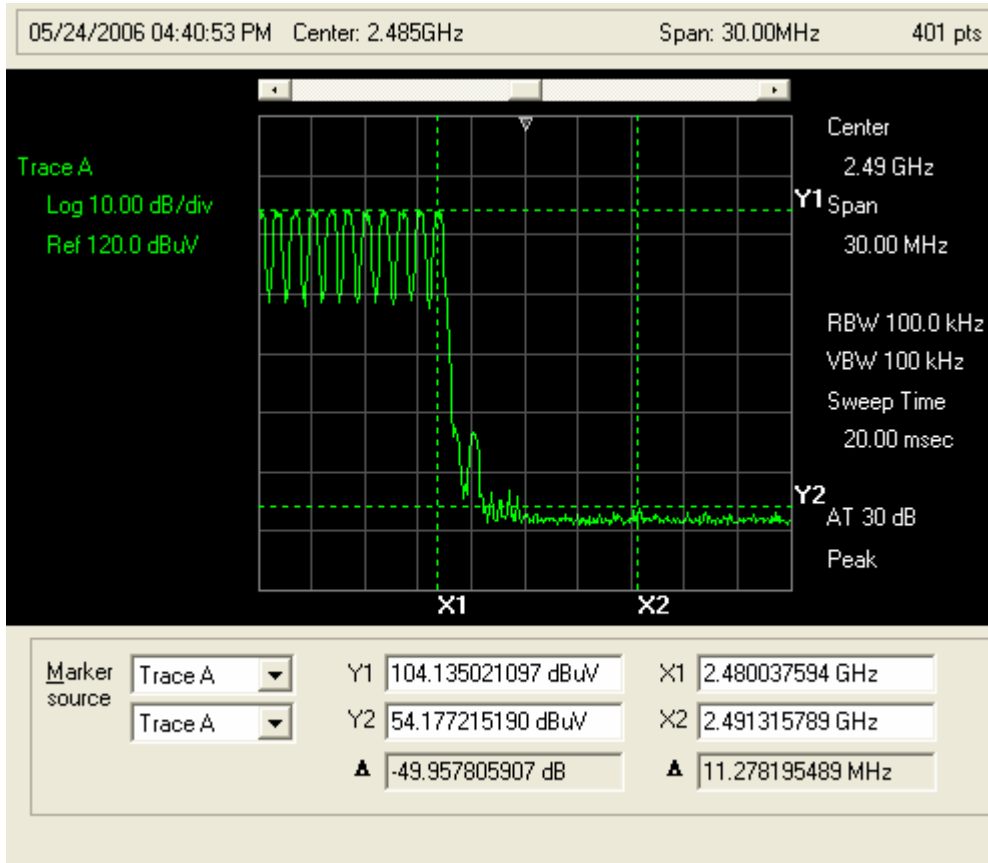
**Plot 10: Band-edge Compliance, Lower Band-edge (Hopping Enabled)**



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



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



## **RESTRICTED BAND MEASUREMENTS**

### Radiated Spurious Emissions

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

<b>EUT</b>	<b>EXPLORER</b>
<b>Test setup</b>	B (Radiated)
<b>Temp, Humidity, Air Pressure</b>	58° F, 30.92
<b>Date of Measurement</b>	7/14/06
<b>Measured by</b>	Bob Cole
<b>Result</b>	PASSED

#### Limits and results

#### RESTRICTED BANDS

Transmit Frequency = 2402 MHz

Frequency (MHz)	Detector	Limit (dBuV/M @ 3M)	Amplitude (dBuV/M)
<b>4803.88</b>	<b>Peak</b>	<b>74</b>	<b>55.62</b>
<b>4804.05</b>	<b>Average</b>	<b>54</b>	<b>40.28</b>

Transmit Frequency = 2480 MHz

Frequency (MHz)	Detector	Limit (dBuV/M @ 3M)	Amplitude (dBuV/M)
<b>4960.21</b>	<b>Peak</b>	<b>74</b>	<b>54.33</b>
<b>4960.74</b>	<b>Average</b>	<b>54</b>	<b>39.54</b>

#### Receive Mode

Frequency (MHz)	Detector	Limit (dBuV/M @ 3M)	Amplitude (dBuV/M)
<b>7827.32</b>	<b>Peak</b>	<b>74</b>	<b>41.22</b>
	<b>Average</b>	<b>54</b>	<b>N/A</b>

*Note: 1. All restricted Bands from 30 MHz to 18 GHz were examined.  
2. RBW = 1 MHz, VBW = 1 MHz*

# 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:	<b>Plantronics</b>	Date:	5/24/2006
Specification:	<b>FCC Cond Spurious 85</b>	Time:	2:29:30 PM
Work Order #:	<b>2512</b>	Sequence#:	3
Test Type:	<b>Conducted Emissions</b>	Tested By:	Bob Cole
Equipment:	<b>BT Headset</b>		120V 60Hz
Manufacturer:	Plantronics		
Model:	Explorer		
S/N:	N/A		

**Test Equipment:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
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**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Explorer	N/A

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

RBW = 100 kHz
VBW = 100 kHz
Hopping Enabled

**Transducer Legend:**

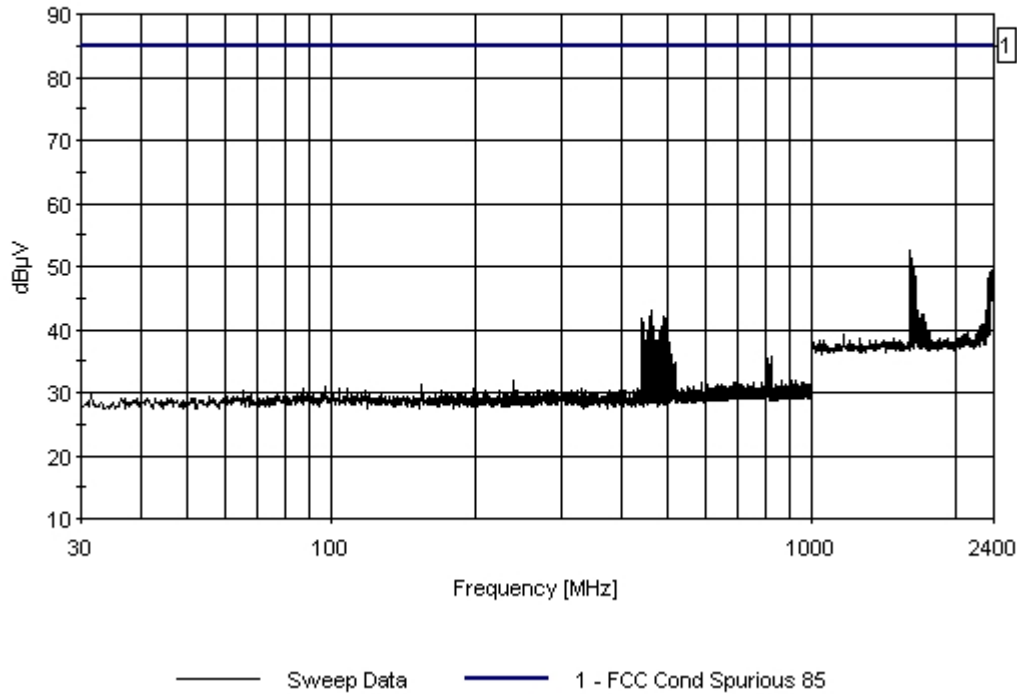
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**Measurement Data:** Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	dB	dB	dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	2399.002M	53.4					+0.0	53.4	85.0	-31.6	Black
2	1600.600M	52.5					+0.0	52.5	85.0	-32.5	Black
3	1605.605M	52.0					+0.0	52.0	85.0	-33.0	Black
4	1613.113M	51.3					+0.0	51.3	85.0	-33.7	Black
5	1618.118M	51.1					+0.0	51.1	85.0	-33.9	Black
6	2396.010M	50.8					+0.0	50.8	85.0	-34.2	Black
7	1625.625M	50.5					+0.0	50.5	85.0	-34.5	Black
8	2393.018M	50.3					+0.0	50.3	85.0	-34.7	Black

9	1630.630M	49.6	+0.0	49.6	85.0	-35.4	Black
10	463.384M	43.1	+0.0	43.1	85.0	-41.9	Black

EMCE Engineering Date: 5/24/2006 Time: 2:29:30 PM Plantronics W/O#: 2512  
FCC Cond Spurious 85 Test Lead: Black 120V 60Hz Sequence#: 3



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

Customer: **Plantronics**  
 Specification: **FCC Cond Spurious 85**  
 Work Order #: **2512**  
 Test Type: **Conducted Emissions**  
 Equipment: **BT Headset**  
 Manufacturer: Plantronics  
 Model: Toga 2  
 S/N: N/A

Date: 7/13/2006  
 Time: 4:01:42 PM  
 Sequence#: 5  
 Tested By: Bob Cole  
 120V 60Hz

**Test Equipment:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
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**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Toga 2	N/A

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

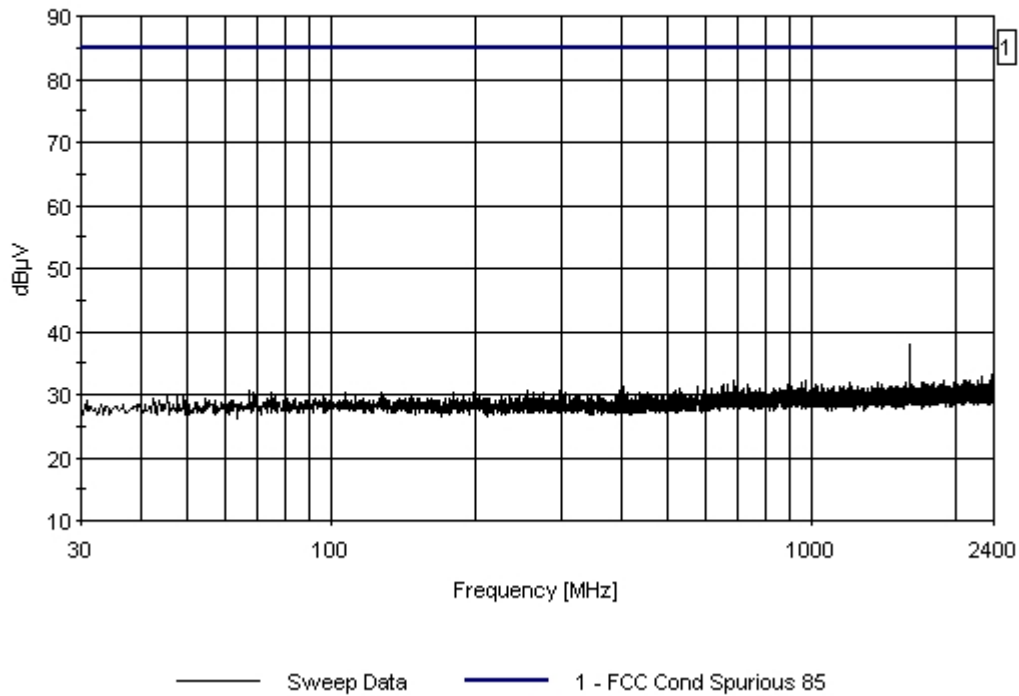
RBW = 100 kHz
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VBW = 100 kHz  
Xmit Freq = 2402 MHz

**Transducer Legend:**

#	Freq MHz	Rdng dB $\mu$ V	Reading listed by margin.				Test Lead: Black				
			dB	dB	dB	dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	1602.272M	37.8					+0.0	37.8	85.0	-47.2	Black
2	2386.637M	33.1					+0.0	33.1	85.0	-51.9	Black
3	2257.676M	32.7					+0.0	32.7	85.0	-52.3	Black
4	688.359M	32.3					+0.0	32.3	85.0	-52.7	Black
5	2094.013M	32.3					+0.0	32.3	85.0	-52.7	Black
6	969.890M	32.2					+0.0	32.2	85.0	-52.8	Black
7	1887.056M	32.2					+0.0	32.2	85.0	-52.8	Black
8	2218.137M	32.2					+0.0	32.2	85.0	-52.8	Black
9	954.875M	32.0					+0.0	32.0	85.0	-53.0	Black
10	1203.623M	31.9					+0.0	31.9	85.0	-53.1	Black

EMCE Engineering Date: 7/13/2006 Time: 4:01:42 PM Plantronics WO#: 2512  
FCC Cond Spurious 85 Test Lead: Black 120V 60Hz Sequence#: 5



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

Customer: **Plantronics**  
Specification: **FCC Cond Spurious 85**  
Work Order #: **2512**  
Test Type: **Conducted Emissions**  
Equipment: **BT Headset**  
Manufacturer: Plantronics  
Model: Toga 2  
S/N: N/A

Date: 7/13/2006  
Time: 3:56:15 PM  
Sequence#: 4  
Tested By: Bob Cole  
120V 60Hz

**Test Equipment:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
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**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Toga 2	N/A

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

RBW = 100 kHz
VBW = 100 kHz
Xmit Freq = 2480 MHz

**Transducer Legend:**

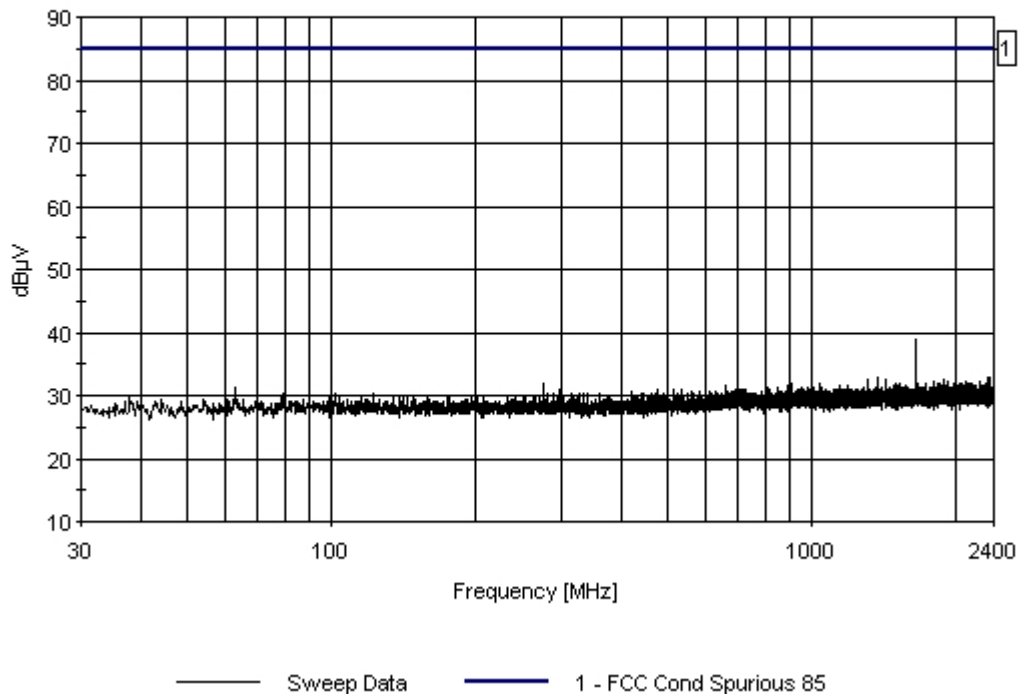
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**Measurement Data:** Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dB $\mu$ V					Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	1654.073M	38.8					+0.0	38.8	85.0	-46.2	Black
2	2355.284M	32.8					+0.0	32.8	85.0	-52.2	Black
3	1373.793M	32.7					+0.0	32.7	85.0	-52.3	Black
4	2328.247M	32.7					+0.0	32.7	85.0	-52.3	Black
5	1426.846M	32.6					+0.0	32.6	85.0	-52.4	Black
6	1308.979M	32.4					+0.0	32.4	85.0	-52.6	Black
7	1888.557M	32.4					+0.0	32.4	85.0	-52.6	Black
8	1796.215M	32.3					+0.0	32.3	85.0	-52.7	Black
9	2099.769M	32.3					+0.0	32.3	85.0	-52.7	Black
10	1037.708M	32.0					+0.0	32.0	85.0	-53.0	Black

EMCE Engineering Date: 7/13/2006 Time: 3:56:15 PM Plantronics WO#: 2512  
FCC Cond Spurious 85 Test Lead: Black 120V 60Hz Sequence#: 4



**Spurious Antenna Conducted Emissions 2.4835-18 GHz**

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

Customer: **Plantronics**  
 Specification: **FCC Rad Spurious 85**  
 Work Order #: **2512**  
 Test Type: **Radiated Scan**  
 Equipment: **BT Headset**  
 Manufacturer: Plantronics  
 Model: Explorer  
 S/N: N/A

Date: 5/24/2006  
 Time: 1:58:29 PM  
 Sequence#: 10  
 Tested By: Bob Cole

***Test Equipment:***

Function	S/N	Calibration Date	Cal Due Date	Asset #
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***Equipment Under Test (\* = EUT):***

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Explorer	N/A

***Support Devices:***

Function	Manufacturer	Model #	S/N
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***Test Conditions / Notes:***

RBW = 100 kHz VBW = 100 kHz Hopping Enabled
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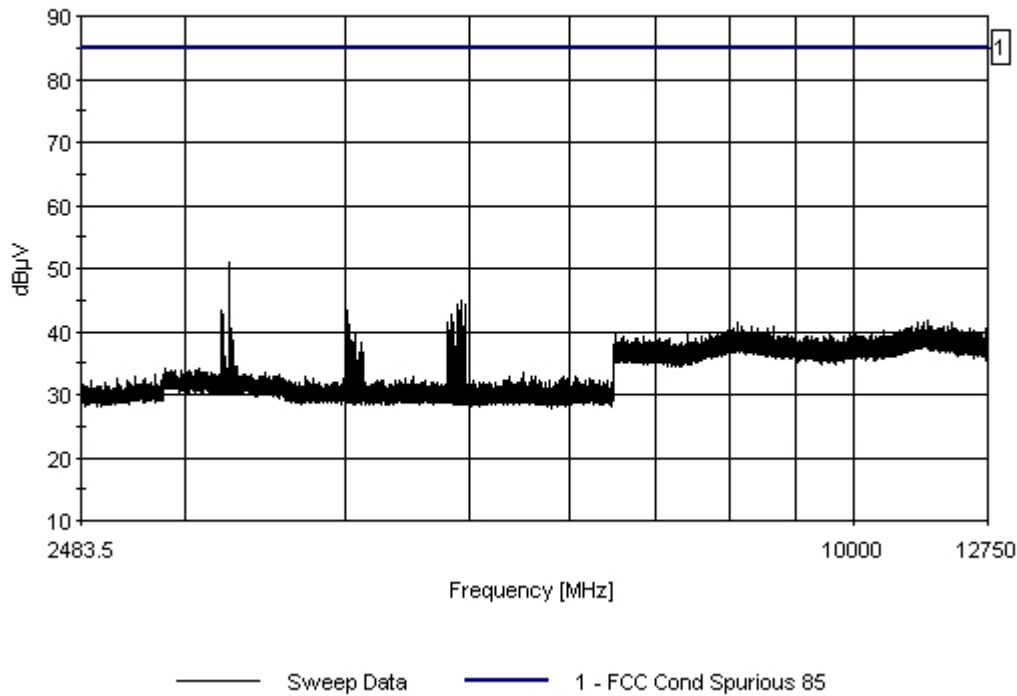
***Transducer Legend:***

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

#	Freq MHz	Rdng dB $\mu$ V	dB	dB	dB	dB	Dist Table	Corr dB $\mu$ V/m	Spec dB $\mu$ V/m	Margin dB	Polar Ant
1	4925.942M	58.0					+0.0	58.0	85.0	-27.0	Vert
2	4803.570M	52.8					+0.0	52.8	85.0	-32.2	Vert
3	4952.469M	52.3					+0.0	52.3	85.0	-32.7	Vert
4	4861.628M	52.2					+0.0	52.2	85.0	-32.8	Vert
5	4957.724M	52.1					+0.0	52.1	85.0	-32.9	Vert
6	4830.096M	51.7					+0.0	51.7	85.0	-33.3	Vert
7	4856.373M	51.0					+0.0	51.0	85.0	-34.0	Vert
8	4894.411M	50.5					+0.0	50.5	85.0	-34.5	Vert
9	4814.081M	49.8					+0.0	49.8	85.0	-35.2	Vert
10	5273.791M	33.2					+0.0	33.2	85.0	-51.8	Vert

EMCE Engineering Date: 5/24/2006 Time: 2:10:42 PM Plantronics WO#: 2512  
FCC Cond Spurious 85 Test Lead: Black 120V 60Hz Sequence#: 2



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

Customer: **Plantronics**  
Specification: **FCC Cond Spurious 85 High**  
Work Order #: **2512**  
Test Type: **Conducted Emissions**  
Equipment: **BT Headset**  
Manufacturer: Plantronics  
Model: Toga 2  
S/N: N/A

Date: 7/13/2006  
Time: 3:16:08 PM  
Sequence#: 3  
Tested By: Bob Cole  
120V 60Hz

**Test Equipment:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
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**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Toga 2	N/A

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

RBW = 100 kHz
VBW = 100 kHz
Xmit Freq = 2402 MHz

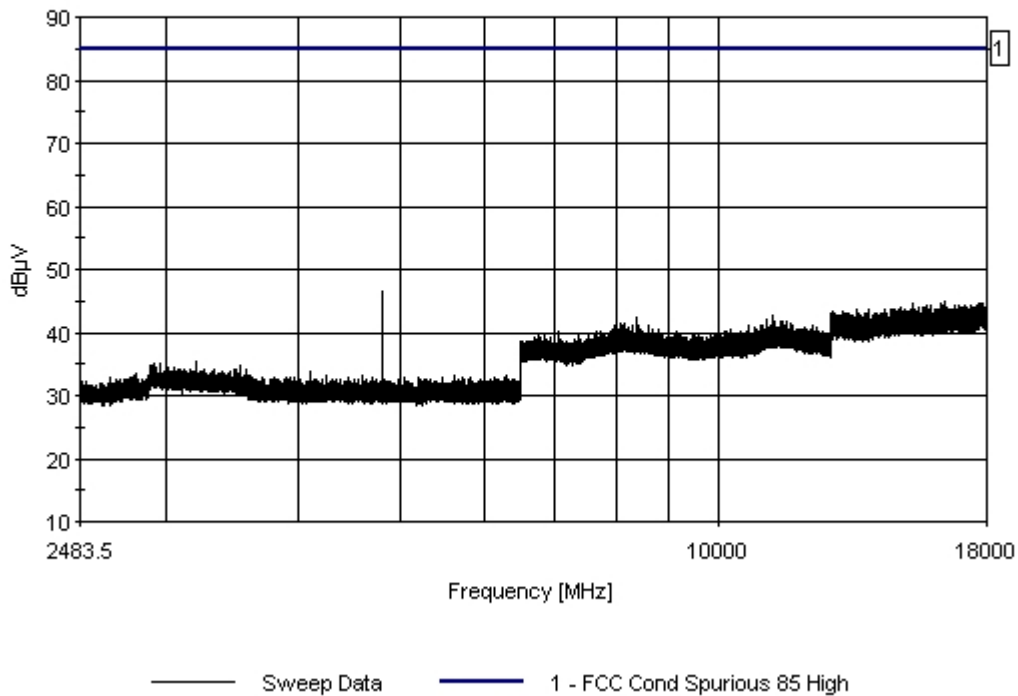
**Transducer Legend:**



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

#	Freq MHz	Rdng dB $\mu$ V	dB	dB	dB	dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	4803.820M	46.5					+0.0	46.5	85.0	-38.5	Black
2	17999.210M	44.9					+0.0	44.9	85.0	-40.1	Black
3	16456.710M	44.8					+0.0	44.8	85.0	-40.2	Black
4	16288.040M	44.7					+0.0	44.7	85.0	-40.3	Black
5	17689.940M	44.7					+0.0	44.7	85.0	-40.3	Black
6	15341.850M	44.5					+0.0	44.5	85.0	-40.5	Black
7	17744.740M	44.5					+0.0	44.5	85.0	-40.5	Black
8	17822.070M	44.5					+0.0	44.5	85.0	-40.5	Black
9	17999.760M	44.5					+0.0	44.5	85.0	-40.5	Black
10	17999.950M	44.5					+0.0	44.5	85.0	-40.5	Black

EMCE Engineering Date: 7/13/2006 Time: 3:16:08 PM Plantronics WO#: 2512  
FCC Cond Spurious 85 High Test Lead: Antenna Terminal 120V 60Hz Sequence#: 3



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

Customer: **Plantronics**  
 Specification: **FCC Cond Spurious 85 High**  
 Work Order #: **2512**  
 Test Type: **Conducted Emissions**  
 Equipment: **BT Headset**  
 Manufacturer: Plantronics  
 Model: Toga 2  
 S/N: N/A

Date: 7/13/2006  
 Time: 3:37:03 PM  
 Sequence#: 4  
 Tested By: Bob Cole  
 120V 60Hz

**Test Equipment:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
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**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Toga 2	N/A

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

RBW = 100 kHz
VBW = 100 kHz
Xmit Freq = 2480 MHz

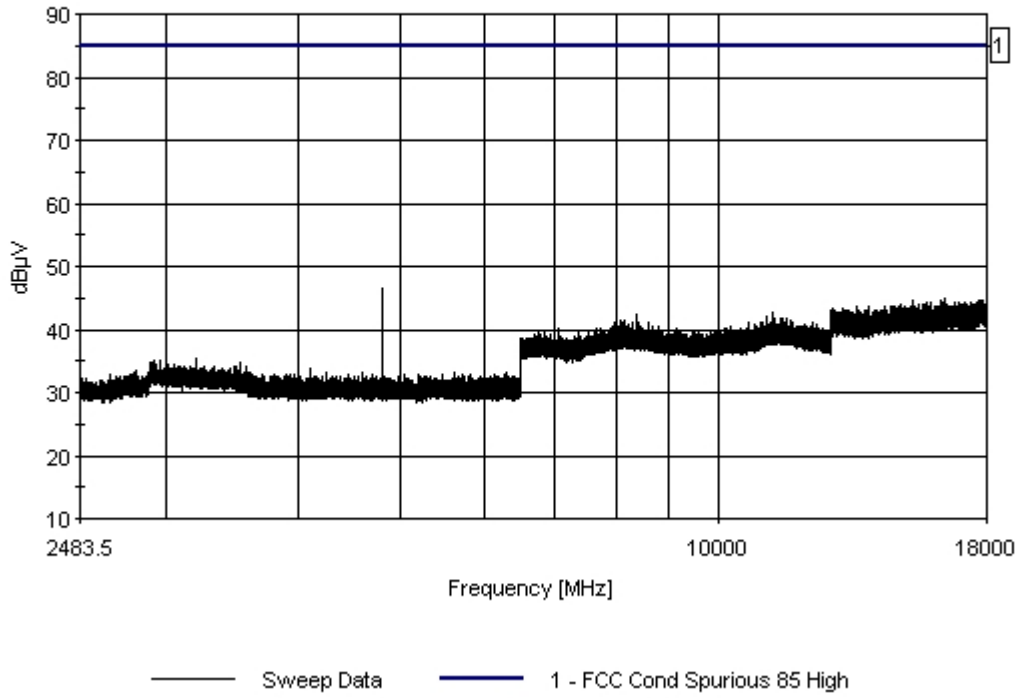
**Transducer Legend:**

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**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	4960.226M	47.2					+0.0	47.2	85.0	-37.8	Anten
2	17769.520M	45.8					+0.0	45.8	85.0	-39.2	Anten
3	17904.910M	45.0					+0.0	45.0	85.0	-40.0	Anten
4	16908.410M	44.9					+0.0	44.9	85.0	-40.1	Anten
5	17414.410M	44.7					+0.0	44.7	85.0	-40.3	Anten
6	17999.630M	44.6					+0.0	44.6	85.0	-40.4	Anten
7	17352.350M	44.5					+0.0	44.5	85.0	-40.5	Anten
8	17593.850M	44.5					+0.0	44.5	85.0	-40.5	Anten
9	17692.190M	44.5					+0.0	44.5	85.0	-40.5	Anten
10	16095.100M	44.4					+0.0	44.4	85.0	-40.6	Anten

EMCE Engineering Date: 7/13/2006 Time: 3:16:08 PM Plantronics WVO#: 2512  
FCC Cond Spurious 85 High Test Lead: Antenna Terminal 120V 60Hz Sequence#: 3



## RECEIVER CONDUCTED EMISSIONS

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

Customer:	<b>Plantronics</b>	Date:	5/24/2006
Specification:	<b>BT RX Conducted 30M-18G</b>	Time:	2:37:29 PM
Work Order #:	<b>2512</b>	Sequence#:	4
Test Type:	<b>Conducted Emissions</b>	Tested By:	Bob Cole
Equipment:	<b>BT Headset</b>		120V 60Hz
Manufacturer:	Plantronics		
Model:	Explorer		
S/N:	N/A		

**Test Equipment:**

Function	S/N	Calibration Date	Cal Due Date	Asset #
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**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Explorer	N/A

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

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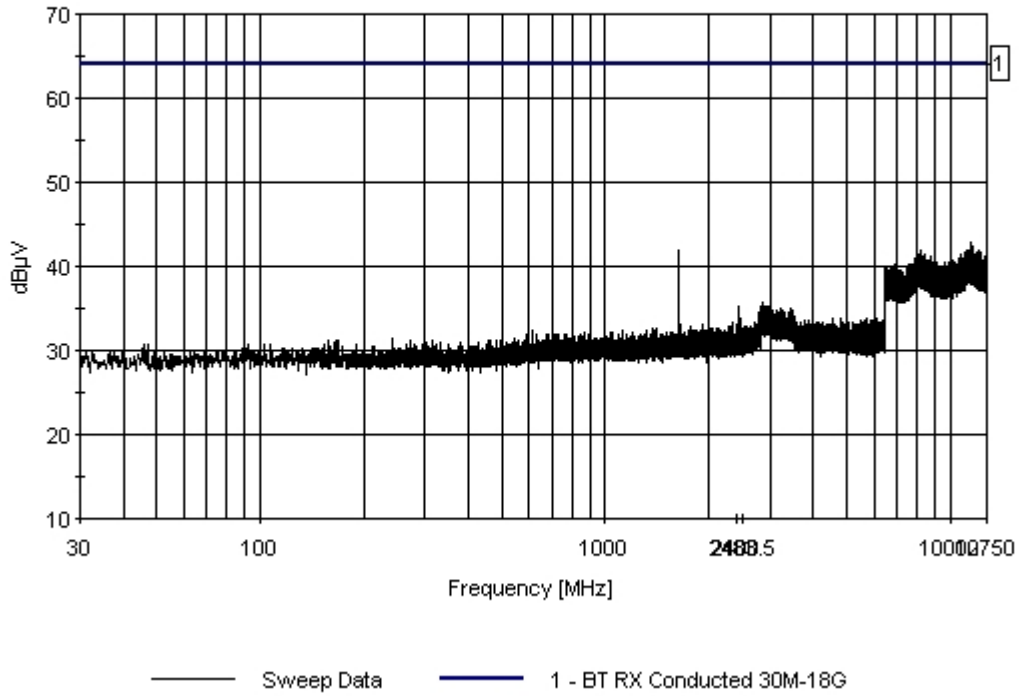
**Transducer Legend:**

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**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	11478.180M	42.9					+0.0	42.9	64.0	-21.1	Black
2	11633.330M	42.3					+0.0	42.3	64.0	-21.7	Black
3	11637.340M	42.1					+0.0	42.1	64.0	-21.9	Black
4	11674.620M	42.1					+0.0	42.1	64.0	-21.9	Black
5	1626.345M	42.0					+0.0	42.0	64.0	-22.0	Black
6	11393.090M	42.0					+0.0	42.0	64.0	-22.0	Black
7	12059.510M	42.0					+0.0	42.0	64.0	-22.0	Black
8	616.336M	32.4					+0.0	32.4	64.0	-31.6	Black
9	866.085M	32.1					+0.0	32.1	64.0	-31.9	Black
10	761.731M	32.0					+0.0	32.0	64.0	-32.0	Black

EMCE Engineering Date: 5/24/2006 Time: 2:37:29 PM Plantronics W/O#: 2512  
BT RX Conducted 30M-18G Test Lead: Black 120V 60Hz Sequence#: 4





## AC LINE CONDUCTED EMISSIONS MEASUREMENT

### AC Line Conducted Emissions Measurement 150 kHz – 30 MHz

<b>EUT</b>	<b>EXPLORER</b>
<b>Test setup</b>	C (conducted – hopping enabled)
<b>Temp, Humidity, Air Pressure</b>	74° F, 30.69
<b>Date of Measurement</b>	5/27/06
<b>Measured by</b>	Bob Cole
<b>Result</b>	PASSED

### CLASS B LIMIT

Frequency Band (MHz)	EN 55022 B Limit (dB $\mu$ V/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

<b>EUT operation mode</b>	Hopping Enabled
<b>EUT channel</b>	Hopping
<b>EUT TX power level</b>	Maximum
<b>EUT operation voltage</b>	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 #: **2489**  
 Test Type: **Conducted Emissions**  
 Equipment: **BT Headset**  
 Manufacturer: **Plantronics**  
 Model: **Explorer**  
 S/N: **N/A**

Date: 5/27/2006  
 Time: 3:40:42 PM  
 Sequence#: 5  
 Tested By: Bob Cole  
 120V 60Hz

#### *Test Equipment:*

Function	S/N	Calibration Date	Cal Due Date	Asset #
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**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Explorer	N/A

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

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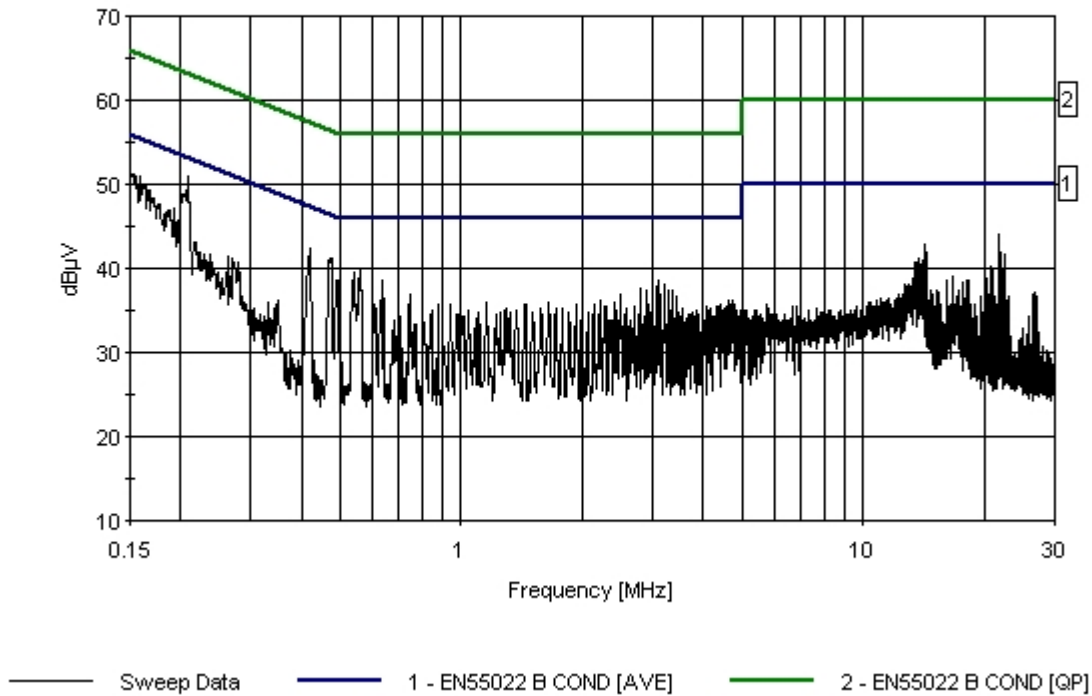
**Transducer Legend:**

T1=Chamber Receive Cable	T2=HP 11947A Transient Limiter
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**Measurement Data:** Reading listed by margin. Test Lead: Line 1

#	Freq MHz	Rdng dB $\mu$ V	T1 dB	T2 dB	Dist dB	Corr dB	Spec dB $\mu$ V	Margin dB	Polar Ant	
1	208.903k	40.7	+0.4	+9.9		+0.0	51.0	53.2	-2.2	Line
2	150.000k	41.2	+0.4	+9.9		+0.0	51.5	56.0	-4.5	Line
3	157.999k	40.6	+0.4	+9.9		+0.0	50.9	55.6	-4.7	Line
4	419.064k	31.9	+0.4	+10.0		+0.0	42.3	47.5	-5.2	Line
5	475.058k	30.8	+0.4	+10.0		+0.0	41.2	46.4	-5.2	Line
6	21.667M	33.1	+0.9	+10.1		+0.0	44.1	50.0	-5.9	Line
7	560.141k	29.6	+0.4	+10.0		+0.0	40.0	46.0	-6.0	Line
8	543.415k	29.1	+0.4	+10.0		+0.0	39.5	46.0	-6.5	Line
9	193.632k	36.8	+0.4	+9.9		+0.0	47.1	53.9	-6.8	Line
10	2.995M	28.7	+0.5	+10.0		+0.0	39.2	46.0	-6.8	Line

EMCE Engineering Plantronics WO#: 2489  
EN55022 B COND [AVE] Test Lead: Line 1 120V 60Hz Sequence#: 5



**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 #: **2489**  
Test Type: **Conducted Emissions**  
Equipment: **BT Headset**  
Manufacturer: Plantronics  
Model: Explorer  
S/N: N/A

Date: 5/27/2006  
Time: 3:37:33 PM  
Sequence#: 4  
Tested By: Bob Cole  
120V 60Hz

***Test Equipment:***

Function	S/N	Calibration Date	Cal Due Date	Asset #
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***Equipment Under Test (\* = EUT):***

Function	Manufacturer	Model #	S/N
BT Headset*	Plantronics	Explorer	N/A

***Support Devices:***

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

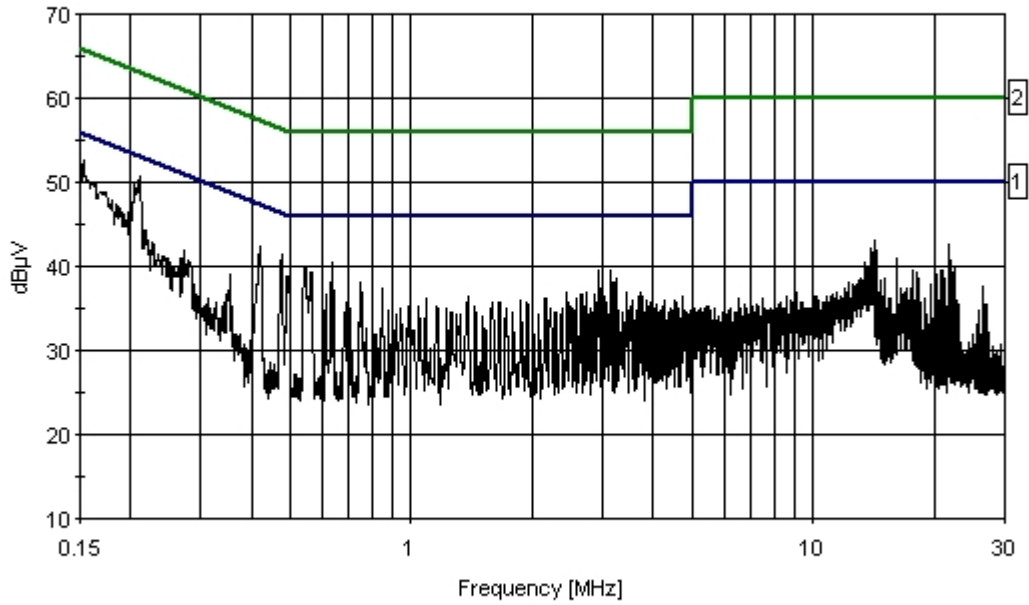
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**Transducer Legend:**

T1=Chamber Receive Cable	T2=HP 11947A Transient Limiter
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#	Freq MHz	Rdng dB $\mu$ V	Reading listed by margin.				Test Lead: Line 2				
			T1 dB	T2 dB	dB	dB	Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant
1	211.085k	40.3	+0.4	+9.9			+0.0	50.6	53.2	-2.6	Line
2	152.909k	42.3	+0.4	+9.9			+0.0	52.6	55.8	-3.2	Line
3	475.058k	31.1	+0.4	+10.0			+0.0	41.5	46.4	-4.9	Line
4	419.064k	31.9	+0.4	+10.0			+0.0	42.3	47.5	-5.2	Line
5	636.497k	30.0	+0.4	+10.0			+0.0	40.4	46.0	-5.6	Line
6	543.415k	29.7	+0.4	+10.0			+0.0	40.1	46.0	-5.9	Line
7	2.935M	29.1	+0.5	+10.0			+0.0	39.6	46.0	-6.4	Line
8	3.148M	29.1	+0.5	+10.0			+0.0	39.6	46.0	-6.4	Line
9	565.958k	28.9	+0.4	+10.0			+0.0	39.3	46.0	-6.7	Line
10	14.269M	32.3	+0.7	+10.0			+0.0	43.0	50.0	-7.0	Line

EMCE Engineering Plantronics W/O#: 2489  
EN55022 B COND [AVE] Test Lead: Line 2 120V 60Hz Sequence#: 4



— Sweep Data      — 1 - EN55022 B COND [AVE]      — 2 - EN55022 B COND [QP]

## 7.0 TEST EQUIPMENT

Name	Manufacturer	Model	Calibrated	Cal. Due Date
Spectrum Analyzer	Hewlett-Packard	8568B	2/1/06	2/1/07
Quasi-Peak Adapter	Hewlett-Packard	85650A	2/1/06	2/1/07
LISN	EMCO	3816/2	6/15/05	6/15/07
Antenna Mast	EMCO	1050		N/A
Rotating Table	EMCO	1060		N/A
Antenna, Biconical	Electro-Metrics	BIA-30	6/17/06	6/17/07
Antenna, Log-periodic	Electro-Metrics	LPA-30	6/17/06	6/17/07
Preamplifier	Hewlett-Packard	8447D	2/1/06	2/1/07
Computer Controller	Fujitsu / EMITest	Lifebook		N/A
EMI Analyzer	Hewlett-Packard	84125B	2/1/06	2/1/07
Oscilloscope	Tektronix	TDS820	10/26/05	10/26/06
Coaxial cable	Own	SMA Male – Reverse SMA Male (Length = 20 cm)	6/1/06	6/1/07
Pre-Amp	Hewlett-Packard	83051A	6/1/06	12/1/06
Pre-Amp	Hewlett-Packard	83017A	6/1/06	12/1/06
High Pass Filter	CMT	9701	6/1/06	12/1/06
Horn Antenna	EMCO	3115	6/1/06	12/1/06
Cable	Hewlett Packard		6/1/06	12/1/06
LISN	EMCO	3810/2	6/15/06	6/15/07
Coaxial cable	Own	N Type – BNC (5 Meters)	6/1/06	6/1/07