Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

Operating Modes Investigated:
No Hop

Data Rates Investigated:
Maximum

Output Power Setting(s) Investigated:
Maximum

Power Input Settings Investigated:
120 VAC, 60 Hz.

Software\Firmware Applied During Test			
Exercise software	Unknown	**Version**	Unknown
Description			
The system was tested using special firmware developed to test all functions of the device during the test. The firmware put the radio into a no-hop mode with a modulated carrier. Transmit channels were selectable between the lowest, a middle, and the highest channels in the operating band.			

EUT and Peripherals			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
EUT - Bluetooth Dongle for Game Pad	Logitech, Inc.	A-0363B Dongle	none
Video Game System	Microsoft, Inc	Xbox	412407321303
Xbox Game Pad	Microsoft	X08-17160	047355112

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Game Pad	PA	1.9	PA	Xbox Game Pad	Video Game System
AC Power	No	2.0	Yes	Video Game System	AC Mains
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Measurement Equipment					
Description	**Manufacturer**	**Model**	**Identifier**	**Last Cal**	**Interval**
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

Requirement: Per 47 CFR 15.247(e), the peak power spectral density conducted from the antenna port of a direct sequence transmitter must not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission.

Configuration: The peak power spectral density measurements were measured with the EUT set to low, mid, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation. Per the procedure outlined in FCC 97-114, the spectrum analyzer was used as follows:

> The emission peak(s) were located and zoom in on within the passband. The resolution bandwidth was set to 3 kHz, the video bandwidth was set to greater than or equal to the resolution bandwidth. The sweep speed was set equal to the span divided by 3 kHz (sweep = (SPAN/3 kHz)). For example, given a span of 1.5 MHz, the sweep should be 1.5 x 106 ÷ 3 x 103 = 500 seconds. External attenuation was used and added to the reading. The following FCC procedure was used for modifying the power spectral density measurements:

"If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 34.8 dB for correction to 3 kHz."

Completed by:

NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/21//2004
Customer:	Logitech, Inc.			Temperature:	70 °F
Attendees:	None	Tested by:	Greg Kiemel	Humidity:	47% RH
Customer Ref. No.:		Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(e)	Year:	2004	Method:	FCC 97-114, ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Meter reading on spectrum analyzer is internally compensated for cable loss and external attenuation.
Power Spectral Density per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction Factor.
Bandwidth Correction Factor = 10*log(3kHz/1Hz) = 34.8 dB

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band

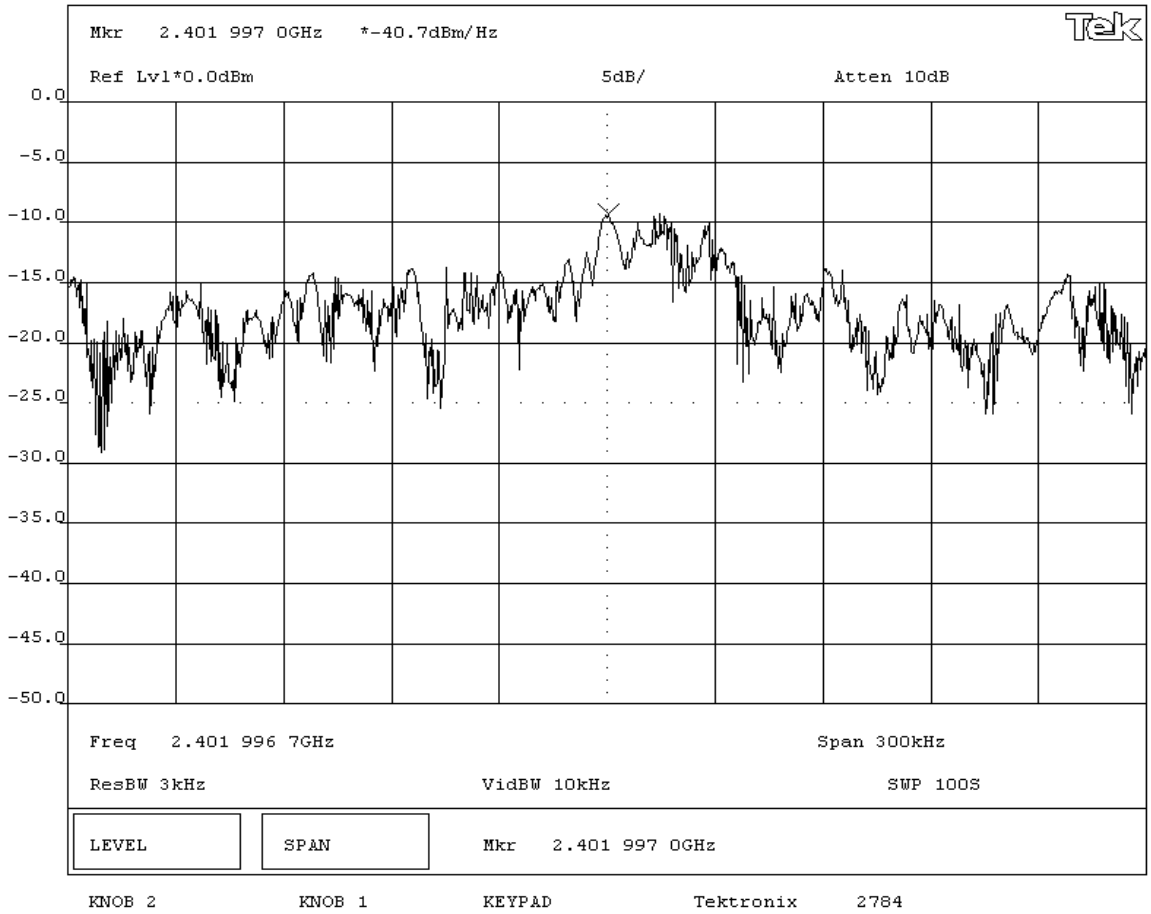
RESULTS	AMPLITUDE
Pass	Power Spectral Density = -5.9 dBm / 3kHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Power Spectral Density - Low Channel



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/21//2004
Customer:	Logitech, Inc.			Temperature:	70 °F
Attendees:	None	Tested by:	Greg Kiemel	Humidity:	47% RH
Customer Ref. No.:		Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(e)	Year:	2004	Method:	FCC 97-114, ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Meter reading on spectrum analyzer is internally compensated for cable loss and external attenuation

Power Spectral Density per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction Factor.

Bandwidth Correction Factor = 10*log(3kHz/1Hz) = 34.8 dB

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band

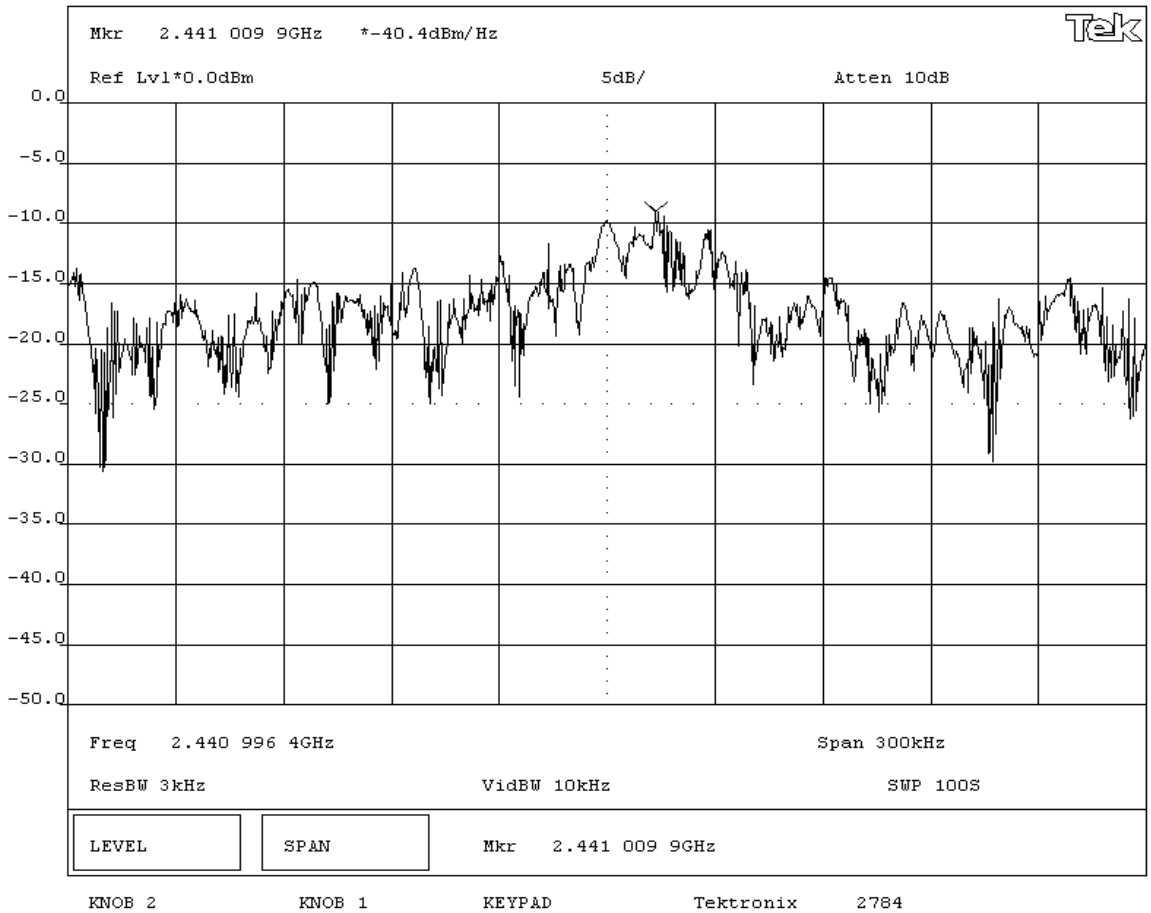
RESULTS	AMPLITUDE
Pass	Power Spectral Density = -5.6 dBm / 3kHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Power Spectral Density - Mid Channel



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/21//2004
Customer:	Logitech, Inc.			Temperature:	70 °F
Attendees:	None	Tested by:	Greg Kiemel	Humidity:	47% RH
Customer Ref. No.:		Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(e)	Year:	2004	Method:	FCC 97-114, ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Meter reading on spectrum analyzer is internally compensated for cable loss and external attenuation

Power Spectral Density per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction Factor.

Bandwidth Correction Factor = 10*log(3kHz/1Hz) = 34.8 dB

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band

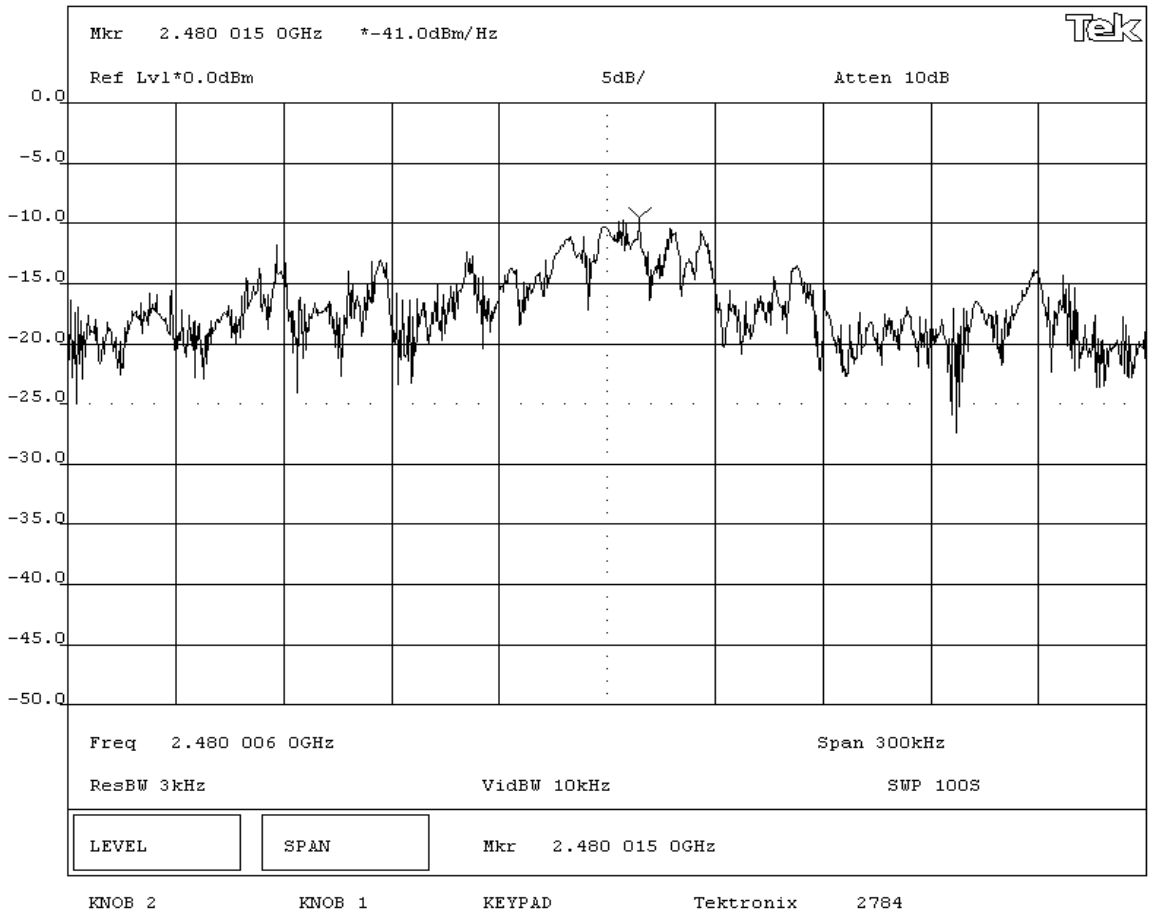
RESULTS	AMPLITUDE
Pass	Power Spectral Density = -6.2 dBm / 3kHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Power Spectral Density - High Channel



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

Operating Modes Investigated:
No Hop

Data Rates Investigated:
Maximum

Output Power Setting(s) Investigated:
Maximum

Power Input Settings Investigated:
120 VAC, 60 Hz.

Frequency Range Investigated			
Start Frequency	30 MHz	**Stop Frequency**	26 GHz

Software\Firmware Applied During Test			
Exercise software	Unknown	**Version**	Unknown
Description			
The system was tested using special firmware developed to test all functions of the device during the test. The firmware put the radio into a no-hop mode with a modulated carrier. Transmit channels were selectable between the lowest, a middle, and the highest channels in the operating band.			

EUT and Peripherals			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Cordless Headset for XBox	Logitech, Inc.	F-0363A	EMC #1
AC/DC adaptor	Logitech, Inc	AU055V150T	None
EUT - Bluetooth Dongle for Game Pad	Logitech, Inc.	A-0363B Dongle	none
Video Game System	Microsoft, Inc	Xbox	441334233606
Xbox Game Pad	Microsoft	X08-17160	047355112
Monitor	Thomson	418XTX807C	4088

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Leads	No	1.8	PA	AC/DC adaptor	Cordless Headset for Xbox
Game Pad	PA	1.9	PA	Xbox Game Pad	Video Game System
AC Power	No	2.0	Yes	Video Game System	AC Mains
Video	Yes	2.6	Yes	Video Game System	Monitor
AC Power	No	1.8	N	Monitor	AC Mains
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Measurement Equipment					
Description	**Manufacturer**	**Model**	**Identifier**	**Last Cal**	**Interval**
High Pass Filter	Micro-Tronics	HPM50111	HFO	04/13/2004	13 mo
Antenna, Biconilog	EMCO	3141	AXE	12/03/2003	24 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	02/05/2004	13 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/05/2004	13 mo
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/23/2003	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/23/2003	13 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	10/08/2003	12 mo
Antenna, Horn	EMCO	3160-08	AHK	NCR	NA
Antenna, Horn	EMCO	3160-09	AHG	NCR	NA
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/08/2003	12 mo
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo

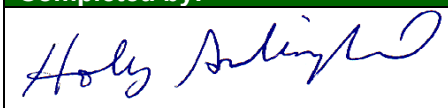
Test Description

Requirement: The field strength of any spurious emissions or modulation products that fall in a restricted band, as defined in 47 CFR 15.205, is measured. The peak level must comply with the limits specified in 47 CFR 15.35(b). The average level (taken with a 10Hz VBW) must comply with the limits specified in 15.209.

Configuration: The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2003). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Bandwidths Used for Measurements			
Frequency Range (MHz)	**Peak Data (kHz)**	**Quasi-Peak Data (kHz)**	**Average Data (kHz)**
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
Measurements were made using the bandwidths and detectors specified. No video filter was used.			

Completed by:



NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	70
Attendees:	None			Humidity:	46%
Cust. Ref. No.:				Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth High Channel

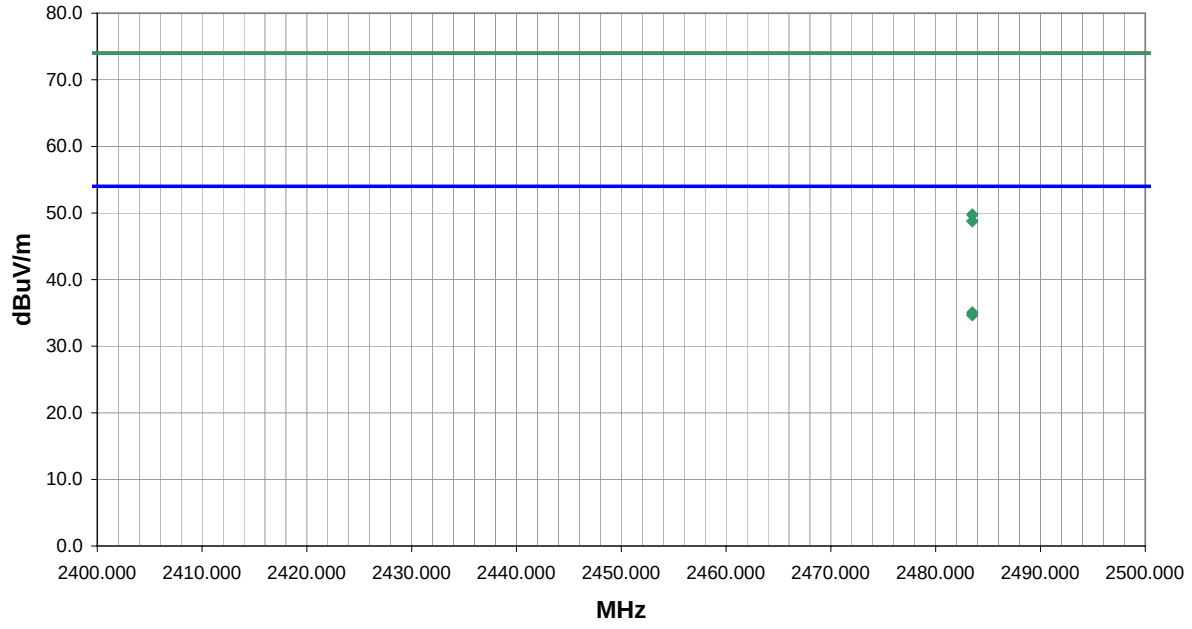
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	1

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
2483.500	12.6	32.0	181.0	1.0	1.0	0.0	H-Horn	AV	-9.5	35.1	54.0	-18.9
2483.500	12.2	32.0	320.0	1.2	1.0	0.0	V-Horn	AV	-9.5	34.7	54.0	-19.3
2483.500	27.3	32.0	320.0	1.2	1.0	0.0	V-Horn	PK	-9.5	49.8	74.0	-24.2
2483.500	26.3	32.0	181.0	1.0	1.0	0.0	H-Horn	PK	-9.5	48.8	74.0	-25.2

NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	70
Attendees:	None			Humidity:	46%
Cust. Ref. No.:				Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

Dongle simultaneously transmitting with Bluetooth headset.

EUT OPERATING MODES

Transmitting Bluetooth High Channel

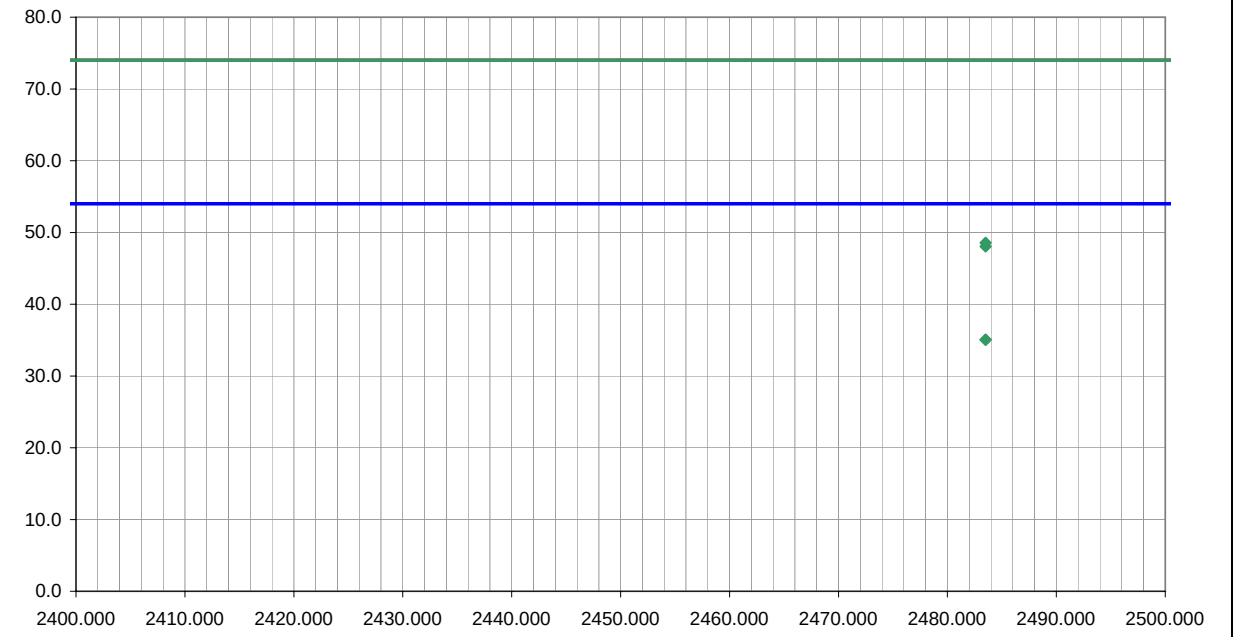
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	2

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
2483.500	12.6	32.0	165.0	1.0	1.0	0.0	H-Horn	AV	-9.5	35.1	54.0	-18.9
2483.500	12.6	32.0	312.0	1.1	1.0	0.0	V-Horn	AV	-9.5	35.1	54.0	-18.9
2483.500	26.1	32.0	312.0	1.1	1.0	0.0	V-Horn	PK	-9.5	48.6	74.0	-25.4
2483.500	25.6	32.0	165.0	1.0	1.0	0.0	H-Horn	PK	-9.5	48.1	74.0	-25.9

NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	70
Attendees:	None			Humidity:	46%
Cust. Ref. No.:				Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth. See comments for channel.

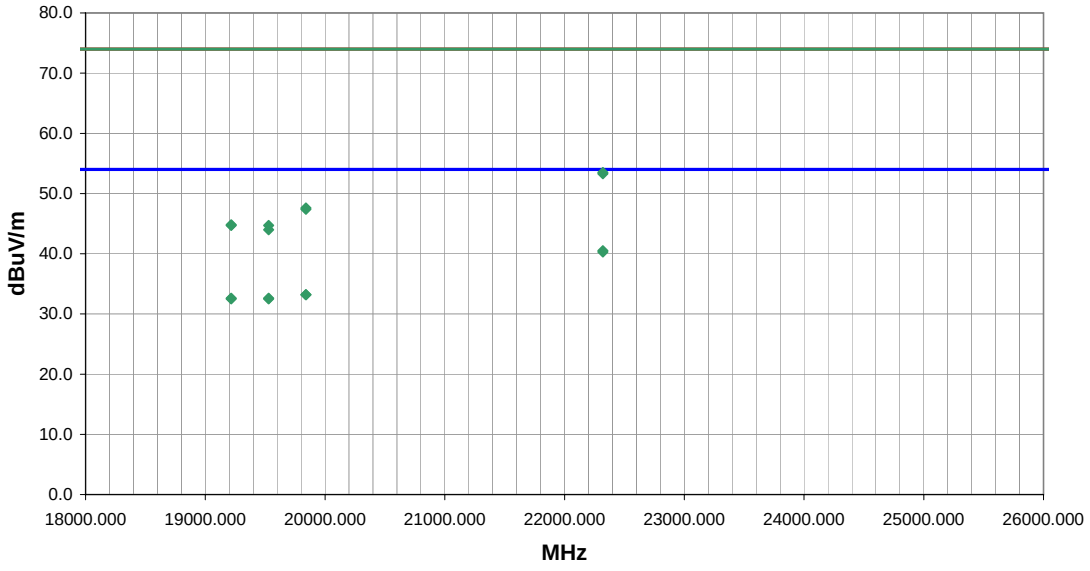
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	3

Other

Tested By: Holly Ashkannejhad



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
22320.000	31.3	9.2	360.0	1.0	3.0	0.0	H-High Horr	AV	0.0	40.5	54.0	-13.5	High channel
22320.000	31.1	9.2	-1.0	1.0	3.0	0.0	V-High Horr	AV	0.0	40.3	54.0	-13.7	High channel
22320.000	44.3	9.2	-1.0	1.0	3.0	0.0	V-High Horr	PK	0.0	53.5	74.0	-20.5	High channel
22320.000	44.1	9.2	360.0	1.0	3.0	0.0	H-High Horr	PK	0.0	53.3	74.0	-20.7	High channel
19840.000	24.3	8.9	52.0	1.1	3.0	0.0	H-High Horr	AV	0.0	33.2	54.0	-20.8	High channel
19840.000	24.3	8.9	81.0	1.0	3.0	0.0	V-High Horr	AV	0.0	33.2	54.0	-20.8	High channel
19528.000	24.2	8.4	21.0	1.0	3.0	0.0	H-High Horr	AV	0.0	32.6	54.0	-21.4	Mid Channel
19216.000	24.8	7.8	-3.0	1.0	3.0	0.0	H-High Horr	AV	0.0	32.6	54.0	-21.4	Low Channel
19216.000	24.7	7.8	362.0	1.0	3.0	0.0	V-High Horr	AV	0.0	32.5	54.0	-21.5	Low Channel
19528.000	24.1	8.4	361.0	1.0	3.0	0.0	V-High Horr	AV	0.0	32.5	54.0	-21.5	Mid Channel
19840.000	38.7	8.9	52.0	1.1	3.0	0.0	H-High Horr	PK	0.0	47.6	74.0	-26.4	High channel
19840.000	38.5	8.9	81.0	1.0	3.0	0.0	V-High Horr	PK	0.0	47.4	74.0	-26.6	High channel
19216.000	37.0	7.8	-3.0	1.0	3.0	0.0	H-High Horr	PK	0.0	44.8	74.0	-29.2	Low Channel
19216.000	36.9	7.8	362.0	1.0	3.0	0.0	V-High Horr	PK	0.0	44.7	74.0	-29.3	Low Channel
19528.000	36.3	8.4	21.0	1.0	3.0	0.0	H-High Horr	PK	0.0	44.7	74.0	-29.3	Mid Channel
19528.000	35.6	8.4	361.0	1.0	3.0	0.0	V-High Horr	PK	0.0	44.0	74.0	-30.0	Mid Channel

NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	66
Attendees:	None			Humidity:	47%
Cust. Ref. No.:				Barometric Pressure	29.96
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth High Channel

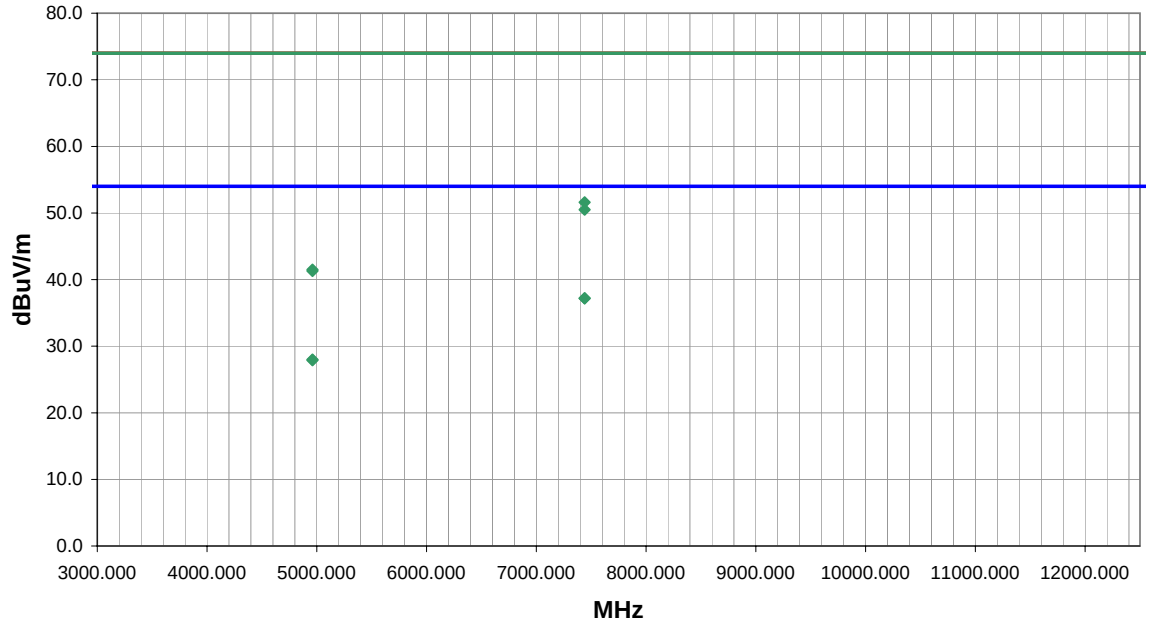
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	4

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
7440.000	26.1	11.1	253.0	3.3	3.0	0.0	H-Horn	AV	0.0	37.2	54.0	-16.8
7440.000	26.1	11.1	24.0	1.2	3.0	0.0	V-Horn	AV	0.0	37.2	54.0	-16.8
7440.000	40.5	11.1	253.0	3.3	3.0	0.0	H-Horn	PK	0.0	51.6	74.0	-22.4
7440.000	39.4	11.1	24.0	1.2	3.0	0.0	V-Horn	PK	0.0	50.5	74.0	-23.5
4960.000	24.4	3.6	276.0	2.8	3.0	0.0	H-Horn	AV	0.0	28.0	54.0	-26.0
4960.000	24.3	3.6	212.0	1.7	3.0	0.0	V-Horn	AV	0.0	27.9	54.0	-26.1
4960.000	37.9	3.6	276.0	2.8	3.0	0.0	H-Horn	PK	0.0	41.5	74.0	-32.5
4960.000	37.7	3.6	212.0	1.7	3.0	0.0	V-Horn	PK	0.0	41.3	74.0	-32.7

NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	66
Attendees:	None			Humidity:	47%
Cust. Ref. No.:				Barometric Pressure	29.96
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

Dongle simultaneously transmitting with Logitech Bluetooth Headset.

EUT OPERATING MODES

Transmitting Bluetooth High Channel

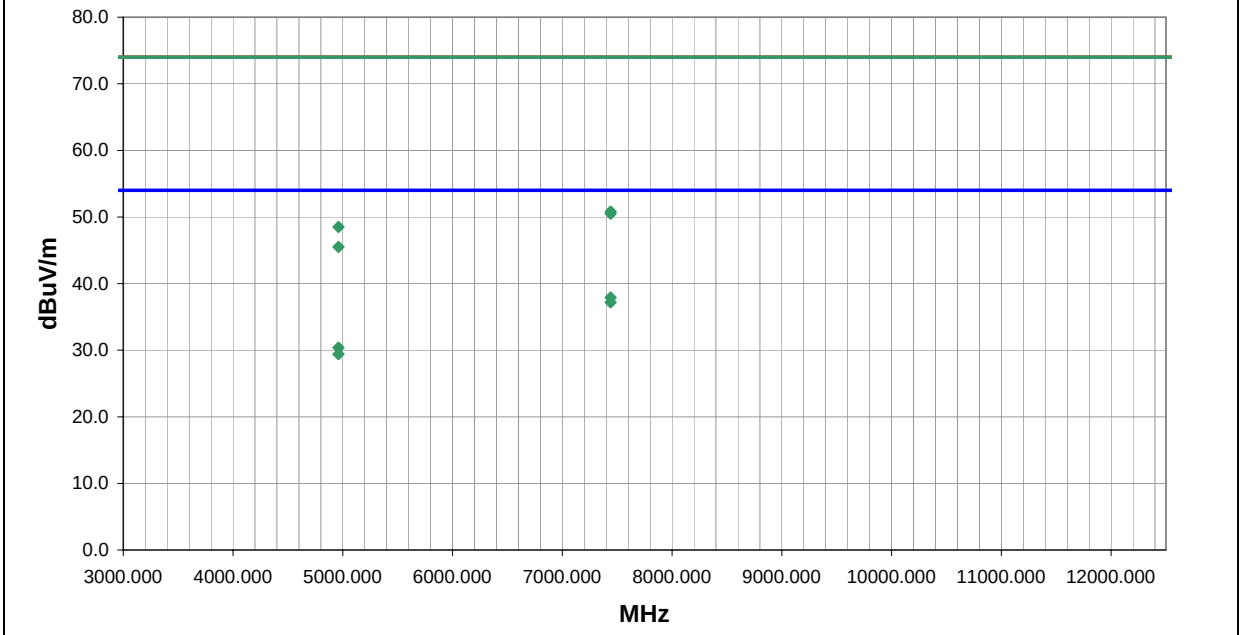
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	5

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
7440.000	26.8	11.1	266.0	3.6	3.0	0.0	H-Horn	AV	0.0	37.9	54.0	-16.1
7440.000	26.1	11.1	332.0	1.2	3.0	0.0	V-Horn	AV	0.0	37.2	54.0	-16.8
7440.000	39.7	11.1	266.0	3.6	3.0	0.0	H-Horn	PK	0.0	50.8	74.0	-23.2
7440.000	39.4	11.1	332.0	1.2	3.0	0.0	V-Horn	PK	0.0	50.5	74.0	-23.5
4960.000	26.8	3.6	222.0	1.3	3.0	0.0	V-Horn	AV	0.0	30.4	54.0	-23.6
4960.000	25.8	3.6	177.0	1.2	3.0	0.0	H-Horn	AV	0.0	29.4	54.0	-24.6
4960.000	44.9	3.6	222.0	1.3	3.0	0.0	V-Horn	PK	0.0	48.5	74.0	-25.5
4960.000	41.9	3.6	177.0	1.2	3.0	0.0	H-Horn	PK	0.0	45.5	74.0	-28.5

NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	66
Attendees:	None			Humidity:	47%
Cust. Ref. No.:				Barometric Pressure	29.96
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth Mid Channel

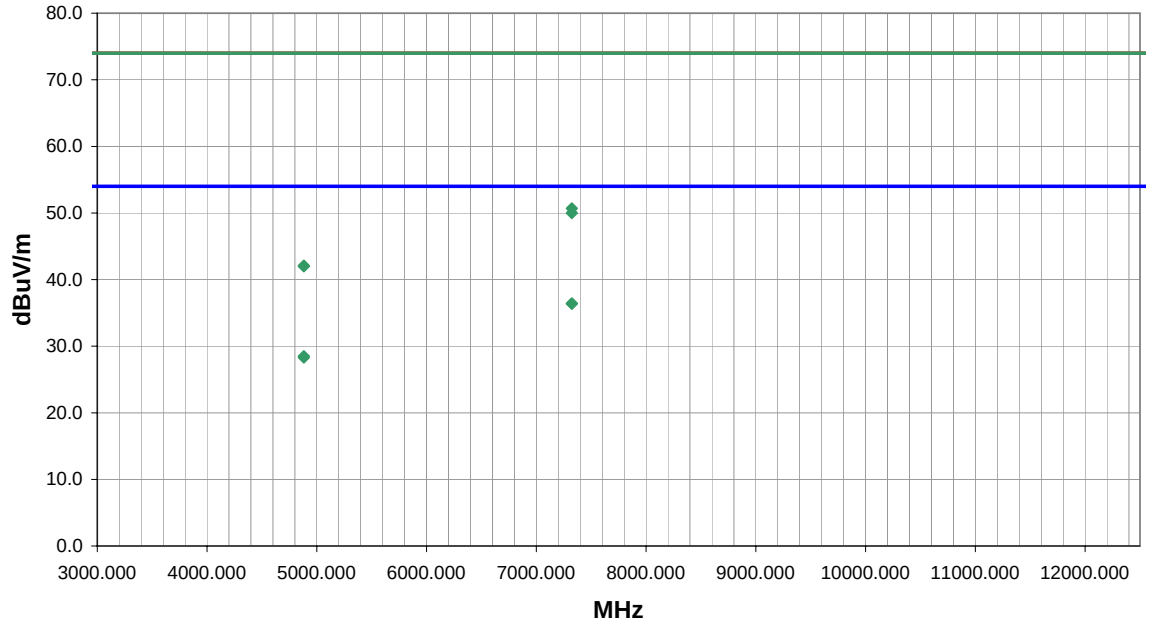
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	6

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
7323.000	25.9	10.5	333.0	1.2	3.0	0.0	V-Horn	AV	0.0	36.4	54.0	-17.6
7323.000	25.9	10.5	216.0	3.1	3.0	0.0	H-Horn	AV	0.0	36.4	54.0	-17.6
7323.000	40.2	10.5	216.0	3.1	3.0	0.0	H-Horn	PK	0.0	50.7	74.0	-23.3
7323.000	39.5	10.5	333.0	1.2	3.0	0.0	V-Horn	PK	0.0	50.0	74.0	-24.0
4882.000	24.9	3.6	295.0	2.0	3.0	0.0	H-Horn	AV	0.0	28.5	54.0	-25.5
4882.000	24.7	3.6	240.0	1.2	3.0	0.0	V-Horn	AV	0.0	28.3	54.0	-25.7
4882.000	38.5	3.6	295.0	2.0	3.0	0.0	H-Horn	PK	0.0	42.1	74.0	-31.9
4882.000	38.4	3.6	240.0	1.2	3.0	0.0	V-Horn	PK	0.0	42.0	74.0	-32.0

NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	66
Attendees:	None			Humidity:	47%
Cust. Ref. No.:				Barometric Pressure	29.96
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

Dongle simultaneously transmitting with Logitech Bluetooth Headset.

EUT OPERATING MODES

Transmitting Bluetooth Mid Channel

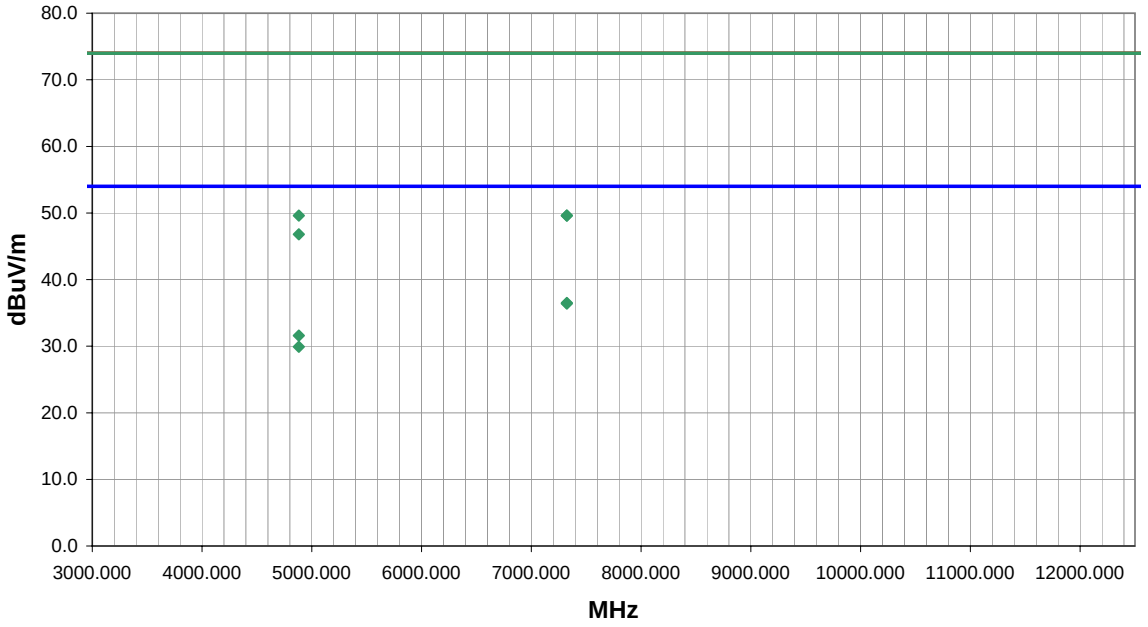
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	7

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
7323.000	26.0	10.5	38.0	1.3	3.0	0.0	H-Horn	AV	0.0	36.5	54.0	-17.5
7323.000	25.9	10.5	296.0	2.0	3.0	0.0	V-Horn	AV	0.0	36.4	54.0	-17.6
4882.000	28.0	3.6	261.0	1.5	3.0	0.0	V-Horn	AV	0.0	31.6	54.0	-22.4
4882.000	26.3	3.6	187.0	1.3	3.0	0.0	H-Horn	AV	0.0	29.9	54.0	-24.1
4882.000	46.0	3.6	261.0	1.5	3.0	0.0	V-Horn	PK	0.0	49.6	74.0	-24.4
7323.000	39.1	10.5	38.0	1.3	3.0	0.0	H-Horn	PK	0.0	49.6	74.0	-24.4
7323.000	39.1	10.5	296.0	2.0	3.0	0.0	V-Horn	PK	0.0	49.6	74.0	-24.4
4882.000	43.2	3.6	187.0	1.3	3.0	0.0	H-Horn	PK	0.0	46.8	74.0	-27.2

NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	66
Attendees:	None			Humidity:	47%
Cust. Ref. No.:				Barometric Pressure	29.96
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth Low Channel

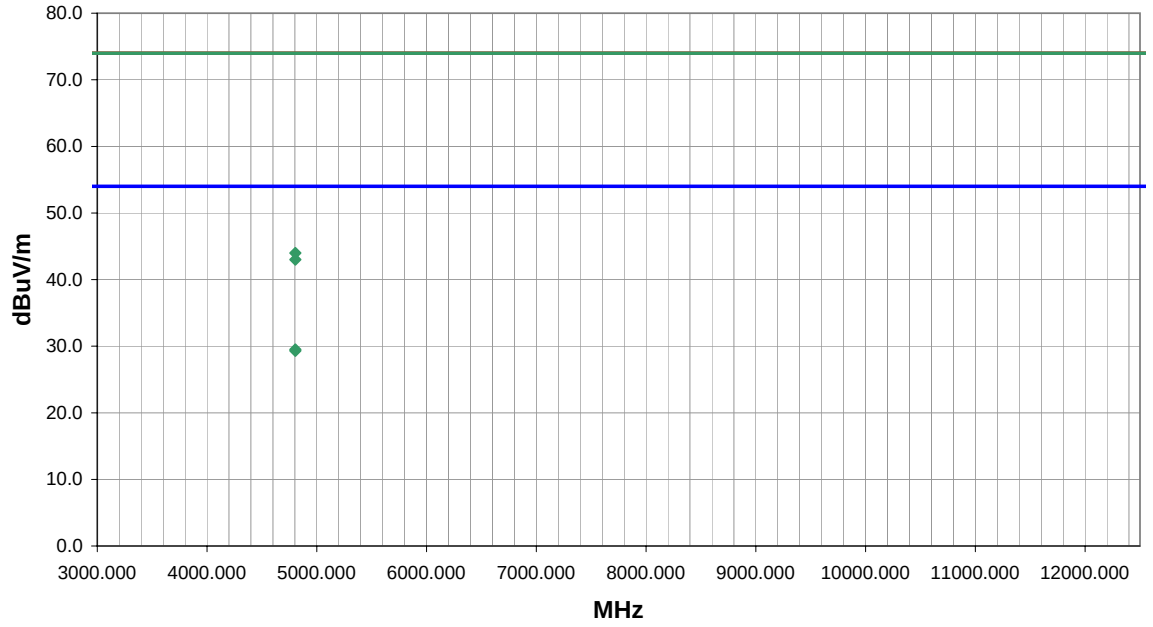
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	8

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
4804.000	26.2	3.3	331.0	1.5	3.0	0.0	V-Horn	AV	0.0	29.5	54.0	-24.5
4804.000	26.0	3.3	55.0	3.3	3.0	0.0	H-Horn	AV	0.0	29.3	54.0	-24.7
4804.000	40.7	3.3	331.0	1.5	3.0	0.0	V-Horn	PK	0.0	44.0	74.0	-30.0
4804.000	39.7	3.3	55.0	3.3	3.0	0.0	H-Horn	PK	0.0	43.0	74.0	-31.0

NORTHWEST EMC

RADIATED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/23/04
Customer:	Logitech, Inc.			Temperature:	66
Attendees:	None			Humidity:	47%
Cust. Ref. No.:				Barometric Pressure	29.96
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.247(d) Spurious Radiated Emissions	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

Dongle simultaneously transmitting with Logitech Bluetooth Headset.

EUT OPERATING MODES

Transmitting Bluetooth Low Channel

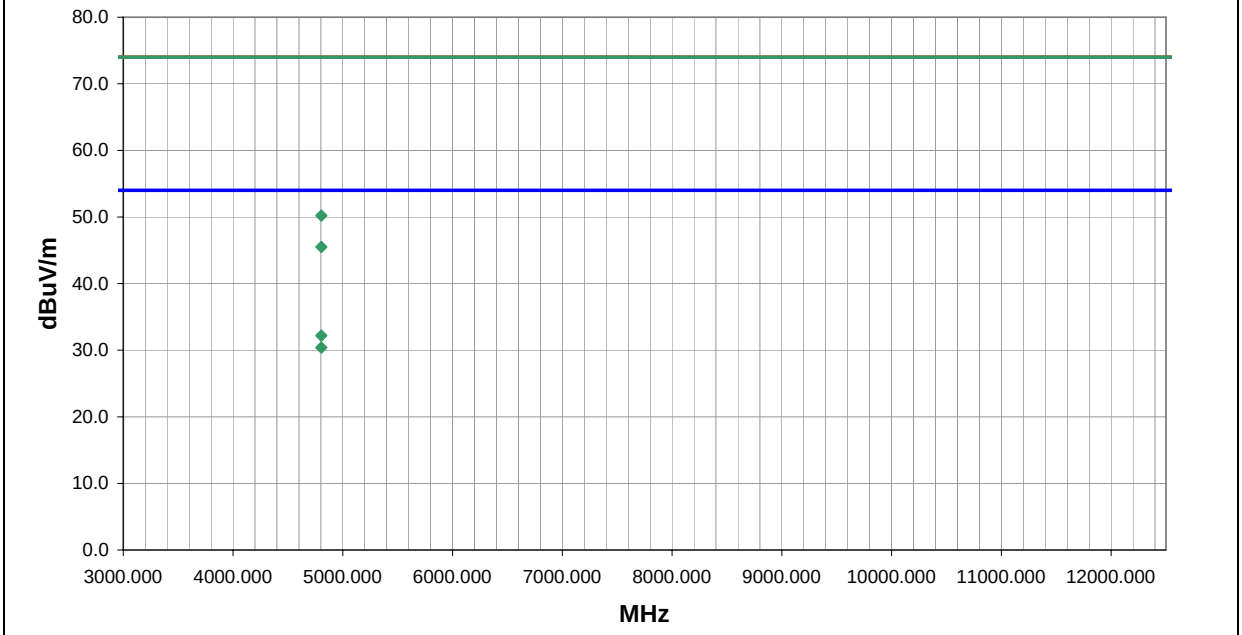
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	9

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
4804.000	28.9	3.3	209.0	1.1	3.0	0.0	V-Horn	AV	0.0	32.2	54.0	-21.8
4804.000	27.1	3.3	182.0	1.3	3.0	0.0	H-Horn	AV	0.0	30.4	54.0	-23.6
4804.000	46.9	3.3	209.0	1.1	3.0	0.0	V-Horn	PK	0.0	50.2	74.0	-23.8
4804.000	42.2	3.3	182.0	1.3	3.0	0.0	H-Horn	PK	0.0	45.5	74.0	-28.5


NORTHWEST
EMC
XBOX


NORTHWEST
EMC


Logitech
XBOX
Microsoft


NORTHWEST
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Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

Operating Modes Investigated:
No Hop

Data Rates Investigated:
Maximum

Output Power Setting(s) Investigated:
Maximum

Power Input Settings Investigated:
120VAC, 60Hz

Software\Firmware Applied During Test			
Exercise software	Unknown	**Version**	Unknown
Description			
The system was tested using special firmware developed to test all functions of the device during the test. The firmware put the radio into a no-hop mode with a modulated carrier. Transmit channels were selectable between the lowest, a middle, and the highest channels in the operating band.			

EUT and Peripherals			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
EUT - Bluetooth Dongle for Game Pad	Logitech, Inc.	A-0363B Dongle	none
Video Game System	Microsoft, Inc	Xbox	441334233606
Xbox Game Pad	Microsoft	X08-17160	047355112
Monitor	Thomson	418XTX807C	4088

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Game Pad	PA	1.9	PA	Xbox Game Pad	Video Game System
AC Power	No	2.0	Yes	Video Game System	AC Mains
Video	Yes	2.6	Yes	Video Game System	Monitor
AC Power	No	1.8	N	Monitor	AC Mains
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

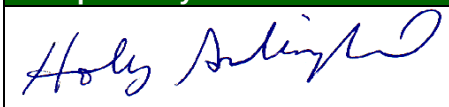
Measurement Equipment					
Description	**Manufacturer**	**Model**	**Identifier**	**Last Cal**	**Interval**
LISN	Solar	9252-50-R-24-BNC	LIN	12/16/2003	13 mo
LISN	Solar	9252-50-R-24-BNC	LIO	04/30/2004	12 mo
High Pass Filter	TTE	H97-100k-50-720B	HFC	02/01/2004	13 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/23/2003	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/23/2003	13 mo

Test Description

Requirement: Per 47 15.207(c), if the EUT is connected to the AC power line indirectly, obtaining its power from another device that is connected to the AC power line, then it should be tested to demonstrate compliance with the conducted limits of 15.207.

Configuration: The EUT will be powered from a device that could be connected to the AC power line. Therefore, the measurements were made on the device used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at the lowest, the highest, and a middle channel in the operational band. The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.4-2003.

Completed by:



NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B	Work Order:	LABT0109
Serial Number:		Date:	10/22/04
Customer:	Logitech, Inc.	Temperature:	70
Attendees:	None	Humidity:	46%
Cust. Ref. No.:		Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power: 120VAC, 60Hz	Job Site: EV01

TEST SPECIFICATIONS

Specification:	FCC 15.207	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth Low Channel

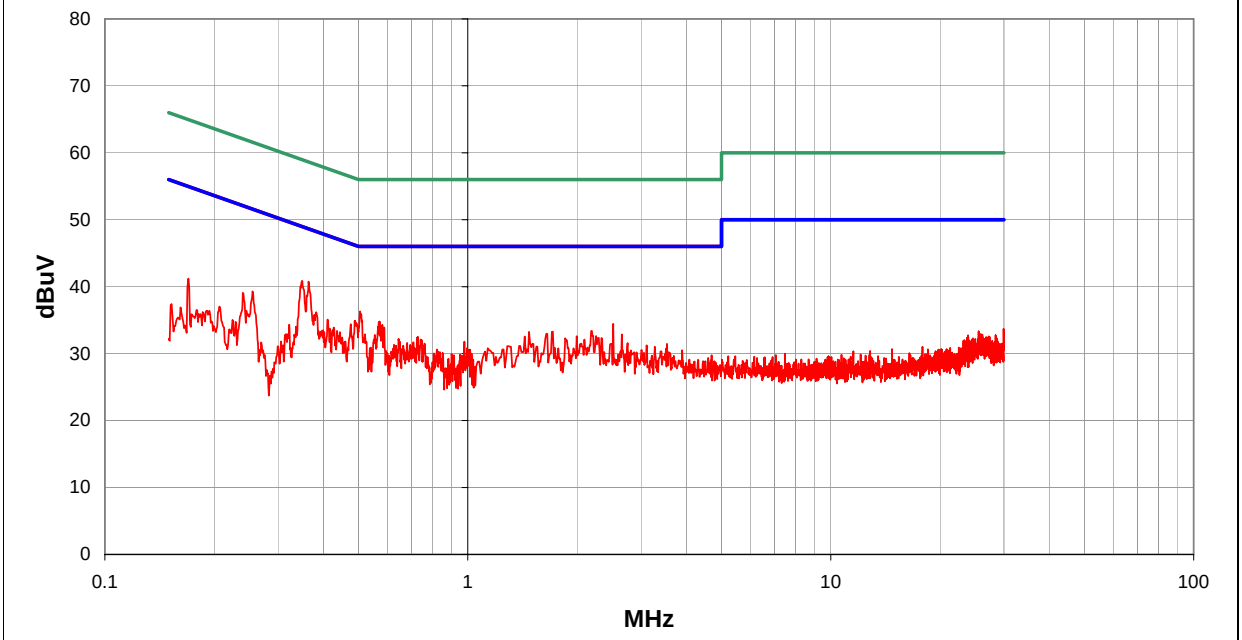
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	N	1

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.364	20.6			0.0	0.2	20.0				40.8	48.6	-7.9
0.350	20.7			0.0	0.1	20.0				40.8	49.0	-8.1
0.505	16.1			0.0	0.2	20.0				36.3	46.0	-9.7
0.571	14.6			0.0	0.2	20.0				34.8	46.0	-11.2
0.488	14.7			0.0	0.2	20.0				34.9	46.2	-11.3
2.516	14.0			0.0	0.5	20.0				34.5	46.0	-11.5
0.581	14.1			0.0	0.2	20.0				34.3	46.0	-11.7
0.476	14.2			0.0	0.2	20.0				34.4	46.4	-12.0
0.588	13.7			0.0	0.2	20.0				33.9	46.0	-12.1
0.255	19.1			0.0	0.2	20.0				39.3	51.6	-12.3
0.411	14.9			0.0	0.2	20.0				35.1	47.6	-12.5
2.196	13.0			0.0	0.4	20.0				33.4	46.0	-12.6
1.715	12.9			0.0	0.4	20.0				33.3	46.0	-12.7
1.475	12.9			0.0	0.3	20.0				33.2	46.0	-12.8
0.240	18.9			0.0	0.2	20.0				39.1	52.1	-13.0
1.655	12.6			0.0	0.4	20.0				33.0	46.0	-13.0
2.656	12.4			0.0	0.5	20.0				32.9	46.0	-13.1
0.554	12.6			0.0	0.2	20.0				32.8	46.0	-13.2
2.256	12.2			0.0	0.4	20.0				32.6	46.0	-13.4

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/22/04
Customer:	Logitech, Inc.			Temperature:	70
Attendees:	None			Humidity:	46%
Cust. Ref. No.:				Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.207	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth Low Channel

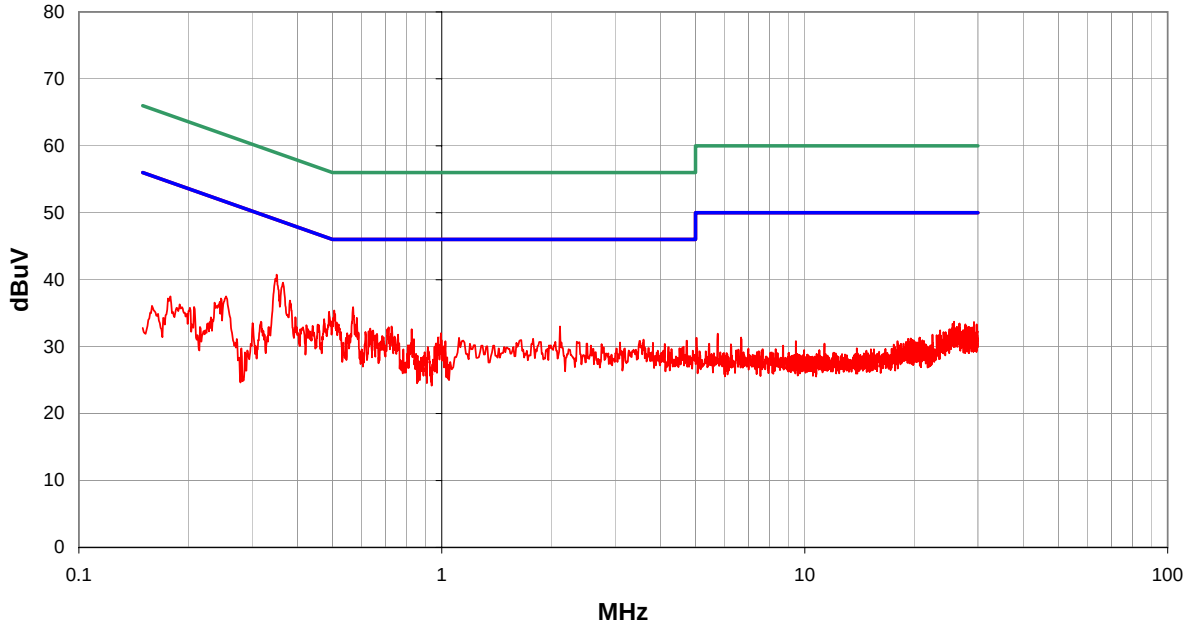
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	L1	2

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.351	20.6			0.0	0.2	20.0				40.8	48.9	-8.2
0.365	19.4			0.0	0.2	20.0				39.6	48.6	-9.0
0.569	15.7			0.0	0.2	20.0				35.9	46.0	-10.1
0.506	15.2			0.0	0.2	20.0				35.4	46.0	-10.6
0.489	15.0			0.0	0.2	20.0				35.2	46.2	-11.0
0.381	16.7			0.0	0.2	20.0				36.9	48.3	-11.4
0.583	14.1			0.0	0.2	20.0				34.3	46.0	-11.7
0.474	13.9			0.0	0.2	20.0				34.1	46.4	-12.3
2.116	12.6			0.0	0.4	20.0				33.0	46.0	-13.0
0.727	12.8			0.0	0.2	20.0				33.0	46.0	-13.0
0.713	12.7			0.0	0.2	20.0				32.9	46.0	-13.1
0.635	12.5			0.0	0.2	20.0				32.7	46.0	-13.3
0.826	12.4			0.0	0.2	20.0				32.6	46.0	-13.4
0.455	13.1			0.0	0.2	20.0				33.3	46.8	-13.5
0.395	14.2			0.0	0.2	20.0				34.4	48.0	-13.6
0.647	12.2			0.0	0.2	20.0				32.4	46.0	-13.6
0.629	12.1			0.0	0.2	20.0				32.3	46.0	-13.7
0.616	12.0			0.0	0.2	20.0				32.2	46.0	-13.8
0.441	12.9			0.0	0.2	20.0				33.1	47.0	-13.9

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B	Work Order:	LABT0109
Serial Number:		Date:	10/22/04
Customer:	Logitech, Inc.	Temperature:	70
Attendees:	None	Humidity:	46%
Cust. Ref. No.:		Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power: 120VAC, 60Hz	Job Site: EV01

TEST SPECIFICATIONS

Specification:	FCC 15.207	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth Mid Channel

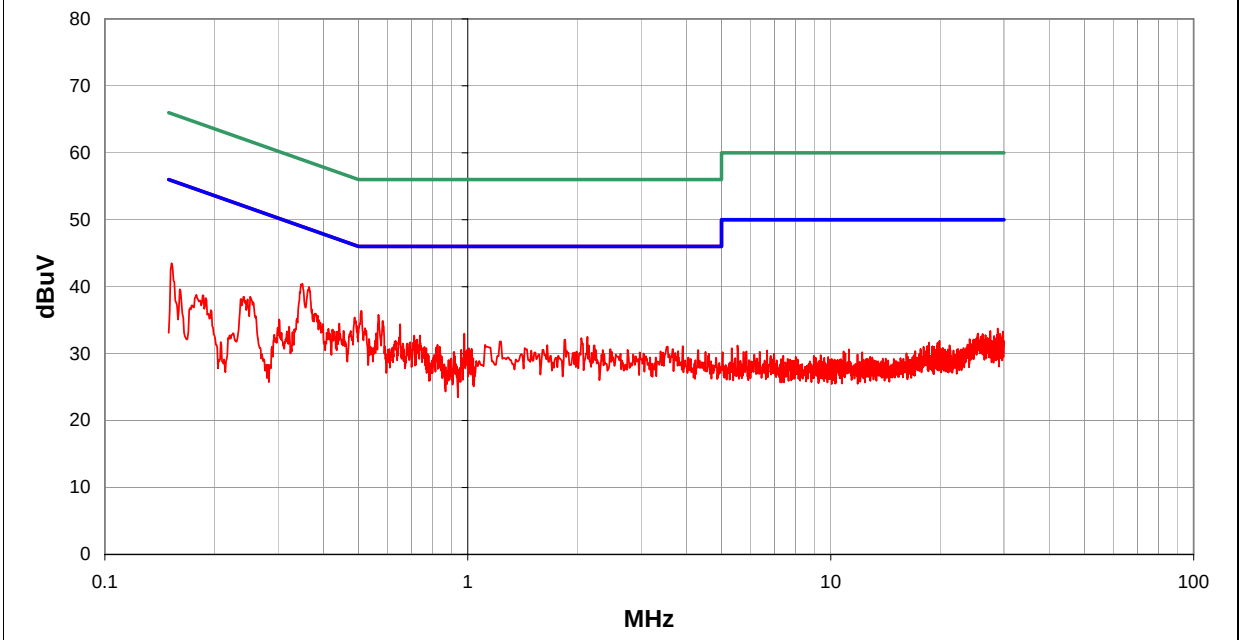
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	L1	3

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.350	20.3			0.0	0.1	20.0				40.4	49.0	-8.5
0.365	19.8			0.0	0.2	20.0				40.0	48.6	-8.6
0.509	16.2			0.0	0.2	20.0				36.4	46.0	-9.6
0.568	15.6			0.0	0.2	20.0				35.8	46.0	-10.2
0.488	15.2			0.0	0.2	20.0				35.4	46.2	-10.8
0.583	14.7			0.0	0.2	20.0				34.9	46.0	-11.1
0.650	14.2			0.0	0.2	20.0				34.4	46.0	-11.6
0.153	23.4			0.0	0.1	20.0				43.5	55.9	-12.4
0.443	14.3			0.0	0.2	20.0				34.5	47.0	-12.5
0.559	12.8			0.0	0.2	20.0				33.0	46.0	-13.0
0.978	12.7			0.0	0.3	20.0				33.0	46.0	-13.0
0.476	13.2			0.0	0.2	20.0				33.4	46.4	-13.0
0.252	18.3			0.0	0.2	20.0				38.5	51.7	-13.2
0.712	12.5			0.0	0.2	20.0				32.7	46.0	-13.3
0.738	12.5			0.0	0.2	20.0				32.7	46.0	-13.3
0.454	13.2			0.0	0.2	20.0				33.4	46.8	-13.4
2.136	12.1			0.0	0.4	20.0				32.5	46.0	-13.5
0.242	18.3			0.0	0.2	20.0				38.5	52.0	-13.6
2.056	11.9			0.0	0.4	20.0				32.3	46.0	-13.7

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/22/04
Customer:	Logitech, Inc.			Temperature:	70
Attendees:	None			Humidity:	46%
Cust. Ref. No.:				Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.207	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth Mid Channel

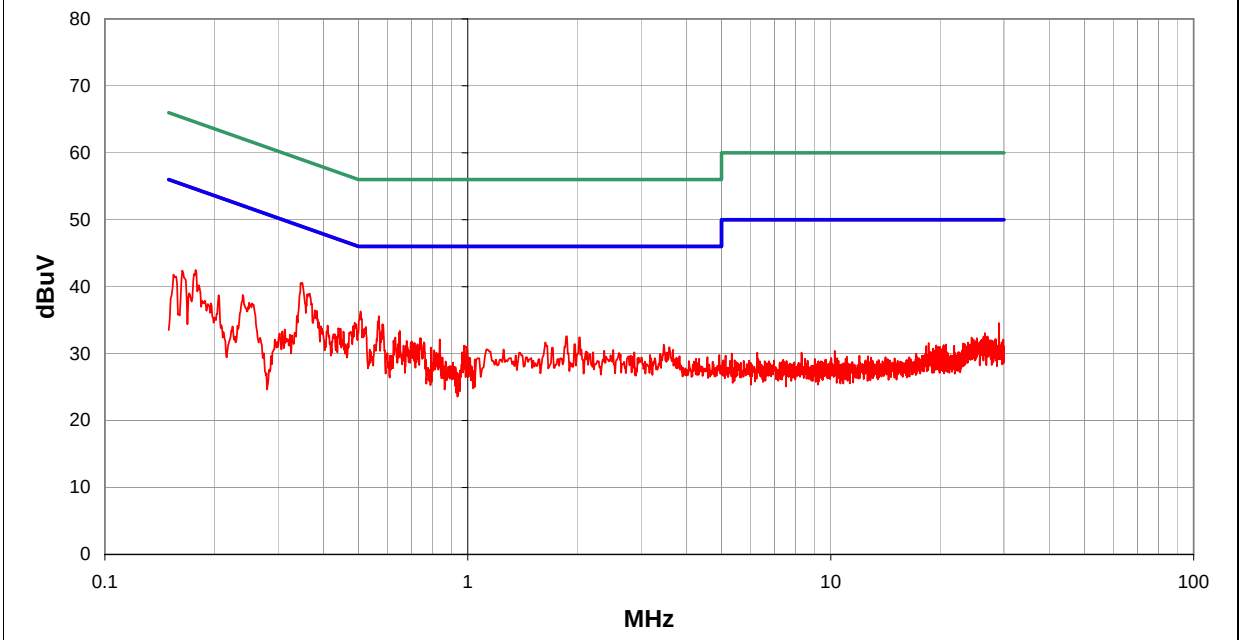
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	N	4

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.350	20.4			0.0	0.1	20.0				40.5	49.0	-8.4
0.367	18.8			0.0	0.2	20.0				39.0	48.6	-9.6
0.506	16.1			0.0	0.2	20.0				36.3	46.0	-9.7
0.568	15.4			0.0	0.2	20.0				35.6	46.0	-10.4
0.582	14.2			0.0	0.2	20.0				34.4	46.0	-11.6
0.488	14.4			0.0	0.2	20.0				34.6	46.2	-11.6
0.178	22.4			0.0	0.1	20.0				42.5	54.6	-12.1
0.649	13.2			0.0	0.2	20.0				33.4	46.0	-12.6
0.164	22.3			0.0	0.1	20.0				42.4	55.3	-12.9
0.647	12.9			0.0	0.2	20.0				33.1	46.0	-12.9
0.446	13.5			0.0	0.2	20.0				33.7	46.9	-13.2
0.440	13.6			0.0	0.2	20.0				33.8	47.1	-13.3
0.240	18.6			0.0	0.2	20.0				38.8	52.1	-13.3
1.875	12.2			0.0	0.4	20.0				32.6	46.0	-13.4
0.411	14.0			0.0	0.2	20.0				34.2	47.6	-13.4
0.454	13.1			0.0	0.2	20.0				33.3	46.8	-13.5
2.036	12.0			0.0	0.4	20.0				32.4	46.0	-13.6
0.631	12.2			0.0	0.2	20.0				32.4	46.0	-13.6
0.739	12.1			0.0	0.2	20.0				32.3	46.0	-13.7

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B			Work Order:	LABT0109
Serial Number:				Date:	10/22/04
Customer:	Logitech, Inc.			Temperature:	70
Attendees:	None			Humidity:	46%
Cust. Ref. No.:				Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power:	120VAC, 60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.207	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth High Channel

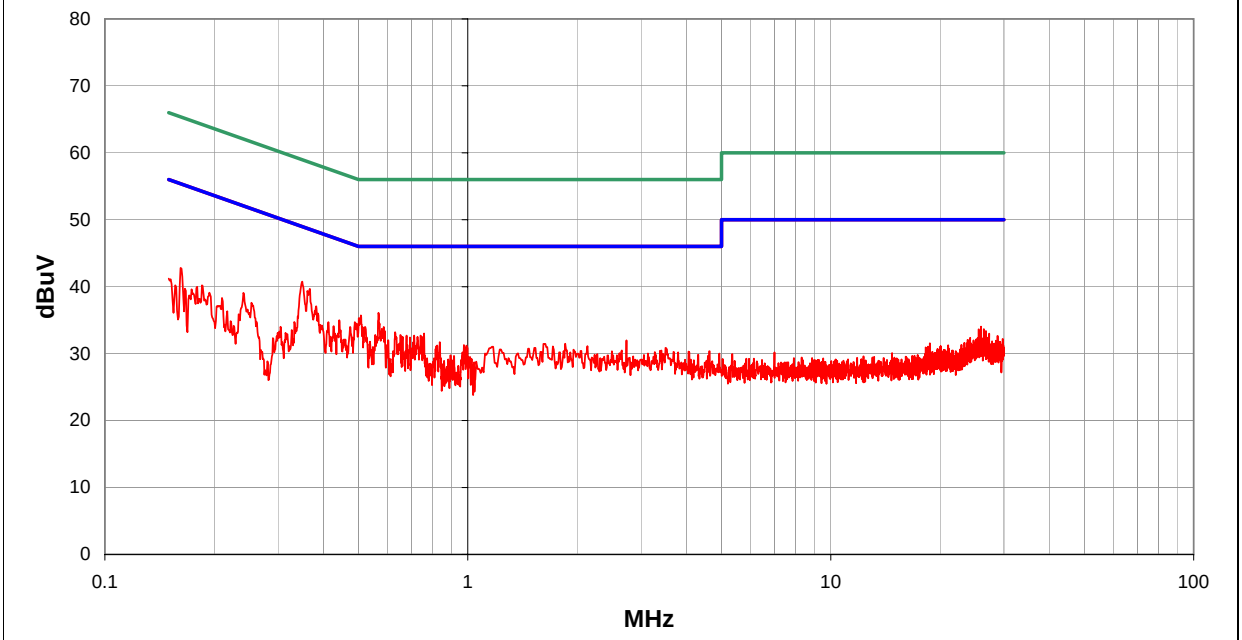
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	N	5

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.350	20.6			0.0	0.1	20.0				40.7	49.0	-8.2
0.367	19.5			0.0	0.2	20.0				39.7	48.6	-8.9
0.568	15.9			0.0	0.2	20.0				36.1	46.0	-9.9
0.507	15.5			0.0	0.2	20.0				35.7	46.0	-10.3
0.382	16.9			0.0	0.2	20.0				37.1	48.2	-11.1
0.488	14.5			0.0	0.2	20.0				34.7	46.2	-11.5
0.522	13.8			0.0	0.2	20.0				34.0	46.0	-12.0
0.586	13.8			0.0	0.2	20.0				34.0	46.0	-12.0
0.443	14.8			0.0	0.2	20.0				35.0	47.0	-12.0
0.474	13.8			0.0	0.2	20.0				34.0	46.4	-12.4
0.162	22.7			0.0	0.1	20.0				42.8	55.4	-12.6
0.631	13.0			0.0	0.2	20.0				33.2	46.0	-12.8
0.413	14.5			0.0	0.2	20.0				34.7	47.6	-12.9
0.241	18.9			0.0	0.2	20.0				39.1	52.1	-13.0
0.757	12.8			0.0	0.2	20.0				33.0	46.0	-13.0
0.652	12.6			0.0	0.2	20.0				32.8	46.0	-13.2
0.427	13.9			0.0	0.2	20.0				34.1	47.3	-13.2
0.678	12.5			0.0	0.2	20.0				32.7	46.0	-13.3
0.712	12.5			0.0	0.2	20.0				32.7	46.0	-13.3

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df4.4 10/22/2004

EUT:	A-0363B	Work Order:	LABT0109
Serial Number:		Date:	10/22/04
Customer:	Logitech, Inc.	Temperature:	70
Attendees:	None	Humidity:	46%
Cust. Ref. No.:		Barometric Pressure	30.01
Tested by:	Holly Ashkannejhad	Power: 120VAC, 60Hz	Job Site: EV01

TEST SPECIFICATIONS

Specification:	FCC 15.207	Year:	2004
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

Transmitting Bluetooth High Channel

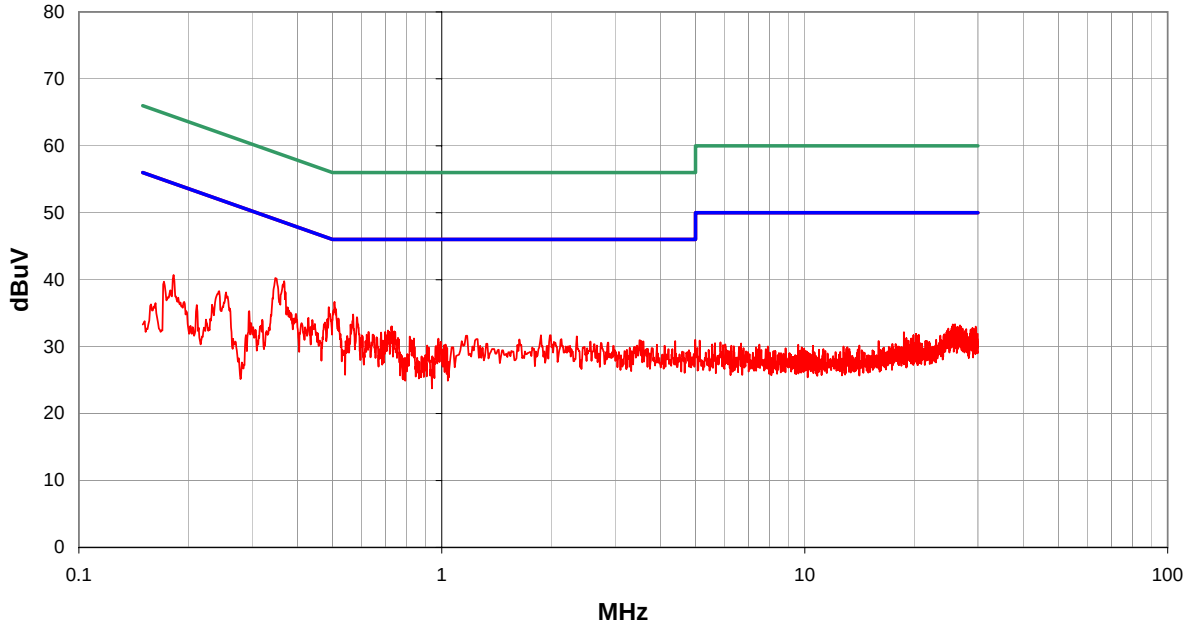
DEVIATIONS FROM TEST STANDARD

No deviations.

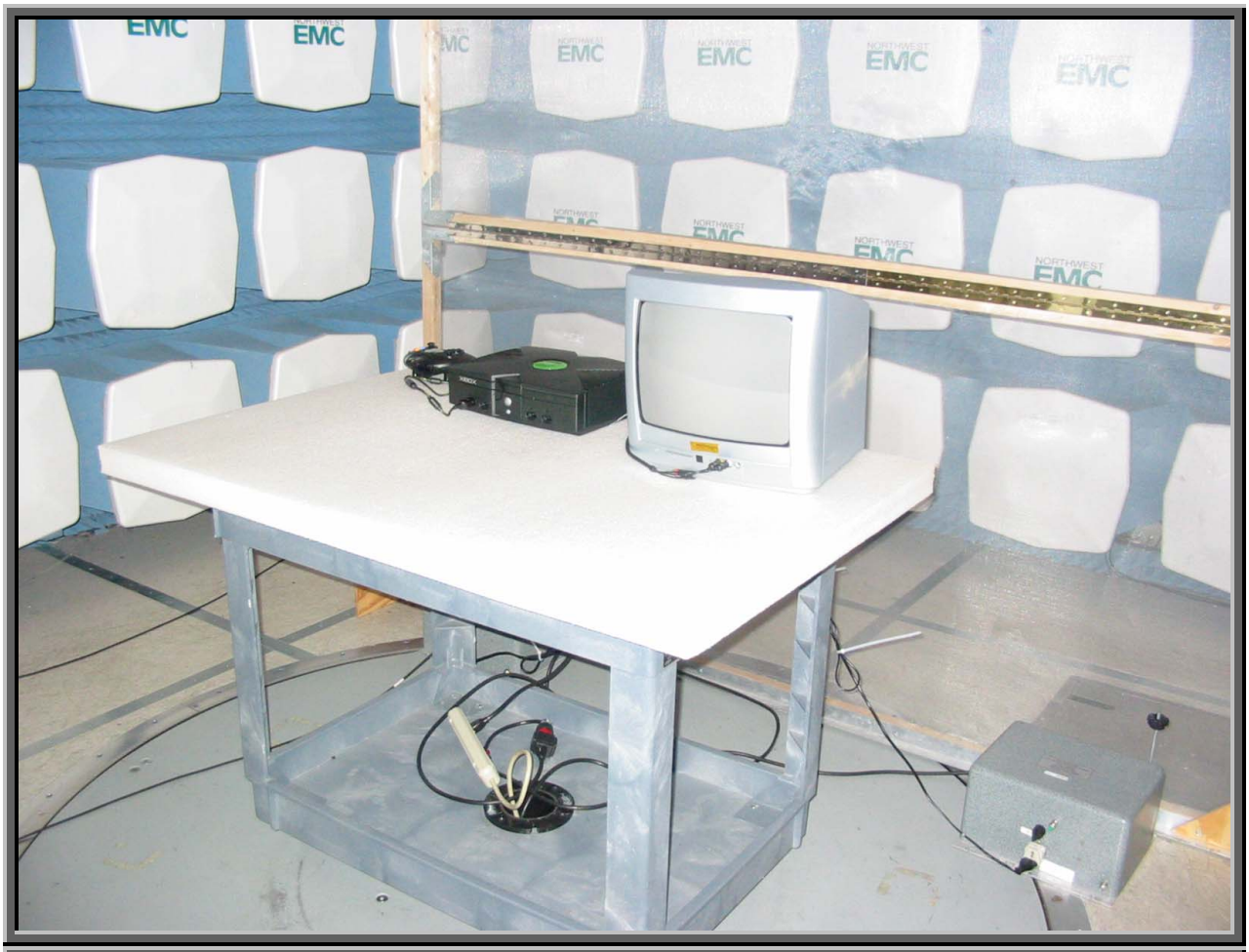
RESULTS	Line	Run #
Pass	L1	6

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.348	20.1			0.0	0.1	20.0				40.2	49.0	-8.8
0.368	19.6			0.0	0.2	20.0				39.8	48.6	-8.8
0.506	16.5			0.0	0.2	20.0				36.7	46.0	-9.3
0.488	15.7			0.0	0.2	20.0				35.9	46.2	-10.3
0.569	14.6			0.0	0.2	20.0				34.8	46.0	-11.2
0.584	14.2			0.0	0.2	20.0				34.4	46.0	-11.6
0.477	13.4			0.0	0.2	20.0				33.6	46.4	-12.8
0.429	14.1			0.0	0.2	20.0				34.3	47.3	-13.0
0.726	12.8			0.0	0.2	20.0				33.0	46.0	-13.0
0.397	14.7			0.0	0.2	20.0				34.9	47.9	-13.0
0.440	13.8			0.0	0.2	20.0				34.0	47.1	-13.1
0.254	17.9			0.0	0.2	20.0				38.1	51.6	-13.5
0.711	12.2			0.0	0.2	20.0				32.4	46.0	-13.6
0.182	20.6			0.0	0.1	20.0				40.7	54.4	-13.7
0.244	18.1			0.0	0.2	20.0				38.3	52.0	-13.7
0.739	12.1			0.0	0.2	20.0				32.3	46.0	-13.7
0.628	12.0			0.0	0.2	20.0				32.2	46.0	-13.8
0.698	12.0			0.0	0.2	20.0				32.2	46.0	-13.8
0.680	11.9			0.0	0.2	20.0				32.1	46.0	-13.9


EMC


EMC

BLUETOOTH APPROVALS

FCC Procedure Received from Joe Dichoso on 2-15-02

The following exhibit indicates the FCC Spread Spectrum requirements in Section 15.247 for devices meeting the Bluetooth Specifications in the 2.4 GHz band as of February 2001 operating in the USA. The purpose of this exhibit is to help expedite the approval process for Bluetooth devices. This exhibit provides items that vary for each device and also provides a list of items that are common to Bluetooth devices that explains the remaining requirements. The list of common items can be submitted for each application for equipment authorization. This exhibit only specifies requirements in Section 15.247, requirements in other rule Sections for intentional radiators such as in Section 15.203 or 15.207 must be also be addressed. A Bluetooth device is a FHSS transmitter in the data mode and applies as a Hybrid spread spectrum device in the acquisition mode.

For each individual device, the following items, 1-7 will vary from one device to another and must be submitted.

1) The occupied bandwidth in Section 15.247(a)(1)(ii).
2) Conducted output power specified in Section 15.247(b)(1).
3) EIRP limit in Section 15.247(b)(3).
4) RF safety requirement in Section 15.247(b)(4)
5) Spurious emission limits in Section 15.247(c).
6) Processing gain and requirements for Hybrids in Section 15.247(f) in the acquisition mode.
7) Power spectral density requirement in Section 15.247(f) in the acquisition mode.

For all devices, the following items, 1-12, are common to all Bluetooth devices and will not vary from one device to another. This list can be copied into the filing.

1 Output power and channel separation of a Bluetooth device in the different operating modes:

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device don't influence the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters.
Only a different hopping sequence will be used. For this reason, the RF parameters in one op-mode is sufficient.

2 Frequency range of a Bluetooth device:

The maximum frequency of the device is: **2402 – 2480 M**Hz.
This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for devices which will be operated in the USA. Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification must **not be** supported by the device.

3 Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organized in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from it's BD address which is unique for every Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

4 Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode:
40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67,
56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59,
72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75,
09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06,
01, 51, 03, 55, 05, 04

5 Equally average use of frequencies in data mode and short transmissions:

The generation of the hopping sequence in connection mode depends essentially on two input values:
1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS. The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronization with other units, only the offsets are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 µs. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.
Regarding short transmissions, the Bluetooth system has the following behavior:
The first connection between the two devices is established, a hopping sequence is generated. For transmitting the wanted data, the complete hopping sequence is not used and the connection ends. The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 µs). The hopping sequence will always differ from the first one.

6 Receiver input bandwidth, synchronization and repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz.
In every connection, one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single or multi-slot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing is according to the packet type of the connection. Also, the slave of the connection uses these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence

7 Dwell time in data mode

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is a follows:
Dwell time = time slot length * hop rate / number of hopping channels *30s
Example for a DH1 packet (with a maximum length of one time slot)
Dwell time = 625 µs * 1600 1/s / 79 * 30s = 0.3797s (in a 30s period)

For multi-slot packet the hopping is reduced according to the length of the packet.
Example for a DH5 packet (with a maximum length of five time slots)
Dwell time = 5 * 625 µs * 1600 * 1/5 *1/s / 79 * 30s = 0.3797s (in a 30s period)
This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for all Bluetooth devices. Therefore, all Bluetooth devices **comply** with the FCC dwell time requirement in the data mode.
This was checked during the Bluetooth Qualification tests.
The Dwell time in hybrid mode is approximately 2.6 mS (in a 12.8s period)

8 Channel Separation in hybrid mode

The nominal channel spacing of the Bluetooth system is 1Mhz independent of the operating mode.
The maximum “initial carrier frequency tolerance” which is allowed for Bluetooth is fcenter = 75 kHz.
This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/07-E) for three frequencies (2402, 2441, 2480 MHz).

9 Derivation and examples for a hopping sequence in hybrid mode

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used (see item 5), but this time with different input vectors:
**For the inquiry hop sequence, a predefined fixed address is always used. This results in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.
**For the page hop sequence, the device address of the paged unit is used as the input vector. This results in the use of a subset of 32 frequencies which is specific for that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies.
So it is ensured that also in hybrid mode, the frequency is used equally on average.
Example of a hopping sequence in inquiry mode:
48, 50, 09, 13, 52, 54,41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23
Example of a hopping sequence in paging mode:
08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

10 Receiver input bandwidth and synchronization in hybrid mode:

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code and the other device is scanning for this inquiry access code. If two devices have been connected previously and want to start a new transmission, a similar procedure takes place. The only difference is, instead of the inquiry access code, a special access code, derived from the BD_ADDRESS of the paged device will be, will be sent by the master of this connection. Due to the fact that both units have been connected before (in the inquiry procedure) the paging unit has timing and frequency information about the page scan of the paged unit. For this reason the time to establish the connection is reduced.

11 Spread rate / data rate of the direct sequence signal

The Spread rate / Data rate in inquiry and paging mode can be defined via the access code. The access code is the only criterion for the system to check if there is a valid transmission or not. If you regard the presence of a valid access code as one bit of information, and compare it with the length of the access code of 68 bits, the Spread rate / Data rate will be 68/1.

12 Spurious emission in hybrid mode

The Dwell in hybrid mode is shorter than in data mode. For this reason the spurious emissions average level in data mode is worst case. The spurious emissions peak level is the same for both modes.