Logitech, Inc.

MN: F-00001

August 13, 2007

Report No. LABT0261

Report Prepared By

www.nwemc.com
1-888-EMI-CERT

EMC Test Report

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Issue Date: August 13, 2007
Logitech, Inc.
Model: MN: F-00001

Emissions			
Test Description	**Specification**	**Test Method**	**Pass/Fail**
Spurious Radiated Emissions	FCC 15.247:2006	ANSI C63.4:2003	**Pass**
Spurious Conducted Emissions	FCC 15.247:2006	ANSI C63.4:2003	**Pass**
Occupied Bandwidth	FCC 15.247:2006	ANSI C63.4:2003	**Pass**
Output Power	FCC 15.247:2006	ANSI C63.4:2003	**Pass**
Band Edge Compliance	FCC 15.247:2006	ANSI C63.4:2003	**Pass**
Power Spectral Density	FCC 15.247:2006	ANSI C63.4:2003	**Pass**
AC Powerline Conducted Emissions	FCC 15.207:2006	ANSI C63.4:2003	**Pass**

Modifications made to the product
See the Modifications section of this report

Approved By:

Donald Facteau, IS Manager

NVLAP

NVLAP Lab Code: 200630-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

FCC: Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP: Northwest EMC, Inc. is accredited under the United States Department of Commerce, National Institute of Standards and Technology, and National Voluntary Laboratory Accreditation Program for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

NVLAP LAB CODE 200629-0
NVLAP LAB CODE 200630-0
NVLAP LAB CODE 200676-0
NVLAP LAB CODE 200761-0

Industry Canada: Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS 212, Issue 1 (Provisional) and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements.

CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

TÜV Product Service: Included in TUV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories, available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV's CARAT Program requirements. Certificate No. USA0604C.

TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.

NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).

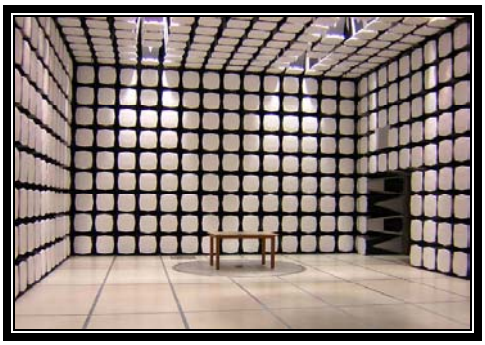
VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Numbers. - Hillsboro: C-1071, R-1025, C-2687, T-289, and R-2318, Irvine: R-1943, C-2766, and T-298, Sultan: R-871, C-1784, and T-294).*

BSMI: Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.

GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

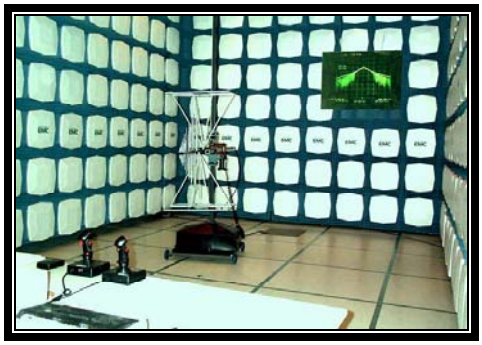
SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/scope.asp



California – Orange County Facility
Labs OC01 – OC13

41 Tesla Ave. Irvine, CA 92618
(888) 364-2378 Fax: (503) 844-3826



Oregon – Evergreen Facility
Labs EV01 – EV11

22975 NW Evergreen Pkwy. Suite 400 Hillsboro, OR 97124
(503) 844-4066 Fax: (503) 844-3826

Washington – Sultan Facility
Labs SU01 – SU07

14128 339th Ave. SE Sultan, WA 98294
(888) 364-2378

Party Requesting the Test

Company Name:	Logitech, Inc.
Address:	1499 SE Tech Center Place, Suite 350
City, State, Zip:	Vancouver, WA 98683
Test Requested By:	Aaron Cohen
Model:	MN: F-00001
First Date of Test:	July 6, 2007
Last Date of Test:	July 20, 2007
Receipt Date of Samples:	July 6, 2007
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
Bluetooth enabled Speaker System.

Testing Objective:
Meet the EMC requirements for FCC 15.247.

CONFIGURATION 1 LABT0261

Software/Firmware Running during test	
Description	**Version**
Hyperterminal	1999

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Bluetooth enabled Speaker System	Logitech, Inc.	F-00001	Unknown

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Tape Deck	Emerson	HS6026	2508602146
USB / AC Adapter	Logitech, Inc.	Unknown	Unknown

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Serial / USB Adapter board	Logitech, Inc.	Unknown	Unknown
Laptop	IBM	2628	78-HKYY6
AC Adapter 1	IBM	02K6657	11S02K6657Z1Z0ZA083446
AC Adapter 2	Logitech, Inc.	KWT06A00JL0622	Unknown

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Audio	No	1.0m	No	Bluetooth Enabled Speaker System	Tape Deck
USB/DC	Yes	1.3m	No	USB/AC Adapter	Bluetooth Enabled Speaker System
Serial	Yes	1.0m	No	Serial/USB Adapter Board	Laptop
Molex Data	No	0.3m	No	Serial / USB Adapter Board	Bluetooth Enabled Speaker System (during set-up only)
DC	No	1.3m	Yes	Laptop	AC Adapter 1
AC	No	1.0m	No	AC Adapter 1	AC Mains
DC	No	1.0m	No	AC Adapter 2	Serial / USB Adapter Board
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATION 2 LABT0261

Software/Firmware Running during test	
Description	**Version**
Hyperterminal	1999

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Bluetooth enabled Speaker System (direct connect)	Logitech, Inc.	F-00001	Unknown

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
USB / AC Adapter	Logitech, Inc.	Unknown	Unknown
Serial / USB Adapter board	Logitech, Inc.	Unknown	Unknown
Laptop	IBM	2628	78-HKYY6
AC Adapter 1	IBM	02K6657	11S02K6657Z1Z0ZA083446
AC Adapter 2	Logitech, Inc.	KWT06A00JL0622	Unknown

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB/DC	Yes	1.3m	No	USB/AC Adapter	Bluetooth Enabled Speaker System
Serial	Yes	1.0m	No	Serial/USB Adapter Board	Laptop
Molex Data	No	0.3m	No	Serial / USB Adapter Board	Bluetooth Enabled Speaker System (during set-up only)
DC	No	1.3m	Yes	Laptop	AC Adapter 1
AC	No	1.0m	No	AC Adapter 1	AC Mains
DC	No	1.0m	No	AC Adapter 2	Serial / USB Adapter Board
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	7/6/2007	Spurious Radiated Emissions	Modified from delivered configuration. Initial or No Modification	Changed antenna matching circuit from parallel cap/ series inductor to paralle inductor/series cap. Modification done by Aaron Cohen.	EUT remained at Northwest EMC following the test.
2	7/9/2007	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	7/9/2007	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	7/9/2007	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	7/10/2007	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	7/10/2007	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	7/20/2007	AC Powerline Conducted Emissions	Modified from delivered configuration. Initial or No Modification	Logitech provided a new power supply for testing. Modification done by Aaron Cohen.	Scheduled testing was completed.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	6/8/2007	13
Spectrum Analyzer	Agilent	E4407B	AAU	12/8/2006	13

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The occupied bandwidth was measured with the EUT set to low, medium, 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 in a no hop mode at its maximum data rate for each of the three different modulations available.

NORTHWEST EMC

Occupied Bandwidth

XMit 2007.06.13

EUT:	F-00001			Work Order:	LABT0261
Serial Number:	None			Date:	07/10/07
Customer:	Logitech, Inc.			Temperature:	24°C
Attendees:	None			Humidity:	40%
Project:	None			Barometric Pres.:	29.92
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

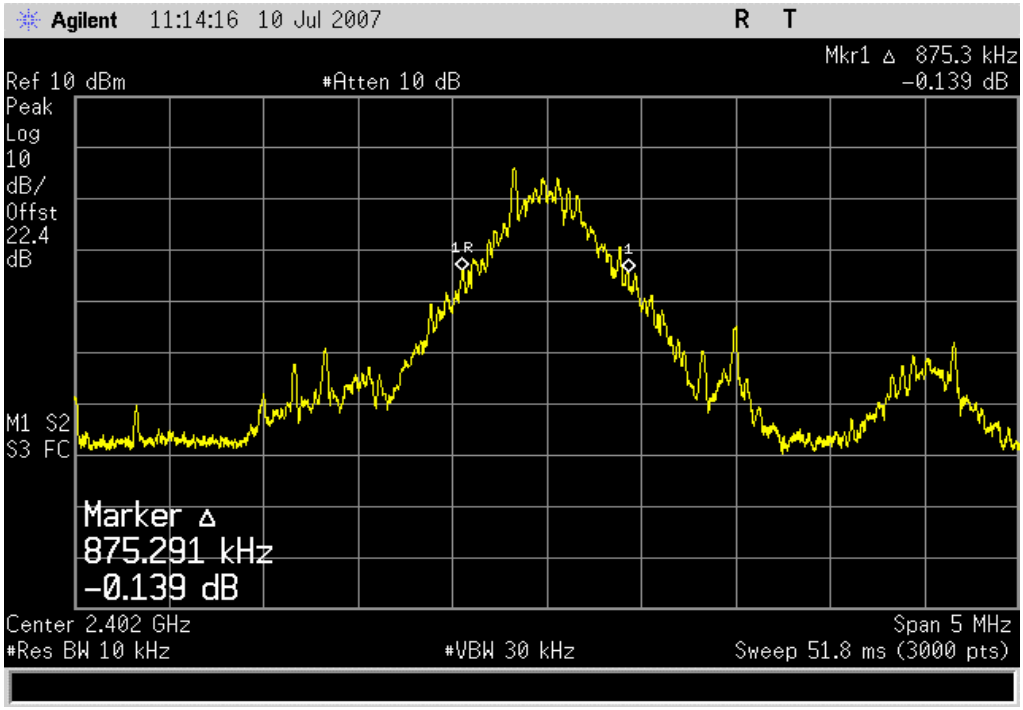
COMMENTS

DEVIATIONS FROM TEST STANDARD

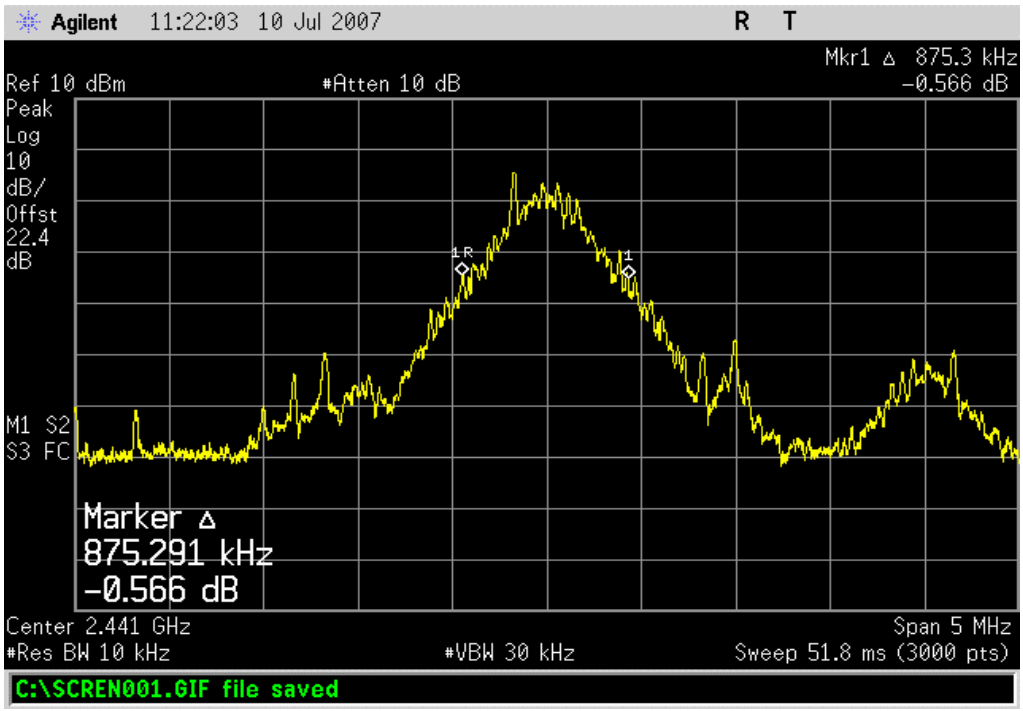
Configuration #	2	Signature Holly Ashkannejhad

	Value	Limit	Results
Bluetooth, GFSK, DH5			
Low channel	875.291 kHz	1.5 MHz	Pass
Mid channel	875.291 kHz	1.5 MHz	Pass
High channel	878.626 kHz	1.5 MHz	Pass
Bluetooth, pi/4 - DQPSK, 2DH5			
Low channel	1.169 MHz	1.5 MHz	Pass
Mid channel	1.152 MHz	1.5 MHz	Pass
High channel	1.184 MHz	1.5 MHz	Pass
Bluetooth, 8DPSK, 3DH5			
Low channel	1.174 MHz	1.5 MHz	Pass
Mid channel	1.165 MHz	1.5 MHz	Pass
High channel	1.164 MHz	1.5 MHz	Pass

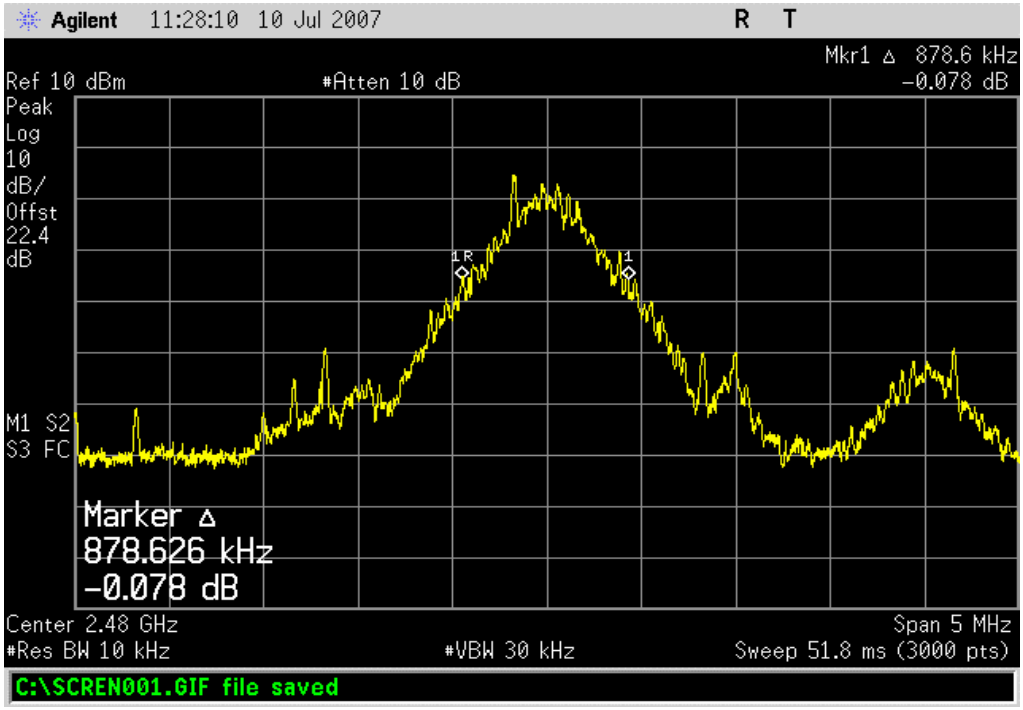
Bluetooth, GFSK, DH5, Low channel					
Result:	Pass	**Value:**	875.291 kHz	**Limit:**	1.5 MHz



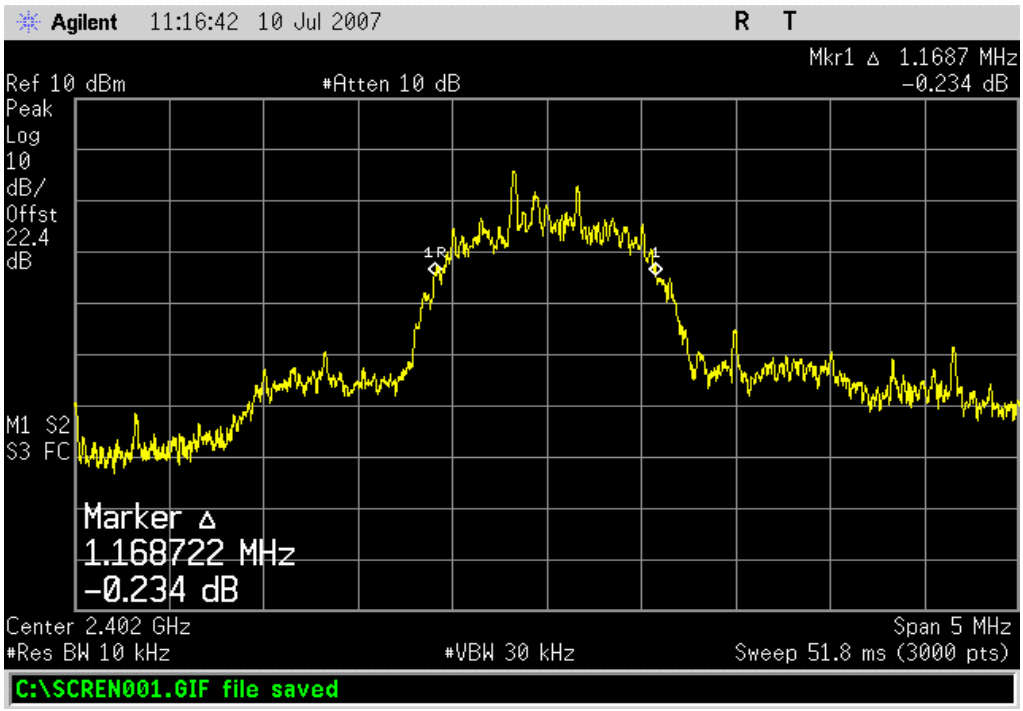
Bluetooth, GFSK, DH5, Mid channel					
Result:	Pass	**Value:**	875.291 kHz	**Limit:**	1.5 MHz



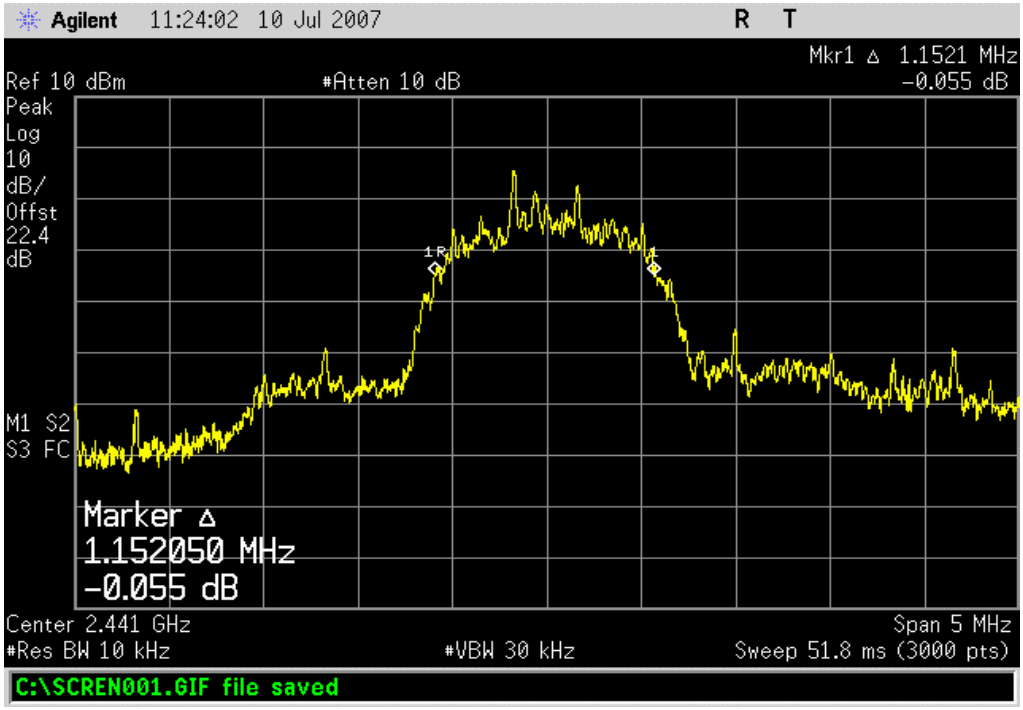
Bluetooth, GFSK, DH5, High channel					
Result:	Pass	**Value:**	878.626 kHz	**Limit:**	1.5 MHz



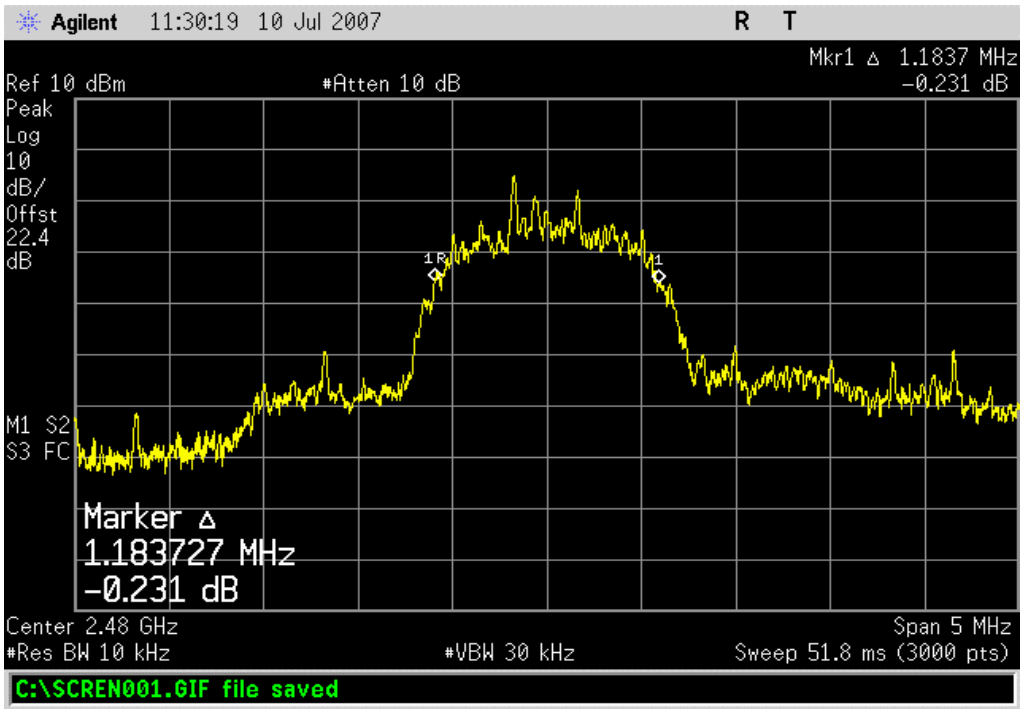
Bluetooth, pi/4 - DQPSK, 2DH5, Low channel					
Result:	Pass	**Value:**	1.169 MHz	**Limit:**	1.5 MHz



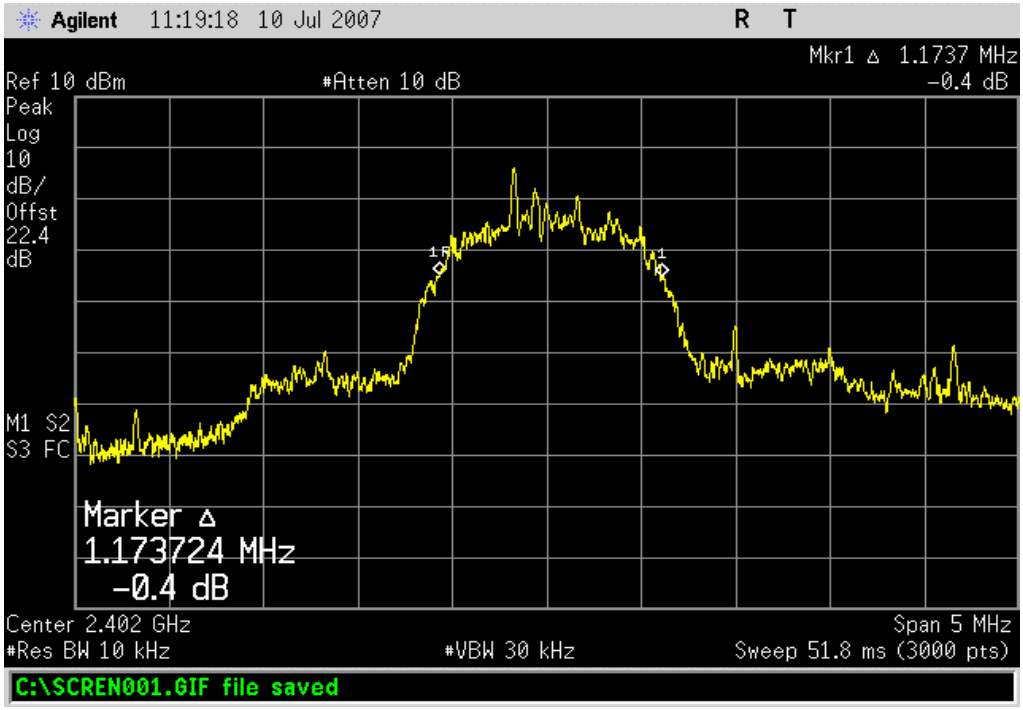
Bluetooth, pi/4 - DQPSK, 2DH5, Mid channel					
Result:	Pass	**Value:**	1.152 MHz	**Limit:**	1.5 MHz



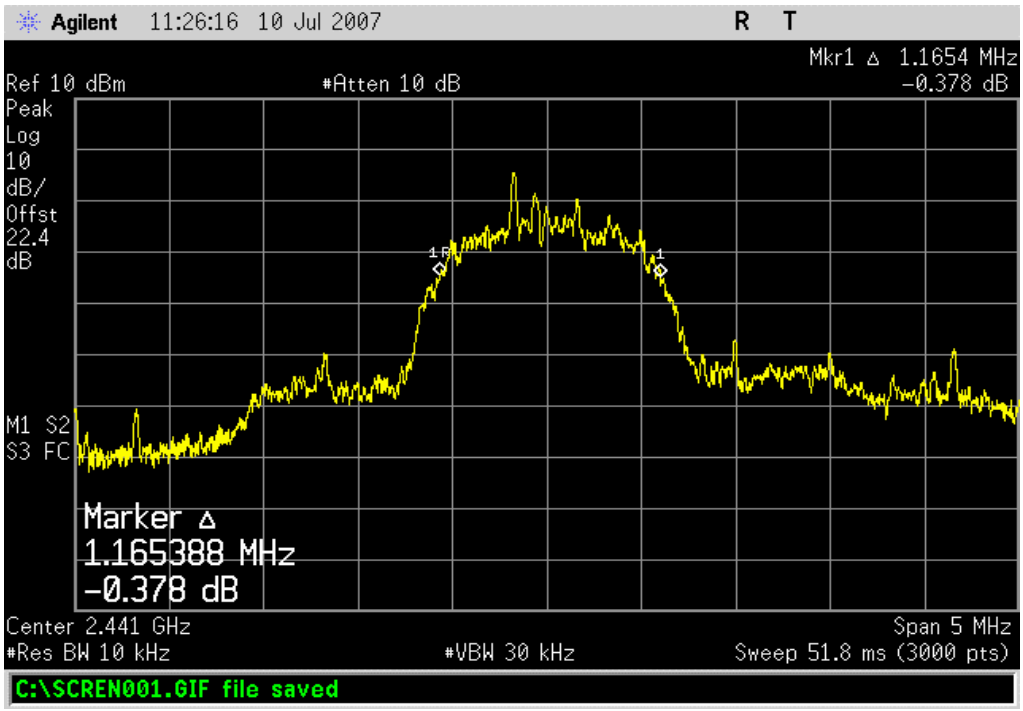
Bluetooth, pi/4 - DQPSK, 2DH5, High channel					
Result:	Pass	**Value:**	1.184 MHz	**Limit:**	1.5 MHz



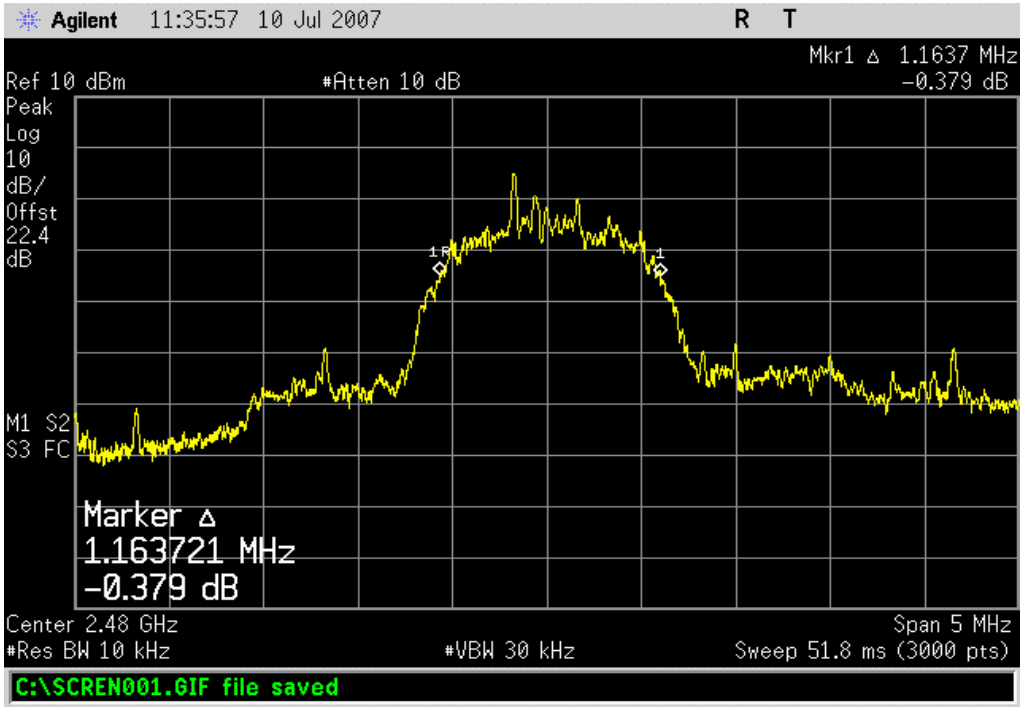
Bluetooth, 8DPSK, 3DH5, Low channel					
Result:	Pass	**Value:**	1.174 MHz	**Limit:**	1.5 MHz



Bluetooth, 8DPSK, 3DH5, Mid channel					
Result:	Pass	**Value:**	1.165 MHz	**Limit:**	1.5 MHz



Bluetooth, 8DPSK, 3DH5, High channel					
Result:	Pass	**Value:**	1.164 MHz	**Limit:**	1.5 MHz



Output Power

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	6/8/2007	13
Spectrum Analyzer	Agilent	E4407B	AAU	12/8/2006	13

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. . The EUT was transmitting in a no hop mode at its maximum data rate for each of the three different modulations available.

De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36dBm.

Output Power

EUT:	F-00001			Work Order:	LABT0261
Serial Number:	None			Date:	07/09/07
Customer:	Logitech, Inc.			Temperature:	23°C
Attendees:	None			Humidity:	39%
Project:	None			Barometric Pres.:	30.04
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

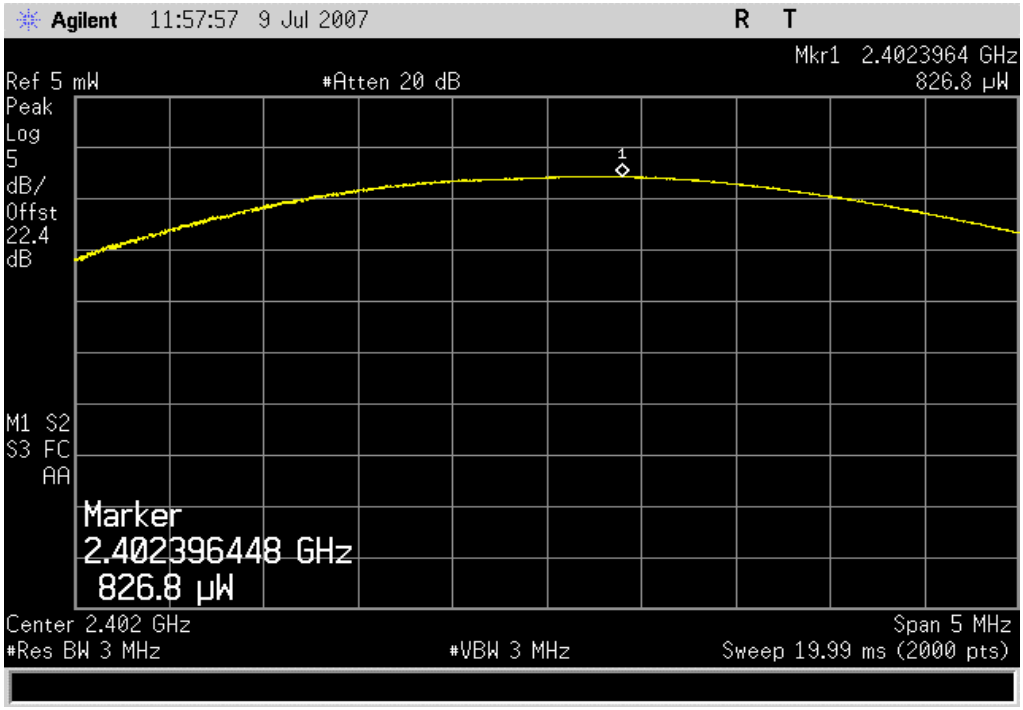
COMMENTS

DEVIATIONS FROM TEST STANDARD

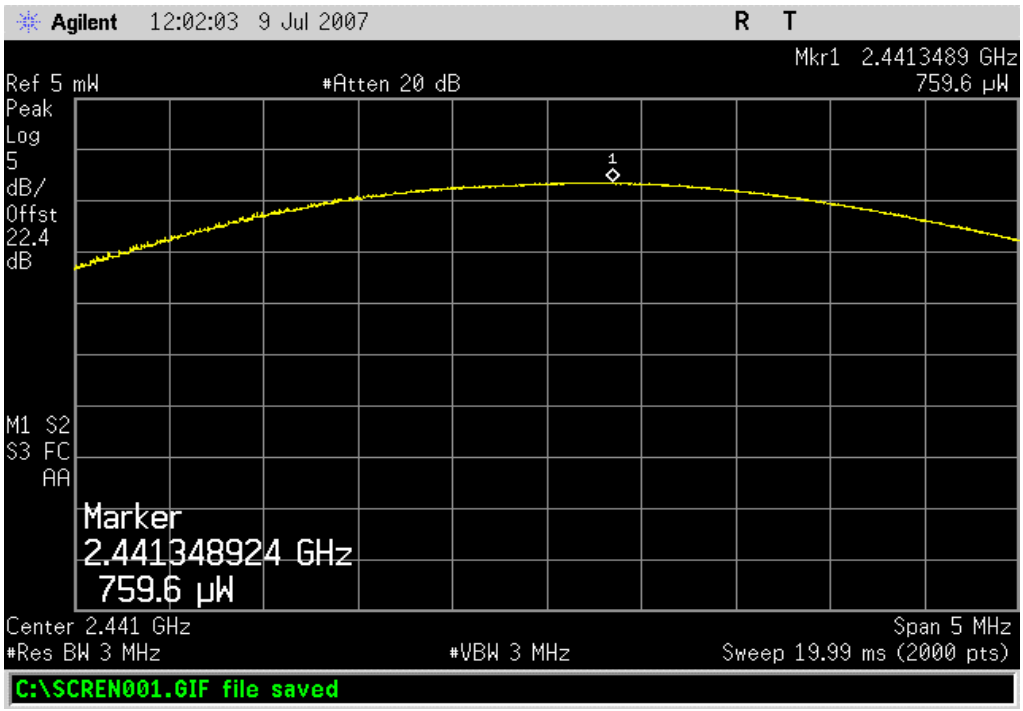
Configuration #	2	Signature

	Value	Limit	Results
Bluetooth, GFSK, DH5			
Low channel	0.8268 mW	1 Watt	Pass
Mid channel	0.7596 mW	1 Watt	Pass
High channel	0.6633 mW	1 Watt	Pass
Bluetooth, pi/4 - DQPSK, 2DH5			
Low channel	0.8318 mW	1 Watt	Pass
Mid channel	0.7565 mW	1 Watt	Pass
High channel	0.6624 mW	1 Watt	Pass
Bluetooth, 8DPSK, 3DH5			
Low channel	0.8279 mW	1 Watt	Pass
Mid channel	0.741 mW	1 Watt	Pass
High channel	0.6631 mW	1 Watt	Pass

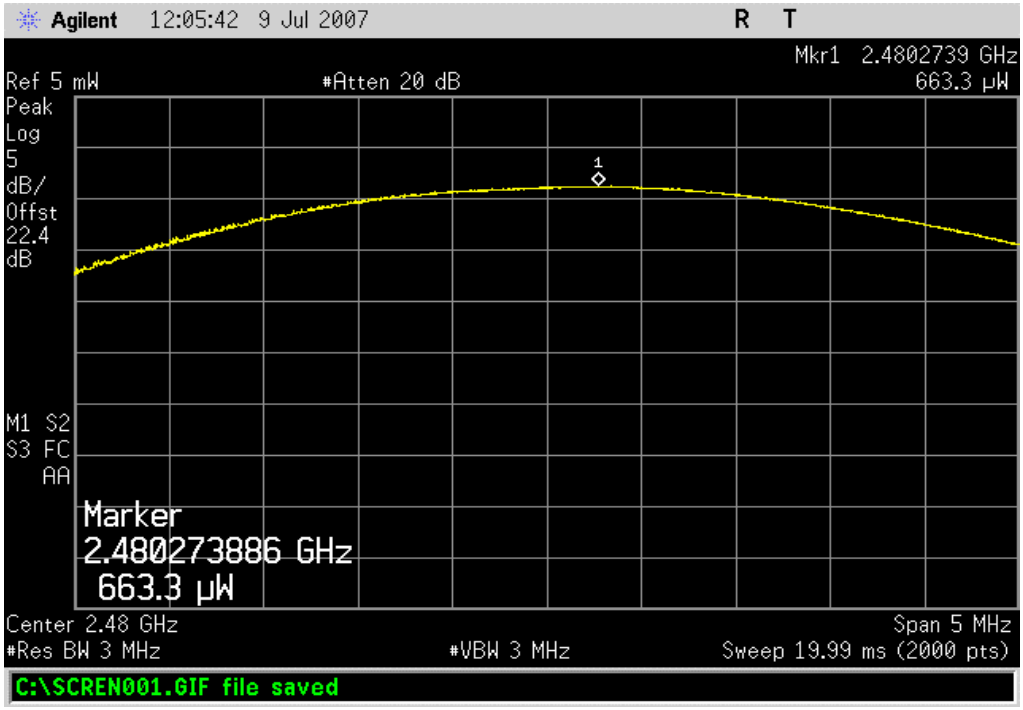
Bluetooth, GFSK, DH5, Low channel					
Result:	Pass	**Value:**	0.8268 mW	**Limit:**	1 Watt



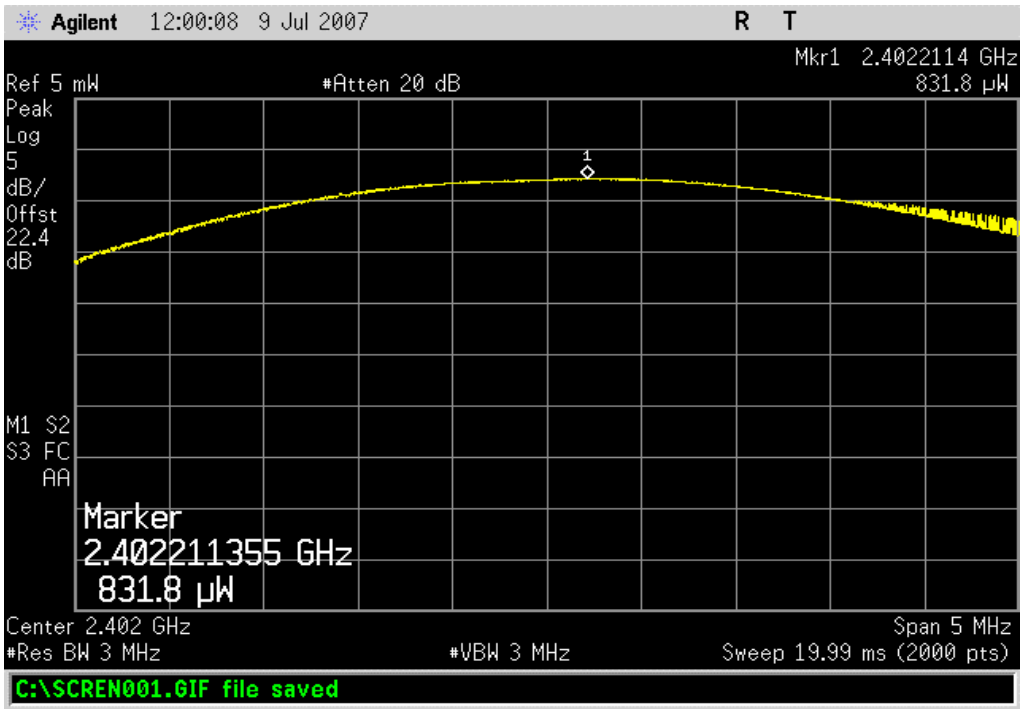
Bluetooth, GFSK, DH5, Mid channel					
Result:	Pass	**Value:**	0.7596 mW	**Limit:**	1 Watt



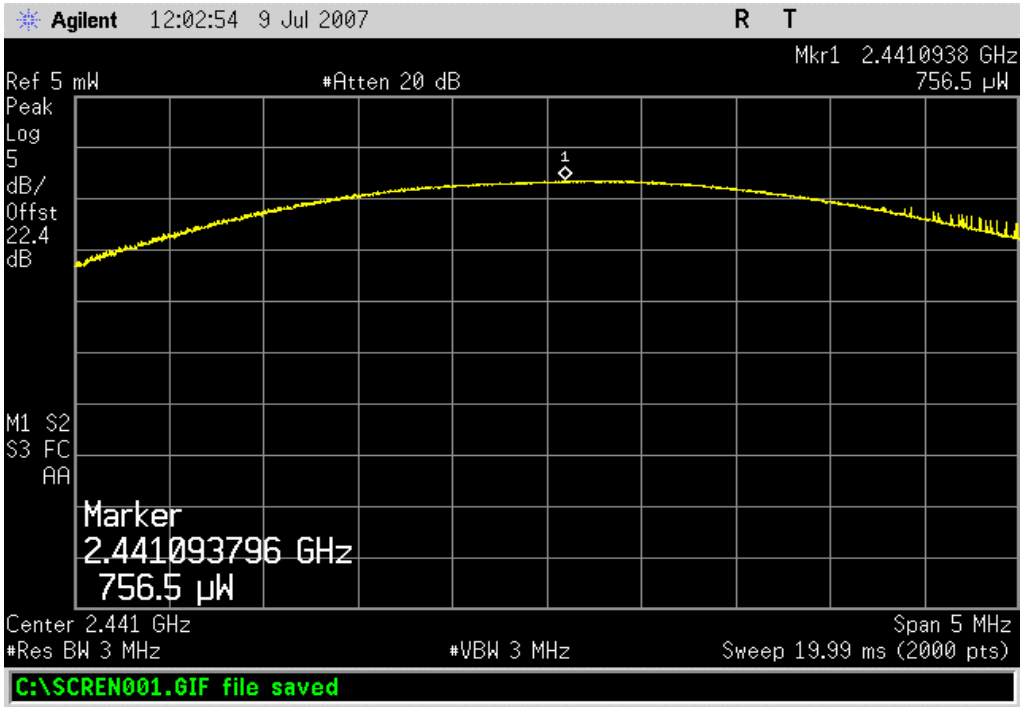
Bluetooth, GFSK, DH5, High channel					
Result:	Pass	**Value:**	0.6633 mW	**Limit:**	1 Watt



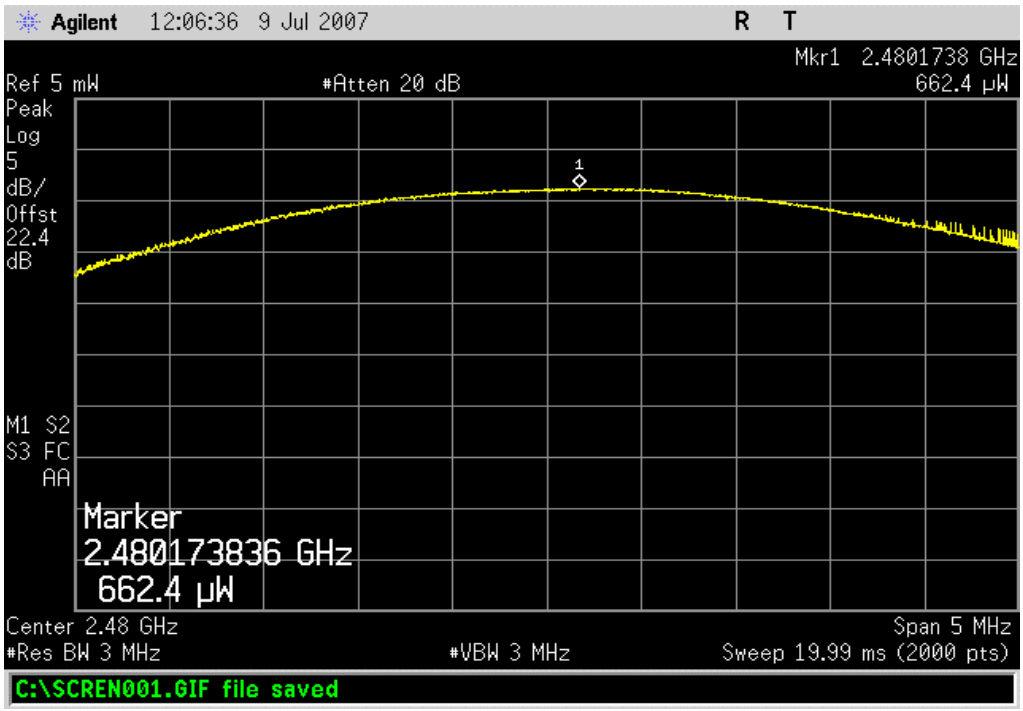
Bluetooth, pi/4 - DQPSK, 2DH5, Low channel					
Result:	Pass	**Value:**	0.8318 mW	**Limit:**	1 Watt



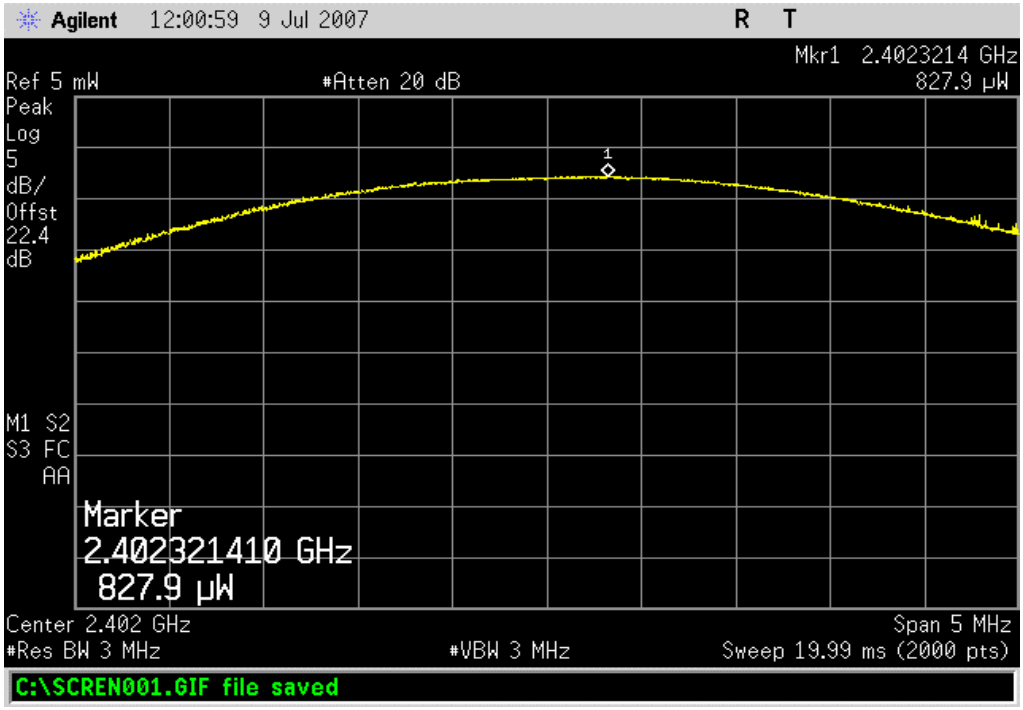
Bluetooth, pi/4 - DQPSK, 2DH5, Mid channel					
Result:	Pass	**Value:**	0.7565 mW	**Limit:**	1 Watt



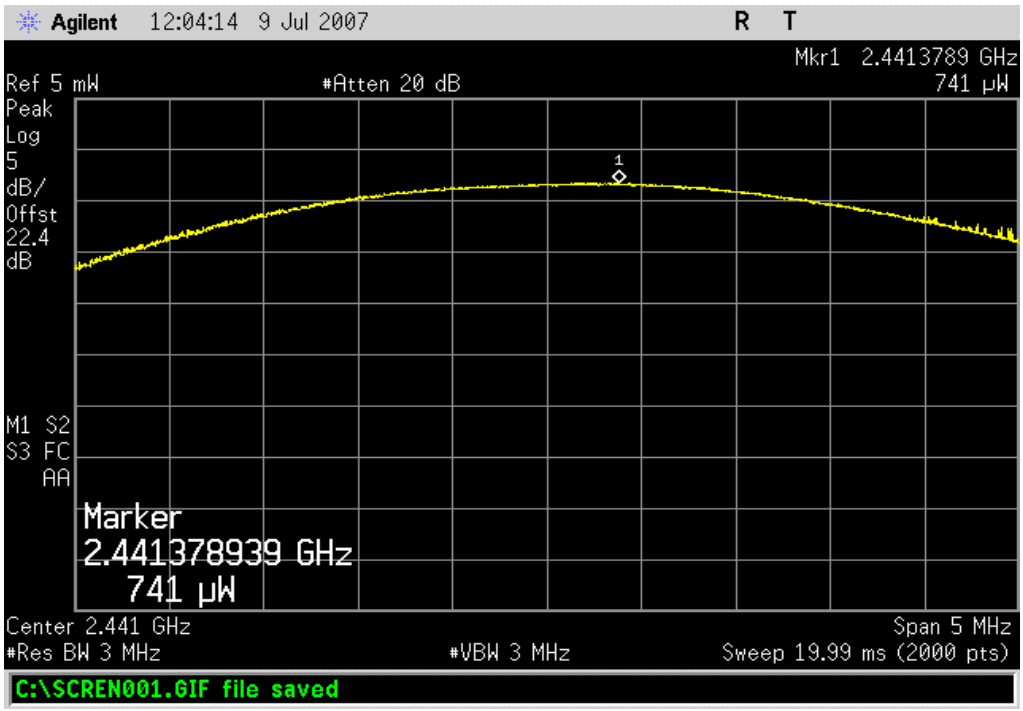
Bluetooth, pi/4 - DQPSK, 2DH5, High channel					
Result:	Pass	**Value:**	0.6624 mW	**Limit:**	1 Watt



Bluetooth, 8DPSK, 3DH5, Low channel					
Result:	Pass	**Value:**	0.8279 mW	**Limit:**	1 Watt

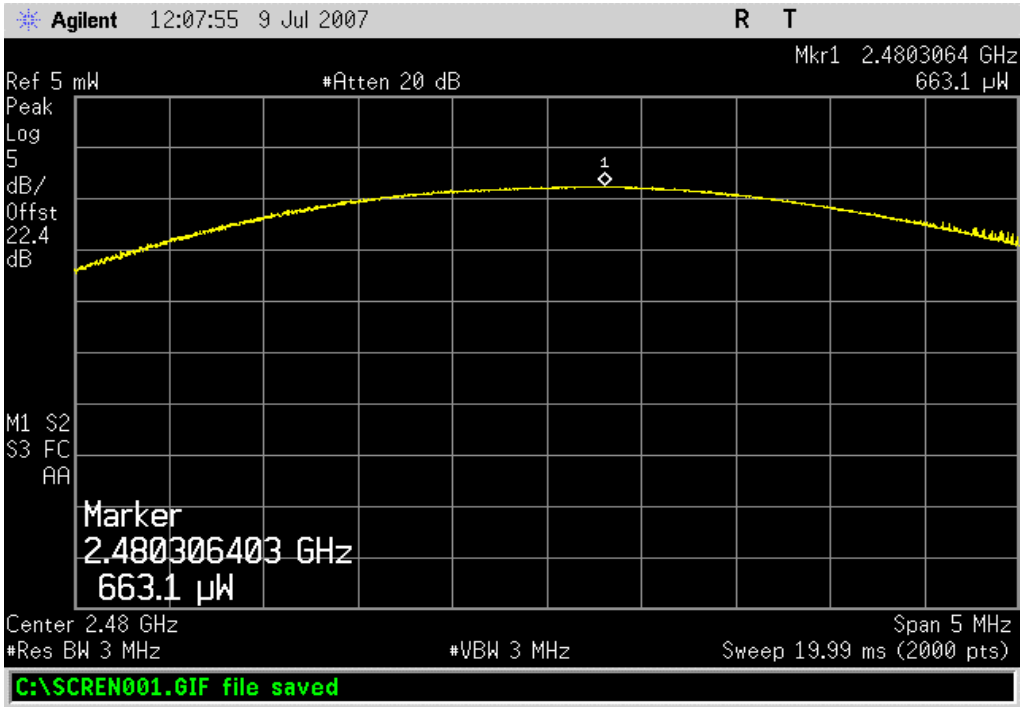


Bluetooth, 8DPSK, 3DH5, Mid channel					
Result:	Pass	**Value:**	0.741 mW	**Limit:**	1 Watt



Output Power

Bluetooth, 8DPSK, 3DH5, High channel					
Result:	Pass	**Value:**	0.6631 mW	**Limit:**	1 Watt



Band Edge Compliance

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	6/8/2007	13
Spectrum Analyzer	Agilent	E4407B	AAU	12/8/2006	13

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The requirements of FCC 15.247(d) for emissions at least 20dB below the carrier in any 100kHz bandwidth outside the allowable band was measured with the EUT set to low and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from 10 MHz below the band edge to 10 MHz above the band edge.

The EUT was transmitting at its maximum data rate using all three types of modulations available in Bluetooth EDR.

NORTHWEST EMC

Band Edge Compliance

XMit 2007.06.13

EUT:	F-00001			Work Order:	LABT0261
Serial Number:	None			Date:	07/10/07
Customer:	Logitech, Inc.			Temperature:	24°C
Attendees:	None			Humidity:	40%
Project:	None			Barometric Pres.:	29.92
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

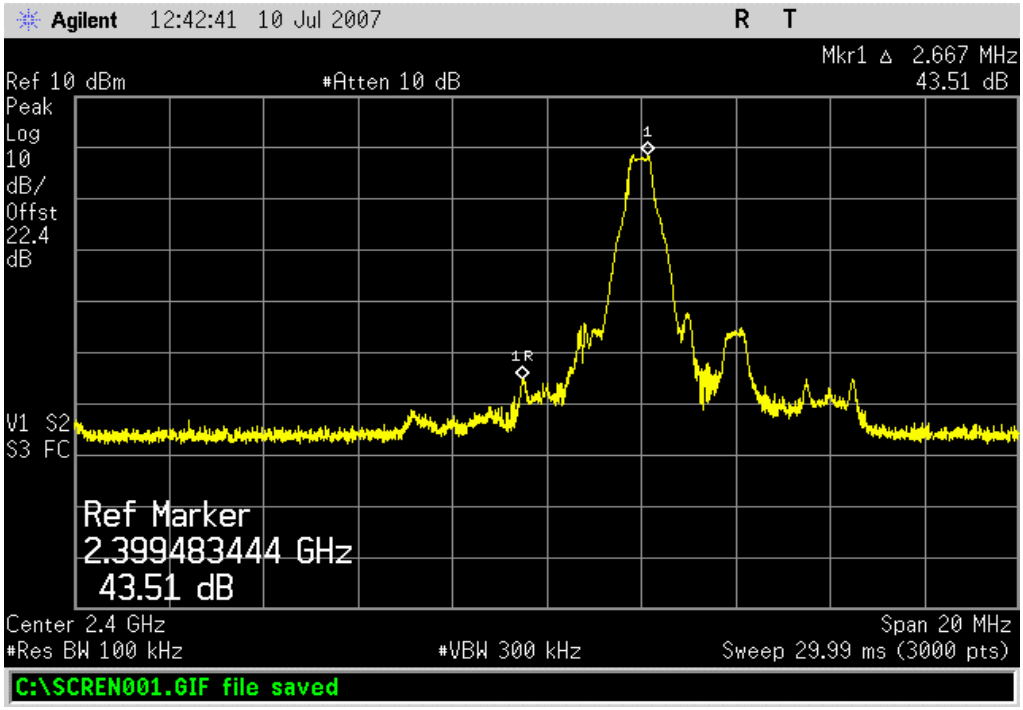
COMMENTS

DEVIATIONS FROM TEST STANDARD

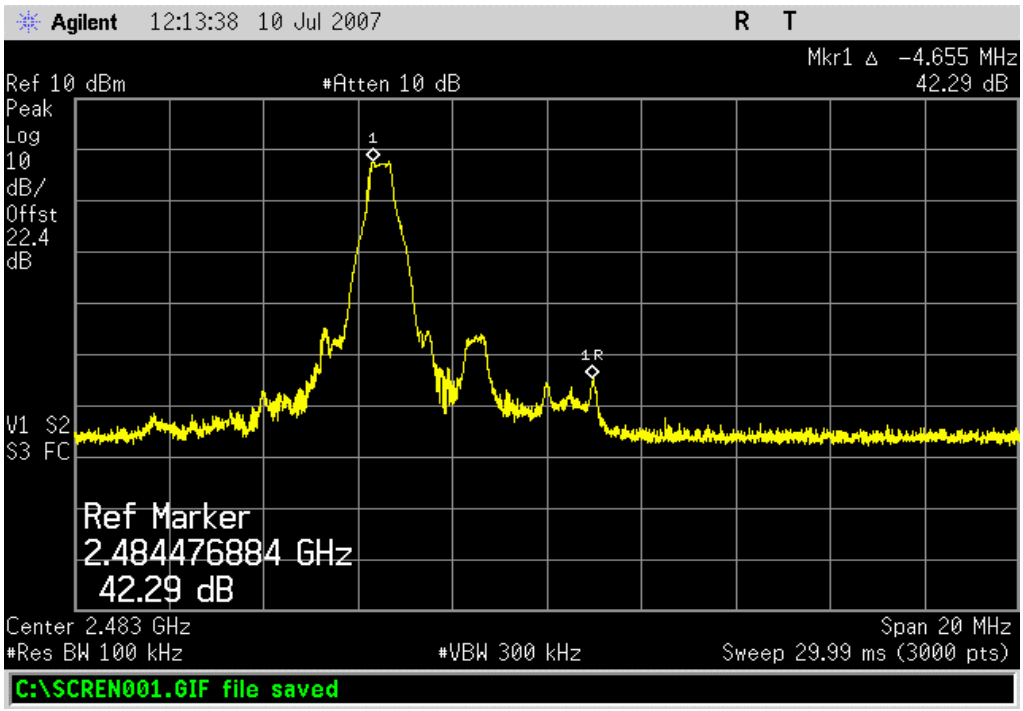
Configuration #	2	Signature Holly Ashkannejhad

	Value	Limit	Results
Bluetooth, GFSK, DH5			
Low channel	-43.51 dBc	≤ -20 dBc	Pass
High channel	-42.29 dBc	≤ -20 dBc	Pass
Bluetooth, pi/4-DQPSK, 2DH5			
Low channel	-38.46 dBc	≤ -20 dBc	Pass
High channel	-38.86 dBc	≤ -20 dBc	Pass
Bluetooth, 8DPSK, 3DH5			
Low channel	-38.75 dBc	≤ -20 dBc	Pass
High channel	-38.04 dBc	≤ -20 dBc	Pass

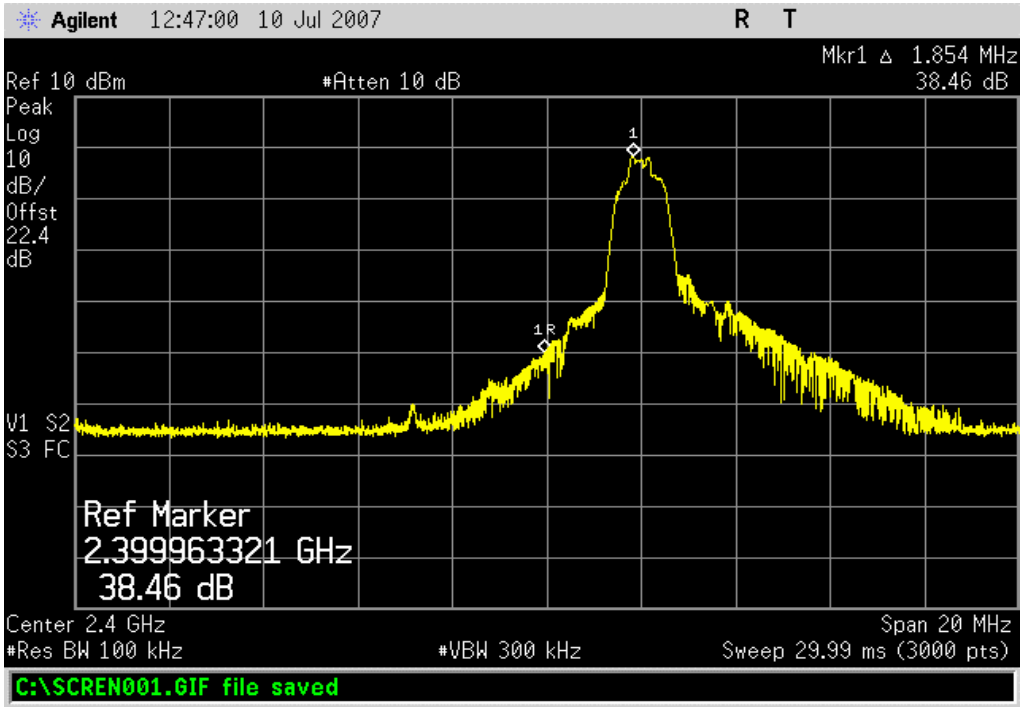
Bluetooth, GFSK, DH5, Low channel					
Result:	Pass	**Value:**	-43.51 dBc	**Limit:**	≤ -20 dBc



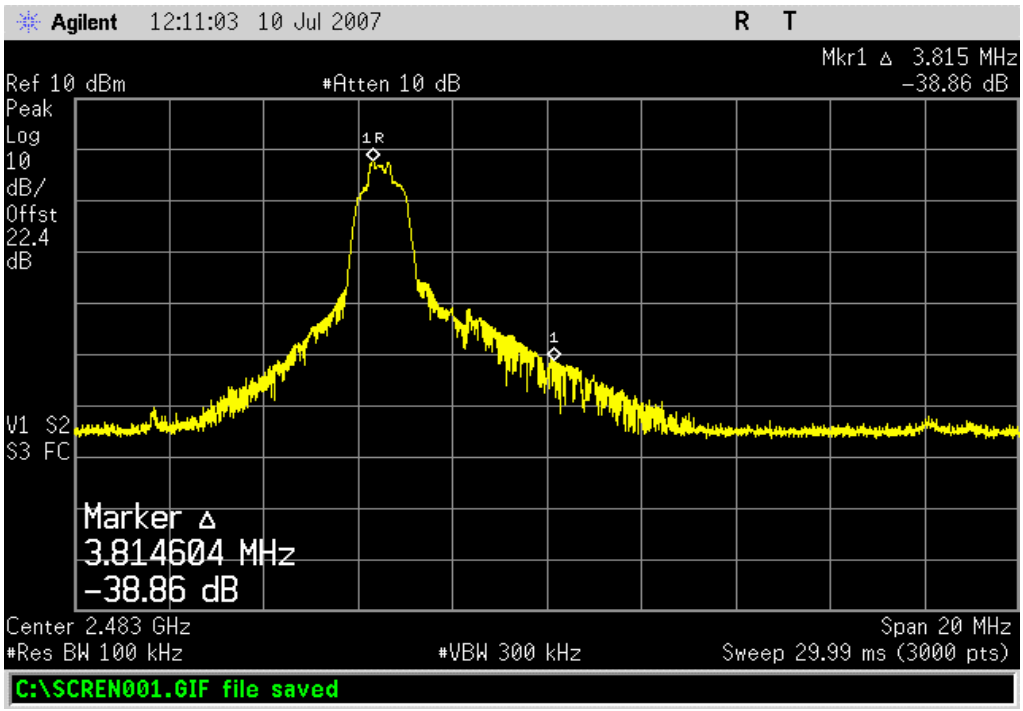
Bluetooth, GFSK, DH5, High channel					
Result:	Pass	**Value:**	-42.29 dBc	**Limit:**	≤ -20 dBc



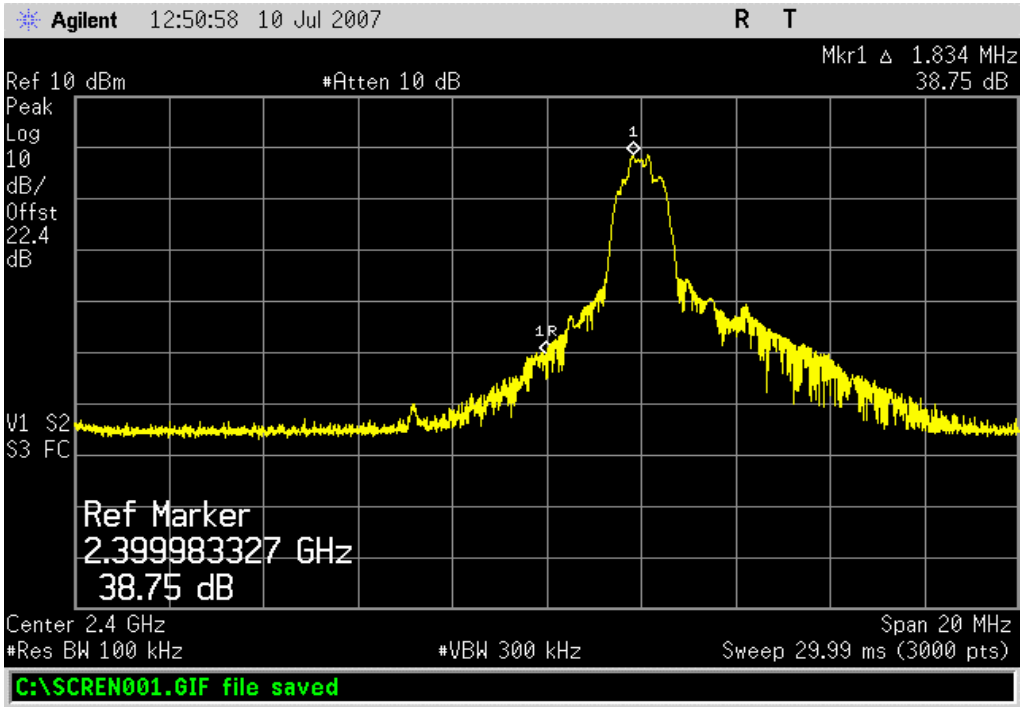
Bluetooth, pi/4-DQPSK, 2DH5, Low channel					
Result:	Pass	**Value:**	-38.46 dBc	**Limit:**	≤ -20 dBc



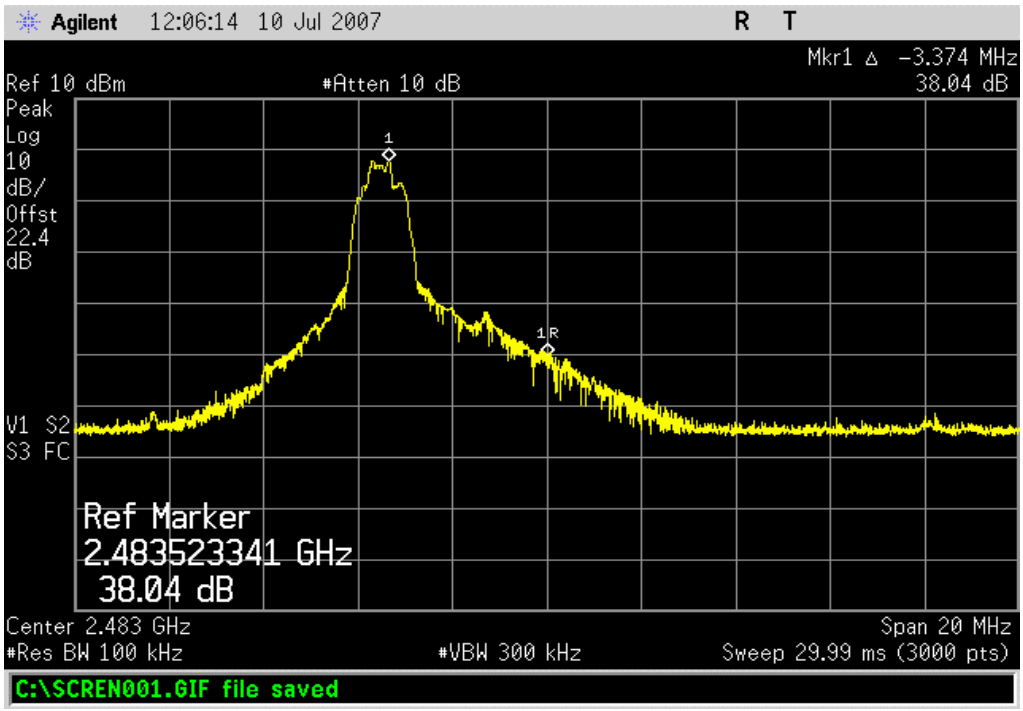
Bluetooth, pi/4-DQPSK, 2DH5, High channel					
Result:	Pass	**Value:**	-38.86 dBc	**Limit:**	≤ -20 dBc



Bluetooth, 8DPSK, 3DH5, Low channel					
Result:	Pass	**Value:**	-38.75 dBc	**Limit:**	≤ -20 dBc



Bluetooth, 8DPSK, 3DH5, High channel					
Result:	Pass	**Value:**	-38.04 dBc	**Limit:**	≤ -20 dBc



Spurious Conducted Emissions

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	6/8/2007	13
Spectrum Analyzer	Agilent	E4407B	AAU	12/8/2006	13

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. The measurements were 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. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

NORTHWEST EMC

Spurious Conducted Emissions

XMit 2007.06.13

EUT:	F-00001			Work Order:	LABT0261
Serial Number:	None			Date:	07/09/07
Customer:	Logitech, Inc.			Temperature:	24°C
Attendees:	None			Humidity:	38%
Project:	None			Barometric Pres.:	30.12
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

COMMENTS

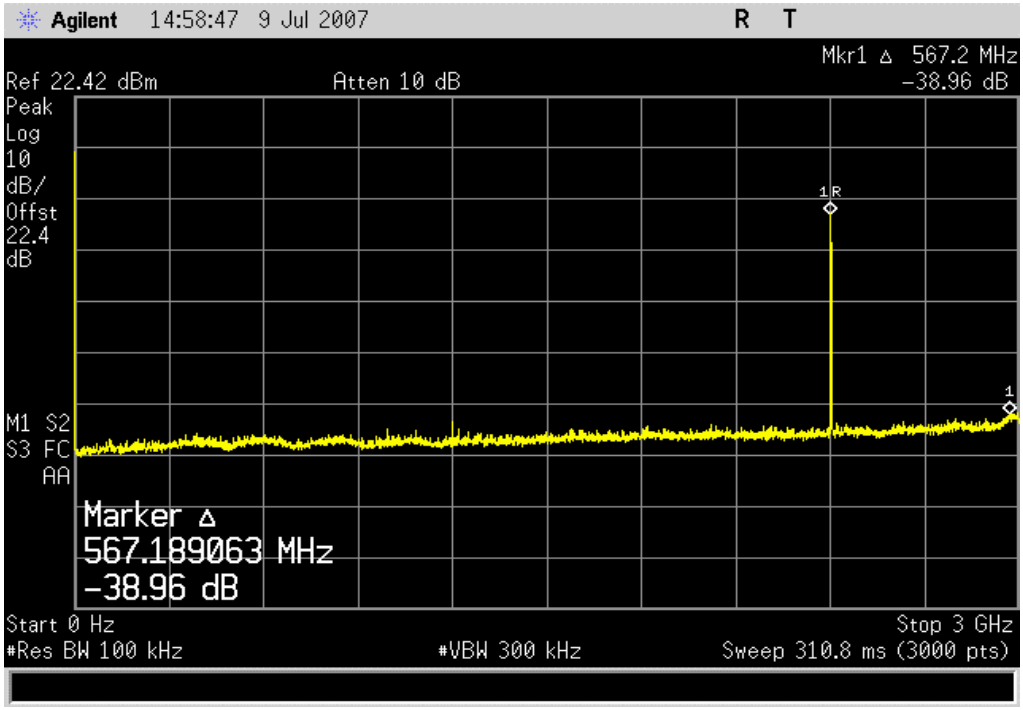
DEVIATIONS FROM TEST STANDARD

Configuration #	2	Signature

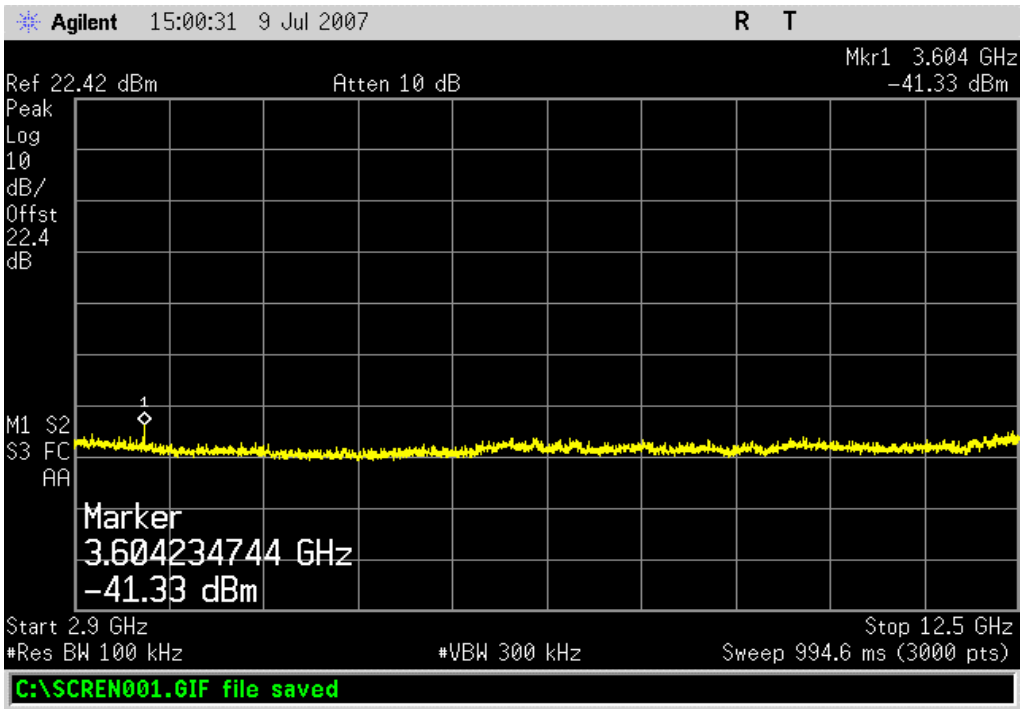
		Value	Limit	Results
Bluetooth, GFSK, DH5				
	Low channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	Mid channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	High channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
Bluetooth, pi/4-DQPSK, 2DH5				
	Low channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	Mid channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	High channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
Bluetooth, 8DPSK, 3DH5				
	Low channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	Mid channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	High channel			
	0 Hz - 3 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	2.9 GHz - 12.5 GHz	≤ - 35 dBc	≤ -20 dBc	Pass
	12.4 GHz - 25 GHz	≤ - 35 dBc	≤ -20 dBc	Pass

Spurious Conducted Emissions

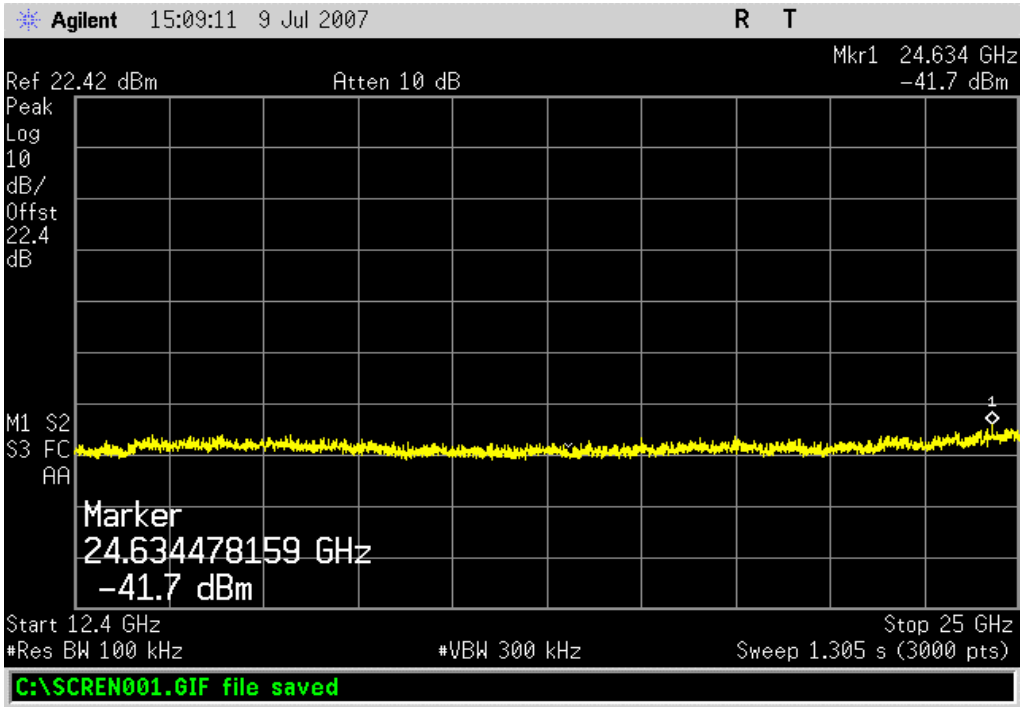
Bluetooth, GFSK, DH5, Low channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



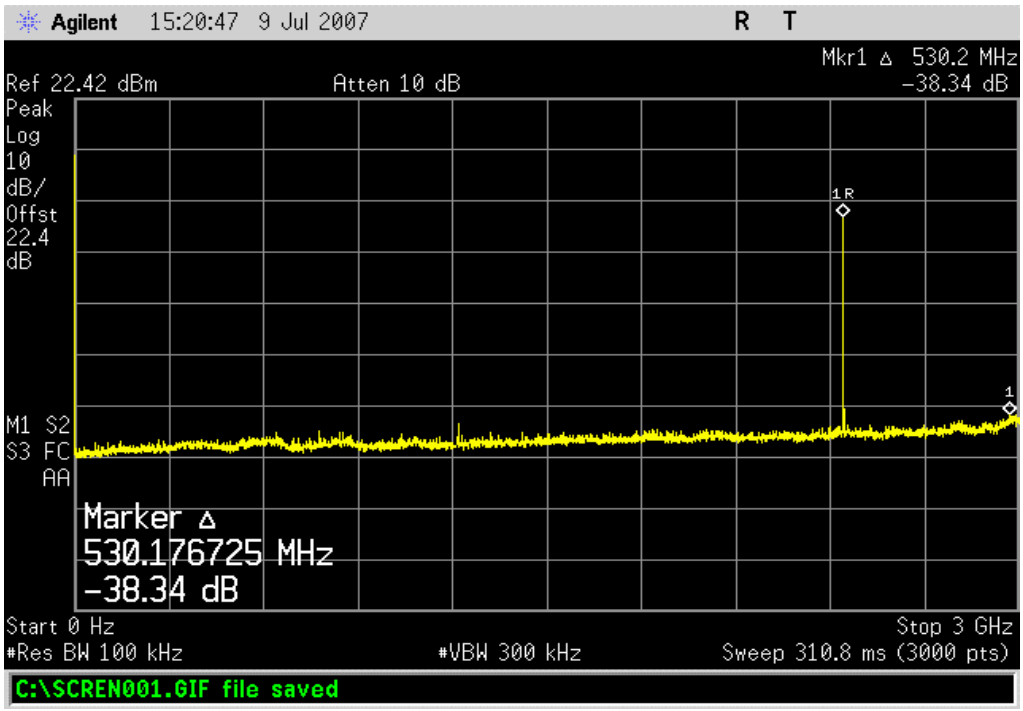
Bluetooth, GFSK, DH5, Low channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



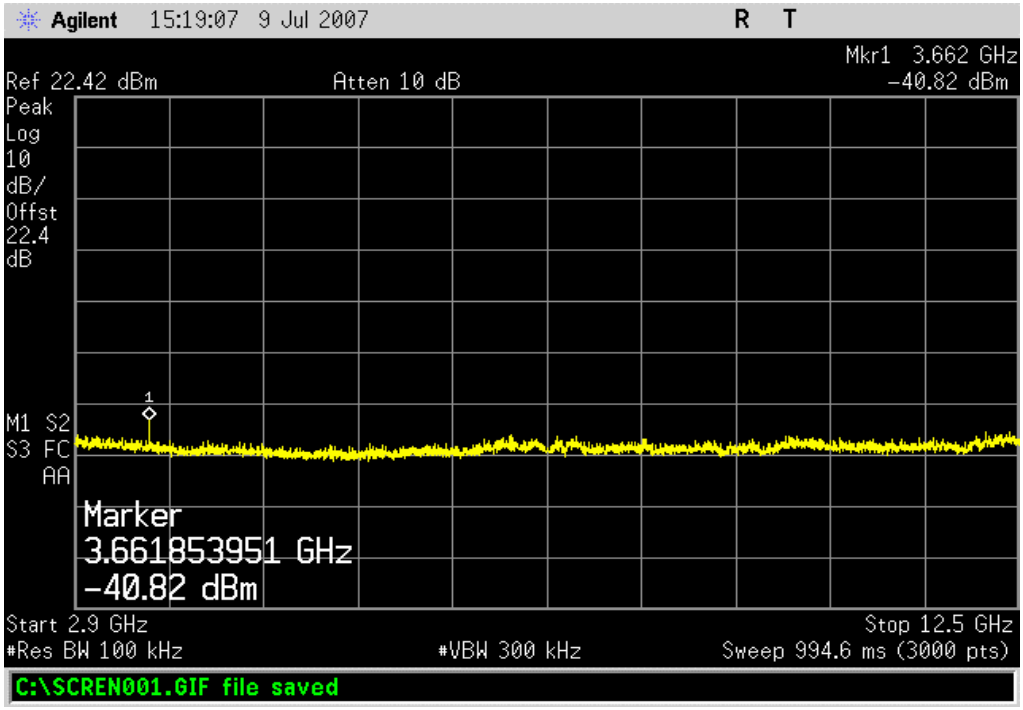
Bluetooth, GFSK, DH5, Low channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



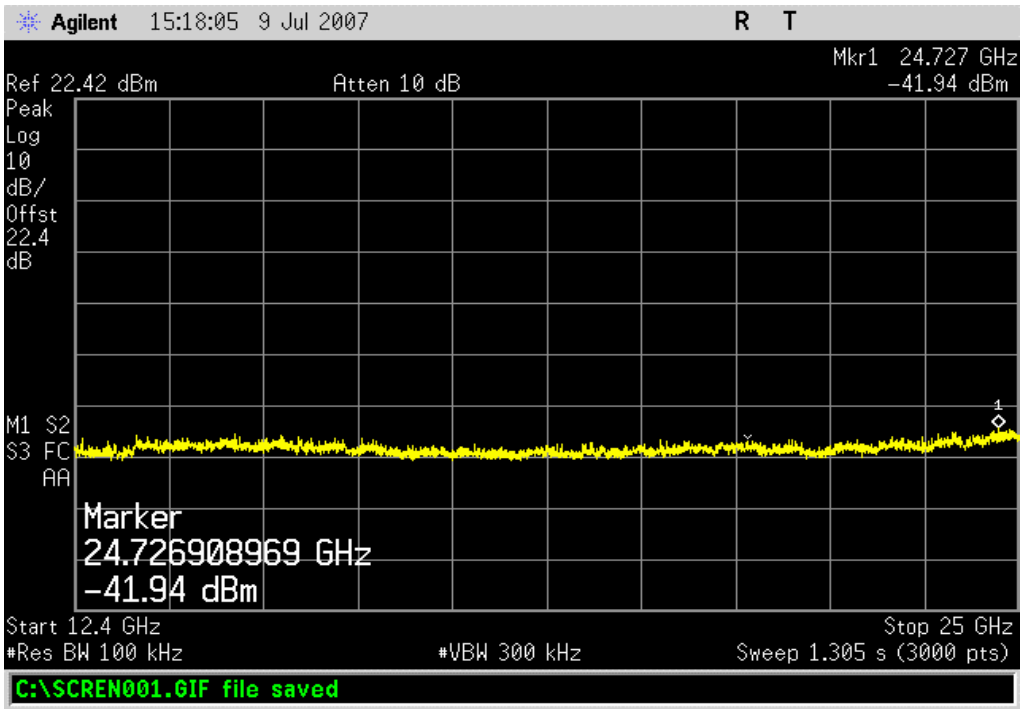
Bluetooth, GFSK, DH5, Mid channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



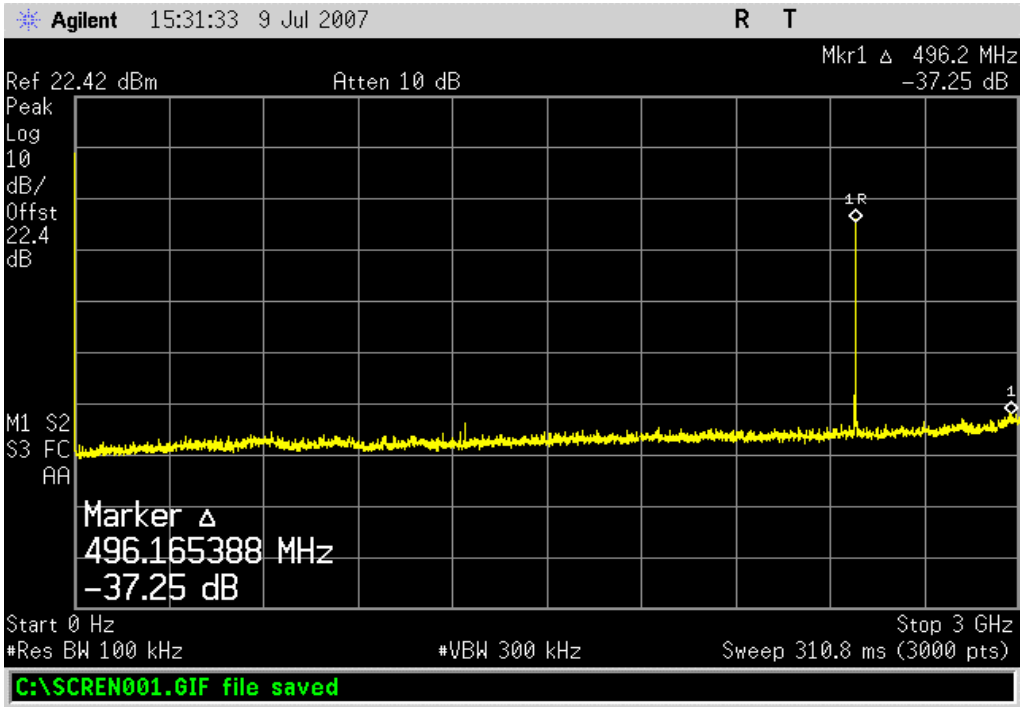
Bluetooth, GFSK, DH5, Mid channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



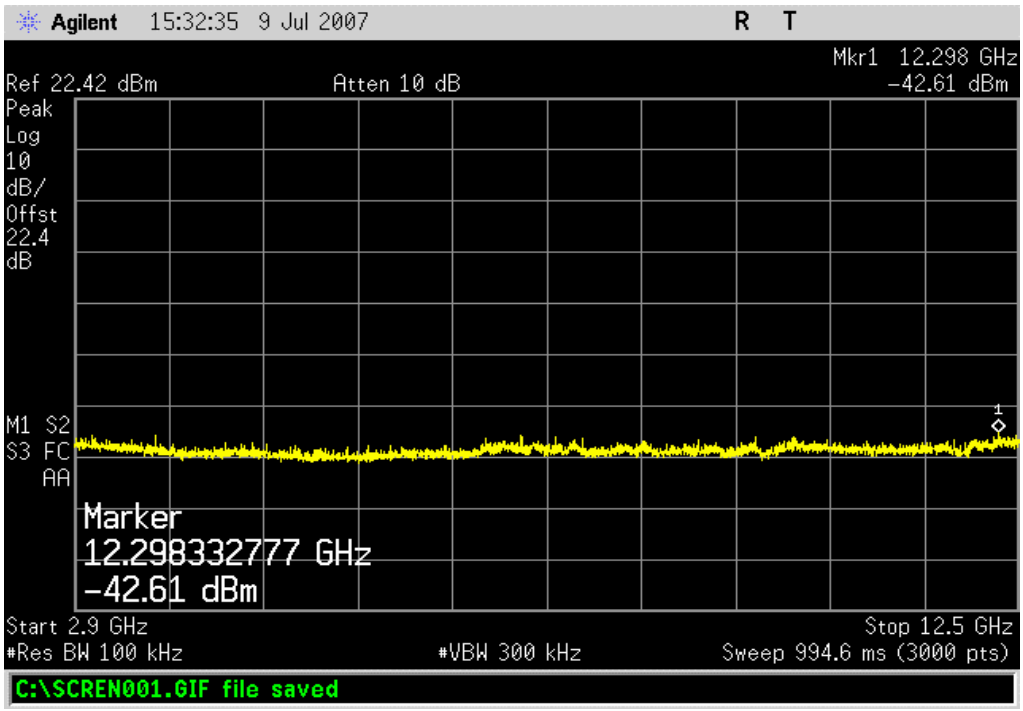
Bluetooth, GFSK, DH5, Mid channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



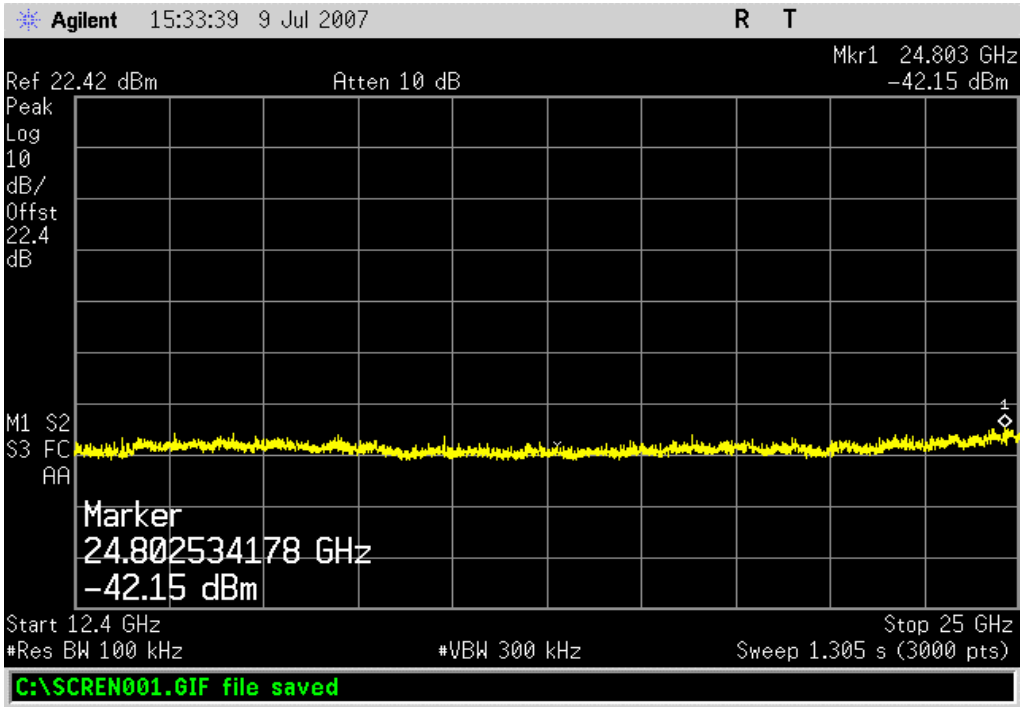
Bluetooth, GFSK, DH5, High channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



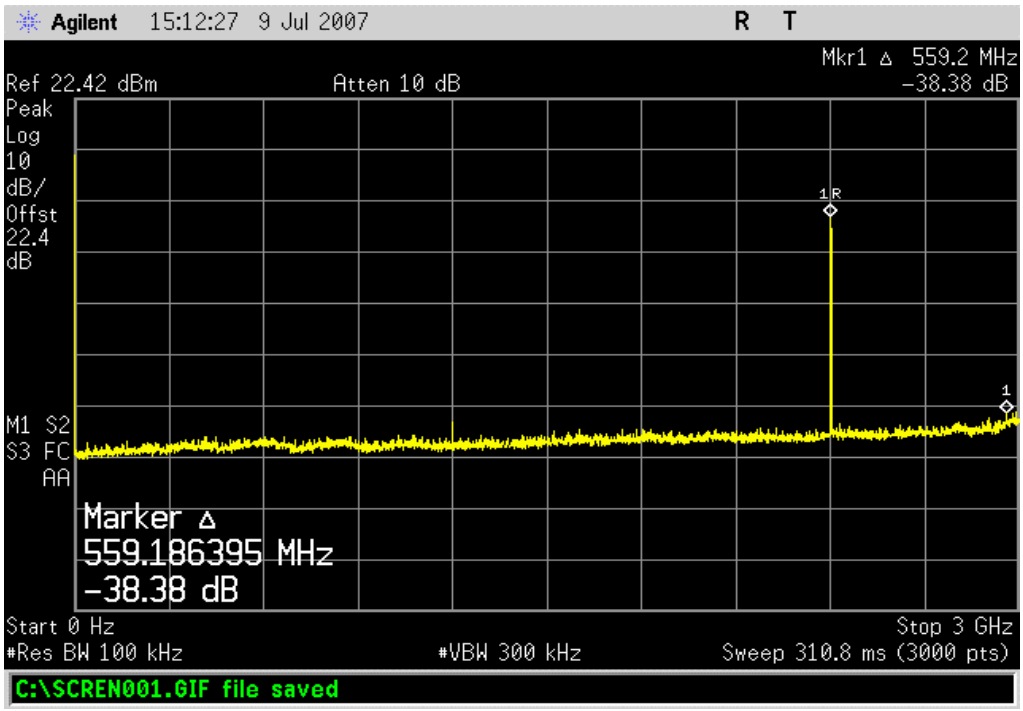
Bluetooth, GFSK, DH5, High channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



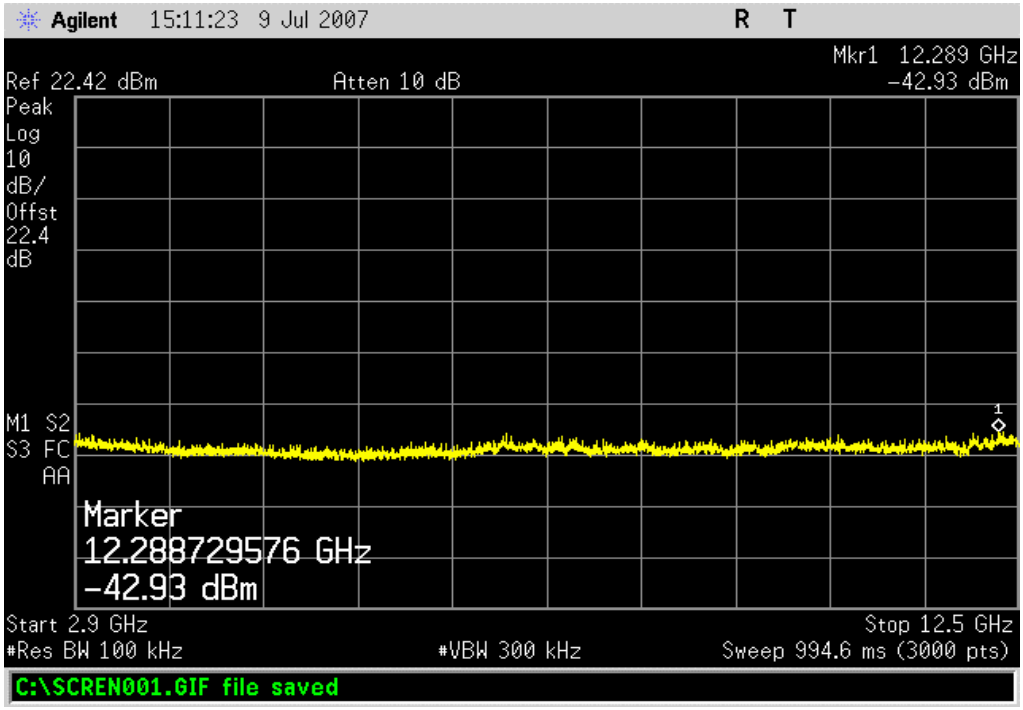
Bluetooth, GFSK, DH5, High channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



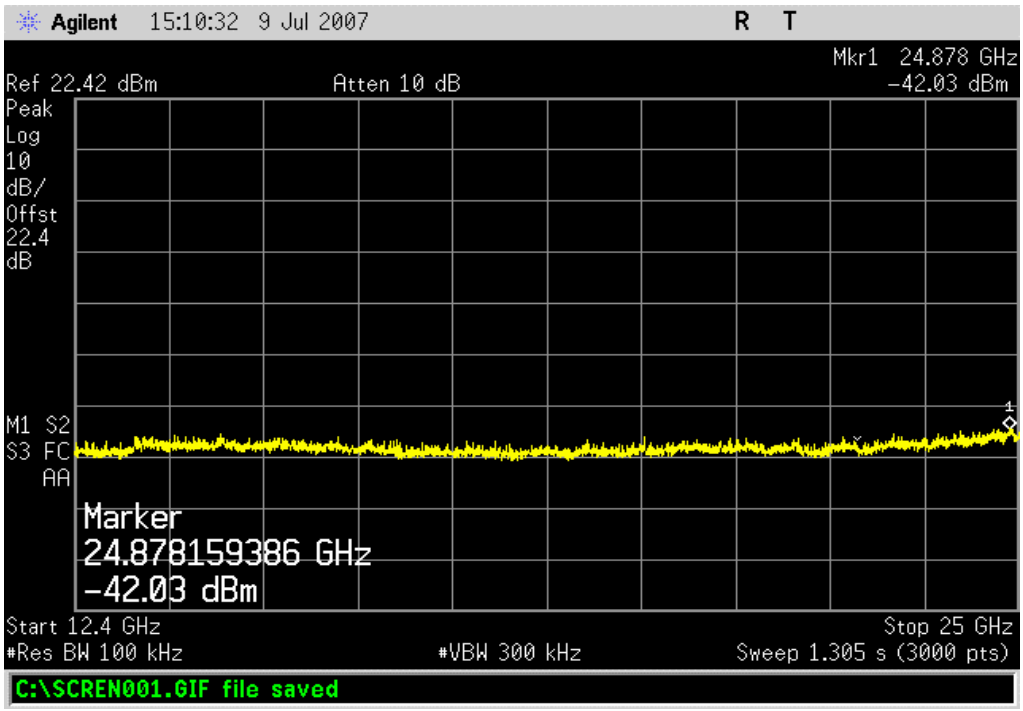
Bluetooth, pi/4-DQPSK, 2DH5, Low channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



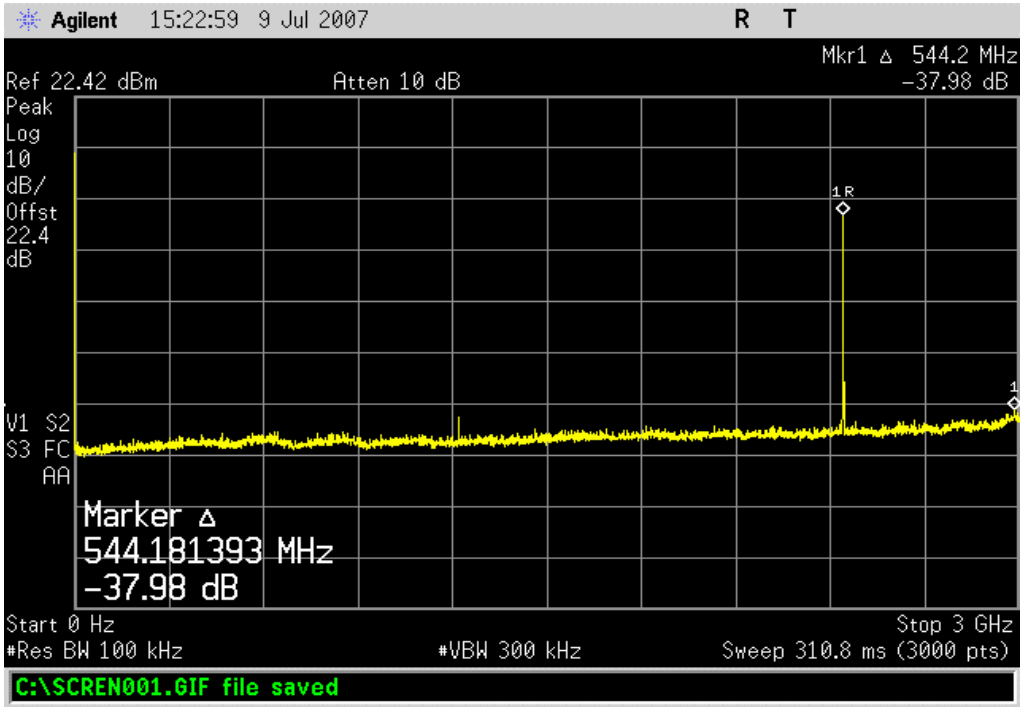
Bluetooth, pi/4-DQPSK, 2DH5, Low channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



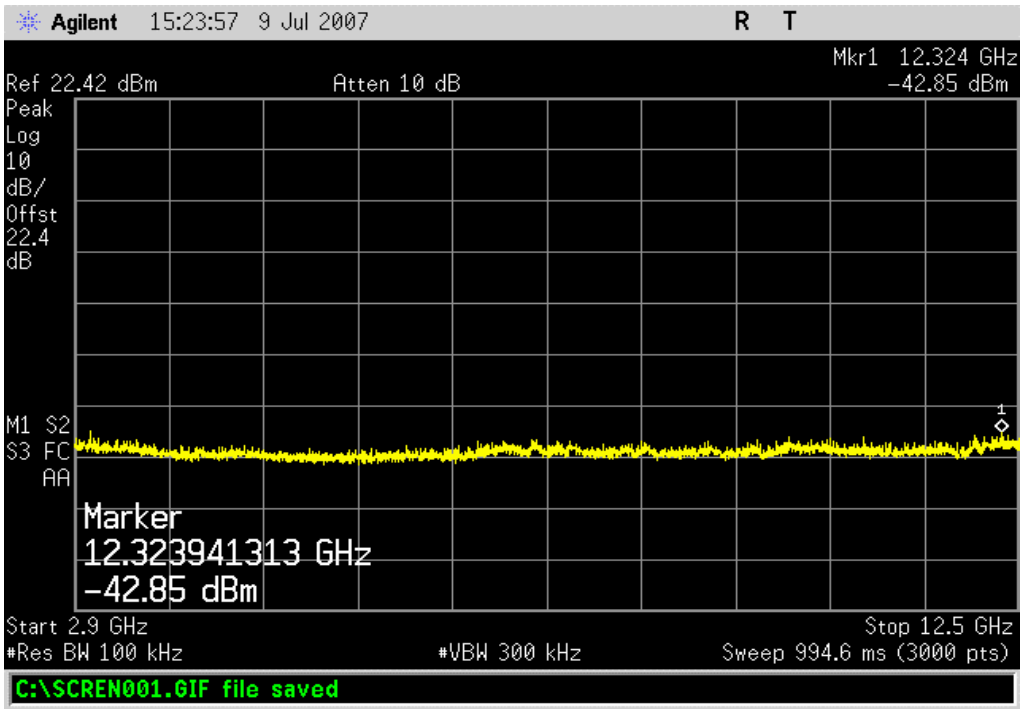
Bluetooth, pi/4-DQPSK, 2DH5, Low channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



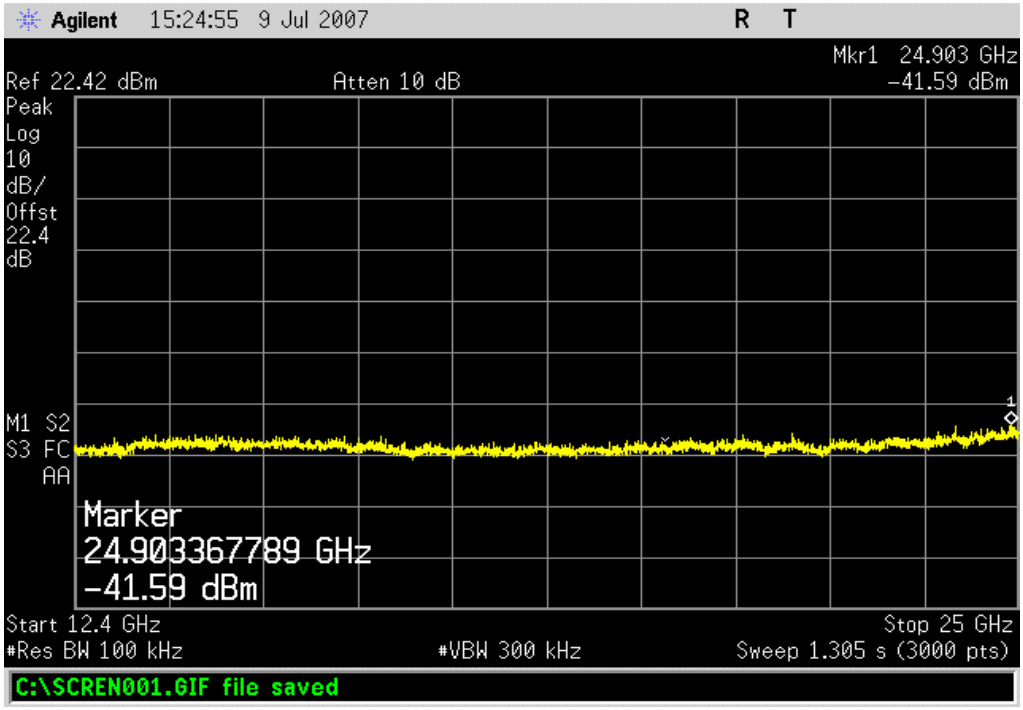
Bluetooth, pi/4-DQPSK, 2DH5, Mid channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



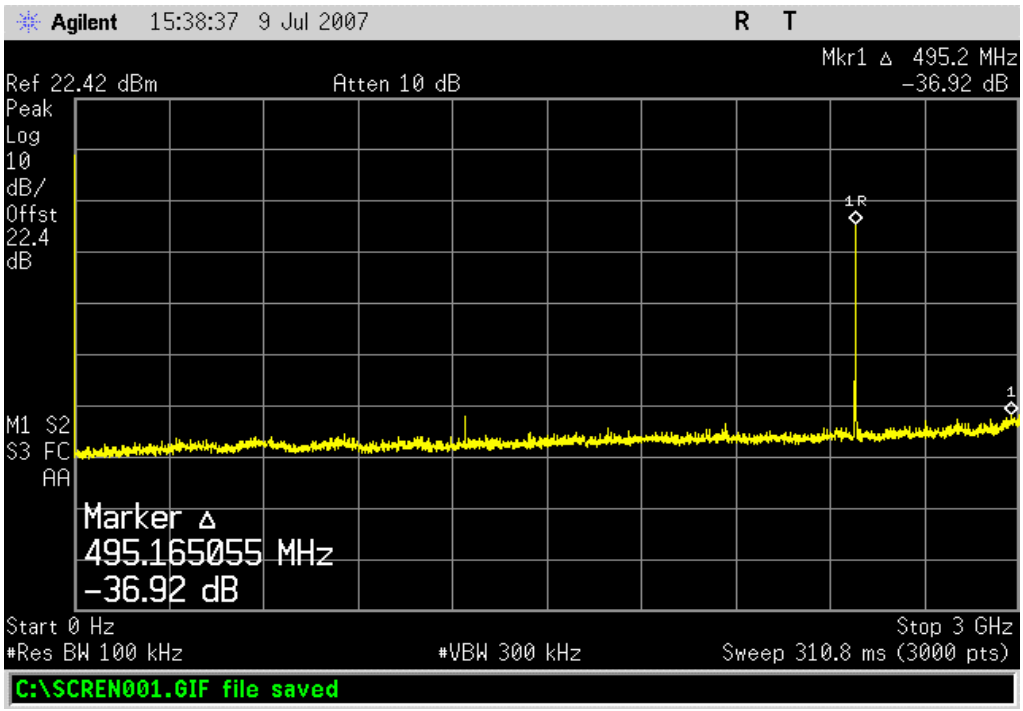
Bluetooth, pi/4-DQPSK, 2DH5, Mid channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



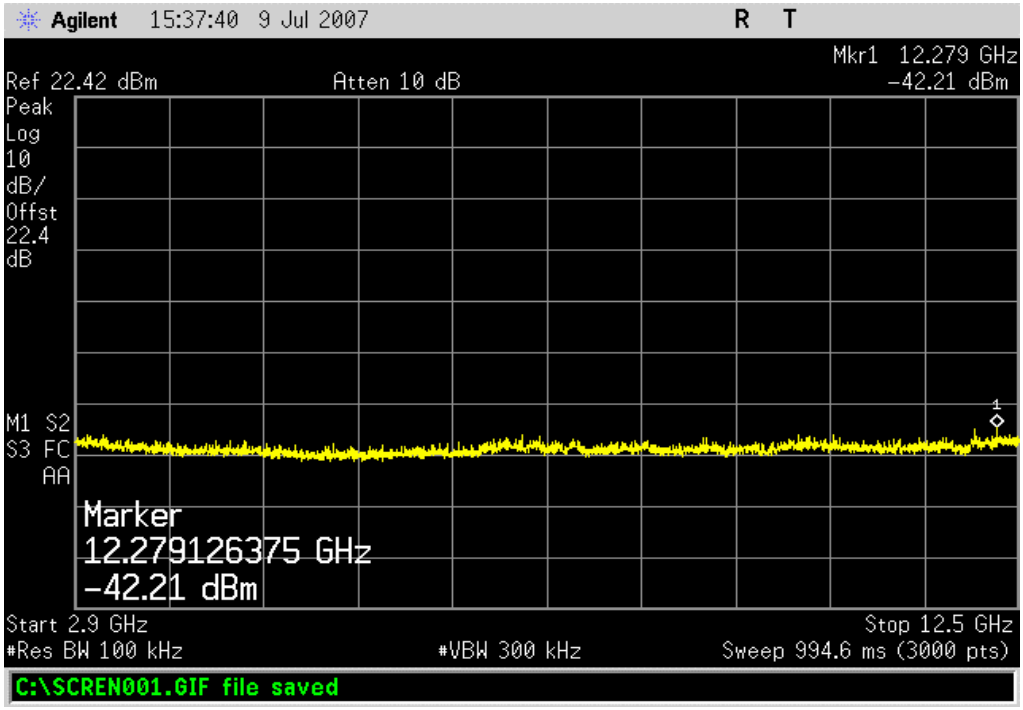
Bluetooth, pi/4-DQPSK, 2DH5, Mid channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



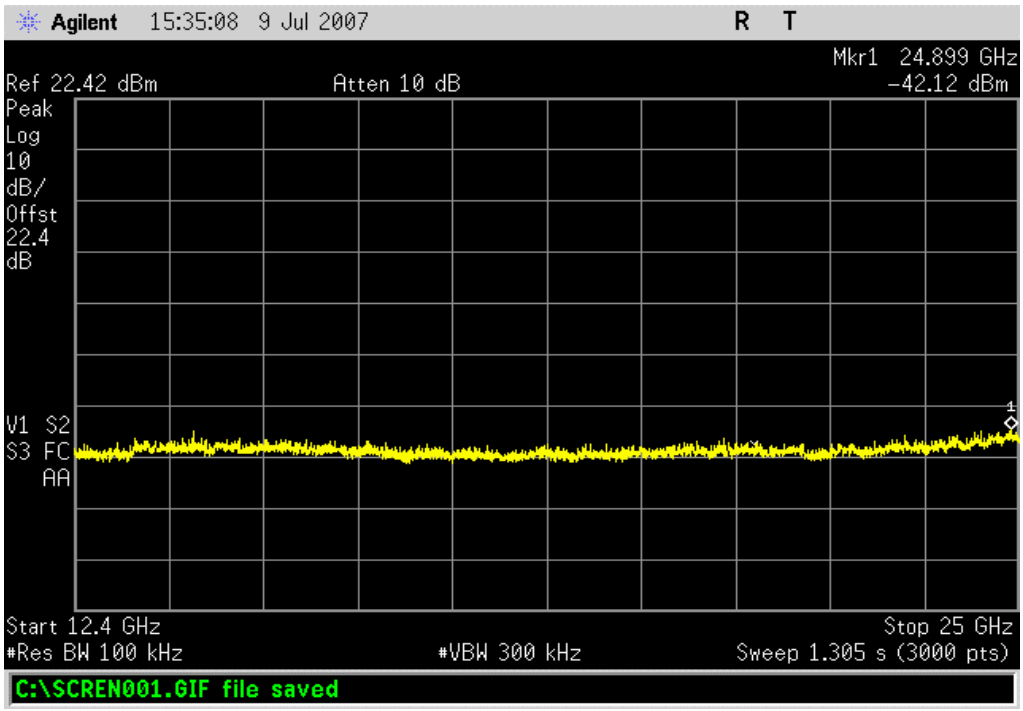
Bluetooth, pi/4-DQPSK, 2DH5, High channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



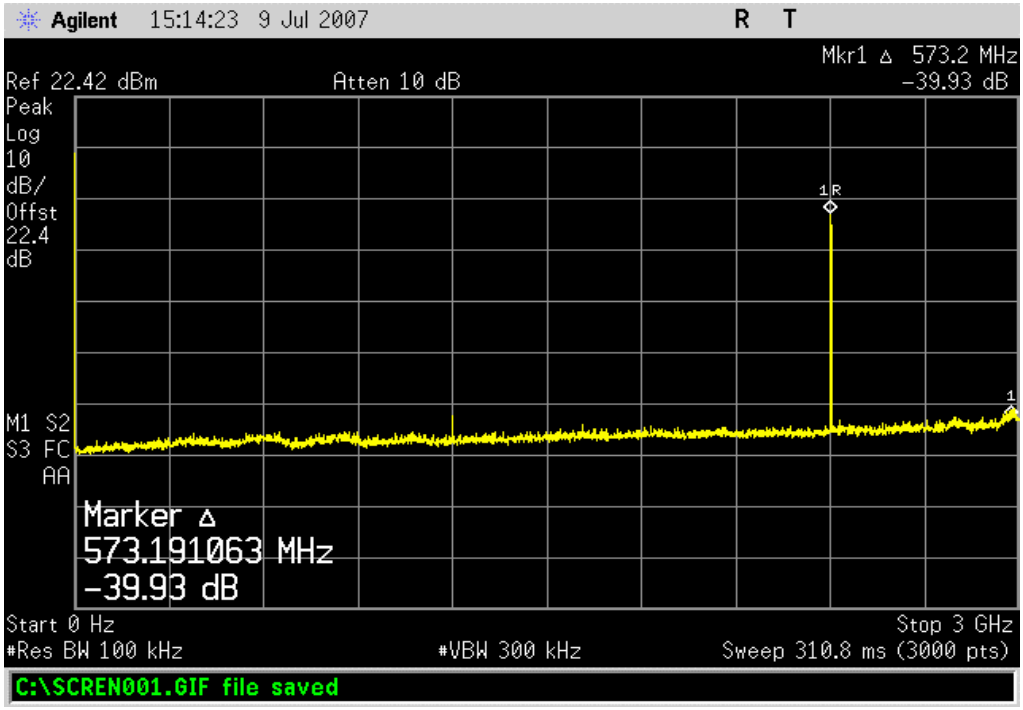
Bluetooth, pi/4-DQPSK, 2DH5, High channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



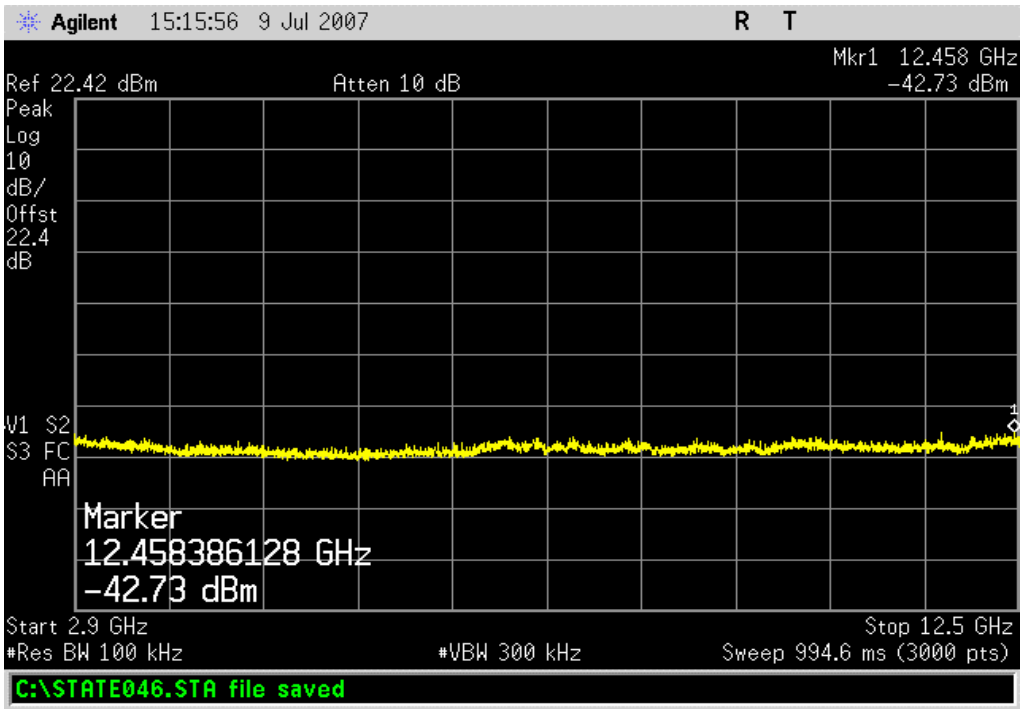
Bluetooth, pi/4-DQPSK, 2DH5, High channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



Bluetooth, 8DPSK, 3DH5, Low channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc

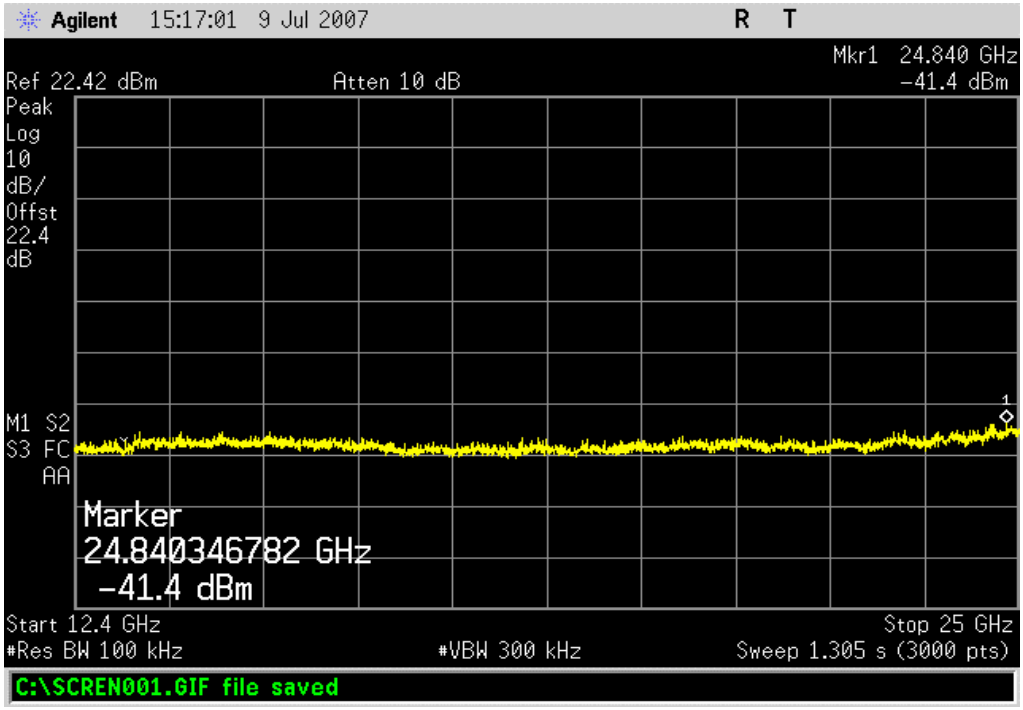


Bluetooth, 8DPSK, 3DH5, Low channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc

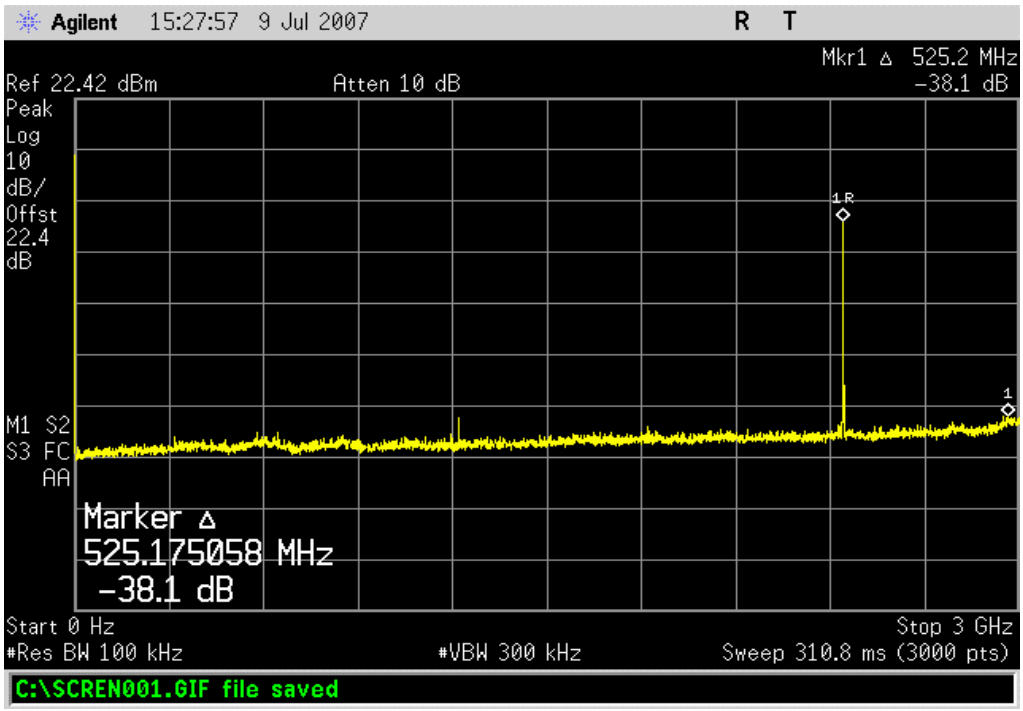


Spurious Conducted Emissions

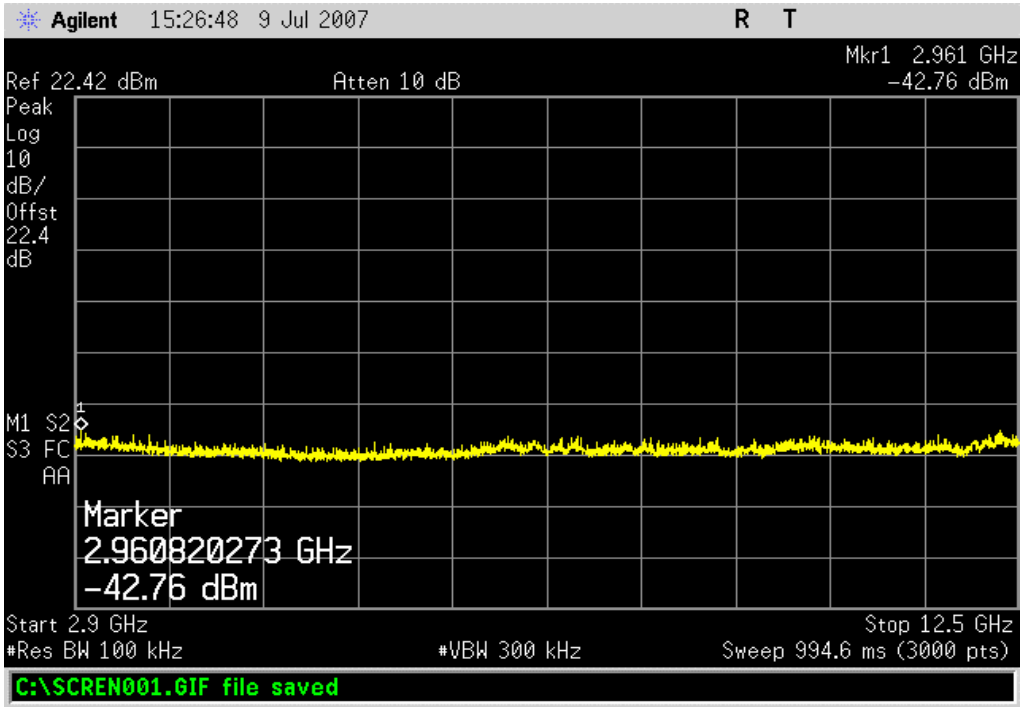
Bluetooth, 8DPSK, 3DH5, Low channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



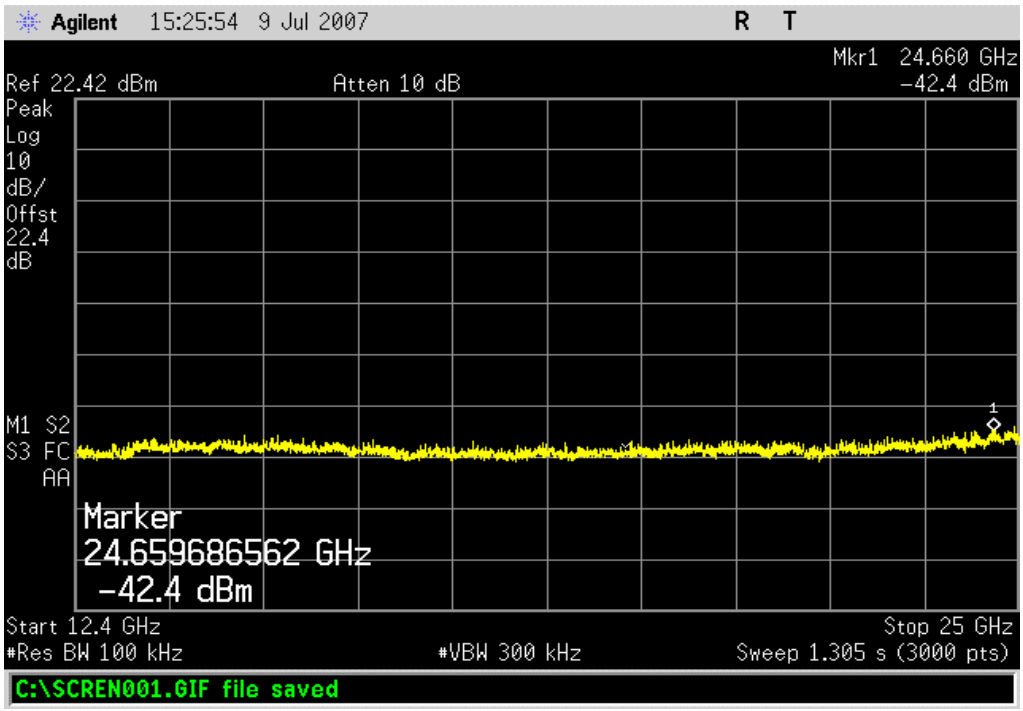
Bluetooth, 8DPSK, 3DH5, Mid channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



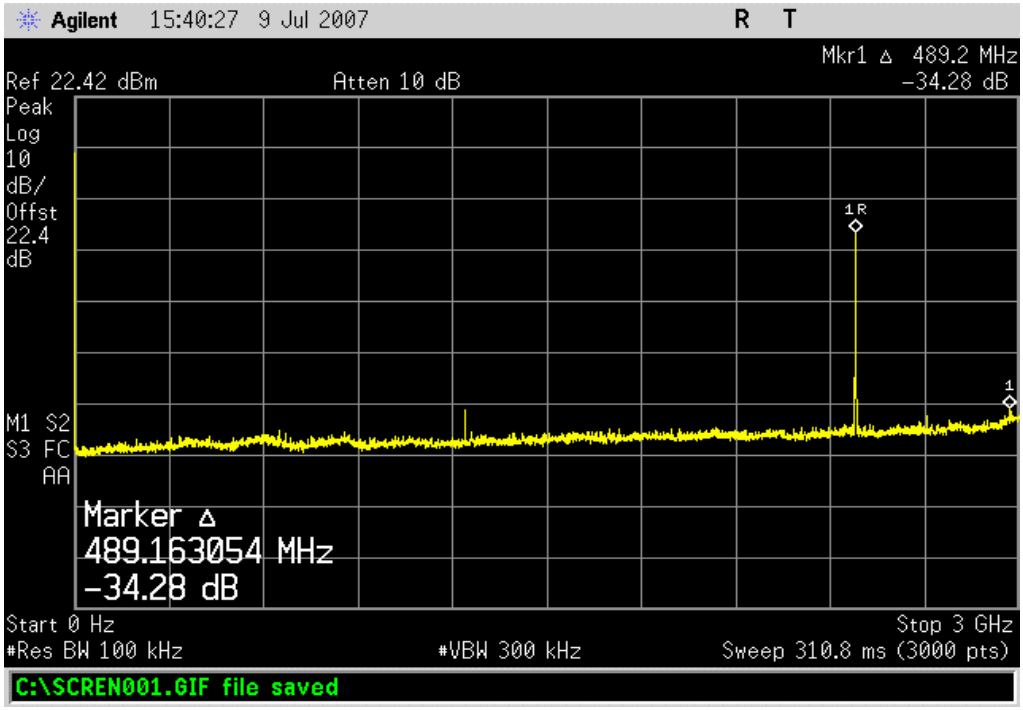
Bluetooth, 8DPSK, 3DH5, Mid channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



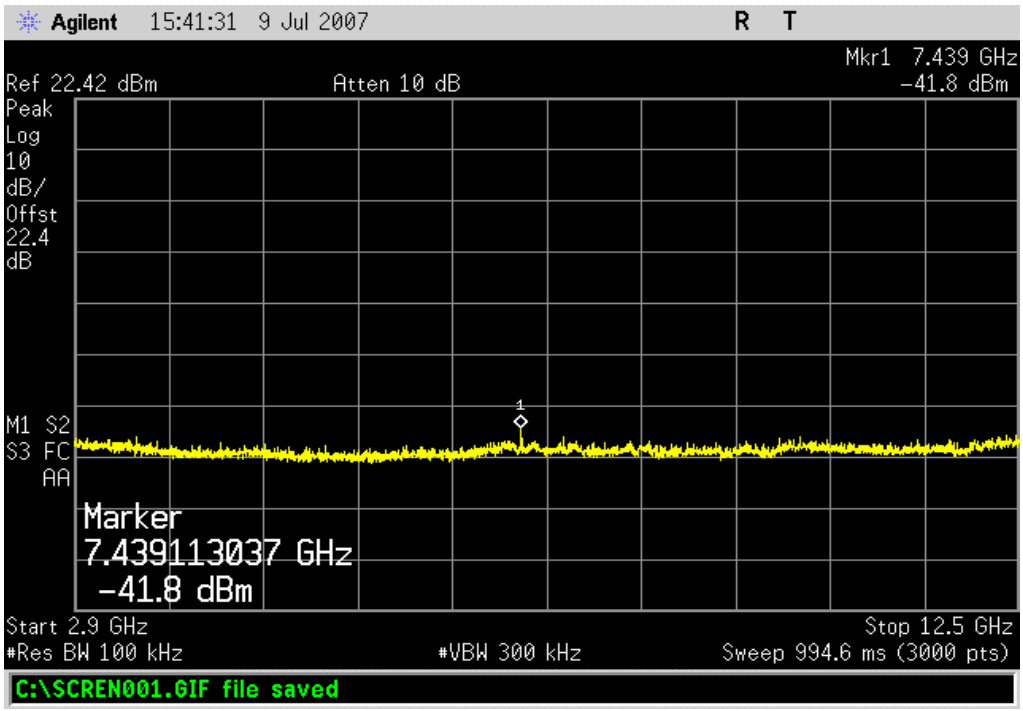
Bluetooth, 8DPSK, 3DH5, Mid channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



Bluetooth, 8DPSK, 3DH5, High channel, 0 Hz - 3 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc

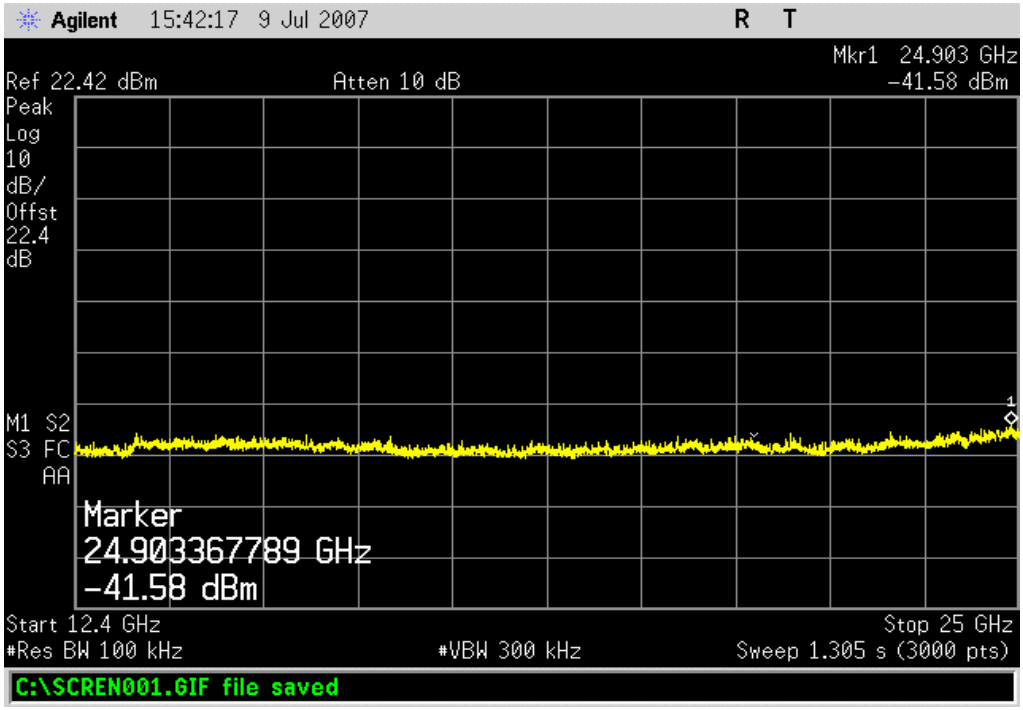


Bluetooth, 8DPSK, 3DH5, High channel, 2.9 GHz - 12.5 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



Spurious Conducted Emissions

Bluetooth, 8DPSK, 3DH5, High channel, 12.4 GHz - 25 GHz					
Result:	Pass	**Value:**	≤ - 35 dBc	**Limit:**	≤ -20 dBc



Power Spectral Density

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	6/8/2007	13
Spectrum Analyzer	Agilent	E4407B	AAU	12/8/2006	13

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

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 10^6 ÷ 3 x 10^3 = 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."

NORTHWEST EMC

Power Spectral Density

XMit 2007.06.13

EUT:	F-00001			Work Order:	LABT0261
Serial Number:	None			Date:	07/09/07
Customer:	Logitech, Inc.			Temperature:	24°C
Attendees:	None			Humidity:	38%
Project:	None			Barometric Pres.:	30.12
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz	Job Site:	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

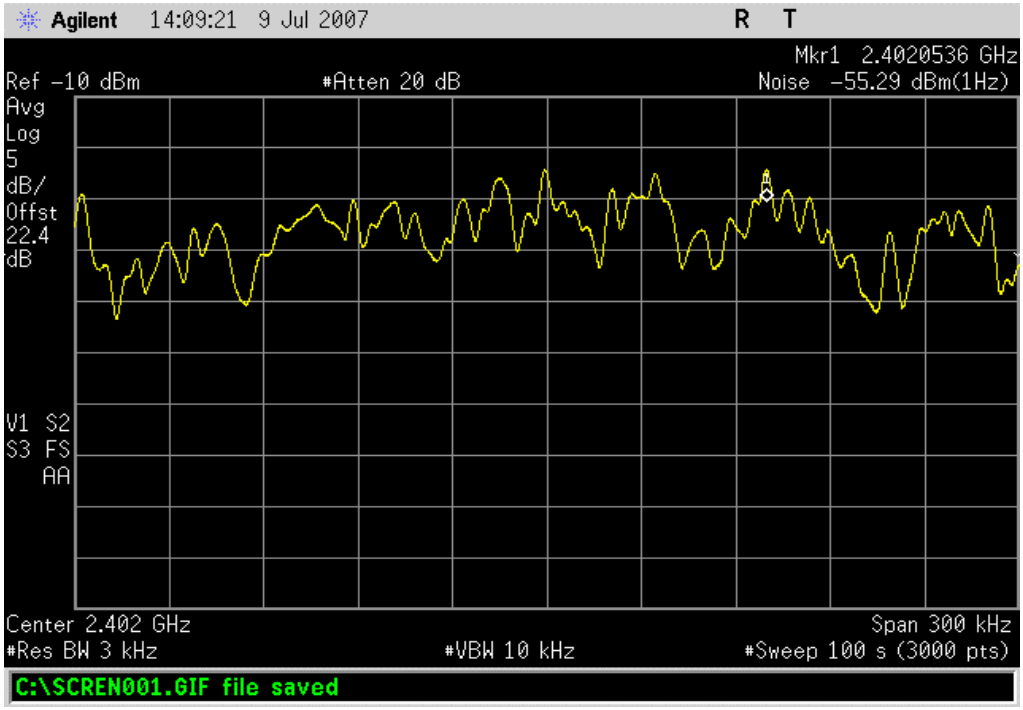
COMMENTS

DEVIATIONS FROM TEST STANDARD

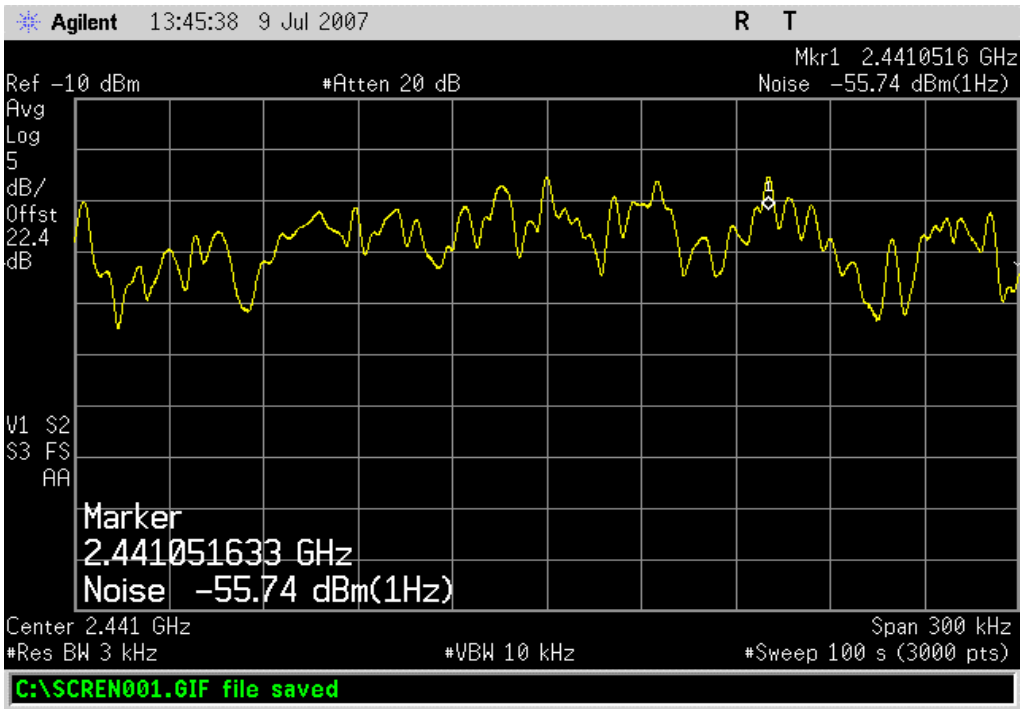
Configuration #	2	Signature Holly Ashkannejhad

	Value	Limit	Results
Bluetooth, GFSK, DH5			
Low channel	-20.49 dBm / 3 kHz	8 dBm / 3 kHz	Pass
Mid channel	-20.94 dBm / 3 kHz	8 dBm / 3 kHz	Pass
High channel	-21.67 dBm / 3 kHz	8 dBm / 3 kHz	Pass
Bluetooth, pi/4 - DQPSK, 2DH5			
Low channel	-26.9 dBm / 3 kHz	8 dBm / 3 kHz	Pass
Mid channel	-27.53 dBm / 3 kHz	8 dBm / 3 kHz	Pass
High channel	-28.81 dBm / 3 kHz	8 dBm / 3 kHz	Pass
Bluetooth, 8DPSK, 3DH5			
Low channel	-24.91 dBm / 3 kHz	8 dBm / 3 kHz	Pass
Mid channel	-25.81 dBm / 3 kHz	8 dBm / 3 kHz	Pass
High channel	-26.96 dBm / 3 kHz	8 dBm / 3 kHz	Pass

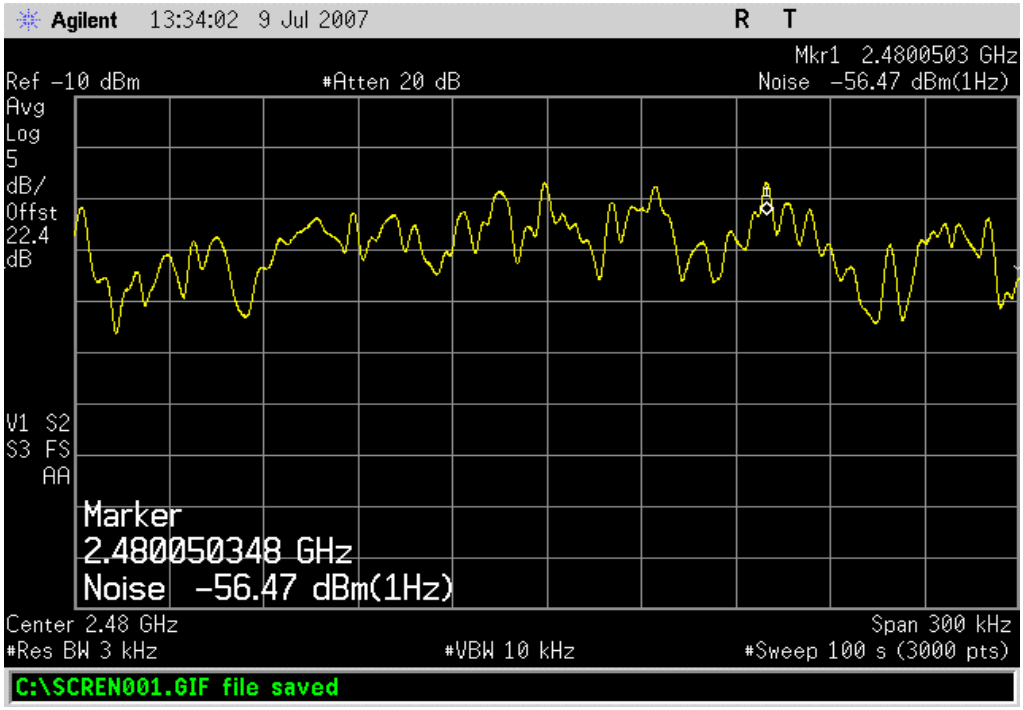
Bluetooth, GFSK, DH5, Low channel					
Result:	Pass	**Value:**	-20.49 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



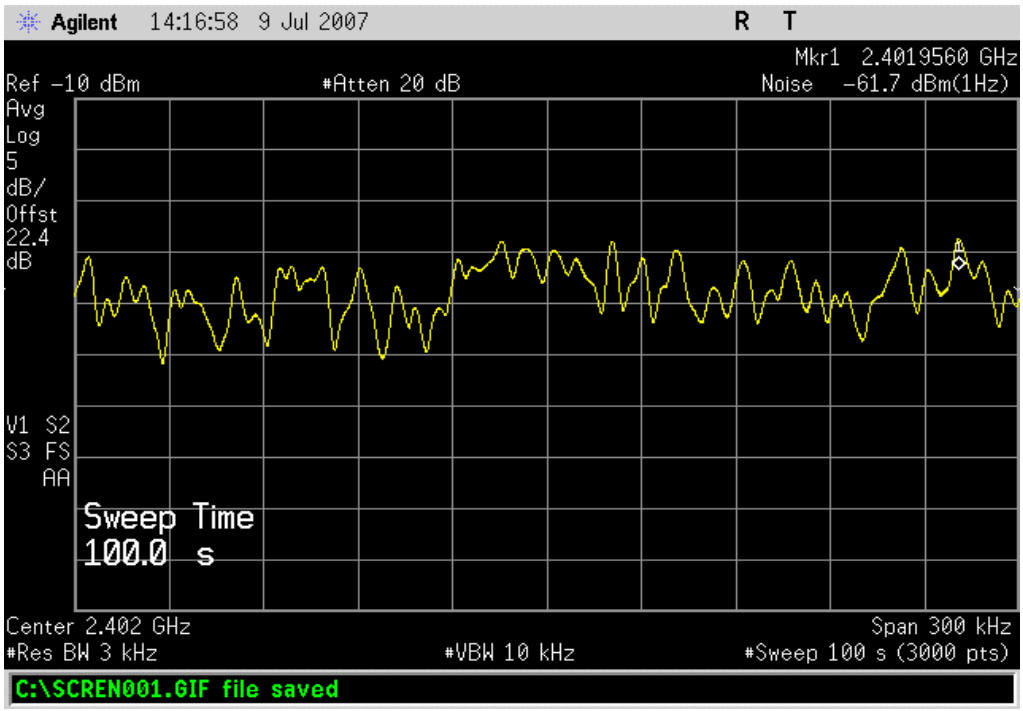
Bluetooth, GFSK, DH5, Mid channel					
Result:	Pass	**Value:**	-20.94 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



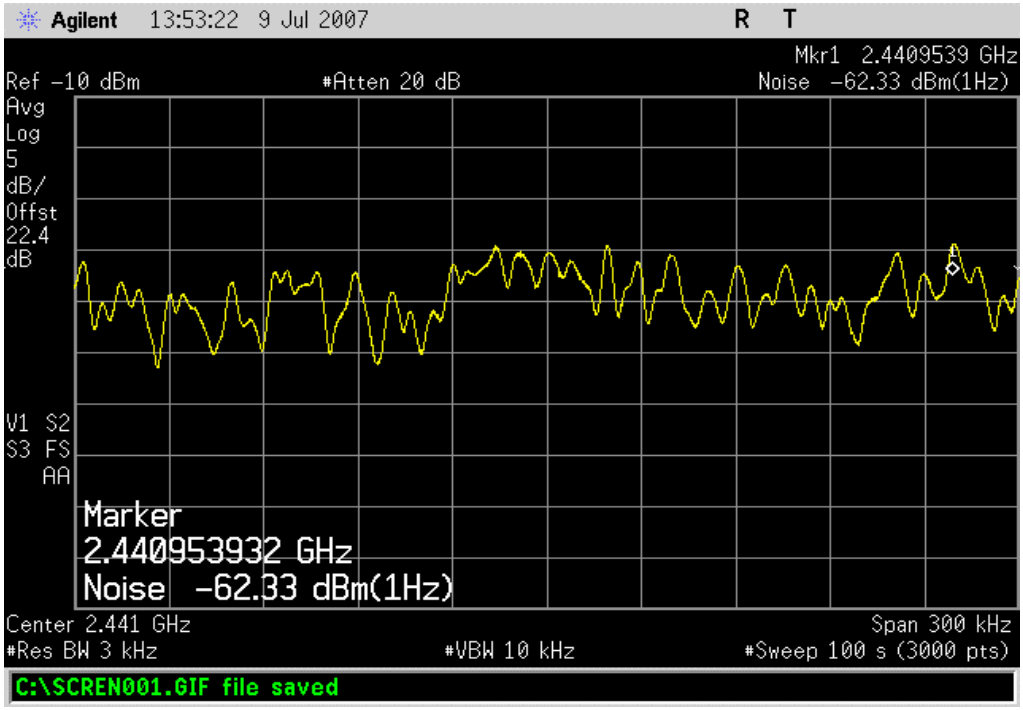
Bluetooth, GFSK, DH5, High channel					
Result:	Pass	**Value:**	-21.67 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



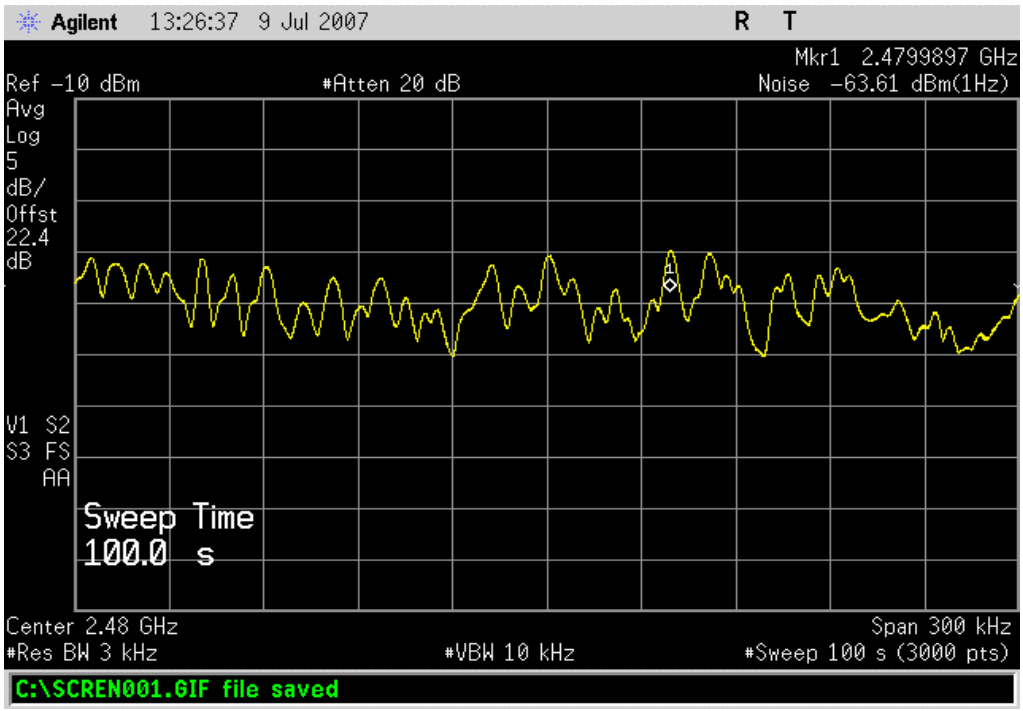
Bluetooth, pi/4 - DQPSK, 2DH5, Low channel					
Result:	Pass	**Value:**	-26.9 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



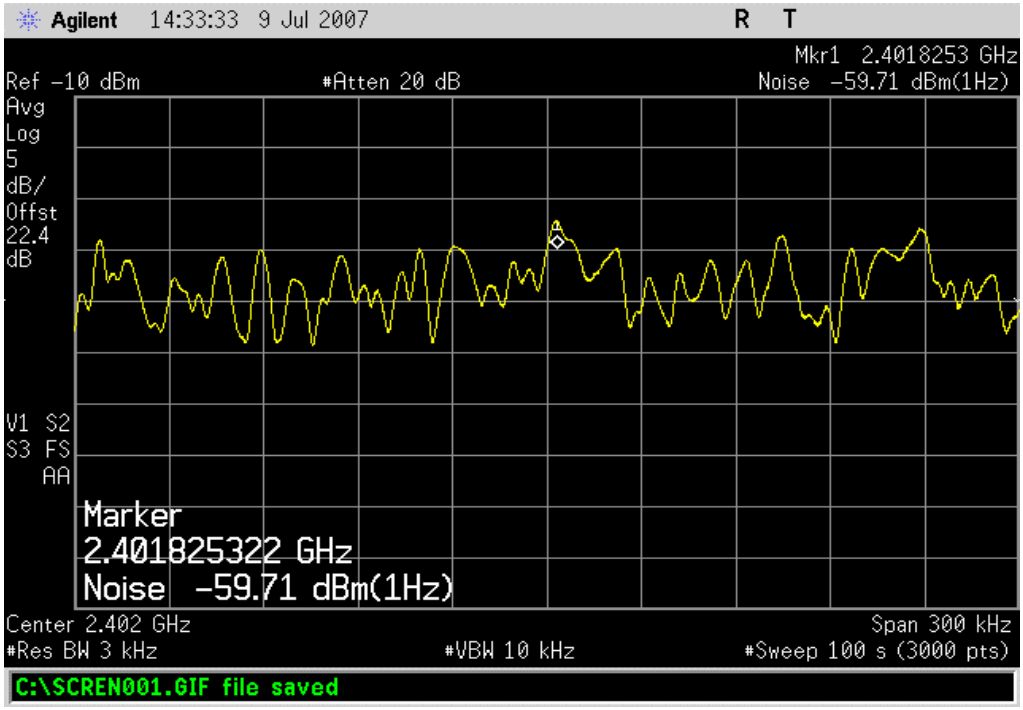
Bluetooth, pi/4 - DQPSK, 2DH5, Mid channel					
Result:	Pass	**Value:**	-27.53 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



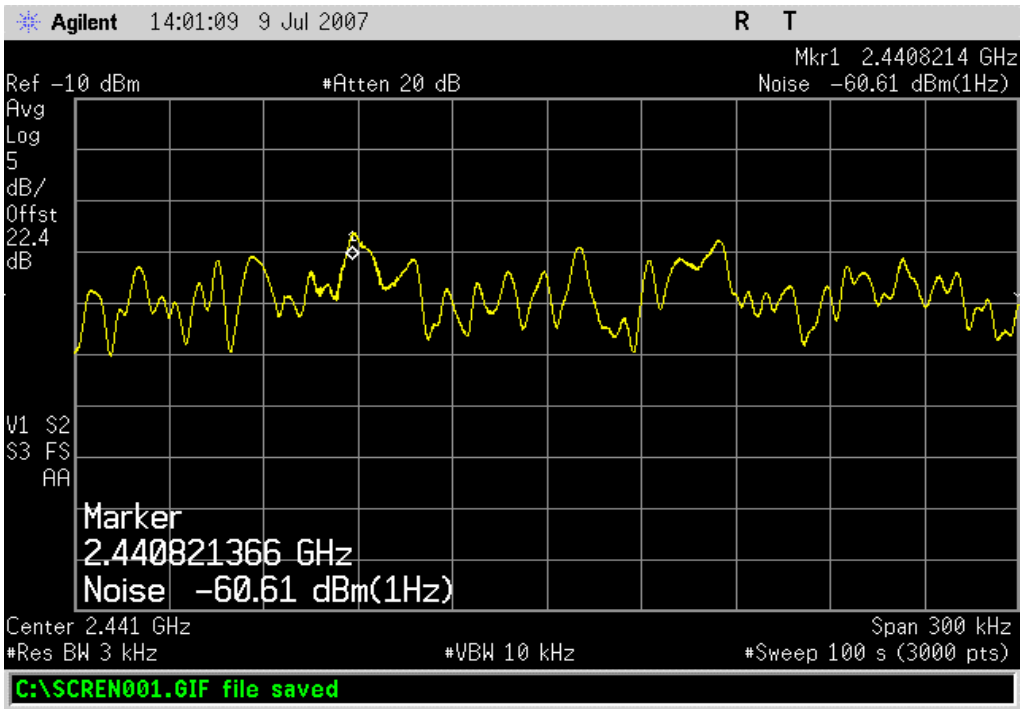
Bluetooth, pi/4 - DQPSK, 2DH5, High channel					
Result:	Pass	**Value:**	-28.81 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



Bluetooth, 8DPSK, 3DH5, Low channel					
Result:	Pass	**Value:**	-24.91 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz

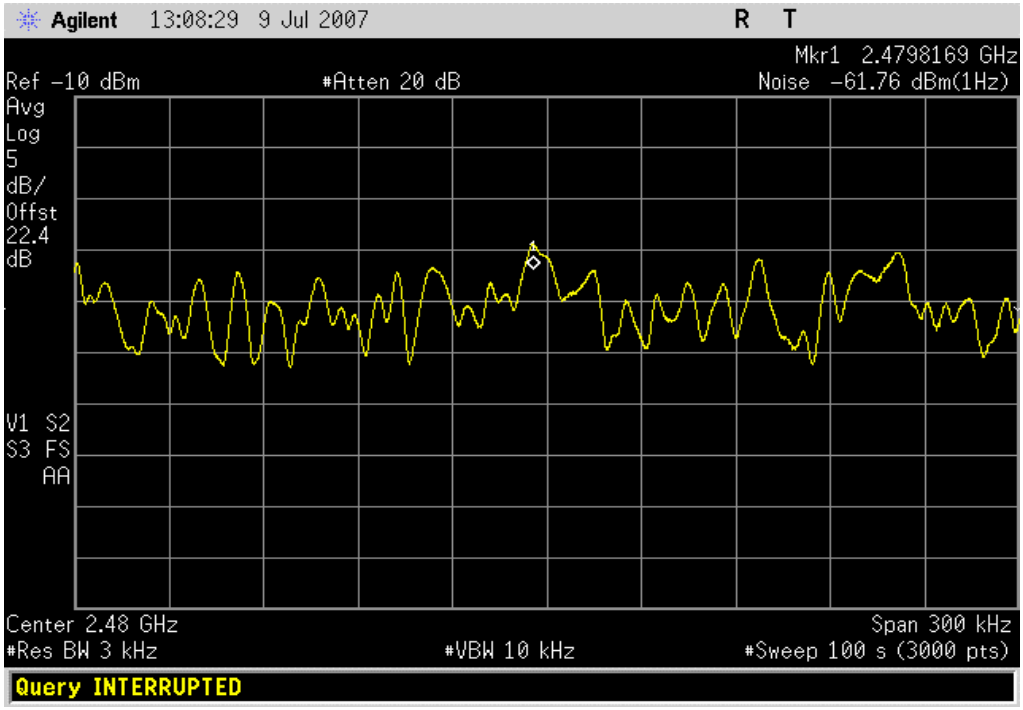


Bluetooth, 8DPSK, 3DH5, Mid channel					
Result:	Pass	**Value:**	-25.81 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



Power Spectral Density

Bluetooth, 8DPSK, 3DH5, High channel					
Result:	Pass	**Value:**	-26.96 dBm / 3 kHz	**Limit:**	8 dBm / 3 kHz



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION
Transmitting Bluetooth, High channel
Transmitting Bluetooth, mid channel
Transmitting Bluetooth, low channel

POWER SETTINGS INVESTIGATED
120VAC/60Hz

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4446A	AAT	12/7/2006	13
EV01 cables g,h,I			EVF	5/10/2007	13
Antenna, Horn	EMCO	3160-09	AHG	NCR	0
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	7/25/2007	13
EV01 Cable D			EVD	7/25/2007	13
Antenna, Horn	EMCO	3160-08	AHK	NCR	0
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	5/10/2007	13
EV01 cables g,h,j			EVB	5/10/2007	13
Antenna, Horn	EMCO	3115	AHC	8/24/2006	12
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	5/10/2007	13
EV01 cables c,g, h			EVA	12/29/2006	13
Antenna, Biconilog	EMCO	3141	AXE	12/28/2005	24
Pre-Amplifier	Miteq	AM-1616-1000	AOL	12/29/2006	13

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The only 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.

NORTHWEST EMC

Spurious Radiated Emissions

PSA 2007.05.07
EMI 2006.12.20

EUT:	F-00001	Work Order:	LABT0261
Serial Number:	None	Date:	07/06/07
Customer:	Logitech, Inc.	Temperature:	23
Attendees:	None	Humidity:	42%
Project:	None	Barometric Pres.:	30.05
Tested by:	Holly Ashkannejhad	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

Power via USB/AC Adapter unless otherwise noted below.

EUT OPERATING MODES

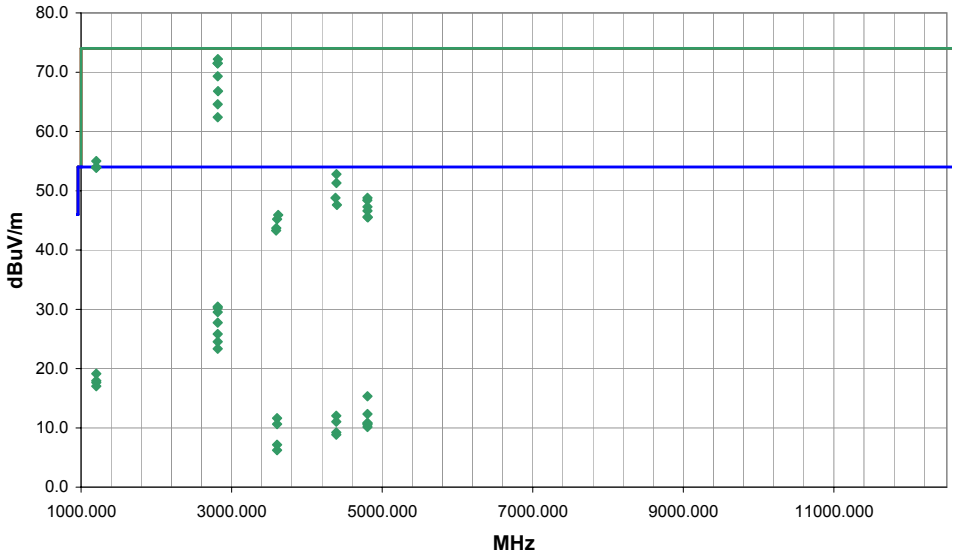
Transmitting Bluetooth, low channel, see comments for modulation

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	6
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2817.810	50.7	1.5	228.0	1.0	0.0	20.0	H-Horn	PK	0.0	72.2	74.0	-1.8	2DH5, EUT flat (horizontal)
2813.410	50.0	1.5	167.0	1.0	0.0	20.0	H-Horn	PK	0.0	71.5	74.0	-2.5	3DH5, EUT vertical
2814.760	50.0	1.5	210.0	1.0	0.0	20.0	H-Horn	PK	0.0	71.5	74.0	-2.5	3DH5, EUT flat (horizontal)
2814.010	47.8	1.5	153.0	1.3	0.0	20.0	H-Horn	PK	0.0	69.3	74.0	-4.7	2DH5, EUT typical position
2818.460	45.3	1.5	44.0	1.9	0.0	20.0	V-Horn	PK	0.0	66.8	74.0	-7.2	2DH5, EUT typical position
2814.430	43.1	1.5	324.0	1.0	0.0	20.0	V-Horn	PK	0.0	64.6	74.0	-9.4	2DH5, EUT horizontal
2814.340	40.9	1.5	320.0	1.0	0.0	20.0	V-Horn	PK	0.0	62.4	74.0	-11.6	3DH5, EUT vertical
1201.450	39.6	-4.6	37.0	1.0	0.0	20.0	H-Horn	PK	0.0	55.0	74.0	-19.0	3DH5, EUT flat (horizontal)
1201.450	38.6	-4.6	107.0	1.0	0.0	20.0	V-Horn	PK	0.0	54.0	74.0	-20.0	DH5, EUT typical position
1201.440	38.5	-4.6	151.0	1.0	0.0	20.0	H-Horn	PK	0.0	53.9	74.0	-20.1	DH5, EUT flat (horizontal)
1201.680	38.5	-4.6	101.0	1.0	0.0	20.0	V-Horn	PK	0.0	53.9	74.0	-20.1	3DH5, EUT typical position
4391.930	46.4	6.4	144.0	1.2	0.0	0.0	H-Horn	PK	0.0	52.8	74.0	-21.2	3DH5, EUT flat (horizontal)
4391.710	44.9	6.4	4.0	1.0	0.0	0.0	V-Horn	PK	0.0	51.3	74.0	-22.7	2DH5, EUT typical position
2815.410	33.7	1.5	210.0	1.0	24.8	20.0	H-Horn	AV	0.0	30.4	54.0	-23.6	3DH5, EUT flat (horizontal)
2815.480	33.5	1.5	167.0	1.0	24.8	20.0	H-Horn	AV	0.0	30.2	54.0	-23.8	3DH5, EUT vertical
2815.700	32.8	1.5	228.0	1.0	24.8	20.0	H-Horn	AV	0.0	29.5	54.0	-24.5	2DH5, EUT flat (horizontal)
4380.240	42.4	6.4	235.0	1.0	0.0	0.0	H-Horn	PK	0.0	48.8	74.0	-25.2	2DH5, EUT flat (horizontal)
4803.350	41.4	7.4	200.0	1.0	0.0	0.0	V-Horn	PK	0.0	48.8	74.0	-25.2	2DH5, EUT typical position
4802.905	41.0	7.4	193.0	1.0	0.0	0.0	V-Horn	PK	0.0	48.4	74.0	-25.6	DH5, EUT typical position
2815.130	31.0	1.5	153.0	1.3	24.8	20.0	H-Horn	AV	0.0	27.7	54.0	-26.3	2DH5, EUT typical position

NORTHWEST EMC

Spurious Radiated Emissions

PSA 2007.05.07
EMI 2006.12.20

EUT:	F-00001	Work Order:	LABT0261
Serial Number:	None	Date:	07/06/07
Customer:	Logitech, Inc.	Temperature:	23
Attendees:	None	Humidity:	42%
Project:	None	Barometric Pres.:	30.05
Tested by:	Holly Ashkannejhad	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

Power via USB/AC Adapter.

EUT OPERATING MODES

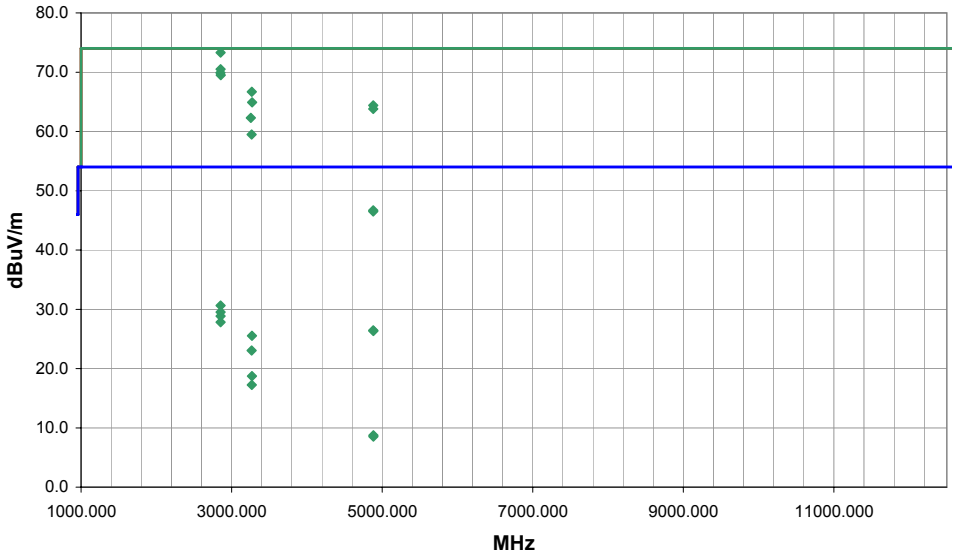
Transmitting Bluetooth, mid channel, see comments for data rate

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	7
Configuration #	1
Results	Pass

Signature Holly Ashkannejhad



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2853.070	51.5	1.8	201.0	1.0	0.0	20.0	H-Horn	PK	0.0	73.3	74.0	-0.7	2DH5, EUT flat (horizontal)
2853.970	48.7	1.8	215.0	1.0	0.0	20.0	H-Horn	PK	0.0	70.5	74.0	-3.5	3DH5, EUT flat (horizontal)
2851.690	48.1	1.8	180.0	1.0	0.0	20.0	V-Horn	PK	0.0	69.9	74.0	-4.1	3DH5, EUT typical position
2855.870	47.7	1.8	180.0	1.0	0.0	20.0	V-Horn	PK	0.0	69.5	74.0	-4.5	2DH5, EUT typical position
3266.860	42.5	4.2	11.0	1.0	0.0	20.0	V-Horn	PK	0.0	66.7	74.0	-7.3	3DH5, EUT typical position
3271.170	60.7	4.2	281.0	1.0	0.0	0.0	V-Horn	PK	0.0	64.9	74.0	-9.1	2DH5, EUT typical position
4881.387	36.7	7.7	-1.0	1.2	0.0	20.0	V-Horn	PK	0.0	64.4	74.0	-9.6	DH5, EUT typical position
4881.107	36.1	7.7	208.0	1.0	0.0	20.0	H-Horn	PK	0.0	63.8	74.0	-10.2	DH5, EUT flat (horizontal)
3255.040	58.1	4.2	307.0	1.0	0.0	0.0	H-Horn	PK	0.0	62.3	74.0	-11.7	2DH5, EUT flat (horizontal)
3265.880	35.3	4.2	57.0	1.0	0.0	20.0	H-Horn	PK	0.0	59.5	74.0	-14.5	3DH5, EUT flat (horizontal)
2853.260	33.6	1.8	201.0	1.0	24.8	20.0	H-Horn	AV	0.0	30.6	54.0	-23.4	2DH5, EUT flat (horizontal)
2854.210	32.5	1.8	215.0	1.0	24.8	20.0	H-Horn	AV	0.0	29.5	54.0	-24.5	3DH5, EUT flat (horizontal)
2853.690	31.8	1.8	180.0	1.0	24.8	20.0	V-Horn	AV	0.0	28.8	54.0	-25.2	3DH5, EUT typical position
2853.070	30.8	1.8	180.0	1.0	24.8	20.0	V-Horn	AV	0.0	27.8	54.0	-26.2	2DH5, EUT typical position
4881.520	39.0	7.7	129.0	1.2	0.0	0.0	V-Horn	PK	0.0	46.7	74.0	-27.3	2DH5, EUT typical position
4881.840	38.8	7.7	249.0	1.0	0.0	0.0	H-Horn	PK	0.0	46.5	74.0	-27.5	2DH5, EUT flat (horizontal)
4881.740	23.5	7.7	-1.0	1.2	24.8	20.0	V-Horn	AV	0.0	26.4	54.0	-27.6	DH5, EUT typical position
4881.890	23.4	7.7	208.0	1.0	24.8	20.0	H-Horn	AV	0.0	26.3	54.0	-27.7	DH5, EUT flat (horizontal)
3268.820	26.1	4.2	11.0	1.0	24.8	20.0	V-Horn	AV	0.0	25.5	54.0	-28.5	3DH5, EUT typical position
3265.070	23.6	4.2	57.0	1.0	24.8	20.0	H-Horn	AV	0.0	23.0	54.0	-31.0	3DH5, EUT flat (horizontal)

NORTHWEST EMC

Spurious Radiated Emissions

PSA 2007.05.07
EMI 2006.12.20

EUT:	F-00001			Work Order:	LABT0261
Serial Number:	None			Date:	07/08/07
Customer:	Logitech, Inc.			Temperature:	23
Attendees:	None			Humidity:	34%
Project:	None			Barometric Pres.:	30.15
Tested by:	Greg Kiemel	Power:	120VAC/60Hz	Job Site:	EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

Power via USB/AC Adapter. Switched antenna matching circuit from a parallel cap/series inductor to a parallel inductor/series cap.

EUT OPERATING MODES

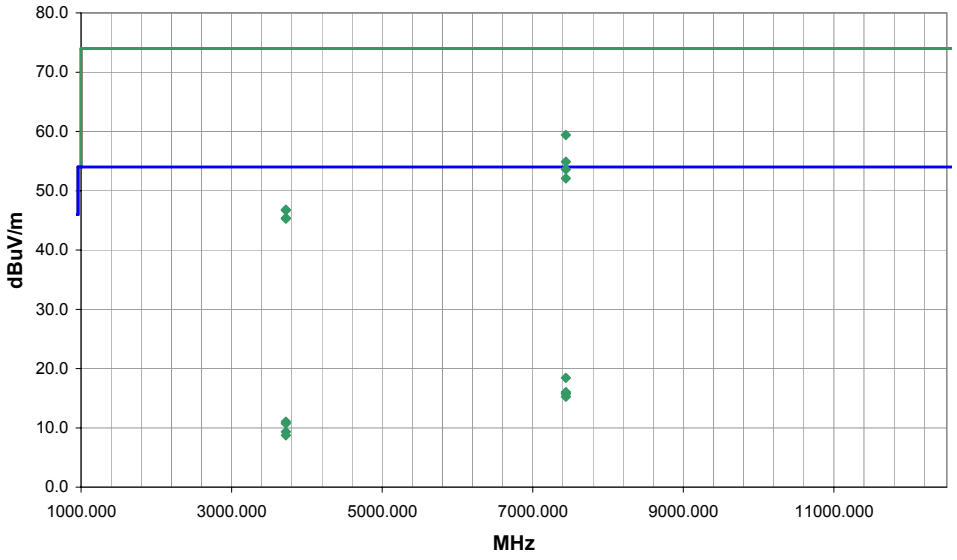
Transmitting Bluetooth, High channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	10
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
7439.916	44.9	14.5	-1.0	1.9	0.0	0.0	V-Horn	PK	0.0	59.4	74.0	-14.6	3DH5, EUT typical position
7440.316	40.4	14.5	317.0	1.0	0.0	0.0	H-Horn	PK	0.0	54.9	74.0	-19.1	3DH5, EUT flat (horizontal)
7440.086	39.1	14.5	188.0	1.0	0.0	0.0	H-Horn	PK	0.0	53.6	74.0	-20.4	2DH5, EUT flat (horizontal)
7439.326	37.6	14.5	308.0	1.0	0.0	0.0	V-Horn	PK	0.0	52.1	74.0	-21.9	2DH5, EUT typical position
3720.207	41.0	5.8	191.0	1.0	0.0	0.0	V-Horn	PK	0.0	46.8	74.0	-27.2	3DH5, EUT typical position
3720.607	40.9	5.8	322.0	1.0	0.0	0.0	H-Horn	PK	0.0	46.7	74.0	-27.3	2DH5, EUT flat (horizontal)
3720.207	39.6	5.8	206.0	1.0	0.0	0.0	V-Horn	PK	0.0	45.4	74.0	-28.6	2DH5, EUT typical position
3720.337	39.5	5.8	98.0	1.0	0.0	0.0	H-Horn	PK	0.0	45.3	74.0	-28.7	3DH5, EUT flat (horizontal)
7440.056	28.7	14.5	-1.0	1.9	24.8	0.0	V-Horn	AV	0.0	18.4	54.0	-35.6	3DH5, EUT typical position
7440.016	26.3	14.5	317.0	1.0	24.8	0.0	H-Horn	AV	0.0	16.0	54.0	-38.0	3DH5, EUT flat (horizontal)
7440.056	26.0	14.5	188.0	1.0	24.8	0.0	H-Horn	AV	0.0	15.7	54.0	-38.3	2DH5, EUT flat (horizontal)
7439.896	25.5	14.5	308.0	1.0	24.8	0.0	V-Horn	AV	0.0	15.2	54.0	-38.8	2DH5, EUT typical position
3720.467	30.0	5.8	191.0	1.0	24.8	0.0	V-Horn	AV	0.0	11.0	54.0	-43.0	3DH5, EUT typical position
3720.467	29.7	5.8	322.0	1.0	24.8	0.0	H-Horn	AV	0.0	10.7	54.0	-43.3	2DH5, EUT flat (horizontal)
3720.427	28.3	5.8	98.0	1.0	24.8	0.0	H-Horn	AV	0.0	9.3	54.0	-44.7	3DH5, EUT flat (horizontal)
3720.487	27.7	5.8	206.0	1.0	24.8	0.0	V-Horn	AV	0.0	8.7	54.0	-45.3	2DH5, EUT typical position

NORTHWEST EMC

Spurious Radiated Emissions

PSA 2007.05.07
EMI 2006.11.29

EUT:	F-00001	Work Order:	LABT0261
Serial Number:	None	Date:	08/08/07
Customer:	Logitech, Inc.	Temperature:	23
Attendees:	Aaron Cohen	Humidity:	40%
Project:	None	Barometric Pres.:	1015.5
Tested by:	Rod Peloquin	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

Power via USB/AC Adapter: Command sequence in Hyperterminal: 1) "scanenable 0", 2) "freq 78 78", 3) "telectxtest 2 3dh5 / 6 2dh5/ 4 dh5"

EUT OPERATING MODES

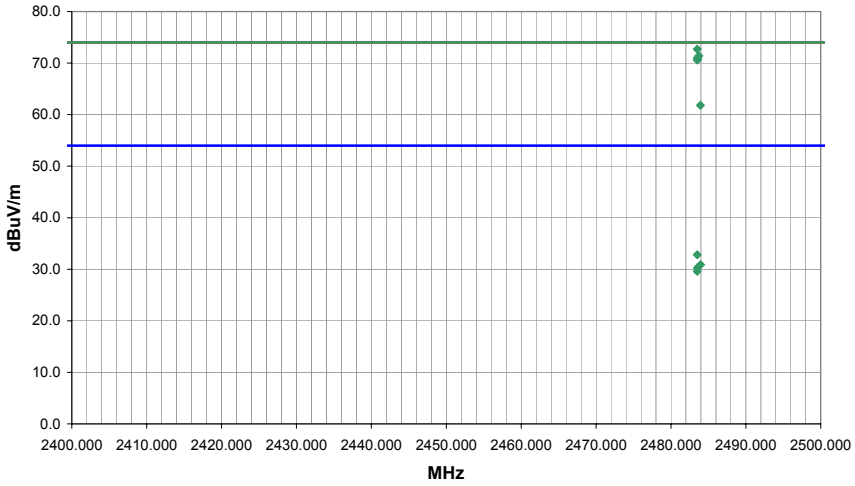
Transmitting Bluetooth, High channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	14
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2483.503	52.3	0.4	217.0	1.1	0.0	20.0	H-Horn	PK	0.0	72.7	74.0	-1.3	3dh5 modulation, EUT horizontal
2483.722	51.0	0.4	221.0	1.1	0.0	20.0	H-Horn	PK	0.0	71.4	74.0	-2.6	dh5 modulation, EUT horizontal
2483.532	50.6	0.4	202.0	1.0	0.0	20.0	V-Horn	PK	0.0	71.0	74.0	-3.0	dh5 modulation, EUT typical orientation
2483.577	50.3	0.4	198.0	1.1	0.0	20.0	H-Horn	PK	0.0	70.7	74.0	-3.3	2dh5 modulation, EUT horizontal
2483.500	50.2	0.4	183.0	1.0	0.0	20.0	V-Horn	PK	0.0	70.6	74.0	-3.4	3dh5 modulation, EUT typical orientation
2480.143	69.6	33.4	201.0	1.0	0.0	0.0	V-Horn	PK	0.0	103.0	N/A	N/A	Fundmental for Marker Delta, 2dh5 modulation, EUT typic
2483.930	N/A	N/A	201.0	1.0	N/A	N/A	V-Horn	PK	0.0	61.8	74.0	-12.2	Calculated Marker Delta, 2dh5 modulation, EUT typical or
2483.512	37.1	0.5	218.0	1.1	24.8	20.0	H-Horn	AV	0.0	32.8	54.0	-21.2	3dh5 modulation, EUT horizontal
2483.948	35.3	0.4	220.0	1.1	24.8	20.0	H-Horn	AV	0.0	30.9	54.0	-23.1	dh5 modulation, EUT horizontal
2483.520	34.7	0.4	182.0	1.0	24.8	20.0	V-Horn	AV	0.0	30.3	54.0	-23.7	2dh5 modulation, EUT typical orientation
2483.508	34.0	0.4	219.0	1.1	24.8	20.0	H-Horn	AV	0.0	29.6	54.0	-24.4	2dh5 modulation, EUT horizontal
2483.535	32.4	0.4	360.0	1.0	24.8	20.0	V-Horn	AV	0.0	28.0	54.0	-26.0	3dh5 modulation, EUT typical orientation

NORTHWEST
EMC

Spurious Radiated Emissions

PSA 2007.05.07
EMI 2006.11.29

EUT:	F-00001			**Work Order:**	LABT0261
Serial Number:	None			**Date:**	08/08/07
Customer:	Logitech, Inc.			**Temperature:**	23
Attendees:	Aaron Cohen			**Humidity:**	40%
Project:	None			**Barometric Pres.:**	1015.5
Tested by:	Rod Peloquin	**Power:**	120VAC/60Hz	**Job Site:**	EV01

TEST SPECIFICATIONS	Test Method
FCC 15.247 (DTS):2006	ANSI C63.4:2003 KDB No. 558074

TEST PARAMETERS

Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

Power via USB/AC Adapter: Command sequence in Hyperterminal: 1) "scanenable 0", 2) "freq 78 78", 3) "telectxtest 2 3dh5 / 6 2dh5/ 4 dh5"

EUT OPERATING MODES

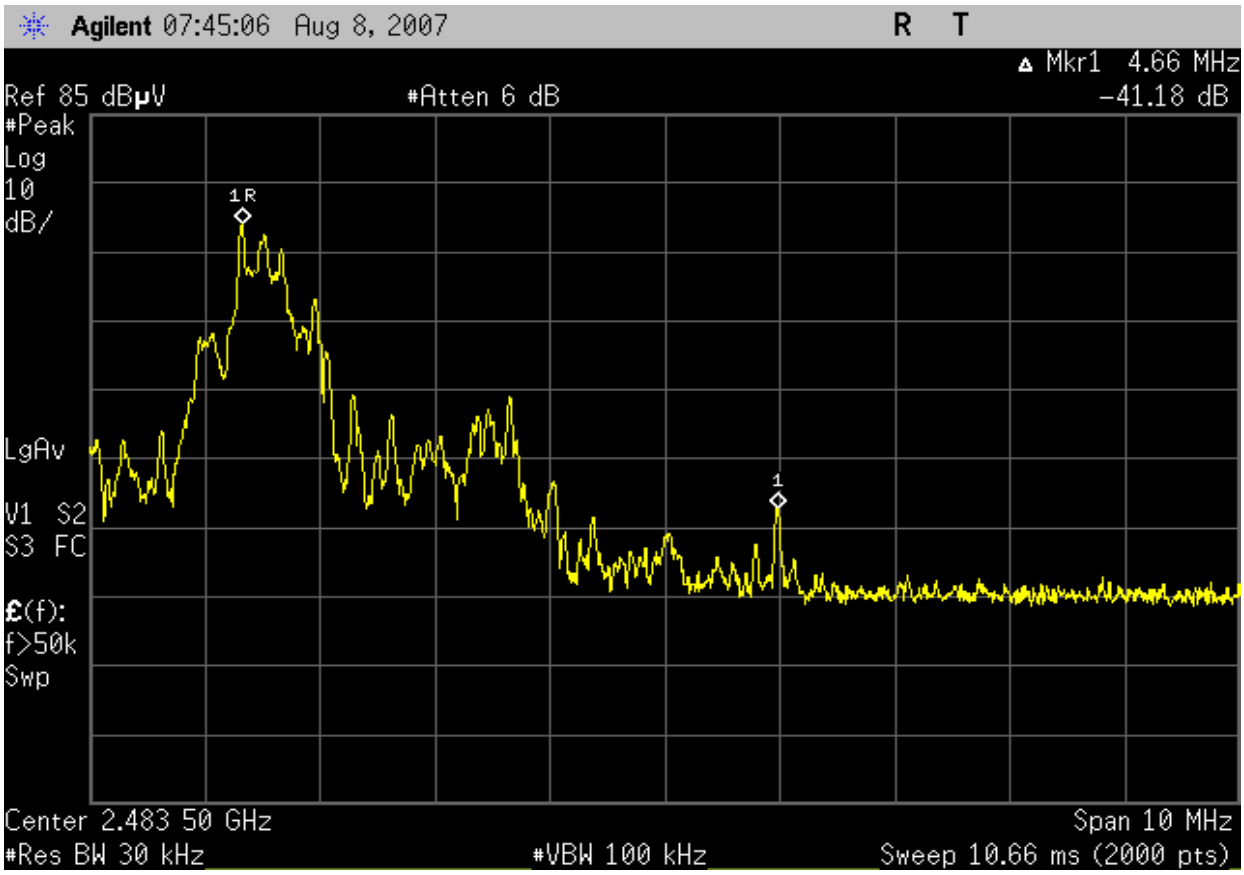
Transmitting Bluetooth, High channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	14
Configuration #	1
Results	Pass

Signature



AC POWERLINE CONDUCTED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION
Transmitting Bluetooth, GPSK, DH5, high channel
Transmitting Bluetooth, GPSK, DH5, mid channel
Transmitting Bluetooth, GPSK, DH5, low channel

POWER SETTINGS INVESTIGATED
120V/60Hz

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
LISN	Solar	9252-50-R-24-BNC	LIQ	12/20/2006	13
Attenuator	Tektronix	011-0059-02	ATC	12/27/2006	13
High Pass Filter	TTE	H97-100K-50-720B	HFX	8/22/2006	13
Receiver	Rohde & Schwartz	ESCI	ARG	12/7/2006	13

MEASUREMENT BANDWIDTHS

	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.				

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50Ω.

NORTHWEST

EMC AC POWERLINE CONDUCTED EMISSIONS

Version 2007.1.29
PSA-ESCI 2007.05.07

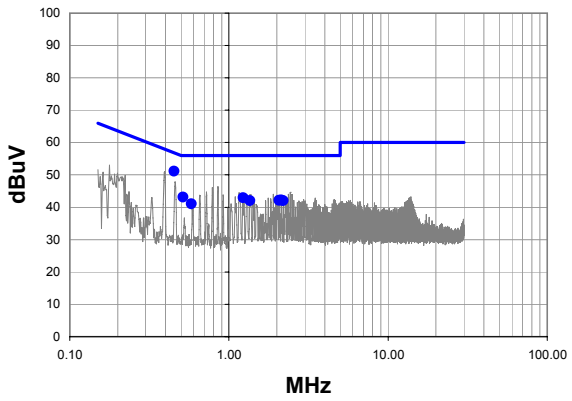
Work Order:	LABT0261	**Date:**	07/20/07		
Project:	None	**Temperature:**	24		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	None	**Barometric Pres.:**	30.01	**Tested by:**	Holly Ashkannejhad

EUT:	F-00001
Configuration:	1 - SRE
Customer:	Logitech, Inc.
Attendees:	None
EUT Power:	120V/60Hz
Operating Mode:	Transmitting Bluetooth, GPSK, DH5, low channel
Deviations:	No deviations.
Comments:	Power from Modified USB/AC Adapter (received from Logitech, 7/20/07).

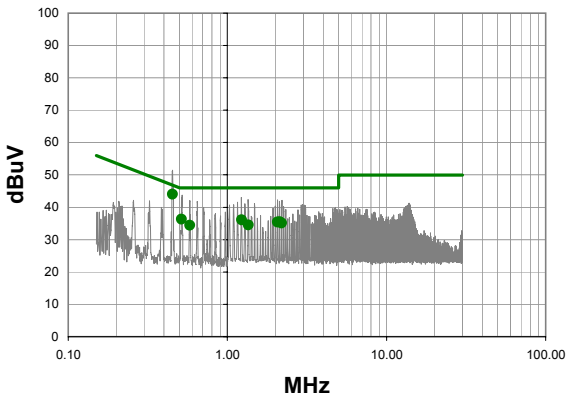
Test Specifications	**Class B**	**Test Method**
FCC 15.207:2006		ANSI C63.4:2003

Run #	2	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.453	30.3	0.8	51.1	56.8	-5.7
0.515	22.3	0.8	43.1	56.0	-12.9
1.228	22.4	0.5	42.9	56.0	-13.1
2.132	21.7	0.5	42.2	56.0	-13.8
2.068	21.6	0.5	42.1	56.0	-13.9
1.356	21.5	0.5	42.0	56.0	-14.0
2.196	21.5	0.5	42.0	56.0	-14.0
0.580	20.3	0.8	41.1	56.0	-14.9

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.453	23.2	0.8	44.0	46.8	-2.8
0.515	15.5	0.8	36.3	46.0	-9.7
1.228	15.6	0.5	36.1	46.0	-9.9
2.132	15.0	0.5	35.5	46.0	-10.5
2.068	14.9	0.5	35.4	46.0	-10.6
2.196	14.6	0.5	35.1	46.0	-10.9
1.356	14.0	0.5	34.5	46.0	-11.5
0.580	13.7	0.8	34.5	46.0	-11.5

NORTHWEST

EMC AC POWERLINE CONDUCTED EMISSIONS

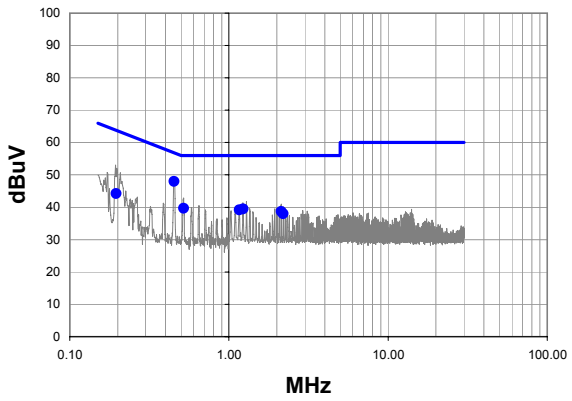
Version 2007.1.29
PSA-ESCI 2007.05.07

Work Order:	LABT0261	**Date:**	07/20/07		
Project:	None	**Temperature:**	24		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	None	**Barometric Pres.:**	30.01	**Tested by:**	Holly Ashkannejhad
EUT:	F-00001				
Configuration:	1 - SRE				
Customer:	Logitech, Inc.				
Attendees:	None				
EUT Power:	120V/60Hz				
Operating Mode:	Transmitting Bluetooth, GPSK, DH5, low channel				
Deviations:	No deviations.				
Comments:	Power from Modified USB/AC Adapter (received from Logitech, 7/20/07).				

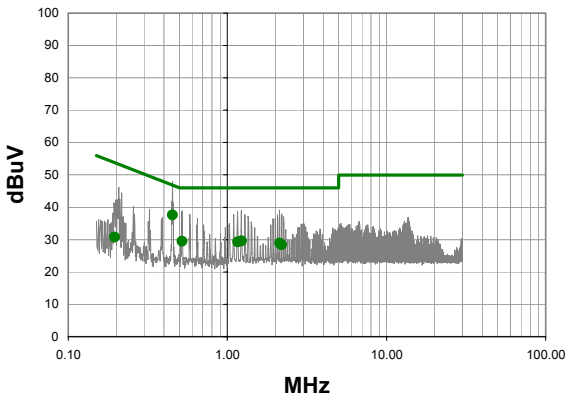
Test Specifications	**Class B**	**Test Method**
FCC 15.207:2006		ANSI C63.4:2003

Run #	3	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.453	27.1	0.8	47.9	56.8	-8.9
0.519	18.9	0.8	39.7	56.0	-16.3
1.228	19.0	0.5	39.5	56.0	-16.5
1.164	18.7	0.5	39.2	56.0	-16.8
2.132	18.2	0.5	38.7	56.0	-17.3
2.196	17.5	0.5	38.0	56.0	-18.0
0.196	23.1	1.1	44.2	63.8	-19.6

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.453	16.7	0.8	37.5	46.8	-9.3
1.228	9.1	0.5	29.6	46.0	-16.4
0.519	8.7	0.8	29.5	46.0	-16.5
1.164	8.8	0.5	29.3	46.0	-16.7
2.132	8.4	0.5	28.9	46.0	-17.1
2.196	7.9	0.5	28.4	46.0	-17.6
0.196	9.7	1.1	30.8	53.8	-23.0

NORTHWEST

EMC AC POWERLINE CONDUCTED EMISSIONS

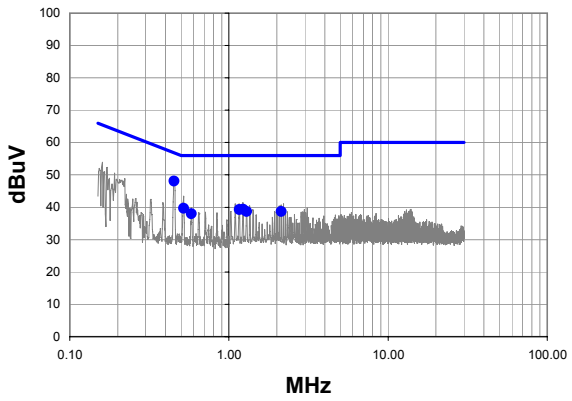
Version 2007.1.29
PSA-ESCI 2007.05.07

Work Order:	LABT0261	**Date:**	07/20/07		
Project:	None	**Temperature:**	24		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	None	**Barometric Pres.:**	30.01	**Tested by:**	Holly Ashkannejhad
EUT:	F-00001				
Configuration:	1 - SRE				
Customer:	Logitech, Inc.				
Attendees:	None				
EUT Power:	120V/60Hz				
Operating Mode:	Transmitting Bluetooth, GPSK, DH5, mid channel				
Deviations:	No deviations.				
Comments:	Power from Modified USB/AC Adapter (received from Logitech, 7/20/07).				

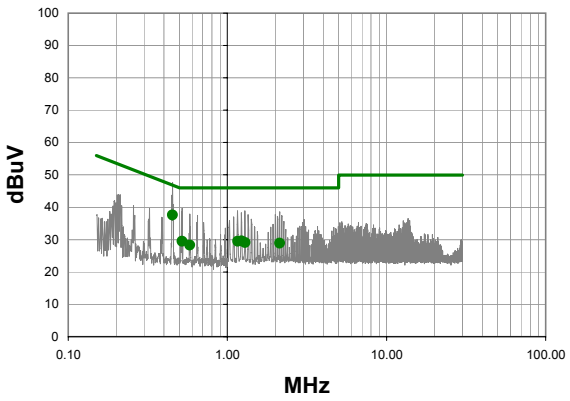
Test Specifications	**Class B**	**Test Method**
FCC 15.207:2006		ANSI C63.4:2003

Run #	4	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.453	27.2	0.8	48.0	56.8	-8.8
0.519	18.9	0.8	39.7	56.0	-16.3
1.228	18.9	0.5	39.4	56.0	-16.6
1.164	18.8	0.5	39.3	56.0	-16.7
1.292	18.2	0.5	38.7	56.0	-17.3
2.132	18.2	0.5	38.7	56.0	-17.3
0.582	17.2	0.8	38.0	56.0	-18.0

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.453	16.7	0.8	37.5	46.8	-9.3
1.228	9.1	0.5	29.6	46.0	-16.4
0.519	8.7	0.8	29.5	46.0	-16.5
1.164	9.0	0.5	29.5	46.0	-16.5
1.292	8.6	0.5	29.1	46.0	-16.9
2.132	8.4	0.5	28.9	46.0	-17.1
0.582	7.5	0.8	28.3	46.0	-17.7

NORTHWEST

EMC AC POWERLINE CONDUCTED EMISSIONS

Version 2007.1.29
PSA-ESCI 2007.05.07

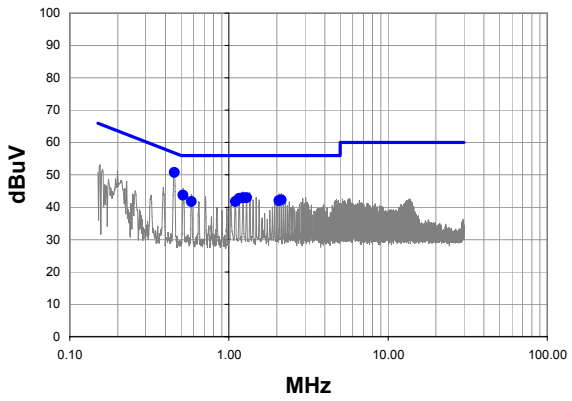
Work Order:	LABT0261	**Date:**	07/20/07		
Project:	None	**Temperature:**	24		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	None	**Barometric Pres.:**	30.01	**Tested by:**	Holly Ashkannejhad

EUT:	F-00001
Configuration:	1 - SRE
Customer:	Logitech, Inc.
Attendees:	None
EUT Power:	120V/60Hz
Operating Mode:	Transmitting Bluetooth, GPSK, DH5, mid channel
Deviations:	No deviations.
Comments:	Power from Modified USB/AC Adapter (received from Logitech, 7/20/07).

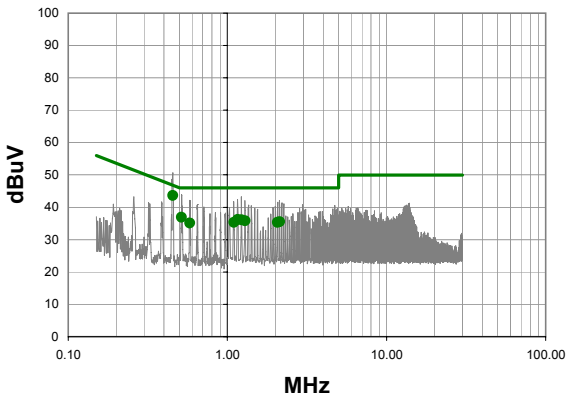
Test Specifications	**Class B**	**Test Method**
FCC 15.207:2006		ANSI C63.4:2003

Run #	5	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.454	29.9	0.8	50.7	56.8	-6.1
0.516	22.9	0.8	43.7	56.0	-12.3
1.228	22.4	0.5	42.9	56.0	-13.1
1.292	22.4	0.5	42.9	56.0	-13.1
1.164	22.2	0.5	42.7	56.0	-13.3
2.132	21.7	0.5	42.2	56.0	-13.8
2.068	21.5	0.5	42.0	56.0	-14.0
0.582	21.0	0.8	41.8	56.0	-14.2
1.100	21.2	0.5	41.7	56.0	-14.3

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.454	22.8	0.8	43.6	46.8	-3.2
0.516	16.1	0.8	36.9	46.0	-9.1
1.164	15.7	0.5	36.2	46.0	-9.8
1.228	15.6	0.5	36.1	46.0	-9.9
1.292	15.3	0.5	35.8	46.0	-10.2
2.132	15.0	0.5	35.5	46.0	-10.5
1.100	14.8	0.5	35.3	46.0	-10.7
2.068	14.8	0.5	35.3	46.0	-10.7
0.582	14.4	0.8	35.2	46.0	-10.8

NORTHWEST

EMC AC POWERLINE CONDUCTED EMISSIONS

Version 2007.1.29
PSA-ESCI 2007.05.07

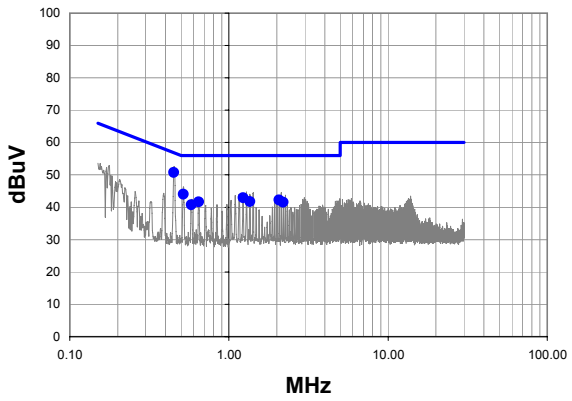
Work Order:	LABT0261	**Date:**	07/20/07		
Project:	None	**Temperature:**	24		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	None	**Barometric Pres.:**	30.01	**Tested by:**	Holly Ashkannejhad

EUT:	F-00001
Configuration:	1 - SRE
Customer:	Logitech, Inc.
Attendees:	None
EUT Power:	120V/60Hz
Operating Mode:	Transmitting Bluetooth, GPSK, DH5, high channel
Deviations:	No deviations.
Comments:	Power from Modified USB/AC Adapter (received from Logitech, 7/20/07).

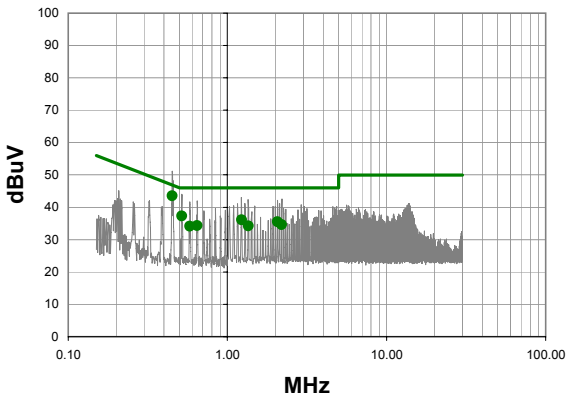
Test Specifications	**Class B**	**Test Method**
FCC 15.207:2006		ANSI C63.4:2003

Run #	6	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.451	29.9	0.8	50.7	56.9	-6.1
0.517	23.2	0.8	44.0	56.0	-12.0
1.228	22.4	0.5	42.9	56.0	-13.1
2.068	21.7	0.5	42.2	56.0	-13.8
1.356	21.2	0.5	41.7	56.0	-14.3
0.646	20.9	0.7	41.6	56.0	-14.4
2.196	21.0	0.5	41.5	56.0	-14.5
0.580	20.0	0.8	40.8	56.0	-15.2

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.451	22.7	0.8	43.5	46.9	-3.3
0.517	16.5	0.8	37.3	46.0	-8.7
1.228	15.6	0.5	36.1	46.0	-9.9
2.068	15.0	0.5	35.5	46.0	-10.5
2.196	14.1	0.5	34.6	46.0	-11.4
0.646	13.6	0.7	34.3	46.0	-11.7
1.356	13.7	0.5	34.2	46.0	-11.8
0.580	13.4	0.8	34.2	46.0	-11.8

NORTHWEST

EMC AC POWERLINE CONDUCTED EMISSIONS

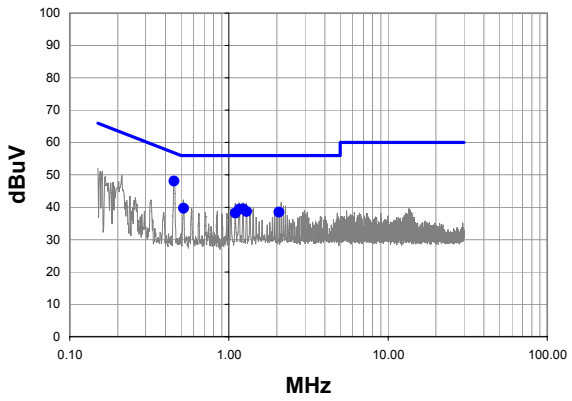
Version 2007.1.29
PSA-ESCI 2007.05.07

Work Order:	LABT0261	**Date:**	07/20/07		
Project:	None	**Temperature:**	24		
Job Site:	EV07	**Humidity:**	38		
Serial Number:	None	**Barometric Pres.:**	30.01	**Tested by:**	Holly Ashkannejhad
EUT:	F-00001				
Configuration:	1 - SRE				
Customer:	Logitech, Inc.				
Attendees:	None				
EUT Power:	120V/60Hz				
Operating Mode:	Transmitting Bluetooth, GPSK, DH5, high channel				
Deviations:	No deviations.				
Comments:	Power from Modified USB/AC Adapter (received from Logitech, 7/20/07).				

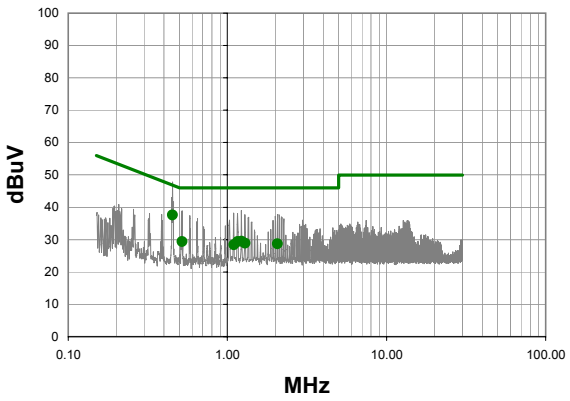
Test Specifications	**Class B**	**Test Method**
FCC 15.207:2006		ANSI C63.4:2003

Run #	7	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.453	27.2	0.8	48.0	56.8	-8.8
0.519	18.9	0.8	39.7	56.0	-16.3
1.228	19.0	0.5	39.5	56.0	-16.5
1.164	18.9	0.5	39.4	56.0	-16.6
1.292	18.2	0.5	38.7	56.0	-17.3
2.068	18.0	0.5	38.5	56.0	-17.5
1.100	17.7	0.5	38.2	56.0	-17.8

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.453	16.7	0.8	37.5	46.8	-9.3
1.228	9.0	0.5	29.5	46.0	-16.5
0.519	8.6	0.8	29.4	46.0	-16.6
1.164	8.9	0.5	29.4	46.0	-16.6
1.292	8.4	0.5	28.9	46.0	-17.1
2.068	8.2	0.5	28.7	46.0	-17.3
1.100	7.9	0.5	28.4	46.0	-17.6

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.