

# Tripod Data Systems, Inc.

## WMBGMR01 in Recon (Bluetooth Radio Portion)

May 30, 2006

Report No. TRPO0022.1

Report Prepared By



[www.nwemc.com](http://www.nwemc.com)  
1-888-EMI-CERT

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EMC Test Report

## Certificate of Test

Issue Date: May 30, 2006

Tripod Data Systems, Inc.

Model: WMBGMR01 in Recon (Bluetooth Radio Portion)

Emissions				
Test Description	Specification	Test Method	Pass	Fail
AC Powerline Conducted Emissions	FCC 15.207 AC Powerline Conducted Emissions:2005-9	ANSI C63.4:2003	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Spurious Radiated Emissions	FCC 15.247(d) Spurious Radiated Emissions:2005-9	ANSI C63.4:2003	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### Modifications made to the product

See the Modifications section of this report

### Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.  
22975 NW Evergreen Parkway, Suite 400; Hillsboro, OR 97124  
Phone: (503) 844-4066  
Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada.

### Approved By:



Greg Kiemel, Director of Engineering

*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.*

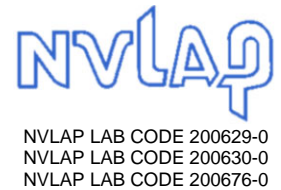
*Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, 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 89/336/EEC, ANSI C63.4, MIL-STD 461E, DO-160D and SAE J1113. 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.



**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 TÜV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TÜV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TÜV's current Listing of CARAT Laboratories, available from TÜV. A certificate was issued to represent that this laboratory continues to meet TÜV's CARAT Program requirements. Certificate No. USA0401C.



**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, and R-2318, Irvine: C-2094 and R-1943, Sultan: R-871, C-1784 and R-1761.*)



**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.



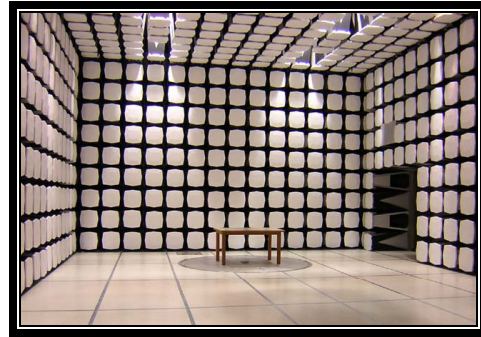
**GOST:** Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results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



## SCOPE

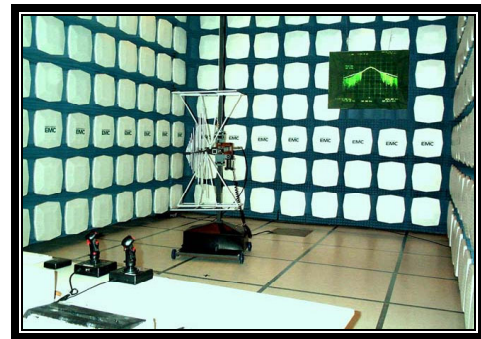
For details on the Scopes of our Accreditations, please visit:

<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 – EV10**

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



**Washington – Sultan Facility  
Labs SU01 – SU07**

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

**Party Requesting the Test**

<b>Company Name:</b>	Tripod Data Systems, Inc.
<b>Address:</b>	345 SW Avery Ave
<b>City, State, Zip:</b>	Corvallis, OR 97333
<b>Test Requested By:</b>	Bob Grant
<b>Model:</b>	WMBGMR01 in Recon (Bluetooth Radio Portion)
<b>First Date of Test:</b>	May 08, 2006
<b>Last Date of Test:</b>	May 18, 2006
<b>Receipt Date of Samples:</b>	May 04, 2006
<b>Equipment Design Stage:</b>	Pre-Production
<b>Equipment Condition:</b>	No visual damage.

**Information Provided by the Party Requesting the Test**

<b>Clocks/Oscillators:</b>	Not provided.
<b>I/O Ports:</b>	Serial, USB, Power

**Functional Description of the EUT (Equipment Under Test):**

The EUT is the Bluetooth portion of a WiFi – Bluetooth combo radio module hosted in the Recon, a handheld data collector.

**Client Justification for EUT Selection:**

The product is a representative production sample.

**Client Justification for Test Selection:**

These test satisfy the FCC 15.247 requirements for the Bluetooth portion of the combo radio.

**CONFIGURATION 1 TRPO0022****Software/Firmware Running during test**

Description	Version
BTCirroTest	Unknown

**EUT**

Description	Manufacturer	Model/Part Number	Serial Number
EUT - Bluetooth radio	Tripod Data Systems, Inc.	WMBGMR01	Unknown
EUT - 802.11(b/g) radio	Tripod Data Systems, Inc.	WMBGMR01	Unknown

**Peripherals in test setup boundary**

Description	Manufacturer	Model/Part Number	Serial Number
Pocket PC Handheld Data Collector	Tripod Data Systems, Inc.	Recon	Compliance Unit 2
DC Power Supply	Cincon Electronics Co.	TR30R050	N/A
GPS	Trimble	Unknown	Unknown

**Cables**

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	1.8	Yes	Pocket PC Handheld Data Collector	AC Power
Serial	Yes	1.5	Yes	Pocket PC Handheld Data Collector	GPS
USB	Yes	1.8	Yes	Pocket PC Handheld Data Collector	Unterminated

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.



<b>Equipment modifications</b>					
Item	Date	Test	Modification	Note	Disposition of EUT
1	5/08/2006	Spurious Radiated 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.
2	5/18/2006	AC Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	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.

#### MODES OF OPERATION

Transmitting Bluetooth, mid channel.  
 Transmitting Bluetooth, high channel.  
 Transmitting Bluetooth, low channel.

#### POWER SETTINGS INVESTIGATED

120VAC/60Hz

#### FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 26 GHz

#### SAMPLE CALCULATIONS

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

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
EV01 cables c,g, h			EVA	3/30/2006	13
EV01 cables g,h,j			EVB	3/30/2006	13
EV01 Cable D			EVD	3/30/2006	13
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	3/23/2006	13
Antenna, Horn	EMCO	3160-09	AHG	NCR	0
EV01 cables g,h,i			EVF	4/17/2006	13
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	2/17/2005	16
Antenna, Horn	EMCO	3160-08	AHK	NCR	0
Low Pass Filter 0-1000 MHz	Micro-Tronics	LPM50004	LFD	9/28/2005	13
High Pass Filter	Micro-Tronics	HPM50111	HFO	4/4/2006	13
Antenna, Horn	EMCO	3115	AHC	8/30/2005	12
Antenna, Biconilog	EMCO	3141	AXE	12/28/2005	24
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	8/2/2005	13
Pre-Amplifier	Miteq	AM-1616-1000	AOL	1/4/2006	13
Spectrum Analyzer	Agilent	E4446A	AAT	4/4/2006	12

#### 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

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.

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/08/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	31%
Project:	None	Barometric Pres.:	30.3
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz
		Job Site:	EV01

<b>TEST SPECIFICATIONS</b>	Test Method
FCC 15.247(d) Spurious Radiated Emissions:2005-9	ANSI C63.4:2003

<b>TEST PARAMETERS</b>			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

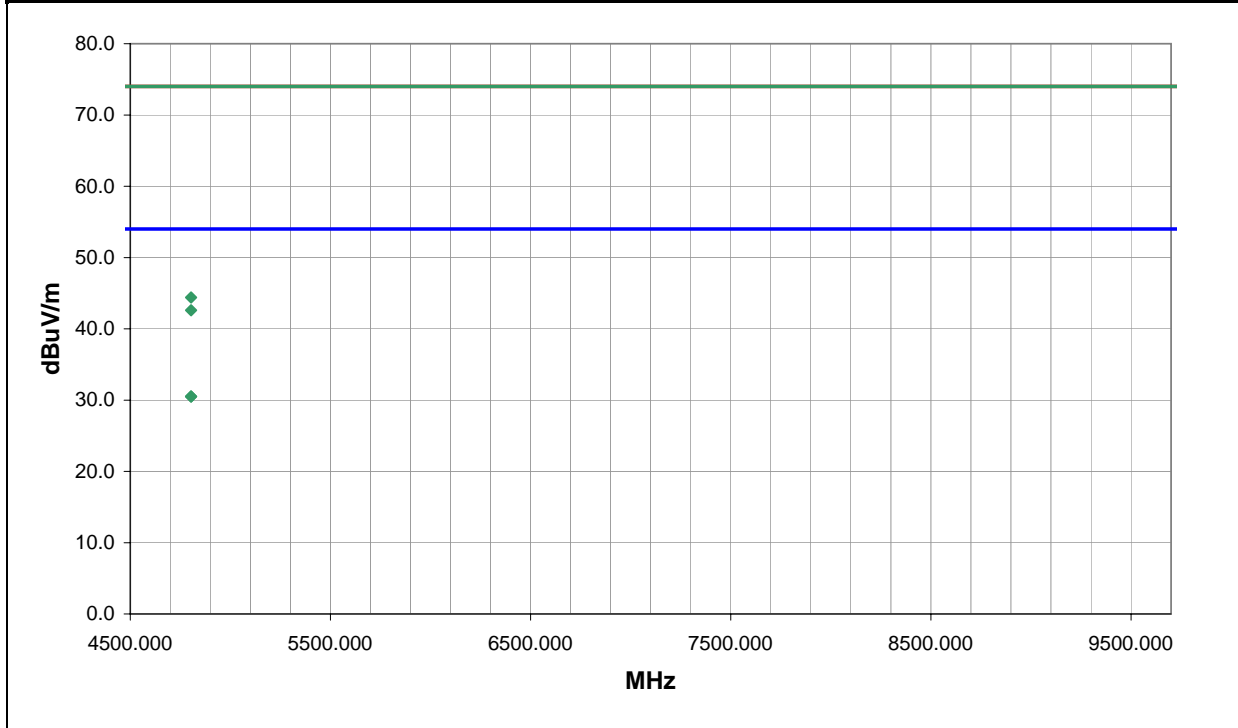
**COMMENTS**  
WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

**EUT OPERATING MODES**  
Transmitting Bluetooth, low channel.

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	1	Signature <i>Holly Ashkannejhad</i>
Configuration #	1	
Results	Pass	

NVLAP Lab Code 200630-0



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)
4803.750	24.2	6.3	313.0	1.0	3.0	0.0	H-Horn	AV	0.0	30.5	54.0	-23.5
4804.036	24.2	6.3	31.0	1.0	3.0	0.0	V-Horn	AV	0.0	30.5	54.0	-23.5
4803.811	38.1	6.3	313.0	1.0	3.0	0.0	H-Horn	PK	0.0	44.4	74.0	-29.6
4803.898	36.3	6.3	31.0	1.0	3.0	0.0	V-Horn	PK	0.0	42.6	74.0	-31.4

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/08/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	31%
Project:	None	Barometric Pres.:	30.3
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz
		Job Site:	EV01

<b>TEST SPECIFICATIONS</b>		Test Method
FCC 15.247(d) Spurious Radiated Emissions:2005-9	ANSI C63.4:2003	

<b>TEST PARAMETERS</b>			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

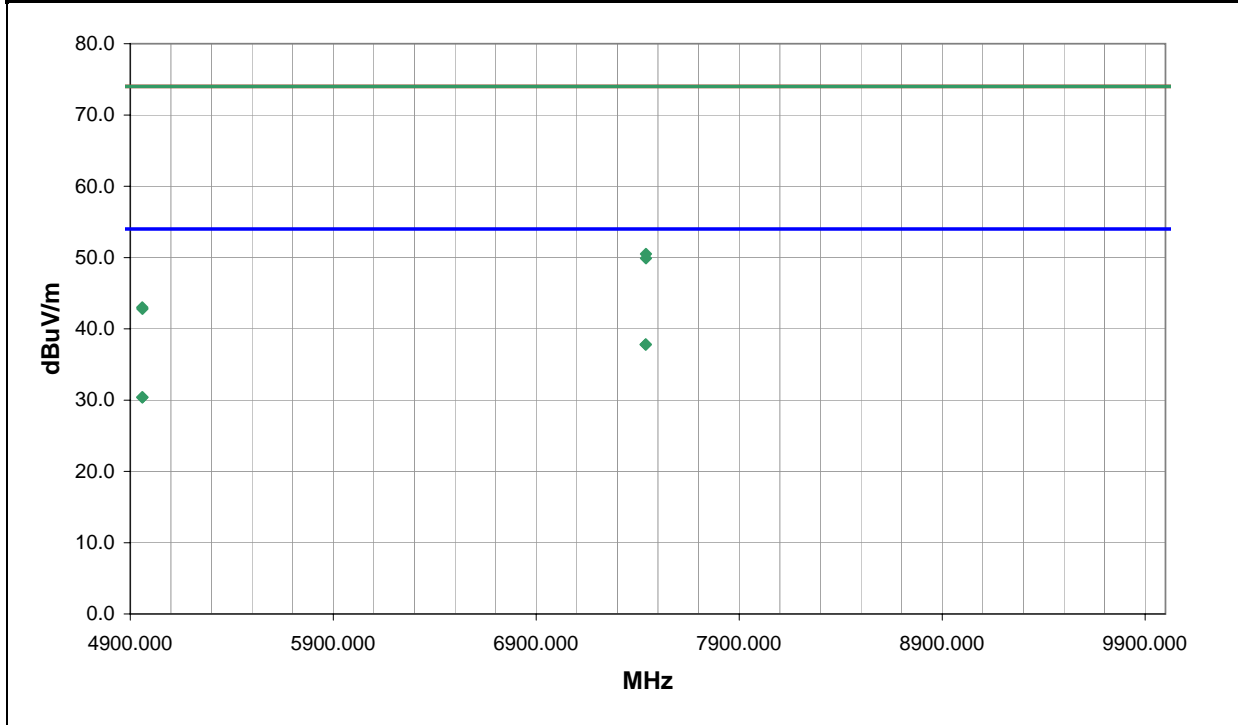
**COMMENTS**  
WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

**EUT OPERATING MODES**  
Transmitting Bluetooth, high channel.

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	2	Signature <i>Holly Ashkannejhad</i>
Configuration #	1	
Results	Pass	

NVLAP Lab Code 200630-0



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)
7439.067	24.0	13.8	124.0	1.0	3.0	0.0	H-Horn	AV	0.0	37.8	54.0	-16.2
7439.367	24.0	13.8	281.0	2.6	3.0	0.0	V-Horn	AV	0.0	37.8	54.0	-16.2
7440.584	36.7	13.8	281.0	2.6	3.0	0.0	V-Horn	PK	0.0	50.5	74.0	-23.5
4959.218	23.7	6.7	293.0	1.0	3.0	0.0	V-Horn	AV	0.0	30.4	54.0	-23.6
4959.576	23.7	6.7	120.0	3.6	3.0	0.0	H-Horn	AV	0.0	30.4	54.0	-23.6
7440.399	36.1	13.8	124.0	1.0	3.0	0.0	H-Horn	PK	0.0	49.9	74.0	-24.1
4959.250	36.3	6.7	120.0	3.6	3.0	0.0	H-Horn	PK	0.0	43.0	74.0	-31.0
4960.096	36.1	6.7	293.0	1.0	3.0	0.0	V-Horn	PK	0.0	42.8	74.0	-31.2

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/08/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	31%
Project:	None	Barometric Pres.:	30.3
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz
		Job Site:	EV01

<b>TEST SPECIFICATIONS</b>		Test Method
FCC 15.247(d) Spurious Radiated Emissions:2005-9	ANSI C63.4:2003	

<b>TEST PARAMETERS</b>			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

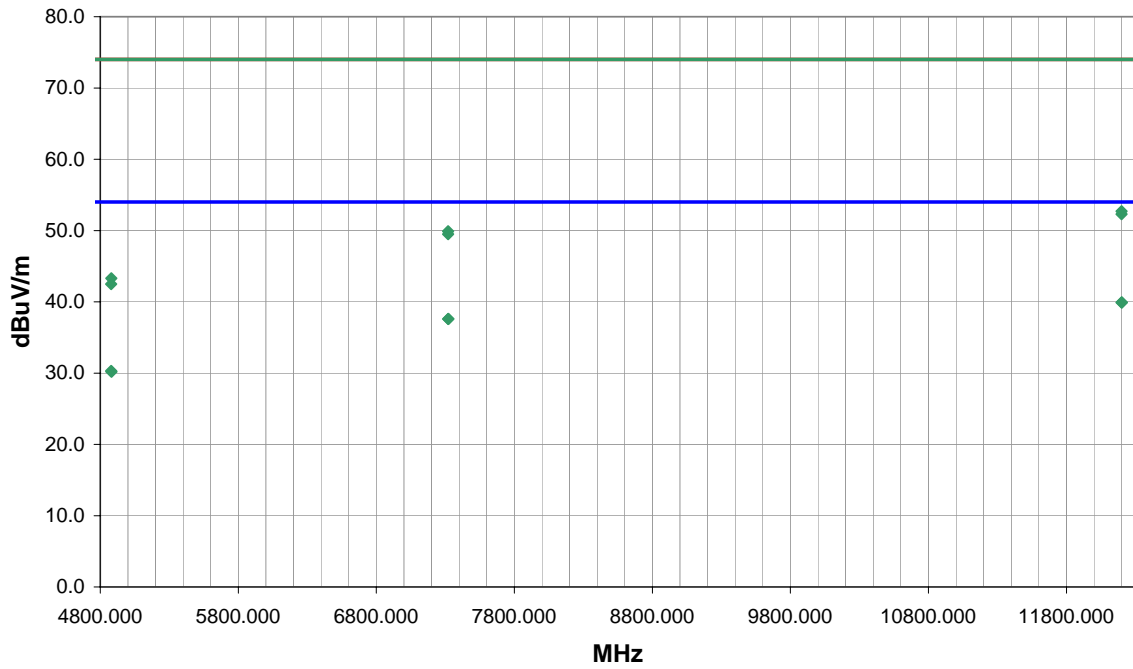
**COMMENTS**  
 WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

**EUT OPERATING MODES**  
 Transmitting Bluetooth, mid channel.

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

Run #	3	Signature <i>Holly Ashkannejhad</i>
Configuration #	1	
Results	Pass	

NVLAP Lab Code 200630-0



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)
12199.610	23.7	16.2	64.0	1.0	3.0	0.0	H-Horn	AV	0.0	39.9	54.0	-14.1
12200.930	23.7	16.2	28.0	2.2	3.0	0.0	V-Horn	AV	0.0	39.9	54.0	-14.1
7320.951	24.2	13.4	287.0	1.0	3.0	0.0	V-Horn	AV	0.0	37.6	54.0	-16.4
7320.987	24.2	13.4	220.0	1.0	3.0	0.0	H-Horn	AV	0.0	37.6	54.0	-16.4
12199.710	36.5	16.2	64.0	1.0	3.0	0.0	H-Horn	PK	0.0	52.7	74.0	-21.3
12199.720	36.1	16.2	28.0	2.2	3.0	0.0	V-Horn	PK	0.0	52.3	74.0	-21.7
4878.980	23.8	6.5	252.0	1.0	3.0	0.0	V-Horn	AV	0.0	30.3	54.0	-23.7
4880.970	23.7	6.5	169.0	2.3	3.0	0.0	H-Horn	AV	0.0	30.2	54.0	-23.8
7319.957	36.5	13.4	287.0	1.0	3.0	0.0	V-Horn	PK	0.0	49.9	74.0	-24.1
7319.543	36.1	13.4	220.0	1.0	3.0	0.0	H-Horn	PK	0.0	49.5	74.0	-24.5
4880.033	36.8	6.5	252.0	1.0	3.0	0.0	V-Horn	PK	0.0	43.3	74.0	-30.7
4879.336	36.0	6.5	169.0	2.3	3.0	0.0	H-Horn	PK	0.0	42.5	74.0	-31.5

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/08/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	31%
Project:	None	Barometric Pres.:	30.3
Tested by:	Holly Ashkannejhad	Power:	120VAC/60Hz
		Job Site:	EV01

<b>TEST SPECIFICATIONS</b>	Test Method
FCC 15.247(d) Spurious Radiated Emissions:2005-9	ANSI C63.4:2003

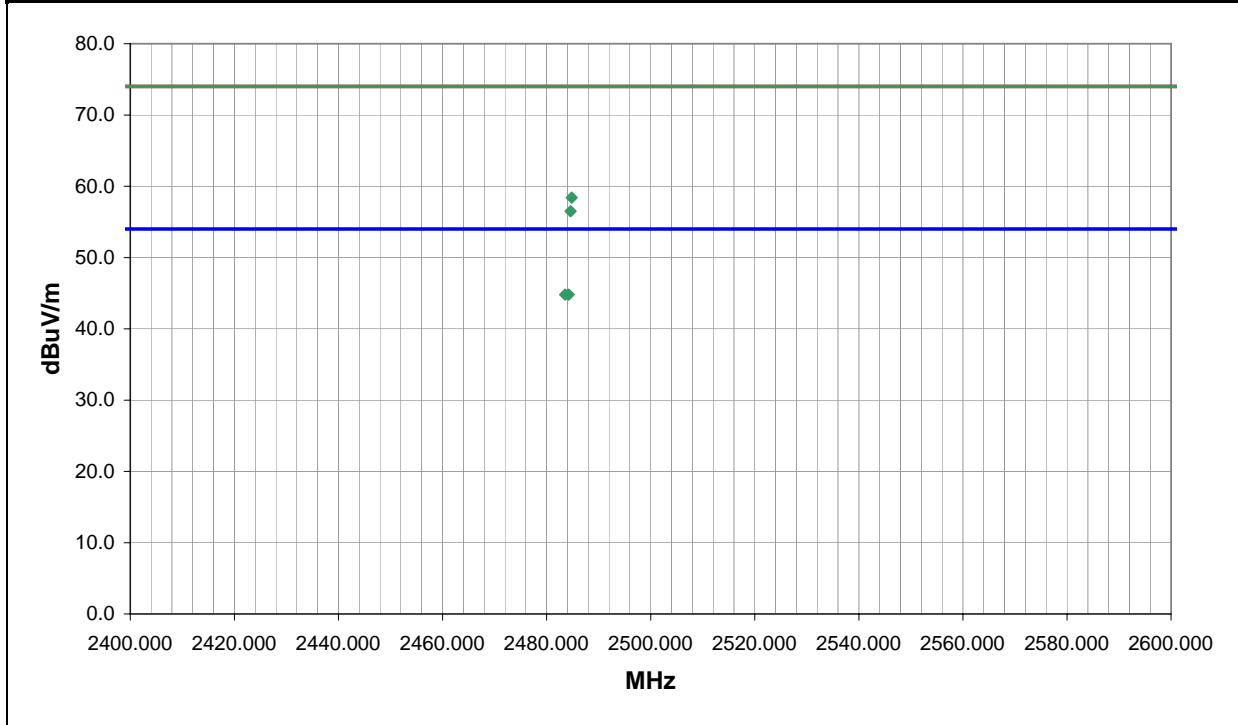
<b>TEST PARAMETERS</b>			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

**COMMENTS**  
WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

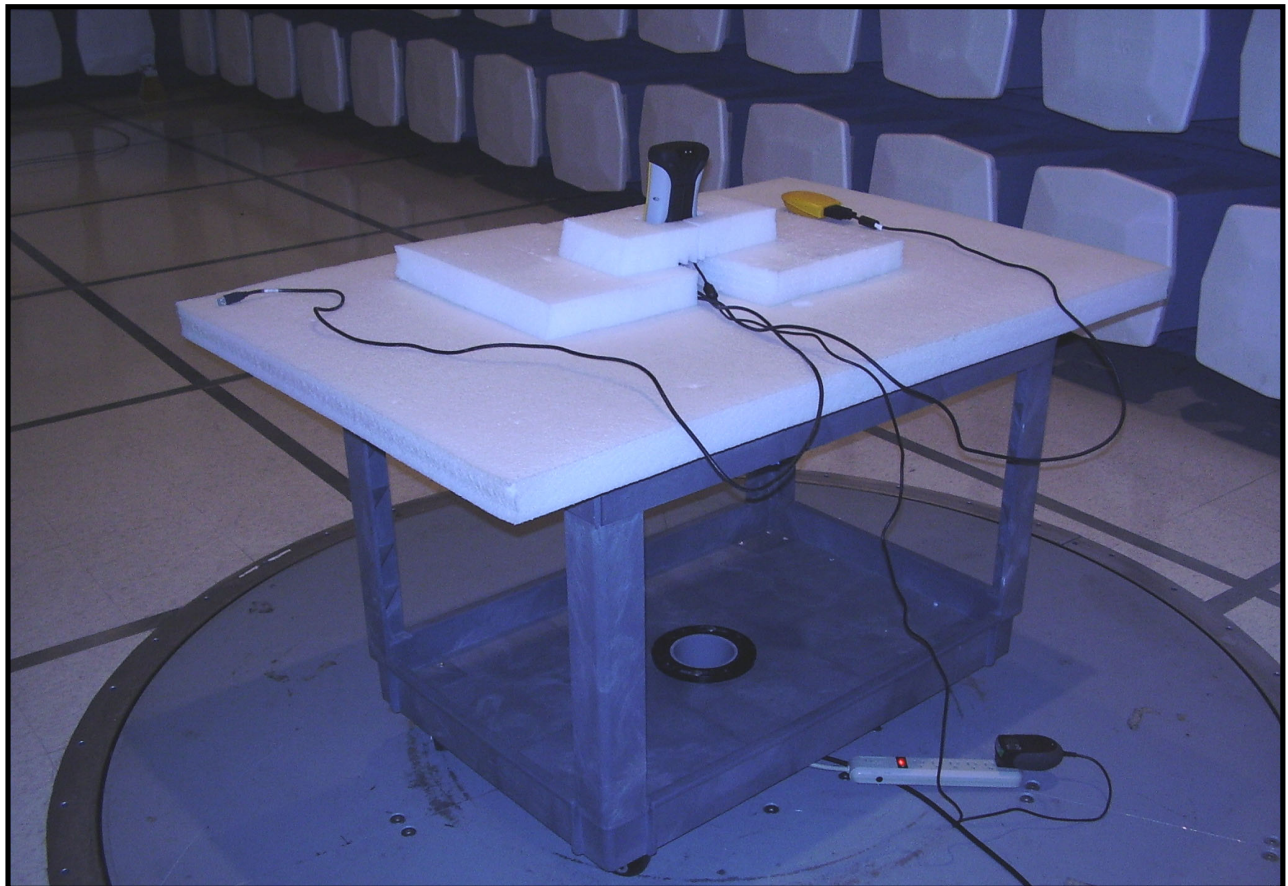
**EUT OPERATING MODES**  
Transmitting Bluetooth, high channel.

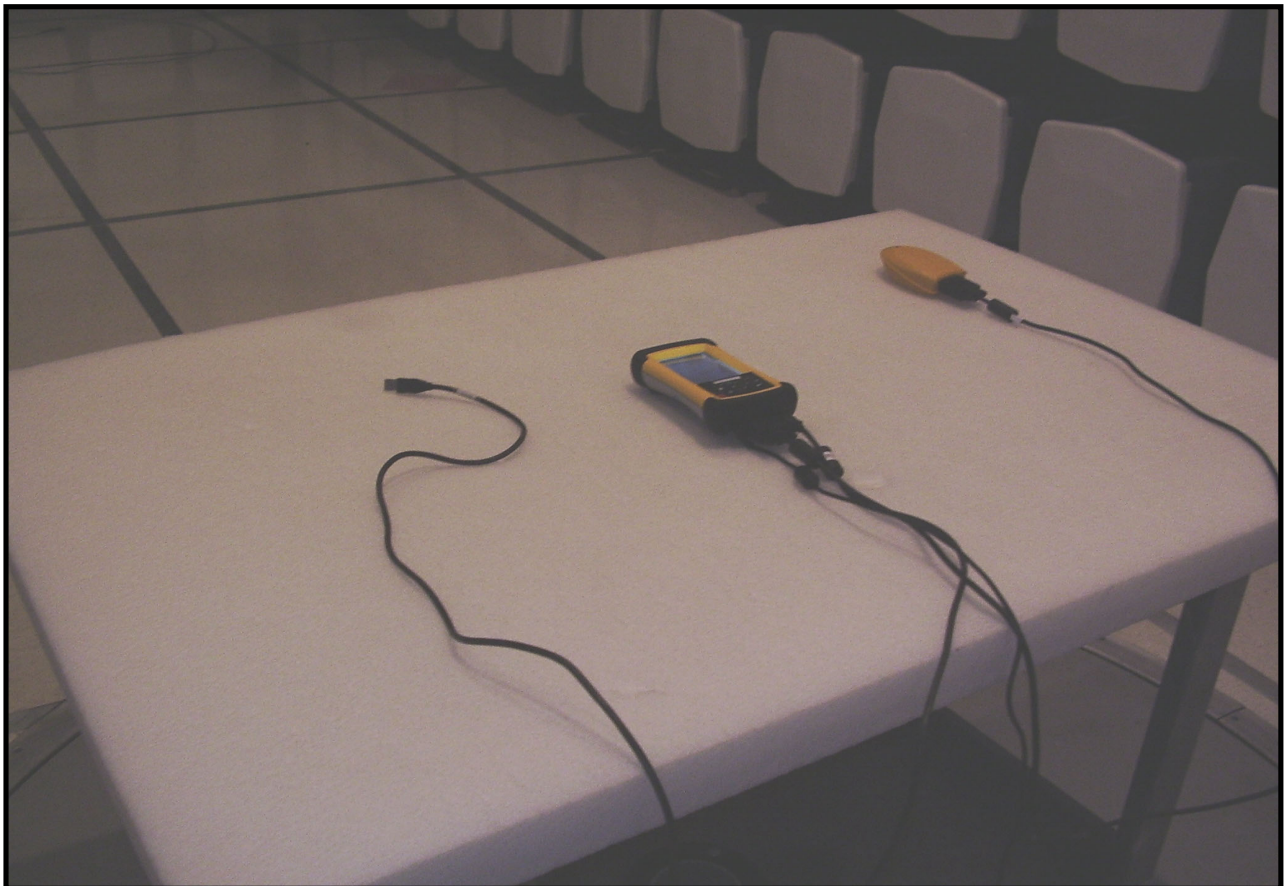
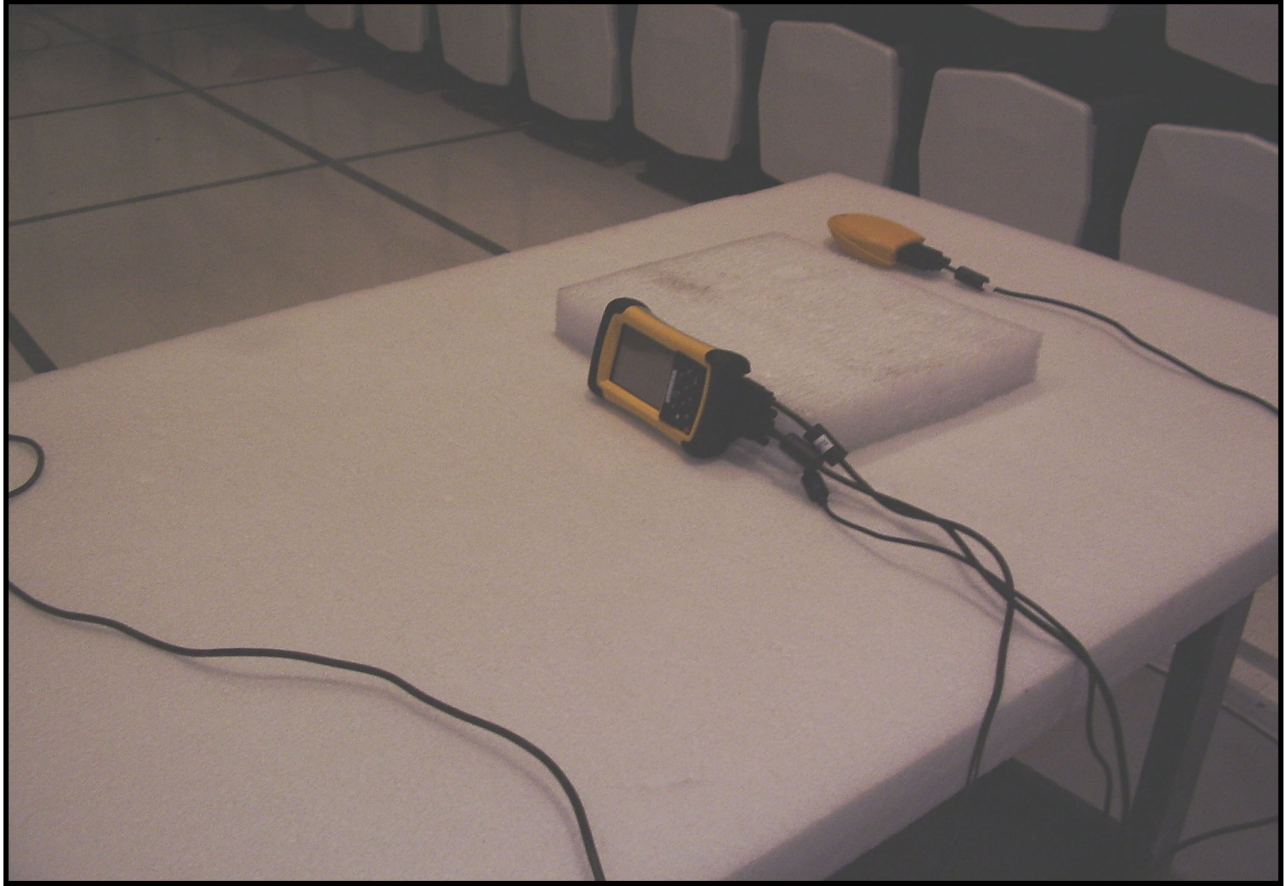
**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	4	NVLAP Lab Code 200630-0	Signature <i>Holly Ashkannejhad</i>
Configuration #	1		
Results	Pass		



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)
2483.561	24.3	0.5	22.0	2.5	3.0	20.0	V-Horn	AV	0.0	44.8	54.0	-9.2
2484.250	24.3	0.5	350.0	1.0	3.0	20.0	H-Horn	AV	0.0	44.8	54.0	-9.2
2484.840	37.9	0.5	350.0	1.0	3.0	20.0	H-Horn	PK	0.0	58.4	74.0	-15.6
2484.617	36.0	0.5	22.0	2.5	3.0	20.0	V-Horn	PK	0.0	56.5	74.0	-17.5







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

#### SAMPLE CALCULATIONS

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

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
High Pass Filter	T.T.E.	7766	HFG	12/19/2005	13
Attenuator	Tektronix	011-0059-02	ATC	12/19/2005	13
LISN	Solar	9252-50-R-24-BNC	LIQ	12/13/2005	13
LISN	Solar	9252-50-R-24-BNC	LIP	12/13/2005	13
Spectrum Analyzer	Agilent	E4443A	AAS	12/8/2005	12

#### 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  $\Omega$  measuring port is terminated by a 50  $\Omega$  EMI meter or a 50  $\Omega$  resistive load. All 50  $\Omega$  measuring ports of the LISN are terminated by 50 $\Omega$ .

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/18/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	38%
Project:	None	Barometric Pres.:	30.04
Tested by:	David Divergigelis	Power:	120VAC/60Hz
		Job Site:	EV11

TEST SPECIFICATIONS		Test Method
FCC 15.207 Class B:2005-10		ANSI C63.4:2003

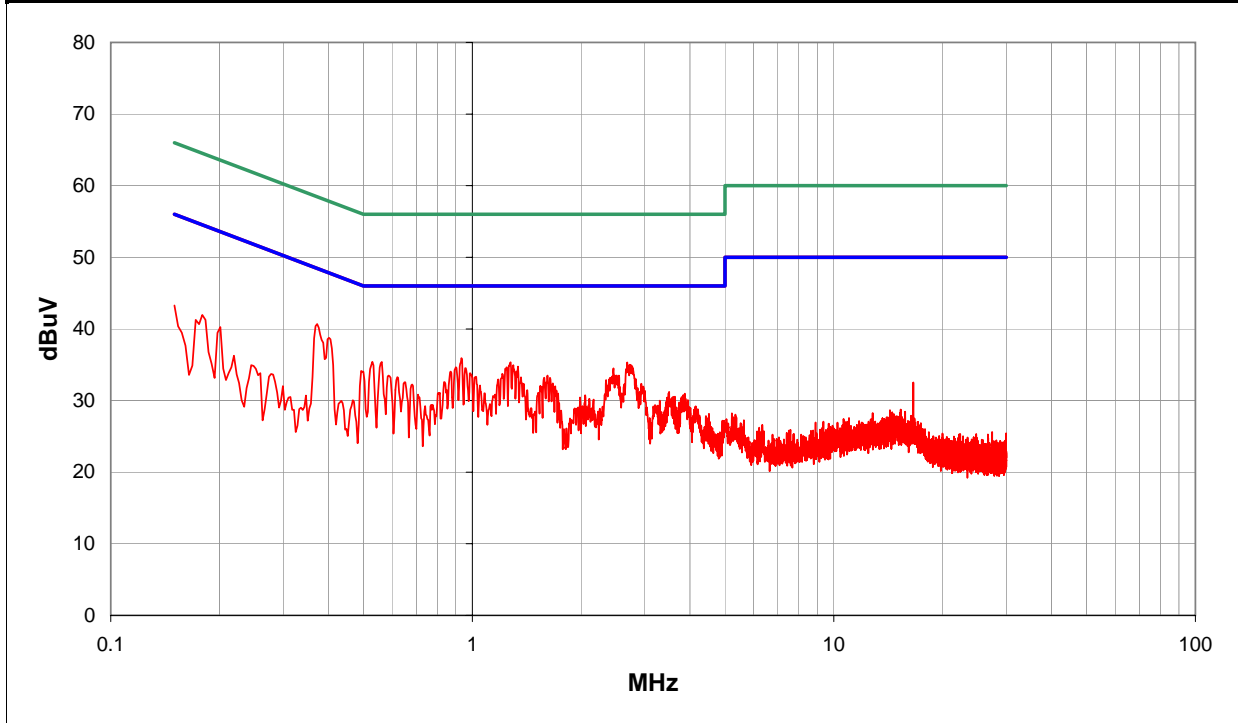
TEST PARAMETERS	
Cable or Line Tested	N

**COMMENTS**  
 WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

**EUT OPERATING MODES**  
 Transmitting Bluetooth, low channel

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

Run #	1	NVLAP Lab Code 200630-0	Signature <i>David Divergigelis</i>
Configuration #	1		
Results	Pass		



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)
0.372	19.9	0.0	0.8	20.0		40.7	48.4	-7.8
0.401	18.0	0.0	0.8	20.0		38.8	47.8	-9.1
0.934	15.4	0.0	0.5	20.0		35.9	46.0	-10.1
0.529	14.7	0.0	0.7	20.0		35.4	46.0	-10.6
0.562	14.7	0.0	0.7	20.0		35.4	46.0	-10.6
1.276	14.8	0.0	0.5	20.0		35.3	46.0	-10.7
2.683	14.6	0.0	0.7	20.0		35.3	46.0	-10.7
1.298	14.4	0.0	0.5	20.0		34.9	46.0	-11.1
1.338	14.2	0.0	0.5	20.0		34.7	46.0	-11.3
0.901	14.1	0.0	0.5	20.0		34.6	46.0	-11.4
1.247	14.1	0.0	0.5	20.0		34.6	46.0	-11.4
0.955	14.0	0.0	0.5	20.0		34.5	46.0	-11.5
2.457	13.8	0.0	0.7	20.0		34.5	46.0	-11.5
0.872	13.5	0.0	0.6	20.0		34.1	46.0	-11.9
0.493	13.4	0.0	0.7	20.0		34.1	46.1	-12.0
0.985	13.3	0.0	0.5	20.0		33.8	46.0	-12.2
1.210	13.2	0.0	0.5	20.0		33.7	46.0	-12.3
0.587	12.8	0.0	0.7	20.0		33.5	46.0	-12.5
1.615	12.9	0.0	0.6	20.0		33.5	46.0	-12.5

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/18/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	38%
Project:	None	Barometric Pres.:	30.04
Tested by:	David Divergigelis	Power:	120VAC/60Hz
		Job Site:	EV11

<b>TEST SPECIFICATIONS</b>	Test Method
FCC 15.207 Class B:2005-10	ANSI C63.4:2003

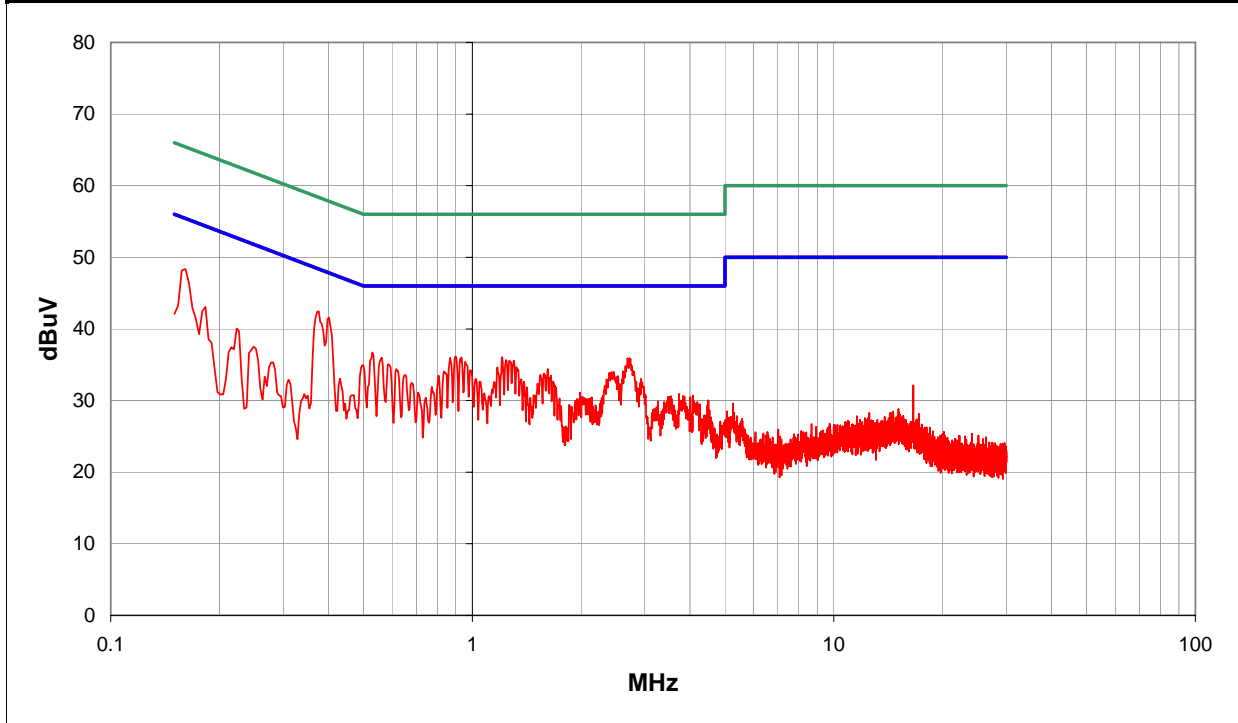
<b>TEST PARAMETERS</b>
Cable or Line Tested: L1

**COMMENTS**  
 WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

**EUT OPERATING MODES**  
 Transmitting Bluetooth, low channel

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

Run #	2	NVLAP Lab Code 200630-0	Signature <i>David Divergigelis</i>
Configuration #	1		
Results	Pass		



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)
0.376	21.7	0.0	0.8	20.0		42.5	48.4	-5.9
0.401	20.8	0.0	0.8	20.0		41.6	47.8	-6.3
0.161	27.5	0.0	0.9	20.0		48.4	55.4	-7.0
0.529	16.0	0.0	0.7	20.0		36.7	46.0	-9.3
0.897	15.6	0.0	0.5	20.0		36.1	46.0	-9.9
0.934	15.5	0.0	0.5	20.0		36.0	46.0	-10.0
1.210	15.5	0.0	0.5	20.0		36.0	46.0	-10.0
0.562	15.3	0.0	0.7	20.0		36.0	46.0	-10.0
0.868	15.4	0.0	0.6	20.0		36.0	46.0	-10.0
2.726	15.2	0.0	0.7	20.0		35.9	46.0	-10.1
1.243	15.1	0.0	0.5	20.0		35.6	46.0	-10.4
1.305	15.0	0.0	0.5	20.0		35.5	46.0	-10.5
1.269	15.0	0.0	0.5	20.0		35.5	46.0	-10.5
0.955	14.9	0.0	0.5	20.0		35.4	46.0	-10.6
0.587	14.4	0.0	0.7	20.0		35.1	46.0	-10.9
0.496	14.2	0.0	0.7	20.0		34.9	46.1	-11.1
0.183	22.2	0.0	0.9	20.0		43.1	54.4	-11.3
1.327	14.1	0.0	0.5	20.0		34.6	46.0	-11.4
1.174	14.1	0.0	0.5	20.0		34.6	46.0	-11.4

EUT: Recon with WMBGMR01 combo radio chip		Work Order: TRPO0022
Serial Number: Compliance Unit 2	Date: 05/18/06	
Customer: Tripod Data Systems, Inc.	Temperature: 24	
Attendees: None	Humidity: 38%	
Project: None	Barometric Pres.: 30.04	
Tested by: David Divergigelis	Power: 120VAC/60Hz	Job Site: EV11

TEST SPECIFICATIONS		Test Method
FCC 15.207 Class B:2005-10		ANSI C63.4:2003

TEST PARAMETERS	
Cable or Line Tested	L1

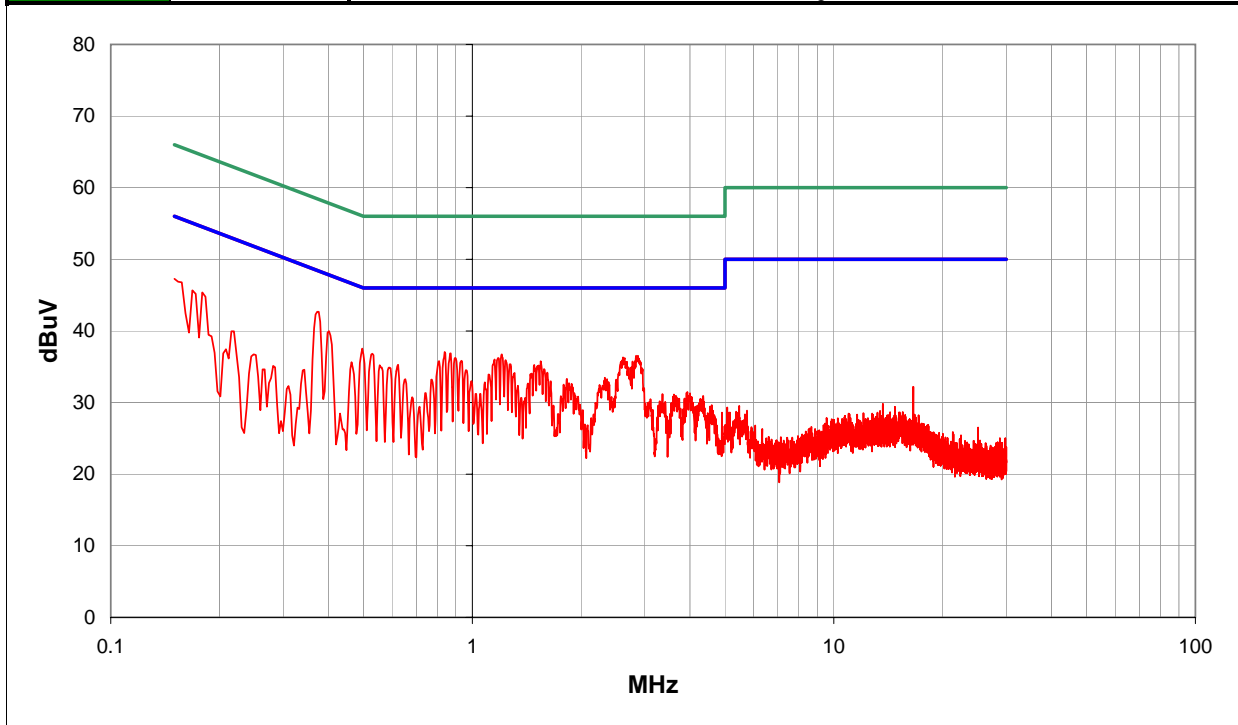
**COMMENTS**  
 WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

**EUT OPERATING MODES**  
 Transmitting Bluetooth, mid channel

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

Run #	3	<i>David Divergigelis</i> Signature
Configuration #	1	
Results	Pass	

NVLAP Lab Code 200630-0



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)
0.372	21.9	0.0	0.8	20.0		42.7	48.4	-5.8
0.401	19.2	0.0	0.8	20.0		40.0	47.8	-7.9
0.496	16.8	0.0	0.7	20.0		37.5	46.1	-8.5
0.150	26.4	0.0	0.9	20.0		47.3	56.0	-8.7
0.839	16.5	0.0	0.6	20.0		37.1	46.0	-8.9
0.868	16.3	0.0	0.6	20.0		36.9	46.0	-9.1
0.179	24.5	0.0	0.9	20.0		45.4	54.5	-9.2
0.529	16.1	0.0	0.7	20.0		36.8	46.0	-9.2
1.207	16.2	0.0	0.5	20.0		36.7	46.0	-9.3
0.168	24.8	0.0	0.9	20.0		45.7	55.0	-9.4
2.872	15.8	0.0	0.7	20.0		36.5	46.0	-9.5
2.614	15.6	0.0	0.7	20.0		36.3	46.0	-9.7
0.897	15.7	0.0	0.5	20.0		36.2	46.0	-9.8
1.181	15.7	0.0	0.5	20.0		36.2	46.0	-9.8
1.152	15.5	0.0	0.5	20.0		36.0	46.0	-10.0
1.236	15.4	0.0	0.5	20.0		35.9	46.0	-10.1
0.934	15.3	0.0	0.5	20.0		35.8	46.0	-10.2
0.810	15.2	0.0	0.6	20.0		35.8	46.0	-10.2
1.546	15.2	0.0	0.6	20.0		35.8	46.0	-10.2

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/18/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	38%
Project:	None	Barometric Pres.:	30.04
Tested by:	David Divergigelis	Power:	120VAC/60Hz
		Job Site:	EV11

TEST SPECIFICATIONS		Test Method
FCC 15.207 Class B:2005-10		ANSI C63.4:2003

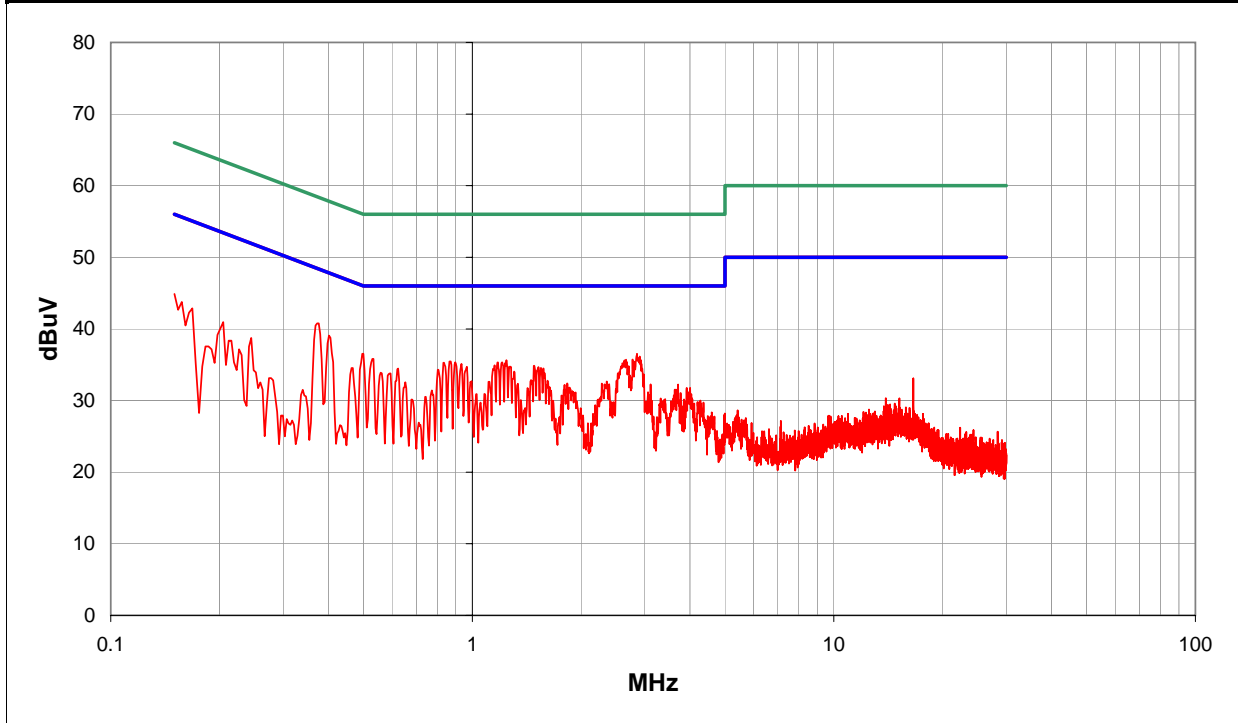
TEST PARAMETERS	
Cable or Line Tested	N

**COMMENTS**  
 WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

**EUT OPERATING MODES**  
 Transmitting Bluetooth, mid channel

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

Run #	4	NVLAP Lab Code 200630-0	Signature <i>David Divergigelis</i>
Configuration #	1		
Results	Pass		



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)
0.372	20.0	0.0	0.8	20.0		40.8	48.4	-7.7
0.401	18.3	0.0	0.8	20.0		39.1	47.8	-8.8
2.854	15.8	0.0	0.7	20.0		36.5	46.0	-9.5
0.496	15.8	0.0	0.7	20.0		36.5	46.1	-9.5
0.529	15.1	0.0	0.7	20.0		35.8	46.0	-10.2
2.777	15.0	0.0	0.7	20.0		35.7	46.0	-10.3
2.665	15.0	0.0	0.7	20.0		35.7	46.0	-10.3
1.243	15.1	0.0	0.5	20.0		35.6	46.0	-10.4
0.864	14.9	0.0	0.6	20.0		35.5	46.0	-10.5
0.897	14.8	0.0	0.5	20.0		35.3	46.0	-10.7
1.210	14.8	0.0	0.5	20.0		35.3	46.0	-10.7
1.178	14.8	0.0	0.5	20.0		35.3	46.0	-10.7
0.831	14.7	0.0	0.6	20.0		35.3	46.0	-10.7
0.934	14.6	0.0	0.5	20.0		35.1	46.0	-10.9
1.152	14.4	0.0	0.5	20.0		34.9	46.0	-11.1
0.150	24.0	0.0	0.9	20.0		44.9	56.0	-11.1
1.484	14.3	0.0	0.6	20.0		34.9	46.0	-11.1
1.276	14.2	0.0	0.5	20.0		34.7	46.0	-11.3
0.966	14.2	0.0	0.5	20.0		34.7	46.0	-11.3

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/18/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	38%
Project:	None	Barometric Pres.:	30.04
Tested by:	David Divergigelis	Power:	120VAC/60Hz
		Job Site:	EV11

TEST SPECIFICATIONS		Test Method
FCC 15.207 Class B:2005-10		ANSI C63.4:2003

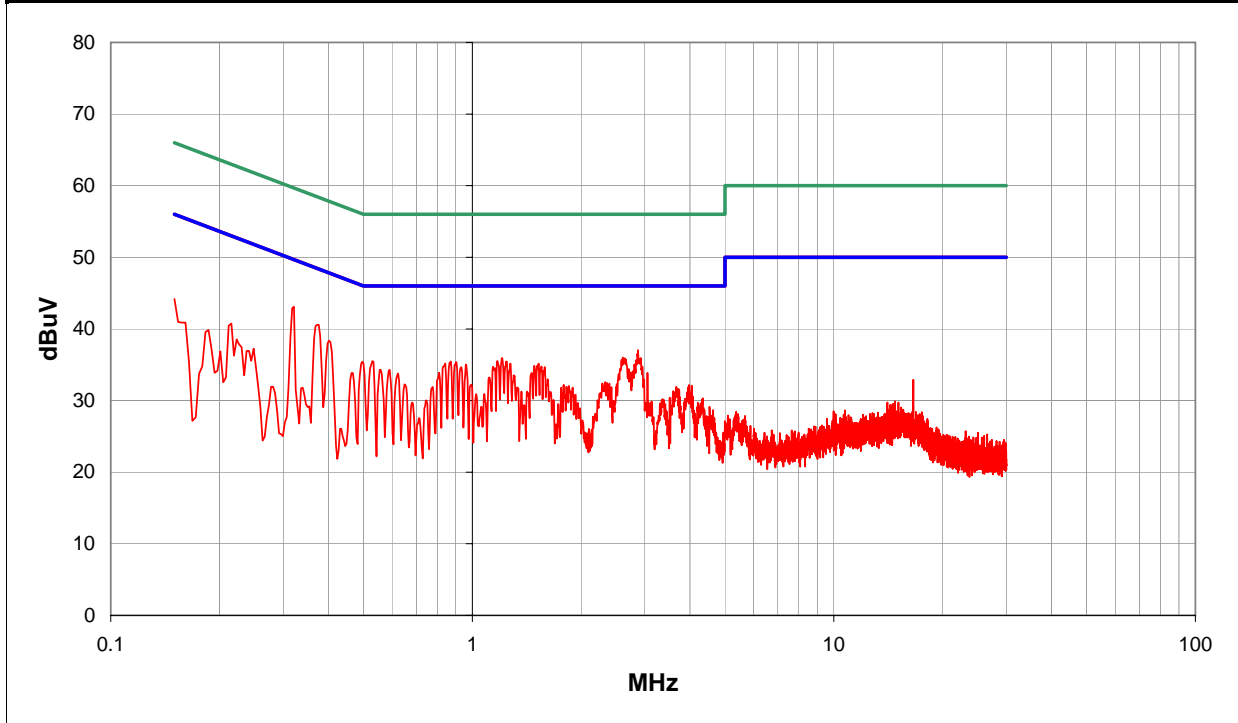
TEST PARAMETERS	
Cable or Line Tested	N

**COMMENTS**  
 WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

**EUT OPERATING MODES**  
 Transmitting Bluetooth, high channel

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

Run #	5	NVLAP Lab Code 200630-0	Signature <i>David Divergigelis</i>
Configuration #	1		
Results	Pass		



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)
0.321	22.3	0.0	0.8	20.0		43.1	49.7	-6.6
0.372	19.8	0.0	0.8	20.0		40.6	48.4	-7.9
2.872	16.3	0.0	0.7	20.0		37.0	46.0	-9.0
0.401	17.6	0.0	0.8	20.0		38.4	47.8	-9.5
2.610	15.3	0.0	0.7	20.0		36.0	46.0	-10.0
1.210	15.4	0.0	0.5	20.0		35.9	46.0	-10.1
1.174	15.0	0.0	0.5	20.0		35.5	46.0	-10.5
0.529	14.8	0.0	0.7	20.0		35.5	46.0	-10.5
0.872	14.9	0.0	0.6	20.0		35.5	46.0	-10.5
1.247	14.9	0.0	0.5	20.0		35.4	46.0	-10.6
0.496	14.7	0.0	0.7	20.0		35.4	46.1	-10.6
0.901	14.8	0.0	0.5	20.0		35.3	46.0	-10.7
0.842	14.6	0.0	0.6	20.0		35.2	46.0	-10.8
1.524	14.6	0.0	0.6	20.0		35.2	46.0	-10.8
1.276	14.6	0.0	0.5	20.0		35.1	46.0	-10.9
0.959	14.5	0.0	0.5	20.0		35.0	46.0	-11.0
1.484	14.3	0.0	0.6	20.0		34.9	46.0	-11.1
1.553	14.2	0.0	0.6	20.0		34.8	46.0	-11.2
1.141	14.2	0.0	0.5	20.0		34.7	46.0	-11.3

EUT:	Recon with WMBGMR01 combo radio chip	Work Order:	TRPO0022
Serial Number:	Compliance Unit 2	Date:	05/18/06
Customer:	Tripod Data Systems, Inc.	Temperature:	24
Attendees:	None	Humidity:	38%
Project:	None	Barometric Pres.:	30.04
Tested by:	David Divergigelis	Power:	120VAC/60Hz
		Job Site:	EV11

## TEST SPECIFICATIONS

FCC 15.207 Class B:2005-10

## Test Method

ANSI C63.4:2003

## TEST PARAMETERS

Cable or Line Tested L1

## COMMENTS

WMBGMR01 internal combo chip: 802.11(b)(g) and Bluetooth.

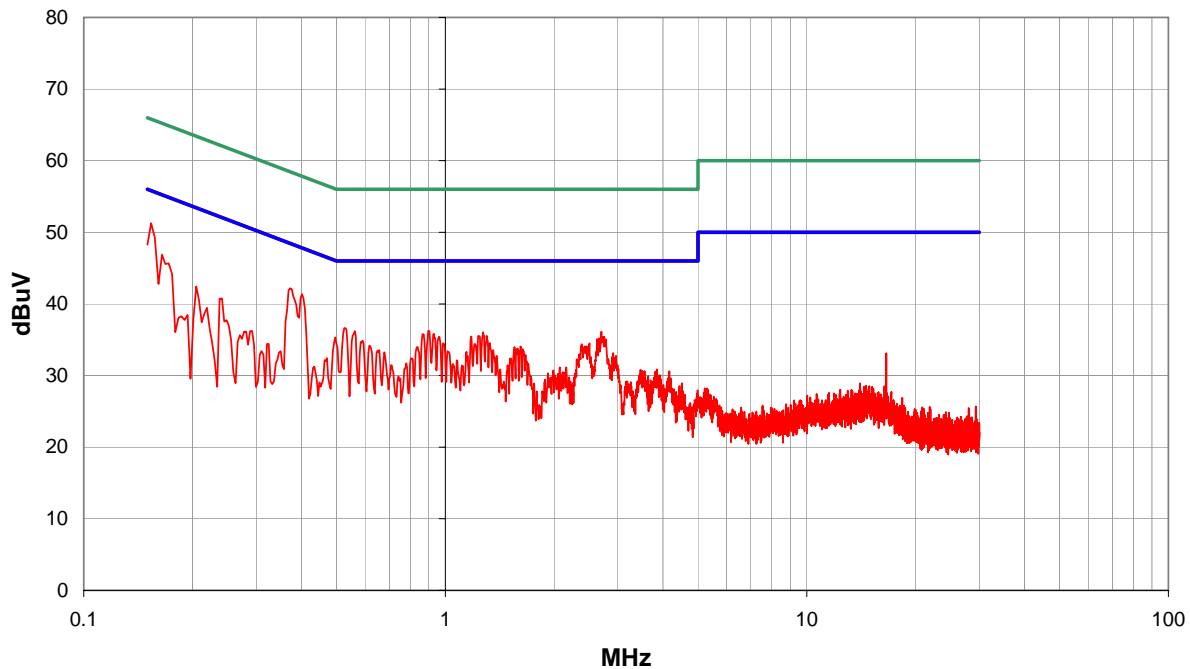
## EUT OPERATING MODES

Transmitting Bluetooth, high channel

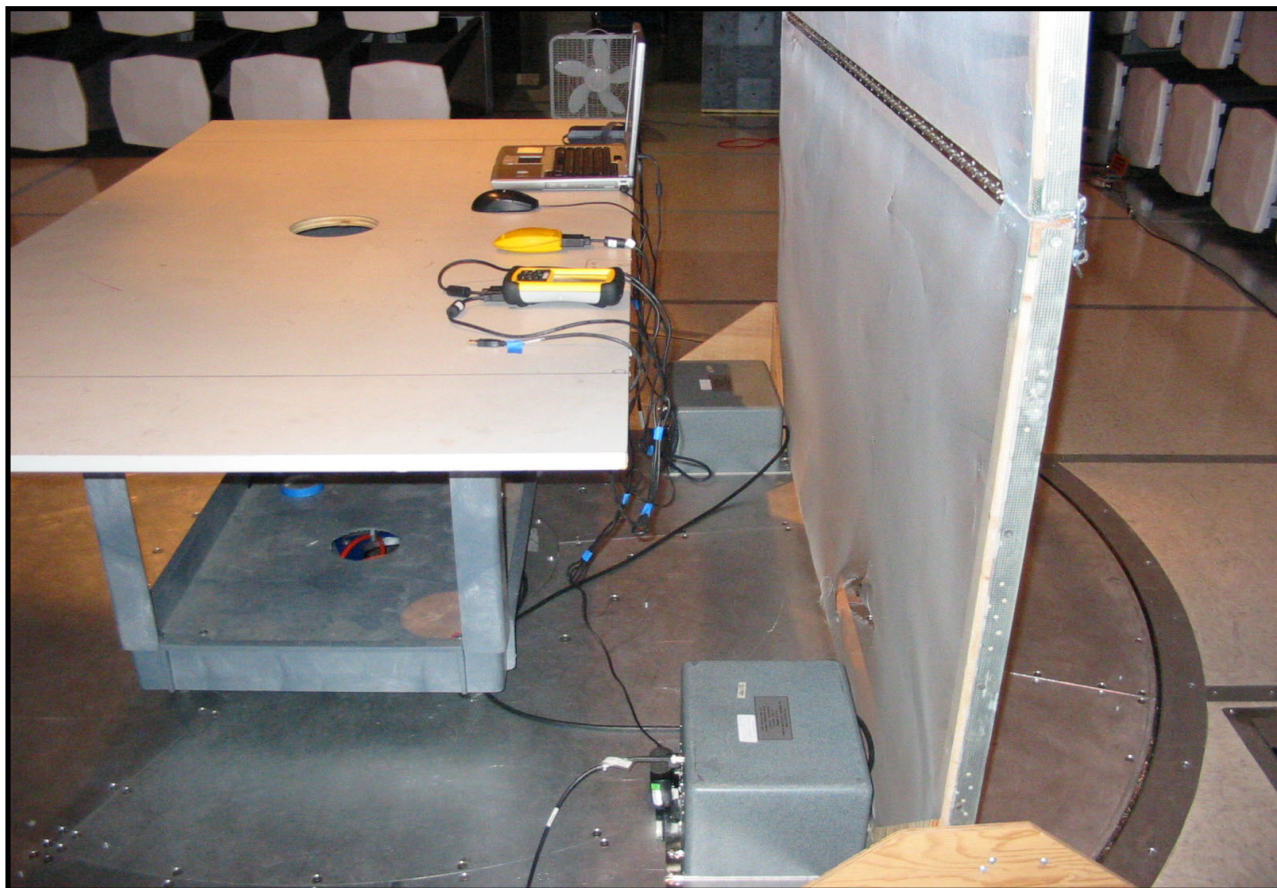
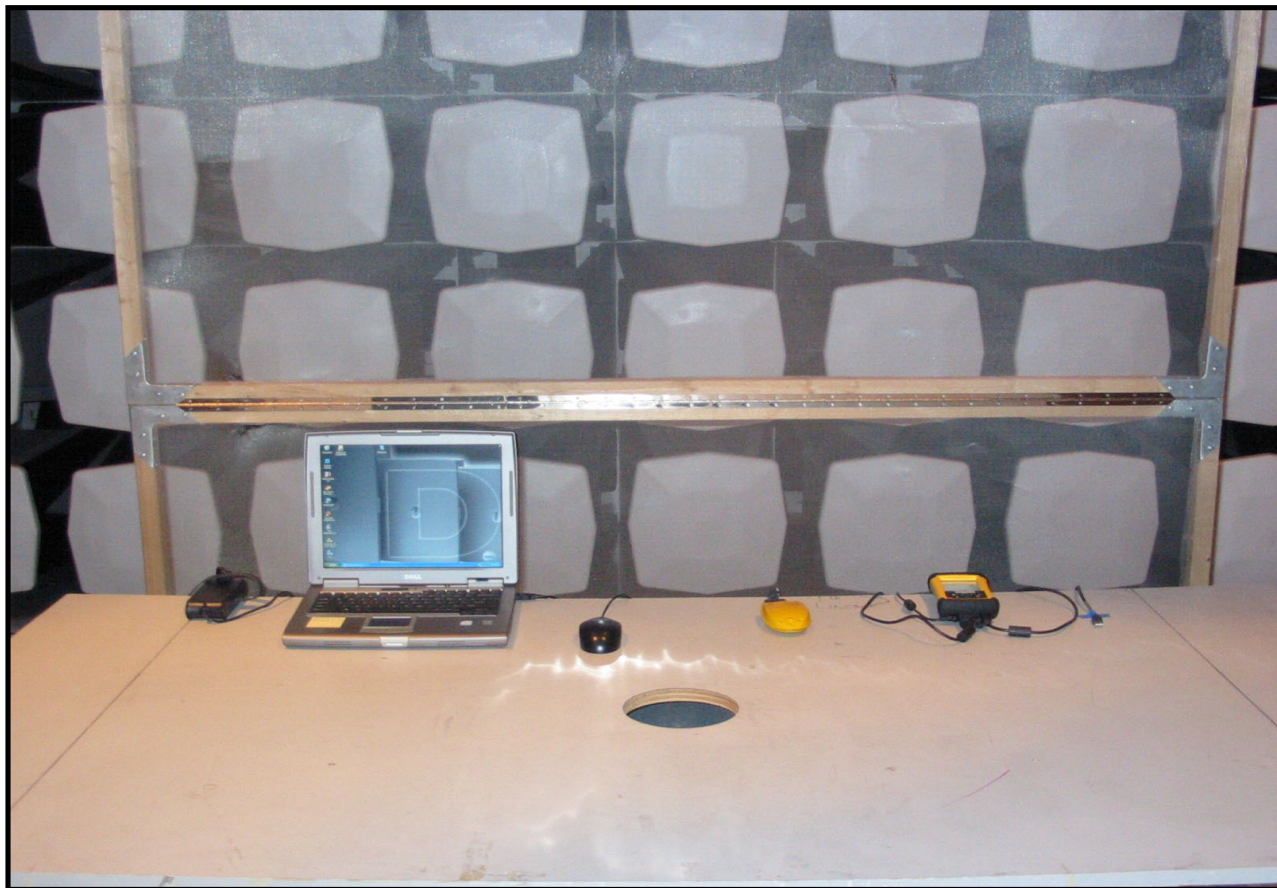
## DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	6	NVLAP Lab Code 200630-0
Configuration #	1	
Results	Pass	

Signature *David Divergigelis*

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)
0.154	30.4	0.0	0.9	20.0		51.3	55.8	-4.5
0.372	21.4	0.0	0.8	20.0		42.2	48.4	-6.3
0.401	20.6	0.0	0.8	20.0		41.4	47.8	-6.5
0.165	26.0	0.0	0.9	20.0		46.9	55.2	-8.4
0.525	15.9	0.0	0.7	20.0		36.6	46.0	-9.4
0.897	15.7	0.0	0.5	20.0		36.2	46.0	-9.8
0.562	15.5	0.0	0.7	20.0		36.2	46.0	-9.8
2.705	15.4	0.0	0.7	20.0		36.1	46.0	-9.9
1.272	15.5	0.0	0.5	20.0		36.0	46.0	-10.0
0.930	15.3	0.0	0.5	20.0		35.8	46.0	-10.2
0.864	15.2	0.0	0.6	20.0		35.8	46.0	-10.2
1.302	15.0	0.0	0.5	20.0		35.5	46.0	-10.5
1.240	15.0	0.0	0.5	20.0		35.5	46.0	-10.5
1.181	14.9	0.0	0.5	20.0		35.4	46.0	-10.6
0.959	14.9	0.0	0.5	20.0		35.4	46.0	-10.6
0.496	14.6	0.0	0.7	20.0		35.3	46.1	-10.7
2.628	14.4	0.0	0.7	20.0		35.1	46.0	-10.9
0.205	21.6	0.0	0.9	20.0		42.5	53.4	-11.0
0.591	14.2	0.0	0.7	20.0		34.9	46.0	-11.1





## **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 MHz**.

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  $\mu$ s. 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  $\mu$ s). 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  $\mu$ s \* 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 =  $5 * 625 \mu s * 1600 * 1/5 * 1/s / 79 * 30s = 0.3797s$  (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  $f_{center} = 75 \text{ kHz}$ .

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.