

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver

To: FCC Part 15.247 (FHSS)

Test Report Serial No:
RF\MPTE1\RP47071JD01A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager: 	
Tested By: Fara Razally  pp	Checked By: Nigel Davison  pp
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The results in this report apply only to the sample(s) tested.

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Registered in England and Wales. Company number: 2117901

Test of: **Electronics Test Centre MPB Technologies Inc.**
 IDBlue, Bluetooth Transceiver
To: **FCC Part 15.247 (FHSS)**

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1. Client Information

Company Name:	Electronics Test Centre MPB Technologies Inc.
Address:	302 Legget Drive Unit 100 Kanata Ontario K2KL 1Y5
Contact Name:	Ms L Diggins

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2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification of Equipment Under Test (EUT)

Brand Name:	Cathexis
Model Name or Number:	IDBlue
Unique Type Identification:	None Stated
Serial Number:	eTTendant 3
Country of Manufacture:	Canada
FCC ID. Number:	SW4IBRF001LBT
Date of Receipt:	28 February 2005

2.2. Accessories

The following accessories were supplied with the EUT:

Description:	AC Charger
Brand Name:	CU1
Model Name or Number:	DV-9150
Serial Number:	DPD090015-P7-DK
Cable Length and Type:	1.9m
Connected to Port:	Battery Charger Port

2.3. Description of EUT

The equipment under test is an RFID reader with *Bluetooth®* technology incorporated.

2.4. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

"The *Bluetooth®* word mark and logos are owned by the Bluetooth SIG, Inc. and any use of such marks by RFI Global Services Ltd. is under license. Other trademarks and trade names are those of their respective owners."

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2.5. Additional Information Related to Testing

Power Supply Requirement:	Internal 3.6 V (nominal) battery charged with nominal 115V AC 60 Hz mains charger		
Intended Operating Environment:	Residential, Commercial, Light Industry		
Equipment Category:	Short Range (Low Power)		
Type of Unit:	Portable.		
Interface Ports:	DC input from AC charger.		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Receive Frequency Range:	2402 MHz to 2480 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	1	2402
	Middle	40	2441
	Top	79	2480
Highest Unintentionally Generated Frequency:	2480 MHz		
Highest Fundamental Frequency:	2480 MHz		
Power Characteristics:	-21.9 dBm EIRP (measured)		
Occupied Bandwidth:	829.659 kHz (measured)		

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2.6. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Test Box
Brand Name:	None Stated
Model Name or Number:	None Stated
Serial Number:	None Stated
Cable Length and Type:	20 cm, 4 pin
Connected to Port:	HCI Interface (Hardwire, the Interface was disconnect during radiated spurious Emissions testing).

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3. Test Specification, Methods and Procedures

3.1. Test Specifications

Reference:	FCC Part 15 Subpart C: 2004 (Sections 15.247).
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices.

3.2. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2003)

Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)

Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

DA00-705 (2000)

Title: Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

3.3. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

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4. Deviations from the Test Specification

None.

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5. Operation of the EUT During Testing

5.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated.

For all transmit mode measurements the *Bluetooth* test mode was active and set to transmit on top, middle, bottom channels and hopping on all channels as necessary with the longest data packet size. Receive mode measurements were performed with the EUT in *Bluetooth* mode and in its normal search mode.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

Standalone with AC Charger connected as this was deemed worse case.

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6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliance Status
Idle Mode AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.107	AC Mains	Complied
Idle Mode Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.109	Antenna	Complied
Transmitter AC Conducted Emissions (150 kHz to 30 MHz)	C.F.R. 47 FCC Part 15: 2004 Section 15.207	AC Mains	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)	Antenna Terminals	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)	Antenna Terminals	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)(iii)	Antenna Terminals	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2004 Section 15.247(b)(1)	Antenna	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Sections 15.247(d) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Sections 15.247(d) & 15.209(a)	Antenna	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

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7. Measurements, Examinations and Derived Results

7.1. General Comments

7.1.1. This section contains test results only.

7.1.2. Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to Section 8 for details of measurement uncertainties.

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7.2. Idle Mode AC Conducted Spurious Emissions: Section 15.107

7.2.1. The EUT was configured for AC conducted emissions measurements as described in Section 9 of this report.

7.2.2. Tests were performed to identify the maximum emission levels on the AC Mains line of the EUT.

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

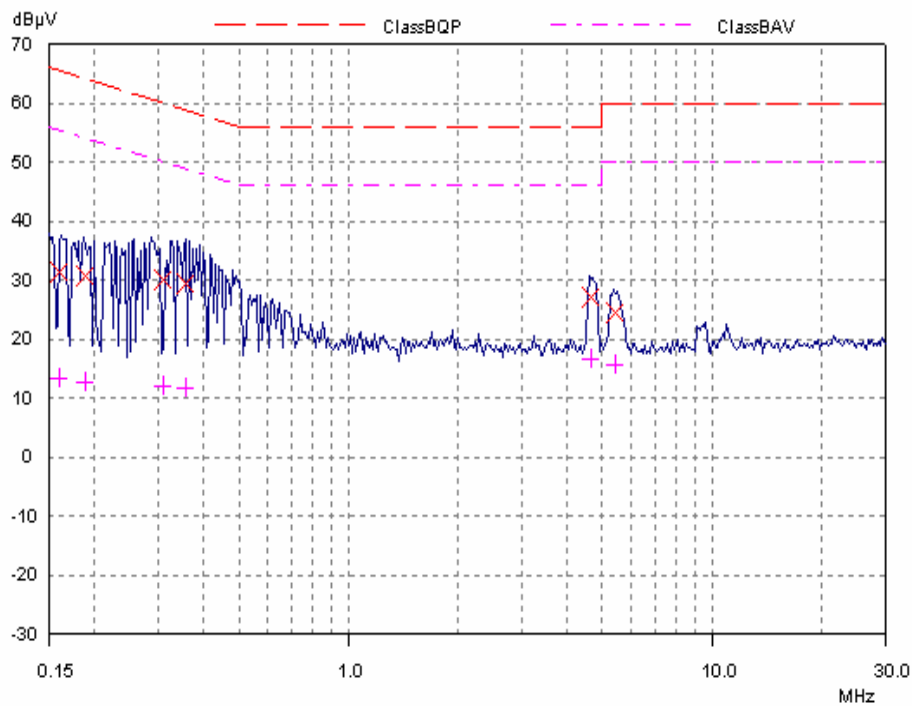
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.16093	Live	31.42	65.42	34.00	Complied
0.18862	Neutral	30.71	64.10	33.39	Complied
0.30843	Live	29.89	60.01	30.12	Complied
0.35916	Live	29.46	58.75	29.29	Complied
4.68833	Neutral	27.23	56.00	28.77	Complied
5.45284	Neutral	24.41	60.00	35.59	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.16093	Neutral	13.36	55.42	42.06	Complied
0.18862	Neutral	12.70	54.10	41.40	Complied
0.30843	Live	11.97	50.01	38.04	Complied
0.35916	Live	11.76	48.75	36.99	Complied
4.68833	Live	16.59	46.00	29.41	Complied
5.45284	Live	15.52	50.00	34.48	Complied

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Idle Mode AC Conducted Spurious Emissions: Section 15.107 (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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7.3. Idle Mode Radiated Spurious Emissions: Section 15.109

7.3.1. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

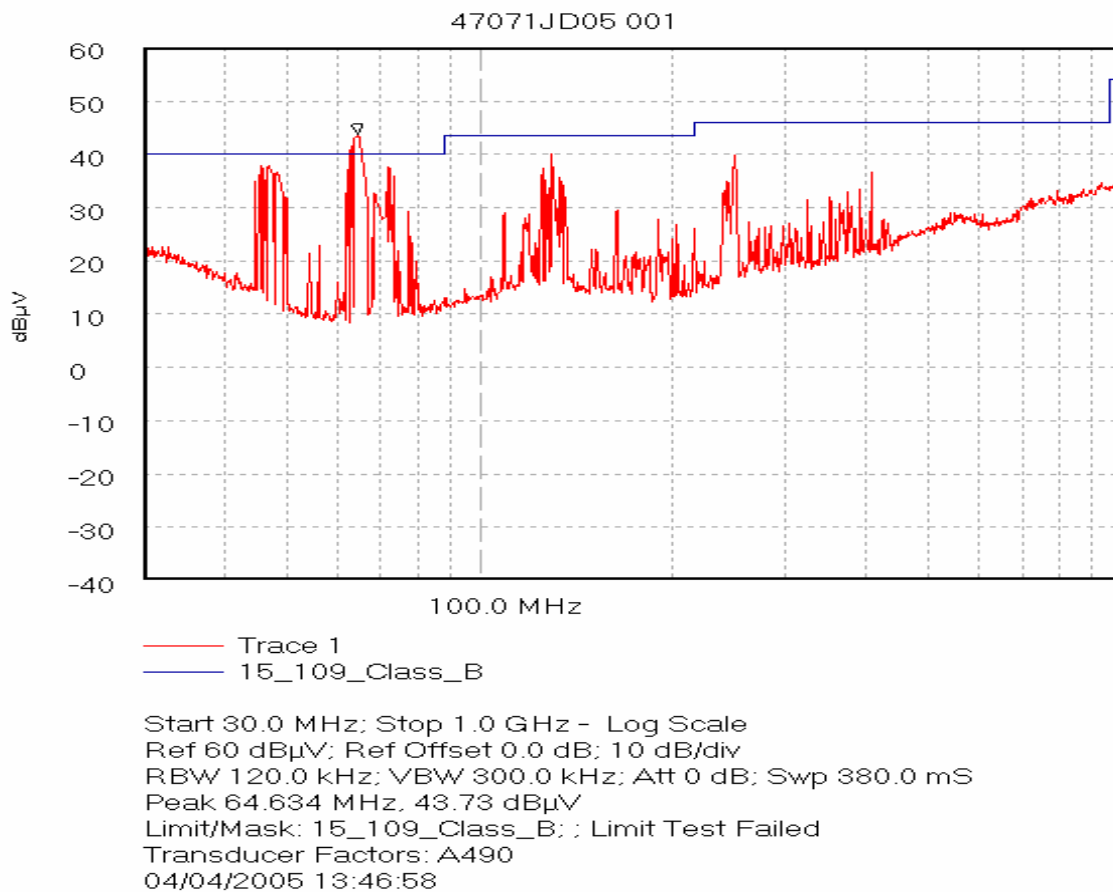
7.3.1.1. The EUT was configured for radiated emissions testing as described in Section 9 of this report.

7.3.1.2. Tests were performed to identify the maximum receiver or standby radiated emission levels.

Results:

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
47.988	Vert	30.1	40.0	9.9	Complied
64.000	Vert	30.2	40.0	9.8	Complied
128.827	Vert	27.2	43.5	16.3	Complied
135.588	Vert	28.3	43.5	15.2	Complied
249.277	Vert	21.3	46.0	24.7	Complied
407.994	Vert	28.8	46.0	17.2	Complied

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Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)

Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)**7.3.2. Electric Field Strength Measurements (Frequency Range: 1 to 12.5 GHz)****Results:****Highest Peak Level:**

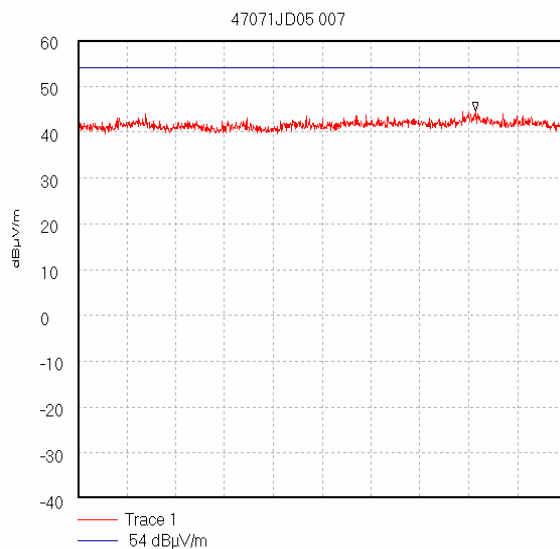
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
12.382941	Horiz	18.2	30.7	3.0	51.9	74.0	22.1	Complied
12.382941	Horiz	7.0	30.7	3.0	40.7	54.0	13.3	Complied

Note(s):

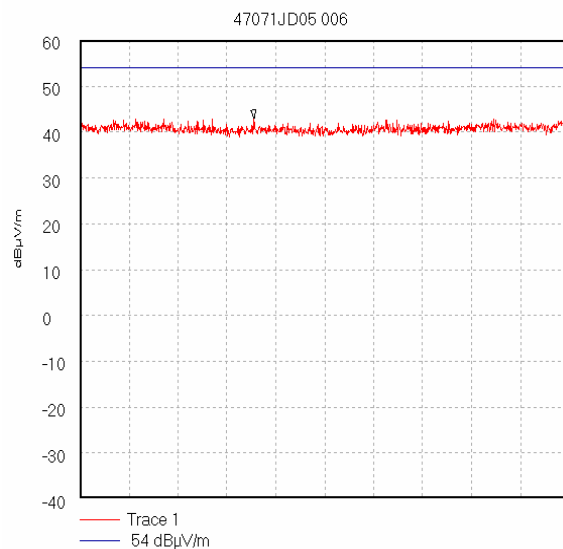
1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.

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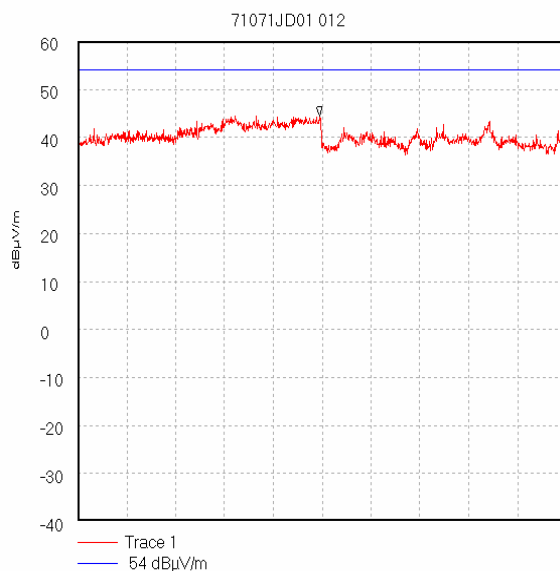
Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



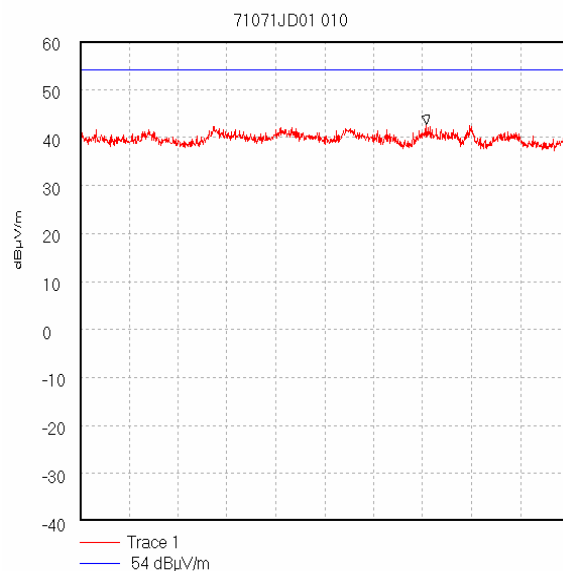
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.814444 GHz, 44.59 dBµV/m
Display Line: 54 dBµV/m; Limit Test Passed
Transducer Factors: A490
04/04/2005 14:31:53



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 2.711111 GHz, 42.97 dBµV/m
Display Line: 54 dBµV/m; Limit Test Passed
Transducer Factors: A490
04/04/2005 14:29:49



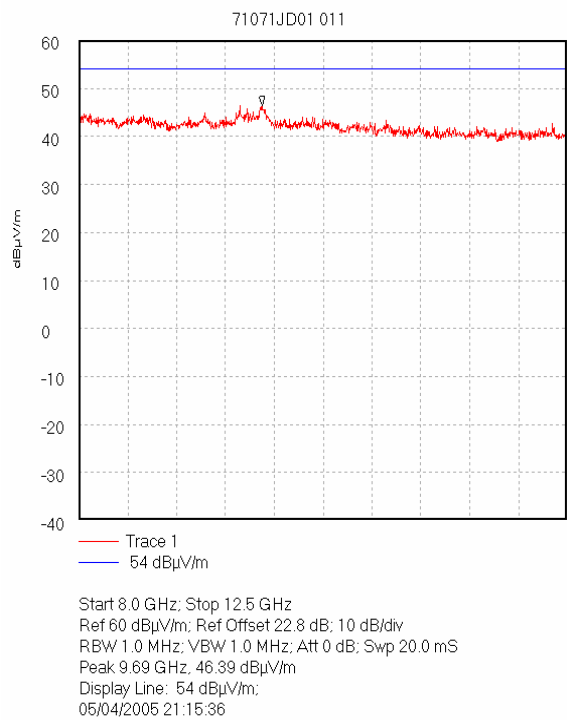
Start 4.0 GHz; Stop 6.0 GHz
Ref 60 dBµV/m; Ref Offset 16.7 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.989 GHz, 44.54 dBµV/m
Display Line: 54 dBµV/m;
05/04/2005 21:17:49



Start 6.0 GHz; Stop 8.0 GHz
Ref 60 dBµV/m; Ref Offset 18.8 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 7.416 GHz, 42.74 dBµV/m
Display Line: 54 dBµV/m;
05/04/2005 21:11:51

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Idle Mode Radiated Spurious Emissions: Section 15.109 (Continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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7.4. Transmitter AC Conducted Spurious Emissions: Section 15.207

7.4.1. The EUT was configured for AC conducted emissions measurements as described in Section 9 of this report.

7.4.2. Tests were performed to identify the maximum emission levels on the AC mains line of the EUT.

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Top Channel

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.22768	Live	31.03	62.53	31.50	Complied
0.28177	Live	30.02	60.76	30.74	Complied
0.31909	Live	30.10	59.73	29.63	Complied
0.36056	Live	29.74	58.72	28.98	Complied
4.70854	Neutral	26.69	56.00	29.31	Complied
5.58284	Live	23.62	60.00	36.38	Complied

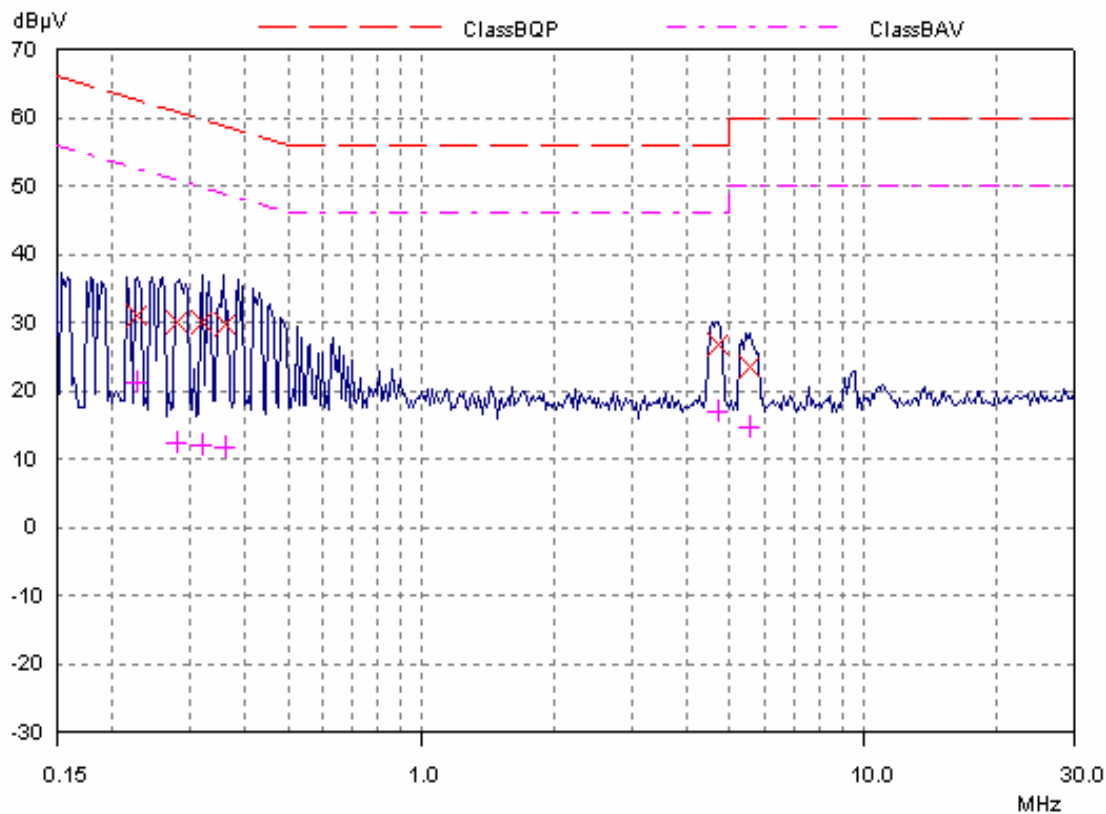
Average Detector Measurements on Live and Neutral Lines

Top Channel

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.22768	Live	21.18	52.53	31.35	Complied
0.28177	Live	12.35	50.76	38.41	Complied
0.31909	Live	11.94	49.73	37.79	Complied
0.36056	Live	11.79	48.72	36.93	Complied
4.70854	Neutral	16.97	46.00	29.03	Complied
5.58284	Neutral	14.63	50.00	35.37	Complied

Test of: Electronics Test Centre MPB Technologies Inc.
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Transmitter AC Conducted Spurious Emissions: Section 15.207 (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test of: Electronics Test Centre MPB Technologies Inc.
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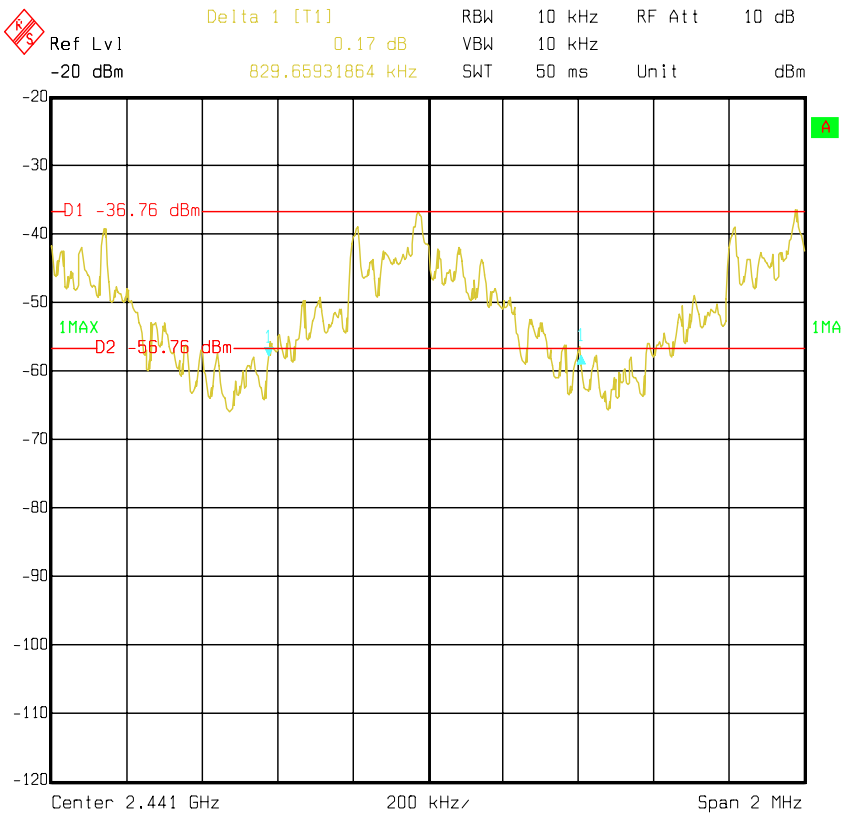
7.5. Transmitter 20 dB Bandwidth: Section 15.247(a)(1)

7.5.1. The EUT was configured for carrier frequency bandwidth measurements as described in Section 9 of this report.

7.5.2. Tests were performed to identify the 20 dB bandwidth.

Results:

Transmitter 20 dB Bandwidth (kHz)	Limit (kHz)
829.659	None specified



Title: Cathexis EUT: IDBlue FCC Part15.247 20dB Bandwidth
Comment A: 47071JD01 Hopping Mode
Date: 16.MAR.2005 11:15:47

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

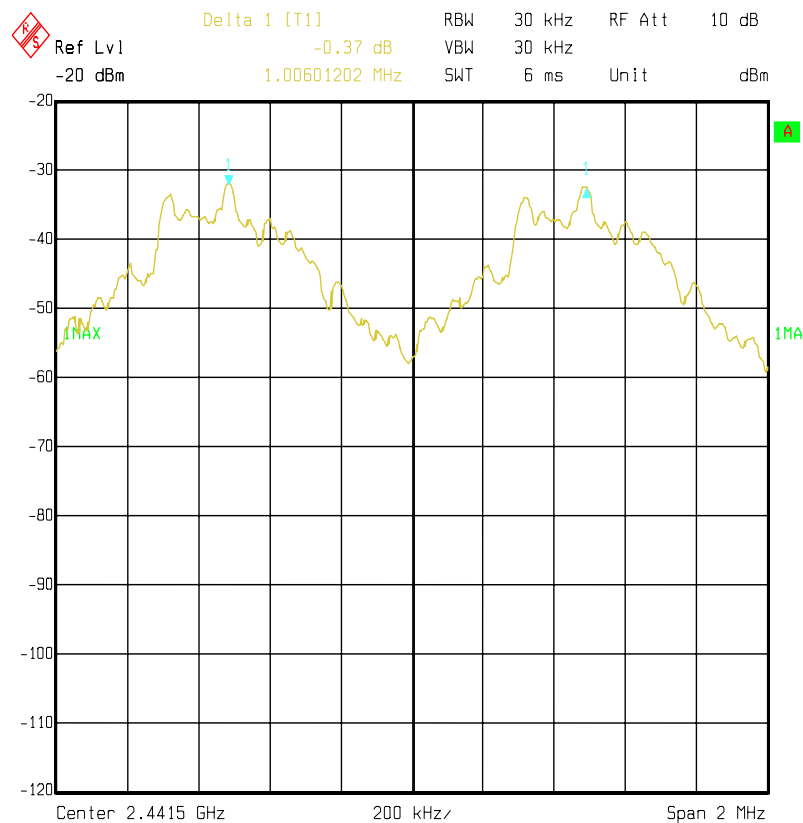
7.6. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)

7.6.1. The EUT was configured for carrier frequency separation measurements as described in Section 9 of this report.

7.6.2. Tests were performed to identify the carrier frequency separation.

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit (> 20 dB BW) (kHz)	Margin (kHz)	Result
1006.012	829.659	176.353	Complied



Title: Cathexis EUT: IDBlue FCC Part15.247 Carrier Separation
Comment A: 47071JD01 Hopping Mode
Date: 16.MAR.2005 11:19:15

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7.6.1. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii)

7.6.1.1. The EUT was configured for average time of occupancy measurements as described in Section 9 of this report.

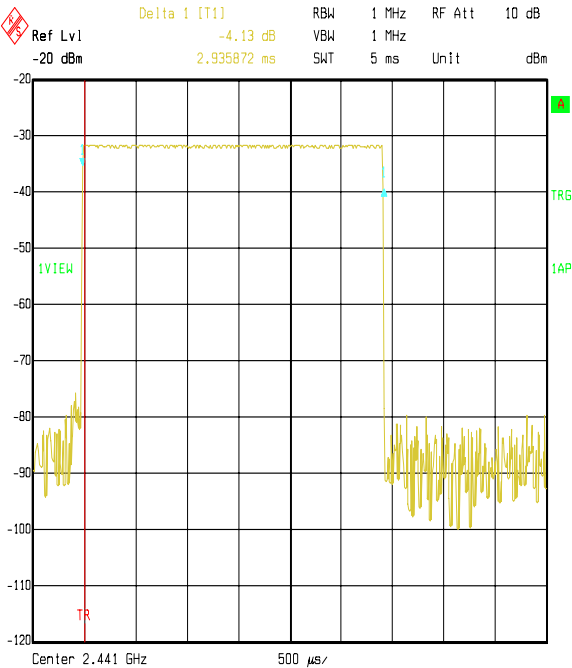
7.6.1.2. Tests were performed to identify the average time of occupancy in number of channels (79) x 0.4 seconds. The calculated period is 31.6 seconds.

Results:

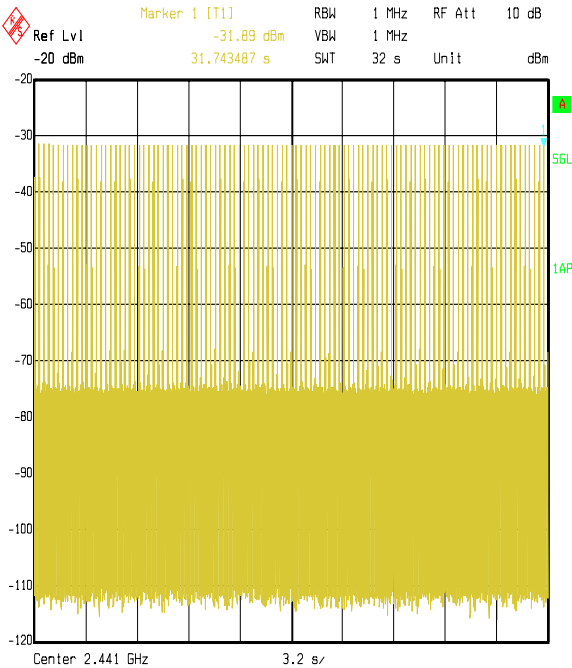
Emission Width (μs)	Number of Hops in 31.6 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
2935.872	111	0.326	0.4	0.074	Complied

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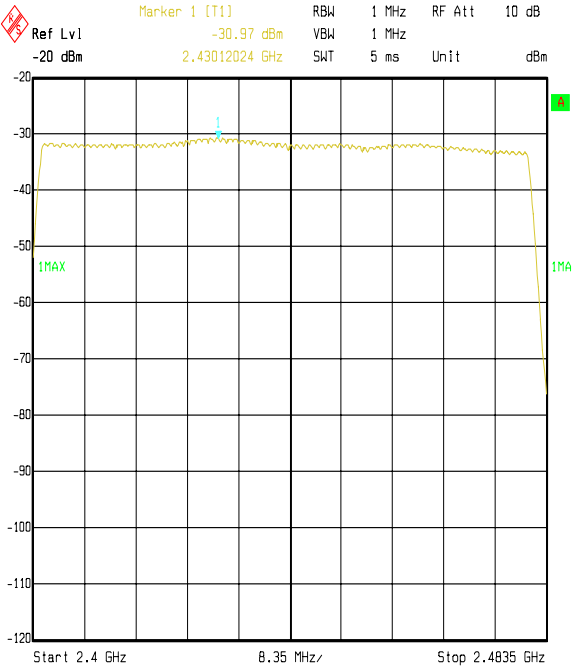
Transmitter Average Time of Occupancy: Section 15.247(a)(1)(iii) (Continued)



Title: Cathexis EUT: IDBlue FCC Part15.247 Emission Width
Comment A: 47071JD01 Hopping Mode
Date: 16.MAR.2005 11:22:44



Title: Cathexis EUT: IDBlue FCC Part15.247 Number of Hops in 31.6s
Comment A: 47071JD01 Hopping Mode
Date: 16.MAR.2005 12:02:47



Title: Cathexis EUT: IDBlue FCC Part15.247 Number of Channels
Comment A: 47071JD01 Hopping Mode
Date: 16.MAR.2005 11:09:31

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7.7. Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1)

7.7.1. The EUT was configured for transmitter peak output power measurements as described in Section 9 of this report.

7.7.2. Tests were performed to identify the transmitter maximum peak output power (EIRP) of the EUT.

Results:**Battery Powered Devices**

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	-23.9	30.0	53.9	Complied
Middle	-25.7	30.0	55.7	Complied
Top	-28.5	30.0	58.5	Complied

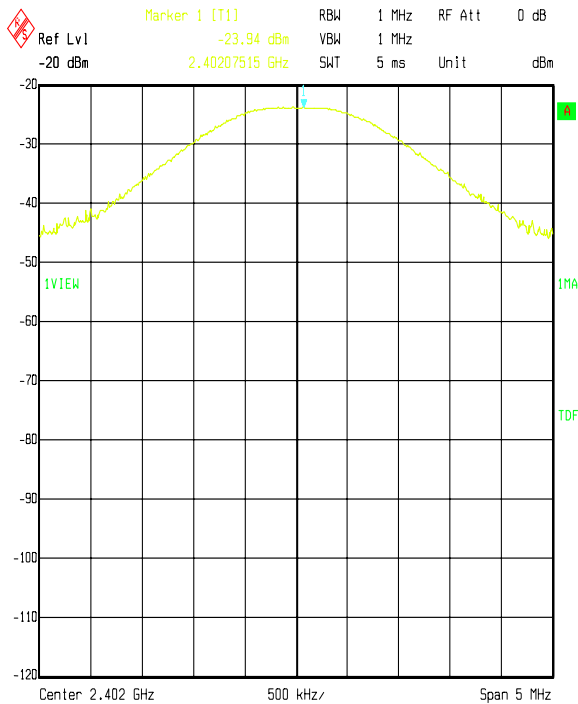
Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result.

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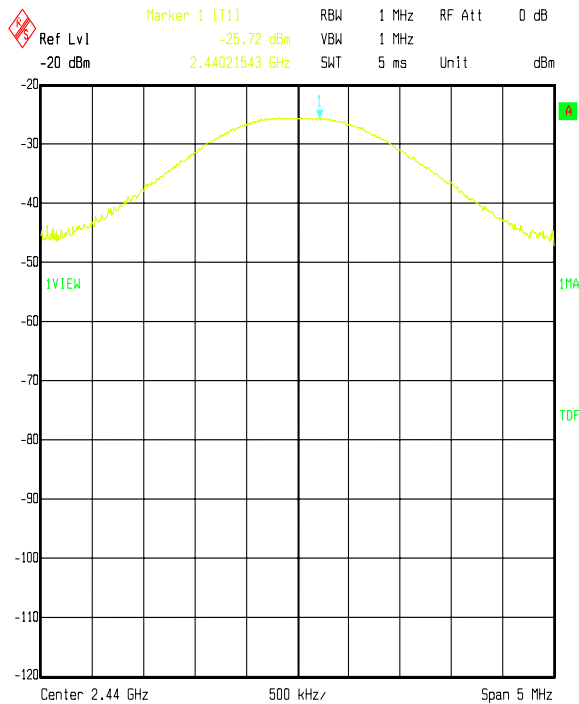
7.8. Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(1) (Continued)

Bottom Channel



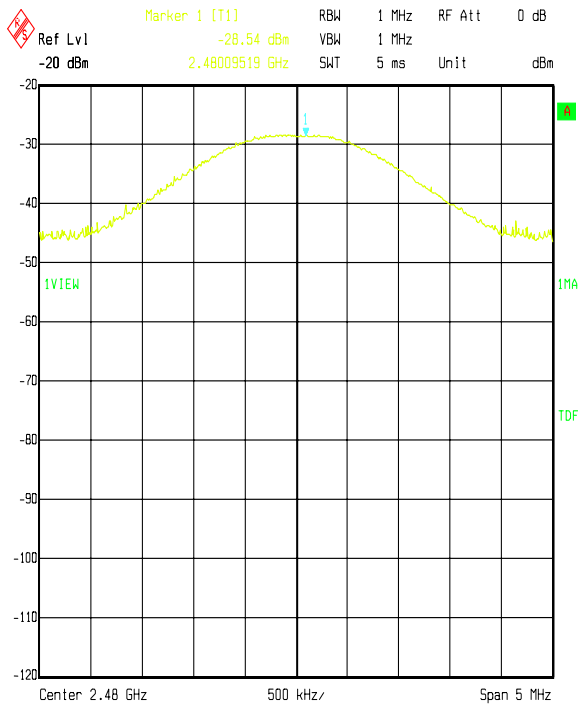
Date: 16.MAY 2005 19:32:05

Middle Channel



Date: 16.MAY 2005 19:29:56

Top Channel



Date: 16.MAY 2005 19:25:06

Test of: Electronics Test Centre MPB Technologies Inc.
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7.9. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a)

7.9.1. Electric Field Strength Measurements: 30 to 1000 MHz **(Emissions Occurring in the Restricted Bands)**

7.9.1.1. The EUT was configured for radiated emissions testing as described in Section 9 of this report.

7.9.1.2. Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Top Channel

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
135.584	Vert.	23.8	43.5	19.7	Complied
162.705	Vert.	25.6	43.5	17.9	Complied
407.988	Vert.	28.1	46.0	17.9	Complied

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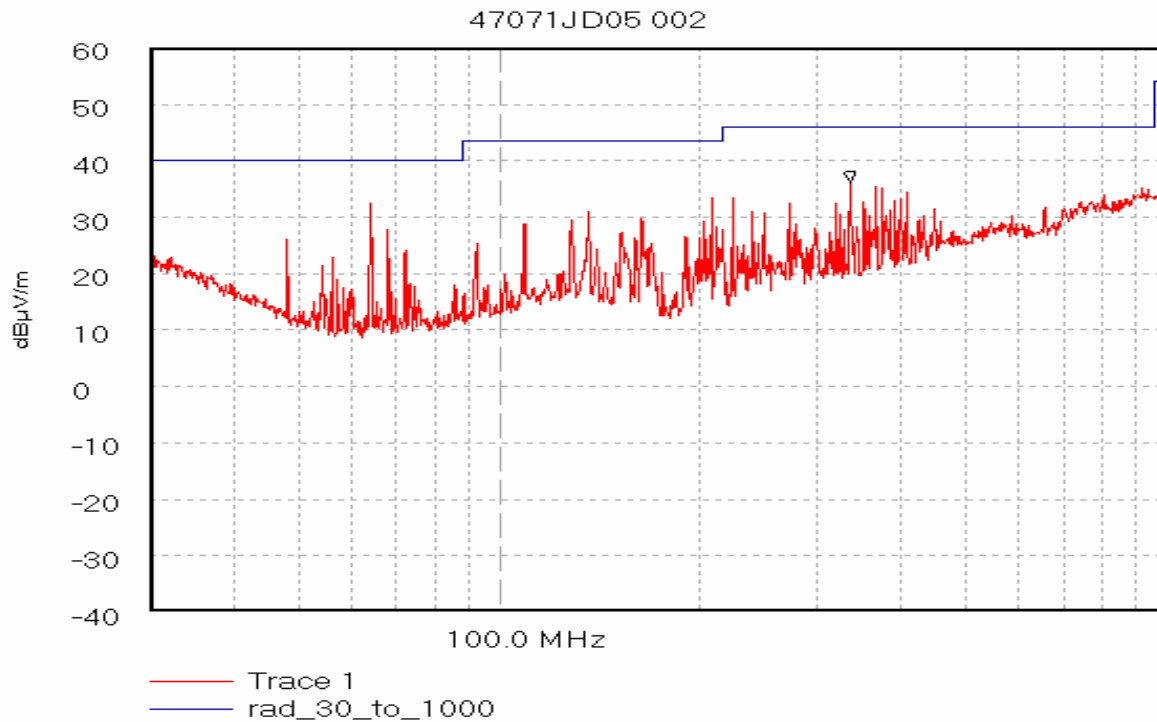
7.10. Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)**7.10.1. Electric Field Strength Measurements: 30 to 1000 MHz**
(Emissions Outside the Restricted Bands)**Results:****Top Channel**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
64.000	Vert.	30.3	53.5	23.2	Complied
336.005	Horiz.	29.2	53.5	24.3	Complied

Note(s):

1. The observed emissions below 1 GHz exhibited similar levels irrespective of EUT channel setting; therefore only the results of the top channel are reported.

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)

Start 30.0 MHz; Stop 1.0 GHz - Log Scale
Ref 60 dBµV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 120.0 kHz; VBW 300.0 kHz; Att 0 dB; Swp 380.0 mS
Peak 335.904 MHz, 36.11 dBµV/m
Limit/Mask: rad_30_to_1000; ; Limit Test Passed
Transducer Factors: A490
04/04/2005 14:03:38

"Note: these plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables."

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Transmitter Radiated Emissions: Section 15.247(d) and 15.209(a) (Continued)

7.10.2. Electric Field Strength Measurements (Frequency Range: 1 to 25 GHz) **(Emissions Occurring in the Restricted Bands)**

Results:

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.806921	Vert.	16.5	24.2	1.8	42.5	54.0	11.5	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.883651	Vert.	20.1	24.2	1.8	46.1	54.0	7.9	Complied

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.964381	Vert.	22.2	24.2	1.8	48.2	54.0	5.8	Complied

Highest Peak Level: Hopping Mode

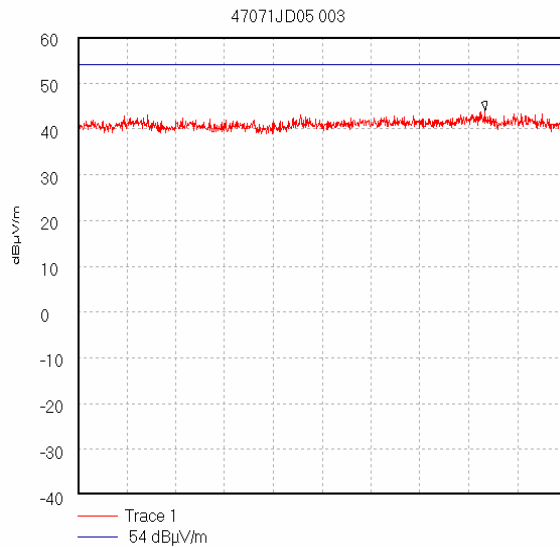
Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4.826891	Vert.	24.2	24.2	1.8	50.2	54.0	3.8	Complied

Note(s):

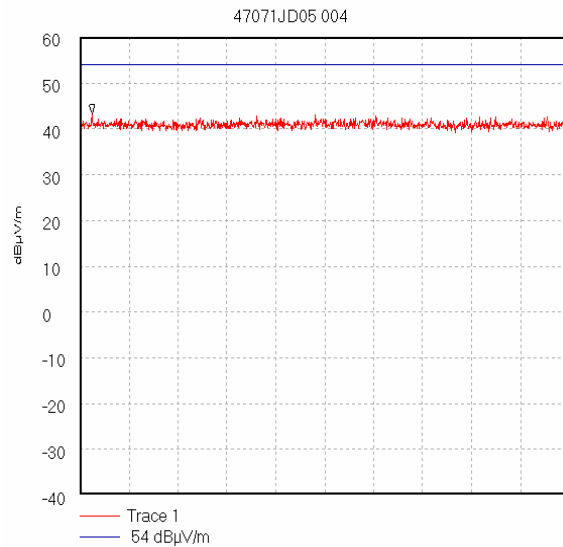
1. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

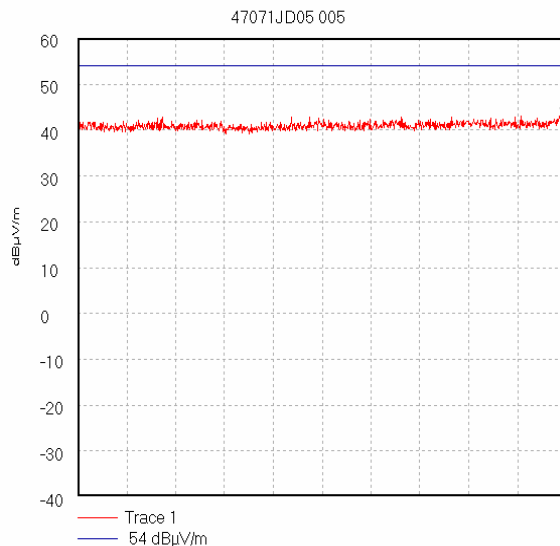
Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)



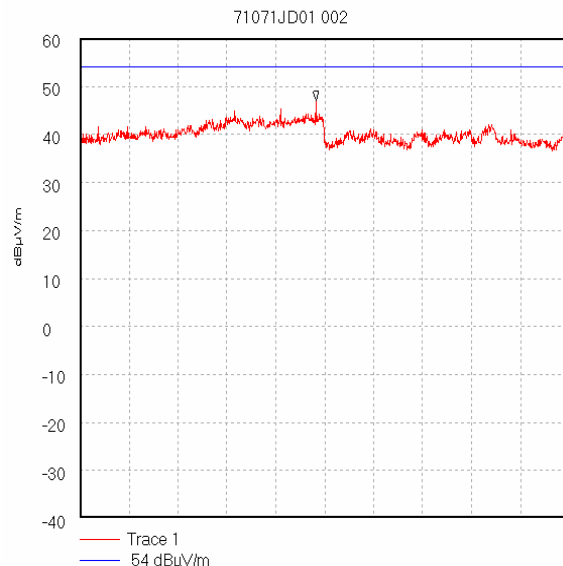
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBμV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.834 GHz, 43.96 dBμV/m
Display Line: 54 dBμV/m; Limit Test Passed
Transducer Factors: A490
04/04/2005 14:20:37



Start 2.0 GHz; Stop 2.4 GHz
Ref 60 dBμV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 2.01 GHz, 43.25 dBμV/m
Display Line: 54 dBμV/m; Limit Test Passed
Transducer Factors: A490
04/04/2005 14:22:38



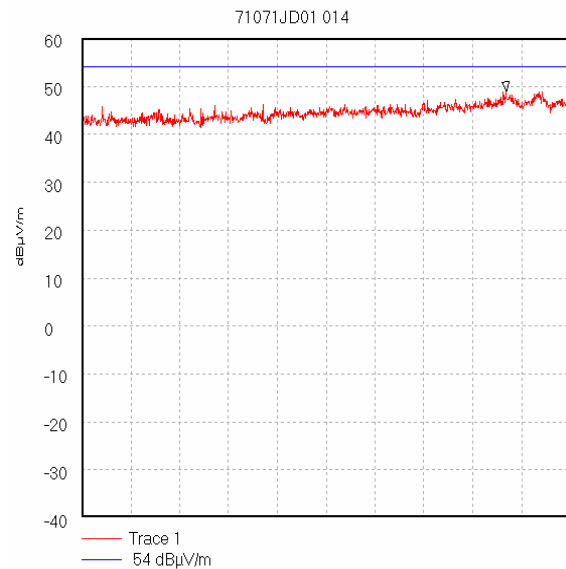
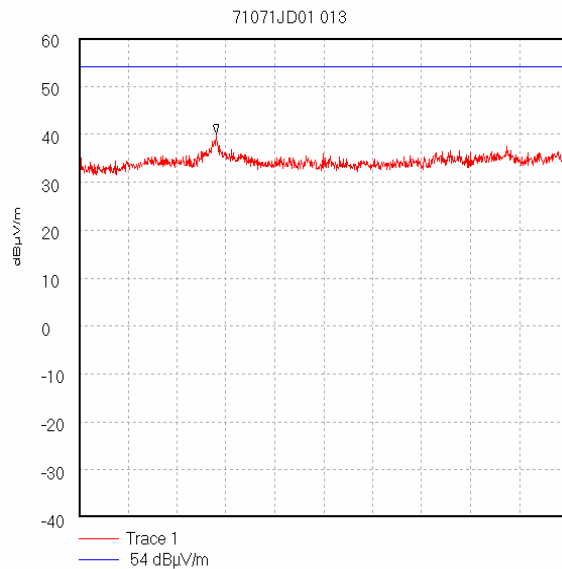
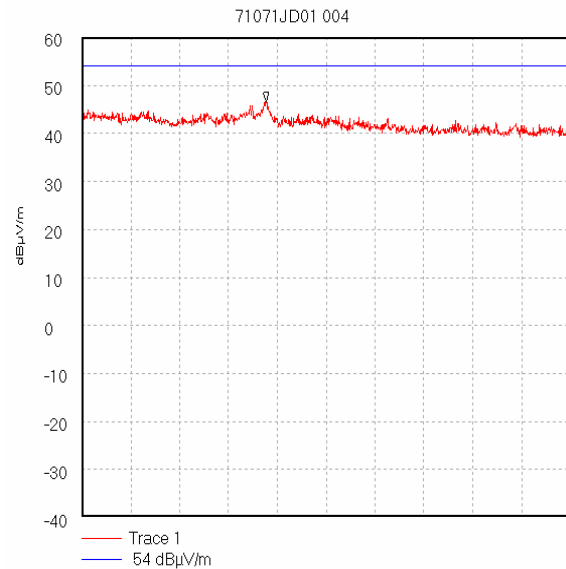
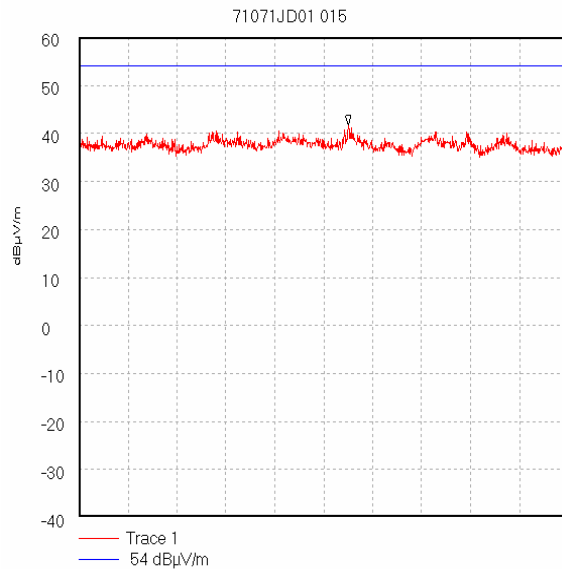
Start 2.4835 GHz; Stop 4.0 GHz
Ref 60 dBμV/m; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 3.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 3.991575 GHz, 43.09 dBμV/m
Display Line: 54 dBμV/m; Limit Test Passed
Transducer Factors: A490
04/04/2005 14:27:33



Start 4.0 GHz; Stop 6.0 GHz
Ref 60 dBμV/m; Ref Offset 16.7 dB; 10 dB/div
RBW 1.0 MHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 4.964 GHz, 47.05 dBμV/m
Display Line: 54 dBμV/m;
05/04/2005 20:36:55

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)



"Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables."

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

7.11. Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a)

7.11.1. The EUT was configured for band edge compliance of radiated emissions measurements as described in Section 9 of this report.

7.11.2. Tests were performed to identify the maximum radiated band edge emissions.

Results:

Electric Field Strength Measurements

Peak Power Level Hopping Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Vert.	17.6	21.5	1.4	40.5	*51.0	10.5	Complied
2.4835	Vert.	23.1	21.1	1.4	45.6	74.0	28.4	Complied

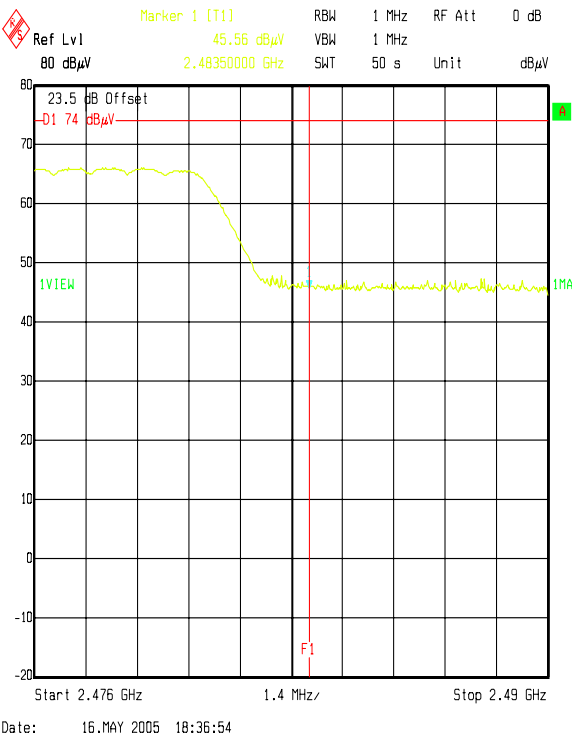
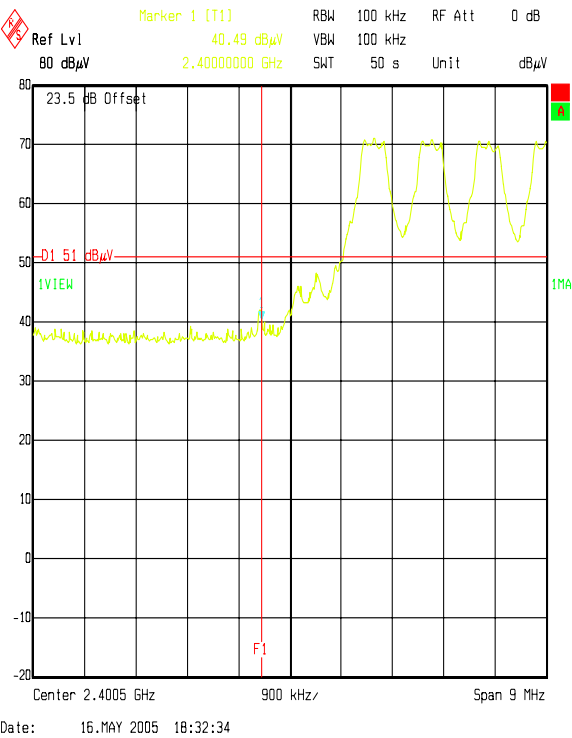
**Note: -20 dBc limit*

Average Power Level Hopping Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4835	Vert.	11.7	21.1	1.4	34.2	54.0	19.8	Complied

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)



Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)**Results:****Peak Power Level Static Mode:**

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2.4000	Vert.	19.3	21.5	1.4	42.2	*51.0	8.8	Complied
2.4835	Vert.	24.2	21.1	1.4	46.7	74.0	27.3	Complied

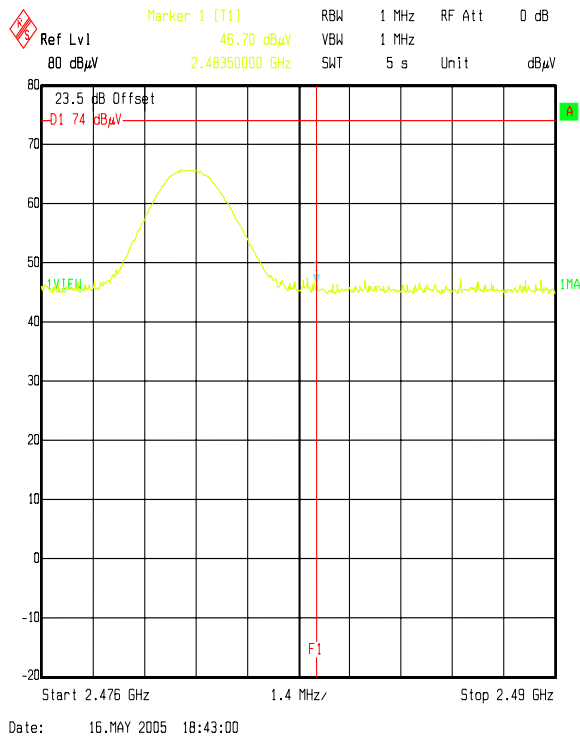
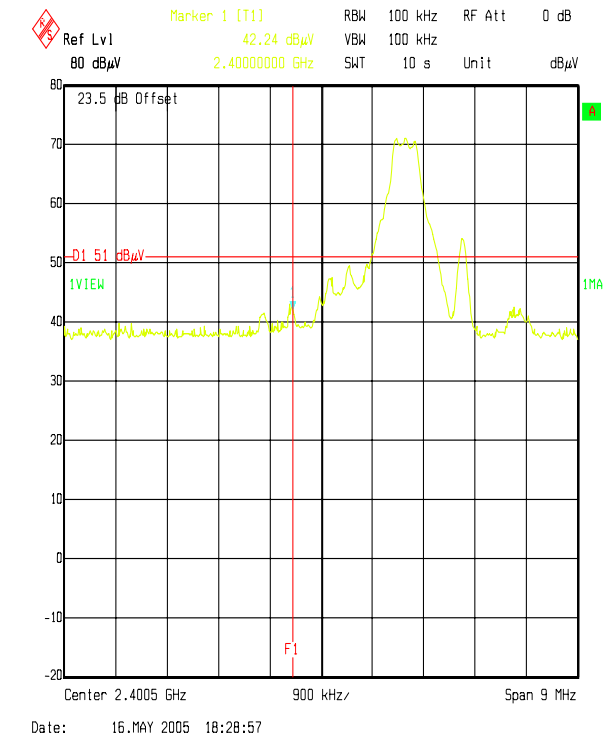
**Note: -20 dBc limit*

Average Power Level Static Mode:

Frequency (GHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2.4835	Vert.	11.7	21.1	1.4	34.2	54.0	19.8	Complied

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Transmitter Band Edge Radiated Emissions: Section 15.247(d) & 15.209(a) (Continued)



Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement regarding the uncertainty of approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of any measurement may need to be taken into account when interpreting the measurement result.

The expanded uncertainties reported below are based on a standard recognised uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Transmitter Maximum Peak Output Power	Not applicable	95%	+/- 3.03 dB
Transmitter Carrier Frequency Separation	Not applicable	95%	+/- 0.01 ppm
Transmitter Average Time of Occupancy	Not applicable	95%	+/- 10%
20 dB Bandwidth	Not applicable	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	+/- 3.03 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

9. Measurement Methods

9.1. AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 110V 60 Hz AC mains supplied via a Line Impedance Stabilisation Network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	Initial Scan	Final Measurements
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz	9 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

9.2. Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. Any emission within 20 dB of the limit were then measured on the open area test site, except in cases where the noise floor was within 20 dB of the limit, in these cases the highest point of the noise floor was measured.

Where an emission fell inside a restricted band, measurements were made at the appropriate test distance using a measuring receiver with a Quasi-Peak detector for measurements below 1000 MHz and an Average and Peak detector for measurements above 1000 MHz. A peak detector was used for all other measurements.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4.

All measurements on the open area test site were performed using broadband antennas in both vertical and horizontal polarisations.

On the open area test site, at each frequency where a signal was to be measured, the trace was maximised by rotating a turntable through 360°. The angle at which the maximum signal was observed was locked out. For frequencies below 1000 MHz the test antenna was varied in height between 1 m and 4 m in order to further maximise the target emission.

For frequencies above 1000 MHz where a horn antenna was used, height searching was performed to locate the optimal height of the horn with respect to the EUT. At this point the horn was locked off and the turntable was again rotated through 360° to maximise the target signal. It should be noted that the received signal from the EUT would diminish very quickly after it exits the beam width of the horn antenna, for this reason it may not be necessary to fully height search with the horns.

At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

Scans were performed to the upper frequency limits as stated in Section 15.33

The final field strength was determined as the indicated level in dB μ V plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	Initial Scan	Final Measurements Below 1 GHz	Final Measurements Above 1 GHz
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak / Average
Mode:	Max Hold	Not applicable	Max Hold
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz
Amplitude Range:	100 dB	100 dB	100 dB
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

9.3. Carrier Frequency Separation / 20 dB Bandwidth

The EUT and spectrum analyser was configured for radiated measurements and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine the bandwidth and separation of each transmission channel the measurement analyser was configured to measure two adjacent channels whilst the EUT was in hopping mode. The spectrum analyser was configured with a resolution bandwidth and video bandwidth greater than 1% of the frequency span.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak points on the two adjacent channels were noted and the separation between them recorded.

To determine the occupied bandwidth, a resolution bandwidth of 10 kHz was used, which is greater than 1% of the 20 dB bandwidth. A video bandwidth of, at least, the same value was used.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20 dB below the peak level.

The bandwidth was determined at the points where the 20 dB reference line intercepted the power envelope of the emission.

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

9.4. Average Time of Occupancy

The EUT and spectrum analyser was configured for radiated measurements and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

First the maximum packet length was determined on the centre channel.

The measurement analyser was configured to the time domain mode by setting the span to zero with a sweep time sufficiently wide enough to measure one pulse.

The EUT was configured to operate in normal mode of operation. The pulse width of one transmission was then recorded. The measurement analyser was then configured in zero span i.e. in the time domain and the sweep time was set to 32 seconds (the closest allowable setting to 31.6 seconds). This 31.6 second period was determined by multiplying the number of channels the device operates over (79) by 0.4 seconds.

The number of transmissions within this period was noted and multiplied by the pulse width recorded earlier. This gives the maximum occupancy over 31.6 seconds.

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

9.5. Effective Isotropic Radiated Power (EIRP)

EIRP measurements were performed in accordance with the standard, against appropriate limits.

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4. The transmitter was fitted with an integral antenna; therefore all radiated tests were performed with the unit operating into the integral antenna.

The level of the EIRP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the Vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a horn antenna. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Effective Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The EIRP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated EIRP to obtain the substituted EUT EIRP.

$$\text{Delta (dB)} = \text{EUT} - \text{SG}$$

where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

$$\text{EIRP SG} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The EUT EIRP is calculated as:

$$\text{EIRP EUT} = \text{EIRP SG} + \text{Delta.}$$

The test equipment settings for EIRP measurements were as follows:

Receiver Function	Setting
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

9.6. Band Edge Compliance of RF Radiated Emissions

The EUT and spectrum analyser were configured for Radiated measurements and as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine band edge compliance, the analyser resolution bandwidth was set to $\geq 1\%$ of the analyser span. The video bandwidth was set to be $\geq$ to the resolution bandwidth. The sweep was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

A plot of the lower band edge of the allocated frequency band was produced. A marker was set to the level of the highest in band emission with a limit line set to 20 dB below this. The marker was then placed on the highest out of band emission (the specification states that either the band edge level must be measured or the highest out of band emission, whichever is the greater). The plots show that the highest out of band emission complies with the -20 dBc Limit.

The above procedure was then repeated for the upper band edge except that, as the upper band edge fell on a restricted band edge (as defined in Section 15.205(a)), the limit for the restricted band was applied instead of the -20 dBc limit i.e. the general limits defined in Section 15.209(a).

Final measurements were performed on the worst-case configuration as described in Part 15.31(i).

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A004	ESH3-Z5 LISN	Rohde & Schwarz	ESH3-Z5	890 604/027
A027	Horn Antenna	Eaton	9188-2	301
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557
A1069	ESH3-Z5	Rohde & Schwarz	ESH3-Z5	837469/012
A1360	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1360-20112003
A1361	ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A1361-20112003
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139
A259	Bilog Antenna	Chase	CBL6111	1513
A392	3 dB attenuator (9)	Suhner	6803.17.B	None
A428	WG 12 horn	Flann	12240-20	134
A429	WG 16 horn	Flann	16240-20	561
A430	WG 18 horn	Flann	18240-20	425
A436	WG 20 horn	Flann	20240-20	330
A490	Bilog Antenna	Chase	CBL6111A	1590
C1023	Rosenberger Cable	Rosenberger	FA210A-1-020m	FA00B 7567
C222	Cable	Rosenberger	UFA210A-1-1181-70x70	None
C453	Cable	Rosenberger	RG142XX-001-RFIB	C453-10081998
E013	PCN Environmental Chamber	Sanyo	ATMOS chamber	None
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M028	FSB Spectrum Analyser	Rohde & Schwarz	FSB	860 001/009 (RF), 860 161/007 (Display)
M044	ESVP Receiver	Rohde & Schwarz	ESVP	891 845/026
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M088	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:835862/018 RU:835387/006
M1124	Rohde & Schwarz	Rohde & Schwarz	ESIB26	100046K
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016
M505	Analyser Display Unit	Rohde & Schwarz	ESAI-D	825316/010
M506	RF unit	Rohde & Schwarz	ESBI-RF	827060/004

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
S001	DC Supply	GW	GPQ-2030	7112644
S002	AC Freq. Cinv.	AP	FJA072-5/6	1179-014
S202	Site 2	RFI	2	S202-15011990
S209	Site 9	RFI	9	
S212	Site 12	RFI	12	

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

Test of: Electronics Test Centre MPB Technologies Inc.
 IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

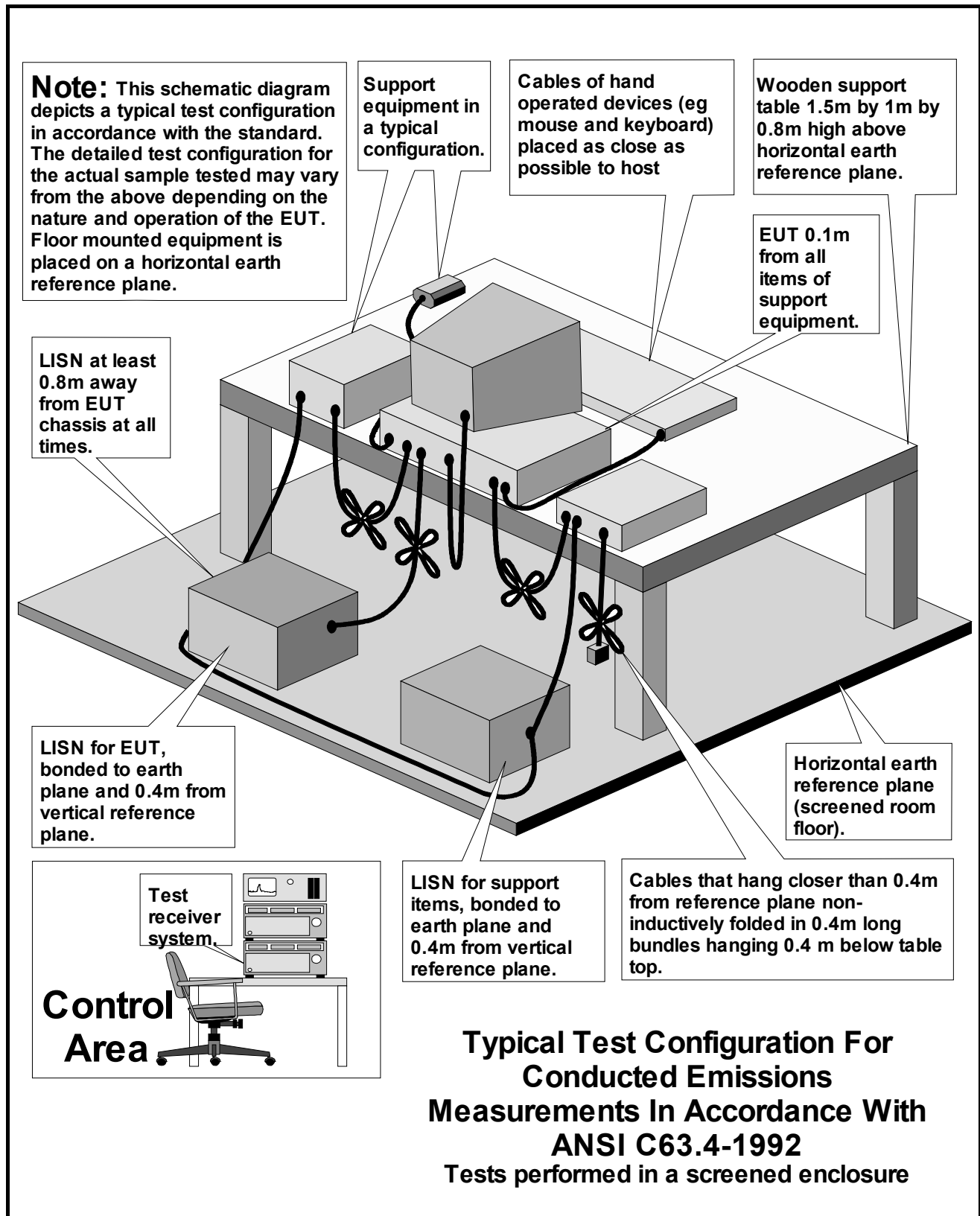
Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\47071JD01\EMICON	Test configuration for measurement of conducted emissions.
DRG\47071JD01\EMIRAD	Test configuration for measurement of radiated emissions.

Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

DRG\47071JD01\EMICON



Test of: Electronics Test Centre MPB Technologies Inc.
IDBlue, Bluetooth Transceiver
To: FCC Part 15.247 (FHSS)

DRG\47071JD01\EMIRAD

