
TEST REPORT

FCC Part 15C Testing in support of an Application for Grant of Equipment Authorisation of
a Promethean ACTIVBoard with Bluetooth Radio Module
FCC ID: QAM003

Report Number: OR612169-05 Issue 2

January 2005

REPORT ON

FCC Part 15C Testing in support of an Application for Grant of
Equipment Authorisation of a Promethean ACTIVboard with
Bluetooth Radio Module
FCC ID: QAM003

Report No OR612169-05

January 2005

EQUIPMENT:

Bluetooth Radio Module

FCC ID:

QAM003

SPECIFICATION:

47 CFR 15.247

PREPARED FOR:

Promethean Limited
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Lower Phillips Road
Blackburn
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**MANUFACTURERS
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DATED:

19th January 2005

19th January 2005

DISTRIBUTION

Promethean

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(Inclusive of Annex A)

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 15. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;


J Holcombe




R Henley



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SECTION 1

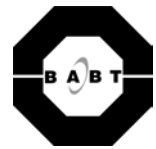
REPORT SUMMARY

FCC Part 15C Testing in support of an Application for Grant of Equipment
Authorisation of a Promethean ACTIVBoard with Bluetooth Radio Module
FCC ID: QAM003

Report OR612169-05 Issue 2 replaced Report OR612169-05 Issue 1.
Issue 2 contains typographical corrections and removal of test results which have been replaced by
test results from 7 Layers.

**1.1 STATUS**

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Promethean ACTIVBoard with Bluetooth Radio
APPLICANT	Promethean Ltd
MANUFACTURERS TYPE NUMBER	PRM-AB2B-02
MANUFACTURERS PART NUMBER	PRM-AB2B-02
SERIAL NUMBER	4043409001
HARDWARE REVISION	530306401
DECLARED VARIANTS	PRM-AB260B-02, PRM-AB248B-02 PRM-AB2BP-02, PRM-AB260BP-02, PRM-AB248BP-02 PRM-AB2B-03, PRM-AB260B-03, PRM-AB248B-03 PRM-AB2BP-03, PRM-AB260BP-03, PRM-AB248BP-03 PRM-AB2B-04, PRM-AB260B-04, PRM-AB248B-04 PRM-AB2BP-04, PRM-AB260BP-04, PRM-AB248BP-04 PRM-AB2B-05, PRM-AB260B-05, PRM-AB248B-05 PRM-AB2BP-05, PRM-AB260BP-05, PRM-AB248BP-05 PRM-AB2B-06, PRM-AB260B-06, PRM-AB248B-06 PRM-AB2BP-06, PRM-AB260BP-06, PRM-AB248BP-06 PRM-AB2B-07, PRM-AB260B-07, PRM-AB248B-07 PRM-AB2BP-07, PRM-AB260BP-07, PRM-AB248BP-07
TEST SPECIFICATION NUMBER	FCC Part 15 Subpart C
REGISTRATION NUMBER	OR612169
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status OR612169-05 21 st March 2004
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal N/A N/A
START OF TEST FINISH OF TEST	2 nd March 2004 23 rd April 2004
TEST ENGINEERS	R Henley J Holcombe
RELATED DOCUMENTS	ANSI C63.4 2001. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. FCC Public Notice document (DA 00-705 released 30 March 2000)



1.2 INTRODUCTION

The information contained within this report is intended to show verification of compliance of the Promethean ACTIVBoard with Bluetooth Radio Module to the requirements of FCC Specification Part 15 – Modular Approval.

FCC ID: QAM003

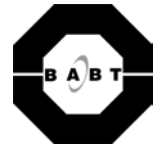
1.3 LOCATION OF TESTING

TUV Product Service Engineers, Brian Airs, Ryan Henley, Jason Holcombe, conducted all testing at the premises TUV Product Service, Segensworth Road, Fareham, Hampshire, PO15 5RH. Spurious Radiated Emissions measurements were performed in a 3 metre Anechoic Chamber. A complete site description is on file with the FCC Laboratory Division, Registration Number: 90987. See Annex A.

1.4 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out is shown below.

Test	Spec Clause	Test Description	Result	Levels/Comments
2.1	FCC: Part 15.247(a)(1)	20dB Bandwidth	PASS	Ref to & Layers Report 4_Natsc_IRV_0304_BTT_FCCa
2.2	FCC: Part 15.247(a)(iii)	Channel Dwell Time (DH1)	PASS	
2.3	FCC: Part 15.247(a)(iii)	Channel Dwell Time (DH3)	PASS	
2.4	FCC: Part 15.247(a)(iii)	Channel Dwell Time (DH5)	PASS	
2.5	FCC: Part 15.247(a)(1)	Channel Separation	PASS	
2.6	FCC: Part 15.247(a)(1)	Number of Hopping Channels	PASS	
2.7	FCC: Part 15.247(b)(1)	Maximum Peak Output Power	PASS	
2.8	FCC: Part 15.247(c)	Spurious Conducted Emissions	PASS	
2.9	FCC: Part 15.109	Spurious Radiated Emissions	PASS	
2.10	FCC: Part 15.205	Measurement at Band Edge	PASS	
2.11	FCC: Part 15.207	Conducted Emissions on Power Lines	PASS	
2.12	FCC: Part 15.247(b)(3)	Maximum Peak Power Output	PASS	
2.13	FCC: Part 15.247(c)	Spurious Radiated Emissions	PASS	
2.14	FCC: Part 15.247(c)	Spurious Radiated Emissions	PASS	Co-Transmit



1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) was a Promethean ActivBoard with Bluetooth Radio, which offers 2.4GHz Wireless connectivity with other Bluetooth devices.

The LMX9820 bluetooth module was supplied in its intended host, a Promethean Whiteboard, PRM-AB2-02.

The ActivBoard without Bluetooth has an FCC ID - QAM002.

Manufacturing Description: ACTIVBoard With Bluetooth Module

Manufacturer: Promethean

Model No: PRM-AB2B-02

Serial No: 4043409001

1.5.2 Modes of Operation

The test software in the EUT enabled selection of full power and continuous transmit on the following channels;

2.4GHz RLAN functionality

Channel 0: 2402MHz
 Channel 39: 2441MHz
 Channel 78: 2480MHz

The EUT was set at the Maximum Output Power during testing.

Co-Transmitting with SRD Device in Host

Test Configuration – Co-transmitting

ActiveBoard with LMX9820 Bluetooth Option. Model No. PRM-AB2B-02

SRD and Bluetooth Transmitting:

SRD		BLUETOOTH	
917.3MHZ	Channel 1	2.480GHz	Channel 78
917.3MHZ	Channel 1	2.402GHz	Channel 0



1.6 DEVIATIONS FROM THE STANDARD

No deviations from the standard were made during testing.



1.7 MODIFICATION RECORD

No modifications were made to the test sample.



SECTION 2

TEST DETAILS

FCC Part 15C Testing in support of an Application for Grant of Equipment
Authorisation of a Promethean ACTIVBoard with Bluetooth Radio Module
FCC ID: QAM003



2.1 20dB BANDWIDTH

2.1.1 Specification Reference

FCC Part 15.247(a)(1)

2.1.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

REFER TO 7 LAYERS REPORT: 4_Natsc_IRV_0304_BTT_FCCa



2.2 CHANNEL DWELL TIME (DH1)

2.2.1 Specification Reference

FCC Part 15.247(a)(iii)

2.2.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.2.3 Date of Test

23rd April 2004

2.2.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 1, 4, 6

2.2.5 Test Procedure

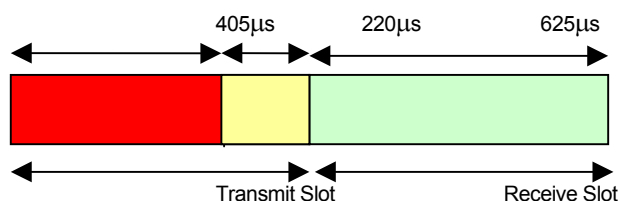
Procedure: Test Performed in accordance with 15.247.

The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second. The DH1 data rate operates on a Transmit on 1 timeslot and Receive on 1 timeslot basis. Thus, in 1 second, there are 800 Transmit timeslots and 800 Receive timeslots.

Thus:

$$1 \text{ Timeslot} = \frac{1}{1600} = 625\mu\text{s}$$

In 1 transmit timeslot, the transmit on time is only 405μs. 220μs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH1 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle

So, with 800 Tx and 800 Rx timeslots, the transmitter is on for $800 \times 405\mu\text{s} = 0.324$ seconds.

$$\therefore \frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.324}{80} = 4.05\text{ms}$$

So, in 32 seconds, the transmitter dwell time per channel is:

$$32 \times 4.05\text{ms} = 0.1296 \text{ seconds}$$



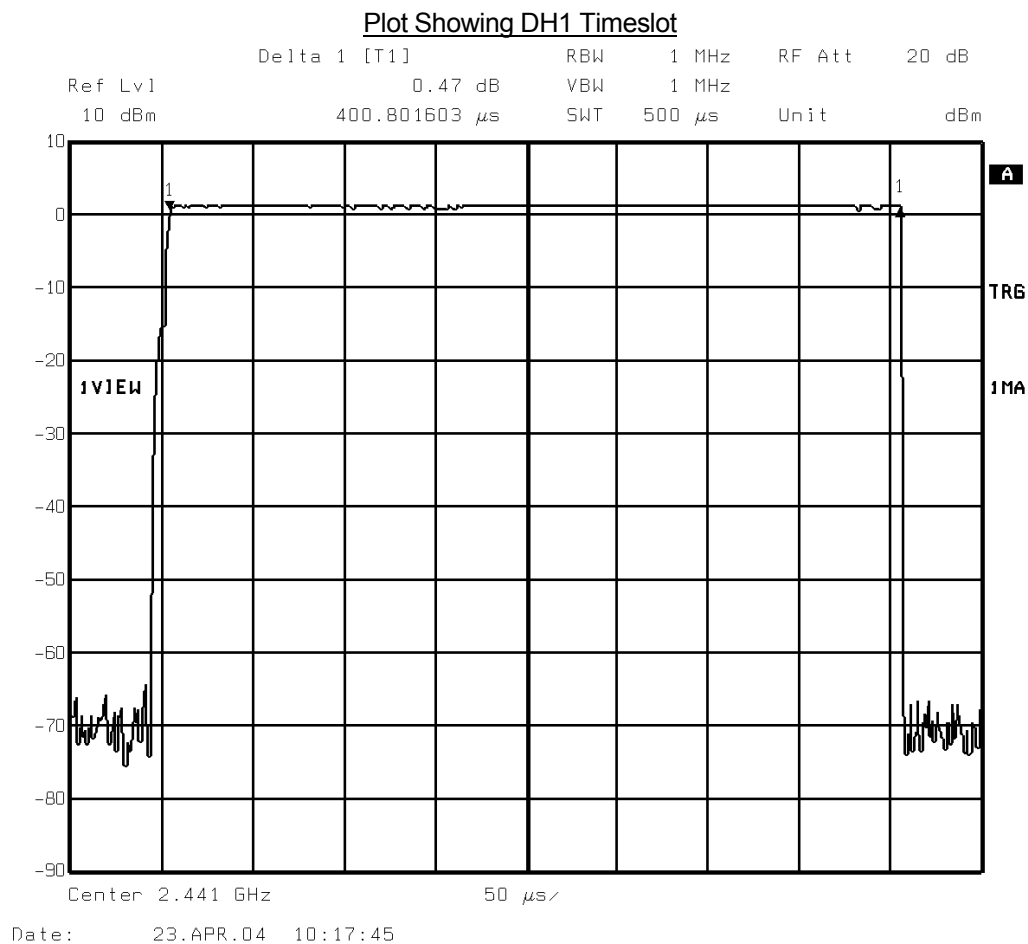
2.2.5 Test Procedure_- Continued

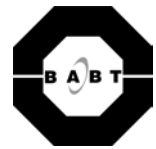
Remarks

The transmitter dwell time for data rate DH1 meets the requirements specified in 15.247(a)(iii)

Performed by: Ryan Henley, Radio Engineer.

2.2.6 Test Results





2.3 CHANNEL DWELL TIME (DH3)

2.3.1 Specification Reference

FCC Part 15.247(a)(iii)

2.3.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.3.3 Date of Test

16th October 2003

2.3.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 1, 4, 6

2.3.5 Test Procedure

Test Performed in accordance with 15.247.

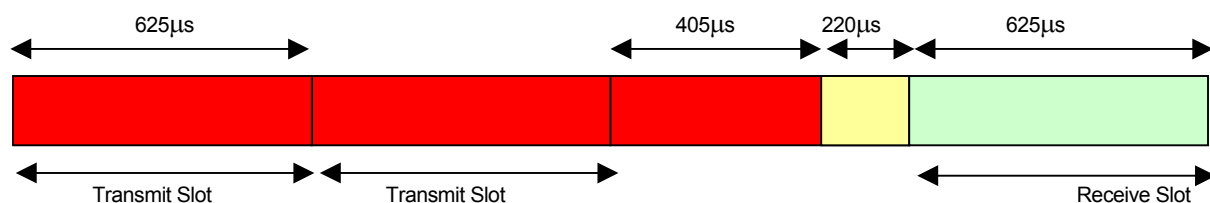
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second. With data rate DH3, the data payload is higher and can use up to 3 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 3 slots, (ie. no receive slot in-between the 3 transmit slots). The 220µs off time for synthesizer re-tuning at the end of a slot is only used on the final slot. Thus, for one cycle, there are 3 transmit timeslots. 2 are 625µs long and the final slot is transmitting for 405µs.

The DH3 data rate operates on a Transmit on 3 timeslots and Receives on 1 timeslot basis, (assuming maximum data payload). The frequency-hopping rate is the same. Thus, in 1 second, there are 1200 Transmit timeslots and 400 Receive timeslots.

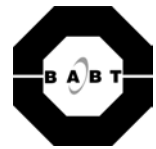
Thus:

$$1 \text{ Timeslot} = \frac{1}{1600} = 625\mu\text{s}$$

The first 2 Transmit timeslots are transmitting for the complete 625µs. In the third transmit slot, the transmit on time is only 405µs. 220µs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH3 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle, (Maximum Payload)



2.3.5 Test Procedure – Continued

Thus, the transmitter for one complete transmit and receive cycle would be on for:

$$\text{Tx} \quad (2 \times 625\mu\text{s}) + (1 \times 405\mu\text{s}) = 1.655\text{ms}$$

So:

$$\begin{aligned} 800 \times 625\mu\text{s} &= 0.5 \text{ seconds} \\ 400 \times 405\mu\text{s} &= 0.162 \text{ seconds} \end{aligned}$$

Thus: $0.5 + 0.162 = 0.662 \text{ seconds}$

$$\therefore \frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.662}{80} = 8.275\text{ms}$$

So, in 32 seconds, the transmitter dwell time per channel is:

$$32 \times 8.275\text{ms} = 0.2648 \text{ seconds}$$

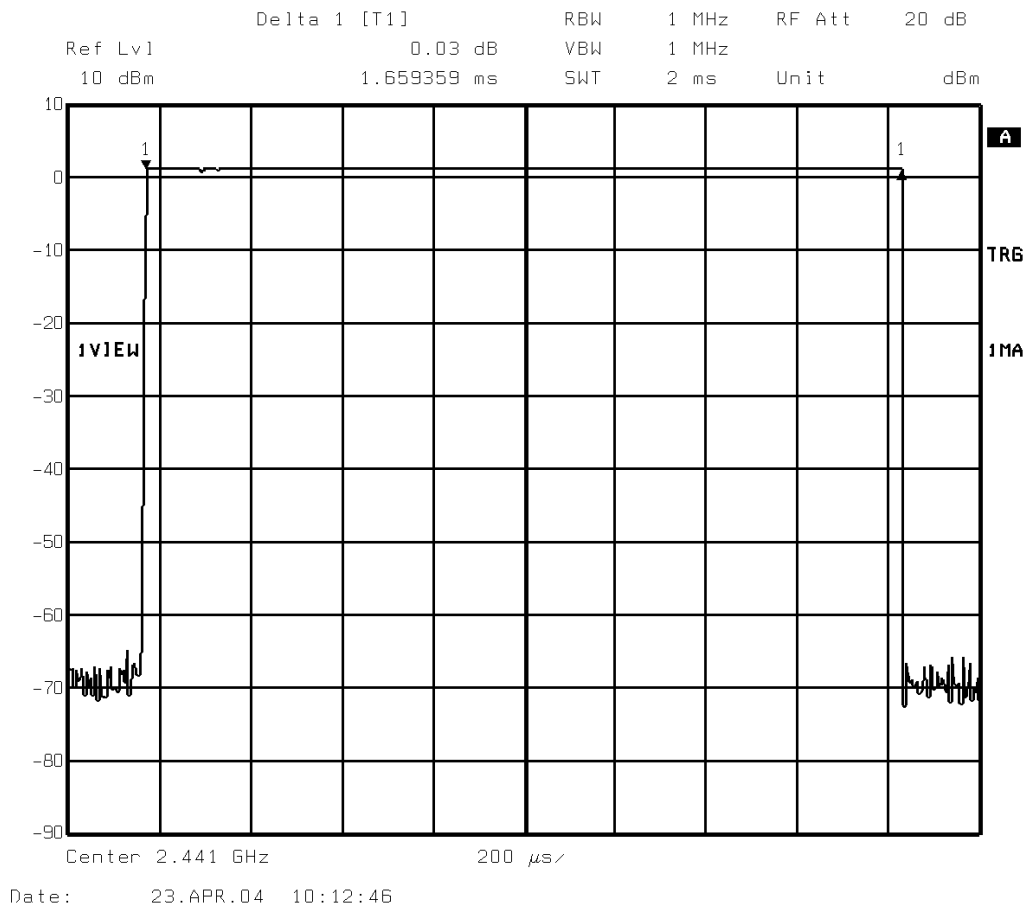
Remarks

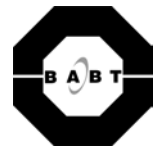
The transmitter dwell time for data rate DH3 meets the requirements specified in 15.247(a)(iii)

Performed by: Ryan Henley, Radio Engineer.

2.3.6 Test Results

Plot Showing DH3 Timeslot





2.4 CHANNEL DWELL TIME (DH5)

2.4.1 Specification Reference

FCC Part 15.247(a)(iii)

2.4.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.4.3 Date of Test

16th October 2003

2.4.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 1, 4, 6

2.4.5 Test Procedure

Test Performed in accordance with 15.247.

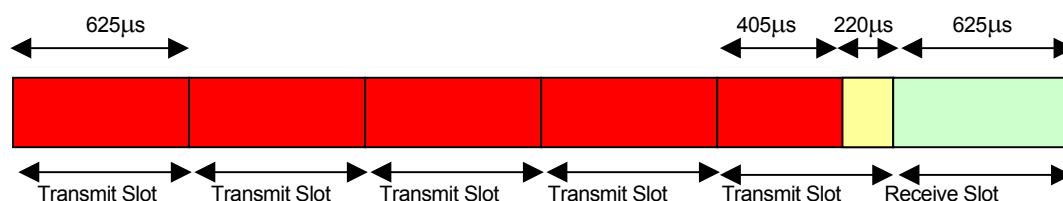
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second. With data rate DH5, the data payload is higher and can use up to 5 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 5 slots, (ie. no receive slot in-between the 5 transmit slots). The 220 μ s off time for synthesizer re-tuning at the end of a slot is only used on the final slot. Thus, for one cycle, there are 5 transmit timeslots. 4 are 625 μ s long and the final slot is transmitting for 405 μ s.

The DH5 data rate operates on a Transmit on 5 timeslots and Receives on 1 timeslot basis, (assuming maximum data payload). The frequency-hopping rate is the same. Thus, in 1 second, there are 1333.3 Transmit timeslots and 266.7 Receive timeslots.

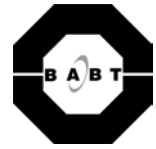
Thus:

$$1 \text{ Timeslot} = \frac{1}{1600} = 625\mu\text{s}$$

The first 4 Transmit timeslots are transmitting for the complete 625 μ s. In the fifth transmit slot, the transmit on time is only 405 μ s. 220 μ s is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH5 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle.
(Maximum Payload)



2.4.5 Test Procedure - Continued

Thus, the transmitter for one complete transmit and receive cycle would be on for:

$$\text{Tx} \quad (2 \times 625\mu\text{s}) + (1 \times 405\mu\text{s}) = 2.905\text{ms}$$

So:

$$\begin{aligned} 1066.7 \times 625\mu\text{s} &= 0.666 \text{ seconds} \\ 266.7 \times 405\mu\text{s} &= 0.108 \text{ seconds} \end{aligned}$$

$$\text{Thus:} \quad 0.666 + 0.108 = 0.774 \text{ seconds}$$

$$\therefore \frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.774}{80} = 9.675\text{ms}$$

So, in 32 seconds, the transmitter dwell time per channel is:

$$32 \times 9.675\text{ms} = 0.31 \text{ seconds}$$

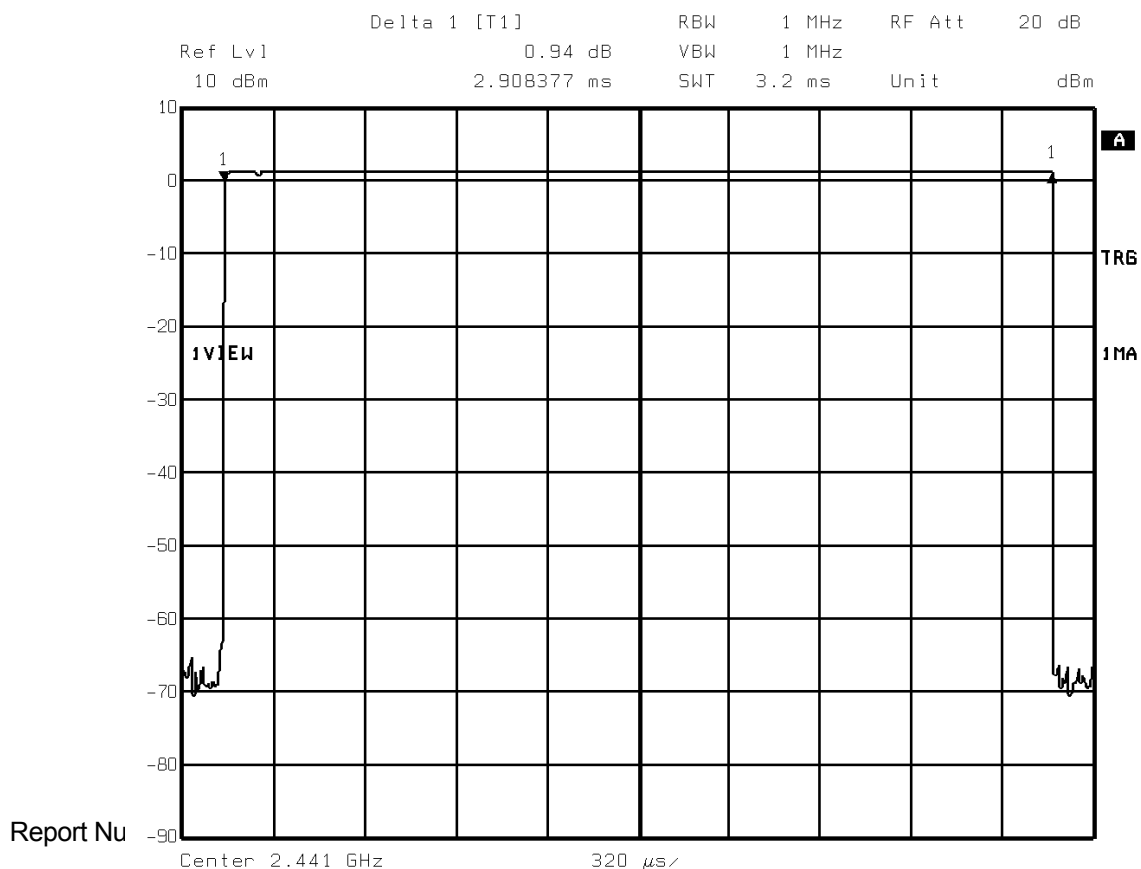
Remarks

Thus, the transmitter dwell time for data rate DH5 meets the requirements specified in 15.247(a)(iii)

Performed by: Ryan Henley, Radio Engineer.

2.4.6 Test Results

Plot Showing DH5 Timeslot





2.5 CHANNEL SEPARATION

2.5.1 Specification Reference

FCC Part 15.247(a)(1)

2.5.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.5.3 Date of Test

22nd April 2004

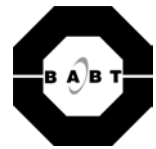
2.5.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 1, 5, 6

2.5.5 Test Procedure

The EUT was transmitted at maximum power into a Spectrum Analyser. The trace was set to Max Hold to store several adjacent channels on screen. Using the marker delta function, the markers were positioned to show the separation between adjacent channels.



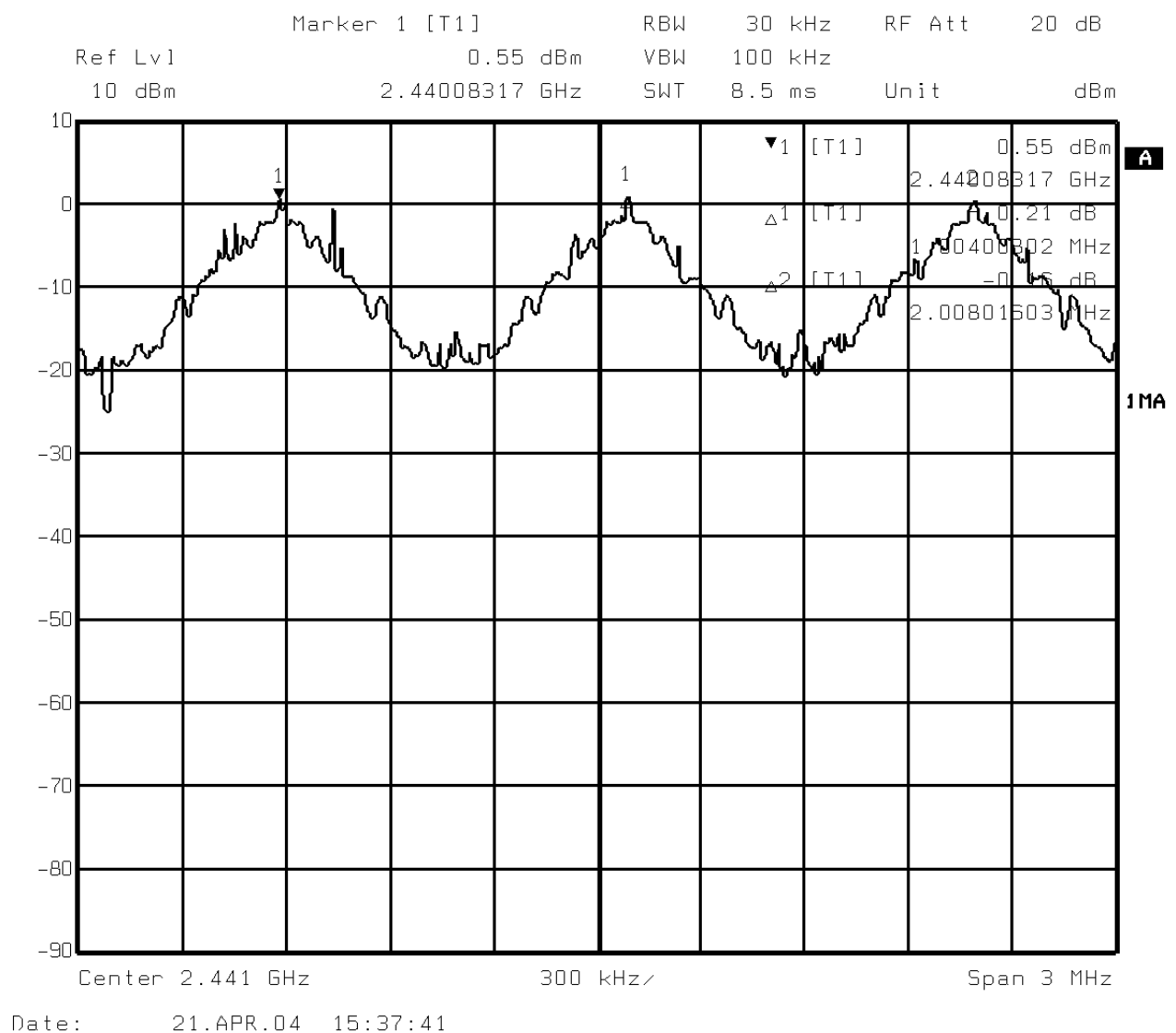
2.5.6 Test Result

The system channel separation is specified as being 1MHz. The measured channel separation from the plot above is: 1.00400802MHz.

Limit	>25kHz
-------	--------

Remarks

The equipment met the requirements outlined in 15.247(a)(1).



**2.6 NUMBER OF HOPPING CHANNELS****2.6.1 Specification Reference**

FCC Part 15.247(a)(1)

2.6.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.6.3 Date of Test

22nd April 2004

2.6.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

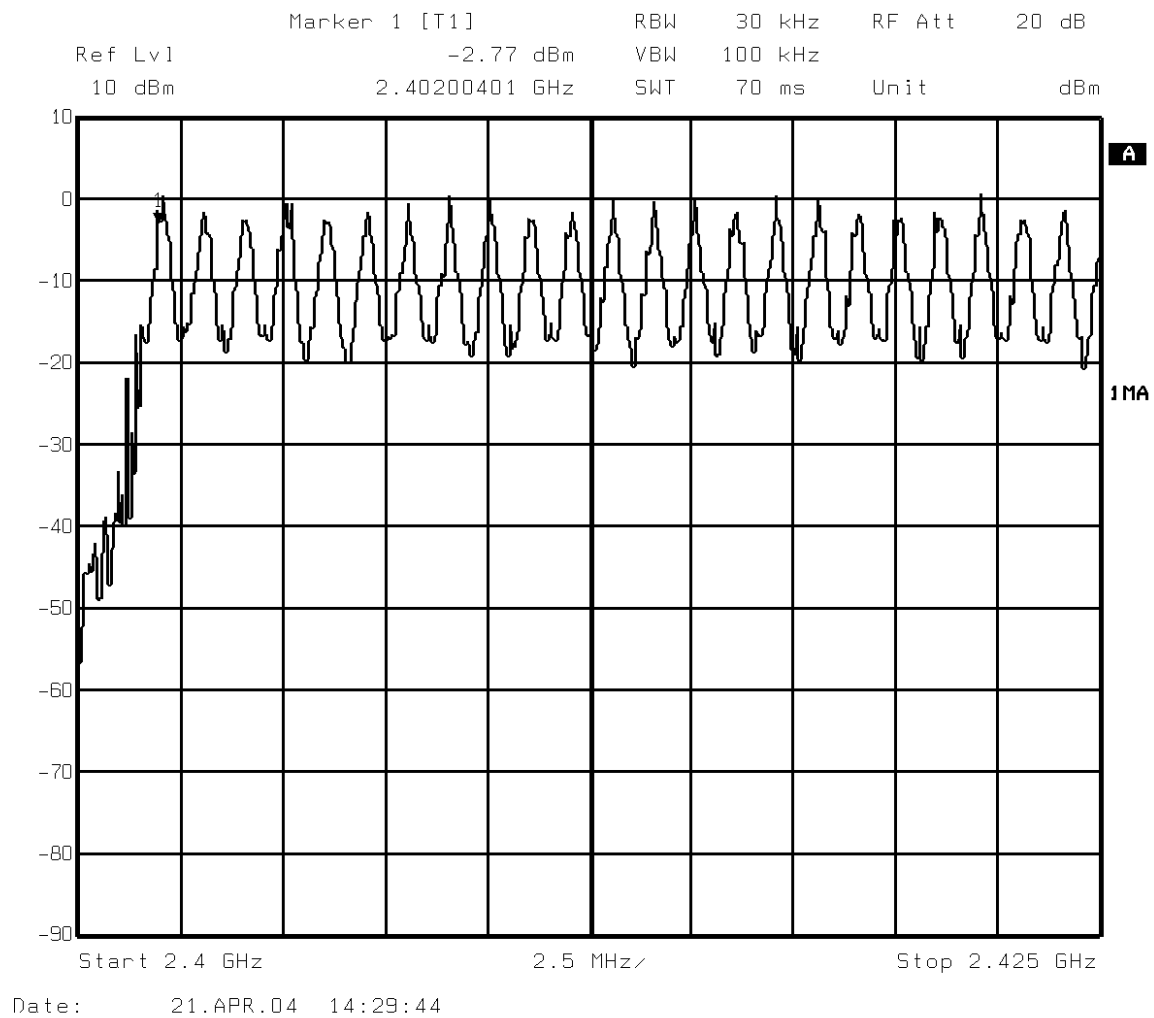
Items: 1, 4, 6

2.6.5 Test Procedure

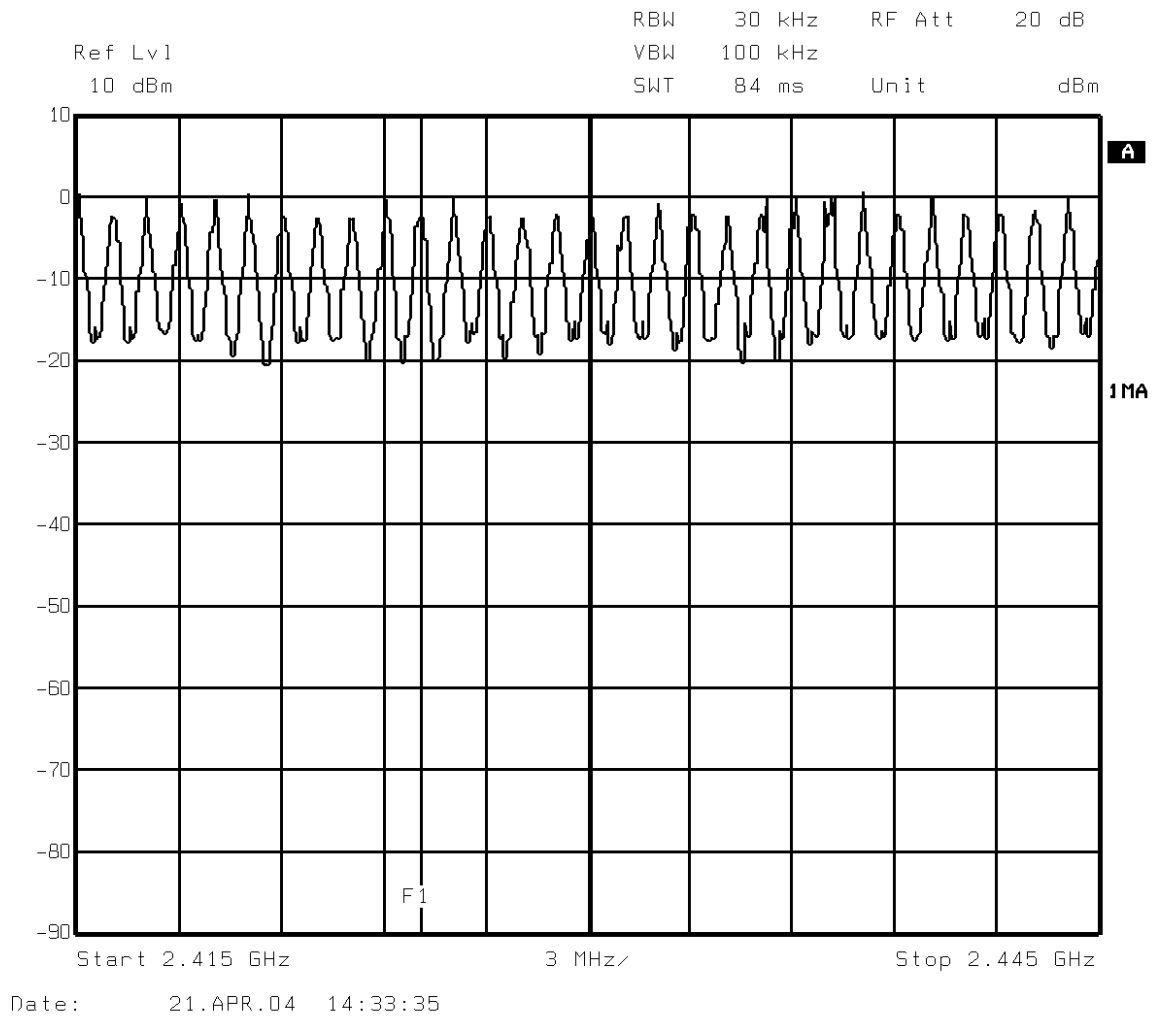
Test Performed in accordance with 15.247.

The EUT was connected to a Spectrum Analyser via a cable. The EUT was set to transmit on maximum power and hopping on all channels. The span was adjusted to show the individual channels. To reasonably display the number of channels, the occupied band was split into four traces. The display trace was set to Max Hold and the plots recorded.

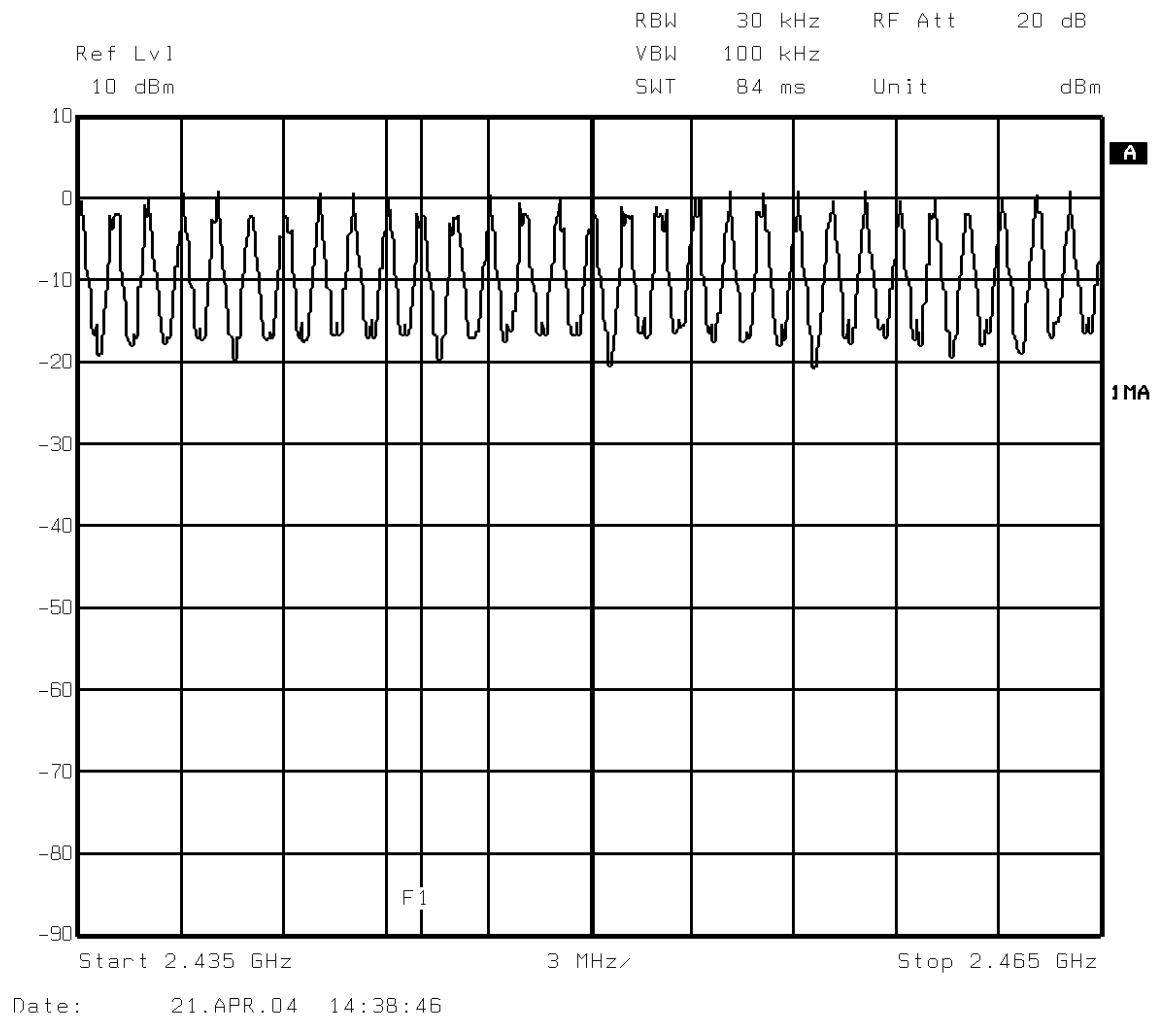
Performed by: R Henley, Radio Engineer.

**2.6.6 Test Results**

Trace Showing Channels 1 - 23

**2.6.6 Test Results - Continued**

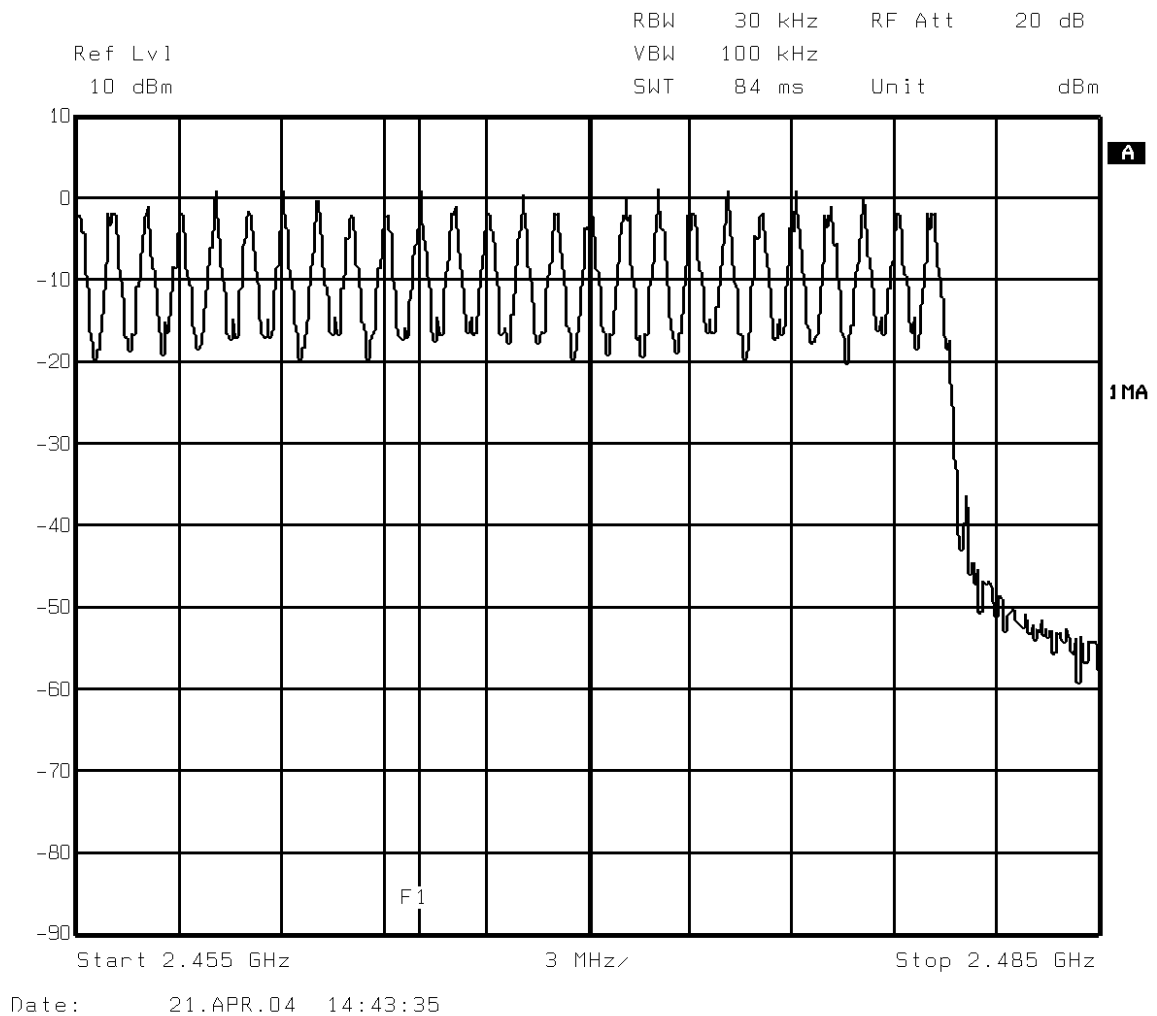
Trace Showing Channels 24 - 43

**2.6.6 Test Results - Continued**

Trace Showing Channels 44 - 63



2.6.6 Test Results - Continued

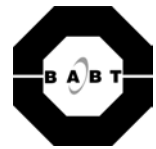


Trace Showing Channels 64 – 79

Limit	≥75 channels
-------	--------------

Remarks

EUT complies with CFR 47 15.247(a)(1)(iii). The EUT utilises more than 75 channels.



2.7 MAXIMUM PEAK OUTPUT POWER

2.7.1 Specification Reference

FCC Part 15.247(b)(1)

2.7.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.7.3 Date of Test

22nd April 2004

2.7.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 2, 3, 5, 6

2.7.5 Test Procedure

Test Performed in accordance with 15.247.

The EUT was connected to a Peak Power Analyser, (8990A), via an RF cable. Using a Signal Generator and the 8990A, the path loss of the cable was measured and entered as an offset adjustment into the 8990A. The peak level was recorded and compared with the test limits.

Performed by: R Henley, Radio Engineer.

2.7.6 Test Results

DH1

Frequency (MHz)	Path Loss (dB)	Peak Output Power (dBm)	Average Output Power (dBm)	Peak Result (mW)
2402.0	1.90	2.60	-2.39	1.820
2441.0	1.86	3.06	-1.94	2.023
2480.0	1.98	3.50	-1.48	2.239

DH3

Frequency (MHz)	Path Loss (dB)	Peak Output Power (dBm)	Average Output Power (dBm)	Result (mW)
2402.0	1.90	2.63	0.86	1.824
2441.0	1.86	3.09	1.23	2.032
2480.0	1.98	3.53	1.70	2.270

**2.7.6 Test Results - Continued**DH5

Frequency (MHz)	Path Loss (dB)	Output Power (dBm)	Average Output Power (dBm)	Result (mW)
2402.0	1.90	2.61	1.51	1.832
2441.0	1.86	3.08	1.94	2.037
2480.0	1.98	3.56	2.42	2.254

Limit	<1W or <+30dBm
-------	----------------

Remarks

EUT complies with CFR 47 15.247(b)(1). The EUT does not exceed 1W or +30dBm at the measured frequencies.



2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.1 Specification Reference

FCC Part 15.247(c)

2.8.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.8.3 Date of Test

15th October 2003

2.8.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 1, 4, 6

2.8.5 Test Procedure

In accordance with Part 15.247(c), the Spurious Conducted Emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9kHz to 25 GHz. The EUT was set to transmit on full power and frequency hopping on all channels. The resolution and video bandwidths were set to 100kHz in accordance with Part 15.247. The spectrum analyser detector was set to Max Hold.

With the EUT transmitting at maximum power, the Spectrum Analyser was set to Max Hold and the fundamental peak measured in a RBW and VBW of 100kHz. This level was used to determine the limit line as displayed on the plots of -20dBc.

The maximum path loss across each measurement band was used as the reference level offset to ensure worst case results.

Remarks

The EUT passed the requirements laid out in 15.247(c).

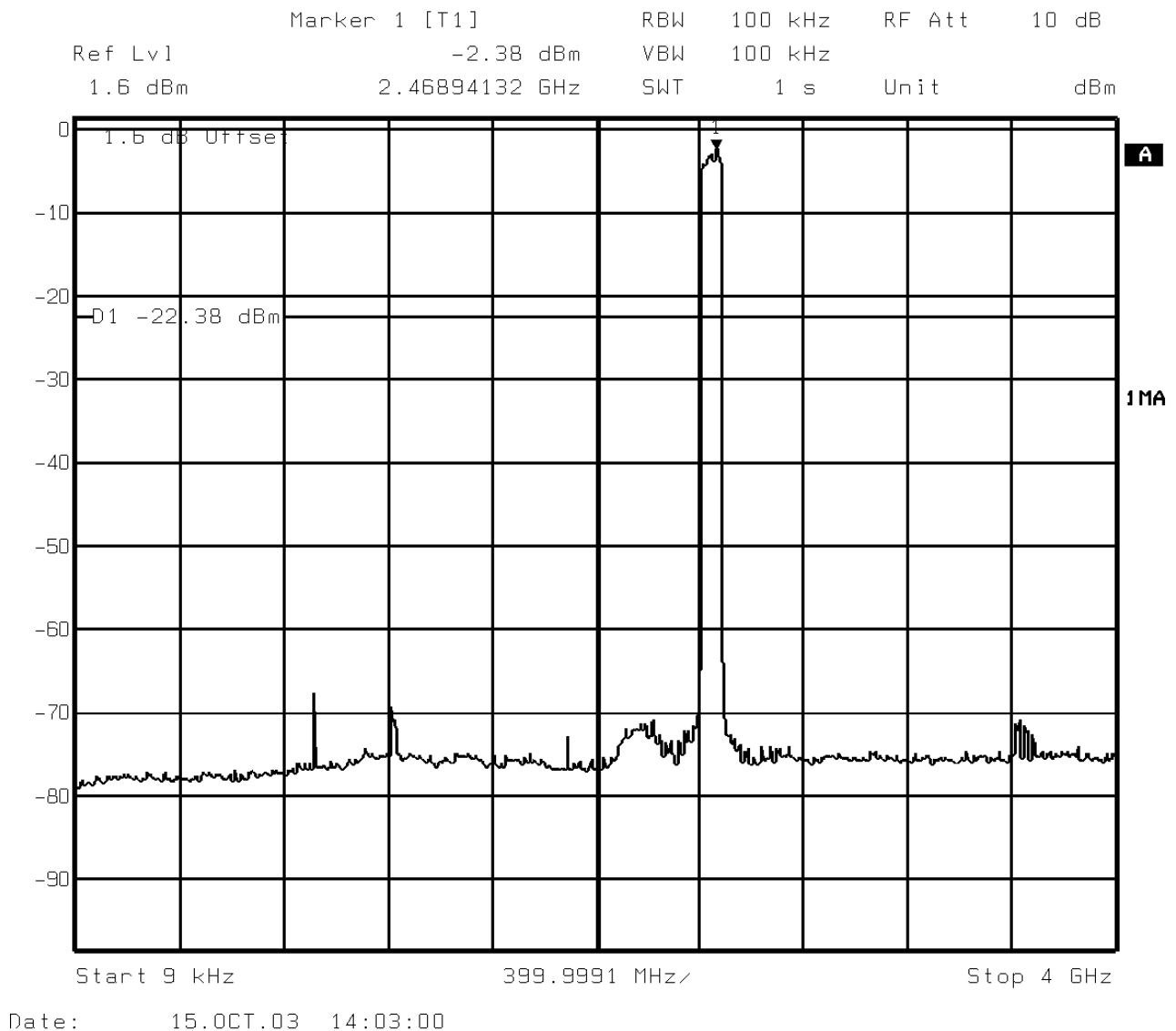
The plots on the following pages show the frequency spectrum from 9kHz to 25GHz of the EUT.

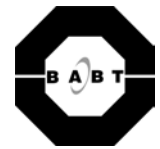


2.8.6 Test Results

Spurious Conducted Emissions (9kHz – 4GHz)

Frequency Hopping On All Channels – Maximum Power DH1

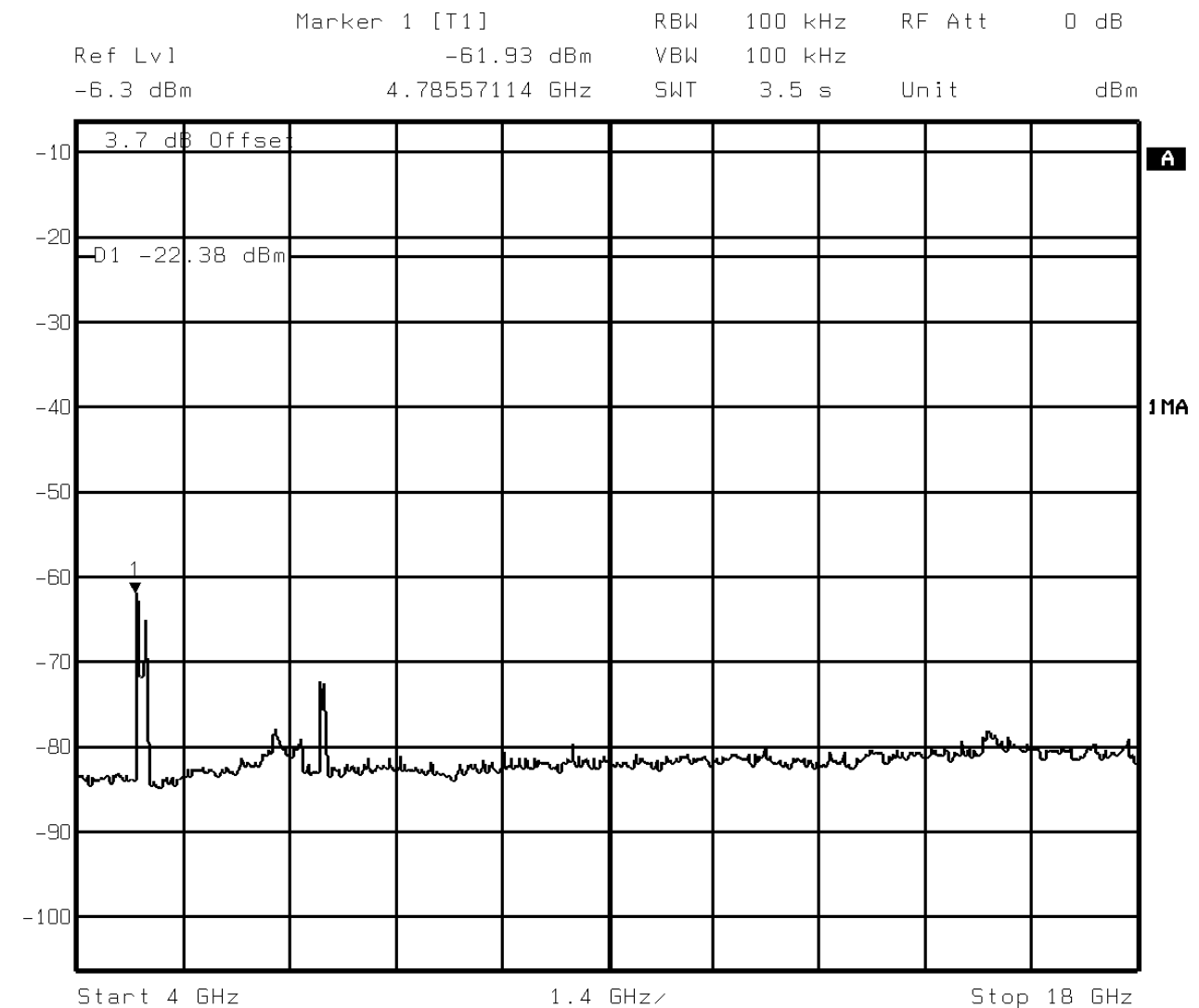




2.8.6 Test Results - Continued

Spurious Conducted Emissions (4GHz – 18GHz)

Frequency Hopping On All Channels – Maximum Power DH1



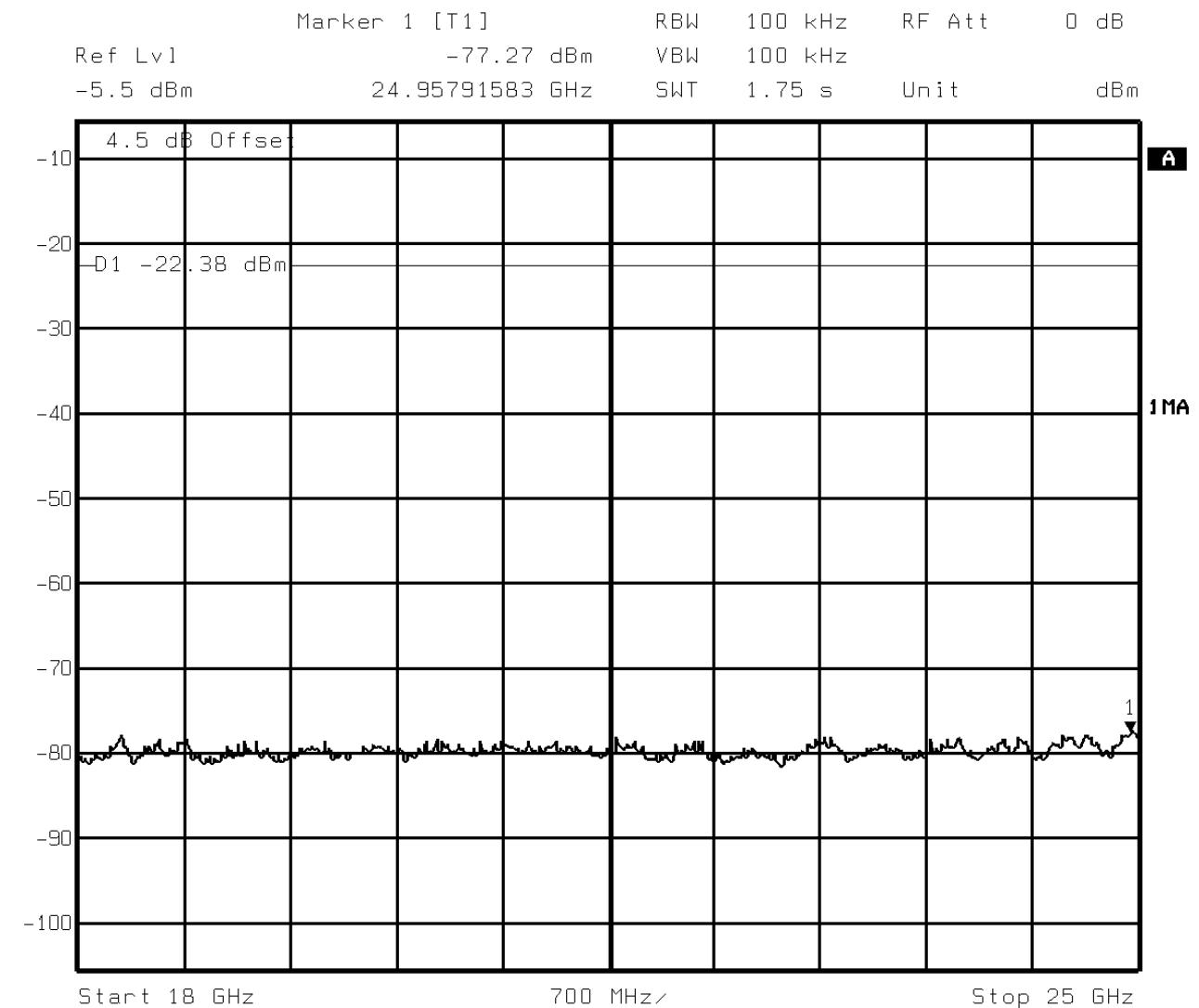
Date: 15.OCT.03 14:11:30



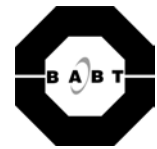
2.8.6 Test Results - Continued

Spurious Conducted Emissions (18GHz – 25GHz)

Frequency Hopping On All Channels – Maximum Power DH1



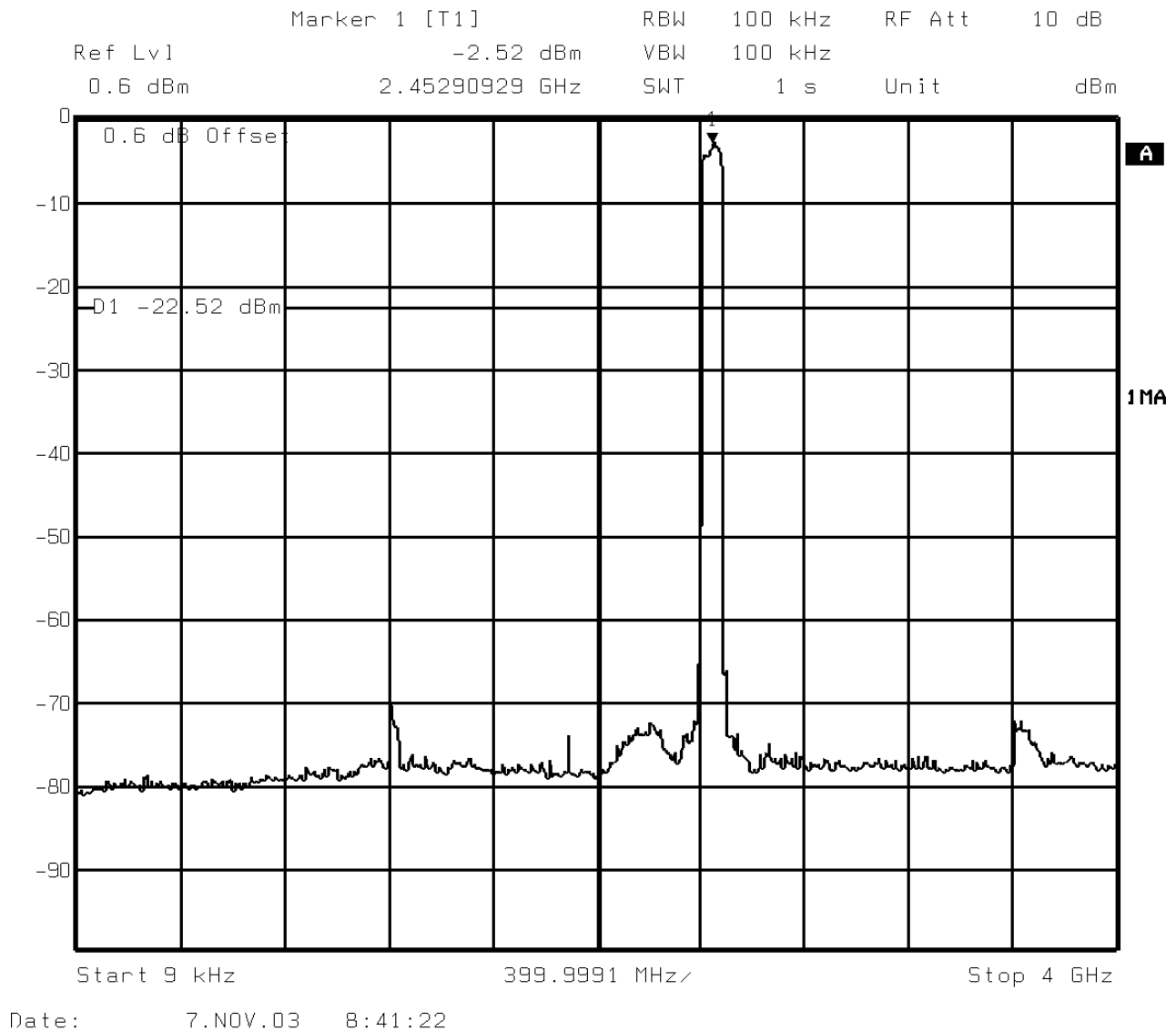
Date: 15.OCT.03 14:16:21



2.8.6 Test Results - Continued

Spurious Conducted Emissions (9kHz – 4GHz)

Frequency Hopping On All Channels – Maximum Power DH3

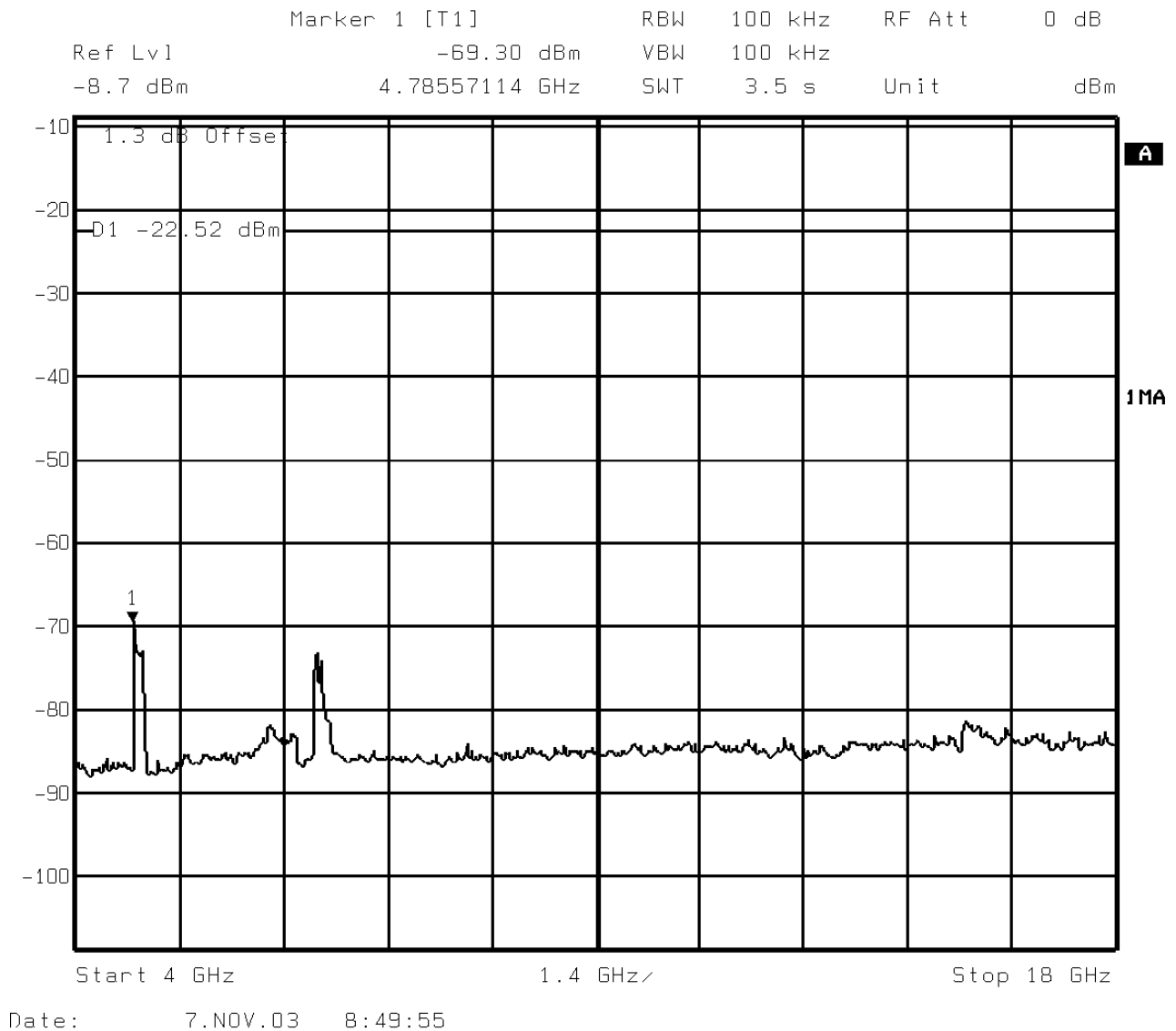




2.8.6 Test Results - Continued

Spurious Conducted Emissions (4GHz – 18GHz)

Frequency Hopping On All Channels – Maximum Power DH3

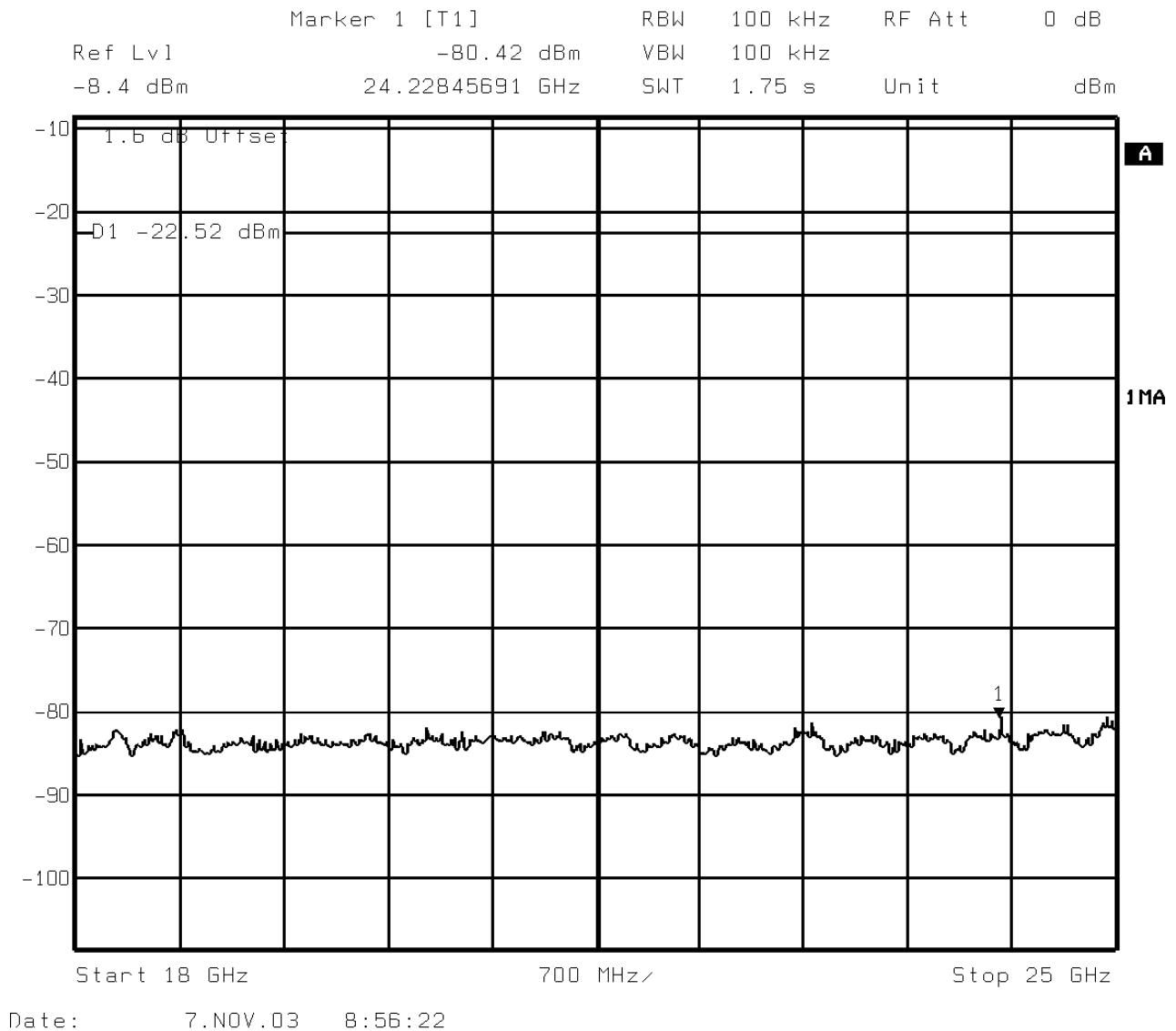




2.8.6 Test Results - Continued

Spurious Conducted Emissions (18GHz – 25GHz)

Frequency Hopping On All Channels – Maximum Power DH3

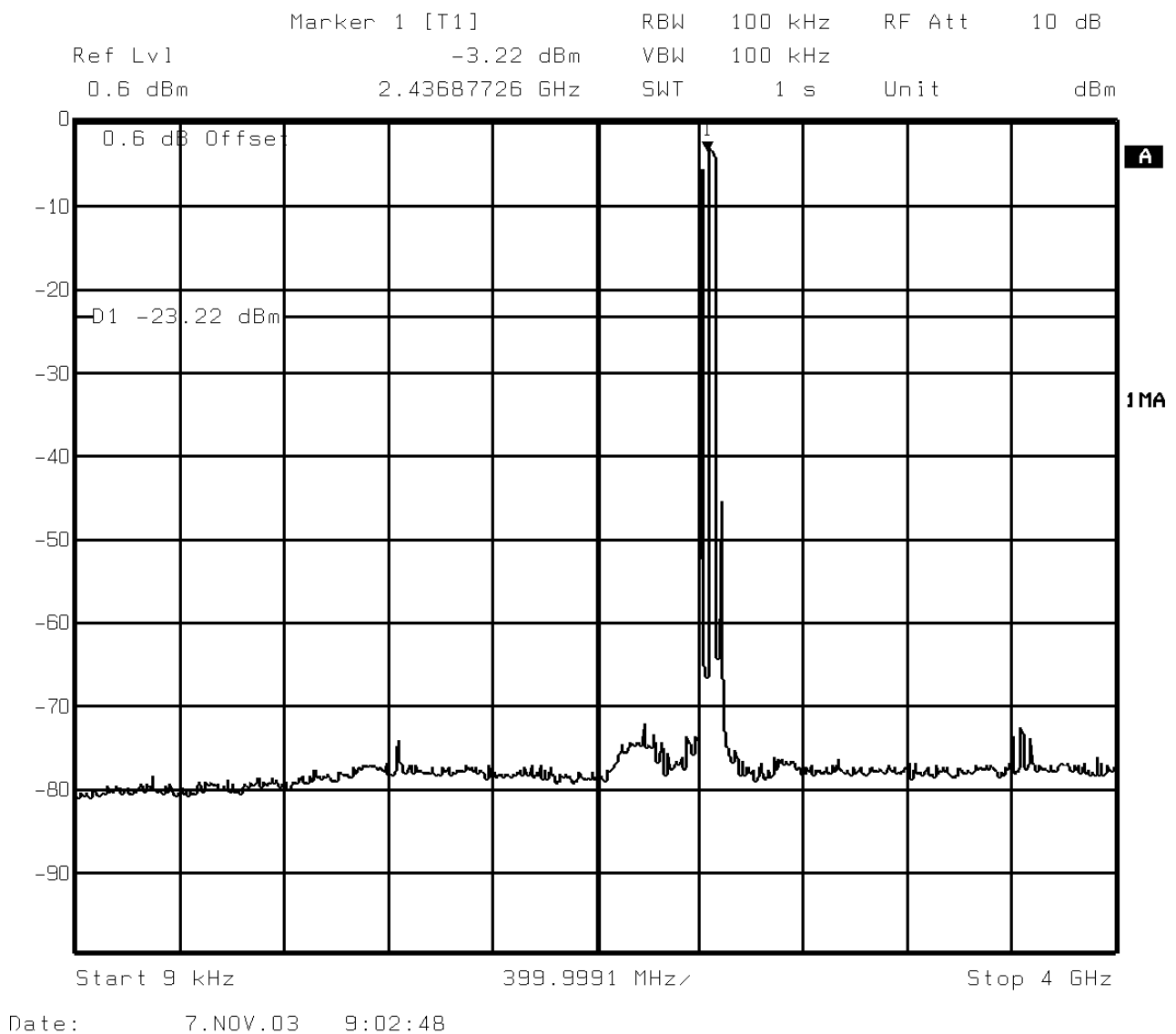




2.8.6 Test Results - Continued

Spurious Conducted Emissions (9kHz – 4GHz)

Frequency Hopping On All Channels – Maximum Power DH5

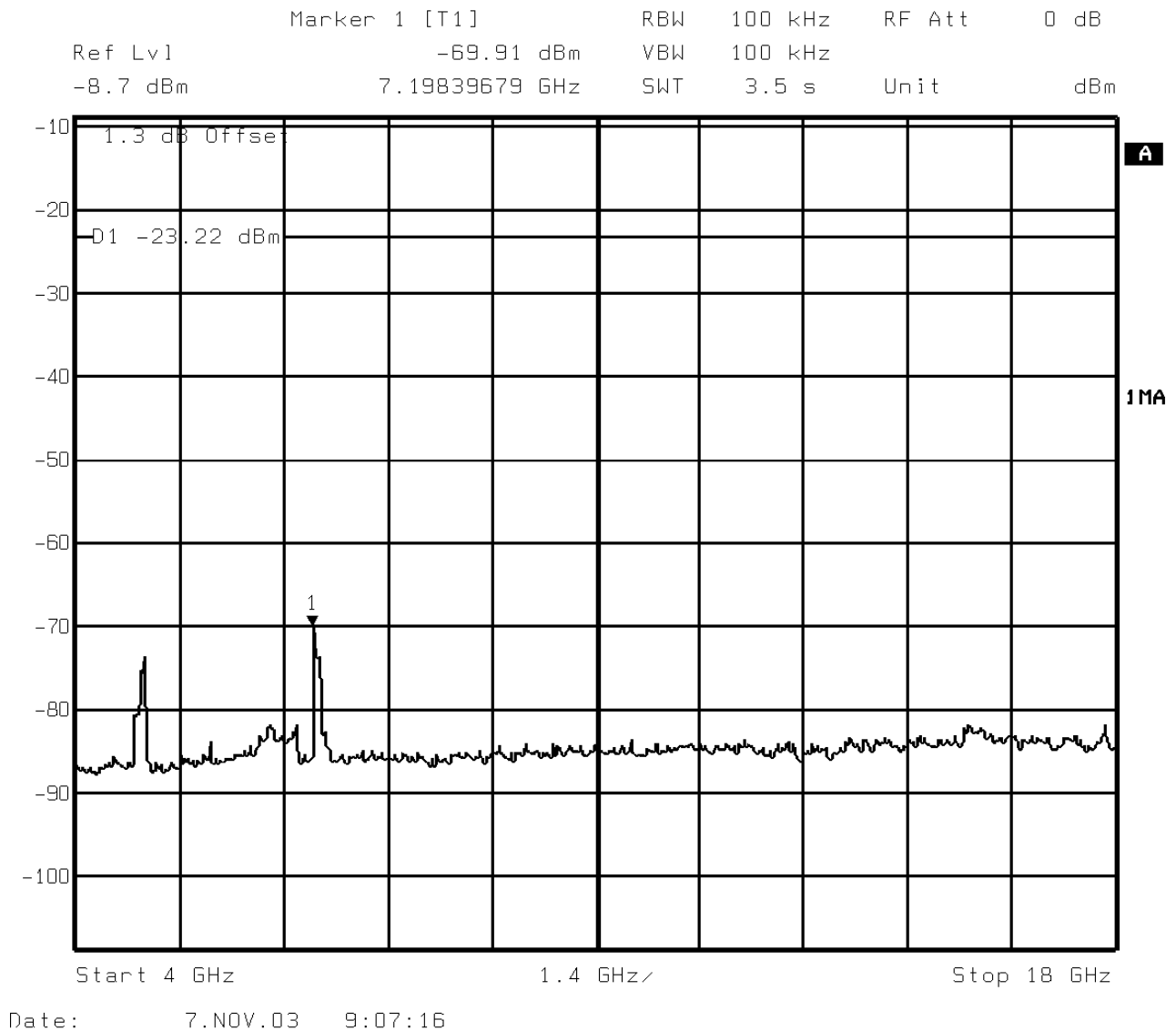


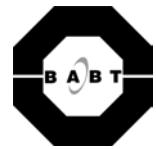
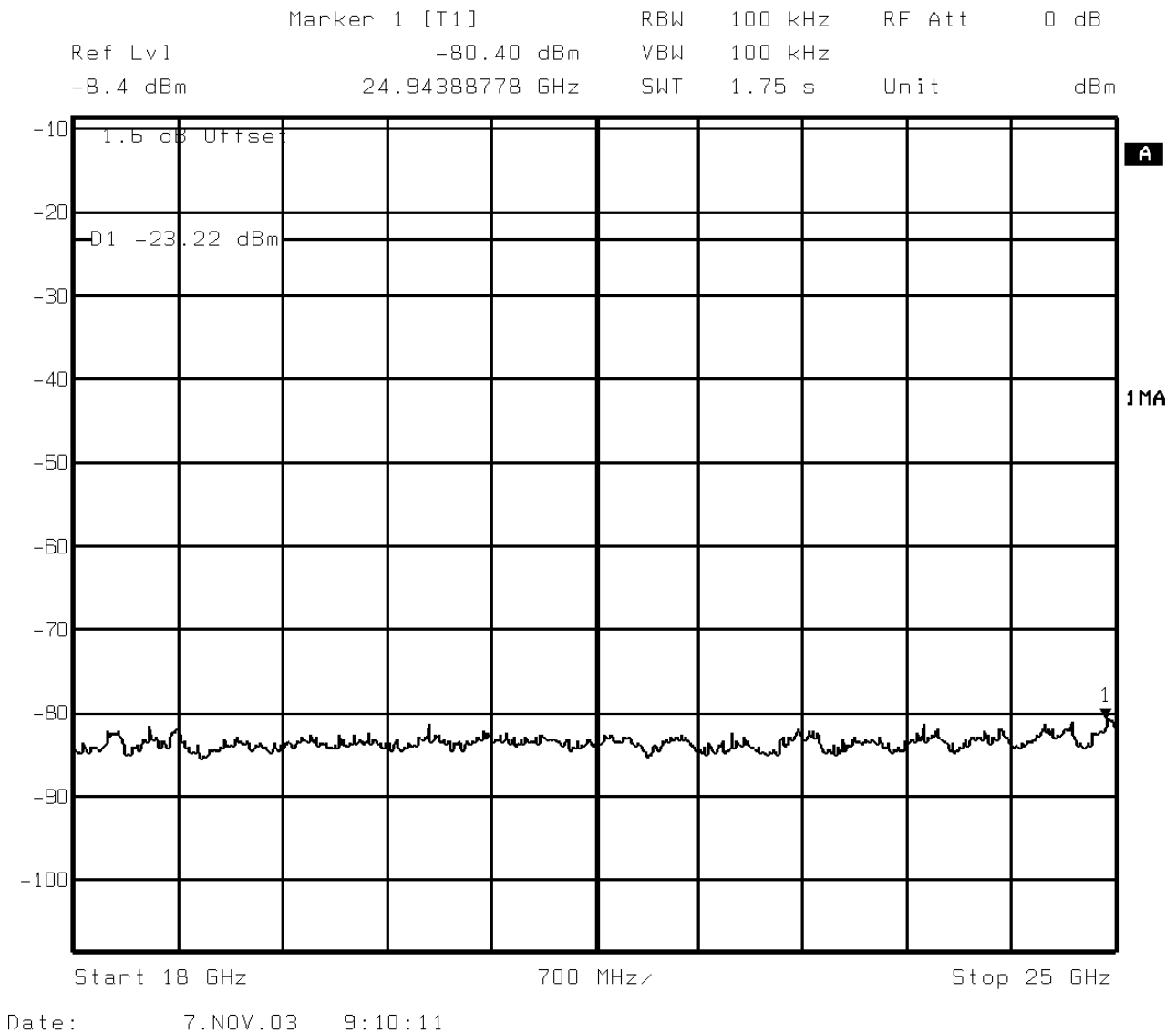


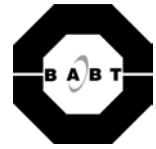
2.8.6 Test Results - Continued

Spurious Conducted Emissions (4GHz – 18GHz)

Frequency Hopping On All Channels – Maximum Power DH5



**2.8.6 Test Results - Continued**Spurious Conducted Emissions (18GHz – 25GHz)Frequency Hopping On All Channels – Maximum Power DH5



2.9 SPURIOUS RADIATED EMISSIONS

2.9.1 Specification Reference

FCC CFR 47: Part 15 Subpart B, Section 15.109

2.9.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.9.3 Date of Test

5th March 2004

2.9.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 23-41

2.9.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

The measurements were performed at a 3m distance unless otherwise stated.

2.9.6 Test Results

Equipment Designation: Unintentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15 Subpart B, Section 15.109 for Spurious Radiated Emissions (30MHz – 1GHz).

Preliminary prescans showed that Transmit Mode was determined to be worst case for emissions. However, no emissions were observed with in 10dB of the relevant limit.

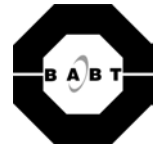


2.9 SPURIOUS RADIATED EMISSIONS - continued

2.9.7 Set Up Photograph



Set Up Photograph

**2.10 MEASUREMENT AT THE BAND EDGE (MARKER DELTA METHOD)****2.10.1 Specification Reference**

FCC CFR 47: Part 15 Subpart C, Section 15.205

2.10.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.10.3 Date of Test

2nd March 2004

2.10.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 23-41

2.10.5 Test Procedure

Test Performed in accordance with FCC Public Notice document (DA 00-705 released 30 March 2000)



2.10 MEASUREMENT AT THE BAND EDGE (MARKER DELTA METHOD) - continued

2.10.6 Test Results

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.205 for Band Edge Measurements.

Measurements were made with the EUT in Channel 0.

Step 1

Bottom Channel Fundamental Field Strength Measurement.

Peak measurements performed utilising a Resolution Bandwidth and Video Bandwidth of 1MHz.
Average measurements performed utilising a Resolution Bandwidth of 1MHz and Video Bandwidth of 10Hz.

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Average Field Strength
MHz	H/V	cm	deg	dB μ V/m	dB μ V/m
2402	H	134	237	102.3	91.4

Step 2

Determine Marker delta amplitude between 2402MHz (the fundamental) and 2390MHz (the Band Edge under investigation).

Using a span of 30MHz with Resolution Bandwidth and Video Bandwidth of 300kHz.

Marker Delta Amplitude = 40.3dB

Step 3

Subtracting the Marker Delta obtained from Step 2 from the 2412MHz Field Strength measurement from Step 1, gives following Result:

Peak of 62.0B μ V/m (Limit is 74.0dB μ V/m)

Average of 51.1dB μ V/m (Limit is 54.0dB μ V/m)



2.10 MEASUREMENT AT THE BAND EDGE (MARKER DELTA METHOD) - continued

2.10.6 Test Results - continued

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.205 for Band Edge Measurements.

Measurements were made with the EUT in Mode 1.

Peak measurements performed utilising a Resolution Bandwidth and Video Bandwidth of 1MHz.
Average measurements performed utilising a Resolution Bandwidth of 1MHz and Video Bandwidth of 10Hz.

Frequency	Antenna Polarisation	Height	Azimuth	Peak Field Strength	Average Field Strength
MHz	H/V	cm	deg	dB μ V/m	dB μ V/m
2480	H	103	255	103.9	90.9

Step 2

Determine Marker delta amplitude between 2480MHz (the fundamental) and 2483.5MHz (the Band Edge under investigation).

Using a span of 30MHz with Resolution Bandwidth and Video Bandwidth of 300kHz.

Marker Delta Amplitude = 50.0dB

Step 3

Subtracting the Marker Delta obtained from Step 2 from the 2483.5MHz Field Strength measurement from Step 1, gives following Result

Peak of 53.9dB μ V/m (Limit is 74.0dB μ V/m)

Average of 40.9dB μ V/m (Limit is 54.0dB μ V/m)



2.11 CONDUCTED EMISSIONS ON POWER LINES

2.11.1 Specification Reference

FCC CFR 47: Part 15 Subpart C, Section 15.207 (Incorporating Co-located Transmitters using SRD)

2.11.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.11.3 Date of Test

29th March 2004

2.11.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 23-41

2.11.5 Test Procedure

Test performed in accordance with ANSI C63.4.

Conducted Emission Measurements were undertaken within the semi-anechoic chamber. Emissions were measured on the Live and Neutral Lines in turn.

Emissions were formally measured using a Quasi-Peak and Average Detectors, which meet the CISPR requirements. The details of the worst-case emissions for the Live and Neutral Lines are presented in Tables 2.3.1 – 2.3.6 respectively.

The EUT was supplied from a 120V, 60Hz supply.



2.11 CONDUCTED EMISSIONS ON POWER LINES - continued

2.11.6 Test Results

The EUT met the Class B requirements of FCC CFR 47: Part 15 Subpart C, Section 15.207 for Conducted Emissions on the Live and Neutral Lines.

EUT Tx on Bottom Channel (2402MHz) – Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4361	36.2	57.1	31.7	47.1
1.0132	36.7	56.0	30.0	46.0
1.3030	36.9	56.0	29.6	46.0
1.3752	36.1	56.0	28.6	46.0
1.6648	36.0	56.0	28.1	46.0
15.2093	39.9	60.0	38.6	50.0

The margin between the specification requirements and all other emissions were 20.9dB or more below the specified Quasi-Peak limit and 17.8dB or more below the Average limit.

EUT Tx on Bottom Channel (2402MHz) – Neutral Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4355	34.1	57.1	29.0	47.1
1.0143	32.1	56.0	26.0	46.0
1.3019	33.4	56.0	28.1	46.0
1.3255	33.4	56.0	25.5	46.0
3.5479	34.5	56.0	24.5	46.0
15.2093	40.9	60.0	40.3	50.0

The margin between the specification requirements and all other emissions were 23.7dB or more below the specified Quasi-peak limit and 21.4dB or more below the specified Average limit.



2.11 CONDUCTED EMISSIONS ON POWER LINES - continued

2.11.6 Test Results - continued

EUT Tx on Middle Channel (2441MHz) – Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4370	35.6	57.1	30.9	47.1
0.7271	34.9	56.0	28.2	46.0
1.0155	35.8	56.0	28.6	46.0
1.3042	35.4	56.0	28.1	46.0
1.3766	36.2	56.0	29.6	46.0
15.4549	38.8	60.0	38.3	50.0

The margin between the specification requirements and all other emissions were 21.5dB or more below the specified Quasi-Peak limit and 17.8dB or more below the Average limit.

EUT Tx on Middle Channel (2441MHz) – Neutral Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4367	33.4	57.1	28.3	47.1
0.7240	33.7	56.0	27.8	46.0
1.3053	32.8	56.0	27.3	46.0
1.3778	33.6	56.0	28.6	46.0
1.7367	33.3	56.0	27.6	46.0
15.2093	41.0	60.0	40.3	50.0

The margin between the specification requirements and all other emissions were 23.7dB or more below the specified Quasi-peak limit and 18.7dB or more below the specified Average limit.



2.11 CONDUCTED EMISSIONS ON POWER LINES - continued

2.11.6 Test Results - continued

EUT Tx on Top Channel (2480MHz) – Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4357	36.3	57.1	31.8	47.1
1.0142	36.7	56.0	29.8	46.0
1.3033	36.9	56.0	30.0	46.0
1.3761	36.0	56.0	28.4	46.0
1.6676	35.9	56.0	26.3	46.0
15.2093	38.6	60.0	38.0	50.0

The margin between the specification requirements and all other emissions were 21.4dB or more below the specified Quasi-Peak limit and 19.6dB or more below the Average limit.

EUT Tx on Top Channel (2480MHz) – Neutral Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4360	33.9	57.1	28.8	47.1
1.0129	34.3	56.0	28.7	46.0
1.3764	32.9	56.0	27.1	46.0
1.4603	33.9	56.0	25.9	46.0
1.9545	33.3	56.0	27.4	46.0
15.2093	40.2	60.0	39.5	50.0

The margin between the specification requirements and all other emissions were 23.2dB or more below the specified Quasi-peak limit and 20.0dB or more below the specified Average limit.



2.11 CONDUCTED EMISSIONS ON POWER LINES - continued

2.11.6 Test Results - continued

EUT Tx on Bluetooth Top Channel (2480MHz) and SRD Slate Bottom Channel (917.3MHz) – Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4327	37.2	57.2	33.3	47.2
0.7215	36.7	56.0	32.7	46.0
1.0111	37.3	56.0	32.5	46.0
1.2987	37.9	56.0	33.1	46.0
1.5876	37.7	56.0	32.0	46.0
15.2093	38.4	60.0	37.8	50.0

The margin between the specification requirements and all other emissions were 21.6dB or more below the specified Quasi-Peak limit and 13.9dB or more below the Average limit.

EUT Tx on Bluetooth Top Channel (2480MHz) and SRD Slate Bottom Channel (917.3MHz) – Neutral Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4325	35.8	57.2	30.4	47.2
0.7213	34.8	56.0	30.7	46.0
1.0088	35.4	56.0	31.8	46.0
1.5857	35.1	56.0	31.7	46.0
1.8759	34.6	56.0	30.0	46.0
15.2093	41.4	60.0	40.8	50.0

The margin between the specification requirements and all other emissions were 21.3dB or more below the specified Quasi-peak limit and 16.8dB or more below the specified Average limit.



2.11 CONDUCTED EMISSIONS ON POWER LINES - continued

2.11.6 Test Results - continued

EUT Tx on Bluetooth Bottom Channel (2402MHz) and SRD Board Top Channel (917.8MHz) – Live Line

Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.4387	36.0	57.1	32.1	47.1
0.7311	35.7	56.0	31.7	46.0
1.0232	36.0	56.0	31.9	46.0
1.2427	36.4	56.0	31.4	46.0
1.5360	37.1	56.0	31.2	46.0
15.2093	38.8	60.0	38.2	50.0

The margin between the specification requirements and all other emissions were 21.2dB or more below the specified Quasi-Peak limit and 14.9dB or more below the Average limit.

EUT Tx on Bluetooth Bottom Channel (2402MHz) and SRD Board Top Channel (917.8MHz) – Neutral Line

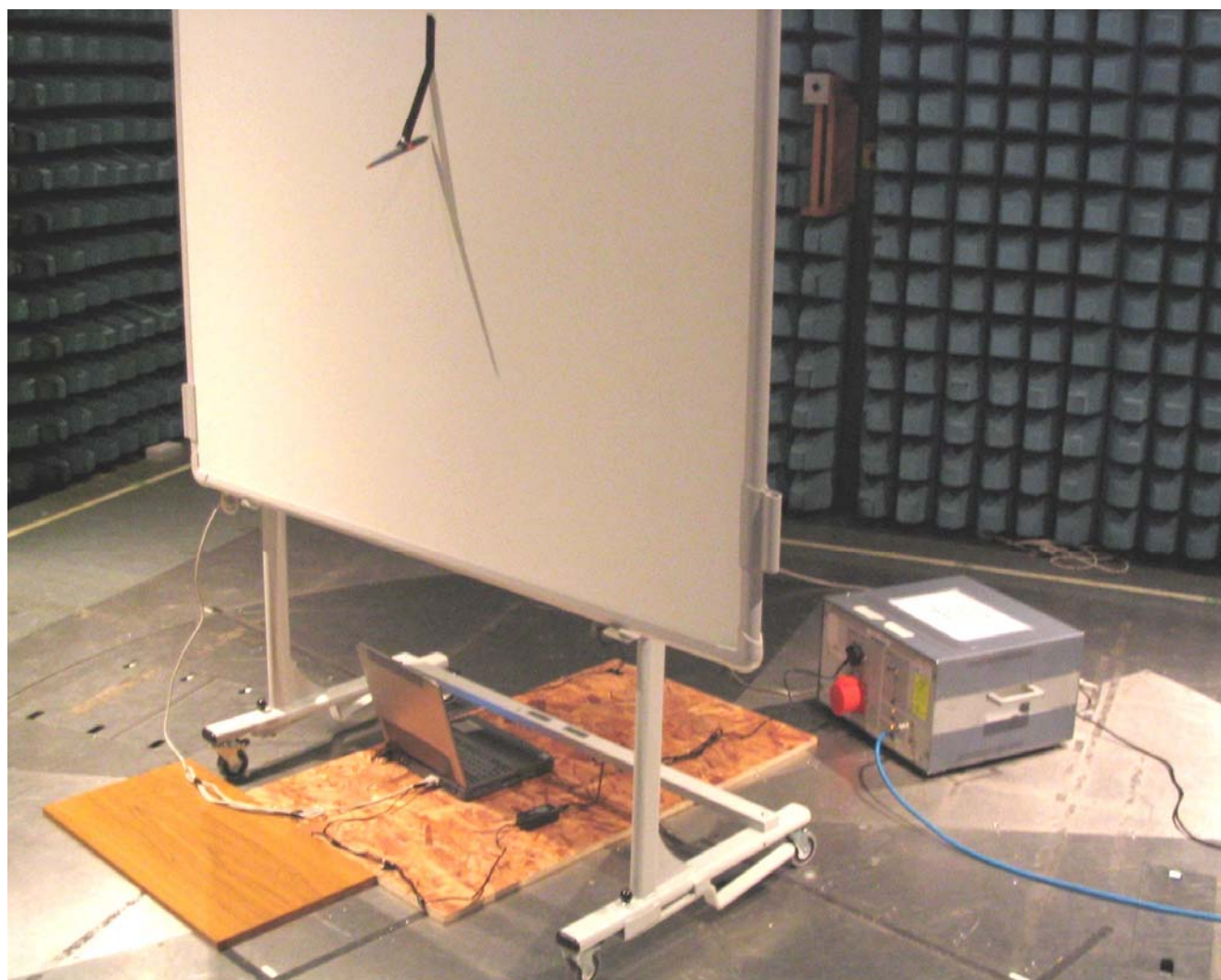
Emission Frequency (MHz)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.7308	33.6	56.0	29.8	46.0
1.0233	33.7	56.0	30.3	46.0
1.3152	33.9	56.0	30.1	46.0
1.5366	33.8	56.0	29.2	46.0
1.8287	34.0	56.0	28.9	46.0
15.2093	38.8	60.0	38.0	50.0

The margin between the specification requirements and all other emissions were 22.2dB or more below the specified Quasi-peak limit and 17.0dB or more below the specified Average limit.



2.11 CONDUCTED EMISSIONS ON POWER LINES - continued

2.11.7 Set Up Photograph -



Conducted Emissions Set Up Photograph

**2.12 MAXIMUM PEAK OUTPUT POWER (EIRP Method)****2.12.1 Specification Reference**

FCC CFR 47: Part 15 Subpart C, Section 15.247(b)(3)

2.12.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.12.3 Date of Test

2nd March 2004

2.12.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 23-41

2.12.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

The EUT contains an integral antenna and therefore the Maximum Peak Output Power was made using the EIRP method.

The Spectrum Analyser was tuned to the test frequency. The device Output Power setting was controlled as specified in the Product Information, Section 1.5 of this document. The device was then rotated through 360 degrees until the highest power level was observed in both horizontal and vertical polarisation. The device was then replaced with a substitution antenna, whose input signal level into the antenna was adjusted until the received level matched that of the previously detected emission.

**2.12 MAXIMUM PEAK OUTPUT POWER (EIRP Method) - continued****2.12.6 Test Results - continued**

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(b)(3) for Maximum Peak Output Power.

Measurements were made with the EUT Transmitting on channels 0, 39 and 78.

Frequency (MHz)	Result EIRP (dBm)	Result EIRP (mW)
2402	4.3	2.691
2441	2.3	1.698
2480	3.9	2.455
Limit	<+36dBm or <4W	



2.13 SPURIOUS RADIATED EMISSIONS

2.13.1 Specification Reference

FCC CFR 47: Part 15 Subpart C, Section 15.247(c)

2.13.2 Equipment Under Test

Promethean ACTIVBoard Bluetooth Radio

2.13.3 Date of Test

2nd March 2004

2.13.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 23-41

2.13.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

FCC CFR 47: Part 15 Subpart C, Section 15.247(c), for Radiated Emissions also requires Sections 15.205 and 15.209 to be applied.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

Emissions identified within the range 1GHz – 25GHz were then formally measured using Peak and Average Detectors, as appropriate.

The measurements were performed at a 3m distance unless otherwise stated.

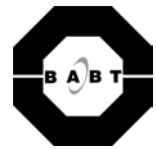


2.13 SPURIOUS RADIATED EMISSIONS - continued

2.13.5 Test Procedure - continued

The limits for Spurious Emissions Outside the Restricted Bands have been measured and calculated as shown in the table below:

Test Mode	Carrier Frequency GHz	Carrier Field Strength dB μ V/m	Limit for Spurious Outside Restricted Band (Carrier F S -20dB) dB μ V/m
Mode 2 (Bluetooth)	2402	102.3	82.3
Mode 2 (Bluetooth)	2441	100.1	80.1
Mode 2 (Bluetooth)	2480	101.4	81.4



2.13 SPURIOUS RADIATED EMISSIONS - continued

2.13.6 Test Results

30MHz - 1GHz Frequency Range

Equipment Designation: Intentional Radiator.

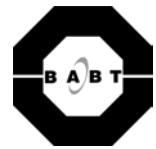
The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c), 15.205 and 15.209 for Radiated Emissions (30MHz – 1GHz).

EUT Tx on Bottom Channel (2402MHz)

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBμV/m	μV/m	dBμV/m	μV/m
162.2	H	153	144	43.2	144.5	43.5	150.0
265.4	H	218	140	42.1	127.4	46.0	200.0
471.9	H	103	193	46.0	200.0	46.0	200.0
825.7	H	103	108	41.5	118.9	46.0	200.0
855.2	H	104	104	42.7	136.5	46.0	200.0
884.7	H	107	104	42.9	139.6	46.0	200.0

EUT Tx on Middle Channel (2441MHz)

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBμV/m	μV/m	dBμV/m	μV/m
162.2	H	153	143	42.6	134.9	43.5	199.5
265.4	H	218	140	42.1	127.4	46.0	200.0
471.9	H	103	192	46.0	200.0	46.0	200.0
825.7	H	103	108	41.5	118.9	46.0	200.0
855.2	H	102	110	43.0	141.3	46.0	200.0
884.7	H	103	108	42.7	136.5	46.0	200.0



2.13 SPURIOUS RADIATED EMISSIONS - continued

2.13.6 Test Results – continued

30MHz - 1GHz Frequency Range

EUT Tx on Top Channel (2480MHz)

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBμV/m	μV/m	dBμV/m	μV/m
162.2	H	153	150	42.4	131.8	43.5	150.0
265.4	H	218	140	42.1	127.4	46.0	200.0
471.9	H	100	194	46.0	200.0	46.0	200.0
825.7	H	103	108	41.5	118.9	46.0	200.0
855.2	H	104	106	42.6	134.9	46.0	200.0
884.7	H	104	112	43.0	141.3	46.0	200.0

30MHz - 1GHz Frequency Range

EUT Tx on Top Channel (2480MHz) and SRD Bottom Channel (917.3MHz)

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBμV/m	μV/m	dBμV/m	μV/m
162.2	H	153	144	43.5	150.0	43.5	150.0
265.4	H	218	140	42.1	127.4	46.0	200.0
471.9	H	102	193	45.8	195.0	46.0	200.0
825.7	H	103	108	41.5	118.9	46.0	200.0
855.2	H	103	110	43.5	149.6	46.0	200.0
884.7	H	100	109	43.6	151.4	46.0	200.0

30MHz - 1GHz Frequency Range

EUT Tx on Bottom Channel (2402MHz) and SRD Bottom Channel (917.3MHz)

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBμV/m	μV/m	dBμV/m	μV/m
162.2	H	153	144	43.4	147.9	43.5	150.0
265.4	H	218	140	42.1	127.4	46.0	200.0
471.9	H	102	193	46.0	200.0	46.0	200.0
825.7	H	103	108	41.5	118.9	46.0	200.0
855.2	H	103	110	43.6	151.4	46.0	200.0
884.7	H	102	111	43.2	144.5	46.0	200.0



2.13 SPURIOUS RADIATED EMISSIONS - continued

2.13.6 Test Results - continued

1GHz - 25GHz Frequency Range

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(c), 15.205 and 15.209 for Radiated Emissions (1GHz – 25GHz).

EUT Tx on Bottom Channel (2402MHz)

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
GHz	H/V	cm	deg	dBμV/m	dBμV/m	dBμV/m	dBμV/m
4.804	H	184	254	54.6	74.0	47.0	54.0

EUT Tx on Middle Channel (2441MHz)

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
GHz	H/V	cm	deg	dBμV/m	dBμV/m	dBμV/m	dBμV/m
4.882	H	102	249	57.4	74.0	49.4	54.0

EUT Tx on Top Channel (2480MHz)

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
GHz	H/V	cm	deg	dBμV/m	dBμV/m	dBμV/m	dBμV/m
2.486	H	123	245	73.9	74.0	40.9	54.0
4.9601	H	101	247	56.2	74.0	48.1	54.0

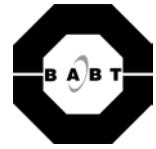


2.13 SPURIOUS RADIATED EMISSIONS - continued

2.13.7 Set Up Photograph



Spurious Radiated Emissions Set Up Photograph



2.14 SPURIOUS RADIATED EMISSIONS TRANSMIT - CO-LOCATED

2.14.1 Specification Reference

FCC CFR 47: Part 15 Subpart C, Sections 15.247(a) and 15.209

2.14.2 Equipment Under Test

Promethean ActivBoard

2.14.3 Date of Test

2nd March 2004

2.14.4 Test Equipment Used

The following major items of test equipment identified in Section 3.1 were used for the above tests.

Items: 23-41

2.14.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 25GHz were then formally measured using Peak and Average Detectors, as appropriate.

The measurements were performed at a 3m distance unless otherwise stated.

Measurements were made with the EUT transmitting on the following Channels

SRD		BLUETOOTH	
917.3MHz	Slate Channel 1	2.480GHz	Channel 78
917.3MHz	Slate Channel 1	2.402GHz	Channel 0



2.14.6 Test Results

EUT Tx on Bluetooth Channels and SRD Channel

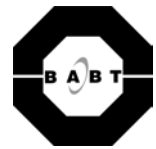
Scans were completed across the relevant frequency range. The emissions detected were those of the Bluetooth and SRD carrier and direct harmonics of those emissions. No inter-modulation products were detected. Carrier harmonics were determined to be the same as previously measured therefore no results are presented here as they are declared above. Below is Channel 1 SRD Measurements.

Frequency	Antenna		Turntable	Peak Field Strength	Peak Limit	Average Field Strength	Average Limit
	Pol	Height	Azimuth				
GHz	H/V	cm	deg	dB μ V/m	dB μ V/m	dB μ V/m	dB μ V/m
1.834	H	100	360	61.1	74.0	48.9	54.0
2.752	H	100	360	63.1	74.0	51.8	54.0



SECTION 3

TEST EQUIPMENT USED & MEASUREMENT UNCERTAINTIES



3.1 TEST EQUIPMENT USED

Item	Instrument	Manufacturer	Type No	Serial No	EMC / INV No	Cal. Due
1	Spectrum Analyser	Rohde & Schwarz	FSEM	827156/006	INV 4034	05/01/05
2	Peak Power Analyser	Hewlett Packard	8990A	3107A00124	1660	14/08/04
3	Peak Power Sensor	Hewlett Packard	84812A	3107A00126	1662	14/08/04
4	Cable	TUV	N Type	CS0578	CS0578	-
5	Hygromer	Rotronic	1-1000	826-15	INV 3227	04/10/04
6	Cable	Sucoflex	-	-	-	-
7	EMI Receiver	Hewlett Packard	8542E	3617A00165_00154	2286	13/12/03
8	Bilog Antenna	Schaffner	CBL 6143	-	2860	11/04/04
9	Turntable & Controller	HD Gmbh	HD 050	050-396	2528	TU
10	Antenna Mast	EMCO	2070	-	-	TU
11	Antenna Mast Controller	EMCO	2090	-	-	TU
12	Screened Room 5	Siemens	EAC54300	-	2533	TU
13	Low Noise Amplifier (1-8GHz)	Miteq	AMF-3D-001080-18-13P	UNK	2457	TU
14	Low Noise Amplifier (8-18GHz)	Miteq	AMF-4E-080180-15-10P	492562	2430	TU
15	Antenna	EMCO	3115	96964848	2297	04/07/04
16	Antenna	EMCO	3115	97015079	2397	04/07/04
17	Signal Generator	Hewlett Packard	8673B	2147A00421	953	TU
18	Hygromer	Rotronic	Hygromer	-	4066	28/11/03
19	3dB Pad	Hewlett Packard	8419B	15108	-	TU
20	Antenna	Link Microtek Ltd	AM180HA-K-TU2	2007	2945	15/08/04
21	Amplifier	Avantek	AMT-26177-33	6669	2072	26/06/04
22	Amplifier	Avantek	AWT-18036	F13365 8452	1081	26/06/04



3.1 TEST EQUIPMENT USED (cont)

Item	Instrument	Manufacturer	Type No	EMC / INV No	Cal. Due
23	EMI Receiver	Hewlett Packard	8542E	2286	09/12/04
24	Bilog Antenna	Chase	CBL 6143	2860	11/04/04
25	Turntable & Controller	HD Gmbh	HD 050	2528	TU
26	Antenna Mast	EMCO	2070	-	TU
27	Antenna Mast Controller	EMCO	2090	-	TU
28	Screened Room 5			2533	TU
29	Low Noise Amplifier (1-8GHz)	Miteq	AMF-3D-001080-18-13P	2457	TU
30	Low Noise Amplifier (8-18GHz)	Miteq	AMF-4E-080180-15-10P	2430	TU
31	Spectrum Analyser			2917	11/02/05
32	Horn	EMCO	3115	2397	04/07/04
33	Horn	EMCO	3115	2297	04/07/04
34	Signal Generator	MARconi	2031	1979	30/10/04
35	Signal Generator	HP	8673b	954	14/06/04
36	Test Receiver	Rohde & Schwarz	ESH3	1020	16/08/04
37	Spectrum Monitor	Rohde & Schwarz	EZM	1416	TU
38	Plotter	Hewlett Packard	7550A	-	TU
39	Transient Limiter	Hewlett Packard	11947A	-	07/05/04
40	Three Phase LISN	Rohde & Schwarz	ESH2-Z5	-	02/10/04
41	Barometer	Oregon Scientific	BAA913HE	Room 5	TU



3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are: -

In the frequency range 30MHz to 2.7GHz

For 20dB Bandwidth

Frequency	$\pm 210.894\text{kHz}$
Amplitude	$\pm 0.5\text{dB}$

For Maximum Output Power

Amplitude	$\pm 0.5\text{dB}$
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For Spurious Radiated Emissions, Quasi-Peak Measurements using the ESVP Test Receiver and Bilog Antenna: - Frequency $\pm 5\text{ppm} + 500\text{Hz}$ Amplitude $\pm 4.1\text{dB}$

In the frequency range 1GHz to 25GHz

For Spurious Radiated Emissions measurements: -

Frequency	$\pm 2 \times 10^{-7} \times \text{Centre Frequency}$
Amplitude	$\pm 3.4\text{dB}$

For Peak Power Spectral Density

Amplitude	$\pm 1.8\text{dB}$
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For Spurious Conducted Emissions

Amplitude	$\pm 3.0\text{dB}$
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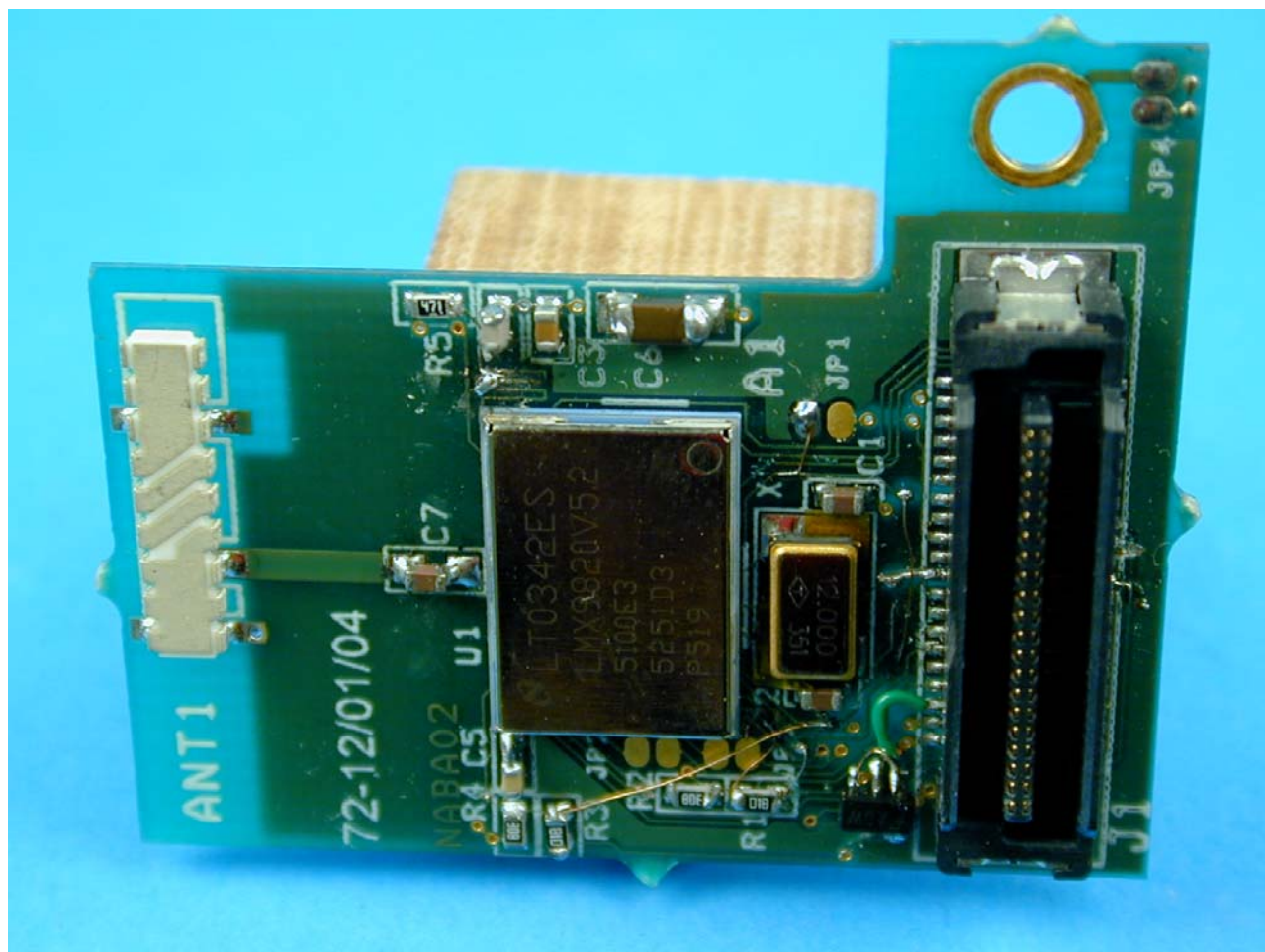


SECTION 4

PHOTOGRAPHS OF TEST SAMPLE



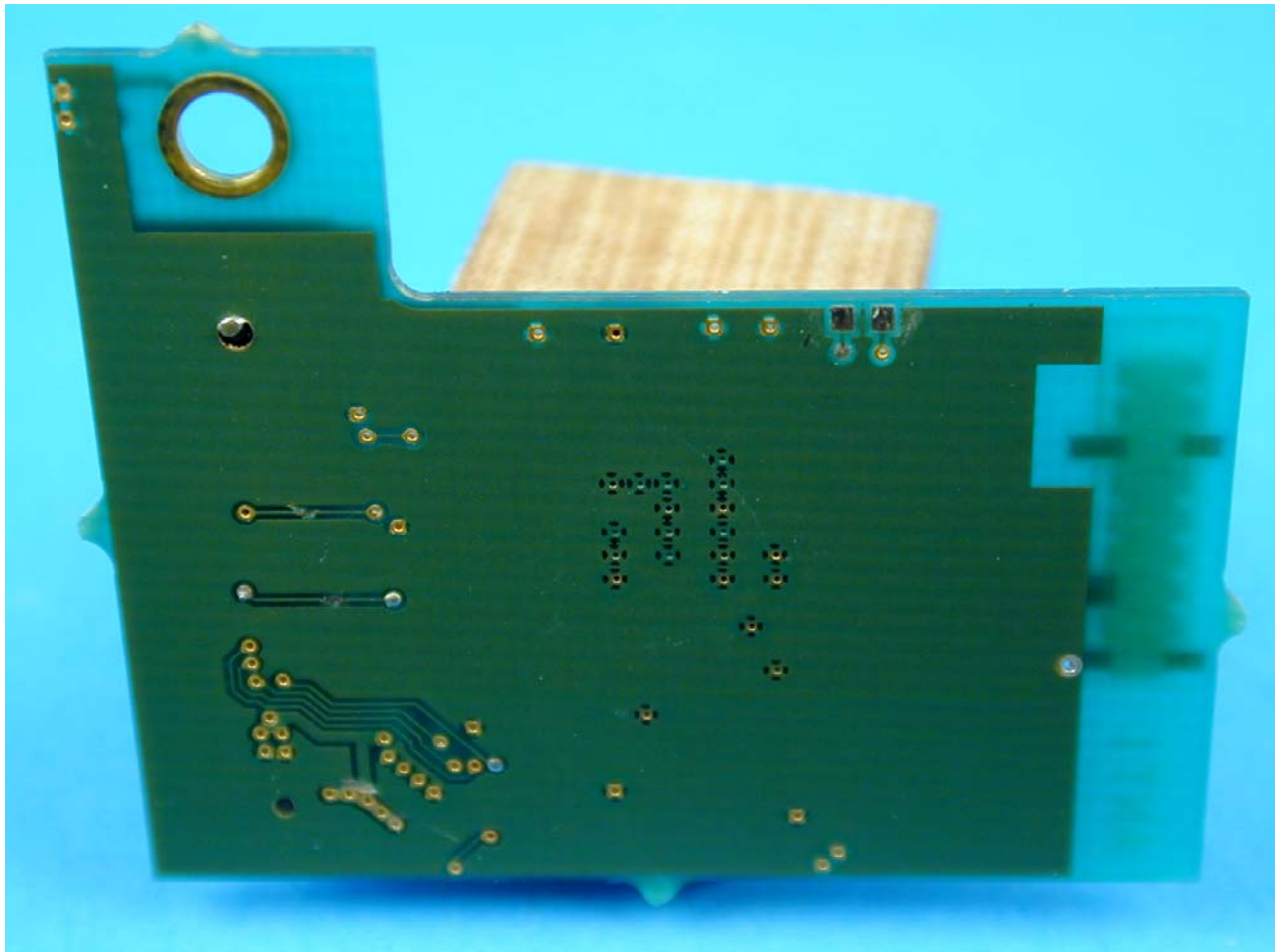
3.1 PHOTOGRAPHS OF EQUIPMENT



Front View of Bluetooth Module



3.1 PHOTOGRAPHS OF EQUIPMENT - Continued



Rear View of Bluetooth Module



SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA
(Not UKAS Accredited).

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ANNEX A
FCC SITE COMPLIANCE LETTER



FEDERAL COMMUNICATIONS COMMISSION

**Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046**

October 18, 2002

Registration Number: 90987

**TUV Product Service Ltd
Segensworth Road
Titchfield
Fareham, Hampshire, PO15 5RH
United Kingdom
Attention: Kevan Adsetts**

**Re: Measurement facility located at Titchfield
Anechoic chamber (3 meters) and 3 & 10 meter OATS
Date of Listing: October 18, 2002**

Gentlemen:

Your request for registration of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC rules. The information has, therefore, been placed on file and the name of your organization added to the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

**Thomas W Phillips
Electronics Engineer**