
REPORT ON

FCC Part 15C Testing in support of an
Application for Grant of Equipment Authorisation
of a Sagem DC2006a Dual Band Handset with Bluetooth Radio

COMMERCIAL-IN-CONFIDENCE

FCC ID: M9HDC2006A

Report No OR615361/03 Issue 3

November 2006



Product Service





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REPORT ON

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Equipment Authorisation of a Sagem DC2006a Dual Band Handset
with Bluetooth Radio

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EQUIPMENT

DC2006a Dual Band Handset with Bluetooth radio

PREPARED FOR

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France

APPROVED BY


K W Adsetts
Authorised signatory


M J Hardy
Authorised Signatory

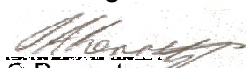
DATED

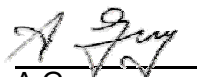
10th November 2006

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


S Bennett


A Guy



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SECTION 1

REPORT SUMMARY

FCC Part 15C Testing in support of an Application for Grant of Equipment
Authorisation of an Sagem DC2006a Dual Band Handset with Bluetooth Radio

1.1 STATUS

Equipment Under Test	DC2006a Dual Band Handset with Bluetooth Radio
Objective	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
Name and Address of Client	Sagem Communications 2, rue du Petit Albi BP 28250 95801 Cergy Pontoise Cedex France
Type Number	DC2006a
Serial Number	IMEI: 01094900950074-1
Hardware Revision	V0x
Software Version	L 5,IF
Test Specification/Issue/Date	FCC CFR 47: Part 15, Subpart C: 2002
Registration Number	OR615361/28
Number of Items Tested	One
Security Classification of EUT	Unclassified
Incoming Release Serial Number Date	Declaration of Build Status 2006
Disposal Reference Number Date	Held pending disposal N/A N/A
Order Number Date	PTP 23 rd June 2006
Start of Test	1 st August 2006
Finish of Test	4 th August 2006
Test Engineer(s)	S Bennett A Guy
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 Sagem DC2006a Dual Band Handset with Bluetooth to the requirements of FCC Specification Part 15.

FCC ID: M9HDC2006A

1.3 LOCATION OF TESTING

TUV Product Service Ltd Engineers, S Bennett and A Guy conducted all testing at the premises TUV Product Service Ltd, Octagon House, Concorde Way, Segensworth North, Fareham, Hampshire, PO15 5RL. 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.

1.4 BRIEF SUMMARY OF RESULTS

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

Section	Spec Clause	Test Description	Result	Levels/Comments
2.1	15.247(a)(1)	20dB Bandwidth	Pass	
2.2	15.247(a)(iii)	Channel Dwell Time (DH1)	Pass	
2.3	15.247(a)(iii)	Channel Dwell Time (DH3)	Pass	
2.4	15.247(a)(iii)	Channel Dwell Time (DH5)	Pass	
2.5	15.247(a)(1)	Channel Separation	Pass	
2.6	15.247(a)(1)	Number of Hopping Channels	Pass	
2.7	15.247(b)(1)	Maximum Peak Output Power	Pass	
2.8	15.247(d)	Spurious Conducted Emissions	Pass	
2.9	15.247(b)(1)	Maximum Peak Output Power	Pass	
2.10	15.247(d)	Spurious Radiated Emissions	Pass	
2.11	15.205	Measurement at the Band Edge	Pass	

The EUT uses a Bluetooth Qualified Component. Please refer to Annex A for a copy of the certificate of Conformance.

The EUT meets the requirements for a Frequency Hopping System as detailed in 15.247 (a) , (g) and (h) and clarified in DA 00-705 by unmodified use of this component, since Bluetooth compliant products inherently meet these requirements

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) was a Sagem DC2006a Dual Band Handset with Bluetooth Radio, which offers 2.4GHz Wireless connectivity with other Bluetooth devices.

A Tescom Bluetooth test set was used to control the EUT during test. The EUT was inside the host unit during test.

Manufacturing Description	DC2006a Dual Band Handset with Bluetooth
Manufacturer	Sagem
Model No	DC2006a
Serial No	IMEI: 01094900950074-1

1.5.2 Modes of Operation

The EUT was controlled using a Tescom Bluetooth test set. The test set was used to control the channel under test and the modulation scheme/data rate.

2.4GHz RLAN functionality

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

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



Photograph of EUT



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 during testing.

SECTION 2

TEST RESULTS

FCC Part 15C Testing in support of an Application for Grant of Equipment
Authorisation of an Sagem DC2006a Dual Band Handset with Bluetooth Radio

2.1 20dB BANDWIDTH

2.1.1 Specification Reference

FCC Part 15.247(a)(1)

2.1.2 Equipment Under Test

DC2006a Bluetooth Radio

2.1.3 Date of Test

1st August 2006

2.1.4 Test Equipment Used

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

2.1.5 Test Procedure

Test Performed in accordance with 15.247.

The EUT was transmitted at maximum power at all data rates via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen. The peak point of the trace was measured and the markers positioned to give the –20dBc points of the displayed spectrum.

The measurement plots can be seen on the following pages.

2.1.6 Test Results

Frequency (MHz)	Data Rate (Mbps)	20dB Bandwidth (kHz)
2402	DH1	1.019230
2441	DH1	1.019230
2480	DH1	1.013025

Frequency (MHz)	Data Rate (Mbps)	20dB Bandwidth (kHz)
2402	DH3	1.019230
2441	DH3	1.016025
2480	DH3	1.016025

Frequency (MHz)	Data Rate (Mbps)	20dB Bandwidth (kHz)
2402	DH5	1.019230
2441	DH5	1.016025
2480	DH5	1.019230

2.1.7 Limit

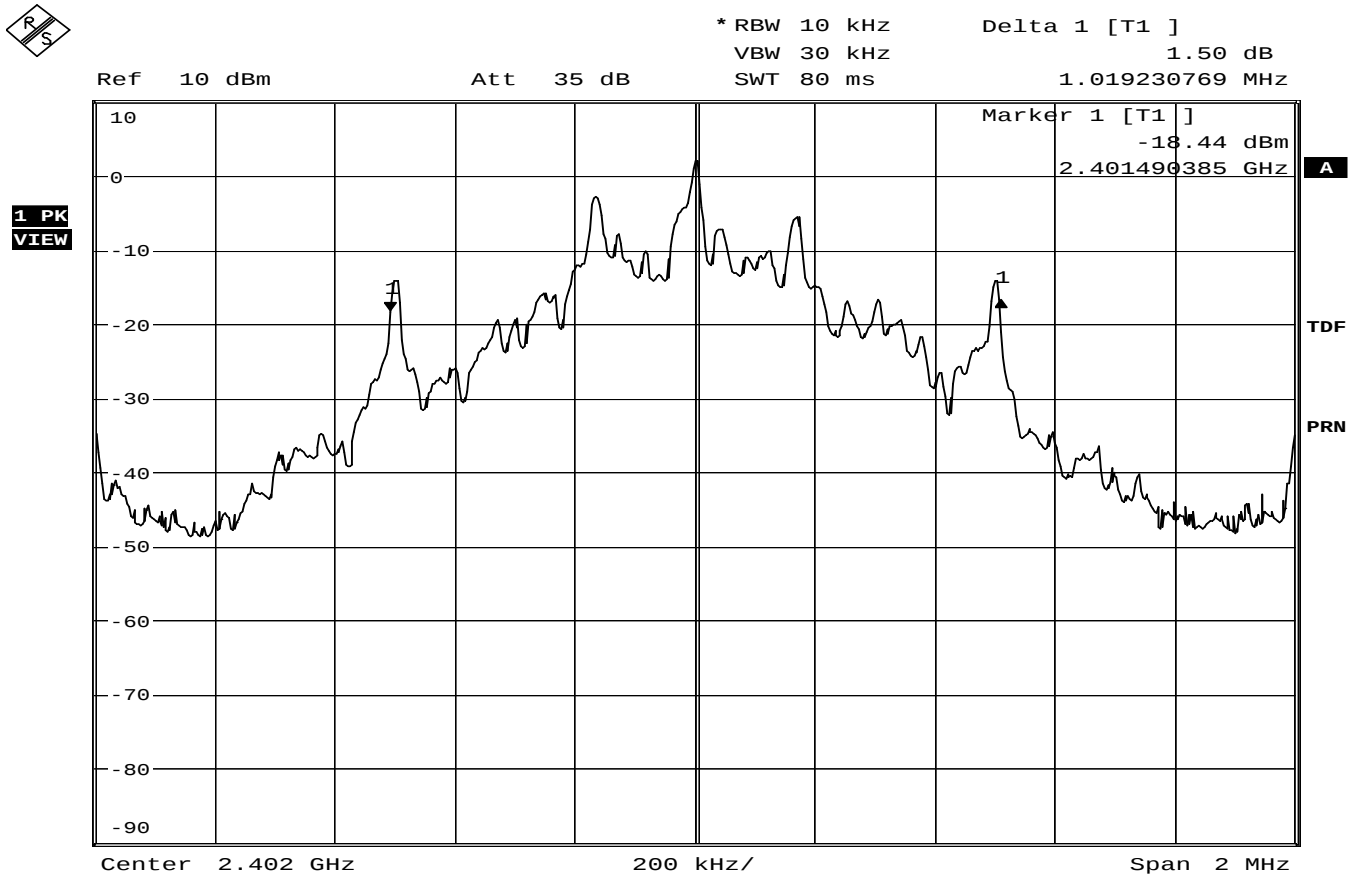
$$20\text{dB Bandwidth} = \frac{\text{Channel Bandwidth}}{2/3} = \frac{1 \times 10^6}{2/3} = 1.5\text{MHz}$$

Remarks

The equipment passed the requirements of this clause

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued

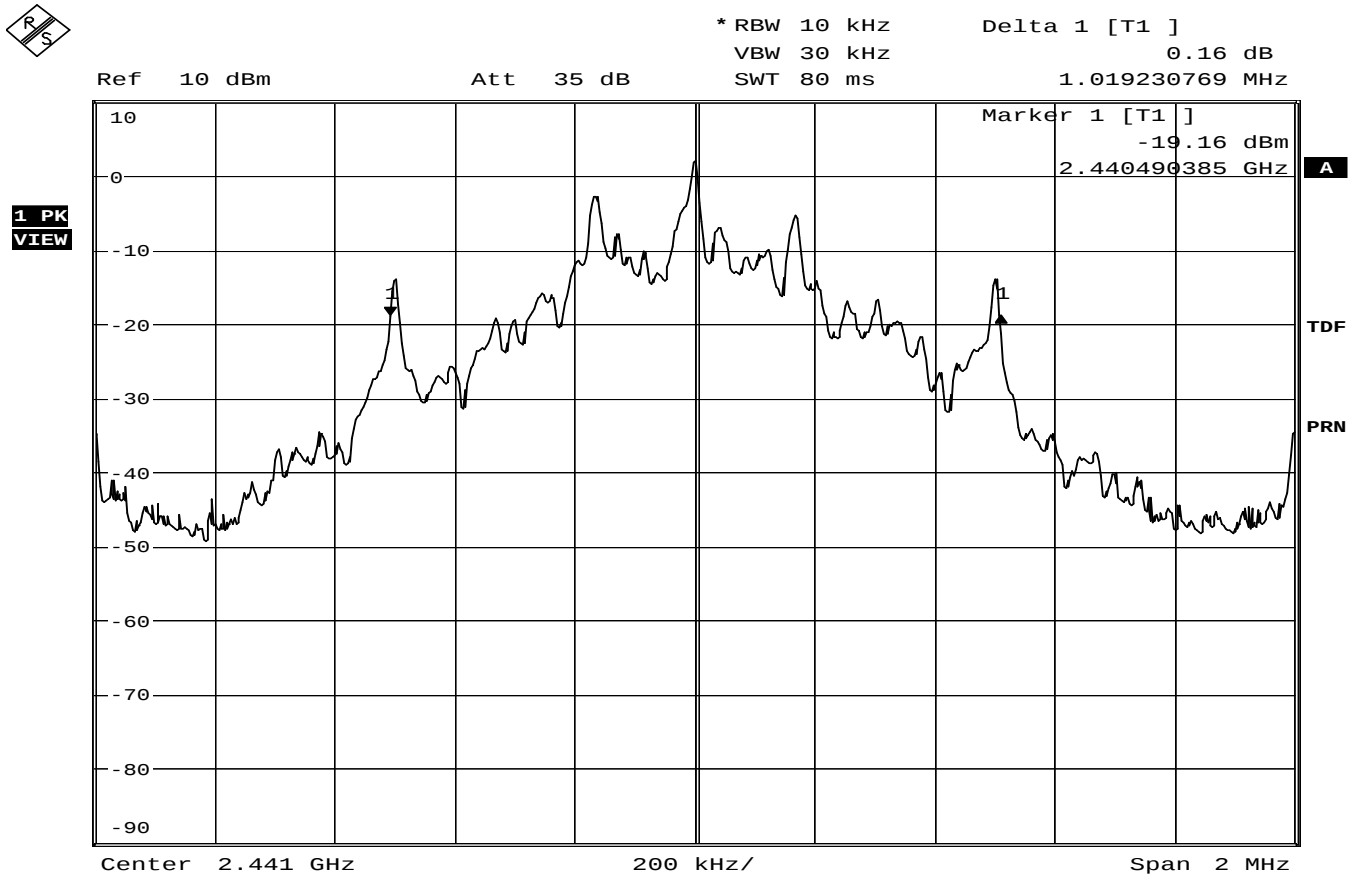


Date: 1.AUG.2006 11:52:42

2402.0MHz – Maximum Power DH1

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued



Date: 1.AUG.2006 12:03:46

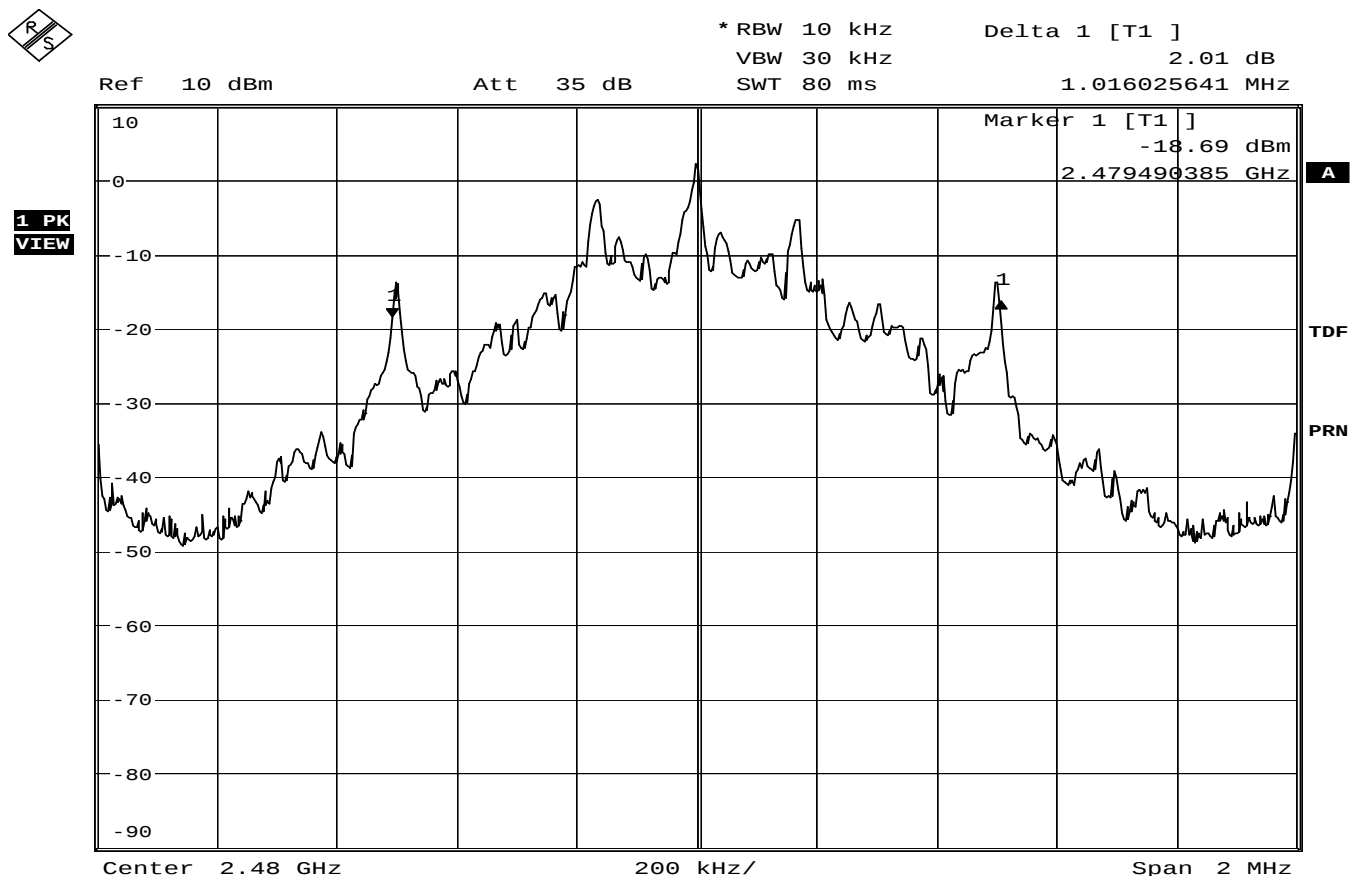
2441.0MHz – Maximum Power DH1



Product Service

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued



Date: 1.AUG.2006 13:35:39

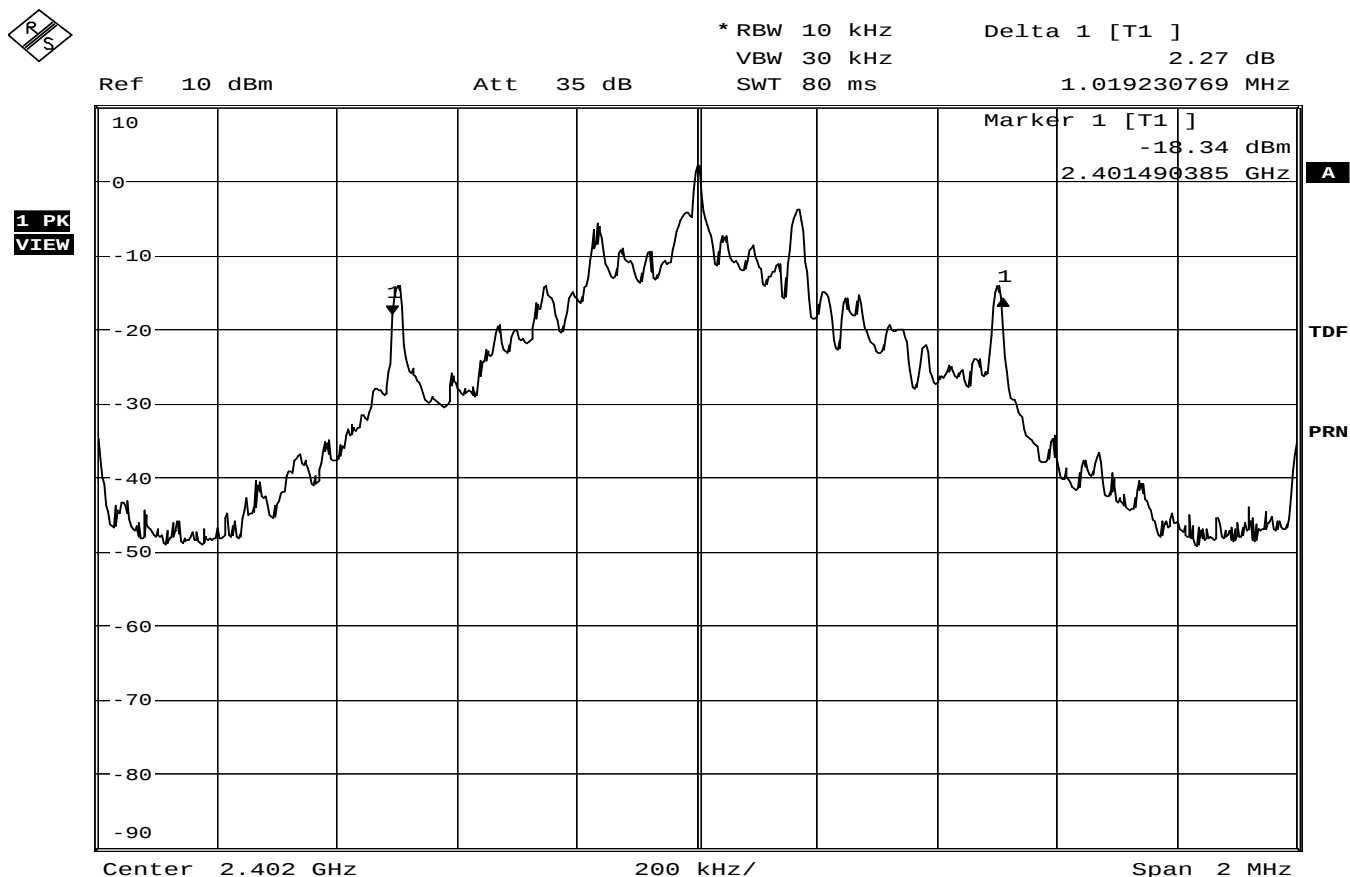
2480.0MHz – Maximum Power DH1



Product Service

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued



Date: 1.AUG.2006 11:56:01

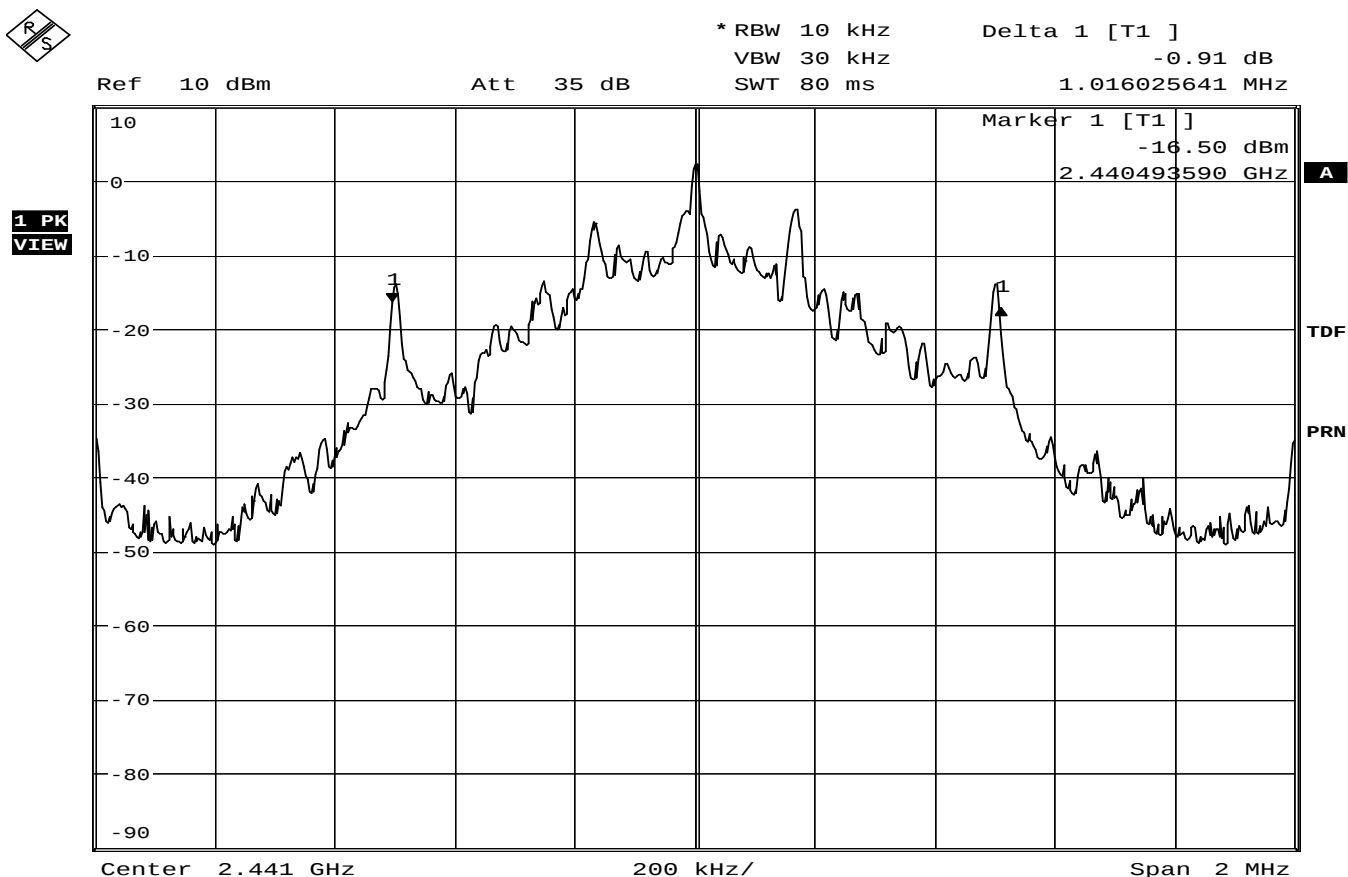
2402.0MHz – Maximum Power DH3



Product Service

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued



Date: 1.AUG.2006 12:06:21

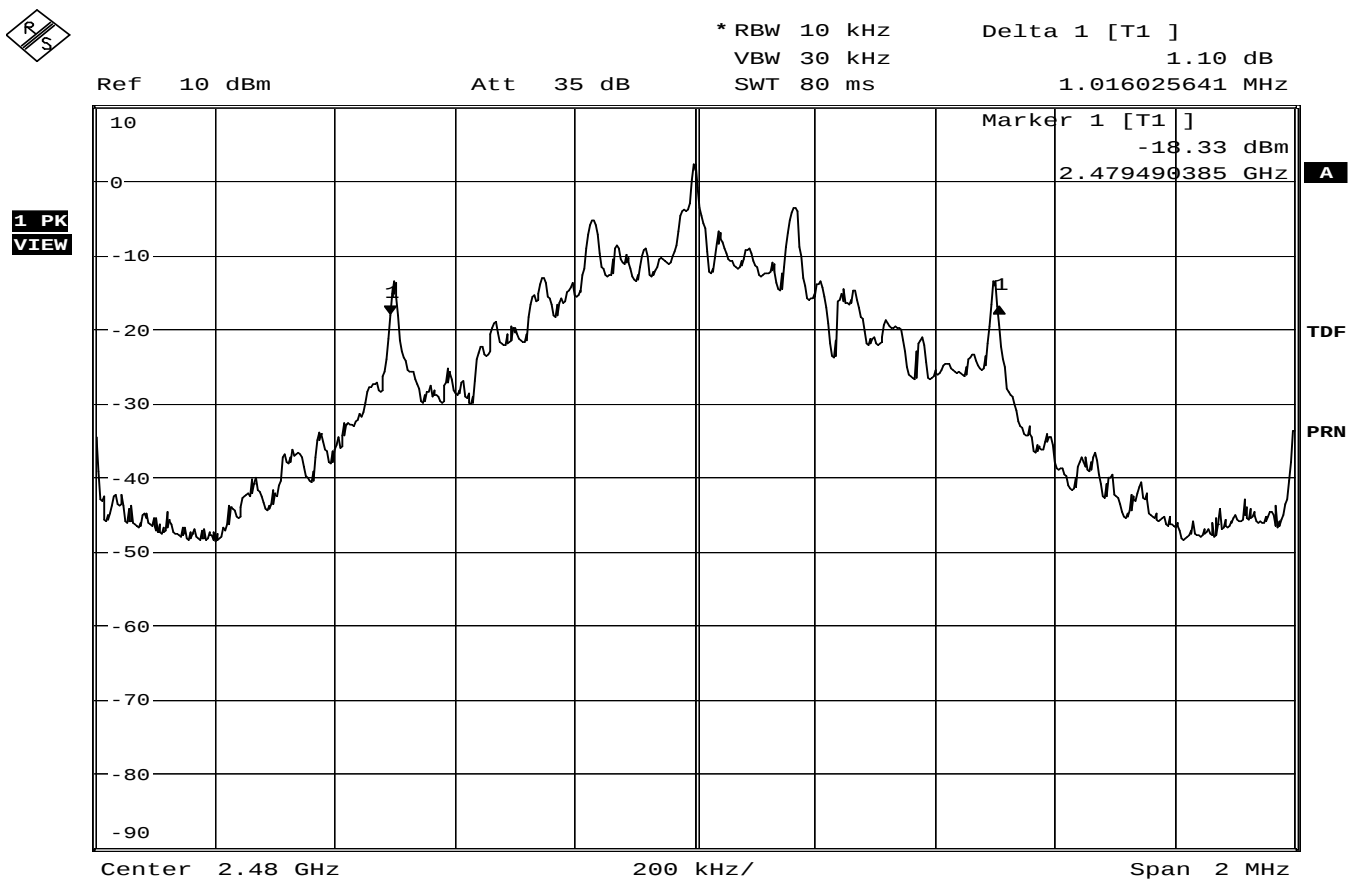
2441.0MHz – Maximum Power DH3



Product Service

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued

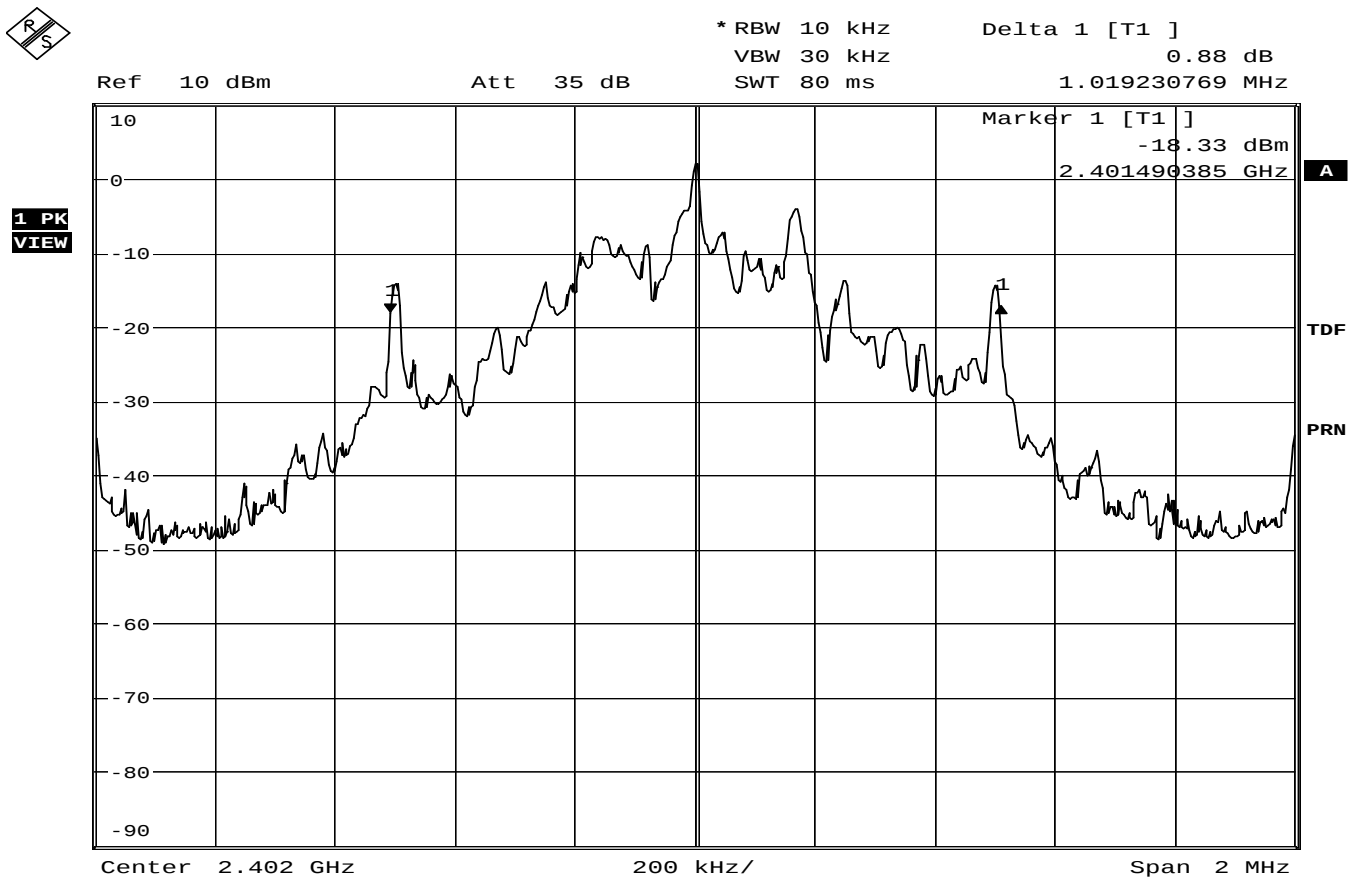


Date: 1.AUG.2006 13:41:44

2480.0MHz – Maximum Power DH3

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued

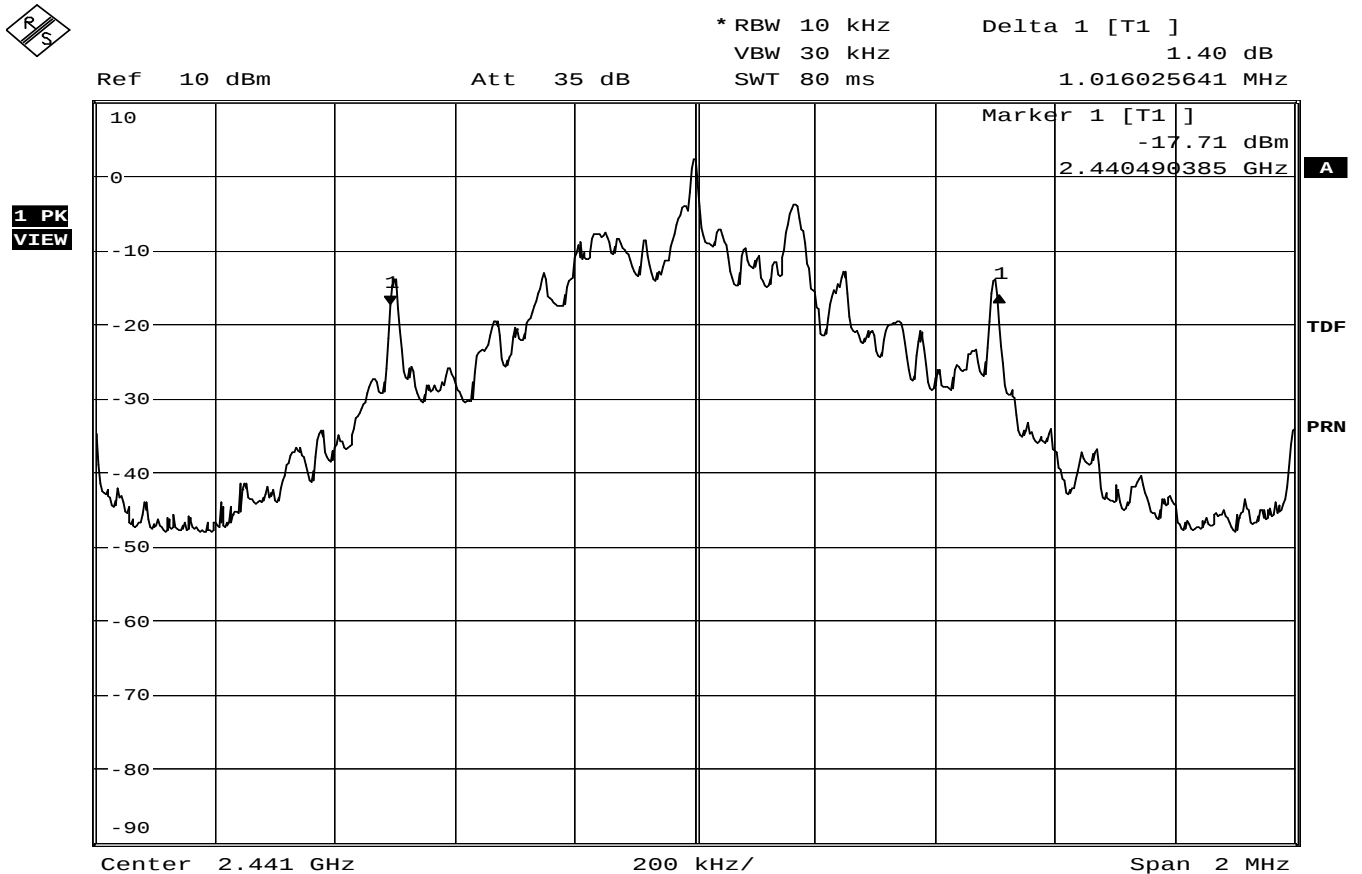


Date: 1.AUG.2006 11:59:39

2402.0MHz – Maximum Power DH5

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued

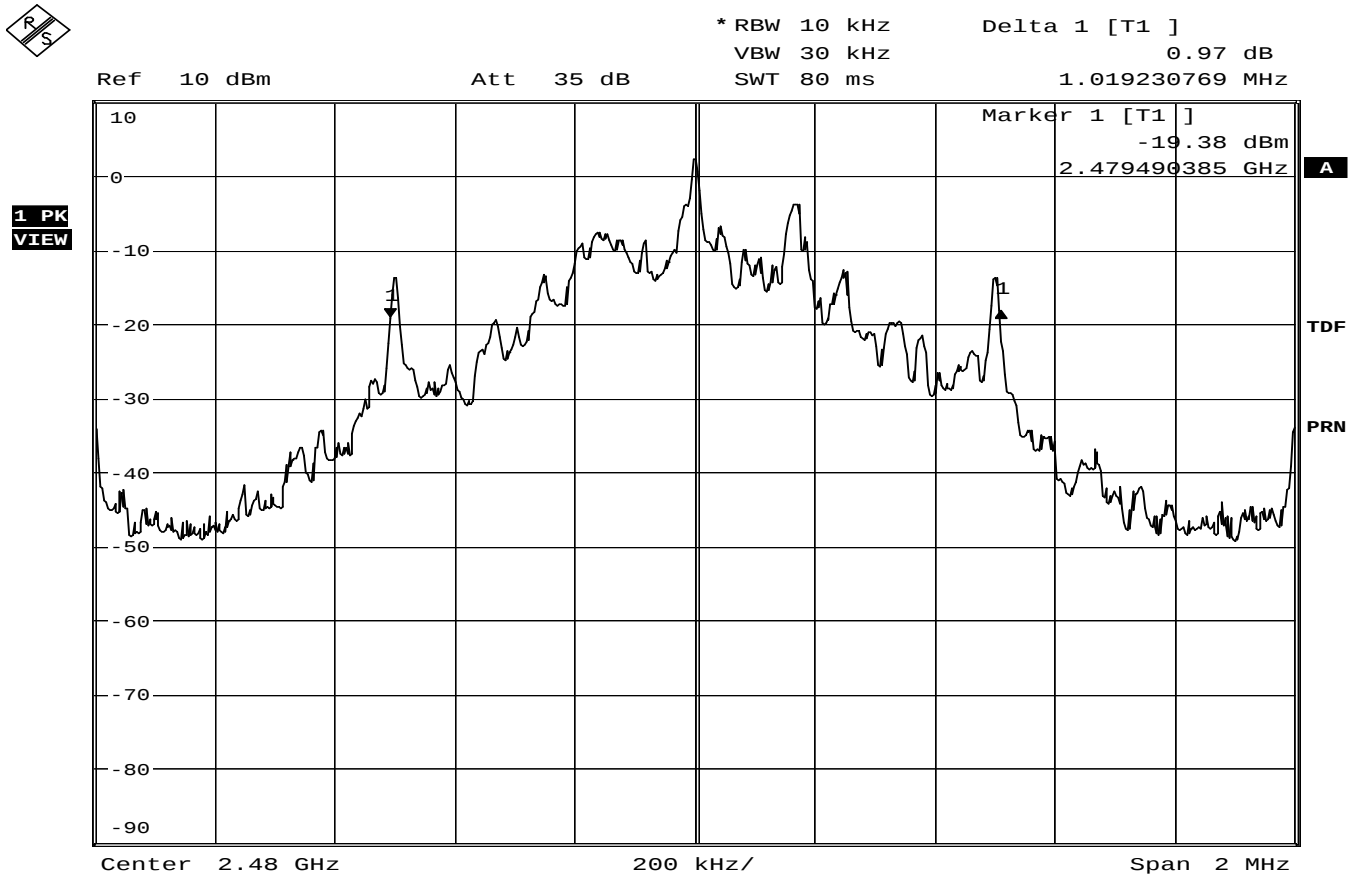


Date: 1.AUG.2006 13:28:09

2441.0MHz – Maximum Power DH5

2.1 20dB BANDWIDTH

2.1.6 Test Results - continued



Date: 1.AUG.2006 13:44:52

2480.0MHz – Maximum Power DH5

2.2 CHANNEL DWELL TIME (DH1)

2.2.1 Specification Reference

FCC Part 15.247(a)(iii)

2.2.2 Equipment Under Test

DC2006a Bluetooth Radio

2.2.3 Date of Test

1st August 2006

2.2.4 Test Equipment Used

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

2.2.5 Test Procedure

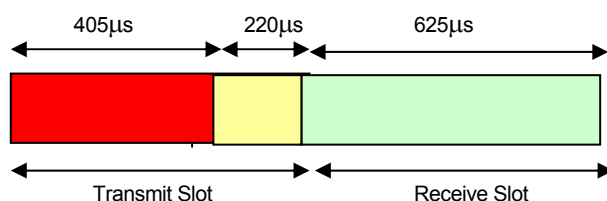
Procedure: Test Performed in accordance with 15.247.

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 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.



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:

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

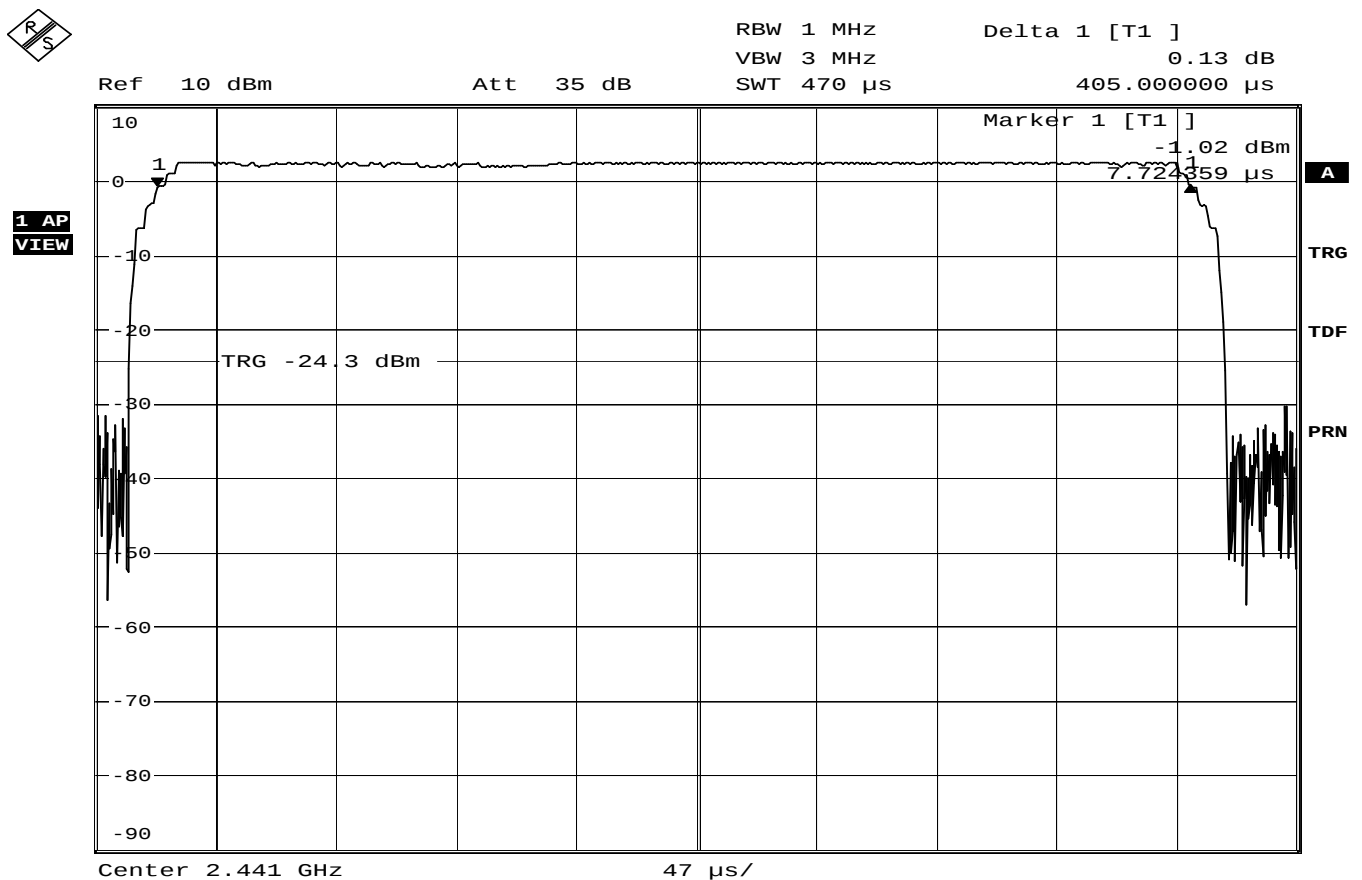
2.2 CHANNEL DWELL TIME (DH1)

2.2.5 Test Procedure - continued

Remarks

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

2.2.6 Test Results



Date: 1.AUG.2006 13:56:56

Plot Showing DH1 Timeslot

2.3 CHANNEL DWELL TIME (DH3)

2.3.1 Specification Reference

FCC Part 15.247(a)(iii)

2.3.2 Equipment Under Test

DC2006a Bluetooth Radio

2.3.3 Date of Test

1st August 2006

2.3.4 Test Equipment Used

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

2.3.5 Test Procedure

Test Performed in accordance with 15.247.

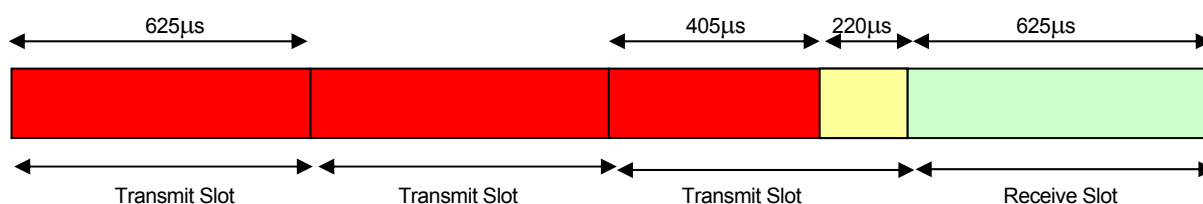
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second. With data rate DH3, the data payload is higher and can use up to 3 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 3 slots,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

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 625 μ s. In the third 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.



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



2.3 CHANNEL DWELL TIME (DH3)

2.3.5 Test Procedure - continued

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

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

So:

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

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

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

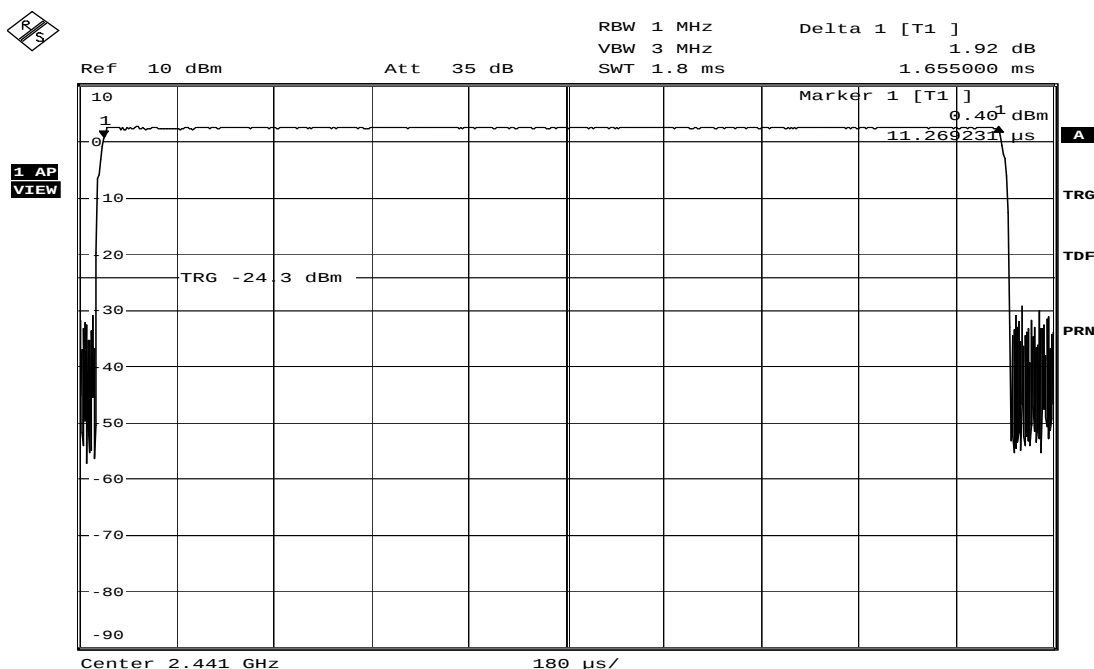
So, in 32 seconds, the transmitter dwell time per channel is:

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

Remarks

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

2.3.6 Test Results



Date: 1.AUG.2006 14:00:12

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

DC2006a Bluetooth Radio

2.4.3 Date of Test

1st August 2006

2.4.4 Test Equipment Used

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

2.4.5 Test Procedure

Test Performed in accordance with 15.247.

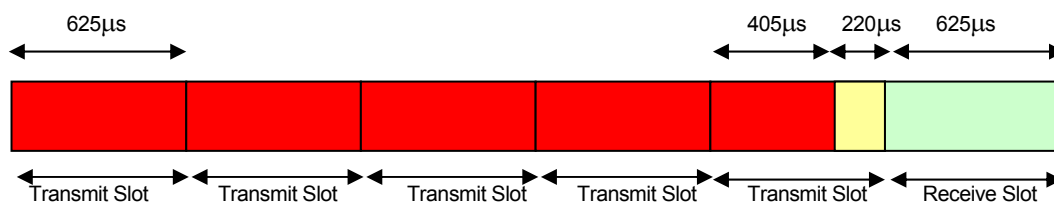
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second. With data rate DH5, the data payload is higher and can use up to 5 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 5 slots,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

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 625µs. In the fifth 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.



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



Product Service

2.4 CHANNEL DWELL TIME (DH5)

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:

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

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

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

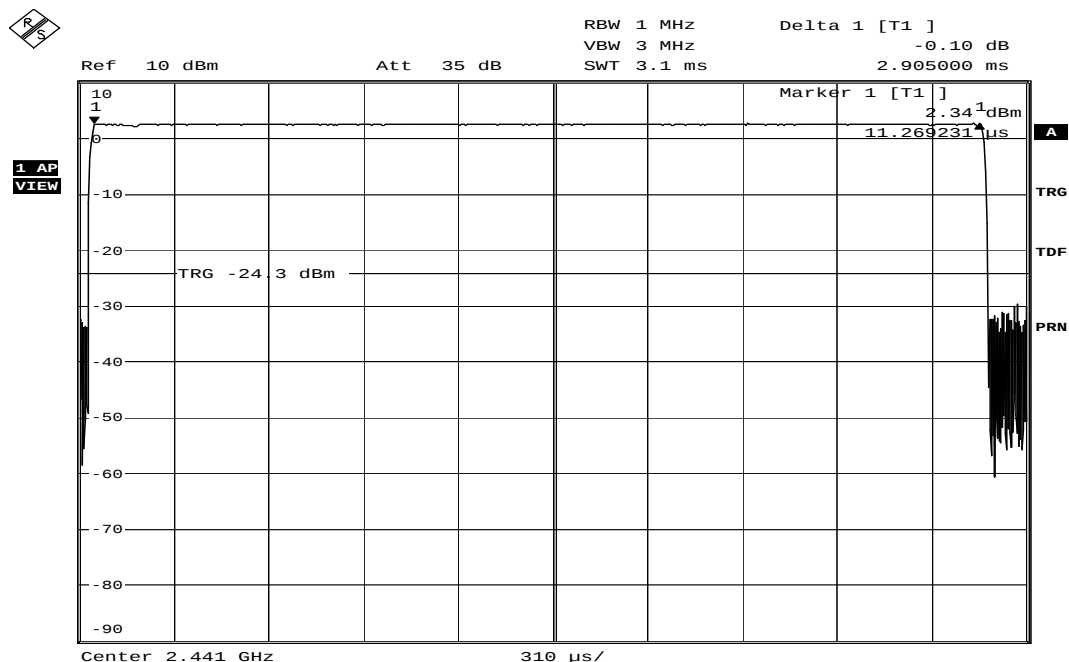
So, in 32 seconds, the transmitter dwell time per channel is:

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

Remarks

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

2.4.6 Test Results



Date: 1.AUG.2006 14:02:23

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

DC2006a Bluetooth Radio

2.5.3 Date of Test

1st August 2006

2.5.4 Test Equipment Used

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

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 CHANNEL SEPARATION

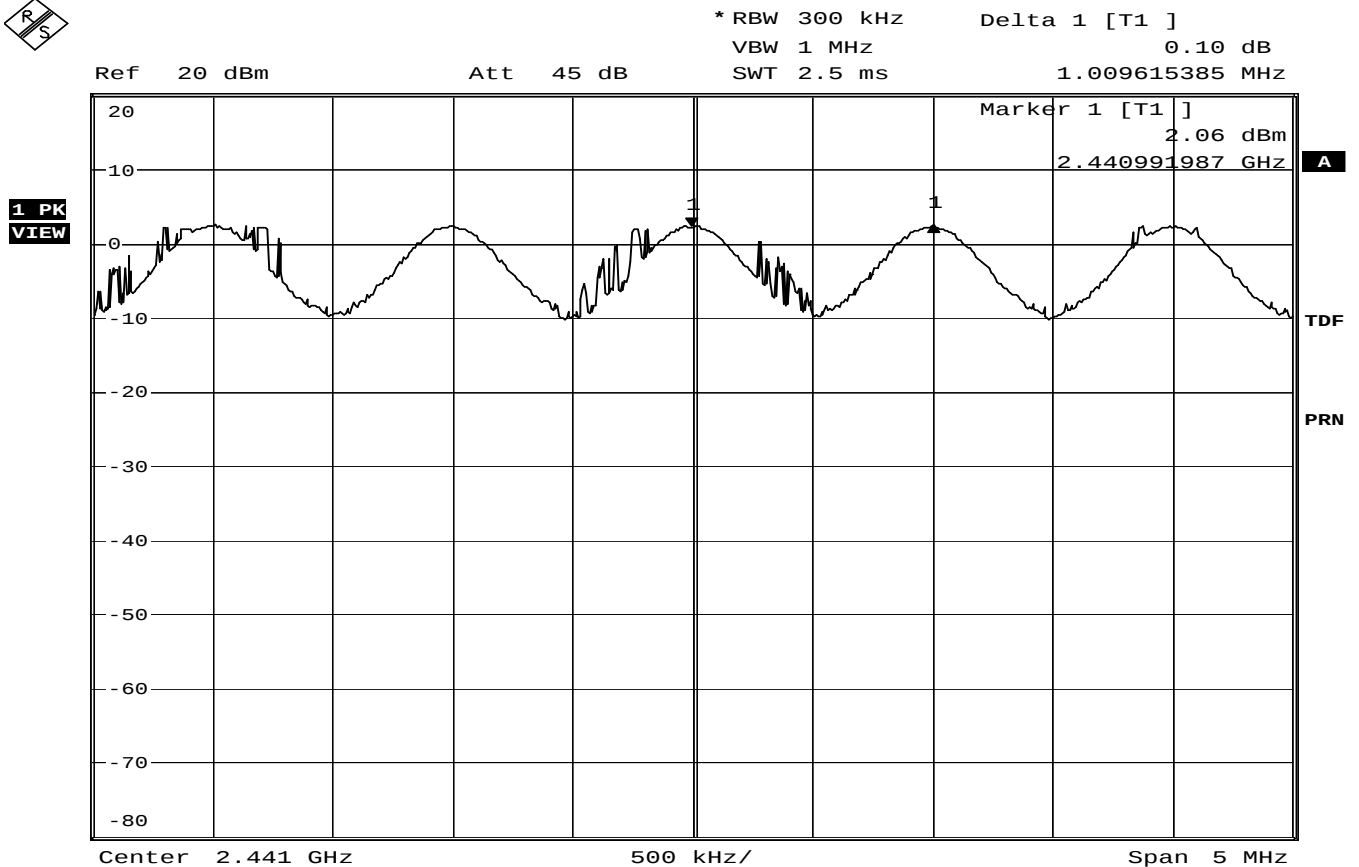
2.5.6 Test Result

The system channel separation is specified as being 1MHz. The measured channel separation from the plot below is: 1.009615MHz.

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

Remarks

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



Date: 1.AUG.2006 14:32:39

Trace showing separation between channels

2.6 NUMBER OF HOPPING CHANNELS

2.6.1 Specification Reference

FCC Part 15.247(a)(1)

2.6.2 Equipment Under Test

DC2006a Bluetooth Radio

2.6.3 Date of Test

1st August 2006

2.6.4 Test Equipment Used

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

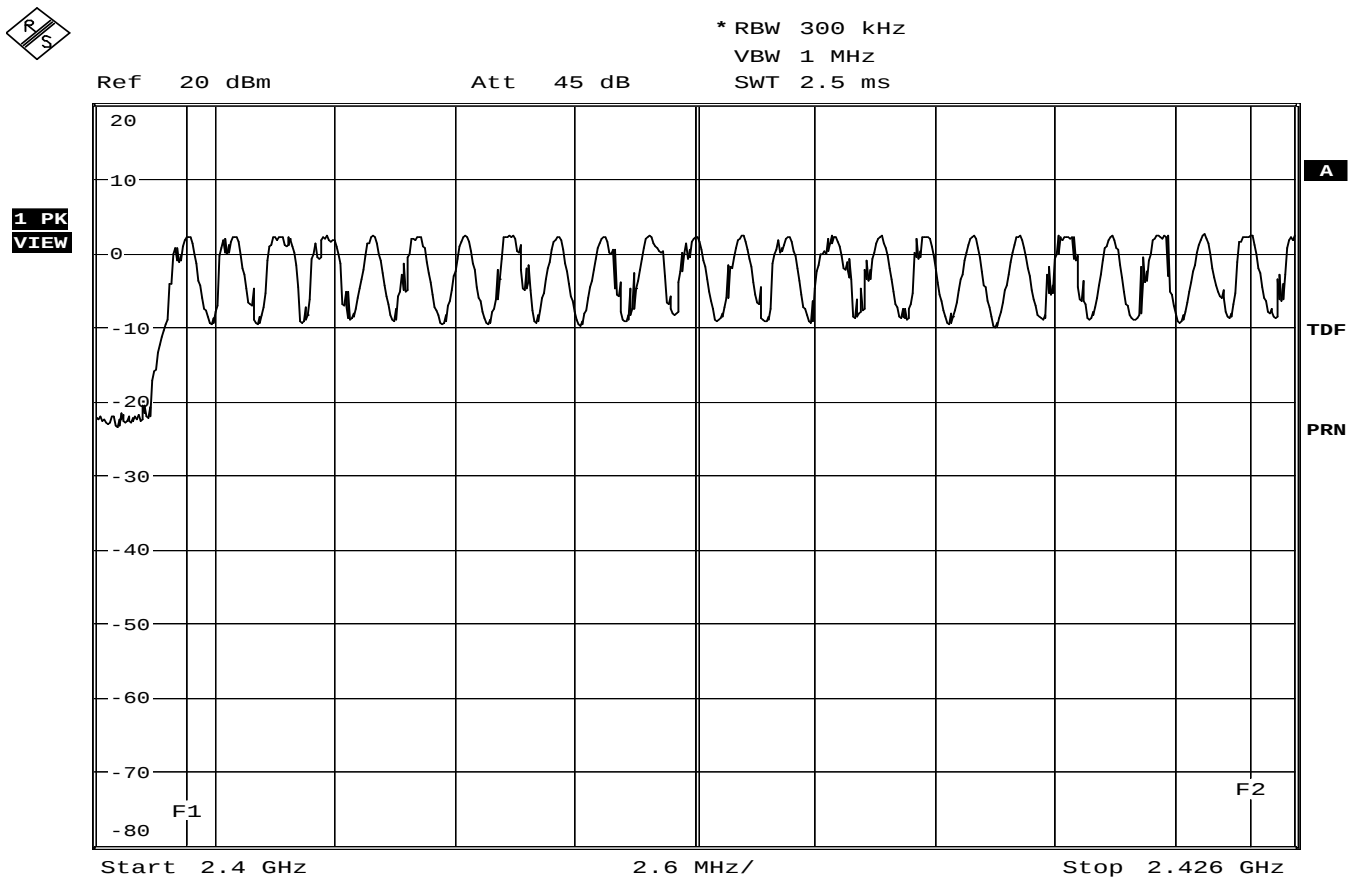
2.6.5 Test Procedure

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.

2.6 NUMBER OF HOPPING CHANNELS

2.6.6 Test Results

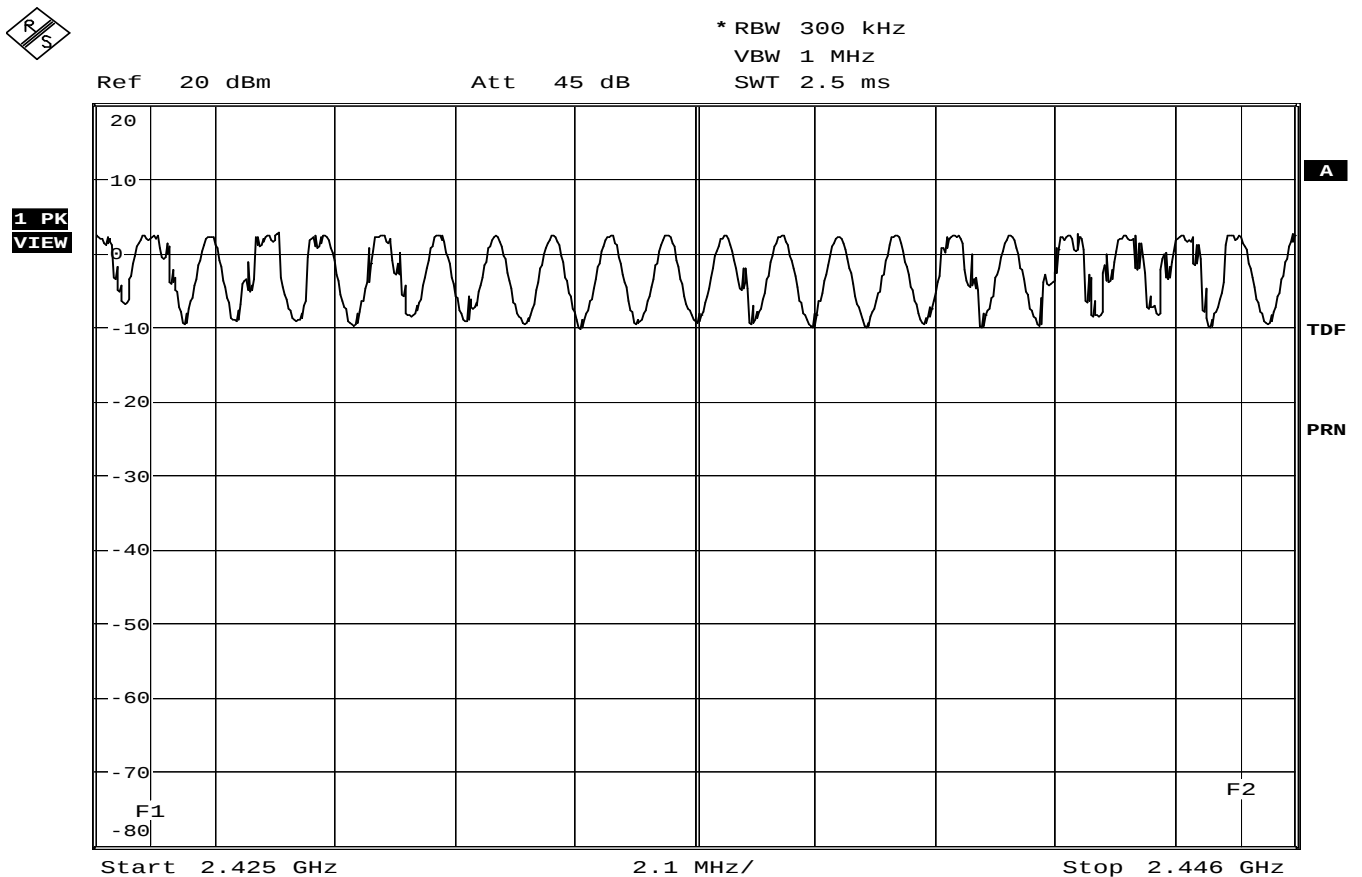


Date: 1.AUG.2006 14:54:09

Trace Showing Channels 0 - 23

2.6 NUMBER OF HOPPING CHANNELS

2.6.6 Test Results - continued

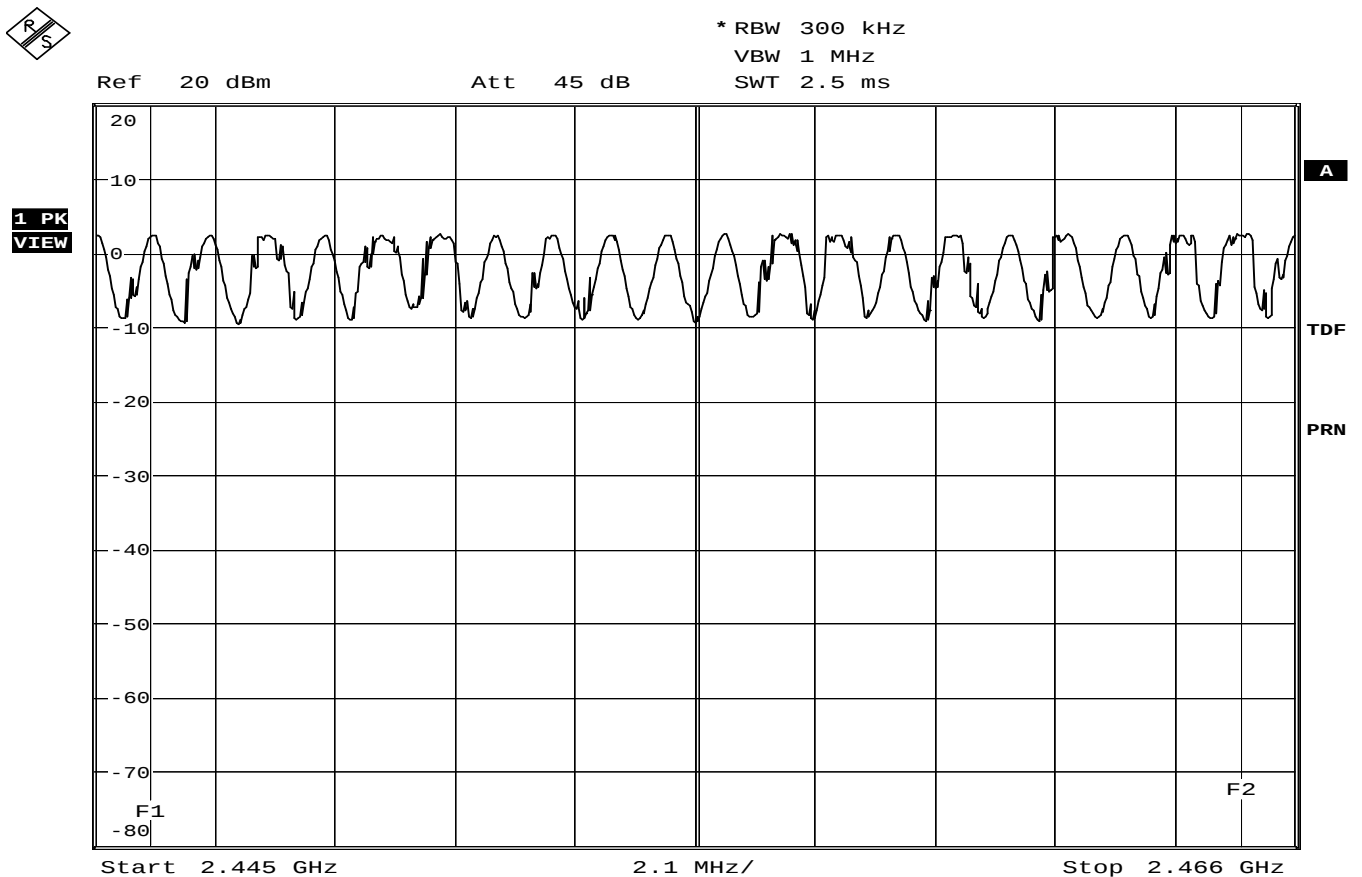


Date: 1.AUG.2006 14:55:50

Trace Showing Channels 24 - 43

2.6 NUMBER OF HOPPING CHANNELS

2.6.6 Test Results - continued



Date: 1.AUG.2006 14:59:05

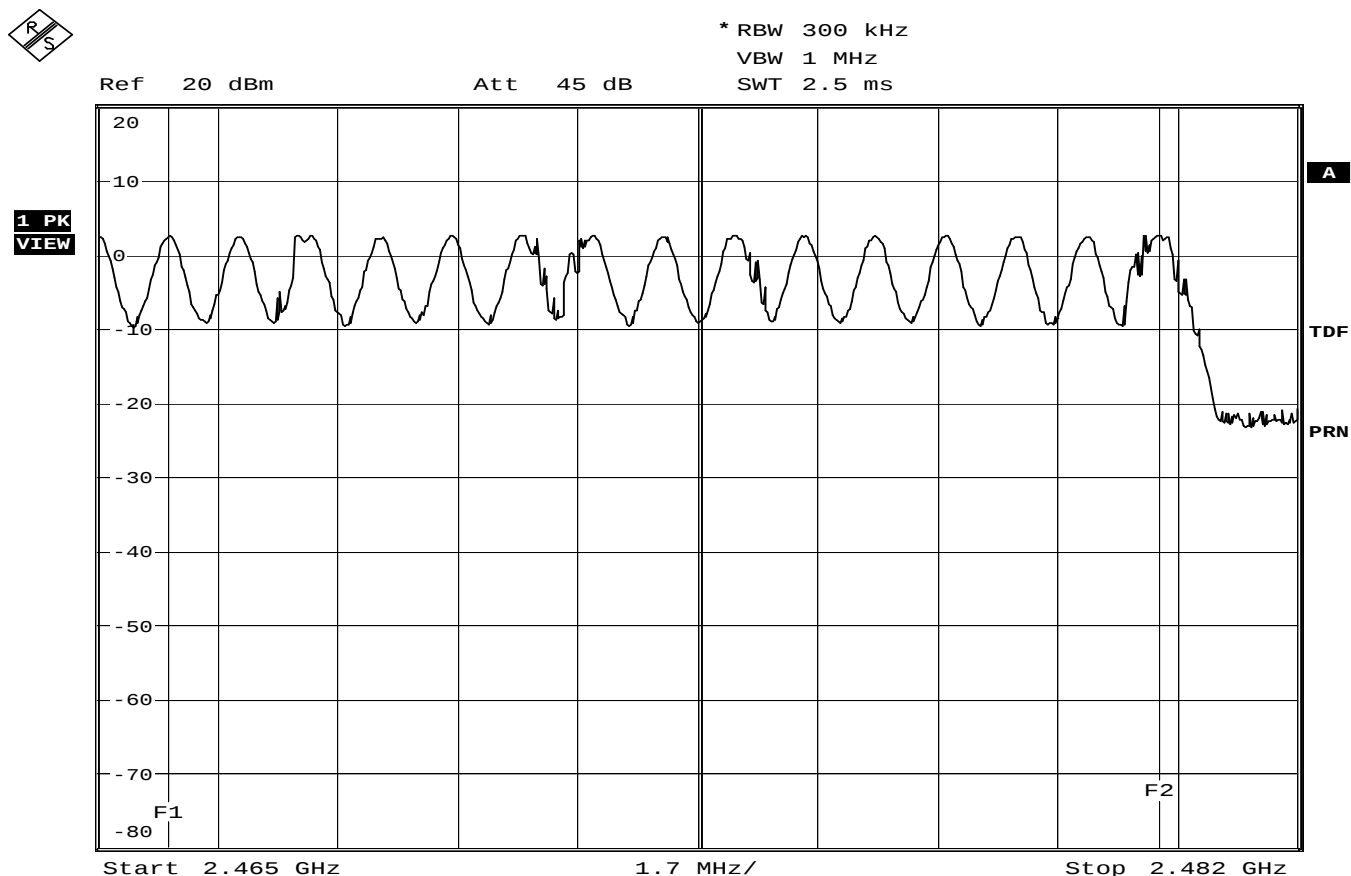
Trace Showing Channels 44 - 63



Product Service

2.6 NUMBER OF HOPPING CHANNELS

2.6.6 Test Results - continued



Date: 1.AUG.2006 15:02:01

Trace Showing Channels 64 – 78

Limit	≥75 channels
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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

DC2006a Bluetooth Radio

2.7.3 Date of Test

1st August 2006

2.7.4 Test Equipment Used

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

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.

2.7.6 Test Results

Frequency (MHz)	Output Power (dBm)	Result (mW)
2402.0	+2.34	1.71
2441.0	+2.49	1.77
2480.0	+2.61	1.82

DH1 Results

Frequency (MHz)	Output Power (dBm)	Result (mW)
2402.0	+2.33	1.71
2441.0	+2.50	1.78
2480.0	+2.60	1.82

DH3 Results



2.7 MAXIMUM PEAK OUTPUT POWER

2.7.6 Test Results - continued

Frequency (MHz)	Output Power (dBm)	Result (mW)
2402.0	+2.26	1.68
2441.0	+2.50	1.78
2480.0	+2.61	1.82

DH3 Results

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(d)

2.8.2 Equipment Under Test

DC2006a Bluetooth Radio

2.8.3 Date of Test

1st August 2006

2.8.4 Test Equipment Used

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

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 path loss was measured for each band and was used as a transducer to factor in the Spectrum Analyser.

Remarks

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

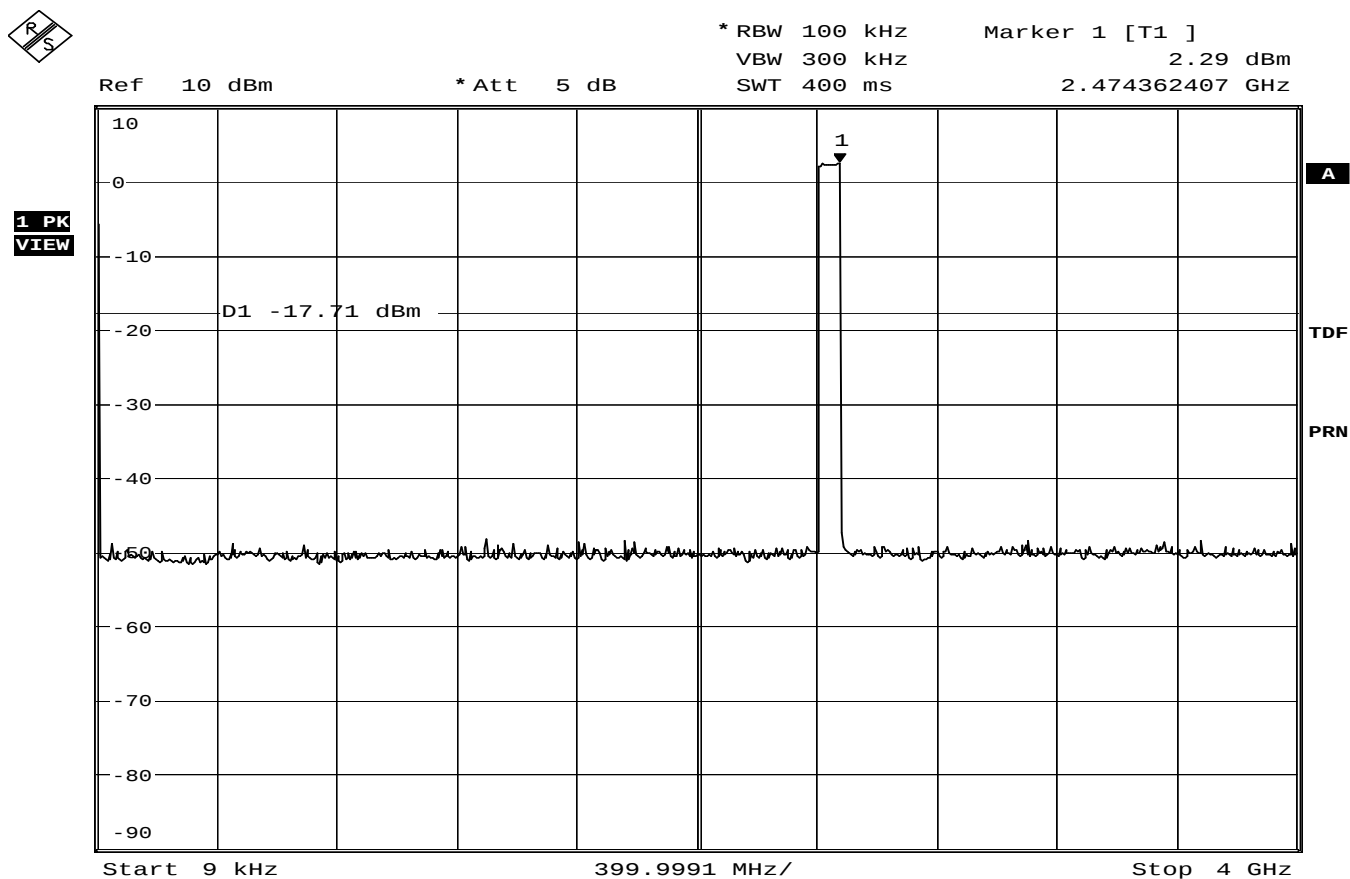
The plots on the following pages show the frequency spectrum from 9kHz to 25GHz of the EUT.



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results



Date: 1.AUG.2006 16:16:53

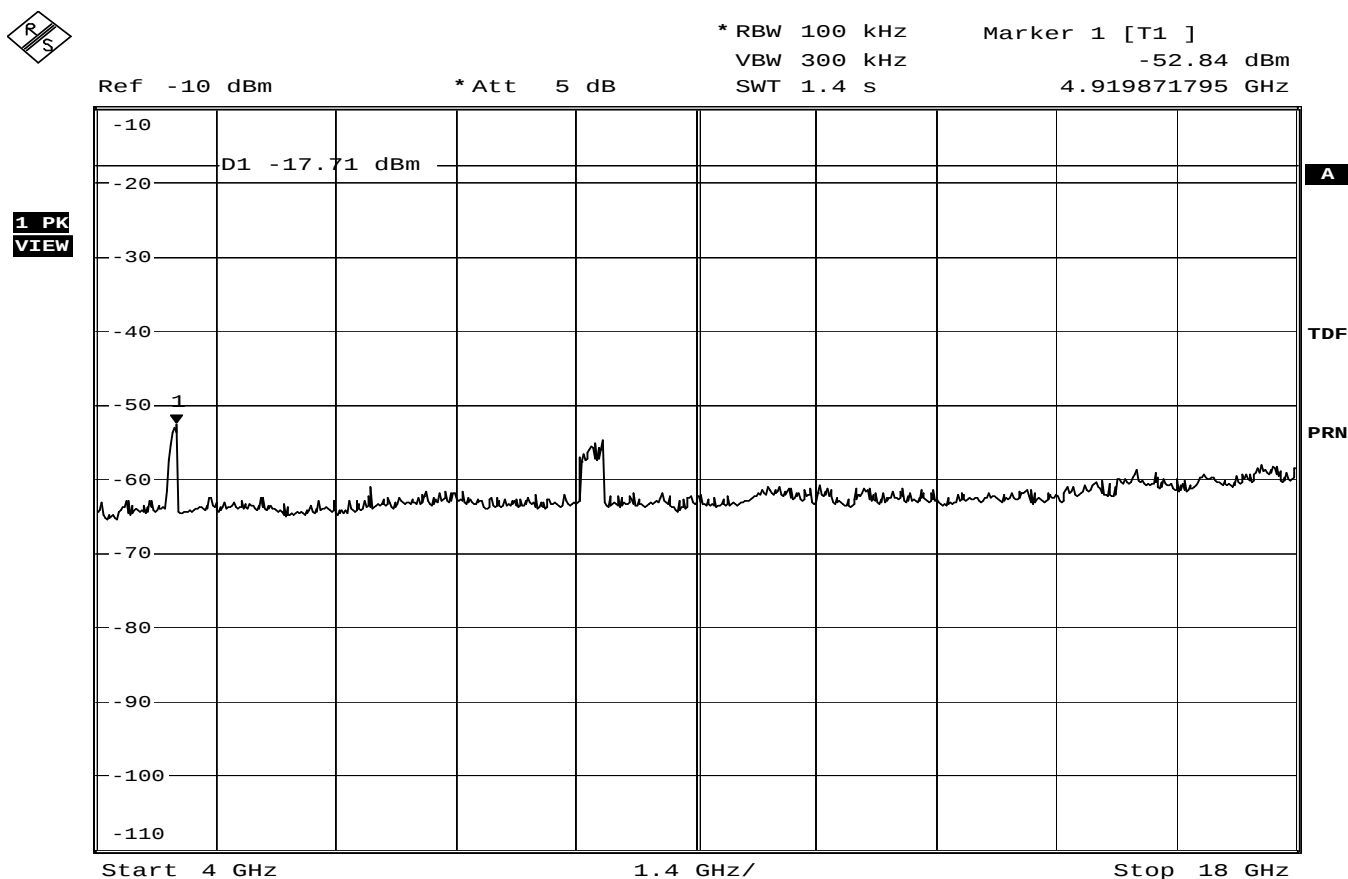
Spurious Conducted Emissions (9kHz – 4GHz)
Frequency Hopping On All Channels – Maximum Power DH1



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results - continued



Date: 1.AUG.2006 17:31:02

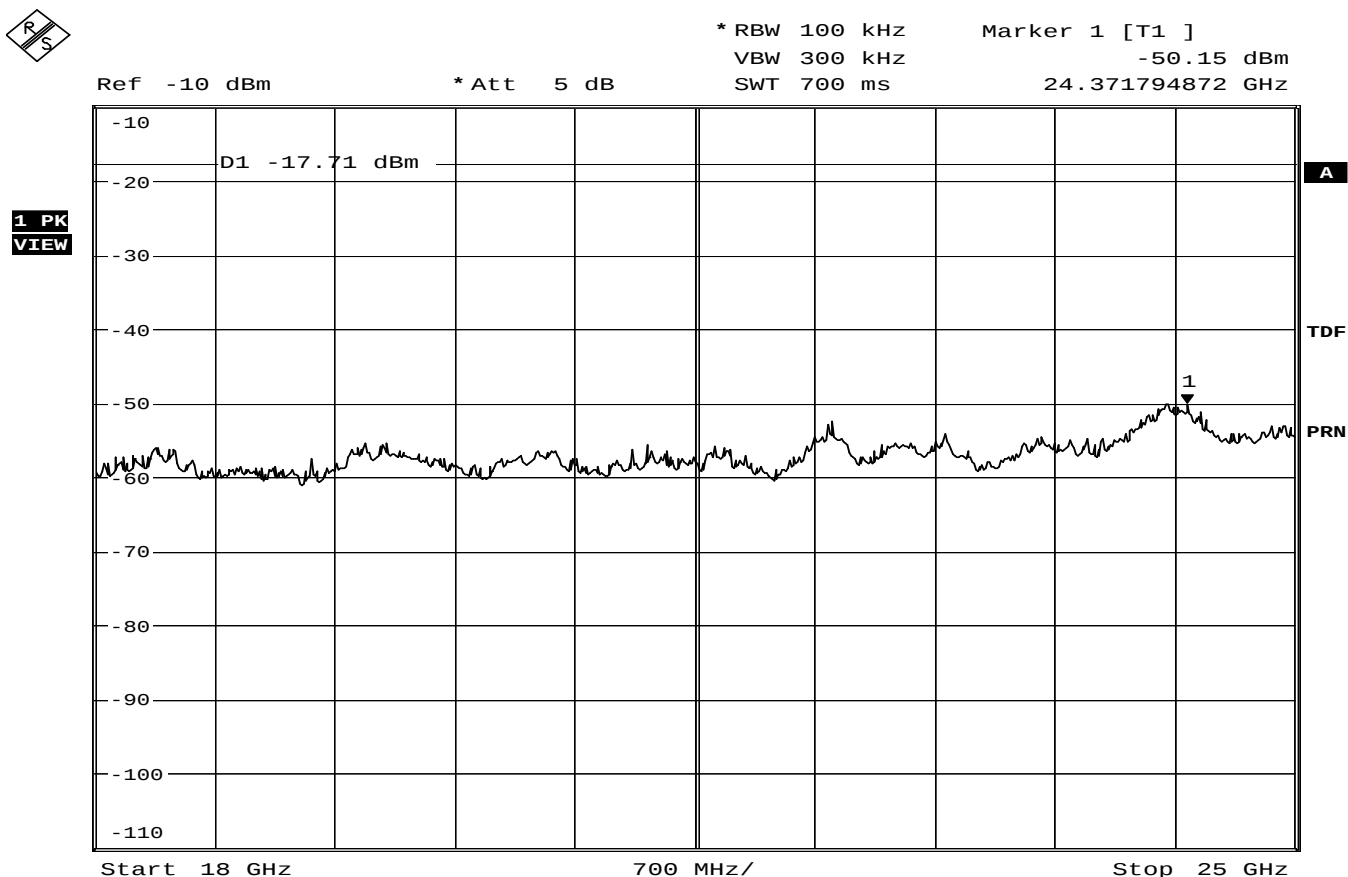
Spurious Conducted Emissions (4GHz – 18GHz)
Frequency Hopping On All Channels – Maximum Power DH1



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results - continued



Date: 1.AUG.2006 17:13:57

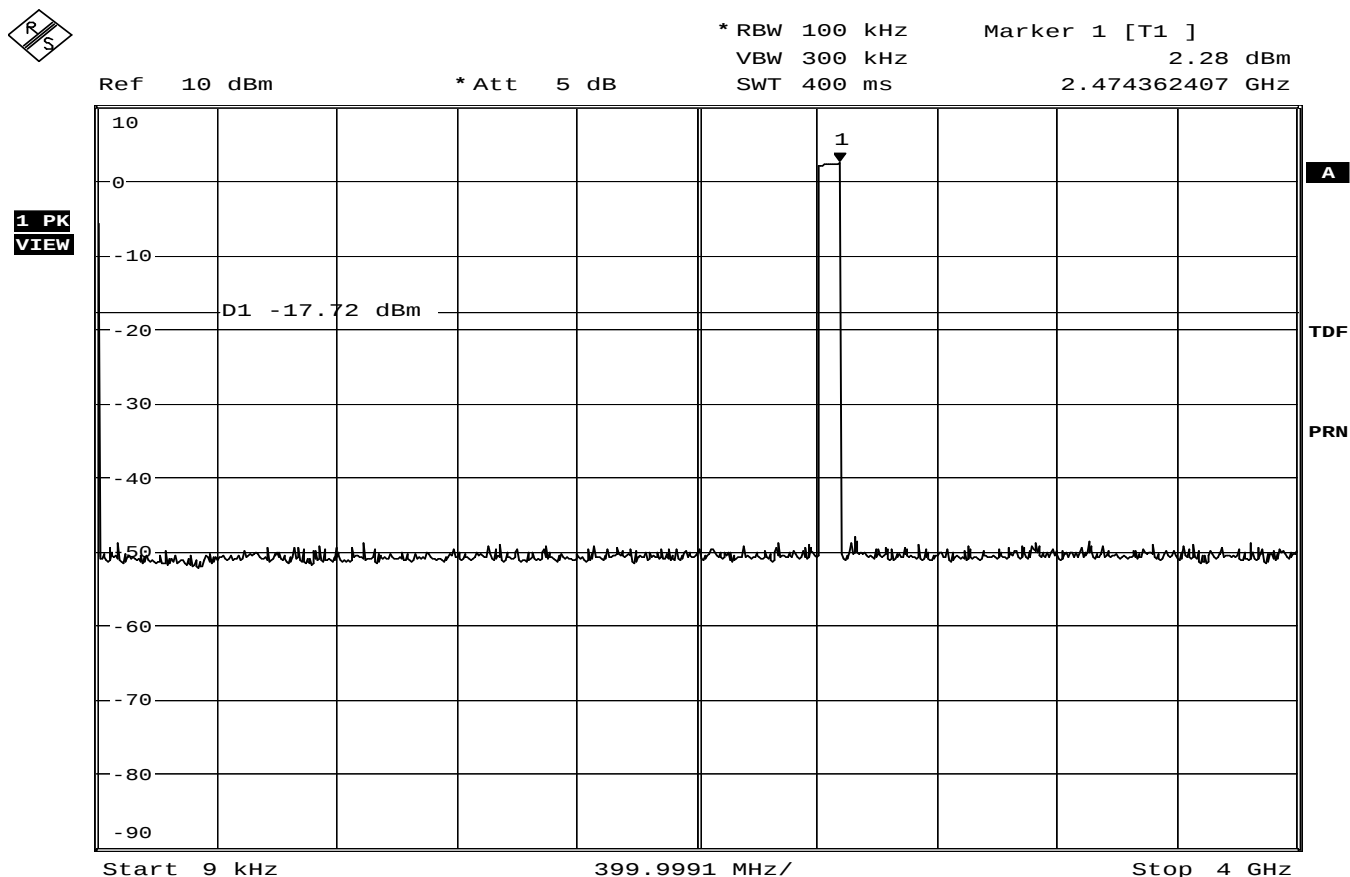
Spurious Conducted Emissions (18GHz – 25GHz)
Frequency Hopping On All Channels – Maximum Power DH1



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results - continued



Date: 1.AUG.2006 16:19:05

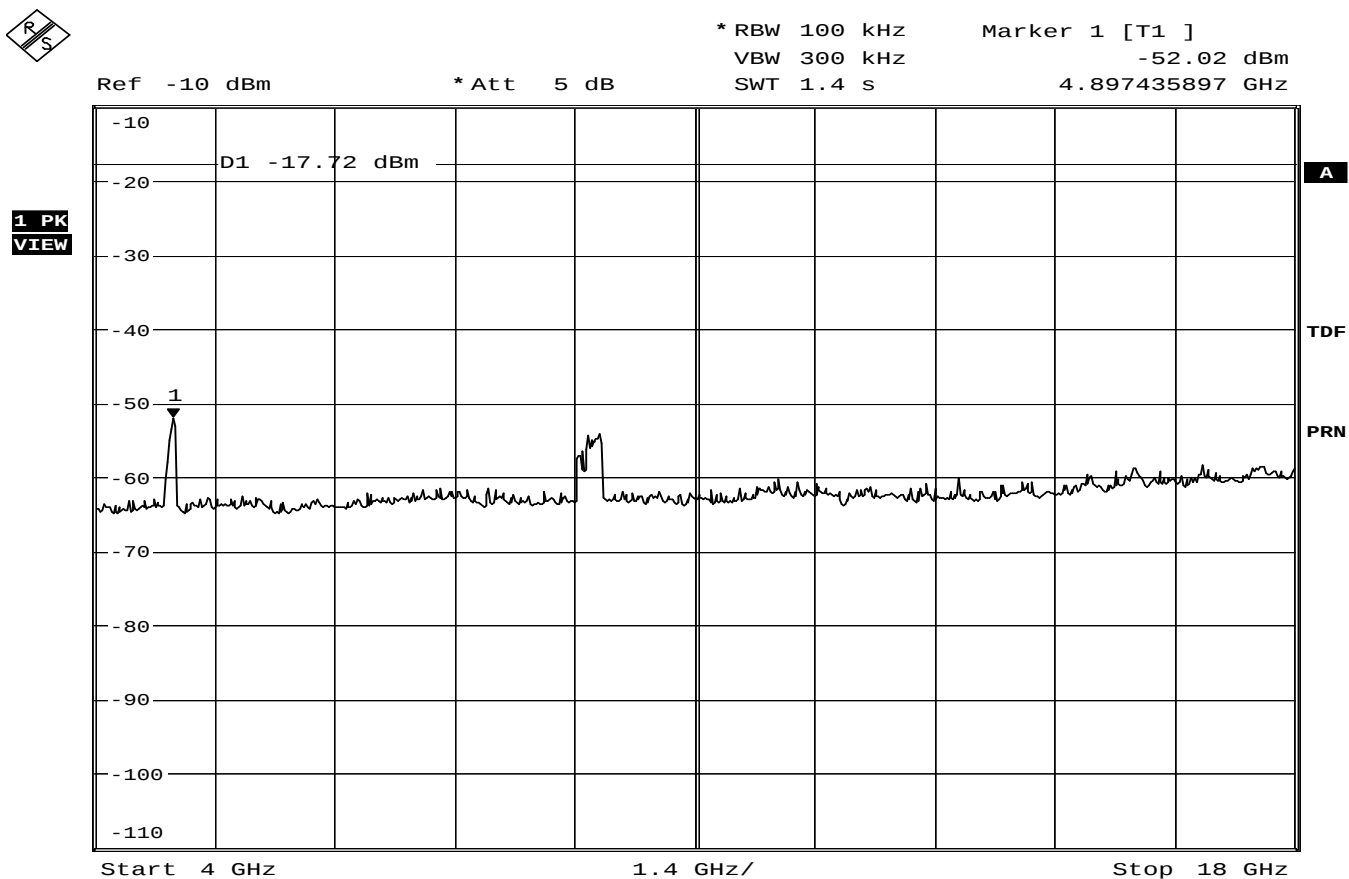
Spurious Conducted Emissions (9kHz – 4GHz)
Frequency Hopping On All Channels – Maximum Power DH3



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results - continued



Date: 1.AUG.2006 17:27:43

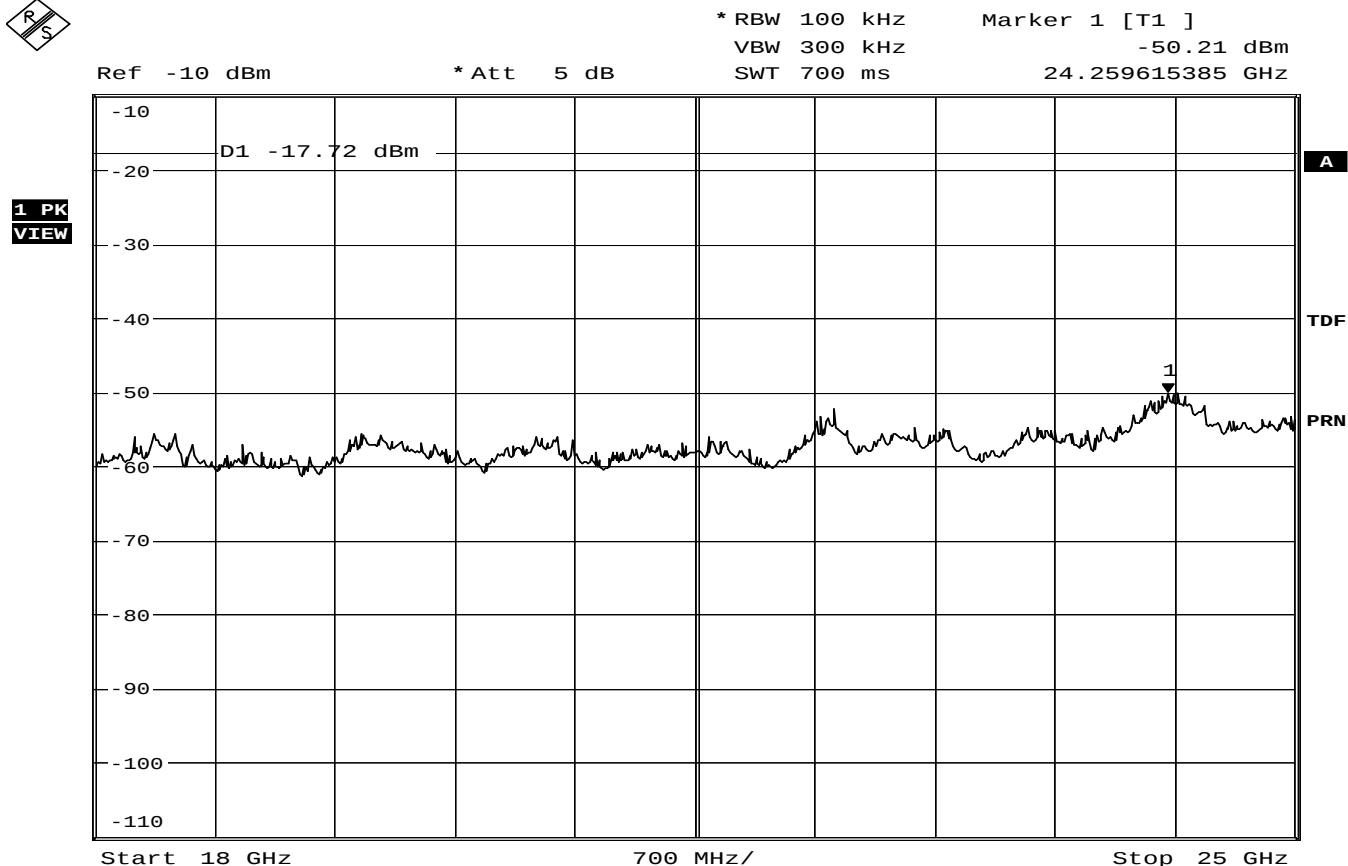
Spurious Conducted Emissions (4GHz – 18GHz)
Frequency Hopping On All Channels – Maximum Power DH3



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results - continued



Date: 1.AUG.2006 17:15:44

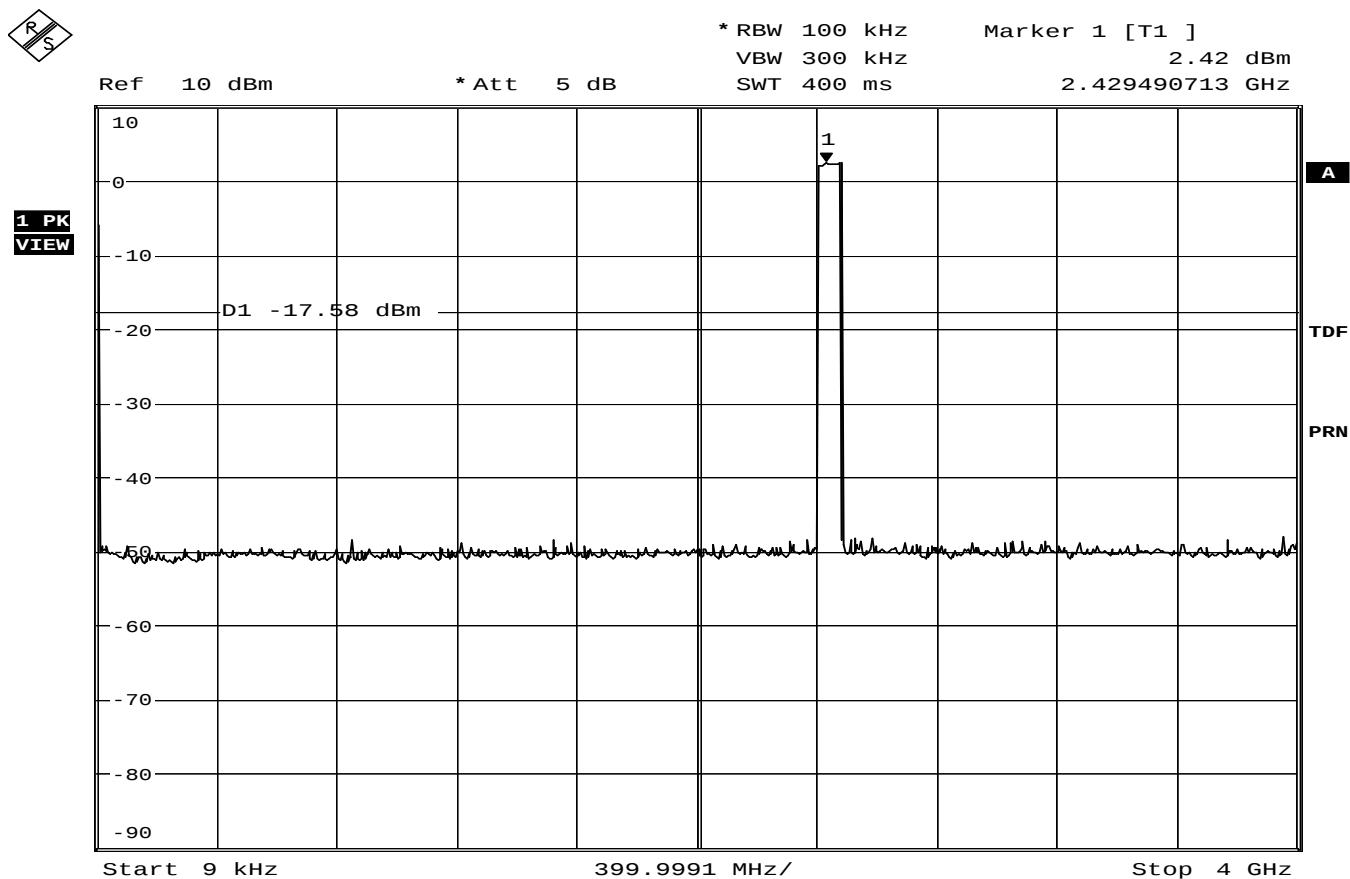
Spurious Conducted Emissions (18GHz – 25GHz)
Frequency Hopping On All Channels – Maximum Power DH3



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results - continued



Date: 1.AUG.2006 16:23:14

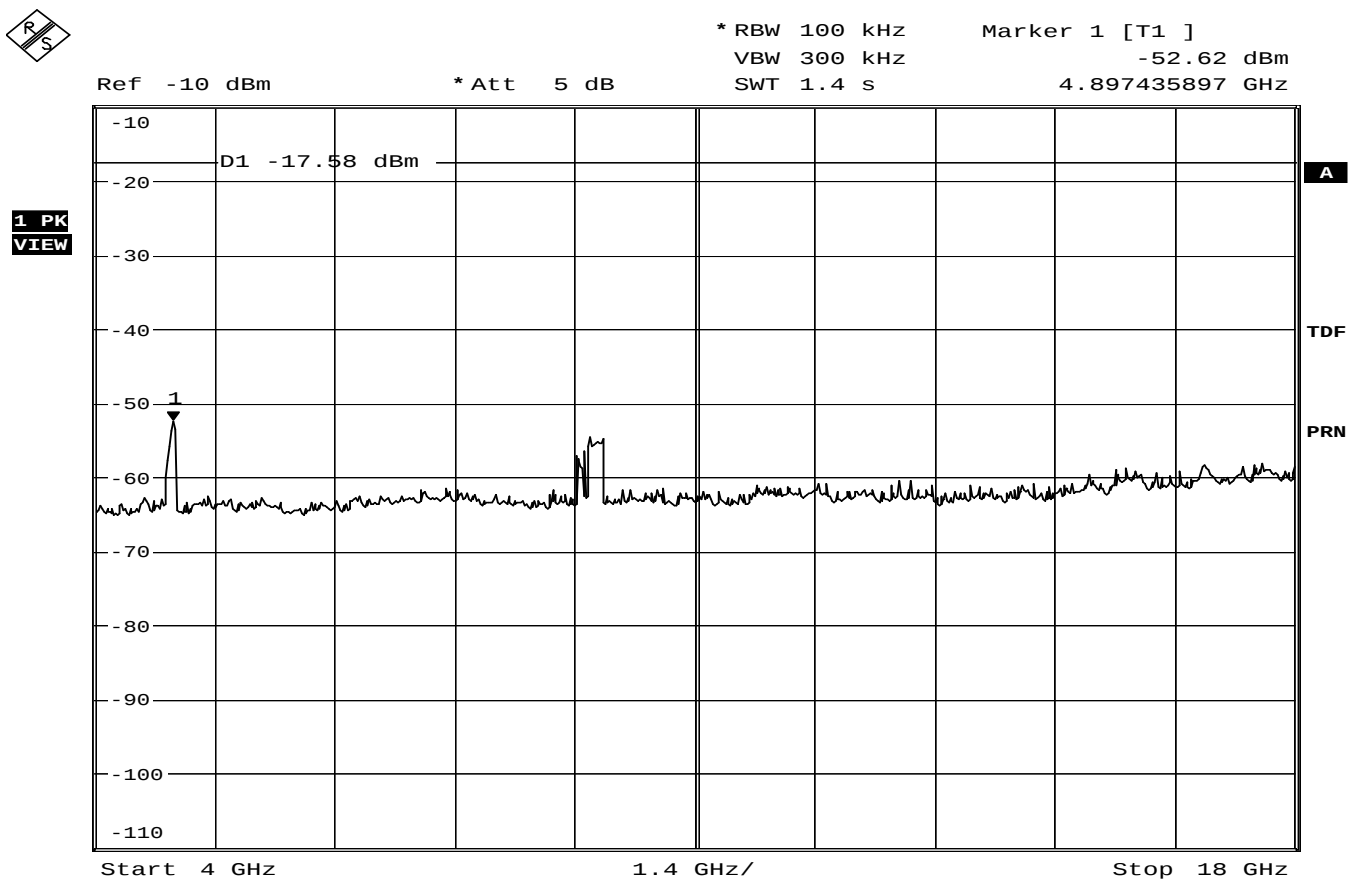
Spurious Conducted Emissions (9kHz – 4GHz)
Frequency Hopping On All Channels – Maximum Power DH5



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results - continued



Date: 1.AUG.2006 17:22:26

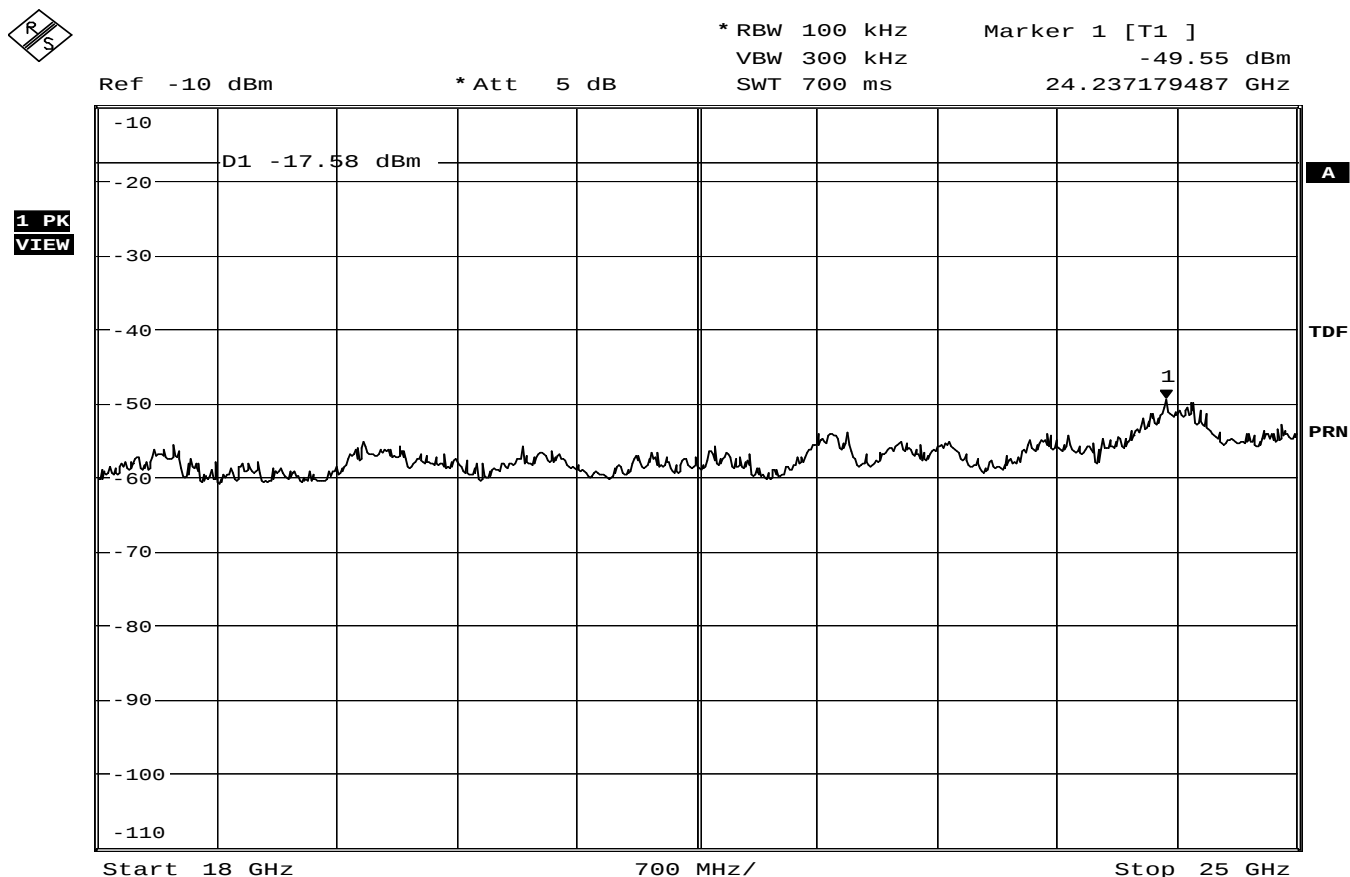
Spurious Conducted Emissions (4GHz – 18GHz)
Frequency Hopping On All Channels – Maximum Power DH5



Product Service

2.8 SPURIOUS CONDUCTED EMISSIONS

2.8.6 Test Results - continued



Date: 1.AUG.2006 17:17:15

Spurious Conducted Emissions (18GHz – 25GHz)
Frequency Hopping On All Channels – Maximum Power DH5

2.9 MAXIMUM PEAK OUTPUT POWER (EIRP Method)

2.9.1 Specification Reference

FCC CFR 47: Part 15 Subpart C, Section 15.247(b)(1)

2.9.2 Equipment Under Test

DC2006a Bluetooth Radio

2.9.3 Date of Test

2nd and 3rd August 2006

2.9.4 Test Equipment Used

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

2.9.5 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.



Product Service

2.9 MAXIMUM PEAK OUTPUT POWER (EIRP Method)

2.9.6 Test Results - continued

The EUT met the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(b)(1) for Maximum Peak Output Power.

Measurements were made with the EUT in Mode 1.

Frequency (MHz)	Result EIRP (dBm)	Result EIRP (mW)
2402	-2.5	0.56
2441	-0.1	0.97
2480	-1.3	0.74
Limit	<+36dBm or <4W	

2.10 SPURIOUS RADIATED EMISSIONS

2.10.1 Specification Reference

FCC Part 15.247(d)

2.10.2 Equipment Under Test

DC2006a Bluetooth Radio

2.10.3 Date of Test

2nd to 4th August 2006

2.10.4 Test Equipment Used

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

2.10.5 Test Procedure

Testing to the requirements of FCC CFR 47: Part 15 Subpart C, Section 15.247(d), for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed in Annex A. Section 15.247(d) also requires Rule parts 15.205 and 15.209 to be applied.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the Equipment Under Test (EUT) on a remotely controlled turntable within a semi-anechoic chamber; measurements were taken at a 3m distance unless otherwise stated. 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, a search was made in the frequency range 30MHz to 25GHz. The list of worst-case emissions was then confirmed or updated under Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

30MHz – 1GHz emissions levels were then formally measured using a CISPR Quasi-Peak detector.

1GHz – 25GHz emissions levels were then formally measured using Peak and Average detectors.

(Note: Peak measurements performed using a Resolution and Video Bandwidth of 1MHz, Average measurements performed using a Resolution Bandwidth of 1MHz and a Video Bandwidth of 10Hz)

The EUT was operating via the internal power supply of the Host.

Measurements were made with the EUT transmitting on the following channels.

Channel 1: 2402 MHz
Channel 6: 2441 MHz
Channel 11: 2480 MHz

2.10 SPURIOUS RADIATED EMISSIONS

2.10.5 Test Procedure - continued

Spurious Radiated Emissions from 30MHz to 25GHz were made using a Rhode and Schwarz ESIB 40 Test Receiver and performed on an Alternative Open Area Test Site.

The test was performed in accordance with ANSI C63.4.

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

Equipment Designation: Intentional Radiator.

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

2.10 SPURIOUS RADIATED EMISSIONS

2.10.6 Test Results

Measurement of radiated carrier field strength on top, middle and bottom channels are detailed in the table below.

EUT Transmitting on Bottom, Middle and Top Channels (2402MHz, 2441MHz and 2480MHz)

30MHz – 1GHz Test Site Results

Noise Floor Measurements

Frequency	Polarisation	Height	Azimuth	Field Strength		Limit	
MHz		cm	degree	dBµV/m	µV/m	dBµV/m	µV/m
35.02	Vertical	100	0	19.78	9.7	40.0	100
35.00	Horizontal	100	0	18.63	8.5	40.0	100
513.75	Vertical	100	0	19.99	9.7	46.0	200
515.62	Horizontal	100	0	21.02	11.2	46.0	200
993.75	Vertical	100	0	26.58	21.1	54.0	500
994.70	Horizontal	100	0	25.36	18.4	54.0	500

EUT Transmitting on Bottom, Middle and Top Channels (2402MHz, 2441MHz and 2480MHz)

1GHz – 25GHz Test Site Results

Noise Floor Measurements

Frequency	Polarisation	Height	Azimuth	Field Strength		Limit	
GHz		cm	degree	dBµV/m	µV/m	dBµV/m	µV/m
1.100	Vertical	100	0	5.26	1.8	74.0	5011
5.800	Vertical	100	0	25.9	19.7	74.0	5011
9.100	Vertical	100	0	25.5	18.8	74.0	5011
14.000	Vertical	100	0	24.4	16.5	74.0	5011
17.172	Vertical	100	0	22.0	12.5	74.0	5011

2.11 MEASUREMENT AT THE BAND EDGE

2.11.1 Specification Reference

FCC CFR 47: Part 15 Subpart C, Section 15.205

2.11.2 Equipment Under Test

DC2006a Bluetooth Radio

2.11.3 Date of Test

2nd August 2006

2.11.4 Test Equipment Used

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

2.11.5 Test Procedure

Test Performed in accordance with ANSI C63.4.

Measurements were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations together with the EUT azimuth and antenna polarisation.

Emission levels in the restricted bands were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

The measurements were performed at a 3m distance.

With the EUT operating at 2402MHz (Bottom Channel) and 2480MHz (Top Channel) measurements were performed at the band edges. In the bands 2310MHz to 2390MHz and 2483.5MHz to 2500MHz, the emissions were more than 10dB below the limit.

2.11.6 Test Results

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



Product Service

SECTION 3

TEST EQUIPMENT

3.1 TEST EQUIPMENT

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.2, 2.3 and 2.4 Radio (Tx) - Channel Dwell Time				
Dual Power Supply Unit	Hewlett Packard	6253A	292	TU
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	13/07/2007
Power Divider	Weinschel	1506A	601	TU
Multimeter	Iso-tech	Iso Tech IDM101	2424	10/08/2006
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	03/02/2007
Hygrometer	Rotronic	I-1000	2891	20/12/2006
Attenuator dc - 18GHz	Suhner	6810.17.B	2966	01/02/2007
1m N(m)-N(m) RF Cable	Reynolds	269-0088-1000 0201	3078	27/07/2007
Signal Generator: 10MHz to 40GHz	Rohde & Schwarz	SMR40	3171	29/06/2007
1m RF Cable sma-sma	Reynolds	262-0248-1000	3221	27/07/2007
Bluetooth Tester	Tescom	TC-300A	S/N 3000A310042	TU
Section 2.8 Radio (Tx) - Conducted Spurious Emissions				
Dual Power Supply Unit	Hewlett Packard	6253A	292	TU
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	13/07/2007
Power Divider	Weinschel	1506A	601	TU
Multimeter	Iso-tech	Iso Tech IDM101	2424	10/08/2006
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	03/02/2007
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	18/05/2007
Hygrometer	Rotronic	I-1000	2891	20/12/2006
Attenuator dc - 18GHz	Suhner	6810.17.B	2966	01/02/2007
1m N(m)-N(m) RF Cable	Reynolds	269-0088-1000 0201	3078	27/07/2007
Signal Generator: 10MHz to 40GHz	Rohde & Schwarz	SMR40	3171	29/06/2007
1m RF Cable sma-sma	Reynolds	262-0248-1000	3221	27/07/2007
Waveguide	FMI UK	200935-10	-	TU
Bluetooth Tester	Tescom	TC-300A	S/N 3000A310042	TU

3.1 TEST EQUIPMENT

Section 2.6 Radio (Tx) - Number of Channels				
Dual Power Supply Unit	Hewlett Packard	6253A	292	TU
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	13/07/2007
Power Divider	Weinschel	1506A	601	TU
Multimeter	Iso-tech	Iso Tech IDM101	2424	10/08/2006
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	03/02/2007
Hygrometer	Rotronic	I-1000	2891	20/12/2006
Attenuator dc - 18GHz	Suhner	6810.17.B	2966	01/02/2007
1m N(m)-N(m) RF Cable	Reynolds	269-0088-1000 0201	3078	27/07/2007
Signal Generator: 10MHz to 40GHz	Rohde & Schwarz	SMR40	3171	29/06/2007
1m RF Cable sma-sma	Reynolds	262-0248-1000	3221	27/07/2007
Bluetooth Tester	Tescom	TC-300A	S/N 3000A310042	TU
Section 2.1 Radio (Tx) - Occupied Bandwidth				
Dual Power Supply Unit	Hewlett Packard	6253A	292	TU
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	13/07/2007
Power Divider	Weinschel	1506A	601	TU
Multimeter	Iso-tech	Iso Tech IDM101	2424	10/08/2006
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	03/02/2007
Hygrometer	Rotronic	I-1000	2891	20/12/2006
Attenuator dc - 18GHz	Suhner	6810.17.B	2966	01/02/2007
1m N(m)-N(m) RF Cable	Reynolds	269-0088-1000 0201	3078	27/07/2007
Signal Generator: 10MHz to 40GHz	Rohde & Schwarz	SMR40	3171	29/06/2007
1m RF Cable sma-sma	Reynolds	262-0248-1000	3221	27/07/2007
Bluetooth Tester	Tescom	TC-300A	S/N 3000A310042	TU

3.1 TEST EQUIPMENT

Section 2.9 EMC - Radiated Emissions				
Spectrum Analyser	Hewlett Packard	8542E	18	09/02/2007
Signal Generator	Marconi	2031	53	20/12/2006
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	22/06/2008
Amplifier	Miteq Corp	AMF-3D-001080-18-13P	231	TU
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	29/06/2007
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	29/06/2007
Amplifier (Low Noise, 18GHz-40GHz)	Narda	NARDA DB02-0447	240	15/06/2007
Dual Power Supply Unit	Thurlby	PL320	288	TU
Variac	R.S Components	8 AMP	290	TU
Antenna (Bilog)	Schaffner	CBL 6143	316	TU
Communications Tester	Rohde & Schwarz	CMU 200	442	11/05/2007
Filter (High Pass, 3GHz)	RLC Electronics	F-100-3000-5-R	563	01/11/2006
Filter (High Pass, 4GHz)	Sematron	F-100-4000-5-R	564	TU
Test Receiver	Rohde & Schwarz	ESIB40	1006	07/04/2007
Mast Controller	Inn-Co GmbH	CO 1000	1606	TU
Turntable/Mast Controller	EMCO	2090	1607	TU
EMI Test Receiver	Rohde & Schwarz	ESIB26	2028	13/06/2007
Amplifier (8GHz-18GHz)	Avantec	AWT-18036	2821	TU
Filter, High Pass	RLC Electronics	RLC-F100-1500-S-R	2843	TU
Bilog Antenna	Chase	CBL6143	2904	10/11/2007
Comb Generator	Schaffner	RSG1000	3034	TU
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	11/03/2007
Signal Generator: 10MHz to 40GHz	Rohde & Schwarz	SMR40	3171	29/06/2007

3.1 TEST EQUIPMENT

Section 2.7 Radio (Tx) - Power Characteristics				
Dual Power Supply Unit	Hewlett Packard	6253A	292	TU
Attenuator 10dB/10W)	Trilithic	HFP-50N	454	13/07/2007
Power Divider	Weinschel	1506A	601	TU
Multimeter	Iso-tech	Iso Tech IDM101	2424	10/08/2006
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	03/02/2007
Hygrometer	Rotronic	I-1000	2891	20/12/2006
Attenuator dc - 18GHz	Suhner	6810.17.B	2966	01/02/2007
1m N(m)-N(m) RF Cable	Reynolds	269-0088-1000 0201	3078	27/07/2007
Signal Generator: 10MHz to 40GHz	Rohde & Schwarz	SMR40	3171	29/06/2007
1m RF Cable sma-sma	Reynolds	262-0248-1000	3221	27/07/2007
Bluetooth Tester	Tescom	TC-300A	S/N 3000A310042	TU

TU Traceability Unscheduled



3.2 MEASUREMENT UNCERTAINTY

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

In the frequency range 30MHz to 1000MHz

For 20dB Bandwidth

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

For Maximum Output Power

Amplitude	$\pm 0.5\text{dB}$
-----------	--------------------

For Spurious Radiated Emissions, Quasi-Peak Measurements using the ESIB 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	$\pm 1.8\text{dB}$
-----------	--------------------

For Spurious Conducted Emissions

Amplitude	$\pm 3.0\text{dB}$
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Product Service

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Front View of DC2006a Handset



Rear View of DC2006a Handset

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



Open View of DC2006a Handset



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
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ANNEX A

QUALIFIED PRODUCT NOTICE



Product Service



Qualified Product Notice

BQB: Andreas Grünwaldt
7 layers AG, Borsigstrasse 11, 40880 Ratingen, Germany

1	applicants details: member ☒ private label product ☐	
	applicant: Texas Instruments	person responsible: Toulitou Thierry
	address : 26 Zarchin st. Rannana, Israel	phone: +972 9 7476969
		fax: +972 9 7430951
		email: t-toulitou@ti.com
2 manufacturers details (if not the applicant):		
manufacturer: see above		
address : N.A.		
3 equipment:		
brand name: BRF6150		
product type: Component-HW-Integrated		
sup. profiles: N.A.		
identifier: BRF6150		
HW version: 2.23, 2.25	SW version: 4.0.27	
4 reference documents:		
Test Case Reference List:	initial: 2004-10-01 update: 2005-05-01	
Test Case Reference List Addendum:	-	
Core Specification:	2.0	
Program Reference Document:	1.0	
5 QPN Identification:		
ref no. of QPN: GRA 003b 05	listing date: 2005-03-10	

Hereby I certify that the above named product is qualified in accordance with the above reference documents as a Bluetooth Component for the Covered Functionality defined in Annex A.

Ratingen, 2006-07-24
place, date

(original signed)
signature

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Qualified Product Notice

BQB: Andreas Grünwaldt
7 layers AG, Borsigstrasse 11, 40880 Ratingen, Germany

Annex A (Covered Functionality Declaration):

The Covered Functionality of this product is defined as follows:

1. RF part as defined in Part A of the Bluetooth Core Specification, Version 2.0 including all mandatory features and the following optional features:

- Power class 2
- Power control
- Support of 3-slot and 5-slot packages

The above mentioned functionality is valid under the following conditions:

- Normal temperature: +22°C
- Temperature range: -40°C to +85°C
- Nominal Voltage: +2.7 V
- Voltage range: +2.7 V
- Antenna gain: 0.0 dBi
- Antenna type: external
- Oscillator: external
- Component type: IC

2. Baseband as defined in Part B of the Bluetooth Core Specification, Version 2.0 including all mandatory features and all optional features with the exception of:

- Enhanced Data Rate
- SCO links from different masters
- AUX1 packet type
- Paging mode R0

The above mentioned functionality is valid under the following condition:

- Temperature range: -40°C to +85°C

3. Link Manager as defined in Part C of the Bluetooth Core Specification, Version 2.0 including all mandatory features and all optional features with the exception of:

- Broadcast encryption
- Enhanced Data Rate ACL
- Enhanced Data Rate eSCO
- Set up broadcast scan window
- Modify beacon parameter
- Optional paging schemes

Annex B (Integration Notes):

For integration and qualification procedure of this component into Bluetooth products the current "Guideline to integrate components including RF functionality" of BTAB shall be considered.

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page 2 of 3 pages



Qualified Product Notice

BQB: Andreas Grünwaldt
7 layers AG, Borsigstrasse 11, 40880 Ratingen, Germany

Annex C (Updates):

The HW was updated from 2.23 to 2.25. The covered functionality is not affected. All necessary re-qualification has been done. As result the following HW versions are qualified:

2.23 and 2.25

Annex D (Revision History):

Date	Reference	Comment
2005-03-10	GRA 003 05	First issue
2005-09-08	GRA 003a 05	Annex A corrected; Power control added
2006-07-24	GRA 003b 05	Add new HW version

* End of document *