



# Wireless Transceiver Test Report



FCC ID:A94404590

IC ID:3232A-404590

Certificate # 1514.1

**Report number:** EMC.404096A.09.192.2

**Prepared for:** Bose Corporation  
DCE - EMC  
1 New York Ave, Framingham MA 01701

**Product Tested:** SoundLink™ Adapter

**Standards:** FCC part 15, RSS210, RSS-gen and ICES-003

**Report prepared by:** Brent DeWitt

**Signature:** 

**Report reviewed by:** Peter Boers

**Signature:** 

**Report issue date:** August 28, 2009 revision 1

**Changes from  
previous revision:** First revision

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## 1. Report Summary

### 1.1 Product

SoundLink™ Adapter

Note: USB key not included in this test report

### 1.2 Client

Bose Corporation  
The Mountain, Framingham MA 01701

### 1.3 Applicable Standards

**FCC part 15.B and C**  
**RSS-210 issue 7**  
**RSS-Gen issue 2**  
**ICES-003 issue 4**

Test Results: Pass  Fail

### 1.4 Test Laboratory

Bose DCE laboratories  
1 New York Ave  
Framingham, MA 01701.

IC registration : 3232A  
FCC site registration under A2LA cert. #1514

This report relates only to the items tested.

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## 2. Product description

The SoundLink™ adapter enables the user to listen to music from a computer in any room you choose, with a wireless connection.

The SoundLink™ Adapter is classified as a data “sink” with a duty cycle that does not exceed 5% in normal operation. For the purposes of the tests described in this report, where an artificial test mode is indicated or necessary for the purposes of the test, the SoundLink™ Adapter is operated with a 10% duty cycle which is considered a worst case for the purposes of these tests.

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### 3. Applicable standards, requirements and tests

FCC part 15	RSS210	RSS-gen	Test references.	Result / Data section
15.15(b)		5.3	There are no user-accessible controls for the adjustment of any transmitter parameters in the device under test.	Complies
15.27			There are no special devices such as shielded cables or special connectors required for compliance to the applicable standards.	Complies
15.203			An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.  The antenna is not accessible by the user.	Complies
15.205	2.2		The device does not operate in either the US or Canadian restricted bands.	Complies
15.107 15.207		7.2.2	Conducted emissions, 150kHz–30 MHz	Section 6.1
15.109 15.209			Radiated emissions, 30MHz–1GHz Spurious emissions, 30MHz–1GHz	Section 6.2
15.247 (b)(1)	A8.4 (4)		Transmitter output power:	Section 6.3
15.247 (a)(1)	A8.1 (b)		Hopper Occupied Bandwidth / channel spacing	Section 6.4
15.247(a) (1) iii	A8.3 (1)		Time occupancy of a frequency hopper.	Section 6.5
15.247(d)	7.2.3		Transmitter conducted spurious emissions	Section 6.6
15.247(d)			Transmitter harmonics.	Section 6.7
15.247(d)	2.2(b)		Transmitted radiated spurious emissions	Section 6.8
	6(b)	7.2.3	Receiver Spurious emissions	Section 6.9
OET65	Canada Health and Safety code 6		MPE calculation	6.10

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## 4 Environmental Conditions

All testing is performed under the following conditions, unless otherwise defined in the detail test report section.

Temperature:  $22 \pm 4$  °C

Humidity: 30 – 60 % RH

## 5. EUT configuration.

In some situations, the SoundLink™ Adapter it may be operated from the mains via a wall-mount power supply which provides 5V DC to the EUT. Conducted emissions are measured at the AC mains plug of this wall-mount power supply.

For the purposes of tests, the volume is adjusted for maximum emissions and then the remote control is removed from the test field. The remote control operates via infra-red transmission.

The 2.4 GHz data link can force the EUT into specific test modes. Specific EUT firmware is loaded to enable this test functionality.

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## 6. Detailed Test Results.

### 6.1. Conducted emissions.

#### 6.1.1. Requirements

47CFR15.207

Frequency MHz	Limits dB( $\mu$ V)	
	Quasi-peak	Average
0.15 -0.5	66-56	56-46
0.5 – 1.6	56	46
1.6 – 30	60	50

#### 6.1.2. Test setup details

The EUT was tested in accordance with ANSI C63.4 test setup conditions in a typical user configuration.

#### 6.1.3. Test data

##### Summary

No conducted emissions were found above the noise floor of the instrumentation using maximum peak detection. See plots below for noise floor levels versus frequency.

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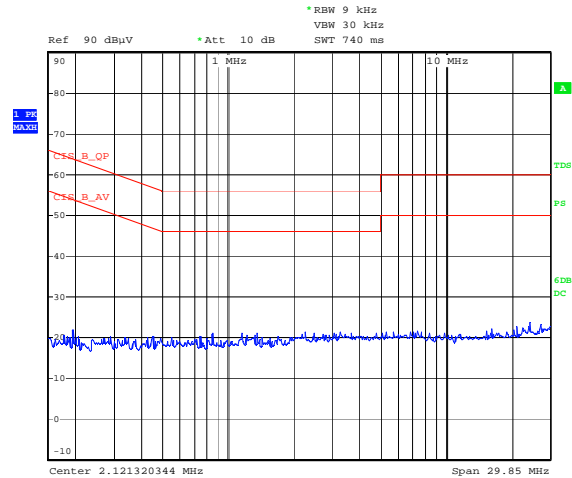
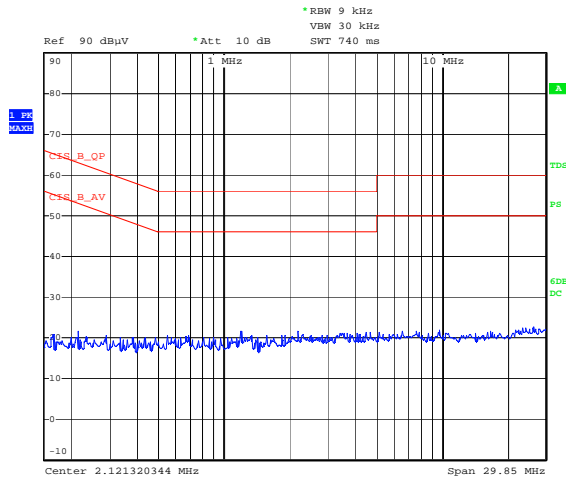
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## Detail data

Plot #1 & 2, 120V AC 60Hz, Neutral and Line side



Date: 14.JUL.2009 12:37:21

Date: 14.JUL.2009 12:35:05

### 6.1.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	due date
LISN	EMCO	3810/2	TN600	2/26/2009	2/26/2010
Receiver	Rohde & Schwarz	ESCI	TN1420	6/2/2009	6/2/2010
Transient Limiter	HP	11947A	TN57	11/5/2007	11/5/2009

### 6.1.5. Test information

<b>Date of test:</b>	July 14, 2009	<b>Test location :</b>	DCE lab – Henry room
<b>EUT serial:</b>	3	<b>Tested by:</b>	Richard Frederick
<b>Test Conclusion:</b>	pass		

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## 6.2. Radiated emissions 30 MHz – 1 GHz

### 6.2.1. Requirements

FCC rules part 15.109 (g), 15.209 , RSS210 section 2.6, ICES-003 issue 4 (2004) and CAN/CSA-CEI/IEC CISPR 22:02

Frequency	Limit in dB $\mu$ V/m @3m
MHz	Quasi-peak
30 – 230	40
230 - 1000	47
Above 1000	54

### 6.2.2. Test setup details

The EUT was placed on a 80 cm high table and configured for worst case emissions based on previous testing. Data represents the worst case operating mode with the audio stream based on pink noise. Most of the data is associated with the FCC part 15.B attributes of the product.

Description of cables:

- 1) The EUT DC power supply connected to terminal strip using unshielded two-conductor power cable bundled to 30cm, total length of 1m. The DC cable connected to the EUT was bundled to 30cm, total length of 1m.
- 2) The permanently attached, shielded EUT cable containing serial, audio and power functions, not bundled, total length 46cm.
- 3) The support equipment power cable connected to terminal strip, bundled to 30cm, total length of 1m.

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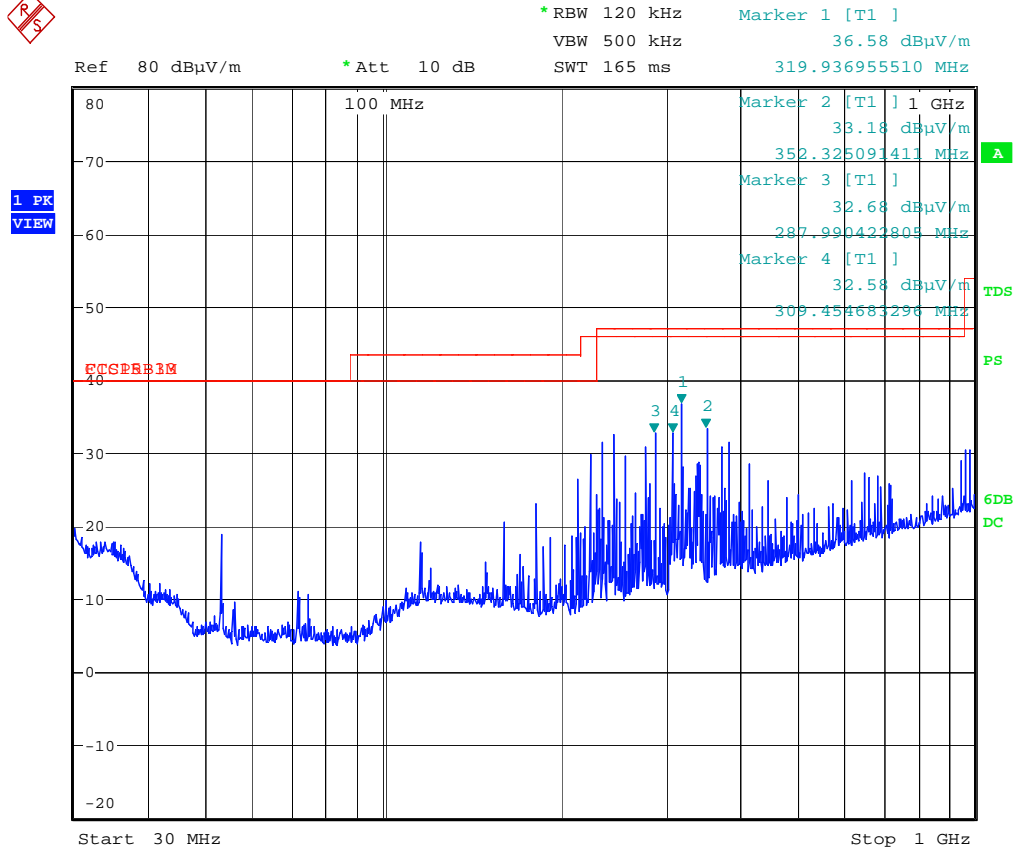
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## 6.2.3. Test data

120VAC, Max-Hold Peak Pre-scan, Max Volume Pink noise



Date: 13.JUL.2009 23:04:29

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## Maximized Quasi-Peak Emissions

120 kHz RBW

Emission Frequency (MHz)	Measured Amplitude (dBuV/m) QP	Limit (dBuV/m) QP	Margin (dB) QP	Azimuth 0° face ant	Receiving Antenna	
					Pol	Height
					H/V	Meters
319.937	22.3	46.0	23.7	0.0	V	1.00
351.980	30.9	46.0	15.1	20.0	H	1.00
287.970	29.8	46.0	16.2	300.0	H	1.00
309.340	31.6	46.0	14.4	300.0	H	1.00
245.300	23.8	46.0	22.2	335.0	V	1.00
383.931	29.3	46.0	16.7	270.0	H	1.00

### 6.2.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				last	due
Antenna	Sunol Sciences	JB6	TN1541	6/18/2009	7/18/2009
Receiver	Rohde & Schwarz	ESU40	TN1663	5/30/2008	7/29/2009
Pre-amp	Rohde & Schwarz	TS-PR8	TN1669	3/5/2009	3/5/2010

### 6.2.5. Test information

<b>Date of test:</b>	July 13, 2009	<b>Test location :</b>	DCE - Maxwell House
<b>EUT serial:</b>	2	<b>Tested by:</b>	A. Paradis
<b>Test Conclusion:</b>	pass		

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## 6.3. Output power

### 6.3.1. Requirements.

FCC 15.247(a)(1) , RSS 210 A8.1(b)

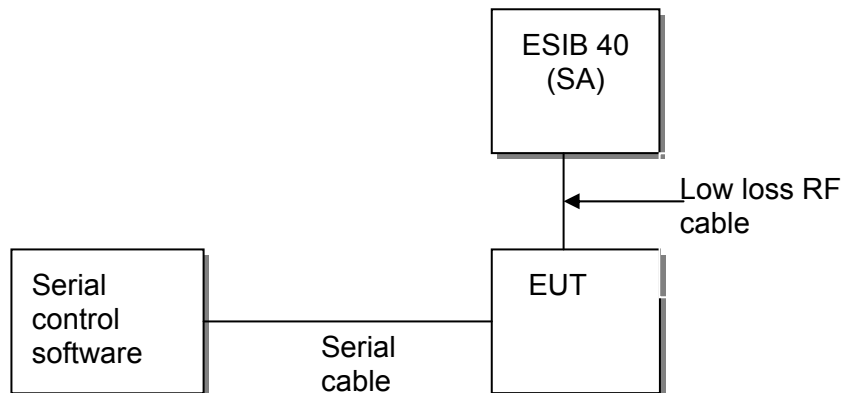
Frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W.

### 6.3.2. Test setup details.

The transceiver is controlled via a TTL serial communications link capable of directly setting the test modes of the BlueTooth controller. The EUT antenna is removed and replaced with an SMA connector, and connected with a 36" low loss cable (TN1277) to the input of a spectrum analyzer. Cable losses are programmed in to the transducer parameter set in the receiver and the displayed measurement data is automatically adjusted for these loss factors. The transceiver is operated in an artificial test mode controlled by the serial link. The EUT is programmed to stop hopping and operated at fixed frequencies at the low end, middle and high end of the authorized frequency band.

The SA resolution bandwidth is set to 2 MHz (higher than the OBW in EDR mode), peak detector and max hold. The maximum output power is recorded for low, mid and high band frequencies. The maximum output power settings are different for basic rate and for Enhanced Data Rate (EDR) settings. Cable and coupler losses are programmed into the SA transducer factors.

### Test Setup Block diagram:



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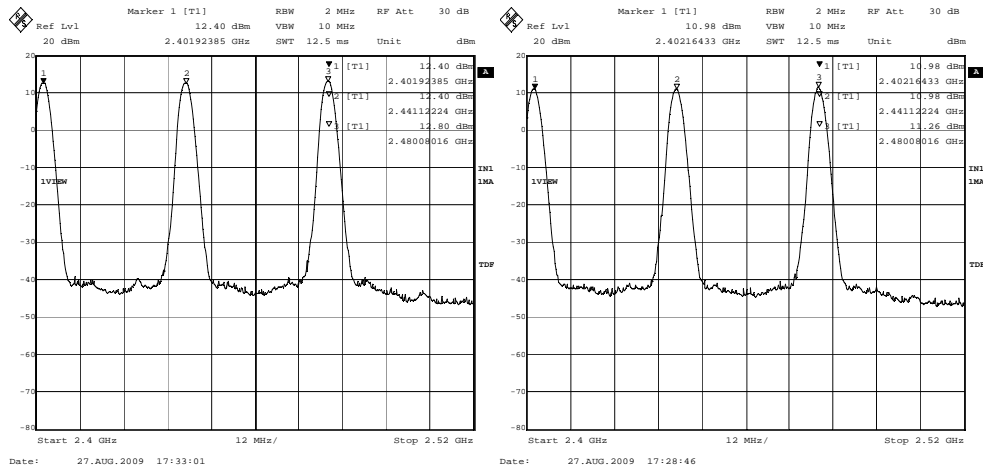
### 6.3.3. Test data.

**Summary:** RBW=2 MHz, detector=peak, max power = 12.8 dBm = 0.0191W

Channel	Frequency MHz	Basic Rate dBm	EDR dBm
0	2402	12.4	11.0
39	2441	12.4	11.0
78	2480	12.8	11.3

### Test detail: Max power

Basic rate, DH5 packet , 10% PRBS (34 bits)    EDR, 3-DH5 packet, 10% PRBS (102 bits)



### 6.3.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Spectrum analyzer	Rohde & Schwarz	ESIB 40	TN1560	3/3/2009	3/3/2010
40 GHz cable	-	-	TN1808	Verify before use	

### 6.3.5. Test information

<b>Date of test:</b>	August 27, 2009	<b>Test location:</b>	BT test station
<b>EUT serial:</b>	Alpha 00064	<b>Tested by:</b>	Brent DeWitt
<b>Test Conclusion:</b>	pass		

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## 6.4. Occupied Bandwidth/Channel Spacing

### 6.4.1. Requirements

RSS210 section 8.1

The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopping frequency set.

FCC part 15.247(a)(1), RSS210 section 8.1(b)

The hopping channel carrier frequencies are separated by at least 2/3<sup>rd</sup> of the 20dB bandwidth provided the output power is less than 125 mW (20.96 dBm)

### 6.4.2. Test setup details

The test setup is identical to section 6.3

### 6.4.3. Test data

Summary: EDR mode packet 3-DH5 (worst case modulation)

BT Channel	Center Frequency (MHz)	20dB OBW (MHz)	99% OBW (MHz)
0	2402	1.423	1.242
39	2441	1.423	1.232
78	2480	1.413	1.242

Conclusion: 2/3<sup>rd</sup> of the largest OBW = 2/3 x 1.423 MHz = 949 kHz, which is less than the carrier channel separation of 1 MHz. In addition, the output power is less than 125 mW. See section 6.3 for the measurement of output power.

The system RF bandwidth as defined in RSS210 A8.1(a) is 79 channels times 1.242 MHz = 98.11 MHz.

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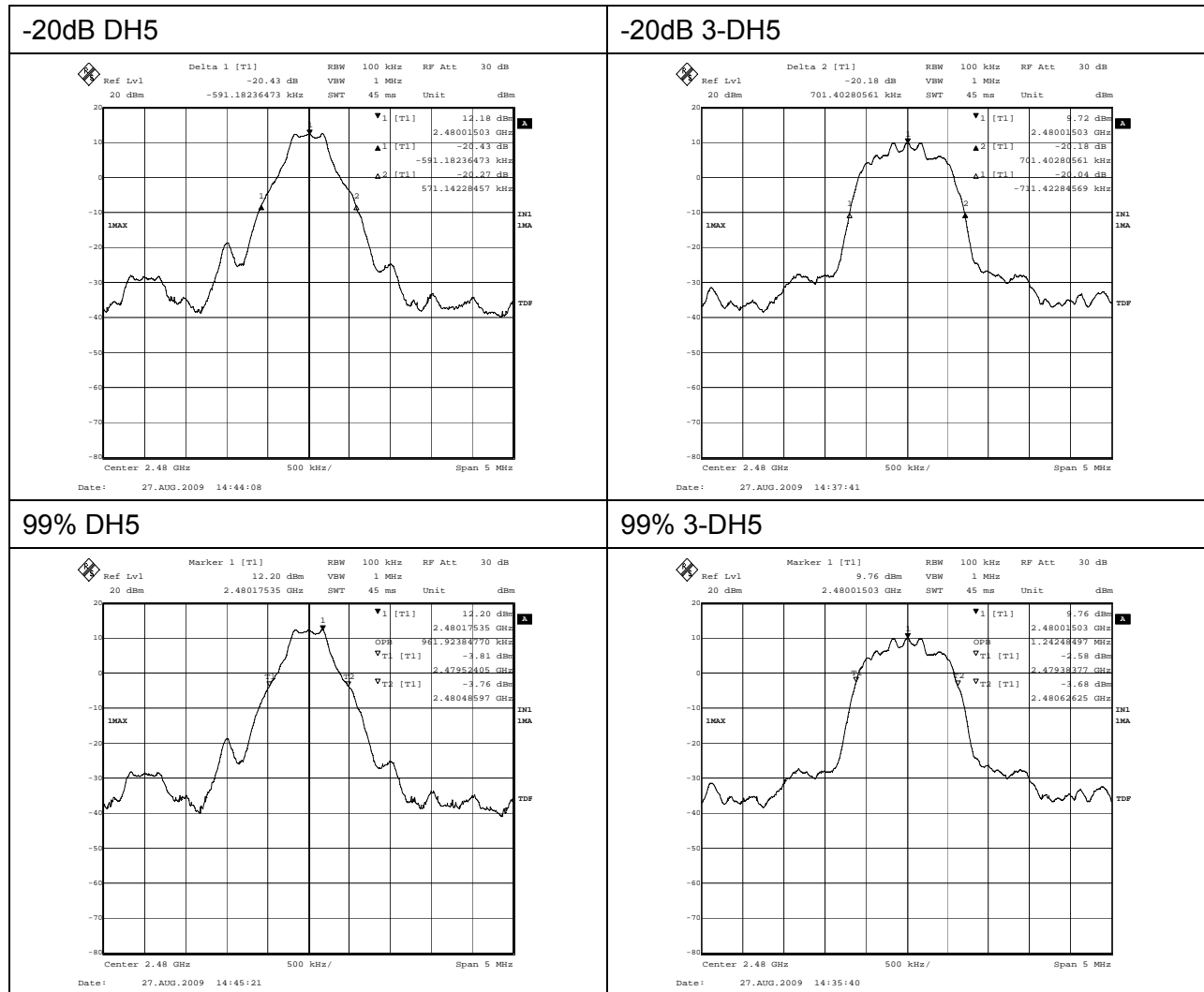
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Detail results:

High Channel, 2480 MHz



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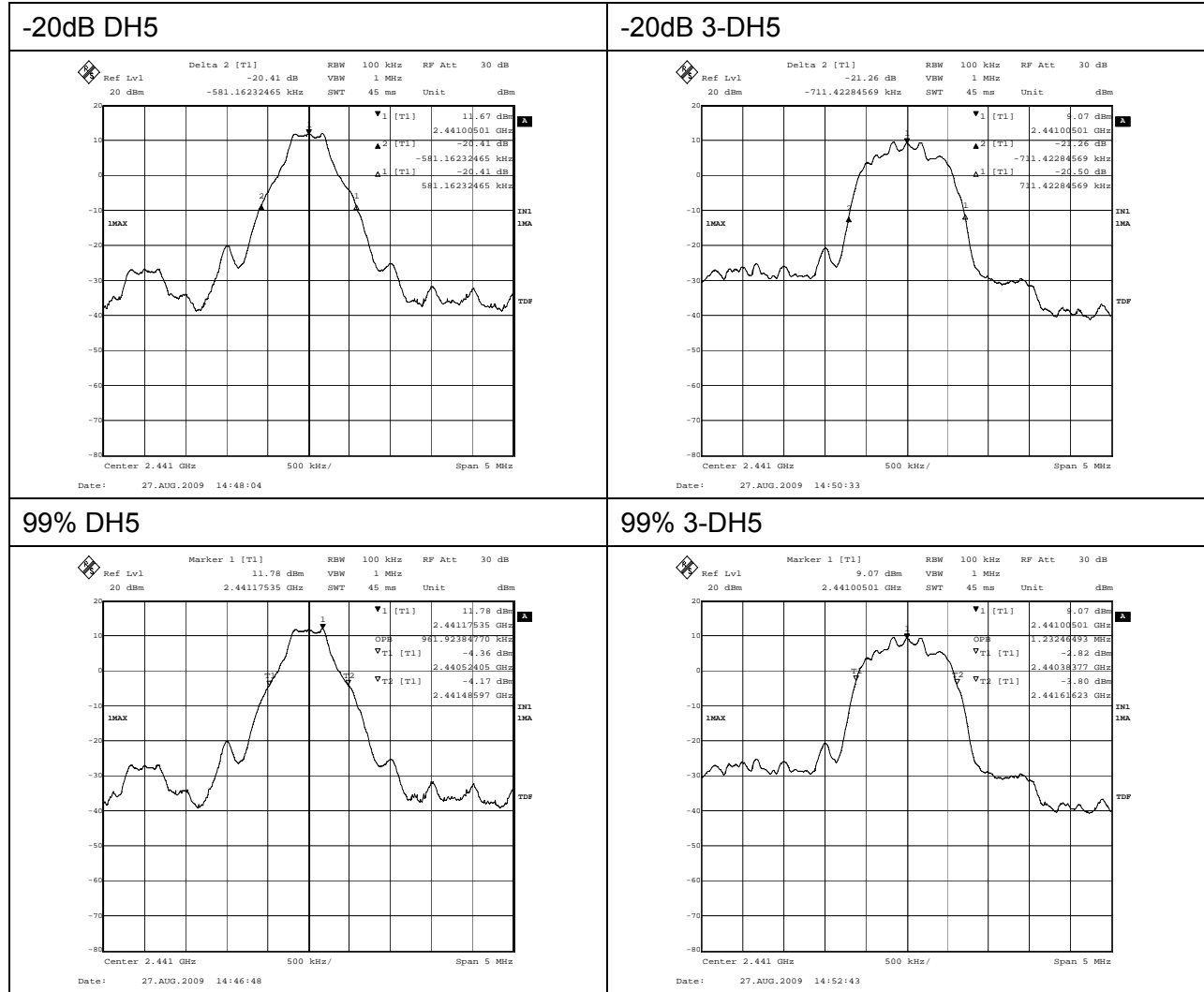


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Mid channel, 2441 MHz



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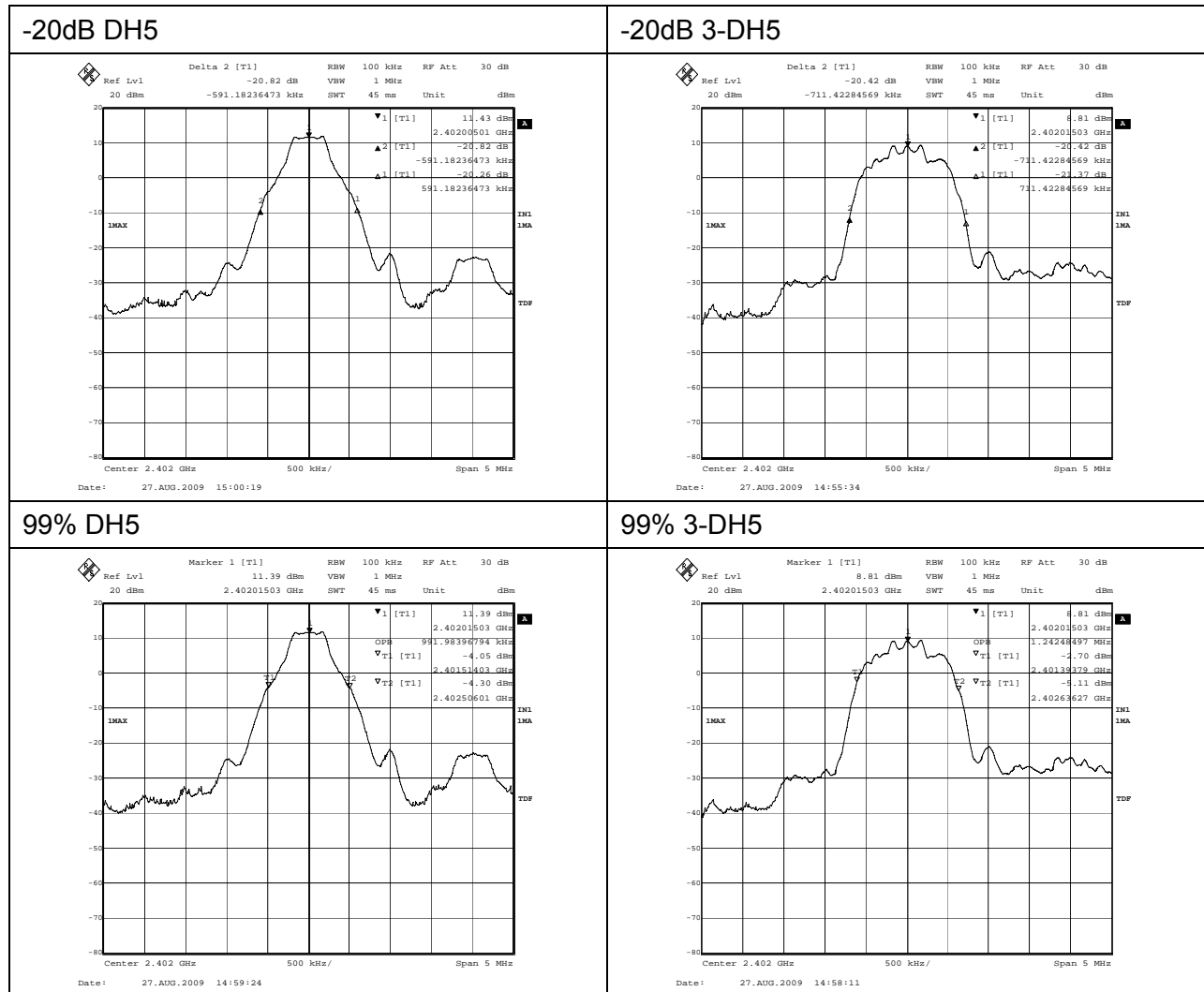


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Low channel, 2402 MHz



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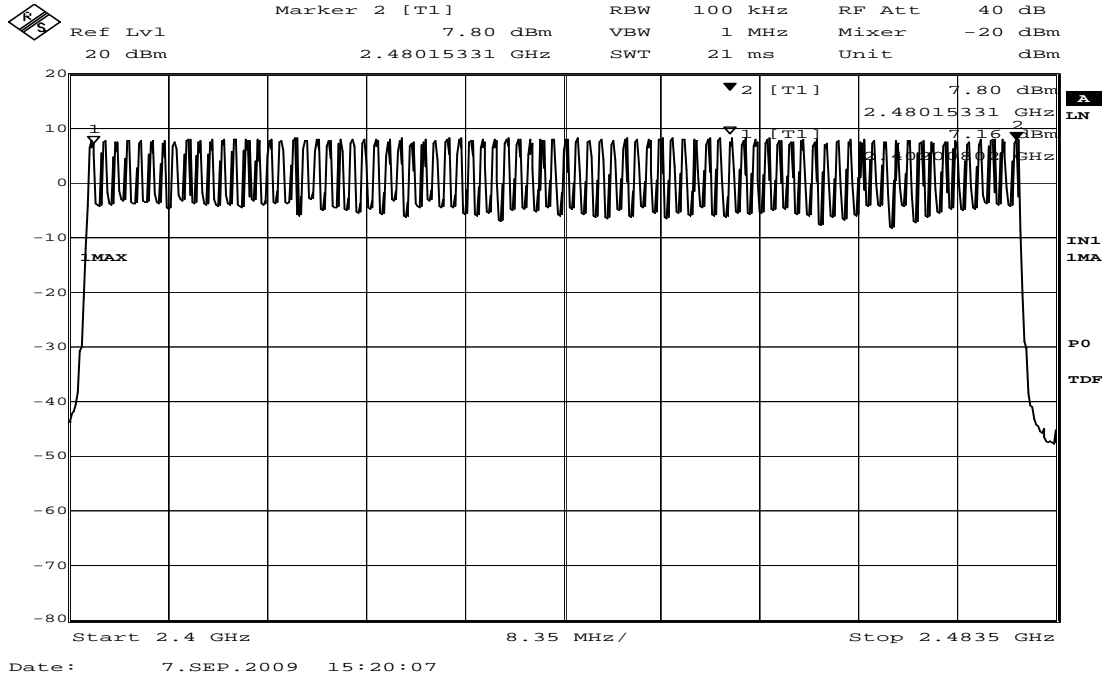
FCC ID:A94404590

IC ID:3232A-404590

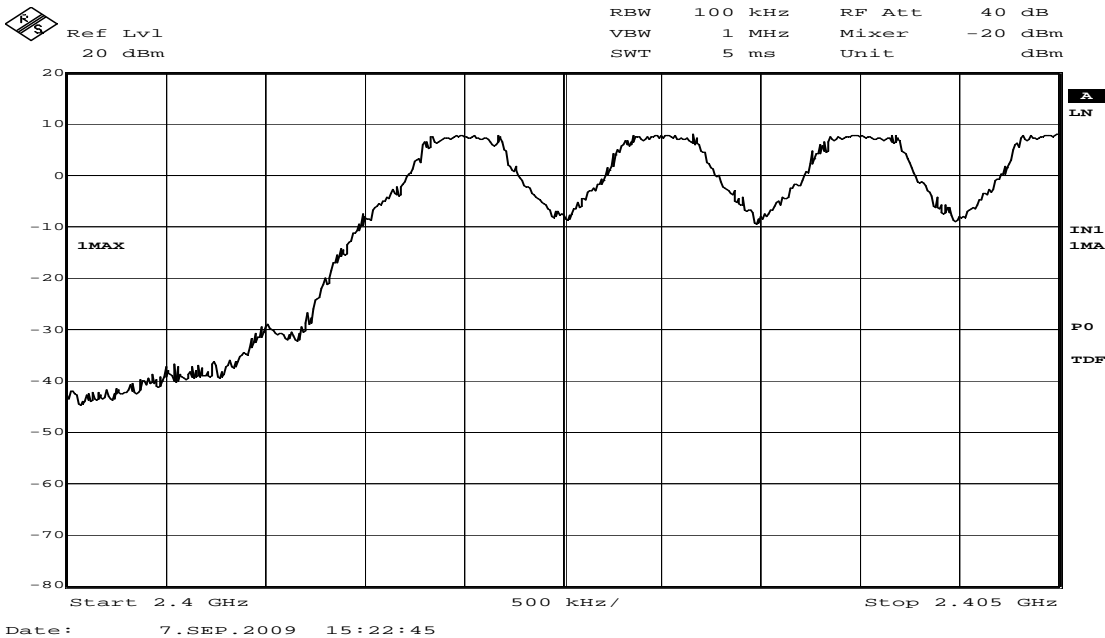
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## Channel Spacing

79 channels between 2402 MHz and 2480 MHz = 1 MHz/channel



## Low band end spacing detail (2402 MHz)



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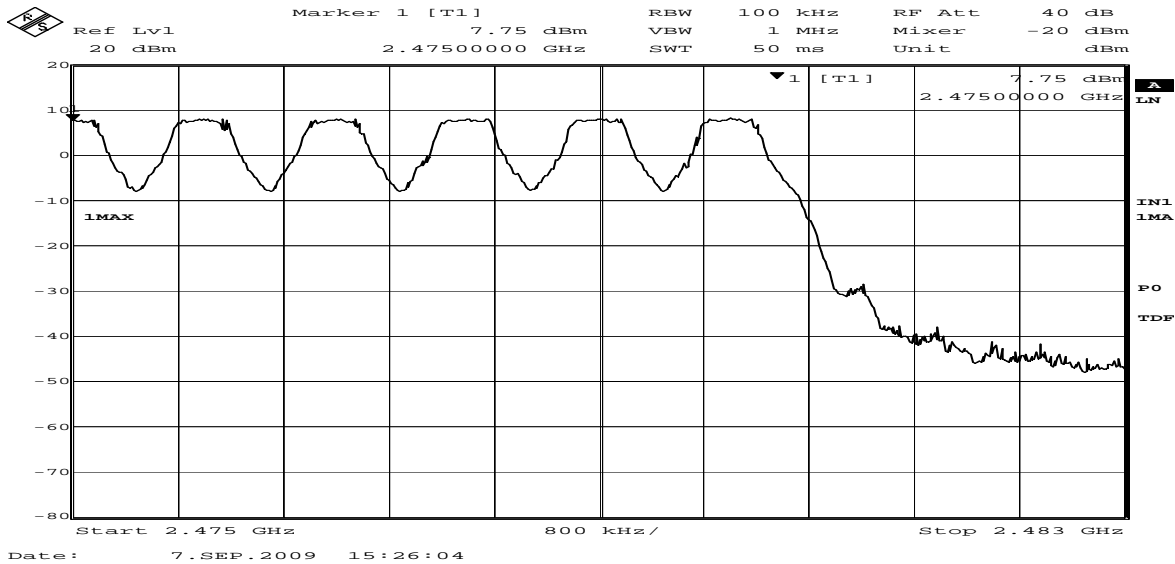


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## High band end spacing detail (2483.5 MHz)



### 6.4.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
40 GHz cable	-	-	TN1808	Verify before use	NA
Receiver	Rohde & Schwarz	ESIB 40	TN1560	03/03/2009	03/03/2010

### 6.4.5. Test information

<b>Date of test:</b>	August 27, 2009	<b>Test location:</b>	Bluetooth test station
<b>EUT serial:</b>	Alpha 00064	<b>Test by:</b>	Brent DeWitt
<b>Test Conclusion:</b>	pass		

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## 6.5. Time of occupancy

### 6.5.1. Requirements

FCC 15.247 (a) (1) iii, RSS210 A8.1 (d)

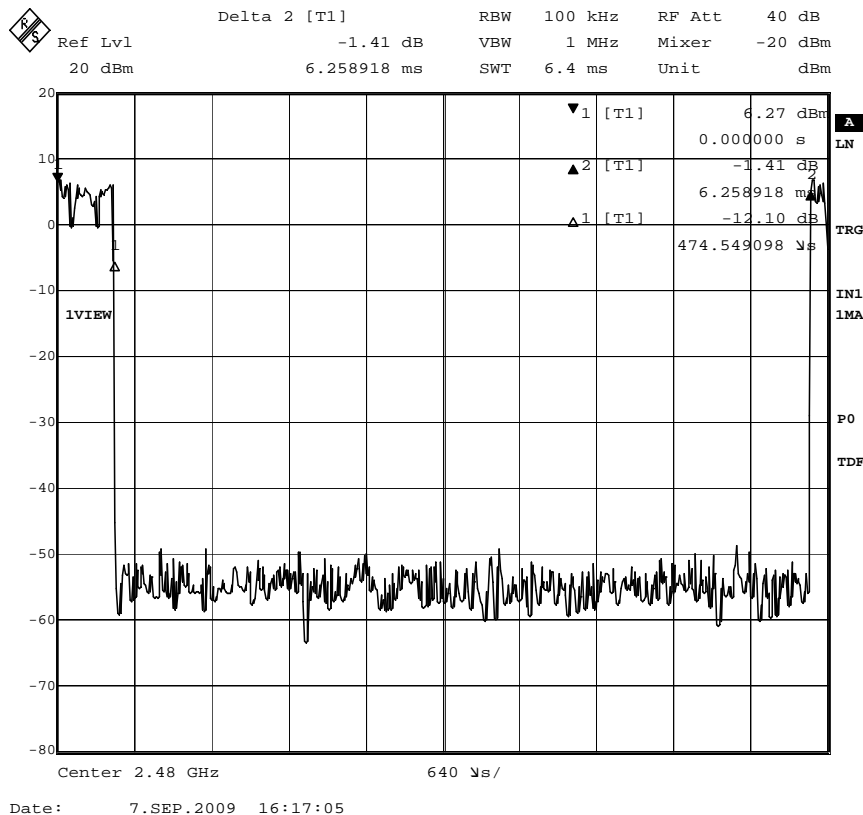
The frequency hopping operation shall have an average time occupancy on any frequency not to exceed 0.4 seconds within the duration in seconds equal to the number of hopping frequencies employed multiplied by 0.4

### 6.5.2. Test setup details

The SA is connected to the EUT via a low loss cable. The EUT is operating on its normal hop set. The SA sweep time is set to the number of hopping channels (79) times 0.4 seconds or 31.6 seconds. The SA is tuned to mid-band (2441MHz), set to a 200 kHz bandwidth in order to minimize bleed-over from adjacent channels and set to a single sweep.

### 6.5.3. Test data

Number of hopping channels is 79 (2402 – 2480 in 1 MHz increments). The longest packet transmission time is 0.474 ms for a DH5 packet type with 10% duty cycle.



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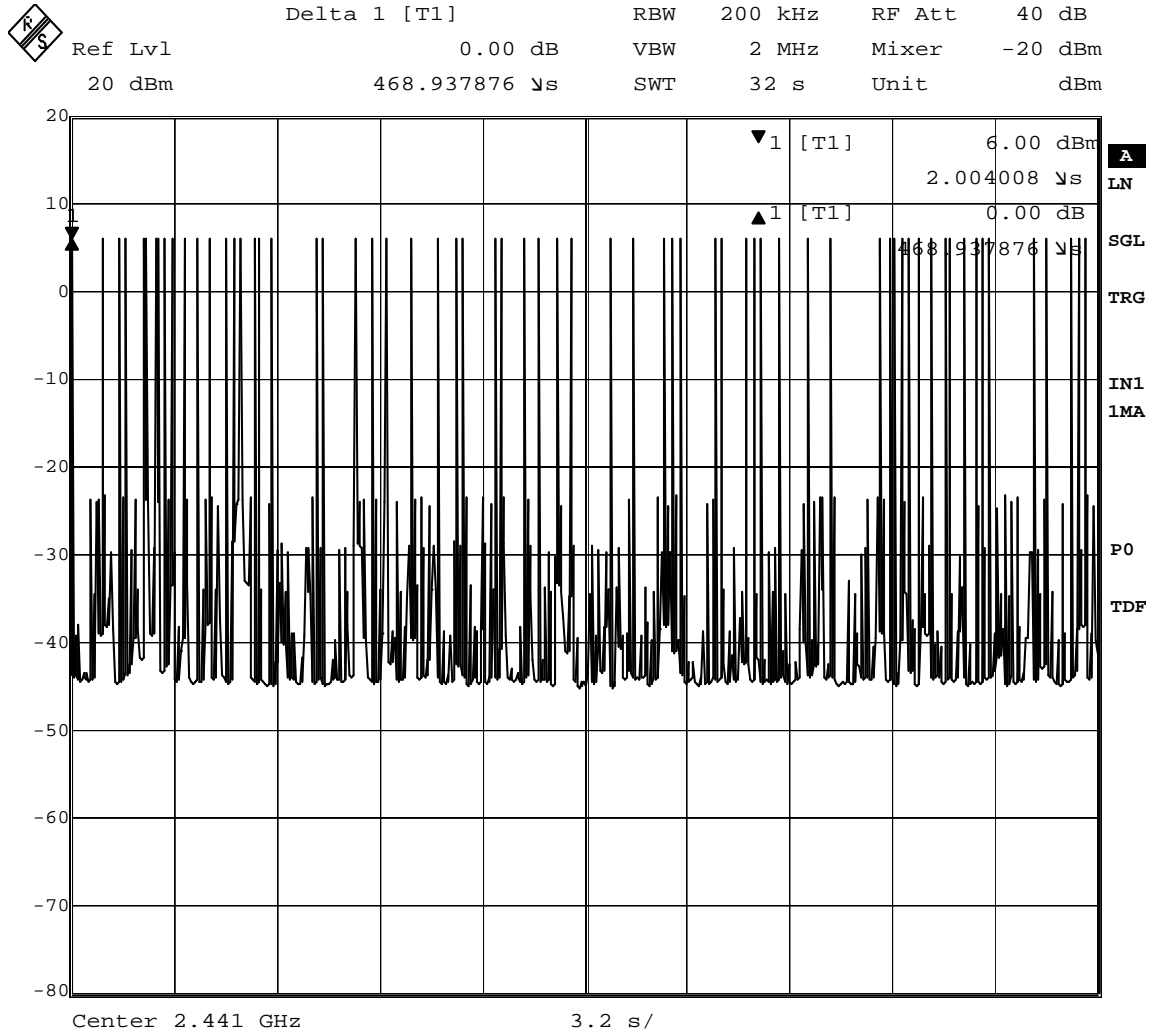


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Mid channel (2441 MHz)



Date: 11.SEP.2009 09:27:07

There are 63 pulses in 32 seconds. Therefore the average dwell time per channel is  $0.474\text{msec} \times 63 = 29.8 \text{ msec}$  which is less than the allowed 400msec.

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## 6.5.3.1. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESIB40	TN1560	3/3/2009	3/3/2010
CBT controller	Rohde & Schwarz	CBT	TN1758	5/15/2009	5/15/2010

## 6.5.4. Test information

<b>Date of test:</b>	August 4, 2009	<b>Test location:</b>	BT test bench
<b>Serial number:</b>	ALPHA-0007	<b>Tested by:</b>	Brent DeWitt
<b>Test Conclusion:</b>	pass		

## 6.6. Spurious emissions

### 6.6.1. Requirements

FCC part 15.247(d), RSS210 A8.5

In any 100kHz BW, the conducted spurious emissions shall be attenuated at least 20dB below the level of the wanted signal.

### 6.6.2. Test Setup

The EUT is connectorized and connected to the Spectrum analyzer with a low loss high frequency cable. The cable loss factors are incorporated into the measured values. A current probe is used to couple the CBT control signal into the signal path. The CBT controls the operation of the EUT to enable testing of the spurious output in specific operational modes, however the CBT does not factor into the spurious emission data itself.

Measurements are made with the EUT in normal operation (hopping through all available channels) in basic rate modulation and in EDR mode.

### 6.6.3. Test data

#### Conducted spurious:

30 MHz – 25 GHz conducted spurious scan, 100kHz RBW, peak detector, normal operation basic rate modulation.

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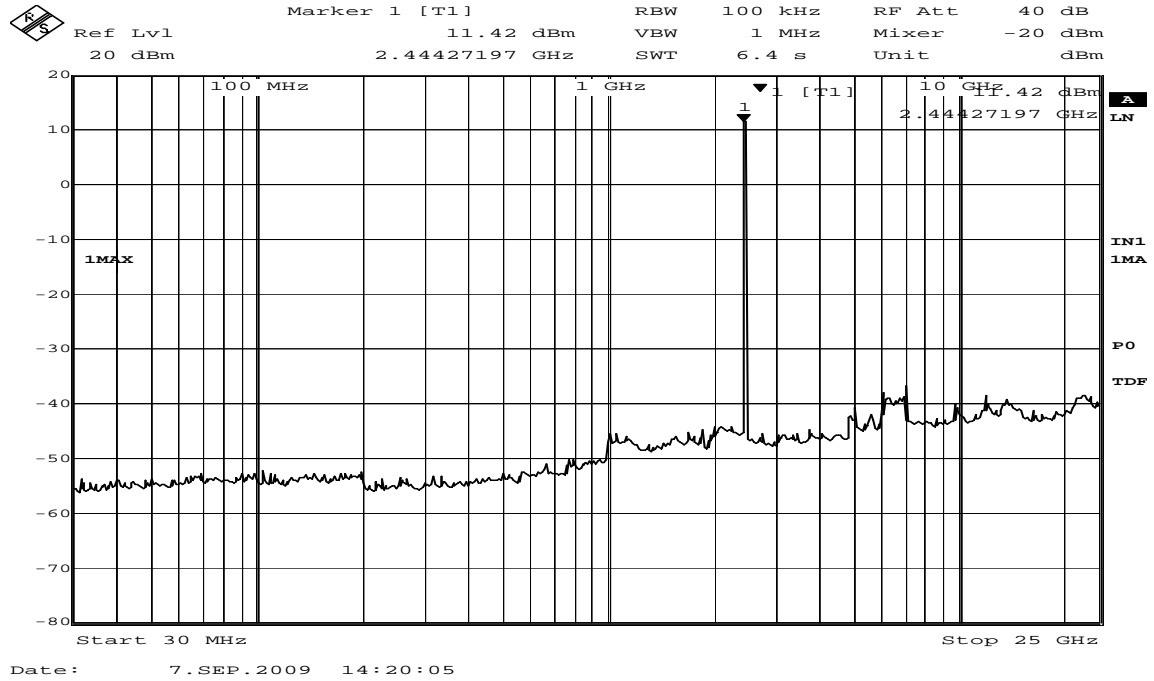


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DH5 basic rate conducted spurious. The level of the wanted signal is 11.42 dBm in 100kHz RBW. All other conducted spurious emissions are more than 50 dB below this level.



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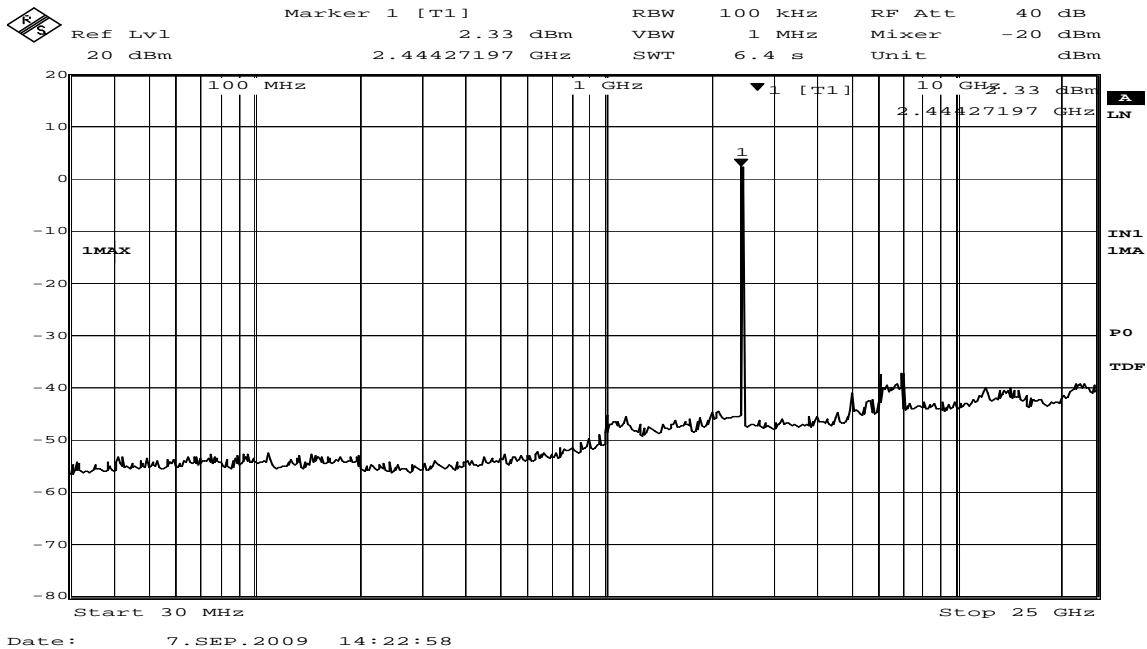


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3-DH5 conducted spurious, 30 MHz – 25 GHz, 100kHz RBW, peak detector, normal operation EDR rate modulation. The level of the wanted signal is 2.33 dBm in. All other conducted spurious emissions are more than 40 dB below this level.



## Conclusion:

Spurious emissions in any 100kHz bandwidth are more than 20 dB below the peak values in the desired transmission band.

## 6.6.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESIB40	TN1560	3/3/2009	3/3/2010
40 GHz cable	-	-	TN1277	Verify before use	
BT tester	Rohde & Schwarz	CBT	145	NA	NA

## 6.6.5. Test information

<b>Date of test:</b>	August 4, 2009	<b>Test Location:</b>	BT test station
<b>EUT serial:</b>	ALPHA-0007	<b>Tested by:</b>	Brent DeWitt
<b>Test Conclusion:</b>	pass		

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## 6.7. Harmonics

### 6.7.1. Requirements

FCC part 15.247(d)

In any of the restricted bands defined in FCC part 15.209(a) , the field strength at a distance of 3 meters shall not exceed 54dBµV/m (average) or 74dBµV/m (peak)

### 6.7.2. Test Setup

The EUT is placed in a standard ANSI C63.4 test setup. The carrier output is measured for reference purposes. Standard gain horns with suitable pre-amps mounted directly on the horn antennas are used for the measurement of the harmonics. The EUT hopping is stopped and measurements are made in the low, mid and high end of the frequency range at the defined limit distance of 3 meters. Above 18GHz the measurement distance may be reduced to make sure the instrumentation noise floor is well below the limit.

The EUT is rotated around the vertical axis, the antenna polarization changed from H to V and the antenna height is varied from 1 to 4 meters in order to find the maximum value of the harmonic emission. Account is taken of the beam width of the horn antennas to make sure the EUT remains in the main lobe of the antenna.

### 6.7.3. Test data

#### 2<sup>nd</sup> Harmonic

Frequency [MHz] Packet Type	Measured values		Limits		Margin dB
	Peak detector dBµV/m @ 3m	Average Detector dBµV/m @ 3m	Peak dBµV/m	Average dBµV/m	
4804, DH5	43.5	27.6	74	54	26.4
4804, 3DH5	31.6	14.9	74	54	39.1
4882, DH5	44.3	29.6	74	54	24.4
4882, 3DH5	33.9	16.3	74	54	37.7
4960, DH5	40.9	25.8	74	54	28.2
4960, 3DH5	31.2	14.3	74	54	39.7

#### 3<sup>rd</sup> Harmonic

Frequency [MHz] Packet Type	Measured values		Limits		Margin dB
	Peak detector dBµV/m @ 3m	Average Detector dBµV/m @ 3m	Peak dBµV/m	Average dBµV/m	
7206, DH5	33.4	15.9	74	54	38.1
7206, 3DH5	25.9	13.2	74	54	40.8
7323, DH5	32.0	16.0	74	54	38.0
7323, 3DH5	25.5	13.0	74	54	41.0
7440, DH5	33.5	17.9	74	54	36.1
7440, 3DH5	27.4	13.6	74	54	40.4

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# Wireless Transceiver Test Report



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Certificate # 1514.1

At the 4th through the 10<sup>th</sup> Harmonic no signal was observed above the instrumentation noise floor.  
In all cases the noise floor was in excess of 10dB below the limit value.

4<sup>th</sup> – 10<sup>th</sup> harmonic instrumentation noise floor

Frequency [GHz]	Measured values		Limits		Margin dB
	Peak detector dB $\mu$ V/m @ 3m	Average Detector dB $\mu$ V/m @ 3m	Peak dB $\mu$ V/m	Average dB $\mu$ V/m	
9.9 (4th Har)	39.2	27.1	not in restricted band		
12.4 (5th Har)	39.9	27.1	74	54	26.90
14.8 (6th Har)	43.9	31.0	74	54	23.00
17.3 (7th Har)	46.0	31.6	not in restricted band		
19.5 (8th Har)	51.5	37.5	74	54	16.50
22.1 (9th Har)	53.0	39.9	74	54	14.10
24.5 (10th Har)	52.1	41.0	not in restricted band		

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# Wireless Transceiver Test Report



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Certificate # 1514.1

## 6.7.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESU40	TN1663	5/30/2008	7/29/2009
Antenna 30M – 6G	Sunol	JB6	TN1541	6/28/2008	7/18/2009
Antenna 4 – 8G	AR	AT4003	TN727	11/24/2008	11/24/2011
Antenna 8 – 18G	AR	AT4004	TN728	11/24/2008	11/24/2011
Antenna 18 – 26.5G	ETS	3160-09	TN1307	2/18/2008	2/18/2010
20 GHz Pre-amp	MITEQ	AFS4-00102000-30-10P-4	TN1672	4/27/2009	4/27/2010
40 GHz pre-amp	MITEQ	JS4018004000-30-8P-A1	TN1757	Verify before use	
Antenna cable 18GHz	Rohde & Schwarz	HFE160D	TN1692	4/27/2009	4/27/2010
40 GHz cable	-	-	TN1277	Verify before use	
BT tester	Rohde & Schwarz	CBT	145	NA	NA

## 6.7.5. Test information

<b>Date of test:</b>	July 13, 2009	<b>Test Location:</b>	Maxwell House
<b>EUT serial:</b>	ALPHA-0005	<b>Tested by:</b>	Brent DeWitt
<b>Test Conclusion:</b>	pass		

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# Wireless Transceiver Test Report



FCC ID:A94404590

IC ID:3232A-404590

Certificate # 1514.1

## 6.8. Spurious emissions 1-25 GHz

### 6.8.1. Requirements

FCC part 15.247(d), RSS210 section 2.2(b)

In any of the restricted bands defined in FCC part 15.209(a), the field strength at a distance of 3 meters shall not exceed 54dBμV/m (average) or 74dBμV/m (peak)

### 6.8.2. Test Setup

The EUT is placed in a standard ANSI C63.4 test setup. From 1 to 4 GHz a linearly polarized hybrid bi-conical / log-periodic antenna is used. Above 4 GHz, standard gain horns with suitable pre-amps mounted directly on the horn antennas are used for the measurement of the emissions.

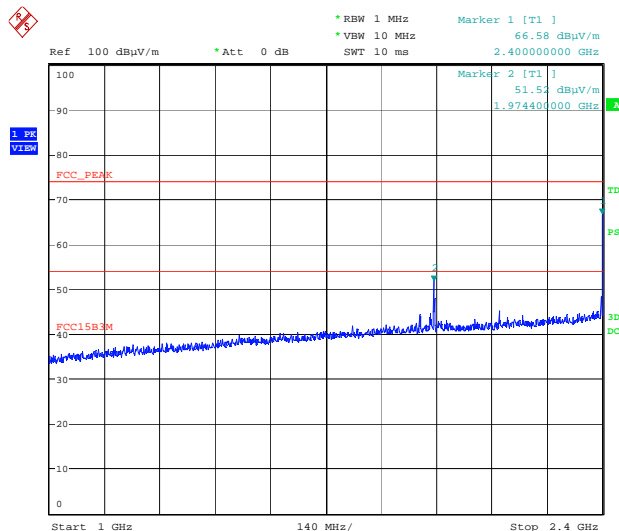
The EUT is operating normally (hopping), and measurements are made at the defined limit distance of 3 meters. Above 18GHz the measurement distance may be reduced to make sure the instrumentation noise floor is well below the limit. Measurements are made with a 1 MHz resolution bandwidth and an average detector. There is an implied peak limit 20dB above the average limit.

The EUT is rotated around the vertical axis, the antenna polarization changed from H to V and the antenna height is varied from 1 to 4 meters in order to find the maximum value of the emissions. Account is taken of the beam width of the horn antennas to make sure the EUT remains in the main lobe of the antenna.

#### 6.8.2.1. Test data

Frequency range 30MHz – 1 GHz. Passes, see section 6.2 of this report

Frequency range 1 – 2.38 GHz



Date: 13.JUL.2009 22:35:23

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# Wireless Transceiver Test Report



FCC ID:A94404590

IC ID:3232A-404590

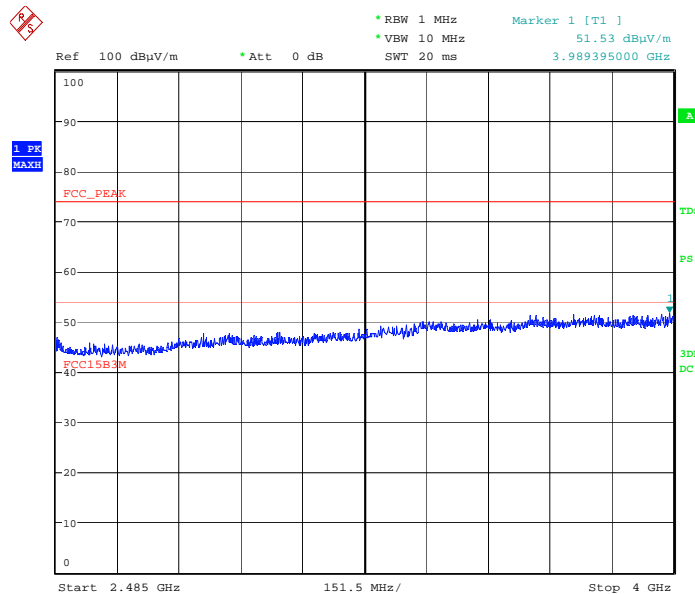
Certificate # 1514.1

120VAC, Max-Hold Peak Pre-scan, MAX volume pink noise via Bluetooth 1GHz-2.4GHz

PEAK & AVERAGE readings made in receiver mode:

Frequency MHz	MEASURED		LIMIT		MARGIN	
	dB Peak	dB AVG	dB Peak	dB AVG	dB Peak	dB AVG
1973.775	53.2	36.3	74.0	54.0	20.8	17.7
2400.000	63.1	30.5	74.0	54.0	10.9	23.5

Worst case: EUT passes FCC Peak Limit by 10.9dB at 2400.0MHz



Date: 13.JUL.2009 22:32:10

120VAC, Max-Hold Peak Pre-scan, MAX volume pink noise via Bluetooth 2.485GHz-4GHz

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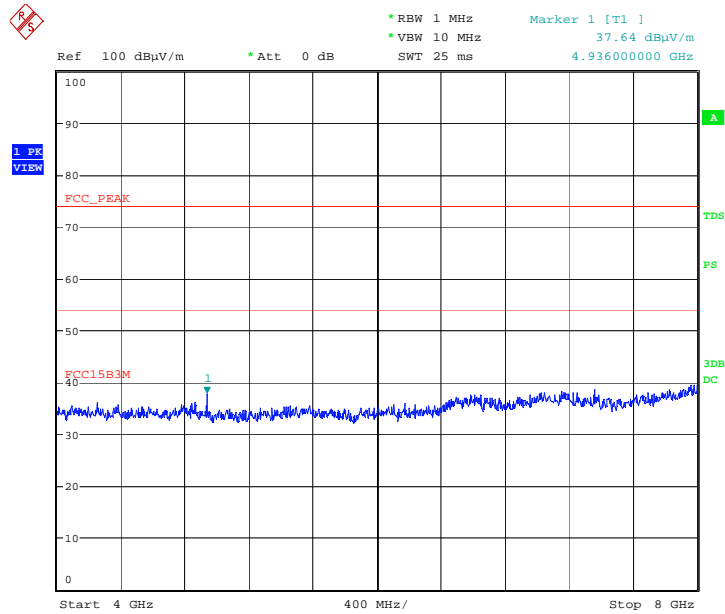
# Wireless Transceiver Test Report



FCC ID:A94404590

IC ID:3232A-404590

Certificate # 1514.1



Date: 13.JUL.2009 21:24:19

120VAC, Max-Hold Peak Pre-scan, MAX volume pink noise via Bluetooth 4GHz-8GHz

\*Above 8 GHz, no spurious emissions in peak detection were observed and the noise floor was at least 10 dB below the Average limit.

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# Wireless Transceiver Test Report



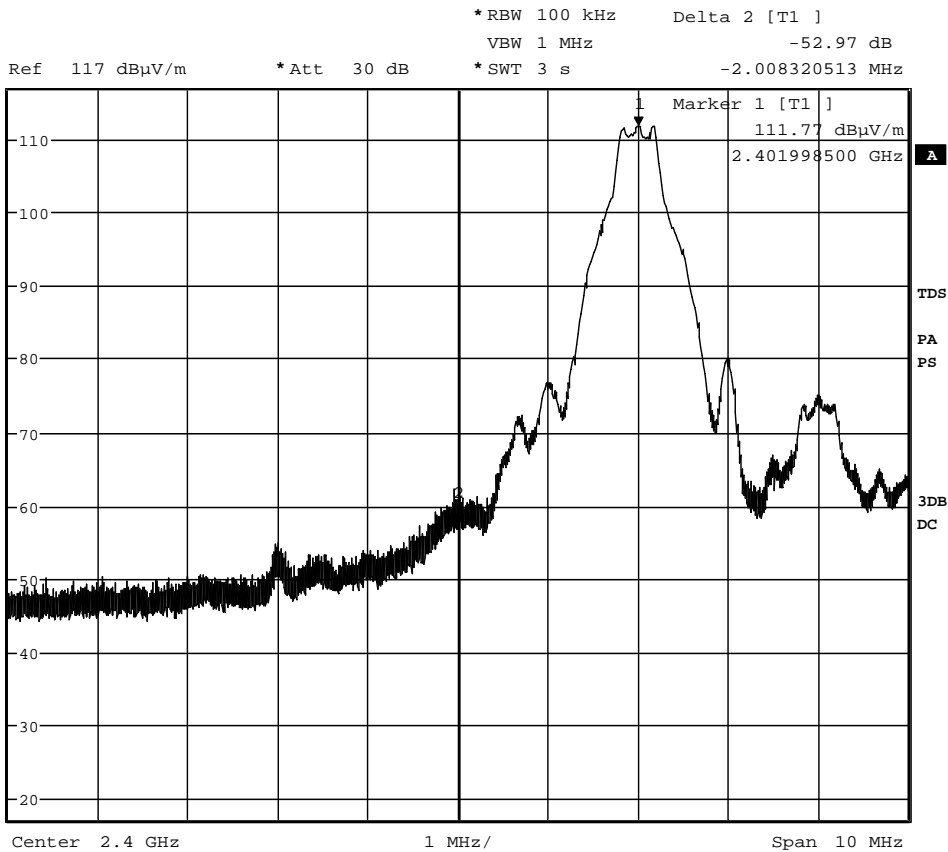
FCC ID:A94404590

IC ID:3232A-404590

Certificate # 1514.1

**Band edge measurements:**

Basic rate (DH5), Center frequency lower band edge, 100 kHz RBW, Peak detection



Date: 8.SEP.2009 13:08:28

The delta between the in-band and maximum value in the lower adjacent restricted band is 52.97 dB.

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# Wireless Transceiver Test Report



FCC ID:A94404590

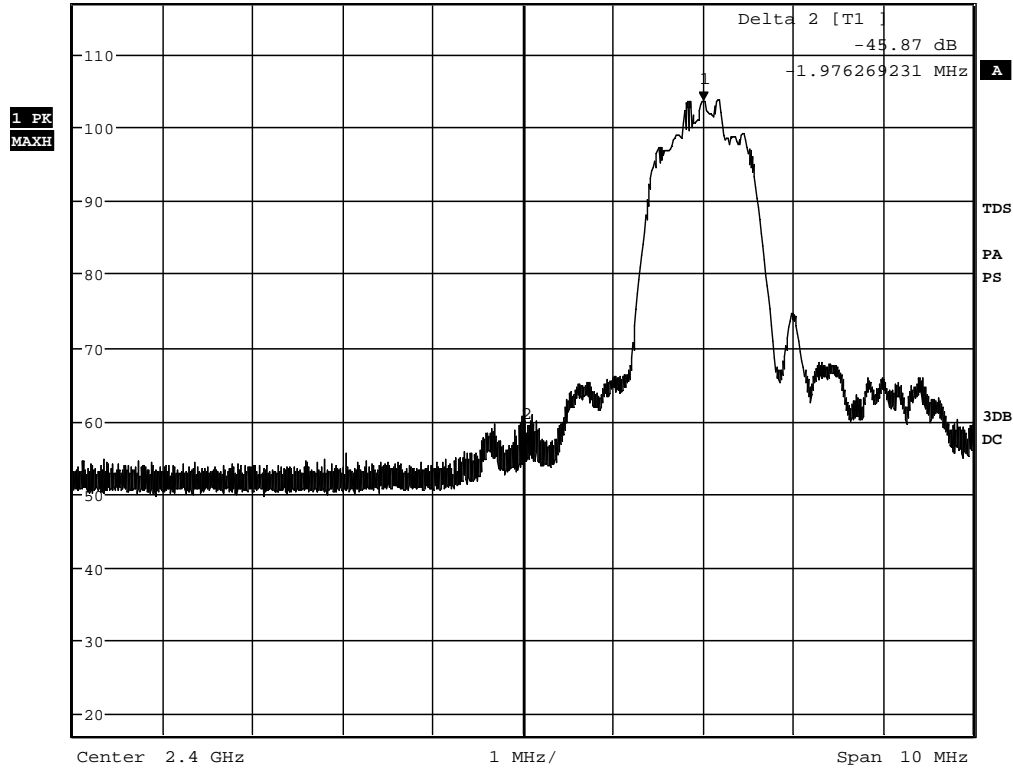
IC ID:3232A-404590

Certificate # 1514.1

Enhanced Data Rate (3-DH5), Center frequency lower band edge, 100 kHz RBW, Peak detection



\*RBW 100 kHz      Marker 1 [T1 ]  
 VBW 1 MHz                      103.66 dBμV/m  
 Ref 117 dBμV/m      \*Att 40 dB      \*SWT 2 s                      2.401998500 GHz



Date: 8.SEP.2009 13:20:07

The delta between the in-band and maximum value in the lower adjacent restricted band is 45.87 dB.

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# Wireless Transceiver Test Report

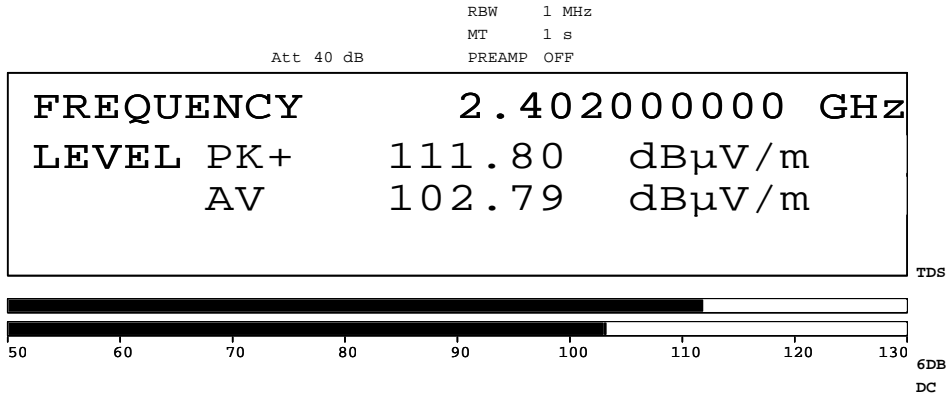


FCC ID:A94404590

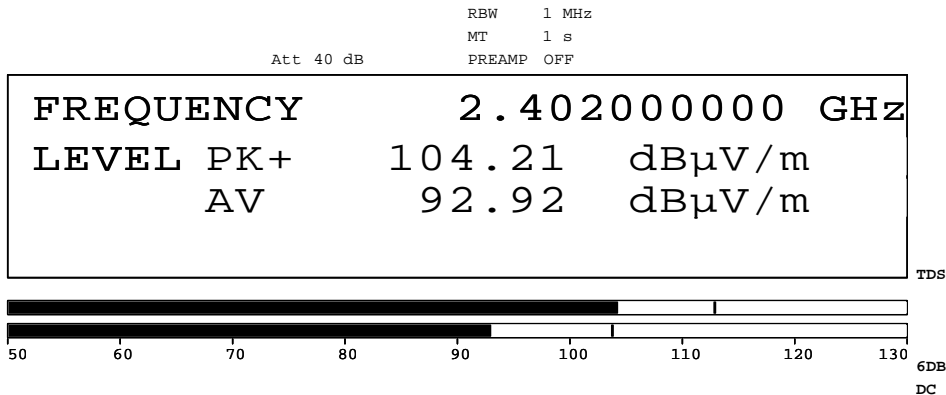
IC ID:3232A-404590

Certificate # 1514.1

Measured peak and average in-band amplitude with 1 MHz RBW and Basic Rate modulation:



Measured peak and average in-band amplitude with 1 MHz RBW and Enhanced Data Rate modulation:



Maximum values for spurious emissions from 2380-2400 MHz is

(a) More than 20 dB

(b) The maximum value in the restricted band is

Basic Rate: 102.79-52.97 = 49.82 dBμV/m average

111.80-52.97 = 58.83 dBμV/m peak

EDR: 92.92-45.87 = 47.05 dBμV/m average

104.21-45.87 = 58.34 dBμV/m peak

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# Wireless Transceiver Test Report



FCC ID:A94404590

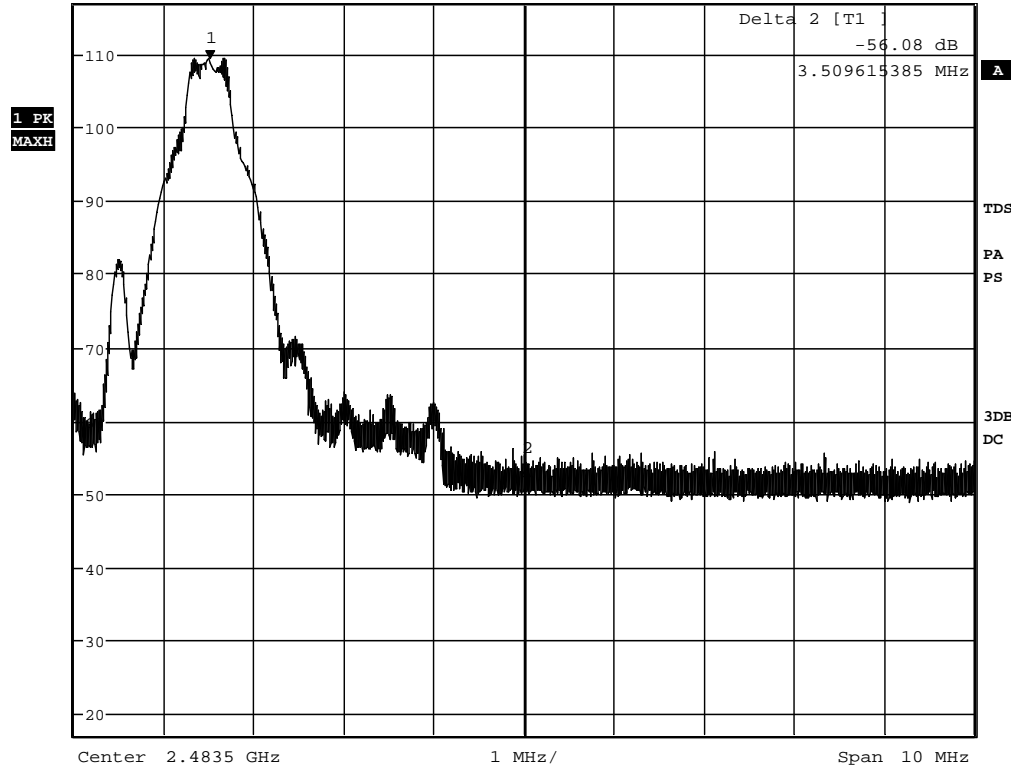
IC ID:3232A-404590

Certificate # 1514.1

Basic rate (DH5), Center frequency upper band edge, 100 kHz RBW, Peak detection



\*RBW 100 kHz      Marker 1 [T1 ]  
 VBW 1 MHz                      109.41 dBμV/m  
 Ref 117 dBμV/m      \*Att 40 dB      \*SWT 2 s                      2.480007282 GHz



Date: 8.SEP.2009 13:25:58

The delta between the in-band and maximum value in the lower adjacent restricted band is 56.08 dB.

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# Wireless Transceiver Test Report



FCC ID:A94404590

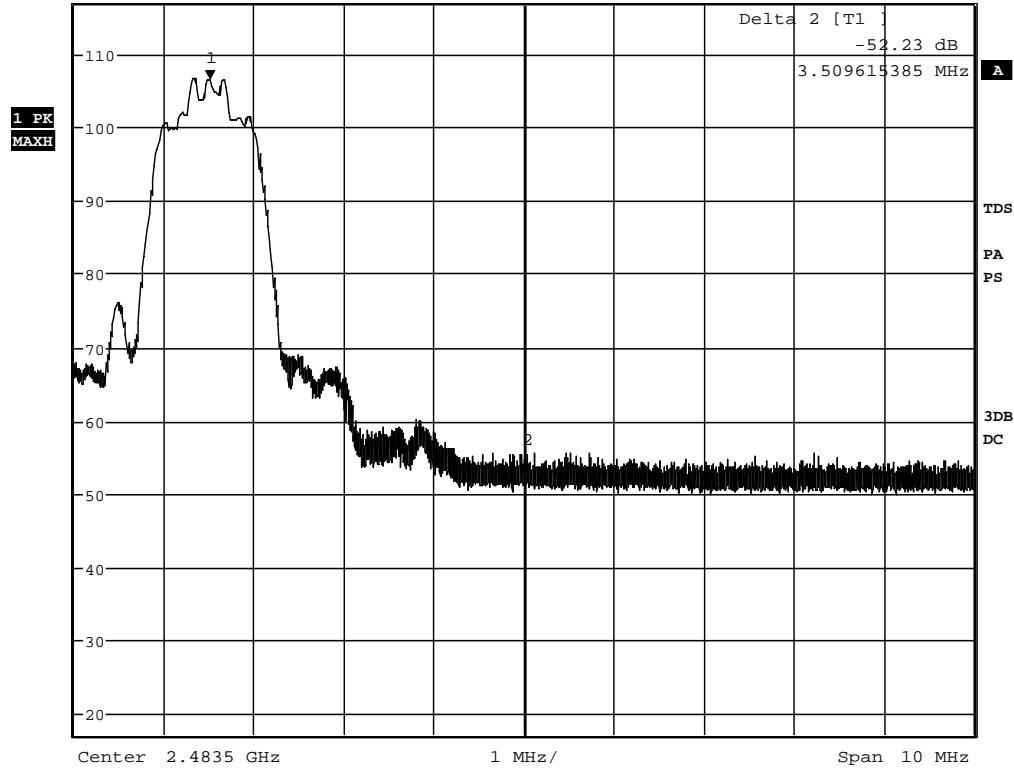
IC ID:3232A-404590

Certificate # 1514.1

Enhanced Data Rate (3-DH5), Center frequency lower band edge, 100 kHz RBW, Peak detection



\*RBW 100 kHz      Marker 1 [T1 ]  
 VBW 1 MHz                      106.61 dBμV/m  
 Ref 117 dBμV/m      \*Att 40 dB      \*SWT 2 s                      2.480007282 GHz



Date: 8.SEP.2009 13:22:08

The delta between the in-band and maximum value in the lower adjacent restricted band is 52.23 dB.

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# Wireless Transceiver Test Report

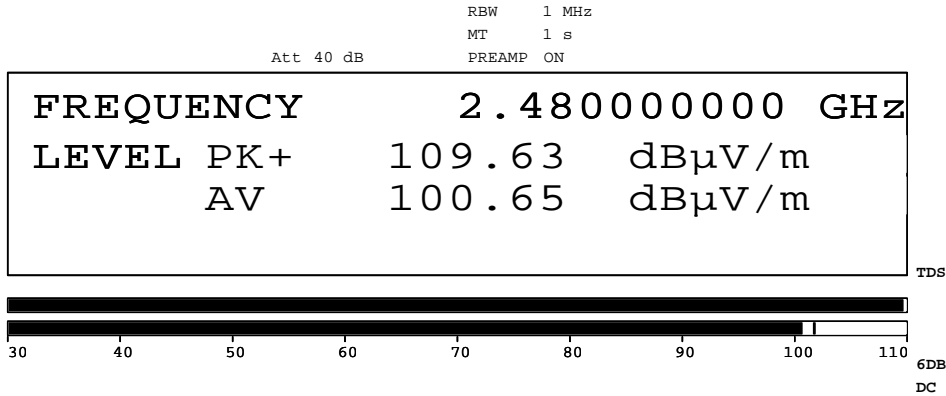


FCC ID:A94404590

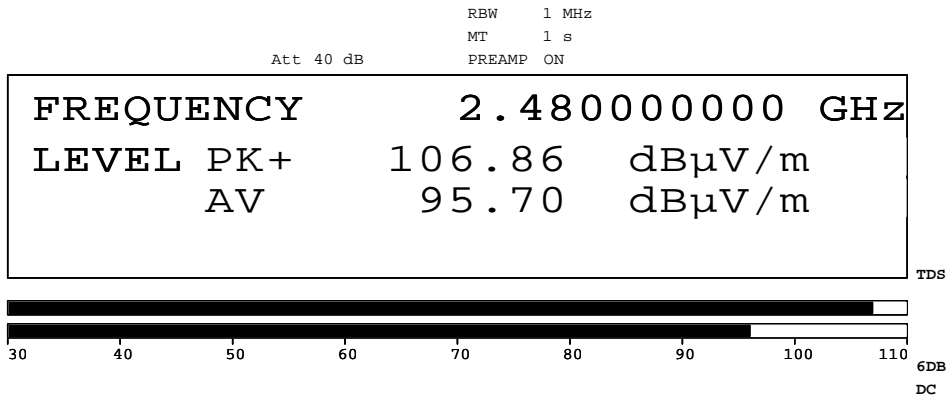
IC ID:3232A-404590

Certificate # 1514.1

Measured peak and average in-band amplitude with 1 MHz RBW and Basic Rate modulation:



Measured peak and average in-band amplitude with 1 MHz RBW and Enhanced Data Rate modulation:



Maximum values for spurious emissions from 2380-2400 MHz is

(a) More than 20 dB

(b) The maximum value in the restricted band is

Basic Rate: 100.65-56.08 = 44.57 dBμV/m average

109.63-56.08 = 53.55 dBμV/m peak

EDR: 95.70-52.23 = 43.47 dBμV/m average

106.86-52.23 = 54.63 dBμV/m peak

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# Wireless Transceiver Test Report



FCC ID:A94404590

IC ID:3232A-404590

Certificate # 1514.1

## 6.8.2.2. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESU40	TN1663	5/30/2008	7/30/2009
Antenna 30M – 6G	Sunol	JB6	TN1541	6/28/2008	7/18/2009
Antenna 4 – 8G	AR	AT4003	TN727	11/24/2008	11/24/2011
Antenna 8 – 18G	AR	AT4004	TN728	11/24/2008	11/24/2011
Antenna 18 – 26G	ETS	3160-09	TN1307	2/18/2008	2/18/2010
20 GHz Pre-amp	MITEQ	AFS4-00102000-30-10P-4	TN1672	4/27/2009	4/27/2010
40 GHz pre-amp	MITEQ	JS4018004000-30-8P-A1	TN1757	Verify before use	
Antenna cable 18GHz	Rohde & Schwarz	HFE160D	TN1692	4/27/2009	4/27/2010
40 GHz cable	-	-	TN1277	Verify before use	
BT tester	Rohde & Schwarz	CBT	145	NA	NA
Antenna cable set	-	-	TN1445	12/2/2008	12/2/2009

## 6.8.3. Test information

<b>Date of test:</b>	July 13, 2009	<b>Test Location:</b>	Maxwell House
<b>EUT serial:</b>	ALPHA-0002	<b>Tested by:</b>	Andrew Paradis
<b>Test Conclusion:</b>	pass		

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# Wireless Transceiver Test Report



FCC ID:A94404590

IC ID:3232A-404590

Certificate # 1514.1

## 6.9. Receiver spurious emissions

### 6.9.1. Requirements

RSS-Gen section 4.10

- if the antenna is detachable, a conducted measurement may be performed.

RSS-GEN section 6(b)

No spurious output signals appearing at the antenna terminals shall exceed 2 nW (-57dBm) per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nW (-53dBm) above 1 GHz.

### 6.9.2. Test Setup

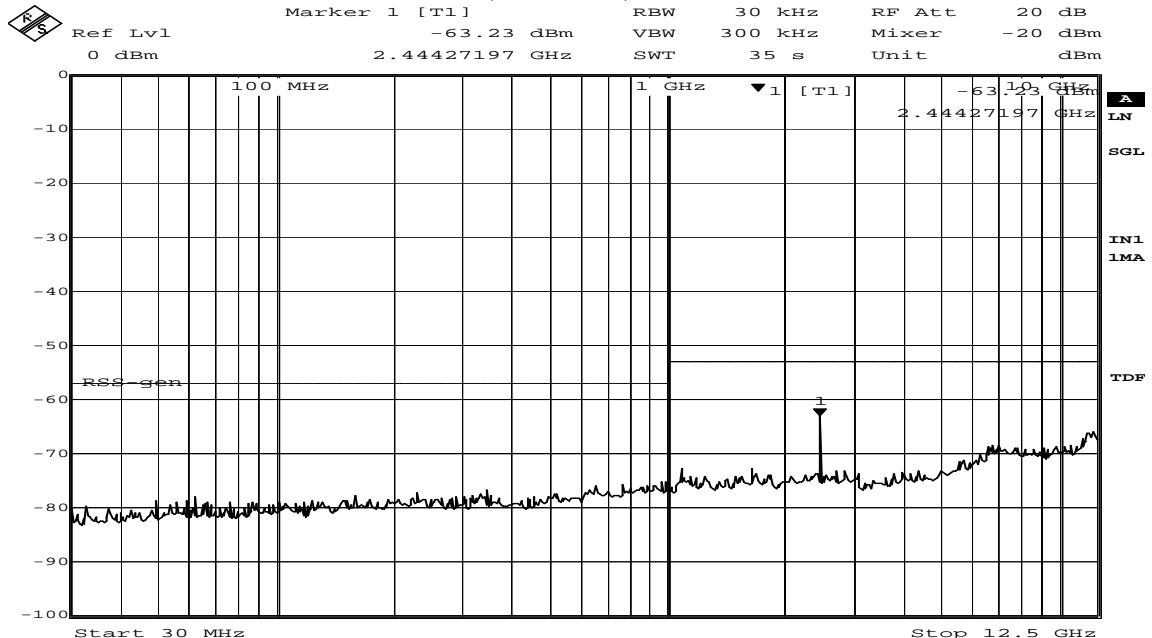
The EUT is tuned to the middle of the band and placed in receive mode. (TX idle).

Conducted:

The EUT is connected with a low loss cable to the spectrum analyzer and placed in receive mode, tuned to the middle of the band (channel 39, 2441 MHz). Cable losses are incorporated in the measured results by the measurement software. A spectrum scan is made from 30 MHz to 12.75 GHz (covering the required 30MHz – 7.5 GHz range) with a 30 kHz RBW (more than the required 4 kHz).

### 6.9.3. Test data

Measurements from 30MHz - 12.5 GHz, RX mode, receiver tuned to mid-band.



Date: 7.SEP.2009 13:57:12

Max level @ 2.444 GHz – 63.23 dBm or 0.475 nW

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# Wireless Transceiver Test Report



FCC ID:A94404590

IC ID:3232A-404590

Certificate # 1514.1

## 6.9.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				last	due
Bluetooth Tester	Rohde & Schwartz	CBT32	TN1758	5/15/2009	5/15/2010
40GHz cable	-	-	TN1277	Verify before use	
Spectrum Analyzer	Rohde & Schwartz	ESIB40	TN1560	3/3/2009	3/3/2010

## 6.9.5. Test information

Date of test:	8-4-2009	Test location:	BT test bench
EUT serial:	ALPHA-0007	Tested by:	Brent DeWitt
Test Conclusion:	Pass		

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# Wireless Transceiver Test Report



FCC ID:A94404590

IC ID:3232A-404590

Certificate # 1514.1

## 6.10. MPE calculation

The peak output power (conducted) as documented in section 6.3 of this report is 12.8dBm or 19.1mW maximum.

The maximum output power of the device (peak) is 12.8 dBm or 19.1mW.  
This is less than  $60/f$  (GHz) = 24 mW, therefore SAR testing is not required.

Ignoring the duty cycle (source based time averaging), at a distance of 20cm from the product (typically a table mounted device, categorized as "mobile" in FCC OET Guide65), and allowing for a 2dBi (1.58 numerical ) antenna gain, the power density would be

$$P/\text{area} = 19.1\text{mW} \times 1.58 / 5026 \text{ cm}^2 = .00600\text{mW}/ \text{cm}^2$$

This is well below the exposure limit of  $1 \text{ mW}/\text{cm}^2$  for the general population.

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