



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

**Report number:** EMC.404096A.09.192.1

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

**Product Tested:** SoundLink™ wireless music system

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

**Report prepared by:** Peter Boers

**Signature:** 

**Report reviewed by:** Brent DeWitt

**Signature:** 

**Report issue date:** July 14, 2009

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## Table of Contents

1. Report Summary.....	3
2. Product description .....	4
3. Applicable standards, requirements and tests.....	5
4 Environmental Conditions.....	6
5. EUT configuration.....	6
6. Detailed Test Results.....	7
6.1. Conducted emissions.....	7
6.2. Radiated emissions 30 MHz – 1 GHz.....	10
6.3. Output power .....	12
6.4. Occupied Bandwidth.....	14
6.5. Time of occupancy .....	15
6.6. Spurious emissions .....	19
6.7. Harmonics .....	21
6.8. Spurious emissions 1-25 GHz .....	24
6.9. Receiver spurious emissions.....	33
6.10. MPE calculation.....	35

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 2. Product description

The SoundLink™ wireless music system is a system enabling the user to enjoy music from a computer in any room you choose, with a wireless connection.

It features

- Simple wireless connection using the SoundLink USB key – no software to install
- Long-range wireless link lets you listen in and around your home
- Rechargeable lithium-ion battery provides hours of Bose® performance
- Handy remote included. The remote utilizes infra-red communications.

The USB key is a separate product, which is not covered in this test report.

The SoundLink™ wireless music system is classified as a Bluetooth® 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™ wireless music system is operated with a 10% duty cycle which is considered a worst-worst case for the purposes of these tests.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

### 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

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 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.

The SoundLink™ wireless music system is configured with a rechargeable battery and may be operated from the mains via a wall-mount power supply which provides 20V DC to the EUT. Conducted emissions are measured at the AC mains plug of this wall-mount power supply.

The device has an auxiliary analog audio input. An appropriate audio cable is provided with the product. In addition an infrared remote control is provided with the device, which enables the user to select inputs and adjust volume.

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 infra-red.

The 2.4 GHz data link to the EUT is provided by a Bluetooth® controller, which can force the EUT into specific test modes. Specific EUT firmware is loaded to enable this test functionality.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 6. Detailed Test Results.

### 6.1. Conducted emissions.

#### 6.1.1. Requirements

47CFR15.207

Frequency MHz	Limits dB(μV)	
	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

Frequency MHz	MEASURED		LIMIT		MARGIN		Notes
	dBμV Q-P	dBμV avg	dBμV Q-P	dBμV avg	dB Q-P	dB avg	
0.1500	54.97	37.70	66.0	56.0	11.0	18.3	Neutral 120VAC 60Hz
0.7276	38.18	25.85	56.0	46.0	17.8	20.2	Neutral 120VAC 60Hz
2.9400	39.21	25.06	56.0	46.0	16.8	20.9	Neutral 120VAC 60Hz
0.1500	54.41	34.94	66.0	56.0	11.6	21.0	Line 120VAC 60Hz
0.6754	38.20	26.31	56.0	46.0	17.8	19.7	Line 120VAC 60Hz
3.4100	40.30	30.25	56.0	46.0	15.7	15.8	Line 120VAC 60Hz

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



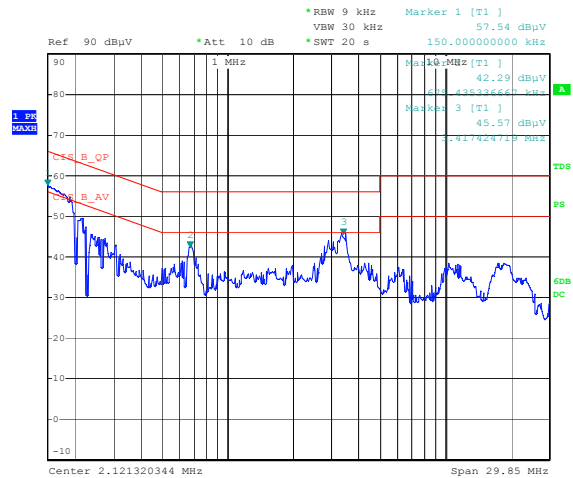
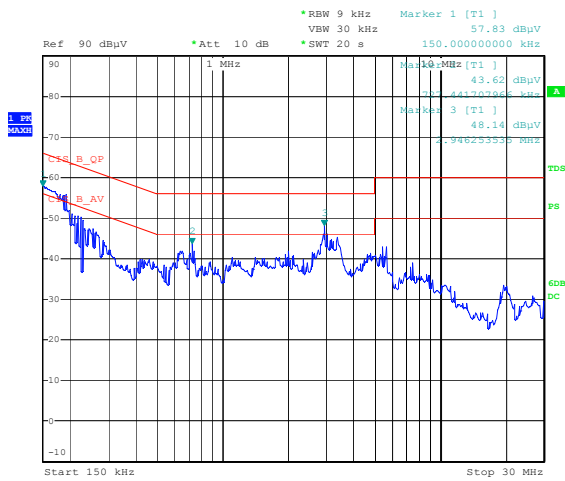
FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## Detail data

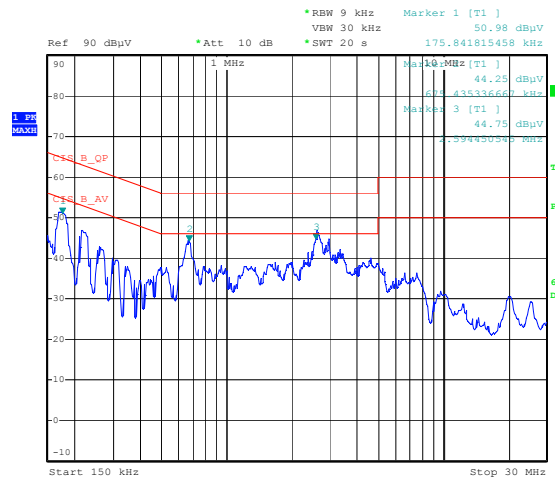
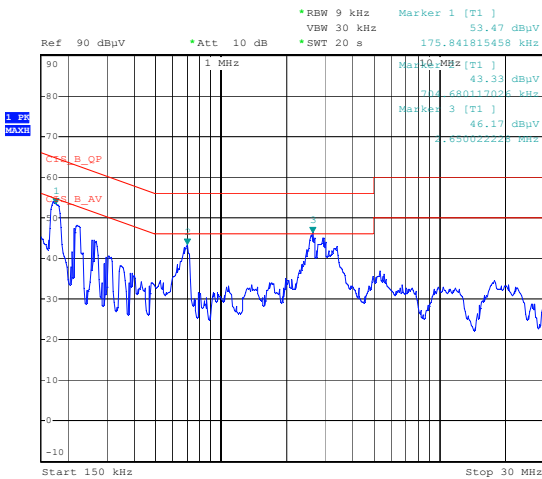
Plot #1 & 2, Aux mode, 120V AC 60Hz, Neutral and Line side



Date: 21.JAN.2009 10:40:15

Date: 21.JAN.2009 11:07:56

Plot#3 & 4: BT mode, AC power 120VAC 60Hz, Neutral and Line side.



Date: 20.JAN.2009 14:12:42

Date: 20.JAN.2009 14:01:36

Without written permission of laboratory, this report shall not be reproduced except in full.





# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 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
Receiver	Rohde & Schwarz	ESCI	TN1452		5/21/2009
Transient Limiter	HP	11947A	TN57		11/5/2009

## 6.1.5. Test information

<b>Date of test:</b>	Jan 20, 2009	<b>Test location :</b>	DCE lab – Henry room
<b>EUT serial:</b>	1	<b>Tested by:</b>	Kevin Thibodeau
<b>Test Conclusion:</b>	pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 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

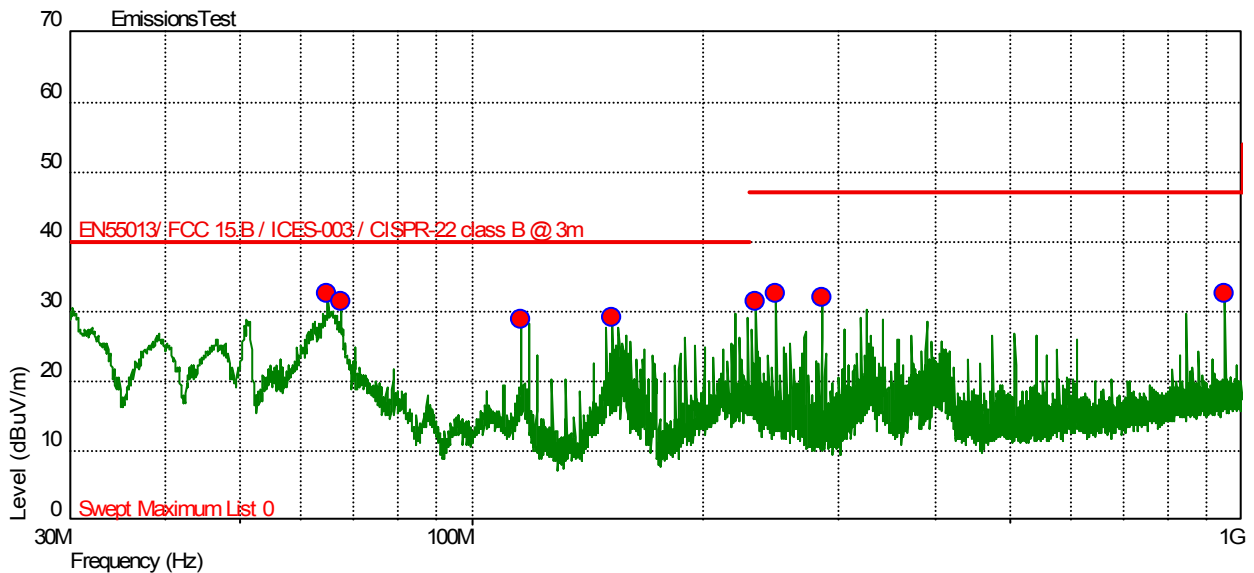
Frequency	Limit in dB $\mu$ V/m @3m
MHz	Quasi-peak
30 – 230	40
230 - 1000	47
Above 1000	54

### 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.

### 6.2.3. Test data

Automated scan peak results



Legend: Green: Automated peak detector readings  
Red dots: Indicate highest recorded peaks using max peak detector

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## Peak Emissions

Frequency (Hz)	Level (dB $\mu$ V/m)	Height (m)	Polar	Angle (Deg)	Limit (dB $\mu$ V/m)	Margin (dB $\mu$ V/m)	Detector	RBW (Hz)
64.9 M	32.60	1.66		210.00	40.00	7.30	PEAK	100.0 k
67.7 M	31.48	1.00		150.00	40.00	8.52	PEAK	100.0 k
115.7 M	28.98	1.66	--	29.00	40.00	11.02	PEAK	100.0 k
152.4 M	29.12	1.00		150.00	40.00	10.88	PEAK	100.0 k
234.25 M	31.56	1.00		150.00	46.00	8.44	PEAK	100.0 k
248.35 M	32.48	1.33	--	30.00	46.00	7.52	PEAK	100.0 k
284.45 M	31.91	1.00		150.00	46.00	8.09	PEAK	100.0 k
948.3 M	32.55	1.00		0.00	46.00	7.45	PEAK	100.0 k

## 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	6/30/2009
Pre-amp	Rohde & Schwarz	TS-PR8	TN1669	3/5/2009	3/5/2010

## 6.2.5. Test information

<b>Date of test:</b>	May 4, 2009	<b>Test location :</b>	DCE - Maxwell House
<b>EUT serial:</b>	20067	<b>Tested by:</b>	C. Bell
<b>Test Conclusion:</b>	pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 6.3. Output power

### 6.3.1. Requirements.

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

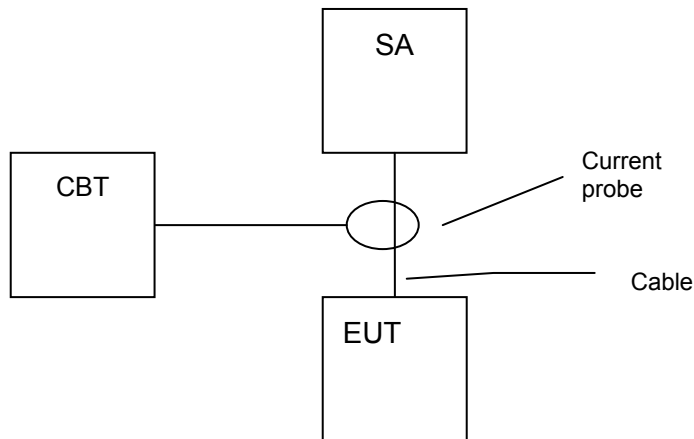
Frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W.

### 6.3.2. Test setup details.

The transceiver is modified with special firmware enabling the control of the Bluetooth radio chip via a R&S Bluetooth tester (CBT) enabling "test mode". 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 R&S CBT Bluetooth tester. 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.

Block diagram:



*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

### 6.3.3. Test data.

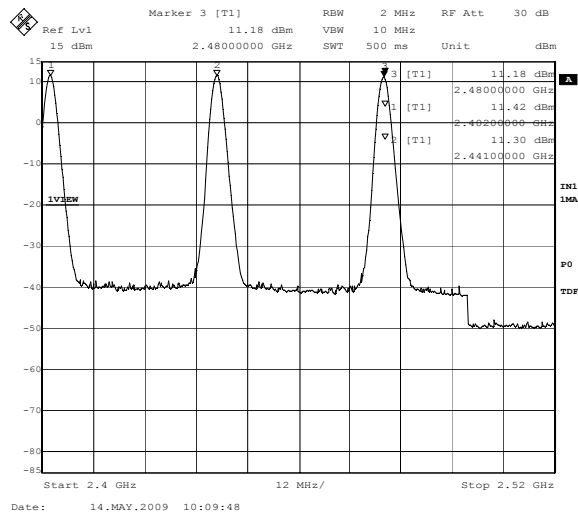
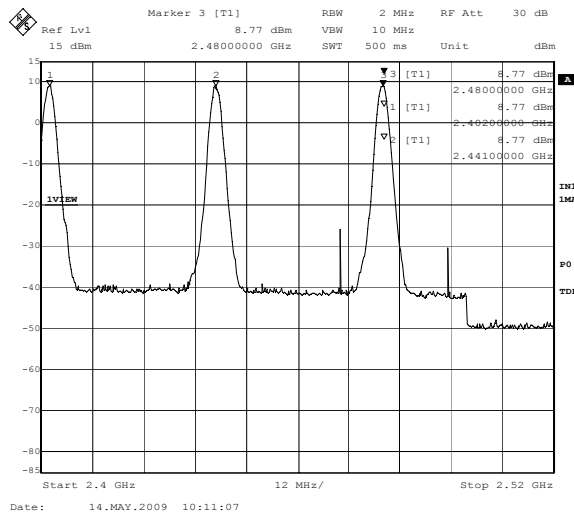
Summary. RBW=2 MHz, detector=peak, max power = 11.42 dBm = 0.0139W

Channel	Frequency MHz	Basic Rate dBm	EDR dBm
0	2402	8.77	11.18
39	2441	8.77	11.42
78	2480	8.77	11.30

Test detail: Max power

Basic rate, Packet type = DH5 , 10% PRBS

EDR, 3-DH5, 10% PRBS



### 6.3.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Spectrum analyzer	Rohde & Schwarz	ESIB40	TN1560	5/30/2008	6/30/2009
40 GHz cable	-	-	TN1277	Verify before use	
BT controller	Rohde & Schwarz	CBT	ID 0145	NA	NA

### 6.3.5. Test information

<b>Date of test:</b>	May 3, 2009	<b>Test location:</b>	BT test station
<b>EUT serial:</b>	20101	<b>Tested by:</b>	Peter Boers
<b>Test Conclusion:</b>	pass		

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 6.4. Occupied Bandwidth

### 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 hopset.

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	1.347	1.216
39	2441	1.338	1.205
78	2480	1.335	1.198

Conclusion: 2/3<sup>rd</sup> of the largest OBW = 2/3 x 1.347 MHz = 898 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 1.216 MHz = 96.06 MHz.

#### 6.4.3.1. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESU40	TN1663	5/30/2008	6/30/2009
BT control box	Rohde & Schwarz	CBT	145	NA	NA

### 6.4.4. Test information

<b>Date of test:</b>	July 14, 2009	<b>Test location:</b>	Maxwell house
<b>EUT serial:</b>	0042	<b>Test by:</b>	Peter Boers
<b>Test Conclusion:</b>	pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 6.5. Time of occupancy

### 6.5.1. Requirements

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

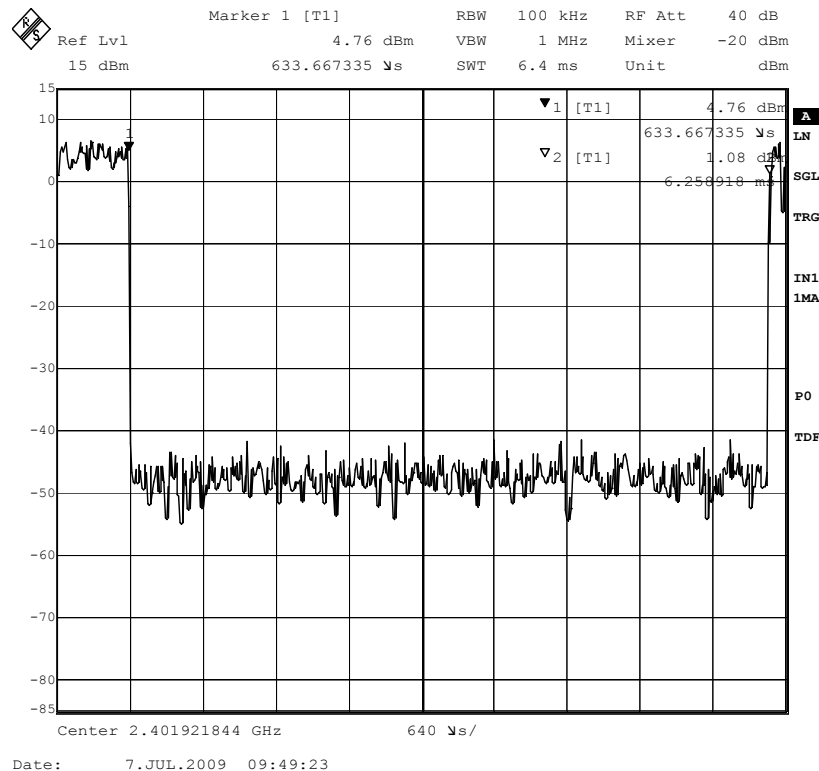
The frequency hopping operation shall have an average time occupancy on any frequency not to exceed 0.4 seconds within the duration in seconds equal to the number of hopping frequencies employed multiplied by 0.4

### 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 (78) times 0.4 seconds or 31.2 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 0.634 ms for a DH5 packet type with 10% duty cycle.



Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94404096A

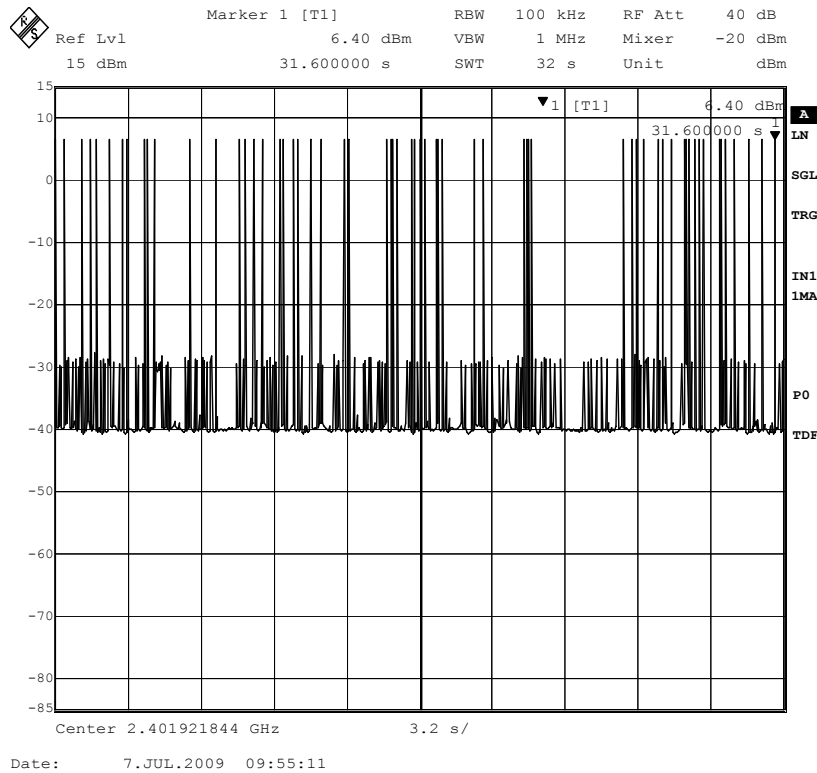
IC ID:3232A-404096A

Certificate # 1514.1

79 times 0.4 seconds = 31.6 seconds. Sweep time is set for 31.6 (32) seconds

Measurements are made on 3 channels to record the number of "hits" on a channel in 31.6 seconds.

Low channel (2402 MHz)



There are 58 pulses in 31.6 seconds. Therefore the average dwell time per channel is  $0.634 \text{ ms} \times 58 = 36.7 \text{ ms}$  which is less than the allowed 400ms.

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report

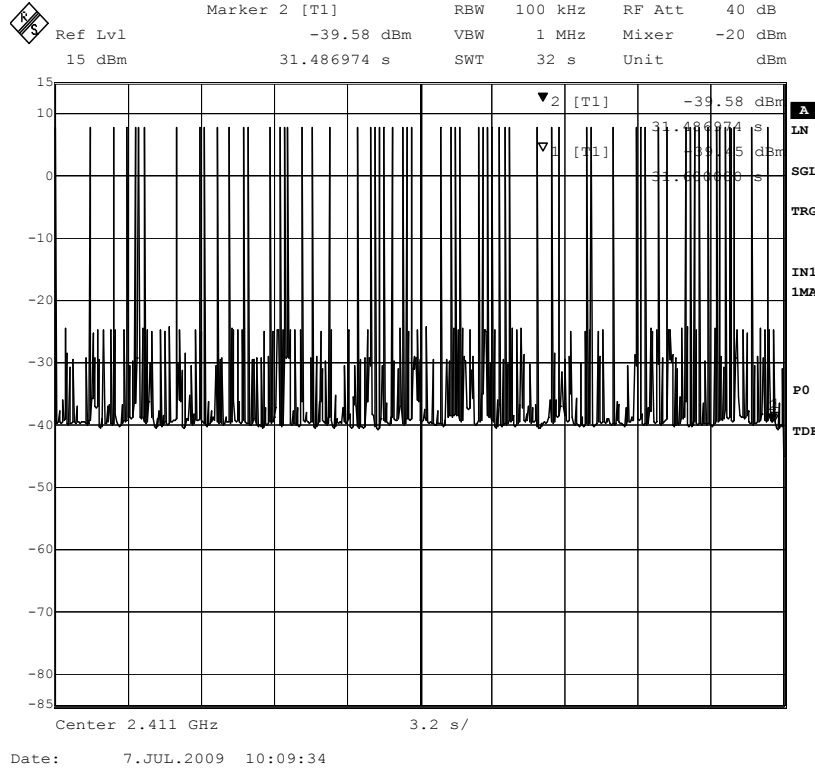


FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

Mid channel (2441 MHz)



There are 64 pulses in 31.6 seconds. Therefore the average dwell time per channel is  $0.634 \text{ ms} \times 64 = 40.6 \text{ ms}$  which is less than the allowed 400ms.

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

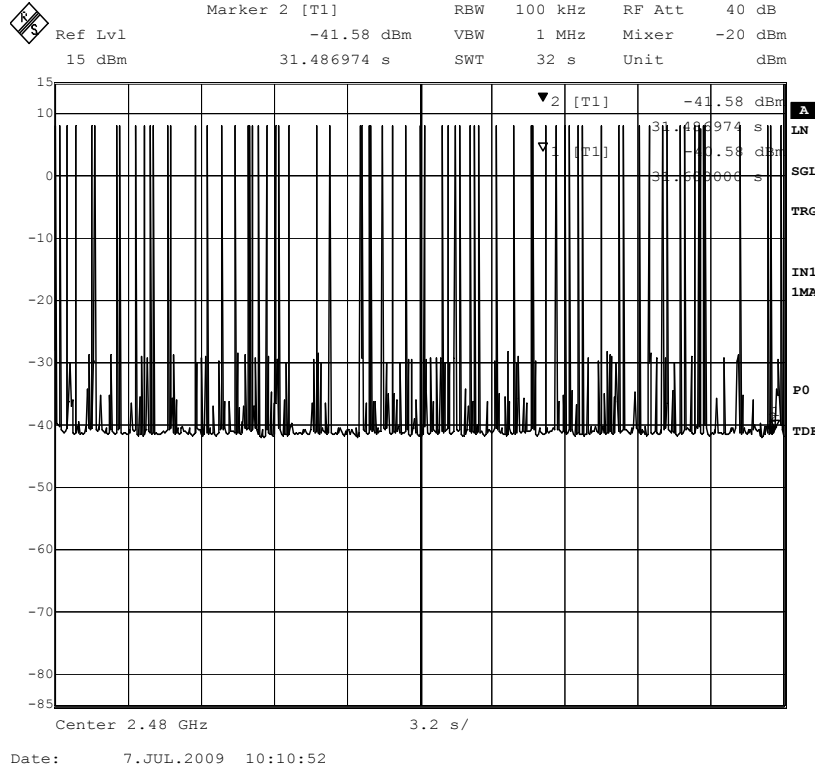


FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

High channel (2480MHz)



There are 67 pulses in 31.6 seconds. Therefore the average dwell time per channel is 0.634 ms x 67 = 42.5 ms which is less than the allowed 400ms.

### 6.5.4. 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
CBT controller	Rohde & Schwarz	CBT	TN1758	5/15/2009	5/15/2010

### 6.5.5. Test information

<b>Date of test:</b>	Jul 7, 2009	<b>Test location:</b>	BT test bench
<b>Serial number:</b>	0042AE	<b>Tested by:</b>	Peter Boers
<b>Test Conclusion:</b>	pass		

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 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.

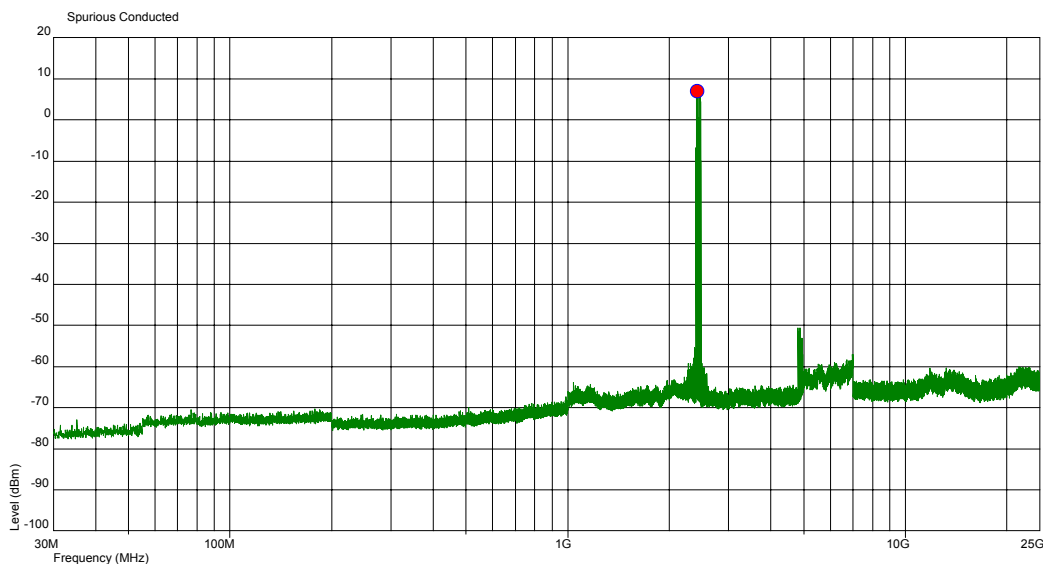
Measurements are made with the EUT in normal operation (hopping through all available channels) in basic rate modulation and in EDR mode.

### 6.6.3. Test data

#### Conducted spurious:

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

DH5 basic rate conducted spurious. The level of the wanted signal is 6.94 dBm in 100kHz. All other conducted spurious emissions are more than 50 dB below this level.



*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

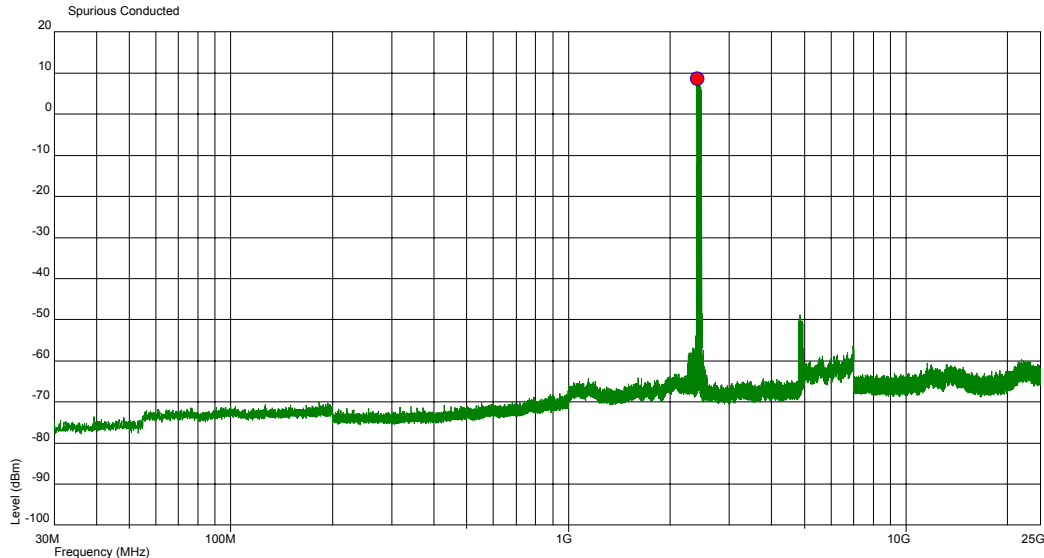


FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

3-DH5 conducted spurious, 30 MHz – 25 GHz, 100kHz RBW, peak detector, normal operation EDR rate modulation. The level of the wanted signal is 8.72 dBm in 100kHz. All other conducted spurious emissions are more than 50 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>	May 27, 2009	<b>Test Location:</b>	BT test station
<b>EUT serial:</b>	20066	<b>Tested by:</b>	Peter Boers
<b>Test Conclusion:</b>	pass		

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 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	55.9	36.4	74	54	17.6
4804, 3DH5	55.9	34.2	74	54	18.1
4882, DH5	55.1	35.7	74	54	18.3
4882, 3DH5	56.2	34.3	74	54	17.8
4960, DH5	57.1	37.4	74	54	16.6
4960, 3DH5	55.7	33.6	74	54	18.3

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

3<sup>rd</sup> Harmonic

Frequency [MHz] Packet Type	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	
7206, DH5	53.8	33.9	74	54	20.10
7206, 3DH5	52.3	31.2	74	54	21.70
7323, DH5	47.2	29.4	74	54	24.60
7323, 3DH5	45.1	27.8	74	54	26.20
7440, DH5	47.8	29.5	74	54	24.50
7440, 3DH5	45.2	28.0	74	54	26.00

At the 4<sup>th</sup> 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)	38.5	25.3	not in restricted band		
12.4 (5th Har)	40.4	27.1	74	54	26.90
14.8 (6th Har)	43.0	30.1	74	54	23.90
17.3 (7th Har)	45.0	31.3	not in restricted band		
19.5 (8th Har)	51.0	38.0	74	54	16.00
22.1 (9th Har)	52.0	39.0	74	54	15.00
24.5 (10th Har)	52.5	40.0	not in restricted band		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

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	6/30/2009
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 – 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>	April 27, 2009	<b>Test Location:</b>	Maxwell House
<b>EUT serial:</b>	20066	<b>Tested by:</b>	Andy Paradis/Chad Bell
<b>Test Conclusion:</b>	pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

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 54dB $\mu$ V/m (average) or 74dB $\mu$ V/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.

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report



FCC ID: A94404096A

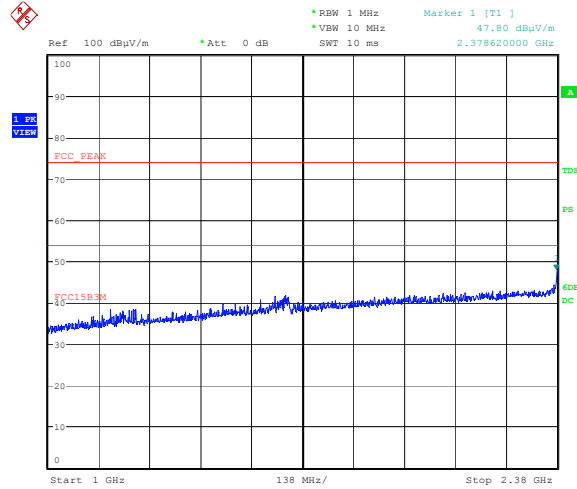
IC ID:3232A-404096A

Certificate # 1514.1

## 6.8.3. Test data

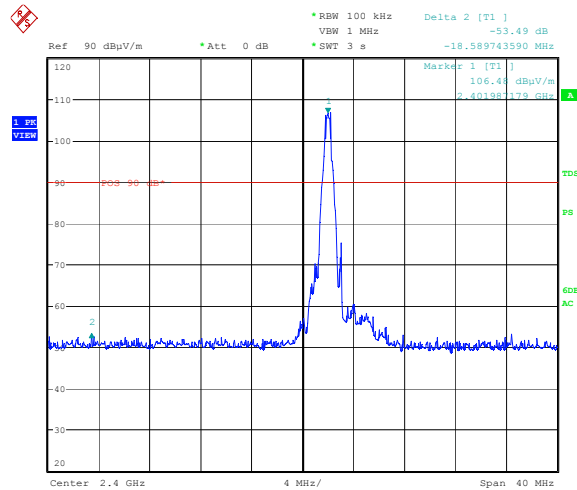
Frequency range 30MHz – 1 GHz. Passes, see section 6.2 of this report

Frequency range 1 – 2.38 GHz



Date: 7.JUL.2009 19:27:34

Frequency range 2.38 – 2.4 GHz, band edge measurement with 100kHz rbw, Basic rate modulation



Date: 9.JUL.2009 17:42:01

The delta between the in-band and the maximum value in the lower adjacent restricted band is 53.49 dB

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

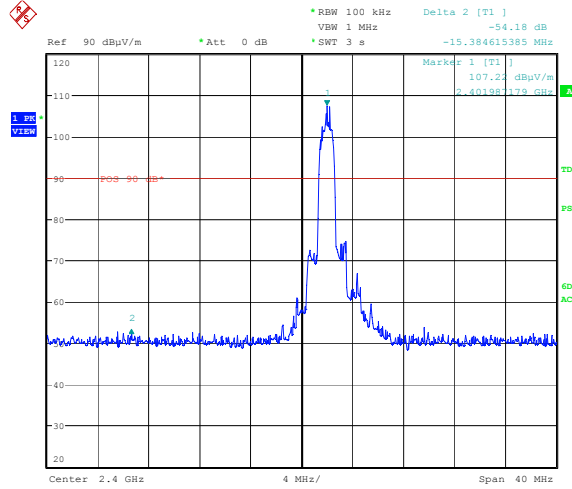


FCC ID: A94404096A

IC ID:3232A-404096A

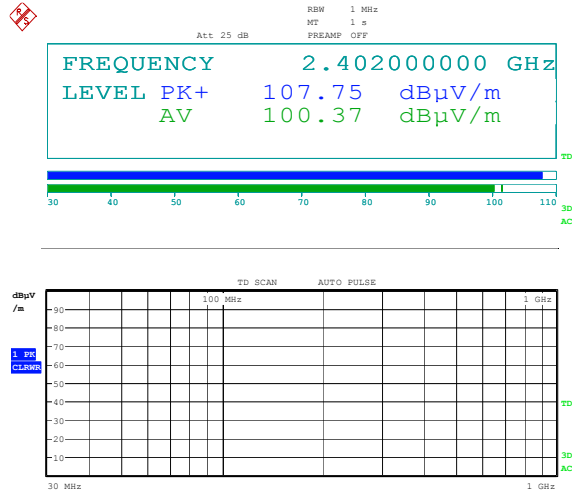
Certificate # 1514.1

Frequency range 2.38 – 2.4 GHz, band edge measurement with 100kHz rbw, EDR modulation.



Date: 9.JUL.2009 17:40:50

The delta between the in-band and the maximum value in the lower adjacent restricted band is 54.18 dB  
 Actual peak and average measured in-band value with 1 MHz rbw and basic rate modulation



Date: 9.JUL.2009 17:15:29

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

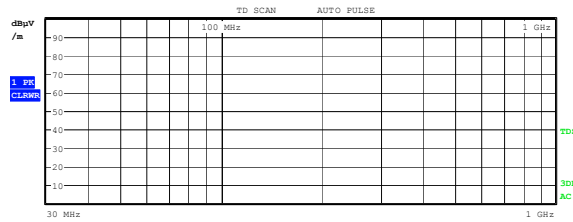
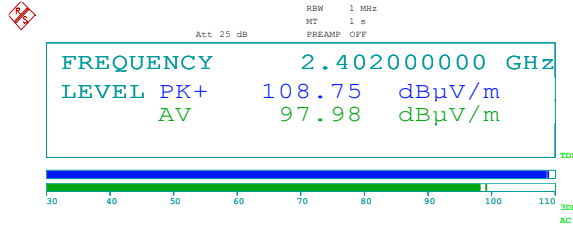


FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

Actual peak and average measured in-band value with 1 MHz rbw and EDR modulation



Date: 9.JUL.2009 17:23:49

Maximum values for spurious emissions from 2380 – 2400 MHz is

(a) More than 20 dB, and

(b) the maximum value in the restricted band with 1 MHz rbw is

Basic rate : 100.37 – 53.49 = 46.88 dBµV/m average  
 107.75 – 53.49 = 54.26 dBµV/m peak

EDR : 97.98 – 54.18 = 43.8 dBµV/m average  
 108.75 – 54.18 = 55.26 dBµV/m peak.

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

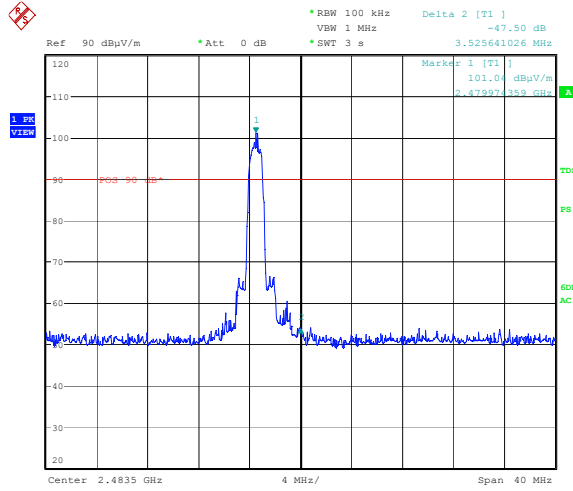


FCC ID: A94404096A

IC ID:3232A-404096A

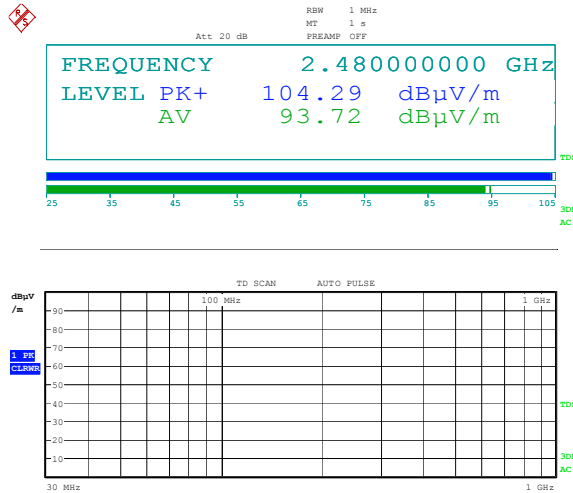
Certificate # 1514.1

Frequency range 2.4835 - GHz, band edge measurement with 100kHz rbw, EDR modulation



Date: 9.JUL.2009 17:32:33

The delta between in-band and the band edge at 2483.5 MHz is 47.5 dB  
Actual in band values with 1 MHz rbw



Date: 9.JUL.2009 17:36:19

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

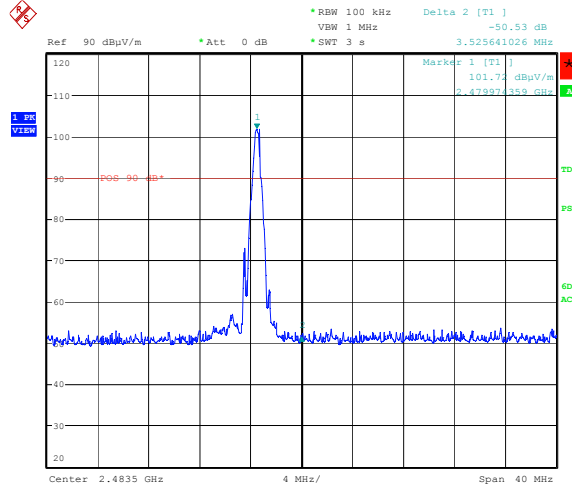


FCC ID: A94404096A

IC ID:3232A-404096A

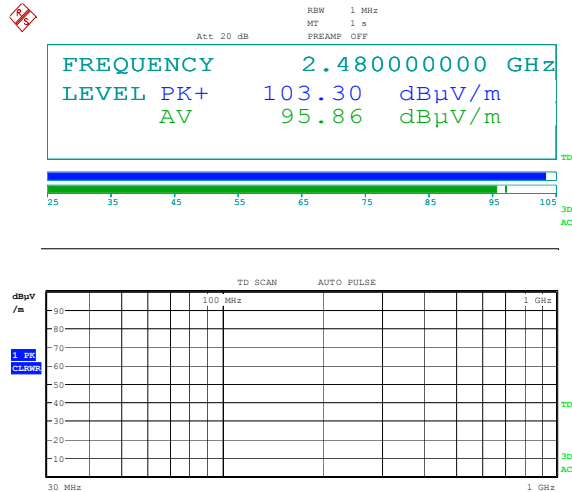
Certificate # 1514.1

Frequency range 2.4815 – 2.4855 GHz, band edge measurement with 100kHz rbw, basic rate modulation



Date: 9.JUL.2009 17:34:38

The delta between in-band and the band edge at 2483.5 MHz is 50.53 dB  
Actual in band values with 1 MHz rbw



Date: 9.JUL.2009 17:35:33

the maximum value in the restricted band with 1 MHz rbw is

Basic rate : 95.86 – 50.53 = 45.33 dBμV/m average  
 103.3 – 50.53 = 52.77 dBμV/m peak

EDR : 93.72 – 47.5 = 46.22 dBμV/m average  
 104.29 – 47.5 = 56.79 dBμV/m peak.

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report

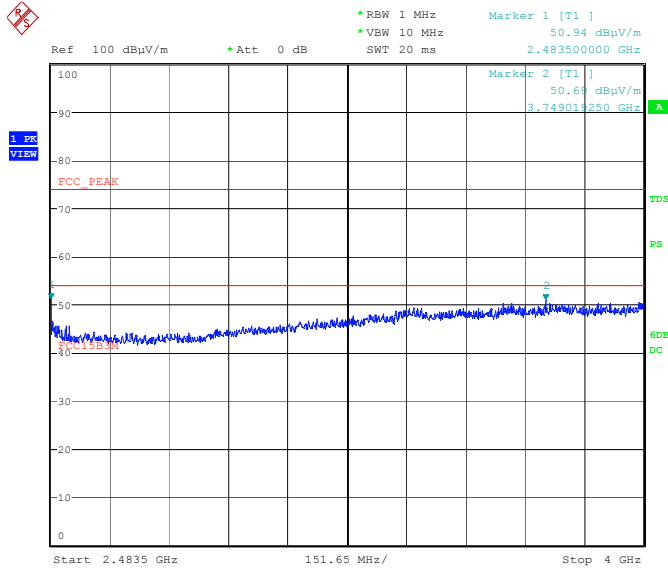


FCC ID: A94404096A

IC ID:3232A-404096A

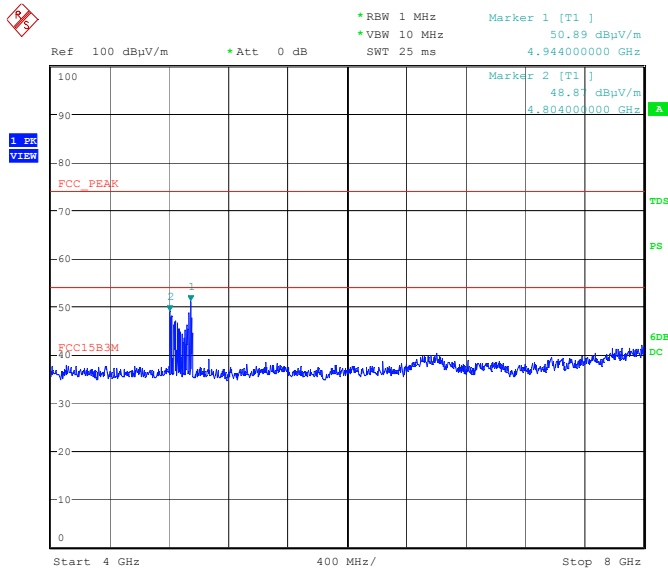
Certificate # 1514.1

Frequency range 2.4835 - 4 GHz



Date: 7.JUL.2009 21:18:55

Frequency range 4 - 8 GHz



Date: 7.JUL.2009 22:08:12

Note that the emissions from 4804 – 4944 MHz are actually harmonics.

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report

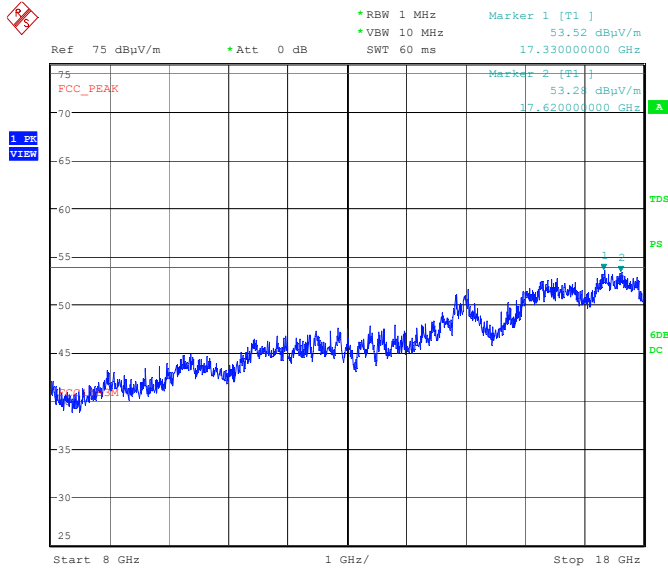


FCC ID: A94404096A

IC ID:3232A-404096A

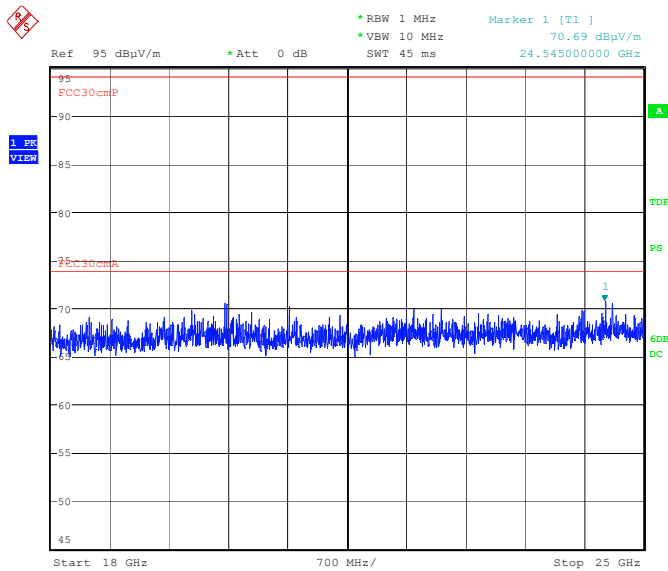
Certificate # 1514.1

Frequency range 8-18 GHz



Date: 7.JUL.2009 22:44:57

Frequency range 18 – 25 GHz. Due to noise floor limitations of the test equipment, the test limits have been normalized to 30cm and antenna distance have been reduced to 30cm distance



Date: 7.JUL.2009 23:05:24

Without written permission of laboratory, this report shall not be reproduced except in full.



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 6.8.4. 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

## 6.8.5. Test information

<b>Date of test:</b>	July 7, 2009	<b>Test Location:</b>	Maxwell House
<b>EUT serial:</b>	39	<b>Tested by:</b>	Andrew Paradis
<b>Test Conclusion:</b>	pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*





# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

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

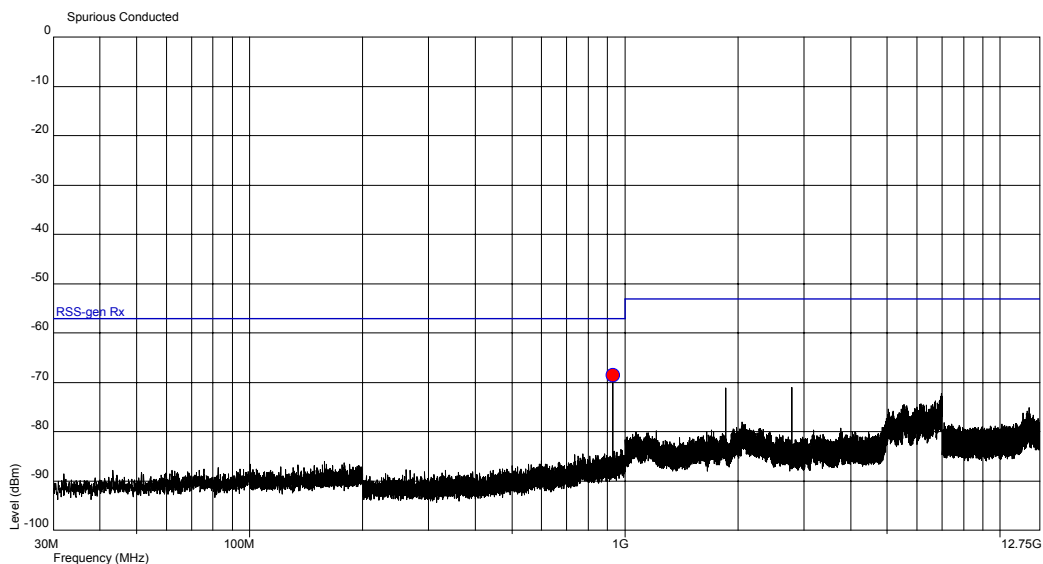
The EUT is tuned to the middle of the band and placed in receive mode. (TX idle).

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 100 kHz RBW (more than the required 4 kHz).

### 6.9.3. Test data

Measurements from 30MHz - 7.5 GHz, RX mode, receiver tuned to mid-band.



Max level @ 927.95MHz is – 68.44 dBm or 0.14 nW

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

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:	6-9-2009	Test location:	BT test bench
EUT serial:	0042AE	Tested by:	Peter Boers
Test Conclusion:	Pass		

*Without written permission of laboratory, this report shall not be reproduced except in full.*



# Wireless Transceiver Test Report



FCC ID: A94404096A

IC ID:3232A-404096A

Certificate # 1514.1

## 6.10. MPE calculation

The peak output power (conducted) as documented in section 6.3 of this report is 11.42dBm or 13.86mW maximum.

The maximum output power of the device (peak) is 11.42 dBm or 13.86 mW.  
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

$$P/\text{area} = 13.86\text{mW} \times 1.58 / 5026 \text{ cm}^2 = .00435 \text{ mW/ cm}^2$$

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

---

*Without written permission of laboratory, this report shall not be reproduced except in full.*