



Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Report number: EMC.404600.11.181.1

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

Product Tested: Model 404600 Powered Speaker

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

Report prepared by: Brent DeWitt

Signature:

Report reviewed by: Jon Kanter

Signature:

Report issue date: July 13, 2011 revision 2

Changes from previous revision: Updated and expanded Section 6.5

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1. Report Summary

1.1 Product Model 404600

1.2 Client Bose Corporation
The Mountain, Framingham MA 01701

1.3 Applicable Standards **FCC part 15.B and C**
RSS-210 issue 8
RSS-Gen issue 3
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

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2. Product description

The Model 404600 powered speaker enables the user to listen to music in any room you choose, with a wireless connection.

The Model 404600 is classified as a data “sink” with a duty cycle that does not exceed 5% in normal operation. For the tests described in this report, where an artificial test mode is indicated or necessary for the purposes of the test, the Model 404600 is operated with a 10% duty cycle which is considered a worst case.

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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 ± 4 °C

Humidity: 30 – 60 % RH

5. EUT configuration

In some situations, the Model 404600 it may be operated from the mains via a wall-mount power supply which provides 12V 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.

The EUT may be placed in specific test modes via the mini-USB Service Port and wireless chip vendor's control software.

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6. Detailed Test Results

6.1. Conducted emissions

6.1.1. Requirements

47CFR15.207

Frequency MHz	Limits dB(μ 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

The unit was tested with both grounded and ungrounded auxiliary input shield, as well as wireless. Grounded auxiliary input shield was found to be the worst case. The worst case margin was 4.6 dB at 495 kHz in Average detection mode.

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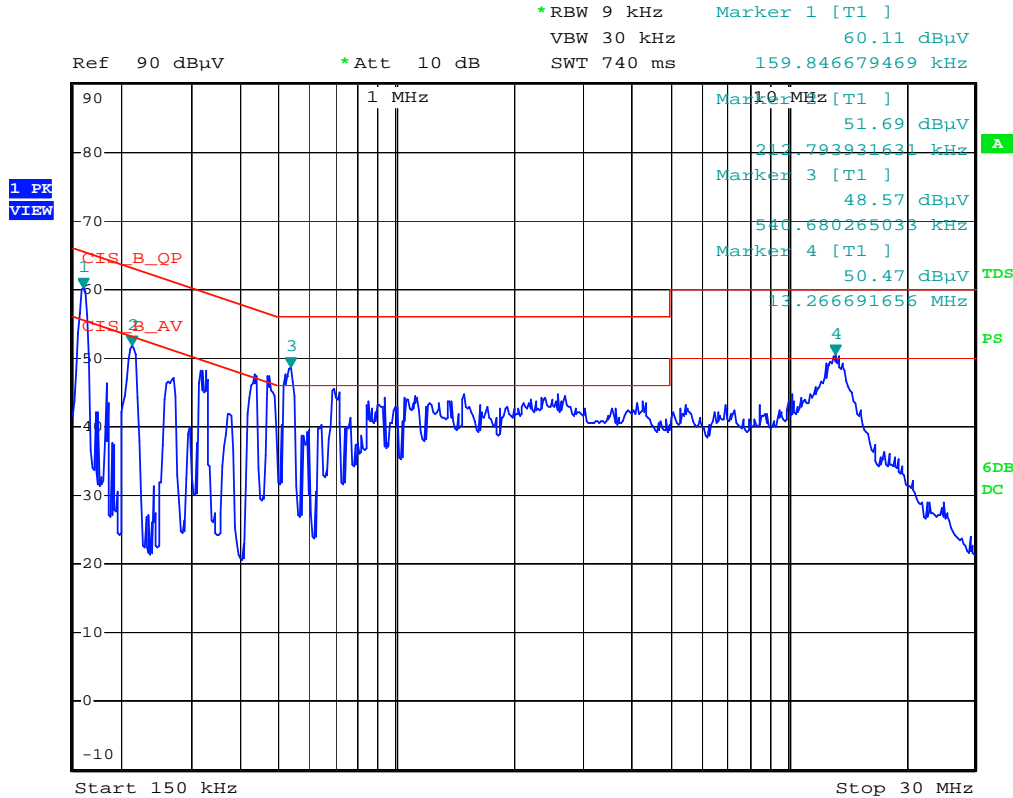


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No input signal (or minimum volume), grounded input (worst case):



Date: 24.MAR.2011 10:25:21

Worst case passes with minimum margin of 4.6 dB AVG at 495 kHz.

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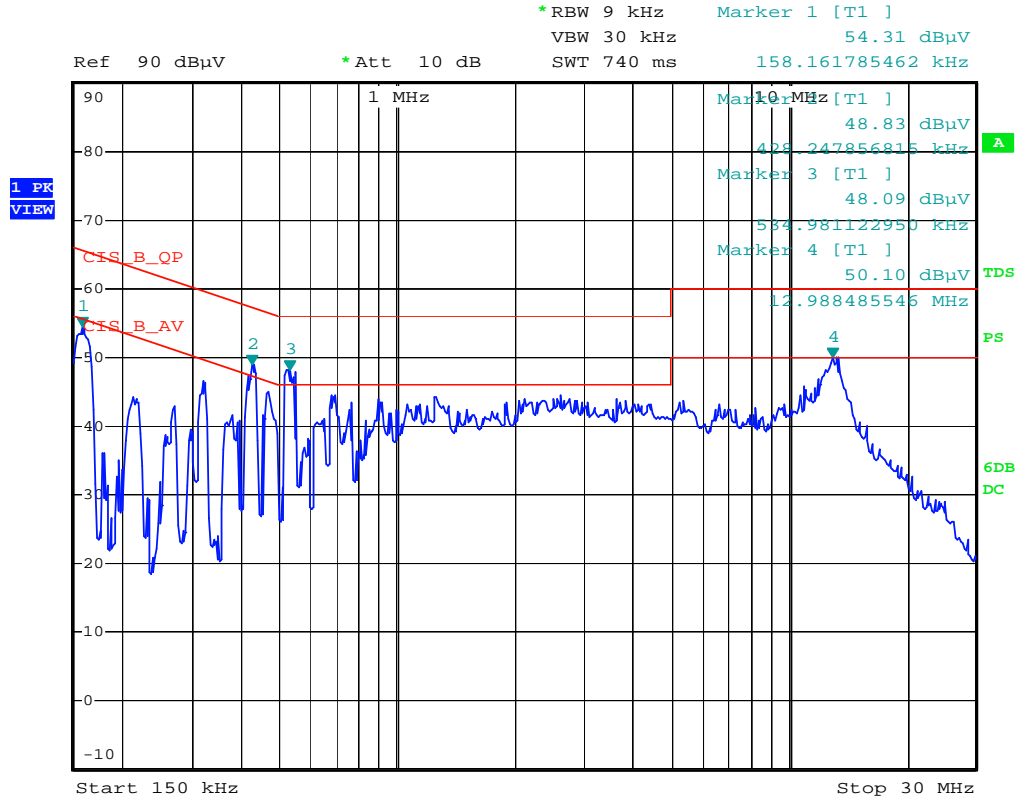


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Pink noise max volume, grounded input (worst case):



Date: 24.MAR.2011 13:06:17

Worst case passes with minimum margin of 5.8 dB AVG at 533 kHz.

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Frequency MHz	MEASURED		LIMIT		MARGIN		Notes
	dBμV QP	dBμV AVG	dBμV QP	dBμV AVG	dB QP	dB AVG	
							With flip-prong PS S/N FP29:
0.1620	53.30	43.70	65.3	55.3	12.0	11.6	Pink noise max volume, grounded input, L side
0.2150	44.30	38.00	63.0	53.0	18.7	15.0	Pink noise max volume, grounded input, L side
0.2684	40.40	34.60	61.2	51.2	20.8	16.6	Pink noise max volume, grounded input, L side
0.3246	44.70	39.20	59.6	49.6	14.9	10.4	Pink noise max volume, grounded input, L side
0.3777	40.00	33.60	58.3	48.3	18.3	14.7	Pink noise max volume, grounded input, L side
0.4784	43.40	35.40	56.4	46.4	13.0	11.0	Pink noise max volume, grounded input, L side
0.5328	48.10	40.20	56.0	46.0	7.9	5.8	Pink noise max volume, grounded input, L side
1.0680	41.40	31.40	56.0	46.0	14.6	14.6	Pink noise max volume, grounded input, L side
13.3500	45.10	39.10	60.0	50.0	14.9	10.9	Pink noise max volume, grounded input, N side
0.1620	56.80	47.00	65.3	55.3	8.5	8.3	No input signal, grounded input, L side
0.2150	46.60	38.80	63.0	53.0	16.4	14.2	No input signal, grounded input, L side
0.2750	40.40	35.30	61.0	51.0	20.6	15.7	No input signal, grounded input, L side
0.3310	43.70	38.60	59.4	49.4	15.7	10.8	No input signal, grounded input, L side
0.3860	43.40	38.40	58.1	48.1	14.7	9.7	No input signal, grounded input, L side
0.4950	47.80	41.50	56.1	46.1	8.3	4.6	No input signal, grounded input, L side
0.5540	46.60	39.90	56.0	46.0	9.4	6.1	No input signal, grounded input, L side
1.0680	41.90	32.10	56.0	46.0	14.1	13.9	No input signal, grounded input, L side
13.3500	45.60	39.60	60.0	50.0	14.4	10.4	No input signal, grounded input, N side

6.1.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				Last	due date
LISN	EMCO	3810/2	TN600	3/11/2011	3/11/2012
Receiver	Rohde & Schwarz	ESCI	TN1420	4/9/2010	4/5/2011
Transient Limiter	HP	11947A	TN57	11/24/2010	11/24/2011

6.1.5. Test information

Date of test:	March 24, 2011	Test location :	DCE lab – Henry room
EUT serial:	0029	Tested by:	Kevin Strong
Test Conclusion:	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 μ 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.

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. The AUX audio cable connected to the EUT was bundled to 30cm, total length of 1m.

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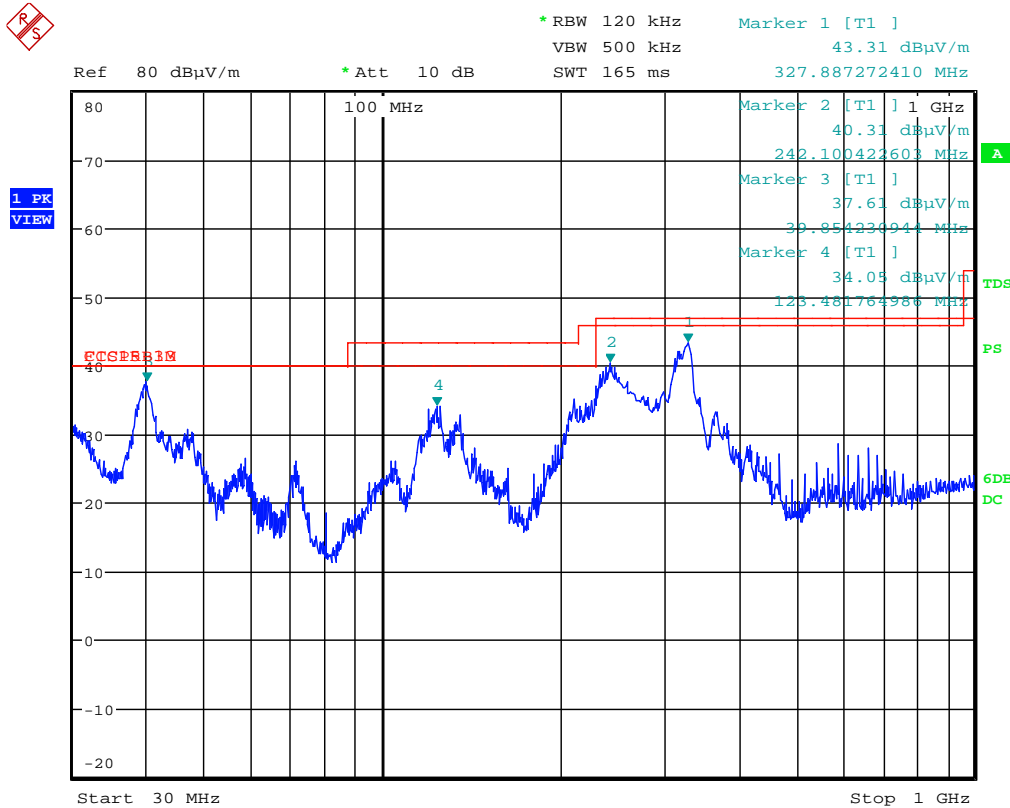
6.2.3. Test data

Tested with EUT sample S/N 0029, Power Adapter S/N FP29.

Tested in AUX mode with iPod used as signal source. 120 VAC, 60 Hz.

All plots shown below are scans using max peak detector, max hold with vertical/horizontal antenna polarization, 0-360° table rotation, 1-4 m antenna height.

Playing pink noise at max volume, charging fully discharged battery:



Date: 29.MAR.2011 09:34:12

Worst case passes with minimum margins of 2.8 dB QP with FCC limit and 3.8 dB QP with CISPR limit at 324 MHz.

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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
323.980	43.20	46.0	2.8	0	H	1.0
242.110	37.10	46.0	8.9	160	V	1.0
230.000	32.90	46.0	13.1	160	V	1.0
118.520	28.20	43.5	15.3	230	V	1.0
135.490	28.20	43.5	15.3	85	V	1.0
39.570	33.60	40.0	6.4	0	V	1.0

6.2.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service	
				last	due
Antenna	Sunol Sciences	JB6	TN1541	5/24/2010	5/24/2011
Receiver	Rohde & Schwarz	ESU40	TN1663	4/9/2010	4/9/2011
Pre-amp	Rohde & Schwarz	TS-PR8	TN1669	2/10/2011	2/10/2012

6.2.5. Test information

Date of test:	March 29, 2011	Test location :	DCE - Maxwell House
EUT serial:	0029	Tested by:	Kevin Strong
Test Conclusion:	pass		

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6.3. Output power

6.3.1. Requirements.

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

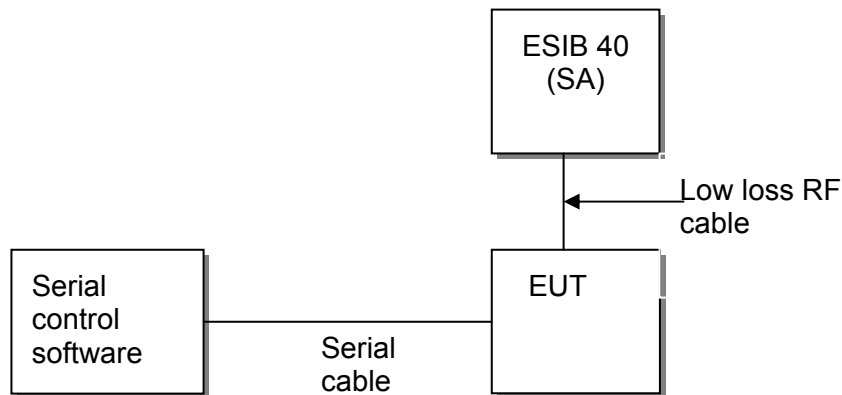
Frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater 0.125 W.

6.3.2. Test setup details.

The transceiver is controlled via a USB communications link capable of directly setting the test modes of the BlueTooth controller. The EUT DSP/radio board has a combination connector/switch which disconnects the antenna when the SMA adapter is connected. The EUT is then 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 USB. 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 the same for basic rate and for Enhanced Data Rate (EDR) settings.

Test Setup Block diagram:



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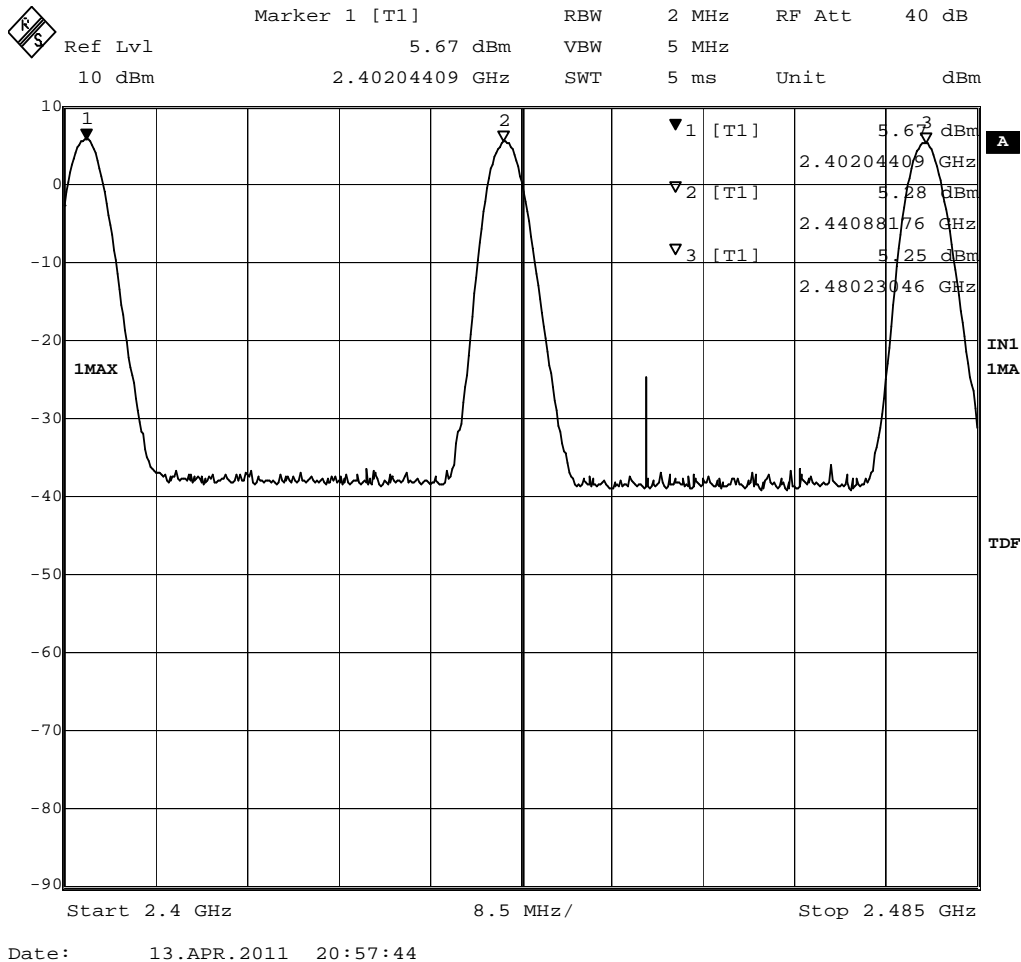
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6.3.3. Test data.

Summary: RBW=2 MHz, detector=peak, max power = 6.77 dBm = 0.00475W

Test detail: Max power

	EDR Output Power (dBm)		
Sample SN:	2402 MHz	2441 MHz	2480 MHz
30	5.67	5.28	5.25



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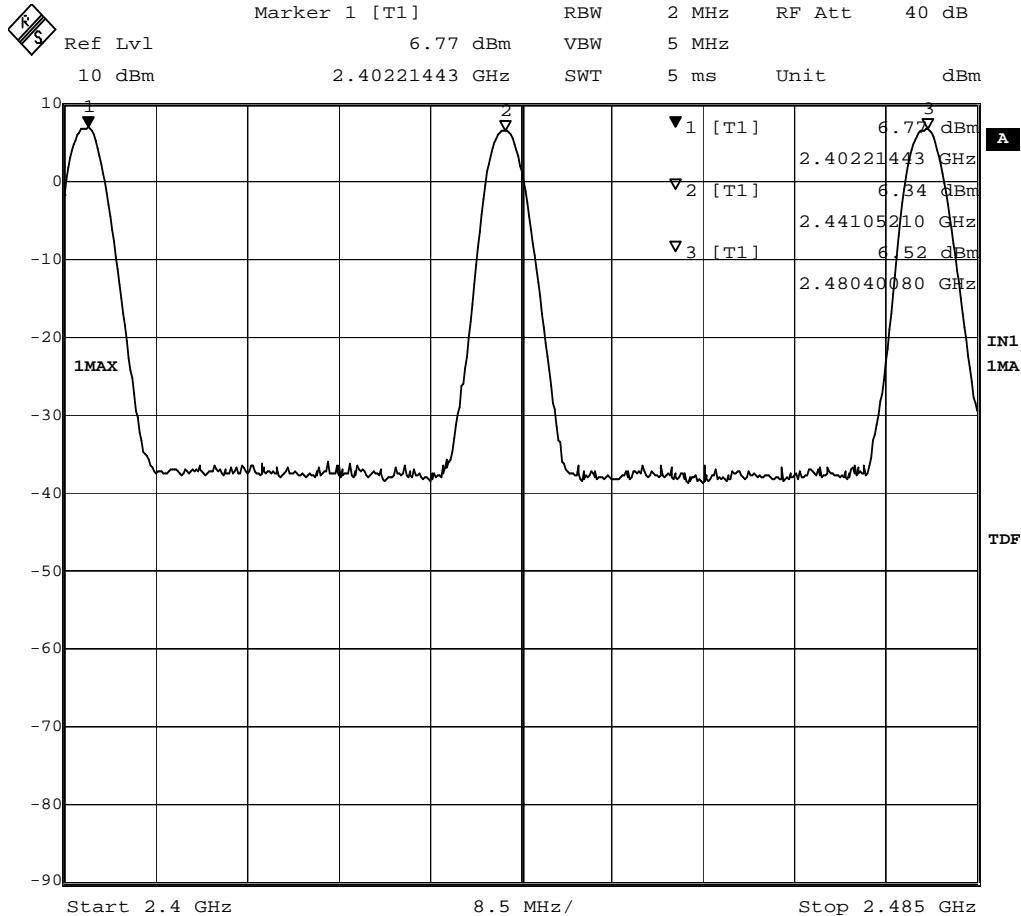


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Basic Rate Output Power (dBm)			
Sample SN:	2402 MHz	2441 MHz	2480 MHz
30	6.77	6.34	6.52



Date: 13.APR.2011 20:53:38

6.3.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Spectrum analyzer	Rohde & Schwarz	ESIB 40	TN1560	4/6/2011	4/6/2012
40 GHz cable	-	-	TN1808	Verify before use	

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6.3.5. Test information

Date of test:	April 13, 2011	Test location:	BT test station
EUT serial:	DP3- 00030	Tested by:	Chad Bell
Test Conclusion:	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 $2/3^{\text{rd}}$ 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

Model #: 404600

Phase: DP3

Test Standard(s): FCC 15.247(a)(1)
RSS210 section 8.1
RSS210 section 8.1(b)

Test: Occupied Bandwidth & Channel Spacing, conducted

Tested By: Chad Bell

Date: 14-apr-2011

Test Equipment (Bose TN): TN1560 – Rohde & Schwarz ESIB40 EMI Test Receiver,
TN1227-18 36 k-connector cable

EUT Operating Mode(s): DH5 basic rate
3DH5 enhanced data rate.
Operating at the low, mid, & high end of the band
Measure 20dB OBW and 99% OBW

Test Sample S/N: 0030

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Note(s):

DH5 settings:

Basic Int PA = 60
Basic TX PA Atten = 0
Packet Type = 15
Packet Size = 34

3DH5 settings:

Enh Int PA = 60
Enh TX PA Atten = 0
Packet Type = 31
Packet Size = 102

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

BT Channel	Center Frequency (MHz)	-20dB OBW (MHz)	99% OBW (MHz)
0	2402	1.393	1.222
39	2441	1.393	1.212
78	2480	1.383	1.212

Conclusion: $2/3^{\text{rd}}$ of the largest OBW = $2/3 \times 1.393 \text{ MHz} = 928.67 \text{ kHz}$, 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 1.222 MHz = 96.538 MHz.

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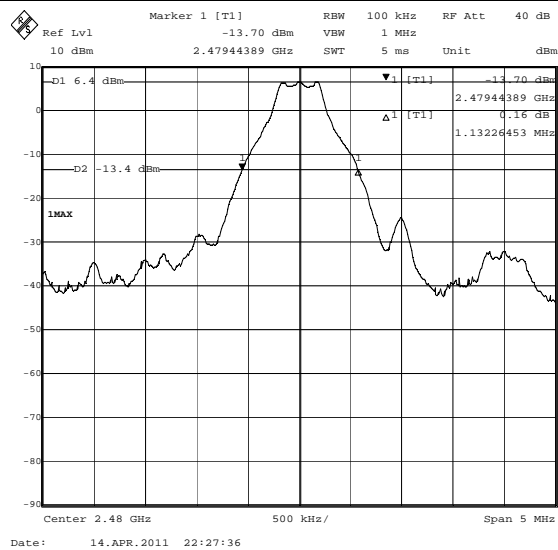
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High Channel, 2480MHz

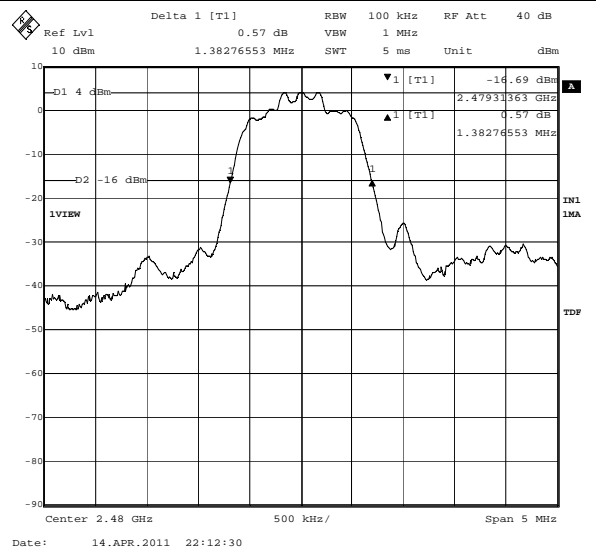
Packet Type: DH5

-20dB OBW = 1.132MHz



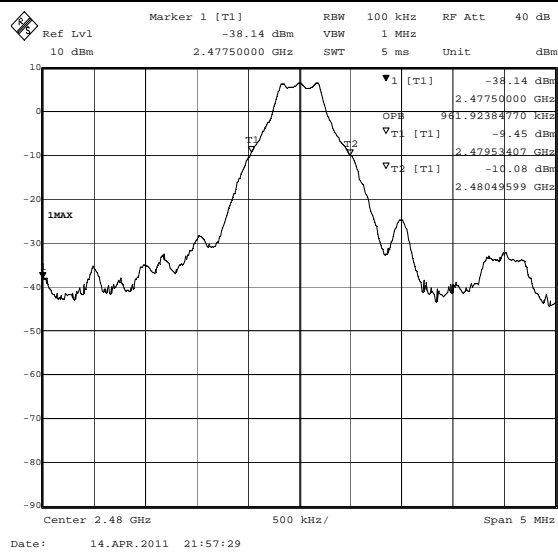
Packet Type: 3-DH5

-20dB OBW = 1.383MHz



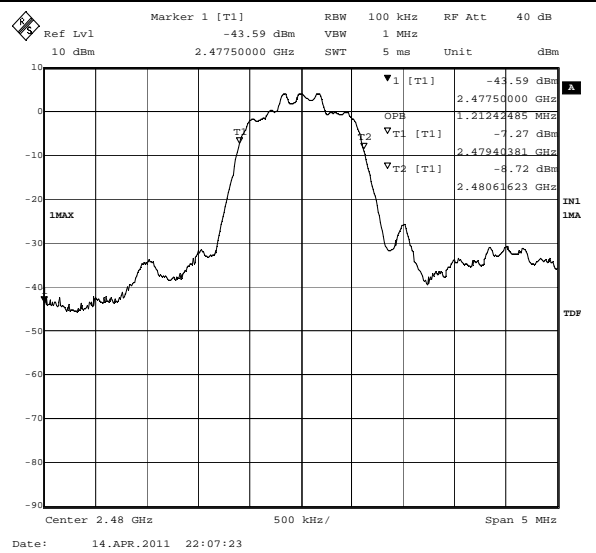
Packet Type: DH5

99% OBW = 961.92kHz



Packet Type: 3-DH5

99% OBW = 1.212MHz



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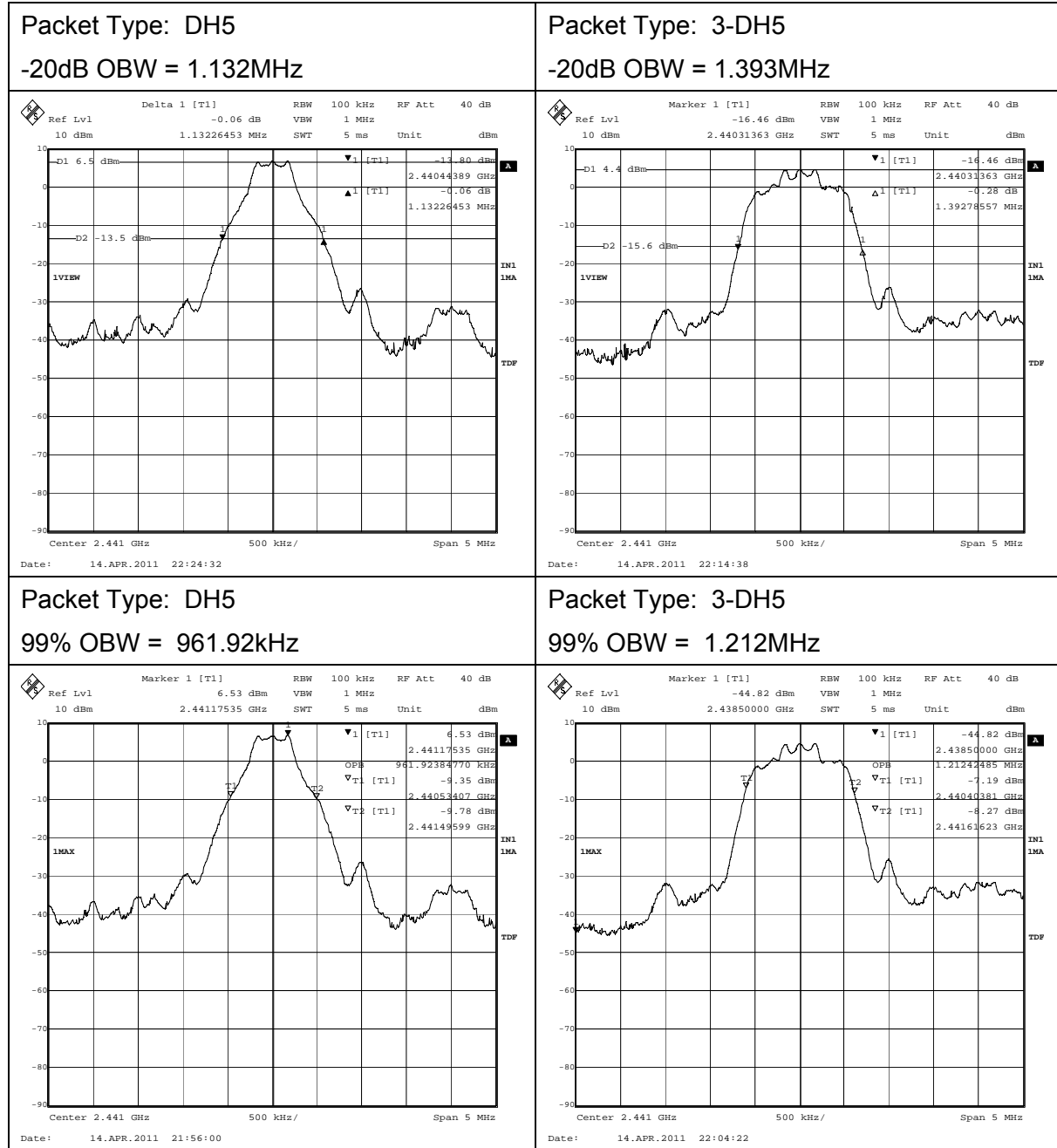


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Mid Channel, 2441MHz



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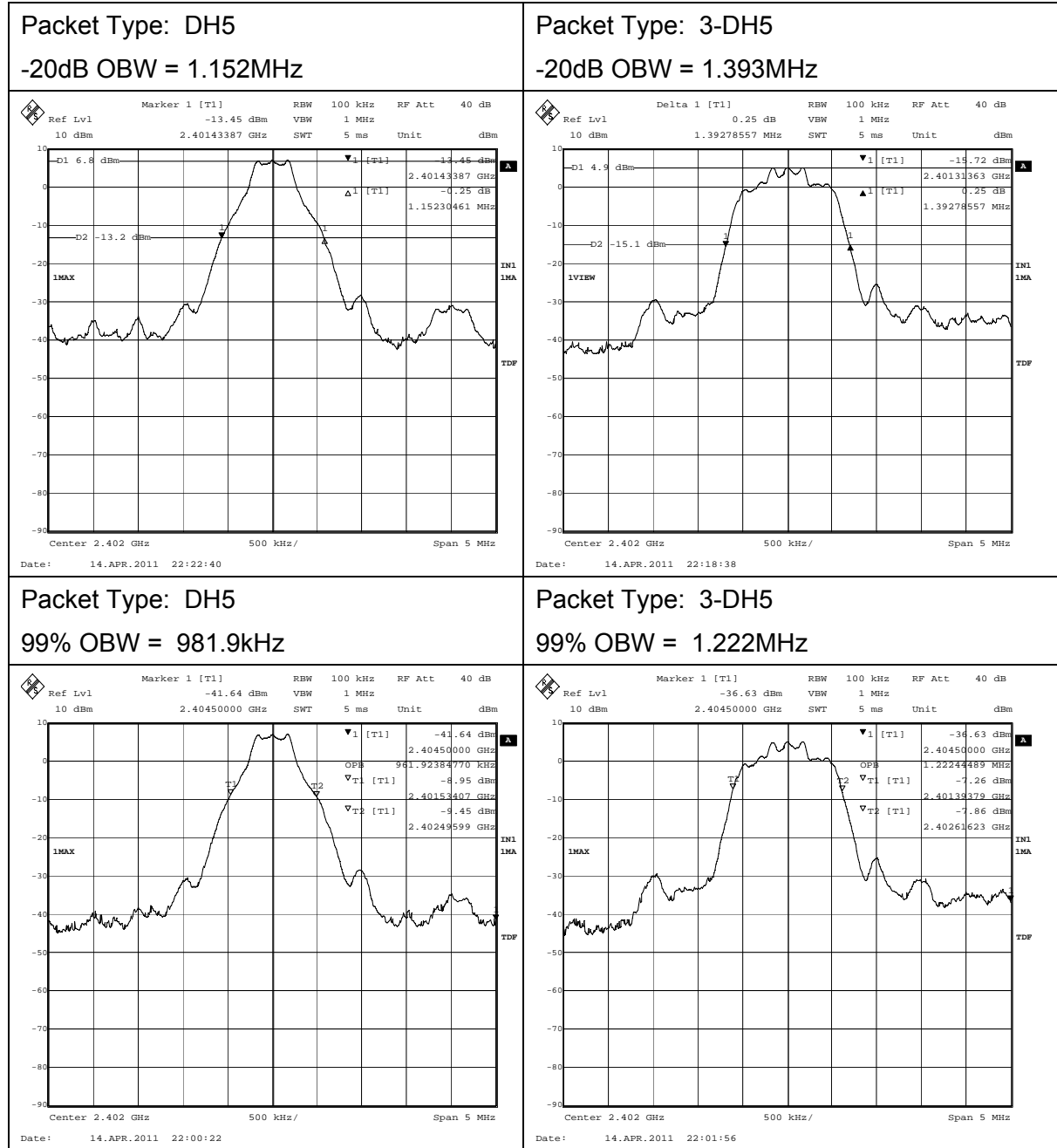


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Low Channel, 2402MHz



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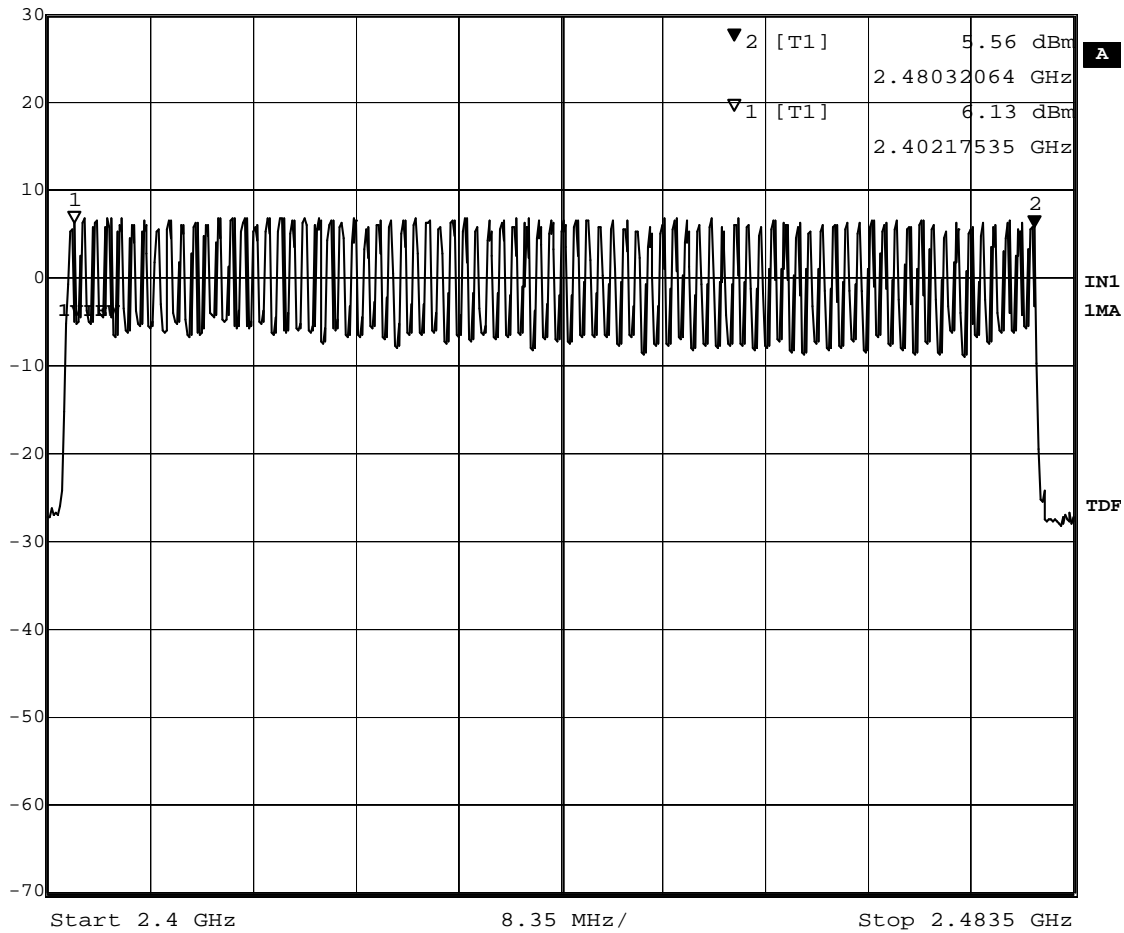
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Channel Spacing

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



Ref Lvl	Marker 2 [T1]	RBW	100 kHz	RF Att	60 dB
30 dBm	5.56 dBm	VBW	1 MHz		
	2.48032064 GHz	SWT	21 ms	Unit	dBm



Date: 14.APR.2011 22:35:12

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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

Packet size is measured with radio control software set to DH5 and 3-DH5 modes with 10% payload of 34 bytes in DH5 mode and 102 bytes in 3-DH5 mode. The packet size was also measured in operating streaming A2DP mode with an audio stream paired with an iPod and the signal detected with an uncalibrated antenna held close to the EUT's antenna.

Duty cycle was measured with small uncalibrated antenna placed near the EUT in A2DP streaming mode in 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.

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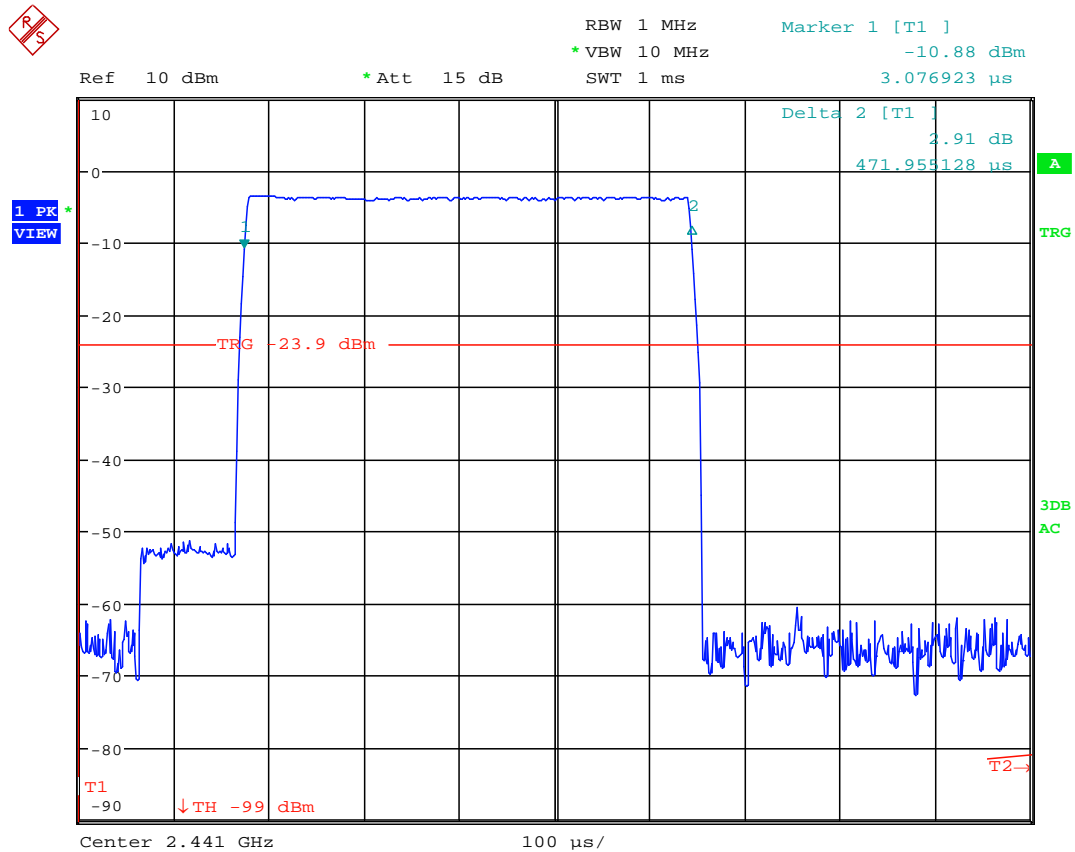
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6.5.3. Test data

DH5 Packet with 10% duty cycle: 472 μ sec



Date: 12.JUL.2011 17:24:01

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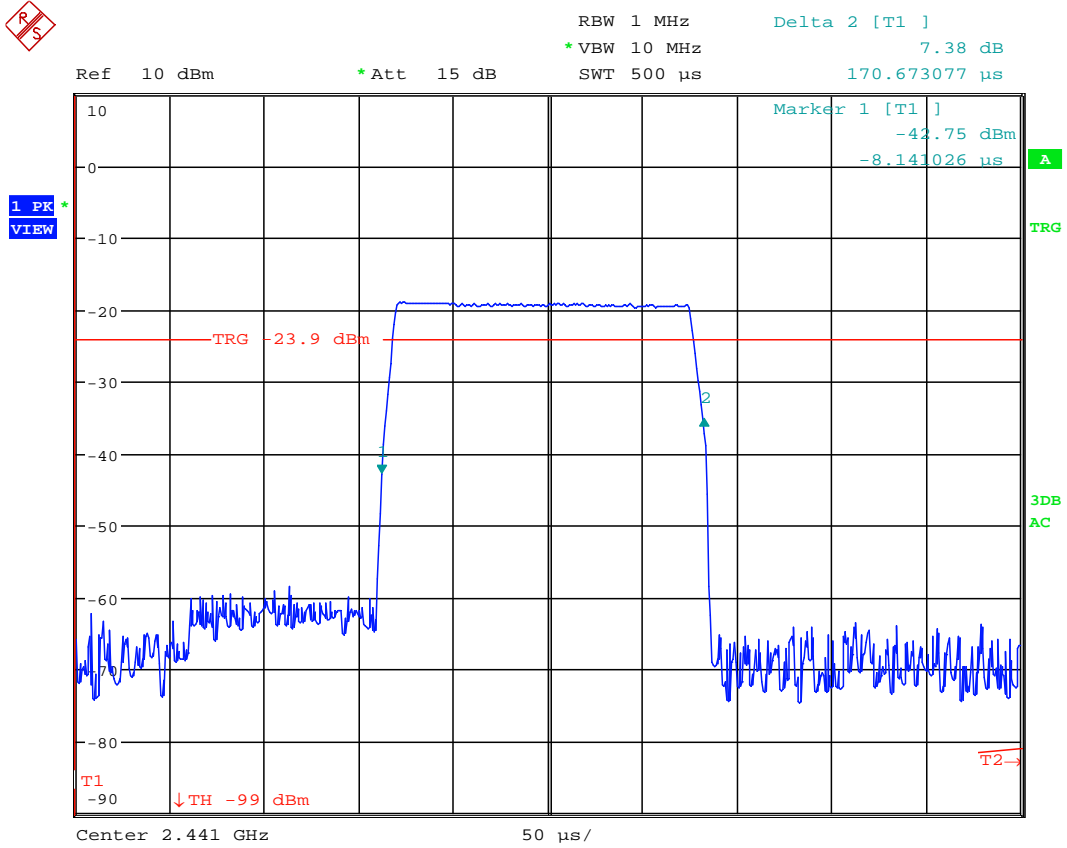


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EUT streaming A2DP stereo audio: 170 μ sec



Date: 12.JUL.2011 17:18:00

This confirms the assumption of approximately 5% (3.7% in this case) payload.

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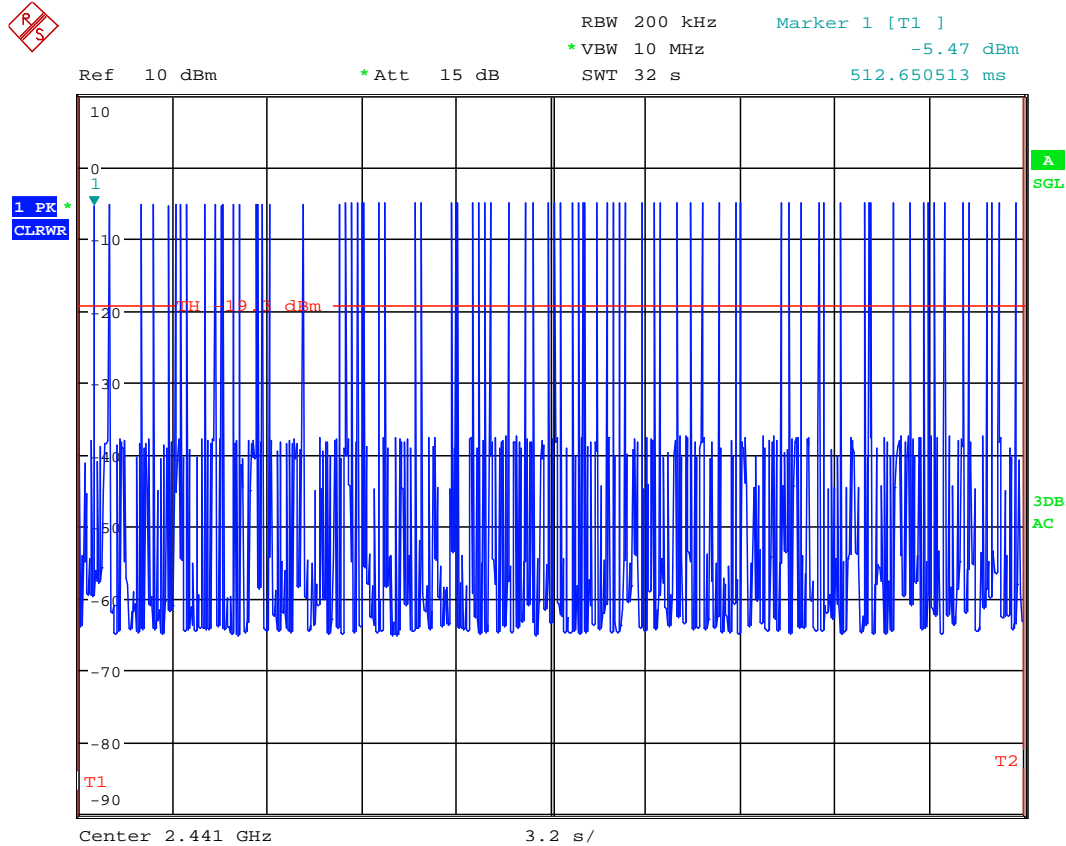


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Mid channel (2441 MHz)



Date: 12.JUL.2011 17:10:51

Four 32 second scans were counted and found to be between 48 and 75 hits on the channel. Using the worst case observed, there are 75 pulses in 32 seconds. Using the 10% packet width of 472 usec the average dwell time per channel is

0.472 msec x 75 = 35.4 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	ESU	TN1560	4/6/2011	4/6/2012
CBT controller	Rohde & Schwarz	CBT	TN1758	4/4/2011	4/4/2012

Date of test:	July 13, 2011	Test Location:	Transmitter test bench
EUT serial:	DP3-0030	Tested by:	Brent DeWitt
Test Conclusion:	pass		

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

6.6. Spurious emissions

6.6.1. Requirements

FCC part 15.247(d), RSS210 A8.5

In any 100 kHz 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. The EUT is controlled via the USB service port using the radio chip vendor supplied software.

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:

Product: Chihuahua
Project #: 404600
Phase: DP3
Test Standard(s): FCC part 15.247(d), RSS210 section 2.2(b)
Test: Conducted Spurious Emissions
Tested By: C. Bell
Date: 13-April-2011

Test Equipment (Bose TN): TN1560, TN1277-18

EUT Operating Mode(s): EUT is connected in normal hopping mode at full power with a worst case packet length set to provide a 10% duty cycle. Tested in DH5 and 3-DH5 mode. RF modes controlled by CSR BlueTest3

Test Sample S/N: 0030

Note(s): TN1277-18 cable used from ESIB40 to Chihuahua SMA adapter cable

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Wireless Transceiver Test Report



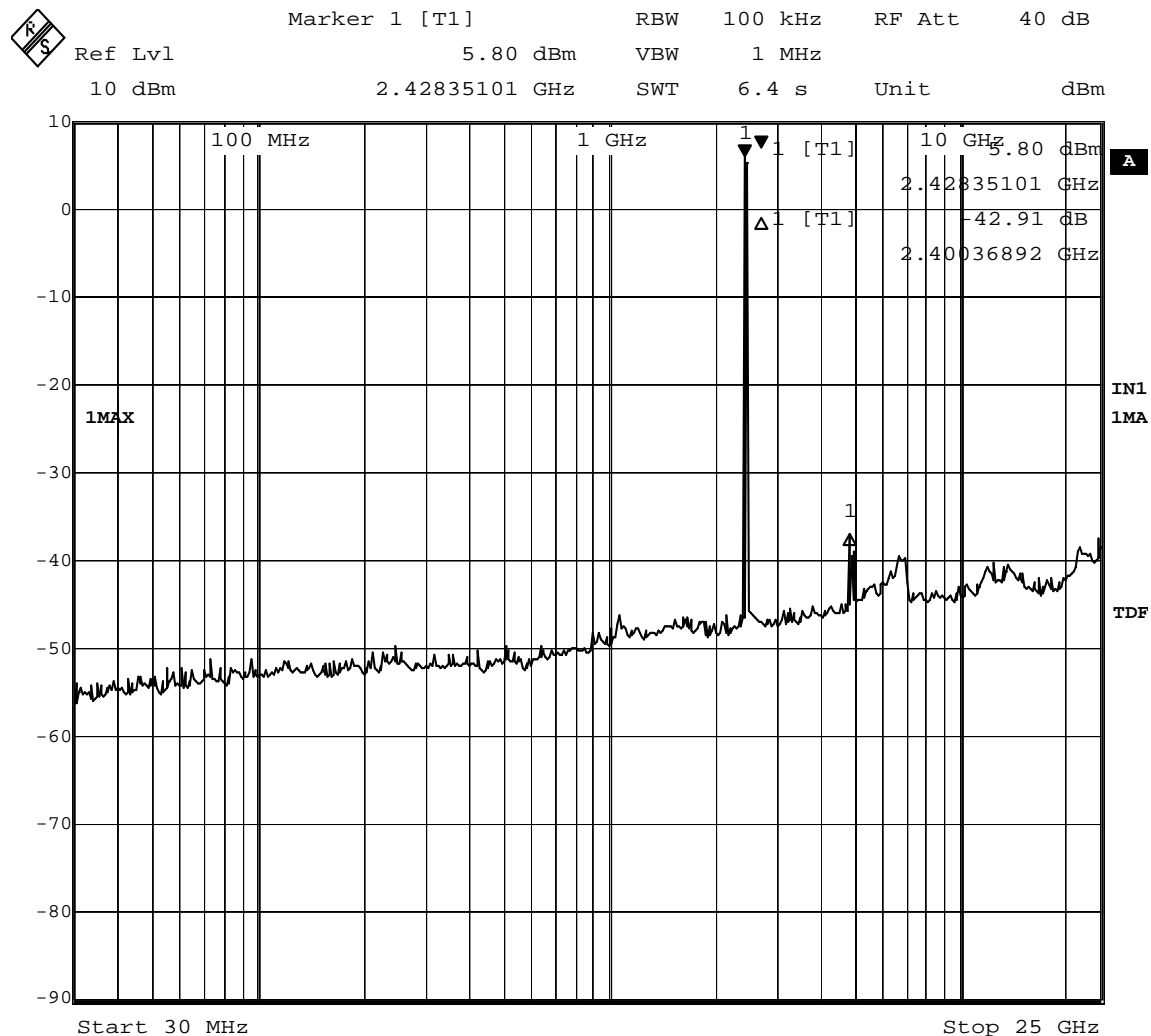
FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

30 MHz – 25 GHz conducted spurious scan, 100 kHz RBW, peak detector, and normal operation (hopping on all channels)

DH5 basic rate conducted spurious. The worst case spurious emission is 42.91dB below the peak values in the desired transmission band, since it is greater than 20dB below the wanted signal it is a passing with 22.91dB of margin.



Date: 13.APR.2011 21:21:15

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Wireless Transceiver Test Report

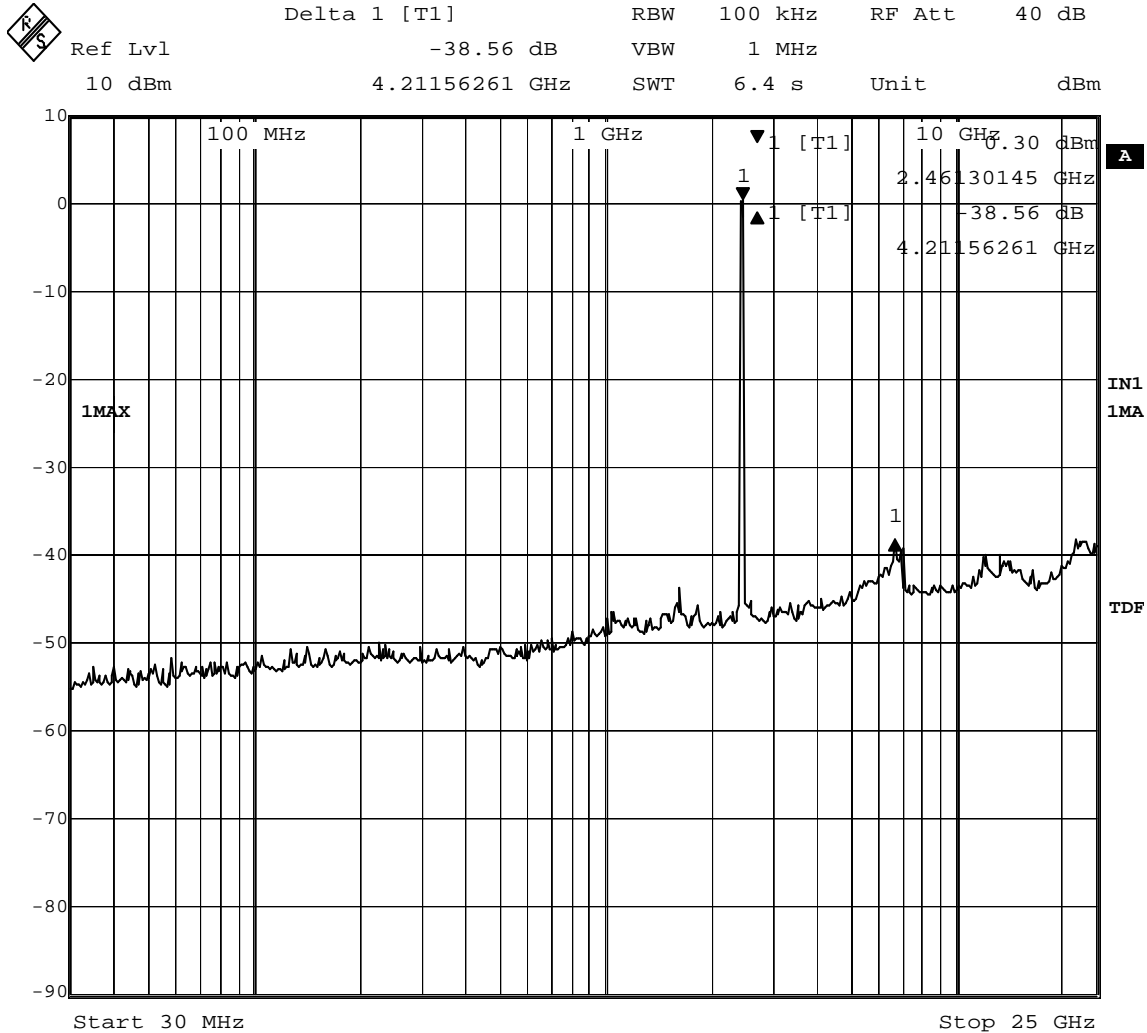


FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

3-DH5 Enhanced Data Rare conducted spurious emissions. The worst case spurious emission is 38.56dB below the peak values in the desired transmission band, since it is greater than 20dB below the wanted signal it is a passing with 18.56dB of margin.



Date: 13.APR.2011 21:17:02

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

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 54dB μ V/m (average) or 74dB μ V/m (peak)

6.7.2. Test Setup

The EUT is placed in a standard ANSI C63.10 test setup. 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

2nd Harmonic

Frequency [MHz] Packet Type	Measured values		Limits		Margin dB
	Peak detector dB μ V/m @ 3m	Average Detector dB μ V/m @ 3m	Peak dB μ V/m	Average dB μ V/m	
4804	60.1	42.2	74	54	11.8
4884	65.6	46.9	74	54	7.1
4960	64.8	46.4	74	54	7.6

At the 3rd through the 10th 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.

4th – 10th harmonic instrumentation noise floor

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Frequency [GHz]	Peak detector dB μ V/m @ 3m	Average Detector dB μ V/m @ 3m	Peak Limit dB μ V/m	Average Limit dB μ V/m	Margin dB
7.4 (3rd Har)	30	16.9	74	54	37.10
9.9 (4th Har)	45.6	31.5	not in restricted band		
12.4 (5th Har)	49.6	36.8	74	54	17.20
14.8 (6th Har)	52.4	39.2	74	54	14.80
17.3 (7th Har)	54.6	41.6	not in restricted band		
19.5 (8th Har)	54.6	41.6	74	54	12.40
22.1 (9th Har)	51.4	38.8	74	54	15.20
24.5 (10th Har)	51.6	38.8	not in restricted band		

6.7.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				Last	Due
Receiver	Rohde & Schwarz	ESU40	TN1663	4/6/2011	4/6/2012
Antenna 30M – 6G	Sunol	JB6	TN1541	6/15/2011	6/15/2012
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	2/23/2011	2/23/2014
20 GHz Pre-amp	MITEQ	AFS4-00102000-30-10P-4	TN1672	6/2/2011	6/2/2012
40 GHz pre-amp	MITEQ	JS4018004000-30-8P-A1	TN1757	Verify before use	
Antenna cable 18GHz	Rohde & Schwarz	HFE160D	TN1692	9/9/2010	9/9/2011
40 GHz cable	-	-	TN1277	Verify before use	

6.7.5. Test information

Date of test:	July 5, 2011	Test Location:	Maxwell House
EUT serial:	DP3-0030	Tested by:	Brent DeWitt
Test Conclusion:	pass		

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

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 μ V/m (average) or 74dB μ 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.

6.8.2.1. Test data

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

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Model #: 404600
Phase: DP3
Test Standard(s): FCC 15B
Test: Spurious Emissions
Tested By: K. Strong/A. Paradis
Date: 4/12/2011

Test Equipment (Bose TN): 644, 1663, 1445, 1823, 1594, 1375, 1376, 1569, 1669, 1786, 478, 1692, 727, 728, 1672, 1307, 1757, 1277-18

EUT Operating Mode(s): EUT is hopping at max TX power in Basic Rate mode. TX parameters were set using BlueTest3 software.

Test Sample S/N: 0029

Note(s): The following PARAMS were set using Bluetest3
TXDATA2: Int PA = 60
CFG PKT: Type=15, Packet Size=339
CFG Hopping SEQ: All Channels

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Wireless Transceiver Test Report

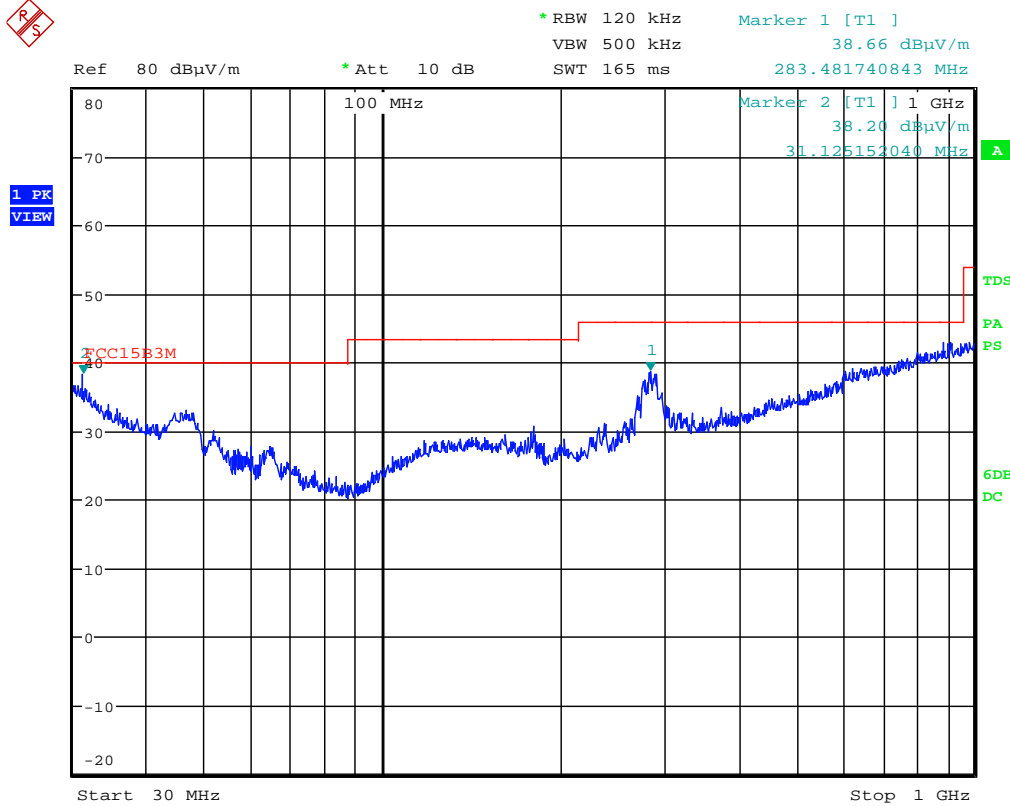


FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Max-Hold Peak Pre-scan, 30 MHz – 1 GHz:



Date: 12.APR.2011 13:50:17

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Wireless Transceiver Test Report

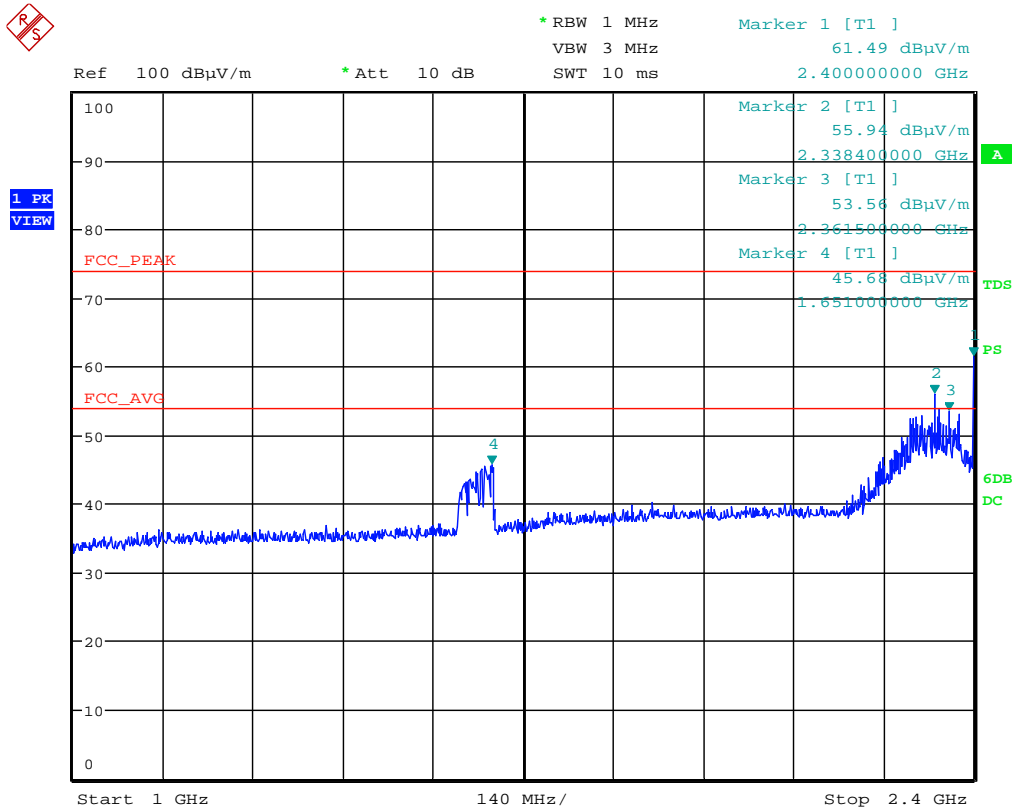


FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Max-Hold Peak Pre-scan, 1.0 GHz – 2.4 GHz:



Date: 12.APR.2011 14:50:23

Worst case peak > 23 dB AVG margin/12.5 dB PK margin at 2.4 GHz.

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Wireless Transceiver Test Report

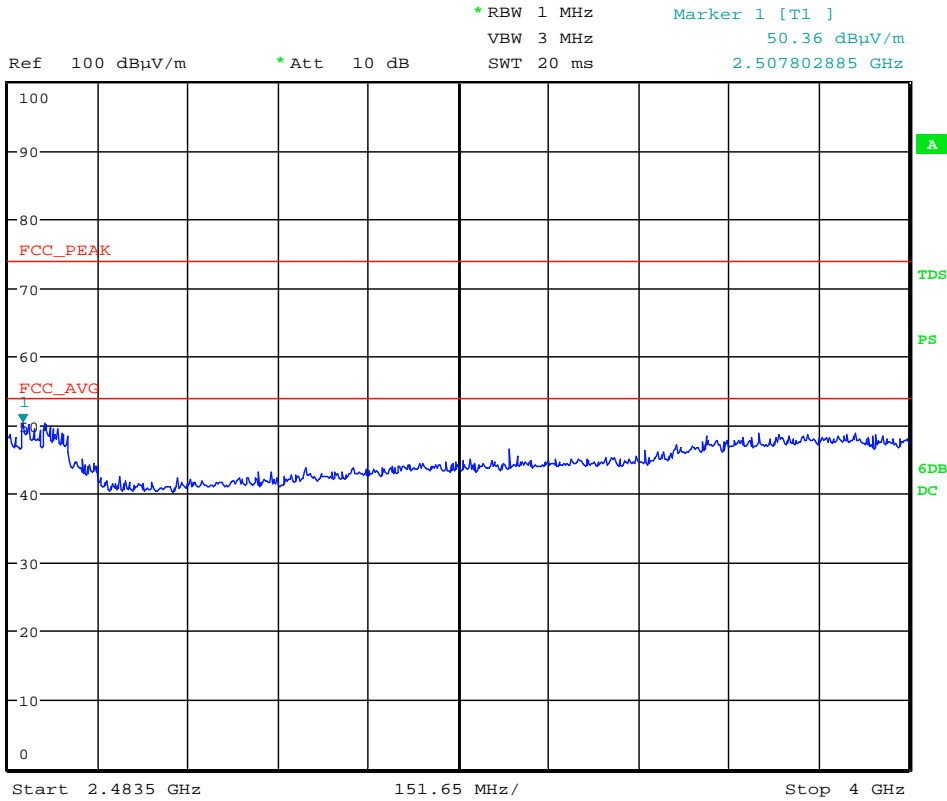


FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Max-Hold Peak Pre-scan, 2.4835 GHz – 4.0 GHz:



Date: 12.APR.2011 15:08:22

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Wireless Transceiver Test Report

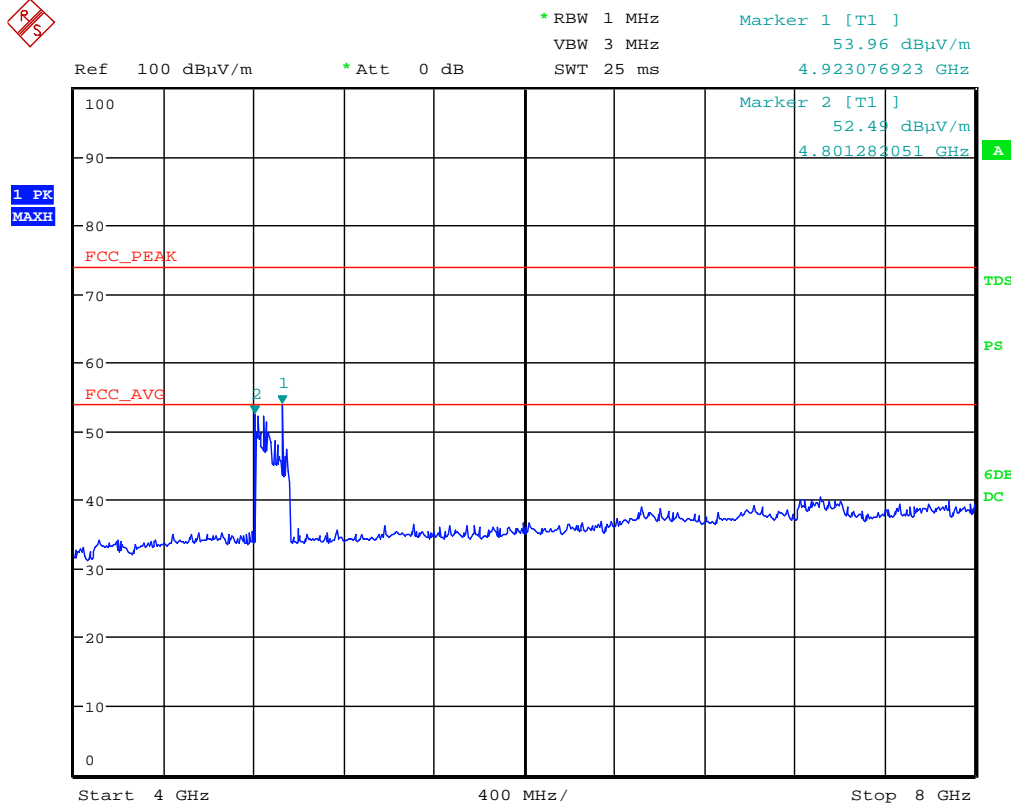


FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Max-Hold Peak Pre-scan, 4.0 GHz – 8.0 GHz:



Date: 12.APR.2011 15:38:16

Note that the emissions from 4804 MHz – 4960 MHz are actually TX harmonics and will be covered by the Harmonics testing.

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Wireless Transceiver Test Report

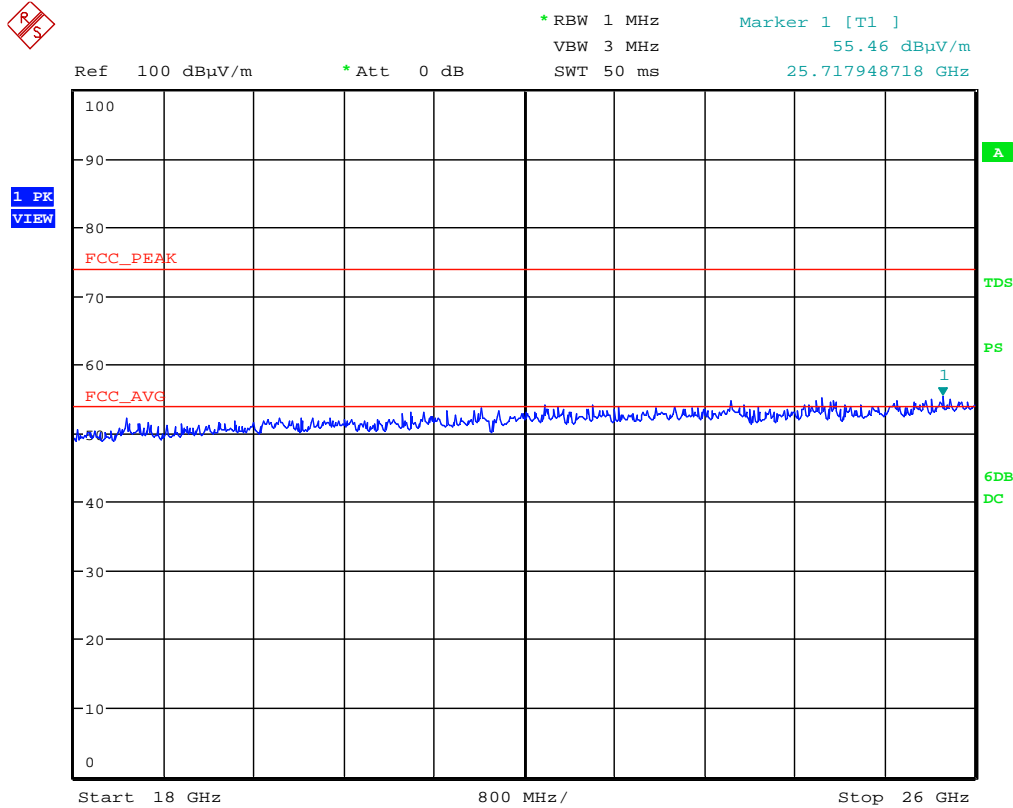


FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Max-Hold Peak Pre-scan, 18.0 GHz – 26.0 GHz:



Date: 12.APR.2011 16:51:53

No discernible signal above the instrumentation noise floor. The average detector reading was ~ 14 dB lower than peak detector reading.

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Wireless Transceiver Test Report



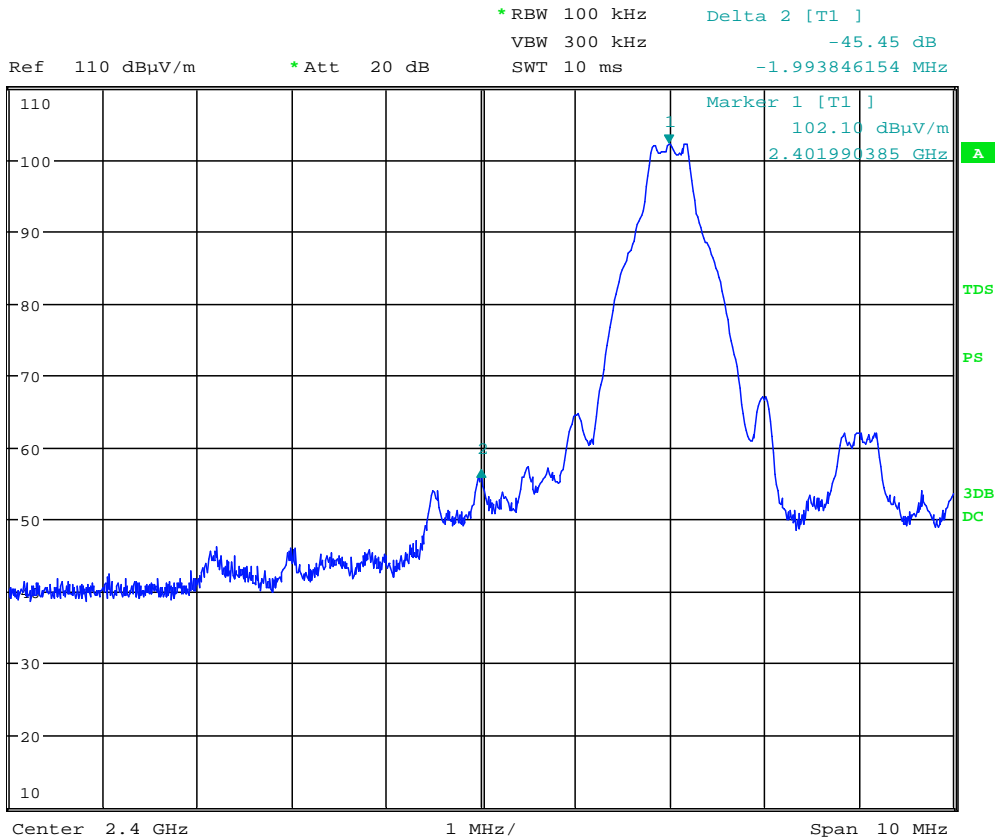
FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

Band edge measurements:

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



Date: 5.JUL.2011 15:28:39

The delta between the in-band and maximum value in the lower adjacent restricted band is 45.45 dB.

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Wireless Transceiver Test Report

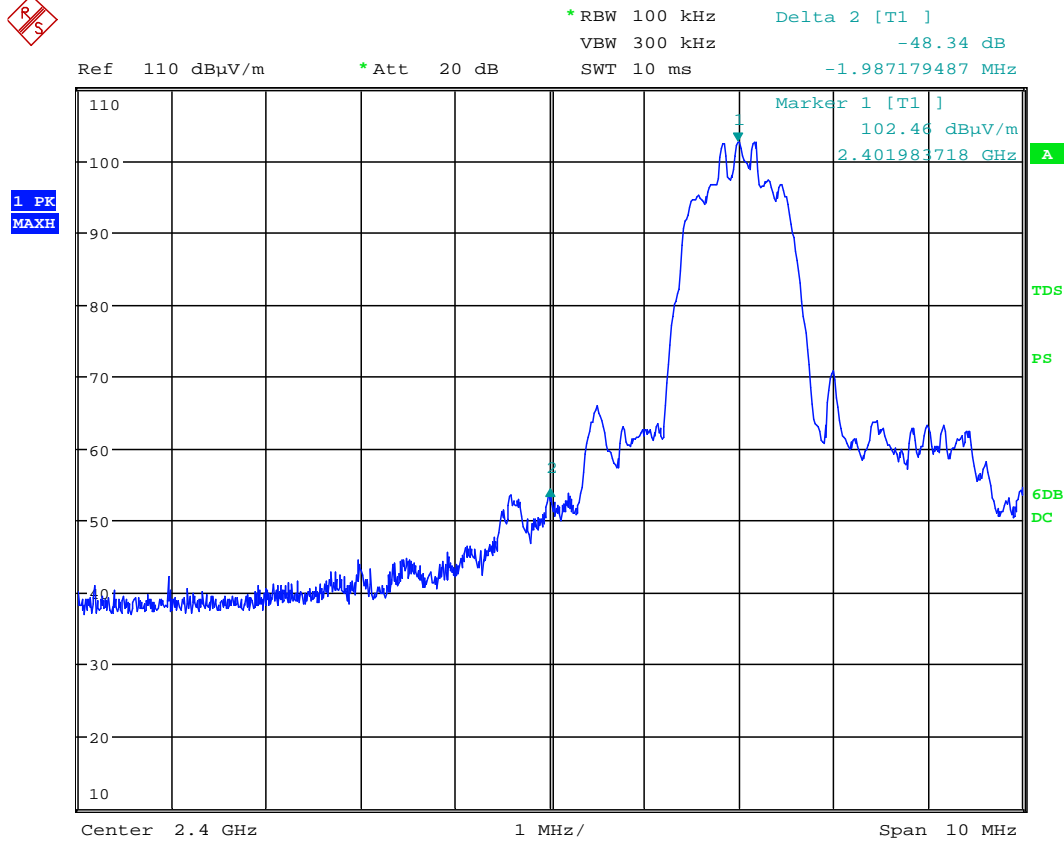


FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

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



Date: 5.JUL.2011 15:51:05

The delta between the in-band and maximum value in the lower adjacent restricted band is 48.34 dB.

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Wireless Transceiver Test Report

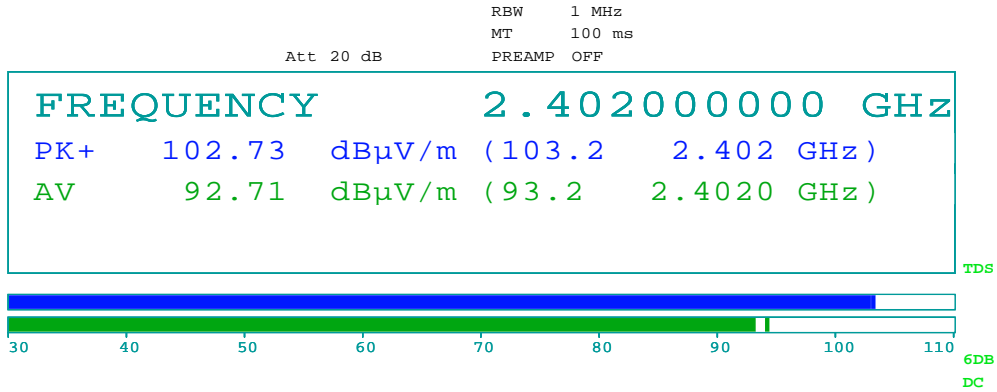


FCC ID:A94404600

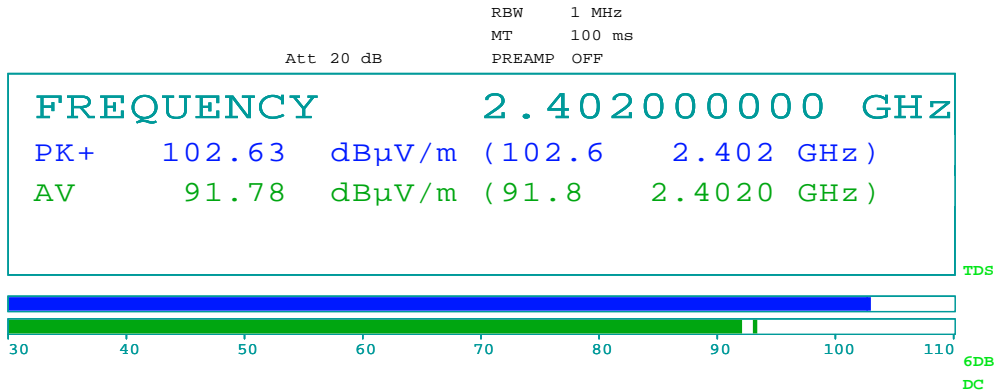
IC ID:3232A-404600

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: 93.2 - 45.45 = 47.75 dB μ V/m average

103.2 - 45.45 = 57.75 dB μ V/m peak

EDR: 91.78 - 48.34 = 43.44 dB μ V/m average

102.6 - 48.34 = 54.26 dB μ V/m peak

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

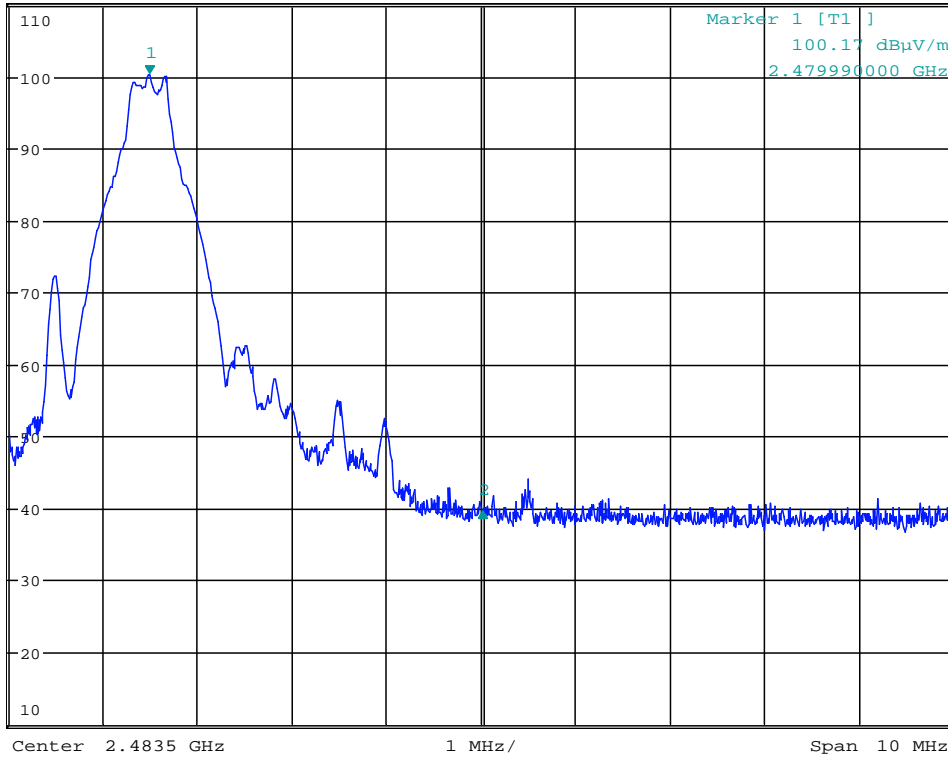
Certificate # 1514.1

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



*RBW 100 kHz Delta 2 [T1]
 VBW 300 kHz -60.62 dB
 *Att 20 dB SWT 10 ms 3.520641026 MHz

1 PK VIEW



Date: 5.JUL.2011 15:41:15

The delta between the in-band and maximum value in the lower adjacent restricted band is 60.62 dB.

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Wireless Transceiver Test Report

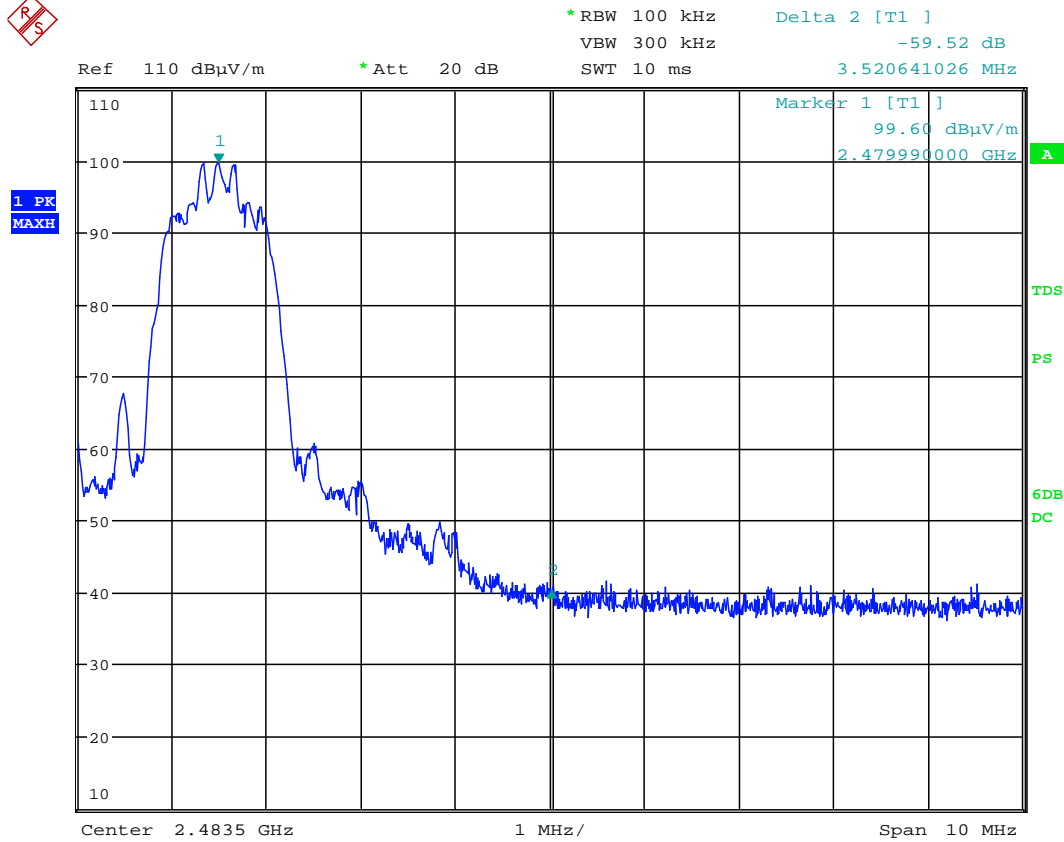


FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

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



Date: 5.JUL.2011 15:47:42

The delta between the in-band and maximum value in the lower adjacent restricted band is 59.52 dB.

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Wireless Transceiver Test Report

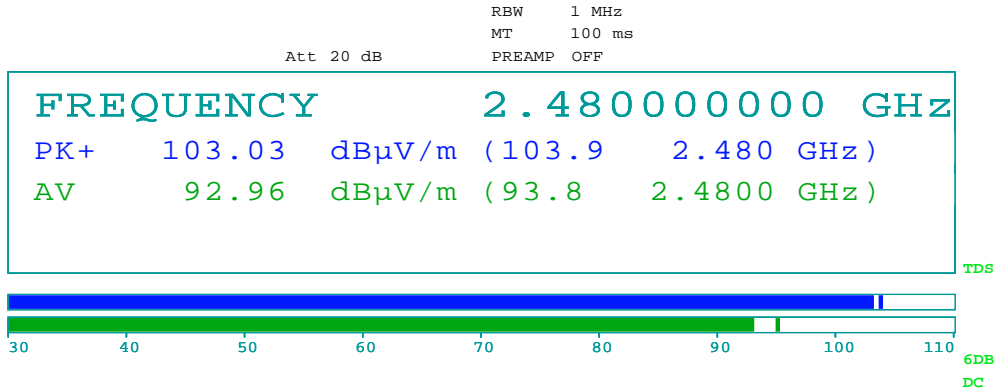


FCC ID:A94404600

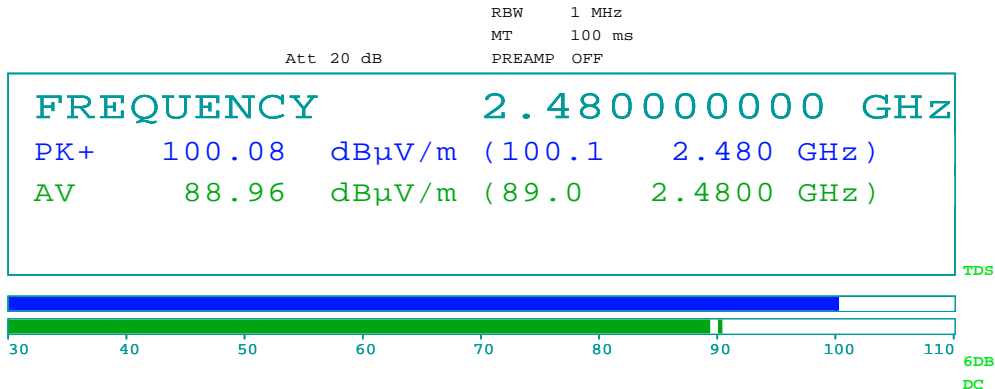
IC ID:3232A-404600

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: 93.8 – 60.62 = 33.18 dB μ V/m average

103.9 – 60.62 = 43.28 dB μ V/m peak

EDR: 89.0 - 59.52 = 29.48 dB μ V/m average

100.1 – 59.52 = 40.58 dB μ V/m peak

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

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	4/6/2011	4/6/2012
Antenna 30M – 6G	Sunol	JB6	TN1541	6/15/2011	6/15/2012
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	2/23/2011	2/23/2014
20 GHz Pre-amp	MITEQ	AFS4-00102000-30-10P-4	TN1672	6/2/2011	6/2/2012
40 GHz pre-amp	MITEQ	JS4018004000-30-8P-A1	TN1757	Verify before use	
Antenna cable 18GHz	Rohde & Schwarz	HFE160D	TN1692	9/9/2010	9/9/2011
40 GHz cable	-	-	TN1277	Verify before use	

6.8.3. Test information

Date of test:	July 5, 2012	Test Location:	Maxwell House
EUT serial:	DP3-0030	Tested by:	Andrew Paradis/Brent DeWitt
Test Conclusion:	pass		

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

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

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Wireless Transceiver Test Report



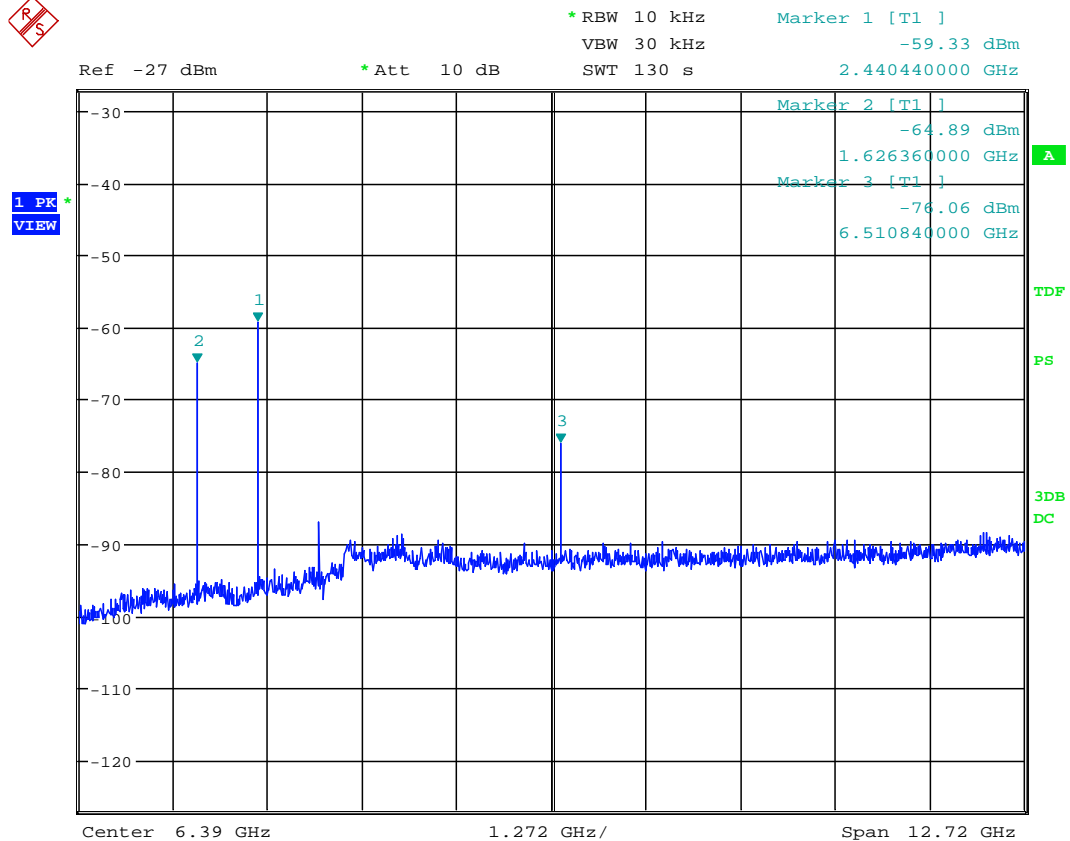
FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

6.9.3. Test data

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



Date: 4.JUL.2011 15:54:18

Max level @ 2.440 GHz – 59.33 dBm or 1.167 nW

6.9.4. Test Equipment

Equipment Type	Manufacturer	Model	Serial or other ID	Service date	
				last	due
40GHz cable	-	-	TN1277	Verify before use	
Spectrum Analyzer	Rohde & Schwartz	ESU	TN1663	3/6/2011	3/6/2012

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

6.9.5. Test information

Date of test:	7-4-2011	Test location:	BT test bench
EUT serial:	DP3-0030	Tested by:	Brent DeWitt
Test Conclusion:	Pass		

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Wireless Transceiver Test Report



FCC ID:A94404600

IC ID:3232A-404600

Certificate # 1514.1

6.10. MPE calculation

The peak output power (conducted) as documented in section 6.3 of this report is 6.8 dBm or 4.8 mW maximum.

The maximum output power of the device (peak) is 6.8 dBm or 4.8 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 applying the maximum measured antenna gain of 1.9 dBi (1.55 numerical) antenna gain, the power density would be

$$P/\text{area} = 4.8 \text{ mW} \times 1.55 / 5026 \text{ cm}^2 = .0017 \text{ mW/ cm}^2$$

This is well below the exposure limit of 1 mW/cm^2 for the general population.

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