

Test Report

FCC Part 15.407 Industry Canada RSS210

UNII Devices

Elektrobit Wireless Communications, Ltd.
Automaatiotie 1
FI-90460 OULUNSALO
FINLAND

Product Name: Integrated Service Access Point

FCC: V27-DT40ISAP IC: 3282B-DT40ISAP

TEST REPORT #: EMC_CETEC_029_15.407n_5.1G_rev1 DATE: 2008-3-31









FCC listed: A2LA accredited

IC recognized # 3462B

CETECOM Inc.

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.

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1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Part 15.407 of the Code of Federal Regulations.

Company	Product Name
Elektrobit Wireless	Integrated Convice Access Doint
Communications, Ltd.	Integrated Service Access Point

This report is reviewed by:

2008-3-31	EMC & Radio	(EMC Project Engineer)	
Date	Section	Name	Signature
This report	is prepared by:		
		Peter Mu	
2008-3-31	EMC & Radio	(EMC Project Engineer)	
Date	Section	Name	Signature

Ivaylo Tankov

The test results of this test report relate exclusively to the test item specified in Identification of the Equipment under Test. The CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.

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2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	EMC
Address:	411 Dixon Landing Road Milpitas, CA 95035
	U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Responsible Test Lab Manager:	Lothar Schmidt
Responsible Project Leader:	Peter Mu
Date of test:	2008-3-4 to 2008-3-25

2.2 Identification of the Client

APPLICANT				
Applicant (Company Name)	Elektrobit Wireless Communications, Ltd.			
Street Address	Automaatiotie 1			
City/Zip Code	FI-90460 OULUNSALO			
Country	FINLAND			
Contact Person	Jussi Harju			
Telephone	+41 55 253 2055			
Fax	+41 55 253 2070			
e-mail	jussi.harju@elektrobit.com			

2.3 Identification of the Manufacturer

Same as above applicant.

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3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

EUT			
Marketing Name of			
EUT (if not same as	Integrated Service Access Point		
Model No.):			
Description:	Wireless LAN Access Point		
Model No:	ISAP		
FCC ID:	V27-DT40ISAP		
IC ID:	3282B-DT40ISAP		

	5180-5250MHz
Frequency Range:	Channel 36, 44, 48 in HT20 mode
	Channel 38, 46 in HT40 mode
Type(s) of Modulation:	OFDM
Antenna Type:	Whip 2.6dBi
	EIRP: 20.5dBm (0.112W) HT20 mode. 20.5dBm (0.112W) HT40 mode.
Max Output Power:	Conducted Output power: 14.9dBm (0.0309W) HT20 mode, 14.9dBm (0.0309W) HT40 mode.
Specified Operating Temperature Range:	-10C to +50C

3.2 Identification of the Equipment under Test (EUT)

EUT#	TYPE	MANF.	MODEL	SERIAL #
1	EUT	Elektrobit	ISAP	026
2	EUT	Elektrobit	ISAP	027

3.3 Identification of Accessory equipment

None

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4 **Subject Of Investigation**

All testing was performed on the product referred to in Section 3 as EUT. EUT operates in the band 5150-5250MHz in 802.11na 20MHz (HT20) and 802.11na 40MHz (HT40) mode. Although the EUT has three antenna ports only two will be used in actual operation. All three ports are measured during testing and ports with worse case performance are reported here to show compliance to applicable standards.

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT operating under 802.11n (20MHz) mode and 802.11na(40MHz) mode in the 5150-5250MHz range as specified by requirements listed in FCC rules Part 15.407 of Title 47 of the Code of Federal Regulations. The maximization of portable equipment is conducted in accordance with ANSI C63.4

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5 Radiated Measurements

5.1 Maximum Peak Output Power § 15.407 (Radiated)

EIRP is calculated from conducted peak power with the following formula:

EIRP = Conducted Peak Power + Directional Antenna Gain (G)

Directional Antenna Gain = Max Stated Antenna Gain + 10*log(N)

N is the number of active transmitting ports. For this EUT N=2 under normal operation mode and all antennae have stated gain of 2.6dBi. G = 2.6dBi + 10*log(2) = 5.6dBi.

5.1.1 EIRP 802.11na HT20 MODE:

TEST CONDITIONS		MAXIMUM 1	PEAK OUTPUT P	POWER (dBm)	
Fı	Frequency (MHz)		5180	5220	5240
Chain AB	T _{nom} (23)°C	V _{nom} VDC	20.5	20.3	20.2
Measurement uncertainty			±0.5dBm		

5.1.2 EIRP 802.11na HT40 MODE:

TEST CONDITIONS				PEAK OUTPUT CR (dBm)
Fı	requency (MI	Hz)	5190	5230
Chain AB T _{nom} (23)°C V _{nom} VDC		20.5	17.3	
Measurement uncertainty			±0	5dBm

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5.2 Restricted Band Edge Compliance §15.407(b)/15.205

5.2.1 Limits

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(2)
13.36 - 13.41			

^{*}PEAK LIMIT= 74dBuV/m

^{*}AVG. LIMIT= 54dBuV/m

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5.2.2 802.11 (na) HT20 MODE

5180MHz Chain AB, Lower band edge PEAK

EUT: 026

Customer:: Elektrobit
Test Mode: 802.11na, HT20

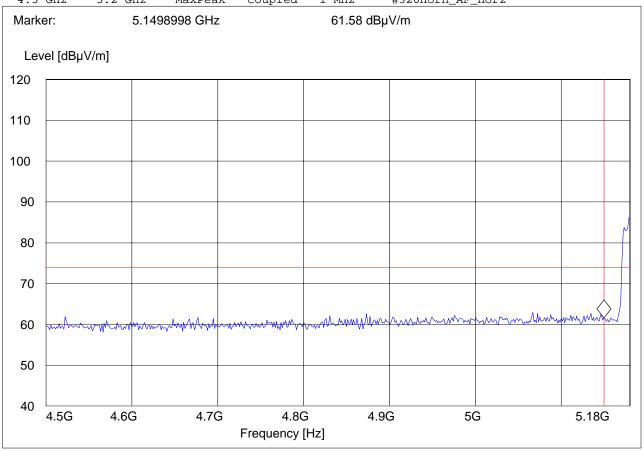
ANT Orientation: V
EUT Orientation: H
Test Engineer: Peter
Voltage: AC

Comments:

SWEEP TABLE: "FCC15.407 A_LBE_PK"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

4.5 GHz 5.2 GHz MaxPeak Coupled 1 MHz #326horn_AF_horz



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5180MHz Chain AB, Lower band edge AVG

EUT: 026

Customer:: Elektrobit
Test Mode: 802.11na, HT20

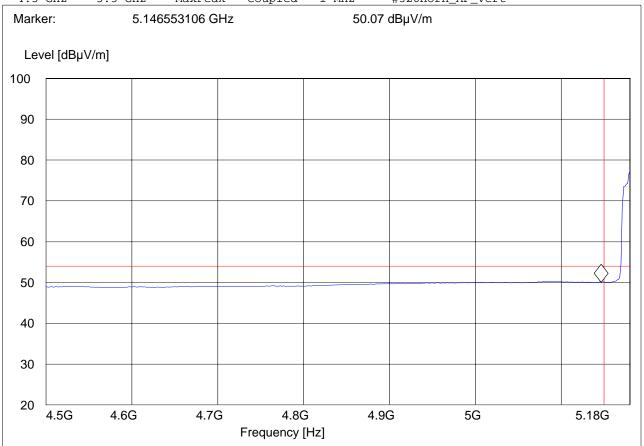
ANT Orientation: V
EUT Orientation: H
Test Engineer: Peter
Voltage: AC

Comments:

SWEEP TABLE: "FCC15.407 A_LBE_AVG"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

4.5 GHz 5.3 GHz MaxPeak Coupled 1 MHz #326horn_AF_vert



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5.2.3 802.11 (na) HT40 MODE

5190MHz Chain AB, Lower band edge PEAK

026 EUT:

Customer:: Elektrobit Test Mode: 802.11na, HT40

ANT Orientation: V EUT Orientation: H Test Engineer: Peter Voltage: AC

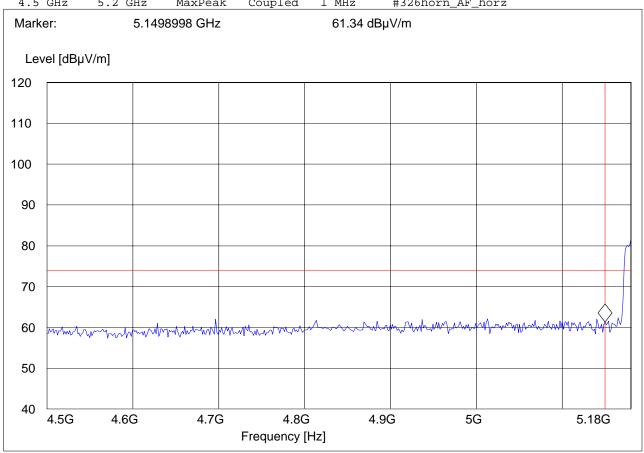
Comments:

SWEEP TABLE: "FCC15.407 A_LBE_PK"

Detector Meas. IF Start Stop Transducer

Frequency Frequency Time Bandw.

4.5 GHz MaxPeak #326horn_AF_horz 5.2 GHz Coupled 1 MHz



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5190MHz Chain AB, Lower band edge AVG

026

Customer:: Elektrobit Test Mode: 802.11na, HT40

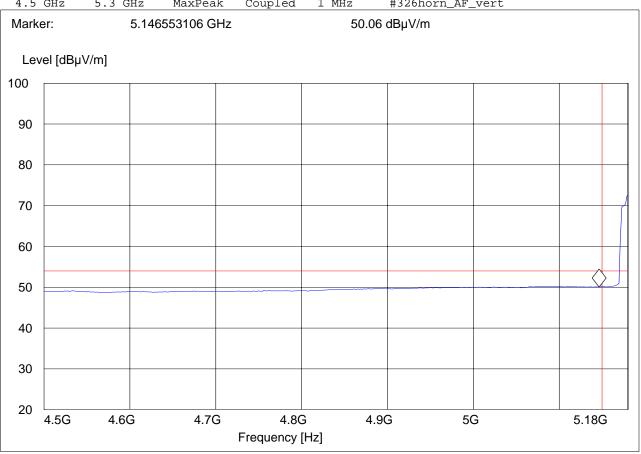
ANT Orientation: V EUT Orientation: H Test Engineer: Peter Voltage:

Comments:

SWEEP TABLE: "FCC15.407 A_LBE_AVG"

Transducer Start Stop Detector Meas. IF Bandw. Time

Frequency Frequency 1 MHz 4.5 GHz 5.3 GHz MaxPeak Coupled #326horn_AF_vert



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5.3 Transmiter Spurious Emission § 15.407(b)/15.205/15.209

5.3.1 Limits

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

^{*}PEAK LIMIT= 74dBuV/m for spurious in restricted bands

NOTE:

- 1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.
- 2. All measurements are done in peak mode using an average limit, unless specified with the plots.

Results for the radiated measurements below 30MHz according § 15.33

Frequency Measured values		Remarks	
9KHz – 30MHz	No emissions found, caused by the EUT	This is valid for all the tested	
	Two emissions found, caused by the EO I	channels	

^{*}AVG. LIMIT= 54dBuV/m for spurious in restricted bands

^{*}PEAK LIMIT= 68.2dBuV/m for spurious NOT in restricted bands

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5.3.2 RESULTS 802.11 (na) HT20 MODE Chain AB

30MHz - 1GHz, Antenna: Horizontal

Note: This plot is valid for low, mid, high channels (worst-case plot).

026 EUT:

Customer:: Elektrobit Test Mode: Ch. 5220

ANT Orientation: H EUT Orientation: H

Test Engineer: Chris Power Cable

Voltage:

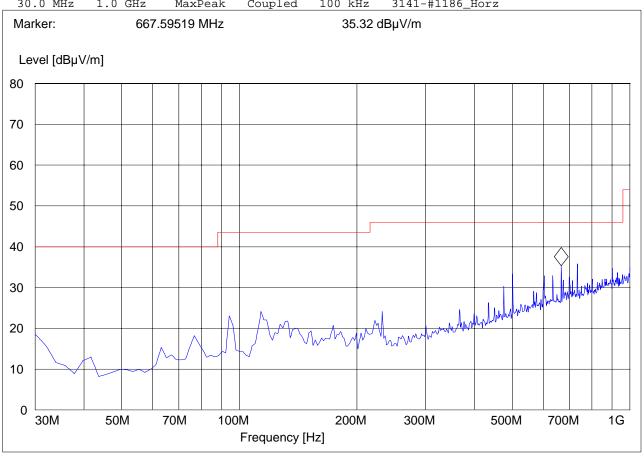
Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Hor"

Start Stop Detector Meas. IF Transducer

Frequency Frequency Bandw. Time

3141-#1186_Horz 30.0 MHz 100 kHz 1.0 GHz MaxPeak Coupled



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30MHz – 1GHz, Antenna: Vertical

Note: This plot is valid for low, mid, high channels (worst-case plot).

EUT: 026

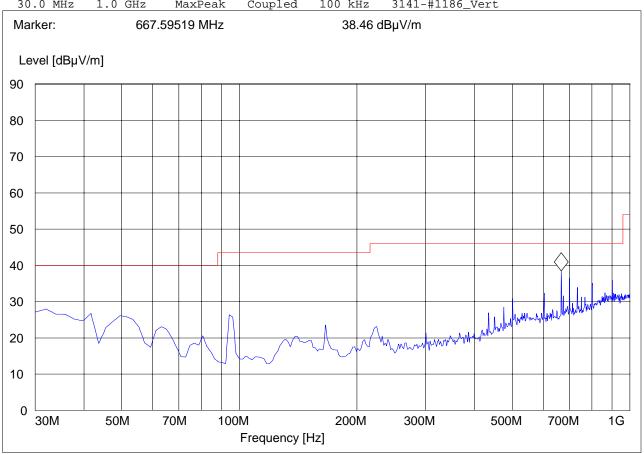
Customer:: Elektrobit Test Mode: Ch. 5220

ANT Orientation: V
EUT Orientation: H
Test Engineer: Chris
Voltage: Power Cable

Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Ver"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.
30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186_Vert



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1-18GHz (5180MHz) Chain AB

Note: The peak above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

EUT / Description: 026

Manufacturer: Elektrobit Operation Mode: Ch. 5180

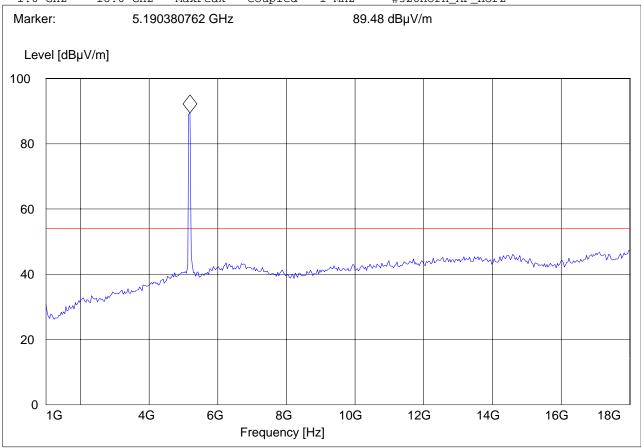
ANT Orientation: : H
EUT Orientation:: H
Test Engineer: Chris
Voltage: Power cable

Comments::

SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn_AF_horz



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1-18GHz (5220MHz) Chain AB

Note: The peak above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

EUT / Description: 026

Manufacturer: Elektrobit Operation Mode: Ch. 5220

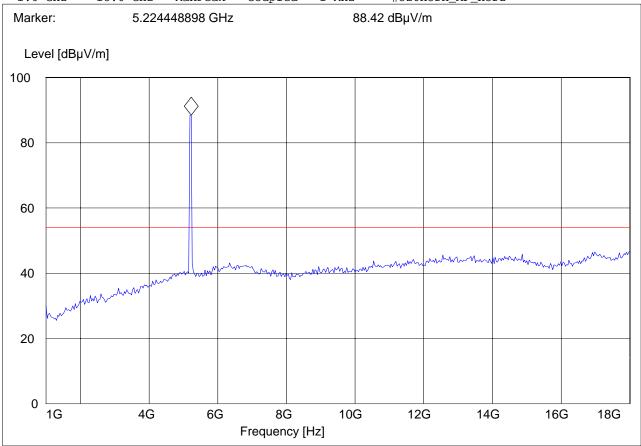
ANT Orientation: : H
EUT Orientation:: H
Test Engineer: Chris
Voltage: Power cable

Comments::

SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn_AF_horz



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1-18GHz (5240MHz) Chain AB

Note: The peak above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

EUT / Description: 026

Manufacturer: Elektrobit Operation Mode: Ch. 5240

ANT Orientation: : H
EUT Orientation:: H
Test Engineer: Chris
Voltage: Power cable

Comments::

SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn_AF_horz

5.224448898 GHz 90.44 dBµV/m Marker: Level [dBµV/m] 100 80 60 40 20 1G 4G 6G 8G 10G 12G 14G 16G 18G Frequency [Hz]

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18-26.5GHz Chain AB

Note: Peak Reading vs. Average limit

Note: This plot is valid for low, mid, high channels (worst-case plot).

EUT: 026

Customer:: Elektrobit Test Mode: Ch. 5220

ANT Orientation: H
EUT Orientation: H
Test Engineer: Chris
Voltage: Power Cable

Comments:

SWEEP TABLE: "FCC 15.407 18-26.5G"

Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.
18.0 GHz 26.5 GHz MaxPeak Coupled 1 MHz Horn # 3116_18-40G

25.886773547 GHz 45.77 dBµV/m Marker: Level [dBµV/m] 90 80 70 60 50 40 30 20 10 5 18G 19G 20G 21G 22G 23G 24G 25G 26.5G Frequency [Hz]

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26.5-40GHz Chain AB

Note: This plot is valid for low, mid, high channels (worst-case plot)

Note: Peak Reading vs. Average limit

Customer:: Elektrobit Test Mode: Ch. 5220

ANT Orientation: H EUT Orientation: H Test Engineer: Chris Voltage: Power Cable

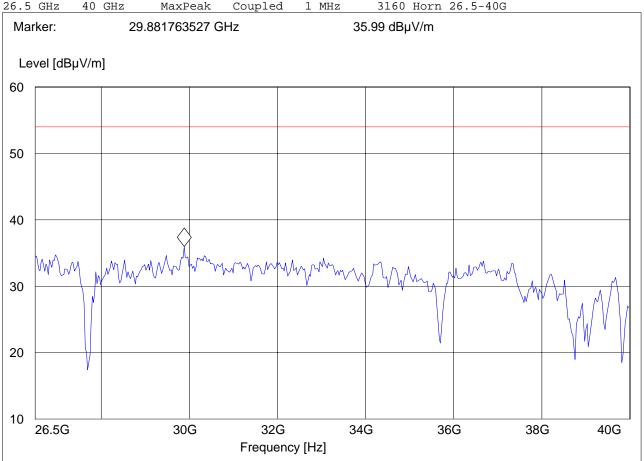
Comments:

SWEEP TABLE: "FCC 15.407 26.5-40G"

Detector Meas. IF Transducer Stop

Frequency Frequency Bandw. Time

26.5 GHz 40 GHz MaxPeak 1 MHz 3160 Horn 26.5-40G



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5.3.3 RESULTS 802.11 (na) HT40 MODE Chain AB

30MHz - 1GHz, Antenna: Horizontal

Note: This plot is valid for low, mid, high channels (worst-case plot).

026 EUT:

Customer:: Elektrobit

Test Mode: 5230 MHz; 40 MHz BW

ANT Orientation: H EUT Orientation: H Test Engineer: Satya

Voltage: Power Cable

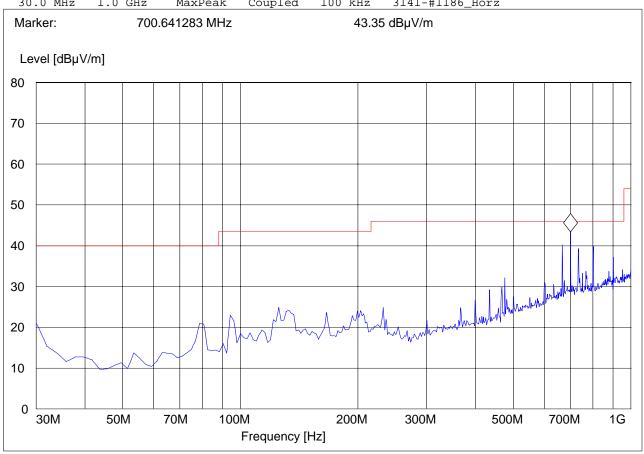
Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Hor"

Start Stop Detector Meas. IF Transducer

Frequency Frequency Bandw. Time

100 kHz 3141-#1186_Horz 30.0 MHz 1.0 GHz MaxPeak Coupled



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30MHz – 1GHz, Antenna: Vertical

Note: This plot is valid for low, mid, high channels (worst-case plot).

EUT: 026

Customer:: Elektrobit

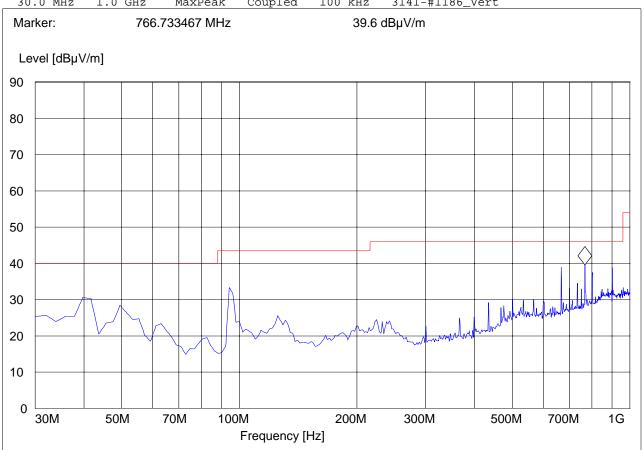
Test Mode: 5230 MHz; 40 MHz BW

ANT Orientation: V
EUT Orientation: H
Test Engineer: Satya
Voltage: Power Cable

Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Ver"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.
30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186_Vert



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1-18GHz (5190MHz) Chain AB

Note: The peak above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

EUT / Description: 026

Manufacturer: Elektrobit Operation Mode: 5190 MHz, 40 MHz

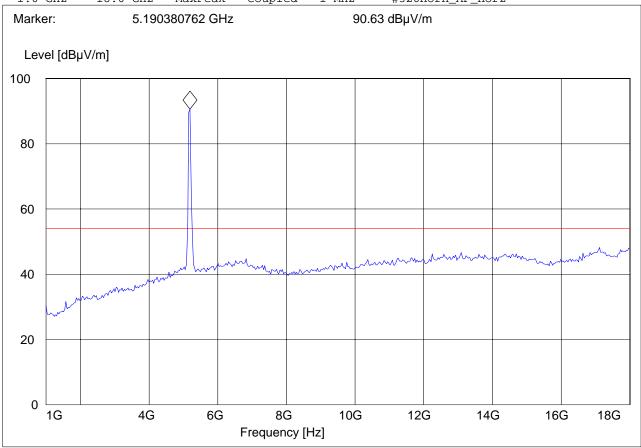
ANT Orientation: : H
EUT Orientation: : H
Test Engineer: Satya
Voltage: Power cable

Comments::

SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn_AF_horz



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1-18GHz (5230MHz) Chain AB

Note: The peak above the limit line is the carrier freq.

Note: Peak Reading vs. Average limit

EUT / Description: 026

Manufacturer: Elektrobit
Operation Mode: 5230 MHz, 40 MHz

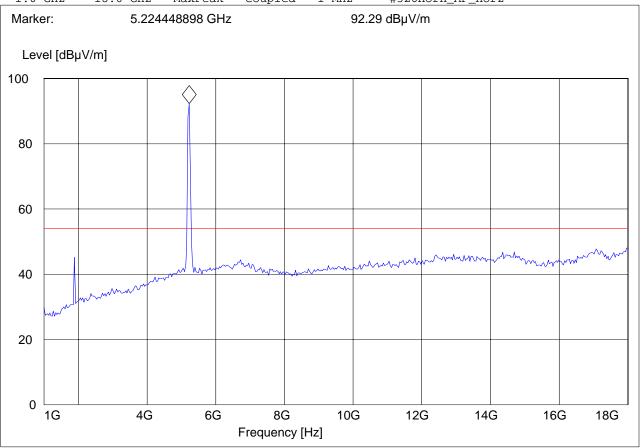
ANT Orientation: : H
EUT Orientation: : H
Test Engineer: Satya
Voltage: Power cable

Comments::

SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn_AF_horz



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18-26.5GHz Chain AB

Note: Peak Reading vs. Average limit

Note: This plot is valid for low, mid, high channels (worst-case plot).

EUT: 026

Customer:: Elektrobit

Test Mode: 5230 MHz; 40 MHz BW

ANT Orientation: H
EUT Orientation: H
Test Engineer: Satya
Voltage: Power Cable

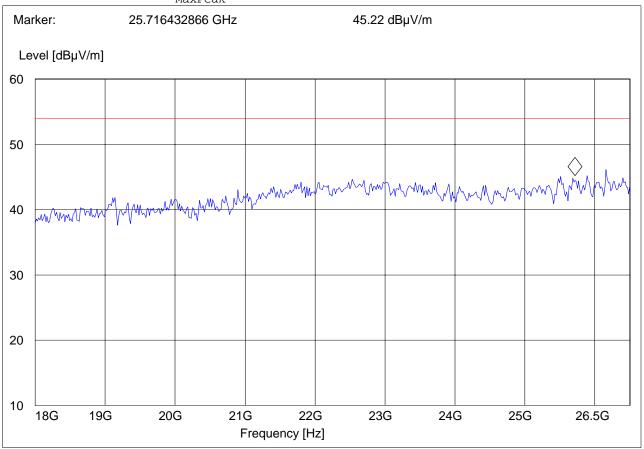
Comments:

SWEEP TABLE: "FCC15.247_18-26.5G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

18.0 GHz 26.5 GHz MaxPeak Coupled 100 kHz Horn # 3116_18-40G

MaxPeak



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26.5-40GHz Chain AB

Note: This plot is valid for low, mid, high channels (worst-case plot)

Note: Peak Reading vs. Average limit

Customer:: Elektrobit

5230 MHz; 40 MHz BW Test Mode:

ANT Orientation: H EUT Orientation: H Test Engineer: Satya Voltage: Power Cable

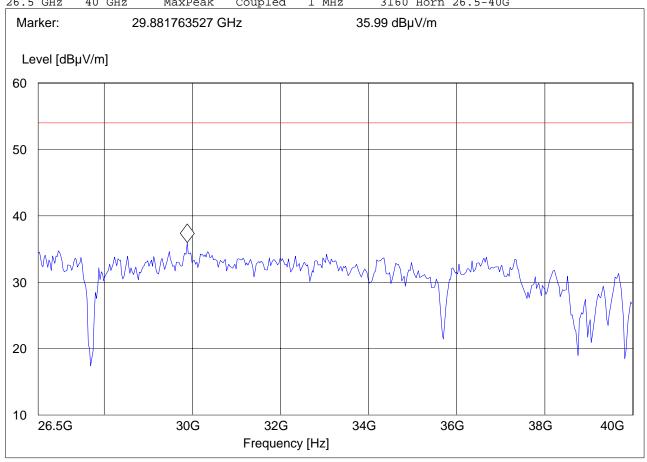
Comments:

SWEEP TABLE: "FCC 15.407 26.5-40G"

IF Transducer Stop Detector Meas.

Frequency Frequency Bandw. Time

26.5 GHz 40 GHz MaxPeak Coupled 1 MHz 3160 Horn 26.5-40G



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5.4 Receiver Spurious Emission § 15.209/RSS210

5.4.1 Limits

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

NOTE:

- 1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.
- 2. All measurements are done in peak mode using an average limit unless specified with the plots.
- 3. There are no measurable emissions up to 18GHz in Rx mode.

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5.4.2 RESULTS 802.11 (na) HT20 MODE Chain AB

30MHz - 1GHz, Antenna: Horizontal

Note: This plot is valid for low, mid, high channels (worst-case plot).

026 EUT:

Customer:: Elektrobit

Test Mode: RX mode; 20 MHz BW

ANT Orientation: H EUT Orientation: H Test Engineer: Satya

Voltage: Power Cable

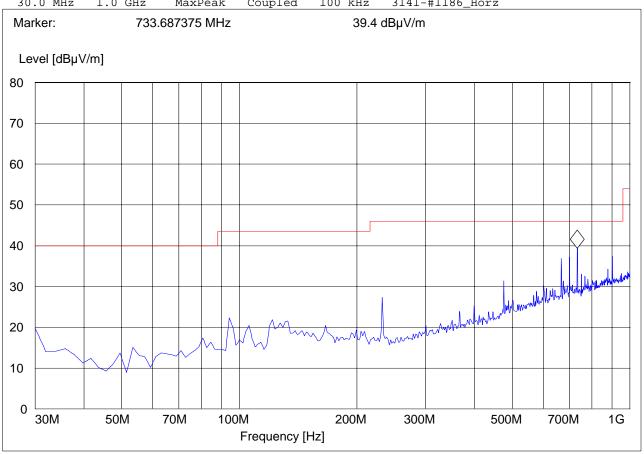
Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Hor"

Stop Detector Meas. IF Transducer Start

Frequency Frequency Bandw. Time

3141-#1186_Horz 100 kHz 30.0 MHz 1.0 GHz MaxPeak Coupled



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30MHz – 1GHz, Antenna: Vertical

Note: This plot is valid for low, mid, high channels (worst-case plot).

EUT: 026

Customer:: Elektrobit

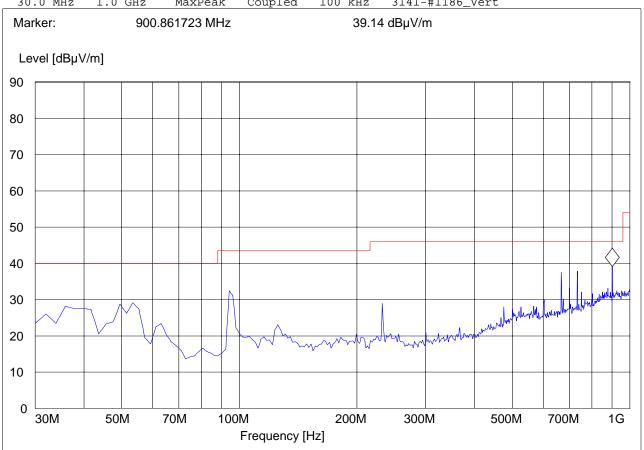
Test Mode: RX mode; 20 MHz BW

ANT Orientation: V
EUT Orientation: H
Test Engineer: Satya
Voltage: Power Cable

Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Ver"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.
30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186_Vert



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1-18GHz Chain AB

Note: Peak Reading vs. Average limit

EUT / Description: 026

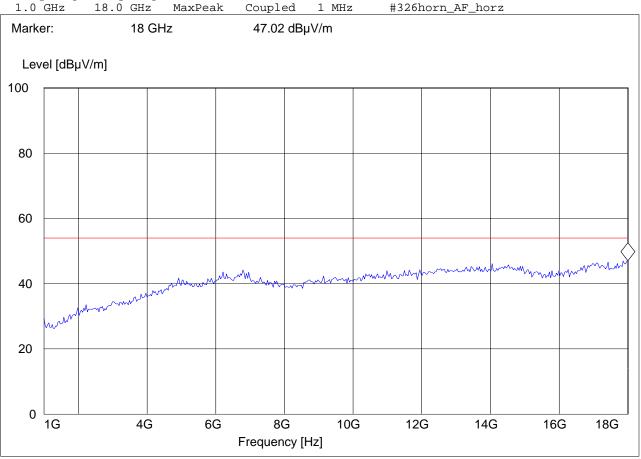
Elektrobit Manufacturer: Operation Mode: Ch. 5220, Rx

ANT Orientation: : H EUT Orientation:: H Test Engineer: Chris Voltage: Power cable

Comments::

SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.



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5.4.3 RESULTS 802.11 (na) HT40 MODE Chain AB

30MHz - 1GHz, Antenna: Horizontal

Note: This plot is valid for low, mid, high channels (worst-case plot).

EUT: 026

Customer:: Elektrobit
Test Mode: RX mode
ANT Orientation: H
EUT Orientation: H

Test Engineer: Satya
Voltage: Power Cable

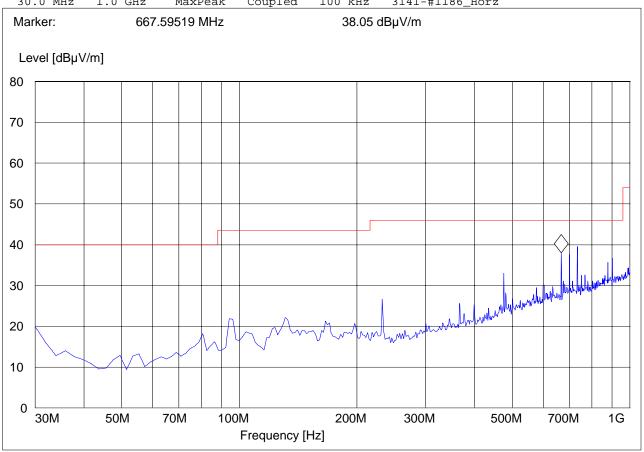
Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Hor"

Start Stop Detector Meas. IF Transducer

 $\label{eq:frequency} \textit{Frequency} \qquad \textit{Time} \qquad \textit{Bandw.}$

30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186_Horz



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30MHz – 1GHz, Antenna: Vertical

Note: This plot is valid for low, mid, high channels (worst-case plot).

EUT: 026

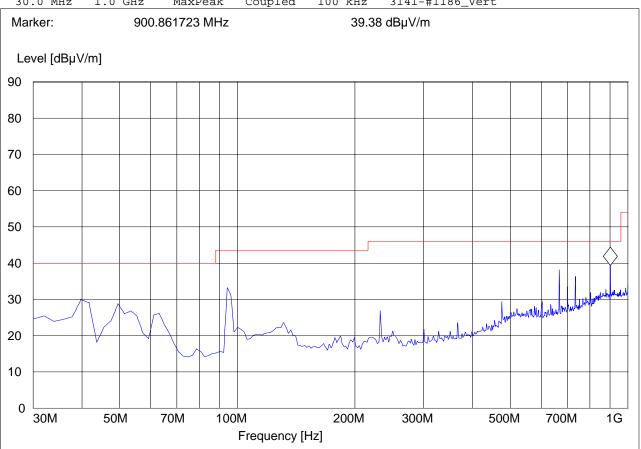
Customer:: Elektrobit
Test Mode: RX mode

ANT Orientation: V
EUT Orientation: H
Test Engineer: Satya
Voltage: Power Cable

Comments:

SWEEP TABLE: "FCC15.247_30M-1G_Ver"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.
30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186_Vert



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1-18GHz Chain AB

Note: Peak Reading vs. Average limit

EUT / Description: 026

Manufacturer: Elektrobit Operation Mode: Rx Mode

ANT Orientation: : H
EUT Orientation: : H
Test Engineer: Satya
Voltage: Power cable

Comments::

SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw.

#326horn_AF_horz 1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz Marker: 17.931863727 GHz 47.35 dBµV/m Level [dBµV/m] 100 80 60 40 20 0 1G 4G 6G 8G 10G 12G 14G 16G 18G Frequency [Hz]

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6 Conducted Measurements

6.1 26dB bandwidth and 99% bandwidth.

6.1.1 Limit

None. Measurement procedure per FCC Public Notice DA02-2138

6.1.2 Measurement Result:

HT20 Mode:

Channel Frequency		26dB Bandwidth	99% Bandwidth	
(MHz)		(MHz)	(MHz)	
5180	Chain A	21.76	18.56	
	Chain B	22.18	18.01	
5220	Chain A	20.40	18.48	
	Chain B	21.47	18.33	
5240	Chain A	23.28	18.32	
	Chain B	20.90	18.46	
M	in:	20.40	18.01	

HT40 Mode:

	Frequency Hz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
5190	Chain A	43.04	36.67
	Chain B	46.79	36.79
5230	Chain A	40.64	36.67
	Chain B	46.79	36.79
M	in:	40.64	36.67

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6.2 Conducted Power Measurement

6.2.1 Limit

FCC15.407 (A)(1): maximum conducted power must not exceed the lesser of 50mW (17dBm) or 4dBm+10*log(B), where B is the 26-dB emission bandwidth in MHz.

HT20 Mode: 4dBm + 10*log(20.40) = 17.096dBm > 17dBm. Limit = 17dBm. HT40 mode: 4dBm + 10*log(40.64) = 20.09dBm > 17dBm. Limit = 17dBm.

RSS-210 (A9.2)(1): maximum conducted power must not exceed the lesser of 200mW (23dBm) or 10dBm+10*log(B), where B is the 99% emission bandwidth in MHz.

HT20 Mode: 10dBm + 10*log(18.01) = 22.56dBm < 23dBm. Limit = 22.56dBm. HT40 mode: 10dBm + 10*log(36.67) = 25.64dBm > 23dBm. Limit = 23dBm.

6.2.2 Results

The peak conducted power is measured with a power sensor with thermal detector. The EUT is set to transmit at 100% duty cycle and powers from all three transmit ports are measured. The two highest powers measured are reported here. Calculated directional gain of the two transmit port is 5.6dBi and the EUT does not support TPC.

HT20 Mode

Frequency	Chain A	Chain B	Total	Margin
(MHz)	(dBm)	(dBm)	(dBm)	(dBm)
5180	12.2	11.5	14.9	2.13
5220	12.0	11.4	14.7	2.28
5240	11.8	11.3	14.6	2.44

HT40 Mode

Frequency (MHz)	Chain A (dBm)	Chain B (dBm)	Total (dBm)	Margin (dBm)
5190	12.2	11.5	14.9	2.11
5230	12.1	11.3	14.7	2.26

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6.3 Power Spectral Density

6.3.1 Limit

FCC 15.407 (A)(1): peak power spectral density shall not exceed 4 dBm in any 1–MHz band.

Industry Canada: RSS-210 (A9.2)(1) & (A9.5)(2): peak power spectral density shall not exceed 10 dBm in any 1–MHz band.

6.3.2 Results

The peak conducted power is measured with a combiner, spectrum analyzer and method 1 specified in FCC public knowledge DA-02-2138A1. The EUT is set to transmit at 100% duty cycle and powers from the two ports with highest transmit power are measured and reported here. The EUT does not support TPC.

HT20 Mode

Frequency (MHz)	Power Spectral Density (dBm)	Margin (dBm)
5180	3.45	0.55
5220	0.97	3.03
5240	1.97	2.03

HT40 Mode

Frequency (MHz)	Power Spectral Density (dBm)	Margin (dBm)
5190	0.39	3.61
5230	-0.83	4.83

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6.4 Peak Excursion

6.4.1 Limit

FCC15.407 (A)(6): The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

6.4.2 Results

The peak conducted power is measured with a spectrum analyzer and method 1 specified in FCC public knowledge DA-02-2138A1. The EUT is set to transmit at 100% duty cycle and powers from all three transmit ports are measured. The two highest powers measured are reported here. The EUT does not support TPC.

HT20 Mode

Frequency (MHz)	Chain A (dBm)	Chain B (dBm)	Margin (dBm)
5180	9.47	10.94	2.06
5220	9.80	9.77	3.20
5240	9.88	9.75	3.12

HT40 Mode

Frequency (MHz)	Chain A (dBm)	Chain B (dBm)	Margin (dBm)
5190	10.35	10.74	2.26
5230	10.26	10.65	2.35

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6.5 Conducted Spurious Emission

6.5.1 Limit

As specified in 15.407 (b)(1)(2)(3)(4) and RSS-210 (A9.3)(1)(2)(3)(4).

6.5.2 Results:

Measurement conducted on Chain A with worse case power output. 30M-1GHz emissions are measured in HT20 mode which has worse case power output comparing with HT40 mode.

No measurable emission over the limit. See plots for details.

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6.6 AC Power Line Conducted Emissions § 15.107/207

6.6.1 LIMITS

Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)

Frequency of Emission (MHz)	Conducted Limit (dBµV)		
	Quasi-Peak	Average	
0.15 - 0.5	66 to 56*	56 to 46*	
0.5 - 5	56	46	
5 – 30	60	50	
* Decreases with logarithm of the frequency			

ANALYZER SETTINGS: RBW = 10KHz

VBW = 10KHz

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6.6.2 RESULTS 802.11na HT20 Mode

Line:

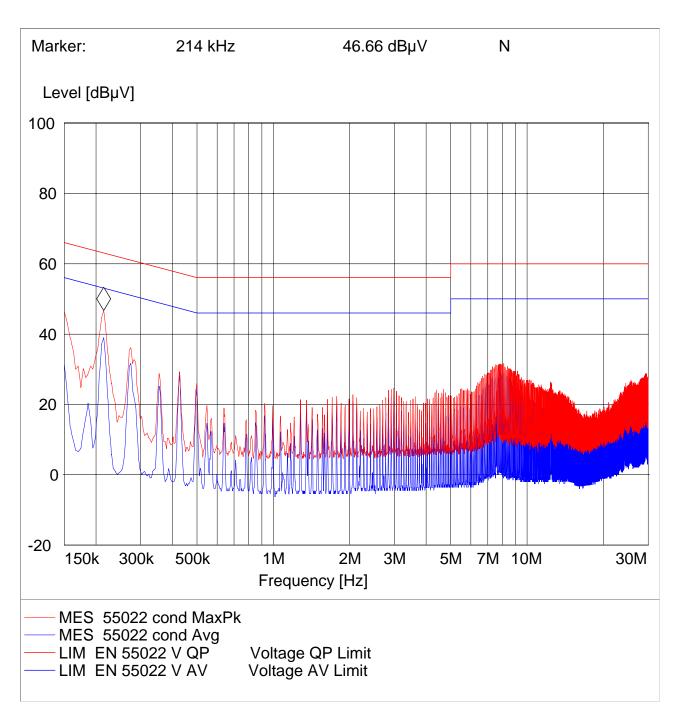
EUT: 026

Manufacturer: Elektrobit Test Mode: Ch. 5220 ANT Orientation:: Conducted

EUT Orientation:: H
Test Engineer:: Chris

Power Supply: : Power Cable

Comments: : LINE



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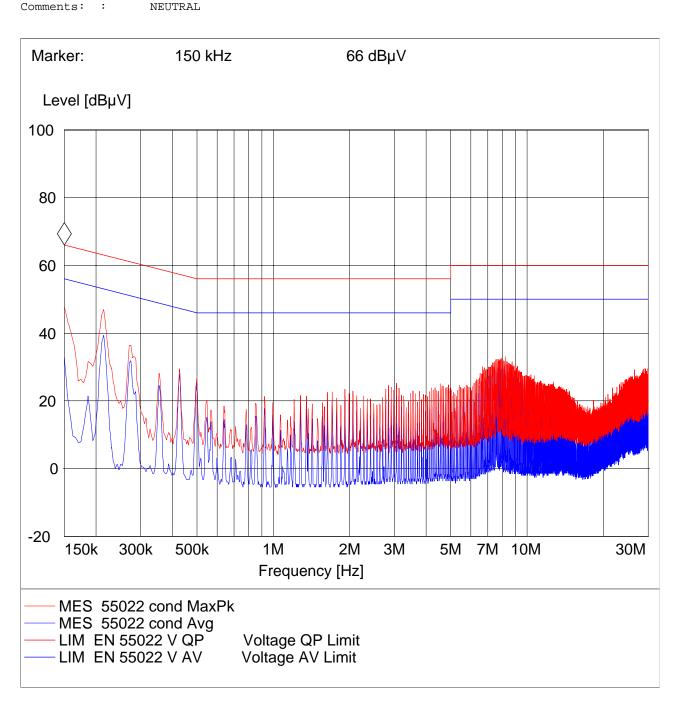


Neutral:

EUT: 026

Manufacturer: Elektrobit Test Mode: Ch. 5220 ANT Orientation:: Conducted

EUT Orientation:: H
Test Engineer:: Chris
Power Supply:: Power Cable



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6.6.3 RESULTS 802.11na HT20 Mode

Line:

EUT: 026

Manufacturer: Elektrobit

Test Mode: 5190 MHz; 40 MHz Bandwidth

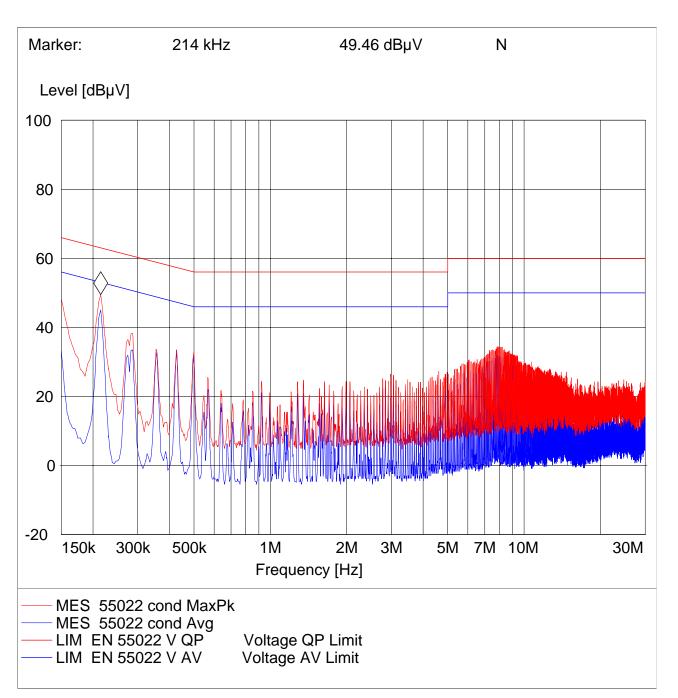
ANT Orientation:: Conducted

EUT Orientation:: H

Test Engineer:: Satya

Power Supply: : Power Cable

Comments: : Line



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Neutral:

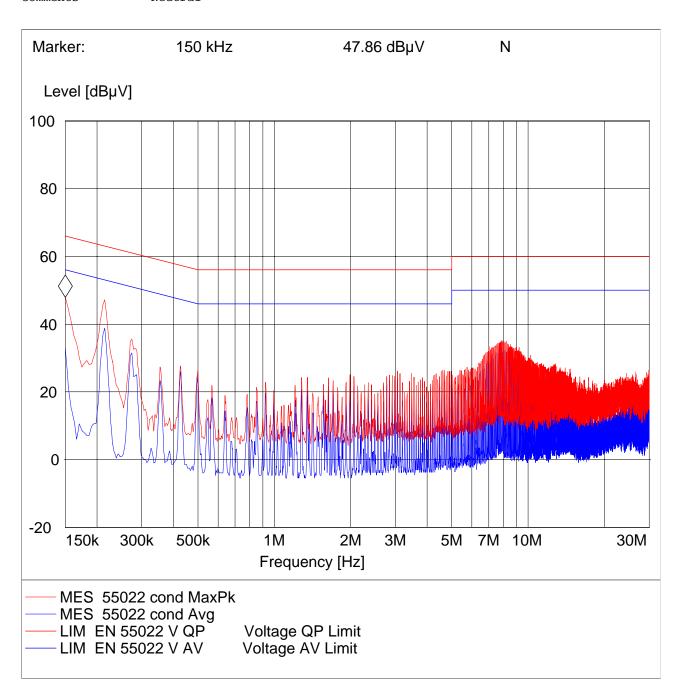
EUT: 026

Manufacturer: Elektrobit

Test Mode: 40 MHz Bandwidth; 5190 MHz

ANT Orientation:: Conducted

EUT Orientation:: H
Test Engineer:: Satya
Power Supply: : Power Cable
Comments: : Neutral



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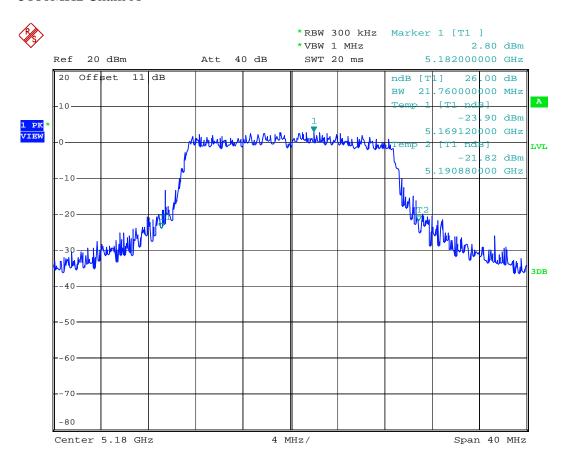


6.7 Conducted Measurement Plots

6.7.1 26dB Bandwidth

6.7.1.1 802.11na HT20 Mode

5180MHz Chain A

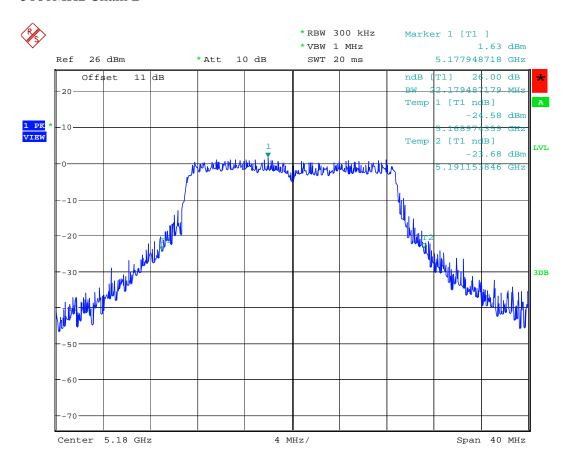


Date: 13.MAR.2008 23:27:27

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5180MHz Chain B

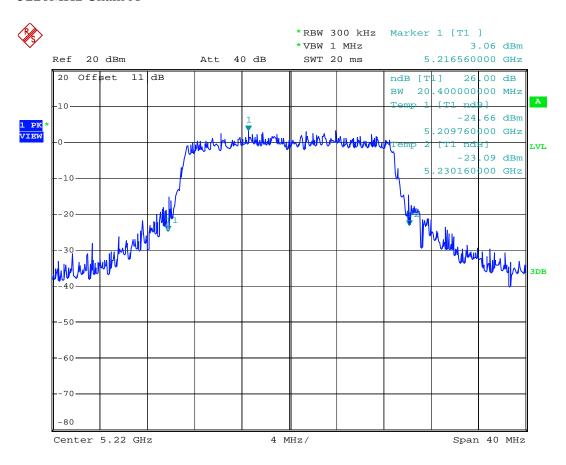


Date: 13.MAR.2008 14:29:18

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5220MHz Chain A

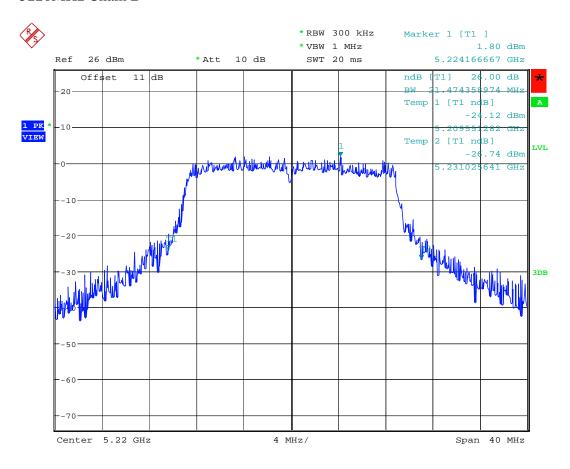


Date: 13.MAR.2008 23:28:23

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5220MHz Chain B

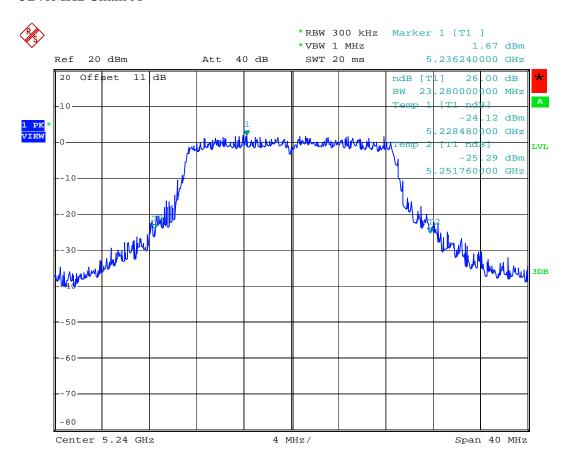


Date: 13.MAR.2008 14:28:35

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5240MHz Chain A

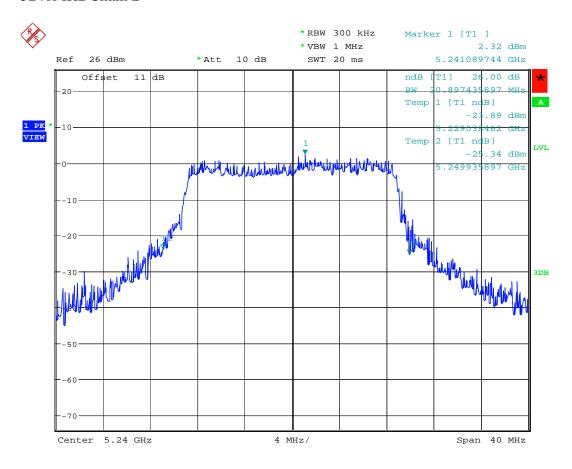


Date: 13.MAR.2008 23:29:12

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5240MHz Chain B



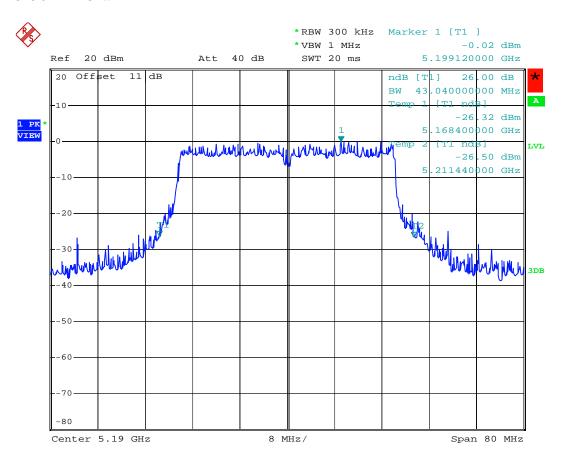
Date: 13.MAR.2008 14:27:53

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6.7.1.2 <u>802.11na HT40 Mode</u>

5190MHz Chain A

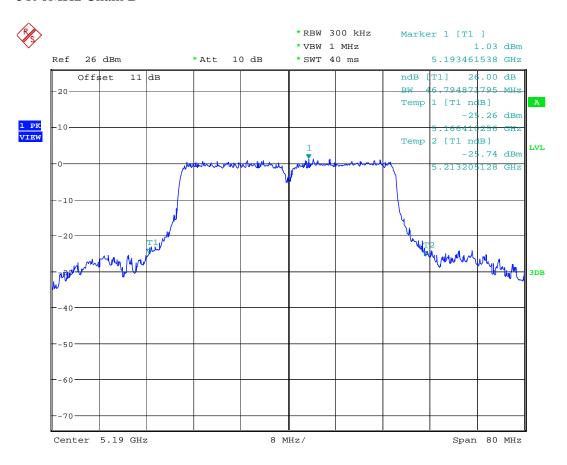


Date: 13.MAR.2008 23:33:50

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5190MHz Chain B

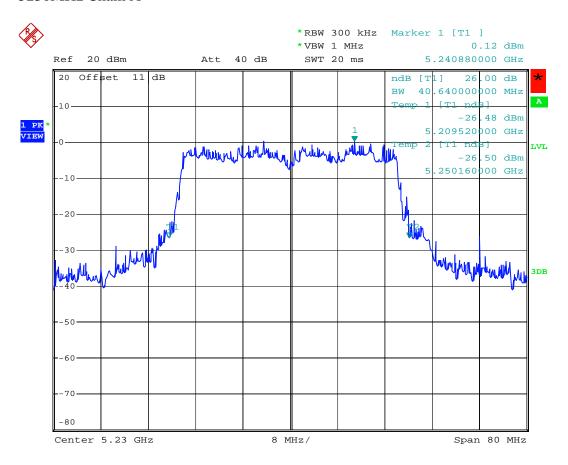


Date: 24.MAR.2008 13:26:08

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5230MHz Chain A

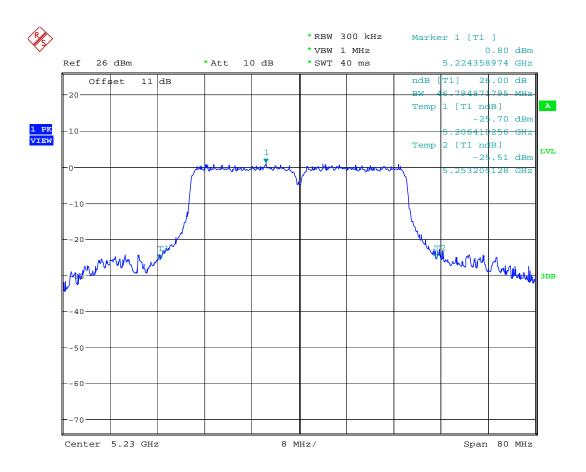


Date: 13.MAR.2008 23:34:55

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5230MHz Chain B



Date: 24.MAR.2008 13:24:06

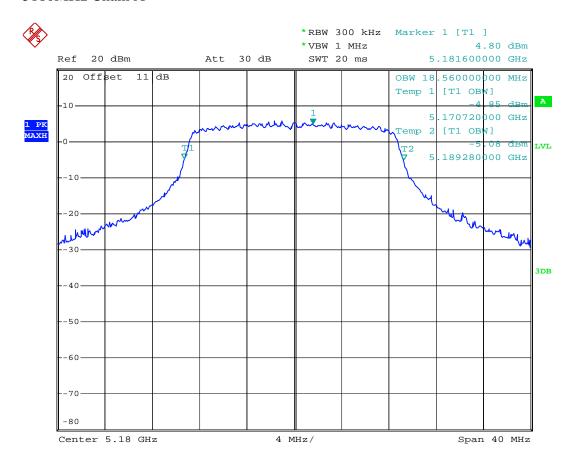
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6.7.2 99% Bandwidth

6.7.2.1 <u>802.11na HT20 mode</u>

5180MHz Chain A

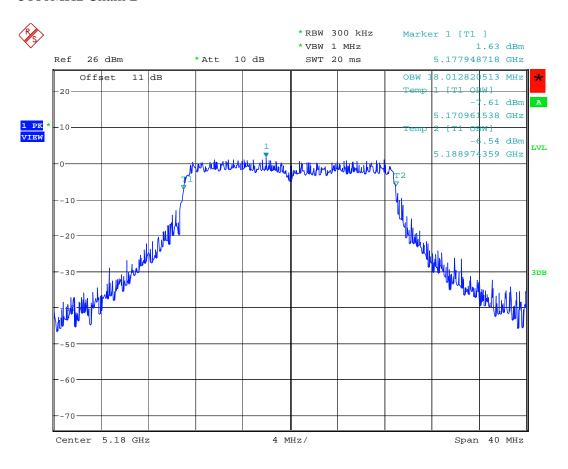


Date: 13.MAR.2008 23:19:03

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5180MHz Chain B

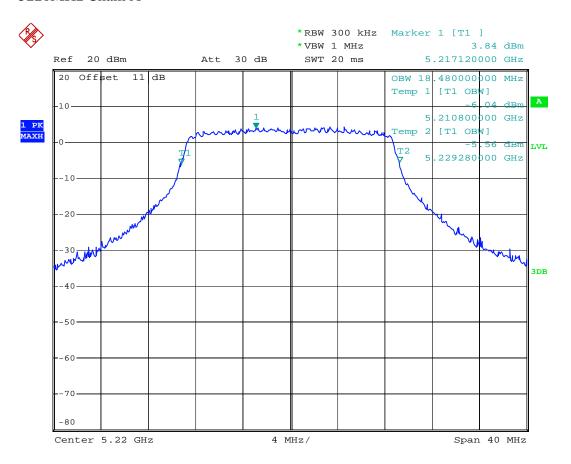


Date: 13.MAR.2008 14:31:19

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5220MHz Chain A

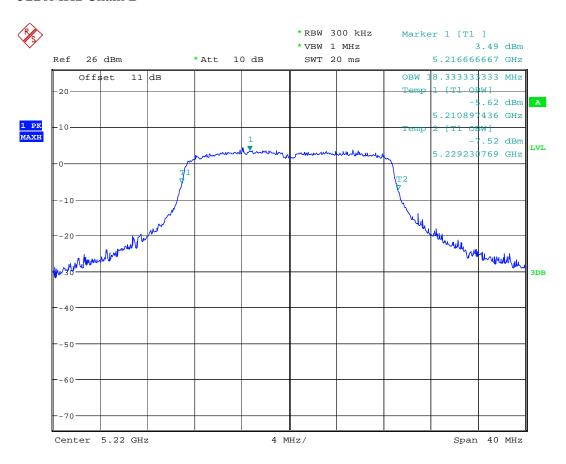


Date: 13.MAR.2008 23:20:44

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5220MHz Chain B

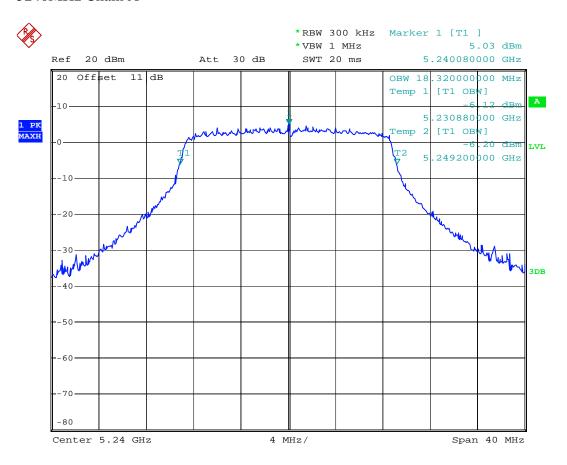


Date: 13.MAR.2008 14:33:28

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5240MHz Chain A

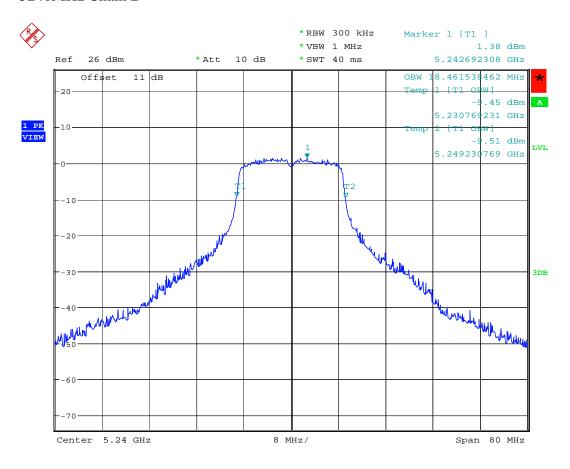


Date: 13.MAR.2008 23:22:50

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5240MHz Chain B



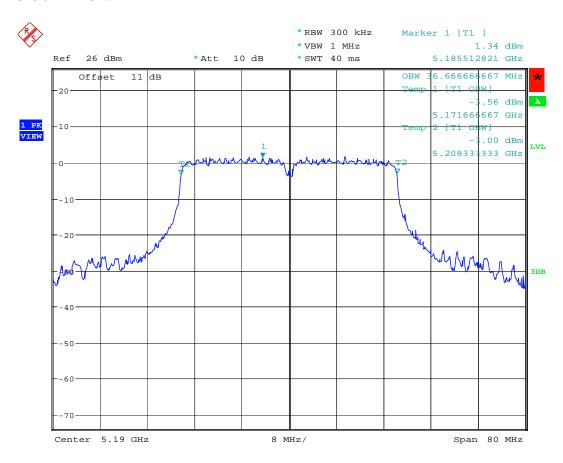
Date: 24.MAR.2008 12:33:25

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6.7.2.2 <u>802.11na HT40 Mode</u>

5190MHz Chain A

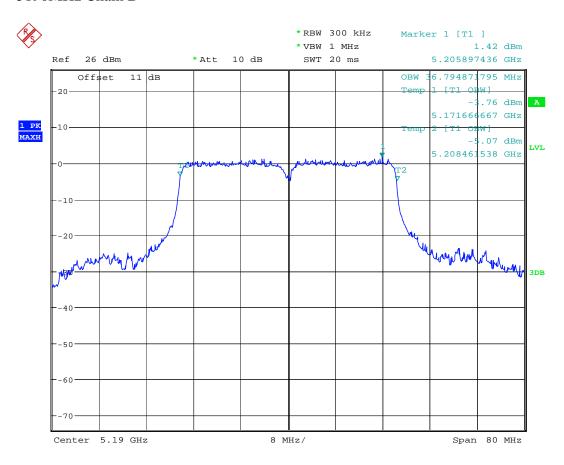


Date: 24.MAR.2008 13:39:53

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5190MHz Chain B

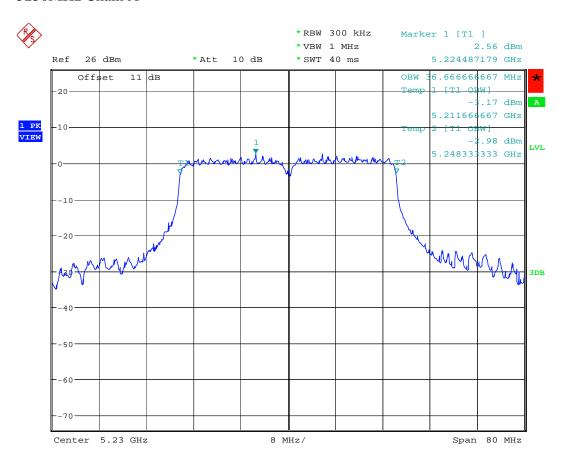


Date: 13.MAR.2008 14:36:40

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5230MHz Chain A

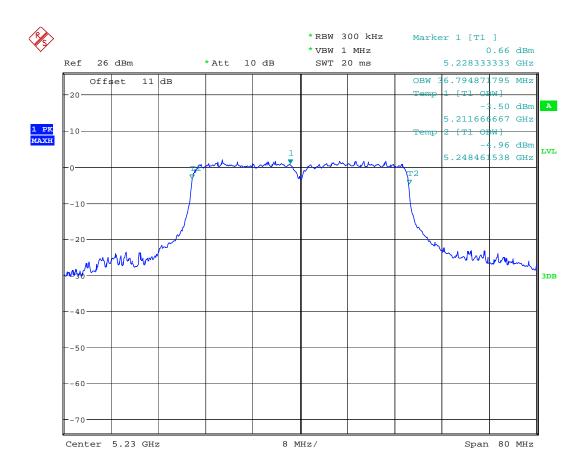


Date: 24.MAR.2008 13:42:20

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5230MHz Chain B



Date: 13.MAR.2008 15:08:03

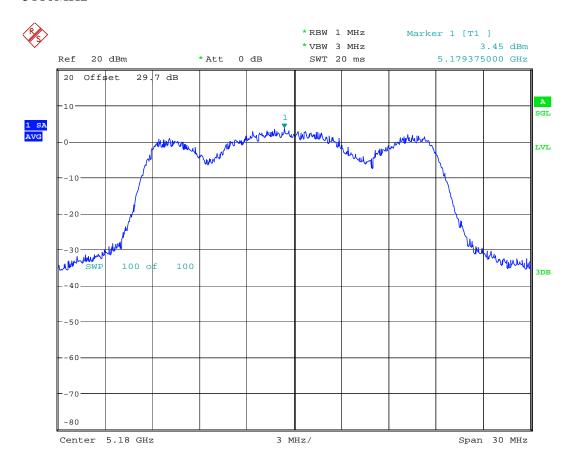
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6.7.3 Power Spectral Density

6.7.3.1 <u>802.11na HT20 mode</u>

5180MHz

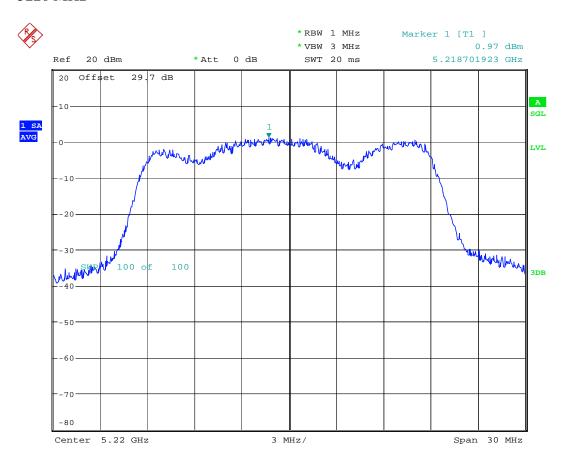


Date: 27.MAR.2008 08:59:02

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5220 MHz

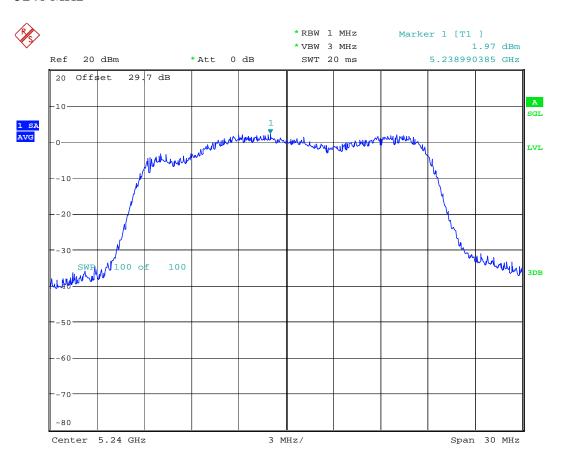


Date: 27.MAR.2008 08:59:44

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5240 MHz



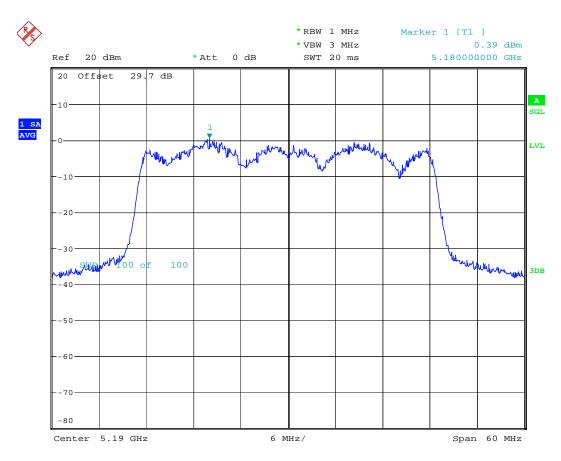
Date: 27.MAR.2008 09:00:17

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6.7.3.2 <u>802.11na HT40 mode</u>

5190 MHz

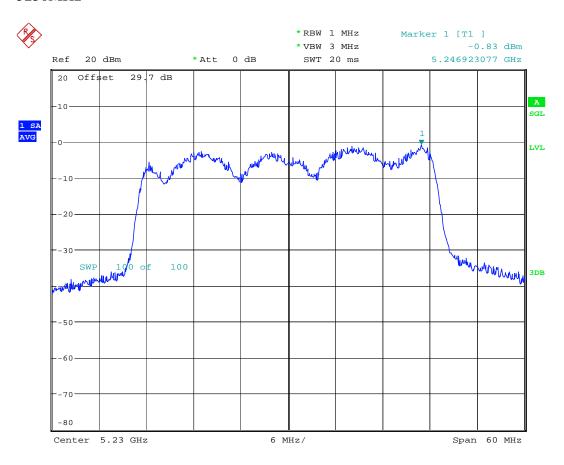


Date: 27.MAR.2008 09:00:58

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5230MHz



Date: 27.MAR.2008 09:01:39

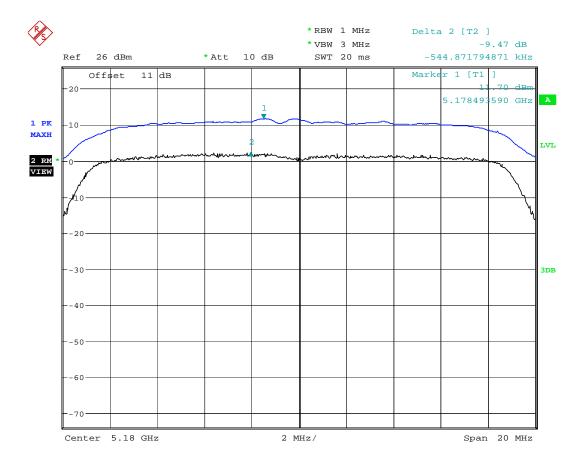
Date of Report: **2008-3-31** Page 70 of 90



6.7.4 Peak Excursion

6.7.4.1 <u>802.11na HT20 mode</u>

5180MHz Chain A

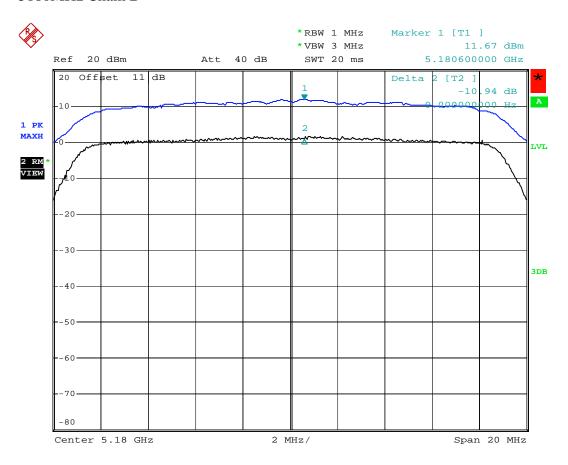


Date: 13.MAR.2008 13:31:01

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5180MHz Chain B

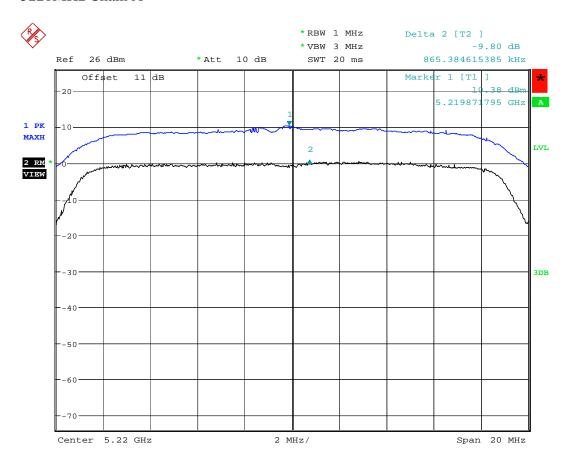


Date: 13.MAR.2008 22:27:30

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5220MHz Chain A

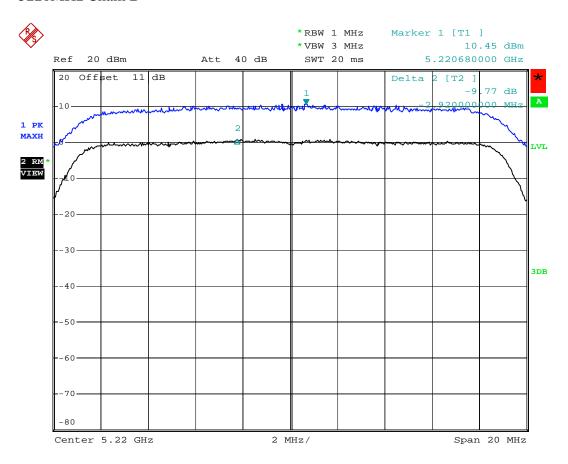


Date: 13.MAR.2008 13:39:20

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5220MHz Chain B

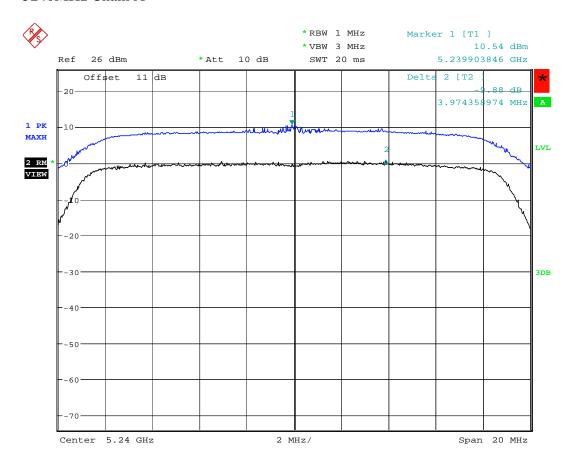


Date: 13.MAR.2008 22:36:15

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5240MHz Chain A

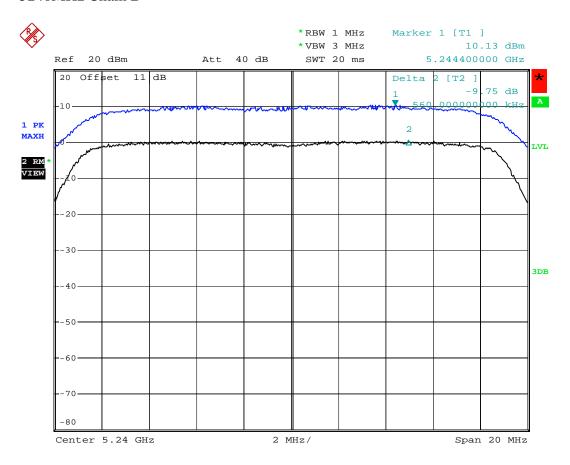


Date: 13.MAR.2008 13:42:28

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5240MHz Chain B



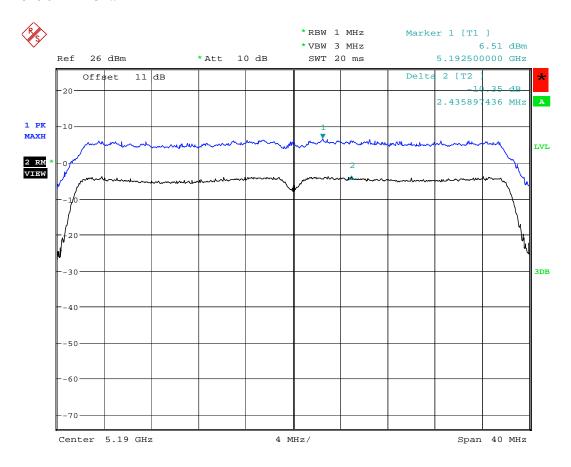
Date: 13.MAR.2008 22:38:08

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6.7.4.2 <u>802.11na HT40 mode</u>

5190MHz Chain A

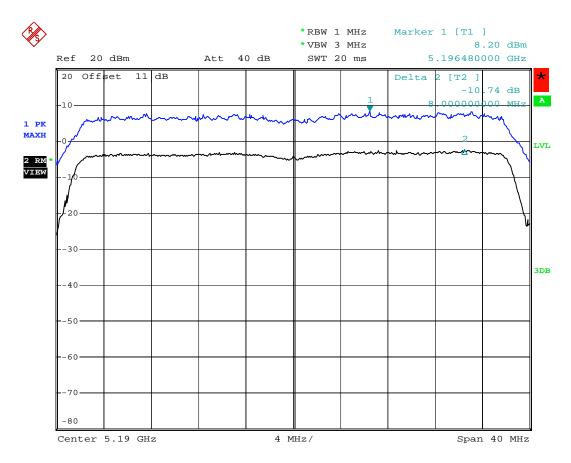


Date: 13.MAR.2008 13:54:10

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5190MHz Chain B

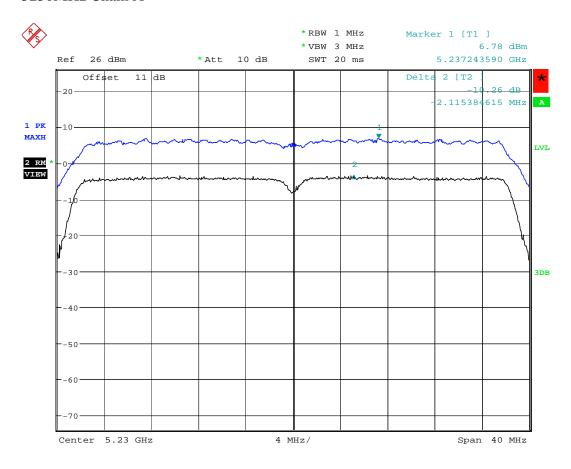


Date: 13.MAR.2008 22:46:23

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5230MHz Chain A

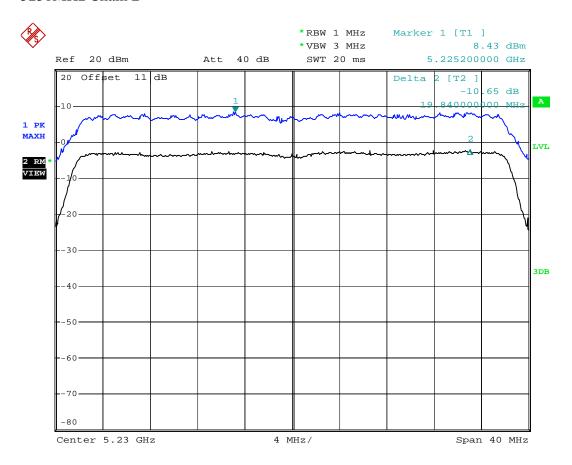


Date: 13.MAR.2008 14:01:18

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5230MHz Chain B



Date: 13.MAR.2008 22:42:06

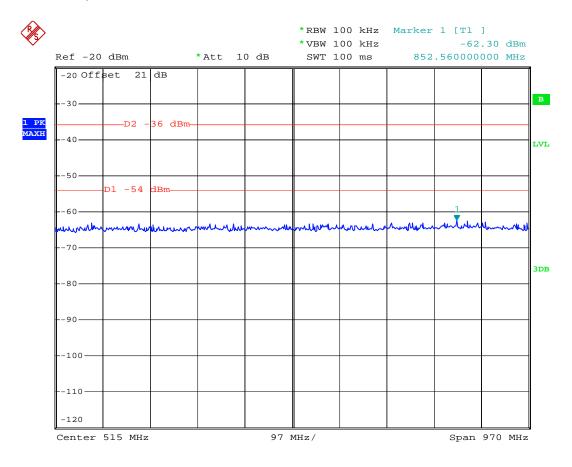
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6.7.5 Conducted Spurious Emissions

6.7.5.1 <u>802.11na HT20 Mode</u>

5180MHz, 30M-1GHz

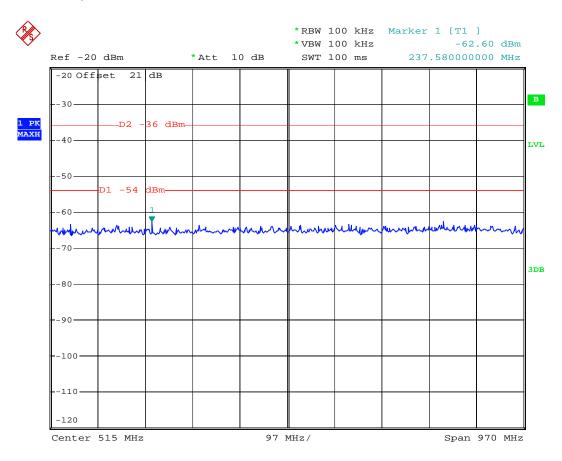


Date: 5.MAR.2008 23:03:30

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5220MHz, 30M-1GHz

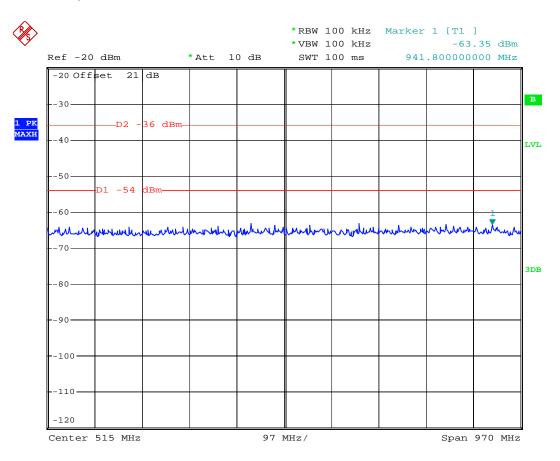


Date: 5.MAR.2008 23:05:37

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5240MHz, 30M-1GHz

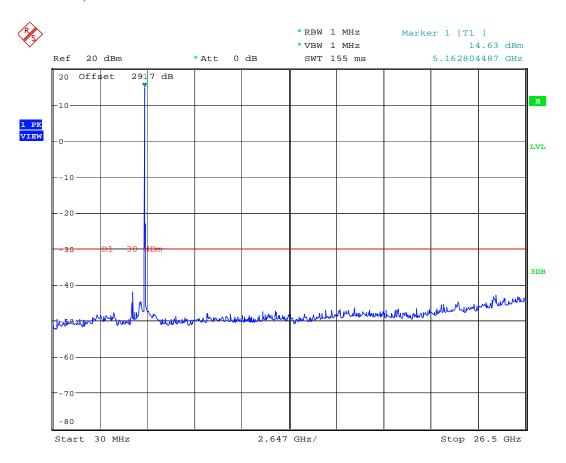


Date: 5.MAR.2008 23:06:39

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5180MHz, 1-26.5GHz

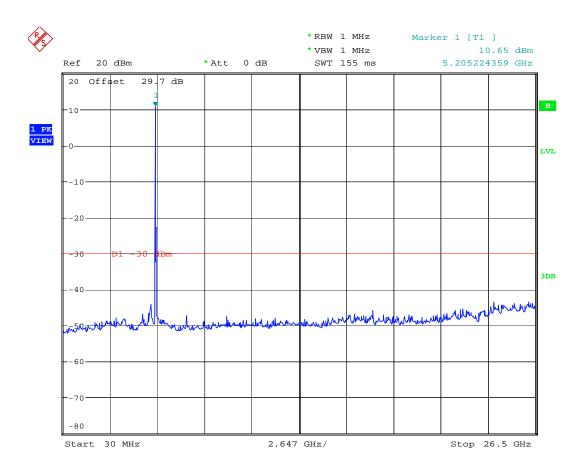


Date: 27.MAR.2008 12:25:31

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5220MHz, 1-26.5GHz

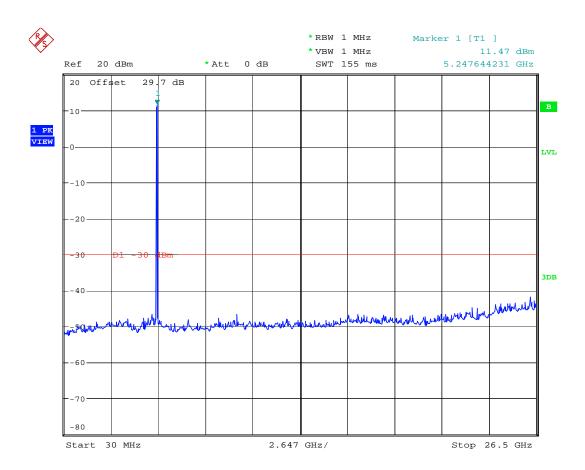


Date: 27.MAR.2008 12:26:55

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5240MHz, 1-26.5GHz



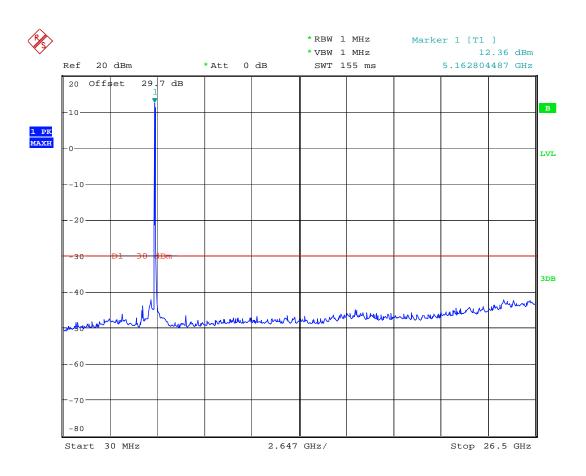
Date: 27.MAR.2008 12:27:37

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6.7.5.2 <u>802.11na HT40 Mode</u>

5190MHz, 1-26.5GHz

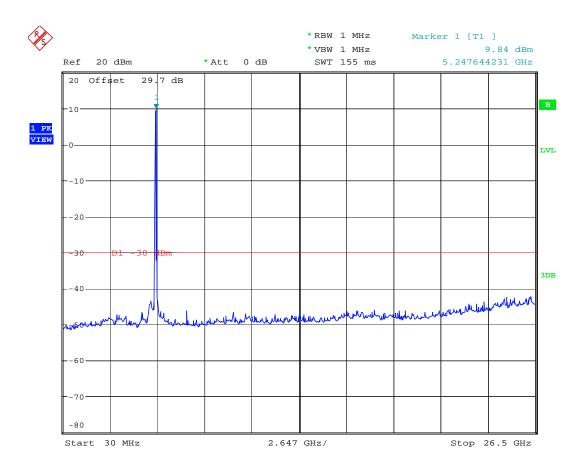


Date: 27.MAR.2008 12:22:20

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5230MHz, 1-26.5GHz



Date: 27.MAR.2008 12:24:09

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7 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Cal Due	Interval
01	Spectrum Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2008	1 year
02	Spectrum Analyzer	FSEM 30	Rohde & Schwarz	100017	August 2008	1 year
03	Signal Generator	SMY02	Rohde & Schwarz	836878/011	May 2008	1 year
04	Power-Meter	NRVD	Rohde & Schwarz	0857.8008.02	May 2008	1 year
05	Biconilog Antenna	3141	EMCO	0005-1186	June 2008	1 year
06	Horn Antenna (1-18GHz)	SAS-200/571	AH Systems	325	June 2008	1 year
07	Horn Antenna (18- 26.5GHz)	3160-09	EMCO	1240	June 2008	1 year
08	Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
09	Climatic Chamber	VT4004	Voltsch	G1115	May 2008	1 year
10	High Pass Filter	5HC2700	Trilithic Inc.	9926013	n/a	n/a
11	High Pass Filter	4HC1600	Trilithic Inc.	9922307	n/a	n/a
12	Pre-Amplifier	JS4-00102600	Miteq	00616	May 2008	1 year
13	Power Sensor	URV5-Z2	Rohde & Schwarz	DE30807	May 2008	1 year
14	Digital Radio Comm. Tester	CMD-55	Rohde & Schwarz	847958/008	May 2008	1 year
15	Universal Radio Comm. Tester	CMU 200	Rohde & Schwarz	832221/06	May 2008	1 year
16	LISN	ESH3-Z5	Rohde & Schwarz	836679/003	May 2008	1 year
17	Loop Antenna	6512	EMCO	00049838	July 2008	2 years

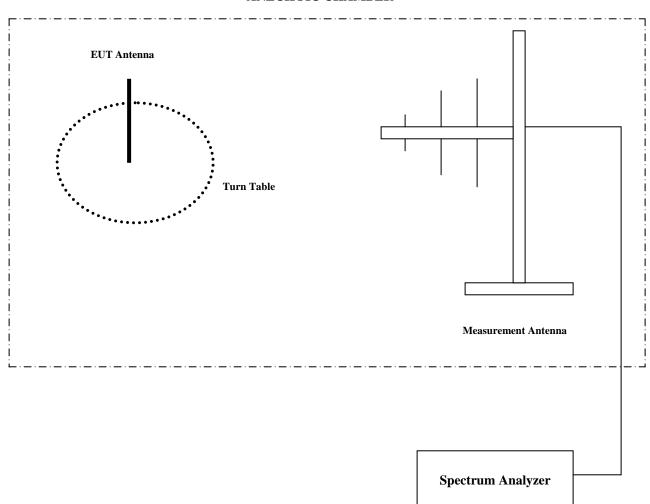
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8 BLOCK DIAGRAMS

Radiated Testing

ANECHOIC CHAMBER



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9 Revision History

2008-3-25: First Issue

2008-3-31: Rev1, adding FCC ID, IC ID on the cover page; adding channel numbers and output power in EUT section; adding EUT number on each measurement plot; deletion of empty quasi-peak frequency list in conducted emissions measurements. Replaces original titled *EMC_CETEC_029_15.407n_5.1G* and dated 2008-3-25.