TÜVRheinland®
Electronic Products and Services (EPS) B.V.

Test Report No.:	**12100401.fcc01**		*Page 1 of 51*
Client:	**Wistron NeWeb Corp.** 20 park Aveneu II, Hsinchu Science park, Hsinchu 308, Taiwan, R.O.C.		
Test Item:	**PCIe 802.11n WiFi module**		
Identification:	**DNXA-H1**	*Serial No.:*	**Engineering Sample**
Project No.:	**12100401**	*Date of Receipt:*	**2012-09-10**
Testing Location:	**TÜV Rheinland EPS B.V.** Eiberkamp 10 9351VT Leek		
Test Specification:	**FCC 47 CFR Part 15, Subpart C, Section 15.247 (October 1, 2010)** ANSI C63.4-2009 KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247 (January 18, 2012)		
Test Result:	*The test item **passed** the test specification(s).*		
Testing Laboratory:	**TÜV Rheinland EPS B.V.** Eiberkamp 10 9351 VT Leek		

Tested by:			*Reviewed by:*		
2012-11-05	R. van der Meer / Inspector		2012-11-05	O. Hoekstra / Reviewer	
Date	*Name/Position*	*Signature*	*Date*	*Name/Position*	*Signature*

Other Aspects: the testitem is placed in host model L-452 and L-451 and test are performed to allow for a Permissive Change Class II.

Abbreviations:

P(ass)	=	***passed***
F(ail)	=	***failed***
N/A	=	***not applicable***
N/T	=	***not tested***

TEST SUMMARY

5.1.1 VOLTAGE REQUIREMENTS
RESULT: N/A

5.1.2 ANTENNA REQUIREMENTS
RESULT: PASS

5.1.3 RESTRICTED BANDS OF OPERATION
RESULT: PASS

5.2.1 CONDUCTED OUTPUT POWER
RESULT: N/A

5.2.2 6DB BANDWIDTH
RESULT: N/A

5.2.3 CONDUCTED SPURIOUS EMISSION
RESULT: N/A

5.2.4 PEAK POWER SPECTRAL DENSITY
RESULT: N/A

5.2.5 BAND EDGE CONDUCTED EMISSIONS
RESULT: Pass

5.2.6 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER
RESULT: PASS

5.3.1 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER
RESULT: Pass

Contents

1. General Remarks

1.1 Complementary Materials

The EUT is a PCIe 802.11n WiFi module. The testdata are provided in two separate testreport.

	Test standard	Testreport reference
WLAN 802.11b/g, 802.11n WLAN 802.11a, 802.11n (5745-5825 MHz)	FCC Part 15, Subpart C, Section 15.247	12100401.fcc01 This report
WLAN 802.11a, 802.11n (5180-5240 MHz)	FCC Part 15, Subpart E, Section 15.407	12100401.fcc02

There is no attachment to this test report.

The EUT is intended to be used inside two hosts. These hosts are mentioned in section 4.5. Pre-tests are performed on both hosts and model L-452 turned out to be the worst case and was therefor selected for full compliance testing.

2. Test Sites

2.1 Test Facilities

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland EPS B.V., located in Leek, 9351VT Eiberkamp 10, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, (10-1-09 edition).

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The description of the test facilities has been filed to Industry Canada under registration number 2932G-2. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 120VAC/60Hz
Air pressure	: 950 – 1050 hPa

When it was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Inventory number	Calibration date (mm/yyyy)	Calibration due date (mm/yyyy)
For Conducted Emission					
LISN	Rohde & Schwarz	3625/2	12512	01/2012	01/2014
Measuring receiver	Rohde & Schwarz	ESCI	99699	03/2012	03/2013
For Radiated Emission					
RF cable	Huber + Suhner	Sucoflex102	99741	04/2012	04/2013
RF Cable S-AR	Gigalink	APG0500	99858	02/2012	02/2013
Controller	Heinrich Deisel	4630-100	99107	N/A	N/A
Test fascility	Comtest	FCC listed: 90828	99580	02/2012	02/2015
Spectrum Analyzer	Rohde & Schwarz	FSP40	99538	11/2011	11/2012
Controller	EMCS	DOC202	99608	N/A	N/A
Antenna mast	EMCS	AP-4702C	99609	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	99855	02/2012	02/2013
Guidehorn 1-18 GHz	EMCO	3115	12484	04/2012	04/2013
Guidehorn 18-26.5 GHz	EMCO	RA42-K-F-4B-C	12488	04/2012	04/2013
Guidehorn 26.5-40 GHz	EMCO	3116	12486	04/2012	04/2013
Biconilog Testantenna	Chase	CBL 6111B	15633	01/2012	01/2013
2.4 GHz bandreject filter	BSC	XN-1783	14450	N/A	N/A
Bandpass filter 4-10 GHz	Reactel	7AS-7G-6G-511	99076	N/A	N/A
Bandpass filter 10-26 GHz	Reactel	9HS-10G/26.5G-S11	99136	N/A	N/A
Preamplifier 0.5 - 18 GHz	Miteq	AMF-5D-005180-28-13p	99596	N/A	N/A

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.5dB
	> 1GHz	±0.7dB
Radiated Emission	150kHz - 30MHz	±5.0dB
	30MHz - 1GHz	±5.0dB
	> 1GHz	±5.5dB

3. General Product Information

3.1 Product Function and Intended Use

The brand WNC model DNXA-H1, hereafter refered to as EUT, is a digitally modulated transmitter intended to be used in WiFi applications.

The content of this report and measurement results have not been changed other than the way of presenting the data.

3.2 System Details

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	PCIe 802.11n WiFi module
Manufacturer	:	Wistron NeWeb Corp.
Brand	:	WNC
Model	:	DNXA-H1
Serial number	:	Engineering Sample
Voltage input rating	:	3.3Vdc
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	External (see Antenna types below)
Operating frequency	:	2412 – 2462 MHz and 5745-5825
Modulation Type	:	CCK, DQPSK, DBPSK for DSSS, 64QAM, 16QAM,QPSK BPSK for OFDM.
Modulation Technology	:	DSSS and OFDM
Remarks	:	n.a.
FCC ID	:	NKR-DNXA-H1

Antenna types:

SWIVEL (3dBi@2.4GHz; 5dBi@5GHz)

PCB (2.5dBi@2.4GHz;4.8dBi@5GHz)

Photos : left=host containing EUT inside (host1 shown), right= AUX2 power supply used with hosts

3.3 Countermeasures to achieve Compliance

No additional measures were employed to achieve compliance.

4. Test Set-up and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247 and KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The test methods, which have been used, are based on ANSI C63.4-2009.

For details, see under each test item.

4.2 Operation Modes

The frequency bands used in this EUT are listed below.

Frequencyband (MHz)	2412-2462	5180-5240	5745-5825
802.11b	√	-	-
802.11g	√	-	-
802.11a	-	√	√
802.11n 20MHz	√	√	√
802.11n 40MHz	√	√	√

The basic operation modes used for testing are:

Mode	Tested Channel	Modulation Technology
802.11b	1 & 11	DSSS
802.11g	1 & 11	OFDM
802.11n-20MHz	1 & 11	OFDM
802.11n-40MHz	1 & 7	OFDM
802.11a	149 & 165	OFDM
802.11n-40MHz	151 & 159	OFDM

Output Power (at U.FL connector of WLAN PCIe card):

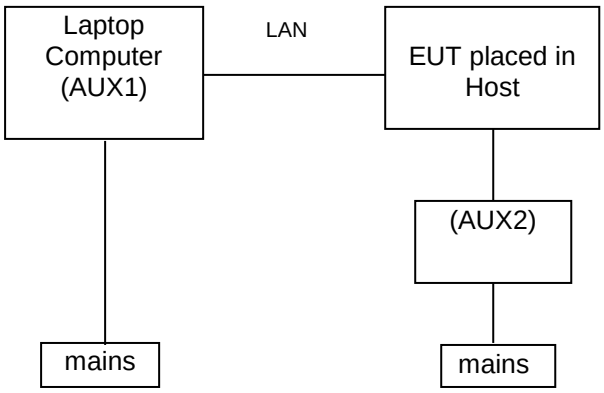
Mode	Frequency (MHz)	Max. Power (dBm)
802.11b	2412-2462	24.7
802.11g	2412-2462	25.5
802.11n(20)	2412-2462	28.6
802.11n(40)	2422-2452	26.1
802.11a	5745-5825	24.1
802.11n(20)	5745-5825	24.6
802.11n(40)	5755-5795	23.7

4.3 Physical Configuration for Testing

The EUT was tested in hosts model L-451 and model L-452 and the test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4:2009.

Figure 1: Test Setup Diagram



Notes:

For more details, refer to the document: Test Set-Up Photographs document.

4.4 Test Software

The EUT was provided by the manufacturer with suitable software to allow operation in all the required modes.

Software used for testing: DiagGUI.

This software was running on a laptop computer (AUX1). It was used to enable the test operation modes listed in section 4.2 as appropriate.

4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. Host 1

Product:	Access point
Brand:	LANCOM
Model:	L-452agn Wireless
Rated Voltage:	12 Vdc
Antenna:	external, 5 pieces SMA-female contra connector
Serial Number:	4002333718100063
Remarks:	host for EUT

2. Host 2

Product:	Access point
Brand:	LANCOM
Model:	L-451agn Wireless
Rated Voltage:	12 Vdc
Antenna:	external, 3 pieces SMA-female contra connector
Serial Number:	4002333718100029
Remarks:	host for EUT

3. AUX1

Product:	Laptop Computer
Brand:	Lenovo
Model:	9456-HTG
Serial Number:	L3-DHKM6
Remark:	property customer, host for testsoftware connects to EUT through LAN connection

5. AUX2

Product:	Power supply adapter
Brand:	Sunny Computer Technology Europe S.R.O.
Model:	SYS1381-1212-W2E
Rated Input Voltage:	100-240Vac, 0.5A
Rated Output Voltage:	12Vdc, 1.0A
Remarks:	connects to Host1 or Host2

5. Test Results

5.1 Technical Requirements

5.1.1 Voltage Requirements

RESULT: N/A

Requirements:

FCC 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict:

N/A.

5.1.2 Antenna Requirements

RESULT: PASS

Requirements:

FCC 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.

Verdict:

The EUT is placed in a host with external antennas. Non standard SMA connectors are used of the reversed type. Hence it complies with the requirements.

5.1.3 Restricted Bands of Operation

RESULT: PASS

Requirements:

FCC 15.205

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict:

Only spurious emissions may be found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement. Any emissions directly related to the transmitter function located in these bands meet the General radiated emissions limits of 15.209.

5.2 Conducted Measurements at Antenna Port

5.2.1 Conducted Output Power

RESULT: N/A

Date of testing: N/A

5.2.2 6dB Bandwidth

RESULT: N/A

Date of testing: N/A

5.2.3 Conducted Spurious Emission

RESULT: N/A

Date of testing: N/A

5.2.4 Peak Power Spectral Density

RESULT: N/A

Date of testing: N/A

5.2.5 Band Edge Emissions in the 2G4 band

RESULT: Pass

Date of testing: 2012-10-25 to 2012-11-05

Requirements:

FCC 15.205, FCC 15.209 and FCC 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test procedure:

ANSI C63.4-2009 and KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings:
RBW = 100kHz, VBW = 300kHz.

The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.
Plots are provided on the next pages. Line D1 indicates the highest level and line D2 indicates the 20dB offset below D1.

Results: All out of band spurious emissions are more than 20 dB below the fundamental.
See Plots through on the following pages.

802.11b

Restricted band (2310 – 2390 MHz)

Frequency (MHz)	Fundamental emission [dBµV]	Delta (dB)	Max field strength in restricted band [dBµV/m]	Limit [dBµV/m]	Plot number
2412.00 (PK)	109.7	55.4	54.3	74.00	1
2412.00 (AV)	105.3	55.4	49.9	54.00	2

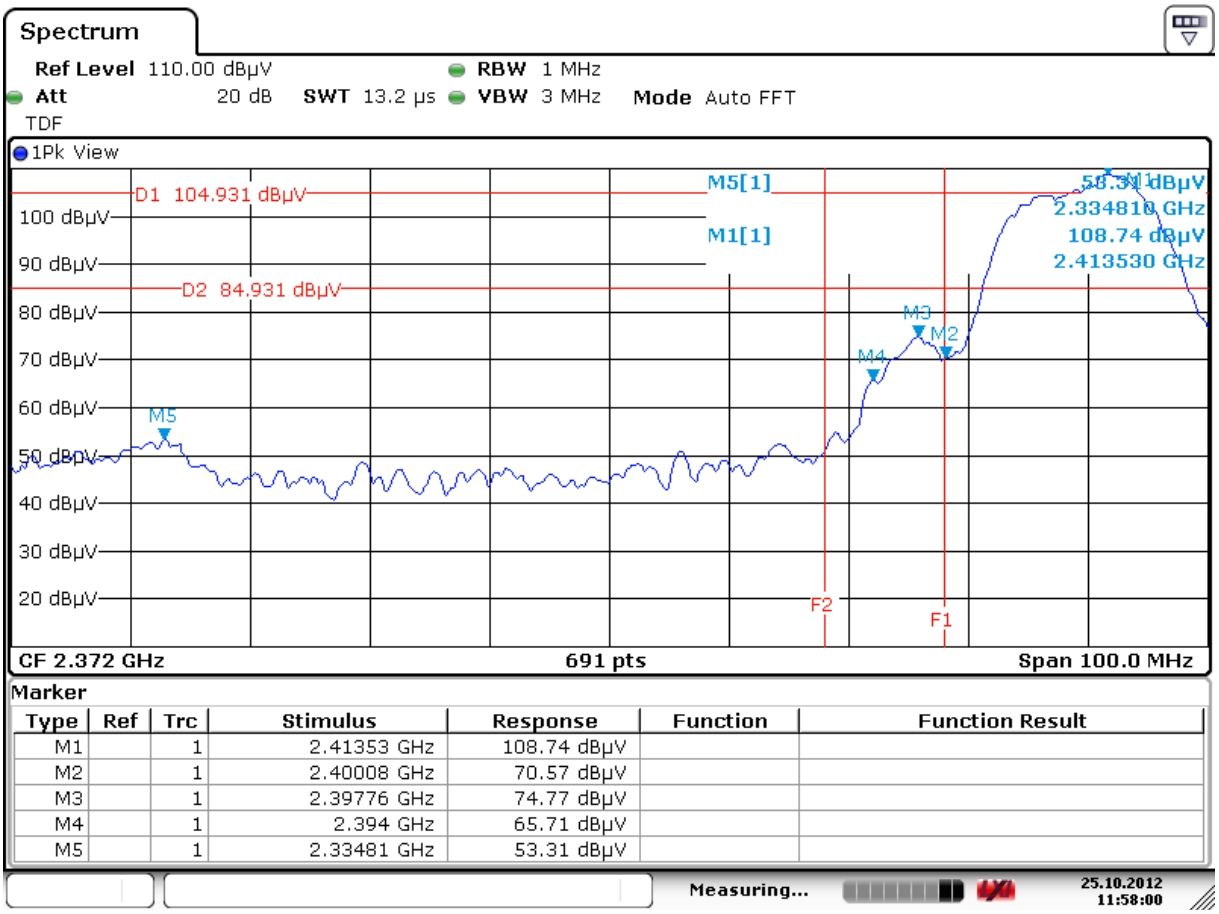
Restricted band (2383.5 – 2500 MHz)

Frequency (MHz)	Fundamental emission [dBµV]	Delta (dB)	Max field strength in restricted band [dBµV/m]	Limit [dBµV/m]	Plot number
2462.00 (PK)	108.2	42.3	65.9	74.00	3
2462.00 (AV)	100.3	52.1	48.2	54.00	4a-4b

Note:

- Delta is the difference in amplitude of the peak of the fundamental and the peak of the band edge emission, as marked in the plots.
- Maximum field strength in restricted band = Fundamental emission – Delta.

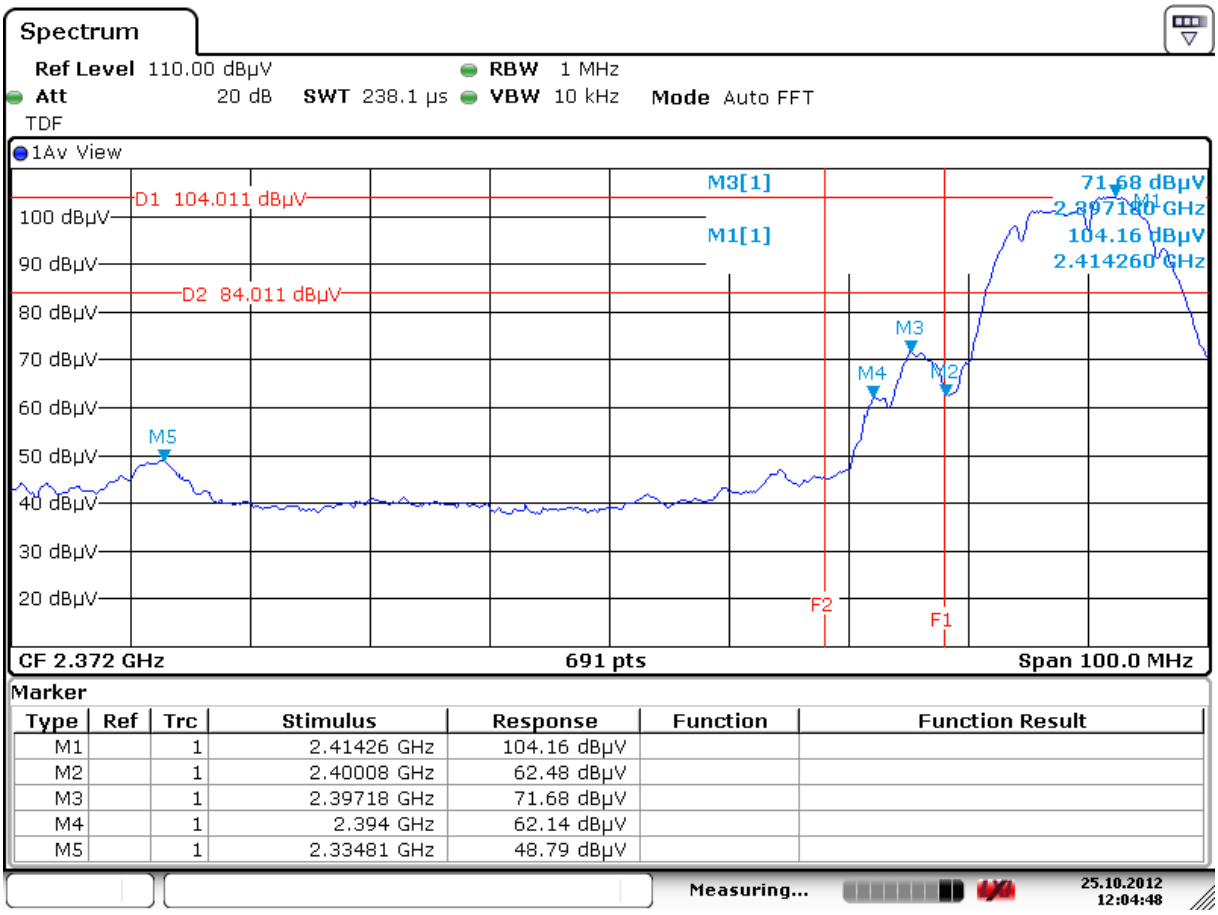
Plot 1: Band Edge Emissions, Spectral Diagram, 802.11b 2412 MHz Peak



Date: 25.OCT.2012 11:58:00

(Note: lines D1 and D2 are placed incorrect –too low in fact, though marker levels are correct)
Lower authorized band edge attenuation is more than the required 20dB.

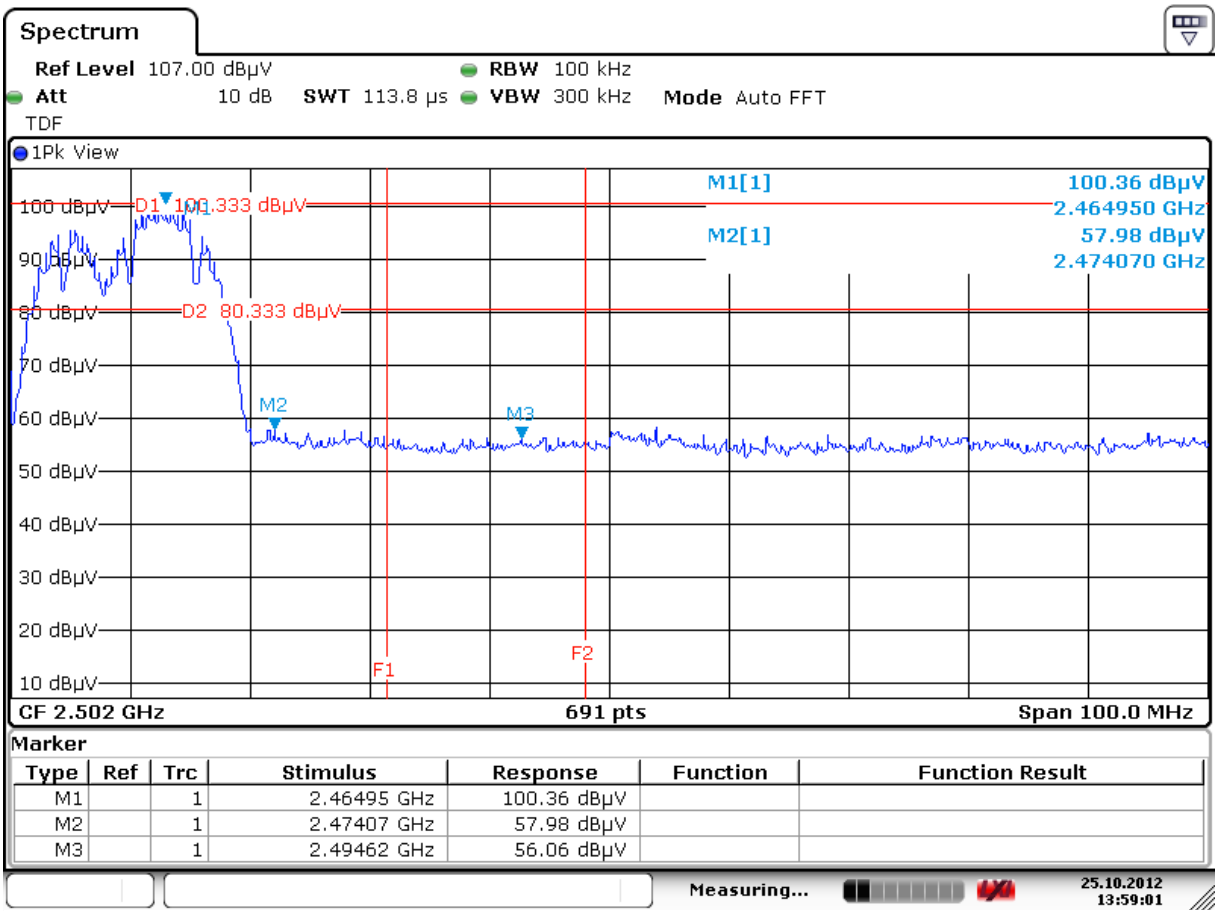
Plot 2: Band Edge Conducted Emission, Spectral Diagram, 802.11b 2412 MHz Average.



Date: 25.OCT.2012 12:04:49

Lower authorized band edge attenuation is more than the required 20dB.

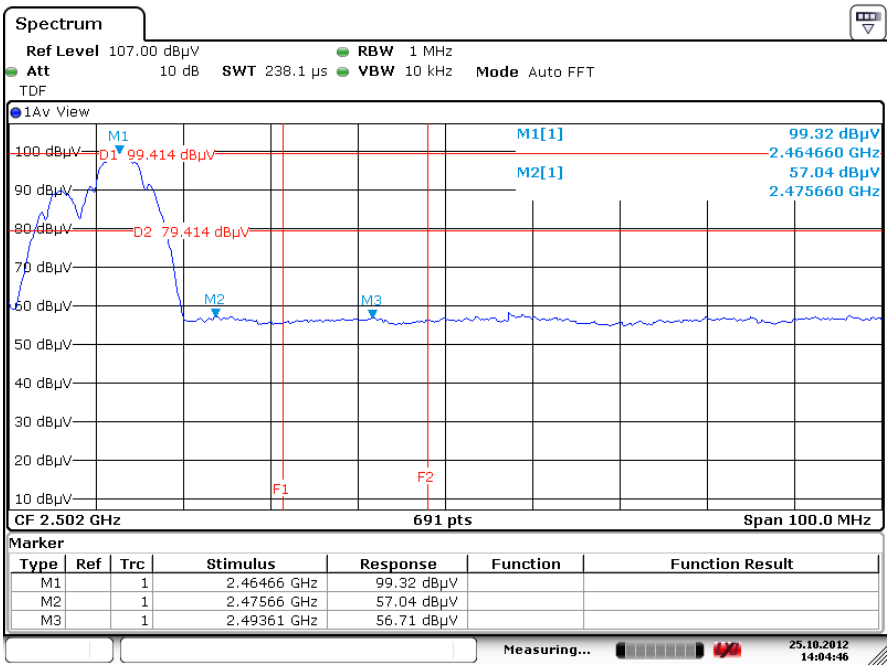
Plot 3: Band Edge Emissions, Spectral Diagram, 802.11b 2462 MHz Peak



Date: 25.OCT.2012 13:59:01

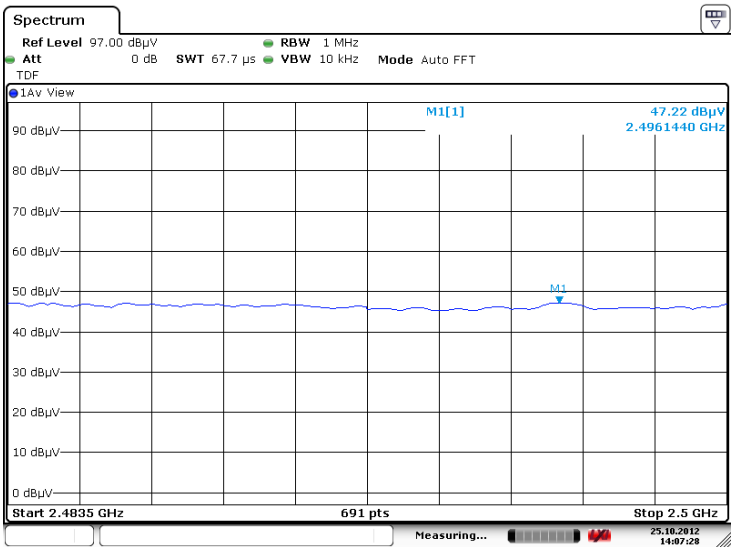
Higher authorized band edge attenuation is more than the required 20dB.

Plot 4a: Band Edge Conducted Emission, Spectral Diagram, 802.11b 2462 MHz Average.



Date: 25.OCT.2012 14:04:46

Higher authorized band edge attenuation is more than the required 20dB.



Date: 25.OCT.2012 14:07:28

Plot 4b: zoomed in to the restrictedband 2310-2390 MHz, delta value is obtained by difference between M1 from plot 4a and M1 from plot 4b (99.32 – 47.22=52.1 dB).

802.11g

Restricted band (2310 – 2390 MHz)

Frequency (MHz)	Fundamental emission [dBµV]	Delta (dB)	Max field strength in restricted band [dBµV/m]	Limit [dBµV/m]	Plot number
2412.00 (PK)	107.2	42.5	64.7	74.00	5
2412.00 (AV)	103.4	50.6	52.8	54.00	6a-6b

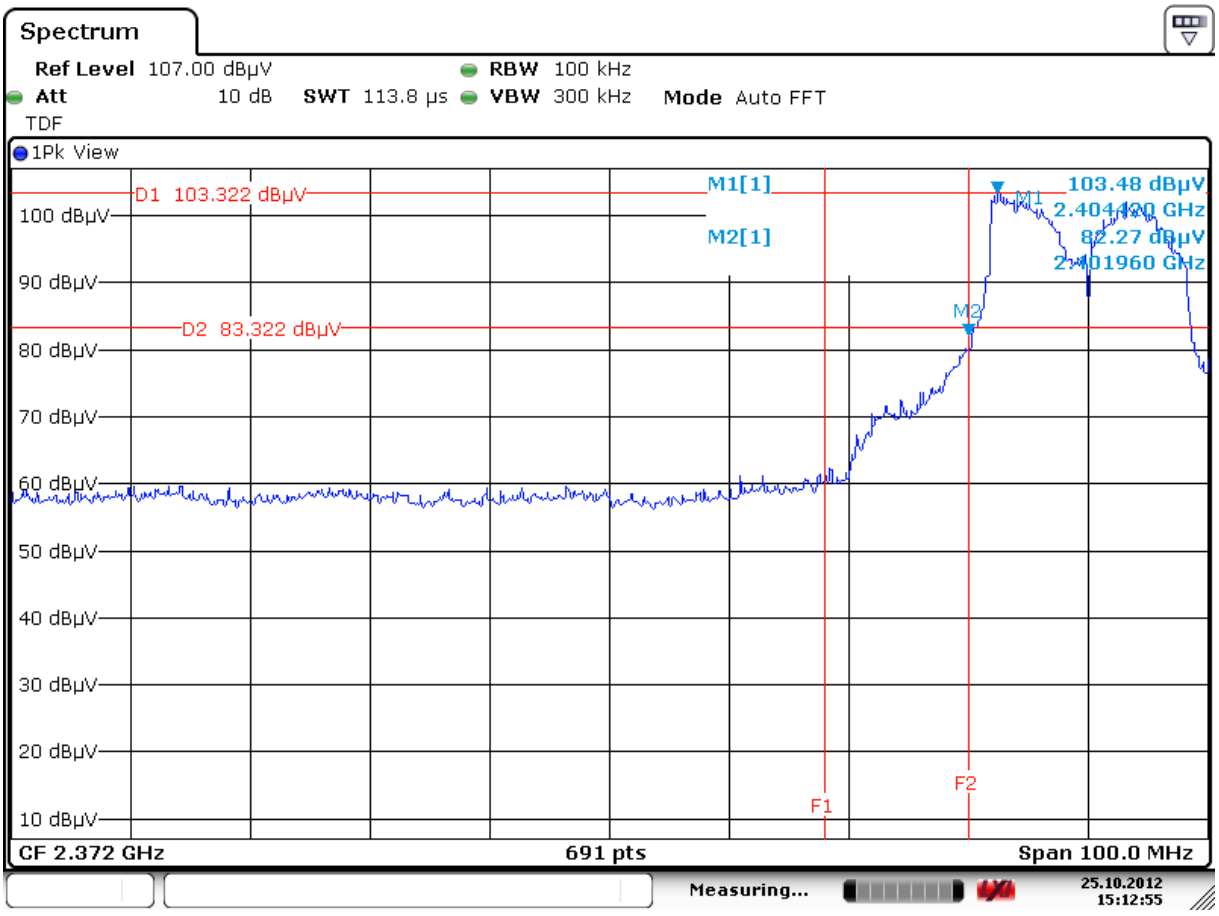
Restricted band (2383.5 – 2500 MHz)

Frequency (MHz)	Fundamental emission [dBµV]	Delta (dB)	Max field strength in restricted band [dBµV/m]	Limit [dBµV/m]	Plot number
2462.00 (PK)	109.1	47.6	61.5	74.00	7
2462.00 (AV)	106.8	52.9	53.9	54.00	8a-8b

Note:

- Delta is the difference in amplitude of the peak of the fundamental and the peak of the band edge emission, as marked in the plots.
- Maximum field strength in restricted band = Fundamental emission – Delta.

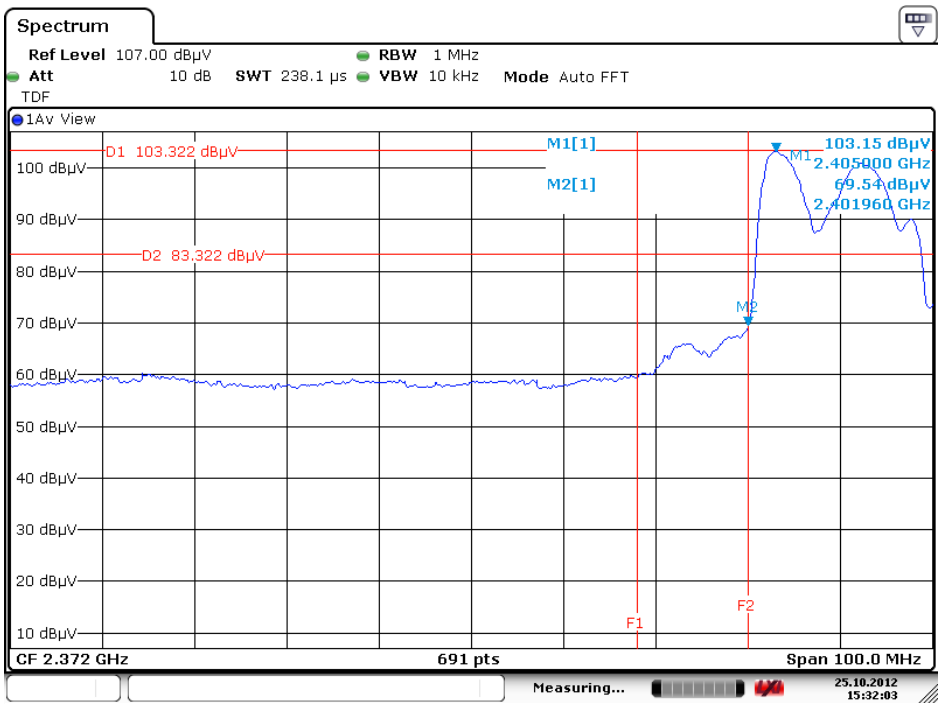
Plot 5: Band Edge Emissions, Spectral Diagram, 802.11g 2412 MHz Peak



Date: 25.OCT.2012 15:12:55

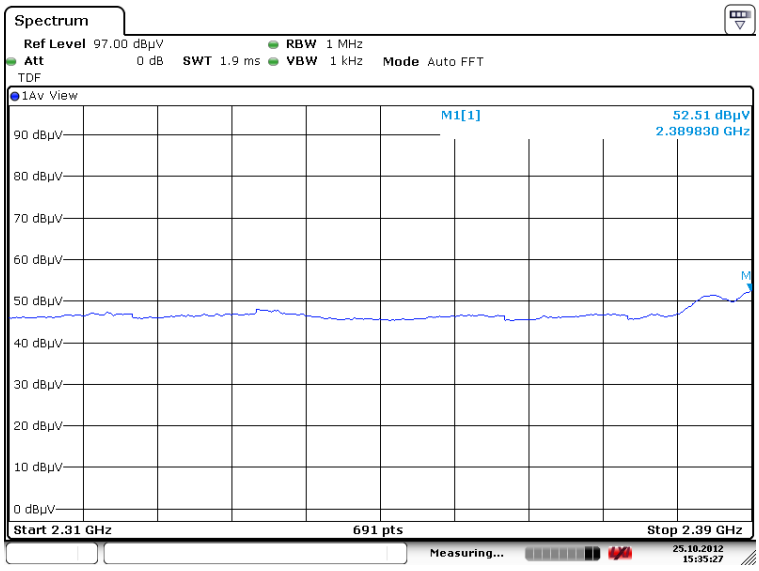
Lower authorized band edge attenuation is more than the required 20dB.

Plot 6a: Band Edge Conducted Emission, Spectral Diagram, 802.11g 2412 MHz Average.



Date: 25.OCT.2012 15:32:03

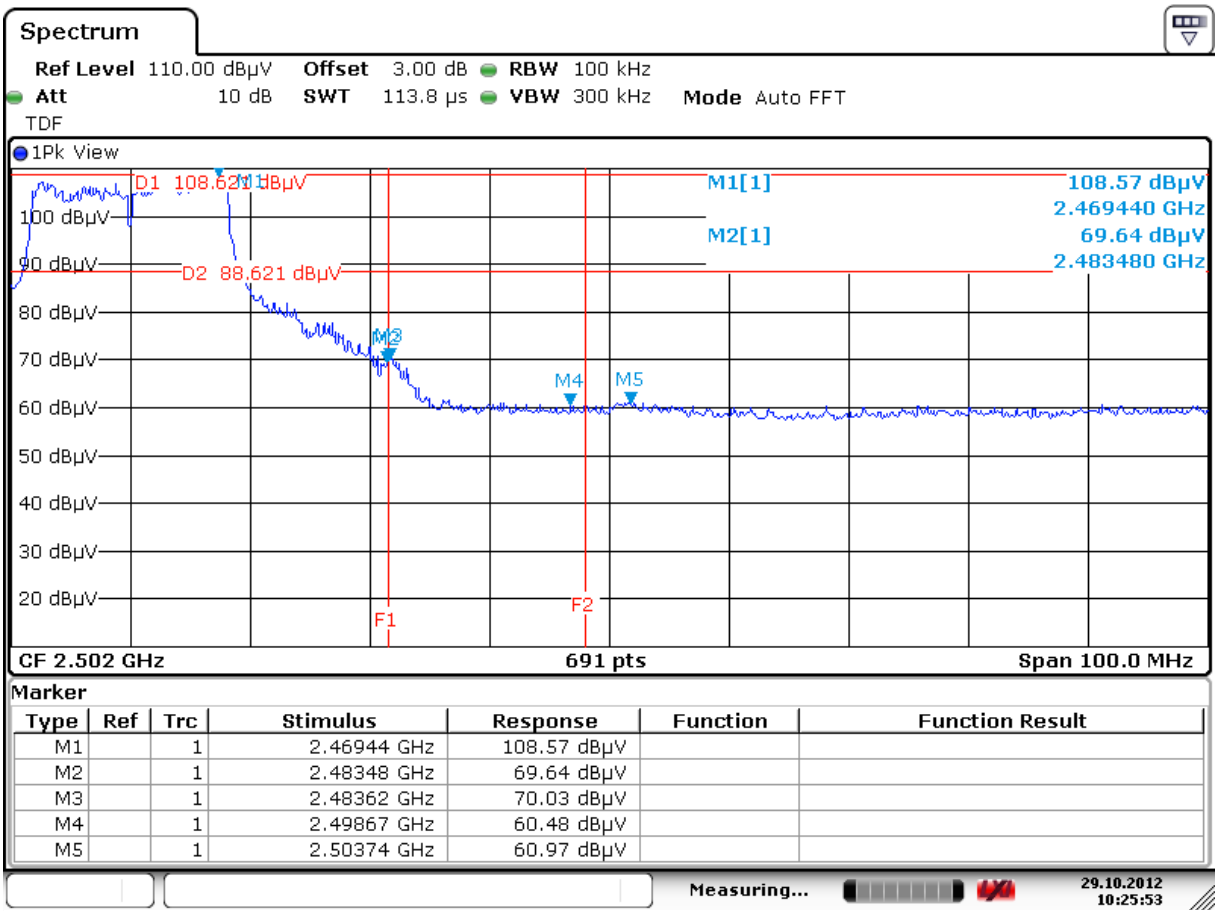
Lower authorized band edge attenuation is more than the required 20dB.



Date: 25.OCT.2012 15:35:28

Plot 6b: zoomed in to the restrictedband 2310 – 2390 MHz, delta value is obtained by difference between M1 from plot 6a and M1 from plot 6b (103.15 – 52.51 = 50.6 dB).

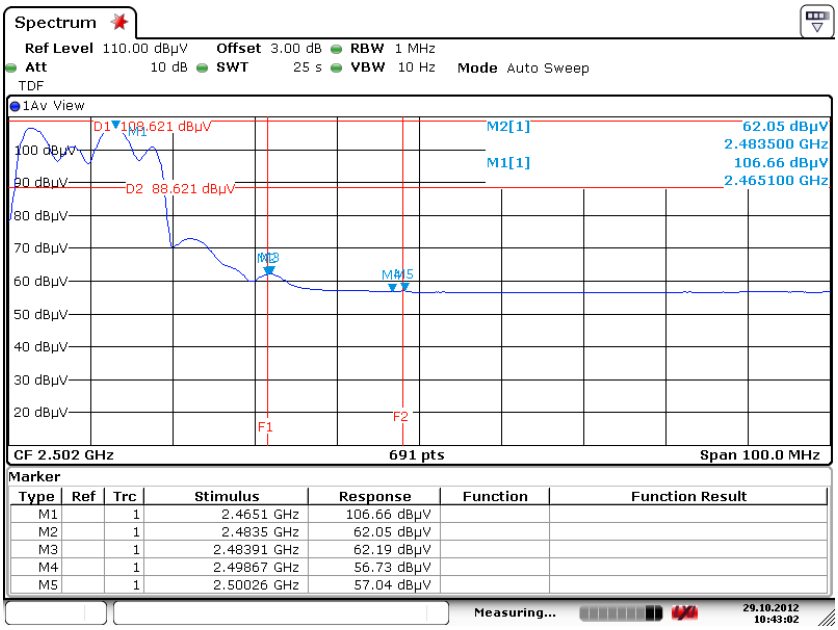
Plot 7: Band Edge Emissions, Spectral Diagram, 802.11g 2462 MHz Peak



Date: 29.OCT.2012 10:25:53

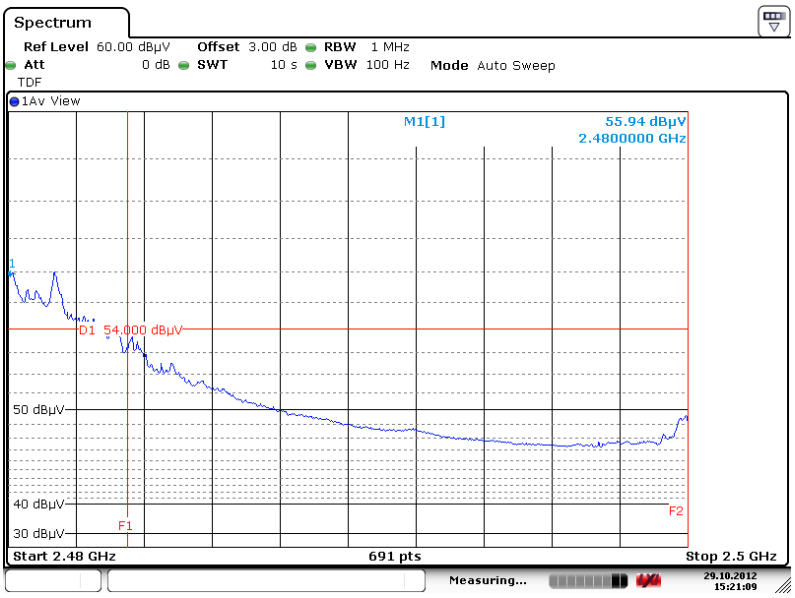
Higher authorized band edge attenuation is more than the required 20dB.

Plot 8a: Band Edge Conducted Emission, Spectral Diagram, 802.11g 2462 MHz Average.



Date: 29.OCT.2012 10:43:02

Higher authorized band edge attenuation is more than the required 20dB.



Date: 29.OCT.2012 15:21:09

Plot 8b: zoomed in to the restrictedband 2483.5 - 2500 MHz, delta value is obtained by difference between M1 from plot 8a and M1 from plot 8b (106.66 – 53.8 = 52.9 dB).

802.11n – 20 MHz

Restricted band (2310 – 2390 MHz)

Frequency (MHz)	Fundamental emission [dBµV]	Delta (dB)	Max field strength in restricted band [dBµV/m]	Limit [dBµV/m]	Plot number
2412.00 (PK)	106.7	39.3	67.4	74.00	9
2412.00 (AV)	104.7	52.1	52.6	54.00	10a-10b

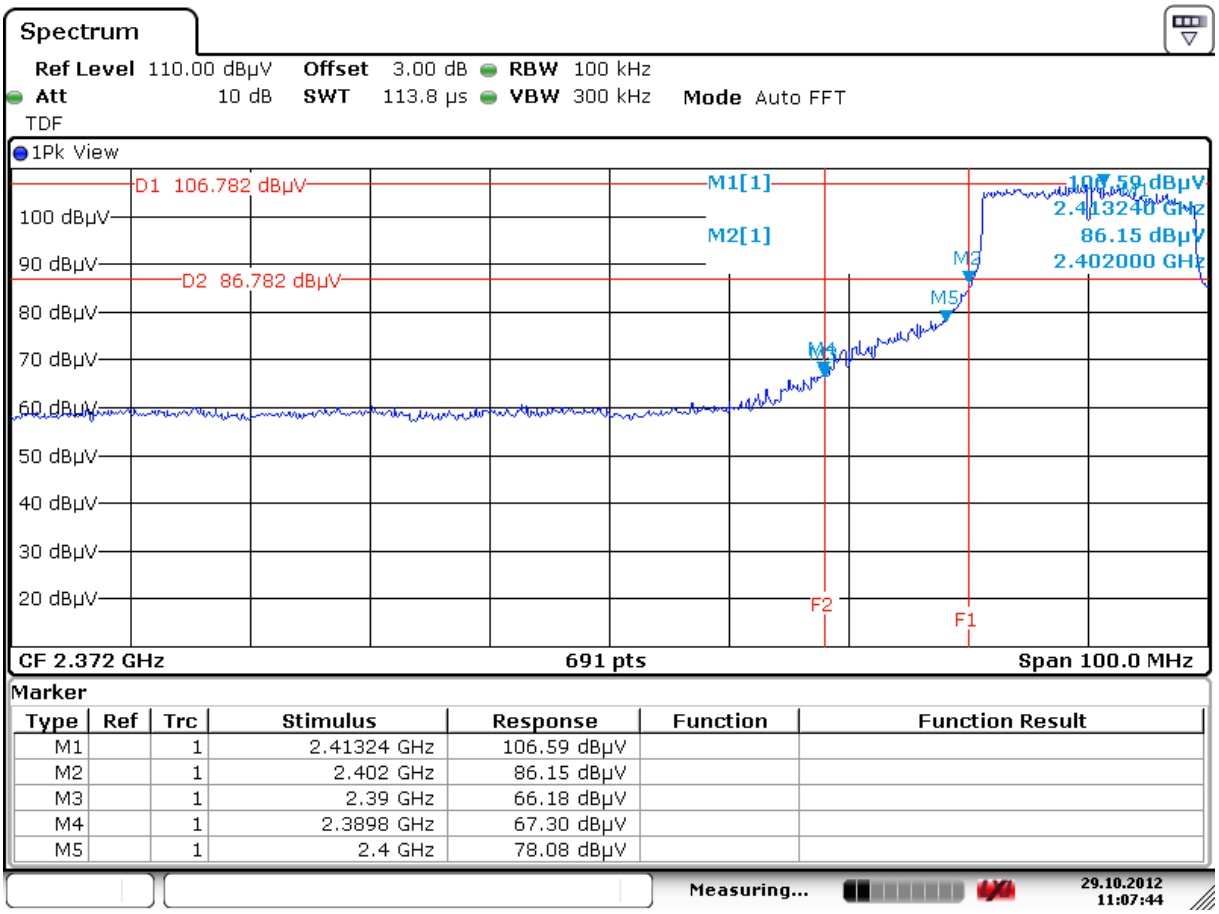
Restricted band (2383.5 – 2500 MHz)

Frequency (MHz)	Fundamental emission [dBµV]	Delta (dB)	Max field strength in restricted band [dBµV/m]	Limit [dBµV/m]	Plot number
2462.00 (PK)	105.2	44.7	60.5	74.00	11
2462.00 (AV)	96.1	42.3	53.8	54.00	12

Note:

- Delta is the difference in amplitude of the peak of the fundamental and the peak of the band edge emission, as marked in the plots.
- Maximum field strength in restricted band = Fundamental emission – Delta.

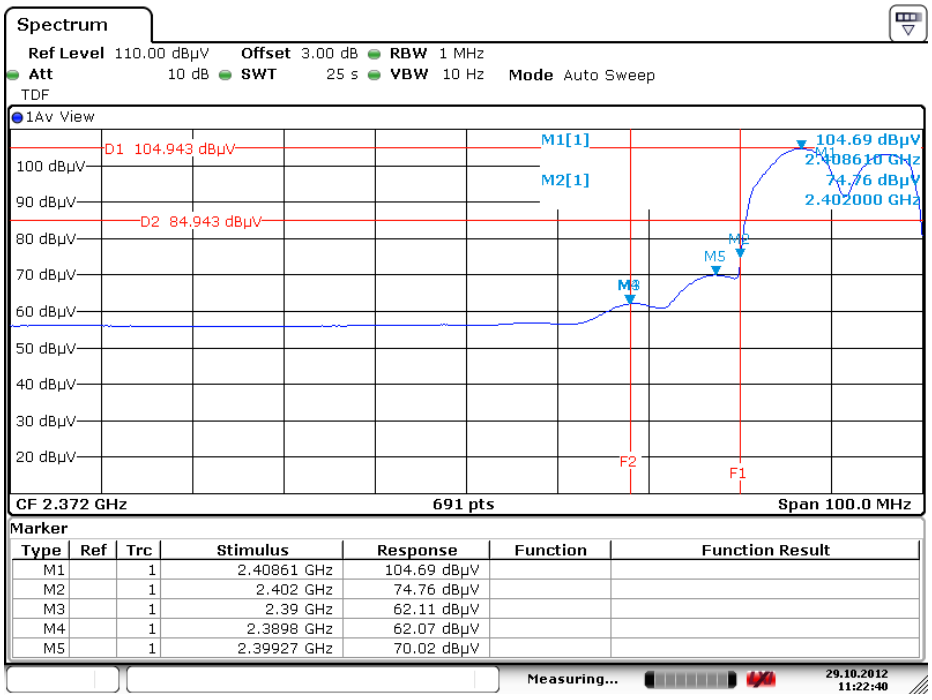
Plot 9: Band Edge Emissions, Spectral Diagram, 802.11n -20MHz 2412 MHz Peak



Date: 29.OCT.2012 11:07:44

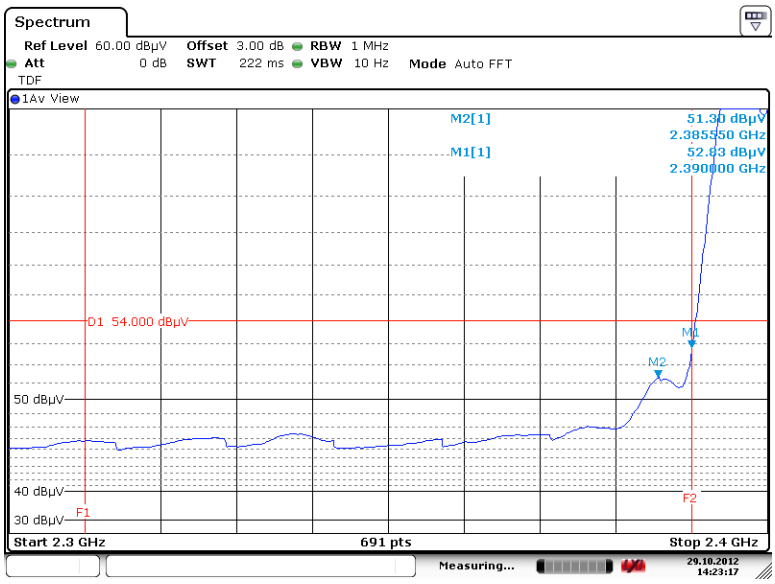
Lower authorized band edge attenuation is more than the required 20dB.

Plot 10a: Band Edge Emissions, Spectral Diagram, 802.11n -20MHz 2412 MHz Average



Date: 29.OCT.2012 11:22:40

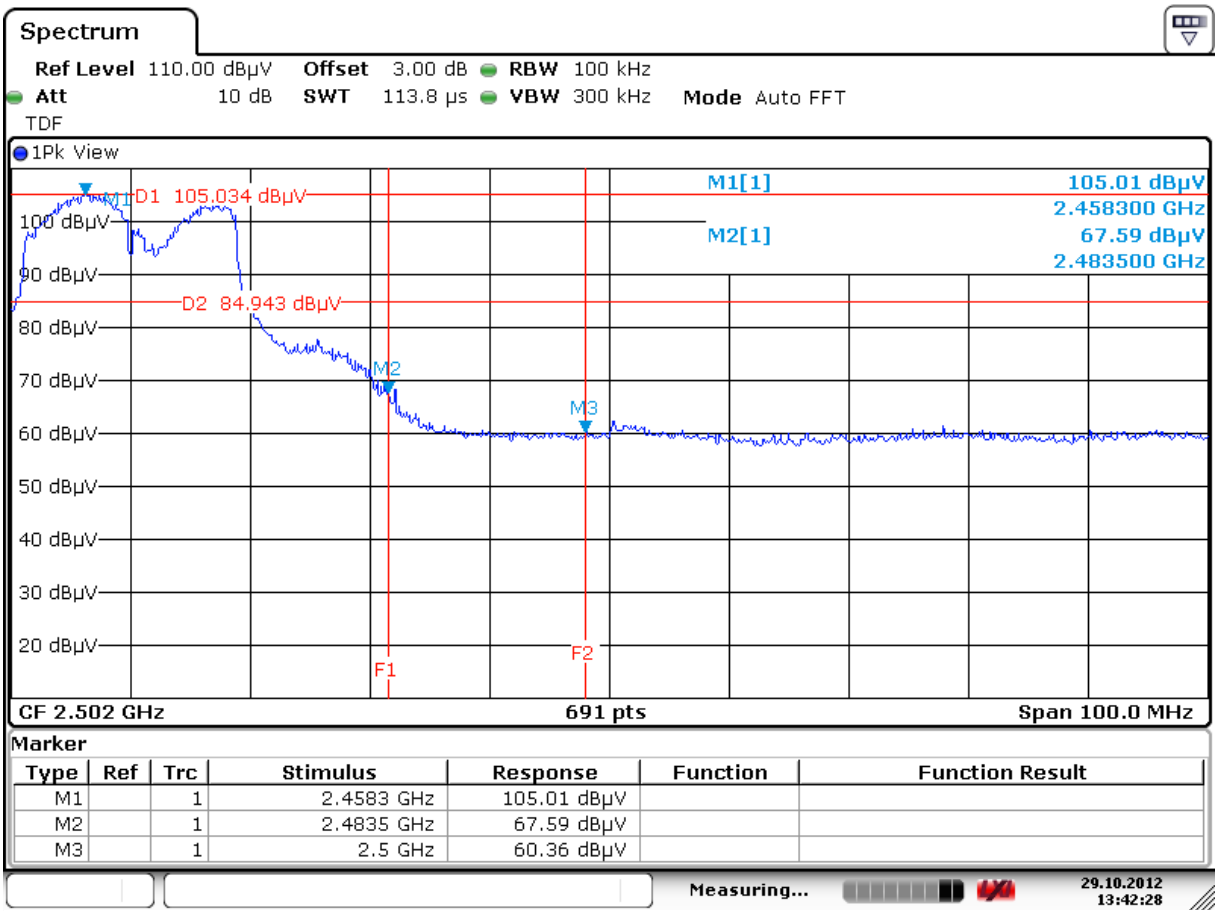
Lower authorized band edge attenuation is more than the required 20dB.



Date: 29.OCT.2012 14:23:17

Plot 10b: zoomed in to the restrictedband 2310 – 2390 MHz, delta value is obtained by difference between M1 from plot 10a and M1 from plot 10b (104.69 – 52.63 = 52.1 dB).

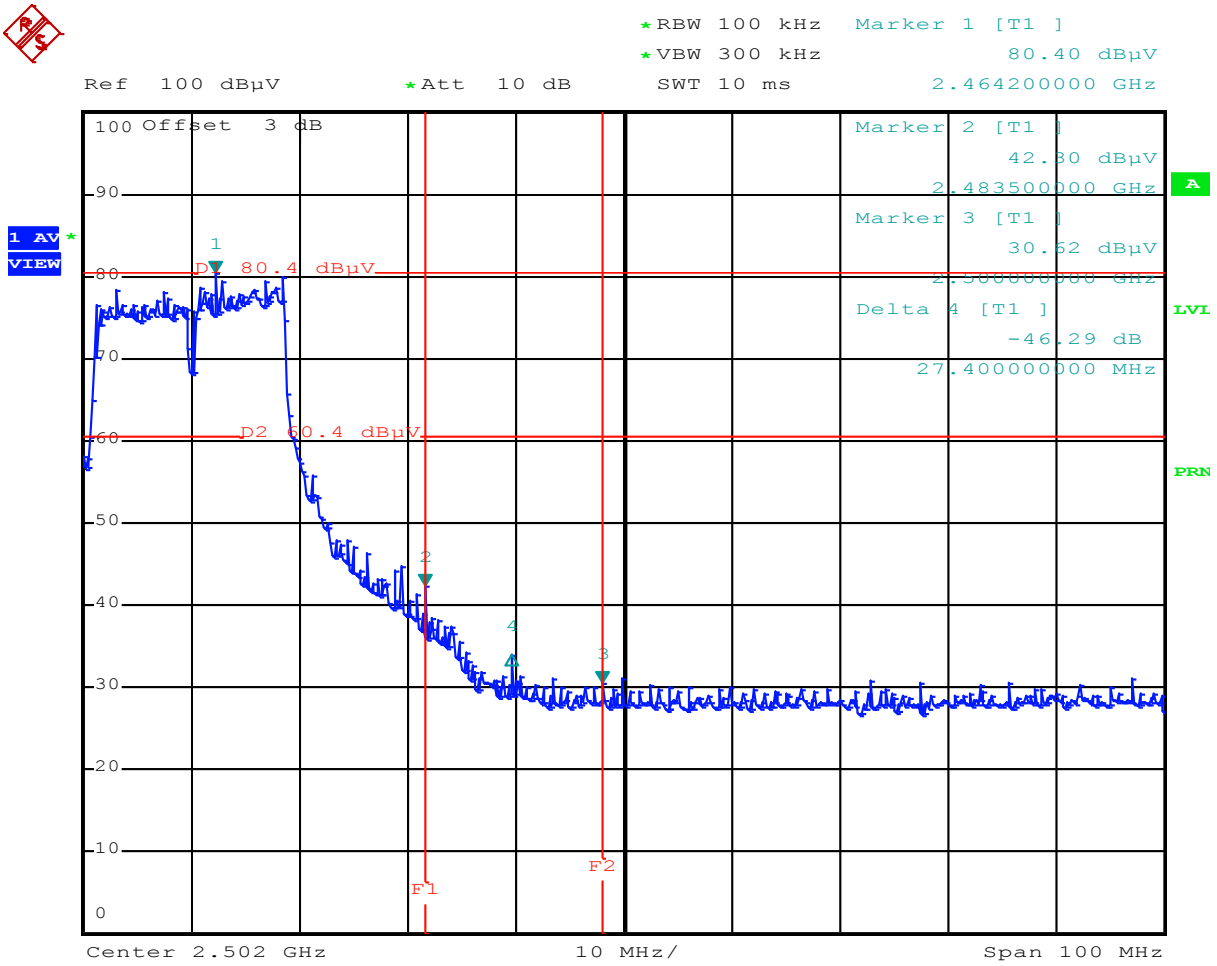
Plot 11: Band Edge Emissions, Spectral Diagram, 802.11n -20MHz 2462 MHz Peak



Date: 29.OCT.2012 13:42:28

Higher authorized band edge attenuation is more than the required 20dB.

Plot 12: Band Edge Emissions, Spectral Diagram, 802.11n -20MHz 2462 MHz Average



Date: 5.NOV.2012 14:14:52

Higher authorized band edge attenuation is more than the required 20dB.

802.11n – 40 MHz

Restricted band (2310 – 2390 MHz)

Frequency (MHz)	Fundamental emission [dBµV]	Delta (dB)	Max field strength in restricted band [dBµV/m]	Limit [dBµV/m]	Plot number
2422.00 (PK)	103.4	40.0	63.4	74.00	13
2422.00 (AV)	102.0	42.9	53.2	54.00	14a-14b

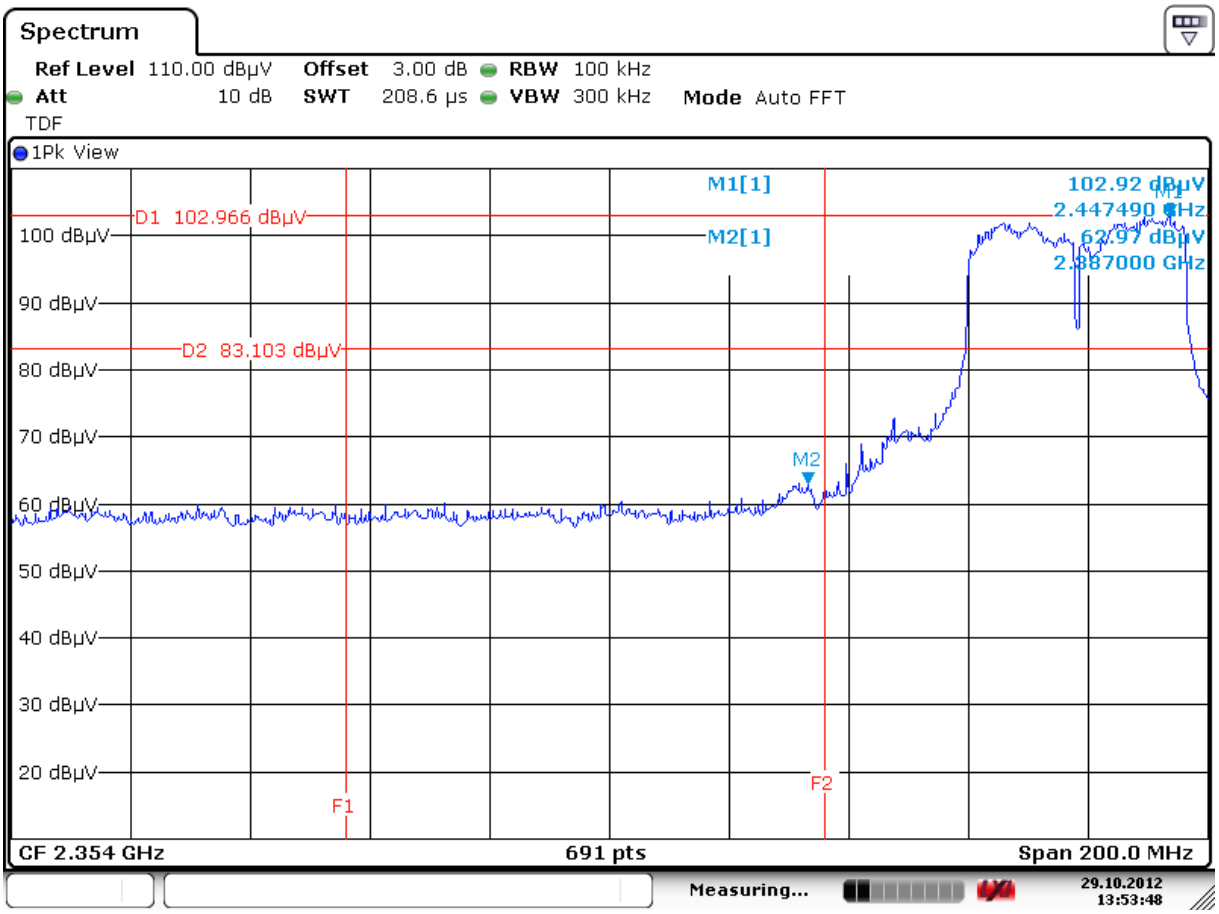
Restricted band (2383.5 – 2500 MHz)

Frequency (MHz)	Fundamental emission [dBµV]	Delta (dB)	Max field strength in restricted band [dBµV/m]	Limit [dBµV/m]	Plot number
2452.00 (PK)	102.9	43.3	59.6	74.00	15
2452.00 (AV)	100.4	51.7	48.7	54.00	16

Note:

- Delta is the difference in amplitude of the peak of the fundamental and the peak of the band edge emission, as marked in the plots.
- Maximum field strength in restricted band = Fundamental emission – Delta.

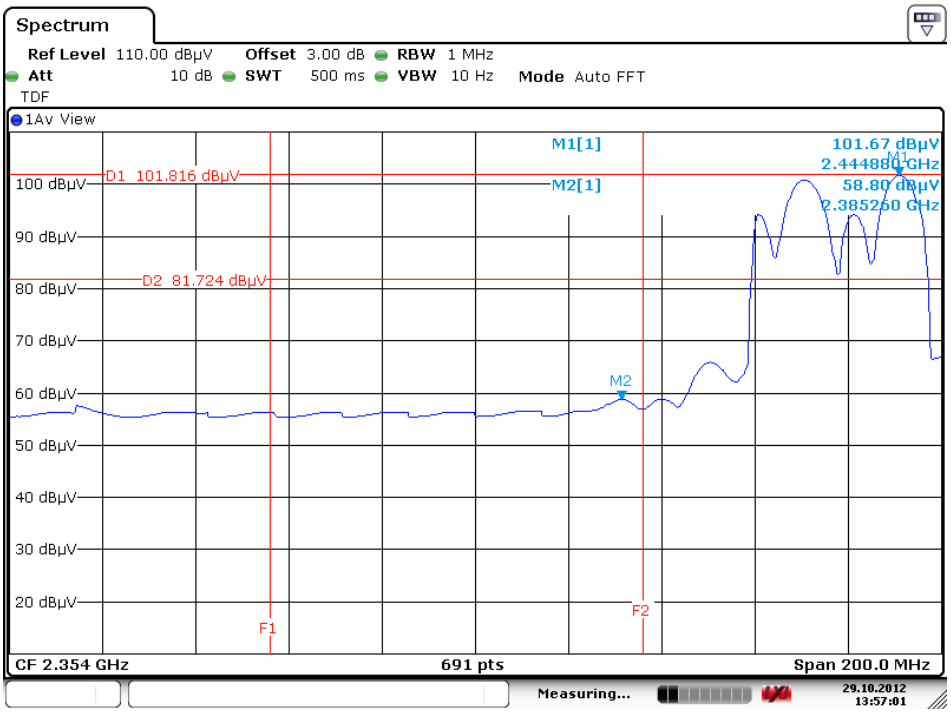
Plot 13: Band Edge Emissions, Spectral Diagram, 802.11n - 40MHz 2422 MHz Peak



Date: 29.OCT.2012 13:53:48

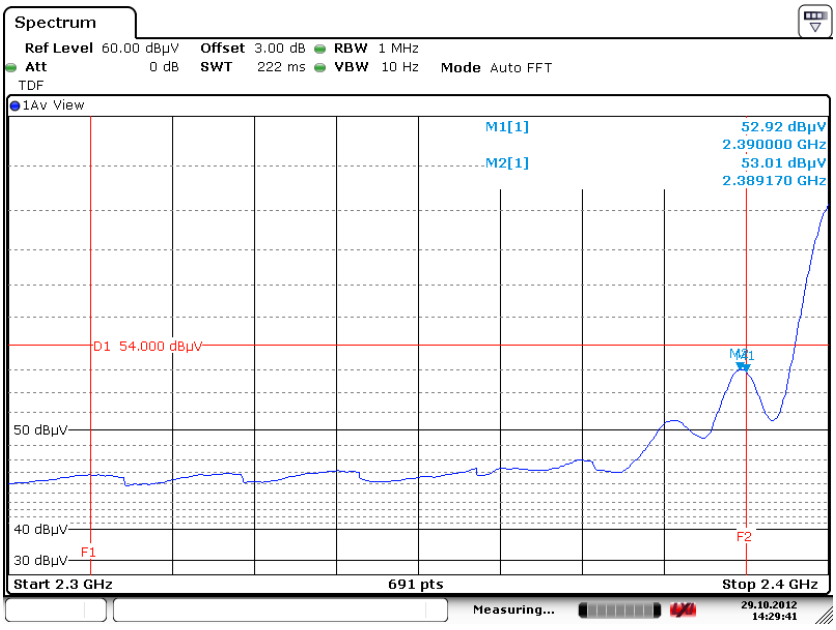
Lower authorized band edge attenuation is more than the required 20dB.

Plot 14a: Band Edge Emissions, Spectral Diagram, 802.11n - 40MHz 2422 MHz Average



Date: 29.OCT.2012 13:57:01

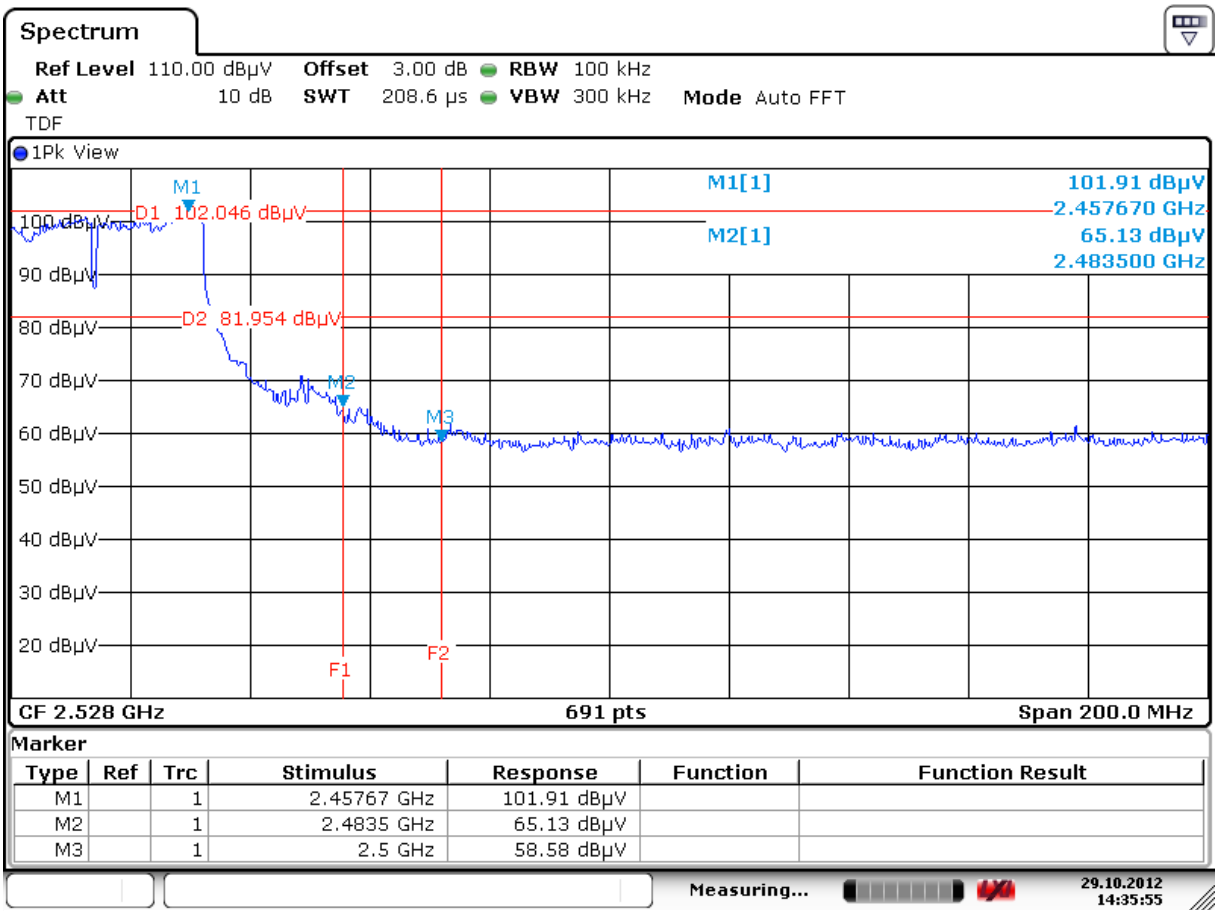
Lower authorized band edge attenuation is more than the required 20dB.



Date: 29.OCT.2012 14:29:41

Plot 14b: zoomed in to the restrictedband 2310 – 2390 MHz, delta value is obtained by difference between M1 from plot 10a and M1 from plot 10b (101.67 – 52.92 = 48.8 dB).

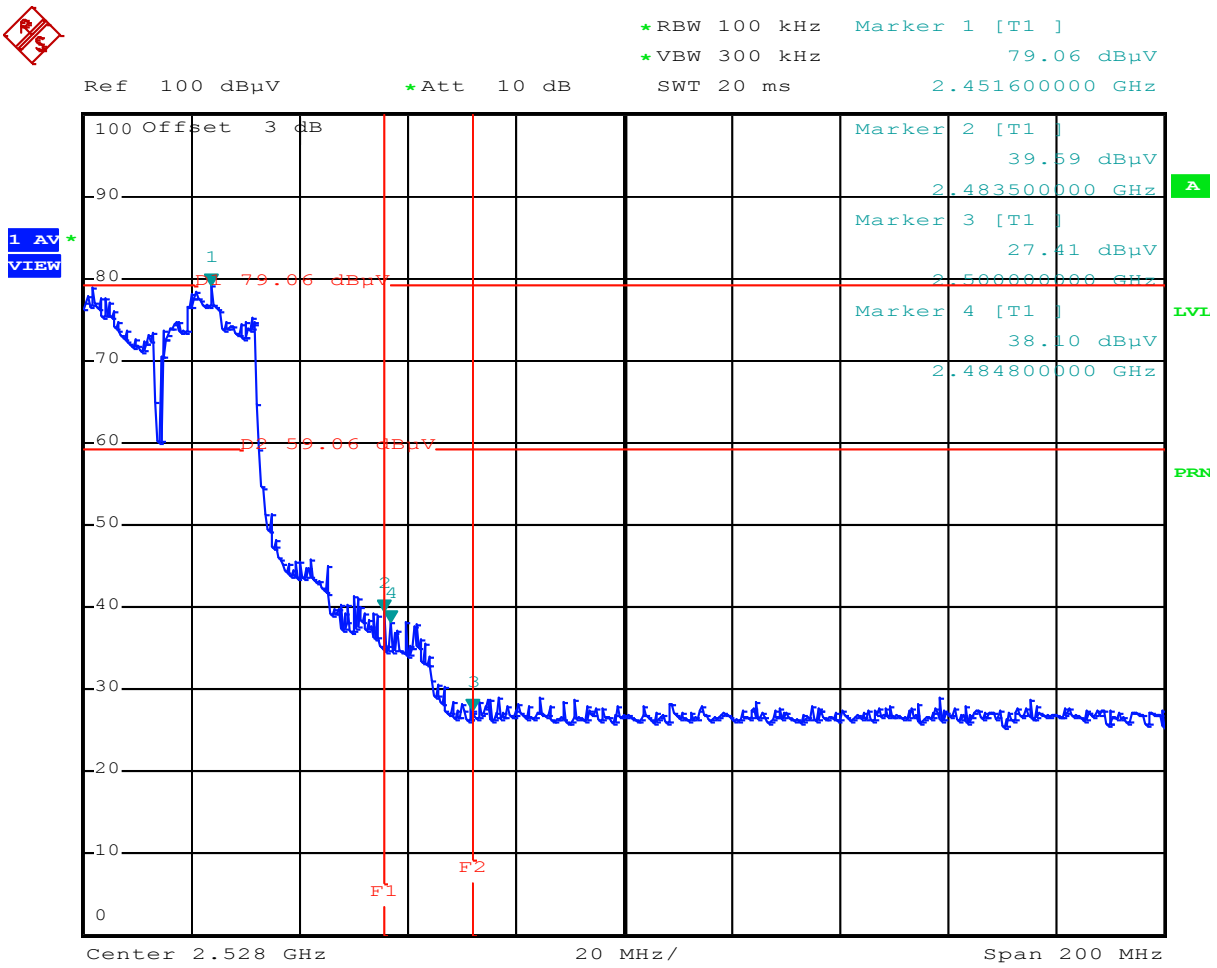
Plot 15: Band Edge Emissions, Spectral Diagram, 802.11n - 40MHz 2452 MHz Peak



Date: 29.OCT.2012 14:35:55

Higher authorized band edge attenuation is more than the required 20dB.

Plot 16: Band Edge Emissions, Spectral Diagram, 802.11n - 40MHz 2452 MHz Average



Date: 5.NOV.2012 14:20:34

Higher authorized band edge attenuation is more than the required 20dB.

5.2.6 Band Edge Emissions in the 5G band

RESULT: Pass

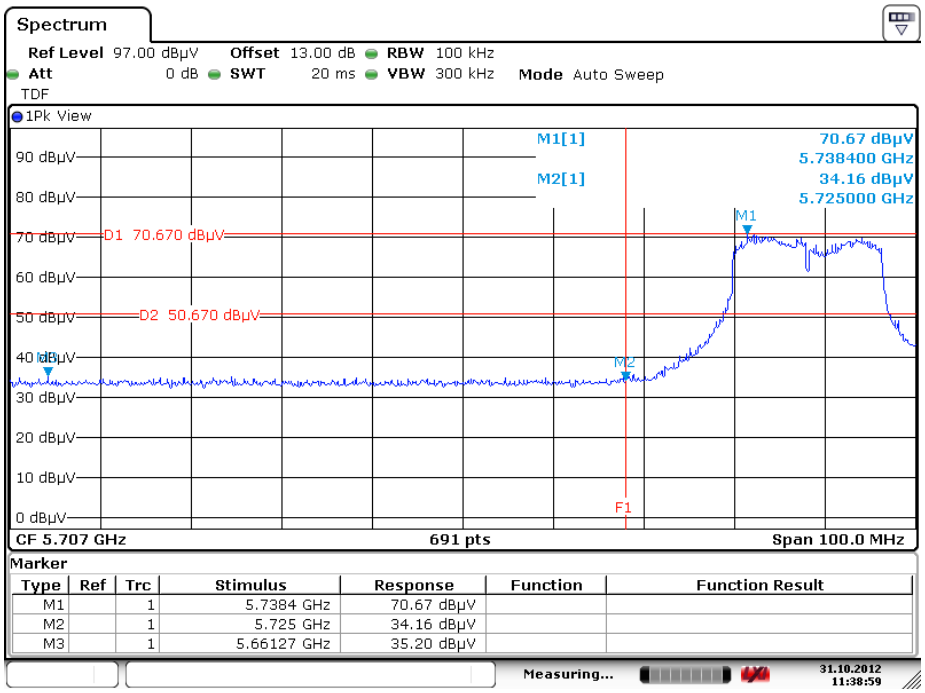
Date of testing: 2012-10-25 to 30

Requirements: below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

Testprocedure: the spectrum analyzer's RBW was set at 100kHz and the VBW set at 300kHz with frequency span set to include 100MHz from the bandedge. The band edges was measured and recorded.

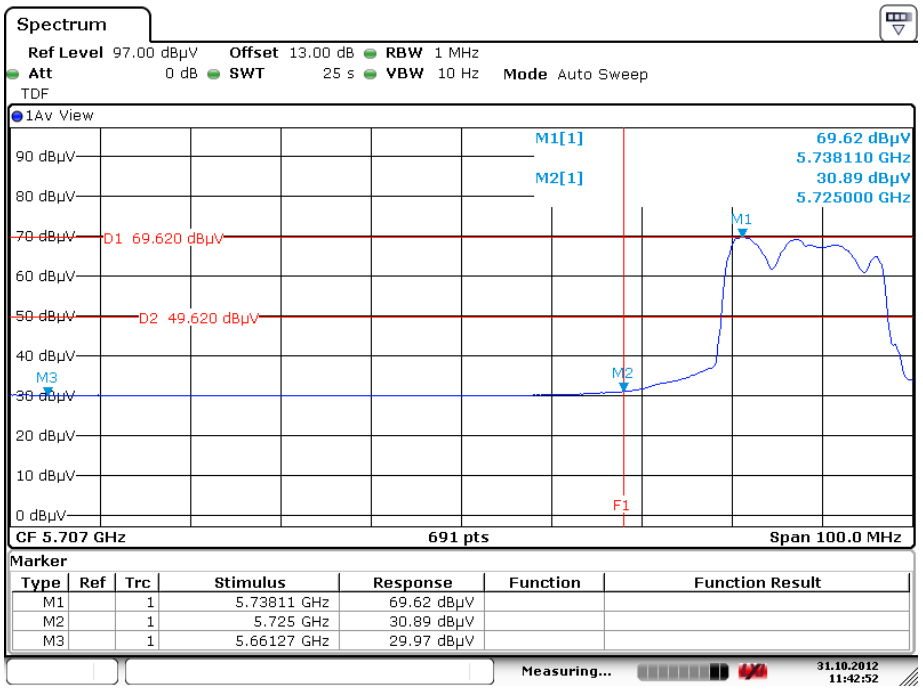
Testresults: The spectrum plots (Peak RBW=100kHz / VBW=300kHz; Average RBW=1MHz / VBW=10Hz) are provided on the following pages. Line D1 indicates the highest level, line D2 indicates the 20dB offset below D1. It shows compliance with the requirements of part 15.247(d).

802.11 a



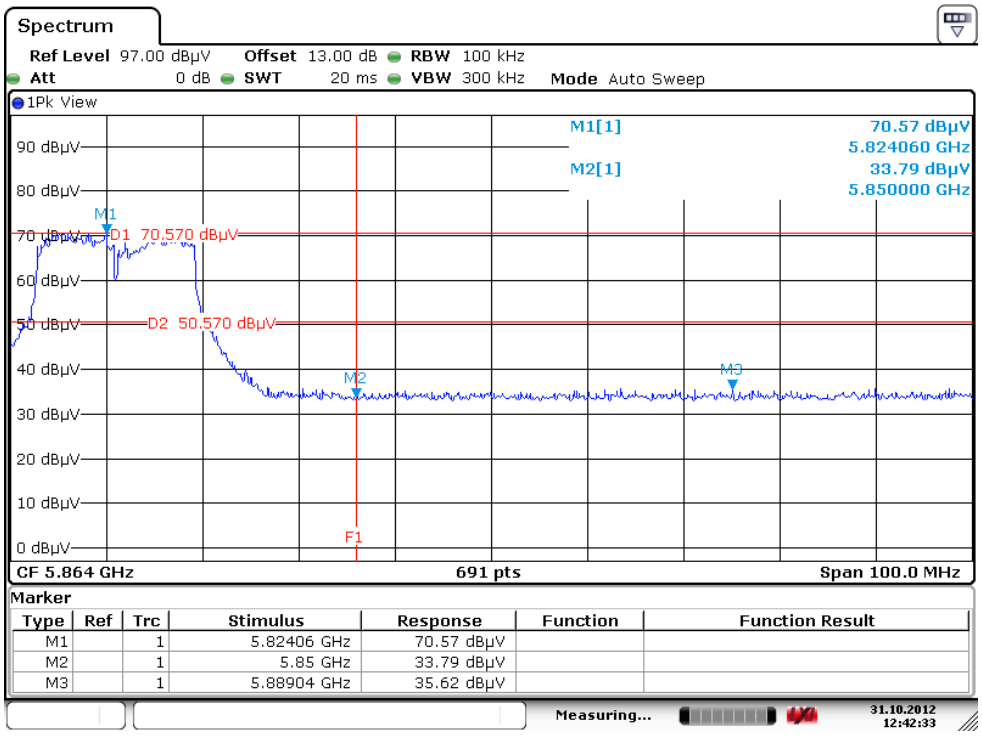
Date: 31.OCT.2012 11:38:59

Ch 149 Peak



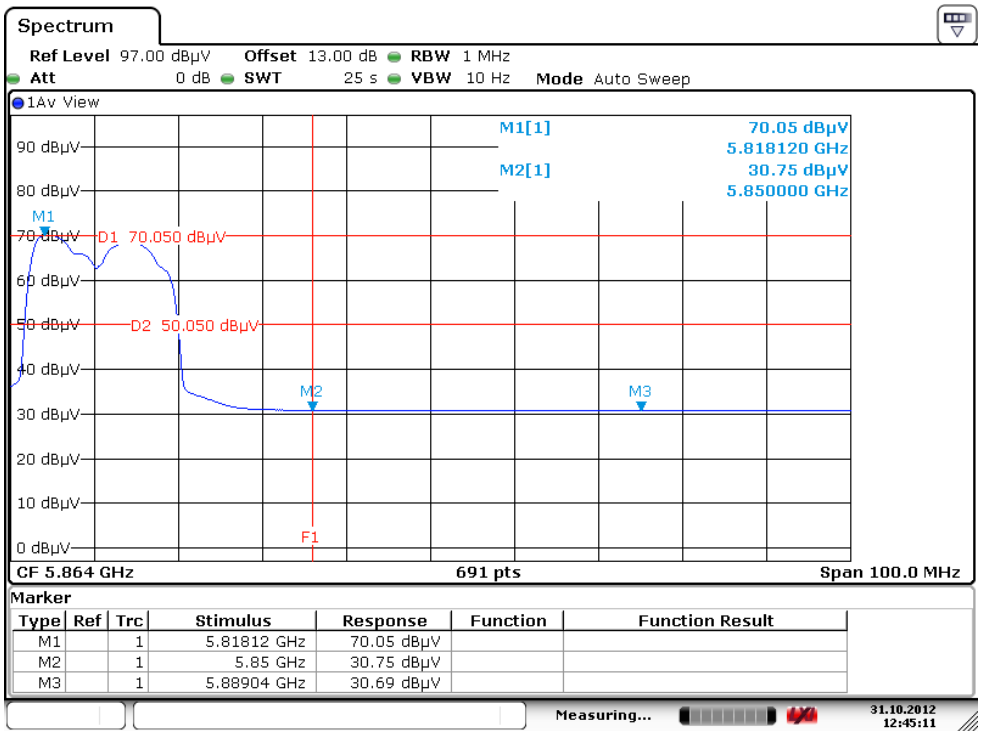
Date: 31.OCT.2012 11:42:52

Ch 149 Average



Date: 31.OCT.2012 12:42:33

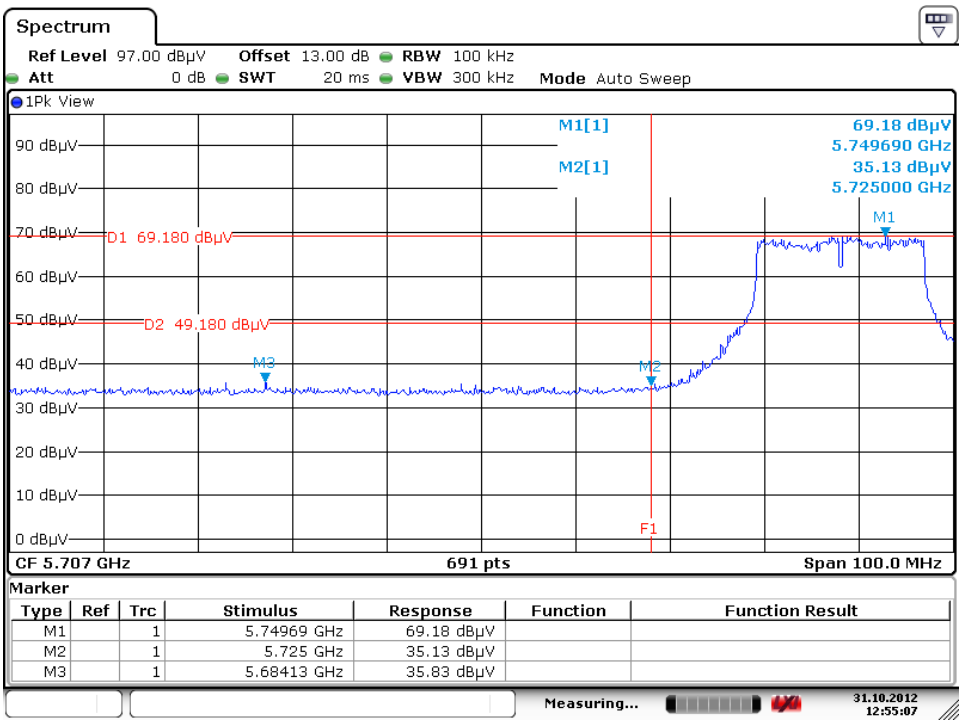
Ch 165 Peak



Date: 31.OCT.2012 12:45:11

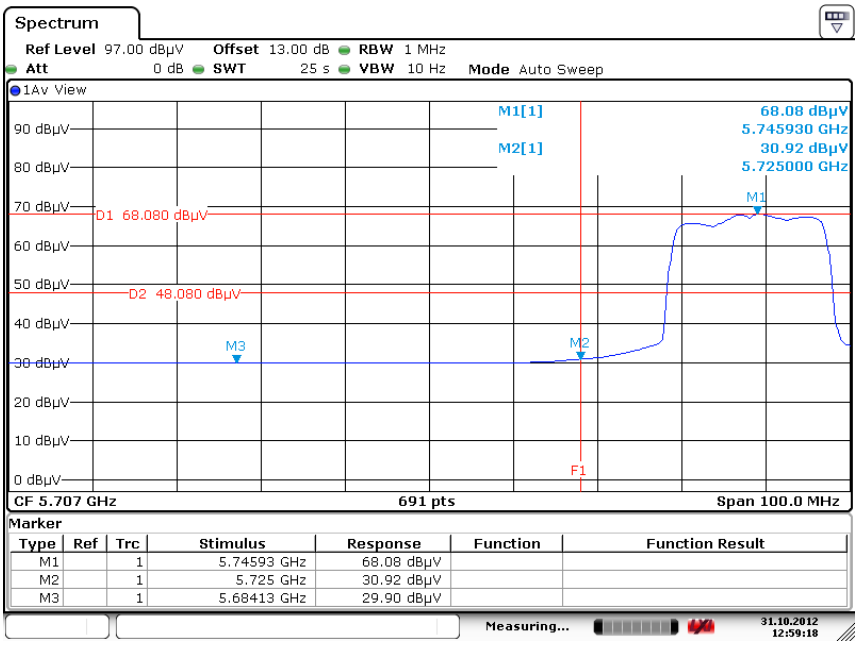
Ch 165 Average

802.11n – 20MHz



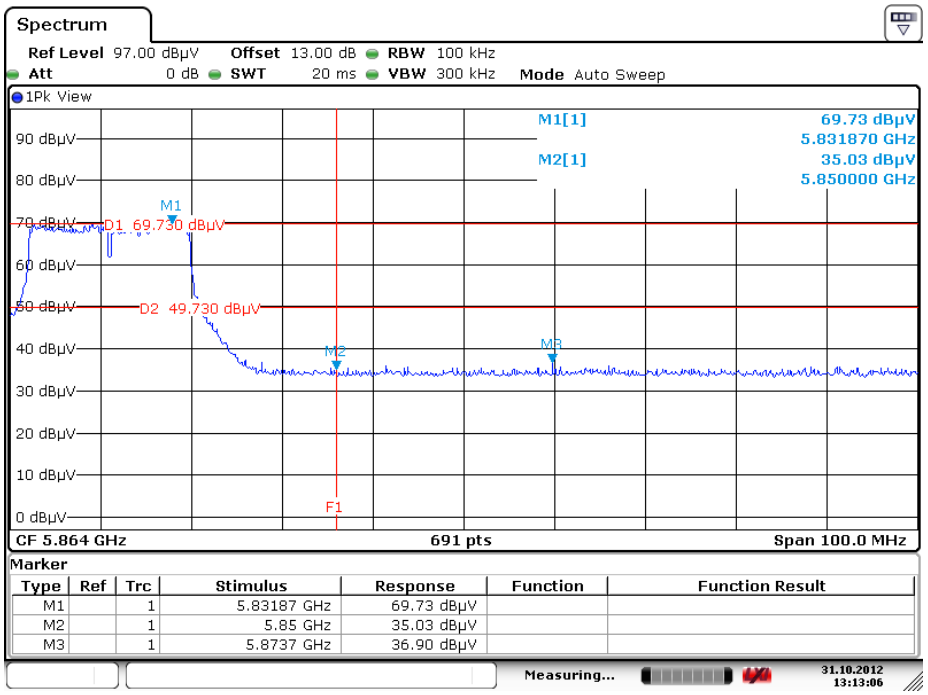
Date: 31.OCT.2012 12:55:07

Ch 149 Peak



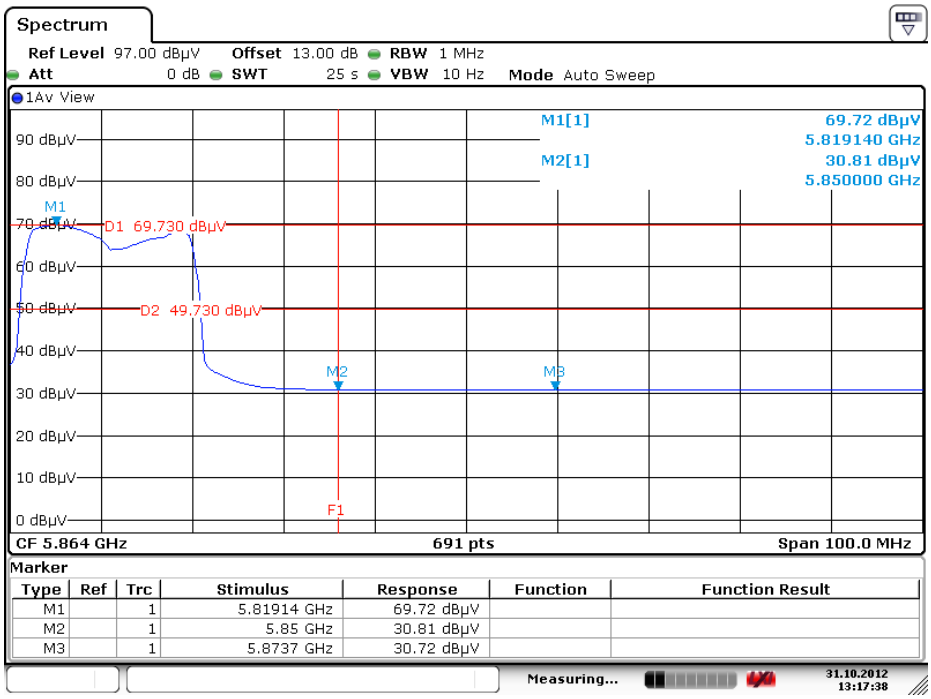
Date: 31.OCT.2012 12:59:18

Ch 149 Average



Date: 31.OCT.2012 13:13:06

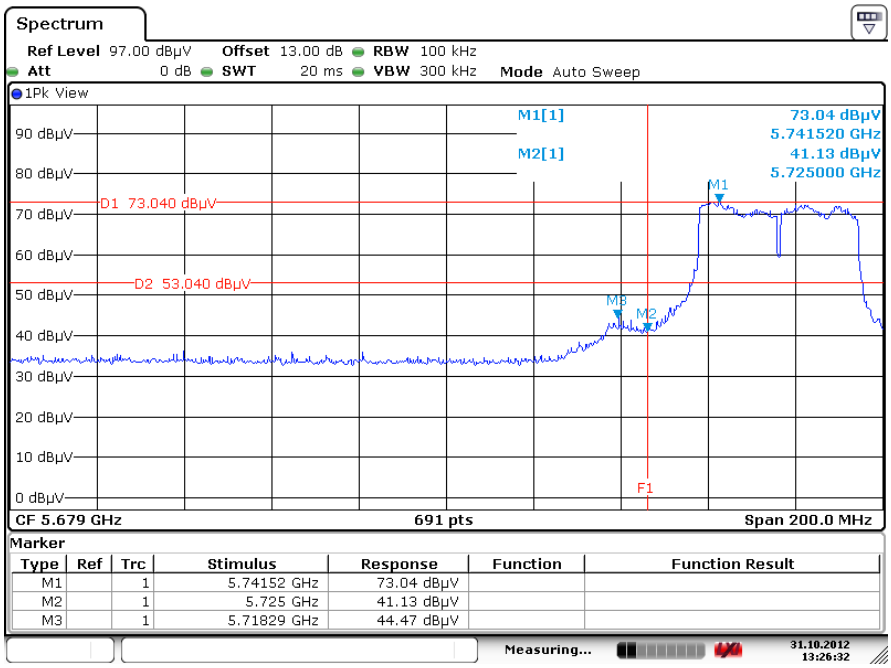
Ch 165 Peak



Date: 31.OCT.2012 13:17:38

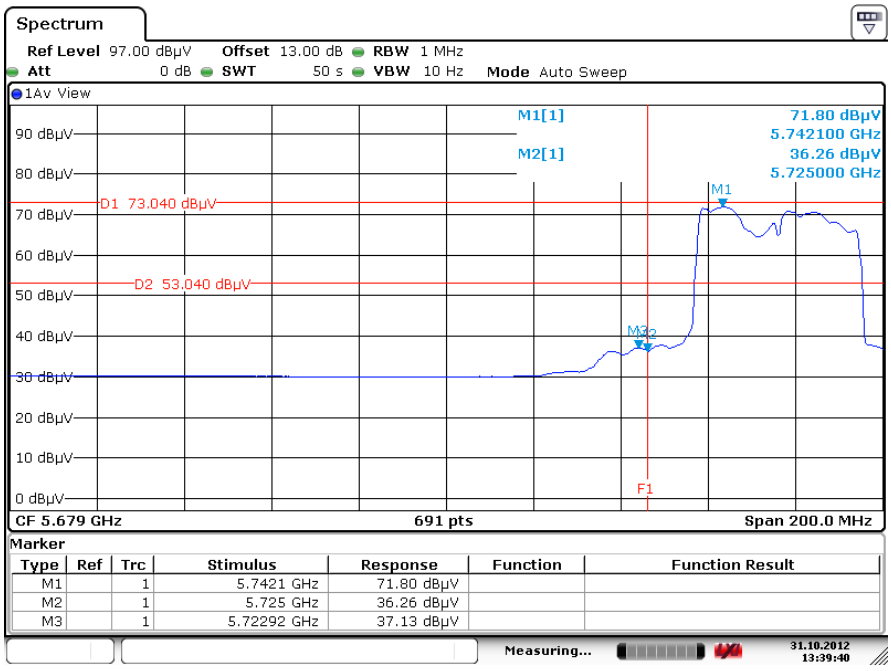
Ch 165 Average

802.11n – 40MHz



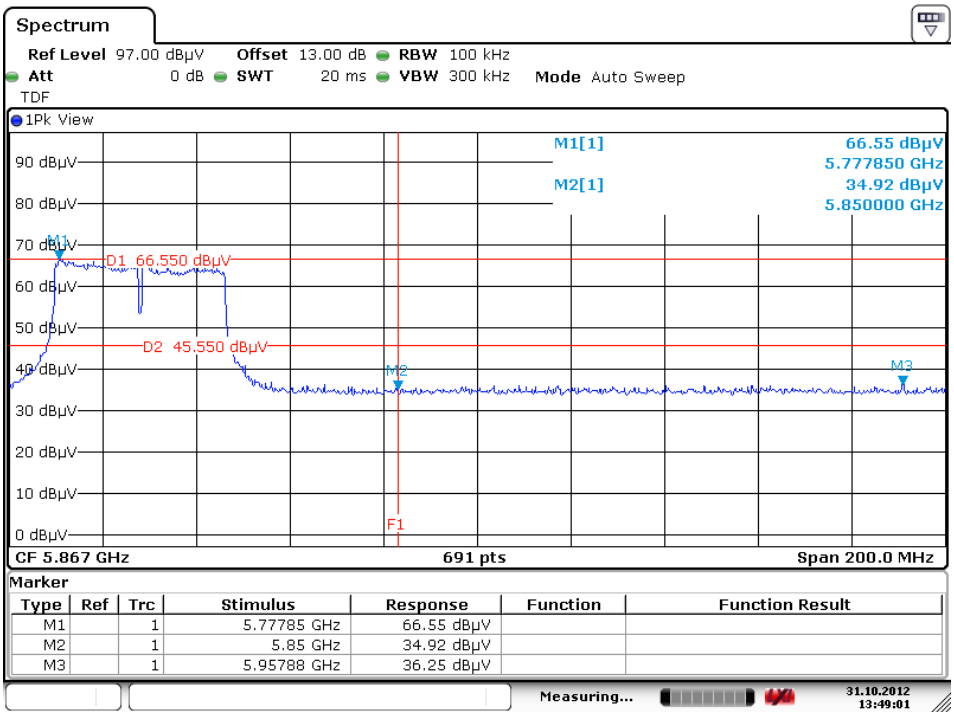
Date: 31.OCT.2012 13:26:33

Ch 151 Peak



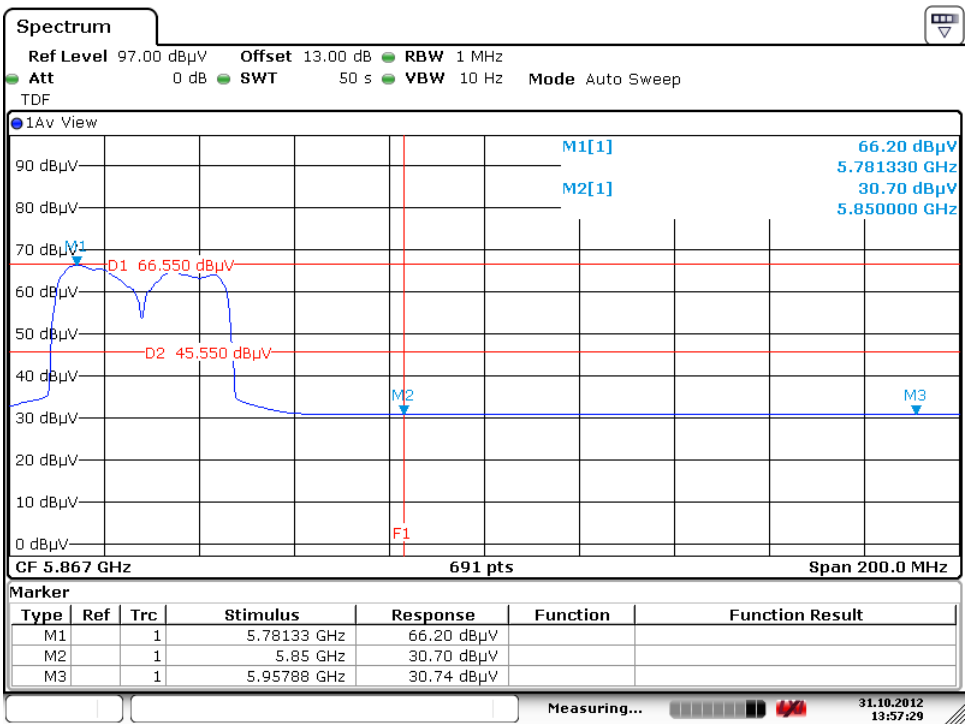
Date: 31.OCT.2012 13:39:40

Ch 151 Average



Date: 31.OCT.2012 13:49:01

Ch 159 Peak



Date: 31.OCT.2012 13:57:29

Ch 159 Average

5.2.7 Radiated Spurious Emissions of Transmitter

RESULT: PASS

Date of testing: 2012-10-13 to 30

Frequency range: 30MHz - 50GHz

Requirements:

FCC 15.205, FCC 15.209 and FCC 15.247(d)

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Test procedure:

ANSI C63.4-2009 and KDB Publication No. 558074 D01: Measurement of Digital Transmission Systems Operating under Section 15.247.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency (50GHz). Since no spurious emissions were observed between 20 GHz and 40 GHz, the band 40 GHz up to 50 GHz was not investigated. Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

Table 3: Radiated Emission, Quasi Peak Data, 30MHz - 1GHz

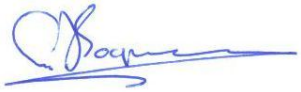
Frequency (MHz)	Measurement results @3m Vertical (dBµV/m)	Measurement results @3m Horizontal (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
30.0–88.0	< 20.0	< 7.0	40.0	PASS
Except for:				
50.52	30.9	22.6	40.0	PASS
82.64	20.0	7.6	40.0	PASS
88.0 – 216.0	< 19.0	< 15.0	43.0	PASS
Except for:				
95.28	21.9	17.0	43.0	PASS
125.0	31.7	29.2	43.0	PASS
172.32	22.7	26.8	43.0	PASS
209.40	19.5	15.2	43.0	PASS
216.0 – 950.0	< 19.0	< 24.0	46.0	PASS
Except for:				
260.80	19.9	24.3	46.0	PASS
302.96	37.2	34.3	46.0	PASS
356.10	33.9	28.3	46.0	PASS
543.20	30.5	31.6	46.0	PASS
875.0	32.4	35.0	46.0	PASS
928.64	36.6	27.3	46.0	PASS
950.0–1000.0	< 40.0	< 30.0	54.0	PASS
Except for:				
956.56	41.4	32.0	54.0	PASS

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15: 2009 section 15.209 with the EUT operating in mode switched to generate maximum levels. Maximum level recorded of the total system.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. The reported field strength values are the worst case values at the indicated frequency. The receiving antenna was varied in horizontal and vertical orientations and also in height (between 1 m and 4 m).
3. A Quasi-Peak detector was used with a resolution bandwidth of 120 kHz.

Test engineer

Signature : 

Name: L. Koopmans
Date: September 13, 2012

Table 4: Radiated Emission, 1 - 40GHz, 802.11b 2G4 band

Freq. [MHz]	Antenna Orientation	Level PK [dBµV/m]	Limit AV [dBµV/m]
6.991	Vertical	23.5	54
14150	Vertical	22.8	54
17225	Vertical	25.5	54
18066	Vertical	29.1	54
19596	Vertical	30.0	54
24033	Vertical	32.3	54

Note: Peak detector used with a bandwidth of 1 MHz. peak values already within Av limits therefor Av values not measured.

Table 5: Radiated Emission, 1 - 40GHz, 802.11g 2G4 band

Freq. [MHz]	Antenna Orientation	Level PK [dBµV/m]	Limit AV [dBµV/m]
6892	Vertical	36.1	54
7015	Vertical	33.8	54
13781	Vertical	34.9	54
17225	Vertical	38.3	54
18116	Vertical	39.1	54
24985	Vertical	41.4	54

Note: Peak detector used with a bandwidth of 1 MHz. peak values already within Av limits therefor Av values not measured.

Table 6: Radiated Emission, 1 - 40GHz, 802.11n-20MHz 2G4 band

Freq. [MHz]	Antenna Orientation	Level PK [dBµV/m]	Limit AV [dBµV/m]
4845	Vertical	35.7	54
7027	Vertical	36.3	54
15651	Vertical	38.4	54
16536	Vertical	38.0	54
17274	Vertical	38.4	54
22179	Vertical	32.6	54
24590	Vertical	34.9	54

Note: Peak detector used with a bandwidth of 1 MHz. peak values already within Av limits therefor Av values not measured.

Table 7: Radiated Emission, 1 - 40GHz, 802.11n-40MHz 2G4 band

Freq. [MHz]	Antenna Orientation	Level PK [dBµV/m]	Limit AV [dBµV/m]
4796	Vertical	36.1	54
6928	Vertical	36.3	54
15700	Vertical	37.3	54
16536	Vertical	36.7	54
17225	Vertical	38.6	54
22138	Vertical	32.2	54
24397	Vertical	35.5	54

Note: Peak detector used with a bandwidth of 1 MHz. peak values already within Av limits therefor Av values not measured.

Table 8: Radiated Emission, 1 - 40GHz, 802.11a 5G band

Freq. [MHz]	Antenna Orientation	Level PK [dBµV/m]	Limit AV [dBµV/m]
6229	Vertical	36.4	54
12208	Vertical	35.8	54
14157	Vertical	37.5	54
15290	Vertical	37.4	54
17221	Vertical	38.4	54
18102	Vertical	39.8	54
23936	Vertical	36.3	54

Note: Peak detector used with a bandwidth of 1 MHz. peak values already within Av limits therefor Av values not measured.

Table 9: Radiated Emission, 1 - 40GHz, 802.11n-20MHz 5G band

Freq. [MHz]	Antenna Orientation	Level PK [dBµV/m]	Limit [dBµV/m]
1370	Vertical	37.3	54
6225	Vertical	36.2	54
14174	Vertical	37.8	54
15700	Vertical	36.9	54
17225	Vertical	39.0	54
29627	Vertical	35.4	54

Note: Peak detector used with a bandwidth of 1 MHz. peak values already within Av limits therefor Av values not measured.

Table 10: Radiated Emission, 1 - 40GHz, 802.11n-40MHz 5G band

Freq. [MHz]	Antenna Orientation	Level PK [dBµV/m]	Limit [dBµV/m]
1381	Vertical	39.1	54
1627	Vertical	37.3	54
14174	Vertical	36.7	54
16610	Vertical	37.5	54
17225	Vertical	39.0	54
29774	Vertical	36.5	54

Note: Peak detector used with a bandwidth of 1 MHz. peak values already within Av limits therefor Av values not measured.

5.3 AC Power Line Conducted Measurements

5.3.1 AC Power Line Conducted Emission of Transmitter

RESULT: Pass

Date of testing: September 13, 2012

Frequency	Measurement results dB(µV) Line		Measurement results dB(µV) Neutral		Limits dB(µV)		Result
MHz	QP	AV	QP	AV	QP	AV	Pass/Fail
0.15 – 0.5	< 24.0	< 10.0	< 25.0	< 15.0	66.0-56.0	56.0-46.0	PASS
Except for:							
0.15	36.0	12.0	<<	<<	66.0	56.0	PASS
0.175	<<	<<	31.2	20.0	64.7	54.7	PASS
0.196	32.0	16.8	<<	<<	63.7	53.7	PASS
0.212	<<	<<	26.1	16.6	63.0	53.0	PASS
0.261	24.5	11.0	<<	<<	61.3	51.3	PASS
0.311	<<	<<	28.2	16.3	60.0	50.0	PASS
0.5 – 5.0	< 24.0	< 10.0	< 10.0	<10.0	56.0	46.0	PASS
Except for:							
0.616	25.1	10.3	<<	<<	56.0	46.0	PASS
0.820	25.7	11.2	<<	<<	56.0	46.0	PASS
2.026	<<	<<	25.2	11.6	56.0	46.0	PASS
2.74	24.4	11.6	<<	<<	56.0	46.0	PASS
4.21	27.8	13.2	30.1	16.3	56.0	46.0	PASS
5.0 – 30.0	< 24.0	< 15.0	< 20.0	< 15.0	60.0	50.0	PASS
Except for:							
13.186	<<	<<	25.2	18.1	60.0	50.0	PASS
13.83	24.1	17.8	<<	<<	60.0	50.0	PASS

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15: 2009 section 15.109, at the AC mains connection terminals which were connected to the EUT, are above in table. The system is tested as in whole, so with all equipment in place and functioning. Being the worst case situation. Maximum results are reported.

Notes:

1. Measurement uncertainty is ±3.5 dB
2. The resolution bandwidth used was 9 kHz.

Test engineer

Signature :
Name : K.F v.d. Molen, Checked by T.E.T. Koning

6. List of Tables

7. List of Figures