



FCC PART 15C TEST REPORT No. 2012WLN0368

Wistron Neweb Corporation

DNUA-93C2

Model Name: DNUA-93C2

Market Name: DNUA-93C2

With

Hardware Version: V1.0

Software Version: /

FCC ID: NKR-DNUA93C2

Issued Date: 2012-6-25



No. DGA-PL-114/01-02

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Note:The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of TMC Beijing.

Test Laboratory:

TMC Beijing, Telecommunication Metrology Center of Ministry of Industry and Information Technology

No. 52, Huayuan Bei Road, Haidian District, Beijing, P. R. China, 100191

Tel:+86(0)10-62304633, Fax:+86(0)10-62304793 Email:welcome@emcite.com. www.emcite.com

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1. TEST LABORATORY

1.1. Testing Location

Company Name: TMC Beijing, Telecommunication Metrology Center of MIIT
Address: No. 52, Huayuan Bei Road, Haidian District, Beijing, P. R. China
Postal Code: 100191
Telephone: 00861062304633
Fax: 00861062304793

1.2. Testing Environment

Normal Temperature: 15-30℃
Extreme Temperature: -20/+55℃
Relative Humidity: 30-60%
Air Pressure 990hPa-1040hPa

Note: The climatic requirements above are general exclude the special requirements for dedicated test environments listed in section 5 and some specific test cases in other parts of this report.

1.3. Project data

Testing End Date: 2012-6-25

1.4. Signature



Sun Zhenyu
(Prepared this test report)



Gao Hong
(Reviewed this test report)



Xiao Li
Deputy Director of the laboratory
(Approved this test report)

2. CLIENT INFORMATION

2.1. Applicant Information

Company Name: Wistron Neweb Corporation
Address /Post: 20 Park Avenue II Road, Hsinchu Science Park, Hsinchu 308,
Taiwan, R.O.C.
City: Hsinchu
Postal Code: /
Country: Taiwan
Telephone: 886-3-666-7799
Fax: 886-3-666-7323

2.2. Manufacturer Information

Company Name: Wistron Neweb Corporation
Address /Post: 20 Park Avenue II Road, Hsinchu Science Park, Hsinchu 308,
Taiwan, R.O.C.
City: Hsinchu
Postal Code: /
Country: Taiwan
Telephone: 886-3-666-7799
Fax: 886-3-666-7323

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY

EQUIPMENT(AE)

3.1. About EUT

Description	WIFI module
Type	DNUA-93C2
Market Name	DNUA-93C2
FCC ID	NKR-DNUA93C2

Note: Photographs of EUT are shown in ANNEX C of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT1	DNUA-93C2	V1.0	/

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Identification of AE used during the test

WLAN Antenna

AE ID*	Name	Supplier	GAIN (dBi)
AE1	AG-011333-0296-A0-0000	SHENZHEN B&T TECHNOLOGY Co.,Ltd	2.00
AE2	AG-041333-0428-A0-0000	SHENZHEN B&T TECHNOLOGY Co.,Ltd	1.60
AE3	EZY-W8-2	Wistron NeWeb Corporation	0.78
AE4	EZY-W11-2	Wistron NeWeb Corporation	1.85
AE5	EZY-W11-1	Wistron NeWeb Corporation	5.15
AE6	EZY-W8-1	Wistron NeWeb Corporation	4.53
AE7	EHD-S6	Wistron NeWeb Corporation	<3
AE8	81EAAB15.G02	Wistron NeWeb Corporation	4.35
AE9	81EAAB15.G02	Wistron NeWeb Corporation	3.91

3.4. General Description

Equipment Under Test (EUT) is a model of DNUA-93C2 with independent antenna. It supports Wireless LAN function.

For radiated measurements, the EZY-W11(81.EZY15.GDL) is selected as WLAN Antenna, because it has the biggest gain(5.15dBi) in all of antennas.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the Client.

4. REFERENCE DOCUMENTS

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902-928MHz, 2400-2483.5 MHz, and 5725-5850 MHz	Oct, 2011 Edition
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2003
KDB 558074 D01	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247	January 18, 2012

5. LABORATORY ENVIRONMENT

Shielding Room1 (6.0 metersx3.0 metersx2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Ground system resistance	< 0.5 Ω
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

Semi-anechoic chamber (10 metersx6.7 metersx6.15 Meters) did not exceed following limits along EMC testing::

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 2 M ohm
Ground system resistance	< 0.5
Normalised site attenuation (NSA)	< ±3.5 dB, 3 m distance
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

6. SUMMARY OF TEST RESULTS

6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15C	Verdict
Maximum Peak Output Power	15.247 (a)	P
Peak Power Spectral Density	15.247 (e)	P
Occupied 6dB Bandwidth	15.247 (a)	P
Band Edges Compliance	15.247 (d)	P
Transmitter Spurious Emission - Conducted	15.247(d)	P
Transmitter Spurious Emission - Radiated	15.247, 15.205, 15.209	P
AC Powerline Conducted Emission	15.107, 15.207	P

Please refer to **ANNEX A** for detail.

The measurement is made according to Public notice KDB558074 D01 and ANSI C63.4.

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NP	Not Perform, The test was not performed by TMC
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

6.2. Statements

TMC has evaluated the test cases requested by the client/manufacturer as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.1.

This report only deals with the WLAN function among the features described in section 3.

Test Conditions

T nom	Normal Temperature
T min	Low Temperature
T max	High Temperature
V nom	Normal Voltage
V min	Low Voltage
V max	High Voltage
H nom	Norm Humidity
A nom	Norm Air Pressure

For this report, all the test case listed above are tested under Normal Temperature and Normal Voltage, and also under norm humidity, the specific conditions as following:

Temperature	T nom	26°C
Voltage	V nom	5.0V
Humidity	H nom	44%
Air Pressure	A nom	1010hPa

7. TEST EQUIPMENTS UTILIZED

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	2012-07-19
2	Spectrum Analyzer	MS2687B	6200819812	Anritsu	2012-09-22
3	Test Receiver	ESS	847151/015	Rohde & Schwarz	2012-10-30
4	LISN	ESH2-Z5	829991/012	Rohde & Schwarz	2012-08-12

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Due date
1	Test Receiver	ESI40	831564/002	Rohde & Schwarz	2012-08-11
2	BiLog Antenna	3142B	9908-1403	EMCO	2013-03-15
3	Dual-Ridge Waveguide Horn Antenna	3115	9906-5827	EMCO	2012-12-25
4	Dual-Ridge Waveguide Horn Antenna	3116	2661	EMCO	2012-06-30

Anechoic chamber

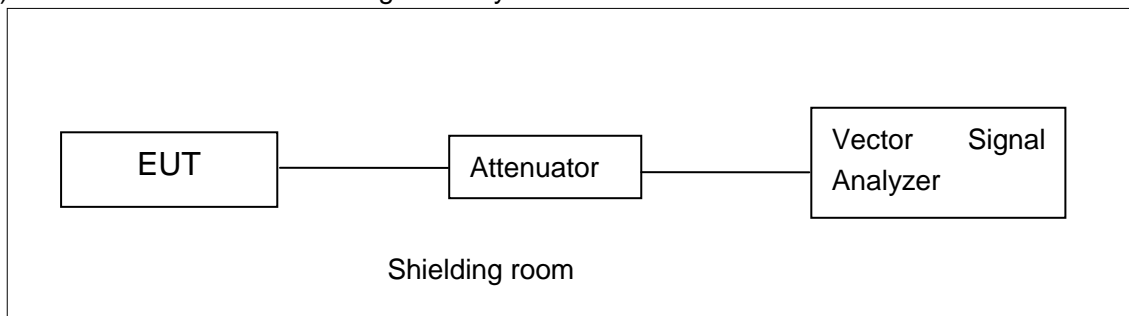
Anechoic chamber by Frankonia German.

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

A.1.1. Conducted Measurements

- 1). Connect the EUT to the test system correctly.
- 2). Set the EUT to the required work mode.
- 3). Set the EUT to the required channel.
- 4). Set the spectrum analyzer to start measurement.
- 5). Record the values. Vector Signal Analyzer

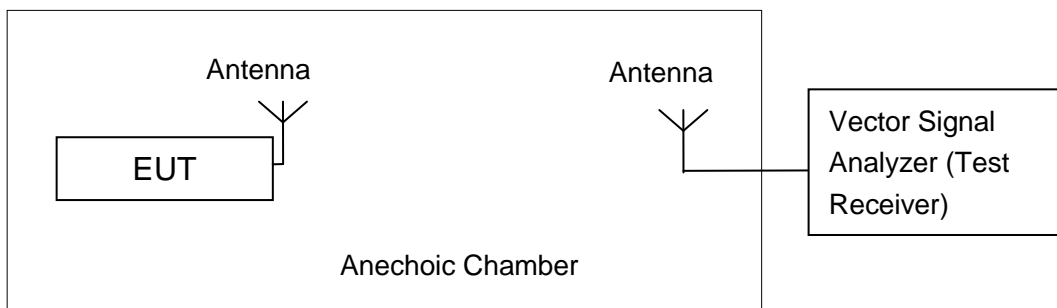


A.1.2. Radiated Emission Measurements

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 10Hz;



The measurement is made according to ANSI C63.4 and KDB558074 D01

A.2. Maximum Peak Output Power

Measurement Limit and Method:

Standard	Limit (dBm)
FCC CRF Part 15.247(b)	< 30

The measurement is made according to ANSI C63.4 and KDB558074 D01, and power output option 1 (RBW=20MHz) in KDB558074 D01 is used for the test. EUT is operating in continuous transmitting mode

Measurement Uncertainty:

Measurement Uncertainty	0.75dB
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Measurement Results:

802.11b/g mode

Mode	Data Rate (Mbps)	Test Result (dBm)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11b	1	19.33	19.91	19.92
	2	19.90	20.42	20.27
	5.5	20.54	21.08	20.80
	11	20.48	21.09	21.04
802.11g	6	19.26	19.44	19.25
	9	19.10	19.63	19.53
	12	19.30	19.80	19.32
	18	19.41	19.88	19.46
	24	20.23	20.43	20.12
	36	20.18	20.54	20.23
	48	20.41	20.65	20.34
	54	20.18	20.68	20.33

The data rate 11Mbps and 54Mbps are selected as worse condition, and the following cases are performed with this condition.

802.11n mode

Mode	Data Rate (MCS Index)	Test Result (dBm)		
		2412MHz (Ch1)	2437MHz (Ch6)	2462 MHz (Ch11)
802.11n (20MHz BW)	MCS0	18.98	19.51	19.13
	MCS1	19.21	19.79	19.42
	MCS2	19.33	19.93	19.87
	MCS3	19.98	20.60	20.57
	MCS4	20.03	20.57	20.60
	MCS5	20.21	20.81	20.39
	MCS6	20.28	20.75	20.77
	MCS7	20.31	20.79	20.71

Mode	Data Rate (MCS Index)	Test Result (dBm)		
		2422MHz (Ch3)	2437MHz (Ch6)	2452 MHz (Ch9)
802.11n (40MHz BW)	MCS0	19.16	20.00	18.79
	MCS1	19.48	20.25	19.05
	MCS2	19.57	20.36	19.20
	MCS3	20.05	20.84	19.73
	MCS4	20.09	20.87	19.72
	MCS5	20.24	21.03	19.88
	MCS6	20.20	21.10	19.91
	MCS7	20.21	21.04	19.85

The data rate index of MCS5(20M) and MCS6(40M) are selected as worse condition, and the following cases are performed with this condition.

Conclusion: PASS

A.3. Peak Power Spectral Density

Measurement Limit:

Standard	Limit
FCC CRF Part 15.247(d)	< 8 dBm/3 kHz

The measurement is made according to ANSI C63.4 and KDB558074 D01

Measurement Uncertainty:

Measurement Uncertainty	0.75dB
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Measurement Results:

802.11b/g mode

Mode	Channel	Peak Power Spectral Density			Conclusion
		Graphs	PMea(dBm)	Result(dBm)	
802.11b	1	Fig.1	2.76	-12.44	P
	6	Fig.2	2.91	-12.29	P
	11	Fig.3	2.96	-12.24	P
802.11g	1	Fig.4	1.60	-13.60	P
	6	Fig.5	1.56	-13.64	P
	11	Fig.6	1.49	-13.71	P

802.11n mode

Mode	Channel	Peak Power Spectral Density			Conclusion
		Graphs	PMea(dBm)	Result(dBm)	
802.11n-20M	1	Fig.7	2.03	-13.17	P
	6	Fig.8	1.57	-13.63	P
	11	Fig.9	1.32	-13.88	P
802.11n-40M	3	Fig.10	-1.77	-16.97	P
	6	Fig.11	-0.99	-16.19	P
	9	Fig.12	-2.09	-17.29	P

Note:

PMea is the value recorded from the instrument.

The measurement results are obtained as described below:

Result=PMea + BWCF. (BWCF= 10log(3kHz/100kHz)=-15.2 dB)

Conclusion: PASS

Test graphs as below:

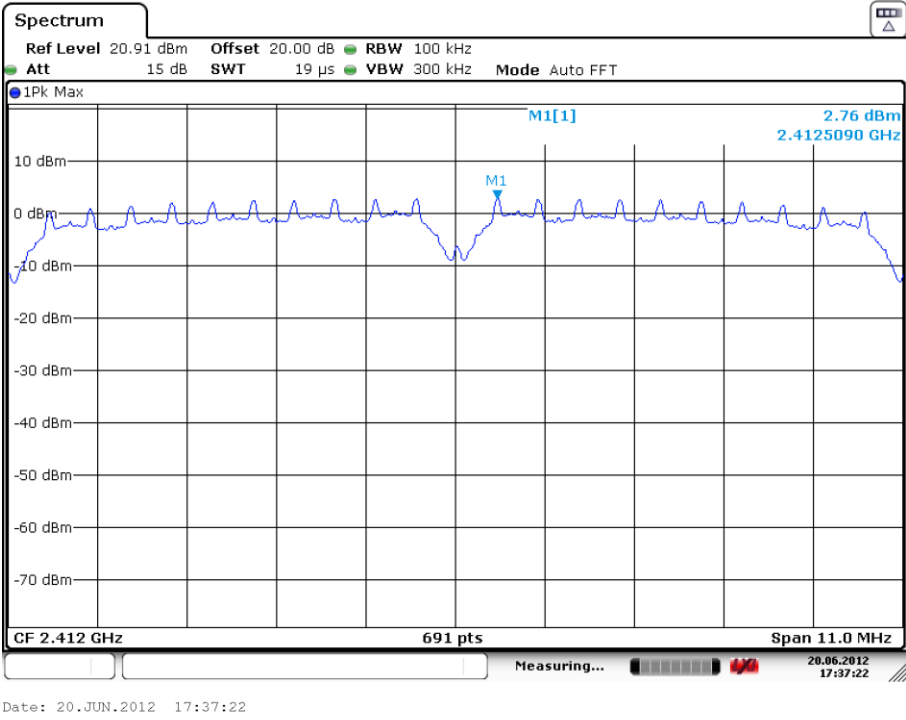


Fig. 1 Power Spectral Density (802.11b, Ch 1)

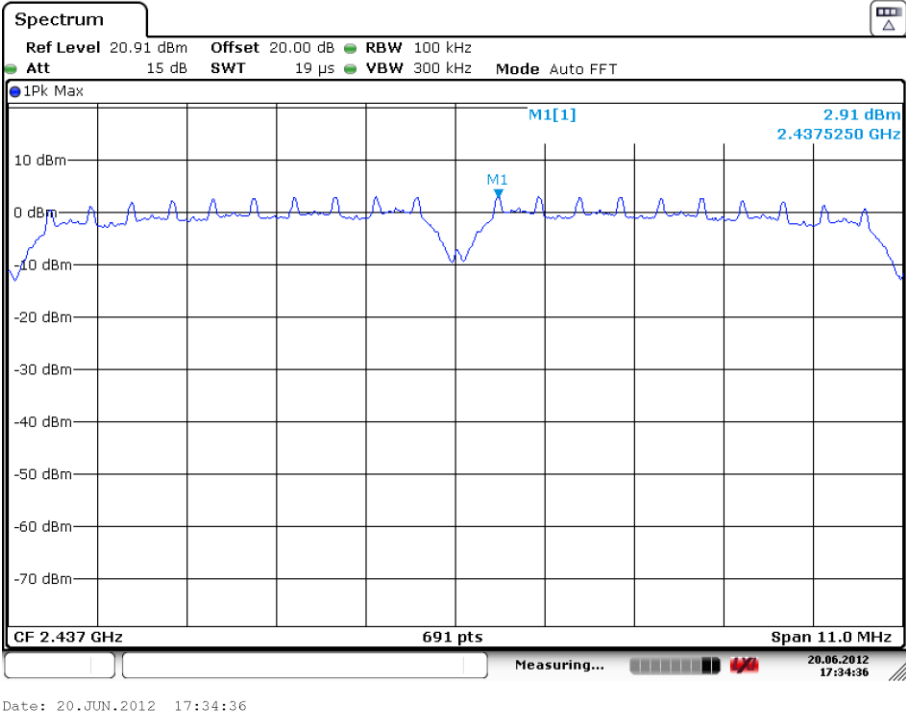
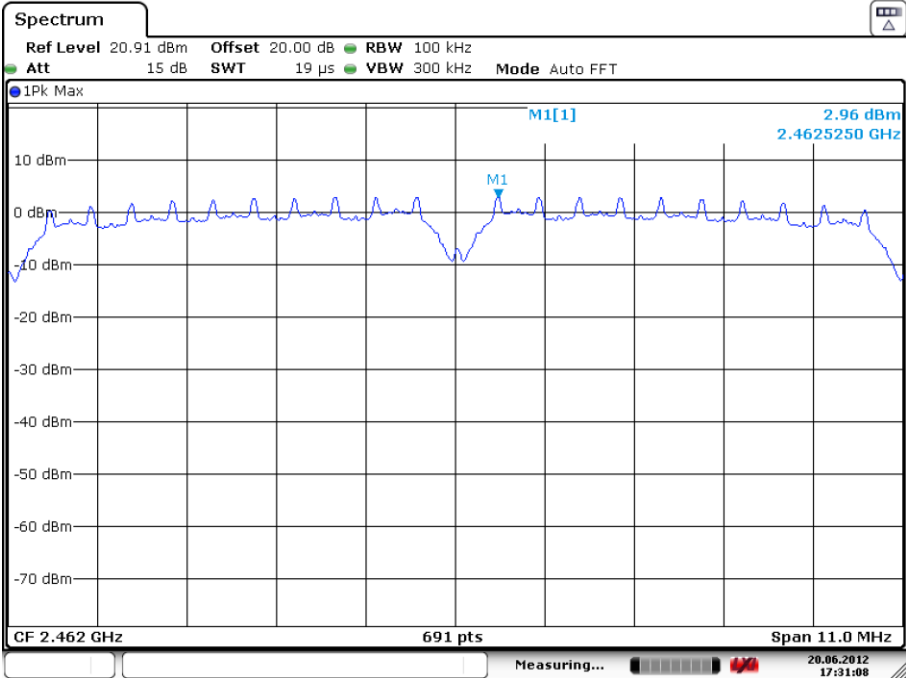
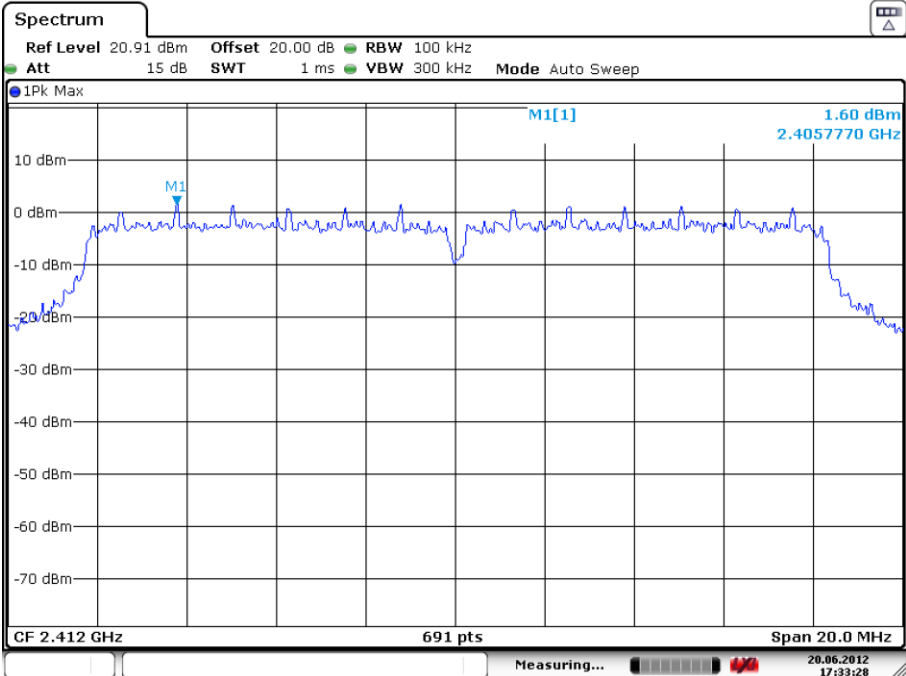


Fig. 2 Power Spectral Density (802.11b, Ch 6)



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Fig. 3 Power Spectral Density (802.11b, Ch 11)



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Fig. 4 Power Spectral Density (802.11g, Ch 1)

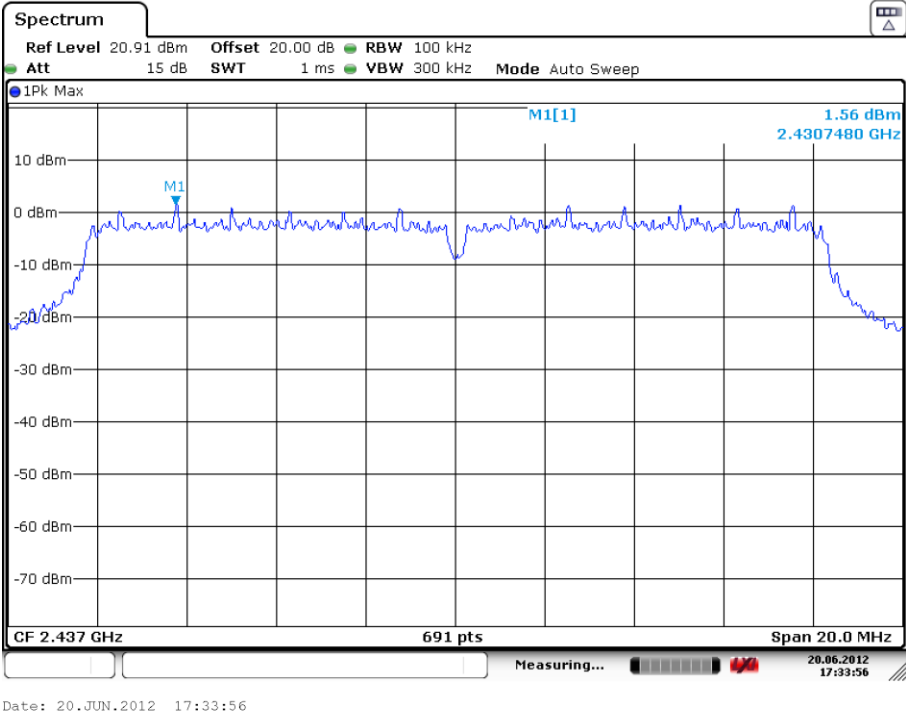


Fig. 5 Power Spectral Density (802.11g, Ch 6)

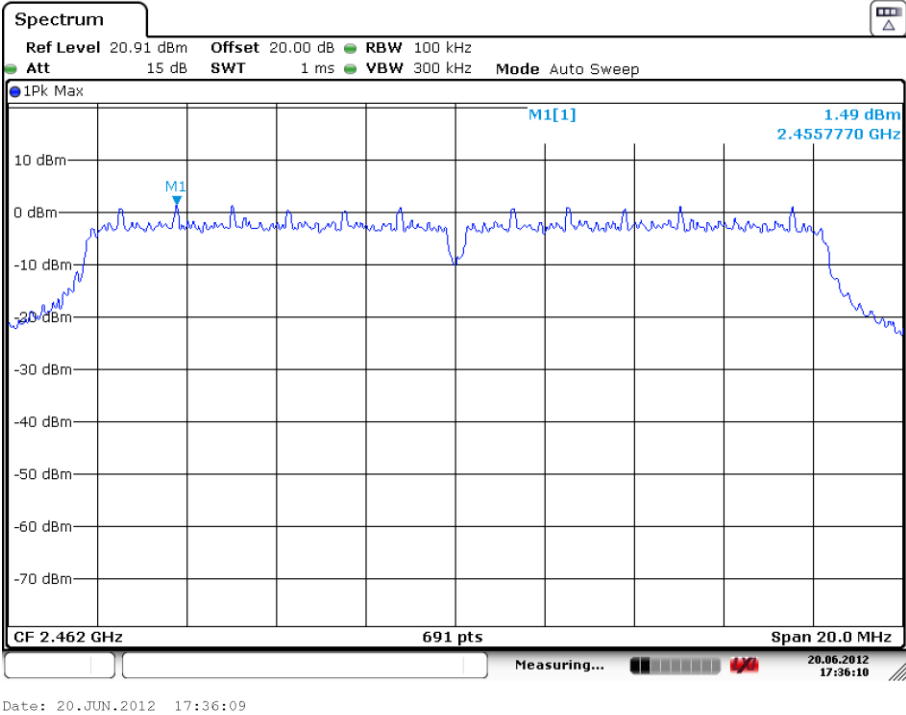


Fig. 6 Power Spectral Density (802.11g, Ch 11)

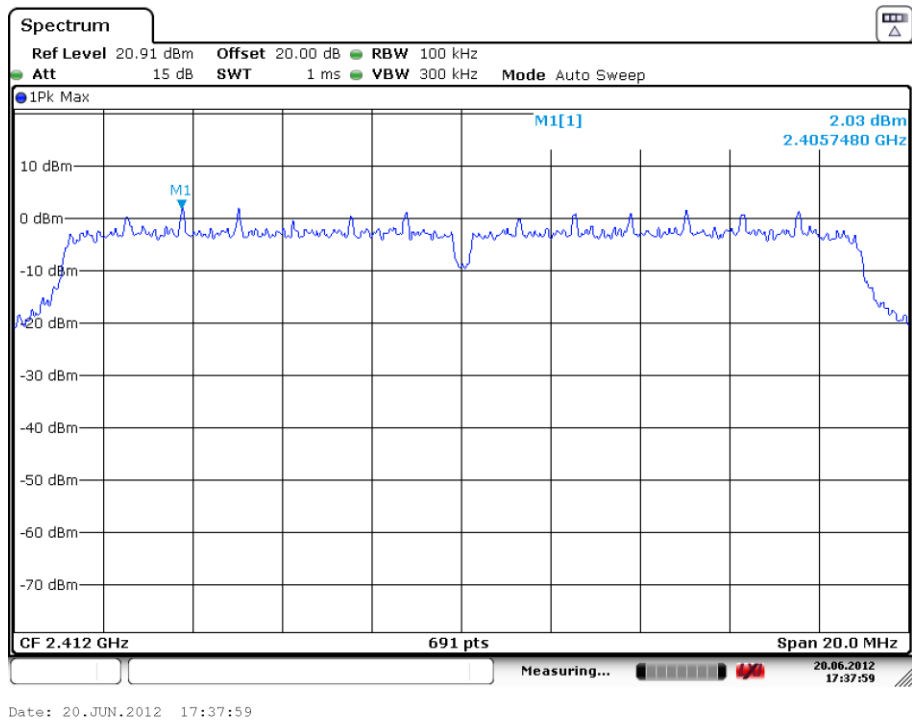


Fig. 7 Power Spectral Density (802.11n-20MHz, Ch 1)

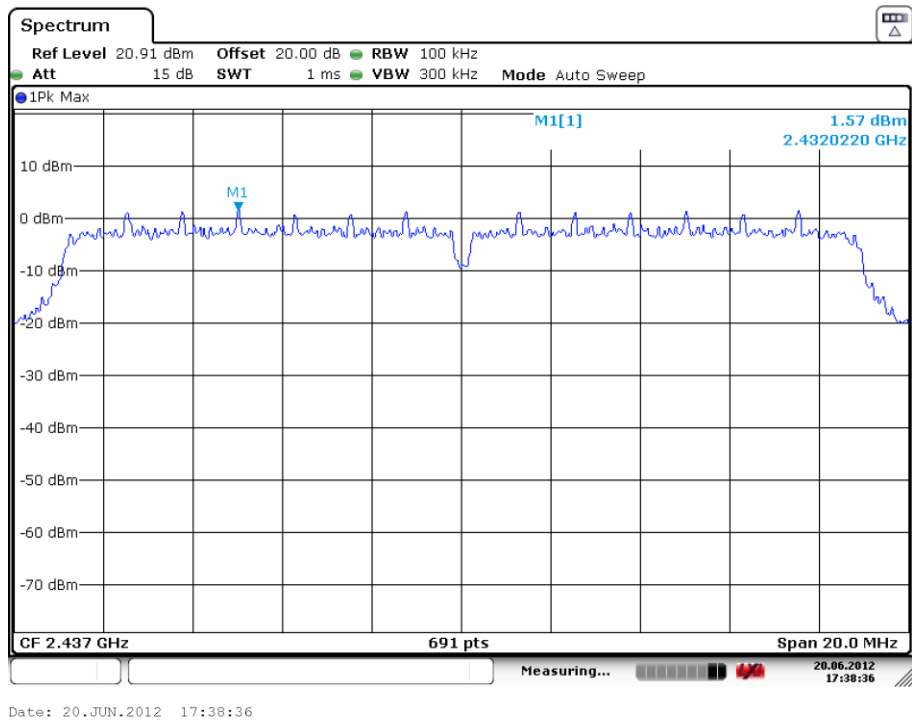


Fig. 8 Power Spectral Density (802.11n-20MHz, Ch 6)

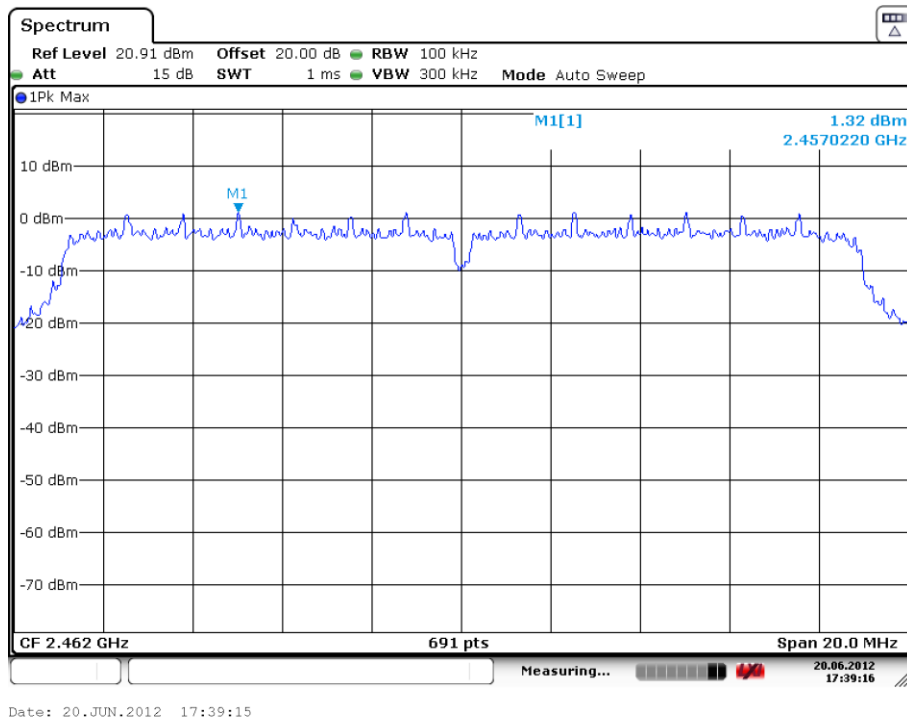


Fig. 9 Power Spectral Density (802.11n-20MHz, Ch 11)

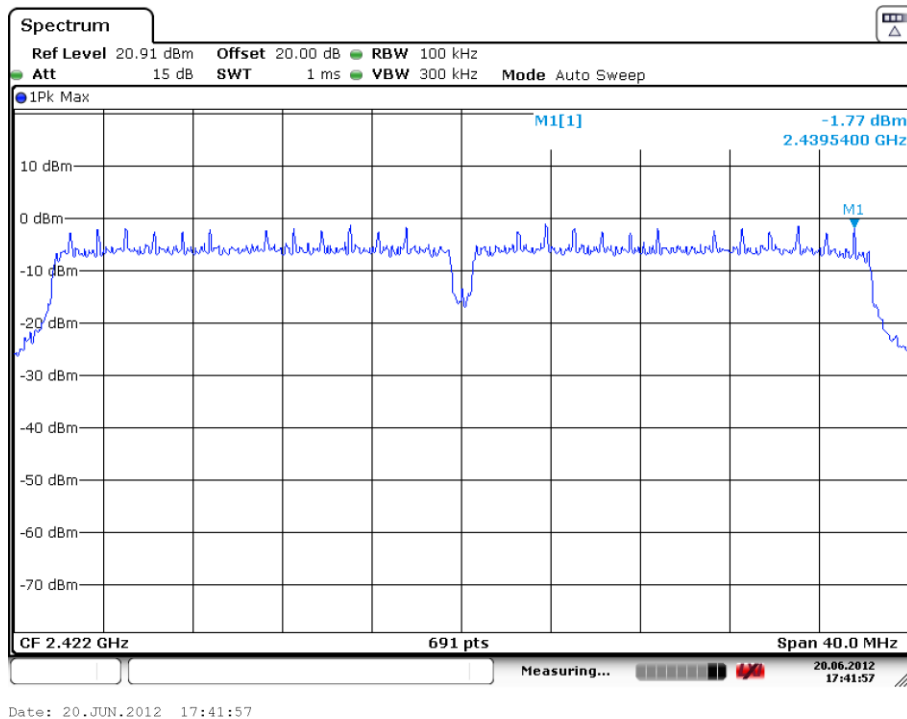


Fig. 10 Power Spectral Density (802.11n-40MHz, Ch 3)

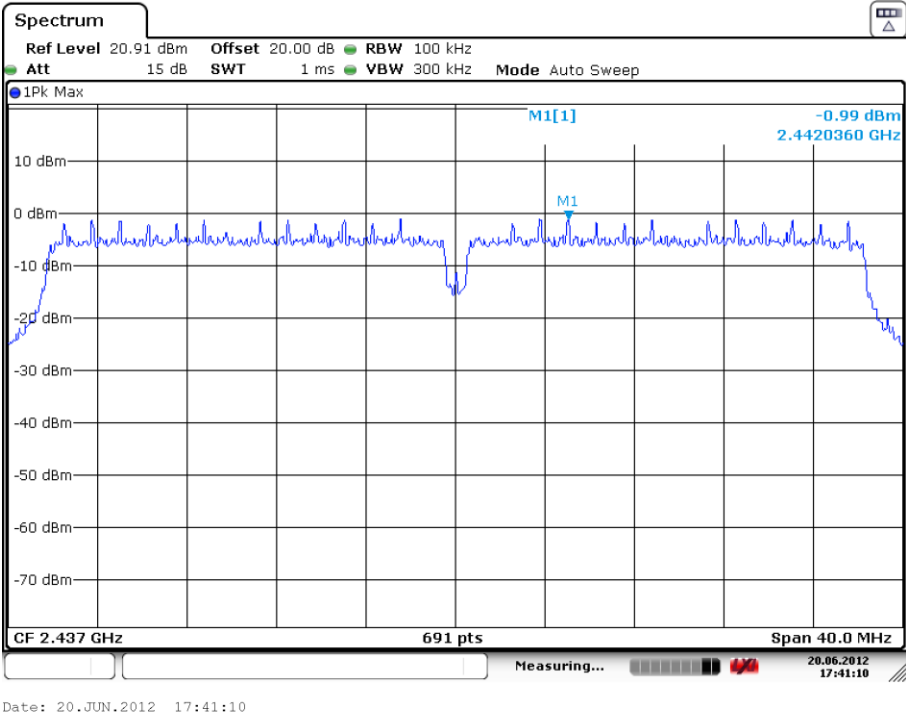


Fig. 11 Power Spectral Density (802.11n-40MHz, Ch 6)

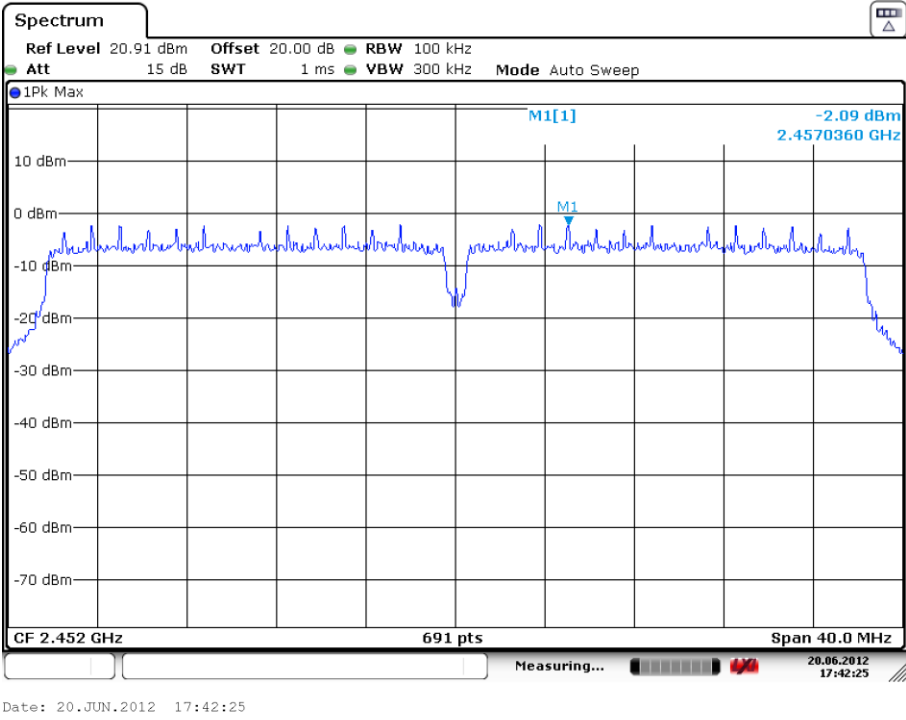


Fig. 12 Power Spectral Density (802.11n-40MHz, Ch 9)

A.4. Occupied 6dB Bandwidth

Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a)	≥ 500

The measurement is made according to ANSI C63.4 and KDB558074 D01

Measurement Uncertainty:

Measurement Uncertainty	60.80Hz
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Measurement Result:

802.11b/g mode

Mode	Channel	Occupied 6dB Bandwidth (kHz)		conclusion
802.11b	1	Fig.13	10167	P
	6	Fig.14	10166	P
	11	Fig.15	10167	P
802.11g	1	Fig.16	16461	P
	6	Fig.17	16426	P
	11	Fig.18	16425	P

802.11n mode

Mode	Channel	Occupied 6dB Bandwidth (kHz)		conclusion
802.11n (20MHz)	1	Fig.19	17366	P
	6	Fig.20	17511	P
	11	Fig.21	17620	P
802.11n (40MHz)	3	Fig.22	36252	P
	6	Fig.23	36404	P
	9	Fig.24	36186	P

Conclusion: PASS

Test graphs as below:

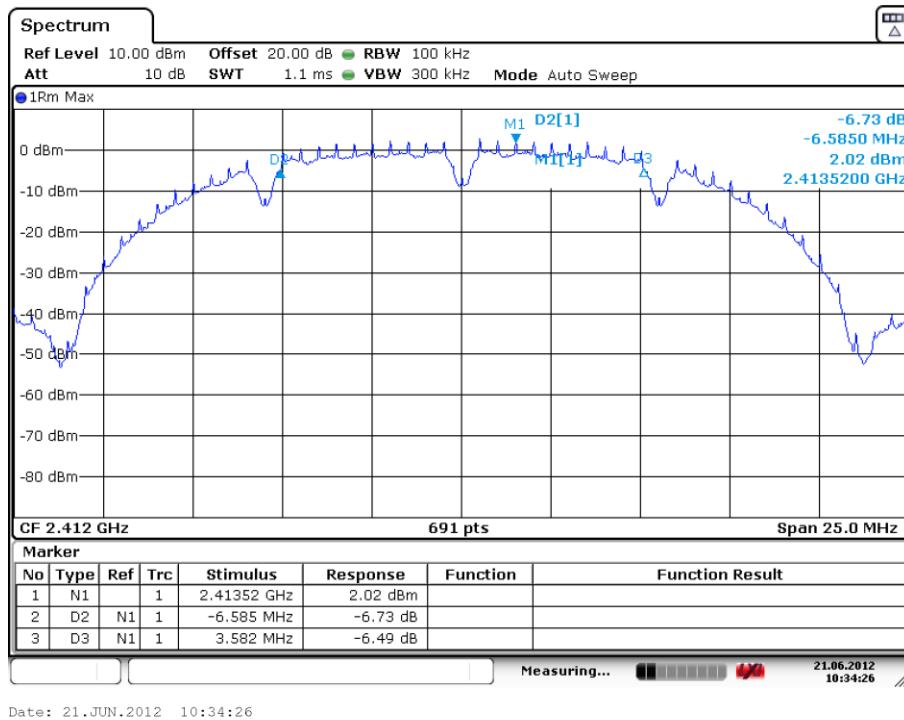


Fig. 13 Occupied 6dB Bandwidth (802.11b, Ch 1)

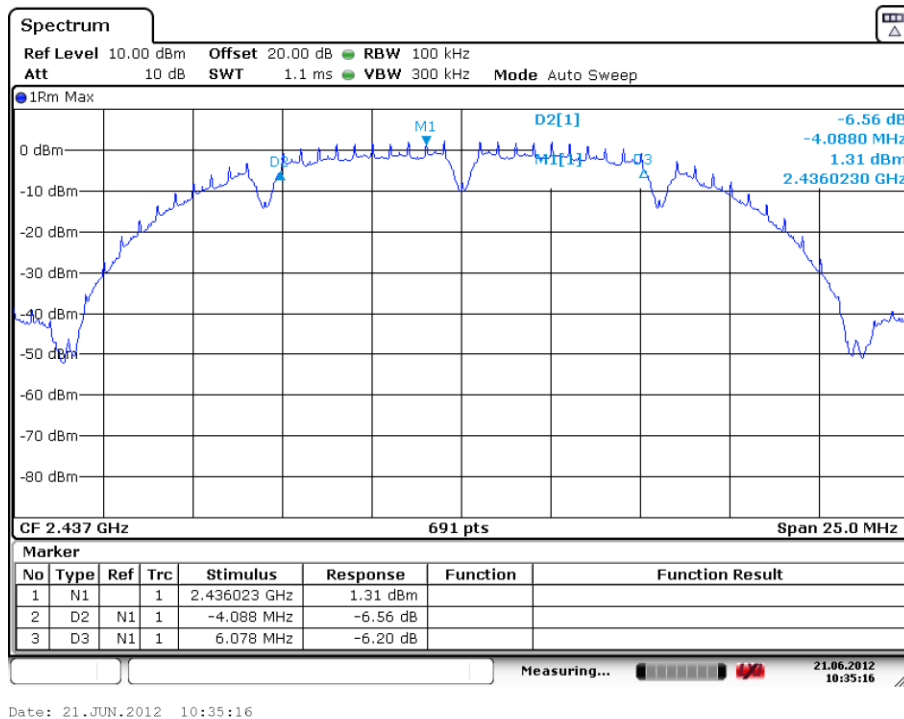


Fig. 14 Occupied 6dB Bandwidth (802.11b, Ch 6)

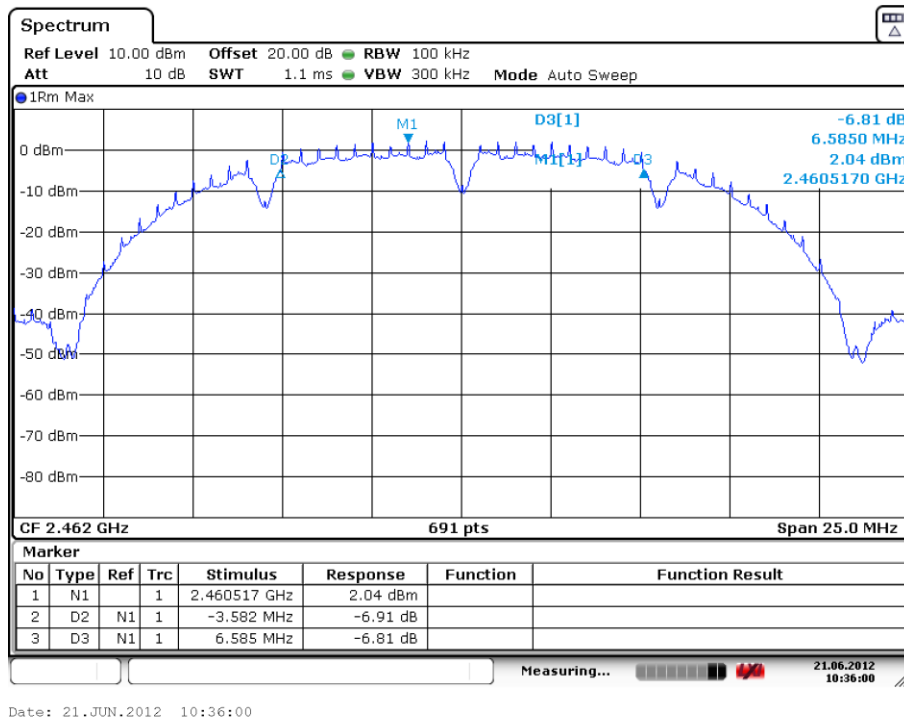


Fig. 15 Occupied 6dB Bandwidth (802.11b, Ch 11)

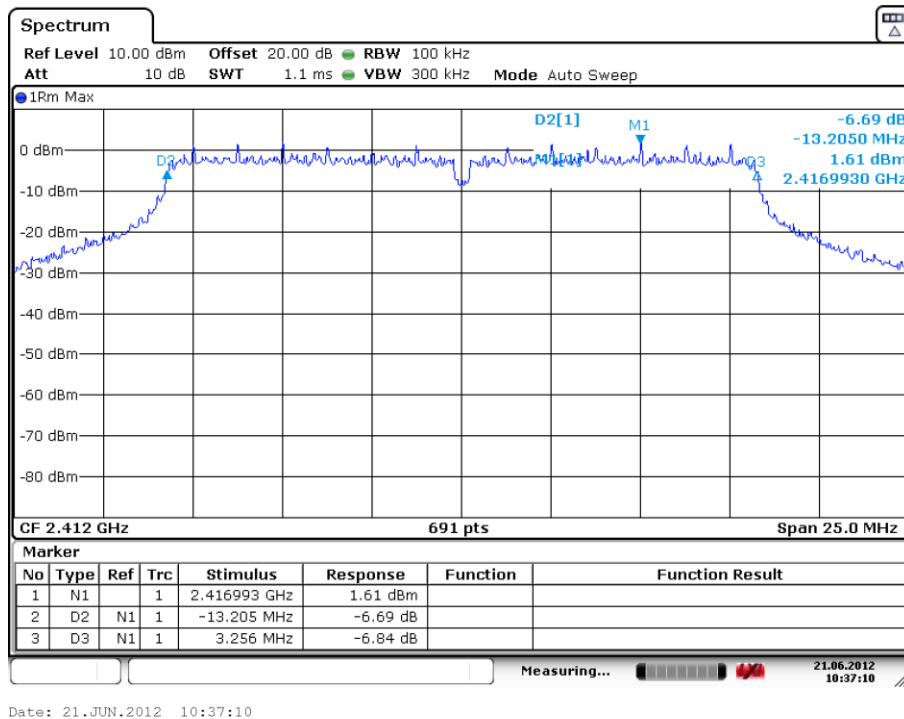


Fig. 16 Occupied 6dB Bandwidth (802.11g, Ch 1)

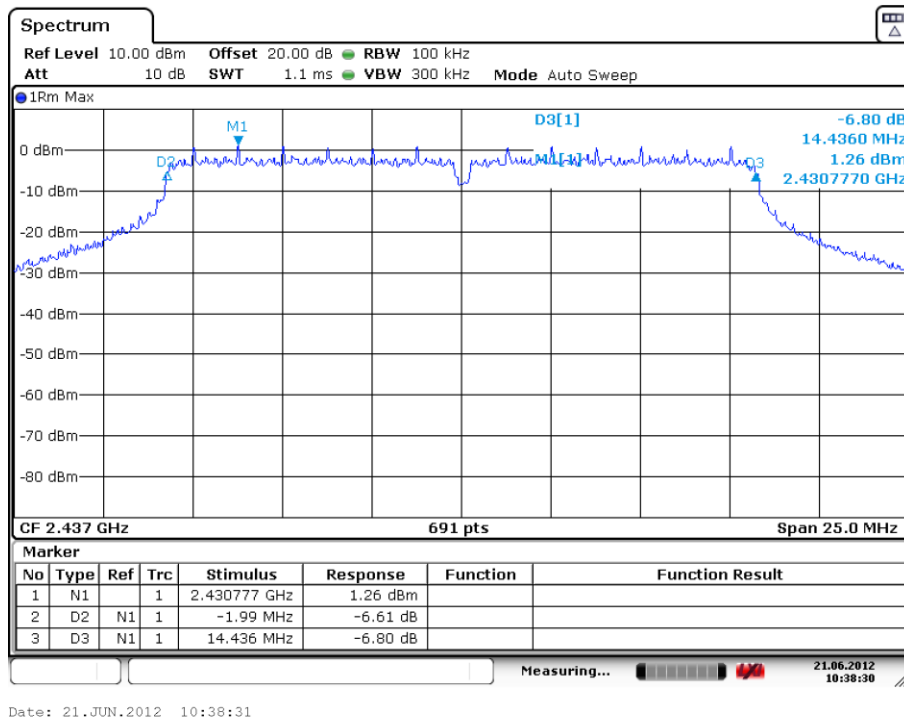


Fig. 17 Occupied 6dB Bandwidth (802.11g, Ch 6)

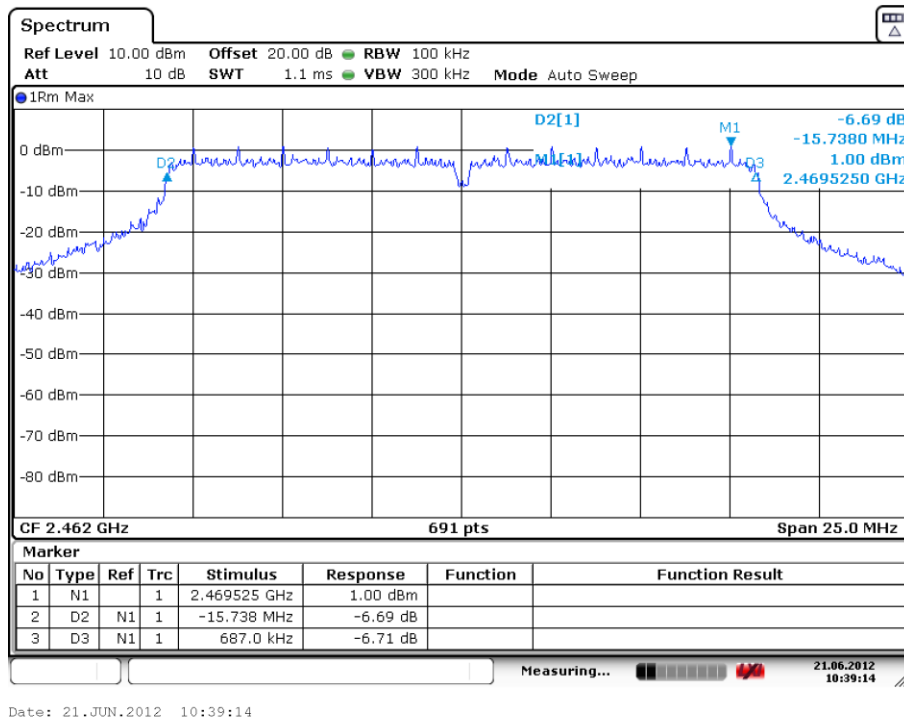


Fig. 18 Occupied 6dB Bandwidth (802.11g, Ch 11)

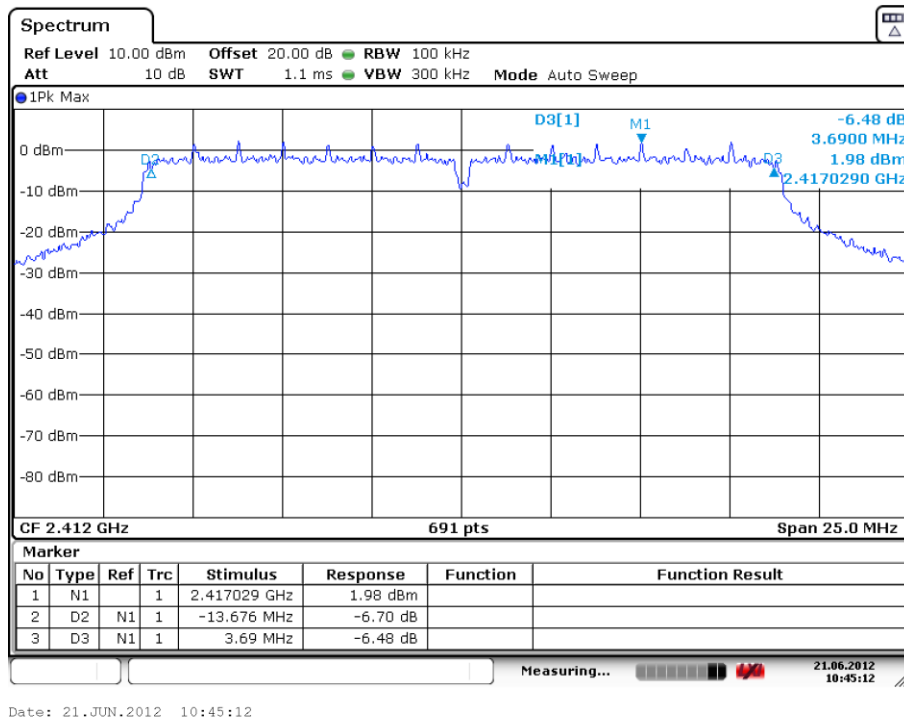


Fig. 19 Occupied 6dB Bandwidth (802.11 n-20MHz, Ch 1)

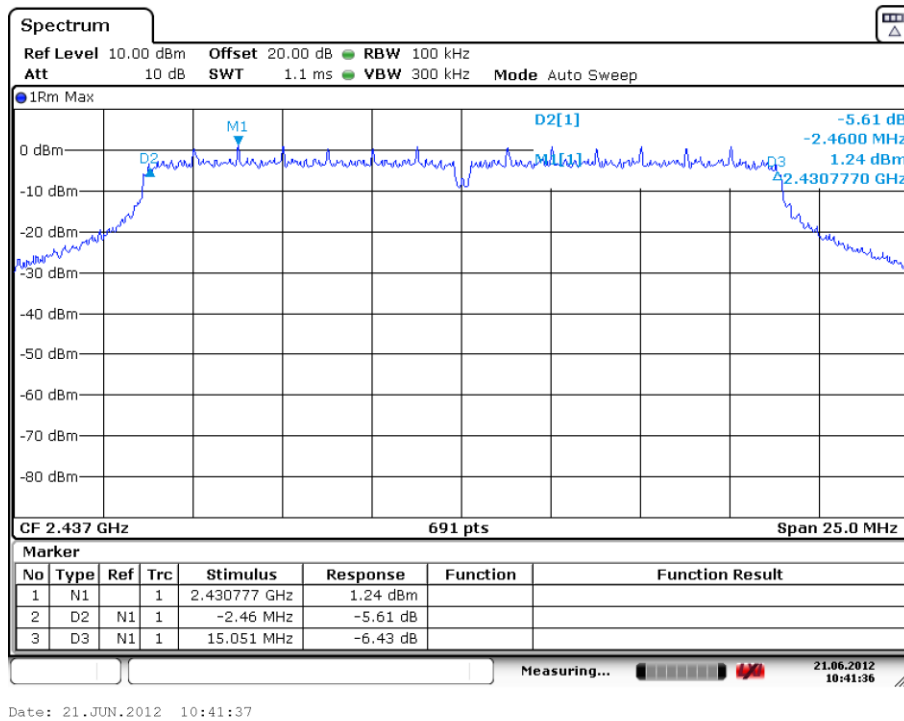


Fig. 20 Occupied 6dB Bandwidth (802.11 n-20MHz, Ch 6)

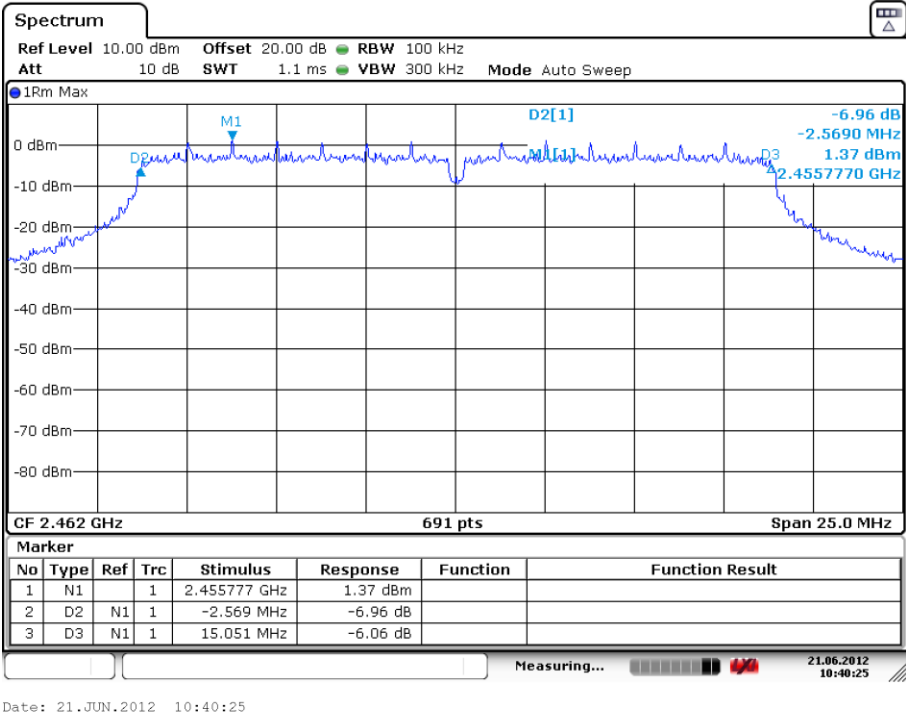


Fig. 21 Occupied 6dB Bandwidth (802.11n-20MHz, Ch 11)

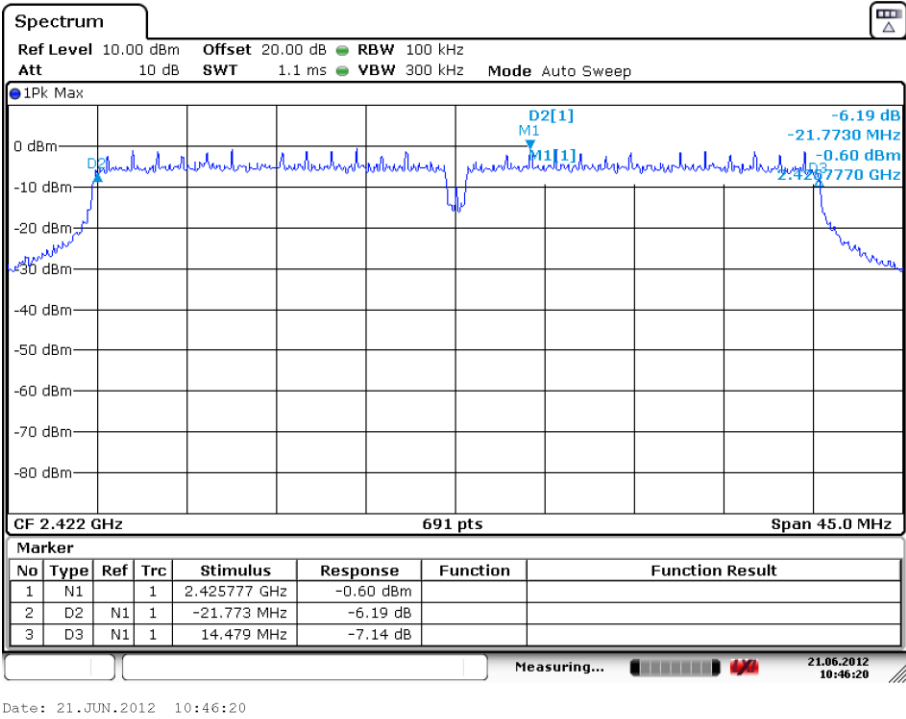


Fig. 22 Occupied 6dB Bandwidth (802.11 n-40MHz, Ch 3)

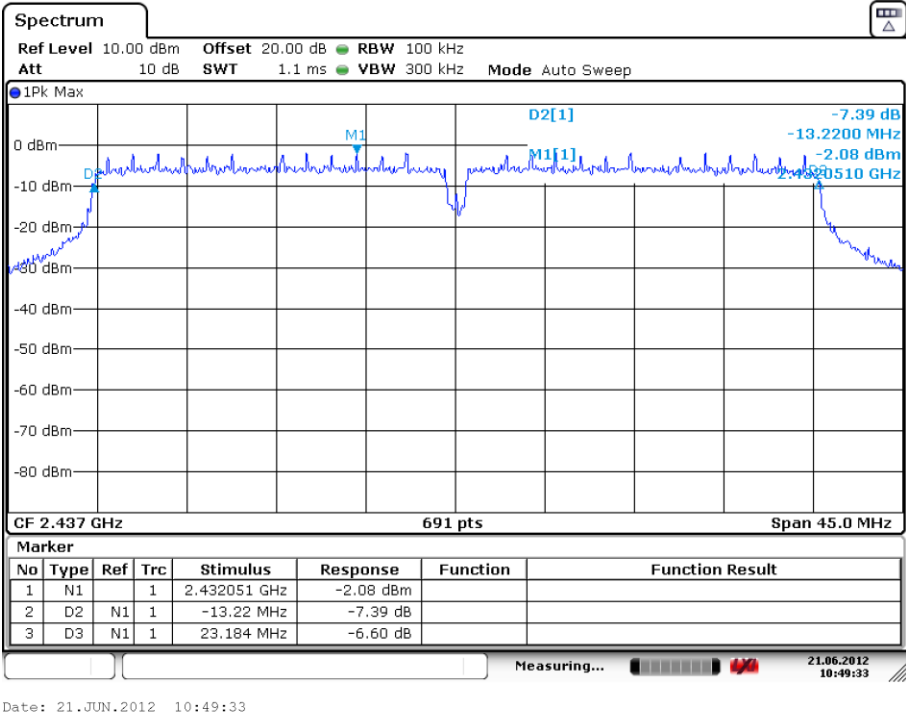


Fig. 23 Occupied 6dB Bandwidth (802.11 n-40MHz, Ch 6)

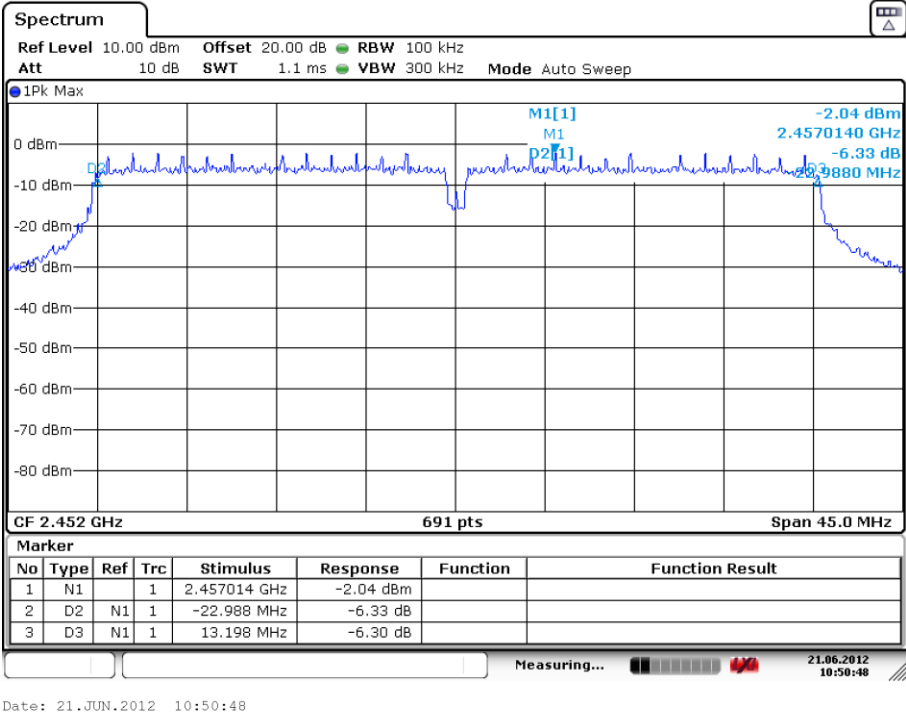


Fig. 24 Occupied 6dB Bandwidth (802.11n-40MHz, Ch 9)

A.5. Band Edges Compliance

Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	> 20

The measurement is made according to ANSI C63.4 and KDB558074 D01

Measurement Uncertainty:

Measurement Uncertainty	0.75dB
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Measurement Result:

802.11b/g mode

Mode	Channel	Test Results	Conclusion
802.11b	1	Fig.25	P
	11	Fig.26	P
802.11g	1	Fig.27	P
	11	Fig.28	P

802.11n mode

Mode	Channel	Test Results	Conclusion
802.11n (20MHz)	1	Fig.29	P
	11	Fig.30	P
802.11n (40MHz)	3	Fig.31	P
	9	Fig.32	P

Conclusion: PASS

Test graphs as below:

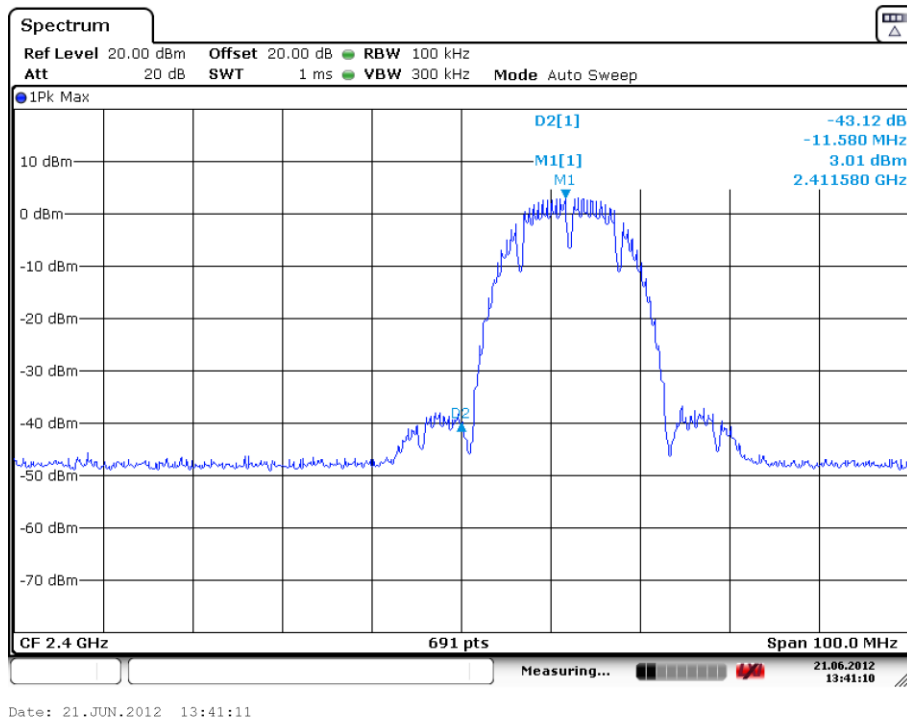


Fig. 25 Band Edges (802.11b, Ch 1)

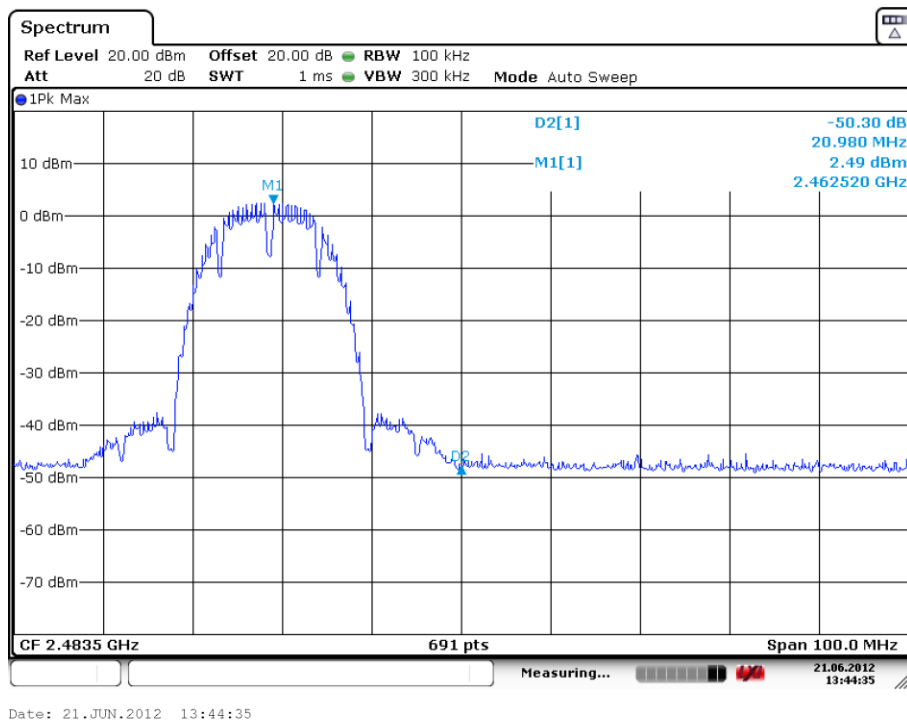


Fig. 26 Band Edges (802.11b, Ch 11)

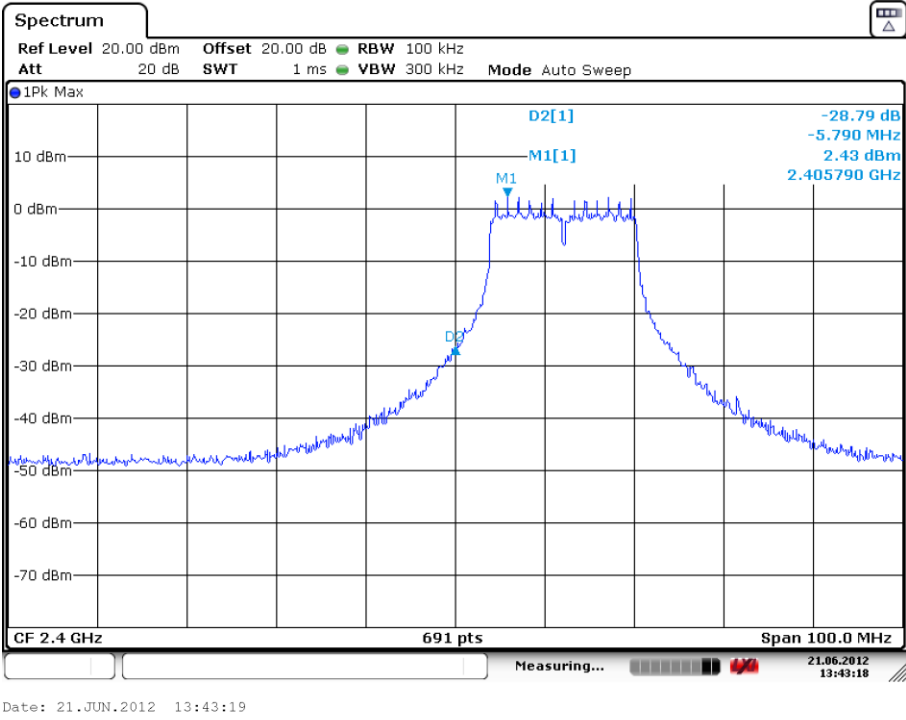


Fig. 27 Band Edges (802.11g, Ch 1)

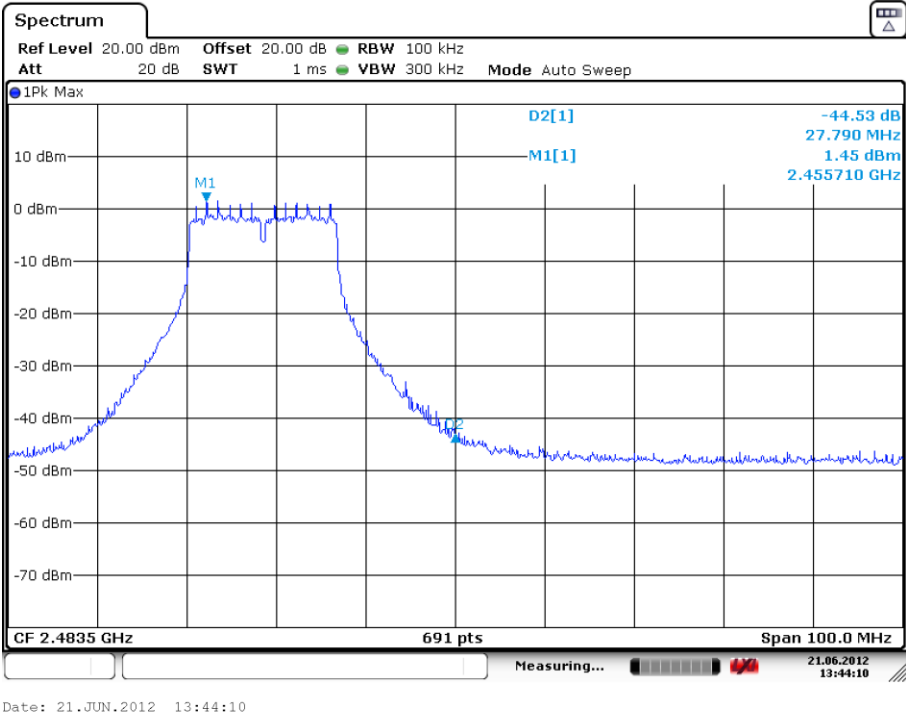


Fig. 28 Band Edges (802.11g, Ch 11)

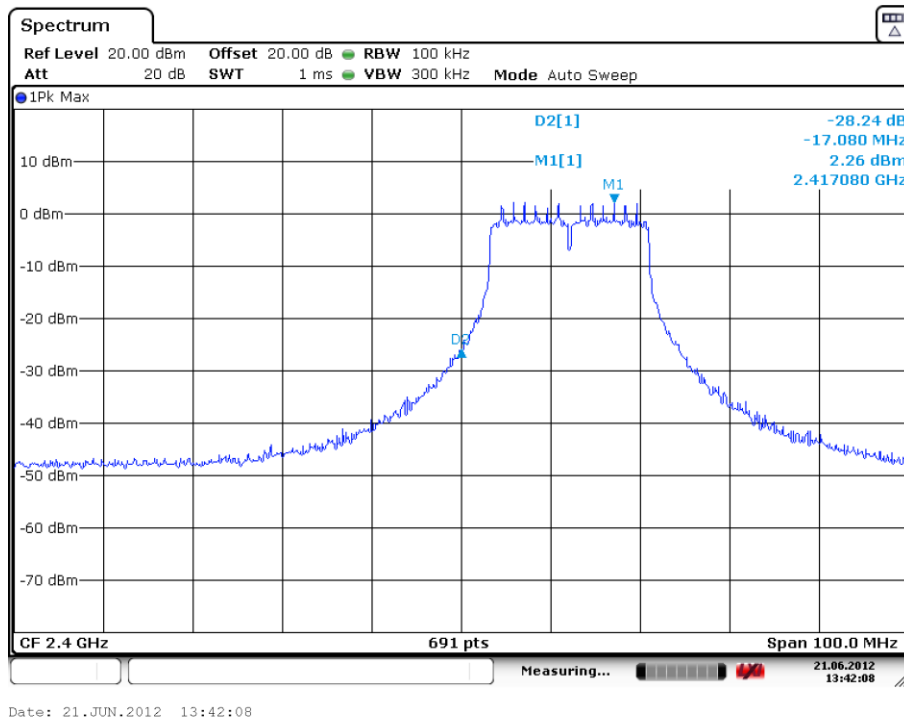


Fig. 29 Band Edges (802.11 n-20MHz, Ch 1)

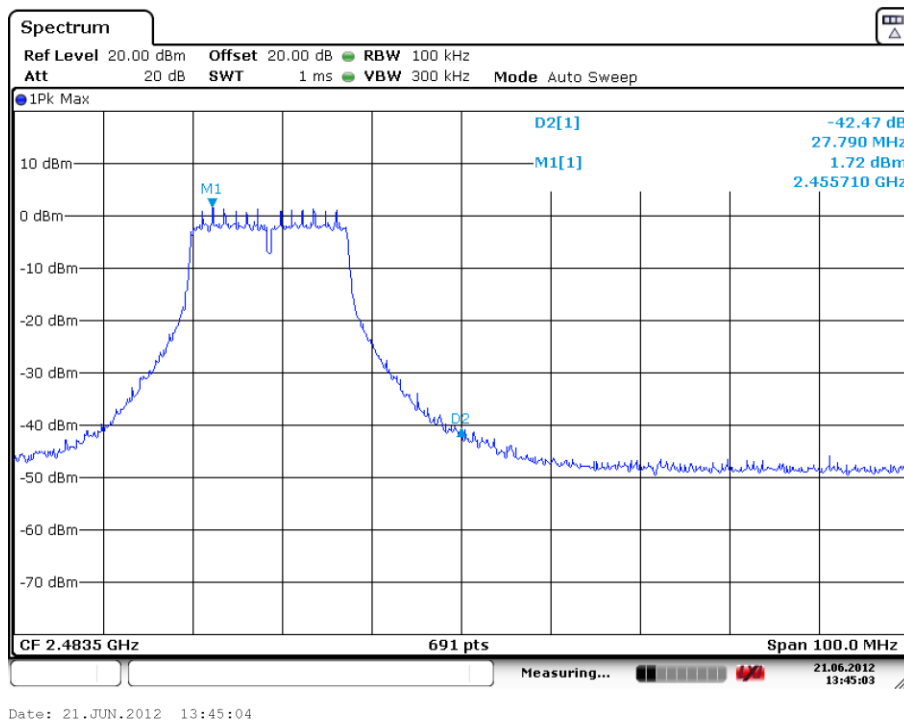


Fig. 30 Band Edges (802.11 n-20MHz, Ch 11)

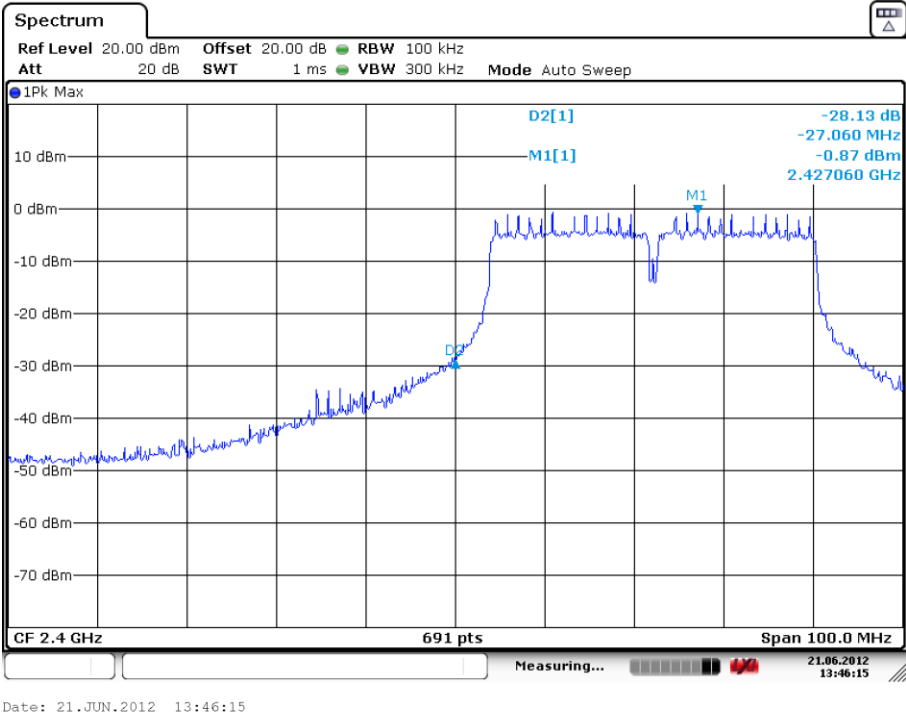


Fig. 31 Band Edges (802.11 n-40MHz, Ch 3)

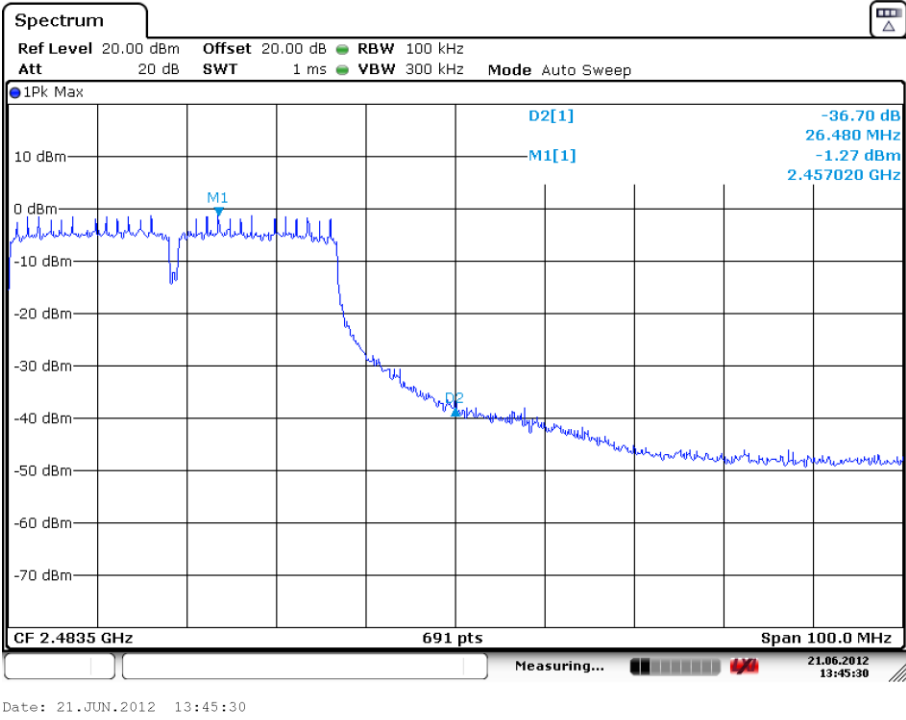


Fig. 32 Band Edges (802.11 n-40MHz, Ch 9)

A.6. Transmitter Spurious Emission

A.6.1 Transmitter Spurious Emission - Conducted

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (d)	20dB below peak output power in 100 kHz bandwidth

The measurement is made according to ANSI C63.4 and KDB558074 D01

Measurement Uncertainty:

Frequency Range	Uncertainty
$30\text{MHz} \leq f \leq 2\text{GHz}$	0.63
$2\text{GHz} \leq f \leq 3.6\text{GHz}$	0.82
$3.6\text{GHz} \leq f \leq 8\text{GHz}$	1.55
$8\text{GHz} \leq f \leq 20\text{GHz}$	1.86
$20\text{GHz} \leq f \leq 22\text{GHz}$	1.90
$22\text{GHz} \leq f \leq 26\text{GHz}$	2.20

Measurement Results:

802.11b/g mode

MODE	Channel	Frequency Range	Test Results	Conclusion
802.11b	1	2.412 GHz	Fig.33	P
		30 MHz-3 GHz	Fig.34	P
		3GHz-18GHz	Fig.35	P
	6	2.437 GHz	Fig.36	P
		30 MHz-3 GHz	Fig.37	P
		3GHz-18GHz	Fig.38	P
	11	2.462 GHz	Fig.39	P
		30 MHz-3 GHz	Fig.40	P
		3GHz-18GHz	Fig.41	P
802.11g	1	2.412 GHz	Fig.42	P
		30 MHz-3 GHz	Fig.43	P
		3GHz-18GHz	Fig.44	P
	6	2.437 GHz	Fig.45	P
		30 MHz-3 GHz	Fig.46	P
		3GHz-18GHz	Fig.47	P
	11	2.462 GHz	Fig.48	P
		30 MHz-3 GHz	Fig.49	P
		3GHz-18GHz	Fig.50	P

802.11n mode

802.11n (20MHz)	1	2.412 GHz	Fig.51	P
		30 MHz-3 GHz	Fig.52	P
		3GHz-18GHz	Fig.53	P
	6	2.437 GHz	Fig.54	P
		30 MHz-3 GHz	Fig.55	P
		3GHz-18GHz	Fig.56	P
	11	2.462 GHz	Fig.57	P
		30 MHz-3 GHz	Fig.58	P
		3GHz-18GHz	Fig.59	P
802.11n (40MHz)	3	2.422 GHz	Fig.60	P
		30 MHz-3 GHz	Fig.61	P
		3GHz-18GHz	Fig.62	P
	6	2.437 GHz	Fig.63	P
		30 MHz-3 GHz	Fig.64	P
		3GHz-18GHz	Fig.65	P
	9	2.452 GHz	Fig.66	P
		30 MHz-3 GHz	Fig.67	P
		3GHz-18GHz	Fig.68	P
/	All channels	18GHz-26GHz	Fig.69	P

Conclusion: PASS

Test graphs as below:

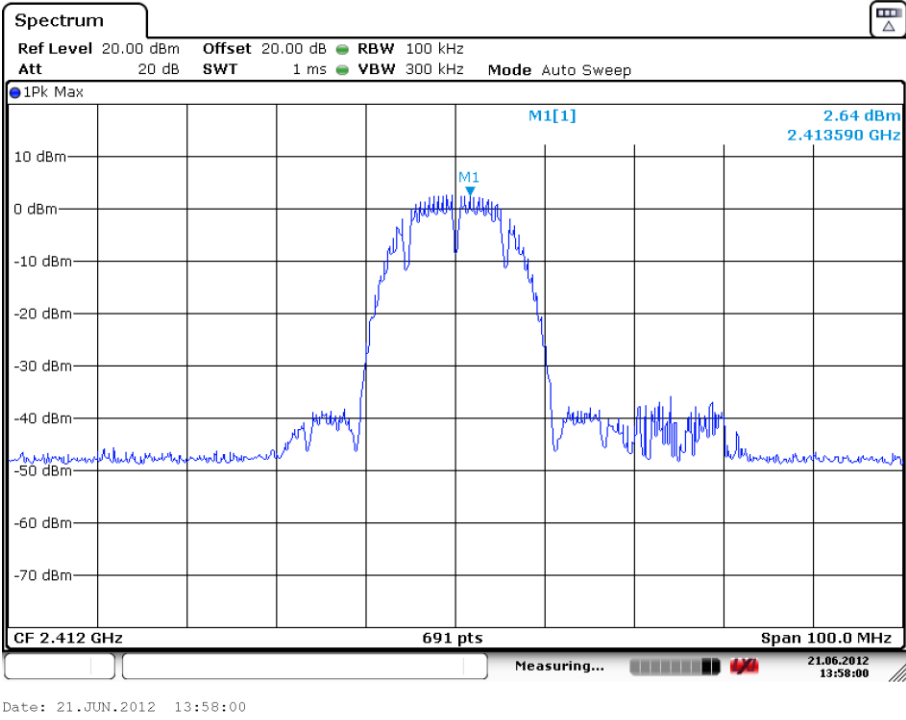


Fig. 33 Conducted Spurious Emission (802.11b, Ch1, Center Frequency)

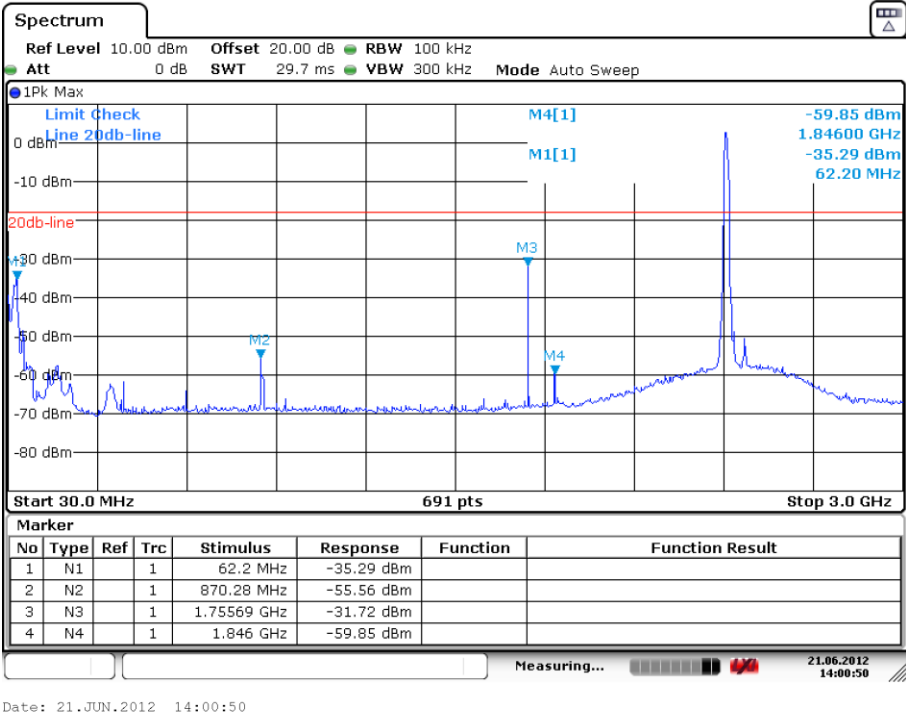


Fig. 34 Conducted Spurious Emission (802.11b, Ch1, 30 MHz-3 GHz)

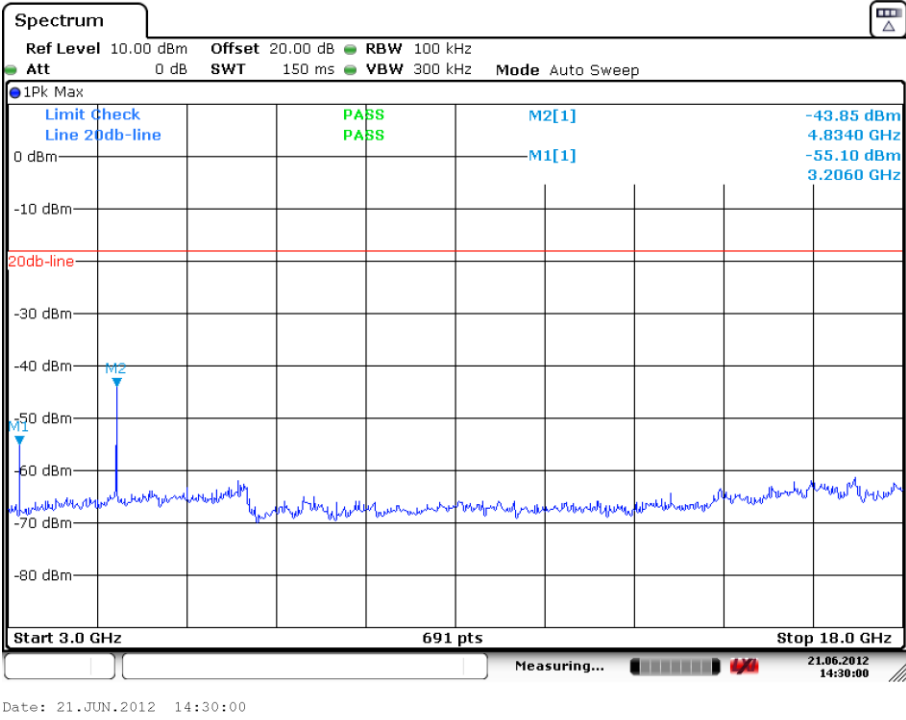


Fig. 35 Conducted Spurious Emission (802.11b, Ch1, 3 GHz-18 GHz)

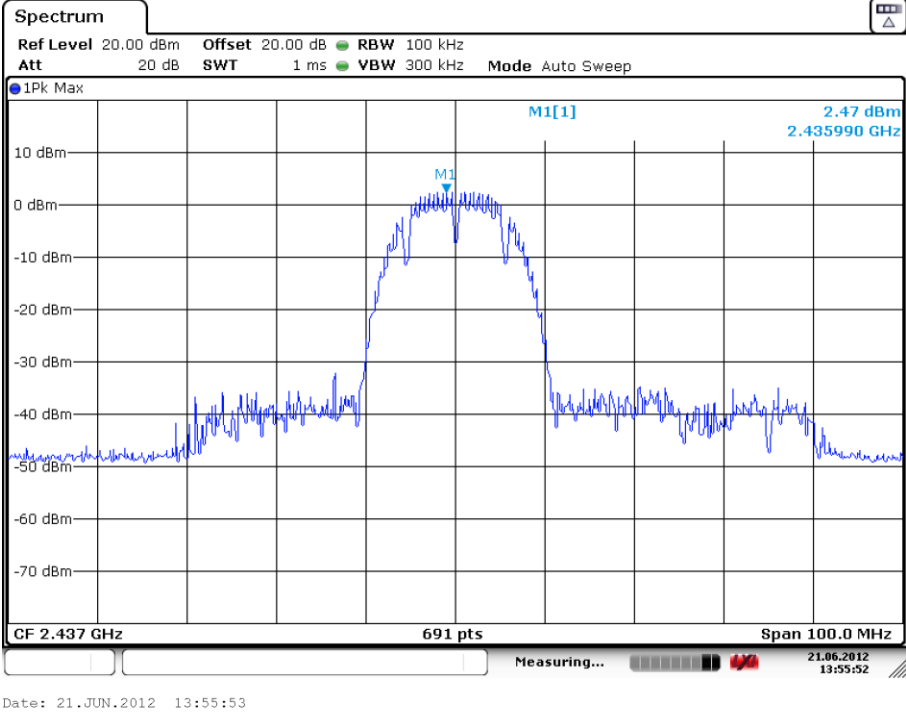


Fig. 36 Conducted Spurious Emission (802.11b, Ch6, Center Frequency)

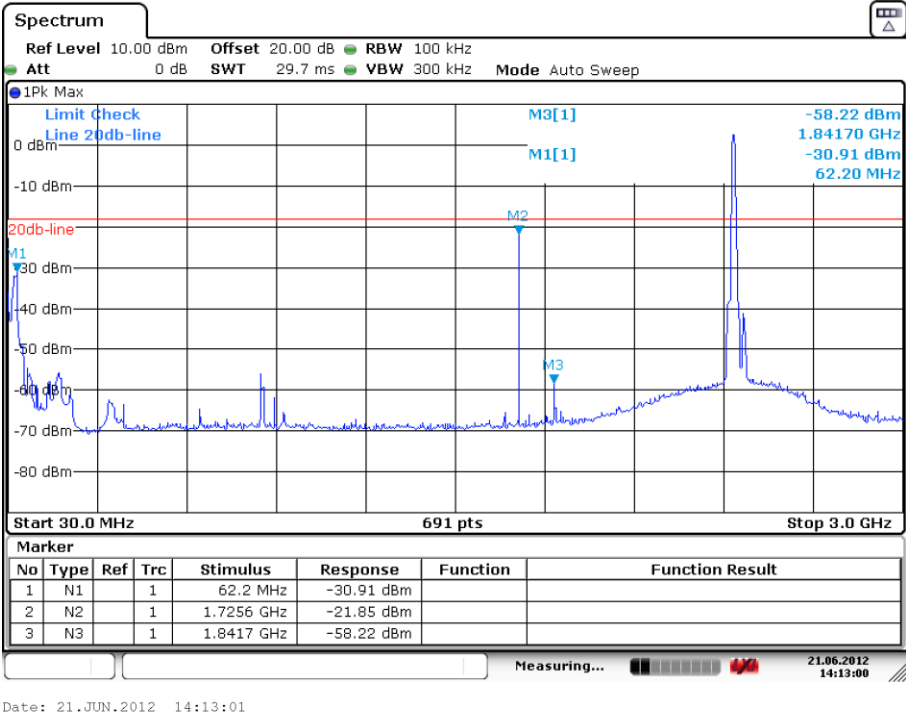


Fig. 37 Conducted Spurious Emission (802.11b, Ch6, 30 MHz-3 GHz)

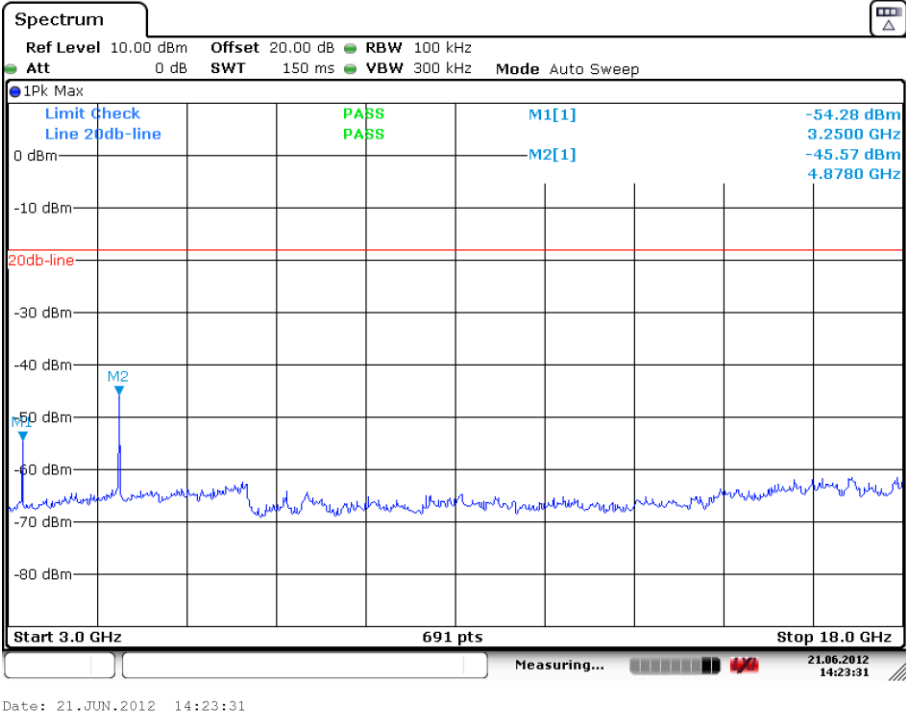


Fig. 38 Conducted Spurious Emission (802.11b, Ch6, 3 GHz-18 GHz)

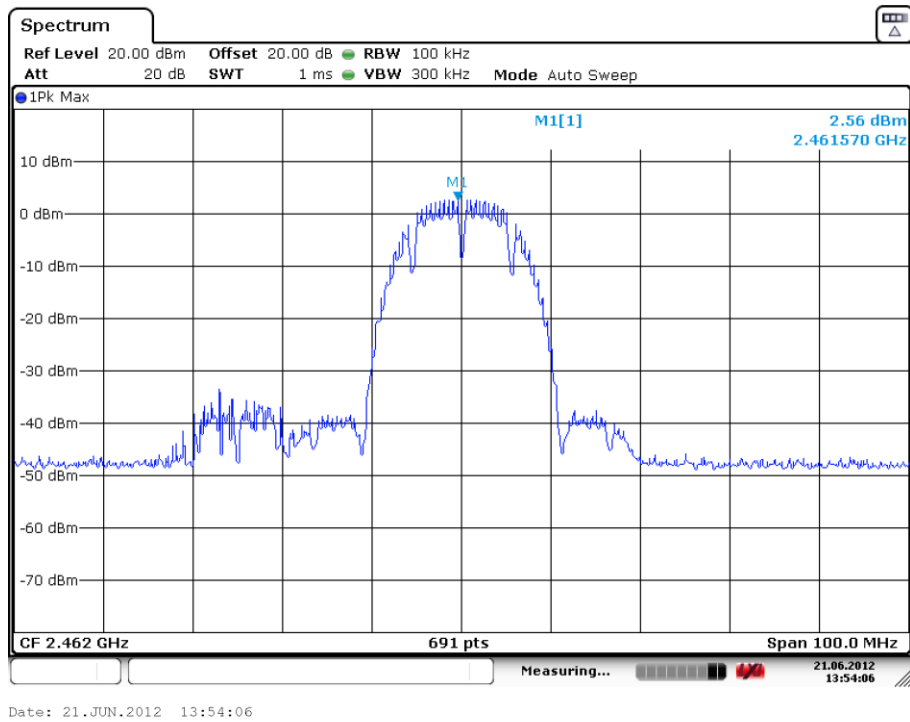


Fig. 39 Conducted Spurious Emission (802.11b, Ch11, Center Frequency)

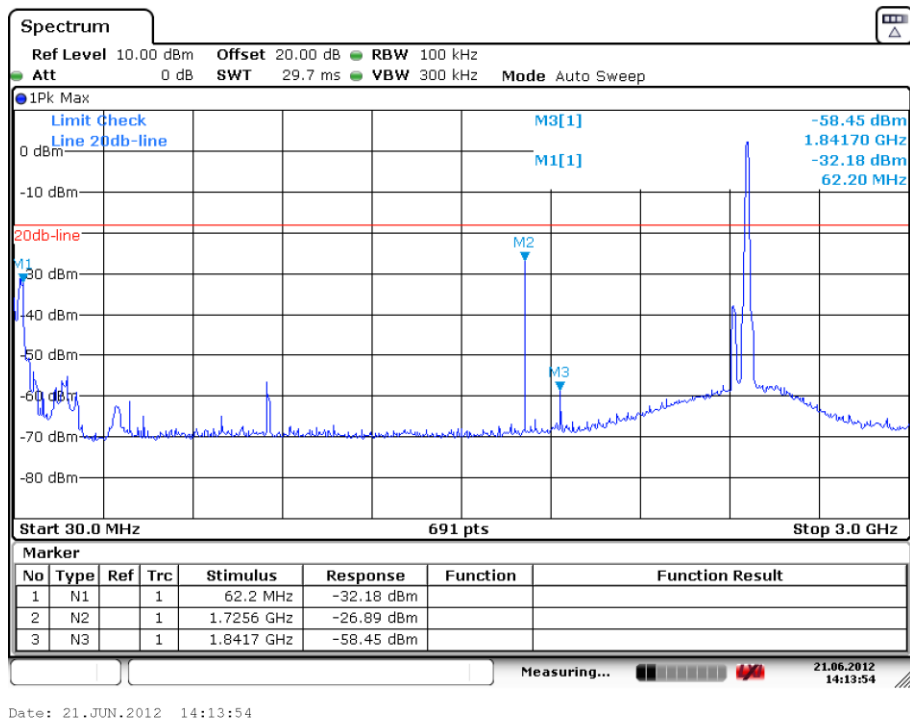


Fig. 40 Conducted Spurious Emission (802.11b, Ch11, 30 MHz-3 GHz)

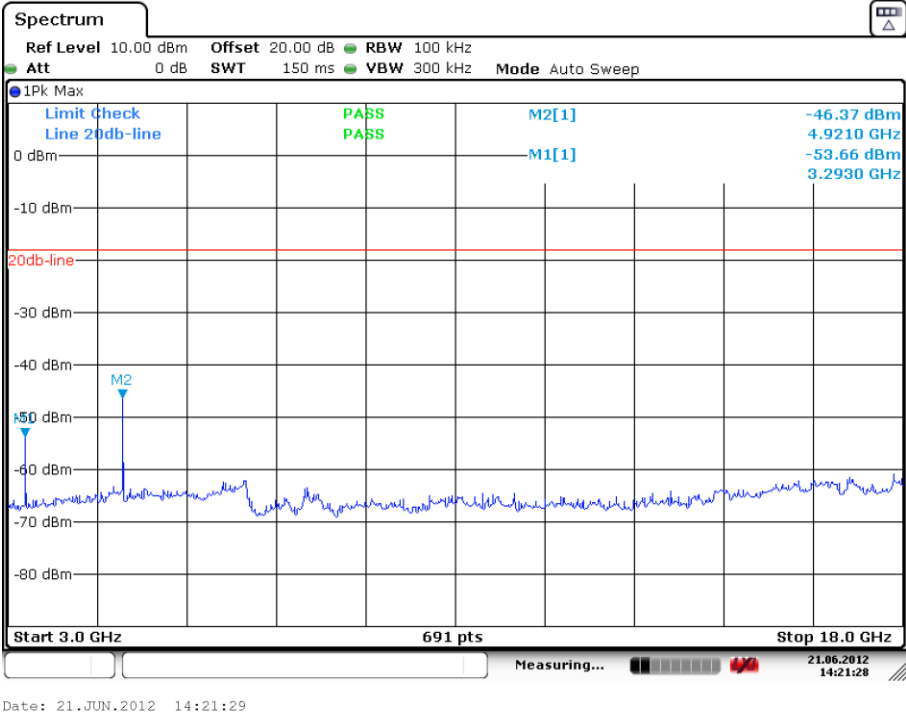


Fig. 41 Conducted Spurious Emission (802.11b, Ch11, 3 GHz-18 GHz)

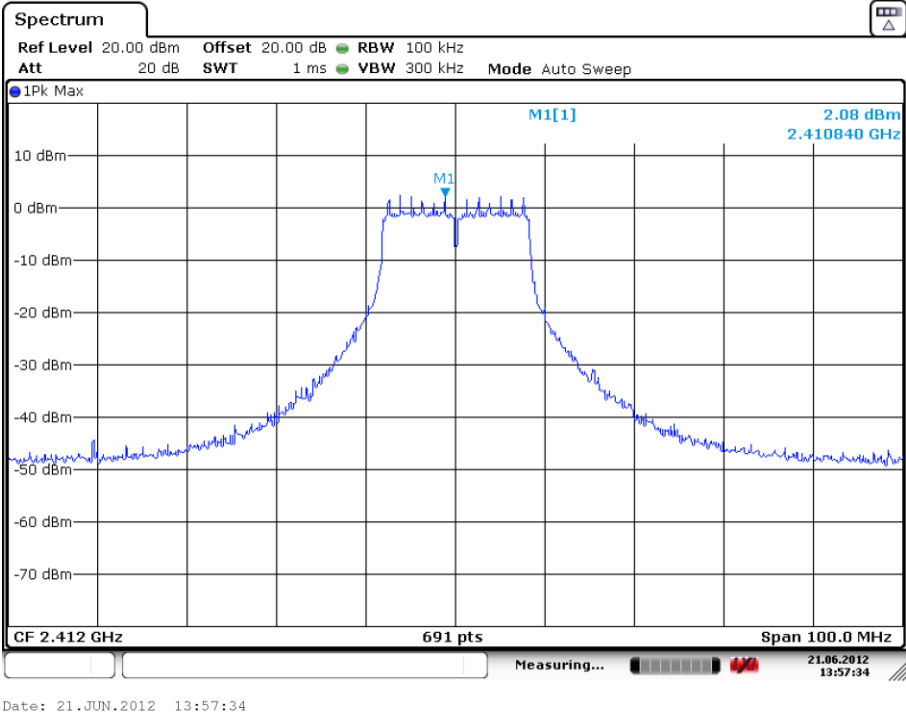


Fig. 42 Conducted Spurious Emission (802.11g, Ch1, Center Frequency)

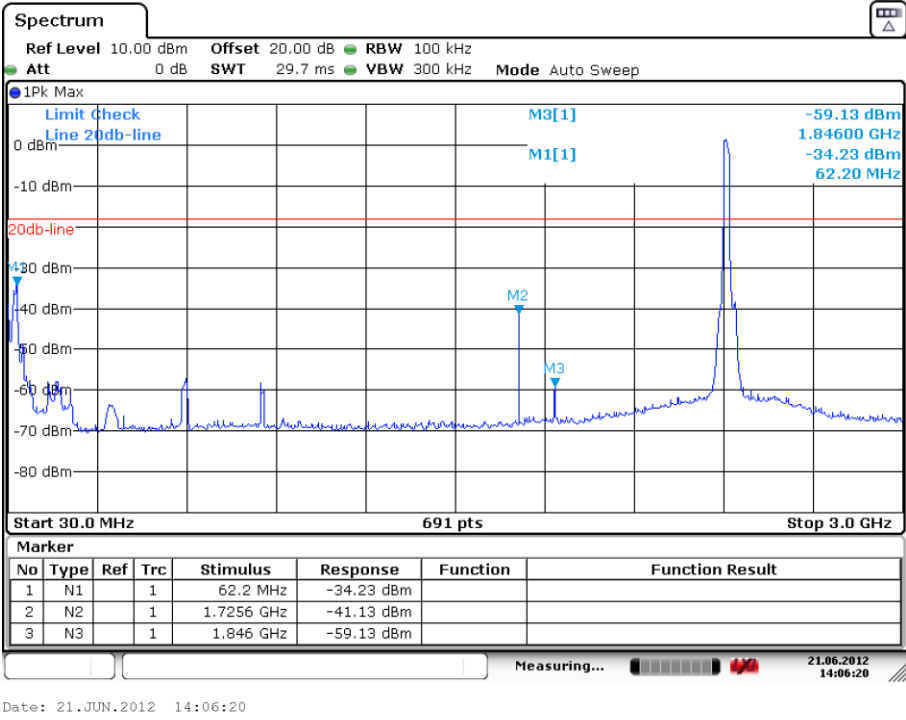


Fig. 43 Conducted Spurious Emission (802.11g, Ch1, 30 MHz-3 GHz)

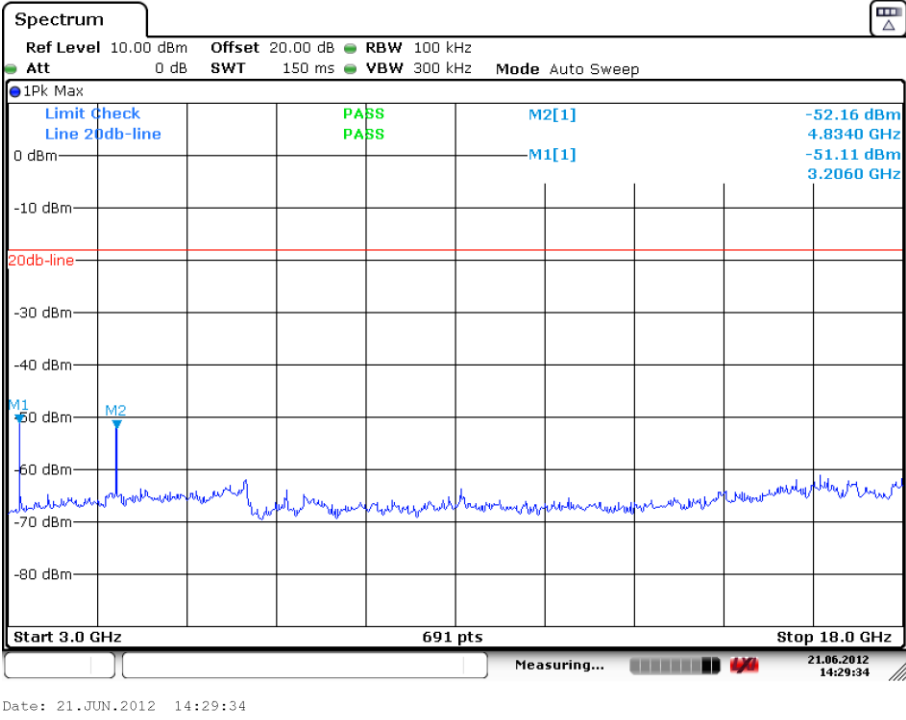
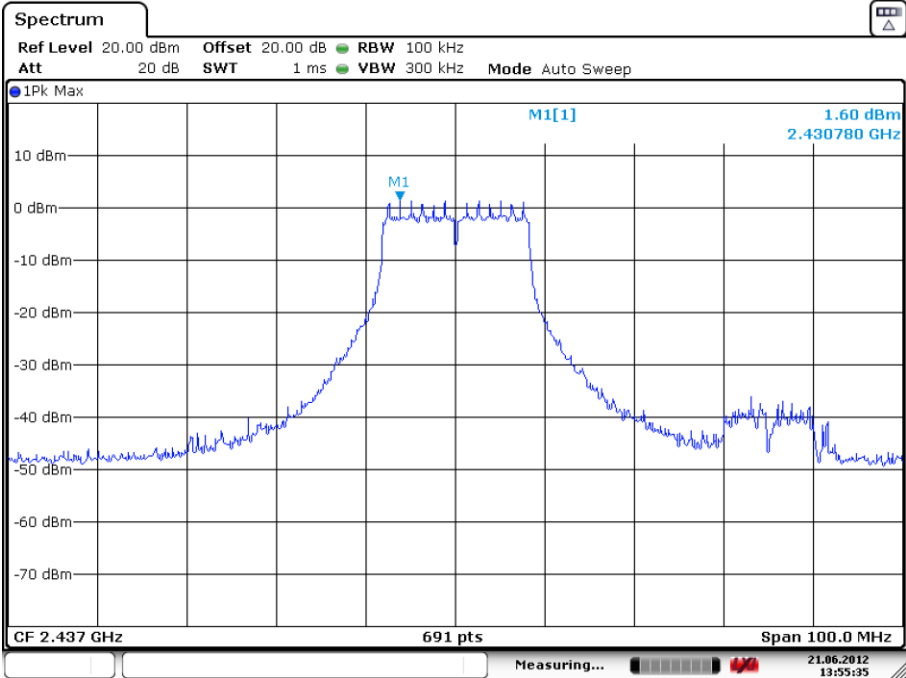
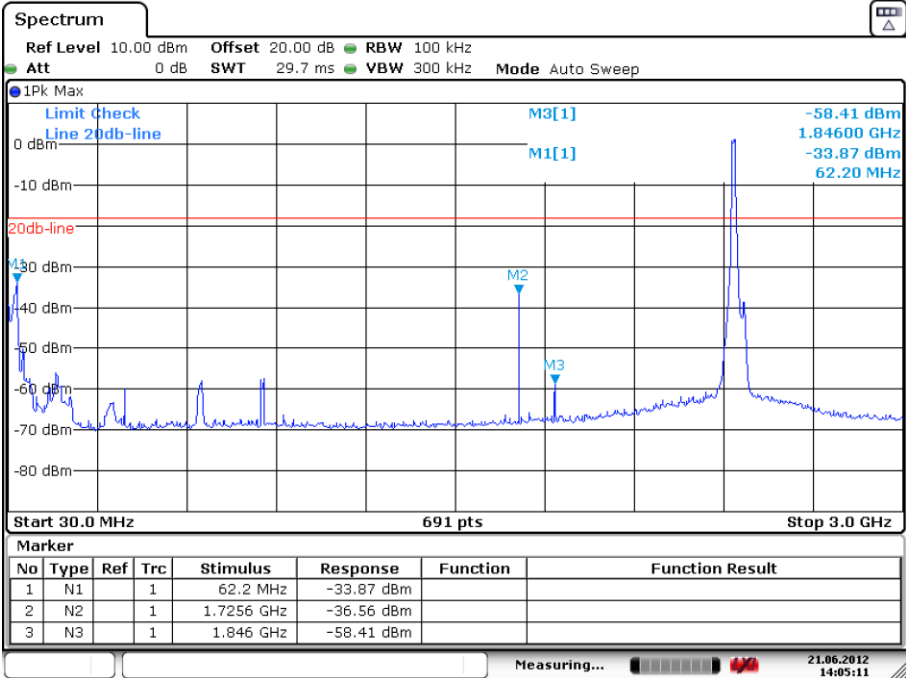


Fig. 44 Conducted Spurious Emission (802.11g, Ch1, 3 GHz-18 GHz)



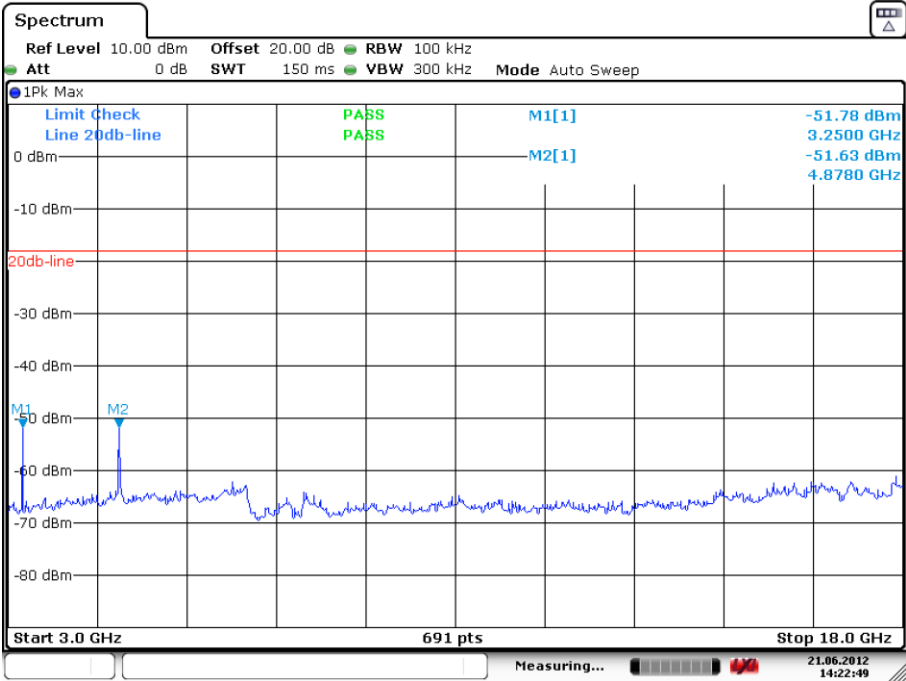
Date: 21.JUN.2012 13:55:35

Fig. 45 Conducted Spurious Emission (802.11g, Ch6, Center Frequency)



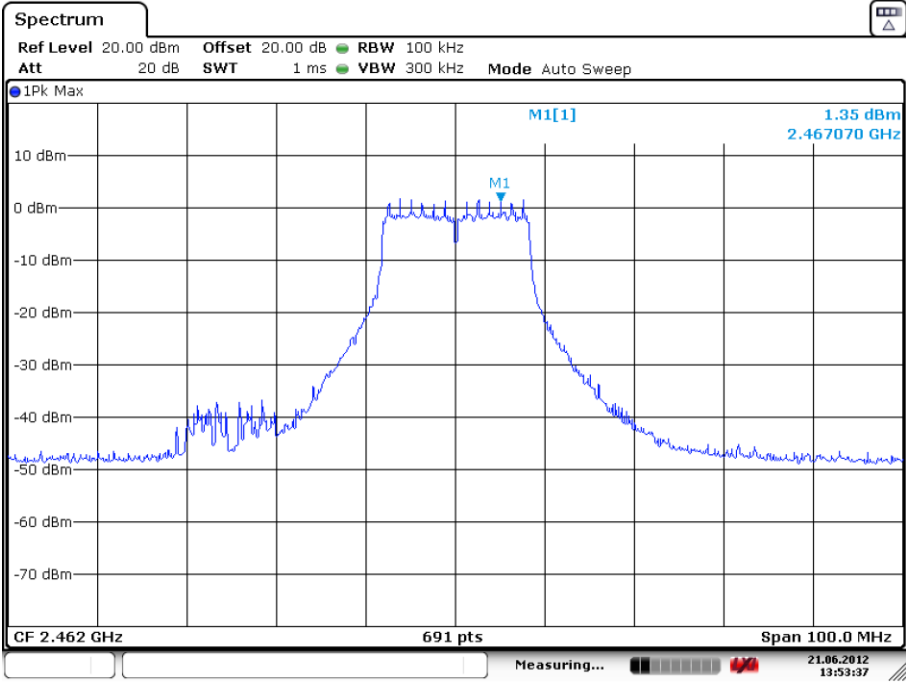
Date: 21.JUN.2012 14:05:11

Fig. 46 Conducted Spurious Emission (802.11g, Ch6, 30 MHz-3 GHz)



Date: 21.JUN.2012 14:22:50

Fig. 47 Conducted Spurious Emission (802.11g, Ch6, 3 GHz-18 GHz)



Date: 21.JUN.2012 13:53:37

Fig. 48 Conducted Spurious Emission (802.11g, Ch11, Center Frequency)

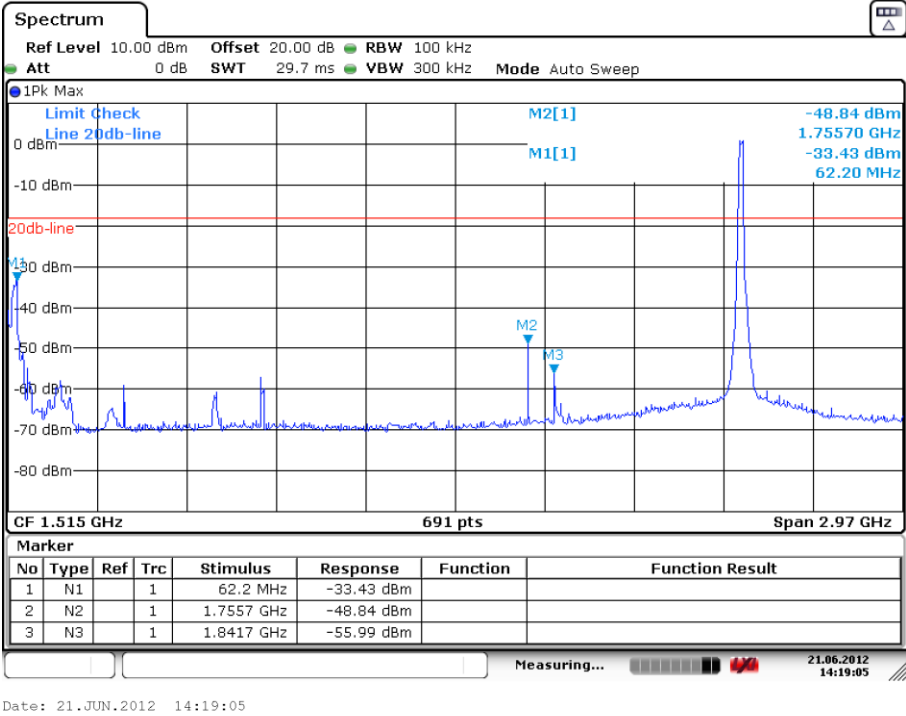


Fig. 49 Conducted Spurious Emission (802.11g, Ch11, 30 MHz-3 GHz)

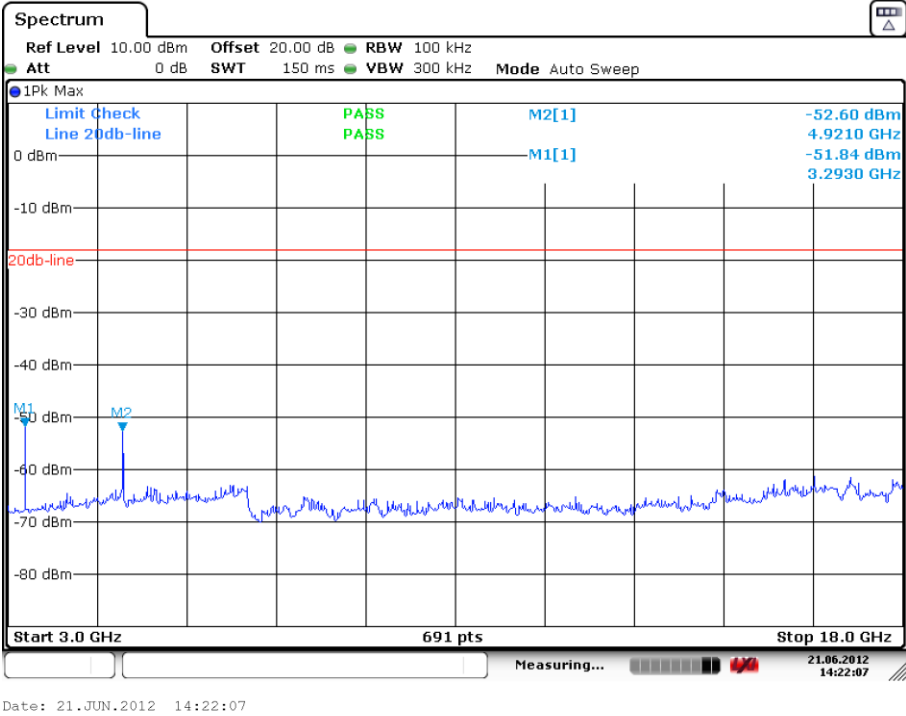


Fig. 50 Conducted Spurious Emission (802.11g, Ch11, 3 GHz-18 GHz)

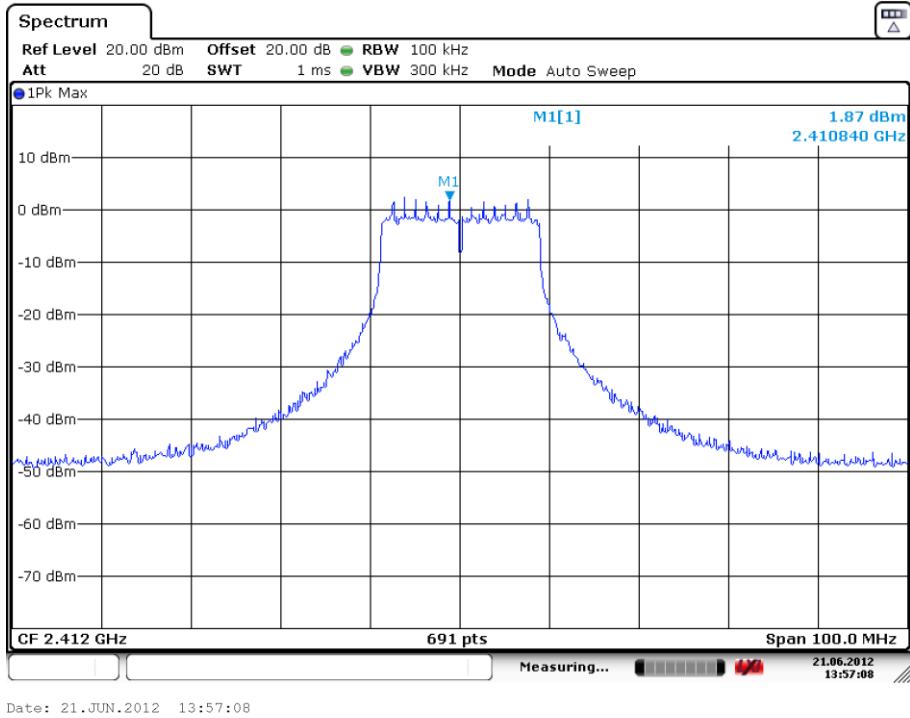


Fig. 51 Conducted Spurious Emission (802.11n-20M, Ch1, Center Frequency)

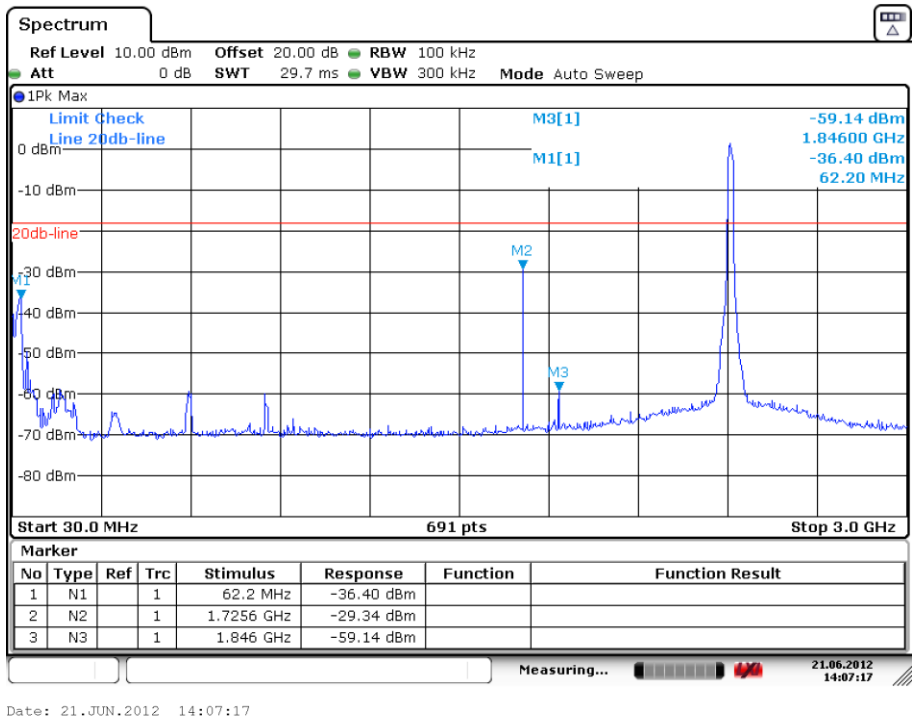


Fig. 52 Conducted Spurious Emission (802.11n-20M, Ch1, 30 MHz-3 GHz)

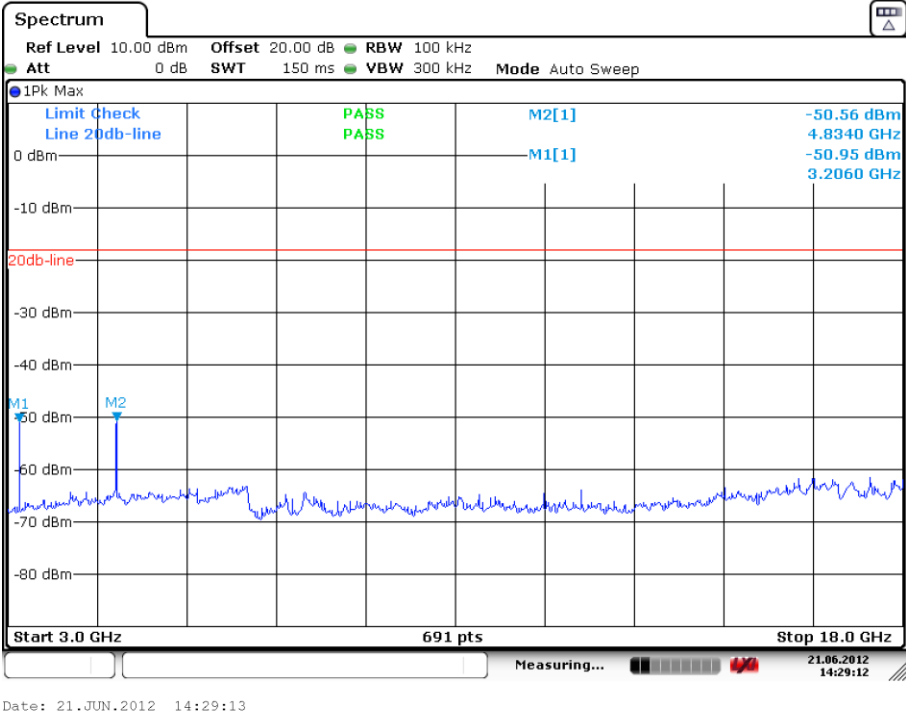


Fig. 53 Conducted Spurious Emission (802.11n-20M, Ch1, 3 GHz-18 GHz)

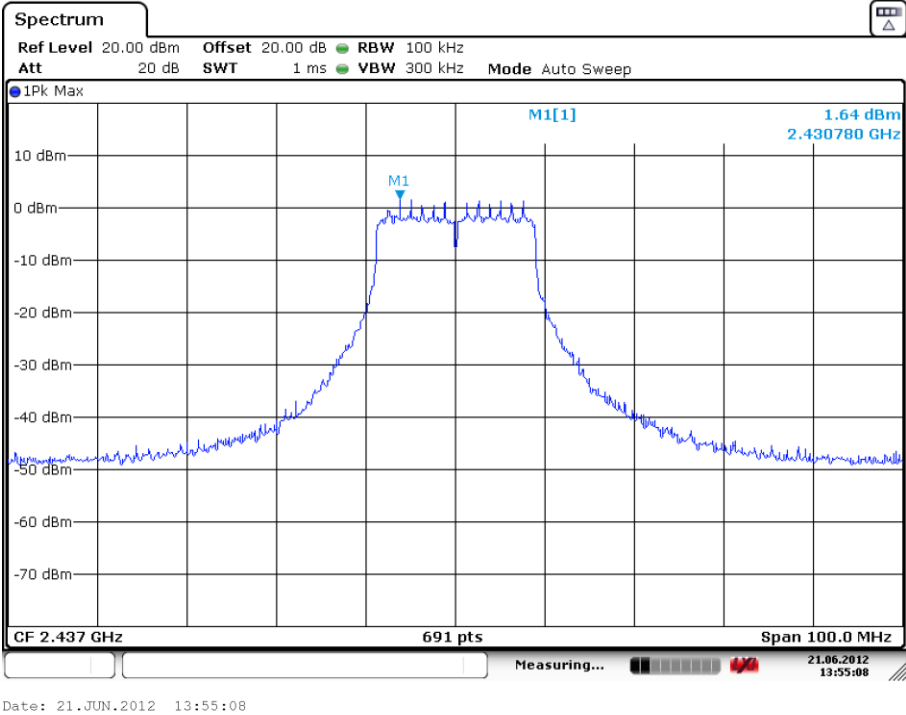


Fig. 54 Conducted Spurious Emission (802.11n-20M, Ch6, Center Frequency)

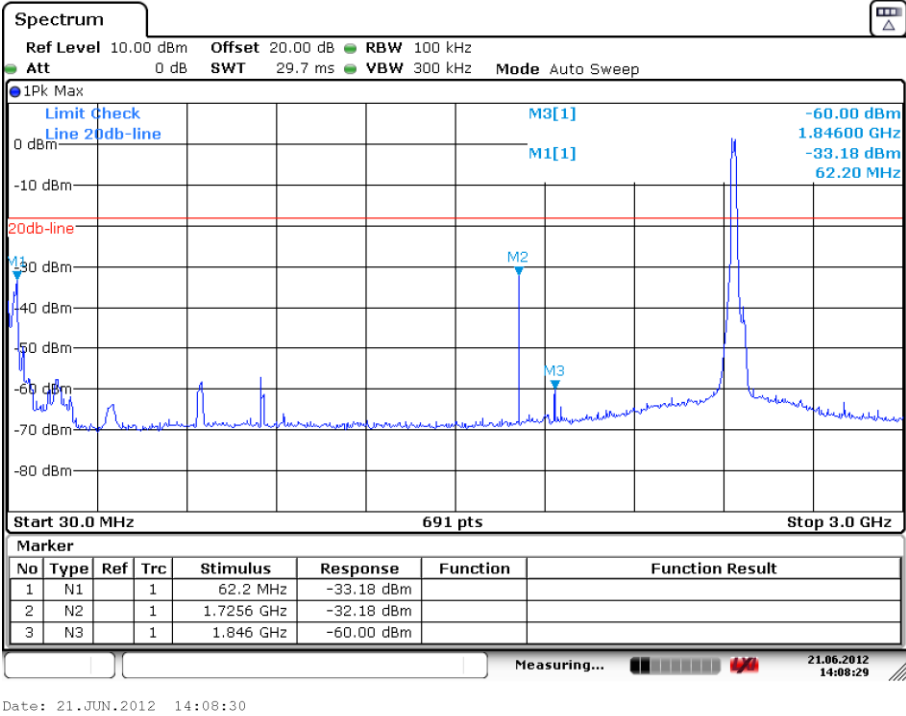


Fig. 55 Conducted Spurious Emission (802.11n-20M, Ch6, 30 MHz-3 GHz)

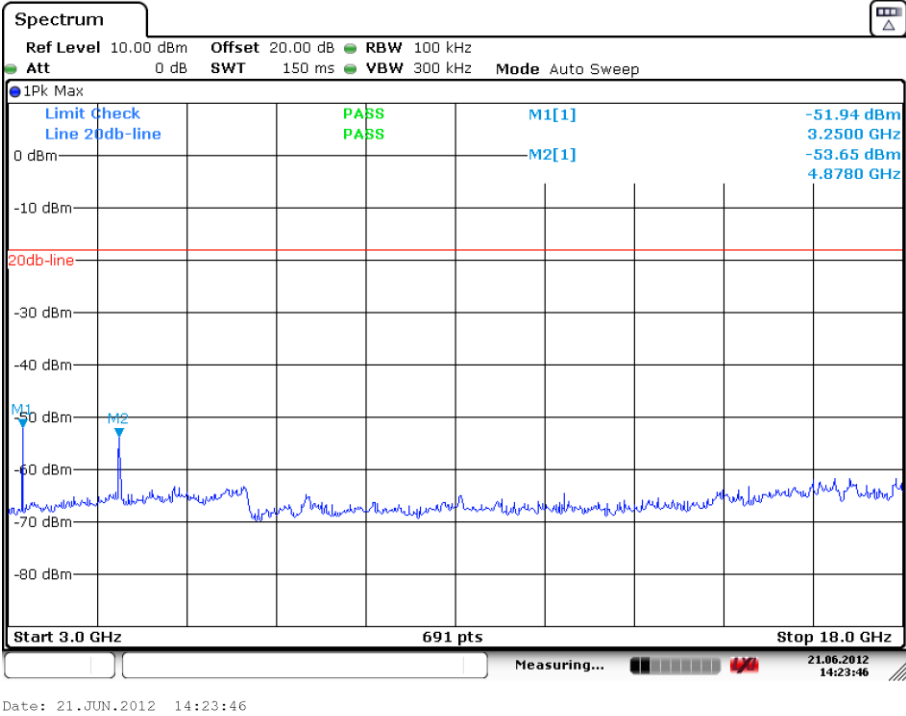


Fig. 56 Conducted Spurious Emission (802.11n-20M, Ch6, 3 GHz-18 GHz)

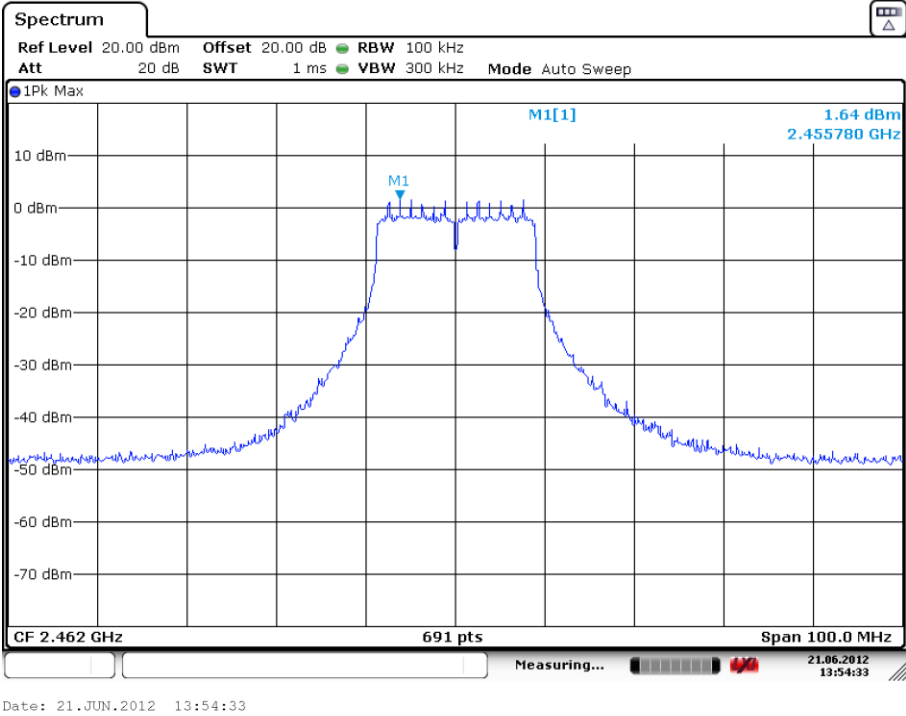


Fig. 57 Conducted Spurious Emission (802.11n-20M, Ch11, Center Frequency)

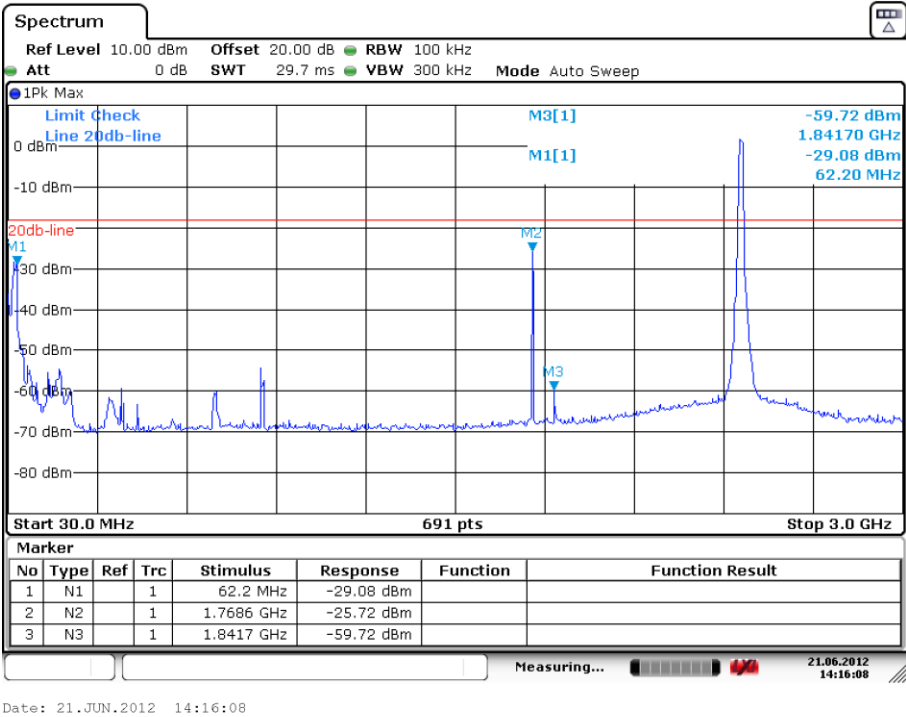


Fig. 58 Conducted Spurious Emission (802.11n-20M, Ch11, 30 MHz-3 GHz)

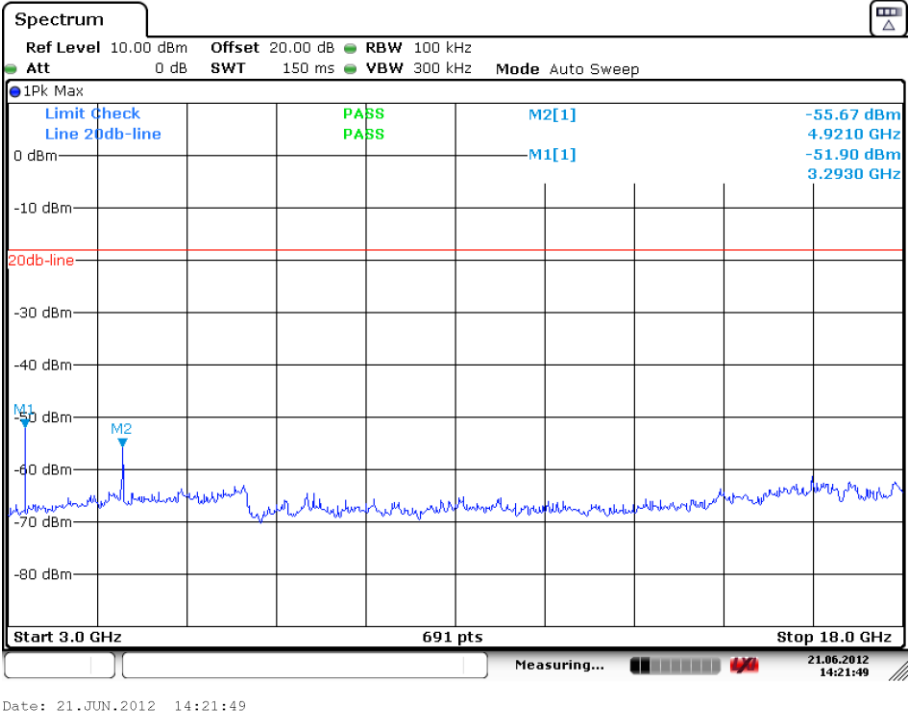


Fig. 59 Conducted Spurious Emission (802.11n-20M, Ch11, 3 GHz-18 GHz)

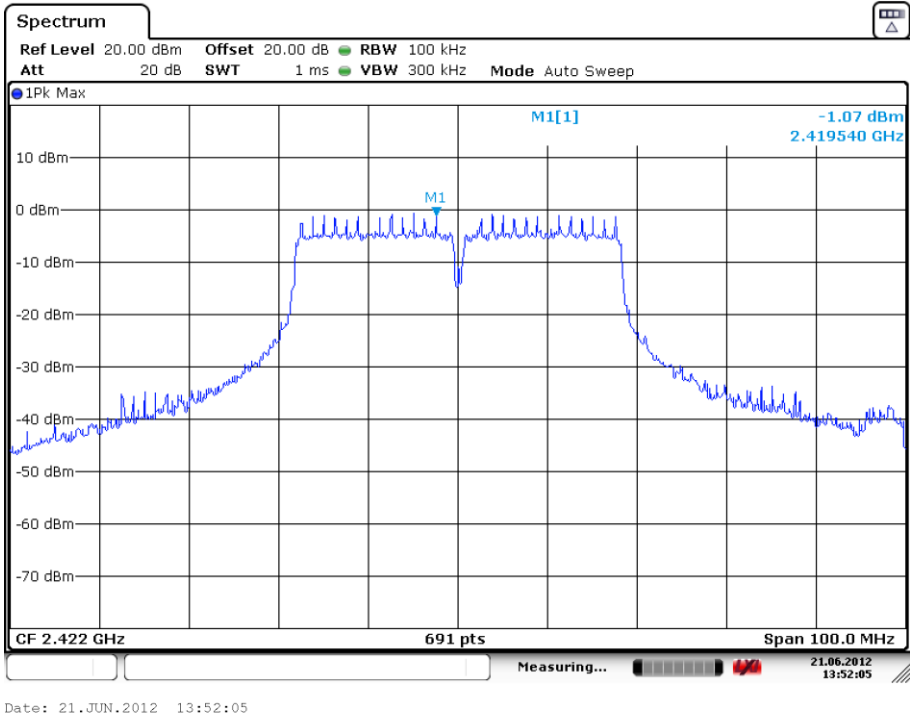


Fig. 60 Conducted Spurious Emission (802.11n-40M, Ch3, Center Frequency)

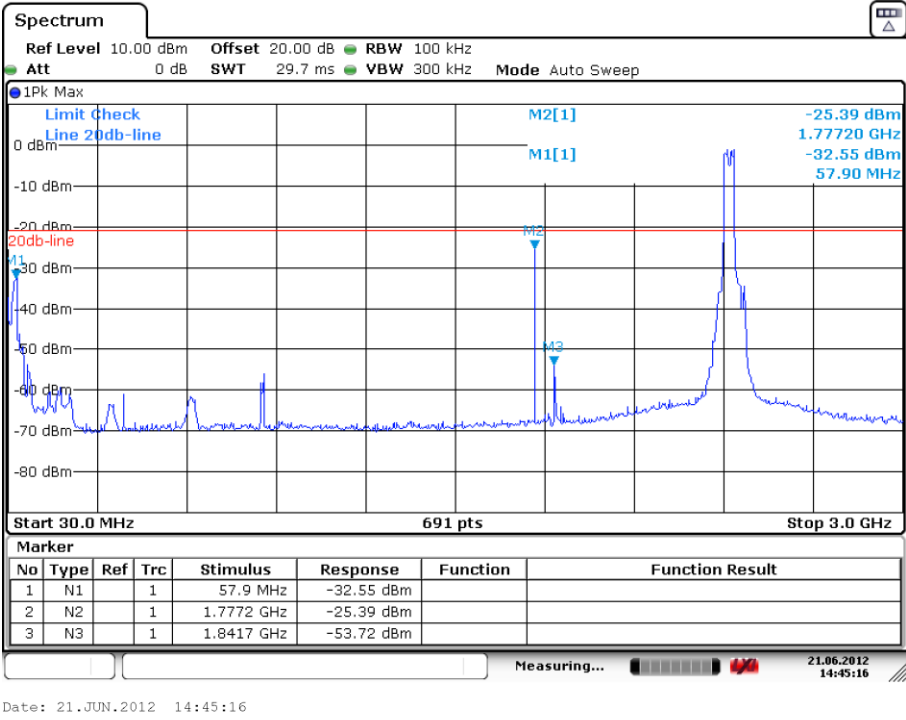


Fig. 61 Conducted Spurious Emission (802.11n-40M, Ch3, 30 MHz-3 GHz)

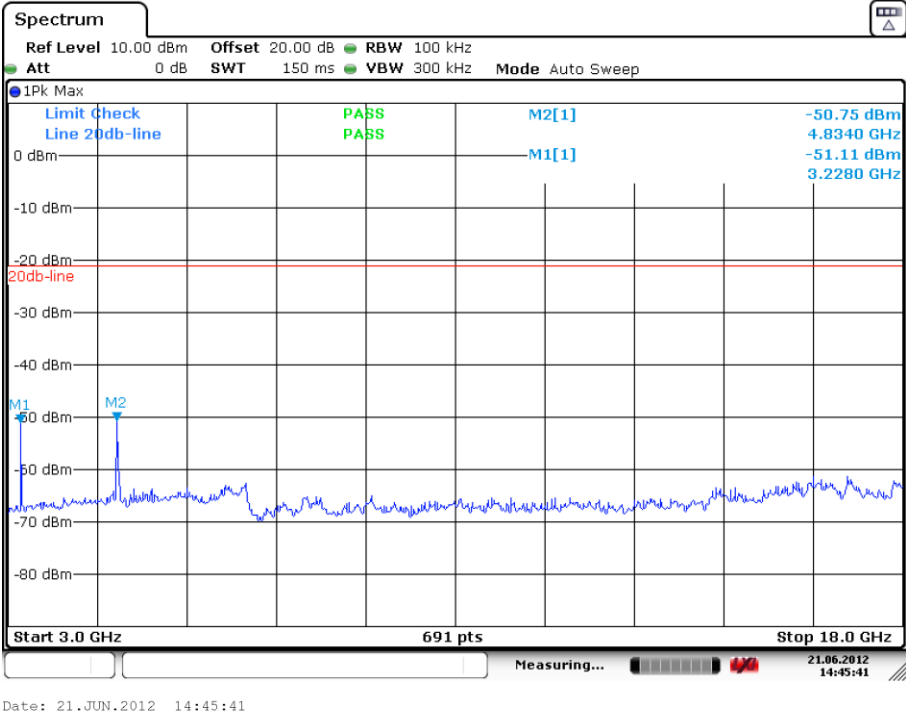


Fig. 62 Conducted Spurious Emission (802.11n-40M, Ch3, 3 GHz-18 GHz)

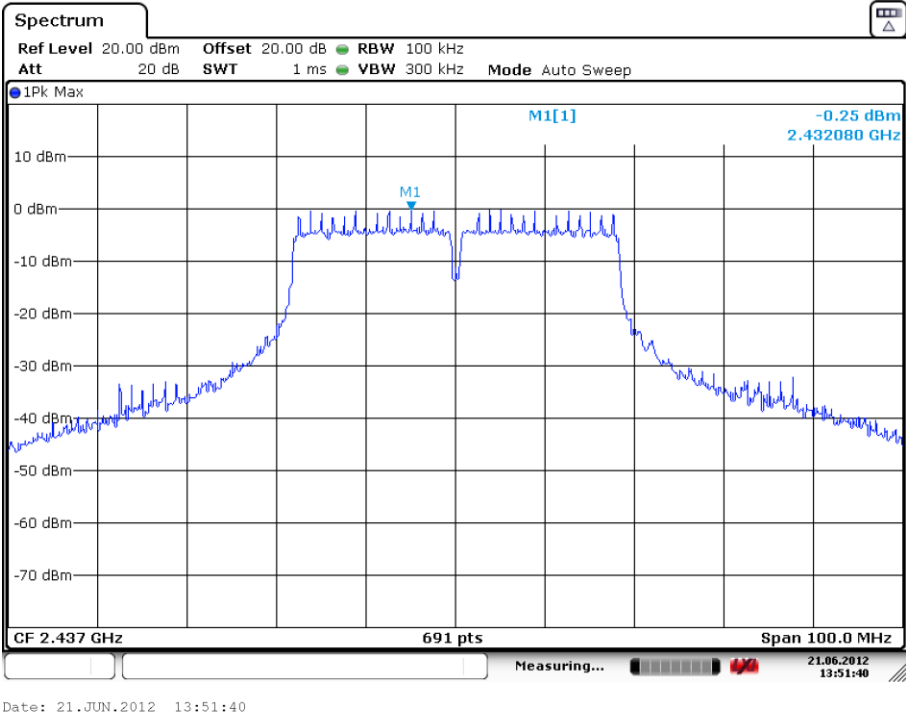


Fig. 63 Conducted Spurious Emission (802.11n-40M, Ch6, Center Frequency)

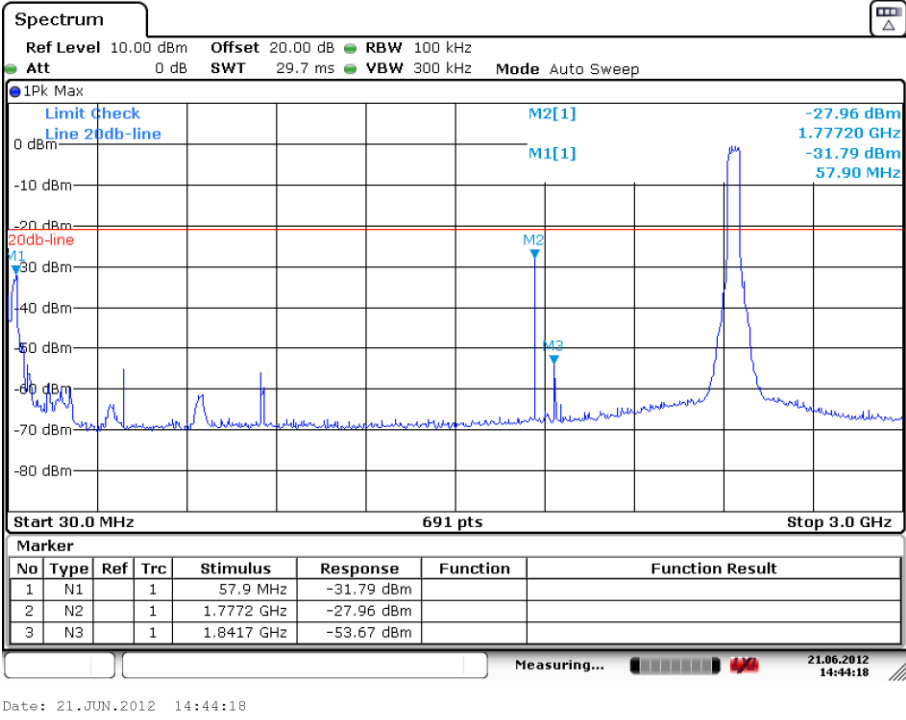


Fig. 64 Conducted Spurious Emission (802.11n-40M, Ch6, 30 MHz-3 GHz)

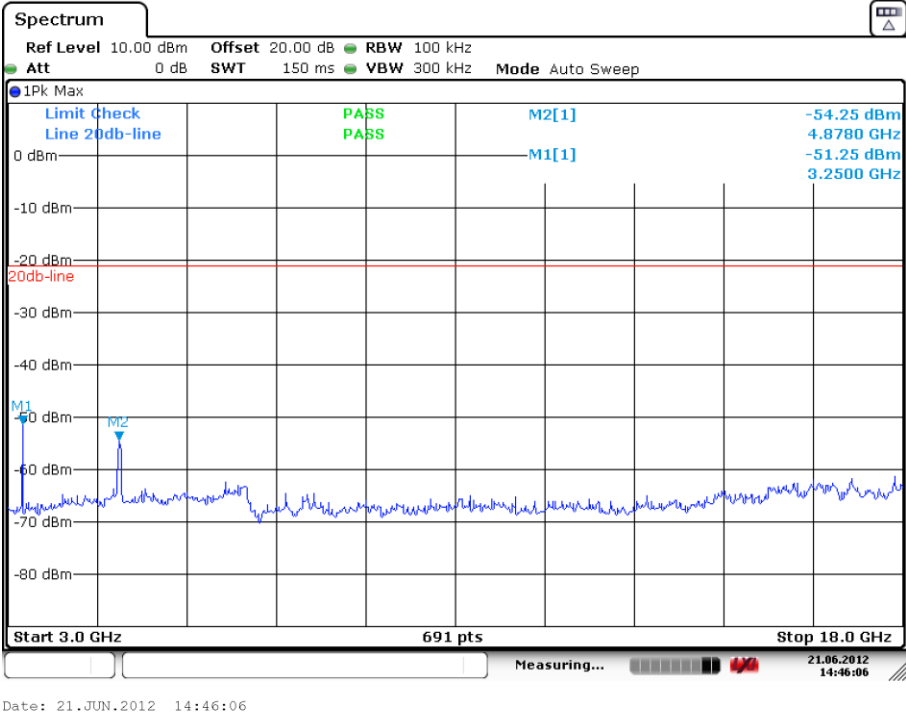


Fig. 65 Conducted Spurious Emission (802.11n-40M, Ch6, 3 GHz-18 GHz)

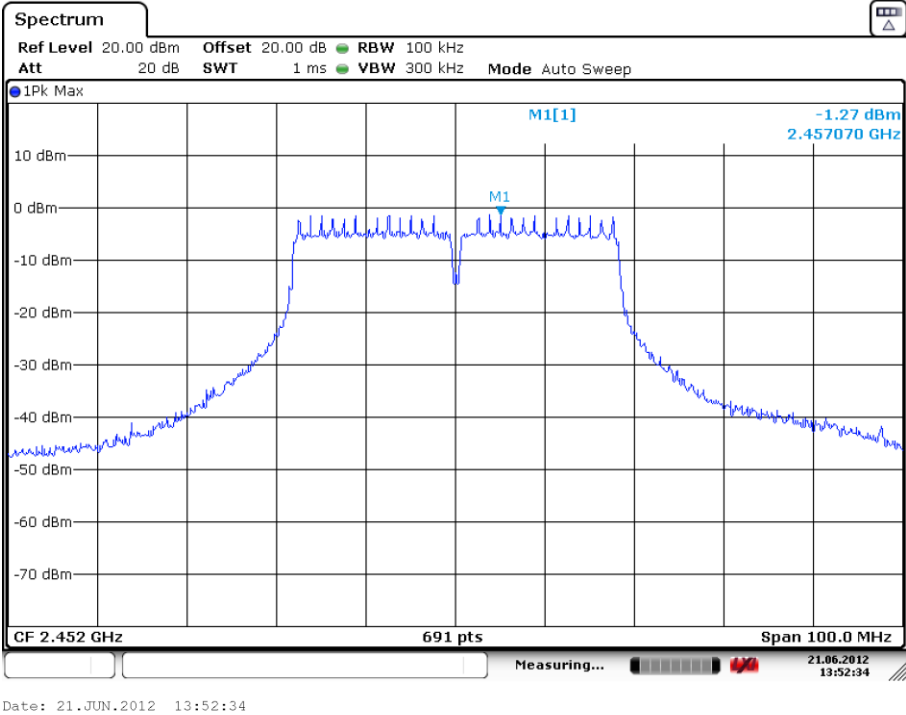


Fig. 66 Conducted Spurious Emission (802.11n-40M, Ch9, Center Frequency)

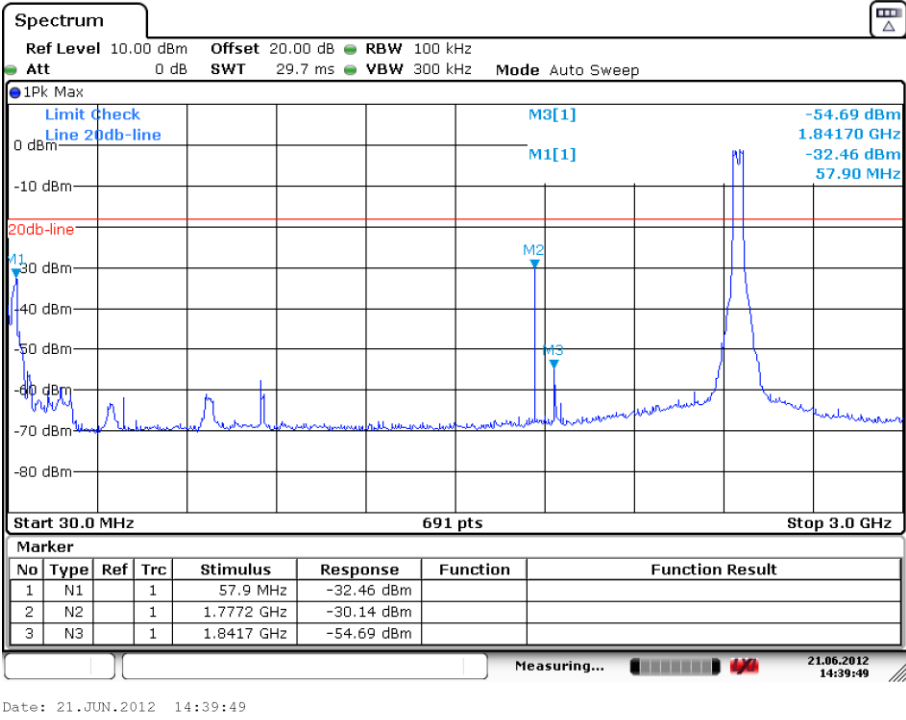


Fig. 67 Conducted Spurious Emission (802.11n-40M, Ch9, 30 MHz-3 GHz)

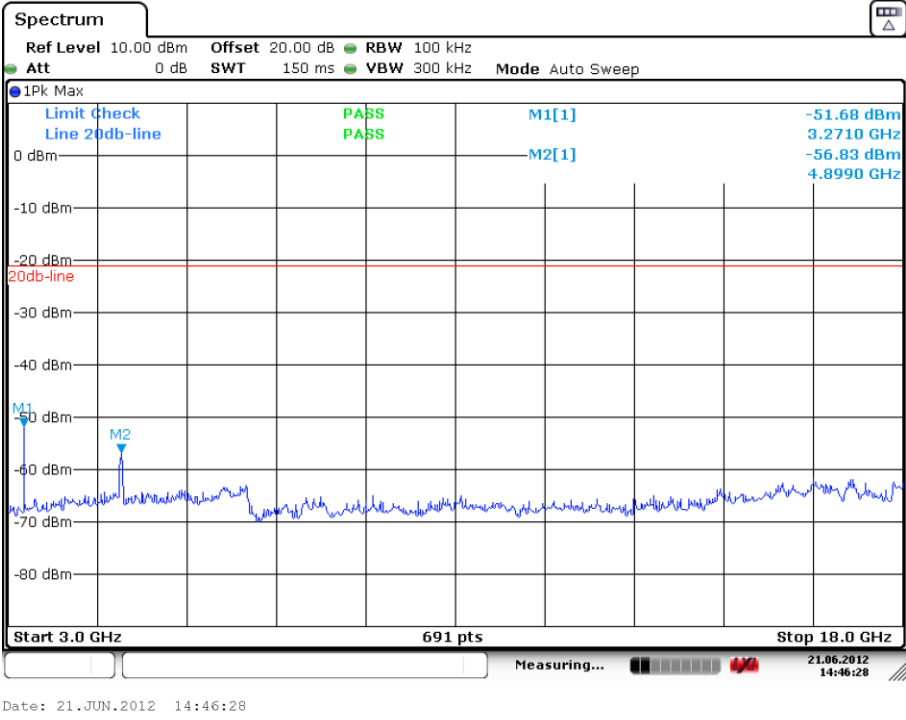


Fig. 68 Conducted Spurious Emission (802.11n-40M, Ch9, 3 GHz-18 GHz)

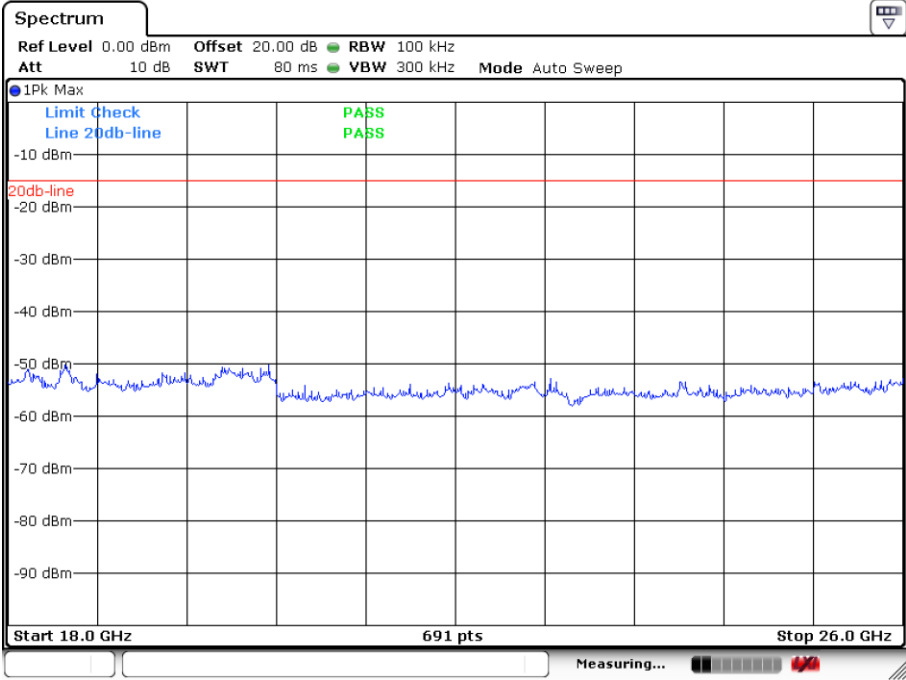


Fig. 69 Conducted Spurious Emission (All channels, 18 GHz-26 GHz)

A.6.2 Transmitter Spurious Emission - Radiated

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209	20dB below peak output power

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

The measurement is made according to ANSI C63.4 and KDB558074 D01.

Limit in restricted band:

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Condition

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100KHz/300KHz	5
1000-4000	1MHz/1MHz	15
4000-18000	1MHz/1MHz	40
18000-26500	1MHz/1MHz	20

Measurement Results:

802.11b/g mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11b	1	30 MHz ~1 GHz	Fig.70	P
		1 GHz ~ 3 GHz	Fig.71	P
		3 GHz ~ 18 GHz	Fig.72	P
	6	30 MHz ~1 GHz	Fig.73	P
		1 GHz ~ 3 GHz	Fig.74	P
		3 GHz ~ 18 GHz	Fig.75	P
	11	30 MHz ~1 GHz	Fig.76	P
		1 GHz ~ 3 GHz	Fig.77	P
		3 GHz ~ 18 GHz	Fig.78	P
802.11g	1	30 MHz ~1 GHz	Fig.79	P
		1 GHz ~ 3 GHz	Fig.80	P
		3 GHz ~ 18 GHz	Fig.81	P
	6	30 MHz ~1 GHz	Fig.82	P
		1 GHz ~ 3 GHz	Fig.83	P
		3 GHz ~ 18 GHz	Fig.84	P
	11	30 MHz ~1 GHz	Fig.85	P
		1 GHz ~ 3 GHz	Fig.86	P
		3 GHz ~ 18 GHz	Fig.87	P

802.11n mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n (20M)	1	30 MHz ~1 GHz	Fig.88	P
		1 GHz ~ 3 GHz	Fig.89	P
		3 GHz ~ 18 GHz	Fig.90	P
	6	30 MHz ~1 GHz	Fig.91	P
		1 GHz ~ 3 GHz	Fig.92	P
		3 GHz ~ 18 GHz	Fig.93	P
	11	30 MHz ~1 GHz	Fig.94	P
		1 GHz ~ 3 GHz	Fig.95	P
		3 GHz ~ 18 GHz	Fig.96	P
802.11n (40M)	3	30 MHz ~1 GHz	Fig.97	P
		1 GHz ~ 3 GHz	Fig.98	P
		3 GHz ~ 18 GHz	Fig.99	P
	6	30 MHz ~1 GHz	Fig.100	P
		1 GHz ~ 3 GHz	Fig.101	P
		3 GHz ~ 18 GHz	Fig.102	P
	9	30 MHz ~1 GHz	Fig.103	P
		1 GHz ~ 3 GHz	Fig.104	P
		3 GHz ~ 18 GHz	Fig.105	P
/	All channels	18 GHz~ 26.5 GHz	Fig.106	P

Conclusion: PASS

Note:

A "reference path loss" is established and the A_{Rpl} is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

P_{Mea} is the field strength recorded from the instrument.

The measurement results are obtained as described below:

Result= $P_{Mea}+A_{Rpl}= P_{Mea}+Cable Loss+Antenna Factor$

802.11b

Ch1

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2402.00	68.47	1.80	66.67	V
2406.00	89.24	1.80	87.44	V
2410.00	94.26	1.80	92.46	V
2414.00	94.18	1.80	92.38	V
2418.00	89.92	1.80	88.12	V
2422.00	70.30	1.80	68.50	H

Ch6

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2427.00	69.32	1.80	67.52	H
2431.00	90.30	1.82	88.48	V
2435.00	94.80	1.83	92.97	V
2439.00	94.61	1.84	92.77	H
2443.00	91.23	1.85	89.38	V
2447.00	71.93	1.86	70.07	V

Ch11

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2452.00	70.45	1.87	68.58	V
2456.00	91.01	1.87	89.14	H
2460.00	94.92	1.87	93.05	V
2464.00	94.47	1.87	92.60	V
2468.00	90.10	1.88	88.22	V
2472.00	70.42	1.88	68.54	V

802.11g

Ch1

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2402.00	68.66	1.80	66.86	H
2406.00	92.70	1.80	90.90	V
2410.00	92.61	1.80	90.81	V
2414.00	92.58	1.80	90.78	V
2418.00	92.80	1.80	91.00	V
2422.00	70.83	1.80	69.03	V

Ch6

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2427.00	69.43	1.80	67.63	V
2431.00	93.06	1.82	91.24	V
2435.00	93.23	1.83	91.40	V
2439.00	92.96	1.84	91.12	V
2443.00	92.75	1.85	90.90	V
2447.00	71.30	1.86	69.44	H

Ch11

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2452.00	69.48	1.87	67.61	V
2456.00	93.36	1.87	91.49	V
2460.00	93.14	1.87	91.27	V
2464.00	92.86	1.87	90.99	V
2468.00	92.78	1.88	90.90	V
2472.00	70.31	1.88	68.43	V

802.11n-20MHz

Ch1

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2402.00	74.67	1.80	72.87	V
2406.00	91.96	1.80	90.16	H
2410.00	91.92	1.80	90.12	V
2414.00	92.04	1.80	90.24	V
2418.00	92.13	1.80	90.33	V
2422.00	77.24	1.80	75.44	V

Ch6

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2427.00	75.22	1.80	73.42	H
2431.00	92.15	1.82	90.33	H
2435.00	93.06	1.83	91.23	V
2439.00	92.41	1.84	90.57	V
2443.00	92.39	1.85	90.54	V
2447.00	79.59	1.86	77.73	V

Ch11

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2452.00	76.37	1.87	74.50	V
2456.00	93.21	1.87	91.34	V
2460.00	93.05	1.87	91.18	V
2464.00	92.67	1.87	90.80	V
2468.00	92.63	1.88	90.75	V
2472.00	77.39	1.88	75.51	H

802.11n-40MHz

Ch3

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2402.00	64.84	1.80	63.04	V
2410.00	89.28	1.80	87.48	V
2418.00	89.51	1.80	87.71	H
2426.00	89.90	1.80	88.10	V
2434.00	90.27	1.82	88.45	V
2442.00	68.39	1.85	66.54	V

Ch6

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2417.00	65.56	1.80	63.76	H
2425.00	90.33	1.82	88.51	V
2433.00	90.39	1.83	88.56	H
2441.00	91.20	1.84	89.36	V
2449.00	90.65	1.85	88.80	V
2457.00	70.33	1.86	68.47	V

Ch9

Frequency(MHz)	Result (dBuV/m)	Cable Loss + Antenna Factor	P _{Mea} (dBuV/m)	Polarization
2432.00	65.26	1.82	63.44	V
2440.00	89.86	1.84	88.02	V
2448.00	90.30	1.87	88.43	V
2456.00	90.27	1.87	88.40	V
2464.00	89.85	1.87	87.98	V
2472.00	66.69	1.88	64.81	V

Test graphs as below:

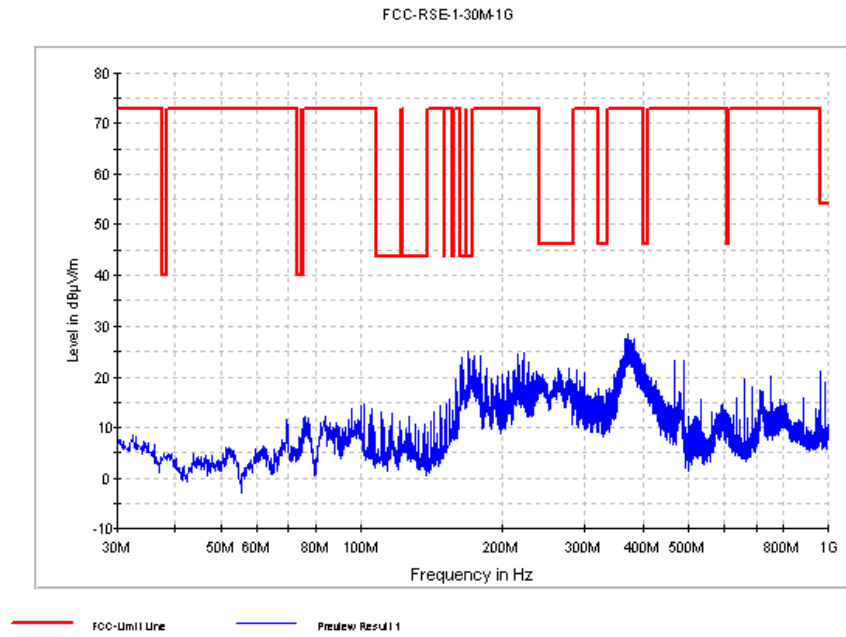


Fig. 70 Radiated Spurious Emission (802.11b, Ch1, 30 MHz-1 GHz)

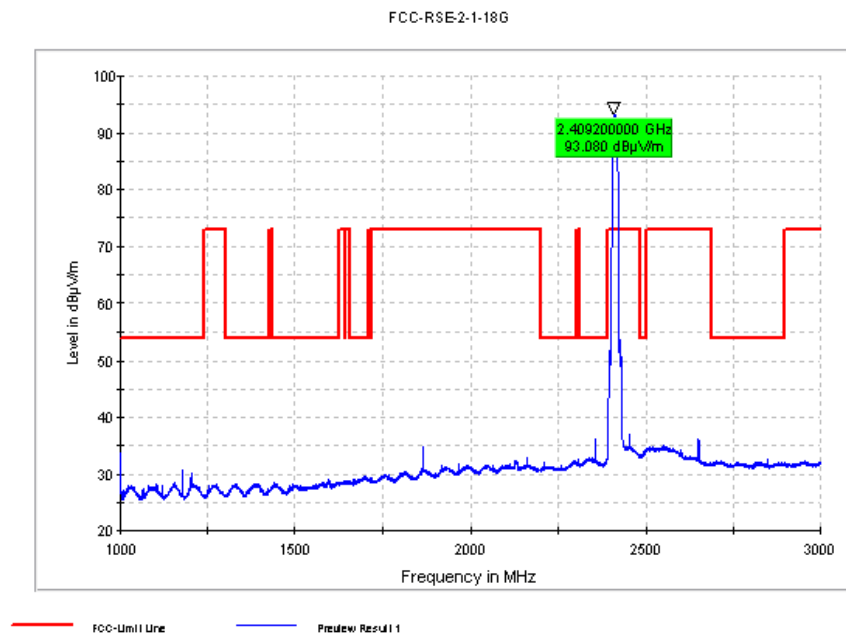


Fig. 71 Radiated Spurious Emission (802.11b, Ch1, 1 GHz-3 GHz)

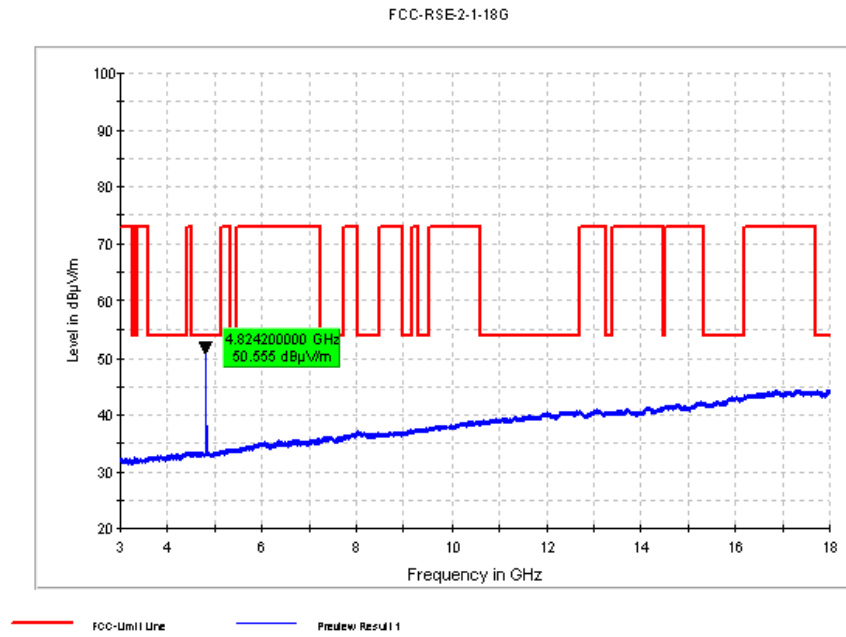


Fig. 72 Radiated Spurious Emission (802.11b, Ch1, 3 GHz-18 GHz)

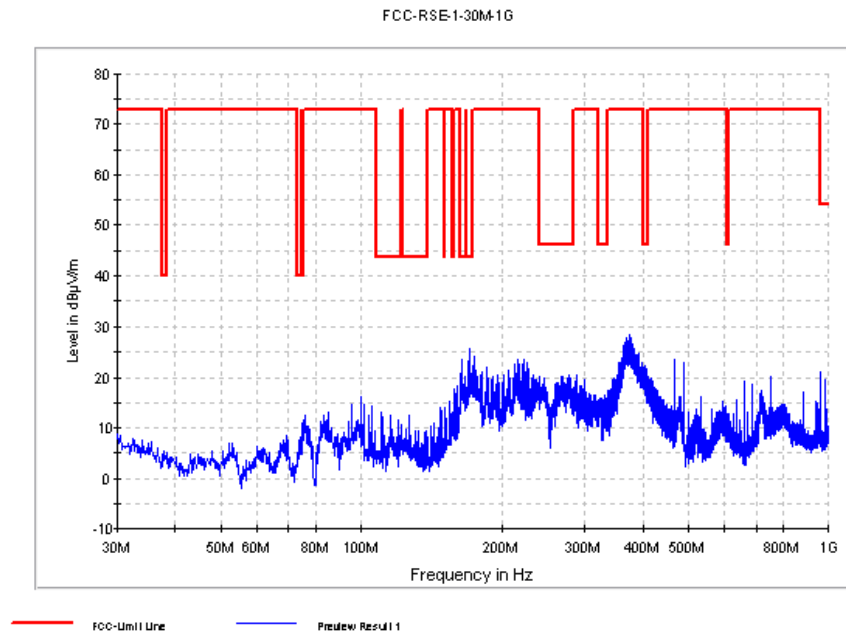


Fig. 73 Radiated Spurious Emission (802.11b, Ch6, 30 MHz-1 GHz)

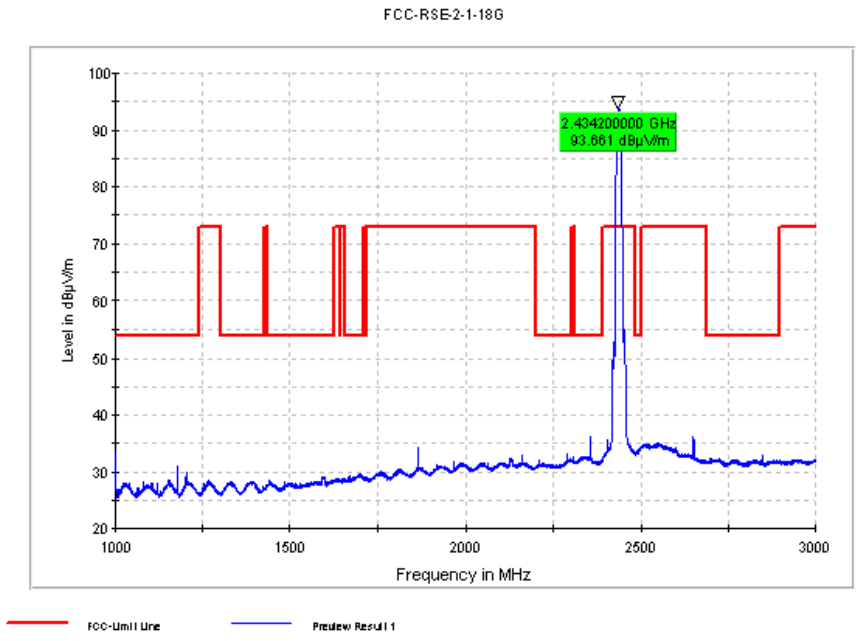


Fig. 74 Radiated Spurious Emission (802.11b, Ch6, 1 GHz-3 GHz)

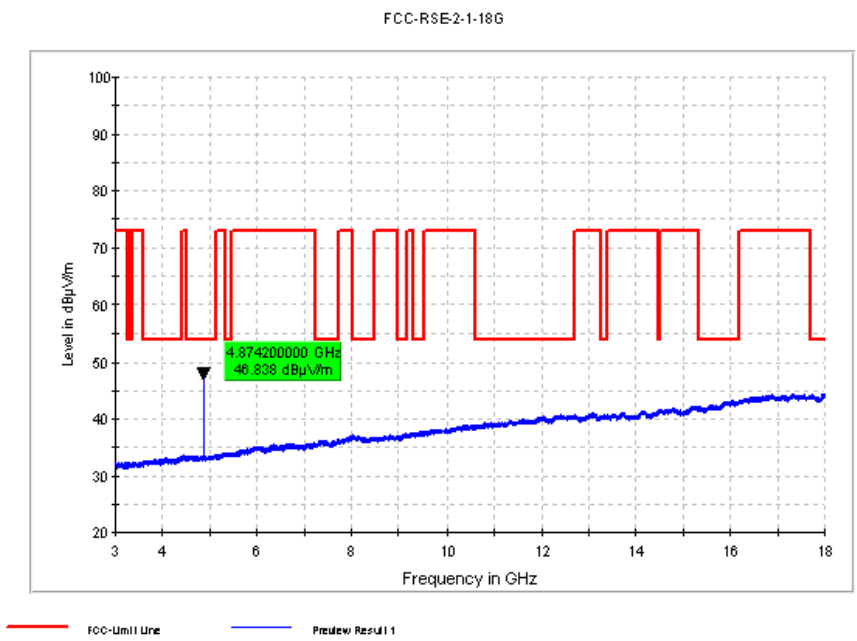


Fig. 75 Radiated Spurious Emission (802.11b, Ch6, 3 GHz-18 GHz)

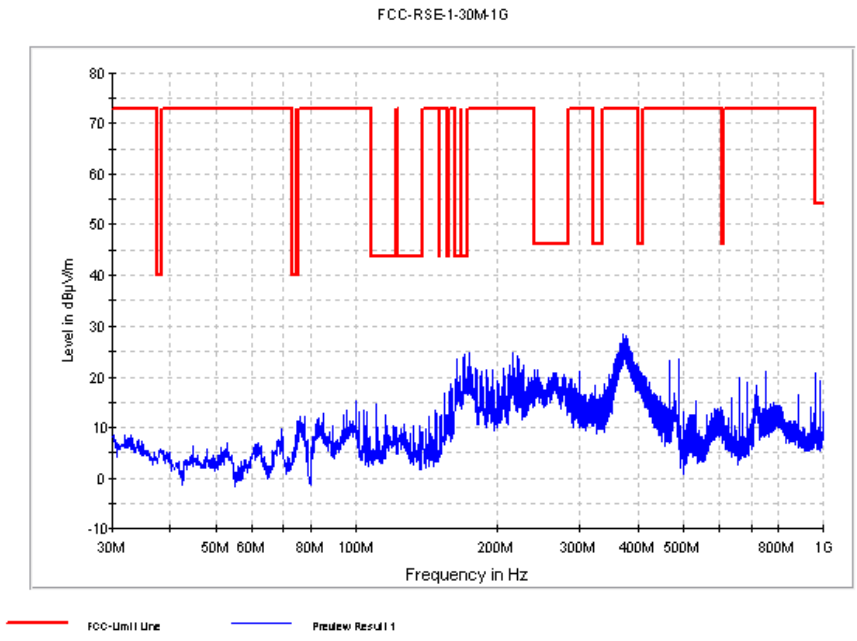


Fig. 76 Radiated Spurious Emission (802.11b, Ch11, 30 MHz-1 GHz)

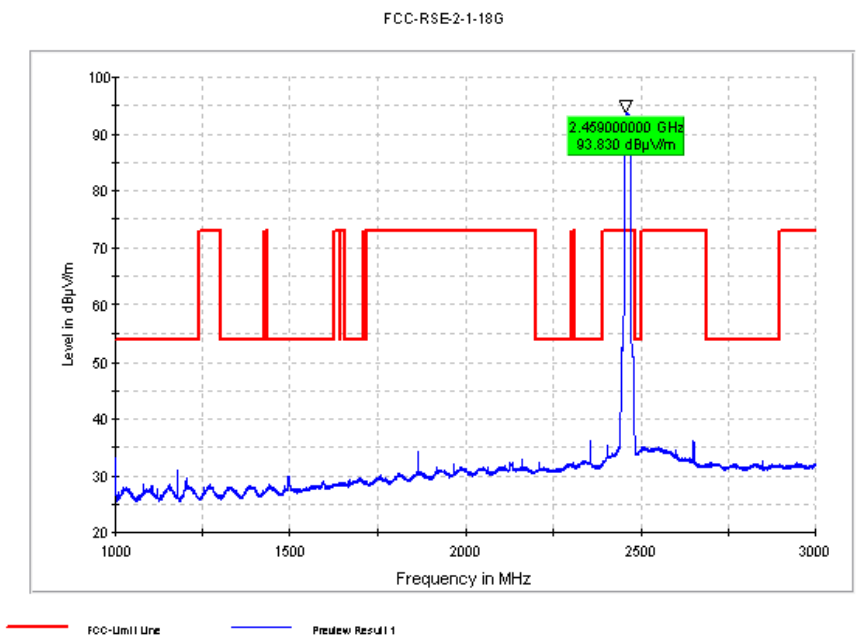


Fig. 77 Radiated Spurious Emission (802.11b, Ch11, 1 GHz-3 GHz)

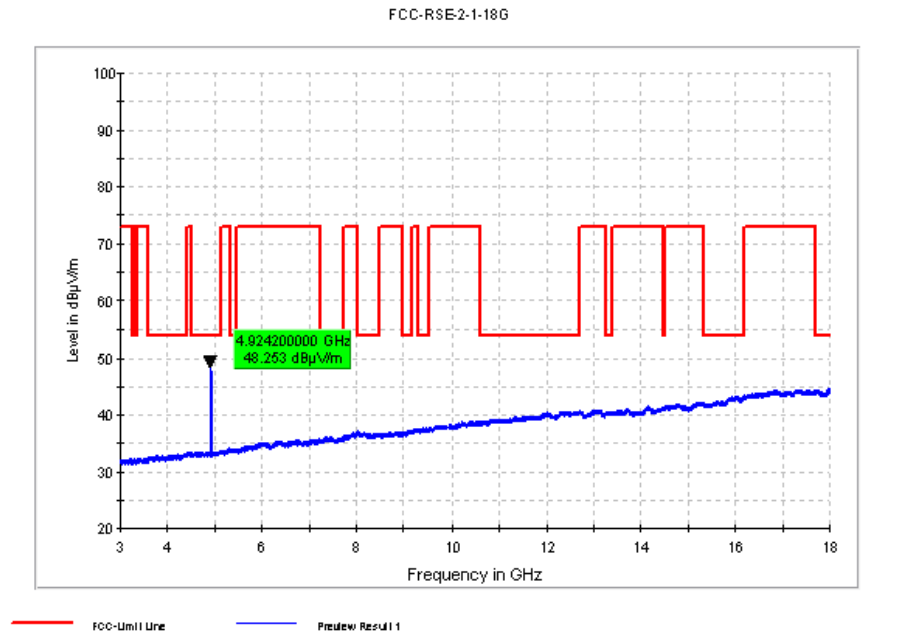


Fig. 78 Radiated Spurious Emission (802.11b, Ch11, 3 GHz-18 GHz)

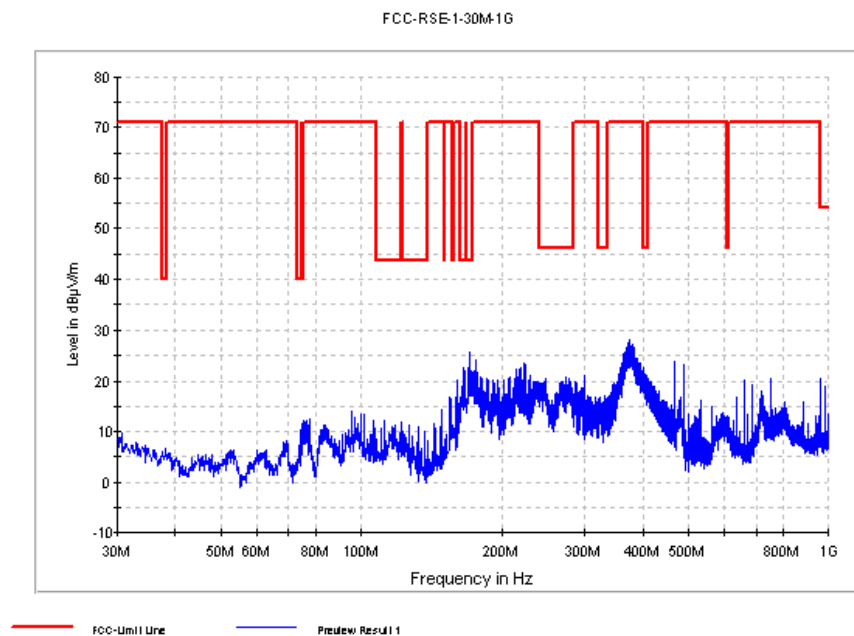


Fig. 79 Radiated Spurious Emission (802.11g, Ch1, 30 MHz-1 GHz)

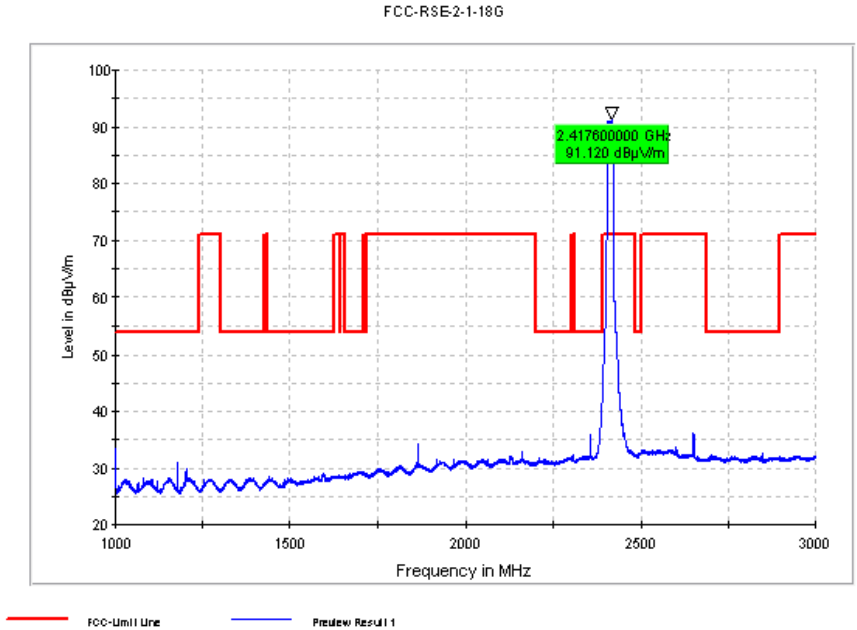


Fig. 80 Radiated Spurious Emission (802.11g, Ch1, 1 GHz-3 GHz)

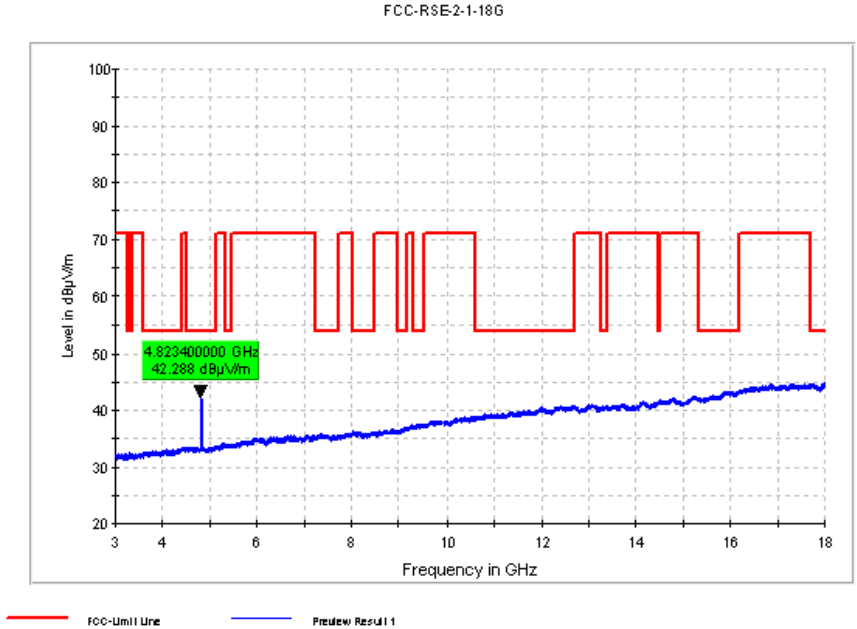


Fig. 81 Radiated Spurious Emission (802.11g, Ch1, 3 GHz-18 GHz)

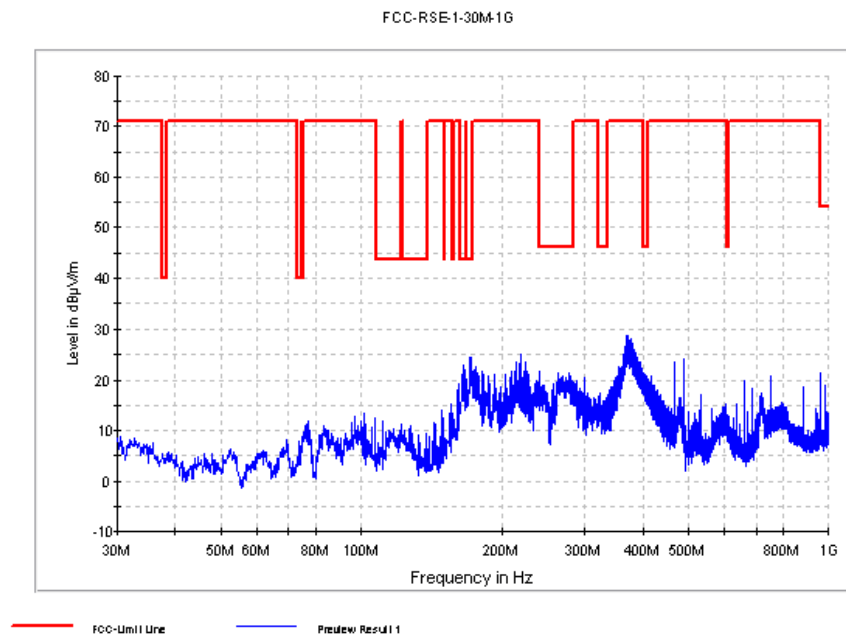


Fig. 82 Radiated Spurious Emission (802.11g, Ch6, 30 MHz-1 GHz)

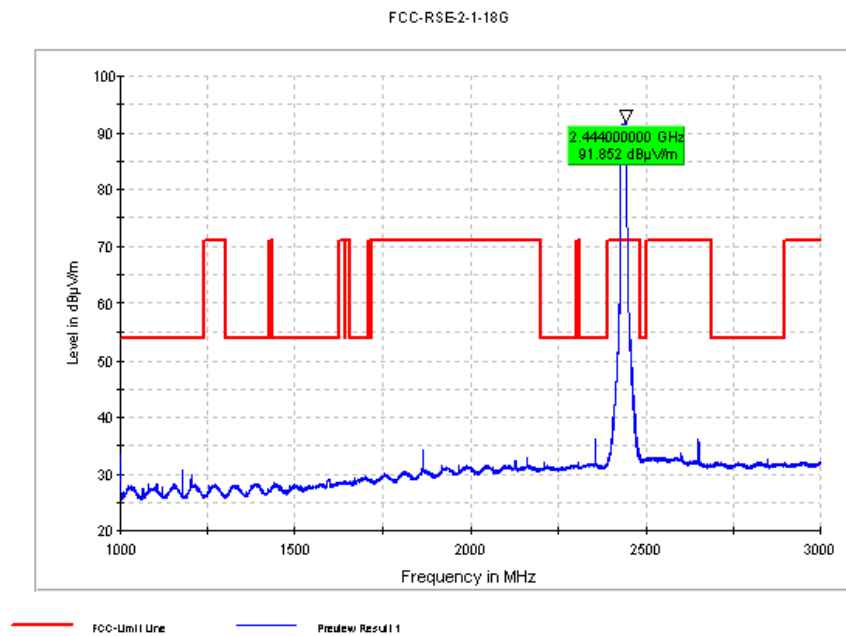


Fig. 83 Radiated Spurious Emission (802.11g, Ch6, 1 GHz-3 GHz)

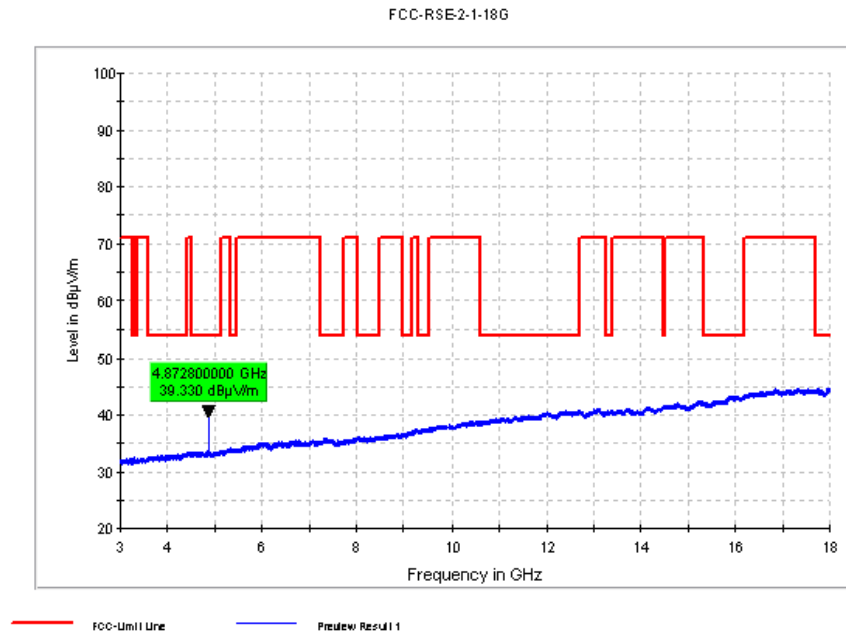


Fig. 84 Radiated Spurious Emission (802.11g, Ch6, 3 GHz-18 GHz)

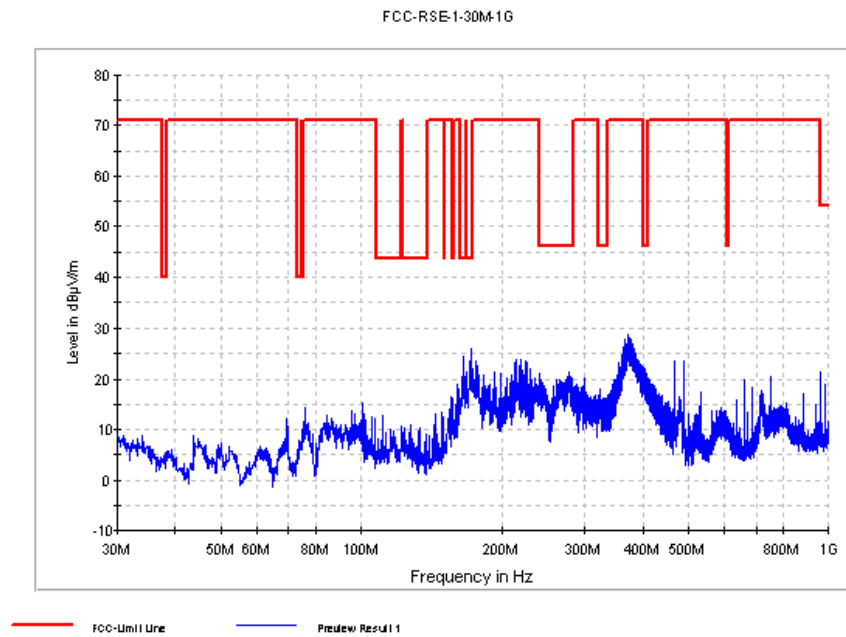


Fig. 85 Radiated Spurious Emission (802.11g, Ch11, 30 MHz-1 GHz)

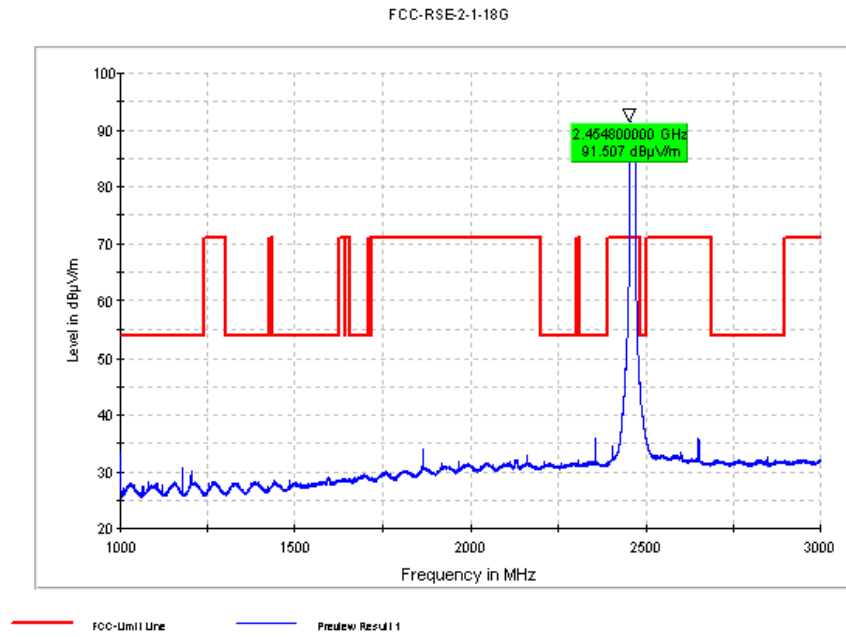


Fig. 86 Radiated Spurious Emission (802.11g, Ch11, 1 GHz-3 GHz)

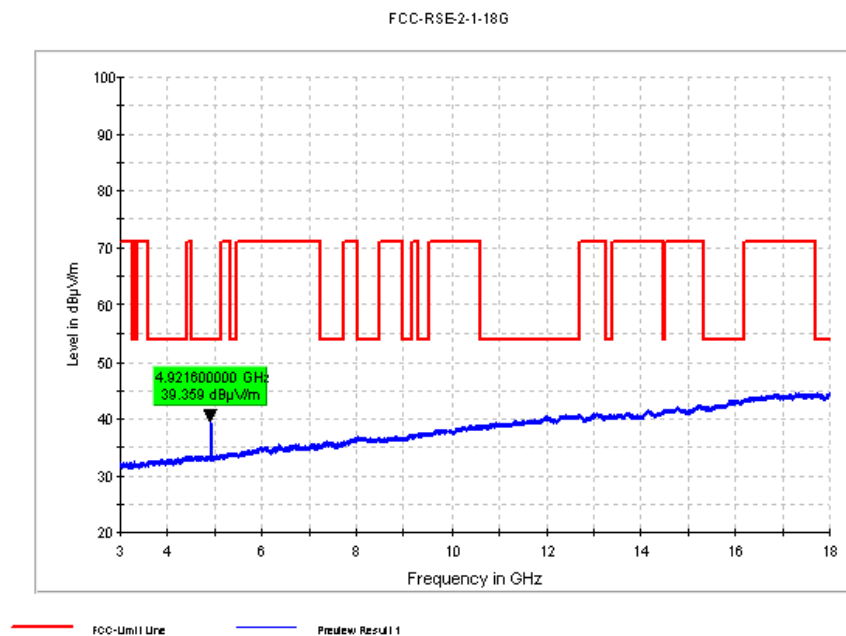


Fig. 87 Radiated Spurious Emission (802.11g, Ch11, 3 GHz-18 GHz)

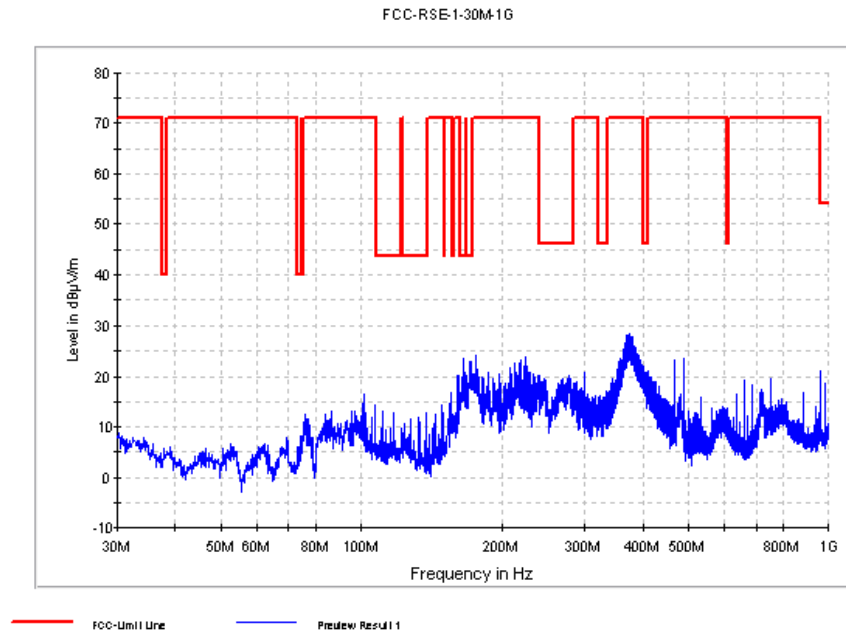


Fig. 88 Radiated Spurious Emission (802.11n-20M, Ch1, 30 MHz-1 GHz)

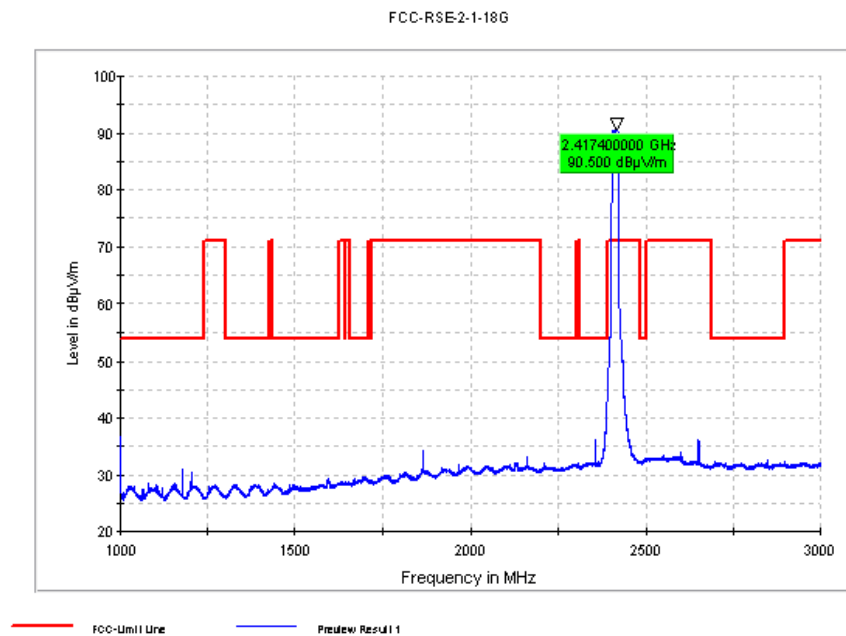


Fig. 89 Radiated Spurious Emission (802.11n-20M, Ch1, 1 GHz-3 GHz)

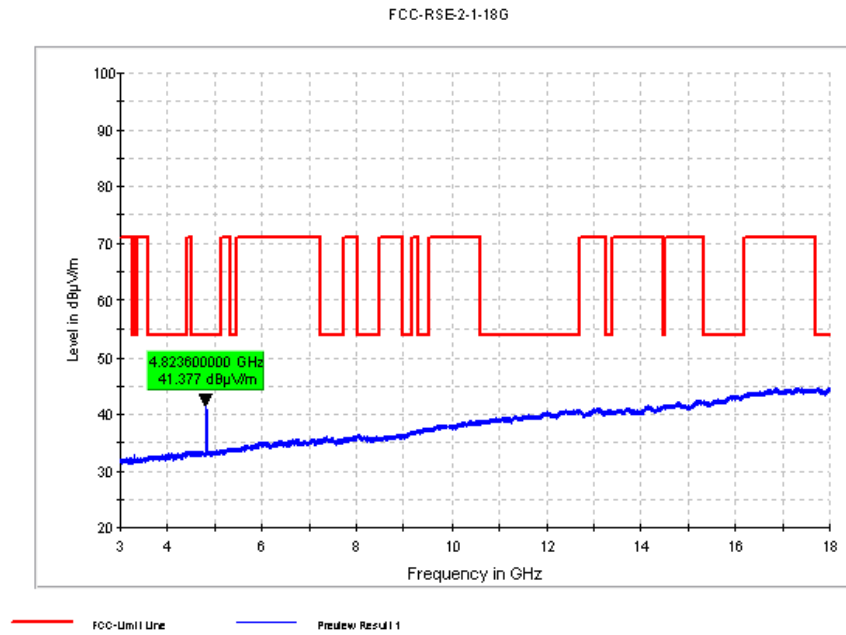


Fig. 90 Radiated Spurious Emission (802.11n-20M, Ch1, 3 GHz-18 GHz)

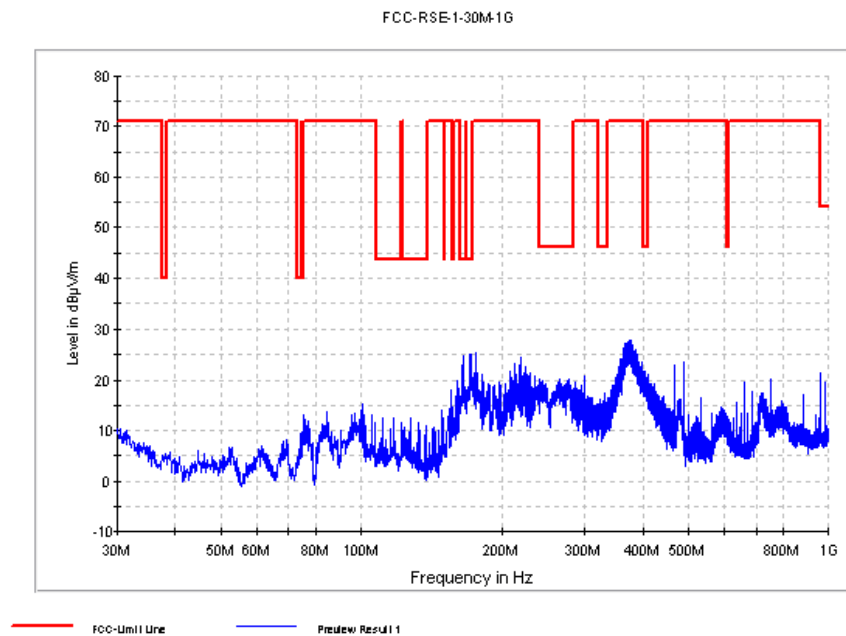


Fig. 91 Radiated Spurious Emission (802.11n-20M, Ch6, 30 MHz-1 GHz)

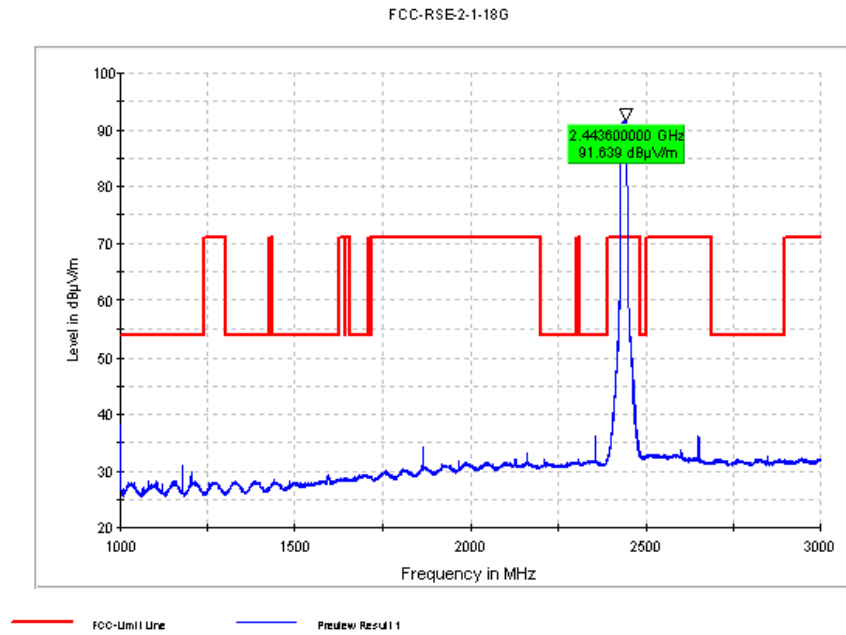


Fig. 92 Radiated Spurious Emission (802.11n-20M, Ch6, 1 GHz-3 GHz)

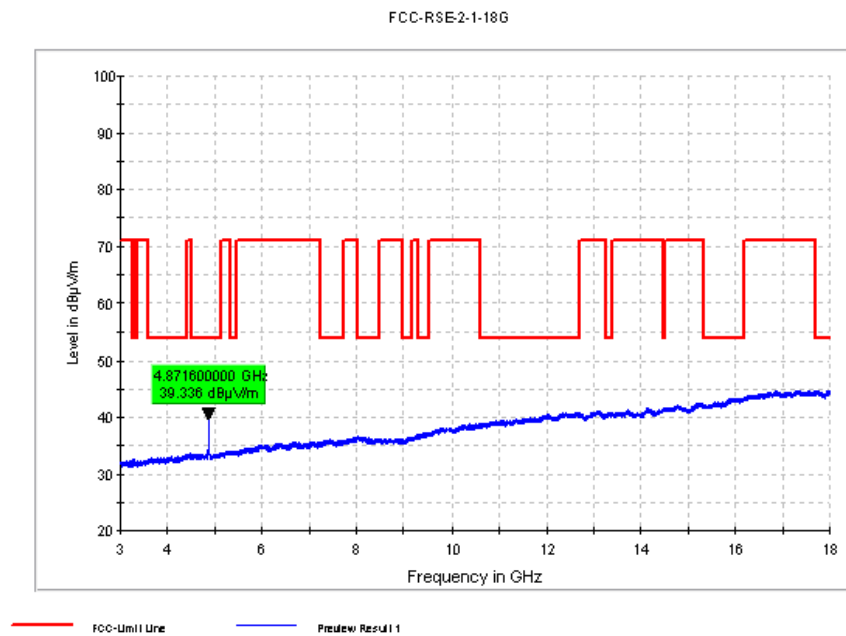


Fig. 93 Radiated Spurious Emission (802.11n-20M, Ch6, 3 GHz-18 GHz)

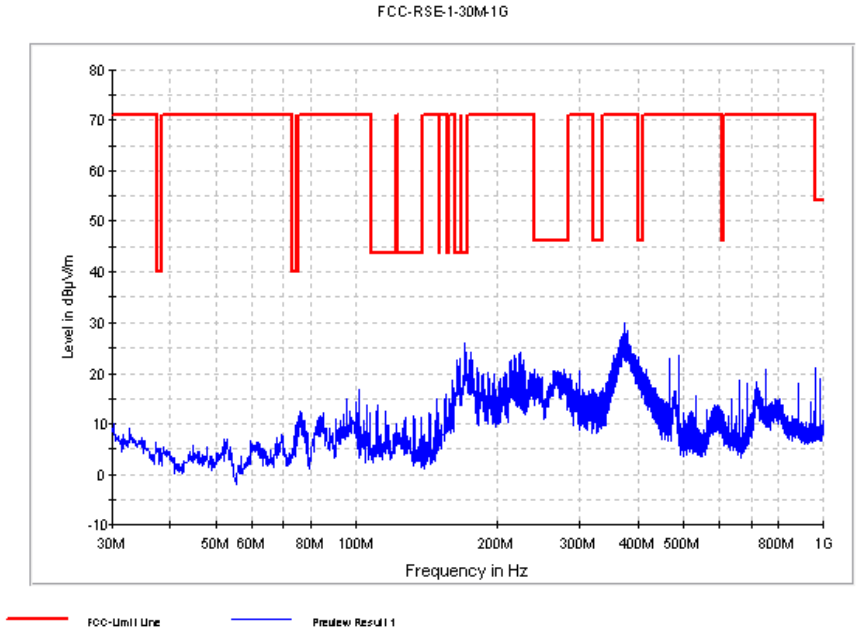


Fig. 94 Radiated Spurious Emission (802.11n-20M, Ch11, 30 MHz-1 GHz)

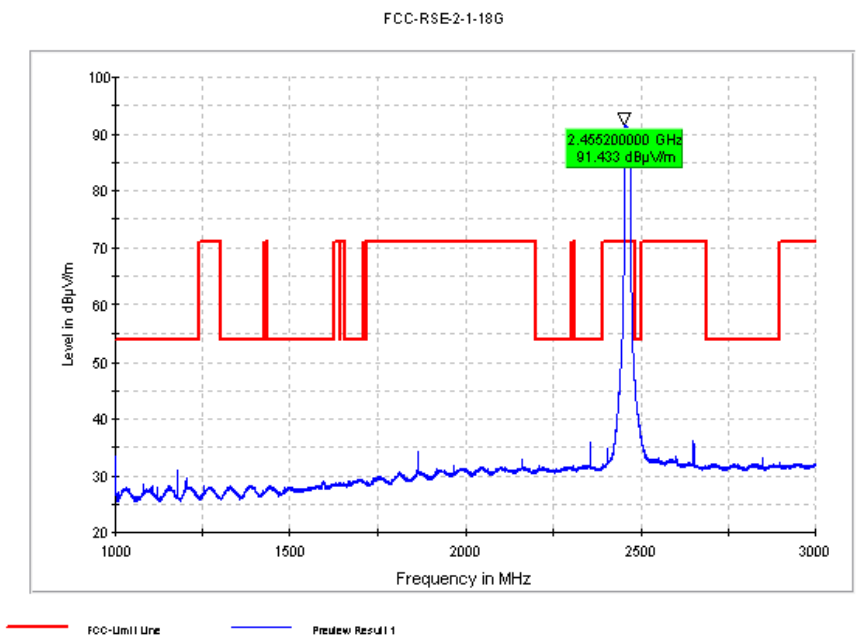


Fig. 95 Radiated Spurious Emission (802.11n-20M, Ch11, 1 GHz-3 GHz)

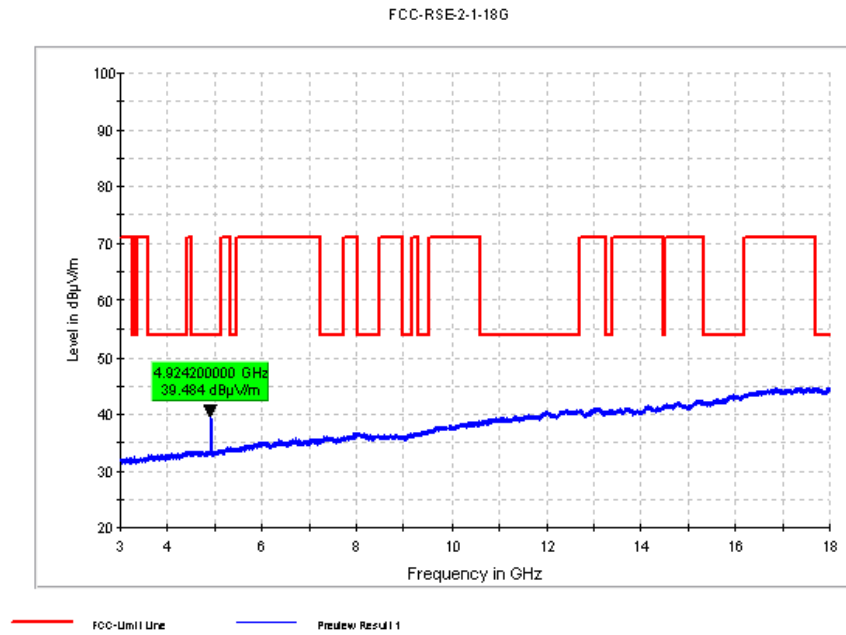


Fig. 96 Radiated Spurious Emission (802.11n-20M, Ch11, 3 GHz-18 GHz)

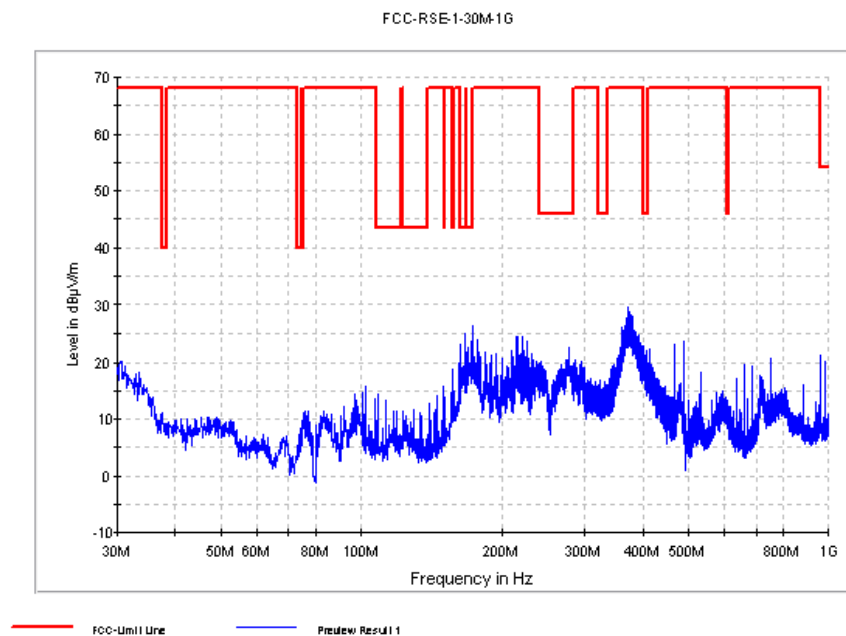


Fig. 97 Radiated Spurious Emission (802.11n-40M, Ch3, 30 MHz-1 GHz)

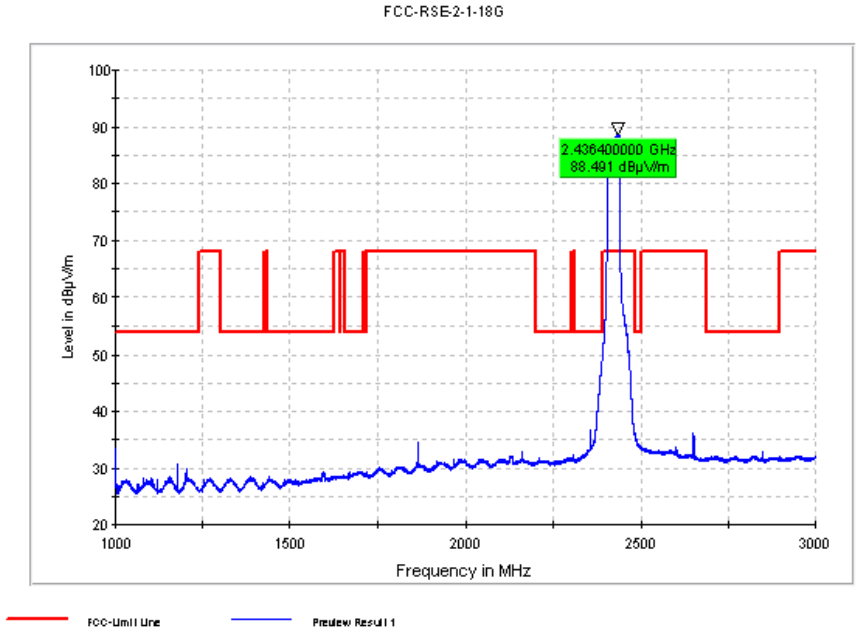


Fig. 98 Radiated Spurious Emission (802.11n-40M, Ch3, 1 GHz-3 GHz)

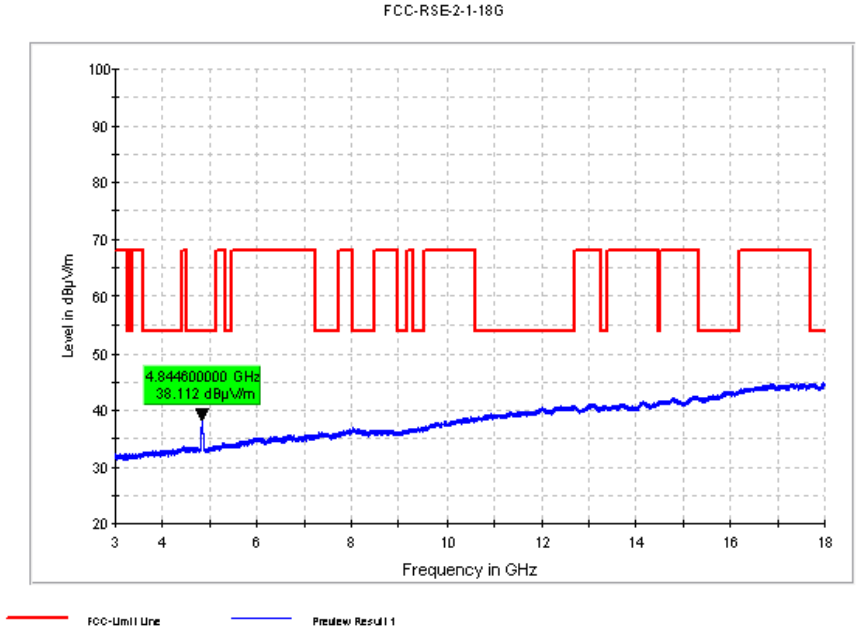


Fig. 99 Radiated Spurious Emission (802.11n-40M, Ch3, 3 GHz-18 GHz)

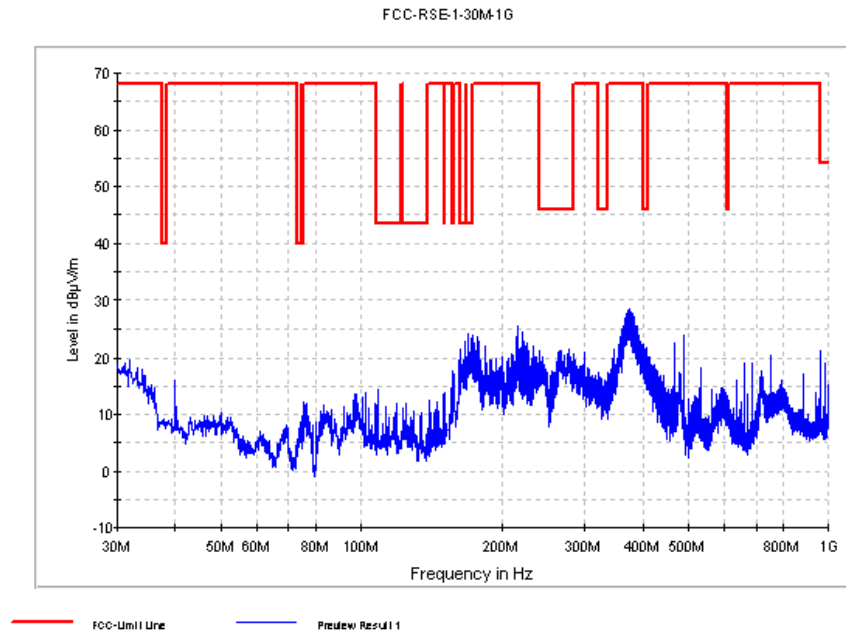


Fig. 100 Radiated Spurious Emission (802.11n-40M, Ch6, 30 MHz-1 GHz)

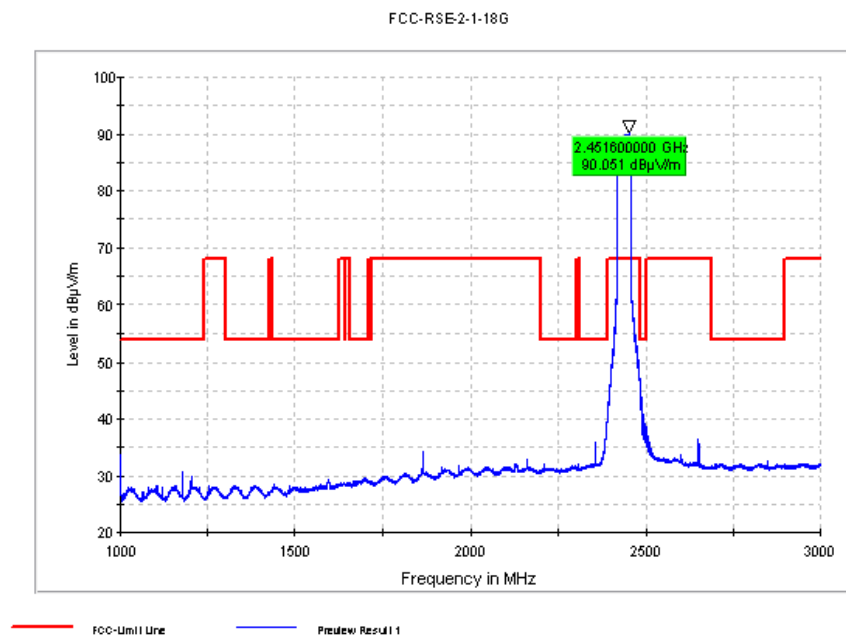


Fig. 101 Radiated Spurious Emission (802.11n-40M, Ch6, 1 GHz-3 GHz)

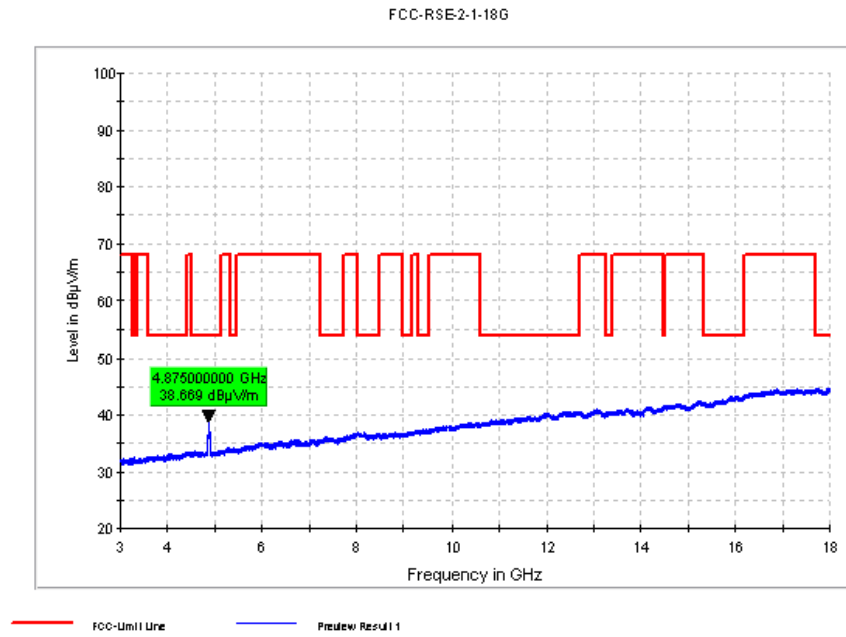


Fig. 102 Radiated Spurious Emission (802.11n-40M, Ch6, 3 GHz-18 GHz)

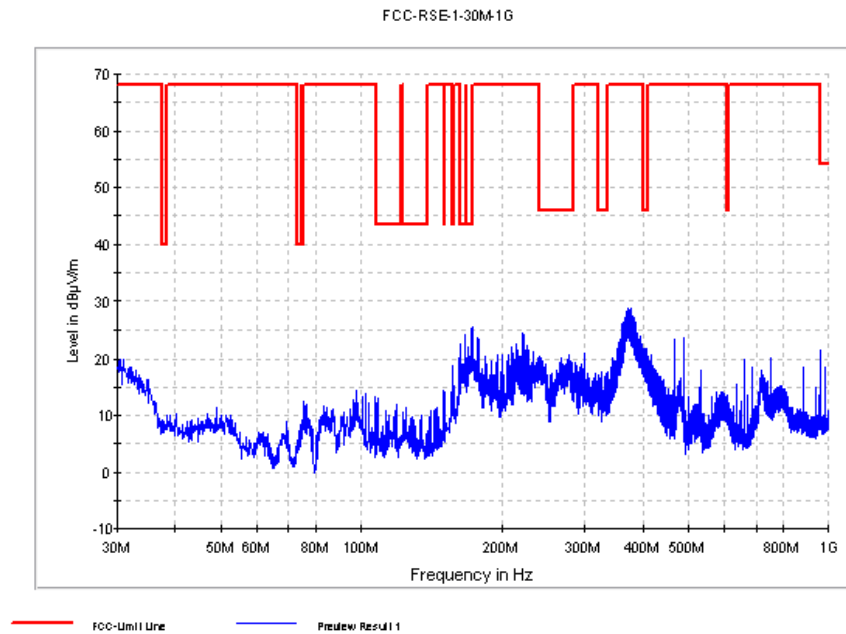


Fig. 103 Radiated Spurious Emission (802.11n-40M, Ch9, 30 MHz-1 GHz)

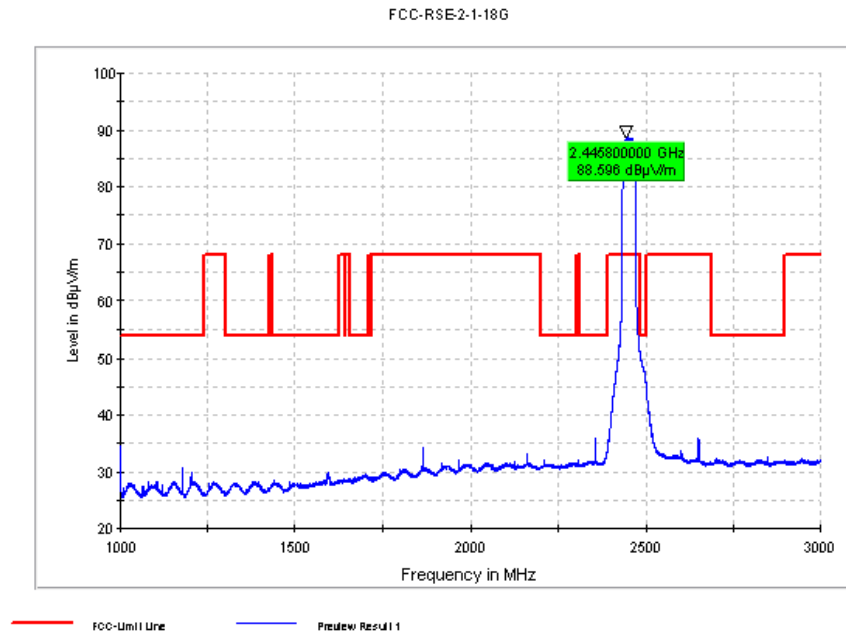


Fig. 104 Radiated Spurious Emission (802.11n-40M, Ch9, 1 GHz-3 GHz)

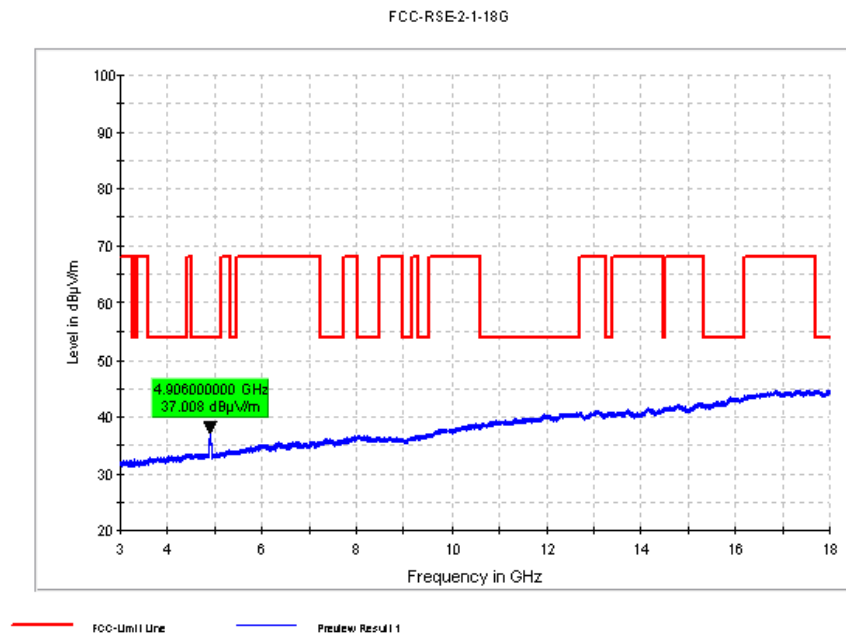


Fig. 105 Radiated Spurious Emission (802.11n-40M, Ch9, 3 GHz-18 GHz)

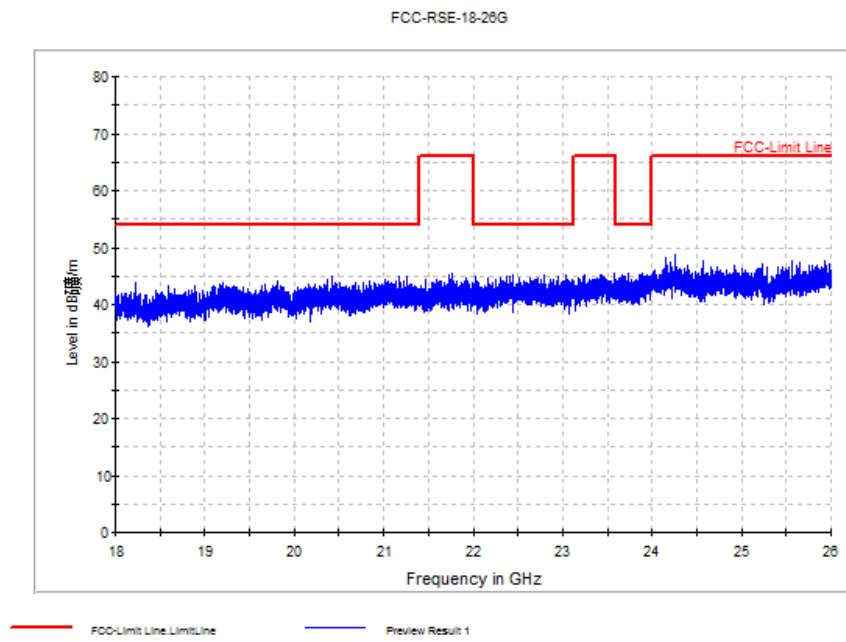


Fig. 106 Radiated emission: 18 GHz - 26.5 GHz

A.8. AC Powerline Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:

WLAN (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dB μ V)	Result (dB μ V)				Conclusion
		With charger				
		11b mode	11g mode	11n-20M mode	11n-40M mode	
0.15 to 0.5	66 to 56	Fig.107	Fig.108	Fig.109	Fig.110	P
0.5 to 5	56					
5 to 30	60					

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

WLAN (Average Limit)

Frequency range (MHz)	Average Limit (dB μ V)	Result (dB μ V)				Conclusion
		With charger				
		11b mode	11g mode	11n-20M mode	11n-40M mode	
0.15 to 0.5	56 to 46	Fig.107	Fig.108	Fig.109	Fig.110	P
0.5 to 5	46					
5 to 30	50					

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

The measurement is made according to ANSI C63.4 and KDB558074 D01

Conclusion: PASS

Test graphs as below:

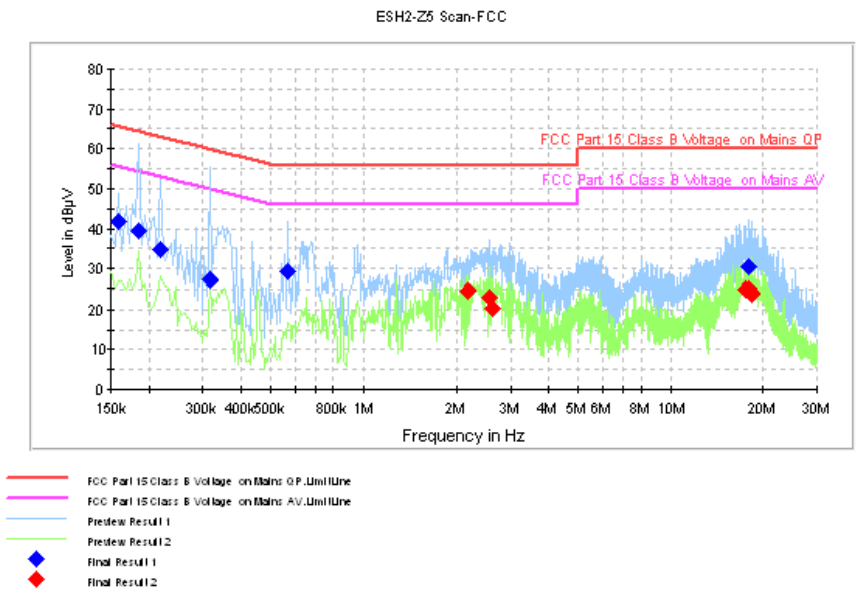


Fig. 107 AC Powerline Conducted Emission-802.11b

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	41.7	FLO	L1	10.0	23.8	65.5
0.186000	39.3	FLO	N	10.1	24.9	64.2
0.217500	34.7	FLO	N	10.0	28.2	62.9
0.316500	27.4	FLO	L1	10.0	32.4	59.8
0.568500	29.3	FLO	L1	10.1	26.7	56.0
17.866500	30.4	FLO	N	10.6	29.6	60.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.161500	24.5	FLO	L1	10.1	21.5	46.0
2.553000	23.0	FLO	L1	10.2	23.0	46.0
2.625000	20.4	FLO	L1	10.2	25.6	46.0
17.574000	25.0	FLO	L1	10.5	25.0	50.0
17.866500	25.1	FLO	N	10.6	24.9	50.0
18.420000	23.8	FLO	L1	10.5	26.2	50.0

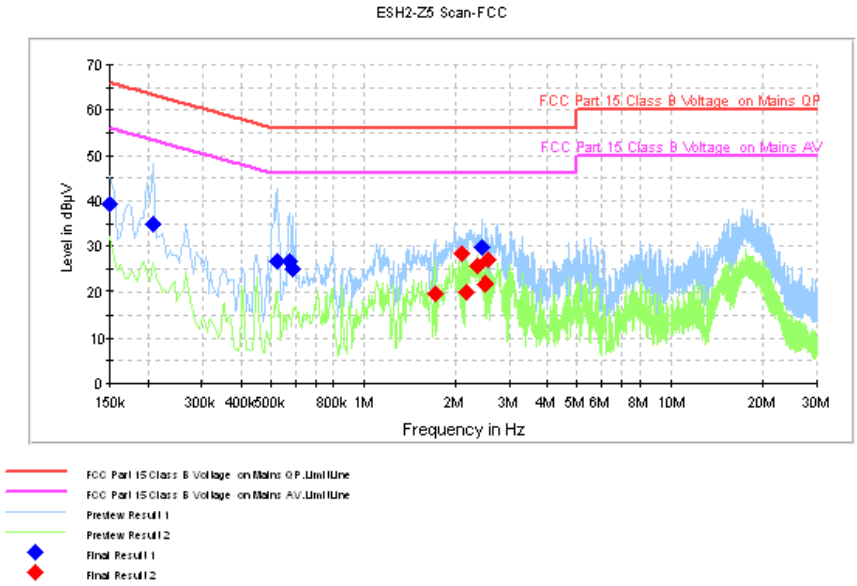


Fig. 108 AC Powerline Conducted Emission-802.11g

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	39.4	FLO	L1	10.0	26.6	66.0
0.208500	34.7	FLO	N	10.1	28.6	63.3
0.523500	26.6	FLO	L1	10.0	29.4	56.0
0.573000	26.5	FLO	L1	10.1	29.5	56.0
0.591000	24.8	FLO	L1	10.1	31.2	56.0
2.436000	29.7	FLO	L1	10.1	26.3	56.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.711500	19.9	FLO	L1	10.1	26.1	46.0
2.107500	28.2	FLO	L1	10.1	17.8	46.0
2.170500	20.0	FLO	L1	10.1	26.0	46.0
2.368500	25.7	FLO	L1	10.1	20.3	46.0
2.503500	21.9	FLO	L1	10.2	24.1	46.0
2.557500	26.9	FLO	L1	10.2	19.1	46.0

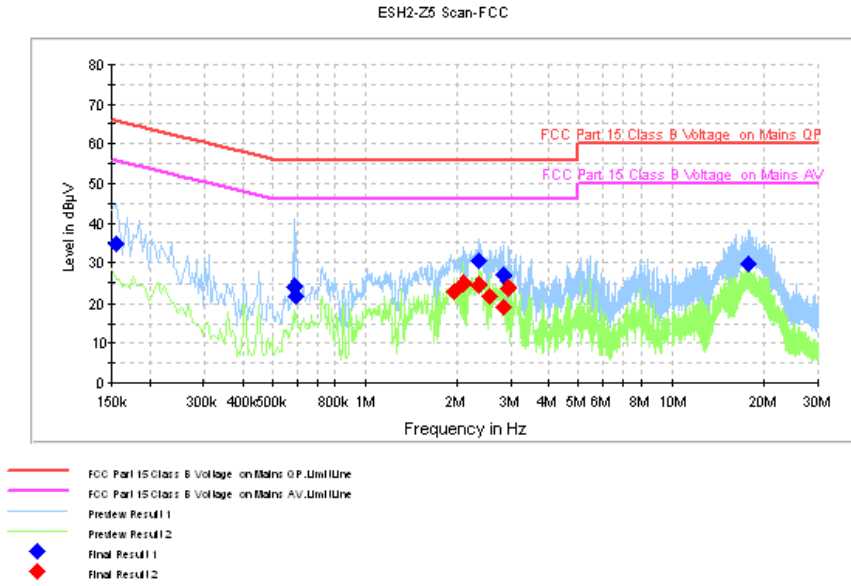


Fig. 109 AC Powerline Conducted Emission-802.11n-20M

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	34.9	FLO	N	10.1	30.9	65.8
0.586500	24.1	FLO	L1	10.1	31.9	56.0
0.595500	21.8	FLO	L1	10.1	34.2	56.0
2.368500	30.3	FLO	L1	10.1	25.7	56.0
2.836500	26.9	FLO	N	10.1	29.1	56.0
17.691000	29.7	FLO	N	10.6	30.3	60.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.963500	23.0	FLO	L1	10.1	23.0	46.0
2.103000	25.1	FLO	L1	10.1	20.9	46.0
2.368500	24.7	FLO	L1	10.1	21.3	46.0
2.562000	21.7	FLO	N	10.2	24.3	46.0
2.836500	19.1	FLO	L1	10.1	26.9	46.0
2.958000	23.7	FLO	L1	10.1	22.3	46.0

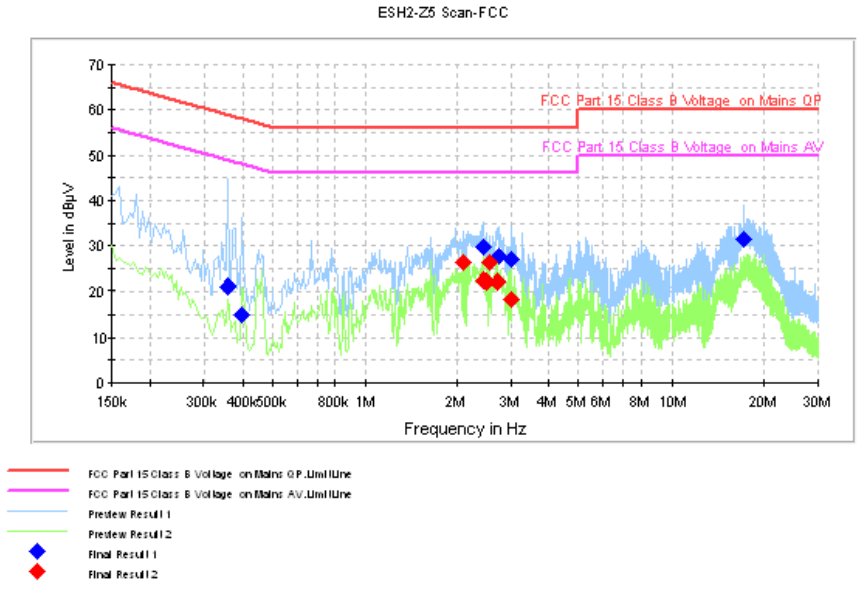


Fig. 110 AC Powerline Conducted Emission-802.11n-40M

MEASUREMENT RESULT: " QuasiPeak "

Frequency (MHz)	QuasiPeak (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.357000	21.3	FLO	L1	10.0	37.5	58.8
0.393000	15.0	FLO	L1	10.0	43.0	58.0
2.436000	29.8	FLO	L1	10.1	26.2	56.0
2.733000	27.7	FLO	N	10.2	28.3	56.0
3.021000	27.1	FLO	L1	10.2	28.9	56.0
17.106000	31.6	FLO	L1	10.5	28.4	60.0

MEASUREMENT RESULT: " Average "

Frequency (MHz)	CAverage (dBµV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.103000	26.2	FLO	L1	10.1	19.8	46.0
2.440500	22.6	FLO	N	10.2	23.4	46.0
2.503500	22.2	FLO	L1	10.2	23.8	46.0
2.553000	26.2	FLO	L1	10.2	19.8	46.0
2.701500	22.3	FLO	L1	10.2	23.7	46.0
3.021000	18.5	FLO	L1	10.2	27.5	46.0

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