

FCC and IC Test Report for Part 15.247, Part 15B, RSS-247 and RSS-Gen

(additional report to 160200396 301)

Product name : Deeper Smart Sonar PRO
Applicant : Deeper UAB
FCC ID : 2AHKO-PRO
IC ID : 21307-PRO

Test report No. : 160600621 001 Ver 1.00

Laboratory information

Accreditation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001

The Industry Canada registration number for the 3 meter test chamber of Telefication is: 4173A-1.

Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Telefication Nederland

Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31316583180 Fax. +31316583189
Test Site FCC	NL0001

Revision History

Version	Date	Remarks	By
v0.50	14-07-2016	First draft version	RVB
V1.00	22-07-2016	Release version	RVB

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Summary of Test results

FCC	IC	Description	Section in report	Verdict
15.247(d), 15.109(a)	RSS-247 5.4	Radiated Spurious emissions	3.1	Pass
15.109(a)	RSS-GEN 7.1.2	RX radiated spurious emissions	3.2	Pass

1 General Description

1.1 Applicant

Client name: Deeper UAB
Address: Sauletekio ave 15, Vilnius, Lithuania
Zip code: 10224
Telephone: +37065033273
Contact name: D. Malinauskas
E-mail: donatas.malinauskas@deeper.eu

1.2 Manufacturer

Manufacturer name: Deeper UAB
Address: Sauletekio ave 15, Vilnius, Lithuania
Zip code: 10224
Telephone: +37065033273
Contact name: D. Malinauskas
E-mail: donatas.malinauskas@deeper.eu

1.3 Tested Equipment Under Test (EUT)

Product name: Deeper Smart Sonar PRO
Brand name: Deeper Smart Sonar
Product type: Wireless Smart Sonar
FCC ID: 2AHKO-PRO
IC ID: 21307-PRO
Model(s): DP1H20S10
Software version: v1.0
Hardware version: H12
Date of receipt: 14-06-2016
Tests started: 11-07-2016
Testing ended: 12-07-2016

1.4 Product specifications of Equipment under test

Tx Frequencies:	2402 – 2483.5 MHz
Rx frequencies:	2402 – 2483.5 MHz
Maximum output power to antenna:	20 dBm
Antenna type and gain:	Omnidirectional Antenna, -2.3 dBi at 2.4 GHz
Type of modulation:	802.11b: DSSS 802.11g: OFDM
Emission designator:	22M0G1D

1.5 Modification of the Equipment Under Test (EUT)

The tested (conducted) sample was modified to include an conducted antenna connector.

1.6 Environmental conditions

Test date	11-07-2016	12-07-2016
Ambient temperature	21.6°C	24.3°C
Humidity	44.7 %	46.1 %

1.7 Measurement standards

- FCC KDB Publication No. 558074 D01DTS Meas. Guidance V03r05
- ANSI C63.10:2013

1.8 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247.
- FCC Part 15 Subpart C §15.109.
- RSS-247 Issue 1, RSS-GEN Issue 4.

1.9 Observation and remarks

The EUT, Deeper Smart Sonar PRO (DP1H20S10) is variant of the model Deeper Smart Sonar PRO+ (DP1H10S10). The difference between these 2 models is that the Deeper Smart Sonar PRO (DP1H20S10) has a depopulated GPS module. For this reason only additional radiated spurious emission measurement have been performed. In report number 160200396 300 all the other test results can be found.

1.10 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.8 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.8 *"Applicable standards"*.

All tests are performed by:

Name : ing R. van Barneveld

Review of test methods and report by:

Name : ing. P.A. Suringa

The above conclusions have been verified by the following signatory:

Date : 22-07-2106

Name : ing M.T.P.M Wouters v/d Oudenweijer

Function : Director Certification

Signature :



2 Test configuration of the Equipment Under Test

2.1 Test mode

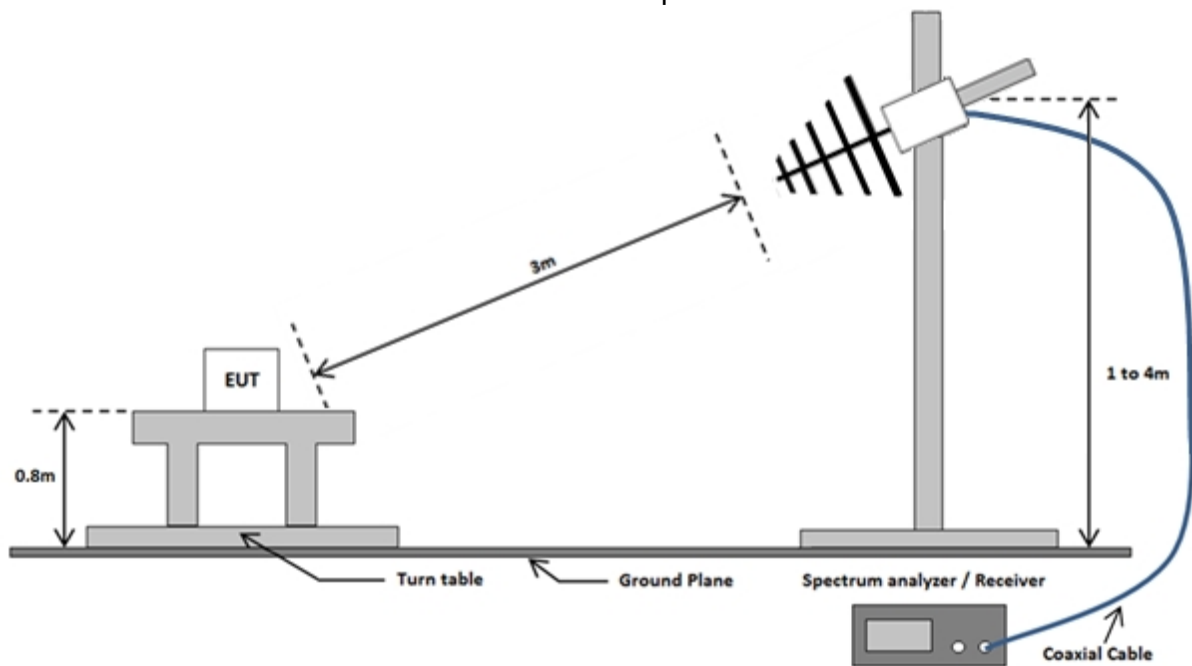
The applicant provided test mode firmware for the EUT, in which it was possible to configure the EUT into different test channels.

2.2 Tested channels and Data rates

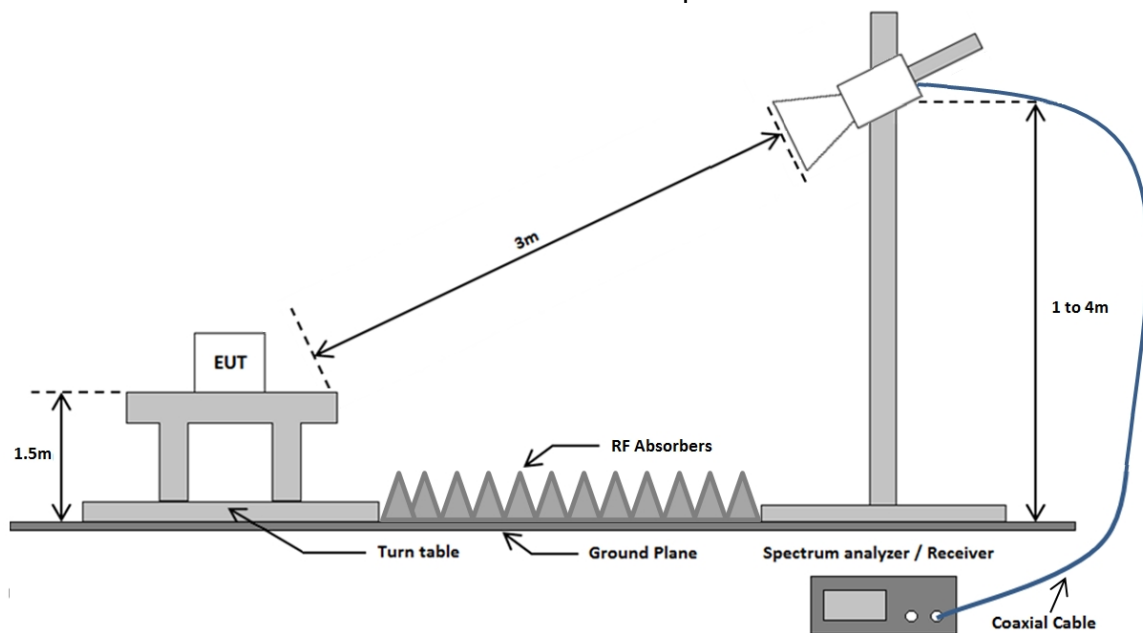
Technology	Channels	Data rate	Frequency (MHz)
IEEE 802.11b	1(Low)	11 Mbps	2412
	6(Mid)	11 Mbps	2437
	11 (High)	11 Mbps	2462
IEEE 802.11g	1(Low)	54 Mbps	2412
	6(Mid)	54 Mbps	2437
	11(High)	54 Mbps	2462

2.3 Radiated Test setup

Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.4 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
Spectrum Analyzer	Rohde & Schwarz	FSV	TE01269	3.1, 3.2
EMI receiver	Rohde & Schwarz	ESR7	TE01220	3.1, 3.2
Pre-amplifier	Miteq	AFS42-041001800-29-OP-42	TE11132	3.1, 3.2
Biconilog Antenna	Chase	CBL6112A	TE00967	3.1, 3.2
Horn Antenna	EMCO The Electro – Mechanics Co	3115	TE00531	3.1, 3.2
SAC Chamber	Comtest Engineering BV	-	TE00861	3.1, 3.2
High pass filter	Wainwright instruments	WHK3.0/18G-10EF	TE01140	3.2, 3.2

2.5 Sample calculations

Field Strength Measurement example:

Frequency (GHz)	Polarization	Height(m)	Peak (dB μ V/m)
7,2	Vertical	4	42.2

The following realtion applies:

$$E \text{ (dB}\mu\text{V/m)} = U \text{ (dB}\mu\text{V)} + AF \text{ (dB/m)} - G \text{ (dB)} + CL \text{ (dB)}$$

Where:

E = Electric field strength

U = Measuring reveiver voltage

AF = Antenna factor

G = Gain of the pre-amplifier

CL = Cable loss

$$(42.2 = 36.02 + 36.4 - 37.62 + 7.2)$$

3 Test results

3.1 Radiated Tx Spurious Emissions Measurement

3.1.1 Limit

In any 100 kHz bandwidth outside the operating frequency band, the RF power 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 a RF conducted or a radiated measurement.

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

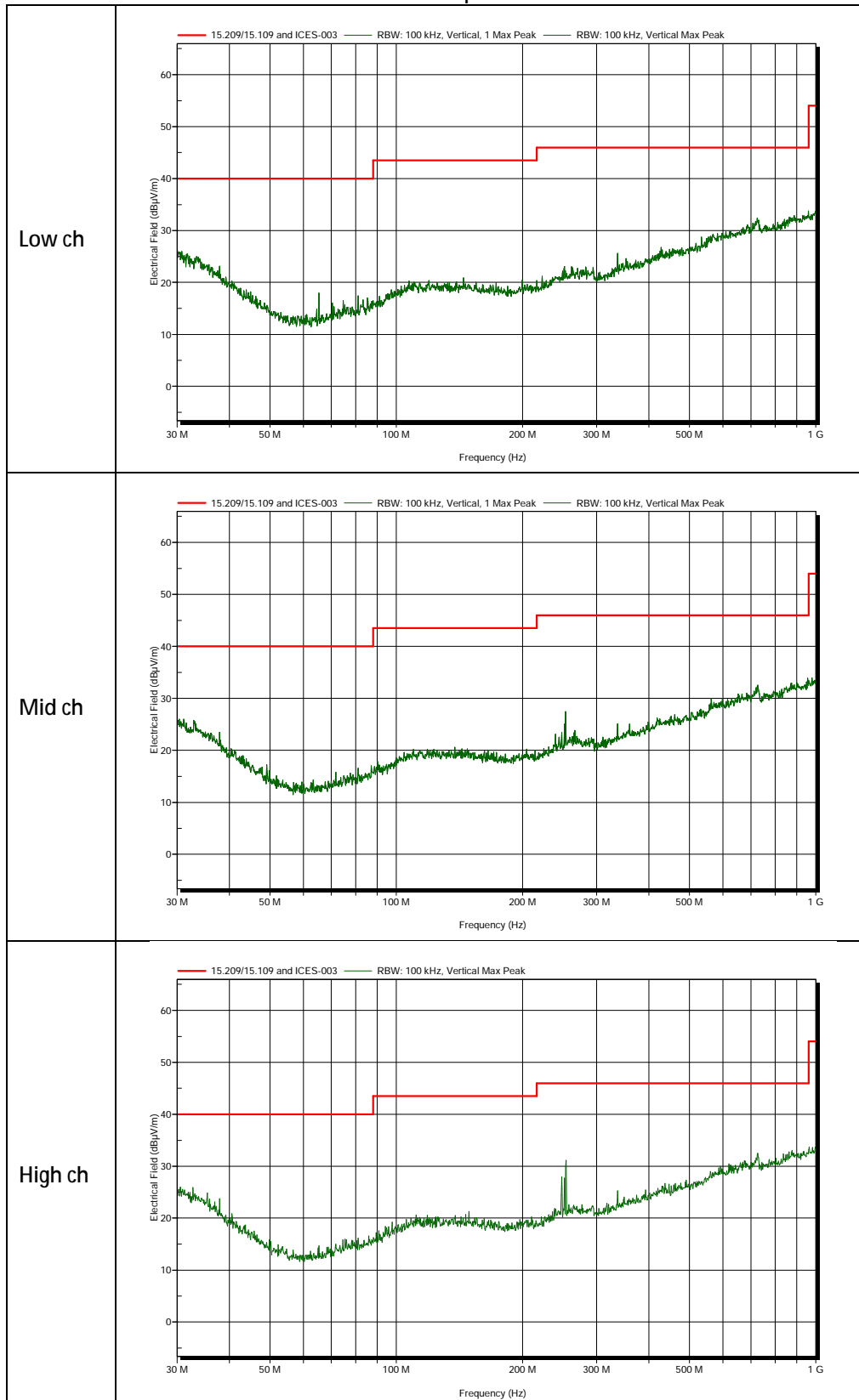
3.1.4 Test procedure

According to KDB Publication 558074 V03r05, sections 11.3 and 12.1

3.1.5 Plots of the Tx Radiated Spurious Emissions Measurement

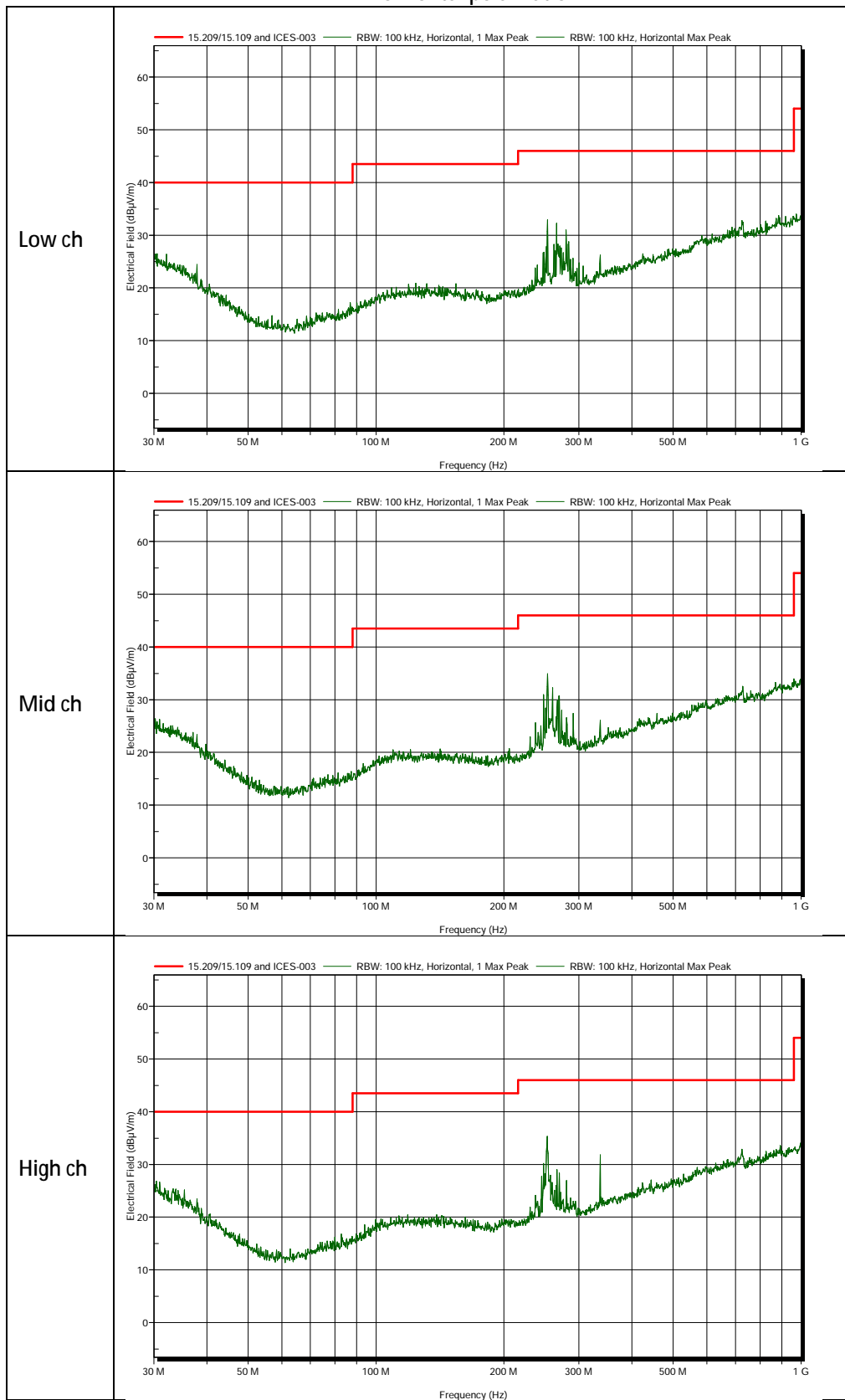
IEEE 802.11b 30 MHz to 1 GHz

Vertical polarization



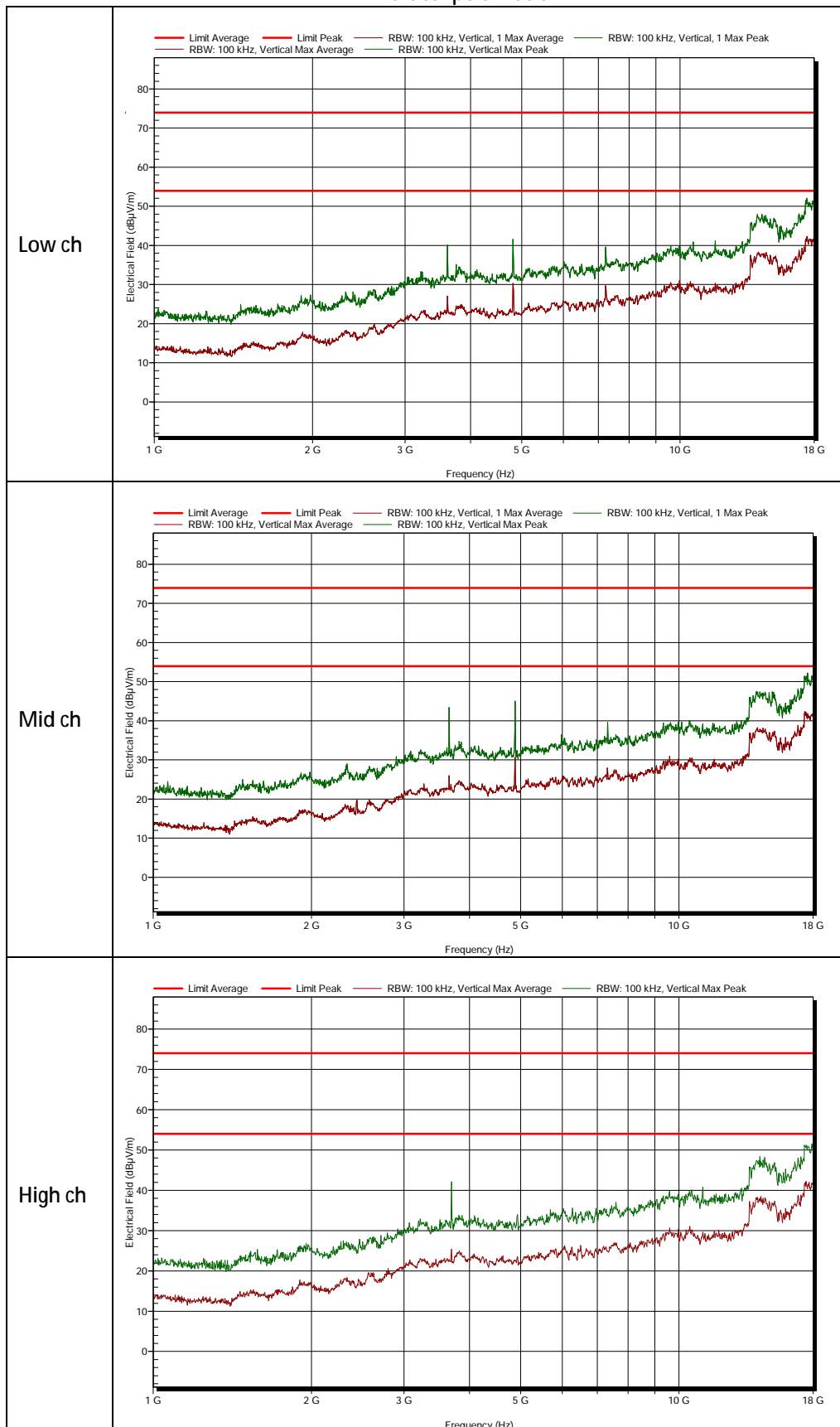
IEEE 802.11b 30 MHz to 1 GHz

Horizontal polarization



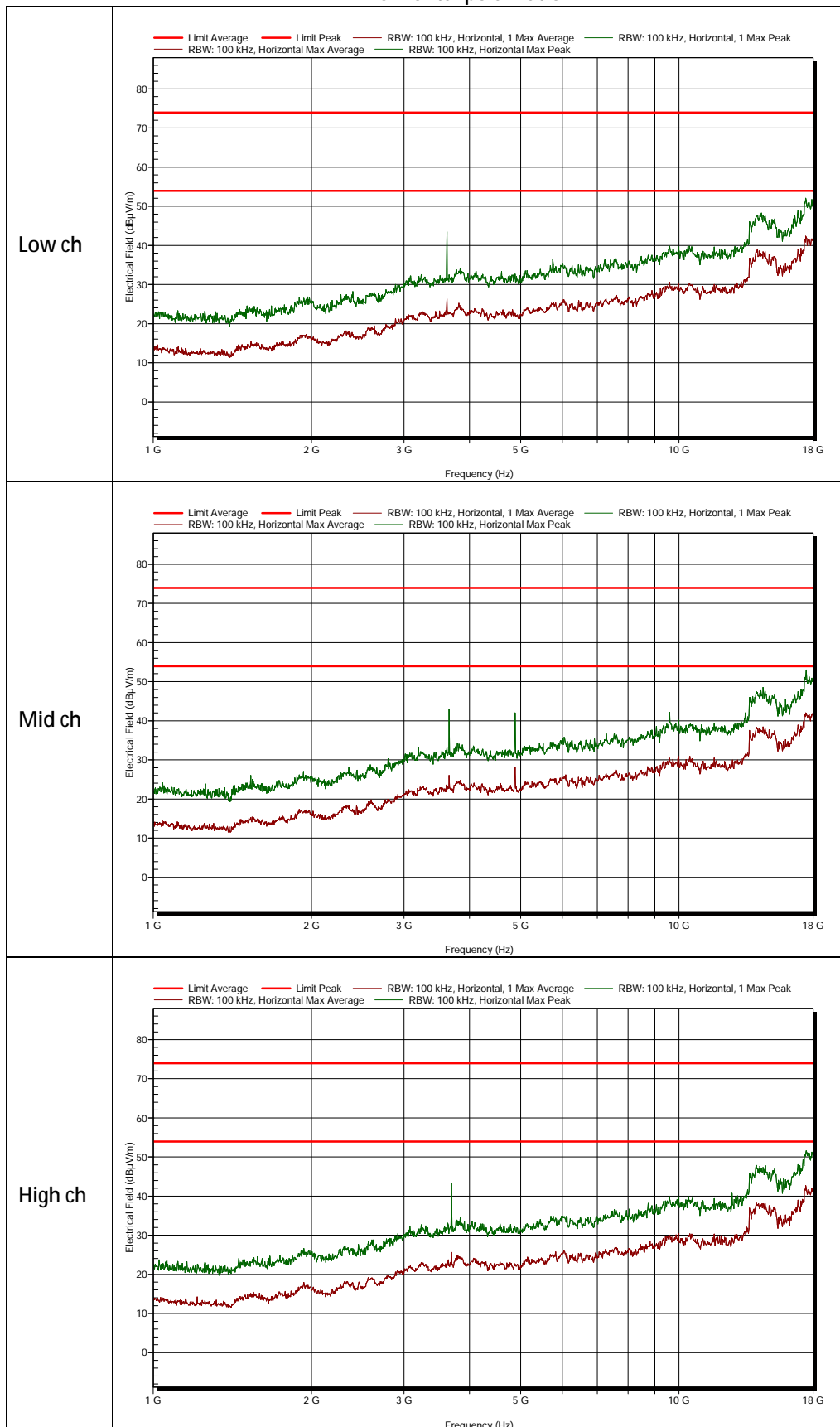
IEEE 802.11b 1 GHz to 18 GHz

Vertical polarization



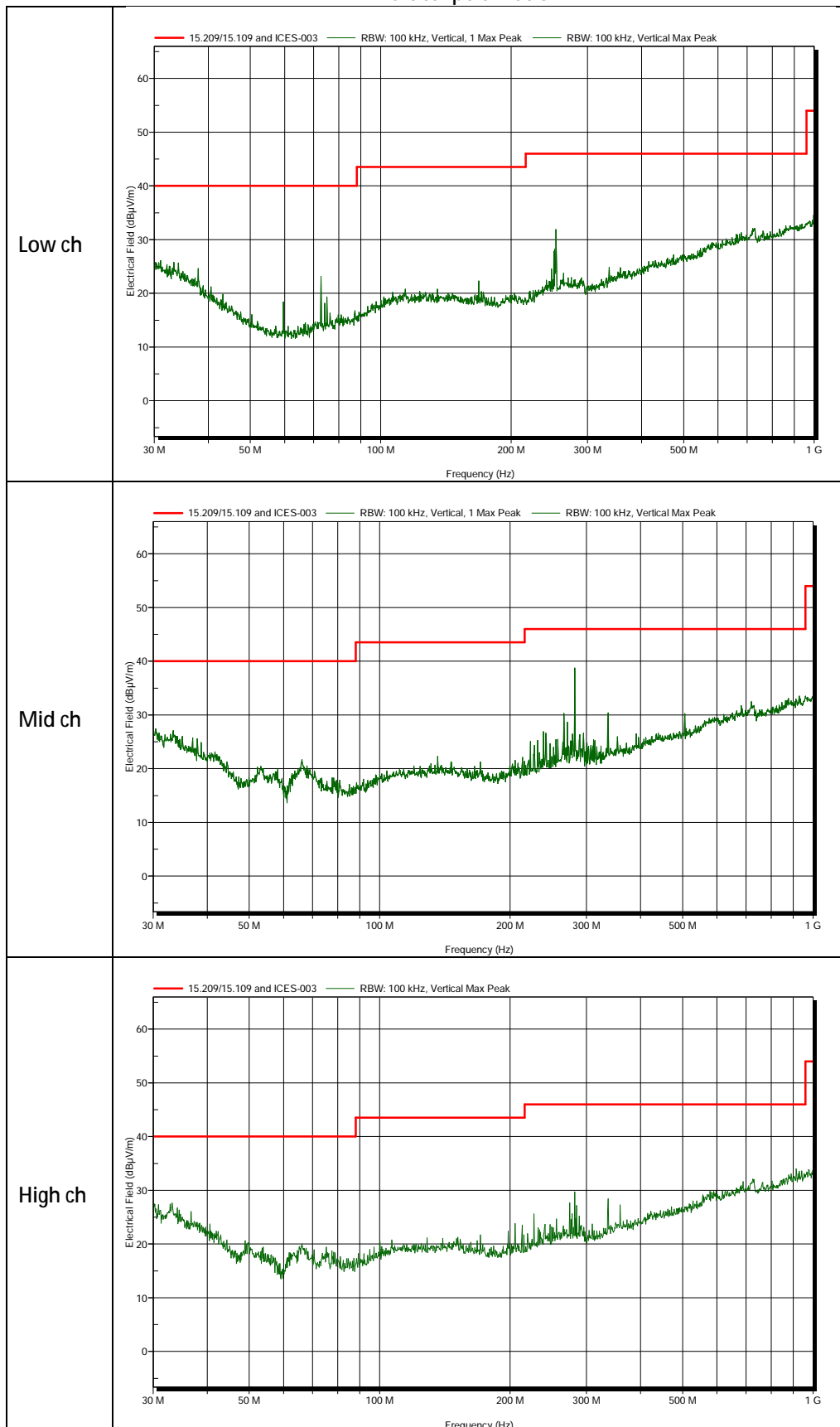
IEEE 802.11b 1 GHz to 18 GHz

Horizontal polarization



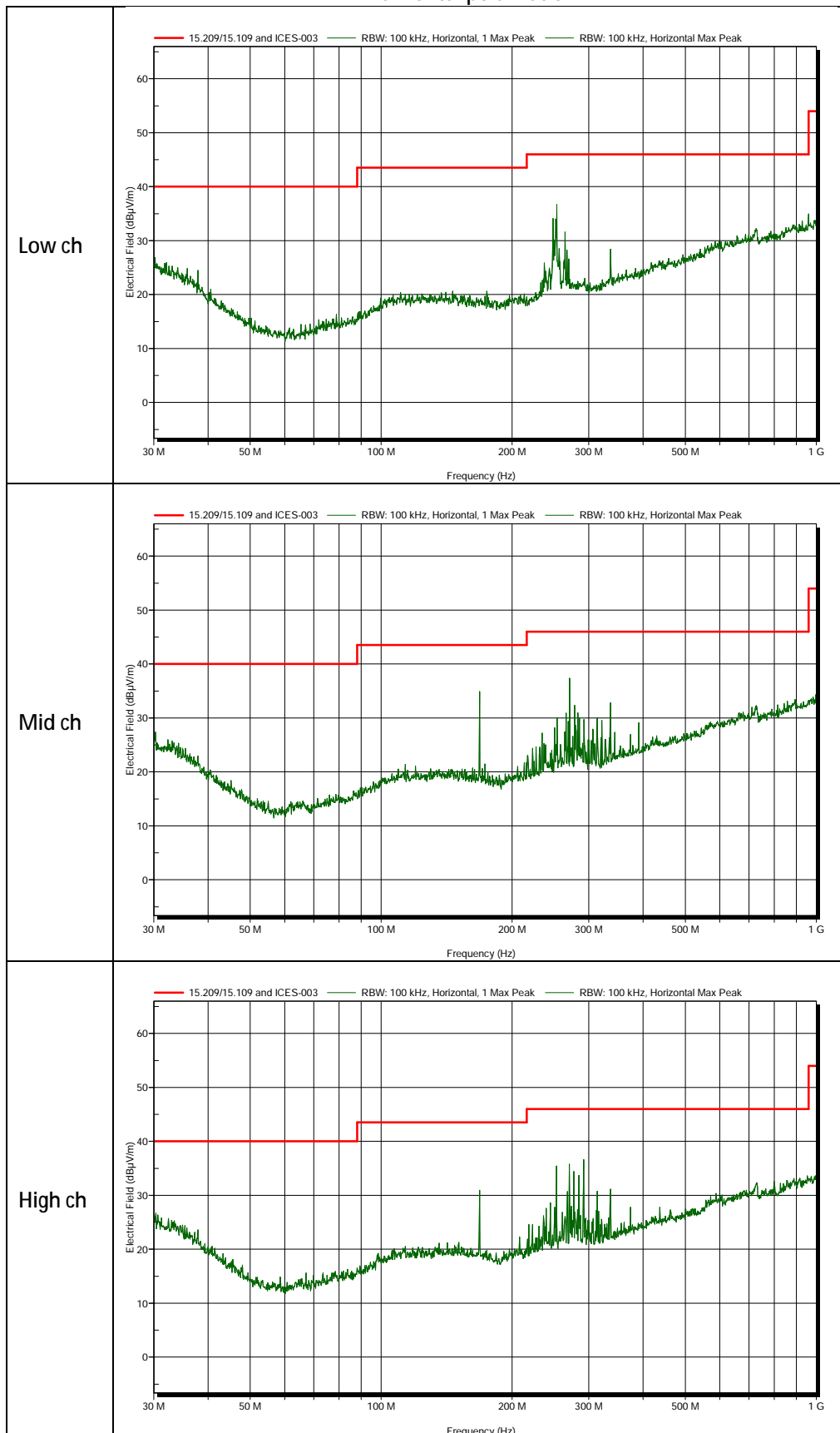
IEEE 802.11g 30 MHz to 1 GHz

Vertical polarization



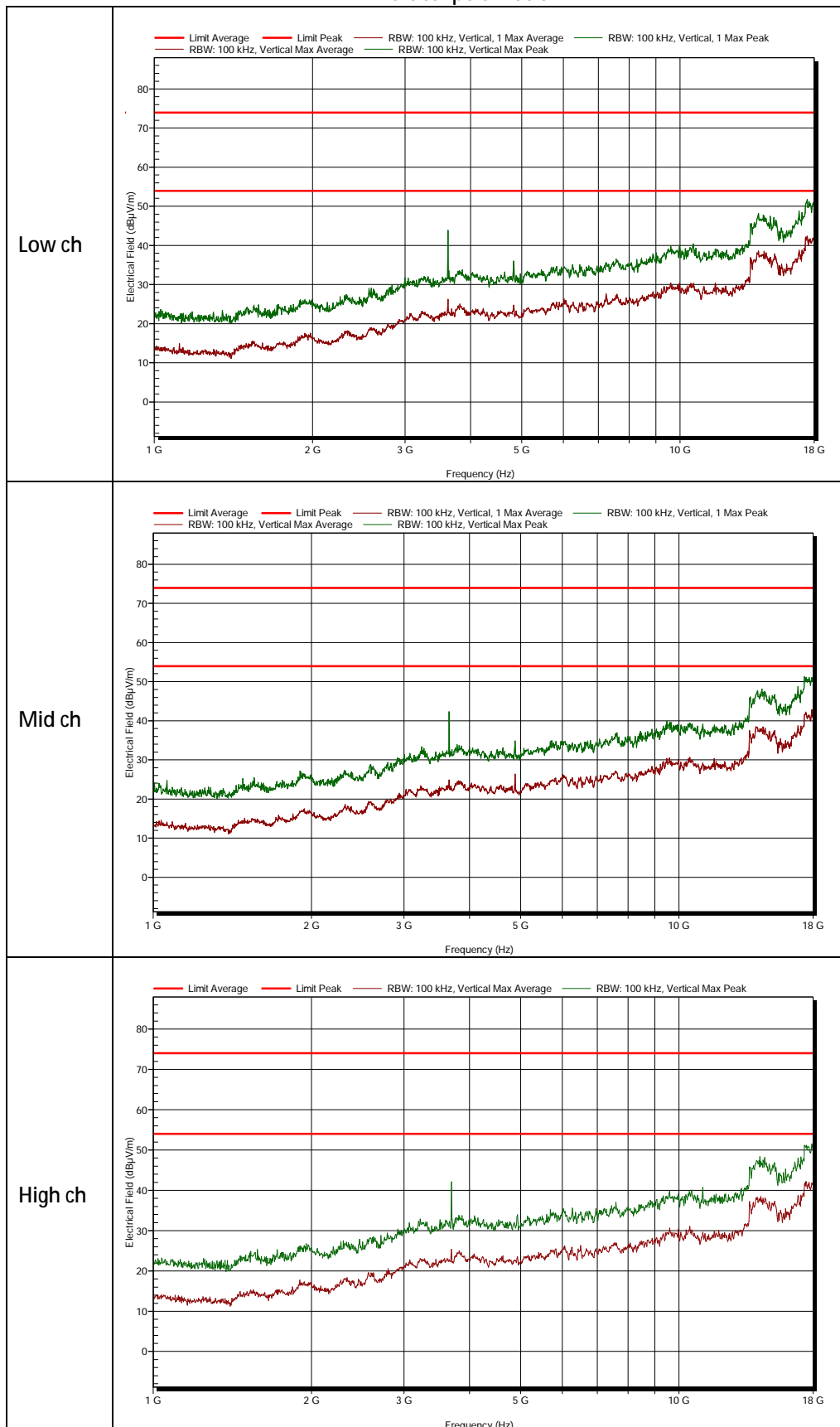
IEEE 802.11g 30 MHz to 1 GHz

Horizontal polarization



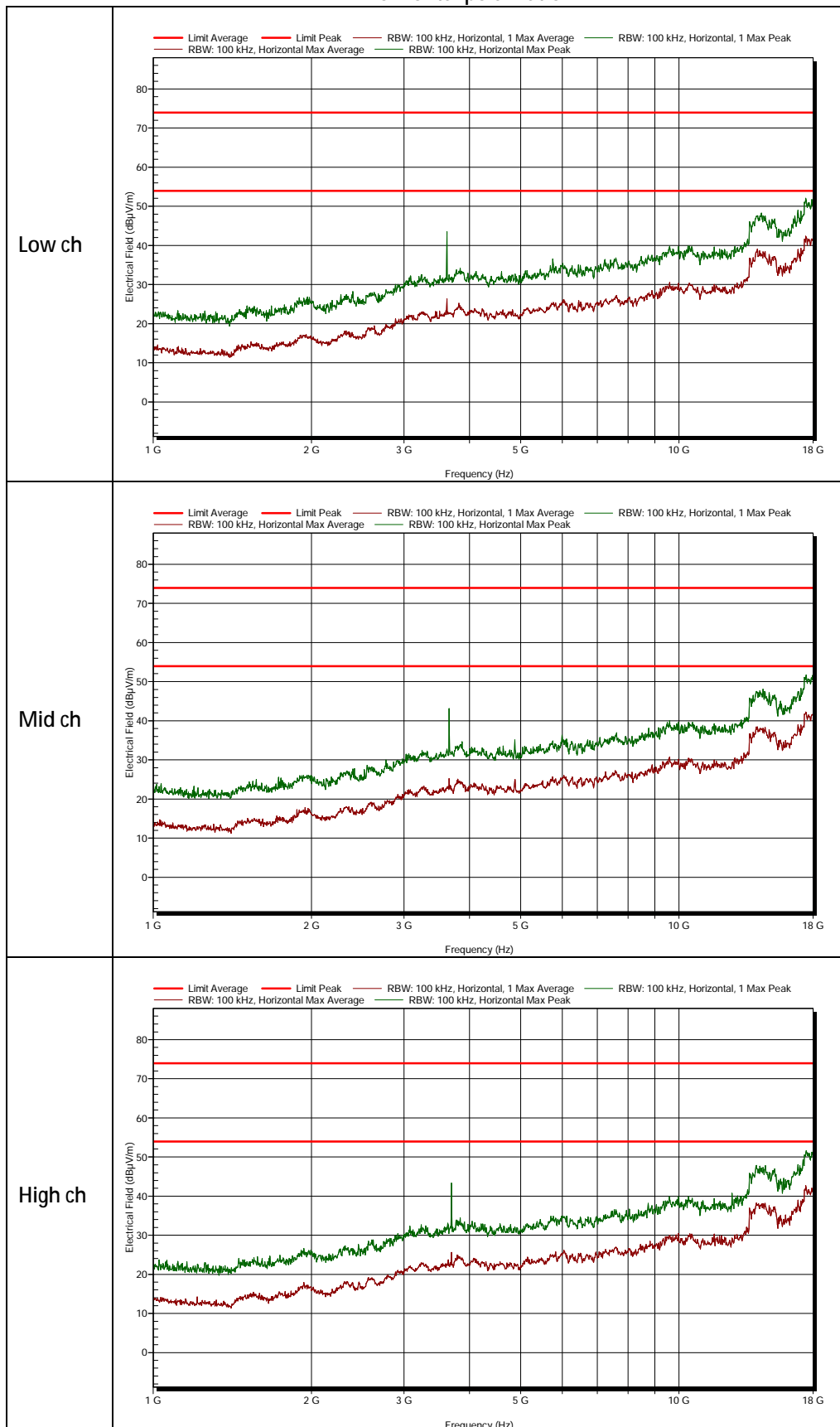
IEEE 802.11g 1 GHz to 18 GHz

Vertical polarization



IEEE 802.11g 1 GHz to 18 GHz

Horizontal polarization



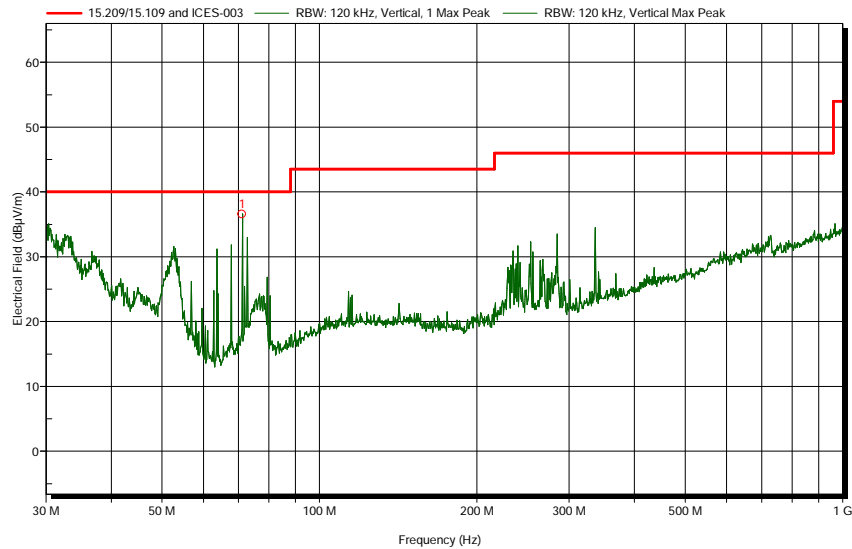
18 GHz to 26 GHz

A pre-scan was performed to see if any emission are found in the frequency range from 18 to 26.5 GHz. As no emission were found, no final radiated measurements were performed.

IEEE 802.11b/g 30 MHz to 1 GHz (data communication)

Limit: see page 23

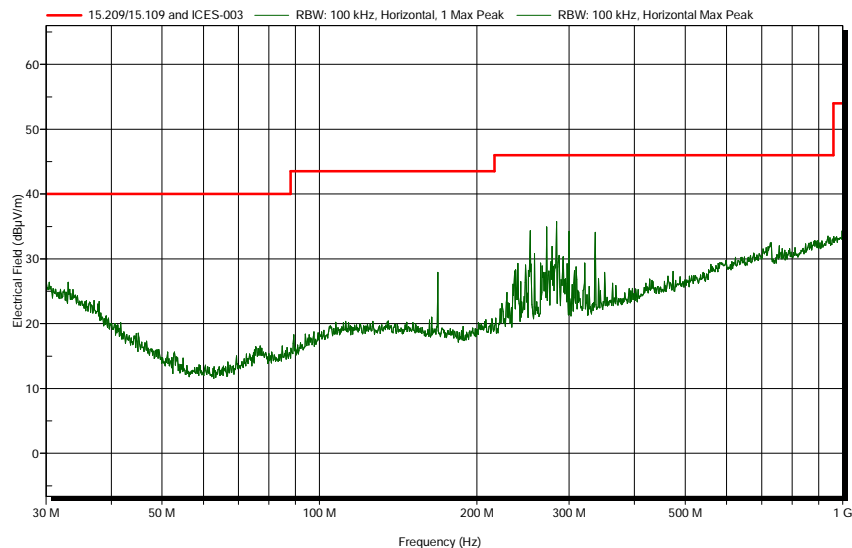
Vertical polarization



Measured peaks Vertical 30 – 1000 MHz

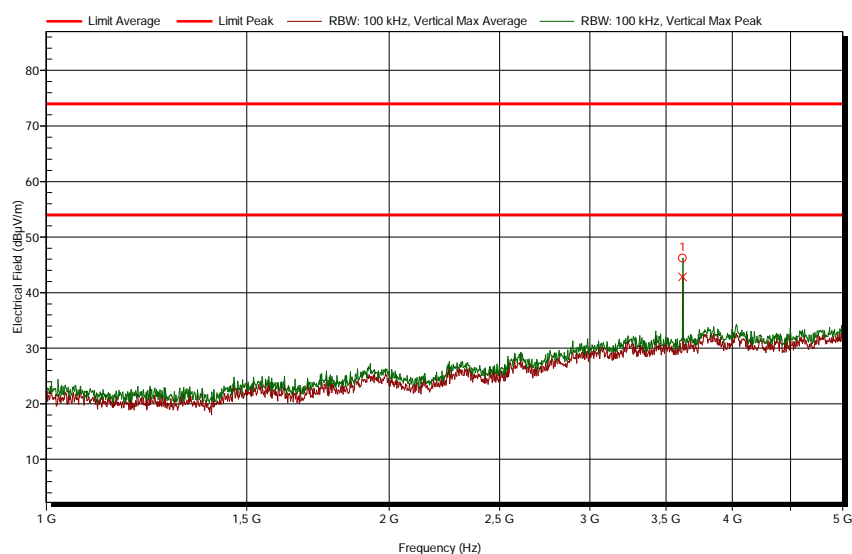
Frequency (MHz)	Polarization	Height (m)	Peak (dBμV/m)
71,04	Vertical	3,5	36,6

Horizontal polarization



IEEE 802.11b/g 1 GHz to 18 GHz (data communication)

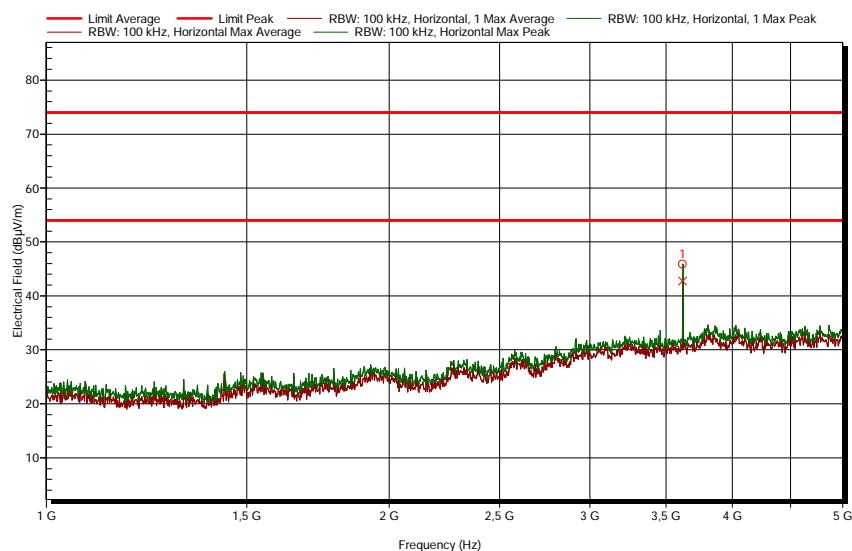
Vertical polarization



Measured peaks Vertical 1 – 5 GHz

Frequency (GHz)	Polarization	Height (m)	Peak (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)
3,618	Vertical	3,5	46,2	74	-27,8

Horizontal polarization



Measured peaks Horizontal 1 – 5 GHz

Frequency (GHz)	Polarization	Height (m)	Peak (dBμV/m)	Peak Limit (dBμV/m)	Margin (dB)
3,618	Horizontal	2	45,9	74	-28,1

3.1.6 Measurement Uncertainty

Measurement uncertainty Radiated emissions below 1 GHz

Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

Measurement uncertainty Radiated emissions above 1 GHz

1000- 18000 MHz	+ 5.7/- 5.7dB
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3.2 Radiated RX Spurious Emissions Measurement

3.2.1 Limit

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Field strength ($\text{dB}\mu\text{V}/\text{m}$)
30 -88	100	40
88 - 216	150	43,5
216- 960	200	46
Above 960	500	54

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

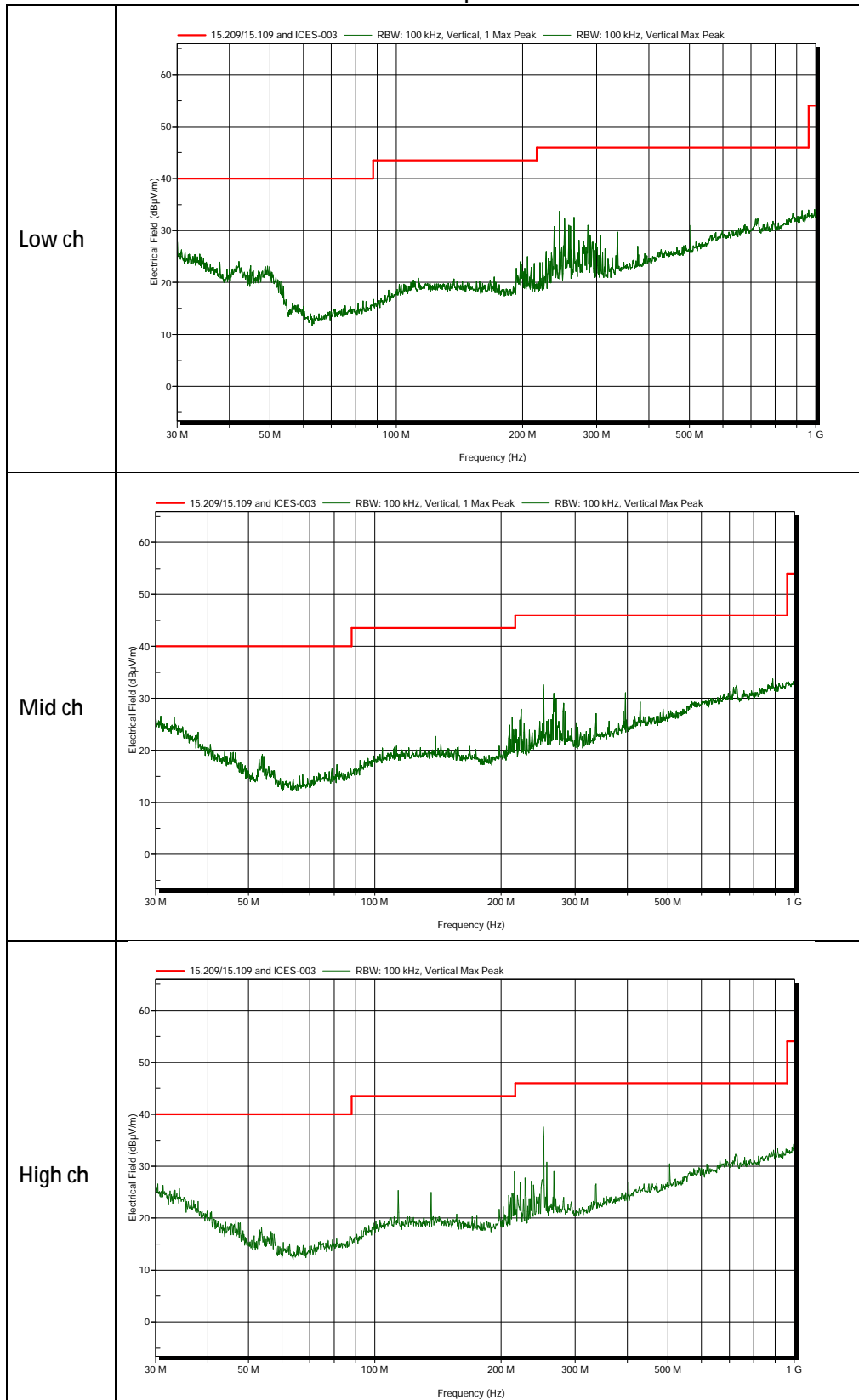
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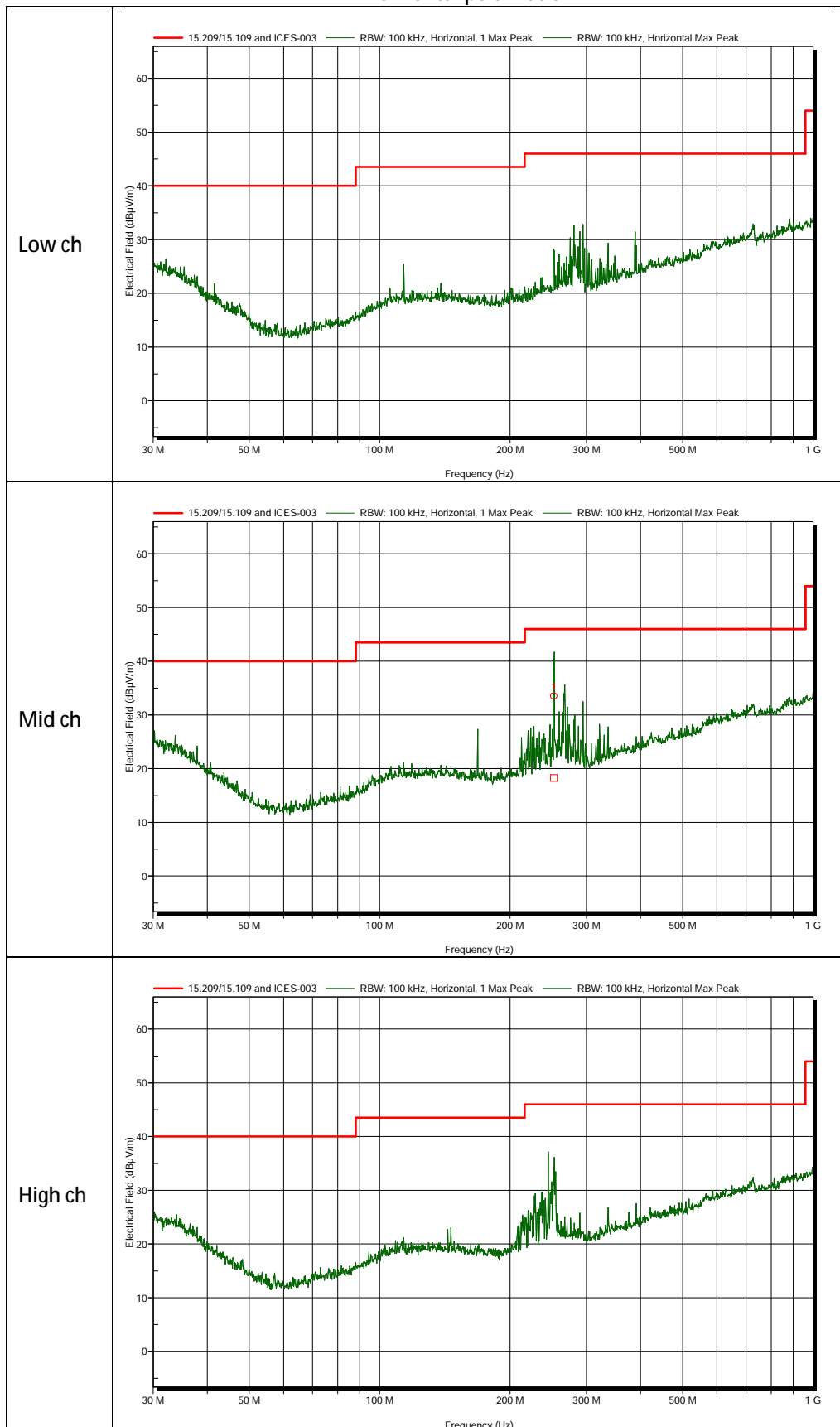
IEEE 802.11b 30 MHz to 1 GHz

Vertical polarization



IEEE 802.11b 30 MHz to 1 GHz

Horizontal polarization

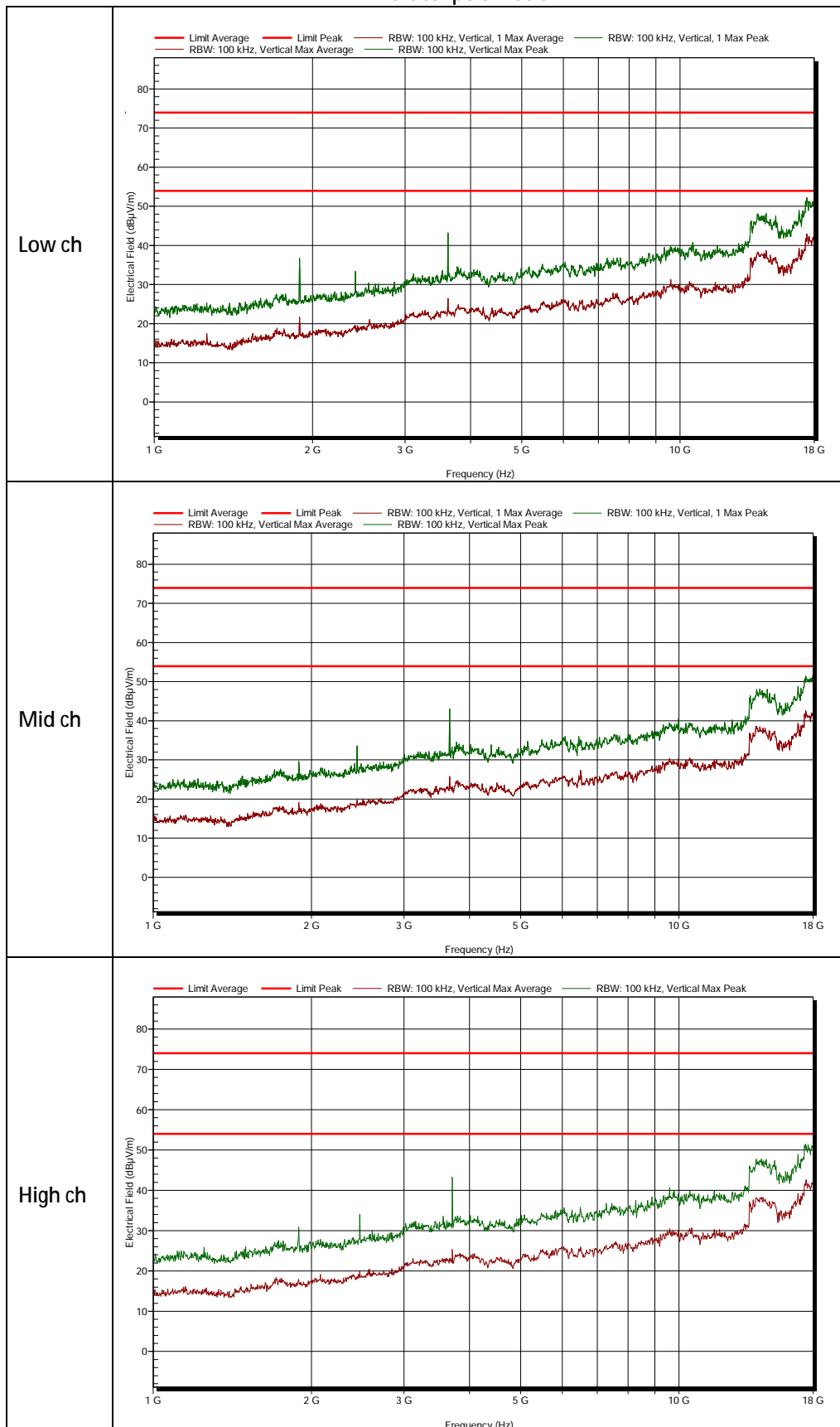


Measured peaks Horizontal 30 – 1000 MHz Middle channel

Frequency (MHz)	Polarization	Height (m)	Quasi-Peak (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)	Margin (dB)
252,26	Horizontal	1,5	18,3	46	-27,7

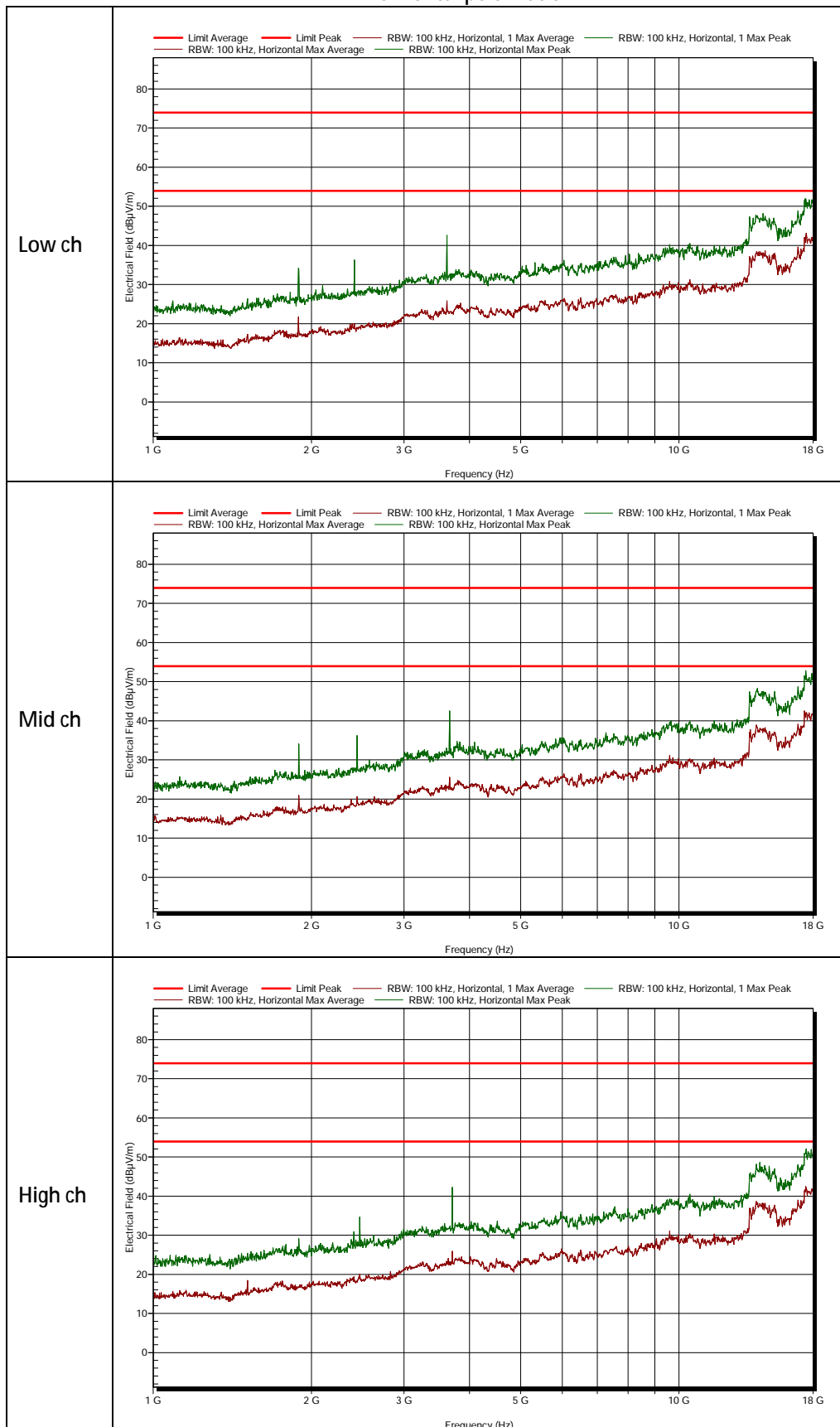
IEEE 802.11b 1 GHz to 18 GHz

Vertical polarization



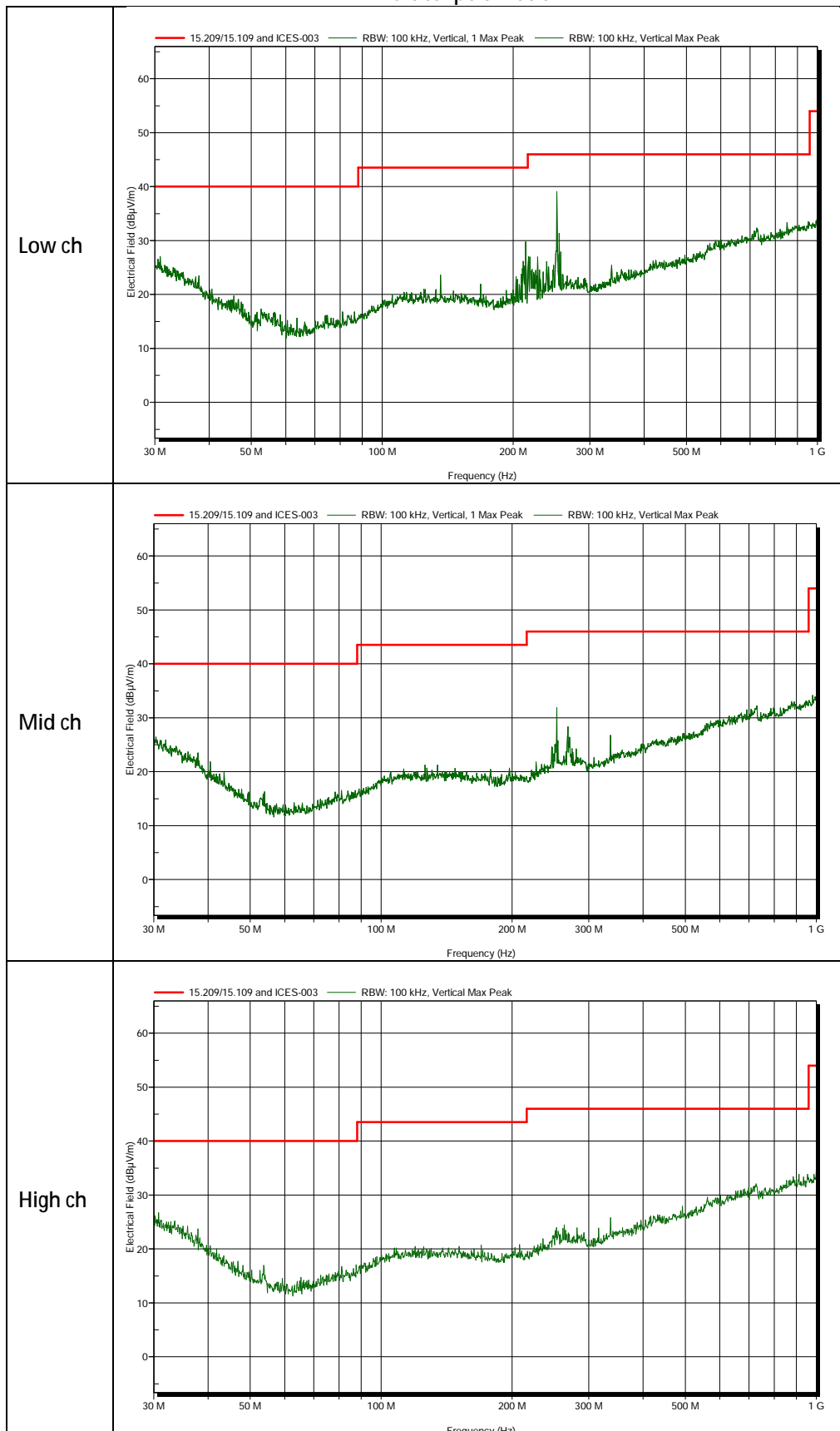
IEEE 802.11b 1 GHz to 18 GHz

Horizontal polarization



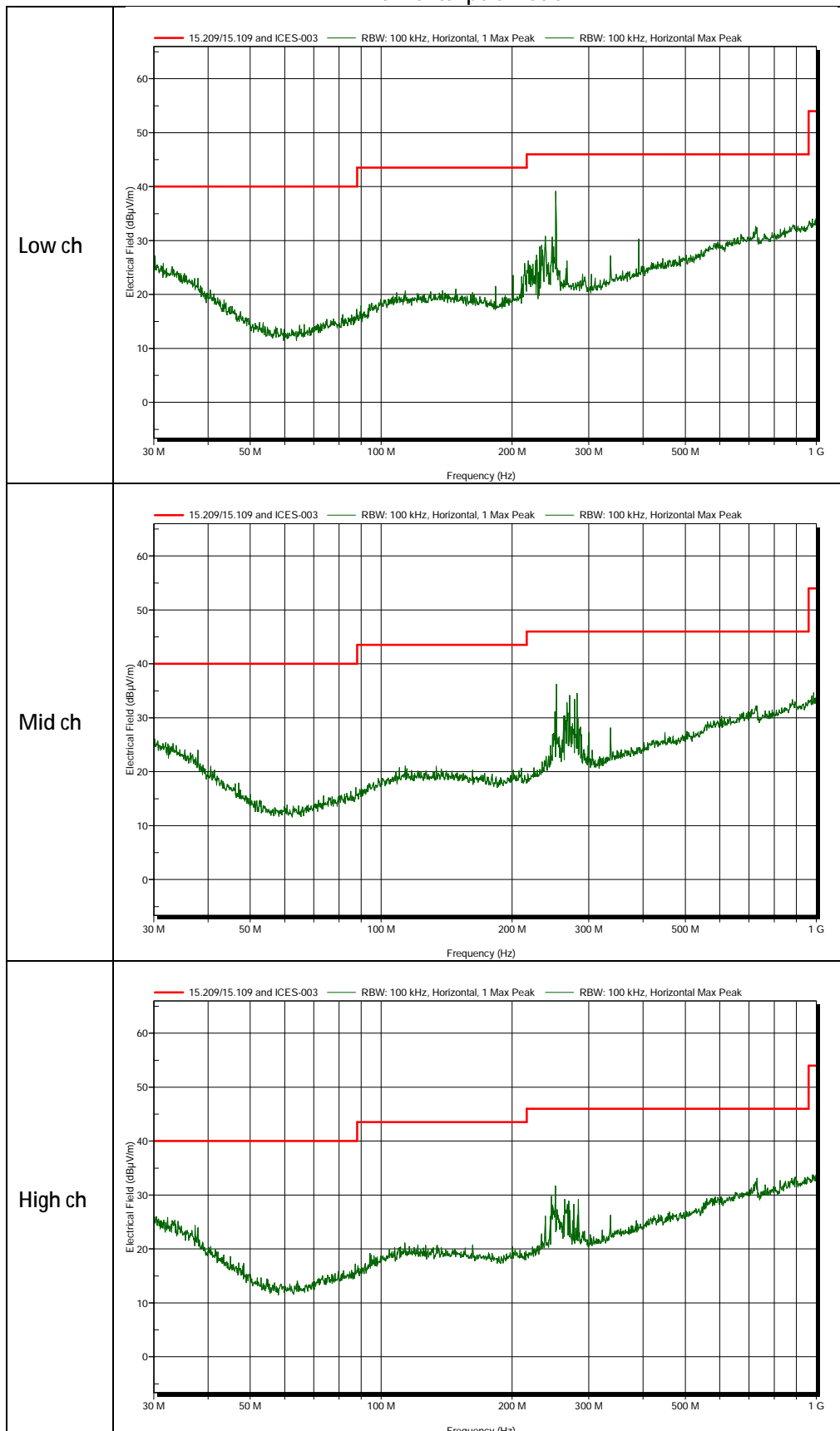
IEEE 802.11g 30 MHz to 1 GHz

Vertical polarization



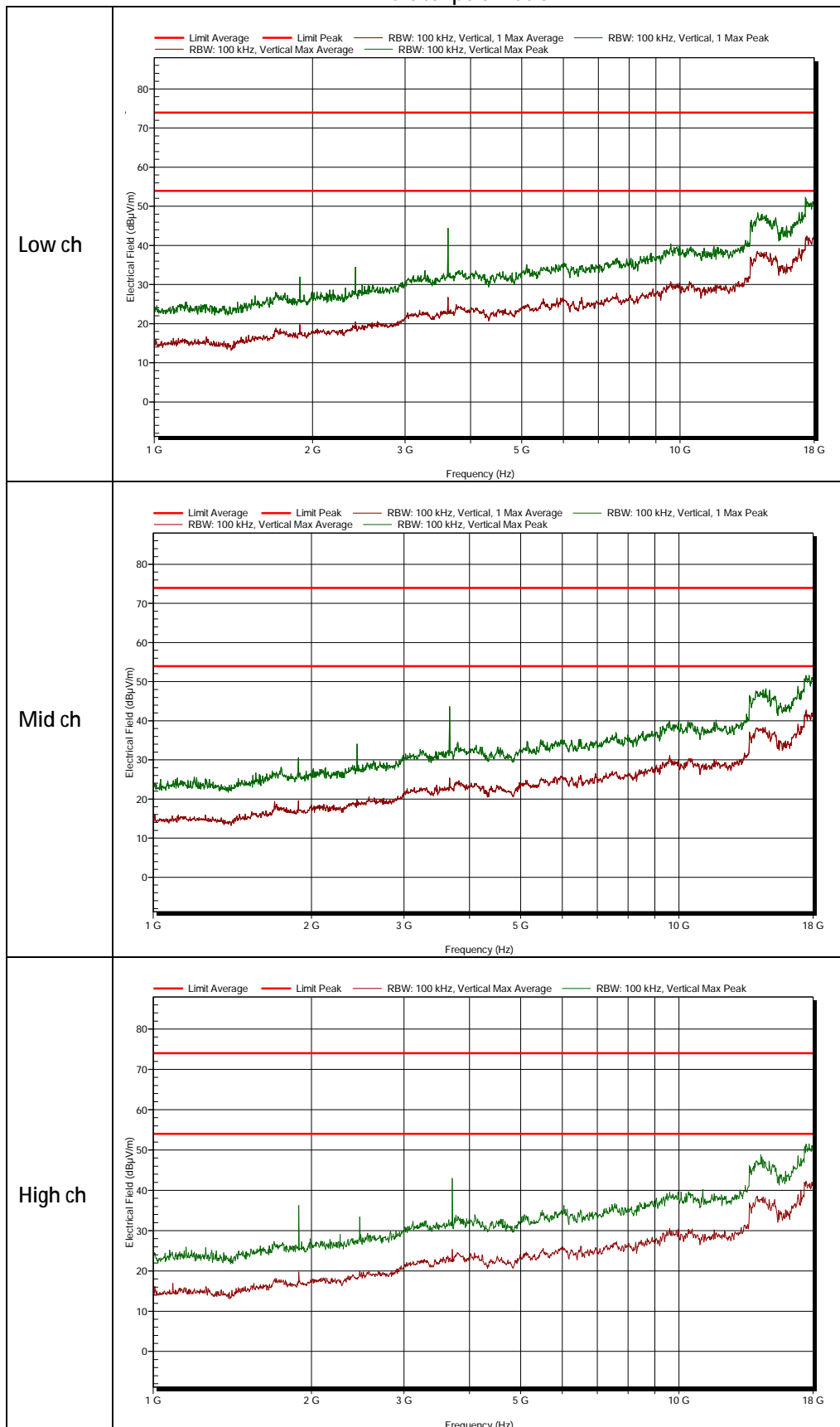
IEEE 802.11g 30 MHz to 1 GHz

Horizontal polarization



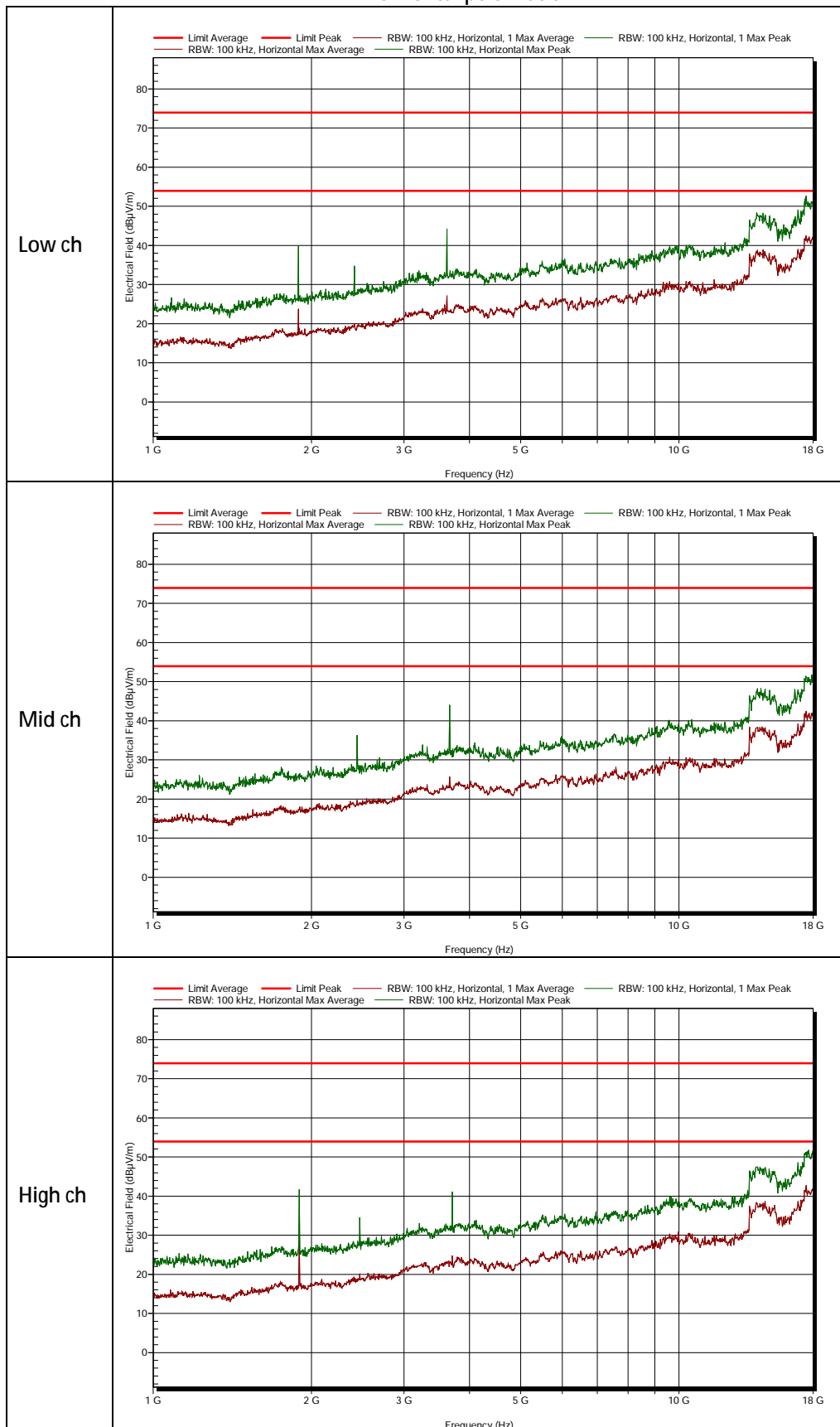
IEEE 802.11g 1 GHz to 18 GHz

Vertical polarization



IEEE 802.11g 1 GHz to 18 GHz

Horizontal polarization



18 GHz to 26 GHz

A pre-scan was performed to see if any emission are found in the frequency range from 18 to 26.5 GHz. As no emission were found, no final radiated measurements were performed.

Measurement Uncertainty

Measurement uncertainty Radiated emissions below 1 GHz

Horizontal polarization	
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

Measurement uncertainty Radiated emissions above 1 GHz

1000- 18000 MHz	+ 5.7/- 5.7dB
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