

**FCC and ISED Test Report for Parts
15.109, 15.207, 15.209 and 15.407;
RSS-247 and RSS-Gen**

**Band edge, spurious emissions, output power
and antenna requirements only**

Product name: WISR R3
Applicant: Orlaco
FCC ID: 2ADBX-PR1A
ISED ID: 12390A-PR1A

Test report No. : 190501396 001 Ver 2.0

Laboratory information

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Documentation

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Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31889983600 Fax. +31316583189
Test Site FCC	NL0001

Revision History

Version	Date	Remarks	By
v0.5	21-05-2019	First draft	PvW
v1.0	22-08-2019	Initial release	PvW
v2.0	10-10-2019	Added results of the output power measurement and updated clause 1.4 Product specifications of Equipment under test	PvW

Table of Contents

Revision History	2
Summary of Test results.....	5
1 General Description.....	6
1.1 Applicant.....	6
1.2 Manufacturer	6
1.3 Tested Equipment Under Test (EUT)	6
1.4 Product specifications of Equipment under test	7
1.5 Modification of the Equipment Under Test (EUT).....	7
1.6 Observations and remarks.....	7
1.7 Environmental conditions.....	8
1.8 Measurement Standards	8
1.9 Applicable Standards	8
1.10 Conclusions.....	9
2 Test configuration of the Equipment Under Test	10
2.1 Test mode	10
2.2 Tested channels and Data rates	10
2.3 Test setups.....	10
2.4 Equipment used in the test configuration.....	12
3 Test results	13
3.1 Band edge Measurement	13
3.1.1 Limit.....	13
3.1.2 Measurement instruments	13
3.1.3 Test setup.....	13
3.1.4 Test procedure	13
3.1.5 Measurement Uncertainty.....	13
3.1.6 Results of the band edge measurement	13
3.2 Radiated Spurious Emissions Measurement	14
3.2.1 Limit.....	14
3.2.2 Measurement instruments	14
3.2.3 Test setup.....	14
3.2.4 Test procedure	14
3.2.5 Notes	14
3.2.6 Peak values of the radiated spurious emissions measurement	14
3.2.7 Plots of the Radiated Spurious Emissions	15
3.2.8 Measurement Uncertainty.....	23
3.3 Output Power Measurement	24
3.3.1 Limit.....	24

3.3.2	Measurement instruments	24
3.3.3	Test setup	24
3.3.4	Test procedure	24
3.3.5	Test results of Output Power Measurement.....	24
3.4	Antenna requirement	25

Summary of Test results

FCC	ISED	Description	Section in report	Verdict
15.407 (b)	RSS-247 6.2	Band edge	3.1	Pass
15.109 (a) 15.209 (a)	RSS-247 6.2	Radiated Spurious emissions	3.2	Pass
15.205 (a)	RSS Gen 8.10	Spurious emissions in the restricted bands	3.2	Pass
15.407 (a)	RSS-247 6.2.1.1 RSS-247 6.2.4.1	Conducted power and e.i.r.p.	3.3	Pass

1 General Description

1.1 Applicant

Client name: Orlaco Products B.V.
Address: Postbus 193, Barneveld, the Netherlands
Zip code: 3770 AD
Telephone: 0342 404 555
E-mail: info@orlaco.nl
Contact name: Mr. A. Canrinus

1.2 Manufacturer

Manufacturer name: Orlaco Products B.V.
Address: Postbus 193, Barneveld, the Netherlands
Zip code: 3770 AD
Telephone: 0342 404 555
E-mail: compliance@orlaco.com
Contact name: --

1.3 Tested Equipment Under Test (EUT)

Product name: PR1A91DA1
Brand name: Orlaco
Product type: Wireless Video System
FCC ID: 2ADBX-PR1A
IC ID: 12390A-PR1A
Software version: V 0.7.1.0
Hardware version: PR1A91DA1
Date of receipt: 07-05-2019
Tests started: 07-05-2019
Testing ended: 09-10-2019

1.4 Product specifications of Equipment under test

TX Frequency range (MHz)	FCC: 5150 – 5250 FCC and ISSED: 5725 – 5850
RX frequency range (MHz)	FCC: 5150 – 5250 FCC and ISSED: 5725 – 5850
Maximum output power to antenna (dBm) ¹	FCC: 5150 – 5250MHz range: 19.4 FCC and ISSED: 5725 – 5850MHz range: 22.1
Antenna type	MIMO: 2x chip antenna
Antenna gain (dBi)	5 GHz WLAN: +3.0 dBi
Type of modulation	BPSK, QPSK, 16-QAM, 64-QAM
Emission designator	37MOD1D

Note 1: Output power to antenna value is based on the summed power sent to both antennas.

1.5 Modification of the Equipment Under Test (EUT)

None.

1.6 Observations and remarks

The EUT can be powered by both 12V and 24V batteries. Additionally, the EUT can be mounted on a metal back plane or on a non-metal backplane.

For each frequency range, the worst case configuration of input voltage and backplane with regards to emissions is determined by an exploratory measurement. The final measurements are performed on the worst-case configuration of input voltage and presence of metal back plane.

The module is installed according to the installation instructions of the module manufacturer without modification.

The manufacturer uses an antenna not used in the original module application. The gain of the used antenna is lower than the gain of the antennas used in the original application, so results of the module report are still considered applicable for this EUT.

The transmit power of the EUT complies with both the FCC and ISSED requirements. If the user sets the device to transmit at the highest programmable transmit power, the device still complies with the stricter limit at all operating frequencies.

The EUT does not use the DFS bands in the 5 GHz range, this limitation is hard coded in the firmware of the EUT and this setting is not accessible for users of the device.

The operating frequencies are limited to the 5725 – 5850 MHz frequency band when Canada is selected as the operating country in the user interface.

1.7 Environmental conditions

Test date	07-05-2019	09-05-2019	13-05-2019	16-05-2019	17-05-2019	20-05-2019	09-10-2019
Ambient temperature	20.9 °C	22.5 °C	22.3 °C	23.5 °C	23.5 °C	23.6 °C	22.7 °C
Humidity	36.1 %	38.3 %	36.0 %	34.1 %	34.1 %	42.8 %	47.6 %

1.8 Measurement Standards

- ANSI C63.10:2013

1.9 Applicable Standards

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

- FCC Part 15 Subpart B §15.109
- FCC Part 15 Subpart C §15.407, §15.207, §15.209
- RSS-247 Issue 2, RSS-Gen Issue 5

1.10 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.9 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 1.9 "*Applicable standards*".

All tests are performed by:

Name : P. van Wanrooij, BAsC

Review of test methods and report by:

Name : ing. R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 18-10-2019

Name : ing. K.A. Roes

Function : Coordinator Wireless & EMC

Signature :



2 Test configuration of the Equipment Under Test

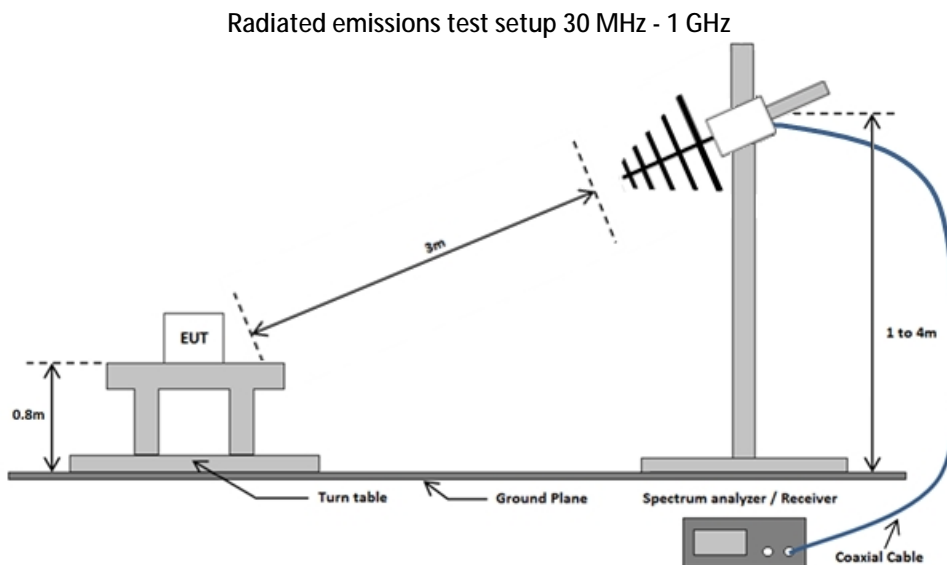
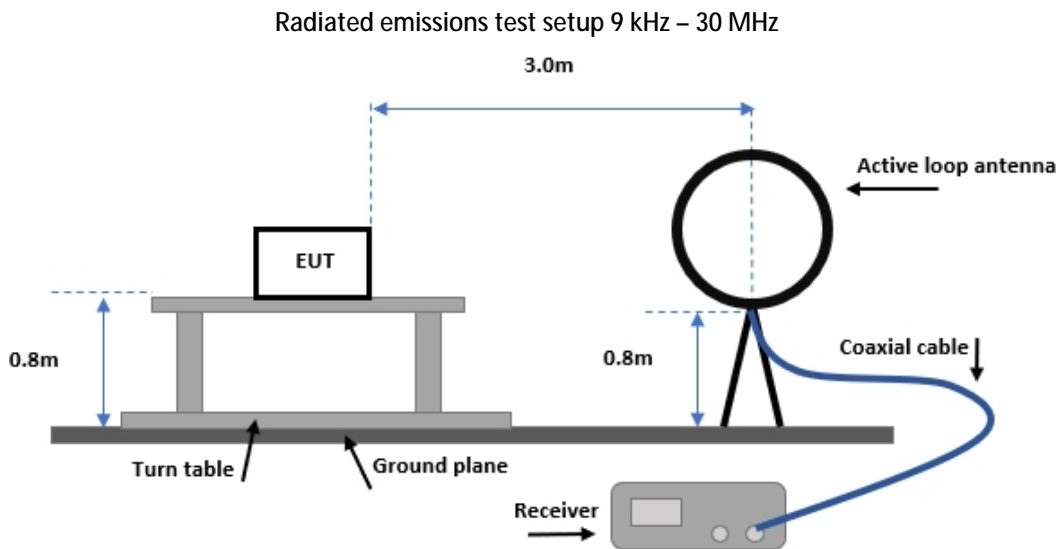
2.1 Test mode

The manufacturer provided software with which it was possible to set the EUT to transmit at different operating channels. Cameras streaming video were connected to the video input ports, making sure the ports were active during spurious emission testing.

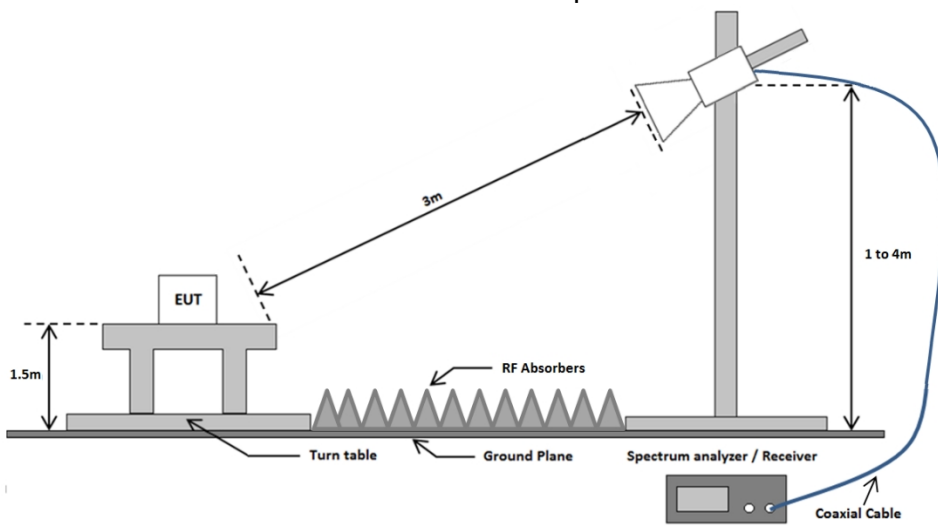
2.2 Tested channels and Data rates

Technology	Channels	Data rate	Frequency (MHz)
WLAN	36	45 MBps	5180
	48	45 MBps	5240
	153	45 MBps	5765
	159	45 Mbps	5795

2.3 Test setups



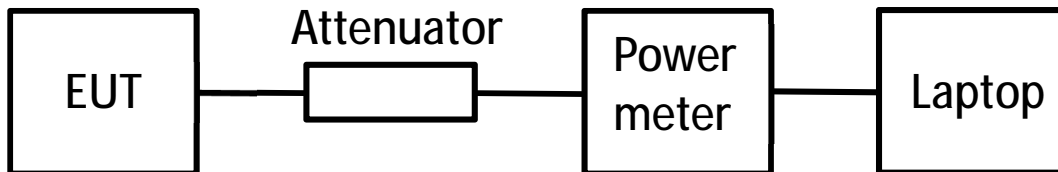
Radiated emissions test setup above 1 GHz



Band edge measurement



RF output power measurement



2.4 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
Spectrum Analyzer	Rohde & Schwarz	FSP40	TE11125	3.2
Spectrum Analyzer	Rohde & Schwarz	ESR7	TE01220	3.1, 3.2
Biconilog Antenna	Chase	CBL6112A	TE00967	3.2
Horn Antenna	EMCO The Electro – Mechanics Co	3115	TE00531	3.2
Horn Antenna	Flann Microwave	20240-25	TE00818	3.2
SAC Chamber	Comtest Engineering BV	-	TE00861	3.2
Highpass filter	Wainwright	WHKX7.0/18G-8SS	TE01141	3.2
Pre-amplifier	Miteq	Js4-18004000-30-8P-A1	TE11131	3.2
Software	DARE Instruments	Radimation 2018.1.3	--	3.2
Active loop antenna	Rohde & Schwarz	HFH-Z2	TE00746	3.2
Power meter	DARE	RPR3006W	TE11140	3.3
Attenuator	HP	8491B	TE00408	3.3
Cable	Rosenberger	FB142A1020002020	TE01314	3.3

3 Test results

3.1 Band edge Measurement

3.1.1 Limit

Band edge:

For transmitters operating in the 5.15 – 5.35 GHz band: all emissions outside of the 5.15 – 5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725 – 5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

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 789033 D02 clause G.2.

IRN 026 – Method 6.

IRN 026 – Method 7.

3.1.5 Measurement Uncertainty

± 5.7 dB.

3.1.6 Results of the band edge measurement

The results of the band edge measurement only report the worst case situation, the lower band edge of operating channel 36.

Measured frequency	Antenna port	Band edge power
5.1495 GHz	1	-31.89 dBm/MHz
5.1495 GHz	2	-31.90 dBm/MHz

The radiated power of the two antenna ports combined at the lower band edge is -28.8 dBm/MHz.

3.2 Radiated Spurious Emissions Measurement

3.2.1 Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

15.109/15.209

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance(m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 - 30	30	30
30 -88	100	3
88 - 216	150	3
216-960	200	3
Above 960	500	3

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.

3.2.4 Test procedure

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz.

Radiated emission limits in these three bands are based on measurements employing an average detector.

Other details are according to KDB Publication 558074 V04, sections 11.3 and 12.1.

IRN 027 – Radiated magnetic disturbance (A per m) Method 1 – Loop antenna.

IRN 026 - Radiated electrical disturbance (V per m) Method 1 – 30 MHz – 1 GHz in SAR.

IRN 026 - Radiated electrical disturbance (V per m) Method 2 – 1 - 18 GHz in SAR.

IRN 026 - Radiated electrical disturbance (V per m) Method 3 – 18 - 26.5 GHz in SAR.

IRN 026 – Radiated electrical disturbance (V per m) Method 4 – 26.5 – 40 GHz in SAR.

3.2.5 Notes

- In the frequency range of 1 – 26.5 GHz the green trace is measured using a peak detector and the red trace is measured using an average detector. The top limit line represent the peak limit and the bottom limit represents the average limit
- No spurious emissions were detected in the 26.5 – 40 GHz frequency range, so these results are not reported.

3.2.6 Peak values of the radiated spurious emissions measurement

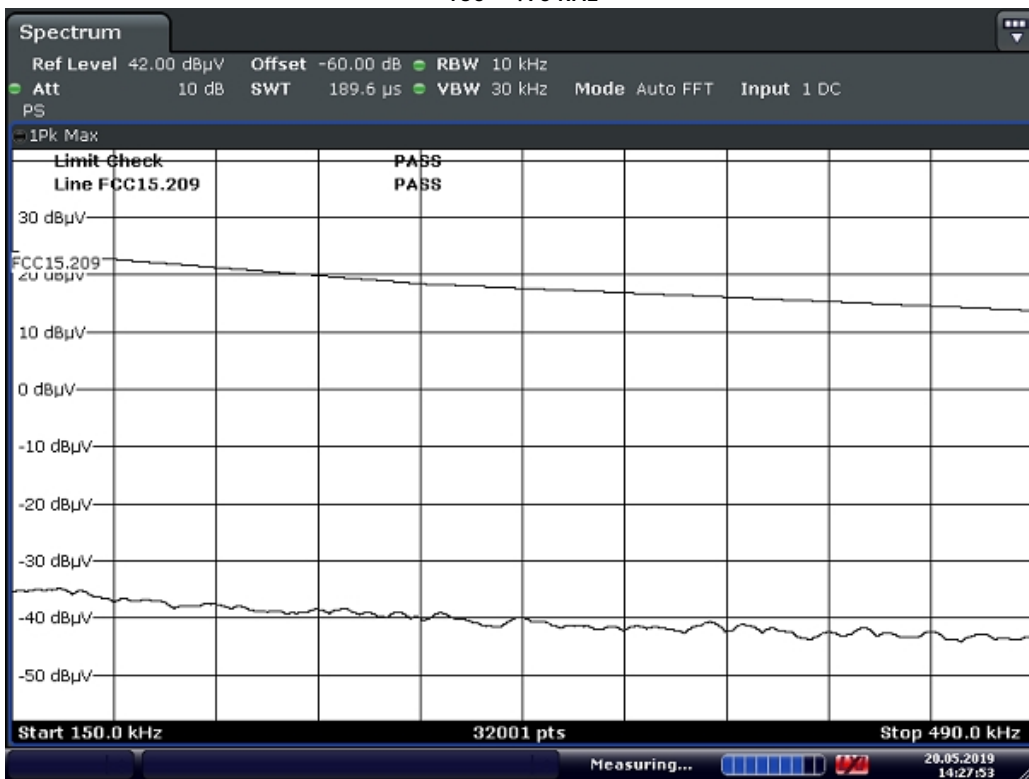
Frequency (MHz)	Measured level (dB $\mu\text{V/m}$)	Limit (dB $\mu\text{V/m}$)	Difference from limit (dB $\mu\text{V/m}$)
26.34983	26.54	29.5	-3.0
26.471892	26.35	29.5	-3.1
26.654761	25.79	29.5	-3.7
74.984	37.3	40.0	-2.7
10.386	Peak: 56.5	Peak: 74.0	-17.5
	Average: 44.6	Average: 54.0	-9.4

3.2.7 Plots of the Radiated Spurious Emissions

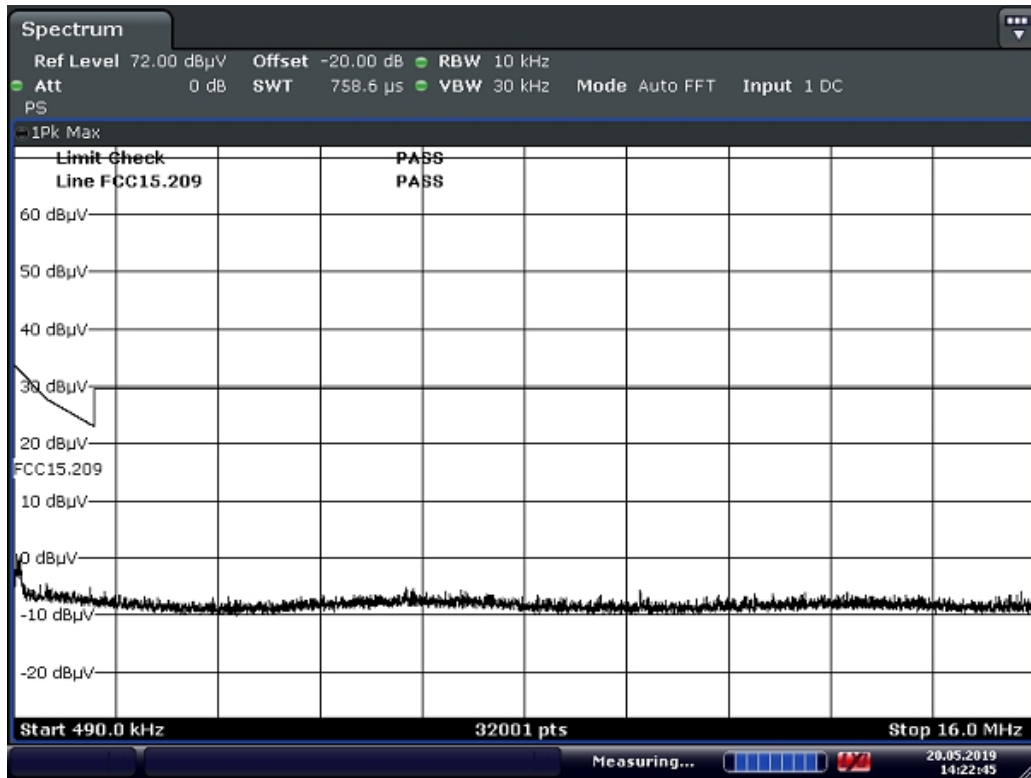
9 – 150 kHz



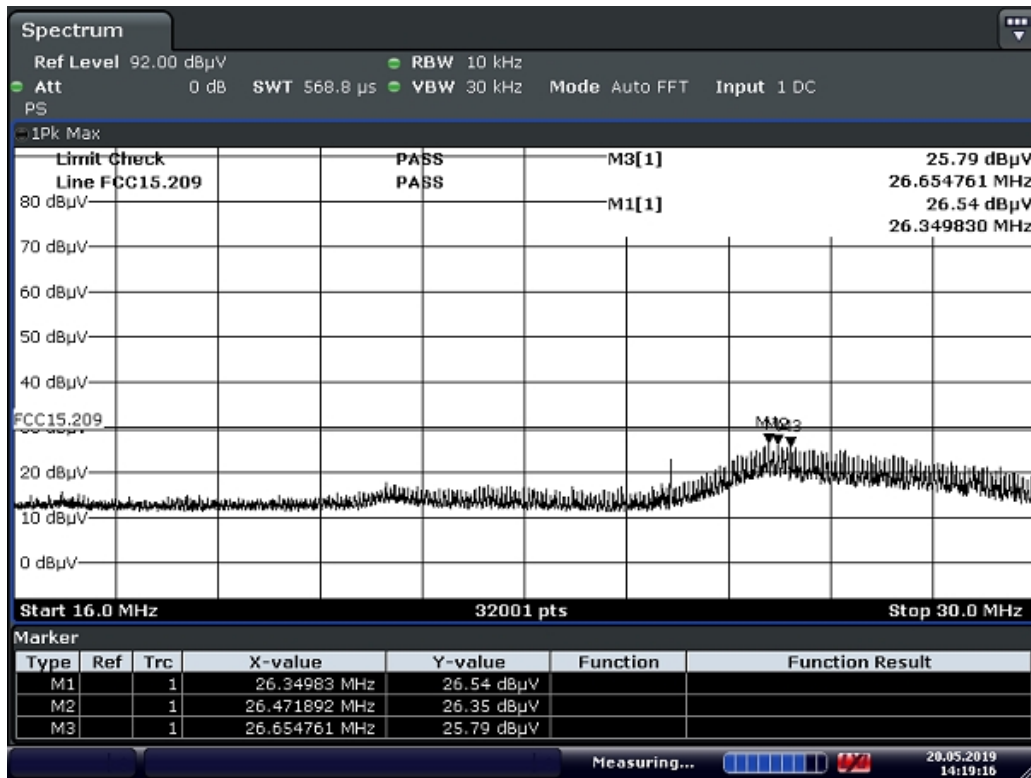
150 – 490 kHz



490 kHz – 16 MHz

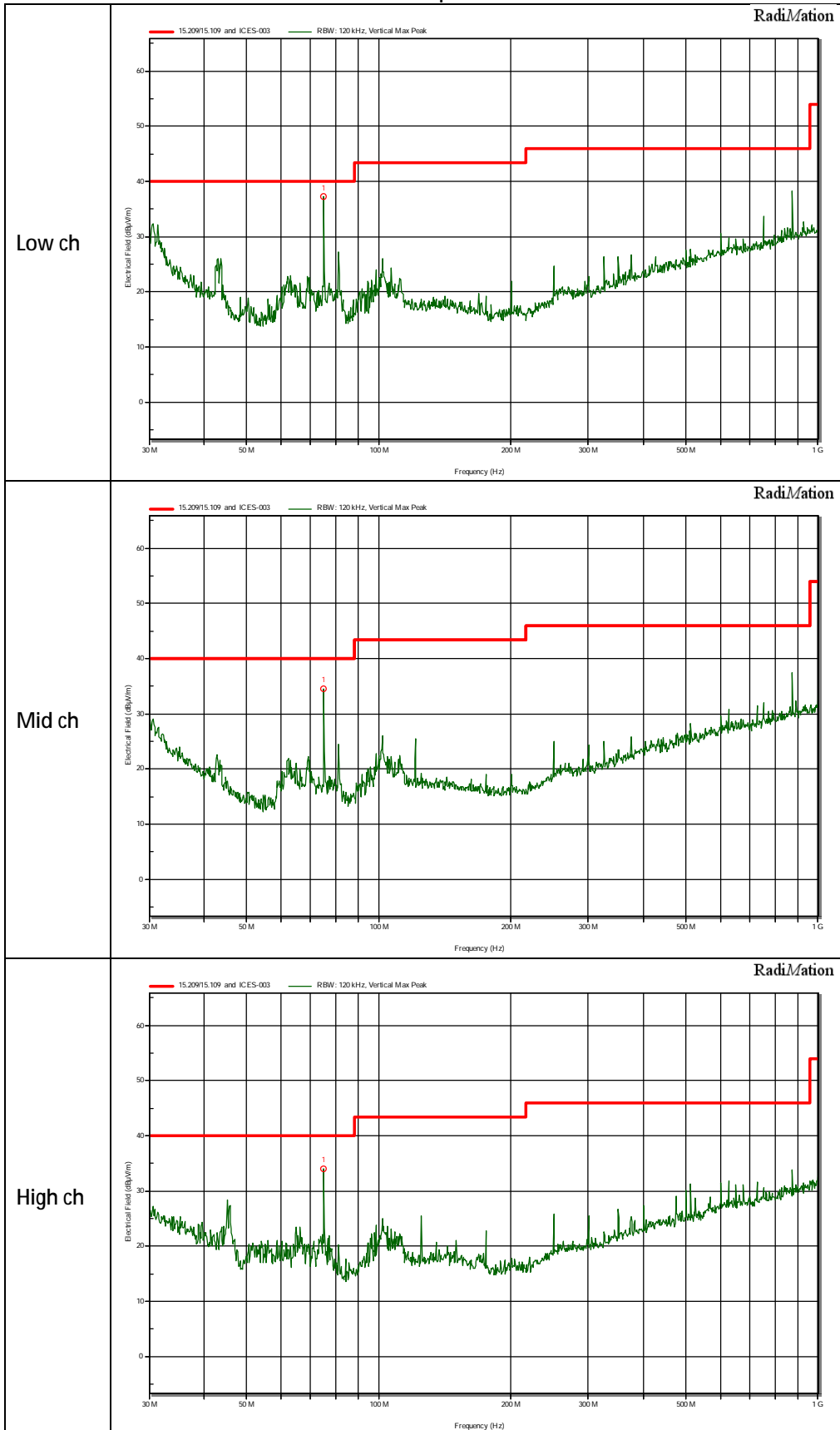


16 – 30 MHz



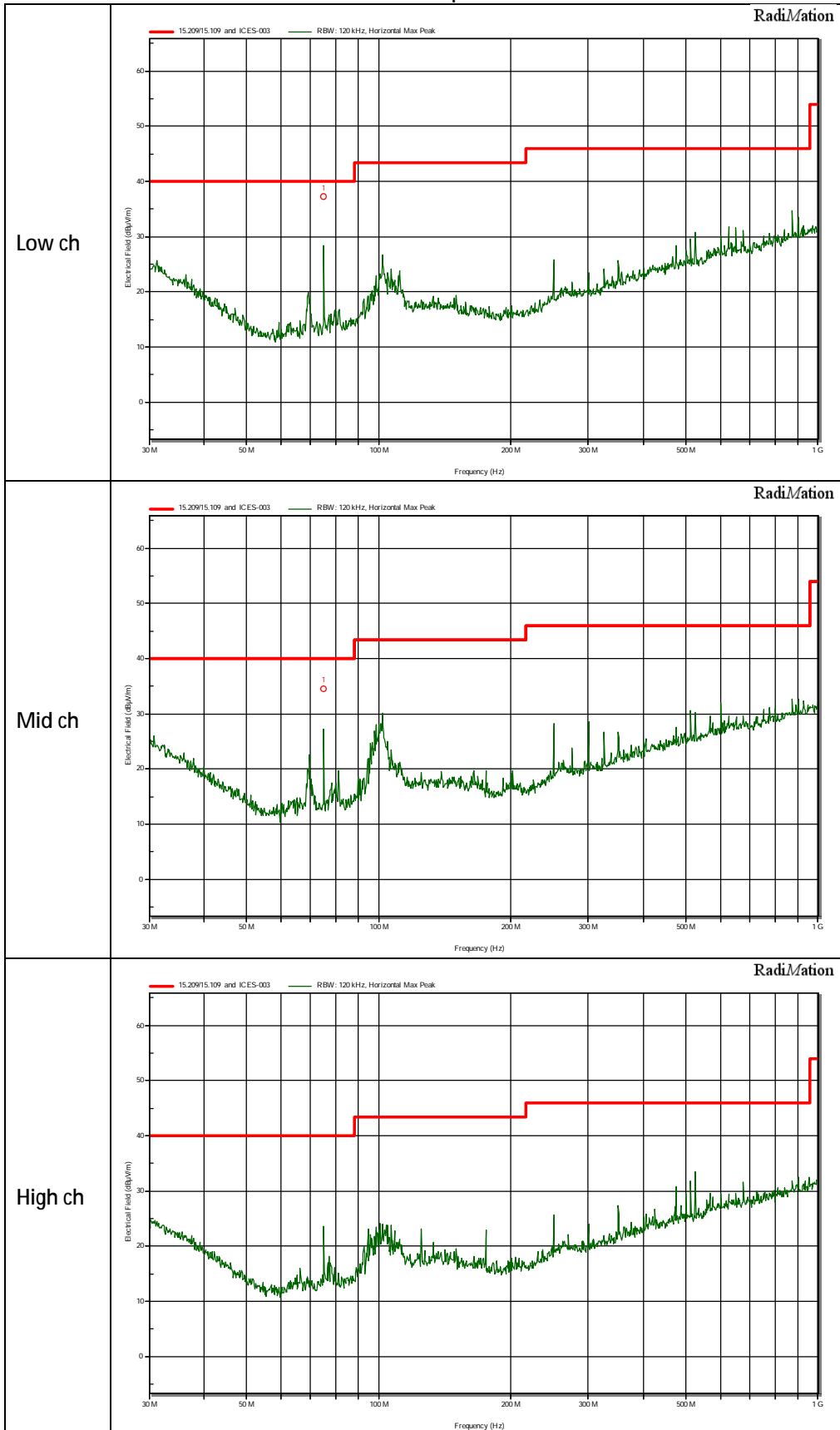
30 – 1000 MHz

Vertical polarization



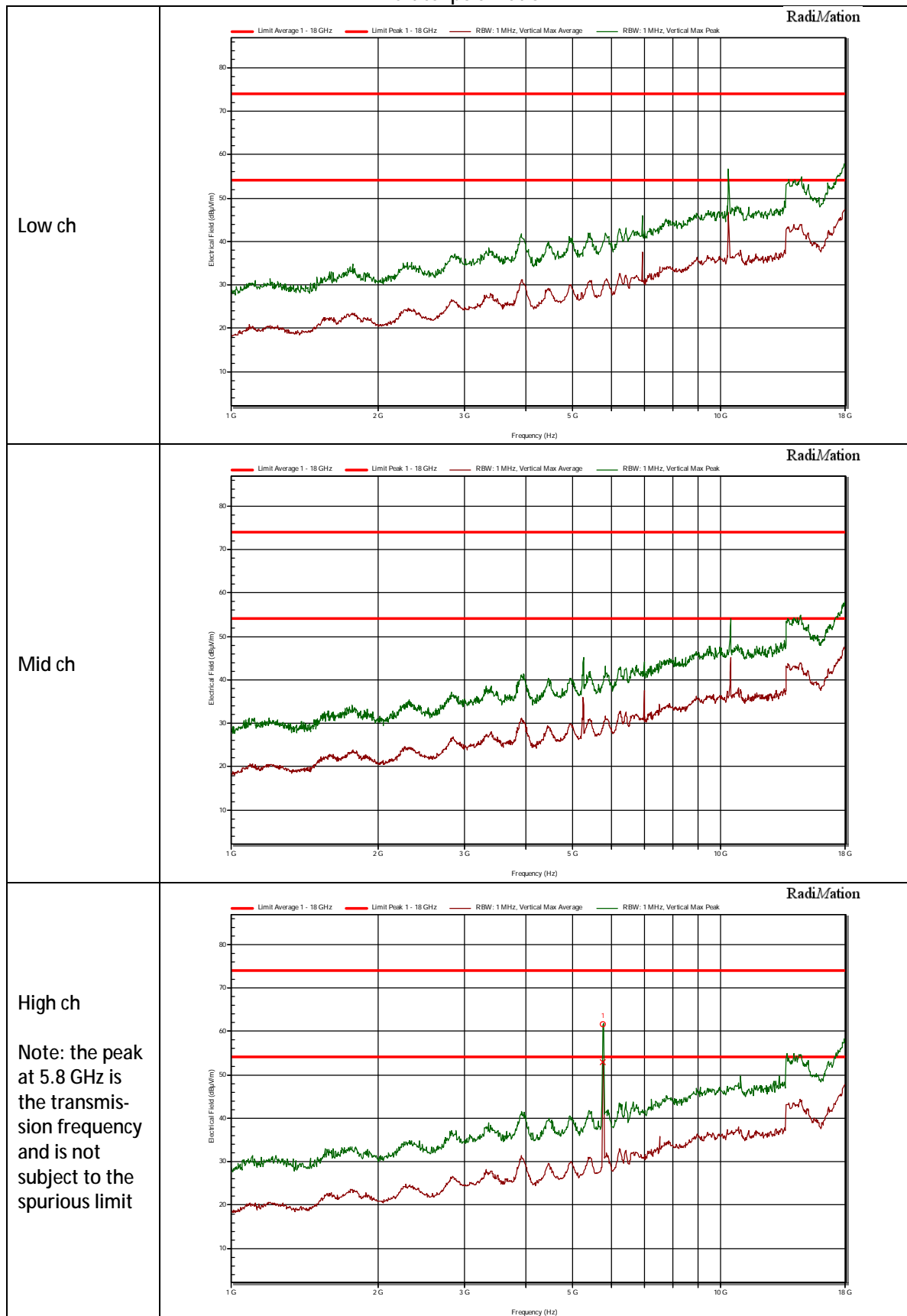
30 MHz to 1 GHz

Horizontal polarization



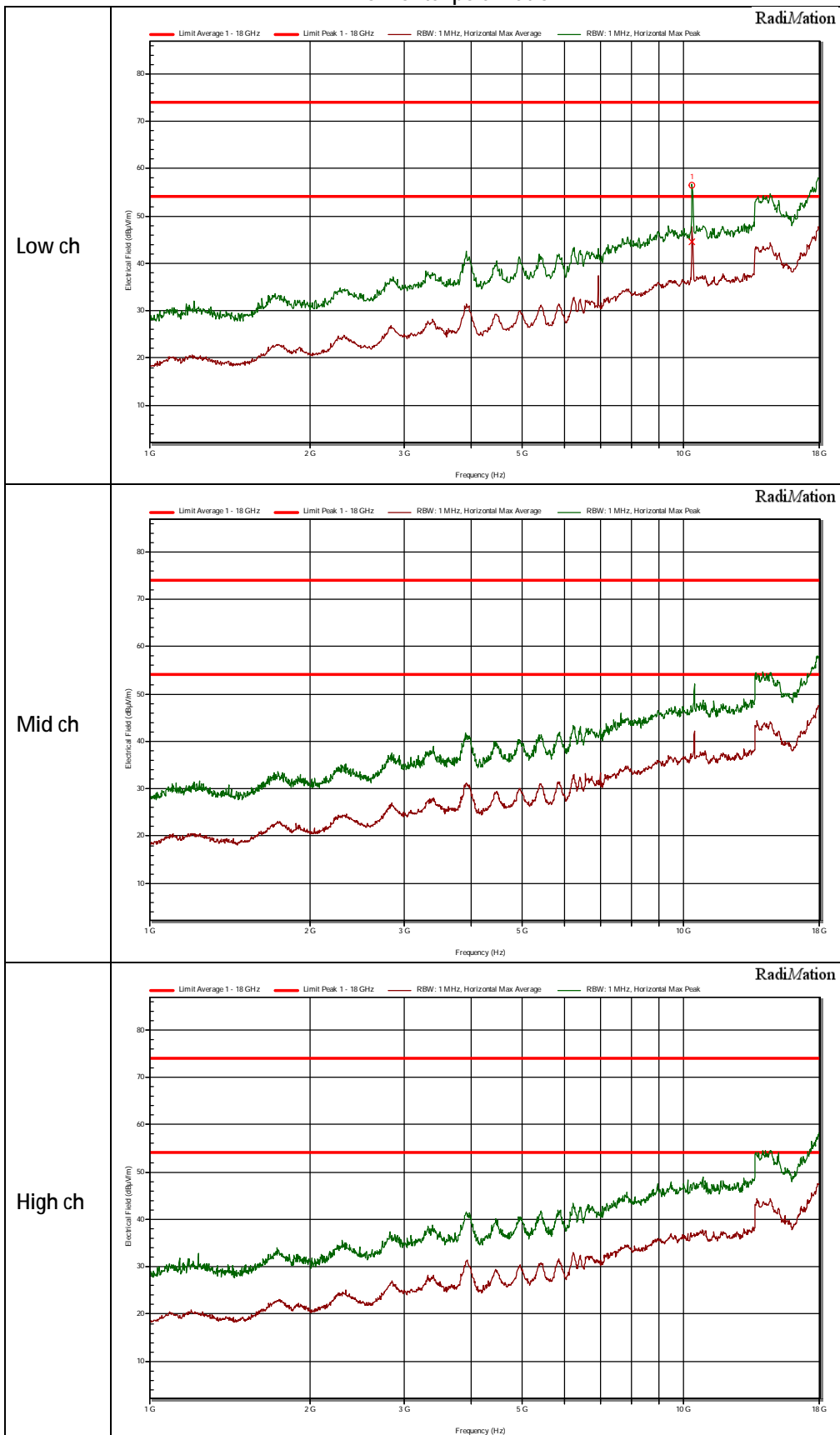
1 GHz to 18 GHz

Vertical polarization



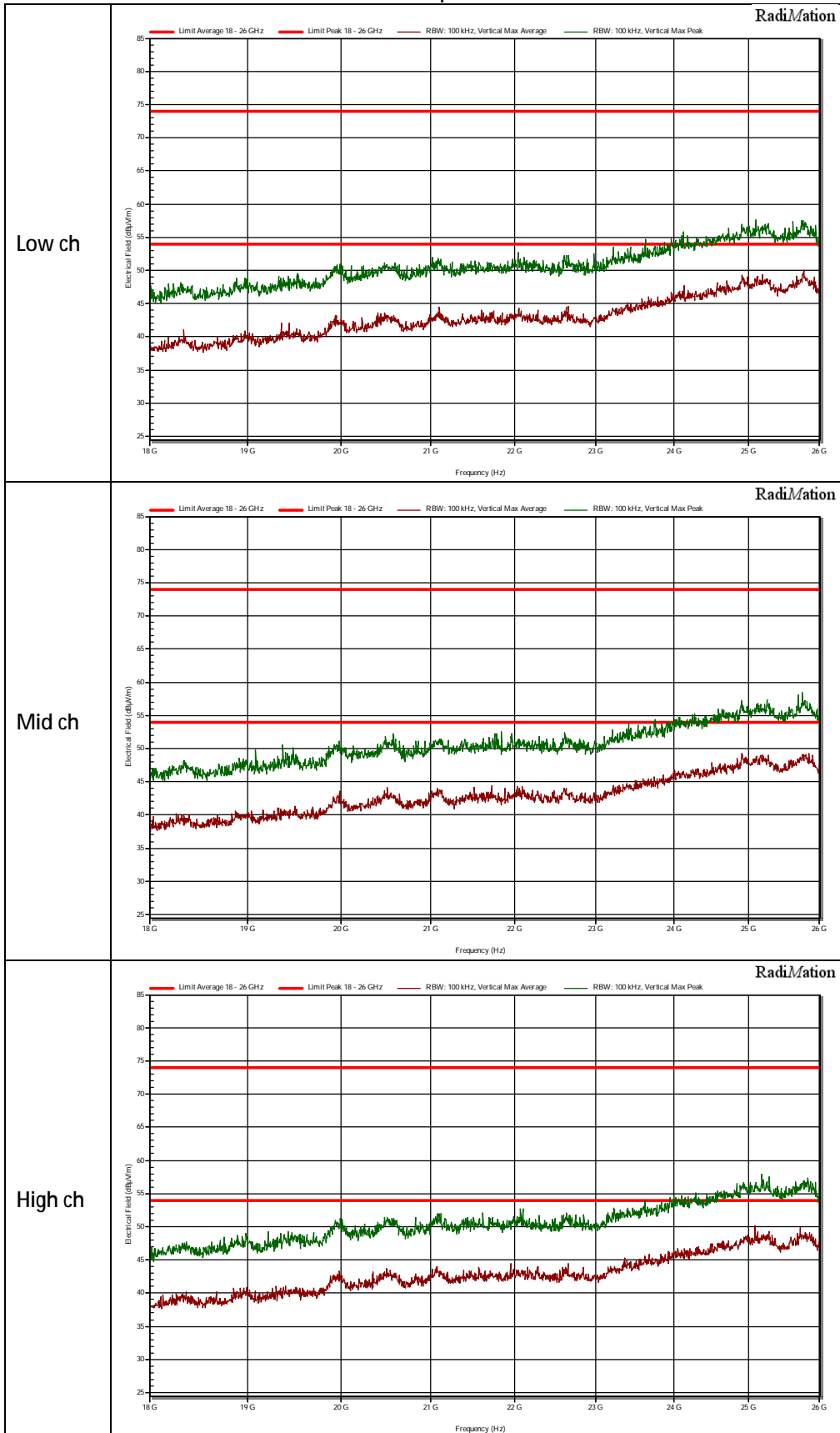
1 GHz to 18 GHz

Horizontal polarization



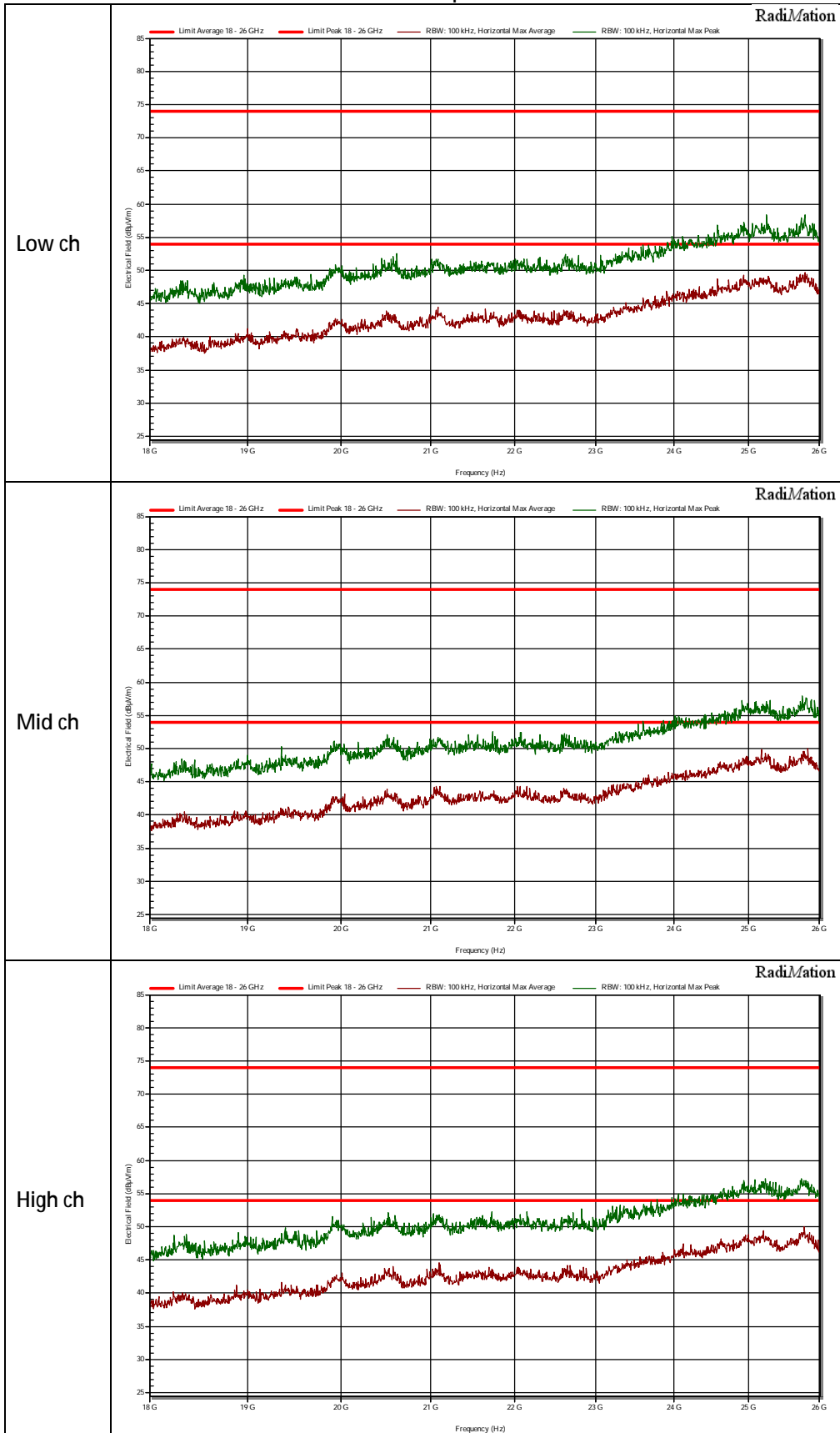
18 GHz to 26 GHz

Vertical polarization



18 GHz to 26 GHz

Horizontal polarization



3.2.8 Measurement Uncertainty

Measurement uncertainty Radiated emissions 30 MHz – 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 9 kHz – 30 MHz and above 1 GHz

9 kHz – 30 MHz	±1.6 dB
1000- 18000 MHz	±5.7 dB
18000 – 26500 MHz	±3.9 dB
26500 – 40000 MHz	±4.5 dB

3.3 Output Power Measurement

3.3.1 Limit

Standard	Frequency range (GHz)	Limit (W)	Specification
FCC 15.407 (a)	5.15 – 5.25	1.0	Conducted
	5.725 – 5.85	1.0	Conducted
RSS-247 6.2	5.15 – 5.25	0.2	e.i.r.p.
	5.725 – 5.85	1.0	Conducted

3.3.2 Measurement instruments

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

3.3.3 Test setup

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

3.3.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.

IRN 014 – Method 2.

3.3.5 Test results of Output Power Measurement

Technology Std.	Channel	Frequency (MHz)	Power setting	Output power (W)	Specification
WLAN	38	5190	30	0.087	Conducted
	46	5230	30	0.087	Conducted
	38	5190	30	0.174	e.i.r.p.
	46	5230	30	0.174	e.i.r.p.
	153	5765	30	0.161	Conducted
	159	5795	30	0.148	Conducted
Uncertainty	±0.52 dB				

Notes:

1. All measurements are performed conducted. e.i.r.p is determined by adding the maximum antenna gain to the conducted measurements
2. All output power results comply with both the IC and FCC requirements, even when the EUT is programmed with the maximum power setting (30) in the USA mode, which is the worst case mode.

3.4 Antenna requirement

The antennas of the EUT are mounted on the PCB inside the enclosure where they are connected to the intentional radiator. It will not be possible to open the enclosure without damage.

The manufacturer uses the Antenova SR42W001 Mutica Dual-band Wi-Fi antenna.