

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

### Accreditation

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### Documentation

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### Testing Location

|                    |                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------|
| Test Site          | Telefication BV                                                                                       |
| Test Site location | Edisonstraat 12a<br>6902 PK Zevenaar<br>The Netherlands<br><br>Tel. +31889983600<br>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)<br>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<br>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:       | <a href="mailto:info@orlaco.nl">info@orlaco.nl</a> |
| 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:            | <a href="mailto:compliance@orlaco.com">compliance@orlaco.com</a> |
| 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<br>FCC and ISSED: 5725 – 5850                               |
| RX frequency range (MHz)                           | FCC: 5150 – 5250<br>FCC and ISSED: 5725 – 5850                               |
| Maximum output power to antenna (dBm) <sup>1</sup> | FCC: 5150 – 5250MHz range: 19.4<br>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

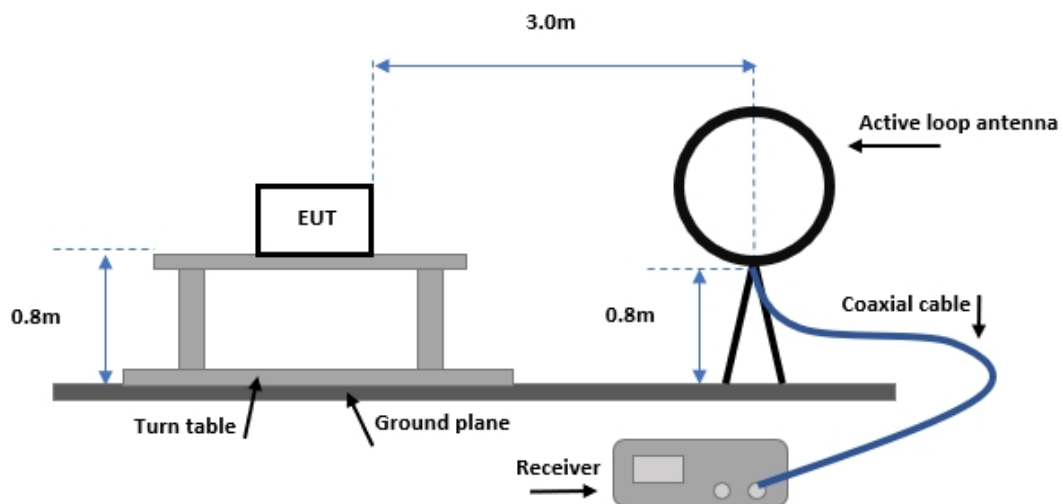
The manufacturer provided software with which it was possible to set the EUT to transmit at different operating channels. Cameras streaming video were connected to the video input ports, making sure the ports were active during spurious emission testing.

### 2.2 Tested channels and Data rates

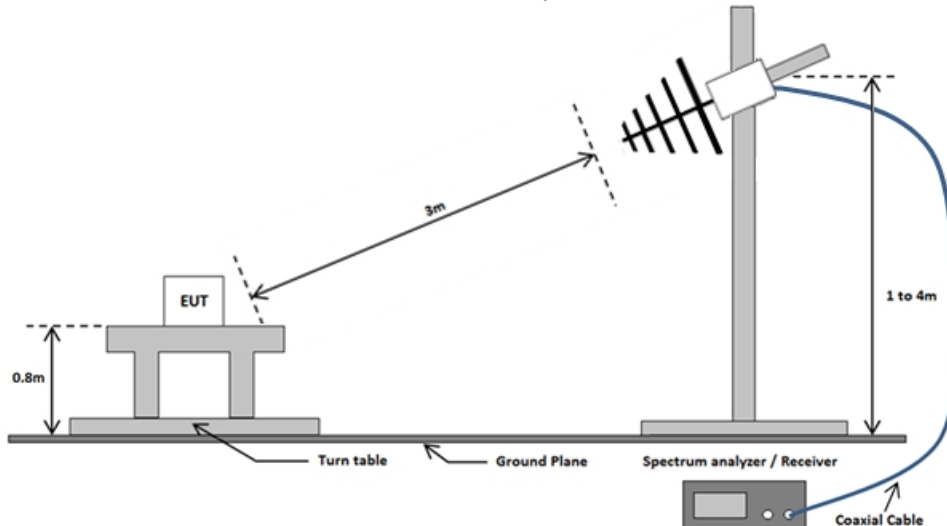
| Technology | Channels | Data rate | Frequency (MHz) |
|------------|----------|-----------|-----------------|
| WLAN       | 36       | 45 MBps   | 5180            |
|            | 48       | 45 MBps   | 5240            |
|            | 153      | 45 MBps   | 5765            |
|            | 159  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

### 2.3 Test setups

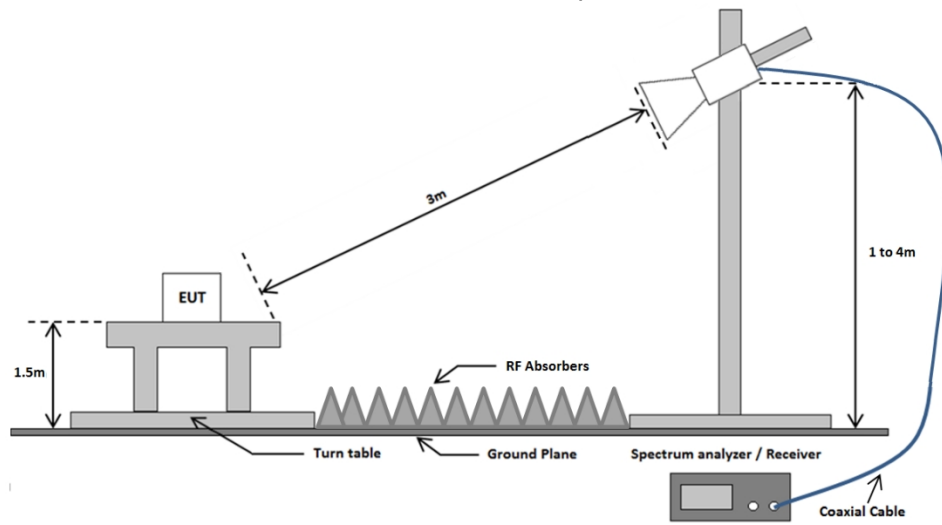
Radiated emissions test setup 9 kHz – 30 MHz



Radiated emissions test setup 30 MHz - 1 GHz



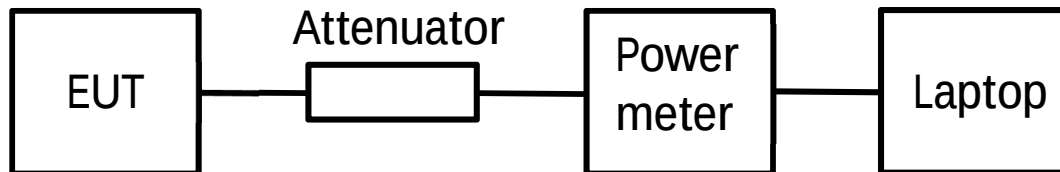
Radiated emissions test setup above 1 GHz



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   | $2400/F(\text{kHz})$               | 300                     |
| 0.490 – 1.705   | $24000/F(\text{kHz})$              | 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

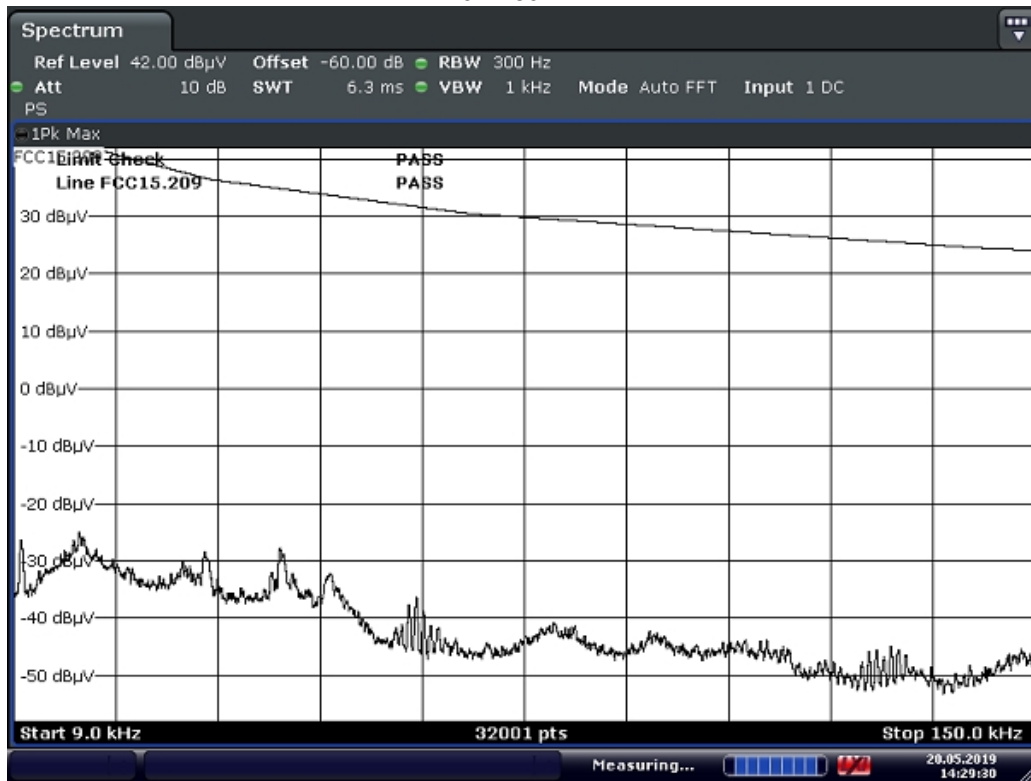
- In the frequency range of 1 – 26.5 GHz the green trace is measured using a peak detector and the red trace is measured using an average detector. The top limit line represent the peak limit and the bottom limit represents the average limit
- No spurious emissions were detected in the 26.5 – 40 GHz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

### 3.2.6 Peak values of the radiated spurious emissions measurement

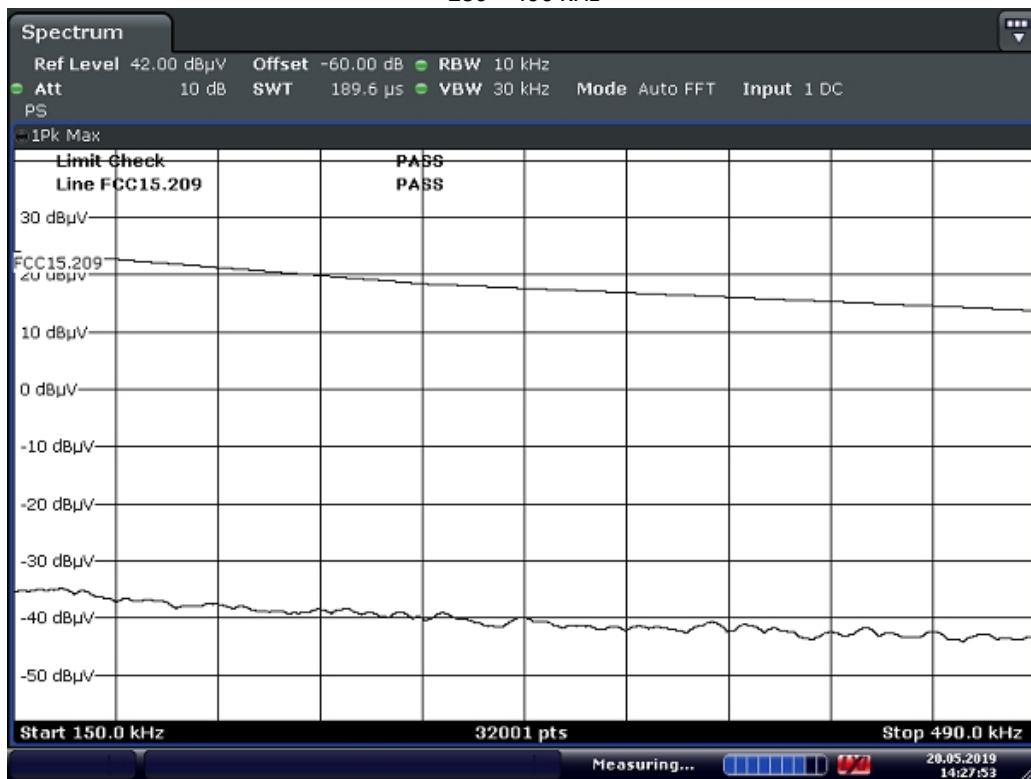
| Frequency (MHz) | Measured level ( $\text{dB}\mu\text{V/m}$ ) | Limit ( $\text{dB}\mu\text{V/m}$ ) | Difference from limit ( $\text{dB}\mu\text{V/m}$ ) |
|-----------------|---------------------------------------------|------------------------------------|----------------------------------------------------|
| 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

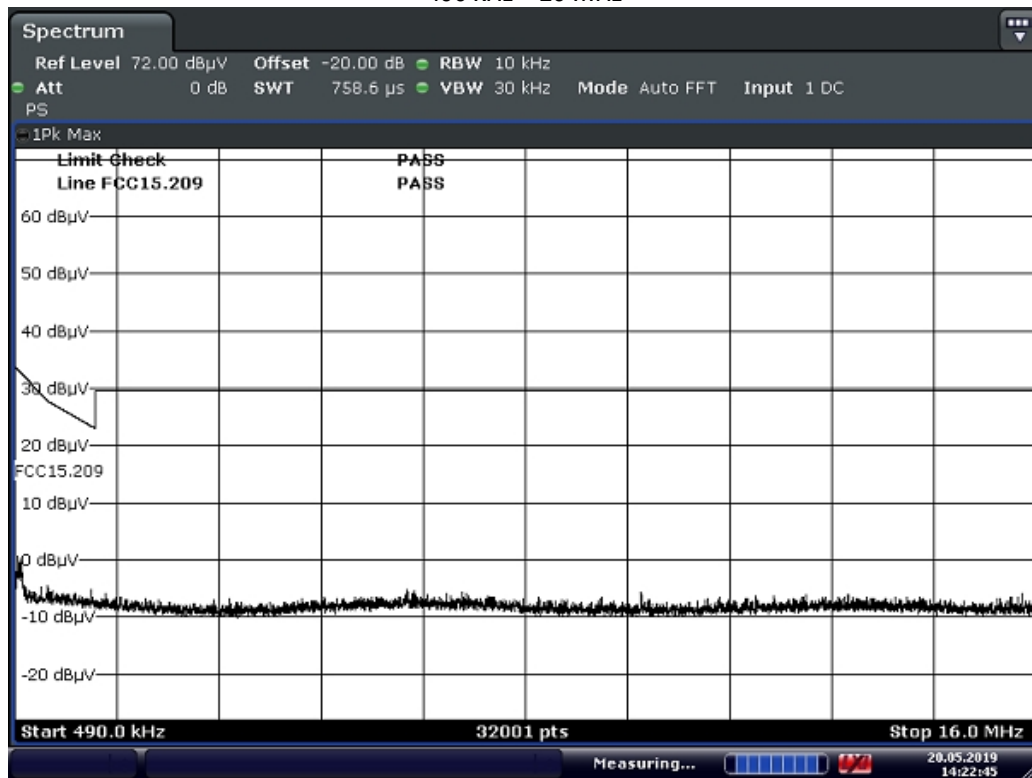
9 – 150 kHz



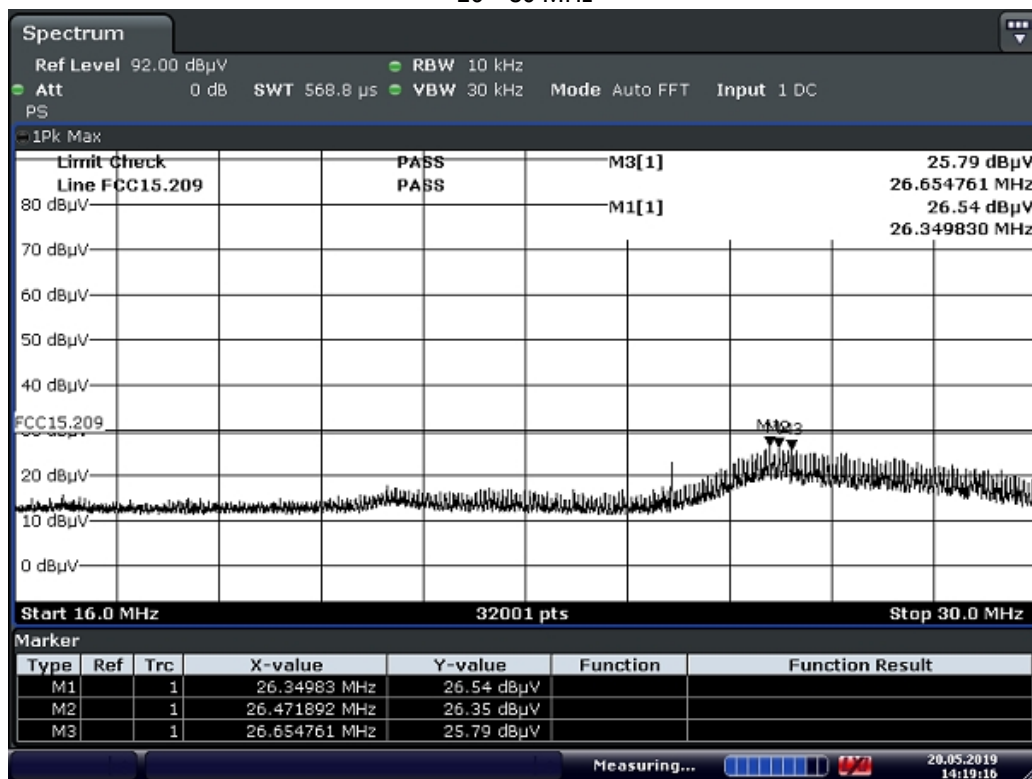
150 – 490 kHz



## 490 kHz – 16 MHz

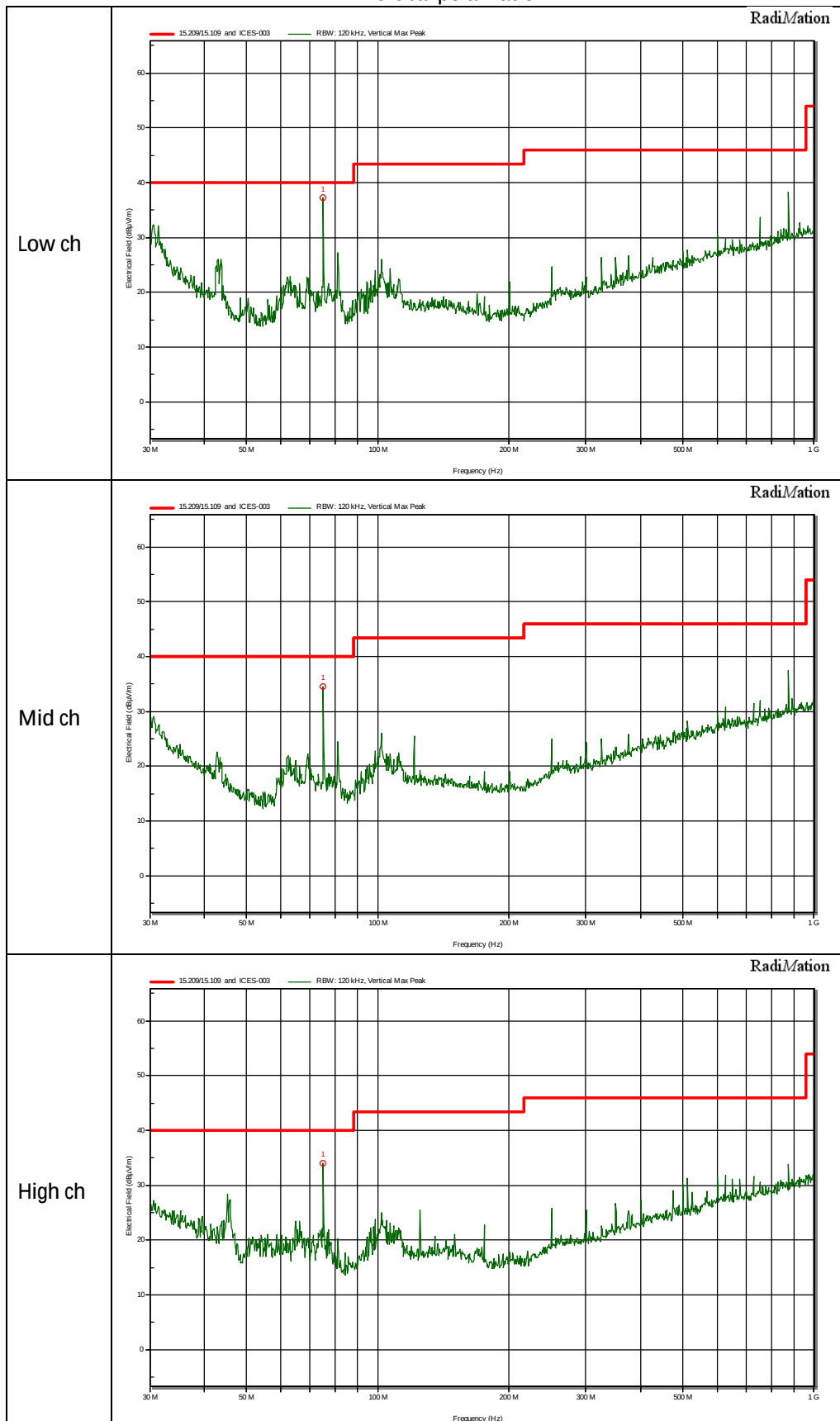


## 16 – 30 MHz



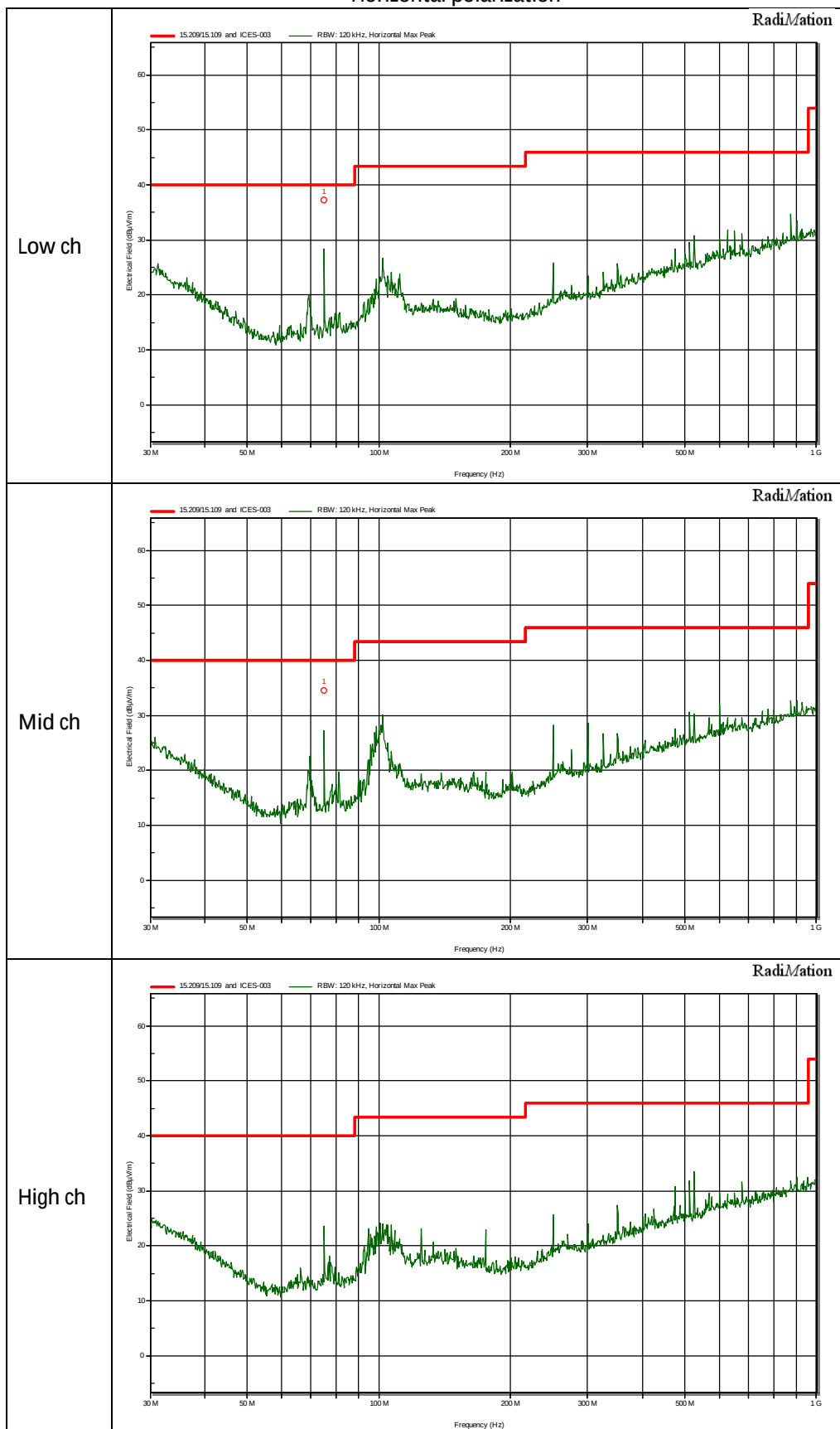
30 – 1000 MHz

Vertical polarization



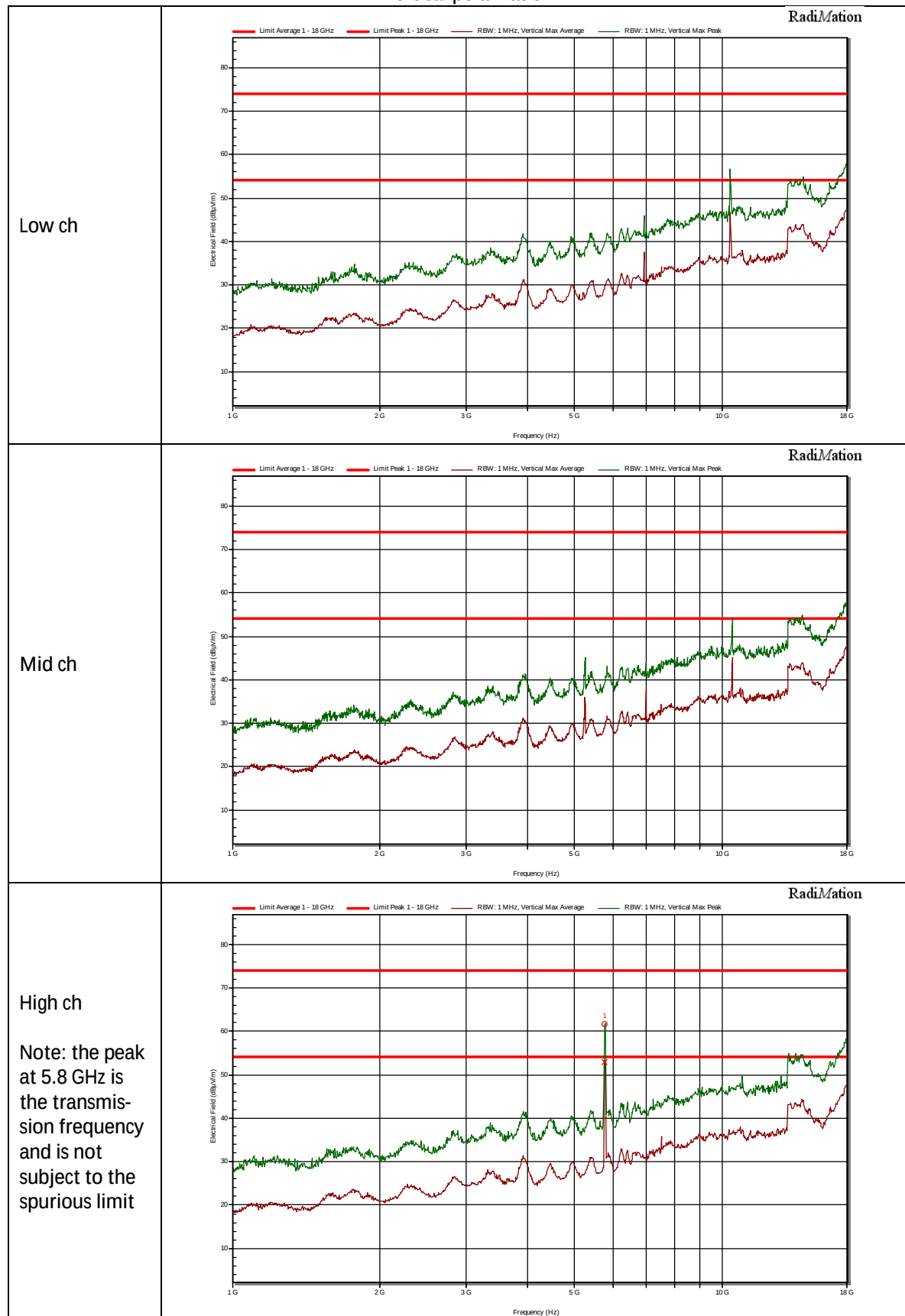
30 MHz to 1 GHz

Horizontal polarization



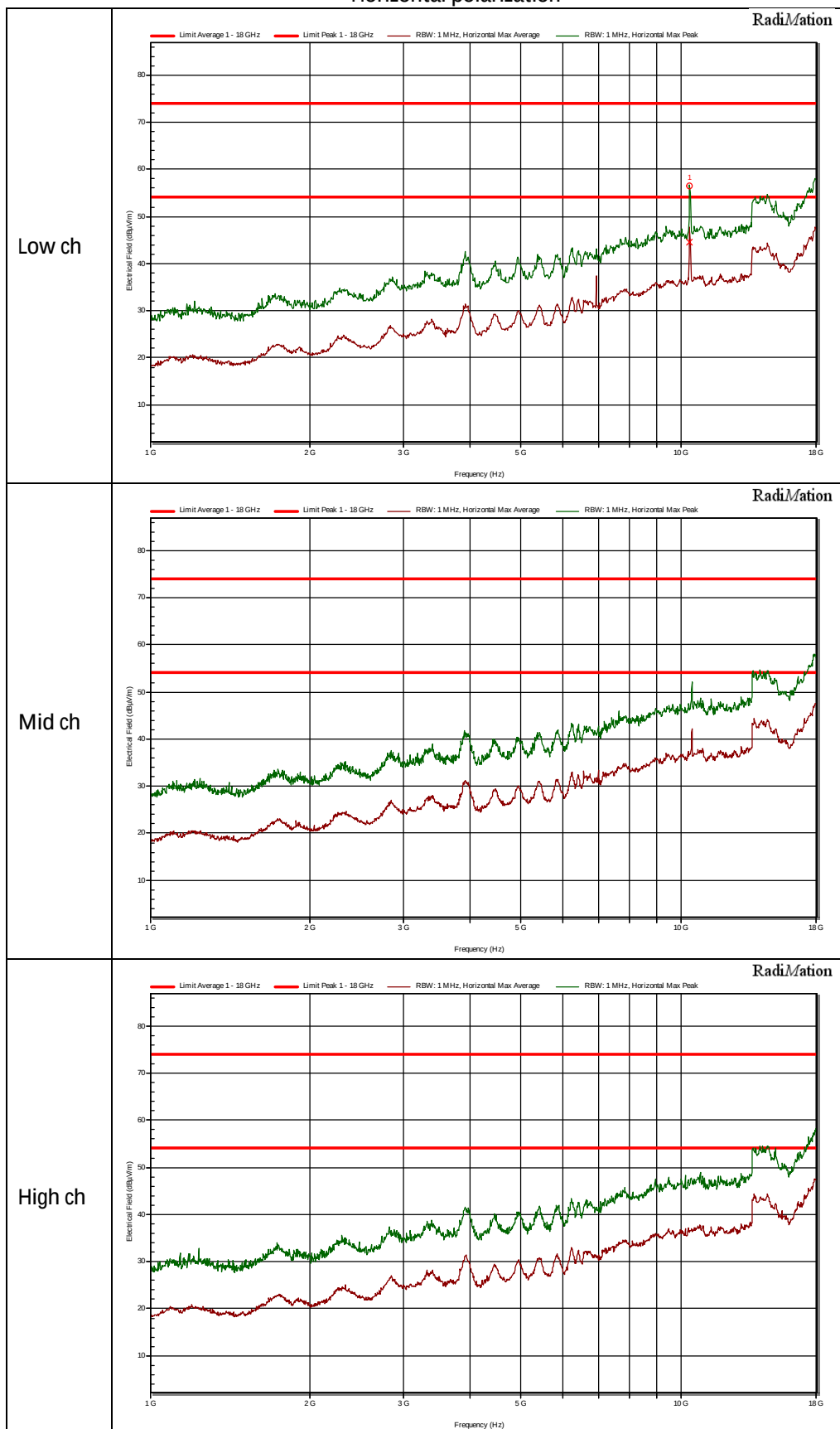
1 GHz to 18 GHz

Vertical polarization



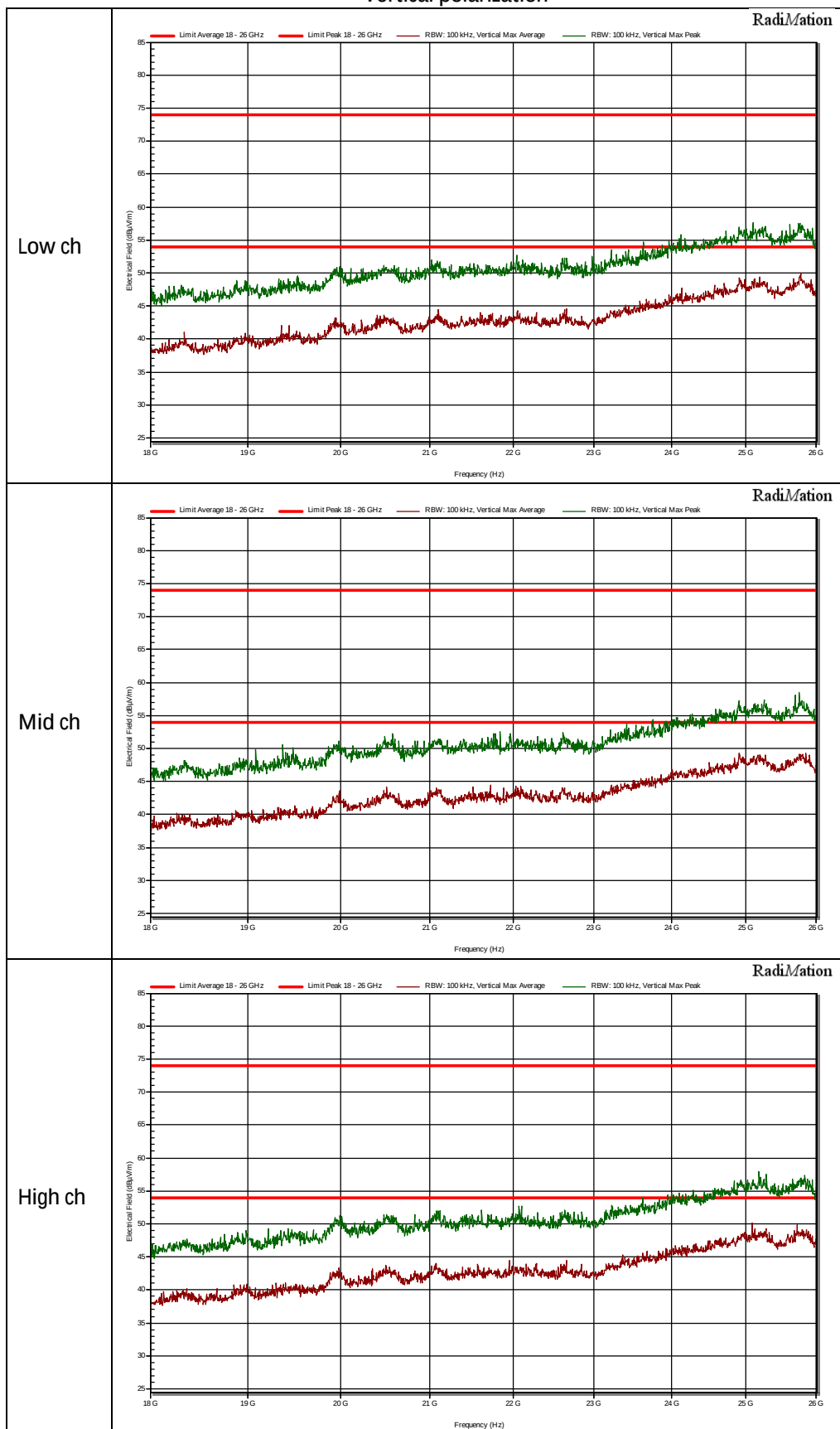
1 GHz to 18 GHz

Horizontal polarization



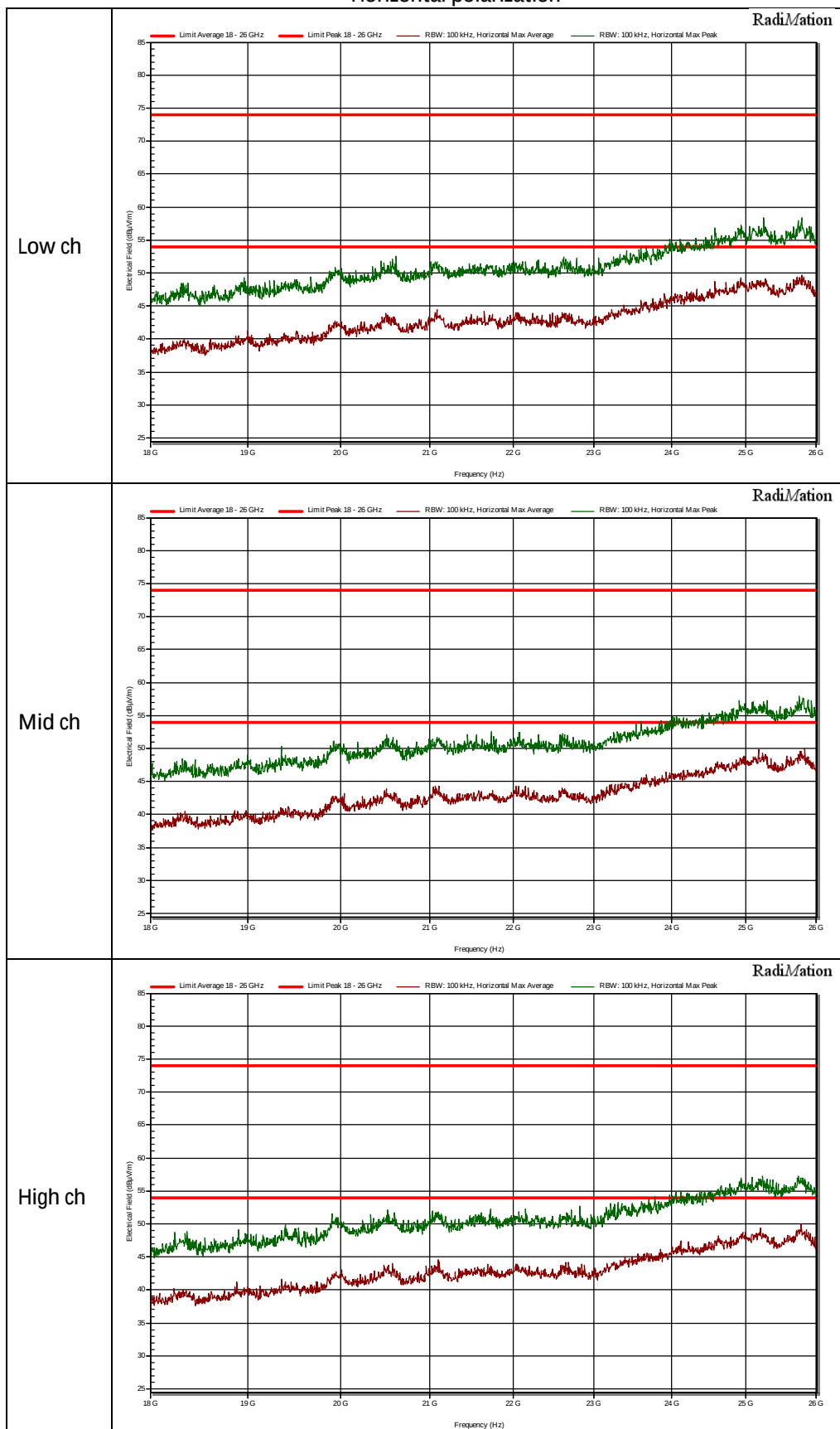
18 GHz to 26 GHz

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.