

FCC and IC Test report for parts 15.109, 15.209, ICES 003

Product name : PTO-Controller
Applicant : Zuidberg Frontline Systems B.V.
Contains FCC ID :SH6MDBT42Q
Contains IC :8017A-MDBT42Q

Test report No. : P000056040 002 Ver 2.00

Laboratory information

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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 Netherlands.

Testing Location

Test Site	Kiwa Telefication BV
Test Site location	Wilmersdorf 50 7327 AC Apeldoorn The Netherlands Tel. +31 88998 3393
Test Site FCC	NL0001
CABID	NL0001

Revision History

Version	Date	Remarks	By
v0.50	14-07-2022	First draft	R.T
v1.00	15-08-2022	Final release	R.T
v2.00	19-09-2022	Revised - Updated clause 1.8: observation and remarks - Updated clause 1.3: description of EUT	R.T

Table of Contents

Revision History.....	2
Summary of Test results	4
1 General Description	5
1.1 Applicant	5
1.2 Manufacturer	5
1.3 Tested Equipment Under Test (EUT)	5
1.4 Product specifications of Equipment under test.....	6
1.5 Environmental conditions	6
1.6 Measurement standards	6
1.7 Applicable standards	6
1.8 Observation and remarks	6
1.9 Conclusions	7
2 Test configuration of the Equipment Under Test.....	8
2.1 Test mode	8
2.2 Test setups	8
2.3 Equipment used in the test configuration	10
2.4 Sample calculations.....	10
3 Test results.....	11
3.1 Radiated spurious emissions	11
3.1.1 Limit	11
3.1.2 Measurement instruments	11
3.1.3 Test setup	11
3.1.4 Test procedure.....	11
3.1.5 Measurement Uncertainty	11
3.1.6 Peak tables of the radiated spurious emissions measurement	12
3.1.7 Plots of the Radiated Spurious Emissions Measurement	13

Summary of Test results

FCC	ISED	Description	Section in report	Verdict
15.209 (a) 15.109	ICES 003	Radiated spurious emissions	3.1	Pass
15.107 / 15.207	ICES 003	AC Power line conducted emissions	See section 1.8	Not Applicable

1 General Description

1.1 Applicant

Client name: Zuidberg Frontline Systems B.V.
Address Buitenveld 5, 8307 DE, Ens, The Netherlands
Telephone: +31527253550
E-mail: zwaan@zuidberg.nl
Contact name: Gerrit de Zwaan

1.2 Manufacturer

Manufacturer name: Zuidberg Frontline Systems B.V.
Address: Buitenveld 5, 8307 DE, Ens, The Netherlands
Telephone: +31527253550
E-mail: zwaan@zuidberg.nl
Contact name: Gerrit de Zwaan

1.3 Tested Equipment Under Test (EUT)

Product name: PTO-Controller
Brand name: Zuidberg
Contains FCC ID: SH6MDBT42Q
Contains IC: 8017A- MDBT42Q
Product type: Power Take Off Controller for vehicles
Model(s): "See Table below"
Batch and/or serial No. "See Table below"
Software version: -
Hardware version: -
Date of receipt 01-07-2022
Tests started: 11-07-2022
Testing ended: 12-07-2022

Overview variants

Type	Product description	Trademark	Type designation
Variant	PTO_CONTROLLER_UNI_3-PINS	Zuidberg	8002006 0
Variant	PTO_CONTROLLER_INT_4-PINS	Zuidberg	8002007 0
Main	PTO_CONTROLLER_UNI_8-PINS	Zuidberg	8002008 0

1.4 Product specifications of Equipment under test

Tx Frequency range:	BLE: 2400 – 2483.5 MHz
Rx frequency range :	BLE: 2400 – 2483.5 MHz
Antenna type:	PCB antenna
Antenna gain:	3.3 dBi
Type of modulation:	BLE: GFSK
Emission designator	1M05F1D

Disclaimer: The antenna gain and operating frequency bands are declared by the applicant

1.5 Environmental conditions

Test date	12-07-2022
Ambient temperature	21.8 °C
Humidity	54 %

1.6 Measurement standards

- ANSI C63.4:2014
- ANSI C63.10:2013

1.7 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 §15.109
- FCC Part 15 Subpart C §15.209
- ICES 003

1.8 Observation and remarks

The manufacturer provided a radiated sample for radio testing. The EUT contains a pre certified radio module therefore only radiated spurious emissions has been measured. The Module model is MDBT42Q-U. AC power line conducted emissions are not tested as the EUT is vehicle battery operated only.

1.9 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.7 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 1.7 "*Applicable standards*".

All conducted tests are performed by:

Name : Raoul Tolud, MSc

Review of test methods and report by:

Name : Peter Suringa

The above conclusions have been verified by the following signatory:

Date : 21-09-2022

Name : Koray Korcum, MSc

Function : Test Engineer

Signature :

A handwritten signature in blue ink, appearing to read "M. Koray", enclosed within a blue circular stamp.

2 Test configuration of the Equipment Under Test

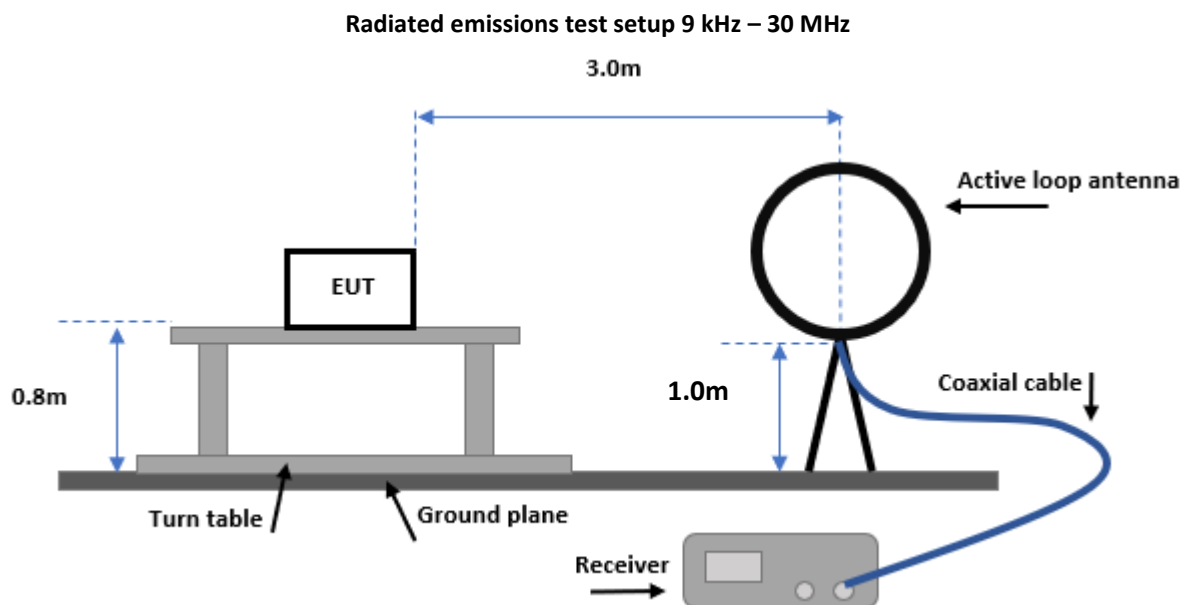
2.1 Test mode

The applicant provided test mode firmware for the radio, in which it was possible to configure the radio to transmit continuously.

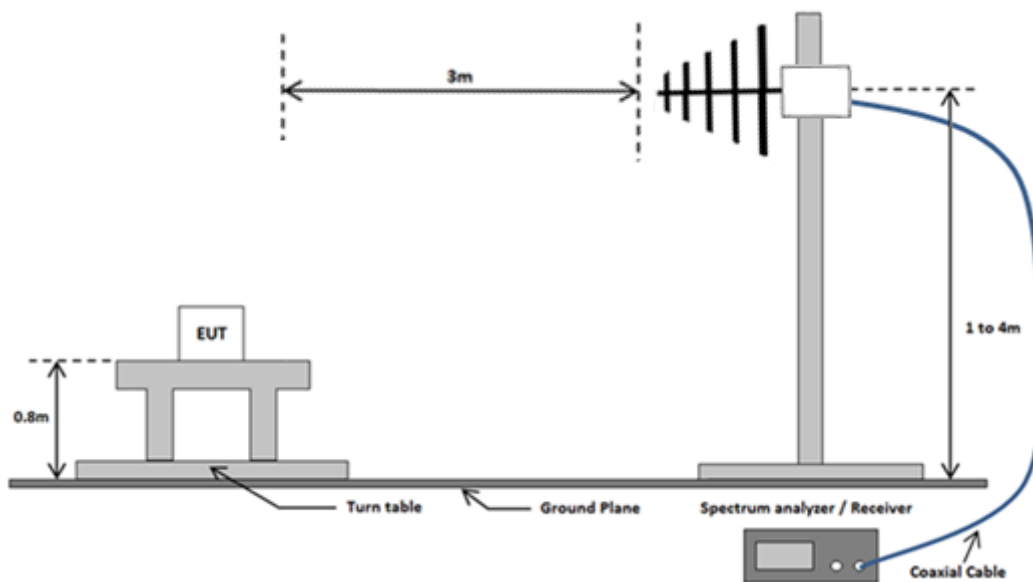
Tested channels:

Technology	Channel	Frequency (MHz)
BLE	37	2402
	17	2442
	39	2480

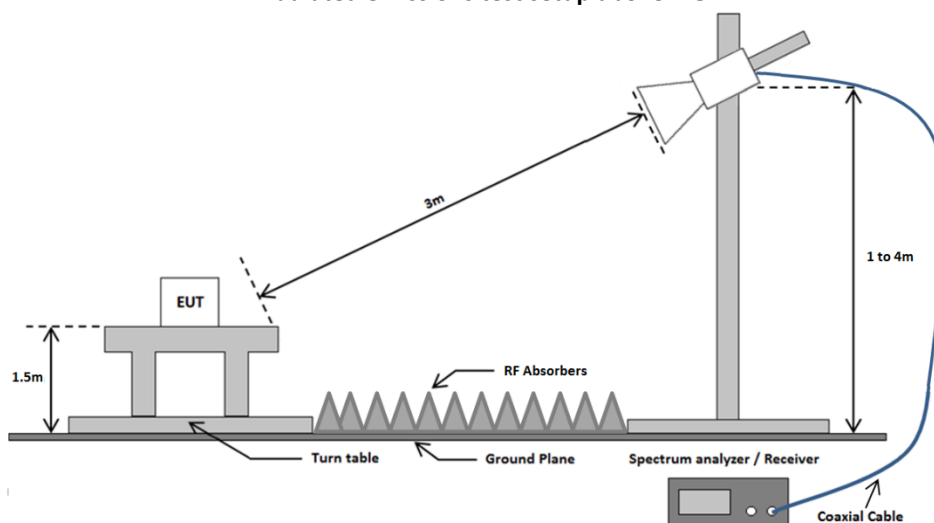
2.2 Test setups



Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.3 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
EMI Receiver	Rohde & Schwarz	ESCI	114161	02-2022	02-2023	3.1
Spectrum analyzer	Rohde & Schwarz	FSP40	TE11125	03-2022	03-2023	3.1
3.0 GHz HPF	Wainwright	WHK3.0/18G-10EF	114682	07-2021	07-2024	3.1
Active loop antenna	EMCO	6502	114515	01-2022	01-2024	3.1
Biconical antenna + 6dB attenuator	Schwarzbeck + HP	VHA9103 + 8491A	114436 + 114254	03-2021	03-2024	3.1
Logperiodic antenna	EMCO	3147	114385	03-2021	03-2024	3.1
Horn antenna	EMCO	3115	114607	01-2021	01-2024	3.1
Horn antenna	FLANN-MICROWAVE	20240-25	114518	NA*	NA*	3.1
Preamplifier 18-40 GHz	Miteq	JS4-18004000-33-8P	114693	01-2022	01-2023	3.1
Test software	Raditeq	Radimation Version 2021.1.9	TE 02008	--	--	3.1

*Note: Standard gain horn antennas do not need calibration

2.4 Sample calculations

All formulas for data conversions and conversion factors are reported in chapter 4 of this test report.

3 Test results

3.1 Radiated spurious emissions

3.1.1 Limit

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance(m)
0.009 – 0.490	2400/F(kHz)	$20*\{\log[2400]-\log[F(\text{kHz})]\}$	300*
0.490 – 1.705	24000/F(kHz)	$20*\{\log[24000]-\log[F(\text{kHz})]\}$	30*
1.705 – 13.11 14.01 – 30.0	30	29.5	30*
30 -88	100	40	3
88 - 216	150	43,5	3
216-960	200	46	3
Above 960	500	54	3

*Note: Measured values in the plots 9 kHz to 30 MHz corrected to 3m measurement distance according to the method described in ANSI C63.10-2013, clause 6.4

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.3 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.2 of this report.

3.1.4 Test procedure

Prior to running the measurements, the EUT has been investigated in the X, Y and Z dimensions to determine the worst case configuration for spurious emissions.

9 kHz – 30 MHz: According to ANSI C63.4-2014, section 5.4.2 and 8.2.3

30 MHz to 26.5 GHz: According to ANSI C63.4-2014, section 8.3

9 kHz to 30 MHz: IRN 026 – Method 10

30 MHz to 1 GHz: IRN 026 – Method 1

1 GHz to 18 GHz: IRN 026 – Method 2

18 to 26.5 GHz: IRN 026 – Method 3

3.1.5 Measurement Uncertainty

Frequency range	Polarization	Uncertainty
9 kHz – 30 MHz	--	± 1.6 dB
30 – 200 MHz	Horizontal	± 4.5 dB
	Vertical	± 5.4 dB
200 -1000 MHz	Horizontal	± 3.6 dB
	Vertical	± 4.6 dB
1 – 18 GHz	Horizontal	± 5.7 dB
	Vertical	± 5.7 dB
18 – 26.5 GHz	Horizontal	± 4.9 dB
	Vertical	± 4.9 dB

3.1.6 Peak tables of the radiated spurious emissions measurement

9KHz -150 KHz

Peak Number	Frequency KHz	Peak dB μ V/m	Peak Limit dB μ V/m	Status	Angle degrees	Height m	Distance m	Polarization
1	48,075	-4,1	50,1	Pass	116	1	3	Vertical
2	95,803	-8,8	25,1	Pass	116	1	3	Vertical
3	143,725	-19,7	17,7	Pass	116	1	3	Vertical

150 KHz -30 MHz

Peak Number	Frequency MHz	Peak dB μ V/m	Peak Limit dB μ V/m	Quasi-Peak	Quasi-Peak Limit	Status	Angle degrees	Height m	Distance m	Polarization
1	1,1	17,3	26,8	14,7	26,8	Pass	122	1	3	Vertical
2	1,343	18,7	25	17,1	25	Pass	142	1	3	Vertical
3	1,152	18,5	26,3	17,3	26,3	Pass	143	1	3	Vertical

1 – 18 GHz

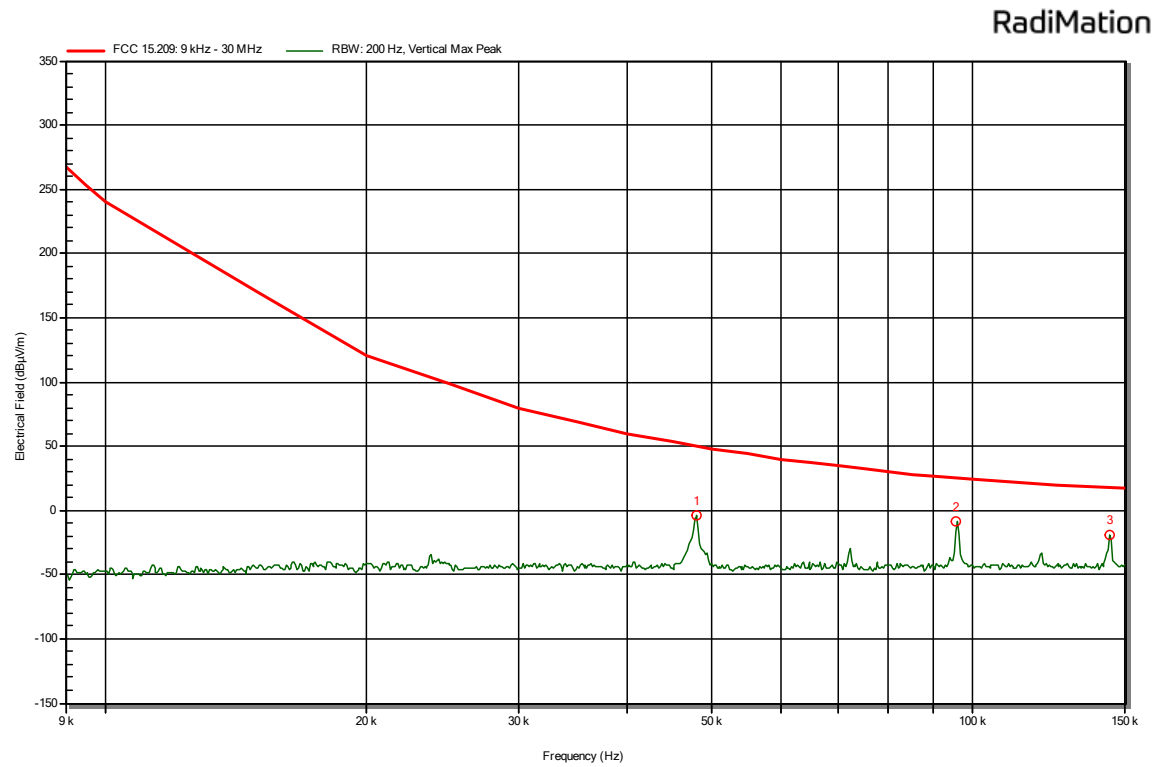
Peak Number	Frequency GHz	Peak dB μ V/m	Peak Limit dB μ V/m	Average dB μ V/m	Average Limit dB μ V/m	Status	Angle degrees	Height m	Distance m	Polarization
1	2,466	32,3	74	25	54	Pass	271	1,9	3	Vertical
2	3,274	36,2	74	23,9	54	Pass	51	3,5	3	Vertical
3	4,332	37,1	74	26,4	54	Pass	307	3	3	Vertical
4	4,88	41,6	74	27,3	54	Pass	0	4	3	Horizontal
5	14,237	54,3	74	43,5	54	Pass	116	3	3	Vertical
6	17,057	54,5	74	42,2	54	Pass	179	4	3	Vertical

18-26 GHz

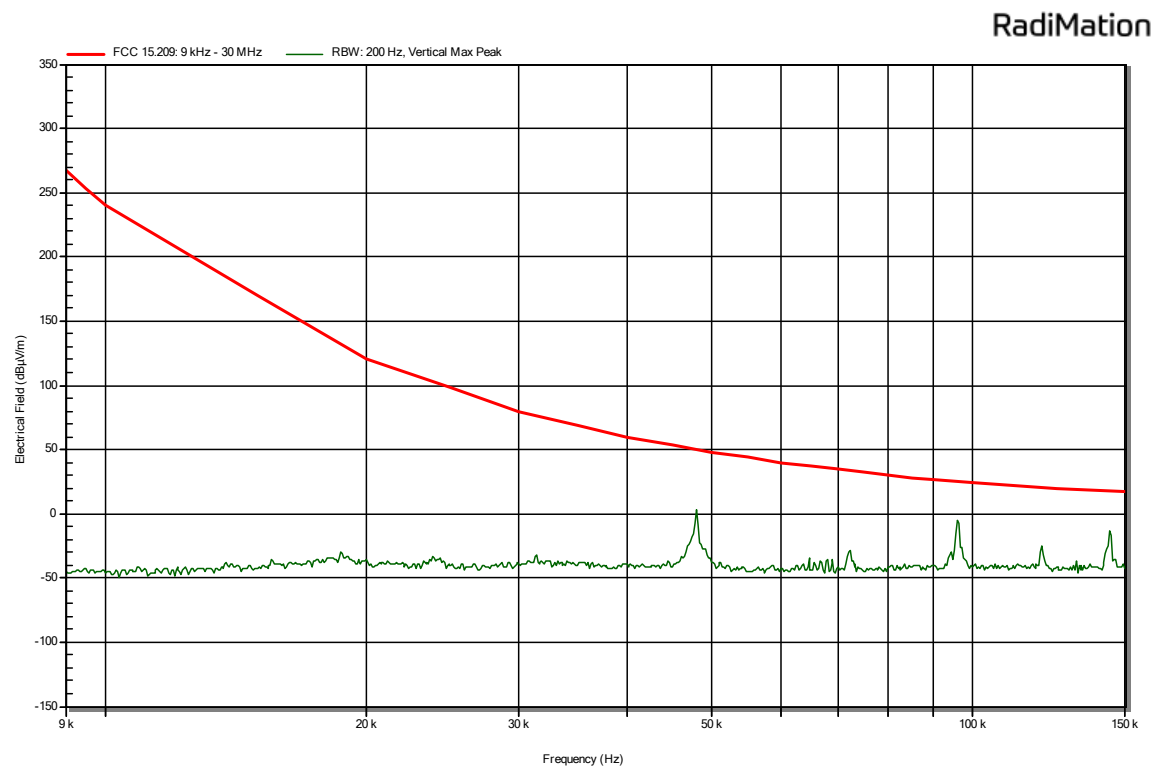
Peak Number	Frequency GHz	Peak dB μ V/m	Peak Limit dB μ V/m	Average dB μ V/m	Average Limit dB μ V/m	Status	Angle degrees	Height m	Distance m	Polarization
1	18,962	51	74	40,3	54	Pass	171	1	3	Vertical
2	19,866	51,9	74	40,7	54	Pass	312	1	3	Vertical
3	20,509	53,3	74	42,1	54	Pass	326	2,5	3	Vertical
4	24,131	56,2	74	45,2	54	Pass	94	1,5	3	Horizontal
5	25,762	59,5	74	50,4	54	Pass	221	2,5	3	Vertical

3.1.7 Plots of the Radiated Spurious Emissions Measurement

9 – 150 kHz (Perpendicular)

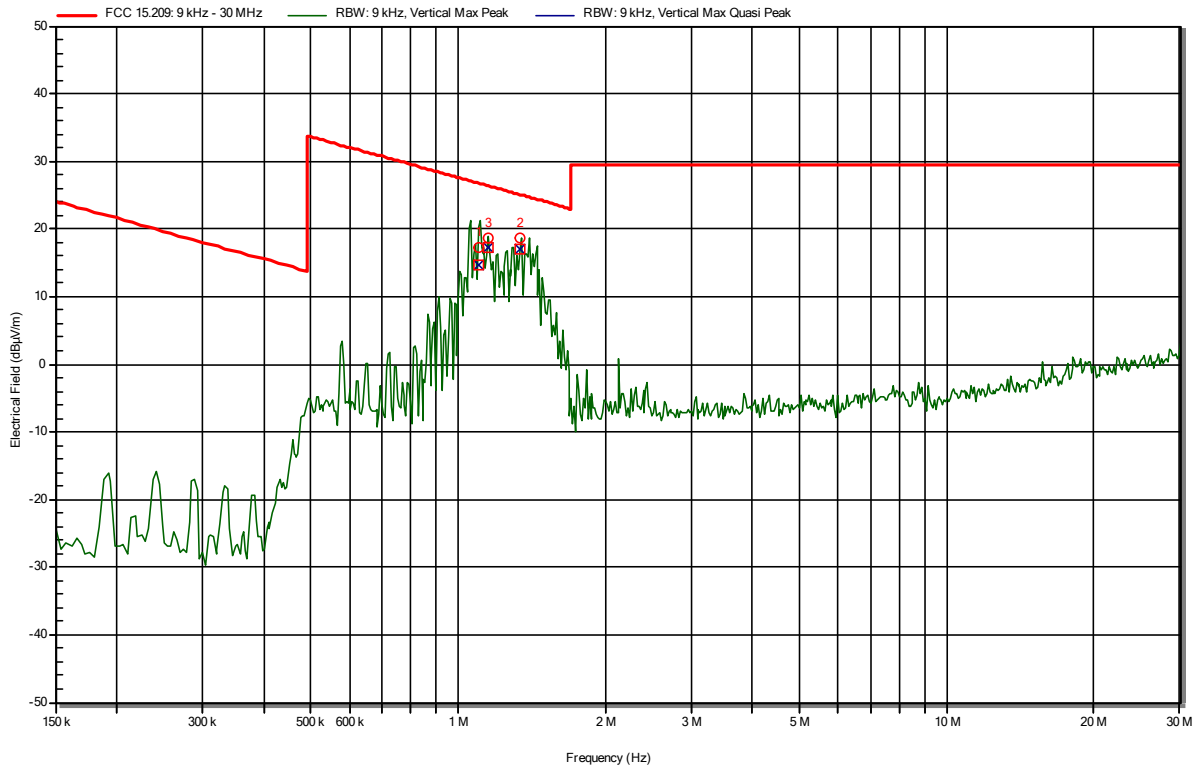


9 – 150 kHz (Orthogonal)



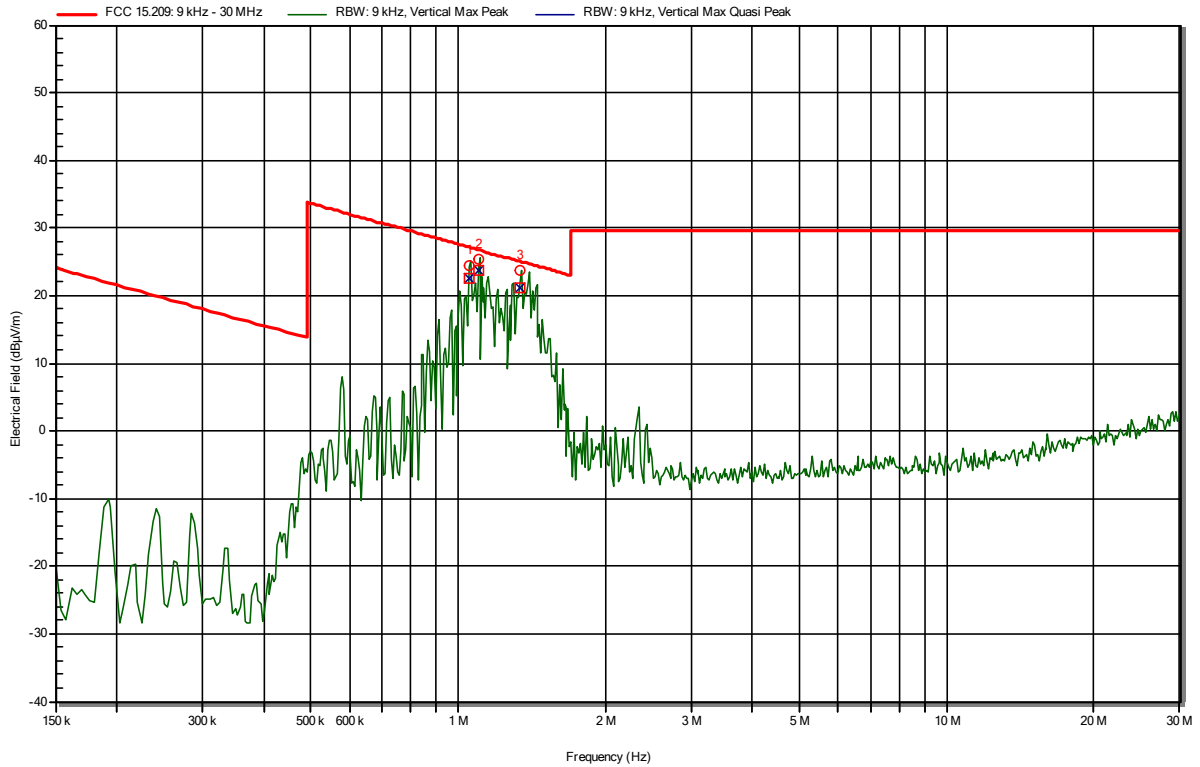
150 kHz – 30 MHz (Perpendicular)

RadiMation



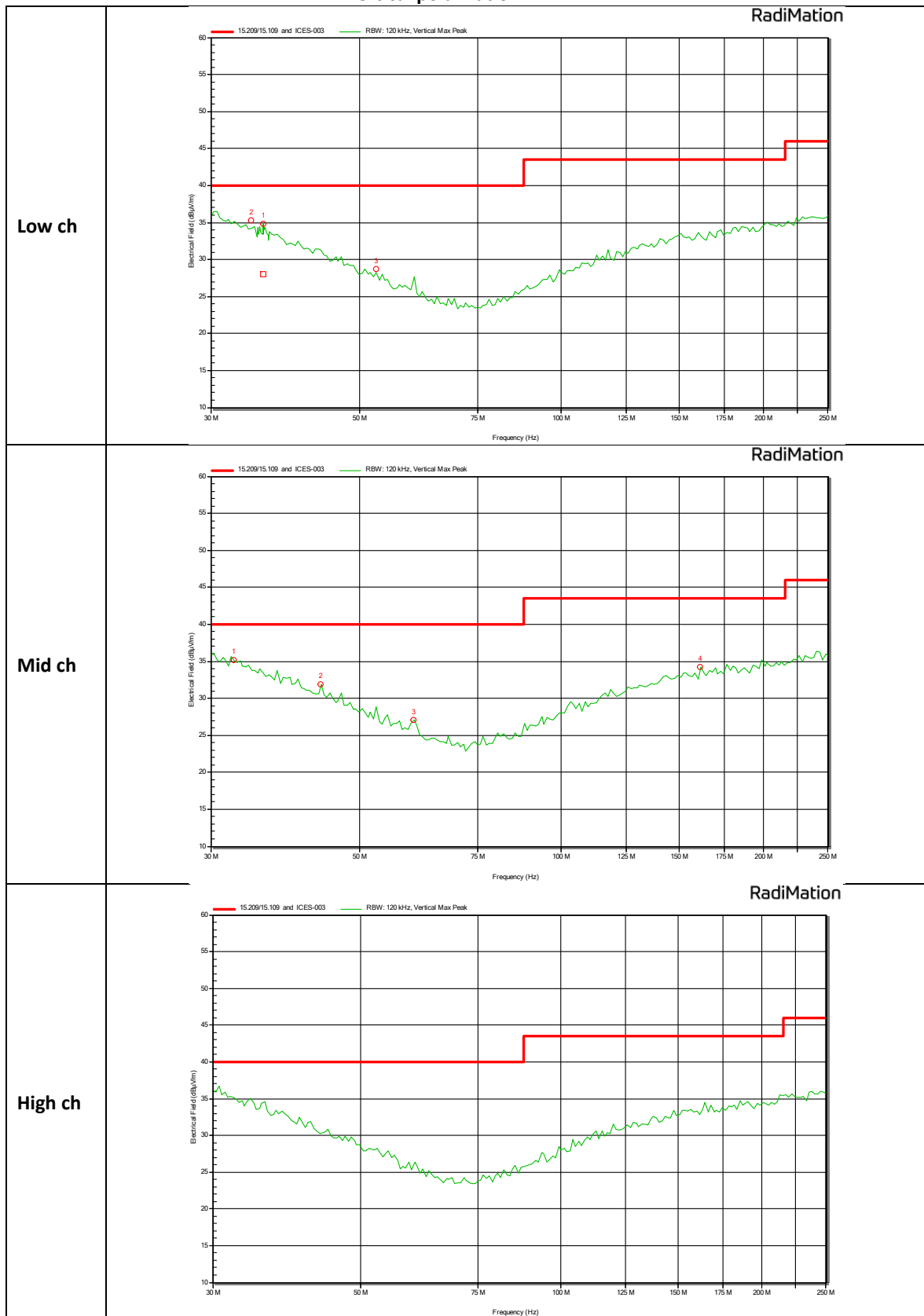
150 kHz – 30 MHz (Orthogonal)

RadiMation



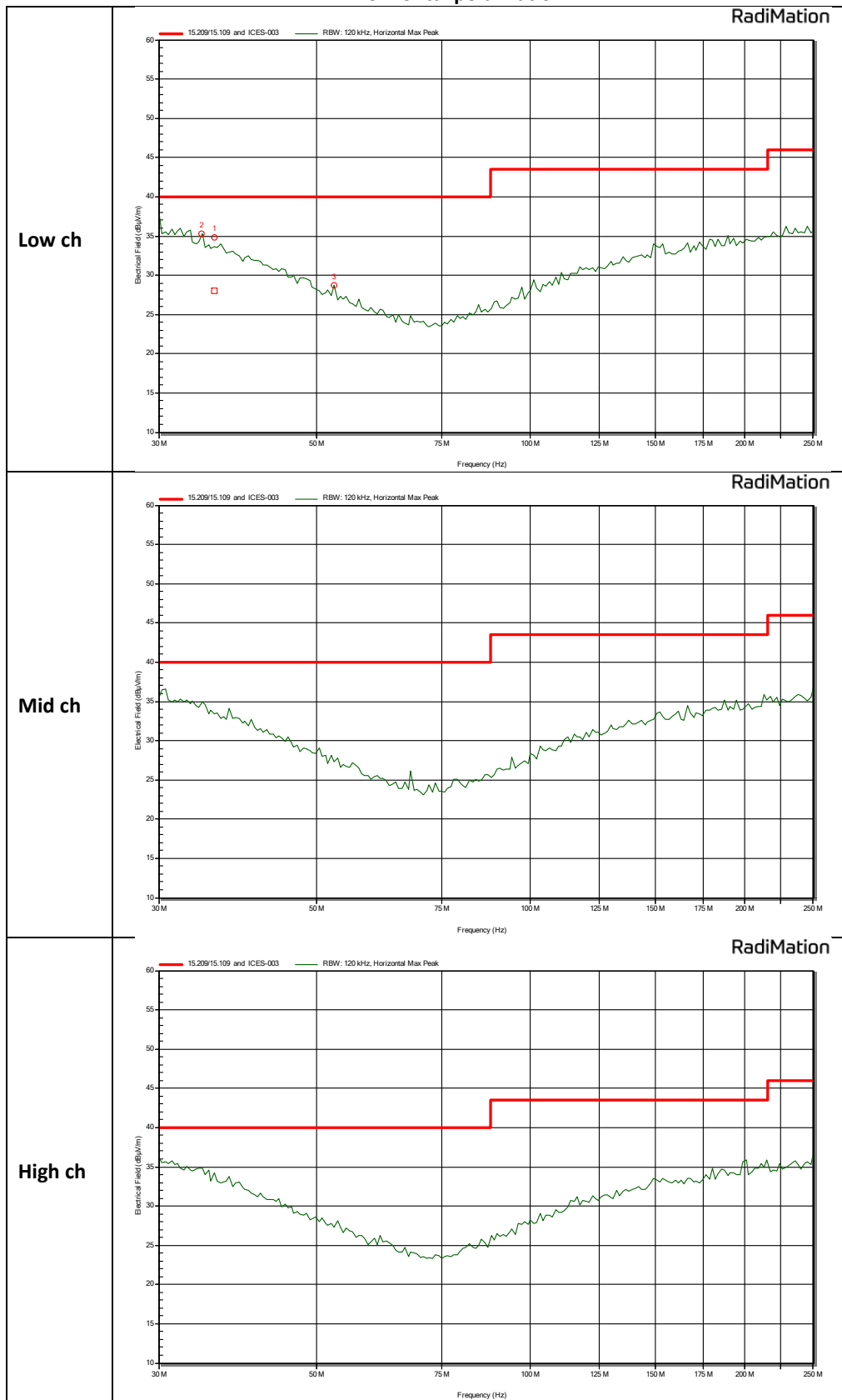
30 MHz to 250 MHz

Vertical polarization



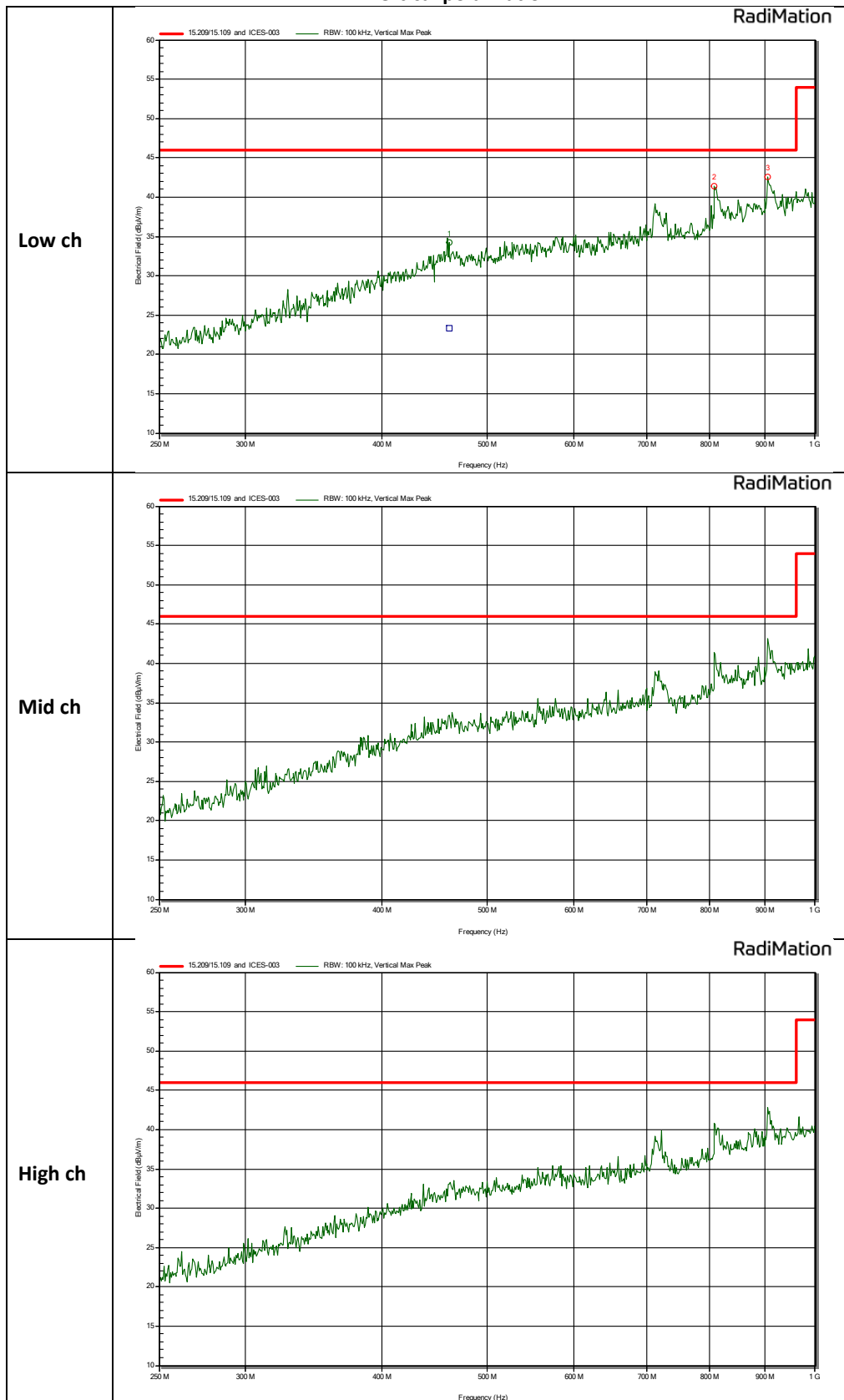
30 MHz to 250 MHz

Horizontal polarization



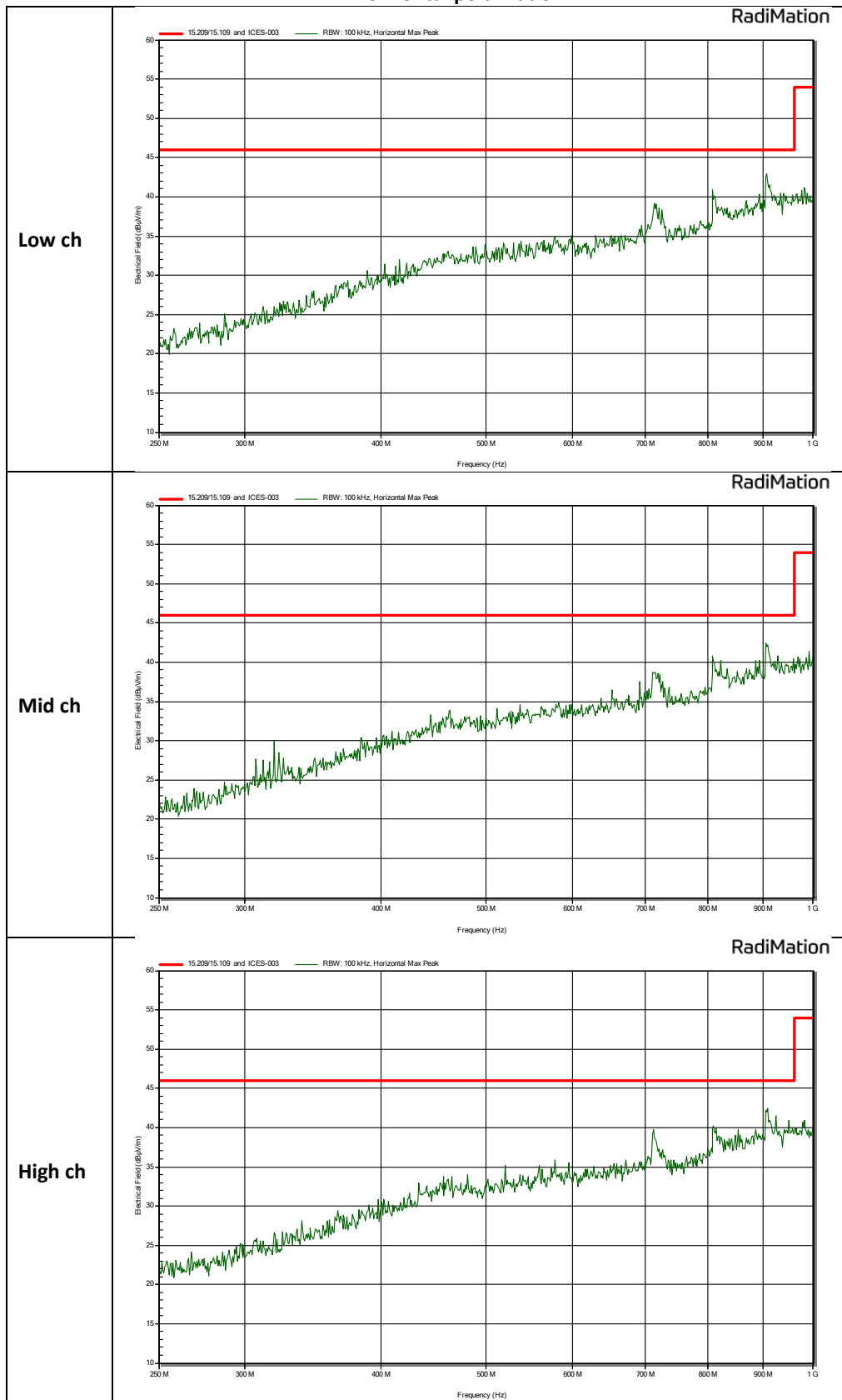
250 MHz to 1 GHz

Vertical polarization



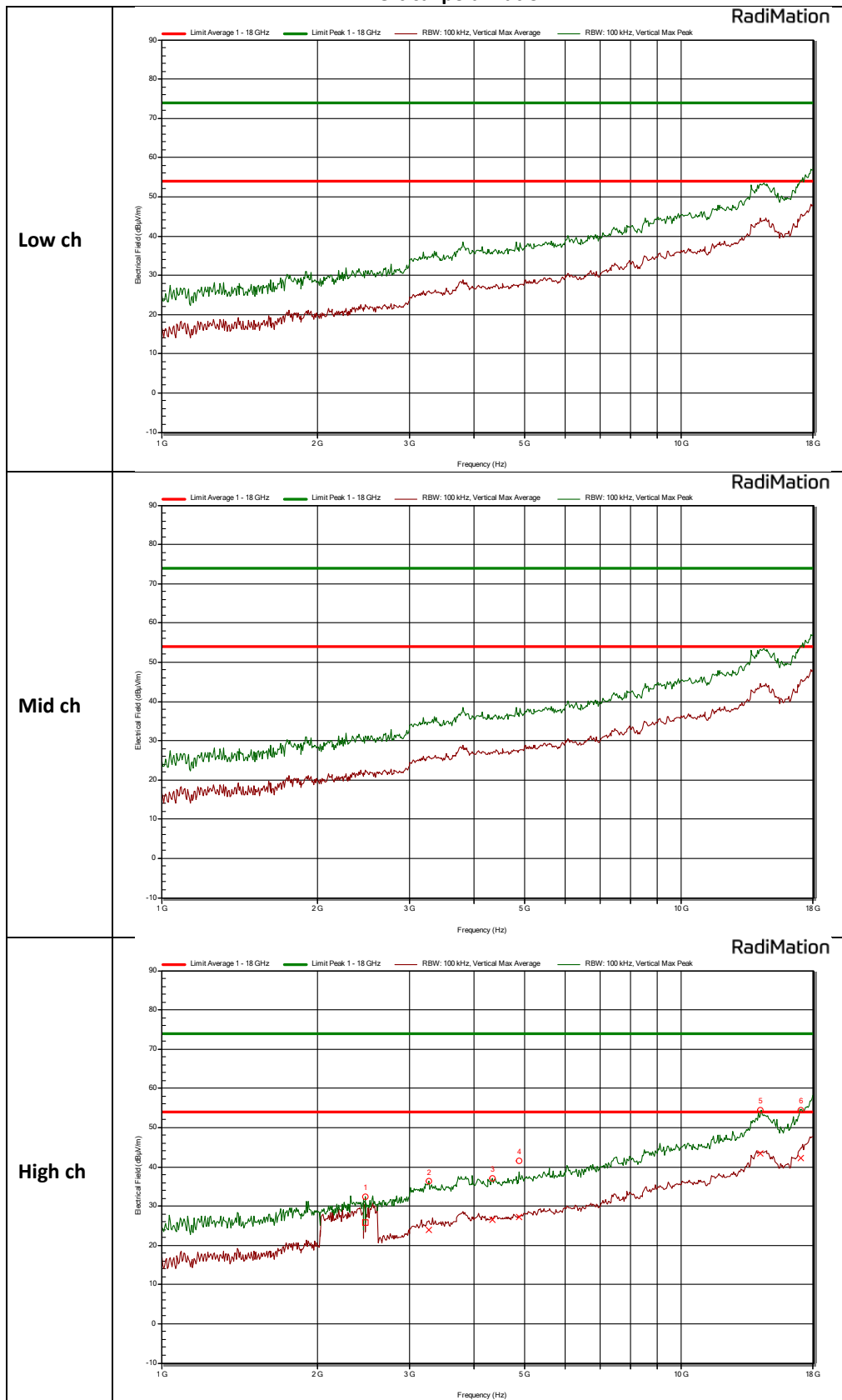
250 MHz to 1 GHz

Horizontal polarization



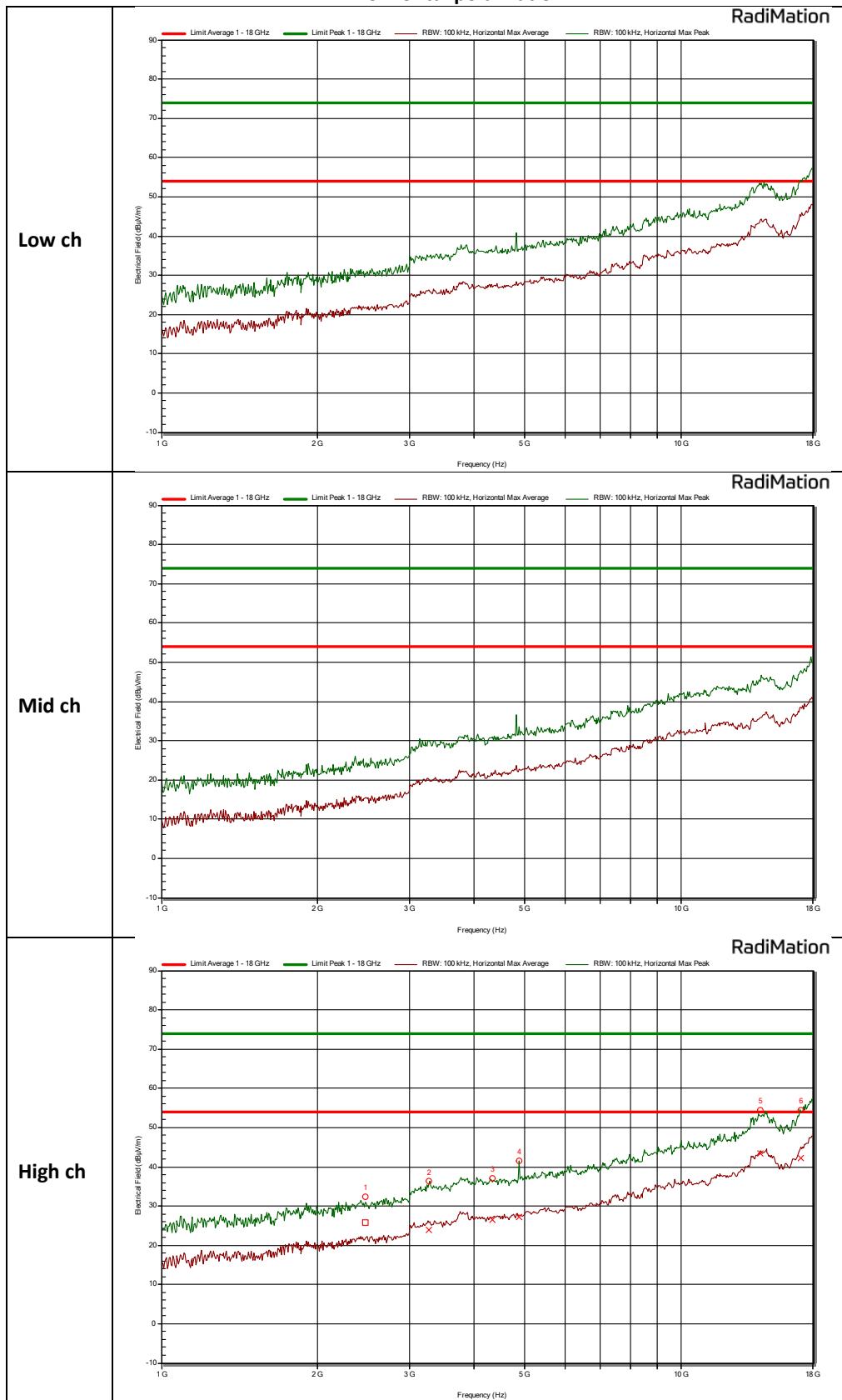
1 GHz to 18 GHz

Vertical polarization

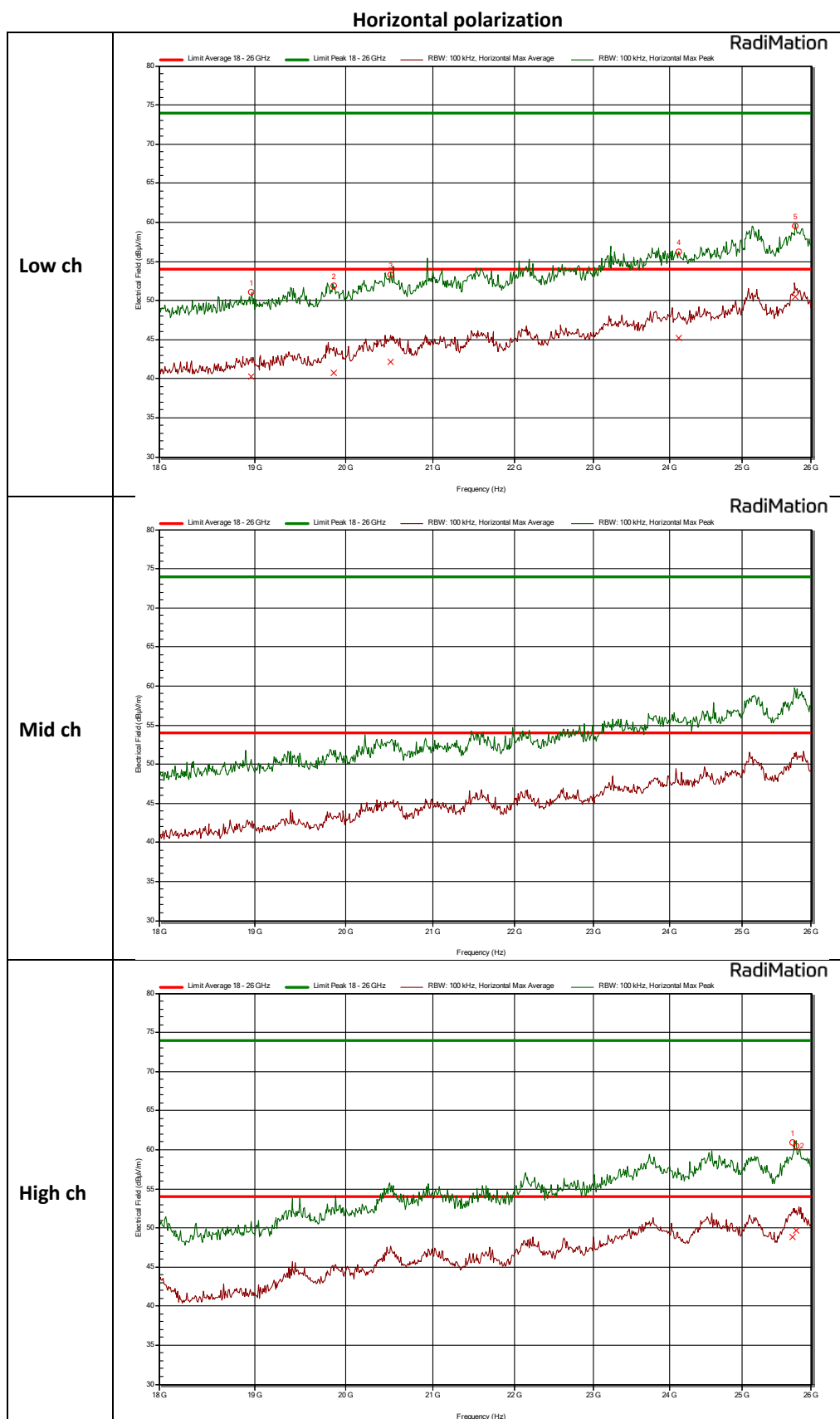


1 GHz to 18 GHz

Horizontal polarization



18 GHz to 26.5 GHz



Vertical polarization

