

FCC and ISED Test Report for Parts 15.247, 15.109 and 15.207; RSS-247 and RSS-Gen

Product name : Wireless GNSS Tracker
Applicant : Findster Technologies S.A.
FCC ID : 2AHM8-FDT04GRDR2
ISED ID : 26000-FDT04GRDR2

Test report No.: 180700034 09 V1.00

Laboratory information

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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 Netherlands.

Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31316583180 Fax. +31316583189
Test Site FCC	NL0001
Test Site ISSED	4173A-1

Revision History

Version	Date	Remarks	By
0.50	30-04-2020	First draft	PS
1.00	13-05-2020	Initial release	PS

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Summary of Test results

FCC	ISED	Description	Section in report	Verdict
925 MHz band operation				
15.247(a)	RSS-247 5.2(a)	RF output power	See report 180700034 08	Pass
15.247(f)	RSS-247 5.3 (a), (b)	Hybrid operation	See report 180700034 08	Pass
15.247(d)	RSS-247 5.5	Conducted Spurious emissions	See report 180700034 08	Pass
15.247(d)	--	Conducted Band edge	See report 180700034 08	Pass
15.247(d)	RSS-247 5.5	Tx Radiated Spurious emissions	3.1	Pass
15.109(a)	RSS-Gen 7.3	Rx Radiated Spurious emissions	3.2	Pass
15.207(c)	RSS-Gen 8.8	Conducted spurious emissions on AC mains	See report 180700034 08	Pass
--	RSS-Gen 6.7	99% bandwidth	See report 180700034 08	Pass
BLE mode				
15.247(a)	RSS-247 5.2(a)	6dB Bandwidth	See report 180700034 08	Pass
15.247(b)	RSS-247 5.2(a)	RF output power	See report 180700034 08	Pass
15.247(e)	RSS-247 5.2 (b)	Power spectral density	See report 180700034 08	Pass
15.247(d)	RSS-247 5.5	Radiated spurious emissions	4.1	Pass
15.247(d)	--	Authorized band edge	See report 180700034 08	Pass
--	RSS-Gen 6.7	99% bandwidth	See report 180700034 08	Pass

1 General Description

1.1 Applicant

Client name:	Findster Technologies S.A.
Address	Rua Pedro Nunes, Edifício C, Coimbra
Zip code:	3030-199
Country:	Portugal
Telephone:	+351 223 248 286
E-mail:	info@getfindster.com

1.2 Manufacturer

Manufacturer name:	Findster Technologies S.A.
Address:	Rua Pedro Nunes, Edifício C, Coimbra
Zip code:	3030-199
Country:	Portugal
Telephone:	+351 223 248 286
E-mail:	info@getfindster.com

1.3 Tested Equipment Under Test (EUT)

Product name:	Wireless GNSS Tracker
Brand name:	Findster DUO+
FCC ID:	2AHM8-FDT04GRDR2
ISED ID	26000-FDT04GRDR2
Serial number:	--
Software version:	--
Hardware version:	--
Date of receipt	20 – 01 – 2020
Tests started:	20 – 01 – 2020
Testing ended:	22 – 01 - 2020

1.4 Product specifications of Equipment under test

	925 MHz band	2400 – 2483.5 MHz band
Tx Frequency range	918 – 927.5 MHz	2402 – 2480 MHz
Rx frequency range	918 – 927.5 MHz	2402 – 2480 MHz
Maximum output power to antenna	0.025 W	0.001 W
Antenna gain	-0.4 dBi	< 2.6 dBi
Type of modulation	Proprietary	GFSK
Emission designator	125KG1D	1M00G1D

1.5 Modification of the Equipment Under Test (EUT)

Not applicable.

1.6 Environmental conditions

- Ambient temperature 24°C
- Humidity 42.2%

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 §15.247
- FCC Part 15 Subpart B, § 15.109
- FCC Part 15 Subpart C §15.207
- ISED RSS-247 §5
- ISED RSS-Gen §'s 6, 7, 8

1.8 Measurement guidances:

- FCC KDB Publication No. 558074 D01DTS Meas. Guidance V05r02
- ANSI C63.10:2013

1.9 Observations and remarks

The product, model Guardian, is part of a location system of which the other part bears the model name Pet. Communicating through Radio Frequency (RF) enables real-time monitoring of the Pet's geo-location and activity. A high-precision GNSS tracking system is used, as well as a proprietary communication in the sub 1 GHz ISM band.

Bluetooth Low Energy (BLE) is used to send information directly from the Guardian to the Findster App.

The Guardian is a depopulated version of the Pet i.e. the Guardian does not contain a GNSS module.

1.10 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 tests are performed by:

Name : ing. P.A. Suringa

Review of test methods and report by:

Name : ing. R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 13-05-2020

Name : ing. R. van Barneveld

Function : Test Engineer

Signature :



2 Test configuration of the Equipment Under Test

2.1 Test mode

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

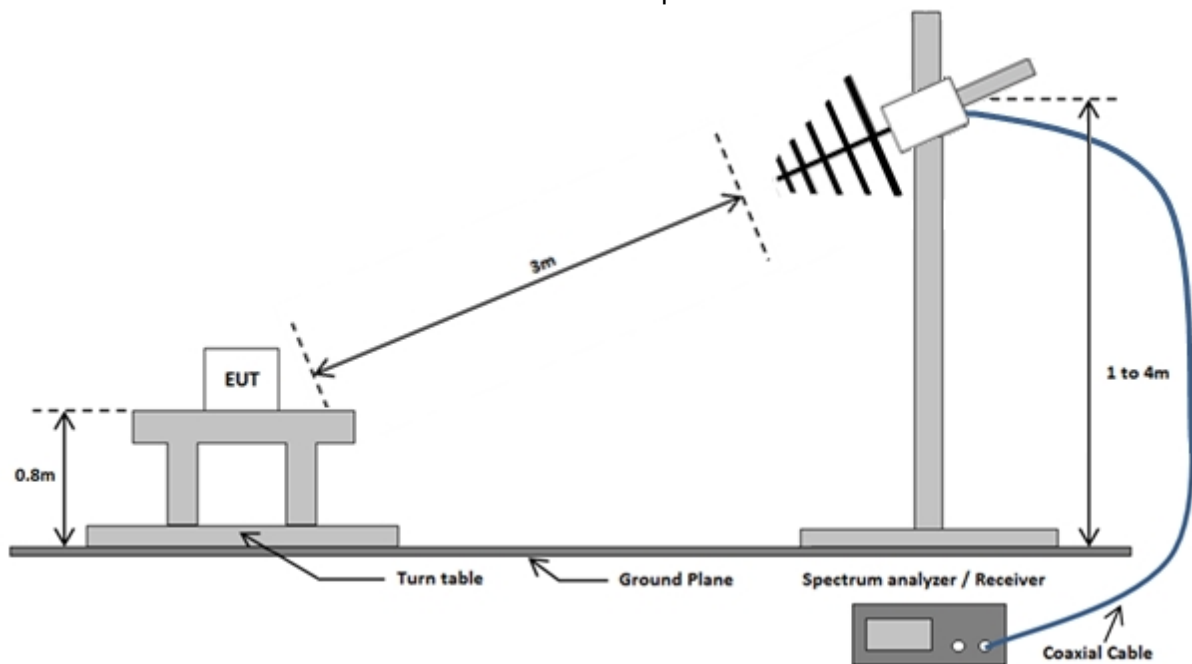
2.2 Tested channels and Data rates

Technology	Channels	Data rate	Frequency (MHz)
Proprietary RF	Low	0.24 – 37.5 kbps	918.0 MHz
	Mid	0.24 - 37.5 kbps	923.0 MHz
	High	0.24 – 37.5 kbps	927.5 MHz

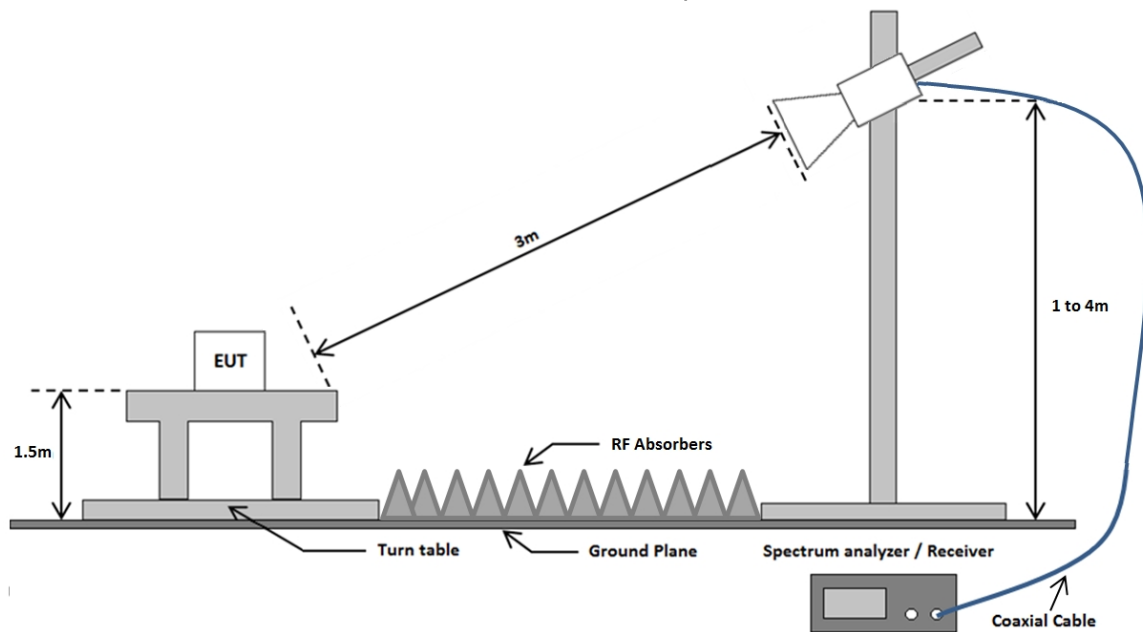
Technology Std.	Channel	Data rate	Frequency (MHz)
Bluetooth Low Energy	37	1 Mbps	2402
	17	1 Mbps	2440
	39	1 Mbps	2480

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, 4.1
EMI receiver	Rohde & Schwarz	ESR7	TE01220	3.1, 3.2, 4.1
Biconilog Antenna	Chase	CBL6112A	TE00967	3.1, 3.2, 4.1
Horn Antenna	EMCO The Electro – Mechanics Co	3115	TE00531	3.1, 3.2, 4.1
Horn antenna	Flann	20240-25	TE00818	4.1
Pre-amplifier	Miteq	AFS42-041001800-29-OP-42	TE11132	3.1, 3.2, 4.1
Pre-amplifier	Miteq	JF4-18004000-30-8P-A1	TE11131	4.1
Semi Anechoic Chamber (SAC)	Comtest Engineering BV	-	TE00861	3.1, 3.2, 4.1
High pass filter	Wainwright instruments	WHK1.1/15G-10EF	TE01139	3.1
High pass filter	Wainwright instruments	WHK10-2520-3000-18000-40EF	TE11146	4.1

2.5 Sample calculations

Field strength measurement example (ref. § 3.5.5 of this report)

Frequency	Polarization	Height	Peak
7,336 GHz	Vertical	4 m	52,2 dB μ V/m

The following relation 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 receiver voltage

AF = Antenna Factor

G = Gain of the pre-amplifier

CL = Cable Loss

$$(52.2 = 46.22 + 36.4 - 37.62 + 7.2)$$

3 Test results 925 MHz band

3.1 Tx Radiated Emissions Measurement

3.1.1 Limit

According to FCC part 15.209(a)

Frequency (MHz)	Field strength ($\mu\text{V}/\text{m}$)	Field strength ($\text{dB}\mu\text{V}/\text{m}$)	Measurement distance(m)
0.009 – 0.490	$2400/\text{F}(\text{kHz})$	$67.6 - 20\log\text{F}(\text{kHz})$	300
0.490 – 1.705	$24000/\text{F}(\text{kHz})$	$87.6 - 20\log\text{F}(\text{kHz})$	30
1.705 - 30	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

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 V05r02, section 12.1
 IRN 026_14.2 Radiated electrical disturbance (V per m) – Method 1, 2

3.1.5 Measurement uncertainty

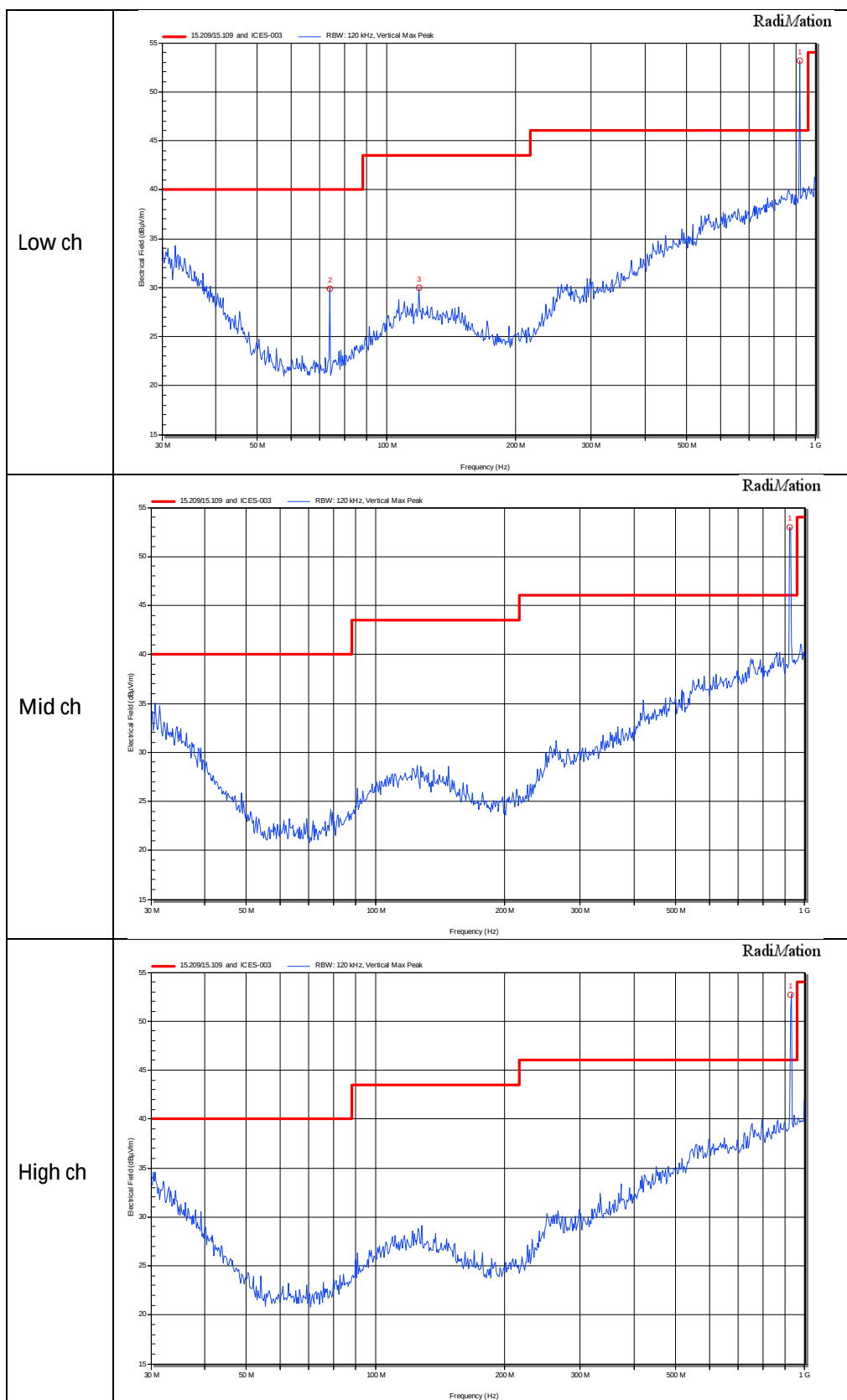
Frequency range (MHz)	Horizontal polarization	Vertical polarization
30 – 200	4.5 dB	5.4 dB
200 – 1000	3.6 dB	4.6 dB
1000 - 18000	5.7 dB	5.7 dB

3.1.6 Plots of the Tx Radiated Emissions Measurement

See next page.

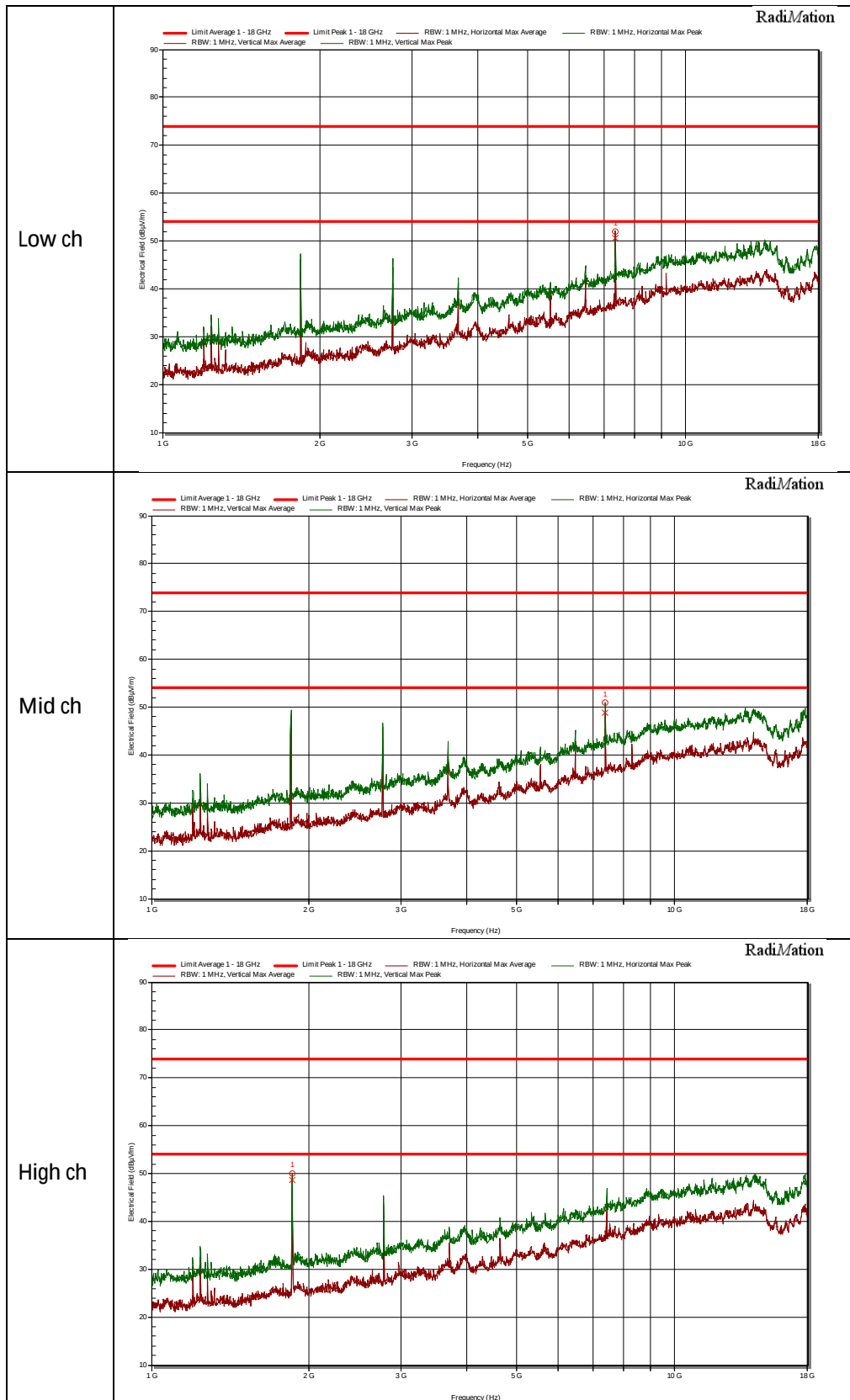
Note: for 0.009 – 30 MHz radiated emission test results see report 180700034 08.

0.03 – 1 GHz (vertical pol.)



Note: in the plots above the emissions exceeding the limit are the fundamental frequencies and are therefore not subject to the limit

1 - 18 GHz (Both polarizations)



3.2 Rx Radiated Emissions Measurement

3.2.1 Limit

According to FCC part 15.109(a)

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance(m)
30 -88	100	40	3
88 - 216	150	43,5	3
216-960	200	46	3
Above 960	500	54	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

According to ANSI C63.4: 2014, section 8.3

IRN 026 - Radiated electrical disturbance (V per m) - Method 1, 2

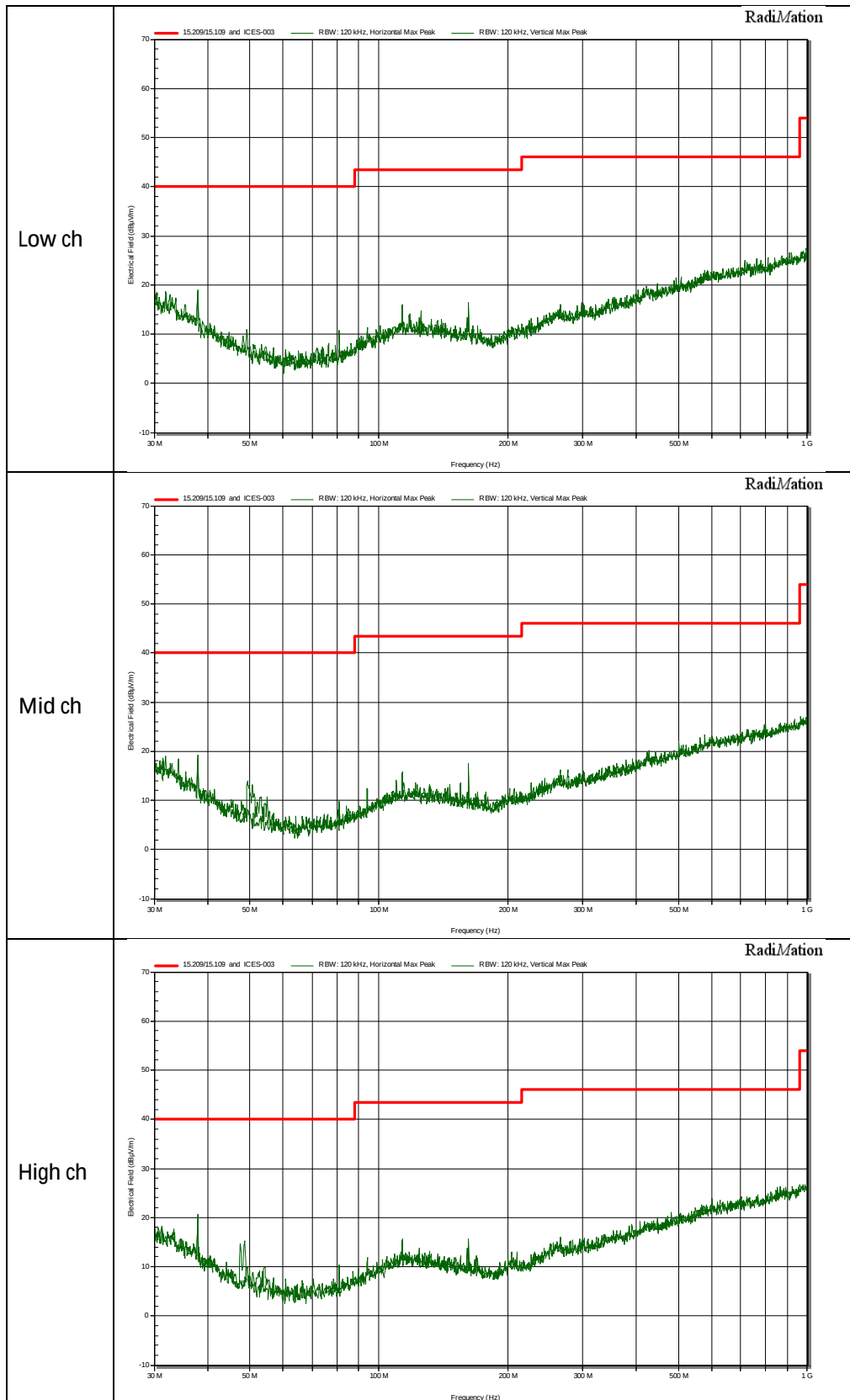
3.2.5 Measurement uncertainty

Frequency range (MHz)	Horizontal polarization	Vertical polarization
30 – 200	4.5 dB	5.4 dB
200 – 1000	3.6 dB	4.6 dB
1000 - 18000	5.7 dB	5.7 dB

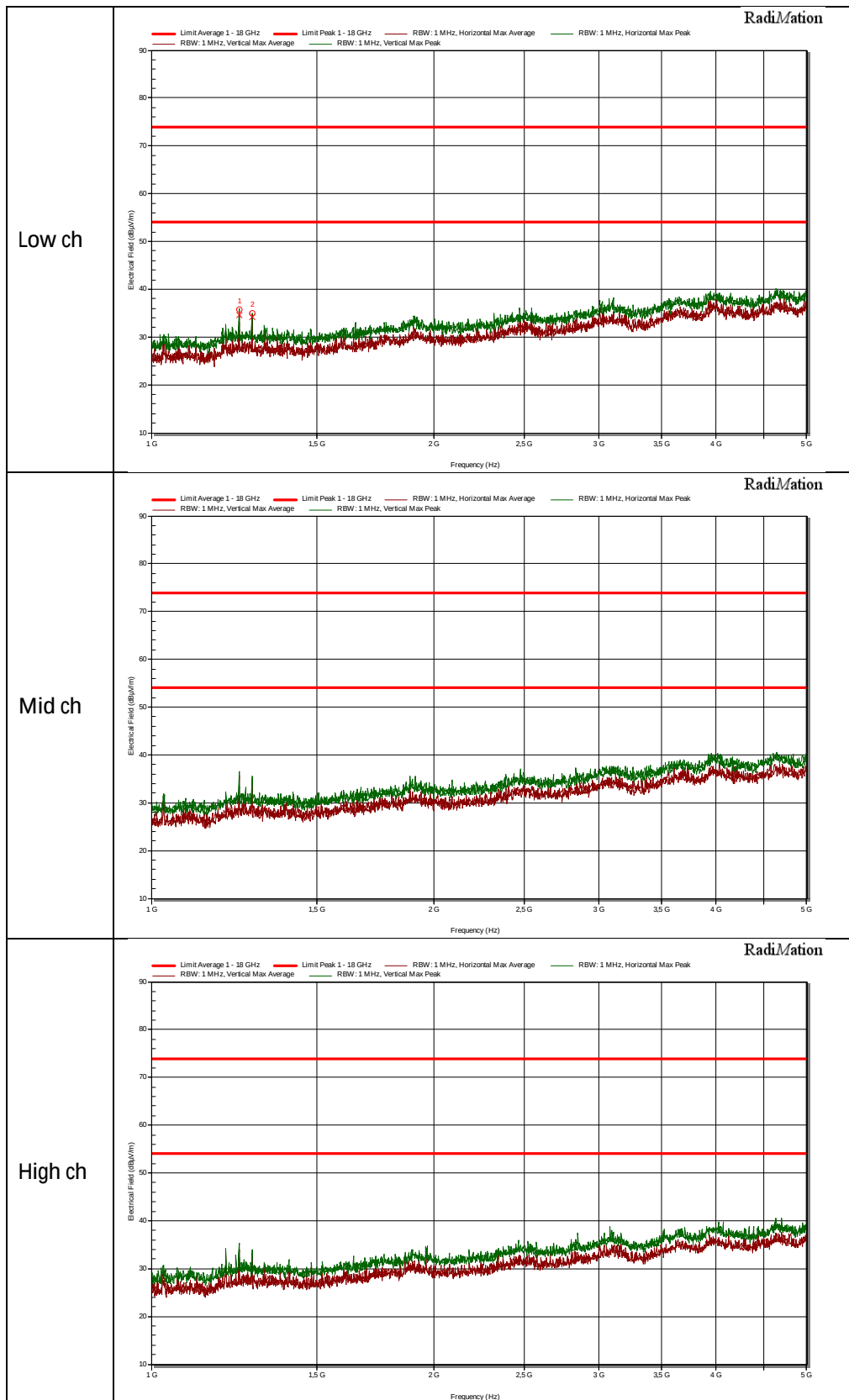
3.2.6 Plots of the Rx Radiated Emissions Measurement

See next page.

0.03 – 1 GHz (Both polarizations)



1 – 5 GHz (Both polarizations)



4 Test results BLE

4.1 Radiated spurious emissions

4.1.1 Limit

According to FCC part 15.209(a)

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)	67.6 – 20logF(kHz)	300
0.490 – 1.705	24000/F(kHz)	87.6 – 20logF(kHz)	30
1.705 - 30	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

4.1.2 Measurement instruments

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

4.1.3 Test setup

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

4.1.4 Test procedure

According to KDB Publication 558074 V05r02, section 12.1

IRN 026_14.2 Radiated electrical disturbance (V per m) – Method 1, 2, 10

4.1.5 Measurement uncertainty

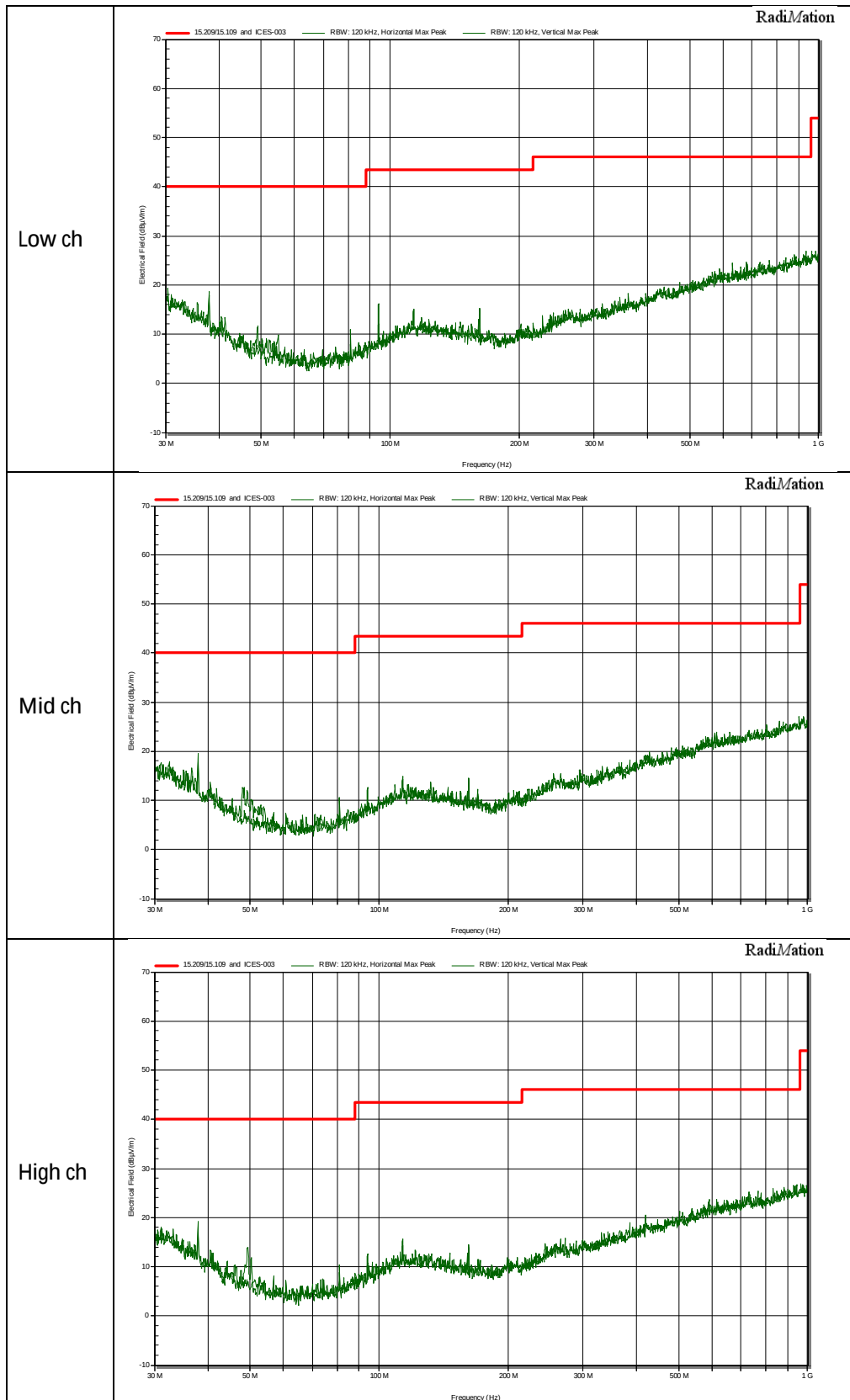
Frequency range (MHz)	Horizontal polarization	Vertical polarization
30 – 200	4.5 dB	5.4 dB
200 – 1000	3.6 dB	4.6 dB
1000 - 18000	5.7 dB	5.7 dB

4.1.6 Plots of the Radiated Emissions Measurement

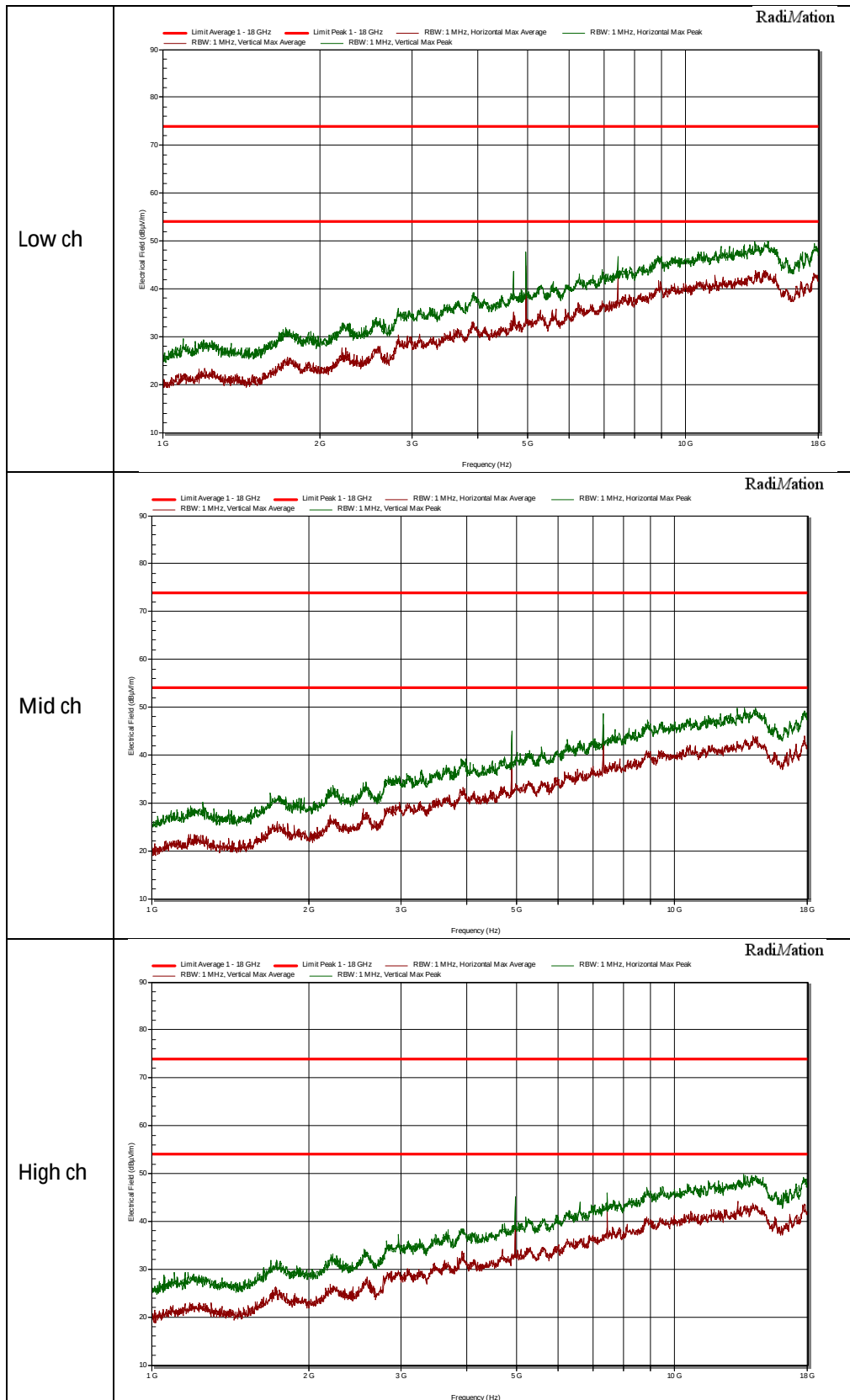
See next pages.

Note: for 0.009 – 30 MHz radiated emission test results see report 180700034 08.

0.03 – 1 GHz (both polarizations)



1 – 18 GHz (both polarizations)



18 - 26 GHz (one channel only)

