

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-FDT04PETR2
ISED ID : 26000-FDT04PETR2

Test report No.: 180700034 08 V1.00

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. +31316583180 Fax. +31316583189
Test Site FCC	NL0001
Test Site ISSED	4173A-1

Revision History

Version	Date	Remarks	By
0.50	11-03-2020	First draft	PS
1.00	26-03-2020	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	3.1	Pass
15.247(f)	RSS-247 5.3 (a), (b)	Hybrid operation; power density	3.2	Pass
15.247(f)	RSS-247 5.3 (a)	Hybrid operation; average time of occupancy	3.3	Pass
15.247(d)	RSS-247 5.5	Conducted Spurious emissions	3.4	Pass
15.247(d)	--	Conducted Band edge	3.5	Pass
15.247(d)	RSS-247 5.5	Tx Radiated Spurious emissions	3.6	Pass
15.109(a)	RSS-Gen 7.3	Rx Radiated Spurious emissions	3.7	Pass
15.207(c)	RSS-Gen 8.8	Conducted spurious emissions on AC mains	3.8	Pass
--	RSS-Gen 6.7	99% bandwidth	3.9	Pass
BLE mode				
15.247(a)	RSS-247 5.2(a)	6dB Bandwidth	4.1	Pass
15.247(b)	RSS-247 5.2(a)	RF output power	4.2	Pass
15.247(e)	RSS-247 5.2 (b)	Power spectral density	4.3	Pass
15.247(d)	RSS-247 5.5	Radiated spurious emissions	4.4	Pass
15.247(d)	--	Authorized band edge	4.5	Pass
--	RSS-Gen 6.7	99% bandwidth	4.6	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-FDT04PETR2
ISED ID	26000-FDT04PETR2
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

Tx Frequencies	918 – 927.5 MHz
Rx frequencies	918 – 927.5 MHz
Maximum output power to antenna	0.025 W
Antenna gain	-0.4 dBi
Type of modulation	Proprietary
Emission designator	125KG1D

Bluetooth Low Energy (BLE)	
Tx Frequency range	2402 - 2480 MHz
Rx frequency range	2402 - 2480 MHz
Maximum output power to antenna	0.001 W
Antenna gain	< 2.6 dBi
Type of modulation	GFSK
Emission designator	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 D01 DTS Meas. Guidance V05r02
- ANSI C63.10:2013

1.9 Observations and remarks

The product, model Pet, is part of a location system of which the other part bears the model name Guardian. 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.

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
	Mid	0.24 - 37.5 kbps	923.0
	High	0.24 – 37.5 kbps	927.5

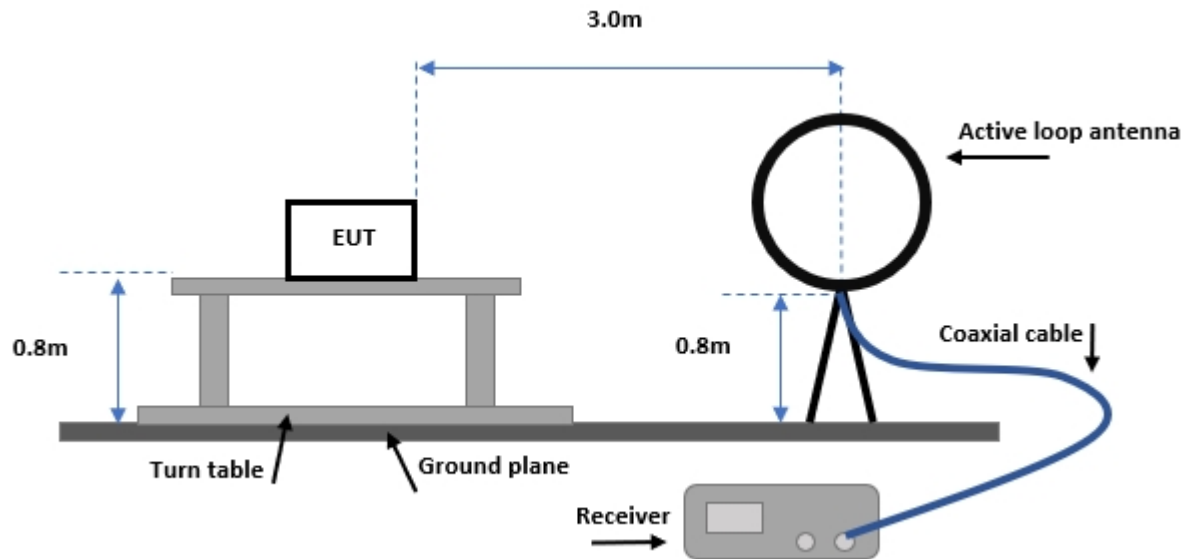
Technology Std.	Channel	Data rate	Frequency (MHz)
Bluetooth Low Energy	37	1 Mbps	2402
	17	1 Mbps	2440
	39	1 Mbps	2480

2.3 Conducted Test setup

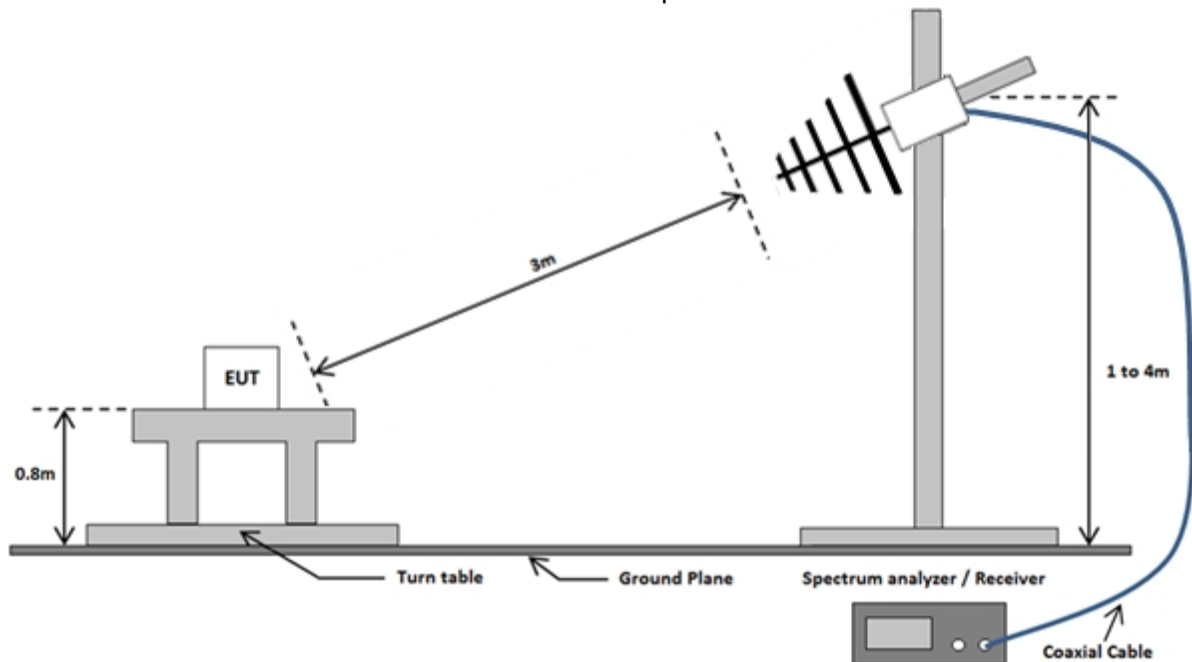


2.4 Radiated Test setup

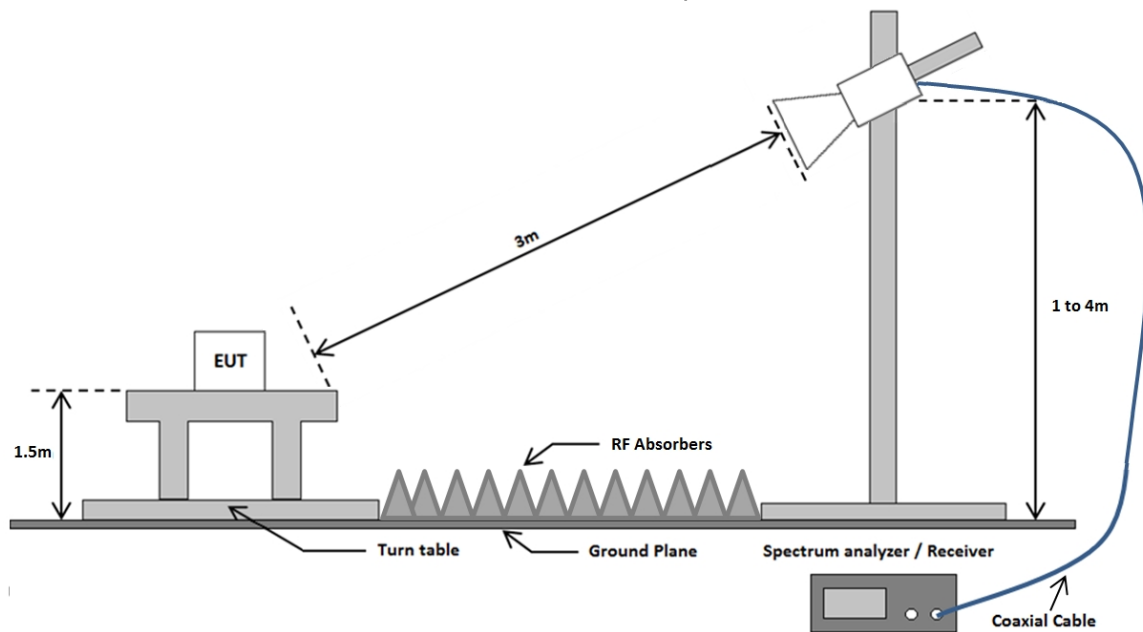
Radiated emissions test setup 9 kHz – 30 MHz



Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.5 Equipment used in the test configurations

Description	Manufacturer	Model	ID	Used at Par.
Spectrum Analyzer	Rohde & Schwarz	FSV	TE01269	3.5, 3.6, 3.7
EMI receiver	Rohde & Schwarz	ESR7	TE01220	3.4, 4.5
Signal Analyzer	Rohde & Schwarz	FSP	TE11125	3.1, 3.2, 3.3, 3.9 4.1 up to 4.5
Biconilog Antenna	Chase	CBL6112A	TE00967	3.5, 3.6, 3.7, 4.5
Horn Antenna	EMCO The Electro – Mechanics Co	3115	TE00531	3.5, 3.6, 3.7, 4.5
Pre-amplifier	Miteq	AFS42-041001800-29- OP-42	TE11132	3.5, 4.5
Pre-amplifier	Miteq	JF4-18004000-30-8P- A1	TE11131	4.5
Semi Anechoic Chamber (SAC)	Comtest Engineering BV	-	TE00861	3.5, 3.6, 3.7, 4.5
High pass filter	Wainwright instruments	WHK1.1/15G-10E	TE01139	3.5
High pass filter	Wainwright instruments	WHK10-2520-3000- 18000-40EF	TE11146	4.5

Other test configuration

Test system	Model	ID	Used at Par.
Conducted emission measurement system	--	TS 00005	3.8

2.6 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 Output Power Measurement

3.1.1 Limit

For systems using digital modulation in the 902 - 928 MHz band, the limit for the peak output power is 30 dBm.

If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point to point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.1.4 Test procedure

IRN 014 - RF power (W) - Method 1 – AVGSA (DTS) according to ANSI C63.10.

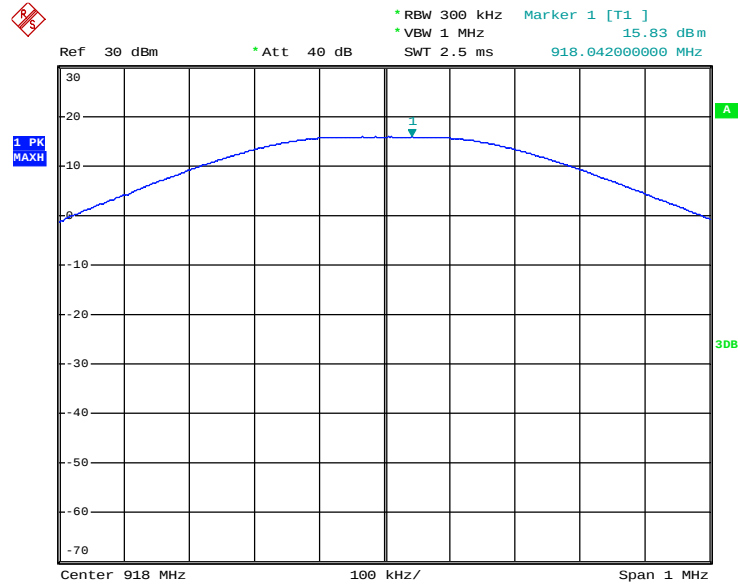
FCC KDB Publication No. 558074 D01 DTS Meas. Guidance V05r02.

3.1.5 Test results of Output Power Measurement

Technology Std.	Channels	Peak method		
		Frequency (MHz)	Data rate	Peak output power (dBm)
Proprietary RF	Low	918.0 MHz	0.24 – 37.5 kbps	15.8
	Mid	923.0 MHz	0.24 – 37.5 kbps	15.8
	High	927.5 MHz	0.24 – 37.5 kbps	15.8
Uncertainty	±1.78 dB			

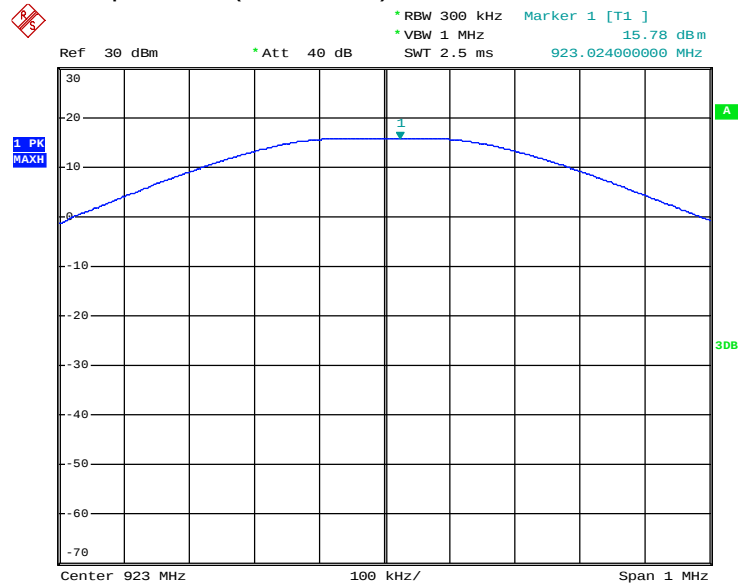
3.1.6 Plots of Peak Output Power Measurement

Peak Output Power (Low Channel)



Date: 22.JAN.2020 10:33:04

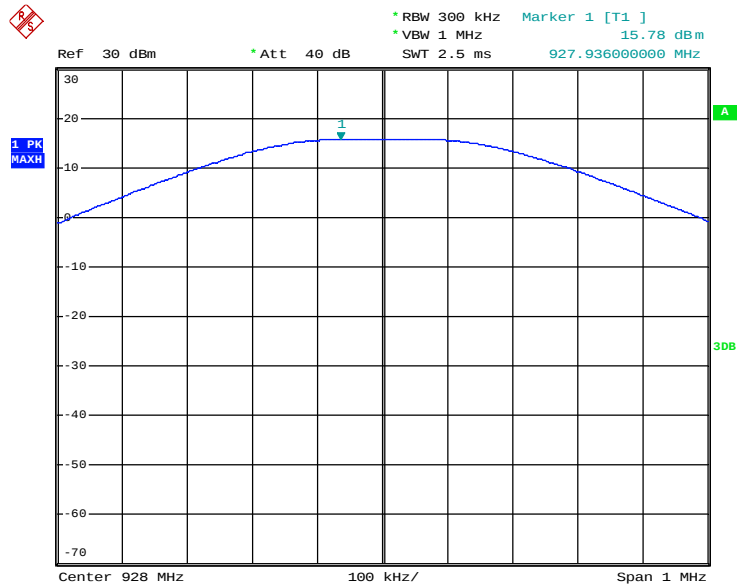
Peak Output Power (Mid Channel)



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Report number: 180700034 08 V1.00

Peak Output Power (High Channel)



Date: 22.JAN.2020 10:35:11

3.2 Hybrid operation

3.2.1 Power density

3.2.1.1 Limit

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.2.2.1 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.2.2.2 Test procedure

IRN 030_15.1 Power Spectral Density (W vs. Hz) – Method 5

According to ANSI C63.10: 2013 section 11.10.3

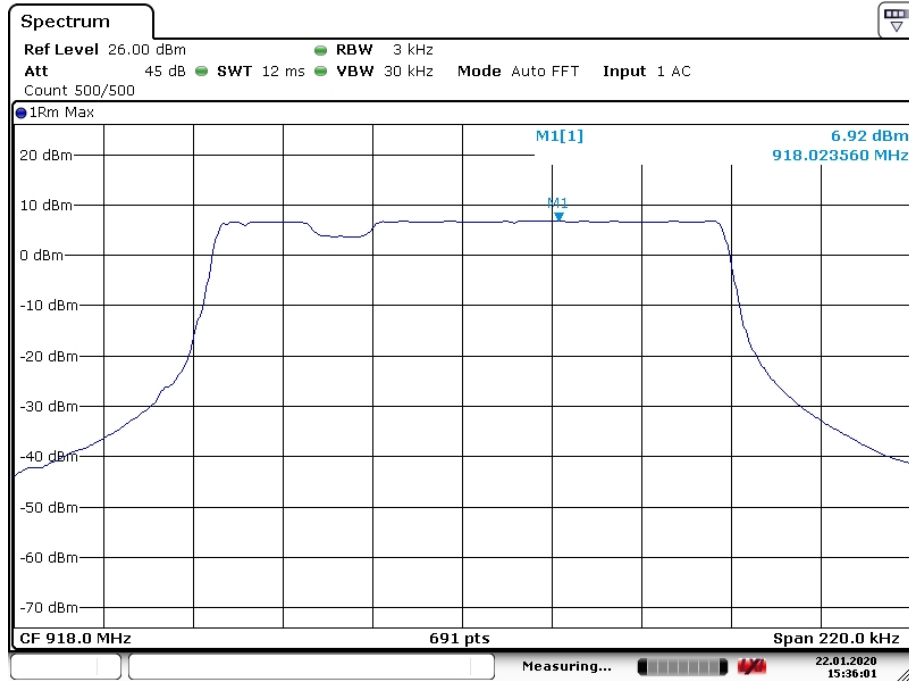
1. As the transmission pulse (or sequence of pulses) does not remain at maximum transmit power throughout each of the 100 sweeps of averaging, a different approach than that described in ANSI C63.10, § 11.10.3 (Method AVGPS-1) is followed.
2. The RF output of EUT was connected to the spectrum analyser by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement. This path loss is stored within the transducer table of the Spectrum analyser.
4. The procedure as described in method AVGPS-1 is followed, with the following deviations:
 - trace averaging is disabled,
 - trace mode is set to Max hold

3.2.2.3 Test results of Power Spectral Density Measurement

Technology Std.	Channels	Frequency (MHz)	Data rate	PSD/3 kHz (dBm)
Proprietary RF	Low	918.0 MHz	0.24 – 37.5 kbps	6.92
	Mid	923.0 MHz	0.24 – 37.5 kbps	6.90
	High	927.5 MHz	0.24 – 37.5 kbps	6.89
Uncertainty	±0.63 dB			

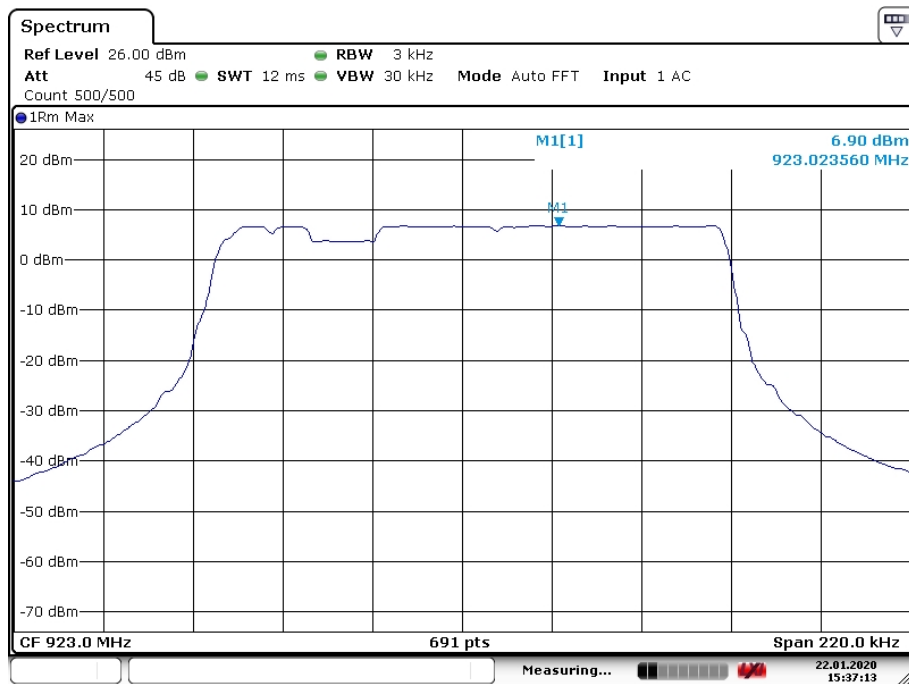
3.2.2.4 Plots of the Power Spectral Density Measurement

Low channel



Date: 22.JAN.2020 15:36:01

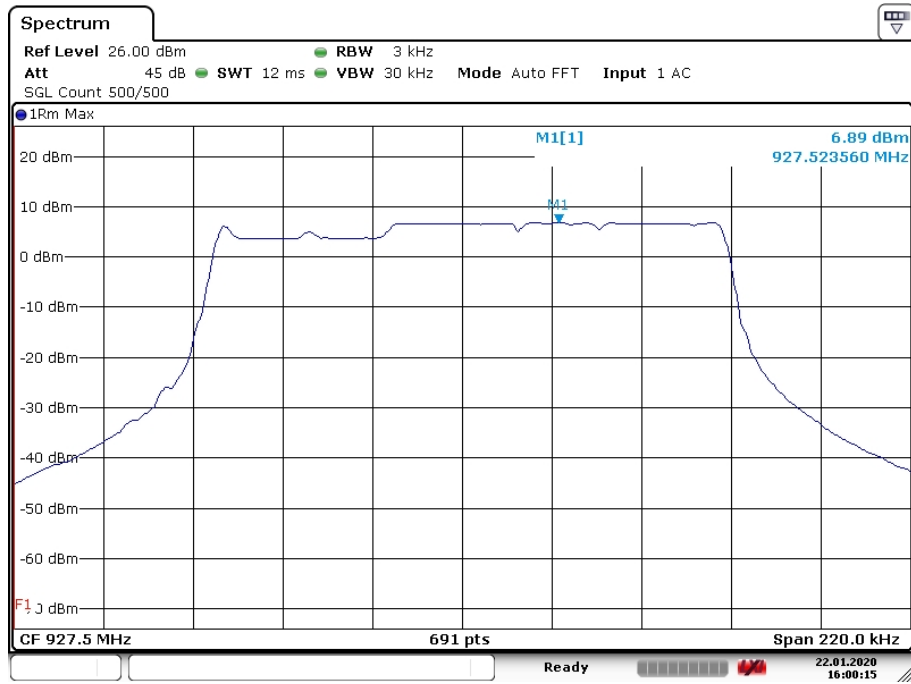
Mid channel



Date: 22.JAN.2020 15:37:13

Report number: 180700034 08 V1.00

High channel



Date: 22. JAN. 2020 16:00:15

3.3 Average time of occupancy

3.3.1 Limit

The average time of occupancy on any frequency shall not exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.3.3 Test setup

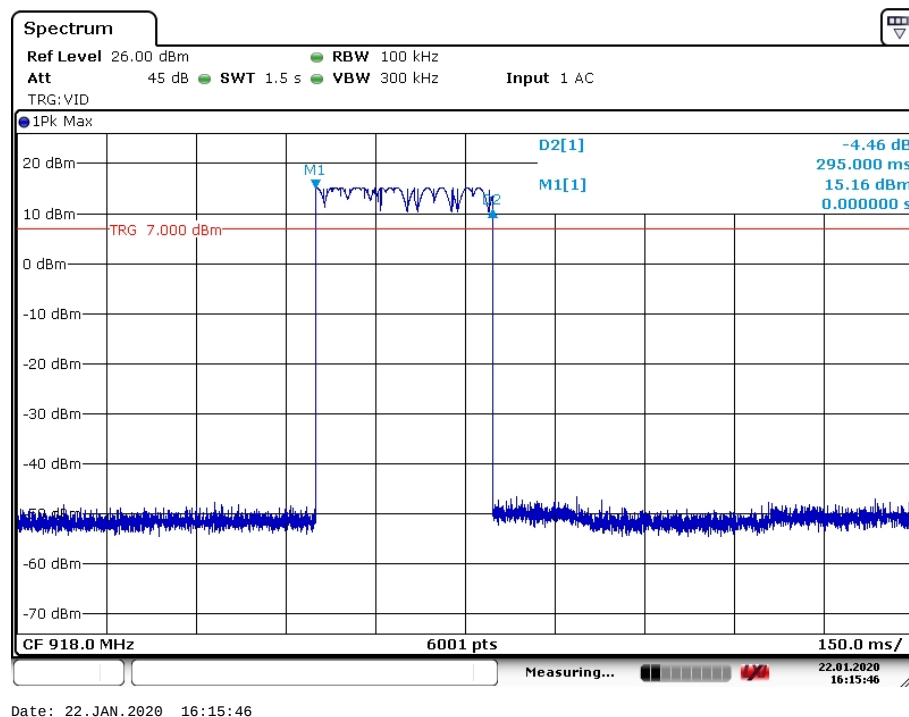
The test setup is as shown in chapter 2.4 of this report.

3.3.4 Test procedure

According to ANSI C63.10: 2013 section 7.8

IRN 013 - Duty cycle (%) - Method 2

3.3.5 Plot of the average time of occupancy measurement.



The measured time of occupancy is: 295 ms in a time period of $0.4 \times 5 = 2$ seconds.

Measurement uncertainty: $\pm 5.7\%$

3.4 Conducted Spurious Emissions Measurement

3.4.1 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.

3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.4.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.4.4 Test procedure

According to KDB Publication 558074 V05r02
IRN 016_11.3 Spurious emission (W) – Method 1

3.4.5 Measurement uncertainty

+/- 0.6 dB

3.4.6 Results of the Conducted Spurious Emissions Measurement

Channel	Frequency	Attenuation below f_c (dB)
Low	All	≥ 40
Mid	All	≥ 40
High	All	≥ 40

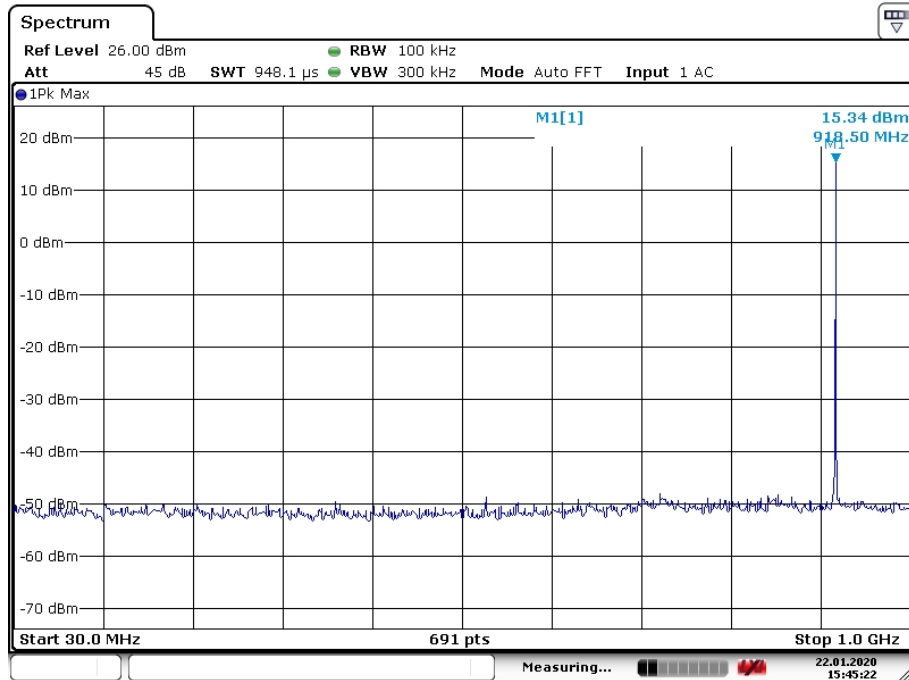
3.4.7 Plots of the Conducted Spurious Measurements

See next page.

Report number: 180700034 08 V1.00

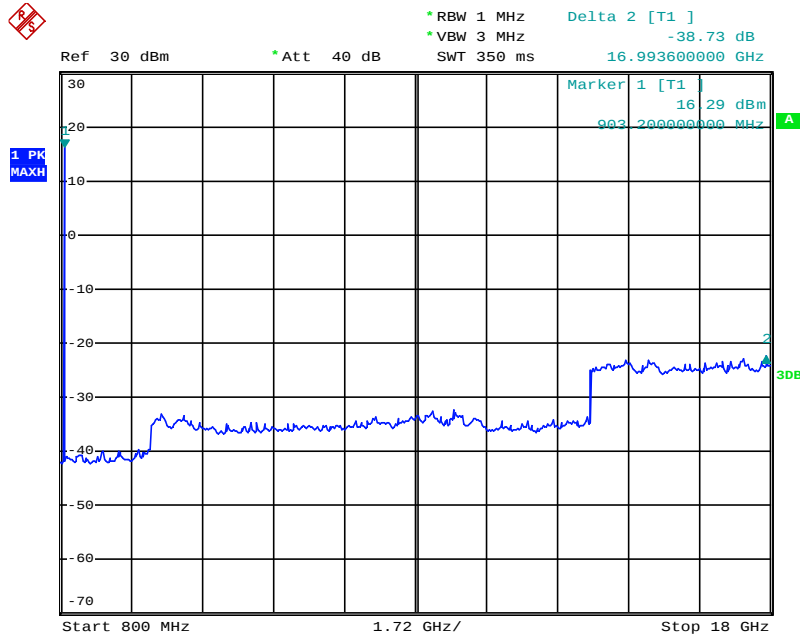
Low channel

30 -1000 MHz



Date: 22.JAN.2020 15:45:22

0.8 -18 GHz

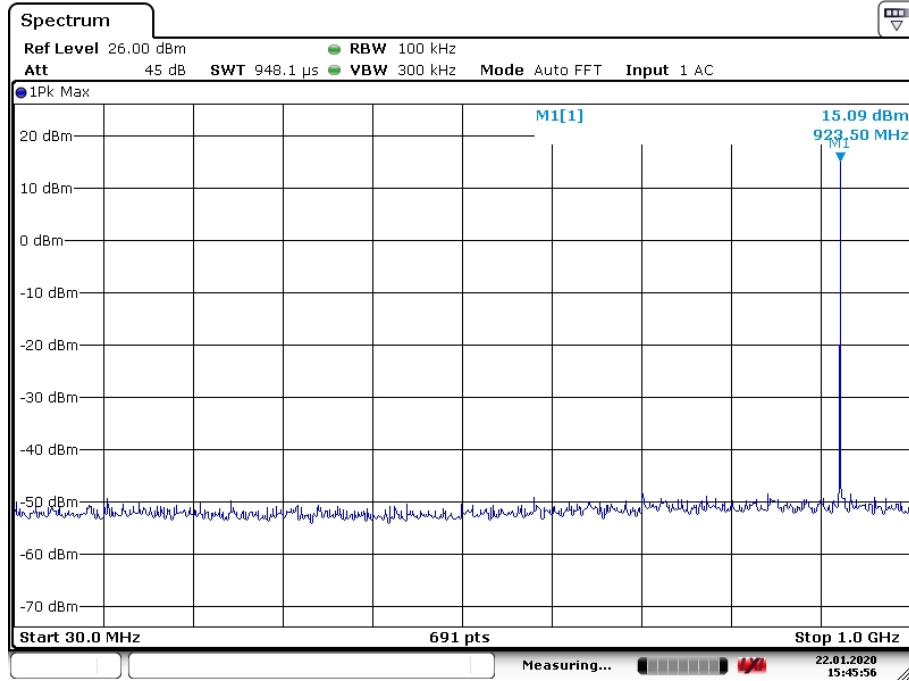


Date: 22.JAN.2020 16:47:51

Report number: 180700034 08 V1.00

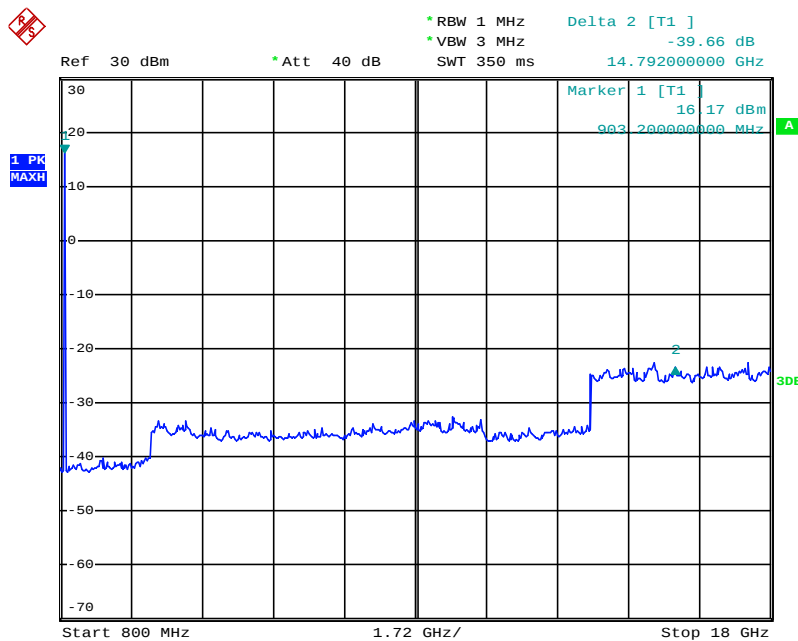
Mid Channel

30 -1000 MHz



Date: 22.JAN.2020 15:45:56

0.8 -18 GHz

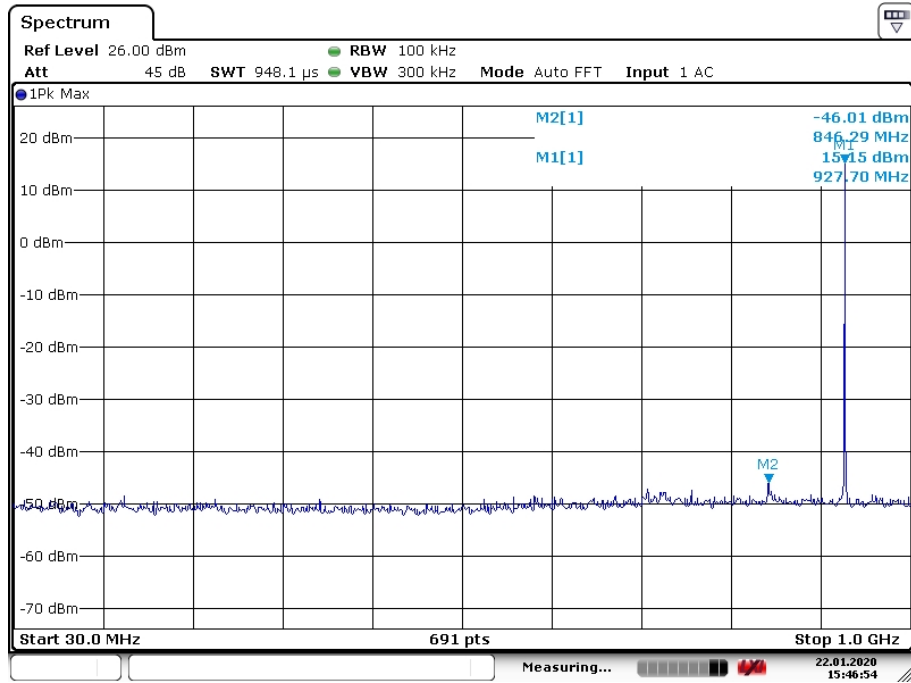


Date: 22.JAN.2020 16:49:02

Report number: 180700034 08 V1.00

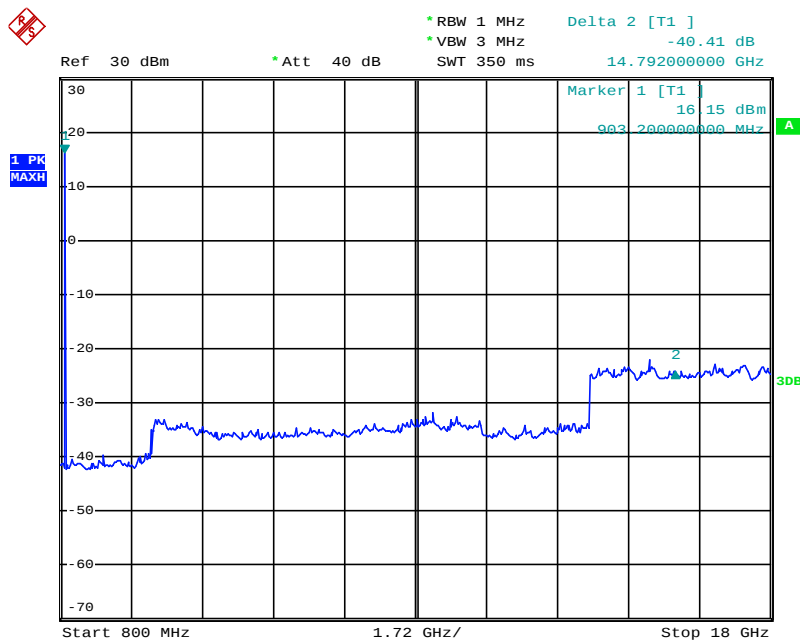
High Channel

30 - 1000 MHz



Date: 22.JAN.2020 15:46:54

0.8 - 18 GHz



Date: 22.JAN.2020 16:50:26

3.5 Conducted band edge measurements

3.5.1 Limit

At the band edge of the authorized band, the level of the emission shall be at least 20 dB below the peak of the in-band emission, based on either a RF conducted or a radiated measurement.

3.5.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.5.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.5.4 Test procedure

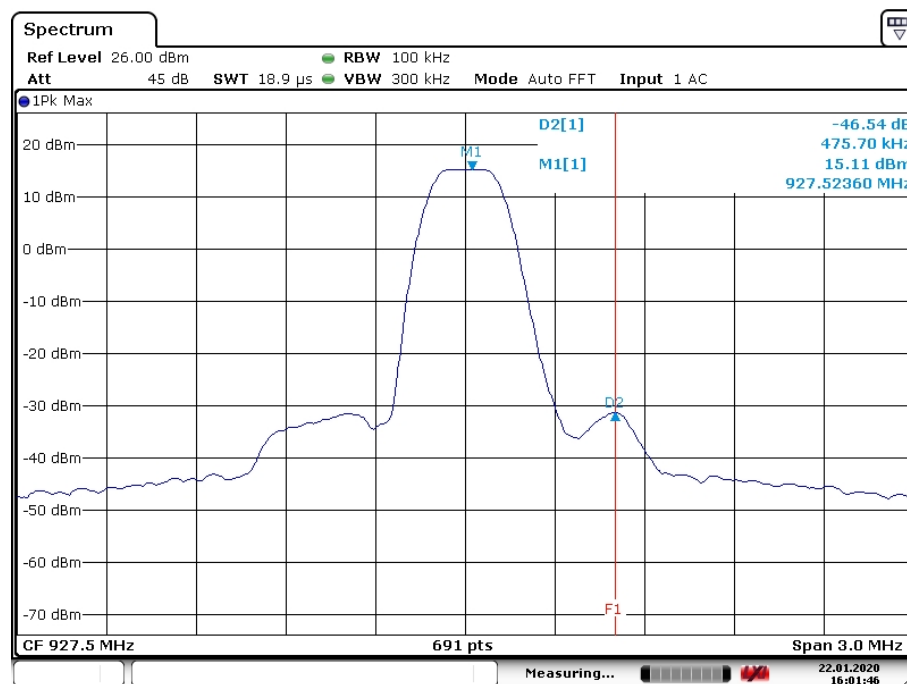
According to KDB Publication 558074 V05r02
IRN 016_11.3 Spurious emission (W) – Method 14

3.5.5 Test results of Conducted Band Edges Measurements

Band edge					
Technology Std.	Channels	Frequency (MHz)	Data rate	N dB down (dB)	Limit (dB)
Proprietary RF	High	927.5	0.24 – 37.5 kbps	46.54	≥ 20
	--	--	--	--	--
Uncertainty	± 0.63 dB				

Note: the lower band edge is not measured since the lowest channel (917 MHz) is 15 MHz away (902 MHz).

3.5.6 Plot of the conducted higher band edge measurement



Date: 22. JAN. 2020 16:01:46

3.6 Tx Radiated Emissions Measurement

3.6.1 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

3.6.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.6.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.6.4 Test procedure

According to KDB Publication 558074 V05r02

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

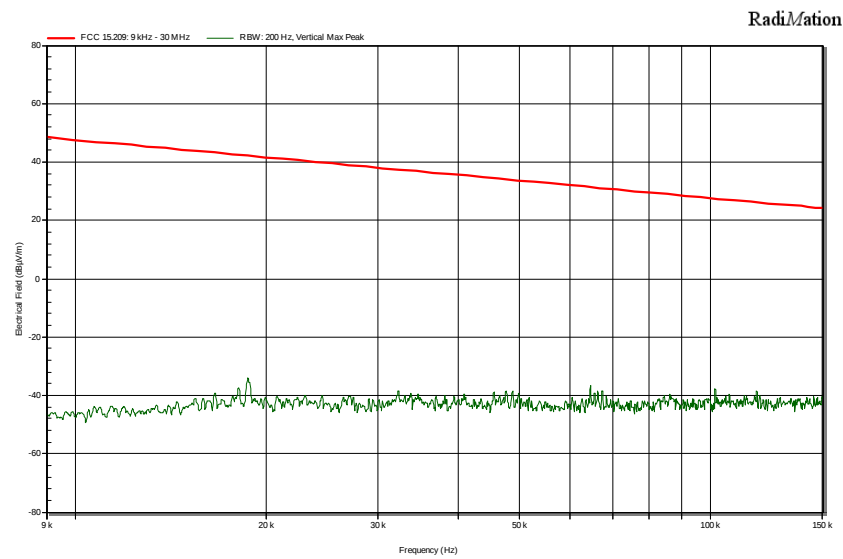
3.6.5 Measurement uncertainty

Frequency range (MHz)	Horizontal polarization	Vertical polarization
0.009 – 30	+1.5/-1.6 dB	+1.5/-1.6 dB
30 – 200	+/-4.5 dB	+/-5.4 dB
200 – 1000	+/-3.6 dB	+/-4.6 dB
1000 - 18000	+/-5.7 dB	+/-5.7 dB

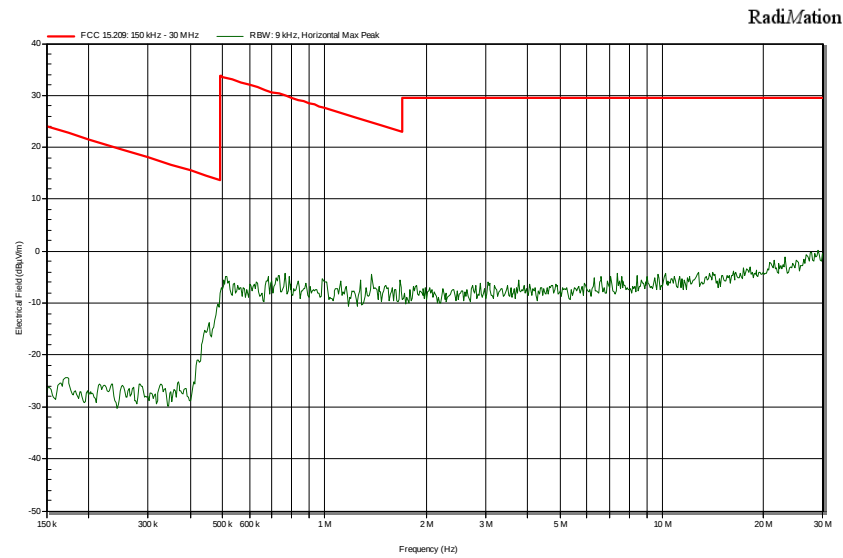
3.6.6 Plots of the Tx Radiated Emissions Measurement

See next pages.

0.009 – 0.150 MHz

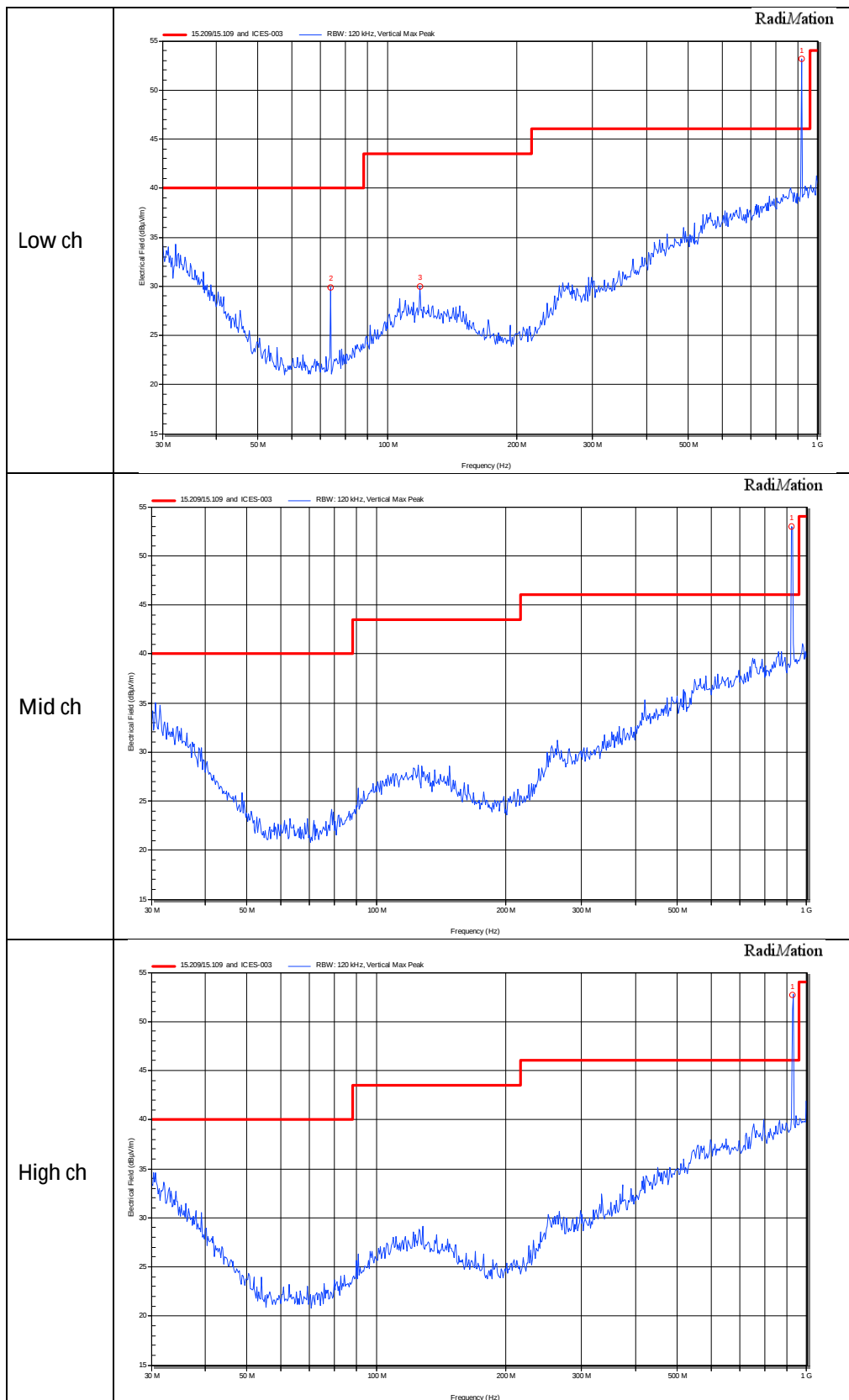


0.15 – 30 MHz



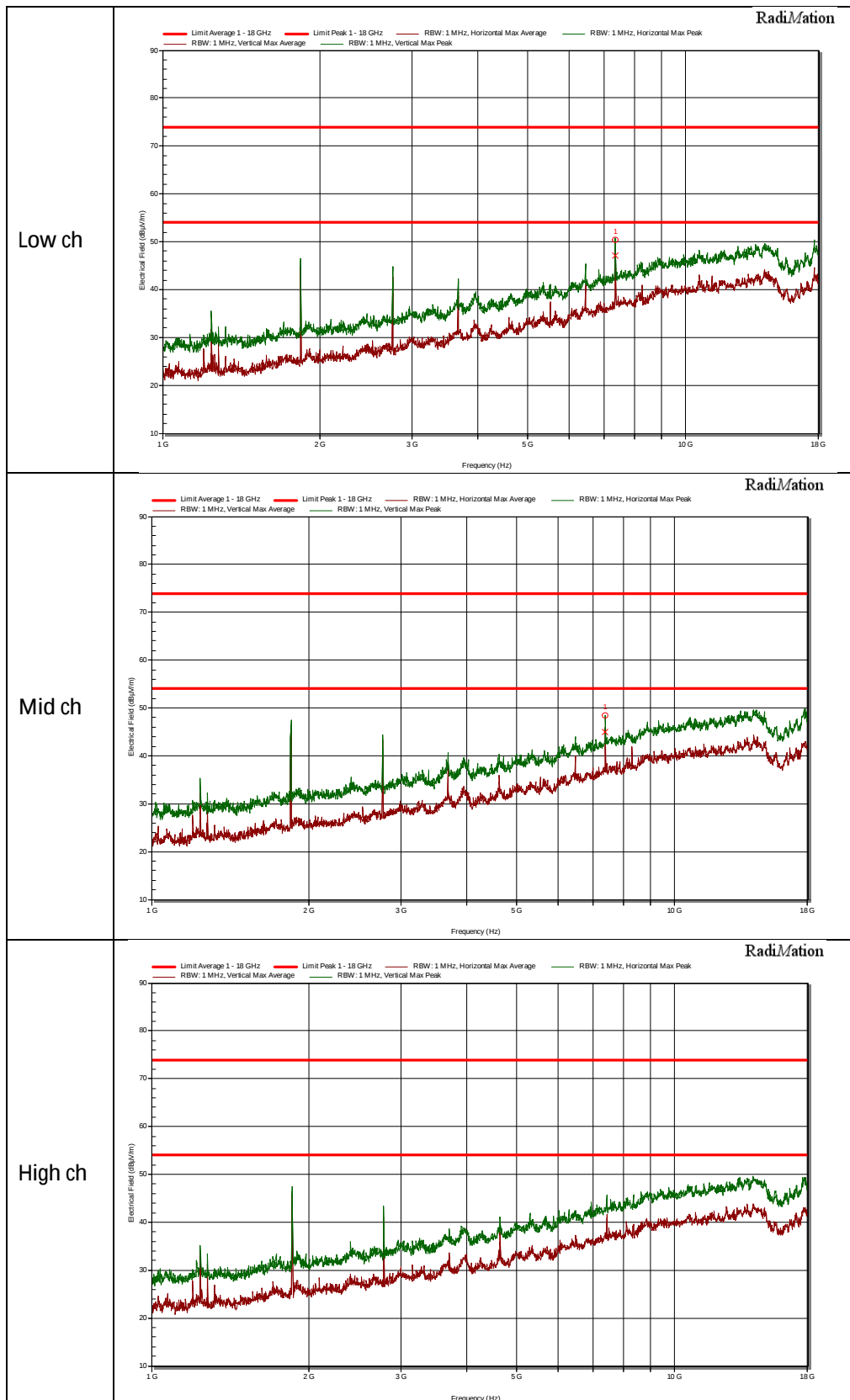
Note: The measurement data, measured at 3 m distance, has been extrapolated to the distances mentioned in the table in section 3.7.1
The extrapolation procedure used is taken from ANSI C63.10; 2013, §6.4.4.2.

0.03 – 1 GHz (Vertical polarization only)



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)



3.7 Rx Radiated Emissions Measurement

3.7.1 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

3.7.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.7.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.7.4 Test procedure

According to ANSI C63.4: 2014, section 8.3

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

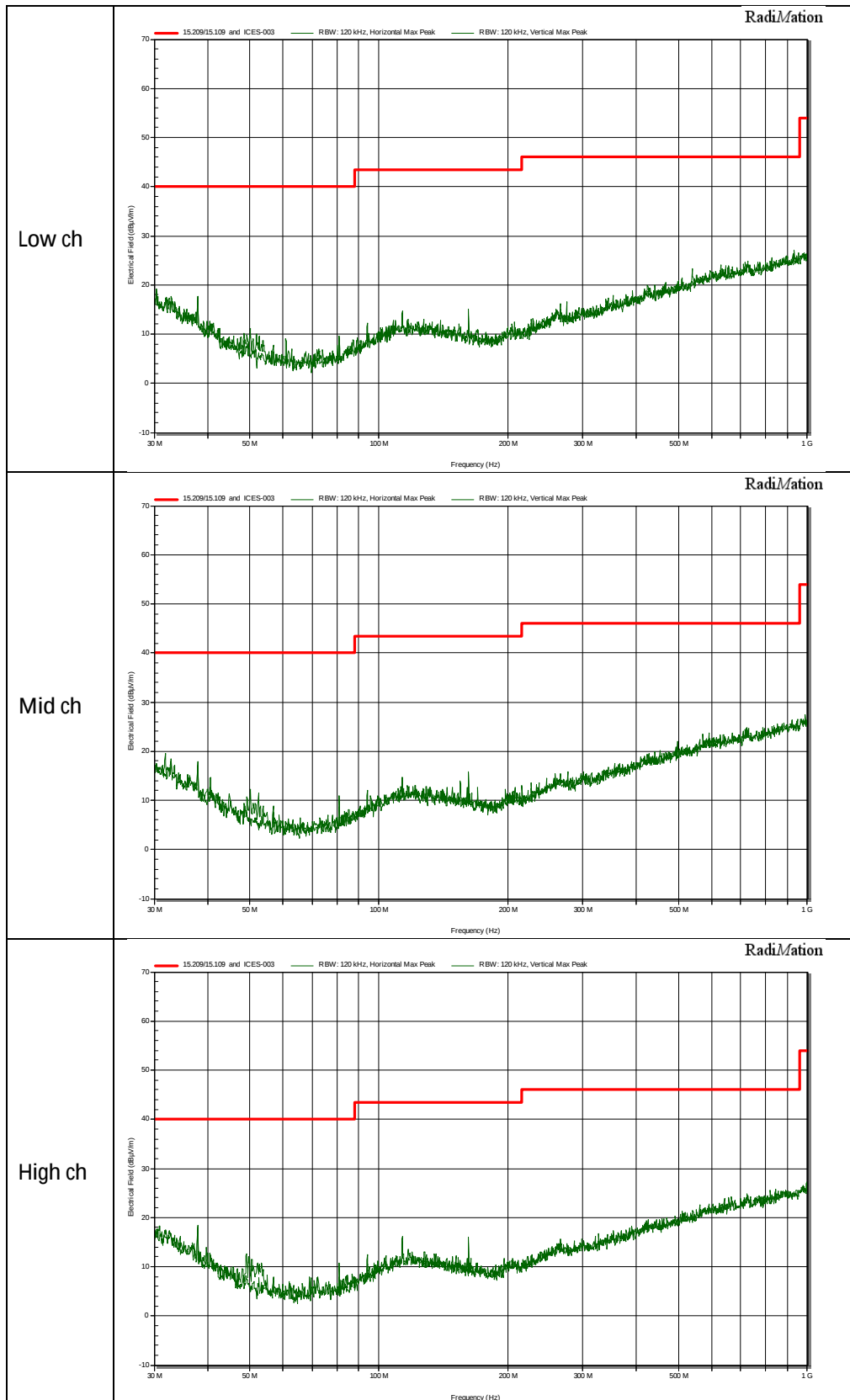
3.7.5 Measurement uncertainty

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

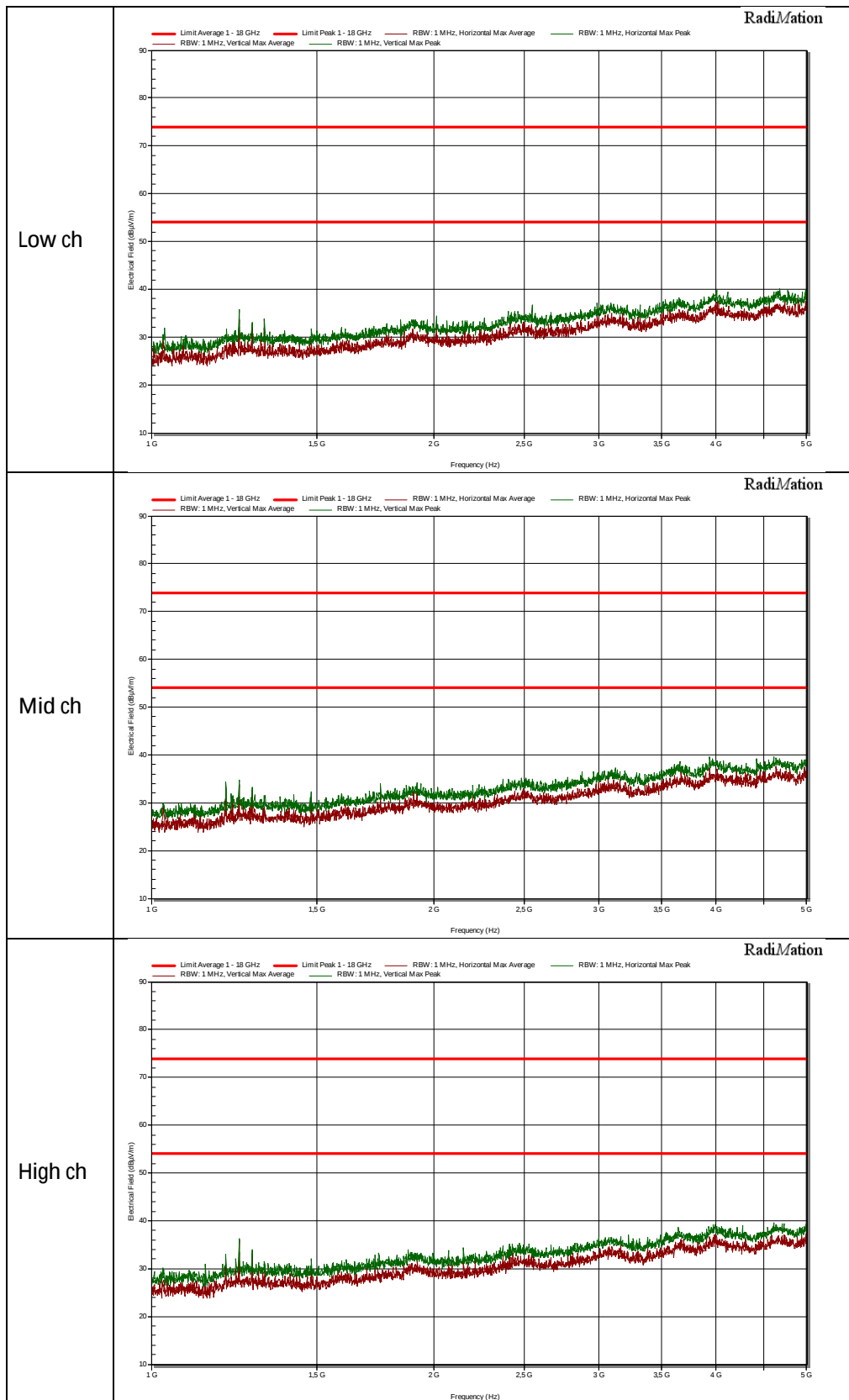
3.7.6 Plots of the Rx Radiated Emissions Measurement

See next pages.

0.03 – 1 GHz (Both polarizations)



1 – 5 GHz (Both polarizations)



3.8 Conducted emissions

3.8.1 Limit

According to 15.207 (c)

Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

3.8.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.8.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.8.4 Test procedure

According to ANSI C63.4: 2014, section 13.3

IRN 029 – Method 1

3.8.5 Test results and plots of the AC mains conducted measurement

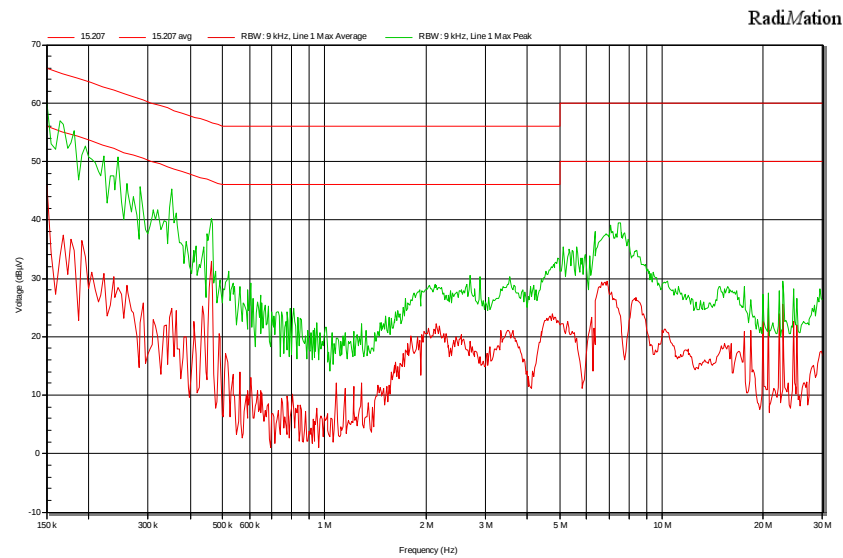
See next page.

3.8.6 Measurement uncertainty

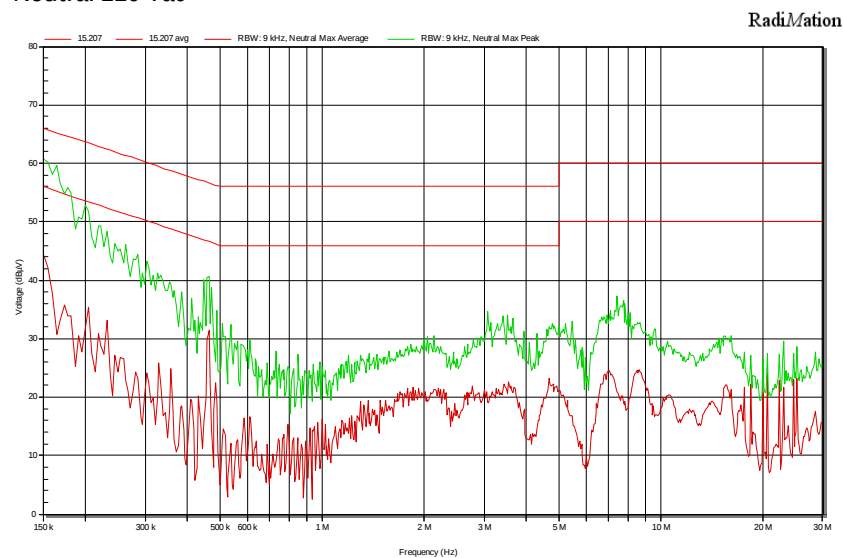
+/- 3.6 dB

3.8.7 Plots of the AC mains conducted spurious measurement

Phase 110 Vac



Neutral 110 Vac



3.9 99% Occupied Bandwidth

3.9.1 Limit

According to RSS-Gen 6.7

3.9.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.9.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

3.9.4 Test procedure

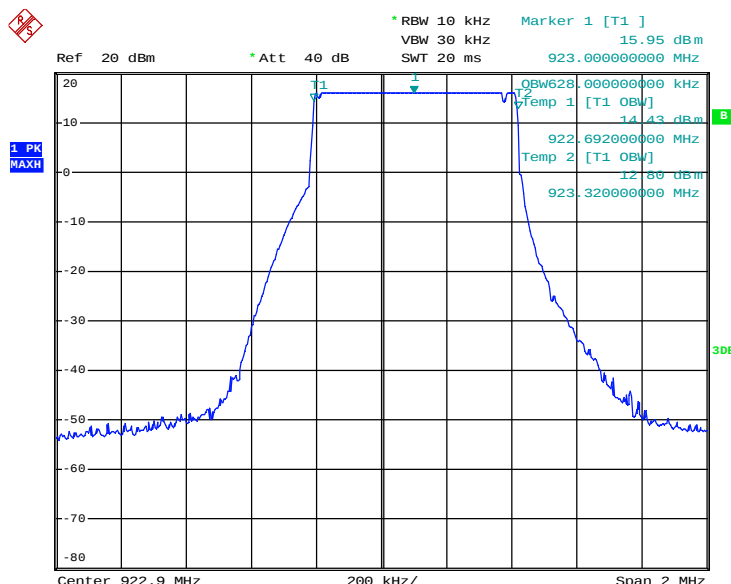
IRN 017 - Occupied bandwidth (Hz) Method 1 – XX % power bandwidth.

1. Set the centre frequency to the nominal EUT channel centre frequency
2. Set span = 1.5 times to 0.5 times the Occupied Bandwidth
3. Set VBW $\geq 3 \times$ RBW
4. Video averaging is not permitted. Where practical, detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

3.9.5 Test results of the 99% occupied bandwidth measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	99% bandwidth (kHz)
Proprietary RF	Mid	923.0 MHz	0.24 – 37.5 kbps	628
Uncertainty	± 25 kHz			

3.9.6 Plot of the 99% occupied bandwidth measurement



Date: 26.MAR.2020 11:14:03

4 Test results BLE

4.1 6 dB bandwidth

4.1.1 Limit

The minimum 6 dB Bandwidth shall be at least 500 kHz.

4.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

4.1.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

4.1.4 Test procedure

Tests according to ANSI C63.10

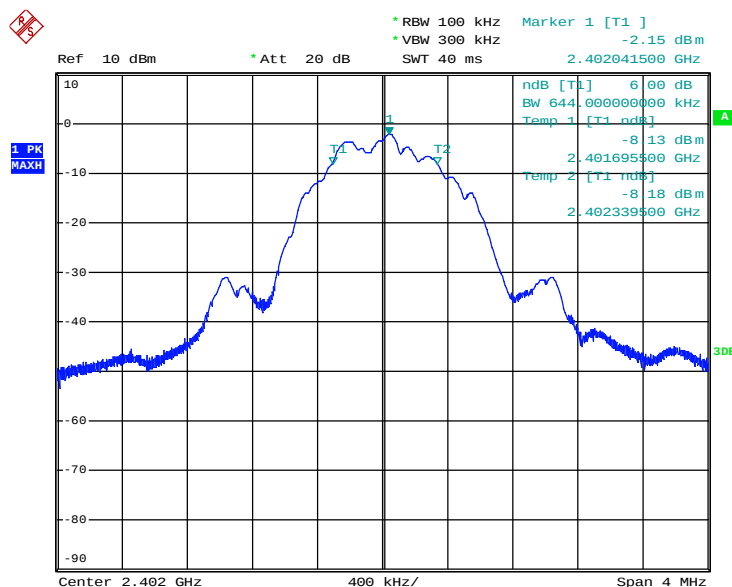
IRN 017 - Occupied bandwidth (Hz) Method 4 – DTS Bandwidth.

4.1.5 Test Results of the 6 dB bandwidth Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (kHz)
Bluetooth Low energy	37	2402	1 Mbps	644.0
	17	2440	1 Mbps	637.5
	39	2480	1 Mbps	684.0
Uncertainty	± 36.2 kHz			

4.1.6 Plots of the 6 dB bandwidth measurement

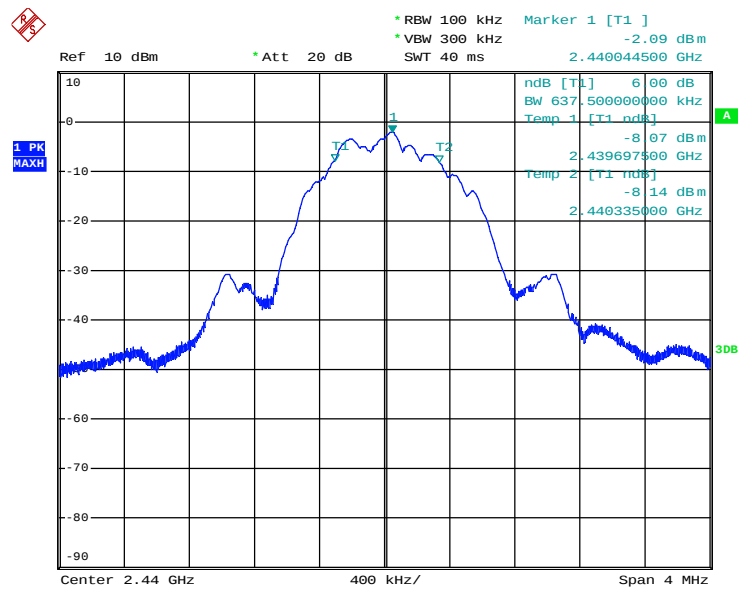
Low channel



Date: 21.JAN.2020 14:48:44

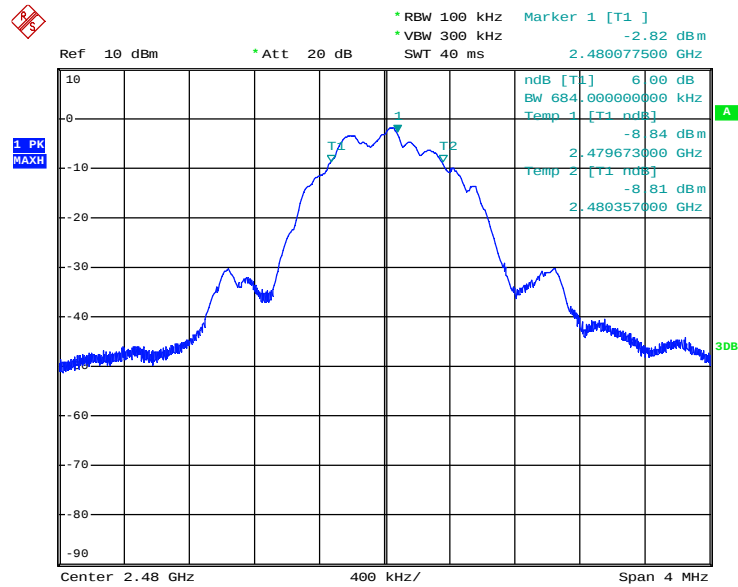
Report number: 180700034 08 V1.00

Mid channel



Date: 21.JAN.2020 14:46:08

High channel



Date: 21.JAN.2020 14:43:46

4.2 Peak output power

4.2.1 Limit

For systems using digital modulation in the 2400-2483.5 MHz, the limit for the peak output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point to point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

4.2.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

4.2.4 Test procedure

FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.

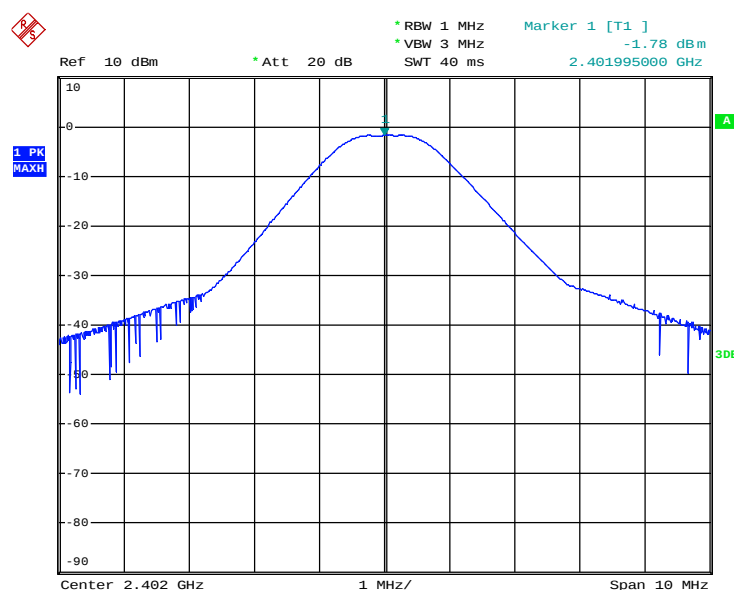
IRN 014 - RF power (W) - Method 1 – AVGSA (DTS) according to ANSI C63.10.

4.2.5 Test results of Output Power Measurement

Peak method				
Technology Std.	Channel	Frequency (MHz)	Data rate	Peak output power (dBm)
Bluetooth Low Energy	37	2402	1 Mbps	-1.78
	17	2440	1 Mbps	-1.73
	39	2480	1 Mbps	-1.53
Uncertainty	± 0.71 dB			

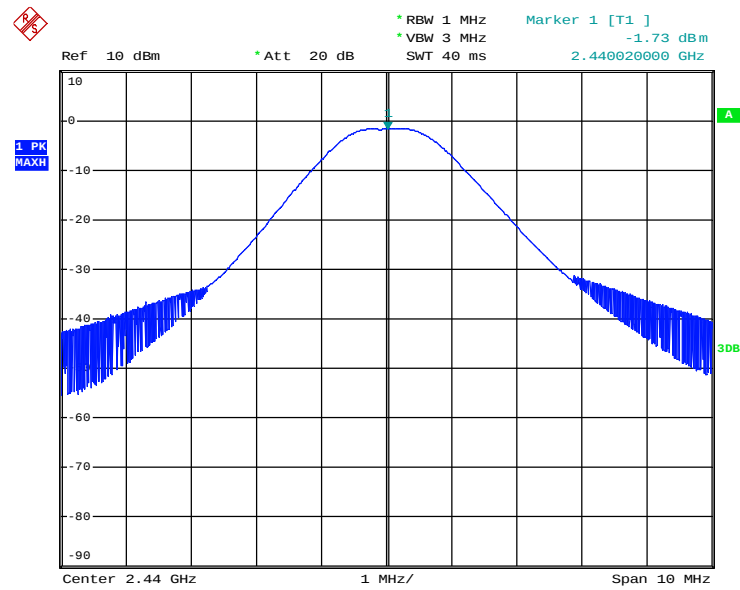
4.2.6 Plots of the peak output power measurement

Low channel



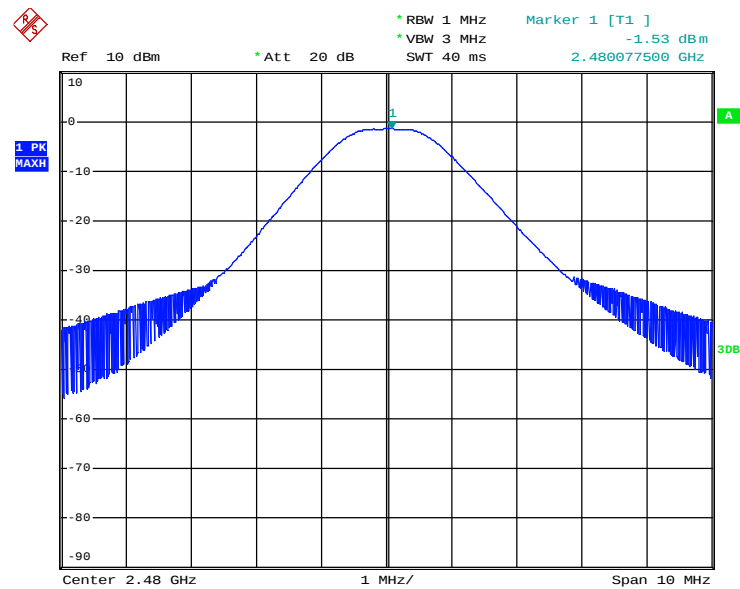
Report number: 180700034 08 V1.00

Mid channel



Date: 21.JAN.2020 14:38:43

High channel



Date: 21.JAN.2020 14:39:51

4.3 Peak power spectral density

4.3.1 Limit

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

4.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

4.3.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

4.3.4 Test procedure

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

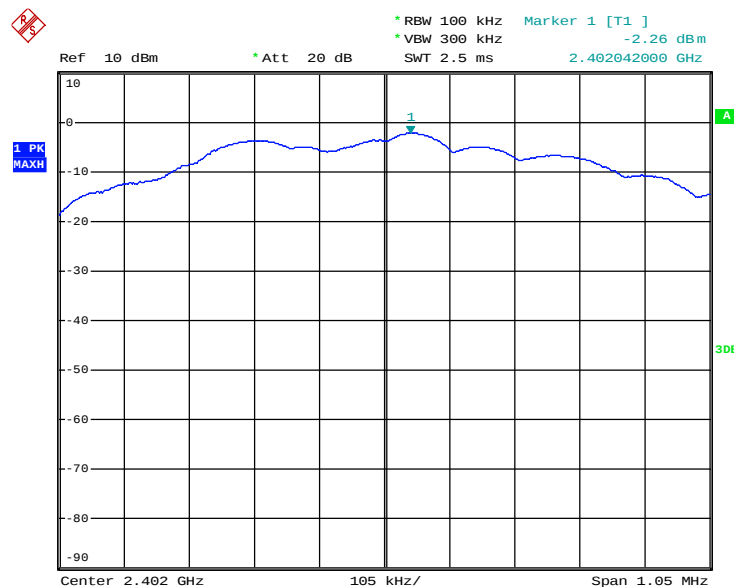
IRN 030 - Spectral power density (W per n.Hz) - Method 5 – Peak method PKPSD

4.3.5 Test results of Power Spectral Density Measurement

Peak Power spectral density				
Technology Std.	Channel	Frequency (MHz)	Data rate	PSD (dBm/100 kHz)
Bluetooth Low Energy	1	2402	1 Mbps	-2.26
	18	2440	1 Mbps	-2.21
	39	2480	1 Mbps	-2.03
Uncertainty	± 0.71 dB			

4.3.6 Plots of the peak power spectral density measurement

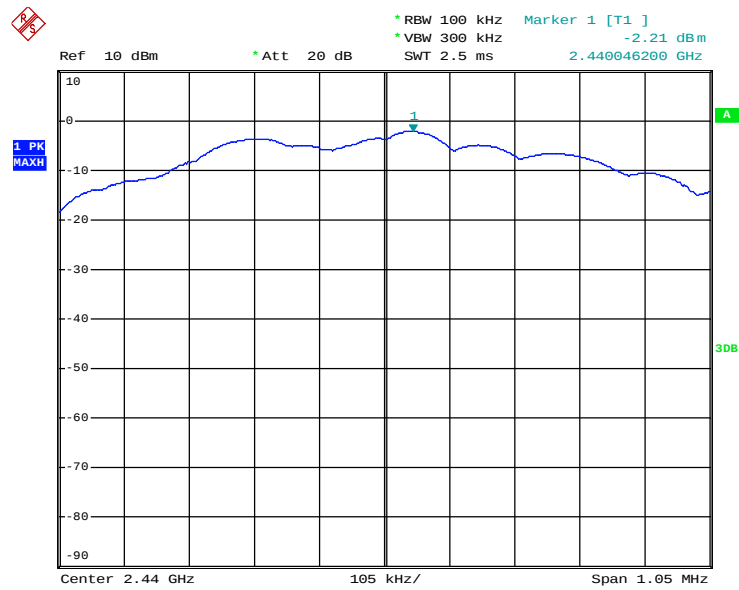
Low channel



Date: 21.JAN.2020 15:43:12

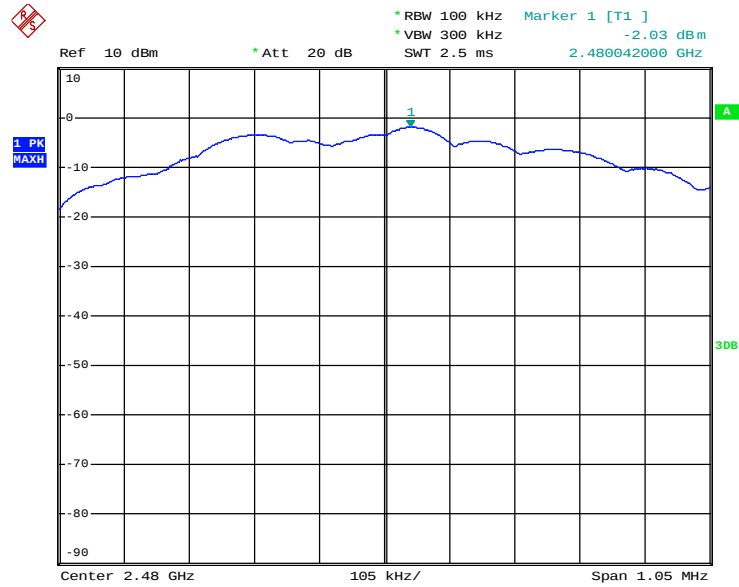
Report number: 180700034 08 V1.00

Mid channel



Date: 21.JAN.2020 15:42:20

High channel



Date: 21.JAN.2020 15:41:26

4.4 Radiated spurious emissions

4.4.1 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)
30 -88	100	40	3
88 - 216	150	43,5	3
216-960	200	46	3
Above 960	500	54	3

4.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

4.4.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

4.4.4 Test procedure

According to KDB Publication 558074 V02r02, section 12.1
IRN 026_14.2 Radiated electrical disturbance (V per m) – Method 1, 2

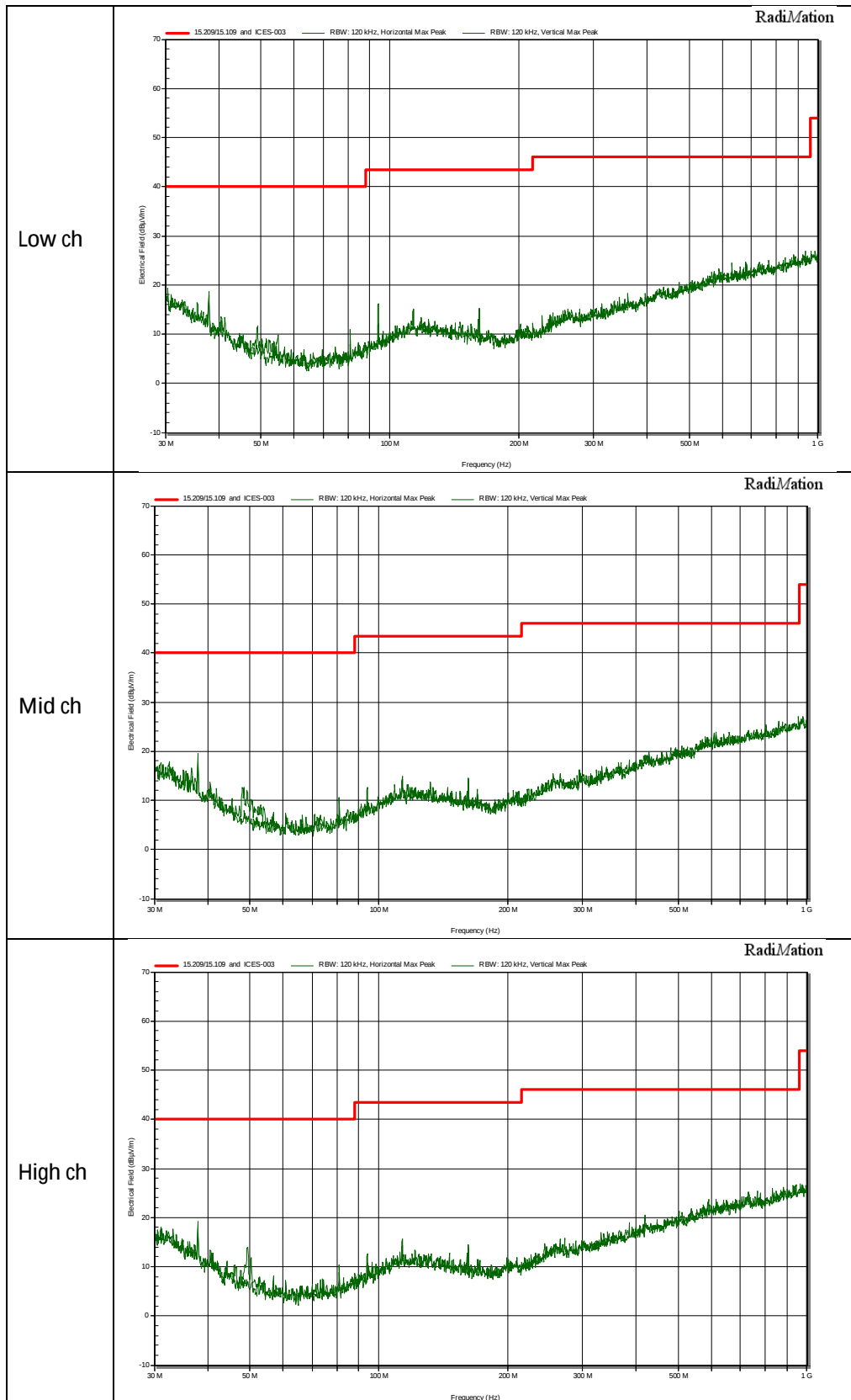
4.4.5 Measurement uncertainty

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

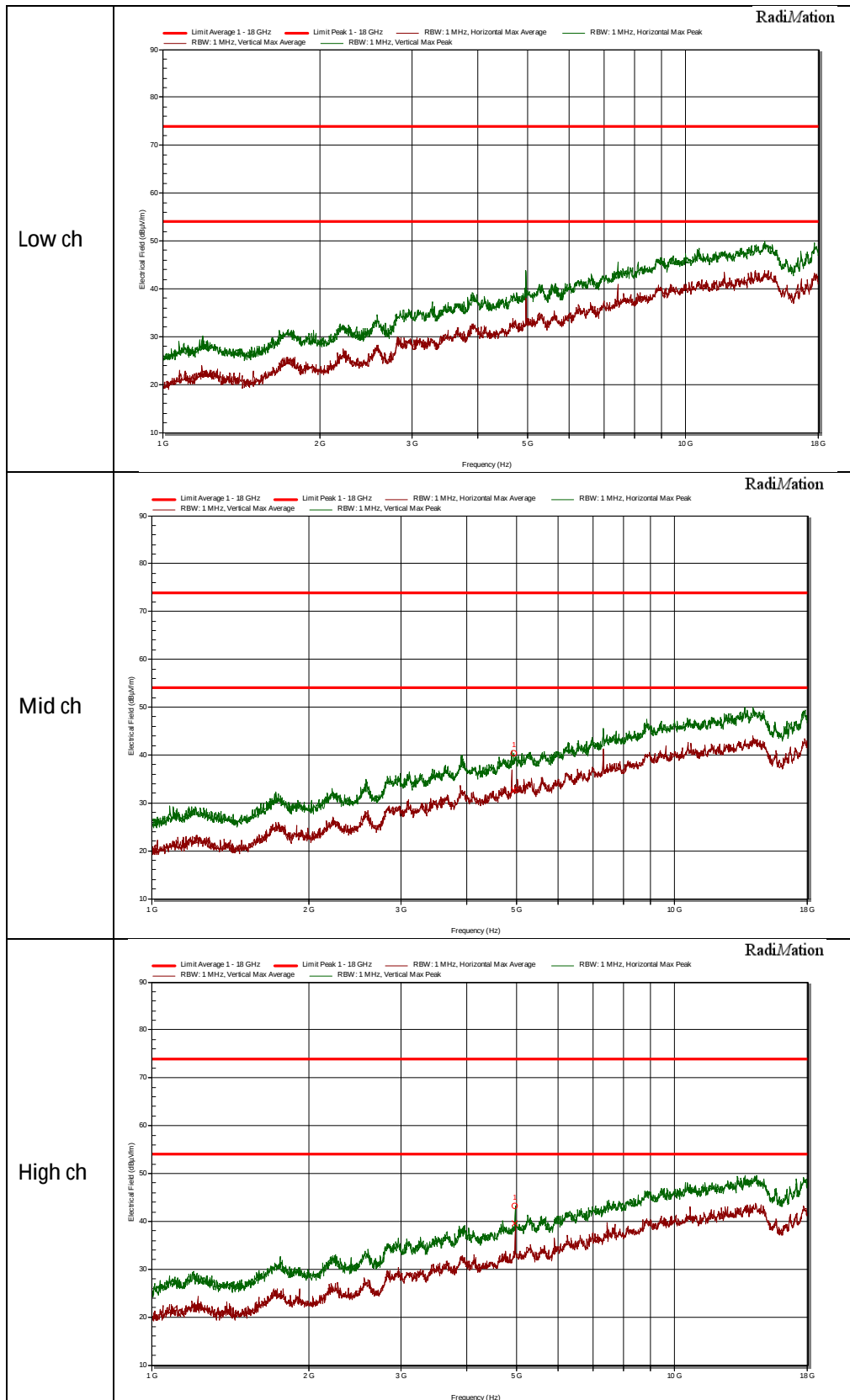
4.4.6 Plots of the Radiated Emissions Measurement

See next page.

0.03 – 1 GHz (both polarizations)



1 – 18 GHz (both polarizations)



4.5 Authorized band edge emissions

4.5.1 Limit

At the edge of the authorized band the RF power shall be at least 20 dB down.

4.5.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

4.5.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

4.5.4 Test procedure

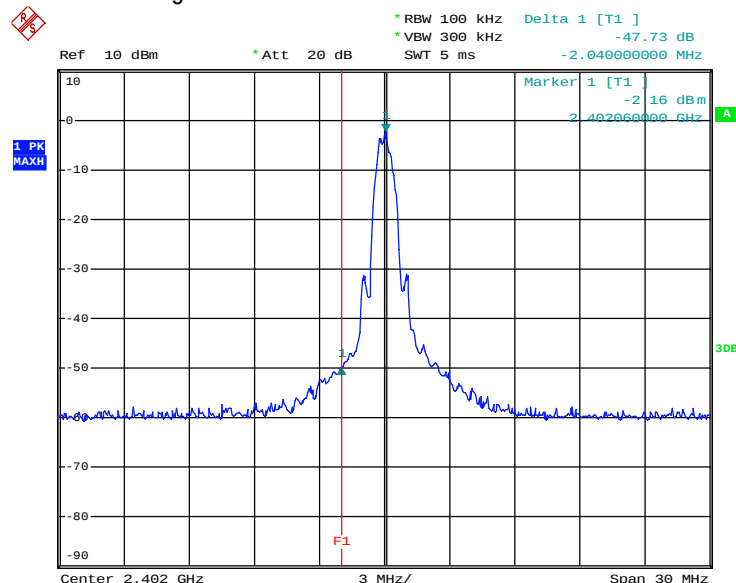
The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05, sections 11.3 and 12.1. IRN 026 - Radiated electrical disturbance (V per m) Method 6 – Radiated electrical disturbance at the authorized band edge.

4.5.5 Test results of Conducted Band Edges Measurements

Band edge					
Technology Std.	Channels	Frequency (MHz)	Data rate	N dB down (dB)	Limit (dB)
Proprietary RF	High	2480	1 Mbps	51.4	≥ 20
	Low	2402	1 Mbps	47.7	≥ 20
Uncertainty	± 0.63 dB				

4.5.6 Plots of the Band edge Measurements

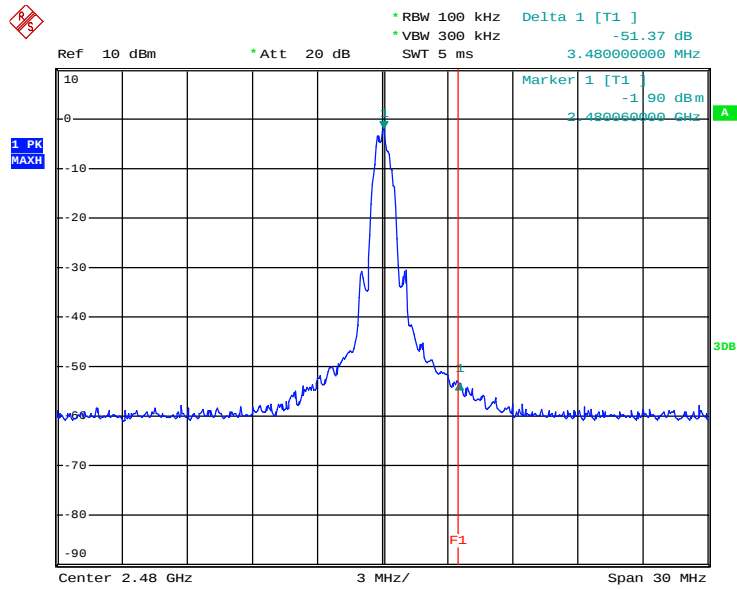
Lower band edge



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Higher band edge



Date: 21.JAN.2020 16:02:00

4.6 99% Occupied Bandwidth

4.6.1 Limit

According to RSS-Gen 6.7

4.6.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

4.6.3 Test setup

The test setup is as shown in chapter 2.4 of this report.

4.6.4 Test procedure

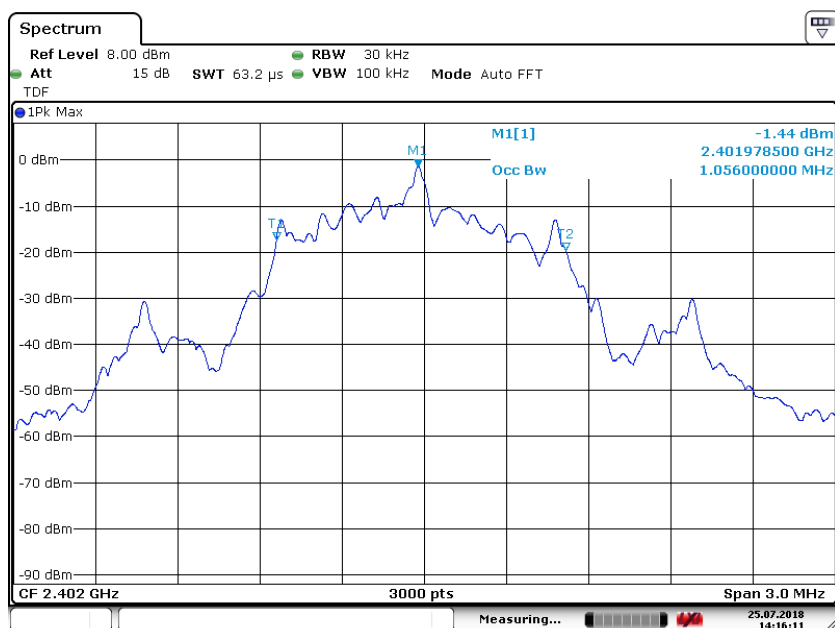
IRN 017 - Occupied bandwidth (Hz) Method 1 – XX % power bandwidth.

5. Set the centre frequency to the nominal EUT channel centre frequency
6. Set span = 1.5 times to 0.5 times the Occupied Bandwidth
7. Set VBW $\geq 3 \times$ RBW
8. Video averaging is not permitted. Where practical, detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

4.6.5 Test results of the 99% occupied bandwidth measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	99% bandwidth (kHz)
Bluetooth Low energy	37	2402	1 Mbps	1056
	39	2480	1 Mbps	1058
Uncertainty	± 12 kHz			

4.6.6 Plots of the 99% occupied bandwidth measurements



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