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FCC and ISED Test report for parts 15.209,15.247 RSS-247, RSS-Gen

Product name	: Rootzone Sensor
Applicant	: Rockwool BV
FCC ID	: 2AUKP-RZ002
IC	: 25447-RZ002

Test report No. : 200701990 004 Ver 3.00

Laboratory information

Accreditation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2017. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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Documentation

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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

Revision History

Version	Date	Remarks	By
v0.50	19-03-2021	Draft version	K.K.
v1.00	04-06-2021	Release version	RvB
v2.00	04-07-2022	Updated chapters 2.4/3.4.5/3.5.4	RvB
V3.00	13-09-2022	Updated chapter 3.5.6	RvB

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Summary of Test results

FCC	ISED	Description	Section in report	Verdict
125 kHz bandwidth mode (FHSS)				
15.247(d) 15.209 (a)	RSS-Gen 8.9 RSS-247 5.5	Radiated spurious emissions	3.5	Pass
15.205 (a)	RSS Gen 8.10	Spurious emissions in the restricted bands	3.5	Pass
15.247 (a)	RSS-247 5.1 (a)	20 dB bandwidth	3.3	Pass
--	RSS-Gen 6.7	99% bandwidth	3.4	Pass
15.247 (b)	RSS-247 5.4	RF output power	3.1	Pass
15.247 (e)	RSS-247 5.2 (b)	Power spectral density	3.2	Pass
15.247 (d)	RSS-247 5.5	Band edge	3.6	Pass
15.247(f)	RSS-247 5.3 (a)	Average time of occupancy	3.7	Pass
15.247(a)	15.247 (a)	Carrier frequency separation	3.8	Pass
15.247(a)	15.247 (a)	Number of hoping frequencies	3.9	Pass
500 kHz bandwidth mode (DTS)				
15.247(d) 15.209 (a)	RSS-Gen 8.9 RSS-247 5.5	Radiated spurious emissions	3.5	Pass
15.205 (a)	RSS Gen 8.10	Spurious emissions in the restricted bands	3.5	Pass
15.247(a)	RSS-247 5.2 (a)	6 dB bandwidth	3.3	Pass
--	RSS-Gen 6.7	99% bandwidth	3.4	Pass
15.247 (b)	RSS-247 5.4	RF output power	3.1	Pass
15.247 (e)	RSS-247 5.2 (b)	Power spectral density	3.2	Pass
15.247 (d)	RSS-247 5.5	Band edge	3.6	Pass

1 General Description

1.1 Applicant

Client name:	Rockwool BV
Address:	Industrieweg 15, Roermond, The Netherlands
Zip code:	6045 JG
E-mail:	Edwin.dilling@grodan.com
Contact name:	Mr. E. Dilling

1.2 Manufacturer

Client name:	Rockwool BV
Address:	Industrieweg 15, Roermond, The Netherlands
Zip code:	6045 JG
E-mail:	Edwin.dilling@grodan.com
Contact name:	Mr. E. Dilling

1.3 Tested Equipment Under Test (EUT)

Product name:	Rootzone Sensor
Brand name:	ROCKWOOL, Grodan, GroSens
FCC ID:	2AUKP-RZ002
IC:	25447-RZ002
Model(s):	GS21RZ03
Software version:	--
Hardware version:	--
Date of receipt	11-09-2020
Tests started:	11-09-2020
Testing ended:	16-03-2021

1.4 Product specifications of Equipment under test

Tx Frequency:	902 – 928 MHz
Rx frequency:	902 – 928 MHz
Antenna type	PCB Antenna
Antenna gain:	-4.9 dBi
Type of modulation:	Chirp spread spectrum (CSS)
Emission designator	510KG1D

1.5 Environmental conditions

Test date	14-09-2020	05-10-2020	11-03-2021	16-03-2021
Ambient temperature	22.7°C	20.7°C	21.3 °C	21.1 °C
Humidity	50.3 %	58.5 %	35.8%	32.6 %

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 B §15.109
- FCC Part 15 Subpart C §15.209
- FCC Part 15 Subpart C §15.247
- RSS-Gen Issue 5
- RSS-247 Issue 2

1.8 Observation and remarks

The RF section of the EUT was modified to suppress spurious emission, all test have been performed with this modification in place..

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 tests are performed by:

Name : Koray Korcum under supervision of ing. R. van Barneveld

Review of test methods and report by:

Name : ing. R. van Barneveld

The above conclusions have been verified by the following signatory:

Date : 13-09-2022

Name : Raoul Tolud, MSc

Function : Test Engineer

Signature :

2 Test configuration of the Equipment Under Test

2.1 Test mode

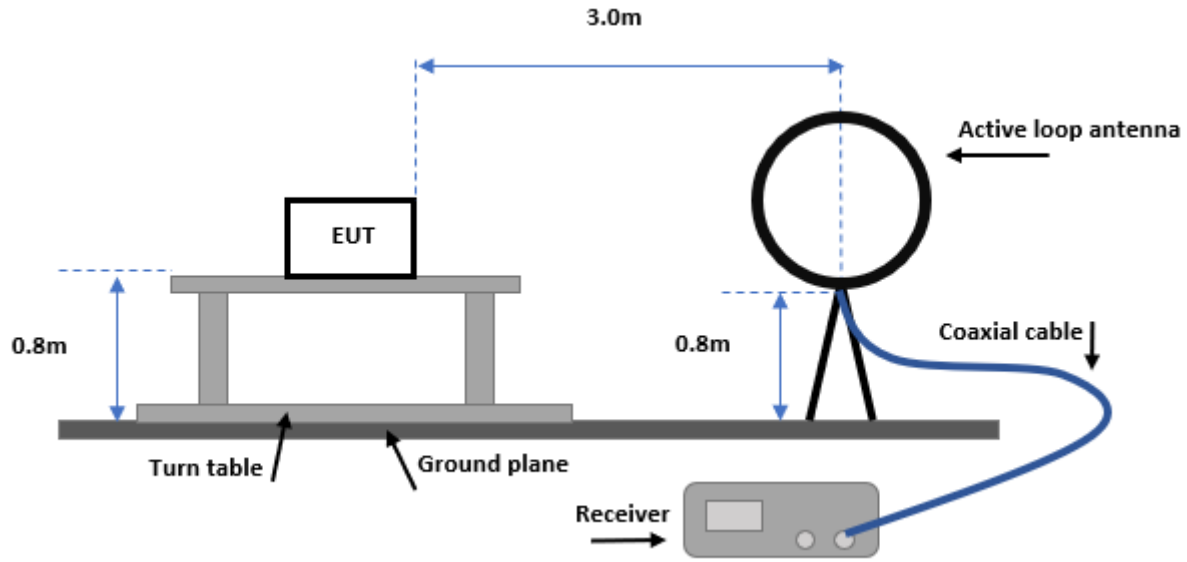
The applicant provided test mode firmware for the LoRa radio, in which it was possible to configure the radio to transmit continuously.

2.2 Tested channels and Data rates

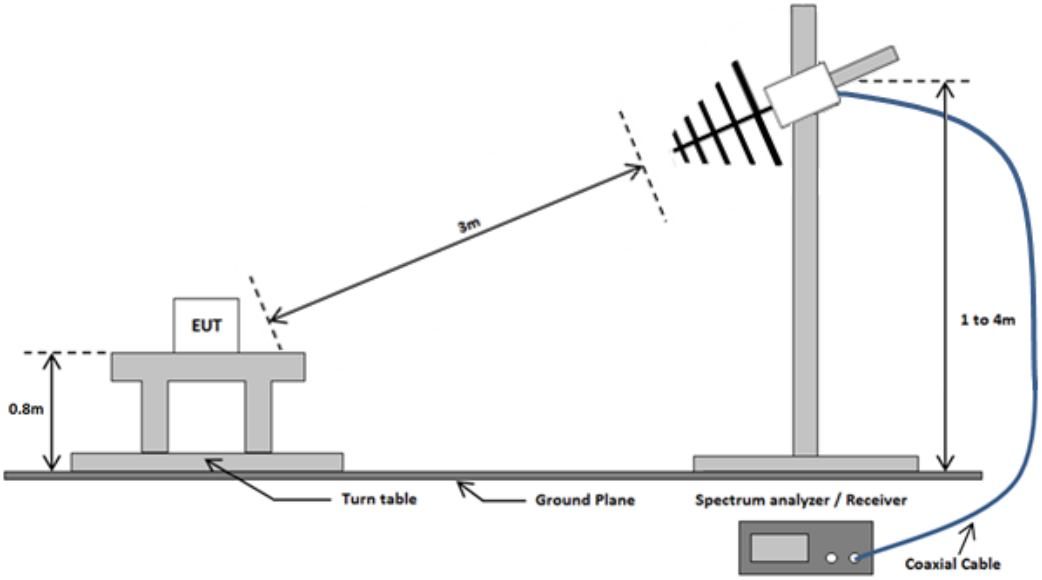
Technology	Channels	Bandwidth (kHz)	Frequency (MHz)	Power setting
Lora	1	125	902.3	15
	32	125	908.7	15
	64	125	914.9	15
	1	500	903	15
	8	500	914.2	15
	16	500	927.5	15

2.3 Test setups

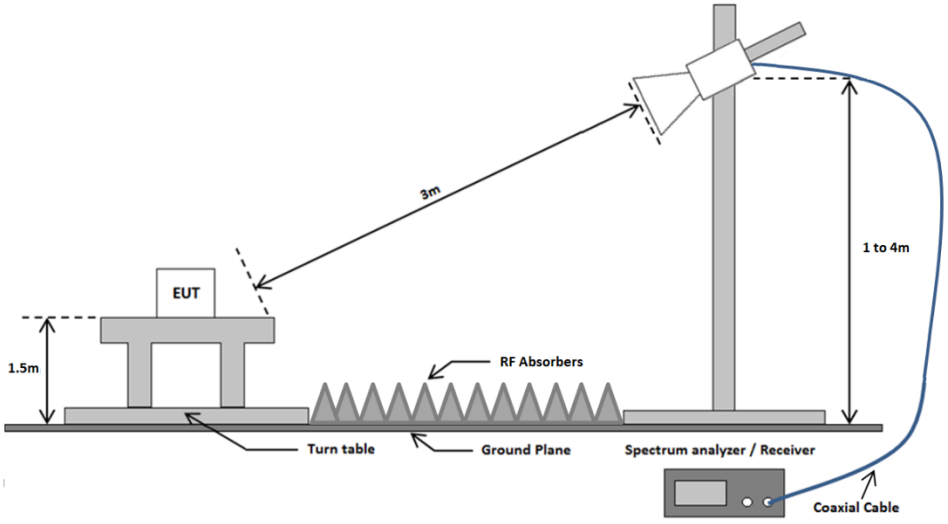
Radiated emissions test setup 9 kHz – 30 MHz



Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.4 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Cal. Done date	Cal. due date	Used at Par.
EMI Receiver	Rohde & Schwarz	ESR7	114534	01-2022	01-2023	3.5
Spectrum analyzer	Rohde & Schwarz	FSP40	114742	03-2022	03-2023	3.5
Spectrum Analyzer	Rohde & Schwarz	FSV40	114527	05-2022	05-2023	3.1 – 3.9
1.1 GHz HPF	Wainwright	WHK1.1/15G-10EF	TE01139	01-2021	01-2024	3.5
Active loop antenna	EMCO	6502	114515	01-2022	01-2024	3.5
Biconilog antenna	Chase	CBL6112A	114516	03-2021	03-2024	3.5
Horn antenna	EMCO	3115	114607	01-2021	01-2024	3.5
Preamplifier 1-18 GHz	µComp Nordic	MCNA-40-0010800-25-10P	114690	01-2022	01-2023	3.5
Test software	Raditeq	Radimation Version 2021.1.9	--	--	--	3.5

2.5 Sample calculations

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

3 Test results

3.1 Output Power Measurement

3.1.1 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.

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

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.
IRN 014 - RF power (W) - Method 1 – AVGSA (DTS) according to ANSI C63.10.

3.1.5 Test results of Output Power Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	Bandwidth (kHz)	Average output power (dBm)	Average output power Corrected (dBm)
LoRa	Low	902.3	5470	125	-1.87	0.21
	Middle	908.7	5470	125	-1.05	1.03
	High	914.9	5470	125	-1.64	0.44
LoRa	Low	903.0	5470	500	-6.84	1.23
	Middle	914.2	5470	500	-7.41	0.66
	High	927.5	5470	500	-7.22	0.85
Uncertainty	±0.71 dB					

Note: 125 kHz bandwidth, DC correction factor = 2.08 dB. 500 kHz bandwidth, DC correction factor = 8.07 dB.

3.2 Power Spectral Density

3.2.1 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 2.3 of this report.

3.2.3 Test setup

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

3.2.4 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 (PSD in 3 kHz band)

3.2.5 Test results of Power Spectral Density Measurement

Power spectral density

Technology Std.	Channel	Frequency (MHz)	Data rate	Bandwidth (kHz)	PSD (dBm/3 kHz)	PSD Corrected (dBm/3 kHz)
LoRa	Low	902.3	5470	125	-2.53	-0.45
	Middle	908.7	5470	125	-1.42	0.66
	High	914.9	5470	125	-1.26	0.82
LoRa	Low	903.0	5470	500	-15.38	-7.31
	Middle	914.2	5470	500	-15.07	-7.00
	High	927.5	5470	500	-14.77	-6.70
Uncertainty	±0.71 dB					

Note: 125 kHz bandwidth, DC correction factor = 2.08 dB. 500 kHz bandwidth, DC correction factor = 8.07 dB.

3.3 99% Occupied Bandwidth

3.3.1 Limit

According to RSS-Gen 6.7

3.3.2 Measurement instruments

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

3.3.3 Test setup

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

3.3.4 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 ≥ 3x 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.

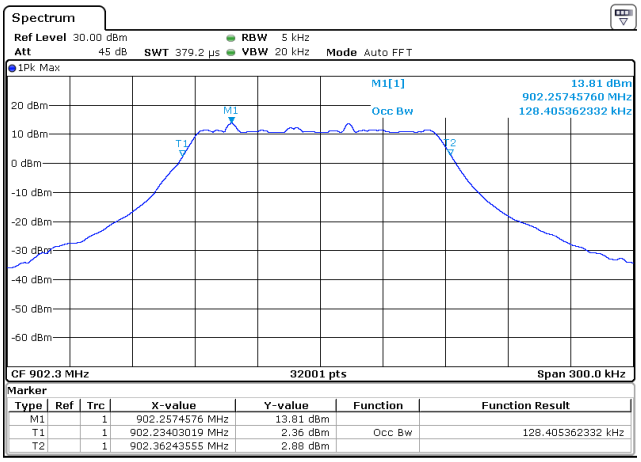
3.3.5 Test results of the 99% occupied bandwidth measurement

Technology Std.	Channel	Frequency (MHz)	99% bandwidth (kHz)
LoRa	Low	902.3	128
	Middle	908.7	129
	High	914.9	129
LoRa	Low	903.0	504
	Middle	914.2	497
	High	927.5	510
Uncertainty	± 12 kHz		

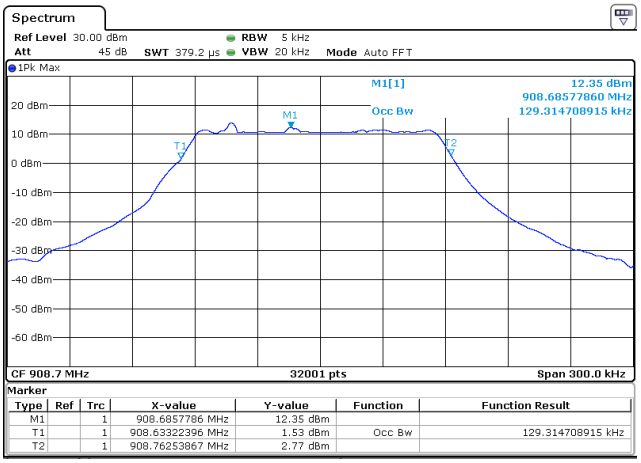
3.3.6 Plots of the 99% occupied bandwidth measurement

125 kHz

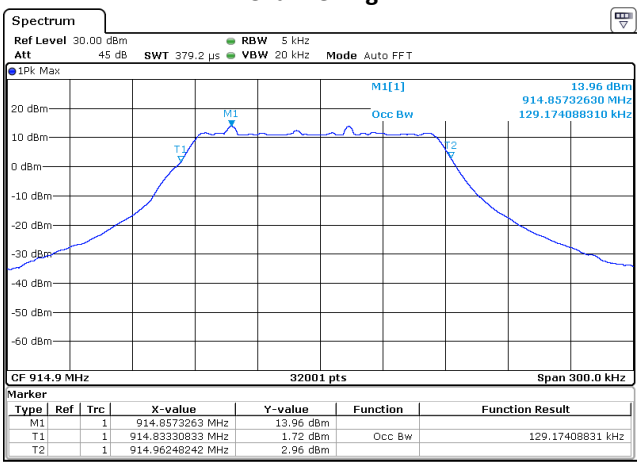
Channel Low



Channel Mid

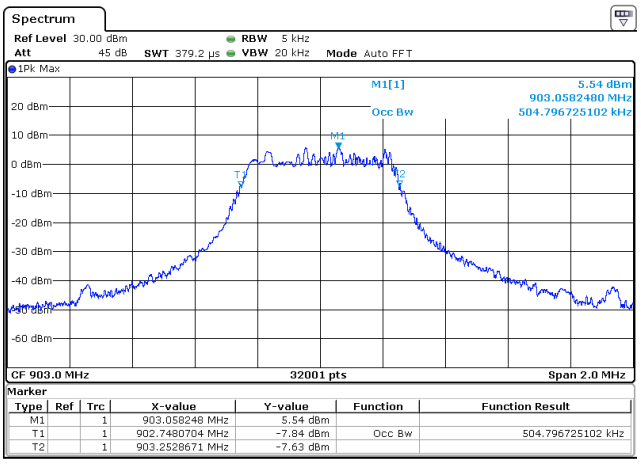


Channel High



500 kHZ

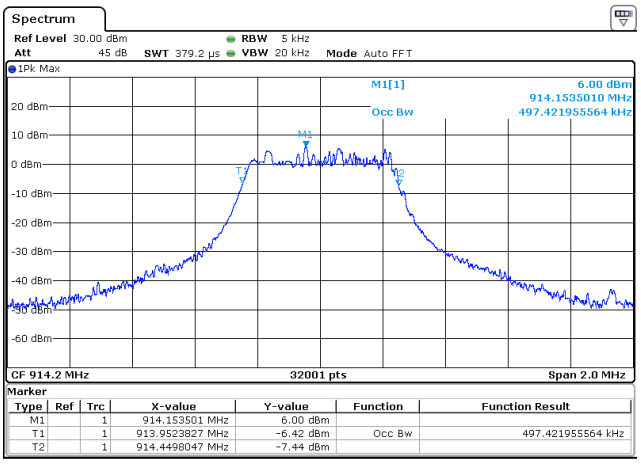
Channel Low



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	903.058248 MHz	5.54 dBm		
T1		1	902.7480704 MHz	-7.84 dBm	Occ Bw	504.796725102 kHz
T2		1	903.2528671 MHz	-7.63 dBm		

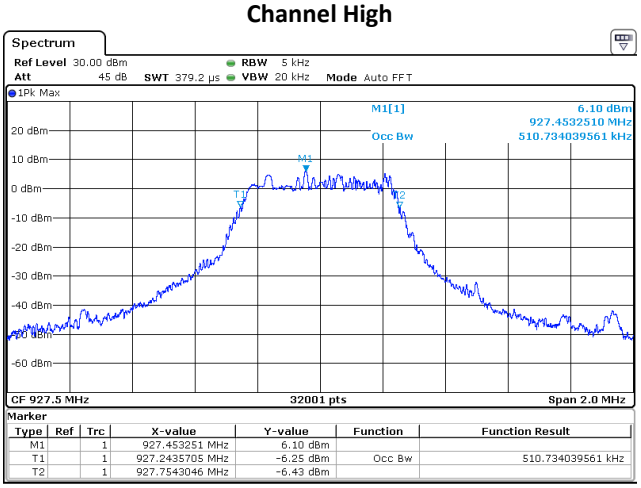
Channel Mid



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	914.153501 MHz	6.00 dBm		
T1		1	913.9523827 MHz	-6.42 dBm	Occ Bw	497.421955564 kHz
T2		1	914.4498047 MHz	-7.44 dBm		

Channel High



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	927.453251 MHz	6.10 dBm		
T1		1	927.2435705 MHz	-6.25 dBm	Occ Bw	510.734039561 kHz
T2		1	927.7543046 MHz	-6.43 dBm		

3.4 6dB and 20 dB bandwidth Measurement

3.4.1 Limit

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

3.4.2 Measurement instruments

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

3.4.3 Test setup

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

3.4.4 Test procedure

Tests according to ANSI C63.10
IRN 017 - Occupied bandwidth (Hz) Method 4 – DTS Bandwidth.

3.4.5 Test Results of the 6 dB and 20 dB bandwidth Measurement

6 dB bandwidth (500 kHz mode)

Technology Std.	Channel	Frequency (MHz)	Data rate	6 dB bandwidth (kHz)
LoRa	Low	902.3	1 Mbps	538
	Middle	908.7	1 Mbps	540
	High	914.9	1 Mbps	541
Uncertainty	± 36.2 kHz			

20 dB bandwidth (125 kHz mode)

Technology Std.	Channel	Frequency (MHz)	Data rate	20 dB bandwidth (kHz)
LoRa	Low	903	1 Mbps	161
	Middle	914.2	1 Mbps	162
	High	927.5	1 Mbps	160
Uncertainty	± 36.2 kHz			

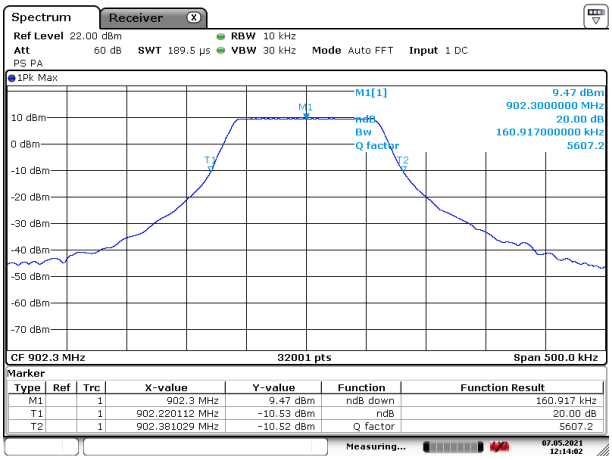
3.4.6 Plots of the 6 dB and 20 dB bandwidth measurement

See the next page.

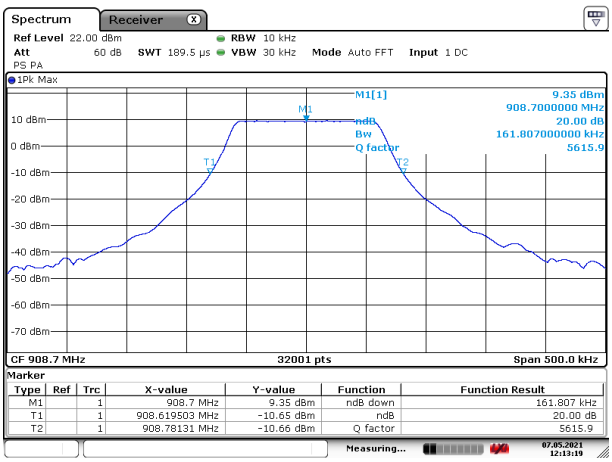
3.4.7 Plots of the 6 dB and 20 dB bandwidth measurement

20dB (125 kHz mode)

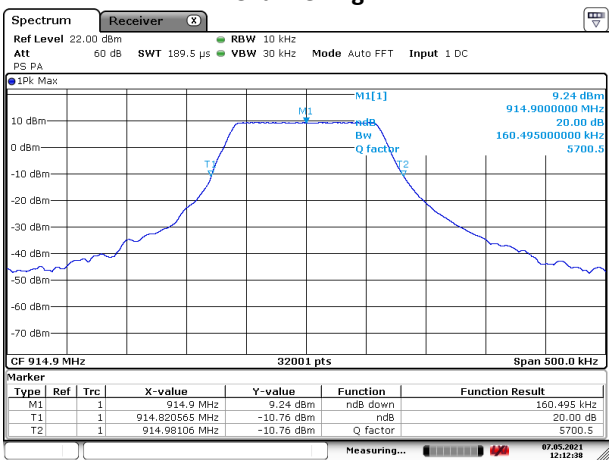
Channel Low



Channel Mid

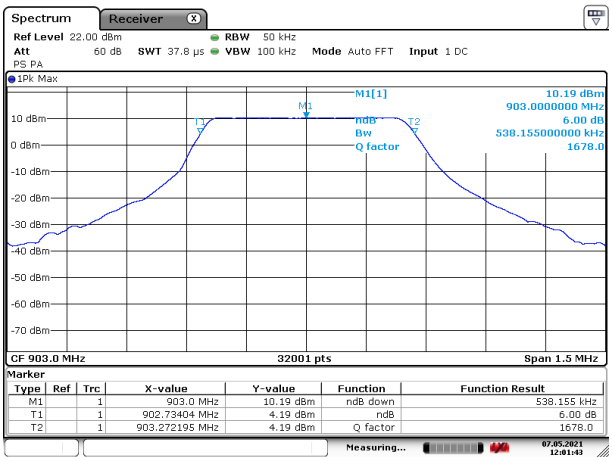


Channel High

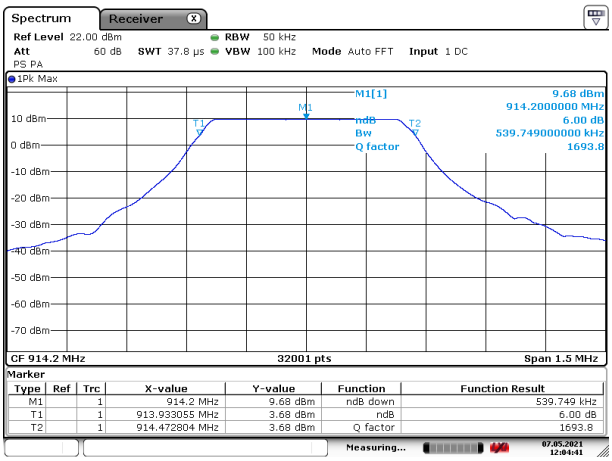


6 dB (500 kHz mode)

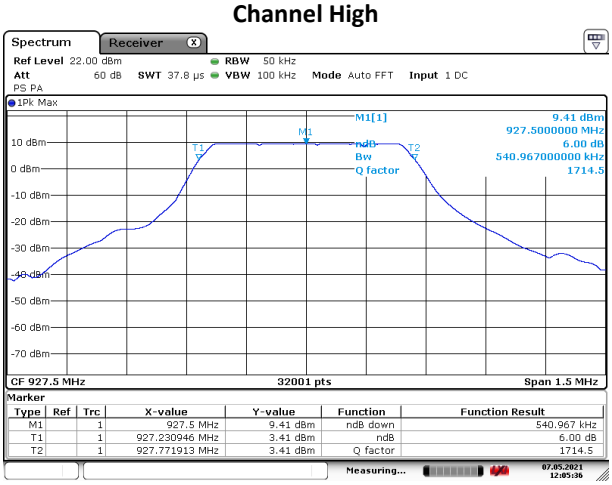
Channel Low



Channel Mid



Channel High



3.5 Radiated spurious emissions

3.5.1 Limit

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance(m)
0.009 – 0.490	2400/F(kHz)	20*{log[2400]-log[F(kHz)]}	300*
0.490 – 1.705	24000/F(kHz)	20*{log[24000]-log[F(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: Limit lines in the plots corrected to 3m measurement distance according to the method described in ANSI C63.10-2013, clause 6.4

3.5.2 Measurement instruments

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

3.5.3 Test setup

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

3.5.4 Test procedure

9 kHz – 30 MHz: According to ANSI C63.10-2013
30 MHz to 26.5 GHz: According to ANSI C63.10-2013

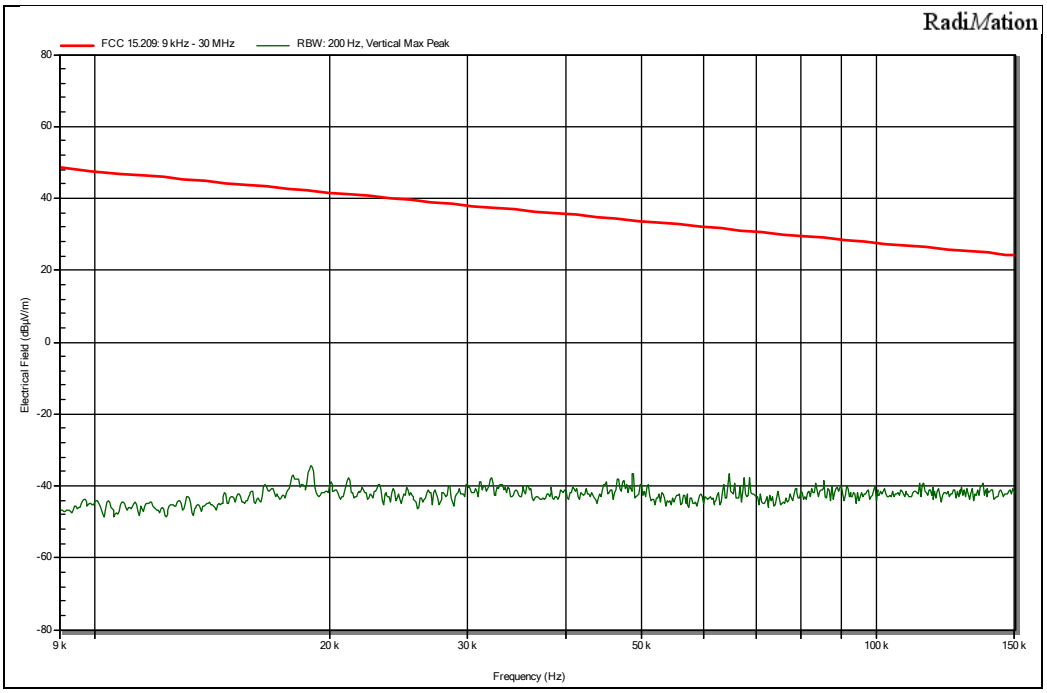
9 kHz to 30 MHz: IRN 026 – Method 10
30 MHz to 1 GHz: IRN 026 – Method 1
1 GHz to 18 GHz: IRN 026 – Method 2

3.5.5 Measurement Uncertainty

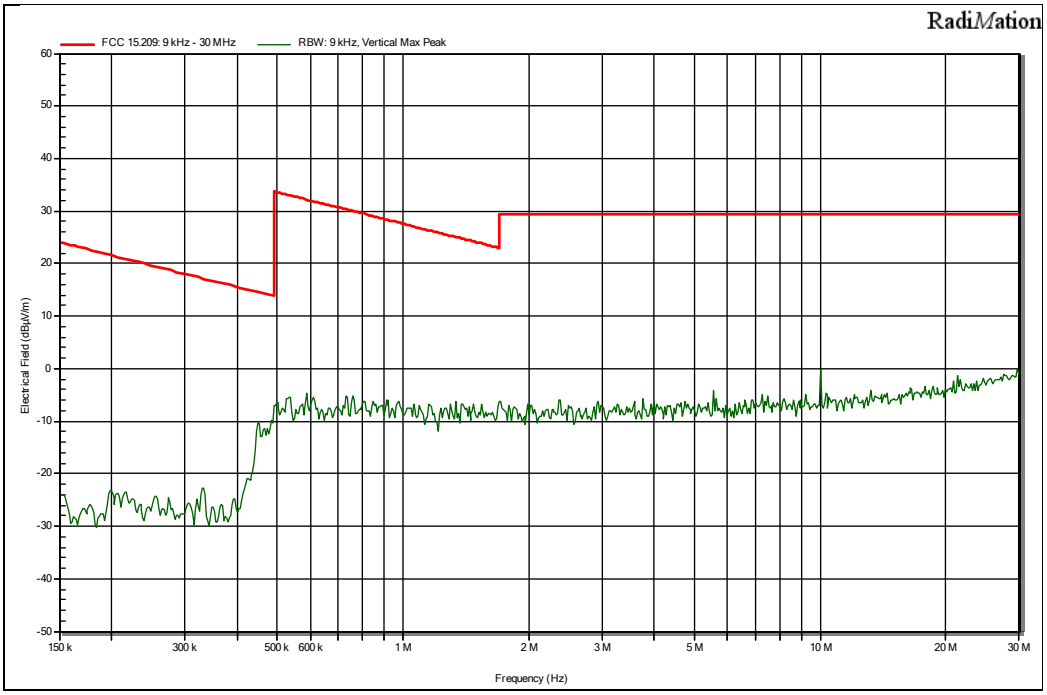
Frequency range	Polarization	Uncertainty
9 kHz – 30 MHz	--	±1.6 dB
30 – 200 MHz	Horizontal	±4.5 dB
	Vertical	±5.4 dB
200 -1000 MHz	Horizontal	±3.6 dB
	Vertical	±4.6 dB
1 – 18 GHz	Horizontal	±5.7 dB
	Vertical	±5.7 dB

3.5.6 Plots of the Radiated Spurious Emissions Measurement

9 kHz to 150 kHz

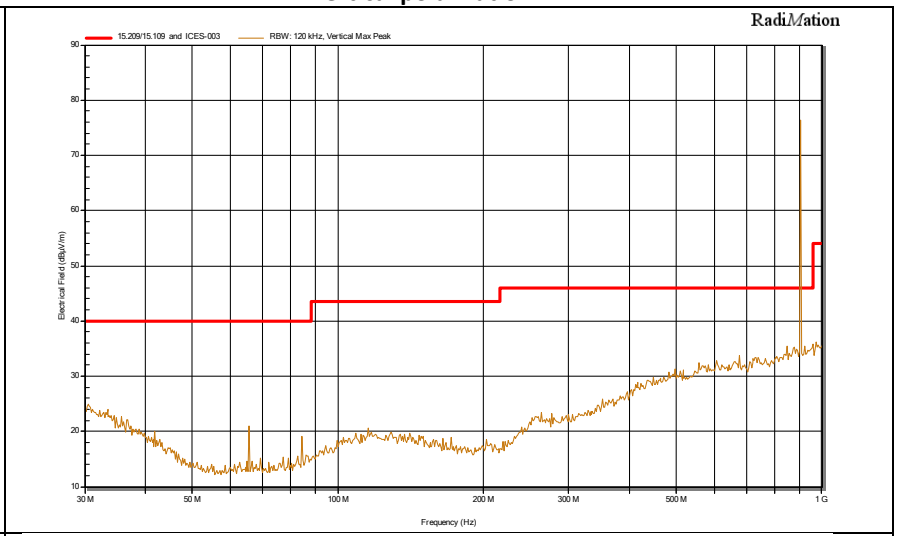
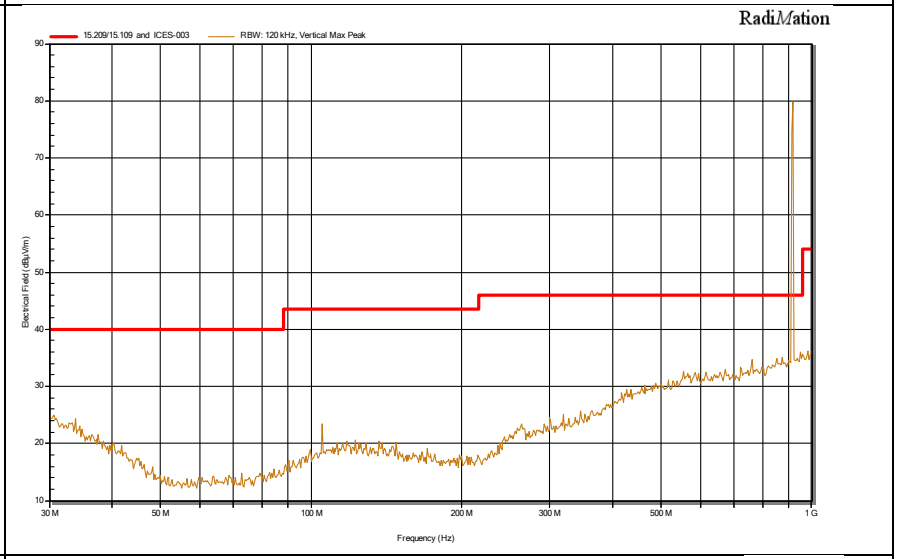
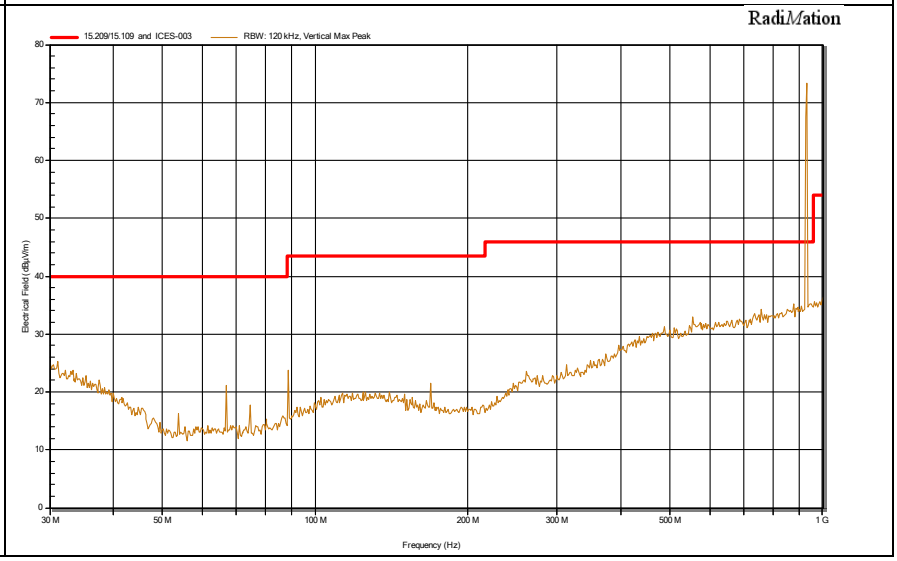


150 kHz to 30 MHz



500 kHz bandwidth mode
30 MHz to 1 GHz

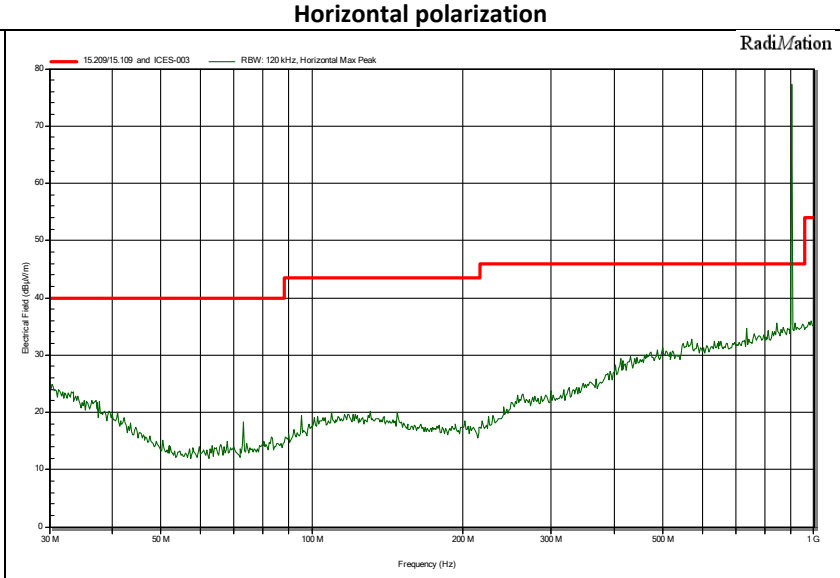
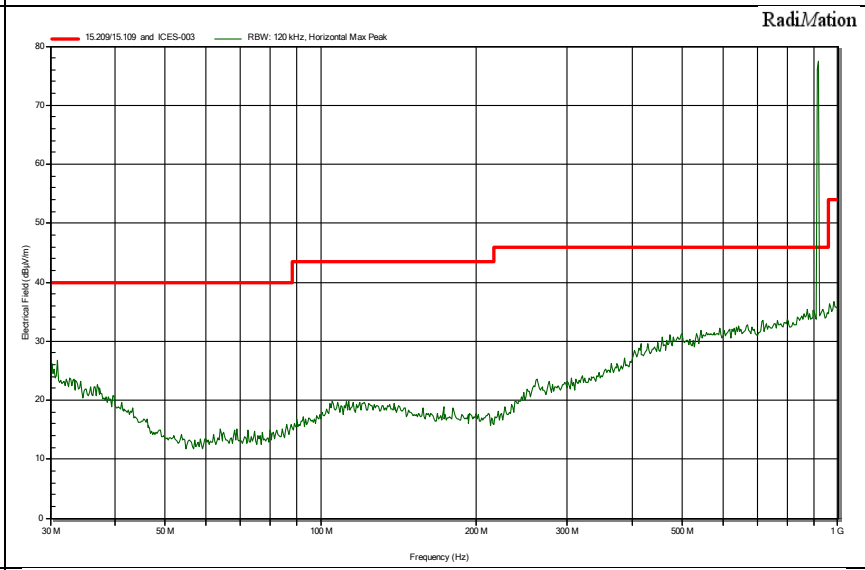
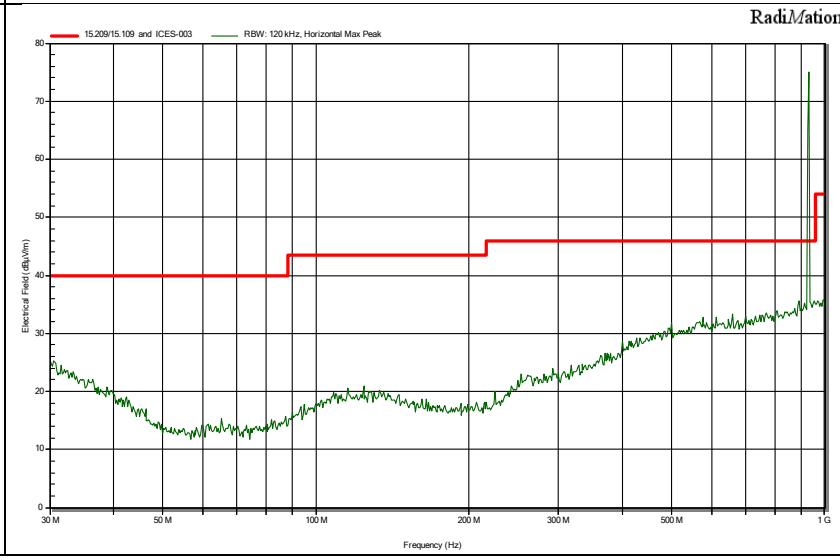
Vertical polarization

Low ch	
Mid ch	
High ch	

Note: the peak seen in the plot is the fundamental frequency , and is not subject to the limit in the plot.

30 MHz to 1 GHz

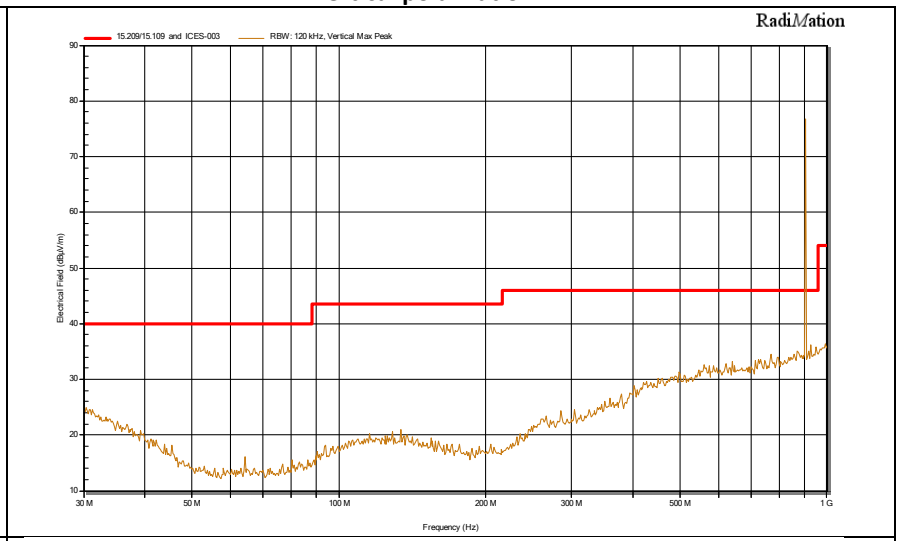
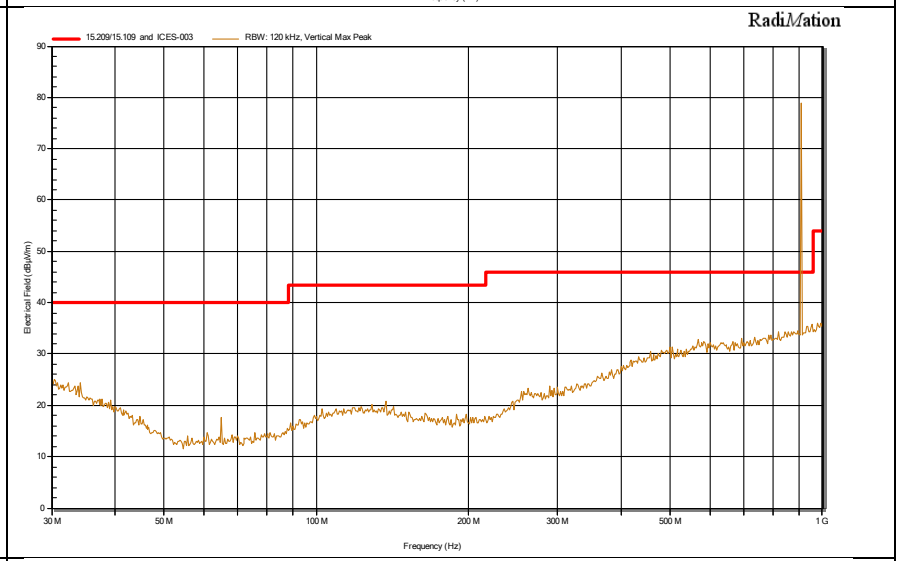
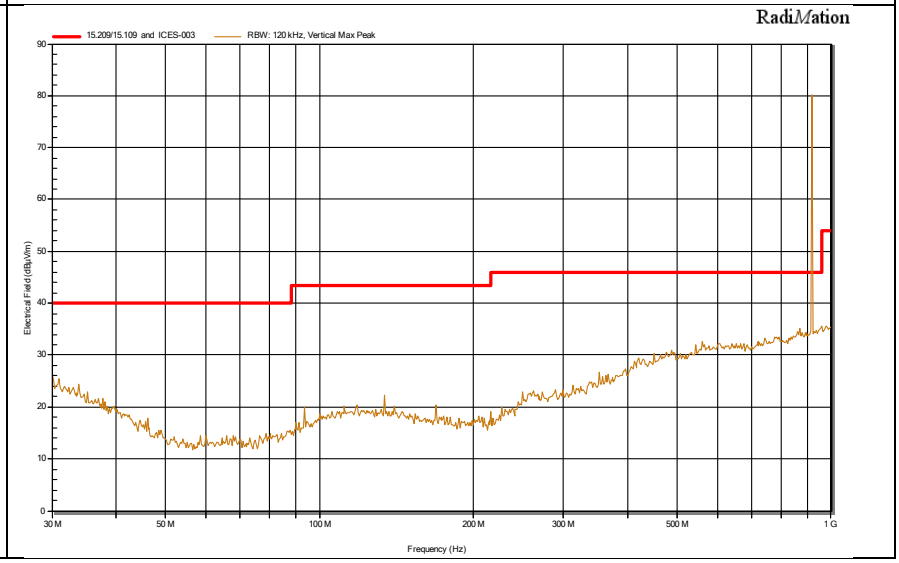
Horizontal polarization

Low ch	
Mid ch	
High ch	

Note: the peak seen in the plot is the fundamental frequency , and is not subject to the limit in the plot.

125 kHz bandwidth mode
30 MHz to 1 GHz

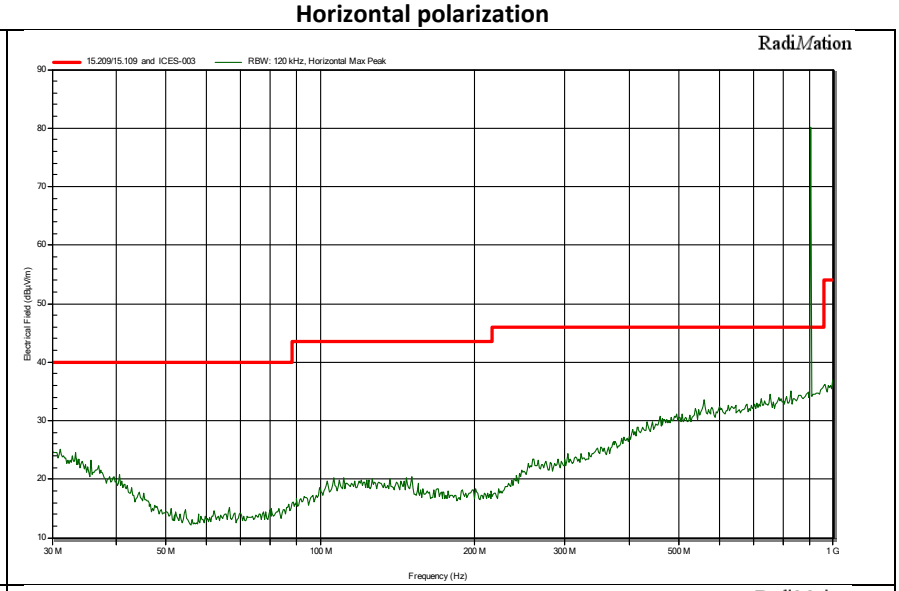
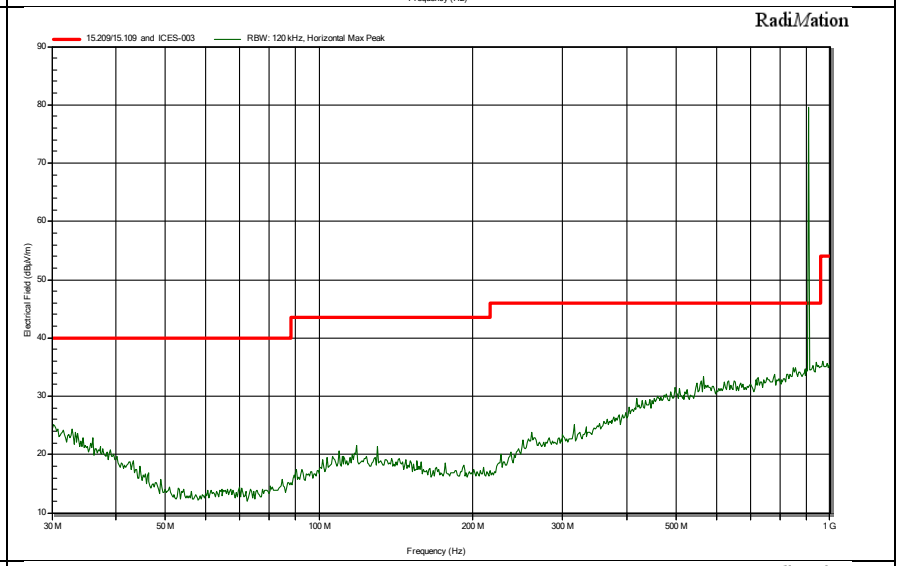
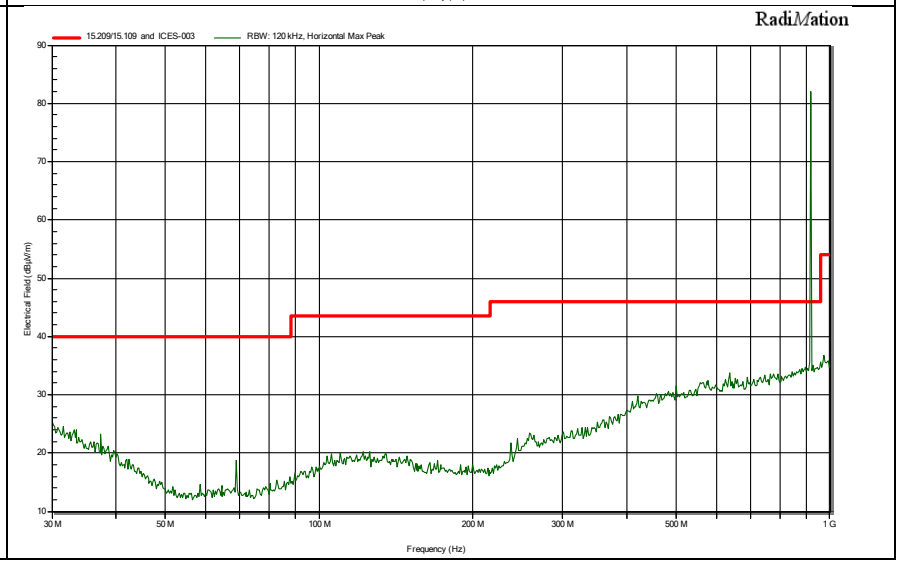
Vertical polarization

Low ch	
Mid ch	
High ch	

Note: the peak seen in the plot is the fundamental frequency , and is not subject to the limit in the plot.

30 MHz to 1 GHz

Horizontal polarization

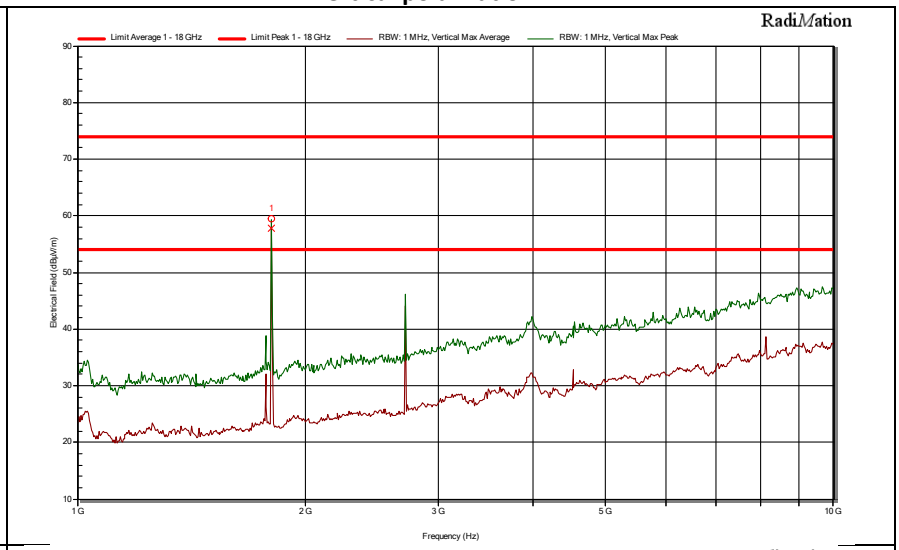
Low ch	
Mid ch	
High ch	

Note: the peak seen in the plot is the fundamental frequency , and is not subject to the limit in the plot.

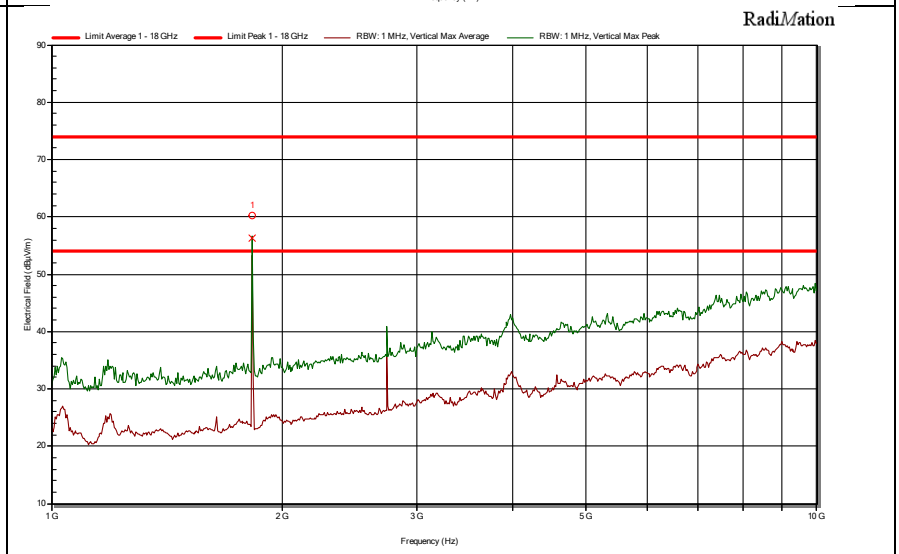
500 kHz bandwidth mode
1 GHz to 10 GHz

Vertical polarization

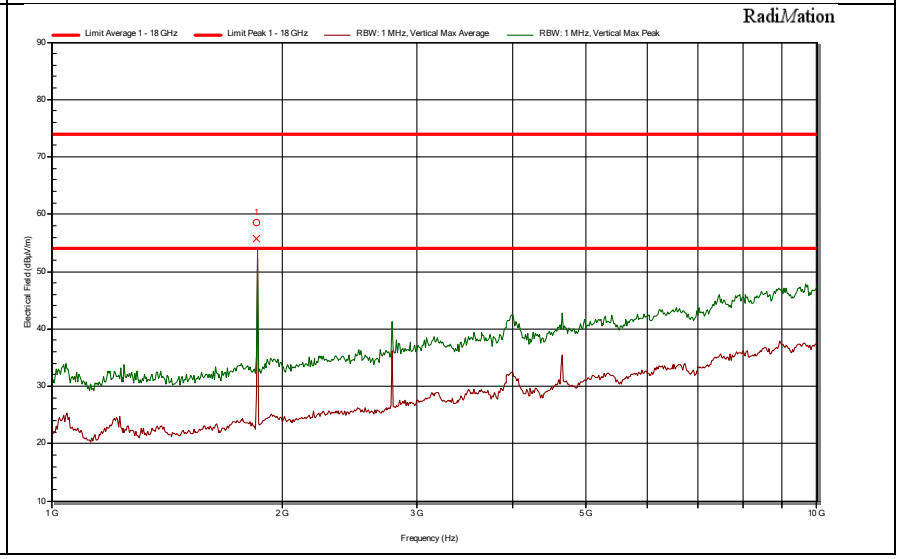
Low ch



Mid ch

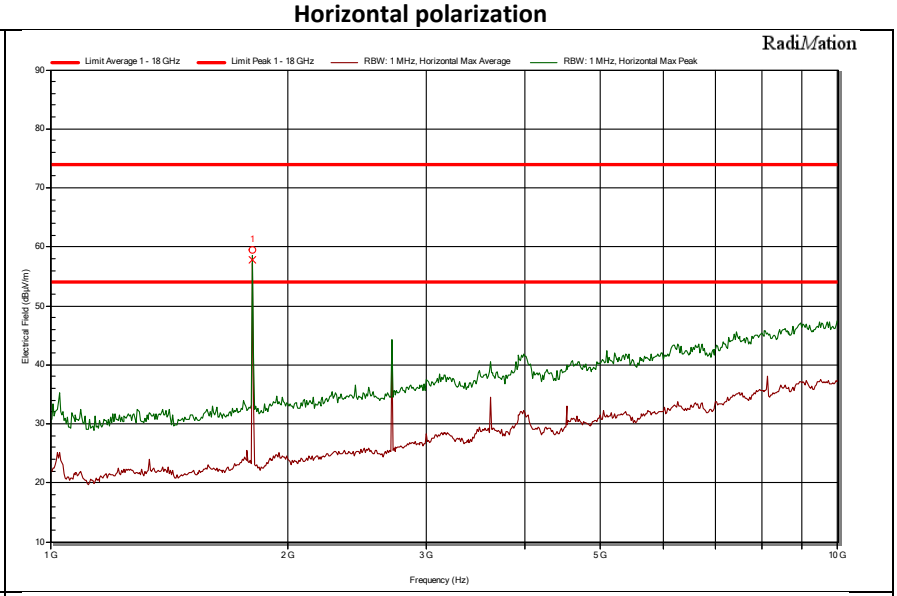
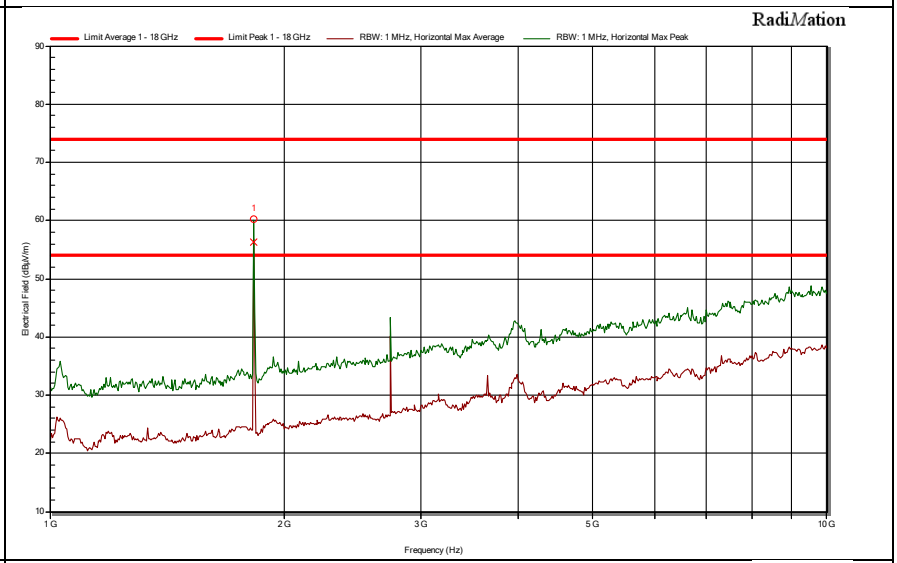
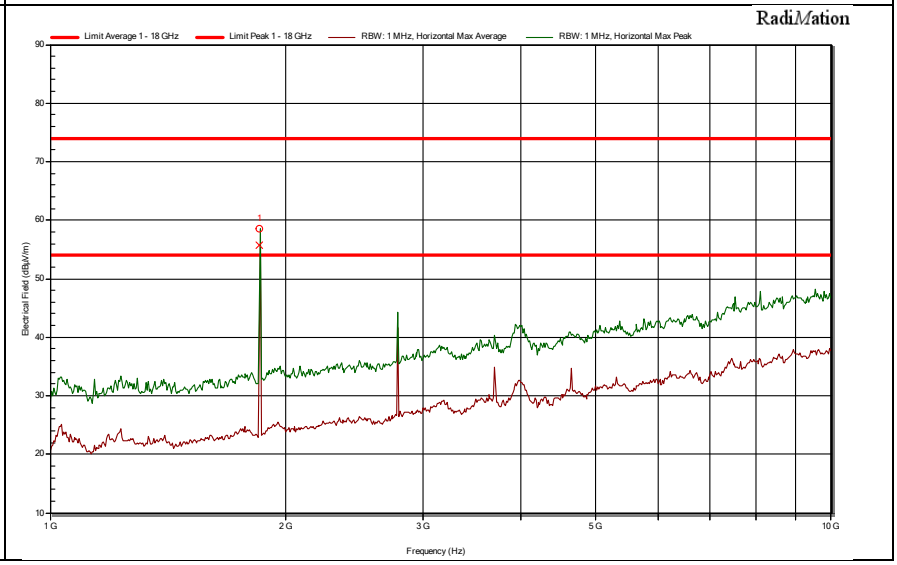


High ch



1 GHz to 10 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

Note: the peaks founds in the frequency range 1 – 10 GHz are not in a restricted band according to 15.205. and shall be at least 20 dB below the level of the fundamental frequency, in any 100 kHz band width

Measured peaks

Low channel

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
1,804 GHz	61,2 dBµV/m	85.41 dBµV/m	59,8 dBµV/m	65.41 dBµV/m	Pass	360 degrees	4 m	Vertical

Mid channel

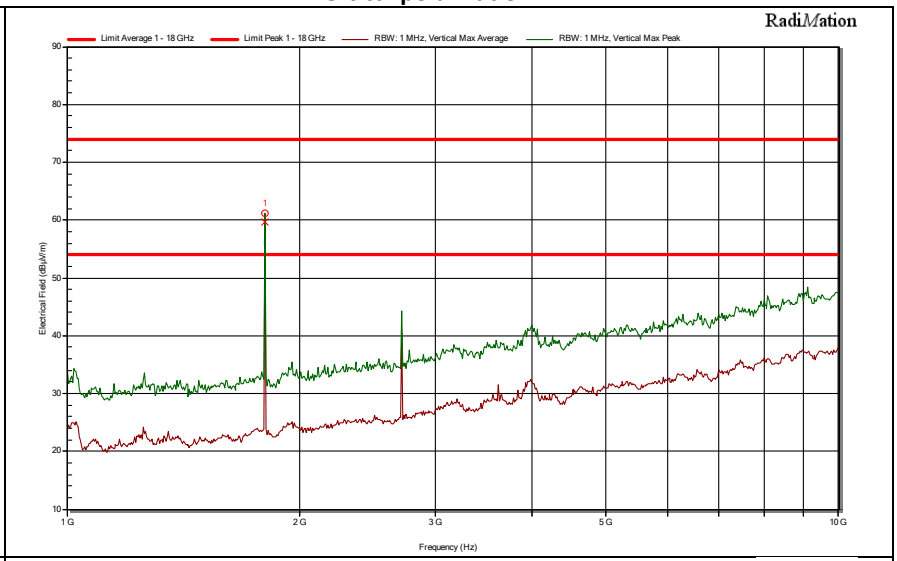
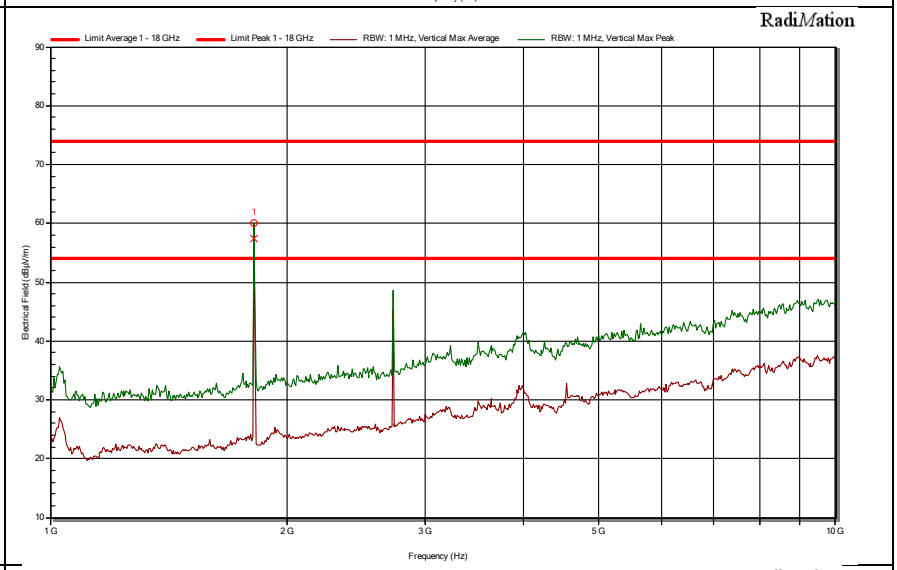
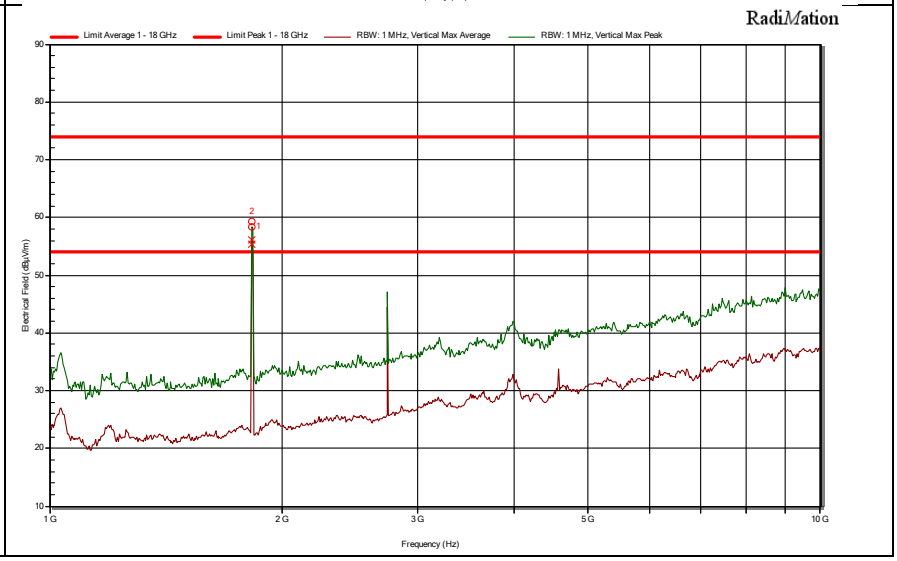
Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
1,817 GHz	60,1 dBµV/m	85.41 dBµV/m	57,4 dBµV/m	65.41 dBµV/m	Pass	360 degrees	4 m	Vertical

High channel

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
1,829 GHz	59,3 dBµV/m	85.41 dBµV/m	56,1 dBµV/m	65.41 dBµV/m	Pass	0 degrees	1,5 m	Horizontal
1,829 GHz	58,4 dBµV/m	85.41 dBµV/m	55,4 dBµV/m	65.41 dBµV/m	Pass	360 degrees	3,5 m	Vertical

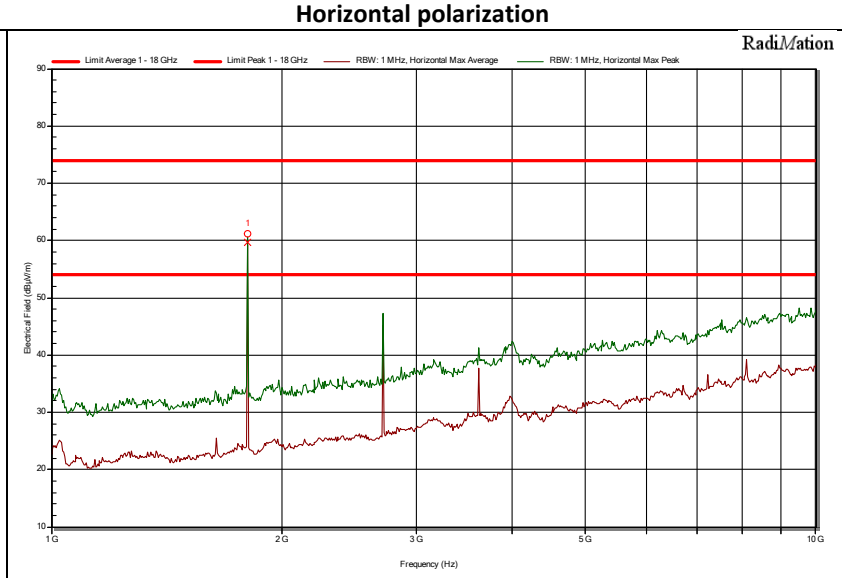
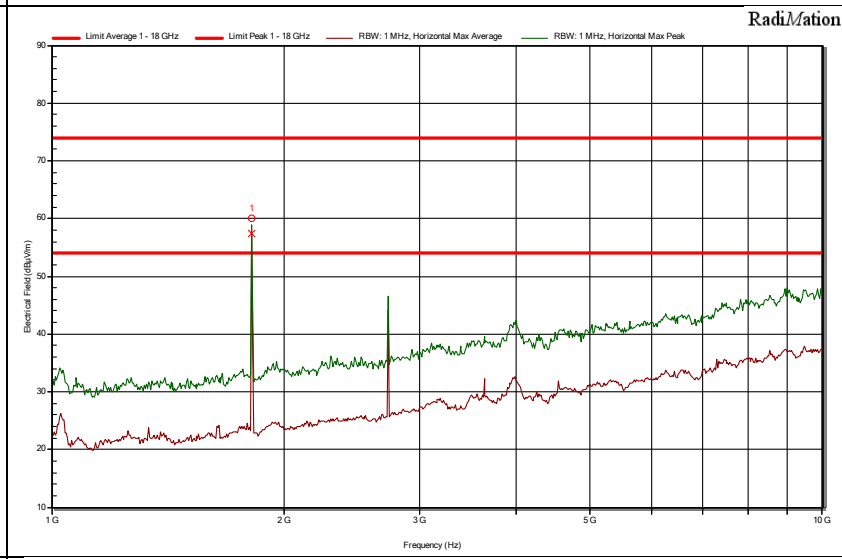
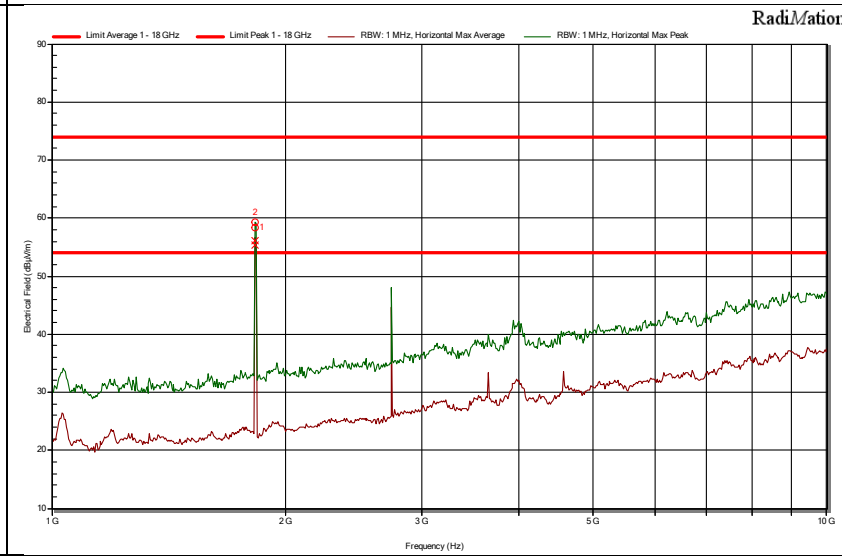
125kHz bandwidth mode
1 GHz to 10 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

1 GHz to 10 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

Note: the peaks founds in the frequency range 1 – 10 GHz are not in a restricted band according to 15.205. and shall be at least 20 dB below the level of the fundamental frequency, in any 100 kHz band width

Measured Peaks

Low channel

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
1,806 GHz	59,4 dBµV/m	108.65 dBµV/m	57,9 dBµV/m	88.65 dBµV/m	Pass	353 degrees	3,5 m	Vertical

Mid channel

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
1,828 GHz	60,2 dBµV/m	108.7 dBµV/m	56,4 dBµV/m	88.7 dBµV/m	Pass	0 degrees	1,5 m	Horizontal

High channel

Frequency	Peak	Peak Limit	Average	Average Limit	Status	Angle	Height	Polarization
1,855 GHz	58,5 dBµV/m	108.8 dBµV/m	55,7 dBµV/m	88.8 dBµV/m	Pass	0 degrees	1,5 m	Horizontal

3.6 Band edge Measurement

3.6.1 Limit

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

3.6.2 Measurement instruments

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

3.6.3 Test setup

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

3.6.4 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.

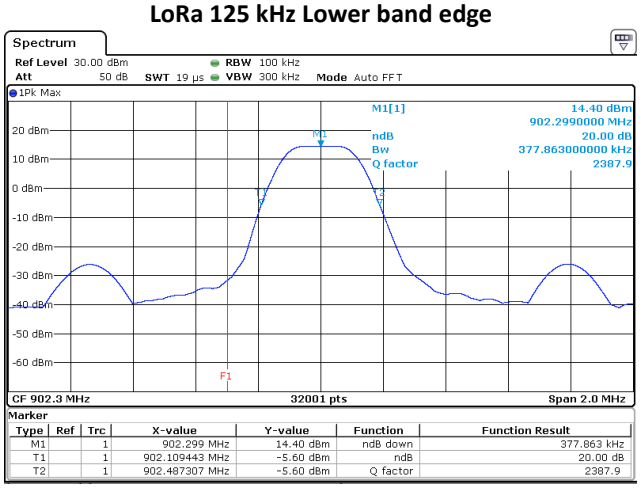
3.6.5 Measurement Uncertainty

± 5.7 dB.

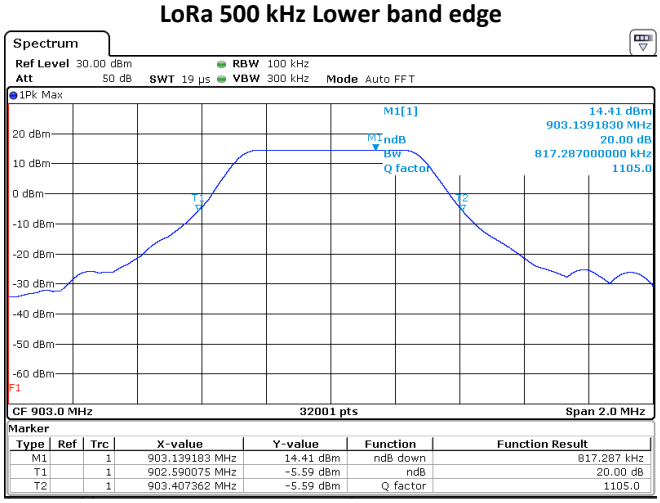
3.6.6 Plots of the Band edge Measurements

See next page.

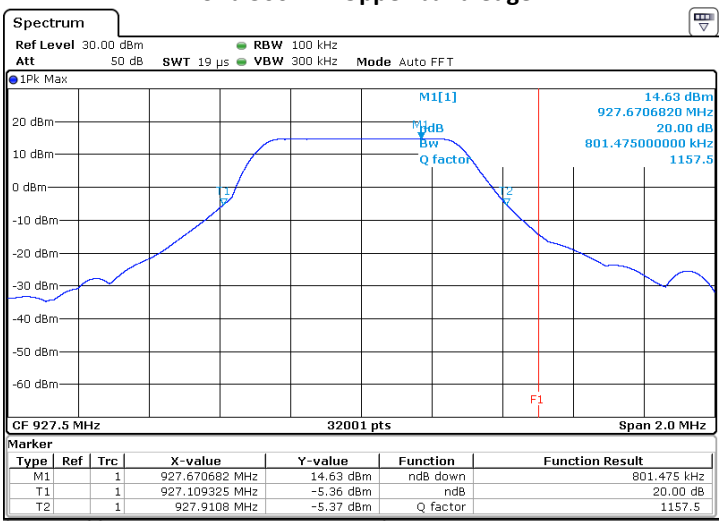
LoRa 125 kHz Lower band edge



LoRa 500 kHz Lower band edge



LoRa 500 kHz Upper band edge



Note: upper band edge in 125 kHz mode is not measured as it is more than 10 MHz from the band edge.

3.7 Average time of occupancy

3.7.1 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.

3.7.2 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.

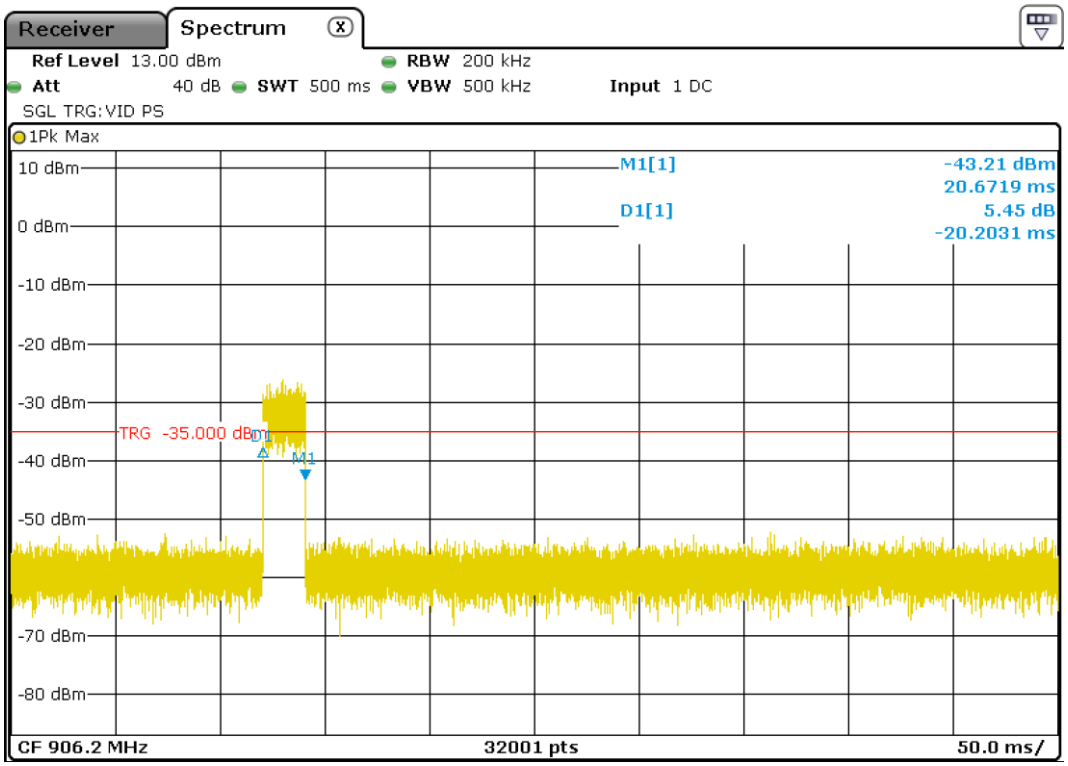
3.7.4 Test procedure

According to ANSI C63.10: 2013 section 7.8

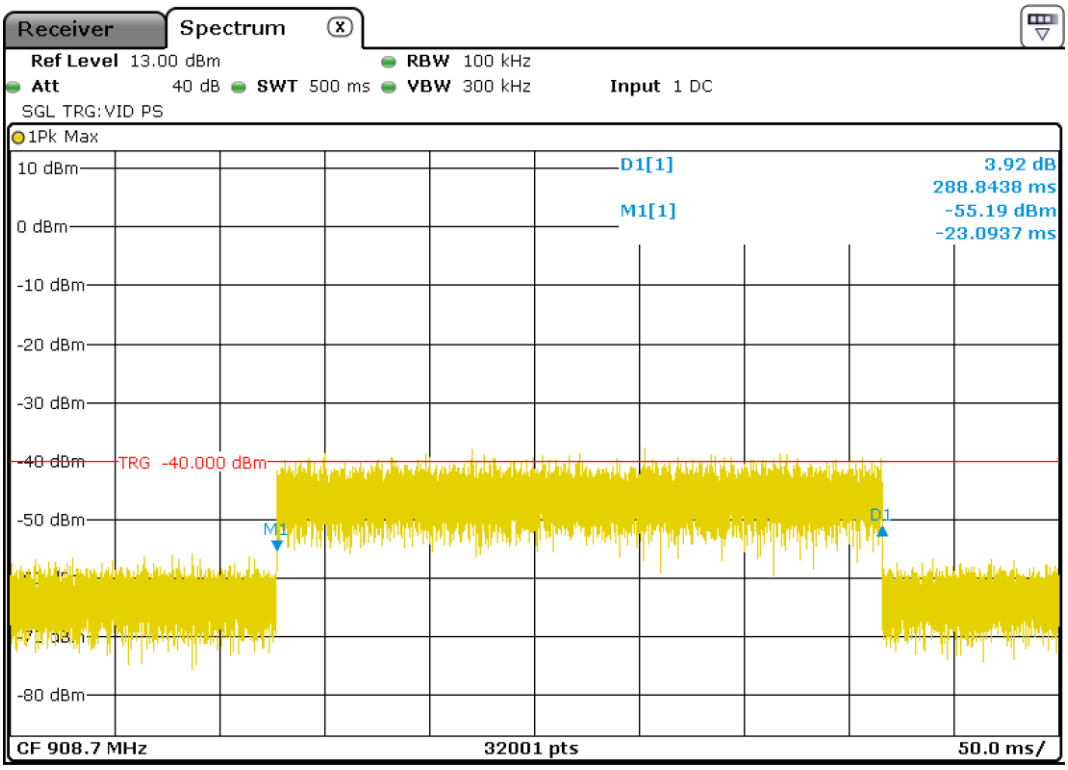
IRN 013 - Duty cycle (%) - Method 2

3.7.5 Plot of the average time of occupancy measurement.

Dwell time for 500 kHz BW



Dwell time for 125 kHz BW



500 kHz mode
The measured time of occupancy is: 20.7 ms in a time period of 0.4 x 8 = 3.2 seconds

125 kHz mode
The measured time of occupancy is: 288.8 ms in a time period of 0.4 x 64 = 25.6 seconds.

3.7.6 Measurement uncertainty

± 5.7%

3.8 Carrier Frequency separation

3.8.1 Limit

Frequency hopping systems operating in the 902 – 928 MHz shall have hopping frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

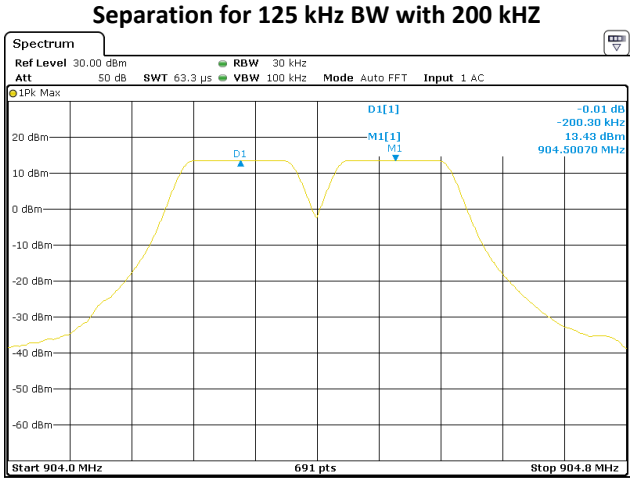
According to ANSI C63.10: 2013 section 7.8

IRN 013 - Duty cycle (%) - Method 2

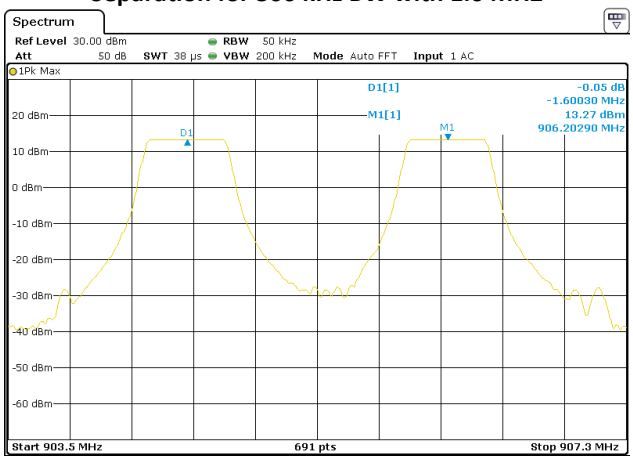
3.8.5 Plot of the average time of occupancy measurement.

See next page.

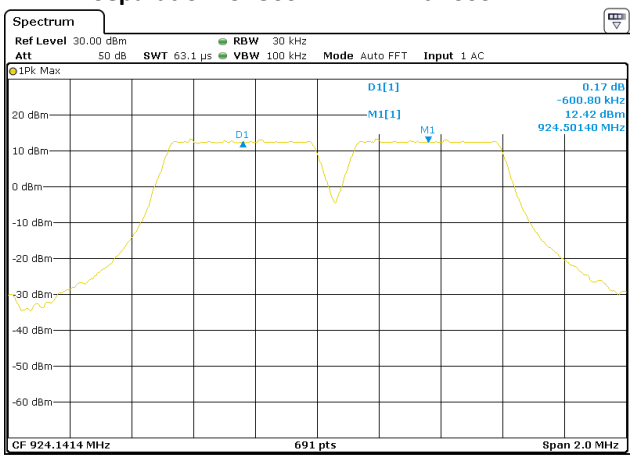
Separation for 125 kHz BW with 200 kHZ



Separation for 500 kHz BW with 1.6 MHZ



Separation for 500 kHz BW with 600 kHZ



3.9 Number of hopping channels

3.9.1 Limit

For frequency hopping systems operating in the 902 – 928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

3.9.2 Measurement instruments

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

3.9.3 Test setup

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

3.9.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.
IRN 005 - Method 2

3.9.5 Test results of Dwell time Measurement.

In 125 kHz bandwidth mode the EUT uses 64 hopping channels

4 Sample calculations

All formulas for data conversions and conversion factors are reported in this chapter.

Conducted emission Measurement:

U_{lisn} (dBµV) = U (dBµV) + Corr. (dB)

Where:
U = Measuring receiver voltage
LISN insertion loss = Voltage division factor of LISN
Corr. = sum of single correction factors of used LISN, cables and pulse limiter.
Linear interpolation will be used for frequencies in between the values in the table.

Frequency (Mhz)	**Voltage division LISN (db)**	**Insertion Loss Pulse limiter (dB)**	**Cable loss (dB)**	**Corr. (dB)**
	TE 00208 SN: 892785/004 Rohde & Schwarz ESH3-Z5	**TE 00756 SN: 5SM03153 Rohde & Schwarz ESH3-Z2**	**TE 11134**	
0,15	0,09	9,87	0,02	9,98
0,2	0,1	9,87	0,03	10
0,3	0,1	9,87	0,03	10
0,5	0,1	9,87	0,08	10,05
0,7	0,12	9,87	0,25	10,24
0,8	0,12	9,87	0,25	10,24
1	0,13	9,87	0,11	10,11
2	0,16	9,87	0,15	10,18
3	0,19	9,87	0,21	10,27
5	0,26	9,88	0,21	10,35
7	0,36	9,89	0,25	10,5
8	0,39	9,89	0,25	10,53
10	0,46	9,91	0,29	10,66
15	0,77	9,93	0,34	11,04
20	0,95	9,96	0,37	11,28
25	1,12	9,99	0,43	11,54
30	1,1	10,04	0,45	11,59

Field Strength Measurement:

E (dBµV/m) = U(dBµV) + AF (dB/m) + Corr. (dB)

Where:
E = Electric field strength
U = Measuring receiver voltage
AF = Antenna factor
CL = Cable loss

Corr. = sum of single correction factors of used cable and amplifier (if applicable).
Linear interpolation will be used for frequencies in between the values in the table.
Tables shows an extract of the values.

Frequency (Mhz)	**AF (dB/m)**	**Cable loss (dB)**	**Corr. (dB)**
	TE 00967 Chase CBL6112A SN: 2308	**Id: SAR cable**	
30	18,6	0,68	19,28
100	10,7	1,15	11,85
150	10,6	1,41	12,01
200	9,3	1,63	10,93
250	12,6	1,93	14,53
300	13,3	2,12	15,42

350	14,6	2,2	16,8
400	15,5	2,29	17,79
450	16,9	2,53	19,43
500	17,5	2,67	20,17
550	18,4	2,9	21,3
600	18,8	3,02	21,82
650	19,2	3,09	22,29
700	19	3,22	22,22
750	19,8	3,56	23,36
800	19,7	3,69	23,39
900	20,4	3,81	24,21
950	20,8	3,91	24,71
1000	21,2	4,3	25,5

Frequency (Mhz)	AF (dB/m) TE 00531 Emco 3115 SN: 9412-4377	Gain (dB) TE 11132 Miteq JS4-18004000-30-8P-A1	Cable loss (dB) TE 01315	Corr. (dB)
1000	23,6	40,4	2,0	66
1500	25,1	40,5	2,4	68
2000	27,1	40,5	2,7	70,3
2500	28,6	40,7	3,2	72,5
3000	30,5	40,7	3,2	74,4
3500	31,2	40,7	3,4	75,3
4000	32,7	40,9	4,9	78,5
4500	32,4	40,9	4,4	77,7
5000	33,2	40,7	4,6	78,5
5500	34,0	40,5	4,5	79
6000	34,6	40,0	5,2	79,8
6500	34,3	39,4	5,9	79,6
7000	35,2	38,6	5,7	79,5
7500	36,4	39,2	5,9	81,5
8000	37,0	38,9	6,3	82,2
8500	37,5	38,4	6,4	82,3
9000	38,1	37,4	6,5	82
9500	37,8	37,0	7,1	81,9
10000	38,2	36,5	7,3	82
10500	38,1	36,7	7,6	82,4
11000	38,3	36,9	8,3	83,5
11500	38,5	37,6	8,1	84,2
12000	39,1	38,3	8,4	85,8
12500	38,7	38,5	8,3	85,5
13000	39,2	38,9	9,2	87,3
13500	40,5	40,2	8,3	89
14000	41,1	40,0	8,2	89,3
14500	41,4	40,1	8,2	89,7
15000	40,2	41,4	8,3	89,9
15500	37,9	41,4	8,6	87,9
16000	37,5	42,8	9,2	89,5
16500	38,6	42,3	8,8	89,7
17000	41,1	43,1	9,4	93,6
17500	42,7	43,2	9,4	95,3
18000	44,0	44,2	9,8	98

Frequency (Mhz)	AF (dB/m) TE 00531 Emco 3115 SN: 9412-4377	Gain (dB) TE 11132 Miteq JS4-18004000-30-8P-A1	Cable loss (dB) TE 01315	Corr. (dB)
18000	31,3	26,2	9,8	67,3
19000	31,5	26,1	9,6	67,2
20000	31,7	25,9	11	68,6
21000	31,9	24,3	10,7	66,9
22000	32,1	18,3	10,5	60,9
23000	32,2	18,9	10,8	61,9
24000	32,3	23,6	11,4	67,3
25000	32,4	24,5	11,6	68,5
26000	32,5	25,3	11,7	69,5