
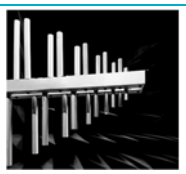


CTC advanced
member of RWTÜV group

TEST REPORT

Test report no.: 1-2606/21-01-02-A

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
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Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

Applicant

Telecom Design SA Zone Actipolis II,
2, bis rue Nully de Harcourt
33610 Canéjan / FRANCE
Phone: +33 5 57 35 63 70
Contact: Stan Marly
e-mail: smarly@telecomdesign.fr

Manufacturer

Telecom Design SA Zone Actipolis II,
2, bis rue Nully de Harcourt
33610 Canéjan / FRANCE

Test standard/s

FCC - Title 47 CFR Part 15	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**Jammer Detector** V3
Model name:	**GWL-AJV3**
FCC ID:	**2AGMK-GWL-AJV3**
Frequency range:	902 MHz - 928 MHz
Technology tested:	Sigfox
Antenna:	Integrated antenna
Power supply:	3.0 V DC by AA batteries
Temperature range:	22°C

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

cn=Christoph Schneider, o=CTC advanced GmbH, ou=SND-161128, email=Christoph.Schneider@ctcadvanced.com, c=DE
2021.10.01 12:57:52 +02'00'

Christoph Schneider
Lab Manager
Radio Communications

Test performed:

cn=Tobias Wittenmeier, o=CTC advanced GmbH, ou=WIT-170519, email=tobias.wittenmeier@ctcadvanced.com, c=DE
2021.10.01 11:22:16 +02'00'

Tobias Wittenmeier
Testing Manager
Radio Communications

1 Table of contents

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report replaces the test report with the number 1-2606/21-01-02 and dated 2021-09-30.

2.2 Application details

Date of receipt of order:	2021-08-03
Date of receipt of test item:	2021-09-14
Start of test:*	2021-09-13
End of test:*	2021-09-16
Person(s) present during the test:	-/-

*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

2.3 Test laboratories sub-contracted

None

3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

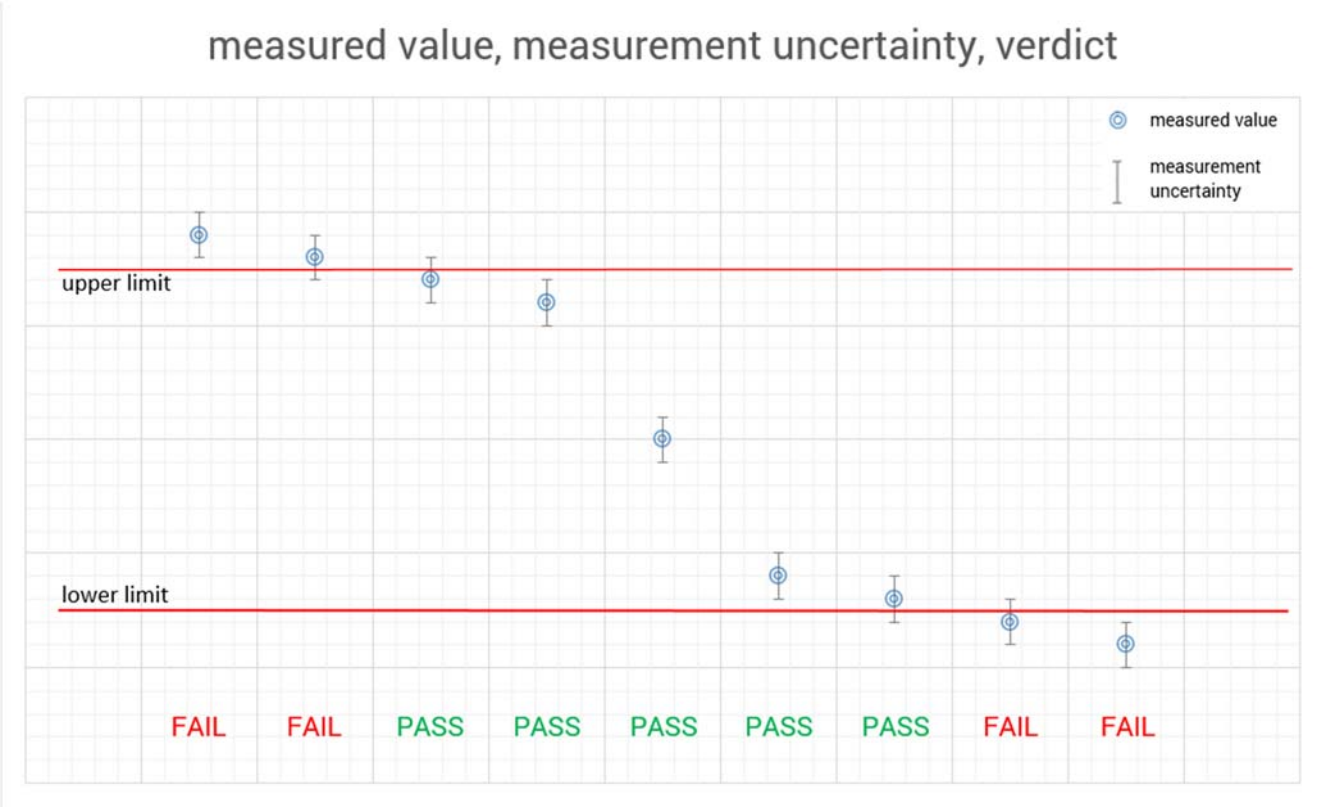
Guidance	Version	Description
DTS: KDB 558074 D01	v05	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

Accreditation	Description
D-PL-12076-01-04	Telecommunication and EMC Canada https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf
D-PL-12076-01-05	Telecommunication FCC requirements https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf

ISED Testing Laboratory Recognized Listing Number: DE0001
FCC designation number: DE0002

4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.
The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



5 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+22 °C during room temperature tests No tests under extreme conditions required. No tests under extreme conditions required.
Relative humidity content	:		55 %
Barometric pressure	:		1021 hpa
Power supply	:	V_{nom} V_{max} V_{min}	3.0 V DC by AA batteries No tests under extreme conditions required. No tests under extreme conditions required.

6 Test item

6.1 General description

Kind of test item	:	Jammer Detector V3
Model name	:	GWL-AJV3
S/N serial number	:	Rad. 2DBU NYJ3 Cond. 2DBU NVSN
Hardware status	:	1B
Software status	:	-/-
Firmware status	:	2.x.x
Frequency band	:	902 MHz - 928 MHz
Type of radio transmission Use of frequency spectrum	: :	FHSS
Type of modulation	:	DHSS
Number of channels	:	108
Antenna	:	Integrated antenna
Power supply	:	3.0 V DC by AA batteries
Temperature	:	22°C

6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report: 1-2606_21-01-01_AnnexA
1-2606_21-01-01_AnnexB
1-2606_21-01-01_AnnexD

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

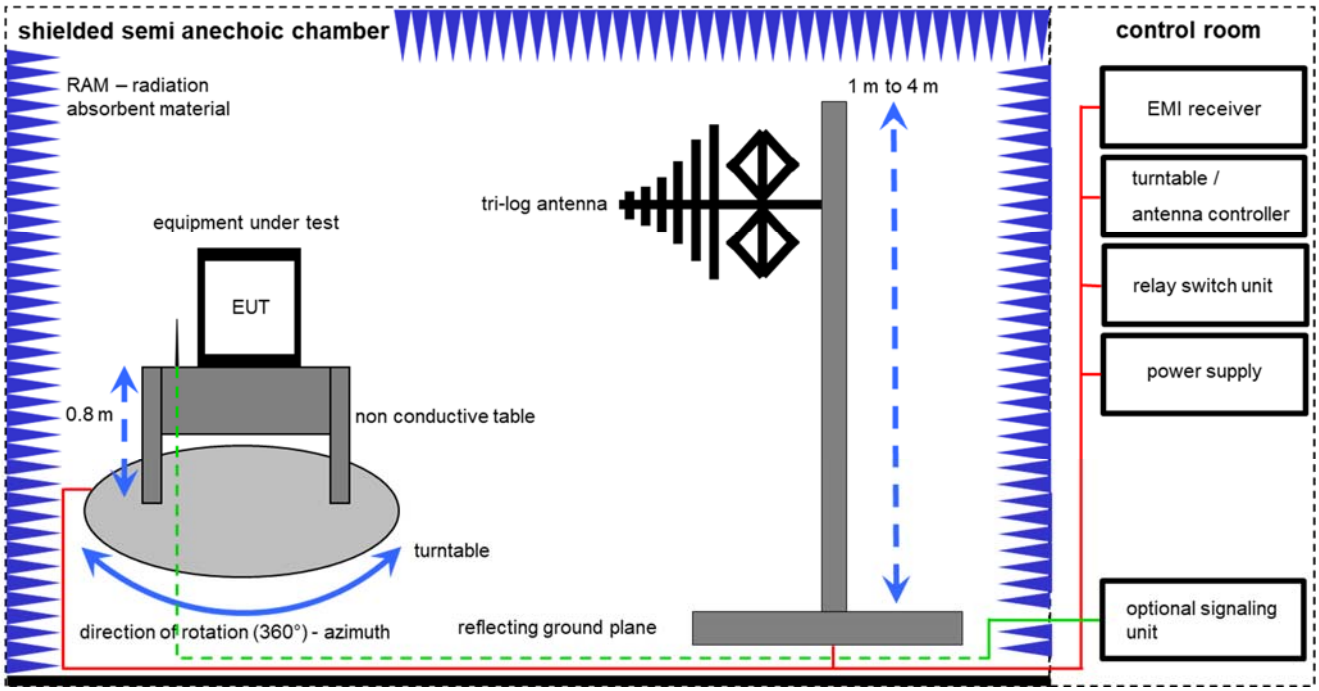
Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter
EMC32 software version: 10.59.00

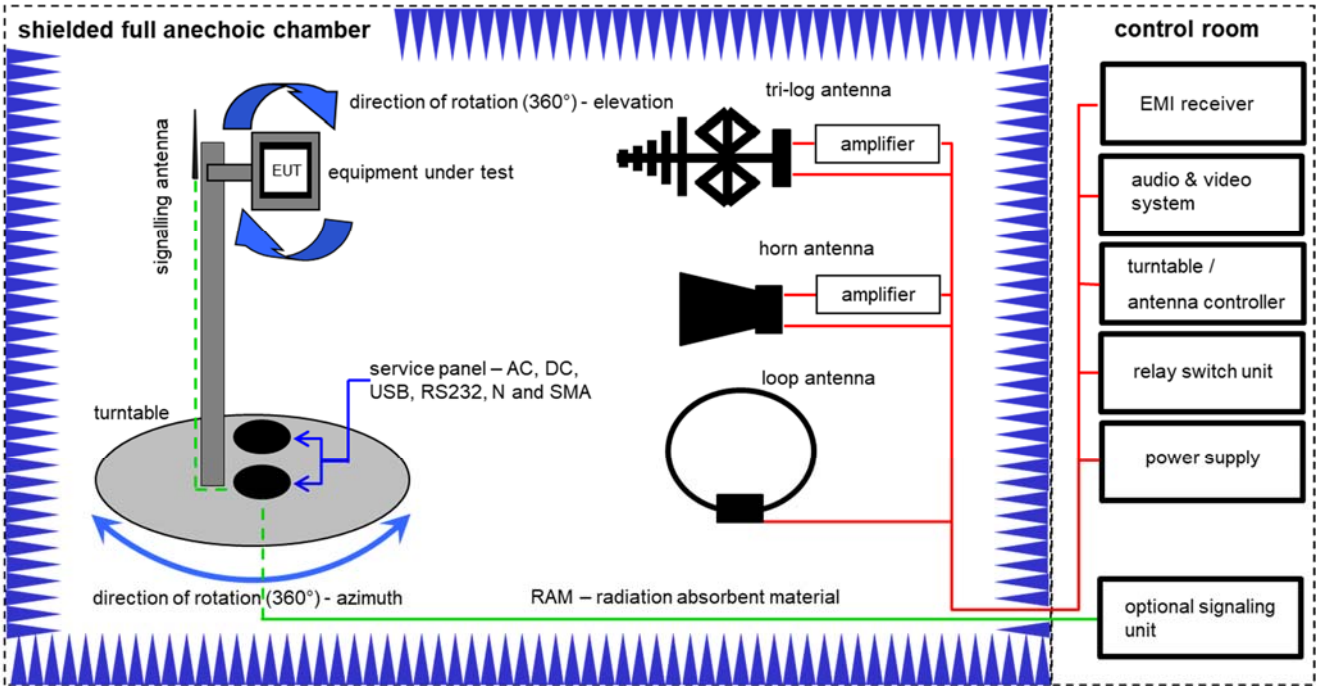
FS = UR + CL + AF
(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	Semi anechoic chamber	3000023	MWB AG		300000551	ne	-/-	-/-
3	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	vlKl!	17.01.2020	16.01.2022
4	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
5	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
7	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	295	300003787	vlKl!	21.04.2021	20.04.2023
8	A	Turntable	2089-4.0	EMCO		300004394	ne	-/-	-/-
9	A	PC	TecLine	F+W		300004388	ne	-/-	-/-
10	A	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	10.12.2020	09.12.2021

7.2 Shielded fully anechoic chamber



Measurement distance: tri-log antenna and horn antenna 3 meter; loop antenna 3 meter / 1 meter

FS = UR + CA + AF
(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
FS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dBµV/m] (71.61 µV/m)

OP = AV + D - G + CA
(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain+amplifier gain; CA-loss signal path)

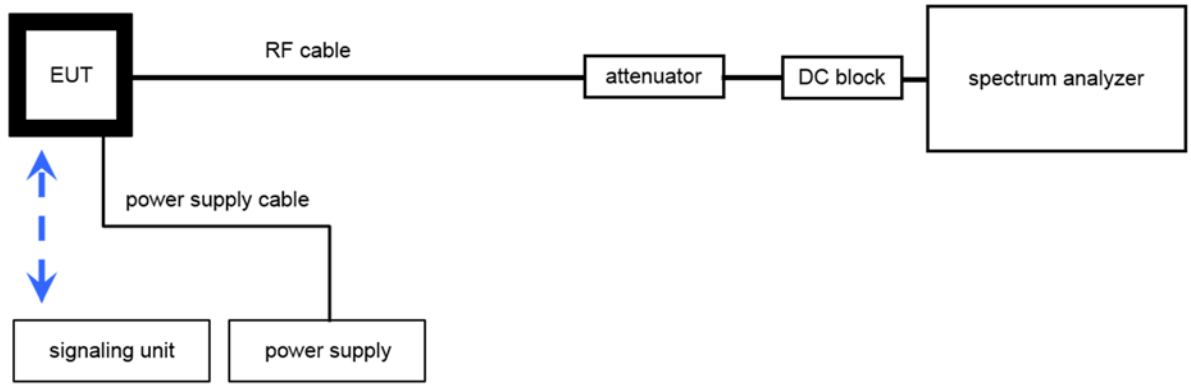
Example calculation:
OP [dBm] = -65.0 [dBm] + 50 [dB] - 20 [dBi] + 5 [dB] = -30 [dBm] (1 µW)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vlKl!	01.07.2021	30.06.2023
2	A,B,C	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	C	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	vlKl!	12.03.2021	11.03.2023
4	A,B,C	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
5	C	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev	-/-	-/-
6	A,B,C	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	11.12.2020	10.12.2021
7	C	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev	-/-	-/-
8	C	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
9	B	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	371	300003854	vlKl!	14.01.2020	13.01.2022
10	C	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
11	A,B,C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
12	A,B,C	NEXIO EMV-Software	BAT EMC V3.20.0.26	EMCO		300004682	ne	-/-	-/-
13	A,B,C	Open Switch and Control Unit and Power Sensors	OSP120 incl. B157	Rohde & Schwarz	101274, 100877	300004825	vlKl!	16.12.2020	15.12.2022
14	A,B,C	PC	ExOne	F+W		300004703	ne	-/-	-/-

7.3 Conducted measurements

Conducted measurements normal conditions



OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

Example calculation:
OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	RF-Cable SRD021 No. 1	Enviroflex 316 D	Huber & Suhner		400001311	ev	-/-	-/-
2	A	Signal analyzer	FSV30	Rohde&Schwarz	104365	300005923	k	16.12.2020	15.12.2021

8 Sequence of testing

8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, it is placed on a table with 0.8 m height.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement*

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

*)Note: The sequence will be repeated three times with different EUT orientations.

8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position ± 45° and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

8.3 Sequence of testing radiated spurious 1 GHz to 12.75 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

9 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Antenna gain	± 3 dB
Carrier frequency separation	± 21.5 kHz
Number of hopping channels	-/-
Spectrum bandwidth	± 21.5 kHz absolute; ± 15.0 kHz relative
Maximum output power	± 1 dB
Detailed conducted spurious emissions @ the band edge	± 1 dB
Band edge compliance radiated	± 3 dB
Spurious emissions conducted	± 3 dB
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB

10 Summary of measurement results

☒	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☐	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15	Passed	2021-10-01	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Mode	C	NC	NA	NP	Remark
§15.247(b)(4)	Antenna gain	Nominal	Nominal	TX cont	☒	☐	☐	☐	-/-
§15.247(a)(1)	Carrier frequency separation	Nominal	Nominal	TX hopping	☒	☐	☐	☐	-/-
§15.247(a)(1)	Number of hopping channels	Nominal	Nominal	TX hopping	☒	☐	☐	☐	-/-
§15.247(a)(1) (iii)	Time of occupancy (dwell time)	Nominal	Nominal	TX hopping	☒	☐	☐	☐	-/-
§15.247(a)(1)	Spectrum bandwidth of a FHSS system bandwidth	Nominal	Nominal	TX hopping	☒	☐	☐	☐	-/-
§15.247(b)(1)	Maximum output power	Nominal	Nominal	TX cont	☒	☐	☐	☐	-/-
§15.247(d)	Detailed spurious emissions @ the band edge - conducted	Nominal	Nominal	TX hopping	☒	☐	☐	☐	-/-
§15.205	Band edge compliance radiated	Nominal	Nominal	-/-	☒	☐	☐	☐	No restricted band nearby
§15.247(d)	Spurious emissions conducted	Nominal	Nominal	TX cont	☒	☐	☐	☐	-/-
§15.209(a)	Spurious emissions radiated below 30 MHz	Nominal	Nominal	TX cont	☒	☐	☐	☐	-/-
§15.247(d) §15.109	Spurious emissions radiated 30 MHz to 1 GHz	Nominal	Nominal	TX cont	☒	☐	☐	☐	-/-
§15.247(d) §15.109	Spurious emissions radiated above 1 GHz	Nominal	Nominal	TX cont	☒	☐	☐	☐	-/-
§15.107(a) §15.207	Conducted emissions below 30 MHz (AC conducted)	Nominal	Nominal	-/-	☐	☐	☒	☐	EUT ceases transmitting after connecting the charger

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

11 RF measurements

11.1 Additional comments

Reference documents: None

Special test descriptions: The EUT uses two different hopping frequency blocks:
Frequency table1: 902.1375 MHz – 904.6625 MHz
Frequency table2: 920.1375 MHz – 922.6625 MHz
Both blocks were tested and stated in this test report.
For single channel tests we used the following nominal frequencies:
Table 1: 902.1375 MHz lowest channel; 903.3875 MHz middle channel; 904.6625 MHz highest channel
Table 2: 920.1375 MHz lowest channel; 921.3875 MHz middle channel; 922.6625 MHz highest channel

Configuration descriptions: None

Test mode: ☒ Special software is used.
EUT is transmitting pseudo random data by itself

12 Measurement results

12.1 Antenna gain

The antenna gain of the complete system is calculated by the difference of radiated power in ERP and the conducted power of the module.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Span	5 MHz
Trace mode	Max hold
Test setup	See sub clause 7.2 B (radiated) See sub clause 7.3 A (conducted)
Measurement uncertainty	See sub clause 9

Limits:

FCC
Antenna gain
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Results:

Table 1	Low channel	Middle channel	High channel
Conducted power [dBm]	24.3	24.2	24.1
Radiated power [dBm]	21.2	20.8	20.6
Gain [dBd] Calculated	-3.1	-3.4	-3.5

Table 2	Low channel	Middle channel	High channel
Conducted power [dBm]	23.2	23.0	22.9
Radiated power [dBm]	21.1	21.1	21.1
Gain [dBd] Calculated	-2.1	-1.9	-1.8

12.2 Carrier Frequency Separation

Description:

Measurement of the carrier frequency separation of a hopping system. The carrier frequency separation is constant for all modulation-modes. EUT in hopping mode.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	See plots
Video bandwidth	See plots
Span	See plots
Trace mode	Max hold
Test setup	See sub clause 7.3 A
Measurement uncertainty	See sub clause 9

Limits:

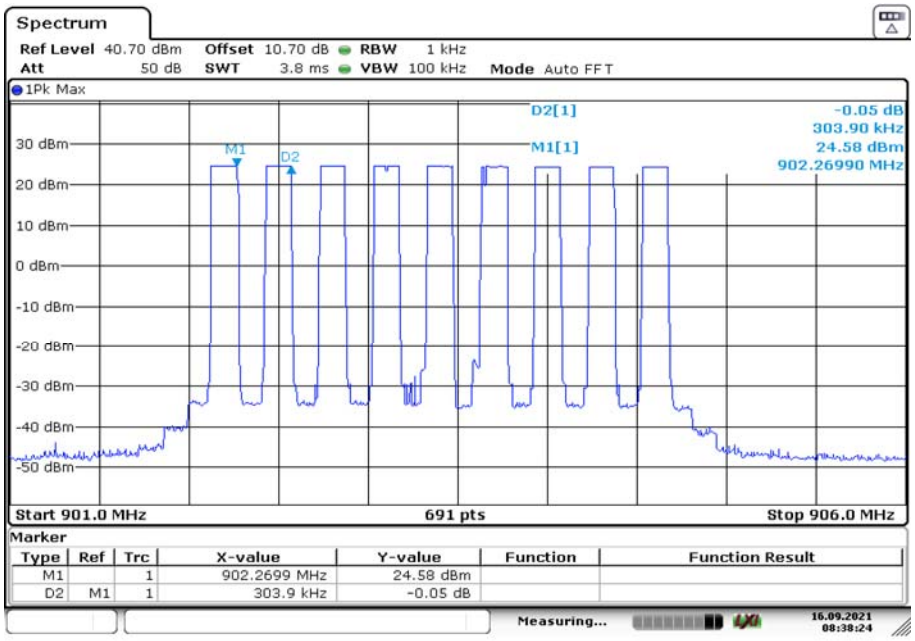
FCC
Carrier frequency separation
Minimum 25 kHz or two-thirds of the 20 dB bandwidth of the hopping system whichever is greater. The two-thirds of the 20 dB bandwidth for IC is only valid for the ISM band 2400 – 2483.5 MHz.

Result table 1: The channel separation is 303.9 kHz for the macro channels and 24.75 kHz for the micro channels.

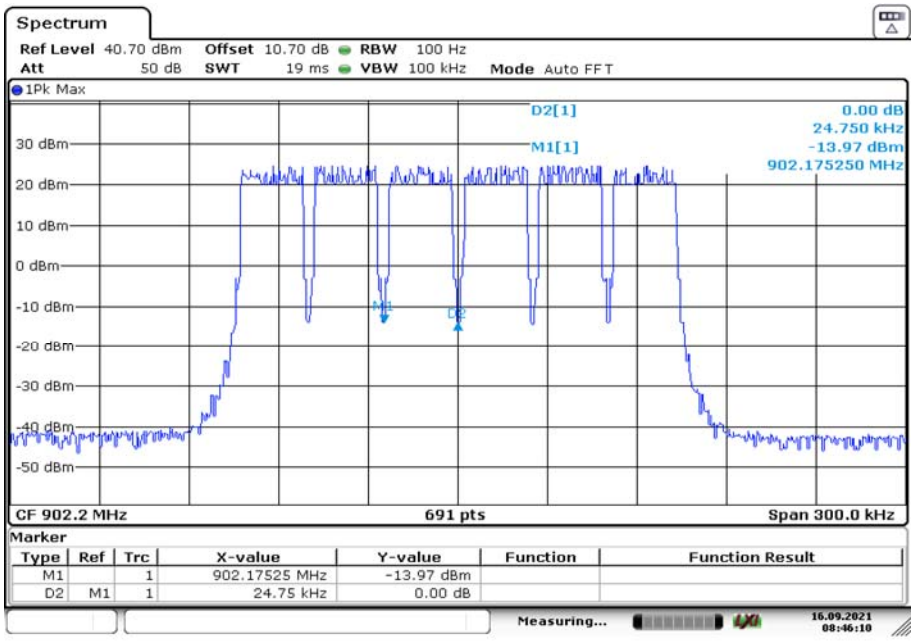
Result table 2: The channel separation is 303.9 kHz for the macro channels and 24.75 kHz for the micro channels.

Plots table 1:

Plot 1: Frequency separation macro channels

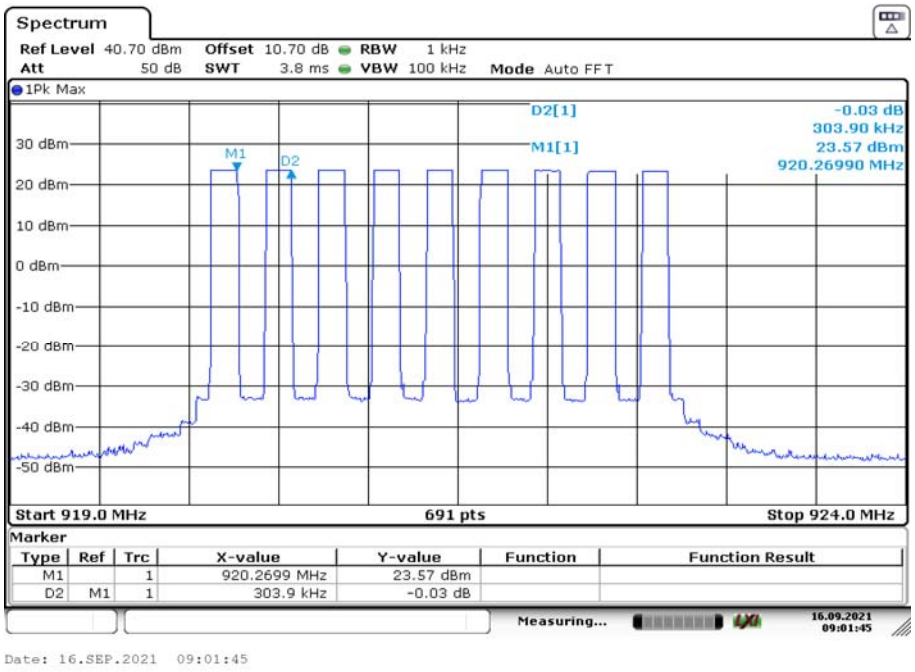


Plot 2: Frequency separation micro channels

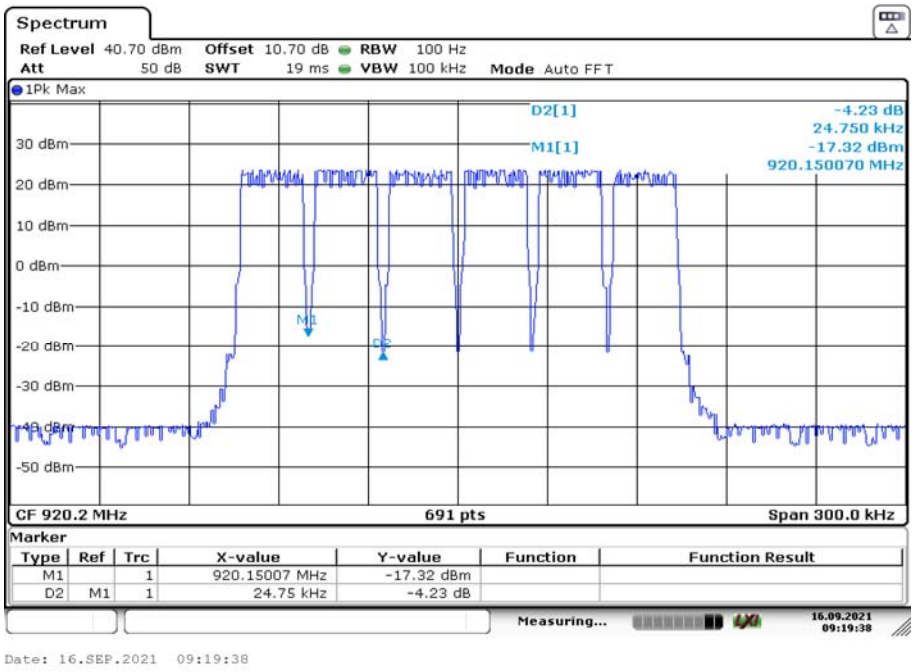


Plots table 1:

Plot 1: Frequency separation macro channels



Plot 2: Frequency separation micro channels



12.3 Number of Hopping Channels

Description:

Measurement of the total number of used hopping channels. The number of hopping channels is constant for all modulation-modes. EUT in hopping mode.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	See plots
Video bandwidth	See plots
Span	See plots
Trace mode	Max hold
Test setup	See sub clause 7.3 A
Measurement uncertainty	See sub clause 9

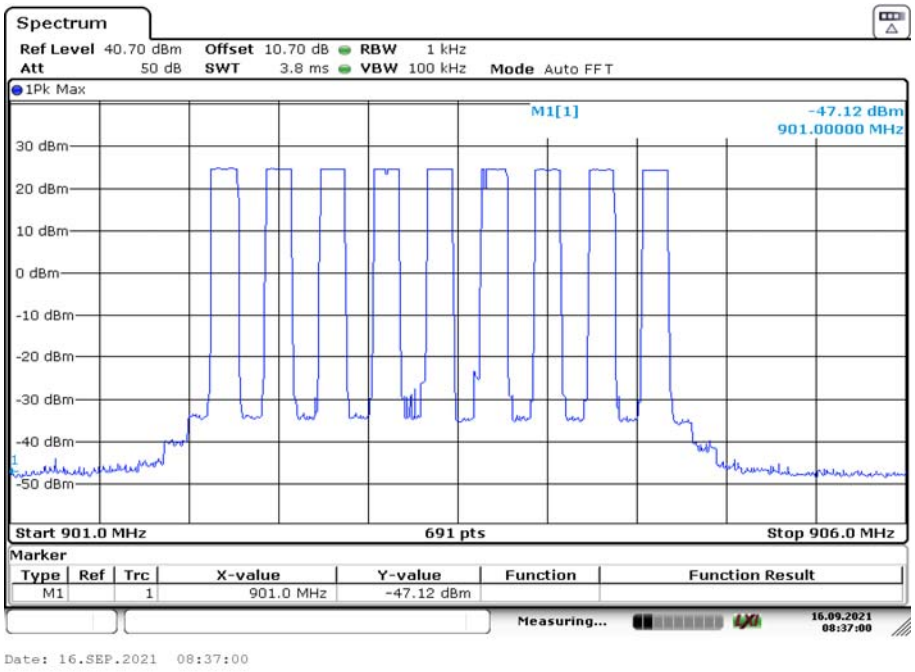
Limits:

FCC
Number of hopping channels
At least 25 non overlapping hopping channels. If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels.

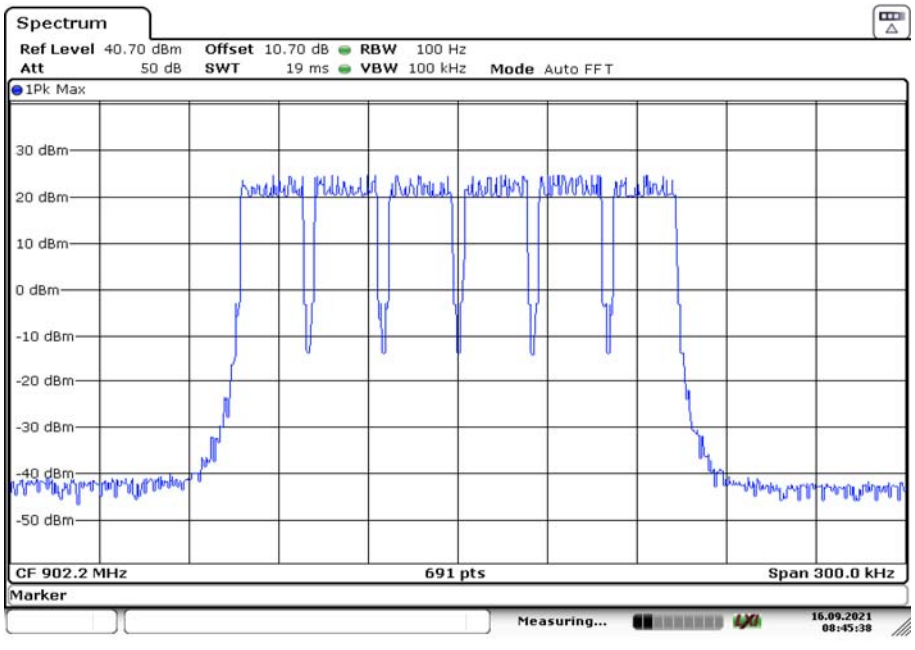
Result (table 1 and 2) : The EUT uses 9*6 = 54 channels.

Plots table1:

Plot 1: Number of macro channels

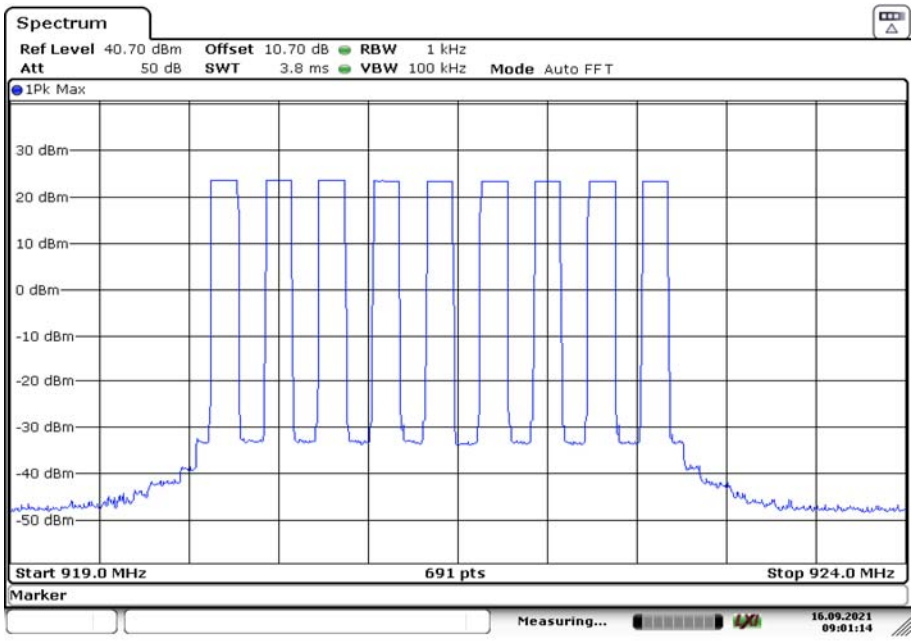


Plot 2: Number of micro channels in one single macro channel zoomed



Plots table2:

Plot 1: Number of macro channels



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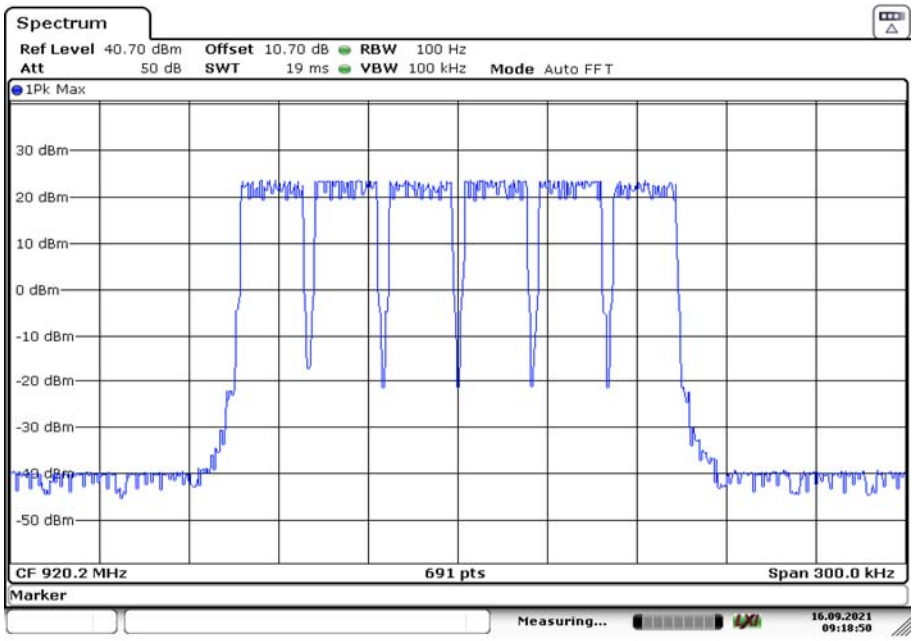
Plot 2: Number of micro channels in one single macro channel zoomed



Date: 16.SEP.2021 09:18:50

12.4 Average Time of Occupancy (dwell time)

Measurement:

The measurement is performed in zero span mode to show that none of the 54 used channels is allocated more than 0.4 seconds within a 10 seconds interval (54 channels times 0.4s).

Limits:

FCC
Average time of occupancy
For frequency hopping systems operating in the 902-928 MHz band: If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within 10 second period.

Result table 1:

The time slot length is = 354 ms
Number of hops / channel @ 20s = 1

Within 20 s period, the average time of occupancy in 20 s: 354 ms

→ The average time of occupancy = 354 ms

Result table 2:

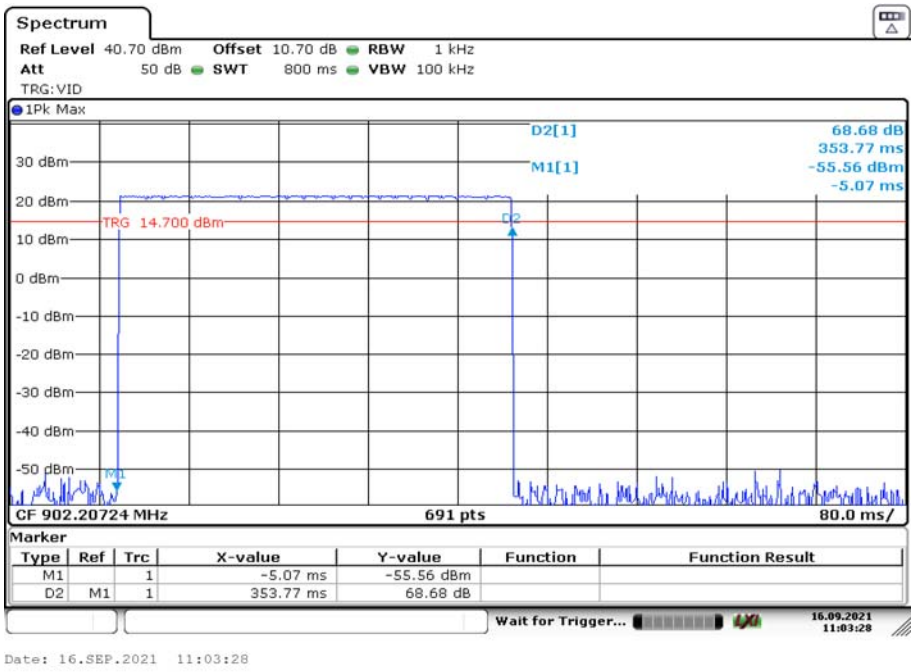
The time slot length is = 354 ms
Number of hops / channel @ 20s = 1

Within 20 s period, the average time of occupancy in 20 s: 354 ms

→ The average time of occupancy = 354 ms

Plots table1:

Plot 1: Time slot length = 356 ms



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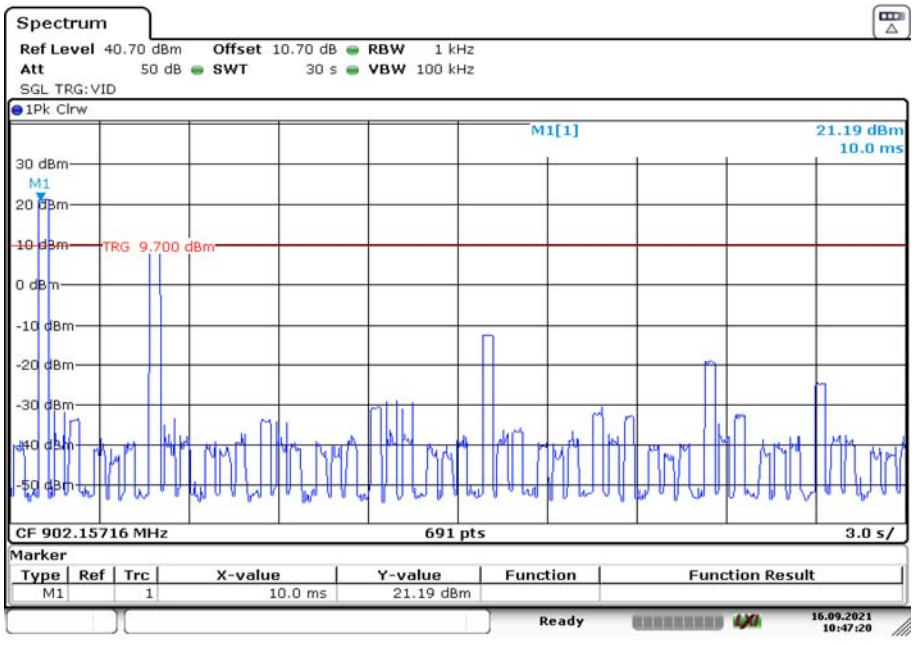
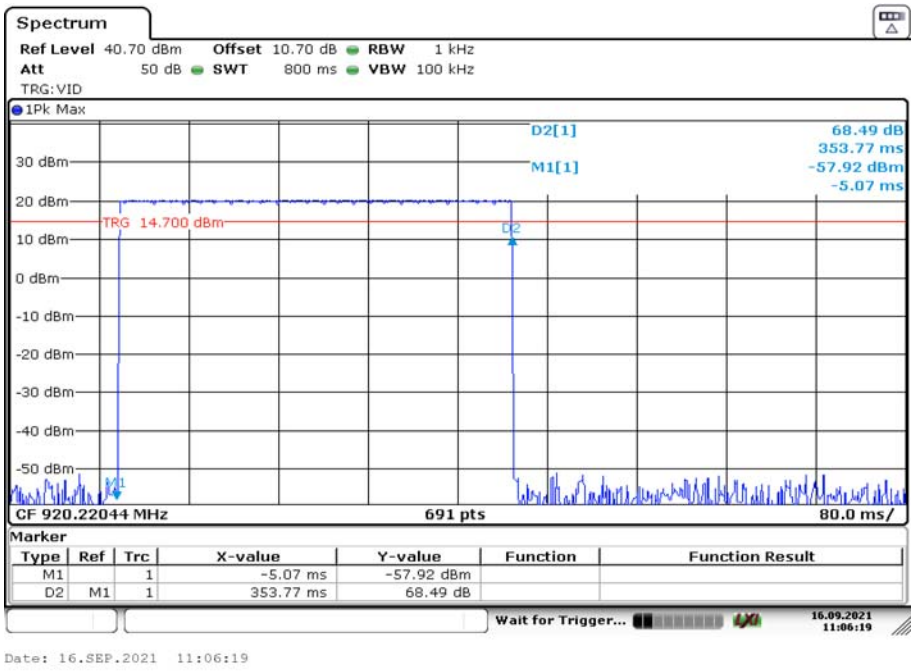
Plot 2: hops / channel @ 20s = 1



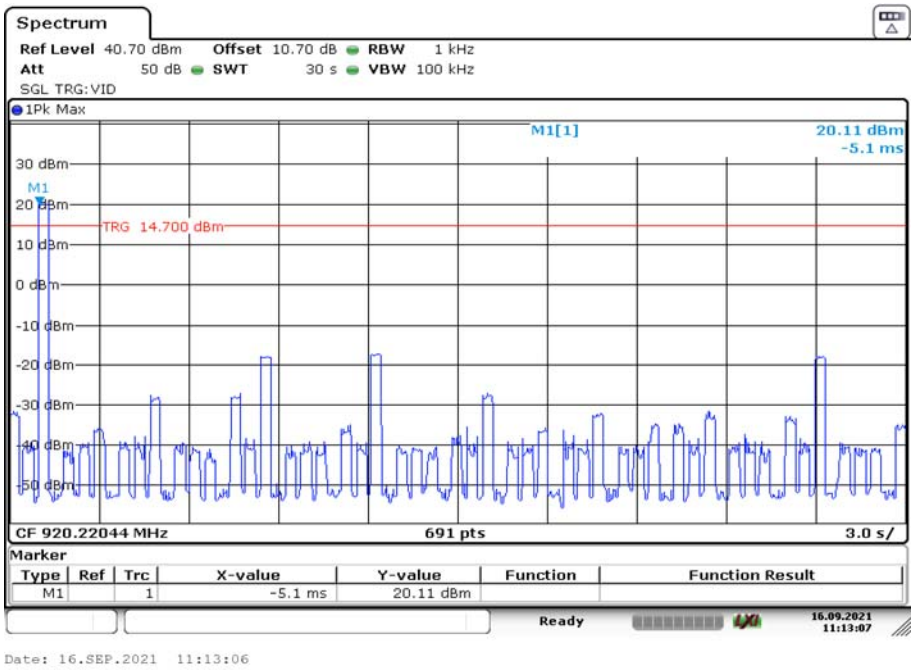
Date: 16.SEP.2021 10:47:20

Plots table1:

Plot 1: Time slot length = 356 ms



Plot 2: hops / channel @ 20s = 1



12.5 Spectrum bandwidth of a FHSS system

Description:

Measurement of the 20dB bandwidth and 99% bandwidth of the modulated signal. The measurement is performed according to the “Measurement Guidelines” (DA 00-705, March 30, 2000).

Measurement:

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	300 Hz
Video bandwidth	1 kHz
Span	See plots
Trace mode	Max hold
Test setup	See sub clause 7.3 A
Measurement uncertainty	See sub clause 8

Limits:

FCC
Spectrum bandwidth of a FHSS system
< 1500 kHz

Result table 1:

Test Conditions		20dB BANDWIDTH [kHz]		
		Low channel	Middle channel	High channel
T_{nom}	V_{nom}	21.6	21.6	21.7

Test Conditions		99% BANDWIDTH [kHz]		
		Low channel	Middle channel	High channel
T_{nom}	V_{nom}	20.86	20.85	20.89

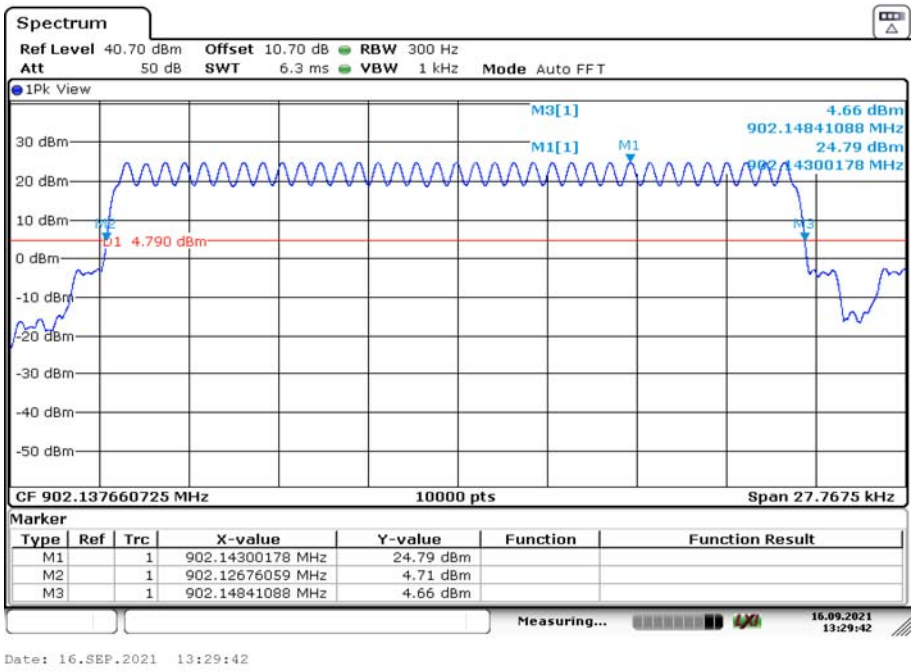
Result table 2:

Test Conditions		20dB BANDWIDTH [kHz]		
		Low channel	Middle channel	High channel
T_{nom}	V_{nom}	21.6	21.6	21.6

Test Conditions		99% BANDWIDTH [kHz]		
		Low channel	Middle channel	High channel
T_{nom}	V_{nom}	20.84	20.84	20.84

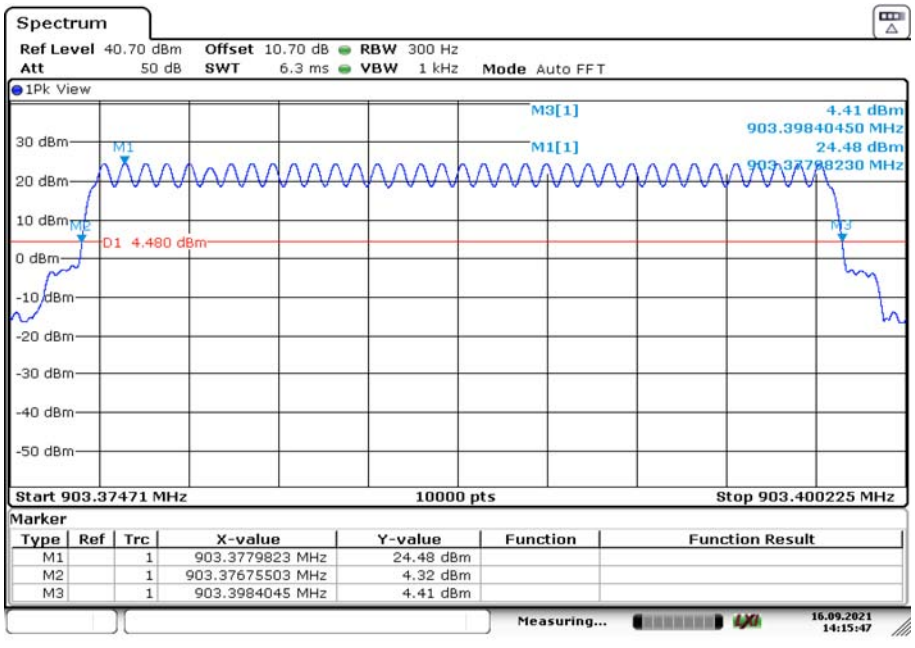
Plots table 1:

Plot 1: Low Channel, 20dB bandwidth



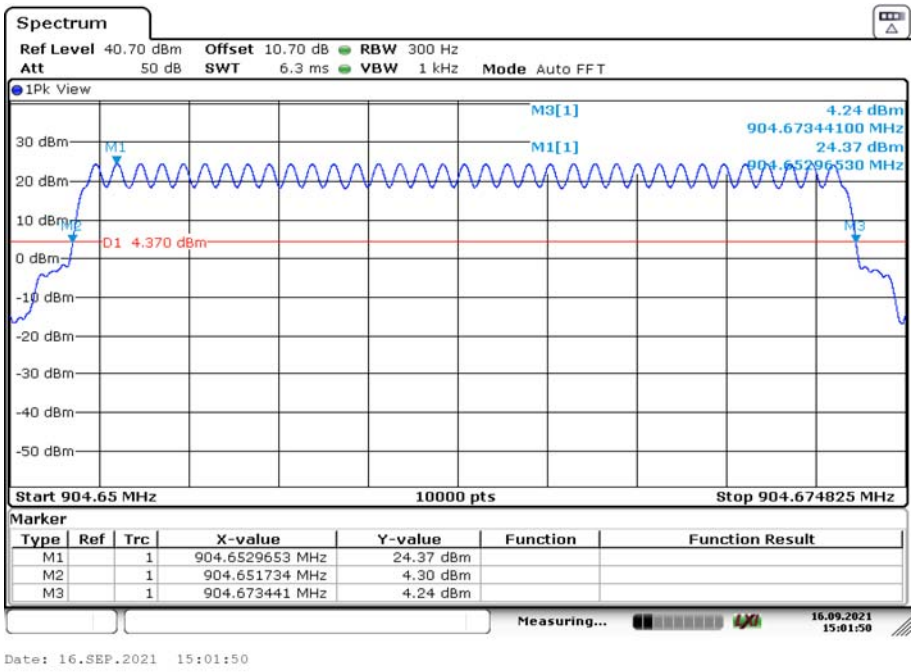
Date: 16.SEP.2021 13:29:42

Plot 2: Middle Channel, 20dB bandwidth



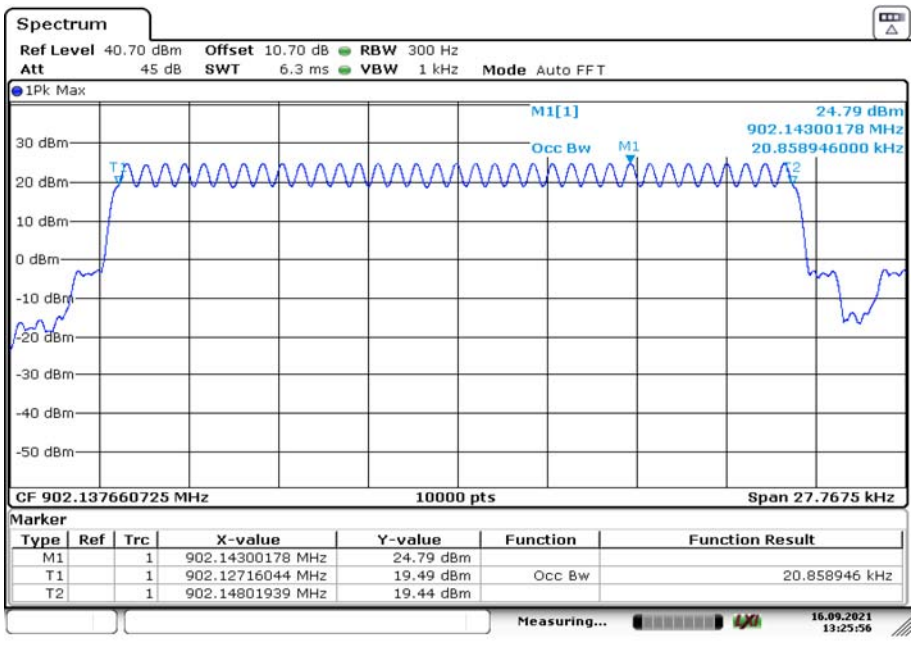
Date: 16.SEP.2021 14:15:47

Plot 3: High Channel, 20dB bandwidth



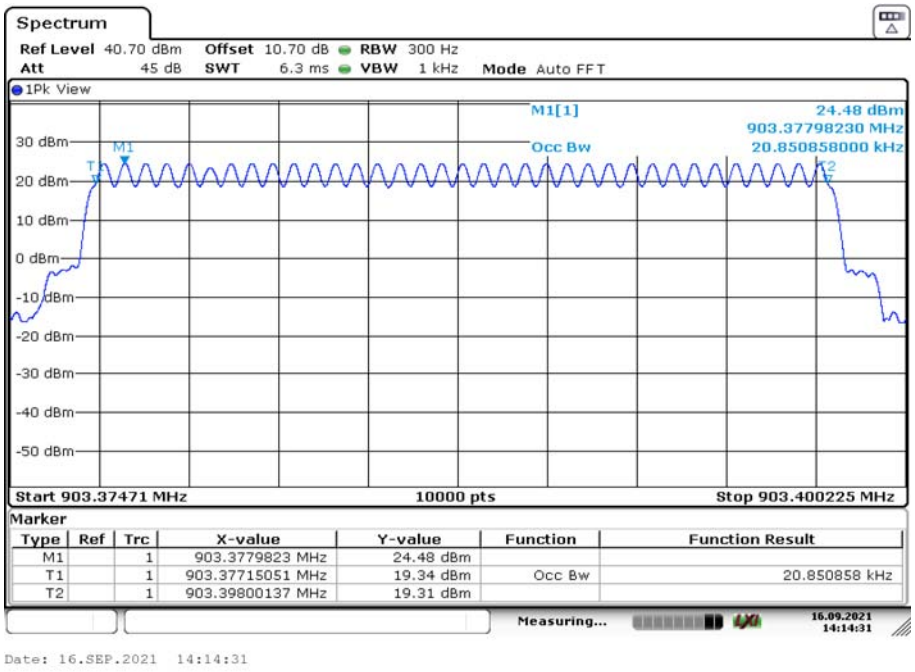
Date: 16.SEP.2021 15:01:50

Plot 4: Low Channel, OBW99



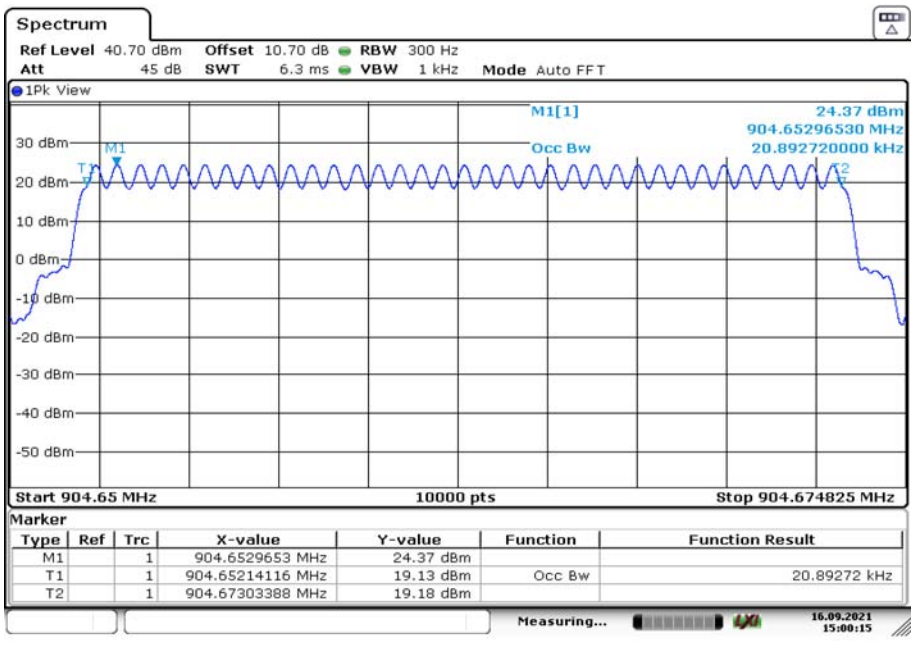
Date: 16.SEP.2021 13:25:55

Plot 5: Middle Channel, OBW99



Date: 16.SEP.2021 14:14:31

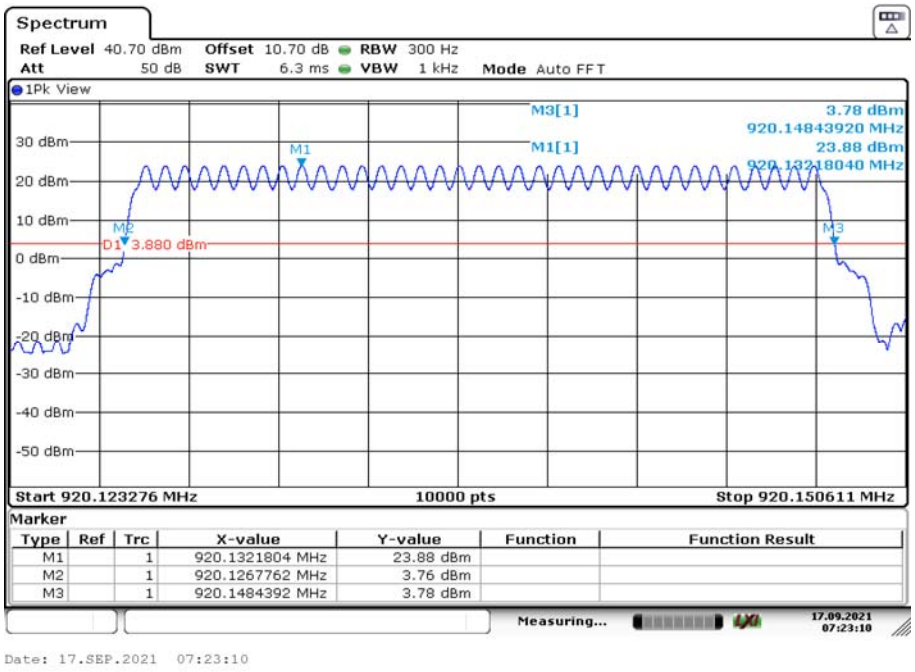
Plot 6: High Channel, OBW99



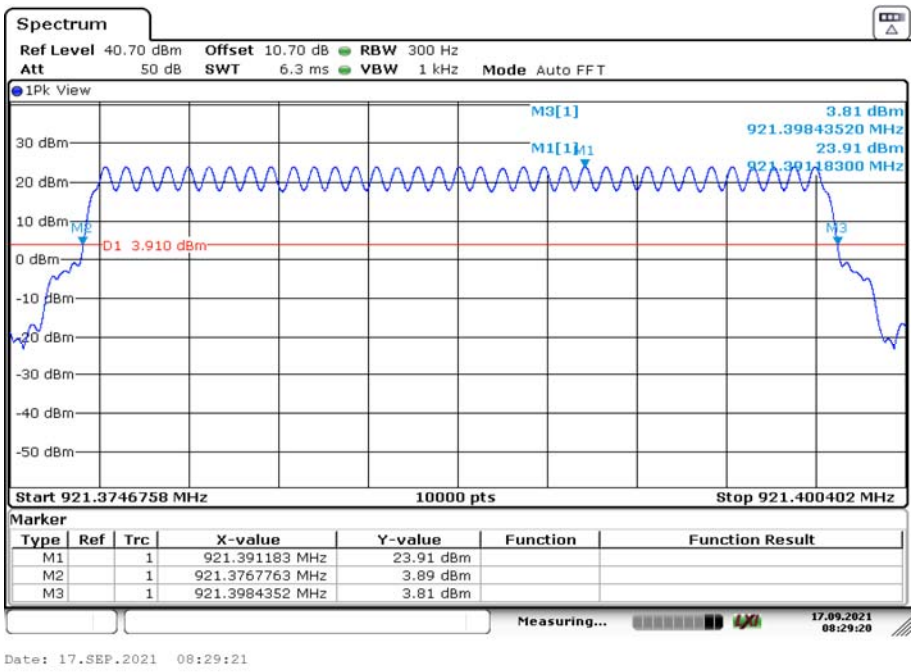
Date: 16.SEP.2021 15:00:15

Plots table 2:

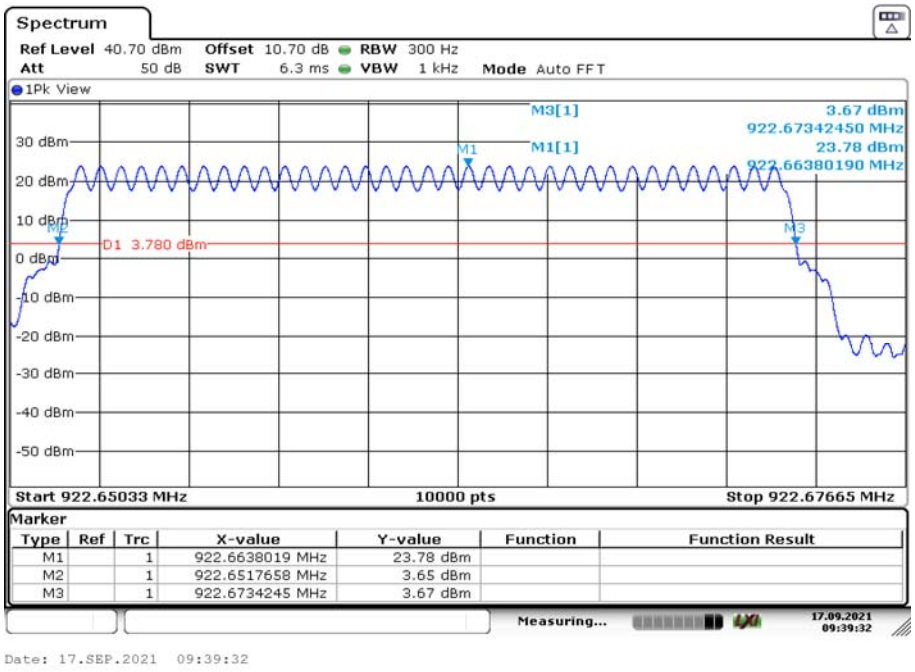
Plot 1: Low Channel, 20dB bandwidth



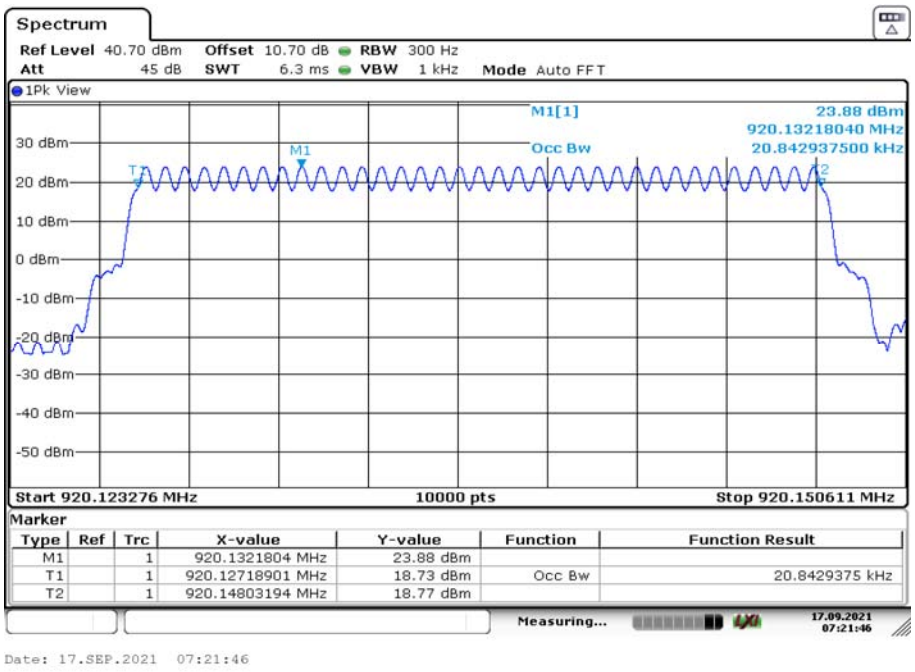
Plot 2: Middle Channel, 20dB bandwidth



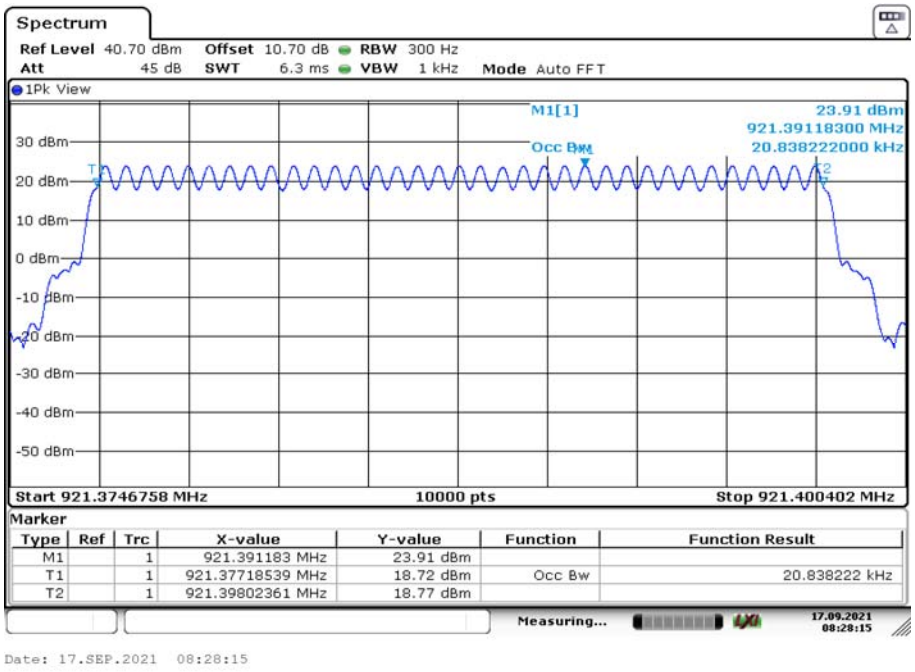
Plot 3: High Channel, 20dB bandwidth



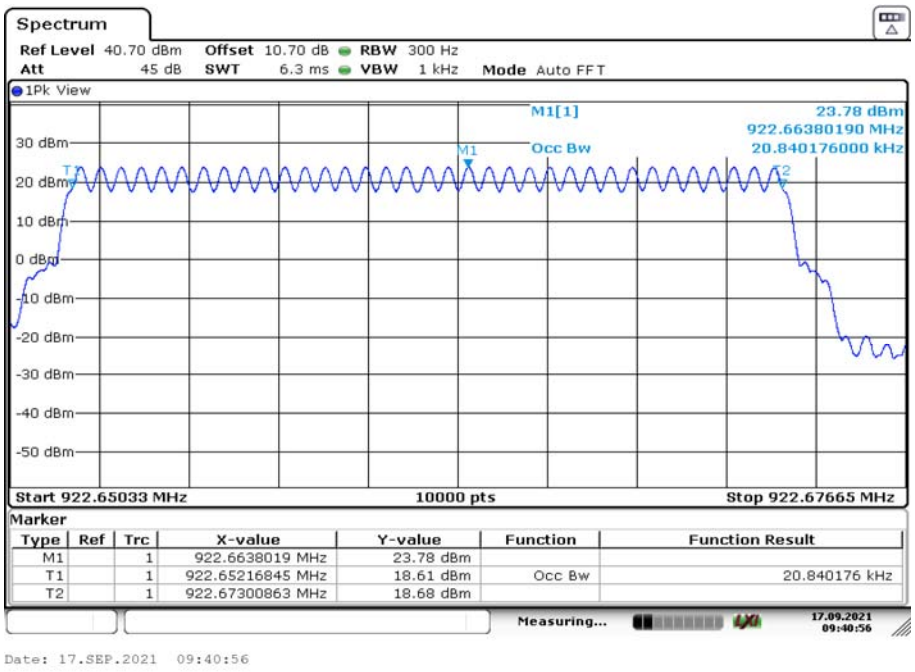
Plot 4: Low Channel, OBW99



Plot 5: Middle Channel, OBW99



Plot 6: High Channel, OBW99



12.6 Maximum Output Power

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	5 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.3 A
Measurement uncertainty:	See chapter 9

Limits:

FCC
Maximum Output Power Conducted
For frequency hopping systems operating in the 902–928 MHz band: 1 watt (30 dBm) for systems employing at least 50 hopping channels; and, 0.25 watts (24 dBm) for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Result table 1:

Test Conditions		Maximum Output Power Conducted [dBm]		
		Low channel	Middle channel	High channel
T_{nom}	V_{nom}	24.3	24.2	24.1

Test Conditions		ERP [dBm]		
		Low channel	Middle channel	High channel
T_{nom}	V_{nom}	21.2	20.8	20.6

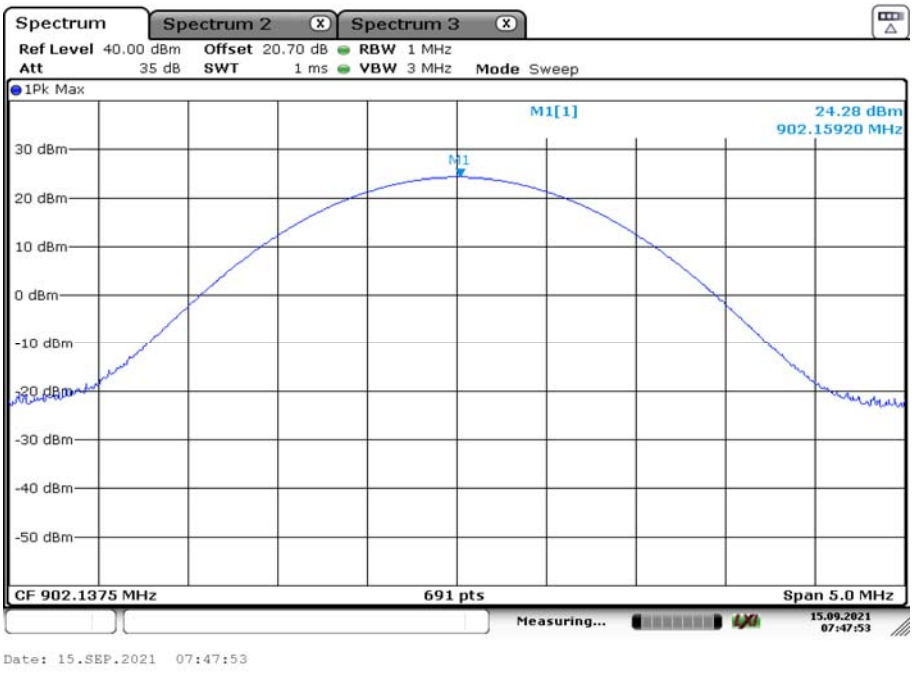
Result table 2:

Test Conditions		Maximum Output Power Conducted [dBm]		
		Low channel	Middle channel	High channel
T_{nom}	V_{nom}	23.2	23.0	22.9

Test Conditions		ERP [dBm]		
		Low channel	Middle channel	High channel
T_{nom}	V_{nom}	21.1	21.1	21.1

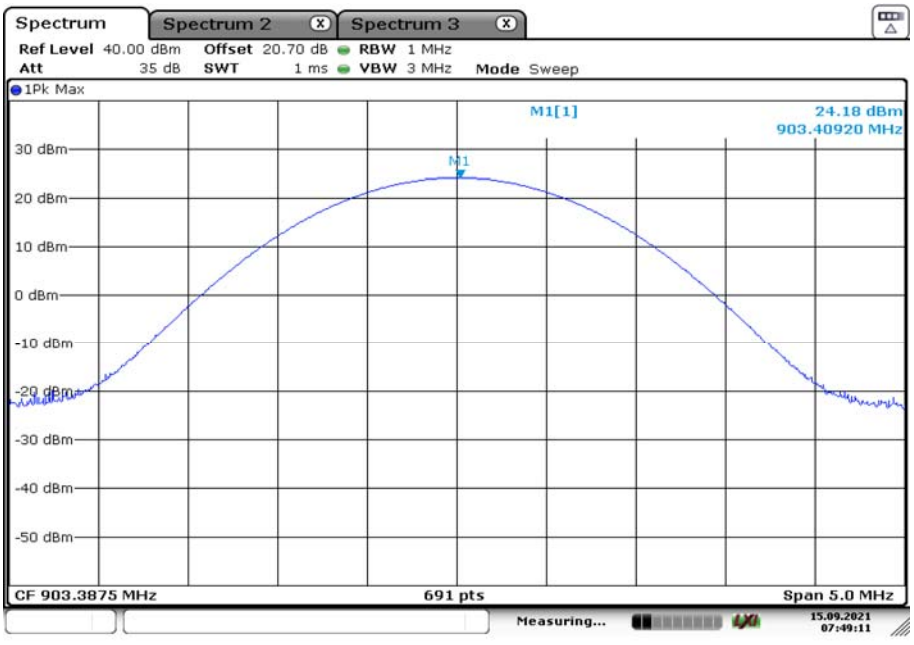
Plots conducted Table 1:

Plot 1: Low Channel



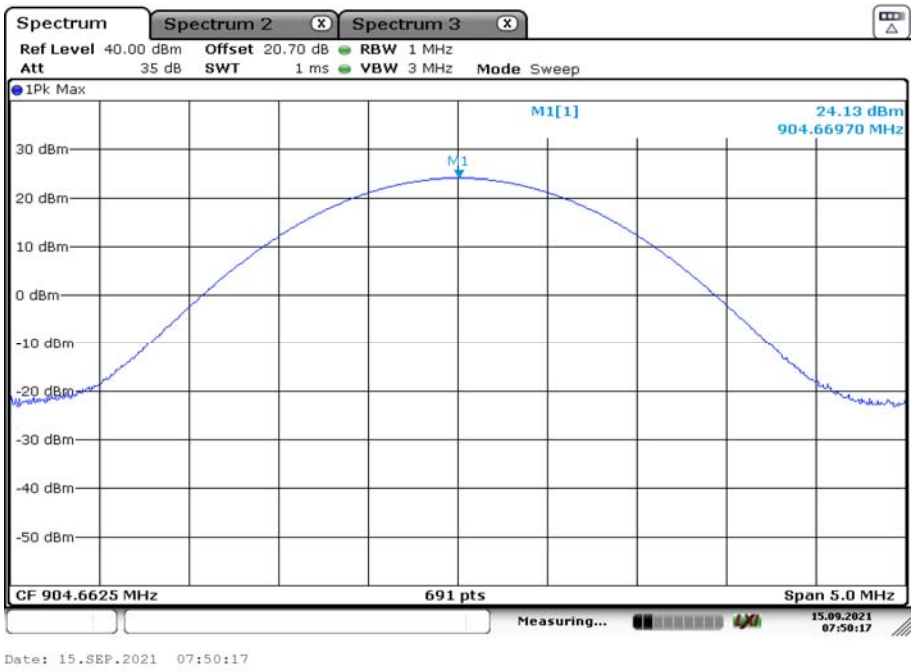
Date: 15.SEP.2021 07:47:53

Plot 2: Middle Channel



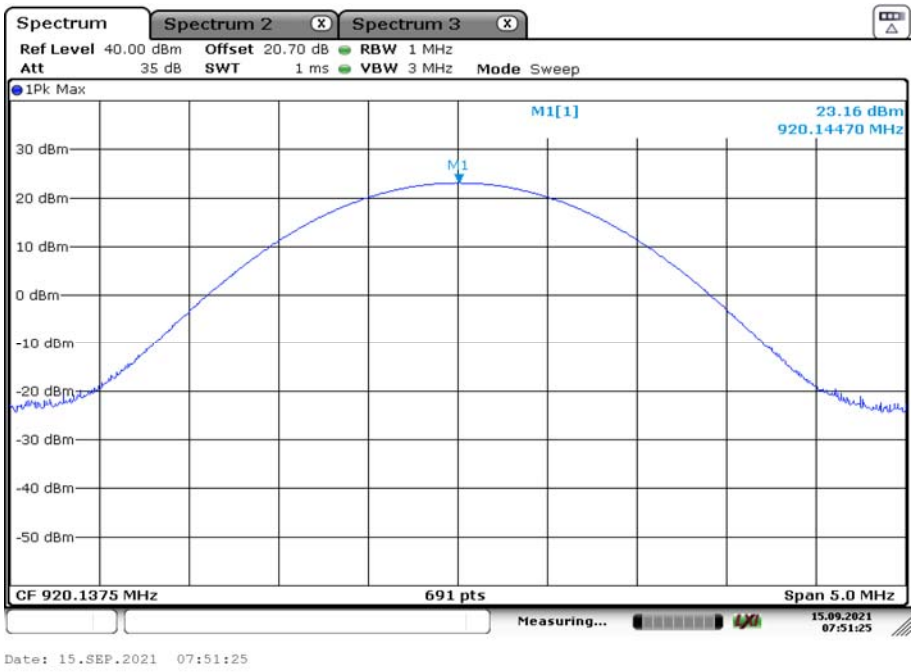
Date: 15.SEP.2021 07:49:11

Plot 3: High Channel

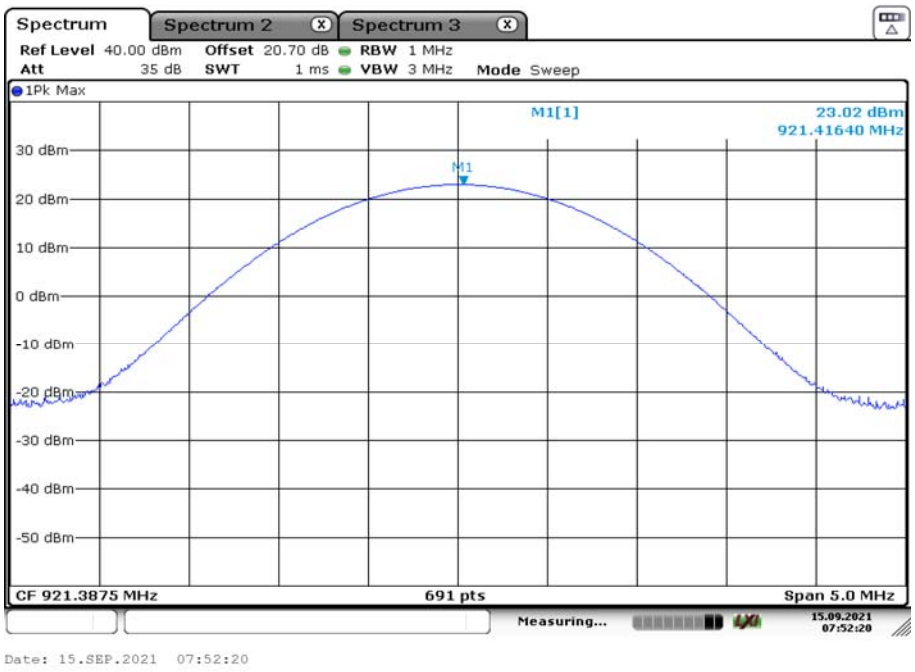


Plots conducted Table 2:

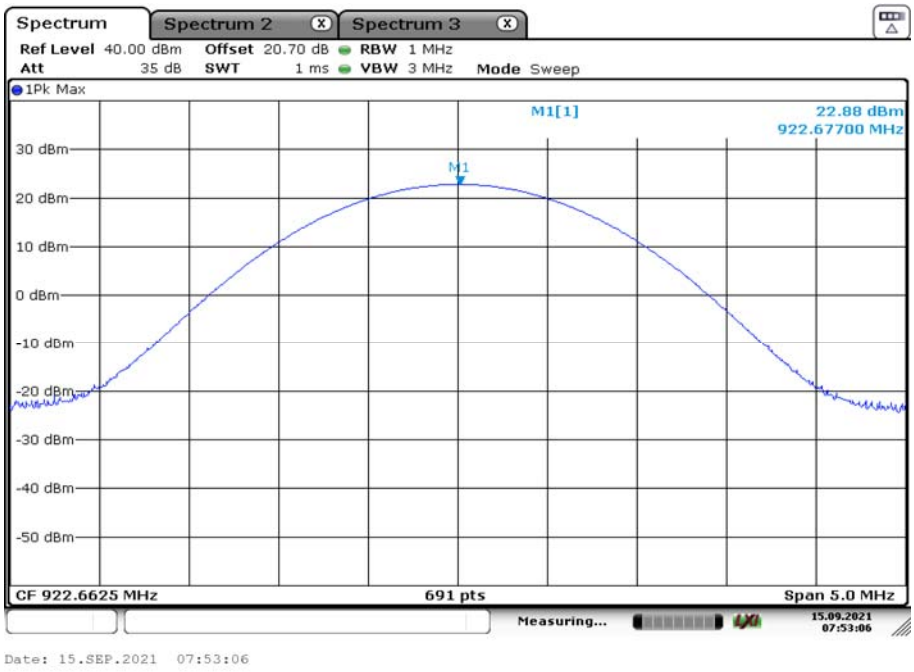
Plot 1: Low Channel



Plot 2: Middle Channel



Plot 3: High Channel



12.7 Detailed spurious emissions @ the band edge – conducted and radiated

Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge in single channel and hopping mode. The measurement is repeated for all modulations.

Measurement parameters	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	100 kHz
Video bandwidth	300 kHz / 500 kHz
Span	Lower Band Edge: 902 MHz Upper Band Edge: 928 MHz
Trace mode	Max hold
Test setup	See sub clause 7.3 A
Measurement uncertainty	See sub clause 9

Limits:

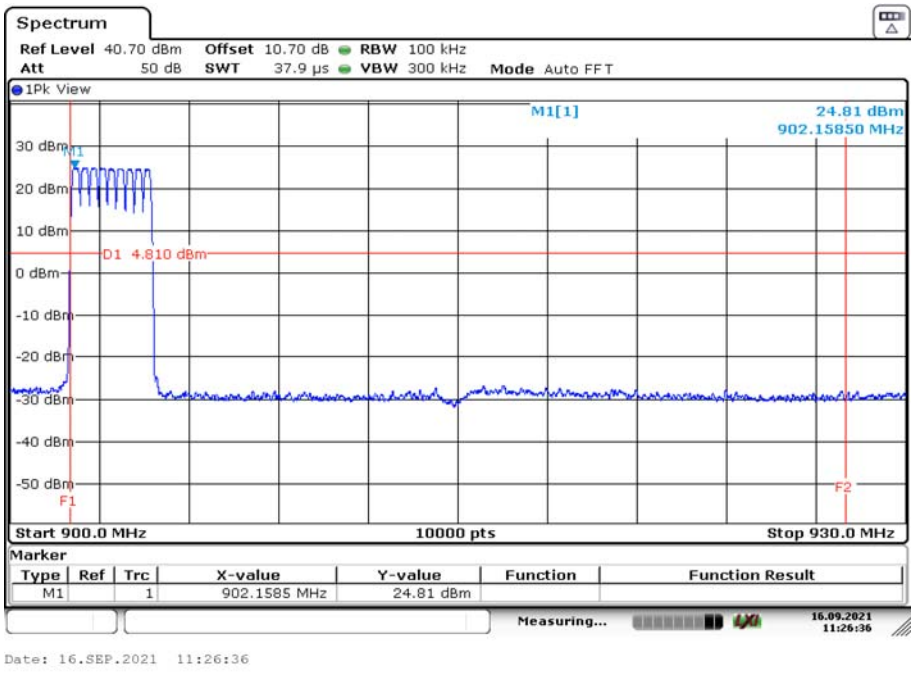
FCC
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Results conducted:

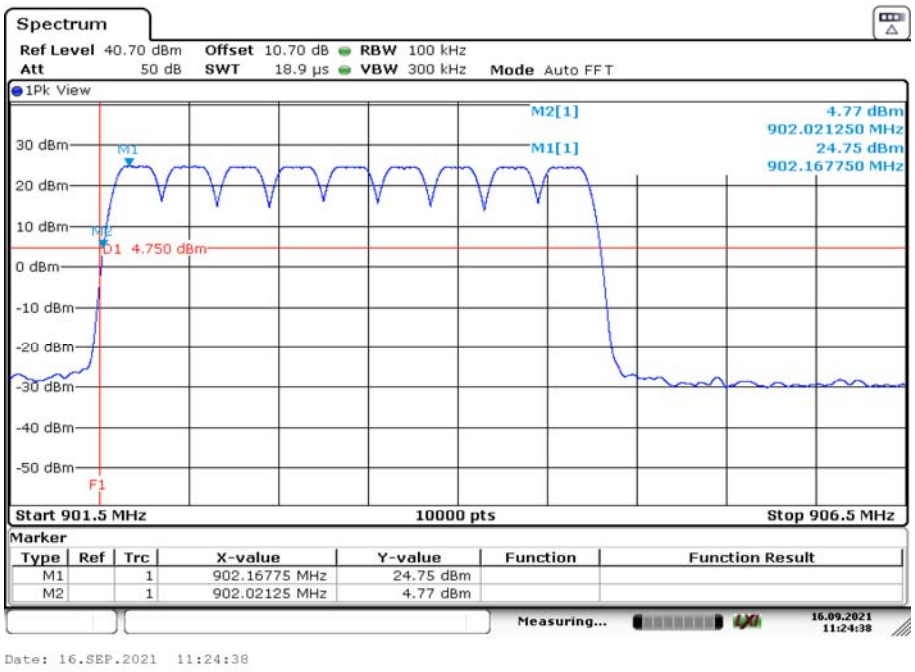
Scenario	Spurious band edge conducted [dB]		
Modulation	lowest channel	middle channel	highest channel
Lower band edge – hopping on	> 20 dB	> 20 dB	> 20 dB
Upper band edge – hopping on	> 20 dB	> 20 dB	> 20 dB

Plots:

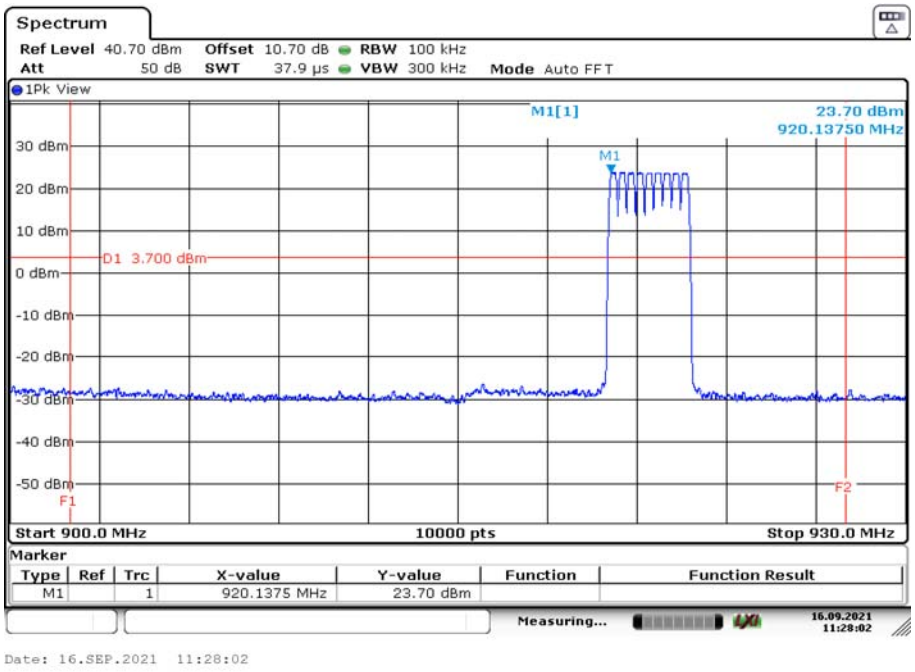
Plot 1: 20 dB – hopping on Table 1



Plot 1: 20 dB – hopping on Table 1 zoomed



Plot 3: 20 dB – hopping on Table 2



Results radiated:

No restricted band in the range ± 2 channel bandwidths of the Band-edges of the specified emission band! (608 MHz – 614 MHz and 960 MHz – 1240 MHz).

Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

12.8 Spurious Emissions Conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The EUT is set to single channel mode. The measurement is repeated for low, mid and high channel.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	F < 1 GHz: 1 MHz F > 1 GHz: 1 MHz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Span:	9 kHz to 12.75 GHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.3A
Measurement uncertainty:	See chapter 9

Limits:

FCC
TX spurious emissions conducted
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required

Result Table 1:

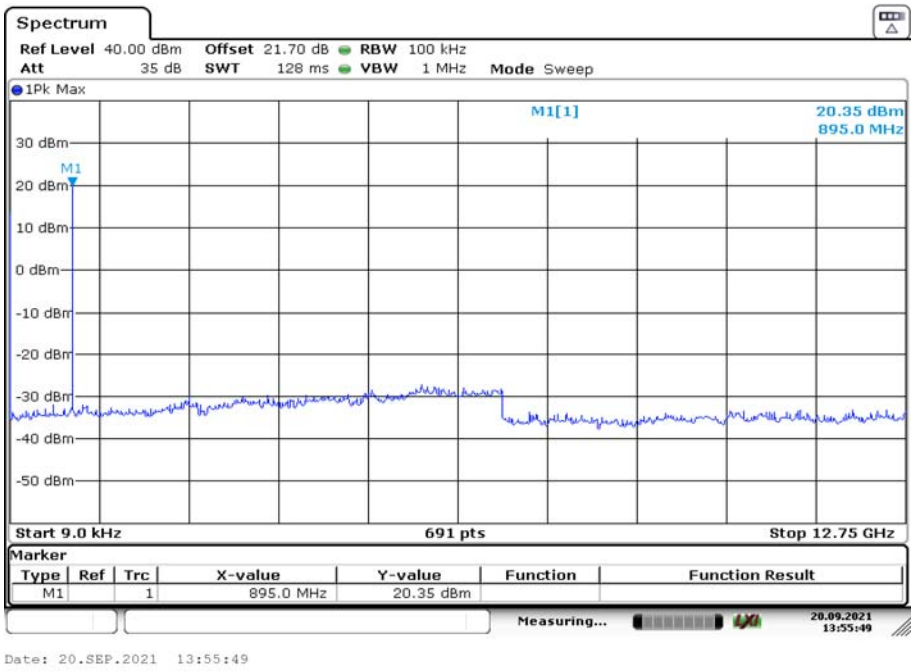
Emission Limitation					
Channel		Amplitude of emission [dBm]	Limit max. allowed emission power	actual attenuation below frequency of operation [dB]	Results
Lowest		20.35	24 dBm	No emissions detected	Operating frequency
See plot			-20 dBc		
Middle		24.05	24 dBm		Operating frequency
See plot			-20 dBc		
Highest		23.81	24 dBm		Operating frequency
See plot			-20 dBc		

Result Table 2:

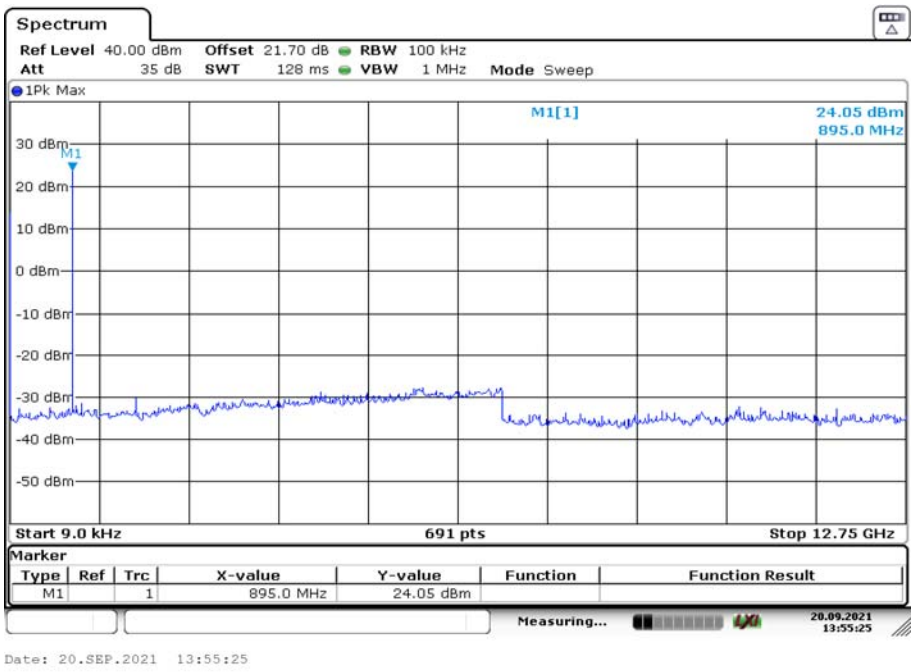
Emission Limitation					
Channel		Amplitude of emission [dBm]	Limit max. allowed emission power	actual attenuation below frequency of operation [dB]	Results
Lowest		23.45	24 dBm	No emissions detected	Operating frequency
See plot			-20 dBc		
Middle		23.20	24 dBm		Operating frequency
See plot			-20 dBc		
Highest		23.08	24 dBm		Operating frequency
See plot			-20 dBc		

Plots Table 1:

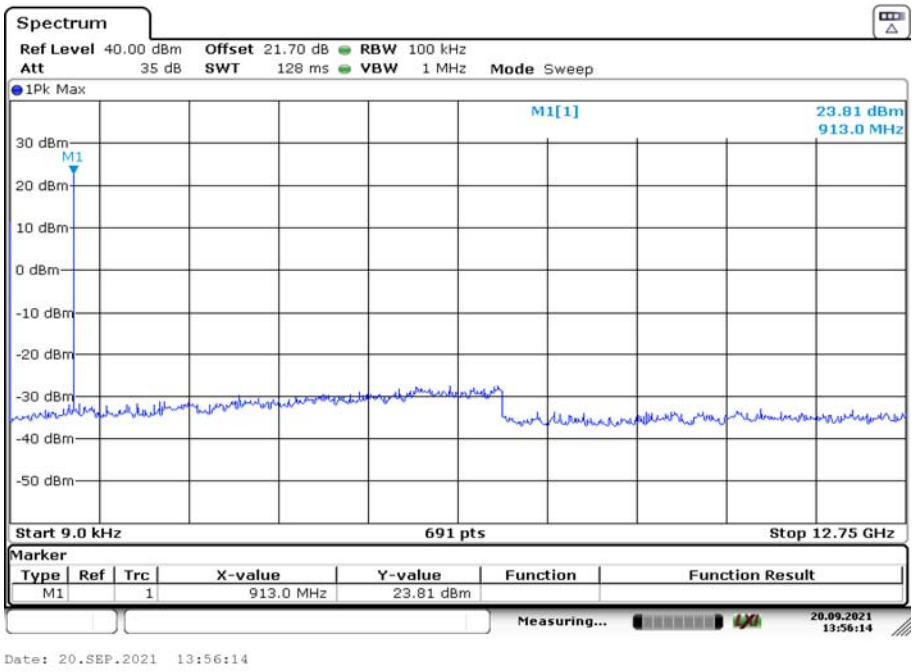
Plot 1: Low channel, 9 kHz – 12.75 GHz



Plot 2: Middle channel, 9 kHz – 12.75 GHz

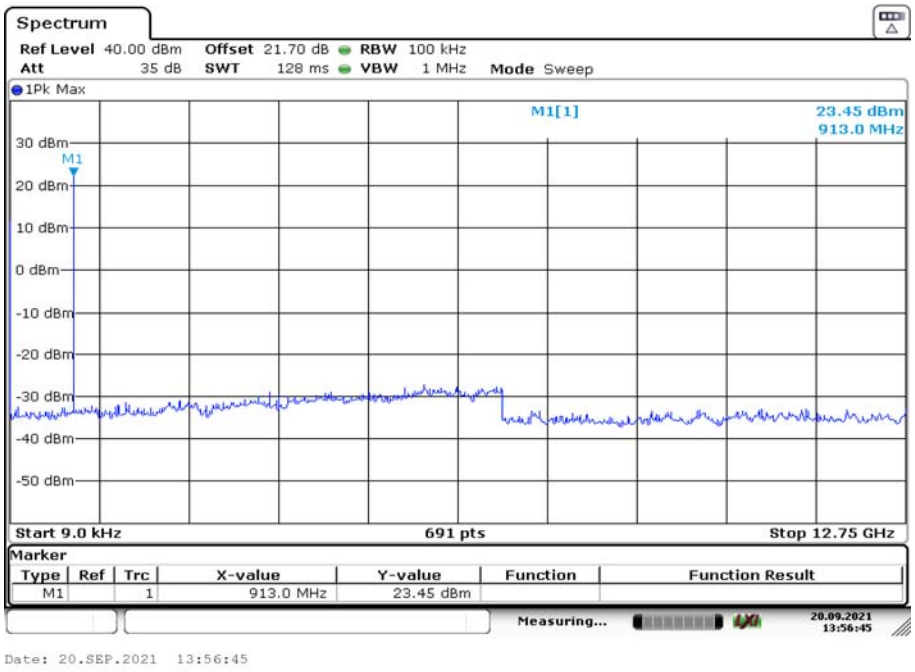


Plot 3: High channel, 9 kHz – 12.75 GHz

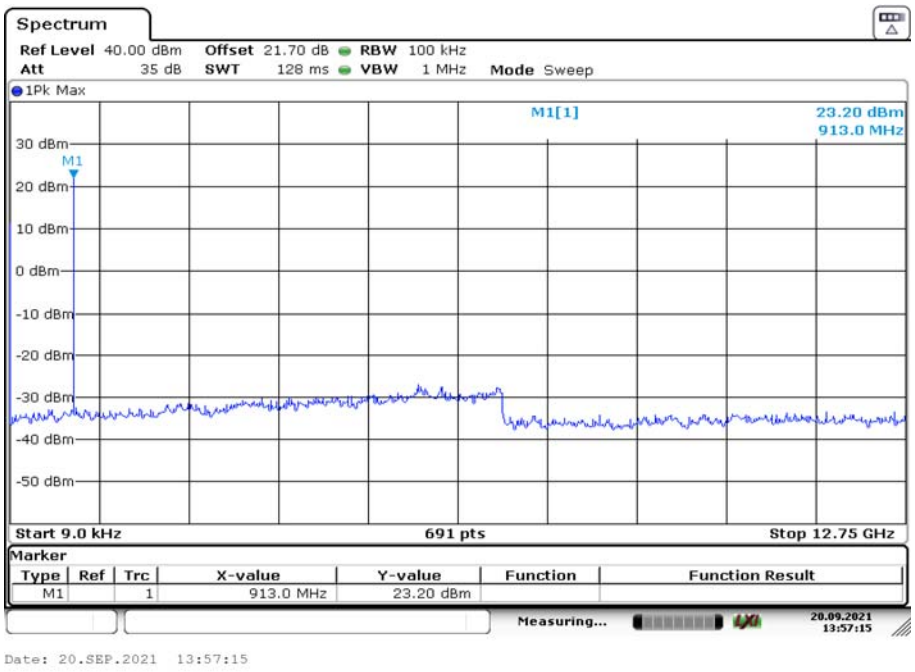


Plots Table 2:

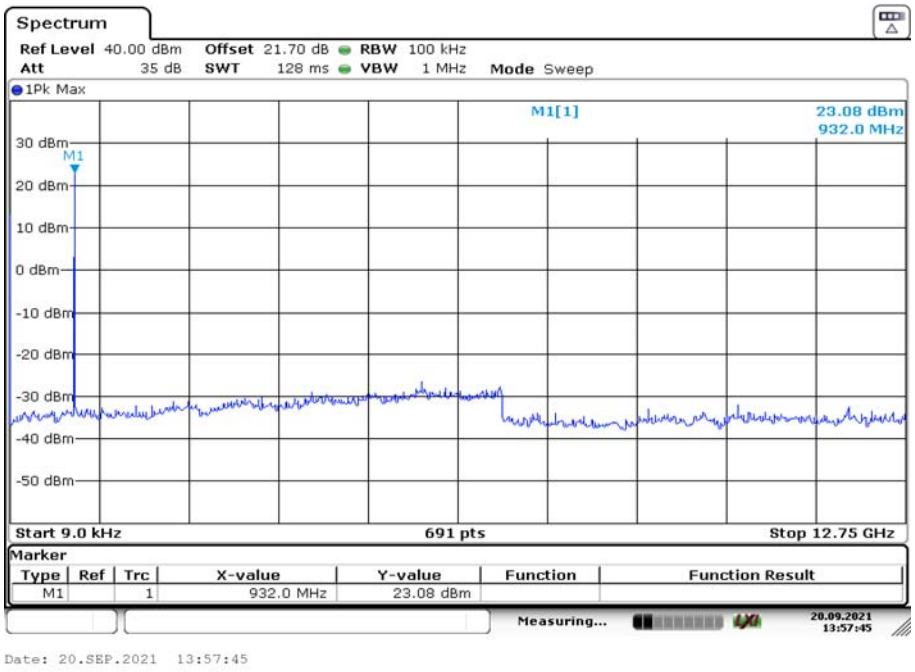
Plot 1: Low channel, 9 kHz – 12.75 GHz



Plot 2: Middle channel, 9 kHz – 12.75 GHz



Plot 3: High channel, 9 kHz – 12.75 GHz



12.9 Spurious Emissions Radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to single channel mode and the transmit channels are 00; 39 and 78. The measurement is performed in the mode with the highest output power. The limits are recalculated to a measurement distance of 3 m according the ANSI C63.10.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.2 B
Measurement uncertainty:	See chapter 9

Limits:

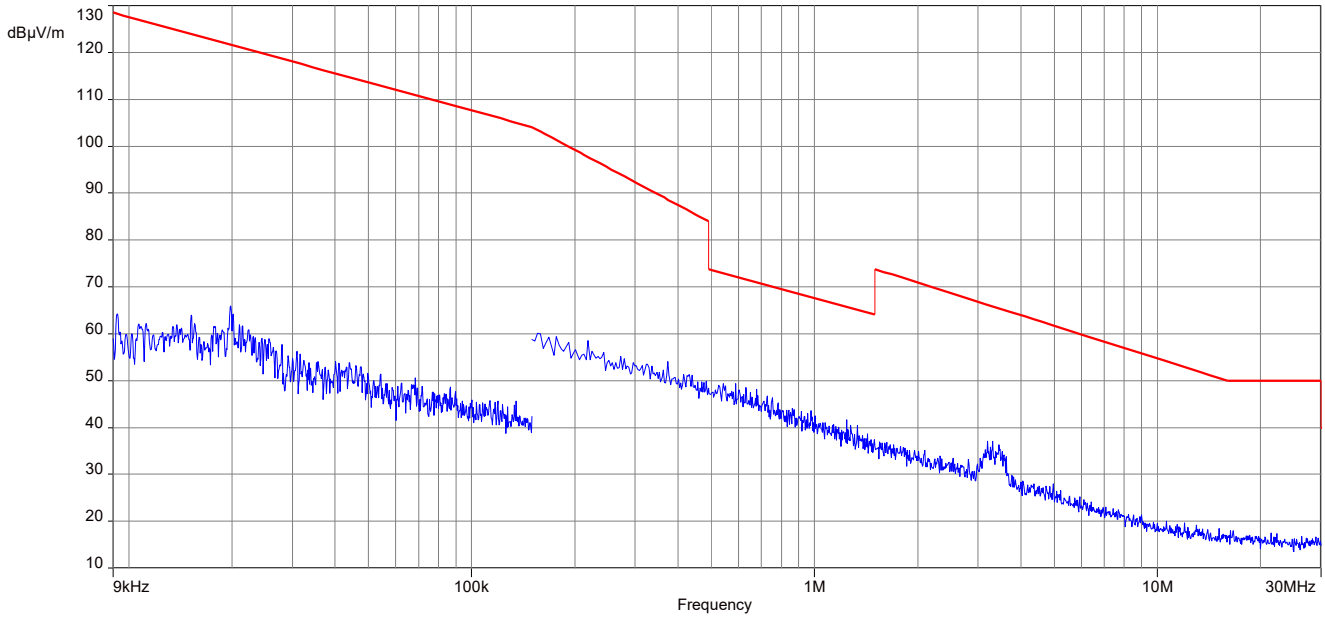
FCC		
TX spurious emissions radiated < 30 MHz		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Result:

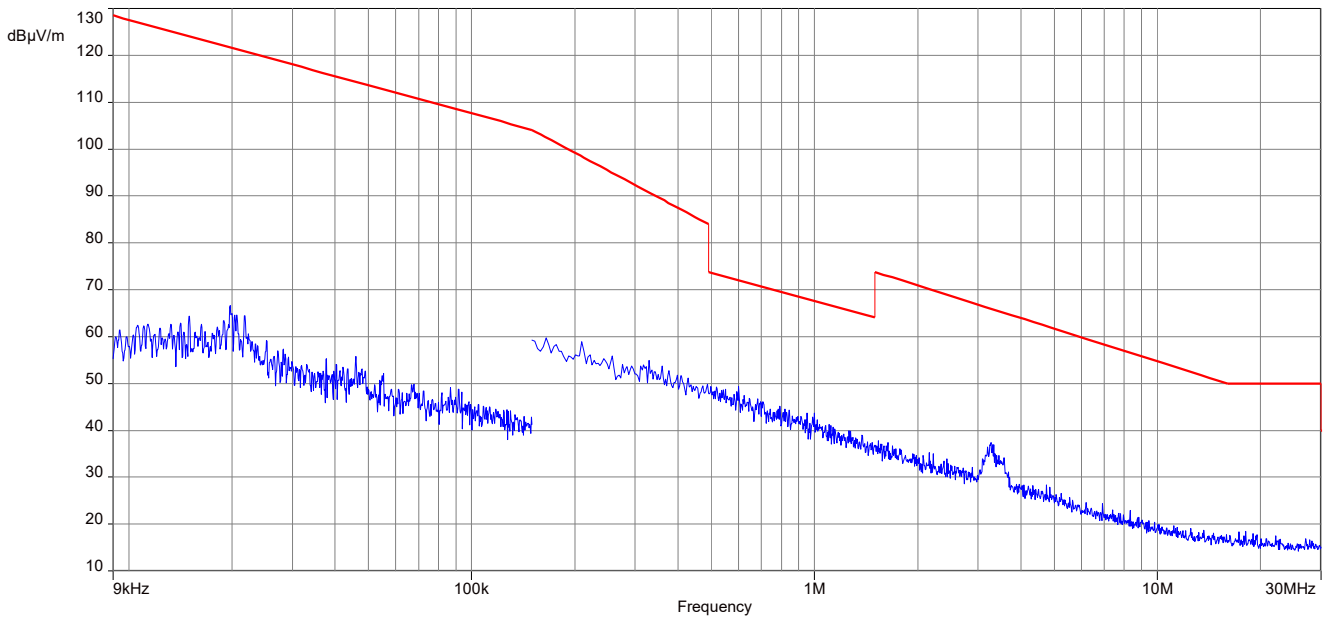
SPURIOUS EMISSIONS LEVEL [dBµV/m]								
Lowest channel			Middle channel			Highest channel		
Frequency [MHz]	Detector	Level [dBµV/m]	Frequency [MHz]	Detector	Level [dBµV/m]	Frequency [MHz]	Detector	Level [dBµV/m]
All emissions were more than 10 dB below the limit.								

Plots Table 1:

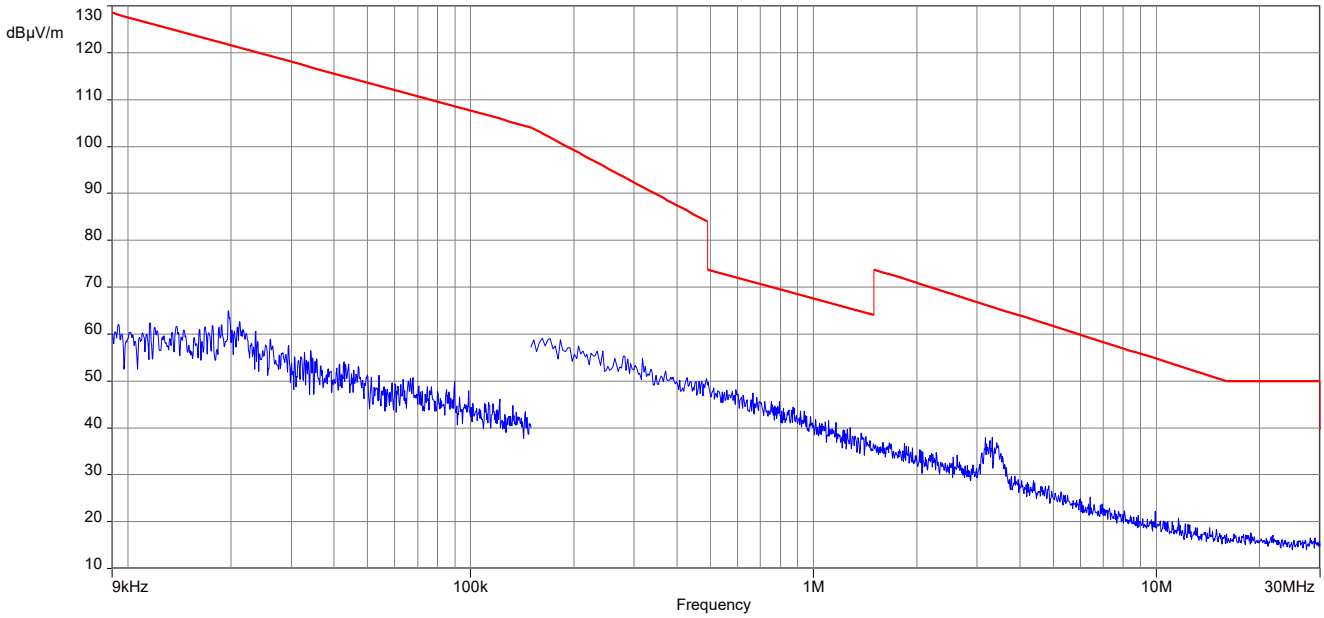
Plot 1: TX-Mode low channel



Plot 2: TX-Mode mid channel

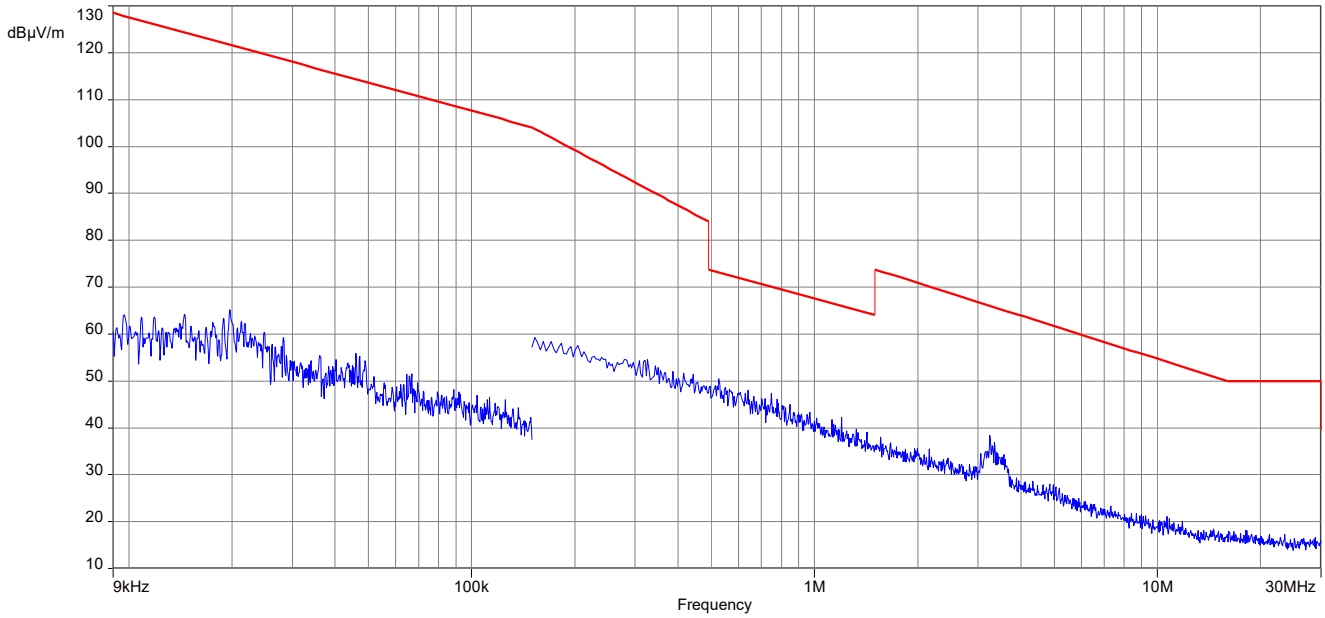


Plot 3: TX-Mode high channel

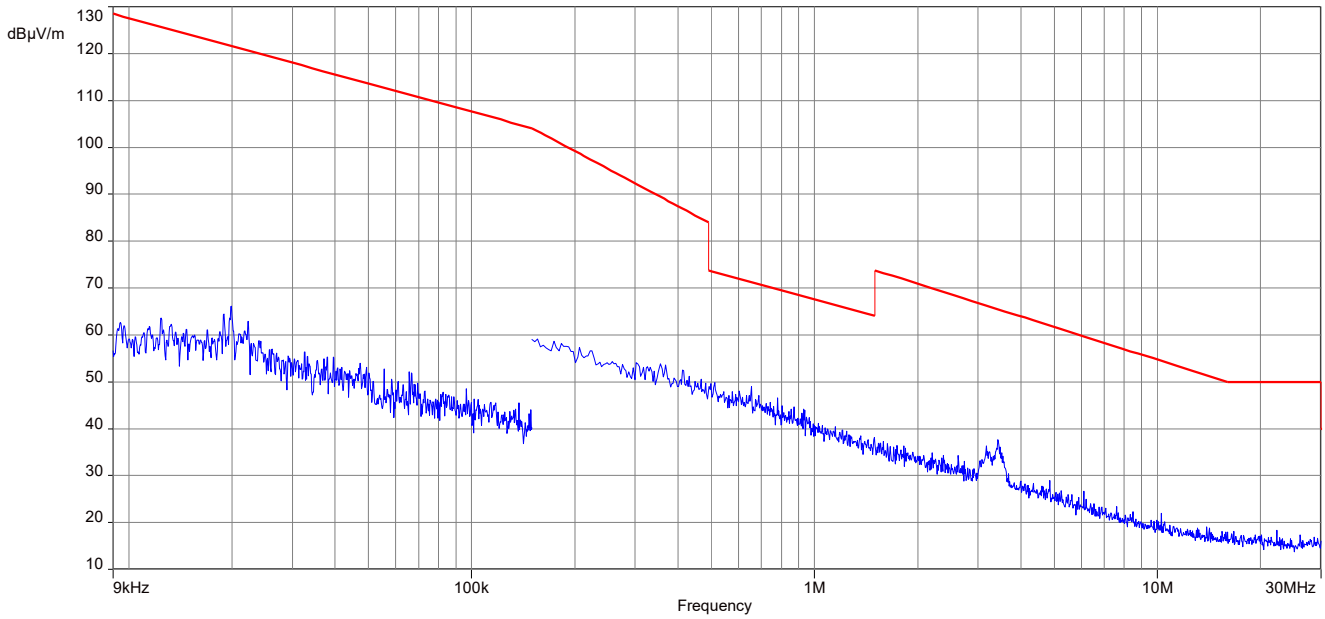


Plots Table 2:

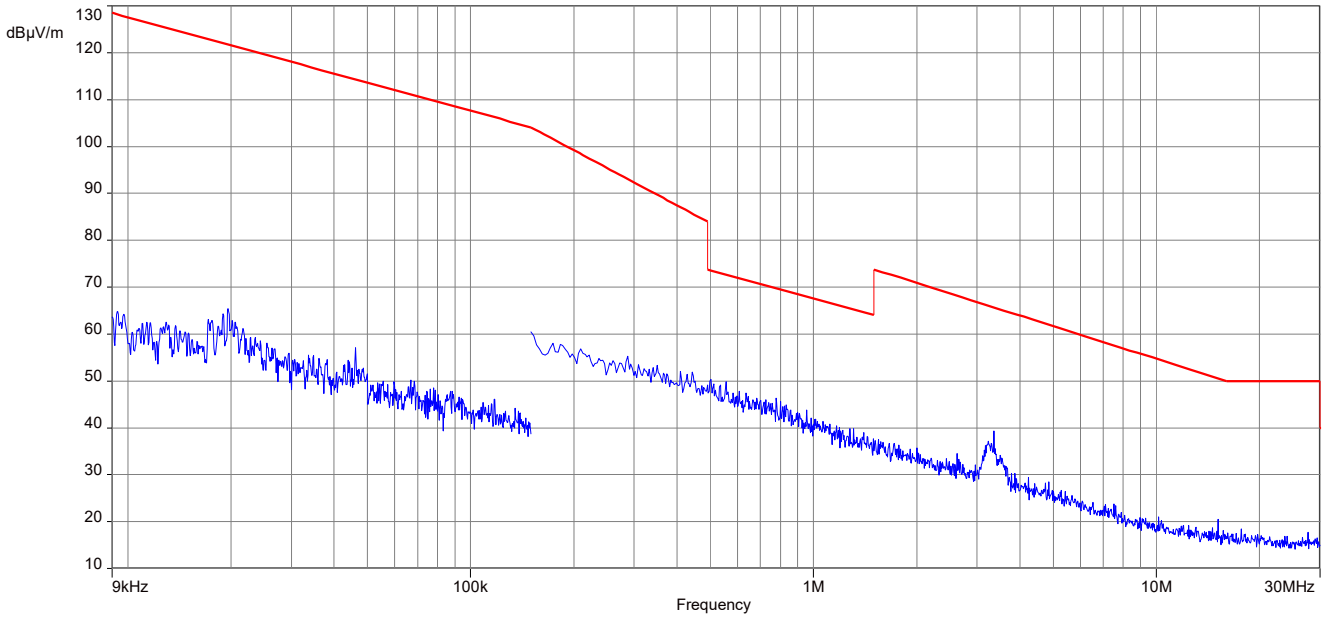
Plot 1: TX-Mode low channel



Plot 2: TX-Mode mid channel



Plot 3: TX-Mode high channel



12.10 Spurious Emissions Radiated > 30 MHz

12.10.1 Spurious emissions radiated 30 MHz to 1 GHz

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at channel low, mid and high.

Measurement:

Measurement parameters	
Detector	Peak / Quasi Peak
Sweep time	Auto
Resolution bandwidth	3 x VBW
Video bandwidth	120 kHz
Span	30 MHz to 1 GHz
Trace mode	Max hold
Measured modulation	DBPSK
Test setup	See sub clause 7.1 A
Measurement uncertainty	See sub clause 9

Limits:

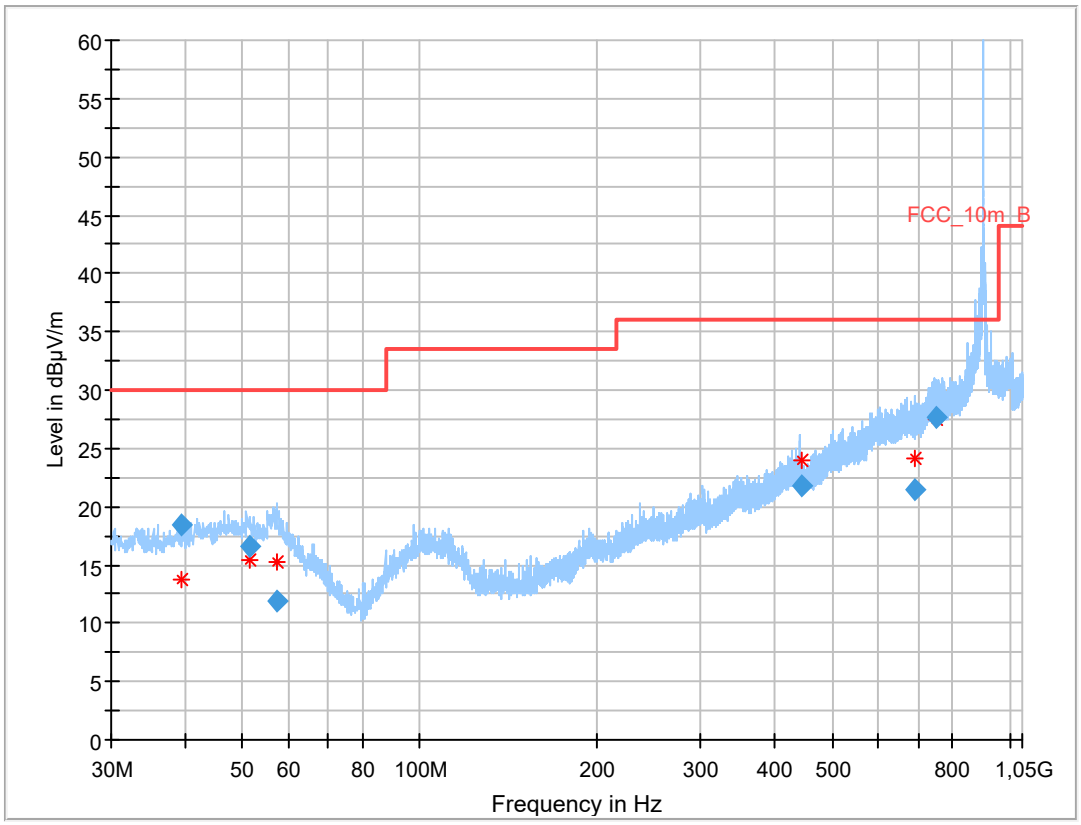
FCC		
Band-edge Compliance of conducted and radiated emissions		
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Result:

See result table below the plots.

Plots Table 1:

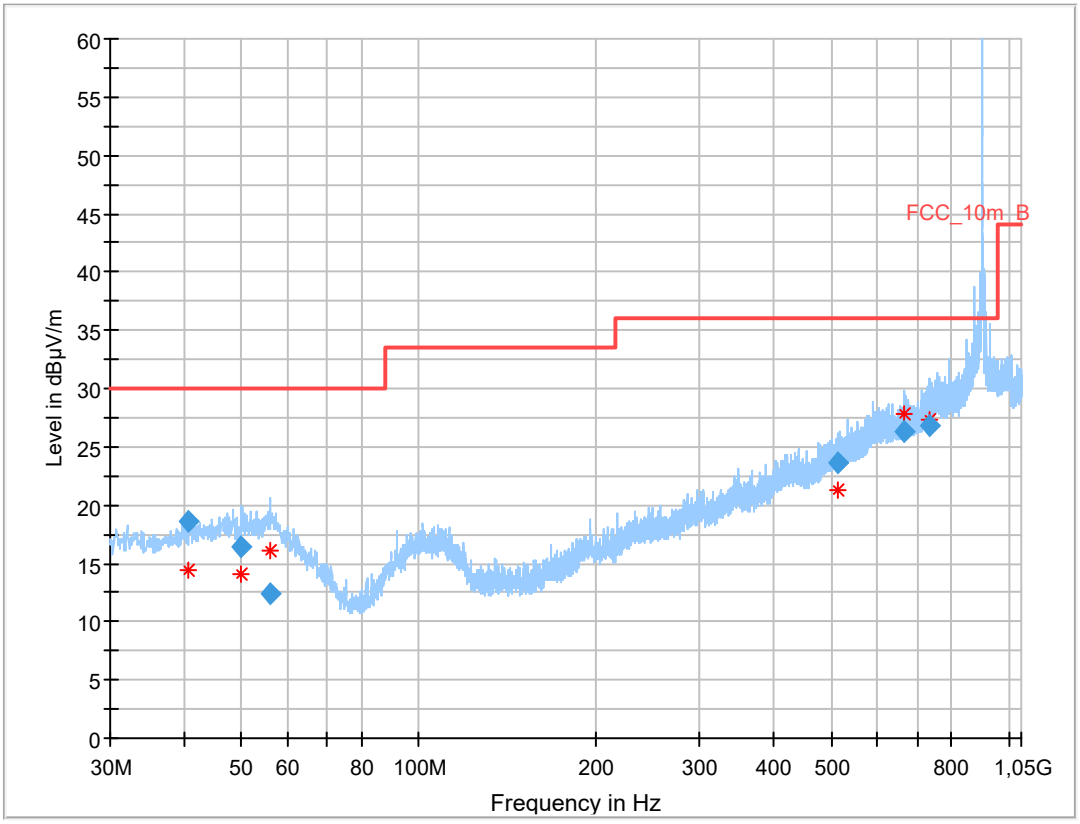
Plot 1: 30 MHz – 1 GHz, horizontal & vertical polarisation (lowest channel)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
39.557	18.38	30.0	11.6	1000	120.0	170.0	H	275	14
51.476	16.51	30.0	13.5	1000	120.0	170.0	H	157	15
57.517	11.95	30.0	18.1	1000	120.0	126.0	H	157	15
442.566	21.78	36.0	14.2	1000	120.0	170.0	V	157	19
691.407	21.50	36.0	14.5	1000	120.0	170.0	V	67	22
750.252	27.58	36.0	8.4	1000	120.0	110.0	H	-22	24

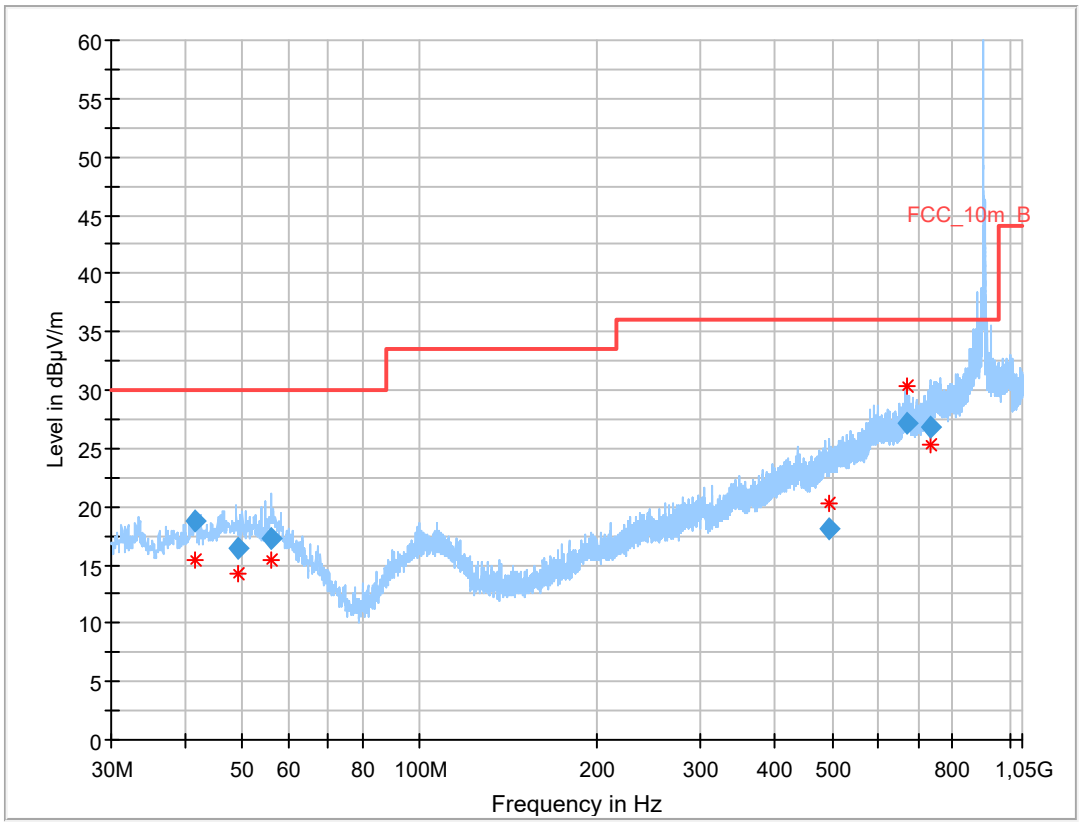
Plot 2: 30 MHz – 1 GHz, horizontal & vertical polarisation (middle channel)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
40.609	18.53	30.0	11.5	1000	120.0	170.0	H	264	14
49.834	16.44	30.0	13.6	1000	120.0	170.0	H	292	15
56.131	12.48	30.0	17.5	1000	120.0	170.0	H	157	16
512.380	23.65	36.0	12.4	1000	120.0	170.0	V	67	20
666.874	26.24	36.0	9.8	1000	120.0	98.0	H	-14	22
735.316	26.86	36.0	9.1	1000	120.0	142.0	H	178	23

Plot 3: 30 MHz – 1 GHz, horizontal & vertical polarisation (highest channel)

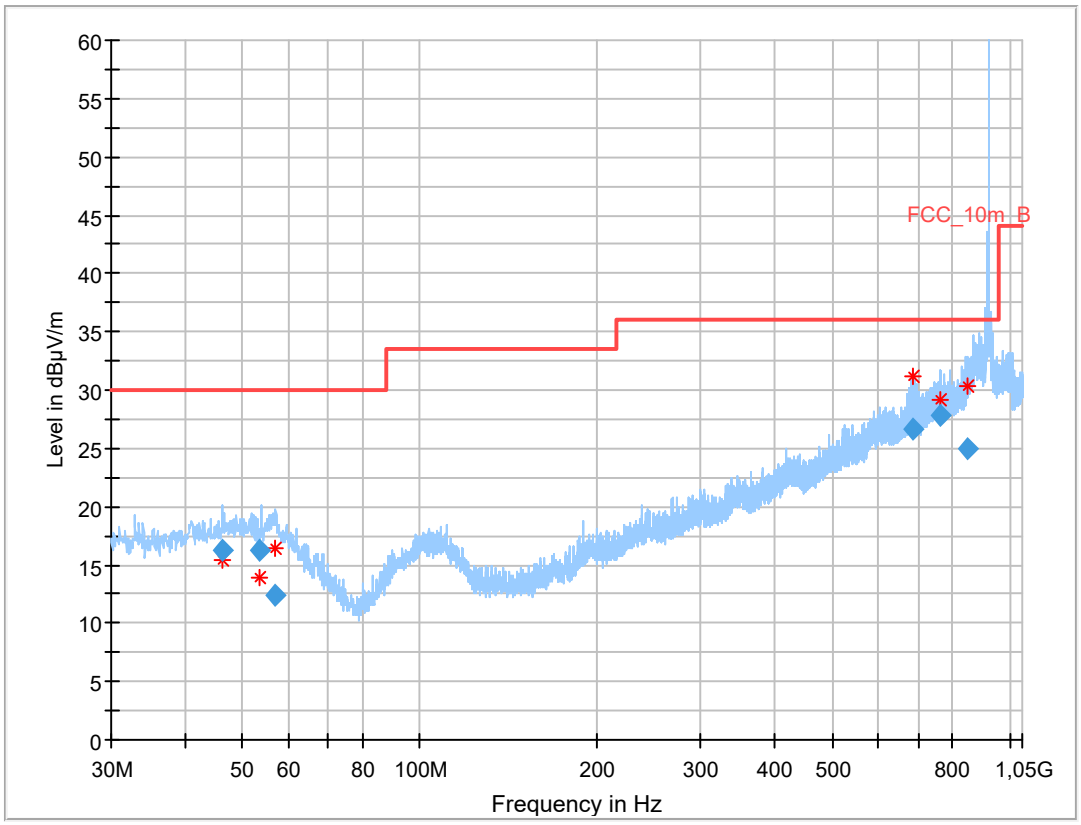


Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
41.768	18.70	30.0	11.3	1000	120.0	98.0	V	202	15
49.094	16.40	30.0	13.6	1000	120.0	170.0	V	112	15
55.813	17.33	30.0	12.7	1000	120.0	113.0	H	-22	16
495.342	18.17	36.0	17.8	1000	120.0	170.0	V	157	20
670.665	27.09	36.0	8.9	1000	120.0	109.0	H	181	22
735.285	26.78	36.0	9.2	1000	120.0	109.0	V	67	23

Plots Table 2:

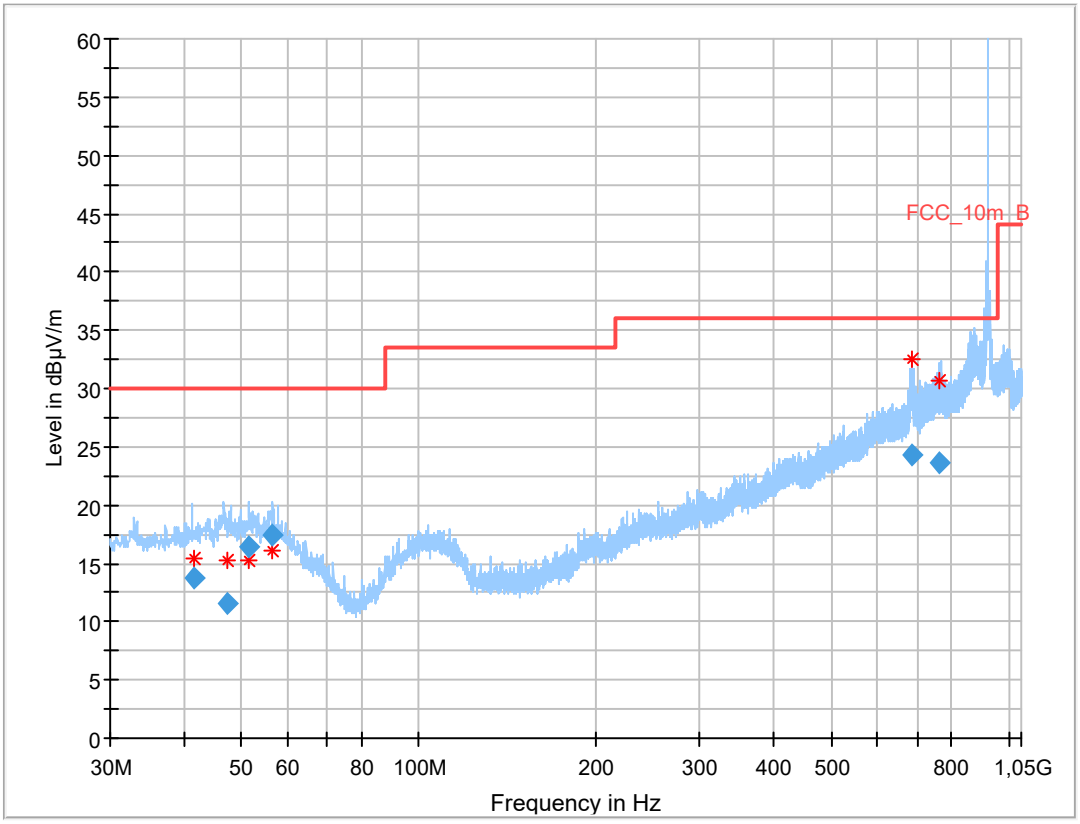
Plot 1: 30 MHz – 1 GHz, horizontal & vertical polarisation (lowest channel)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
46.342	16.26	30.0	13.7	1000	120.0	170.0	H	2	15
53.419	16.27	30.0	13.7	1000	120.0	170.0	V	159	15
56.778	12.41	30.0	17.6	1000	120.0	110.0	V	93	16
687.199	26.66	36.0	9.3	1000	120.0	142.0	H	-17	22
760.091	27.79	36.0	8.2	1000	120.0	105.0	H	15	24
846.417	24.93	36.0	11.1	1000	120.0	116.0	H	157	25

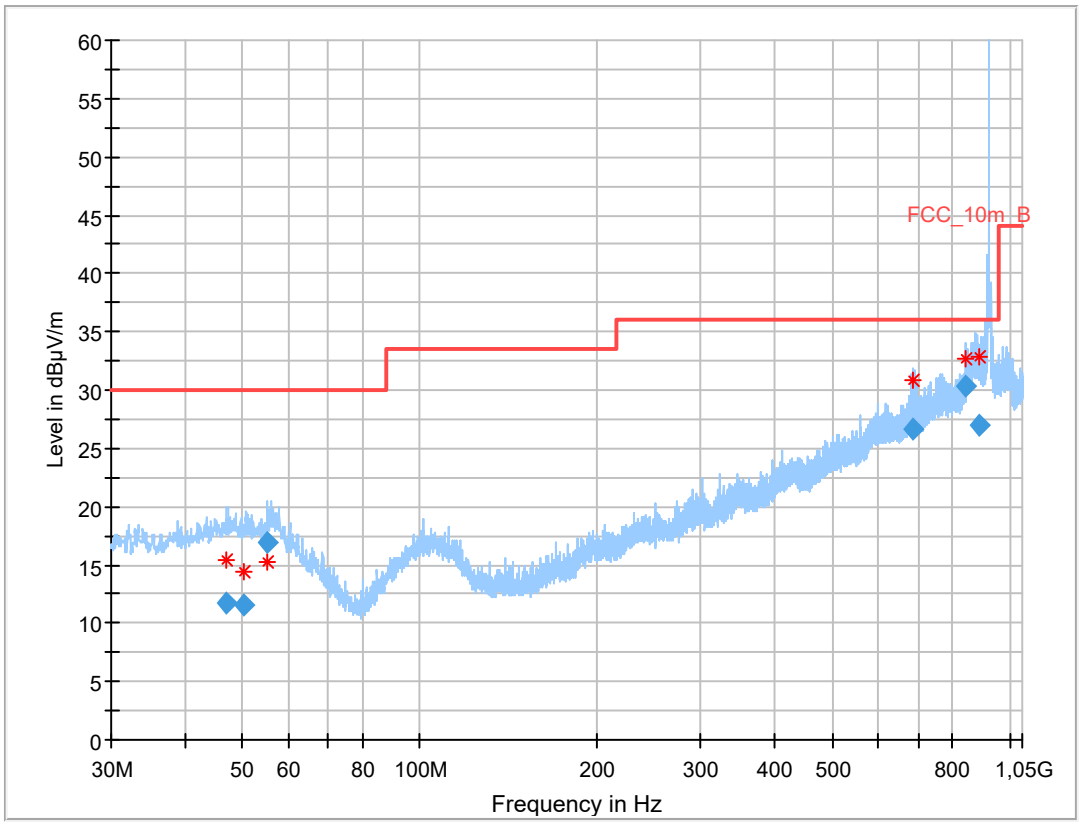
Plot 2: 30 MHz – 1 GHz, horizontal & vertical polarisation (middle channel)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
41.756	13.80	30.0	16.2	1000	120.0	170.0	H	165	15
47.219	11.52	30.0	18.5	1000	120.0	144.0	H	-22	15
51.585	16.48	30.0	13.5	1000	120.0	170.0	V	112	15
56.264	17.38	30.0	12.6	1000	120.0	170.0	V	15	16
687.422	24.30	36.0	11.7	1000	120.0	170.0	H	170	22
765.454	23.70	36.0	12.3	1000	120.0	132.0	H	-12	24

Plot 3: 30 MHz – 1 GHz, horizontal & vertical polarisation (highest channel)



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
47.046	11.66	30.0	18.3	1000	120.0	104.0	V	248	15
50.391	11.57	30.0	18.4	1000	120.0	170.0	V	22	15
55.357	16.94	30.0	13.1	1000	120.0	98.0	V	157	16
684.676	26.58	36.0	9.4	1000	120.0	112.0	H	158	22
844.665	30.32	36.0	5.7	1000	120.0	123.0	H	-21	25
888.746	26.93	36.0	9.1	1000	120.0	101.0	H	157	25

12.10.2 Spurious emissions radiated above 1 GHz

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed in the mode with the highest output power.

Measurement parameters	
Detector	Peak / RMS
Sweep time	Auto
Resolution bandwidth	1 MHz
Video bandwidth	3 x RBW
Span	1 GHz to 26 GHz
Trace mode	Max hold
Measured modulation	DBPSK
Test setup	See sub clause 7.2 C (1 GHz – 12.75 GHz)
Measurement uncertainty	See sub clause 8

The modulation with the highest output power was used to perform the transmitter spurious emissions. If spurious were detected a re-measurement was performed on the detected frequency with each modulation.

Limits:

ANSI C63.10
The average emission shall be determined by using Video averaging (VBW = 10 Hz). If the dwell time of the hopping signal is less than 100 ms (per channel), the VBW=10 Hz reading may be adjusted by a factor: F = 20log (dwell time/100 ms)

FCC		
TX spurious emissions radiated		
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
§15.209		
Frequency (MHz)	Field strength (dBµV/m)	Measurement distance
Above 960	54.0	3

Result:

For radiated spurious emission the limits of 15.209 applies for all frequencies mentioned in 15.205. According to FCC Public Notice DA 00-705 (ANSI C63.10) the average emission shall be determined by using Video averaging (VBW = 10 Hz). If the dwell time of the hopping signal is less than 100 ms (per channel), the VBW=10 Hz reading may be adjusted by a factor:

F = 20*log (dwell time/100 ms)

One pulse train is higher than 100 ms so the correction factor is 0 (see plots in chapter 12.4)

Table 1:

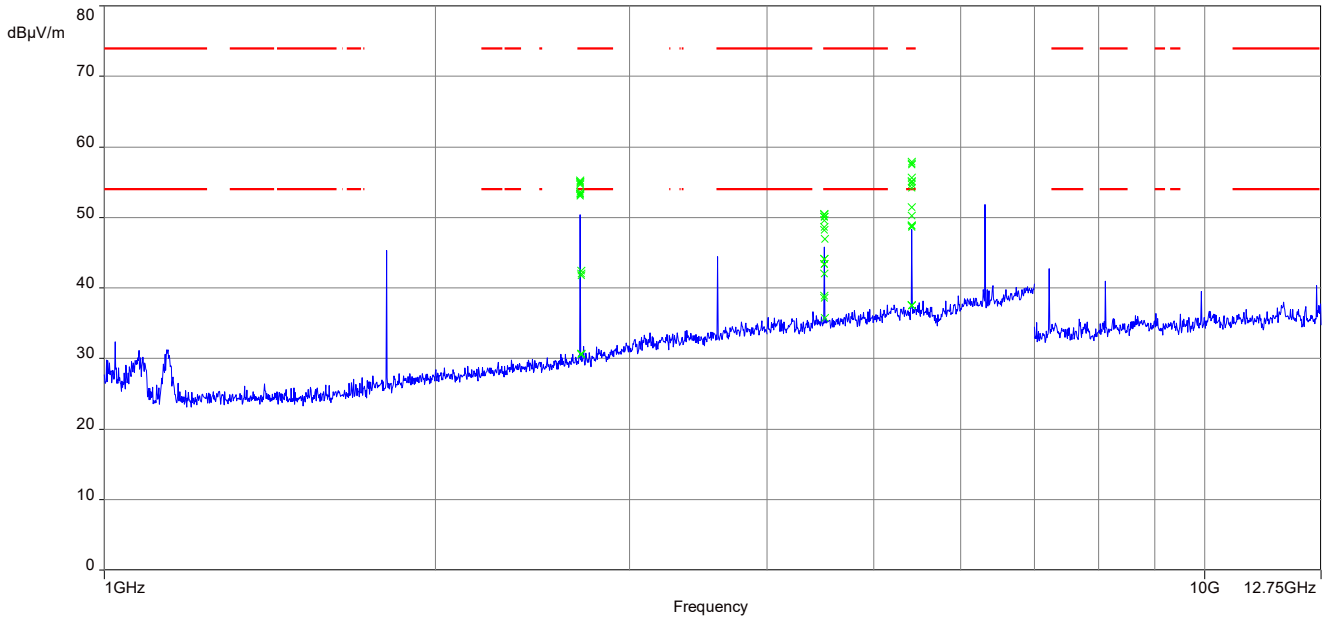
TX spurious emissions radiated [dBµV/m]								
Lowest channel			Middle channel			Highest channel		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
2711	Peak	55.3	2715	Peak	55.3	2714	Peak	55.1
	AVG	41.2		AVG	43.6		AVG	43.5
4515	Peak	50.5	5420	Peak	57.4	5433	Peak	58.5
	AVG	38.7		AVG	46.8		AVG	47.1
5418	Peak	57.9		Peak		8142	Peak	53.6
	AVG	46.7		AVG			AVG	42.0

Table 2:

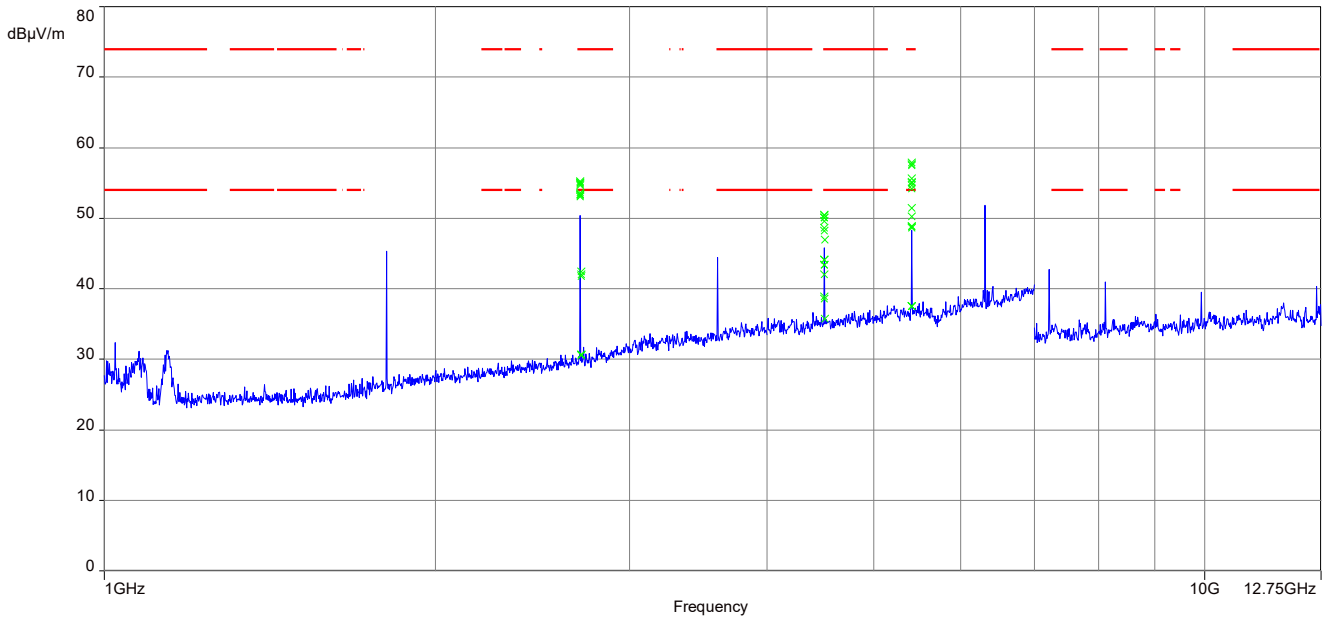
TX spurious emissions radiated [dBµV/m]								
Lowest channel			Middle channel			Highest channel		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
2765	Peak	54.1	2769	Peak	54.0	2773	Peak	53.1
	AVG	41.3		AVG	46.1		AVG	41.8
4601	Peak	60.6	8297	Peak	51.5	3696	Peak	52.8
	AVG	49.0		AVG	40.2		AVG	39.2
	Peak			Peak		4613	Peak	60.4
	AVG			AVG			AVG	48.7

Plots table 1:

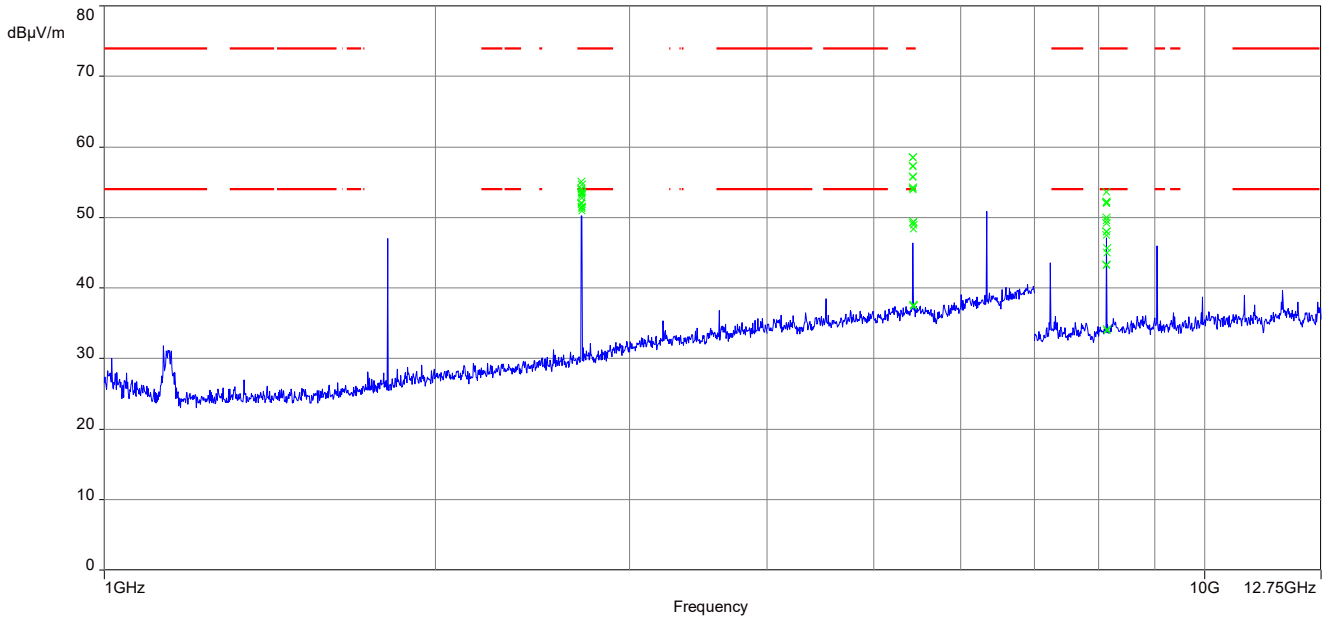
Plot 1: 1 GHz – 12.75 GHz, horizontal & vertical polarisation (lowest channel)



Plot 2: 1 GHz – 12.75 GHz, horizontal & vertical polarisation (middle channel)

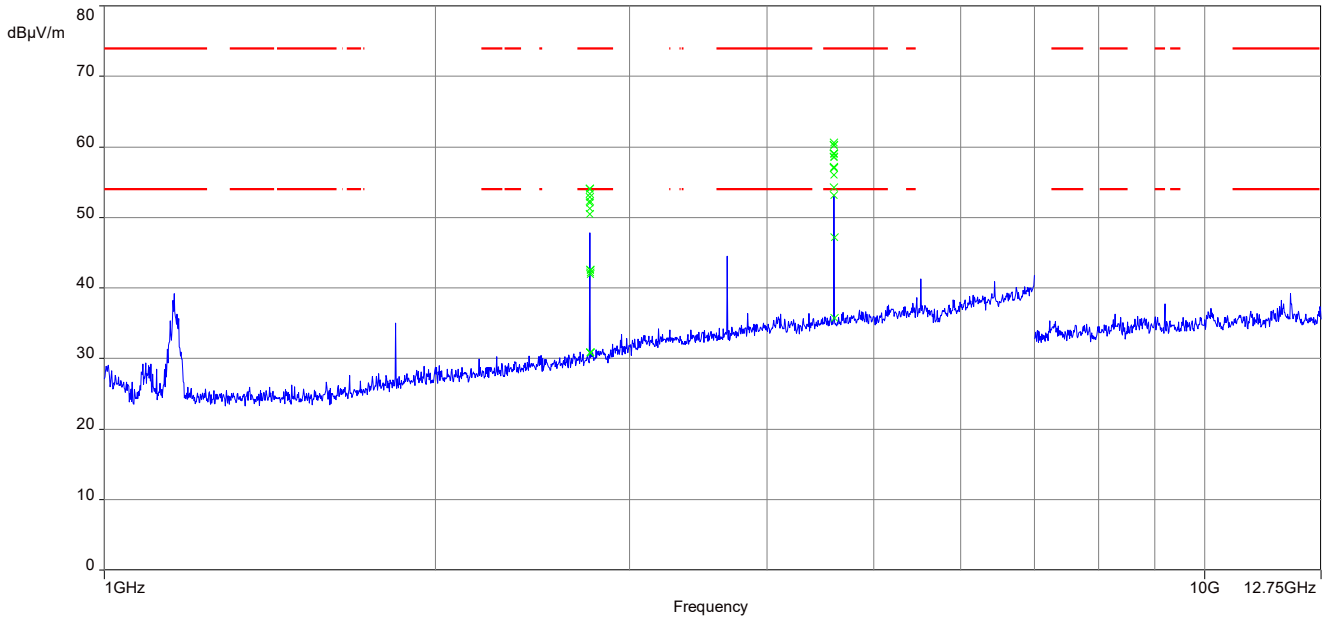


Plot 3: 1 GHz – 12.75 GHz, horizontal & vertical polarisation (highest channel)

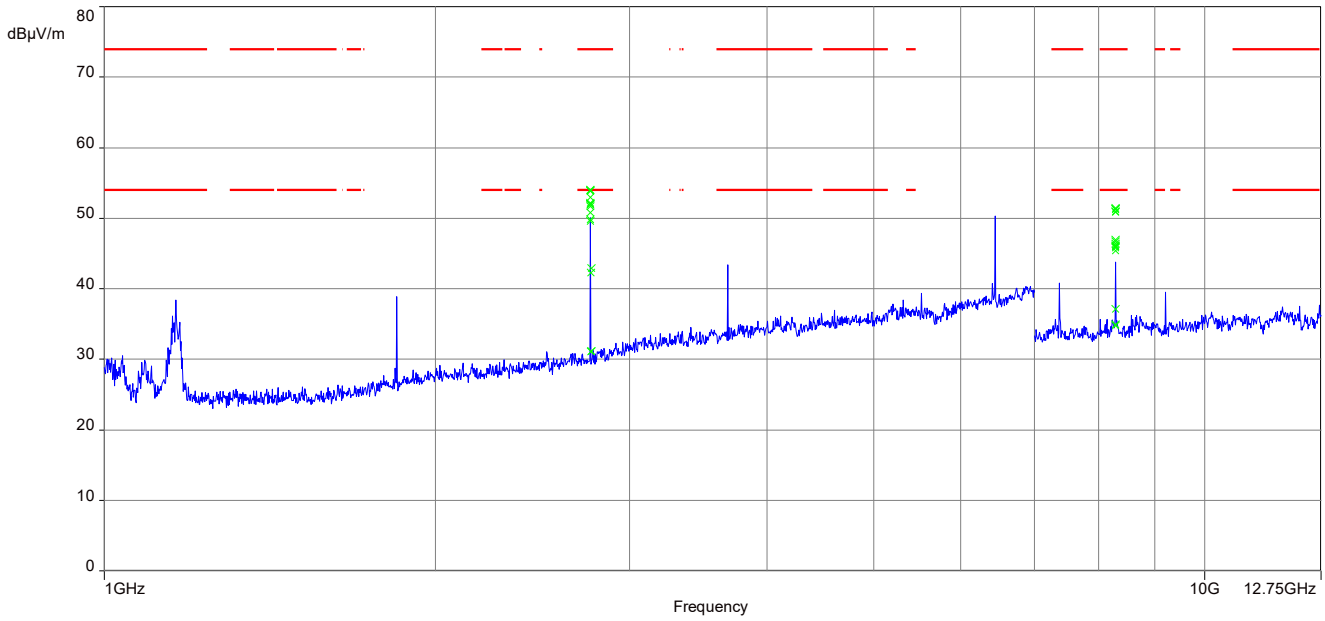


Plots table 2:

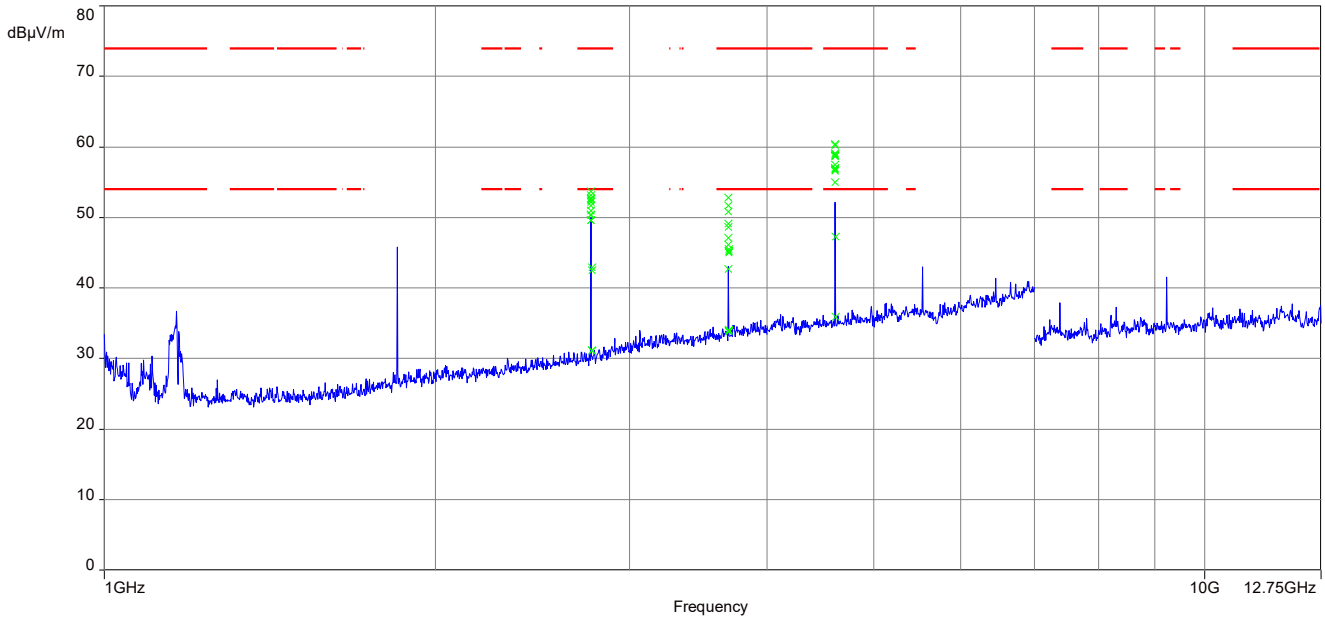
Plot 1: 1 GHz – 12.75 GHz, horizontal & vertical polarisation (lowest channel)



Plot 2: 1 GHz – 12.75 GHz, horizontal & vertical polarisation (middle channel)



Plot 3: 1 GHz – 12.75 GHz, horizontal & vertical polarisation (highest channel)



13 Observations

No observations except those reported with the single test cases have been made.

14 Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N_0	Carrier to noise-density ratio, expressed in dB-Hz

15 Document history

Version	Applied changes	Date of release
-/-	Initial release	2021-09-30
-A	Unit of antenna gain corrected HW/FW status added	2021-10-01

16 Accreditation Certificate – D-PL-12076-01-04

first page	last page
	

Note: The current certificate annex is published on the websites (link see below).

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04.pdf

or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-04_Canada_TCEMC.pdf

################################## END OF TEST REPORT ##################################