
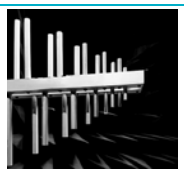
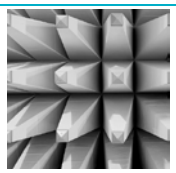

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

TEST REPORT

Test report no.: 1-8460/19-01-03-B

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-03

Testing laboratory

CTC advanced GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.ctcadvanced.com
e-mail: mail@ctcadvanced.com

Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-03

Applicant

Sennheiser electronic GmbH & Co. KG
Am Labor 1
30900 Wedemark / GERMANY
Phone: +49 5130 600-0
Contact: Volker Bartsch
e-mail: volker.bartsch@sennheiser.com
Phone: +49 5130 600 1465

Manufacturer

Sennheiser electronic GmbH & Co. KG
Am Labor 1
30900 Wedemark / GERMANY

Test standard/s

FCC - Title 47 CFR Part 74	FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 74 - Experimental radio, auxiliary, special broadcast and other program distributional services
RSS - 210 Issue 9	Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment

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

Test Item

Kind of test item:	**UHF Wireless Microphone**
Model name:	**SKM 100 G4, SKM 100 S G4, SKM 300 G4, SKM 500 G4**
FCC ID:	**DMOSKM1574**
IC:	**2099A-SKM1574**
Frequency:	470 MHz to 608 MHz
Technology tested:	Proprietary
Antenna:	Integrated antenna
Power supply:	2.55 V to 3.45 V DC by 2 x AA batteries
Temperature range:	-30°C to +50°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
2019.08.19 15:04:20 +02'00'

Christoph Schneider
Lab Manager
Radio Communications & EMC

Test performed:

Sumit Kumar

cn=Sumit Kumar, o=CTC Advanced GmbH, ou=KUM-190228, email=sumit.kumar@ctcadvanced.com, c=DE
2019.08.19 14:01:45 +02'00'

Sumit Kumar
Testing Manager
Radio Communications & EMC

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 1-8460/19-01-03-A and dated 2019-06-18

2.2 Application details

Date of receipt of order:	2019-05-28
Date of receipt of test item:	2019-05-28
Start of test:	2019-05-29
End of test:	2019-05-31
Person(s) present during the test:	-/-

2.3 Test laboratories sub-contracted

None

3 Test standard/s and references

Test standard	Date	Description
FCC - Title 47 CFR Part 74		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 74 - Experimental radio, auxiliary, special broadcast and other program distributional services
RSS - 210 Issue 9	August 2016	Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment

Guidance	Version	Description
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

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+23 °C during room temperature tests +50 °C during high temperature tests -30 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		1021 hpa
Power supply	:	V_{nom} V_{max} V_{min}	3.00 V DC by 2 x AA batteries 3.45 V 2.55 V

5 Test item

5.1 General description

Kind of test item	:	UHF Wireless Microphone
Type identification	:	SKM 100 G4, SKM 100 S G4, SKM 300 G4, SKM 500 G4
HMN	:	-/-
PMN	:	ewG4
HVIN	:	SKM 100 G4, SKM 100 S G4, SKM 300 G4, SKM 500 G4
FVIN	:	1.1.2
S/N serial number	:	Band Aw+: 1347000010 Band Gw1: 1347000010
Hardware status	:	1.1.0
Software status	:	525529_19
Frequency band	:	470 MHz to 608 MHz Band Aw+: 470 MHz to 558 MHz also available as sub-bands A1: 470 MHz to 516 MHz A: 516 MHz to 558 MHz AS: 520 MHz to 558 MHz Band Gw1: 558 MHz to 608 MHz also available as sub-band G: 566 MHz to 608 MHz
Type of radio transmission Use of frequency spectrum	: :	Modulated carrier
Type of modulation	:	Analog FM
Number of channels	:	-/-
Antenna	:	Integrated antenna
Power supply	:	2.55 V to 3.45 V DC by 2 x AA batteries
Temperature range	:	-30°C to +50°C

5.2 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: 1-6614/18-01-04_AnnexA
1-6614/18-01-04_AnnexB
1-6614/18-01-04_AnnexC

6 Description of the test setup

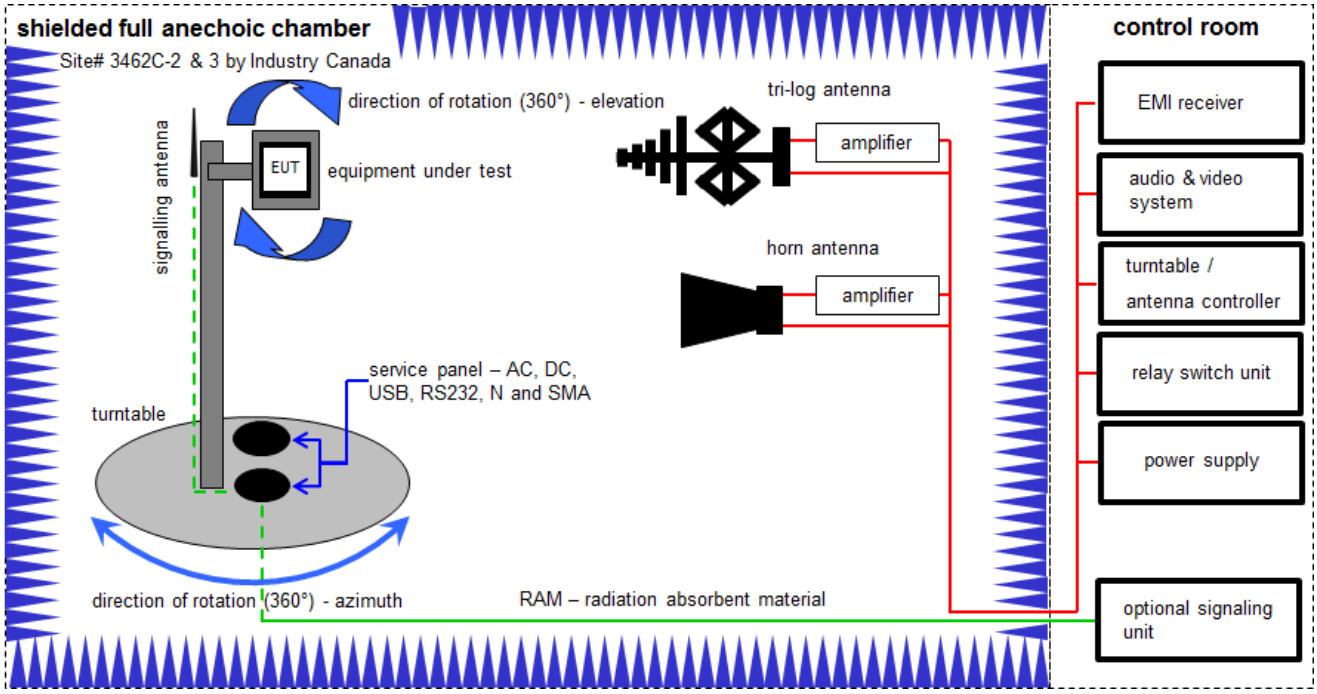
Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements 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).

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

6.1 Shielded fully anechoic chamber



Measurement distance: tri-log antenna and horn antenna 3 meter

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)

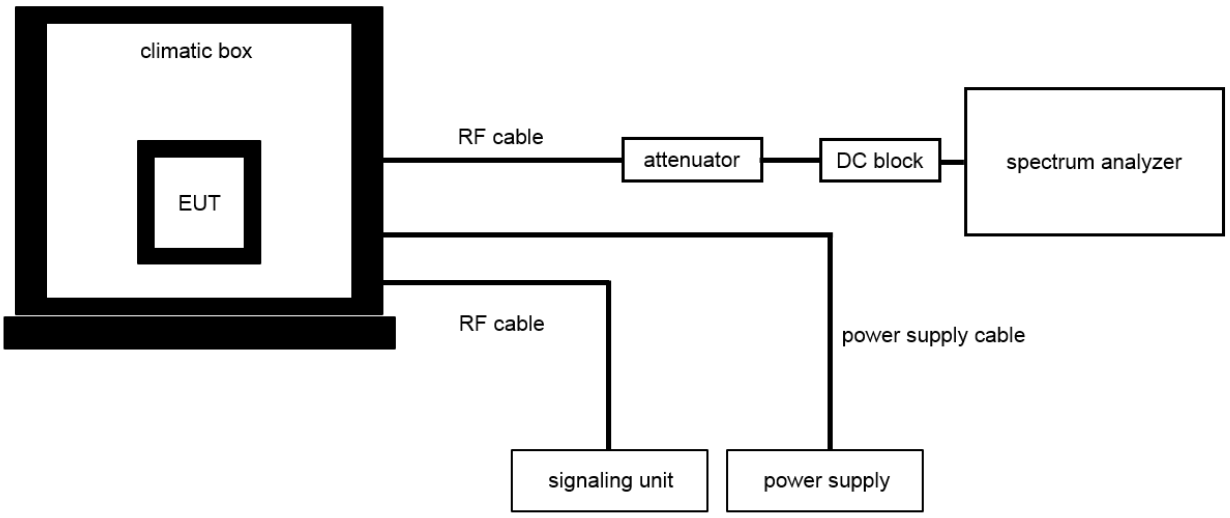
Example calculation:
OP [dBm] = -65.0 [dBm] + 50 [dB] - 20 [dBi] + 5 [dB] = -30 [dBm] (1 µW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3089	300000307	vlKl!	07.07.2017	06.07.2019
2	A,B	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	A,B.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev	-/-	-/-
4	A,B.	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	14.09.2018	13.12.2019
5	A,B.	Broadband Amplifier 5-13 GHz	CBLU5135235	CERNEX	22010	300004491	ev	-/-	-/-
6	A,B.	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
7	A,B	NEXIO EMV-Software	BAT EMC V3.16.0.49	EMCO		300004682	ne	-/-	-/-
8	A,B	PC	ExOne	F+W		300004703	ne	-/-	-/-
9	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	01029	300005379	vlKl!	07.04.2017	06.04.2020

6.2 Conducted measurements normal and extreme conditions

Conducted measurements normal & extreme 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.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	DC Power Supply, 60V, 10A	6038A	HP	3122A11097	300001204	vIKI!	12.12.2017	11.12.2020
2	A	Signal- and Spectrum Analyzer	FSW26	R&S	101455	300004528	k	19.12.2018	18.12.2019
3	A	RF-Cable SRD021 No. 3	Enviroflex 316 D	Huber & Suhner		400001313	ev	-/-	-/-
4	A	RF-Cable SRD021 No. 4	Enviroflex 316 D	Huber & Suhner		400001314	ev	-/-	-/-
5	A	Climatic Box	VT 4011	Voetsch Industrietechnik	5856623060001 0	300005363	ev	07.05.2018	06.05.2020

7 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Transmitter output power	± 3 dB
Occupied bandwidth	± 3 kHz to 10 kHz (depends on the used RBW)
Transmitter frequency stability	± 1 Hz to 1 kHz (depends on the used RBW)
Transmitter unwanted emissions (radiated or conducted)	Radiated: ± 3 dB Conducted: ± 0.5 dB
Modulation characteristics	-/-
Necessary bandwidth (BN) for analogue systems	± 1 kHz (depends on the used RBW)
Frequency modulation	± 3 kHz (depends on the used RBW)
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB

8 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	FCC Part 74 RSS - 210, Issue 9 RSS-Gen Issue 4	See table!	2019-08-19	-/-

Test specification clause	Test case	Temperature conditions	Voltage conditions	C	NC	NA	NP	Remark
FCC Part 74.861 (e)(1)(ii) FCC Part 2.1046) RSS-210 – G.3.1 RSS-Gen – 6.12	Transmitter output power	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC Part 74.861 (e)(5) FCC Part 2.1049 RSS-210 – G.3.2 RSS-Gen – 6.6	**Occupied bandwidth**	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC Part 74.861 (e)(4) FCC Part 2.1055 RSS-210 – G.3.3 RSS-Gen – 6.11	Transmitter frequency stability	Nominal	Nominal	☒	☐	☐	☐	-/-
		Extreme	Extreme	☒	☐	☐	☐	
FCC Part 74.861 (e)(6) FCC Part 74.861 (e)(7) RSS-210 – G.3.4 ETSI EN 300 422-1 v1.4.2 (2011-08)	Transmitter unwanted emissions (radiated or conducted)	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC Part 2.1047	Modulation characteristics	Nominal	Nominal	-/-				-/-
FCC Part 74.861 (e)(7) ETSI EN 300 422-1 v1.4.2 (2011-08)	Necessary bandwidth (BN) for analogue systems	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC Part 74.861 (e)(3) RSS-210 – G.3.5.2	Frequency modulation	Nominal	Nominal	☒	☐	☐	☐	-/-
FCC Part 74.861 (e)(7) RSS-210 – G.3.4	Receiver spurious emissions	Nominal	Nominal	☐	☐	☒	☐	No receiver integrated!
FCC Part 15.107(a) FCC Part 15.207	Conducted emissions < 30 MHz	Nominal	Nominal	☒	☐	☐	☐	-/-

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

9 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions:

Tested Frequencies:

Band Aw+:
Lowest Channel: 470.100 MHz
Middle Channel: 516.100 MHz
Highest Channel: 557.900 MHz

Band Gw1:
Lowest Channel: 558.100 MHz
Middle Channel: 583.000 MHz
Highest Channel: 607.900 MHz

Test mode:

☒ No test mode available.
Test signal is applied to the transmitter.

☐ Special software is used.
EUT is transmitting pseudo random data by itself

Antennas and transmit operating modes:

☒ Operating mode 1 (single antenna)

- *Equipment with 1 antenna,*
- *Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,*
- *Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)*

☐ Operating mode 2 (multiple antennas, no beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.*

☐ Operating mode 3 (multiple antennas, with beamforming)

- *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.*
  In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.

10 Measurement results

10.1 Transmitter output power

Measurement:

Measurement parameter	
Detector:	Peak (worst case) / Average (RMS)
Sweep time:	Auto / 20s
Resolution bandwidth:	> emission bandwidth
Video bandwidth:	> resolution bandwidth
Span:	> 2 times emissions bandwidth
Trace mode:	Max. hold
EUT configuration:	Peak: Unmodulated carrier RMS: Modulate the transmitter with a 2.5 kHz tone at a level 16 dB higher than that required to produce a frequency deviation of ± 75 kHz, or to produce 50% of the manufacturer's rated deviation, whichever is less.
Test setup:	See sub clause 6.2 – A
Measurement uncertainty:	See sub clause 7

Limits:

FCC & IC	
470 MHz to 608 MHz	250 mW (average) / 24 dBm (average)

Result:

Channels	Transmitter output power			
	Band Aw+*		Band Gw1*	
	Peak	Average	Peak	Average
Lowest	15.95 dBm	15.87 dBm	15.19 dBm	15.12 dBm
Middle	16.19 dBm	16.10 dBm	15.86 dBm	15.79 dBm
Highest	15.41 dBm	15.31 dBm	16.66 dBm	16.55 dBm

*) Only radiated EUT available.
**) Output power set to 50 mW.

10.2 Occupied bandwidth

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 % to 5 % of the occupied bandwidth
Video bandwidth:	3 x resolution bandwidth
Span:	2 x emission bandwidth
Trace mode:	Max. hold
Analyzer function:	99% power occupied bandwidth function
EUT:	Modulated signal with max. frequency deviation
Test setup:	See sub clause 6.2 - A
Measurement uncertainty:	See sub clause 7

Limits:

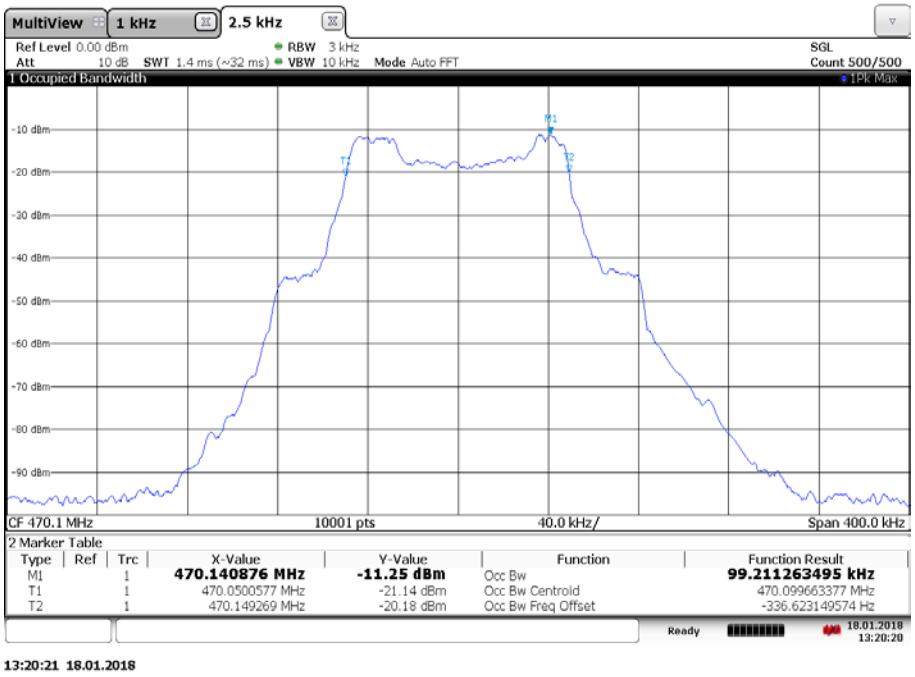
FCC & IC
470 MHz to 608 MHz 200 kHz
Occupied bandwidth 99%. Other than single sideband or independent sideband transmitters - when modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.

Result:

Occupied bandwidth		
Channels	**Band Aw+**	**Band Gw1**
Lowest	99.2 kHz	98.5 kHz
Middle	96.3 kHz	97.8 kHz
Highest	95.4 kHz	98.3 kHz

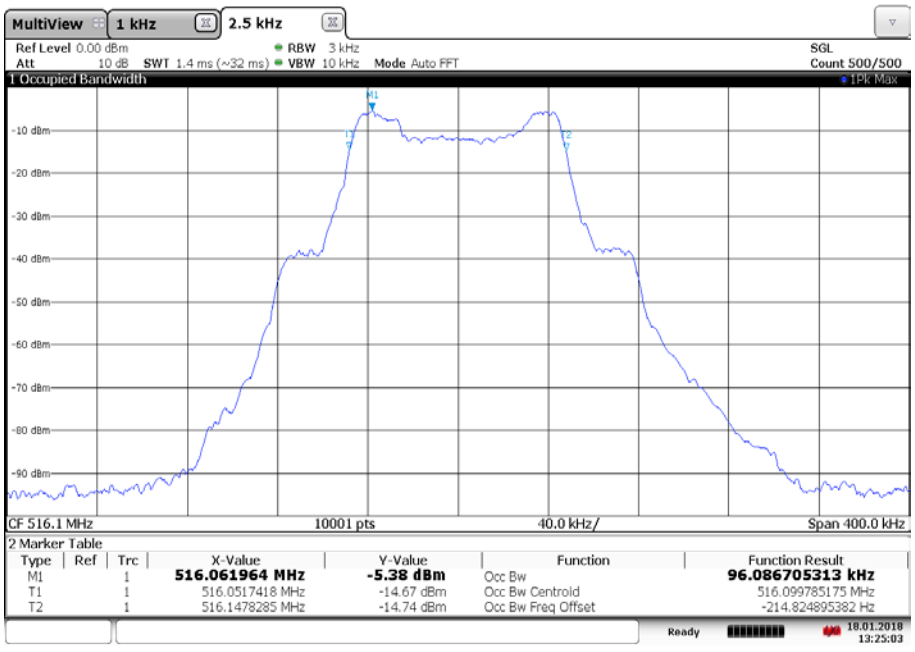
Plots: Band Aw+

Plot 1: lowest channel



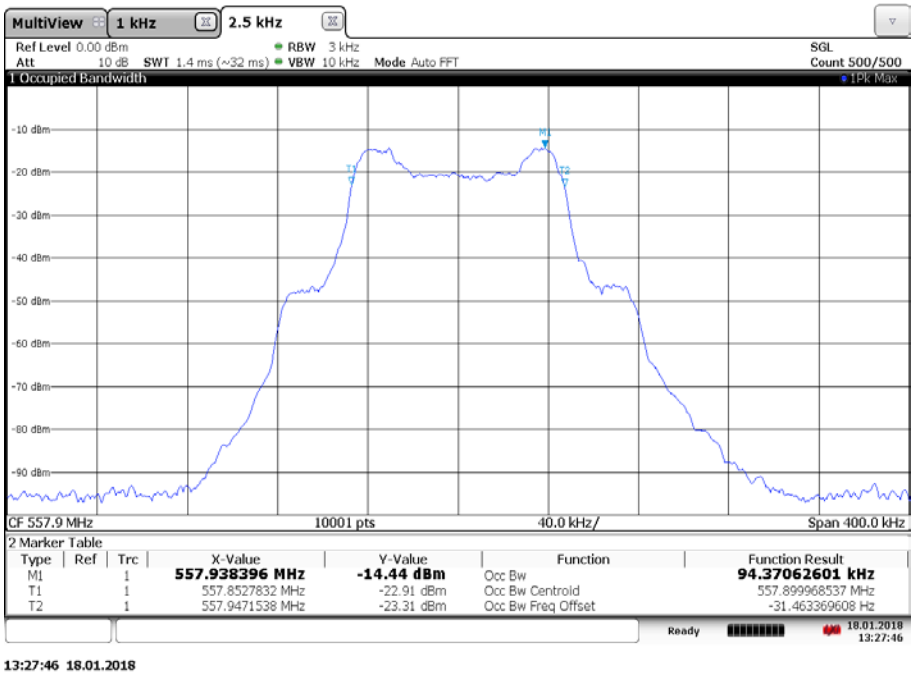
13:20:21 18.01.2018

Plot 2: middle channel



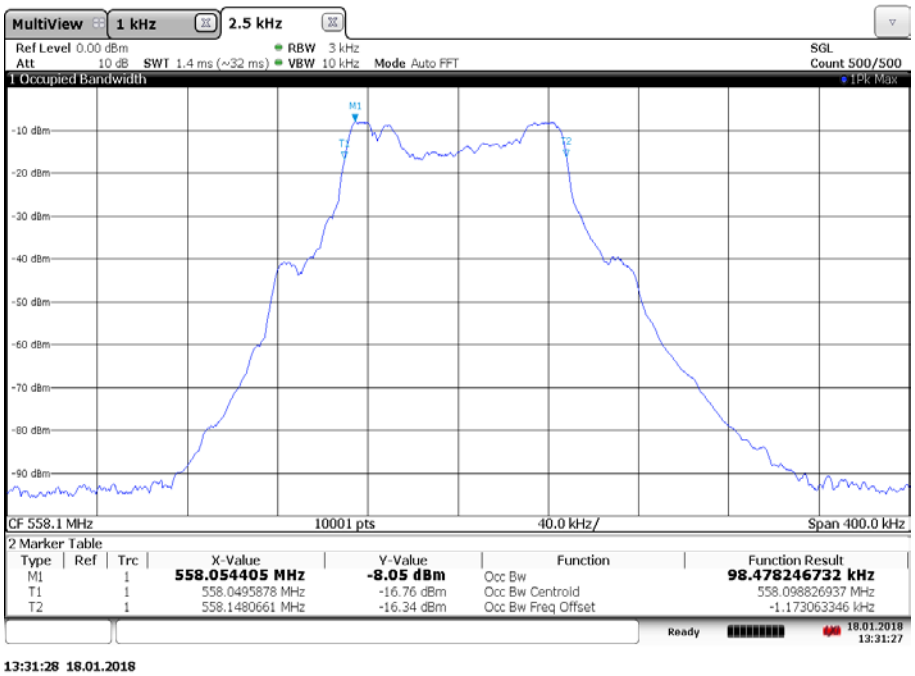
13:25:04 18.01.2018

Plot 3: highest channel

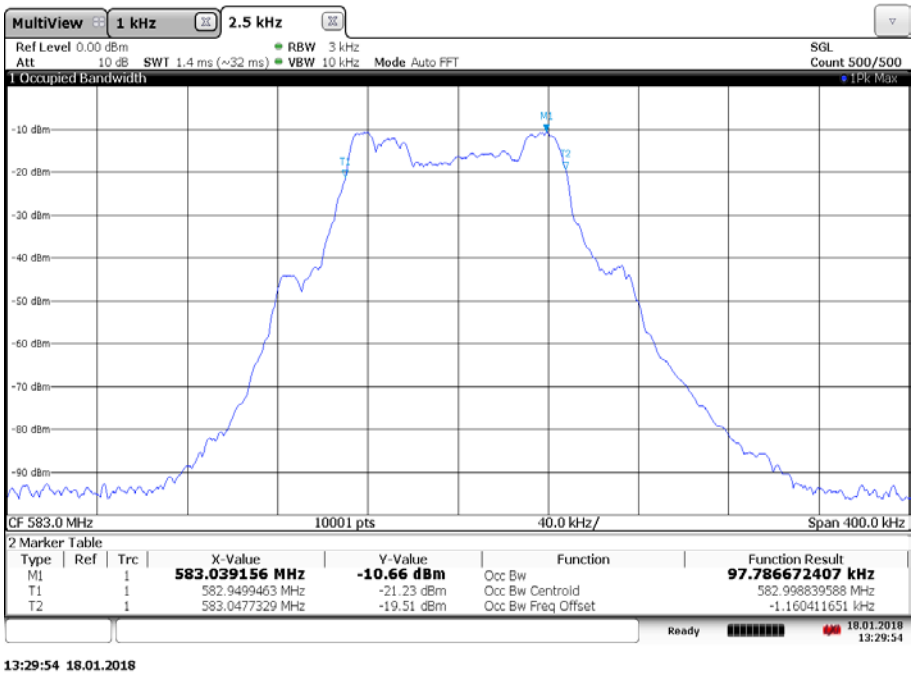


Plots: Band Gw1

Plot 1: lowest channel

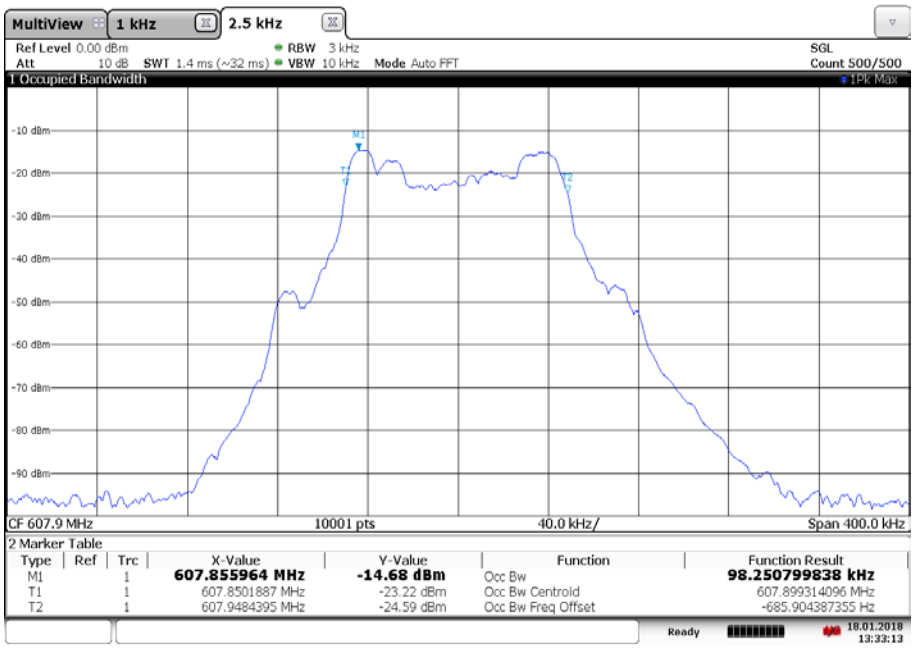


Plot 2: middle channel



13:29:54 18.01.2018

Plot 3: highest channel



13:33:14 18.01.2018

10.3 Transmitter frequency stability

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 Hz / 10 Hz / 100 Hz
Video bandwidth:	3 x resolution bandwidth
Span:	wide enough to follow the frequency drift
Trace mode:	clear/write/view
EUT:	CW signal or MC with measurement method description
Test setup:	See sub clause 6.2 - B
Measurement uncertainty:	See sub clause 7

Limits:

FCC & IC
470 MHz to 608 MHz ± 50 ppm

Results: Band Aw+, lowest channel

Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / V_{nom}	470.095591	-0.409	-0.870
-20 °C / V_{nom}	470.098339	-1.661	-3.533
-10 °C / V_{nom}	470.099782	-0.218	-0.464
0 °C / V_{nom}	470.100484	0.484	1.030
+10 °C / V_{nom}	470.100610	0.610	1.298
+20 °C / V_{nom}	470.100269	0.269	0.572
+30 °C / V_{nom}	470.100327	0.327	0.696
+40 °C / V_{nom}	470.100620	0.620	1.319
+50 °C / V_{nom}	470.101084	1.084	2.306
+20 °C / V_{nom} - 15%	470.100269	0.269	0.572
+20 °C / V_{nom}	470.100282	0.282	0.600
+20 °C / V_{nom} + 15%	470.100279	0.279	0.594

Results: Band Aw+, middle channel

Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / V_{nom}	516.095917	-1.083	-2.099
-20 °C / V_{nom}	516.098442	-1.559	-3.021
-10 °C / V_{nom}	516.099953	-0.047	-0.091
0 °C / V_{nom}	516.100541	0.542	1.050
+10 °C / V_{nom}	516.100664	0.665	1.289
+20 °C / V_{nom}	516.100275	0.275	0.533
+30 °C / V_{nom}	516.100343	0.343	0.665
+40 °C / V_{nom}	516.100583	0.583	1.130
+50 °C / V_{nom}	516.101093	1.093	2.118
+20 °C / V_{nom} - 15%	516.100273	0.273	0.529
+20 °C / V_{nom}	516.100275	0.275	0.533
+20 °C / V_{nom} + 15%	516.100269	0.269	0.521

Results: Band Aw+, highest channel

Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / V_{nom}	557.897020	-0.481	-0.862
-20 °C / V_{nom}	557.898275	-1.725	-3.092
-10 °C / V_{nom}	557.899920	-0.080	-0.143
0 °C / V_{nom}	557.900619	0.619	1.110
+10 °C / V_{nom}	557.900747	0.747	1.339
+20 °C / V_{nom}	557.900292	0.292	0.523
+30 °C / V_{nom}	557.900402	0.402	0.721
+40 °C / V_{nom}	557.900615	0.615	1.102
+50 °C / V_{nom}	557.901182	1.182	2.119
+20 °C / V_{nom} - 15%	557.900308	0.308	0.552
+20 °C / V_{nom}	557.900292	0.292	0.523
+20 °C / V_{nom} + 15%	557.900326	0.326	0.584

Results: Band Gw1, lowest channel

Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / Vnom	558.099508	-0.492	-0.882
-20 °C / Vnom	558.100596	0.596	1.068
-10 °C / Vnom	558.101952	1.952	3.498
0 °C / Vnom	558.102102	2.102	3.766
+10 °C / Vnom	558.101639	1.639	2.937
+20 °C / Vnom	558.099790	-0.211	-0.378
+30 °C / Vnom	558.099780	-0.221	-0.396
+40 °C / Vnom	558.099354	-0.646	-1.158
+50 °C / Vnom	558.099373	-0.627	-1.124
+20 °C / Vnom - 15%	558.099761	-0.239	-0.428
+20 °C / Vnom	558.099790	-0.211	-0.378
+20 °C / Vnom + 15%	558.099751	-0.249	-0.446

Results: Band Gw1, middle channel

Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / V_{nom}	582.999863	-0.138	-0.237
-20 °C / V_{nom}	583.000623	0.623	1.069
-10 °C / V_{nom}	583.003057	3.057	5.244
0 °C / V_{nom}	583.002198	2.198	3.770
+10 °C / V_{nom}	583.001684	1.685	2.890
+20 °C / V_{nom}	582.999744	-0.256	-0.439
+30 °C / V_{nom}	582.999869	-0.131	-0.225
+40 °C / V_{nom}	582.999310	-0.690	-1.184
+50 °C / V_{nom}	582.999322	-0.678	-1.163
+20 °C / V_{nom} - 15%	582.999771	-0.229	-0.393
+20 °C / V_{nom}	582.999744	-0.256	-0.439
+20 °C / V_{nom} + 15%	582.999732	-0.268	-0.460

Results: Band Gw1, highest channel

Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / V_{nom}	607.900078	0.078	0.128
-20 °C / V_{nom}	607.900957	0.957	1.574
-10 °C / V_{nom}	607.902265	2.265	3.726
0 °C / V_{nom}	607.902333	2.332	3.836
+10 °C / V_{nom}	607.901793	1.793	2.950
+20 °C / V_{nom}	607.899867	-0.133	-0.219
+30 °C / V_{nom}	607.899912	-0.088	-0.145
+40 °C / V_{nom}	607.899438	-0.562	-0.925
+50 °C / V_{nom}	607.899400	-0.601	-0.989
+20 °C / V_{nom} - 15%	607.899908	-0.092	-0.151
+20 °C / V_{nom}	607.899867	-0.133	-0.219
+20 °C / V_{nom} + 15%	607.899772	-0.228	-0.375

10.4 Transmitter unwanted emissions (radiated)

Measurement:

Measurement parameter	
Detector:	Peak (prescan) / RMS
Sweep time:	Auto
Resolution bandwidth:	See table below!
Video bandwidth:	See table below!
Span:	100 MHz steps!
Trace-Mode:	Max. hold
EUT:	MC with max frequency deviation
Used equipment:	See chapter 6.1- A / B
Measurement uncertainty:	See chapter 7

Frequency being measured	Measuring receiver bandwidth
25 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1 000 MHz	100 kHz
> 1 000 MHz	1 MHz

Limits:

FCC & IC (according to ETSI EN 300 422-1 v1.4.2 (2011-08))			
State	Max. spurious level		
	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies ≤ 1000 MHz	All frequencies > 1000 MHz
Operating	4.0 nW	250 nW	1.00 µW
Standby	2.0 nW	2.0 nW	20.0 nW

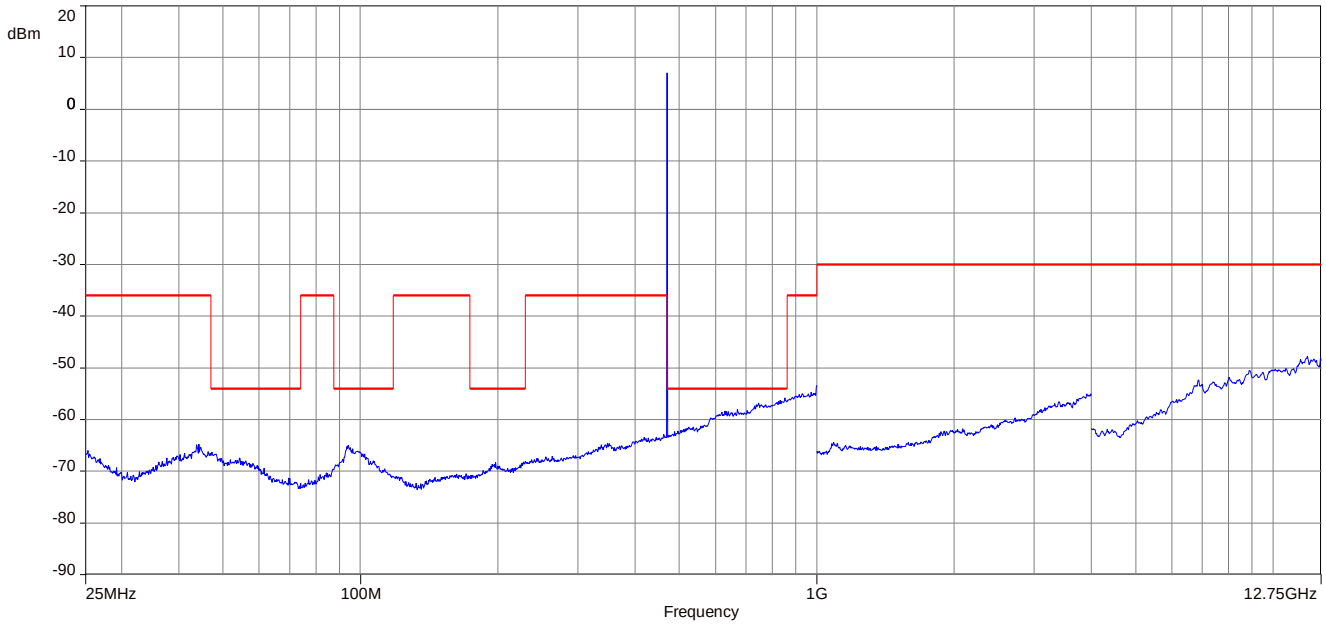
FCC & IC	
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:	
On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least	25 dB
On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth	35 dB
On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least	43 + 10log10 (mean output power in watts) dB

Results:

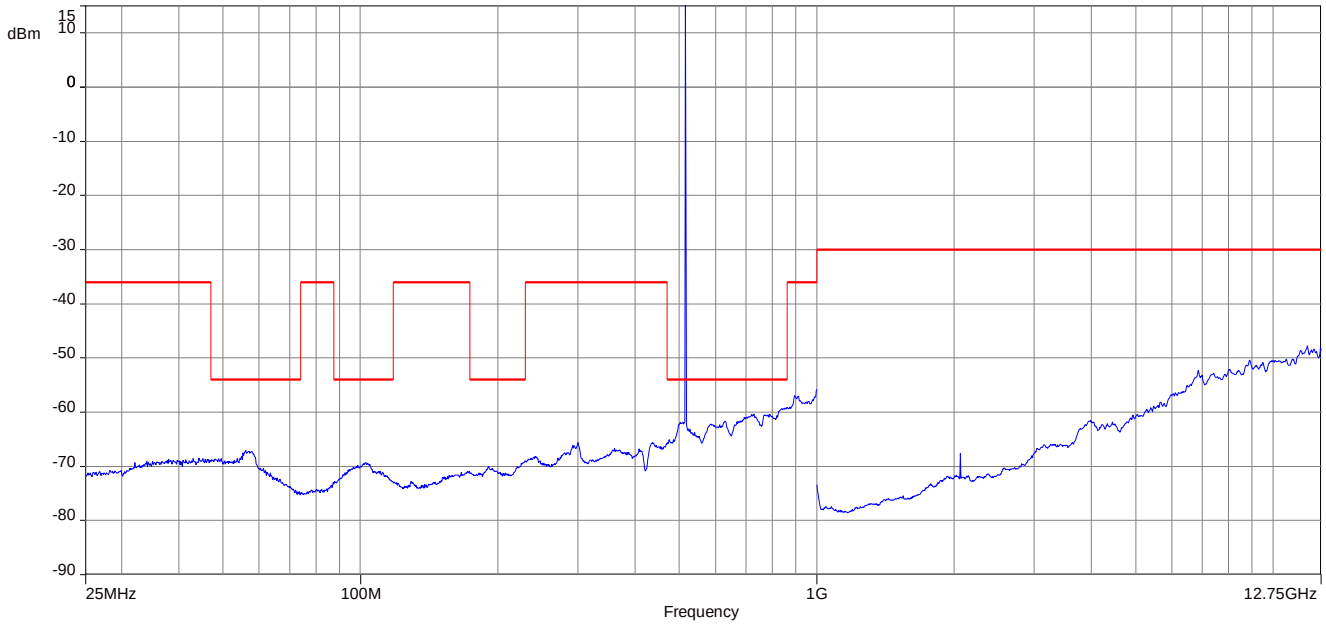
carrier frequency (MHz)	unwanted emission frequency (MHz)	Limit	level (dB) / (dBm) or remark
All detected emissions are more than 20 dB below the limit.			

Plots: Band Aw+

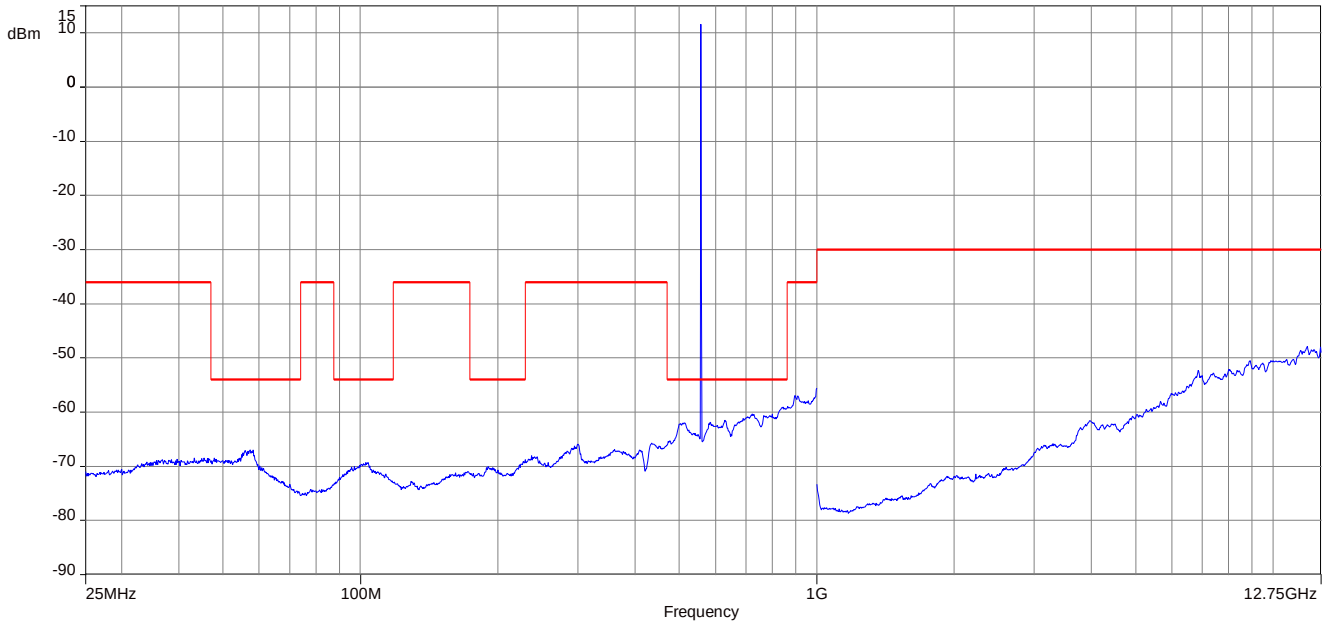
Plot 1: lowest channel, spurious emissions, 25 MHz – 12.75 GHz



Plot 2: middle channel, spurious emissions, 25 MHz – 12.75 GHz

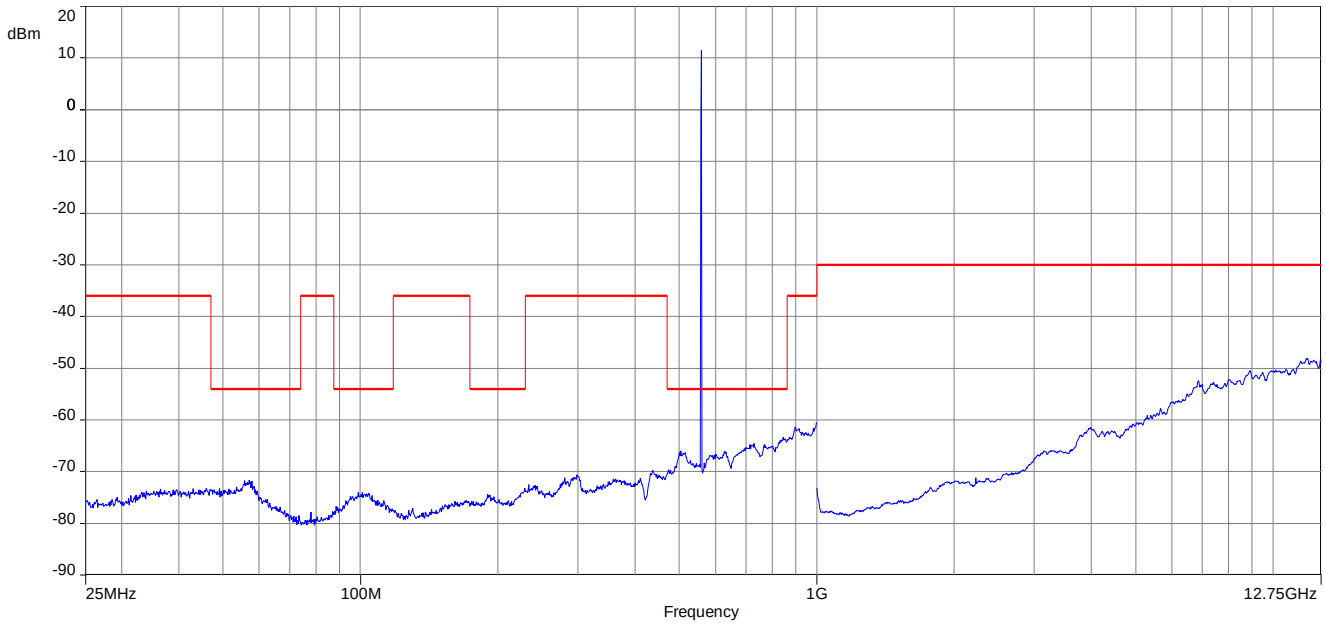


Plot 3: highest channel, spurious emissions, 25 MHz – 12.75 GHz

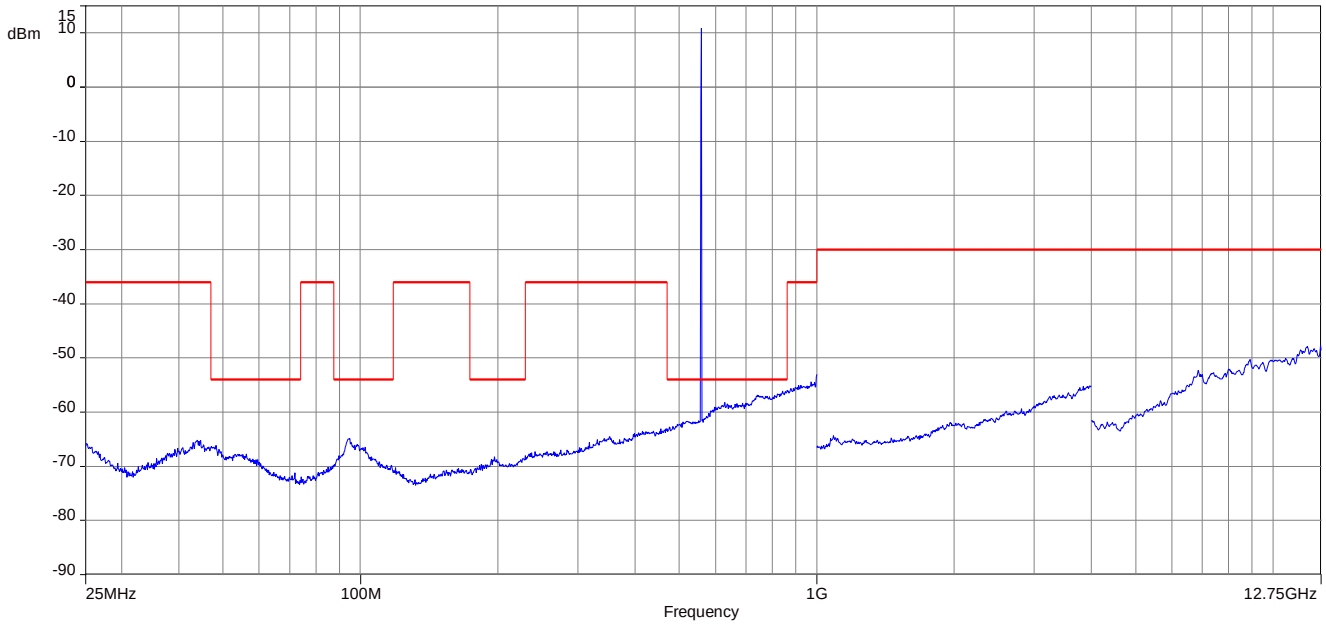


Plots: Band Gw1

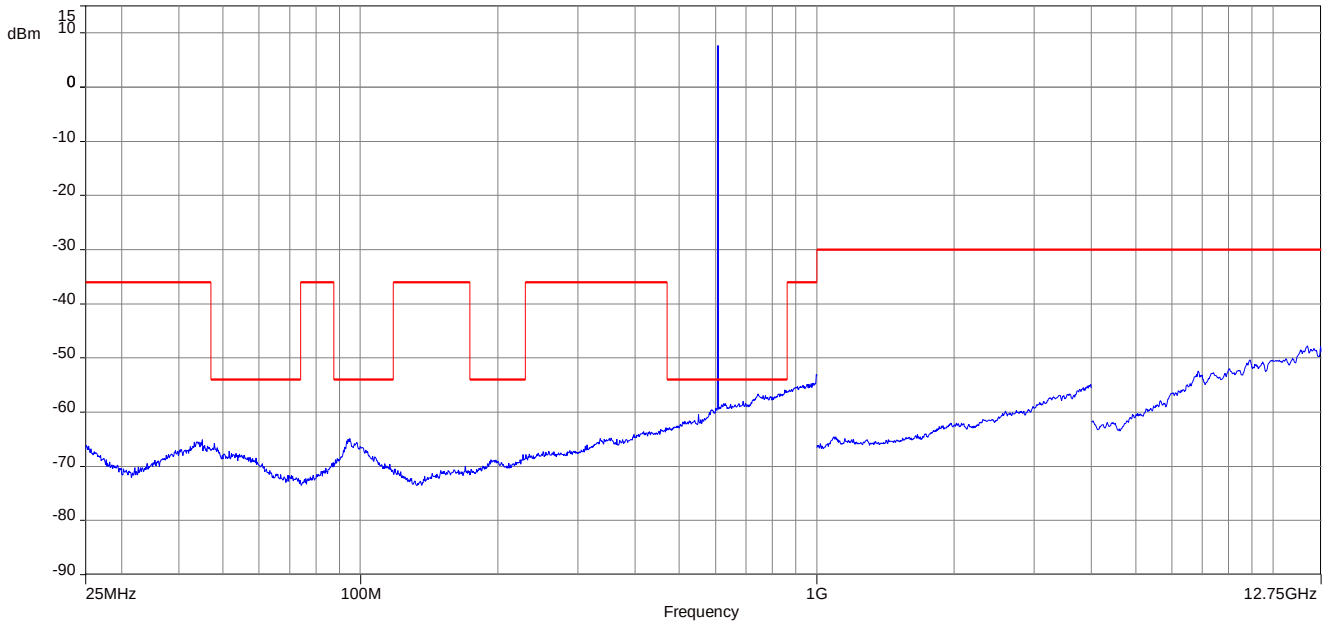
Plot 1: lowest channel, spurious emissions, 25 MHz – 12.75 GHz



Plot 2: middle channel, spurious emissions, 25 MHz – 12.75 GHz



Plot 3: highest channel, spurious emissions, 25 MHz – 12.75 GHz



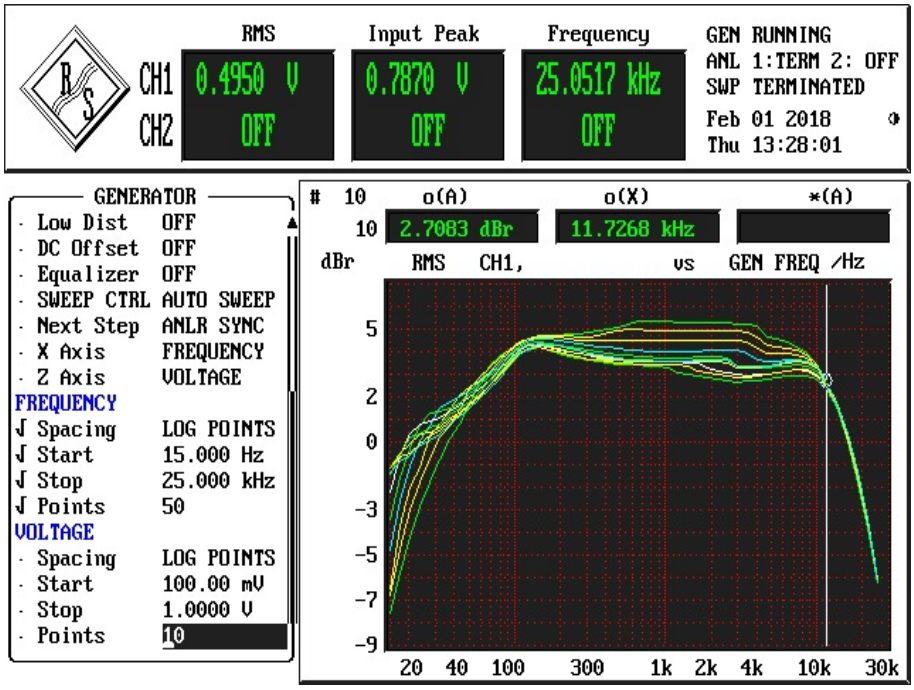
10.5 Modulation characteristics

Method of measurement:

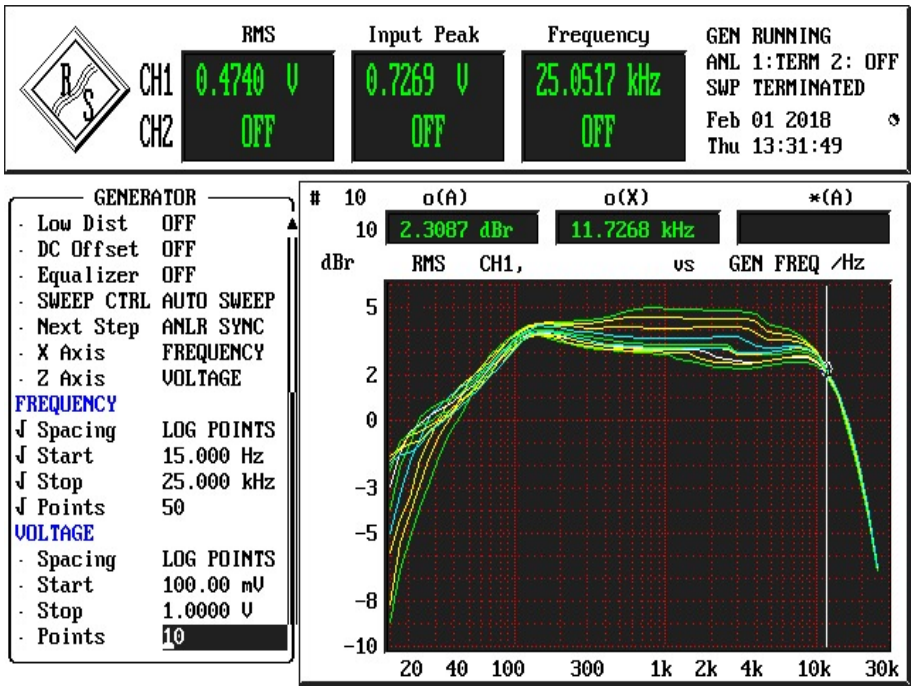
The audio frequency response was measured in accordance with EIA/TIA 603. The plots shows 10 curves with different modulation levels, the test frequency is varied from 15 Hz to 20 kHz.

Plots: Band Aw+

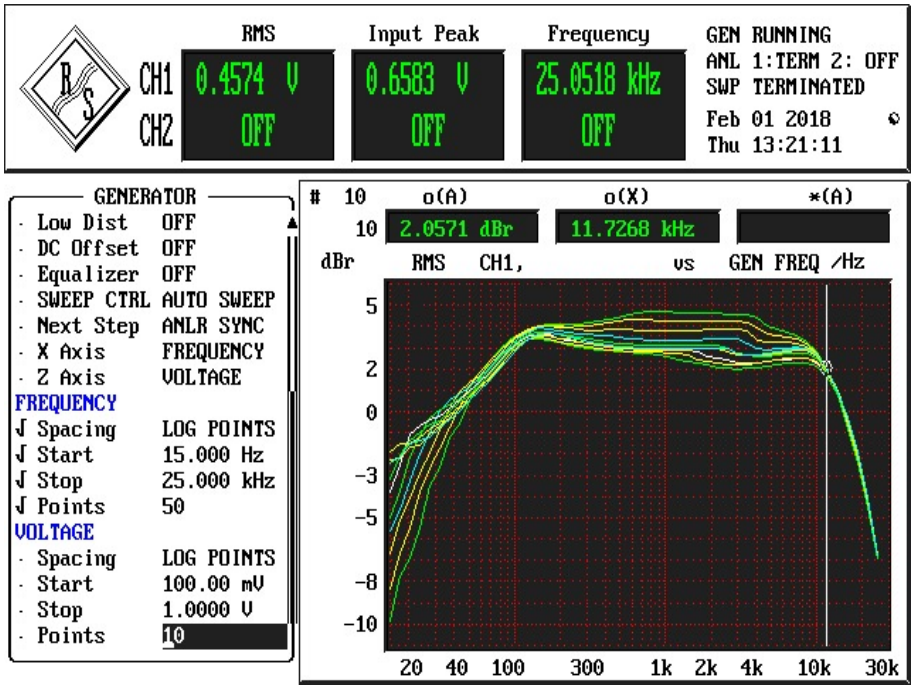
Plot 1: lowest channel, 10 curves with voltage and frequency variation



Plot 2: middle channel, 10 curves with voltage and frequency variation

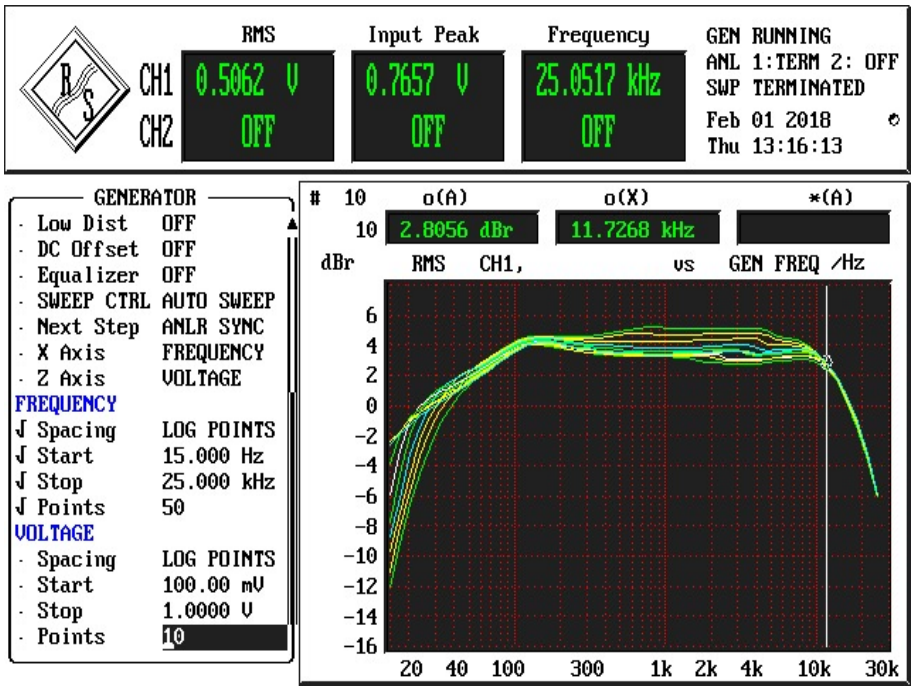


Plot 3: highest channel, 10 curves with voltage and frequency variation

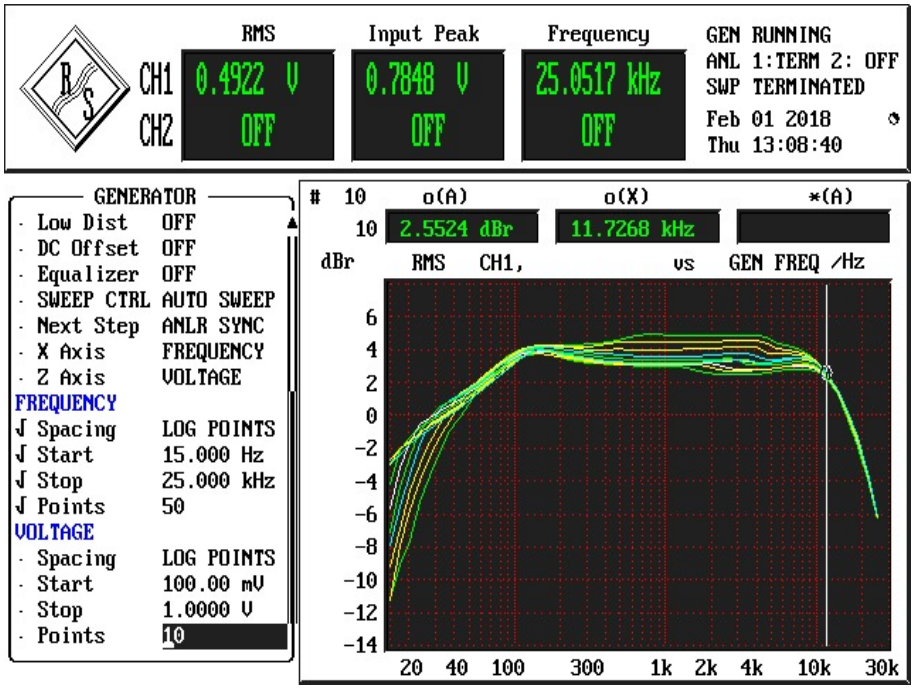


Plots: Band Gw1

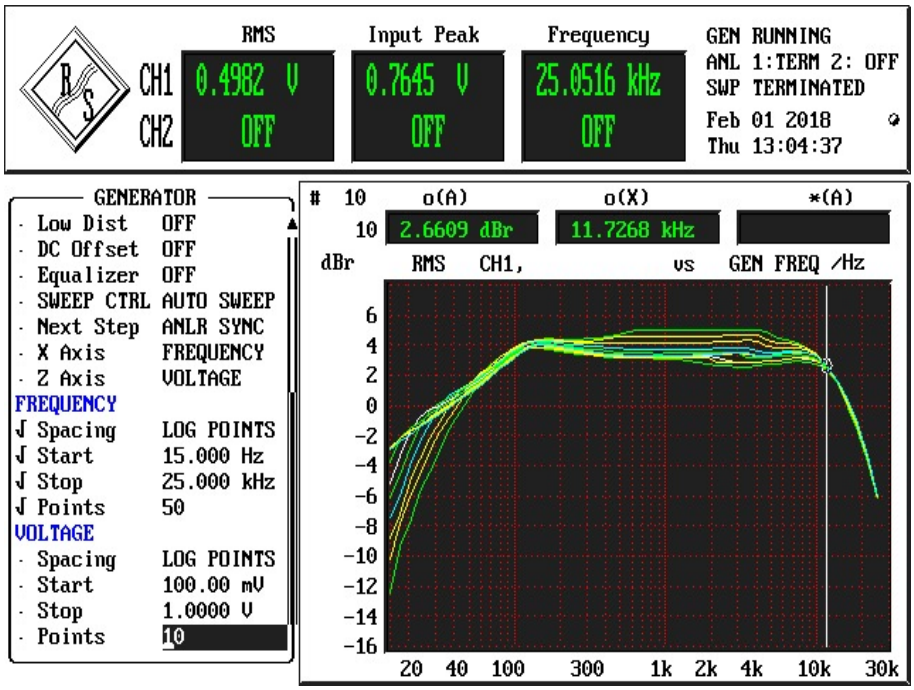
Plot 1: lowest channel, 10 curves with voltage and frequency variation



Plot 2: middle channel, 10 curves with voltage and frequency variation



Plot 3: highest channel, 10 curves with voltage and frequency variation



10.6 Necessary bandwidth (BN) for analogue systems

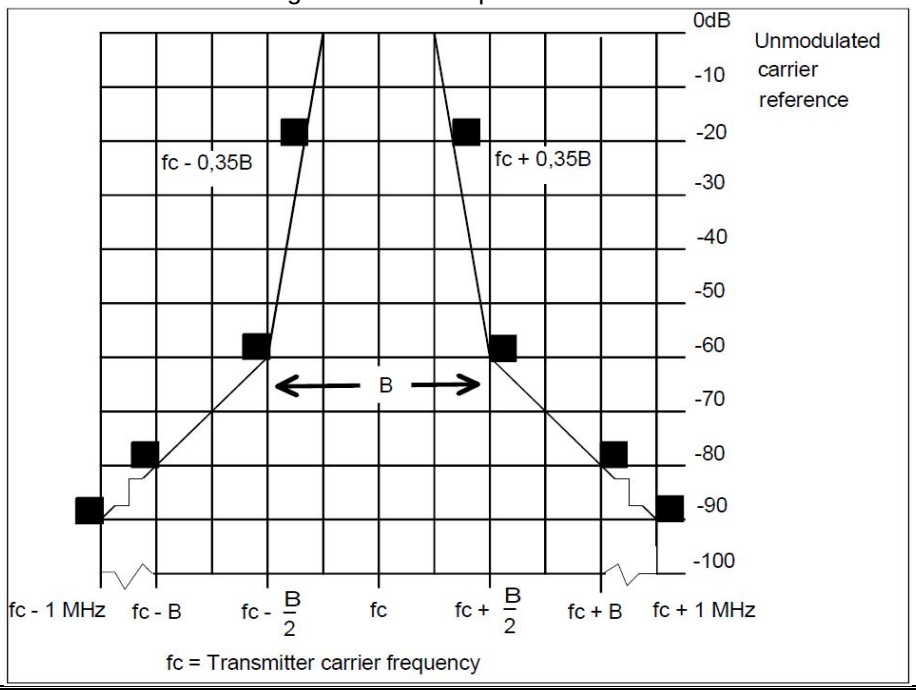
Measurement:

Measurement parameter	
Detector:	Peak / Average (-90 dBc point only)
Sweep time:	Auto
Resolution bandwidth:	1 kHz
Video bandwidth:	1 kHz
Span:	fc - 1 MHz to fc + 1 MHz (2 MHz)
Trace mode:	Max hold/view
EUT:	CW and MC
Test setup:	See sub clause 6.2 - D
Measurement uncertainty:	See sub clause 7

Limits: according to ETSI EN 300 422-1 v1.4.2 (2011-08)

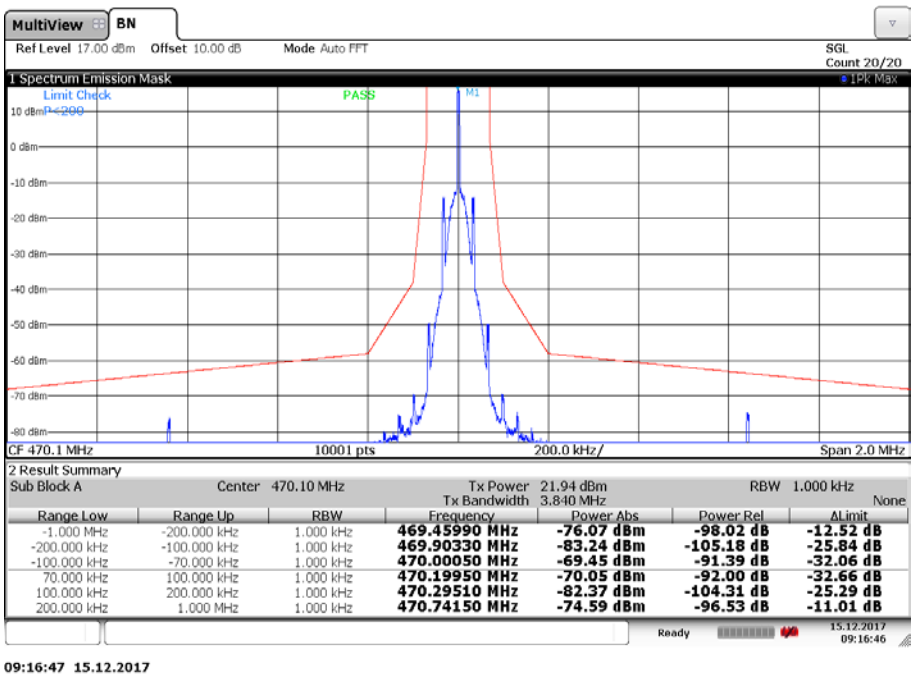
FCC & IC

Signal within the spectrum mask:

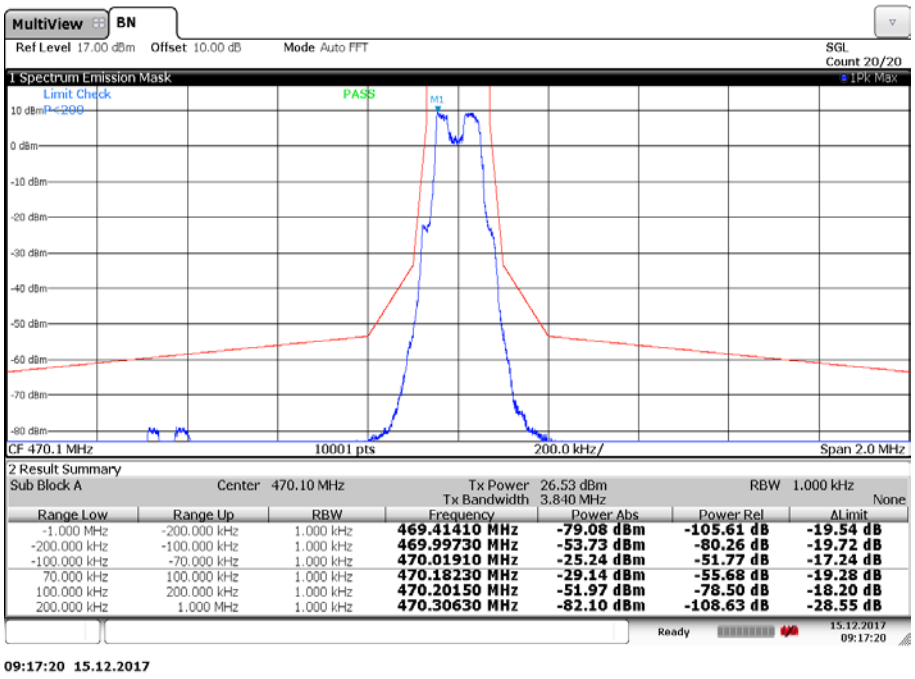


Plots: Band Aw+, lowest channel

Plot 1: Unmodulated carrier reference (with pilot-tone)

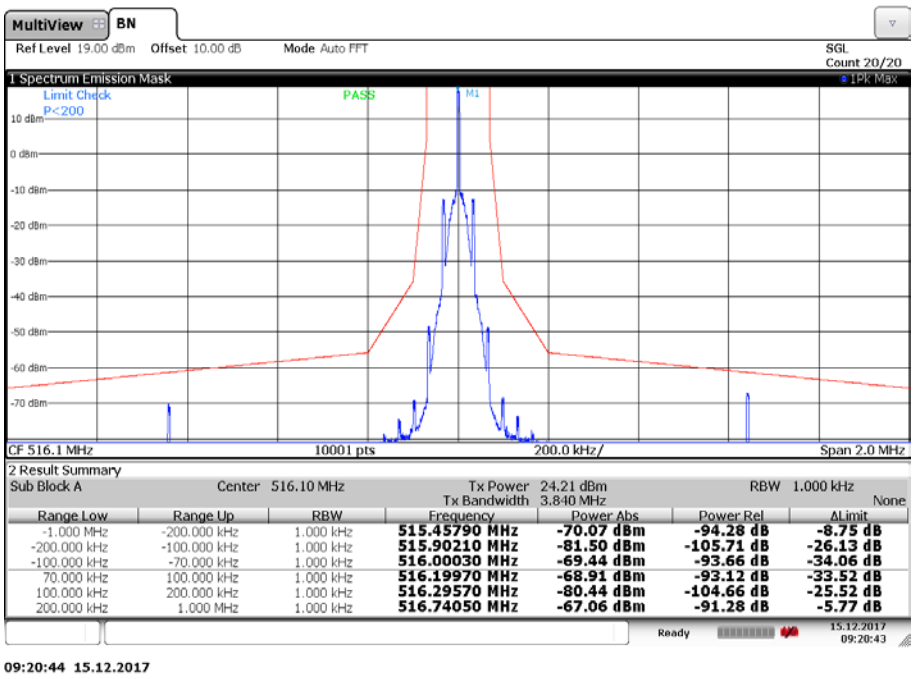


Plot 2: Modulated carrier with the weighted noise source



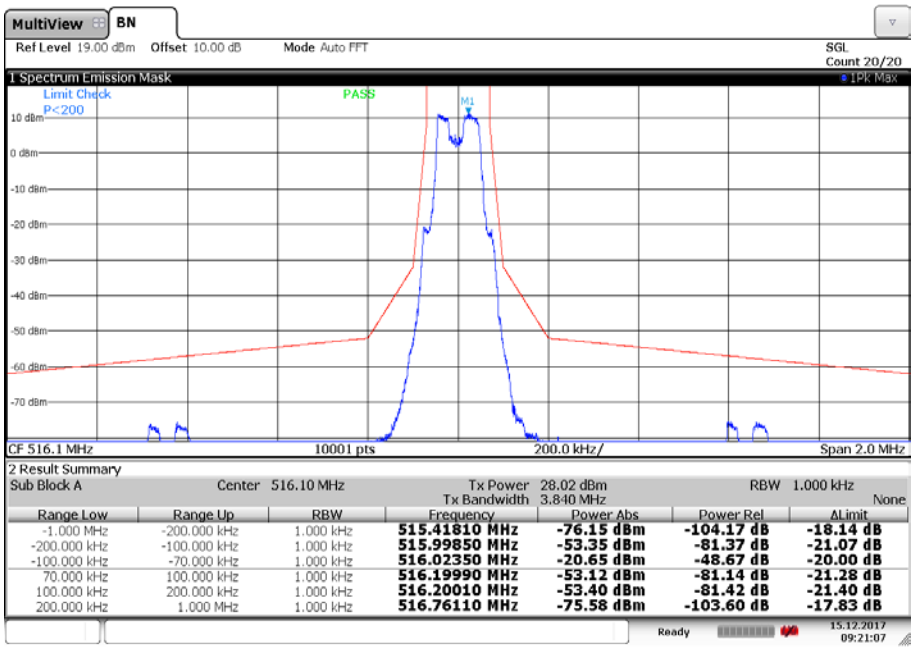
Plots: Band Aw+, middle channel

Plot 1: Unmodulated carrier reference (with pilot-tone)



09:20:44 15.12.2017

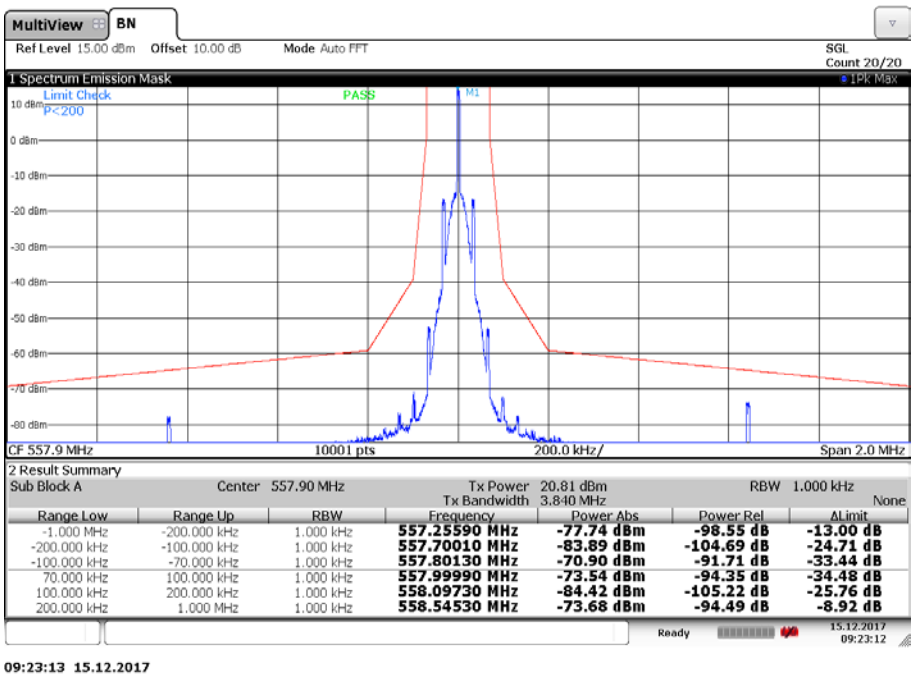
Plot 2: Modulated carrier with the weighted noise source



09:21:08 15.12.2017

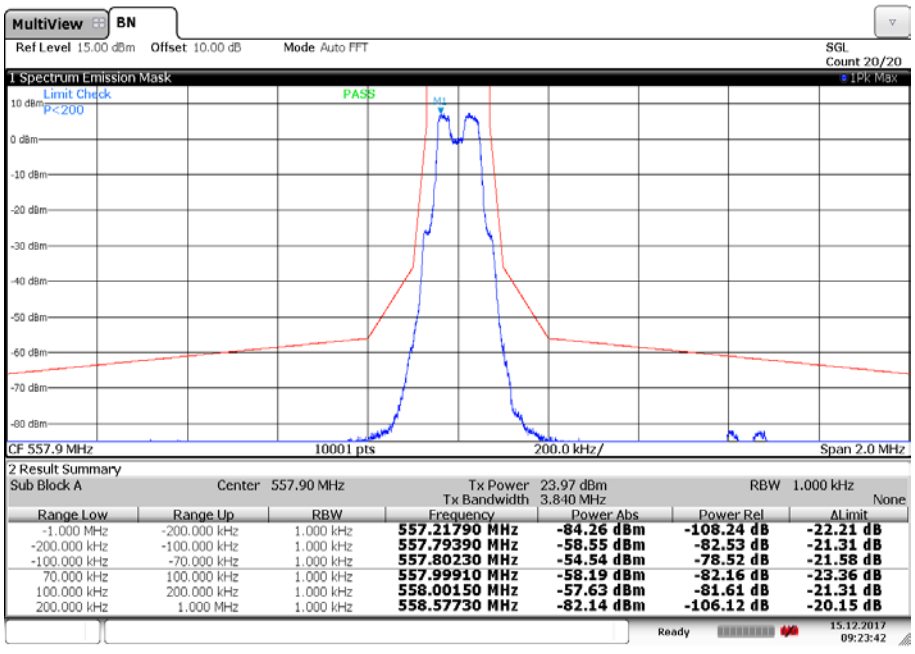
Plots: Band Aw+ (Included Band A), highest channel

Plot 1: Unmodulated carrier reference (with pilot-tone)



09:23:13 15.12.2017

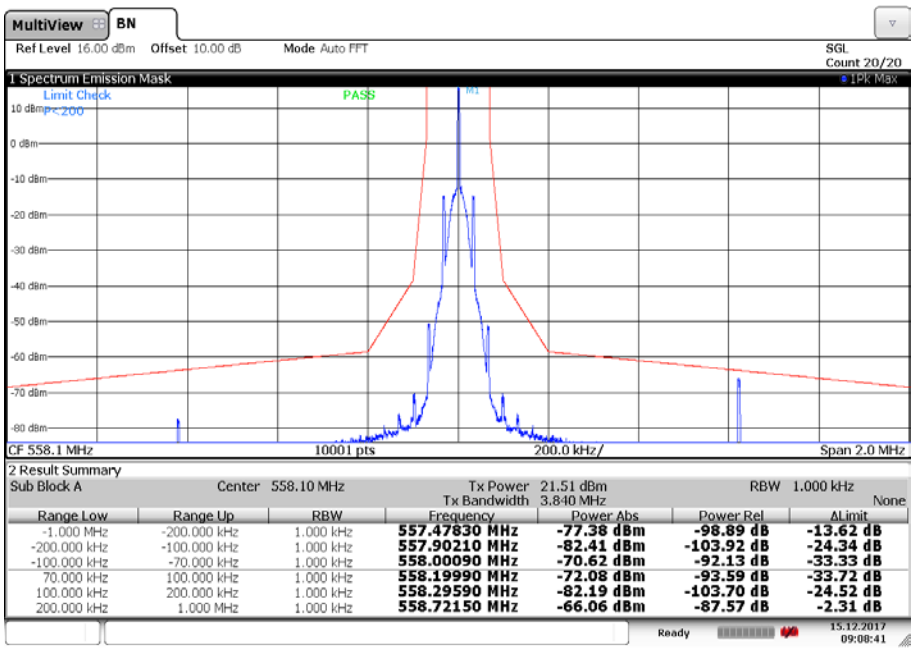
Plot 2: Modulated carrier with the weighted noise source



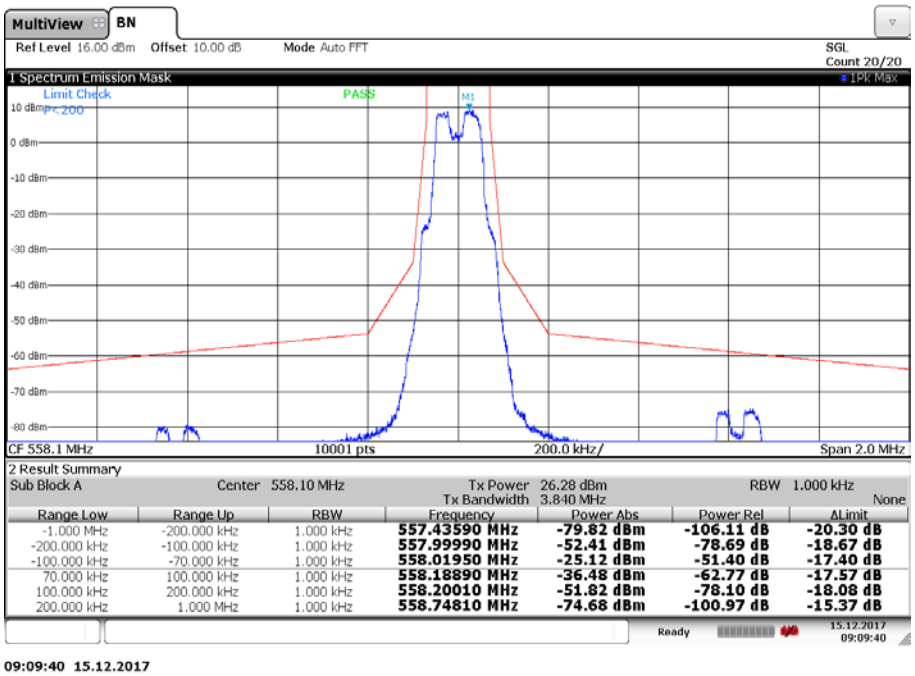
09:23:42 15.12.2017

Plots: Band Gw1, lowest channel

Plot 1: Unmodulated carrier reference (with pilot-tone)

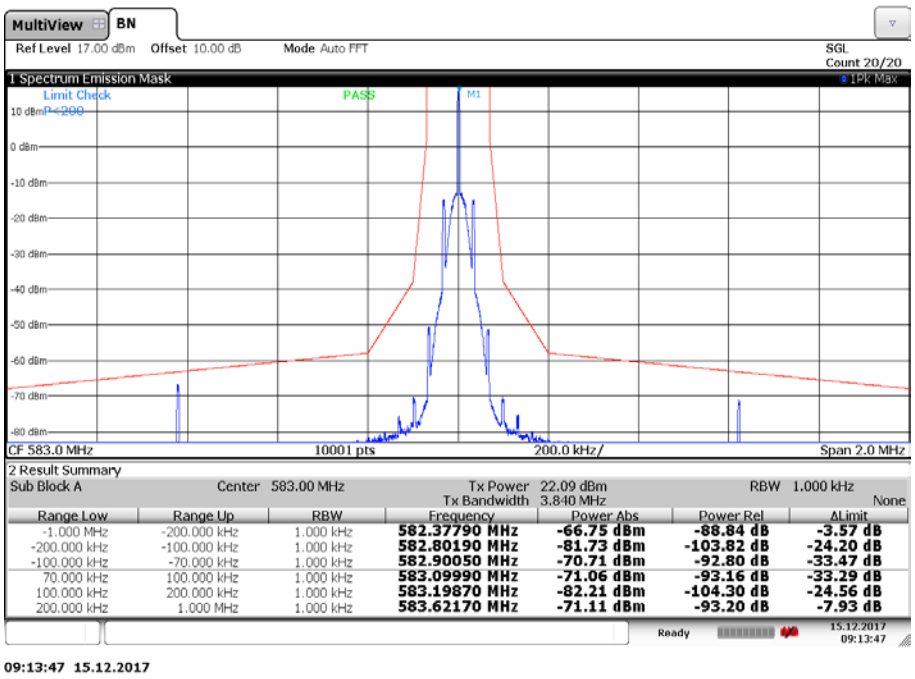


Plot 2: Modulated carrier with the weighted noise source



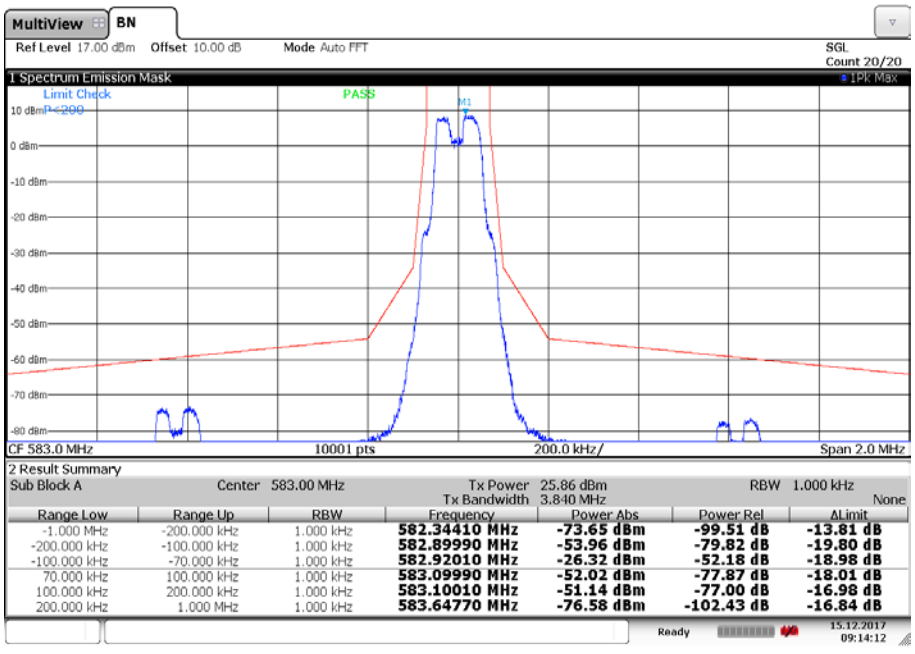
Plots: Band Gw1, middle channel

Plot 1: Unmodulated carrier reference (with pilot-tone)



09:13:47 15.12.2017

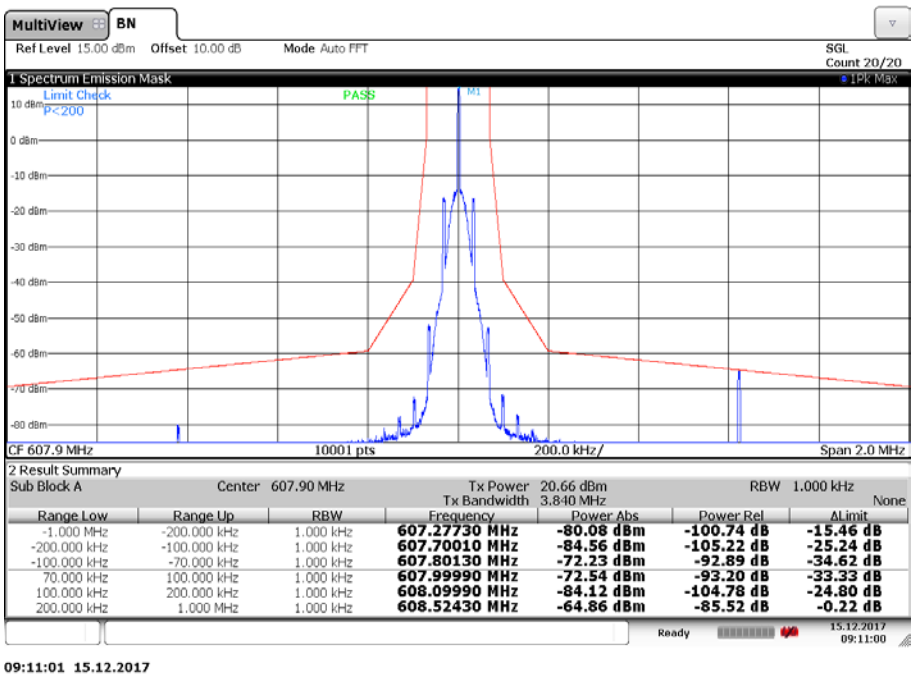
Plot 2: Modulated carrier with the weighted noise source



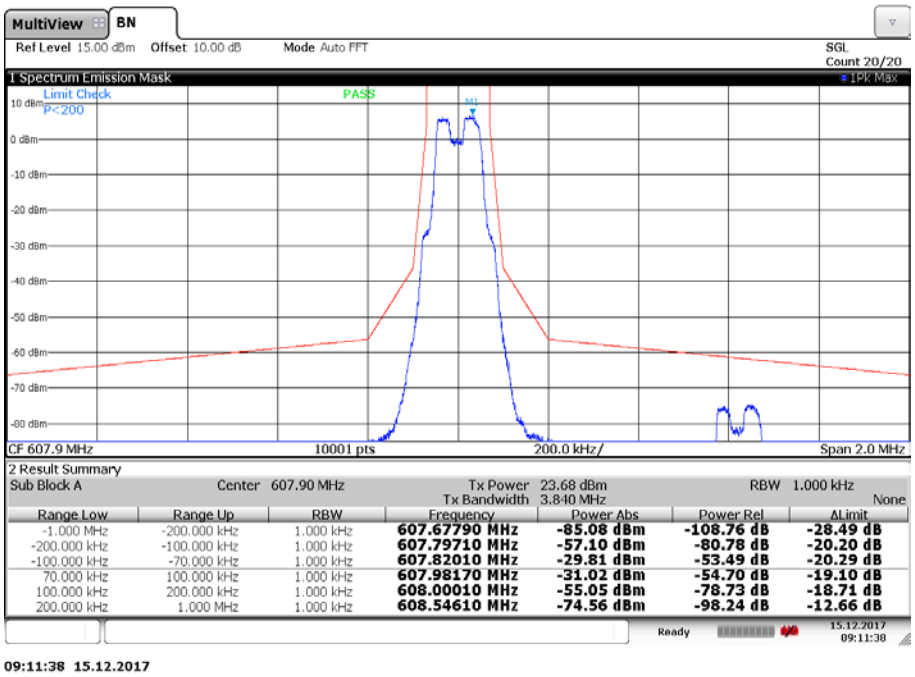
09:14:12 15.12.2017

Plots: Band Gw1, highest channel

Plot 1: Unmodulated carrier reference (with pilot-tone)



Plot 2: Modulated carrier with the weighted noise source



10.7 Frequency modulation

Measurement:

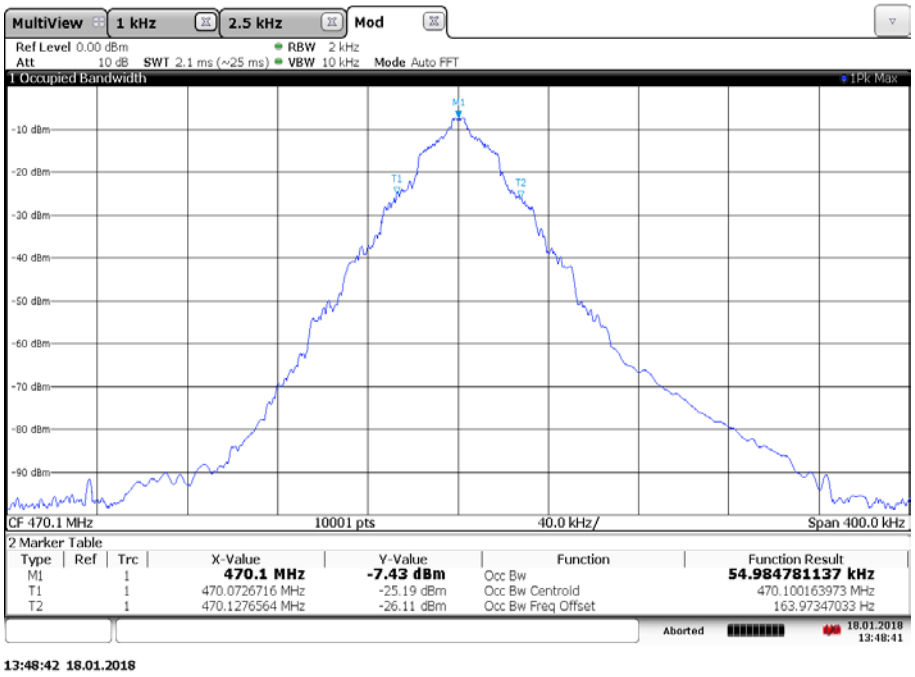
Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 % to 5 % of the occupied bandwidth
Video bandwidth:	3 x resolution bandwidth
Span:	2 x emission bandwidth
Trace mode:	Max. hold
Analyzer function:	99% power occupied bandwidth function
EUT:	Modulated signal with frequency varied between 50 Hz and 15 kHz
Test setup:	See sub clause 6.2 - D
Measurement uncertainty:	See sub clause 7

Limits:

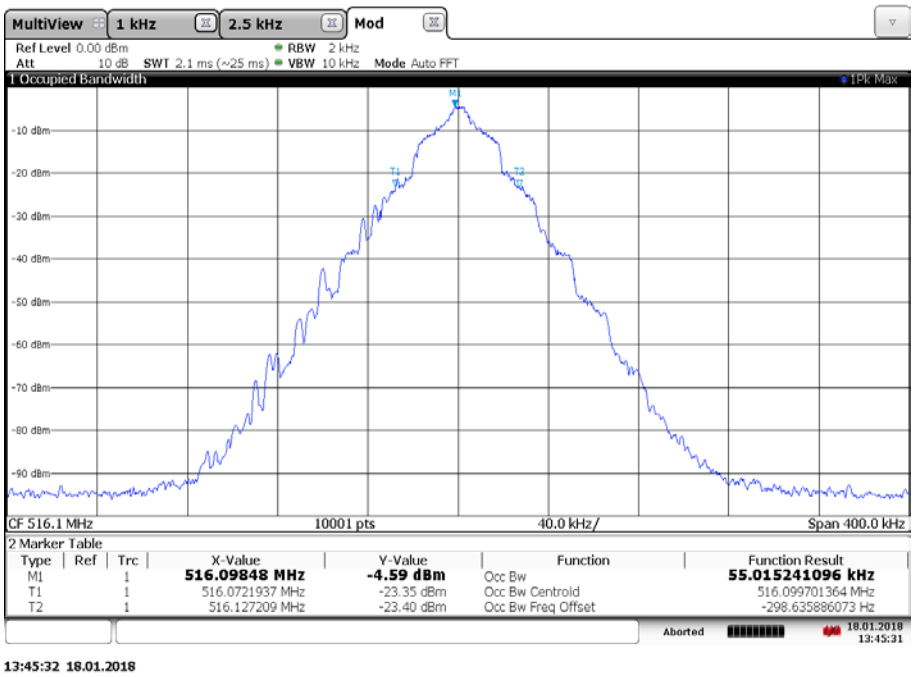
FCC & IC
Frequency deviation up to a maximum of ± 75 kHz

Plots: Band Aw+

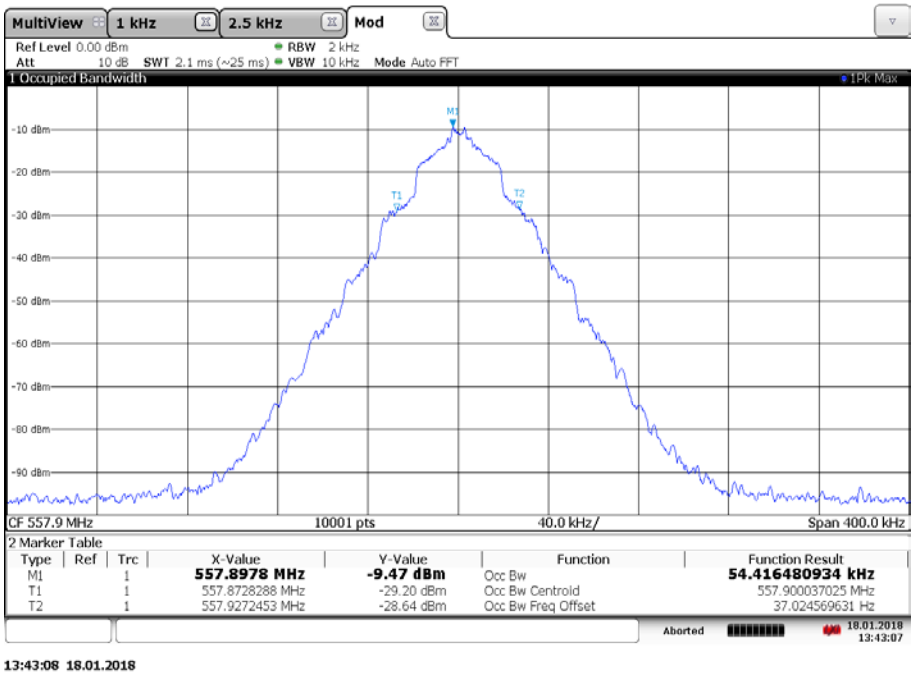
Plot 1: lowest channel, max hold with frequency variation from 50 Hz to 15 kHz



Plot 2: middle channel, max hold with frequency variation from 50 Hz to 15 kHz



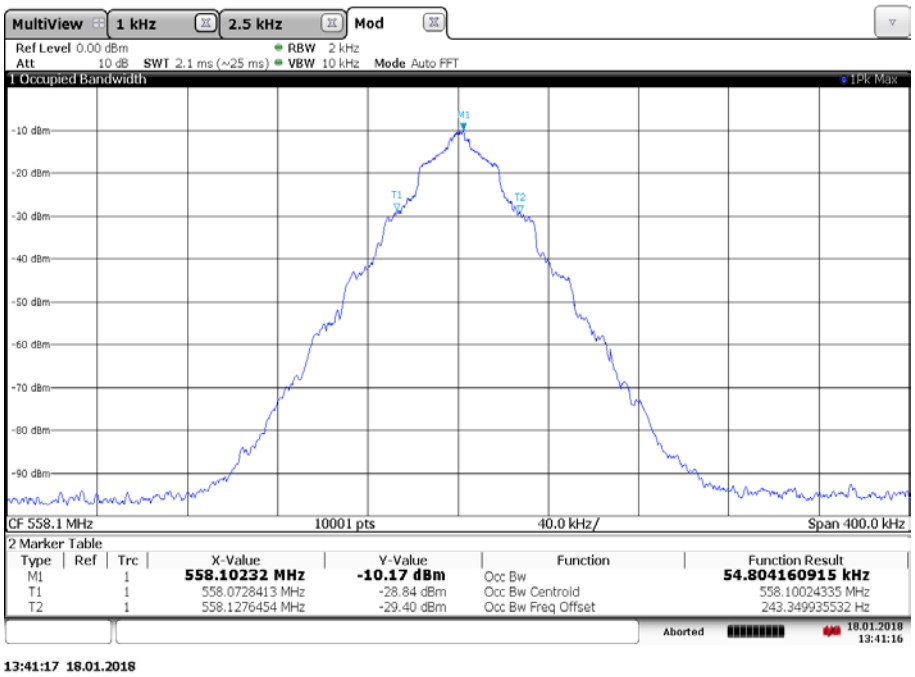
Plot 3: highest channel, max hold with frequency variation from 50 Hz to 15 kHz



13:43:08 18.01.2018

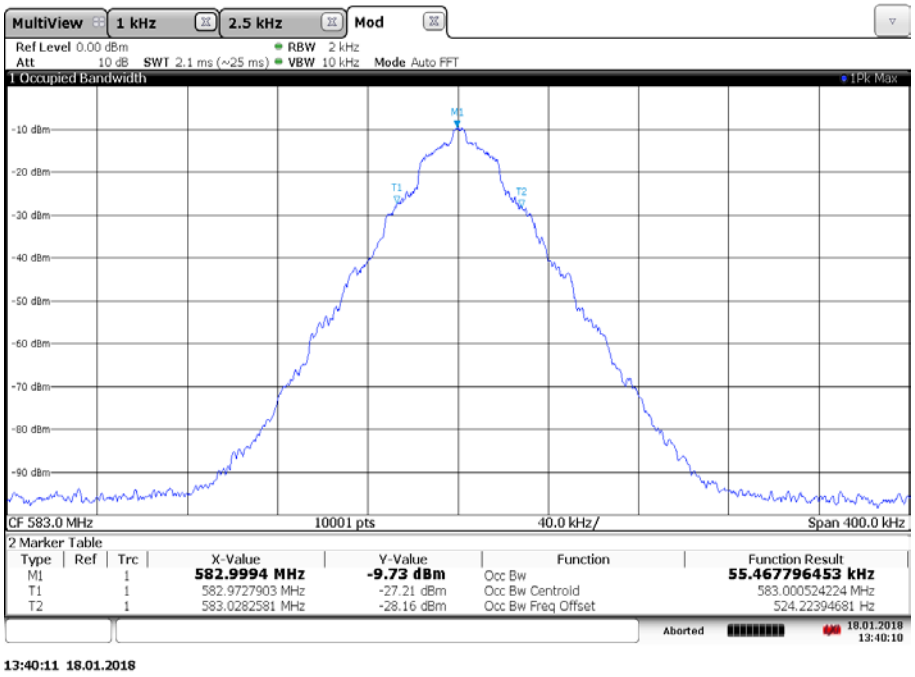
Plots: Band Gw1

Plot 1: lowest channel, max hold with frequency variation from 50 Hz to 15 kHz

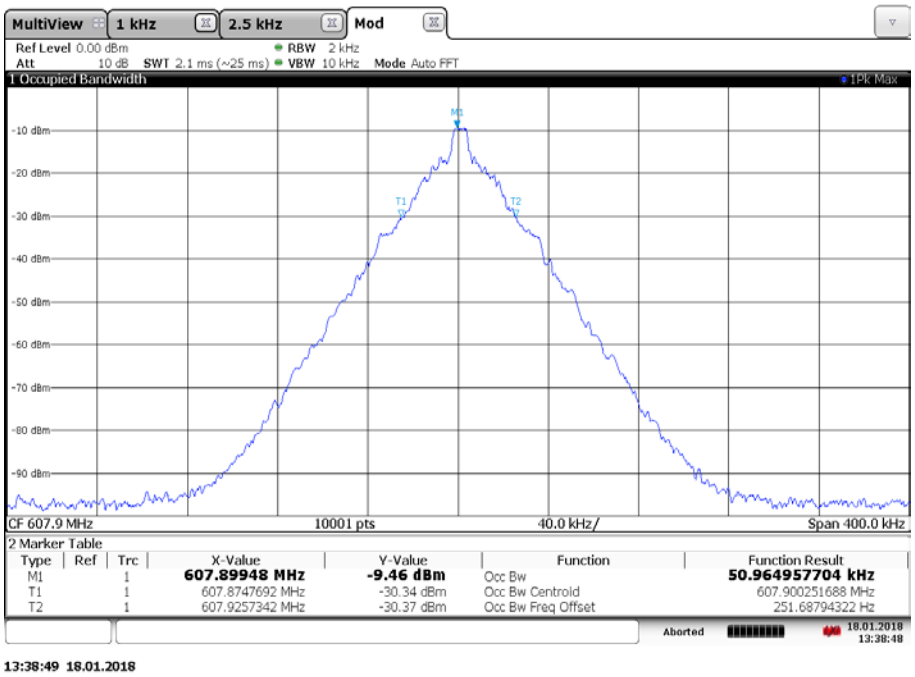


13:41:17 18.01.2018

Plot 2: middle channel, max hold with frequency variation from 50 Hz to 15 kHz



Plot 3: highest channel, max hold with frequency variation from 50 Hz to 15 kHz



11 Observations

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

Annex A 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

Annex B Document history

Version	Applied changes	Date of release
-/-	Initial release	2019-05-29
-A	Editorial Changes HVIN / FVIN	2019-06-18
-B	Re measured Output Power values added	2019-08-19

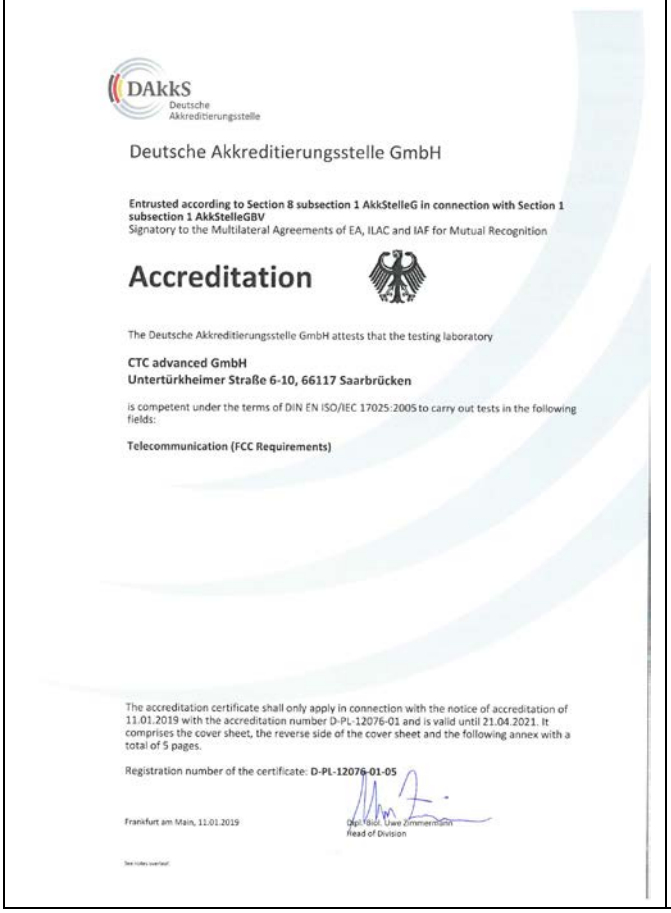
Annex C Accreditation Certificate – D-PL-12076-01-04

first page	last page
	

Note: The current certificate annex is published on the website (link see below) of the Accreditation Body DAkkS or may be received by CTC advanced GmbH on request

https://www.dakks.de/as/ast/d/D-PL-12076-01-04.pdf

Annex D Accreditation Certificate – D-PL-12076-01-05

first page	last page
	

DAkkS Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory

CTC advanced GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

Telecommunication (FCC Requirements)

The accreditation certificate shall only apply in connection with the notice of accreditation of 11.01.2019 with the accreditation number D-PL-12076-01 and is valid until 21.04.2021. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 5 pages.

Registration number of the certificate: **D-PL-12076-01-05**

Frankfurt am Main, 11.01.2019

Dipl.-Biol. Uwe Zimmermann
Head of Division

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Europa-Allee 52
60327 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkkS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

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ILAC: www.ilac.org
IAF: www.iaf.nu

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https://www.dakks.de/as/ast/d/D-PL-12076-01-05.pdf

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