	CTC I advanced
Bundesnetzagentur TEST RI	
BNetzA-CAB-02/21-102	I-4298/17-02-10
Testing laboratory	Applicant
CTC advanced GmbH Untertuerkheimer Strasse 6 – 10 66117 Saarbruecken / Germany Phone: + 49 681 5 98 - 0 Fax: + 49 681 5 98 - 9075 Internet: <u>http://www.ctcadvanced.com</u> e-mail: <u>mail@ctcadvanced.com</u> Accredited Testing Laboratory: The testing laboratory (area of testing) is accredited	Sennheiser electronic GmbH & Co. KG Am Labor 1 30900 Wedemark / GERMANY Phone: +49 5130 600-0 Fax: +49 5130 600-574 Contact: Volker Bartsch e-mail: volker.bartsch@sennheiser.com Phone: +49 5130 600 1465
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	Manufacturer Sennheiser electronic GmbH & Co. KG Am Labor 1 30900 Wedemark / GERMANY
	ndard/s I Regulations; Chapter I; Part 74 - Experimental radio, d 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

	lest item	
Kind of test item:	UHF Wireless Microphones – Handheld Transmitter	
Model name:	SKM 100 G4, SKM 100 S G4, SKM 300 G4, SKM 500 G4	
FCC ID:	DMOG4SKM	
IC:	2099A-G4SKM	
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:

p.o.
------

Andreas Luckenbill Lab Manager Radio Communications & EMC

### **Test performed:**

Yves Olsommer Testing Manager Radio Communications & EMC



### 1 Table of contents

1	Table	of contents	2
2	Gener	ral information	3
	2.1 2.2 2.3	Notes and disclaimer Application details Test laboratories sub-contracted	3
3	Test s	standard/s and references	4
4	Test e	environment	5
5	Test if	tem	5
	5.1 5.2	General description Additional information	
6	Descr	iption of the test setup	6
	6.1 6.2	Shielded fully anechoic chamber RF measurements normal and extreme conditions	
7	Seque	ence of testing	9
	7.1 7.2 7.3	Sequence of testing radiated spurious 9 kHz to 30 MHz Sequence of testing radiated spurious 30 MHz to 1 GHz Sequence of testing radiated spurious 1 GHz to 12.75 GHz	10
8	Measu	urement uncertainty	12
9	Summ	nary of measurement results	13
10	Add	litional comments	14
11	Меа	asurement results	15
	11.1 11.2 11.3 11.4 11.5 11.6 11.7	Transmitter output power Occupied bandwidth Transmitter frequency stability Transmitter unwanted emissions (radiated) Modulation characteristics Necessary bandwidth (BN) for analogue systems Frequency modulation	16 22 27 37 41
12	Ohs	servations	57
	003	servauons	
	nex A	Glossary	
Anr			58



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

#### 2.2 Application details

Date of receipt of order:	2017-11-17
Date of receipt of test item:	2017-11-14
Start of test:	2017-12-13
End of test:	2018-02-05
Person(s) present during the test:	-/-

### 2.3 Test laboratories sub-contracted

None



Test standard	Date	Description
47 CFR Part 74		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
Guidance ANSI C63.4-2014 ANSI C63.10-2013	<b>Version</b> -/- -/-	<b>Description</b> 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 American national standard of procedures for compliance testing of unlicensed wireless devices

# 3 Test standard/s and references



#### 4 **Test environment**

Temperature	:	T <sub>nom</sub> T <sub>max</sub> T <sub>min</sub>	<ul> <li>+23 °C during room temperature tests</li> <li>+50 °C during high temperature tests</li> <li>-30 °C during low temperature tests</li> </ul>	
Relative humidity content	:		41 %	
Barometric pressure	:		1009 hpa	
Vnom         3.00 V DC by 2 x AA batteries           Vmax         3.45 V           Vmin         2.55 V		3.45 V		

#### 5 **Test item**

#### 5.1 **General description**

Kind of test item :	UHF Wireless Microphones – Handheld Transmitter
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 :	1.1.0
S/N serial number :	Band Aw+: 1347000010 Band Gw1: 1347000010
HW hardware status :	1.1.0
SW 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:

1-4298/17-01-33\_AnnexA 1-4298/17-01-33\_AnnexB 1-4298/17-01-33\_AnnexD



### 6 Description of the test setup

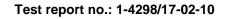
Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements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

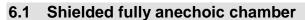
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

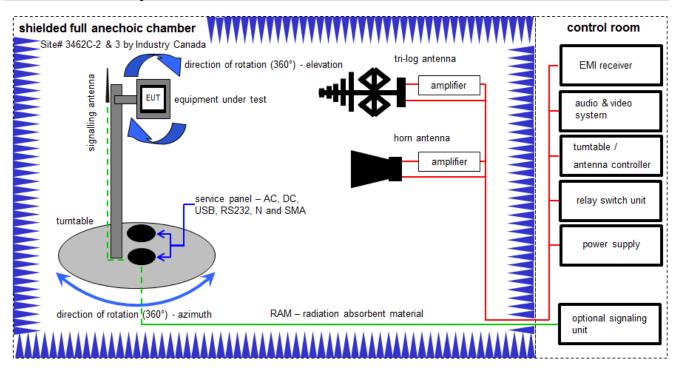
Agenda: Kind of Calibration

- k calibration / calibrated
- ne not required (k, ev, izw, zw not required)
- ev periodic self verification
- Ve long-term stability recognized
- vlkl! Attention: extended calibration interval
- NK! Attention: not calibrated

- EK limited calibration
- zw cyclical maintenance (external cyclical maintenance)
- izw internal cyclical maintenance
- g blocked for accredited testing
- \*) next calibration ordered / currently in progress







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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)

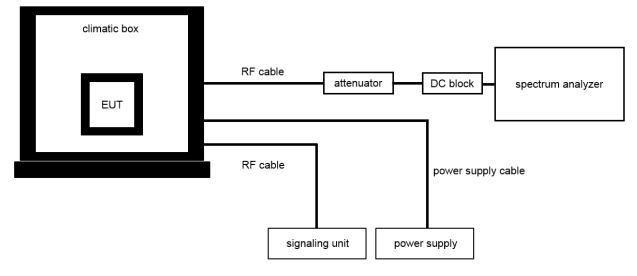
<u>Example calculation:</u> OP [dBm] = -65.0 [dBm] + 50 [dB] - 20 [dBi] + 5 [dB] = -30 [dBm] (1 μW)

#### Equipment table:

No.	Lab / Item	Equipment	Туре	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	В	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	viKi!	07.07.2017	06.07.2019
2	В	Highpass Filter	WHK1.1/15G-10SS	Wainwright	37	400000148	ne	-/-	-/-
3	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	318	300003696	k	23.05.2017	22.05.2020
4	В	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22051	300004483	ev	-/-	-/-
5	А, В	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne	-/-	-/-
6	А, В	Computer	Intel Core i3 3220/3,3 GHz, Prozessor	-/-	2V2403033A54 21	300004591	ne	-/-	-/-
7	А, В	NEXIO EMV- Software	BAT EMC V3.16.0.49	EMCO	-/-	300004682	ne	-/-	-/-
8	А, В	Anechoic chamber	-/-	TDK	-/-	300003726	ne	-/-	-/-
9	A, B	EMI Test Receiver 9kHz-26,5GHz	ESR26	R&S	101376	300005063	k	14.12.2017	13.12.2018



### 6.2 RF measurements normal and 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	Туре	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A, B, C	Isolating Transformer	RT5A	Grundig	12780	300001166	ev	-/-	-/-
2	A, B, C	Signal- and Spectrum Analyzer	FSW26	R&S	101455	300004528	k	20.12.2017	19.12.2018
3	А	Climatic Box	VT 4011	Voetsch Industrietechnik	5856623060001 0	300005363	ev	01.06.2017	31.05.2019
4	в	Multifunction synthesizer DC-600 kHz	8904A	HP	2822A01203	300001367	viKi!	26.01.2017	25.01.2020
5	B, C	Radiocom. Analyzer	CMTA 84	R&S	894581/013	300001355	k	11.01.2018	10.01.2020
6	С	Audio Analyzer 2Hz - 300 kHz	UPD	R&S	841074/009	300001236	k	29.01.2018	28.01.2020



### 7 Sequence of testing

#### 7.1 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.



### 7.2 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.



### 7.3 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.

## 8 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: $\pm 3 \text{ dB}$ Conducted: $\pm 0.5 \text{ dB}$				
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				

$\square$	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.

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TC Identifier	Description	Verdict	Date	Remark
RF-Testing	FCC Part 74 RSS - 210, Issue 9 RSS-Gen Issue 4	See table!	2018-03-21	-/-

Test specification clause	Test case	Temperature conditions	Voltage conditions	С	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	X				-/-
FCC Part 74.861 (e)(4) FCC Part 2.1055 RSS-210 – G.3.3	Transmitter frequency	Nominal	Nominal	$\boxtimes$				-/-
RSS-Gen – 6.11	stability	Extreme	Extreme	$\boxtimes$				
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	X				-/-
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	$\boxtimes$				-/-
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					-/-

**<u>Note:</u>** C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

#### Test report no.: 1-4298/17-02-10



### 10 Additional comments

Reference documents:	None				
Special test descriptions:	None				
Configuration descriptions:		asurements are made with a device supporting band full Aw+ band. are reported separately for A1 and A band.			
Test mode:	$\boxtimes$	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:		<ul> <li>Operating mode 1 (single antenna)</li> <li>Equipment with 1 antenna,</li> <li>Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,</li> <li>Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)</li> </ul>			
		<ul> <li>Operating mode 2 (multiple antennas, no beamforming)</li> <li>Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.</li> </ul>			
		<ul> <li>Operating mode 3 (multiple antennas, with beamforming)</li> <li>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.</li> </ul>			



### 11 Measurement results

# 11.1 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 6.1 – A			
Measurement uncertainty:	See sub clause 8			

#### Limits:

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

### Result:

	Transmitter output power (dBm)					
Channels	Band Aw+ (Included Band A1)*		Band Aw+ (Included Band A)*		Band Gw1*	
	Peak	Average	Peak	Average	Peak	Average
Lowest	12.58	-/-	19.10	-/-	15.98	-/-
Middle	17.41	-/-	15.73	-/-	17.63	-/-
Highest	19.14	-/-	13.35	-/-	16.13	-/-

\*) Output power set to 50 mW.



### 11.2 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 - B			
Measurement uncertainty:	See sub clause 8			

### 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.

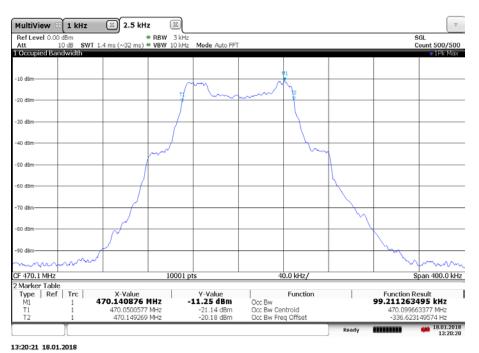
#### Result:

Occupied bandwidth (kHz)					
Channels Band Aw+ Band Aw+ Band Gw1 (Included Band A1) (Included Band A)					
Lowest	99.2	96.1	98.5		
Middle	96.3	95.0	97.8		
Highest	95.4	94.4	98.3		



#### Plots: Band Aw+ (Included Band A1)

#### Plot 1: lowest channel



## Plot 2: middle channel



13:22:11 18.01.2018



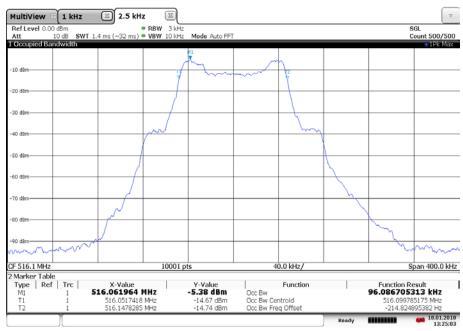
#### Plot 3: highest channel



13:23:46 18.01.2018

#### **<u>Plots</u>**: Band Aw+ (Included Band A)

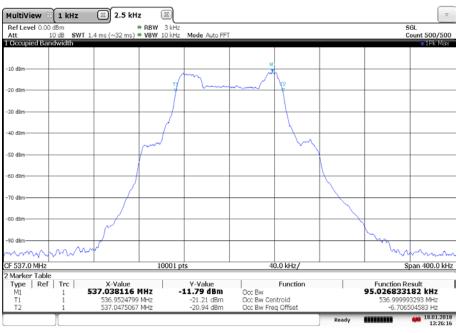
#### Plot 1: lowest channel



13:25:04 18.01.2018

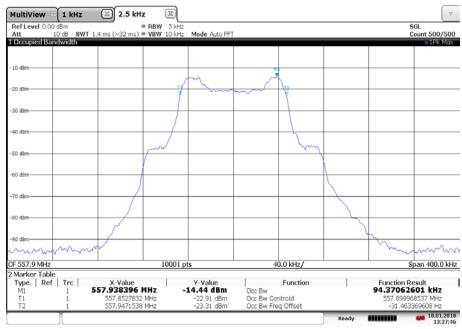


#### Plot 2: middle channel



13:26:17 18.01.2018

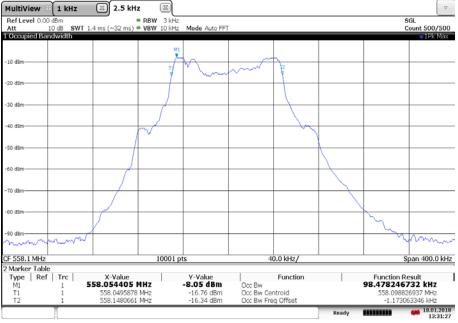
#### Plot 3: highest channel



13:27:46 18.01.2018

### Plots: Band Gw1

#### Plot 1: lowest channel



13:31:28 18.01.2018

#### Plot 2: middle channel



13:29:54 18.01.2018





#### Plot 3: highest channel



13:33:14 18.01.2018



## 11.3 Transmitter frequency stability

### Measurement:

Measurement parameter				
Detector:	Peak			
Sweep time:	Auto			
Resolution bandwidth:	10 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 - A			
Measurement uncertainty:	See sub clause 8			

#### Limits:

### FCC & IC

### 470 MHz to 608 MHz ± 50 ppm

### Results: Band Aw+ (Included Band A1), lowest channel

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



Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / V <sub>nom</sub>	492.996979	0.979	1.986
-20 °C / V <sub>nom</sub>	492.998570	-1.430	-2.901
-10 °C / V <sub>nom</sub>	492.999860	-0.140	-0.284
0 °C / V <sub>nom</sub>	493.000544	0.543	1.102
+10 °C / V <sub>nom</sub>	493.000615	0.615	1.248
+20 °C / V <sub>nom</sub>	493.000251	0.251	0.509
+30 °C / V <sub>nom</sub>	493.000357	0.357	0.724
+40 °C / V <sub>nom</sub>	493.000622	0.622	1.262
+50 °C / V <sub>nom</sub>	493.001224	1.224	2.483
+20 °C / V <sub>nom</sub> - 15%	493.000289	0.289	0.586
+20 °C / V <sub>nom</sub>	493.000251	0.251	0.509
+20 °C / V <sub>nom</sub> + 15%	493.000271	0.271	0.550

Results: Band Aw+ (Included Band A1), middle channel

### Results: Band Aw+ (Included Band A1), highest channel

Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / V <sub>nom</sub>	515.896504	-0.796	-1.543
-20 °C / V <sub>nom</sub>	515.898412	-1.589	-3.080
-10 °C / V <sub>nom</sub>	515.899913	-0.087	-0.169
0 °C / V <sub>nom</sub>	515.900523	0.523	1.014
+10 °C / V <sub>nom</sub>	515.900632	0.632	1.225
+20 °C / V <sub>nom</sub>	515.900265	0.265	0.514
+30 °C / V <sub>nom</sub>	515.900343	0.343	0.665
+40 °C / V <sub>nom</sub>	515.900609	0.609	1.181
+50 °C / V <sub>nom</sub>	515.901140	1.140	2.210
+20 °C / V <sub>nom</sub> - 15%	515.900268	0.268	0.520
+20 °C / V <sub>nom</sub>	515.900265	0.265	0.514
+20 °C / V <sub>nom</sub> + 15%	515.900254	0.254	0.492



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

Results: Band Aw+ (Included Band A), lowest channel

### Results: Band Aw+ (Included Band A), middle channel

Temperature / Voltage	Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
-30 °C / Vnom	536.996031	0.331	0.616
-20 °C / Vnom	536.998144	-1.856	-3.456
-10 °C / Vnom	536.999876	-0.124	-0.231
0 °C / Vnom	537.000483	0.483	0.900
+10 °C / Vnom	537.000582	0.582	1.084
+20 °C / Vnom	537.000188	0.188	0.350
+30 °C / Vnom	537.000252	0.252	0.469
+40 °C / Vnom	537.000489	0.489	0.911
+50 °C / Vnom	537.001030	1.030	1.918
+20 °C / Vnom - 15%	537.000198	0.198	0.369
+20 °C / Vnom	537.000188	0.188	0.350
+20 °C / Vnom + 15%	537.000163	0.163	0.304



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

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

### 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



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

Results: Band Gw1, middle channel

### Results: Band Gw1, highest channel

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



# 11.4 Transmitter unwanted emissions (radiated)

### Measurement:

Measurement parameter		
Detector:	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 8	

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))				
	Max. spurious level			
State	47 MHz to74 MHzOther frequenciesAll frequencies87.5 MHz to118 MHzOther frequenciesAll frequencies174 MHz to230 MHz≤ 1000 MHz> 1000 MHz470 MHz to862 MHz> 1000 MHz			
Operating	4.0 nW	250 nW	1.00 µW	
Standby	2.0 nW	2.0 nW	20.0 nW	

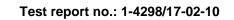
FCC & IC			
The mean power of emissions shall be attenuated below the mean output power of the transmitter in			
accordance with the follow	ving schedule:		
On any frequency removed from the operating frequency by			
more than 50 percent up to and including 100 percent of the	25 dB		
authorized bandwidth: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

Test report	no.:	1-4298/1	7-02-10
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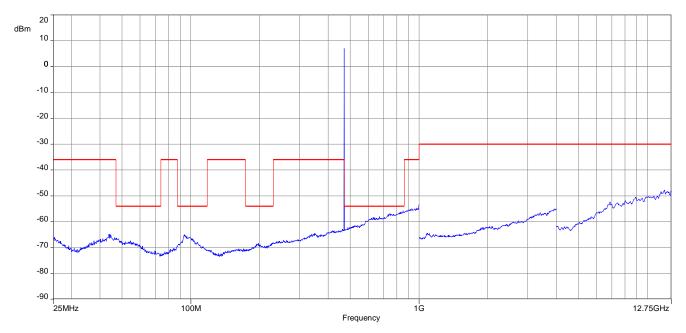
### Results:

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

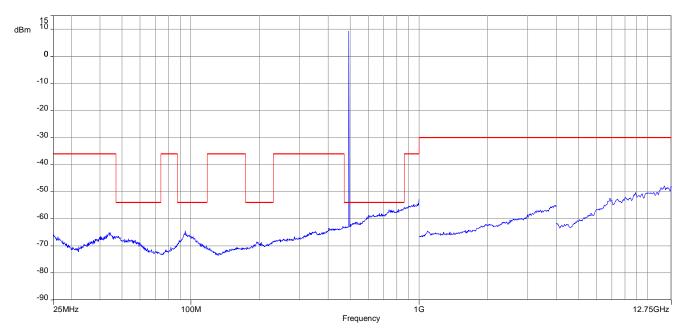


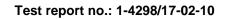
### Plots: Band Aw+ (Included Band A1)

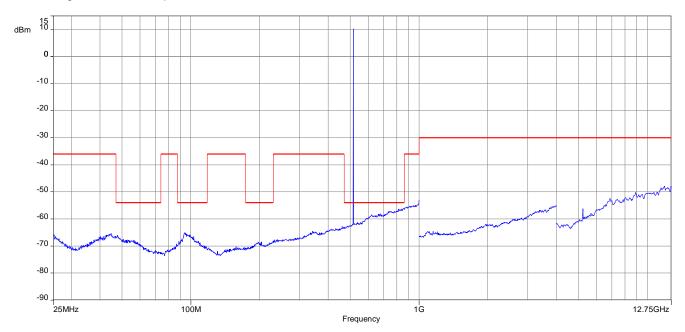
Plot 1: lowest channel, spurious emissions, 25 MHz - 12.75 GHz



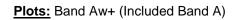
Plot 2: middle channel, spurious emissions, 25 MHz - 12.75 GHz

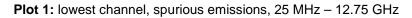


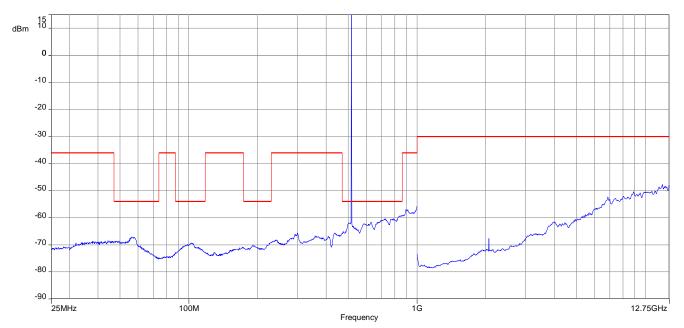




Plot 3: highest channel, spurious emissions, 25 MHz - 12.75 GHz

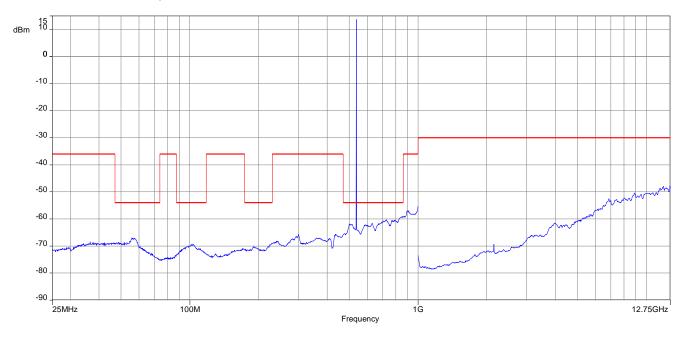




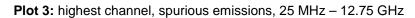


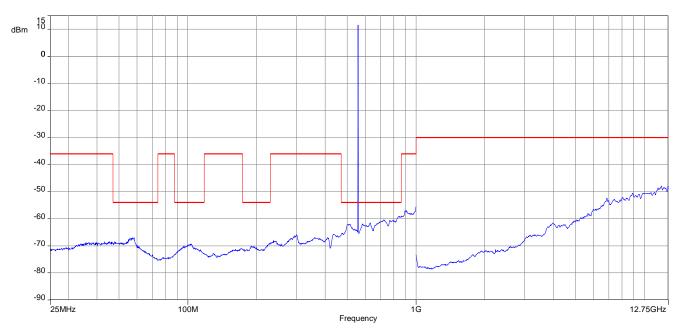
CTC I advanced

### Test report no.: 1-4298/17-02-10



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



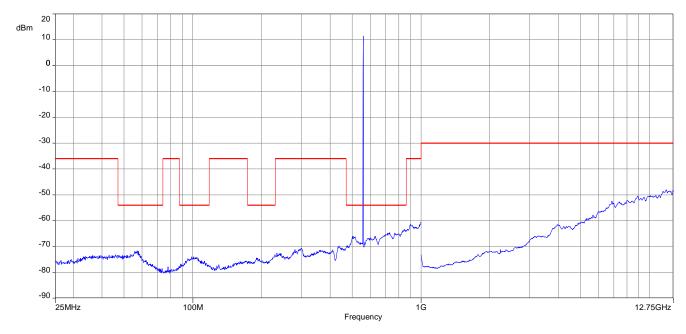


CTC I advanced

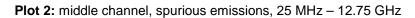
### Test report no.: 1-4298/17-02-10

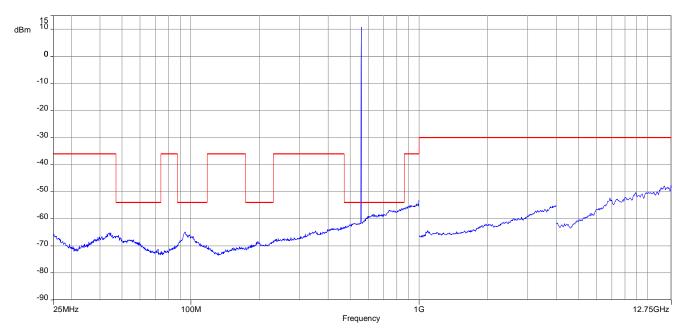


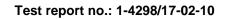
### Plots: Band Gw1

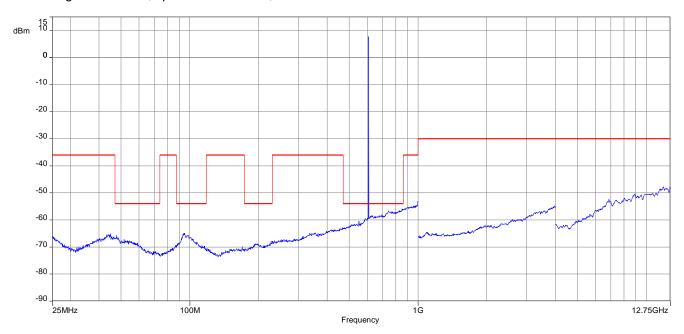


Plot 1: lowest channel, spurious emissions, 25 MHz - 12.75 GHz









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



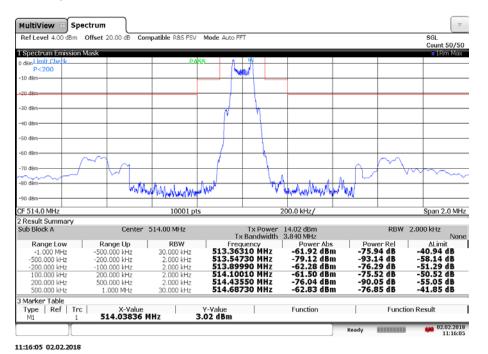


MultiView 😁 Spectrum  $\nabla$ Ref Level 12.00 dBm Offset 20.00 dB Compatible R&S FSV Mode Auto FFT SGL Count 50/50 1 Spectrum Emission Mas Limit Ch P<200 i. In 10 dB 20 dE 30 d 50 d 60 d 70 di evelopping and the marginest state Antonio and a second 80 dt 200.0 kHz/ CF 470.0 MHz 10001 pts Span 2.0 MHz 2 Result Summary Sub Block A Center 470.00 MHz Tx Power 23.06 dBm Tx Bandwidth 3.840 MHz RBW 2,000 kHz None Tx Bandwidt Frequency 469.32130 MHz 469.79390 MHz 469.89950 MHz 470.10010 MHz 470.20390 MHz 470.69910 MHz Power Rel -91.76 dB -98.62 dB -74.88 dB -72.19 dB ALimit -56.76 dB -63.62 dB -49.88 dB -47.19 dB Range Low -1.000 MHz -500.000 kHz Range Up -500.000 kHz -200.000 kHz RBW 30.000 kHz 2.000 kHz Power Abs -68.70 dBm -75.56 dBm -51.83 dBm -49.14 dBm -77.09 dBm -68.45 dBm 200.000 kHz 100.000 kHz 100.000 kHz 200.000 kHz 2.000 kHz 2.000 kHz 200.000 kHz 500.000 kHz 500.000 kHz 1.000 MHz -100.14 dB -91.51 dB 2.000 kHz 30.000 kHz -65.14 dB -56.51 dB Marker Table Type | Ref | Trc | X-Value 469.95964 MHz Y-Value 11.71 dBm Т Function 1 Function Result 1 02.02.2018 11:14:41 000000 Ready

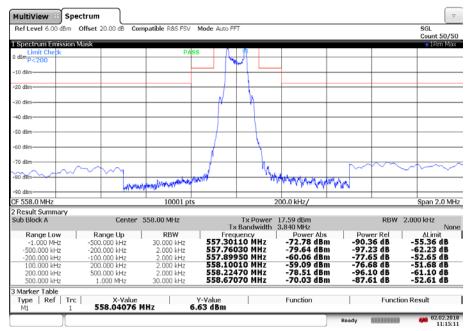
11:14:41 02.02.2018

CTC I advanced

#### Plot 2: middle channel, spectrum mask



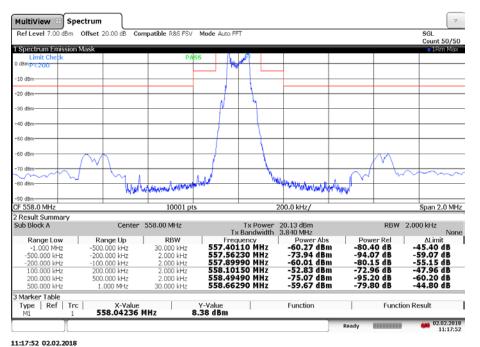
**Plot 3:** highest channel, spectrum mask



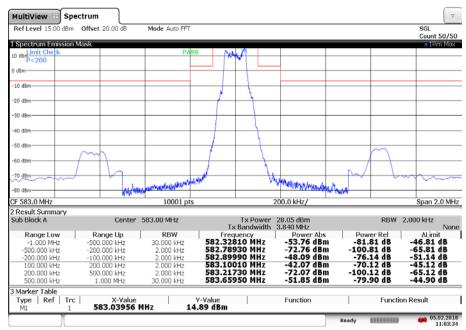
11:15:12 02.02.2018

#### Plots: Band Gw1

Plot 1: lowest channel, spectrum mask

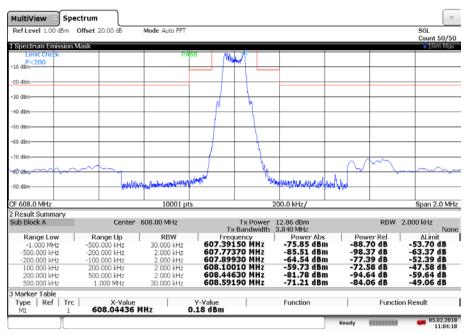


Plot 2: middle channel, spectrum mask



11:03:34 05.02.2018

#### Plot 3: highest channel, spectrum mask



11:04:19 05.02.2018



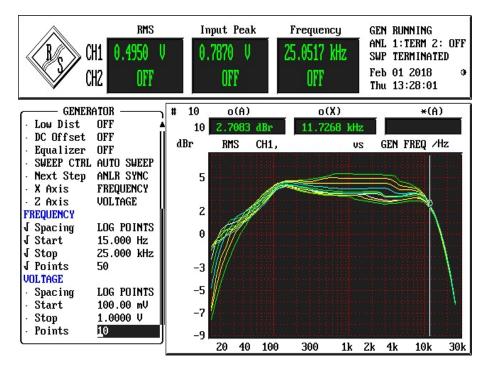
# **11.5 Modulation characteristics**

#### Method of measurement:

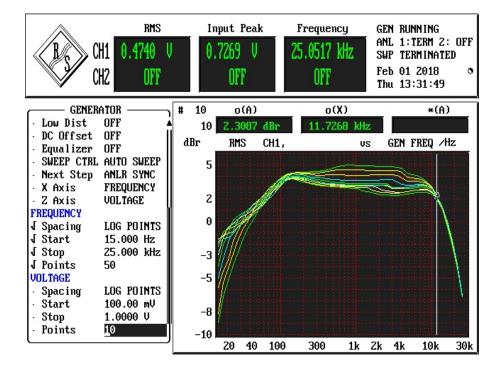
The audio frequency response was measured in accordance with EIA/TIA 603. The plots shows 10 curves with different modulation levels, the test frequency is varied from 15 Hz to 20 kHz.

#### Plots: Band Aw+

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

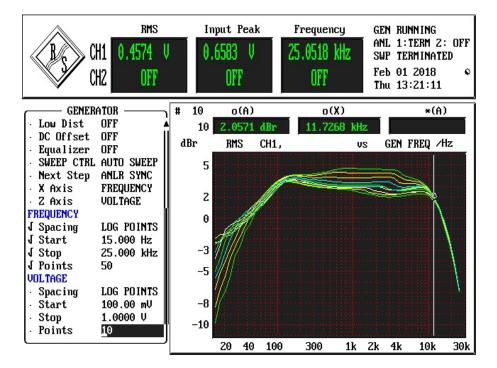






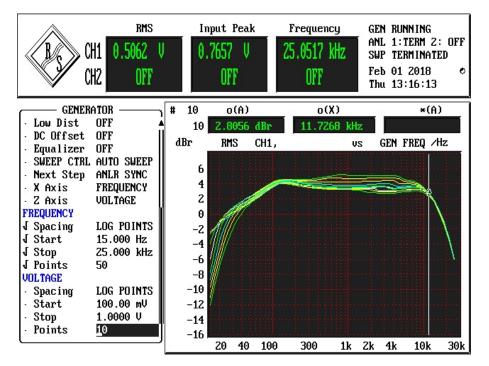
Plot 2: middle channel, 10 curves with voltage and frequency variation

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

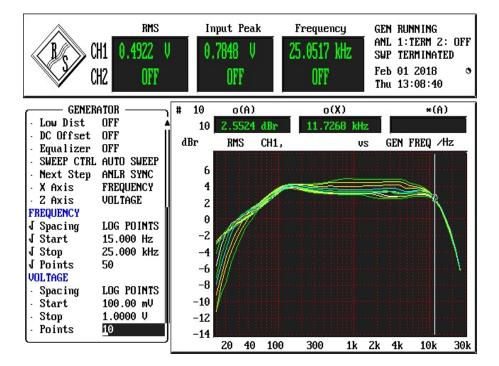


# Plots: Band Gw1

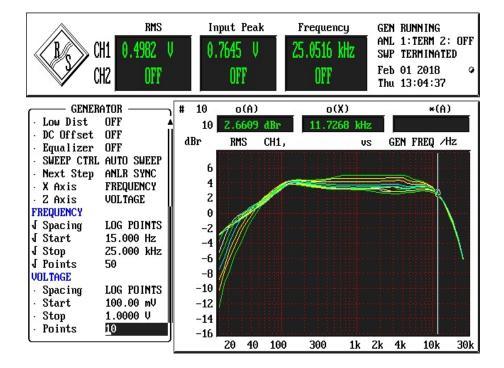
Plot 1: lowest channel, 10 curves with voltage and frequency variation



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







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

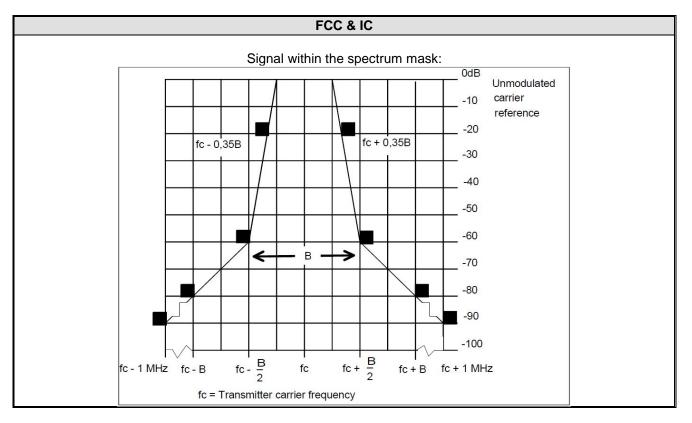


# 11.6 Necessary bandwidth (BN) for analogue systems

# 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 - C	
Measurement uncertainty:	See sub clause 8	

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



Plots: Band Aw+ (Included Band A1), lowest channel



MultiView 😁 BN  $\nabla$ Mode Auto FFT Offset 10.00 dB Ref Level 17.00 dBm SGL 20/20 Count 1 Spectrum Emission Mask IPk Ma: -10 dB 40 d! 50 di 60 d8 كاريا M CF 470.1 MHz 10001 pts 00.0 kHz/ Span 2.0 MHz 2 Result Summary Sub Block A Center 470.10 MHz Tx Power 21.94 dBm Tx Bandwidth 3.840 MHz RBW 1.000 kHz Non Power Rel -98.02 dB -105.18 dB -91.39 dB -92.00 dB -104.31 dB -96.53 dB Frequency 469.45990 MHz 469.90330 MHz 470.00050 MHz 470.19950 MHz 470.29510 MHz 470.74150 MHz Power Abs -76.07 dBm -83.24 dBm -69.45 dBm -70.05 dBm -82.37 dBm -74.59 dBm ALimit -12.52 dB -25.84 dB -32.06 dB -32.66 dB -25.29 dB -11.01 dB Range Up RBW Range Low -1.000 MHz -200.000 kHz -200.000 kHz -100.000 kHz 1.000 kHz 1.000 kHz -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz ..000 kHz ..000 kHz 100.000 kHz 200.000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 1.000 kHz 15.12.2017 09:16:46

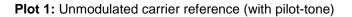
09:16:47 15.12.2017

**Plot 2:** Modulated carrier with the weighted noise source

MultiView 🖽 BN  $\nabla$ Ref Level 17.00 dBm Offs et 10.00 df Mode Auto FE SGI Cou . nt 20/20 l Spectrum Emission Mask 10 di -10 di en da 50.0 -60 dBr 70 d8 - P Span 2.0 MHz CF 470.1 MHz 10001 pt 200.0 kHz/ 2 Result Summary Sub Block A Center 470.10 MHz RBW 1.000 kHz Tx Power 26.53 dBm Tx Bandwidth 3.840 MHz None ALimit -19.54 dB -19.72 dB -17.24 dB -19.28 dB -18.20 dB -28.55 dB 469.41410 MHz 469.99730 MHz 470.01910 MHz 470.18230 MHz 470.30630 MHz Power Abs -79.08 dBm -53.73 dBm -25.24 dBm -29.14 dBm -51.97 dBm -82.10 dBm RBW Range Low Range Up Power Rel -105.61 dB -1.000 MHz -200.000 kHz -200.000 kHz -100.000 kHz 1.000 kHz 1.000 kHz -105.61 dB -80.26 dB -51.77 dB -55.68 dB -78.50 dB -108.63 dB -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz ..000 kHz ..000 kHz 100.000 kHz 200.000 kHz 1.000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 5.12.2017 09:17:20

09:17:20 15.12.2017

Plots: Band Aw+ (Included Band A1), middle channel



MultiView 😁 BN  $\nabla$ Mode Auto FFT Offset 10.00 dB Ref Level 18.00 dBm SGL 20/20 Cot 1 Spectrum Emission Mask 10 ١Æ 30 di 40 d8 60 d8 70 dBr July' -80 dBm CF 493.0 MHz 00.0 kHz/ Span 2.0 MHz 10001 pt 2 Result Summary Sub Block A Center 493.00 MHz Tx Power 23.73 dBm Tx Bandwidth 3.840 MHz RBW 1.000 kHz Non Power Rel -94.46 dB -105.30 dB -93.23 dB -93.78 dB -105.28 dB -91.51 dB Frequency 492.36150 MHz 492.80390 MHz 492.90010 MHz 493.09990 MHz 493.19790 MHz 493.64450 MHz Power Abs -70.73 dBm -81.57 dBm -69.50 dBm -70.05 dBm -81.55 dBm -67.77 dBm ALimit -8.98 dB -26.08 dB -33.36 dB -33.91 dB -25.70 dB -5.95 dB Range Up RBW Range Low -1.000 MHz -200.000 kHz -200.000 kHz -100.000 kHz 1.000 kHz 1.000 kHz -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz ..000 kHz ..000 kHz 100.000 kHz 200.000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 1.000 kHz 15.12.2017 09:18:01

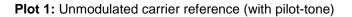
09:18:02 15.12.2017

**Plot 2:** Modulated carrier with the weighted noise source

MultiView 😁 BN  $\nabla$ Ref Level 18.00 dBm Offs et 10.00 df Mode Auto FE SGI Cou nt 20/20 l Spectrum Emission Mask PA M1 10 di 40 dB 50 di 50 dB 20 di nr <u>n</u> – -80 dBm CF 493.0 MHz Span 2.0 MHz 10001 pt 200.0 kHz/ 2 Result Summary Sub Block A Center 493.00 MHz RBW 1.000 kHz Tx Power 27.62 dBm Tx Bandwidth 3.840 MHz None ALimit -15.74 dB -19.35 dB -18.47 dB -20.12 dB -20.21 dB -18.03 dB 492.31530 MHz 492.89990 MHz 492.92150 MHz 493.08110 MHz 493.10110 MHz 493.65770 MHz Power Abs -74.18 dBm -51.75 dBm -22.18 dBm -27.30 dBm -52.81 dBm -76.13 dBm Power Rel -101.80 dB -79.37 dB -49.80 dB -54.92 dB -80.43 dB -103.75 dB Range Up -200.000 kHz -100.000 kHz RBW Range Low -1.000 MHz -200.000 kHz 1.000 kHz 1.000 kHz -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz ..000 kHz ..000 kHz 100.000 kHz 200.000 kHz 1.000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 5.12.2017 09:18:26

09:18:27 15.12.2017

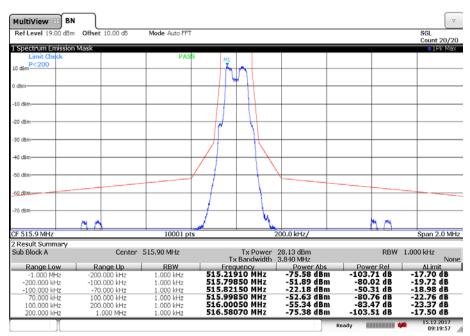
Plots: Band Aw+ (Included Band A1), highest channel



MultiView 🕀 BN  $\nabla$ Offset 10.00 dB Mode Auto FFT Ref Level 19.00 dBm SGL 20/20 Cot 1 Spectrum Emission Mask 10 c 20 d 50 c Y) CF 515.9 MHz 10001 pt Span 2.0 MHz 2 Result Summary Sub Block A Center 515.90 MHz Tx Power 23.80 dBm Tx Bandwidth 3.840 MHz RBW 1.000 kHz Non Power Rel -93.15 dB -105.11 dB -92.99 dB -93.82 dB -105.28 dB -91.33 dB Frequency 515.25810 MHz 515.70330 MHz 515.80010 MHz 515.99990 MHz 516.09870 MHz 516.54370 MHz Power Abs -69.36 dBm -81.32 dBm -69.20 dBm -70.03 dBm -81.48 dBm -67.53 dBm ALimit -7.63 dB -25.77 dB -33.13 dB -33.96 dB -25.54 dB -5.78 dB Range Up RBW Range Low -1.000 MHz -200.000 kHz -200.000 kHz -100.000 kHz 1.000 kHz 1.000 kHz -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz ..000 kHz ..000 kHz 100.000 kHz 200.000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 1.000 kHz 15.12.2017 09:19:20

09:19:21 15.12.2017

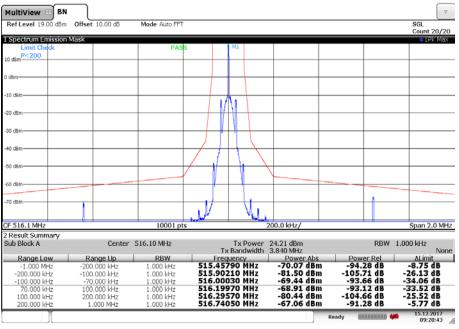
**Plot 2:** Modulated carrier with the weighted noise source



09:19:57 15.12.2017

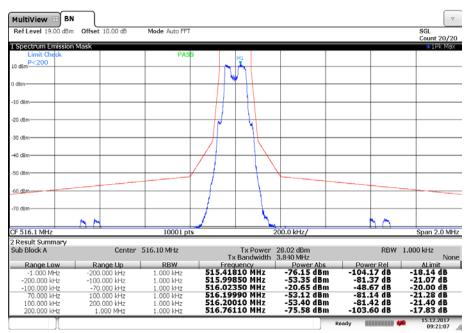
Plots: Band Aw+ (Included Band A), lowest channel

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), middle channel



MultiView 😁 BN  $\nabla$ Offset 10.00 dB Mode Auto FFT Ref Level 16.00 dBm SGL 20/20 Count 1 Spectrum Emission Mask IPk Max 10 dB 10 di ıÆı h nc 60 di 70 dBr 80 d8 CF 537.0 MHz Span 2.0 MHz 10001 pt 200.0 kHz 2 Result Summary Sub Block A Center 537.00 MHz Tx Power 21.97 dBm Tx Bandwidth 3.840 MHz RBW 1.000 kHz Non Range Low -1.000 MHz -200.000 kHz Frequency 536.35670 MHz 536.80270 MHz 536.90010 MHz 537.19890 MHz 537.64070 MHz Power Abs -74.58 dBm -83.77 dBm -71.60 dBm -72.12 dBm -83.79 dBm -74.27 dBm Power Rel -96.55 dB -105.74 dB -93.57 dB -94.09 dB -105.76 dB -96.24 dB ALimit -11.01 dB -26.28 dB -33.70 dB -34.49 dB -25.98 dB -10.73 dB Range Up RBW -200.000 kHz -100.000 kHz 1.000 kHz 1.000 kHz -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz ..000 kHz ..000 kHz 100.000 kHz 200.000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 1.000 kHz 15.12.2017 09:21:53

09:21:53 15.12.2017

**Plot 2:** Modulated carrier with the weighted noise source

MultiView 🖽 BN V Ref Level 16.00 dBm Offs et 10.00 df Mode Auto FE SGI Count 20/20 l Spectrum Emission Mask -10 d 50 d8 70 da an da - 04 Span 2.0 MHz CF 537.0 MHz 10001 pt 200.0 kHz/ 2 Result Summary Sub Block A Center 537.00 MHz RBW 1.000 kHz Tx Power 25.66 dBm Tx Bandwidth 3.840 MHz None ALimit -21.00 dB -20.58 dB -20.34 dB -21.92 dB -20.52 dB -21.34 dB 536.31830 MHz 536.89690 MHz 536.92290 MHz 537.10090 MHz 537.67130 MHz Power Abs -81.37 dBm -55.54 dBm -24.15 dBm -26.26 dBm -55.04 dBm -81.58 dBm Power Rel -107.02 dB -81.20 dB -49.81 dB -51.92 dB -80.70 dB -107.23 dB Range Up -200.000 kHz -100.000 kHz RBW Range Low -1--1.000 MHz -200.000 kHz 1.000 kHz 1.000 kHz -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz .000 kHz .000 kHz 100.000 kHz 200.000 kHz .000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 5.12.2017 09:22:20

09:22:21 15.12.2017

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



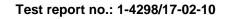
MultiView 🕀 BN  $\nabla$ Offset 10.00 dB Mode Auto FFT SGL Ref Level 15.00 dBm Count 20/20 1 Spectrum Emission Mask IPk M 10 dB 70.1 -20 d8 50 di h 60 d V AD dBr CF 557.9 MHz 10001 pts Span 2.0 MHz 00.0 kHz 2 Result Summary Sub Block A Center 557.90 MHz Tx Power 20.81 dBm Tx Bandwidth 3.840 MHz RBW 1.000 kHz Non Range Low -1.000 MHz -200.000 kHz Frequency 557.25590 MHz 557.70010 MHz 557.80130 MHz 557.99990 MHz 558.09730 MHz 558.54530 MHz Power Abs -77.74 dBm -83.89 dBm -70.90 dBm -73.54 dBm -84.42 dBm -73.68 dBm Power Rel -98.55 dB -104.69 dB -91.71 dB -94.35 dB -105.22 dB -94.49 dB Range Up RBW ALimit -13.00 dB -24.71 dB -33.44 dB -34.48 dB -25.76 dB -8.92 dB -200.000 kHz -100.000 kHz 1.000 kHz 1.000 kHz -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz ..000 kHz ..000 kHz 100.000 kHz 200.000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 1.000 kHz 15.12.2017 09:23:12

09:23:13 15.12.2017

**Plot 2:** Modulated carrier with the weighted noise source

MultiView 🖽 BN  $\nabla$ Ref Level 15.00 dBm Offset 10.00 de Mode Auto FE SGI Count 20/20 l Spectrum Emission Mask 0 dB 10 d 20 di 30 d8 60 dB -70 dBr <u>n a</u> Span 2.0 MHz CF 557.9 MHz 10001 pts 200.0 kHz/ 2 Result Summary Sub Block A Center 557.90 MHz RBW 1.000 kHz Tx Power 23.97 dBm Tx Bandwidth 3.840 MHz None ALimit -22.21 dB -21.31 dB -21.58 dB -23.36 dB -21.31 dB -20.15 dB 557.21790 MHz 557.79390 MHz 557.80230 MHz 557.80230 MHz 557.99910 MHz 558.00150 MHz 558.57730 MHz Power Abs -84.26 dBm -58.55 dBm -54.54 dBm -58.19 dBm -57.63 dBm -82.14 dBm Power Rel -108.24 dB -82.53 dB -78.52 dB -82.16 dB -81.61 dB -106.12 dB Range Up -200.000 kHz -100.000 kHz RBW Range Low -1.000 MHz -200.000 kHz 1.000 kHz 1.000 kHz -100.000 kHz 70.000 kHz -70.000 kHz 100.000 kHz .000 kHz .000 kHz 100.000 kHz 200.000 kHz .000 kHz 200.000 kHz 1.000 MHz 1.000 kHz 5.12.2017 09:23:42

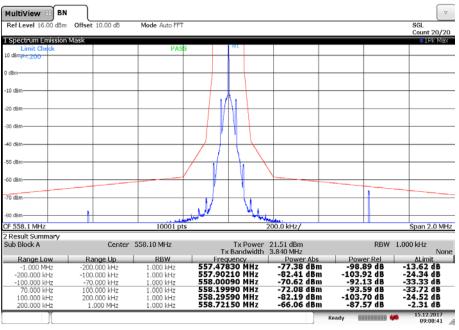
09:23:42 15.12.2017





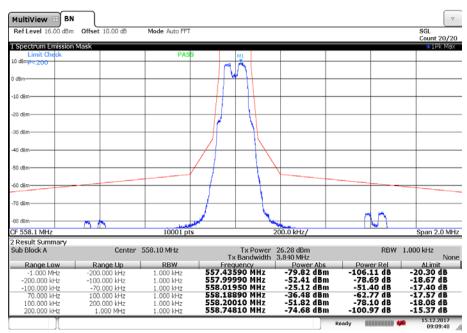
## Plots: Band Gw1, lowest channel

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

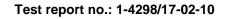


09:08:42 15.12.2017

Plot 2: Modulated carrier with the weighted noise source



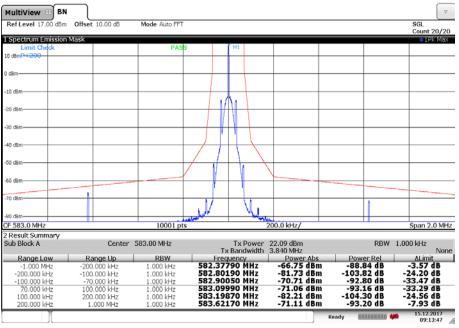
09:09:40 15.12.2017





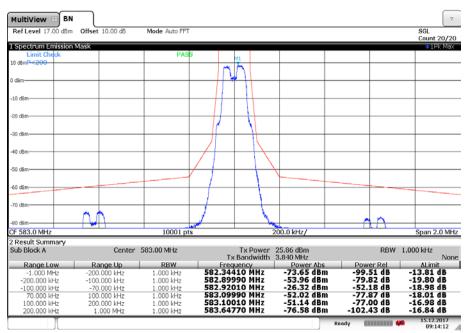
## Plots: Band Gw1, middle channel

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

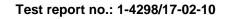


09:13:47 15.12.2017

Plot 2: Modulated carrier with the weighted noise source



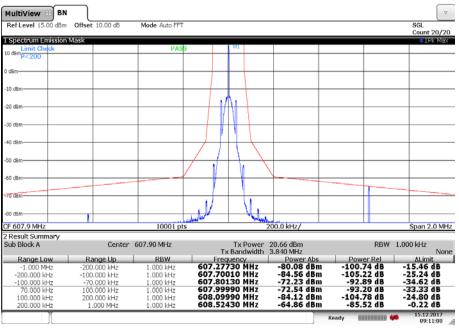
09:14:12 15.12.2017





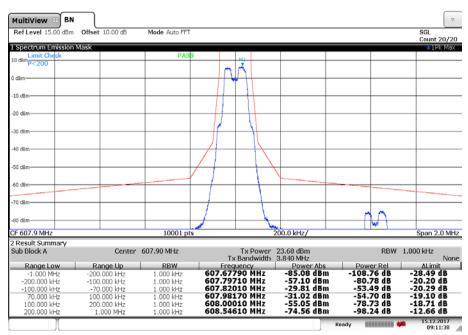
## Plots: Band Gw1, highest channel

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



09:11:01 15.12.2017

Plot 2: Modulated carrier with the weighted noise source



09:11:38 15.12.2017



# 11.7 Frequency modulation

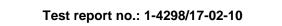
# Measurement:

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 - B	
Measurement uncertainty:	See sub clause 8	

# Limits:

FCC & IC

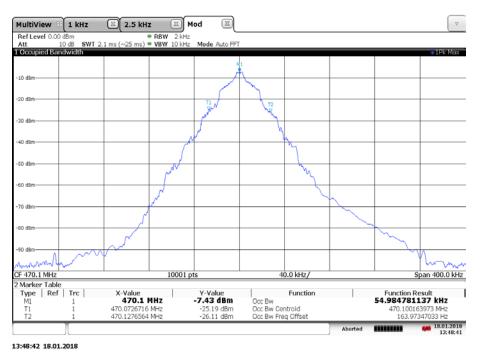
Frequency deviation up to a maximum of  $\pm$  75 kHz



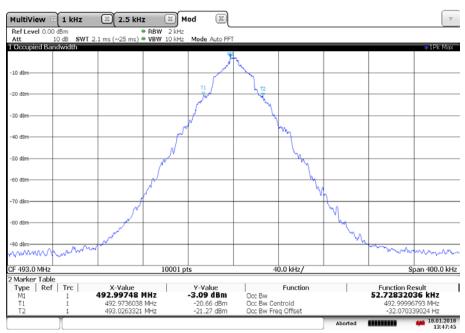


# Plots: Band Aw+ (Included Band A1)

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



13:47:45 18.01.2018



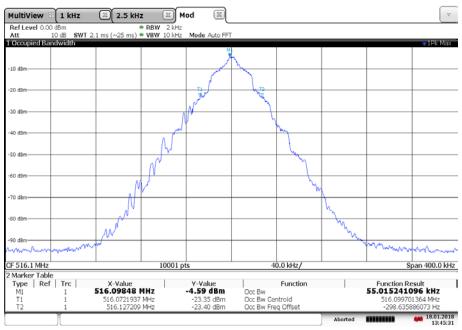


Plot 3: highest channel, max hold with frequency variation from 50 Hz to 15 kHz

13:40:39 18:01.2018

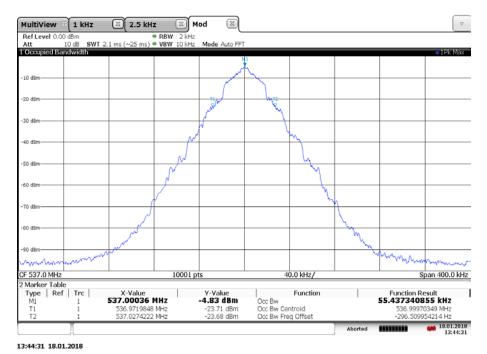
Plots: Band Aw+ (Included Band A)

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



13:45:32 18.01.2018



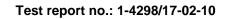


Plot 2: middle channel, max hold with frequency variation from 50 Hz to 15 kHz

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



13:43:08 18.01.2018





# Plots: Band Gw1

MultiView 🗄 1 kHz 🗵 2.5 kHz Mod X  $\nabla$ Ref Level 0.00 dBm Att 10 dB 5 1 Occupied Bandwidth RBW 2 kHz
 SWT 2.1 ms (~25 ms)
 VBW 10 kHz Mode Auto FFI -10 dB 20 di 30 40 d -SO dBr 60 0 80 d 90 d man 1 .... CF 558.1 MHz 10001 pts 40.0 kHz/ Span 400.0 kHz Marker Table Type | Ref | Trc | M1 1 Function Function Result 54.804160915 kHz I 558.10232 MHz -10.17 dBm Occ Bw Occ Bw Centroid Occ Bw Freq Offset Τ1 558.0728413 MHz 558.1276454 MHz -28.84 dBm -29.40 dBm 558.10024335 MHz 243.349935532 Hz Τ2 18.01.2018 13:41:16 Aborted ..... 13:41:17 18.01.2018

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

V 🔟 Mod MultiView 🗄 🛛 1 kHz 🖾 2.5 kHz X 
 Ref Level 0.00 dBm

 RBW 2 kHz

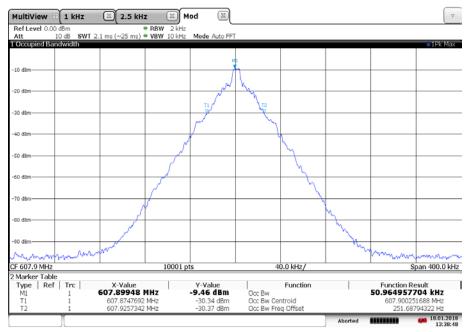
 Att 10 dB SWT 2.1 ms (~25 ms) = VBW 10 kHz

 VBW 10 kHz

 I Occupied Bandwidth
 de Auto FFI M -10 di 20 dE -30 dBr 50 di 60 ( 70 c 90 dE ...Α An A mm Span 400.0 kHz CF 583.0 MHz 10001 pts 40.0 kHz/ Marker Table Type | Ref | Trc | M1 1 Y-Value -9.73 dBm Function Т Function Result 55.467796453 kHz X-Value 582.9994 MHz Occ Bw Occ Bw Centroid Occ Bw Freq Offset 583.000524224 MHz 524.22394681 Hz TI -27.21 dBm -28.16 dBm 582.9727903 MHz 583.0282581 MHz 18.01.2018 13:40:10 Aborted \*\*\*\*\*\*\*

13:40:11 18.01.2018





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

13:38:49 18.01.2018



# 12 **Observations**

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

# Test report no.: 1-4298/17-02-10



#### Annex A Glossary

EUT	Equipment under test		
DUT	Device under test		
	Unit under test		
GUE			
ETSI			
EN	European Standard		
FCC			
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		
00	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 <sub>0</sub>	Carrier to noise-density ratio, expressed in dB-Hz		

# Annex B Document history

Version	Applied changes	Date of release
-/-	Initial release	2018-03-21

# Annex C Accreditation Certificate

first page	last page
Deutsche Akkreditierungsstelle GmbH	Deutsche Akkreditierungsstelle GmbH
Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGW Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition Accreditation	Office Berlin Office Frankfurt am Main Office Braunschweig Spittelmarkt 10 Europa-Alles 52 Bundesalles 100 10117 Berlin 60327 Frankfurt am Main 38116 Braunschweig
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	The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akfreditienungsstelle GmbH (DAMAS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf. No impression shall be made that the accreditation also extends to fields beyond the scope of
The accreditation certificate shall only apply in connection with the notice of accreditation of 02.06.2017 with the accreditation number D-Pt-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 tatol of 43 pages.	accreditation attested by DAkks. The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal au Gazette J. 2-523) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance, relating to the marketing of products (Official Journal of the European Into 1.218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA). International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.
Registration number of the certificate: D-PL-12076-01-03	The up-to-date state of membership can be retrieved from the following websites: EA: www.upopena-acceditation.org ILAC: www.lac.org IAF: www.laf.nu
Frankfurt, 02.06.2017 Health of Division Incommunitat	

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

http://www.dakks.de/as/ast/d/D-PL-12076-01-03.pdf