

# EMI – TEST REPORT

- FCC Part 15.407 -

**Type / Model Name** : NXP2RX

**Product Description** : Digital Wireless Audio Network

**Applicant** : Neutrik AG

**Address** : Im Alten Riet 143

9494 Schaan

LIECHTENSTEIN

**Manufacturer** : Neutrik AG

**Address** : Im Alten Riet 143

9494 Schaan

LIECHTENSTEIN

**Test Result** according to the standards  
listed in clause 1 test standards:

**POSITIVE**

**Test Report No. :** **T40632-00-03JP**

17. March 2016

Date of issue



Deutsche  
Akkreditierungsstelle  
D-PL-12030-01-01  
D-PL-12030-01-02

The test report merely corresponds to the test sample.  
It is not permitted to copy extracts of these test results  
without the written permission of the test laboratory.

## Contents

<b>1</b>	<b><u>TEST STANDARDS</u></b>	<b>3</b>
<b>2</b>	<b><u>EQUIPMENT UNDER TEST</u></b>	<b>4</b>
<b>3</b>	<b><u>TEST RESULT SUMMARY</u></b>	<b>8</b>
<b>4</b>	<b><u>TEST ENVIRONMENT</u></b>	<b>9</b>
4.1	Address of the test laboratory	9
4.2	Environmental conditions	9
4.3	Statement of the measurement uncertainty	9
4.1	Measurement protocol for FCC and IC	10
<b>5</b>	<b><u>TEST CONDITIONS AND RESULTS</u></b>	<b>11</b>
5.1	Conducted emissions	11
5.2	Maximum conducted output power	16
5.3	26dB Bandwidth	18
5.4	99% Bandwidth	26
5.5	6dB Bandwidth	34
5.6	Peak power spectral density	39
5.7	Frequency stability	47
5.8	radiated emissions	49
5.9	Duty cycle and transmission duration	58
<b>6</b>	<b><u>USED TEST EQUIPMENT AND ACCESSORIES</u></b>	<b>62</b>

## 1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (February, 2016)

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (February, 2016)

Part 15, Subpart C, Section 15.207

Conducted limits

Part 15, Subpart C, Section 15.209

Radiated emission limits, general requirements

FCC Rules and Regulations Part 15, Subpart E – Unlicensed National Information Infrastructure Devices (February, 2016)

Part 15, Subpart E, Section 15.407

General technical requirements

ANSI C63.10: 2013

Testing Unlicensed Wireless Devices

KDB 789033 D02 v01

Guidelines for compliance testing of UNII-Devices – Part 15E,  
June 6, 2014.

## 2 EQUIPMENT UNDER TEST

### 2.1 Photo documentation of the EUT



FCC ID: 2ABA7XPR



## 2.2 Equipment category

Digital Wireless Audio Network

## 2.3 Short description of the equipment under test (EUT)

The NXP2RX is part of a digital wireless audio network. The product consists out of a RX base station and a repeater module. It is used to extend the range of the XIRIUM wireless transmission system. The audio stream is transmitted either in the UNII-1 band (5150MHz to 5250MHz) or in the UNII-3 band (5725MHz to 5825MHz). The repeater is programmed by Tablet, Mobile Phone or similar by use of the 2.4GHz module with the FCC ID: R68XPICOW.

The 2.4GHz functionality of the Module R68XPICOW is not part of this report.

Number of tested samples: 1

Serial number: RX PRO 600007 (RX base station) & 515685 (repeater module)

### EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

## 2.4 Variants of the EUT

none

## 2.5 Operation frequency and channel plan

Band UNII-1		Band UNII-3	
Channel 36	5180 MHz*	Channel 149	5745 MHz*
Channel 40	5200 MHz	Channel 153	5765 MHz
Channel 44	5220 MHz*	Channel 157	5785 MHz*
Channel 48	5240 MHz*	Channel 161	5805 MHz
		Channel 165	5825 MHz*

\*Channels tested

## 2.6 Antenna

Name	Connector	Frequency band	Gain
NXPA 9-360-12.5	N	5GHz	9 dBi

## 2.7 Power supply system utilised

Power supply voltage,  $V_{nom}$  : 5V DC (internal battery)  
Power supply voltage (alternative) : 120V/60Hz (for charging of internal battery)

## 2.8 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- Tablet \_\_\_\_\_ Model : iPad \_\_\_\_\_
- TX base station \_\_\_\_\_ Model : NXP2TX \_\_\_\_\_

The tablet and the TX base station are used to do the settings (XROC on/off and Channel adjustment) on the NXP2RX.

### 2.8.1 Test software

For radiated emission testing a special test software was used with a maximum achievable duty cycle. This maximum duty cycle does not appear during operation with standard software. All conducted measurements (Duty cycle, Bandwidth and spectral density) were made with standard software under maximum duty cycle conditions achievable with standard software.

### **3 TEST RESULT SUMMARY**

This report replaces the report T40632-00-00JP.

FCC Rule Part	Description	Result
15.207	AC power line conducted emissions	passed
15.407(a)	Conducted output power	passed
15.407(a)	26dB Bandwidth	No limit
--	99% Bandwidth	No limit
15.407(e)	6dB Bandwidth	passed
15.407(g)	Frequency stability	No limit
15.407(a)	Power spectral density	passed
15.209	spurious emissions, radiated	passed
--	Duty cycle	No limit

#### **3.1 Final assessment**

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 13 January 2016

Testing concluded on : 15 March 2016

Checked by:

Tested by:

\_\_\_\_\_  
Klaus Gegenfurtner  
Teamleader Radio

\_\_\_\_\_  
Jürgen Pessinger



## **4 TEST ENVIRONMENT**

### **4.1 Address of the test laboratory**

**CSA Group Bayern GmbH  
Ohmstrasse 1-4  
94342 STRASSKIRCHEN  
GERMANY**

### **4.2 Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

### **4.3 Statement of the measurement uncertainty**

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor  $k = 2$ . The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

<b>Measurement uncertainty</b>	
<b>Test</b>	<b>Uncertainty</b>
Conducted emissions mains	$\pm 3.1$ dB
Power spectral density	$\pm 2.7$ dB
bandwidth measurement	$\pm 100$ kHz (depends on the used RBW)
Maximum output power	$\pm 1.0$ dB
Spurious emissions radiated below 30 MHz	$\pm 3$ dB
Spurious emissions radiated 30 MHz to 1 GHz	$\pm 4.4$ dB
Spurious emissions radiated 1 GHz to 12.75 GHz	$\pm 3.7$ dB
Spurious emissions radiated above 12.75 GHz	$\pm 5.0$ dB

## 4.1 Measurement protocol for FCC and IC

### 4.1.1 General information

#### 4.1.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The Open Area test site is a listed Open Site under the Canadian Test-Sites File-No:

### IC 3009A-01

The anechoic chamber site is a listed chamber under the Canadian Test-Sites File-No:

### IC 3009A-02

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

#### 4.1.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left without termination. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

#### 4.1.1.3 Details of test procedures

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

## 5 TEST CONDITIONS AND RESULTS

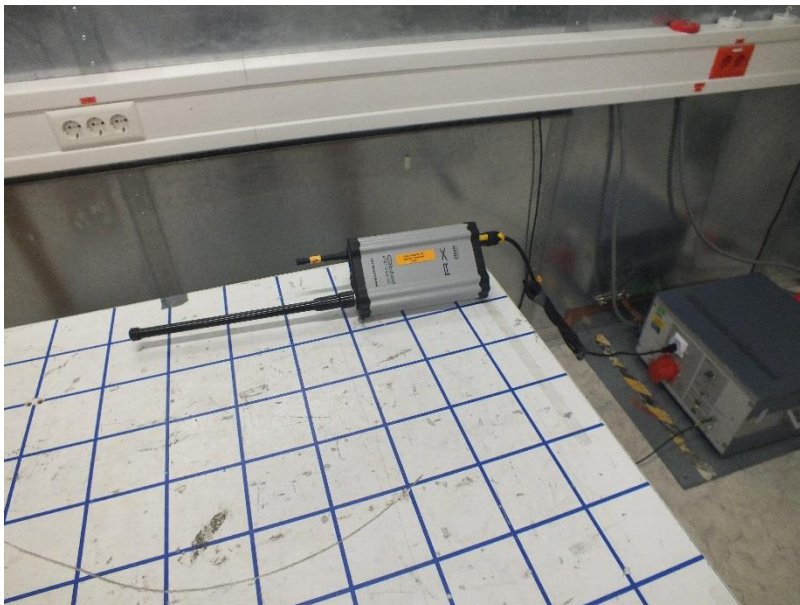
### 5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A4.

#### 5.1.1 Description of the test location

Test location: Shielded Room S2

#### 5.1.2 Photo documentation of the test set-up



#### 5.1.3 Applicable standard

FCC Part 15C, Section 15.207

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency

#### 5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 15.23 dB at 0.516 MHz

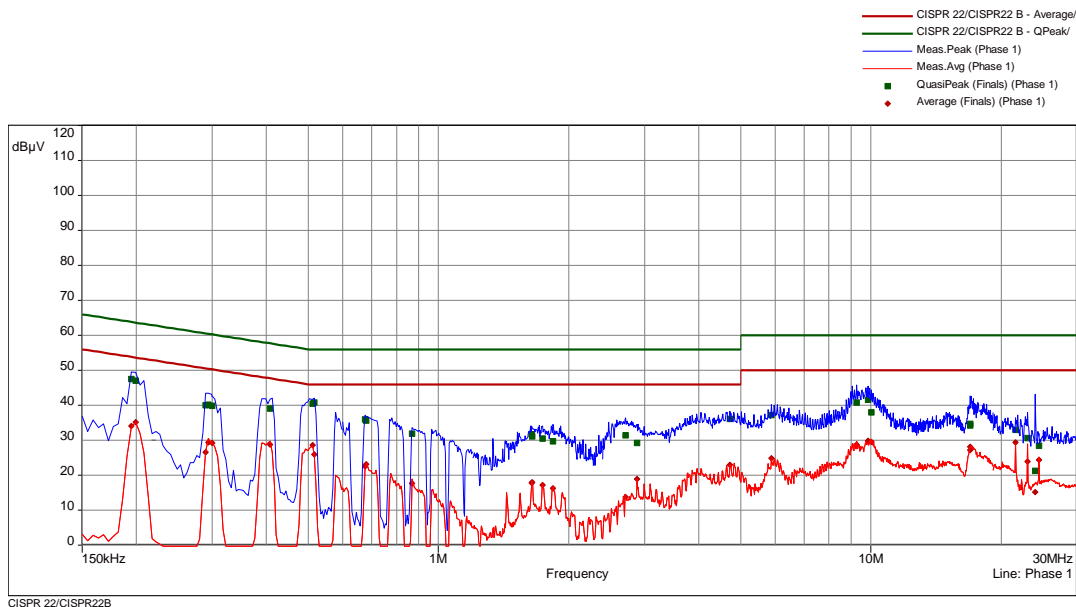
The requirements are **FULFILLED**.

**Remarks:** Test was performed in charging and repeating mode in the center channel of each band.

### 5.1.5 Test protocol

Test point L1  
Operation mode: repeating mode on CH44, XROC OFF  
Remarks: none

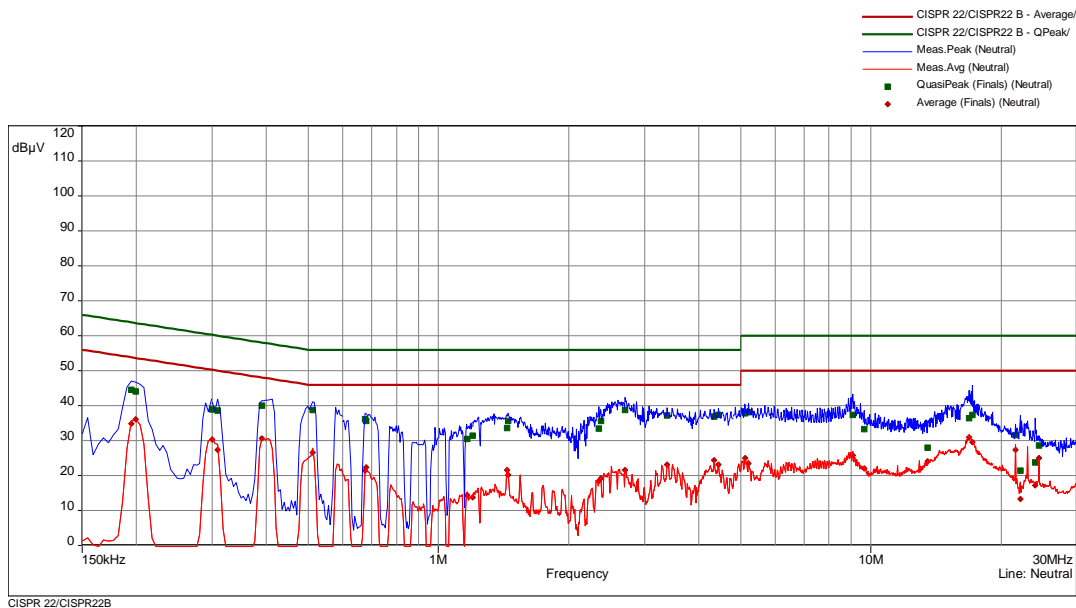
Result: passed



freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.195	47.45	16.37	63.82	34.10	19.72	53.82	Phase 1	9.83
0.1995	47.00	16.63	63.63	35.18	18.45	53.63	Phase 1	9.83
0.2895	40.05	20.49	60.54	26.54	24.00	50.54	Phase 1	9.82
0.294	40.17	20.24	60.41	29.40	21.01	50.41	Phase 1	9.82
0.3	39.89	20.35	60.24	29.22	21.02	50.24	Phase 1	9.82
0.408	39.10	18.59	57.69	28.71	18.98	47.69	Phase 1	9.81
0.5115	40.48	15.52	56.00	28.68	17.32	46.00	Phase 1	9.82
0.516	40.77	15.23	56.00	25.99	20.01	46.00	Phase 1	9.82
0.6765	35.99	20.01	56.00	22.44	23.56	46.00	Phase 1	9.81
0.681	35.67	20.33	56.00	23.07	22.93	46.00	Phase 1	9.81
0.87	31.92	24.08	56.00	17.74	28.26	46.00	Phase 1	9.81
1.641	31.67	24.33	56.00	17.83	28.17	46.00	Phase 1	9.79
1.6455	31.12	24.88	56.00	18.00	28.00	46.00	Phase 1	9.79
1.74	30.50	25.50	56.00	17.22	28.78	46.00	Phase 1	9.79
1.839	29.73	26.27	56.00	16.33	29.67	46.00	Phase 1	9.80
2.706	31.35	24.65	56.00	13.69	32.31	46.00	Phase 1	9.79
2.877	29.17	26.83	56.00	18.85	27.15	46.00	Phase 1	9.79
4.7265	36.05	19.95	56.00	23.01	22.99	46.00	Phase 1	9.82
5.8845	37.18	22.82	60.00	24.79	25.21	50.00	Phase 1	9.83
9.2595	40.72	19.28	60.00	28.83	21.17	50.00	Phase 1	9.88
9.8385	41.61	18.39	60.00	29.92	20.08	50.00	Phase 1	9.89
10.0365	37.90	22.10	60.00	29.51	20.49	50.00	Phase 1	9.90
16.9485	34.74	25.26	60.00	27.12	22.88	50.00	Phase 1	10.19
16.989	34.28	25.72	60.00	28.21	21.79	50.00	Phase 1	10.19
21.594	32.92	27.08	60.00	29.39	20.61	50.00	Phase 1	10.34
23.0295	30.58	29.42	60.00	23.97	26.03	50.00	Phase 1	10.34
24.006	21.33	38.67	60.00	15.13	34.87	50.00	Phase 1	10.34
24.474	28.46	31.54	60.00	24.43	25.57	50.00	Phase 1	10.35

Test point: N  
Operation mode: repeating mode on CH44, XROC OFF  
Remarks: none

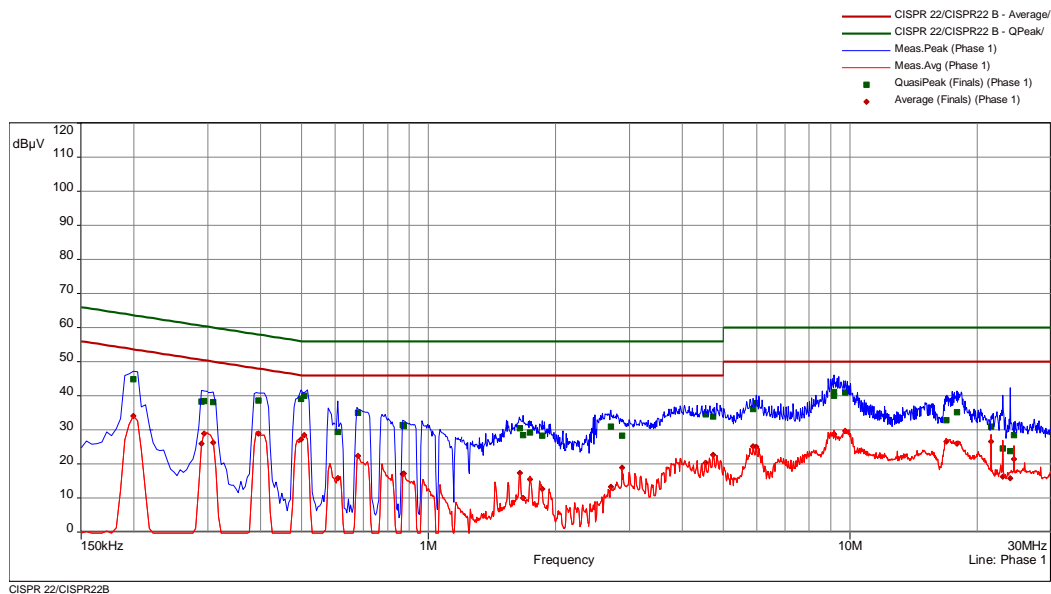
Result: passed



freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.195	44.57	19.25	63.82	34.85	18.97	53.82	Neutral	9.85
0.1995	44.15	19.48	63.63	36.05	17.58	53.63	Neutral	9.85
0.3	38.85	21.39	60.24	30.26	19.98	50.24	Neutral	9.82
0.309	38.63	21.37	60.00	27.41	22.59	50.00	Neutral	9.82
0.39	39.95	18.12	58.06	30.57	17.49	48.06	Neutral	9.81
0.5115	38.73	17.27	56.00	26.54	19.46	46.00	Neutral	9.82
0.6765	36.06	19.94	56.00	21.43	24.57	46.00	Neutral	9.81
0.681	35.57	20.43	56.00	22.29	23.71	46.00	Neutral	9.81
1.167	30.53	25.47	56.00	14.32	31.68	46.00	Neutral	9.80
1.1985	31.39	24.61	56.00	13.70	32.30	46.00	Neutral	9.80
1.443	33.55	22.45	56.00	21.60	24.40	46.00	Neutral	9.79
1.4475	35.63	20.37	56.00	20.17	25.83	46.00	Neutral	9.79
2.352	33.52	22.48	56.00	18.42	27.58	46.00	Neutral	9.79
2.3745	35.67	20.33	56.00	19.21	26.79	46.00	Neutral	9.79
2.7015	38.77	17.23	56.00	21.56	24.44	46.00	Neutral	9.79
3.3765	37.13	18.87	56.00	23.15	22.85	46.00	Neutral	9.81
4.344	36.84	19.16	56.00	24.32	21.68	46.00	Neutral	9.80
4.4385	37.41	18.59	56.00	23.11	22.89	46.00	Neutral	9.80
5.115	37.87	22.13	60.00	24.97	25.03	50.00	Neutral	9.82
5.2095	38.07	21.93	60.00	23.40	26.60	50.00	Neutral	9.81
9.0705	37.38	22.62	60.00	25.81	24.19	50.00	Neutral	9.82
9.6495	33.35	26.65	60.00	21.99	28.01	50.00	Neutral	9.83
13.5195	27.99	32.01	60.00	24.06	25.94	50.00	Neutral	9.89
16.8945	36.36	23.64	60.00	30.88	19.12	50.00	Neutral	10.00
17.169	37.28	22.72	60.00	29.60	20.40	50.00	Neutral	10.01
21.594	31.65	28.35	60.00	27.43	22.57	50.00	Neutral	10.06
22.188	21.44	38.56	60.00	13.36	36.64	50.00	Neutral	10.03
24.0105	23.82	36.18	60.00	17.19	32.81	50.00	Neutral	9.96
24.4785	28.65	31.35	60.00	25.06	24.94	50.00	Neutral	9.95

Test point L1  
Operation mode: repeating mode on CH157, XROC ON  
Remarks: none

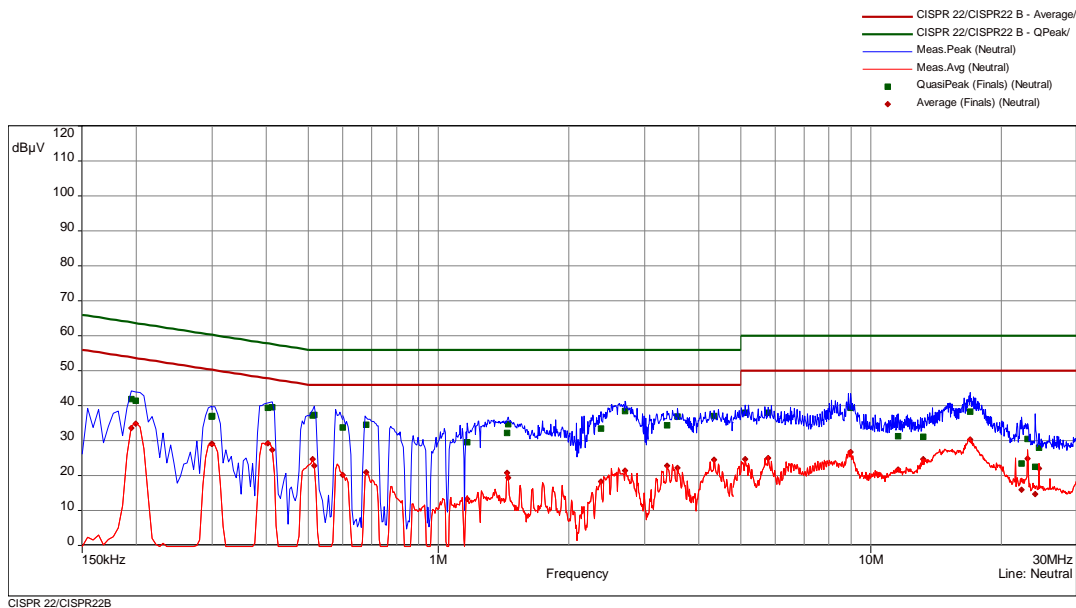
Result: passed



freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.1995	44.85	18.78	63.63	34.07	19.56	53.63	Phase 1	9.83
0.2895	38.33	22.21	60.54	25.99	24.55	50.54	Phase 1	9.82
0.294	38.47	21.94	60.41	28.95	21.46	50.41	Phase 1	9.82
0.309	38.07	21.92	60.00	26.30	23.70	50.00	Phase 1	9.82
0.3945	38.63	19.34	57.97	28.91	19.06	47.97	Phase 1	9.81
0.498	39.04	16.99	56.03	27.16	18.87	46.03	Phase 1	9.82
0.507	40.00	16.00	56.00	28.38	17.62	46.00	Phase 1	9.82
0.609	29.45	26.55	56.00	15.73	30.27	46.00	Phase 1	9.82
0.681	34.97	21.03	56.00	22.42	23.58	46.00	Phase 1	9.81
0.87	31.34	24.66	56.00	16.97	29.03	46.00	Phase 1	9.81
0.8745	31.08	24.92	56.00	17.23	28.77	46.00	Phase 1	9.81
1.6455	30.45	25.55	56.00	17.30	28.70	46.00	Phase 1	9.79
1.677	28.41	27.59	56.00	10.03	35.97	46.00	Phase 1	9.79
1.74	29.27	26.73	56.00	15.40	30.60	46.00	Phase 1	9.79
1.8615	28.25	27.75	56.00	12.65	33.35	46.00	Phase 1	9.80
2.706	30.93	25.07	56.00	13.27	32.73	46.00	Phase 1	9.79
2.8815	28.36	27.64	56.00	18.96	27.04	46.00	Phase 1	9.79
4.551	34.56	21.44	56.00	20.32	25.68	46.00	Phase 1	9.81
4.731	33.95	22.05	56.00	22.66	23.34	46.00	Phase 1	9.82
5.889	36.10	23.90	60.00	25.21	24.79	50.00	Phase 1	9.83
5.9835	37.79	22.21	60.00	24.95	25.05	50.00	Phase 1	9.83
9.165	41.17	18.83	60.00	28.76	21.24	50.00	Phase 1	9.87
9.1695	40.05	19.95	60.00	28.60	21.40	50.00	Phase 1	9.87
9.744	40.95	19.05	60.00	29.74	20.26	50.00	Phase 1	9.89
16.899	32.81	27.19	60.00	26.57	23.43	50.00	Phase 1	10.19
17.9475	35.15	24.85	60.00	25.91	24.09	50.00	Phase 1	10.23
21.603	30.92	29.08	60.00	26.54	23.46	50.00	Phase 1	10.34
23.0295	24.52	35.48	60.00	16.23	33.77	50.00	Phase 1	10.34
24.006	23.75	36.25	60.00	15.73	34.27	50.00	Phase 1	10.34
24.4785	28.43	31.57	60.00	21.47	28.53	50.00	Phase 1	10.35

Test point L1  
Operation mode: repeating mode on CH157, XROC ON  
Remarks: none

Result: passed



freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.195	41.90	21.92	63.82	33.57	20.25	53.82	Neutral	9.85
0.1995	41.47	22.16	63.63	34.79	18.84	53.63	Neutral	9.85
0.2985	36.93	23.35	60.28	29.05	21.24	50.28	Neutral	9.82
0.3	37.03	23.21	60.24	29.03	21.21	50.24	Neutral	9.82
0.4035	39.41	18.37	57.78	29.25	18.53	47.78	Neutral	9.81
0.4125	39.54	18.06	57.60	27.28	20.32	47.60	Neutral	9.81
0.5115	37.13	18.87	56.00	24.73	21.27	46.00	Neutral	9.82
0.516	37.41	18.59	56.00	22.88	23.12	46.00	Neutral	9.82
0.6	33.82	22.18	56.00	20.09	25.91	46.00	Neutral	9.82
0.681	34.57	21.43	56.00	20.98	25.02	46.00	Neutral	9.81
1.167	29.50	26.50	56.00	13.36	32.64	46.00	Neutral	9.80
1.443	32.14	23.86	56.00	20.74	25.26	46.00	Neutral	9.79
1.4475	34.64	21.36	56.00	19.41	26.59	46.00	Neutral	9.79
2.3745	33.43	22.57	56.00	18.28	27.72	46.00	Neutral	9.79
2.7015	38.40	17.60	56.00	21.48	24.52	46.00	Neutral	9.79
3.381	34.46	21.54	56.00	22.77	23.23	46.00	Neutral	9.81
3.57	36.90	19.10	56.00	22.22	23.78	46.00	Neutral	9.82
4.344	37.02	18.98	56.00	24.58	21.42	46.00	Neutral	9.80
5.115	37.99	22.01	60.00	24.76	25.24	50.00	Neutral	9.82
5.79	38.04	21.96	60.00	24.95	25.05	50.00	Neutral	9.81
8.9715	39.38	20.62	60.00	26.78	23.22	50.00	Neutral	9.82
11.5755	31.24	28.76	60.00	21.80	28.20	50.00	Neutral	9.85
13.2225	31.08	28.92	60.00	24.68	25.32	50.00	Neutral	9.89
16.98	38.23	21.77	60.00	30.25	19.75	50.00	Neutral	10.00
22.269	23.39	36.61	60.00	15.99	34.01	50.00	Neutral	10.03
23.052	30.47	29.53	60.00	24.91	25.09	50.00	Neutral	10.00
24.0105	22.52	37.48	60.00	14.73	35.27	50.00	Neutral	9.96
24.4965	27.92	32.08	60.00	21.97	28.03	50.00	Neutral	9.95



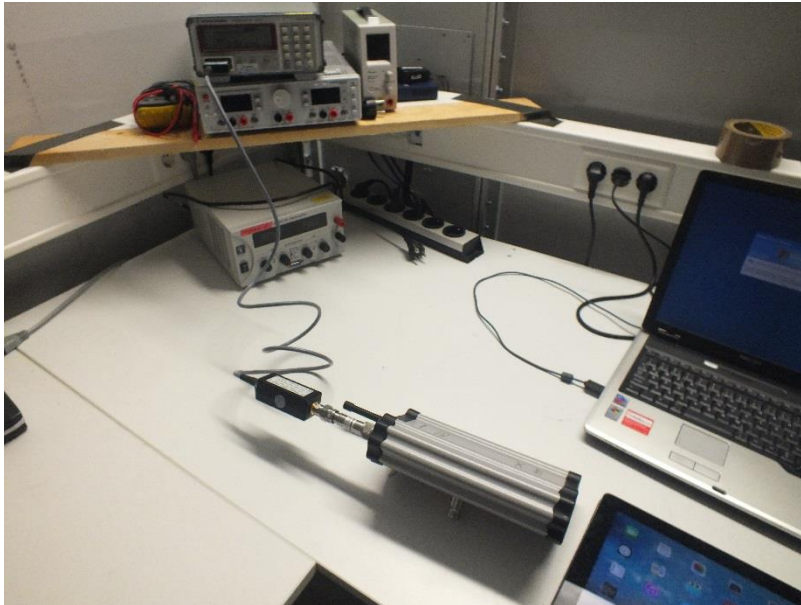
## 5.2 Maximum conducted output power

For test instruments and accessories used see section 6 Part **CPC 3**.

### 5.2.1 Description of the test location

Test location: AREA 4

### 5.2.2 Photo documentation of the test set-up



### 5.2.3 Applicable standard

FCC Part 15E, Section 15.407(a):

The maximum conducted output power over the frequency band of operation shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement is done according to KDB 789033 D02 sub clause 3a)



**5.2.4 Test result**

XROC OFF	Reading dBm	DC correction dB	Peak power dBm	Limit dBm	DELTA dB
CH36	6,3	4,1	10,4	27	-16,7
CH40	11,8	4,1	15,9	27	-11,2
CH44	19,8	4,1	23,9	27	-3,2
CH48	19,8	4,1	23,9	27	-3,2
CH149	21,3	4,1	25,4	27	-1,7
CH157	21,1	4,1	25,2	27	-1,9
CH165	20,8	4,1	24,9	27	-2,2

XROC ON	Reading dBm	DC correction dB	Peak power dBm	Limit dBm	DELTA dB
CH36	3,7	6,2	9,9	27	-17,1
CH40	9,1	6,2	15,3	27	-11,7
CH44	18,4	6,2	24,6	27	-2,4
CH48	18,4	6,2	24,6	27	-2,4
CH149	19,8	6,2	26,0	27	-1,0
CH157	19,7	6,2	25,9	27	-1,1
CH165	19,5	6,2	25,7	27	-1,3

DC correction was calculated according to KDB 789033 D02 sub clause 3a) (iv).

The requirements are **FULFILLED**.

**Remarks:** Limit was reduced by 3dB due the use of 9dBi antenna. Maximum power setting was adjusted.

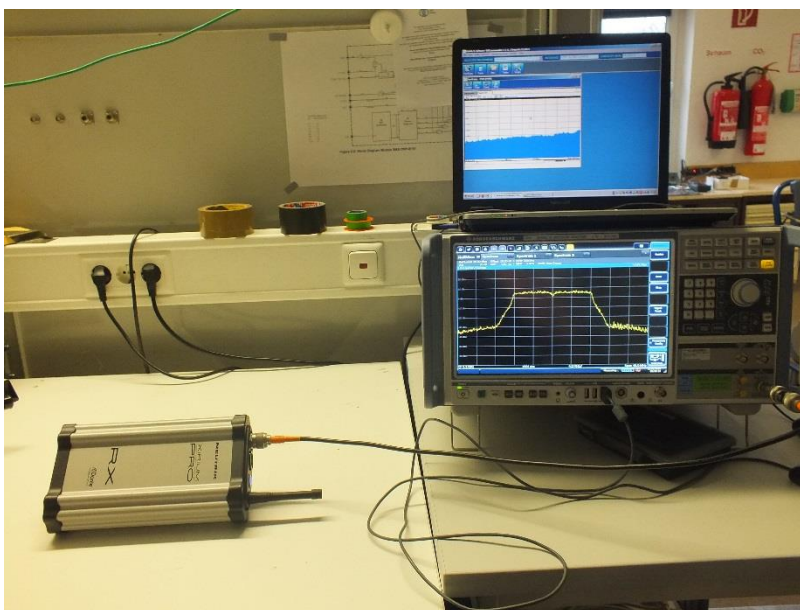
### 5.3 26dB Bandwidth

For test instruments and accessories used see section 6 Part MB.

#### 5.3.1 Description of the test location

Test location: AREA 4

#### 5.3.2 Photo documentation of the test set-up



#### 5.3.3 Applicable standard

According to FCC Part 15E, Section 15.407(a):

The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier centre frequency and one above the carrier centre frequency, that are 26 dB down relative to the maximum of the modulated carrier.

## 5.3.4 Test result

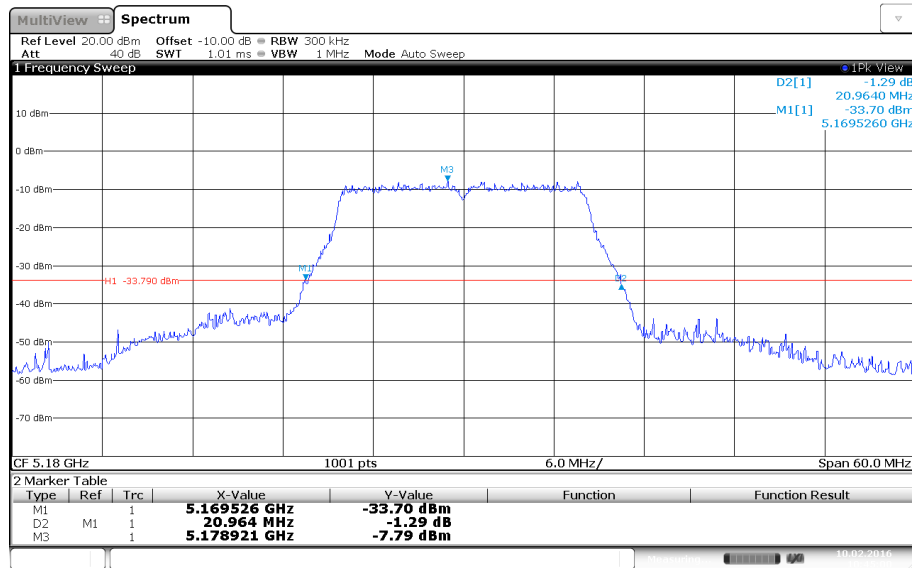
Channel	26 dB bandwidth	
	XROC OFF	XROC ON
	(MHz)	(MHz)
36	20,964	20,844
44	25,097	23,808
48	28,546	22,729
149	35,382	34,993
157	34,183	34,063
165	30,285	32,714

Remarks: none

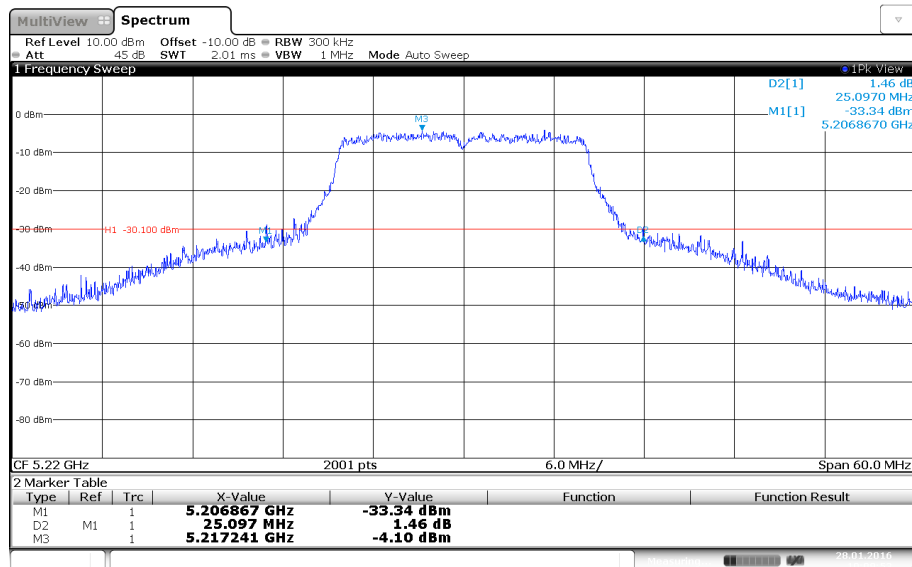
### 5.3.5 Test protocol

26dB Bandwidth Measurement plots, XROC OFF

Channel 36

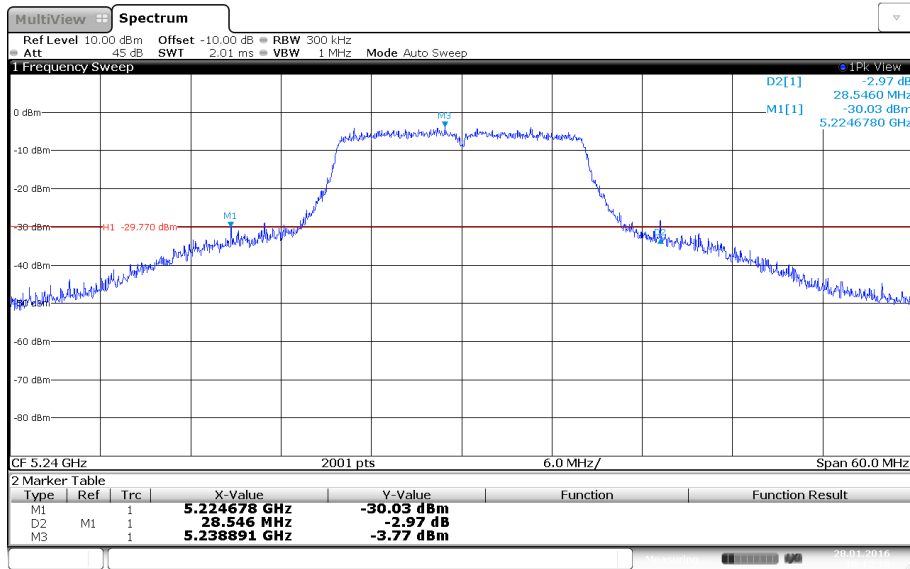


Channel 44

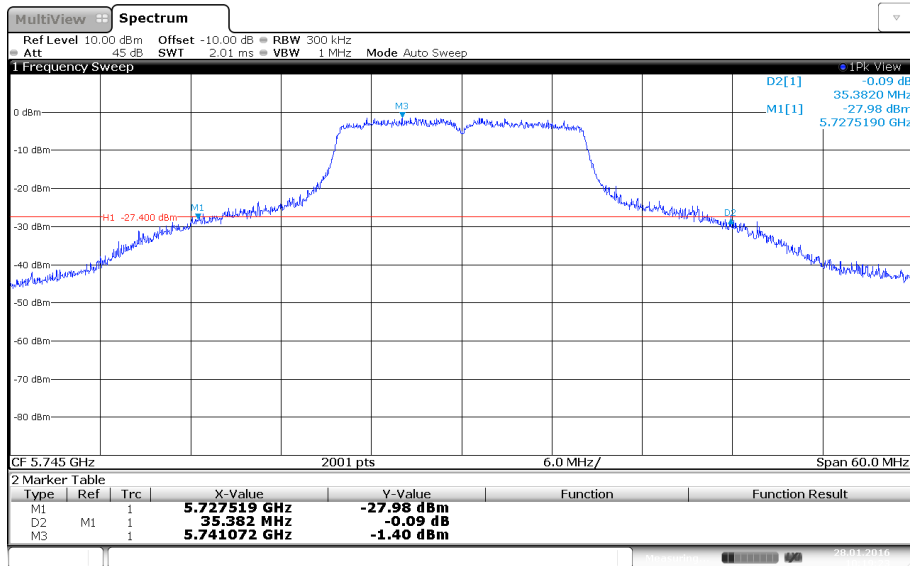


# FCC ID: 2ABA7XPR

## Channel 48

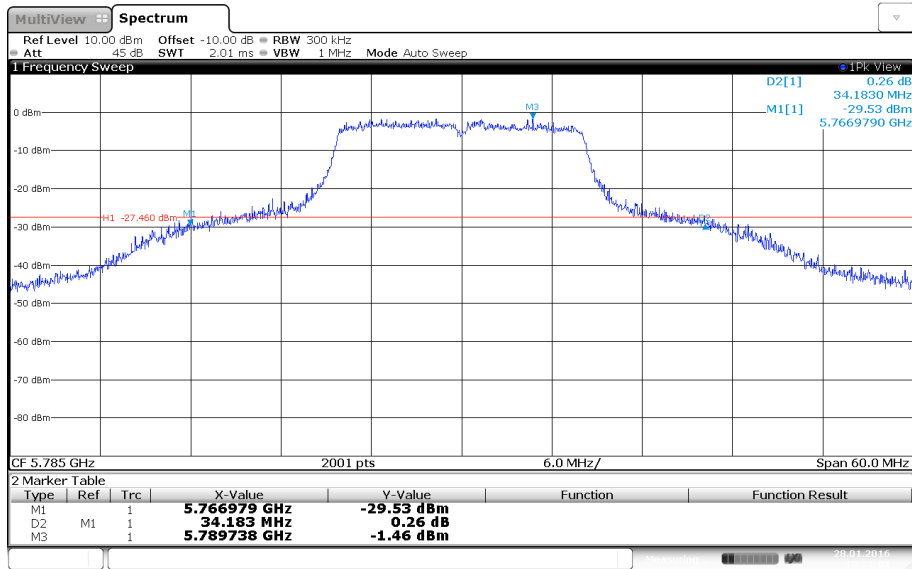


## Channel 149

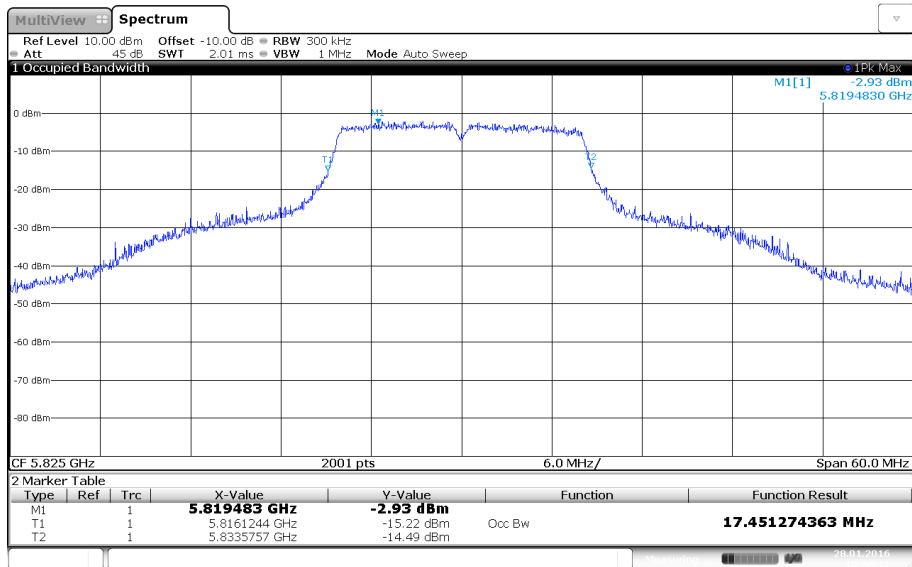


# FCC ID: 2ABA7XPR

## Channel 157



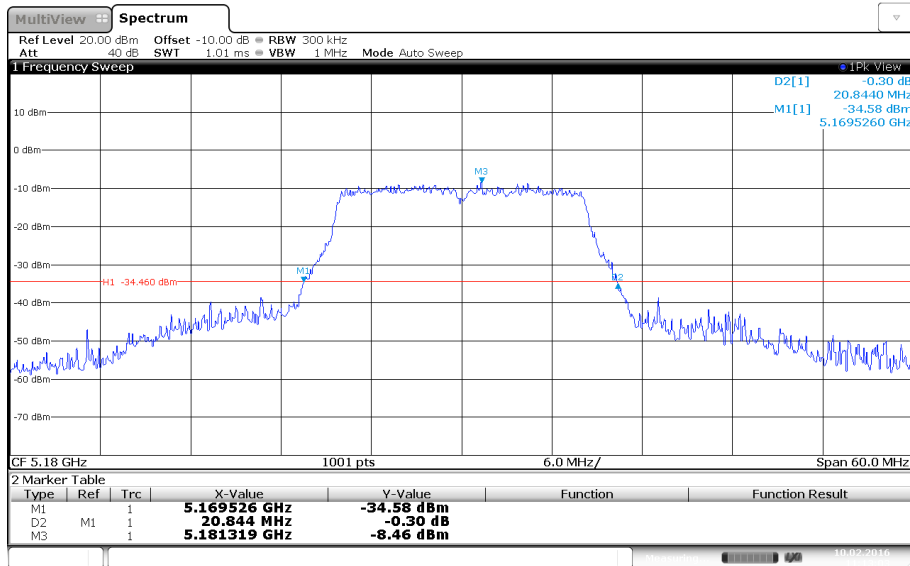
## Channel 165



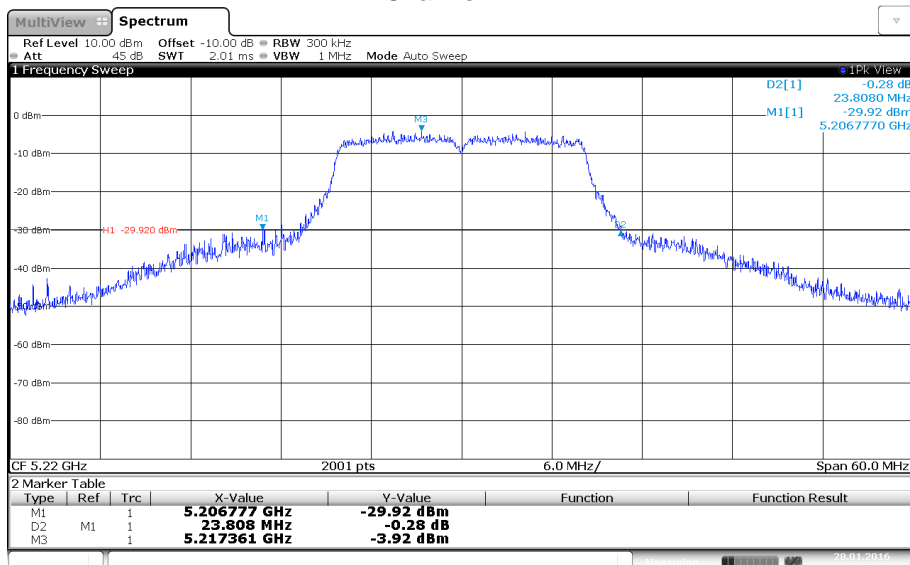
FCC ID: 2ABA7XPR

26dB Bandwidth Measurement plots, XROC ON

Channel 36

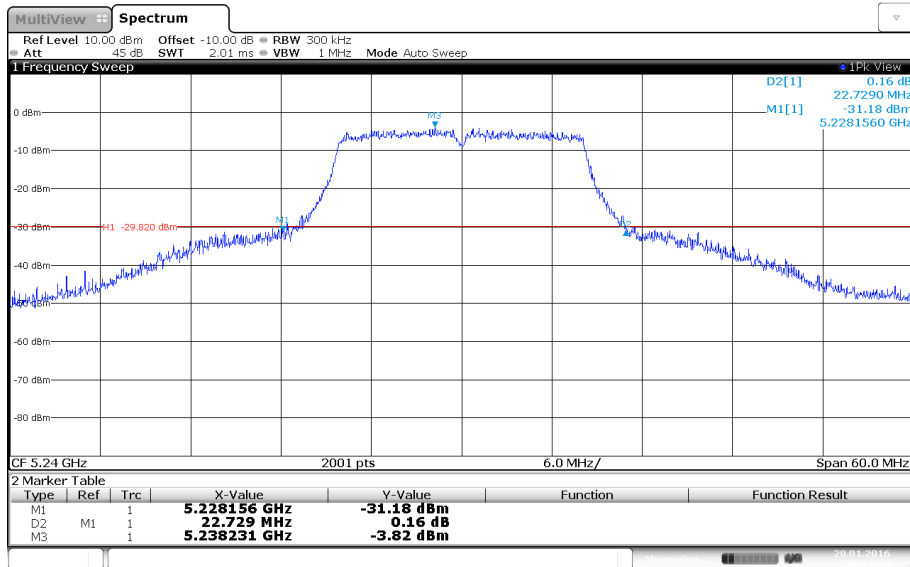


Channel 44

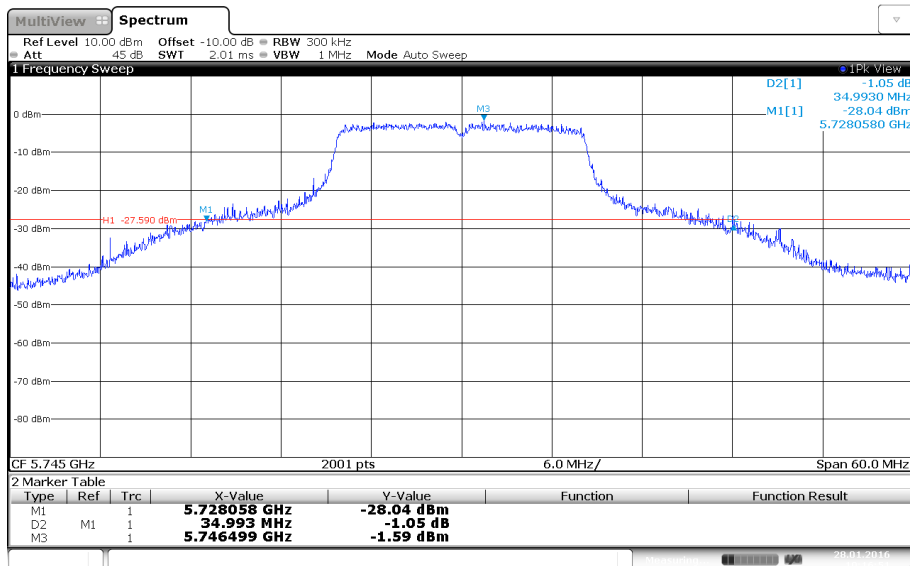


# FCC ID: 2ABA7XPR

## Channel 48



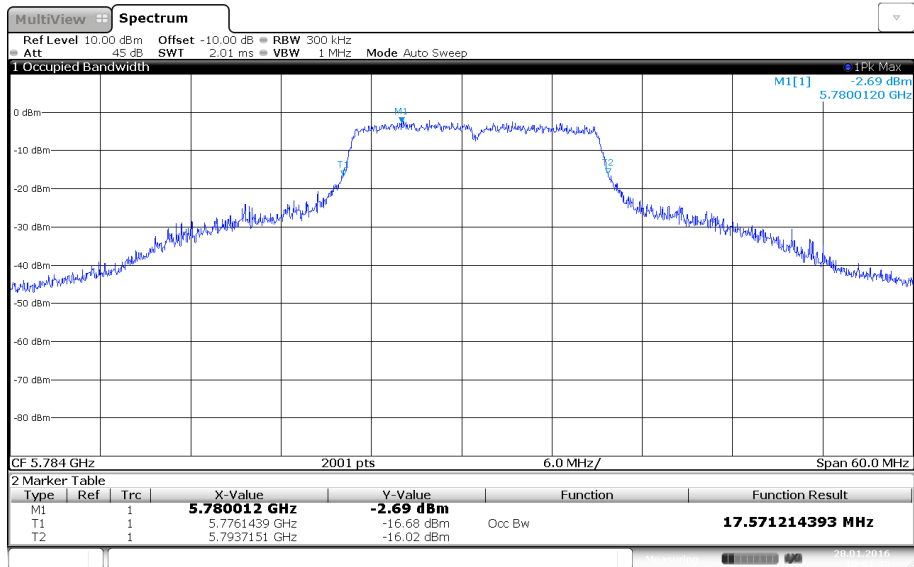
## Channel 149



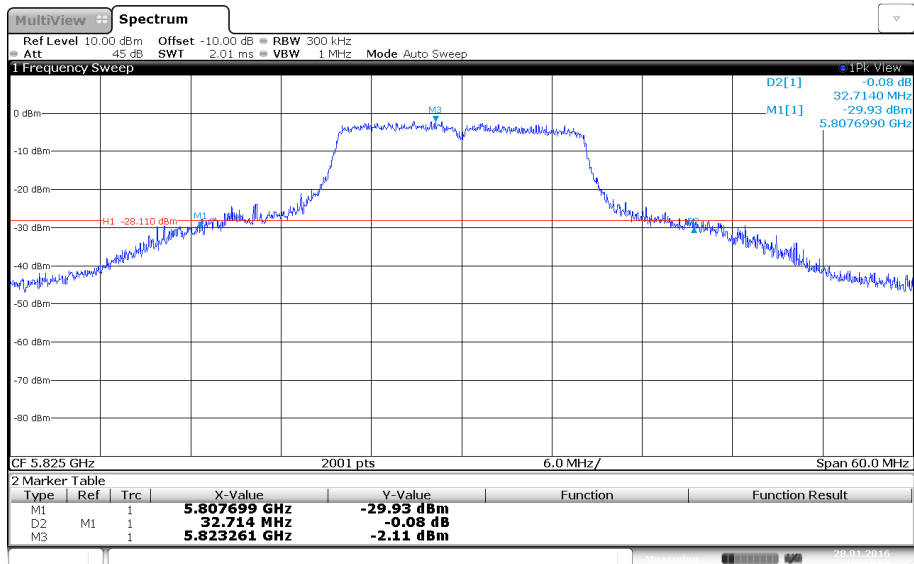


FCC ID: 2ABA7XPR

### Channel 157



### Channel 165



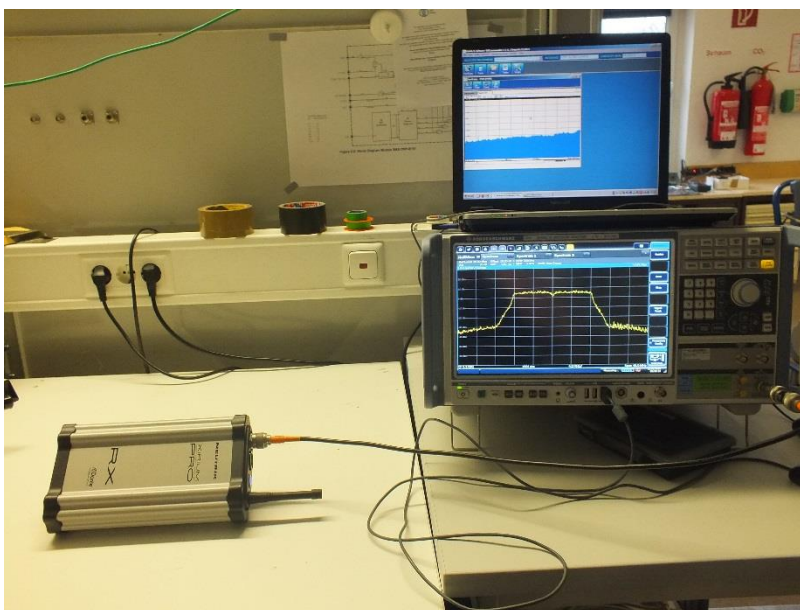
## 5.4 99% Bandwidth

For test instruments and accessories used see section 6 Part MB.

### 5.4.1 Description of the test location

Test location: AREA 4

### 5.4.2 Photo documentation of the test set-up



### 5.4.3 Applicable standard

According to FCC Part 15E, Section 15.407(a):  
The 99% power function of the measurement instrument was used.

## 5.4.4 Test result

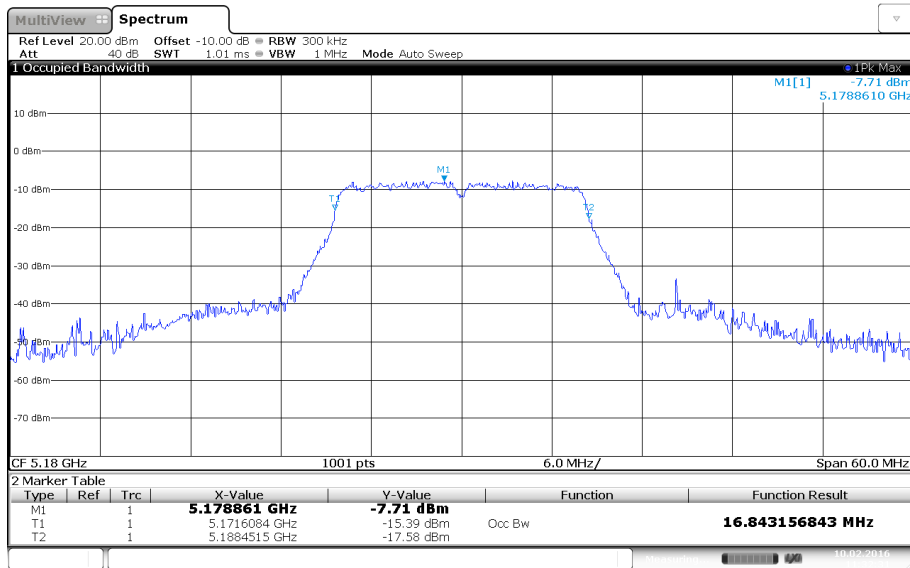
Channel	99% bandwidth	
	XROC OFF	XROC ON
	(MHz)	(MHz)
36	16,843	16,783
44	17,061	17,091
48	17,121	17,091
149	17,841	18,050
157	17,511	17,571
165	17,451	17,451

Remarks: none

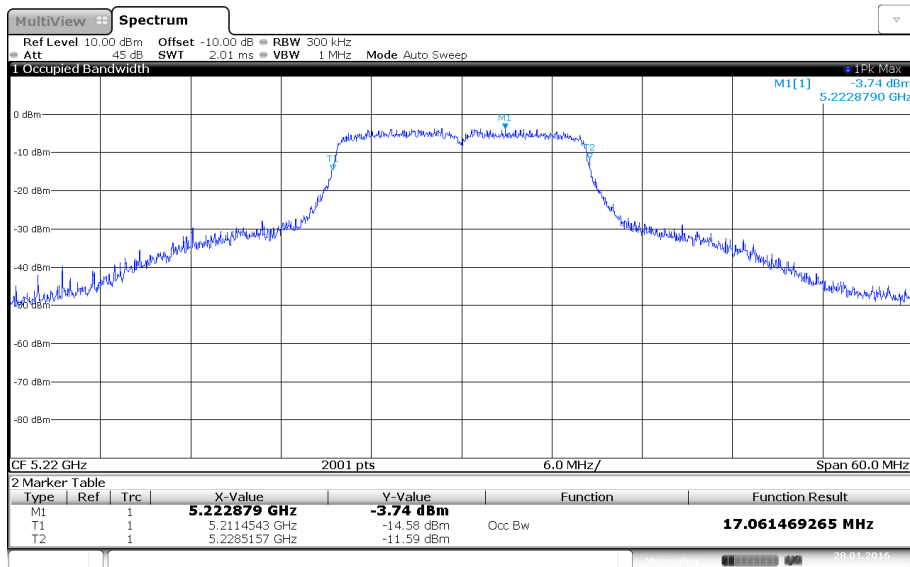
#### 5.4.5 Test protocol

99% Bandwidth Measurement plots, XROC OFF

Channel 36

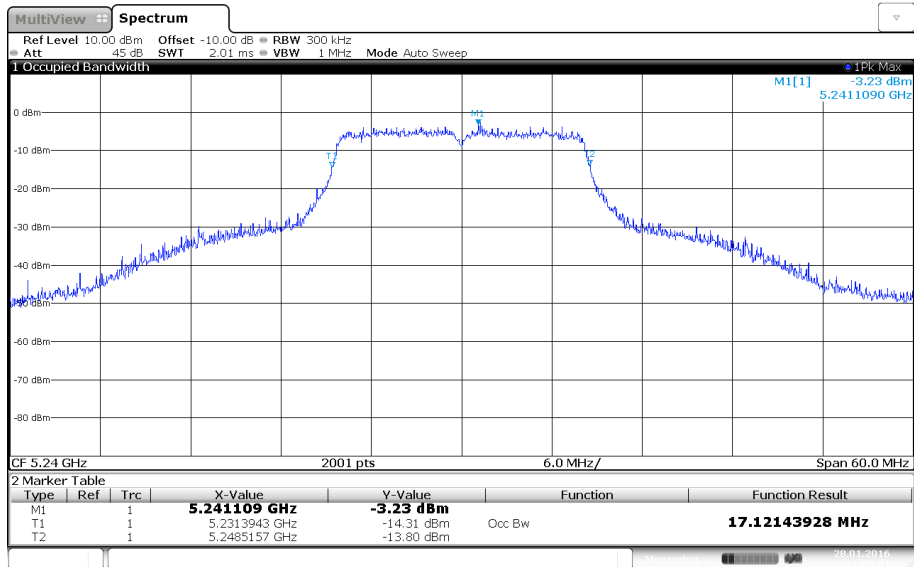


Channel 44

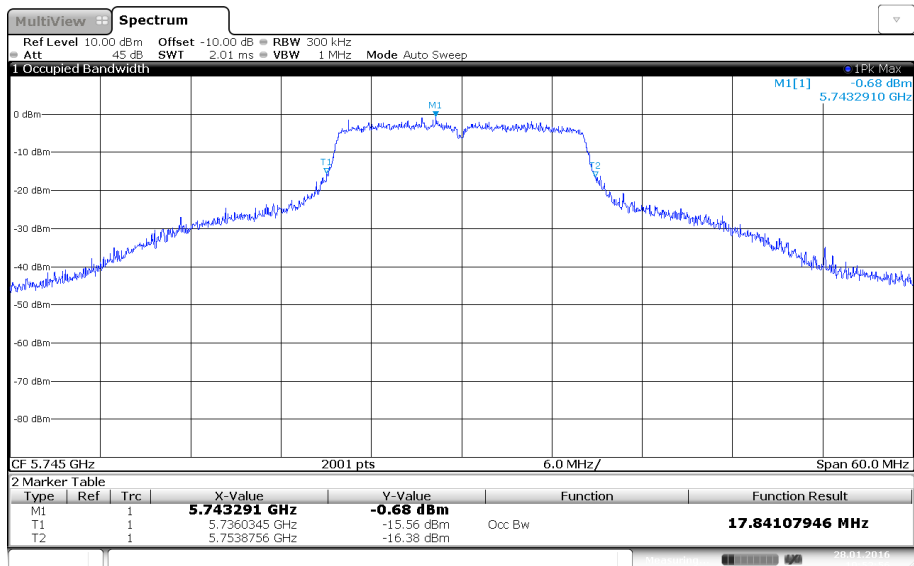


# FCC ID: 2ABA7XPR

## Channel 48

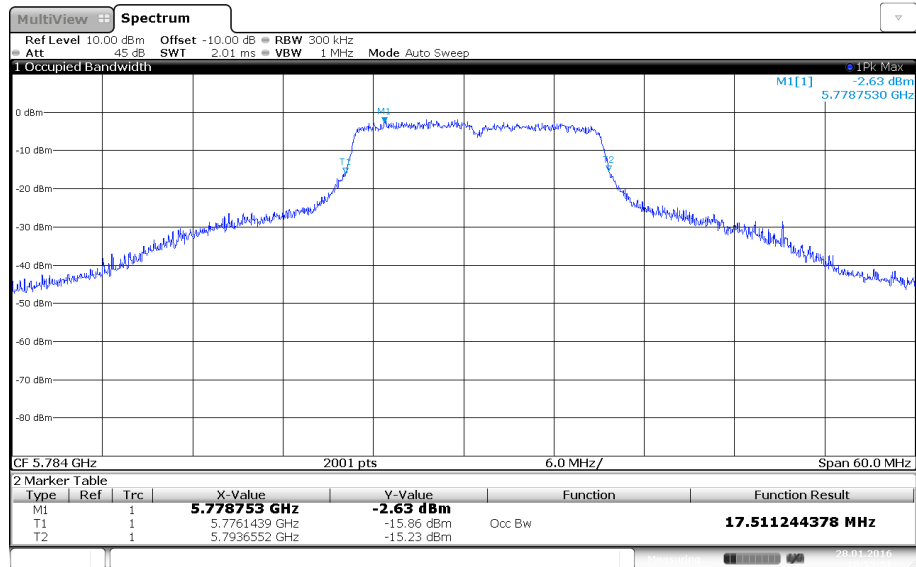


## Channel 149

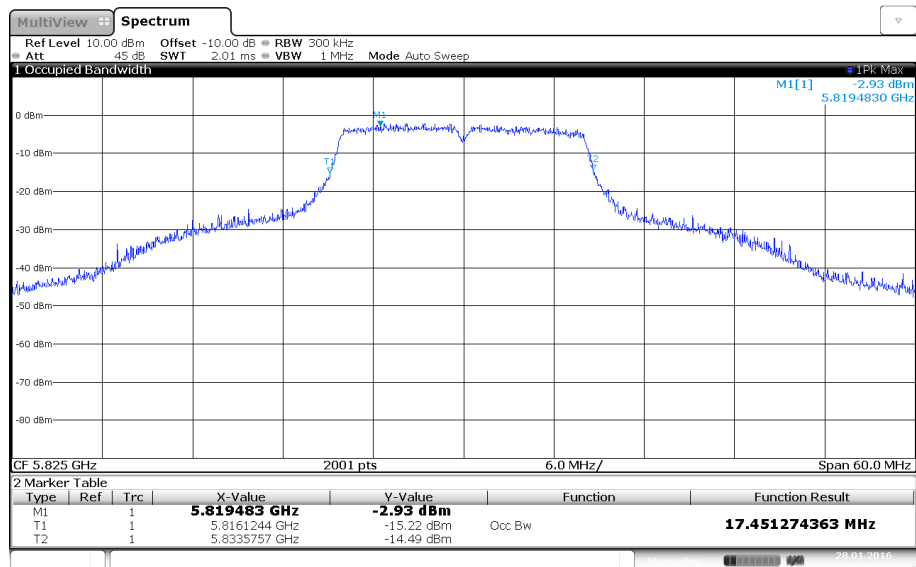


# FCC ID: 2ABA7XPR

## Channel 157

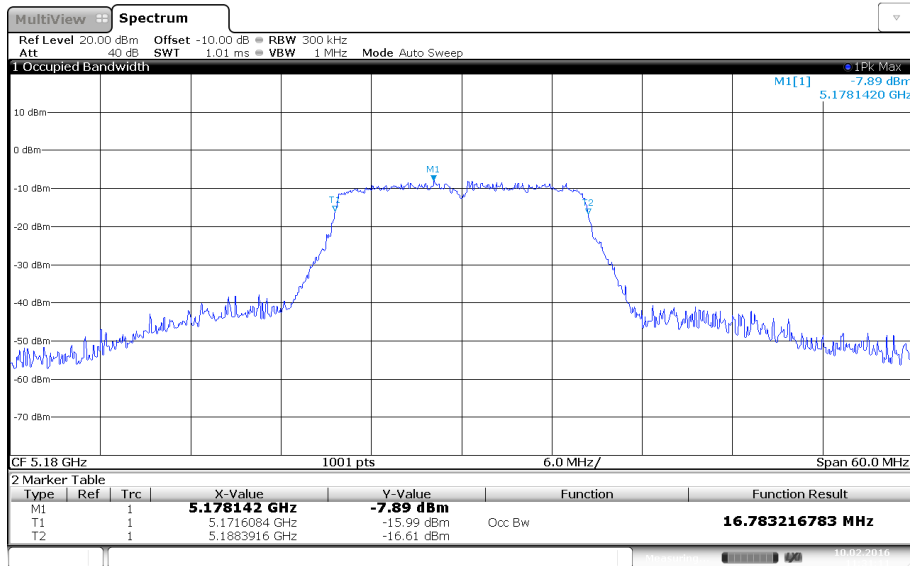


## Channel 165

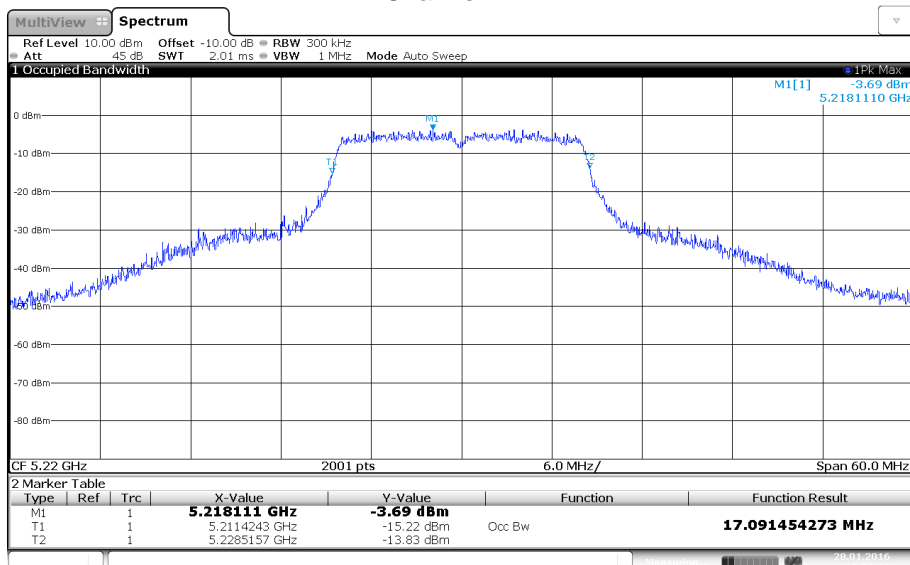


99% Bandwidth Measurement plots, XROC ON

Channel 36

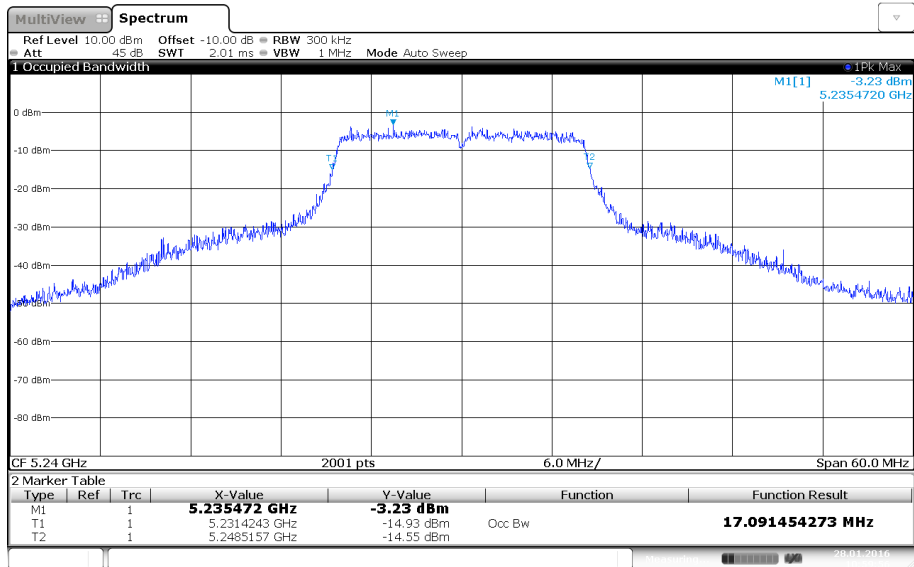


Channel 44

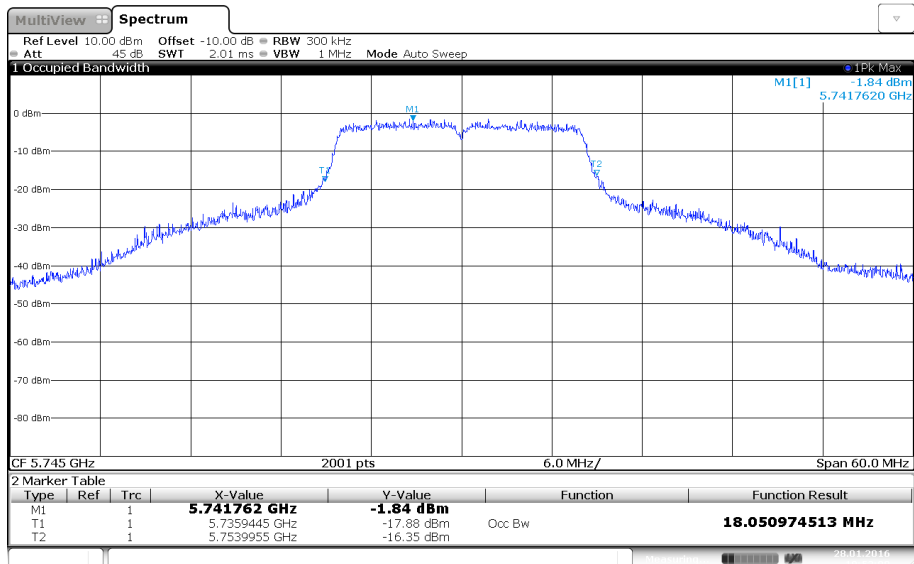


# FCC ID: 2ABA7XPR

## Channel 48



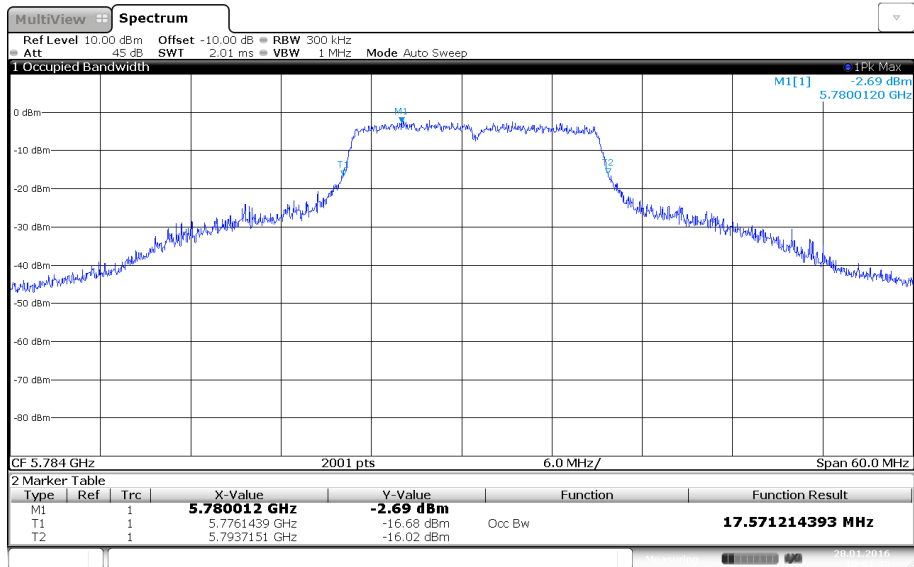
## Channel 149



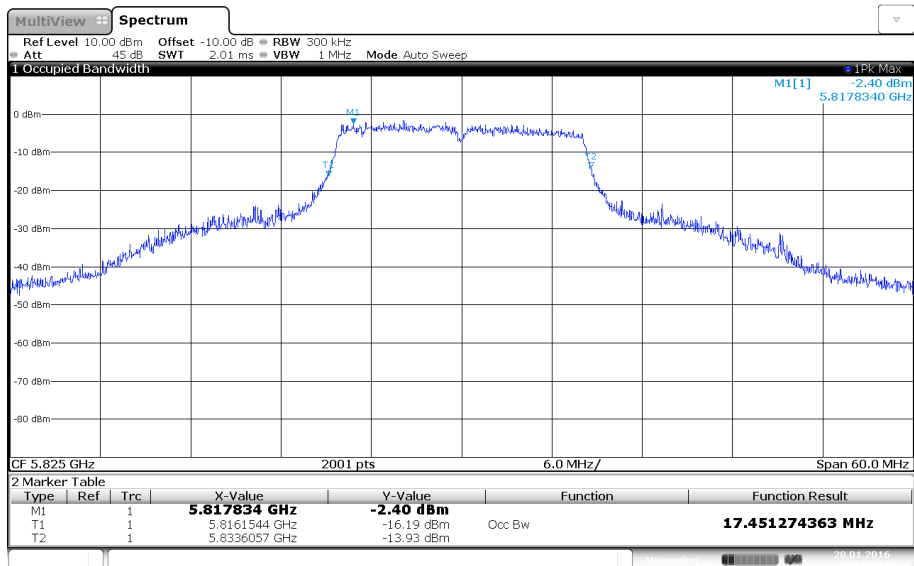


## FCC ID: 2ABA7XPR

### Channel 157



### Channel 165



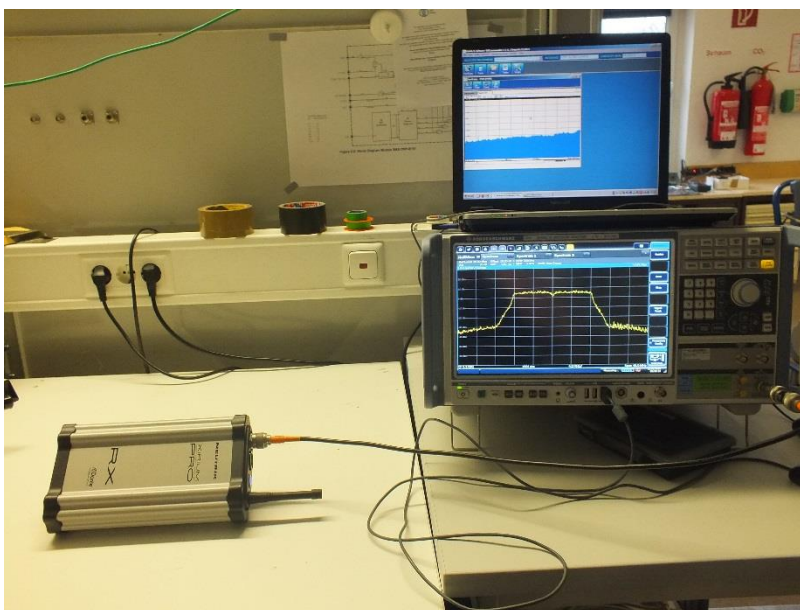
## 5.5 6dB Bandwidth

For test instruments and accessories used see section 6 Part **MB**.

### 5.5.1 Description of the test location

Test location: AREA 4

### 5.5.2 Photo documentation of the test set-up



### 5.5.3 Applicable standard

According to FCC Part 15E, Section 15.407(e):

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz

## 5.5.4 Test result

Channel	6dB bandwidth		
	XROC OFF	XROC ON	Limit (minimum)
	kHz	kHz	kHz
149	16,462	16,492	500
157	16,462	16,462	500
165	16,462	16,522	500

Remarks: none

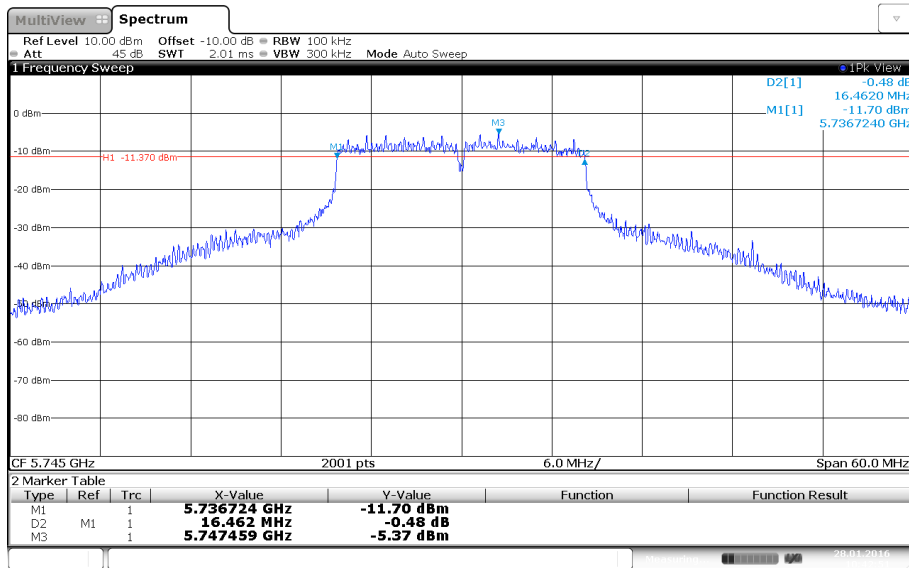
---

---

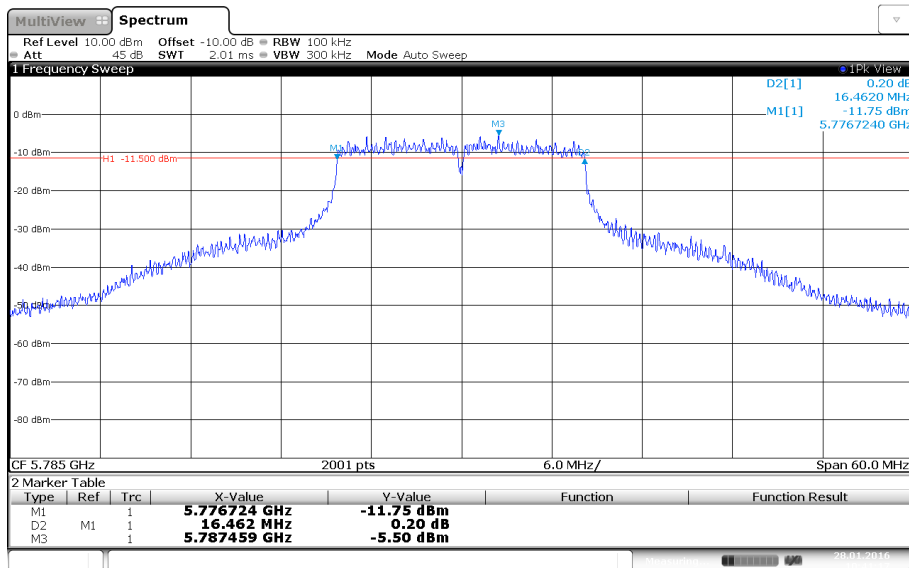
### 5.5.5 Test protocol

#### 6dB Bandwidth Measurement plots, XROC OFF

Channel 149

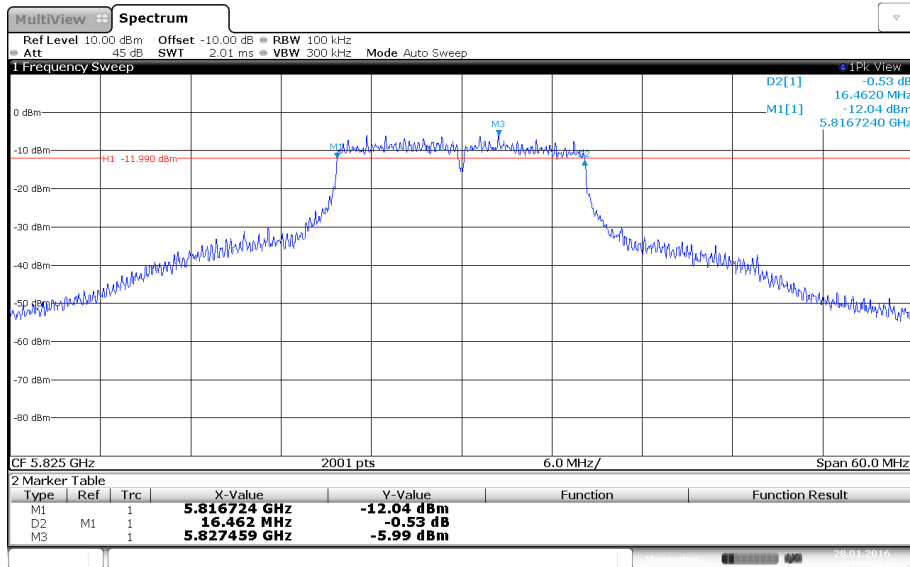


Channel 157



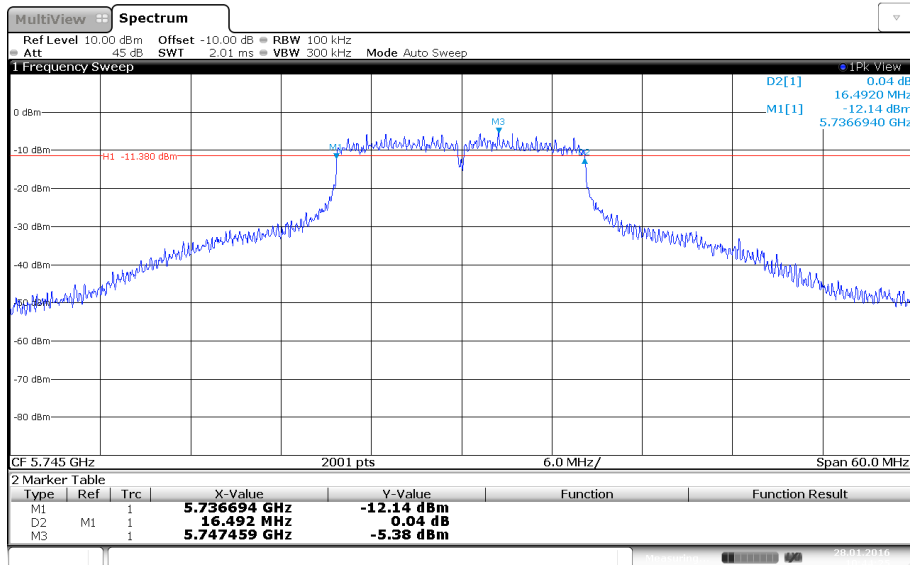
FCC ID: 2ABA7XPR

### Channel 165



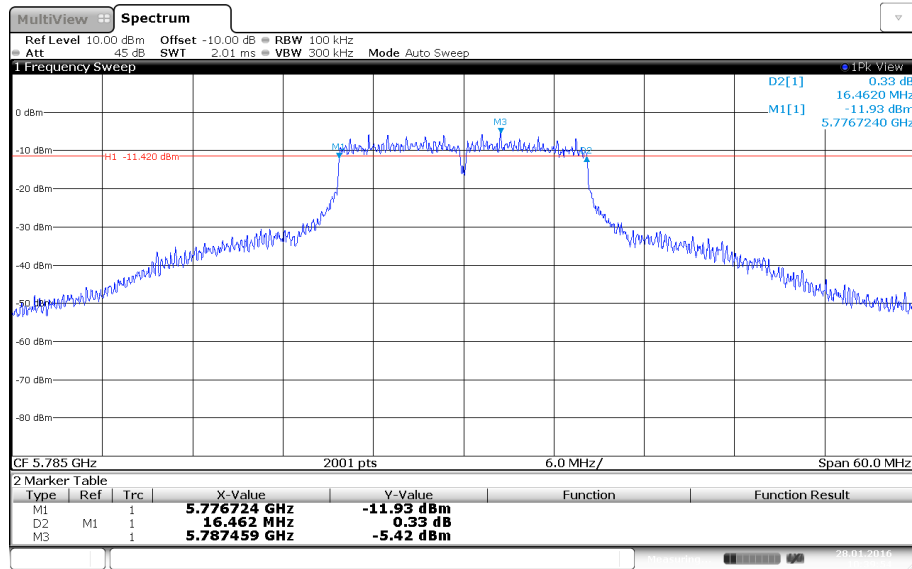
### 6dB Bandwidth Measurement plots, XROC ON

### Channel 149

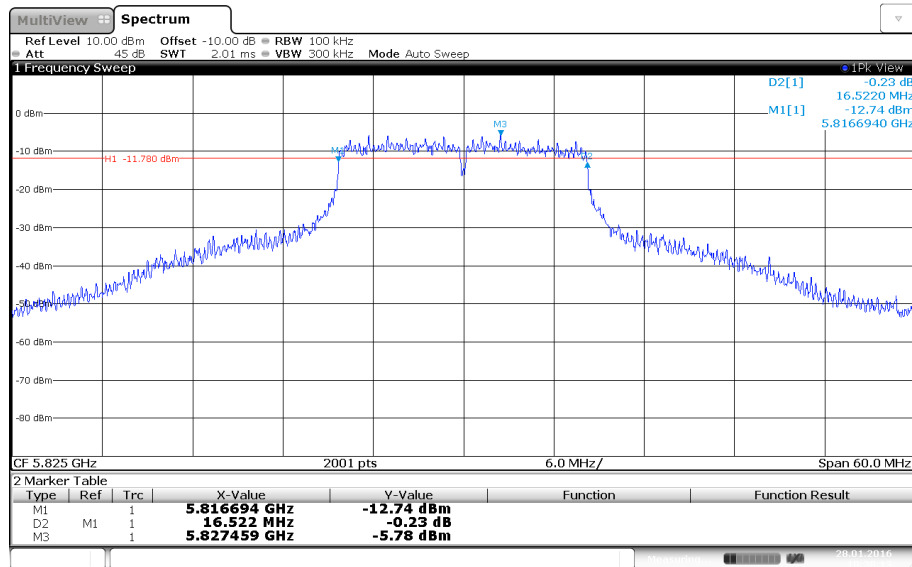


# FCC ID: 2ABA7XPR

## Channel 157



## Channel 165



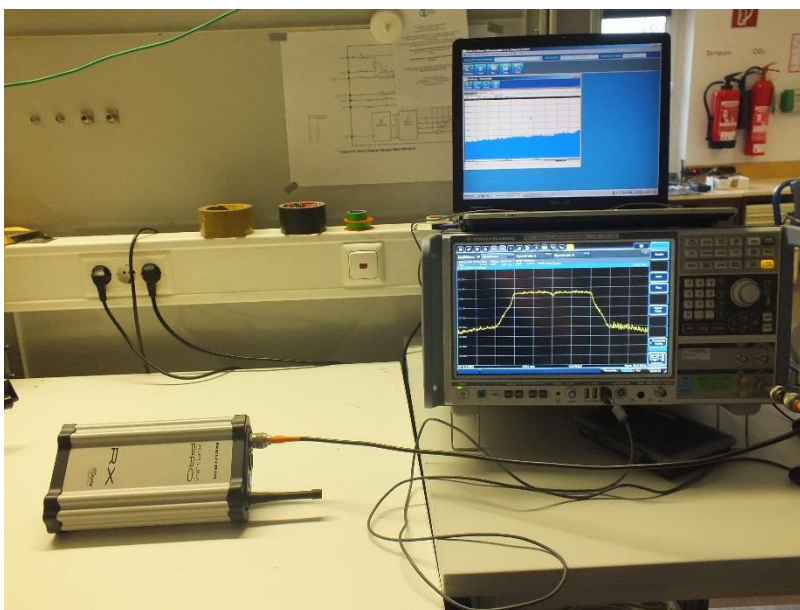
## 5.6 Peak power spectral density

For test instruments and accessories used see section 6 Part MB.

### 5.6.1 Description of the test location

Test location: AREA 4

### 5.6.2 Photo documentation of the test set-up



### 5.6.3 Applicable standard

According to FCC Part 15E, Section 15.407(a):

For the defined operating bands the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than the appropriate limit in any 1 MHz band during any time interval of continuous transmission.

### 5.6.4 Description of Measurement

The measurement is performed using the procedure set out in KDB 789033, PSD Method SA-2.

**5.6.5 Test result**

XROC OFF	Reading dBm/MHz dBm/500kHz	DC correction dB	Peak PSD dBm/MHz dBm/500kHz	Limit dBm/MHz dBm/500kHz	DELTA dB
CH36	-4,45	4,1	-0,4	14	-14,4
CH44	9,24	4,1	13,3	14	-0,7
CH48	9,42	4,1	13,5	14	-0,5
CH149	9,38	4,1	13,4	27	-13,6
CH157	8,19	4,1	12,2	27	-14,8
CH165	9,26	4,1	13,3	27	-13,7

XROC ON	Reading dBm/MHz dBm/500kHz	DC correction dB	Peak PSD dBm/MHz dBm/500kHz	Limit dBm/MHz dBm/500kHz	DELTA dB
CH36	-6,67	6,2	-0,5	14	-14,5
CH44	5,85	6,2	12,0	14	-2,0
CH48	7,69	6,2	13,9	14	-0,1
CH149	7,39	6,2	13,6	27	-13,5
CH157	7,29	6,2	13,5	27	-13,6
CH165	7,58	6,2	13,7	27	-13,3

DC correction was calculated according to KDB 789033 D02.

Peak power limit according to FCC Part 15E, Section 15.407(a):

Frequency (GHz)	Peak power spectral density limit (dBm/MHz)
5.150 - 5.250	17
Frequency (GHz)	Peak power spectral density limit (dBm/500kHz)
5.470 - 5.725	30

The requirements are **FULFILLED**.

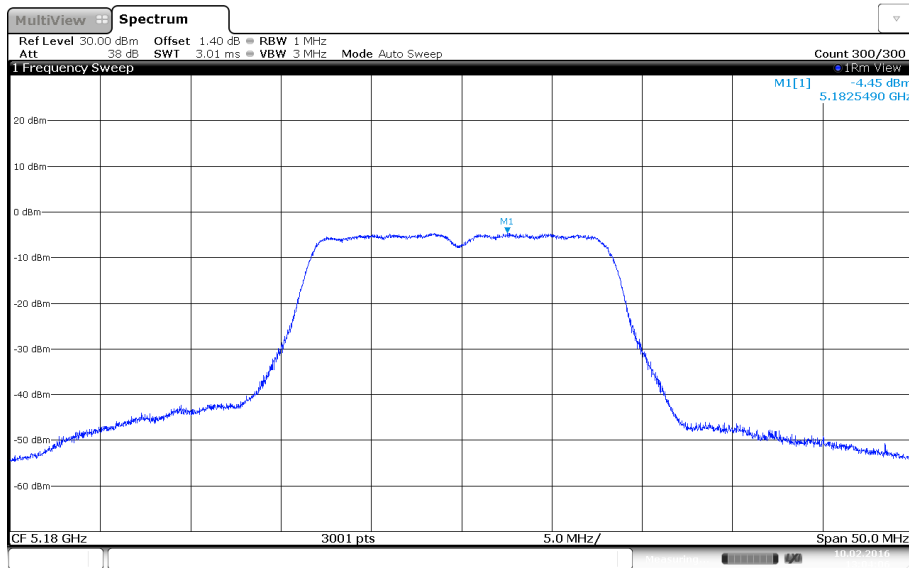
**Remarks:** Limit was reduced by 3dB due the use of 9dBi antenna. Maximum power setting was adjusted.



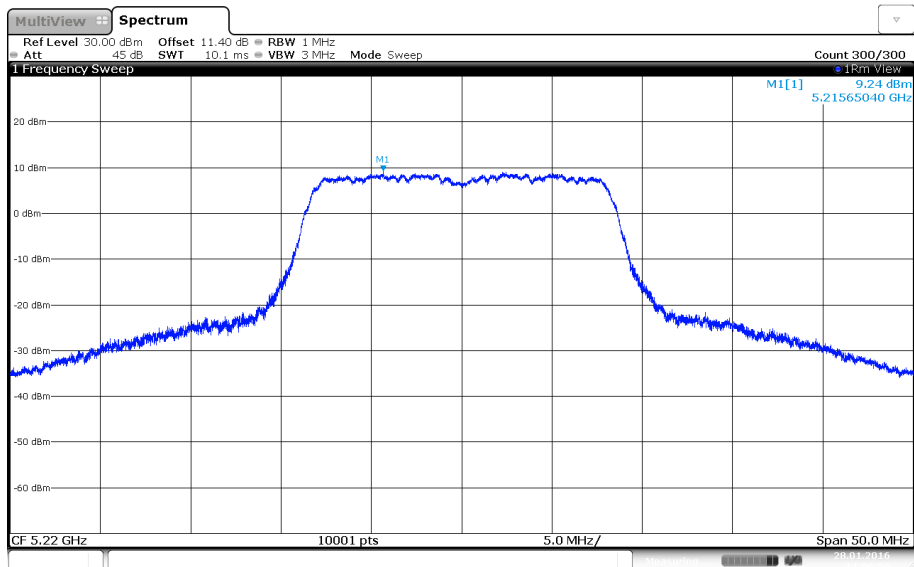
## 5.6.6 Peak Power spectral density plots

XROC OFF

Channel 36

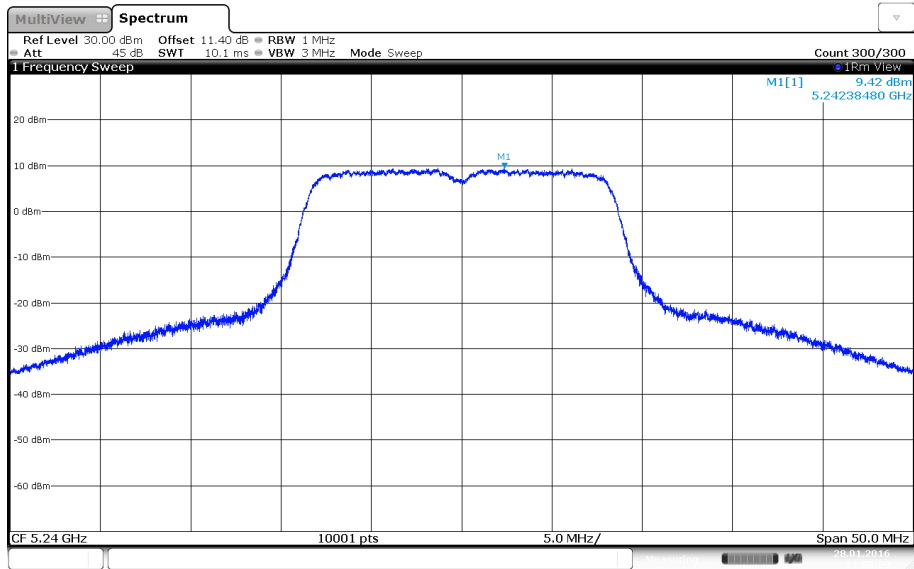


Channel 44

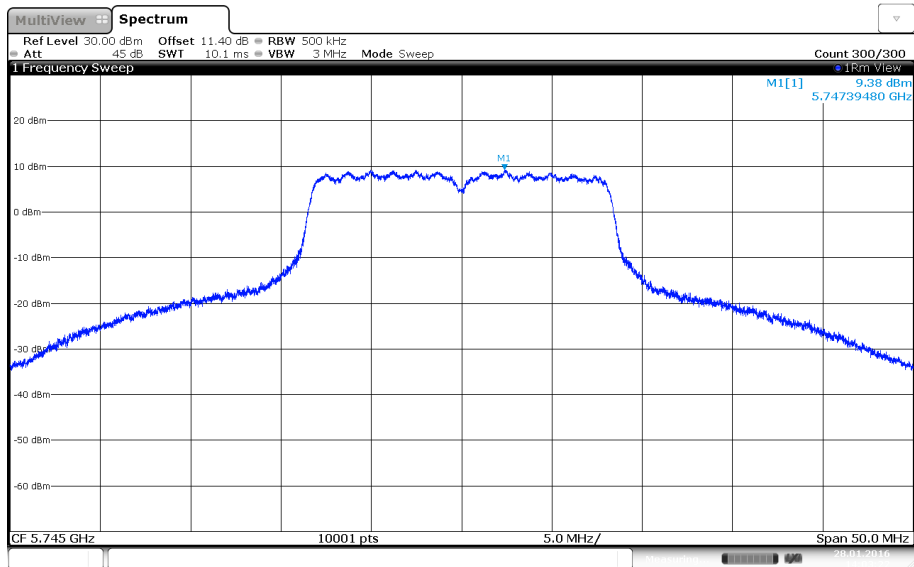


# FCC ID: 2ABA7XPR

## Channel 48

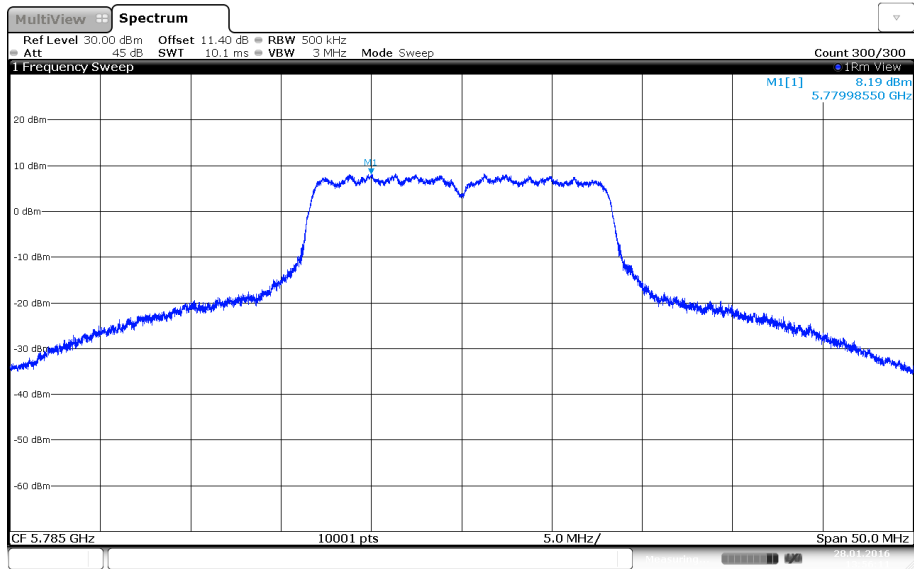


## Channel 149

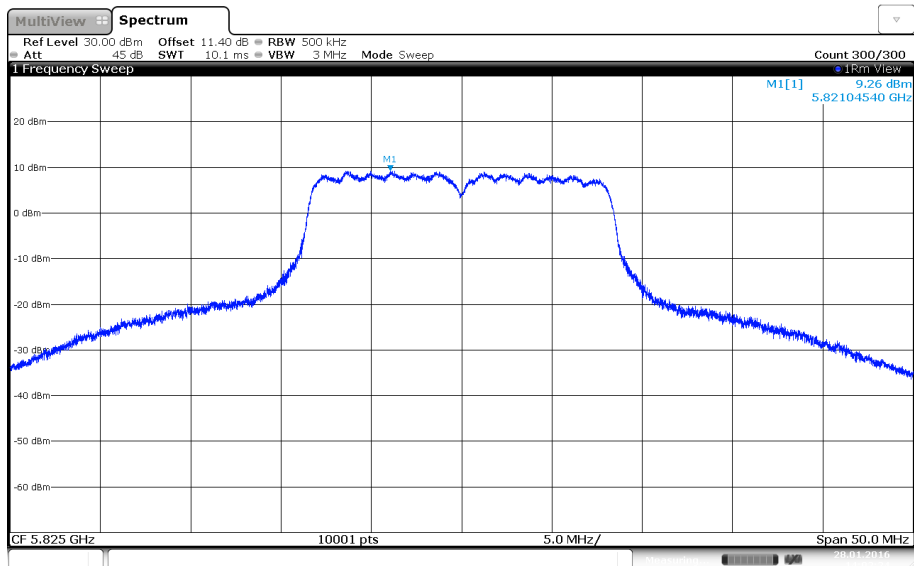


FCC ID: 2ABA7XPR

Channel 157



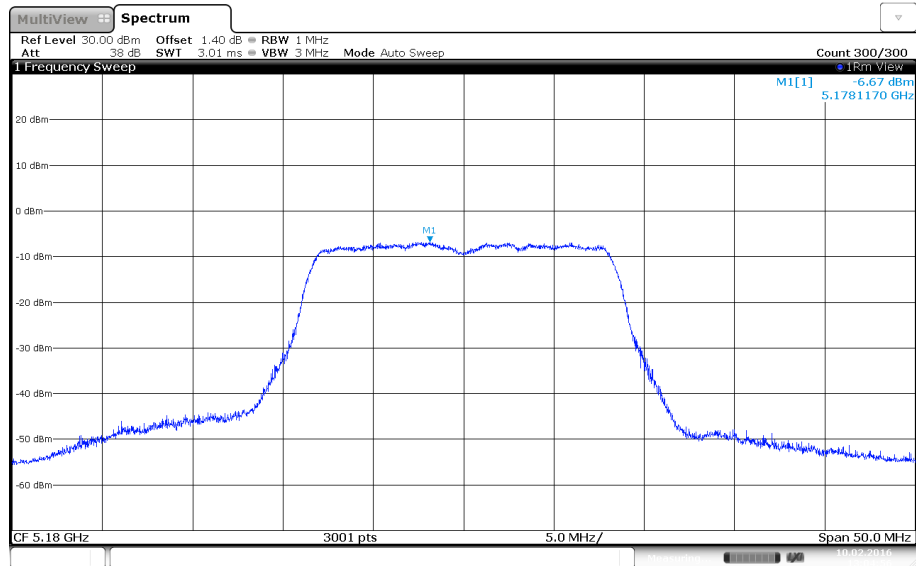
Channel 165



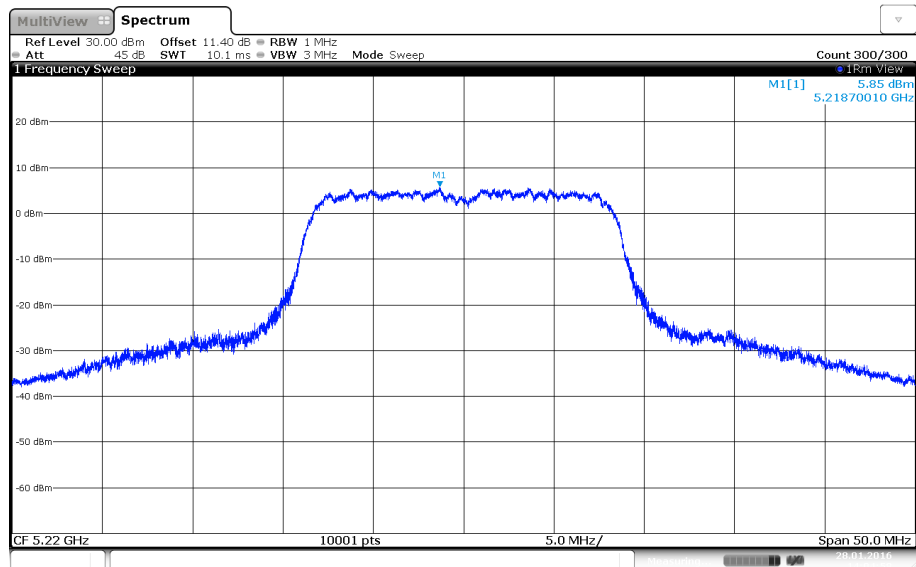
FCC ID: 2ABA7XPR

XROC ON

Channel 36

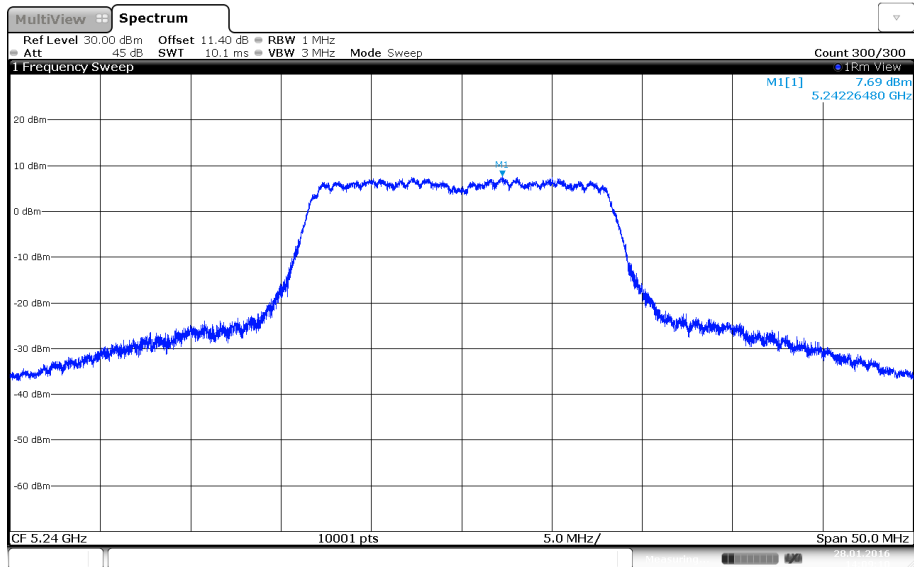


Channel 44

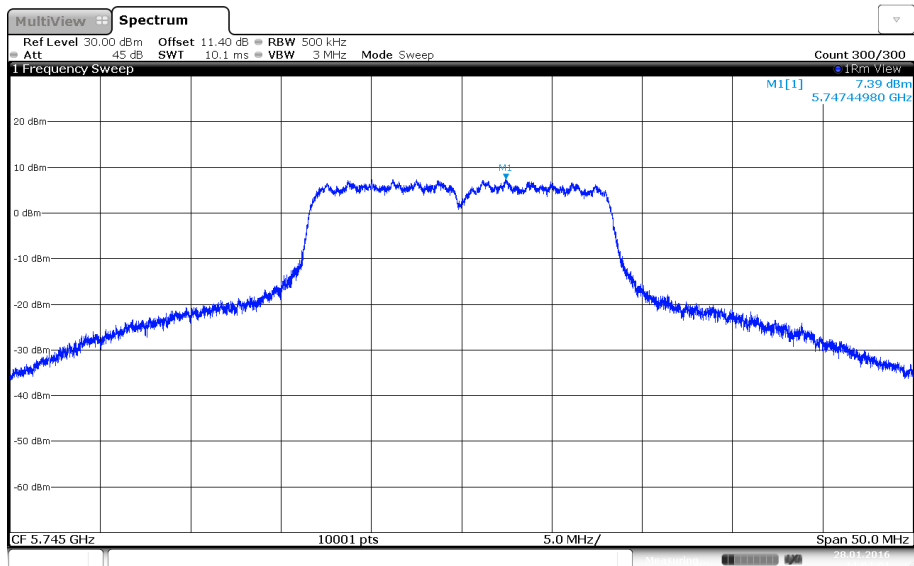


# FCC ID: 2ABA7XPR

## Channel 48

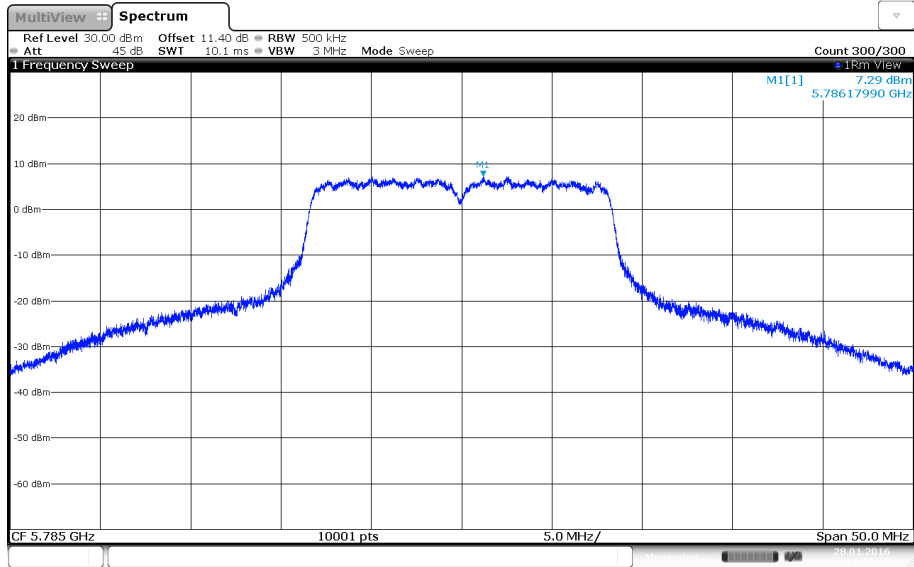


## Channel 149

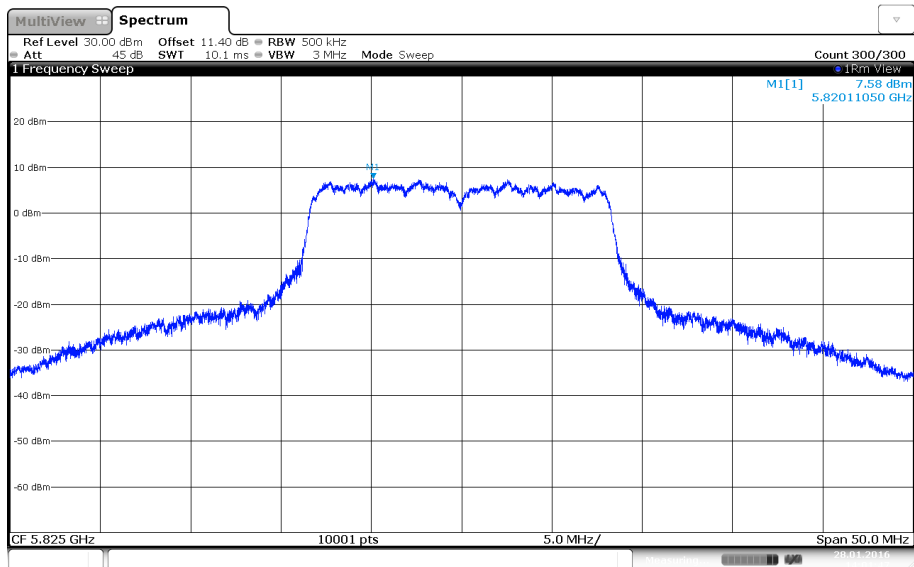


## FCC ID: 2ABA7XPR

Channel 157



Channel 165



## 5.7 Frequency stability

For test instruments and accessories used see section 6 Part FE.

### 5.7.1 Description of the test location

Test location: AREA 4

### 5.7.2 Photo documentation of the test set-up



### 5.7.3 Applicable standard

According to FCC Part 15E, Section 15.407(g):

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual

**5.7.4 Test result**

Temperature	Frequency error		
	XROC OFF	XROC ON	Maximum frequency error
	ppm	ppm	ppm
20°C	reference	reference	--
50°C	2,557	2,519	2,557
40°C	3,130	2,939	3,130
30°C	2,099	0,954	2,099
10°C	-0,496	-0,725	-0,725
0°C	0,038	0,954	0,954

**Battery supplied**

Voltage	Frequency error		
	XROC OFF	XROC ON	Maximum frequency error
	ppm	ppm	ppm
5.00V	reference	reference	--
4.25V	-1,889	-1,908	-1,908
5.75V	-2,118	-2,214	-2,214

**AC supplied (battery charging)**

Voltage	Frequency error		
	XROC OFF	XROC ON	Maximum frequency error
	ppm	ppm	ppm
120.00V	reference	reference	--
102.00V	-0,019	0,038	0,038
138.00V	0,000	-0,057	-0,057

**Remarks:**     The measurement was performed on CH48. The measured frequency at 20°C and nominal  
Voltage was used as reference for calculating the frequency error.



## 5.8 radiated emissions

For test instruments and accessories used see section 6 Part **SER 1**, **SER 2** and **SER 3**.

### 5.8.1 Description of the test location

Test location: OATS 1  
Test location: Anechoic chamber 2  
Test distance: 3 m

### 5.8.2 Photo documentation of the test set-up

Open area test site (Test setup for 9 kHz – 30 MHz)



Open area test site (Test setup for 30 MHz – 1000 MHz)



Anechoic chamber (Test setup for 1 GHz – 40 GHz)



### 5.8.3 Applicable standard

According to FCC Part 15C, Section 15.209:

### 5.8.4 Description of Measurement

The radiated emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 8.3. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level in peak mode complies with the average limit testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and reported. The EUT is measured in TX mode unmodulated under normal conditions.

Instrument settings:

9 kHz – 150 kHz	RBW:	200 Hz
150 kHz - 30 MHz	RBW:	9 kHz
30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 40 GHz	RBW:	1 MHz

**5.8.5 Test result  $f < 30$  MHz**

Note: In the frequency range 9 kHz to 30 MHz no emission could be detected. The frequencies mention the noise level. The measurement results from distance 3 m are extrapolated (D factor) to the specified distance.

TX mode CH44 XROC ON

Frequency (MHz)	Reading PK dB( $\mu$ V)	D factor dB( $\mu$ V/m)	Level PK dB( $\mu$ V/m)	Limit AV dB( $\mu$ V/m)	Delta (dB)
0.047	52.0	-80.0	-28.0	34.2	-62.2
1.5	51.0	-40.0	11.0	24.1	-13.1
18.2	39.0	-40.0	-1.0	29.5	-30.5

TX mode CH157 XROC ON

Frequency (MHz)	Reading PK dB( $\mu$ V)	D factor dB( $\mu$ V/m)	Level PK dB( $\mu$ V/m)	Limit AV dB( $\mu$ V/m)	Delta (dB)
0.047	52.0	-80.0	-28.0	34.2	-62.2
1.5	51.0	-40.0	11.0	24.1	-13.1
18.2	39.0	-40.0	-1.0	29.5	-30.5

**5.8.6 Test result  $30 \text{ MHz} < f < 1 \text{ GHz}$** 

TX mode CH44 XROC ON

Frequency (MHz)	Reading QP Vert. (dB $\mu$ V)	Reading QP Hor. (dB $\mu$ V)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level QP Vert. (dB $\mu$ V/m)	Level QP Hor. (dB $\mu$ V/m)	QP Limit (dB $\mu$ V/m)	Dlimit (dB)
82,34	19,2	13,3	10,3	9,9	29,5	23,2	40,0	-10,5
150,00	4,2	2,7	13,3	14,0	17,5	16,7	43,5	-26,0
250,00	4,2	4,6	13,5	13,6	17,7	18,2	46,0	-27,8
300,00	3,6	5,0	16,3	15,9	19,9	20,9	46,0	-25,1
400,00	1,3	2,0	18,8	18,6	20,1	20,6	46,0	-25,4

TX mode CH157 XROC ON

Frequency (MHz)	Reading QP Vert. (dBµV)	Reading QP Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level QP Vert. (dBµV/m)	Level QP Hor. (dBµV/m)	QP Limit (dBµV/m)	Dlimit (dB)
82,34	19,2	13,3	10,3	9,9	29,5	23,2	40,0	-10,5
150,00	4,1	2,7	13,3	14,0	17,4	16,7	43,5	-26,1
250,00	4,2	4,6	13,5	13,6	17,7	18,2	46,0	-27,8
300,00	3,7	4,9	16,3	15,9	20,0	20,8	46,0	-25,2
400,00	1,3	2,0	18,8	18,6	20,1	20,6	46,0	-25,4

### 5.8.7 Test result f > 1 GHz

TX mode CH36 XROC ON

Frequency (MHz)	Reading PK Vert. (dBµV)	Reading PK Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level PK Vert. (dBµV/m)	Level PK Hor. (dBµV/m)	Limit AV (dBµV/m)	Dlimit (dB)
4808,30	48,3	44,1	3,6	3,6	51,9	47,7	54,0	-2,1
5586,70	46,2	36,1	3,9	3,9	50,1	40,0	54,0	-3,9
15538,10	39,6	36,8	4,4	4,4	44,0	41,2	54,0	-10,0

TX mode CH44 XROC ON

Frequency (MHz)	Reading PK Vert. (dBµV)	Reading PK Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level PK Vert. (dBµV/m)	Level PK Hor. (dBµV/m)	Limit AV (dBµV/m)	Dlimit (dB)
4849,30	47,8	44,2	3,8	3,8	51,6	48,0	54,0	-2,4
5628,90	46,1	34,6	3,9	3,9	50,0	38,5	54,0	-4,0
15658,60	39,1	34,9	4,6	4,6	43,7	39,5	54,0	-10,3

TX mode CH48 XROC ON

Frequency (MHz)	Reading PK Vert. (dBµV)	Reading PK Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level PK Vert. (dBµV/m)	Level PK Hor. (dBµV/m)	Limit AV (dBµV/m)	Dlimit (dB)
4853,80	46,8	38,9	3,8	3,8	50,6	42,7	54,0	-3,4
5643,80	40,3	33,6	4,0	4,0	44,3	37,6	54,0	-9,7
15719,80	40,6	33,2	4,9	4,9	45,5	38,1	54,0	-8,5

**FCC ID: 2ABA7XPR**

TX mode CH149 XROC ON

Frequency (MHz)	Reading PK Vert. (dBµV)	Reading PK Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level PK Vert. (dBµV/m)	Level PK Hor. (dBµV/m)	Limit AV (dBµV/m)	Dlimit (dB)
5360,32	47,3	41,7	4,7	4,7	52,0	46,4	54,0	-2,0
6150,30	47,2	41,3	6,0	6,0	53,2	47,3	54,0	-0,8
17234,89	46,8	41,6	5,7	5,7	52,5	47,3	54,0	-1,5

TX mode CH157 XROC ON

Frequency (MHz)	Reading PK Vert. (dBµV)	Reading PK Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level PK Vert. (dBµV/m)	Level PK Hor. (dBµV/m)	Limit AV (dBµV/m)	Dlimit (dB)
5378,20	48,8	41,2	4,8	4,8	53,6	46,0	54,0	-0,4
6192,60	47,4	41,3	6,3	6,3	53,7	47,6	54,0	-0,3
17354,76	46,6	40,2	5,8	5,8	52,4	46,0	54,0	-1,6

TX mode CH165 XROC ON

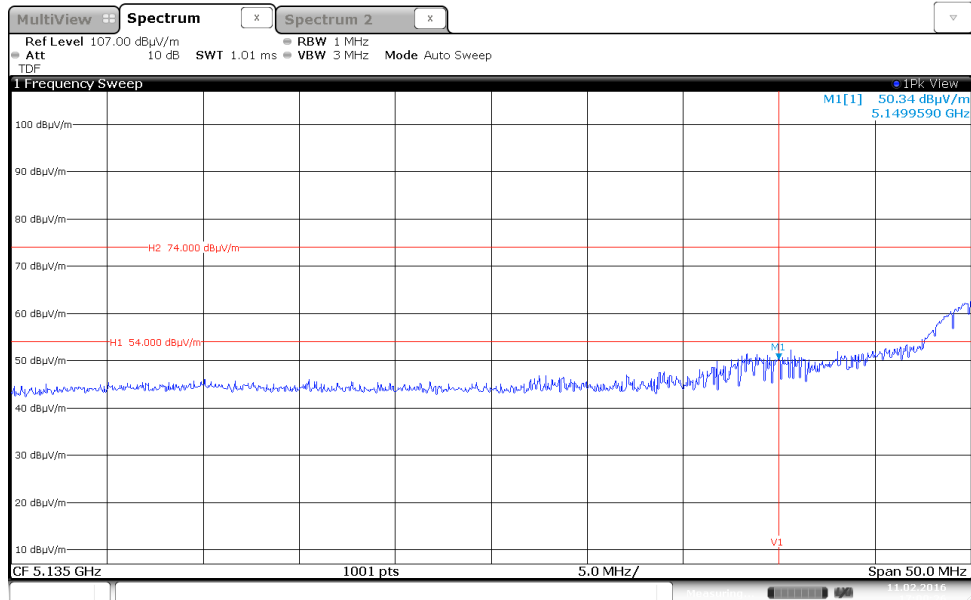
Frequency (MHz)	Reading PK Vert. (dBµV)	Reading PK Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level PK Vert. (dBµV/m)	Level PK Hor. (dBµV/m)	Limit AV (dBµV/m)	Dlimit (dB)
5448,30	48,7	41,9	4,7	4,7	53,4	46,6	54,0	-0,6
6233,40	46,1	40,8	6,5	6,5	52,6	47,3	54,0	-1,4
17354,76	47,3	39,8	5,8	5,8	53,1	45,6	54,0	-0,9

NOTE: For frequencies where the PK value is below the average limit no average measurement was performed

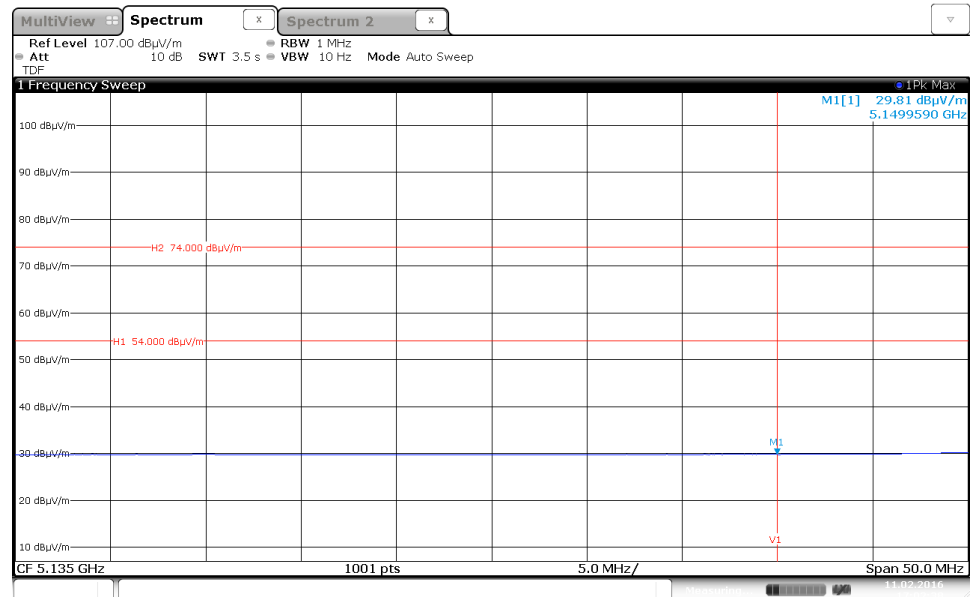
## 5.8.8 Band edges

TX mode CH36 XROC ON

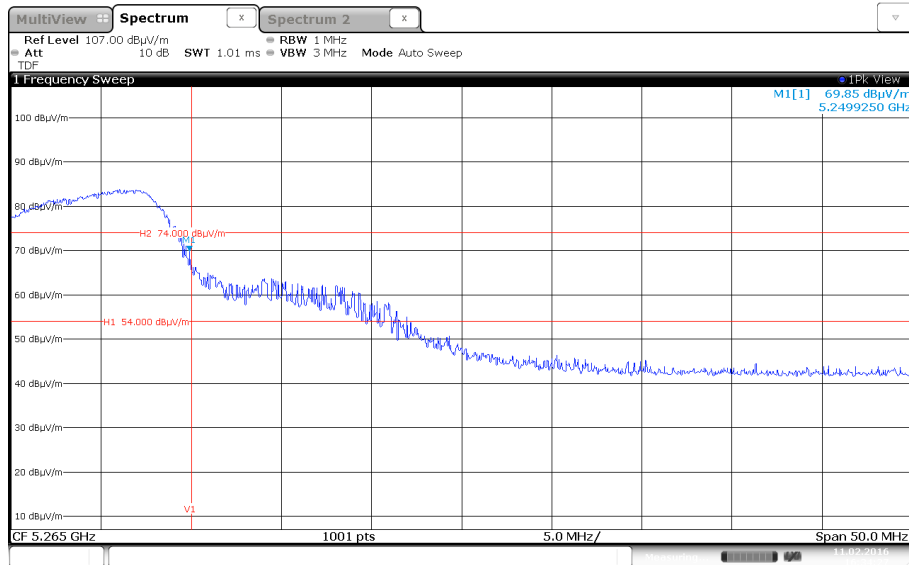
Peak



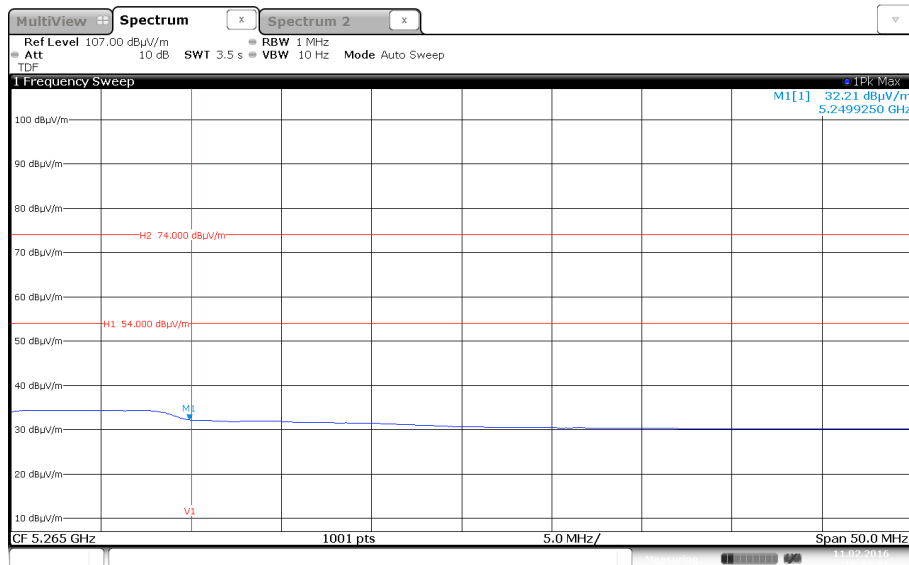
Average



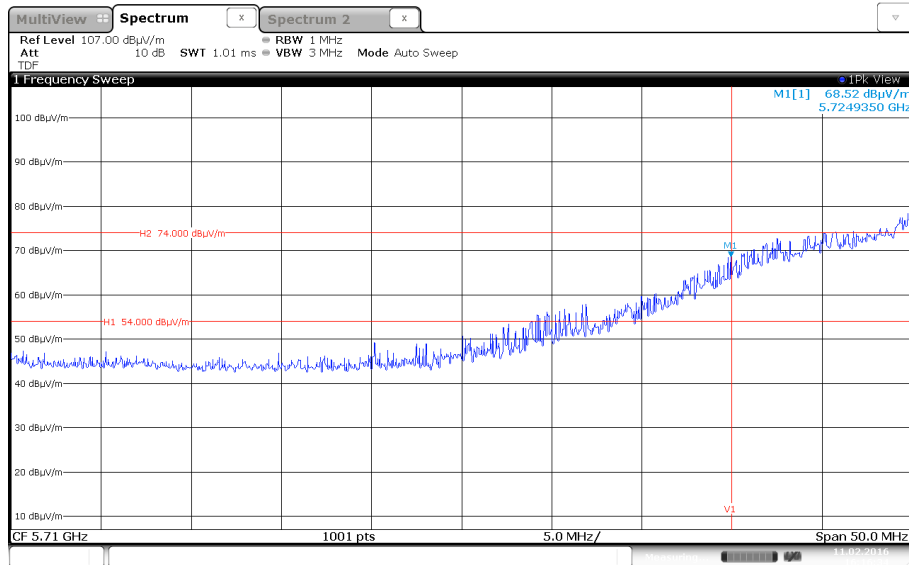
TX mode CH48 XROC ON  
Peak



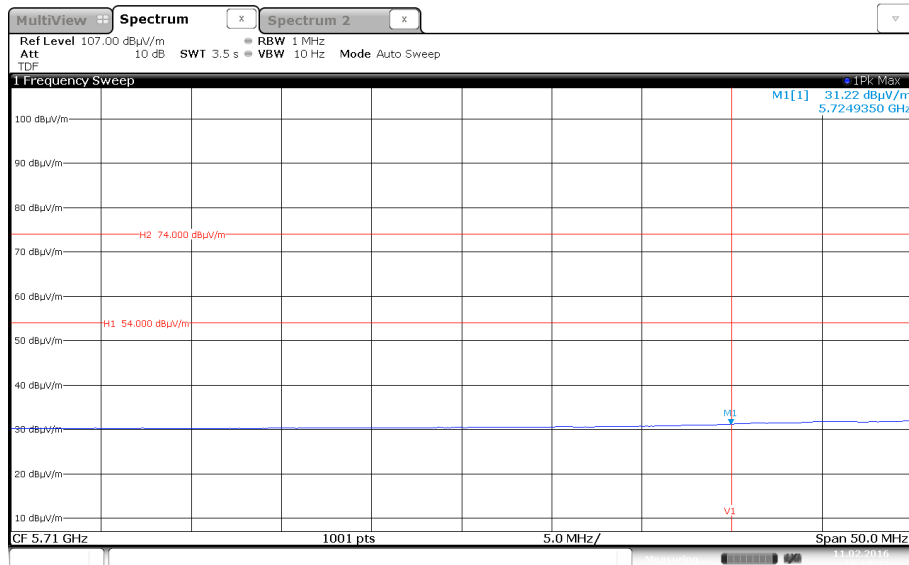
Average



TX mode CH149 XROC ON  
Peak

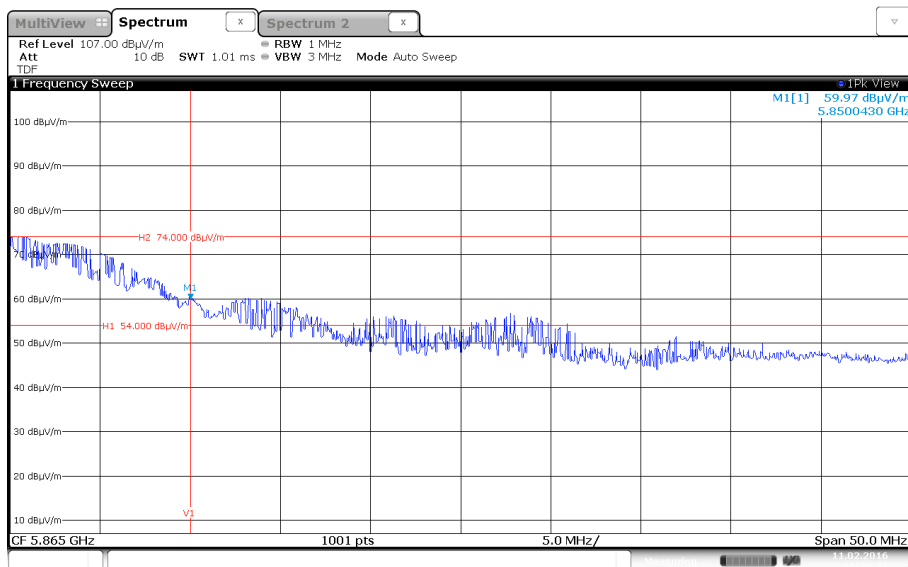


Average

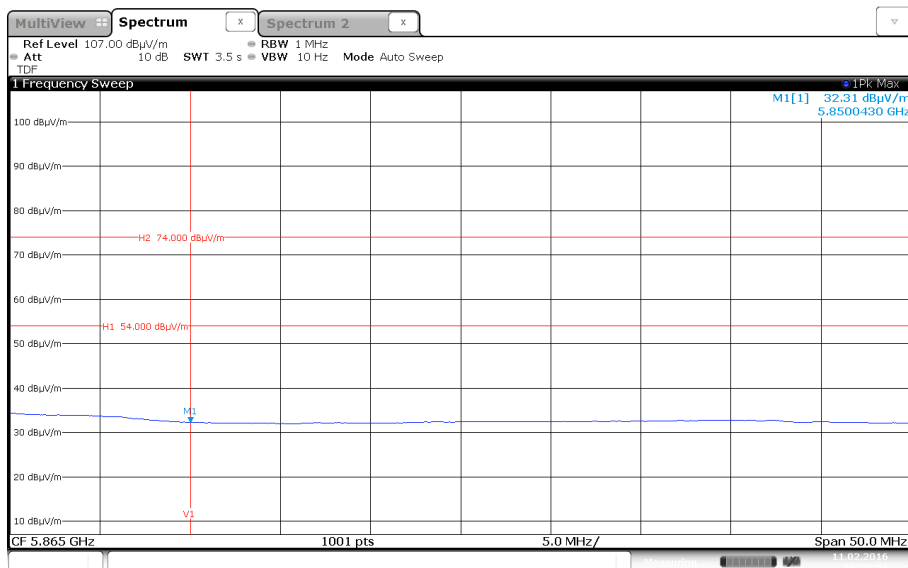




TX mode CH165 XROC ON  
Peak



Average



The requirements are **FULFILLED**.

**Remarks:**

The measurement was performed from 9 kHz up to 40 GHz.

The measurement was performed with XROC ON. Pescans indicate this as worst case operation Mode.

The testing was performed according to FCC Part 15.209. The result show that all spurious Emissions (peak measurement) are below the general average limit according to Part 15.209.

In this case the limit according to FCC Part 15.407(b) (-27dBm/MHz) should be meet.

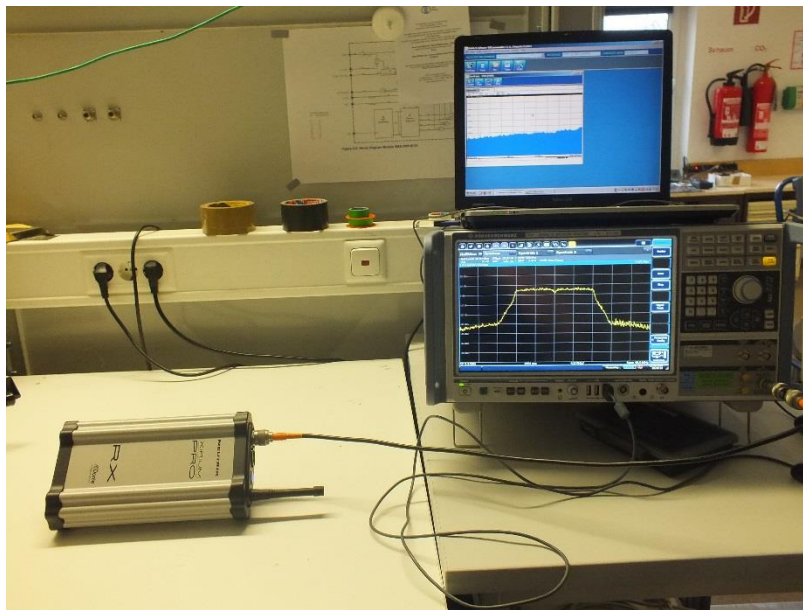
## 5.9 Duty cycle and transmission duration

For test instruments and accessories used see section 6 Part DC.

### 5.9.1 Description of the test location

Test location: AREA4

### 5.9.2 Photo documentation of the test set-up



### 5.9.3 Applicable standard

According to KDB 789033 D02:

The emission from intentional radiator has to be categorised and its value determined in order to select the right measurement method for the EUT.

Duty cycle (x), as used in this document, refers to the fraction of time over which the transmitter is on and is transmitting at its maximum power control level.

T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 5.9.4 Description of Measurement

The duty cycle is measured conducted with the spectrum analyser in time domain mode. The EUT transmits with its possible modulations supported by a internal or external working packet generator, which may enable a constant packet length. In zero-span mode a trigger is set to decide for a constant duty cycle. The screen is set for two following packets.

Analyser settings:

The duty cycle is calculated as transmission on-time in relation to the transmission off-time:

$$DC = t_{on} / t_d;$$

$t_{on}$  pulse on-time ( $\mu s$ );

$t_d$  transmission duration ( $\mu s$ )

### 5.9.5 Test result

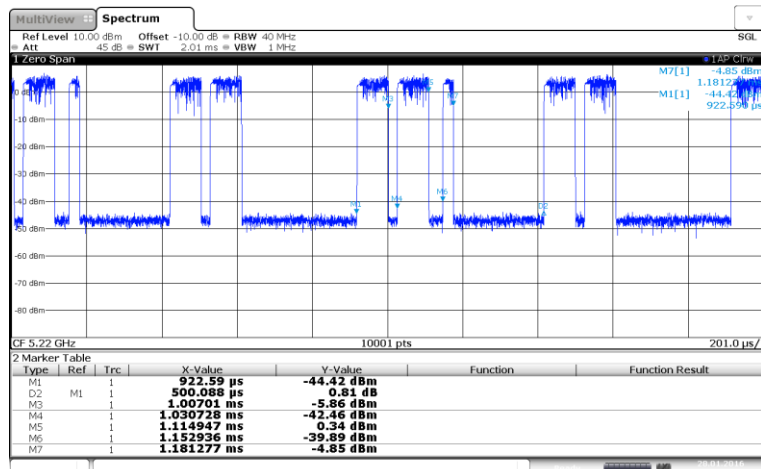
#### Duty cycle determination:

Channel	$t_{on}$	$t_d$	$DC$
	( $\mu s$ )	( $\mu s$ )	(%)
44 XROC OFF	197	500	39,4
44 XROC ON	121	500	24,2
157 XROC OFF	197	500	39,4
157 XROC ON	121	500	24,2

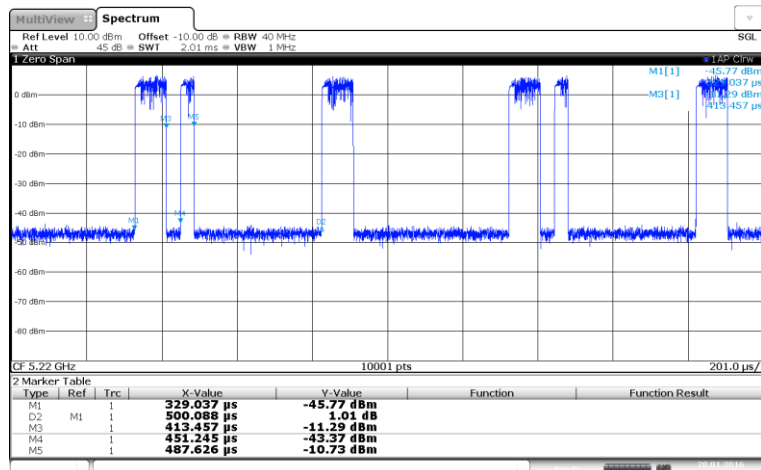
Remarks: none

## 5.9.6 Test protocols duty cycle

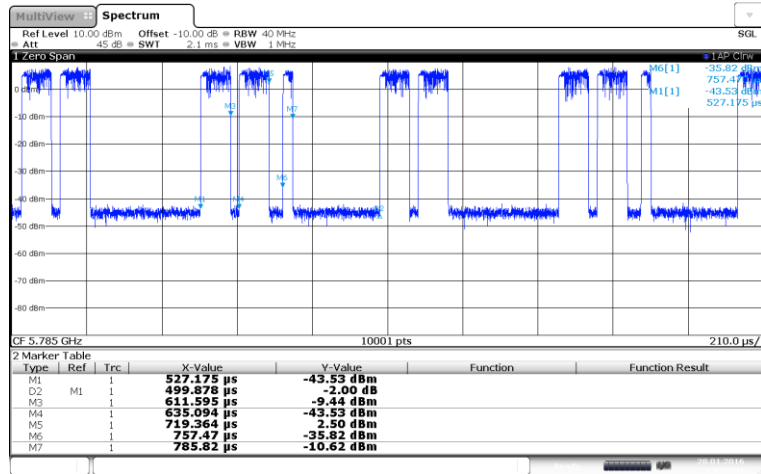
CH44, XROC OFF:



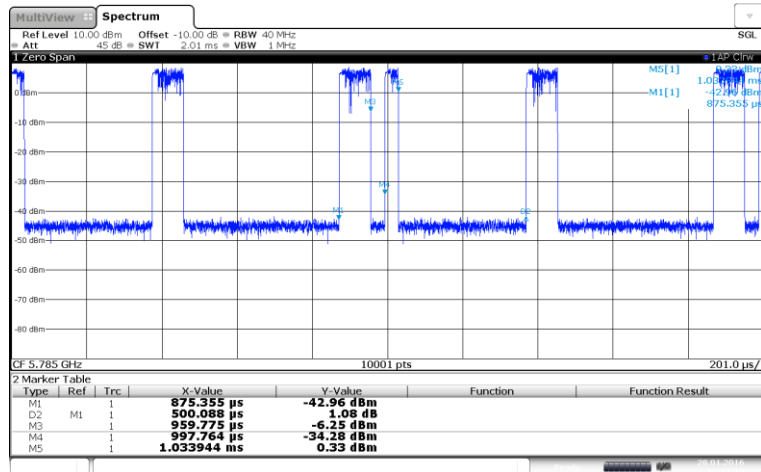
CH44, XROC ON:



CH157, XROC OFF:



CH157, XROC ON:



## **6 USED TEST EQUIPMENT AND ACCESSORIES**

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

<b>Test ID</b>	<b>Model Type</b>	<b>Equipment No.</b>	<b>Next Calib.</b>	<b>Last Calib.</b>	<b>Next Verif.</b>	<b>Last Verif.</b>
A 4	ESCI	02-02/03-15-001	15/05/2016	15/05/2015		
	ESH 2 - Z 5	02-02/20-05-004	26/10/2017	26/10/2015	21/07/2016	21/01/2016
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	06/11/2016	06/11/2015	06/05/2016	06/11/2015
CPC 3	NRVS	02-02/07-06-003				
	NRV-Z51	02-02/07-06-006	16/07/2016	16/07/2015		
MB	FSW43	02-02/11-15-001	05/08/2016	05/08/2015		
SER 1	FMZB 1516	01-02/24-01-018			21/01/2017	21/01/2016
	ESCI	02-02/03-05-004	17/09/2016	17/09/2015		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015		
	VULB 9168	02-02/24-05-005	17/04/2016	17/04/2015	29/02/2016	31/08/2015
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 3	FSW43	02-02/11-15-001	05/08/2016	05/08/2015		
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	3117	02-02/24-05-009	12/05/2016	12/05/2015		
	BBHA 9170	02-02/24-05-014	02/06/2018	02/06/2015	02/12/2016	02/12/2015
	Sucoflex N-2000-SMA	02-02/50-05-075				
	KMS102-0.2 m	02-02/50-11-020				
	SF104/11N/11N/1500MM	02-02/50-13-015				
FE	FSW43	02-02/11-15-001	05/08/2016	05/08/2015		
	METRAHIT WORLD	02-02/32-15-001	24/11/2016	24/11/2015		
	WK-340/40	02-02/45-05-001	07/07/2016	07/07/2015		
	6543A	02-02/50-05-157				
	6430	02-02/50-13-014				