

EMI – TEST REPORT

- FCC Part 15.247, RSS247 -

Type / Model Name : Active Cradle AC3

Product Description : Charging cradle with ZigBee

Applicant : Libify Technologies GmbH

Address : Rüdesheimer Straße 11

80686 MÜNCHEN, GERMANY

Manufacturer : Libify Technologies GmbH

Address : Rüdesheimer Straße 11

80686 MÜNCHEN, GERMANY

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

POSITIVE

Test Report No. : **T40862-00-02KS**

03. April 2018

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.

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1 TEST STANDARDS

The tests were performed according to following standards:

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

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

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

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

ANSI C63.10: 2013 Testing Unlicensed Wireless Devices

ETSI TR 100 028 V1.3.1: 2001-03 Electromagnetic Compatibility and Radio Spectrum Matters (ERM);
Uncertainties in the Measurement of Mobile Radio Equipment
Characteristics—Part 1 and Part 2

KDB 558074 D01 v03r05 Guidance for performing compliance measurements on DTS
operating under §15.247, April 8, 2016.

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.2 Equipment type

ZigBee device

2.3 Short description of the equipment under test (EUT)

The EUT is a charging cradle AC3 for GeoCare GC5 and part of an emergency call system working in the 2.4 GHz ISM-Band. The EUT is compatible with the standard 802.15.4. A complete functional unit consists of a radio button, GEOCARE (GC5) and the EUT AC3. The EUT has only one integrated antenna, no temporary connector and no external antenna can be connected.

Number of tested samples: 1
Serial number: AC3-005324
Firmware version: v1.1

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

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	26	2480

Note: the marked frequencies are determined for final testing. Channel 26 is not supported by the EUT.

2.6 Transmit operating modes

The EUT uses O-QPSK modulation and may provide following data rates:

- 250 kbps (kbps = *kilobits per second*)

2.7 Antennas

The following antenna shall be used with the EUT:

Number	Type	Certification name	Plug	Frequency range (GHz)	Peak Gain (dBi)
1	Omni	SMD antenna	none	2.4	2.1

2.8 Power supply system utilised

Supply voltage, V_{nom} : 115 V AC / 60 Hz (AC adaptor, USB connector)

Alternative voltage : 5 V DC (USB powered by laptop computer or power adaptor) and internal power backup with 3.7 V accumulator pack.

2.9 Extreme test conditions

The extreme temperature range for the EUT is defined by the manufacturer:

0 °C to +50 °C, $T_{nom} = 20$ °C;

2.10 Peripheral devices and interface cables

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

- _____ Model : _____

- _____ Model : _____

- _____ Model : _____

2.11 Determination of worst case conditions for final measurement

For the final test the following channels and test modes are selected:

IEEE Standard	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.15.4	11 to 25	11, 18, 25	Pmax	DSSS	O-QPSK	250 kbps

2.11.1 Test jig

No special test jig was used.

2.11.2 Test software

The EUT has a special firmware that allows enabling a continuous transmission modulated and receiving mode. The output power is set to maximum power and cannot be changed during tests.

3 TEST RESULT SUMMARY

Operating in the 2400 MHz – 2483.5 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 8.8	AC power line conducted emissions	passed
15.247(a)(2)	RSS247, 5.2(1)	-6 dB EBW	passed
15.247(b)(3)	RSS247, 5.4(4)	Maximum peak conducted output power	passed
15.247(b)(4)	RSS247, 5.4(4)	Defacto limit	passed
15.247(d)	RSS247, 5.5	Unwanted emission, radiated	passed
15.247(d)	RSS-Gen, 8.10	Emissions in restricted bands	passed
15.247(e)	RSS247, 5.2(2)	PSD	passed
15.35(c)	RSS-Gen, 6.10	Pulsed operation	passed
15.247(b)(4)	-	Antenna requirement	passed
	RSS-Gen, 6.11	Transmitter frequency stability	passed
	RSS-Gen, 6.6	99 % Bandwidth	passed

The mentioned RSS Rule Parts in the above table are related to:

RSS Gen, Issue 4, November 2014

RSS 247, Issue 2, February 2017

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 : 23 January 2017

Testing concluded on : 30 June 2017

Checked by:


Klaus Gegenfurtner
I confirm the correctness
and integrity of this
document.
2018.04.05 09:46:26
+02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:


Kathrin Schiebl
I am the author of this
document
2018.04.05 09:42:11
+02'00'

Kathrin Schiebl
Radio Team

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.

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 3000 MHz	95%	$\pm 2.5 \times 10^{-7}$
Maximum peak conducted output power	2400 MHz to 3000 MHz	95%	± 0.62 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB
Conducted Spurious Emissions	10000 MHz to 40000 MHz	95%	± 3.47 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Field strength of the fundamental	100 kHz to 100 MHz	95%	± 3.53 dB

4.4 Measurement protocol for FCC and ISCED

4.4.1 General information

4.4.1.1 Test methodology

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

IC 3009A-1

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

IC 3009A-2

In compliance with RSS 247 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.

4.4.1.2 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 unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.1.3 General Standard information

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 C63.10 and applying the CISPR 22 limits.

4.4.1.3.1 Radiated emission (electrical field 30 MHz - 1 GHz)

Description of measurement

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.

The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency	Level	+	Factor	=	Level	-	CISPR Limit	=
Delta								
(MHz)	(dBµV)		(dB)		(dBµV/m)		(dBµV/m)	(dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	= -2.4

4.4.1.3.2 Radiated emission (electrical field 1 GHz - 40 GHz)Description of measurement

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table, 1.5 metre above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyzer set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

5 TEST CONDITIONS AND RESULTS

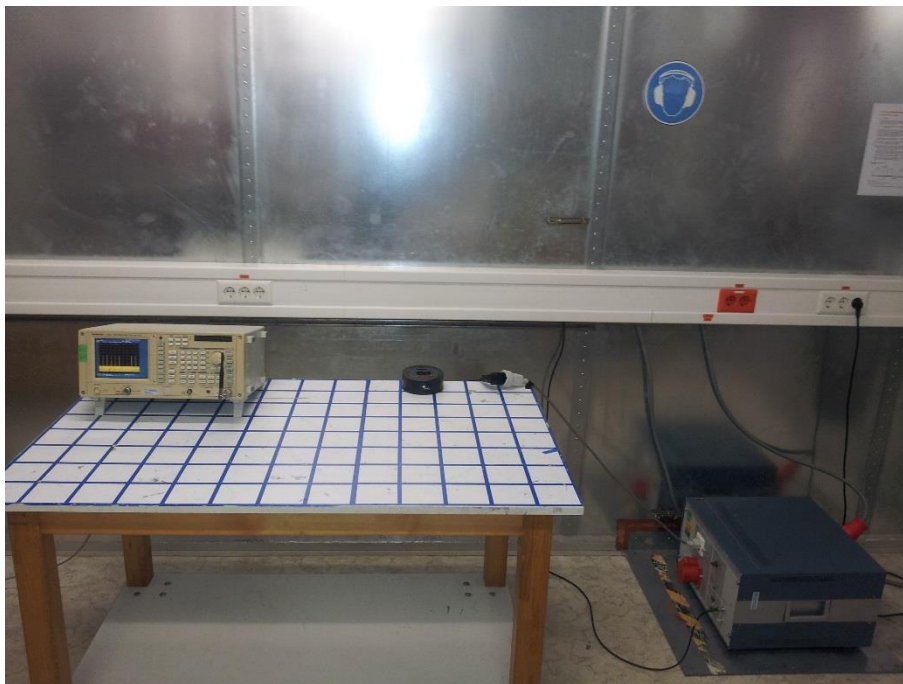
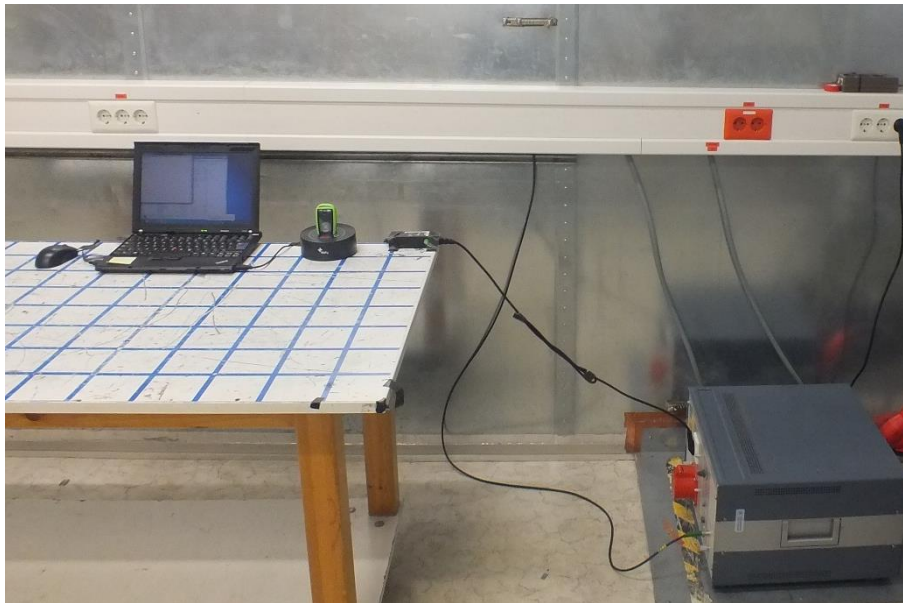
5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part A 4.

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

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 13.18 dB at 0.471 MHz

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols

Limit according to FCC Part 15, Section 15.207(a):

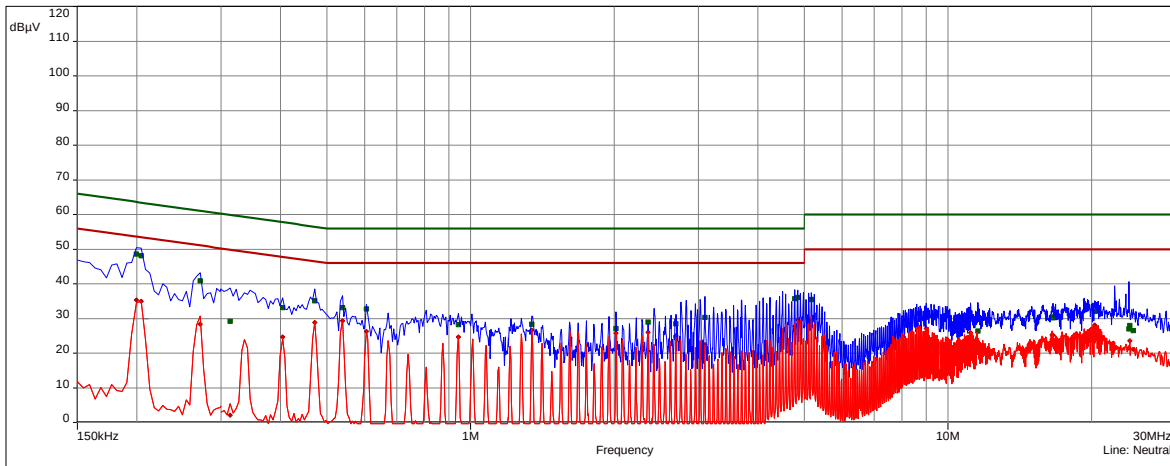
Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

5.1.6 Test protocol

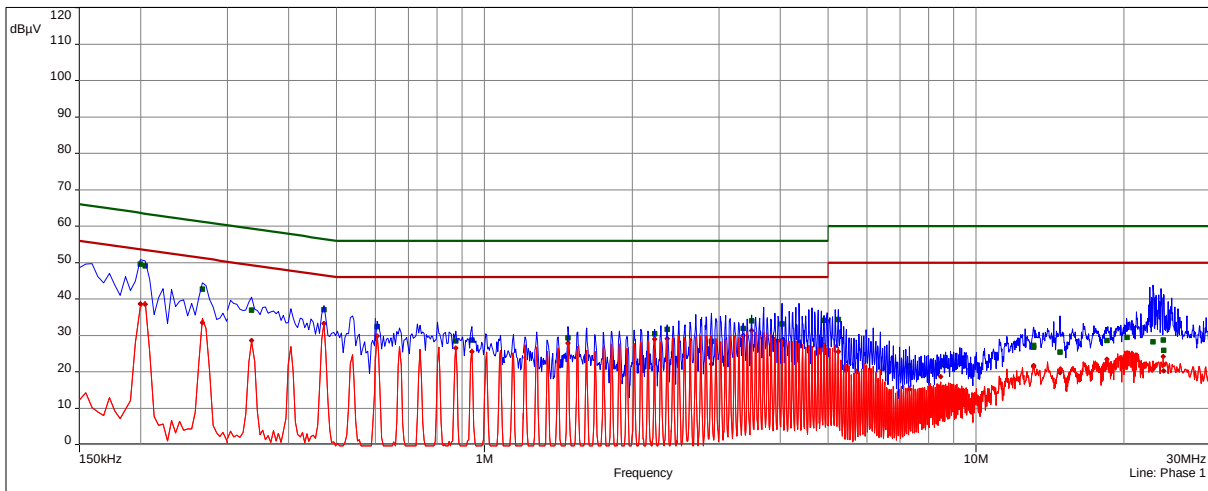
File No.:	T40862-00-02KS	Result	positive
Operation mode:	Active transmission		
Tested by:	TK		
Location:	S2	Date:	23.01.2017
Remarks:	Tested when connected to a laptop via USB		

Line: Neutral



Frequency (MHz)	QuasiPeak (dBμV)	QP Margin	QP Limit	Average (dBμV)	AV Margin	AV Limit	Line	Correction (dB)
0.1995	48.57	15.06	63.63	35.35	18.28	53.63	Neutral	9.84
0.204	48.06	15.39	63.45	35.03	18.42	53.45	Neutral	9.83
0.2715	40.87	20.20	61.07	28.33	22.74	51.07	Neutral	9.81
0.3135	29.18	30.70	59.88	2.05	47.83	49.88	Neutral	9.80
0.4035	33.11	24.67	57.78	24.64	23.14	47.78	Neutral	9.80
0.471	35.08	21.42	56.50	28.85	17.65	46.50	Neutral	9.80
0.5385	33.18	22.82	56.00	29.39	16.61	46.00	Neutral	9.81
0.6045	32.76	23.24	56.00	26.25	19.75	46.00	Neutral	9.80
0.942	28.18	27.82	56.00	24.65	21.35	46.00	Neutral	9.80
1.344	28.36	27.64	56.00	26.68	19.32	46.00	Neutral	9.78
2.0145	27.16	28.84	56.00	25.81	20.19	46.00	Neutral	9.80
2.352	28.94	27.06	56.00	26.08	19.92	46.00	Neutral	9.79
2.688	28.52	27.48	56.00	25.02	20.98	46.00	Neutral	9.78
3.093	30.36	25.64	56.00	22.45	23.55	46.00	Neutral	9.79
4.7715	35.72	20.28	56.00	27.68	18.32	46.00	Neutral	9.81
4.8405	36.07	19.93	56.00	29.59	16.41	46.00	Neutral	9.81
5.1735	35.48	24.52	60.00	29.44	20.56	50.00	Neutral	9.82
8.67	31.47	28.53	60.00	27.66	22.34	50.00	Neutral	9.82
9.0075	30.77	29.23	60.00	27.15	22.85	50.00	Neutral	9.82
11.157	29.88	30.12	60.00	25.88	24.12	50.00	Neutral	9.85
11.5485	26.40	33.60	60.00	20.84	29.16	50.00	Neutral	9.85
16.5345	30.43	29.57	60.00	25.31	24.69	50.00	Neutral	9.99
16.602	30.15	29.85	60.00	25.11	24.89	50.00	Neutral	9.99
20.3025	32.09	27.91	60.00	28.10	21.90	50.00	Neutral	10.12
23.934	27.02	32.98	60.00	21.43	28.57	50.00	Neutral	9.97
24.024	28.02	31.98	60.00	23.55	26.45	50.00	Neutral	9.97
24.456	26.54	33.46	60.00	21.10	28.90	50.00	Neutral	9.96

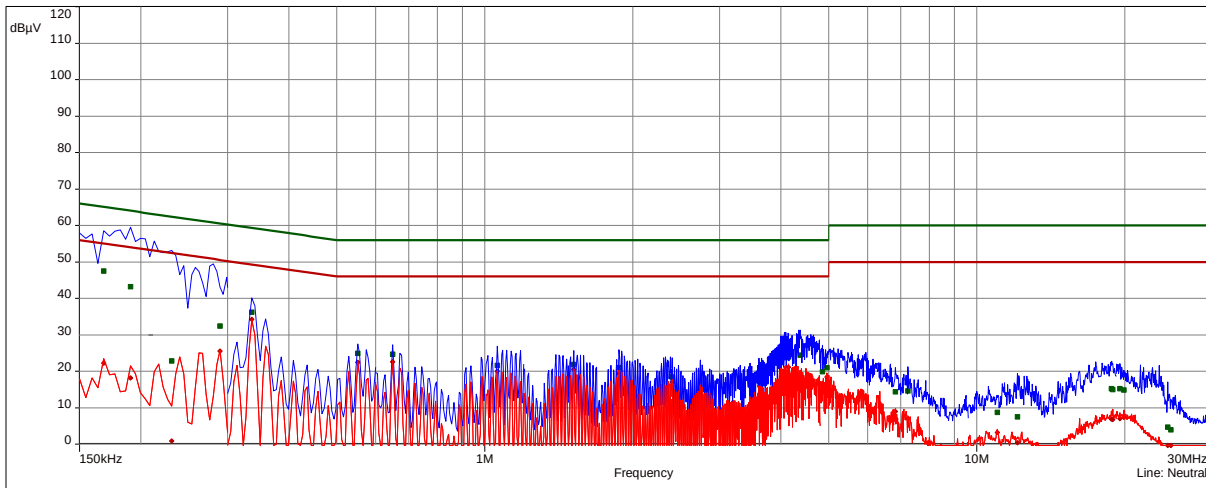
Line: Phase 1



Frequency (MHz)	QuasiPeak (dBμV)	QP Margin	QP Limit	Average (dBμV)	AV Margin	AV Limit	Line	Correction (dB)
0.1995	49.63	14.00	63.63	38.64	15.00	53.63	Phase 1	9.82
0.204	49.12	14.33	63.45	38.56	14.89	53.45	Phase 1	9.82
0.267	42.74	18.47	61.21	33.56	17.65	51.21	Phase 1	9.81
0.336	36.89	22.41	59.30	28.59	20.71	49.30	Phase 1	9.80
0.471	37.01	19.49	56.50	33.32	13.18	46.50	Phase 1	9.80
0.6045	32.44	23.56	56.00	29.81	16.19	46.00	Phase 1	9.80
0.8745	28.48	27.52	56.00	26.56	19.44	46.00	Phase 1	9.80
0.942	28.68	27.32	56.00	25.57	20.43	46.00	Phase 1	9.80
1.479	29.27	26.73	56.00	27.86	18.14	46.00	Phase 1	9.78
2.217	30.39	25.61	56.00	28.97	17.03	46.00	Phase 1	9.79
2.352	31.72	24.28	56.00	29.14	16.86	46.00	Phase 1	9.79
2.895	28.41	27.59	56.00	22.05	23.95	46.00	Phase 1	9.79
3.3585	31.88	24.12	56.00	29.93	16.07	46.00	Phase 1	9.81
3.4935	34.02	21.98	56.00	31.31	14.69	46.00	Phase 1	9.82
4.029	33.16	22.84	56.00	28.72	17.28	46.00	Phase 1	9.81
4.9035	34.07	21.93	56.00	27.16	18.84	46.00	Phase 1	9.82
5.241	34.42	25.58	60.00	25.55	24.45	50.00	Phase 1	9.83
7.3245	21.55	38.45	60.00	15.18	34.82	50.00	Phase 1	9.85
8.4675	22.04	37.96	60.00	18.61	31.39	50.00	Phase 1	9.86
13.083	26.76	33.24	60.00	21.39	28.61	50.00	Phase 1	10.03
13.0965	27.22	32.78	60.00	21.73	28.27	50.00	Phase 1	10.03
14.82	25.36	34.64	60.00	19.73	30.27	50.00	Phase 1	10.11
18.4785	28.54	31.46	60.00	23.47	26.53	50.00	Phase 1	10.27
20.289	29.40	30.60	60.00	24.06	25.94	50.00	Phase 1	10.34
22.8855	28.18	31.82	60.00	20.77	29.23	50.00	Phase 1	10.34
24.024	28.69	31.31	60.00	24.21	25.79	50.00	Phase 1	10.35
24.078	25.87	34.13	60.00	20.28	29.72	50.00	Phase 1	10.35

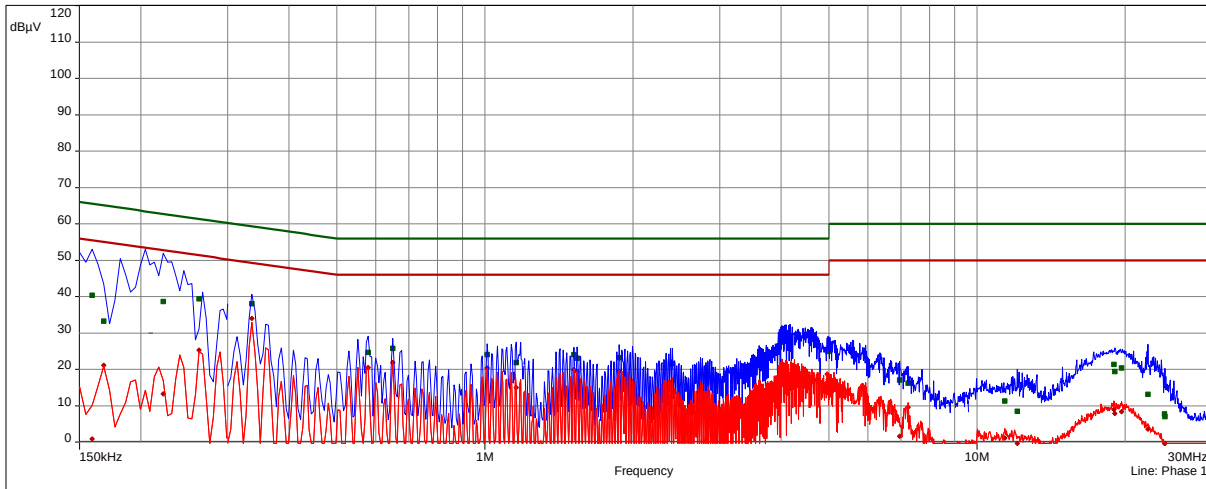
File No.:	T40862-00-02KS	Result	positive
Operation mode:	Active transmission		
Tested by:	TK		
Location:	S2	Date:	23.01.2017
Remarks:	Tested with provided AC adaptor		

Line: Neutral



Frequency (MHz)	QuasiPeak (dBμV)	QP Margin	QP Limit	Average (dBμV)	AV Margin	AV Limit	Line	Correction (dB)
0.168	47.49	17.56	65.06	22.20	32.86	55.06	Neutral	9.83
0.1905	43.20	20.82	64.01	18.22	35.79	54.01	Neutral	9.83
0.231	22.89	39.52	62.41	0.91	51.50	52.41	Neutral	9.83
0.2895	32.39	28.15	60.54	25.54	25.00	50.54	Neutral	9.81
0.336	36.23	23.07	59.30	34.19	15.11	49.30	Neutral	9.80
0.552	24.97	31.03	56.00	22.49	23.51	46.00	Neutral	9.81
0.6495	24.71	31.29	56.00	22.55	23.45	46.00	Neutral	9.80
1.059	21.57	34.43	56.00	20.07	25.93	46.00	Neutral	9.80
1.515	21.81	34.19	56.00	20.44	25.56	46.00	Neutral	9.77
1.875	21.05	34.95	56.00	19.41	26.59	46.00	Neutral	9.79
2.4045	18.42	37.58	56.00	17.02	28.98	46.00	Neutral	9.78
4.137	23.93	32.07	56.00	21.11	24.89	46.00	Neutral	9.80
4.371	24.49	31.51	56.00	18.13	27.87	46.00	Neutral	9.80
4.8585	19.87	36.13	56.00	16.66	29.34	46.00	Neutral	9.81
4.953	20.95	35.05	56.00	18.36	27.64	46.00	Neutral	9.81
6.8295	14.33	45.67	60.00	8.97	41.03	50.00	Neutral	9.81
7.2345	14.60	45.40	60.00	6.98	43.02	50.00	Neutral	9.82
11.0085	8.69	51.31	60.00	3.22	46.78	50.00	Neutral	9.85
12.1065	7.52	52.48	60.00	0.33	49.67	50.00	Neutral	9.87
18.762	15.24	44.76	60.00	6.87	43.13	50.00	Neutral	10.08
18.879	14.98	45.02	60.00	6.77	43.23	50.00	Neutral	10.08
19.5465	15.20	44.80	60.00	6.99	43.01	50.00	Neutral	10.11
19.902	14.86	45.14	60.00	7.33	42.67	50.00	Neutral	10.13
24.4245	4.70	55.30	60.00	-1.96	51.96	50.00	Neutral	9.96
24.798	3.99	56.01	60.00	-2.02	52.02	50.00	Neutral	9.95

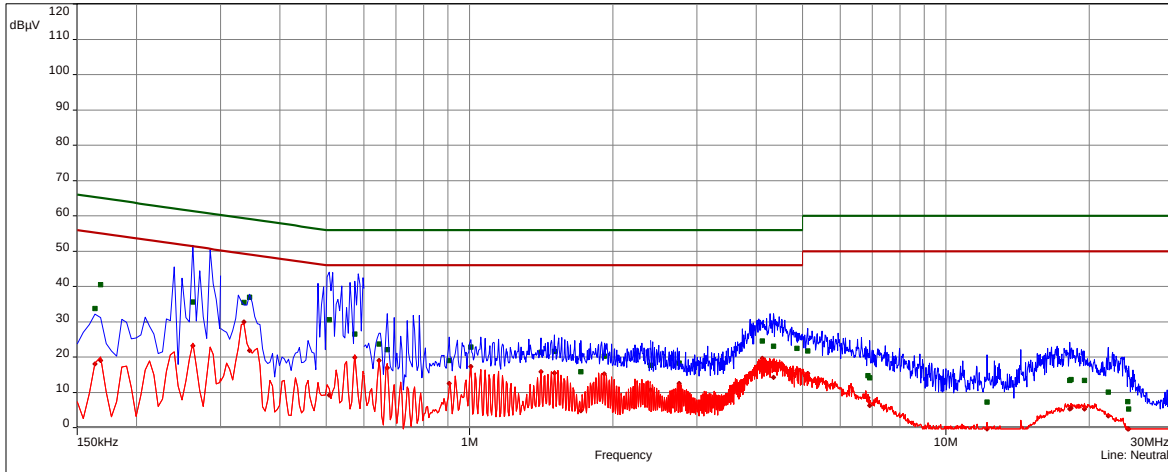
Line: Phase 1



Frequency (MHz)	QuasiPeak (dBμV)	QP Margin	QP Limit	Average (dBμV)	AV Margin	AV Limit	Line	Correction (dB)
0.159	40.39	25.12	65.52	0.93	54.59	55.52	Phase 1	9.82
0.168	33.31	31.75	65.06	21.14	33.91	55.06	Phase 1	9.82
0.222	38.65	24.09	62.74	13.31	39.44	52.74	Phase 1	9.81
0.2625	39.35	22.00	61.35	25.30	26.05	51.35	Phase 1	9.81
0.336	37.99	21.31	59.30	34.05	15.26	49.30	Phase 1	9.80
0.579	24.65	31.35	56.00	20.54	25.46	46.00	Phase 1	9.80
0.6495	25.83	30.17	56.00	21.84	24.16	46.00	Phase 1	9.80
1.0095	24.10	31.90	56.00	20.33	25.67	46.00	Phase 1	9.80
1.158	21.84	34.16	56.00	15.01	30.99	46.00	Phase 1	9.79
1.515	24.10	31.90	56.00	19.93	26.07	46.00	Phase 1	9.77
1.5375	23.04	32.96	56.00	19.37	26.63	46.00	Phase 1	9.77
1.875	23.22	32.78	56.00	19.40	26.60	46.00	Phase 1	9.79
2.4045	21.62	34.38	56.00	16.68	29.32	46.00	Phase 1	9.79
4.0155	27.50	28.50	56.00	21.49	24.51	46.00	Phase 1	9.81
4.164	28.25	27.75	56.00	14.68	31.32	46.00	Phase 1	9.81
4.953	25.35	30.65	56.00	18.62	27.38	46.00	Phase 1	9.82
4.9755	24.89	31.11	56.00	17.15	28.85	46.00	Phase 1	9.82
6.96	17.06	42.94	60.00	1.57	48.43	50.00	Phase 1	9.85
7.2345	16.15	43.85	60.00	9.57	40.43	50.00	Phase 1	9.85
11.391	11.32	48.68	60.00	1.13	48.87	50.00	Phase 1	9.95
12.066	8.47	51.53	60.00	-0.10	50.10	50.00	Phase 1	9.98
18.987	21.32	38.68	60.00	9.01	40.99	50.00	Phase 1	10.29
19.05	19.39	40.61	60.00	7.89	42.11	50.00	Phase 1	10.29
19.641	20.43	39.57	60.00	8.39	41.61	50.00	Phase 1	10.32
22.242	13.14	46.86	60.00	3.55	46.45	50.00	Phase 1	10.34
24.0285	7.70	52.30	60.00	-0.93	50.93	50.00	Phase 1	10.35
24.069	6.99	53.01	60.00	-1.62	51.62	50.00	Phase 1	10.35

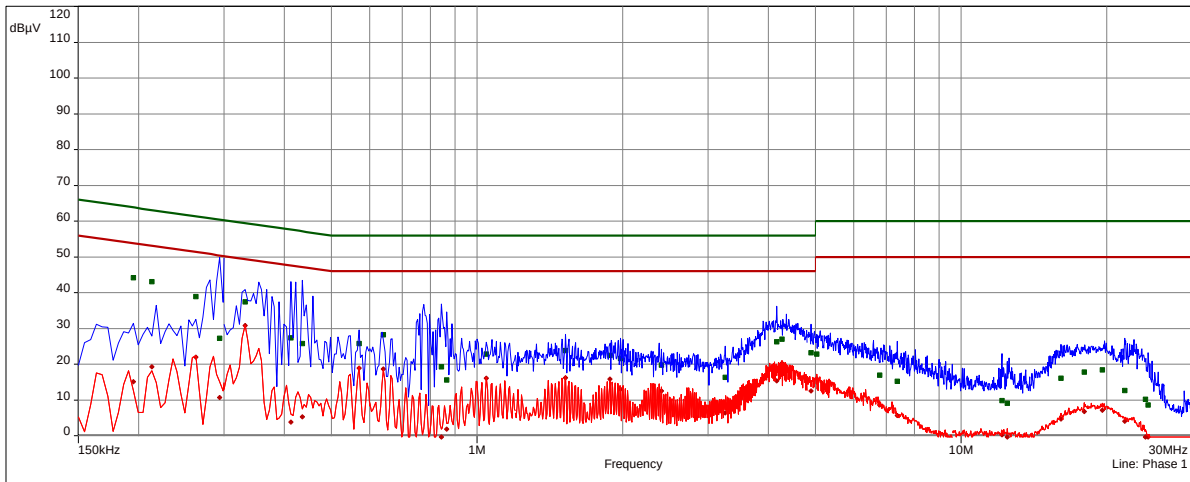
File No.:	T40862-00-02KS	Result	positiv
Operation mode:	Standby		
Tested by:	TK		
Location:	S2	Date:	23.01.2017
Remarks:			

Line: Neutral



Frequency (MHz)	QuasiPeak (dBμV)	QP Margin	QP Limit	Average (dBμV)	AV Margin	AV Limit	Line	Correction (dB)
0.1635	33.72	31.56	65.28	18.10	37.19	55.28	Neutral	9.83
0.168	40.54	24.51	65.06	18.97	36.09	55.06	Neutral	9.83
0.2625	35.64	25.71	61.35	23.25	28.10	51.35	Neutral	9.82
0.336	35.41	23.89	59.30	29.95	19.35	49.30	Neutral	9.80
0.345	36.93	22.15	59.08	21.91	27.17	49.08	Neutral	9.80
0.507	30.53	25.47	56.00	9.19	36.81	46.00	Neutral	9.80
0.5745	26.55	29.45	56.00	19.94	26.06	46.00	Neutral	9.80
0.645	23.64	32.36	56.00	19.04	26.96	46.00	Neutral	9.80
0.672	22.13	33.87	56.00	16.92	29.08	46.00	Neutral	9.80
0.906	18.98	37.02	56.00	12.53	33.47	46.00	Neutral	9.80
1.005	22.83	33.17	56.00	17.36	28.64	46.00	Neutral	9.80
1.4115	21.30	34.70	56.00	15.86	30.14	46.00	Neutral	9.78
1.506	21.56	34.44	56.00	15.51	30.49	46.00	Neutral	9.77
1.713	15.85	40.15	56.00	4.81	41.19	46.00	Neutral	9.78
1.9155	20.19	35.81	56.00	15.26	30.74	46.00	Neutral	9.80
2.4	17.64	38.36	56.00	10.70	35.30	46.00	Neutral	9.78
2.7555	18.32	37.68	56.00	12.55	33.45	46.00	Neutral	9.78
4.119	24.54	31.46	56.00	19.60	26.40	46.00	Neutral	9.80
4.3485	23.12	32.88	56.00	14.30	31.70	46.00	Neutral	9.80
4.863	22.52	33.48	56.00	16.20	29.80	46.00	Neutral	9.81
5.1285	21.72	38.28	60.00	15.40	34.60	50.00	Neutral	9.82
6.8565	14.78	45.22	60.00	8.42	41.58	50.00	Neutral	9.81
6.9105	14.18	45.82	60.00	6.22	43.78	50.00	Neutral	9.82
12.1875	7.28	52.72	60.00	-0.62	50.62	50.00	Neutral	9.87
18.1995	13.34	46.66	60.00	5.30	44.70	50.00	Neutral	10.06
18.294	13.58	46.42	60.00	5.50	44.50	50.00	Neutral	10.06
19.515	13.42	46.58	60.00	5.31	44.69	50.00	Neutral	10.11
21.9045	10.09	49.91	60.00	3.35	46.65	50.00	Neutral	10.05
24.0645	7.32	52.68	60.00	-0.48	50.48	50.00	Neutral	9.97
24.2085	5.33	54.67	60.00	-1.47	51.47	50.00	Neutral	9.97

Line: Phase 1



Frequency (MHz)	QuasiPeak (dBμV)	QP Margin	QP Limit	Average (dBμV)	AV Margin	AV Limit	Line	Correction (dB)
0.195	44.19	19.63	63.82	15.10	38.72	53.82	Phase 1	9.82
0.213	43.07	20.01	63.09	19.22	33.87	53.09	Phase 1	9.81
0.2625	38.87	22.48	61.35	22.00	29.35	51.35	Phase 1	9.81
0.294	27.22	33.19	60.41	10.75	39.66	50.41	Phase 1	9.80
0.3315	37.39	22.03	59.41	30.87	18.55	49.41	Phase 1	9.80
0.4125	27.43	30.17	57.60	3.82	43.78	47.60	Phase 1	9.80
0.435	25.73	31.43	57.16	5.33	41.83	47.16	Phase 1	9.80
0.57	25.74	30.26	56.00	18.91	27.09	46.00	Phase 1	9.80
0.6405	28.19	27.81	56.00	18.67	27.33	46.00	Phase 1	9.80
0.843	19.33	36.67	56.00	-0.18	46.18	46.00	Phase 1	9.79
0.8655	15.61	40.39	56.00	1.88	44.12	46.00	Phase 1	9.80
1.0455	22.89	33.11	56.00	16.09	29.91	46.00	Phase 1	9.80
1.524	23.78	32.22	56.00	16.23	29.77	46.00	Phase 1	9.77
1.8795	22.48	33.52	56.00	15.83	30.17	46.00	Phase 1	9.79
1.9785	21.66	34.34	56.00	12.96	33.04	46.00	Phase 1	9.80
2.4045	19.73	36.27	56.00	12.51	33.49	46.00	Phase 1	9.79
3.255	16.33	39.67	56.00	6.39	39.61	46.00	Phase 1	9.80
4.1595	26.21	29.79	56.00	15.35	30.65	46.00	Phase 1	9.81
4.263	27.00	29.00	56.00	20.24	25.76	46.00	Phase 1	9.81
4.899	23.18	32.82	56.00	12.47	33.53	46.00	Phase 1	9.82
5.0295	22.85	37.15	60.00	15.94	34.06	50.00	Phase 1	9.83
6.7935	16.99	43.01	60.00	8.56	41.44	50.00	Phase 1	9.84
7.374	15.21	44.79	60.00	5.71	44.29	50.00	Phase 1	9.85
12.147	9.87	50.13	60.00	0.28	49.72	50.00	Phase 1	9.99
12.453	9.09	50.91	60.00	0.00	50.00	50.00	Phase 1	10.00
16.0935	16.13	43.87	60.00	4.63	45.37	50.00	Phase 1	10.16
17.979	17.79	42.21	60.00	6.77	43.23	50.00	Phase 1	10.24
19.587	18.46	41.54	60.00	7.16	42.84	50.00	Phase 1	10.32
21.801	12.61	47.39	60.00	4.07	45.93	50.00	Phase 1	10.34
24.051	10.20	49.80	60.00	-0.28	50.28	50.00	Phase 1	10.35
24.33	8.57	51.43	60.00	-1.02	51.02	50.00	Phase 1	10.35

5.2 EBW and OBW

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

5.2.1 Description of the test location

Test location: Anechoic chamber 1

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. An alternative is to use the bandwidth measurement of the analyser.

Spectrum analyser settings for EBW:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Sweep time: 2 ms, Span: 5 MHz;

Spectrum analyser settings for OBW:

RBW: 1-5% OBW, VBW: 3 RBW, Detector: Max peak, Sweep time: 2 ms, Span: 2 OBW;

5.2.5 Test result

EBW:

Channel	Centre frequency (MHz)	6 dB bandwidth (MHz)	Minimum limit (MHz)
11	2405	1.044	0.5
18	2440	1.077	0.5
25	2475	1.217	0.5

OBW:

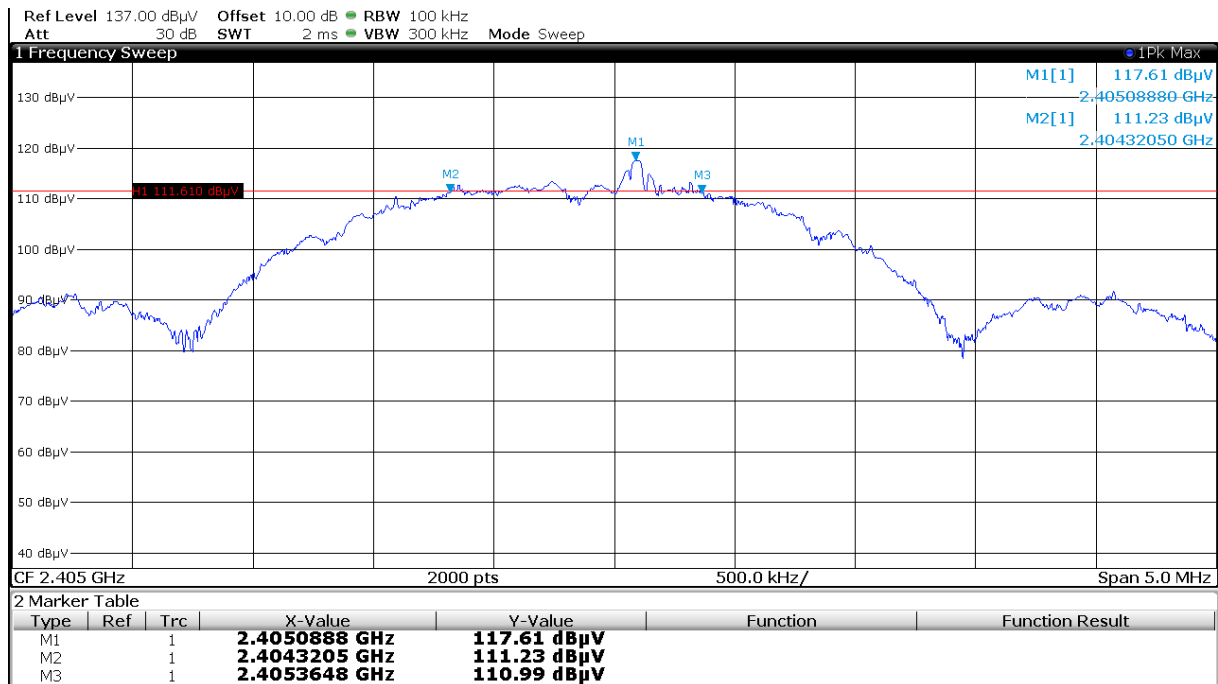
Channel	Centre frequency (MHz)	99 % bandwidth (MHz)
11	2405	2.517
18	2440	2.498
25	2475	2.509

The requirements are **FULFILLED**.

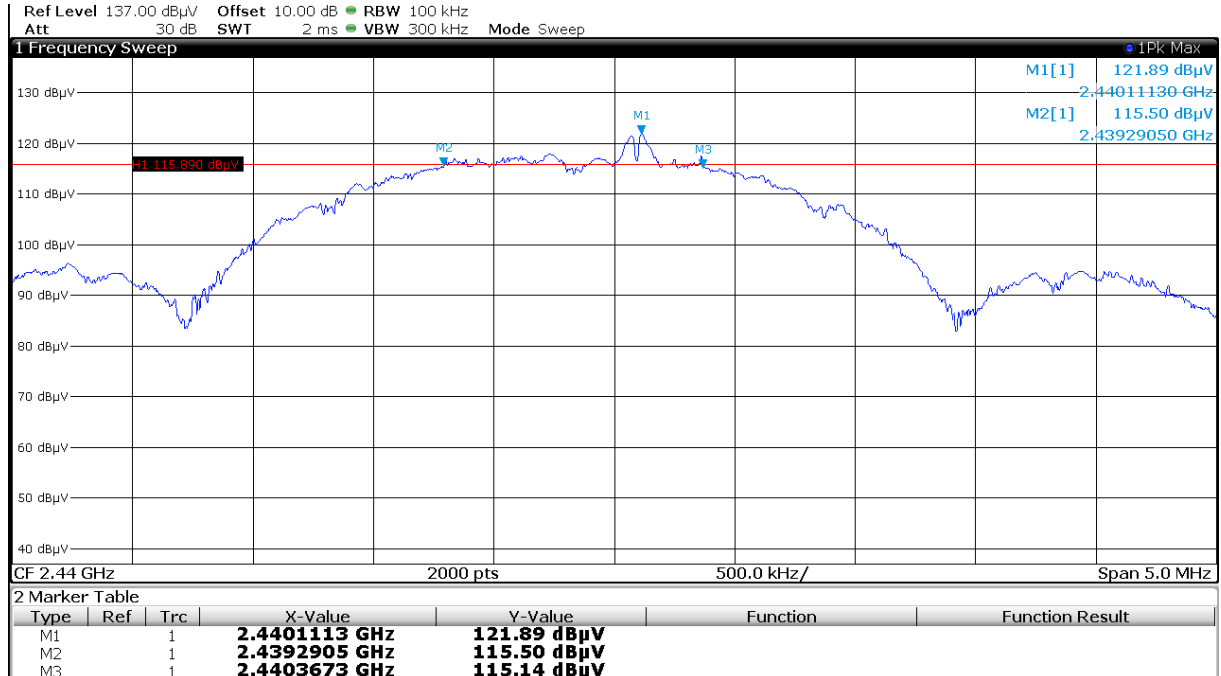
Remarks: For detailed test results please refer to following test protocols. The RSS Gen defines no limit for the occupied bandwidth!

5.2.6 Test protocols EBW

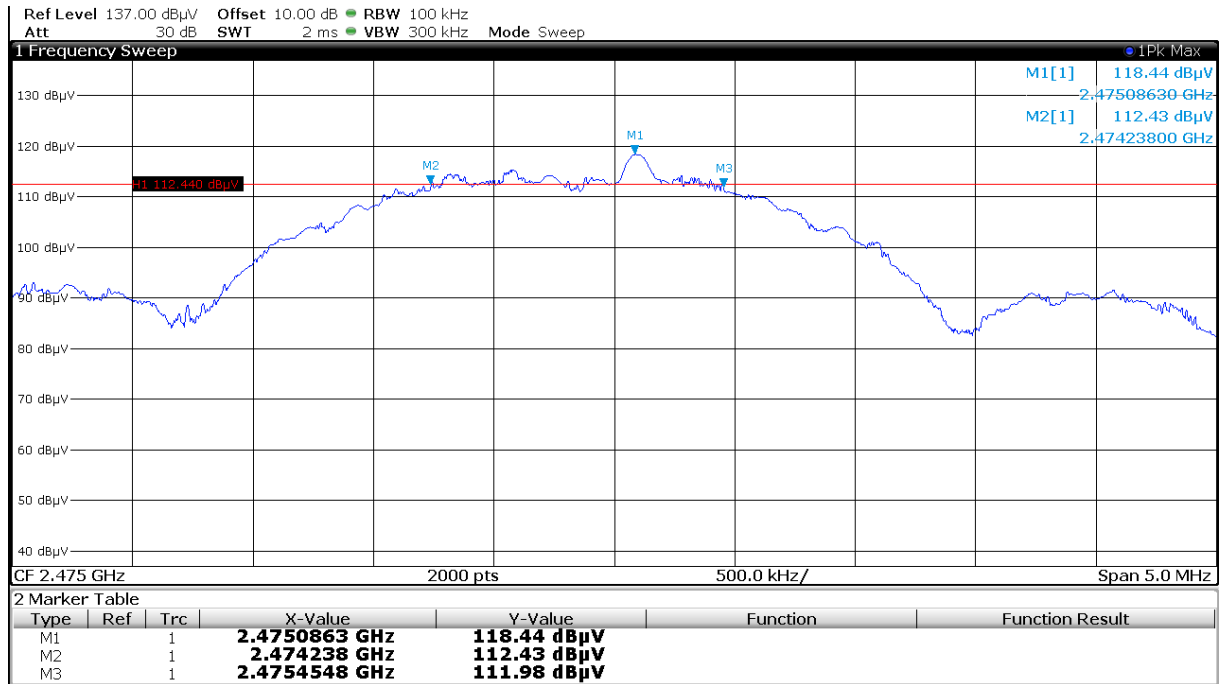
Channel 11 (2405 MHz)



Channel 18 (2440 MHz)

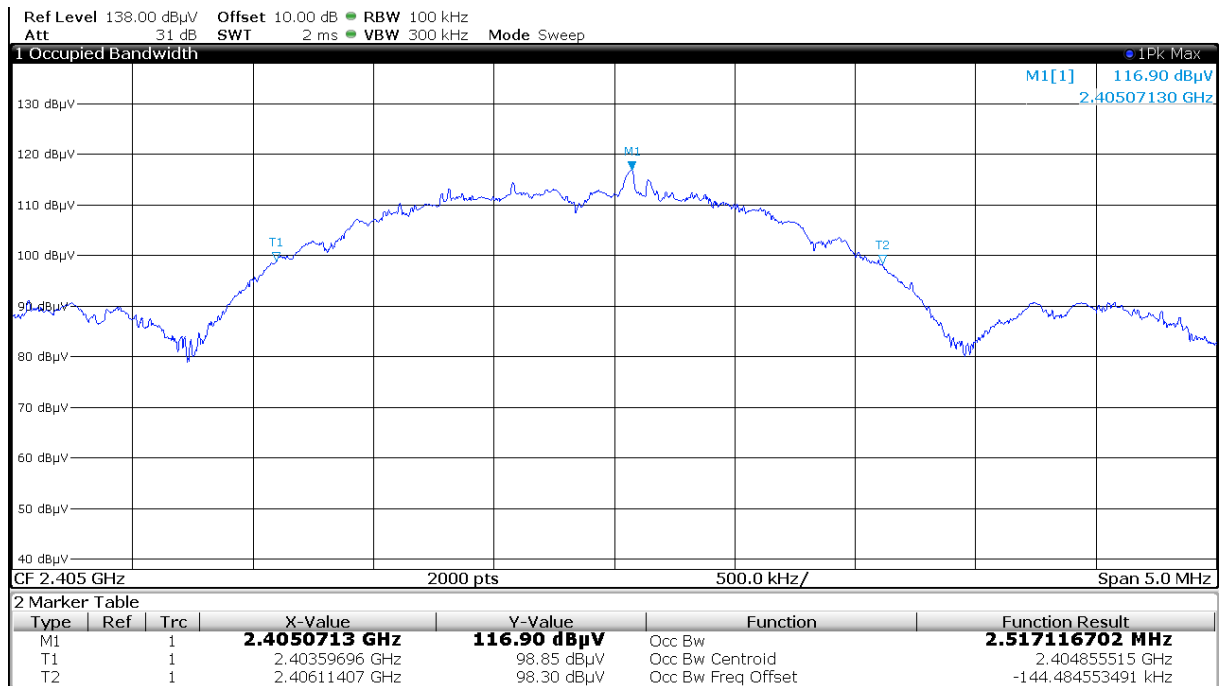


Channel 25 (2475 MHz)

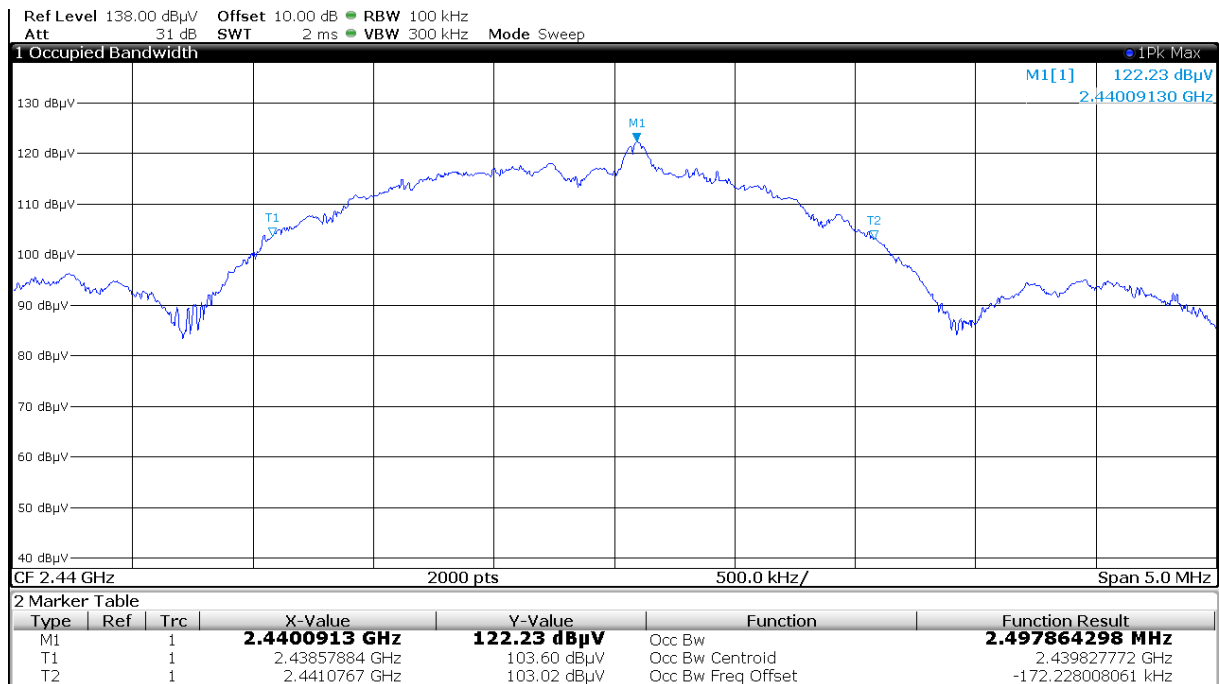


5.2.7 Test protocols OBW

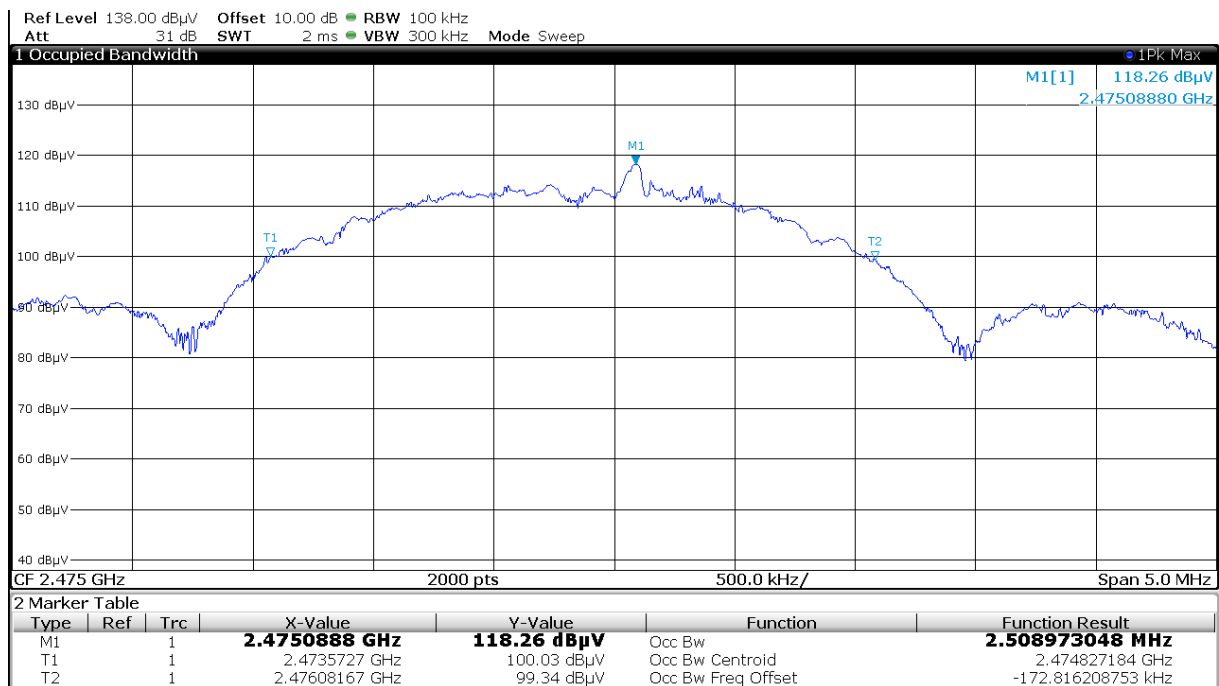
Channel 11 (2405 MHz)



Channel 18 (2440 MHz)



Channel 25 (2475 MHz)



5.3 Maximum peak conducted output power

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

5.3.1 Description of the test location

Test location: Anechoic chamber 1

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):

For systems using digital modulation in the 2400 – 2483.5 MHz bands, the maximum peak output power of the transmitter shall not exceed 1 Watt. The limit is based on transmitting antennas of directional gain that do not exceed 6 dBi.

5.3.4 Description of Measurement

The maximum peak radiated output power is measured using a spectrum analyser following the procedure set out in KDB 558074, item 9.1.1. The EUT is set in TX continuous mode while measuring. The radiated measurement was performed as a fieldstrength measurement and converted afterwards into power according to the following term:

$$E = \text{EIRP} - (20 \cdot \log_{10} 3) + 104.8$$

The conducted output power can be obtained by subtracting the antenna gain of 2.1 dBi.

5.3.5 Test result

802.15.4, 250 kbps, TX		Test results radiated			
		Fieldstrength E (dBμV/m)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Lowest frequency: CH11					
T_{nom}	V_{nom}	104.30	9.0	36.0	-27.0
Middle frequency: CH18					
T_{nom}	V_{nom}	106.40	11.1	36.0	-24.9
Highest frequency: CH25					
T_{nom}	V_{nom}	103.80	8.5	36.0	-27.5

802.15.4, 250 kbps, TX		Test results conducted				
		EIRP (dBm)	P (dBm)	Antenna Gain (dBi)	Peak Power Limit (dBm)	Margin (dB)
Lowest frequency: CH11						
T_{nom}	V_{nom}	9.0	6.9	2.1	30.0	-23.1
Middle frequency: CH18						
T_{nom}	V_{nom}	11.1	9.0	2.1	30.0	-21.0
Highest frequency: CH25						
T_{nom}	V_{nom}	8.5	6.4	2.1	30.0	-23.6

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

Frequency (MHz)	Peak Power Limit	
	(dBm)	(Watt)
902-928	30	1.0
2400-2483.5	30	1.0
5725-5850	30	1.0

The requirements are **FULFILLED**.

Remarks:

5.4 Power spectral density

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

5.4.1 Description of the test location

Test location: Anechoic chamber 1

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15, Section 15.247(e):

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

5.4.4 Description of Measurement

The measurement is performed using the procedure 10.2 set out in KDB-558074. The power measurement was done as peak power measurement. Therefore the PKPSD is measured. The max peak was located with the spectrum analyser and a marker set to peak.

Spectrum analyser settings:

RBW: 3 kHz, VBW: 10 kHz, Detector: Peak, Sweep time: auto,

5.4.5 Test result

802.15.4, 250 kbps, TX		Test results conducted				
		Peak PSD radiated (dBm/3kHz)	Antenna Gain (dBi)	Peak PSD conducted (dBm/3kHz)	Peak PSD Limit (dBm/3kHz)	Margin (dB)
Lowest frequency: 2405 MHz						
T_{nom}	V_{nom}	-6.0	2.1	-8.1	8.0	-16.1
Middle frequency: 2440 MHz						
T_{nom}	V_{nom}	3.9	2.1	1.8	8.0	-6.2
Highest frequency: 2475 MHz						
T_{nom}	V_{nom}	-4.4	2.1	-6.5	8.0	-14.5

Power spectral density limit according to FCC Part 15, Section 15.247(e):

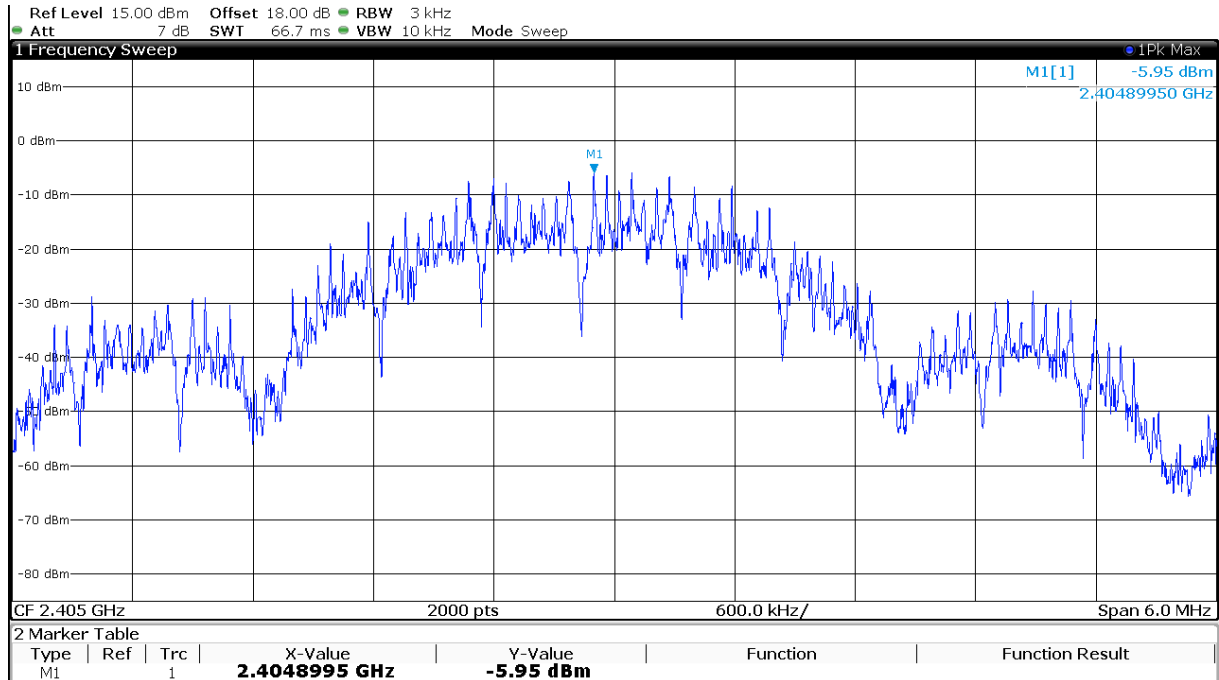
Frequency (MHz)	Power spectral density limit
	(dBm/3 kHz)
2400 - 2483.5	8

The requirements are **FULFILLED**.

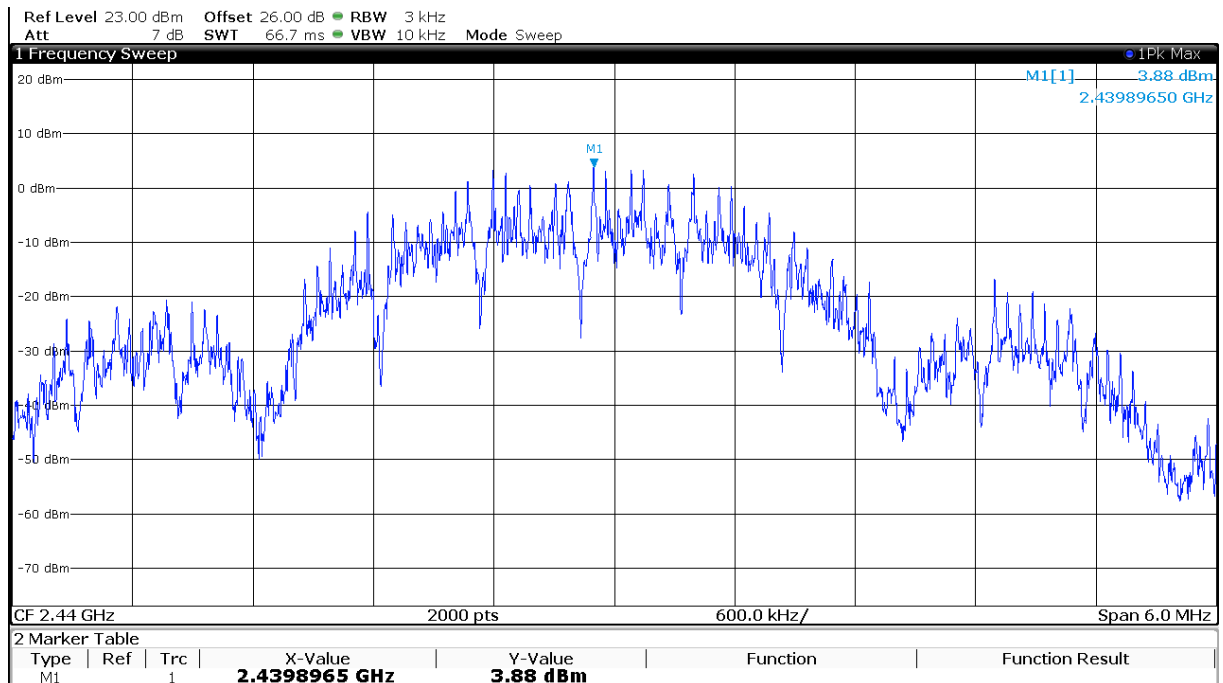
Remarks: For detailed test results please refer to following test protocols.

5.4.6 Power spectral density plots

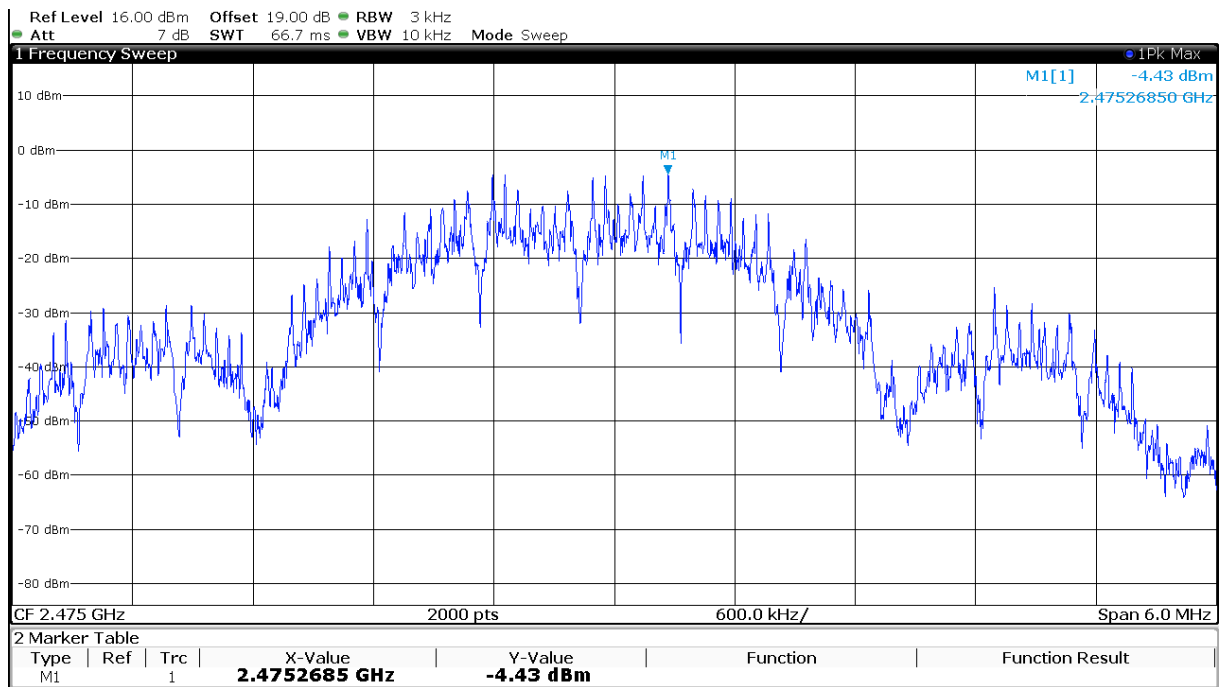
Channel 11 (2405 MHz)



Channel 18 (2440 MHz)



Channel 25 (2475 MHz)



5.5 Band edge compliance

For test instruments and accessories used see section 6 Part **SER3**.

5.5.1 Description of the test location

Test location: Anechoic chamber 1

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

5.5.4 Description of Measurement

The measurement was performed radiated with a spectrum analyser while the EUT was operating in transmit mode at the assigned frequency according OET 558074, 4/5/2017.

Spectrum analyser settings:

RBW: 100 kHz, VBW: 300 kHz, Detector: Average, Trace: RMS, Sweep: auto

5.5.5 Test result

Frequency (MHz)	Fieldstrength (dBμV/M)	Margin (dB)
2485.00	35.55	-18.45

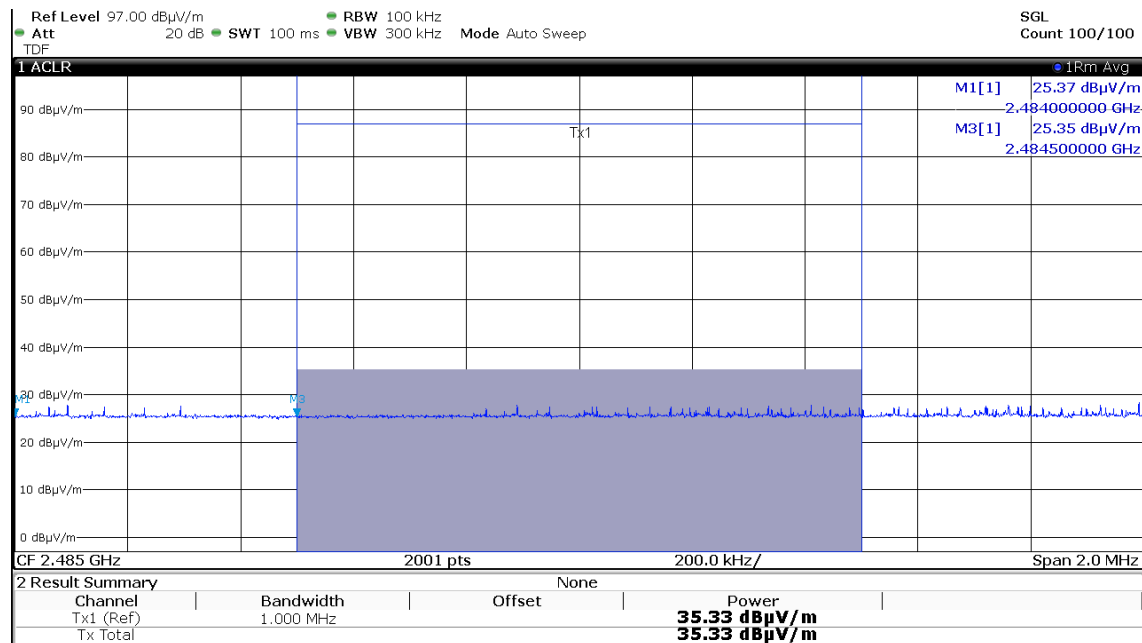
Limit according to FCC Subpart 15.247(d):

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limit specified in §15.209(a) (see §15.205(c)).

The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols.

5.5.6 Test protocol



5.6 Unwanted emissions

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

5.6.1 Description of the test location

Test location: NONE

5.6.2 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

Remarks: Not tested because the EUT is compatible with the general limits according to Section 15.209 (a).

For further details, refer to chapter 5.7 of this test report.

5.7 Unwanted emissions, radiated

For test instruments and accessories used see section 6 Part **SER1**, **SER 2**, **SER 3**.

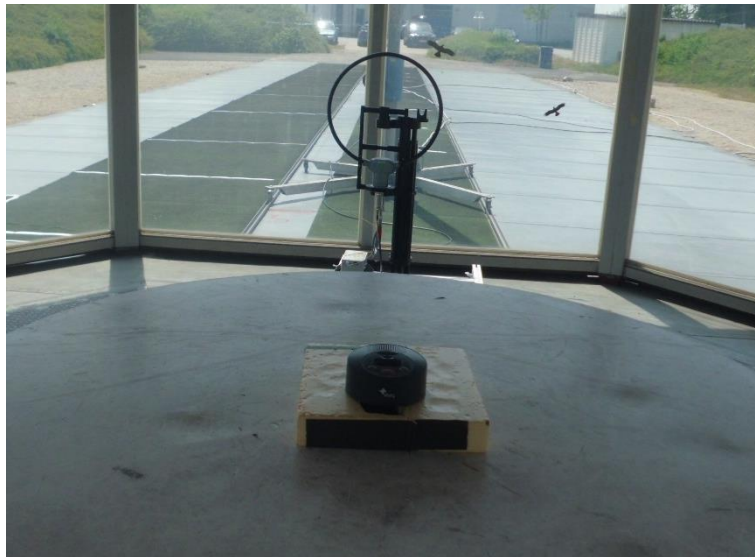
5.7.1 Description of the test location

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

5.7.2 Photo documentation of the test set-up

Open area test site

9 kHz – 30 MHz



30 MHz – 1000 MHz



Anechoic chamber



5.7.3 Applicable standard

According to FCC Part 15, Section 15.205(a):

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a). Emissions that do not fall in restricted bands also comply with the general limits specified in Section 15.209(a).

5.7.4 Description of Measurement

The unwanted emissions are measured radiated using a spectrum analyser. The EUT transmits at the lowest, middle and the highest channel in the operating band while measuring. The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10. If the emission level of the EUT in peak mode complies with the average limit, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

Spectrum analyser settings:

9 kHz – 150 kHz	RBW: 200 Hz
150 kHz - 30 MHz	RBW: 9 kHz
30 MHz – 1000 MHz:	RBW: 120 kHz
1000 MHz – 25 GHz:	RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto, Detector function: Peak

5.7.1 Test result
9 kHz to 1000 MHz

Test conditions: TX continuous			Test results				
Start <i>f</i> (MHz)	Stop <i>f</i> (MHz)	RBW (kHz)	Maximum emission		AVLimit (dBμV/m)	Margin (dB)	Detector
			(MHz)	(dBμV/m)			
0.009	0.15	0.2	0.0456	6.4	52.6	-46.2	QP
0.15	30	9	0.3118	7.5	7.7	-0.2	AV
30	1000	120	49.80	29.30	40.0	-10.7	QP
30	1000	120	246.18	29.60	46.0	-16.4	QP
Measurement uncertainty 9 kHz to 30 MHz				± 3.53 dB			
Measurement uncertainty 30 MHz to 1000 MHz				± 3.71 dB			

Note: No differences between the operating frequencies 2405 MHz, 2440 MHz and 2475 MHz could be detected.

1 GHz to 18 GHz
CH11

CH11, 2405 MHz										
Test conditions:										
TX active			Test results							
Start frequency (MHz)	Stop frequency (MHz)	RBW (kHz)	Frequency (MHz)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Duty cycle correction (dB)	AV Level (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)
1000	2400	1000	2398.34	71.7	74.0	-2.3	-21.6	50.1	54.0	-3.9
2483.5	4000	1000	2483.50	45.6	74.0	-28.4			54.0	
4000	8000	1000	4808.60	61.1	74.0	-12.9	-21.6	39.5	54.0	-14.5
4000	8000	1000	7213.00	52.9	74.0	-21.1			54.0	
8000	12000	1000	9621.40	51.8	74.0	-22.2			54.0	
12000	18000	1000	12021.75	57.3	74.0	-16.7	-21.6	35.7	54.0	-18.3
Measurement uncertainty							± 2.34 dB			

CH18

CH18, 2440 MHz										
Test conditions:										
TX active			Test results							
Start frequency	Stop frequency	RBW (kHz)	Frequency (MHz)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Duty cycle correction	AV Level (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)
1000	2400	1000	2399.65	56.0	74.0	-18.0	-21.6	34.4	54.0	-19.6
2483.5	4000	1000	2483.50	46.4	74.0	-27.6			54.0	
4000	8000	1000	4880.60	58.0	74.0	-16.0	-21.6	36.4	54.0	-17.6
4000	8000	1000	7321.00	56.0	74.0	-18.0	-21.6	34.4	54.0	-19.6
8000	12000	1000	9757.74	55.7	74.0	-18.3	-21.6	34.1	54.0	-19.9
12000	18000	1000	12196.75	62.8	74.0	-11.2	-21.6	41.2	54.0	-12.8
Measurement uncertainty							± 2.34 dB			

CH25

CH25, 2475 MHz										
Test conditions:										
TX active			Test results							
Start frequency	Stop frequency	RBW (kHz)	Frequency (MHz)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Duty cycle correction	AV Level (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)
1000	2400	1000	2400.00	44.5	74.0	-29.5			54.0	
2483.5	4000	1000	2488.45	66.0	74.0	-8.0	-21.6	44.4	54.0	-9.6
4000	8000	1000	4948.60	64.1	74.0	-9.9	-21.6	42.5	54.0	-11.5
4000	8000	1000	7425.80	60.4	74.0	-13.6	-21.6	38.8	54.0	-15.2
8000	12000	1000	9901.00	58.2	74.0	-15.8	-21.6	36.6	54.0	-17.4
12000	18000	1000	12376.75	54.5	74.0	-19.5	-21.6	32.9	54.0	-21.1
Measurement uncertainty							± 2.34 dB			

Note: Only when the peak value exceeds the average limit an average measurement is required. Average values are calculated by subtracting the absolute value of the correction ducty cycle factor from the peak values. For example, channel 11 at 4808.6 MHz: peak value – DC = average value
 $61.1 \text{ dB}\mu\text{V/m} - 21.6 = 39.5 \text{ dB}\mu\text{V/m}$

18 GHz to 25 GHz

Note: No emissions could be detected in this frequency range for the channels 11, 18 and 25. The plot of the measurement at 2475 MHz is shown for reference only.

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance
	($\mu\text{V/m}$)	dB($\mu\text{V/m}$)	(metres)
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

The requirements are **FULFILLED**.

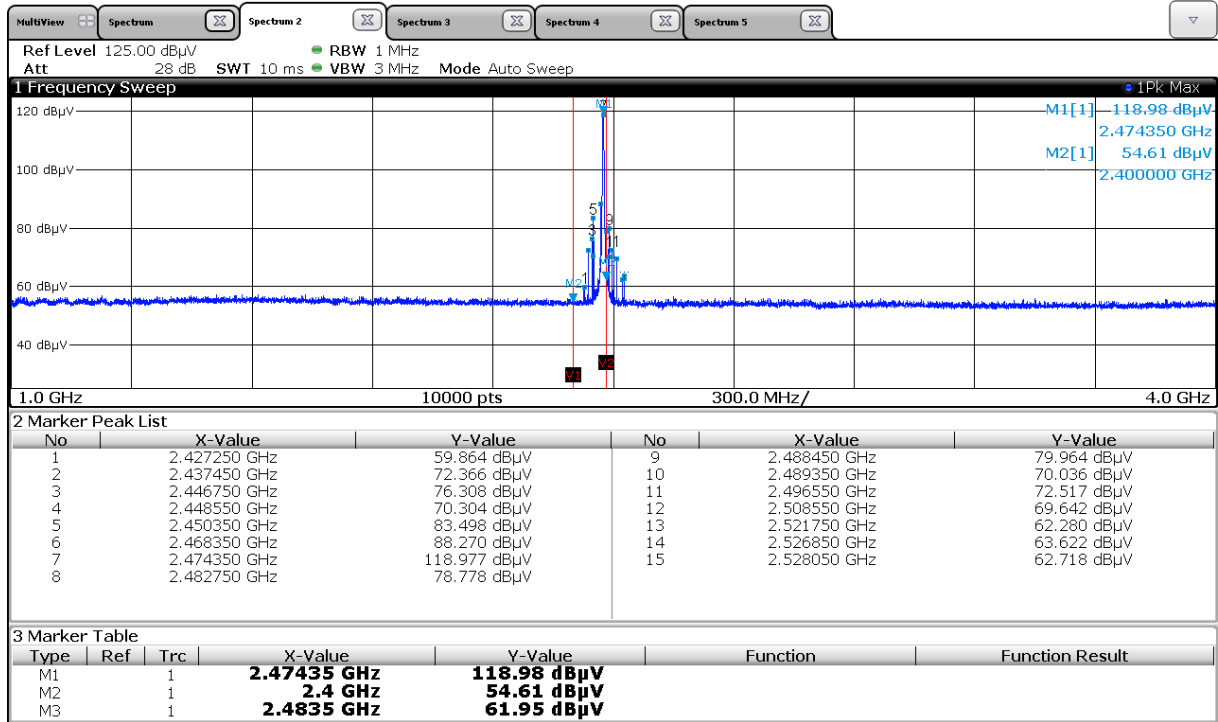
Remarks: The measurement was performed up to the 10th harmonic. For detailed test results please see to following test protocols.

All emissions comply with the general limits according to Section 15.209 (a).

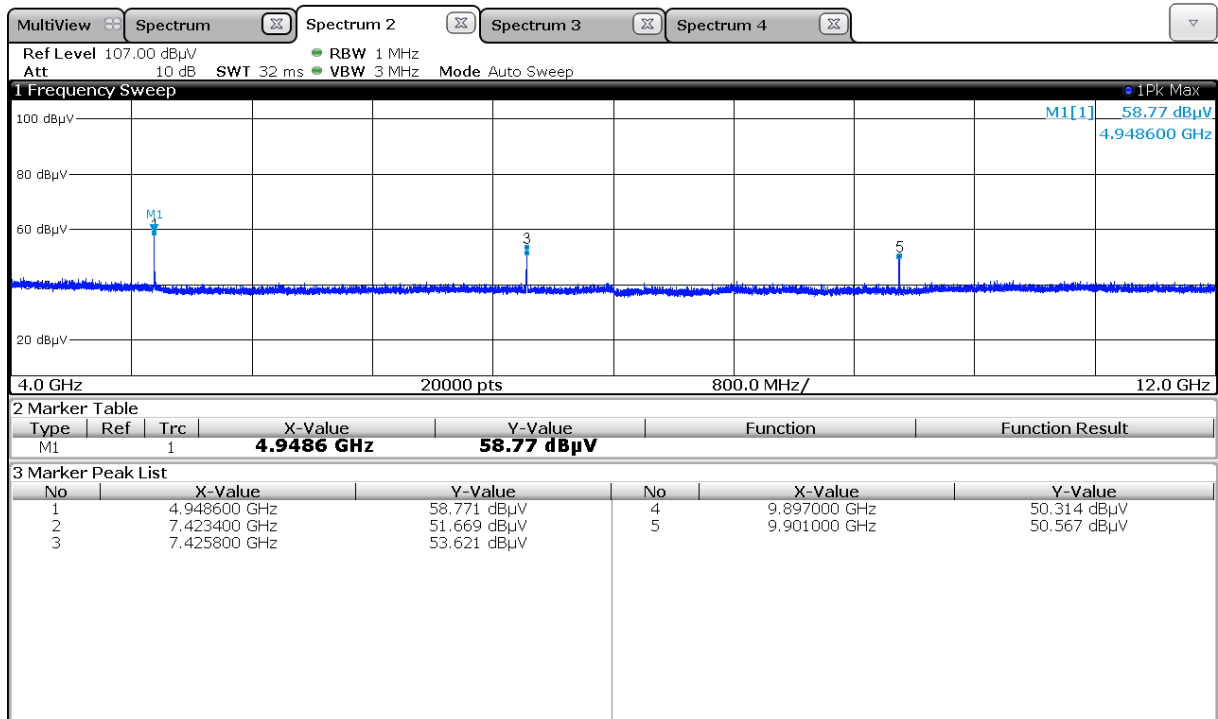
5.7.2 Test protocols of restricted band emissions

For reference the plots from 1 GHz to 18 GHz at TX 2475 MHz (only raw data)

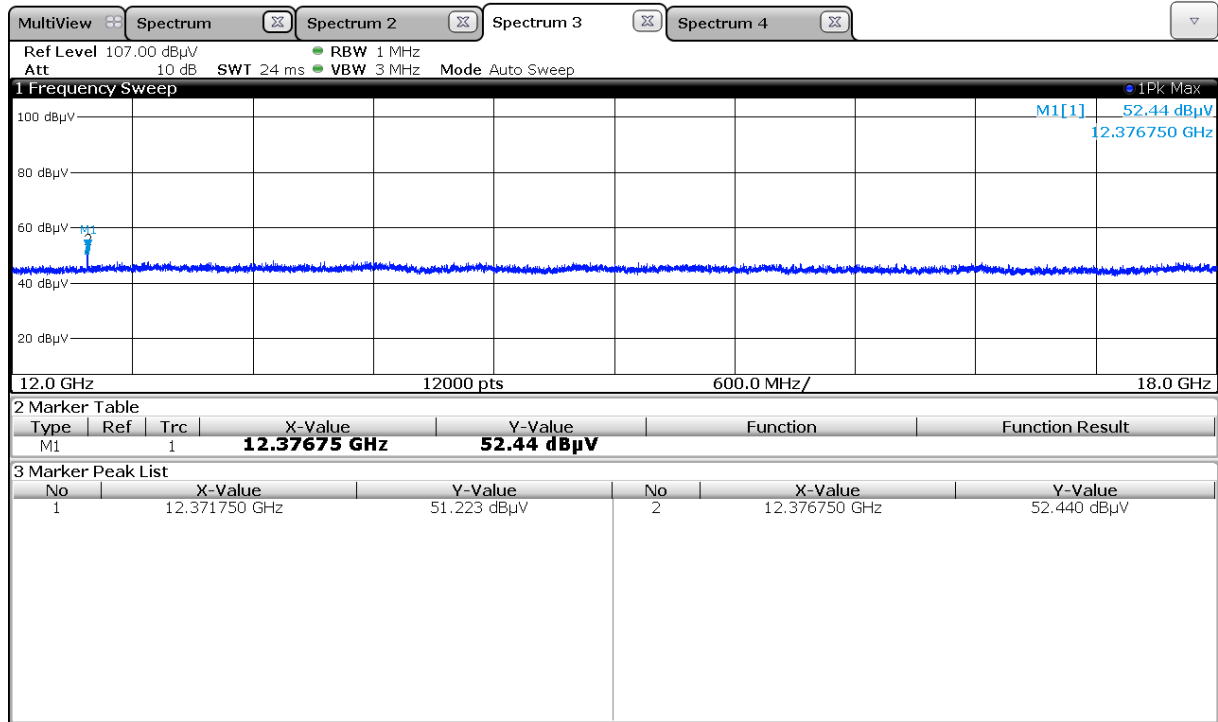
1 to 4 GHz



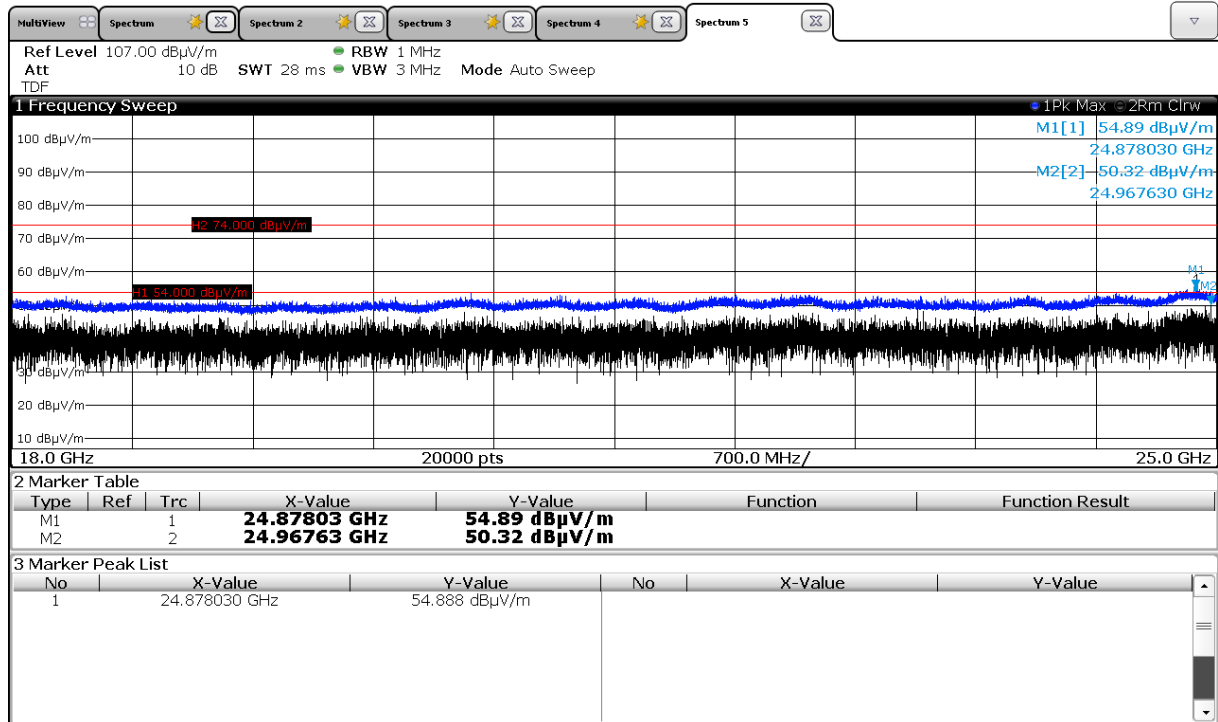
4 to 12 GHz



12 to 18 GHz



18 to 25 GHz



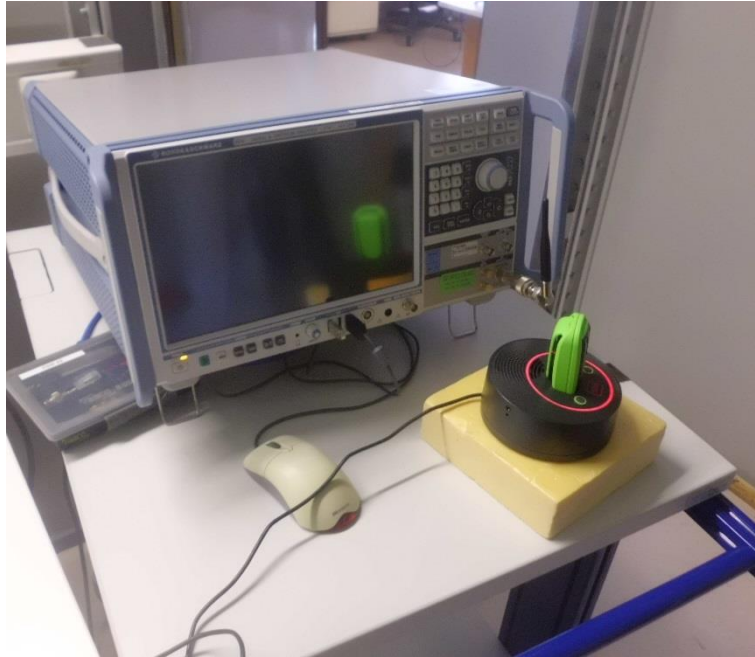
5.8 Correction for pulse operation (duty cycle)

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

5.8.1 Description of the test location

Test location: AREA4

5.8.2 Photo documentation of the test set-up



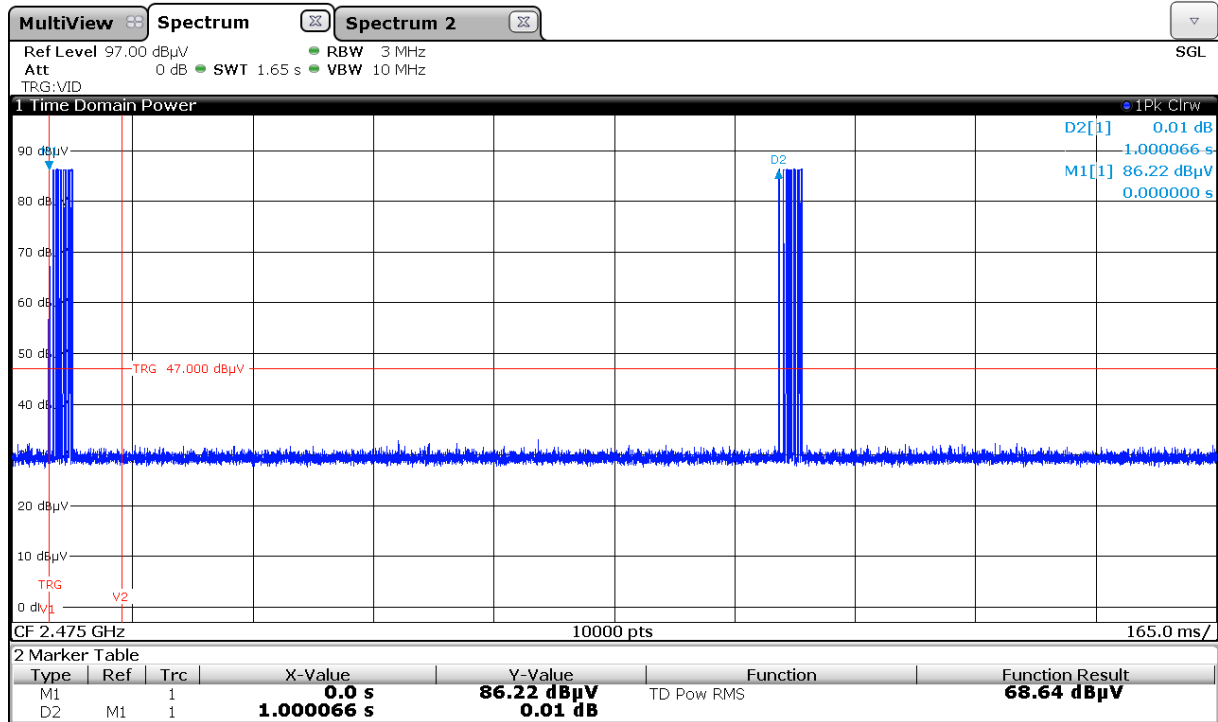
5.8.3 Applicable standard

According to FCC Part 15A, Section 15.35(c):

When the radiated emission limits are expressed in terms of average value and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete puls train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the puls train exceeds 0.1s, the measured field strength shall be determined from the average absolute voltage during a 0.1s interval during which the field strength is at its maximum. The exact method of calculating the average field strength shall be submitted.

5.8.4 Description of Measurement

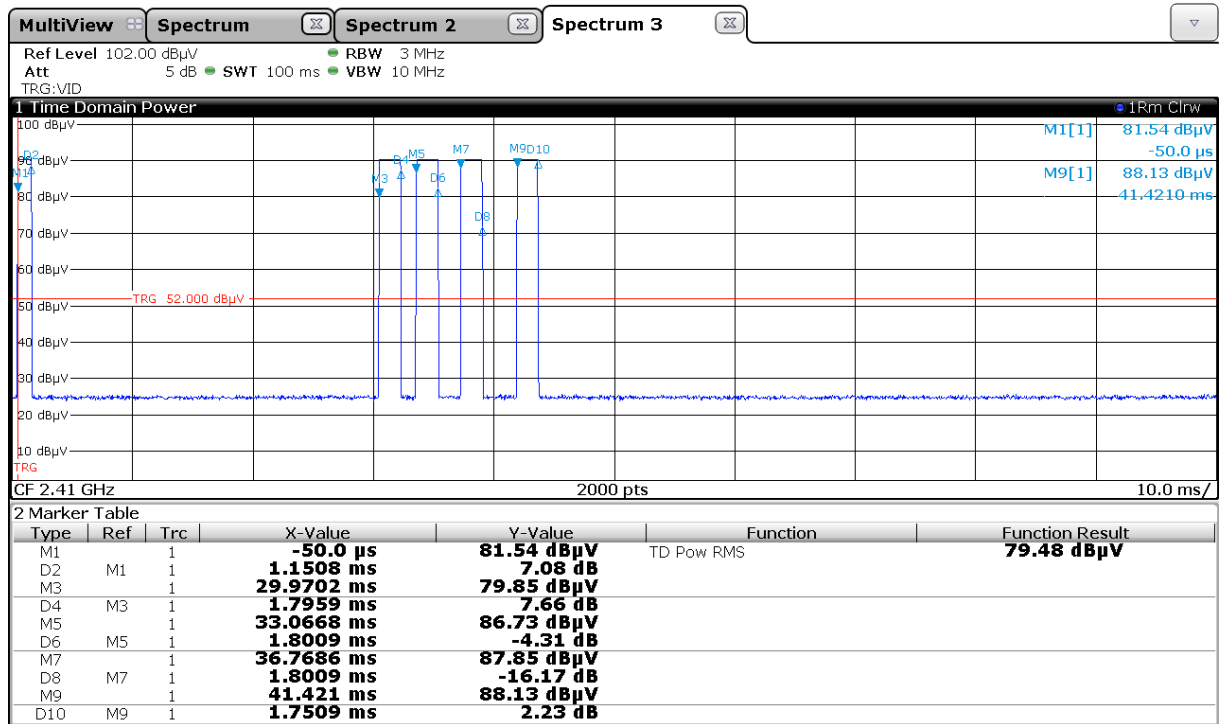
The pulse train exceeds 0.1 s. Therefore, the field strength is determined during a 100 ms interval.



The duty cycle factor (dB) is calculated applying the following formula:

$$KE = 20 \log (t_{iw} / 0.1 \text{ s})$$

KE : pulse operation correction factor
 t_{iw} pulse duration for one complete pulse track

5.8.5 Test result


Complete burst duration (5 bursts): 1.1508 ms + 1.7959 ms + 1.8009 ms + 1.8009 ms + 1.7509 ms = 8.2994 ms

$$KE = 20 \log (8.2994 \text{ ms} / 100 \text{ ms}) = -21.62$$

Remarks:

5.9 Antenna application

5.9.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has an integrated antenna. No other antenna can be used with the device. The maximum peak antenna gain is 2.1 dBi, therefore the output power must not be reduced.

All supplied antennas meet the requirements of part 15.203 and 15.204.

5.9.2 Antenna requirements

According to FCC Part 15C, Section 15.247(b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Remarks: No power reduction results from the defacto limit.

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESCI	02-02/03-15-001	31/05/2018	31/05/2017		
	ESH 2 - Z 5	02-02/20-05-004	26/10/2017	26/10/2015	24/05/2017	24/11/2016
	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	18/11/2019	18/11/2016	21/10/2017	21/04/2017
CPR 3	FSW43	02-02/11-15-001	07/04/2018	07/04/2017		
	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	10/05/2018	10/05/2017		
	Sucoflex N-2000-SMA	02-02/50-05-075				
	SF104/11N/11N/1500MM	02-02/50-13-015				
DC	FSW43	02-02/11-15-001	07/04/2018	07/04/2017		
	RF Antenna	02-02/24-05-032				
MB	FSW43	02-02/11-15-001	07/04/2018	07/04/2017		
	RF Antenna	02-02/24-05-032				
SER 1	ESCI	02-02/03-05-005	12/12/2017	12/12/2016		
	HFH 2 - Z 2	02-02/24-15-001	23/03/2018	23/03/2017	23/09/2017	23/03/2017
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESCI	02-02/03-05-005	12/12/2017	12/12/2016		
	VULB 9168	02-02/24-05-005	12/04/2018	12/04/2017	12/10/2017	12/04/2017
	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	07/04/2018	07/04/2017		
	JS4-18004000-30-5A	02-02/17-05-017				
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	10/05/2018	10/05/2017		
	BBHA 9170	02-02/24-05-014	02/06/2018	02/06/2015	09/12/2017	09/12/2016
	KMS102-1 m	02-02/50-11-014				
	KMS102-0.2 m	02-02/50-11-020				
	SF104/11N/11N/300MM	02-02/50-13-008				
	Ultimate 1000W	02-02/50-16-004				
	18N-20	02-02/50-17-003				
	NMS111-GL200SC01-NMS11	02-02/50-17-012				
	Bandpass Filter	02-02/50-17-019				