

EMI – TEST REPORT

- FCC Part 15.249, RSS210 -

Type : 2759 / 2760

Model Name : 759A

Product Description : Wireless remote control

Applicant : ruwido austria gmbh

Address : Köstendorfer Straße 8
5202 NEUMARKT, AUSTRIA

Manufacturer : ruwido austria gmbh

Address : Köstendorfer Straße 8
5202 NEUMARKT, AUSTRIA

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

POSITIVE

Test Report No. : T39090-01-00KS

28. August 2017

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 15.249	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz
ANSI C63.4: 2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ANSI C95.1:2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2013	Uncertainty in EMC measurement
CISPR 22: 2008 EN 55022: 2010	Information technology equipment

2 EQUIPMENT UNDER TEST

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

The photo documentation can be viewed in T39090-01-xxKS.

2.2 Equipment category

Bluetooth Low Energy device, portable equipment

2.3 Short description of the equipment under test (EUT)

The EUT is a Bluetooth 4.0 Low Energy system. The EUT is compatible with the standard 802.15.1. It supports the 2.4 GHz frequency band. A single PCB antenna is used within the system. The modulation used by the EUT is GFSK with a data rate of 1000 kbps which means worst case for testing. The EUT has only one integrated antenna, no temporary connector and no external antenna can be connected.

Number of tested samples: 1
Serial number: 168259
Firmware version: v1.0.0

Items	Description
Power type	3.0 V DC (Battery powered)
Modulation	GFSK
Frequency range	2400 MHz to 2483.5 MHz
Channel numbers	40
Data rate (kbps)	1000
Antenna type	PCB

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	Channel	Frequency
37	2402	18	2442
0	2404	19	2444
1	2406	20	2446
2	2408	21	2448
3	2410	22	2450
4	2412	23	2452
5	2414	24	2454
6	2416	25	2456
7	2418	26	2458
8	2420	27	2460
9	2422	28	2462
10	2424	29	2464
38	2426	30	2466
11	2428	31	2468
12	2430	32	2470
13	2432	33	2472
14	2434	34	2474
15	2436	35	2476
16	2438	36	2478
17	2440	39	2480

Note: the marked frequencies are determined for final testing.

2.6 Transmit operating modes

The EUT uses GFSK and may provide following data rates:

- 1000 kbps (kbps = *kilobits per second*)

2.7 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Certification name	Plug	Frequency range (GHz)
1	Omni	PCB antenna	none	2.4 - 2.4835

2.8 Power supply system utilised

Power supply voltage, V_{nom} : 3.0 VDC (Battery powered)

2.9 Peripheral devices and interface cables

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

- _____ Model : _____
- _____ Model : _____
- _____ Model : _____

2.10 Determination of worst case conditions for final measurement

As worst case the following channels and test modes are selected for the final test:

BT 4.0 LE	Available channels	Tested channels	Power setting	Modulation	Data rate
802.15.1	00 to 39	37, 18, 39	full power	GFSK	1000 kbps

2.10.1 Test jig

No special test jig was used for testing.

2.10.2 Test software

The EUT has a special firmware that allows enabling a permanent advertising mode with three advertising channels. The output power is set to full power by firmware and cannot be changed during tests.

3 TEST RESULT SUMMARY

Operating in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.35(c)	RSS-Gen, 6.10	Pulsed operation	passed
15.203	RSS Gen, 8.3	Antenna requirement	passed
15.204	RSS Gen, 8.2	External radio frequency power amplifiers	passed
15.205(a)	RSS Gen, 8.1	Emissions in restricted bands	passed
15.207(a)	RSS Gen, 8.8	AC power line conducted emissions	not tested
15.215(c)	-	EBW	passed
-	RSS-Gen, 6.6	OBW	passed
15.249(a)	RSS-210, B10(a)	Field strength of fundamental	passed
15.249(d)	RSS-210, B10(b)	Out-of-band emission, radiated	passed
-	RSS-Gen, 6.11	Transmitter frequency stability	not applicable

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

RSS Gen, Issue 4, November 2014

RSS 210, Issue 9, August 2016

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 : 19 July 2017

Testing concluded on : 25 July 2017

Checked by:

Tested by:



Klaus Gegenfurtner
2017.08.29 09:06:39 +02'00'

Klaus Gegenfurtner
Teamleader Radio



Kathrin Schiebl
2017.08.29
08:55:56 +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 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.

4.4.2 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.

4.4.2.1 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.

4.4.2.1.1 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

4.4.2.1.2 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: NONE

Remarks: Not applicable, the EUT is battery powered and has no externally connectable cables.

5.2 Field strength of fundamental

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

5.2.1 Description of the test location

Test location: Anechoic chamber 1
Test distance: 3 m

5.2.2 Photo documentation of the test set-up



5.2.1 Applicable standard

According to FCC Part 15C, Section 15.249(a):

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the effective limits.

5.2.2 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas. The set up of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 6.5. The EUT is measured in TX continuous mode unmodulated under normal conditions.

Analyser settings:

Peak measurement: RBW: 3 MHz

VBW: 10 MHz

Detector: Max peak

5.2.3 Test result

Frequency (MHz)	Level PK dB(μV/m)	Limit PK dB(μV/m)	Margin PK (dB)	Level AV dB(μV/m)	Limit AV dB(μV/m)	Margin AV (dB)
2402	92.8	114.0	-21.2	69.3	94.0	-24.7
2442	92.2	114.0	-21.8	68.7	94.0	-25.3
2480	92.0	114.0	-22.0	68.5	94.0	-25.5

Note: The peak values are corrected with the duty cycle of -23.5 dB to get the average value.

Average-Limit according to FCC Part 15C, Section 15.249(a):

Frequency (MHz)	Field strength of fundamental	
	(mV/m)	dB(μV/m)
902 - 928	50	94
2400 - 2483.5	50	94
5725-5875	50	94
24000 - 24250	250	108

Peak-Limit according to FCC Part 15C, Section 15.249(e):

However the peak fieldstrength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are **FULFILLED**.

Remarks:

5.3 Out-of-band emission, radiated

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

5.3.1 Description of the test location

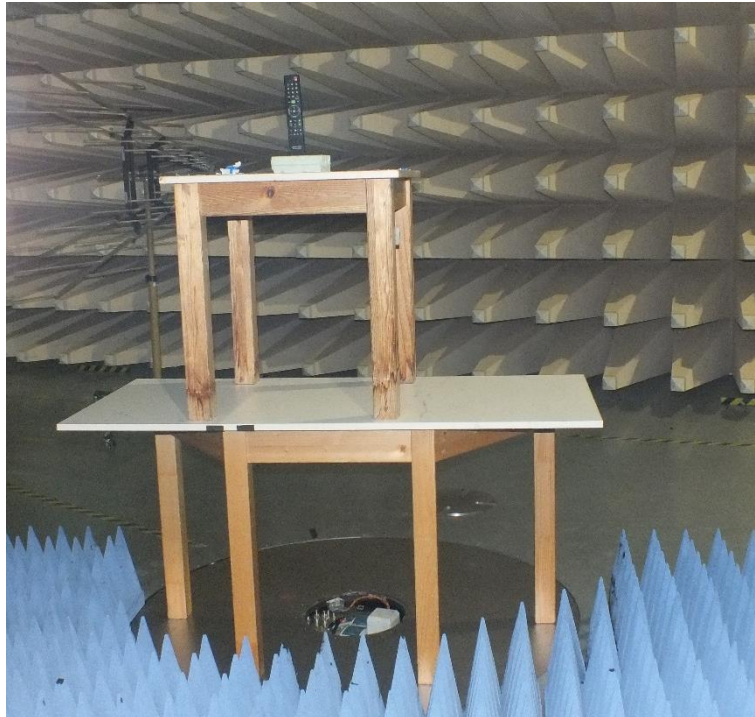
Test location: OATS 1
Test location: Anechoic chamber 2
Test distance: 3 m

5.3.2 Photo documentation of the test set-up

Test setup 30 MHz – 1000 MHz:



Test setup 1 GHz – 18 GHz:



5.3.3 Applicable standard

According to FCC Part 15C, Section 15.249 (d):

Emission radiated outside of the specified frequency bands, except harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limit in FCC Part 15C, Section 15.209, whichever is the lesser attenuation.

5.3.4 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 6.3. 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 continuous mode unmodulated under normal conditions.

Instrument settings:

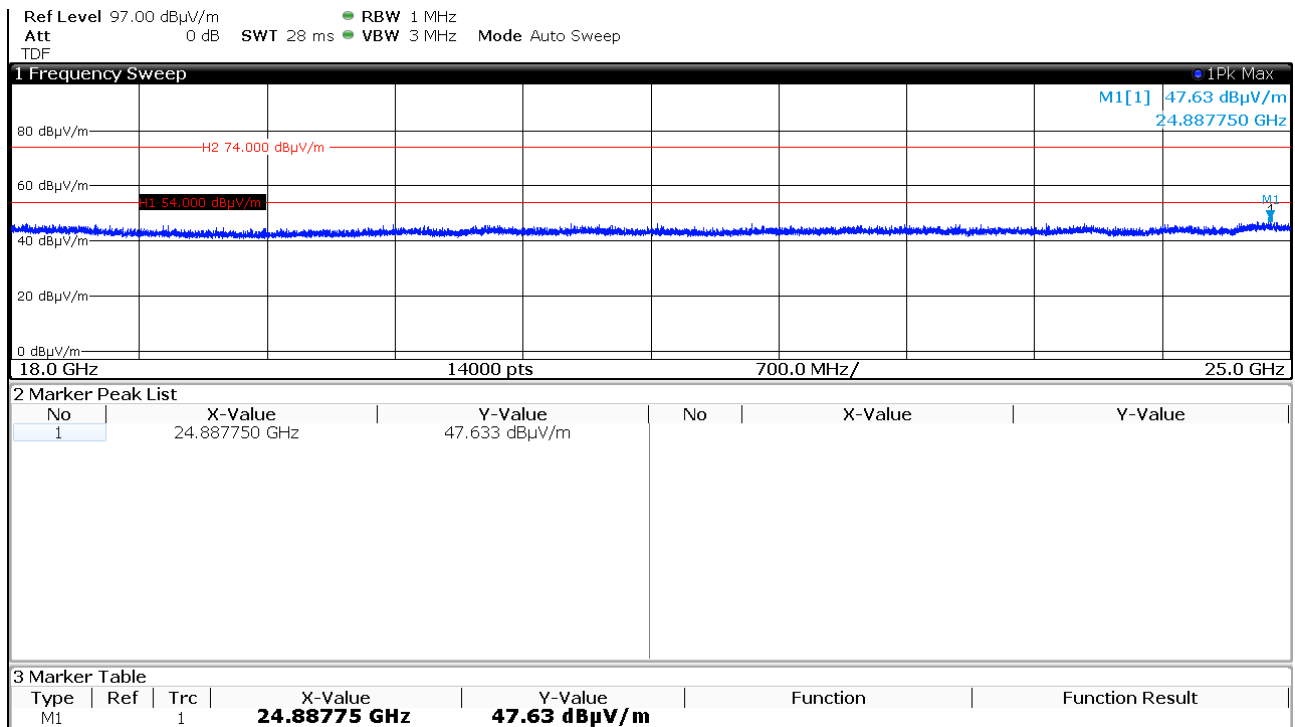
9 kHz – 150 kHz	RBW:	200 Hz
150 kHz - 30 MHz	RBW:	9 kHz
30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 25 GHz	RBW:	1 MHz

5.3.1 Test result

Note: Pre-scans were performed in the frequency range 9 kHz to 30 MHz and 18 to 25 GHz. No emissions could be detected in these ranges.

The plot of the pre-measurement at 2402 MHz is shown only for reference.

Pre-measurement 18 GHz to 25 GHz:



5.3.2 Test result 30 MHz to 1000 MHz

Frequency (MHz)	Level QP dB(μV/m)	Limit QP dB(μV/m)	Delta (dB)
64.00	16.2	40.0	-23.8
127.90	17.4	43.5	-26.1
191.99	21.7	43.5	-21.8
287.97	25.1	46.0	-20.9
297.97	26.20	46.0	-19.8

Note: No difference could be detected for the intentional radiated frequencies 2402 MHz, 2442 MHz and 2480 MHz in the frequency range 30 MHz to 1000 MHz.

5.3.3 Test result f > 1 GHz
Channel 37

Frequency (MHz)	Level PK dB(μV/m)	Level AV dB(μV/m)	Limit PK dB(μV/m)	Margin PK (dB)	Limit AV dB(μV/m)	Margin AV (dB)
2400.00	68.2	44.7	74.0	-5.8	54.0	-9.3
4804.25	57.6	34.1	74.0	-16.4	54.0	-19.9
16941.75	51.9	-	74.0	-22.1	54.0	-

Channel 18

Frequency (MHz)	Level PK dB(μV/m)	Level AV dB(μV/m)	Limit PK dB(μV/m)	Margin PK (dB)	Limit AV dB(μV/m)	Margin AV (dB)
2400.00	38.9	-	74.0	-35.1	54.0	-
2483.50	39.1	-	74.0	-34.9	54.0	-
4883.75	53.1	-	74.0	-20.9	54.0	-
16735.25	52.0	-	74.0	-22.0	54.0	-

Channel 39

Frequency (MHz)	Level PK dB(μV/m)	Level AV dB(μV/m)	Limit PK dB(μV/m)	Margin PK (dB)	Limit AV dB(μV/m)	Margin AV (dB)
2483.5	49.4	-	74.0	-24.6	54.0	-
4959.25	51.1	-	74.0	-22.9	54.0	-
17949.75	51.1	-	74.0	-22.9	54.0	-

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 duty cycle factor from the peak values. For example, channel 37 at 4804.25 MHz: peak value – DC = average value
57.6 dBμV/m – 23.5 dB = 34.1 dBμV/m

Limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits ($\mu\text{V/m}$)	Measurement distance (m)
0.009 - -0.49	$2400/f(\text{kHz})$	300
0.49 – 1.705	$24000/f(\text{kHz})$	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Average limit according to FCC Part 15C, Section 15.249(a):

Fundamental frequency (MHz)	Field strength of harmonics	
	($\mu\text{V/m}$)	dB($\mu\text{V/m}$)
902 - 928	500	54
2400 - 2483.5	500	54
5725 - 5875	500	54
24000 - 24250	2500	68

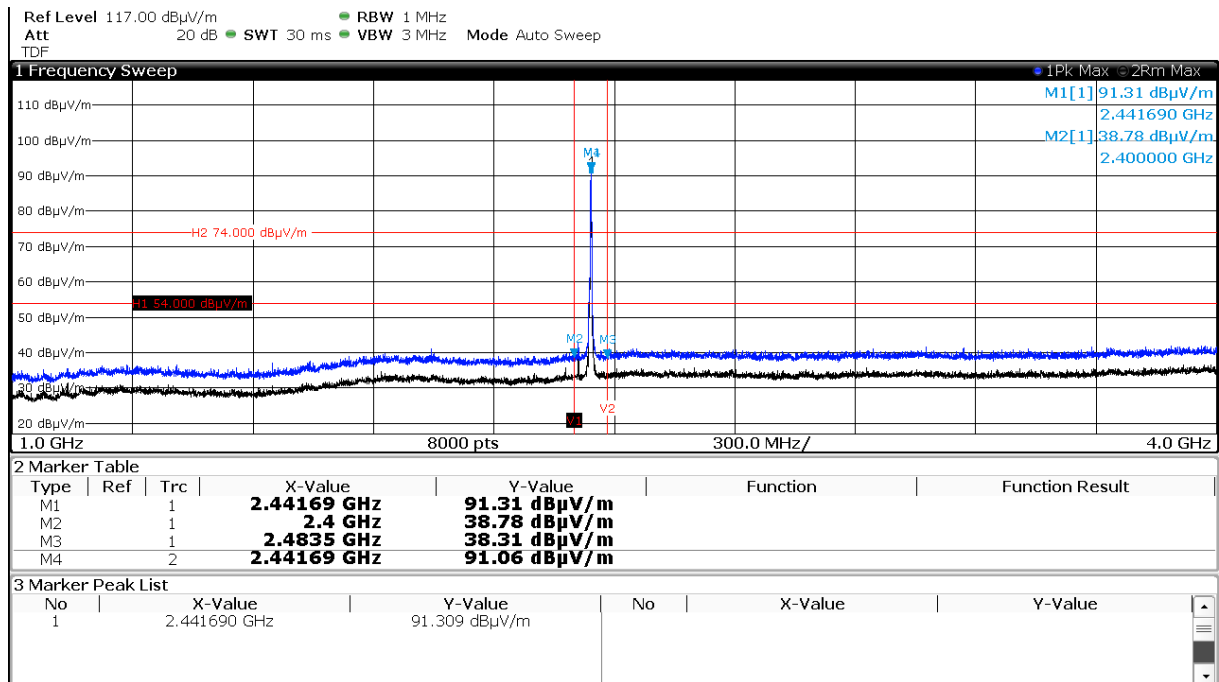
The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic (25000 MHz). For detailed test result
please refer to following test protocols.

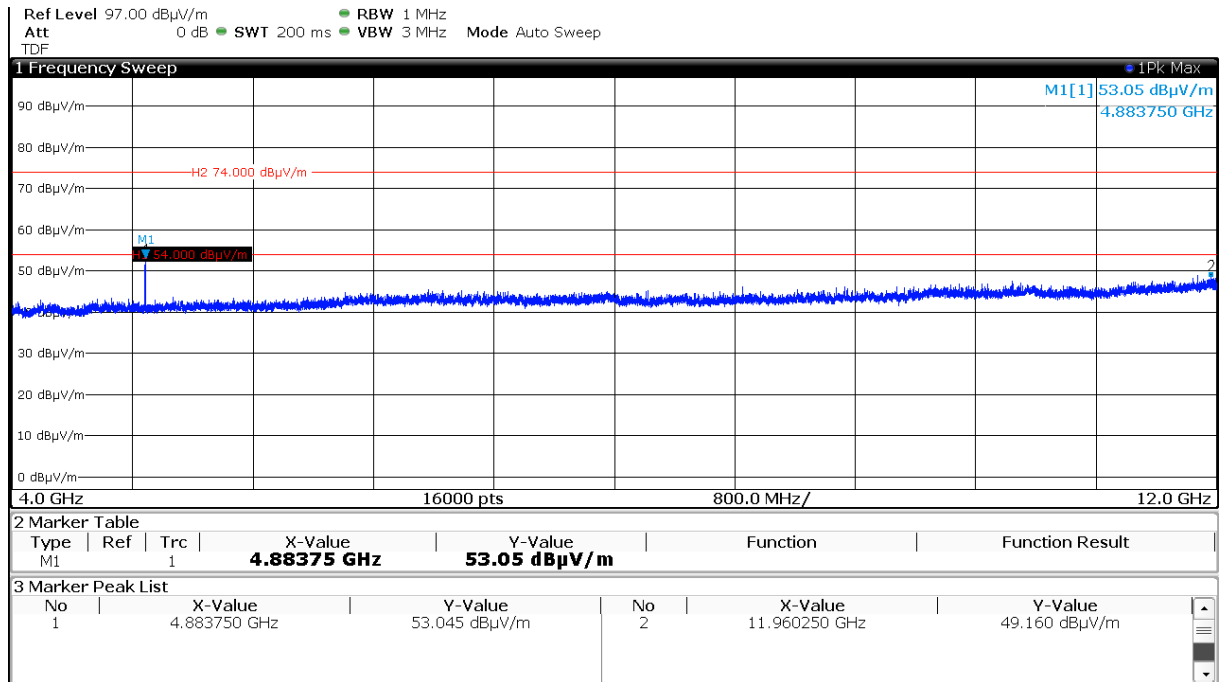
5.3.4 Test protocols

For reference the plots from 1 GHz to 18 GHz at 2442 MHz:

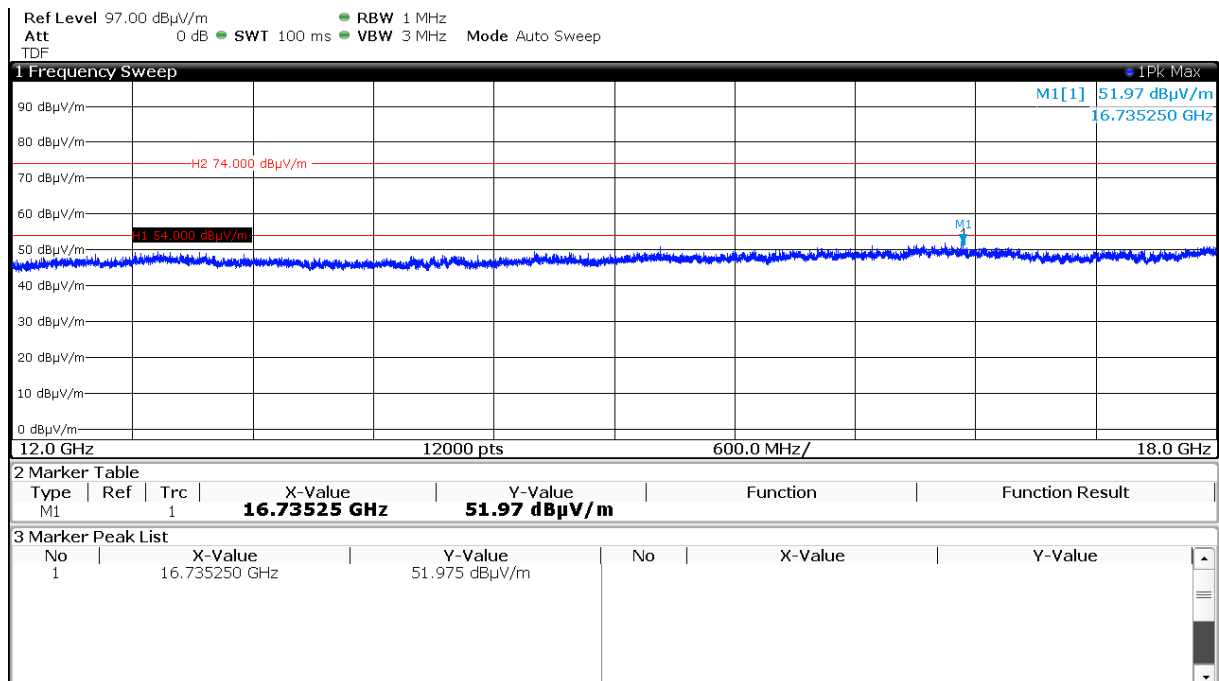
Spurious emissions from 1 to 4 GHz
(incl. Fundamental carrier)



Spurious emissions from 4 to 12 GHz



Spurious emissions from 12 to 18 GHz



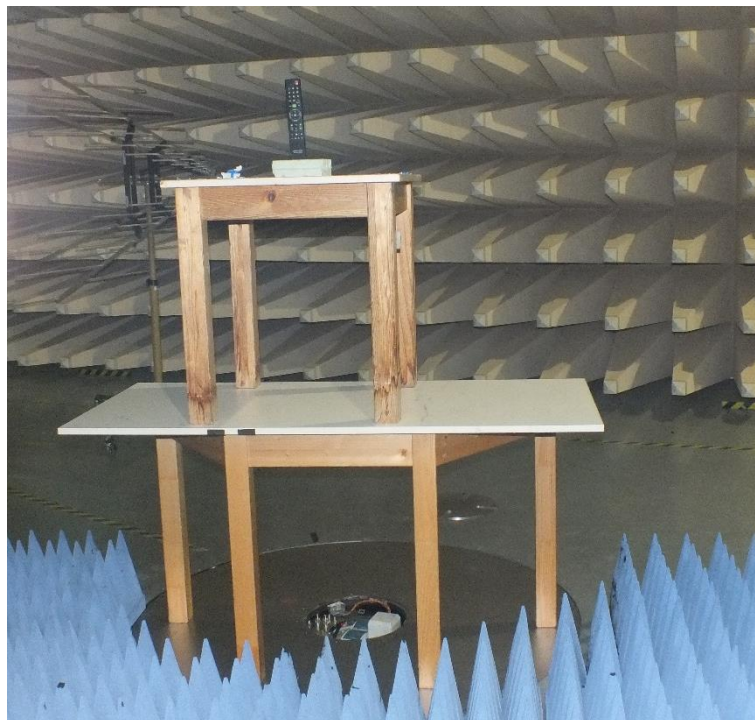
5.4 EBW and OBW

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 15.215(c):

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Section 15.217 through Section 15.257, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated.

5.4.4 Description of Measurement

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio of -20 dB (99%). The x-dB-down (OBW) function of the analyser is used. The measurement is performed with normal modulation in TX continuous mode.

Spectrum analyser settings:

RBW: 30 kHz, VBW: 100 kHz, Span: 3 MHz, Trace mode: max. hold, Detector: max. peak;

5.4.5 Test result

Centre f (MHz)	20dB bandwidth f_1	20dB bandwidth f_2	Measured EBW (MHz)
2401.973800	2401.3888	2402.558800	1.170000
2441.958800	2441.3663	2442.551300	1.185000
2479.970050	2479.3708	2480.569300	1.198500

Centre f (MHz)	99% bandwidth f_1	99% bandwidth f_2	Measured OBW (MHz)
2401.967970	2401.43346	2402.502480	1.069020
2441.961445	2441.43647	2442.486420	1.049950
2479.961925	2479.43333	2480.490520	1.057190

Operating frequency band (MHz)	20 dB Bandwidth (MHz)	
$f_{\text{low}} > 2400$	$f_{\text{low}} =$	2401.38880
$f_{\text{high}} < 2483.5$	$f_{\text{high}} =$	2480.56930
Operating Band occupancy	79.18	

Operating Band occupancy percentage	94.83 %
Operating channel occupancy percentage	59.92 %

Limit according to FCC Part 15C, Section 15.215(c):

If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within the central 80% of the permitted band in order to minimize the possibility of out-of-band operation. Due to the channelising of the operating band into 16 channels with channel bandwidth of 5 MHz the limit central 80% of the permitted band can not be applied. Therefore the stability of the EUT will be shown staying within the central 80% of the operating channel.

The requirements are **FULFILLED**.

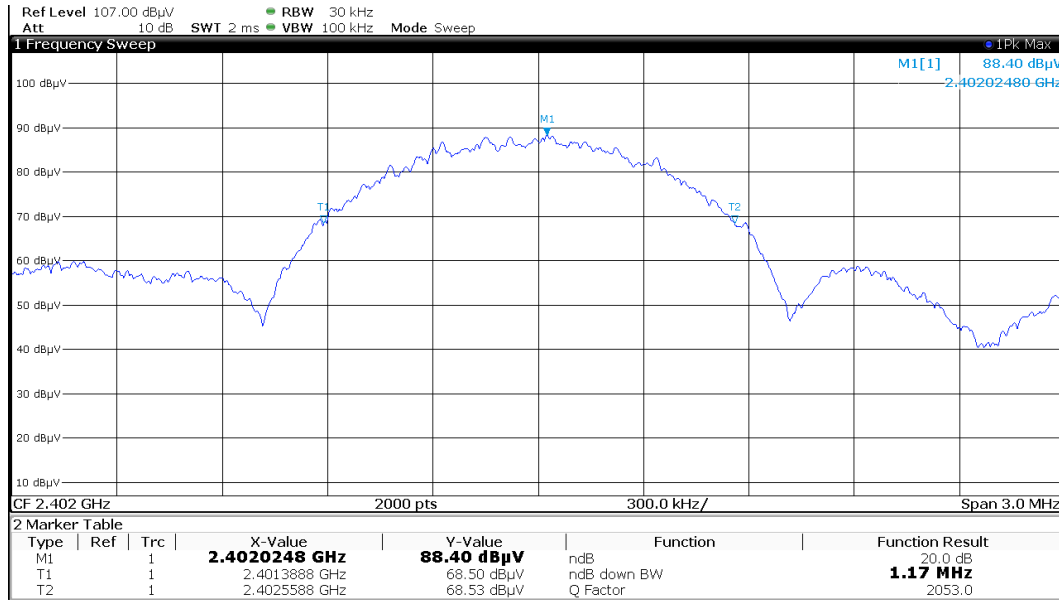
Remarks: For detailed test result please refer to following test protocols.

The OBW99 is measured for RSS only.

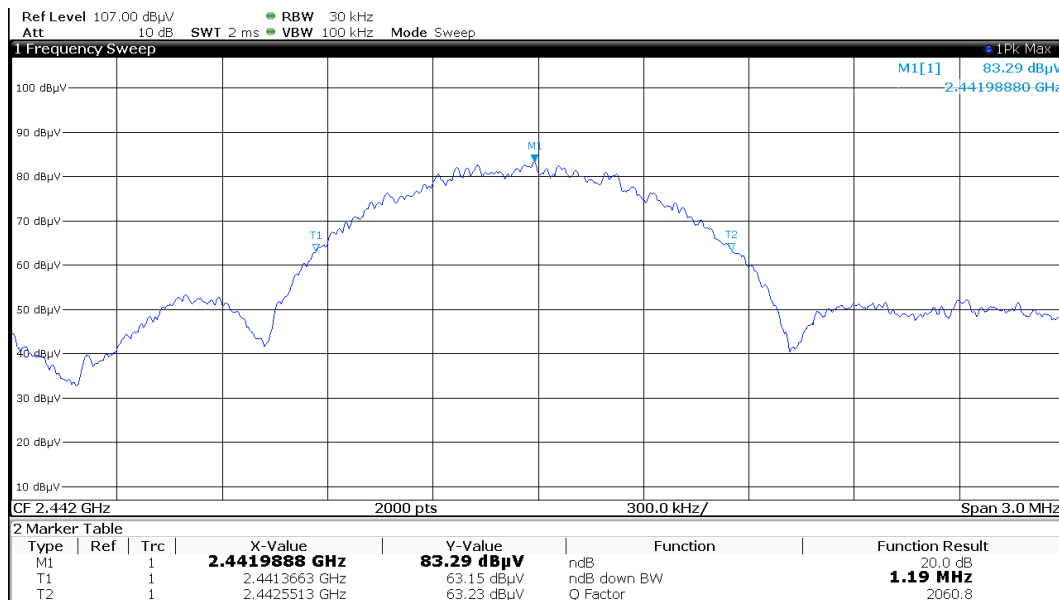
5.4.6 Test protocols

20 dB bandwidth

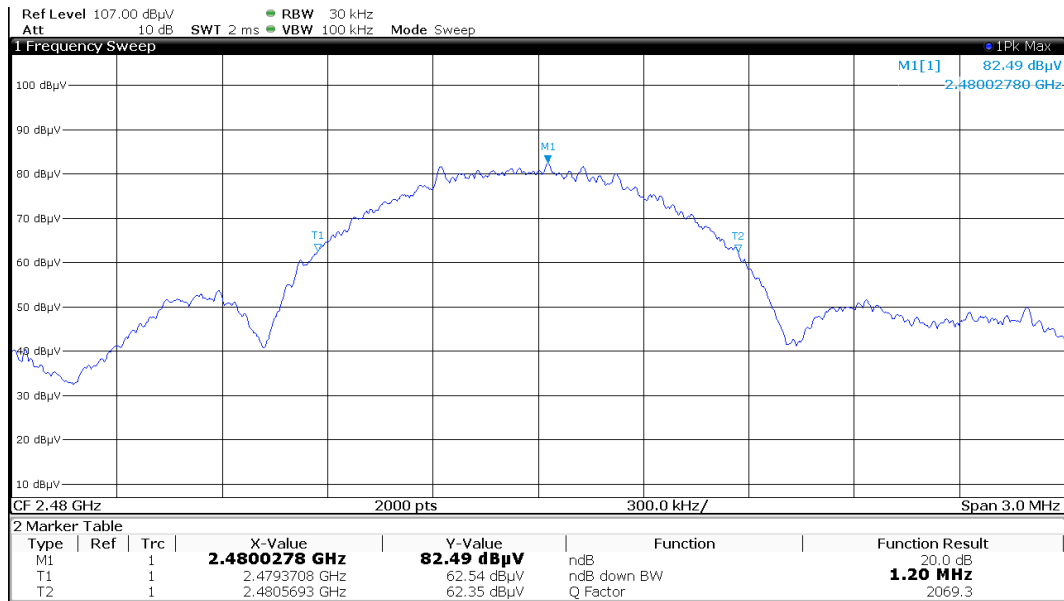
2402 MHz



2442 MHz

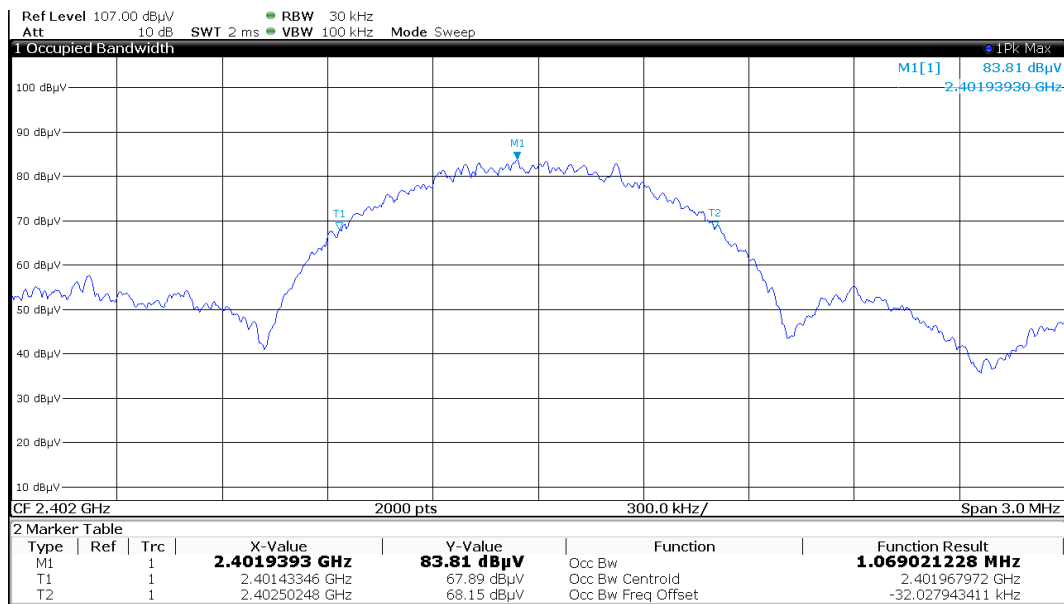


2480 MHz

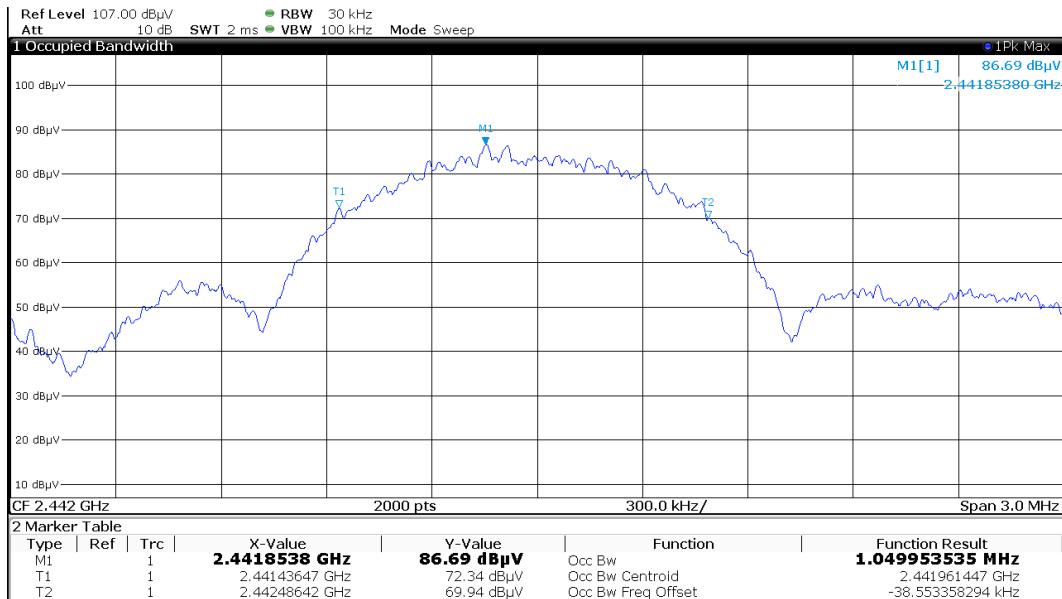


OBW 99%

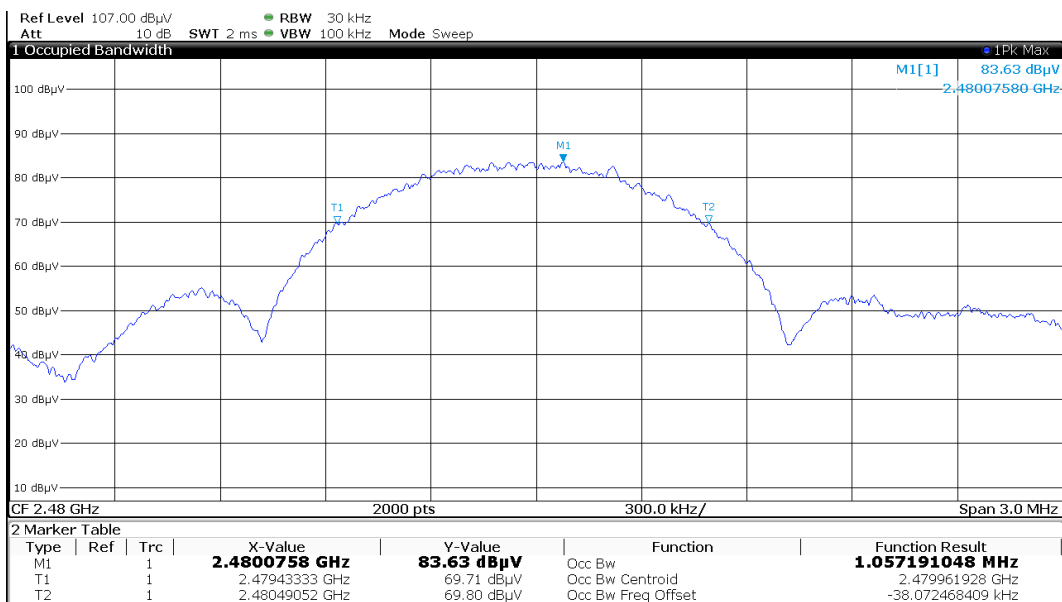
2402 MHz



2442 MHz



2480 MHz



5.5 Correction for pulse operation (duty cycle)

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

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up



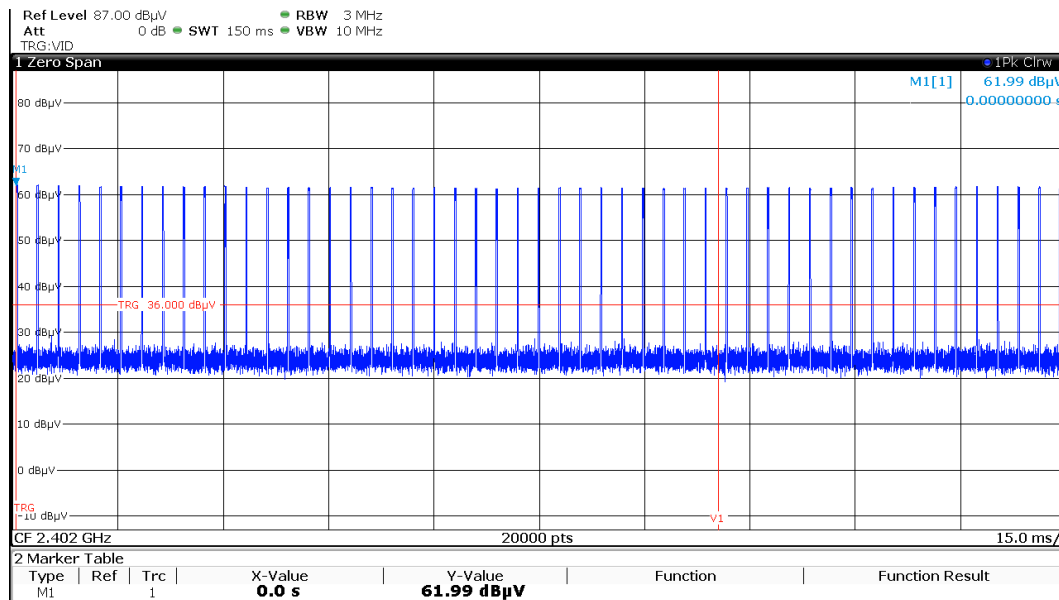
5.5.3 Applicable standard

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.

5.5.4 Description of Measurement

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



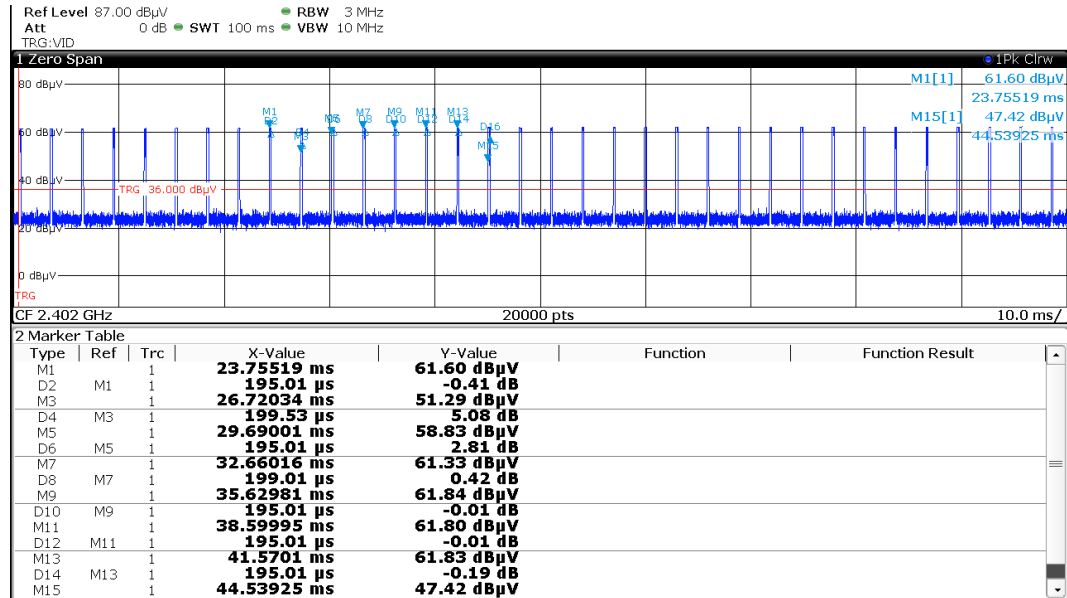
The duty cycle factor (dB) is calculated applying the following formula:

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

KE : pulse operation correction factor

t_{iw} pulse duration for one complete pulse track

5.5.5 Test result



Note: the worst case regarding duty cycle of a BLE device is in advertising mode. Channel 37 was chosen for measurement.

Complete burts duration (34 bursts): 195.01 µs + 194.53 µs + 195.01 µs + 199.51 µs + 195.01 µs + 195.01 µs + 195.01 µs + 195.01 µs + 199.53 µs + 195.01 µs + 199.01 µs + 195.01 µs + 195.01 µs + 204.51 µs + 194.53 µs + 195.01 µs + 199.01 µs + 195.01 µs + 199.51 µs + 199.51 µs + 194.51 µs + 194.03 µs + 194.51 µs + 194.01 µs + 199.51 µs + 194.01 µs + 194.51 µs + 195.01 µs + 195.48 µs + 195.01 µs + 194.51 µs + 199.01 µs + 194.51 µs = 6668.39 µs

$$K_E = 20 \log (6.66839 \text{ ms} / 100 \text{ ms}) = -23.5$$

Remarks:

5.6 Antenna application

5.6.1 Applicable standard

According to FCC Part 15C, Section 15.203(a):

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.

5.6.2 Result

The EUT use an integrated PCB antenna. No other antenna than that furnished by the responsible party or external power amplifier can be applied by a customer.

The antenna of the EUT meets the requirement of FCC Part 15C, Section 15.203 and 15.204.

The requirements are **FULFILLED**.

Remarks:

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.
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	FSW43	02-02/11-15-001	07/04/2018	07/04/2017		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
SER 2	ESVS 30	02-02/03-05-003	12/07/2018	12/07/2017		
	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				
	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		
	BBHA 9170	02-02/24-05-013	19/05/2020	19/05/2017	19/05/2018	19/05/2017
	Sucoflex N-2000-SMA	02-02/50-05-075				
	KMS102-1 m	02-02/50-11-014				
	KMS102-0.2 m	02-02/50-11-016				
	SF104/11N/11N/1500MM	02-02/50-13-015				