

TÜV AUSTRIA SERVICES GMBH

Office: Deutschstrasse 10 1230 Vienna/Austria Tel.: +43 1 61091-0 Fax: +43 1 61091-6505 emv@tuv.at

Division: Industry & Energy

Department: Testing Body for Communication Technology/ EMC

TÜV®



Accredited as: Testing Laboratory, Inspection Body, Certification Body. Calibration Laboratory. First and Boiler test laboratory

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Management: Dipl.-Ing. Dr. Stefan HAAS Mag. Christoph WENNINGER

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Bank Details: UC BA 52949 001 066 IBAN AT131200052949001066 **BIC BKAUATWW** RZB 001-04.093.282 **IBAN** AT153100000104093282 **BIC RZBAATWW**

VAT ATU63240488 DVR 3002476

TEST REPORT

of the accredited test laboratory

TÜV Nr.:M/FG-16/133

Applicant:

StreamUnlimited Engineering GmbH

High Tech Campus Vienna Gutheil-Schoder-Gasse 10

A-1100 Vienna

Tested Product:

STREAM810 Bluetooth / BLE / WIFI streaming module

Test report for Bluetooth part only

FCC-ID:

2AJYB-S810

IC-ID:

20504-S810

Manufacturer:

See applicant

Output power /

14.45 mW

power supply:

5 VDC

field strength:

Frequency range:

conducted

2402 - 2480 MHz Channel separation:

1 MHz

Standard:

FCC: 47 CFR Part 15 (October 1, 2015 edition)

RSS-247 Issue 1, May 2015; including modifications and

clarifications in CB Notice 2015-07

TUV Austria Services GmbH Test laboratory for EMC

Supervisor of EMC-laboratory:

Ing Wilhelm Seier

19.12.2016

Ing. Michael Emminger

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The results of this test report only refer to the provided equipment.

Relative humidity: 21%



LIST OF MEASUREMENTS

The complete list of measurements called for in 47 CFR 15 and RSS-247 is given below.

SUBCLAUSE	PARAMETER TO BE MEASURED	PAGE
	Intentional Radiators	
	Test object data	3
15.247(a)(1) 5.1 (2) (4)	Number of channels and channel spacing	4
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Relative humidity: 21%



TEST OBJECT DATA

General EUT Description

This Bluetooth / BLE / WIFI module is using either 2.4 GHz frequencies or 5 GHz (WIFI only). This test report is only for the Bluetooth part. See additional test reports:

M/FG-16/134 for BLE

M/FG-16/135 for 2,4 GHz WIFI and

M/FG-16/136 for 5 GHz WIFI measurement results including photodocumentation.

2.1033 (c) Technical description

2.1033 (4) Type of emission: Basic datarate: 923KF1D – Channel bandwidth < 1MHz – Channel spacing 1 MHz.

Enhanced datarate: 1M34F1D - Channel spacing 1 MHz > 2/3 of channel

bandwidth - > maximum power should be 125 mW.

2.1033 (5) Frequency range: 2402 to 2480 MHz (channel center frequencies).

2.1033 (6) Power range and Controls: The maximum peak output power is 14,45 mW and there is no power regulation.

2.1033 (7) Maximum output power rating: 14,45 mW conducted.

2.1033 (8) DC Voltage and Current: 5V DC

maximum current consumption: 200 mA

RSS-135 This standard does not apply to:

1.1.(a) a receiver that scans radio frequencies for the purpose of enabling its associated transmitter to avoid transmitting in an occupied frequency but which does not have the capability of decoding the message (e.g. converting it to audio voice) contained in the radio signal

Antennas used for all radiated measurements: 'STANDARD WLAN 1000418'

Tests were performed December 2nd till 14th 2016.

Relative humidity: 21%



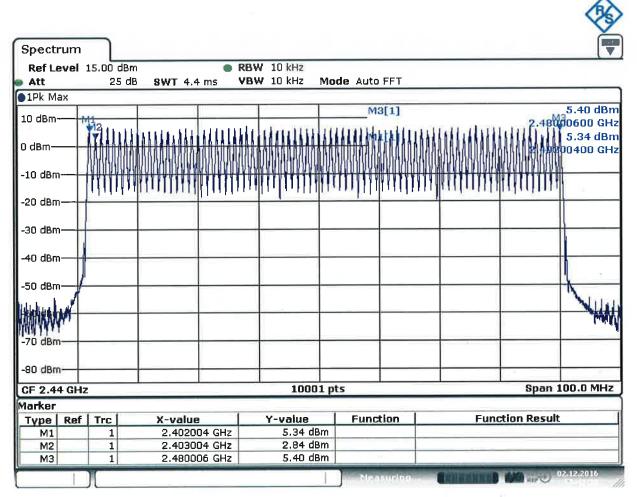
Number of channels and channel spacing

§ 15.247 (a) (1) 5.1 (2) (4)

Mode: Bluetooth

Conducted Measurement

Rated output power: 14,45 mW



Date: 2.DEC 2016 09:41:30

There are 79 Channels used, starting at 2402 till 2480 each spaced by 1 MHz channel spacing.

LIMIT

SUBCLAUSE 15.247(a) (1) - 5.1(4)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Relative humidity: 21%

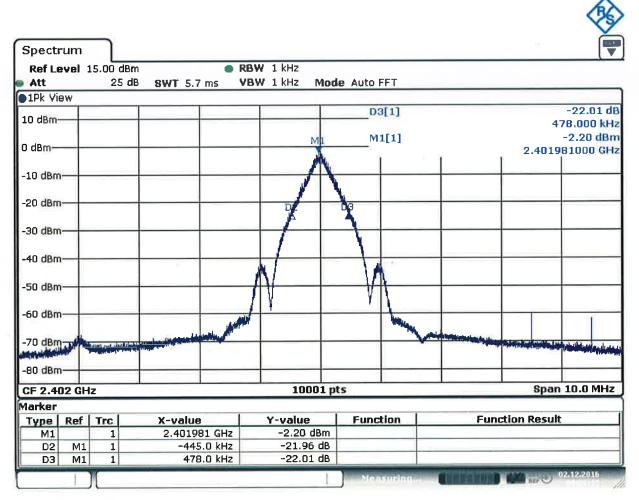


20dB Bandwidth

§ 15.247 (a) (1) 5.1 (2)

Conducted Measurement - Mode: Bluetooth BDR

Rated output power: 14,45 mW 2402 MHz



Date: 2.DEC 2016 09:21:16

20dB Bandwidth:

923 kHz

LIMIT

SUBCLAUSE 15.247(a) (1) - 5.1(2)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Relative humidity: 21%

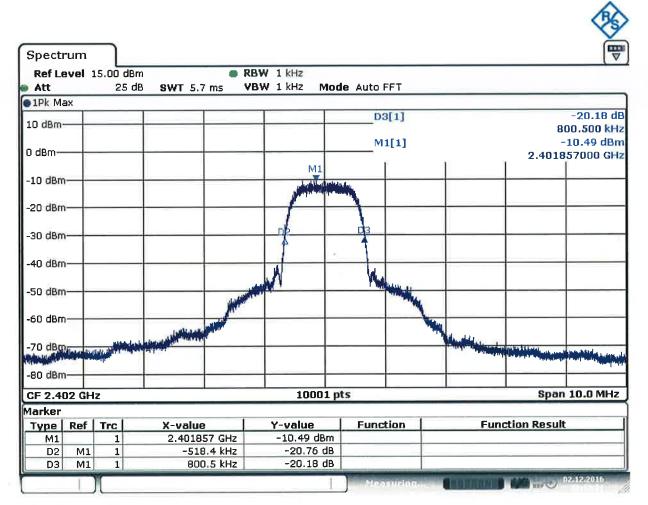


20dB Bandwidth

§ 15.247 (a) (1) 5.1 (2)

Conducted Measurement - Mode: Bluetooth EDR

Rated output power: 14,45 mW 2402 MHz



Date: 2 DEC 2016 09:13:22

20dB Bandwidth:

1318,9 kHz

LIMIT

SUBCLAUSE 15.247(a) (1) – 5.1(2)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Relative humidity: 21%

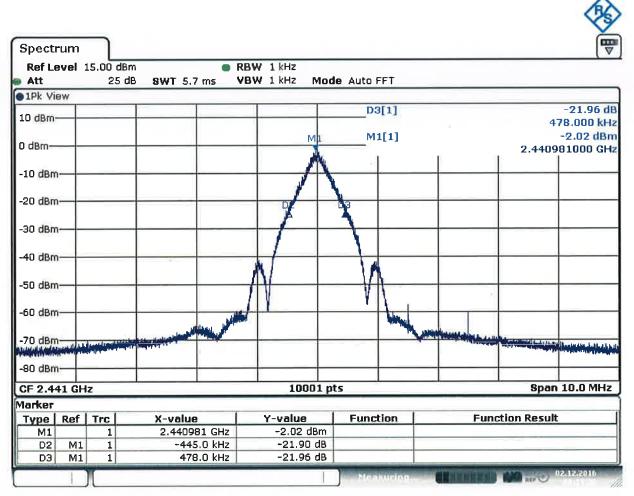


20dB Bandwidth

§ 15.247 (a) (1) 5.1 (2)

Conducted Measurement - Mode: Bluetooth BDR

Rated output power: 14,45 mW 2441 MHz



Date: 2.DEC 2016 09:19:36

20dB Bandwidth:

923 kHz

LIMIT

SUBCLAUSE 15.247(a) (1) – 5.1(2)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Relative humidity: 21%

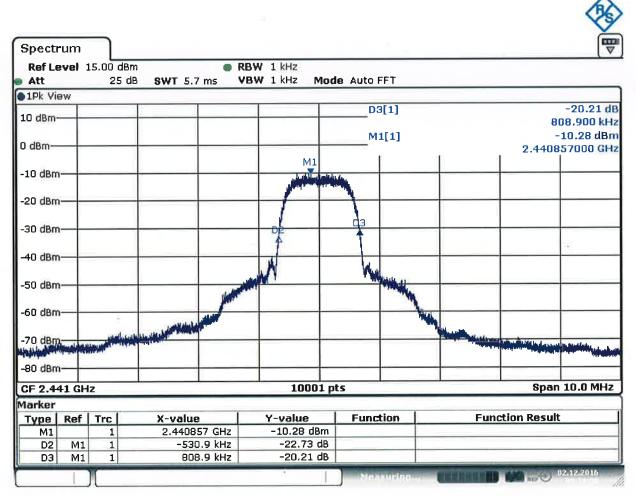


20dB Bandwidth

§ 15.247 (a) (1) 5.1 (2)

Conducted Measurement - Mode: Bluetooth EDR

Rated output power: 14,45 mW 2441 MHz



Date: 2.DEC.2016 09:14:59

20dB Bandwidth:

1339,8 kHz

LIMIT

SUBCLAUSE 15.247(a) (1) - 5.1(2)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Relative humidity: 21%

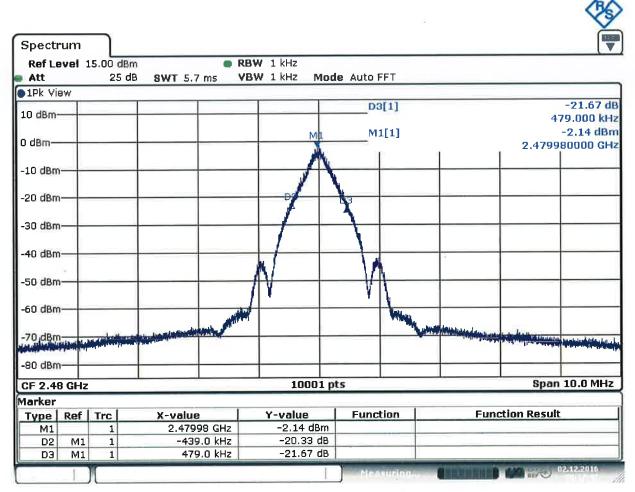


20dB Bandwidth

§ 15.247 (a) (1) 5.1 (2)

Conducted Measurement - Mode: Bluetooth BDR

Rated output power: 14,45 mW 2480 MHz



Date: 2.DEC 2016 09:17:47

20dB Bandwidth:

918 kHz

LIMIT

SUBCLAUSE 15.247(a) (1) – 5.1(2)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Relative humidity: 21%

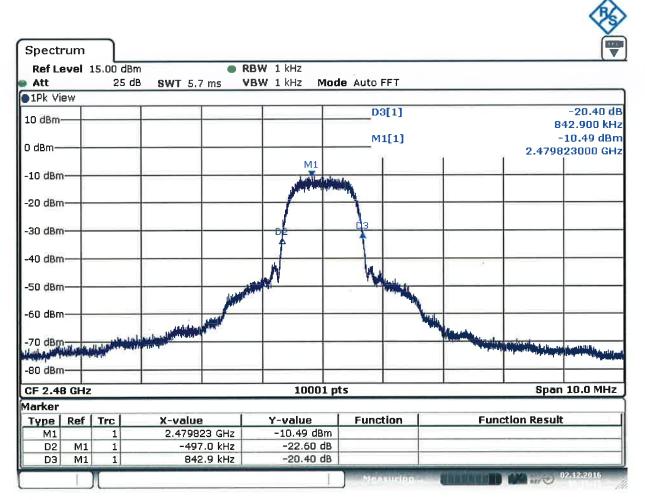


20dB Bandwidth

§ 15.247 (a) (1) 5.1 (2)

Conducted Measurement - Mode: Bluetooth EDR

Rated output power: 14,45 mW 2480 MHz



Date: 2.DEC 2016 09:16:11

20dB Bandwidth:

1339,9 kHz

LIMIT

SUBCLAUSE 15.247(a) (1) – 5.1(2)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Relative humidity: 21%



Maximum Peak RF Power Output (EIRP)

§ 15.247(b)(1) 5.4(2)

Conducted Measurement - Mode: Bluetooth BDR

Rated output power: 14,45 mW

Test conditions		Transmitter power (mW)		
		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} (5) V	13,80	14,45	14,13
Maximum deviation under normal test	n from rated output power conditions (dB)			
Measurement uncertainty			<u>+</u> 0,75 dB	

LIMIT

SUBCLAUSE 15.247(b)(1) - 5.4(2)

Under normal test conditons	1W conducted (4W eirp)

Maximum Antenna Gain: 6dBi, eirp can be calculated by multiplying conducted value with factor 4.

Relative humidity: 21%



Maximum Peak RF Power Output (EIRP)

§ 15.247(b)(1) 5.4(2)

Conducted Measurement - Mode: Bluetooth EDR

Rated output power: 14,45 mW

Test conditions		Transmitter power (mW)		
		2402 MHz	2441 MHz	2480 MHz
T _{nom} (23)°C	V _{nom} (5) V	12,02	12,59	13,18
Maximum deviation under normal test	n from rated output power conditions (dB)			
Measurement uncertainty			<u>+</u> 0,75 dB	

LIMIT

SUBCLAUSE 15.247(b)(1) - 5.4(2)

Under normal test conditons	1W conducted (4W eirp)
Under normal test conditions	TVV conducted (4VV elip)

Maximum Antenna Gain: 6dBi, eirp can be calculated by multiplying conducted value with factor 4.

Relative humidity: 21%

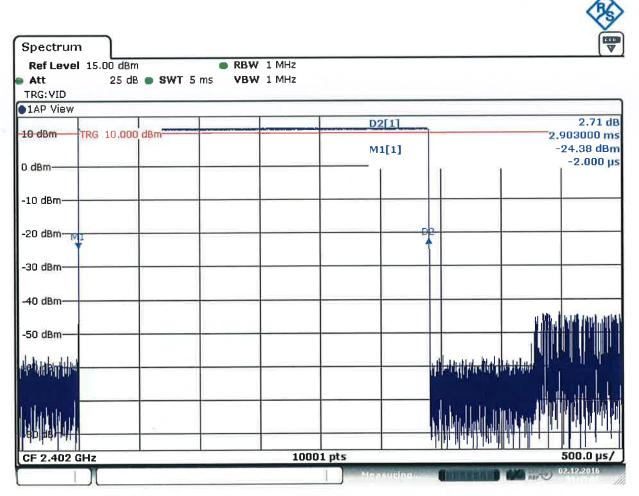


Average Time of Occupancy

§ 15.247(a)(1)(iii) 5.1(4)

Conducted Measurement - Mode: Bluetooth BDR

Rated output power: 14,45 mW 2402 MHz



Date: 2DEC 2016 09:45:06

The dwell time is constant 2,9 ms.

LIMIT

SUBCLAUSE 15.247(a)(1)(iii) – 5.1(4)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Relative humidity: 21%

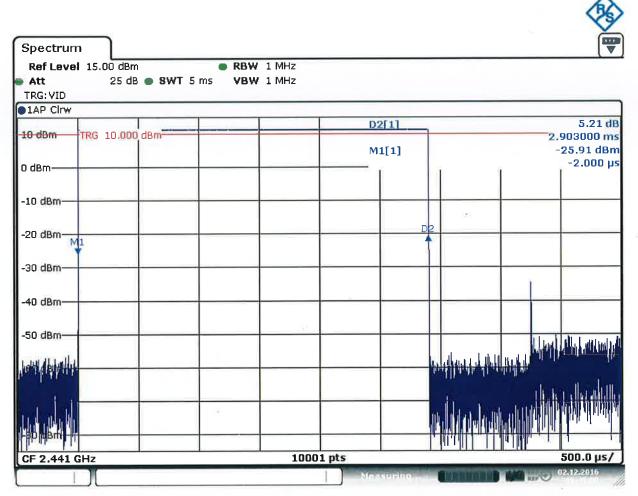


Average Time of Occupancy

§ 15.247(a)(1)(iii) 5.1(4)

Conducted Measurement - Mode: Bluetooth BDR

Rated output power: 14,45 mW 2441 MHz



Date: 2.DEC.2016 09:45:50

The dwell time is constant 2,9 ms.

LIMIT

SUBCLAUSE 15.247(a)(1)(iii) - 5.1(4)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Relative humidity: 21%

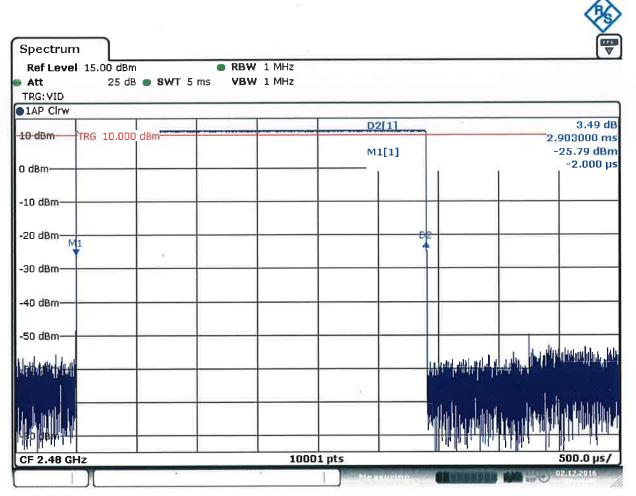
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Average Time of Occupancy

§ 15.247(a)(1)(iii) 5.1(4)

Conducted Measurement - Mode: Bluetooth BDR

Rated output power: 14,45 mW 2480 MHz



Date: 2.DEC.2016 09:46:45

The dwell time is constant 2,9 ms.

LIMIT

SUBCLAUSE 15.247(a)(1)(iii) - 5.1(4)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Report Reference: M/FG-16/133

Ambient temperature: 23°C

Relative humidity: 21%



Average Time of Occupancy

§ 15.247(a)(1)(iii) 5.1(4)

Conducted Measurement - Mode: Bluetooth BDR

Rated output power: 14,45 mW

	Channel 0 (2402 MHz)	Channel 39 (2441 MHz)	Channel 78 (2480 MHz)
Observed time period	79 tir	mes 0,4 Seconds = 31,6 sec	conds
Time of each individual transmission	2,9 ms	2,9 ms	2,9 ms
Observed number of transmissions	109	102	102
Average time of occupancy	0,3161 seconds	0,2958 seconds	0,2958 seconds

LIMIT

SUBCLAUSE 15.247(a)(1)(iii) – 5.1(4)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Relative humidity: 21%

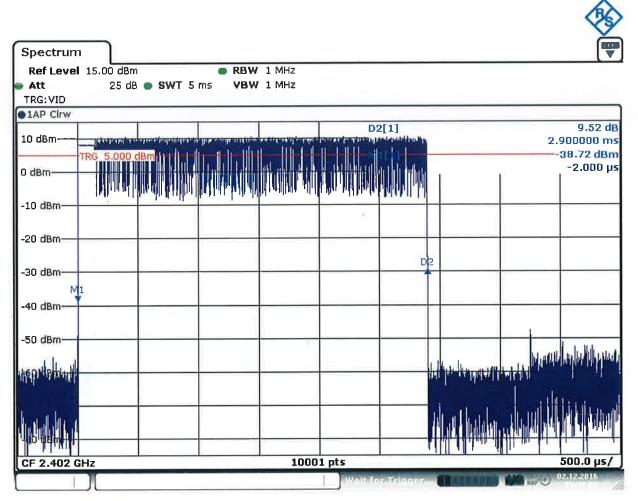


Average Time of Occupancy

§ 15.247(a)(1)(iii) 5.1(4)

Conducted Measurement - Mode: Bluetooth EDR

Rated output power: 14,45 mW 2402 MHz



Date: 2.DEC 2016 09:49:03

The dwell time is constant 2,9 ms.

LIMIT

SUBCLAUSE 15.247(a)(1)(iii) – 5.1(4)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Relative humidity: 21%

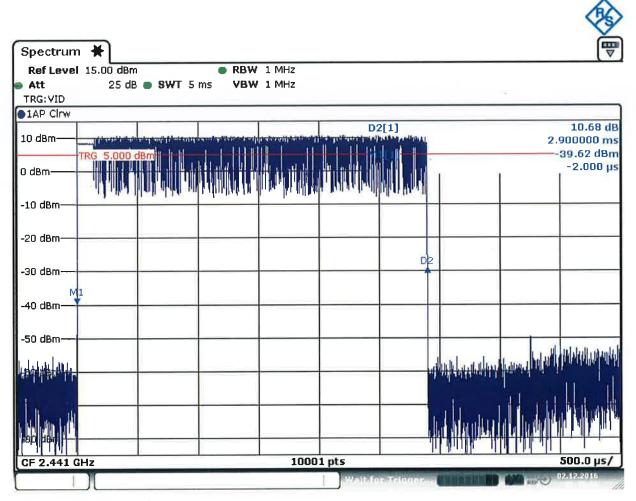


Average Time of Occupancy

§ 15.247(a)(1)(iii) 5.1(4)

Conducted Measurement - Mode: Bluetooth EDR

Rated output power: 14,45 mW 2441 MHz



Date: 2.DEC 2016 09:48:38

The dwell time is constant 2,9 ms.

LIMIT

SUBCLAUSE 15.247(a)(1)(iii) - 5.1(4)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Relative humidity: 21%

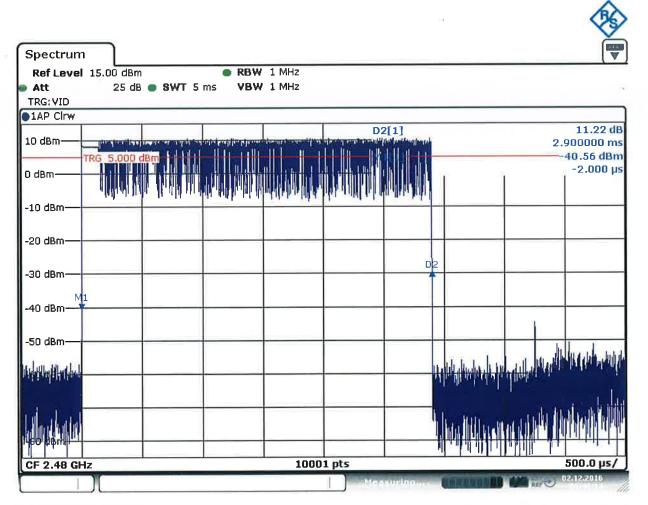


Average Time of Occupancy

§ 15.247(a)(1)(iii) 5.1(4)

Conducted Measurement - Mode: Bluetooth EDR

Rated output power: 14,45 mW 2480 MHz



Date: 2.DEC 2016 09:48:15

The dwell time is constant 2,9 ms.

LIMIT

SUBCLAUSE 15.247(a)(1)(iii) – 5.1(4)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Report Reference: M/FG-16/133

Ambient temperature: 23°C

Relative humidity: 21%



Average Time of Occupancy

§ 15.247(a)(1)(iii) 5.1(4)

Conducted Measurement - Mode: Bluetooth EDR

Rated output power: 14,45 mW

	Channel 0 (2402 MHz)	Channel 39 (2441 MHz)	Channel 78 (2480 MHz)
Observed time period	79 tir	mes 0,4 Seconds = 31,6 sec	conds
Time of each individual transmission	2,9 ms	2,9 ms	2,9 ms
Observed number of transmissions	103	128	96
Average time of occupancy	0,2987 seconds	0,3712 seconds	0,2784 seconds

LIMIT

SUBCLAUSE 15.247(a)(1)(iii) – **5.1(4)**

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Relative humidity: 21%

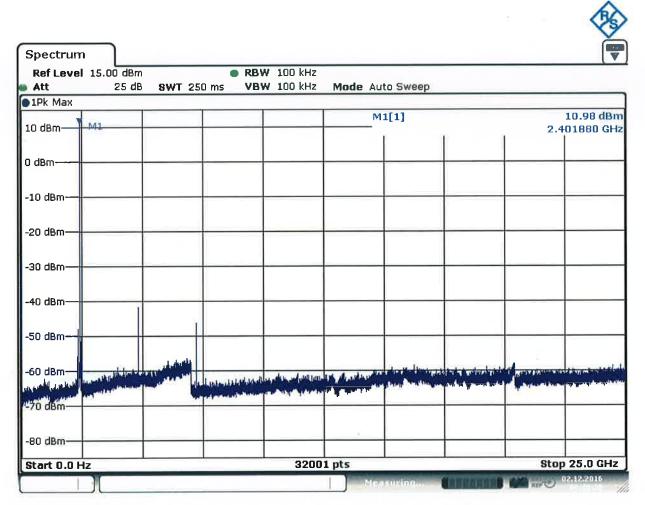


Out-of-band Emission

§ 15.247(d) 5.5

Measurement conducted with Peak-Detector:

Mode: Bluetooth BDR - Channel 0 - 2402 MHz



Date: 2.DEC 2016 08:40:29

LIMIT

SUBCLAUSE 15.247(d) - 5.5

In any 100 kHz bandwidth outside the frequency band in which the radio device is operating.

At least 20dB below the power in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Relative humidity: 21%

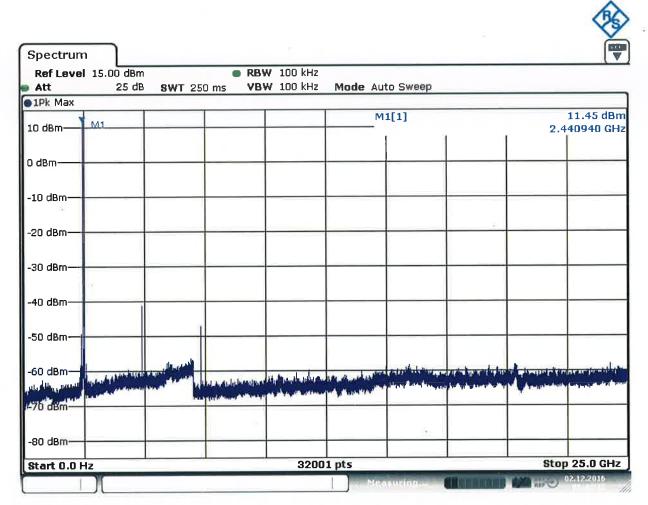


Out-of-band Emission

§ 15.247(d) 5.5

Measurement conducted with Peak-Detector:

Mode: Bluetooth BDR - Channel 39 - 2441 MHz



Date: 2.DEC 2016 08:42:13

LIMIT

SUBCLAUSE 15.247(d) - 5.5

In any 100 kHz bandwidth outside the frequency band in which the radio device is operating.

At least 20dB below the power in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Relative humidity: 21%

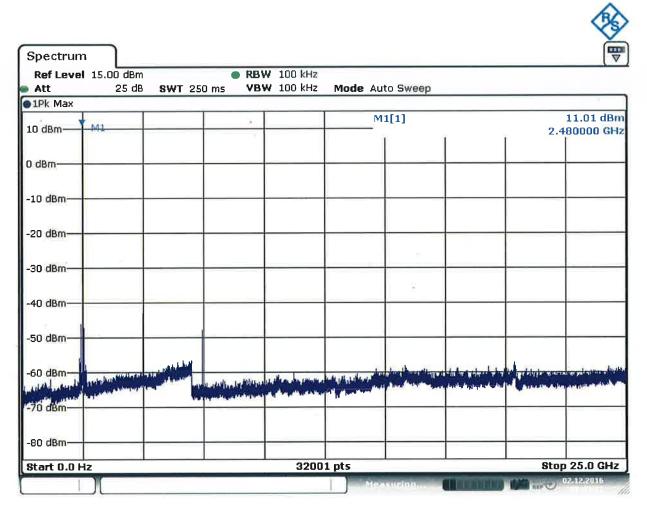


Out-of-band Emission

§ 15.247(d) 5.5

Measurement conducted with Peak-Detector:

Mode: Bluetooth BDR - Channel 78 - 2480 MHz



Date: 2.DEC 2016 08:43:12

LIMIT

SUBCLAUSE 15.247(d) - 5.5

		At least 20dB below the power in the 100 kHz bandwidth
١	which the radio device is operating.	within the band that contains the highest level of the
l		desired power.

Test Equipment used: EMV-205

19.12.2016

Relative humidity: 21%

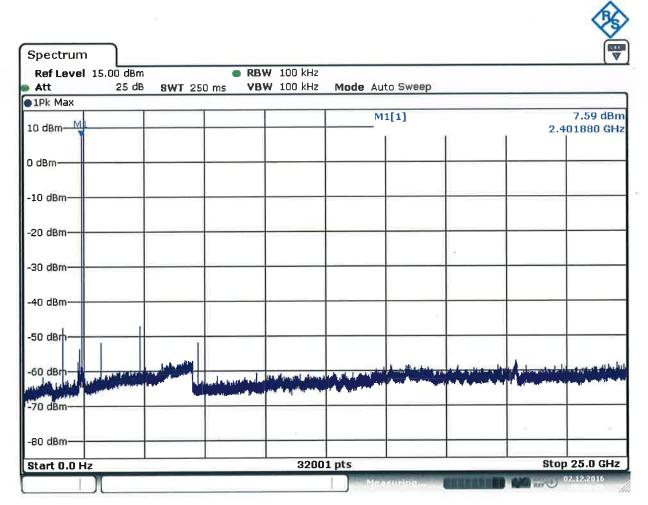


Out-of-band Emission

§ 15.247(d) 5.5

Measurement conducted with Peak-Detector:

Mode: Bluetooth EDR - Channel 0 - 2402 MHz



Date: 2.DEC 2016 08:50:17

LIMIT

SUBCLAUSE 15.247(d) - 5.5

In any 100 kHz bandwidth outside the frequency band in	At least 20dB below the power in the 100 kHz bandwidth
which the radio device is operating.	within the band that contains the highest level of the
	desired power.

Relative humidity: 21%

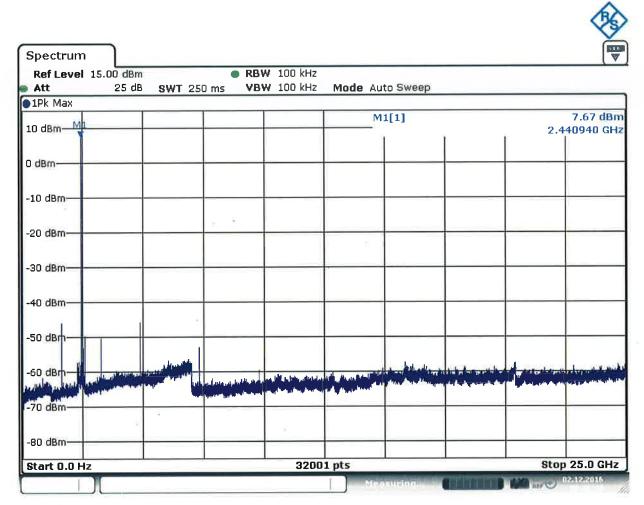


Out-of-band Emission

§ 15.247(d) 5.5

Measurement conducted with Peak-Detector:

Mode: Bluetooth EDR - Channel 39 - 2441 MHz



Date: 2.DEC 2016 08:48:45

LIMIT

SUBCLAUSE 15.247(d) - 5.5

In any 100 kHz bandwidth outside the frequency band in which the radio device is operating.	At least 20dB below the power in the 100 kHz bandwidth within the band that contains the highest level of the
Which the radio device is operating.	desired power.

Relative humidity: 21%

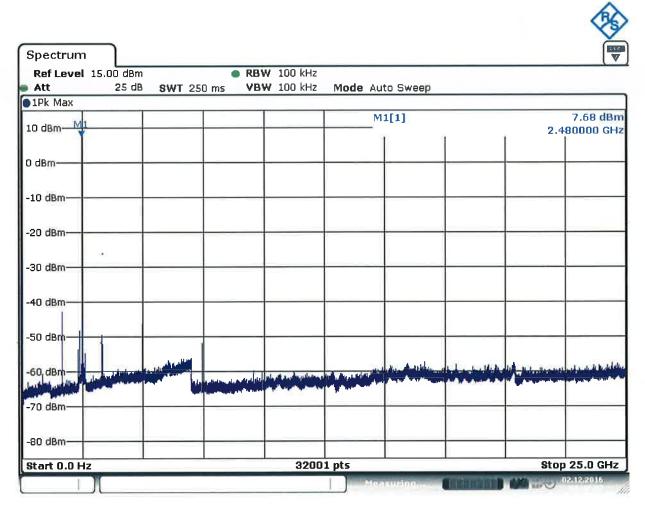


Out-of-band Emission

§ 15.247(d) 5.5

Measurement conducted with Peak-Detector:

Mode: Bluetooth EDR - Channel 78 - 2480 MHz



Date: 2.DEC 2016 08:47:13

LIMIT

SUBCLAUSE 15.247(d) - 5.5

In any 100 kHz bandwidth outside the frequency band in which the radio device is operating.	At least 20dB below the power in the 100 kHz bandwidth within the band that contains the highest level of the
	desired power.

Relative humidity: 21%

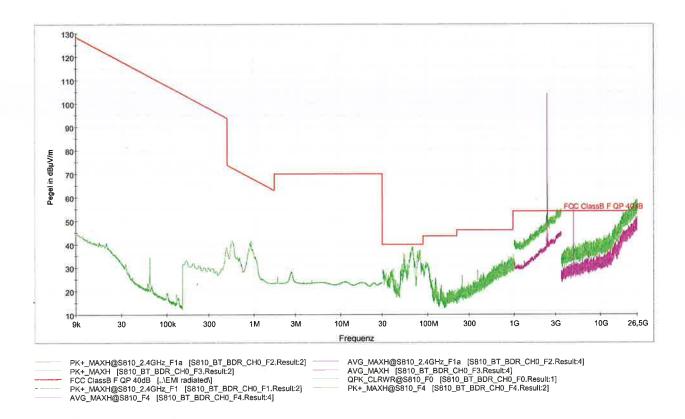


Emissions in restricted bands Emissions falling within restricted frequency bands

§ 15.209(a) RSS-Gen

Measurement radiated with Peak-Detector (green line) and Average detector (magenta line):

Mode: Bluetooth BDR - Channel 0 - 2402 MHz



Worst case emission: 31,5 dBµV/m @ 4808 MHz

Remark: An averaging factor of -24,7 dB was taken into account at the harmonics, assuming that a maximum of two transmissions can occur at one channel in 100ms (average time between transmissions on one channel >250ms).

LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-105; NT-122; NT-126; NT-416

Relative humidity: 21%

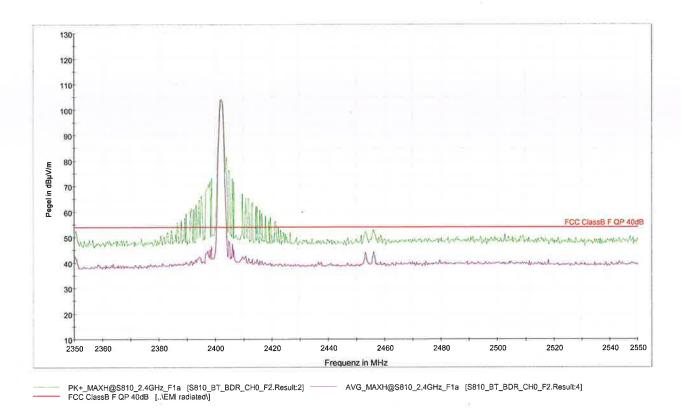


Emissions in restricted bands Emissions falling within restricted frequency bands

§ 15.209(a) RSS-Gen

Measurement with Peak-Detector (green line) and Average detector (magenta line): Band Edge requirement

Setup: Bluetooth BDR - CH 0: 2402 MHz



LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Band edges of the nearest restricted bands: 2390 MHz and 2483,5 MHz.

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-200

Relative humidity: 21%

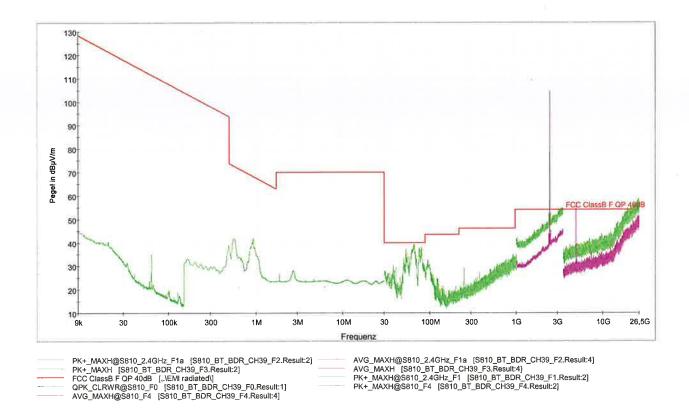


Emissions in restricted bands Emissions falling within restricted frequency bands

§ 15.209(a) RSS-Gen

Measurement radiated with Peak-Detector (green line) and Average detector (magenta line):

Mode: Bluetooth BDR - Channel 39 - 2441 MHz



Worst case emission: 31,8 dBµV/m @ 4882 MHz

Remark: An averaging factor of -24,7 dB was taken into account at the harmonics, assuming that a maximum of two transmissions can occur at one channel in 100ms (average time between transmissions on one channel >250ms).

LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200; EMV-205; NT-122; NT-126; NT-416

Relative humidity: 21%

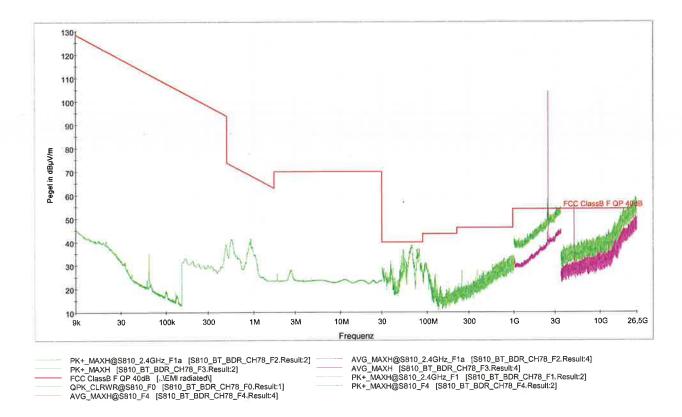
TUV AUSTRIA

Emissions in restricted bands
Emissions falling within restricted frequency bands

§ 15.209(a) RSS-Gen

Measurement radiated with Peak-Detector (green line) and Average detector (magenta line):

Mode: Bluetooth BDR - Channel 78 - 2480 MHz



Worst case emission: 31,0 dBµV/m @ 4960 MHz

Remark: An averaging factor of -24,7 dB was taken into account at the harmonics, assuming that a maximum of two transmissions can occur at one channel in 100ms (average time between transmissions on one channel >250ms).

LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-105; NT-122; NT-126; NT-416

Emissions in restricted bands
Emissions falling within restricted frequency bands

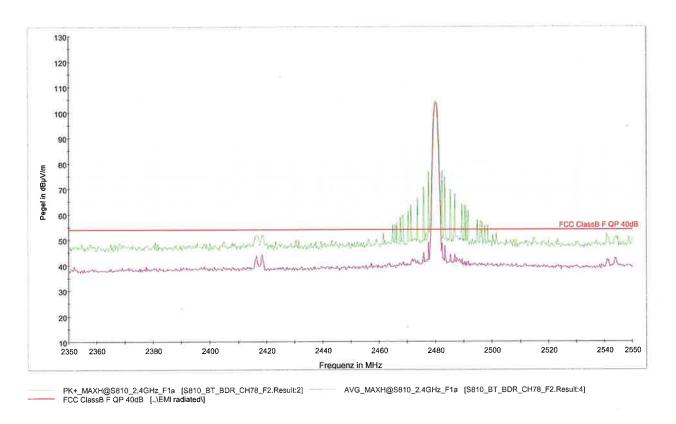
§ 15.209(a) RSS-Gen

Relative humidity: 21%



Measurement with Peak-Detector (green line) and Average detector (magenta line): Band Edge requirement

Setup: Bluetooth BDR - CH 78: 2480 MHz



LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Band edges of the nearest restricted bands: 2390 MHz and 2483,5 MHz.

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-200

Relative humidity: 21%

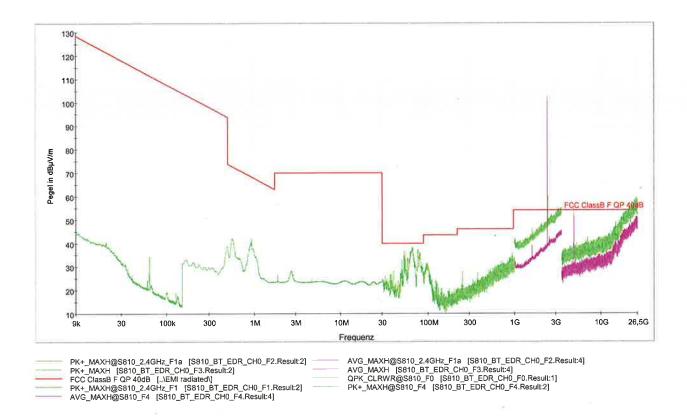


Emissions in restricted bands Emissions falling within restricted frequency bands

§ 15.209(a) RSS-Gen

Measurement radiated with Peak-Detector (green line) and Average detector (magenta line):

Mode: Bluetooth EDR - Channel 0 - 2402 MHz



Worst case emission: 26,5 dBµV/m @ 4808 MHz

Remark: An averaging factor of -24,7 dB was taken into account at the harmonics, assuming that a maximum of two transmissions can occur at one channel in 100ms (average time between transmissions on one channel >250ms).

LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200; EMV-205; NT-122; NT-126; NT-416

Relative humidity: 21%

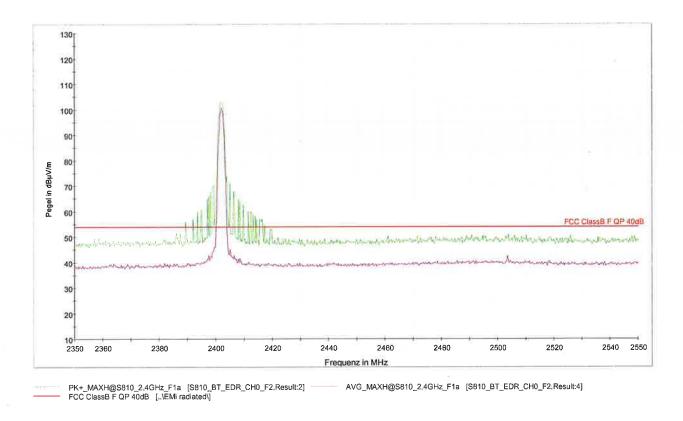
TUV AUSTRIA

Emissions in restricted bands
Emissions falling within restricted frequency bands

§ 15.209(a) RSS-Gen

Measurement with Peak-Detector (green line) and Average detector (magenta line): Band Edge requirement

Setup: Bluetooth EDR - CH 0: 2402 MHz



LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Band edges of the nearest restricted bands: 2390 MHz and 2483,5 MHz.

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-200

Relative humidity: 21%

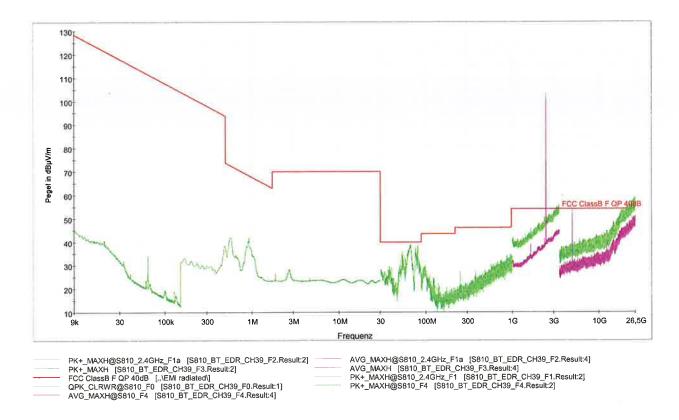


Emissions in restricted bands Emissions falling within restricted frequency bands

§ 15.209(a) RSS-Gen

Measurement radiated with Peak-Detector (green line) and Average detector (magenta line):

Mode: Bluetooth EDR - Channel 39 - 2441 MHz



Worst case emission: $28,2 \ dB\mu V/m \ @ 4882 \ MHz$ Remark: An averaging factor of -24,7 dB was taken into account at the harmonics, assuming that a maximum of two transmissions can occur at one channel in 100ms (average time between transmissions on one channel >250ms).

LIMIT

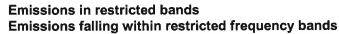
SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-114; EMV-200; EMV-205; NT-122; NT-126; NT-416

Relative humidity: 21%

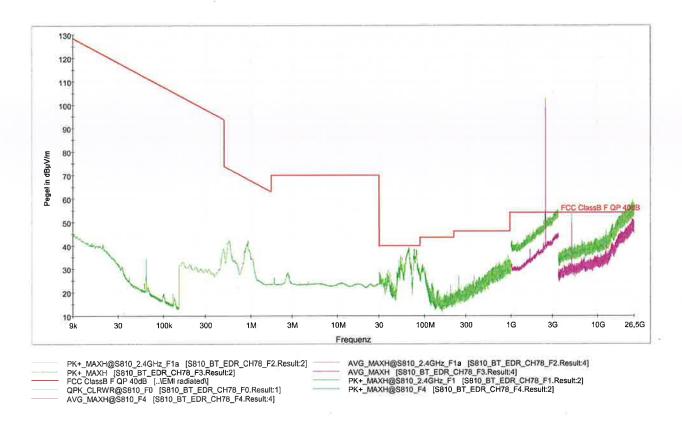
00(-)



§ 15.209(a) RSS-Gen

Measurement radiated with Peak-Detector (green line) and Average detector (magenta line):

Mode: Bluetooth EDR - Channel 78 - 2480 MHz



Worst case emission: 25,9 dBµV/m @ 4960 MHz

Remark: An averaging factor of -24,7 dB was taken into account at the harmonics, assuming that a maximum of two transmissions can occur at one channel in 100ms (average time between transmissions on one channel >250ms).

LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-111; EMV-112; EMV-200; EMV-205; NT-122; NT-126; NT-416

Emissions in restricted bands
Emissions falling within restricted frequency bands

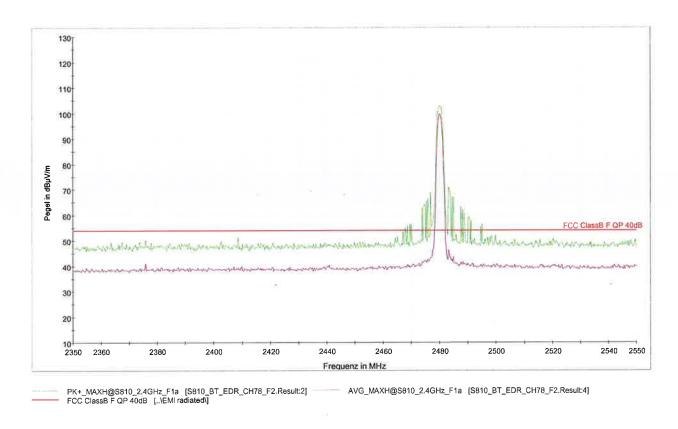
§ 15.209(a) RSS-Gen

Relative humidity: 21%



Measurement with Peak-Detector (green line) and Average detector (magenta line): Band Edge requirement

Setup: Bluetooth EDR - CH 78: 2480 MHz



LIMIT

SUBCLAUSE 15.209(a) - RSS-Gen

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Band edges of the nearest restricted bands: 2390 MHz and 2483,5 MHz.

Test Equipment used: EMV-100; EMV-101; EMV-102; EMV-103; EMV-105; EMV-110; EMV-200

Relative humidity: 21%

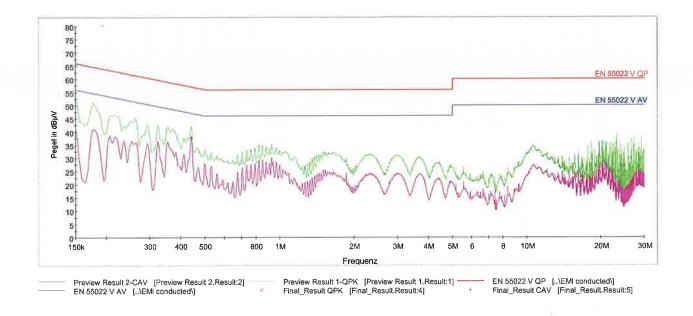


Conducted Limits

§ 15.207 RSS-Gen 8.8

Measurement with Peak-Detector (green line) and Average detector (magenta line):

Setup: Bluetooth BDR, Frequency hopping active



LIMIT

SUBCLAUSE 15.207(a) - RSS-Gen 8.8

		Conducted limit (dBµV)	
Frequency of emission (MHz)	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.

Test Equipment used: EMV-105; EMV-151; EMV-200; EMV-405

Relative humidity: 21%

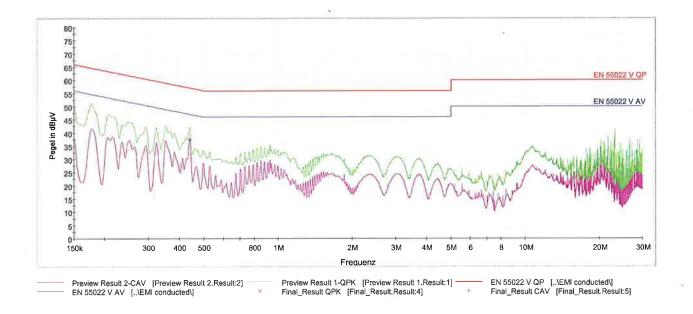


Conducted Limits

§ 15.207 RSS-Gen 8.8

Measurement with Peak-Detector (green line) and Average detector (magenta line):

Setup: Bluetooth EDR, Frequency hopping active



LIMIT

SUBCLAUSE 15.207(a) - RSS-Gen 8.8

	Conducted limit (dBµV)		
Frequency of emission (MHz)	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.

Test Equipment used: EMV-105; EMV-151; EMV-200; EMV-405

Test Report Reference: M/FG-16/133

Ambient temperature: 23°C

Relative humidity: 21%



Maximum permissible Exposure

§ 15.247(i)

This kind of radio equipment is categorically excluded from routine environmental evaluation.

Appendix 1 Test equipment used



Anechoic Chamber with 3m measurement distance	NT-100	Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-173
Stripline according to ISO 11452-5	NT-108	Spectrumanalyzer – FSP7 9 kHz – 7 GHz	NT-200
MA4000 - Antenna mast 1 - 4 m height	NT-110/1	ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
DS - Turntable 0 - 400 ° Azimuth	NT-111/1	ESI26 – Test receiver 20 Hz – 26,5 GHz	NT-207
CO3000 Controller Mast+Turntable	NT-112/1	Digital Radio Tester CTS55	NT-208
HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	Noise-gen., ITU-R 559-2 20 Hz – 20 kHz	NT-209
HFH-Z2 - Loop Antenna 9 kHz - 30 MHz	NT-122	CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
3121C - Dipole Antenna 28 - 1000 MHz	NT-124	Digital Radio Tester Aeroflex 3920	NT-212/1
3115 - Horn Antenna 1 - 18 GHz (immunity)	NT-125	Mixer M28HW 26,5 GHz - 40 GHz	NT-214
3116 - Horn Antenna 18 - 40 GHz	NT-126	RubiSource T&M Timing reference	NT-216
SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz	NT-127	Radiocommunicationanalyzer SWR 1180 MD	NT-217
AT-1080 - Log. Per. Antenna 80 - 1000 MHz	NT-128	Mixer M19HWD 40 GHz – 60 GHz	NT-218
HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	Mixer M12HWD 60 GHz – 90 GHz	NT-219
HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-130	DSO9104 Digital scope	NT-220/1
3146 - Log. Per. Antenna 200 – 1000 MHz	NT-131	TPS 2014 Digital scope	NT-222
VULB 9163 Trilog Antenna 30 – 3000 MHz	NT-131/1	Artificial Ear according to IEC 60318	NT-224
Loop Antenna H-Field	NT-132	1 kHz Sound calibrator	NT-225
Horn Antenna 500 MHz - 2900 MHz	NT-133	B10 - Harmonics and flicker analyzer	NT-232
Horn Antenna 500 MHz - 6000 MHz	NT-133/1	SRM-3000 Spectrumanalyzer	NT-233
Log. per. Antenna 800 MHz - 2500 MHz	NT-134	SRM-3006 Spectrumanalyzer	NT-233/1a
Log. per. Antenna 800 MHz - 2500 MHz	NT-135	E-field probe SRM 75 MHz – 3 GHz	NT-234
BiConiLog Antenna 26 MHz – 2000 MHz	NT-137	Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-d
Conical Dipol Antenna PCD8250	NT-138	Hall-Teslameter ETM-1	NT-241
HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	EFA-3 H-field- / E-field probe	NT-243
HZ-1 Antenna tripod	NT-150	Field Meter EMR-200 100 kHz – 3 GHz	NT-244
BN 1500 Antenna tripod	NT-151	E-field probe 100 kHz – 3 GHz	NT-245
Ant. tripod for EN61000-4-3 Model TP1000A	NT-156	H-field probe 300 kHz – 30 MHz	NT-246

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Department: FG

Test report number: M/FG-16/133

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Date: 19.12.20161

Checked by:

Appendix 1 (continued) Test equipment used



E-field probe 3 MHz – 18 GHz	NT-247	Oscillatory Wave Simulator incl. Coupling networks	NT- 328a+b+c
H-field probe 27 MHz – 1 GHz	NT-248	BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330
ELT-400 1 Hz – 400 kHz	NT-249	T82-50 RF-Amplifier 2 GHz – 8 GHz	NT-331
MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	500W1000M7 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332
FCC-203I EM Injection clamp	NT-251	AS0102-65R - RF-Amplifier 1 GHz - 2 GHz	NT-333
FCC-203I-DCN Ferrite decoupling network	NT-252	APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
PR50 Current Probe	NT-253	Preamplifier 1 GHz - 4 GHz	NT-335
i310s Current Probe	NT-254/1	Preamplifier for GPS MKU 152 A	NT-336
Fluke 87 V True RMS Multimeter	NT-260	Preamplifier 100 MHz – 23 GHz	NT-337
Model 2000 Digital Multimeter	NT-261	DC Block 10 MHz – 18 GHz Model 8048	NT-338
Fluke 87 V Digital Multimeter	NT-262/1	2-97201 Electronic load	NT-341
ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	VDS 200 Mobil-impuls-generator	NT-350
ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	LD 200 Mobil-impuls-generator	NT-351
 PHE 4500/B Power amplifier	NT-304	MPG 200 Mobil-Impuls-Generators	NT-352
EZ10 T-Artificial Network	NT-305	EFT 200 Mobil-impuls-generator	NT-353
SMG - Signal generator 0,1 - 1000 MHz	NT-310	AN 200 S1 Artificial Network	NT-354
SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1	FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1
RefRad Reference generator	NT-312	PHE 4500 - Mains impedance network	NT-401
SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	IP 6.2 Coupling filter for data lines (Surge)	NT-403
40 MHz Arbitrary Generator TGA1241	NT-315	TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409
Artificial mains network NSLK 8127-PLC	NT-316	ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
PEFT - Burst generator up to 4 kV	NT-320	IP 4 - Capacitive clamp (Burst)	NT-411
ESD 30 System up to 25 kV	NT-321	Highpass-Filter 100 MHz – 3 GHz	NT-412
PSURGE 4.1 Surge generator	NT-324	Highpass-Filter 600 MHz – 4 GHz	NT-413
IMU4000 Immunity test system	NT-325/1	Highpass-Filter 1250 MHz – 4 GHz	NT-414
VCS 500-M6 Surge-Generator	NT-326	Highpass-Filter 1800 MHz – 16 GHz	NT-415

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Department: FG

Test report number: M/FG-16/133

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Date: 19.12.2016/

Checked by:

Appendix 1 (continued) Test equipment used



				Division:
Highpass-Filter 3500 MHz – 18 GHz	NT-416	FCC-801-S25 Coupling decoupling network	NT-462	Industry & Energy
RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417	FCC-801-T4 Coupling decoupling network	NT-463	Department: FG
RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	FCC-801-C1 Coupling decoupling network	NT-464	Test report number: M/FG-16/133
RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	SW 9605 - Current probe 150 kHz – 30 MHz	NT-465/1	Page: 3 of 4
RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	95242-1 Current probe 1 MHz 400 MHz	NT-468	Date: 19.12.2016
RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471	Checked by:
RF-Attenuator 30 dB	NT-424	GA 1240 Power amplifier according to EN 61000-4-16	NT-480	
RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	Coupling networks according to EN 61000-4-16	NT-481 - NT-483	
RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	Van der Hoofden Test Head	NT-484	
RF-Attenuator 6 dB	NT-428	PC P4 3 GHz Test computer	NT-500	
RF-Attenuator 0 dB - 81 dB	NT-429	PC P4 1700 MHz Notebook	NT-505	
WRU 27 - Band blocking 27 MHz	NT-430	Monitoring camera with Monitor	NT-511	
WHJ450C9 AA - High pass 450 MHz	NT-431	ES-K1 Version 1.71 SP2 Test software	NT-520	
WHJ250C9 AA - High pass 250 MHz	NT-432	EMC32 Version 10.01 Test software	NT-520/1	
RF-Load 150 W	NT-433	SRM-TS Version 1.3 software for SRM-3000	NT-522	
Impedance transducer 1:4; 1:9; 1:16	NT-435	SRM-TS Version 1.3.1 software for SRM-3006	NT-522/1	
RF-Attenuator DC – 18 GHz 6 dB	NT-436	Spitzenberger und Spies Test software V4.1	NT-525	
RF-Attenuator DC – 18 GHz 6 dB	NT-437	Noise power test apparatus according to EN 55014	NT-530	
RF-Attenuator DC – 18 GHz 10 dB	NT-438	Vertical coupling plane (ESD)	NT-531	
RF-Attenuator DC – 18 GHz 20 dB	NT-439	Test cable #4 for EN 61000-4-6	NT-553	
I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	Test cable #3 for conducted emission	NT-554	
ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556	
Power Divider 6 dB/1 W/50 Ohm	NT-443	Test cable #8 Sucoflex 104EA	NT-559	
Directional coupler 0,1 MHz – 70 MHz	NT-444	Test cable #9 (for outdoor measurements)	NT-580	
Directional coupler 0,1 MHz – 70 MHz	NT-445	Test cable #10 (for outdoor measurements)	NT-581	
Tube imitations according to EN 55015	NT-450	Test cable #13 Sucoflex 104PE	NT-584	
FCC-801-M3-16A Coupling decoupling network	NT-458	Test cable #21 for SRM-3000	NT-592	
FCC-801-M2-50A Coupling decoupling network	NT-459	Shield chamber	NT-600	
FCC-801-M5-25 Coupling decoupling network	NT-460	Climatic chamber	M-1200	
FCC-801-AF10 Coupling decoupling network	NT-461			

Appendix 1 (continued) Test equipment used



Anechoic Chamber 3 m / 5 m measuring distance	EMV-100	Log.per Antenna 80-2700 MHz STLP 9128 E special	EMV-304	Division: Industry & Energy
Turntabel	EMV-101	Log.per Antenna 0,7 – 9 GHz STLP9149	EMV-305	Department: FG
6 m diameter Antenna mast	EMV-102	Load Dump Generator LD 200N	EMV-350	Test report number:
1 – 4 m Mast and Turntable controller	EMV-103	Ultra Compact Symulator UCS 200N100	EMV-351	M/FG-16/133
FC-06 EMC Video/Audiosystem	EMV-104	Automotive Power fail module PFM 200N100.1	EMV-352	Page: 4 of 4 Date: 19.12.2016
EMC Software	EMV-105	Voltage Drop Symulator VDS 200Q100	EMV-353	Checked by:
EMC32 Version 10.01 Hornantenna 1 – 18 GHz	EMV-110	Arb. Generator AutoWave	EMV-354	7
	EMV-111	Ultra Compact Symulator UCS 500N7	EMV-355	
	EMV-112	Coupling decoupling network CNI 503B7 / 32 A	EMV-356	
VULB9163 Monopol 9 kHz – 30 MHz	EMV-113	Coupling decoupling network CNI 503B7 / 63 A	EMV-357	
	EMV-114	Telecom Surge Generator TSurge 7	EMV-358	
BBV 9721 DC Artificial Network	EMV-150	Coupling decoupling network CNI 508N2	EMV-359	
	EMV-151	Coupling decoupling network CNV 504N2.2	EMV-360	
NNLK 8121 RC EMI Receiver	EMV-200	Immunity generator NSG4060/NSG4060-1	EMV-361	
	EMV-201	Coupling network CDND M316-2	EMV-362	
	EMV-202	Coupling network CT419-5	EMV-363	
B-88 DC Power supply	EMV-203	ESD Generator NSG 437	EMV-364	
N5745A DC Power supply	EMV-204	Pulse Limiter VTSD 9561-F BNC	EMV-405	
N5745A Spektrum Analyzator FSV40	EMV-205	Transient emission BSM200N40+BS200N100	EMV- 450+451	
Thd Multimeter	EMV-206	Cap. Coupling Clamp HFK	EMV-455	
•	EMV- 207/abc	Mag. Field System MS100N+MC26100+MC2630	EMV- 456-458	
PAS15000 Inrush Current Source	EMV- 208/abc	Coupling network CDN M2-100A	EMV-459	
	EMV-209	Coupling network CDN M3-32A	EMV-460	
Sycore Harmonics/Flicker analyzer ARS 16/3	EMV-210	Coupling network CDN M5-100A	EMV-461	
HF- Ampflifier 9 kHz-250 MHz	EMV-300	Current Clamp CIP 9136A	EMV-462	
•	EMV-301	DC Artificial Network HV-AN 150	EMV- 464+465	
•	EMV-302	Coupling Clamp EM 101	EMV-466	
	EMV-303	Decoupling Clamp FTC 101	EMV-467	
VHBD 9134		Power attenuator DG 250 W 6 GHz 6 dB	EMV-469	