

EMI – TEST REPORT

- FCC Part 15.225, RSS210 B.6 -

Type / Model Name : VIB 5.200

Product Description : Vibration meter

Applicant : PRÜFTECHNIK Condition Monitoring GmbH

Address : Oskar-Messter-Straße 19-21

85737 ISMANING, GERMANY

Manufacturer : PRÜFTECHNIK Condition Monitoring GmbH

Address : Oskar-Messter-Straße 19-21

85737 ISMANING, GERMANY

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

POSITIVE

Test Report No. : **T42136-02-06GK**

20. February 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 (December, 2017)

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (December, 2017)

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 15.225 Operation within the band 13.110 - 14.010 MHz

Part 15, Subpart C, Section 15.215 Additional provisions to the general radiated
Emission limitations

RSS-Gen Issue 4, Nov 2014

General Requirements and Information for the Certification of Radio
Apparatus

RSS-210 Issue 9, Aug 2016

Licence-exempt Radio Apparatus (All Frequency Bands): Category I
Equipment

ANSI C63.10: 2013

Testing Unlicensed Wireless Devices

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT please see ATTACHMENT A

2.2 Equipment category

RFID device; operating frequency 13.56MHz

2.3 Short description of the equipment under test (EUT)

The EUT is a vibration meter with four integrated radio technologies (NFC, Bluetooth, Bluetooth low energy and WLAN).

Number of tested samples : 1
Serial number : 5200 0121
Firmware version : 0.87

EUT configuration:

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

2.4 Operation frequency

The operating frequency is 13.56MHz.

2.5 Antenna

Integrated antenna.

EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- continuous TAG reading/writing @ 13.56MHz

2.6 Power supply system utilised

The extreme voltage for the transmitter (battery powered) is:

☒ V _{nom} :	7.2 V
☒ V _{min} :	5.9 V (lower end-point)
☒ V _{max} :	8.2 V (fully charged)

Mains adaptor:

Power supply voltage : 100 V – 240 V AC / 50 Hz – 60 Hz (output 12 V DC)

2.7 Peripheral devices and interface cables

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

- None _____ Model : _____

3 SUMMARY

3.1 Test results

FCC Rule Part	RSS Rule Part	Description	Result
15.207	RSS Gen, 8.8	AC power line conducted emissions	passed
15.225	RSS-210, B.6	Field strength of fundamental	passed
15.209	RSS Gen, 8.9	Spurious emissions	passed
15.225	RSS-210, B.6	Frequency tolerance	passed
15.215	RSS-Gen, 6.6	Occupied bandwidth	passed
15.225	RSS-210, B.6	Transmitter spectrum mask	passed

3.2 General Remarks

None

3.3 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 : 21 November 2017

Testing concluded on : 14 December 2017

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Hermann Smetana
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 Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	$\pm 3.29 \text{ dB}$
20 dB Bandwidth	Center frequency of EuT	95%	$\pm 2.5 \times 10^{-7}$
99% Occupied Bandwidth	Center frequency of EuT	95%	$\pm 2.5 \times 10^{-7}$
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	$\pm 3.53 \text{ dB}$
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	$\pm 3.71 \text{ dB}$
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	$\pm 2.34 \text{ dB}$
Peak conducted output power	Center frequency of EuT	95%	$\pm 3.53 \text{ dB}$
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	$\pm 2.15 \text{ dB}$

4.4 Measurement protocol for FCC and IC

4.4.1 General information

4.4.1.1 Test methodology

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

The Open Area test sites are listed Open Sites under the Canadian Test-Sites File-No:

IC 3009A-1 (OATS1)

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

IC 3009A-2

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

4.4.1.2 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 Details of test procedures

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

5 TEST CONDITIONS AND RESULTS

5.1 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

Please see Attachment B

5.1.3 Applicable standard

FCC Part 15, Section 15.207 and RSS-Gen 8.8

5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz
Min. limit margin 3.53 dB at 0.1905 MHz

Limit according to FCC Part 15, Section 15.207(a) and RSS-Gen 8.8 Table 3:

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

* Decreases with the logarithm of the frequency

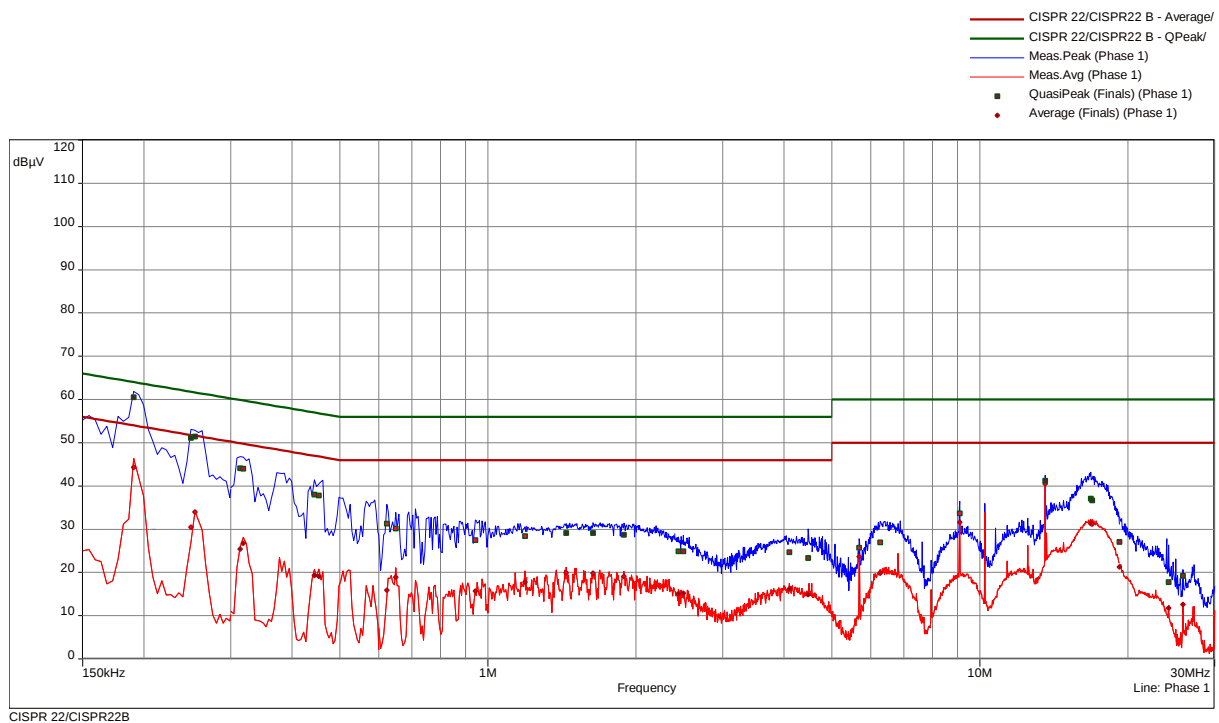
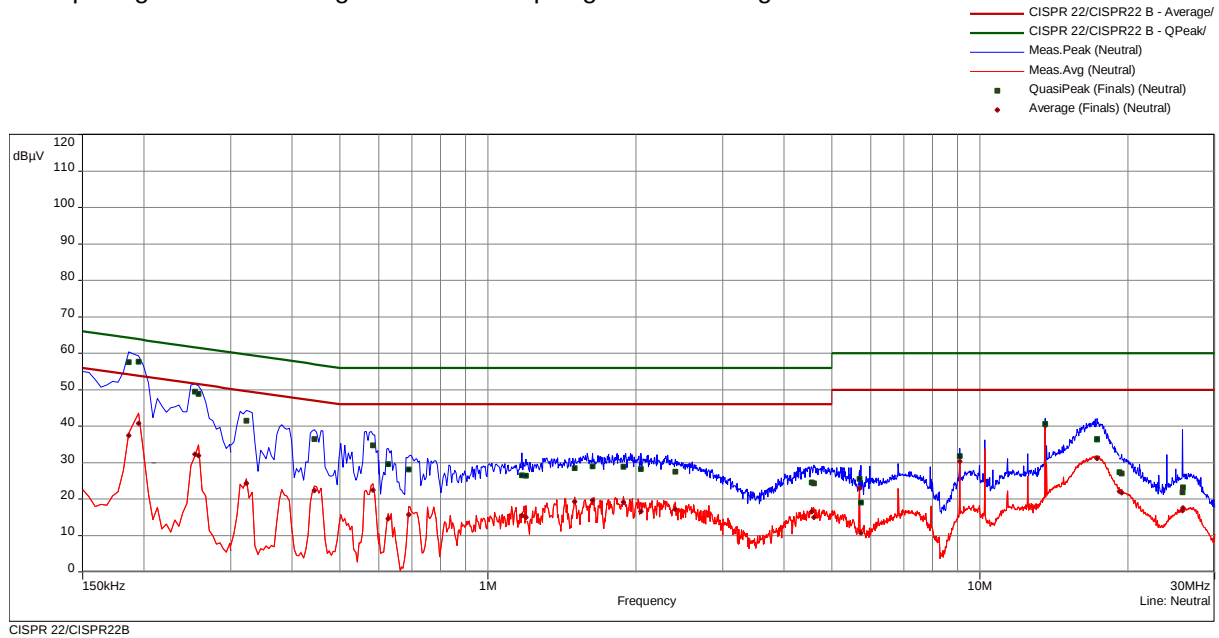
The requirements are **FULFILLED**.

Remarks: Test was performed on the AC input of the used AC/DC power supply

5.1.5 Test protocol

Operation mode: continous TAG reading/writing @ 13.56MHz

Note: To get the worst case for this measurement all other radio technologies were active and a connected USB stick was in polling mode. The integrated stroboscope light was blinking.



freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
0.1905	1	60.49	3.53	64.01	44.31	9.70	54.01	Phase 1
0.249	1	51.10	10.69	61.79	30.45	21.34	51.79	Phase 1
0.2535	1	51.46	10.18	61.64	33.94	17.70	51.64	Phase 1
0.3135	2	44.08	15.80	59.88	25.46	24.42	49.88	Phase 1
0.318	2	43.97	15.78	59.76	26.75	23.01	49.76	Phase 1
0.444	2	38.01	18.97	56.99	19.37	27.62	46.99	Phase 1
0.453	2	37.85	18.97	56.82	19.09	27.73	46.82	Phase 1
0.6225	3	31.32	24.68	56.00	15.94	30.06	46.00	Phase 1
0.6495	3	30.17	25.83	56.00	18.94	27.06	46.00	Phase 1
0.942	3	27.50	28.50	56.00	15.69	30.31	46.00	Phase 1
1.1895	3	28.45	27.55	56.00	17.79	28.21	46.00	Phase 1
1.443	4	29.13	26.87	56.00	19.97	26.03	46.00	Phase 1
1.6365	4	29.10	26.90	56.00	19.82	26.18	46.00	Phase 1
1.8885	4	28.76	27.24	56.00	19.12	26.88	46.00	Phase 1
2.4405	5	24.93	31.07	56.00	15.13	30.87	46.00	Phase 1
2.4945	5	24.92	31.08	56.00	15.20	30.80	46.00	Phase 1
4.0965	5	24.72	31.28	56.00	16.18	29.82	46.00	Phase 1
4.4745	5	23.34	32.66	56.00	14.89	31.11	46.00	Phase 1
5.682	6	25.69	34.31	60.00	23.65	26.35	50.00	Phase 1
6.2715	6	26.99	33.01	60.00	19.80	30.20	50.00	Phase 1
9.093	6	33.63	26.37	60.00	31.65	18.35	50.00	Phase 1
13.56	7	41.25	18.75	60.00	40.51	9.49	50.00	Phase 1
16.818	7	37.03	22.97	60.00	31.28	18.72	50.00	Phase 1
16.899	7	36.70	23.30	60.00	31.18	18.82	50.00	Phase 1
19.209	8	27.06	32.94	60.00	21.24	28.76	50.00	Phase 1
24.159	8	17.74	42.26	60.00	11.78	38.22	50.00	Phase 1
25.8375	8	19.24	40.76	60.00	12.64	37.36	50.00	Phase 1
0.186	9	57.58	6.63	64.21	37.48	16.73	54.21	Neutral
0.195	9	57.73	6.09	63.82	40.70	13.12	53.82	Neutral
0.2535	9	49.48	12.16	61.64	32.26	19.38	51.64	Neutral
0.258	9	48.84	12.65	61.50	31.96	19.53	51.50	Neutral
0.3225	10	41.47	18.17	59.64	24.34	25.30	49.64	Neutral
0.444	10	36.42	20.57	56.99	22.32	24.66	46.99	Neutral
0.5835	10	34.69	21.31	56.00	22.44	23.56	46.00	Neutral
0.627	11	29.59	26.41	56.00	14.61	31.39	46.00	Neutral
0.69	11	28.07	27.93	56.00	15.71	30.29	46.00	Neutral
1.1715	11	26.50	29.50	56.00	15.48	30.52	46.00	Neutral
1.194	11	26.36	29.64	56.00	15.03	30.97	46.00	Neutral
1.5015	12	28.53	27.47	56.00	19.23	26.77	46.00	Neutral
1.632	12	28.98	27.02	56.00	19.59	26.41	46.00	Neutral
1.884	12	28.82	27.18	56.00	19.10	26.90	46.00	Neutral
2.046	12	28.28	27.72	56.00	16.52	29.48	46.00	Neutral
2.4045	13	27.46	28.54	56.00	17.17	28.83	46.00	Neutral

FCC ID: CHOVSC2
IC: 10238A-VSC2

4.551	13	24.57	31.43	56.00	16.51	29.49	46.00	Neutral
4.596	13	24.33	31.67	56.00	14.96	31.04	46.00	Neutral
5.6865	14	25.49	34.51	60.00	22.99	27.01	50.00	Neutral
5.7225	14	18.98	41.02	60.00	10.70	39.30	50.00	Neutral
9.0975	14	31.73	28.27	60.00	30.29	19.71	50.00	Neutral
13.56	15	40.67	19.33	60.00	40.09	9.91	50.00	Neutral
17.313	15	36.37	23.63	60.00	31.12	18.88	50.00	Neutral
17.3175	15	36.45	23.55	60.00	31.19	18.81	50.00	Neutral
19.209	16	27.41	32.59	60.00	22.10	27.90	50.00	Neutral
19.4295	16	26.97	33.03	60.00	21.69	28.31	50.00	Neutral
25.833	16	21.82	38.18	60.00	16.85	33.15	50.00	Neutral
25.8375	16	23.14	36.86	60.00	17.54	32.46	50.00	Neutral

5.2 Field strength of fundamental

For test instruments and accessories used see section 6 Part CPR 1.

5.2.1 Description of the test location

Test location: OATS 1
Test distance: 3 m

5.2.2 Photo documentation of the test set-up

Please see Attachment B

5.2.1 Applicable standard

FCC Part 15, Section 15.225 and RSS-210 B.6

5.2.2 Test result

Measurement result at 3m measurement distance

Frequency (MHz)	Level (dB μ V)	Corr. factor (dB)	Corr. Level dB(μ V/m)
13.56	38.8	20.5	59.3

Extrapolated values to a distance of 30m

Frequency (MHz)	Level (dB μ V)	Corr. factor (dB)	Corr. Level dB(μ V/m)	Limit dB(μ V/m)	Margin (dB)
13.56	-1.2	20.5	19.3	84	64.7

Limit according to FCC Part 15, Section 15.225(a) and RSS-210 B.6(a):

Frequency (MHz)	Field strength of fundamental wave		Measurement distance
	(μ V/m)	dB(μ V/m)	(metres)
13.553 - 13.567	15848	84	30

The requirements are **FULFILLED**.

Remarks: none

5.3 Spurious emissions

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

5.3.1 Description of the test location

Test location: OATS 1

Test location: Anechoic chamber 1

Test distance: 3 m

5.3.2 Photo documentation of the test set-up

Please see Attachment B

5.3.3 Applicable standard

FCC Part 15, Section 15.209 and RSS-Gen 8.9

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 – 4 GHz	RBW:	1 MHz

5.3.1 Test result $f < 30$ MHz

Note: In the frequency range 9 kHz to 30 MHz the measurement results from 3m distance are extrapolated (D factor) to the specified distance.

Frequency (MHz)	Reading level QP (dB μ V) @ 3m	D-factor (dB)	Extrapolated level QP (dB μ V) @ specified distance	Correction factor (dB/m)	Corrected level QP dB(μ V/m)	Limit dB(μ V/m)	Margin (dB)
27.12	2.7	40	-37.3	20.5	-16.8	29.5	46.3

5.3.2 Test result 30 MHz < f < 1 GHz

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
40.68	12.9	1.0	12.2	12.2	25.1	13.2	40.0	-14.9
54.24	3.7	-1.2	12.6	12.6	16.3	11.4	40.0	-23.7
67.80	6.8	8.1	10.2	10.2	17.0	18.3	40.0	-21.7
81.36	10.8	4.8	8.8	8.8	19.6	13.6	40.0	-20.4
108.48	1.5	5.0	12.7	12.7	14.2	17.7	43.5	-25.8
122.04	6.2	3.2	10.9	10.9	17.1	14.1	43.5	-26.4
135.60	0.9	0.8	9.8	9.8	10.7	10.6	43.5	-32.8

Note: The correction factor includes cable loss and antenna factor.

Limit according to FCC Part 15, Section 15.209(a) and RSS-Gen 8.9 Tables 4 and 5:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance
	(µV/m)	dB(µV/m)	(metres)
0.009 - 0.490	2400/F(kHz)	--	300
0.490 - 1.705	24000/F (kHz)	--	30
1.705 - 30.0	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

The requirements are **FULFILLED**.

Remarks:

5.4 Frequency tolerance

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

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up

Please see Attachment B

5.4.3 Applicable standard

FCC Part 15, Section 15.225 and RSS-210 B.6

5.4.4 Test result

Test conditions		Test result
		Frequency (MHz)
$T_{min} (-20)^{\circ}C$	$V_{max} (8.2 V)$	13.559602
$T (-10)^{\circ}C$	$V_{max} (8.2 V)$	13.559600
$T (0)^{\circ}C$	$V_{max} (8.2 V)$	13.559576
$T (10)^{\circ}C$	$V_{max} (8.2 V)$	13.559537
$T_{nom} (20)^{\circ}C$	$V_{min} (5.9 V)$	13.559497
	$V_{nom} (7.2 V)$	13.559497
	$V_{max} (8.2 V)$	13.559497
$T (30)^{\circ}C$	$V_{max} (8.2 V)$	13.559463
$T (40)^{\circ}C$	$V_{max} (8.2 V)$	13.559439
$T_{max} (50)^{\circ}C$	$V_{max} (8.2 V)$	13.559436
Measurement uncertainty		$\pm 10 \text{ Hz}$

Carrier frequency: $f_c = 13.56 \text{ MHz}$
 Max. tolerance: $\pm 0.01 \% \text{ of } 13.56 \text{ MHz} = \pm 1.356 \text{ kHz}$

Highest frequency: $f_h = 13.559602 \text{ MHz}$
 Lowest frequency: $f_l = 13.559436 \text{ MHz}$

Negative tolerance: $f_l - f_c = -0.564 \text{ kHz} < - 1.356 \text{ kHz}$
 Positive tolerance: $f_h - f_c = 0.398 \text{ kHz} < + 1.356 \text{ kHz}$

Limit according to FCC Part 15, Section 15.225(e) and RSS-210 B.6
 Carrier frequency stability shall be maintained to $\pm 0.01\%$ ($\pm 100 \text{ ppm}$).

Remarks:

5.5 Occupied Bandwidth

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

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up

Please see Attachment B

5.5.3 Applicable standard

FCC Part 15, Section 15.215 and RSS-Gen, 6.6

5.5.4 Test result

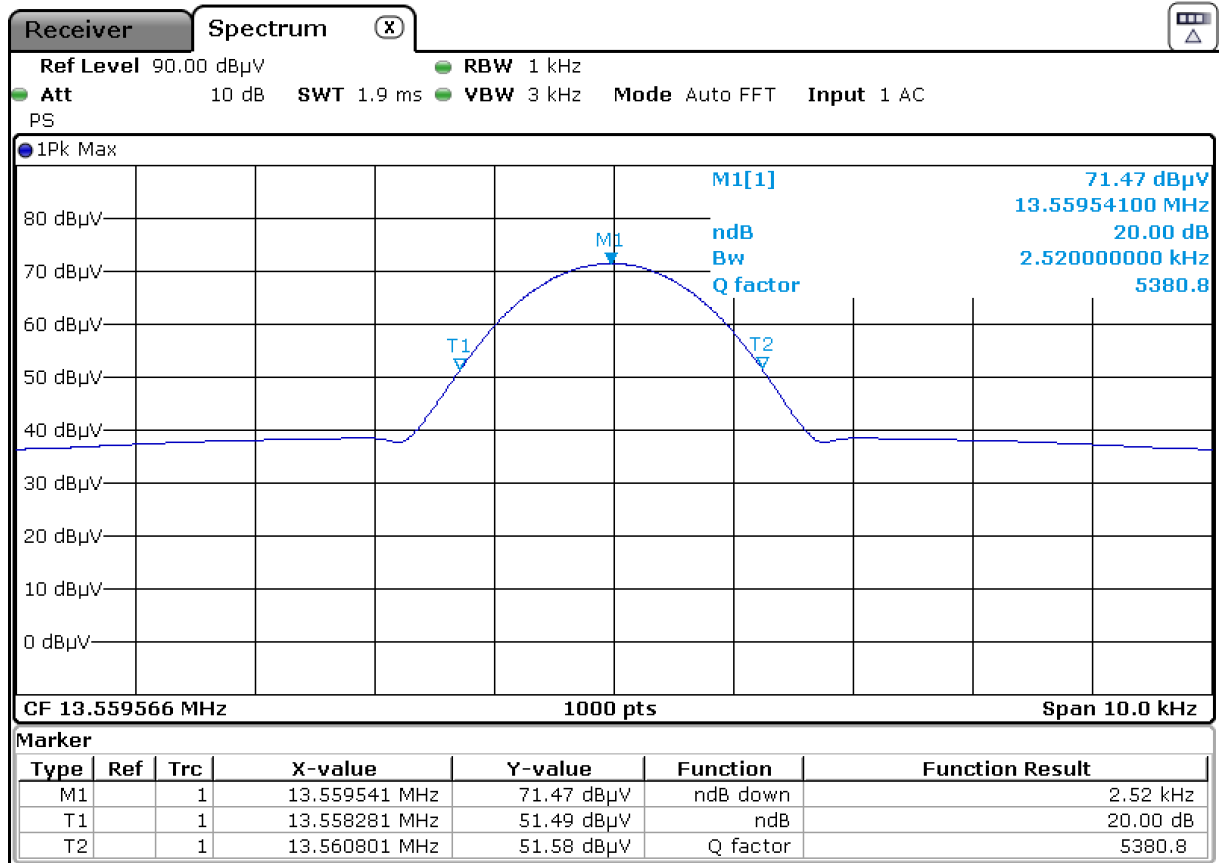
Measured Bandwidth	result (kHz)	Limit (kHz)
20dB	2.52	--
99%	2.24	--

The requirements are **FULFILLED**.

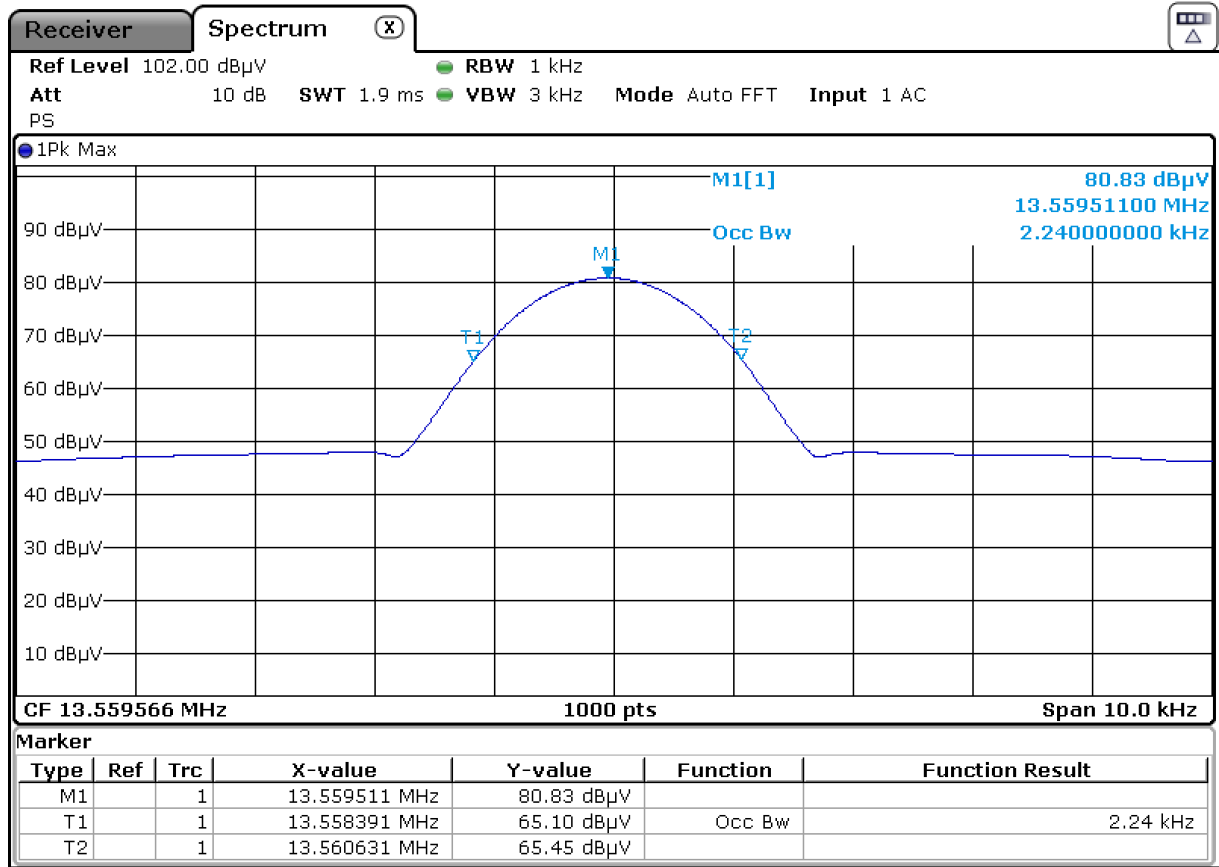
Remarks:

5.5.5 Test protocols

20 dB bandwidth



OBW 99%



5.6 Transmitter spectrum mask

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

5.6.1 Description of the test location

Test location: AREA4

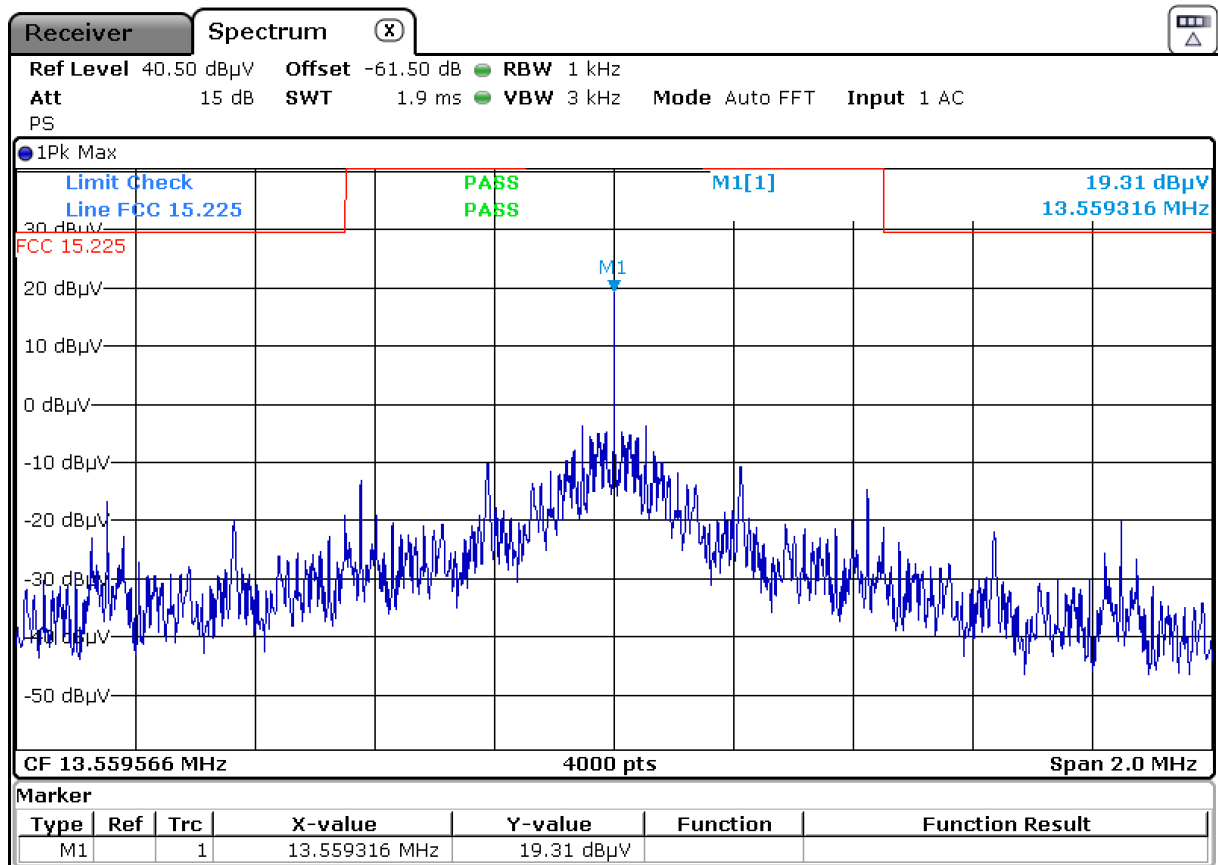
5.6.2 Photo documentation of the test set-up

Please see Attachment B

5.6.3 Applicable standard

FCC Part 15, Section 15.225 and RSS-210 B.6

5.6.4 Test result



Limit according to FCC Part 15, Section 15.225(a) and RSS-210 B.6:

Frequency band (MHz)	Emission level limit at 30 m ($\mu\text{V/m}$)	Emission level limit at 30 m (dB $\mu\text{V/m}$)
13.110 – 13.410	106	40.5
13.410 - 13.553	334	50.5
13.553 - 13.567	15,848	84.0
13.567 – 13.710	334	50.5
13.710 – 14.010	106	40.5
outside of 13.110 – 14.010	30	29.5

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.
A 4	BAT-EMC 3.16.0.73	01-02/68-13-001				
	ESCI	02-02/03-15-001	31/05/2018	31/05/2017		
	ESH 2 - Z 5	02-02/20-05-004	25/10/2019	25/10/2017	25/04/2018	25/10/2017
	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	06/05/2018	06/11/2017
	SP 103 /3.5-60	02-02/50-05-182				
CPR 1	ESCI 7	01-02/03-11-001	27/03/2018	27/03/2017		
	HFH 2 - Z 2	02-02/24-15-001	23/03/2018	23/03/2017	23/09/2017	23/03/2017
	INA 265 A / CAS 3025	02-02/50-05-028	20/04/2018	20/04/2017		
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
FE	ESR 7	02-02/03-17-001	25/07/2018	25/07/2017		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
	WK-340/40	02-02/45-05-001	13/04/2018	13/04/2017		
	6543A	02-02/50-05-157				
MB	ESR 7	02-02/03-17-001	25/07/2018	25/07/2017		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
SER 1	ESCI 7	01-02/03-11-001	27/03/2018	27/03/2017		
	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 7	01-02/03-11-001	27/03/2018	27/03/2017		
	VULB 9168	02-02/24-05-005	12/04/2018	12/04/2017	28/03/2018	28/09/2017
	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				