

FCC ID: NDX-WALKBY

EMI - TEST REPORT

- FCC Part 15.209 -

Test Report No. :	T36972-00-00HU	06. August 2013 Date of issue
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Type / Model Name : WALK BY

Product Description : Stationary RFID Reader

Applicant : Datamars S.A.

Address : Via ai Prati

CH – 6930 BEDANO

Manufacturer : Datamars S.A.

Address : Via ai Prati

CH – 6930 BEDANO

Licence holder : Datamars S.A.

Address : Via ai Prati

CH – 6930 BEDANO

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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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 (October, 2012)

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 (October, 2012)

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 15.209	Radiated emission limits, general requirements

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
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ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
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CISPR 16-4-2: 2003	Uncertainty in EMC measurement
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2 SUMMARY

GENERAL REMARKS:

The carrier frequency is 134.2 kHz

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 : 20. June 2013

Testing concluded on : 17. July 2013

Checked by:

Tested by:

Eduard Stangl
Dipl.-Ing.(FH)
Technical Director

Huber Markus

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3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see Attachment A

3.2 Power supply system utilised

Power supply voltage: : AC: 115 V / 60 Hz
DC: 12 to 14 V / DC

3.3 Short description of the Equipment under Test (EUT)

The EUT is a RFID Universal Scanning Station for animal identification.

Number of tested samples: 1
Serial number: Beta 006

EUT operation mode:

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

- Tx mode at 134.2 kHz
- Accu charging mode
- Bluetooth active (open connection)

EUT configuration:

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

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

- USB 2.0 Cable A-B, m-m, 2.0 Model : Supplied by manufacturer
- Power line DC cable Model : Supplied by manufacturer
- Serial cable RS 232 for ext. display Model : Supplied by manufacturer
- Model :
- Model :
- Model :
- customer specific cables
- External power supply cable: Eupen IMU 03 (2 x 0.8 mH, 100 nF)
- Marking of the cable: LL76227 AWM II A/B 60 °C 300V FT1 EUPEN E137991 AWM STYLE 207040 3G1 mm2 (ICC COLOURS) VW-1 GNLM 05 VDE-REG.NR. 11359372

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
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. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners 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 diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement Protocol for FCC, VCCI and AUSTEL

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 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.

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.

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5 TEST CONDITIONS AND RESULTS

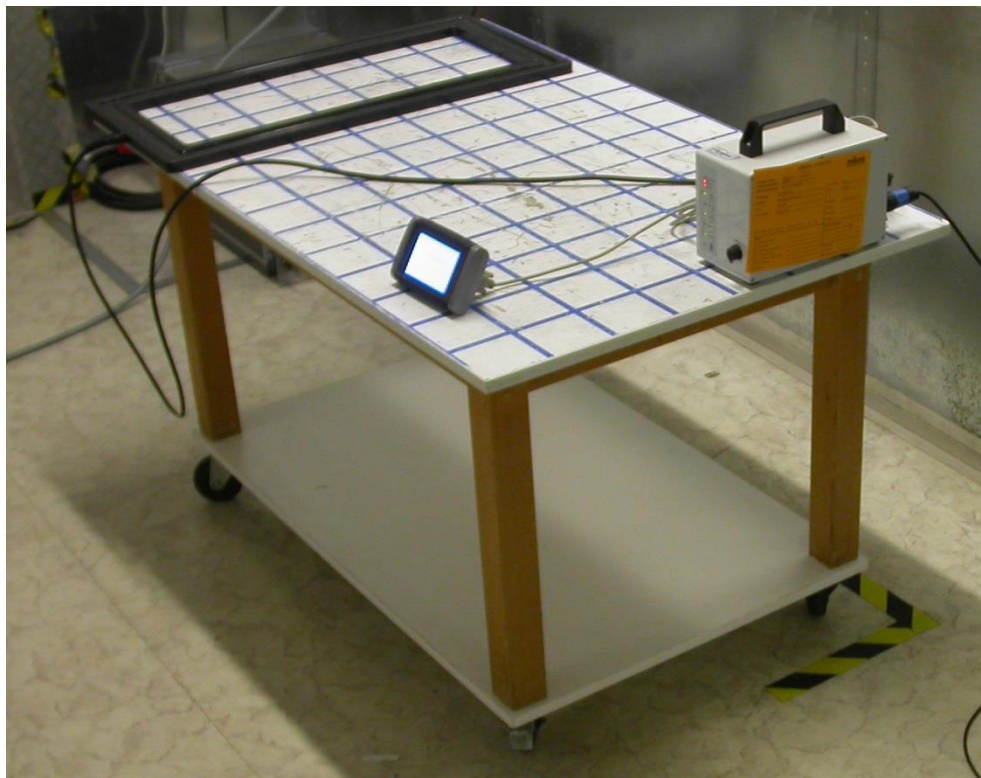
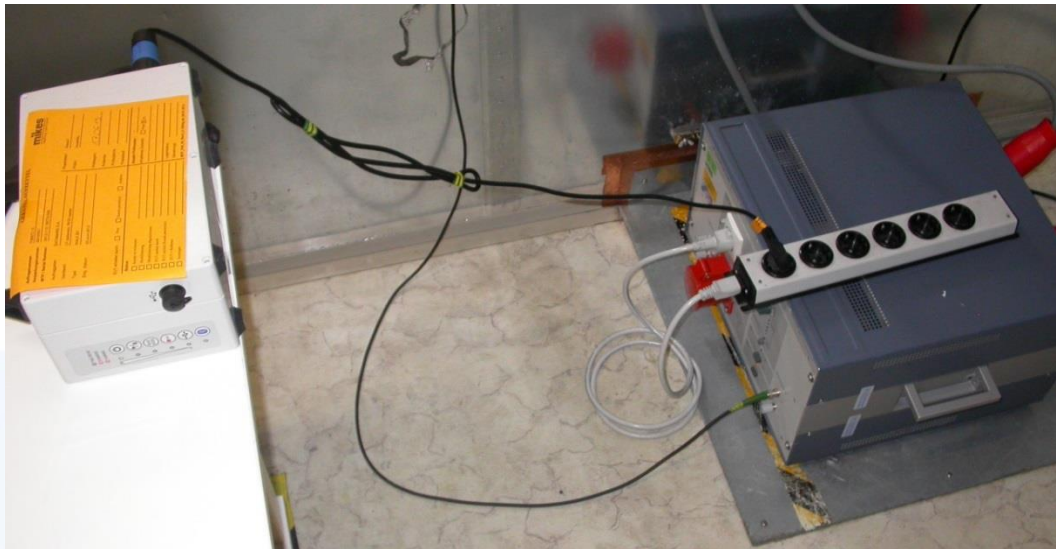
5.1 Conducted emissions

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



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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 limits in the following table.

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

5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin: 8.6 dB at 10.335 MHz

The requirements are **FULFILLED**.

Remarks: For detailed results, please see the following page(s).

FCC ID: NDX-WALKBY

Test point: L1
Operation mode: Accu charging mode – TX mode
Remarks: External power supply cable: Eupen IMU 03
Date: 17.07.2013
Tested by: Huber Markus

Result: passed

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
150	42	24,0	150	34,5	21,5
220	32,4	30,4	220	29,1	23,7
230	16,3	46,1	290	10,6	39,9
290	16	44,5	365	5,6	43,0
400	8,6	49,3	510	4,2	41,8
500	7,8	48,2	655	7,2	38,8
660	11,1	44,9	670	4,3	41,7
805	8,1	47,9	940	5,3	40,7
930	7,7	48,3	1205	4,7	41,3
1020	7,8	48,2	1475	5,4	40,6
1340	7,6	48,4	1745	5,9	40,1
1880	8,6	47,4	2280	7,2	38,8
2280	11	45,0	2820	8,8	37,2
2815	11,5	44,5	3355	13,4	32,6
3220	14,2	41,8	4430	19,9	26,1

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
4295	22,1	33,9	4965	22,1	23,9
4830	24,2	31,8	5905	10,9	39,1
5905	22,7	37,3	6980	16,9	33,1
7785	22,9	37,1	10335	40	10,0
10335	41,9	18,1	10600	38,4	11,6
10600	40,5	19,5	13555	15,9	34,1
14090	19,2	40,8	19190	18	32,0
19190	20,5	39,5	23620	33,8	16,2
23620	34,5	25,5	24290	29,8	20,2
24290	31,4	28,6			

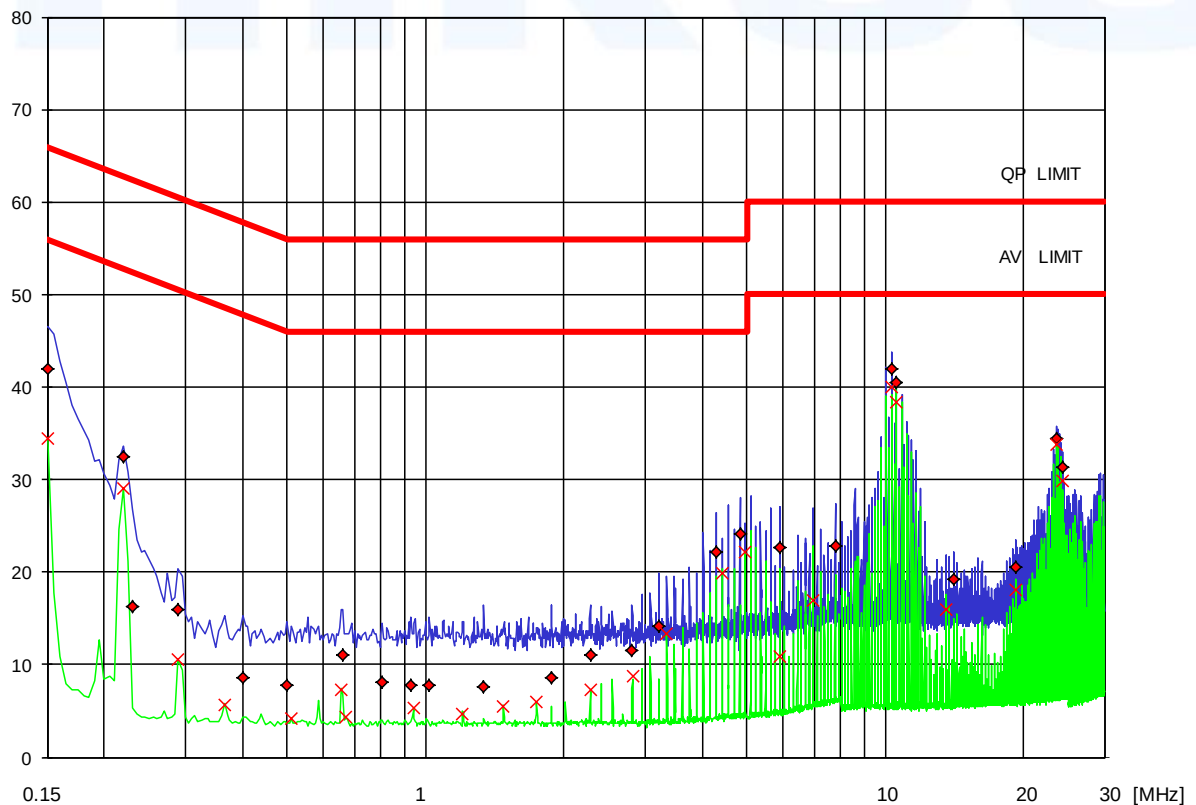
dB [μV]

Legend

PK: — AV: —

Detector:

QP: ♦ AV: ×



FCC ID: NDX-WALKBY

Test point: N
Operation mode: Accu charging mode – Tx mode
Remarks: External power supply cable: Eupen IMU 03
Date: 17.07.2013
Tested by: Huber Markus

Result: passed

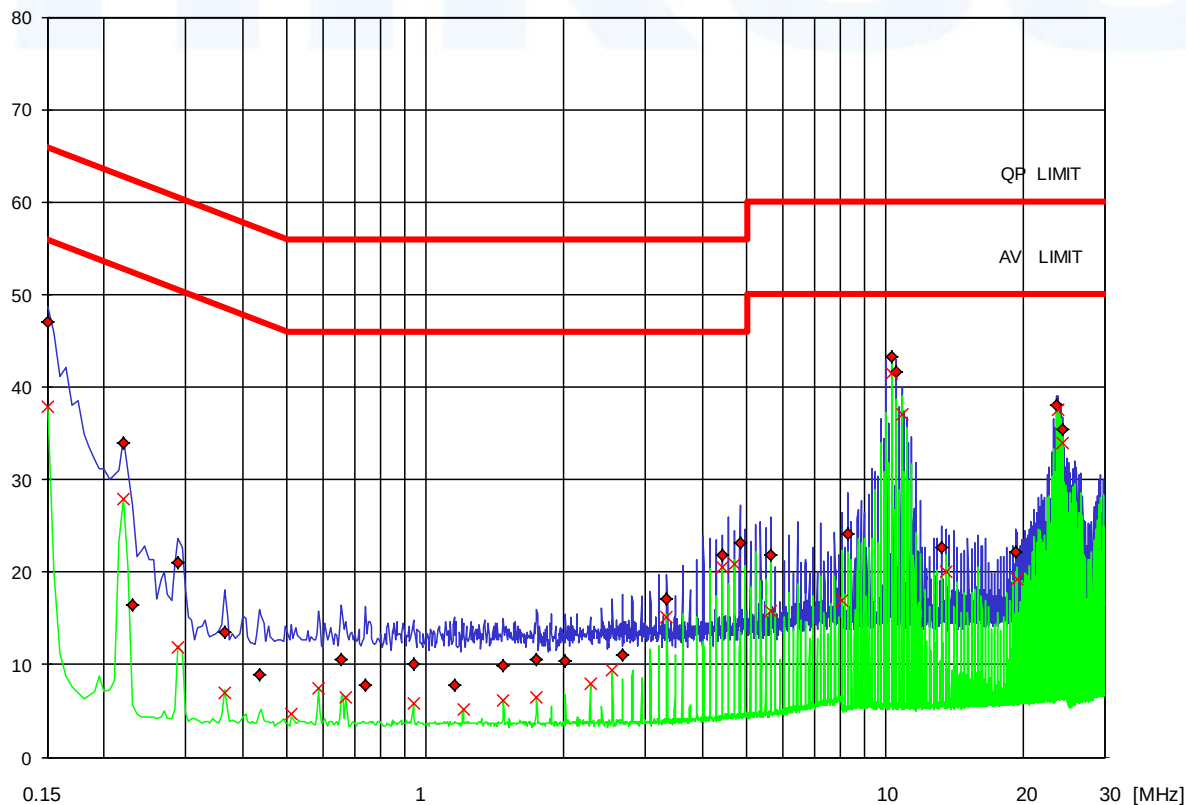
Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
150	47,1	18,9	150	37,9	18,1
220	33,9	28,9	220	27,9	24,9
230	16,4	46,0	290	11,9	38,6
290	21,1	39,4	365	7	41,6
365	13,5	45,1	510	4,6	41,4
435	8,9	48,3	585	7,4	38,6
655	10,6	45,4	670	6,5	39,5
740	7,8	48,2	940	5,8	40,2
940	10	46,0	1210	5,1	40,9
1155	7,8	48,2	1475	6,1	39,9
1475	9,9	46,1	1745	6,5	39,5
1745	10,5	45,5	2280	7,9	38,1
2015	10,4	45,6	2550	9,4	36,6
2685	11,1	44,9	3355	15,1	30,9
3355	17,1	38,9	4430	20,6	25,4

[illegible]dB [μ V]

Legend

PK: █ AV: █

Detector: OP: ◆ AV: ✗



FCC ID: NDX-WALKBY

Test point: L1
Operation mode: Accu charging mode – Standby mode
Remarks: External power supply cable: Eupen IMU 03
Date: 17.07.2013
Tested by: Huber Markus

Result: passed

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
150	40	26,0	150	31,9	24,1
190	25,9	38,1	220	27,5	25,3
230	16,3	46,1	290	10	40,5
295	14,4	46,0	365	5,4	43,2
425	7,7	49,6	500	3,5	42,5
515	7,9	48,1	655	6,3	39,7
655	10,5	45,5	730	4,2	41,8
775	7,8	48,2	965	3,5	42,5
865	7,5	48,5	1195	3,5	42,5
1030	7,7	48,3	1505	3,5	42,5
1360	7,7	48,3	1905	3,5	42,5
1630	7,8	48,2	2215	3,6	42,4
2040	7,9	48,1	2900	3,6	42,4
2420	7,8	48,2	2985	3,5	42,5
3490	9,9	46,1	4430	4,7	41,3

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
3880	8,2	47,8	4830	4,7	41,3
4830	13,4	42,6	6755	5,3	44,7
6165	9,1	50,9	7245	6,3	43,7
7245	13,6	46,4	9795	9,7	40,3
9795	24	36,0	11270	6,2	43,8
10435	10,1	49,9	14360	5,6	44,4
14090	11,8	48,2	15975	5,7	44,3
19195	11,2	48,8	22545	6,3	43,7
22545	12,3	47,7	29925	8,4	41,6
29925	17,5	42,5			

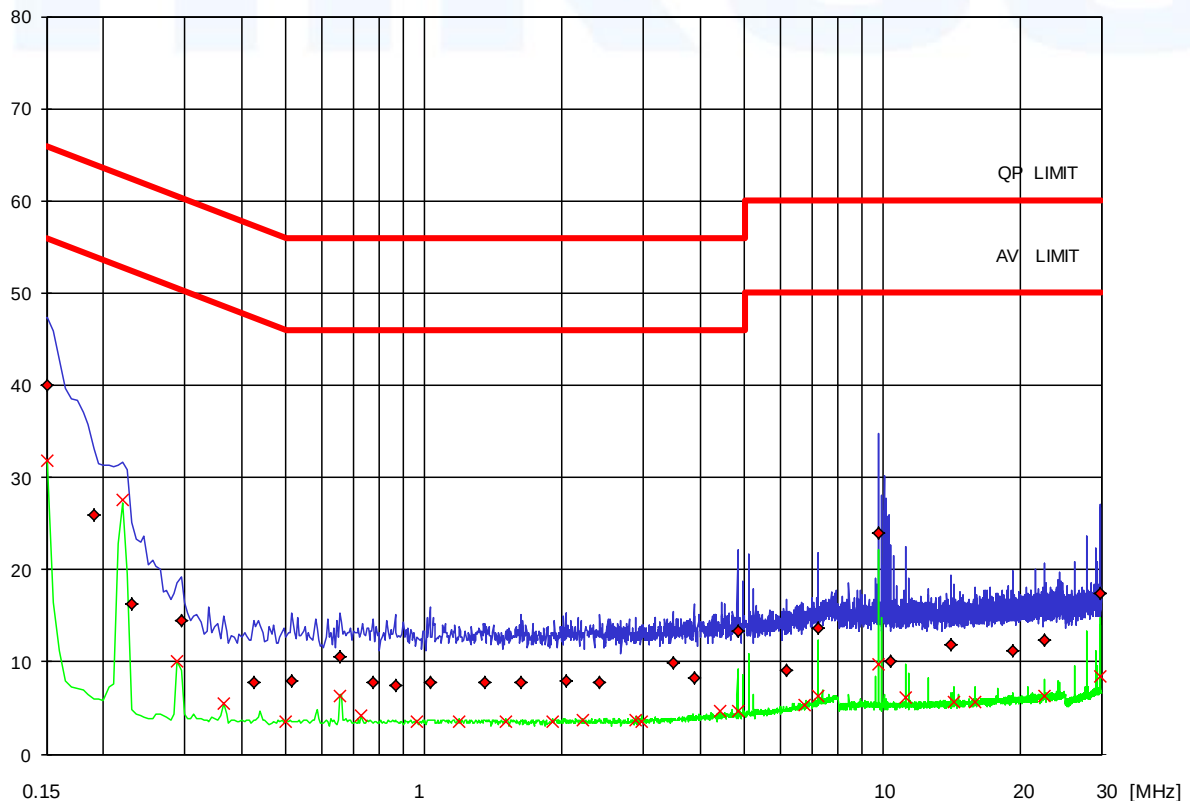
dB [μV]

Legend

PK: — AV: —

Detector:

QP: ♦ AV: ×



FCC ID: NDX-WALKBY

Test point: N
Operation mode: Accu charging mode – Standby mode
Remarks: External power supply cable: Eupen IMU 03
Date: 17.07.2013
Tested by: Huber Markus

Result: passed

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
150	44,5	21,5	150	35,3	20,7
220	32,6	30,2	220	26,6	26,2
235	14,2	48,1	290	9,9	40,6
290	19,4	41,1	365	7,2	41,4
365	13,8	44,8	510	4,2	41,8
500	7,8	48,2	585	6,3	39,7
660	10,7	45,3	730	4,1	41,9
755	7,7	48,3	830	3,5	42,5
830	7,8	48,2	1210	3,6	42,4
1005	7,8	48,2	1430	3,6	42,4
1370	7,7	48,3	1745	3,6	42,4
1835	7,7	48,3	2150	3,6	42,4
2025	8	48,0	2415	3,6	42,4
2635	8,1	47,9	3420	3,7	42,3
3585	8,2	47,8	3625	4,8	41,2

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
3625	12,3	43,7	4565	5,5	40,5
4565	14,3	41,7	6040	5,2	44,8
5900	11,4	48,6	7815	5,9	44,1
7945	10,5	49,5	10195	9,6	40,4
10195	24,1	35,9	10870	10,2	39,8
10870	25,1	34,9	12880	5,5	44,5
12880	11,5	48,5	18920	6,7	43,3
18920	14,4	45,6	22410	6,3	43,7
22410	12,9	47,1	29925	8,1	41,9
29925	16,9	43,1			

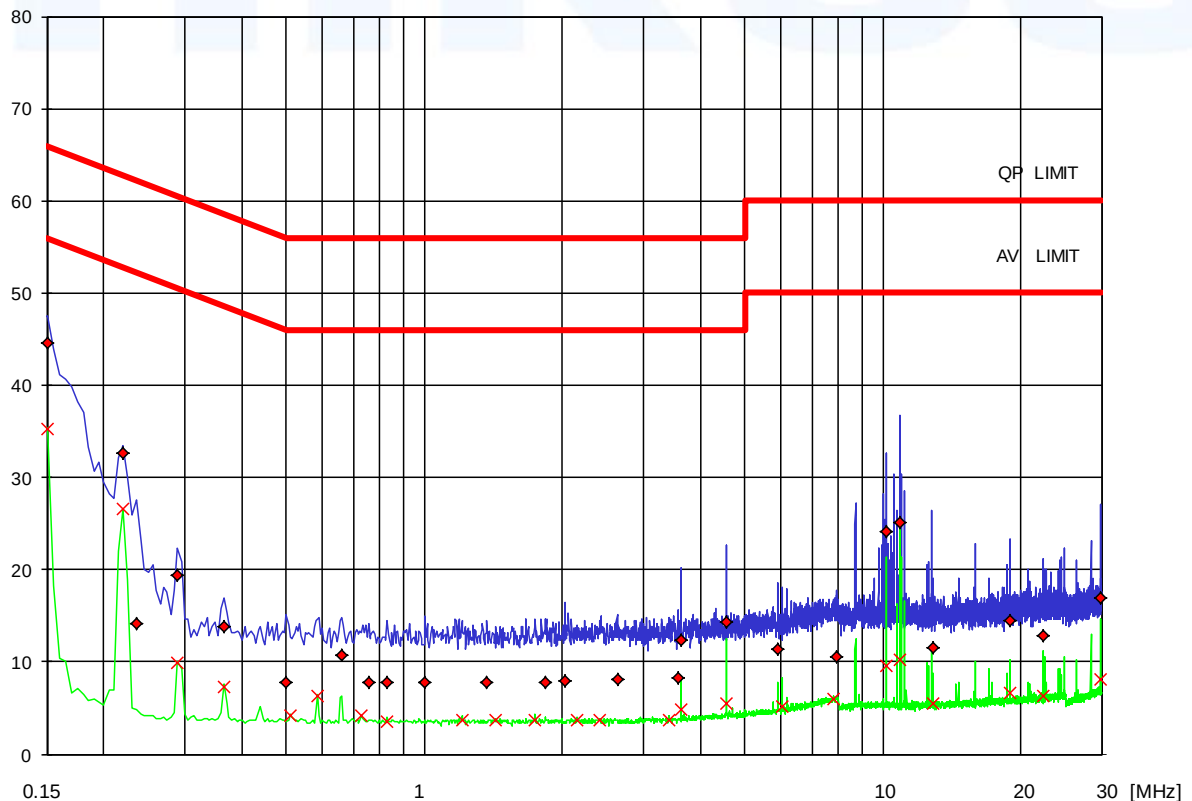
dB [μV]

Legend

PK: — AV: —

Detector:

QP: ♦ AV: ×



FCC ID: NDX-WALKBY

5.2 Field strength of the fundamental wave

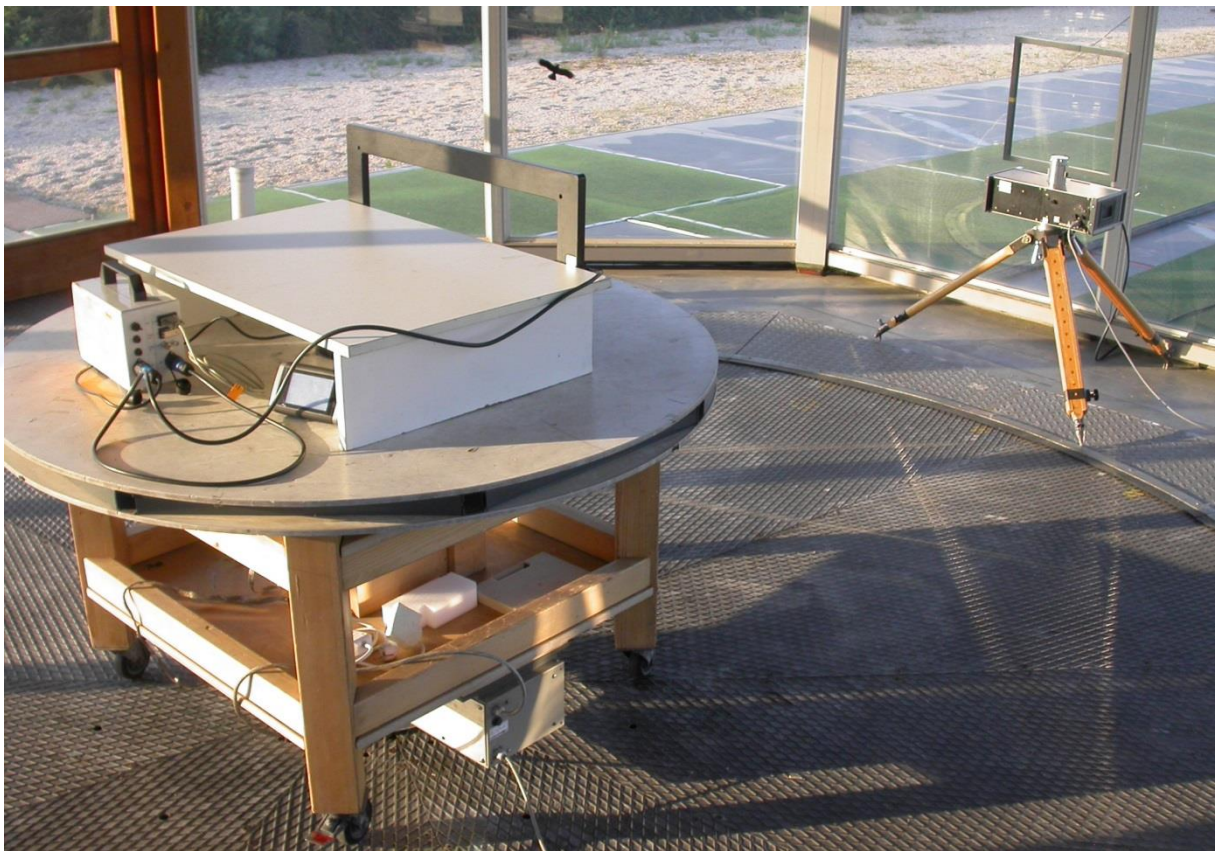
For test instruments and accessories used see section 6 Part CPR 1.

5.2.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.2.2 Photo documentation of the test set-up



5.2.1 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the effective field strength limits.

FCC ID: NDX-WALKBY

5.2.2 Description of Measurement

The spurious emissions of the EUT have to be measured at an open area test site in the frequency range from 9 kHz to 1000 MHz using a tuned EMI receiver. The set up of the equipment under test will be in accordance with ANSI C63.4. The measurement has been performed at 3 m. The results have been compared to the limits defined at 30 m or 300 m distances according to FCC Part 15C, Section 15.31(f)(2) using an inverse linear distance extrapolation factor of 40 dB/decade. The final measurement has been performed with the EMI receiver using Quasi peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used, according to Section 15.209(d).

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

Example:

Frequency (MHz)	Level (dBμV)	+	Factor (dB)	=	Level dB(μV/m)	-	Limit dB(μV/m)	=	Delta (dB)
1.705	5	+	20	=	25	-	30	=	-5

5.2.3 Test result

Measurement distance: 3 m

Frequency (kHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
134.2	85.73	84.87	85.26	0.2	20	105.73	104.87	105.26	105.1	-0.13

Calculated value at distance: 300 m

Frequency (kHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
134.2	5.73	4.87	5.26	0.2	20	25.73	24.87	25.26	25.1	-0.13

Limit according to FCC Part 15C, Section 15.209(a):

Frequency (MHz)	Field strength of fundamental wave (μV/m)	dB(μV/m)	Measurement distance (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

The requirements are **FULFILLED**.

Remarks:

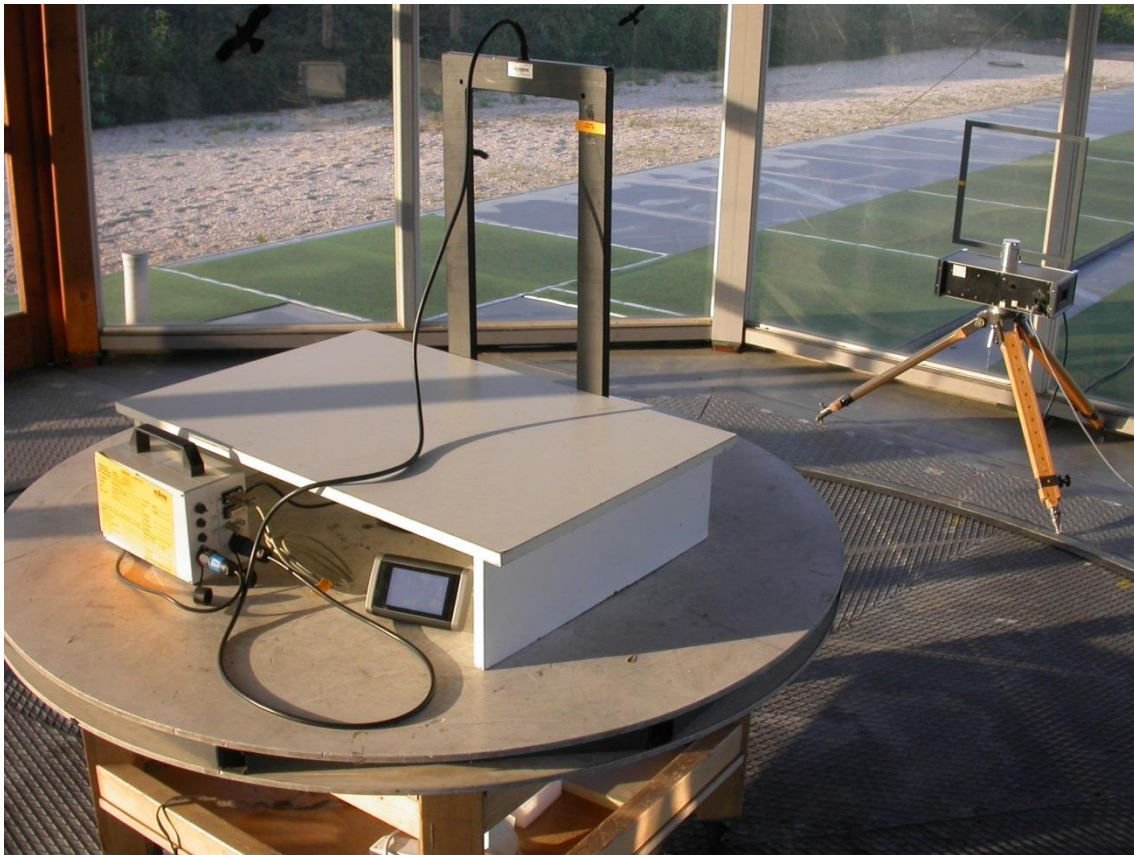
FCC ID: NDX-WALKBY**5.3 Spurious emissions (magnetic field) 9 kHz – 30 MHz**

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

5.3.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.3.2 Photo documentation of the test set-up**5.3.3 Applicable standard**

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the effective field strength limits.

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5.3.4 Description of Measurement

The spurious emissions of the EUT have to be measured at an open area test site in the frequency range from 9 kHz to 1000 MHz using a tuned EMI receiver. The set up of the equipment under test will be in accordance with ANSI C63.4. The measurement has been performed at 3 m. The results have been compared to the limits defined at 30 m or 300 m distances according to FCC Part 15C, Section 15.31(f)(2) using an inverse linear distance extrapolation factor of 40 dB/decade. The final measurement has been performed with the EMI receiver using Quasi peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used, according to Section 15.209(d).

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

Example:

Frequency (MHz)	Level (dBμV)	+	Factor (dB)	=	Level dB(μV/m)	-	Limit dB(μV/m)	=	Delta (dB)
1.705	5	+	20	=	25	-	30	=	-5

5.3.5 Test result

Measurement distance: 3 m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
0.268	51.37	16.53	38.67	9	20	71.4	36.5	58.7	99.03	-62.5
0.402	78.92	52.27	67.06	9	20	98.9	72.3	87.1	95.51	-23.2

Calculated value at distance: 300m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
0.268	-28.63	-63.47	-41.33	9	20	-8.6	-43.5	-21.3	19.0	-62.5
0.402	-1.08	-27.73	-12.94	9	20	18.9	-7.7	7.1	95.51	-23.2

Measurement distance: 3 m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
0.536	73.01	22.24	56.29	9	20	93.0	42.2	76.3	73.01	-30.8

Calculated value at distance: 30m

Frequency (MHz)	Level PK (dBμV)	Level AV (dBμV)	Level QP (dBμV)	Band- width (kHz)	Correct. factor (dB)	Corrected Level PK dB(μV/m)	Corrected Level AV dB(μV/m)	Corrected Level QP dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
0.536	33.01	-17.76	16.29	9	20	53.0	2.2	36.3	43.01	-30.8

FCC ID: NDX-WALKBY

Limit according to FCC Part 15 Subpart 15.209(a):

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
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

Remarks: All other unwanted emissions in the frequency range from 9 kHz to 30 MHz were
below $< -10.5 \text{ dB}\mu\text{V/m}$.

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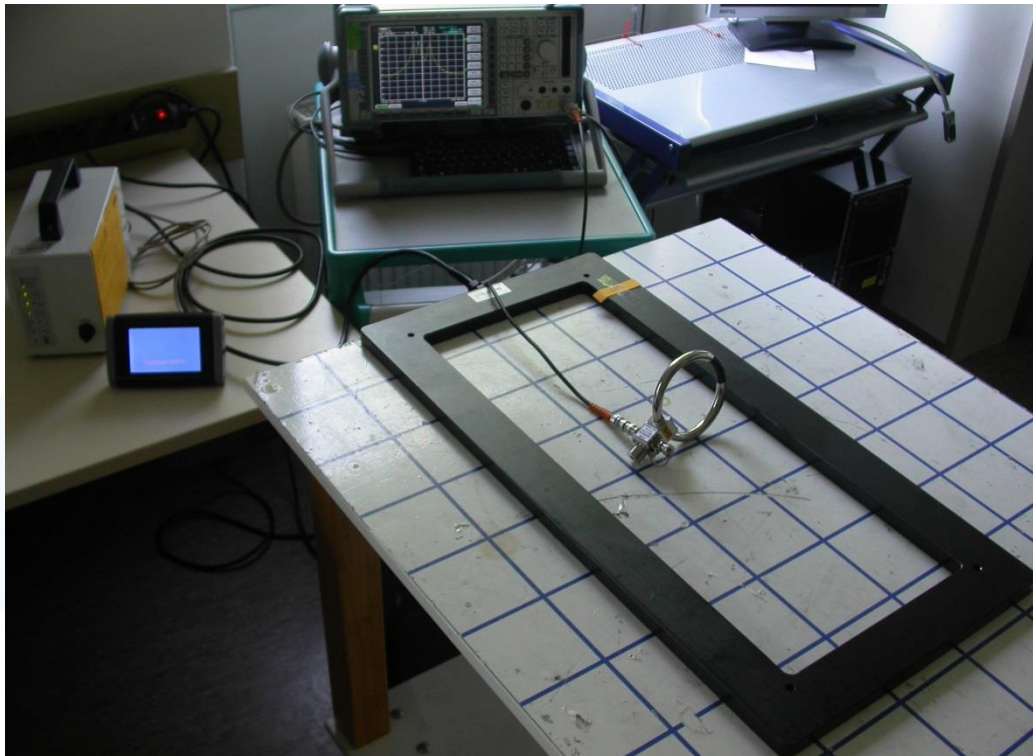
5.4 Emission Bandwidth

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

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up



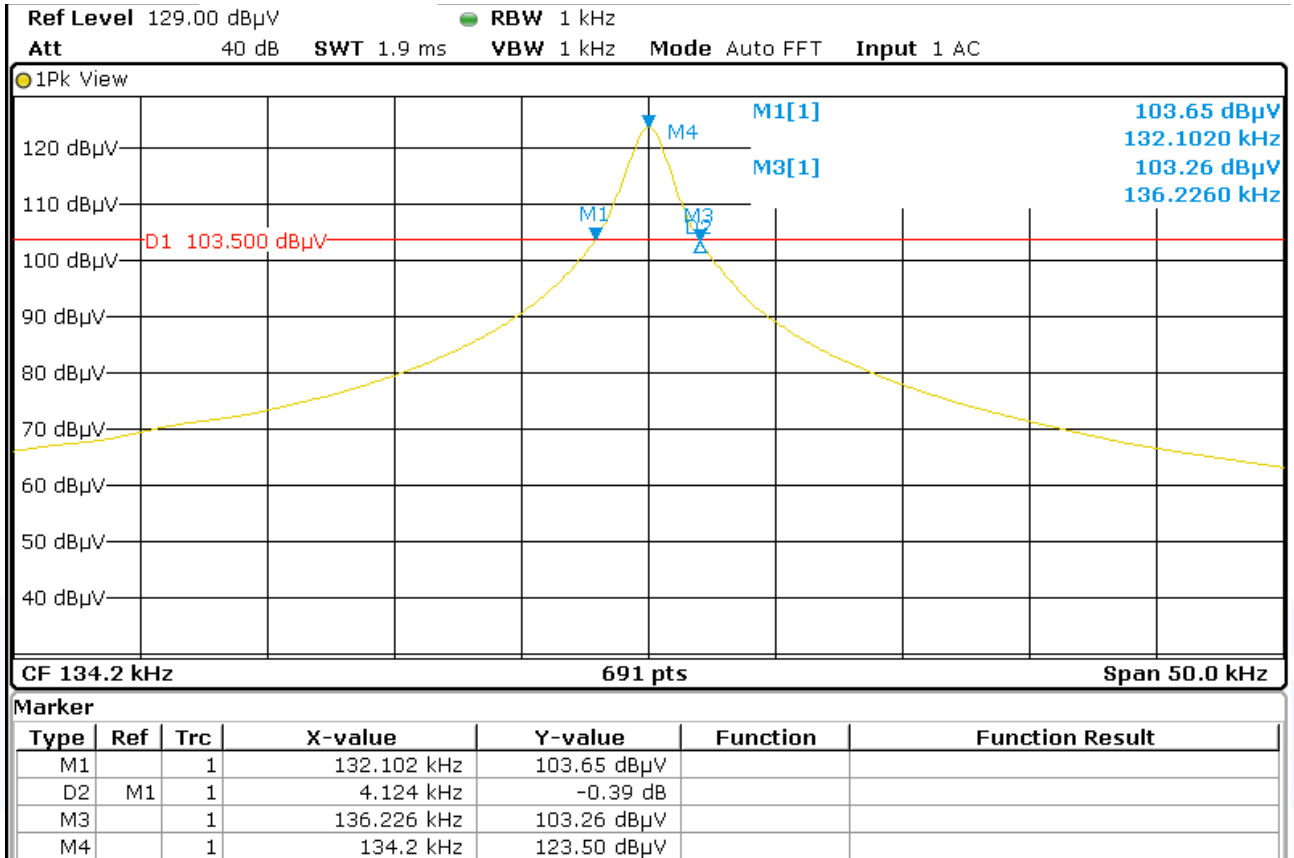
Fundamental [kHz] See Plot 1	20dB Bandwidth F1	20dB Bandwidth F2	Measured Bandwidth [kHz]
134.20	133.66	134.72	1.06

Remarks:

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5.4.3 Test protocol

Emission Bandwidth plots



FCC ID: NDX-WALKBY

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	ESHS 30	02-02/03-05-002	16/07/2014	16/07/2013		
	ESH 2 - Z 5	02-02/20-05-004	06/06/2014	06/06/2013	06/12/2013	06/06/2013
	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			05/10/2013	05/04/2013
	SP 103 /3.5-60	02-02/50-05-182				
CPR 1	FMZB 1516	01-02/24-01-018			14/02/2014	14/02/2013
	ESR7	02-02/03-13-001	21/05/2014	21/05/2013		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
MB	ESR7	02-02/03-13-001	21/05/2014	21/05/2013		
	HFRAE 5161 _ 50kHz-120M	02-02/24-11-004				
SER 1	FMZB 1516	01-02/24-01-018			14/02/2014	14/02/2013
	ESR7	02-02/03-13-001	21/05/2014	21/05/2013		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				