

FCC ID: NDX-COMPACTMAX

EMI – TEST REPORT

- FCC Part 15.209 -

Test Report No. :	T38601-00-02HU	19. August 2014 Date of issue
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Type / Model Name : COMPACT MAX**Product Description** : RFID handheld reader for animal identification**Applicant** : Datamars S.A.

Address : Via ai Prati

CH – 6930 BEDANO

Manufacturer : Datamars (Thailand) Co. LTD

Address : Northern Region Industrial Estate, 179/1 Moo4

T. Banklang, A. Muang, Lamphoon, 5100 THAILAND

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.

Contents

1	<u>TEST STANDARDS</u>	3
2	<u>SUMMARY</u>	4
3	<u>EQUIPMENT UNDER TEST</u>	5
3.1	Photo documentation of the EUT – Detailed photos see Attachment A	5
3.2	Power supply system utilised	5
3.3	Short description of the Equipment under Test (EUT)	5
4	<u>TEST ENVIRONMENT</u>	6
4.1	Address of the test laboratory	6
4.2	Statement regarding the usage of logos in test reports	6
4.3	Environmental conditions	6
4.4	Statement of the measurement uncertainty	6
4.5	Measurement Protocol for FCC, VCCI and AUSTEL	7
5	<u>TEST CONDITIONS AND RESULTS</u>	8
5.1	Conducted emissions	8
5.2	Field strength of the fundamental wave	14
5.3	Spurious emissions (magnetic field) 9 kHz – 30 MHz	16
5.4	Emission Bandwidth	18
6	<u>USED TEST EQUIPMENT AND ACCESSORIES</u>	20

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2013)

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, 2013)

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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Mobile and portable devices RF exposure procedures and equipment authorisation policies	447498 D01 General RF exposure Guidance v05r01, 5/28/2013
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2 SUMMARY

GENERAL REMARKS:

The EuT is working at frequency of 134.2 kHz.

It is possible to have a Data connection via USB to a PC.

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 : 04. August 2014

Testing concluded on : 07. August 2014

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Huber Markus

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: : Tx 4.00 V / DC
 Rx 3.00 V / DC

3.3 Short description of the Equipment under Test (EUT)

The EuT is a RFID handheld reader for animal identification.

Number of tested samples: 1
Serial number: ALPHA-00005

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

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EUT configuration:

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

- USB cable male type A to micro USB, 1.0 m	Model : Supplied by manufacturer
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- Power Supply CASIO, Model: AD-C53U Model : Supplied by CSA

- Model :

- Model :

- Model :

- Model :

- customer specific cables

- unscreened power cables

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Statement regarding the usage of logos in test reports

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

4.3 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

4.4 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.

4.5 Measurement Protocol for FCC, VCCI and AUSTEL

4.5.1 GENERAL INFORMATION

4.5.1.1 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.

4.5.1.2 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.

5 TEST CONDITIONS AND RESULTS

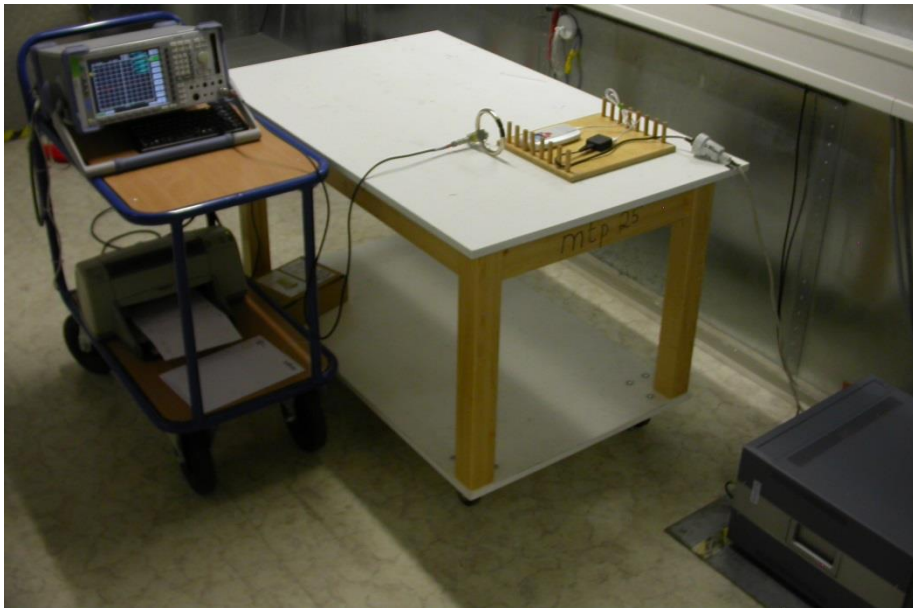
5.1 Conducted emissions

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



FCC ID: NDX-COMPACTMAX

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 (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

5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 14.33 dB at 0.186 MHz

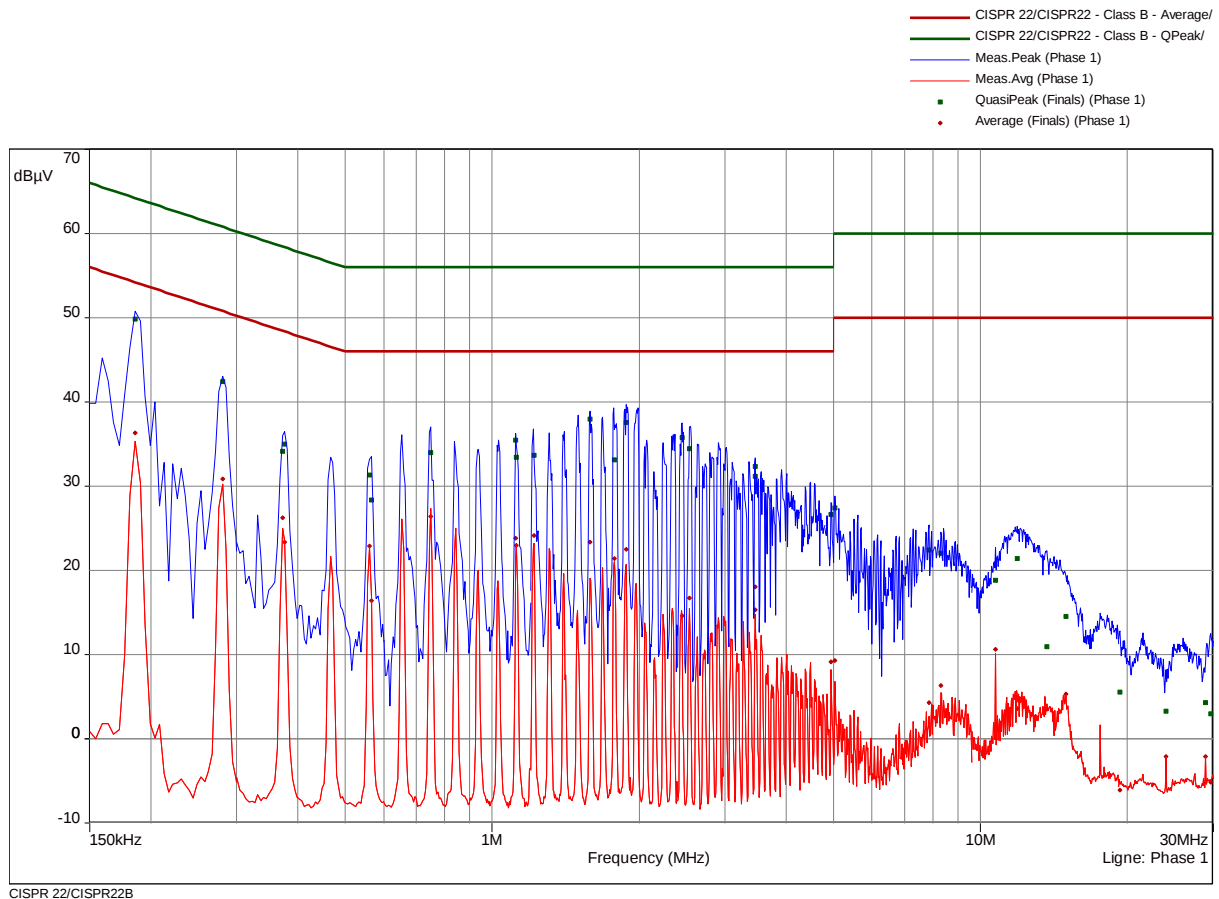
The requirements are **FULFILLED**.

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

FCC ID: NDX-COMPACTMAX

Test point: L1
 Operation mode: Accu charging mode
 Remarks:
 Date:
 Tested by: Huber Markus

Result: passed



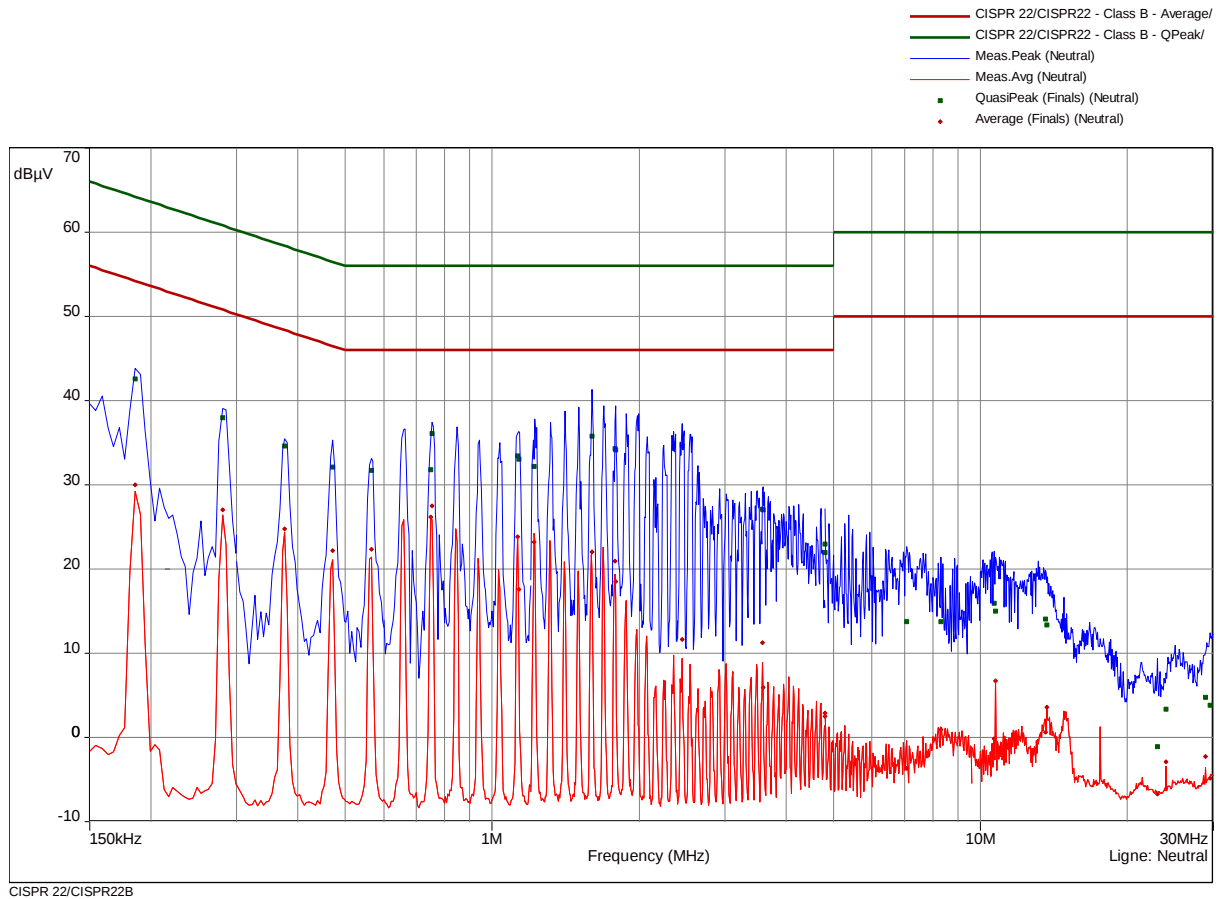
FCC ID: NDX-COMPACTMAX

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
0.186	1	49.88	14.33	64.21	36.32	17.89	54.21	Phase 1
0.2805	1	42.39	18.41	60.8	30.89	19.91	50.8	Phase 1
0.372	2	34.16	24.29	58.46	26.22	22.23	48.46	Phase 1
0.3765	2	35.04	23.31	58.36	23.39	24.96	48.36	Phase 1
0.561	2	31.35	24.65	56	22.9	23.1	46	Phase 1
0.5655	2	28.33	27.67	56	16.43	29.57	46	Phase 1
0.7485	3	33.95	22.05	56	26.37	19.63	46	Phase 1
1.1175	3	35.44	20.56	56	23.87	22.13	46	Phase 1
1.122	3	33.48	22.52	56	22.96	23.04	46	Phase 1
1.218	4	33.67	22.33	56	24.17	21.83	46	Phase 1
1.587	4	37.98	18.02	56	23.37	22.63	46	Phase 1
1.7805	4	33.15	22.85	56	21.43	24.57	46	Phase 1
1.8795	4	37.62	18.38	56	22.51	23.49	46	Phase 1
2.4495	5	35.82	20.18	56	14.62	31.38	46	Phase 1
2.5395	5	34.42	21.58	56	16.72	29.28	46	Phase 1
3.4575	5	32.39	23.61	56	18.07	27.93	46	Phase 1
3.462	5	31.21	24.79	56	15.3	30.7	46	Phase 1
4.9485	6	26.68	29.32	56	9.15	36.85	46	Phase 1
5.043	6	27.45	32.55	60	9.31	40.69	50	Phase 1
7.8375	6	22.46	37.54	60	4.33	45.67	50	Phase 1
8.31	6	22.07	37.93	60	6.34	43.66	50	Phase 1
10.734	7	18.85	41.15	60	10.61	39.39	50	Phase 1
11.8905	7	21.41	38.59	60	3.61	46.39	50	Phase 1
13.6815	7	10.96	49.04	60	3.53	46.47	50	Phase 1
14.955	7	14.52	45.48	60	5.3	44.7	50	Phase 1
19.281	8	5.59	54.41	60	-6.07	56.07	50	Phase 1
23.997	8	3.25	56.75	60	-2.11	52.11	50	Phase 1
28.902	8	4.29	55.71	60	-2.12	52.12	50	Phase 1
29.6535	8	2.98	57.02	60	-5.17	55.17	50	Phase 1

FCC ID: NDX-COMPACTMAX

Test point: N
Operation mode: Accu charging mode
Remarks:
Date:
Tested by: Huber Markus

Result: passed



FCC ID: NDX-COMPACTMAX

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
0.186	9	42.55	21.66	64.21	29.99	24.22	54.21	Neutral
0.2805	9	38.01	22.79	60.8	27.03	23.77	50.8	Neutral
0.3765	10	34.62	23.73	58.36	24.77	23.58	48.36	Neutral
0.471	10	32.13	24.36	56.5	22.2	24.29	46.5	Neutral
0.5655	10	31.71	24.29	56	22.35	23.65	46	Neutral
0.7485	11	31.79	24.21	56	26.19	19.81	46	Neutral
0.753	11	36.11	19.89	56	27.48	18.52	46	Neutral
1.1265	11	33.48	22.52	56	23.87	22.13	46	Neutral
1.1355	11	33.04	22.96	56	17.55	28.45	46	Neutral
1.218	12	32.21	23.79	56	23.21	22.79	46	Neutral
1.6005	12	35.75	20.25	56	22	24	46	Neutral
1.785	12	34.27	21.73	56	20.94	25.06	46	Neutral
1.7895	12	34.11	21.89	56	18.55	27.45	46	Neutral
2.4495	13	34.64	21.36	56	11.64	34.36	46	Neutral
3.579	13	27.15	28.85	56	11.26	34.74	46	Neutral
3.588	13	27.03	28.97	56	5.91	40.09	46	Neutral
4.809	14	21.94	34.06	56	2.89	43.11	46	Neutral
4.8135	14	23	33	56	2.49	43.51	46	Neutral
7.059	14	13.73	46.27	60	-3.69	53.69	50	Neutral
8.31	14	13.75	46.25	60	0.93	49.07	50	Neutral
10.6755	15	15.95	44.05	60	-0.13	50.13	50	Neutral
10.734	15	14.99	45.01	60	6.74	43.26	50	Neutral
13.6095	15	14.07	45.93	60	0.64	49.36	50	Neutral
13.6815	15	13.36	46.64	60	3.59	46.41	50	Neutral
23.0385	16	-1.07	61.07	60	-6.75	56.75	50	Neutral
23.997	16	3.33	56.67	60	-2.87	52.87	50	Neutral
28.902	16	4.79	55.21	60	-2.26	52.26	50	Neutral
29.5275	16	3.85	56.15	60	-4.86	54.86	50	Neutral

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.

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

FCC ID: NDX-COMPACTMAX

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	84.5	80.2	82.7	0.2	20	104.5	100.2	102.7	105.1	-4.9

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	4.5	0.2	2.7	0.2	20	24.5	20.2	22.7	25.1	-4.9

Note: The EUT is a handheld device, so the test was performed in all three orientations; X, Y and Z axis (flat, upright and side position of the EuT). The values in the table are show the maximum measured value in the worst case position of the EuT.

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

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

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.

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

FCC ID: NDX-COMPACTMAX

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	49.7	43.4	46.3	9	20	69.7	63.4	66.3	99.0	-35.6
0.403	52.4	46.8	49.9	9	20	72.4	66.8	69.9	95.5	-28.7

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	-30.3	-36.6	-33.7	9	20	-10.3	-16.6	-13.7	19.0	-35.6
0.403	-27.6	-33.2	-30.1	9	20	-7.6	-13.2	-10.1	15.5	-28.7

Values 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 dB(μV/m)	Delta (dB)
0.49 – 30.0				9	20				29.5	> 40

Note: The EUT is a handheld device, so the test was performed in all three orientations; X, Y and Z axis (flat, upright and side position of the EuT). The values in the table are show the maximum measured value in the worst case position of the EuT.

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

Frequency (MHz)	Field strength of spurious emissions (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: All other unwanted emissions in the frequency range from 9 kHz to 30 MHz were below < -10.5 dBμV/m.

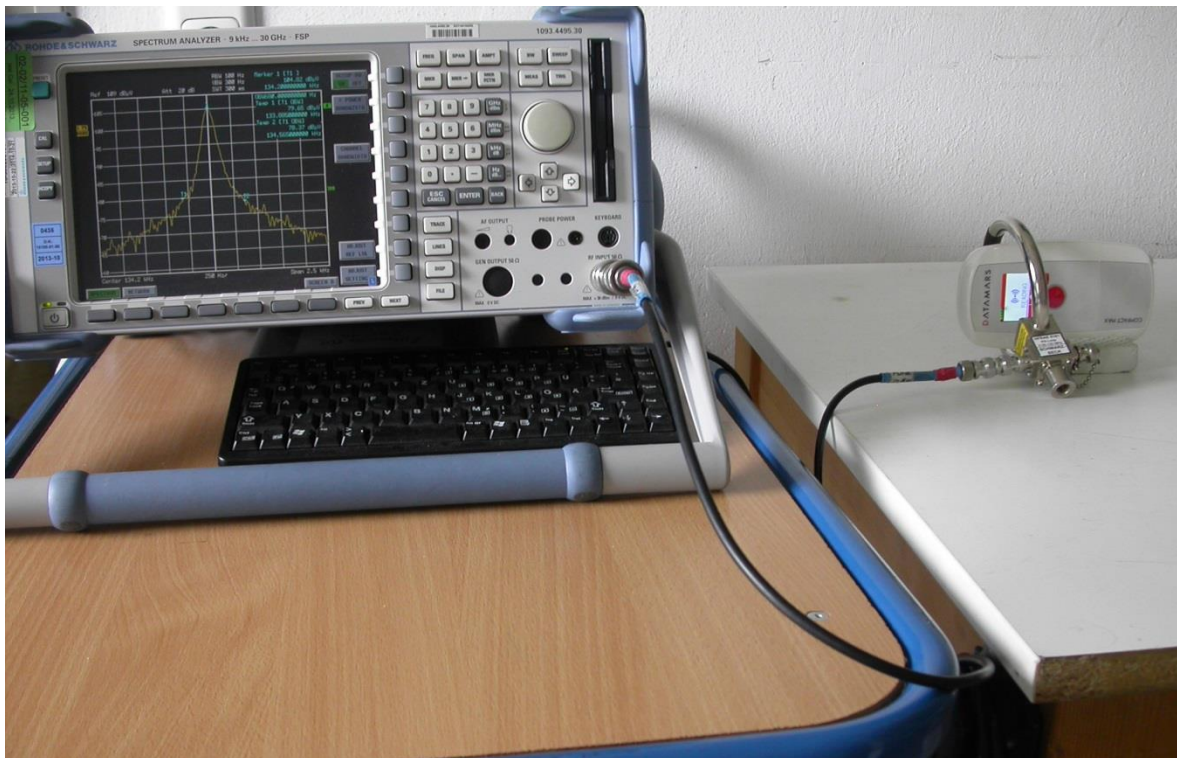
5.4 Emission Bandwidth

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



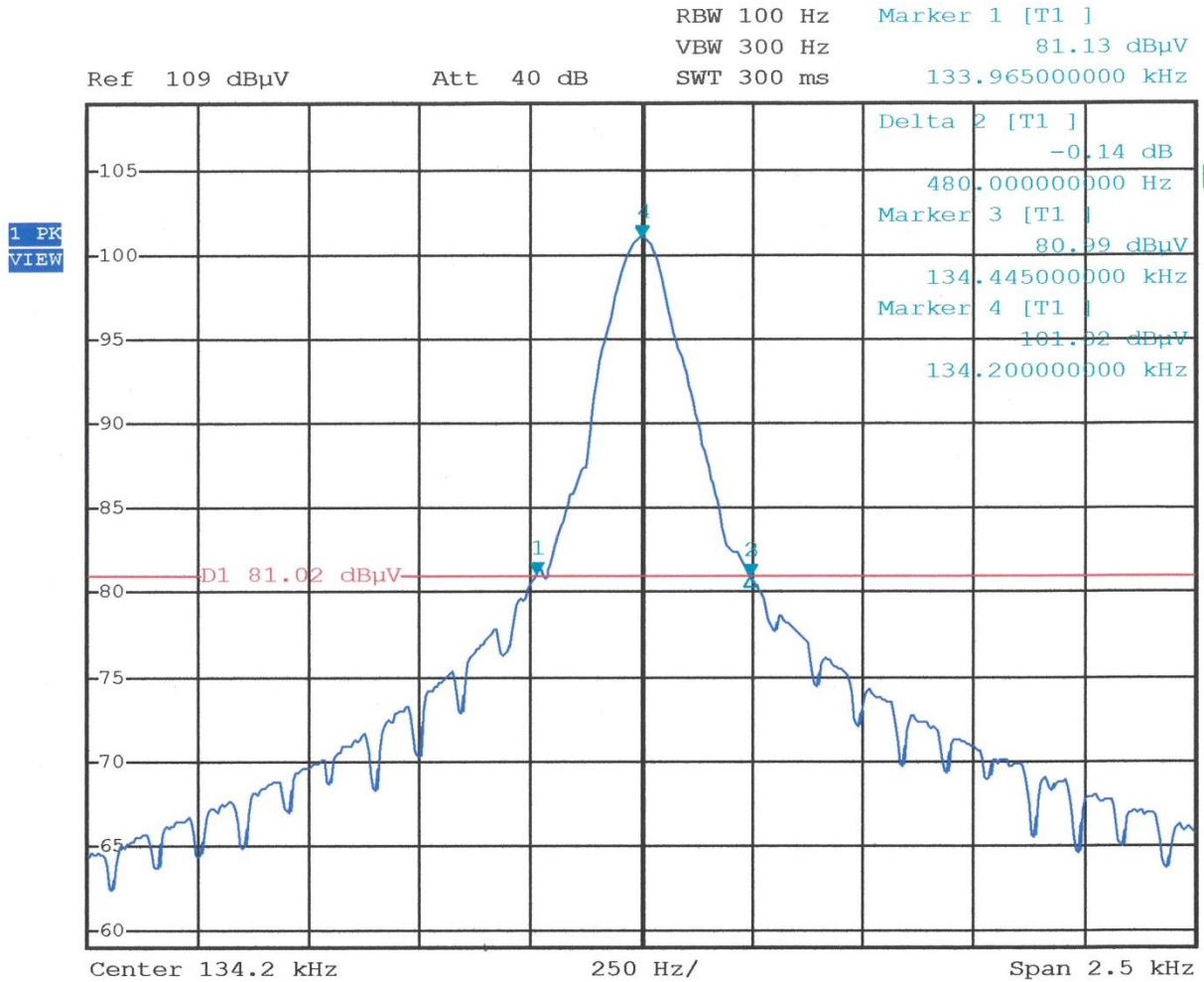
Fundamental [kHz] See Plot 1	20dB Bandwidth F1	20dB Bandwidth F2	Measured Bandwidth [kHz]
134.20	133.965	134.445	0.48

Remarks:

FCC ID: NDX-COMPACTMAX

5.4.3 Test protocol

Emission Bandwidth plots



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	18/10/2014	18/10/2013	18/04/2014	18/10/2013
	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			10/04/2014	10/10/2013
	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
	ESCI	02-02/03-05-005	22/12/2014	22/12/2013		
	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	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	HFRAE 5161 _ 50 kHz-120	02-02/24-11-004				
SER 1	FMZB 1516	01-02/24-01-018			14/02/2014	14/02/2013
	ESCI	02-02/03-05-005	22/12/2014	22/12/2013		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				