

EMI – TEST REPORT

- FCC Part 15B -

Test Report No. :	T37213-00-03HU	17. December 2013 Date of issue
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Type / Model Name : TrackKing-1

Product Description : RFID handheld reader for livestock applications

Applicant : Datamars S.A.

Address : Via ai Prati

CH – 6930 BEDANO

Manufacturer : Datamars (Thailand) Co. LTD

Address : Northern Region Industrial Estate, 179/1 MOD4,

T. Banklang, A. Muang, Lamphun, 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.

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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 B - Unintentional Radiators (October, 2012)

Part 15, Subpart B, Section 15.107	AC Line conducted emissions
Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements
Part 15, Subpart B, Section 15.111	Antenna power conduction

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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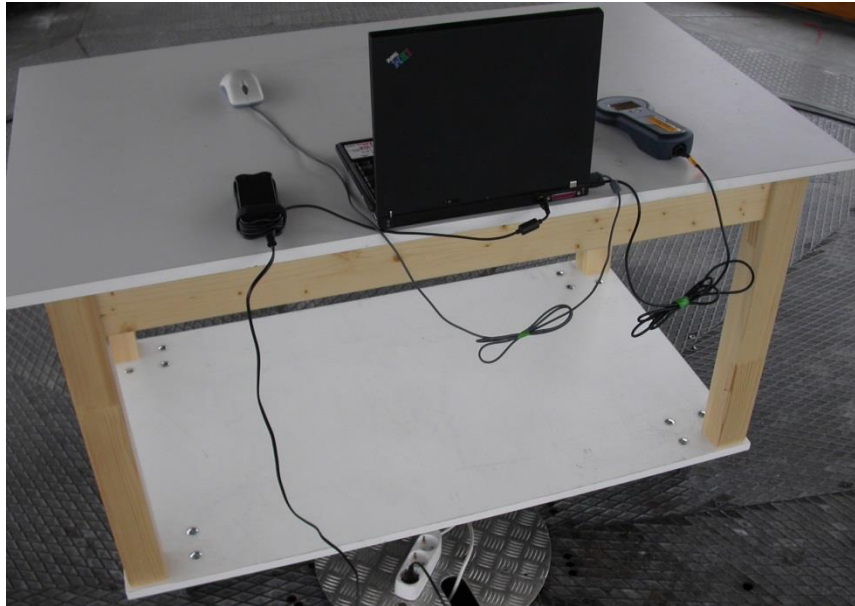
CISPR 22: 2005 EN 55022: 2006	Information technology equipment
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2 SUMMARY

GENERAL REMARKS:

The EuT is working at frequency of 134.2 kHz.

Data connection via USB to a LapTop:



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 : 08. October 2013

Testing concluded on : 14. October 2013

Checked by:

Tested by:

Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

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 : DC: 3.70 V powered via USB

3.3 Short description of the Equipment under Test (EuT)

The EuT is a RFID handheld reader for livestock applications.

The device will be sold only with USB cable without any power supply.

Number of tested samples: 1
Serial number: Beta 0004

EuT operation mode:

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

- Standby - Data connection via USB to a Laptop

-

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:

-	<u>USB cable male type A to mini USB, 1.80</u>	Model : <u>Supplied by manufacturer</u>
-	<u>IBM LapTop</u>	Model : <u>Supplied by CSA</u>
-	<u></u>	Model : <u></u>

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.

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 in order to obtain maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

4.4.2.1 General Standard Information

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."

5 TEST CONDITIONS AND RESULTS

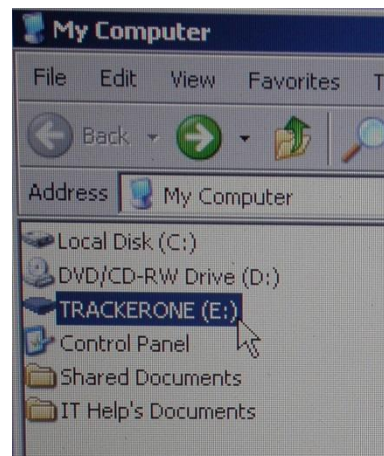
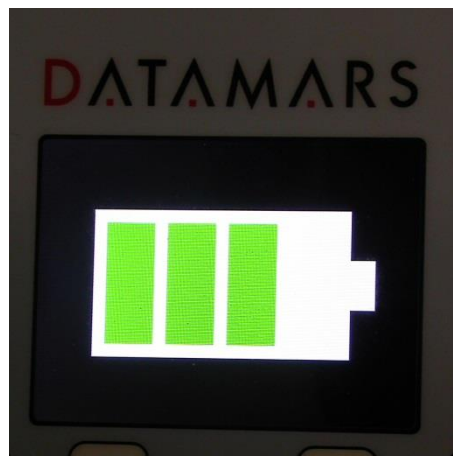
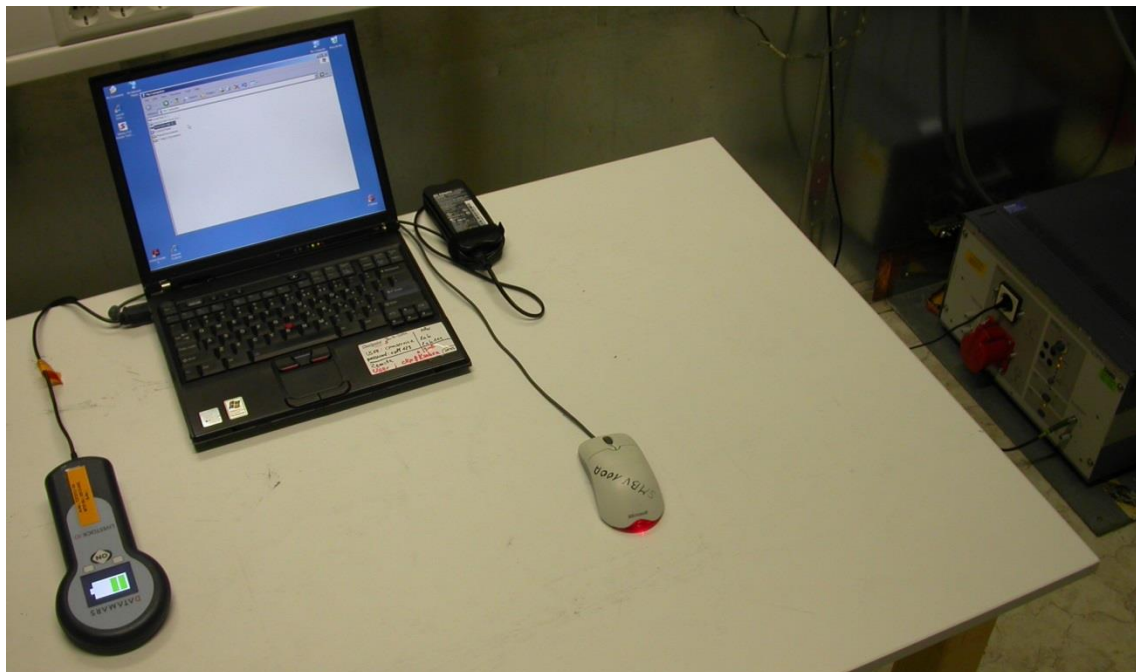
5.1 Conducted emissions

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



5.1.3 Applicable standard

According to FCC Part 15B, Section 15.107(a):

Except as shown in paragraphs (b) and (c) of this Section, for an unintentional 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 Description of Measurement

The correction factors for cable loss and antenna gain are stored in the memory of the EMI receiver therefore the final level (dBμV) appears directly in the reading of the EMI receiver. This level is compared to the FCC limit.

To convert between dBμV and μV, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)}$$

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with 50Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 6.22 dB at 0.5565 MHz

The requirements are **FULFILLED**.

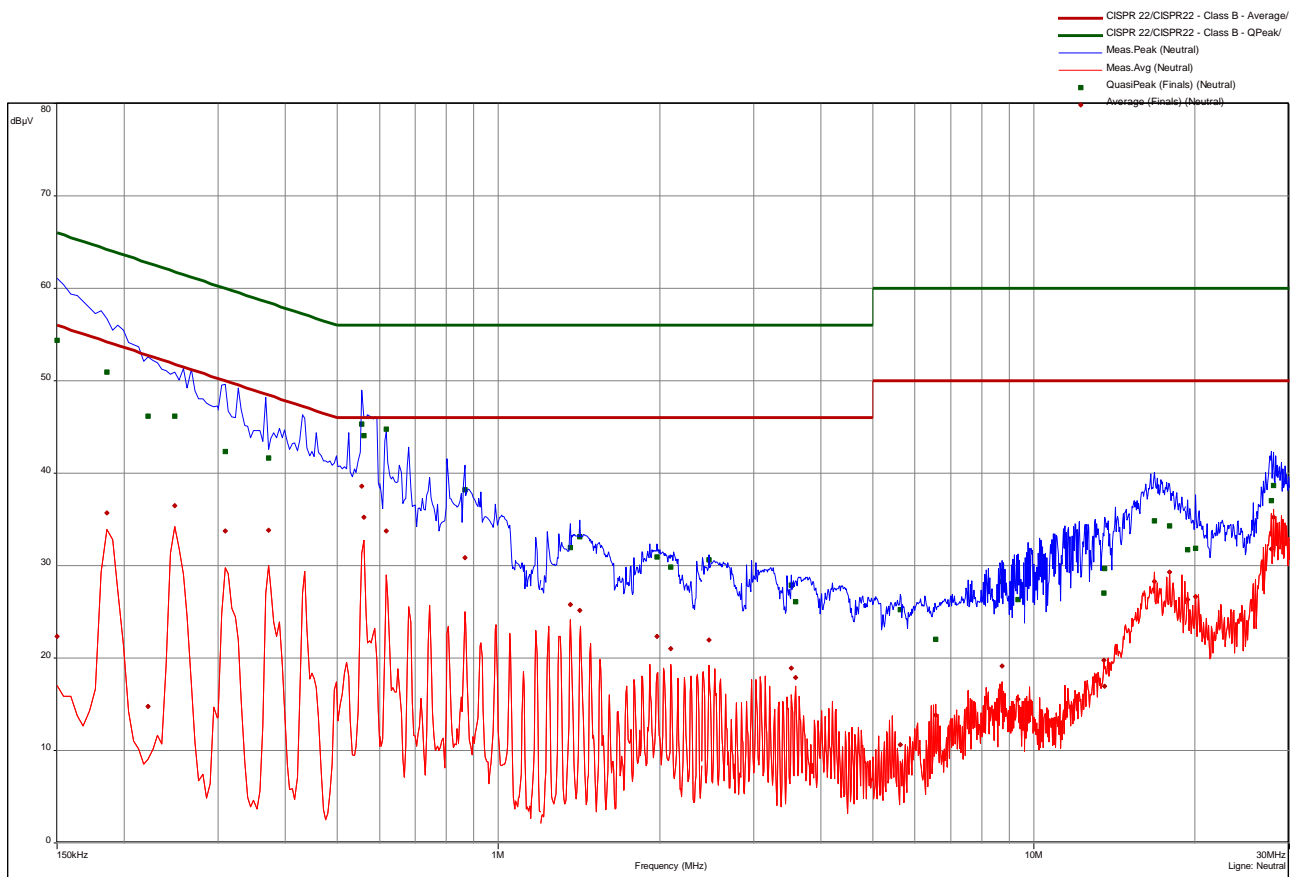
Remarks:

FCC ID: NDX-TRACKING1

5.1.6 Test protocol

Test point: L1
 Operation mode: Standby mode
 Remarks: Connection via USB to a LapTop
 Date:
 Tested by: Huber Markus

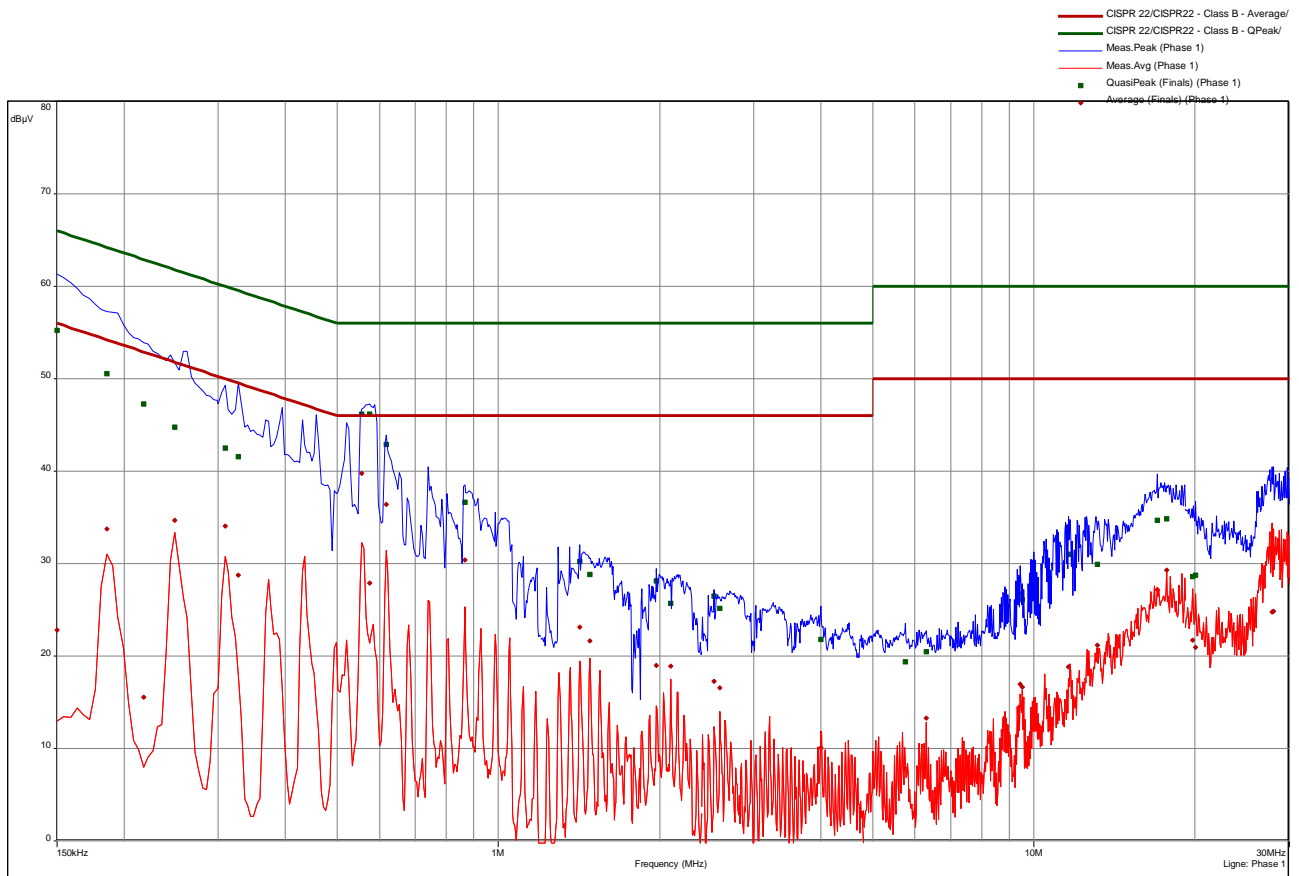
Result: passed



FCC ID: NDX-TRACKING1

Test point: N
 Operation mode: Standby mode
 Remarks: Connection via USB to a Laptop
 Date:
 Tested by: Huber Markus

Result: passed



FCC ID: NDX-TRACKING1

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
0.15	1	54.4	11.6	66	22.35	33.65	56	Neutral
0.186	1	50.97	13.24	64.21	35.71	18.5	54.21	Neutral
0.222	1	46.19	16.55	62.74	14.8	37.94	52.74	Neutral
0.249	1	46.17	15.62	61.79	36.46	15.33	51.79	Neutral
0.309	2	42.38	17.62	60	33.78	16.22	50	Neutral
0.372	2	41.64	16.81	58.46	33.81	14.64	48.46	Neutral
0.5565	2	45.28	10.72	56	38.59	7.41	46	Neutral
0.561	2	44.04	11.96	56	35.27	10.73	46	Neutral
0.618	3	44.75	11.25	56	33.76	12.24	46	Neutral
0.8655	3	38.23	17.77	56	30.87	15.13	46	Neutral
1.362	4	32	24	56	25.83	20.17	46	Neutral
1.4205	4	33.14	22.86	56	25.16	20.84	46	Neutral
1.9785	4	30.95	25.05	56	22.32	23.68	46	Neutral
2.1	4	29.88	26.12	56	20.99	25.01	46	Neutral
2.472	5	30.64	25.36	56	21.94	24.06	46	Neutral
3.525	5	27.88	28.12	56	18.92	27.08	46	Neutral
3.588	5	26.14	29.86	56	17.89	28.11	46	Neutral
5.637	6	25.24	34.76	60	10.64	39.36	50	Neutral
6.555	6	22.01	37.99	60	13.84	36.16	50	Neutral
8.715	6	28.3	31.7	60	19.11	30.89	50	Neutral
9.327	6	26.3	33.7	60	15.53	34.47	50	Neutral
13.515	7	27.04	32.96	60	19.76	30.24	50	Neutral
13.533	7	29.69	30.31	60	16.99	33.01	50	Neutral
16.7775	7	34.86	25.14	60	28.31	21.69	50	Neutral
17.943	7	34.33	25.67	60	29.27	20.73	50	Neutral
19.3395	8	31.74	28.26	60	26.31	23.69	50	Neutral
20.037	8	31.87	28.13	60	26.63	23.37	50	Neutral
27.795	8	37.03	22.97	60	31.82	18.18	50	Neutral
28.0245	8	38.67	21.33	60	35.23	14.77	50	Neutral
0.15	9	55.23	10.77	66	22.81	33.19	56	Phase 1
0.186	9	50.59	13.62	64.21	33.77	20.44	54.21	Phase 1
0.2175	9	47.25	15.66	62.91	15.53	37.38	52.91	Phase 1
0.249	9	44.75	17.04	61.79	34.69	17.1	51.79	Phase 1
0.309	10	42.48	17.52	60	34.05	15.95	50	Phase 1
0.327	10	41.54	17.99	59.53	28.79	20.74	49.53	Phase 1
0.5565	10	46.14	9.86	56	39.78	6.22	46	Phase 1
0.5745	10	46.14	9.86	56	27.86	18.14	46	Phase 1
0.618	11	42.91	13.09	56	36.42	9.58	46	Phase 1
0.8655	11	36.67	19.33	56	30.43	15.57	46	Phase 1
1.4205	12	30.25	25.75	56	23.14	22.86	46	Phase 1
1.4835	12	28.81	27.19	56	21.62	24.38	46	Phase 1
1.974	12	28.11	27.89	56	18.99	27.01	46	Phase 1
2.0955	12	25.73	30.27	56	18.91	27.09	46	Phase 1
2.5305	13	26.47	29.53	56	17.24	28.76	46	Phase 1
2.5935	13	25.13	30.87	56	16.59	29.41	46	Phase 1
3.9975	13	21.81	34.19	56	10.06	35.94	46	Phase 1

FCC ID: NDX-TRACKING1

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB	
5.7585	14	19.41	40.59	60	7.85	42.15	50	Phase 1
6.294	14	20.45	39.55	60	13.29	36.71	50	Phase 1
9.4395	14	26.73	33.27	60	16.94	33.06	50	Phase 1
9.5025	14	26.12	33.88	60	16.64	33.36	50	Phase 1
11.598	15	31.02	28.98	60	18.8	31.2	50	Phase 1
13.146	15	29.94	30.06	60	21.21	28.79	50	Phase 1
17.0205	15	34.66	25.34	60	27.16	22.84	50	Phase 1
17.7225	15	34.88	25.12	60	29.29	20.71	50	Phase 1
19.821	16	28.61	31.39	60	21.72	28.28	50	Phase 1
20.055	16	28.76	31.24	60	20.98	29.02	50	Phase 1
27.822	16	30.69	29.31	60	24.78	25.22	50	Phase 1
28.056	16	31.45	28.55	60	24.82	25.18	50	Phase 1

5.2 Radiated emissions

For test instruments and accessories used see section 6 Part **SER 1**, **SER 2**.

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



5.2.3 Applicable standard

According to FCC Part 15B, Section 15.109 (a):

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 m shall not exceed the given limit.

5.2.4 Description of Measurement

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 dB(μ V/m) non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with horizontal and vertical antenna polarization and the EUT is rotated 360 degrees. The radiated emissions from the EUT are measured in the frequency range of 1 GHz to maximum frequency as specified in section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The Interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 m horizontally from the EUT.

Measurements are made in horizontal and vertical polarization in a fully anechoic chamber. All tests are performed at a test distance of 3 m. Hand-held or body-worn devices are rotated through three orthogonal axes to determine the attitude of the highest emission shall be used for final testing. During the tests the EUT is rotated 360° and the cables and equipment are placed and moved in position in such a way to find the maximum emission level. For testing above 1 GHz, the emission level of the EUT in peak mode complies to the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

The resolution bandwidth during the measurement is as following:

30 MHz – 1000 MHz: RBW: 120 kHz

Above 1000 MHz: RBW: 1 MHz

FCC ID: NDX-TRACKING1

5.2.5 Test result

Measurement distance: 3 m

Frequency [kHz]	L: QP [dBμV]	L: AV [dBμV]	Bandwidth [kHz]	Correct. [dB]	L: QP [dBμV/m]	L: AV [dBμV/m]	Limit [dBμV/m]	Delta [dB]
536.8	24.1	19.7	9.0	20	44.1	39.7	73.0	-33.3
1073.6	23.4	18.0	9.0	20	43.4	38.0	67.0	-29.0
1342.0	21.6	15.9	9.0	20	41.6	35.9	65.0	-29.1

Frequency [MHz]	L: QP [dBμV]	Correct. [dB]	L: QP [dBμV/m]	Limit [dBμV/m]	Delta [dB]
33.78	3.7	13.4	17.1	40.0	-22.9
118.54	9.3	12.9	22.2	43.5	-21.3
517.43	4.8	21.9	26.7	46.0	-19.3

Limit according to FCC Part 15 Subpart 15.209(a)

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (meters)
	(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

Limit according to FCC part , Section 15.109(a):

Frequency (MHz)	Limit (μV/m)	Limit dB(μV/m)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

The requirements are **FULFILLED**.

Remarks: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.

Only ambient noises could be detected.

5.3 Spurious emissions (antenna conducted)

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

5.3.1 Description of the test location

Test location: None

5.3.2 Photo documentation of the test set-up

5.3.3 Applicable standard

According to FCC Part 15B, Section 15.111(a):

In addition to the radiated emission limits, receivers that operate in the frequency range 30 MHz to 960 MHz that provide terminals for the connection of a external receiving antenna may tested to demonstrate compliance with provisions of §15.109 with the antenna terminals shielded and terminated.

5.3.4 Description of Measurement

The receiver antenna terminal was connected to the spectrum analyzer. The frequency range was scanned for spurious emissions up to 5 GHz and recorded in the table below if it comes closer as 20 dB to the limit.

Spectrum analyser setting:

RBW: 100 kHz

VBW: 100 kHz

Detector: peak

5.3.5 Test result

SPURIOUS EMISSIONS								
f (MHz)	Bandwidth (kHz)	Level (dBm)	f (MHz)	Bandwidth (kHz)	Level (dBm)	f (MHz)	Bandwidth (kHz)	Level (dBm)
Measurement uncertainty			± 3 dB					

Bandwidth (kHz); refers to the bandwidth of the measuring receiver

Limit according to FCC Part 15B, Section 15.111(a):

Frequency (MHz)	Limit (nW)	Limit (dBm)
30-960	2.0	-57
Above 960	2.0	-57

FCC ID: NDX-TRACKING1

Effective measurement range according to FCC Part 15A, Section 15.33(b)(1):

Highest frequency generated or used on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.0
1.705 - 108	1000.0
108 – 500	2000.0
500 – 1000	5000.0
Above 1000	5 th harmonics of the highest frequency or 40 GHz, whichever is lower.

Remarks: The measurement is not applicable, because the EuT has no antenna connector.

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	06/06/2015	06/06/2014	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				
SER 1	FMZB 1516	01-02/24-01-018			14/02/2014	14/02/2013
	ESR7	02-02/03-13-001	21/05/2014	21/05/2014		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	28/06/2014	28/06/2014		
	VULB 9168	02-02/24-05-005	11/04/2014	11/04/2014	04/03/2014	04/09/2013
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				