



EMI – TEST REPORT

– FCC Part 15B –

Type / Model Name : COMPACT MAX RW

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, 76/4 Moo 4
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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Test Report No. : T40616-00-03HU	04. February 2016 Date of issue
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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 (October, 2015)

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, 2015)

Part 15, Subpart B, Section 15.107	AC Line conducted emissions
Part 15, Subpart B, Section 15.209	Radiated emissions, general requirements
Part 15, Subpart B, Section 15.111	Antenna power conduction

ANSI C63.10: 2010	Testing Unlicensed Wireless Devices
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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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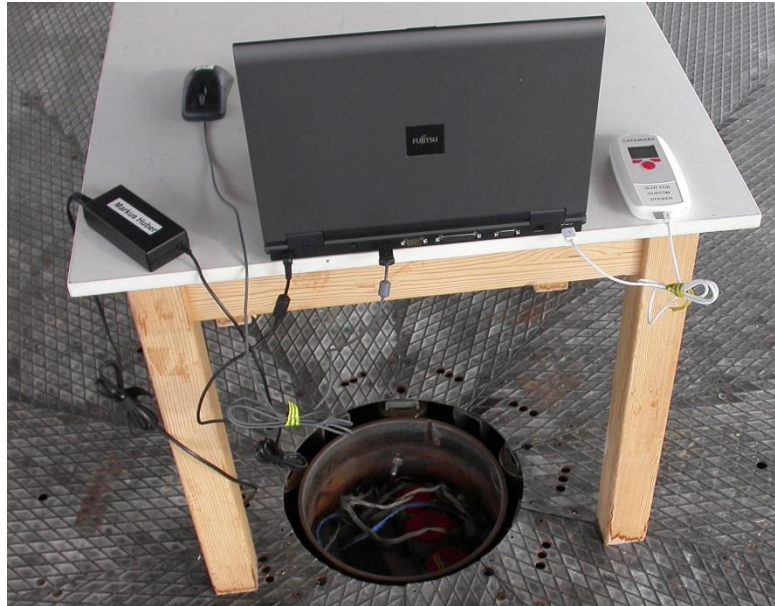
CISPR 22: 2005 EN 55022: 2006	Information technology equipment
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2 SUMMARY

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 : 19. January 2016

Testing concluded on : 02. February 2016

Checked by:

Tested by:

Gegenfurtner Klaus
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: Prototype

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

- | | | |
|---|--|--|
| - | <u>USB cable male type A to micro USB, 1.0 m</u> | Model : <u>Supplied by Datamars</u> |
| - | <u>PHIHONG Power Supply</u> | Model : <u>PSA10F-050Q, DD30004069A1</u> |
| - | <u>Fujitsu LapTop</u> | Model : <u>Supplied by CSA</u> |

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 in order to obtain maximum disturbances from the unit.

4.5.2 DETAILS OF TEST PROCEDURES

4.5.2.1 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

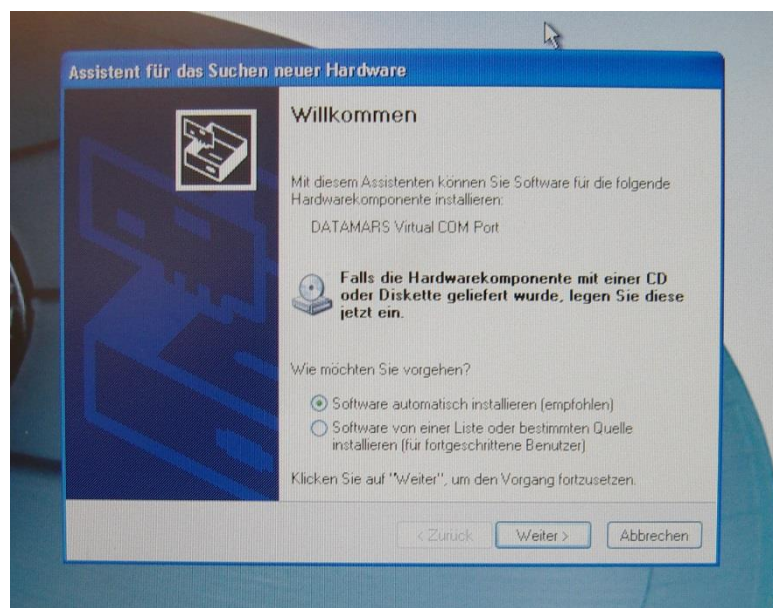
5.1 Conducted emissions

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 1.83 dB at 0.186 MHz

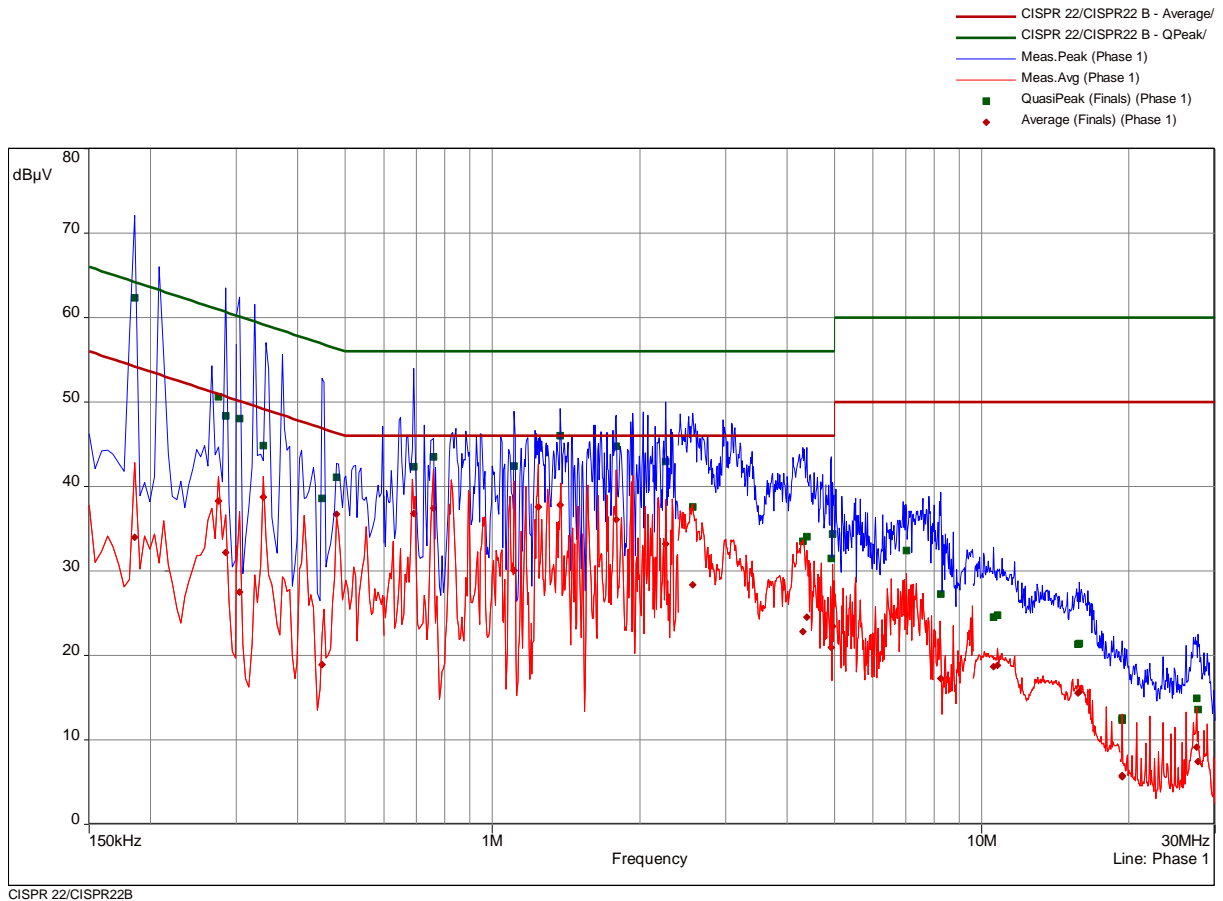
The requirements are **FULFILLED**.

Remarks:

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



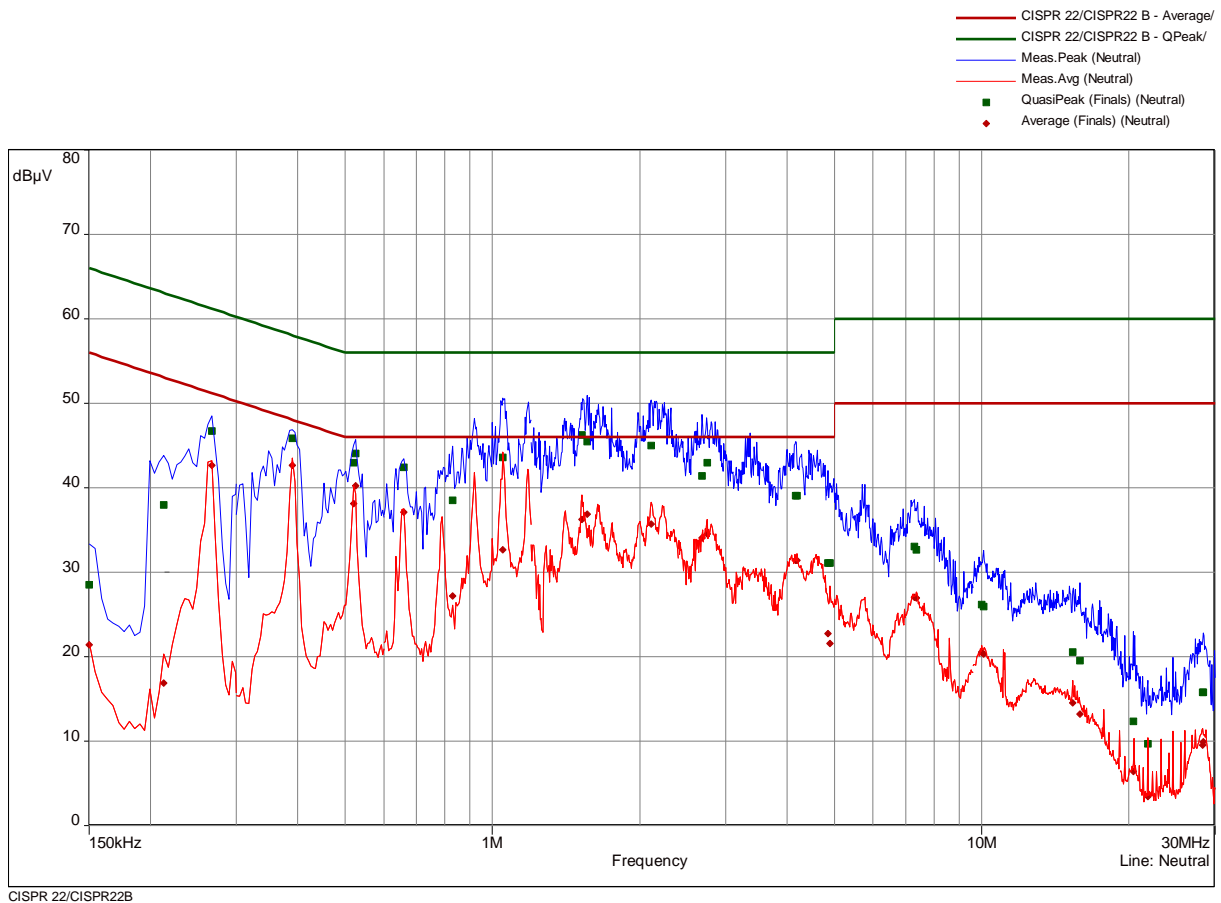
FCC ID: NDX-COMPACTMAXRW

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.186	1	62.38	1.83	64.21	33.98	20.23	54.21	Phase 1	9.84
0.276	1	50.60	10.34	60.94	38.32	12.61	50.94	Phase 1	9.82
0.285	1	48.38	12.29	60.67	32.18	18.49	50.67	Phase 1	9.82
0.3045	2	48.05	12.06	60.12	27.54	22.58	50.12	Phase 1	9.82
0.3405	2	44.83	14.36	59.19	38.77	10.42	49.19	Phase 1	9.81
0.4485	2	38.60	18.30	56.90	18.88	28.02	46.90	Phase 1	9.82
0.48	2	41.07	15.27	56.34	36.75	9.59	46.34	Phase 1	9.82
0.69	3	42.37	13.63	56.00	36.83	9.17	46.00	Phase 1	9.81
0.7575	3	43.55	12.45	56.00	37.45	8.55	46.00	Phase 1	9.80
1.1085	3	42.40	13.60	56.00	30.06	15.94	46.00	Phase 1	9.81
1.2405	4	44.94	11.06	56.00	37.56	8.44	46.00	Phase 1	9.80
1.3755	4	46.04	9.96	56.00	37.78	8.22	46.00	Phase 1	9.79
1.7895	4	44.77	11.23	56.00	36.12	9.88	46.00	Phase 1	9.79
2.262	4	42.96	13.04	56.00	33.20	12.80	46.00	Phase 1	9.80
2.5665	5	37.60	18.40	56.00	28.37	17.63	46.00	Phase 1	9.79
4.3125	5	33.52	22.48	56.00	22.83	23.17	46.00	Phase 1	9.81
4.389	5	34.04	21.96	56.00	24.52	21.48	46.00	Phase 1	9.81
4.926	6	31.53	24.47	56.00	20.94	25.06	46.00	Phase 1	9.82
4.962	6	34.42	21.58	56.00	23.41	22.59	46.00	Phase 1	9.82
7.0185	6	32.41	27.59	60.00	24.86	25.14	50.00	Phase 1	9.84
8.247	6	27.24	32.76	60.00	17.26	32.74	50.00	Phase 1	9.86
10.5765	7	24.53	35.47	60.00	18.68	31.32	50.00	Phase 1	9.92
10.761	7	24.76	35.24	60.00	18.83	31.17	50.00	Phase 1	9.92
15.7245	7	21.37	38.63	60.00	15.54	34.46	50.00	Phase 1	10.14
15.846	7	21.44	38.56	60.00	15.71	34.29	50.00	Phase 1	10.14
19.362	8	12.32	47.68	60.00	5.60	44.40	50.00	Phase 1	10.30
19.3755	8	12.58	47.42	60.00	5.78	44.22	50.00	Phase 1	10.30
27.525	8	14.96	45.04	60.00	9.16	40.84	50.00	Phase 1	10.34
27.6735	8	13.62	46.38	60.00	7.40	42.60	50.00	Phase 1	10.34

FCC ID: NDX-COMPACTMAXRW

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

Result: passed



FCC ID: NDX-COMPACTMAXRW

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(μV)	dB	dB	dB(μV)	dB	dB		dB
0.15	9	28.56	37.44	66.00	21.41	34.59	56.00	Neutral	9.84
0.213	9	37.97	25.12	63.09	16.90	36.19	53.09	Neutral	9.85
0.267	9	46.76	14.45	61.21	42.67	8.54	51.21	Neutral	9.83
0.39	10	45.89	12.17	58.06	42.69	5.37	48.06	Neutral	9.81
0.5205	10	42.96	13.04	56.00	38.11	7.89	46.00	Neutral	9.82
0.525	10	44.09	11.91	56.00	40.23	5.77	46.00	Neutral	9.82
0.6585	11	42.40	13.60	56.00	37.12	8.88	46.00	Neutral	9.81
0.8295	11	38.56	17.44	56.00	27.17	18.83	46.00	Neutral	9.81
1.05	11	43.63	12.37	56.00	32.62	13.38	46.00	Neutral	9.81
1.524	12	46.24	9.76	56.00	36.24	9.76	46.00	Neutral	9.79
1.5645	12	45.47	10.53	56.00	36.86	9.14	46.00	Neutral	9.79
2.109	12	45.03	10.97	56.00	35.74	10.26	46.00	Neutral	9.80
2.6835	13	41.44	14.56	56.00	34.04	11.96	46.00	Neutral	9.79
2.7465	13	42.96	13.04	56.00	34.55	11.45	46.00	Neutral	9.79
4.1685	13	39.03	16.97	56.00	31.45	14.55	46.00	Neutral	9.80
4.191	13	39.05	16.95	56.00	31.39	14.61	46.00	Neutral	9.80
4.8585	14	31.06	24.94	56.00	22.78	23.22	46.00	Neutral	9.81
4.899	14	31.09	24.91	56.00	21.60	24.40	46.00	Neutral	9.81
7.2795	14	33.06	26.94	60.00	27.05	22.95	50.00	Neutral	9.82
7.365	14	32.64	27.36	60.00	26.93	23.07	50.00	Neutral	9.82
9.987	15	26.19	33.81	60.00	20.57	29.43	50.00	Neutral	9.83
10.0905	15	25.91	34.09	60.00	20.30	29.70	50.00	Neutral	9.83
15.3285	15	20.53	39.47	60.00	14.53	35.47	50.00	Neutral	9.95
15.9	15	19.52	40.48	60.00	13.18	36.82	50.00	Neutral	9.96
20.4015	16	12.34	47.66	60.00	6.39	43.61	50.00	Neutral	10.11
21.873	16	9.71	50.29	60.00	3.42	46.58	50.00	Neutral	10.05
28.2675	16	15.78	44.22	60.00	9.54	40.46	50.00	Neutral	9.78
28.4025	16	15.79	44.21	60.00	9.91	40.09	50.00	Neutral	9.77

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 15C, Section 15.209:

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

5.2.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with 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 follows:

9 kHz – 150 kHz:	RBW: 200 Hz
150 kHz – 30 MHz:	RBW: 9 kHz
30 MHz – 1000 MHz:	RBW: 120 kHz

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

Note: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.
Only ambient noises could be detected!

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

Note: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.
Only ambient noises could be detected!

FCC ID: NDX-COMPACTMAXRW

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

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	($\mu\text{V/m}$)	dB($\mu\text{V/m}$)	
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30
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: 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-COMPACTMAXRW

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	ESCI	02-02/03-05-004	17/09/2016	17/09/2015		
	ESH 2 - Z 5	02-02/20-05-004	26/10/2017	26/10/2015	21/01/2016	21/07/2015
	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	06/11/2016	06/11/2015	06/05/2016	06/11/2015
	SP 103 /3.5-60	02-02/50-05-182				
SER 1	FMZB 1516	01-02/24-01-018			21/01/2017	21/01/2016
	ESCI	02-02/03-05-004	17/09/2016	17/09/2015		
	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	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015		
	UHALP 9108 A	02-02/24-05-022	03/12/2016	03/12/2015	07/03/2016	07/09/2015
	BBA 9106 / VHA 9103	02-02/24-05-023	14/10/2016	14/10/2015	14/04/2016	14/10/2015
	HF 7/8 inch	02-02/50-05-116				
	RG 214/U	02-02/50-05-117				
	KK-EF393/U-16N-21N20 m	02-02/50-12-019				