FCC ID: NDX-TRACKING1

EMI – TEST REPORT

- FCC Part 15.209 -

Test Report No. : **T37213-00-02HU**	10. December 2013 Date of issue

Type / Model Name : TracKing-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**

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12030-01-01 D-PL-12030-01-02

Contents

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.
ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement

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 : 08. October 2013

Testing concluded on : 14. October 2013

Checked by:

Klaus Gegenfurtner
I confirm the correctness and Integrity of this documents
2013.12.10 15:33:34 +01'00'

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

Tested by:

Markus Huber
I'm the author of this document
2013.12.10 15:21:42 +01'00'

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:

- Tx mode at 134.2 kHz

- Accu charging mode

-

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 cable male type A to mini USB, 1.80	Model :	Supplied by manufacturer
-	AC/DC Power supply - Samsung	Model :	SAC-46, S/N: 976068856, 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 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 other thus obtaining maximum disturbances from the unit.

5 TEST CONDITIONS AND RESULTS

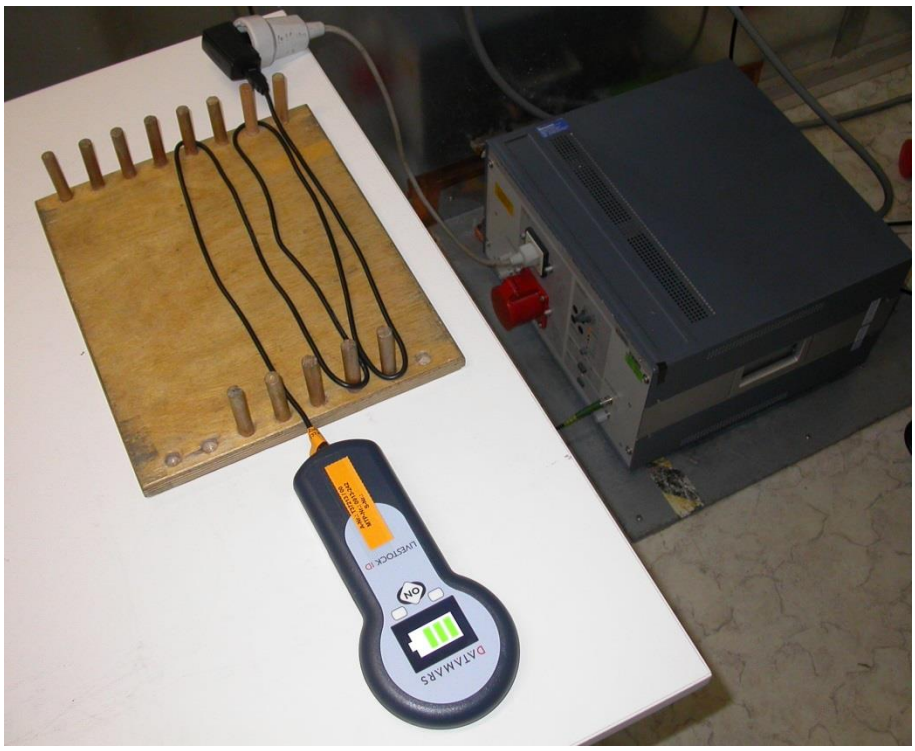
5.1 Conducted emissions

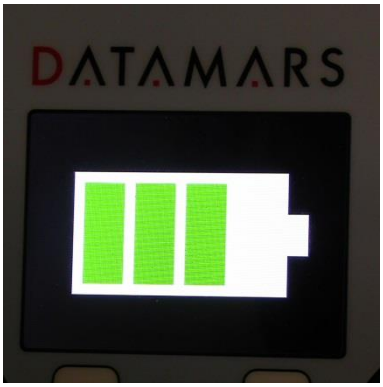
For test instruments and accessories used see section 6 Part **A 4**.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up





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

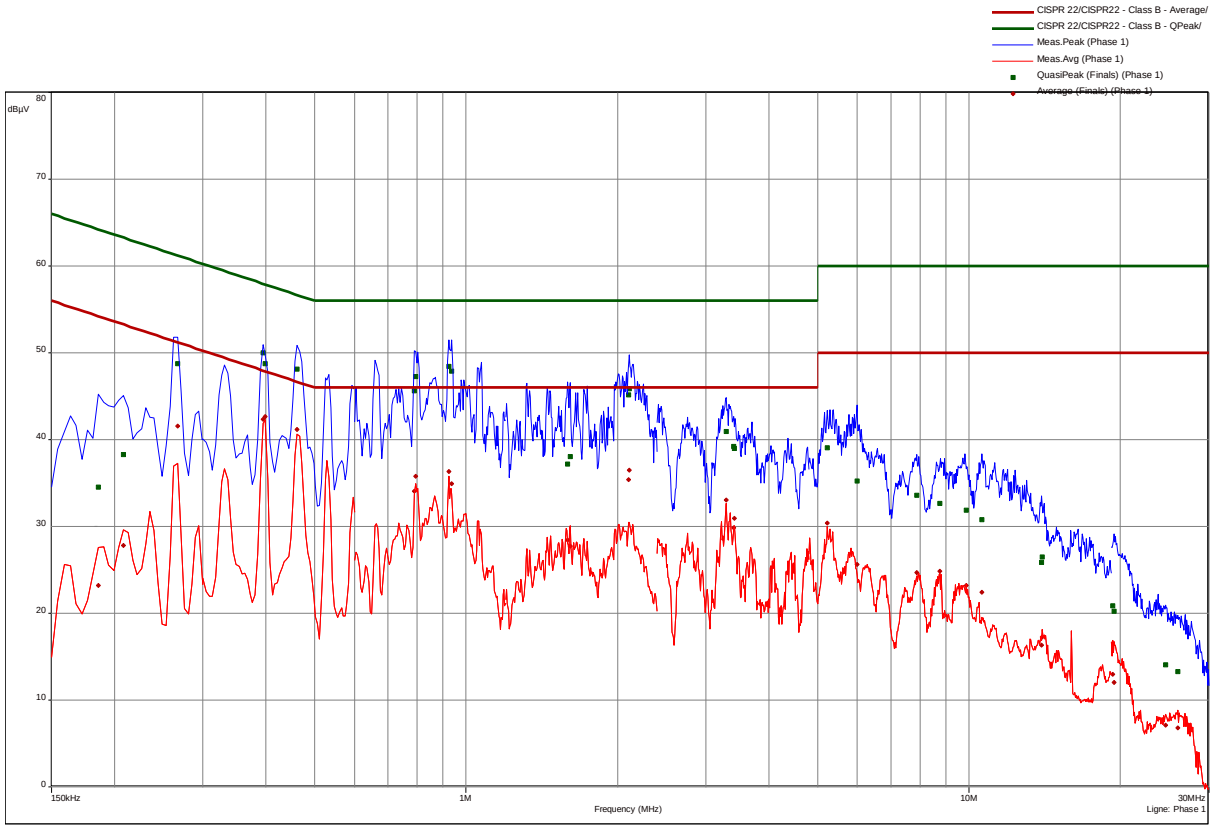
Frequency range: 0.15 MHz - 30 MHz

Min. limit margin: 5.19 dB at 0.399 MHz

The requirements are **FULFILLED.**

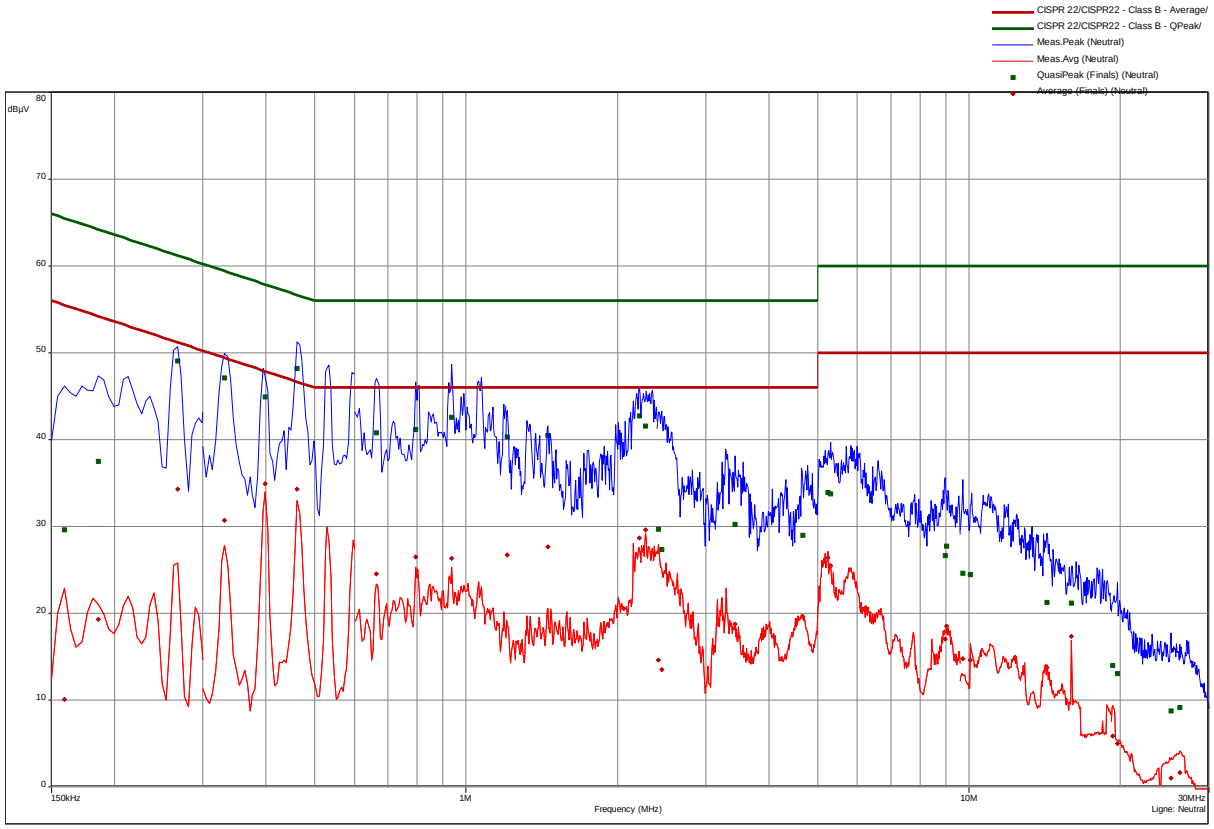
Remarks: For detailed results, please see the following page(s).

Test point:	L1	Result: passed
Operation mode:	Accu charging mode	
Remarks:	Samsung, SAC-46, PSU	
Date:		
Tested by:	Huber Markus	



Test point: N
Operation mode: Accu charging mode
Remarks: Samsung, SAC-46, PSU
Date:
Tested by: Huber Markus

Result: passed



freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB	
0.159	1	29.64	35.88	65.52	10.09	45.43	55.52	Neutral
0.186	1	37.48	26.73	64.21	19.31	34.9	54.21	Neutral
0.267	1	49.03	12.18	61.21	34.27	16.94	51.21	Neutral
0.3315	2	47.14	12.27	59.41	30.71	18.7	49.41	Neutral
0.399	2	44.94	12.93	57.87	34.93	12.94	47.87	Neutral
0.462	2	48.17	8.48	56.66	34.3	12.35	46.66	Neutral
0.663	3	40.82	15.18	56	24.53	21.47	46	Neutral
0.7935	3	41.15	14.85	56	26.51	19.49	46	Neutral
0.9375	3	42.62	13.38	56	26.3	19.7	46	Neutral
1.209	4	40.31	15.69	56	26.75	19.25	46	Neutral
1.4565	4	40.45	15.55	56	27.69	18.31	46	Neutral
2.2125	4	42.73	13.27	56	28.68	17.32	46	Neutral
2.2755	4	41.57	14.43	56	29.63	16.37	46	Neutral
2.4135	5	29.68	26.32	56	14.63	31.37	46	Neutral
2.4495	5	27.37	28.63	56	13.49	32.51	46	Neutral
3.4305	5	30.21	25.79	56	18.78	27.22	46	Neutral
4.677	5	29.03	26.97	56	19.63	26.37	46	Neutral
5.241	6	33.9	26.1	60	26.42	23.58	50	Neutral
5.313	6	33.79	26.21	60	25.44	24.56	50	Neutral
8.976	6	26.67	33.33	60	17.03	32.97	50	Neutral
9.021	6	27.71	32.29	60	18.49	31.51	50	Neutral
9.7305	7	24.62	35.38	60	14.76	35.24	50	Neutral
10.059	7	24.48	35.52	60	14.63	35.37	50	Neutral
14.271	7	21.28	38.72	60	13.77	36.23	50	Neutral
15.999	7	21.17	38.83	60	17.37	32.63	50	Neutral
19.3125	8	14.02	45.98	60	5.84	44.16	50	Neutral
19.731	8	13.03	46.97	60	5.04	44.96	50	Neutral
25.2345	8	8.73	51.27	60	1.04	48.96	50	Neutral
26.2425	8	9.14	50.86	60	1.63	48.37	50	Neutral
0.186	9	34.57	29.64	64.21	23.23	30.98	54.21	Phase 1
0.2085	9	38.28	24.98	63.26	27.85	25.41	53.26	Phase 1
0.267	9	48.79	12.42	61.21	41.59	9.62	51.21	Phase 1
0.3945	10	49.98	7.99	57.97	42.34	5.63	47.97	Phase 1
0.399	**10**	**48.72**	**9.15**	**57.87**	**42.68**	**5.19**	**47.87**	**Phase 1**
0.462	10	48.13	8.52	56.66	41.21	5.44	46.66	Phase 1
0.789	11	45.65	10.35	56	34.03	11.97	46	Phase 1
0.7935	11	47.23	8.77	56	35.75	10.25	46	Phase 1
0.924	11	48.46	7.54	56	36.3	9.7	46	Phase 1
0.9375	11	47.92	8.08	56	34.94	11.06	46	Phase 1
1.5915	12	37.23	18.77	56	28.45	17.55	46	Phase 1
1.6095	12	38.04	17.96	56	27.78	18.22	46	Phase 1
2.1045	12	45.15	10.85	56	35.41	10.59	46	Phase 1
2.109	12	45.89	10.11	56	36.47	9.53	46	Phase 1
3.2865	13	40.96	15.04	56	33.08	12.92	46	Phase 1

freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB	
3.4035	13	39.19	16.81	56	29.87	16.13	46	Phase 1
3.417	13	38.97	17.03	56	30.95	15.05	46	Phase 1
5.2275	14	39.07	20.93	60	30.37	19.63	50	Phase 1
5.9925	14	35.24	24.76	60	25.66	24.34	50	Phase 1
7.878	14	33.57	26.43	60	24.72	25.28	50	Phase 1
8.742	14	32.69	27.31	60	24.83	25.17	50	Phase 1
9.87	15	31.91	28.09	60	23.23	26.77	50	Phase 1
10.6125	15	30.77	29.23	60	22.42	27.58	50	Phase 1
13.9335	15	25.85	34.15	60	16.3	33.7	50	Phase 1
13.983	15	26.46	33.54	60	17.28	32.72	50	Phase 1
19.3215	16	20.88	39.12	60	13.01	36.99	50	Phase 1
19.434	16	20.27	39.73	60	12.04	37.96	50	Phase 1
24.582	16	14.06	45.94	60	7.13	42.87	50	Phase 1
26.0175	16	13.26	46.74	60	6.82	43.18	50	Phase 1

5.2 Field strength of the fundamental wave

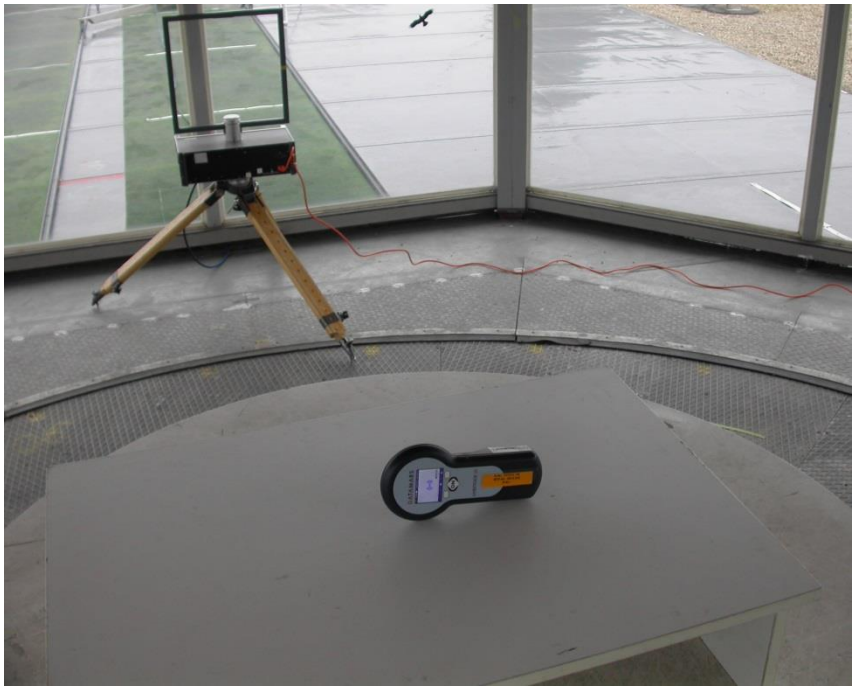
For test instruments and accessories used see section 6 Part **CPR 1**.

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

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	87.0	83.9	85.5	0.2	20	107.0	103.9	105.5	105.1	-1.6

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	7.0	3.9	5.5	0.2	20	27.0	23.9	25.5	25.1	-1.6

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

Frequency	Field strength of fundamental wave		Measurement distance
(MHz)	(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

The requirements are **FULFILLED.**

Remarks: _____

5.3 Spurious emissions (magnetic field) 9 kHz – 30 MHz

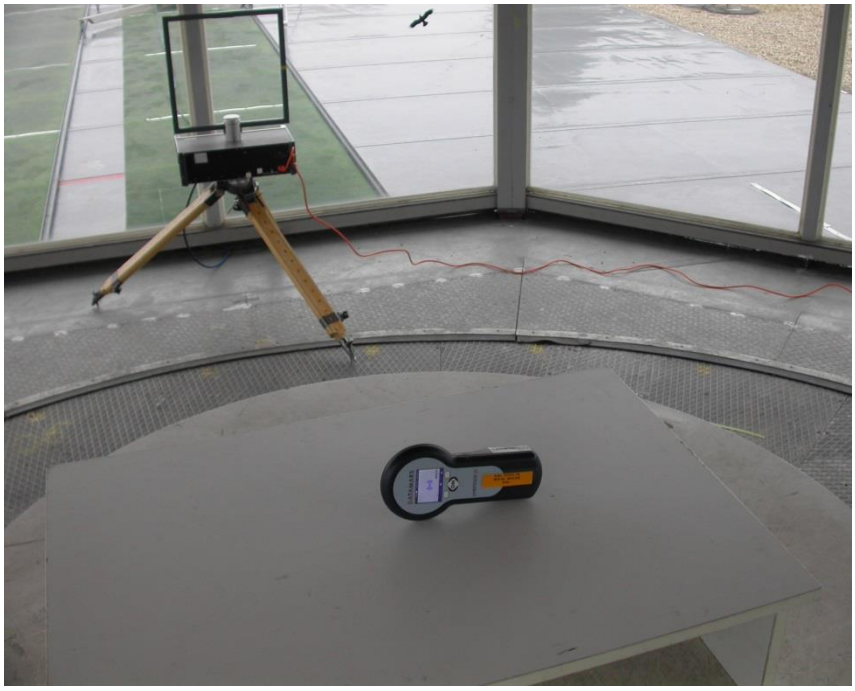
For test instruments and accessories used see section 6 Part **SER 1**.

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

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	39.2	36.1	37.7	9	20	59.2	56.1	57.7	99.0	-42.9
402.8	45.2	42.1	43.7	9	20	65.2	62.1	63.7	95.5	-33.4

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	-40.8	-43.9	-42.3	9	20	-20.8	-23.9	-22.3	19.0	-42.9
402.8	-34.8	-37.9	-36.3	9	20	-14.8	-17.9	-16.3	15.5	-33.4

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

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

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

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.

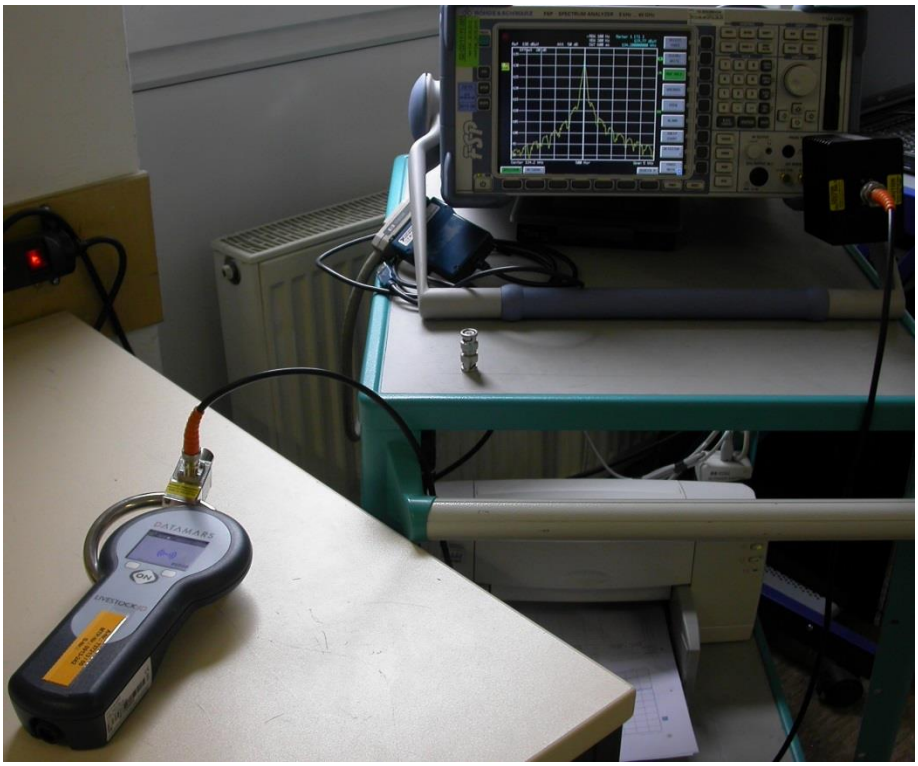
5.4 Emission Bandwidth

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

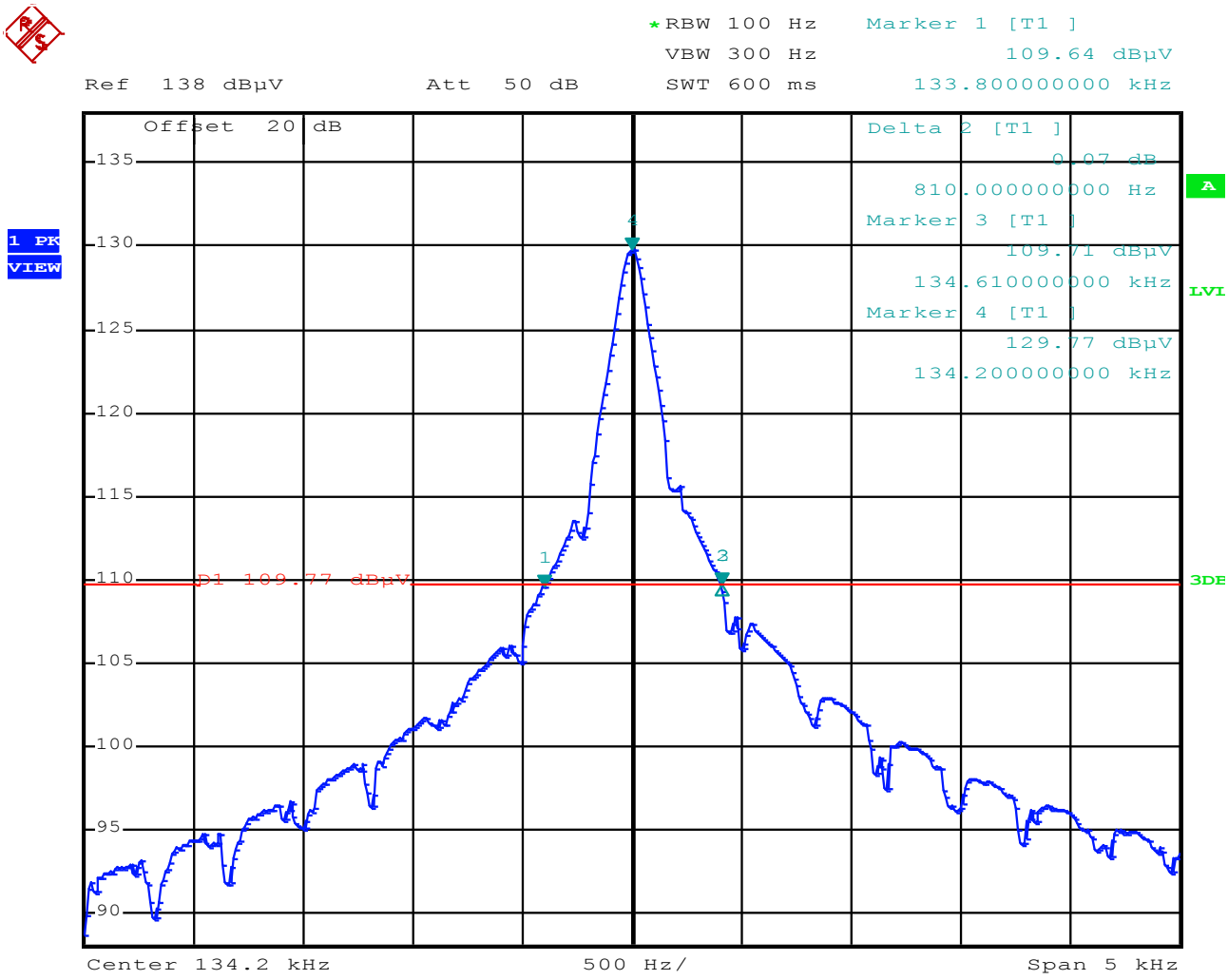


Fundamental [kHz] See Plot 1	20dB Bandwidth F1	20dB Bandwidth F2	Measured Bandwidth [kHz]
134.20	133.80	134.61	0.81

Remarks:

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	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				
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	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	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				