TEST REPORT CONCERNING THE COMPLIANCE OF A INDUCTIVE PROXIMITY CARD READER ADD-ON MODULE OPERATING IN THE RANGE 115 – 148 kHz. BRAND INID, MODEL 4000A WITH THE REQUIREMENTS OF 47 CFR PART 15 (10-1-14 Edition)

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June 17, 2015

FCC listed : 90828
Industry Canada : 2932G-2
R&TTE, LVD, EMC Notified Body : 1856

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MEASUREMENT/TECHNICAL REPORT

Brand: INID
Model: 4000A
FCC ID: YAB-NGRPAOLFA
IC: 8908A-NGRPAOLFA

This report concerns:	Original certification/LMA ~~Class 2 Permissive Change~~ ~~Verification~~
Equipment type:	DCD: Part 15 Low Power Transmitter below 1705 kHz

Report prepared by:		
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The data taken for this test and report herein was done in accordance with 47 CFR Part 15 (10-1-14 edition) and the measurement procedures of ANSI C63.10-2009. TÜV Rheinland Nederland B.V. at Leek, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: June 17, 2015 Signature:

P. de Beer
Technical Manager TÜV Rheinland Nederland B.V.

Summary

The device under test does:

- ● fulfill the general approval requirements as identified in this test report
- ○ not fulfill the general approval requirements as identified in this test report

Description of test item

Test item (EUT)	:	RFID Device (Add-on module) operating in the range 115 -148 kHz
Manufacturer	:	INID BV
Brand	:	INID
Model(s)	:	4000A
Serial number(s)	:	079080416
Revision	:	1.12a
FCC ID		YAB-NGRPAOLFA
Receipt date	:	May 19, 2015

Applicant information

Applicant's representative	:	Mr. Mark de Olde
Company	:	INID BV
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Postal code	:	1713HX
City	:	Opdam
Country	:	The Netherlands
Telephone number	:	+31 226450009
Telefax number	:	+31 226450030
e-mail address	:	Mark@inid-readers.com

Test(s) performed

Location	:	Leek
Test(s) started	:	May 19, 2015
Test(s) completed	:	July 17, 2015
Purpose of test(s)	:	Equipment Authorization (Original certification)
Test specification(s)	:	47 CFR Part 15 (10-1-14 edition)
Compliance statement	:	The test has demonstrated that this unit complies with stipulated standards.
Test engineer(s)	:	R. van der Meer
Report written by	:	R. van der Meer
Report date	:	July 17, 2015

Table of contents

1 General information.

1.1 Product description.

1.1.1 Introduction.

The EUT is an Inductive Proximity Card Reader (Add-On module) intended to be used in access control systems, parking systems and other applications using RFID readers. The content of this report and measurement results have not been changed other than the way of presenting the data.

1.2 Related submittal(s) and/or Grant(s).

1.2.1 General.

This test report supports the original certification in equipment authorization files under registration number.
FCC: YAB-NGRPAOLFA.

1.3 Tested system details.

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	Inductive Proximity Card Reader add-on module, operating in the range 115 - 148 kHz
Manufacturer	:	INID B.V.
Brand	:	INID
Model	:	4000A
Serial number	:	--
Voltage input rating	:	3.3 - 5 Vdc
Voltage output rating	:	--
Current input rating	:	Max 200 mA
Antenna	:	Copper wire loop antenna soldered on PCB
Operating frequency	:	115 -148 kHz, nominal 133 kHz.
Modulation type	:	ASK
Remarks	:	Revision 1.21e

AUX1	:	MultiSmart multi technology inductive proximity card reader operating on 13.56 MHz
Manufacturer	:	INID BV
Brand	:	INID
Models	:	5040A, 5050, 5060 and 5050 Dummy Load
Serial number	:	107190216, 084140519, 095030029 and 095030021
Voltage input rating	:	7 – 24 Vdc (12 Vdc recommended)
Voltage output rating	:	--
FCC ID		YAB-ISOACRDR
IC	:	8908A-ISOACRDR
Remark	:	host for EUT

AUX2	:	Power supply
Manufacturer	:	--
Brand	:	Delta Elektronika
Model	:	
Serial number	:	--
Voltage input rating	:	100-240Vac 50-60 Hz
Voltage output rating	:	adjusted for 12Vdc
Remark	:	ID A00041

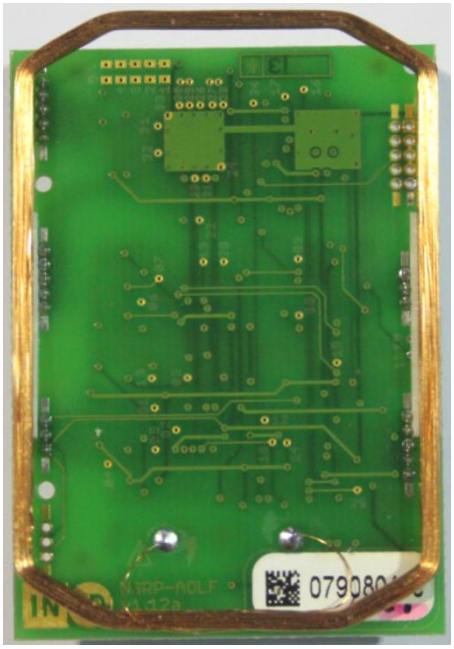


Photo 1a: EUT

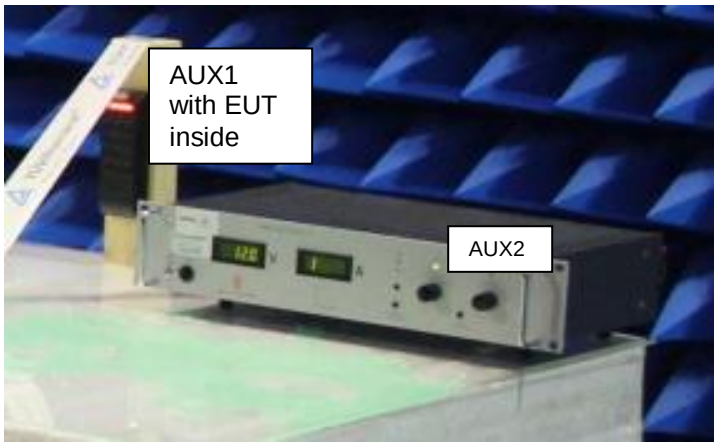


Photo 1b: EUT in typical setup

Photo 1c: EUT in a setup with communication interface

1.3.1 Description of input and output ports.

Number	Ports	From	To	Shielding	Remarks
1	AC mains	AC mains	AUX1	~~yes~~ / no	None
2	DC power	AUX1	EUT	~~yes~~ / no	None

1.4 Test Summary

The EUT was tested in accordance with the specifications given in Table 1 below.

Test Standard	Description	Page	Pass / Fail
FCC CFR 47 Part 15, (10-1-14 Edition)			
15.207(a)	AC Power Line Conducted Emissions	14 – 15 / 17 - 18	Pass
15.209	Radiated Emissions	10 – 13	Pass
15.215	Occupied bandwidth	16	Pass

Table 1: testspecifications

Testmethods: ANSI C63.10-2009

1.5 Test methodology.

The test methodology used is based on the requirements of sections 47 CFR Part 15 (10-1-14 Edition), sections 15.31, 15.207 and 15.209.
The test methods, which have been used, are based on ANSI C63.10-2009.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters.
Radiated emission tests below 30 MHz were performed at a measurement distance of 3 meters.
To calculate the field strength level from these results to the appropriate distance at which the limit is specified, the appropriate extrapolation factor is used.

The receivers are switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

1.6 Test facility.

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland Nederland B.V., located in Leek, Eiberkamp 10, 9351 VT, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The description of the test facilities has been filed to Industry Canada under registration number 2932G-2. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

1.7 Test conditions.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 12 Vdc
Air pressure	: 950 – 1050 hPa

When it was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

2 System test configuration.

2.1 Justification.

The system was configured for testing in a typical fashion (as a customer would normally use it). The EUT was tested with the various host (AUX1) as mentioned in the attestation, after pre-test the following host models were selected for final tests: 5040A, 5050 and 5060.

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10-2009.

2.2 EUT mode of operation.

The EUT has been tested in normal mode (without detecting a card) and active mode, i.e. the EUT is ready to detect a card.

The intentional radiator tests have been performed with a complete functioning EUT and interconnections.

2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance.

2.4 Equipment modifications.

Only for the AC Power Line Conducted Emissions testing (section 4) test, the host unit (model 5050) was modified to add a resistive termination in lieu of the antenna of the host device AUX1 according to KDB 174176. For all other tests no modifications have been made to the equipment.

2.5 Product Labeling

The product labeling information is available in the technical documentation package.

2.6 Block diagram of the EUT.

The block diagram is available in the technical documentation package.

2.7 Schematics of the EUT.

The schematics are available in the technical documentation package.

2.8 Part list of the EUT.

The part list is available in the technical documentation package at the applicant.

3 Radiated emission data.

RESULT: PASS

Date of testing: 2015-05-20/21 and July-17

Frequency range: 9kHz - 1GHz

Requirements: 47 CFR Part 15 section 15.209

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Field strength (dBmicrovolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	43.5 – 13.8	300
0.490-1.705	24000/F(kHz)	33.8 – 22.9	30
1.705-30.0	30	29.5	30
30-88	100**	40.0	3
88-216	150**	43.5	3
216-960	200**	46.0	3
Above 960	500	54.0	3

Test procedure:

ANSI C63.10-2009.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 9 kHz to 1 GHz. The radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit.

3.1 Radiated field strength measurements (30 MHz – 1 GHz, E-field)

RESULT: Pass.

Date of testing: 2015-05-20 and 21

Frequency (MHz)	Antenna polarization	Detector / Bandwidth (kHz)	Results after correction @3m (dBµV/m)	Limits @3m (dBµV/m)	Pass/Fail
136.531	Horizontal	Quasi-Peak / 120	41.8	43.5	Pass
190.727	Vertical	Quasi-Peak / 120	35.4	43.5	Pass
239.02	Vertical	Quasi-Peak / 120	29.0	46.0	Pass
299.66	Vertical	Quasi-Peak / 120	21.8	46.0	Pass
567.38	Vertical	Quasi-Peak / 120	29.3	46.0	Pass
631.40	Vertical	Quasi-Peak / 120	30.2	46.0	Pass

Table 2 Radiated emissions of the EUT

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 are depicted in Table 2.

Notes:

1. Measurement uncertainty is ±5.0dB.
2. The EUT was varied in three positions, the antenna was varied in horizontal and vertical orientations and also around it's axis. The reported value is the worst case found at the reported frequency
3. The EUT was tested in both normal mode (i.e. without a label in its proximity) and in activated mode (i.e. with a label in its proximity). Worst case noted.
4. Tested with model 5060 which proved from pre-tests to be the worst case model.

3.1.1 Test equipment used (for reference see test equipment listing).

A00257	A00258	A00314	A00447	A00235	A00466	A00257	A00041	

3.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field).

RESULT: Pass.

Date of testing: 2015-07-17

Frequency (MHz)	(a) Measurement results	Detector	(b) Antenna factor	(c) Cable loss	(d) Extrapolation factor	Measurement results (calculated =a+b+c-d)	Limits
	dBµV @3m		dB	dB	dB	dBµV/m@30m (unless otherwise stated)	dBµV/m@30m (unless otherwise stated)
0.1009	42.1	Qp	20.1	1	80	-16.8 @300m	47.53 @300m
0.1996	38.9	Pk	20.1	1	80	-20.0 @300m	41.60 @300m
0.1326 fundamental	61.5	Pk	20.1	1	80	2.6 @300m	45.16 @300m
0.3118	24.7	Pk	20.0	1	80	-34.3 @300m	37.73 @300m
0.4361	37.0	Pk	20.0	1	80	-22.0 @300m	34.81 @300m
0.4830	39.0	Pk	20.0	1	80	-20.0 @300m	33.93 @300m

Table 3a Radiated emissions of the EUT in the frequency range 0.009 – 30 MHz, Peak and Quasi Peak values

Frequency (MHz)	(a) Measurement results Peak	(b) Duty cycle factor	Measurement results Average (calculated =a-b)	Limits
	dBµV/m @300m	dB	dBµV/m @300m	dBµV/m @300m
0.1996	-20.0	0.80	-20.8	21.60
0.1326 fundamental	2.6	0.80	1.8	25.16
0.3118	-34.3	0.80	-35.1	17.73
0.4361	-22.0	0.80	-22.8	14.81
0.4830	-20.0	0.80	-20.8	13.93

Table 3b Radiated emissions of the EUT in the frequency range 0.009 – 30 MHz, average values

The results of the radiated emission tests in the frequency range 0.009 – 30 MHz, carried out in accordance with 47 CFR Part 15 section 15.209 are depicted in Tables 3a and 3b.

See notes and used equipment on the next page.

Notes:

1. Calculated measurement results are obtained by using the 40dB/decade factor (antenna factor and cable loss is included). i.e at 0.1326 MHz: 61.5 dBµV + 20.1 dB + 1dB - 80dB= 2.6 dBµV/m.
2. A resolution bandwidth of 9kHz was used during testing
3. The six highest emissions relative to the applicable limits are noted.
4. The loop antenna was varied in horizontal and vertical orientations and also around it's axis. The reported value is the worst case found at the reported frequency.
5. From pre-test of all models, the EUT placed in host model 5050 generated the highest emissions.
6. The EUT was varied in three positions, vertical orientation (it's normal use) showed the highest emissions.
7. The table was turned 360° by hand.
8. Measured on the outdoor testfascility.
9. Measurement uncertainty is ±5.0dB.
10. See section 6 for Duty Cycle data.

Used test equipment and ancillaries:

A01491	A00450	A00314	A00444	A00447	

4 AC Power Line Conducted Emissions Data.

RESULT: Pass.

Date of testing: 2015-05-28

Requirements: 47 CFR Part 15 section 15.207(a).

Except when the requirements applicable to a given device state otherwise, for any license-exempt radio communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the following table. The tighter limit applies at the frequency range boundaries.

Frequency of Emission (MHz)	Conducted Limit (dBµV) Quasi-Peak	Conducted Limit (dBµV) Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 - 30	46	50

*Decreases with the logarithm of the frequency.

Test procedure:

ANSI C63.10-2009.

Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a 50 µH / 50 Ω LISN. The frequency range from 150kHz to 30MHz was searched.
The six highest EUT emissions relative to the limit were noted for three supply voltages.
In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane.

4.1 AC power Line Conducted Emission data of the EUT.

Frequency (MHz)	Measurement results dB(µV) Line 1		Measurement results dB(µV) Neutral/Line 2		Limits dB(µV)		Result
	QP	AV	QP	AV	QP	AV	
0.150	27.0	Note 5	26.8	Note 5	66.0	56.0	PASS
0.200	33.5	Note 5	30.0	Note 5	63.6	53.6	PASS
0.280	30.0	Note 5	22.2	Note 5	60.8	50.8	PASS
0.905	34.0	Note 5	33.9	Note 5	56.0	46.0	PASS
7.430	21.8	Note 5	20.0	Note 5	60.0	50.0	PASS
14.850	26.5	Note 5	25.0	Note 5	60.0	50.0	PASS

Table 4 AC Power line Conducted Emission measurements results

The results of the AC power line conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207(a), at the 120 Volts AC mains connection terminals of the AC/DC power supply which was connected to the EUT, are depicted in Table 4.

Notes:

1. The test unit of type 5050 was modified to add a resistive termination in lieu of the antenna of the host**.**
2. The test data shown above is of the worst case EUT. The six highest values relative to the applicable limits were recorded.
3. Measurement uncertainty is ±3.5dB
4. See section 5.3 for the plots.
5. QP levels are already within AV limits and therefore AV is not tested.

Used test equipment and ancillaries:

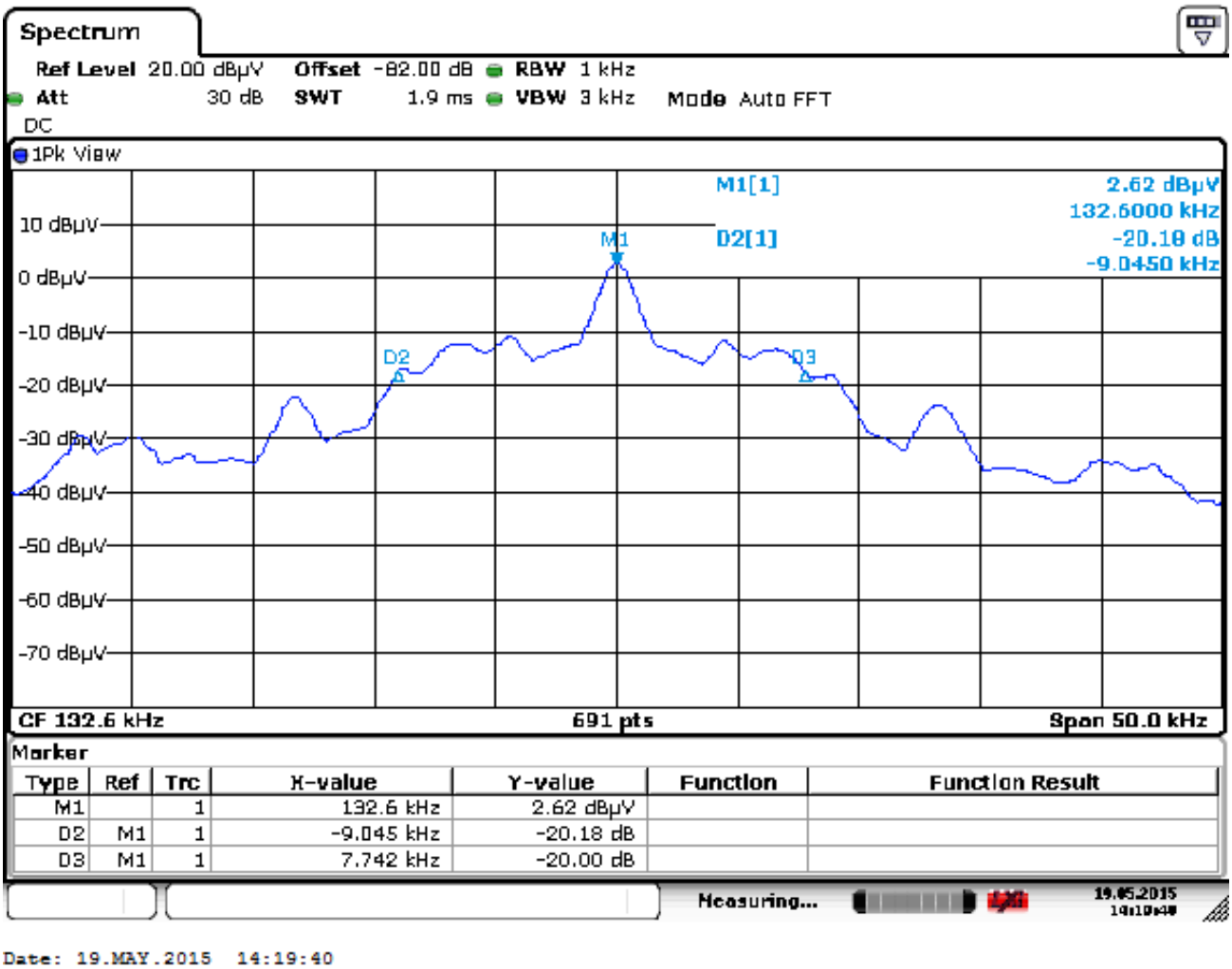
A00022	A00051	A00171	A00437	A00444	A00726
A00041					

5 Plots of measurement data

5.1 Bandwidth of the emission

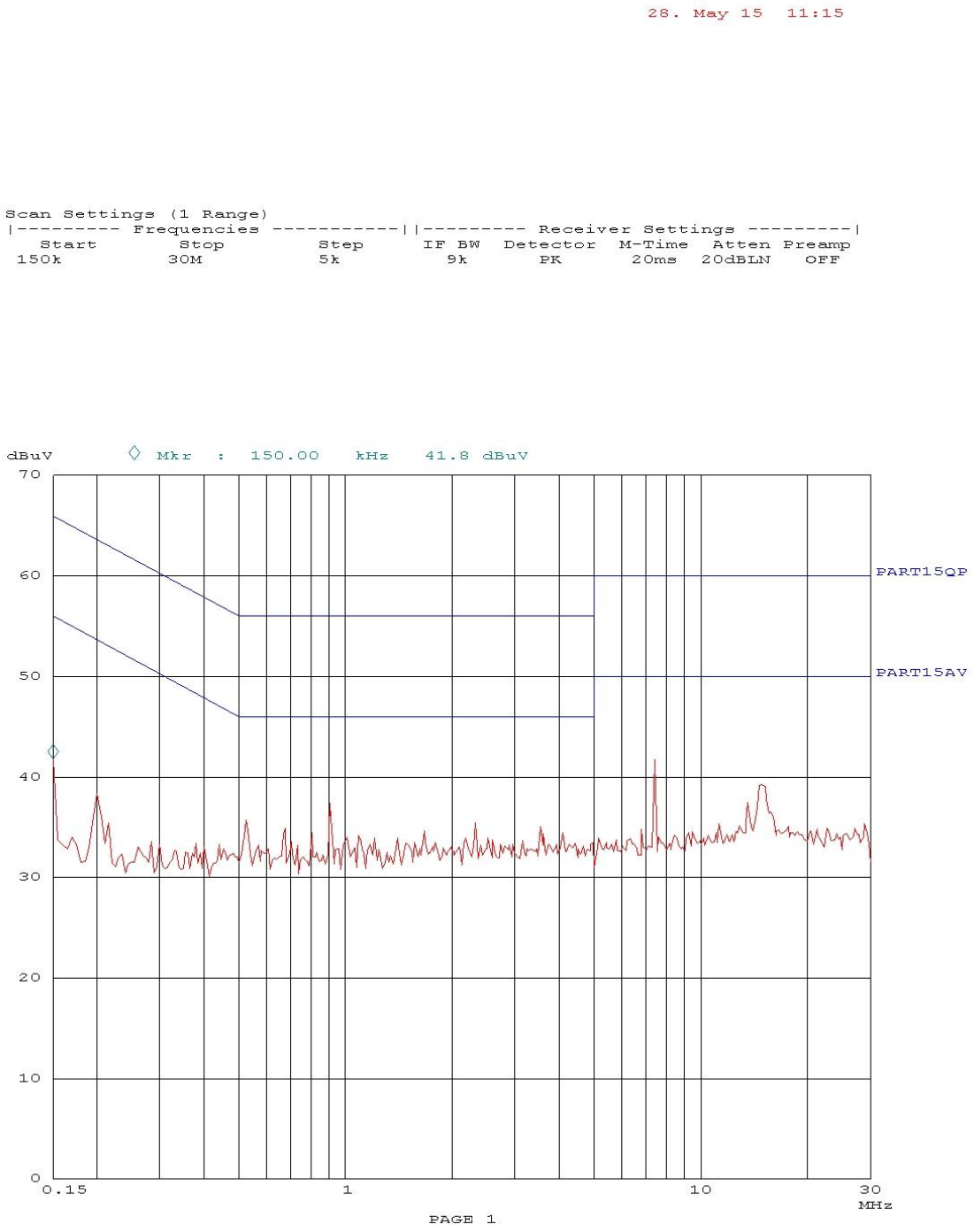
RESULT: PASS

Date of testing: 2015-05-19



Plot1a: 20 dB Bandwidth of the emission at 132.6 kHz (Fundamental Carrier),
the measured Occupied Bandwidth is 16.79 kHz. Measured on a spectrum analyzer.

5.2 Plots of the AC Power Line Conducted Emissions

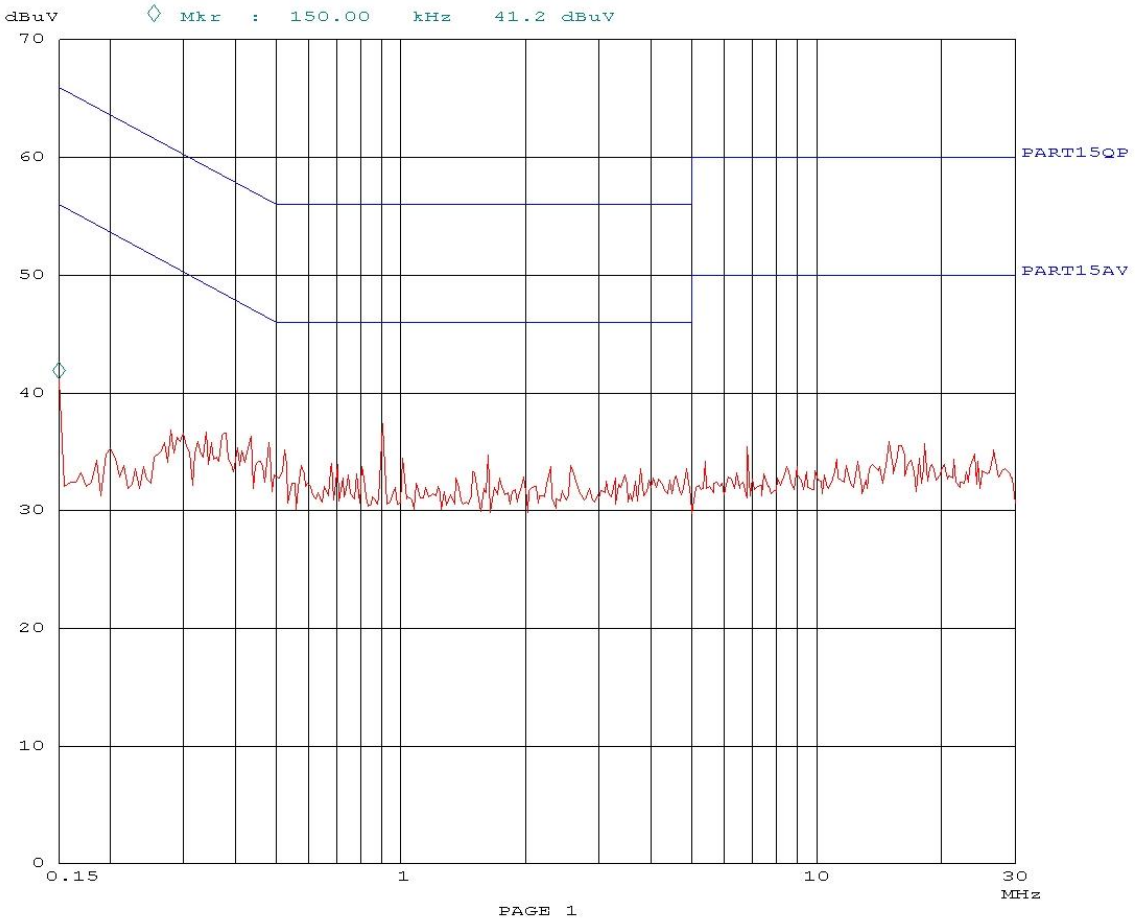


Plot 2a: Plot of the AC Power Line Conducted Emissions on L1

28. May 15 11:47

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	5k	9k	PK	20ms	20dBLN	OFF



Plot 2b: Plot of the AC Power Line Conducted Emissions on L2/Neutral

6 Peak to Average values correction

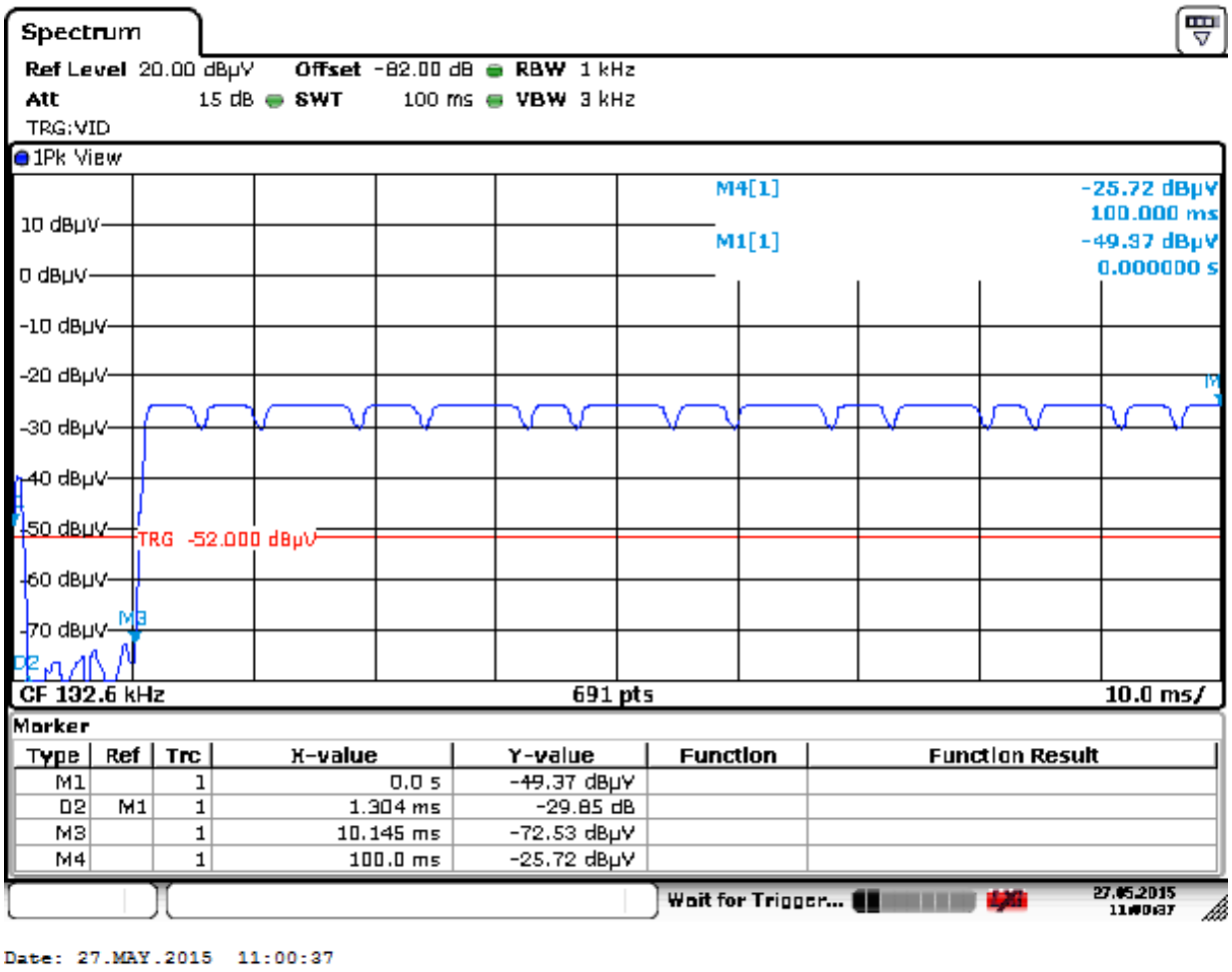
The plot below shows the duty cycle of the EUT.

From the measured Peak values the average values are calculated by the formula:

Average value = Peak value – Duty cycle factor

The duty cycle factor is obtained from the actual RF On time in a 100ms period. From plot 3 can be seen that the RF On time of the EUT is (1.304ms + (100ms-10.145ms)= 91.16 ms in a 100ms period. In this case the Duty cycle factor results in:

Duty cycle factor = 20 Log (T^{ON} / 0,1) = 20 Log (0,09116 / 0,1) = 0.80 dB.



Plot 3: Duty cycle in a 100ms period, measured on a spectrum analyzer

7 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
A00022	LISN	EMCO	3625/2	01/2014	01/2016
A00051	Pulse Limiter	R&S	ESH3-Z2	02/2015	02/2016
A01491	Active loopant. 60 cm	Chase	HLA6120A	05-20/2015	05-20/2016
A00466	Biconilog Testantenna	Teseq	CBL 6111D	06/2014	06/2015
A00726	Measuring receiver	R&S	ESCS30	09/2014	09/2015
A00257	Controller mast	EMCS	DOC202	NA	NA
A00171	Variac 250V 6A	RFT	LTS006	NA	NA
A00207	Spectrum analyzer	R&S	FSP40	11/2014	11/2015
A00444/ A00441	Temperature-Humiditymeter	Extech	SD500	04/2015	04/2016
A00235	Semi-Anechoic Room	Siepel	FCC listed: 90828 IC: 2932G-2	04/2014	04/2017
A00437	Shielded Room	Euroshield	RFD-100 359	NA	NA
A00450	Controller Turntable S-AR	Maturo	SCU/088/8090811	NA	NA
A00258	Antenna mast	EMCS	AP-4702C	NA	NA
A00309	Loop antenna, 6cm	NA	7405-901	09/2014	09/2015
A00314	Measuring receiver	R&S	ESCI	04/2015	04/2016
A00447	RF Cable S-AR	Gigalink	APG0500	01/2015	01/2016
A00041	Power Supply	Delta Elektronika	SM 7020-D	04-2015	04-2016

NA= Not Applicable