



**TEST REPORT CONCERNING THE COMPLIANCE OF A
13.56 MHZ INDUCTIVE PROXIMITY TAG READER,
BRAND COLLIS, MODEL SMARTWAVE BOX
WITH 47 CFR PART 15 (JULY 10, 2008).**

FCC listed : 90828
Industry Canada : 2932G-1
VCCI Registered : R-1518, C-1598
R&TTE, LVD, EMC Notified Body : 1856

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MEASUREMENT/TECHNICAL REPORT

COLLIS
Model : SmartWave Box

FCC ID: XKD-SMARTWAVEBOX

July 14, 2009

This report concerns: Original grant/certification ~~Class 2 change Verification~~

Equipment type: 13.56 MHz Inductive proximity tag reader

Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ? Yes No n.a.

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The data taken for this test and report herein was done in accordance with 47 CFR Part 15 (july 10, 2008) and the measurement procedures of ANSI C63.4-2003. TÜV Rheinland EPS B.V. at Niekerk, 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: July 14, 2009

Signature:



O. Hoekstra
Senior Engineer Telecom TÜV Rheinland EPS B.V.

Description of test item

Test item : Inductive proximity tag reader, operating on 13.56 MHz
 Manufacturer : Collis B.V.
 Brand : Collis
 Model(s) : SmartWave Box
 Serial number(s) : n.a.
 Revision : 2.01

Applicant information

Applicant's representative : Mr. R. Jozefzoon
 Company : Collis B.V.
 Address : De Heyderweg 1
 Postal code : 2314 XZ
 City : Leiden
 Country : The Netherlands
 Telephone number : +31 71 581 36 36
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 Email : info@collis.nl
 Internet : www.collis.nl

Test(s) performed

Location : Niekerk
 Test(s) started : May 20, 2009
 Test(s) completed : June 29, 2009
 Purpose of test(s) : Equipment Authorization (Original grant/certification)

 Test specification(s) : 47 CFR Part 15 (July 10, 2008)

Test engineer(s) : R. van der Meer



Report written by : R. van der Meer



Report date : July 14, 2009

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The test results relate only to the item(s) tested.

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1 General information.

1.1 Product description.

1.1.1 Introduction.

The Contactless Smartcard reader & simulator, brand Collis, model SmartWave Box, operates on a frequency of 13.56 MHz and is therefore classified as an inductive proximity card reader. The SmartWave Box is a hardware tool that acts as a card simulator, using the SmartWave Box Probe to wave in the terminal's target field for contactless cards. A PC with a software package, the TEST REPORT, is set up by placing Collis SmartWave Box (in the case of contactless cards) in between the card and the terminal/reader. This picks up the communication between the two entities and sends it to the PC where the TEST REPORT software is running.

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 grant/certification in equipment authorization files under FCC ID: XKD-SMARTWAVEBOX.

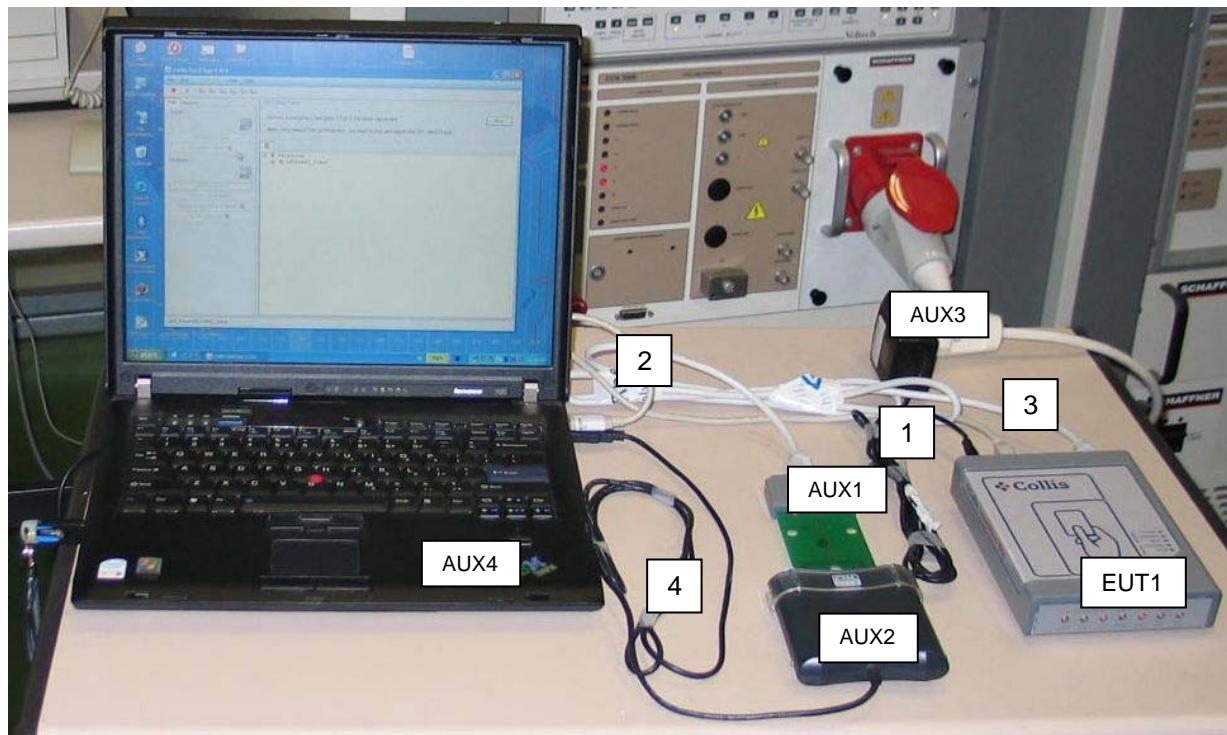
2 Tested system details.

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

EUT	:	Contactless Smartcard reader & simulator
Manufacturer	:	Collis B.V.
Brand	:	Collis
Model	:	SmartWave Box
Serial number	:	n.a.
Voltage input rating	:	18 Vdc
Voltage output rating	:	n.a.
Current input rating	:	not provided
Antenna	:	Internal
Remarks	:	v02.01
AUX1	:	Probe
Manufacturer	:	Collis B.V.
Brand	:	Collis
Model	:	v02.00
Serial number	:	N.a.
Remark	:	Connect to EUT with FireWire cable
AUX2	:	Cardman
Manufacturer	:	Omnikey
Brand	:	Cardman
Models	:	5321
Serial number	:	---
Voltage input rating	:	---
Current input rating	:	---
Remark	:	Connect to AUX4 with USB cable

AUX3	:	Adapter
Manufacturer	:	Friwo
Brand	:	Friwo
Models	:	FW75550/18
Serial number	:	---
Voltage input rating	:	100-240Vac 50/60Hz
Current input rating	:	18Vdc/840mA
Remark	:	Connect to EUT
AUX4	:	Laptop
Manufacturer	:	Lenovo
Brand	:	Lenovo
Models	:	IBM ThinkPad
Serial number	:	L3-BF847 07/02
Voltage input rating	:	18Vdc
Current input rating	:	18Vdc/5A
Remark	:	Connect to AUX2
Software	:	Collis Card Spy v1.0

AUX2 and AUX4 are only used to program the EUT and were not part of the testsetup..



Photograph of the system

2.1.1 Description of input and output ports.

Number	Terminal	From	To	Remarks
1	Mains	Adapter	EUT	Cable 1.5m
2	Probe	AUX1	EUT	Cable 1.8m
3	Link cable	Laptop	EUT	Cable 60cm
4	USB	Laptop	AUX2	Cable 1.5m

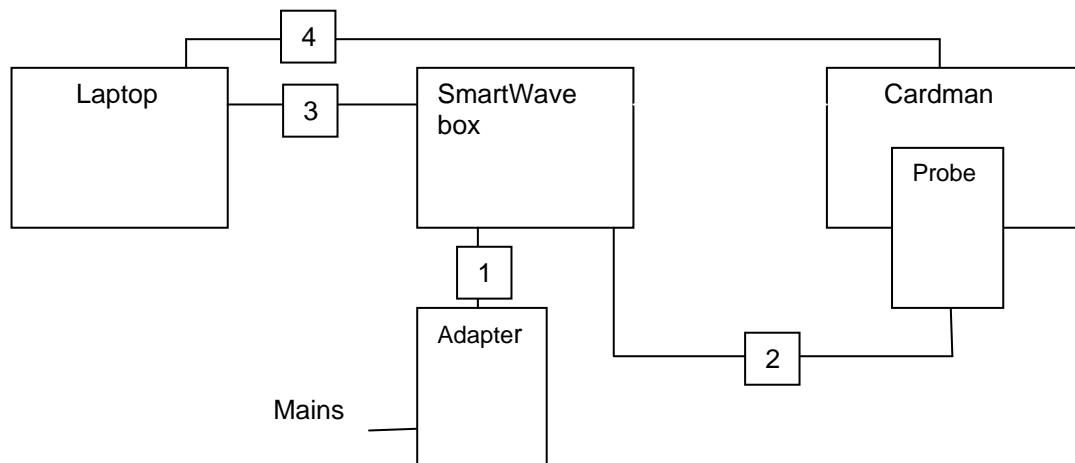


Figure 1. Basic set-up normal use

2.2 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (July 10, 2008), sections 15.31, 15.207, 15.209 and 15.225.

The test methods, which have been used, are based on ANSI C63.4: 2003.

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.

2.3 Test facility.

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland EPS B.V., located in Niekerk, 9822 TL Smidhornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, per October 23, 2000.

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-1. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

2.4 Test conditions.

Normal test conditions:

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: 115VAC/60Hz to the AC/DC Power Supply – the DC output was varied across the voltage range specified by the manufacturer
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.

3 System test configuration.

3.1 Justification.

The system was configured for testing in a typical fashion (as a customer would normally use it).

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 C63.4: 2003.

3.2 EUT mode of operation.

The EUT has been tested in active mode, i.e. the EUT is ready to detect a tag. To assess the behavior of the EUT while reading the tag, the EUT is tested with a tag presented such that it continuously reads the tag. The intentional radiator tests (47 CFR Part 15 sections, 15.207 , 15.209 an 15.225) have been performed with a complete functioning EUT and interconnections.

3.3 Special accessories.

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

3.4 Equipment modifications.

No modifications have been made to the equipment in order to achieve compliance.

3.5 Product Labelling

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

3.6 Block diagram of the EUT.

The block diagram is available in the technical documentation package.

3.7 Schematics of the EUT.

The schematics are available in the technical documentation package.

3.8 Part list of the EUT.

The part list is available in the technical documentation package.

4 Radiated emission data.

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

Frequency (MHz)	Measurement results @3m Vertical (dBuV/m)	Measurement results @3m Horizontal (dBuV/m)	Limits @3m (dBuV/m)	Pass/Fail
30 – 88	<35	<35	40.0	pass
88 – 216	<30	<30	43.5	pass
216 - 1000	<35	<35	46.0	pass

Table 1 Radiated emissions of the EUT.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 and 15.225 with the EUT operating in on 13.56 MHz are depicted in table 1. The system is tested without AUX 2 and AUX4 and the associating cables. AUX2 and AUX4 were only used in the situation for programming the EUT for continues transmitting.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is $\pm 5.0\text{dB}$
3. The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in three positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
4. A Quasi-peak detector was used with a resolution bandwidth of 120 kHz, except for frequencies above 960 MHz where an average detector was used.

Test engineer

Signature : 

Name : Richard van der Meer

Date : May 27, 2009

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

Frequency (MHz)	Measurement results (dB μ V)		Antenna factor	Cable loss	Measurement results (calculated)	Limits Part 15.209
	3 meters	10 meters				
0.009 - 0.490	53	n.i.	20.1	1	-5.9	48.5 – 13.8 (300 m)
0.490 - 1.705	51	n.i.	19.7	1	-7.9	33.8 - 22.9 (30 m)
1.705 - 30.0 Except fundamental	<40	n.i.	19.5	1	20.5	29.5 (30 m)
13.56 (fundamental)	44.5	22.5	19.6	1	25.1 (30m)	84.0 (30m) (FCC 15.225-(a))

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 and 15.225 with the EUT operating in continuous transmit mode on 13.56 MHz, are depicted in table 2.

Notes:

- Calculated measurement results are obtained by using the 40 dB/decade extrapolation factor and the antenna factor and cable loss is included. For instance the corrected value for the 13.56 MHz fundamental is calculated as: Measurement result + Antenna Factor + Cable loss – Extrapolation Factor => $44.5 \text{ dBuV} + 19.6 \text{ dB} + 1 \text{ dB} - 40 \text{ dB} = 25.1 \text{ dBuV/m}$.
- Frequency range:
except for a. and b. below a Quasi-Peak detector was used during testing.
 - 9- 90 kHz Average detector used during measurements
 - 110-490 kHz Average detector used during measurements
- A resolution bandwidth of 9kHz was used during testing
- n.i. Indicates that no field strength values could be measured on the listed frequencies or in the listed frequency range.
- Field strength values of radiated emissions at frequencies not listed in table 2 are more than 20 dB below the applicable limit
- The EUT was varied in three positions, the loop antenna was varied in horizontal and vertical orientations and also around its axis. The reported value is the worst case found at the reported frequency.
- The EUT was tested in both normal mode (i.e. without a tag in its proximity) and in activated mode (i.e. with a tag in its proximity).
- Measurement uncertainty is $\pm 5.0 \text{ dB}$

Test engineer

Signature : 

Name : R. van der Meer

Date : May 27, 2009

5 Carrier stability under special conditions.

5.1 Frequency stability (on 13.56 MHz) in accordance with 47 CFR Part 15, section 15.225:

- 1) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of 0 °C to +50 °C at normal supply voltage (see table 3). The EUT is specified by the applicant for a temperature range of 0°C to +55°C.
- 2) Variation in temperature is not a requirement, tested for information only.

Stability under special conditions	Measured frequency (MHz)	Frequency deviation (limit $\pm 0.01\%$) (%)	PASS/FAIL
Temperature (°C)			
20.0	13.559440 (reference)	N.A.	N.A.
0.0	13.559888	<+0.01	N.A.
50.0	13.559720	<+0.01	N.A.

Table 3.

5.1.1 At 85% and 115% of rated voltage supply level

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency at 85% and at 115% of the rated power supply voltage at +20 °C environmental temperature. The results are stated in Table 4.

Stability under special conditions % variation U	Measured frequency (MHz)	Frequency deviation (limit $\pm 0.01\%$) (%)	PASS/FAIL
100.0	13.559440 (reference)	N.A.	N.A.
85.0	13.560392	<+0.01	PASS
115.0	13.560420	<+0.01	PASS

Table 4

Test engineer

Signature : 

Name : R. van der Meer

Date : May 29, 2009

6 Conducted emission data.

6.1 Conducted emission data of the EUT

Frequency (MHz)	Measurement results dB(µV) Neutral		Measurement results dB(µV) Line 1		Limits dB(µV)		Result
	QP	AV	QP	AV	QP	AV	
0.154	30	21	31	23	66.0	56.0	PASS
0.166	31	24	30	24	65.0	55.0	PASS
0.194	32	26	32	22	64.0	54.0	PASS
0.222	<20	<20	<20	<20	62.8	52.8	PASS
0.258	30	17	30	15	61.4	51.4	PASS
0.370	34	26	30	27	58.5	48.5	PASS
0.482	34	29	31	28	56.3	46.3	PASS
0.5 – 5	<35	<35	<35	<35	56.0	46.0	PASS
5 - 30	<35	<35	<35	<35	60.0	50.0	PASS

Table 5 Conducted emission measurements.

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207, at the 115 Volts AC mains connection terminals of the AC/DC power supply which was connected to the EUT, are depicted in table 5. The EUT was tested in both passive and active mode (while detecting a card). Maximum values recorded. The system is tested as in whole, so with all equipment as shown in Figure.1 in place and functioning. Being the worst case situation.

Notes:

1. Measurement uncertainty is $\pm 3.5\text{dB}$
2. The resolution bandwidth used was 9 kHz.
3. Values of conducted emissions at frequencies not listed in table 5 are more than 20 dB below the applicable limit.

Test engineer

Signature : 

Name : R. van der Meer

Date : May 25, 2009

7 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
15453	Loop antenna	Chase	HLA6120	05/2009	05/2010
12513	LISN	EMCO	3625/2	01/2008	01/2010
12640	Temperature chamber	Heraeus	VEM03/500	01/2009	01/2010
15275	Spectrum analyzer	HP	8594E	10/2008	10/2009
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2009	02/2010
99069	Coax 5m RG213 OATS	NMi Certin B.V.	KABEL 5M OATS	11/2008	11/2009
99070	Coax 15m RG213 OATS	NMi Certin B.V.	KABEL 15M OATS	11/2008	11/2009
99071	Coax OATS ground	NMi Certin B.V.	KABEL GROND OATS	11/2008	11/2009
99107	Controller OATS	Heinrich Deisel	4630-100	NA	NA
99318	Digital multimeter	HP	34401A	10/2008	10/2009
99538	Spectrum analyzer	R&S	FSP40	04/2009	04/2010
99547	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2008	10/2009
99580	OATS	Comtest	FCC listed: 90828	08/2008	08/2011
99580	Open Area testsite	Comtest	NA	09/2006	09/2009
99608	Controller (OATS)	EMCS	DOC202	NA	NA
99609	Antenna mast	EMCS	AP-4702C	NA	NA
99613	Temperature-Humiditymeter	Europe supplies	WS-7082	10/2008	10/2009
99615	Laptop	IBM	Lenovo 9456-HTG	NA	NA
99651	Variac	NA	Vast Activa: 08-9510	NA	NA
99683	Loop antenna, 6cm	NA	7405-901	9/2008	9/2009
99699	Measuring receiver	R&S	ESCI	11/2008	11/2009

NA= Not Applicable