

<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	10048915 001	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	114036404	Seite 1 von 18 <i>Page 1 of 18</i>
<b>Kunden-Referenz-Nr.:</b> <i>Client Reference No.:</i>	N/A	<b>Auftragsdatum:</b> <i>Order date:</i>	22-May-2015	
<b>Auftraggeber:</b> <i>Client:</i>	N.V. Nederlandsche Apparatenfabriek "Nedap" , Parallelweg 2, NL-7141 DC, Groenlo, The Netherlands			
<b>Prüfgegenstand:</b> <i>Test item:</i>	Long-range vehicle and driver identification tag			
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	SMARTCARD BOOSTER ULTIMATE			
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	FCC Part 15C / IC RSS-210 Test report			
<b>Prüfgrundlage:</b> <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.225 RSS-210 Issue 8, December 2010			
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	5-Jun-2015			
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	A000210273-011			
<b>Prüfzeitraum:</b> <i>Testing period:</i>	10-Jun-2015 - 10-Aug-2015			
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	EMC/RF Laboratory Taipei			
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TUV Rheinland Taiwan Ltd.			
<b>Prüfergebnis*:</b> <i>Test result*:</i>	Pass			
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
28-Aug-2015 Ryan W. T. Chen / Project Engineer		28-Aug-2015 Rene Charton / Senior Project Manager		
<i>Datum</i>	<i>Name / Stellung</i>	<i>Unterschrift</i>	<i>Datum</i>	<i>Name / Stellung</i>
<i>Date</i>	<i>Name / Position</i>	<i>Signature</i>	<i>Date</i>	<i>Name / Position</i>
<b>Sonstiges / Other:</b>				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut      2 = gut      3 = befriedigend      4 = ausreichend      5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n)      F(ail) = entspricht nicht o.g. Prüfgrundlage(n)      N/A = nicht anwendbar      N/T = nicht getestet				
Legend: 1 = very good      2 = good      3 = satisfactory      4 = sufficient      5 = poor P(ass) = passed a.m. test specification(s)      F(ail) = failed a.m. test specification(s)      N/A = not applicable      N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

## TEST SUMMARY

### **5.1.1 ANTENNA REQUIREMENT**

*RESULT: Passed*

### **5.1.2 FIELD STRENGTH OF FUNDAMENTAL**

*RESULT: Passed*

### **5.1.3 FREQUENCY STABILITY**

*RESULT: Passed*

### **5.1.4 99% BANDWIDTH**

*RESULT: Passed*

### **5.1.5 SPURIOUS EMISSION**

*RESULT: Passed*

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## 1. General Remarks

### 1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

**Appendix S: Test Setup Photo Documentation**  
(File Name: 10048915APPENDIX S)

**Appendix D: Test Result of Radiated Emissions**  
(File Name: 10048915APPENDIX D)

Test Specifications

The following standards were applied (in bold: product standards, otherwise: basic standards).

**Table 1: Applied Standard and Test Levels**

<b>Radio</b>
FCC CFR47 Part 15: Subpart C Section 15.225
RSS-210 Issue 8, December 2010
RSS-Gen, Issue 4, November 2014
ANSI C63.10:2013

## 2. Test Sites

### 2.1 Test Facilities

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)

FCC Registration No.: 365730  
IC Canada Registration No.: 9465A-1  
TAF Accredited NCC Test Lab. No.:0759  
TAF ISO17025 Certification effective periods: 2013-Jul-1st to 2016-Jun-30th



**Testing Laboratory**  
**0759**

## 2.2 List of Test and Measurement Instruments

**Table 2: List of Test and Measurement Equipment**

Kind of Equipment	Manufacturer	Type	S/N	Last Calibration	Next Calibration
EMI Test Receiver	R&S	ESR7	101062	31-Aug-14	30-Aug-15
Bilog Antenna	TESEQ	CBL6111D	29802	4-Jul-14	3-Jul-16
Spectrum Analyzer	R&S	FSV 40	100921	17-Dec-14	16-Dec-15
Spectrum Analyzer	Agilent	N9010A	MY53470241	1-Apr-15	30-Mar-16
Horn Antenna	ETS-Lindgren	3117	138160	12-Jan-15	11-Jan-17
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	30-Oct-13	29-Oct-15
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	23-Aug-14	22-Aug-15
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	26-Aug-14	25-Aug-15
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM30180	60558	4-Nov-14	3-Nov-15
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	22-Oct-14	21-Oct-15
EMI Test Receiver	R&S	ESCI7	100797	28-Dec-14	27-Dec-15
LISN (1 phase)	R&S	ENV216	101243	31-May-14	30-May-15
LISN	Rolf Heine	NNB-2/16Z	99080	26-Aug-14	25-Aug-15
Spectrum Analyzer	R&S	FSL3	101943	14-Sep-14	14-Sep-15

## 2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are  $\pm 3\text{dB}$ .

**Table 3: Emission Measurement Uncertainty**

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF power, conducted	$\pm 1.5 \text{ dB}$
Adjacent channel power	$\pm 3 \text{ dB}$
Radiated emission of transmitter, valid up to 26 GHz	$\pm 6 \text{ dB}$
Radiated emission of receiver, valid up to 26 GHz	$\pm 6 \text{ dB}$
Temperature	$\pm 2 \text{ }^\circ\text{C}$
Humidity	$\pm 10 \%$

## **3. General Product Information**

### **3.1 Product Function and Intended Use**

The EUT is a Device which can read Data from a 13.56 MHz Near Field RFID tag and transfer these Data it to a 2.4 GHz writable Tag inside the device. Additionally it contains a 433 MHz RF interface to exchange control signals with an external 2.4 GHz RFID reader. This report covers the 13.56 MHz portion of the device

For details refer to the User Guide, Data Sheet and Circuit Diagram.



## 3.2 Ratings and System Details

**Table 4: Basic Information of EUT**

Item	EUT information
Kind of Equipment	Long-range vehicle and driver identification tag
Type Designation	SMARTCARD BOOSTER ULTIMATE
FCC ID	CGDBOOSTER10
Canada ID	1444A-BOOSTER10
Canda HVIN	SMARTCARD BOOSTER ULTIMATE

**Table 5: Technical Specification of EUT**

Technical Specification	Value
Operating Frequency	13.56 MHz
Operation Voltage	3
Extreme Voltage Range	2.7V~3.3V V
Modulation	ASK

### **3.3 Independent Operation Modes**

Basic operation modes are:

- A. Transmitting

### **3.4 Noise Generating and Noise Suppressing Parts**

Refer to the Circuit Diagram.

### **3.5 Submitted Documents**

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

## **4. Test Set-up and Operation Modes**

### **4.1 Principle of Configuration Selection**

The equipment under test (EUT) was configured to measure its maximum emission level. The test modes were adapted accordingly in reference to the instructions for use.

### **4.2 Test Operation and Test Software**

Setup for testing: Test samples are provided with a special firmware which provides the test modes

### **4.3 Special Accessories and Auxiliary Equipment**

The product has been tested together with the following additional accessories:

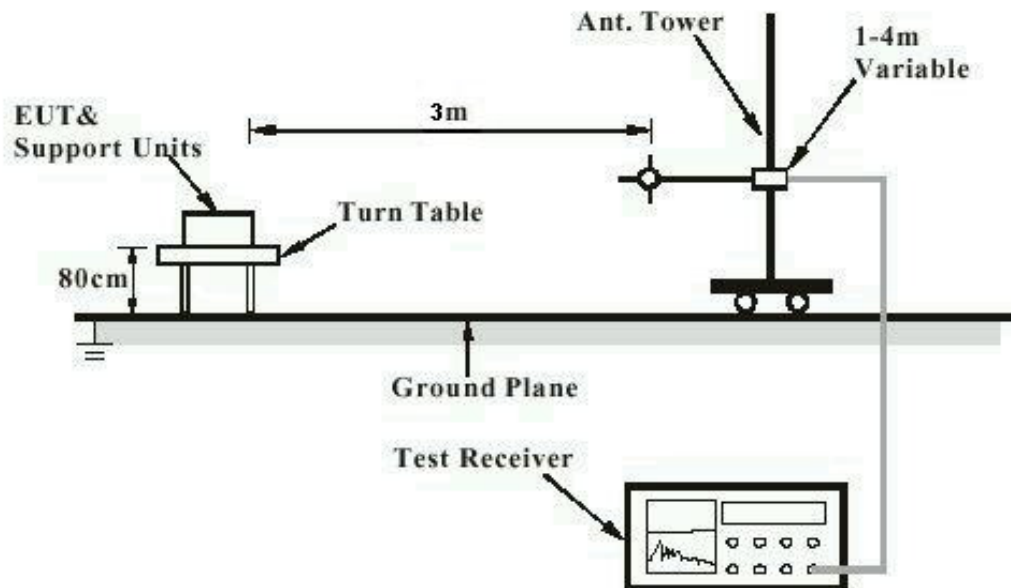
None.

## 4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

## 4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



## 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Antenna Requirement

**RESULT:****Passed**

Standard : LP0002(2011): 2.2  
Part 15.203 and RSS-Gen 7.1.4  
Requirement : use of approved antennas only

The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

### 5.1.2 Field strength of fundamental

**RESULT:**
**Passed**

Test standard : LP0002(2011) 3.2  
 FCC Part 15. 225  
 RSS-210 A2.6

Basic standard : ANSI C63.10:2013

**Test setup**

Test Frequency : 13.56 MHz  
 Operation Mode : A

**Table 6: Test result of Field strength of fundamental and modulation sidebands**

Frequency (MHz)	Meas. Result	Detector	Test Result	Limits		Pass/Fail
	dB $\mu$ V/m @3m		dB $\mu$ V/m @30m	dB $\mu$ V/m@3m	dB $\mu$ V/m@30m	
13.110–13.410	54.32	Peak	14.32	80.5	40.5	Pass
13.410–13.553	56.32	Peak	16.32	90.5	50.5	Pass
13.560	71.25	QP	31.25	124.0	84.0	Pass
13.567–13.710	57.29	Peak	17.29	90.5	50.5	Pass
13.710–14.010	55.85	Peak	15.85	80.5	40.5	Pass

For details refer to Appendix D.

### 5.1.3 Frequency Stability

**RESULT:****Passed**

Test standard : LP0002(2011) 3.2.1(3)  
FCC Part 15. 225(e)  
RSS-210 A2.6

Basic standard : ANSI C63.10:2013  
Kind of test site : Shielded room

**Test setup**

Test Frequency : 13.56 MHz  
Operation Mode : A

Relative humidity : 50-65 %  
Atmospheric pressure : 100-103 kPa

**Table 7: Test result of Frequency Stability**
**Voltage vs. Frequency Stability at 20 °C**

Voltage	Measurement Frequency (MHz)	
(V)	13.560000	-
3.45	13.560320	-
3	13.560320	-
2.55	13.560310	-
Max. Deviation (MHz)	0.000320	-
Max. Deviation (ppm)	23.60	-

**Temperature vs. Frequency Stability**

Temp	Measurement Frequency (MHz)	
(°C)	13.560000	-
-20	13.560460	-
-10	13.560480	-
0	13.560500	-
10	13.560500	-
20	13.560320	-
30	13.560410	-
40	13.560470	-
50	13.560450	-
Max. Deviation (MHz)	0.000500	-
Max. Deviation (ppm)	36.87	-

Voltage vs. Frequency Stability	Temperature vs. Frequency Stability	Limit	Result
23.6	36.87	100 ppm	Pass



### 5.1.4 99% Bandwidth

**RESULT:**
**Passed**

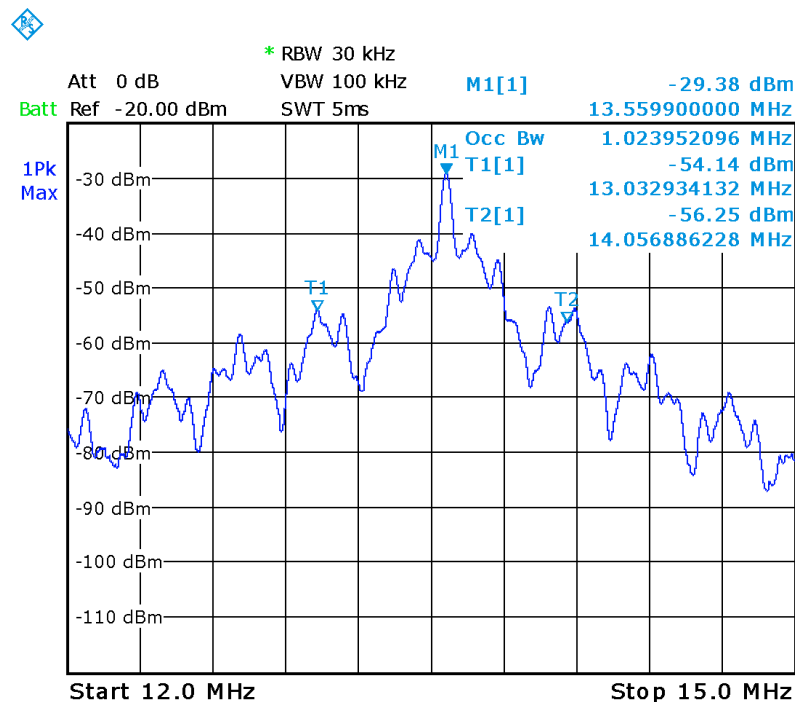
Test standard : LP0002(2011) 3.1  
                   : RSS-Gen  
 Basic standard : ANSI C63.10:2013, KDB558074  
 Kind of test site : Shielded room

**Test setup**

Operation Mode : A  
  
 Ambient temperature : 22-26 °C  
 Relative humidity : 50-65 %  
 Atmospheric pressure : 100-103 kPa

**Table 8: Test result of 99% Bandwidth**

Channel	Frequency (MHz)	99% Bandwidth (kHz)
1	13.56	1024

**Test Plot of 99% Bandwidth**


## 5.1.5 Spurious Emission

**RESULT:****Passed**

Test standard	:	LP0002(2011) 3.2.1(2) FCC part 15.209 FCC part 15.225 RSS-210 A2.6
Basic standard	:	ANSI C63.10: 2013
Limits	:	The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209. RSS-210: 30 microvolts/m (29.5 dB $\mu$ V/m) at 30 m, outside the band 13.110-14.010 MHz.
Kind of test site	:	3m Semi-Anechoic Chamber

**Test setup**

Operation mode : A

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic.

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case orientation is recorded in this test report.