



# Kraftfahrt-Bundesamt

DE-24932 Flensburg



## MITTEILUNG

ausgestellt von:

**Kraftfahrt-Bundesamt**

über die Erweiterung der Genehmigung  
eines Typs eines elektrischen/elektronischen Bauteiles nach der  
Regelung Nr. 10

## COMMUNICATION

issued by:

**Kraftfahrt-Bundesamt**

concerning approval extended  
of a type of electrical/electronic sub-assembly with regard to  
Regulation No. 10

Nummer der Genehmigung: **046862**  
Approval No.:

Erweiterung Nr.: **01**  
Extension No.:

1. Fabrikmarke (Handelsname des Herstellers):  
Make (trade name of manufacturer):  
**NetModule AG**

2. Typ:  
Type:  
**NB2700**

Ausführung(en):  
Version(s):

<b>NB2700-R</b>	<b>(Wireline)</b>
<b>NB2700-W</b>	<b>(WLAN)</b>
<b>NB2700-Ca</b>	<b>(CDMA)</b>
<b>NB2700-U</b>	<b>(UMTS)</b>
<b>NB2700-U-G</b>	<b>(UMTS, GPS)</b>
<b>NB2700-UW</b>	<b>(UMTS, WLAN)</b>
<b>NB2700-UW-G</b>	<b>(UMTS, WLAN, GPS)</b>
<b>NB2700-2U</b>	<b>(2xUMTS)</b>
<b>NB2700-2U-G</b>	<b>(2xUMTS, GPS)</b>
<b>NB2700-L</b>	<b>(LTE)</b>
<b>NB2700-L-G</b>	<b>(LTE, GPS)</b>



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

2

Nummer der Genehmigung: 046862, Erweiterung 01

Approval No.:

NB2700-LW	(LTE, WLAN)
NB2700-LW-G	(LTE, WLAN, GPS)
NB2700-2L	(2xLTE)
NB2700-2L-G	(2xLTE, GPS)
NB2710-UA-V	(UMTS, Audio, Voice)
NB2710-UWA-GV	(UMTS, WLAN, Audio, GPS, Voice)
NB2710-2UW	(2xUMTS, WLAN)
NB2710-2UW-G	(2xUMTS, WLAN, GPS)
NB2710-LSa	(LTE, RS-485)
NB2710-LWA-GV	(LTE, WLAN, Audio, GPS, Voice)
NB2710-LWC-G	(LTE, WLAN, CAN, GPS)
NB2710-LWI-G	(LTE, WLAN, IBIS, GPS)
NB2710-2LW	(2xLTE, WLAN)
NB2710-2LW-G	(2xLTE, WLAN, GPS)

Handelsbezeichnung(en):

General commercial description(s):

**NetModule Router**

3. Merkmale zur Typidentifizierung, sofern am Bauteil vorhanden:

Means of identification of type, if marked on the component:

**Ausführungsbezeichnung**

**version**

- 3.1 Anbringungsstelle dieser Merkmale:

Location of that marking:

**auf dem Gehäuse**

**on the housing**

4. Klasse der Fahrzeuge:

Category of vehicle:

**entfällt**

**not applicable**

5. Name und Anschrift des Herstellers:

Name and address of manufacturer:

**NetModule AG**

**CH-3172 Niederwangen bei Bern**

6. Bei Bauteilen und selbständigen technischen Einheiten, Lage und Anbringungsart des ECE-Genehmigungszeichens:

In the case of components and separate technical units, location and method of affixing of the ECE approval-mark:

**Klebeschild auf dem Gehäuse**

**adhesive label on the housing**



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

3

Nummer der Genehmigung: 046862, Erweiterung 01

Approval No.:

7. Anschrift(en) der Fertigungsstätte(n):  
Address(es) of assembly plant(s):  
**Telefield Limited**  
**CN-Shatin, New Territories, Hong Kong**
8. Zusätzliche Angaben (erforderlichenfalls):  
Additional information (where applicable):  
**siehe Anlage**  
**see appendix**
9. Für die Durchführung der Prüfungen zuständiger technischer Dienst:  
Technical service responsible for carrying out the tests:  
**MBtech EMC GmbH**  
**DE-71332 Waiblingen**
10. Datum des Prüfprotokolls:  
Date of test report:  
**16.02.2015**
11. Nummer des Prüfprotokolls:  
Number of test report:  
**P121547A**
12. Gegebenenfalls Bemerkungen:  
Remarks (if any):  
**siehe Anlage**  
**see appendix**
13. Ort:  
Place: **DE-24932 Flensburg**
14. Datum:  
Date: **01.04.2015**
15. Unterschrift:  
Signature: **Im Auftrag**

Ulrike Althoff





# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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4

Nummer der Genehmigung: 046862, Erweiterung 01

Approval No.:

16. Das Inhaltsverzeichnis der bei den zuständigen Behörden hinterlegten Typgenehmigungsunterlagen, die auf Antrag erhältlich sind, liegt bei.  
The index to the information package lodged with the approval authority, which may be obtained on request is attached.

1. Anlage zur ECE-Typgenehmigungs-Mitteilung  
Appendix to the ECE type-approval communication
2. Inhaltsverzeichnis zu den Beschreibungsunterlagen  
Index to the information package
3. Beschreibungsunterlagen  
Information package

17. Grund oder Gründe für die Erweiterung der Genehmigung:  
Reason(s) of extension of approval:  
**Anpassung an der Änderungsserie 04 der Regelung**  
**adaptation of the 04 series of amendments of the regulation**

**technische Änderungen**  
**technical modification**

**weitere Ausführungen kommen hinzu**  
**further versions are added**

**eine Ausführung entfällt**  
**one version is omitted**





# Kraftfahrt-Bundesamt

DE-24932 Flensburg

5

Nummer der Genehmigung: 046862, Erweiterung 01  
Approval No.:

## Anlage Appendix

zur ECE-Typgenehmigungs-Mitteilung Nr. **046862, Erweiterung 01** betreffend die  
Typgenehmigung einer elektrischen/elektronischen Unterbaugruppe nach der Regelung  
Nr. 10

to ECE type-approval certificate No. **046862, Erweiterung 01** concerning the type-approval  
of an electric/electronic sub-assembly under Regulation No. 10

1. Ergänzende Angaben:  
Additional information:
  - 1.1. Nennspannung des elektrischen Systems:  
Electric system rated voltage:  
**12 V bis - up to 48 V**
  - 1.2. Diese EUB kann für jeden Fahrzeugtyp mit folgenden Einschränkungen verwendet werden:  
This ESA can be used on any vehicle type with the following restrictions:  
**keine Beschränkungen bezüglich EMV für den bestimmungsmäßigen Gebrauch**  
**no restrictions regarding EMC for intended use**
  - 1.2.1. Einbauvorschriften (gegebenenfalls):  
Installation conditions, if any:  
**die Einbauvorschriften sind der Einbauanleitung zu entnehmen**  
**the installation conditions have to be gathered from the installation instructions**
  - 1.3. Diese EUB kann nur für die folgenden Fahrzeugtypen verwendet werden:  
This ESA can only be used on the following vehicle types:  
**entfällt**  
**not applicable**
  - 1.4. Angewandte(s) spezielle(s) Prüfverfahren und Frequenzbereiche zur Ermittlung der Störfestigkeit:  
The specific test method(s) used and the frequency ranges covered to determine immunity were:  
**siehe Prüfbericht Nr.: P121547A vom 16.02.2015**  
**see technical report**



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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6

Nummer der Genehmigung: 046862, Erweiterung 01

Approval No.:

- 1.5. Nach ISO 17025 akkreditiertes und von der (gemäß dieser Richtlinie zuständigen) Genehmigungsbehörde anerkanntes Prüflabor, das für die Durchführung der Prüfungen zuständig ist:  
Laboratory accredited to ISO 17025 and recognised by the Approval Authority (for the purpose of this Directive) responsible for carrying out the test:  
**MBtech EMC GmbH**  
**DE-71332 Waiblingen**
2. Bemerkungen:  
Remarks:  
**entfällt**  
**not applicable**



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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## Inhaltsverzeichnis zu den Beschreibungsunterlagen Index to the information package

Zum ECE-Genehmigungsbogen Nr.: **046862, Erweiterung 01**  
To ECE approval certificate No.:

Ausgabedatum: **08.02.2013**  
Date of issue:

letztes Änderungsdatum: **01.04.2015**  
last date of amendment:

1. Nebenbestimmungen und Rechtsbehelfsbelehrung  
Collateral clauses and instruction on right to appeal
  
2. Beschreibungsbogen Nr.: Datum:  
Information document No.: Date:  
**BB\_NB2700\_20121008-1** **08.10.2012**  
**BB\_NB2700\_20121008-1** **10.02.2015**  
  
letztes Änderungsdatum: **10.02.2015**  
last date of amendment:
  
3. Prüfbericht(e) Nr.: Datum:  
Test report(s) No.: Date:  
**P121547** **08.11.2012**  
**P121547A** **16.02.2015**
  
4. Beschreibung der Änderungen:  
Description of the modifications:  
**siehe Punkt 5.1 des Prüfberichtes**  
**see item 5.1 of the test report**



# Kraftfahrt-Bundesamt

DE-24932 Flensburg

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Nr. der Genehmigung: 046862, Erweiterung 01  
Approval No.:

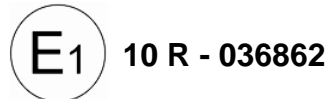
## - Anlage -

### Nebenbestimmungen und Rechtsbehelfsbelehrung

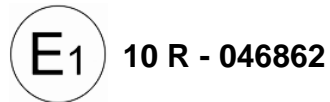
#### Nebenbestimmungen

Die Einzelerzeugnisse der reihenweisen Fertigung müssen mit den Genehmigungsunterlagen genau übereinstimmen. Die in der bisherigen Genehmigung enthaltenen Auflagen gelten auch für diese Erweiterung.

Das bisherige Genehmigungszeichen



wird geändert in:



#### Rechtsbehelfsbelehrung

Gegen diese Genehmigung kann innerhalb eines Monats nach Bekanntgabe Widerspruch erhoben werden. Der Widerspruch ist **beim Kraftfahrt-Bundesamt, Fördestraße 16, DE-24944 Flensburg**, schriftlich oder zur Niederschrift einzulegen.

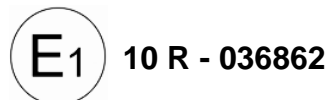
## - Attachment -

### Collateral clauses and instruction on right to appeal

#### Collateral clauses

The individual production of serial fabrication must be in exact accordance with the approval documents. The requirements contained in the previous approval are also valid for this amendment.

The previous approval sign



is changed to: - see German version -

#### Instruction on right to appeal

This approval can be appealed within one month after notification. The appeal is to be filed in writing or as a transcript at the **Kraftfahrt-Bundesamt, Fördestraße 16, DE-24944 Flensburg**.

Technischer Dienst:  
*technical service:*

MBtech EMC GmbH

Hersteller:  
*manufacturer:*

NetModule AG

Typ:  
*type:*

NB2700

Prüfbericht:  
*test report:*

P121547A

Datum:  
*date:*

2015-02-16



## ADDENDUM

# P121547A

**zur Erteilung einer Typgenehmigung  
für eine elektrische/ elektronische Unterbaugruppe  
hinsichtlich**

**Elektromagnetische Verträglichkeit  
entsprechend der  
Regelung ECE-R10 Rev. 04**

***in granting a type approval  
for an electrical/ electronic (sub)system  
with respect to  
Electromagnetic Compatibility  
in accordance with  
Regulation ECE-R10 Rev. 04***

Bisher erteilte Genehmigungen/ <i>valid approvals</i>	Nr./ <i>No.:</i>	Erw./ <i>Ext.</i>	Datum/ <i>Date</i>	Prüfbericht/ <i>Report</i>	Datum/ <i>Date</i>
	036862	00	2013-02-08	P121547	2012-11-08

Technischer Dienst: <i>technical service:</i>	Hersteller: <i>manufacturer:</i>	Typ: <i>type:</i>	Prüfbericht: <i>test report:</i>	Datum: <i>date:</i>
MBtech EMC GmbH	NetModule AG	NB2700	P121547A	2015-02-16

## 0. Allgemeine Angaben – *General information:*

0.1 Fabrikmarke –  
*Mark:*

**NetModule AG**

0.2. Typ-  
*type*

**NB2700**

Handelsbezeichnung(en) –  
*General commercial description:*

**NetModule Router**

Ausführungsformen –  
*Version*

<b>NB2700-R</b>	<b>(Wireline)</b>
<b>NB2700-W</b>	<b>(WLAN)</b>
<b>NB2700-Ca</b>	<b>(CDMA)</b>
<b>NB2700-U</b>	<b>(UMTS)</b>
<b>NB2700-U-G</b>	<b>(UMTS, GPS)</b>
<b>NB2700-UW</b>	<b>(UMTS, WLAN)</b>
<b>NB2700-UW-G</b>	<b>(UMTS, WLAN, GPS)</b>
<b>NB2700-2U</b>	<b>(2xUMTS)</b>
<b>NB2700-2U-G</b>	<b>(2xUMTS, GPS)</b>
<b>NB2700-L</b>	<b>(LTE)</b>
<b>NB2700-L-G</b>	<b>(LTE, GPS)</b>
<b>NB2700-LW</b>	<b>(LTE, WLAN)</b>
<b>NB2700-LW-G</b>	<b>(LTE, WLAN, GPS)</b>
<b>NB2700-2L</b>	<b>(2xLTE)</b>
<b>NB2700-2L-G</b>	<b>(2xLTE, GPS)</b>
<b>NB2710-UA-V</b>	<b>(UMTS, Audio, Voice)</b>
<b>NB2710-UWA-GV</b>	<b>(UMTS, WLAN, Audio, GPS, Voice)</b>
<b>NB2710-2UW</b>	<b>(2xUMTS, WLAN)</b>
<b>NB2710-2UW-G</b>	<b>(2xUMTS, WLAN, GPS)</b>
<b>NB2710-LSa</b>	<b>(LTE, RS-485)</b>
<b>NB2710-LWA-GV</b>	<b>(LTE, WLAN, Audio, GPS, Voice)</b>
<b>NB2710-LWC-G</b>	<b>(LTE, WLAN, CAN, GPS)</b>
<b>NB2710-LWI-G</b>	<b>(LTE, WLAN, IBIS, GPS)</b>
<b>NB2710-2LW</b>	<b>(2xLTE, WLAN)</b>
<b>NB2710-2LW-G</b>	<b>(2xLTE, WLAN, GPS)</b>

0.3. Merkmal zur Typidentifizierung sofern  
am Bauteil vorhanden –

**NB2700, NB2710**  
**Bezeichnung der Ausführung**

*Means of identification of type, if marked on the  
component:*

**NB2700, NB2710**  
**Name of the version**

0.3.1 Anbringungsstelle dieser Merkmale -

**NB2700, NB2710 auf dem Gehäuse**  
**Ausführung auf Zusatzkleber**  
**NB2700, NB2710 on the housing**  
**version on additional label**

*Location of that marking :*

0.4 Name und Anschrift des Herstellers -  
*name and address of manufacturer:*

**NetModule AG**  
**Meriedweg 11**  
**CH-3172 Niederwangen**

Technischer Dienst:  
*technical service:*

**MBtech EMC GmbH**

Hersteller:  
*manufacturer:*

**NetModule AG**

Typ:  
*type:*

**NB2700**

Prüfbericht:  
*test report:*

**P121547A**

Datum:  
*date:*

**2015-02-16**

0.5 Bei Bauteilen und selbständig  
technischen Einheiten, Lage und  
Anbringungsart des EG-  
Genehmigungszeichens -  
*In the case of components and separate  
technical units, location and method of affixing  
of the EEC approval-mark*

Beschreibungsbogen -  
*No. of information document:*

Ausgabedatum-  
*Date of issue:*

Änderungsstand -  
*Date of last change:*

## **Selbstklebendes Typenschild auf dem Gehäuse**

***stick-on-label on the housing***

**BB\_NB2700\_20121008-1**

**2012-10-08**

**2015-02-10**

Technischer Dienst:  
technical service:

MBtech EMC GmbH

Hersteller:  
manufacturer:

NetModule AG

Typ:  
type:

NB2700

Prüfbericht:  
test report:

P121547A

Datum:  
date:

2015-02-16

## 1. **Angaben zum Prüfobjekt –** *Details to device under test:*

1.1 Repräsentative EUB -  
*representative component:*

**Ja –**  
**yes**

1.2 Beschreibung dieser EUB  
*Description of the subsystem:*

**siehe Anlagen zum Beschreibungsbogen -**  
**see appendix to the information document**

1.3 Betriebszustände der EUB -  
*Test Modes:*

Zustand 1 -  
*Test Mode 1 :*

**Run Modus**  
**Run mode**

## 2. **Prüfprotokoll -** *Test documentation:*

2.1 Messung von gestrahlten breitbandigen elektromagnetischen Störungen (Anhang VII / CISPR 25)  
*Radiated emission test of broadband disturbances (according annex VII / CISPR 25):*

2.1.1 Angaben zur Prüfung -  
*detailed test information:*

**Siehe beigefügter Prüfbericht**  
**see test report added**

2.1.2 Prüfergebnisse -  
*Test results:*

**Durch das verwendete Verfahren (Zeitbereichsmessung mit Peakbewertung) ist sichergestellt, dass sämtliche geforderten Frequenzbereiche gemessen wurden.**

**Die Anforderungen der ECE R10 Anhang VII werden eingehalten.**

**Die Einzelergebnisse sind den Seiten 23-26 des beigefügten Prüfberichts zu entnehmen.**

*The used method (Time Domain Measurement with Peak detection) guarantees that the required frequency ranges were covered.*

*The requirements of the ECE R10 Rev. 4 (Annex VII) were met.*

*Detailed results are shown on pages 23 - 26 of the EMC test report added.*



Technischer Dienst:  
technical service:

MBtech EMC GmbH

Hersteller:  
manufacturer:

NetModule AG

Typ:  
type:

NB2700

Prüfbericht:  
test report:

P121547A

Datum:  
date:

2015-02-16

## 2.2 Messung von gestrahlten schmalbandigen elektromagnetischen Störungen (Anh. VIII / CISPR 25)- Radiated emission test of narrowband disturbances (according annex VIII / CISPR25):

2.2.1 Angaben zur Prüfung -  
detailed test information:

**Siehe beigefügter Prüfbericht**  
**see test report added**

2.2.2 Prüfergebnisse -  
Test results:

**Durch das verwendete Verfahren (Zeitbereichsmessung mit Peakbewertung und AV Nachmessung der kritischen Spitzen) ist sichergestellt, dass sämtliche geforderten Frequenzbereiche gemessen wurden.**

**Die Anforderungen der ECE R10 Anhang VIII werden eingehalten.**

**Die Einzelergebnisse sind den Seite 23 - 26 des beigefügten Prüfberichts zu entnehmen.**  
*The used method (Time Domain Measurement with Peak detection and Average measuring of the maximum values) guarantees that the required frequency ranges were covered.*

*The requirements of the ECE R10 Rev. 4 (Annex VIII) were met.*

*Detailed results are shown on pages 23 - 26 of the EMC test report added.*

## 2.3 Prüfung der Störfestigkeit gegenüber eingestrahlten elektromagnetischen Feldern (ISO 11452-2) Immunity test with radiated high frequency electromagnetic fields according ISO11452-2:

**Diese Prüfung ist nur bei den Ausführungsformen mit CAN Schnittstelle erforderlich, da bei den anderen Varianten eine Fehlfunktion des Systems keinen Einfluss auf das Fahrzeug oder die Kontrolle des Fahrers über das Fahrzeug hat. Daher wurde die Variante NB2710-UVC-G (EUT2) stellvertretend für die CAN- Ausführer getestet.**

**Im geforderten Frequenzbereich 20 – 2000 MHz wurde keine Beeinflussung festgestellt. Die Anforderung der Regelung wurden eingehalten.**

*This test is only required for the variants with CAN Interface. In all other cases a malfunction of the DUT doesn't influence the vehicle operations or the driver in controlling the vehicle. Therefore the NB2710-UVC-G (EUT2) was tested as representative for all CAN Versions.*

*In the tested range 20 – 2000 MHz there was no malfunction of the system detected. The requirements of the regulation were met.*

Technischer Dienst:  
technical service:

MBtech EMC GmbH

Hersteller:  
manufacturer:

NetModule AG

Typ:  
type:

NB2700

Prüfbericht:  
test report:

P121547A

Datum:  
date:

2015-02-16

## 2.4 Prüfung der Störfestigkeit gegen/ Störaussendung von Impulsen nach Anhang X bzw. ISO 7637-2 Immunity and emission test of Transients according annex X or ISO 7637-2

### 2.4.1 Prüfergebnisse SF Prüfung- Test result immunity tests:

**Die Prüfungen sind im beigefügten Prüfbericht Kapitel 1.6.2 und 2.2.3 dokumentiert. Die Anforderungen an die Störfestigkeit gegen eingekoppelte Impulse wurden eingehalten.**

**Die Ergebnisse sind der nachfolgenden Tabelle zu entnehmen.**

*The tests were documented in chapter 1.6.2 and 2.2.3 of the test report attached to this document. The requirements for immunity against coupled transients were met.*

*The results are shown on in the table below.*

Nennspannung Nominal voltage	Impuls - pulse	Funktionszustand gefordert Functional Status required	Funktionszustand gemessen Functional Status tested
EUT1 (12V)	1	D	C
EUT1 (12V)	2a	D	A
EUT1 (12V)	2b	D	C
EUT1 (12V)	3a	D	A
EUT1 (12V)	3b	D	A
EUT1 (12V)	4	D	C
EUT2 (24V)	1	C	C
EUT2 (24V)	2a	B	A
EUT2 (24V)	2b	C	C
EUT2 (24V)	3a	A	A
EUT2 (24V)	3b	A	A
EUT2 (24V)	4	C	A

### 2.4.2 Prüfergebnisse SA Prüfung- Test result transient emission tests:

**Die Anforderungen an die Störaussendung von Impulsen wurde nicht überprüft, da im Prüfling keine Schalter oder Induktivitäten eingebaut sind.**

*The requirements for emission were not tested because of the EUT contains no switches or inductive loads.*

## 2.5 Datum der Prüfung – Date of test

**2015-02-16**

Technischer Dienst: <i>technical service:</i>	Hersteller: <i>manufacturer:</i>	Typ: <i>type:</i>	Prüfbericht: <i>test report:</i>	Datum: <i>date:</i>
MBtech EMC GmbH	NetModule AG	NB2700	P121547A	2015-02-16

2.6 Ort der Prüfung –  
*Place:*

**MBtech EMC GmbH in Waiblingen**  
*MBtech EMC GmbH, Waiblingen*

2.7 Bemerkungen –

**Das Labor «Electrosuisse Albislab» ist ein nach ISO 17025 akkreditiertes und von der MBtech EMC GmbH freigegebenes Prüflabor. Der vorgelegte Prüfbericht ist daher anzuerkennen.**

*Remarks:*

**Die Ergebnisse gelten für alle im Beschreibungsbogen aufgeführten Ausführungsformen.**  
*The test laboratory of Electrosuisse Albislab is an accredited test lab. The lab is accredited according to ISO 17025 and is released by MBtech EMC GmbH. The present test report has to be homologated.*

*The results are valid for all variants listed in the information document.*

### **3. Anlagen -** *Appendix:*

3.1. Ergebnisse der EMV-Messung –  
*results of the EMC test:*

**Siehe Prüfbericht 14-EL-068.E02, 2015-01-30**  
*See test report*

3.2 Zur Verfügung gestellte Prüfberichte –

**14-EL-068.E02, 2015-01-30**  
**Electrosuisse Albislab**

3.3 Zusätzliche Anlagen –  
*additional appendices*

**keine -**  
*none*

### **4. Schlussbescheinigung –** *Final declaration:*

**Der o. a. Beschreibungsbogen und der darin beschriebene Typ entspricht der genannten Prüfgrundlage.**

**Die Prüfungsdurchführung entspricht den Kriterien zum Betreiben von Prüflaboratorien nach DIN EN ISO/IEC 17025.**

**Abweichungen, Zusätze oder Einschränkungen gegenüber der Prüfspezifikation sind keine vorgenommen worden.**

**Es wird darauf hingewiesen, dass die Prüfergebnisse sich ausschließlich auf die zur Verfügung gestellten Prüfgegenstände beziehen.**

**Die Kalibrierung der eingesetzten Messgeräte erfolgt im Rahmen des Qualitätssicherungssystems entsprechend DIN EN ISO/IEC 17025.**

**Die Einhaltung dieser Richtlinien ist Grundlage der Benennung und wird von der Benennungsstelle des Kraftfahrtbundesamtes (KBA) unter der DAR-Registriernummer KBA-P 00061-96 laufend überwacht.**

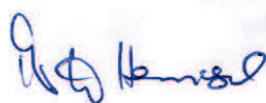
**Eine auszugsweise Vervielfältigung und Veröffentlichung des Prüfberichts ist ohne schriftliche Genehmigung des Prüflaboratoriums nicht zulässig.**

**Der Bericht umfasst Blatt 1 bis 8. -**

Technischer Dienst: technical service:	Hersteller: manufacturer:	Typ: type:	Prüfbericht: test report:	Datum: date:
MBtech EMC GmbH	NetModule AG	NB2700	P121547A	2015-02-16

The listed information document and the type documented is corresponding with the tested device.  
The execution of the test is in accordance to the requirements for test laboratories (DIN EN ISO/IEC 17025). No deviations, additions or restrictions to the test specification were made.  
The test results apply only to the delivered equipment.  
The used measuring equipment is calibrated in accordance to the quality management system required in DIN EN ISO/IEC 17025.  
The accordance of this directive is regularly observed by the designation body of the German national approval authority for traffic "Kraftfahrt-Bundesamt" under the DAR-registration number KBA-P 00061-96.  
Copying and publishing of the test report is only allowed with license of the test laboratory.  
The test report includes page 1 to 8.

Waiblingen, 2015-02-16



Martin Herriegel  
cn=Martin Herriegel,  
o=MBtech EMC GmbH, ou,  
email=martin.herriegel@mbt-  
ech-group.com, c=DE  
Ich bin der Verfasser dieses  
Dokuments  
2015.02.17 08:08:38 +01'00'



Digital unterschrieben von Gerd  
Seez  
DN: cn=Gerd Seez, o=MBtech  
EMCtech GmbH, ou=EMV,  
email=gerd.seez@mbtech-  
group.com, c=DE  
Grund: Ich bestätige die Richtigkeit  
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Datum: 2015.02.17 08:20:05 +01'00'

i.A. **Dipl.-Ing. Martin Herriegel**  
**(Fachfunktion)**

i.V. **Gerd Seez**  
**(Koordination)**

## 5. Anhang appendix

5.1	Liste der Änderungen - list of modifications	Datum- date	Grund der Änderung- reason of change
5.1.1	Es wird berichtigt - Correction of		<b>Nicht zutreffend – not applicable</b>
5.1.2	Es wird geändert - Modification of	2015-02-16	<b>Anpassung auf Revisionsstand 04 – Adoption to Rev. 04</b>
		2015-02-16	<b>Hardwareänderungen – Hardwarechanges</b>
		2015-02-16	<b>Umbenennung NB2700 -&gt; NB2700-R– Renaming NB2700 -&gt; NB2700-R</b>
5.1.3	Es wird hinzugefügt - Addition of	2015-02-16	<b>Ausführung – version</b>  NB2700-Ca, NB2700-2U, NB2700-2U-G, NB2700-2L, NB2700-2L-G, NB2710-UA-V, NB2710-UWA-GV, NB2710-2UW, NB2710-2UW-G, NB2710-LSa, NB2710-LWA-GV, NB2710-LWC-G, NB2710-LWI-G, NB2710-2LW, NB2710-2LW-G
5.1.4	Es entfällt - Deletion of	2015-02-16	<b>Ausführung NB2700-UW-G – Version NB2700-UW-G</b>



## EMC Test Report

Number, Revision:	14-EL-0068.E02
Date:	2015-01-30
Client:	NetModule AG, Meriedweg 11 3172 Niederwangen bei Bern
Equipment under Test:	NB2700 and NB2710
Magnitude of Test:	EMC tests according to Regulation UN ECE R10: 2011  The EUT is an Electric subassembly (ESA) with no immunity related functions. Any tests according to immunity as defined in this directive are not required.
Result of Test:	<b>The equipment under test (EUT) conforms to all requirements mentioned above. This ESA can be used on any vehicle type.</b>
Author:	P. Stillhard
Telephone:	+41 44 956 1463

Function	Department	Name	Signature	Date
Test engineer	IH-EAL	P. Stillhard	<i>Peter Stillhard</i>	2015-01-30
Review	IH-EAL	Pascal Treichler	<i>P. Treichler</i>	2015-01-30
Head of Business Unit	IH-ELM	Urs von Känel	<i>U. Känel</i>	2015-01-30

The client named in this report has the right to reproduce and quote this report as necessary, in connection with the consent of the equipment under test.

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Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Table of contents

<b>1</b>	<b>GENERAL .....</b>	<b>3</b>
1.1	TEST LABORATORY .....	3
1.2	CLIENT .....	3
1.3	EQUIPMENT UNDER TEST (EUT) .....	3
1.4	CHARACTERISTICS OF THE EUT .....	7
1.4.1	<i>Short Description of the EUT .....</i>	<i>7</i>
1.4.2	<i>Power supply and Interface cables .....</i>	<i>8</i>
1.4.3	<i>Power specification .....</i>	<i>9</i>
1.4.4	<i>Operating conditions of the EUT for the tests (active condition) .....</i>	<i>9</i>
1.4.5	<i>Clock frequencies in the EUT .....</i>	<i>11</i>
1.5	SUPPORTING EQUIPMENT USED DURING TEST .....	11
1.6	TEST SPECIFICATIONS AND RESULTS .....	12
1.6.1	<i>References .....</i>	<i>12</i>
1.6.2	<i>Assembly of test specifications and results .....</i>	<i>13</i>
1.6.3	<i>Compliance criteria for immunity tests .....</i>	<i>18</i>
1.6.4	<i>Test environment .....</i>	<i>18</i>
1.7	DATE OF TESTS / SAMPLING METHOD .....	18
1.8	TEST REPORT SUMMARY .....	19
1.9	MODIFICATIONS .....	19
1.10	COMMENTS .....	19
<b>2</b>	<b>TEST .....</b>	<b>20</b>
2.1	EMISSION .....	20
2.1.1	<i>Measurement of the electromagnetic field (Regulation R10, Annex 7 und 8) .....</i>	<i>20</i>
2.2	IMMUNITY .....	27
2.2.1	<i>Radiated Field Measurement (EN ISO 11452-2) .....</i>	<i>27</i>
2.2.2	<i>Stripline (EN ISO 11452-5) .....</i>	<i>33</i>
2.2.3	<i>Impulse tests (ISO 7637-2), EUT 1 as 12 V system .....</i>	<i>36</i>
2.2.4	<i>Impulse tests (ISO 7637-2), EUT 2 as 24 V system .....</i>	<i>44</i>

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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# 1 General

## 1.1 Test Laboratory

Test site:	Electrosuisse Albislab Albisriederstrasse 199 CH-8047 Zürich
Head of Albislab:	Mr. Pascal Treichler

## 1.2 Client

Address:	NetModule AG Meriedweg 11 3172 Niederwangen bei Bern
Contact person:	Mr. Thomas Siegrist Phone number +41 (52) 209 00 41 Thomas.Siegrist@netmodule.com

## 1.3 Equipment under test (EUT)

Supplier:	same address as client
Factory location:	same address as client

<b>Identification:</b>	
Type:	NB2700 and NB2710
Serial:	00112B00889F / 00112B00888F









**Photo 2: EUT 2**



Photo 3: Marking plate EUT 1



Photo 4: Marking plate EUT 2

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## 1.4 Characteristics of the EUT

### 1.4.1 Short Description of the EUT

The EUT Testing system is a Vehicle Router with Mobile, WLAN & GPS interface. It is built for this purpose in vehicles and powered from the board net.

There were two tested versions:

NB2710-LWA-GV (EUT 1)

NB2710-UWC-G (EUT 2)

They are part of a whole family of routers. The measurements are representative for the whole family, which is described below:

All covered NB2700 variants contain the same main board (PCB), have the same case and the same form factor. The same applies to the NB2710 variants.

They can host up to two (NB2700) or three (NB2710) communication modules. These modules can even include a GPS module. There can be up to 5 (NB2700) or 7 (NB2710) antenna connectors.

The wireless communication modules applied have been CE and FCC certified in an independent way of the Tested Equipment.

'H<sub>1</sub>...H<sub>n</sub>' is a sequence of the following letters that identify the communication modules included:

R: none, router only

Ed: 2G = GPRS/EDGE

U: 3G+ = 2G+UMTS/HSPA/HSPA+

L: 4G = 3G+ + LTE

Ca: CDMA450

W: WLAN a/b/g/n Client & Access Point

A: Audio in/out

C: CAN-bus

Sa: RS-485 (on the same module as CAN)

I: IBIS-bus

S: RS-232 (on the same module as IBIS)

... (more to follow)

'S<sub>1</sub>...S<sub>n</sub>' indicate the software options activated:

G: GPS

V: Voice gateway

The following NB2700/NB2710 variants are currently available or planned:

NB2700 variants:	NB2710 variants:
NB2700-R	NB2710-UA-V
NB2700-W	NB2710-UWA-GV
NB2700-Ca	NB2710-2UW
NB2700-U	NB2710-2UW-G
NB2700-U-G	NB2710-LSa
NB2700-UW	NB2710-LWA-GV
NB2700-UW-G	NB2710-LWC-G
NB2700-2U	NB2710-LWI-G
NB2700-2U-G	NB2710-2LW
NB2700-L	NB2710-2LW-G
NB2700-L-G	
NB2700-LW	
NB2700-LW-G	
NB2700-2L	
NB2700-2L-G	

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## 1.4.2 Power supply and Interface cables

### EUT 1:

Port	Cable			Remark
	Max. length	Type	Screen	
DC Supply	Not defined	2 wires	No	If not stated otherwise, powered with AC/DC adapter
Ethernet 1	< 100m	RJ45 cat 5e	Yes	Connected to Test-PC
Ethernet 2	< 100m	RJ45 cat 5e	Yes	If not stated otherwise, no cable connected
Ethernet 3	< 100m	RJ45 cat 5e	Yes	If not stated otherwise, no cable connected
Ethernet 4	< 100m	RJ45 cat 5e	Yes	If not stated otherwise, no cable connected
RS232	< 10 m	3 wire	Yes	Connected to Test-PC
USB	< 3m	USB	Yes	Connected to USB memory stick (for radiated tests connected with 3 m USB standard cable)
2x Digital inputs	< 30 m	2 wire	No	Cables connected
2x Outputs (relays)	< 30 m	2 wire	No	Cables connected
WLAN1	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Mob1 (GSM, UMTS, LTE)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
GPS	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Audio	< 10 m	RJ45 cat 5e	Yes	Connected to Loopback cable (3m)

### EUT 2:

Port	Cable			Remark
	Max. length	Type	Screen	
DC Supply	Not defined	2 wires	No	If not stated otherwise, powered with AC/DC adapter
Ethernet 1	< 100m	RJ45 cat 5e	Yes	Connected to Test-PC
Ethernet 2	< 100m	RJ45 cat 5e	Yes	If not stated otherwise, no cable connected
Ethernet 3	< 100m	RJ45 cat 5e	Yes	If not stated otherwise, no cable connected
Ethernet 4	< 100m	RJ45 cat 5e	Yes	If not stated otherwise, no cable connected
RS232	< 10 m	3 wire	Yes	Connected to Test-PC
USB	< 3m	USB	Yes	Connected to USB memory stick (for radiated tests connected with 3 m USB standard cable)
2x Digital inputs	< 30 m	2 wire	No	Cables connected
2x Outputs (relays)	< 30 m	2 wire	No	Cables connected
WLAN1	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Mob1 (GSM, UMTS, LTE)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
GPS	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
CAN	< 1000 m	RJ45 cat 5e	Yes	Connected to Test-PC (with CAN-to-USB Adapter)

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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### 1.4.3 Power specification

Description	Manufacturers specifications
Connection	Plus, Minus
Rated voltage range	12 VDC / 24 VDC
Input power	<10W

### 1.4.4 Operating conditions of the EUT for the tests (active condition)

The performance of the EUT during the test is monitored as following:

**General:**

Monitor of all Ping-outputs on the Test-PC

**EUT 1: NB2710-LWA-GV:**

SIP connection (SIP Softphone „PhonerLite“) to EUT. (partly)

EUT: Audio-In & Out on SIP configured. Audio In and Audio Out via Loopback-cable connected.

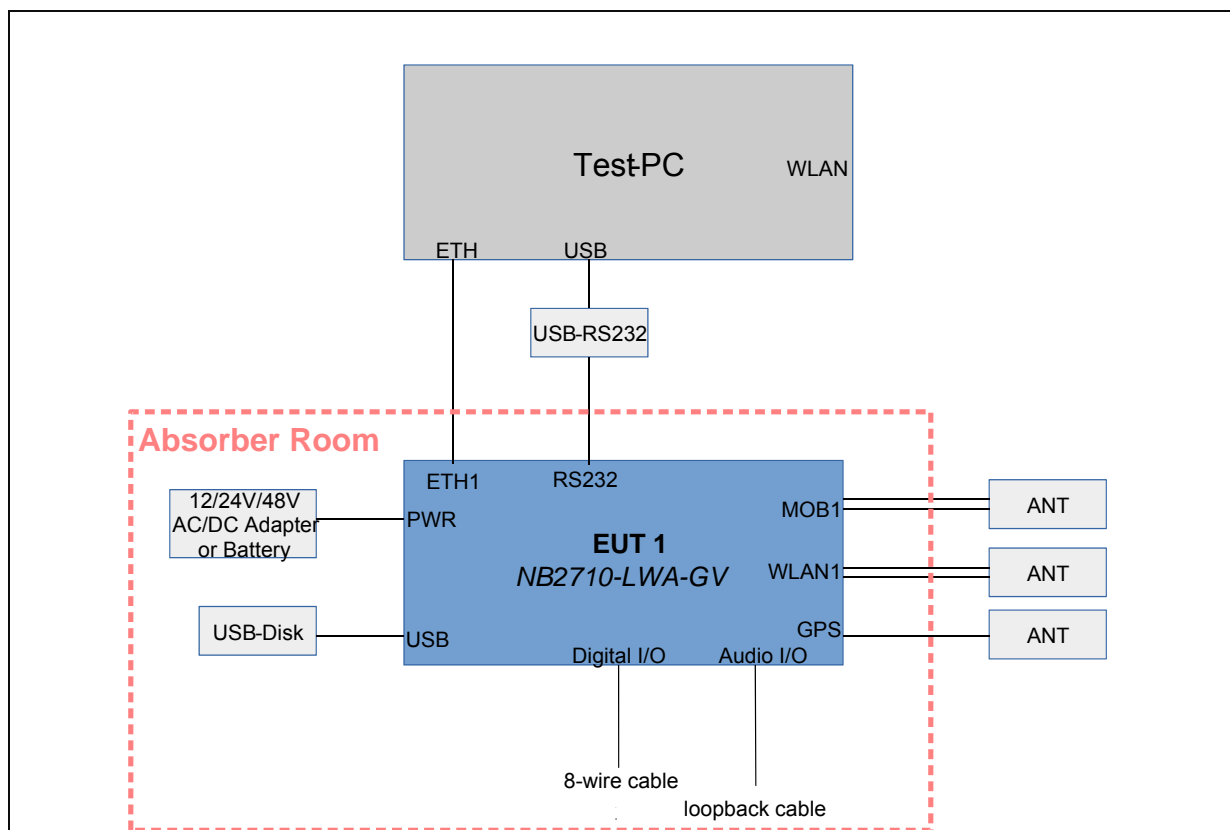
Via SIP Phone: send music and check if music will be returned.

**EUT 2: NB2710-UVC-G:**

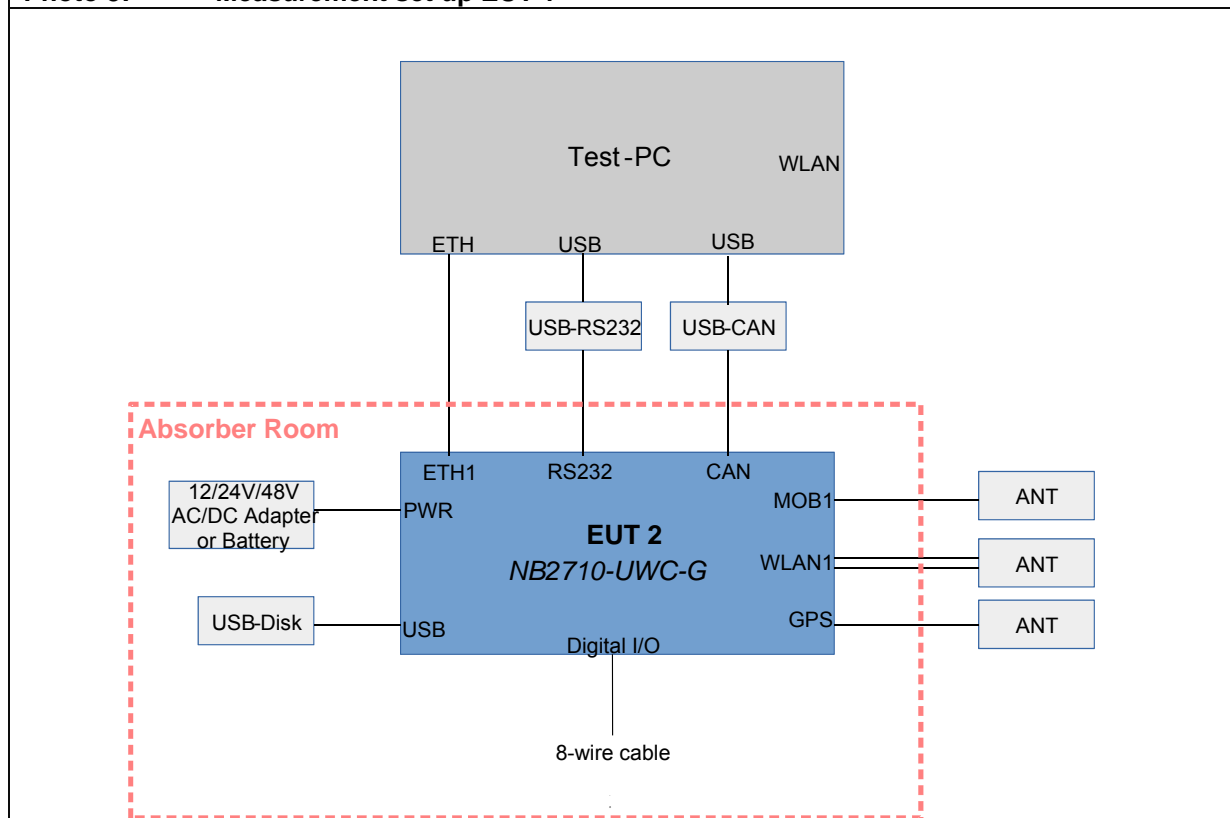
CAN connection between EUT and Test-PC. EUT and Test-PC send CAN messages (1s cycle)

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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The following measurement setups were used:



**Photo 5: Measurement set up EUT 1**



**Photo 6: Measurement set up EUT 2**



Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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#### EUT 1 : NB2710-LWA-GV:

- 1 Ethernet connection established to Test-PC
- 1 RS232 connection established to Test-PC
- 1 GSM/UMTS/LTE Antenna (2 cables)
- 1 WLAN Antenna (2 cables)
- 1 GPS Antenna (1 cable)
- Digital I/O cable (floating)
- Audio-cable (RJ-45) with Loopback
- USB cable with USB Memory Stick
- 1 SIM card

#### EUT 2 : NB2710-UWC-G:

- 1 Ethernet connection established to Test-PC
- 1 RS232 connection established to Test-PC
- 1 GSM/UMTS/LTE Antenna (1 cable)
- 1 WLAN Antenna (2 cables)
- 1 GPS Antenna (1 cable)
- Digital I/O cable (floating)
- CAN-cable (RJ-45) to Test-PC
- USB cable with USB Memory Stick
- 1 SIM card

### 1.4.5 Clock frequencies in the EUT

Not relevant for this type of equipment

## 1.5 Supporting equipment used during test

The following auxiliary equipment AUX are used for the monitoring of the EUT or are necessary for the EUT but they are not part of the EUT.

Product:	Brand:	Model No.:	Serial:	Remark:
Test-PC / Notebook	Dell	E5540	1PF9M12	
USB-to-CAN Adapter	IXXAT	USB-to-CAN compact	HW243428	
USB-to-RS232 Adapter	n/a	U232-P9(2.4)	0608SP030727	
USB Disk	n/a			
Audio Loopback Cable	n/a			
WWAN Antenna	n/a	Antenna-Roof-2L DL-9	A140812300036	
GPS Antenna	n/a			
WLAN Antenna		Antenna-Roof-2W		
Power supply				See tests

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## 1.6 Test specifications and results

### 1.6.1 References

Standard	Description
EN 55025:2008	Radio disturbance characteristics for the protection of receivers used on board vehicles, boats and on devices – Limits and methods of measurement
ISO 7637-2:2004	Road vehicles — Electrical disturbances from conduction and coupling —Part 2: Electrical transient conduction along supply lines only
ISO 11452-1:2005	Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology
ISO 11452-2:2004	Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 2: Absorber-lined shielded enclosure
ISO 11452-4:2005	Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 4: Bulk current injection (BCI)
ISO 11452-5:2005	Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 5: Stripline
UN ECE R10:2011	Regulation No. 10 Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility



Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## 1.6.2 Assembly of test specifications and results

EUT 1 and EUT 2:

Emission tests for Electric subassembly (ESA) according to Regulation UN ECE R10:2011		
Test	Limit	Result
Radiated E-Field Appendix VII (Broadband disturbances, Quasi peak) Appendix VIII (Narrowband disturbances, Average) Test set-up according to EN 55025:2003 Measurement distance 1m; E-Field-Antenna 30 - 1000 MHz <b>EUT with all cables</b>	Broadband limits according to Regulation R10, chapter 6.5.2.1  Narrowband limits according to Regulation R10, chapter 6.6.2.1	<b>PASS</b>
Conducted emission disturbances Annex X (transient disturbances, Peak-Values) Test set-up according to ISO 7637-2:2004  <b>Power supply lines</b>	limits according to Regulation R10, chapter 6.9.1, for 12 V- und 24 V-Systems	<b>N/A</b>  <b>Note 1</b>

**Note 1: Not Applicable**, due to chapter 8.5: Conducted emission: ESA's that are not switched, contain no switches or do not include inductive loads need not be tested for conducted emission and shall be deemed to comply with paragraph 6.9 of this Annex.

### Remark:

The Broadband and the narrowband limits of the radiated emission are not equal to the corresponding limits of EN55025.

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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#### EUT 1:

Immunity tests for Electric subassembly (ESA) according to Regulation UN ECE R10:2011			
Electric subassembly (ESA) may comply with the requirements of any combination of the following test methods at the manufacturers discretion provided that this results in the full frequency range with the following modulation methods are covered 20 – 800 MHz: Amplitude Modulation AM 80% (1kHz) 800 – 2000 MHz: Pulse Modulation PM 217.34 Hz, Duty cycle 12.5%			
Test	Norm / Test level	Compliance Criteria	Result
Radiated electromagnetic field (Absorber-lined shielded enclosure) Appendix IX Test set-up according to EN ISO 11452-2:2004 Distance of Antenna: 1m; 20 - 2000 MHz Antenna vertical polarization  <b>EUT with all cables</b>	Limits according to Regulation R10, chapter 6.7.2.1 30 V/m in over 90% of the frequency band and 25 V/m over the whole band	<b>A</b>	<b>N/A</b>  <b>Note 2</b>
BCI, Bulk current injection Appendix IX Test set-up according to EN ISO 11452-4:2005 20 - 400 MHz  <b>EUT with all cables</b>	Limits according to Regulation R10, chapter 6.7.2.1 60 mA in over 90% of the frequency band and 50 mA over the whole band	<b>A</b>	<b>N/A</b>  <b>Note 2</b>
Stripline 150 mm Appendix IX Test set-up according to EN ISO 11452-5:2005 20 - 400 MHz (expanded to 1000 MHz)  <b>EUT with all cables</b>	Limits according to Regulation R10, chapter 6.7.2.1 60 V/m in over 90% of the frequency band and 50 V/m over the whole band	<b>A</b>	<b>N/A</b>  <b>Note 2</b>

**Note 2: The EUT has no 'immunity-related functions', the test has not to be applied.** Due to Chap. 6.10.2: Vehicles which do not have electrical/electronic systems with 'immunity related functions' need not be tested for immunity to radiated disturbances and shall be deemed to comply with paragraph 6.4 and with Annex 6 to Regulation R10.



Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## EUT 2:

Immunity tests for Electric subassembly (ESA) according to Regulation UN ECE R10:2011			
Electric subassembly (ESA) may comply with the requirements of any combination of the following test methods at the manufacturers discretion provided that this results in the full frequency range with the following modulation methods are covered 20 – 800 MHz: Amplitude Modulation AM 80% (1kHz) 800 – 2000 MHz: Pulse Modulation PM 217.34 Hz, Duty cycle 12.5%			
Test	Norm / Test level	Compliance Criteria	Result
Radiated electromagnetic field (Absorber-lined shielded enclosure) Appendix IX Test set-up according to EN ISO 11452-2:2004 Distance of Antenna: 1m; 20 - 2000 MHz Antenna vertical polarization  <b>EUT with all cables</b>	Limits according to Regulation R10, chapter 6.7.2.1 30 V/m in over 90% of the frequency band and 25 V/m over the whole band	<b>A</b>	<b>Note 2</b>  <b>PASS</b>
BCI, Bulk current injection Appendix IX Test set-up according to EN ISO 11452-4:2005 20 - 400 MHz  <b>EUT with all cables</b>	Limits according to Regulation R10, chapter 6.7.2.1 60 mA in over 90% of the frequency band and 50 mA over the whole band	<b>A</b>	<b>N/A</b>  <b>Note 3</b>
Stripline 150 mm Appendix IX Test set-up according to EN ISO 11452-5:2005 20 - 400 MHz (expanded to 1000 MHz)  <b>EUT with all cables</b>	Limits according to Regulation R10, chapter 6.7.2.1 60 V/m in over 90% of the frequency band and 50 V/m over the whole band	<b>A</b>	<b>Note 2</b>  <b>PASS</b>

**Note 2:** EUT 2 itself has no immunity related function, but it can be connected via CAN bus to a device with immunity related function. Therefore criteria A has to be fulfilled.

**Note 3:** covered by stripline test

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## EUT 2:

Immunity tests for Electric subassembly (ESA) according to Regulation UN ECE R10:2011			
Test	Norm / Test level		Result
Immunity to transient disturbances conducted along supply lines Annex X Test setup according to EN ISO 7637-2:2004	Limits according to Regulation R10, chapter 6.8.1		<b>Note 2</b>
Test pulse Nr. 1	12 V Sys. -75 V	24 V Sys. -450 V	Crit.1 cl. C
		Crit.2 cl. D	C
Test pulse Nr. 2a	+37 V	+37 V	cl. B
Test pulse Nr. 2b	+10 V	+20 V	cl. C
Test pulse Nr. 3a	-112 V	-150 V	cl. A
Test pulse Nr. 3b	+75 V	+150 V	cl. A
Test pulse Nr. 4	-6 V	-12 V	cl. B/C*)
Test pulse Nr. 5	---		
<b>Supply lines and connections to supply lines</b>	*) for ESA which must not be operational during engine start phases.		
			<b>PASS</b>
			<b>PASS</b>
			<b>PASS</b>
			<b>PASS</b>
			<b>PASS</b>
			<b>N/A</b>
			<b>note 3</b>

**Note 2:** EUT 2 itself has no immunity related function, but it can be connected via CAN bus to a device with immunity related function. Therefore the stronger criteria have to be fulfilled.

**note 3:** Test not required by Commission Regulation R10

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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### 1.6.3 Compliance criteria for immunity tests

Compliance criteria according to ISO 11452-1	
<b>A</b>	All functions of a device or system perform as designed during and after exposure to a disturbance.
<b>B</b>	All functions of a device or system perform as designed during exposure; however, one or more of them may go beyond the specified tolerance. All functions return automatically to within normal limits after exposure is removed. Memory functions shall remain class A.
<b>C</b>	One or more functions of a device or system do not perform as designed during exposure but return automatically to normal operation after exposure is removed.
<b>D</b>	One or more functions of a device or system do not perform as designed during exposure and do not return to normal operation until exposure is removed and the device or system is reset by a simple "operator/use" action.
<b>E</b>	One or more functions of a device or system do not perform as designed during and after exposure and cannot be returned to proper operation without repairing or replacing the device or system.

EUT specific compliance criteria	
<b>A</b>	The EUT shall operate in normal mode
<b>B</b>	After the test, the EUT shall operate as in normal mode, during the test one or more functions may be out of tolerance.
<b>C</b>	After the test, the EUT shall operate as in normal mode.
<b>D</b>	No specific requirement
<b>E</b>	No specific requirement

**In any case, the EUT should not be damaged by the tests!**

### 1.6.4 Test environment

Variable	Requirement	Actual values during the test	Complied
Mains		12.5 VDC / 25 VDC	Yes
Temperature	15° C – 35° C	24° C	Yes
Relative humidity (RH)	25 % - 75 %	25 % - 75 %	Yes
Air pressure	860 mbar – 1060 mbar	980 mbar – 1035 mbar	Yes

## 1.7 Date of tests / sampling method

Method of sampling:	1 of 1 EUT delivered by client
State of the EUT	serial
Delivery date of EUT	October 20, 2014 October 27, 2014 November 5, 2014 January 22, 2015
Date of tests	October 20 – 21, 2014 October 27 – 28, 2014 November 5 – 7, 2014 January 22, 2015

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## 1.8 Test report summary

The EUT mentioned in chapter 1.3 with the modifications according to chapter 1.9 is in conformance with the EMC requirements indicated in the chapter 1.6.

## 1.9 Modifications

after Ferrite Ls105 (330R@100MHz, 2.5A) a LC-Filter has been implemented:

C: electrolytic capacitor, 33 uF, 100 V, 450 mR

L: Inductor, 3.3 uH, 3.3 A, 27 mR

## 1.10 Comments

The test report applies exclusively to the EUT specified in chapter 1.3 of this document.

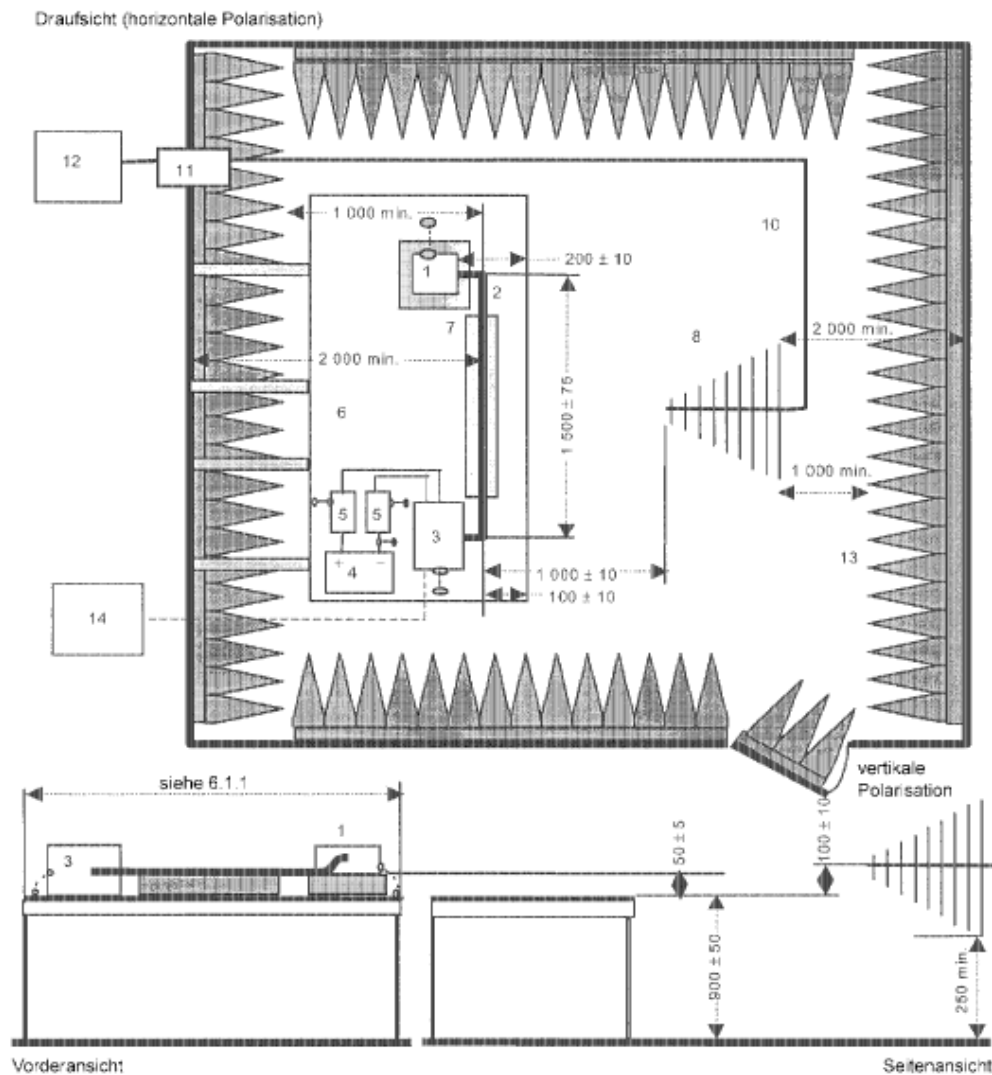
## 2 Test

### 2.1 Emission

#### 2.1.1 Measurement of the electromagnetic field (Regulation R10, Annex 7 und 8)

##### Measurement set-up

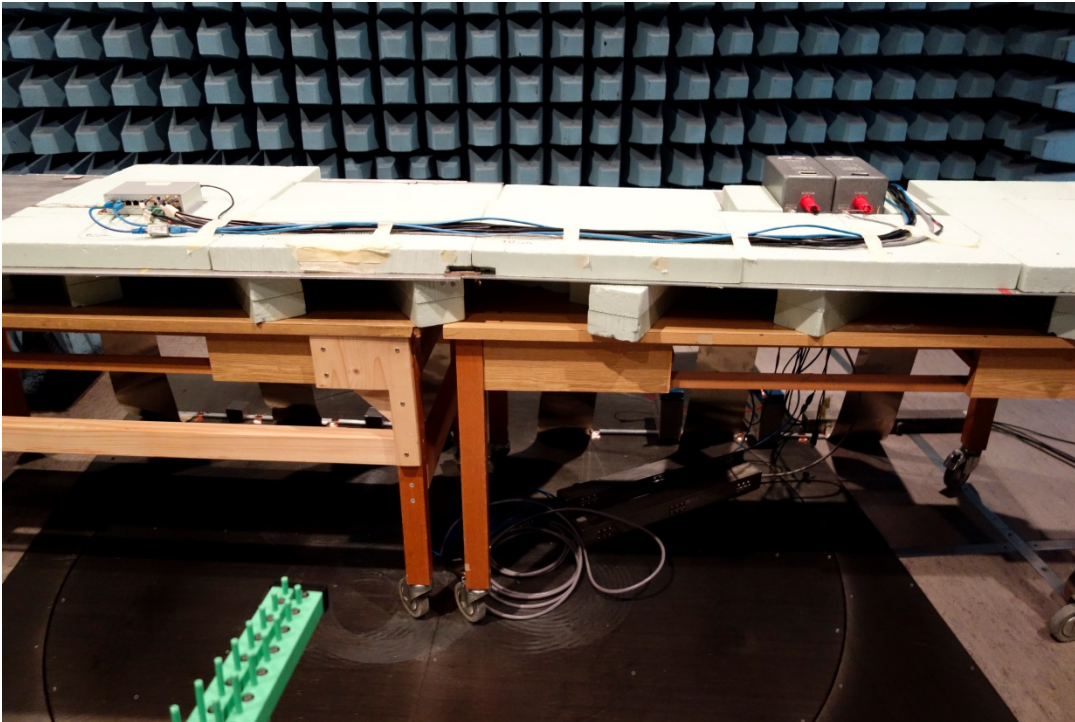
Maße in mm



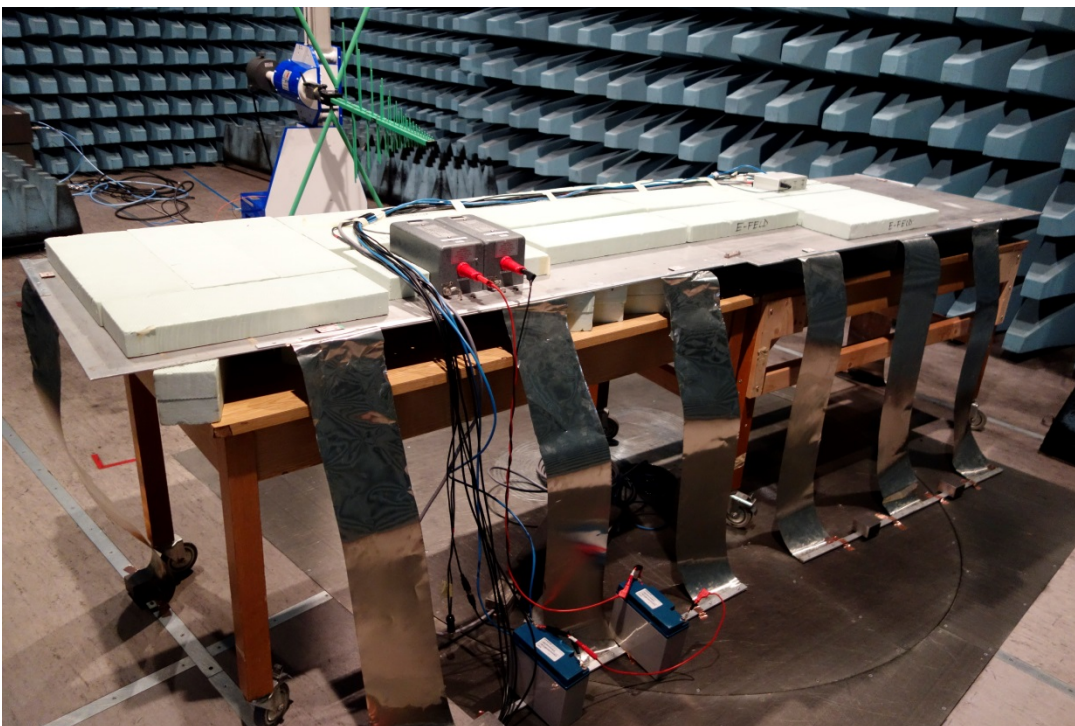
##### Legende

- |   |   |
|---|---|
| 1 Prüfling (direkt mit Masse verbunden, wenn dies im Prüfplan gefordert wird) | 8 logarithmisch-periodische Antenne                       |
| 2 Prüfkabelbaum   | - -   |
| 3 Lastsimulator (Anordnung und Masseverbindung entsprechend 6.4.2.5)          | 10 doppelt geschirmtes Koaxialkabel hoher Qualität (50 Ω) |
| 4 Spannungsversorgung (Anordnung freigestellt)                                | 11 Durchführungsanschluss                                 |
| 5 Netznachbildung (BAN)   | 12 Messinstrument   |
| 6 Masseplatte (mit der Wand des Schirmraums verbunden)                        | 13 HF-Absorbermaterial                                    |
| 7 Unterlage mit niedriger relativer Permittivität ( $\epsilon_r \leq 1,4$ )   | 14 Anregungs- und Überwachungssystem                      |





**Photo 7:** Measurement set-up for radiated Emission



**Photo 8:** Measurement set-up for radiated Emission

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test equipment

Device Type	Description	Brand	Type	ID
Antenna	H9728 BiLog Chase CBL 6112B	Chase	CBL 6112B	H9728
Cable preamp -> analyser	RE <8 GHz Receiver---Ant H10010---H10013	Huber&Suhner	Koaxial Cable	H10010-H10011-H10012-H10013
Antenna tower	Maturo MC32 Tower	Maturo	MC32	
Spectrum analyser	Rohde & Schwarz ESU 8 Input 1 Time Domain (LAN)	Rohde & Schwarz	ESU 8	OA10193
Turn table	Maturo MC32 Table	Maturo	MC32	
LISN	LISN 5µH/50Ω	SOLAR	LISN-6338	PE3745

## Process of the measurement

The measurement was carried out in a semi anechoic chamber with a distance of 1 m between antenna and the harm of the EUT. The EUT is placed on a metallic plane. For low DC resistance, every 0.3m earth straps are placed to connect the metallic plane to the anechoic chamber. The power supply is connected to a LISN with 5µH/50Ω/50Amp. The radiated electromagnetic field was measured at a height of 1 m with the antenna on vertical and horizontal polarization.

The following diagrams show the result of the Peak measurement and the Quasi-Peak limit. At each frequency point where the Peak value exceeds the Quasi-Peak limit, a measurement with the Quasi-Peak detector is carried out and the result is listed in the table below the diagram

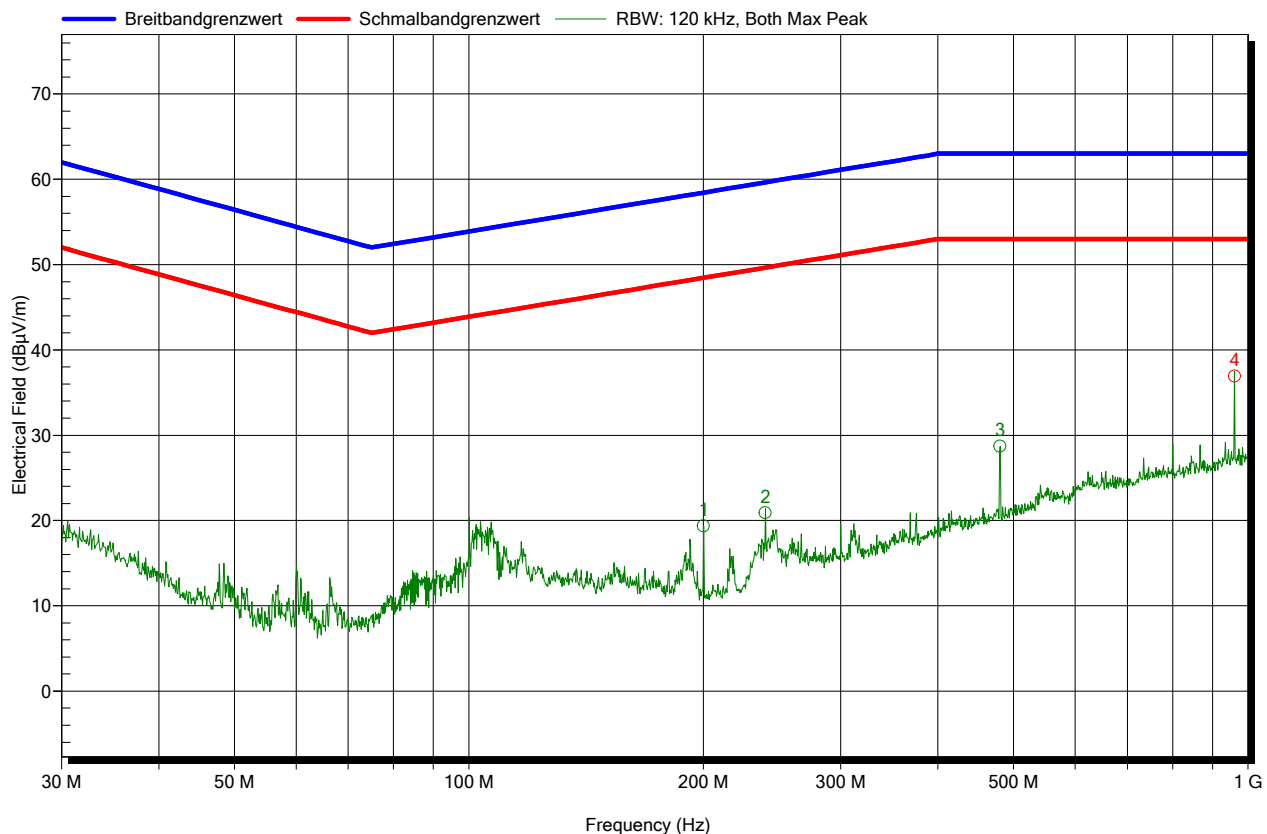
Bandwidths	Peak Resolution Bandwidth 120kHz	Quasi-Peak detector QP-Bandwidth 120kHz
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## Result of the measurement

The EUT is in conformance with the specification.

## Measurement 1

<b>EUT</b>	EUT 1 : NB2710 LWA-GV		
<b>Verdict, Test</b>	Test 43: ESU8_30M-1G KFZ05/83EG Antenne 1m 0 Grad		
<b>Modification</b>	None		
<b>Cables, Notes</b>	All cables, see chapter 1.4.2		
<b>Mode of operation</b>	Normal mode, see chapter 1.4.4, supplied with 12 VDC		
<b>Test date, time</b>	21 October 2014, 09:25:13		
<b>Antenna height</b>	1 m	<b>Antenna polarization</b>	Vertical/Horizontal
<b>EUT position</b>	0 Degree (stable)	<b>Antenna distance</b>	1 m
<b>Measurement settings</b>	Radimation Version: 2014.1.7, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: Auto [120 ms], Step freq: Linear: 30 kHz steps, Attenuator: 0 dB, Internal preamp: 20 dB, Measure time: Auto [0 ns]		



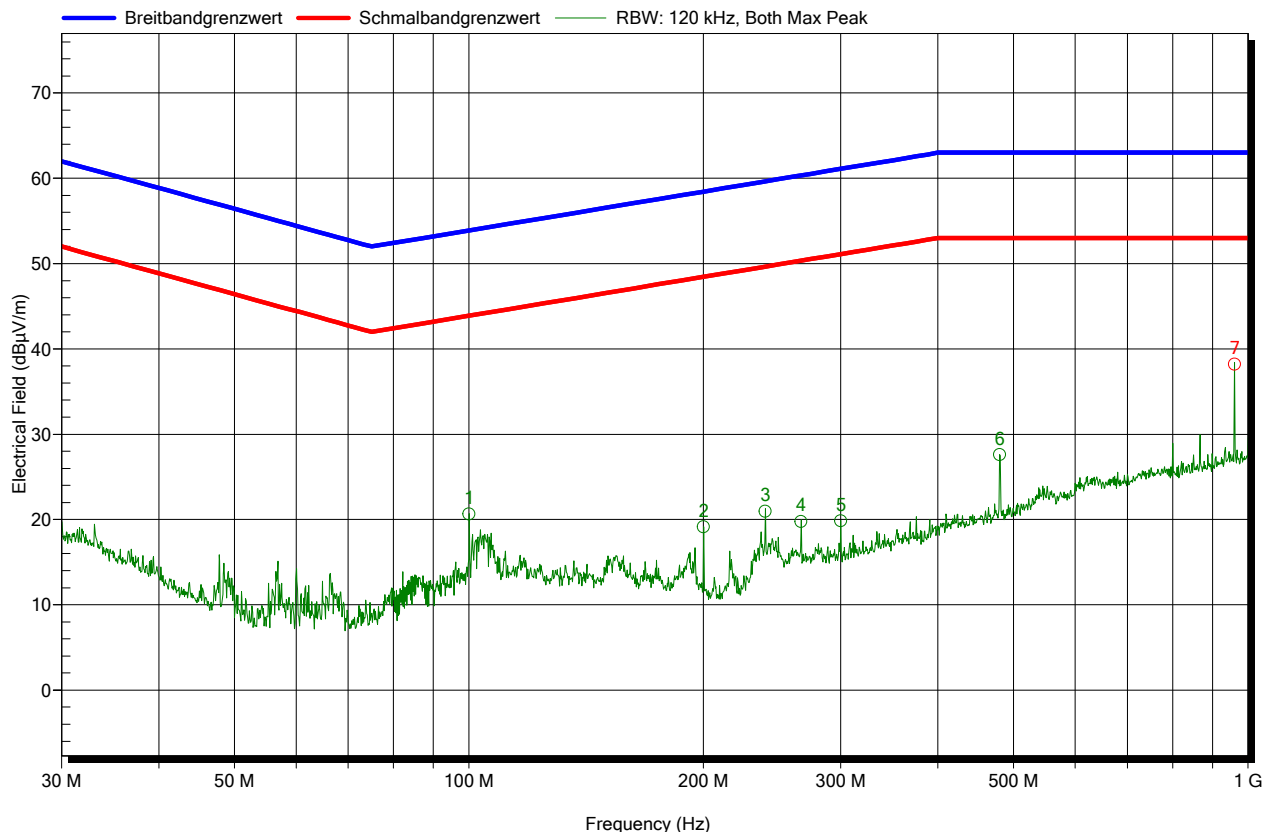
## Detected peaks

Peak Number	Frequency	Peak	Angle	Height	Polarization
1	199.98 MHz	19.38 dBµV/m	0 Degree	1 m	Vertical
2	240 MHz	20.93 dBµV/m	0 Degree	1 m	Vertical
3	480.09 MHz	28.71 dBµV/m	0 Degree	1 m	Vertical
4	960.12 MHz	36.94 dBµV/m	0 Degree	1 m	Vertical

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Measurement 2

<b>EUT</b>	EUT 1 : NB2710 LWA-GV		
<b>Verdict, Test</b>	Test 44: ESU8_30M-1G KFZ05/83EG Antenne 1m 0 Grad		
<b>Modification</b>	None		
<b>Cables, Notes</b>	All cables, see chapter 1.4.2		
<b>Mode of operation</b>	Normal mode, see chapter 1.4.4, supplied with 24 VDC		
<b>Test date, time</b>	21 October 2014, 09:42:39		
<b>Antenna height</b>	1 m	<b>Antenna polarization</b>	Vertical/Horizontal
<b>EUT position</b>	0 Degree (stable)	<b>Antenna distance</b>	1 m
<b>Measurement settings</b>	Radimation Version: 2014.1.7, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: Auto [120 ms], Step freq: Linear: 30 kHz steps, Attenuator: 0 dB, Internal preamp: 20 dB, Measure time: Auto [0 ns]		



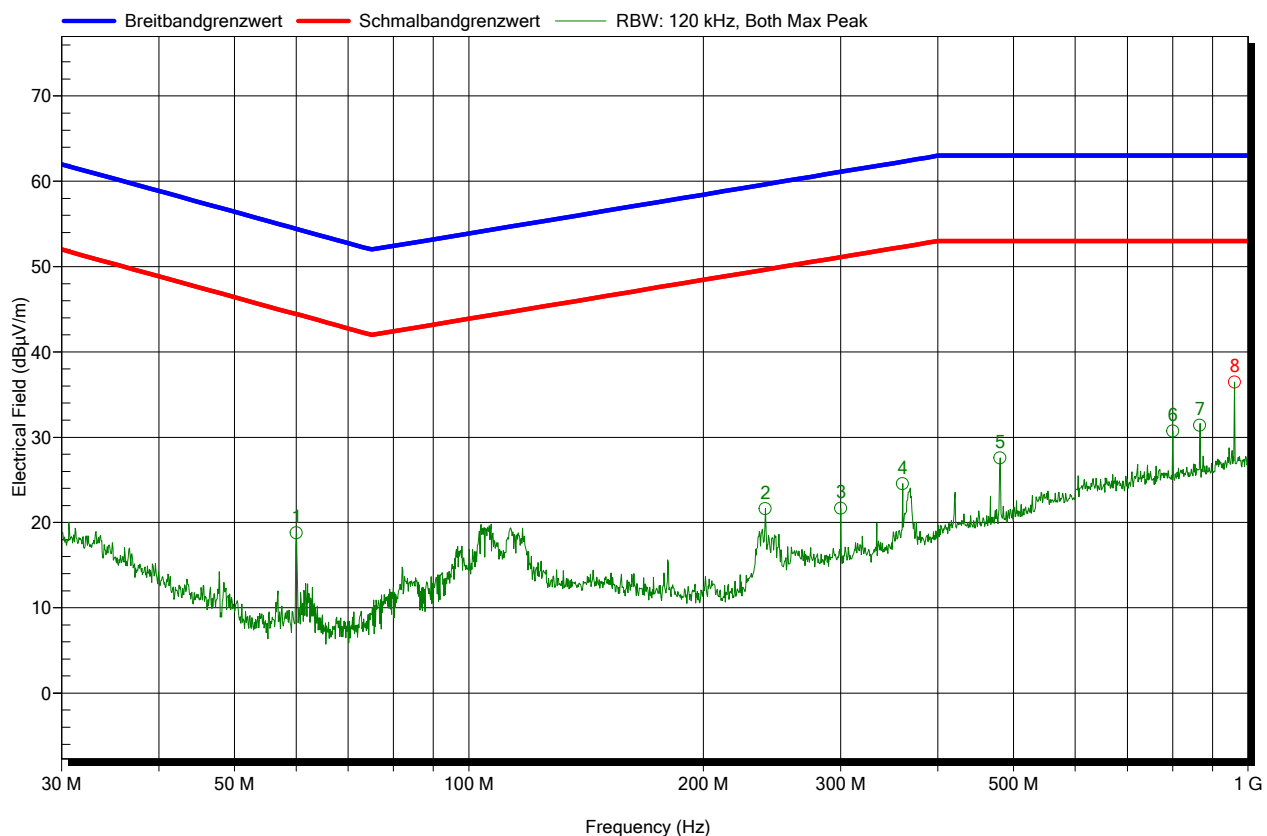
## Detected peaks

Peak Number	Frequency	Peak	Angle	Height	Polarization
1	99.99 MHz	20.65 dBµV/m	0 Degree	1 m	Vertical
2	199.98 MHz	19.14 dBµV/m	0 Degree	1 m	Vertical
3	240 MHz	20.97 dBµV/m	0 Degree	1 m	Vertical
4	266.67 MHz	19.78 dBµV/m	0 Degree	1 m	Vertical
5	300 MHz	19.87 dBµV/m	0 Degree	1 m	Vertical
6	479.76 MHz	27.61 dBµV/m	0 Degree	1 m	Vertical
7	960.15 MHz	38.19 dBµV/m	0 Degree	1 m	Vertical

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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### Measurement 3

<b>EUT</b>	EUT 2 : NB2710 UWC-G		
<b>Verdict, Test</b>	Test 46: ESU8_30M-1G KFZ05/83EG Antenne 1m 0 Grad		
<b>Modification</b>	None		
<b>Cables, Notes</b>	All cables, see chapter 1.4.2		
<b>Mode of operation</b>	Normal mode, see chapter 1.4.4, supplied with 12 VDC		
<b>Test date, time</b>	21 October 2014, 10:01:50		
<b>Antenna height</b>	1 m	<b>Antenna polarization</b>	Vertical/Horizontal
<b>EUT position</b>	0 Degree (stable)	<b>Antenna distance</b>	1 m
<b>Measurement settings</b>	Radimation Version: 2014.1.7, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: Auto [120 ms], Step freq: Linear: 30 kHz steps, Attenuator: 0 dB, Internal preamp: 20 dB, Measure time: Auto [0 ns]		



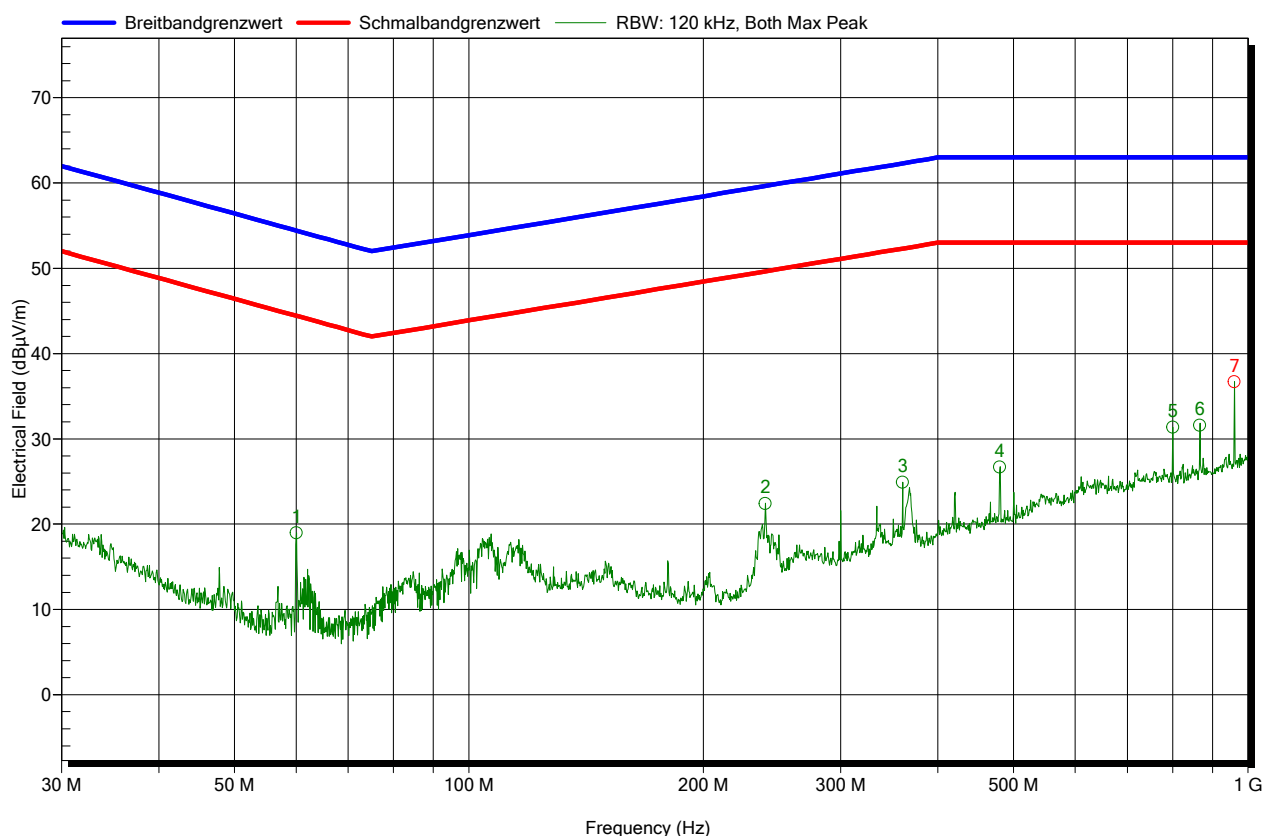
### Detected peaks

Peak Number	Frequency	Peak	Angle	Height	Polarization
1	60 MHz	18.8 dBµV/m	0 Degree	1 m	Vertical
2	240 MHz	21.63 dBµV/m	0 Degree	1 m	Horizontal
3	300 MHz	21.66 dBµV/m	0 Degree	1 m	Horizontal
4	360 MHz	24.55 dBµV/m	0 Degree	1 m	Vertical
5	480.09 MHz	27.55 dBµV/m	0 Degree	1 m	Horizontal
6	799.98 MHz	30.74 dBµV/m	0 Degree	1 m	Vertical
7	866.67 MHz	31.42 dBµV/m	0 Degree	1 m	Vertical
8	960.21 MHz	36.47 dBµV/m	0 Degree	1 m	Horizontal

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Measurement 4

<b>EUT</b>	EUT 2 : NB2710 UWC-G		
<b>Verdict, Test</b>	Test 45: ESU8_30M-1G KFZ05/83EG Antenne 1m 0 Grad		
<b>Modification</b>	None		
<b>Cables, Notes</b>	All cables, see chapter 1.4.2		
<b>Mode of operation</b>	Normal mode, see chapter 1.4.4, supplied with 24 VDC		
<b>Test date, time</b>	21 October 2014, 09:56:28		
<b>Antenna height</b>	1 m	<b>Antenna polarization</b>	Vertical/Horizontal
<b>EUT position</b>	0 Degree (stable)	<b>Antenna distance</b>	1 m
<b>Measurement settings</b>	Radimation Version: 2014.1.7, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: Auto [120 ms], Step freq: Linear: 30 kHz steps, Attenuator: 0 dB, Internal preamp: 20 dB, Measure time: Auto [0 ns]		



## Detected peaks

Peak Number	Frequency	Peak	Angle	Height	Polarization
1	60 MHz	18.99 dBµV/m	0 Degree	1 m	Vertical
2	240 MHz	22.42 dBµV/m	0 Degree	1 m	Horizontal
3	360 MHz	24.91 dBµV/m	0 Degree	1 m	Vertical
4	480.06 MHz	26.71 dBµV/m	0 Degree	1 m	Horizontal
5	799.98 MHz	31.38 dBµV/m	0 Degree	1 m	Vertical
6	866.64 MHz	31.6 dBµV/m	0 Degree	1 m	Vertical
7	959.52 MHz	36.69 dBµV/m	0 Degree	1 m	Horizontal

## Uncertainty of Measurement Instrumentation

Estimated uncertainty of the measurement results for 30MHz – 230MHz: (normal distribution, k=2)  $\pm 3.4$  dB  
Estimated uncertainty of the measurement results for 230MHz – 1GHz: (normal distribution, k=2)  $\pm 2.2$  dB

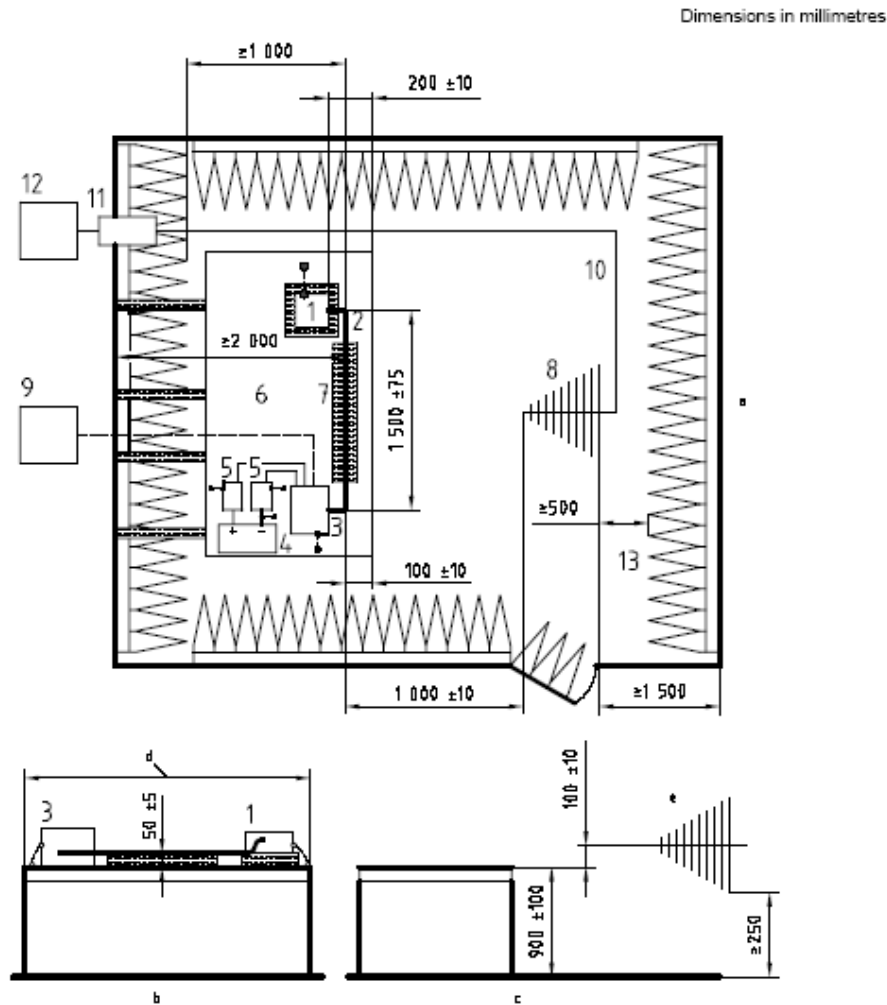
Maximum uncertainty defined by the standard for 30MHz – 230MHz:  $\pm 5,2$  dB  
Maximum uncertainty defined by the standard for 230MHz – 1GHz:  $\pm 5,2$  dB

The measurement instrumentation uncertainty does not affect the compliance to the specification limits.

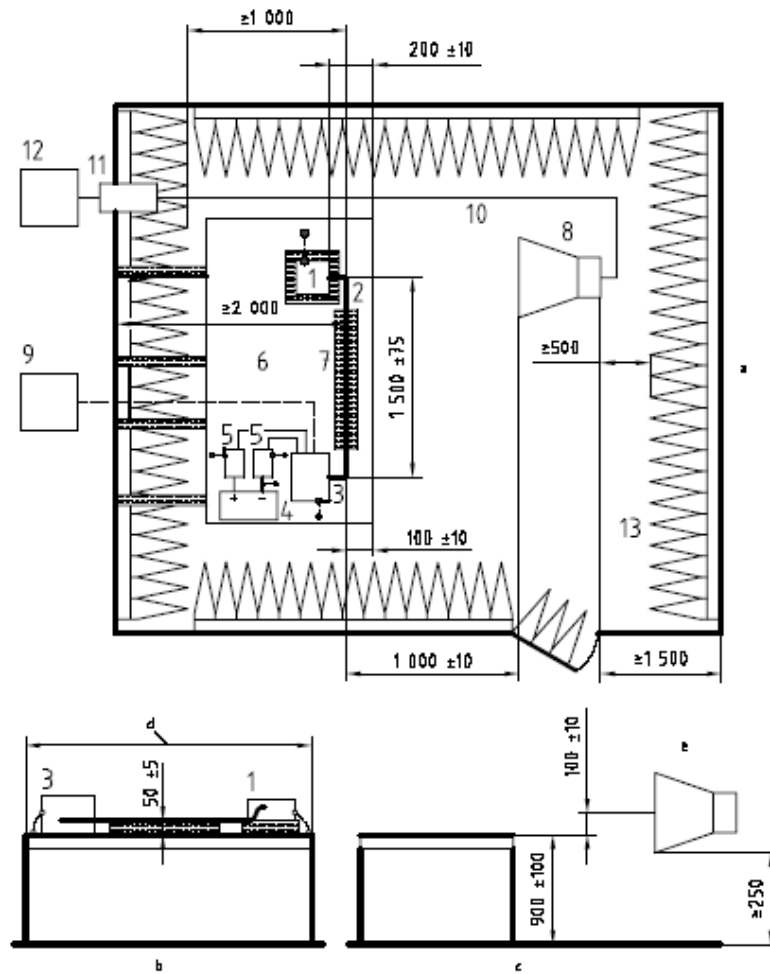
## 2.2 Immunity

### 2.2.1 Radiated Field Measurement (EN ISO 11452-2)

Test set-up according to ISO 11452-2:



Dimensions in millimetres



#### Key

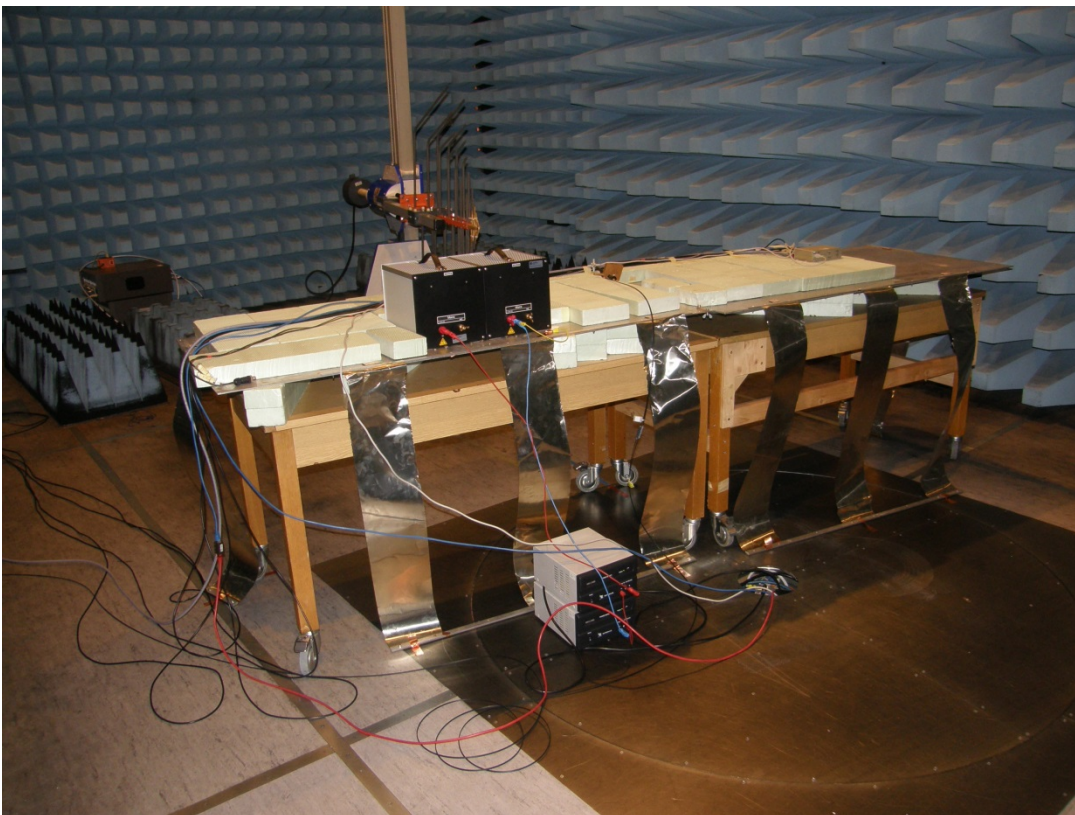
- |  |   |
|--|---|
| 1 DUT (grounded locally if required in test plan)                    | 7 low relative permittivity support ( $\epsilon_r \leq 1.4$ ) |
| 2 test harness   | 8 horn antenna  |
| 3 load simulator (placement and ground: connection according to 7.5) | 9 stimulation and monitoring system                           |
| 4 power supply (location optional)                                   | 10 high quality double-shielded coaxial cable ( $50 \Omega$ ) |
| 5 artificial network (AN)  | 11 bulkhead connector   |
| 6 ground plane (bonded to shielded enclosure)                        | 12 RF signal generator and amplifier                          |
| a Upper view (horizontal polarisation).                              | 13 RF absorber material                                       |
| b Front view.  |   |
| c Side view.   |   |
| d See 7.1.   |   |
| e Vertical polarization.   |   |



Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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**Photo 9: Measurement set-up for radiated Immunity, Log-periodic-antenna**

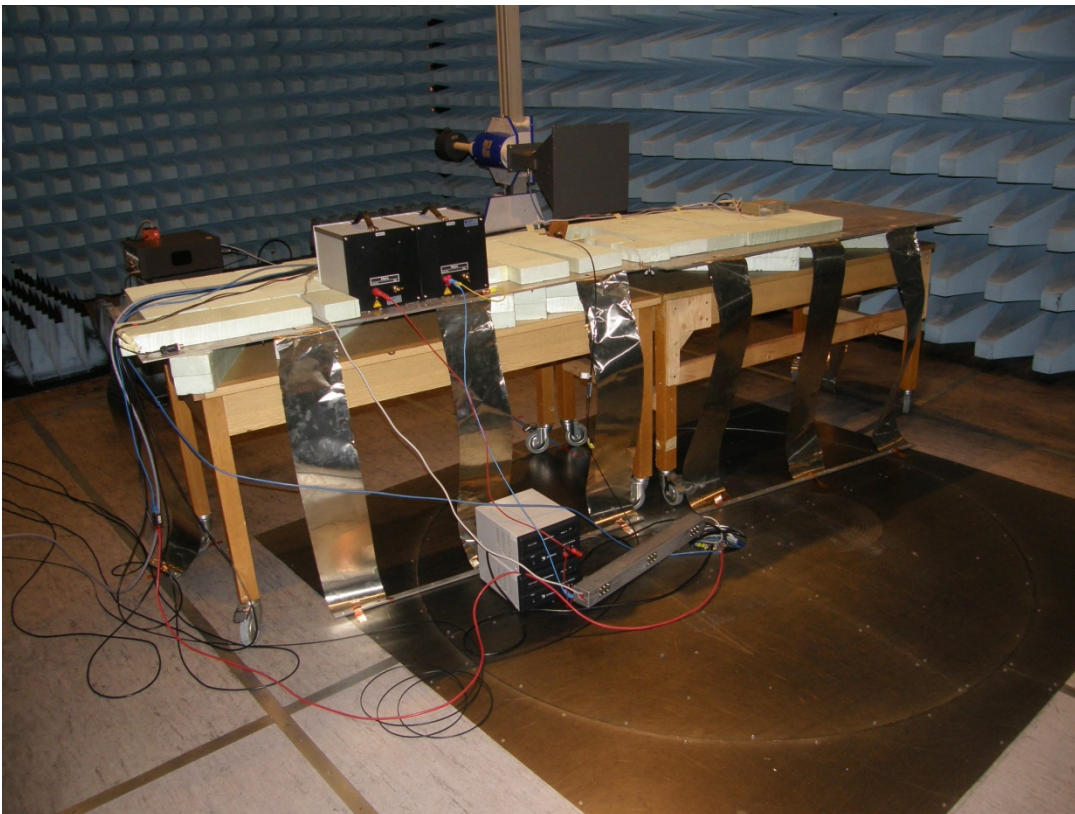


**Photo 10: Measurement set-up for radiated Immunity, Log-periodic-antenna**





**Photo 11:** Measurement set-up for radiated Immunity, Horn antenna, for immunity above 1 GHz



**Photo 12:** Measurement set-up for radiated Immunity, Horn antenna, for immunity above 1 GHz

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test equipment

Device Type	Description	Brand	Type	ID
Signal generator	AnaPico APSIN 6010	AnaPico	APSIN 6010	13.6632.14
Amplifier:	AR 750W1000	Amplifier Research	AR 750W1000	14.6632.04
Antenna:	AT 6080 H10192	Amplifier Research	AT 6080	H10192
Antenna	AT4002A	Amplifier Research	AT4002A	H9673
Amplifier:	Amplifier Research 50S1G6	Amplifier Research	AR 50S1G6	13.6632.13
Field sensor 1	146632.02 PMM EP601	PMM	EP601	146632.02

<b>EUT:</b>	EUT 2 : NB2710 UWC-G		
<b>Connected:</b>	All cables		
<b>Test set-up:</b>	EUT is on the metallic table 95 cm above ground plane		
<b>Operating mode:</b>	Active condition, see chap. 1.4.4		
<b>Compliance criteria (see chap. 1.6.3):</b>	<b>Field strength:</b>	<b>ISO 11452-2: with test levels according to Directive 72/245/EEC last update directive 2006/28/EC</b>	<b>Compliance Criterion:</b>
	30 V/m	20 MHz – 800 MHz, 80% AM, 1 kHz	A
	30 V/m	0.8 GHz – 2 GHz, PM 217Hz, 12.5% Duty	A
<b>Function surveillance:</b>	Visual observation		

Settings of the test equipment			
<b>Frequency range:</b>	80 MHz - 1000 MHz	<b>Height of the antenna:</b>	1.05 m
<b>Frequency step:</b>	1 %	<b>Amplitude modulation:</b>	80 % with 1 kHz
<b>Polarisation:</b>	Vertical	<b>Dwell time:</b>	1 s
<b>Side of EUT to antenna:</b>	Front		

## Measurement 1:

<b>Mode of operation:</b>	Active condition, see chap. 1.4.4		
<b>Frequency range:</b>	<b>Test Voltage:</b>	<b>Performance of the EUT:</b>	
80 – 1000 MHz	50 V/m	No degradation noticed, EUT conforms to the compliance criteria A	

Settings of the test equipment			
<b>Frequency range:</b>	0.8 GHz – 2.0 GHz	<b>Height of the antenna:</b>	1.05 m
<b>Frequency step:</b>	1 %	<b>Pulse modulation:</b>	217 Hz, 12.5 % Duty
<b>Polarisation:</b>	Horizontal, vertical	<b>Dwell time:</b>	1 s
<b>Side of EUT to antenna:</b>	Front		

## Measurement 2:

<b>Mode of operation:</b>	Active condition, see chap. 1.4.4		
<b>Frequency range:</b>	<b>Test Voltage:</b>	<b>Performance of the EUT:</b>	
0.8 GHz – 2.0 GHz	50 V/m	No degradation noticed, EUT conforms to the compliance criteria A	
0.8 GHz – 2.0 GHz	100 V/m	No degradation noticed, EUT conforms to the compliance criteria A	

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Uncertainty of Measurement

The uncertainty of measurement is: (normal distribution, k=2)

$\pm 26 \%$

The uncertainty does not affect the compliance to the specification.

## Result of the test

The EUT is **in conformance** with the specification.





Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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**Photo 13: Set-up for the Stripline test**

### Test equipment

Device Type	Description	Brand	Type	ID
Field sensor 1	H9768 PMM OR03 + EP330	PMM	OR03 + EP330	H9768
Amplifier	V8169 Amplifier Research 100W1000M5A	Amplifier Research	100W1000M5A	V8169
Signal generator	Rohde & Schwarz SME 03	Rohde & Schwarz	SME 03	
Cable coupler -> antenna	RI <6 GHz Coupler-Ant H10015---H10017	Huber Su-hner	Sucoflex 106	H10015, H10016, H10017
Antenna tower	Manual Tower		Manual Controlled Antenna Tower	
Spectrum analyzer	OA9715 HP 8546A 20M-2.9G	Hewlett Packard	8546A	OA9715
Coupler	H8322 Amplifier Research DC3001M2	Amplifier Research	DC3001A	H8322
Antenna	H10115 Stimpfl SL-3.2M	Stimpfl	SL-3.2M	H10115
Turn table	Manual Controlled Turn Table		Manual Controlled Turn Table	
Forward power meter	OL8386 Gigatronic 8542C+80401A Ch A	Gigatronic	8542 Channel A	OL8386

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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<b>EUT:</b>	EUT 2 : NB2710 UWC-G		
<b>Connected:</b>	All cables		
<b>Operating mode:</b>	Active condition, see chap. 1.4.4		
<b>Compliance criteria (see chap. 1.6.3):</b>	<b>Field strength:</b>	<b>ISO 11452-2: with test levels according to Directive 72/245/EEC last update directive 2006/28/EC</b>	<b>Compliance Criterion:</b>
	60 V/m	20 MHz – 800 MHz, 80% AM, 1 kHz	A
	60 V/m	0.8GHz – 1 GHz, 217 Hz with 12.5% Duty	A
<b>Function surveillance:</b>	Visual observation		

### Protocol of the test:

Settings of the test equipment			
<b>Frequency range:</b>	0.1 MHz - 30 MHz	<b>Height of the antenna:</b>	0.15 m
<b>Frequency step:</b>	5 %	<b>Amplitude modulation:</b>	80 % with 1 kHz
<b>Polarisation:</b>	vertical	<b>Dwell time:</b>	1 s
<b>Side of EUT to antenna:</b>	Front		

Settings of the test equipment			
<b>Frequency range:</b>	30 MHz - 1000 MHz	<b>Height of the antenna:</b>	0.15 m
<b>Frequency step:</b>	2 %	<b>Pulse modulation:</b>	80 % with 1 kHz
<b>Polarisation:</b>	vertical	<b>Dwell time:</b>	1 s
<b>Side of EUT to antenna:</b>	Front		

### Measurement 1:

<b>Mode of operation:</b>	Active condition, see chap. 1.4.4		
<b>Frequency range:</b>	<b>Test Voltage:</b>	<b>Performance of the EUT:</b>	
0.1 – 30 MHz	100 V/m	No degradation noticed, EUT conforms to the compliance criteria A	
30 – 1000 MHz	100 V/m	No degradation noticed, EUT conforms to the compliance criteria A	

### Uncertainty of Measurement

The uncertainty of measurement is: (normal distribution, k=2)

± 26 %

The uncertainty does not affect the compliance to the specification.

### Result of the test

The EUT is **in conformance** with the specification.

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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### 2.2.3 Impulse tests (ISO 7637-2), EUT 1 as 12 V system

#### Test set-up



#### Measurement equipment

Equipment	Manufacturer	Type	Serial Nr.	Inv-Nr.
Load Dump Generator	EM-Test	LD200	06100107	QS2481
Transient Generator	EM-Test	UCS200-M	06100108	QS2480
Voltage Drop Generator	EM-Test	VDS200	06100109	QS2479
Oscilloscope	Tektronix	TDS350	B010167	QS2453
Oscilloscope	Tektronix	TDS2012B	C040208	QS2546
Test Software	EM-Test		000029	

#### Test Pulse Nr. 1:

##### Requirements

Test level (U <sub>s</sub> )	Min. number of test pulses	Pulse repetition time		Compliance criteria
		min	max.	
-75 V	5000 pulses	0.5 s	5 s	Immunity-related functions: Class C Not immunity-related functions: Class D



Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Measurement protocol

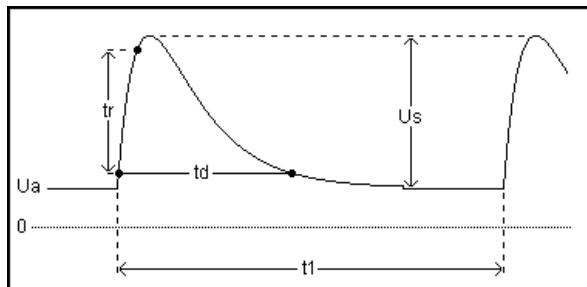
Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 15:45
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2011
Application:	12 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	96 kPa

### Settings:

Pulse form:	ISO 7637-2 : 2011 : Pulse 1				
Test generator:	UCS200M	Software-Nr.:	000029		
		Serial:	06100108		
Ua (Alternator):	13.5	V	Current limiting:	15	A

### Pulse parameters:

Us:	-75	V
t1:	1.0	s
t2:	200	ms
tr:	1	us
td:	2000	us
Coupling:	Battery	
Number of events:	5000	
Test duration:	01:23:20	h



### Test result:

Number of pulses:	5000
Requirement:	Criteria D
Test result:	The EUT shuts down, ethernet communication lost, after the test restart without any operation, communication over ethernet already o.k., EUT conforms to the compliance criteria C & D

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 2a:

### Requirements

Test level ( $U_s$ )	Min. number of test pulses	Pulse repetition time		Compliance criteria
		min	max.	
+37 V	5000 pulses	0.2 s	5 s	Immunity-related functions: Class B Not immunity-related functions: Class D

### Measurement protocol

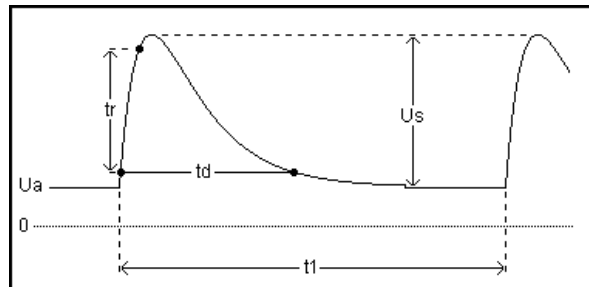
Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 12:16
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	12 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	1012 mbar

### Settings:

Pulse form:	ISO 7637-2 : 2004 : Pulse 2a			
Test generator	UCS200M	Software-Nr.:	000029	
		Serial:	06100108	
Ua (Alternator):	13.5	V	Current limiting:	15 A

### Pulse parameters:

Us:	+37	V
t1:	0.5	s
tr:	1	us
td:	50	us
Ri:	2	Ohm
Coupling:	Battery	
Number of events:	5000	
Test duration:	00:41:40	h



### Test result:

Number of pulses:	5000
Requirement:	Criteria D
Test result:	No degradation noticed, EUT conforms to the compliance criteria A & D



Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 3a:

### Requirements

Test level ( $U_s$ )	Min. test time	Burst cycle		Compliance criteria
		min	max.	
-112 V	1 h	90 ms	100 ms	Immunity-related functions: Class A Not immunity-related functions: Class D

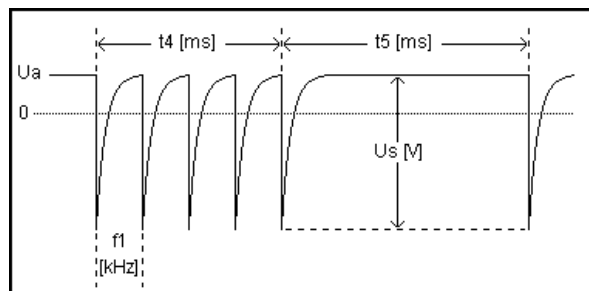
Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 13:18
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	12 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	1012 mbar

### Settings:

Pulse form:	ISO 7637-2 : 2004 : Pulse 3a			
Test generator	UCS200M	Software-Nr.:	000029	
		Serial:	06100108	
Ua (Alternator):	13.5	V	Current limiting:	15 A

### Pulse parameters:

Us:	-112	V
f1:	10	kHz
t4:	10	ms
t5:	90	ms
tr:	5	ns
td:	100	ns
Ri:	50	Ohm
Coupling:	Battery	
Test duration:	1	h



### Test result:

Test duration:	01:00:01	h	
Requirement:	Criteria D		
Test result:	No degradation noticed, EUT conforms to the compliance criteria A & D		

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 3b:

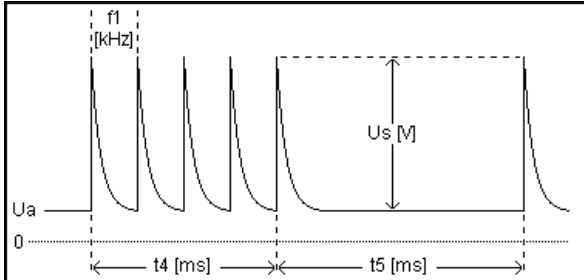
### Requirements

Test level ( $U_s$ )	Min. test time	Burst cycle		Compliance criteria
		min	max.	
+75 V	1 h	90 ms	100 ms	Immunity-related functions: Class A Not immunity-related functions: Class D

Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 14:20
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	12 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	1012 mbar

Settings:					
Pulse form:	ISO 7637-2 : 2004 : Pulse 3b				
Test generator	UCS200M		Software-Nr.:	000029	
			Serial:	06100108	
Ua (Alternator):	13.5	V	Current limiting:	15	A

Pulse parameters:		
Us:	+75	V
f1:	10	kHz
t4:	10	ms
t5:	90	ms
tr:	5	ns
td:	100	ns
Ri:	50	Ohm
Coupling:	Battery	
Test duration:	1	h



The graph illustrates a pulse train  $U_a$  over time. The pulses have a frequency  $f_1$  [kHz] and a peak voltage  $U_s$  [V]. The time intervals  $t_4$  [ms] and  $t_5$  [ms] are indicated. The pulse train consists of a series of pulses with a high-frequency burst followed by a lower-frequency burst.

Test result:			
Test duration:	01:00:01	h	
Requirement:	Criteria D		
Test result:	No degradation noticed, EUT conforms to the compliance criteria A & D		

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 4:

### Requirements

Test level (U <sub>s</sub> )	Min. number of test pulses	Pulse repetition time		Compliance criteria
		min	max.	
-6 V	1 pulse	---	---	Immunity-related functions: Class C Not immunity-related functions: Class D

Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 16:05
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	12 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	1012 mbar

Settings:				
Pulse form:	ISO 7637-2 : 2004 : Pulse 4			
Test generator	VDS200B	Software-Nr.:	000374	
		Serial:	06100109	
U <sub>b</sub> (Battery):	12.0	V	Current limiting:	15 A

Pulse parameters:			
U <sub>a1</sub> :	-6.0	V	
U <sub>a2</sub> :	-2.5	V	
t1:	1.0	s	
t6:	5	ms	
t7:	15	ms	
t8:	50	ms	
t9:	0.5	s	
t11:	5	ms	
Number of events:	1		
Test duration:	00:00:02	h	

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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Test result:		
Number of pulses:	10	
Requirement:	Criteria D	
Test result:	The EUT shuts down, ethernet communication lost, after the test restart without any operation, communication over ethernet already o.k., EUT conforms to the compliance criteria C & D	

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## 2.2.4 Impulse tests (ISO 7637-2), EUT 2 as 24 V system

### Test set-up



### Measurement equipment

Equipment	Manufacturer	Type	Serial Nr.	Inv-Nr.
Load Dump Generator	EM-Test	LD200	06100107	QS2481
Transient Generator	EM-Test	UCS200-M	06100108	QS2480
Voltage Drop Generator	EM-Test	VDS200	06100109	QS2479
Oscilloscope	Tektronix	TDS350	B010167	QS2453
Oscilloscope	Tektronix	TDS2012B	C040208	
Test Software	EM-Test		000029	

### Test Pulse Nr. 1:

#### Requirements

Test level ( $U_s$ )	Min. number of test pulses	Pulse repetition time		Compliance criteria
		min	max.	
-450 V	5000 pulses	0.5 s	5 s	Immunity-related functions: Class C Not immunity-related functions: Class D



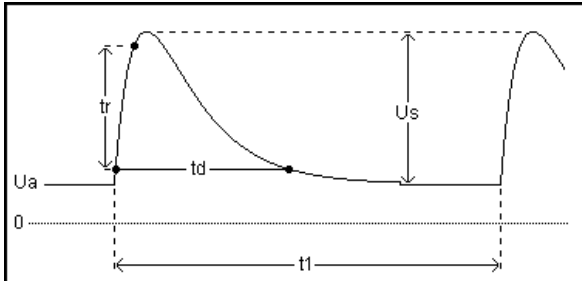
Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Measurement protocol

Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 11:50
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2011
Application:	24 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	96 kPa

Settings:			
Pulse form:	ISO 7637-2 : 2011 : Pulse 1		
Test generator:	UCS200M	Software-Nr.:	000029
		Serial:	06100108
Ua (Alternator):	27.0	V	Current limiting: 15 A

Pulse parameters:		
Us:	-450	V
t1:	1.0	s
t2:	200	ms
tr:	3	us
td:	1000	us
Coupling:	Battery	
Number of events:	5000	
Test duration:	01:23:20	h



The graph illustrates a pulse waveform. The vertical axis represents voltage, with a zero line indicated by a dotted line. The horizontal axis represents time. The pulse starts at a baseline voltage  $U_a$ , rises to a peak voltage  $U_s$  (indicated by a dashed line), and then decays back to the baseline. The rise time  $t_r$  is the time from the start of the rise to the peak. The delay time  $t_d$  is the time from the start of the pulse to the point where the voltage has decayed to a certain level. The pulse width  $t_1$  is the total duration of the pulse. The coupling is set to Battery, and the number of events is 5000.

Test result:		
Number of pulses:	5000	
Requirement:	Criteria C	
Test result:	The EUT shuts down, ethernet communication lost, after the test restart without any operation, communication over ethernet already o.k., EUT conforms to the compliance criteria C	

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 2a:

### Requirements

Test level (U <sub>s</sub> )	Min. number of test pulses	Pulse repetition time		Compliance criteria
		min	max.	
+37 V	5000 pulses	0.2 s	5 s	Immunity-related functions: Class B Not immunity-related functions: Class D

### Measurement protocol

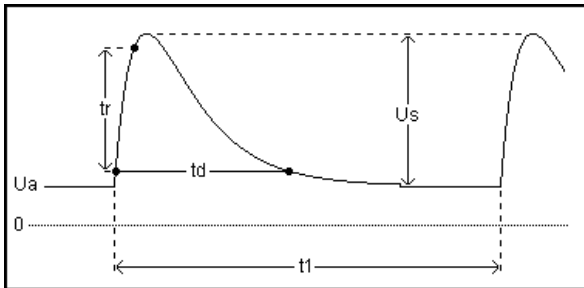
Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 08:18
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	24 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	96 kPa

### Settings:

Pulse form:	ISO 7637-2 : 2004 : Pulse 2a				
Test generator:	UCS200M	Software-Nr.:	000029		
		Serial:	06100108		
U <sub>a</sub> (Alternator):	27.0	V	Current limiting:	15	A

### Pulse parameters:

Us:	+37	V
t1:	0.2	s
tr:	1	us
td:	50	us
Ri:	2	Ohm
Coupling:	Battery	
Number of events:	5000	
Test duration:	00:16:40	h



### Test result:

Number of pulses:	5000	
Requirement:	Criteria B	
Test result:	No degradation noticed, EUT conforms to the compliance criteria A & B	

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 2b:

### Requirements

Test level ( $U_s$ )	Min. number of test pulses	Pulse repetition time		Compliance criteria
		min	max.	
+20 V	10 pulses	0.5 s	5 s	Immunity-related functions: Class C Not immunity-related functions: Class D

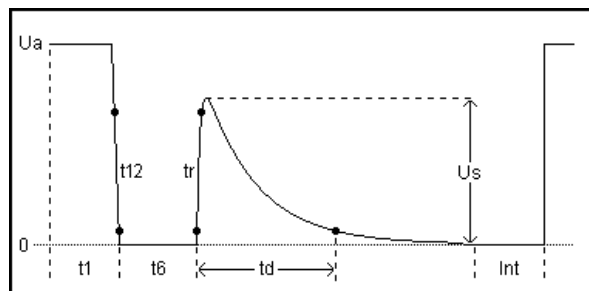
Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 11:55
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	24 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	96 kPa

### Settings:

Pulse form:	ISO 7637-2 : 2004 : Pulse 2b			
Test generator:	VDS200B	Software-Nr.:	000374	
		Serial:	06100109	
Ua (Alternator):	27.0	V	Current limiting:	15 A

### Pulse parameters:

Us:	20.0	V
t1:	5	s
t6:	1	ms
td:	200	ms
Int:	1	s
Ri:	0.00	Ohm
t12:	1	ms
tr:	1	ms
Number of events:	10	
Test duration:	00:01:08	h



### Test result:

Number of pulses:	10
Requirement:	Criteria C
Test result:	The EUT shuts down, ethernet communication lost, after the test restart without any operation, communication over ethernet already o.k., EUT conforms to the compliance criteria C

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 3a:

### Requirements

Test level ( $U_s$ )	Min. test time	Burst cycle		Compliance criteria
		min	max.	
-150 V	1 h	90 ms	100 ms	Immunity-related functions: Class A Not immunity-related functions: Class D

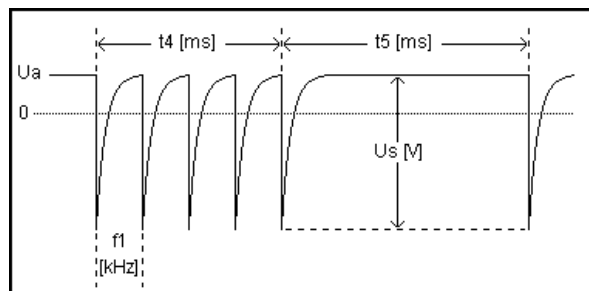
Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 09:20
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	24 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	96 kPa

### Settings:

Pulse form:	ISO 7637-2 : 2004 : Pulse 3a			
Test generator:	UCS200M	Software-Nr.:	000029	
		Serial:	06100108	
Ua (Alternator):	27.0	V	Current limiting:	15 A

### Pulse parameters:

Us:	-150	V
f1:	10	kHz
t4:	10	ms
t5:	90	ms
tr:	5	ns
td:	100	ns
Ri:	50	Ohm
Coupling:	Battery	
Test duration:	1	h



### Test result:

Test duration:	01:00:01	h	
Requirement:	Criteria A		
Test result:	No degradation noticed, EUT conforms to the compliance criteria A		

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 3b:

### Requirements

Test level (U <sub>s</sub> )	Min. test time	Burst cycle		Compliance criteria
		min	max.	
+150 V	1 h	90 ms	100 ms	Immunity-related functions: Class A Not immunity-related functions: Class D

Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 10:25
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	24 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	96 kPa

### Settings:

Pulse form:	ISO 7637-2 : 2004 : Pulse 3b			
Test generator:	UCS200M	Software-Nr.:	000029	
		Serial:	06100108	
U <sub>a</sub> (Alternator):	27.0	V	Current limiting:	15 A

### Pulse parameters:

U <sub>s</sub> :	+150	V
f <sub>1</sub> :	10	kHz
t <sub>4</sub> :	10	ms
t <sub>5</sub> :	90	ms
t <sub>r</sub> :	5	ns
t <sub>d</sub> :	100	ns
R <sub>i</sub> :	50	Ohm
Coupling:	Battery	
Test duration:	1	h

### Test result:

Test duration:	01:00:01	h	
Requirement:	Criteria A		
Test result:	No degradation noticed, EUT conforms to the compliance criteria A		

Electrosuisse	EUT: NB2700 and NB2710	14-EL-0068.E02
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## Test Pulse Nr. 4:

### Requirements

Test level (U <sub>s</sub> )	Min. number of test pulses	Pulse repetition time		Compliance criteria
		min	max.	
-12 V	1 pulse	---	---	Immunity-related functions: Class C Not immunity-related functions: Class D

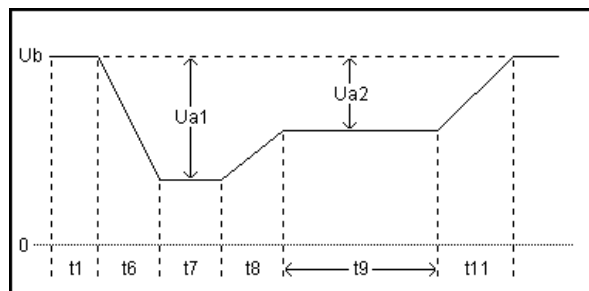
Subcontractor:	Electrosuisse Albislab
Report:	14-EL-0068.E02
Date of test:	11-11-2014, 11:58
Test engineer:	Peter Stillhard
Client:	NetModule AG, Mr. Thomas Siegrist
EUT:	NB2700 and NB2710
Standard:	ISO 7637-2 : 2004
Application:	24 V System
Temperature:	22 °C
Relative humidity (RH):	49 %
Pressure:	96 kPa

### Settings:

Pulse form:	ISO 7637-2 : 2004 : Pulse 4			
Test generator:	VDS200B	Software-Nr.:	000374	
Coupling:	UCS200M	Serial:	06100109	
U <sub>b</sub> (Battery):	24.0	V	Current limiting:	15 A

### Pulse parameters:

U <sub>a1</sub> :	-12.0	V
U <sub>a2</sub> :	-5.0	V
t <sub>1</sub> :	1.0	s
t <sub>6</sub> :	10	ms
t <sub>7</sub> :	50	ms
t <sub>8</sub> :	50	ms
t <sub>9</sub> :	0.5	s
t <sub>11</sub> :	10	ms
Ereignisse:	10	
Testdauer:	00:00:30	h



### Test result:

Number of pulses:	10
Requirement:	Criteria C
Test result:	No degradation noticed, EUT conforms to the compliance criteria A & C

hinsichtlich der Typgenehmigung für die elektrische/elektronische Unterbaugruppe in Bezug auf die elektromagnetische Verträglichkeit entsprechend der Regelung ECE-R10 einschließlich aller Ergänzungen bis Rev. 04 - Amend. 02 vom 06.08.2013 –

*concerning the type approval of an electric/ electronic sub-assembly with regard to  
Electromagnetic Compatibility In accordance with Regulation EEC-R10  
including all amendments to Rev. 04 - Amend. 02 from 2013-08-06*

**Allgemeine Angaben –**  
**General information:**

- |     |   |  |
|-----|---|--|
| 1   | Fabrikmarke (Firmenname des Herstellers) -<br><i>Mark (trade name of manufacturer):</i>   | <b>NetModule AG</b>  |
| 2   | Type(n) -<br><i>Type:</i>   | <b>NB2700</b>  |
|     | Handelsbezeichnung(en) -<br><i>General commercial description(s):</i>   | <b>NetModule Router</b>  |
|     | Ausführungen -<br><i>Versions:</i>  | <div style="display: flex; flex-direction: row;"><div style="flex: 1;"><b>NB2700-R</b><br/><b>NB2700-W</b><br/><b>NB2700-Ca</b><br/><b>NB2700-U</b><br/><b>NB2700-U-G</b><br/><b>NB2700-UW</b><br/><b>NB2700-UW-G</b><br/><b>NB2700-2U</b><br/><b>NB2700-2U-G</b><br/><b>NB2700-L</b><br/><b>NB2700-L-G</b><br/><b>NB2700-LW</b><br/><b>NB2700-LW-G</b><br/><b>NB2700-2L</b><br/><b>NB2700-2L-G</b><br/><b>NB2710-UA-V</b><br/><b>NB2710-UWA-GV</b><br/><b>NB2710-2UW</b><br/><b>NB2710-2UW-G</b><br/><b>NB2710-LSa</b><br/><b>NB2710-LWA-GV</b><br/><b>NB2710-LWC-G</b><br/><b>NB2710-LWI-G</b><br/><b>NB2710-2LW</b><br/><b>NB2710-2LW-G</b></div><div style="flex: 1; padding-left: 10px;"><b>(Wireline)</b><br/><b>(WLAN)</b><br/><b>(CDMA)</b><br/><b>(UMTS)</b><br/><b>(UMTS, GPS)</b><br/><b>(UMTS, WLAN)</b><br/><b>(UMTS, WLAN, GPS)</b><br/><b>(2xUMTS)</b><br/><b>(2xUMTS, GPS)</b><br/><b>(LTE)</b><br/><b>(LTE, GPS)</b><br/><b>(LTE, WLAN)</b><br/><b>(LTE, WLAN, GPS)</b><br/><b>(2xLTE)</b><br/><b>(2xLTE, GPS)</b><br/><b>(UMTS, Audio, Voice)</b><br/><b>(UMTS, WLAN, Audio, GPS, Voice)</b><br/><b>(2xUMTS, WLAN)</b><br/><b>(2xUMTS, WLAN, GPS)</b><br/><b>(LTE, RS-485)</b><br/><b>(LTE, WLAN, Audio, GPS, Voice)</b><br/><b>(LTE, WLAN, CAN, GPS)</b><br/><b>(LTE, WLAN, IBIS, GPS)</b><br/><b>(2xLTE, WLAN)</b><br/><b>(2xLTE, WLAN, GPS)</b></div></div> |
| 3.  | Merkmale zur Typidentifizierung, sofern am Bauteil vorhanden -<br><i>Means of identification of type, if marked on the component:</i> | <b>NB2700, NB2710</b><br><b>zusätzlich Bezeichnung der Ausführung</b><br><i>in addition, designation of the version</i>  |
| 3.1 | Anbringungsstelle dieser Merkmale -<br><i>Location of that marking:</i>   | <b>NB2700, NB2710 auf dem Typenschild</b><br><i>NB2700, NB2710 on the type label</i><br><br><b>Ausführung auf Zusatzkleber</b><br><i>version on an additional sticker</i>  |
| 4.  | Name und Anschrift des Herstellers-<br><i>Name and address of manufacturer:</i>   | <b>NetModule AG</b><br><b>Meriedweg 11</b><br><b>3172 Niederwangen</b>   |

Gegebenenfalls Name und Anschrift  
des beauftragten des Herstellers:  
*Name and address of authorised representative,  
if any:* **Entfällt -  
not applicable**

5. Bei Bauteilen und selbständig  
technischen Einheiten, Lage und  
Anbringungsart des EG-  
Genehmigungszeichens -  
*In the case of components and separate  
technical units, location and method of affixing of  
the EEC approval-mark:* **Selbstklebendes Typenschild auf dem Gehäuse –  
stick-on-label on the housing**
6. Anschrift(en) der Fertigungsstätte(n) -  
*Address(es) of assembly plant(s):* **Telefield Limited  
Units 609 – 610,  
6/F., Bio-Informatics Centre,  
No.2 Science Park West Avenue,  
Hong Kong Science Park, Shatin,  
New Territories, Hong Kong.**
7. Diese EUB wird als Bauteil genehmigt -  
*This ESA will be approved as component:*
8. Mögliche Beschränkungen für die Benutzung und Bedienungen für die Anbringung -  
*possible restrictions for the use and conditions for the installation:*  
keine - none
9. Nennspannung des elektrischen  
Systems - **12V ... 48V**  
*nominal voltage of the electrical system:*

Anlagenverzeichnis –  
annex

Nr. No:	Dokument- Document	Bezeichnung - Name	Ausgabestand date of first version	Änderungsstand date of last version	Seitenzahl number of pages
1.	Technische Beschreibung, Bedienungsanleitung - <i>technical data, manual</i>	Product Information: (NB2700_product_information_d.pdf, NB2710_product_information_d.pdf) User Manual: (nb2700_manual_en.pdf, nb2710_manual_en.pdf)	2012-09-04 - 2012-07-25 -	2015-02-04 2015-02-04 2014-10-29 2014-08-12	2 2 191 178
2.	Bestückungspläne - <i>Layout diagram</i>	Assembly Drawing: (NB2700_Assembly_Drawing.pdf, NB2710_Assembly_Drawing.pdf, NB2710_PCIe_Assembly_Drawing.pdf)	2012-07-06 - -	2015-02-10 2015-02-10 2014-04-29	2 2 2
3.	Schaltplan - <i>wiring diagram</i>	Schematics (NB2700_Schematics.pdf, NB2710_Schematics.pdf, NB2710_PCIe_Schematics.pdf)	2012-07-06 - -	2015-02-10 2015-02-10 2014-04-29	25 25 7
4.	Blockschaltbild - <i>block circuit</i>	-			

Ausgabestand - date of 1. version:	<b>2012-10-08</b>	letztes Änderungsdatum - date of last amendment:	<b>2015-02-10</b>	Seite- page	<b>2/3</b>
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Beschreibungsbogen Nr. –  
Information document No.:

**BB\_NB2700\_20121008-1**

5.	Stückliste - <i>part list</i>	Bill of Material (NB2700_BOM.pdf, NB2710_BOM.pdf, NB2710_PCle_BOM.pdf)	2012-07-06 - -	2015-02-10 2015-02-10 2014-04-29	4 4 2
6.	Gehäuseabmessungen - <i>dimensional sketch</i>	NB2700:165/190mm x 104mm x 40mm NB2710:165/190mm x 104mm x 45mm	2012-07-06 -	2012-07-06 2014-04-02	- -
7.	Fotos - <i>Photographs</i>	Photo see Product Information	2012-09-12	2015-02-04	2

**Zum Schutz der "Intellectual Property" von netModule AG wurden die folgenden Anhänge zum Beschreibungsbogen entfernt:**

*To protect the intellectual property of netModule AG, the following attachments of the information document have been removed:*

#	<b>Titel des Anhangs</b> <i>Title of the attachment</i>	<b>Seiten des Originaldokumentes</b> <i>Pages of the original Document</i>
1	<b>Technische Beschreibung, Bedienungsanleitung</b> <i>Technical data, manual</i>	70 .. 442
2	<b>Bestückungspläne</b> <i>Layout diagram</i>	443 .. 448
3	<b>Schaltplan</b> <i>Wiring diagram</i>	449 .. 505
5	<b>Stückliste</b> <i>Parts list</i>	506 .. 515