

Report:	<b>Electromagnetic compatibility</b>		Report no:	<b>19CH-00374.E21*</b>
Test item description:	<b>NetModule NB800 Rev. B02</b>			
Applicant:	<b>NetModule AG; Maulbeerstrasse 10; 3011 Bern; Switzerland</b>			
Manufacturer:	<b>NetModule AG; Maulbeerstrasse 10; 3011 Bern; Switzerland</b>			
Model/Type reference:	NB800-LWWtSu-G: LTE, WLAN & GNSS (Base) NB800-LWWtScSu-G: Base & RS232/485 & DIO NB800-LWWtSu2C-G: Base & DualCAN	Serial no:	NB800-LWWtSu-G: 00112B029DFE NB800-LWWtScSu-G: 00112B029E07 NB800-LWWtSu2C-G: 00112B029E03	
Trade mark:	<b>NetModule AG</b>	Date of tests:	<b>2019-11-25 to 2020-03-10</b>	

\* Replaces report 19CH-00374.E01

Standards		Result
EN 55032:2015 CISPR 32:2015	Electromagnetic compatibility of multimedia equipment - Emission requirements	Pass *
EN 55035:2017 CISPR 35:2016	Electromagnetic compatibility of multimedia equipment - Immunity requirements	Pass
IEC 61000-6-2:2016	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments	Pass
EN 61000-6-2:2005 IEC 61000-6-2:2005	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments	Pass
EN 61000-6-3:2007 + A1:2011 + AC:2012 IEC 61000-6-3:2006 /AMD1:2010	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	Pass
ETSI EN 301 489-1 V2.1.1:2017	(Common requirements)	Pass **
ETSI EN 301 489-3 V2.1.1:2017	(Short Range Devices 9kHz – 40GHz)	Pass **
ETSI EN 301 489-7 V1.3.1:2005	(Digital cellular radio telecommunication)	Pass **
ETSI EN 301 489-17 V3.2.0:2017	(Broadband Data Transmission Systems)	Pass **
ETSI EN 301 489-19 V2.1.0:2017	(GNSS receivers)	Pass **
ETSI EN 301 489-24 V1.5.1:2010	(CDMA)	Pass **
ETSI EN 301 489-52 V1.1.1:2016	(LTE)	Pass **
47 CFR, Part 15 / ICES-003	(Subpart B, Class B digital device) / (Canada)	Pass *

\* With exclusion for wireless services

\*\* Radiated Immunity tested only with the intended software application running on the EUT. Tests only refer to the functional application of the EUT. See documents of the risk analyse according directive RED (2014/53/EU)

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Mr J. Ding  
EMC test-engineer



Rossens, 2020-04-08

(Issue Date)

Normal.dotm

Main language : English

The present document results from tests on one specimen and does not prejudice to the conformity of all the manufactured products.

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## Contents

	Page
FOREWORD .....	3
1 SUMMARY OF TEST RESULTS .....	4
1.1 EN 61000-6-2 & -3.....	4
1.2 EN 55032 & EN 55035 .....	5
1.3 FCC / Canada.....	5
1.4 ETSI EN 301 489--1, -3, -7, -17, -19, -24 & -52.....	6
2 APPLIED STANDARDS .....	7
3 ABBREVIATIONS .....	8
4 APPLICANT .....	9
5 EQUIPMENT UNDER TEST .....	10
5.1 Identification* .....	10
5.2 Product family .....	11
5.3 Pictures of the EUT .....	15
5.4 Classification .....	16
5.5 Ports .....	17
6 TEST CONDITIONS .....	18
6.1 Climatic conditions, location and date .....	18
6.2 Test facility and methodology .....	18
6.3 Attendant persons .....	18
6.4 Test configuration .....	18
6.5 Operating conditions.....	19
6.6 Monitoring of the EUT.....	19
6.7 Auxiliary equipment .....	19
6.8 Performance criteria .....	20
7 EMISSION TESTS .....	21
7.1 Interference voltage.....	22
7.2 Conducted emission on I/O and telecommunication ports / wired network ports .....	31
7.3 Radiated electromagnetic field .....	41
7.4 Radiated emission - Electromagnetic field according CFR 47 15 (radiated – 30 MHz to 6 GHz) .....	50
8 IMMUNITY TESTS .....	58
8.1 Immunity to electrostatic discharge (ESD) (EN 61000-4-2).....	59
8.2 Immunity to electromagnetic fields (antenna) (EN 61000-4-3).....	67
8.3 Immunity to fast electric transients (EN 61000-4-4) .....	70
8.4 Immunity to surge (EN 61000-4-5: 1.2/50 µs).....	74
8.5 Immunity to conducted disturbances induced by radio-frequency fields (EN 61000-4-6) .....	79
9 MODIFICATIONS ON THE EUT .....	82

## Foreword

According to NetModule AG, the radio modules, which are included in the EUT, has been tested by its manufacturer in accordance with the RED Directive and the relevant standards. Therefore, these tests have not been carried out. According to NetModule AG, the radio module is installed in accordance with the instructions of its manufacturer. The tests of the EUT performed according to EN/ETSI 301 489-1 and -17 and documented in this report only refer to the functional application of the EUT.

# 1 Summary of test results

## 1.1 EN 61000-6-2 & -3

§	Test Type	Result
<b>7</b>	<b>Emission</b>	<b>EN 61000-6-3</b>
7.1	Interference voltage EN 55016-2-1:2014 CISPR 16-2-1:2014	<b>Pass <sup>1</sup></b>
7.2	Conducted emission on I/O or other ports EN 55022:2010 CISPR 22:2008	<b>Pass</b>
--	Discontinuous disturbances (clicks) EN 55014-1:2017 CISPR 14-1:2016	<b>Not required <sup>1</sup></b>
7.3	Radiated electromagnetic field EN 55016-2-3:2010 + A1 + A2 CISPR 16-2-3:2010 + A1 + A2	<b>Pass</b>
--	Harmonics EN 61000-3-2:2014 IEC 61000-3-2:2014	<b>Not required <sup>1</sup></b>
--	Voltage fluctuations (flicker) EN 61000-3-3:2013 IEC 61000-3-3:2013	<b>Not required <sup>1</sup></b>
<b>8</b>	<b>Immunity</b>	<b>EN 61000-6-2</b>
8.1	Electrostatic discharges EN 61000-4-2:2009 IEC 61000-4-2:2008	<b>Pass</b>
8.2	Electromagnetic fields EN 61000-4-3:2006 +A1 +A2 IEC 61000-4-3:2006 +A1 +A2	<b>Pass</b>
8.3	Fast electric transients (Burst) EN 61000-4-4:2012 IEC 61000-4-4:2012	<b>Pass</b>
8.4	Surges EN 61000-4-5:2014 +A1:2017 IEC 61000-4-5:2014 /AMD1:2017	<b>Pass</b>
8.5	Radio frequency common mode EN 61000-4-6:2014 IEC 61000-4-6:2013	<b>Pass</b>
--	Magnetic fields (industrial frequencies) EN 61000-4-8:2010 IEC 61000-4-8:2009	<b>Not required<sup>2</sup></b>
--	Voltage dips and interruptions EN 61000-4-11:2004+A1:2017 IEC 61000-4-11:2004/AMD1:2017	<b>Not required<sup>1</sup></b>

1. Powered with: 12 up to 24 VDC

2. Does not contain any devices susceptible to magnetic fields.

## 1.2 EN 55032 &amp; EN 55035

§	Test Type	Result
<b>7</b>	<b>Emission</b>	<b>EN 55032</b>
7.1	Interference voltage EN 55016-2-1:2014 CISPR 16-2-1:2014	<b>Pass</b> <sup>1</sup>
7.2	Conducted emission on I/O or other ports EN 55016-2-1:2014 CISPR 16-2-1:2014	<b>Pass</b>
7.3	Radiated electromagnetic field EN 55016-1-2:2014 CISPR 16-1-2:2014 EN 55016-2-3:2010/A2:2014 CISPR 16-2-3:2010/A2:2014	<b>Pass</b>

1. Powered with: 12 up to 24 VDC:

§	Test Type	Result
<b>8</b>	<b>Immunity</b>	<b>EN 55035</b>
8.1	Electrostatic discharges EN 61000-4-2:2009 IEC 61000-4-2:2008	<b>Pass</b>
8.2	Electromagnetic fields EN 61000-4-3:2006 +A1 +A2 IEC 61000-4-3:2006 +A1 +A2	<b>Pass</b>
8.3	Fast electric transients (Burst) EN 61000-4-4:2012 IEC 61000-4-4:2012	<b>Pass</b>
8.4	Surges EN 61000-4-5:2014 +A1:2017 IEC 61000-4-5:2014 /AMD1:2017	<b>Pass</b>
8.5	Radio frequency common mode EN 61000-4-6:2014 IEC 61000-4-6:2013	<b>Pass</b>
--	Magnetic fields (industrial frequencies) EN 61000-4-8:2010 IEC 61000-4-8:2009	<b>Not required</b> <sup>2</sup>
--	Voltage dips and interruptions EN 61000-4-11:2004+A1:2017 IEC 61000-4-11:2004/AMD1:2017	<b>Not required</b> <sup>1</sup>
--	Broadband impulsive conducted disturbances EN 55035:2017 CISPR 35: 2016	<b>Not required</b> <sup>3</sup>

1. Powered with: 12 up to 24 VDC:

2. EUT contains no components susceptible to magnetic fields

3. EUT has no DSL port.

## 1.3 FCC / Canada

§	Test Type	Result
<b>7</b>	<b>Emission</b>	<b>CFR 47 ICES-003 RSS-310 Industry Canada</b>
--	Conducted emission CFR 47 § 15.107 (Class B) ICES-003 §5.3 (Class B)	<b>Not required</b> <sup>1</sup>
7.4	Radiated emission – EM-field CFR 47 § 15.109 (Class B) ICES-003 §5.5 (Class B)	<b>Pass</b>

1. Powered with: 12 up to 24 VDC

## 1.4 ETSI EN 301 489--1, -3, -7, -17, -19, -24 &amp; -52

§	Test Type	Result
<b>7</b>	<b>Emission</b>	<b>EN 301 489-1, -3, -7, -17, -19, -24 &amp; -52 fixed use</b>
7.1	Conducted emission on AC ports EN 55032:2015 CISPR 32:2015	<b>Pass <sup>1</sup></b>
7.2	Conducted emission on I/O or other ports EN 55032:2015 CISPR 32:2015	<b>Pass</b>
7.3	Radiated electromagnetic field EN 55032:2015 CISPR 32:2015	<b>Pass</b>
--	Harmonics EN 61000-3-2:2014 IEC 61000-3-2:2014	<b>Not required<sup>1</sup></b>
--	Voltage fluctuations (flicker) EN 61000-3-3:2013 IEC 61000-3-3:2013	<b>Not required<sup>1</sup></b>
<b>8</b>	<b>Immunity</b>	<b>EN 301 489-1, -3, -7, -17, -19, -24 &amp; -52 fixed use</b>
8.1	Electrostatic discharges EN 61000-4-2:2009 IEC 61000-4-2:2008	<b>Pass</b>
8.2	Electromagnetic fields EN 61000-4-3:2006 +A1 +A2 IEC 61000-4-3:2006 +A1 +A2	<b>Pass</b>
8.3	Fast electric transients (Burst) EN 61000-4-4:2012 IEC 61000-4-4:2012	<b>Pass</b>
8.4	Surges EN 61000-4-5:2014 IEC 61000-4-5:2014	<b>Pass</b>
8.5	Radio frequency common mode EN 61000-4-6:2014 IEC 61000-4-6:2013	<b>Pass</b>
--	Voltage dips and interruptions EN 61000-4-11:2004 IEC 61000-4-11:2004	<b>Not required<sup>1</sup></b>

1. Powered with: 12 up to 24 VDC

## 2 Applied standards

EN 55032:2015 CISPR 32:2015	Electromagnetic compatibility of multimedia equipment - Emission requirements
EN 55035:2017 CISPR 35:2016	Electromagnetic compatibility of multimedia equipment - Immunity requirements
EN 61000-6-2:2005 IEC 61000-6-2:2016	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-3:2007 +A1:2011 + AC:2012 IEC 61000-6-3:2006 /AMD1:2010	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
ETSI EN 301 489-1 V2.1.1:2017	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 1: Common technical requirements
ETSI EN 301 489-3 V2.1.1:2017	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz
ETSI EN 301 489-7 V1.3.1:2005	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)
ETSI EN 301 489-17 V3.2.0:2017	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment; Part 17: Specific conditions for Broadband Data Transmission Systems
ETSI EN 301 489-19 V2.1.0:2017	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band (ROGNSS) providing positioning, navigation, and timing data; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
ETSI EN 301 489-24 V1.5.1:2010	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment
ETSI EN 301 489-52 V1.1.1: 2016	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
47 CFR Part 15 Subpart B (USA)	Code of Federal Regulations - Title 47 - Telecommunication, Part 15, Subpart B: "Unintentional Radiators
ICES-003 (Canada) NMB-003 (Canada)	Spectrum Management and Telecommunications Policy - Interference-Causing Equipment Standard Digital Apparatus

### 3 Abbreviations

Electromagnetic compatibility and radio spectrum matters:

AC	Alternating current
AFA	Adaptive Frequency Agility
AM	Amplitude Modulation
AN	Artificial Network
AV	Average
BB	Broad Band
BW	Bandwidth
CDN	Coupling Decoupling Network
CW	Continuous Wave
d(t)	Relative voltage change characteristic
DAA	Detect And Avoid spectrum access technique
dB	Decibel
dBi	Gain in decibels relative to an isotropic antenna
DC	Direct current
DL	Downlink
dmax	Maximum relative voltage change
DS	Defined State
DSSS	Direct Sequence Spread Spectrum
e.i.r.p.	equivalent isotropic radiated power
EMC	ElectroMagnetic Compatibility
ERC	European Radiocommunication Committee
ESA	Electrical/electronic sub-assembly
ESD	Electro Static Discharge
EUT	Equipment under Test
FHSS	Frequency Hopping Spread Spectrum
FS	Functional Safety
GBSAR	Ground Based Synthetic Aperture Radar
GRP	Ground reference plane
GTEM	Gigahertz Transverse ElectroMagnetic cell
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ISM	Industrial Scientific Medical (frequency band)
ITU	International Telecommunications Union
ITU-R	International Telecommunications Union, Radio Sector
ITU-T	International Telecommunications Union, Telecommunications Sector

L1,L2,L3	Phase
LBT	Listen Before Talk
LISN	Line impedance stabilization network
MDS	Absorbing measuring clamp
MU	Master Unit
N	Neutral
NB	Narrow Band
NRI	National Radio Interfaces
N/A	Not Aplicable
PE	Protective earth
PK	Peak
Plt	Long-term flicker indicator
PM	Pulse Modulation
Pst	Short-term flicker Indicator
QFE	Local atmospheric pressure (Field Elevation)
QP	Quasi-Peak
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
RFID	Radio Frequency Identification
RU	Remote Unit
Rx	Receiver
SAC	Semi-Anechoic chamber
SCU	System Control Unit
SF-CW	Step Frequency Continuous Wave (spread spectrum)
SND/ND	Signal + Noise + Distortion divided by Noise + Distortion
SRD	Short Range Device
TEM	Transverse ElectroMagnetic cell
TETRA	Terrestrial Trunked Radio
THD	Total Harmonic Distorsion
Tx	Transmitter
UL	Uplink
UWB	Ultra Wide Band
VSWR	Voltage Standing Wave Ratio

Date & Time Fomat: yyyy-MM-dd, HH:mm

General vocabulary: <http://www.electropedia.org>



**4 Applicant**

Applicant name and address	NetModule AG; Maulbeerstrasse 10; 3011 Bern; Switzerland
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## 5 Equipment under test

### 5.1 Identification\*

Manufacturer name and address	NetModule AG; Maulbeerstrasse 10; 3011 Bern; Switzerland	
Production country	Switzerland	
Trade mark	NetModule AG	
Test item description	NB800	
Use description	Industrial Router with Mobile, WLAN & GNSS.	
Model/Type reference	NB800-LWWtSu-G: LTE, WLAN & GNSS (Base) NB800-LWWtScSu-G: Base & RS232/485 & DIO (COMIO) NB800-LWWtSu2C-G: Base & DualCAN (DualCAN)	
Serial no	NB800-LWWtSu-G: 00112B029DFE NB800-LWWtScSu-G: 00112B029E07 NB800-LWWtSu2C-G: 00112B029E03	
Software version	1.0.6	
Highest frequency	CPU Core U100                      1000 MHz Crystal Q100                      25 MHz CPU DDR3 RAM                      400 MHz USB                                      480 MHz Ethernet                              125 MHz eMMC                                   48 MHz DC/DC Main U5000                   700 kHz PMIC U5100                          3.0 MHz DC/DC GSM U3100                   1.2 MHz	
Supply	U = 12 ... 24 VDC P = 10 W	
Dimension	~ 11.0 cm x 9.0 cm x 3.2 cm (l x w x h)	
Weight	~ 250 g	
Technical documentation	None. The equipment is completely identified by the above-mentioned information. NetModule AG assures the traceability of the documentation and is responsible for the product identification.	

\* According to information provided by the customer and not verified by Eurofins Electric & Electronic Product Testing AG

## 5.2 Product family

Tested Equipment	Covered Variants	Explanation <sup>1)</sup>																																																				
NB800-LWWtSu-G Rev. B02  NB800-LWWtScSu-G Rev. B02  NB800-LWWtSu2C-G Rev. B02	NB800-H1...Hn S1...Sn-O1...On	<p>All covered NB800 Rev. B02 variants contain the same mainboard (PCB), have the same case and the same form factor.</p> <p>The base variant includes Ethernet. Additionally, they can provide 4G mobile network access, WLAN, Bluetooth, GNSS and USB (via mainboard assembly options).</p> <p>Optionally, different interfaces can be included as extension boards called 'shields' (e.g. order code Sc for COMIO, 2C for 2xCAN, 2Cm for 2xCAN passive).</p> <p>There can be up to 4 antenna connectors on the mainboard and additionally 1 optional antenna connector (for GNSS).</p> <p>The wireless communication modules applied have been CE and FCC certified in an independent way of the tested equipment.</p> <p><b>'H1...Hn'</b> is a sequence of the following letters that identify the communication modules included (hardware option):</p> <table><tr><td>B</td><td>basic device</td></tr><tr><td>R</td><td>basic device, router only, no wireless</td></tr><tr><td>L</td><td>4G = 2G + 3G+ + LTE, Cat.4 Europe</td></tr><tr><td>Lbb</td><td>4G, Cat. 4, North America</td></tr><tr><td>Lf</td><td>4G, Cat. 4, South America</td></tr><tr><td>Lg</td><td>4G, Cat. 4, Asia Pacific (APAC)</td></tr><tr><td>W</td><td>WLAN a/b/g/n 2.4/5 GHz</td></tr><tr><td>Wb</td><td>WLAN b/g 2.4 GHz WLAN 11b/g</td></tr><tr><td>Wt</td><td>Bluetooth + BLE (BT)</td></tr><tr><td>Wz</td><td>Zigbee</td></tr><tr><td>Su</td><td>USB Host Port</td></tr><tr><td>Sc</td><td>RS232/485 + Digital IO (shield) COMIO</td></tr><tr><td>2C*</td><td>Dual CAN (shield), 2xCAN active</td></tr><tr><td>2Cn*</td><td>Dual CAN active (shield), 2xCAN active</td></tr><tr><td>2Cm*</td><td>Dual CAN passive (shield), 2xCAN passive</td></tr></table> <p>* Number before C can be omitted e.g. replace 2C (2xCAN) with C (CAN).</p> <p><b>'S1...Sn'</b> indicate software options activated:</p> <table><tr><td>G</td><td>Standard GNSS</td></tr><tr><td>V</td><td>VoIP Gateway (Voice)</td></tr><tr><td>Y</td><td>Plain Linux</td></tr><tr><td>Vi</td><td>Virtualisation, LXC</td></tr><tr><td>E</td><td>Vehicle E-Mark Approval</td></tr><tr><td>F</td><td>FMS to IP Gateway</td></tr><tr><td>Ix</td><td>ITxPT Approval</td></tr></table> <p><b>'O1...On'</b> indicate OEM options, typ. customer brand labeling e.g.:</p> <table><tr><td>TAG</td><td>Tagfinder</td></tr><tr><td>OEMa</td><td>Customer A</td></tr><tr><td>OEMb</td><td>Customer B</td></tr><tr><td>xyz</td><td>any customer abbreviation with or without number</td></tr></table>	B	basic device	R	basic device, router only, no wireless	L	4G = 2G + 3G+ + LTE, Cat.4 Europe	Lbb	4G, Cat. 4, North America	Lf	4G, Cat. 4, South America	Lg	4G, Cat. 4, Asia Pacific (APAC)	W	WLAN a/b/g/n 2.4/5 GHz	Wb	WLAN b/g 2.4 GHz WLAN 11b/g	Wt	Bluetooth + BLE (BT)	Wz	Zigbee	Su	USB Host Port	Sc	RS232/485 + Digital IO (shield) COMIO	2C*	Dual CAN (shield), 2xCAN active	2Cn*	Dual CAN active (shield), 2xCAN active	2Cm*	Dual CAN passive (shield), 2xCAN passive	G	Standard GNSS	V	VoIP Gateway (Voice)	Y	Plain Linux	Vi	Virtualisation, LXC	E	Vehicle E-Mark Approval	F	FMS to IP Gateway	Ix	ITxPT Approval	TAG	Tagfinder	OEMa	Customer A	OEMb	Customer B	xyz	any customer abbreviation with or without number
B	basic device																																																					
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Lf	4G, Cat. 4, South America																																																					
Lg	4G, Cat. 4, Asia Pacific (APAC)																																																					
W	WLAN a/b/g/n 2.4/5 GHz																																																					
Wb	WLAN b/g 2.4 GHz WLAN 11b/g																																																					
Wt	Bluetooth + BLE (BT)																																																					
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F	FMS to IP Gateway																																																					
Ix	ITxPT Approval																																																					
TAG	Tagfinder																																																					
OEMa	Customer A																																																					
OEMb	Customer B																																																					
xyz	any customer abbreviation with or without number																																																					

Tested Equipment	Covered Variants	Explanation <sup>1)</sup>																																																																																
	NB800-H1...Hn S1...Sn-O1...On	<p>The following NB800 Rev. B02 variants are currently available or planned:</p> <p><b><u>LTE Modem with Options (NB800-H1...Hn-S1...Sn-O1...On):</u></b></p> <table><tr><td><b>NB800-L</b></td><td><b>LTE</b></td></tr><tr><td>NB800-LSu</td><td>+ USB</td></tr><tr><td>NB800-LSc</td><td>+ COMIO</td></tr><tr><td>NB800-L2C*</td><td>+ 2xCAN active</td></tr><tr><td>NB800-L2Cm</td><td>+ 2xCAN passive</td></tr><tr><td>NB800-LScSu</td><td>+ COMIO + USB</td></tr><tr><td>NB800-LSu2C*</td><td>+ USB + 2xCAN active</td></tr><tr><td>NB800-LSu2Cm</td><td>+ USB + 2xCAN passive</td></tr></table> <table><tr><td><b>NB800-L-G</b></td><td><b>LTE + GNSS</b></td></tr><tr><td>NB800-LSu-G</td><td>+ USB</td></tr><tr><td>NB800-LSc-G</td><td>+ COMIO</td></tr><tr><td>NB800-L2C*-G</td><td>+ 2xCAN active</td></tr><tr><td>NB800-L2Cm-G</td><td>+ 2xCAN passive</td></tr><tr><td>NB800-LScSu-G</td><td>+ COMIO + USB</td></tr><tr><td>NB800-LSu2C*-G</td><td>+ USB + 2xCAN active</td></tr><tr><td>NB800-LSu2Cm-G</td><td>+ USB + 2xCAN passive</td></tr></table> <table><tr><td><b>NB800-LW</b></td><td><b>LTE + WLAN</b></td></tr><tr><td>NB800-LWSu</td><td>+ USB</td></tr><tr><td>NB800-LWSc</td><td>+ COMIO</td></tr><tr><td>NB800-LW2C*</td><td>+ 2xCAN active</td></tr><tr><td>NB800-LW2Cm</td><td>+ 2xCAN passive</td></tr><tr><td>NB800-LWScSu</td><td>+ COMIO + USB</td></tr><tr><td>NB800-LWSu2C</td><td>+ USB + 2xCAN active</td></tr><tr><td>NB800-LWSu2Cm</td><td>+ USB + 2xCAN passive</td></tr></table> <table><tr><td><b>NB800-LWWt</b></td><td><b>LTE + WLAN + BT</b></td></tr><tr><td>NB800-LWWtSu</td><td>+ USB</td></tr><tr><td>NB800-LWWtSc</td><td>+ COMIO</td></tr><tr><td>NB800-LWWt2C*</td><td>+ 2xCAN active</td></tr><tr><td>NB800-LWWt2Cm</td><td>+ 2xCAN passive</td></tr><tr><td>NB800-LWWtScSu</td><td>+ COMIO + USB</td></tr><tr><td>NB800-LWWtSu2C*</td><td>+ USB + 2xCAN active</td></tr><tr><td>NB800-LWWtSu2Cm</td><td>+ USB + 2xCAN passive</td></tr></table> <table><tr><td><b>NB800-LWWt-G</b></td><td><b>LTE + WLAN + BT + GNSS</b></td></tr><tr><td>NB800-LWWtSu-G</td><td>+ USB</td></tr><tr><td>NB800-LWWtSc-G</td><td>+ COMIO</td></tr><tr><td>NB800-LWWt2C*-G</td><td>+ 2xCAN active</td></tr><tr><td>NB800-LWWt2Cm-G</td><td>+ 2xCAN passive</td></tr><tr><td>NB800-LWWtScSu-G</td><td>+ COMIO + USB</td></tr><tr><td>NB800-LWWtSu2C*-G</td><td>+ USB + 2xCAN active</td></tr><tr><td>NB800-LWWtSu2Cm-G</td><td>+ USB + 2xCAN passive</td></tr></table> <p>NB800-Lbb...      LTE modem for <b>North America</b>, and NB800-Lb...      any of above options (replace L with Lbb or Lb)</p> <p>NB800-Lg...      LTE modem for <b>Asia Pacific</b>, and any of above options (replace L with Lg)</p> <p>NB800-Lf...      LTE modem for <b>South America</b>, and any of above options (replace L with Lf)</p> <p>* 2C can be replaced with 2Cn (future code for 2xCAN active). Number before C (CAN) can be omitted e.g. replace 2C (2xCAN) with C (CAN).</p>	<b>NB800-L</b>	<b>LTE</b>	NB800-LSu	+ USB	NB800-LSc	+ COMIO	NB800-L2C*	+ 2xCAN active	NB800-L2Cm	+ 2xCAN passive	NB800-LScSu	+ COMIO + USB	NB800-LSu2C*	+ USB + 2xCAN active	NB800-LSu2Cm	+ USB + 2xCAN passive	<b>NB800-L-G</b>	<b>LTE + GNSS</b>	NB800-LSu-G	+ USB	NB800-LSc-G	+ COMIO	NB800-L2C*-G	+ 2xCAN active	NB800-L2Cm-G	+ 2xCAN passive	NB800-LScSu-G	+ COMIO + USB	NB800-LSu2C*-G	+ USB + 2xCAN active	NB800-LSu2Cm-G	+ USB + 2xCAN passive	<b>NB800-LW</b>	<b>LTE + WLAN</b>	NB800-LWSu	+ USB	NB800-LWSc	+ COMIO	NB800-LW2C*	+ 2xCAN active	NB800-LW2Cm	+ 2xCAN passive	NB800-LWScSu	+ COMIO + USB	NB800-LWSu2C	+ USB + 2xCAN active	NB800-LWSu2Cm	+ USB + 2xCAN passive	<b>NB800-LWWt</b>	<b>LTE + WLAN + BT</b>	NB800-LWWtSu	+ USB	NB800-LWWtSc	+ COMIO	NB800-LWWt2C*	+ 2xCAN active	NB800-LWWt2Cm	+ 2xCAN passive	NB800-LWWtScSu	+ COMIO + USB	NB800-LWWtSu2C*	+ USB + 2xCAN active	NB800-LWWtSu2Cm	+ USB + 2xCAN passive	<b>NB800-LWWt-G</b>	<b>LTE + WLAN + BT + GNSS</b>	NB800-LWWtSu-G	+ USB	NB800-LWWtSc-G	+ COMIO	NB800-LWWt2C*-G	+ 2xCAN active	NB800-LWWt2Cm-G	+ 2xCAN passive	NB800-LWWtScSu-G	+ COMIO + USB	NB800-LWWtSu2C*-G	+ USB + 2xCAN active	NB800-LWWtSu2Cm-G	+ USB + 2xCAN passive
<b>NB800-L</b>	<b>LTE</b>																																																																																	
NB800-LSu	+ USB																																																																																	
NB800-LSc	+ COMIO																																																																																	
NB800-L2C*	+ 2xCAN active																																																																																	
NB800-L2Cm	+ 2xCAN passive																																																																																	
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NB800-LSu2C*	+ USB + 2xCAN active																																																																																	
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NB800-LSc-G	+ COMIO																																																																																	
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NB800-LScSu-G	+ COMIO + USB																																																																																	
NB800-LSu2C*-G	+ USB + 2xCAN active																																																																																	
NB800-LSu2Cm-G	+ USB + 2xCAN passive																																																																																	
<b>NB800-LW</b>	<b>LTE + WLAN</b>																																																																																	
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NB800-LWScSu	+ COMIO + USB																																																																																	
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NB800-LWWtSc	+ COMIO																																																																																	
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NB800-LWWt2Cm	+ 2xCAN passive																																																																																	
NB800-LWWtScSu	+ COMIO + USB																																																																																	
NB800-LWWtSu2C*	+ USB + 2xCAN active																																																																																	
NB800-LWWtSu2Cm	+ USB + 2xCAN passive																																																																																	
<b>NB800-LWWt-G</b>	<b>LTE + WLAN + BT + GNSS</b>																																																																																	
NB800-LWWtSu-G	+ USB																																																																																	
NB800-LWWtSc-G	+ COMIO																																																																																	
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NB800-LWWt2Cm-G	+ 2xCAN passive																																																																																	
NB800-LWWtScSu-G	+ COMIO + USB																																																																																	
NB800-LWWtSu2C*-G	+ USB + 2xCAN active																																																																																	
NB800-LWWtSu2Cm-G	+ USB + 2xCAN passive																																																																																	

Tested Equipment	Covered Variants	Explanation <sup>1)</sup>
		<p><b><u>Base-Devices (no wireless interfaces):</u></b></p> <p><b>NB800-R</b>                      <b>no modem, no WLAN, but Ethernet</b>  <b>NB800-B</b>                      <b>no modem, no WLAN, but Ethernet</b>  NB800-Su                      + USB  NB800-Sc                      + COMIO  NB800-2C*                    + 2xCAN active  NB800-2Cm                   + 2xCAN passive  NB800-ScSu                   + COMIO + USB  NB800-Su2C*                + USB + 2xCAN active  NB800-Su2Cm               + USB + 2xCAN passive</p> <p><b><u>No Cellular Modem but WLAN:</u></b></p> <p><b>NB800-W</b>                      <b>WLAN</b>  NB800-WSu                    + USB  NB800-WSc                    + COMIO  NB800-W2C*                   + 2xCAN  NB800-W2Cm                  + 2xCAN passive  NB800-WScSu                + COMIO + USB  NB800-WSu2C*               + USB + 2xCAN active  NB800-WSu2Cm              + USB + 2xCAN passive</p> <p><b>NB800-WWt</b>                   <b>WLAN + BT</b>  NB800-WWtSu                + USB  NB800-WWtSc                + COMIO  NB800-WWt2C*               + 2xCAN active  NB800-WWt2Cm              + 2xCAN passive  NB800-WWtScSu              + COMIO + USB  NB800-WWtSu2C*            + USB + 2xCAN active  NB800-WWtSu2Cm           + USB + 2xCAN passive</p> <p><b><u>SW Options (NB800-H1...Hn-S1...Sn-O1...On):</u></b>  Add suffix for any SW option, e.g. <b>Y</b> for plain Linux, <b>Vi</b> for Virtualisation (LX Container), <b>G</b> for GNSS, <b>V</b> for Voice, <b>E</b> for E-Mark Approval</p> <p>Order Code Examples:  NB800-LWWtSu-<b>GE</b>  NB800-LbbWWtSu-<b>GE</b>  NB800-LgWWtSu-<b>GE</b>  NB800-LWWtSu2Cm-<b>GE</b>  NB800-LbbWWtSu2Cm-<b>GE</b>  NB800-LgWWtSu2Cm-<b>GE</b>  NB800-LWWtSu2Cm-<b>GE</b>  NB800-LbbWWtSu2Cm-<b>GE</b>  NB800-LgWWtSu2Cm-<b>GE</b>  NB800-LWWtSu-<b>Y</b>  NB800-LWWtSu-<b>GY</b>  NB800-LWWtSu-<b>GY</b>  NB800-LWWtSu-<b>Vi</b>  NB800-LWWtSu-<b>GVi</b>  NB800-LWWtSu2Cm-<b>GE</b>  NB800-LWWtSu2Cm-<b>GEVi</b>  NB800-LWWtSu2C-<b>GEVi</b>  NB800-LWWtScSu-<b>Y</b>  NB800-LSu-<b>V</b>  ...</p> <p>* 2C can be replaced with 2Cn (future code for 2xCAN active). Number before C (CAN) can be omitted e.g. replace 2C (2xCAN) with C (CAN).</p>

Tested Equipment	Covered Variants	Explanation <sup>1)</sup>
		<p><b>OEM Options (NB800-H1...Hn-S1...Sn-01...On):</b>  Add suffix -TAG, -OEM1, -OEM2 for OEM branding options (logo print)</p> <p>Order Code Examples:</p> <p>NB800-LWWtSu-G-<b>TAG</b> (Tagfinder)  NB800-LWWtSu- -<b>OM2</b> (customer <b>OM</b>, design <b>2</b>)  NB800-LWWtScSu- -<b>OM2</b> (customer <b>OM</b>, design <b>2</b>)  NB800-LWWtSu2Cm-GE-<b>OM3</b> (customer <b>OM</b>, design <b>3</b>)  NB800-LSu- -<b>S1</b> (customer <b>S</b>, design <b>1</b>)  ...</p>

<sup>1)</sup> According to information provided by the customer and not verified by Eurofins Electric & Electronic Product Testing AG

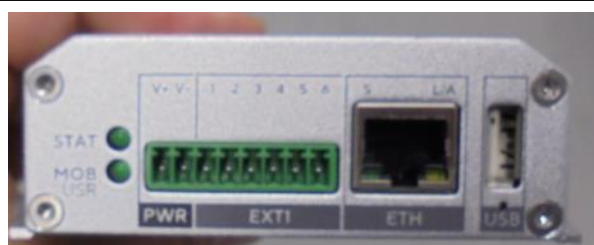
## 5.3 Pictures of the EUT



Top view of the EUT



Top view of the EUT



View on Power &amp; LAN port



View on Radio ports

NB800-LWWtSu-G Type plate  
(Base)NB800-LWWtScSu-G Type plate  
(COMIO)NB800-LWWtSu2C-G Type plate  
(DualCAN)



## 5.4 Classification

EN 55032:2015 CISPR 32:2015	<input type="checkbox"/> Class A (suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes) Such equipment should not be restricted in its sale but the following warning shall be included in the instructions for use: Warning: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. <input checked="" type="checkbox"/> Class B (suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes) <input type="checkbox"/> The highest frequency of the internal sources of the EUT is less than 108 MHz (measurement shall be made up to 1 GHz). <input type="checkbox"/> The highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz (measurement shall be made up to 2 GHz). <input checked="" type="checkbox"/> The highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz (measurement shall be made up to 5 GHz). <input type="checkbox"/> The highest frequency of the internal sources of the EUT is above 1 GHz (measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less).
EN 61000-6-3:2007 +A1:2011 + AC:2012 IEC 61000-6-3:2006 /AMD1:2010	<input type="checkbox"/> The highest frequency of the internal sources of the EUT is less than 108 MHz (measurement shall be made up to 1 GHz). <input type="checkbox"/> The highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz (measurement shall be made up to 2 GHz). <input checked="" type="checkbox"/> The highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz (measurement shall be made up to 5 GHz). <input type="checkbox"/> The highest frequency of the internal sources of the EUT is above 1 GHz (measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less).
EN 301 489	<input checked="" type="checkbox"/> Radio and ancillary equipment for fixed use (e.g. base station equipment) <input checked="" type="checkbox"/> Radio and ancillary equipment for vehicular use (e.g. mobile equipment) <input type="checkbox"/> Radio and ancillary equipment for portable use (portable equipment) <input type="checkbox"/> Ancillary equipment <input checked="" type="checkbox"/> Radio services: GSM, UMTS, LTE & WLAN
CFR 47 Part 15	<input type="checkbox"/> Unintentional radiator (Subpart B) <input type="checkbox"/> Class A digital device <input checked="" type="checkbox"/> Class B digital device <input type="checkbox"/> The highest frequency of the internal sources of the EUT is less than 108 MHz (measurement shall be made up to 1 GHz). <input type="checkbox"/> The highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz (measurement shall be made up to 2 GHz). <input checked="" type="checkbox"/> The highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz (measurement shall be made up to 5 GHz). <input type="checkbox"/> The highest frequency of the internal sources of the EUT is above 1 GHz (measurement shall be made up to 5 times the highest frequency or 40 GHz, whichever is lower). <input type="checkbox"/> Intentional radiator (Subpart C) <input type="checkbox"/> The highest fundamental frequency of the EUT is less than 10 GHz (measurement shall be made up to the tenth harmonic or 40 GHz, whichever is lower). <input type="checkbox"/> The highest fundamental frequency of the EUT is between 10 GHz and 30 GHz (measurement shall be made up to the fifth harmonic or 100 GHz, whichever is lower). <input type="checkbox"/> The highest fundamental frequency of the EUT is above 30 GHz (measurement shall be made up to the fifth harmonic or 200 GHz, whichever is lower).



**5.5 Ports****5.5.1 Ports NB800 LWWtSu-G (Base)**

Port	Cable			Remark
	Max. length	Type	Screen	
DC Supply	< 30 m	2 wires	No	If not stated otherwise, powered with AC/DC power supply of Dr. Widmer
Ethernet 100bTx	< 100 m	RJ45 cat 5e	Yes	Connected to Test-PC
WLAN 1 (Main)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
WLAN 2 (Aux)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Mobile 1 (Main) (GSM, UMTS, LTE)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Mobile 2 (Aux) (GSM, UMTS, LTE)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
GNSS	< 30 m	SMA (Coax)	Yes	Connected to GNSS antenna
USB	< 3 m	USB	Yes	Connected to USB memory stick (for radiated tests connected with 3 m USB standard cable)

**5.5.2 Ports NB800 LWWtScSu-G (COMIO)**

Port	Cable			Remark
	Max. length	Type	Screen	
DC Supply	< 30 m	2 wires	No	If not stated otherwise, powered with AC/DC power supply of Dr. Widmer
Ethernet 100bTx	< 100 m	RJ45 cat 5e	Yes	Connected to Test-PC
RS232/RS485	< 100 m	2 wires	No	Connected to Test-PC
WLAN 1 (Main)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
WLAN 2 (Aux)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Mobile 1 (Main) (GSM, UMTS, LTE)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Mobile 2 (Aux) (GSM, UMTS, LTE)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
GNSS	< 30 m	SMA (Coax)	Yes	Connected to GNSS antenna
USB	< 3 m	USB	Yes	Connected to USB memory stick (for radiated tests connected with 3 m USB standard cable)
Digital In	100 m	2 wires	No	Cables connected
Digital Out	100 m	2 wires	No	Cables connected

**5.5.3 Ports NB800 LWWtSu2C-G (DualCAN)**

Port	Cable			Remark
	Max. length	Type	Screen	
DC Supply	< 30 m	2 wires	No	If not stated otherwise, powered with AC/DC power supply of Dr. Widmer
Ethernet 100bTx	< 100 m	RJ45 cat 5e	Yes	Connected to Test-PC
2x CAN	< 100 m	2 wires	Yes	CAN 1 connected to CAN 2
WLAN 1 (Main)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
WLAN 2 (Aux)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Mobile 1 (Main) (GSM, UMTS, LTE)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
Mobile 2 (Aux) (GSM, UMTS, LTE)	< 30 m	SMA (Coax)	Yes	Connected to multiband-antenna
GNSS	< 30 m	SMA (Coax)	Yes	Connected to GNSS antenna
USB	< 3 m	USB	Yes	Connected to USB memory stick (for radiated tests connected with 3 m USB standard cable)

## 6 Test conditions

### 6.1 Climatic conditions, location and date

Location	Date	Temp	Pressure (QFE)	Rel. humidity
Eurofins Electric & Electronic Product Testing AG Route de Montena 75 1728 Rossens SWITZERLAND	2019-11-25 to 2020-03-10			See § 7 and § 8

### 6.2 Test facility and methodology

The alternate test site is accepted by FCC:

- Test Firm Registration Number: 683197
- Designation Number: CH5001

### 6.3 Attendant persons

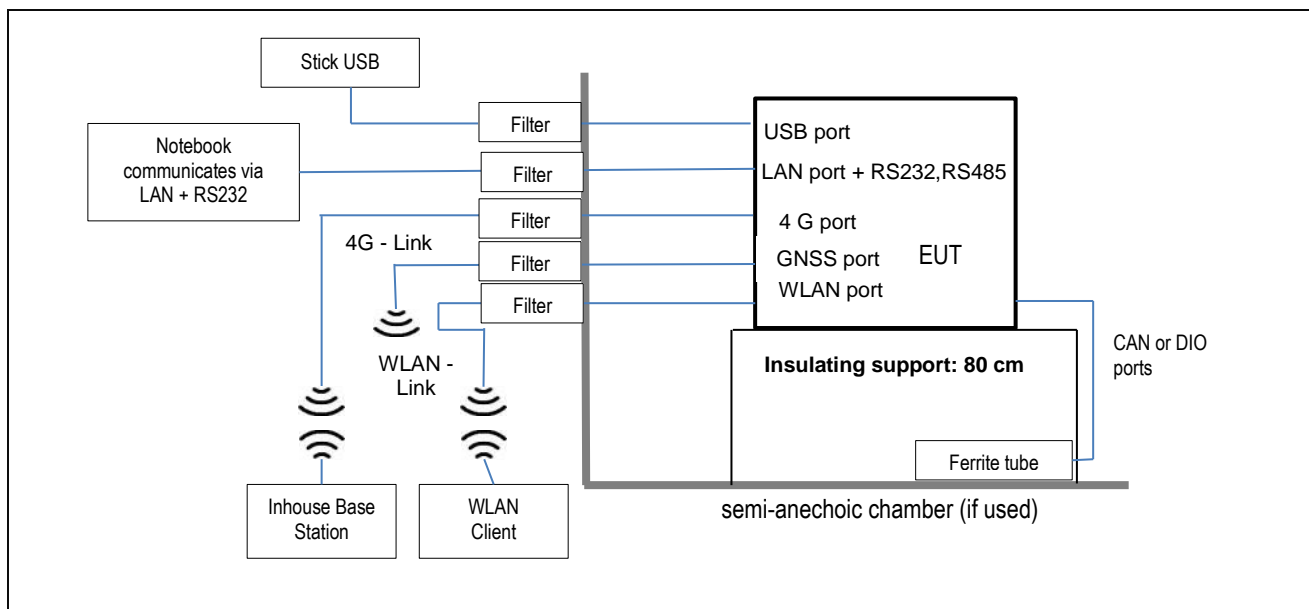
Test Engineer(s):

Mr F. Wyler & Mr M. Rodrigues

Other(s):

Name	Company
Mr Nicolas Gugger	NetModule AG
Mr Simon Schmid	NetModule AG

### 6.4 Test configuration



## 6.5 Operating conditions

Power supply during tests if not stated otherwise in § 7 and § 8 : 12 VDC

Routing mode:

- WLAN AP
- Ping over WWAN (LTE)
- Ping over Ethernet cable
- Memory Test (RAM Read/Write, Flash Read/Write)
- Core Test (PMIC read)
- DIO Test (12V, Relais On/Off)
- 2x CAN Echo Test, CAN transmit
- RS232 Console
- LED toggle

## 6.6 Monitoring of the EUT

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

The test application running on the EUT monitors the results of all tests executed:

Monitor of all Ping-outputs

Monitor memory tests

Monitor PMIC voltages and temperature

Read IMU acceleration value

## 6.7 Auxiliary equipment

The following pieces of equipment 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.	SN	Remark
Test-PC / Notebook	Dell	E5570	287QMF2	--
Wiring Harness	Custom	-	-	-
WWAN+WLAN+GNSS Antenna	--	Antenna-Roof-2L2WG	A1705006700033	--
Power supply	Dr. K. Witmer	von Eurofins	--	See tests § 7.1 & 7.2
AC/DC Adapter	I.T.E	--	FW7577/EU/12	See tests § 8.4



Notebook with the different ping-windows



Antenna

**6.8 Performance criteria**

General requirements:	Requirements according to the EUT:
<b>Criterion A (Continuous phenomena for receivers / transmitters according EN 301 489):</b>  The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed.	
<b>Criterion B (Transient phenomena for receivers / transmitters according EN 301 489):</b>  The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed.	- No transmission loss on LAN, WWAN (UMTS/LTE), WLAN   During the test: - short interruptions of the communication allowed - LED's may flicker
	After the test the EUT shall operate as expected
<b>Criterion C:</b>  Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.	
	Not applied. No specific requirements.

## 7 Emission tests

**7.1 Interference voltage**

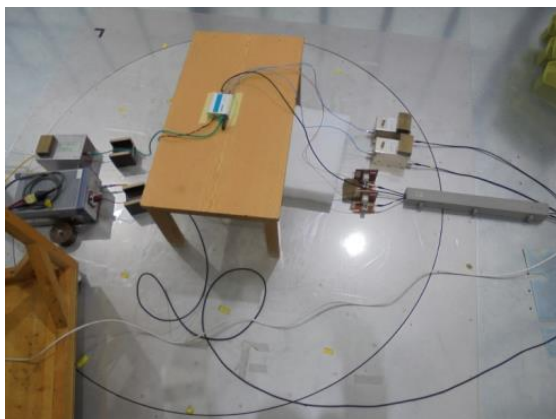
Test site: ☐ SAC3 ☒ SAC5 ☐ SAC10  
☐ Laboratory ☒ Faraday ☐ Open test site

Meas. uncertainty:  $\pm 3.6$  dB

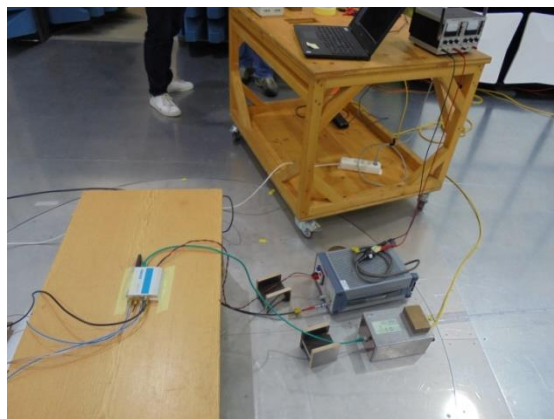
Measuring method: The conducted disturbance is measured using a spectrum analyser and a line impedance substitution network (LISN). The measurement of the voltage against the earth is carried out successively. The peak values are recorded continuously on the graph. The values that exceed the limit shall be re-measured with a measuring receiver.

Modifications: ☒ None ☐ 1 ☐ 2

Climatic conditions: Temperature: 23 °C Humidity: 37 % Pressure QFE: 920 hPa (2019-11-27)  
Climatic conditions: Temperature: 23 °C Humidity: 28 % Pressure QFE: 938 hPa (2020-03-10)

**Test set-up:**

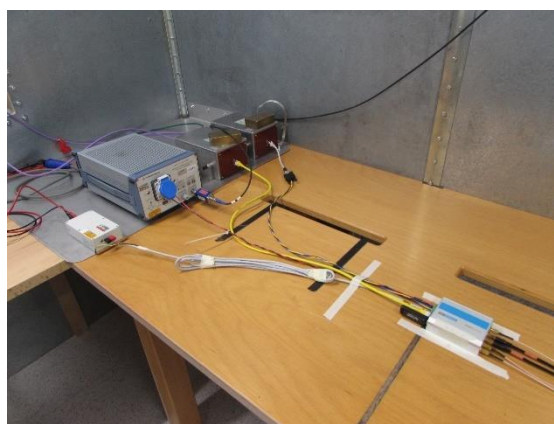
Overview SAC5 (Base, DualCAN)



Coupling on Power port SAC5(Base, DualCAN)



Overview Faraday (COMIO)



Coupling on Power port Faraday (COMIO)

Remarks: None

**Test equipment:**

Spectrum analyser	<input checked="" type="checkbox"/> 168593	<input checked="" type="checkbox"/> 16-03 (Faraday)			
Receiver	<input checked="" type="checkbox"/> 168593	<input checked="" type="checkbox"/> 16-03 (Faraday)			
LISN (=VNNB)	<input checked="" type="checkbox"/> 00-43	<input checked="" type="checkbox"/> 10540 (Faraday)			
Coupling network	<input checked="" type="checkbox"/> 25971	<input checked="" type="checkbox"/> 25949	<input checked="" type="checkbox"/> 26009	<input checked="" type="checkbox"/> 14-34B	<input checked="" type="checkbox"/> 14-34A
Coupling network	<input type="checkbox"/> 25971	<input type="checkbox"/> 105487	<input type="checkbox"/> 16562	<input type="checkbox"/> 16559	<input type="checkbox"/> 10539
Coupling Network	<input checked="" type="checkbox"/> 181762	<input checked="" type="checkbox"/> 17-LaBe-02			
Decoupling clamp	<input checked="" type="checkbox"/> 25781	<input type="checkbox"/> 17901	<input type="checkbox"/> 17902	<input type="checkbox"/> 17909	<input type="checkbox"/> 17910 <input type="checkbox"/> 17913
Current clamp	<input type="checkbox"/> 7525				
Cables	<input checked="" type="checkbox"/> BNC 5m	<input checked="" type="checkbox"/> Faraday_CE			
Artificial hand	<input type="checkbox"/> 184450				
Software and Revision	<input type="checkbox"/> Vitam, Rev. 2.4.13	<input checked="" type="checkbox"/> RadiMation 2019.1.5			

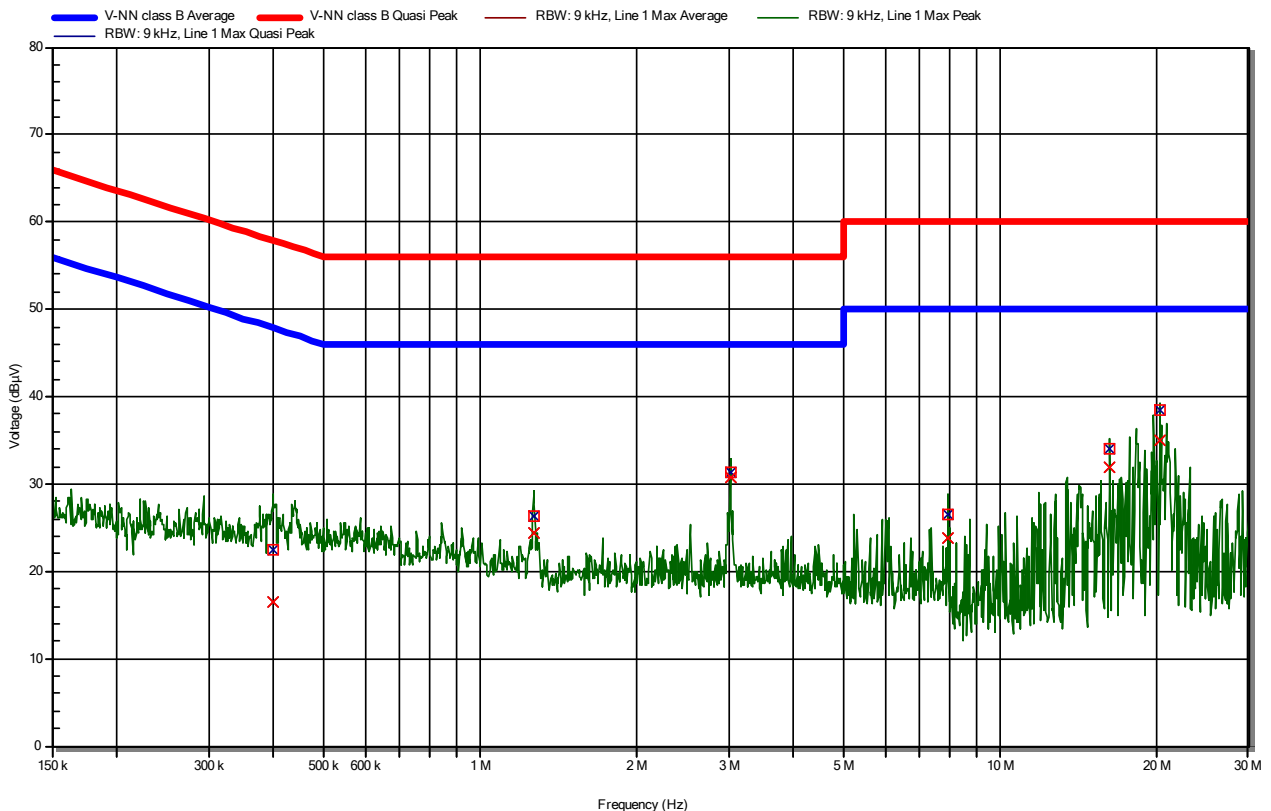
Result: ☒ pass ☐ fail ☐ not applicable ☐ partly tested

**Results NB800 LWWtSu-G (Base)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Power port 12 VDC, Plus  
 Set-up / CDN: Table-top / V-LISN 00-43 (L1)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

**RadiMation****Detected peaks**

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
4	7.923 MHz	28.9 dBµV	23.8 dBµV	-26.25 dB	26.6 dBµV	-33.43 dB	Pass
1	400.814 kHz	28.9 dBµV	16.4 dBµV	-31.41 dB	22.5 dBµV	-35.37 dB	Pass
2	1.264 MHz	29.2 dBµV	24.5 dBµV	-21.52 dB	26.3 dBµV	-29.67 dB	Pass
3	3.024 MHz	32.9 dBµV	30.7 dBµV	-15.29 dB	31.3 dBµV	-24.7 dB	Pass
5	16.228 MHz	35.1 dBµV	31.8 dBµV	-18.18 dB	34 dBµV	-26.01 dB	Pass
6	20.258 MHz	39.3 dBµV	35 dBµV	-14.97 dB	38.4 dBµV	-21.58 dB	Pass

Place and date of test:

Rossens, 2019-11-27

Operator:

M. Rodrigues

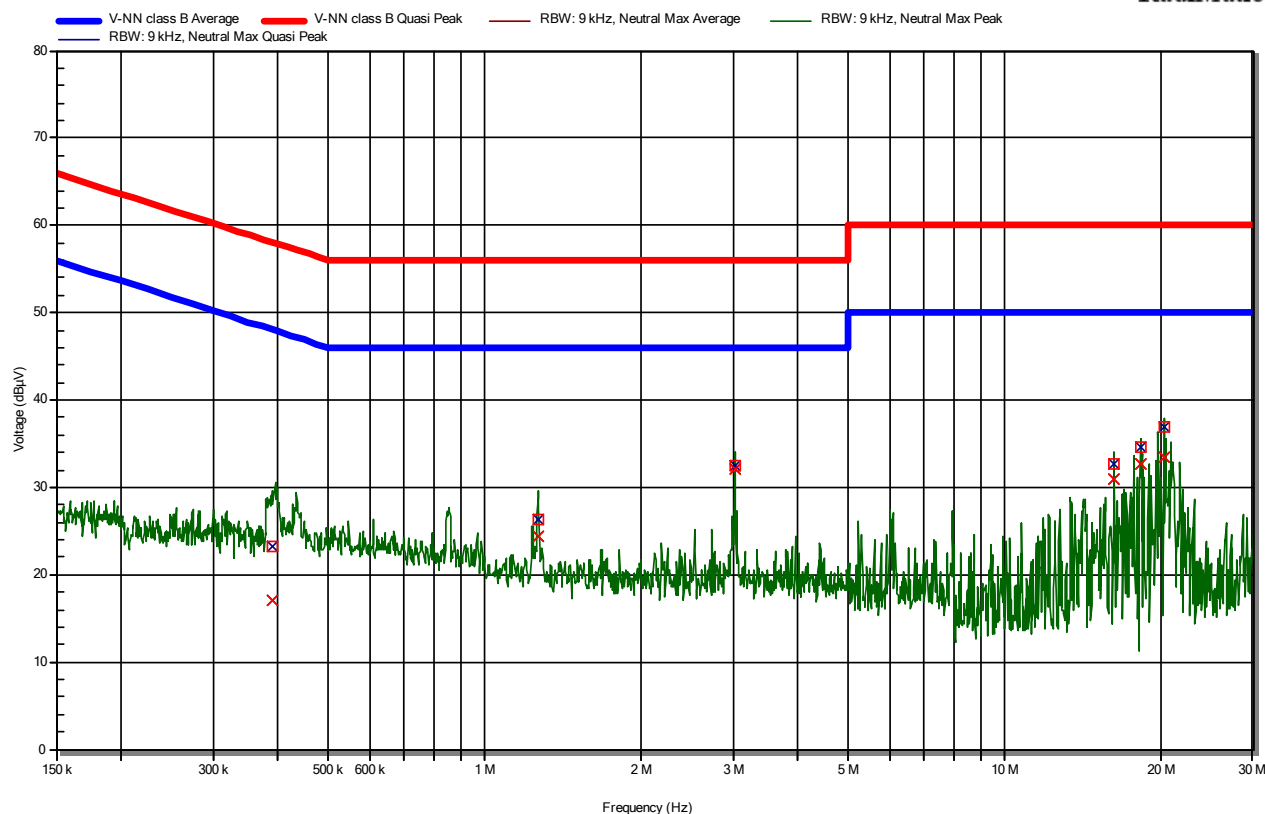


Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Power port 12 VDC, Minus  
 Set-up / CDN: Table-top / V-LISN 00-43 (N)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

## RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	389.381 kHz	28.8 dBµV	17 dBµV	-31.07 dB	23.2 dBµV	-34.89 dB	Pass
2	1.265 MHz	29.5 dBµV	24.3 dBµV	-21.71 dB	26.3 dBµV	-29.67 dB	Pass
4	16.228 MHz	33.9 dBµV	31 dBµV	-18.97 dB	32.7 dBµV	-27.34 dB	Pass
3	3.027 MHz	34 dBµV	32.1 dBµV	-13.88 dB	32.5 dBµV	-23.54 dB	Pass
5	18.243 MHz	35.6 dBµV	32.6 dBµV	-17.36 dB	34.6 dBµV	-25.44 dB	Pass
6	20.259 MHz	37.9 dBµV	33.5 dBµV	-16.54 dB	36.9 dBµV	-23.07 dB	Pass

Place and date of test:  
Operator:

Rossens, 2019-11-27  
M. Rodrigues

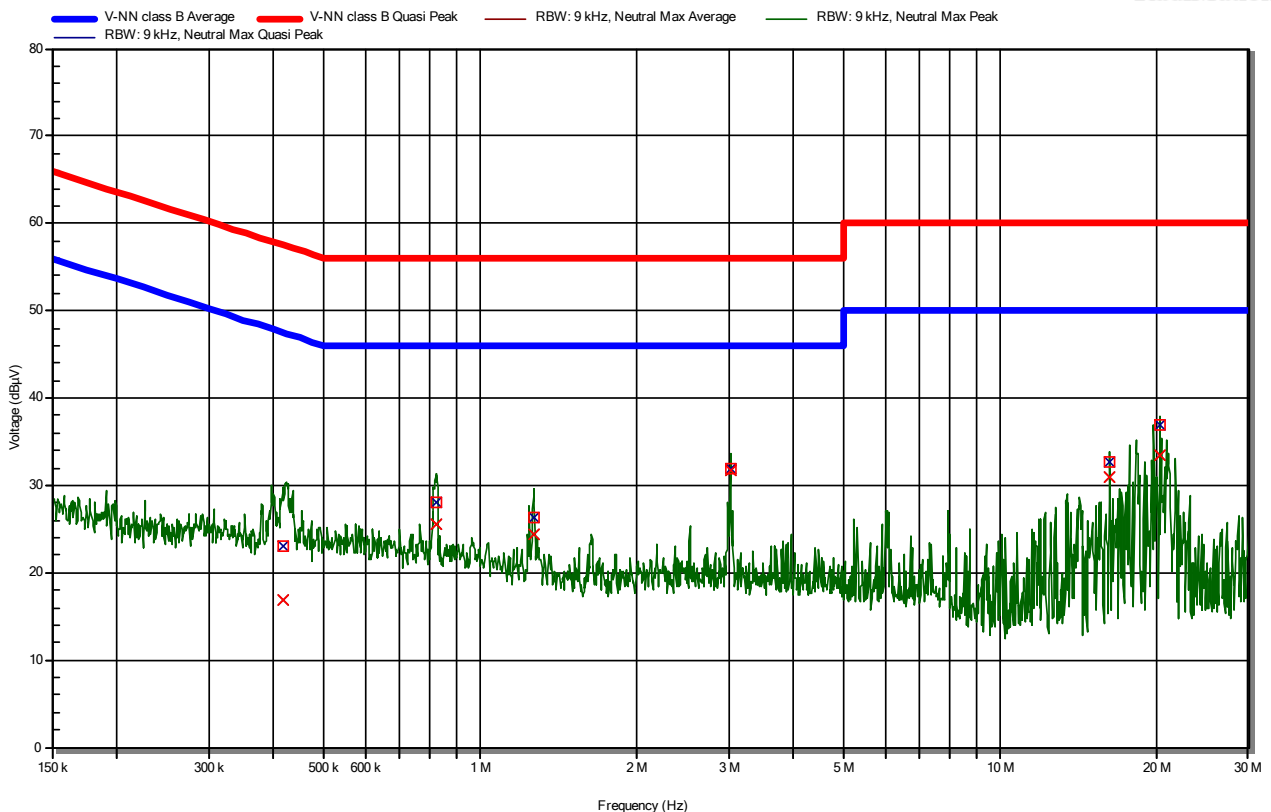


Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Power port 24 VDC, Minus  
 Set-up / CDN: Table-top / V-LISN 00-43 (N)  
 Cables connected: Power 24 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
3	1.264 MHz	29.6 dBµV	24.3 dBµV	-21.71 dB	26.3 dBµV	-29.72 dB	Pass
1	418.941 kHz	29.9 dBµV	16.8 dBµV	-30.63 dB	23 dBµV	-34.44 dB	Pass
2	820.515 kHz	31.3 dBµV	25.5 dBµV	-20.51 dB	28 dBµV	-28.02 dB	Pass
4	3.024 MHz	33.6 dBµV	31.6 dBµV	-14.35 dB	32 dBµV	-24.02 dB	Pass
5	16.228 MHz	33.9 dBµV	31 dBµV	-18.97 dB	32.6 dBµV	-27.35 dB	Pass
6	20.258 MHz	37.9 dBµV	33.5 dBµV	-16.46 dB	37 dBµV	-23 dB	Pass

Place and date of test:  
Operator:

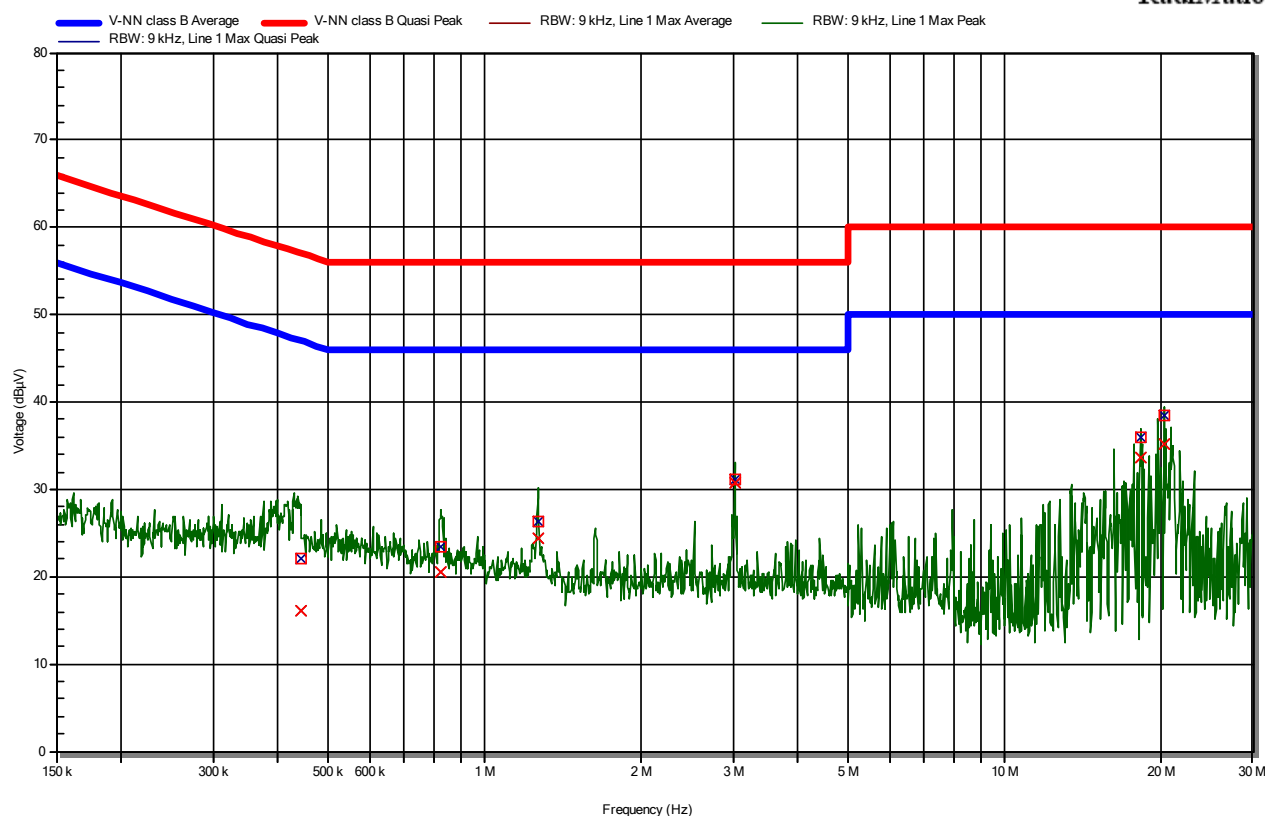
Rossens, 2019-11-27  
M. Rodrigues

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Power port 24 VDC, Plus  
 Set-up / CDN: Table-top / V-LISN 00-43 (L1)  
 Cables connected: Power 24 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
2	820.908 kHz	27.7 dBµV	20.5 dBµV	-25.55 dB	23.5 dBµV	-32.5 dB	Pass
1	443.055 kHz	28.2 dBµV	16.2 dBµV	-30.82 dB	22.1 dBµV	-34.86 dB	Pass
3	1.265 MHz	30.1 dBµV	24.4 dBµV	-21.63 dB	26.3 dBµV	-29.7 dB	Pass
4	3.028 MHz	32.8 dBµV	30.7 dBµV	-15.32 dB	31.1 dBµV	-24.89 dB	Pass
5	18.243 MHz	36.9 dBµV	33.5 dBµV	-16.45 dB	35.9 dBµV	-24.13 dB	Pass
6	20.258 MHz	39.4 dBµV	35.1 dBµV	-14.89 dB	38.5 dBµV	-21.53 dB	Pass

Place and date of test:  
Operator:

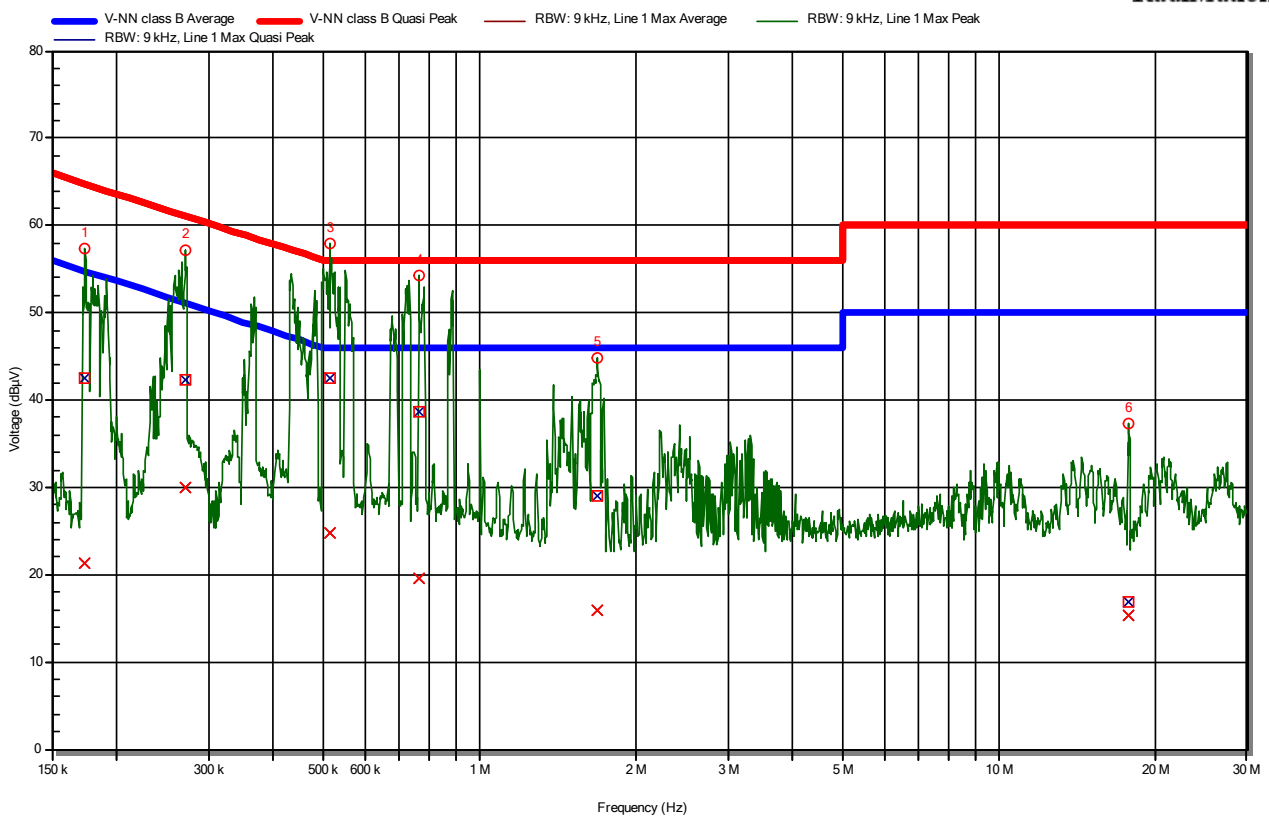
Rossens, 2019-11-27  
M. Rodrigues

**Results NB800 LWWtScSu (COMIO)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Power port 12 VDC, Plus  
 Set-up / CDN: Table-top / V-LISN 10540 (L1)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, RS232, DIO, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet, Mobile & RS232, USB Stick read/write. Relais On/Off); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	80/80/30
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 10 s

**RadiMation****Detected peaks**

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	173.824 kHz	57.4 dBµV	21.3 dBµV	-33.51 dB	42.5 dBµV	-22.25 dB	Pass
2	271.246 kHz	57.1 dBµV	30 dBµV	-21.1 dB	42.3 dBµV	-18.78 dB	Pass
3	514.59 kHz	58 dBµV	24.7 dBµV	-21.28 dB	42.5 dBµV	-13.55 dB	Pass
4	766.016 kHz	54.3 dBµV	19.6 dBµV	-26.36 dB	38.6 dBµV	-17.42 dB	Pass
5	1.686 MHz	44.8 dBµV	16 dBµV	-30.01 dB	29.1 dBµV	-26.9 dB	Pass
6	17.781 MHz	37.4 dBµV	15.3 dBµV	-34.7 dB	16.8 dBµV	-43.22 dB	Pass

Place and date of test:

Rossens, 2020-03-10

Operator:

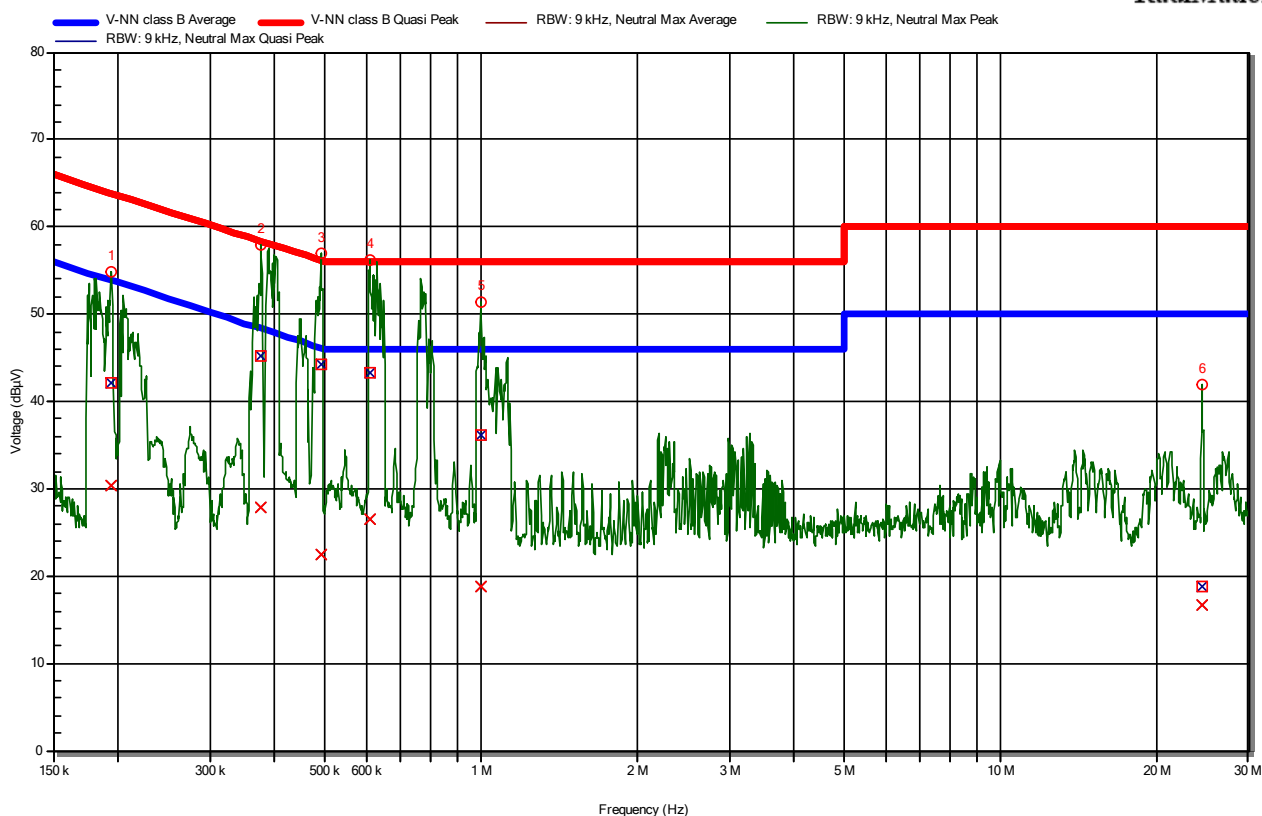
F. Wyler

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Power port 12 VDC, Minus  
 Set-up / CDN: Table-top / V-LISN 10540 (N)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, RS232, DIO, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet, Mobile & RS232, USB Stick read/write. Relais On/Off); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	80/80/30
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 10 s

RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	193.393 kHz	54.8 dBμV	30.3 dBμV	-23.55 dB	42.1 dBμV	-21.8 dB	Pass
2	377.177 kHz	57.9 dBμV	27.8 dBμV	-20.49 dB	45.2 dBμV	-13.14 dB	Pass
3	492.042 kHz	57 dBμV	22.4 dBμV	-23.69 dB	44.3 dBμV	-11.83 dB	Pass
4	609.459 kHz	56.2 dBμV	26.5 dBμV	-19.55 dB	43.3 dBμV	-12.71 dB	Pass
5	996.597 kHz	51.3 dBμV	18.9 dBμV	-27.11 dB	36.2 dBμV	-19.8 dB	Pass
6	24.426 MHz	41.9 dBμV	16.6 dBμV	-33.37 dB	18.7 dBμV	-41.28 dB	Pass

Place and date of test:  
Operator:

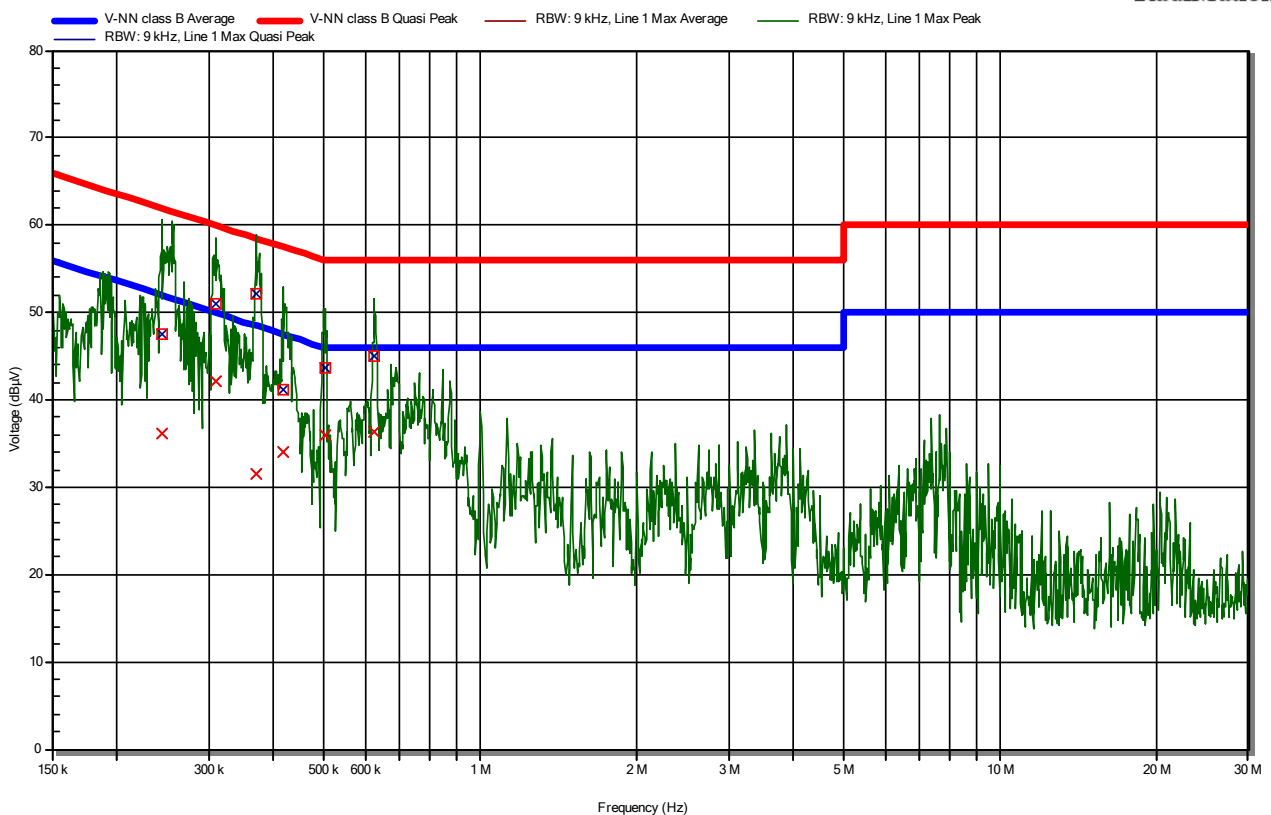
Rossens, 2020-03-10  
F. Wyler

**Results NB800 LWWtSu2C-G (DualCAN)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Power port 12 VDC, Plus  
 Set-up / CDN: Table-top / V-LISN 00-43 (L1)  
 Cables connected: Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

**RadiMation****Detected peaks**

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
5	503.14 kHz	50.4 dBμV	35.9 dBμV	-10.09 dB	43.6 dBμV	-12.4 dB	Pass
6	627.151 kHz	51.7 dBμV	36.3 dBμV	-9.7 dB	45 dBμV	-10.97 dB	Pass
4	417.701 kHz	52.8 dBμV	34 dBμV	-13.53 dB	41.2 dBμV	-16.34 dB	Pass
2	310.448 kHz	58.4 dBμV	42 dBμV	-7.92 dB	51 dBμV	-8.99 dB	Pass
3	372.171 kHz	58.9 dBμV	31.4 dBμV	-17.03 dB	52.1 dBμV	-6.38 dB	Pass
1	244.993 kHz	60.5 dBμV	36.1 dBμV	-15.83 dB	47.6 dBμV	-14.33 dB	Pass

Place and date of test:

Rossens, 2019-11-27

Operator:

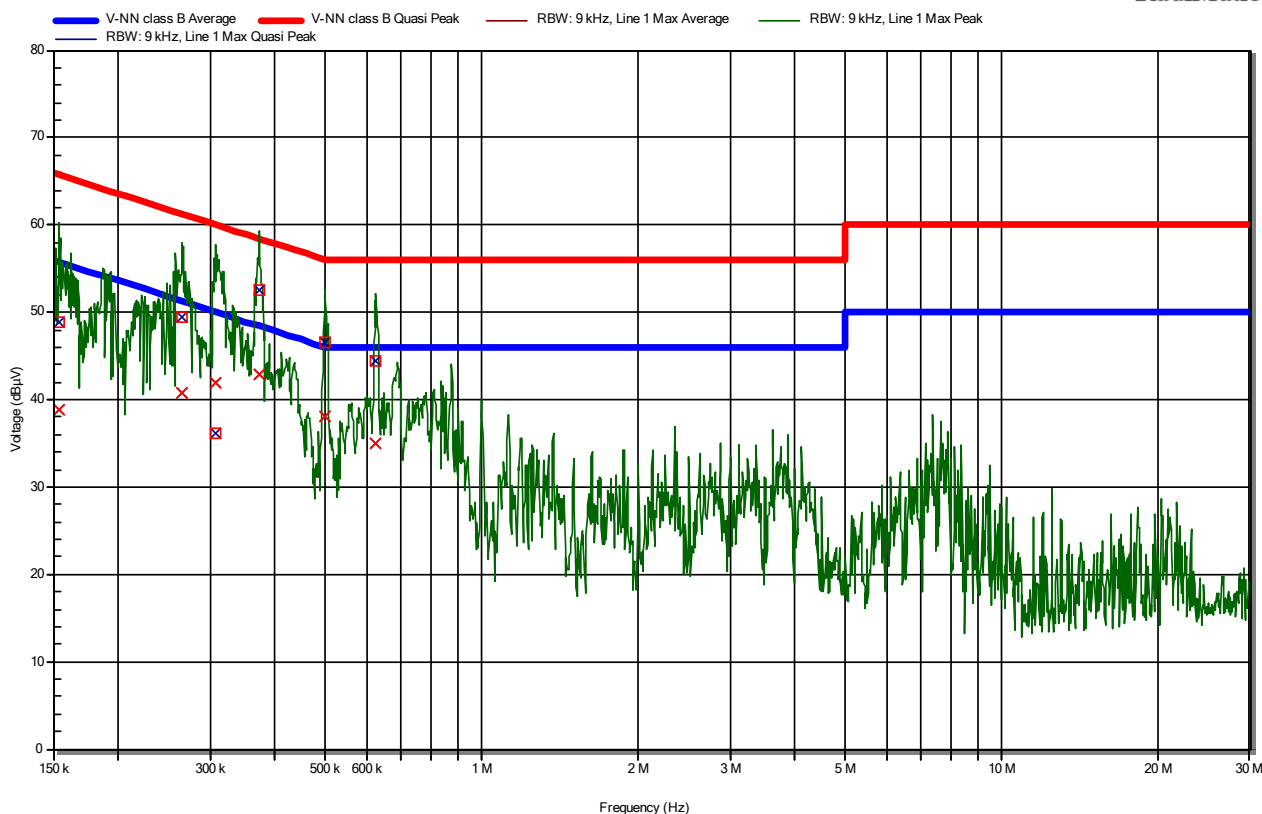
M. Rodrigues

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Power port 12 VDC, Minus  
 Set-up / CDN: Table-top / V-LISN 00-43 (N)  
 Cables connected: Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN);see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
6	623.703 kHz	51.4 dBµV	35.1 dBµV	-10.95 dB	44.4 dBµV	-11.6 dB	Pass
5	500.679 kHz	52.4 dBµV	38 dBµV	-7.98 dB	46.6 dBµV	-9.45 dB	Pass
3	308.344 kHz	57.3 dBµV	41.9 dBµV	-8.07 dB	36.1 dBµV	-23.95 dB	Pass
2	264.364 kHz	58 dBµV	40.8 dBµV	-10.47 dB	49.4 dBµV	-11.88 dB	Pass
4	373.949 kHz	59.3 dBµV	42.8 dBµV	-5.58 dB	52.5 dBµV	-5.95 dB	Pass
1	153.96 kHz	60.2 dBµV	38.8 dBµV	-17.03 dB	49 dBµV	-16.83 dB	Pass

Place and date of test:

Rossens, 2019-11-27

Operator:

M. Rodrigues

**7.2 Conducted emission on I/O and telecommunication ports / wired network ports**

Test site: ☐ SAC3 ☒ SAC5 ☐ SAC10  
☐ Laboratory ☒ Faraday ☐ Open test site

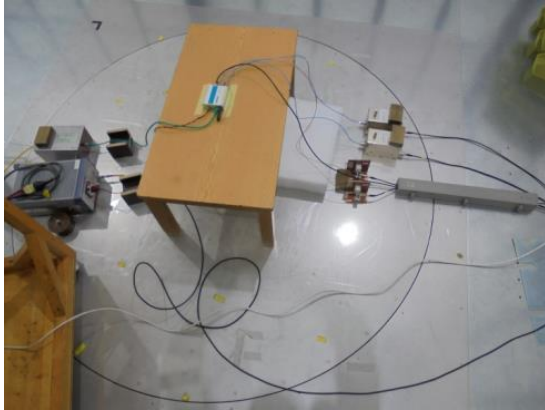
Meas. uncertainty:  $\pm 3.6$  dB

Measuring method: The conducted disturbance is measured using a spectrum analyser and a voltage probe. The peak values are recorded continuously on the graph. The values that exceed the limit shall be re-measured with a measuring receiver.

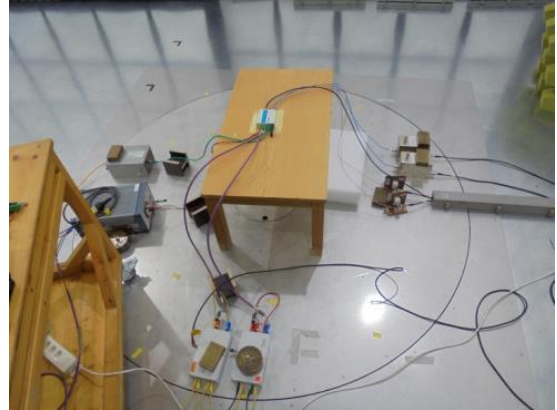
Modifications: ☒ None ☐ 1 ☐ 2

Climatic conditions: Temperature: 23 °C Humidity: 37 % Pressure QFE: 920 hPa (2019-11-27)  
Climatic conditions: Temperature: 23 °C Humidity: 28 % Pressure QFE: 938 hPa (2020-03-10)

Test set-up:



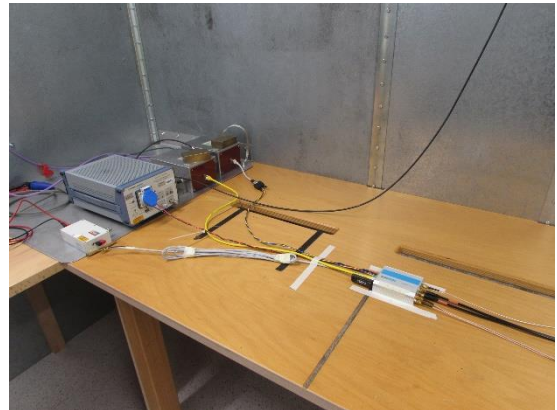
Overview (Basic, DualCAN)



Coupling on CAN port (Basic, DualCAN)



Overview (COMIO)



Coupling on RS232 port (COMIO)

Remarks: None

**Test equipment:**

Spectrum analyser	<input checked="" type="checkbox"/> 168593	<input checked="" type="checkbox"/> 16-03 (Faraday)			
Receiver	<input checked="" type="checkbox"/> 168593	<input checked="" type="checkbox"/> 16-03 (Faraday)			
LISN (=VNNB)	<input checked="" type="checkbox"/> 00-43	<input checked="" type="checkbox"/> 10540 (Faraday)			
Coupling network	<input checked="" type="checkbox"/> 25971	<input checked="" type="checkbox"/> 25949	<input checked="" type="checkbox"/> 26009	<input checked="" type="checkbox"/> 14-34B	<input checked="" type="checkbox"/> 14-34A
Coupling network	<input type="checkbox"/> 25971	<input type="checkbox"/> 105487	<input type="checkbox"/> 16562	<input type="checkbox"/> 16559	<input type="checkbox"/> 10539
Coupling Network	<input checked="" type="checkbox"/> 181762	<input checked="" type="checkbox"/> 17-LaBe-02			
Decoupling clamp	<input checked="" type="checkbox"/> 25781	<input type="checkbox"/> 17901	<input type="checkbox"/> 17902	<input type="checkbox"/> 17909	<input type="checkbox"/> 17910 <input type="checkbox"/> 17913
Current clamp	<input type="checkbox"/> 7525				
Cables	<input checked="" type="checkbox"/> BNC 5m	<input checked="" type="checkbox"/> Faraday_CE			
Artificial hand	<input type="checkbox"/> 184450				
Software and Revision	<input type="checkbox"/> Vitam, Rev. 2.4.13	<input checked="" type="checkbox"/> RadiMation 2019.1.5			

Result: ☒ pass ☐ fail ☐ not applicable ☐ partly tested

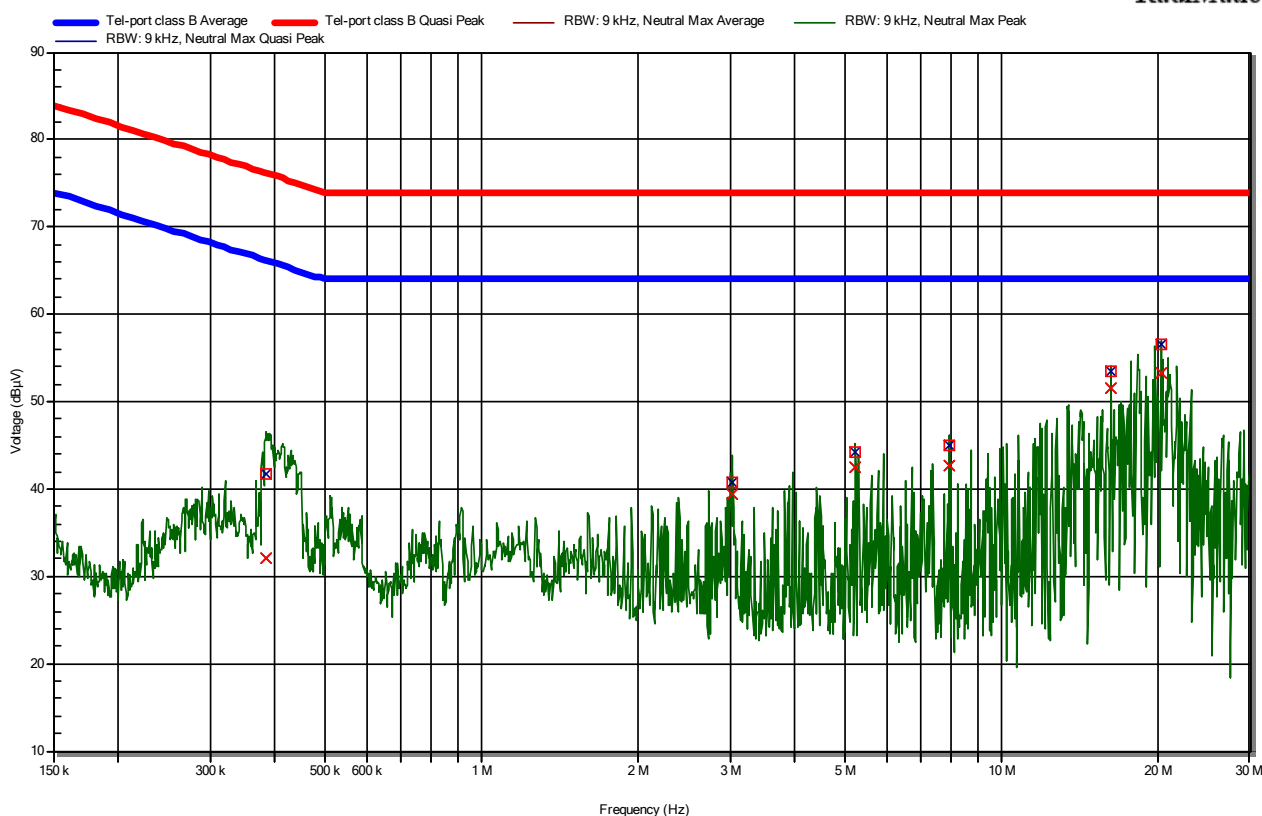


**Results NB800 LWWtSu-G (Base)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Ethernet  
 Set-up / CDN: Table-top / T-ISN 17-LaBe-02 (N)  
 Cables connected: Power 24 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

**RadiMation****Detected peaks**

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
2	3.038 MHz	43.8 dBµV	39.4 dBµV	-24.6 dB	40.7 dBµV	-33.29 dB	Pass
3	5.236 MHz	45.3 dBµV	42.6 dBµV	-21.45 dB	44.3 dBµV	-29.74 dB	Pass
4	7.923 MHz	46.2 dBµV	42.7 dBµV	-21.28 dB	45 dBµV	-29.01 dB	Pass
1	386.275 kHz	46.4 dBµV	32.1 dBµV	-34.05 dB	41.7 dBµV	-34.48 dB	Pass
5	16.228 MHz	54 dBµV	51.6 dBµV	-12.38 dB	53.5 dBµV	-20.51 dB	Pass
6	20.258 MHz	56.9 dBµV	53.2 dBµV	-10.78 dB	56.5 dBµV	-17.54 dB	Pass

Place and date of test:

Rossens, 2019-11-27

Operator:

M. Rodrigues

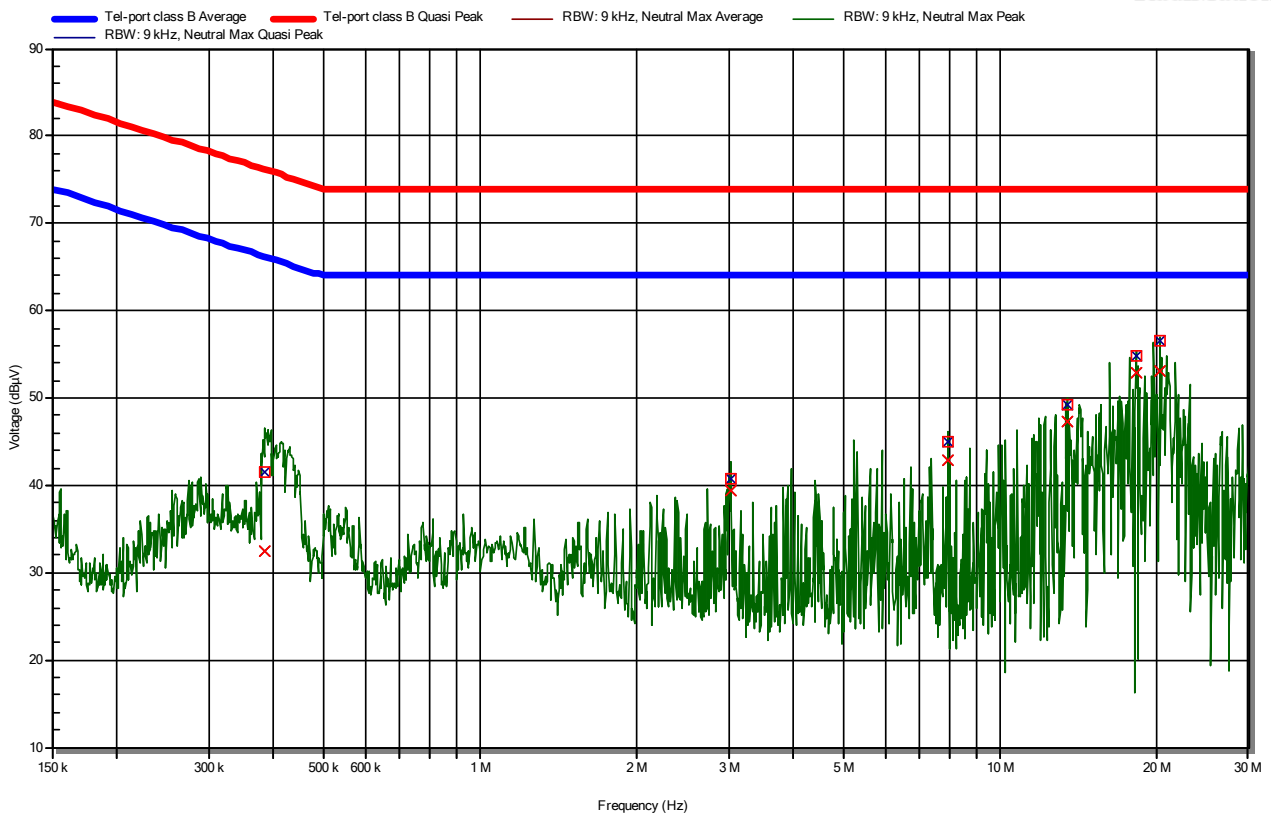


Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Ethernet  
 Set-up / CDN: Table-top / T-ISN 17-LaBe-02 (N)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
2	3.038 MHz	42.6 dBµV	39.4 dBµV	-24.61 dB	40.7 dBµV	-33.31 dB	Pass
3	7.923 MHz	46.2 dBµV	42.8 dBµV	-21.17 dB	45.1 dBµV	-28.92 dB	Pass
1	385.453 kHz	46.6 dBµV	32.4 dBµV	-33.77 dB	41.6 dBµV	-34.55 dB	Pass
4	13.419 MHz	49.9 dBµV	47.4 dBµV	-16.62 dB	49.3 dBµV	-24.75 dB	Pass
5	18.243 MHz	55.4 dBµV	52.9 dBµV	-11.1 dB	54.9 dBµV	-19.12 dB	Pass
6	20.258 MHz	57 dBµV	53.2 dBµV	-10.85 dB	56.5 dBµV	-17.53 dB	Pass

Place and date of test:  
Operator:

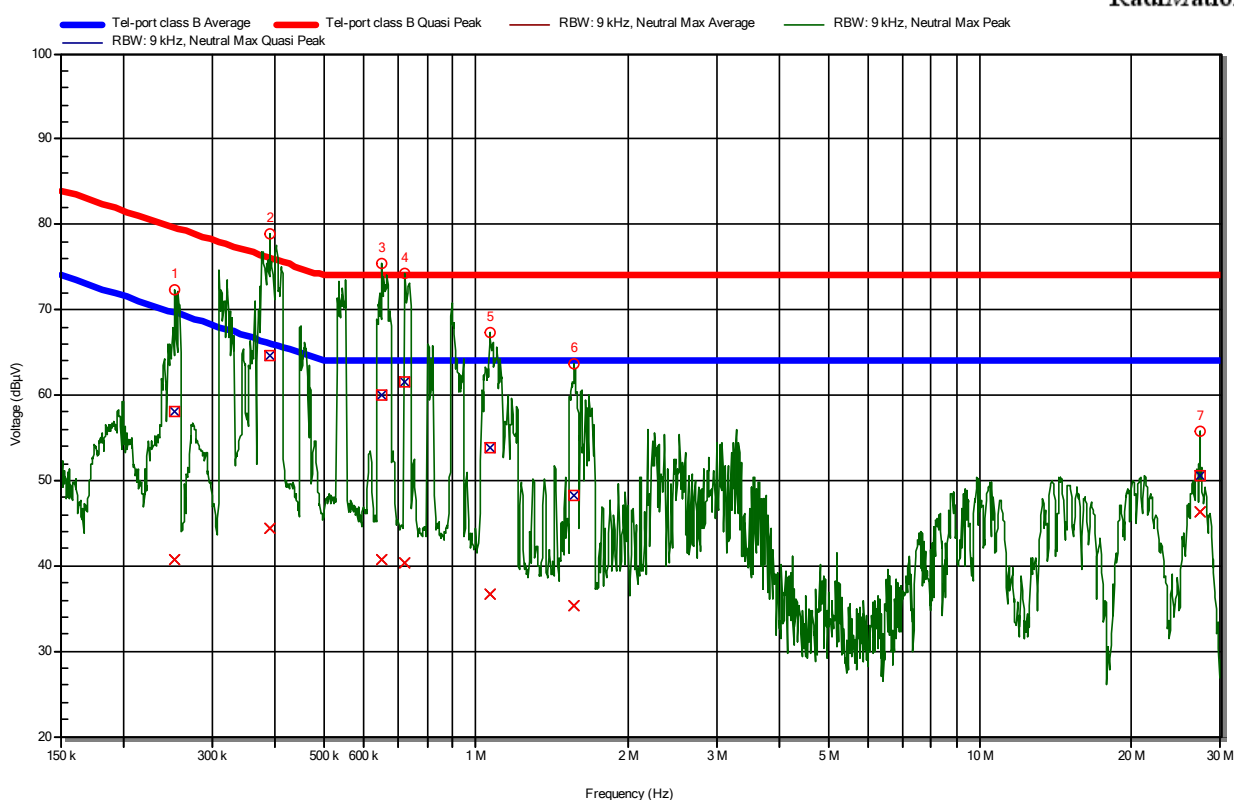
Rossens, 2019-11-27  
M. Rodrigues

**Results NB800 LWWtScSu (COMIO)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: RS232 (N)  
 Set-up / CDN: Table-top / T-ISO 181762 (N)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, RS232, DIO see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet, Mobile & RS232; USB Stick read/write, Relais On/Off); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	80/80/30
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 10 s

**RadiMation****Detected peaks**

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	253.378 kHz	72.3 dBμV	40.7 dBμV	-28.9 dB	58.1 dBμV	-21.58 dB	Pass
2	389.515 kHz	78.9 dBμV	44.3 dBμV	-21.74 dB	64.7 dBμV	-11.38 dB	Pass
3	652.002 kHz	75.4 dBμV	40.8 dBμV	-23.24 dB	60 dBμV	-13.99 dB	Pass
4	723.899 kHz	74.4 dBμV	40.4 dBμV	-23.65 dB	61.5 dBμV	-12.48 dB	Pass
5	1.067 MHz	67.4 dBμV	36.6 dBμV	-27.37 dB	53.9 dBμV	-20.11 dB	Pass
6	1.57 MHz	63.7 dBμV	35.3 dBμV	-28.66 dB	48.3 dBμV	-25.71 dB	Pass
7	27.28 MHz	55.8 dBμV	46.2 dBμV	-17.75 dB	50.5 dBμV	-23.47 dB	Pass

Place and date of test:  
 Operator:

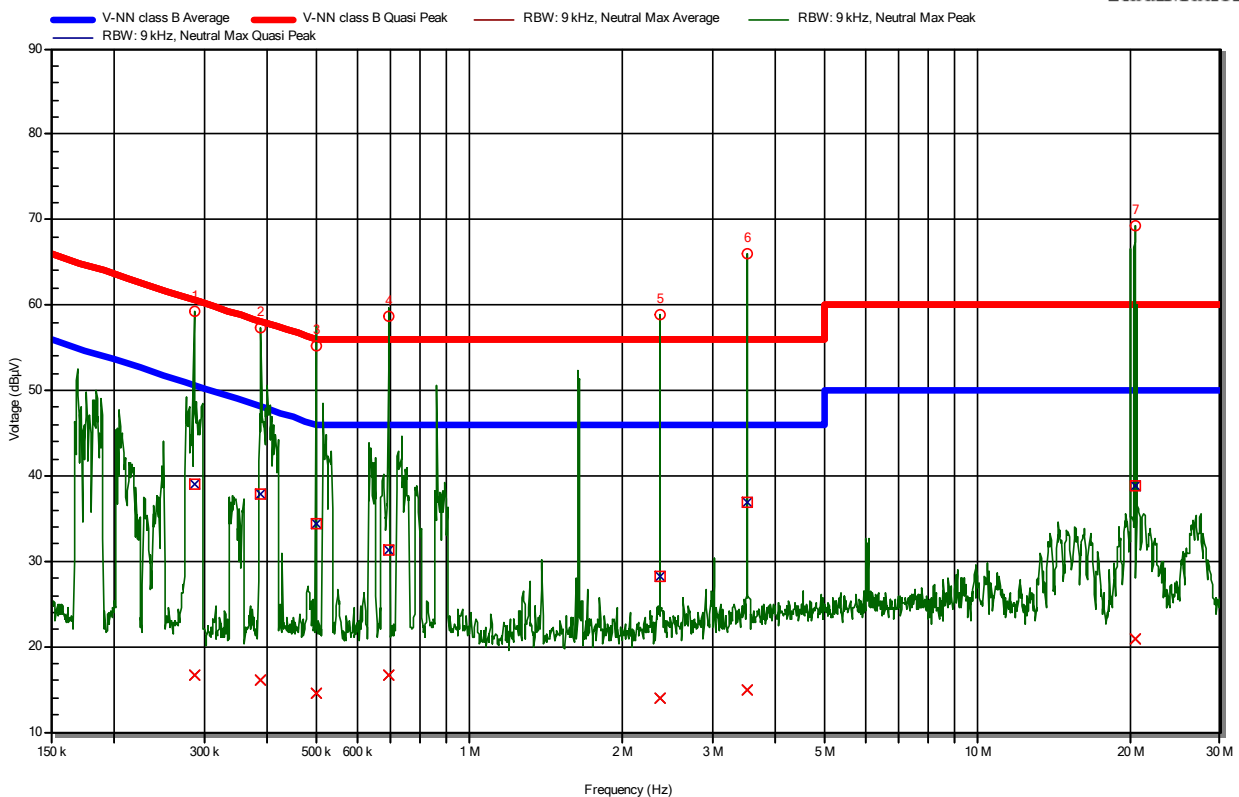
Rossens, 2020-03-10  
 F.Wyler

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: DIO (L1)  
 Set-up / CDN: Table-top / T-ISO 25971 (N)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, RS232, DIO see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet, Mobile & RS232; USB Stick read/write, Relais On/Off); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	80/80/30
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 10 s

## Radiation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	286.987 kHz	59.2 dBμV	16.6 dBμV	-34.03 dB	39 dBμV	-21.64 dB	Pass
2	389.089 kHz	57.3 dBμV	16.1 dBμV	-32 dB	37.9 dBμV	-20.22 dB	Pass
3	498.849 kHz	55.3 dBμV	14.5 dBμV	-31.56 dB	34.4 dBμV	-21.63 dB	Pass
4	692.843 kHz	58.7 dBμV	16.7 dBμV	-29.32 dB	31.4 dBμV	-24.63 dB	Pass
5	2.37 MHz	58.8 dBμV	13.9 dBμV	-32.1 dB	28.1 dBμV	-27.86 dB	Pass
6	3.533 MHz	66 dBμV	15 dBμV	-31 dB	36.9 dBμV	-19.06 dB	Pass
7	20.394 MHz	69.3 dBμV	20.8 dBμV	-29.2 dB	38.7 dBμV	-21.26 dB	Pass

Place and date of test:  
Operator:

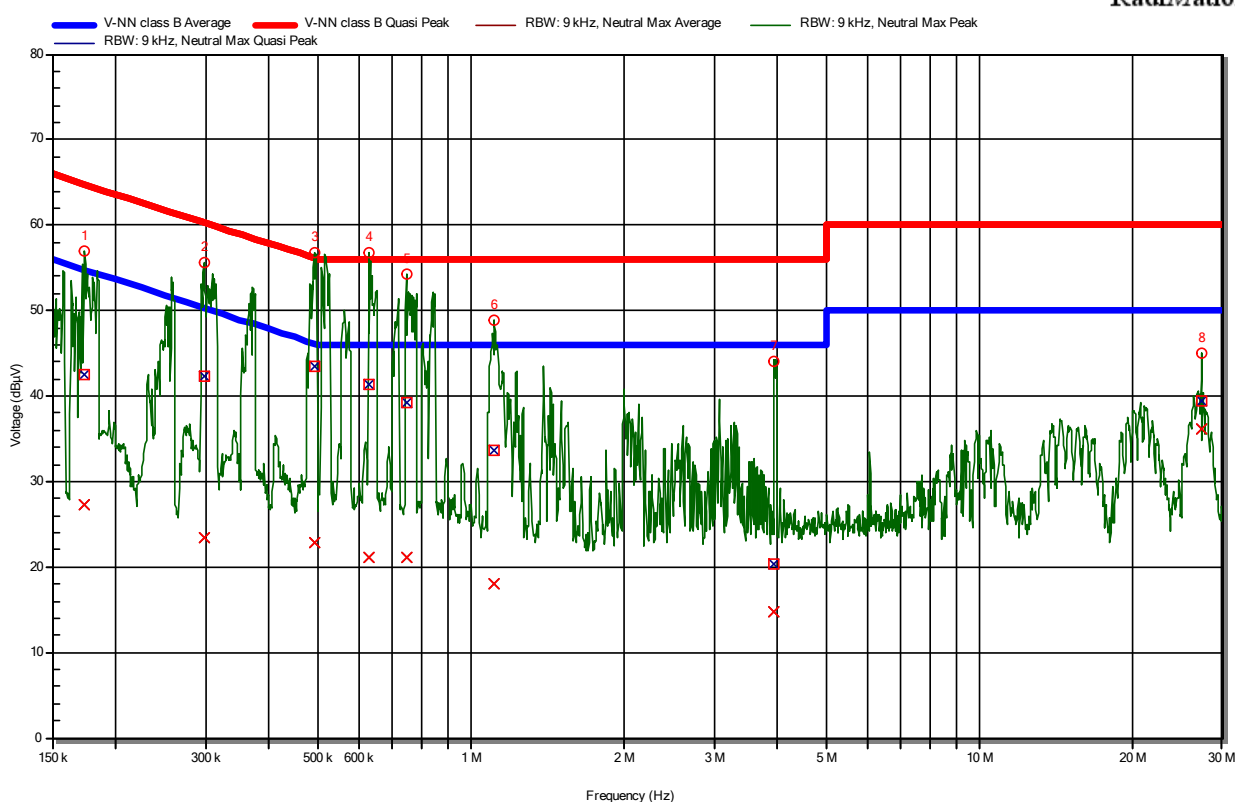
Rossens, 2020-03-10  
F.Wyler

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Ethernet (N)  
 Set-up / CDN: Table-top / T-ISN 17-LaBe-02 (N)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, RS232, DIO see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet, Mobile & RS232; USB Stick read/write, Relais On/Off); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	80/80/30
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 10 s

RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	173.824 kHz	57.1 dBµV	27.2 dBµV	-27.59 dB	42.6 dBµV	-22.21 dB	Pass
2	298.048 kHz	55.7 dBµV	23.5 dBµV	-26.8 dB	42.2 dBµV	-18.08 dB	Pass
3	490.766 kHz	56.7 dBµV	22.8 dBµV	-23.37 dB	43.4 dBµV	-12.76 dB	Pass
4	629.454 kHz	56.7 dBµV	21.2 dBµV	-24.85 dB	41.3 dBµV	-14.69 dB	Pass
5	744.745 kHz	54.2 dBµV	21.1 dBµV	-24.93 dB	39.2 dBµV	-16.8 dB	Pass
6	1.112 MHz	48.8 dBµV	18.1 dBµV	-27.93 dB	33.7 dBµV	-22.27 dB	Pass
7	3.942 MHz	44 dBµV	14.8 dBµV	-31.18 dB	20.3 dBµV	-35.65 dB	Pass
8	27.321 MHz	45.1 dBµV	36.1 dBµV	-13.89 dB	39.5 dBµV	-20.5 dB	Pass

Place and date of test:

Rossens, 2020-03-10

Operator:

F. Wyler

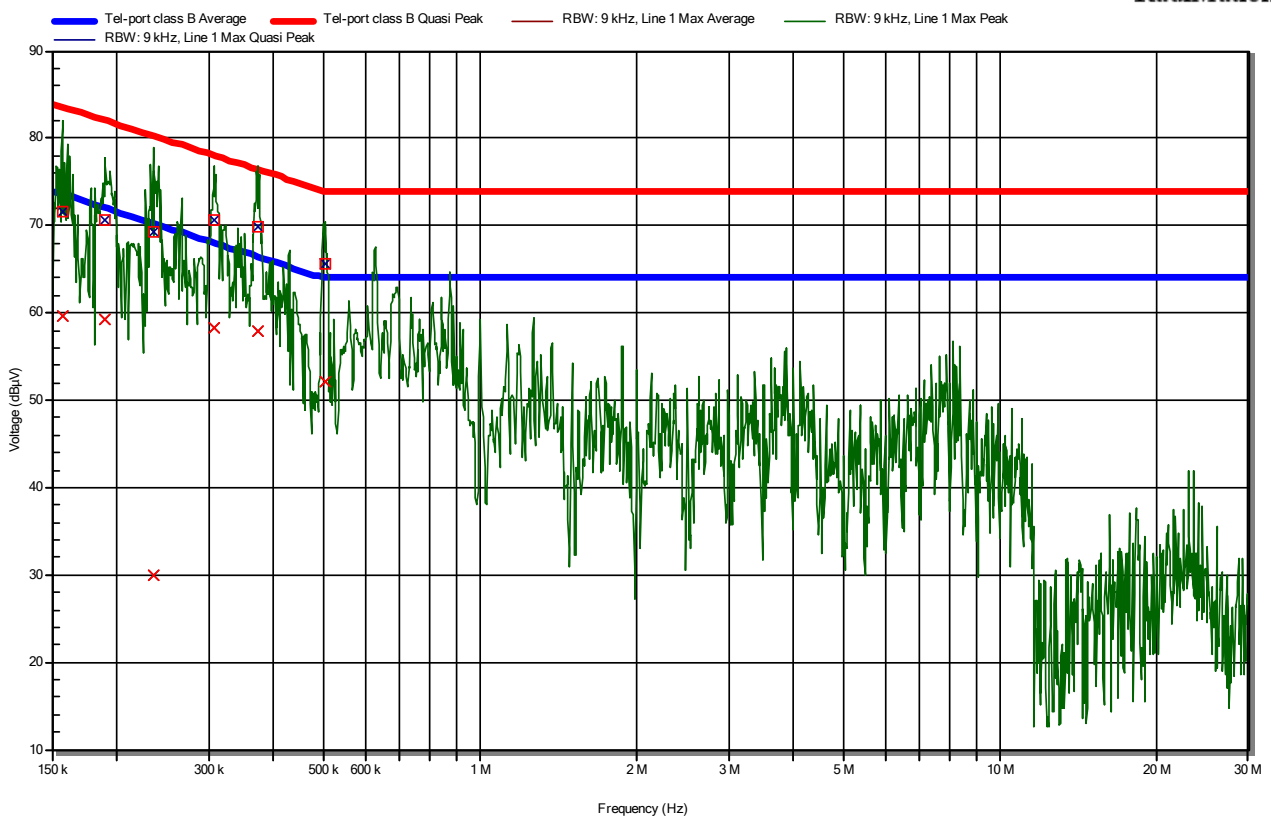
**Results NB800 LWWtSu2C-G (DualCAN)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: CAN port 1 (L1)  
 Set-up / CDN: Table-top / T-ISO 25971 (L1)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

RadiMation

**Detected peaks**

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
6	501.696 kHz	70.5 dBµV	52.2 dBµV	-11.81 dB	65.7 dBµV	-8.35 dB	Pass
4	307.956 kHz	76.7 dBµV	58.3 dBµV	-9.68 dB	70.6 dBµV	-7.44 dB	Pass
5	372.529 kHz	76.7 dBµV	57.8 dBµV	-8.61 dB	69.9 dBµV	-6.57 dB	Pass
2	189.475 kHz	77.7 dBµV	59.2 dBµV	-12.86 dB	70.7 dBµV	-11.38 dB	Pass
3	234.731 kHz	78.6 dBµV	29.9 dBµV	-40.41 dB	69.4 dBµV	-10.91 dB	Pass
1	157 kHz	81.9 dBµV	59.7 dBµV	-13.9 dB	71.6 dBµV	-12.05 dB	Pass

Place and date of test:

Rossens, 2019-11-27

Operator:

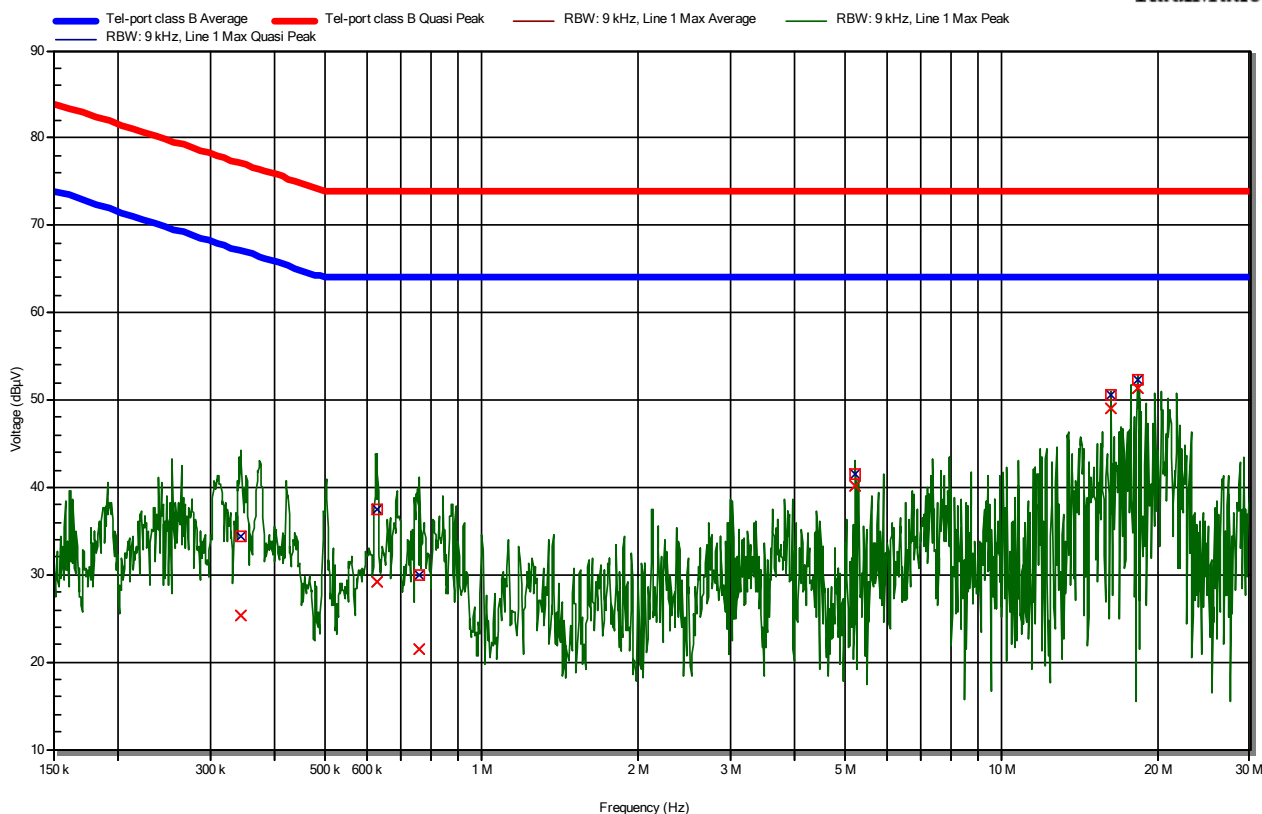
M. Rodrigues

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Ethernet  
 Set-up / CDN: Table-top / T-ISN 17-LaBe-02 (N)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
3	757.601 kHz	41 dBµV	21.5 dBµV	-42.5 dB	30 dBµV	-44.04 dB	Pass
4	5.235 MHz	43 dBµV	40.1 dBµV	-23.87 dB	41.5 dBµV	-32.51 dB	Pass
2	627.884 kHz	43.9 dBµV	29.2 dBµV	-34.85 dB	37.4 dBµV	-36.6 dB	Pass
1	344.788 kHz	44.1 dBµV	25.3 dBµV	-41.78 dB	34.4 dBµV	-42.67 dB	Pass
5	16.228 MHz	51 dBµV	49.1 dBµV	-14.89 dB	50.5 dBµV	-23.47 dB	Pass
6	18.243 MHz	52.9 dBµV	51.3 dBµV	-12.7 dB	52.4 dBµV	-21.6 dB	Pass

Place and date of test:  
Operator:

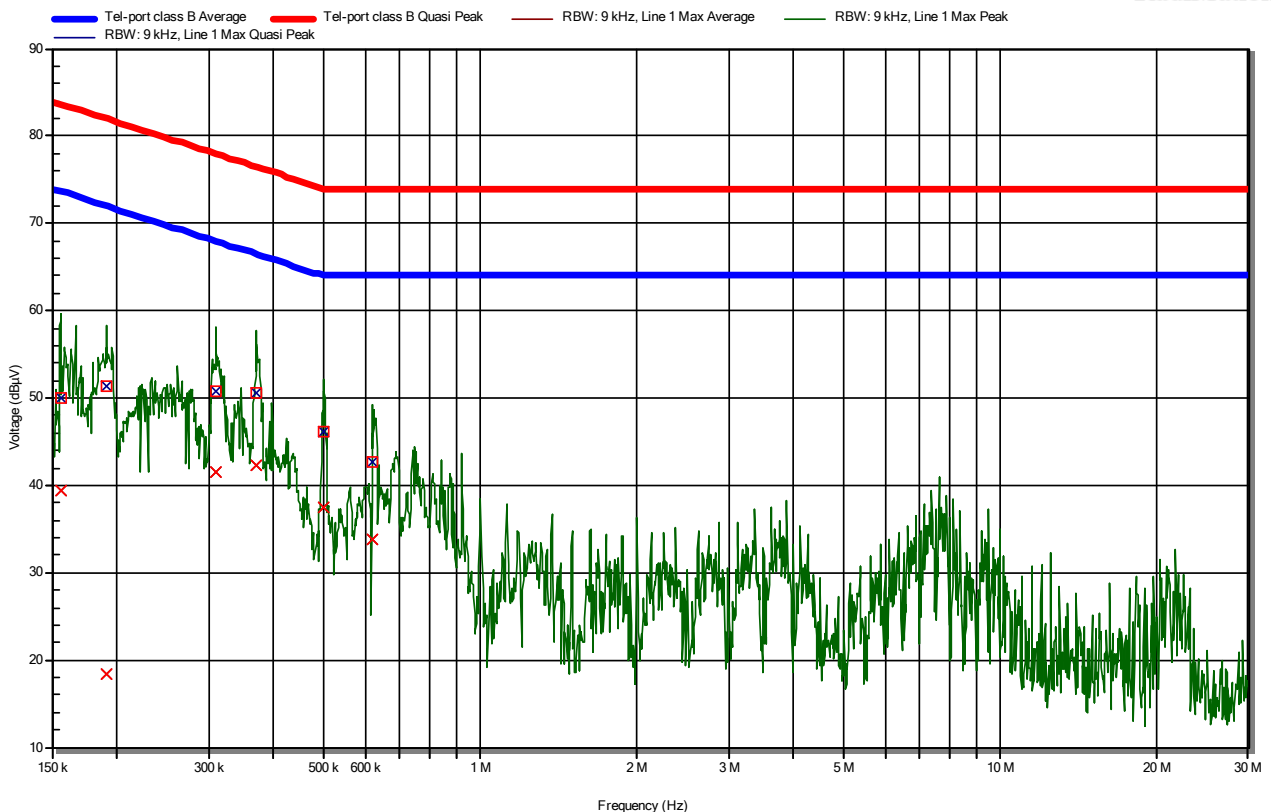
Rossens, 2019-11-27  
M. Rodrigues

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: Mobile Port link on Coax (L1)  
 Set-up / CDN: Table-top / S1-ISO 25949 (L1)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

Radiation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
6	622.288 kHz	49.3 dBµV	33.7 dBµV	-30.29 dB	42.6 dBµV	-31.38 dB	Pass
5	499.569 kHz	52.2 dBµV	37.5 dBµV	-26.53 dB	46.1 dBµV	-27.91 dB	Pass
4	370.605 kHz	57.6 dBµV	42.2 dBµV	-24.24 dB	50.6 dBµV	-25.91 dB	Pass
3	310.558 kHz	58.1 dBµV	41.6 dBµV	-26.34 dB	50.7 dBµV	-27.27 dB	Pass
2	190.475 kHz	58.2 dBµV	18.3 dBµV	-53.67 dB	51.3 dBµV	-30.68 dB	Pass
1	155.904 kHz	59.5 dBµV	39.4 dBµV	-34.23 dB	49.9 dBµV	-33.76 dB	Pass

Place and date of test:  
Operator:

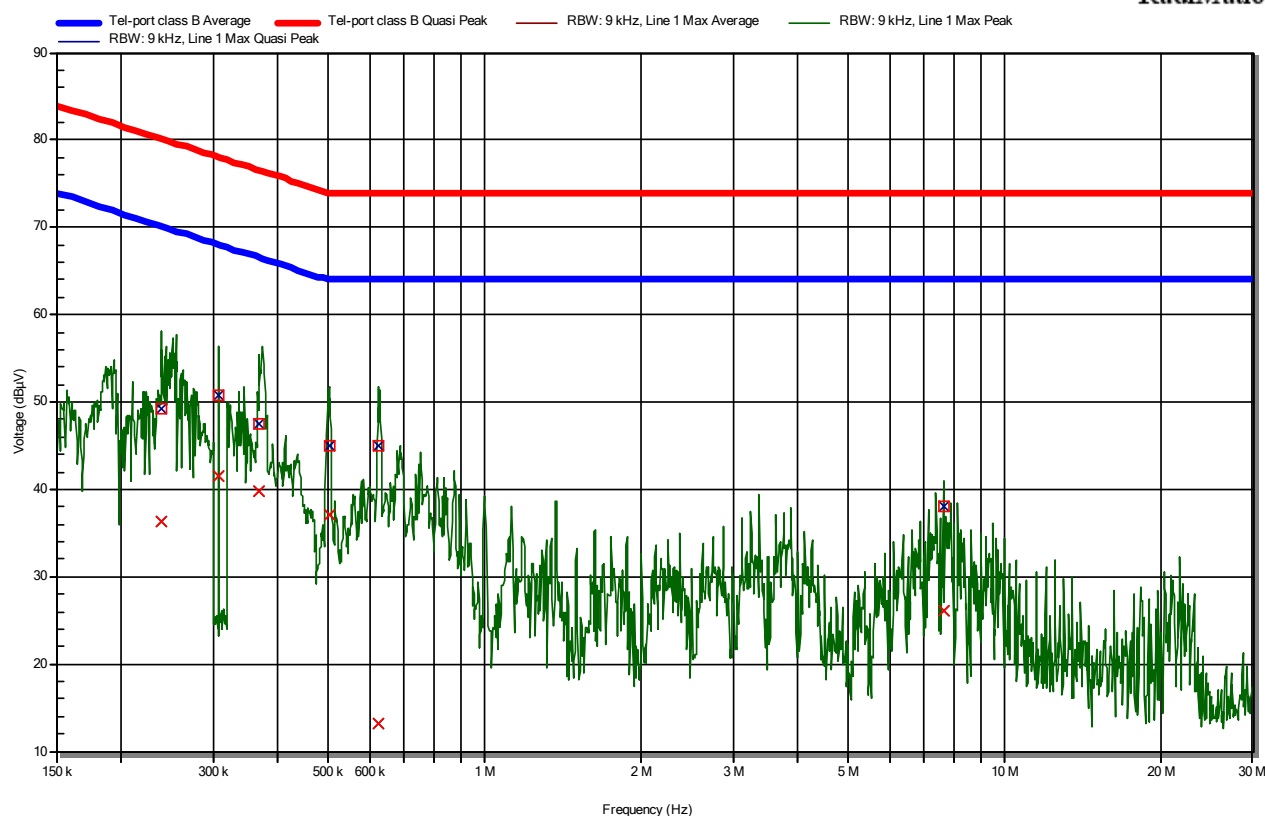
Rossens, 2019-11-27  
M. Rodrigues

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Measured interface: WLAN port link on Coax (L1)  
 Set-up / CDN: Table-top / S1-ISO 26009 (L1)  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	150 kHz ... 30 MHz
Coarse measurements:	Peak	Resolution / Video Bandwidth	9 kHz / 30 kHz
Sweep time:	200ms/200ms/560ms	Number of sweeps:	40/40/20
Receiver measurement	Peak, Quasi-Peak & Average	Measure / Observation Time	1 s / 5 s

RadiMation



## Detected peaks

Nr	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
6	7.626 MHz	40.9 dBµV	26 dBµV	-37.97 dB	38 dBµV	-35.96 dB	Pass
4	501.779 kHz	51 dBµV	37.1 dBµV	-26.9 dB	45 dBµV	-29.01 dB	Pass
5	626.124 kHz	51.7 dBµV	13.3 dBµV	-50.75 dB	45.1 dBµV	-28.93 dB	Pass
3	368.234 kHz	55.4 dBµV	39.8 dBµV	-26.69 dB	47.5 dBµV	-29.07 dB	Pass
2	307.794 kHz	56.4 dBµV	41.5 dBµV	-26.51 dB	50.7 dBµV	-27.31 dB	Pass
1	239.569 kHz	58.1 dBµV	36.4 dBµV	-33.71 dB	49.2 dBµV	-30.9 dB	Pass

Place and date of test:

Rossens, 2019-11-27

Operator:

M. Rodrigues



### 7.3 Radiated electromagnetic field

Test site: ☐ SAC3 ☒ SAC5 ☐ SAC10  
☐ Laboratory ☐ Shielded room ☐ Open test site

Distance: ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 0.8 m (height of the equipment under test above floor)

Meas. uncertainty:  $\pm 4.6$  dB (30 - 300 MHz) /  $\pm 3.7$  dB (300 - 1000 MHz) /  $\pm 3.7$  dB (1 - 6 GHz) /  $\pm 4.4$  dB (6 - 18 GHz)

Measuring method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyser and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarisations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit shall be re-measured manually using a receiver.

Modifications: ☒ None ☐ 1 ☐ 2

Climatic conditions: Temperature: 22.4 °C Humidity: 34 % Pressure QFE: 928 hPa

Test set-up:



Overview



Measurement at f &gt; 1 GHz



Close view

**Limit correction factor with respect to a reference value**

$$\Delta = -20 \cdot \log\left(\frac{l_{ref}[m]}{l[m]}\right)$$

Calculation example for the delta of distance between 10 m and 3 m. Given into standard

$$\Delta_{10to3m} = -20 \cdot \log\left(\frac{10}{3}\right) = -10.45 \cong -10 \text{ dB}$$

Calculation example for the delta of distance between 10 m and 5 m. The -0.02 dB is adding into the incertitude budget of measurement.

$$\Delta_{10to5m} = -20 \cdot \log\left(\frac{10}{5}\right) = -6.02 \cong -6 \text{ dB}$$

Calculation example for the delta of distance between 10 m and 5 m. The 0.43 dB is adding into the incertitude budget of measurement.

$$\Delta_{3to5m} = -20 \cdot \log\left(\frac{3}{5}\right) = 4.43 \cong 4 \text{ dB}$$

**Test equipment:**

Spectrum analyser	<input checked="" type="checkbox"/> 168593	<input type="checkbox"/> 184454	<input type="checkbox"/> 25953
Receiver	<input checked="" type="checkbox"/> 168593	<input type="checkbox"/> 184454	<input type="checkbox"/> 25953
Preamplifier	<input checked="" type="checkbox"/> 18-LaBe-13	<input type="checkbox"/> 168520	
Antenna, (log-per)	<input type="checkbox"/> 168585	<input type="checkbox"/> 26021	
Antenna, (bi-con-log)	<input checked="" type="checkbox"/> 181955		
Antenna, (bi-log)	<input type="checkbox"/> 26933		
Antenna, (log-per dir)	<input type="checkbox"/> 168591		
Cables	<input checked="" type="checkbox"/> 20191001	<input type="checkbox"/> 168547	
Software and Revision	<input type="checkbox"/> Vitam, Rev. 2_4_13	<input checked="" type="checkbox"/> RadiMation 2019.1.5	

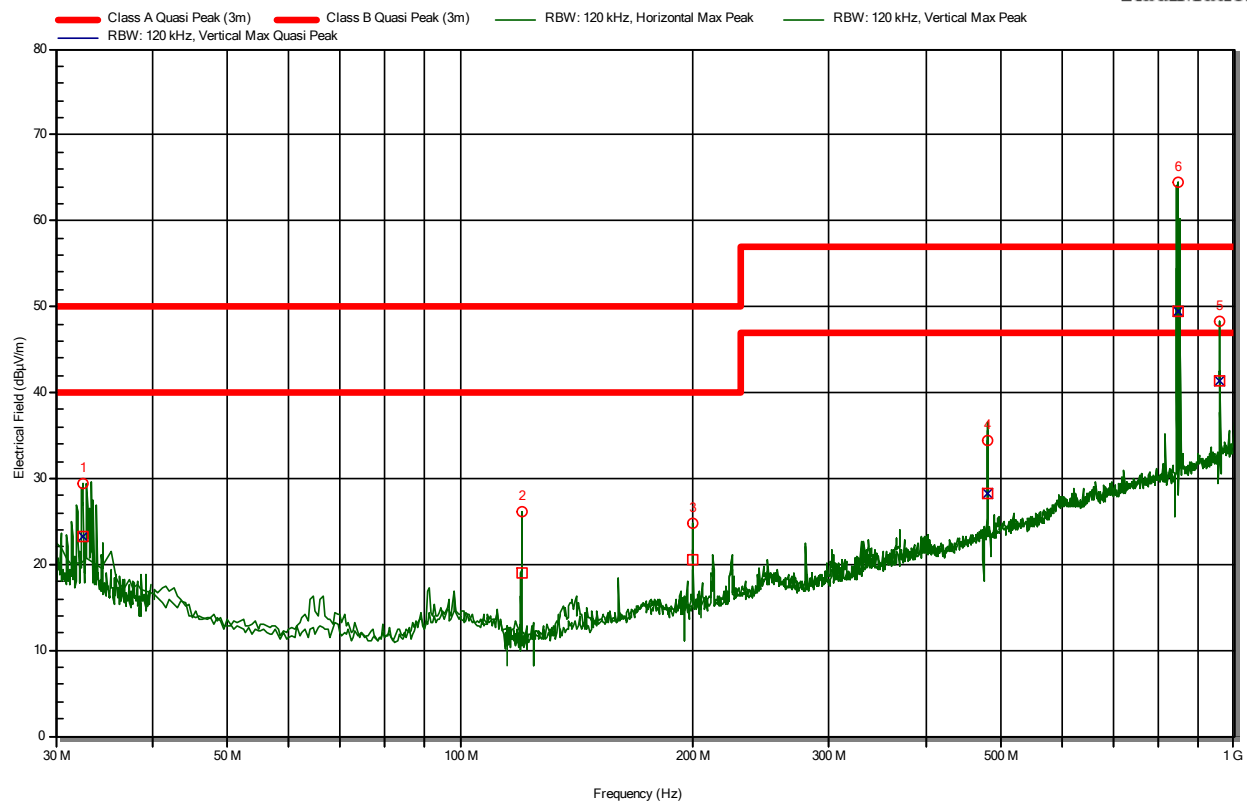
**Result:** ☒ pass ☐ fail ☐ not applicable ☐ partly tested

**Results NB800 LWWtSu-G (Base)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	30 MHz ... 1000 MHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	120 kHz / 1 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 4 m, 4 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

**RadiMation****Detected peaks**

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
1	32.503 MHz	29.36 dBµV/m	23.22 dBµV/m	-16.78 dB	Pass	90 degrees	1 m	Vertical
2	119.992 MHz	26.19 dBµV/m	18.97 dBµV/m	-21.03 dB	Pass	337 degrees	3 m	Horizontal
3	199.993 MHz	24.84 dBµV/m	20.46 dBµV/m	-19.54 dB	Pass	112 degrees	3 m	Horizontal
4	479.959 MHz	34.43 dBµV/m	28.3 dBµV/m	-18.7 dB	Pass	67 degrees	1 m	Vertical
5	959.958 MHz	48.37 dBµV/m	41.38 dBµV/m	-5.62 dB	Pass	90 degrees	1 m	Vertical
6	846.071 MHz	64.54 dBµV/m	49.45 dBµV/m	2.45 dB	Pass*	90 degrees	1 m	Vertical

\* Nr 6 is the carrier of mobile service LTE

Place and date of test:  
 Operator:

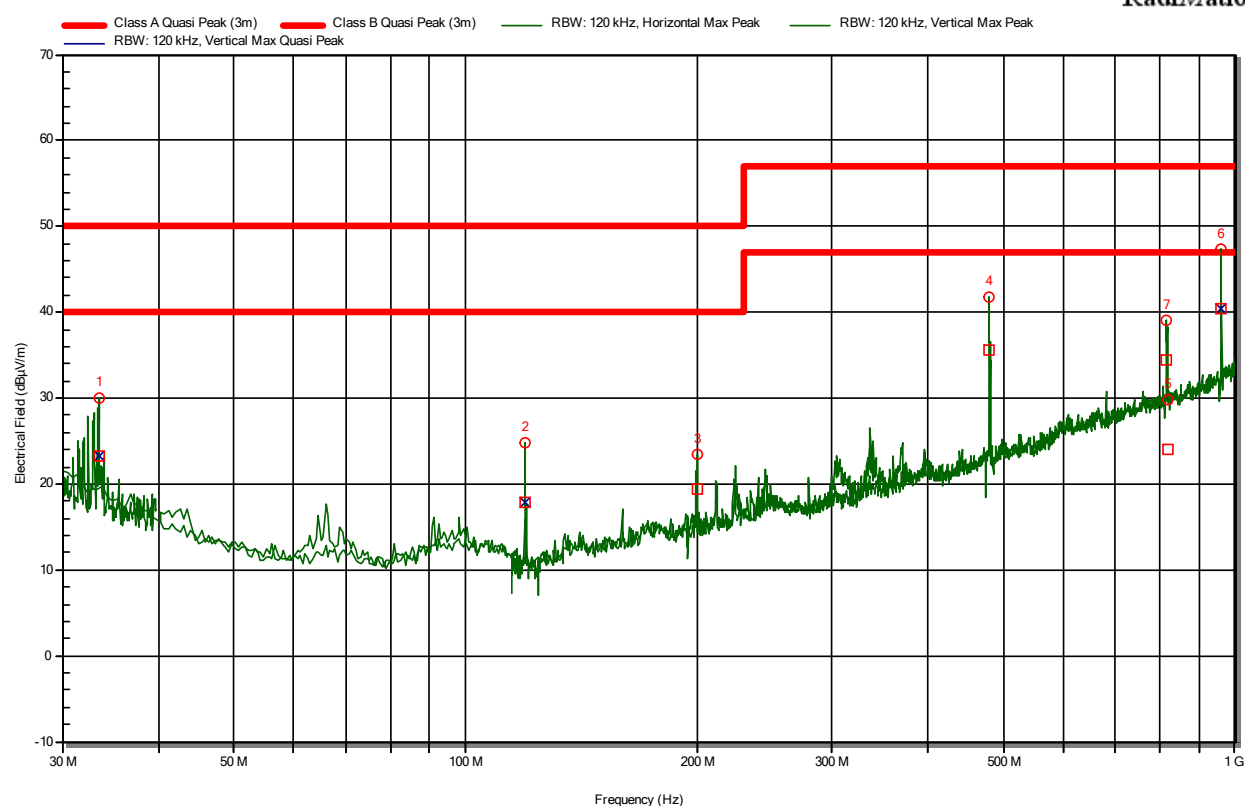
Rossens, 2019-11-25  
 Mr F. Wyler

**Results NB800 LWWtSu-G (Base) without mobile**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	30 MHz ... 1000 MHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	120 kHz / 1 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 4 m, 4 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

**RadiMation****Detected peaks**

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
1	33.468 MHz	29.91 dBμV/m	23.23 dBμV/m	-16.77 dB	Pass	90 degrees	1 m	Vertical
2	119.992 MHz	24.7 dBμV/m	17.8 dBμV/m	-22.2 dB	Pass	270 degrees	1 m	Vertical
3	200.007 MHz	23.52 dBμV/m	19.41 dBμV/m	-20.59 dB	Pass	112 degrees	1 m	Horizontal
4	479.988 MHz	41.72 dBμV/m	35.67 dBμV/m	-11.33 dB	Pass	315 degrees	1 m	Horizontal
5	820.128 MHz	29.72 dBμV/m	24.1 dBμV/m	-22.9 dB	Pass	337 degrees	1 m	Horizontal
6	959.973 MHz	47.34 dBμV/m	40.33 dBμV/m	-6.67 dB	Pass	0 degrees	1 m	Vertical
7	816.034 MHz	39.08 dBμV/m	34.45 dBμV/m	-12.55 dB	Pass	337 degrees	1 m	Horizontal

Place and date of test:  
 Operator:

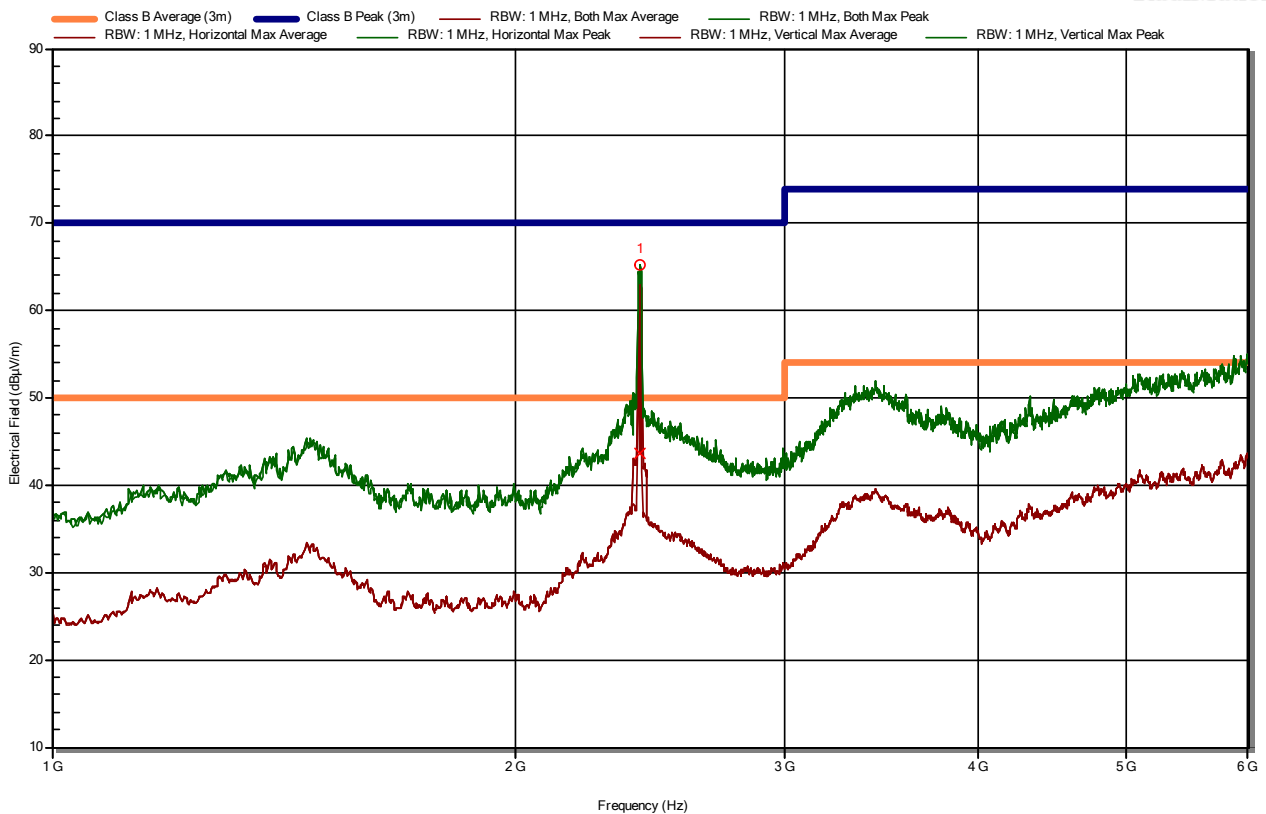
Rossens, 2019-11-25  
 Mr F. Wyler

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	1 GHz ... 6 GHz
Pre-scan measurement	Peak & Average	Resolution / Video Bandwidth	1 MHz / 3 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 2 m, 2 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

RadiMation



## Detected peaks

Nr	Frequency	Peak	Peak Difference	Average	Average Difference	Status	Angle	Height	Polarization
1	2.413 GHz	65.19 dBµV/m	-4.81 dB	43.69 dBµV/m	-6.31 dB	Pass	90 degrees	1 m	Vertical

Remark: Nr 1 is the carrier of the radio service WLAN

Place and date of test:  
 Operator:

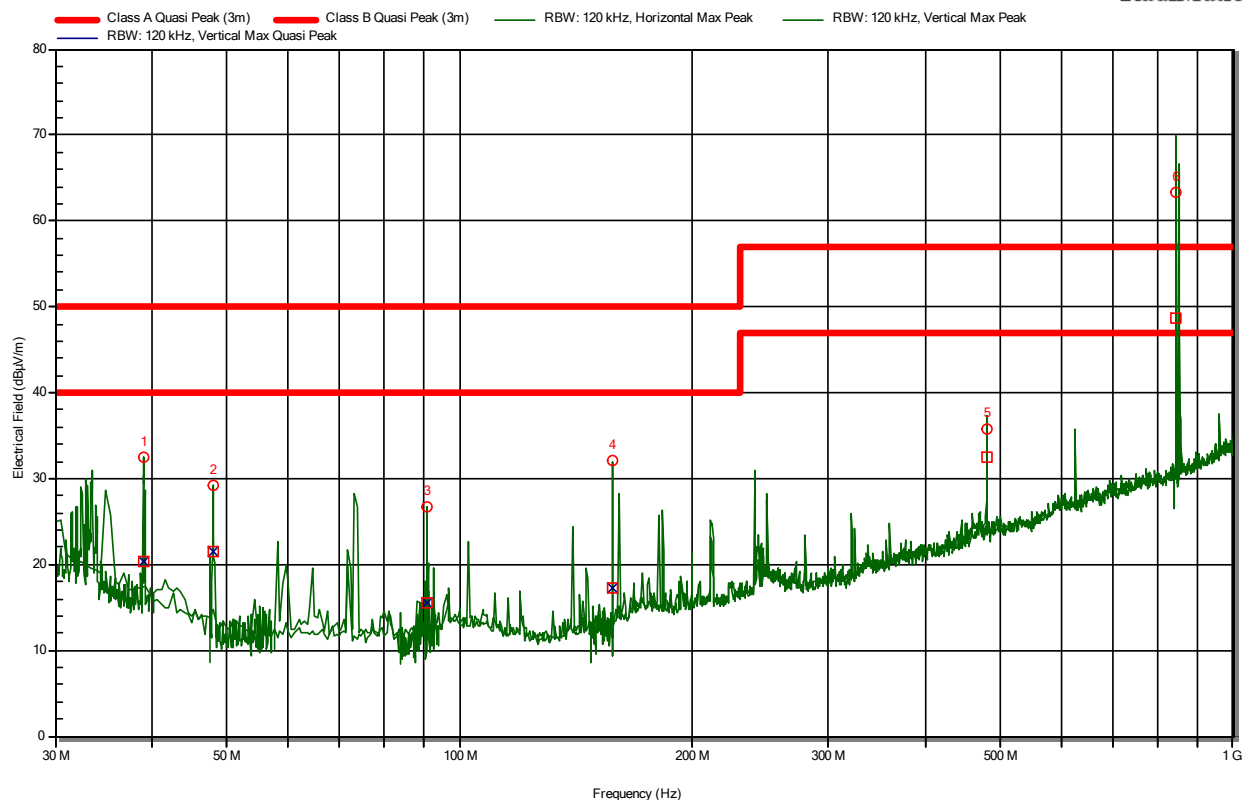
Rossens, 2019-11-25  
 Mr F. Wyler

**Results NB800 LWWtScSu-G (COMIO)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC) ; see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	30 MHz ... 1000 MHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	120 kHz / 1 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 4 m, 4 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

**RadiMation****Detected peaks**

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
3	90.979 MHz	26.78 dBµV/m	15.46 dBµV/m	-24.54 dB	Pass	202 degrees	2 m	Vertical
2	48.018 MHz	29.3 dBµV/m	21.52 dBµV/m	-18.48 dB	Pass	22 degrees	2 m	Vertical
4	157.536 MHz	32.12 dBµV/m	17.23 dBµV/m	-22.77 dB	Pass	112 degrees	1 m	Vertical
1	39.123 MHz	32.41 dBµV/m	20.29 dBµV/m	-19.71 dB	Pass	22 degrees	1 m	Vertical
5	480.002 MHz	35.73 dBµV/m	32.54 dBµV/m	-14.46 dB	Pass	292 degrees	1 m	Horizontal
6	842.782 MHz	63.35 dBµV/m	48.75 dBµV/m	1.75 dB	Pass*	292 degrees	3 m	Horizontal

\* Nr 6 is the carrier of mobile service LTE

Place and date of test:  
 Operator:

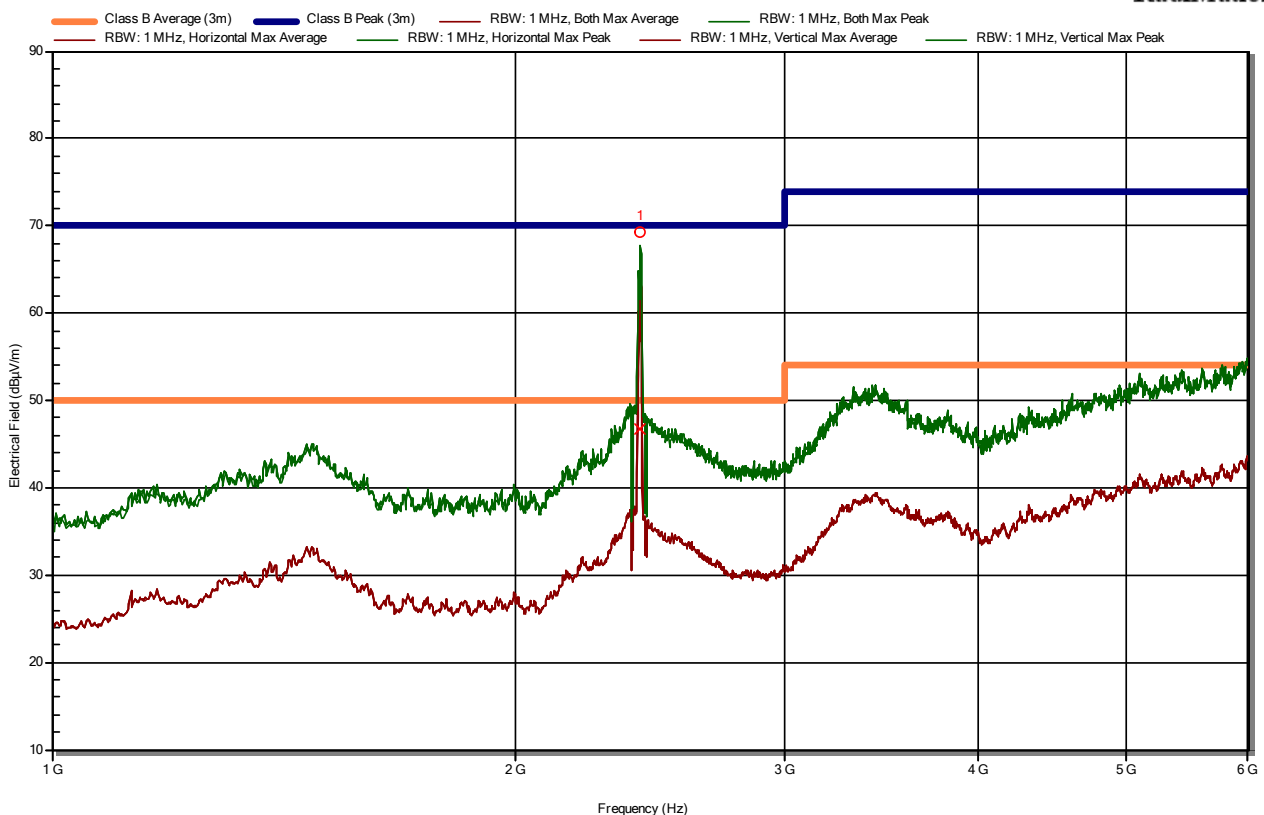
Rossens, 2019-11-25  
 Mr M. Rodrigues

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC) ; see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	1 GHz ... 6 GHz
Pre-scan measurement	Peak & Average	Resolution / Video Bandwidth	1 MHz / 3 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 2 m, 2 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

## RadiMation



## Detected peaks

Nr	Frequency	Peak	Peak Difference	Average	Average Difference	Status	Angle	Height	Polarization
1	2.411 GHz	69.29 dBμV/m	-0.71 dB	46.68 dBμV/m	-3.32 dB	Pass	112 degrees	1 m	Vertical

Remark: Nr 1 is the carrier of the radio service WLAN

Place and date of test:  
 Operator:

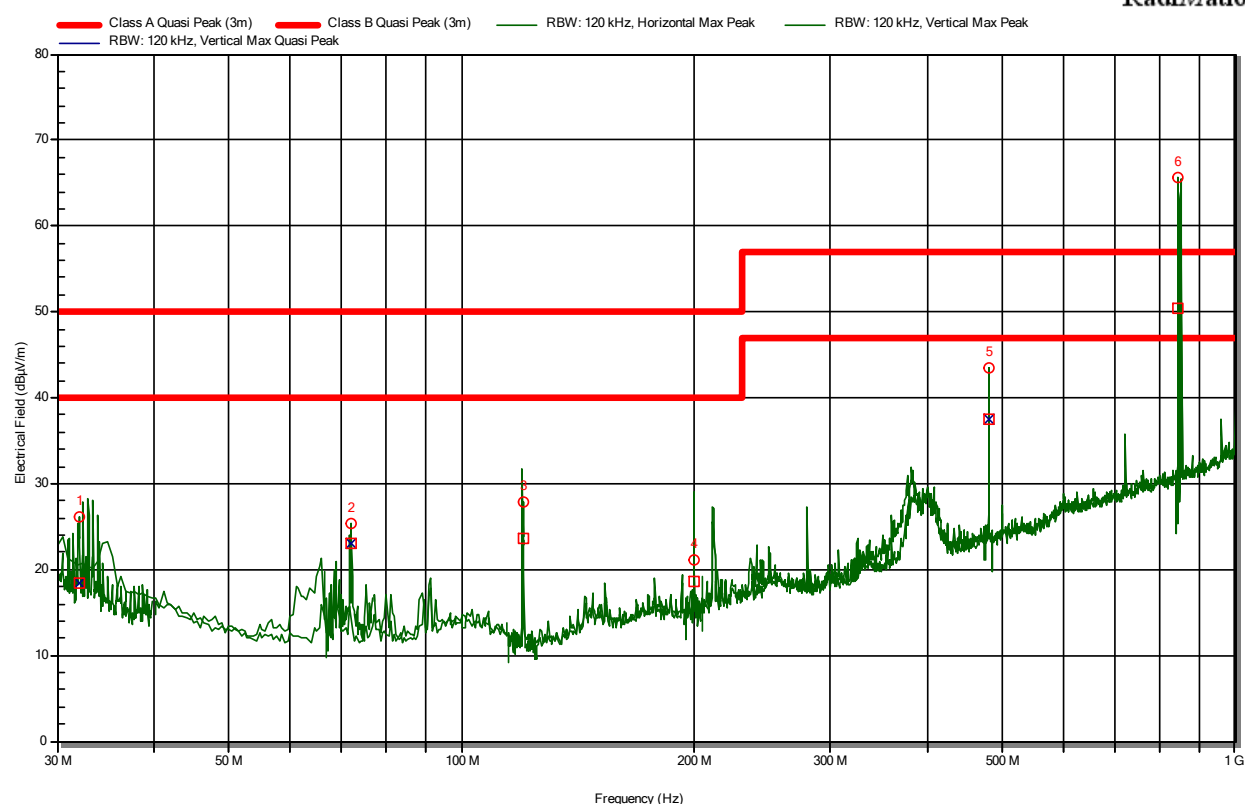
Rossens, 2019-11-25  
 Mr M. Rodrigues

**Results NB800 LWWtSu2C-G (DualCAN)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	EN 55032 (Cl. B)	Frequency range	30 MHz ... 1000 MHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	120 kHz / 1 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 4 m, 4 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

**RadiMation****Detected peaks**

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
4	199.983 MHz	21.14 dBµV/m	18.62 dBµV/m	-21.38 dB	Pass	22 degrees	3 m	Horizontal
2	72.001 MHz	25.32 dBµV/m	22.95 dBµV/m	-17.05 dB	Pass	247 degrees	1 m	Vertical
1	32.037 MHz	26.14 dBµV/m	18.48 dBµV/m	-21.52 dB	Pass	90 degrees	1 m	Vertical
3	120.011 MHz	27.8 dBµV/m	23.71 dBµV/m	-16.29 dB	Pass	0 degrees	3 m	Horizontal
5	479.973 MHz	43.56 dBµV/m	37.54 dBµV/m	-9.46 dB	Pass	0 degrees	1 m	Vertical
6	844.354 MHz	65.56 dBµV/m	50.43 dBµV/m	3.43 dB	Pass*	247 degrees	2 m	Horizontal

\* Nr 6 is the carrier of mobile service LTE

Place and date of test:  
 Operator:

Rossens, 2019-11-25  
 Mr M. Rodrigues

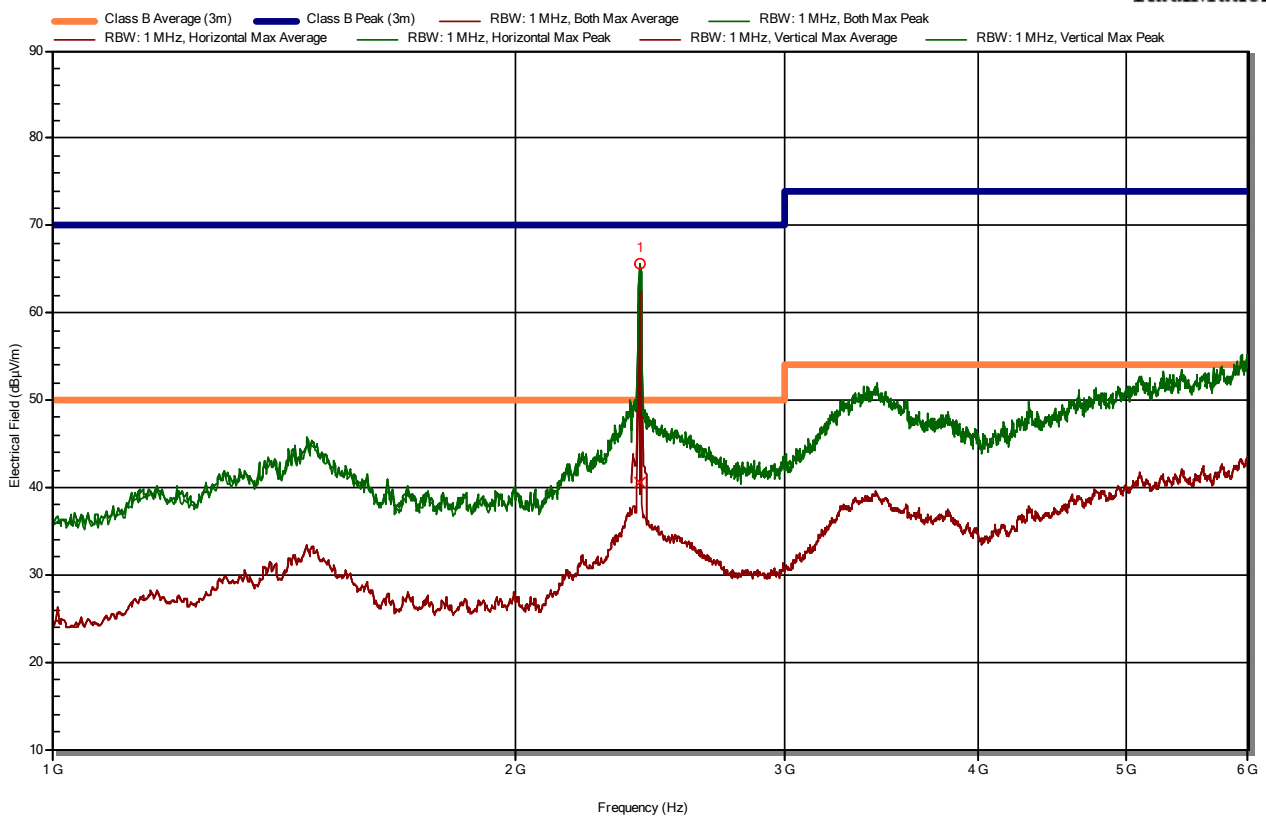


Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	EN 55032 (Cl. B)	Frequency range	1 GHz ... 6 GHz
Pre-scan measurement	Peak & Average	Resolution / Video Bandwidth	1 MHz / 3 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 2 m, 2 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

RadiMation



## Detected peaks

Nr	Frequency	Peak	Peak Difference	Average	Average Difference	Status	Angle	Height	Polarization
1	2.411 GHz	65.62 dBµV/m	-4.38 dB	40.47 dBµV/m	-9.53 dB	Pass	45 degrees	1 m	Vertical

Remark: Nr 1 is the carrier of the radio service WLAN

Place and date of test:  
 Operator:

Rossens, 2019-11-25  
 Mr M. Rodrigues

**7.4 Radiated emission - Electromagnetic field according CFR 47 15 (radiated – 30 MHz to 6 GHz)**

Test site: ☐ SAC3 ☒ SAC5 ☐ SAC10  
☐ Laboratory ☐ Shielded room ☐ Open test site

Distance: ☒ 3 m ☐ 10 m ☐ 30 m

Position of EUT: 0.8 m (height of the equipment under test above floor)

Meas. uncertainty:  $\pm 4.6$  dB (30 - 300 MHz) /  $\pm 3.7$  dB (300 - 1000 MHz) /  $\pm 3.7$  dB (1 - 6 GHz) /  $\pm 4.4$  dB (6 - 18 GHz)

Measuring method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyser and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarisations. The turning table is operated through 360° during the measurements. The recordings are carried out taking into account the maximum value of all the disturbances appearing while the apparatus is under test. The peak values are recorded continuously on the graph. The values exceeding a limit shall be re-measured manually using a receiver.

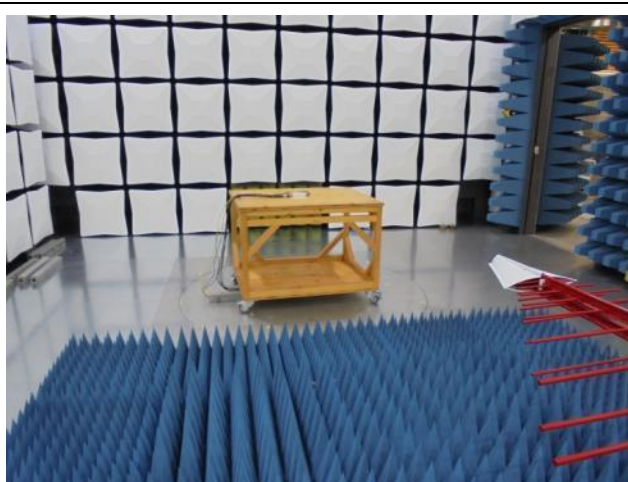
Modifications: ☒ None ☐ 1 ☐ 2

Climatic conditions: Temperature: 22.4 °C Humidity: 34 % Pressure QFE: 928 hPa

Test set-up:



Overview



Measurement at f &gt; 1 GHz



Close view

**Test equipment:**

Spectrum analyser	<input checked="" type="checkbox"/> 168593	<input type="checkbox"/> 184454	<input type="checkbox"/> 25953
Receiver	<input checked="" type="checkbox"/> 168593	<input type="checkbox"/> 184454	<input type="checkbox"/> 25953
Preamplifier	<input checked="" type="checkbox"/> 18-LaBe-13	<input type="checkbox"/> 168520	
Antenna, (log-per)	<input type="checkbox"/> 168585	<input type="checkbox"/> 26021	
Antenna, (bi-con-log)	<input checked="" type="checkbox"/> 181955		
Cables	<input checked="" type="checkbox"/> 20191001	<input type="checkbox"/> 168547	
Software and Revision	<input type="checkbox"/> Vitam, Rev. 2_4_13	<input checked="" type="checkbox"/> RadiMation 2019.1.5	

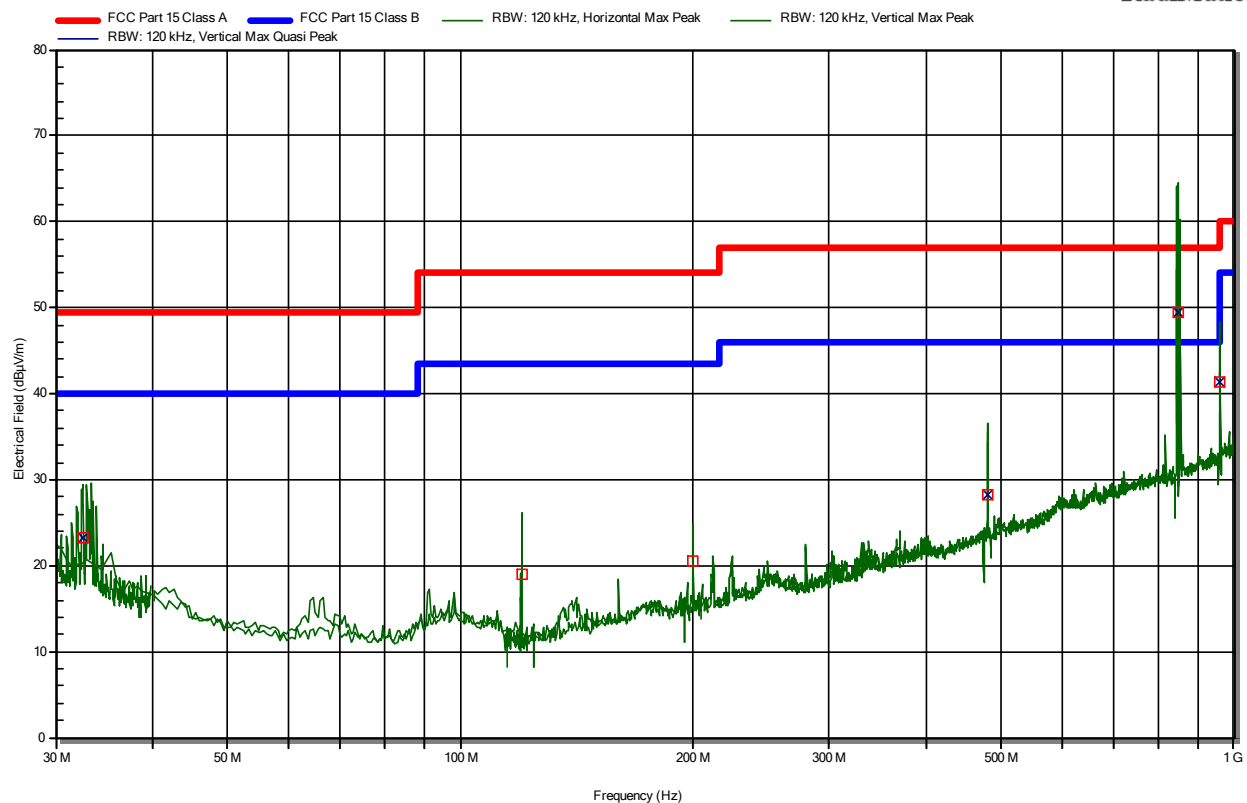
Result: ☒ pass ☐ fail ☐ not applicable ☐ partly tested

**Results NB800 LWWtSu-G (Base)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	CFR 47 15B / ICES-003	Frequency range	30 MHz ... 1000 MHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	120 kHz / 1 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 4 m, 4 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

**RadiMation****Detected peaks**

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
3	199.993 MHz	24.84 dBµV/m	20.46 dBµV/m	-23.04 dB	Pass	112 degrees	3 m	Horizontal
2	119.992 MHz	26.19 dBµV/m	18.97 dBµV/m	-24.53 dB	Pass	337 degrees	3 m	Horizontal
1	32.503 MHz	29.36 dBµV/m	23.22 dBµV/m	-16.78 dB	Pass	90 degrees	1 m	Vertical
4	479.959 MHz	34.43 dBµV/m	28.3 dBµV/m	-17.7 dB	Pass	67 degrees	1 m	Vertical
5	959.958 MHz	48.37 dBµV/m	41.38 dBµV/m	-4.62 dB	Pass	90 degrees	1 m	Vertical
6	846.071 MHz	64.54 dBµV/m	49.45 dBµV/m	3.45 dB	Pass*	90 degrees	1 m	Vertical

\* Nr 6 is the carrier of mobile service LTE

Place and date of test:  
 Operator:

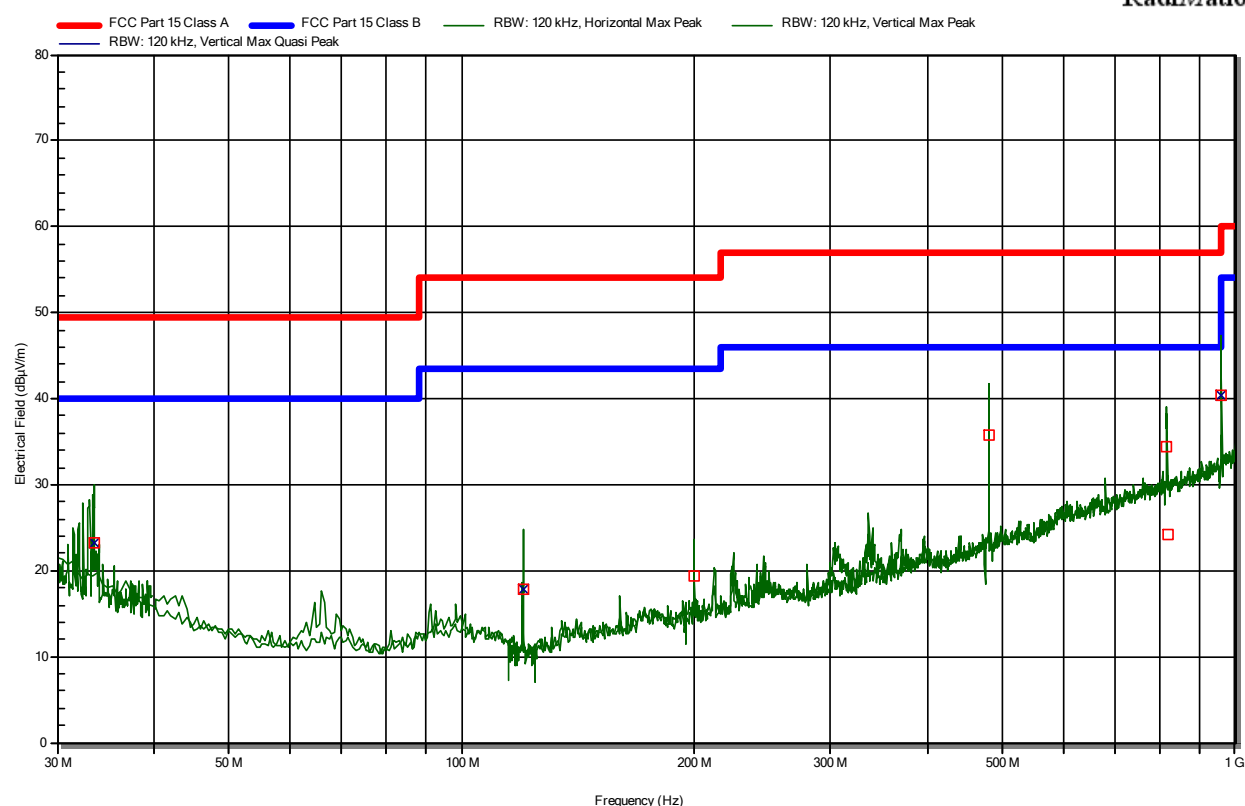
Rossens, 2019-11-25  
 Mr F. Wyler

**Results NB800 LWWtSu-G (Base) without mobile**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	CFR 47 15B / ICES-003	Frequency range	30 MHz ... 1000 MHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	120 kHz / 1 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 4 m, 4 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

**RadiMation****Detected peaks**

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
3	200.007 MHz	23.52 dBμV/m	19.41 dBμV/m	-24.09 dB	Pass	112 degrees	1 m	Horizontal
2	119.992 MHz	24.7 dBμV/m	17.8 dBμV/m	-25.7 dB	Pass	270 degrees	1 m	Vertical
5	820.128 MHz	29.72 dBμV/m	24.1 dBμV/m	-21.9 dB	Pass	337 degrees	1 m	Horizontal
1	33.468 MHz	29.91 dBμV/m	23.23 dBμV/m	-16.77 dB	Pass	90 degrees	1 m	Vertical
7	816.034 MHz	39.08 dBμV/m	34.45 dBμV/m	-11.55 dB	Pass	337 degrees	1 m	Horizontal
4	479.988 MHz	41.72 dBμV/m	35.67 dBμV/m	-10.33 dB	Pass	315 degrees	1 m	Horizontal
6	959.973 MHz	47.34 dBμV/m	40.33 dBμV/m	-5.67 dB	Pass	0 degrees	1 m	Vertical

Place and date of test:  
 Operator:

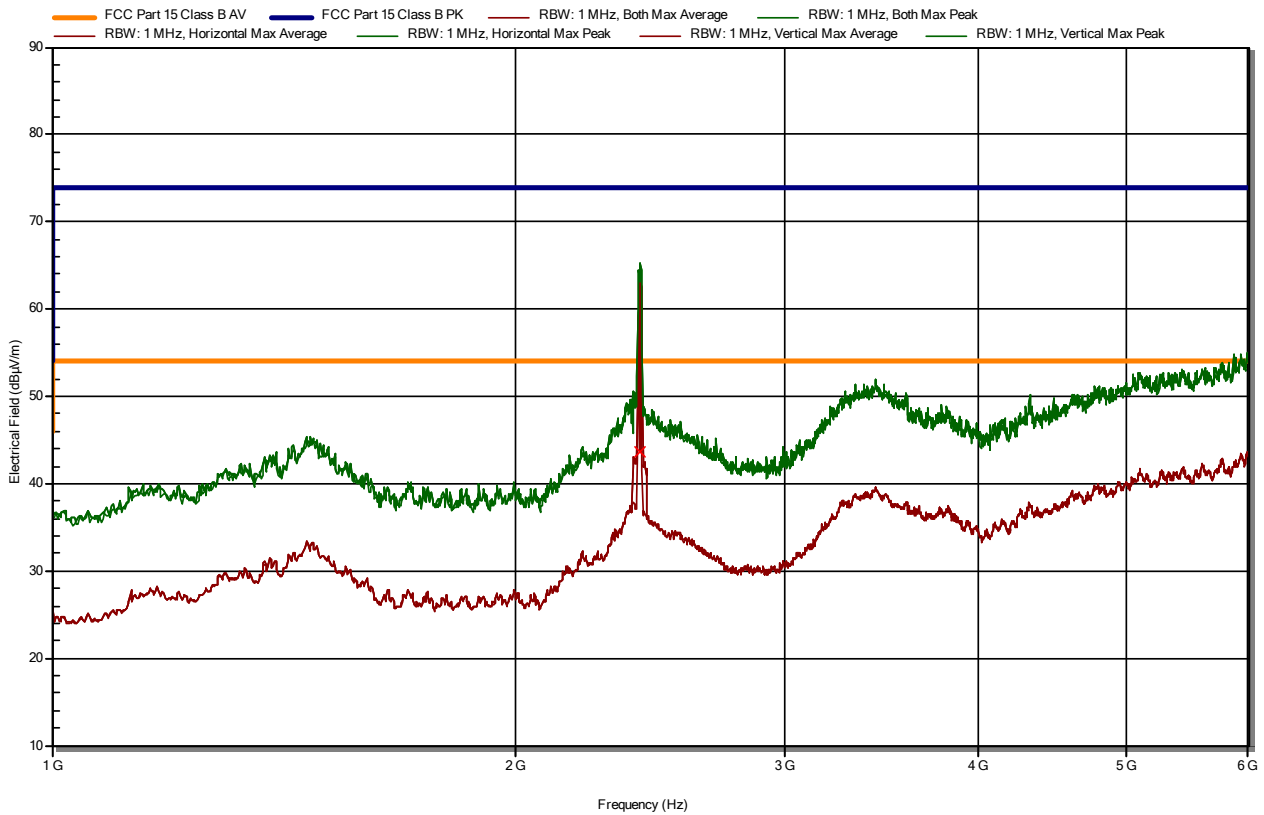
Rossens, 2019-11-25  
 Mr F. Wyler

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits CFR 47 15B / ICES-003 Frequency range 1 GHz ... 6 GHz  
 Pre-scan measurement Peak & Average Resolution / Video Bandwidth 1 MHz / 3 MHz  
 Sweep time: 200 ms Number of sweeps: 20  
 Geometry: Height: 1 - 2 m, 2 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical  
 Receiver measurement: Peak & Quasi-Peak Measure / Observation Time 1 s / 5 s  
 Geometry: On the position of the maximum

RadiMation



## Detected peaks

Nr	Frequency	Peak	Peak Difference	Average	Average Difference	Status	Angle	Height	Polarization
1	2.413 GHz	65.19 dBµV/m	-8.81 dB	43.69 dBµV/m	-10.31 dB	Pass	90 degrees	1 m	Vertical

Remark: Nr 1 is the carrier of the radio service WLAN

Place and date of test:  
 Operator:

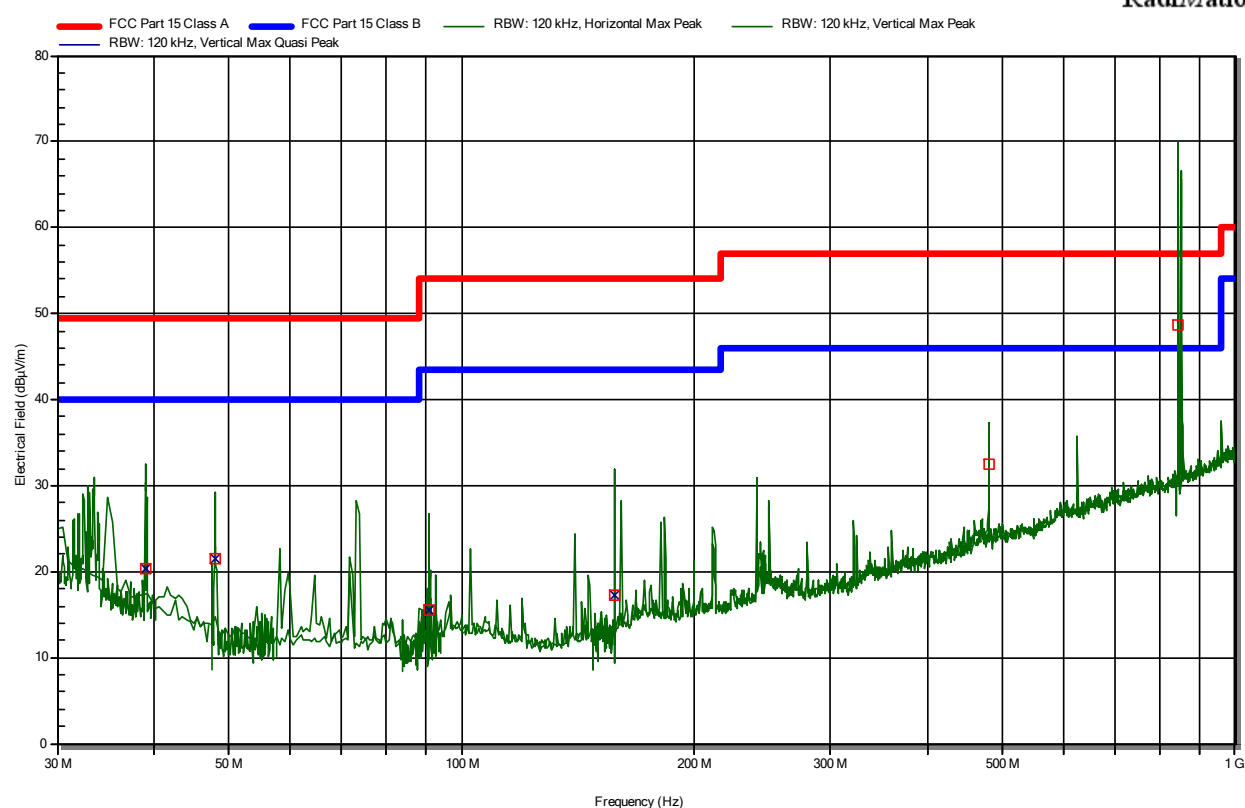
Rossens, 2019-11-25  
 Mr F. Wyler

**Results NB800 LWWtScSu-G (COMIO)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC) ; see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	CFR 47 15B / ICES-003	Frequency range	30 MHz ... 1000 MHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	120 kHz / 1 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 4 m, 4 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

**RadiMation****Detected peaks**

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
3	90.979 MHz	26.78 dBµV/m	15.46 dBµV/m	-28.04 dB	Pass	202 degrees	2 m	Vertical
2	48.018 MHz	29.3 dBµV/m	21.52 dBµV/m	-18.48 dB	Pass	22 degrees	2 m	Vertical
4	157.536 MHz	32.12 dBµV/m	17.23 dBµV/m	-26.27 dB	Pass	112 degrees	1 m	Vertical
1	39.123 MHz	32.41 dBµV/m	20.29 dBµV/m	-19.71 dB	Pass	22 degrees	1 m	Vertical
5	480.002 MHz	35.73 dBµV/m	32.54 dBµV/m	-13.46 dB	Pass	292 degrees	1 m	Horizontal
6	842.782 MHz	63.35 dBµV/m	48.75 dBµV/m	2.75 dB	Pass*	292 degrees	3 m	Horizontal

\* Nr 6 is the carrier of mobile service LTE

Place and date of test:  
 Operator:

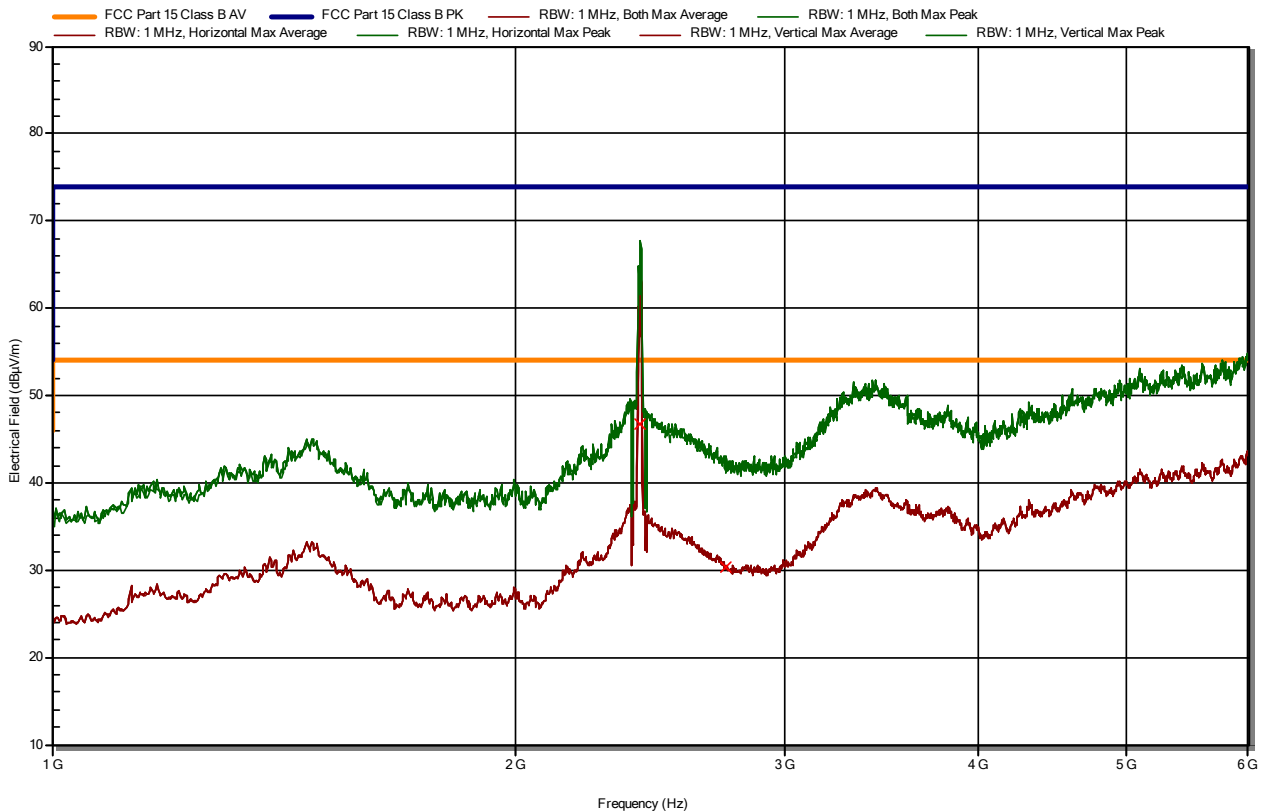
Rossens, 2019-11-25  
 Mr M. Rodrigues

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC) ; see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits	CFR 47 15B / ICES-003	Frequency range	1 GHz ... 6 GHz
Pre-scan measurement	Peak & Average	Resolution / Video Bandwidth	1 MHz / 3 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 2 m, 2 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

## RadiMation



## Detected peaks

Nr	Frequency	Peak	Peak Difference	Average	Average Difference	Status	Angle	Height	Polarization
2	2.745 GHz	43.09 dBµV/m	-30.91 dB	30.26 dBµV/m	-23.74 dB	Pass	0 degrees	2 m	Vertical
1	2.411 GHz	69.29 dBµV/m	-4.71 dB	46.68 dBµV/m	-7.32 dB	Pass	112 degrees	1 m	Vertical

Remark: Nr 1 is the carrier of the radio service WLAN

Place and date of test:  
 Operator:

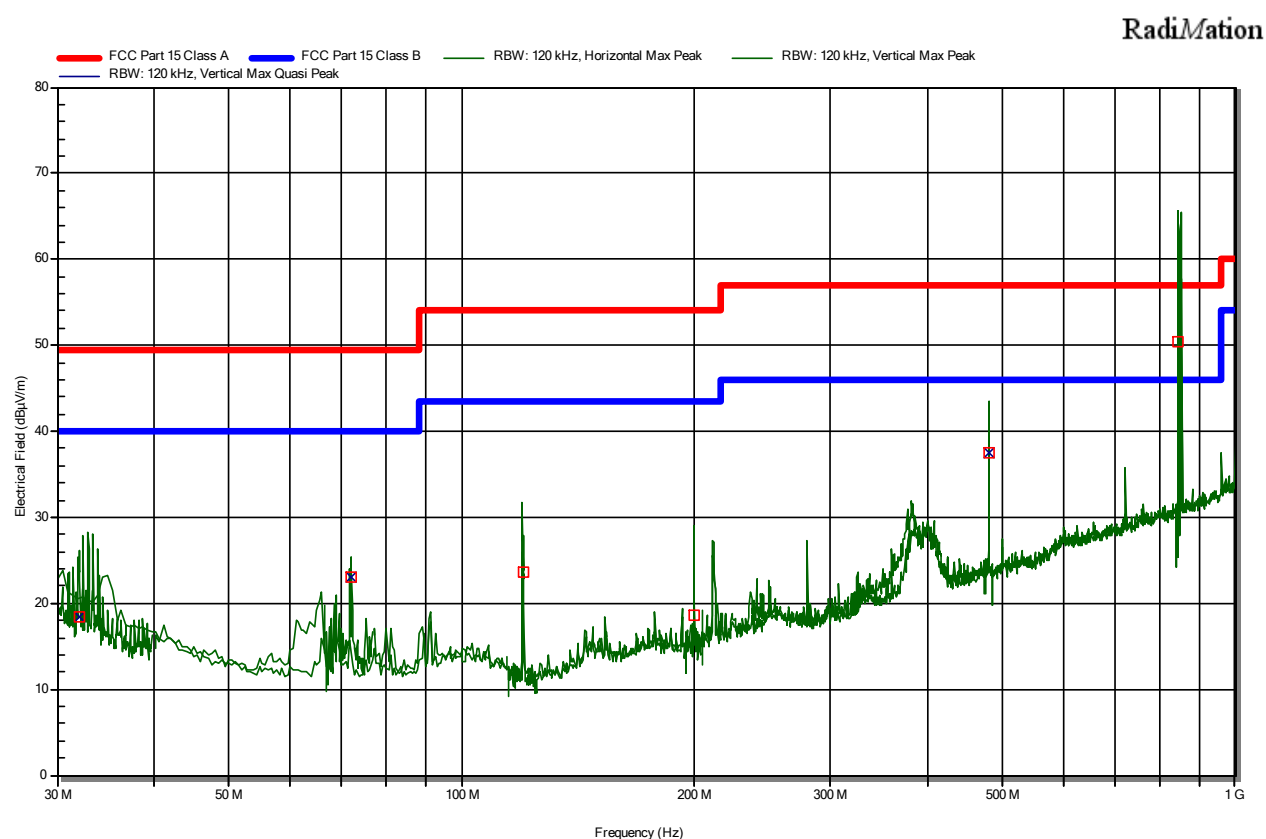
Rossens, 2019-11-25  
 Mr M. Rodrigues

**Results NB800 LWWtSu2C-G (DualCAN)**

Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN); see § 6.5  
 Modification: None  
 Remarks: None

**Settings of the measurement equipment**

Limits	CFR 47 15B / ICES-003	Frequency range	30 MHz ... 1000 MHz
Pre-scan measurement	Peak	Resolution / Video Bandwidth	120 kHz / 1 MHz
Sweep time:	200 ms	Number of sweeps:	20
Geometry:	Height: 1 - 4 m, 4 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical		
Receiver measurement:	Peak & Quasi-Peak	Measure / Observation Time	1 s / 5 s
Geometry:	On the position of the maximum		

**Detected peaks**

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
4	199.983 MHz	21.14 dBμV/m	18.62 dBμV/m	-24.88 dB	Pass	22 degrees	3 m	Horizontal
2	72.001 MHz	25.32 dBμV/m	22.95 dBμV/m	-17.05 dB	Pass	247 degrees	1 m	Vertical
1	32.037 MHz	26.14 dBμV/m	18.48 dBμV/m	-21.52 dB	Pass	90 degrees	1 m	Vertical
3	120.011 MHz	27.8 dBμV/m	23.71 dBμV/m	-19.79 dB	Pass	0 degrees	3 m	Horizontal
5	479.973 MHz	43.56 dBμV/m	37.54 dBμV/m	-8.46 dB	Pass	0 degrees	1 m	Vertical
6	844.354 MHz	65.56 dBμV/m	50.43 dBμV/m	4.43 dB	Pass*	247 degrees	2 m	Horizontal

\* Nr 6 is the carrier of mobile service LTE

Place and date of test:  
 Operator:

Rossens, 2019-11-25  
 Mr M. Rodrigues

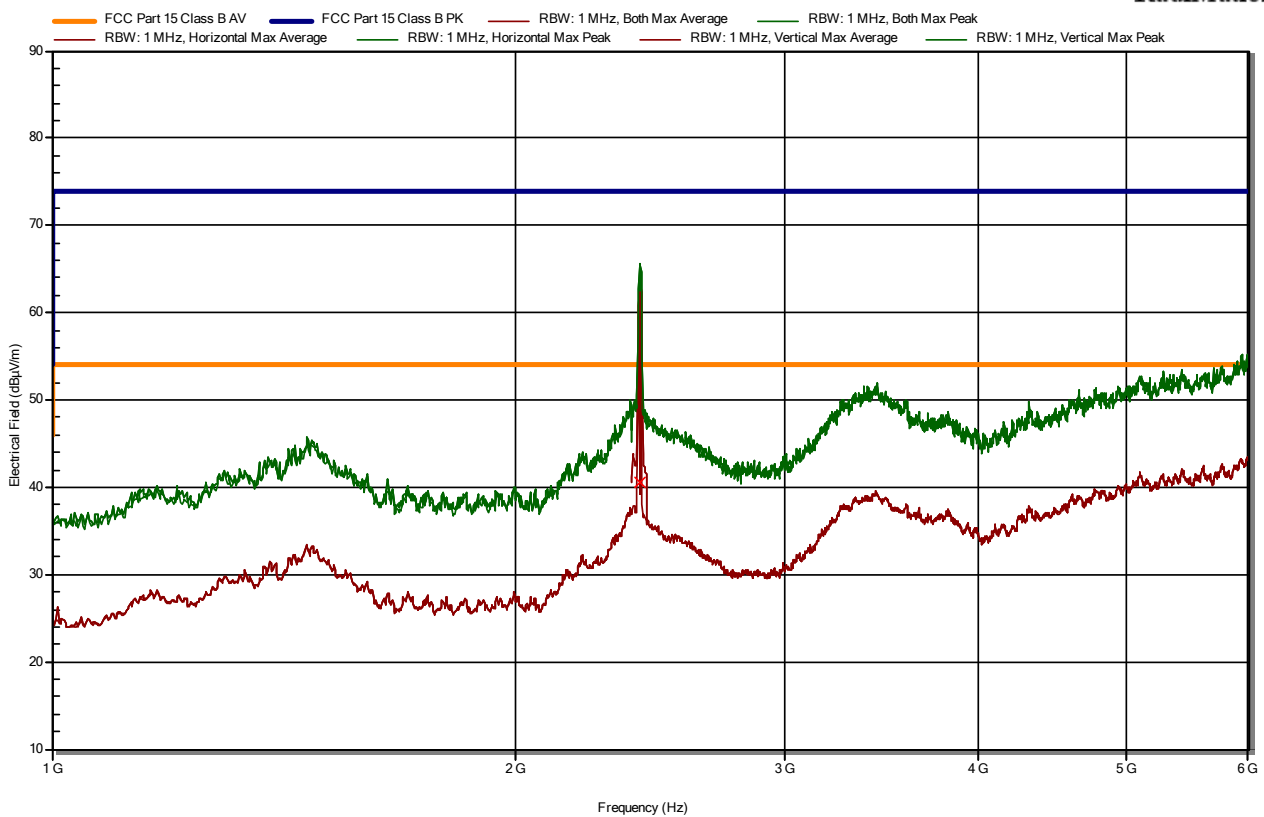


Client: NetModule AG  
 Equipment: NetModule NB800 Rev. B02  
 Cables connected: Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS, see § 5.5 & § 6.4  
 Operating mode: Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN); see § 6.5  
 Modification: None  
 Remarks: None

## Settings of the measurement equipment

Limits CFR 47 15B / ICES-003 Frequency range 1 GHz ... 6 GHz  
 Pre-scan measurement Peak & Average Resolution / Video Bandwidth 1 MHz / 3 MHz  
 Sweep time: 200 ms Number of sweeps: 20  
 Geometry: Height: 1 - 2 m, 2 steps; Azimuth: 0° – 360°, 16 steps; Polarisation: Horizontal & Vertical  
 Receiver measurement: Peak & Quasi-Peak Measure / Observation Time 1 s / 5 s  
 Geometry: On the position of the maximum

RadiMation



## Detected peaks

Nr	Frequency	Peak	Peak Difference	Average	Average Difference	Status	Angle	Height	Polarization
1	2.411 GHz	65.62 dBμV/m	-8.38 dB	40.47 dBμV/m	-13.53 dB	Pass	45 degrees	1 m	Vertical

Remark: Nr 1 is the carrier of the radio service WLAN

Place and date of test:  
 Operator:

Rossens, 2019-11-25  
 Mr M. Rodrigues

## 8 Immunity tests

**8.1 Immunity to electrostatic discharge (ESD) (EN 61000-4-2)**

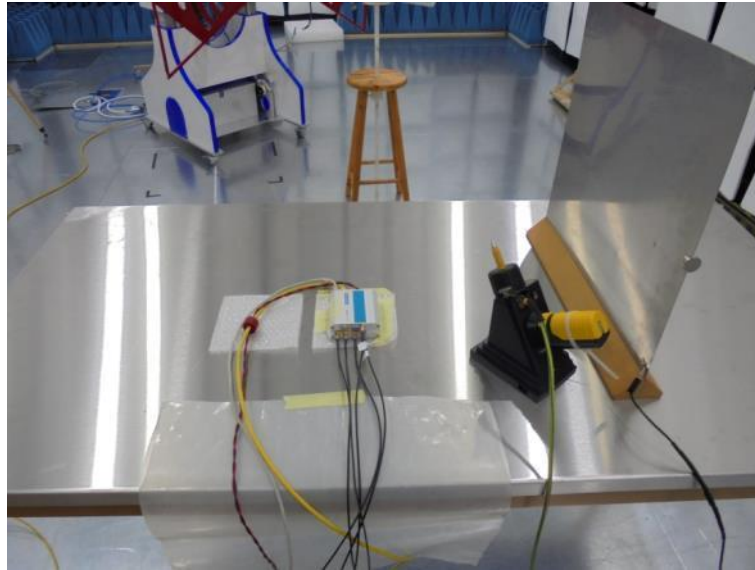
**Introduction:** The aim of this test is to determine the reaction of the material to electrostatic discharges (ESD) produced for example by walking on a carpet made of synthetic fibre. The humidity of the air has an influence on the discharge time and therefore on the severity of the discharge that could appear.

**Coupling:** ☒ 150 pF / 330 Ohm      ☐ 150 pF / 2000 Ohm  
☐ 500 pF / 500 Ohm      ☐ 500 pF / 5000 Ohm      ☐ 330 pF / 2000 Ohm

**Meas. uncertainty:**  $\pm 10 \%$

**Test method:** All the points accessible to the operator are tested successively. Contact discharges are carried out on conducting surfaces as well as indirect discharges on a vertical or horizontal coupling plate. Air discharges are carried out on insulated surfaces. A minimum of 10 discharges for each voltage level and polarity are applied to each test point.

**Test set-up:**



Overview

**Remarks:** None

**Test equipment:**

Test generator	<input type="checkbox"/> 84-05	<input type="checkbox"/> 91-04	<input type="checkbox"/> 93-61	<input checked="" type="checkbox"/> 99-36
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<b>Result:</b>	<input checked="" type="checkbox"/> pass	<input type="checkbox"/> fail	<input type="checkbox"/> not applicable	<input type="checkbox"/> partly tested
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**Protocol**

Client: NetModule AG

Equipment: NetModule NB800 Rev. B02

Cables connected: NB800 LWWtSu-G (Base); Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS  
 NB800 LWWtScSu-G (COMIO); Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS  
 NB800 LWWtSu2C-G (DualCAN); Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS see § 5.5 & § 6.4

Operating mode: NB800 LWWtSu-G (Base); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write)  
 NB800 LWWtScSu-G (COMIO); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC)  
 NB800 LWWtSu2C-G (DualCAN); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN)  
 Active, see § 6.5

Observation of EUT: Visually and report from the script on PC extern, see § 6.6

Remarks: None

Modifications: ☒ None ☐ 1 ☐ 2

Test site: ☐ SAC3 ☐ SAC5 ☐ SAC10  
☒ Laboratory ☐ Shielded room ☐ Open test site

Test set-up: ☒ table-top equipment ☐ floor-standing equipment



Climatic conditions: Temperature: 23 °C Humidity: 37 % Pressure QFE: 920 hPa

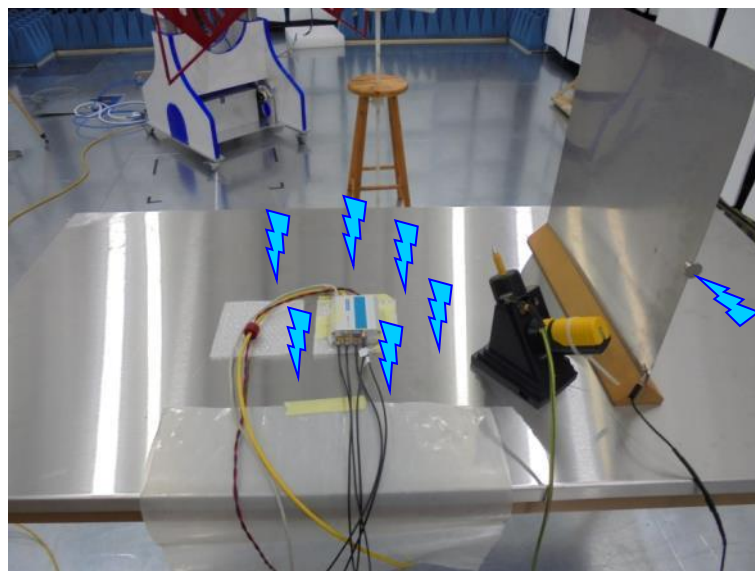
**Requirements**

Standard:	Required level Air discharge: [kV]	Required level Contact discharge: [kV]	Impulses per point, level and polarity:	Perf. criterion:
EN 55035:2017 CISPR 35:2016	±2, ±4, ±8	±4	10	B
EN 61000-6-2:2005 IEC 61000-6-2:2016	±2, ±4, ±8	±4	10	B
ETSI EN 301 489-1 V2.1.1	±2, ±4, ±8	±4	10	B / TT / TR
ETSI EN 301 489-3 V1.6.1	±2, ±4, ±8	±4	10	B / TT / TR
ETSI EN 301 489-17 V3.1.1	±2, ±4, ±8	±4	10	B / TT / TR
Additional requirement	±15 kV	±8 kV	10	B

**Results NB800 LWWtSu-G (Base)**

Protocol: Indirect discharges

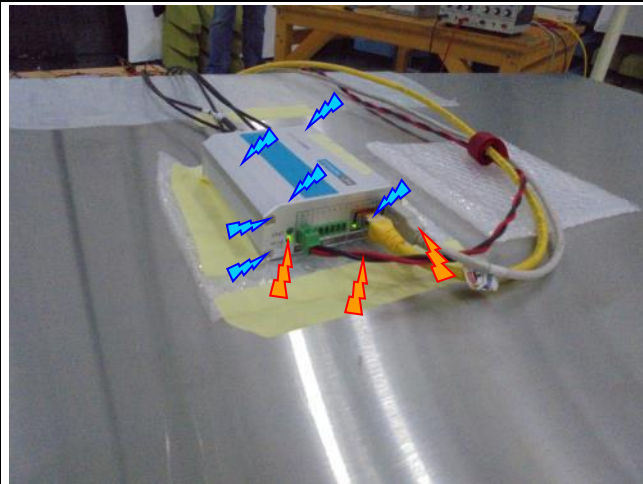
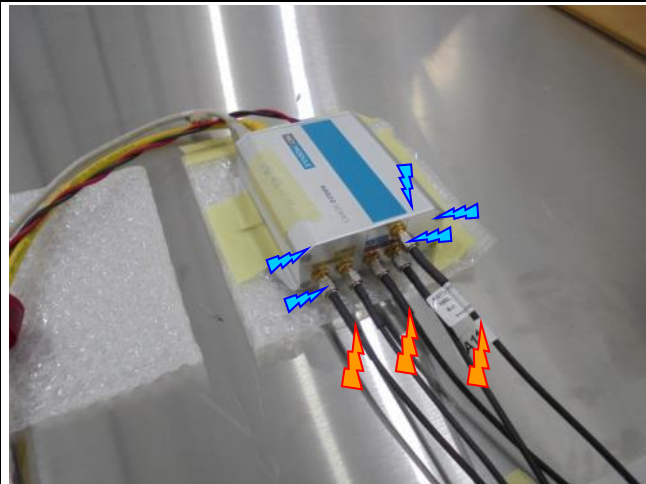
Level [kV]	No of discharges for each point, level and polarity	Discharge air 	cont. 	Result, observation, behaviour of EUT	Fulfilled criterion	Result
$\pm 4; \pm 8$ (on all sides of the EUT)	10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No errors occurred	A	Pass



Tested points

Protocol: direct discharges

Level [kV]	No of discharges for each point, level and polarity	Discharge		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
		air	cont.			
$\pm 4; \pm 6; \pm 8$	10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No errors occurred	A	Pass
$\pm 2; \pm 4; \pm 8; \pm 15$	10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No errors occurred	A	Pass



Tested points

## Results



Tested point	Level [kV]	No of discharges for each point, level and polarity	Discharge		Result, observation, behaviour of EUT	Fulfilled criterion	Result
			air	cont.			
Housing	$\pm 4; \pm 6; \pm 8$	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
Screws	$\pm 4; \pm 6; \pm 8$	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
Connectors	$\pm 4; \pm 6; \pm 8$	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
LEDs	$\pm 2; \pm 4; \pm 8; \pm 15$	> 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass
Cable isolation	$\pm 2; \pm 4; \pm 8; \pm 15$	> 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass

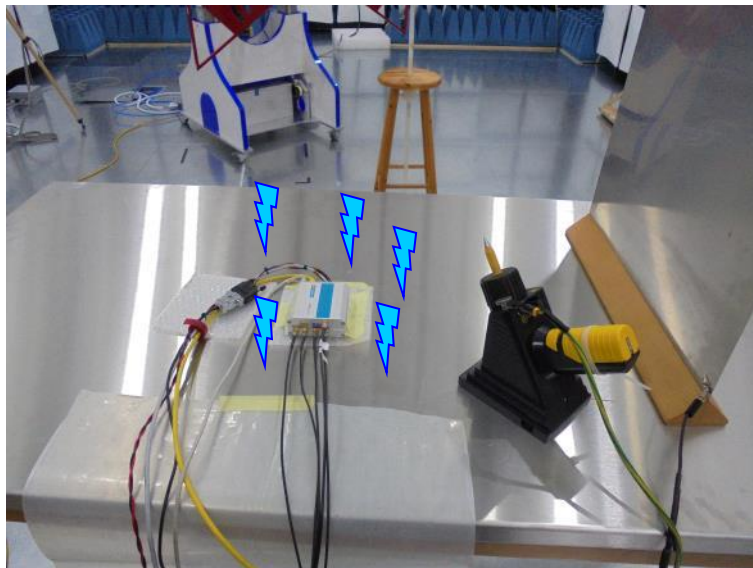
Place and date of test:  
Operator:

Rossens, 2019-11-27  
M. Rodrigues

**Results NB800 LWWtScSu-G (COMIO)**

Protocol: Indirect discharges



Level [kV]	No of discharges for each point, level and polarity	Discharge air 	cont. 	Result, observation, behaviour of EUT	Fulfilled criterion	Result
$\pm 4; \pm 8$ (on all sides of the EUT)	10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No errors occurred	A	Pass

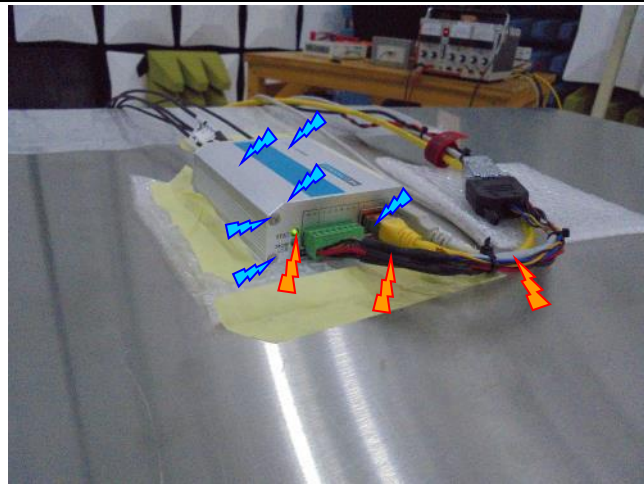
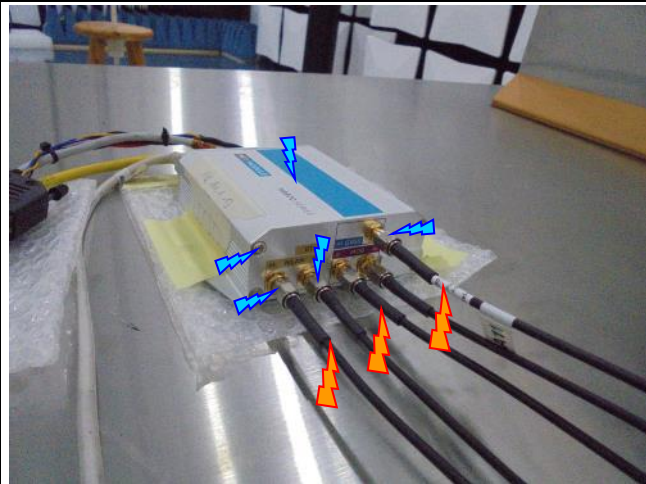


Tested points



Protocol: direct discharges

Level [kV]	No of discharges for each point, level and polarity	Discharge		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
		air 	cont. 			
$\pm 4; \pm 6; \pm 8$	10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No errors occurred	A	Pass
$\pm 2; \pm 4; \pm 8; \pm 15$	10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No errors occurred	A	Pass



Tested points

## Results

Tested point	Level [kV]	No of discharges for each point, level and polarity	Discharge		Result, observation, behaviour of EUT	Fulfilled criterion	Result
			air	cont.			
Housing	$\pm 4; \pm 6; \pm 8$	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
Screws	$\pm 4; \pm 6; \pm 8$	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
Connectors	$\pm 4; \pm 6; \pm 8$	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
LEDs	$\pm 2; \pm 4; \pm 8; \pm 15$	> 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass
Cable isolation	$\pm 2; \pm 4; \pm 8; \pm 15$	> 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass



Place and date of test:  
Operator:

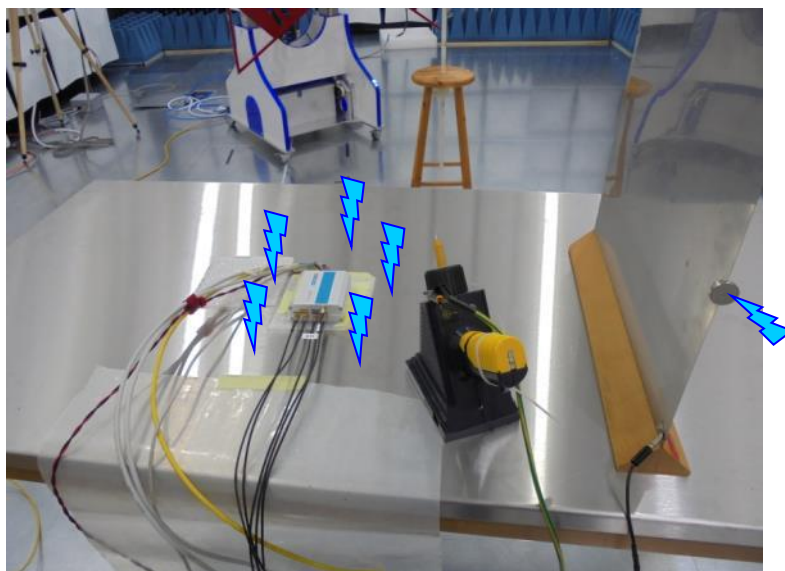
Rossens, 2019-11-27  
M. Rodrigues



**Results NB800 LWWtSu2C-G (DualCAN)**

Protocol: Indirect discharges

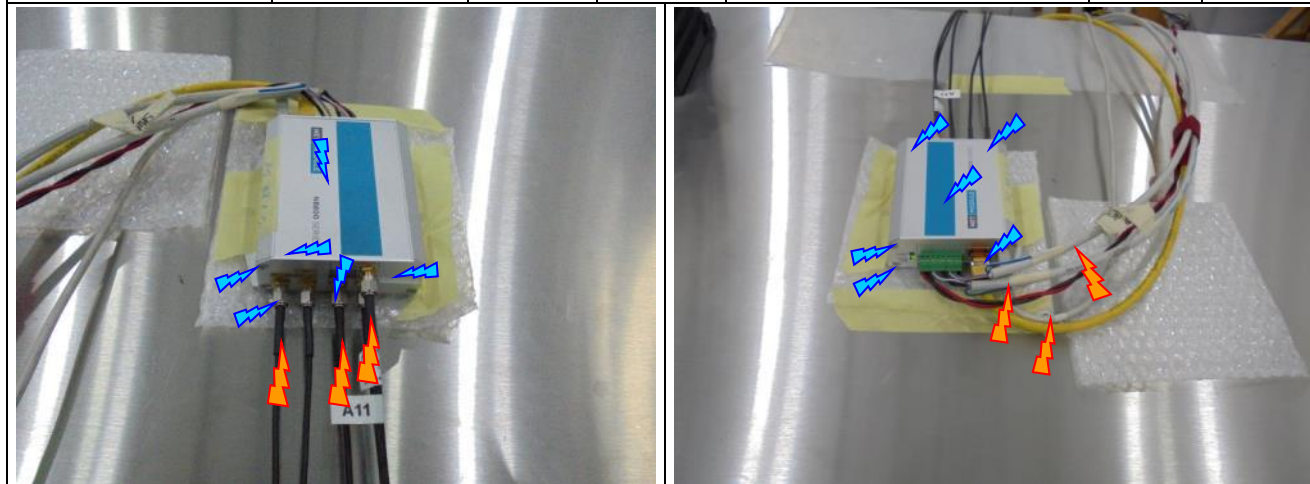
Level [kV]	No of discharges for each point, level and polarity	Discharge air 	cont. 	Result, observation, behaviour of EUT	Fulfilled criterion	Result
$\pm 4$ ; $\pm 8$ (on all sides of the EUT)	10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No errors occurred	A	Pass



Tested points

Protocol: direct discharges

Level [kV]	No of discharges for each point, level and polarity	Discharge		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
		air	cont.			
±4	10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No errors occurred	A	Pass
±2; ±4; ±8; ±15	10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No errors occurred	A	Pass



Tested points

## Results

Tested point	Level [kV]	No of discharges for each point, level and polarity	Discharge		Result, observation, behaviour of EUT	Fulfilled criterion	Result
			air	cont.			
Housing	±4	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
Screws	±4	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
Connectors	±4	> 10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
LEDs	±2; ±4; ±8; ±15	> 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass
Cable isolation	±2; ±4; ±8; ±15	> 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass

Place and date of test:  
Operator:

Rossens, 2019-11-27  
M. Rodrigues

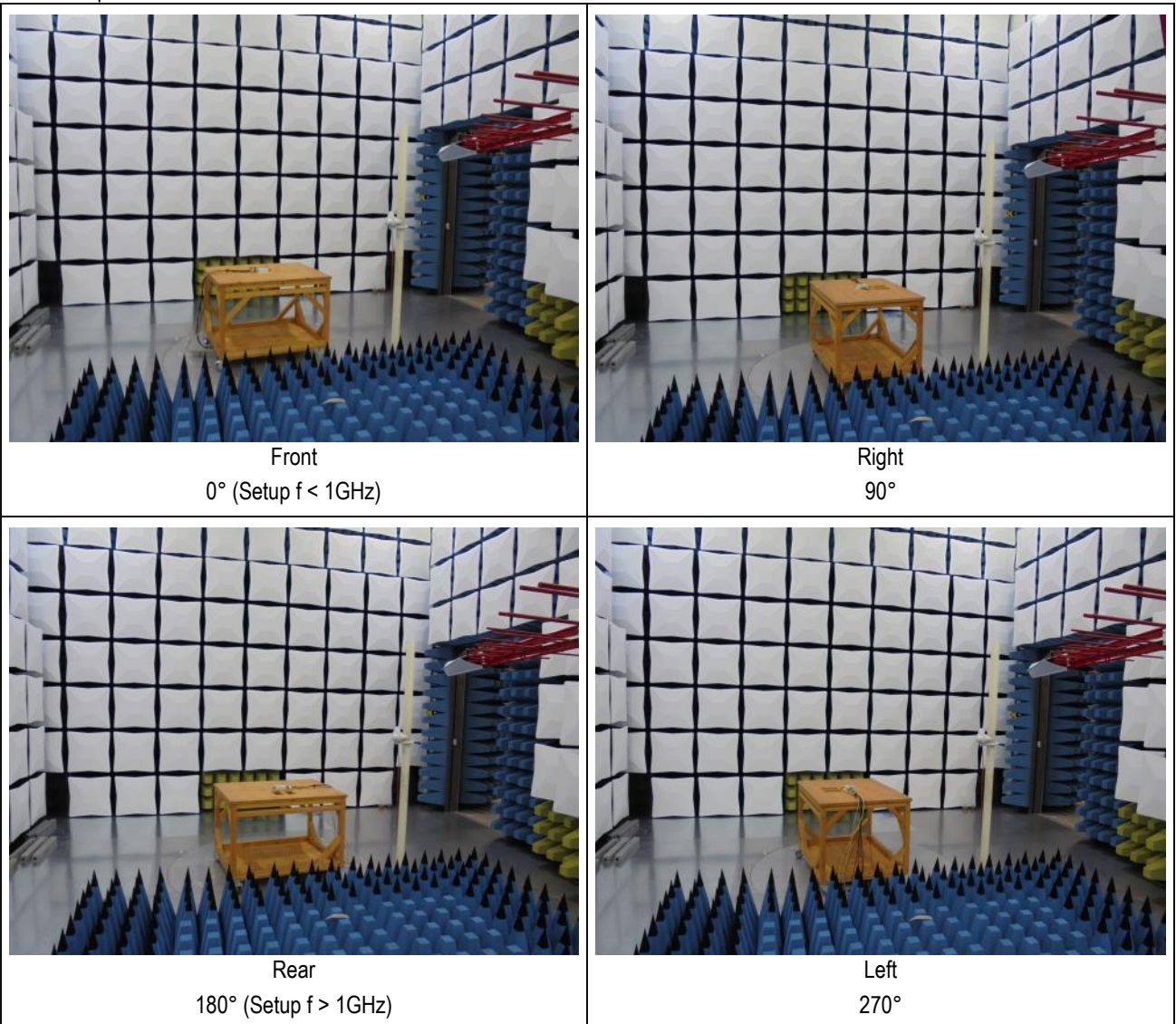
## 8.2 Immunity to electromagnetic fields (antenna) (EN 61000-4-3)

**Introduction:** The aim of this test is to evaluate the performance of the equipment when in the presence of electromagnetic fields created by the transmission of radio or television, by cellular phones or by any other system producing electromagnetic radiation in continuous waves

**Meas. uncertainty:**  $\pm 2.2$  dB

**Test method:** The field is emitted from one or different antennas placed successively in vertical and then in horizontal polarisation. The field is calibrated without the EUT using an isotropic probe.

**Test set-up:**



**Remarks:** None

### Test equipment:

HF-generator	<input checked="" type="checkbox"/> 166388	<input type="checkbox"/> 25200			
Amplifier	<input checked="" type="checkbox"/> 17921	<input checked="" type="checkbox"/> 166639	<input type="checkbox"/> 18230	<input type="checkbox"/> 105488	<input type="checkbox"/> 168576
Field probe	<input type="checkbox"/> 18366	<input type="checkbox"/> 25961	<input type="checkbox"/> 25962	<input checked="" type="checkbox"/> 25963	
Relais Matrix	<input checked="" type="checkbox"/> 18368				
Antenna	<input checked="" type="checkbox"/> 181955	<input type="checkbox"/> 182185			
Field calibration	<input checked="" type="checkbox"/> 1G6 SME06				
Software and Revision	<input checked="" type="checkbox"/> RadiMation 2019.1.5				
Cables	<input checked="" type="checkbox"/> 047, 048, 049, 106B	<input type="checkbox"/> 14846	<input type="checkbox"/> 26712	<input type="checkbox"/> 9879	
Audioanalyzer	<input type="checkbox"/> 105491				

**Result:** ☒ pass ☐ fail ☐ not applicable ☐ partly tested

**Protocol**

Client: NetModule AG

Equipment: NetModule NB800 Rev. B02

Cables connected: NB800 LWWtSu-G (Base); Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS  
 NB800 LWWtScSu-G (COMIO); Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS  
 NB800 LWWtSu2C-G (DualCAN); Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS see § 5.5 & § 6.4

Operating mode: NB800 LWWtSu-G (Base); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write)  
 NB800 LWWtScSu-G (COMIO); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC)  
 NB800 LWWtSu2C-G (DualCAN); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN)  
 Active, see § 6.5

Observation of EUT: Visually and report from the script on PC extern, see § 6.6

Remarks: None

Modifications: ☒ None ☐ 1 ☐ 2

Test site: ☐ SAC3 ☒ SAC5 ☐ SAC10  
☐ Laboratory ☐ Shielded room ☐ Open test site

Position of EUT: 0.8 m (height of the equipment under test above floor)

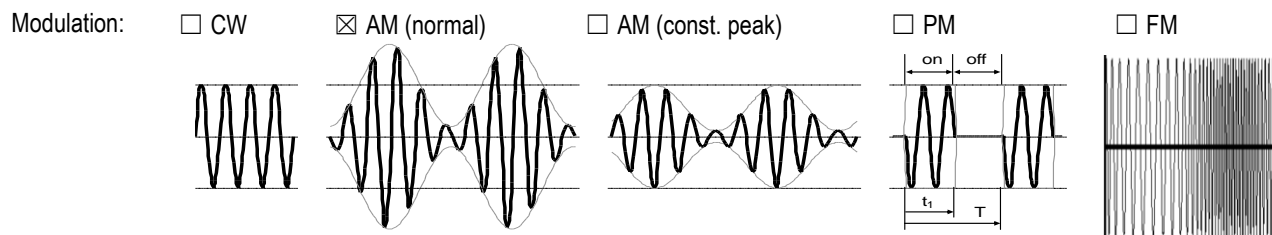
Climatic conditions: Temperature: 22 °C Humidity: 35 % Pressure QFE: 929 hPa

**Requirements**

Standard:	Frequency range: [MHz]	Req. level [V/m]:	Modulation:	Dwell time: [s]	Freq. step: [%]	Perf. crit.:
EN 55035:2017 CISPR 35:2016	80 – 1000 80, 120, 160, 230, 434, 460, 600, 863, 900 1800, 2600, 3500, 5000	3* 3** 3	AM, 1 kHz, 80% AM, 1 kHz, 80% AM, 1 kHz, 80%		1* - -	A A A
EN 61000-6-2:2005 IEC 61000-6-2:2005	80 – 1000 1400 – 2000 2000 – 2700	10 3 1	AM, 1 kHz, 80 % AM, 1 kHz, 80 % AM, 1 kHz, 80 %	≥1 ≥1 ≥1	1 1 1	A A A
IEC 61000-6-2:2016	80 – 1000 1400 – 6000	10 3	AM, 1 kHz, 80 % AM, 1 kHz, 80 %	≥1 ≥1	1 1	A A
ETSI EN 301 489-1 V2.1.1	80 – 6000	3	AM, 1 kHz, 80 % ev. AM, 400 Hz, 80 %		1	A / CT / CR
ETSI EN 301 489-17 V3.1.1	80 – 6000	3	AM, 1 kHz, 80 % ev. AM, 400 Hz, 80 %		1	A / CT / CR
Additional requirement	80 – 1000 1000 – 6000	20 10	AM, 1 kHz, 80 % AM, 1 kHz, 80 %	2-3 2-3	1 1	A A

\* Freq.step may be 4% if test level is 6 V/m (§4.2.2.1 EN 55035:2017 / CISPR 35:2016)

\*\* Testing in this frequency range is required if the primary function of the device is telephony.



**Results NB800 LWWtSu-G (Base)**

Frequency [MHz]	E [V/m]	Polarisation	Direction	Dwell time [s]	Freq. step [%]	Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
80 – 1000	20	hor. & vert.	Front 0°	3	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Right 90°	2	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Rear 180°	2	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Left 270°	3	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Front 0°	3	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Right 90°	2	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Rear 180°	2	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Left 270°	3	1	No influence observed	A	Pass

**Results NB800 LWWtScSu-G (COMIO)**

Frequency [MHz]	E [V/m]	Polarisation	Direction	Dwell time [s]	Freq. step [%]	Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
80 – 1000	20	hor. & vert.	Front 0°	3	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Right 90°	2	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Rear 180°	2	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Left 270°	3	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Front 0°	3	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Right 90°	2	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Rear 180°	2	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Left 270°	3	1	No influence observed	A	Pass

**Results NB800 LWWtSu2C-G (DualCAN)**

Frequency [MHz]	E [V/m]	Polarisation	Direction	Dwell time [s]	Freq. step [%]	Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
80 – 1000	20	hor. & vert.	Front 0°	3	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Right 90°	2	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Rear 180°	2	1	No influence observed	A	Pass
80 – 1000	20	hor. & vert.	Left 270°	3	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Front 0°	3	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Right 90°	2	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Rear 180°	2	1	No influence observed	A	Pass
1000 – 6000	10	hor. & vert.	Left 270°	3	1	No influence observed	A	Pass

Place and date of test:  
Operator:

Rossens, 2019-11-26  
Mr M. Rodrigues

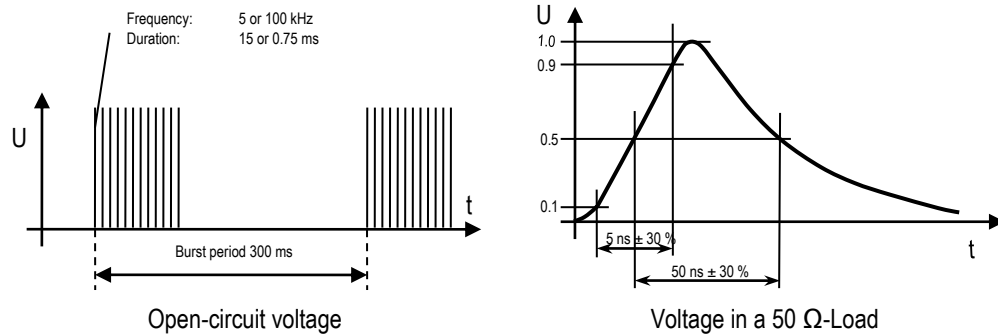


### 8.3 Immunity to fast electric transients (EN 61000-4-4)

#### Introduction:

The test is intended to demonstrate the immunity when subjected to types of transient disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce, etc.). This test is also known as "burst".

#### Pulse:



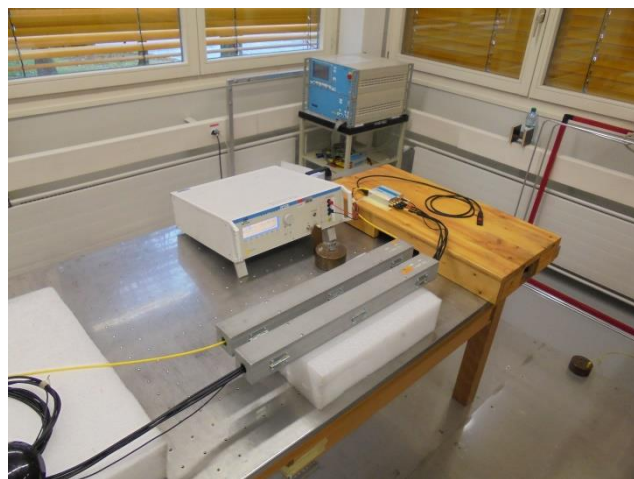
Meas. Uncertainty:

$\pm 10 \%$

#### Test method:

The transient coupling is carried out using a coupling network for the supply cables and a capacitive coupling clamp for the other cables. The two voltage polarities and all the intermediate levels are tested.

#### Test set-up:



Coupling with CDN (power port)



Coupling with clamp (Ethernet)

#### Remarks:

None

#### Test equipment:

Burst generator	<input type="checkbox"/> 92-05	<input type="checkbox"/> 00-35	<input type="checkbox"/> 03-19	<input type="checkbox"/> 03-53	<input checked="" type="checkbox"/> 05-96	<input type="checkbox"/> 07-21	<input type="checkbox"/> 15-14A
Capacitive coupling clamp	<input type="checkbox"/> 88-07	<input type="checkbox"/> 94-77	<input type="checkbox"/> 05-02	<input checked="" type="checkbox"/> 05-03			
Coupling network	<input type="checkbox"/> 03-54	<input type="checkbox"/> 03-76	<input type="checkbox"/> 07-21	<input type="checkbox"/> 07-27	<input type="checkbox"/> 15-14B		
Digital oscilloscope	<input type="checkbox"/> 90-14	<input type="checkbox"/> 93-85	<input type="checkbox"/> 93-86	<input type="checkbox"/> 01-20	<input type="checkbox"/> 04-06	<input type="checkbox"/> 04-50	<input type="checkbox"/> 05-22
	<input type="checkbox"/> 05-28	<input type="checkbox"/> 05-44	<input type="checkbox"/> 06-46	<input type="checkbox"/> 06-64			
Probe	<input type="checkbox"/> 93-64	<input type="checkbox"/> 06-19					
Artificial hand	<input type="checkbox"/> 10-45	<input type="checkbox"/> 10-45b	<input type="checkbox"/> 10-45c	<input type="checkbox"/> 10-45d	<input type="checkbox"/> 10-45e		
	<input type="checkbox"/> 10-58	<input type="checkbox"/> 10-58b	<input type="checkbox"/> 10-58c	<input type="checkbox"/> 10-58d	<input type="checkbox"/> 10-58e		

#### Result:

☒ pass

☐ fail

☐ not applicable

☐ partly tested

**Protocol**

Client: NetModule AG

Equipment: NetModule NB800 Rev. B02

Cables connected: NB800 LWWtSu-G (Base); Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS  
 NB800 LWWtScSu-G (COMIO); Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS  
 NB800 LWWtSu2C-G (DualCAN); Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS see § 5.5 & § 6.4

Operating mode: NB800 LWWtSu-G (Base); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write)  
 NB800 LWWtScSu-G (COMIO); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC)  
 NB800 LWWtSu2C-G (DualCAN); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN)  
 Active, see § 6.5

Observation of EUT: Visually and report from the script on PC extern, see § 6.6

Remarks: None

Modifications: ☒ None ☐ 1 ☐ 2

Test site: ☐ SAC3 ☐ SAC5 ☐ SAC10  
☒ Laboratory ☐ Shielded room ☐ Open test site

Climatic conditions: Temperature: 23 °C Humidity: 32 % Pressure QFE: 927 hPa

**Requirements**

Standard :	Req. level AC supply: [kV]	Req. level DC supply: [kV]	Req. level Signal: [kV]	Prot. Earth : [kV]	Burst- freq. [kHz]	Perf. crit.:
EN 55035:2017	±1	±0.5	±0.5	.....	5	B
CISPR 35:2016						
EN 61000-6-2:2005	±2	±2	±1	.....	5	B
IEC 61000-6-2:2005						
IEC 61000-6-2:2016	±2	±1	±1		5 or 100	B
ETSI EN 301 489-1 V2.1.1	±1	±0.5	±0.5	-	5	B / TT / TR
ETSI EN 301 489-3 V1.6.1	±1	±0.5	±0.5	-	5	B / TT / TR
ETSI EN 301 489-17 V3.1.1	±1	±0.5	±0.5	-	5 (100 for xDSL)	B / TT / TR
Additional requirement	--	±3	±1		5, 100	B

**Results NB800-LWWtSu-G (Base)** (Settings Duration 1 min, Burst-Frequency 5 kHz)

Tested port	Level [kV]	Coupling clamp direct		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
Power 12 VDC	$\pm 2, \pm 3$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
Ethernet	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass
2xMobile, 2xWIFI, GNSS	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass

**Results NB800-LWWtSu-G (Base)** (Settings Duration 1 min, Burst-Frequency 100 kHz)

Tested port	Level [kV]	Coupling clamp direct		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
Power 12 VDC	$\pm 2, \pm 3$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
Ethernet	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass
2xMobile, 2xWIFI, GNSS	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass

Not tested port	Explanation
USB port	Shorter than 3 m

**Results NB800-LWWtScSu-G (COMIO)** (Settings Duration 1 min, Burst-Frequency 5 kHz)

Tested port	Level [kV]	Coupling clamp direct		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
Power 12 VDC	$\pm 2, \pm 3$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
RS485/RS232	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass
Digital In / Out	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass

**Results NB800-LWWtScSu-G (COMIO)** (Settings Duration 1 min, Burst-Frequency 100 kHz)

Tested port	Level [kV]	Coupling clamp direct		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
Power 12 VDC	$\pm 2, \pm 3$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
RS485/RS232	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass
Digital In / Out	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass

Not tested port	Explanation
USB port	Shorter than 3 m
2xMobile, 2xWIFI, GNSS, Ethernet	Already tested with Base EUT



**Results NB800-LWWtSu2C-G (DualCAN)** (Settings Duration 1 min, Burst-Frequency 5 kHz)

Tested port	Level [kV]	Coupling clamp direct		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
Power 12 VDC	$\pm 2, \pm 3$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
2xCAN	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass

**Results NB800-LWWtSu2C-G (DualCAN)** (Settings Duration 1 min, Burst-Frequency 100 kHz)

Tested port	Level [kV]	Coupling clamp direct		Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
Power 12 VDC	$\pm 2, \pm 3$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No influence observed	A	Pass
2xCAN	$\pm 1$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No influence observed	A	Pass

Not tested port	Explanation
USB port	Shorter than 3 m
2xMobile, 2xWIFI, GNSS, Ethernet	Already tested with Base EUT

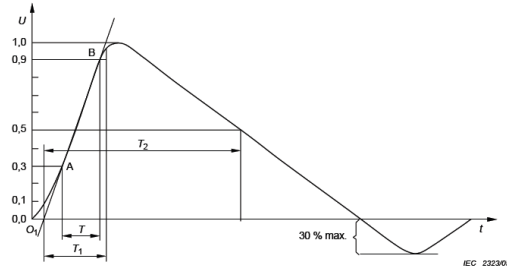
Place and date of test:  
Operator:

Rossens, 2019-11-29  
M. Rodrigues

## 8.4 Immunity to surge (EN 61000-4-5: 1.2/50 $\mu$ s)

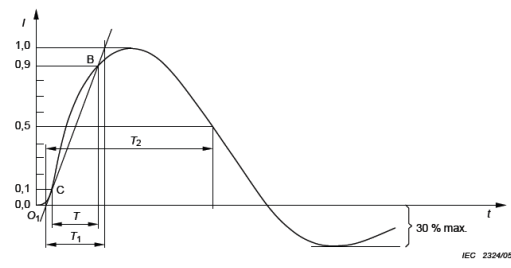
**Introduction:** The aim of the test is to determine the immunity of the material submitted to non repetitive transient overvoltage created by lightning.

**Impulses:**



Front time:  $T_1 = 1,67 \times T = 1,2 \mu s \pm 30 \%$   
Time to half-value:  $T_2 = 50 \mu s \pm 20 \%$

Open-circuit voltage



Front time:  $T_1 = 1,25 \times T = 8 \mu s \pm 20 \%$   
Time to half-value:  $T_2 = 20 \mu s \pm 20 \%$

Short-circuit current

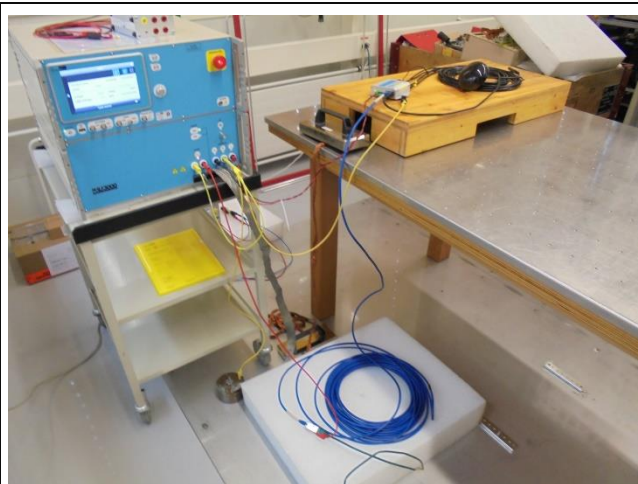
**Meas. Uncertainty:**  $\pm 10 \%$

**Measuring method:** The impulses are coupled using the coupling network where the supply lines and unshielded cables are concerned. The shielded cables are coupled directly. The two polarities and different phase angles are tested for all the test levels up until the specified level.

**Test set-up:**



Coupling on AC power port of power adapter



Coupling on Ethernet

**Remarks:** None

### Test equipment:

Generator	<input checked="" type="checkbox"/> 18-LaBe-11	<input type="checkbox"/> 92-07	<input type="checkbox"/> 94-30	<input type="checkbox"/> 04-34	<input type="checkbox"/> 07-22	<input type="checkbox"/> 15-14A
Pulser-module	<input type="checkbox"/> 92-54	<input type="checkbox"/> 95-41	<input type="checkbox"/> 95-42	<input type="checkbox"/> 04-35		
Coupling network	<input type="checkbox"/> 93-13	<input type="checkbox"/> 93-14	<input type="checkbox"/> 93-15	<input type="checkbox"/> 93-16	<input type="checkbox"/> 04-33	<input type="checkbox"/> 04-36
	<input type="checkbox"/> 07-27	<input type="checkbox"/> 15-14B				<input type="checkbox"/> 07-22
Coupling Capacitor	<input type="checkbox"/> 15-12					
Digital oscilloscope	<input type="checkbox"/> 90-14	<input type="checkbox"/> 93-85	<input type="checkbox"/> 93-86	<input type="checkbox"/> 01-20	<input type="checkbox"/> 04-06	<input type="checkbox"/> 04-50
	<input type="checkbox"/> 05-28	<input type="checkbox"/> 05-44	<input type="checkbox"/> 06-46	<input type="checkbox"/> 06-64		<input type="checkbox"/> 05-22
Probe	<input type="checkbox"/> 93-64	<input type="checkbox"/> 06-19				

**Result:** ☒ pass ☐ fail ☐ not applicable ☐ partly tested

**Protocol**

Client: NetModule AG

Equipment: NetModule NB800 Rev. B02

Cables connected: NB800 LWWtSu-G (Base); Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS  
NB800 LWWtScSu-G (COMIO); Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS  
NB800 LWWtSu2C-G (DualCAN); Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS see § 5.5 & § 6.4

Operating mode: NB800 LWWtSu-G (Base); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write)  
NB800 LWWtScSu-G (COMIO); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC)  
NB800 LWWtSu2C-G (DualCAN); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN)  
Active, see § 6.5

Observation of EUT: Visually and report from the script on PC extern, see § 6.6

Remarks: None

Modifications: ☒ None      ☐ 1      ☐ 2

Test site: ☐ SAC3      ☐ SAC5      ☐ SAC10  
☒ Laboratory      ☐ Shielded room      ☐ Open test site

Climatic conditions: Temperature: 22.4 °C      Humidity: 36 %      Pressure QFE: 923 hPa

**Requirements**

Standard :	Required level AC-supply: [kV]		Required level DC-supply: [kV]		Required level Signal: [kV]		Perf. crit.:
	L – L 2 $\Omega$ + 18 $\mu$ F	L – PE 12 $\Omega$ + 9 $\mu$ F	L – L 2 $\Omega$ + 18 $\mu$ F	L – PE 12 $\Omega$ + 9 $\mu$ F	L – L 42 $\Omega$ + 0.5 $\mu$ F N/A to shielded cables	L – PE 42 $\Omega$ + 0.5 $\mu$ F Shield – PE 2 $\Omega$ + 18 $\mu$ F	
EN 55035:2017 CISPR 35:2016	$\pm 0.5, \pm 1$	$\pm 0.5, \pm 1, \pm 2$	---	$\pm 0.5^{1)}$	$\pm 0.5, \pm 1$	$\pm 0.5, \pm 1 / \pm 0.5, \pm 1, \pm 2; \pm 4^{2)}$	B
EN 61000-6-2:2005 IEC 61000-6-2:2005	$\pm 0.5, \pm 1$	$\pm 0.5, \pm 1, \pm 2$	$\pm 0.5^{****}$	$\pm 0.5^{****}$	---	$\pm 0.5, \pm 1$	B
IEC 61000-6-2:2016	$\pm 0.5, \pm 1$	$\pm 0.5, \pm 1, \pm 2$	$\pm 0.5^{****}$	$\pm 0.5, \pm 1^{****}$	---	$\pm 0.5, \pm 1$	B
ETSI EN 301 489-1 V2.1.1	$\pm 0.5, \pm 1$ In telecom centres: $\pm 0.5$	$\pm 0.5, \pm 1, \pm 2$ In telecom centres: $\pm 1.0$	---	---	---	Telecom ports: Indoor cables >10m and in telecom centres: $\pm 0.5$ Outdoor cables: $\pm 0.5, \pm 1$	B / TT / TR
ETSI EN 301 489-3 V1.6.1	$\pm 0.5, \pm 1$ In telecom centres: $\pm 0.5$	$\pm 0.5, \pm 1, \pm 2$ In telecom centres: $\pm 1.0$	---	---	---	Telecom ports: Indoor cables >10m and in telecom centres: $\pm 0.5$ Outdoor cables: $\pm 0.5, \pm 1$	B / TT / TR
ETSI EN 301 489-17 V3.1.1	$\pm 1$ In telecom centres: $\pm 0.5$	$\pm 2$ In telecom centres: $\pm 1$	---	---	---	Telecom ports: Indoor cables >10m and in telecom centres: $\pm 0.5$ Outdoor cables: $\pm 1$	B / TT / TR

\*\*\*\* DC ports which are not intended to be connected to a DC distribution network shall be tested as signal ports.

Applicable only to ports which according to the manufacturer's specification may connect directly to outdoor cables.

<sup>1)</sup> Excluding equipment marketed with a a.c./d.c. power converter

<sup>2)</sup> With primary protectors fitted

**Results NB800-LWWtSu-G (Base)**

Tests on AC power ports, 12 V Power Supply

Tested port	Level [kV]	Coupling	Number of pulses*				Result, Observation, Behaviour of EUT	Fulfilled criterion	Result
			0°	90°	180°	270°			
AC power port, L - N	±0.5; ±1	2 Ω + 18 µF	5	5	5	5	No influence observed	A	Pass
AC power port, L – Ref	±0.5; ±1; ±2	12 Ω + 9 µF	5	5	5	5	No earth connection	A	N/A
AC power port, N - Ref	±0.5; ±1; ±2	12 Ω + 9 µF	5	5	5	5	No earth connection	A	N/A

\* Number of pulses for each voltage level and each polarity

Tests on DC power ports

Tested port	Level [kV]	Coupling mode	Coupling network	Number of pulses *	Remarks	Fulfilled Criterion	Result
Power 18V DC	±0.5	Plus – Minus	2 Ω + 18 µF	5	No influence observed	A	Pass
	±0.5; ±1	P, M – Ref	12 Ω + 9 µF	5	No influence observed	A	Pass

\* Number of pulses for each voltage level and each polarity

Tests on LAN ports with shielded cable

Tested port	Level [kV]	Coupling mode	Coupling network	Number of pulses *	Remarks	Fulfilled Criterion	Result
LAN port	±0.5; ±1	Screen - PE	2 Ω	5	No influence observed	A	Pass

\* Number of pulses for each voltage level and each polarity

Not tested port	Explanation
USB, 2xMobile, 2xWIFI, GNSS	Shorter than 30 m

**Results NB800-LWWtScSu-G (COMIO)**

Tests on DC power ports

Tested port	Level [kV]	Coupling mode	Coupling network	Number of pulses *	Remarks	Fulfilled Criterion	Result
Power 18V DC	±0.5	Plus – Minus	2 Ω + 18 µF	5	No influence observed	A	Pass
	±0.5; ±1	P, M – Ref	12 Ω + 9 µF	5	No influence observed	A	Pass

\* Number of pulses for each voltage level and each polarity

Tests on signal ports / powered signal ports, operating mode: Routing.

Tested port	Level [kV]	Coupling mode	Coupling network	Number of pulses *	Remarks	Fulfilled Criterion	Result
RS485/RS232 (Rx, Tx)	±0.5; ±1	Rx – Ref	42 Ω + 0.5 µF	5	No influence observed	A	Pass
	±0.5; ±1	Tx – Ref	42 Ω + 0.5 µF	5	No influence observed	A	Pass
Input Output **	±0.5; ±1	Pin3 – Ref	42 Ω + 0.5 µF	5	No influence observed	A	Pass
	±0.5; ±1	Pin6 - Ref	42 Ω + 0.5 µF	5	No influence observed	A	Pass

\* Number of pulses for each voltage level and each polarity

\*\* Pin4 connected to Pin5

Not tested port	Explanation
Power 230 VAC	Already tested with Base EUT
LAN port	Already tested with Base EUT
USB, 2xMobile, 2xWIFI, GNSS	Shorter than 30 m

**Results NB800-LWWtSu2C-G (DualCAN)**

Tests on DC power ports

Tested port	Level [kV]	Coupling mode	Coupling network	Number of pulses *	Remarks	Fulfilled Criterion	Result
Power 18V DC	±0.5	Plus – Minus	2 $\Omega$ + 18 $\mu$ F	5	No influence observed	A	Pass
	±0.5; ±1	P, M – Ref	12 $\Omega$ + 9 $\mu$ F	5	No influence observed	A	Pass

\* Number of pulses for each voltage level and each polarity

Tests on CAN ports with shielded cable (tested with cable length 3 m)

Tested port	Level [kV]	Coupling mode	Coupling network	Number of pulses *	Remarks	Fulfilled Criterion	Result
CAN port (1, 2, 3)	±0.5; ±1	Screen - PE	2 $\Omega$	5	No influence observed	A	Pass
CAN port (4, 5, 6)	±0.5; ±1	Screen - PE	2 $\Omega$	5	No influence observed	A	Pass

\* Number of pulses for each voltage level and each polarity

Not tested port	Explanation
Power 230 VAC	Already tested with Base EUT
LAN port	Already tested with Base EUT
USB, 2xMobile, 2xWIFI, GNSS Partly tested CAN port	Shorter than 30 m

Place and date of test:  
Operator:

Rossens, 2019-11-28 & 2019-11-29  
Mr F. Wyler & Mr M. Rodrigues

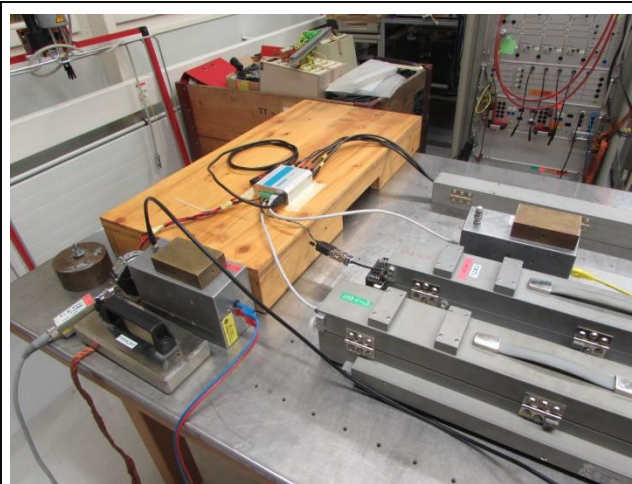
**8.5 Immunity to conducted disturbances induced by radio-frequency fields (EN 61000-4-6)**

**Introduction:** The object of this test is to determine the immunity of equipment when subjected to conducted disturbances coming from intended radiofrequency transmitters. These disturbances can be found as common mode currents on the conductors and the screens of the cables.

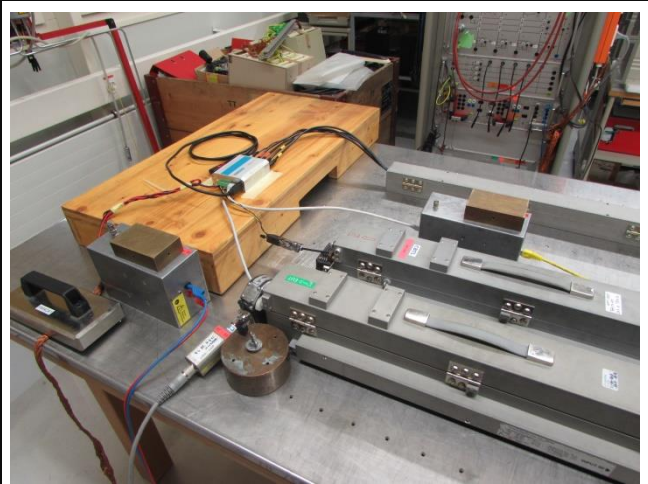
**Meas. Uncertainty:**  $\pm 1.85$  dB

**Measuring method:** The HF voltage is injected on the cables using different coupling/decoupling networks. All connected cables shall be provided with the appropriate coupling and decoupling devices. The voltage is calibrated without the equipment under test. The Dwell time is depending on the reaction time of the tested equipment.

**Test set-up:**



Coupling with CDN



Coupling with clamp

**Remarks:** None

**Test equipment:**

HF-generator	<input type="checkbox"/> 03-39	<input checked="" type="checkbox"/> 04-03	<input type="checkbox"/> 07-02	<input type="checkbox"/> 07-04	<input type="checkbox"/> 13-16	<input type="checkbox"/> 15-09	<input type="checkbox"/> 15-21
Amplifier	<input type="checkbox"/> 88-15	<input type="checkbox"/> 88-19	<input type="checkbox"/> 00-49	<input checked="" type="checkbox"/> 11-21			
Power attenuator	<input type="checkbox"/> 95-18	<input type="checkbox"/> 99-23	<input checked="" type="checkbox"/> 09-42	<input type="checkbox"/> 04-07			
HF-power meter	<input type="checkbox"/> 95-97	<input type="checkbox"/> 01-15	<input type="checkbox"/> 01-17	<input type="checkbox"/> 03-12	<input type="checkbox"/> 04-96	<input type="checkbox"/> 05-20	<input checked="" type="checkbox"/> 05-73
Power sensor	<input type="checkbox"/> 92-03	<input type="checkbox"/> 05-74	<input type="checkbox"/> 05-88	<input checked="" type="checkbox"/> 07-03	<input type="checkbox"/> 09-03	<input type="checkbox"/> 09-04	<input type="checkbox"/> 10-27
	<input type="checkbox"/> 10-28	<input type="checkbox"/> 12-11					
Current clamp	<input type="checkbox"/> 8266						
Coupling networks	<input checked="" type="checkbox"/> 95-108	<input checked="" type="checkbox"/> 05-07					
Electromagnetic clamp	<input checked="" type="checkbox"/> 88-26	<input checked="" type="checkbox"/> 96-24					
Cables	<input type="checkbox"/> 13-10 (136, 205, 210, 234)	<input checked="" type="checkbox"/> 13-11 (202, 215, 217)					
Artificial hand	<input type="checkbox"/> 10-45	<input type="checkbox"/> 10-45b	<input type="checkbox"/> 10-45c	<input type="checkbox"/> 10-45d	<input type="checkbox"/> 10-45e		
	<input type="checkbox"/> 10-58	<input type="checkbox"/> 10-58b	<input type="checkbox"/> 10-58c	<input type="checkbox"/> 10-58d	<input type="checkbox"/> 10-58e		
Software and Revision	<input checked="" type="checkbox"/> RadiMation 2015.1.7						

**Result:** ☒ pass ☐ fail ☐ not applicable ☐ partly tested



**Protocol**

Client: NetModule AG

Equipment: NetModule NB800 Rev. B02

Cables connected: NB800 LWWtSu-G (Base); Power 12 VDC, Ethernet, USB stick, 2x WLAN, 2x Mob, GNSS  
 NB800 LWWtScSu-G (COMIO); Power 12 VDC, Ethernet, RS232 (console), 1x Input, 1x Output, USB stick, 2x WLAN, 2x Mob, GNSS  
 NB800 LWWtSu2C-G (DualCAN); Power 12 VDC, Ethernet, 2x CAN, USB stick, 2x WLAN, 2x Mob, GNSS see § 5.5 & § 6.4

Operating mode: NB800 LWWtSu-G (Base); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write)  
 NB800 LWWtScSu-G (COMIO); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Console, Output to input; 12VDC)  
 NB800 LWWtSu2C-G (DualCAN); Test script (Routing, RAM-Test, Ping via Ethernet & Mobile, USB Stick read/write, Loop over CAN)  
 Active, see § 6.5

Observation of EUT: Visually and report from the script on PC extern, see § 6.6

Remarks: None

Modifications: ☒ None ☐ 1 ☐ 2

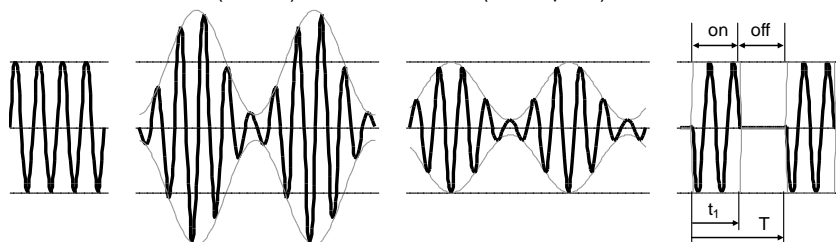
Test site: ☐ SAC3 ☐ SAC5 ☐ SAC10  
☒ Laboratory ☐ Shielded room ☐ Open test site

Climatic conditions: Temperature: 22.4 °C Humidity: 36 % Pressure QFE: 923 hPa (2019-11-28)  
 Temperature: 23 °C Humidity: 32 % Pressure QFE: 923 hPa (2019-11-29)

**Requirements**

Standard:	Frequency range: [MHz]	Required level: [V <sub>EMF</sub> ]	Modulation:	Dwell time: [s]	Freq. step: [%]	Perf. crit.:
EN 55035:2017 CISPR 35:2016	0.15 – 10 10 – 30 30 – 80 Check Standard for Telephony Terminal equipment (Annex A)	3 3 to 1 1	AM, 1 kHz, 80 % AM, 1 kHz, 80 % AM, 1 kHz, 80 %		1	A
EN 61000-6-2:2005 IEC 61000-6-2:2016	0.15 – 80	10	AM, 1 kHz, 80 %		≥1	A
ETSI EN 301 489-1 V2.1.1	0.15 – 80	3	AM, 1 kHz, 80 % ev. AM, 400 Hz, 80 %		≥1	A / CT / CR
EN 301 489-3 V1.6.1:2013 Type 1 and 2	0.15 – 80	3	AM, 1 kHz, 80 % ev. AM, 400 Hz, 80 %		≥1	A / CT / CR
EN 301 489-3 V1.6.1:2013 Type 3	0.15 – 5	3	AM, 1 kHz, 80 % ev. AM, 400 Hz, 80 %		≥1	A / CT / CR
	5 – 80	3	AM, 1 kHz, 80 % ev. AM, 400 Hz, 80 %		≥1	A / CT / CR
ETSI EN 301 489-17 V3.1.1	0.15 - 80	3	AM, 1 kHz, 80 % ev. AM, 400 Hz, 80 %		≥1	A / CT / CR

Signal modulation:

☐ CW☒ AM (normal)☐ AM (const. peak)☐ PM



**Test Results NB800-LWWtSu-G (Base)** (Frequency 0.15 – 80 MHz): Running

Coupling	CDN	Terminated (50 Ω)	CDN	Level [V]	Dwell time [s]	Result, Observation, Behaviour of EUT	Fulfilled crit.	Result
Power 12 VDC	05-07	Ethernet	95-108	10	1	No influence observed	A	Pass
Ethernet	95-108	Power 12 VDC	05-07	10	1	No influence observed	A	Pass
2xMobile, 2xWIFI, GNSS	88-26	Power 12 VDC	05-07	10	1	No influence observed	A	Pass

Not tested port	Explanation
USB port	Not longer than 3 m

**Test Results NB800-LWWtScSu-G (COMIO)** (Frequency 0.15 – 80 MHz): Running

Coupling	CDN	Terminated (50 Ω)	CDN	Level [V]	Dwell time [s]	Result, Observation, Behaviour of EUT	Fulfilled crit.	Result
Power 12 VDC	05-07	Ethernet	95-108	10	1	No influence observed	A	Pass
RS485/RS232	88-26	Power 12 VDC	05-07	10	1	No influence observed	A	Pass
Digital In / Out	96-24	Power 12 VDC	05-07	10	1	No influence observed	A	Pass

Not tested port	Explanation
USB port	Not longer than 3 m
2xMobile, 2xWIFI, GNSS, Ethernet	Already tested with Base EUT

**Test Results NB800-LWWtSu2C-G (DualCAN)** (Frequency 0.15 – 80 MHz): Running

Coupling	CDN	Terminated (50 Ω)	CDN	Level [V]	Dwell time [s]	Result, Observation, Behaviour of EUT	Fulfilled crit.	Result
Power 12 VDC	05-07	Ethernet	95-108	10	1	No influence observed	A	Pass
2xCAN	88-26	Power 12 VDC	05-07	10	1	No influence observed	A	Pass

Not tested port	Explanation
USB port	Not longer than 3 m
2xMobile, 2xWIFI, GNSS, Ethernet	Already tested with Base EUT

Place and date of test:  
Operator:

Rossens, 2019-11-28 and 2019-11-29  
Mr F. Wyler & Mr M. Rodrigues

## 9 Modifications on the EUT

No modifications