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STS 0001

Schweizerischer Prüfstellendienst
Service suisse d'essai
Swiss testing service



Report:	Electromagnetic Compatibility		Report no:	15-EL-0364.E01
Product name:	NB3700		Date of test:	October 23 – November 10, 2015
Applicant:	NetModule AG Meriedweg 11 3172 Niederwangen bei Bern Switzerland	Model no:	NB3700-LWPb-G	
Manufacturer:	NetModule AG	Serial no:	00112B00F762	

Standards		Result
EN 50121-3-2 : 2015	Railway applications - EMC - Part 3-2: Rolling stock - Apparatus	Pass
EN 50155 : 2007	Railway applications – Electronic equipment used on rolling stock	See § 2
EN 55022 : 2010	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement: Class B	Pass
EN 61000-6-2 : 2005	EMC - Part 6-2: Generic standards - Immunity for industrial environments	Pass
EN 301 489-1 V1.9.2	Electromagnetic compatibility and Radio spectrum Matters (ERM); EMC standard for radio equipment and services; Part 1: Common technical requirements	Pass
EN 301 489-7 V1.3.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); EMC standard for radio equipment and services; Part 7	Pass
EN 301 489-17 V2.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); EMC standard for radio equipment; Part 17	Pass
EN 301 489-24 V1.5.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); EMC standard for radio equipment and services; Part 24	Pass
CFR 47 Part 15 - B: 2015	Code of Federal Regulations - Title 47 - Telecommunication, Part 15, Subpart B: "Unintentional Radiators"	Pass

Remark: In this test report only the DC-Supply port has been tested. For the test of the Communication and I/O-Lines see test report 12-EL-0088.E02.

Test performed by

Mr Daniel Rufer
EMC Test-Engineer



Reviewed by

Mr Pascal Treichler
Head Albislab



Approved by

Mr U. von Känel
Head of Business Unit ELM



Fehraltorf, 2015-11-17

(Issue Date)

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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Foreword

NetModule's railway router series are designed for mobile railway communications. These routers comply with the industry standard EN 50155 which is mandatory for most railway appliances. Supporting the latest WAN/LAN technologies (including GSM, UMTS, LTE, WLAN) and GPS they are offering highly-available connectivity with seamless handover between the broadband links using the Mobile IP protocol. In this test report only the DC-Supply port has been tested. For the test of the Communication and I/O-Lines see test report 12-EL-0088.E02.

1. Summary of Test Results (EN 50121-3-2)

§	Test Type	Result
12	Emission	EN 50121-3-2
12.1	Interference voltage EN 55011:2009 +A1 CISPR 11:2009 +A1	PASS
12.2	Radiated electromagnetic field EN 55011:2009 + A1 CISPR 11:2009 + A1	PASS
13	Immunity	EN 50121-3-2
13.1	Electrostatic discharges EN 61000-4-2:2009 IEC 61000-4-2:2008	PASS
13.2	Electromagnetic fields EN 61000-4-3:2006 +A1 +A2 IEC 61000-4-3:2006 +A1 +A2	PASS
13.3	Fast electric transients (Burst) EN 61000-4-4:2012 IEC 61000-4-4:2012	PASS ¹
13.4	Surges EN 61000-4-5:2006 IEC 61000-4-5:2005	PASS ¹
13.5	Radio frequency common mode EN 61000-4-6:2009 IEC 61000-4-6:2008	PASS ²

1. only DC-Supply port tested, other ports see test report 12-EL-0088.E02

2. only DC-Supply and LAN port tested, other ports see test report 12-EL-0088.E02

2. Summary of Test Results (EN 50155)

§	Test Type	Result
12	Emission	EN 50155
12.1	Interference voltage EN 55011 Class B CISPR 11	PASS
12.2	Radiated electromagnetic field EN 55011 Class A CISPR 11	PASS
13	Immunity	EN 50155
--	Visual inspection EN 50155 §12.2.1	PASS
13.6	Performance test EN 50155 §12.2.2	PASS
13.6	Supply overvoltages EN 50155 §12.2.6	PASS
13.4	Surges, electrostatic discharge and transient burst susceptibility tests EN 50155 §12.2.7	PASS ¹
13.5	Radio interference test EN 50155 §12.2.8	PASS ²
13.7	Insulation test EN 50155 §12.2.9	PASS

1. only DC-Supply port tested, other ports see test report 12-EL-0088.E02

2. only DC-Supply and LAN port tested, other ports see test report 12-EL-0088.E02

3. Summary of Test Results (EN 55022)

§	Test Type	Result
12	Emission	EN 55022
12.1	Interference voltage EN 55022:2010 CISPR 22:2008	Class B, PASS
12.1	Common mode at telecom. ports EN 55022:2010 CISPR 22:2008	Class B, PASS
12.2	Radiated electromagnetic field EN 55022:2010 CISPR 22:2008	Class A, PASS
--	Harmonics EN 61000-3-2:2006 +A1 +A2 IEC 61000-3-2:2005 +A1 +A2	Not applicable ¹
--	Voltage fluctuations (flicker) EN 61000-3-3:2013 IEC 61000-3-3:2013	Not applicable ¹

1. DC Powered EUT

4. Summary of Test Results (EN 61000-6-2)

§	Test Type	Result
13	Immunity	EN 61000-6-2
13.1	Electrostatic discharges EN 61000-4-2:2009 IEC 61000-4-2:2008	PASS
13.2	Electromagnetic fields EN 61000-4-3:2006 +A1 +A2 IEC 61000-4-3:2006 +A1 +A2	PASS
13.3	Fast electric transients (Burst) EN 61000-4-4:2012 IEC 61000-4-4:2012	PASS ²
13.4	Surges EN 61000-4-5:2006 IEC 61000-4-5:2005	PASS ^{2,4}
13.5	Radio frequency common mode EN 61000-4-6:2014 IEC 61000-4-6:2013	PASS ³
--	Magnetic fields (industrial frequencies) EN 61000-4-8:2010 IEC 61000-4-8:2009	Not applicable ⁵
--	Voltage dips and interruptions EN 61000-4-11:2004 IEC 61000-4-11:2004	Not applicable ¹

1. DC Powered EUT
2. only DC-Supply port tested, other ports see test report 12-EL-0088.E02
3. only DC-Supply and LAN port tested, other ports see test report 12-EL-0088.E02
4. Antenna ports not applicable (< 30 m)
5. Does not contain any devices susceptible to magnetic fields.

5. Summary of Test Results (EN 301 489-X)

The EUT contains CE approved radio modules. The modules have been tested by the radio manufacturer and were found to comply with the applicable RADIO ETSI standards 301 489-X.

§	Test Type		Result
12	Emission		EN 301 489-X mobile equipment
12.1	Interference voltage	EN 55022:2010 CISPR 22:2008	Class B, PASS
12.1	Common mode at telecom. ports	EN 55022:2010 CISPR 22:2008	Class B, PASS
12.2	Radiated electromagnetic field	EN 55022:2010 CISPR 22:2008	Class A, PASS
--	Harmonics	EN 61000-3-2:2006 +A1 + A2 IEC 61000-3-2:2005 +A1 + A2	Not applicable ¹
--	Voltage fluctuations (flicker)	EN 61000-3-3:2013 IEC 61000-3-3:2013	Not applicable ¹
13	Immunity		EN 301 489-X mobile equipment
13.1	Electrostatic discharges	EN 61000-4-2:2009 IEC 61000-4-2:2008	PASS
13.2	Electromagnetic fields	EN 61000-4-3:2006 + A1 + A2 IEC 61000-4-3:2006 + A1 + A2	PASS
13.3	Fast electric transients (Burst)	EN 61000-4-4:2012 IEC 61000-4-4:2012	PASS ²
13.4	Surges	EN 61000-4-5:2006 IEC 61000-4-5:2005	PASS ²
13.5	Radio frequency common mode	EN 61000-4-6:2009 IEC 61000-4-6:2008	PASS ³
--	Voltage dips and interruptions	EN 61000-4-11:2004 IEC 61000-4-11:2004	Not applicable ¹

1. DC Powered EUT

2. only DC-Supply port tested, other ports see test report 12-EL-0088.E02

3. only DC-Supply and LAN port tested, other ports see test report 12-EL-0088.E02

6. Summary of Test Results (FCC / Canada)

§	Test Type		Result
12	Emission		CFR 47 ICES-003 RSS-310 Industry Canada
12.1	Conducted emission	CFR 47 § 15.107 (Class B) ICES-003 §5.3 (Class B)	Not applicable ¹
12.2	Radiated emission – EM-field	CFR 47 § 15.109 (Class A) ICES-003 §5.4 (Class A)	PASS

1. no AC power port

7. Applied Standards

EN 50121-3-2 : 2015 IEC 62236-3-2 : 2008	Railway applications – Electromagnetic compatibility Part 3-2: Rolling stock - Apparatus
EN 550155 : 2007 IEC 60571:2012	Railway applications - Electronic equipment used on rolling stock
EN 55022 : 2010 CISPR 22 : 2008	Information technology equipment Radio disturbance characteristics – Limits and methods of measurement
EN 61000-6-2 : 2005 IEC 61000-6-2 : 2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 301 489-1 V1.9.2:2011	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 1: Common technical requirements
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)
EN 301 489-17 V2.2.1:2012	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment; Part 17: Specific conditions for Broadband Data Transmission Systems
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
CFR 47 Part 15 Subpart B: 2015	Code of Federal Regulations - Title 47 - Telecommunication, Part 15, Subpart B: "Unintentional Radiators"

8. Abbreviations

Electromagnetic compatibility and radio spectrum matters:

AC	Alternating current
AFA	Adaptive Frequency Agility
AM	Amplitude Modulation
AV	Average
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
DSSS	Direct Sequence Spread Spectrum
e.i.r.p.	equivalent isotropic radiated power
EMC	ElectroMagnetic Compatibility
ERC	European Radiocommunication Committee
ESD	Electro Static Discharge
EUT	Equipment under Test
FHSS	Frequency Hopping Spread Spectrum
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-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
NRI	National Radio Interfaces
PE	Protective earth
PK	Peak
Pit	Long-term flicker indicator
PM	Pulse Modulation
Pst	Short-term flicker Indicator
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
RFID	Radio Frequency Identification
RU	Remote Unit
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
Tx	Transmitter
UL	Uplink
UWB	Ultra Wide Band
VSWR	Voltage Standing Wave Ratio

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

9. Applicant

Client name and address	<i>NetModule AG Meriedweg 11 3172 Niederwangen bei Bern Switzerland</i>
Contact Person	<i>Mr. Thomas Siegrist</i>
Telephone	<i>+41 52 209 00 41</i>
E-mail	<i>Thomas.Siegrist@netmodule.com</i>

10. Equipment Under Test

10.1 Identification

Manufacturer name and address	<i>NetModule AG Meriedweg 11 3172 Niederwangen bei Bern</i>
Production country	<i>Switzerland</i>
Product name	<i>NB3700</i>
Product description	<i>Railway Router with Mobile, WLAN and GPS</i>
Model number	<i>NB3700-LWPb-G</i>
Serial no	<i>00112B00F762</i>
Software version	<i>3.8.0.101</i>
Highest frequency	<i>CPU Clock: 400 MHz PCI Express: 2500 MHz DDR2SDRAM: 266 MHz USB: 480 MHz DC/DC Converter (Main): < 1 MHz</i>
Radio modules	<i>GSM: 0.9 / 1.8 GHz UMTS: 1.9 – 2.2 GHz LTE: 0.8 / 1.7 / 2.6 GHz WLAN: 2.4 – 2.5 GHz GPS: 1.5 GHz</i>
Supply	<i>$U = 50 - 136 \text{ VDC}$, $P_{\text{MAX}} = 15 \text{ W}$ $U_{\text{Nom}} = 72, 96 \text{ \& } 110 \text{ VDC}$ according EN 50155</i>
Dimension	<i>104 mm x 190 mm x 85 mm (l x w x h)</i>
Weight	<i>1.2 kg</i>
Technical documentation	<i>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.</i>

10.2 Product Family

Tested Equipment	Covered Variants	Explanation
NB3700-LWPb-G	NB3700-H ₁ ...H _n -S ₁ ...S _n	<p>All covered NB3700 variants contain the same CP Modules, MC Boards, and PSE Boards, have the same case and the same form factor.</p> <p>They can host up to six communication and other interface modules. These modules can even include a GPS module. There can be up to 5 antenna connectors.</p> <p>The wireless communication modules applied have been CE and FCC certified in an independent way of the tested equipment.</p> <p>'H₁...H_n' is a sequence of the following letters that identify the communication modules included:</p> <p>R: none, router only Ed: 2G = GPRS/EDGE U: 3G+ = 2G+UMTS/HSPA/HSPA+ L: 4G = 3G+ + LTE Ca: CDMA450 Gr: GSM-R Ge: GNSS W: WLAN a/b/g/n Client & Access Point A: Audio in/out C: CAN-bus Sa: RS-485 (on the same module as CAN) I: IBIS-bus Sb: RS-232 (on the same module as IBIS) Pb: Power supply 50 V_{DC} – 110 V_{DC} ... (more to follow)</p> <p>'S₁...S_n' indicate the software options activated:</p> <p>G: GPS V: Voice gateway M: Mobile IP (Client) S: Server</p> <p>The following NB3700 variants with 50-136V_{DC} power supplies are currently available or planned:</p> <p>NB3700-RPb NB3700-WPb NB3700-UPb NB3700-UPb-G NB3700-UWPb NB3700-UWPb-G NB3700-LWPb NB3700-LWPb-G</p>

Remarks:

- This test report covers all variants with additional letters "Pb" (power supply 50 VDC - 110 VDC), all other variants (power supply 12 VDC - 60 VDC) are covered by test report 12-EL-0088.E02.
- According to information of the customer and not verified by Electrosuisse

10.3 Pictures of the EUT



EUT



Type label

10.4 Classification

EN 50121-3-2	<input checked="" type="checkbox"/> Mounted in the passenger compartments, drivers cab or external to the rolling stock (roof, underframe) <input type="checkbox"/> Accessible to passengers and operational staff (not maintenance)
EN 55022 CISPR 22	<input checked="" 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: <i>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.</i> <input 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 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 checked="" 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 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
CFR 47 Part 15	<input type="checkbox"/> Unintentional radiator (Subpart B) <input checked="" type="checkbox"/> Class A digital device <input 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 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 checked="" 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 checked="" 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).

10.5 Ports

Port	Cable			Remarks
	Max. length	Type	Screen	
DC Supply	Not defined	2 wires	No	If not stated otherwise, powered with AC/DC adapter
Ethernet 1 - 5	< 100 m	RJ45 cat 5e	Yes	Ethernet 5 used for all tests, connected to Laptop
Digital I/O	< 30m	4 wires	No	Cabel connected, but left open on far side
WLAN 1&2	< 30 m	BNC (Coax)	Yes	Connected to multiband-antenna
Mob 1&2 (GSM, UMTS, LTE)	< 30 m	BNC (Coax)	Yes	Connected to multiband-antenna
GPS	< 30 m	BNC (Coax)	Yes	Connected to multiband-antenna
USB Type A (Service Port)	< 3 m	USB	Yes	Not used

11. Test Conditions

11.1 Climatic conditions, location and date

Location	Date	Temp	Pressure [QFE]	Rel. humidity
<i>Electrosuisse Albislab Albisriederstrasse 199 8047 Zürich Switzerland</i>	<i>October 23 & 26, November 10, 2015</i>	<i>24 ± 2 °C</i>	<i>970 ± 10 hPa</i>	<i>35 ± 5 %</i>

11.2 Attendant Persons

Test Engineer(s):

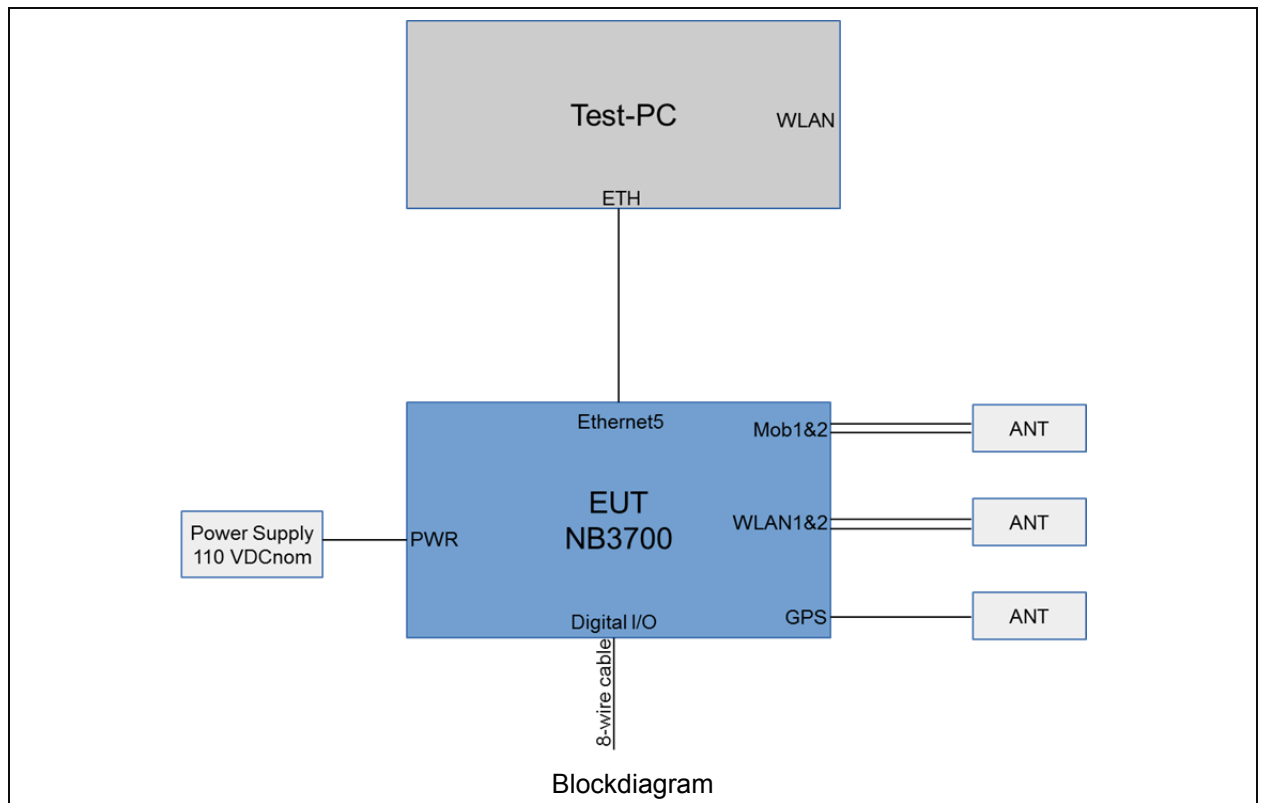
<i>Mr Daniel Rufer</i>

Other(s):

Name	Company
<i>Mr Raffael Rohrer</i>	<i>NetModule AG</i>

11.3 Test Configuration

*powered with 110 VDC unless otherwise specified
 1 Fast-Ethernet-connection to Test-PC (Ethernet 5)
 1 GSM/UMTS/LTE antennas (2 cables)
 1 WLAN antennas (2 cables)
 1 GPS antenna (1 cable)
 Digital I/O cable (floating)
 SIM card
 USB port not used (floating cable connected for radiated emission and immunity)*



11.4 Operating Conditions

Normal mode:

- Ping over WLAN 1
- Ping over WWAN (UMTS/LTE)
- Ping over Ethernet cable

powered with 110 VDC unless otherwise specified

11.5 Monitoring of the EUT

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

General:

Monitor of all Ping-Outputs on the Test-PC

11.6 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
Test-PC / Notebook	Dell	E5430	B2DT3X1
WWAN Antenna	n/a	Antenna-Roof-2L DL-9	A140812300036
GPS Antenna	REEL	C70ZAR 0300 00 03 03 PWN1	02 1501
WLAN Antenna	--	Antenna-Roof-2W	--
Power Supply (for Emission measurements)	Oltronix	B60-1T	Q2859, Q2848
Power Supply (for Immunity tests)	EA	EA-PS-8160-04	13.6632.11

11.7 Performance Criteria

General requirements:	Requirements according to the EUT:
<p style="text-align: center;">Criterion A:</p> <p>The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed.</p>	
<p style="text-align: center;">Criterion B:</p> <p>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.</p>	
<p style="text-align: center;">Criterion C:</p> <p>Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.</p>	

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12. Emission Tests

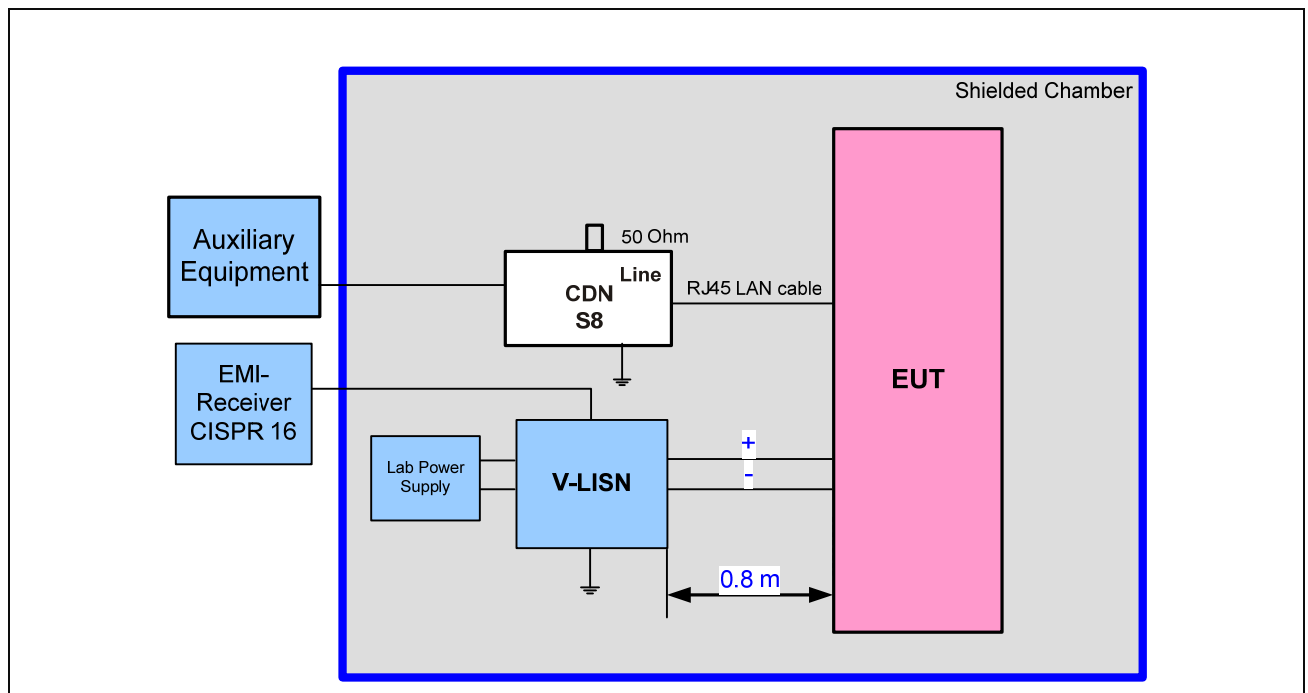
12.1 Interference Voltage

Test site: *shielded room*

Meas. uncertainty: *see chapter 14*

Measuring method: *The conducted disturbance is measured using a spectrum analyzer 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.*

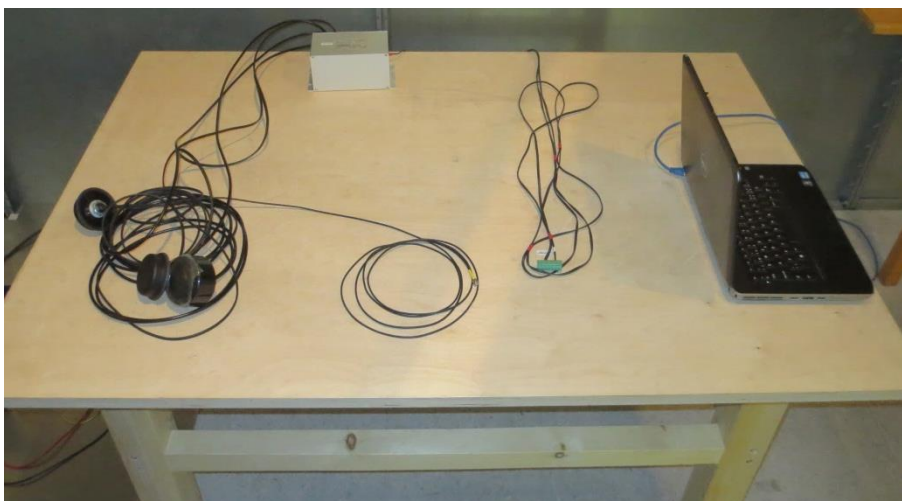
Test Setup



Test Equipment

Device Type	Brand	Type	ID
EMI Receiver	Rhode & Schwarz	ESR 7	15.6637.07
V-Network	Rohde & Schwarz	ESH3-Z5	PE7627
CDN	EM Test	CDN S8 RJ45	13.6632.07
Power Supply	Oltronix	B60-1T	Q2859, Q2848

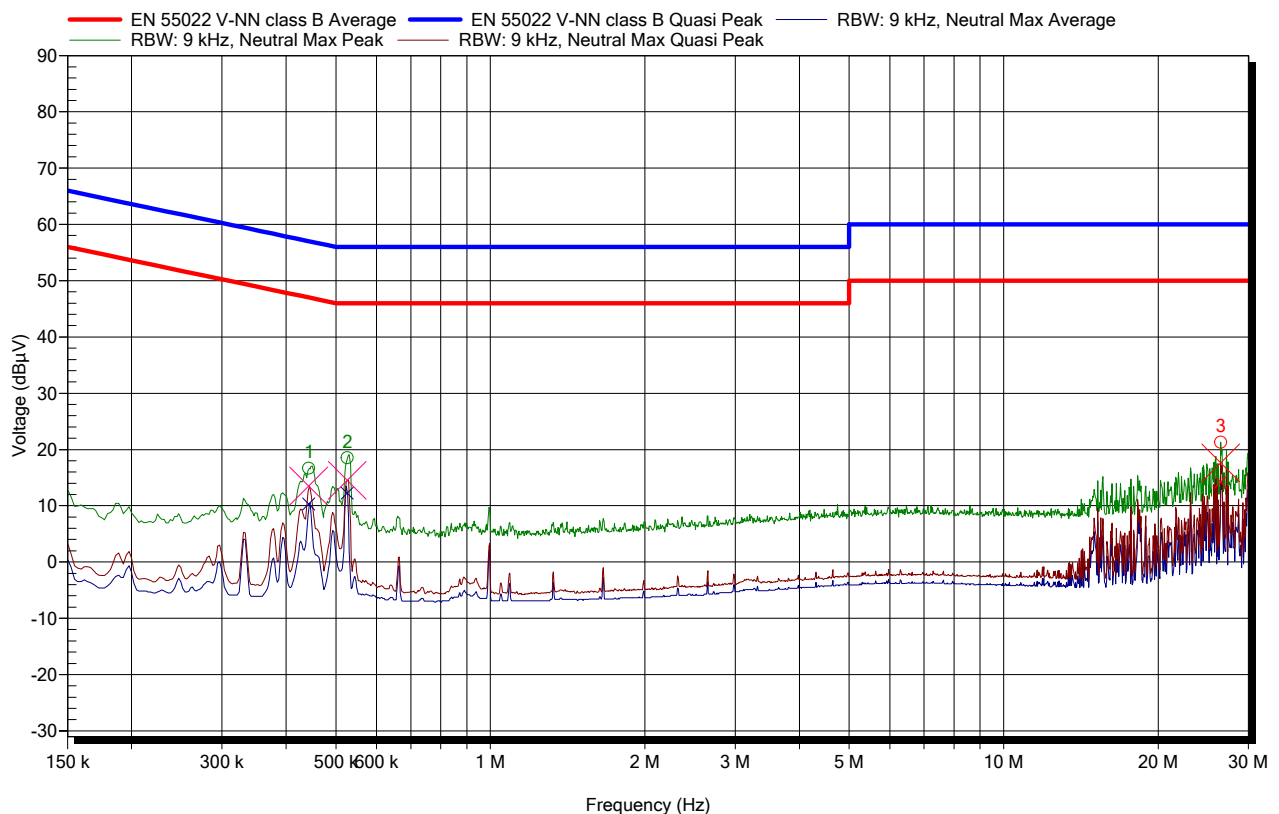
Photos of the Setup



Measurement Results

Measurement 1: Power Supply 110 VDC, Minus

EUT	NB3700-LWPB-G
Verdict, Test	Pass, Class B
Modification	none
Mode of operation	110 VDC
Test date, time	26.10.2015 08:35:56
Interface / Line under test	Neg (-), DC Supply
Transducer	PE7627 V-LISN 1Ph+N 16A Rohde & Schwarz ESH3-Z5
Measurement settings	Radimation Version: 2015.1.11, RBW: 9 kHz, VBW: 30 kHz, Sweep time: Auto [120 ms], Step freq: Linear: 2.25 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 0 dB, Measure time: 1 s, Measurement equipment: CE 9k-30M ESR7-TD V-LISN ESH3-Z5

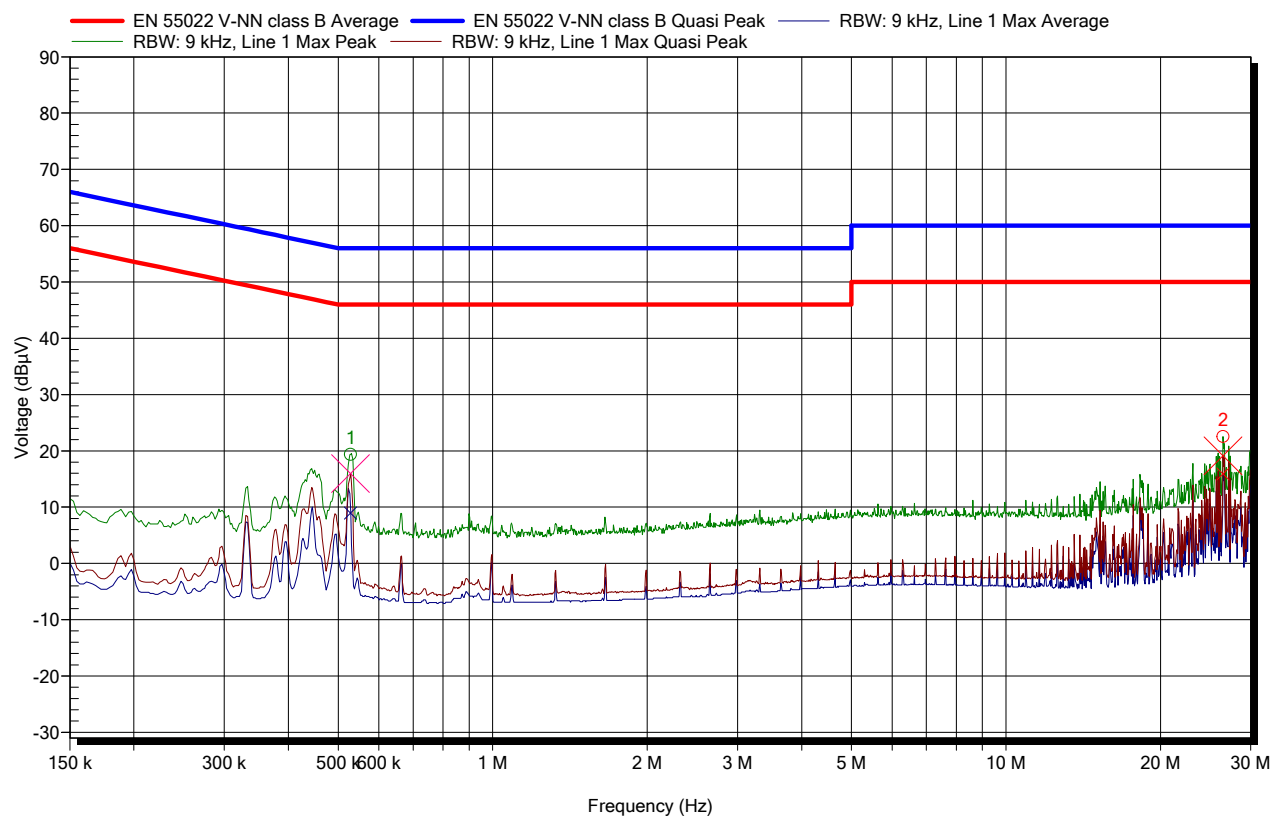


Detected peaks

Peak Number	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	442.5 kHz	16.69 dBμV	10.33 dBμV	-36.68 dB	13.49 dBμV	-43.52 dB	Pass
2	525.75 kHz	18.53 dBμV	12.26 dBμV	-33.74 dB	14.49 dBμV	-41.51 dB	Pass
3	26.486 MHz	21.32 dBμV	14.24 dBμV	-35.76 dB	17.66 dBμV	-42.34 dB	Pass

Measurement 2: Power Supply 110 VDC, Plus

EUT	NB3700-LWPB-G
Verdict, Test	Pass, Class B
Modification	none
Mode of operation	110 VDC
Test date, time	26.10.2015 08:36:52
Interface / Line under test	Pos (+), DC Supply
Transducer	PE7627 V-LISN 1Ph+N 16A Rohde & Schwarz ESH3-Z5
Measurement settings	Radimation Version: 2015.1.11, RBW: 9 kHz, VBW: 30 kHz, Sweep time: Auto [120 ms], Step freq: Linear: 2.25 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 0 dB, Measure time: 1 s, Measurement equipment: CE 9k-30M ESR7-TD V-LISN ESH3-Z5

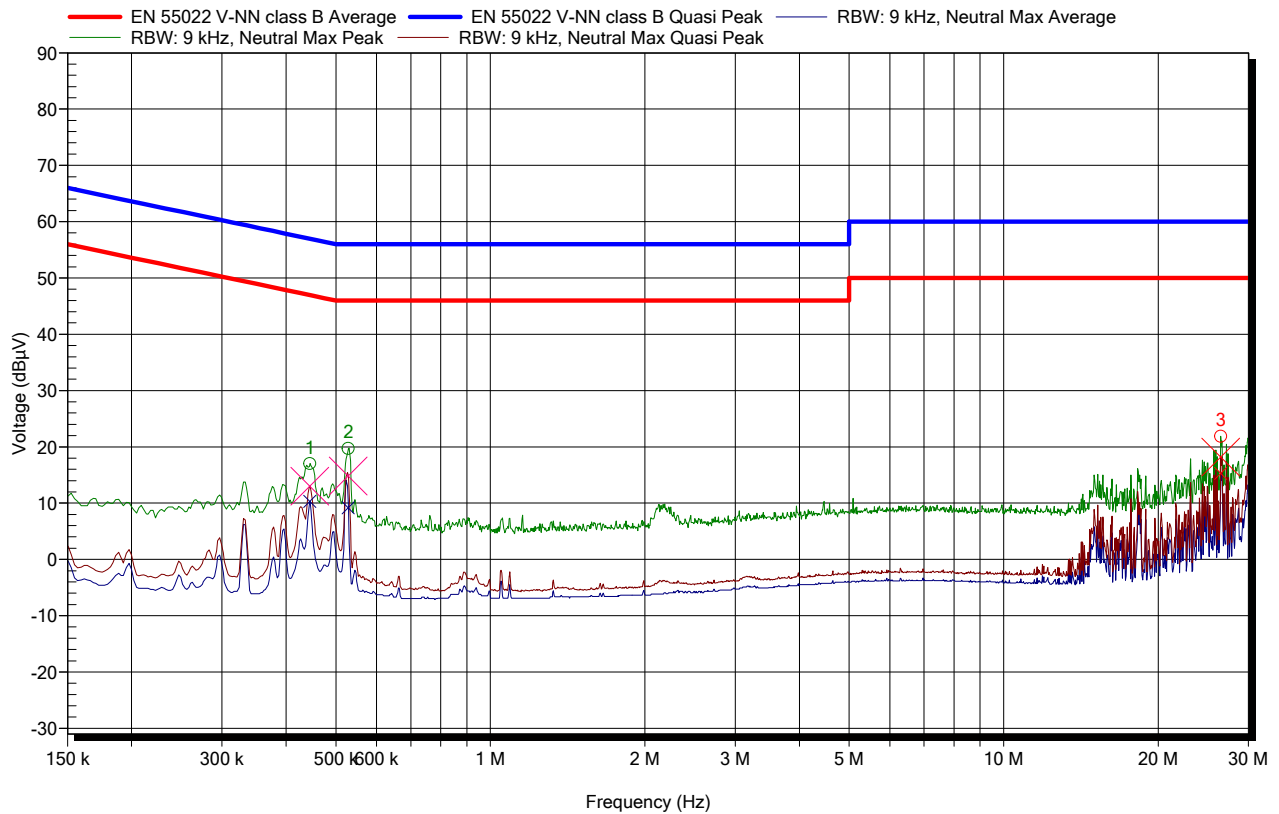


Detected peaks

Peak Number	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	528 kHz	19.34 dBμV	8.92 dBμV	-37.08 dB	15.95 dBμV	-40.05 dB	Pass
2	26.486 MHz	22.54 dBμV	15.9 dBμV	-34.1 dB	19.11 dBμV	-40.89 dB	Pass

Measurement 3: Power Supply 50 VDC, Minus

EUT	NB3700-LWPB-G
Verdict, Test	Pass, Class B
Modification	none
Mode of operation	50 VDC
Test date, time	26.10.2015 08:38:26
Interface / Line under test	Neg (-), DC Supply
Transducer	PE7627 V-LISN 1Ph+N 16A Rohde & Schwarz ESH3-Z5
Measurement settings	Radimation Version: 2015.1.11, RBW: 9 kHz, VBW: 30 kHz, Sweep time: Auto [120 ms], Step freq: Linear: 2.25 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 0 dB, Measure time: 1 s, Measurement equipment: CE 9k-30M ESR7-TD V-LISN ESH3-Z5

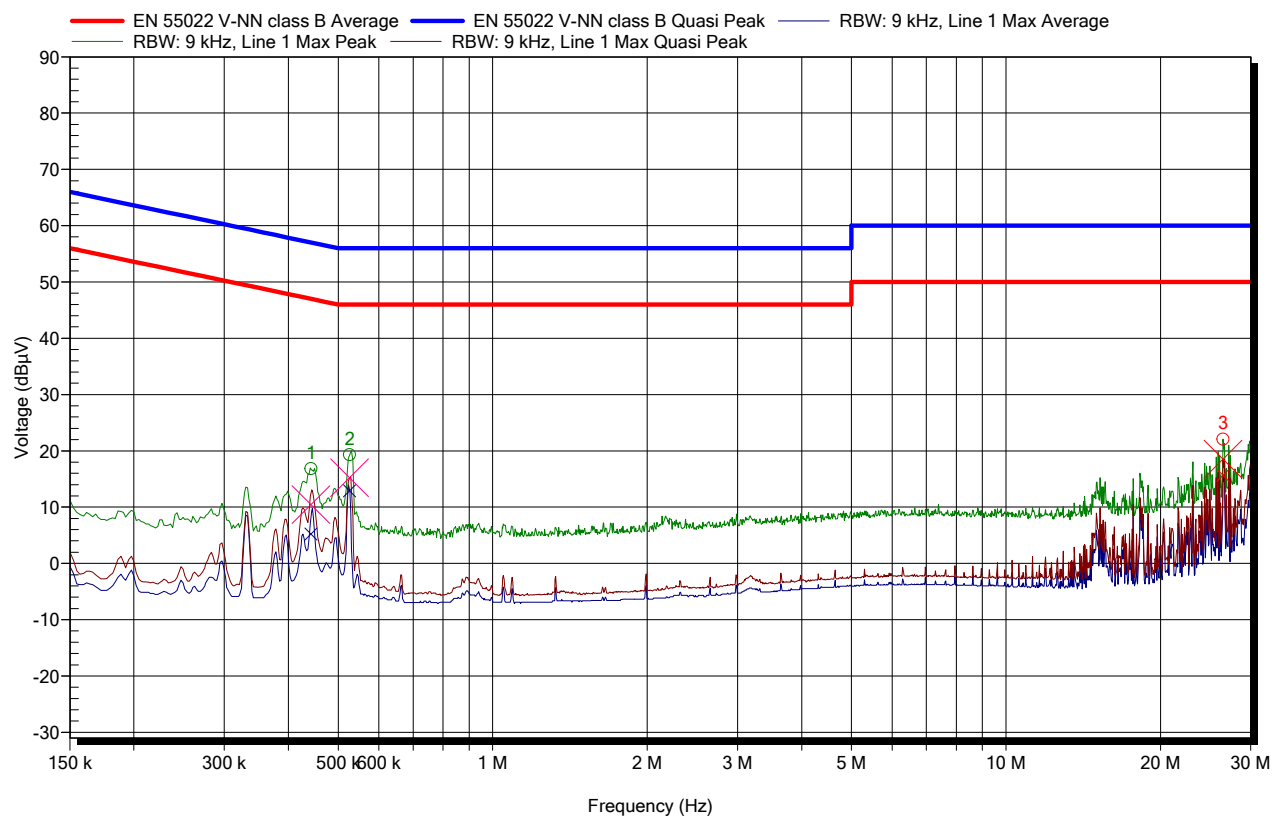


Detected peaks

Peak Number	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	444.75 kHz	17.01 dBμV	10.33 dBμV	-36.64 dB	13 dBμV	-43.97 dB	Pass
2	528 kHz	19.71 dBμV	9.2 dBμV	-36.8 dB	14.8 dBμV	-41.2 dB	Pass
3	26.486 MHz	21.87 dBμV	15.28 dBμV	-34.72 dB	18.2 dBμV	-41.8 dB	Pass

Measurement 4: Power Supply 50 VDC, Plus

EUT	NB3700-LWPB-G
Verdict, Test	Pass, Class B
Modification	none
Mode of operation	50 VDC
Test date, time	26.10.2015 08:39:26
Interface / Line under test	Pos (+), DC Supply
Transducer	PE7627 V-LISN 1Ph+N 16A Rohde & Schwarz ESH3-Z5
Measurement settings	Radimation Version: 2015.1.11, RBW: 9 kHz, VBW: 30 kHz, Sweep time: Auto [120 ms], Step freq: Linear: 2.25 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 0 dB, Measure time: 1 s, Measurement equipment: CE 9k-30M ESR7-TD V-LISN ESH3-Z5

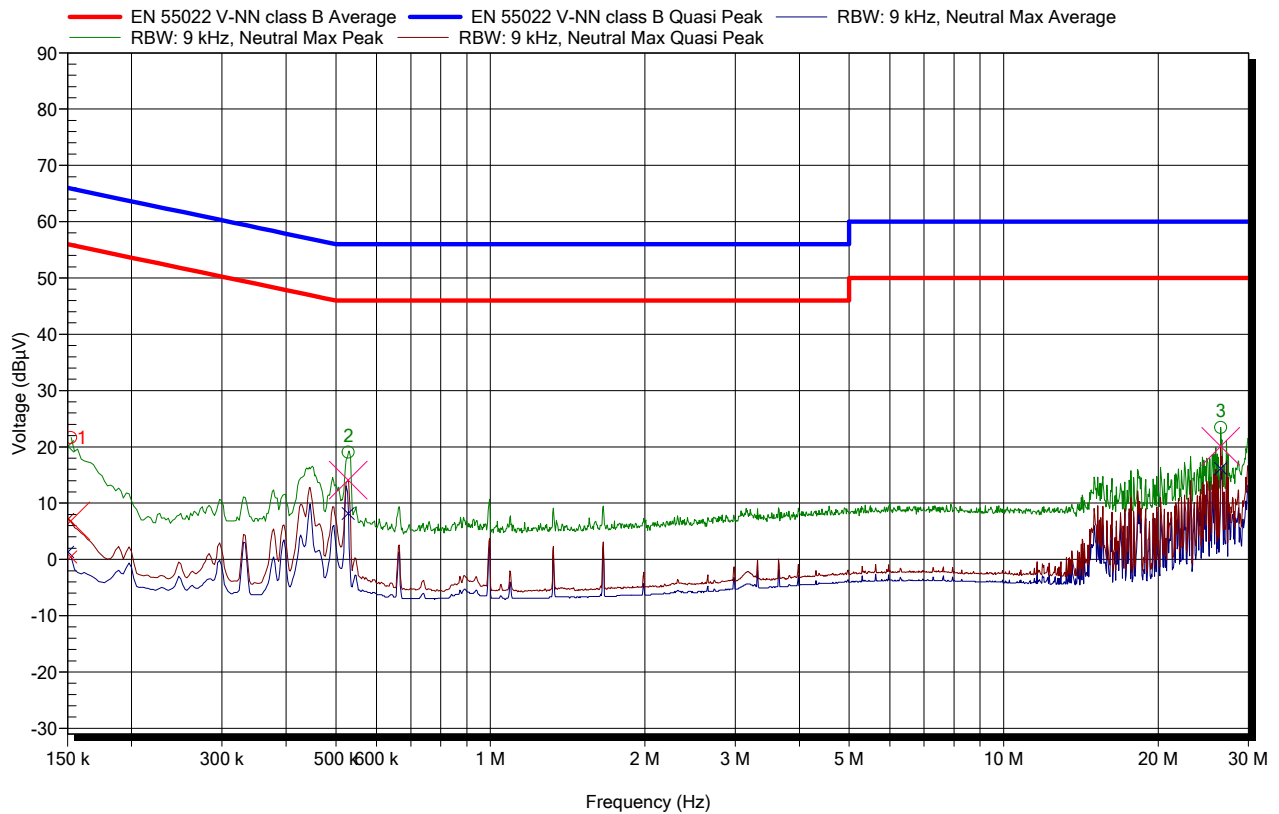


Detected peaks

Peak Number	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	442.505 kHz	16.83 dBμV	5.25 dBμV	-41.76 dB	10.43 dBμV	-46.58 dB	Pass
2	525.75 kHz	19.29 dBμV	12.87 dBμV	-33.13 dB	15.23 dBμV	-40.77 dB	Pass
3	26.486 MHz	22.09 dBμV	15.65 dBμV	-34.35 dB	18.51 dBμV	-41.49 dB	Pass

Measurement 5: Power Supply 138 VDC, Minus

EUT	NB3700-LWPB-G
Verdict, Test	Pass, Class B
Modification	none
Mode of operation	138 VDC
Test date, time	26.10.2015 08:41:46
Interface / Line under test	Neg (-), DC Supply
Transducer	PE7627 V-LISN 1Ph+N 16A Rohde & Schwarz ESH3-Z5
Measurement settings	Radimation Version: 2015.1.11, RBW: 9 kHz, VBW: 30 kHz, Sweep time: Auto [120 ms], Step freq: Linear: 2.25 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 0 dB, Measure time: 1 s, Measurement equipment: CE 9k-30M ESR7-TD V-LISN ESH3-Z5

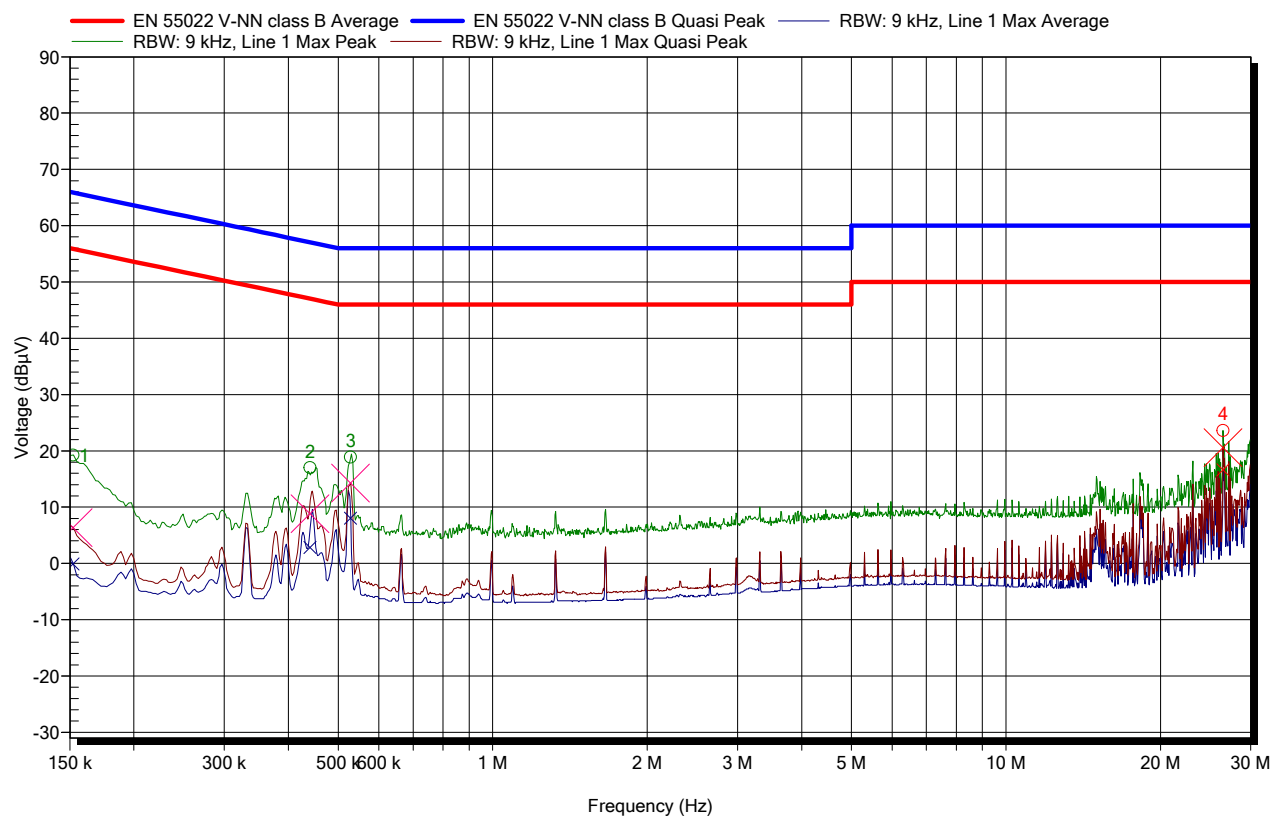


Detected peaks

Peak Number	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	152.25 kHz	21.64 dBμV	0.41 dBμV	-55.47 dB	6.83 dBμV	-59.04 dB	Pass
2	528 kHz	19.04 dBμV	8.15 dBμV	-37.85 dB	14.09 dBμV	-41.91 dB	Pass
3	26.486 MHz	23.42 dBμV	16.13 dBμV	-33.87 dB	20.11 dBμV	-39.89 dB	Pass

Measurement 6: Power Supply 138 VDC, Plus

EUT	NB3700-LWPB-G
Verdict, Test	Pass, Class B
Modification	none
Mode of operation	138 VDC
Test date, time	26.10.2015 08:43:30
Interface / Line under test	Pos (+), DC Supply
Transducer	PE7627 V-LISN 1Ph+N 16A Rohde & Schwarz ESH3-Z5
Measurement settings	Radimation Version: 2015.1.11, RBW: 9 kHz, VBW: 30 kHz, Sweep time: Auto [120 ms], Step freq: Linear: 2.25 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 0 dB, Measure time: 1 s, Measurement equipment: CE 9k-30M ESR7-TD V-LISN ESH3-Z5

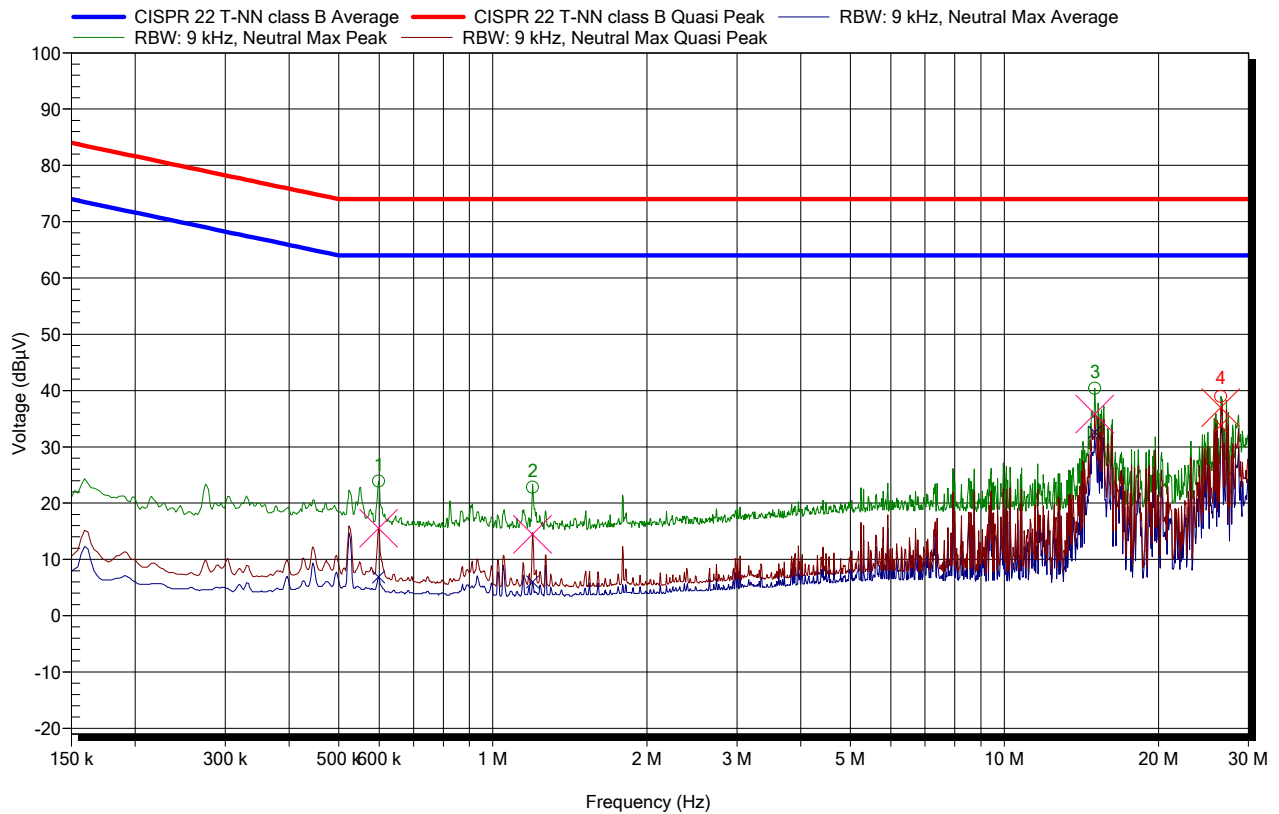


Detected peaks

Peak Number	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	152.25 kHz	19.27 dBμV	-0.09 dBμV	-55.97 dB	6.36 dBμV	-59.52 dB	Pass
2	440.874 kHz	17.02 dBμV	2.81 dBμV	-44.23 dB	8.82 dBμV	-48.22 dB	Pass
3	528 kHz	18.92 dBμV	8.07 dBμV	-37.93 dB	14.28 dBμV	-41.72 dB	Pass
4	26.486 MHz	23.61 dBμV	16.63 dBμV	-33.37 dB	20.6 dBμV	-39.4 dB	Pass

Measurement 7: LAN Port

EUT	NB3700-LWPB-G
Verdict, Test	Pass, Class B
Modification	none
Mode of operation	Normal mode, 110 VDC
Test date, time	26.10.2015 08:45:31
Interface / Line under test	Ethernet 5
Transducer	ISN_RJ45
Measurement settings	Radimation Version: 2015.1.11, RBW: 9 kHz, VBW: 30 kHz, Sweep time: Auto [120 ms], Step freq: Linear: 2.25 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 0 dB, Measure time: 1 s, Measurement equipment: CE 150k-30M ESR7-TD T_RJ45 ISN



Detected peaks

Peak Number	Frequency	Peak	Average	Average Difference	Quasi-Peak	Quasi-Peak Difference	Status
1	597.75 kHz	23.94 dBμV	6.88 dBμV	-57.12 dB	15.52 dBμV	-58.48 dB	Pass
2	1.196 MHz	22.83 dBμV	5.99 dBμV	-58.01 dB	14.43 dBμV	-59.57 dB	Pass
3	15.012 MHz	40.37 dBμV	32.6 dBμV	-31.4 dB	35.84 dBμV	-38.16 dB	Pass
4	26.486 MHz	38.98 dBμV	33.79 dBμV	-30.21 dB	36.97 dBμV	-37.03 dB	Pass

12.2 Radiated Electromagnetic Field

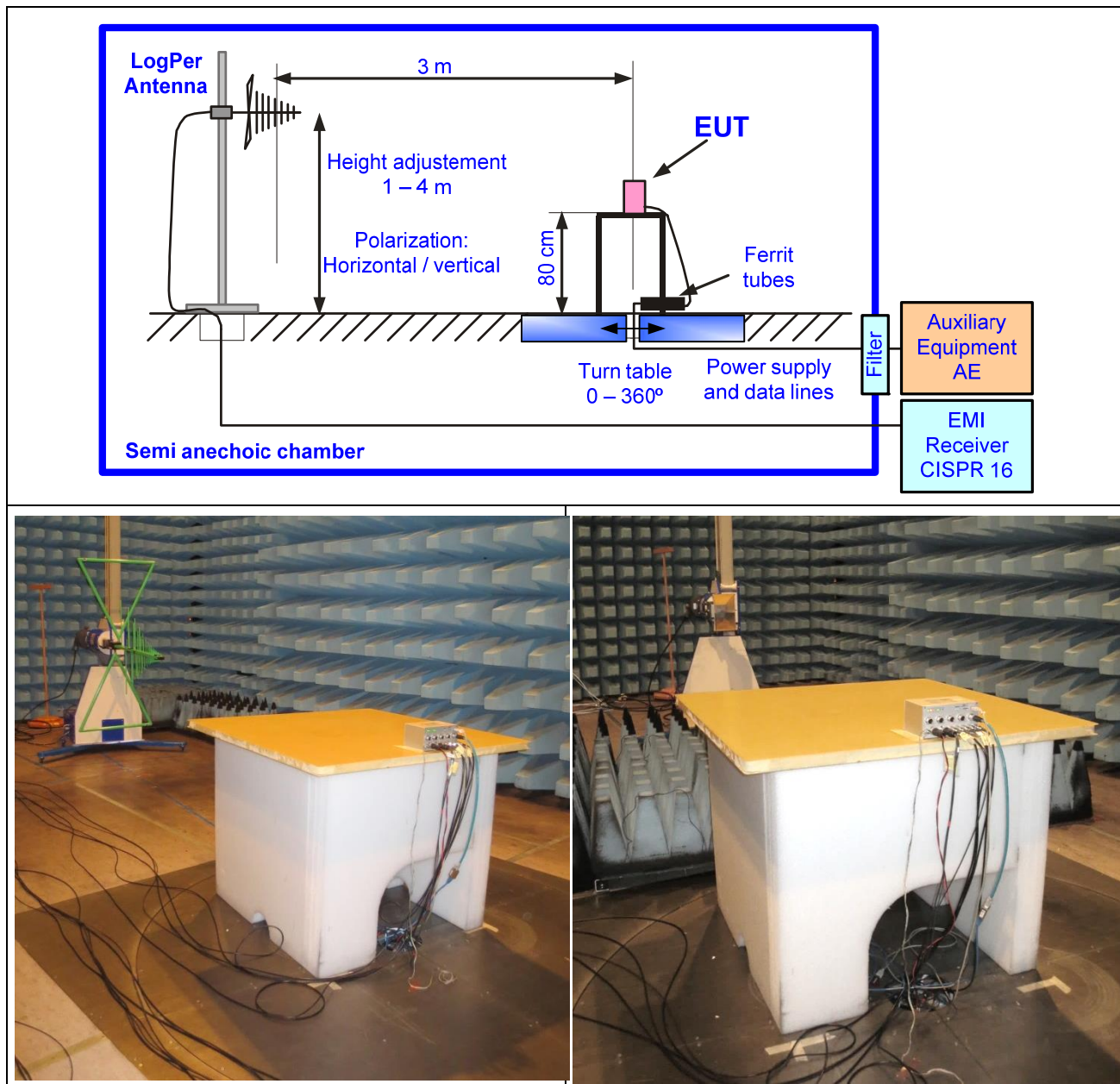
Test site: semi-anechoic chamber (hybrid)

Distance: 3 m

Meas. uncertainty: see chapter 14

Measuring method: The electromagnetic disturbance radiated by the equipment is measured using a spectrum analyzer and a wide band antenna. The antenna is moved from 1 to 4 m in height successively with horizontal and vertical polarizations. 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.

Test Setup



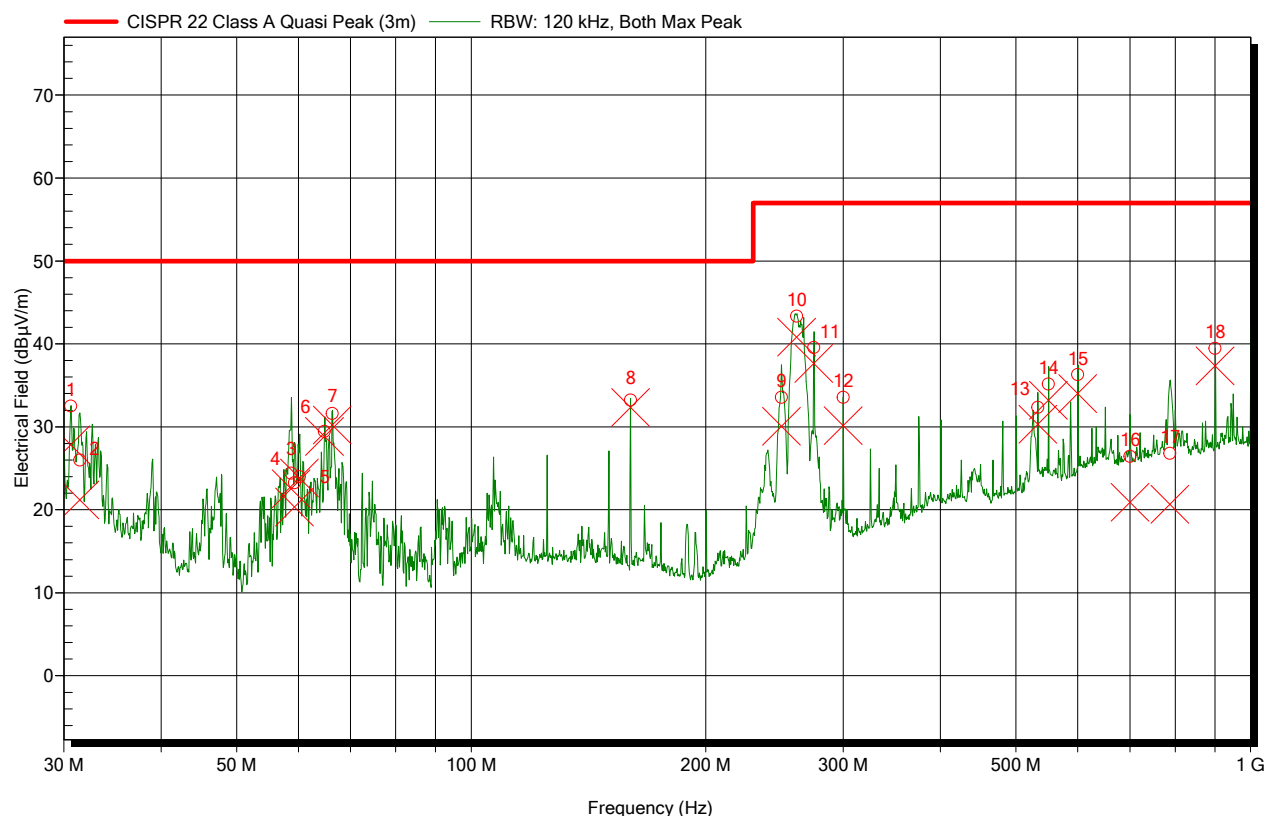
Test Equipment

Device type	Brand	Type	ID
EMI Receiver 30 MHz – 6 GHz	Rohde & Schwarz	ESU8	OA 10193
Spectrum Analyzer 6 – 13 GHz	Hewlett Packard	8563E	--
Pre Amplifier 6 – 13 GHz	Mini-Circuits	ZVA-183X-S+	--
Antenna LogPer	Chase	CBL 6112B	H9695
Antenna Horn	Emco	3115	H9351
Power Supply	Oltronix	B60-1T	Q2859, Q2848

Measurement Results 80 – 1000 MHz

Measurement 1: 110 VDC

EUT	NB3700-LWPB-G		
Verdict, Test	Pass, Class A		
Modification	None		
Mode of operation	Normal mode, 110 VDC		
Test date, time	23/10/2015 11:59:41		
Antenna height	1 m - 4 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: 1 ms, Step freq: Linear: 30 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 20 dB, Measure time: 5 ms, Measurement equipment: RE_30M-2GHz_ESU8_Inp1_CBL6112B_TD		

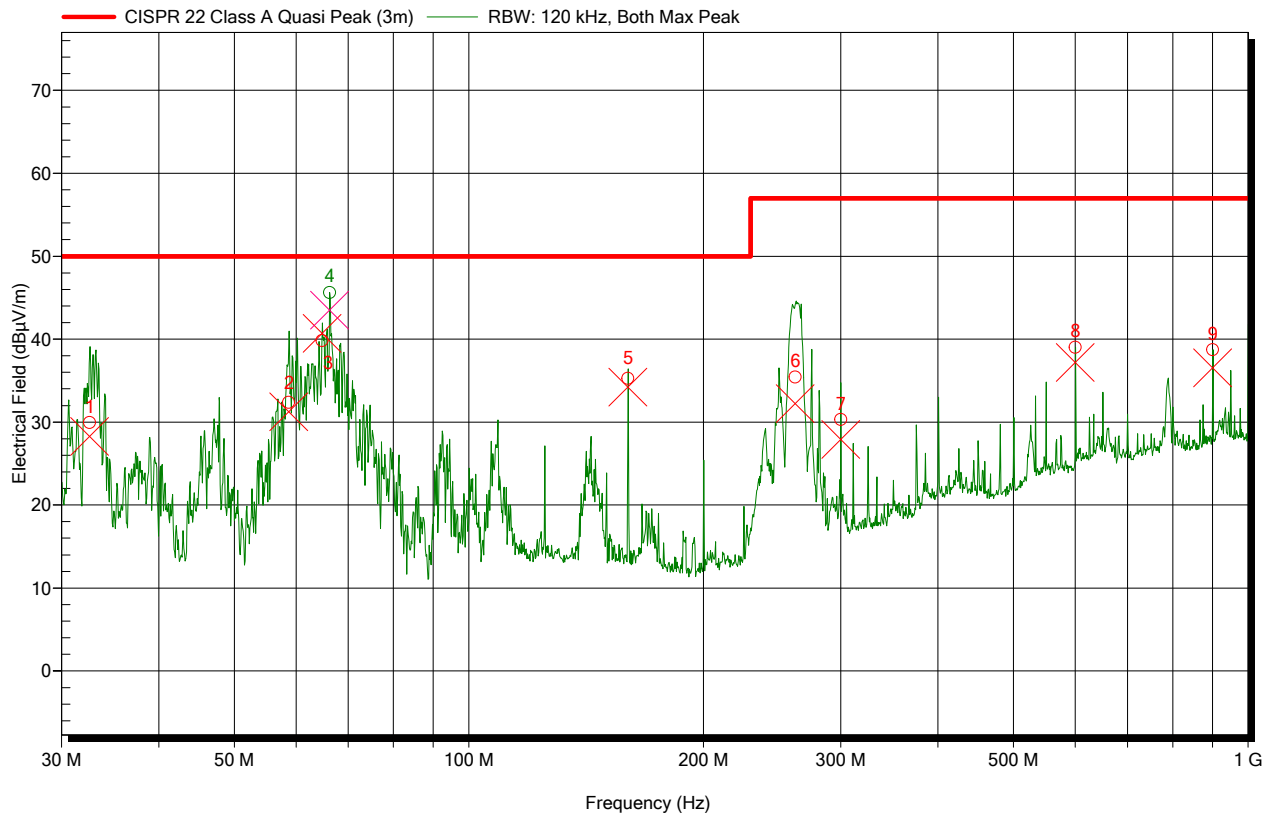


Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
1	30.63 MHz	32.5 dBμV/m	27.83 dBμV/m	-22.17 dB	Pass	150 Degree	3 m	Horizontal
2	31.44 MHz	26.01 dBμV/m	21.2 dBμV/m	-28.8 dB	Pass	150 Degree	1 m	Vertical
3	58.71 MHz	24.43 dBμV/m	22.53 dBμV/m	-27.47 dB	Pass	120 Degree	1 m	Vertical
4	59.31 MHz	23.26 dBμV/m	20.35 dBμV/m	-29.65 dB	Pass	150 Degree	2 m	Vertical
5	60.18 MHz	24.01 dBμV/m	23.82 dBμV/m	-26.18 dB	Pass	150 Degree	2 m	Vertical
6	64.83 MHz	29.47 dBμV/m	28.85 dBμV/m	-21.15 dB	Pass	330 Degree	1 m	Vertical
7	66.3 MHz	31.64 dBμV/m	30.23 dBμV/m	-19.77 dB	Pass	30 Degree	2 m	Vertical
8	160.02 MHz	33.26 dBμV/m	32.35 dBμV/m	-17.65 dB	Pass	240 Degree	1 m	Vertical
9	249.99 MHz	33.57 dBμV/m	30.06 dBμV/m	-26.94 dB	Pass	90 Degree	1 m	Horizontal
10	261.54 MHz	43.33 dBμV/m	40.83 dBμV/m	-16.17 dB	Pass	240 Degree	1 m	Vertical
11	275.01 MHz	39.55 dBμV/m	37.63 dBμV/m	-19.37 dB	Pass	300 Degree	2 m	Horizontal
12	300 MHz	33.55 dBμV/m	30.14 dBμV/m	-26.86 dB	Pass	300 Degree	1 m	Horizontal
13	533.31 MHz	32.35 dBμV/m	30.33 dBμV/m	-26.67 dB	Pass	330 Degree	1 m	Vertical
14	549.99 MHz	35.17 dBμV/m	33.2 dBμV/m	-23.8 dB	Pass	300 Degree	1 m	Vertical
15	600 MHz	36.29 dBμV/m	34.01 dBμV/m	-22.99 dB	Pass	300 Degree	2 m	Vertical
18	900 MHz	39.48 dBμV/m	37.37 dBμV/m	-19.63 dB	Pass	0 Degree	1 m	Vertical

Measurement 2: 50 VDC

EUT	NB3700-LWPB-G		
Verdict, Test	Pass, Class A		
Modification	None		
Mode of operation	Normal mode, 50 VDC		
Test date, time	23/10/2015 12:37:15		
Antenna height	1 m - 2 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: 1 ms, Step freq: Linear: 30 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 20 dB, Measure time: 5 ms, Measurement equipment: RE_30M-2GHz_ESU8_Inp1_CBL6112B_TD		

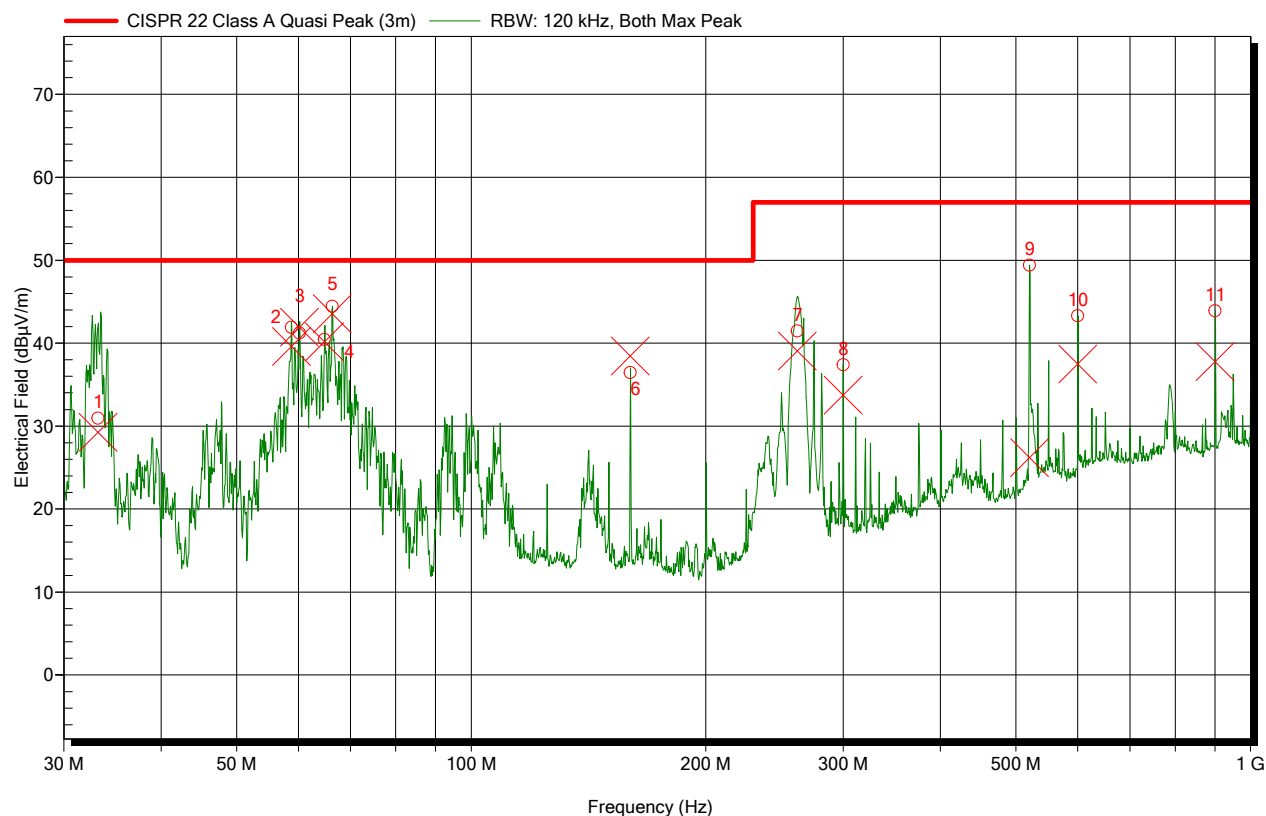


Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
1	32.61 MHz	29.93 dBμV/m	28.29 dBμV/m	-21.71 dB	Pass	30 Degree	2 m	Vertical
2	58.71 MHz	32.4 dBμV/m	31.25 dBμV/m	-18.75 dB	Pass	300 Degree	2 m	Vertical
3	64.8 MHz	39.85 dBμV/m	40.72 dBμV/m	-9.28 dB	Pass	180 Degree	2 m	Vertical
4	66.27 MHz	45.63 dBμV/m	43.49 dBμV/m	-6.51 dB	Pass	180 Degree	2 m	Vertical
5	159.96 MHz	35.3 dBμV/m	34.23 dBμV/m	-15.77 dB	Pass	210 Degree	1 m	Vertical
6	262.35 MHz	35.43 dBμV/m	32.22 dBμV/m	-24.78 dB	Pass	300 Degree	1 m	Horizontal
7	300 MHz	30.33 dBμV/m	27.9 dBμV/m	-29.1 dB	Pass	270 Degree	1 m	Horizontal
8	600 MHz	39.02 dBμV/m	37.21 dBμV/m	-19.79 dB	Pass	210 Degree	1 m	Vertical
9	900 MHz	38.75 dBμV/m	36.55 dBμV/m	-20.45 dB	Pass	30 Degree	1 m	Vertical

Measurement 3: 138 VDC

EUT	NB3700-LWPB-G		
Verdict, Test	Pass, Class A		
Modification	None		
Mode of operation	Normal mode, 138 VDC		
Test date, time	23/10/2015 12:59:27		
Antenna height	1 m - 2 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: 1 ms, Step freq: Linear: 30 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 20 dB, Measure time: 5 ms, Measurement equipment: RE_30M-2GHz_ESU8_Inp1_CBL6112B_TD		

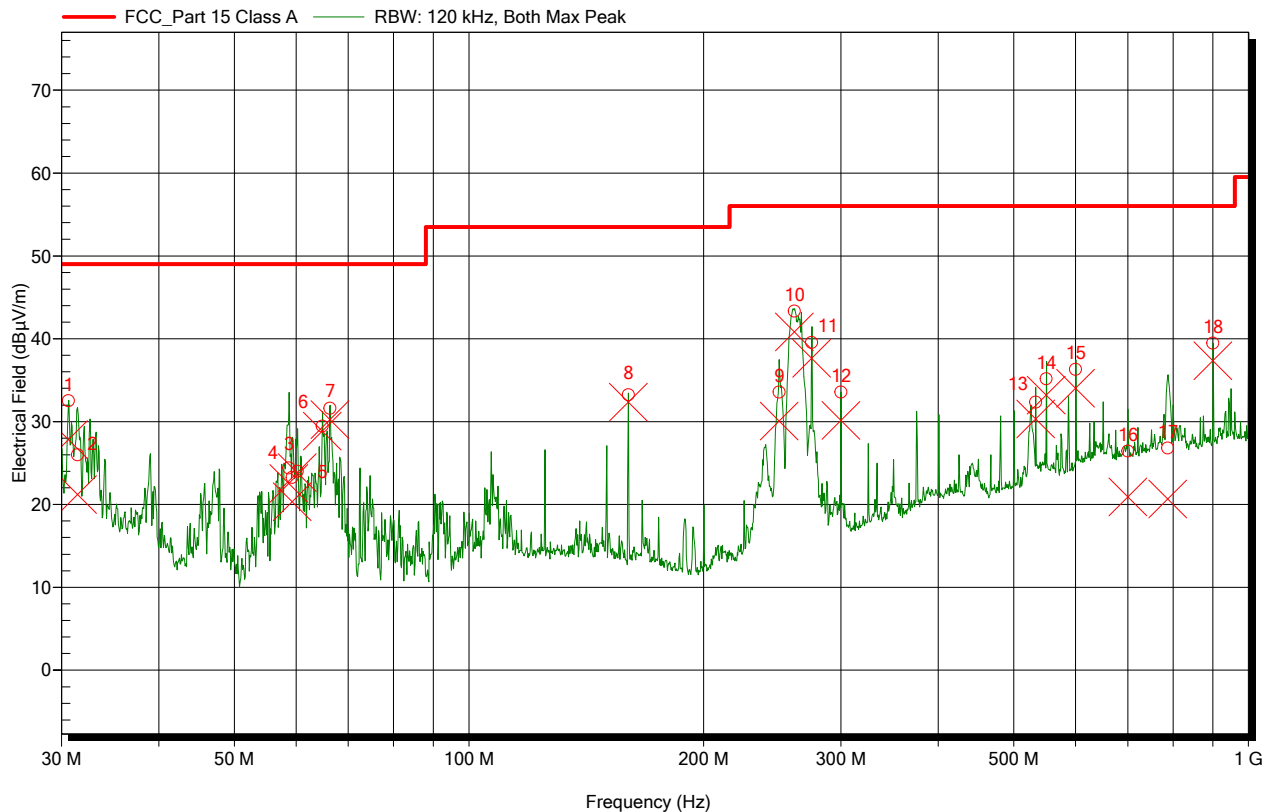


Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
1	33.18 MHz	30.97 dBμV/m	29.27 dBμV/m	-20.73 dB	Pass	210 Degree	1 m	Vertical
2	58.77 MHz	41.91 dBμV/m	39.58 dBμV/m	-10.42 dB	Pass	210 Degree	1 m	Vertical
3	60.18 MHz	41.24 dBμV/m	41.92 dBμV/m	-8.08 dB	Pass	210 Degree	1 m	Vertical
4	64.83 MHz	40.45 dBμV/m	40.15 dBμV/m	-9.85 dB	Pass	240 Degree	2 m	Vertical
5	66.3 MHz	44.43 dBμV/m	43.54 dBμV/m	-6.46 dB	Pass	180 Degree	1 m	Vertical
6	159.99 MHz	36.48 dBμV/m	38.47 dBμV/m	-11.53 dB	Pass	210 Degree	1 m	Vertical
7	261.99 MHz	41.49 dBμV/m	39.05 dBμV/m	-17.95 dB	Pass	0 Degree	1 m	Horizontal
8	300 MHz	37.41 dBμV/m	33.72 dBμV/m	-23.28 dB	Pass	270 Degree	1 m	Horizontal
9	520.02 MHz	49.39 dBμV/m	26.22 dBμV/m	-30.78 dB	Pass	150 Degree	1 m	Horizontal
10	600 MHz	43.29 dBμV/m	37.5 dBμV/m	-19.5 dB	Pass	210 Degree	1 m	Vertical
11	900 MHz	43.91 dBμV/m	37.76 dBμV/m	-19.24 dB	Pass	270 Degree	1 m	Horizontal

Measurement 4: 110 VDC, FCC

EUT	NB3700-LWPB-G		
Verdict, Test	PASS Test 6: ESU8_30M-1G CISPR 22 Class B 3m		
Modification	None		
Mode of operation	normal mode, 110 VDC		
Test date, time	23/10/2015 11:59:41		
Antenna height	1 m - 4 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: 1 ms, Step freq: Linear: 30 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 20 dB, Measure time: 5 ms, Measurement equipment: RE_30M-2GHz_ESU8_Inp1_CBL6112B_TD		

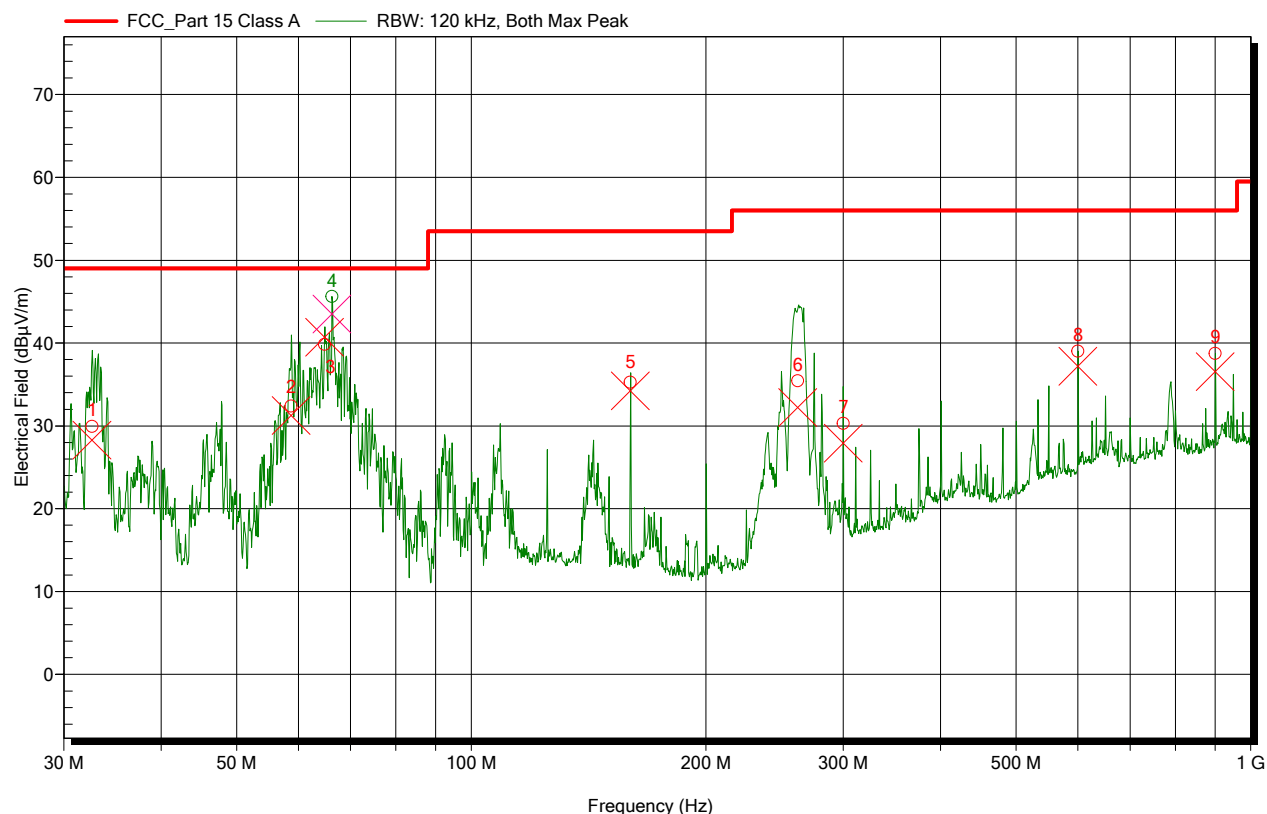


Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
1	30.63 MHz	32.5 dBμV/m	27.83 dBμV/m	-21.17 dB	Pass	150 Degree	3 m	Horizontal
2	31.44 MHz	26.01 dBμV/m	21.2 dBμV/m	-27.8 dB	Pass	150 Degree	1 m	Vertical
3	58.71 MHz	24.43 dBμV/m	22.53 dBμV/m	-26.47 dB	Pass	120 Degree	1 m	Vertical
4	59.31 MHz	23.26 dBμV/m	20.35 dBμV/m	-28.65 dB	Pass	150 Degree	2 m	Vertical
5	60.18 MHz	24.01 dBμV/m	23.82 dBμV/m	-25.18 dB	Pass	150 Degree	2 m	Vertical
6	64.83 MHz	29.47 dBμV/m	28.85 dBμV/m	-20.15 dB	Pass	330 Degree	1 m	Vertical
7	66.3 MHz	31.64 dBμV/m	30.23 dBμV/m	-18.77 dB	Pass	30 Degree	2 m	Vertical
8	160.02 MHz	33.26 dBμV/m	32.35 dBμV/m	-21.15 dB	Pass	240 Degree	1 m	Vertical
9	249.99 MHz	33.57 dBμV/m	30.06 dBμV/m	-25.94 dB	Pass	90 Degree	1 m	Horizontal
10	261.54 MHz	43.33 dBμV/m	40.83 dBμV/m	-15.17 dB	Pass	240 Degree	1 m	Vertical
11	275.01 MHz	39.55 dBμV/m	37.63 dBμV/m	-18.37 dB	Pass	300 Degree	2 m	Horizontal
12	300 MHz	33.55 dBμV/m	30.14 dBμV/m	-25.86 dB	Pass	300 Degree	1 m	Horizontal
13	533.31 MHz	32.35 dBμV/m	30.33 dBμV/m	-25.67 dB	Pass	330 Degree	1 m	Vertical
14	549.99 MHz	35.17 dBμV/m	33.2 dBμV/m	-22.8 dB	Pass	300 Degree	1 m	Vertical
15	600 MHz	36.29 dBμV/m	34.01 dBμV/m	-21.99 dB	Pass	300 Degree	2 m	Vertical
16	700.02 MHz	26.43 dBμV/m	20.89 dBμV/m	-35.11 dB	Pass	330 Degree	2 m	Horizontal
17	787.32 MHz	26.82 dBμV/m	20.67 dBμV/m	-35.33 dB	Pass	150 Degree	1 m	Horizontal
18	900 MHz	39.48 dBμV/m	37.37 dBμV/m	-18.63 dB	Pass	0 Degree	1 m	Vertical

Measurement 5: 50 VDC, FCC

EUT	NB3700-LWPB-G		
Verdict, Test	PASS Test 7: ESU8_30M-1G CISPR 22 Class B 3m		
Modification	None		
Mode of operation	normal mode, 50 VDC		
Test date, time	23/10/2015 12:37:15		
Antenna height	1 m - 2 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: 1 ms, Step freq: Linear: 30 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 20 dB, Measure time: 5 ms, Measurement equipment: RE_30M-2GHz_ESU8_Inp1_CBL6112B_TD		

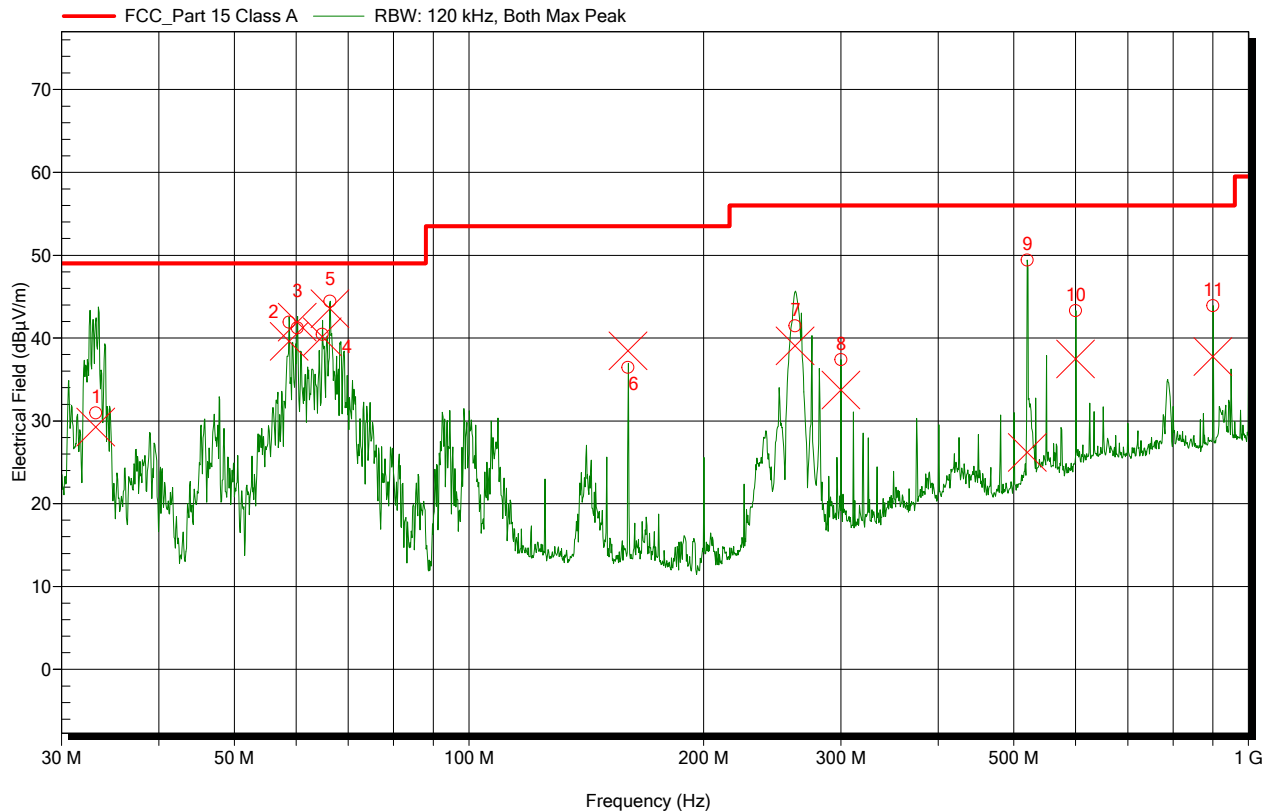


Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
1	32.61 MHz	29.93 dBμV/m	28.29 dBμV/m	-20.71 dB	Pass	30 Degree	2 m	Vertical
2	58.71 MHz	32.4 dBμV/m	31.25 dBμV/m	-17.75 dB	Pass	300 Degree	2 m	Vertical
3	64.8 MHz	39.85 dBμV/m	40.72 dBμV/m	-8.28 dB	Pass	180 Degree	2 m	Vertical
4	66.27 MHz	45.63 dBμV/m	43.49 dBμV/m	-5.51 dB	Pass	180 Degree	2 m	Vertical
5	159.96 MHz	35.3 dBμV/m	34.23 dBμV/m	-19.27 dB	Pass	210 Degree	1 m	Vertical
6	262.35 MHz	35.43 dBμV/m	32.22 dBμV/m	-23.78 dB	Pass	300 Degree	1 m	Horizontal
7	300 MHz	30.33 dBμV/m	27.9 dBμV/m	-28.1 dB	Pass	270 Degree	1 m	Horizontal
8	600 MHz	39.02 dBμV/m	37.21 dBμV/m	-18.79 dB	Pass	210 Degree	1 m	Vertical
9	900 MHz	38.75 dBμV/m	36.55 dBμV/m	-19.45 dB	Pass	30 Degree	1 m	Vertical

Measurement 6: 138 VDC, FCC

EUT	NB3700-LWPB-G		
Verdict, Test	PASS Test 8: ESU8_30M-1G CISPR 22 Class B 3m		
Modification	None		
Mode of operation	normal mode, 138 VDC		
Test date, time	23/10/2015 12:59:27		
Antenna height	1 m - 2 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 120 kHz, VBW: Auto [120 kHz], Sweep time: 1 ms, Step freq: Linear: 30 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 20 dB, Measure time: 5 ms, Measurement equipment: RE_30M-2GHz_ESU8_Inp1_CBL6112B_TD		



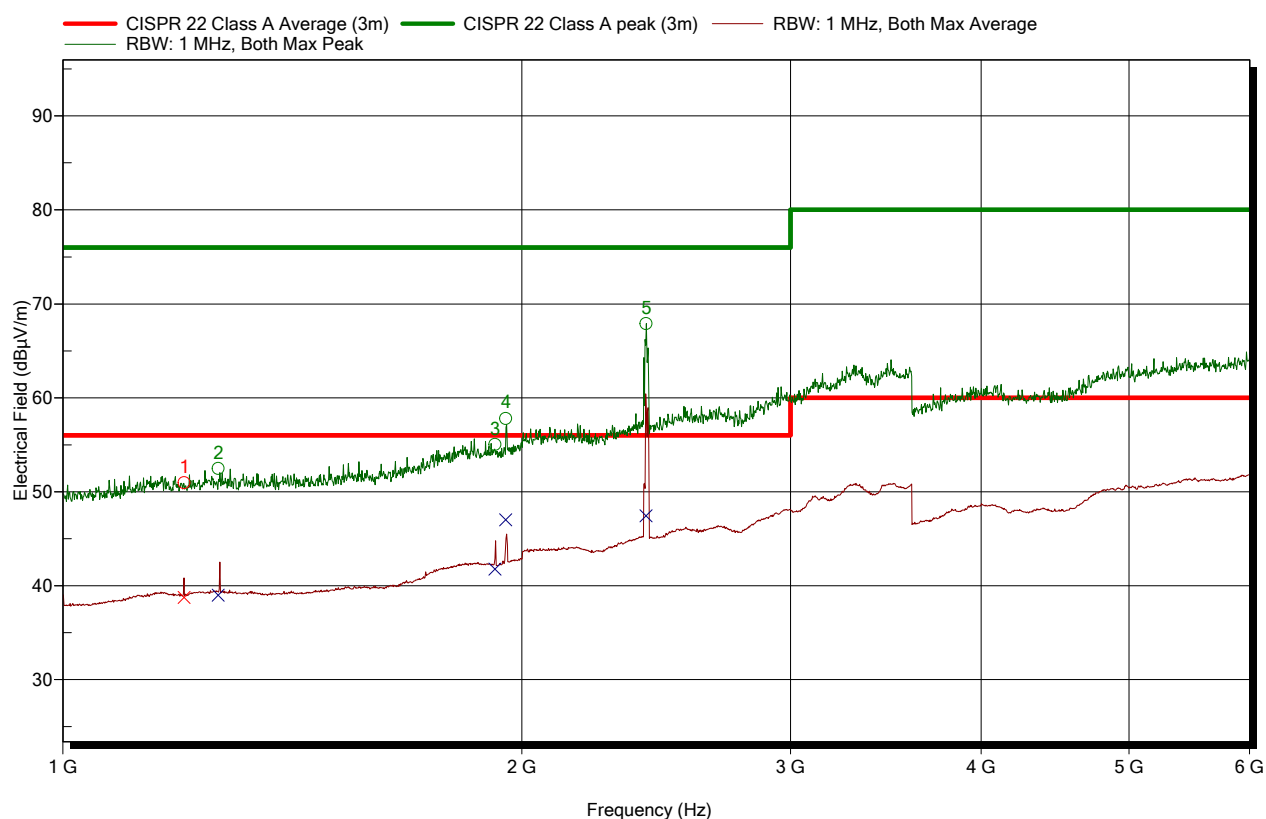
Detected peaks

Peak Number	Frequency	Peak	Quasi-Peak	Quasi-Peak Difference	Status	Angle	Height	Polarization
1	33.18 MHz	30.97 dBμV/m	29.27 dBμV/m	-19.73 dB	Pass	210 Degree	1 m	Vertical
2	58.77 MHz	41.91 dBμV/m	39.58 dBμV/m	-9.42 dB	Pass	210 Degree	1 m	Vertical
3	60.18 MHz	41.24 dBμV/m	41.92 dBμV/m	-7.08 dB	Pass	210 Degree	1 m	Vertical
4	64.83 MHz	40.45 dBμV/m	40.15 dBμV/m	-8.85 dB	Pass	240 Degree	2 m	Vertical
5	66.3 MHz	44.43 dBμV/m	43.54 dBμV/m	-5.46 dB	Pass	180 Degree	1 m	Vertical
6	159.99 MHz	36.48 dBμV/m	38.47 dBμV/m	-15.03 dB	Pass	210 Degree	1 m	Vertical
7	261.99 MHz	41.49 dBμV/m	39.05 dBμV/m	-16.95 dB	Pass	0 Degree	1 m	Horizontal
8	300 MHz	37.41 dBμV/m	33.72 dBμV/m	-22.28 dB	Pass	270 Degree	1 m	Horizontal
9	520.02 MHz	49.39 dBμV/m	26.22 dBμV/m	-29.78 dB	Pass	150 Degree	1 m	Horizontal
10	600 MHz	43.29 dBμV/m	37.5 dBμV/m	-18.5 dB	Pass	210 Degree	1 m	Vertical
11	900 MHz	43.91 dBμV/m	37.76 dBμV/m	-18.24 dB	Pass	270 Degree	1 m	Horizontal

Measurement Results 1 – 13 GHz

Measurement 7: 1 – 6 GHz, 110 VDC

EUT	NB3700-LWPB-G		
Verdict, Test	Pass, Class A		
Modification	None		
Mode of operation	Normal mode, 110 VDC		
Test date, time	23/10/2015 13:17:51		
Antenna height	1 m - 2 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 1 MHz, VBW: 1 MHz, Sweep time: Auto [0 ms], Step freq: Linear: 500 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 20 dB, Measure time: 1 ms, Measurement equipment: RE_1-8GHz_ESU8_Inp1_TD		

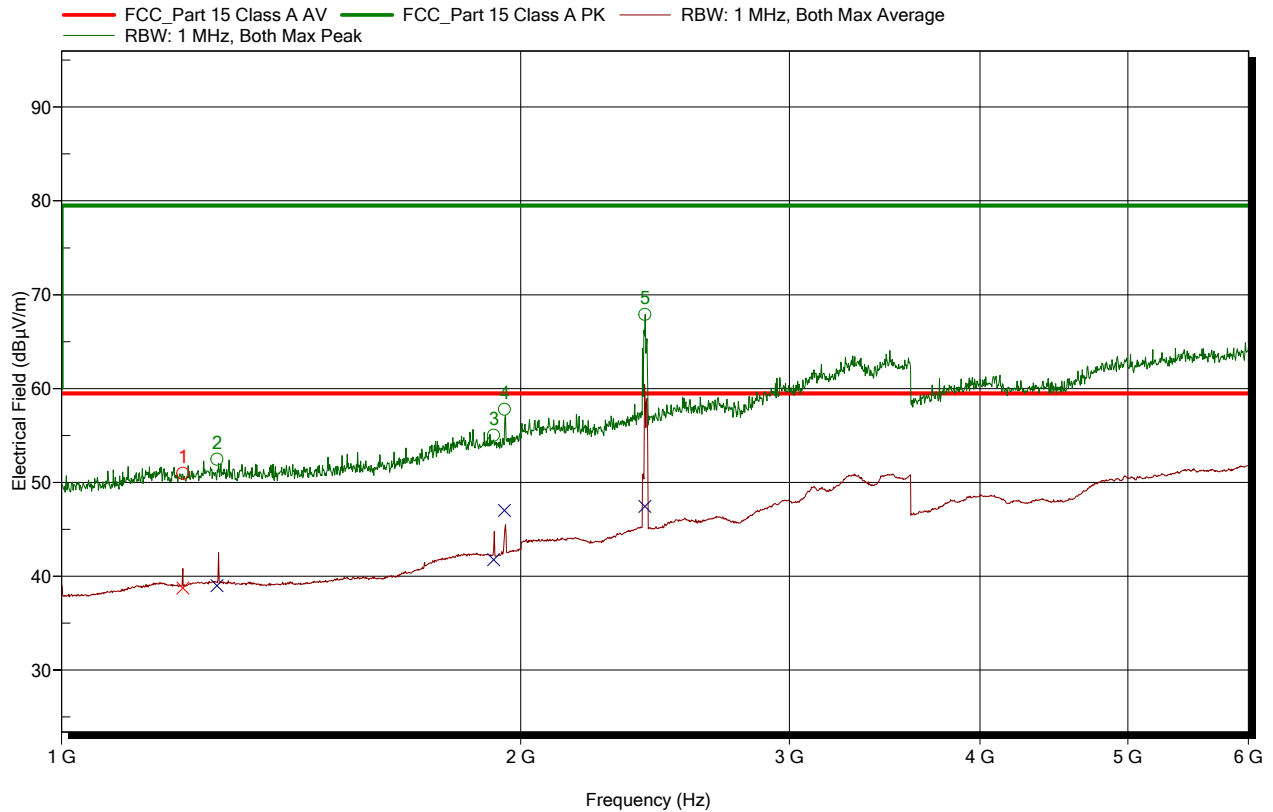


Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average	Average Difference	Status	Angle	Height	Polarization
1	1.201 GHz	50.97 dBμV/m	-25.03 dB	38.74 dBμV/m	-17.26 dB	Pass	30 Degree	1 m	Horizontal
2	1.265 GHz	52.48 dBμV/m	-23.52 dB	38.98 dBμV/m	-17.02 dB	Pass	300 Degree	1 m	Vertical
3	1.92 GHz	55.01 dBμV/m	-20.99 dB	41.75 dBμV/m	-14.25 dB	Pass	330 Degree	1 m	Vertical
4	1.952 GHz	57.8 dBμV/m	-18.2 dB	46.99 dBμV/m	-9.01 dB	Pass	90 Degree	1 m	Vertical
5	2.412 GHz	67.9 dBμV/m	-8.1 dB	47.44 dBμV/m	-8.56 dB	Pass	60 Degree	1 m	Horizontal

Measurement 8: 1 – 6 GHz, 110 VDC, FCC

EUT	NB3700-LWPB-G		
Verdict, Test	Pass, Class A		
Modification	None		
Mode of operation	normal mode, 110 VDC		
Test date, time	23/10/2015 13:17:51		
Antenna height	1 m - 2 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 1 MHz, VBW: 1 MHz, Sweep time: Auto [0 ms], Step freq: Linear: 500 kHz steps, Attenuator: Auto [10 dB], Internal preamp: 20 dB, Measure time: 1 ms, Measurement equipment: RE_1-8GHz_ESU8_Inp1_TD		

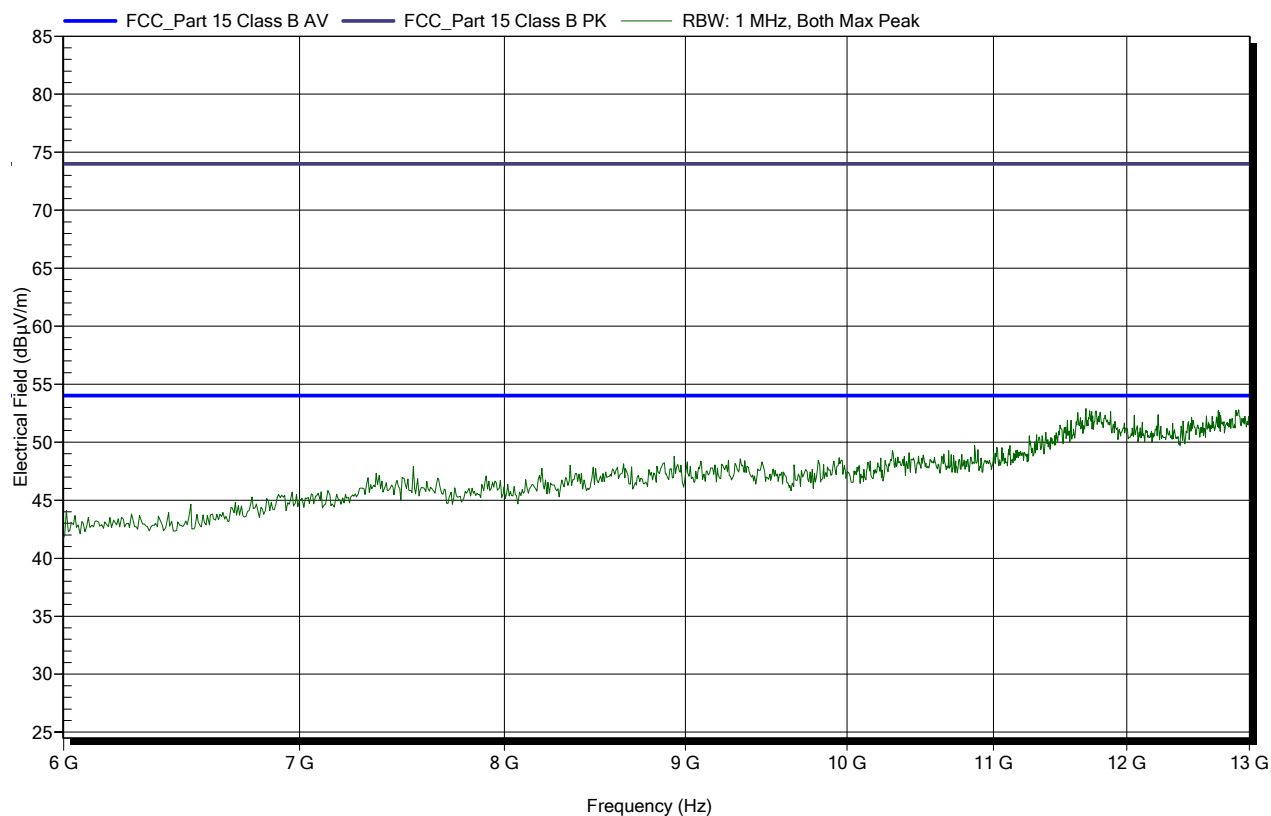


Detected peaks

Peak Number	Frequency	Peak	Peak Difference	Average	Average Difference	Status	Angle	Height	Polarization
1	1.201 GHz	50.97 dBμV/m	-28.53 dB	38.74 dBμV/m	-20.76 dB	Pass	30 Degree	1 m	Horizontal
2	1.265 GHz	52.48 dBμV/m	-27.02 dB	38.98 dBμV/m	-20.52 dB	Pass	300 Degree	1 m	Vertical
3	1.92 GHz	55.01 dBμV/m	-24.49 dB	41.75 dBμV/m	-17.75 dB	Pass	330 Degree	1 m	Vertical
4	1.952 GHz	57.8 dBμV/m	-21.7 dB	46.99 dBμV/m	-12.51 dB	Pass	90 Degree	1 m	Vertical
5	2.412 GHz	67.9 dBμV/m	-11.6 dB	47.44 dBμV/m	-12.06 dB	Pass	60 Degree	1 m	Horizontal

Measurement 8: 6 – 13 GHz, 110 VDC, FCC

EUT	NB3700-LWPB-G		
Verdict, Test	Pass, Class B		
Modification	None		
Mode of operation	normal mode, 110 VDC		
Test date, time	23/10/2015 13:39:50		
Antenna height	1 m	Antenna polarization	Vertical/Horizontal
EUT position	0 Degree to 360 Degree	Antenna distance	3 m
Measurement settings	Radimation Version: 2015.1.11, RBW: 1 MHz, VBW: 1 MHz, Sweep time: Auto [80 ms], Step freq: Fixed step count: 601 steps per Band, Attenuator: 0 dB, Internal preamp: 0 dB, Measure time: Auto [120 ms], Measurement equipment: RE FCC 1 GHz to 18 GHz E4407 preamp		



Detected peaks

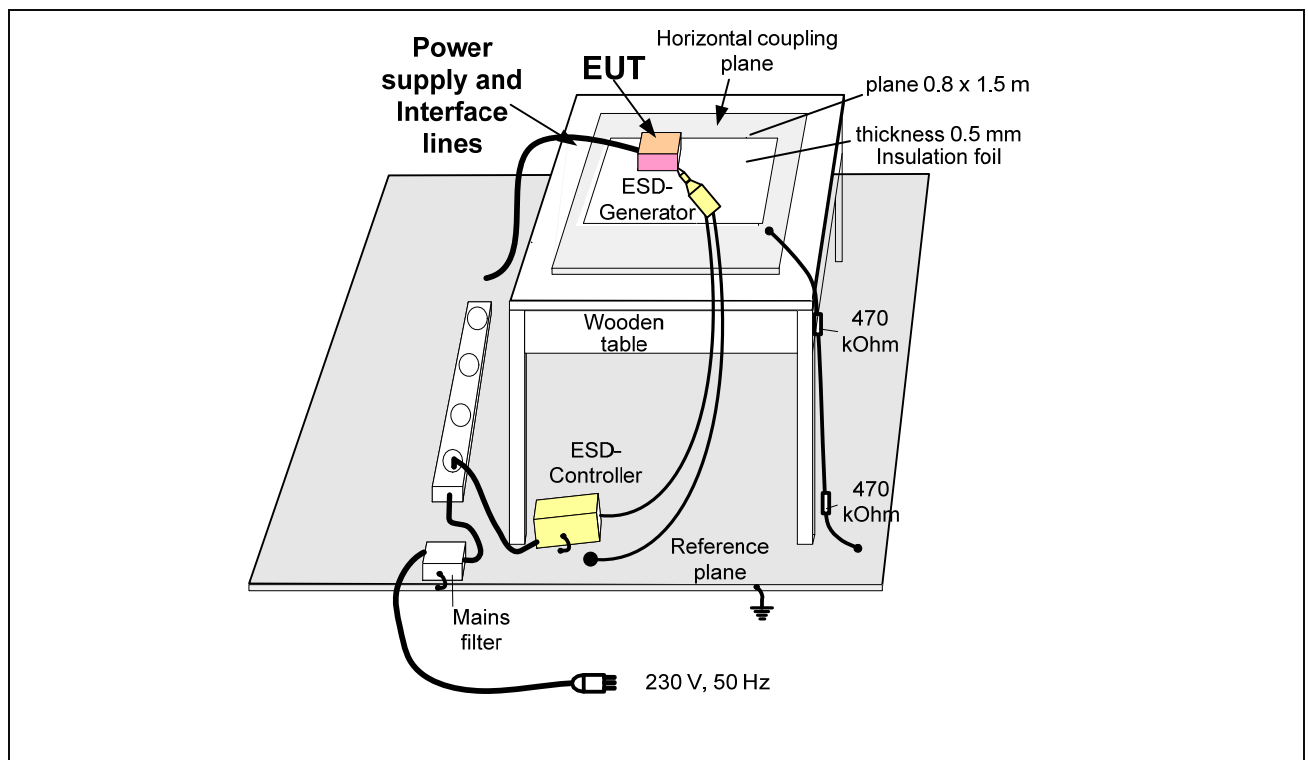
none

13. Immunity Tests

13.1 Immunity to Electrostatic Discharge (ESD) (EN 61000-4-2)

Introduction:	<i>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 fiber. The humidity of the air has an influence on the discharge time and therefore on the severity of the discharge that could appear.</i>
Coupling:	150 pF / 330 Ohm
Meas. uncertainty:	see chapter 14
Test method:	<i>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.</i>

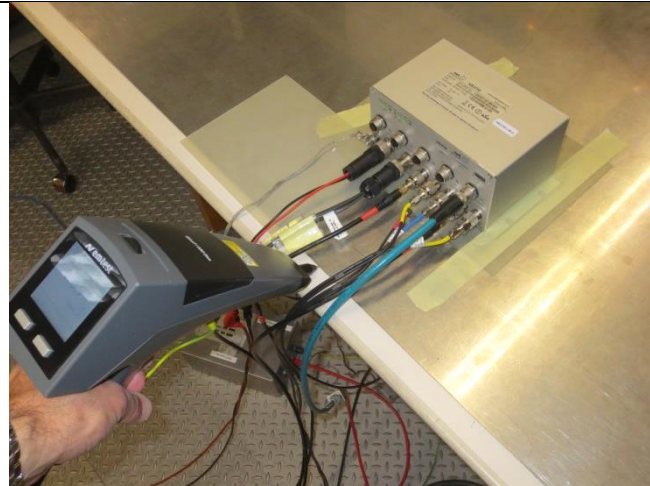
Test Setup



Test Equipment

Device Type	Brand	Type	ID
ESD Generator	EM-Test	ESD N30	PE10238
Power Supply	EA	EA-PS-8160-04	13.6632.11

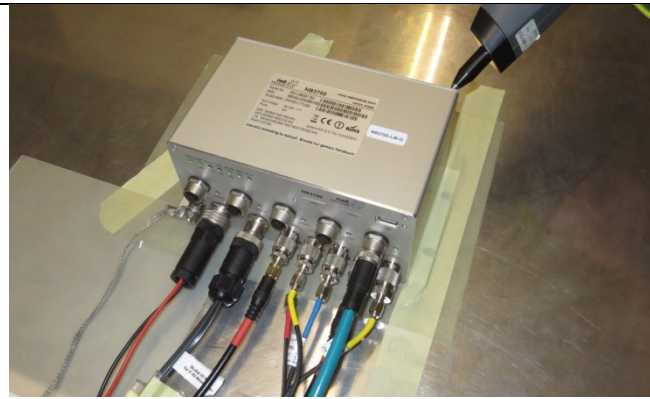
Photos of the Setup



Indirect Discharge



Direct Discharge



Direct Discharge



Air Discharge

Test Results

Equipment: *NB3700-LWPB-G*
 Cables connected: *See chapter 11.3*
 Operating mode: *Active, see chapter 11.4*
 Observation of EUT: *See chapter 11.5*
 Modifications: *none*
 Test site: *Laboratory*

Requirements

Standard	Required Level Air Discharge	Required Level Contact Discharge	Impulses per Point, Level and Polarity	Performance Criterion
EN 50121-3-2	$\pm 8 \text{ kV}$	$\pm 6 \text{ kV}$	10	B
EN 50155	$\pm 8 \text{ kV}$	$\pm 6 \text{ kV}$	10	B
EN 61000-6-2	$\pm 8 \text{ kV}$	$\pm 4 \text{ kV}$	10	B
EN 301 489-1	$\pm 8 \text{ kV}$	$\pm 4 \text{ kV}$	10	B

Protocol of the Test - Indirect Discharges

Indirect Discharges:

Level [kV]	No of discharges (for each level)	Discharge	Result, Observation, Behavior of EUT	Fulfilled criterion	Verdict
$\pm 2; \pm 4; \pm 6$	10	HCP	No errors observed	A	Pass
$\pm 2; \pm 4; \pm 6$	10	VCP	No errors observed	A	Pass

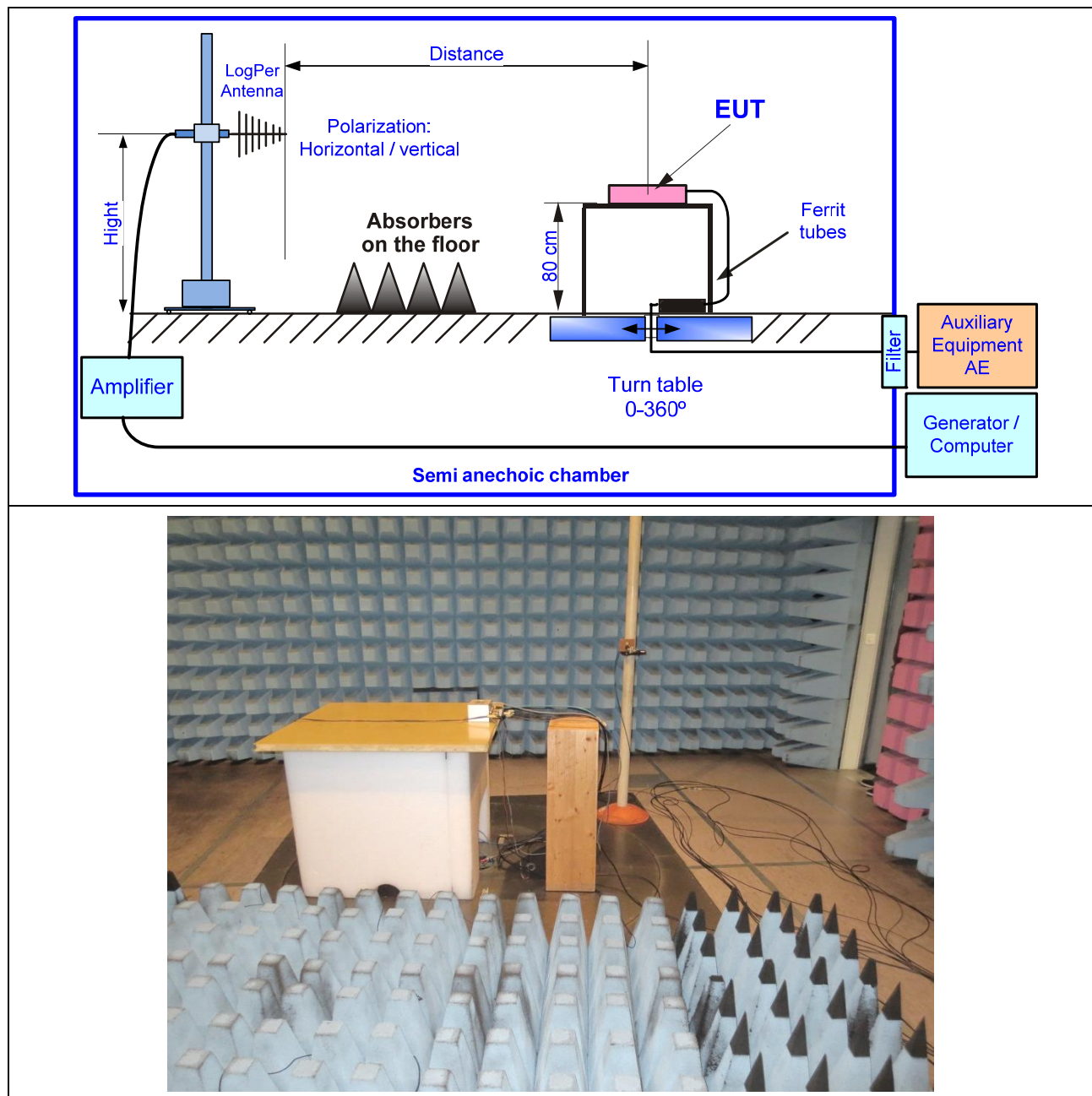
Direct Discharges:

Level [kV]	No of discharges (for each level)	Discharge		Result, Observation, Behavior of EUT	Fulfilled criterion	Verdict
		Air	Contact			
$\pm 2; \pm 4; \pm 6$	10	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No errors observed	A	Pass
$\pm 2; \pm 4; \pm 8$	10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No errors observed	A	Pass
Tested points: LED's, Connectors, Enclosure						

13.2 Immunity to Electromagnetic Fields (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:** *see chapter 14*
- Test method:** *The field is emitted from one or different antennas placed successively in vertical and then in horizontal polarization. The field is calibrated without the EUT using an isotropic probe.*

Test Setup



Test Equipment

Device Type	Brand	Type	ID
Signal Generator	AnaPico	APSin 6010	13.6632.14
Amplifier 80 – 1000 MHz	Amplifier Research	750W1000	14.6632.04
Amplifier 1 – 6 GHz	Amplifier Research	50S1G6	14.6632.01
Antenna	Amplifier Research	AT 6080	H10192
Field Sensor	Narda S.T.S	EP 601	14.6632.02
Power Supply	EA	EA-PS-8160-04	13.6632.11

Test Results

Equipment: *NB3700-LWPB-G*
 Cables connected: *See chapter 11.3*
 Operating mode: *Active, see chapter 11.4*
 Observation of EUT: *See chapter 11.5*
 Modifications: *none*
 Test site: *Semi-anechoic chamber (hybrid)*

Requirements

Standard	Frequency Range	Required Level	Modulation	Freq. step	Dwell time	Performance Criterion
<i>EN 50121-3-2</i>	<i>80 – 1000 MHz</i>	<i>20 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
	<i>1400 – 2000 MHz</i>	<i>10 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
	<i>2000 – 2700 MHz</i>	<i>5 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
	<i>5100 – 6000 MHz</i>	<i>3 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
<i>EN 50155</i>	<i>80 – 1000 MHz</i>	<i>20 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
	<i>1400 – 2100 MHz</i>	<i>10 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
	<i>2100 – 2500 MHz</i>	<i>5 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
<i>EN 61000-6-2</i>	<i>80 – 1000 MHz</i>	<i>10 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
	<i>1400 – 2000 MHz</i>	<i>3 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
	<i>2000 – 2700 MHz</i>	<i>1 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
<i>EN 301 489-1</i>	<i>80 – 1000 MHz</i>	<i>3 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>
	<i>1400 – 2700 MHz</i>	<i>3 V/m</i>	<i>AM, 1 kHz, 80%</i>	<i>1 %</i>	<i>1 s</i>	<i>A</i>

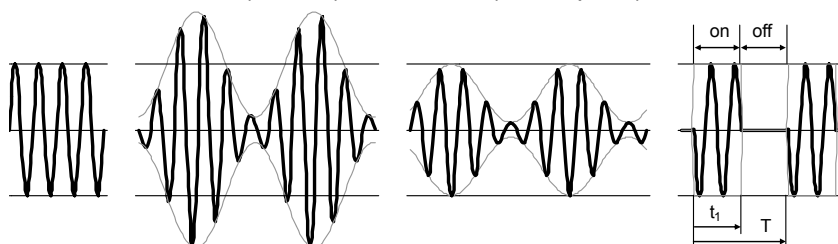
Modulation:

☐ CW

☒ AM (normal)

☐ AM (const. peak)

☐ PM



Protocol of the Test

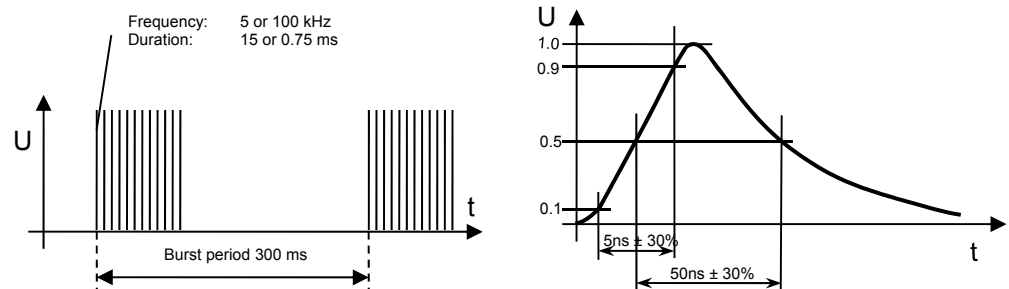
Frequency [MHz]	E [V/m]	Polarization	Direction	Result, Observation Behavior of EUT	Fulfilled criterion	Verdict
80 - 1000	20	horizontal	0, 90, 180, 270°	No errors observed	A	Pass
	20	vertical	0, 90, 180, 270°	No errors observed	A	Pass
1000 - 6000	10	horizontal	0, 90, 180, 270°	No errors observed	A	Pass
	10	vertical	0, 90, 180, 270°	No errors observed	A	Pass

13.3 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:



Open-circuit voltage

see chapter 14

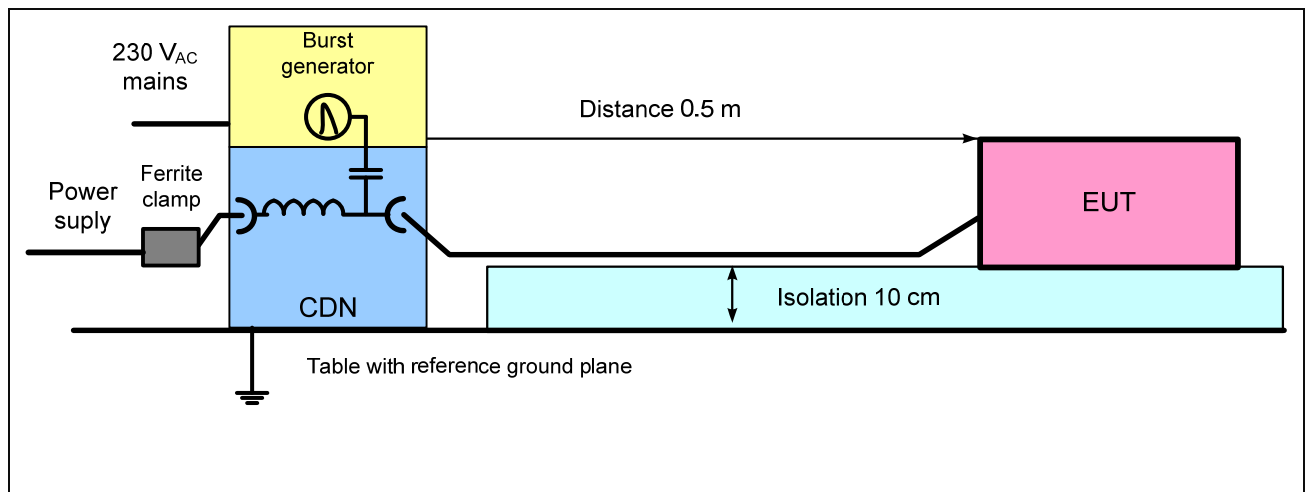
Voltage in a 50Ω-Load

Meas. uncertainty:

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.

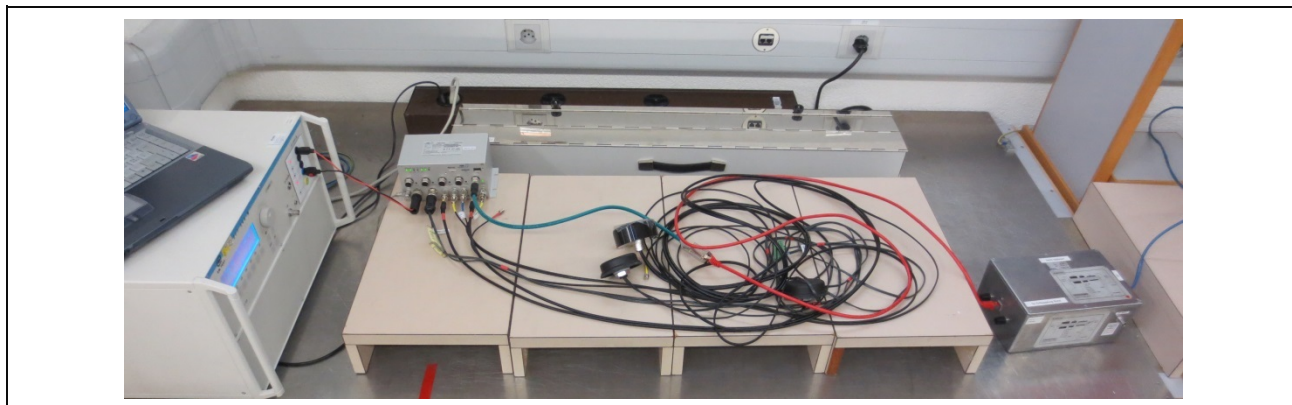
Test Setup



Test Equipment

Device Type	Brand	Type	ID
Burst Generator	EM-Test	EFT500M4S1	PE10105
Capacitive Coupling Clamp	EM-Test	EM-Test HFK	H9360
Power Supply	EA	EA-PS-8160-04	13.6632.11

Photos of the Setup



Test Results

Equipment: *NB3700-LWPB-G*
 Cables connected: *See chapter 11.3*
 Operating mode: *Active, see chapter 11.4*
 Observation of EUT: *See chapter 11.5*
 Modifications: *none*
 Test site: *Laboratory*

Requirements

Standard	Required Level AC Supply:	Required Level DC Supply	Required Level Signal	Protection. Earth	Burst Frequency	Performance Criterion
EN 50121-3-2	$\pm 2.0 \text{ kV}$	.....	$\pm 2.0 \text{ kV}$	.....	5 kHz	A
EN 50155	$\pm 2.0 \text{ kV}$	$\pm 2.0 \text{ kV}$	$\pm 2.0 \text{ kV}$	.....	5 kHz	A
EN 61000-6-2	$\pm 2.0 \text{ kV}$	$\pm 2.0 \text{ kV}$	$\pm 1.0 \text{ kV}$	--	5 kHz	B
EN 301 489-1	$\pm 1.0 \text{ kV}$	$\pm 0.5 \text{ kV}$	$\pm 0.5 \text{ kV}$	.....	5 kHz	B

Protocol of the Test

Tested port	Level [kV]	Duration	Frequency	Coupling	Result, Observation, Behavior of EUT	Fulfilled criterion	Verdict
DC Supply	2.0 kV	60 s	5 kHz	direct	No errors observed	A	Pass
	2.0 kV	60 s	100 kHz	direct	No errors observed	A	Pass

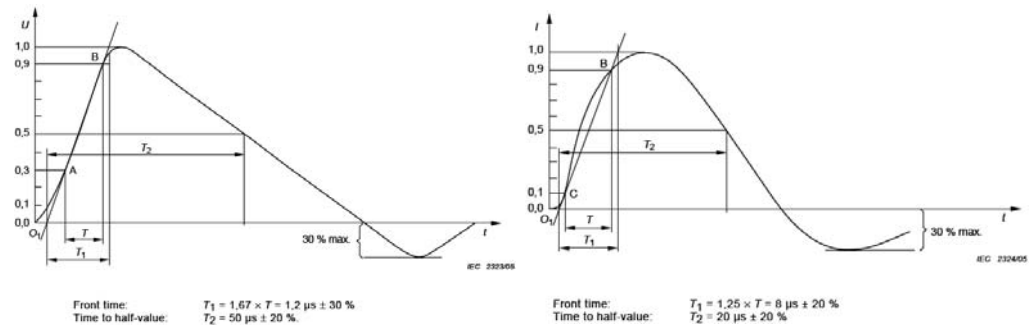
Note: Other ports see test report 12-EL-0088.E02

13.4 Immunity to Surge (EN 61000-4-5 : 1.2/50µs)

Introduction:

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

Impulses:



Open-circuit voltage

Short-circuit current

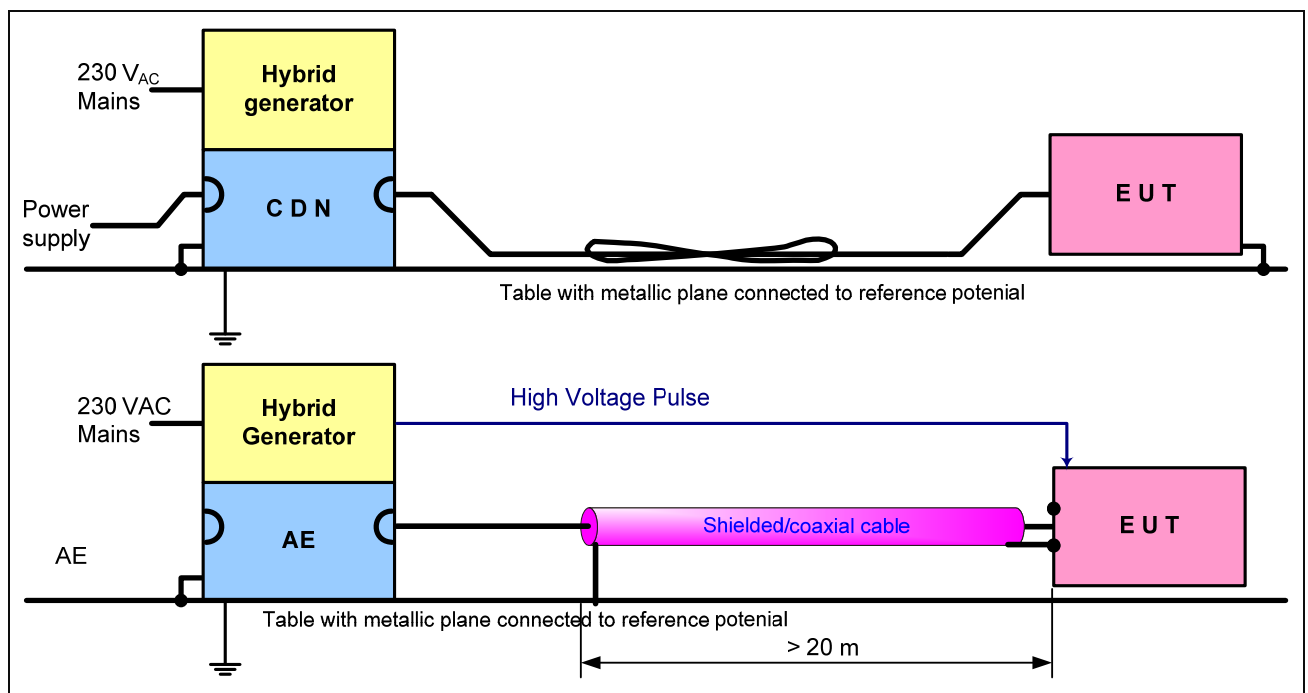
Meas. uncertainty:

see chapter 14

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.

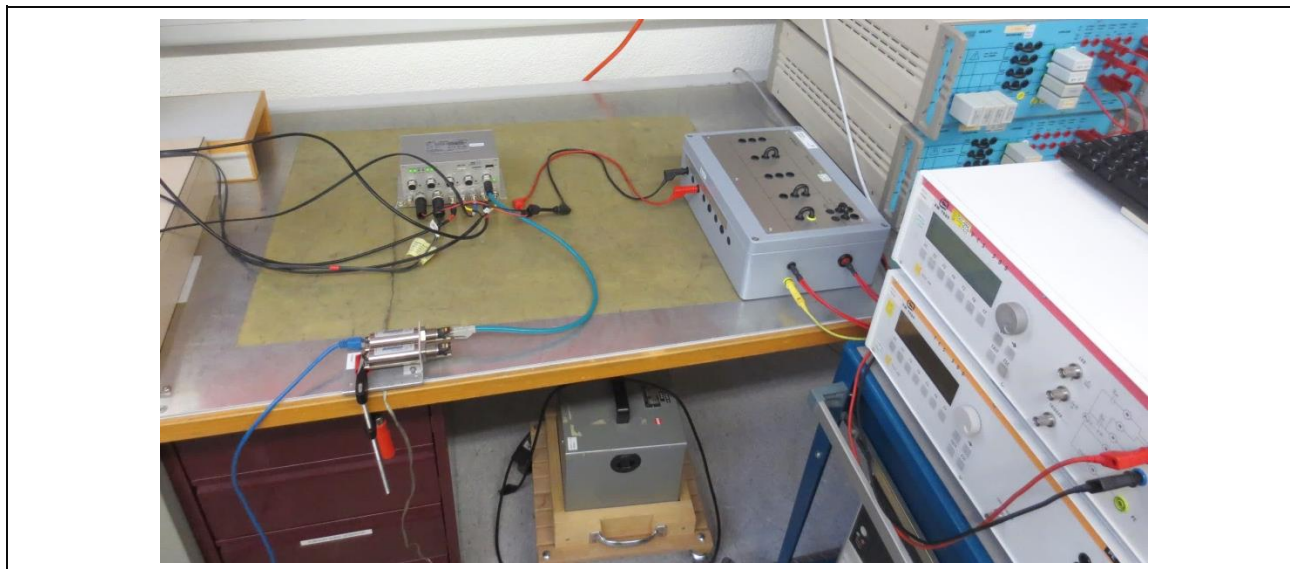
Test Setup



Test Equipment

Device Type	Brand	Type	ID
Surge Generator	EM Test	VCS 500	PE 7239
Coupling Device CDN	EM Test	CNV 504N1	15.6632.13
Power Supply	EA	EA-PS-8160-04	13.6632.11

Photo of the Setup



Test Results

Equipment: *NB3700-LWPB-G*
 Cables connected: *See chapter 11.3*
 Operating mode: *Active, see chapter 11.4*
 Observation of EUT: *See chapter 11.5*
 Modifications: *Test repeated on November 10th with modifications according chapter 15*
 Test site: *Laboratory*

Requirements

Standard	Required Level AC-Supply		Required Level DC-Supply		Required Level Signal		Performance Criterion
	L – N 2 Ω+18 μF	L, N – PE 12 Ω+9 μF	L1 – L2 2 Ω+18 μF	L1, L2 – PE 12 Ω+9 μF	L1 – L2 42 Ω+0.5 μF	L1, L2 – PE 42 Ω+0.5 μF	
EN 61000-6-2	±1.0 kV	±2.0 kV	±0.5 kV	±0.5 kV	--	±1.0 kV	B
EN 301 489-1	±1.0 kV Note 1	±2.0 kV Note 1	---	---	---	Note 2	B

Notes:

- 1) In telecom centers: ±0.5 kV resp. ±1.0 kV
- 2) Telecom ports: Indoor cables >10m and in telecom centers: ±0.5 kV Outdoor cables: ±1 kV

Standard	Required Level Battery referenced ports, auxiliary AC power input ports		Required Level Signal and communication, process measurement and control ports		Performance Criterion
	L1 – L2 42 Ω+0.5 μF	L1, L2 – PE 42 Ω+0.5 μF	L1 – L2 42 Ω+0.5 μF	L1, L2 – PE 42 Ω+0.5 μF	
EN 50121-3-2	±1.0 kV	±2.0 kV	--	--	B
EN 50155	±1.0 kV	±2.0 kV	--	--	B

Protocol of the Test

Tests on DC Power Port EN 50121-3-2:

Tested port	Level [kV]	Coupling mode	Coupling network	Number of pulses*	Remarks	Fulfilled criterion	Verdict
DC Supply @ 50 V	$\pm 0.5; \pm 1.0$	L1(+) – L2(-)	$42 \Omega + 0.5 \mu\text{F}$	5	No errors observed	A	Pass
	$\pm 0.5; \pm 1.0; \pm 2.0$	L1(+) – PE L2(-) – PE	$42 \Omega + 0.5 \mu\text{F}$	5	No errors observed	A	Pass
DC Supply @ 138 V	$\pm 0.5; \pm 1.0$	L1(+) – L2(-)	$42 \Omega + 0.5 \mu\text{F}$	5	No errors observed	A	Pass
	$\pm 0.5; \pm 1.0; \pm 2.0$	L1(+) – PE L2(-) – PE	$42 \Omega + 0.5 \mu\text{F}$	5	No errors observed	A	Pass

* Number of pulses for each voltage level and each polarity

Tests on DC Power Port EN 61000-6-2:

Tested port	Level [kV]	Coupling mode	Coupling network	Number of pulses*	Remarks	Fulfilled criterion	Verdict
DC Supply @ 50 V	± 0.5	L1(+) – L2(-)	$2 \Omega + 18 \mu\text{F}$	5	No errors observed	A	Pass
	± 0.5	L1(+) – PE L2(-) – PE	$12 \Omega + 9 \mu\text{F}$	5	No errors observed	A	Pass
DC Supply @ 138 V	± 0.5	L1(+) – L2(-)	$2 \Omega + 18 \mu\text{F}$	5	No errors observed	A	Pass
	± 0.5	L1(+) – PE L2(-) – PE	$12 \Omega + 9 \mu\text{F}$	5	No errors observed	A	Pass

* Number of pulses for each voltage level and each polarity

Note: LAN port see test report 12-EL-0088.E02

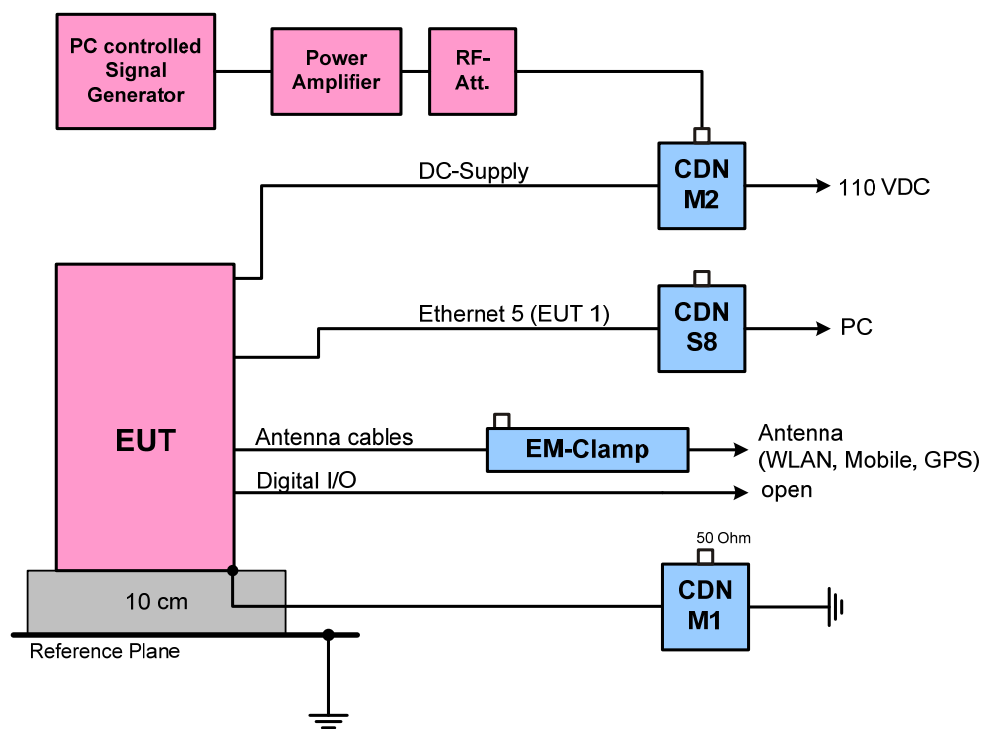
13.5 Immunity to Conducted Disturbances Induced by RF Fields (EN 61000-4-6)

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: *see chapter 14*

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 Setup



Notes:

- all CDN's are connected directly to the Reference Plane



Test Equipment

Device Type	Brand	Type	ID
Signal Generator	Marconi	2024	GF7839
Amplifier	Amplifier Research	150A250	V10108
Current sensor	Fischer	F-55	H10123
Sensor power meter	Gigatronix	8541	IV9490
Injection device	EM-Test	CDN M2	H10167
Injection device	EM-Test	CDN M1 32 A	H10165
Injection device	Lüthi	CDS S8 (RJ45)	13.6632.07
Injection device	EM-Test	EM 100	H4844
Power Supply	EA	EA-PS-8160-04	13.6632.11

Test Results

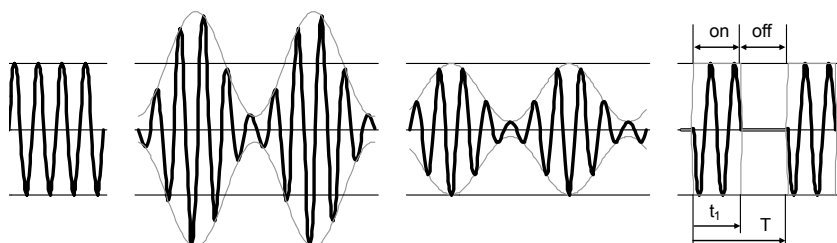
Equipment: *NB3700-LWPB-G*
 Cables connected: *see chapter 11.3*
 Operating mode: *Active, see chapter 11.4*
 Observation of EUT: *See chapter 11.5*
 Modifications: *none*
 Test site: *Laboratory*

Requirements

Standard	Frequency range	Required level	Modulation	Freq. step	Dwell time	Performance crit.
EN 50121-3-2	0.15 – 80 MHz	10 V _{EMF}	AM, 1 kHz, 80 %	1 %	1 s	A
EN 50155	0.15 – 80 MHz	10 V _{EMF}	AM, 1 kHz, 80 %	1 %	1 s	A
EN 61000-6-2	0.15 – 80 MHz	10 V _{EMF}	AM, 1 kHz, 80 %	1 %	1 s	A
EN 301 489-1	0.15 – 80 MHz	3 V _{EMF}	AM, 1 kHz, 80 %	1 %	1 s	A

Step time: 1 s

Signal modulation: ☐ CW ☒ AM ☐ AM ☐ PM



Protocol of the Test

Coupling	CDN	Terminated (50 Ω)	CDN	Frequency [MHz]	Level [V]	Remarks	Fulfilled criterion	Verdict
DC Supply @ 110 V	M2	Enclosure	M1	0.15 – 80	12	No errors observed	A	Pass
Ethernet 5	S8	Enclosure	M1	0.15 – 80	12	No errors observed	A	Pass
Enclosure	M1	DC Supply	M2	0.15 – 80	12	No errors observed	A	Pass

Notes:

- 1) All ports overtested with 12 V
- 2) Other ports see test report 12-EL-0088.E02

13.6 Performance Test & Supply Overvoltages (EN 50155 §12.2 & EN 61000-4-29)

Test Setup



Test Equipment

Device Type	Brand	Type	ID
Power Source & Power Fail Generator	EM Test	NetWave 7	Q10381

Test Results

Equipment: *NB3700-LWPB-G*
 Cables connected: *see chapter 11.3*
 Operating mode: *Active, see chapter 11.4*
 Observation of EUT: *See chapter 11.5*
 Modifications: *none*
 Test site: *Laboratory*

Protocol of the Test

Test at 72 V:

Standard	Chapter	Voltage		Duration	Requirements	Remarks	Verdict
EN 50155	5.1.1.1	43.2 V	0.6 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.1.1	100.8 V	1.4 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.1.1	90 V	1.25 U_N	1 s	Criterion C	No errors observed	Pass
	5.1.1.1	100.8 V	1.4 U_N	1 s	Criterion C	No errors observed	Pass
	5.1.1.2	0 V (Note 1)	0 U_N	10 ms	Criterion A	No errors observed	Pass
	5.1.2	64.8 V	0.9 U_N	Unlimited	Criterion A	No errors observed	Pass
	5.1.2	79.2 V	1.1 U_N	Unlimited	Criterion A	No errors observed	Pass
	5.1.2	43.2 V	0.6 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.2	100.8 V	1.4 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.2	50.4 V	0.7 U_N	1 s	Criterion A	No errors observed	Pass
	5.1.2	90 V	1.25 U_N	1 s	Criterion A	No errors observed	Pass
	5.1.3	43.2 V	0.6 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.3	0 V (Note 1)	0 U_N	30 ms	Criterion A	No errors observed	Pass
	12.2.6	100.8 V	1.4 U_N	1 s	Criterion A	rise & fall time 0.1 s No errors observed	Pass

Test at 110 V:

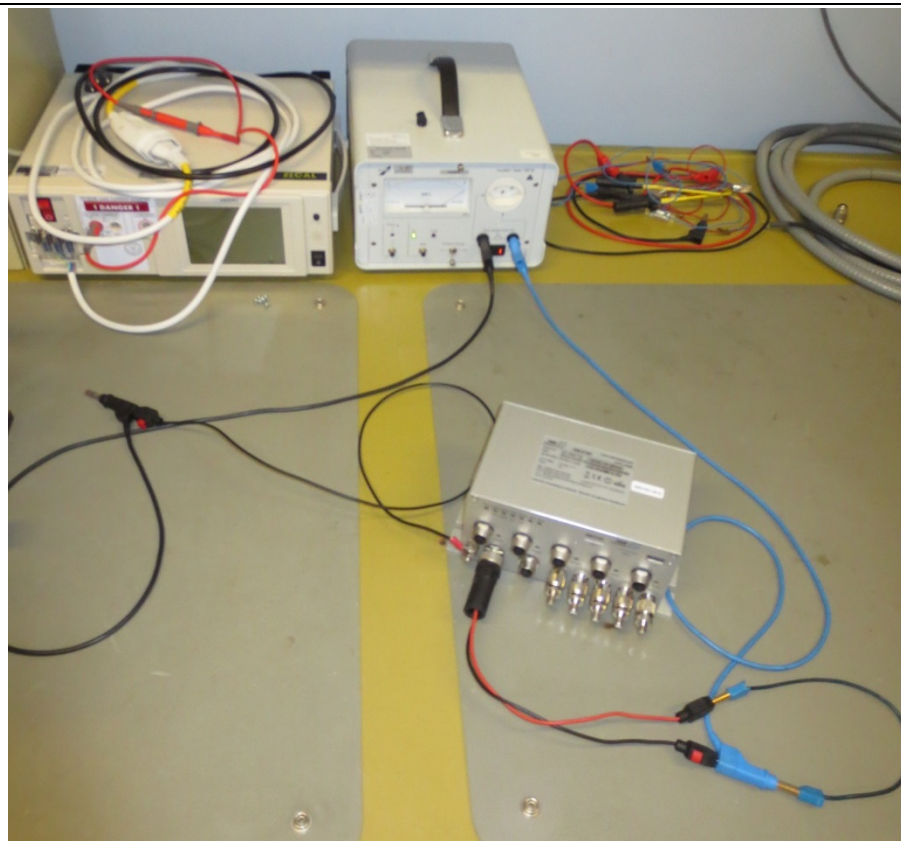
Standard	Chapter	Voltage		Duration	Requirements	Remarks	Verdict
EN 50155	5.1.1.1	66 V	0.6 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.1.1	154 V	1.4 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.1.1	137.5 V	1.25 U_N	1 s	Criterion C	No errors observed	Pass
	5.1.1.1	154 V	1.4 U_N	1 s	Criterion C	No errors observed	Pass
	5.1.1.2	0 V (Note 1)	0 U_N	10 ms	Criterion A	No errors observed	Pass
	5.1.2	99 V	0.9 U_N	Unlimited	Criterion A	No errors observed	Pass
	5.1.2	121 V	1.1 U_N	Unlimited	Criterion A	No errors observed	Pass
	5.1.2	66 V	0.6 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.2	154 V	1.4 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.2	77 V	0.7 U_N	1 s	Criterion A	No errors observed	Pass
	5.1.2	137.5 V	1.25 U_N	1 s	Criterion A	No errors observed	Pass
	5.1.3	66 V	0.6 U_N	0.1 s	Criterion A	No errors observed	Pass
	5.1.3	0 V (Note 1)	0 U_N	30 ms	Criterion A	No errors observed	Pass
	12.2.6	154 V	1.4 U_N	1 s	Criterion A	rise & fall time 0.1 s No errors observed	Pass

Note:

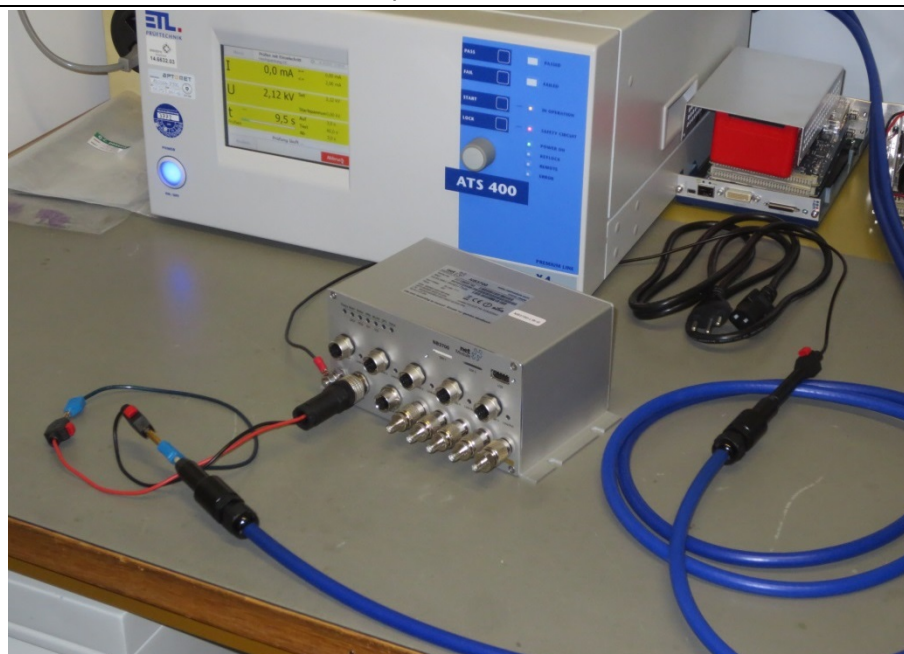
- 1) tested with low impedance (according EN 61000-4-29)

13.7 Insulation Test (EN 50155 §12.2.9)

Test Setup



Setup Insulation Test



Setup Voltage Withstand Test

Test Equipment

Device Type	Brand	Type	ID
Insulation Tester	Elabo	SIS 05	PE 9829
HV Tester	ETL Prüftechnik	ATS 400	14.6632.03

Test Results

Equipment: *NB3700-LWPB-G*
Cables connected: *see chapter 11.3*
Operating mode: *Active, see chapter 11.4*
Observation of EUT: *See chapter 11.5*
Modifications: *none*
Test site: *Safety Laboratory*

Protocol of the Test

Standard	Chapter	Test	Voltage	Behavior of EUT	Verdict
EN 50155	12.2.9.1	Insulation test (Note)	500 VDC	No essential change, >10 MOhm	Pass
	12.2.9.2	Voltage withstand test	± 2120 VDC	No breakthrough	Pass

Note: Measured before and after voltage withstand test

14. Measurement Uncertainty

Conducted emission	Estimated uncertainty of the measurement results: (normal distribution, k=2)		± 2.8 dB
	Maximum uncertainty defined by the standard:		± 3.6 dB
Radiated emission	Estimated uncertainty of the measurement results for 30 – 230 MHz: (normal distribution, k=2)		± 3.4 dB
	Estimated uncertainty of the measurement results for 230 – 1000 MHz:(normal distribution, k=2)		± 2.2 dB
	Maximum uncertainty defined by the standard for 30 – 230 MHz:		± 5.2 dB
	Maximum uncertainty defined by the standard for 230 – 1000 MHz:		± 5.2 dB
	Estimated uncertainty of the measurement results for 1 – 6 GHz:(normal distribution, k=2)		± 4.8 dB
	Maximum uncertainty defined by the standard for 1 – 6 GHz:	Under consideration	± 5.2 dB
Electrostatic discharge	The measurement uncertainties are within the requirements of EN 61000-4-2 with a confidence level of 95 %.		/
Radiated immunity	The Uncertainty of measurement instrumentation is: (normal distribution, k=2)		± 26 %
Fast transients	The measurement uncertainties are within the requirements of EN 61000-4-4 with a confidence level of 95 %.		/
Conducted radio frequency	The Uncertainty of measurement instrumentation is: (normal distribution, k=2)		± 19 %
Slow transients surge	The measurement uncertainties are within the requirements of EN 61000-4-5 with a confidence level of 95 %.		/
Power frequency magnetic field	The uncertainty of the measurement is: (normal distribution)		± 16 %
Voltage dips and interruptions	Output voltage U_o : (normal distribution)		± 9.0 %
	Duration of the voltage interruption t_e : (rectangular distribution)		± 5.0 %
	Phase ϕ_o :(rectangular distribution)		± 2.8 %
Voltage fluctuation	Output voltage U_o : (normal distribution)		± 9 %
	Duration of the voltage fluctuation t_o : (rectangular distribution)		± 20 %

15. Modifications on the EUT

The surge test has been repeated on November 10th with the following modification:

- Fuse Fs100 & Fs101: Schurter OMF250 2.0A (P/N 3403.0019.xx)
- Varistor Rs100: Bourns MOV-14D201K