

Wireless Router

# SmartFlex SR310

TEST Report No: PO-2021-08

**According to:**

ČSN ETSI EN 301 489-1 V2.2.3 (2020-5)

ČSN EN 61000-6-2:2016

ČSN EN 55032:2015



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**ADVANTECH**

Document Revision Table		
Revision	Changes	Made by
20210303	First edition	M.Svoboda
20210412	Additional measurements with AC/DC adaptor, additional measures	M. Svoboda

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# SmartFlex SR310

## 1. Tests overview

<i>Test cases</i>	<i>Port</i>	<i>Standard</i>	<i>Link</i>
ESD	Enclosure EUT A	IEC 61000-4-2	<a href="#">link</a>
ESD	Enclosure EUT B	IEC 61000-4-2	<a href="#">link</a>
ESD	Enclosure EUT C	IEC 61000-4-2	<a href="#">link</a>
Radiated, radio-frequency, electromagnetic field	Enclosure	IEC 61000-4-3	<a href="#">link</a>
Electrical fast transient/burst	DC port	IEC 61000-4-4	<a href="#">link</a>
Surge	DC port	IEC 61000-4-5	<a href="#">link</a>
Immunity to conducted disturbances, induced by radio-frequency fields	DC port	IEC 61000-4-6	<a href="#">link</a>
Electrical fast transient/burst	ETH ports	IEC 61000-4-4	<a href="#">link</a>
Surge	ETH ports	IEC 61000-4-5	<a href="#">link</a>
Immunity to conducted disturbances, induced by radio-frequency fields	ETH ports	IEC 61000-4-6	<a href="#">link</a>
Electrical fast transient/burst	Serial Ports	IEC 61000-4-4	<a href="#">link</a>
Surge	RS485 port	IEC 61000-4-5	<a href="#">link</a>
Immunity to conducted disturbances, induced by radio-frequency fields	Serial ports	IEC 61000-4-6	<a href="#">link</a>
Electrical fast transient/burst	I/O port	IEC 61000-4-4	<a href="#">link</a>
Surge	I/O port	IEC 61000-4-5	<a href="#">link</a>
Immunity to conducted disturbances, induced by radio-frequency fields	I/O ports	IEC 61000-4-6	<a href="#">link</a>
Electrical fast transient/burst	AC/DC adapter	IEC 61000-4-4	<a href="#">link</a>
Surge	AC/DC adapter	IEC 61000-4-5	<a href="#">link</a>
Immunity to conducted disturbances, induced by radio-frequency fields	AC/DC adapter	IEC 61000-4-6	<a href="#">link</a>
Power frequency magnetic field	Enclosure	IEC 61000-4-8	Not tested <sup>1)</sup>
Voltage dips, short interruptions and voltage variations	AC/DC adapter	IEC 61000-4-11	<a href="#">link</a>

Table 1: Summary of immunity tests

<i>Test cases</i>	<i>Port</i>	<i>Standard</i>	<i>Link</i>
Radiated emission	Enclosure EUT A	EN 55032	<a href="#">link</a>
Radiated emission	Enclosure EUT B	EN 55032	<a href="#">link</a>
Conducted emission	DC port	EN 55032	<a href="#">link</a>
Conducted emission	Ethernet port	EN 55032	<a href="#">link</a>
Conducted emission	RS 232 port	EN 55032	<a href="#">link</a>
Conducted emission	RS 485 port	EN 55032	<a href="#">link</a>
Conducted emission	AC/DC adapter	EN 55032	<a href="#">link</a>

Table 2: Summary of emission tests

**Comment:**

1) There are no magnetic field sensitive parts in the device.

## 2. Administrative data

Manufacturer:	Advantech Czech s.r.o., Sokolská 71, 562 04 Ústí nad Orlicí, Czech Republic
Production site:	Advantech Czech s.r.o., Sokolská 71, 562 04 Ustí nad Orlicí, Czech Republic
Responsible for test report:	Martin Svoboda
Location of testing 1:	Eurosignal, a.s., Mstěnice 34, Czech Republic
Responsible for testing laboratory:	Ing. Martin Otradovec – Eurosignal, a.s. M. Svoboda – Advantech Czech s.r.o.
Accreditation:	Eurosignal, a.s. - nr. 79/2021
Date(s) of test:	8th February – 12th February 2021 3rd March 2021
Date of report:	12th April 2021



### 3. Equipment under test

#### 3.1 Description of EUT

<b>EUT A</b>	Order name	BB-SR31019320		
	Type	SmartFlex		
	HW revision, sn	B-RB3-WiFi-3 B-XC3-485-232-2 B-MO3-EG25-1 B-PW3-PD-2		
	SW revision	6.2.8		
Typical use:	<input type="checkbox"/> Portable use <input checked="" type="checkbox"/> Fixed use <input type="checkbox"/> Vehicular use			
Place of use	<input checked="" type="checkbox"/> Home use <input checked="" type="checkbox"/> Industrial environmental, comercial and light industry <input type="checkbox"/> Vehicular use			
Highest internal frequency generated by EUT	<input type="checkbox"/> less than 108 MHz <input type="checkbox"/> between 108 MHz and 500 MHz <input type="checkbox"/> between 500 MHz and 1 GHz <input checked="" type="checkbox"/> more than 1 GHz			
Power line:	<input checked="" type="checkbox"/> AC	Only with AC/DC Adapter 100-240VAC; 50/60Hz		
	<input checked="" type="checkbox"/> DC	Range: 10 V – 60 V		
EUT-grounding	<input checked="" type="checkbox"/> none <input checked="" type="checkbox"/> with power supply <input type="checkbox"/> additional: grounded over grounding screw			
Other ports				
Description	Connector	Possible total length		Shielding
1. DC power port	2 pin terminal block	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m		<input type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
2. I/O port	6 pin terminal block	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m		<input type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
3. Ethernet 0 & 1 ports	RJ45	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m		<input checked="" type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
4. Antenna ANT, DIV, GPS ports	SMA	<input type="checkbox"/> < 3 m <input checked="" type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m		<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened
5. Antenna WiFi port	SMA	<input type="checkbox"/> < 3 m <input checked="" type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m		<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened
6. USB port	USB A connector	<input checked="" type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m		<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened
7. RS232 port	5 pin terminal block	<input type="checkbox"/> < 3 m <input checked="" type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m		<input checked="" type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
8. RS485 port	4 pin terminal block	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m		<input checked="" type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened

Table 3: Description of EUT A

<b>EUT B</b>	Order name	BB-BL31010030	
	Type	SmartFlex	
	HW revision, sn	B-RB3-WiFi-3 B-MO3-EG25-1	
	SW revision	6.2.8	
Typical use:	<input type="checkbox"/> Portable use <input checked="" type="checkbox"/> Fixed use <input type="checkbox"/> Vehicular use		
Place of use	<input checked="" type="checkbox"/> Home use <input checked="" type="checkbox"/> Industrial environmental, comercial and light industry <input type="checkbox"/> Vehicular use		
Highest internal frequency generated by EUT	<input type="checkbox"/> less than 108 MHz <input type="checkbox"/> between 108 MHz and 500 MHz <input type="checkbox"/> between 500 MHz and 1 GHz <input checked="" type="checkbox"/> more than 1 GHz		
Power line:	<input checked="" type="checkbox"/> AC	Only with AC/DC Adapter 100-240VAC; 50/60Hz	
	<input checked="" type="checkbox"/> DC	Range: 10 V – 60 V	
EUT-grounding	<input checked="" type="checkbox"/> none <input checked="" type="checkbox"/> with power supply <input type="checkbox"/> additional: grounded over grounding screw		
Other ports			
Description	Connector	Possible total length	Shielding
1. DC power port	2 pin terminal block	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m	<input type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
2. I/O port	6 pin terminal block	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m	<input type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
3. Ethernet 0 & 1 ports	RJ45	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
4. Antenna ANT, DIV, GPS ports	SMA	<input type="checkbox"/> < 3 m <input checked="" type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened
5. Antenna WiFi port	SMA	<input type="checkbox"/> < 3 m <input checked="" type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened
6. USB port	USB A connector	<input checked="" type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened

Table 4: Description of EUT B

<b>EUT C</b>	Order name	BB-BL31010410	
	Type	SmartFlex	
	HW revision, sn	B-RB3-WiFi-3 B-MO3-EG25-1 B-XC3-232-485-ETH2	
	SW revision	6.2.8	
Typical use:	<input type="checkbox"/> Portable use <input checked="" type="checkbox"/> Fixed use <input type="checkbox"/> Vehicular use		
Place of use	<input checked="" type="checkbox"/> Home use <input checked="" type="checkbox"/> Industrial environmental, comercial and light industry <input type="checkbox"/> Vehicular use		
Highest internal frequency generated by EUT	<input type="checkbox"/> less than 108 MHz <input type="checkbox"/> between 108 MHz and 500 MHz <input type="checkbox"/> between 500 MHz and 1 GHz <input checked="" type="checkbox"/> more than 1 GHz		
Power line:	<input checked="" type="checkbox"/> AC	Only with AC/DC Adapter 100-240VAC; 50/60Hz	
	<input checked="" type="checkbox"/> DC	Range: 10 V – 60 V	
EUT-grounding	<input checked="" type="checkbox"/> none <input checked="" type="checkbox"/> with power supply <input type="checkbox"/> additional: grounded over grounding screw		
Other ports			
Description	Connector	Possible total length	Shielding
1. DC power port	2 pin terminal block	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m	<input type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
2. I/O port	6 pin terminal block	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m	<input type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
3. Ethernet 0 & 1 ports	RJ45	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
4. Antenna ANT, DIV, GPS ports	SMA	<input type="checkbox"/> < 3 m <input checked="" type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened
5. Antenna WiFi port	SMA	<input type="checkbox"/> < 3 m <input checked="" type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened
6. USB port	USB A connector	<input checked="" type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input type="checkbox"/> unscreened
7. RS232 port	4 pin terminal block	<input type="checkbox"/> < 3 m <input checked="" type="checkbox"/> > 3 m <input type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened
8. RS485 port	3 pin terminal block	<input type="checkbox"/> < 3 m <input type="checkbox"/> > 3 m <input checked="" type="checkbox"/> > 30 m	<input checked="" type="checkbox"/> screened <input checked="" type="checkbox"/> unscreened

### 3.1 Auxiliary Equipment (AE)

AE	Auxiliary Equipment	SN	HW status	SW status
AE1	SR303	---	---	---
AE2	SR303	---	---	---

Table 5: List of Auxiliary Equipments

### 3.2 EUT set-ups

EUT set-up	Combination of EUT and AE	Remarks
EUT A set 1	EUT A + AE1 + AE2	
EUT A set 2	EUT A + AE1	
EUT B set 1	EUT B + AE1	
EUT C set 1	EUT C + AE1	

Table 6: List of EUT set-up

### 3.3 EUT operating modes

#### 3.3.1 EUT A operating modes

EUT operating mode	Description of operating mode	Additional information
OM A1	Ppp connected to LTE – iperf 1M, iperf on the ETH, iperf on WiFi, sittool 9600 8N1 (RS232, RS485)	Router is connected to privated APN advantech.czech.cz
OM A2	Ppp connected to LTE – ping to 10.0.0.1, ping on the ETH, ping on the WiFi, sittool 9600 (RS232, RS485)	Router is connected to privated APN advantech.czech.cz

Table 7: List of EUT operating modes

#### 3.3.2 EUT B operating modes

EUT operating mode	Description of operating mode	Additional information
OM B1	Ppp connected to LTE – iperf 1M, iperf on the ETH, iperf on WiFi	Router is connected to privated APN advantech.czech.cz
OM B2	Ppp connected to LTE – ping to 10.0.0.1, ping on the ETH, ping on the WiFi	Router is connected to privated APN advantech.czech.cz

Table 8: List of EUT operating modes

#### 3.3.3 EUT C operating modes

EUT operating mode	Description of operating mode	Additional information
OM C1	Ppp connected to LTE – iperf 1M, iperf on the ETH, iperf on WiFi	Router is connected to privated APN advantech.czech.cz
OM C2	Ppp connected to LTE – ping to 10.0.0.1, ping on the ETH, ping on the WiFi, sittool 9600 (RS232, RS485)	Router is connected to privated APN advantech.czech.cz

Table 9: List of EUT operating modes

### 3.4 Functional criterion

Criterion	During test	After test
A	The device shall continue to operate as intended. No restart of the device, wireless modules or some peripheral. Temporary degradation of the transmission speed is allowed Examples: some packets have to be resend during the TCP/IP communication (ethernet, cellular, WiFi).	The Device shall continue to operate as intended.
B	Degradation of performance accepted No change of operating mode. No restart of the whole device. Each peripheral can be restarted. Examples: restart of the cellular module, loss of data or uncorrected errors in communication, unintentional state changes of digital I/O which are seen by the system or test set-up. No irreversible loss of stored data.	The device shall continue to operate as intended. Temporary degradation of performance must be self-recoverable.
C	Loss of functions accepted, but no destruction of hardware or software (programme or data).	The device shall continue to operate as intended automatically, after manual restart or power off/power on.

Table 10: Functional criterion

## 4. Test records

### 4.1 Radiated emission test

#### 4.1.1 Radiated emission: Measurements, limits and results

Standard	ČSN EN 55032 ed.2		
Test specification	Radiated emission		
Frequency range	30 MHz – 1000 MHz 1 GHz – 6 GHz		
Test site	EMC semi-anechoic chamber		
Measuring distance	3m (distance between Antenna Reference Point and EUT front panel)		
EUT orientation to the antenna	30 – 1000 MHz: 0° - 360 °C(step 45°), height 1 m, 1.5 m, 2 m 1 – 6 GHz: 0° - 360°C(step 30°), height 1 m		
Antenna polarization	Horizontal, Vertical		
EUT set-up	EUT A set 1, EUT B set 1		
EUT operation mode	OM A1, OM B1		
Emission test limits for class B from 3m	Frequency range (MHz)	Quasipeaks limits dB (µV/m)	Average limits dB (µV/m)
	30 – 230	40	-
	230 – 1000	47	-
	1000 – 6000	-	54
<b>Results EUT A</b>			
Frequency range	Result of test	Report	
30 MHz to 1000 MHz	<b>PASS</b>	<a href="#">test result</a>	
1 GHz to 6 GHz	<b>PASS</b>	<a href="#">test result</a>	
<b>Results EUT B</b>			
30 MHz to 1000 MHz	<b>PASS</b>	<a href="#">test result</a>	
1 GHz to 6 GHz	<b>PASS</b>	<a href="#">test result</a>	
<b>Notes</b>			

## 4.1.2 Radiated emission: Photographs

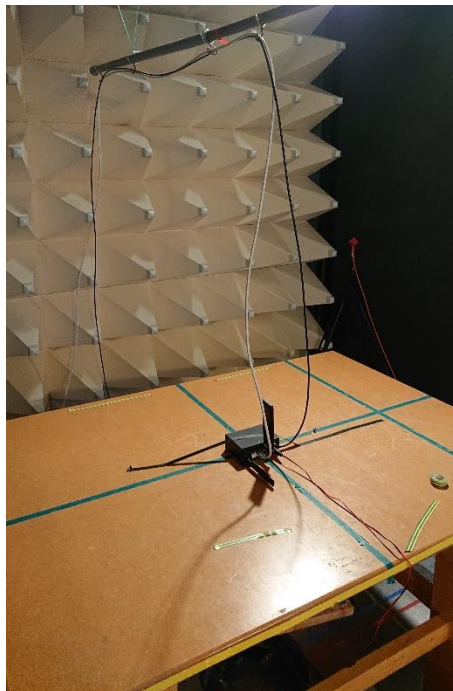


Figure 1: EUT B in the chamber on table

## 4.2 Conducted emission test

### 4.2.1 Conducted emission: Measurements, limits and results

Standard	ČSN EN 55032 ed.2
Test specification	Conducted emission
Frequency range	0,15 MHz – 30 MHz
Test site	Wood test table (1 m x 2,5 m)
Ports under test	DC port ETH port SERIAL ports
Coupling unit (measuring point)	CDN for DC Current Clamp for ETH Current and Voltage clamp for serial ports
EUT set-up	DC port: EUT A set 2 ETH ports: EUT A set 2 SERIAL ports: EUT A set 2 AC/DC Adaptor: EUT A set 2

EUT operation mode	OM A1		
Conducted test limits telecommunication ports for class B	Frequency range (MHz)	Quasipeaks limits dB ( $\mu$ V)	Average limits dB ( $\mu$ V)
	0,15 – 0,5 0,5 – 30	84 - 74 74	74 - 64 64
Conducted test limits power ports for class B	Frequency range (MHz)	Quasipeaks limits dB ( $\mu$ V)	Average limits dB ( $\mu$ V)
	0,15 – 0,5 0,5 - 5 5 – 30	66 - 56 56 60	56 - 46 46 50
<b>Results</b>			
Port & conditions	Result of test	Report	
DC port 9 V	<b>PASS</b>	<a href="#">test result</a>	
DC port 9 V + GND	<b>PASS</b>	<a href="#">test result</a>	
DC port 60 V	<b>PASS</b>	<a href="#">test result</a>	
DC port 60 V + GND	<b>PASS</b>	<a href="#">test result</a>	
ETH0 port 48 V	<b>PASS</b>	<a href="#">test result</a>	
ETH0 port 48 V + GND	<b>PASS</b>	<a href="#">test result</a>	
ETH1 port 48 V	<b>PASS</b>	<a href="#">test result</a>	
ETH1 port 48 V + GND	<b>PASS</b>	<a href="#">test result</a>	
RS485 port	<b>PASS</b>	<a href="#">test result lcp</a> , <a href="#">test result Ucvp</a>	
RS485 port + GND	<b>PASS</b>	<a href="#">test result lcp</a> , <a href="#">test result Uvcp</a>	
RS232 port	<b>PASS</b>	<a href="#">test result lcp</a> , <a href="#">test result Ucvp</a>	
RS232 port + GND	<b>PASS</b>	<a href="#">test result lcp</a> , <a href="#">test result Uvcp</a>	
AC/DC Adapter	<b>PASS</b>	<a href="#">test result</a>	
<b>Notes</b>			



## 4.2.2 Conducted emission: Photographs

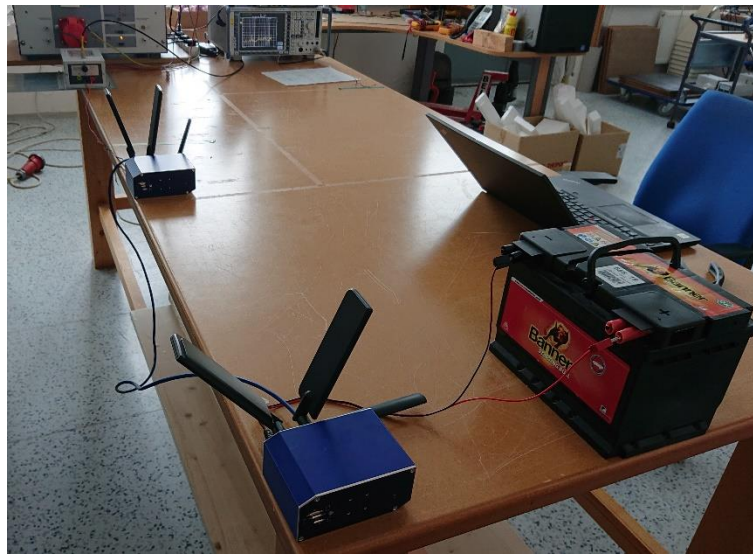


Figure 2: Conducted emission on DC port with CDN

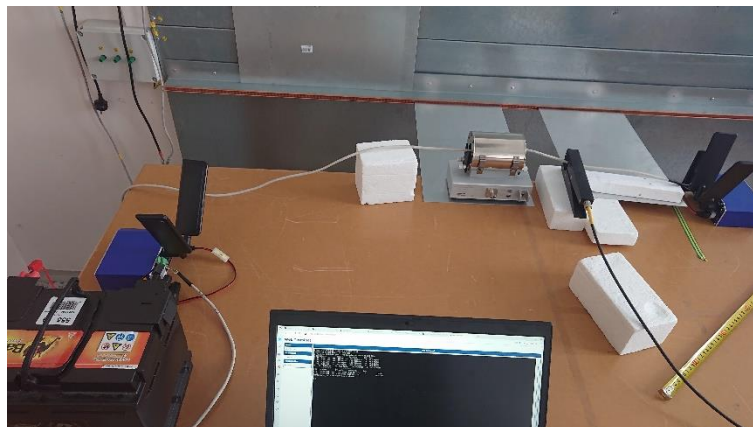


Figure 3: Conducted emission on SERIAL port (current and voltage clamps)

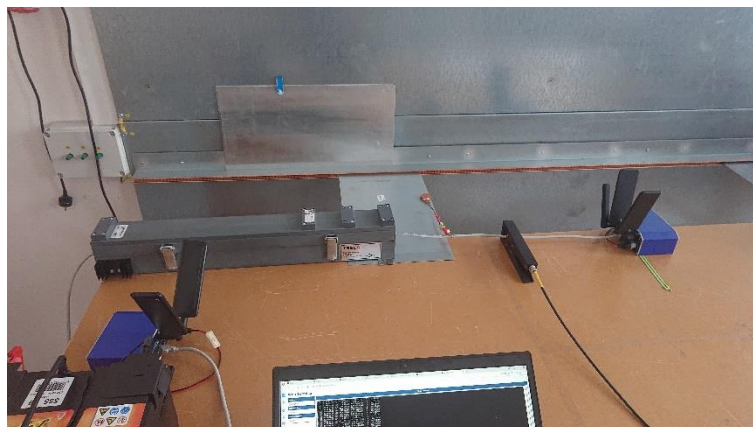


Figure 4: Conducted emission on ETH port (current clamp)

## 4.4 ESD test

### 4.4.1 ESD: Measurement, limits and results EUT A

Standard	ČSN EN 61000-4-2 ed.2	
Test specification	Electrostatic discharge immunity test (Contact)	
Requirements	Contact discharge $\pm 6$ kV	
Test site	Wood test table (0,8 m x 1,6 m) with steel surface standing ON the HGRP	
Test points – Contact	Front ETH, Front screw, Top, Bottom, Back, Left, Right	
EUT set-up	EUT A set 2	
EUT operation mode	OM A2	
<b>Results</b>		
Conditions	Test result	Requirement EN 61000-6-2
Contact discharge $\pm 6$ kV Bottom	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Back	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Left	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Right	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Top	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Shielding ETH connector	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Front screw	A	<b>PASS</b>
<b>Notes</b>		

**Comment:**

# SmartFlex SR310

## 4.4.2 ESD: Photographs EUT A

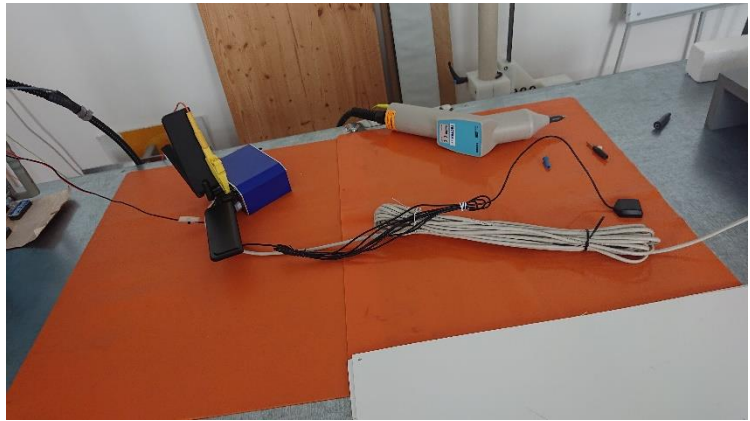


Figure 5: ESD test setup EUT A

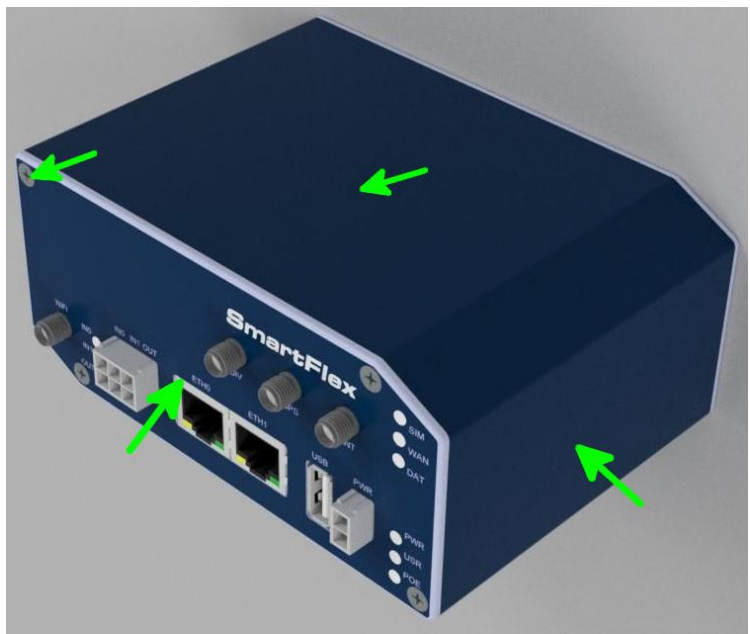


Figure 6: ESD EUT A test points I

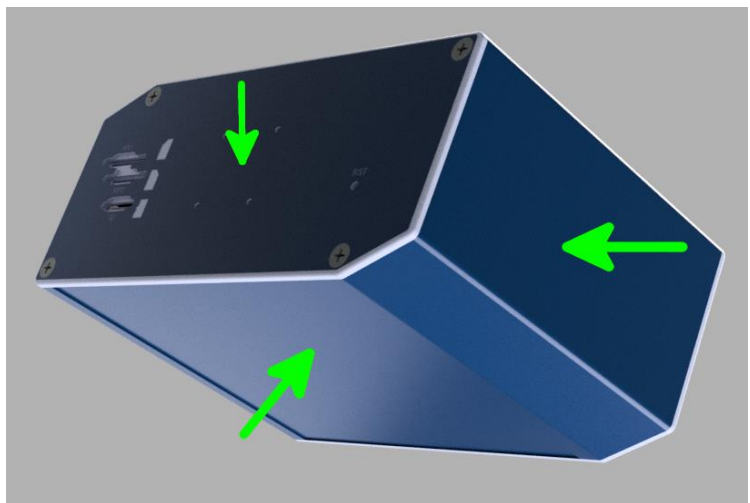


Figure 7: ESD EUT A test points II

#### 4.4.3 ESD: Measurement, limits and results EUT B

Standard	ČSN EN 61000-4-2 ed.2	
Test specification	Electrostatic discharge immunity test (Contact)	
Requirements	Contact discharge $\pm 6$ kV	
Test site	Wood test table (0,8 m x 1,6 m) with steel surface standing ON the HGRP	
Test points – Contact	Front ETH, Front screw, Top, Bottom, Back, Left, Right	
EUT set-up	EUT B set 1	
EUT operation mode	OM B2	
<b>Results</b>		
Conditions	Test result	Requirement EN 61000-6-2
Contact discharge $\pm 6$ kV Bottom	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Back	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Left	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Right	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Top	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Shielding ETH connector	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Bottom screw	A	<b>PASS</b>
<b>Notes</b>		

**Comment:**

## 4.4.4 ESD: Photographs EUT B

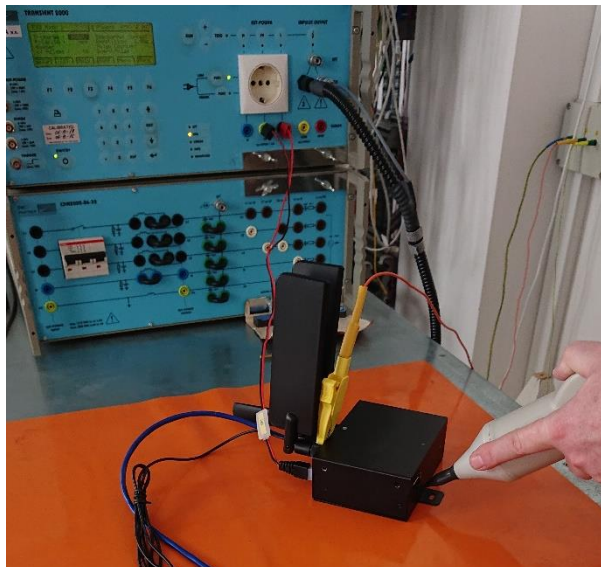


Figure 8: ESD test setup EUT B

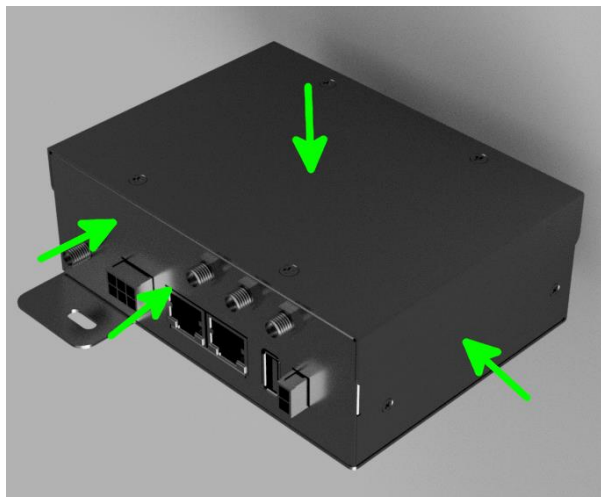


Figure 9: ESD EUT B test points I

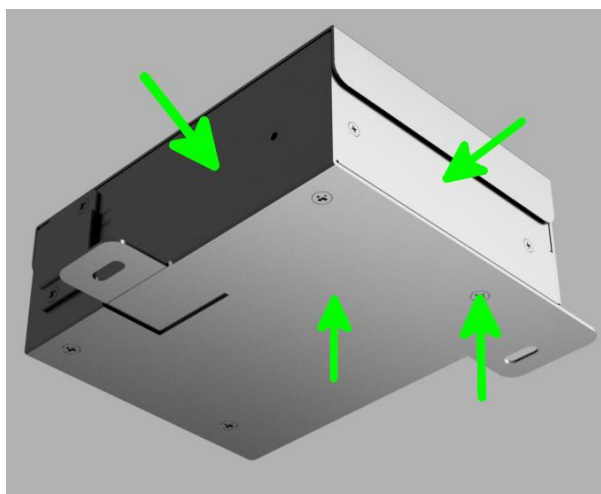


Figure 10: ESD EUT B test points II



## 4.4.5 ESD: Measurement, limits and results EUT C

Standard	ČSN EN 61000-4-2 ed.2	
Test specification	Electrostatic discharge immunity test (Contact, Air)	
Requierements	Air discharge up to $\pm 8$ kV plastic enclosure, Contact discharge up to $\pm 6$ kV metal front face	
Test site	Wood test table (0,8 m x 1,6 m) with steel surface standing ON the HGRP	
Test points – Contact	Front, Top, Bottom, Back, Left, Right – 10 test different points at each side except front (AD), 1 test point at front side (CD)	
EUT set-up	EUT C set 1	
EUT operation mode	OM C2	
<b>Results</b>		
Conditions	Test result	Requirement EN 61000-6-2
Air discharge $\pm 2$ kV Bottom	A	<b>PASS</b>
Air discharge $\pm 4$ kV Bottom	A	<b>PASS</b>
Air discharge $\pm 8$ kV Bottom	A	<b>PASS</b>
Air discharge $\pm 2$ kV Top	A	<b>PASS</b>
Air discharge $\pm 4$ kV Top	A	<b>PASS</b>
Air discharge $\pm 8$ kV Top	A	<b>PASS</b>
Air discharge $\pm 2$ kV Left	A	<b>PASS</b>
Air discharge $\pm 4$ kV Left	A	<b>PASS</b>
Air discharge $\pm 8$ kV Left	A	<b>PASS</b>
Air discharge $\pm 2$ kV Right	A	<b>PASS</b>
Air discharge $\pm 4$ kV Right	A	<b>PASS</b>
Air discharge $\pm 8$ kV Right	A	<b>PASS</b>
Air discharge $\pm 2$ kV Back*	A	<b>PASS</b>
Air discharge $\pm 4$ kV Back*	A	<b>PASS</b>
Air discharge $\pm 8$ kV Back*	A	<b>PASS</b>
Contact discharge $\pm 2$ kV Front	A	<b>PASS</b>
Contact discharge $\pm 4$ kV Front	A	<b>PASS</b>
Contact discharge $\pm 6$ kV Front	A	<b>PASS</b>
<b>Notes</b>	Device reset occurs when CD level $\pm 8$ kV to front metal panel applied (this level is out of the required)	

\*applied to inserted SIM card too

## 4.4.6 ESD: Photographs EUT C

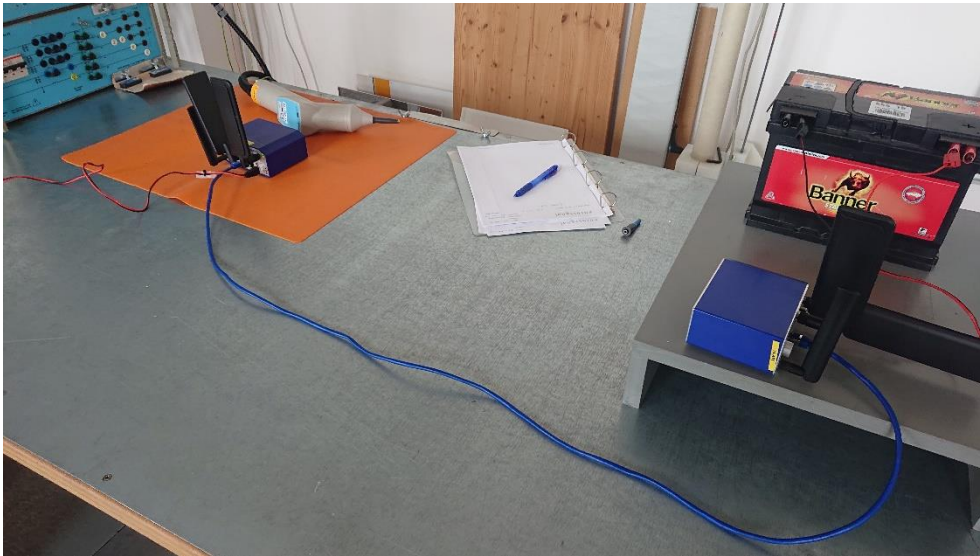


Figure 11. ESD test setup EUT C

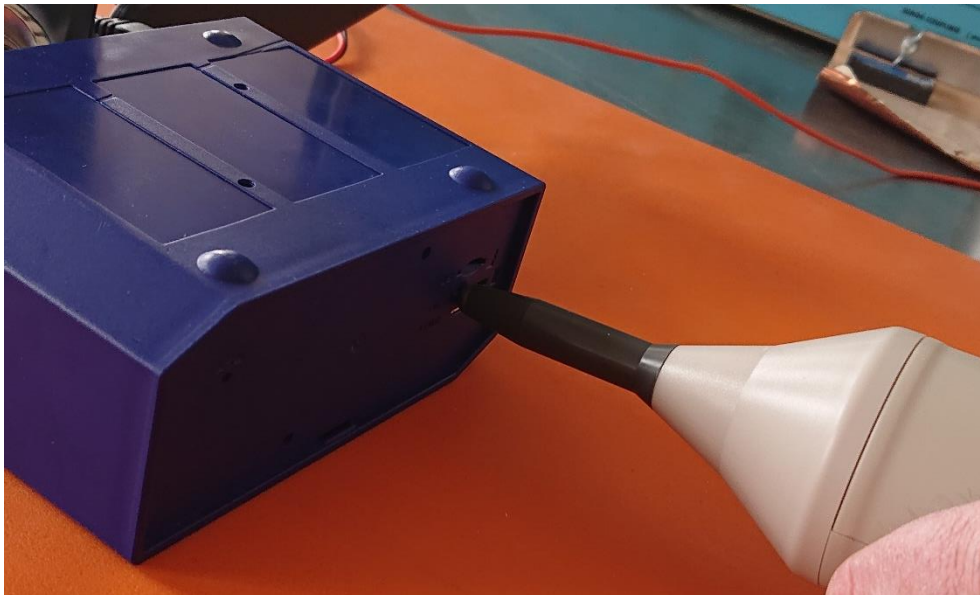


Figure 12. Test point example EUT C

## 4.5 EFT test

### 4.5.1 EFT: Measurements, limits and results

Standard	ČSN EN 61000-4-4 ed.3	
Test specification	Electrical fast transient/burst immunity test	
Tested interfaces	DC port – port on the generator ETH ports – clamp SERIAL ports – clamp I/O port – clamp	
Pulses	±1 kV, ±2 kV, 5/50 Tr/Th ns, 5 kHz, 100 kHz Duration 1 minutes each polarity	
Test site	Wood test table (0,8 m x 3 m) with steel surface	
EUT set-up	DC port: EUT A set 2 ETH ports with shielded cable: EUT A set 2 SERIAL ports: EUT A set 2 I/O port: EUT A set 2	
EUT operation mode	OM A2	
<b>Results</b>		
Conditions	Test result	Requirement EN 61000-6-2
DC port ±1 kV, 5 kHz (PWR 12 V)	A	<b>PASS</b>
DC port ±1 kV, 5 kHz (PWR 60 V)	A	<b>PASS</b>
DC port ±1 kV, 100 kHz (PWR 12 V)	A	<b>PASS</b>
DC port ±1 kV, 100 kHz (PWR 60 V)	A	<b>PASS</b>
ETH0 port ±1 kV, 5 kHz (PWR 48 V)	A	<b>PASS</b>
ETH0 port ±1 kV, 100 kHz (PWR 48 V)	A	<b>PASS</b>
ETH1 port ±1 kV, 5 kHz (PWR 48 V)	A	<b>PASS</b>
ETH1 port ±1 kV, 100 kHz (PWR 48 V)	A	<b>PASS</b>
SERIAL port ±1 kV, 5 kHz (PWR 48 V)	A	<b>PASS</b>
SERIAL port ±1 kV, 100 kHz (PWR 36 V)	A	<b>PASS</b>
I/O port ±1 kV, 5 kHz (PWR 48 V)	A	<b>PASS</b>
I/O port ±1 kV, 100 kHz (PWR 48 V)	A	<b>PASS</b>
AC/DC adapter ±2 kV, 5 kHz (PWR 240 V)	A	<b>PASS</b>
AC/DC adapter ±2 kV, 100 kHz (PWR 240 V)	A	<b>PASS</b>
<b>Notes</b>		



## 4.5.2 EFT: Photographs



Figure 13: EFT – DC port



Figure 14: EFT – ETH port



Figure 15: EFT – I/O port

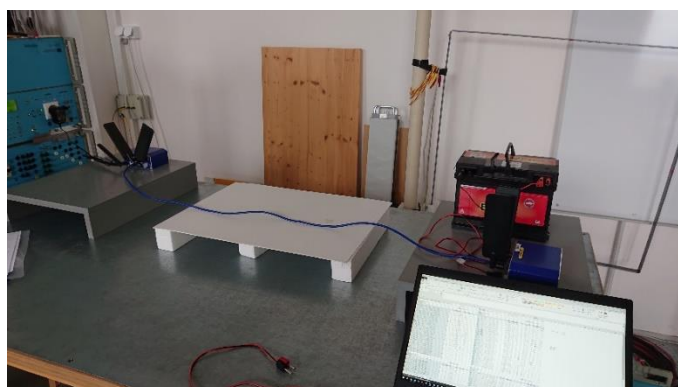


Figure 16: EFT - AC/DC adapter

## 4.6 Surge test

### 4.6.1 Surge: Measurements, limits and results

Standard	ČSN EN 61000-4-5 ed.3		
Test specification	Surge immunity test		
Tested interfaces	DC port – port on the generator ETH port – direct application RS485 - CDN		
Pulses	±0,5 kV, ±1 kV 1.2/50 (8/20) Tr/Td μs, 5 kHz 5 pulses / 30 second in each polarity		
Test site	Wood test table (0,8 m x 3 m) with steel surface		
EUT set-up	DC port: EUT A set 2		
EUT operation mode	OM A1		
<b>Results</b>			
Conditions	Test result	Requirement EN 61000-6-2	Statistics
DC port +0,5 kV, 12 Ω, (PWR 15 V)	A	<b>PASS</b>	ETH0: BW – 92.6; retries/s – 7.3 WIFI: BW – 20.8; retries/s – 0 CELL: BW – 1*; retries/s – 0.18
DC port -0,5 kV, 12 Ω, (PWR 15 V)	A	<b>PASS</b>	
DC port +0,5 kV, 12 Ω, (PWR 60 V)	A	<b>PASS</b>	ETH0: BW – 82.1; retries/s – 5.63 WIFI: BW – 27.0; retries/s – 0 CELL: BW – 1*; retries/s – 0.32
DC port -0,5 kV, 12 Ω, (PWR 60 V)	A	<b>PASS</b>	ETH0: BW – 82.0; retries/s – 5.42 WIFI: BW – 24.5; retries/s – 0 CELL: BW – 1*; retries/s – 0.96
AC/DC adapter +0,5 kV, (PWR 240 V)	A	<b>PASS</b>	ETH0: BW – 91.1; retries/s – 7.0 WIFI: BW – 21.7; retries/s – 0 CELL: BW – 1*; retries/s – 0.88
AC/DC adapter -0,5 kV, (PWR 240 V)	A	<b>PASS</b>	
AC/DC adapter +1 kV, (PWR 240 V)	A	<b>PASS</b>	
AC/DC adapter -1 kV, (PWR 240 V)	A	<b>PASS</b>	
ETH0 port +0,5 kV, shielded cable, (PWR 60 V)	A	<b>PASS</b>	ETH0: BW – 91.5; retries/s – 5.8 WIFI: BW – 19.7; retries/s – 0 CELL: BW – 1*; retries/s – 0.03
ETH0 port -0,5 kV, shielded cable, (PWR 60 V)	A	<b>PASS</b>	
ETH0 port +1 kV, shielded cable, (PWR 60 V)	A	<b>PASS</b>	ETH0: BW – 79.7; retries/s – 7.57 WIFI: BW – 29.6; retries/s – 0 CELL: BW – 1*; retries/s – 0.54

ETH0 port -1 kV, shielded cable, (PWR 60 V)	A	PASS	ETH0: BW – 81.2; retries/s – 6.94 WIFI: BW – 29.4; retries/s – 0.1 CELL: BW – 1*; retries/s – 0.46
ETH1 port +0,5 kV, shielded cable, (PWR 60 V)	A	PASS	ETH1: BW – 91.9; retries/s – 6.4 WIFI: BW – 19.3; retries/s – 0 CELL: BW – 1*; retries/s – 0.19
ETH1 port -0,5 kV, shielded cable, (PWR 60 V)	A	PASS	
ETH1 port +1 kV, shielded cable, (PWR 60 V)	A	PASS	
ETH1 port -1 kV, shielded cable, (PWR 60 V)	A	PASS	
RS485 port +0,5 kV, 40 Ω, (PWR 24 V)	A	PASS	
RS485 port -0,5 kV, 40 Ω, (PWR 24 V)	A	PASS	ETH0: BW – 90.3; retries/s – 7.04 WIFI: BW – 20.9; retries/s – 0 CELL: BW – 1*; retries/s – 0.43
RS485 port +1 kV, 40 Ω, (PWR 24 V)	A	PASS	ETH0: BW – 89.9; retries/s – 9.04 WIFI: BW – 26.7; retries/s – 0 CELL: BW – 1*; retries/s – 1.87
RS485 port -1 kV, 40 Ω, (PWR 24 V)	A	PASS	ETH0: BW – 89.8; retries/s – 9.19 WIFI: BW – 23.7; retries/s – 0 CELL: BW – 1*; retries/s – 0.97
BIN port +0,5 kV, 40 Ω, (PWR 24 V)	A	PASS	No change of state of Binary input. No change of state of Binary output.
BIN port -0,5 kV, 40 Ω, (PWR 24 V)	A	PASS	
BIN port +1 kV, 40 Ω, (PWR 24 V)	A	PASS	
BIN port -1 kV, 40 Ω, (PWR 24 V)	A	PASS	
BOUT port +0,5 kV, 40 Ω, (PWR 24 V)	A	PASS	
BOUT port -0,5 kV, 40 Ω, (PWR 24 V)	A	PASS	
BOUT port +1 kV, 40 Ω, (PWR 24 V)	A	PASS	
BOUT port -1 kV, 40 Ω, (PWR 24 V)	A	PASS	
<b>Notes</b>	* Bandwith was limited to 1Mbps/sec		

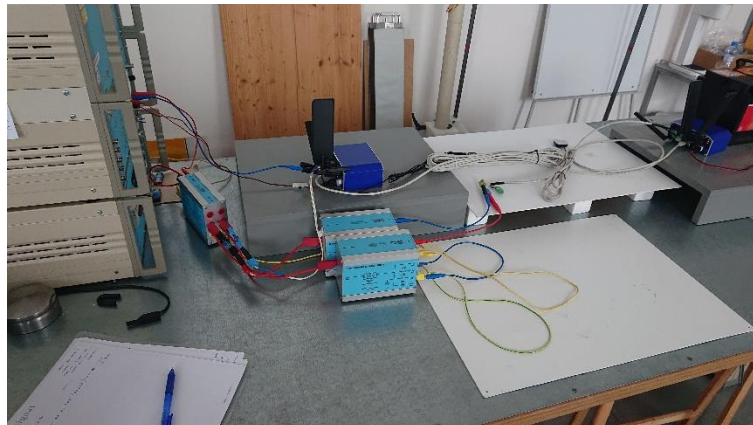


Figure 17: Surge – RS485 port



Figure 18: Surge – DC



Figure 19: Surge – ETH



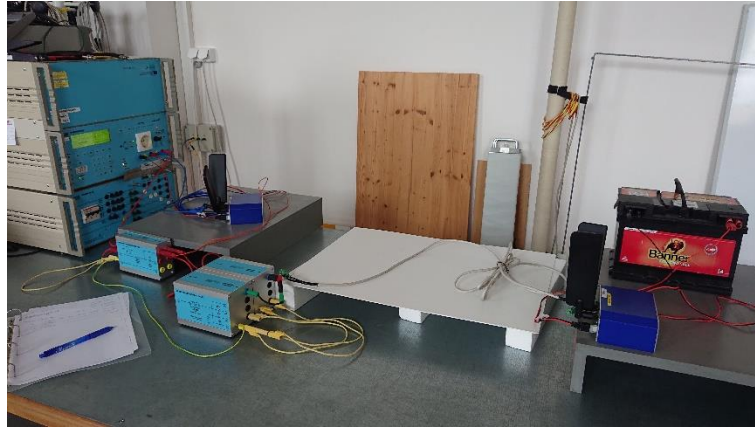


Figure 20: Surge – I/O

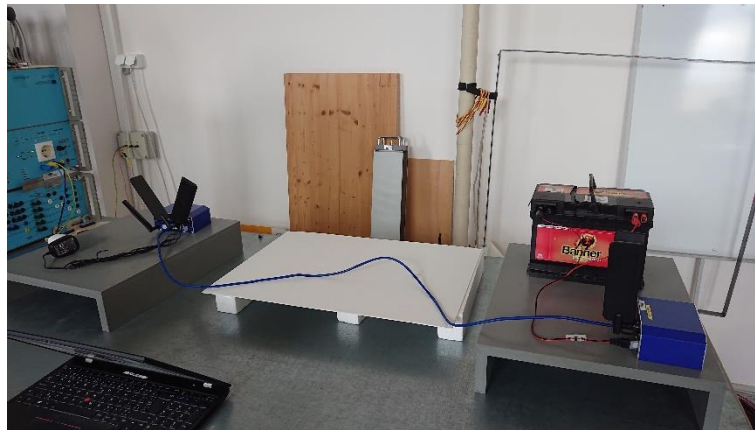


Figure 21: Surge – AC/DC Adapter

## 4.7 Immunity to conducted disturbances test

### 4.7.1 Immunity to conducted disturbances: Measurement, limits and results

Standard	ČSN EN 61000-4-6 ed.4		
Test specification	Immunity to conducted disturbances, induced by radio-frequency fields		
Tested interfaces	DC port - CDN ETH ports – clamping unit SERIAL ports – clamping unit I/O port – clamping unit		
Test signal	0,15 to 80 MHz, 10V, 80% AM(1kHz)		
Test site	Wood test table (1m x 2,5m) with steel surface		
EUT set-up	DC port: EUT A set 2		
EUT operation mode	OM A1		
<b>Results</b>			
Conditions	Test result	Requirement EN 61000-6-2	Statistics
DC port + GND (PWR 9 V)	A	<b>PASS</b>	ETH0: BW – 88.1 ; retries/s – 8.57 WIFI: BW – 29.1; retries/s – 0.01 CELL: BW – 1*; retries/s – 0.37
DC port + GND (PWR 60 V)	A	<b>PASS</b>	ETH0: BW – 86.7; retries/s – 9.1 WIFI: BW – 18.1; retries/s – 0.19 CELL: BW – 1*; retries/s – 0.1.17
DC port (PWR 9 V)	A	<b>PASS</b>	ETH0: BW – 81.0 ; retries/s – 6.28 WIFI: BW – 23.9; retries/s – 0.1 CELL: BW – 1*; retries/s – 0.71
DC port (PWR 60 V)	A	<b>PASS</b>	ETH0: BW – 84.2 ; retries/s – 7.37 WIFI: BW – 19.7; retries/s – 0.09 CELL: BW – 1*; retries/s – 0.65
ETH0 port shielded cable, (PWR 60 V)	A	<b>PASS</b>	ETH0: BW – 79.5 ; retries/s – 5.76 WIFI: BW – 28.6; retries/s – 0.00 CELL: BW – 1*; retries/s – 0.9
ETH1 port shielded cable, (PWR 60 V)	A	<b>PASS</b>	ETH0: BW – 79.5 ; retries/s – 5.76 WIFI: BW – 28.6; retries/s – 0.00 CELL: BW – 1*; retries/s – 0.9
RS232 port (PWR 60 V)	A	<b>PASS</b>	Sittoll
RS485 port (PWR 60 V)	A	<b>PASS</b>	
BIN port (PWR 60V)	A	<b>PASS</b>	No change of state of Binary input. No change of state of Binary output.
BOU port (PWR 60V)	A	<b>PASS</b>	
AC/DC adapter (PWR 240V)	A	<b>PASS</b>	ETH0: BW – 91.9 ; retries/s – 5.36 WIFI: BW – 19.6; retries/s – 0.00 CELL: BW – 1*; retries/s – 0.18
<b>Notes</b>	* Bandwith was limited to 1Mbits/sec		

## 4.7.2 Immunity to conducted disturbances: Photographs



Figure 22: Immunity to conducted disturbances measurement – DC port



Figure 23: Immunity to conducted disturbances measurement – I/O ports



Figure 24: Immunity to conducted disturbances measurement – ETH port



Figure 25: Immunity to conducted disturbances measurement – RS485 RS232



## 4.8 Radiated, radio-frequency, electromagnetic field test

### 4.8.1 Radiated, RF, electromagnetic field: Measurement, limits and results

Standard	ČSN EN 61000-4-3 ed.3	
Test specification	Radiated, radio-frequency, electromagnetic field immunity test	
Requirements	80 MHz to 1000 MHz	20 V/m 80% AM(1 kHz)
	1 GHz to 6 GHz	10 V/m 80% AM(1 kHz)
Test site	EMC semi-anechoic chamber	
EUT set-up	EUT A set 1	
EUT operation mode	OM A2	
<b>Results</b>		
Conditions	Test result	Requirement EN 61000-6-2
Front	A	<b>PASS</b>
Back	A	<b>PASS</b>
Left side	A	<b>PASS</b>
Right side	A	<b>PASS</b>
Top	A	<b>PASS</b>
Bottom	A	<b>PASS</b>
<b>Notes</b>		

## 4.8.2 Radiated, radio-frequency, electromagnetic field: Photographs

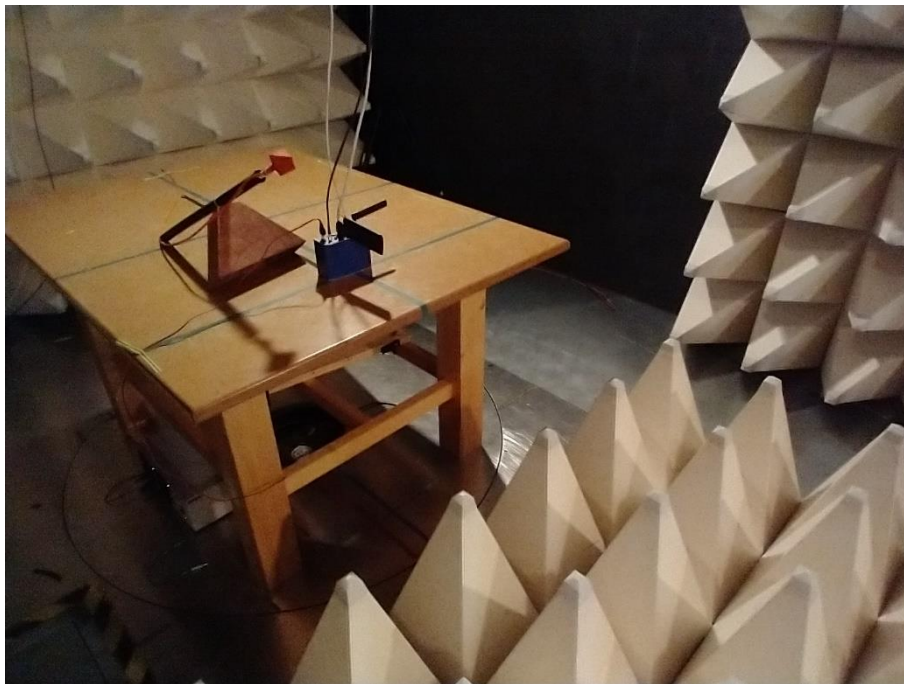


Figure 26: Radiated, radio-frequency, electromagnetic field 80 MHz - 1 GHz, TOP

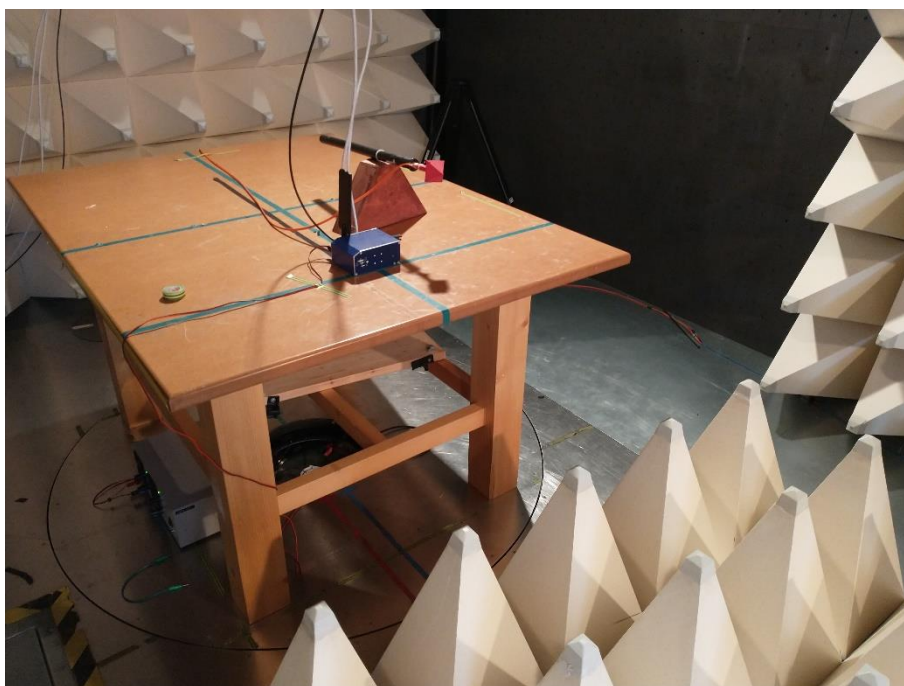


Figure 27: Radiated, radio-frequency, electromagnetic field 80 MHz - 1 GHz, BACK

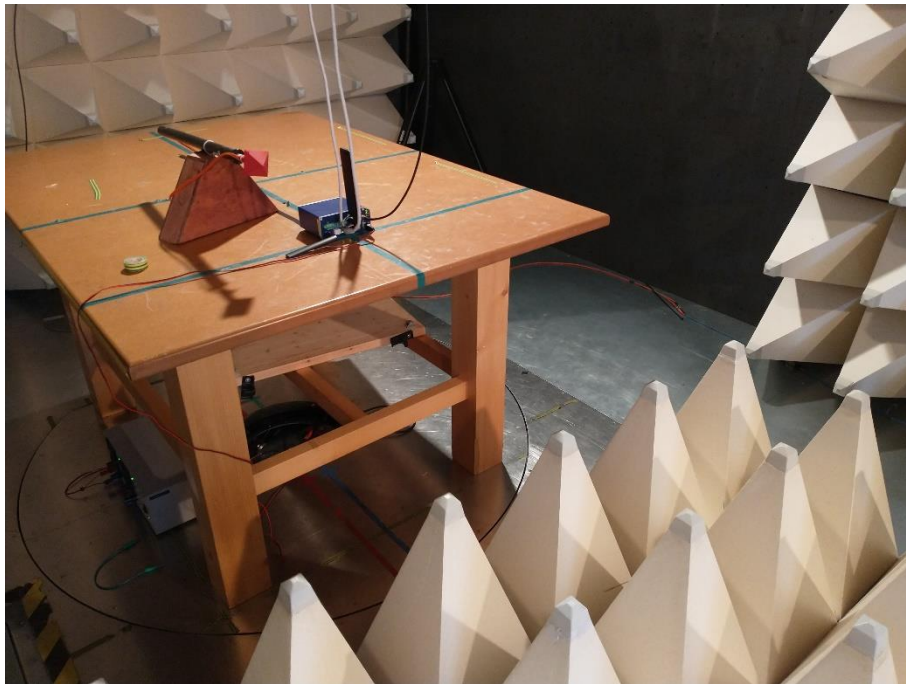


Figure 28: Radiated, radio-frequency, electromagnetic field 80 MHz - 1 GHz, FRONT

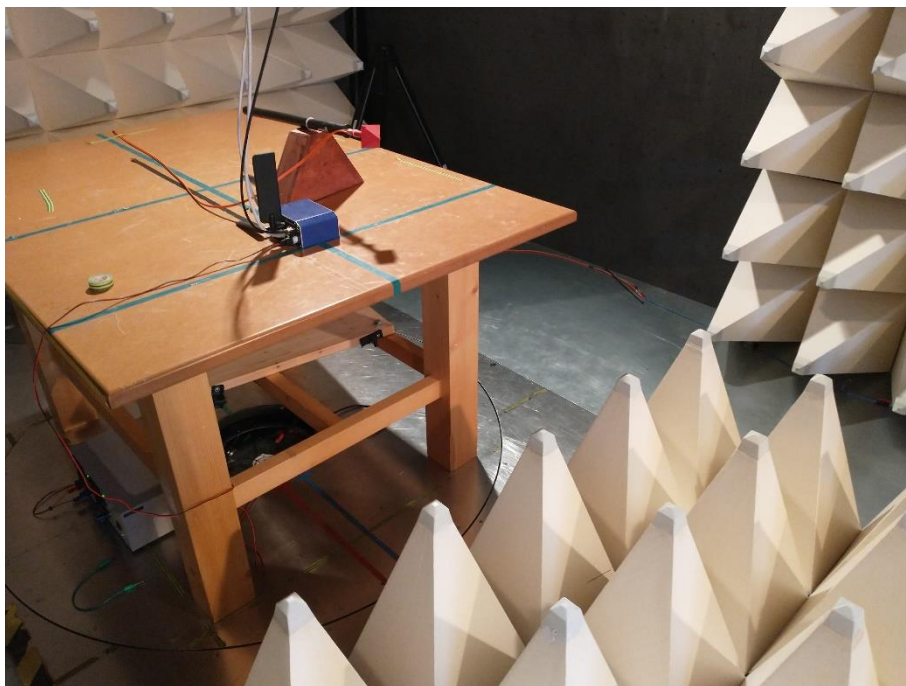


Figure 29: Radiated, radio-frequency, electromagnetic field 80 MHz - 1 GHz, LEFT



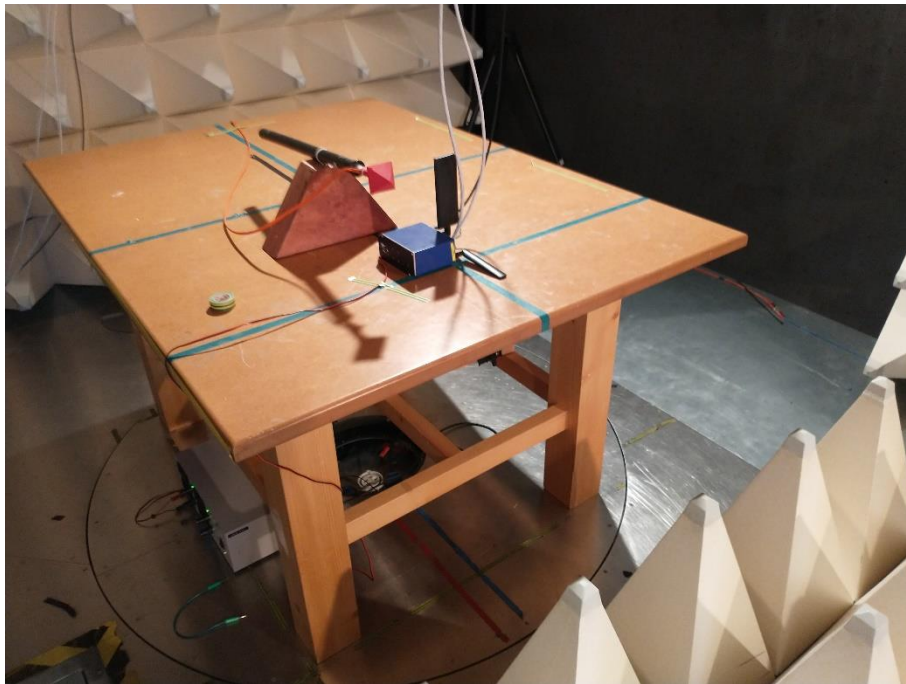


Figure 30: Radiated, radio-frequency, electromagnetic field 80 MHz - 1 GHz, RIGHT

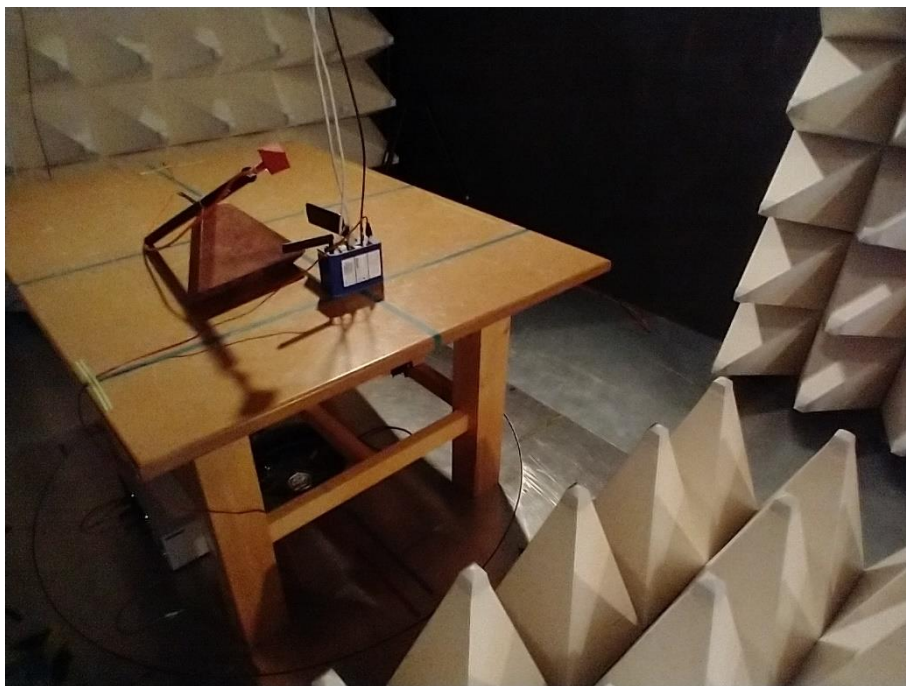


Figure 31: Radiated, radio-frequency, electromagnetic field 80 MHz - 1 GHz, BOT

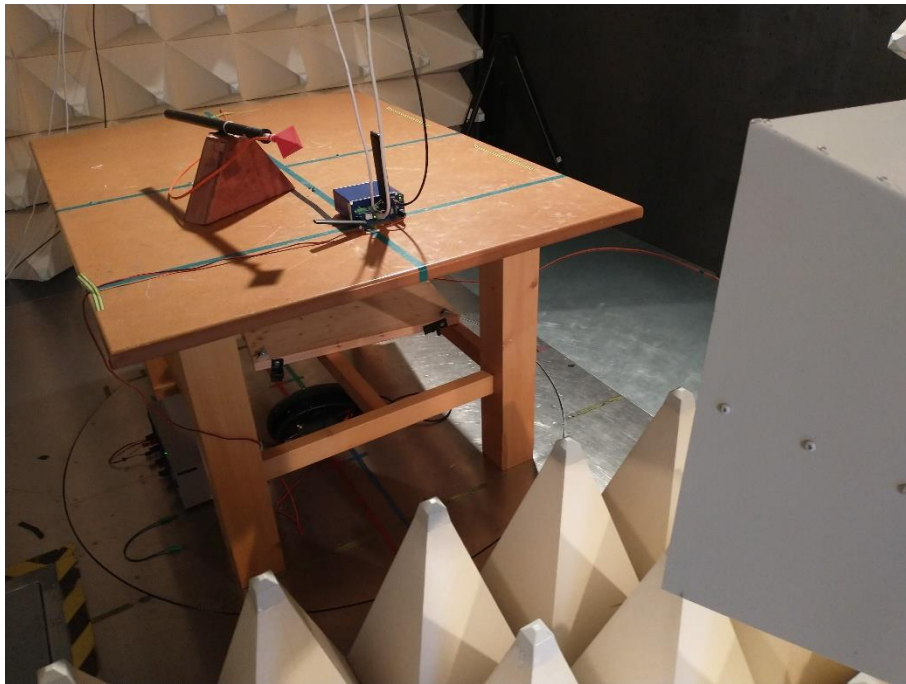


Figure 32: Radiated, radio-frequency, electromagnetic field 1 GHz – 6 GHz, FRONT

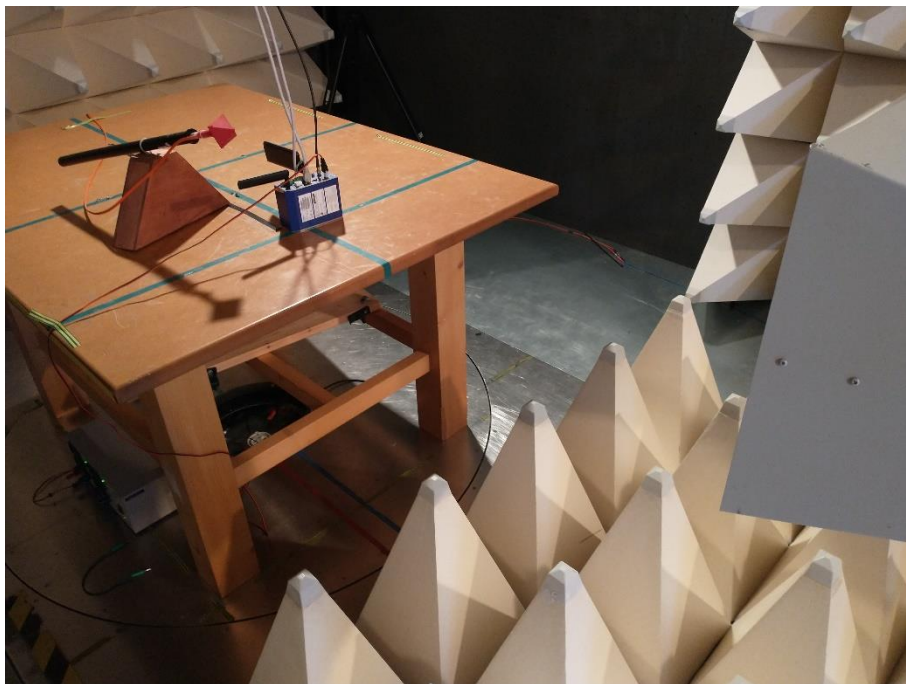


Figure 33: Radiated, radio-frequency, electromagnetic field 1 GHz – 6 GHz, BOT

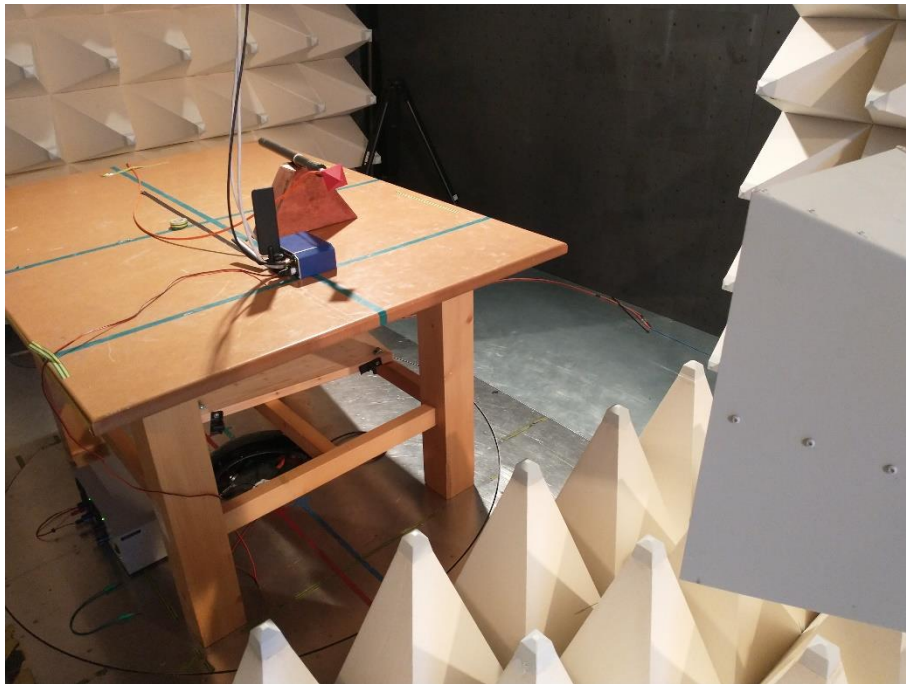


Figure 34: Radiated, radio-frequency, electromagnetic field 1 GHz – 6 GHz, LEFT



Figure 35: Radiated, radio-frequency, electromagnetic field 1 GHz – 6 GHz, RIGHT



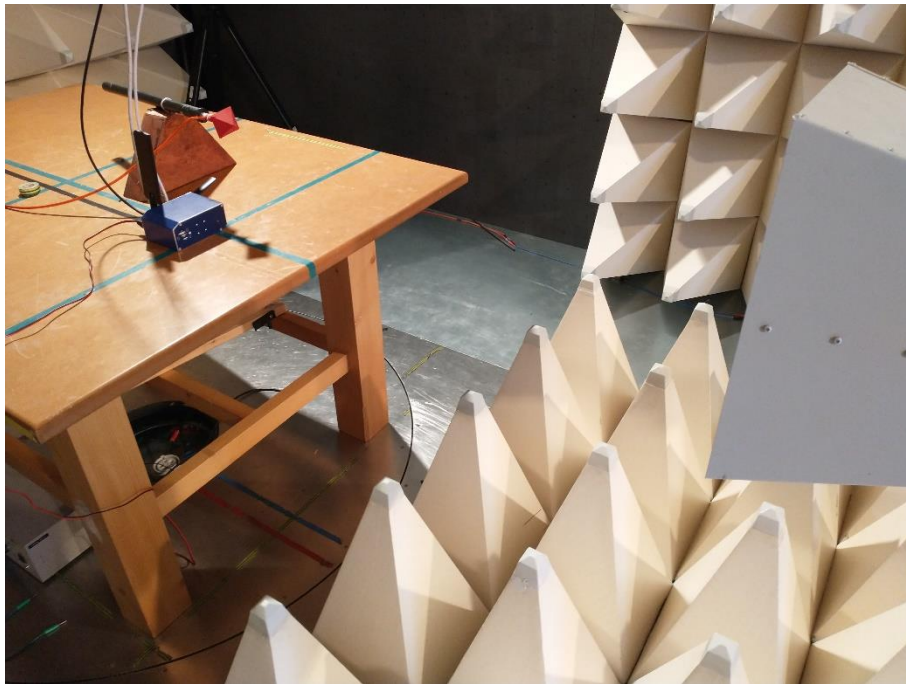


Figure 36: Radiated, radio-frequency, electromagnetic field 1 GHz – 6 GHz, BACK

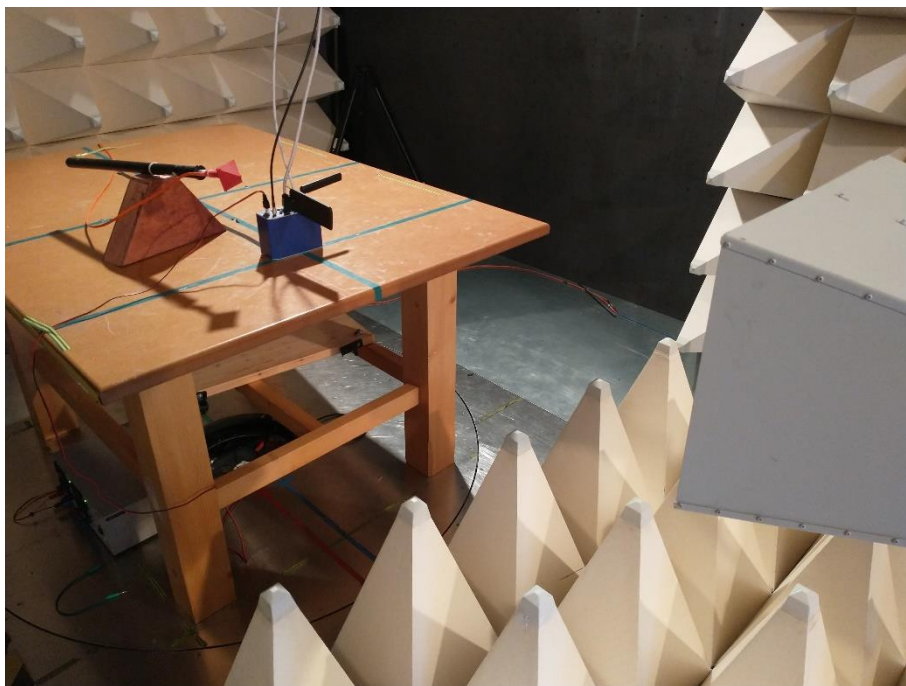


Figure 37: Radiated, radio-frequency, electromagnetic field 1 GHz – 6 GHz, TOP

## 4.9 Voltage dips, short interruptions and voltage variations

### 4.9.1 Voltage dips, short interruptions and voltage variations: Measurement, limits and results

Standard	ČSN EN 61000-4-11 ed.3		
Test specification	Voltage dips, short interruptions and voltage variations immunity tests		
Requirements	DIP 0%, 1 periods, High-Z on/off	240VAC	
	Interrupt 0%, 250 periods, High-Z on/off	240VAC	
	DIP 40%, 10 periods	240VAC	
	DIP 75%, 25 periods	240VAC	
Test site	Wood test table (1m x 2,5m) with steel surface		
EUT set-up	EUT A set 1		
EUT operation mode	OM A2		
<b>Results</b>			
Conditions	Test result EN 61000-6-2	Test result EN 61000-4-11	Requirement
DIP 0%, High-Z OFF, 1 pulse	A	A	<b>PASS</b>
DIP 0%, High-Z ON, 1 pulse	A	A	<b>PASS</b>
Interrupt 0%, High-Z OFF, 250 pulses	C	B	<b>PASS</b>
Interrupt 0%, High-Z ON, 250 pulses	C	B	<b>PASS</b>
DIP 40%, 10 pulses	A	A	<b>PASS</b>
DIP 75%, 25 pulses	A	A	<b>PASS</b>
<b>Notes</b>			





Figure 38: Voltage dips, short interruptions and voltage variations test setup

## 5. Instruments and Ancillary

Ident.No	Description	Type	Manufacturer	Serial No.
DM1444	EMC semi-anechoic chamber	CHC	Frankonia	---
DM1457	Antenna	BTA-M	Frankonia	07002
DM1461	Antenna	BBHA 9120 E	Frankonia	BBHA 9120 E384
DM1419	Test receiver	ESCI	Rohde & Schwarz	1166.5950K03 Ser.100751
DM1547	Test receiver	ESR 7	Rohde & Schwarz	1316.3003K07- 101730-Ah
DM1538	Test software	EMC32 v.06.20.1	Rohde & Schwarz	1501.9590.02 Ser.100356
DM1402	Artificial-mains network	ESH2-Z5	Tectra a.s.	Ser.100210
DM1405	DC power source 2x 0V-30V	Typ 2225	Statron	---
DM1406	DC power source 2x 0V-30V	Typ 2225	Statron	0801019
DM1463	KEMZ clamp	KEMZ 801	TESEQ	Ser.25466
DM1469	Coupling/decoupling network	CDN M2+M3	Frankonia	A3027004
DM1531	Coupling/decoupling network	CDN M2+M3	Frankonia	A2210254 / 2014
DM1468	Coupling/decoupling network	CDN RJ45	Frankonia	A3023017
DM1562	Capacitive Voltage Proge	CVP 9222B	Schwarzbeck	01038
DM1561	Currant Probe	SW 9605	Schwarzbeck	#166
DM1458	EFT bank	CN-EFT1000	EMC-Partner	Ser.586
DM1421	Imunity tester	TRA2000-IN-4	EMC-Partner	Ser.989
DM1452	Aplifier	FLG-30F	Frankonia	s.n.:1016
DM1423	Aplifier	FLH-200B	Frankonia	1061
DM1422	Aplifier	FLG-30D	Frankonia	1058
DM1568	Test software	Prove EMC, v. 2.0.0.8	Frankonia	---
DM1538	Test software	EMC32 v 10.1	Rohde & Schwarz	1501.9590.02 Ser. 100356
DM1566	EM field probe	EFS-laser	Frankonia	0134
DM1425	Switch unit	RSU_1233	Frankonia	s.n.:113B1261/2016

Table 11: List of instruments in Eurosignal