




# EMC and EMF Test Report

## EAS product (Electromagnetic Anti-Scaling)

*[Produit ATE (Anti-Tartre Electromagnétique)]*

	NAME & FUNCTION	DATE	SIGNATURE
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## DOCUMENT STATUS

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## TABLE OF CONTENT

<b>1</b>	<b>Purpose of the test</b> .....	<b>4</b>
<b>2</b>	<b>Applicable documents</b> .....	<b>4</b>
<b>3</b>	<b>Acronym list</b> .....	<b>5</b>
<b>4</b>	<b>General information</b> .....	<b>6</b>
4.1	Testing provider .....	6
4.2	Testing laboratory .....	6
4.3	Customer reference .....	6
4.4	Equipment under test .....	7
4.5	Operating Mode .....	8
4.6	EUT Pass/Fail criteria .....	8
<b>5</b>	<b>Result summary</b> .....	<b>9</b>
<b>6</b>	<b>General conclusion</b> .....	<b>9</b>
<b>7</b>	<b>Radiated emission: EN 55016</b> .....	<b>10</b>
7.1	Test parameters .....	10
7.2	Pictures .....	11
7.3	Test results .....	12
<b>8</b>	<b>Conducted Emissions: EN55016</b> .....	<b>17</b>
8.1	Test parameters .....	17
8.2	Pictures .....	18
8.3	Test results .....	18
<b>9</b>	<b>Electrostatic Discharges: NF EN 61000-4-2</b> .....	<b>21</b>
9.1	Test Parameters .....	21
9.2	Pictures .....	23
9.3	Test results .....	25
<b>10</b>	<b>Radiated Immunity: NF EN 61000-4-3</b> .....	<b>26</b>
10.1	Test parameters .....	26
10.2	Pictures .....	27
10.3	Test results .....	29
<b>11</b>	<b>Electrical fast transient burst Immunity: NF EN 61000-4-4</b> .....	<b>30</b>
11.1	Test parameters .....	30
11.2	Pictures .....	33
11.3	Test results .....	33
<b>12</b>	<b>Surge immunity: NF EN 61000-4-5</b> .....	<b>34</b>
12.1	Test parameters .....	34
12.2	Pictures .....	35
12.3	Test results .....	36
<b>13</b>	<b>Conducted disturbances induced by Radio Frequency Fields immunity: NF EN 61000-4-638</b> .....	<b>38</b>
13.1	Test parameters .....	38
13.2	Pictures .....	40
13.3	Test results .....	41
<b>14</b>	<b>Voltage dips and voltage variations immunity: NF EN 61000-4-11</b> .....	<b>42</b>
14.1	Test parameters .....	42
14.2	Pictures .....	43
14.3	Test results .....	43
<b>15</b>	<b>Measurements of human exposure to electromagnetic fields</b> .....	<b>44</b>
15.1	Test parameters .....	44
15.2	Pictures .....	45
15.3	Test results .....	46

## 1 Purpose of the test

This document is an EMC and EMF test report carried out as part of the CE marking of the EAS (Electromagnetic Anti-Scaling) product.

<b>Company</b>	HUMIDISTOP
<b>N° quote</b>	Quote 7988-2
<b>Operators</b>	Jean-Baptiste DUMON / Maxime PAYET
<b>Test dates</b>	Monday, March 21 <sup>th</sup> 2022 to Wednesday, March 23 <sup>th</sup> 2022

## 2 Applicable documents

- Quote NEXIO 7988-2
- Standards for EMC

Standards applied		
Harmonized standards	Test standard	Type of tests
<b>NF EN 61000-6-1</b> 2007	NF EN 61000-4-2	Electrostatic Discharge Immunity tests
	NF EN 61000-4-3	Radiated Electric Field Immunity tests
	NF EN 61000-4-4	Electrical Fast Transients Burst Immunity tests
	NF EN 61000-4-5	Surge Immunity tests
	NF EN 61000-4-6	Conducted Disturbances Induced by radio-Frequency Field Immunity tests
	NF EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests
<b>NF EN 61000-6-3</b> 2007 + A1 : 2011 + AC : 2012	NF EN 55016	Radiated and conducted electromagnetic emission tests

- Standards for health protection

Standards applied		
Recommendation	Test standard	Type of tests
<b>1999/519/CE</b>	NF EN 62479 NF EN 62311	Measurements of human exposure to electromagnetic fields

### 3 Acronym list

BW	Bandwidth
EMC	ElectroMagnetic Compatibility
EMF	ElectroMagnetic Field
ESD	Electrostatic Discharge
EUT	Equipment Under Test
HCP	Horizontal Coupling Plan
NA	Not Applicable
VCP	Vertical Coupling Plan
PH	Horizontal Polarization
PV	Vertical Polarization
RBW	Resolution Bandwidth
CDN	Coupling/Decoupling network
SN	Serial Number
VBW	Video Bandwidth

## 4 General information

### 4.1 Testing provider

NEXIO SAS  
48, Rue René Sentenac  
31 300 TOULOUSE  
FRANCE  
Tel : 05 61 44 02 47 – Fax : 05 61 44 05 67

### 4.2 Testing laboratory

Laboratoire ACEMIP  
282, rue du Chêne-Vert  
31670 LABEGE  
FRANCE

### 4.3 Customer reference

HUMIDISTOP  
7, Avenue Didier DAURAT  
31700 BLAGNAC – France

#### 4.4 Equipment under test

This test campaign concerns the EAS product: an Electromagnetic Anti-Scale which prevents the formation of scale in pipes by sending an electromagnetic field. It has the following characteristics:

- Size: 22cm x 16cm x 3cm
- Weight: 1.05kg
- Use inside buildings
- Installation in the residential environment
- P+N power supply, 230Vac/50Hz via a CE marked power adapter, 24W
- 1 x 20cm 3.5mm Jack to Jack interconnecting cable
- 1 operating mode



#### References

ATE  
S/N: 26347-22/10-00100

EUT:



(operating mode: see §0)

**Cables:**

- Power supply P+N, 230Vac/50Hz via a CE marked power adapter, 24W
- 1 x 20cm long 3.5mm jack/jack interconnecting cable

#### 4.5 Operating Mode

The equipment to be tested is placed in an anechoic chamber.

During this campaign the equipment is configured in "descaling" mode.

We will call it **nominal mode** in this document.

#### 4.6 EUT Pass/Fail criteria

During the immunity tests the proper functioning of the equipment is checked by controlling the display LED on the front panel.



## 5 Result summary

TEST	§	PAGE	STATUS
<b>Emission</b>			
Radiated emission: EN 55016	7	10	<b>Class B compliant</b>
Conducted Emissions: Conducted Emissions: EN55016	8	17	<b>Class B compliant</b>
<b>Immunity</b>			
Electrostatic Discharges: NF EN 61000-4-2	9	21	<b>Pass criteria A</b>
Radiated Immunity: NF EN 61000-4-3	10	26	<b>Pass criteria A</b>
Electrical fast transient burst Immunity: NF EN 61000-4-4	11	30	<b>Pass criteria A</b>
Surge immunity: NF EN 61000-4-5	12	34	<b>Pass criteria A</b>
Conducted disturbances induced by Radio Frequency Fields immunity: NF EN 61000-4-6	13	38	<b>Pass criteria A</b>
Voltage dips and voltage variations immunity: NF EN 61000-4-11	14	42	<b>Pass criteria A</b>
<b>Health protection</b>			
Measurements of human exposure to electromagnetic fields	15	44	<b>Pass</b>

**Note:** Tests were not performed in a COFRAC – ISO 17025 environment.

## 6 General conclusion

The equipment, which references are given in paragraph 4.4, is **Compliant** with the recommendations of the harmonised standards cited in paragraph 2.

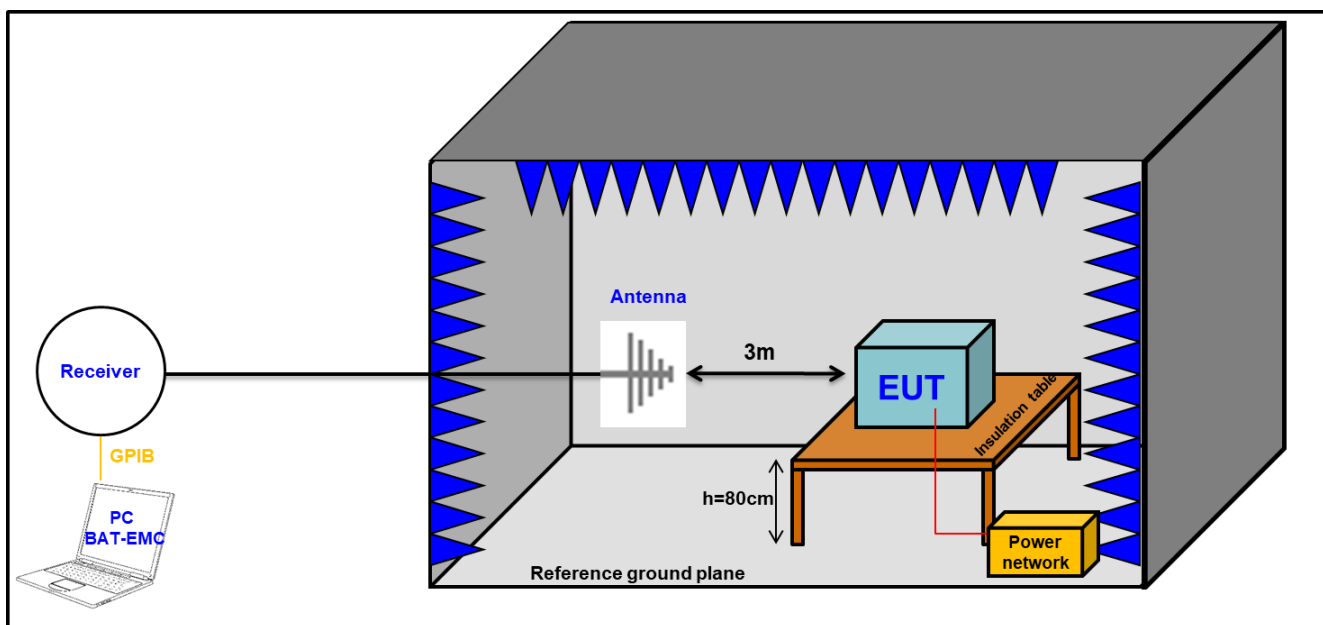
## 7 Radiated emission: EN 55016

### 7.1 Test parameters

#### 7.1.1 Equipment

Name	Reference	S/N	Remarks
Antenna	Schwarzbeck VULB 9162	9162-024 10955	30MHz-6GHz
Receiver	Rohde & Schwarz – ESR7	1316.3003K07-102515-GD	10Hz-7GHz
RF Cable	Cable: 12 and 17	/	/

#### 7.1.2 Setup



#### 7.1.3 Configuration

Frequency band	Mode	Step	RBW	VBW	Sweep time	Detectors
30MHz-1GHz	Linear Scan	60 kHz	120 kHz	Auto	15ms/Pts	Peak

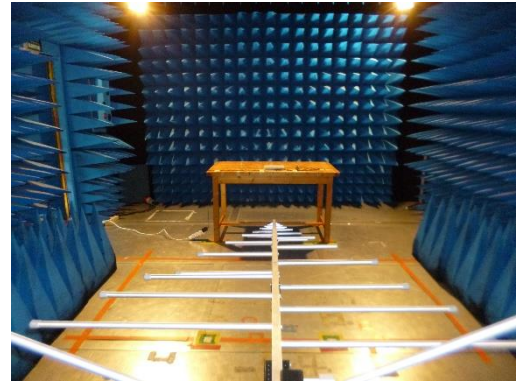
#### 7.1.4 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

## 7.2 Pictures



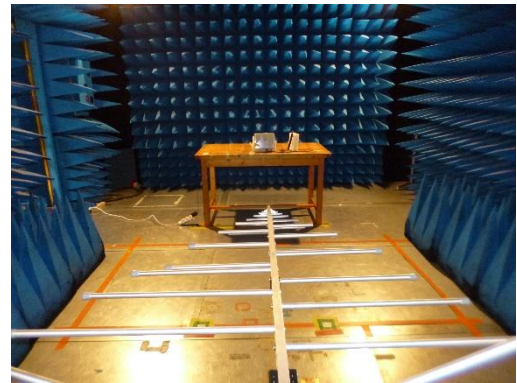
Radiated emissions 30MHz - 1GHz – Front face – Vertical Polarization



Radiated emissions 30MHz - 1GHz – Front face – Horizontal Polarization



Radiated emissions 30MHz - 1GHz – Top face – Vertical Polarization



Radiated emissions 30MHz - 1GHz – Top face – Horizontal Polarization



Radiated emissions 30MHz - 1GHz – Right face – Vertical Polarization



Radiated emissions 30MHz - 1GHz – Right face – Horizontal Polarization

## 7.3 Test results

### 7.3.1 Conclusion

Frequency Band	Configuration	Antenna Polarization	Figure	Conclusion	Remarques
30MHz-1GHz	Background noise: EUT in the room but not powered	Vertical	Figure 1	/	/
	EUT ON – Front face	Horizontal	Figure 2	<b>Class B compliant</b>	/
		Vertical	Figure 3	<b>Class B compliant</b>	/
	EUT ON – Right face	Horizontal	Figure 4	<b>Class B compliant</b>	/
		Vertical	Figure 5	<b>Class B compliant</b>	/
	EUT ON – Top face	Horizontal	Figure 6	<b>Class B compliant</b>	/
		Vertical	Figure 7	<b>Class B compliant</b>	/

The equipment is **Compliant** with the recommendations of the standards referred in paragraph 2.

### 7.3.2 Curves

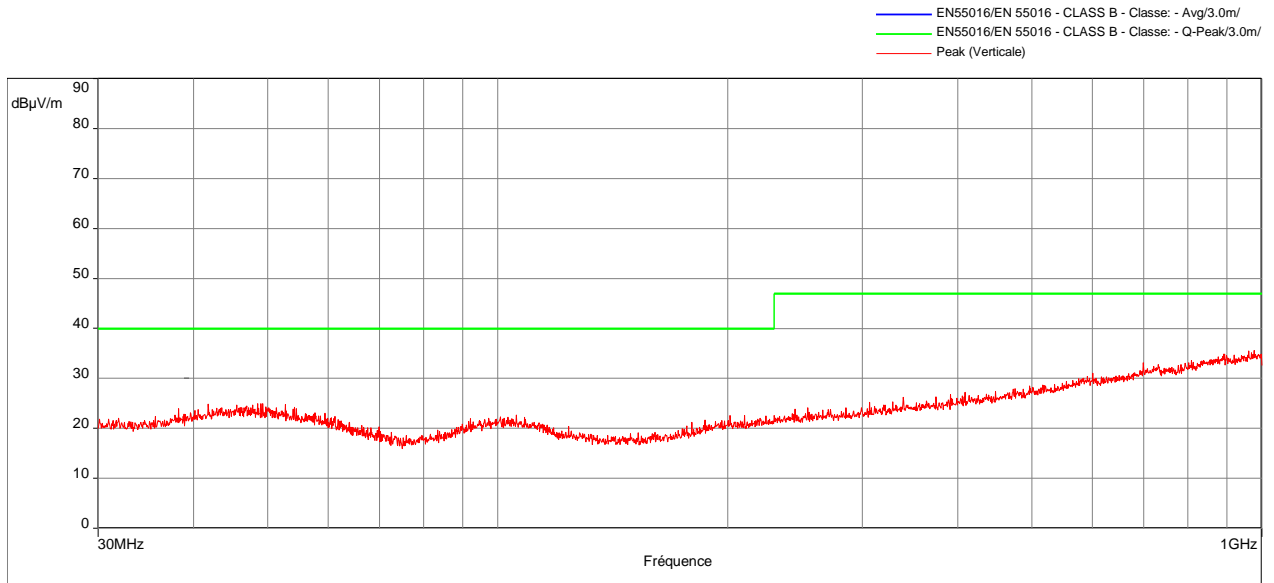


Figure 1: Background noise – PV

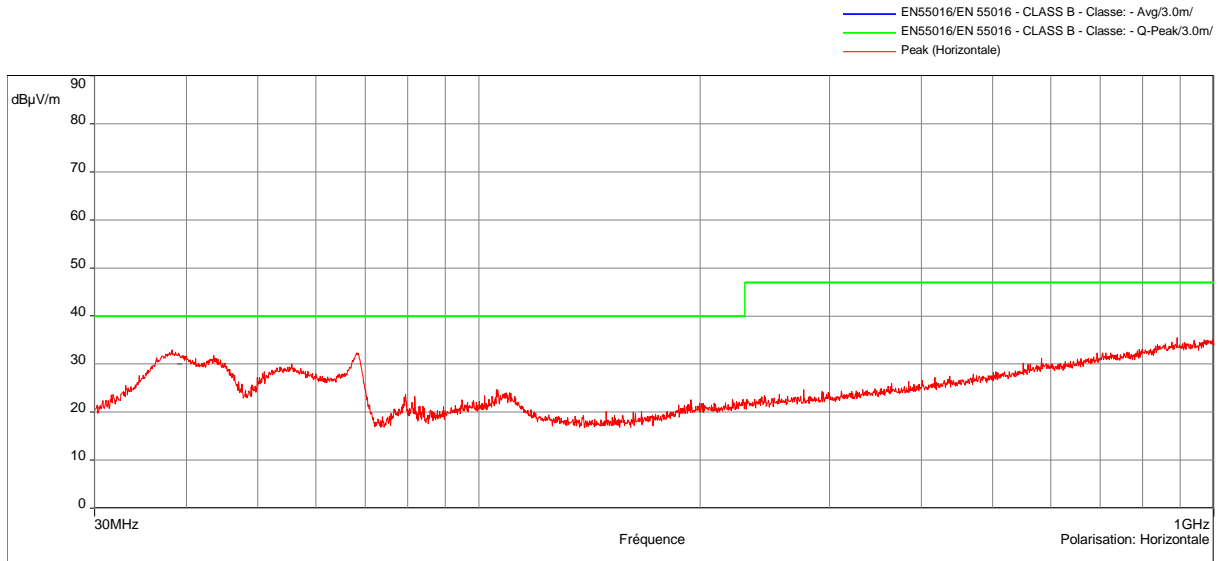


Figure 2: EST ON - Nominal Mode - Front face - PH

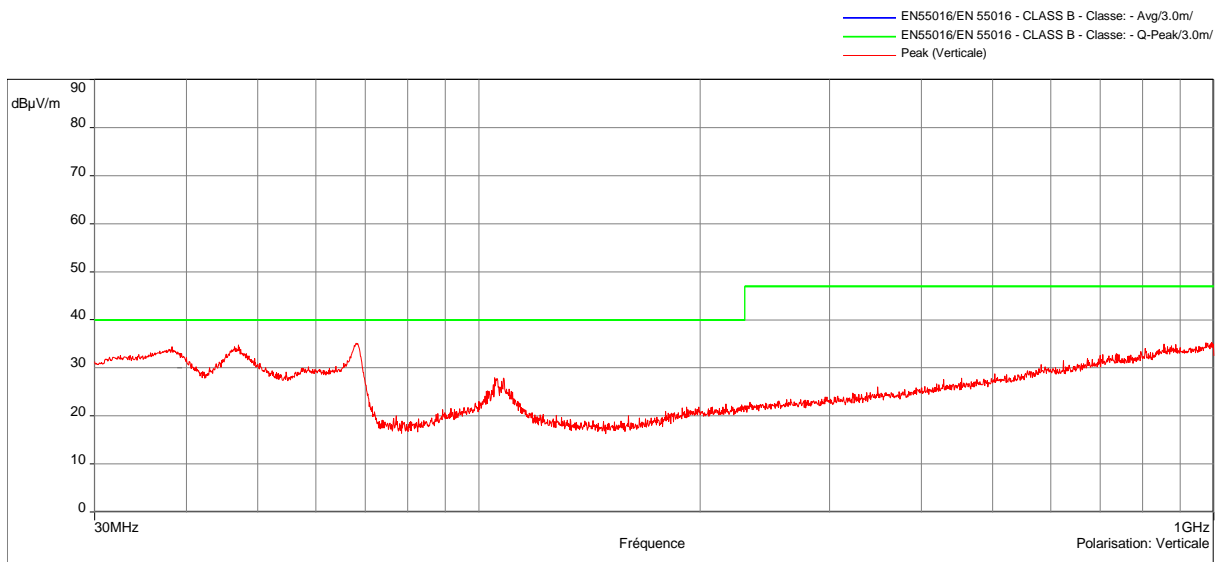


Figure 3: EST ON - Nominal mode - Front face - PV

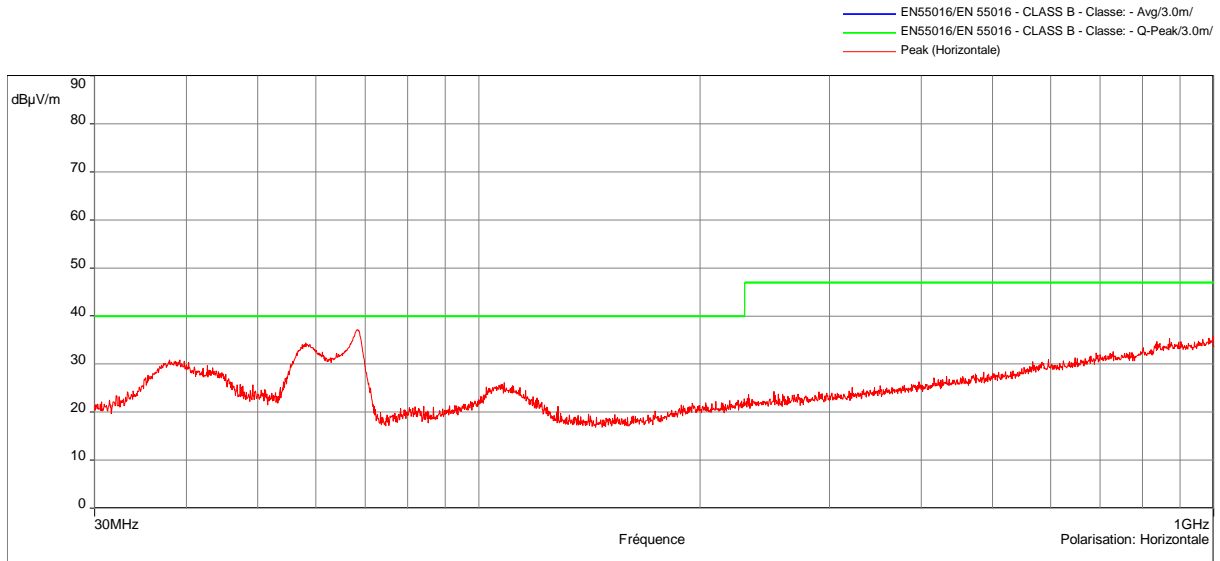


Figure 4: EST ON - Nominal mode - Right face - PH

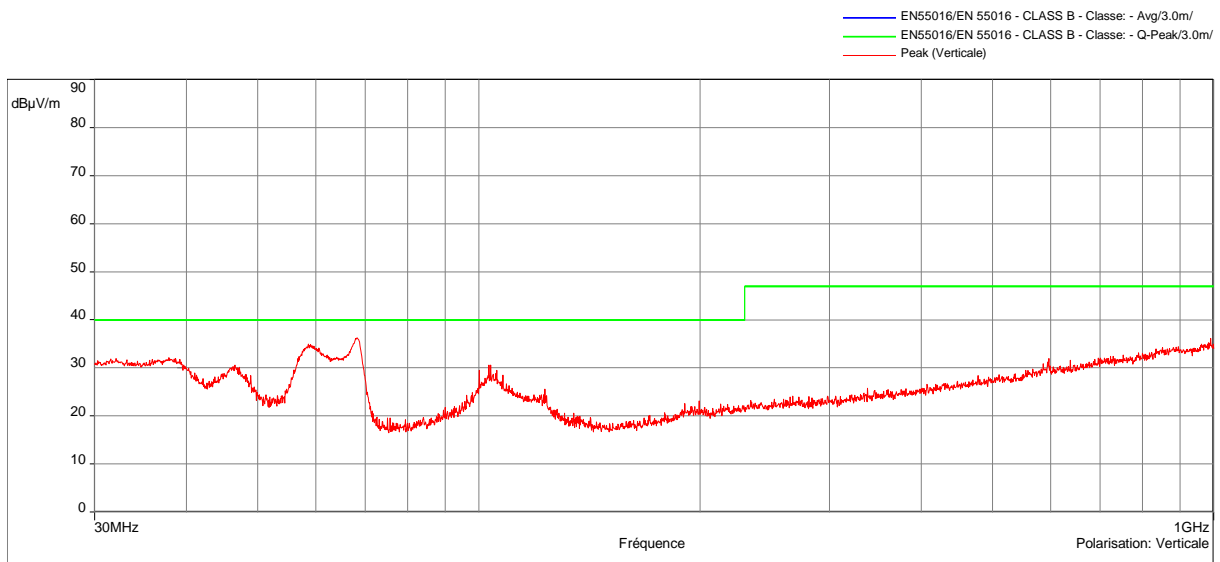


Figure 5: EST ON - Nominal mode - Right face - PV

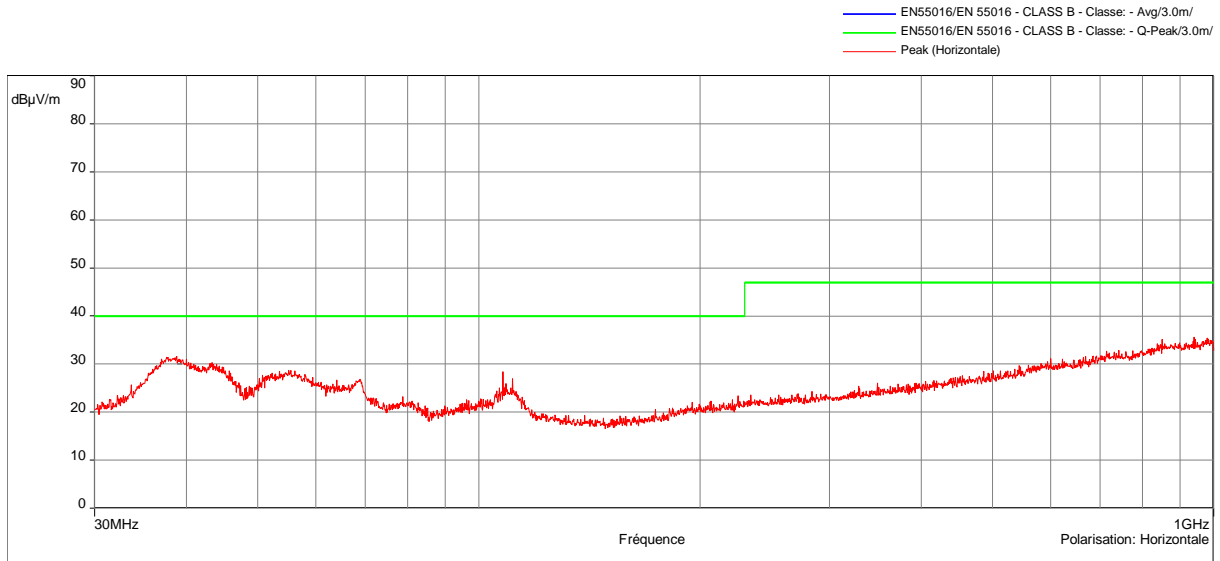


Figure 6: EST ON - Nominal mode - Top face - PH

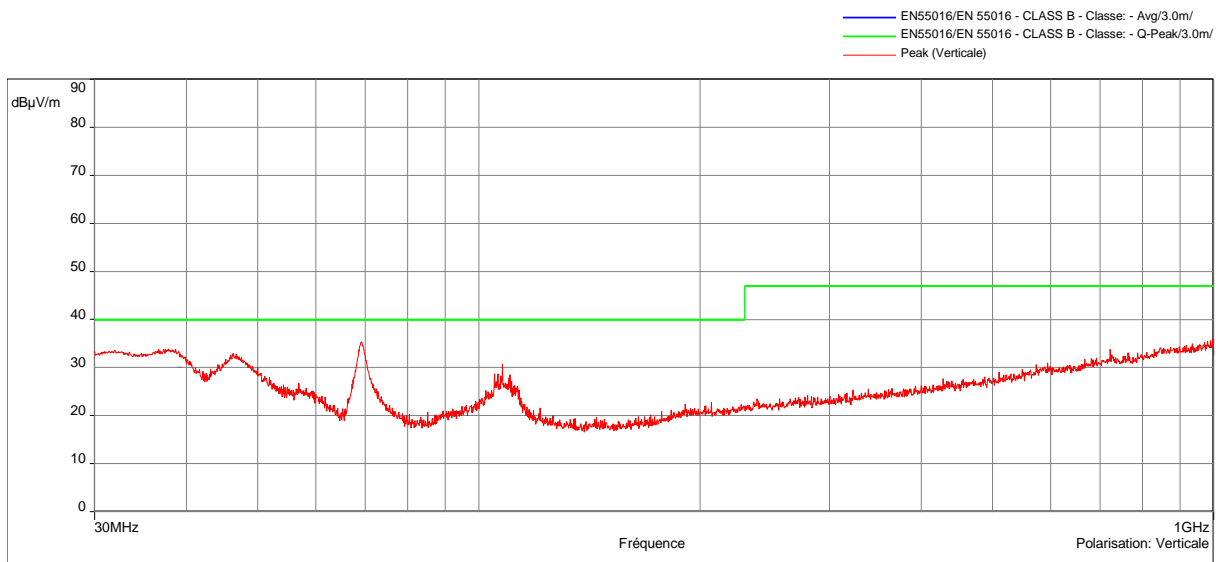


Figure 7: EST ON - Nominal mode - Top face - PV



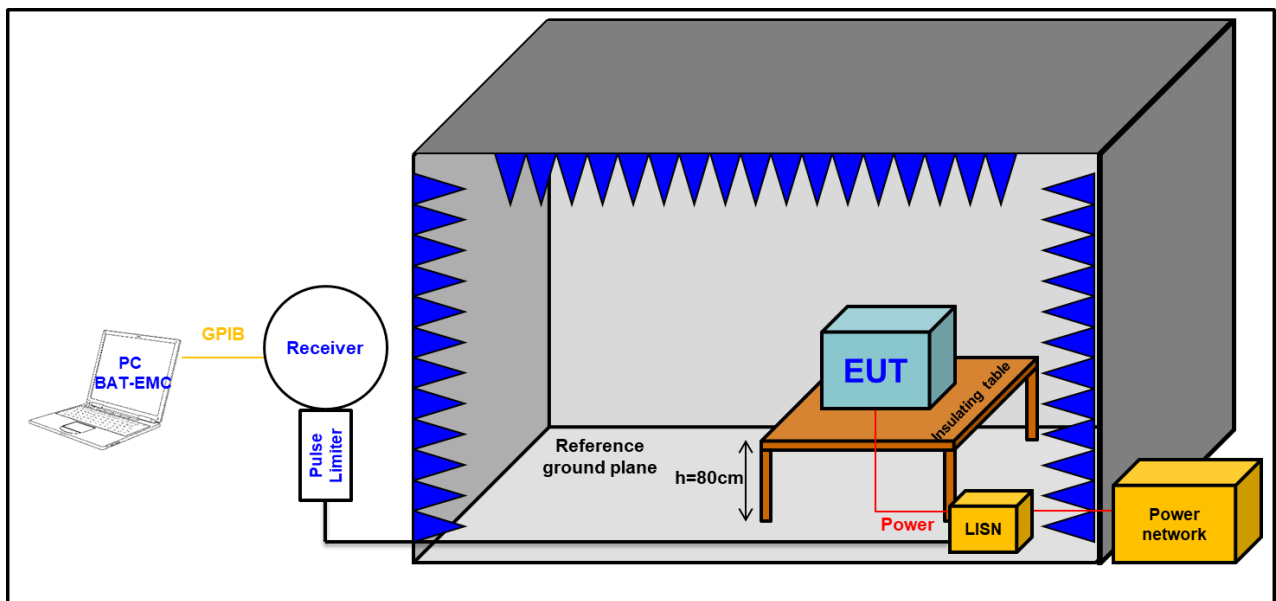
## 8 Conducted Emissions: EN55016

### 8.1 Test parameters

#### 8.1.1 Equipment

Name	Reference	S/N	Remarks
Receiver	Rohde & Schwarz – ESR	1316.3003K07-102515-GD	10Hz-7GHz
RF Cable	Cable 18	/	/
Impulse Limiter	R&S ESH3-Z2	100688	/
LISN	R&S ENV216	/	/

#### 8.1.2 Setup



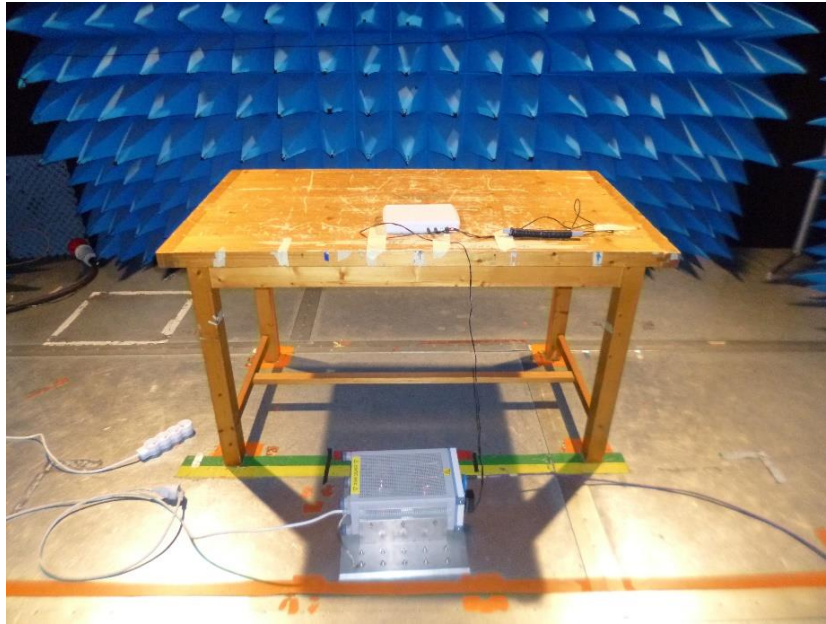
#### 8.1.3 Configuration

Frequency Band	Mode	Step	RBW	VBW	Sweep time	Detectors
150kHz-30MHz	Linear Scan	4 kHz	9 kHz	Auto	15 ms/Pts	Peak and Average

#### 8.1.4 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

## 8.2 Pictures



Conducted emission on power supplies

## 8.3 Test results

### 8.3.1 Conclusion

Frequency Band	Configuration	Measured access	Figure	Conclusion	Remarques
150kHz-30MHz	Background noise: EUT in the room but not powered	Phase	Figure 8	/	/
		Neutral	Figure 9	/	/
	EUT ON – 230Vac supply	Phase	Figure 10	<b>Class B compliant</b>	/
		Neutral	Figure 11	<b>Class B compliant</b>	/

The equipment is **Compliant** with the recommendations of the standards referred in paragraph 2.

### 8.3.2 Curves

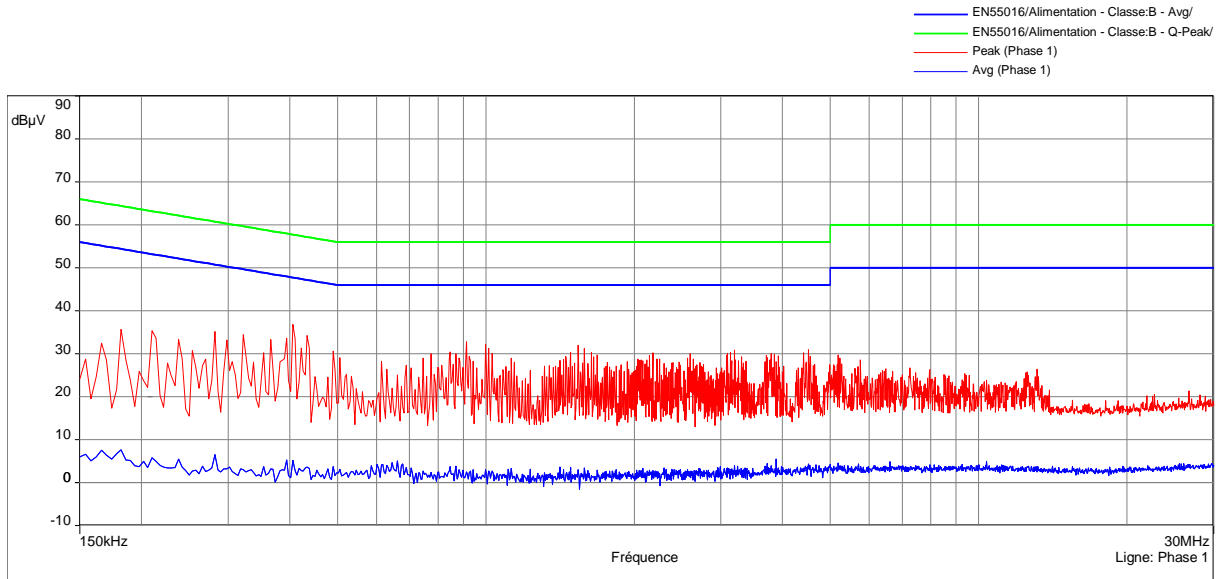


Figure 8: Background noise - Phase

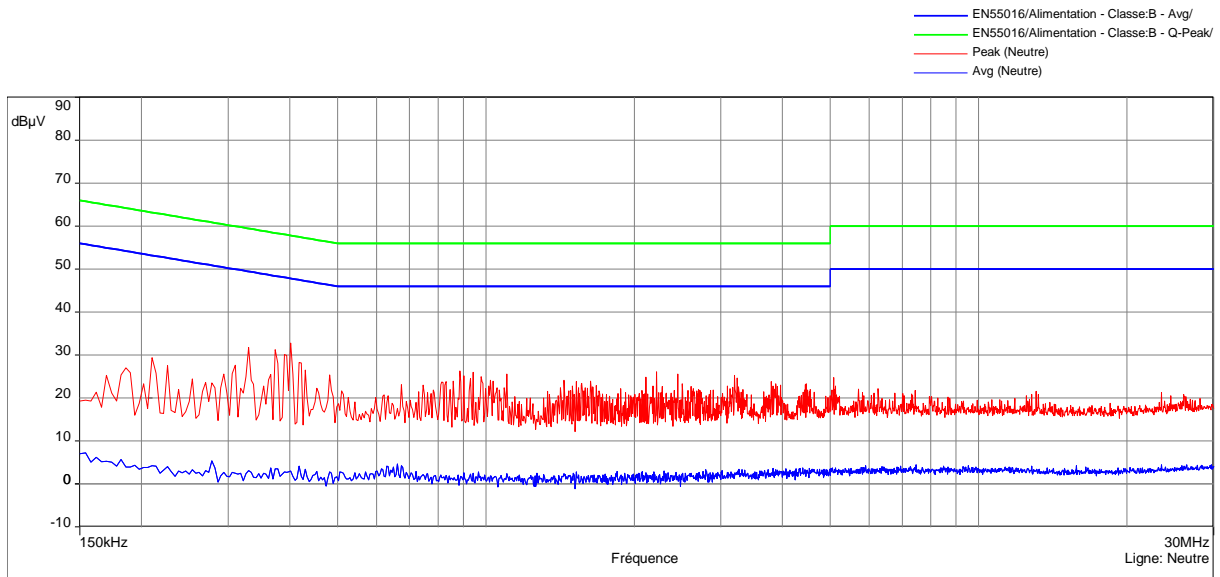


Figure 9: Background noise - Neutral

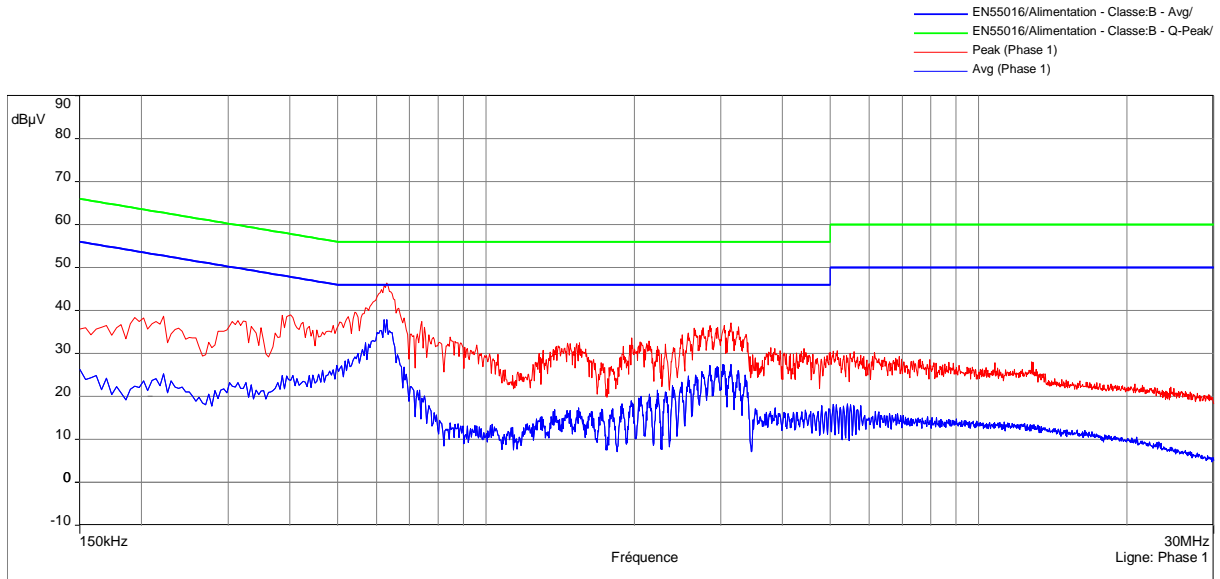


Figure 10: EUT ON - Nominal mode - 230Vac supply – Phase

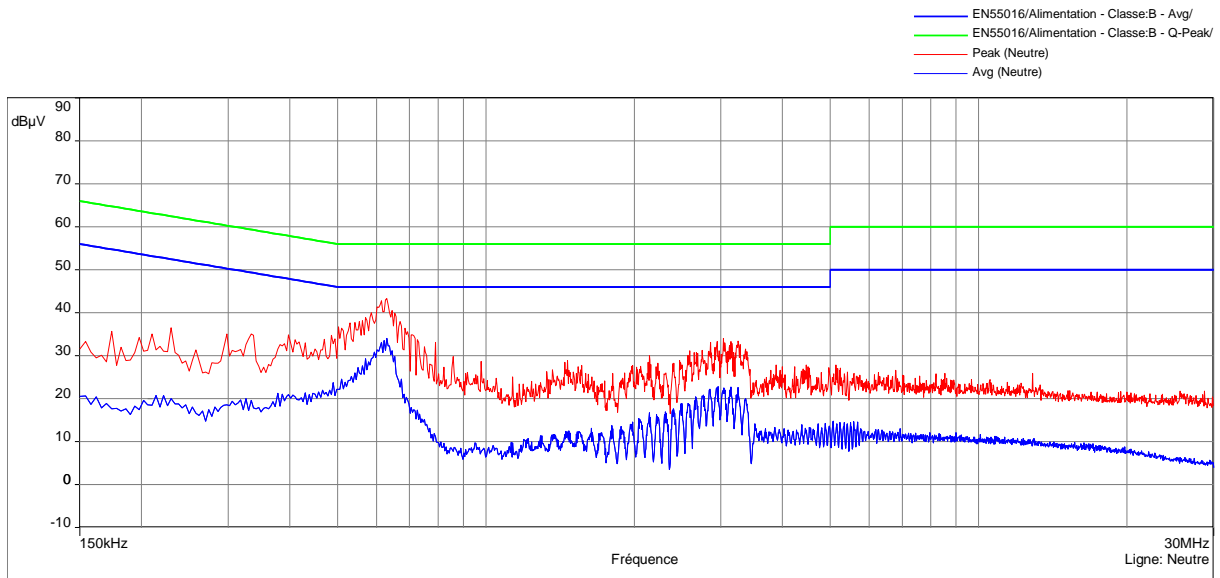


Figure 11: EUT ON - Nominal mode - 230Vac supply - Neutral

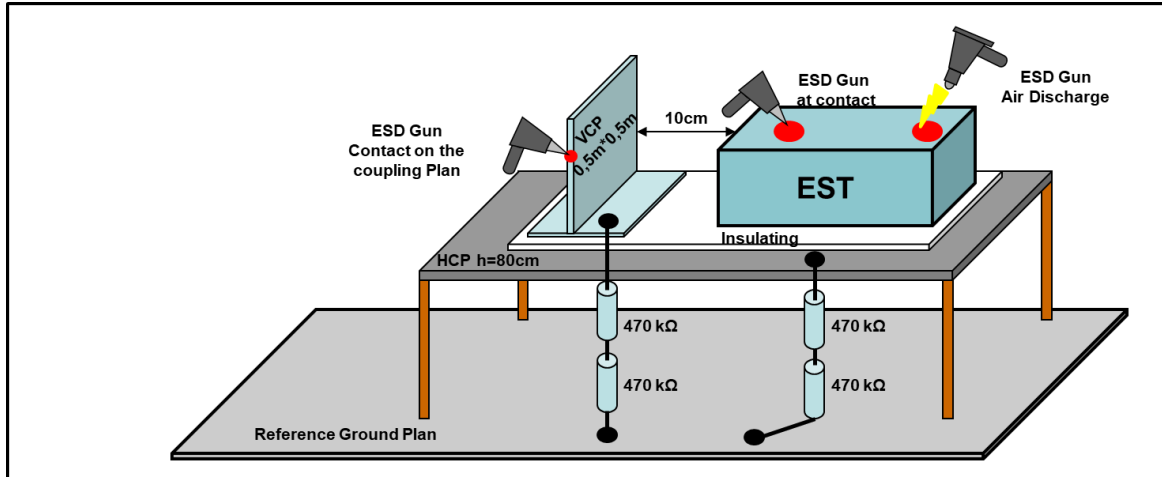
## 9 Electrostatic Discharges: NF EN 61000-4-2

### 9.1 Test Parameters

#### 9.1.1 Equipment

Name	Reference	S/N	Remarks
ESD Gun	TESEQ NSG 435	/	/

#### 9.1.2 Setup



#### 9.1.3 Configuration

Test	Level	Frequency	Polarity	Number of discharges
Air discharges	8kV	1 per second	+ / -	10 by polarity
Direct Contact discharges	4kV	1 per second	+ / -	10 by polarity
Indirect Contact discharges (Vertical & horizontal coupling plane)	4kV	1 per second	+ / -	10 by polarity

#### 9.1.4 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

## 9.1.5 Points of discharges

### 9.1.5.1 Air Discharges

- Front face
- Back face
- Up face
- Down face
- Left face
- Right face

### 9.1.5.2 Direct contact Discharges

- Rivets face down
- Power connector

### 9.1.5.3 Indirect contact Discharges

- VCP Left face (VCP1)
- VCP Right face (VCP2)
- VCP Front face (VCP3)
- VCP Rear face (VCP4)
- HCP Top face (HCP1)
- HCP Bottom face (HCP2)

## 9.1.6 Discharge network

C = 150pF

R = 330Ω

## 9.1.7 Climatic conditions

Ambient Temperature	18,6°C
Relative Humidity	52,3%

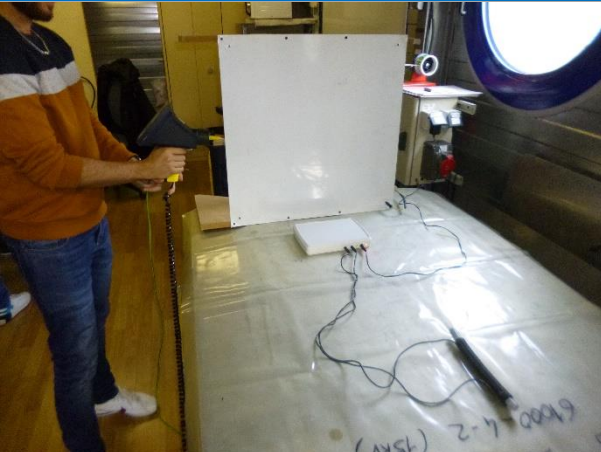
## 9.2 Pictures



Electrostatic discharges - Direct contact discharges  
- Power connector



Electrostatic discharges - Direct contact discharges – Rivets face down



Electrostatic discharges - Indirect contact discharges - VCP4 rear face



Electrostatic Discharges - Indirect Contact Discharges - HCP1 top face



Electrostatic discharges - Indirect contact discharges - HCP2 bottom face



Electrostatic discharges - Indirect contact discharges – VCP1 left face



Electrostatic discharges - Indirect contact discharges - VCP2 right face



Electrostatic discharges - Indirect contact discharges - VCP3 front face



## 9.3 Test results

### 9.3.1 Conclusion

Type of discharge	Points of discharge	Nb of injection	Polarity / Level	Conclusion
Direct contact Discharges	Power connector	10	+4kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-4kV	
	Rivets face down	10	+4kV	
		10	-4kV	
Air discharges	Front/Back/Up/Down/ Left/Right faces	10	+2kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-2kV	
		10	+4kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-4kV	
		10	+8kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-8kV	
Indirect contact discharges	VCP1	10	+4kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-4kV	
	VCP2	10	+4kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-4kV	
	VCP3	10	+4kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-4kV	
	VCP4	10	+4kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-4kV	
	HCP1	10	+4kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-4kV	
	HCP2	10	+4kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		10	-4kV	

The equipment is **Compliant** with the recommendations of the standards referred in paragraph 2.

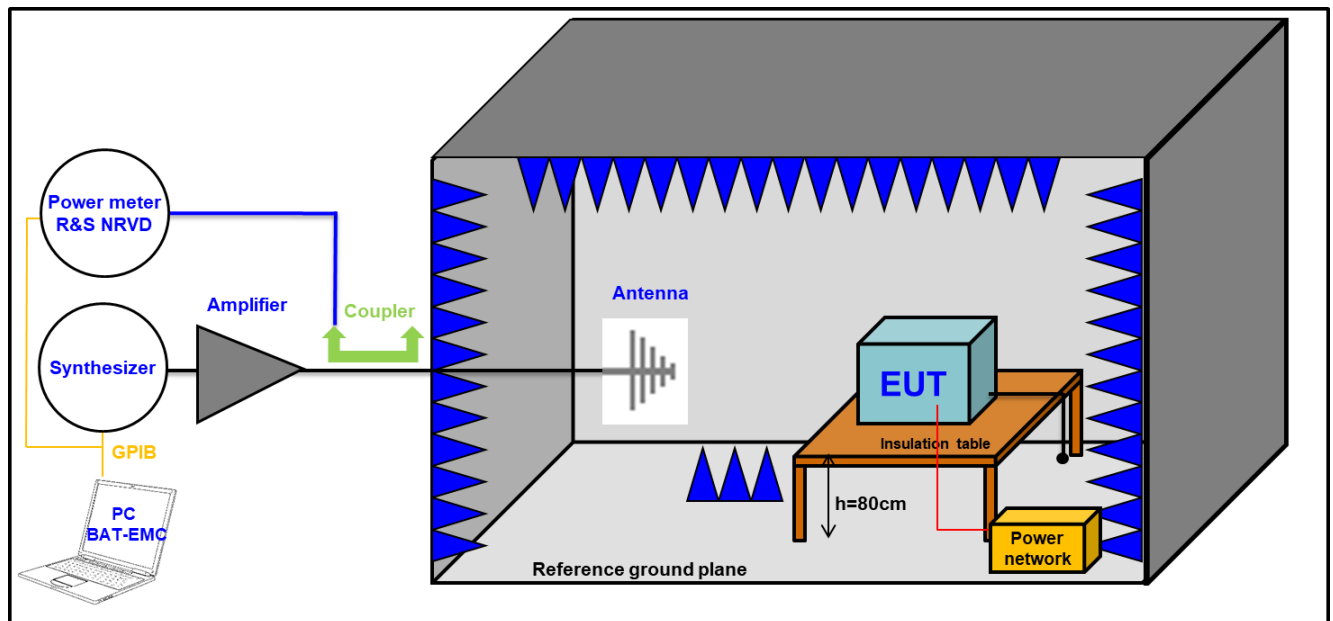
## 10 Radiated Immunity: NF EN 61000-4-3

### 10.1 Test parameters

#### 10.1.1 Equipment

Name	Reference	S/N	Remarks
Antenna	AR ATL 80M1G	338368	80MHz-1GHz
Antenna	Schwarzbeck BBHA 9129	504	1GHz-6GHz
Synthesizer	AR SG6000	324285	100kHz-6GHz
Amplifier	Prana N-MT500	2005-2695	80MHz-1GHz 500W
Amplifier	AR 20/15S1G8M5	338997	1GHz-4,2GHz 20W 4,2-6GHz 15W
Coupler	AR DC6180A	339247	80MHz-1GHz 60dB
Coupler	HYTEM 700M-6GHz	/	1GHz-6GHz
Field probe	NARDA EP 601	401WX11047	5kHz-9.25GHz
Communication relay	AR SC1000M1	/	/
Power meter	R&S NRVD	857.8008.02	/
Power meter probe	NRV Z4	828.3618.02 SN:100473	100kHz-6GHz 100mW max
RF cable	Cable 19	/	/

#### 10.1.2 Setup



#### 10.1.3 Configuration

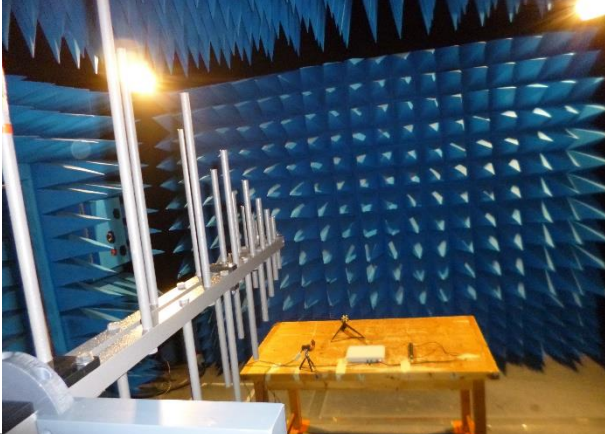
Frequency Band	Level	Step	Dwell time	Modulation
800MHz – 1GHz	3 V/m	1%	1s by modulation	AM (80%, 1kHz)
1.4GHz – 2,7GHz	3 V/m	1%	1s by modulation	AM (80%, 1kHz)

A calibration without equipment was performed previously.

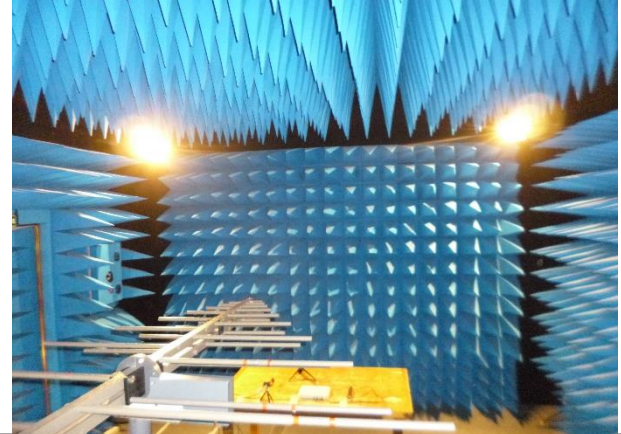
### 10.1.4 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

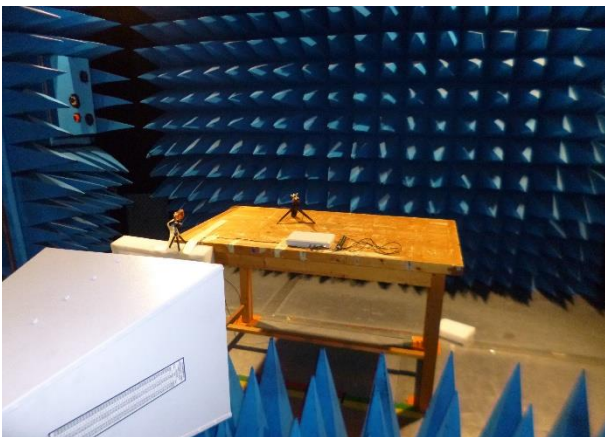
### 10.2 Pictures



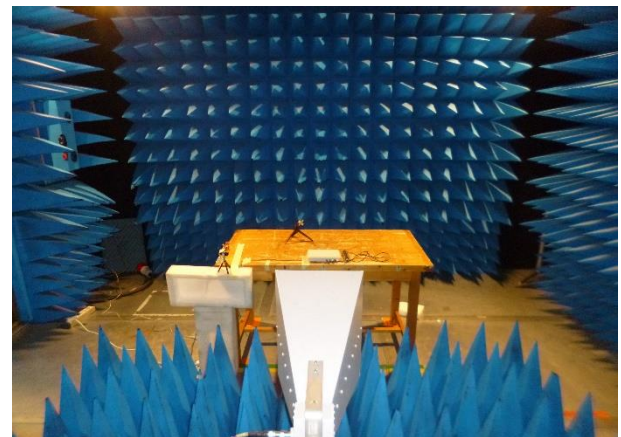
Radiated Immunity - 80MHz-1GHz - Front face - Vertical Polarization



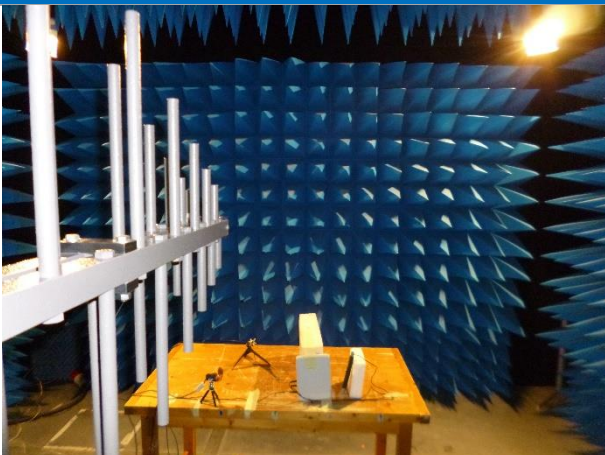
Radiated Immunity - 80MHz-1GHz - Front face - Horizontal Polarization



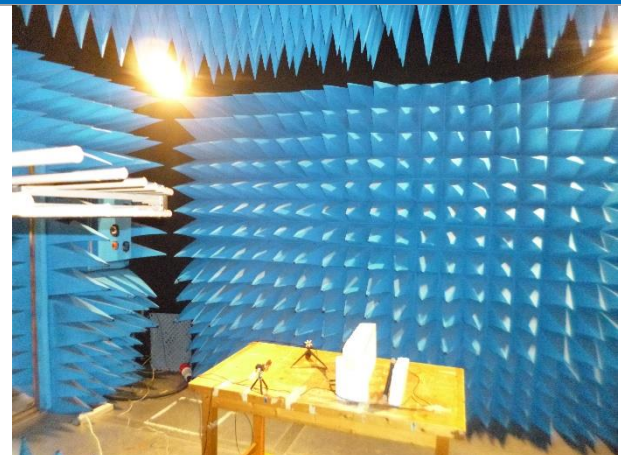
Radiated Immunity - 1GHz-6GHz - Front face - Vertical Polarization



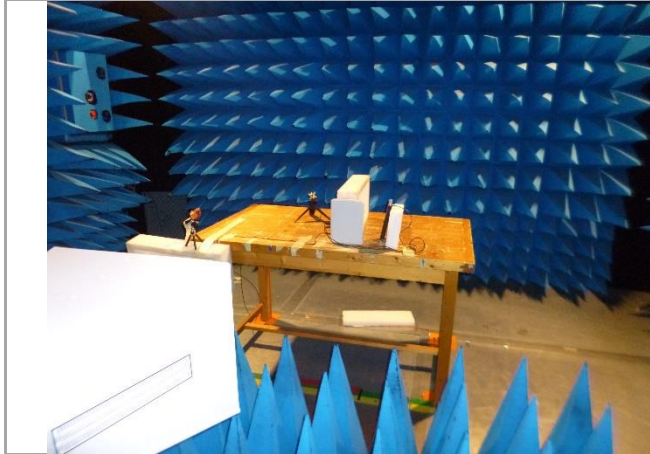
Radiated Immunity - 1GHz-6GHz - Front face - Horizontal Polarization



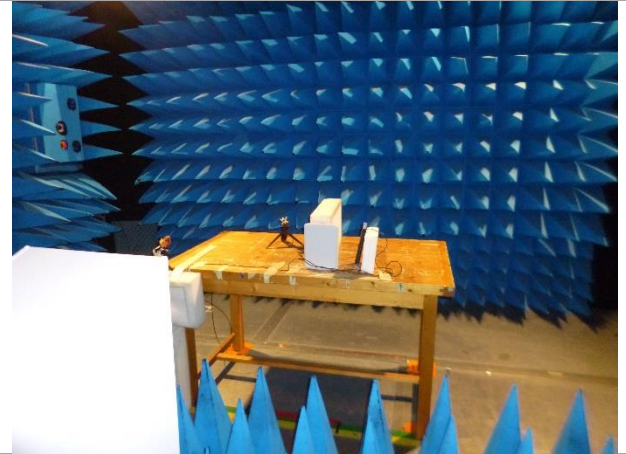
Radiated Immunity - 80MHz-1GHz - Top face - Vertical Polarization



Radiated Immunity - 80MHz-1GHz - Top face - Horizontal Polarization



**Radiated Immunity - 1GHz-6GHz - Top face - Vertical Polarization**



**Radiated Immunity - 1GHz-6GHz - Top face - Horizontal Polarization**

## 10.3 Test results

### 10.3.1 Conclusion

Tested face	Frequency Band	Antenna Polarization	Level	Conclusion
Front face	80MHz-1GHz	Horizontal	3V/m	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		Vertical		No susceptibility of EUT <b>EUT complies with the recommendation</b>
	1.4GHz-2,7GHz	Horizontal	3V/m	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		Vertical		No susceptibility of EUT <b>EUT complies with the recommendation</b>
Top Face	80MHz-1GHz	Horizontal	3V/m	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		Vertical		No susceptibility of EUT <b>EUT complies with the recommendation</b>
	1.4GHz-2,7GHz	Horizontal	3V/m	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		Vertical		No susceptibility of EUT <b>EUT complies with the recommendation</b>

The equipment is **Compliant** with the recommendation of the standards referred in paragraph 2.

## 11 Electrical fast transient burst Immunity: NF EN 61000-4-4

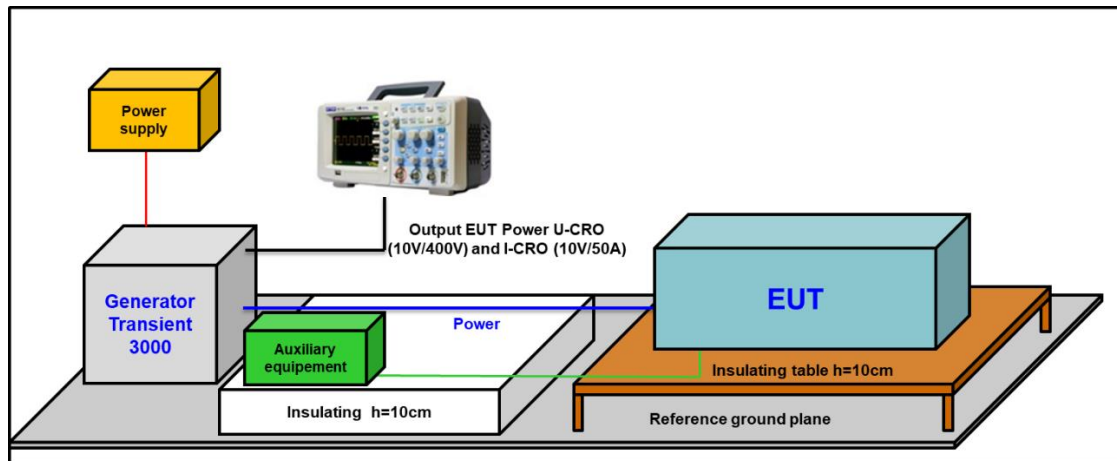
### 11.1 Test parameters

#### 11.1.1 Equipment

Name	Reference	S/N	Remarks
Oscilloscope	LECROY Wavepro 960	2991	BW 2GHz
Generator	EMC PARTNER Transient 3000	TRA3000-F-S-1504	-
Capacitive coupling clamp	EMC PARTNER CNEFT 1000-142	CNEFT1000-142	-

#### 11.1.2 Setup

##### 11.1.2.1 Power supply test



### 11.1.2.2 Configuration

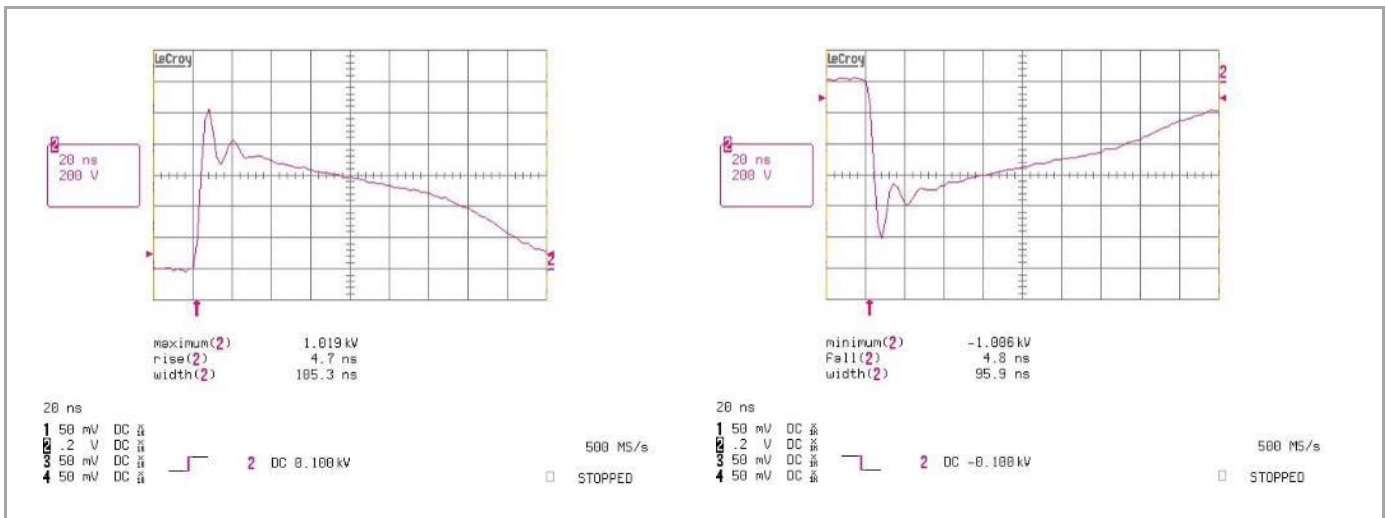
Tested line	Level	Repetition frequency	Salve duration	Salve Period	Test duration	Generator function
Power supply Line 230Vac	±1kV	5kHz	15ms	300ms	120s by polarity	EFT

Note: Verifications of the generator at ±1KV on a 1KΩ load and at ±1KV on a 50Ω load were performed before the test (See chapter 11.1.4).

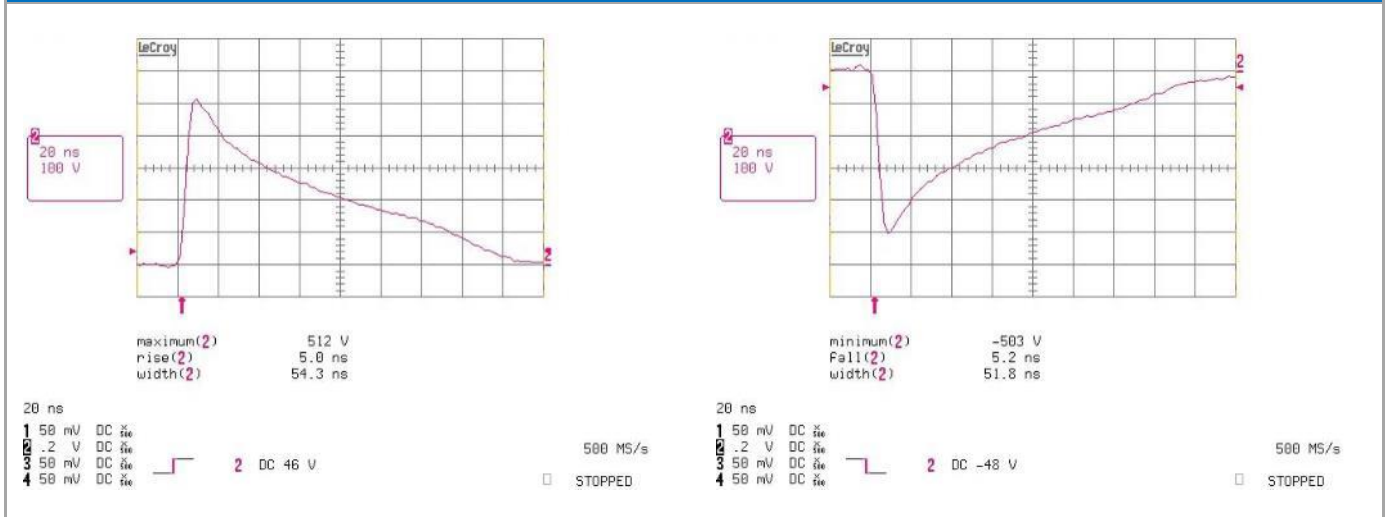
### 11.1.3 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

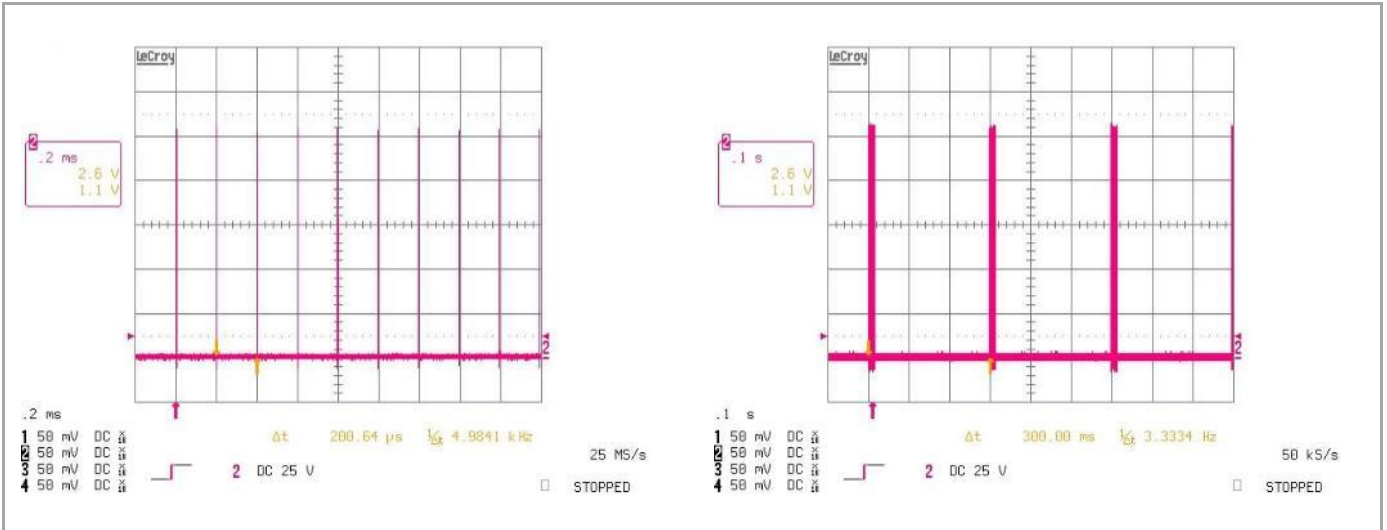
### 11.1.4 Generator verification



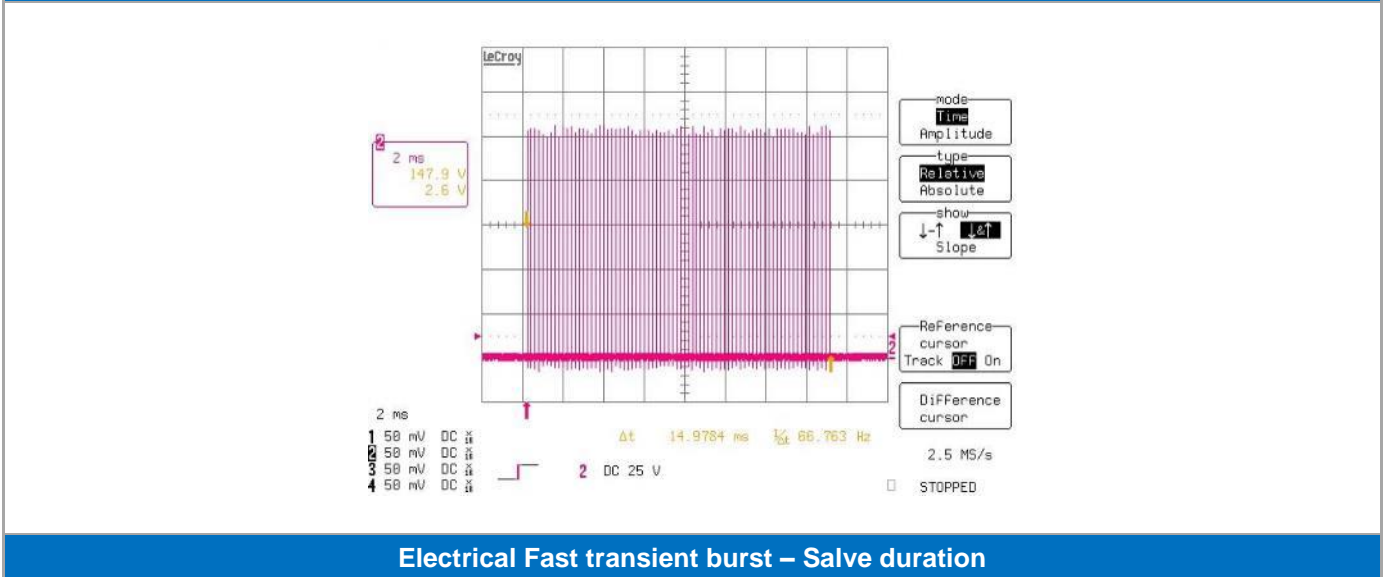
Electrical Fast transient burst – Calibration on 1kΩ: Positive Impulsion (Left), negative impulsion (right)



Electrical Fast transient burst – Calibration on 50Ω: Positive Impulsion (Left), negative impulsion (right)



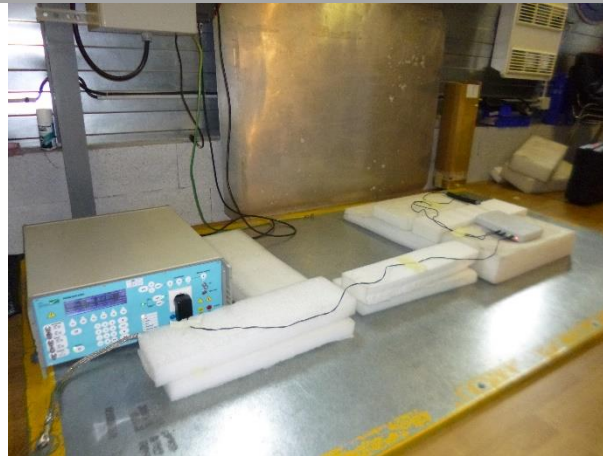
Electrical Fast transient burst – Frequency repetition (Left), period (Right)



Electrical Fast transient burst – Salve duration



## 11.2 Pictures



Electric fast transient bursts on power lines

## 11.3 Test results

### 11.3.1 Conclusion

Tested line	Polarity / Level	Conclusion
Power supply	+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>

The equipment is **Compliant** with the recommendations of the standards referred in paragraph 2.

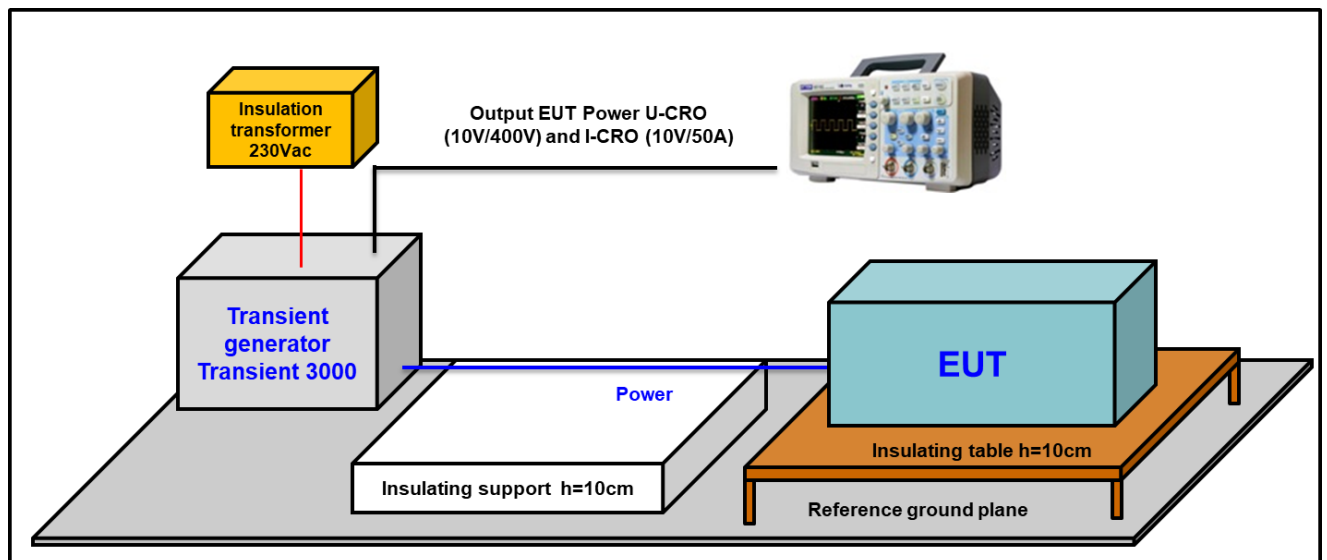
## 12 Surge immunity: NF EN 61000-4-5

### 12.1 Test parameters

#### 12.1.1 Equipment

Name	Reference	S/N	Remarques
Oscilloscope	LECROY Wavepro 960	2991	BW 2GHz
Generator	EMC PARTNER Transient 3000	TRA3000-F-S-1504	-

#### 12.1.2 Setup



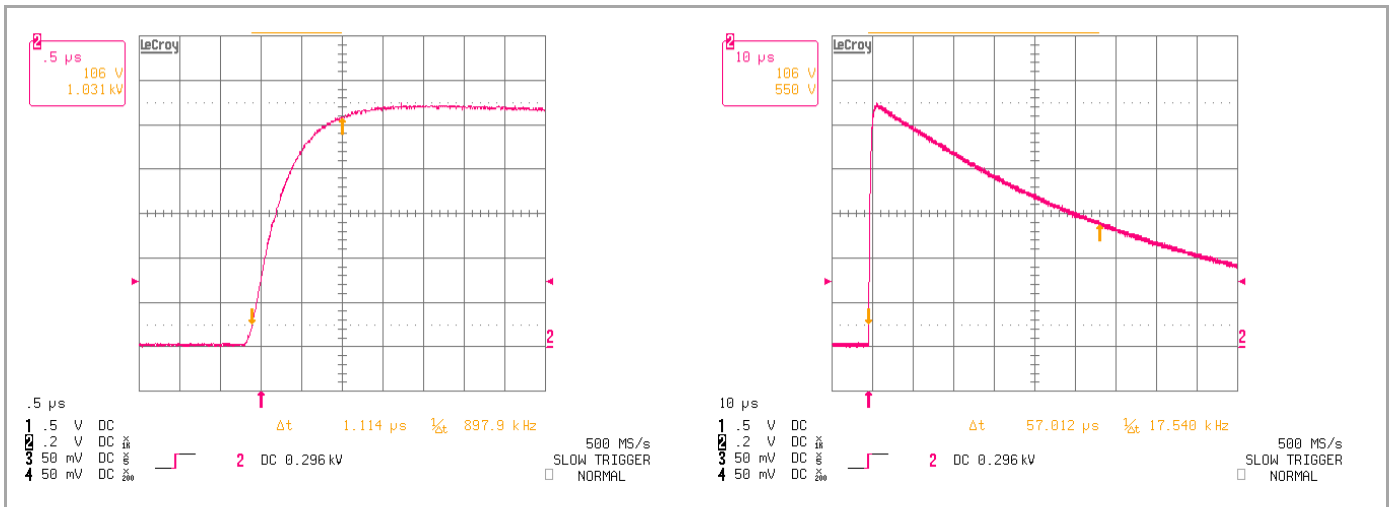
#### 12.1.3 Configuration

Tested line	Level	Nb of pulses	Nb of pulse / min	Line phase synchronisation	Rise Time	Duration at half height
Line / Earth L/PE	$\pm 2\text{kV}$	5(+)/5(-)	1	$0^\circ, 90^\circ, 180^\circ, 270^\circ$	$1,2\mu\text{s} \pm 30\%$	$50\mu\text{s} \pm 20\%$
Neutral / Earth N/PE	$\pm 2\text{kV}$	5(+)/5(-)	1	$0^\circ, 90^\circ, 180^\circ, 270^\circ$	$1,2\mu\text{s} \pm 30\%$	$50\mu\text{s} \pm 20\%$
Line / Neutral L/N	$\pm 1\text{kV}$	5(+)/5(-)	1	$0^\circ, 90^\circ, 180^\circ, 270^\circ$	$1,2\mu\text{s} \pm 30\%$	$50\mu\text{s} \pm 20\%$

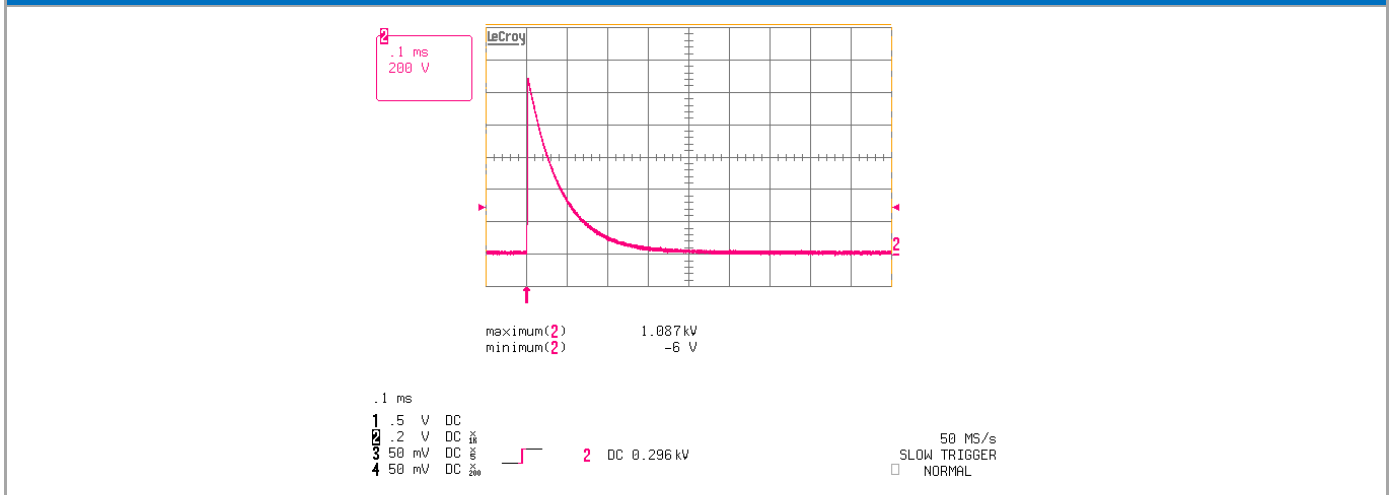
#### 12.1.4 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

### 12.1.5 Generator verification



Surge – Calibration: Rise time (left), Duration at half height (right)



Surge – Calibration

### 12.2 Pictures



Surge immunity test

## 12.3 Test results

### 12.3.1 Conclusion

Tested line	Coupling	Line phase synchronisation	Level	Conclusion	
Power supply 230Vac	Phase / Ground (L/PE)	0°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-2kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
		90°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-2kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
		180°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-2kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
		270°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-2kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
	Phase / Neutral (L/N)	0°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
		90°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
		180°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
		270°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>	
		Neutral / Ground (N/PE)	0°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>
				+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
				+/-2kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
			90°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>
	+/-1kV			No susceptibility of EUT <b>EUT complies with the recommendation</b>	
	+/-2kV			No susceptibility of EUT <b>EUT complies with the recommendation</b>	

Tested line	Coupling	Line phase synchronisation	Level	Conclusion
		180°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
			+/-2kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
		270°	+/-500V	No susceptibility of EUT <b>EUT complies with the recommendation</b>
			+/-1kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>
			+/-2kV	No susceptibility of EUT <b>EUT complies with the recommendation</b>

The equipment is **Compliant** with the recommendations of the standards referred in paragraph 2.

## 13 Conducted disturbances induced by Radio Frequency Fields immunity: NF EN 61000-4-6

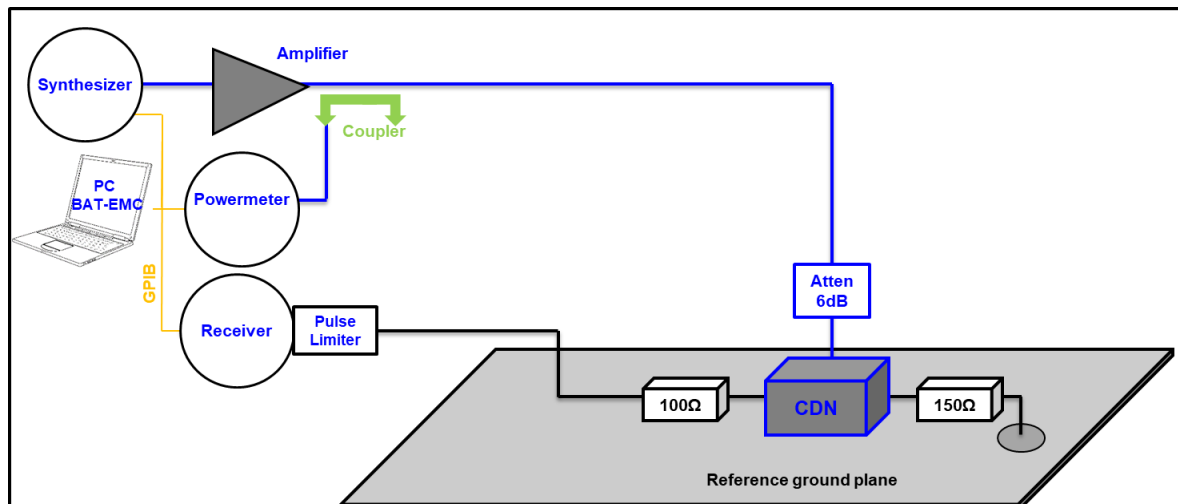
### 13.1 Test parameters

#### 13.1.1 Equipment

Name	Reference	S/N	Remarks
Synthesizer	AR SG6000	324285	100kHz-6GHz
Amplifier	AR 75A250A	340329	10kHz-250MHz 75W
Coupler	M2S DC2101	/	10kHz-400MHz
Communication relay	AR SC1000M1	/	/
Attenuator	Diconex 16-0629	/	6dB 100W
Power meter	R&S NRVD	857.8008.02	/
Power meter probe	NRV Z4	828.3618.02 Ser.100473	100kHz-6GHz 100mW max
Receiver	R&S ESR7	1316.3003K07-102515	10Hz-7GHz
Pulse Limiter	R&S ESH3-Z2	100688	/
CDN	CDN M016	31595	/
Calibration load	Teseq TRA U150 et CAL U100A	Respectively 32557 et 32315	Adaptor SAR (M300 & M016A)

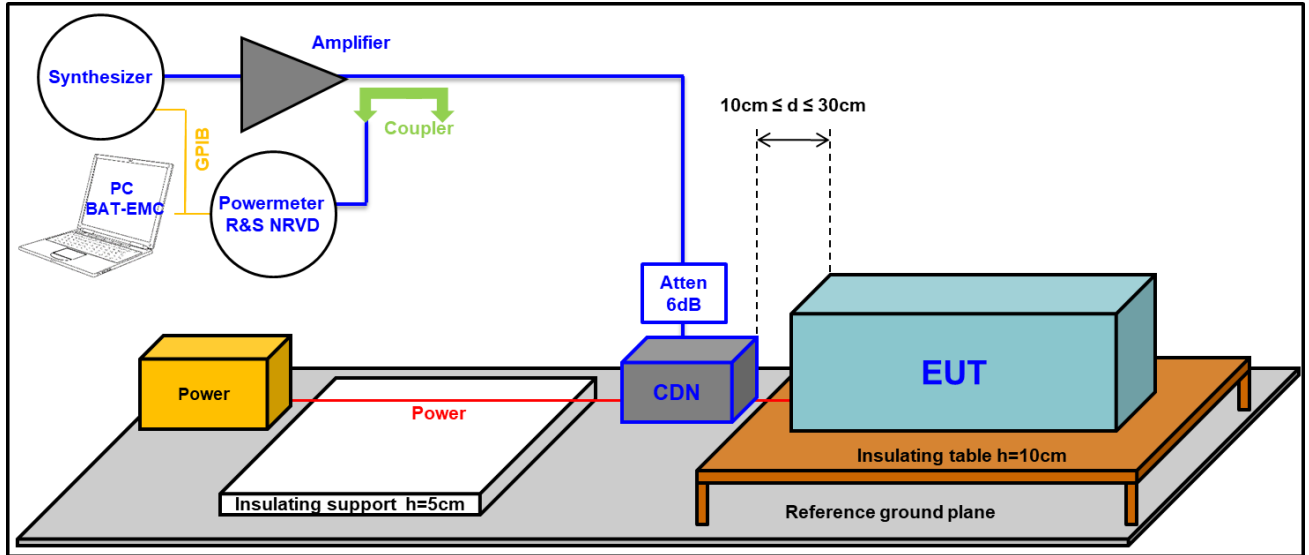
#### 13.1.2 Calibration setup

- With CDN:



### 13.1.1 Test Setup

- With CDN:



### 13.1.2 Configuration

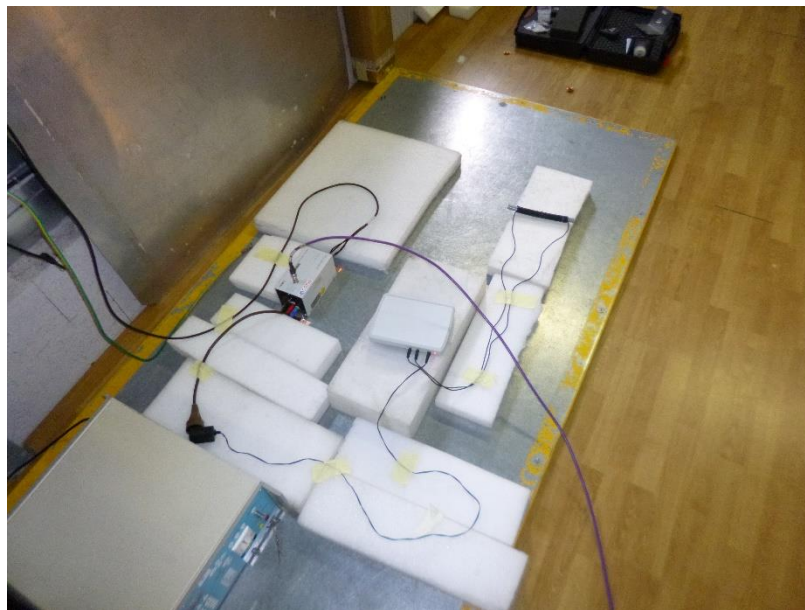
Frequency band	Level	Step	Dwell Time	Modulation
150kHz-80MHz	3 V	1%	1s by modulation	AM (80%, 1kHz)

Note: A calibration at 3V was performed before the test. During the tests, an "Open loop" regulation was used with the BAT-EMC Software for the application of the conducted disturbance.

### 13.1.3 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

## 13.2 Pictures



Conducted Immunity test on power supply



## 13.3 Test results

### 13.3.1 Conclusion

Tested line	Frequency Band	Level	Conclusion
Power supply 230Vac	150kHz-80MHz	3Vrms	No susceptibility of EUT <b>EUT complies with the recommendation</b>

The equipment is **Compliant** with the recommendations of the standards referred in paragraph 2.

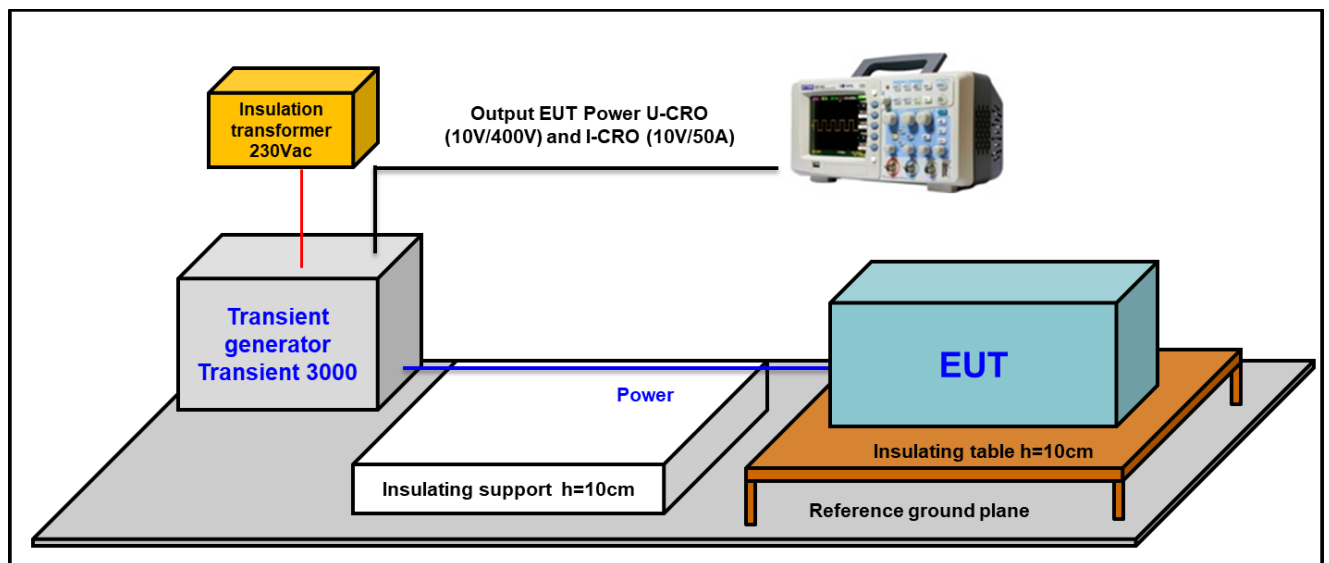
## 14 Voltage dips and voltage variations immunity: NF EN 61000-4-11

### 14.1 Test parameters

#### 14.1.1 Equipment

Name	Reference	S/N	Remarks
Oscilloscope	LECROY Wavepro 960	2991	BW 2GHz
Generator	EMC PARTNER Transient 3000	TRA3000-F-S-1504	-

#### 14.1.2 Test Setup



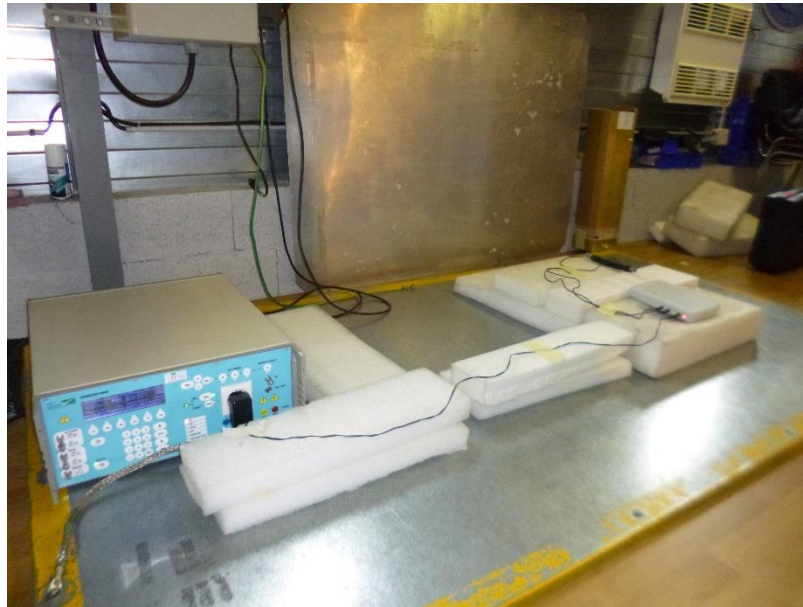
#### 14.1.1 Configuration

Test Voltage drops and short interruptions	Reduction duration (Number of periods)	Number of reductions	Interval between reductions	Generator function
100% voltage reduction	1	3	10 s	Short disp
30 % voltage reduction	25	3	10 s	Short disp
100 % voltage reduction	250	3	10 s	Short disp

#### 14.1.2 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

## 14.2 Pictures



Voltage dip immunity test

## 14.3 Test results

### 14.3.1 Conclusion

Tests	Line phase synchronisation	Conclusion
100% voltage reduction for 1 period	0°	No susceptibility of EUT <b>EUT complies with the recommendation</b>
30% voltage reduction for 25 periods	0°	No susceptibility of EUT <b>EUT complies with the recommendation</b>
100% voltage reduction for 250 periods	0°	No susceptibility of EUT <b>EUT complies with the recommendation</b>

The equipment is **Compliant** with the recommendations of the standards referred in paragraph 2.

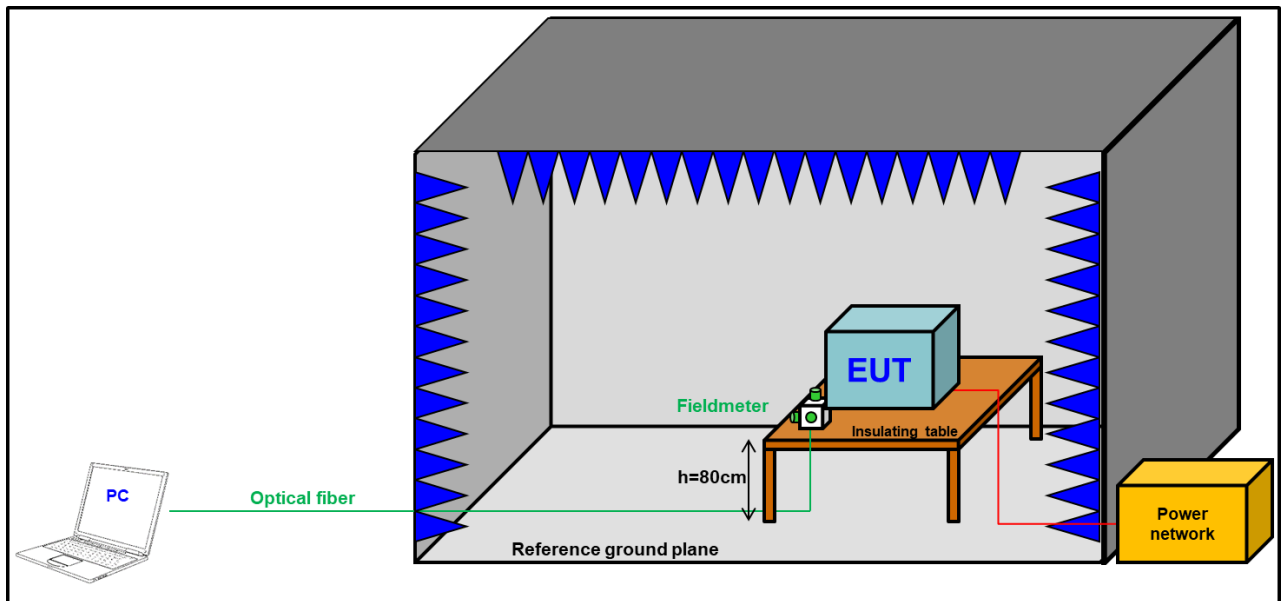
## 15 Measurements of human exposure to electromagnetic fields

### 15.1 Test parameters

#### 15.1.1 Equipment

Name	Reference	S/N	Remarks
Fieldmeter	Narda EP 602	711WX80893	5kHz – 9.25GHz

#### 15.1.2 Test Setup



#### 15.1.3 Tested mode

The equipment is tested in **nominal mode** defined in paragraph 4.5.

The frequency generated by the EUT is close to 8kHz.

## 15.2 Pictures



Measurements of human exposure to electromagnetic fields – Up face



Measurements of human exposure to electromagnetic fields – Right face



Measurements of human exposure to electromagnetic fields – Coil

## 15.3 Test results

### 15.3.1 Conclusion

Field probe position	Recommended limit	Max measured level	Conclusion
Front face	87V/m	10.3V/m	EUT complies with the recommendation
Back face		6.2V/m	EUT complies with the recommendation
Right face		8.07V/m	EUT complies with the recommendation
Left face		12.2V/m	EUT complies with the recommendation
Up face		7.9V/m	EUT complies with the recommendation
Down face		8.9V/m	EUT complies with the recommendation
Coil		8.3V/m	EUT complies with the recommendation

The equipment is **Compliant** with the recommendations of the standards referred in paragraph 2.