TEST REPORT

No 204 285

CCMAFF01658

BREIZELEC MANTAGUA

ELECTROMAGNETIC COMPATIBILITY

SPECIFICATIONS : EN/IEC 60945 Fourth Edition 2002-08

Date: May 2021

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1. INTRODUCTION

This report only concerns the product submitted for tests and described on page 5.

2. TEST HOUSE

KENTA Electronic
Rue Albert Einstein
Z.A. Kerourvois 2
29500 ERGUE GABERIC

Phone: 33-(02) 98 52 16 02
Fax: 33-(02) 98 52 14 19

Manager: Mr. KEVIN RODGERS

Bureau Veritas certificate number: SMS.LAB.320/50130/B.0

2.1. CLIENT INFORMATION

Company: BREIZELEC MANTAGUA
Address: 23 Z.A. de Pann Ar Roz
29150 CHATEAULIN
Country: France
Phone : +33 (0) 298 865 036

People in charge: Mr. JULIEN CADIOU

3. SPECIFICATIONS REFERENCES

3.1. SPECIFICATION APPLIED FOR THE PRODUCT ON TEST

All testing are made in accordance with this generic or product specification.

EN/IEC 60945 Fourth Edition 2002-08

Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test result

3.2. NORMATIVE REFERENCES

[1] CENELEC EN 61000-4-3 (2006), A1 (2008) and A2 (2010): Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.

[2] CENELEC EN 61000-4-4 (2012): Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test.

[3] CENELEC EN 61000-4-6 (2014): Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.

[4] CENELEC EN 61000-4-5 (2014), A1 (2017): Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques – Surges immunity test

4. THE PRODUCT

4.1. PRODUCT DESCRIPTION

Specification	Description
Trademark	MANTAGUA
Model	CCMAFF01658
Description	Masthead light
Serial Number	-
Soft version	-
Dimensions	Diameter: 38 mm – Length: 83 mm
Weight	54 g
Power Supply	230 Vac
Consumption	6 W
Radio Frequency	No
Battery	No
State	Serial

Note: The product must be full representative of commercial equipment.

4.2. INTERCONNECTION CABLES

Ref	Identification	Timbering		Length (m)	Qty
		Braid	Sheet		
1					
2					
3					
4					
5					
6					

4.3. PERIPHERICAL EQUIPMENTS

Ref	Type	Manufacturer	Serial Number
1			-
2			
3			
4			

5. PICTURE



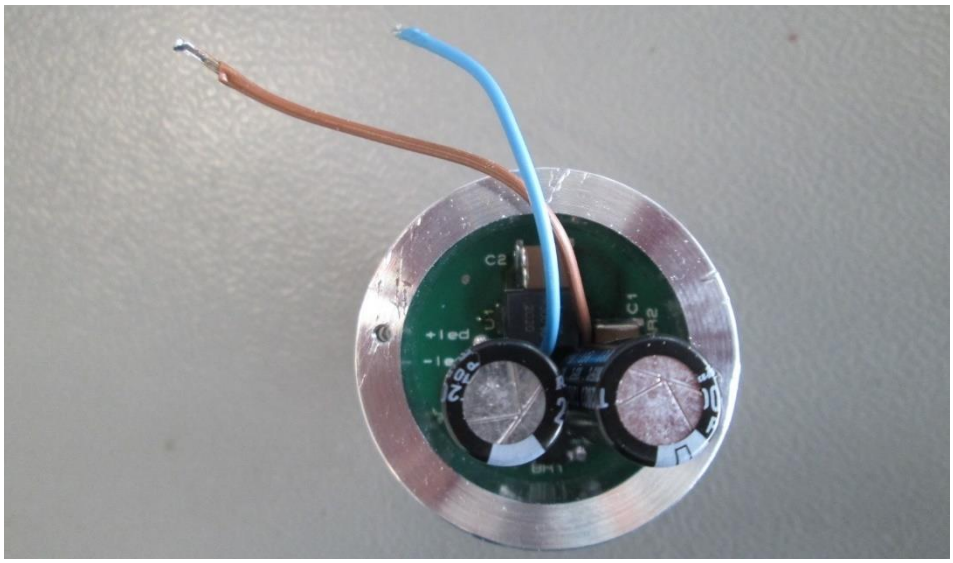
Picture 1



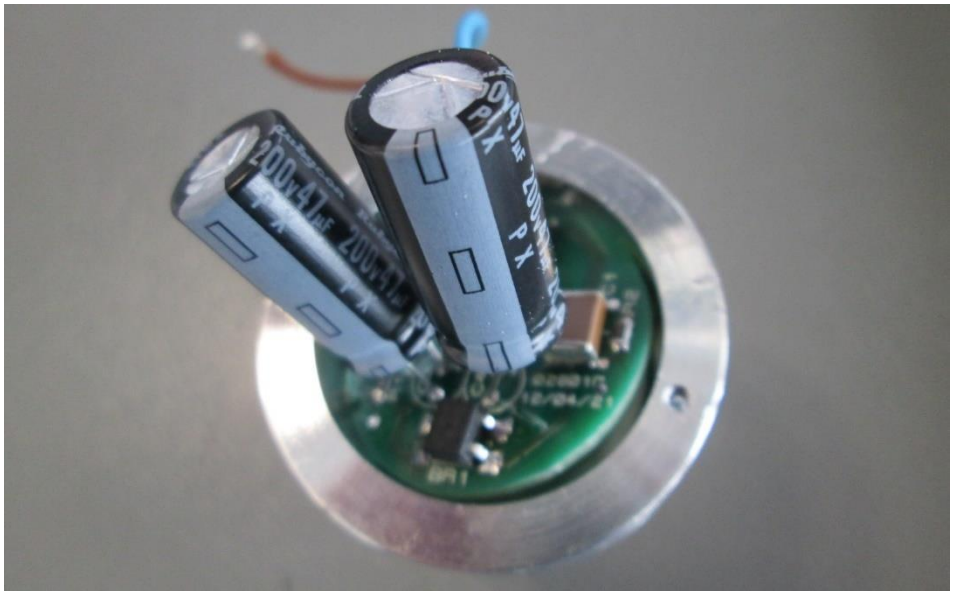
Picture 2



Picture 3



Picture 4



Picture 5

6. MEASUREMENTS

6.1. GENERAL CONDITIONS DURING THE TESTS

- **Made inside anechoïd room.**

Designation	Measurement
Temperature	18,8°C
Humidity	52.6 %rh
Atmospheric pressure	1018.5 hPa

6.2. MEASUREMENT INSTRUMENTATION UNCERTAINTY

- **The instrument uncertainty are include into the results of the test report.**

Measurement	Uncertainty	Procedure
Conducted distrubance (mains port) (150kHz – 30MHz)	3,6dB	-
Vertically polarised radiated at a distance of 3m :		
- From 30MHz to 200MHz :	4.7dB	EN55016-4-2
- From 200MHz to 1GHz	4.7dB	
Horizontally polarised disturbance at a distance of 3m :		
- From 30MHz to 200MHz	4.9dB	EN55016-4-2
- From 200MHz to 1GHz	4.9dB	
Immunity to continuous conducted signals (frequencies>150kHz)	2.6dB	-
Immunity to surges on signal lines, AC and DC ports		
Voltage:	3.5%	-
Time:	0.1%	
Immunity to electrical fast trensients		
Voltage:	4%	-
Time:	2.5%	
Immunity to radiated electromagnetic fields	2.8dB	-
Immunity to electrostatic discharge		
Voltage:	7.5%	-
Time:	4.5%	
Temperature	±1°C	-
Humidity	±10%	-

7. APPLICABILITY OVERVIEW TABLES

7.1. ELECTROMAGNETIC EMISSION AND IMMUNITY

Environmental Phenomena	Application	Basic Test Method	Peformance Criteria	Result
Radiated emission	Enclosure	IEC/EN60945	-	**§10.1**
Conducted emission	AC and DC mains port	IEC/EN60945	-	**§10.2**
Radiated disturbance	Enclosure port	IEC 61000-4-3	Criteria A	**§11.1**
Power supply failure	AC and DC mains port	IEC 61000-4-11	-	**NT**
Electrostatic Discharge	Enclosure port	IEC 61000-4-2	Criteria B	**NT**
Conducted radio frequency disturbance	AC and DC power ports, signal and control ports	IEC 61000-4-6	Criteria A	**§11.2**
Slow transients	AC power port	IEC 61000-4-5	Criteria B	**§11.4**
Fast Transients	AC power port	IEC 61000-4-4	Criteria B	**§11.3**
Power short term variation	AC power port	IEC 61000-4-11		**NT**

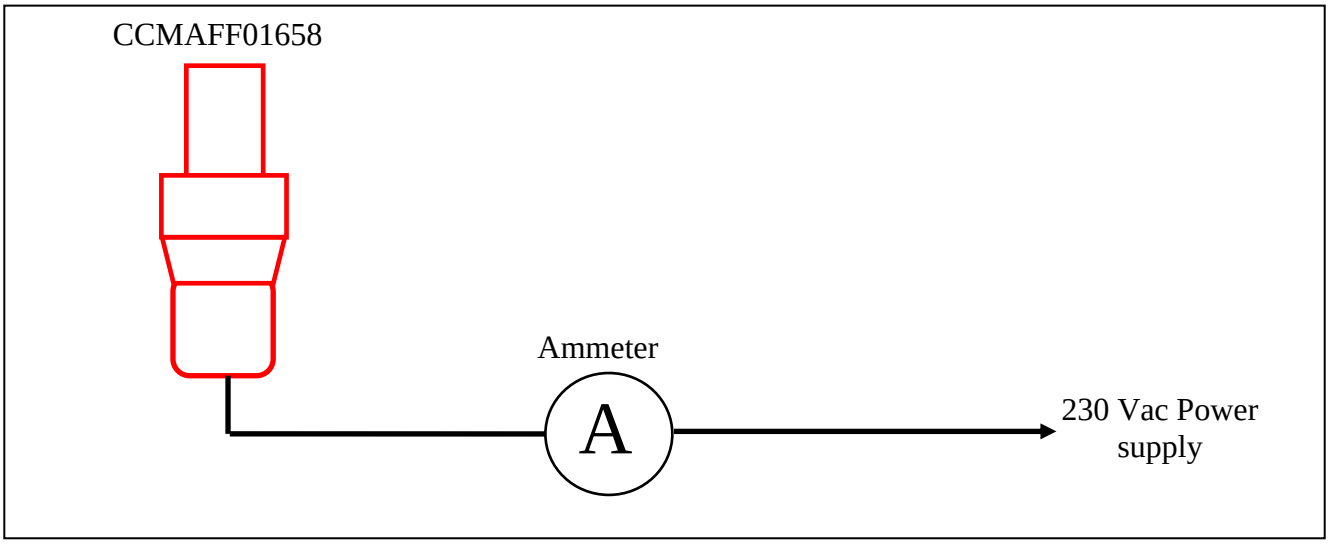
NT: Not tested
NA: Not applicable

8. OPERATIONAL STATE

All tests were carried out with unmodified test sample, which were operating in normal mode.

Test configuration:

Checking the consumption of the bulb with the ammeter.



Performance ckeck – Configuration

9. TESTING EQUIPMENTS

9.1. EMISSION

Description / Supplier	Model / Part Number	Serial Number	Calib.	Valid.
Spectrum Analyzer – Rhode & Schwarz	FSV 30	100720	09/2020	1 Year
Log Periodic Antenna n°1	30MHz – 1GHz		10/2019	2 Years
Log Periodic Antenna n°5	PowerLog 70180	04026	10/2019	2 Years
Large loop Antenna	RF300	9043	10/2019	2 Years
Pre-amplifier – Mini-circuits	ZKL-2+		10/2019	2 Years
Pre-amplifier - RF-LAMBDA	RLNA01G18GA	16122600125	10/2019	2 Years
Coaxial cable n°1	1.5m		01/2020	2 Years
Coaxial cable n°2	4m		10/2019	2 Years
Anechoïd room			01/2019	4 Years
Rotating board			NA	

9.2. CONDUCTED EMISSION

Description / Supplier	Model / Part Number	Serial Number	Calib.	Valid.
Dual Phase V Network - Telmeter Electronic	NNB-2/16Z	03/10206	04/2019	2 Years
Spectrum Analyser - Rhode & Schwarz	FSV 30	100720	09/2020	1 Year
Power and Harmonics Analyzer – Thurbly Thandar Instruments Limited	FNL 125-2079 HA1600A	412778	-	-

9.3. CONDUCTED DISTURBANCE

Description / Supplier	Model / Part Number	Serial Number	Calib.	Valid.
Signal Generator - RIGOL	DSG3060	DSG3A1833000064	05/2021	2 Years
Signal Generator - Marconi Instrument	2024	112255/061	10/2019	2 Years
Power Amplifier - RFPA	RF1100-10	158	07/2019	2 Years
Current injection probe - Solar Electronics	9108-1N	031214	07/2019	2 Years
Impedance Stabilization Network Teseq	ISN T08	43323	07/2019	2 Years
Coupling Decoupling Network Teseq	CDN M016	43252	07/2019	2 Years
Attenuator – 6dB	-	-	07/2019	2 Years

9.4. RADIATED DISTURBANCE

Description / Supplier	Model / Part Number	Serial Number	Calib.	Valid.
Signal Generator - RIGOL	DSG3060	DSG3A1833000064	05/2021	2 Years
Signal Generator - Marconi Instrument	2024	112255/061	10/2019	2 Years
Power Amplifier - PST	AR1658-50 AR4819-50		01/2020	2 Years
Power Amplifier - RFPA	AP9002000-10	073481	01/2020	2 Years
Power amplifier - Mini-Circuits	ZHL-16W-43-S+	289701507	11/2019	2 Years
Fieldmeter - Chauvin Arnoux	C.A. 43		11/2019	2 Years
Log Periodic Antenna n°1	30MHz – 1GHz		10/2019	2 Years
Log Periodic Antenna n°2	1GHz – 4GHz		10/2019	2 Years

9.5. SURGE, FAST TRANSIENTS

Description / Supplier	Model / Part Number	Serial Number	Calib.	Valid.
EFT Generator - EMC PARTNER.	Transient 2000IN4	1101	05/2020	2 Years
Capacitive coupling clamp	KCT	198	NA	

9.6. ELECTROSTATIQUE DISCHARGE

Description / Supplier	Model / Part Number	Serial Number	Calib.	Valid.
EFT Generator - EMC PARTNER.	Transient 2000IN4	1101	05/2020	2 Years
EMC Partner	ESD2000	327	05/2020	2 Years

Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor k=2). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques.

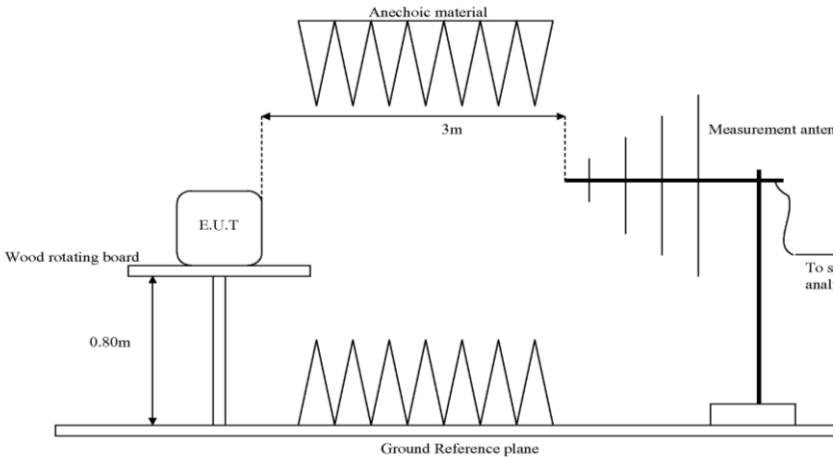
10. ELECTROMAGNETIC EMISSION

10.1. RADIATED EMISSION

10.1.1. TESTS CONDITIONS

- **Frequency band : 30 MHz to 2 GHz**

  <u>Full anechoic chamber:</u>

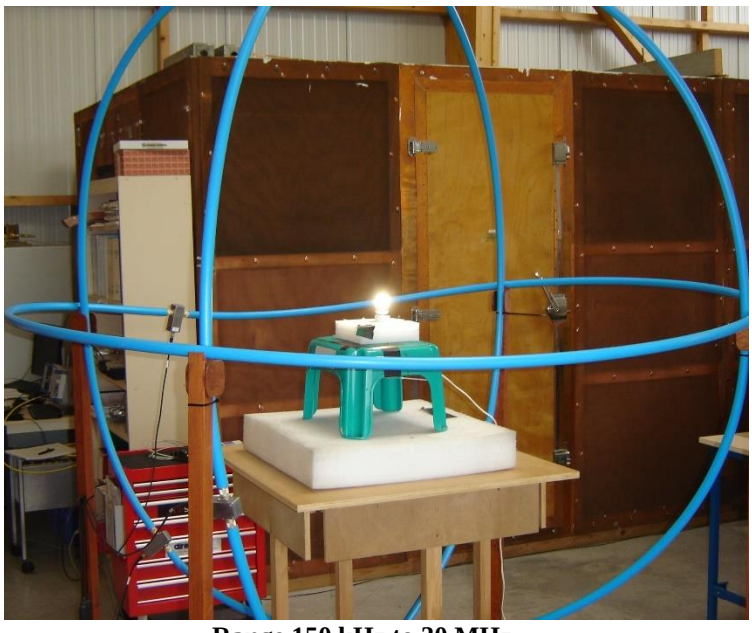


The result is obtained by calculation.
Result = Spectrum result + cable attenuation – Preamplifier gain – Antenna gain

- **Frequency band : 150kHz to 30MHz**

  The reasurement is realized by means of large loop antenna. The result is obtained by calculation with an offset for the result at 3m.

- **Position of E.U.T.:**



Range 150 kHz to 30 MHz



Range 30 MHz to 2 GHz

Limits – According to EN/IEC 60945:2002

Frequency range (MHz)	Distance	Detector	Limits (dBµV/m)
0.15 to 0.30	3 m	Peak	80 – 52
0.30 to 30	3 m	Peak	52 – 34
30 to 2000	3 m	Peak	54
156 to 165	3 m	Peak	30

10.1.2. RESULTS

Range 150kHz to 30MHz

Detector	RBW	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Δ Limit (dB)	Verdict
Peak	9 kHz	15.50	23.44	36.58	-13.14	Pass

Range 30MHz to 2GHz: Horizontal polarization

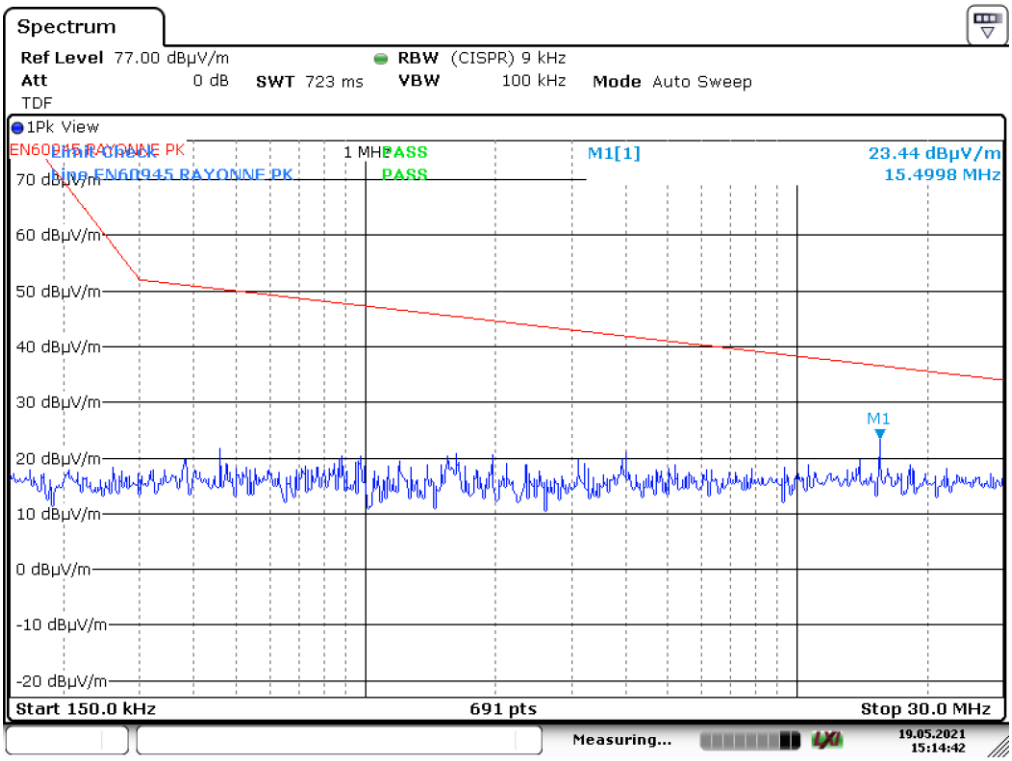
Detector	RBW	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Δ Limit (dB)	Verdict
Peak	120 kHz	40.87	37.30	54.00	-16.70	Pass
Peak	9kHz	162.08	9.61	30.00	-20.39	Pass
Peak	120 kHz	977.15	36.21	54.00	-17.79	Pass
Peak	120 kHz	1912.72	37.75	54.00	-16.25	Pass

Range 30MHz to 2GHz: Vertical polarization

Detector	RBW	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Δ Limit (dB)	Verdict
Quasi-Peak	120 kHz	40.16	36.82	54.00	-17.18	Pass
Peak	9kHz	159.51	9.08	30.00	-20.92	Pass
Peak	120 kHz	960.24	36.05	54.00	-17.95	Pass
Peak	120 kHz	1966.51	37.05	54.00	-16.95	Pass

10.1.3. GRAPHS

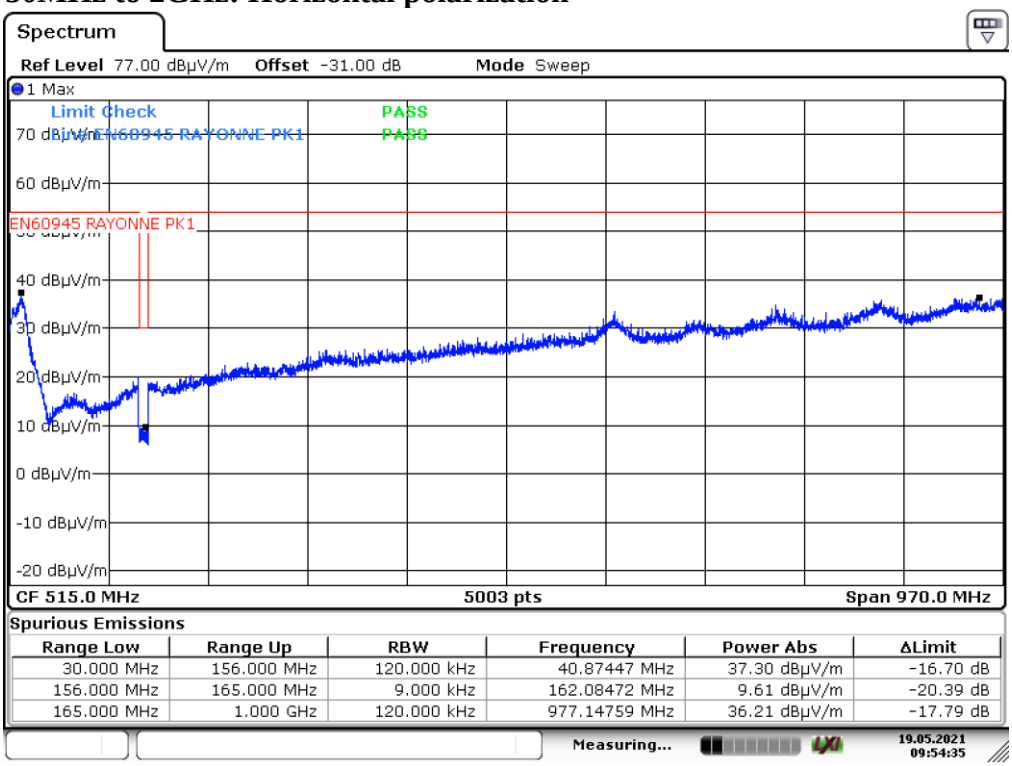
Range 150kHz to 30MHz



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150kHz to 30 MHz

Range 30MHz to 2GHz: Horizontal polarization

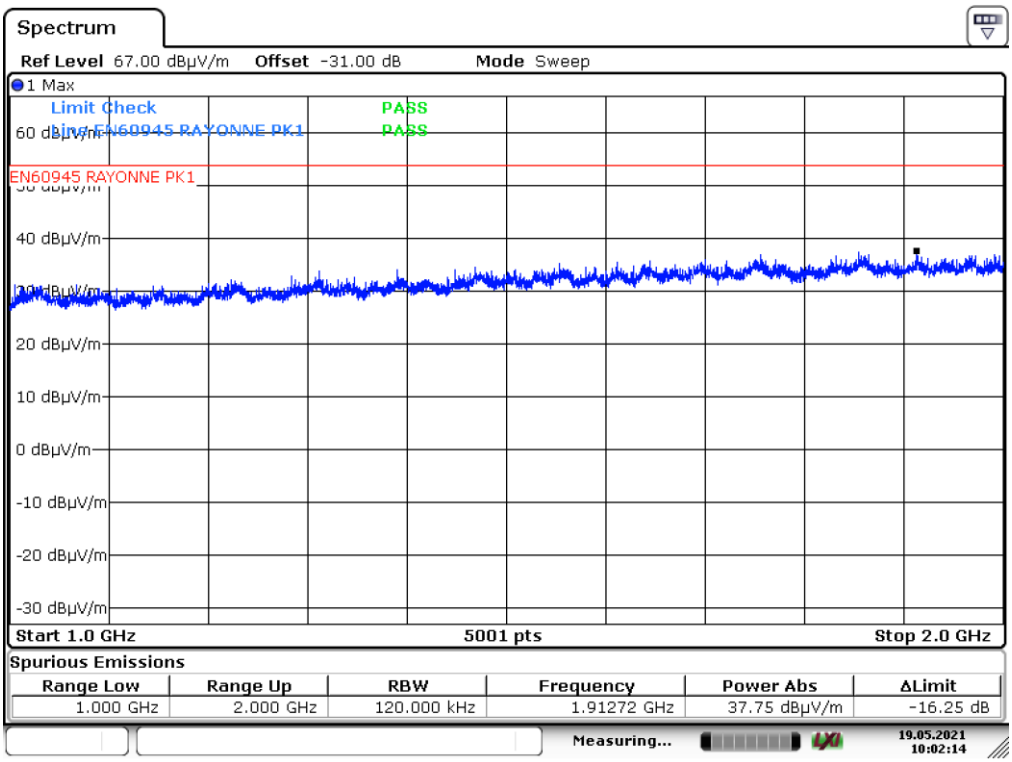


Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	156.000 MHz	120.000 kHz	40.87447 MHz	37.30 dBµV/m	-16.70 dB
156.000 MHz	165.000 MHz	9.000 kHz	162.08472 MHz	9.61 dBµV/m	-20.39 dB
165.000 MHz	1.000 GHz	120.000 kHz	977.14759 MHz	36.21 dBµV/m	-17.79 dB

Date: 19.MAY.2021 09:54:35

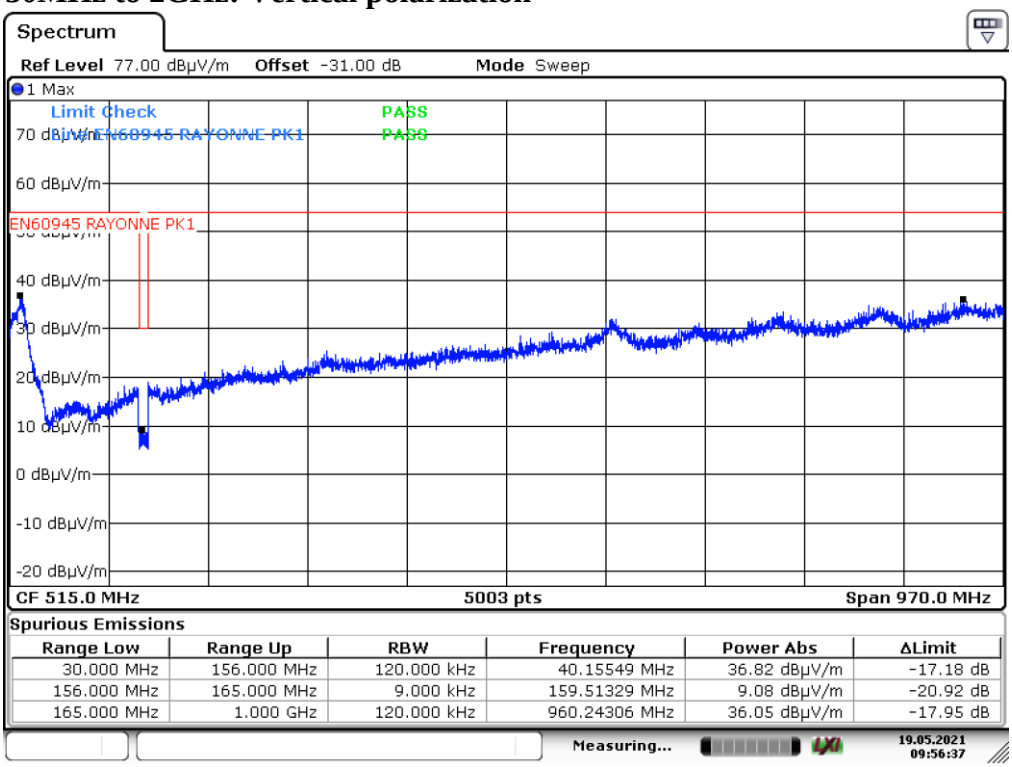
Horizontal polarization: 30 to 1000 MHz



Date: 19.MAY.2021 10:02:14

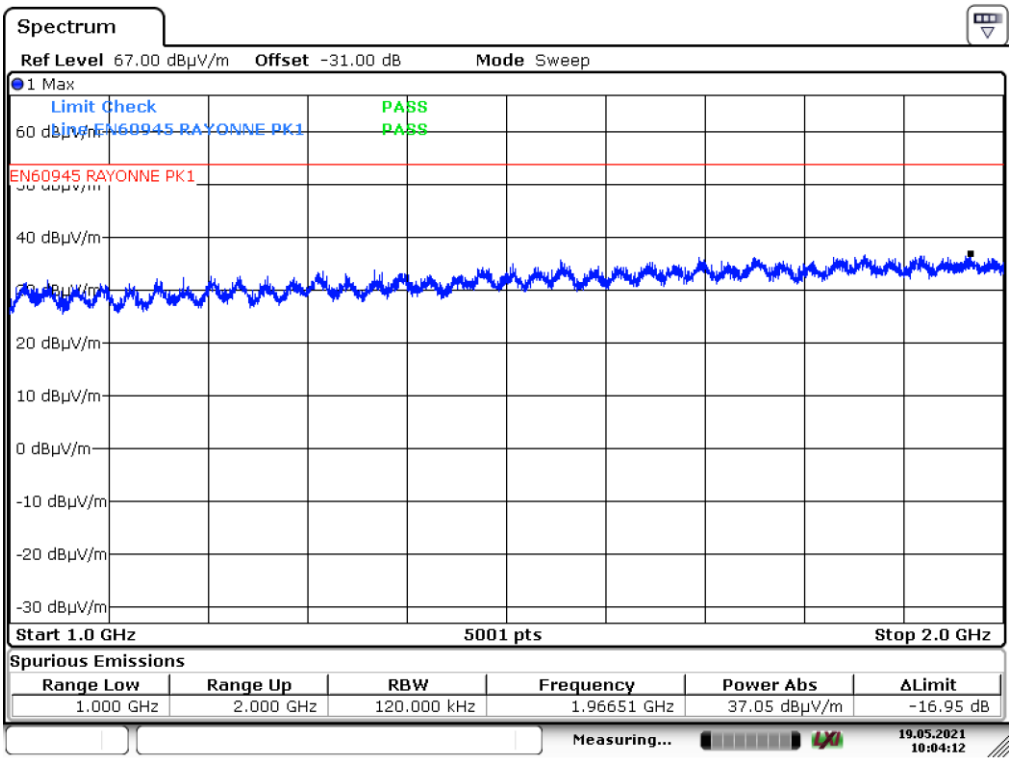
Horizontal polarization: 1 to 6 GHz

Range 30MHz to 2GHz: Vertical polarization



Date: 19.MAY.2021 09:56:37

Vertical polarization: 30 to 1000 MHz

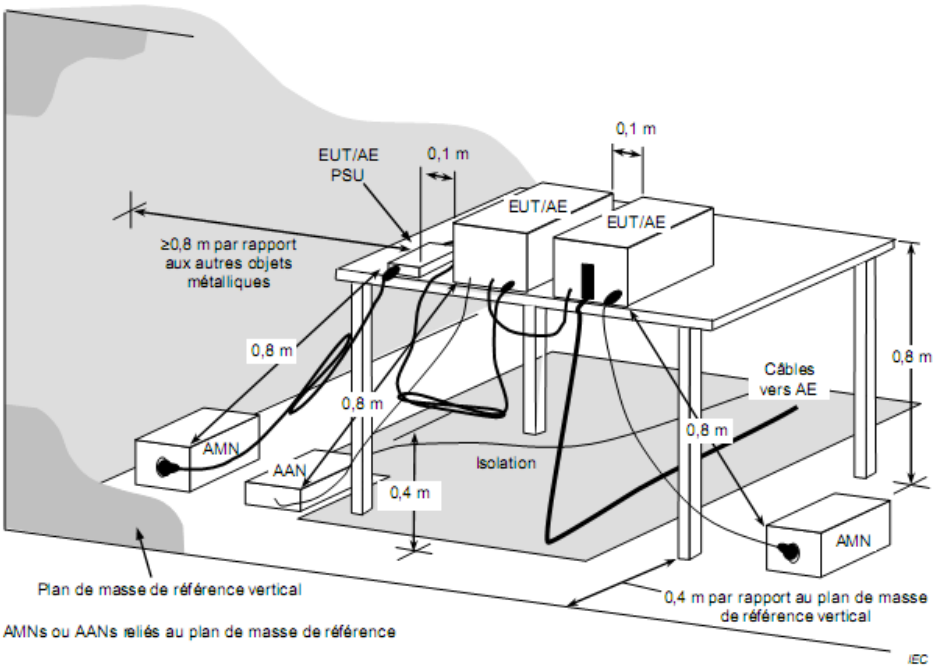


Date: 19.MAY.2021 10:04:12

Vertical polarization: 1 to 6 GHz

10.2. CONDUCTED EMISSION

10.2.1. TESTS CONDITIONS



Test configuration



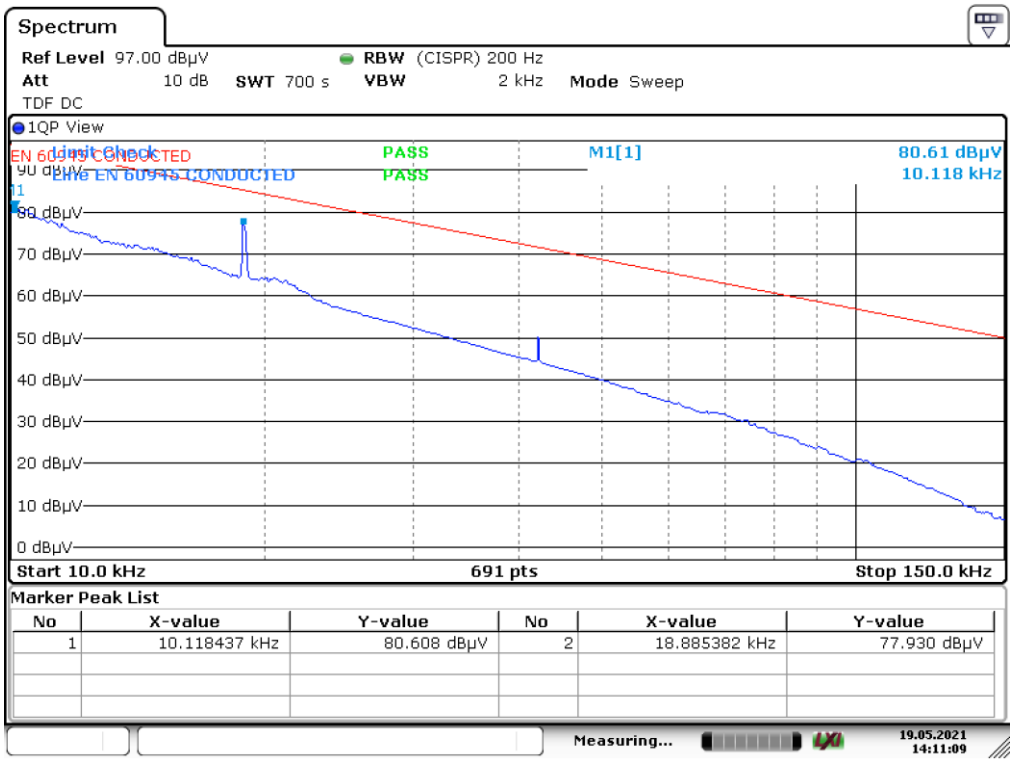
Position of E.U.T.

LIMITS

Frequency range	Coupling device	Detector/Bandwidth	Limits (dBµV/m)
10 kHz to 150 kHz	AMN	Quasi-Peak / 200 Hz	96 to 50
150 kHz to 350 kHz	AMN	Quasi-Peak / 9 kHz	60 to 50
350 kHz to 30 MHz	AMN	Quasi-Peak / 9 kHz	50

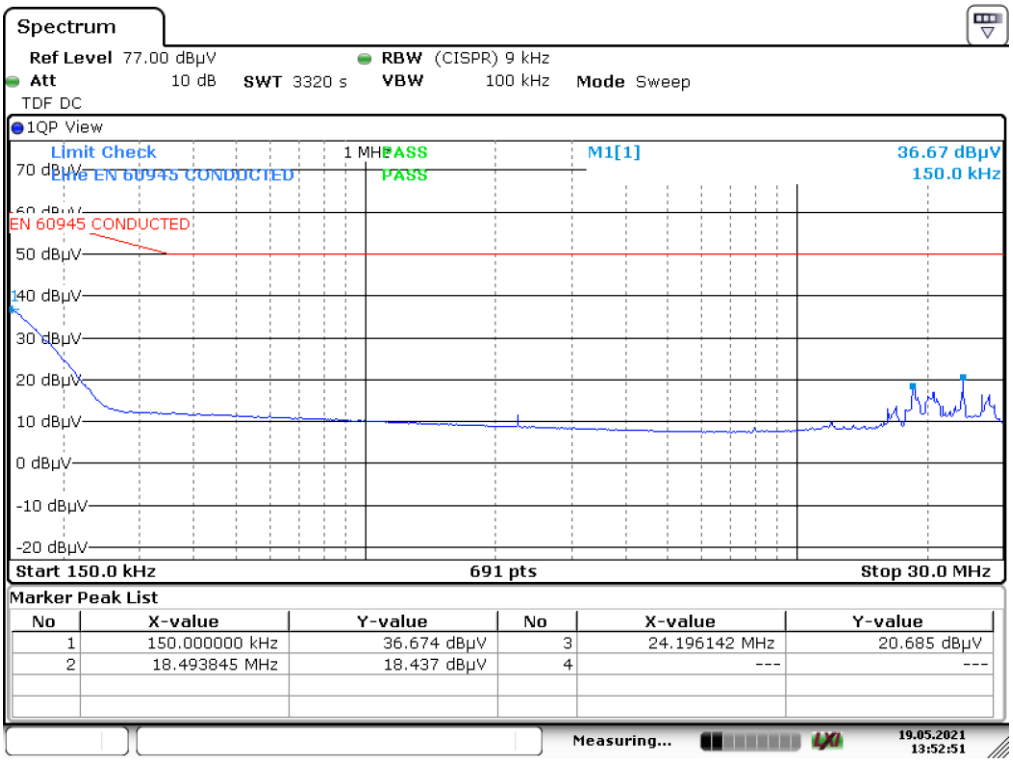
10.2.2. RESULTS

Dtector	RBW	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Δ Limit (dB)	Verdict
Quasi-Peak	200 Hz	0.010	80.61	96.00	-15.39	Pass
Quasi-Peak	200 Hz	0.019	77.93	85.10	-7.17	Pass
Quasi-Peak	9 kHz	0.150	36.67	60.00	-23.33	Pass
Quasi-Peak	9 kHz	18.49	18.44	50.00	-31.56	Pass
Quasi-Peak	9 kHz	24.20	20.69	50.00	-29.31	Pass



Date: 19.MAY.2021 14:11:09

Quasi-Peak :: 10 kHz to 150 kHz



Date: 19.MAY.2021 13:52:52

Quasi-Peak :: 150 kHz to 30 MHz

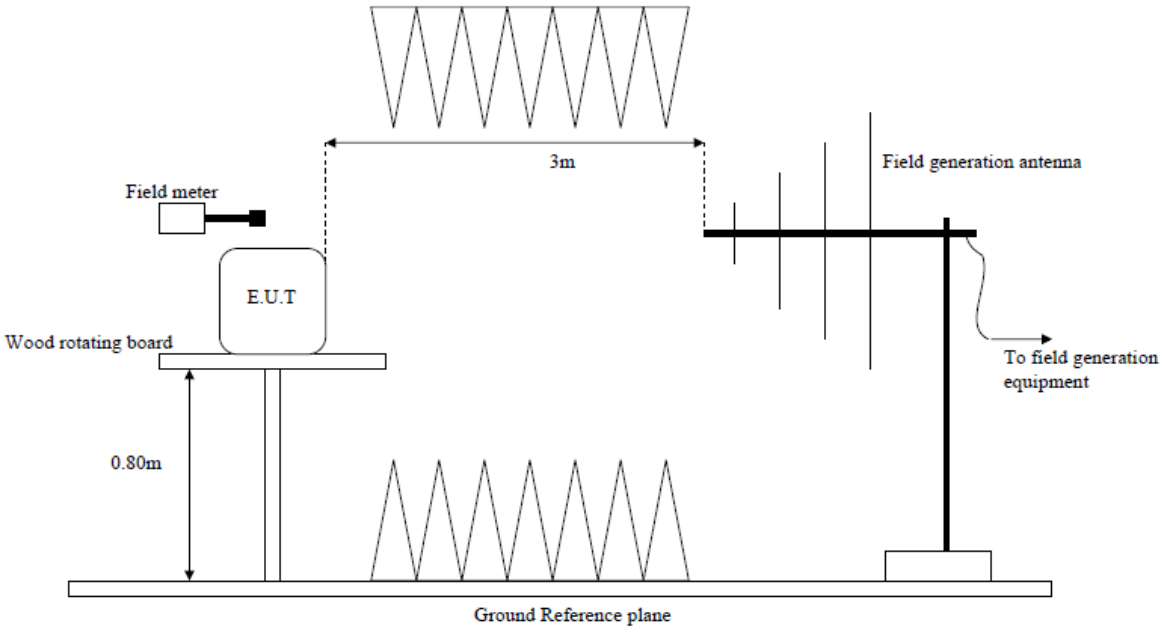
11. IMMUNITY

11.1. IMMUNITY TO RADIATED RADIOFREQUENCIES

TESTS SUMMARY	
Type of port	Enclosure port
Basic Standard	EN 61000-4-3:2006-05 +/A1:2008-04 +/A2:2011-01
Performance Criteria	A
Frequencies / Level	10 V/m amplitude swept over the frequency range 80 MHz to 2000 MHz
Modulation	AM: 80 % :: 400 Hz

Test conditions:

- The equipment under test was placed in the anechoic chamber.
- The unit under test was exposed to a test field on all 2 faces.
- The field generation antenna was mounted 1.2m above the floor.



Position of E.U.T.



Position of EUT at 0°



Position of E.U.T. at 180°

Result:

The equipment under test showed no effects or failures either during or subsequence to the test

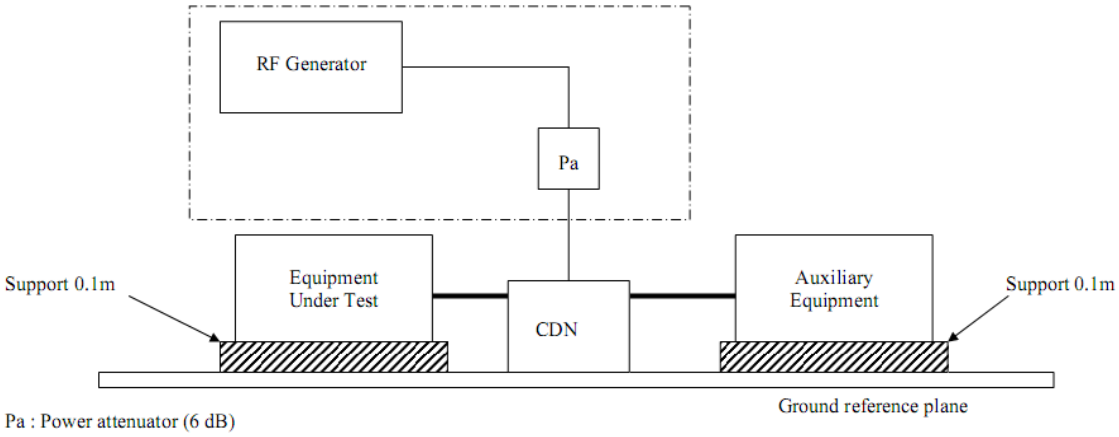
N°	Configuration	Test Modulation	Polarization	Position of EUT	Result
1	Test mode	AM	Horizontal	0°	Pass – Criterion A
2	Test mode	AM	Vertical	0°	Pass – Criterion A
3	Test mode	AM	Horizontal	180°	Pass – Criterion A
4	Test mode	AM	Vertical	180°	Pass – Criterion A

11.2. IMMUNITY TO CONDUCTED RADIO FREQUENCY DISTURBANCE

TESTS SUMMARY	
Type of port	On 230 Vac power line
Basic Standard	EN 61000-4-6:2014-02
Performance Criteria	A
Frequencies / Level	150 kHz to 80 MHz :: 3 Vrms emf Specified spot frequencies* :: 10 Vrms emf
Modulation	AM 80 % :: 400 Hz
Sweep rate	1.5 x 10^{-3} decade/sec

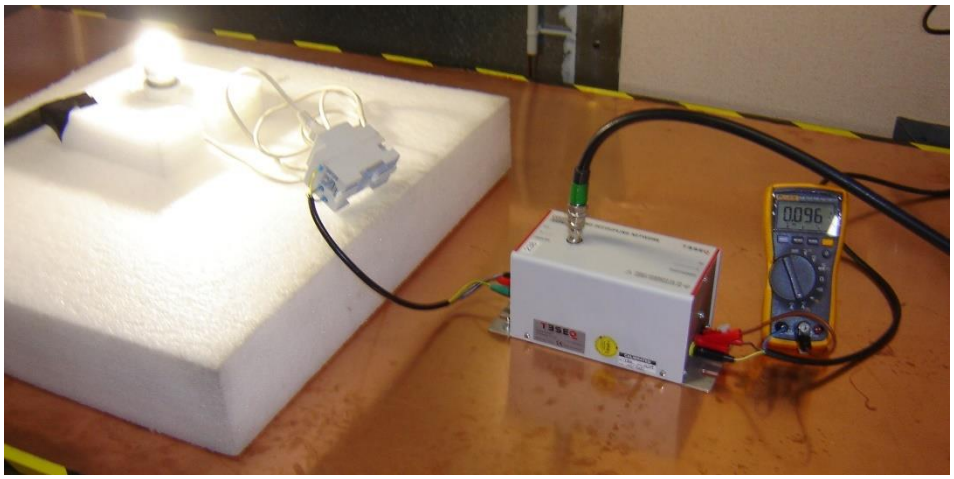
* Specified spot frequencies: 2 MHz; 3 MHz; 4 MHz; 6,2 MHz; 8,2 MHz; 12,6 MHz; 16,5 MHz; 18,8 MHz; 22 MHz;25 MHz

Test conditions:



Test with CDN

Picture:



On a.c. input port

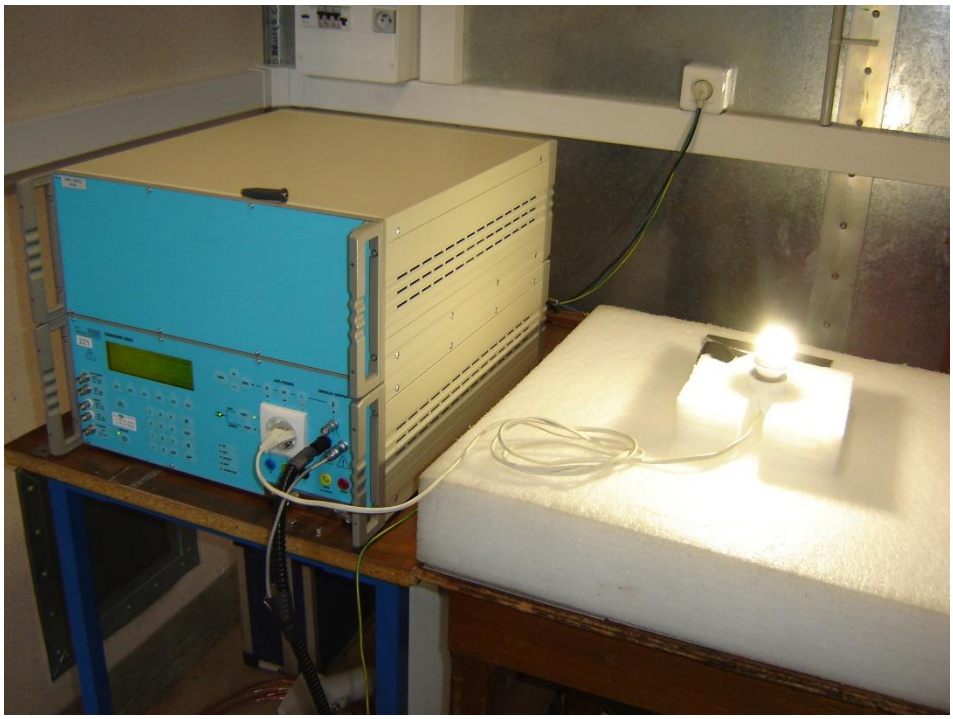
Results:

N°	Application	Injection mode	Configuration	Result
1	230 Vac power line	CDN	3 Vrms :: 150 kHz to 80 Mhz	Pass
2	230 Vac power line	CDN	10 Vrms :: Spot frequencies	Pass

11.3. IMMUNITY TO FAST TRANSIENTS

TESTS SUMMARY	
Type of port	On 230 Vac power line
Basic standard	EN 61000-4-4:2012-11
Basic criteria	B
Requirements	± 2 kV
Duration	5 min by polarization

Picture:



On a.c. input port

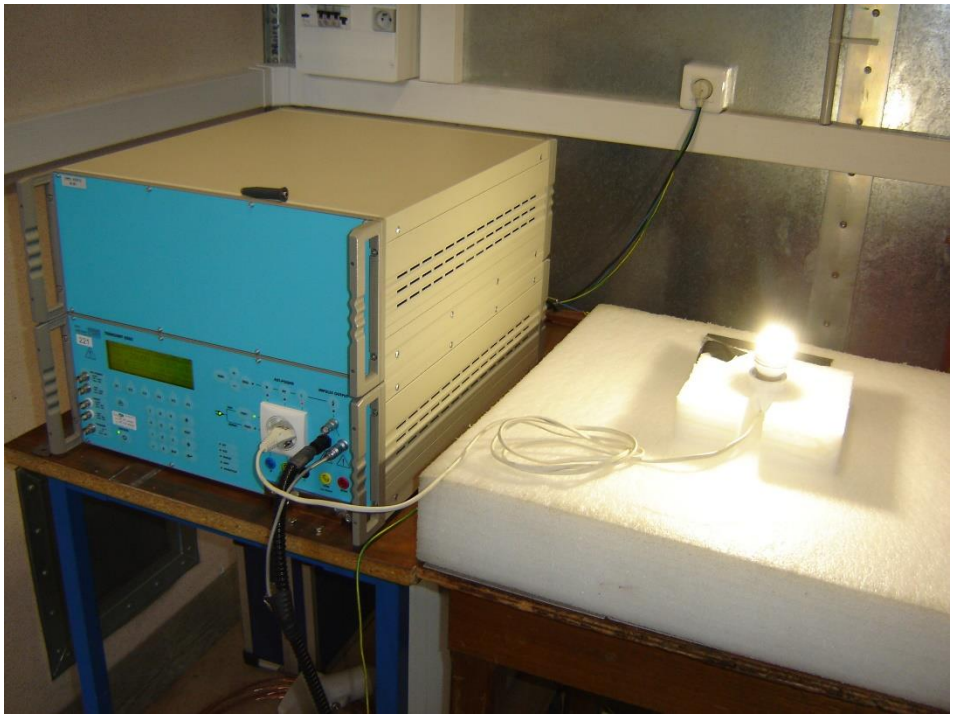
Results:

N°	Application	Injection mode	Configuration	Level	Result
1	230 Vac power line	Functional	CDN	+2kV	Pass
2	230 Vac power line	Functional	CDN	-2kV	Pass

11.4. IMMUNITY TO SURGES

TESTS SUMMARY		
Type of port	On 230 Vac power line	
Basic standard	EN 61000-4-11 :: 2004-08 +/A1 :: 2017-08	
Basic criteria	B	
Requirements	Line to Line: Line to Ground: Phase angle:	± 0.5 kV No ground 0°; 90°; 180° and 270°
Duration	1 pulse / min 5 pulses by polarization	

- **Picture:**



On a.c. input port

- **Results:**

N°	Application	Injection mode	Configuration	Synchro.	Level	Result
1	AC power line	CDN	line to line	0°	+ 0.5kV	Pass
2	AC power line	CDN	line to line	0°	- 0.5kV	Pass
3	AC power line	CDN	line to line	90°	+ 0.5kV	Pass
4	AC power line	CDN	line to line	90°	- 0.5kV	Pass
5	AC power line	CDN	line to line	180°	+ 0.5kV	Pass
6	AC power line	CDN	line to line	180°	- 0.5kV	Pass
7	AC power line	CDN	line to line	270°	+ 0.5kV	Pass
8	AC power line	CDN	line to line	270°	- 0.5kV	Pass

12. CONCLUSION

The tests were performed on May 19th, 2021.

Sum up:

Client: **BREIZELEC MANTATGUA**
Product: **CCMAFF01658**
Standard: **EN/IEC 60945 Fourth Edition 2002-08**

Electromagnetic emission and immunity

Environmental Phenomena	Result
Radiated emission	Compliant
Conducted emission	Compliant
Radio Frequency Electromagnetic Field	Compliant
Radio Frequency Common	Compliant
Electrical Fast Transients	Compliant
Slow transients	Compliant

	Name	Date	Signature
Tests made by :	T. RONARC'H	2021/05/21	
Tests approved by :	D. BERNARD	2021/05/21	

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