TEST REPORT

N°: 159387-732085-A(FILE#1011822) **Version : 02**

Subject	**Electromagnetic compatibility tests according to the standards:** **FCC CFR 47 Part 15, Subpart B.** **ANSI C63.4 (2014)** **ICES-003 Ed6.0 (2016)**
Issued to	**Syclope Electronique** Rue du Bruscos 64230 - SAUVAGNON FRANCE
Apparatus under test	
↳ Product	**TRIKLORAME and DOSIMETER**
↳ Trade mark	**SYCLOPE**
↳ Manufacturer	**SYCLOPE**
↳ Model under test	**PCC0029 and CHM0072**
↳ Serial number	**190301623 and 190301653**
↳ FCCID	**2AS3B-TRIKLORAME**
Conclusion	See Test Program chapter
Test date	January 22, 2019 to January 24, 2019
Test location	MOIRANS
Sample receipt date	January 22, 2019
Composition of document	13 pages
Document issued on	June 19, 2019

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	March 7, 2019	Hamza GHAFILI	Creation of the document
02	June 19, 2019	Hamza GHAFILI	Adding of FCCID

Each new edition of this test report replaces and cancels the previous edition. The control of the old editions of report is under responsibility of client.

SUMMARY

1. TEST PROGRAM

1.1. REQUIREMENTS FOR DISTURBANCE EMISSIONS

Standard:

- ✓ **FCC Part 15, Subpart B (Digital Devices)**
- ✓ **ANSI C63.4 (2014)**
- ✓ **ICES-003 (2016)**

EMISSION TEST	LIMITS			RESULTS (Comments)
Limits for conducted disturbance at mains ports 150kHz-30MHz	**Frequency**	**Quasi-peak value**	**Average value**	**NA**
	150-500kHz	66.0 dBµV to 56.0 dBµV	56.0 dBµV to 46.0 dBµV	
	0.5-5MHz	56.0 dBµV	46.0 dBµV	
	5-30MHz	60.0 dBµV	50.0 dBµV	
Radiated emissions 30MHz-1GHz	**Frequency**	**Quasi-peak value @3m**		**PASS**
	30MHz-88MHz	40.0 dBµV/m		
	88MHz-216MHz	43.5 dBµV/m		
	216MHz-960MHz	46.0 dBµV/m		
	Above 960MHz	54.0 dBµV/m		

NP: Not Performed / NA: Not Applicable / NR: Not Requested by the customer (It cannot be taken into account for the declaration of conformity)
***§15.33:** The highest internal source of a testing device is defined like more the highest frequency generated or used in the testing device or on which the testing device works or agrees.
- If the highest frequency of the internal sources of the testing device is lower than 108 MHz, measurement must be only performed until 1GHz.
- If the highest frequency of the internal sources of the testing device ranges between 108 MHz and 500 MHz, measurement must be only performed until 2GHz.
- If the highest frequency of the internal sources of the testing device ranges between 500 MHz and 1 GHz, measurement must be only performed until 5GHz.
If the highest frequency of the internal sources of the testing device is above 1 GHz, measurement must be only performed until 5 times the highest frequency or 40 GHz, while taking smallest of both.

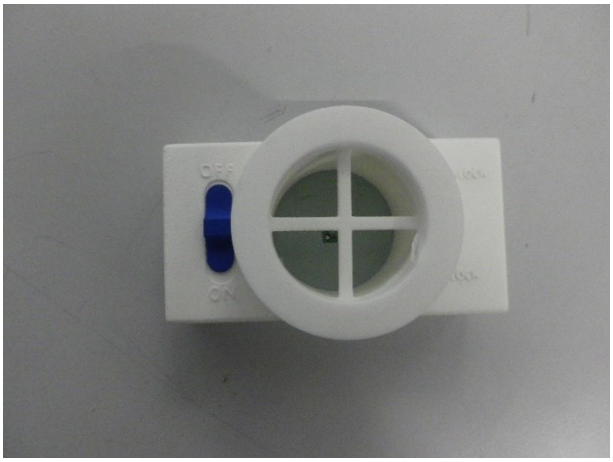
2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

- **EUT 1 :** ***TRIKLORAME***
- **EUT 2 :** ***DOSIMETER***
- **Serial Number of the EUT 1 :** ***190301623***
- **Serial Number of the EUT 2 :** ***190301653***
- **Model under test of the EUT1: PCC0029**
- **Model under test of the EUT1: CHM0072**

Equipment Under Test 1 : TRIKLORAME



Equipment Under Test 2 : DOSIMETER

Power supply:
During all the tests, EUT is supplied by V_{nom}: 3 VDC and 3,6VDC
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	☐ AC ☐ DC ☑ Battery	3VDC	-	EUT1
Supply2	☐ AC ☐ DC ☑ Battery	3,6VDC	-	EUT2

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
None						

Auxiliary equipment used during test:

Type	FCC Id	Reference	Sn	Comments
None				

2.2. EUT CONFIGURATION – RUNNING MODE

Hardware information			
Highest internal frequency (PLL, Quartz, Clock, Microprocessor…):	$F_{Highest}$:	16	MHz
Firmware (if applicable):	V. :	1.0	
Software (if applicable):	V. :	Not applicable	

***Configuration n°1*:**

Based on firmware V1.0, the software has been modified to make continuous measurements with an operating cycle of less than 3s.

A resistance of 39K +/- 1% is soldered between the 2 terminals of the contacts which connect the measurement vial to the device in real case. This resistance is there to simulate the measurement vial.

2.3. EQUIPMENT MODIFICATIONS

☑ None ☐ Modification:

2.4. SPECIAL ACCESSORIES

None

2.5. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:

FS = RA + AF + CF – AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 is added. The amplifier gain of 29dB is subtracted, giving field strength of 32 dBµV/m.
FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m
The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

2.6. CALIBRATION DATE

The calibration intervals are extended at 12+/-1 or 24+/-1 months. This extended interval is based on the fact that there is sufficient calibration data to statistically establish a trend or based on experience of use of the test equipment to assure good measurement results for a longer period.

3. MEASUREMENT OF RADIATED EMISSION (30MHZ- 1GHZ)

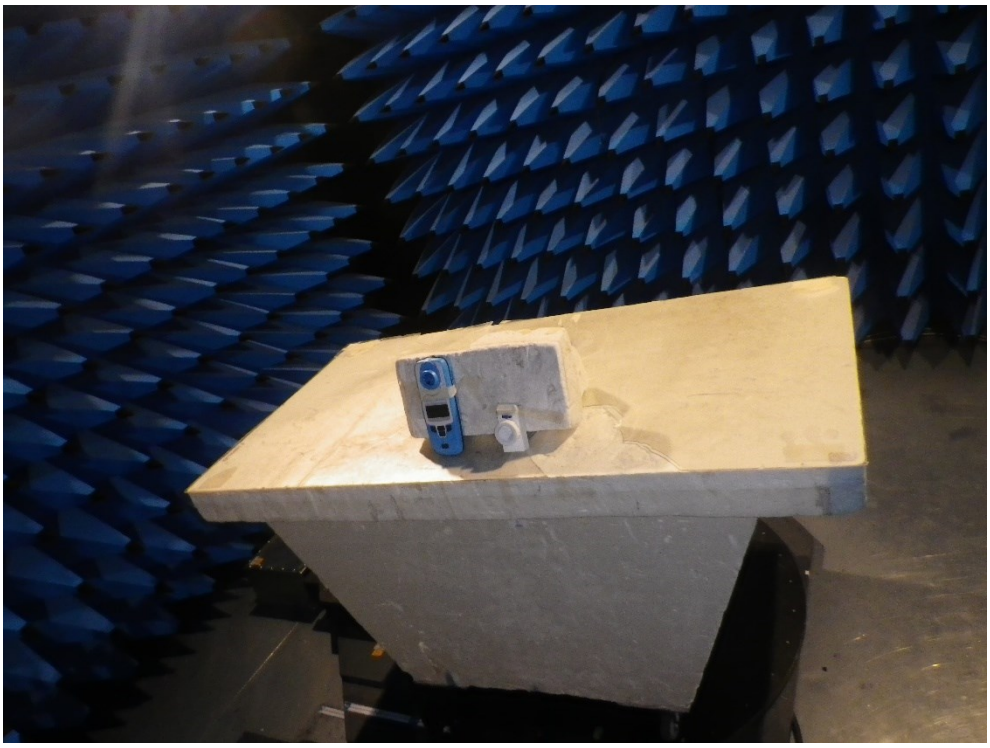
3.1. ENVIRONMENTAL CONDITIONS

Date of test : January 23, 2019
Test performed by : Hamza GHAFILI
Atmospheric pressure (hPa) : 971
Relative humidity (%) : 22
Ambient temperature (°C) : 24

3.2. TEST SETUP

The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.
The EUT and auxiliaries are set:
☑ 80cm above the ground on the non-conducting table (Table-top equipment)
☐ 10cm above the ground on isolating support (Floor standing equipment)
The EUT is powered by V_{nom}.

Test setup on OATS



Test setup in anechoic chamber

3.3. TEST METHOD

The product has been tested according to ANSI C63.4, FCC part 15 subpart B.

Pre-characterisation measurement: (30MHz –1GHz)
A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization during the test for maximized the emission measurement. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration.
The pre-characterization graphs are obtained in PEAK detection and PEAK/AVERAGE from 30 MHz to 1GHz.

Characterization on 10 meters open site from 30MHz to 1GHz:
Radiated Emissions were measured on an open area test site. A description of the facility is on file with the FCC. The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart B limits. Measurement bandwidth was 120kHz from 30 MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization, during the test for maximized the emission measurement. The height antenna is varied from 1m to 4m. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown. Frequency list has been created with anechoic chamber pre-scan results.

3.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Amplifier 25MHz – 6 GHz	LCIE	-	A7085026	11/18	11/19
Antenna Bi-Log XWing	TESEQ	CBL6144	C2040146	03/17	03/19
Antenna horn 18GHz	EMCO	3115	C2042027	04/18	04/20
Emission Cable	MICRO-COAX	6GHz	A5329654	06/18	06/19
Emission Cable	MICRO-COAX	6GHz	A5329655	06/18	06/19
Emission Cable	MICRO-COAX	6GHz	A5329656	06/18	06/19
Semi-Anechoic chamber #2	SIEPEL	-	D3044015	04/18	04/19
Radiated emission comb generator	BARDET	-	A3169050	-	-
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A4060049	11/17	11/19
BAT EMC	NEXIO	v3.17.0.10	L1000115	-	-
Thermo-hygrometer (C2)	LACROSS Techn.	WS-2357	B4206015	10/18	10/20
Turntable controller (Cage#2)	ETS Lingren	Model 2066	F2000393	-	-
Turntable chamber (Cage#2)	ETS Lingren	Model 2165	F2000404	-	-
Table C2/OATS	LCIE	-	F2000438	-	-
Antenna Bi-log	CHASE	CBL6111A	C2040051	01/18	01/19
Emission Cable	SUCOFLEX	6GHz	A5329061	03/18	03/19
Cable (OATS)	-	1GHz	A5329623	03/18	03/19
Receiver 20-1000MHz	ROHDE & SCHWARZ	ESVS30	A2642006	12/17	12/19
Facteur OATS 30M-1GHz	LCIE	V3	L2000035	-	-
Turntable / Mast controller (OATS)	ETS Lindgren	Model 2066	F2000372	-	-
Antenna mast (OATS)	ETS Lindgren	2071-2	F2000392	-	-
Turntable (OATS)	ETS Lindgren	Model 2187	F2000403	-	-

3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

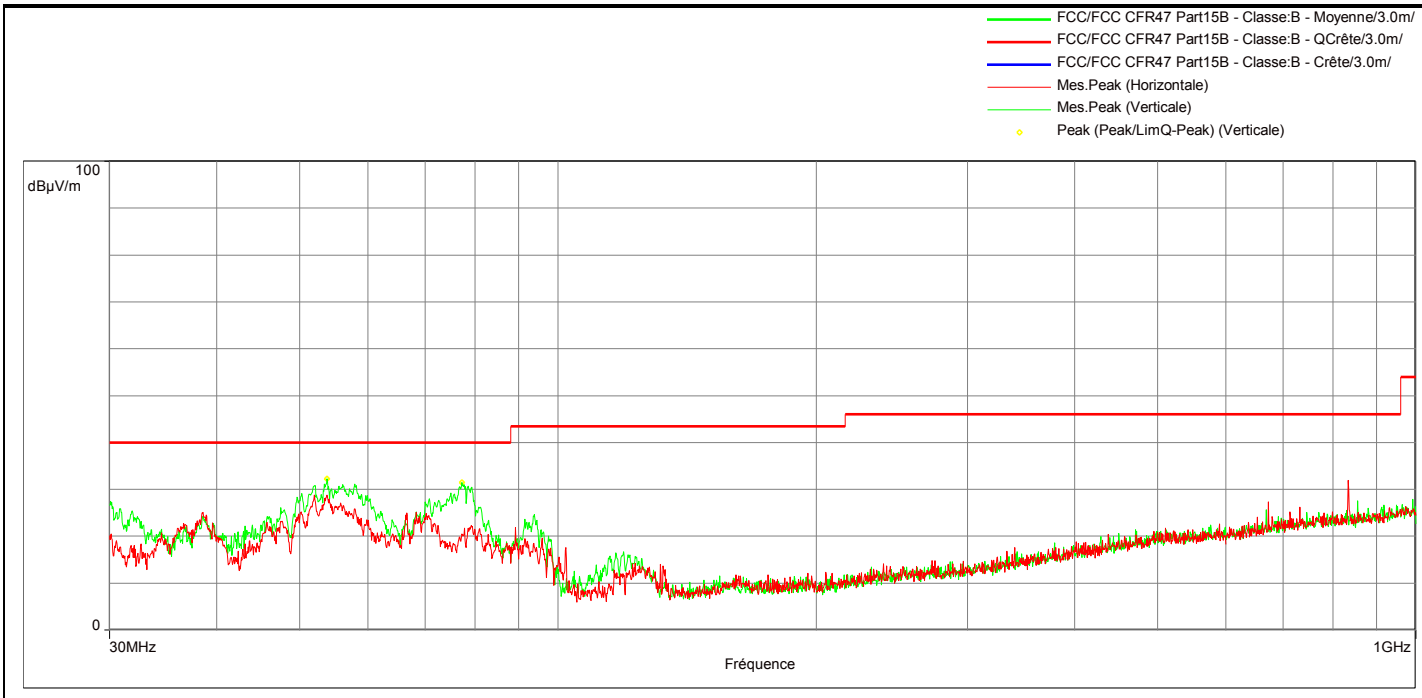
3.6. TEST RESULTS

Pre-characterisation measurement (30MHz-1GHz): pre-scan measurement at 3m (PEAK detection, graph examples)

See graphs:

Graph identifier	Polarization	EUT position	Comments	
Emr# 1	Vertical+ Horizontal	Axis XY		See below

RADIATED EMISSIONS			
Graph name:	Emr#1	**Test configuration:**	
Limit:	FCC CFR47 Part15B	test_<1GHz_FCC	
Class:	B		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	LimQP (dBµV/m)	Peak-LimQP (dB)	Polarization	Correction (dB)
53.783	32.3	40.0	-7.7	Vertical	-16.2
77.192	31.5	40.0	-8.5	Vertical	-17.5

QUALIFICATION (30MHz-1GHz): 10 meters measurement on the Open Area Test Site.
Frequency list has been created with semi-anechoic chamber pre-scan results.
Measurements are performed using a QUASI-PEAK detection.

Test Frequency (MHz)	Meter Reading dB(µV)	Detector (Pk/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
77.200	23.8	QP	V	360	100	-	9.4	33.2	40.0	**-6.8**
53.750	29.6	QP	V		100	-	8.9	38.5	40.0	**-1.5**

Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)
(M@3m = M@10m+10.5dB)

3.7. CONCLUSION

The sample of the equipment **PCC0029 and CHM0072**, Sn: **190301623 and 190301653** , tested in the configuration presented in this test report **satisfies** to requirements of class B limits of the standard FCC Part15B and ICES-003, for radiated emissions.

4. UNCERTAINTIES CHART

Type de mesure / Kind of measurement	Incertitude élargie laboratoire / Wide uncertainty laboratory (k=2) ±x	Incertitude limite du CISPR / CISPR uncertainty limit ±y
Mesure des perturbations conduites en tension sur le réseau d'énergie (monophasé /triphasé) 10kHz-150kHz *Measurement of conducted disturbances in voltage on the power port (single & three phases)10kHz-150kHz*	3.27dB	3.8dB
Mesure des perturbations conduites en tension sur le réseau d'énergie (monophasé /triphasé) 150kHz-30MHz *Measurement of conducted disturbances in voltage on the power port (single & three phases)150kHz-30MHz*	3.29dB	3.4dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication *Measurement of conducted disturbances in voltage on the telecommunication port.*	3.26dB	5dB
Mesure des perturbations discontinues conduites en tension *Measurement of discontinuous conducted disturbances in voltage*	3.33dB	3.4dB
Mesure des perturbations conduites en courant *Measurement of conducted disturbances in current*	2.67dB	2.9dB
Mesure du champ électrique rayonné en cage de Faraday semi-anéchoïque de 30MHz à 1GHz *Measurement of radiated electric field in half-anechoic Faraday room From 30MHz to 1GHz*	5.06dB	5.3dB
Mesure du champ électrique rayonné en cage de Faraday semi-anéchoïque de 1GHz à 6GHz *Measurement of radiated electric field in half-anechoic Faraday room From 1GHz à 6GHz*	5.18dB	5.2dB
Mesure du champ électrique rayonné en cage de Faraday semi-anéchoïque de 6GHz à 18GHz *Measurement of radiated electric field in half-anechoic Faraday room From 6GHz to 18GHz*	5.21dB	5.5dB
Mesure du champ électrique rayonné sur le site en espace libre de Moirans 30MHz – 1GHz. *Measurement of radiated electric field on the Moirans open area test site 30MHz – 1GHz.*	5.2dB	6.3dB
Mesure du champ électrique rayonné IN SITU de 30 à 1000 MHz *IN SITU measurement of radiated electric field from 30 to 1000MHz*	A l'étude / Under consideration	5.2dB
Mesure de la puissance perturbatrice *Measurement of disturbance power*	3.32dB	4.5dB
Mesure des harmoniques de courant *Measurement of current harmonics*	11.11%	/
Mesure du flicker *Flicker measurement*	9.26%	/

Les valeurs d'incertitudes calculées du laboratoire étant inférieures aux valeurs d'incertitudes limites établies par le CISPR, la conformité de l'échantillon est établie directement par les niveaux limites applicables. Ce tableau regroupe l'ensemble des incertitudes maximales pour les essais réalisables dans le laboratoire, qu'ils aient été ou non réalisés dans le cadre du présent rapport */ The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report*

Note - L'incertitude de mesure instrumentale est déterminée selon la CISPR 16-4-2. / *The instrumentation measurement uncertainty is determined according to CISPR16-4-2*