



RFID 125kHz Template: Release October 14th, 2019

TEST REPORT

N°: 165999-748048-A

Version : 01

Subject

Radio spectrum matters
tests according to standards:
47 CFR Part 15.209 & Part 15.207 

Issued to

BIOLOG ID
1, Rue du Commandant Robert Malrait -ZA des Granges
27300-BERNAY
FRANCE

Apparatus under test

↳ Product	RFID reader
↳ Trade mark	BIOLOG ID
↳ Manufacturer	BIOLOG ID
↳ Model under test	PRD 654-0002A
↳ Serial number	01BI2005000021
↳ FCC ID	2AKUFPRD65402A

Conclusion

See Test Program chapter

Test date

: January 30, 2020

Test location

Ecuelles

Test Site

6230B-1

Sample receipt date

January 30, 2020

Composition of document

25 pages

Document issued on

March 12, 2020

Written by :
Laurent DENEUX
Tests operator

Approved by :
BUREAU VERITAS
S.A.S au capital de 15 745 984 €
RCS Nanterre B 408 363 174
F-92260 FONTENAY AUX ROSES



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PUBLICATION HISTORY

Version	Date	Author	Modification
01	March 12th, 2020	Laurent DENEUX	Creation of the document

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

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1. TEST PROGRAM

References

- 47 CFR Part 15.
- ANSI C63.10-2013

Radio requirement:

Clause (47CFR Part 15.209 & 15.207) Test Description	Test result - Comments			
AC Power Line Conducted Emission	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA(2)	<input type="checkbox"/> NP(1)
Transmitter Radiated Emission	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Receiver Radiated Emissions	<input checked="" type="checkbox"/> PASS (3)	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)

This table is a summary of test report, see conclusion of each clause of this test report for detail.

(1): Limited program

(2): EUT not directly or indirectly connected to the AC Power Public Network

(3)Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

NA: Not Applicable

NP: Test Not Performed



L C I E

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

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

BIOLOG ID PRD 654-0002A

Serial Number: 01BI2005000021



RFID reader



Power supply



Tag

Equipment Under Test



L C I E

Power supply:

During all the tests, EUT is supplied by V_{nom} : 120V-60Hz

For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	<input checked="" type="checkbox"/> AC <input type="checkbox"/> DC <input type="checkbox"/> Battery	100-240V / 50-60Hz	GTM96300-2307.5-R3A	

Voltage table used (for Power Line Conducted Emissions):

Type	Measurement performed:	
<input checked="" type="checkbox"/> AC	<input checked="" type="checkbox"/> 120VAC/60Hz	<input checked="" type="checkbox"/> 240VAC/50Hz
<input type="checkbox"/> DC	<input type="checkbox"/> +12VDC	<input type="checkbox"/> -....VDC
<input type="checkbox"/> Battery	<input type="checkbox"/> +3.6VDC	<input type="checkbox"/> -....VDC
<input type="checkbox"/> USB (Laptop auxiliary)	<input type="checkbox"/> 120VAC/60Hz (Laptop auxiliary)	<input type="checkbox"/> 240VAC/50Hz(Laptop auxiliary)

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	Power SUPPLY	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2	USB	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	PROBOOK 430 G4		Use to set the EUT
Power supply	GTM96300-2307.5-R3A		GLOBTEK



L C I E

Equipment information:

Type:	<input checked="" type="checkbox"/> RFID		
Frequency band:	[134.2] kHz		
Number of Channel:	1		
Antenna Type:	<input checked="" type="checkbox"/> Integral	<input type="checkbox"/> External	<input type="checkbox"/> Dedicated
Transmit chains:	1		
Receiver chains	1		
Type of equipment:	<input type="checkbox"/> Stand-alone	<input checked="" type="checkbox"/> Plug-in	<input type="checkbox"/> Combined
Equipment type:	<input checked="" type="checkbox"/> Production model		
Operating temperature range	T _{nom} :	20°C	
Type of power source:	<input checked="" type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input type="checkbox"/> Battery
Operating voltage range:	V _{nom} :	<input checked="" type="checkbox"/> 120V/60Hz	<input type="checkbox"/> XVdc

2.2. RUNNING MODE

Test mode	Description of test mode
Test mode 1	Permanent emission with modulation on a fixed channel in the data rate that produced the highest power

Test	Running mode
AC Power Line Conducted Emission	<input checked="" type="checkbox"/> Test mode 1 <input type="checkbox"/> Alternative test mode()
Transmitter Radiated Emission	<input checked="" type="checkbox"/> Test mode 1 <input type="checkbox"/> Alternative test mode()
Receiver Radiated emissions	<input checked="" type="checkbox"/> Test mode 1 <input type="checkbox"/> Alternative test mode()



2.3. EQUIPMENT LABELLING



2.4. EQUIPMENT MODIFICATION

None Modification:

- changing the location of the power cable



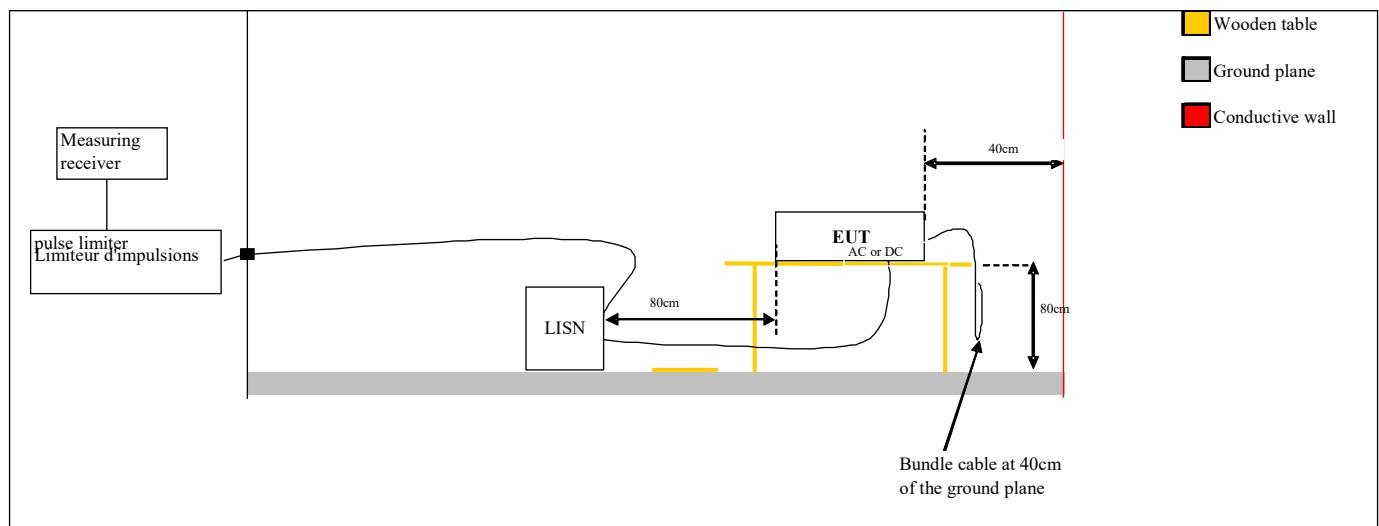
3. AC POWER LINE CONDUCTED EMISSIONS

3.1. TEST CONDITIONS

Test performed by : Laurent DENEUX
 Date of test : January 30, 2020
 Ambient temperature : 21 °C
 Relative humidity : 51 %

3.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013) method. The EUT is placed on the ground reference plane, at 80cm from the LISN. The distance between the EUT and the vertical ground plane is 40cm. Auxiliaries are powered by another LISN. The cable has been shorted to 1meter length. The EUT is powered through the LISN. Measurement is made with a receiver in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary. The LISN (measure) is $50\Omega / 50\mu\text{H}$. Interconnecting cables and equipment's were moved to position that maximized emission.



Test set up of AC Power Line Conducted Emissions



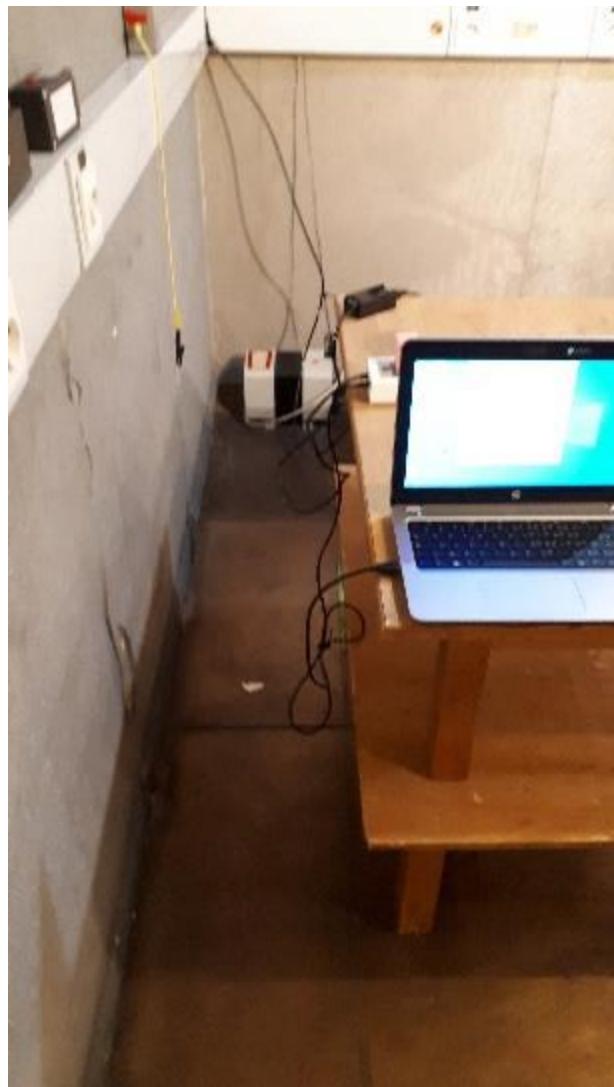
L C I E



Photograph for AC Power Line Conducted Emissions (Front view)



L C I E



Photograph for AC Power Line Conducted Emissions (Rear view)



3.3. LIMIT

Frequency range	Level	Detector
0,15kHz to 0,5MHz	66dB μ V to 56 μ V*	QPeak
	56dB μ V to 46 μ V*	Average
0,5MHz to 5MHz	56dB μ V	QPeak
	46dB μ V	Average
5MHz to 30MHz	60B μ V	QPeak
	50dB μ V	Average

*Decreases with the logarithm of the frequency

3.4. TEST EQUIPMENT LIST

Test equipment used					
Description	Manufacturer	Model	Identifier	Last Calibration date	Calibration due date
Open test site	LCIE	-	F2000400	2019/06	2020/06
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2018/10	2020/10
V ISLN	ROHDE & SCHWARZ	ESH2-Z5	C2322002	2019/08	2020/08
Pulse limiter	ROHDE & SCHWARZ	ESH3-Z2	A2649008	2019/03	2020/03
Cable	-	-	A5329417	2019/12	2020/12
Reference ground plan 2 x 3m	L.C.I.E.	-	-	-	-

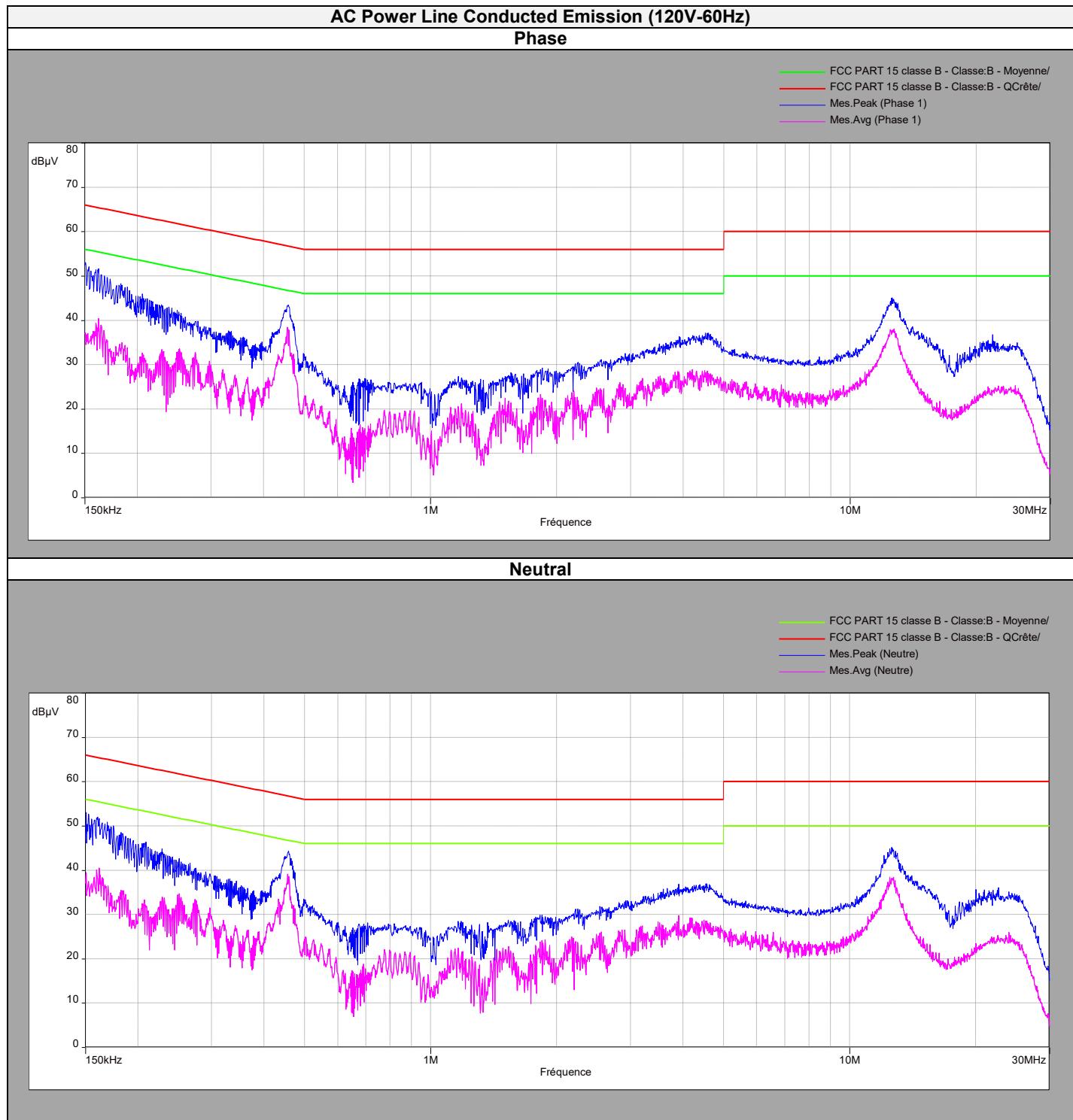
Note: In our quality system, the test equipment calibration due is more & less 2 months

3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

Divergence:

3.6. RESULTS





L C I E

Phase Line

Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Margin peak/Quasi Peak (dB)	Average Level (dBμV)	Average Limit (dBμV)	Margin Avg/Avg (dB)
0,162	51,6	-	65,4	13,8	40,4	55,4	15
0,457	43	-	56,7	13,7	38,3	46,7	8,4
4,37	36,5	-	56	19,5	28,9	46	17,1
12,6	45	-	60	15	37,6	50	12,4
21,89	36,7	-	60	23,3	24	50	26

Neutral Line

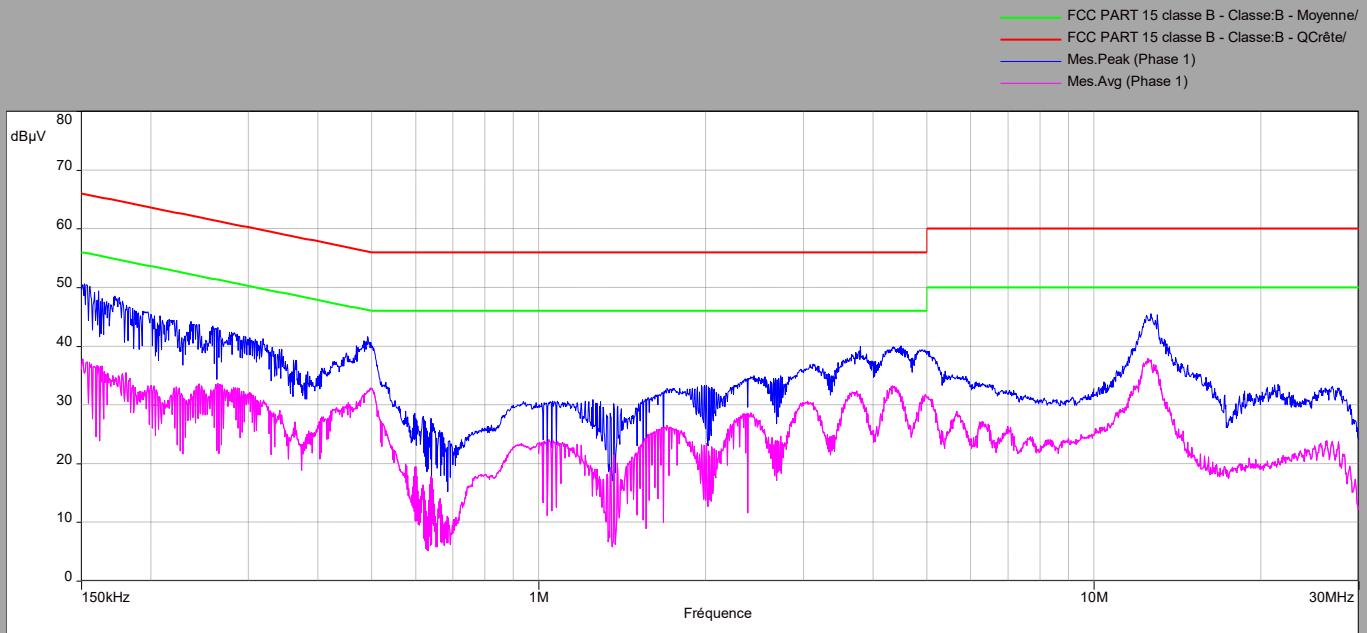
Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Margin peak/Quasi Peak (dB)	Average Level (dBμV)	Average Limit (dBμV)	Margin Avg/Avg (dB)
0,158	51,8	-	65,4	13,6	40	55,4	15,4
0,456	43,7	-	56,7	13	39	46,7	7,7
3,91	36,9	-	56	19,1	29,8	46	16,2
12,6	45,2	-	56	10,8	38,2	46	7,8
22,6	36	-	60	24	23,4	50	26,6



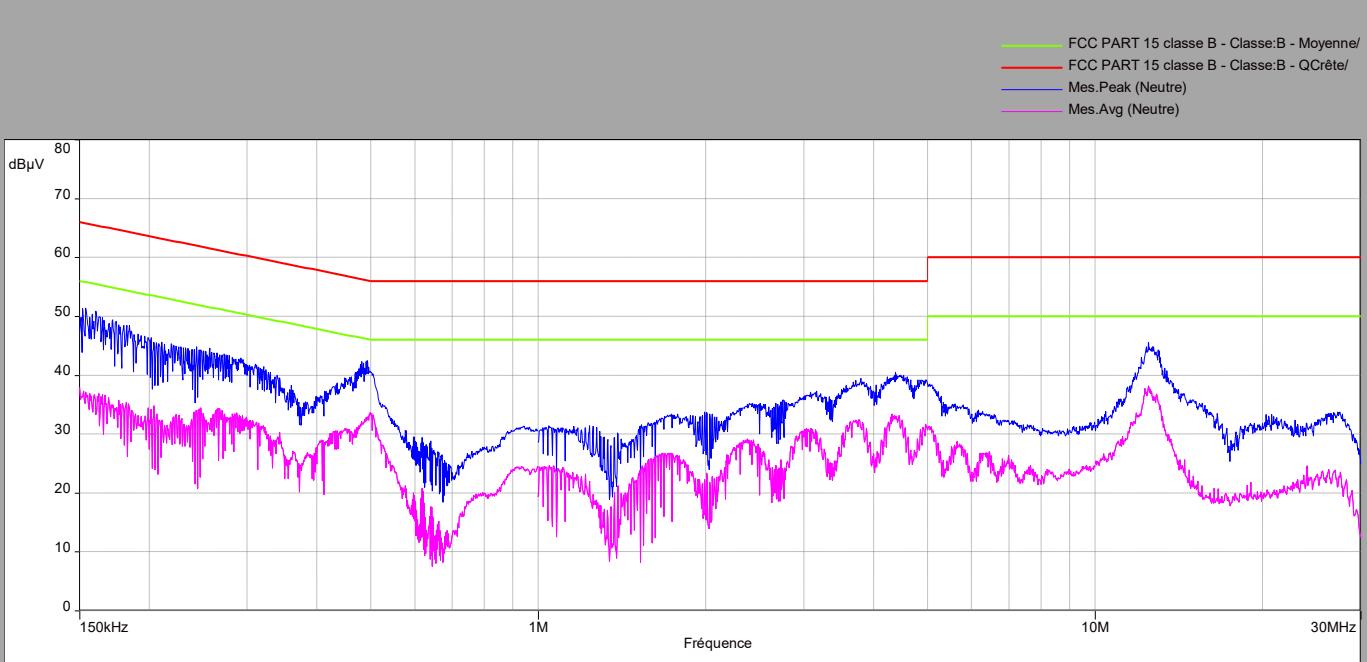
L C I E

AC Power Line Conducted Emission (240V-50Hz)

Phase



Neutral





L C I E

Phase Line							
Frequency (MHz)	Peak Level (dB μ V)	Quasi-Peak Level (dB μ V)	Quasi-Peak Limit (dB μ V)	Margin peak/Quasi Peak (dB)	Average Level (dB μ V)	Average Limit (dB μ V)	Margin Avg/Avg (dB)
0,15	50,4	-	66	15,6	37,8	56	18,2
0,5	39,7	-	56	16,3	32,5	46	13,5
2,44	35	-	56	21	27,9	46	18,1
4,35	40	-	56	16	33	46	13
12,65	45,5	-	60	14,5	37,3	50	12,7

Neutral Line							
Frequency (MHz)	Peak Level (dB μ V)	Quasi-Peak Level (dB μ V)	Quasi-Peak Limit (dB μ V)	Margin peak/Quasi Peak (dB)	Average Level (dB μ V)	Average Limit (dB μ V)	Margin Avg/Avg (dB)
0,15	51,3	-	66	14,7	37,2	56	18,8
0,5	40,5	-	56	15,5	43,5	46	2,5
1,7	33,3	-	56	22,7	26,6	46	19,4
4,38	40,5	-	56	15,5	32,9	46	13,1
12,49	43,4	-	60	16,6	37,9	50	12,1



3.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **BIOLOG ID PRD 654-0002A**, SN: **01BI2005000021**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.207 limits.

4. TRANSMITTER RADIATED EMISSION

4.1. TEST CONDITIONS

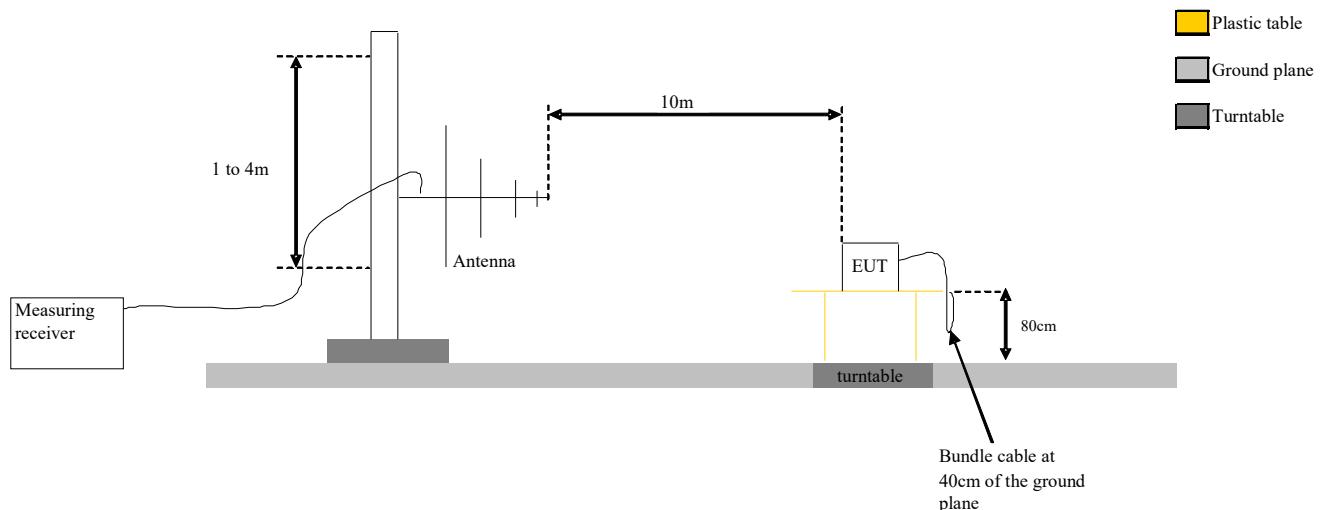
Test performed by : Laurent DENEUX
 Date of test : January 30, 2020
 Ambient temperature : 20 °C
 Relative humidity : 47 %

4.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013).

Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height was 1m. The EUT is placed **on an open area test site**. Distance between measuring antenna and the EUT is **3m**.

Test is performed in horizontal (H) and vertical (V) polarization with **bilog** between 30MHz & 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height search was performed from 1 to 4m. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz. The EUT is placed **on an open area test site** above 1GHz and **on an open area test site** from 30MHz to 1GHz. Distance between measuring antenna and the EUT is **10m**.



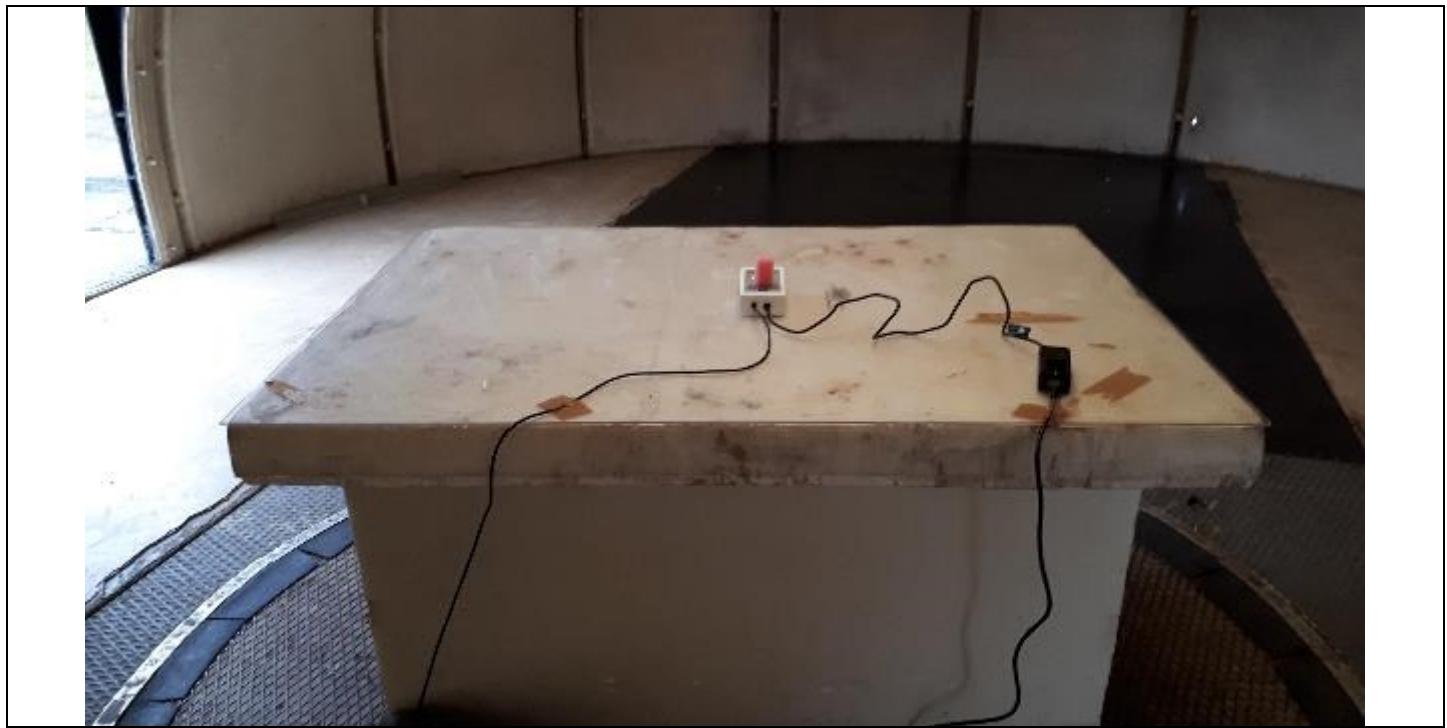
Test Set up for radiated measurement in open area test site



Photograph for Transmitter Radiated Emission



L C I E



Photograph for Transmitter Radiated Emission



L C I E

4.3. LIMIT

Measure at 300m		
Frequency range	Level	Detector
9kHz-490kHz	67.6dB μ V/m /F(kHz)	QPeak
Measure at 30m		
Frequency range	Level	Detector
490kHz-1.705MHz	87.6dB μ V/m /F(kHz)	QPeak
1.705MHz-30MHz	29.5dB μ V/m	QPeak
Measure at 10m		
Frequency range	Level	Detector
30MHz to 88MHz	29.5dB μ V/m	QPeak
88MHz to 216MHz	33dB μ V/m	QPeak
216MHz to 960MHz	35.5dB μ V/m	QPeak
960MHz to 1000MHz	43.5dB μ V/m	QPeak
Above 1000MHz	63.5dB μ V/m	Peak
	43.5dB μ V/m	Average
Measure at 3m		
Frequency range	Level	Detector
30MHz to 88MHz	40dB μ V/m	QPeak
88MHz to 216MHz	43.5dB μ V/m	QPeak
216MHz to 960MHz	46dB μ V/m	QPeak
960MHz to 1000MHz	54dB μ V/m	QPeak
Above 1000MHz	74dB μ V/m	Peak
	54dB μ V/m	Average



4.4. TEST EQUIPMENT LIST

Test equipment used					
Description	Manufacturer	Model	Identifier	Last Calibration date	Calibration due date
Open test site	LCIE	-	F2000400	2019-06	2020-06
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2018-10	2020-10
Cable	-	-	A5329444	2019-12	2020-12
Bilog antenna	CHASE	CBL 6112A	C2040040	2019-04	2020-04
Cable	-	-	A5329442	2019-129	2020-12
Cable	-	-	A5329876	2019-12	2020-12
Cable	-	-	A5329542	2019-08	2020-08
Preamplifier	HEWLETT PACKARD	8449B	A4069002	2018-04	2020-04
Horn	EMCO	3115	C2042016	2019-06	2020-06
loop antenna	RHODE & SCHWARZ	HFH2-Z2	C2040007	2017-11	2019-11
Cable	-	-	A5329416	2019-12	2020-12

Note: In our quality system, the test equipment calibration due is more & less 2 months

4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

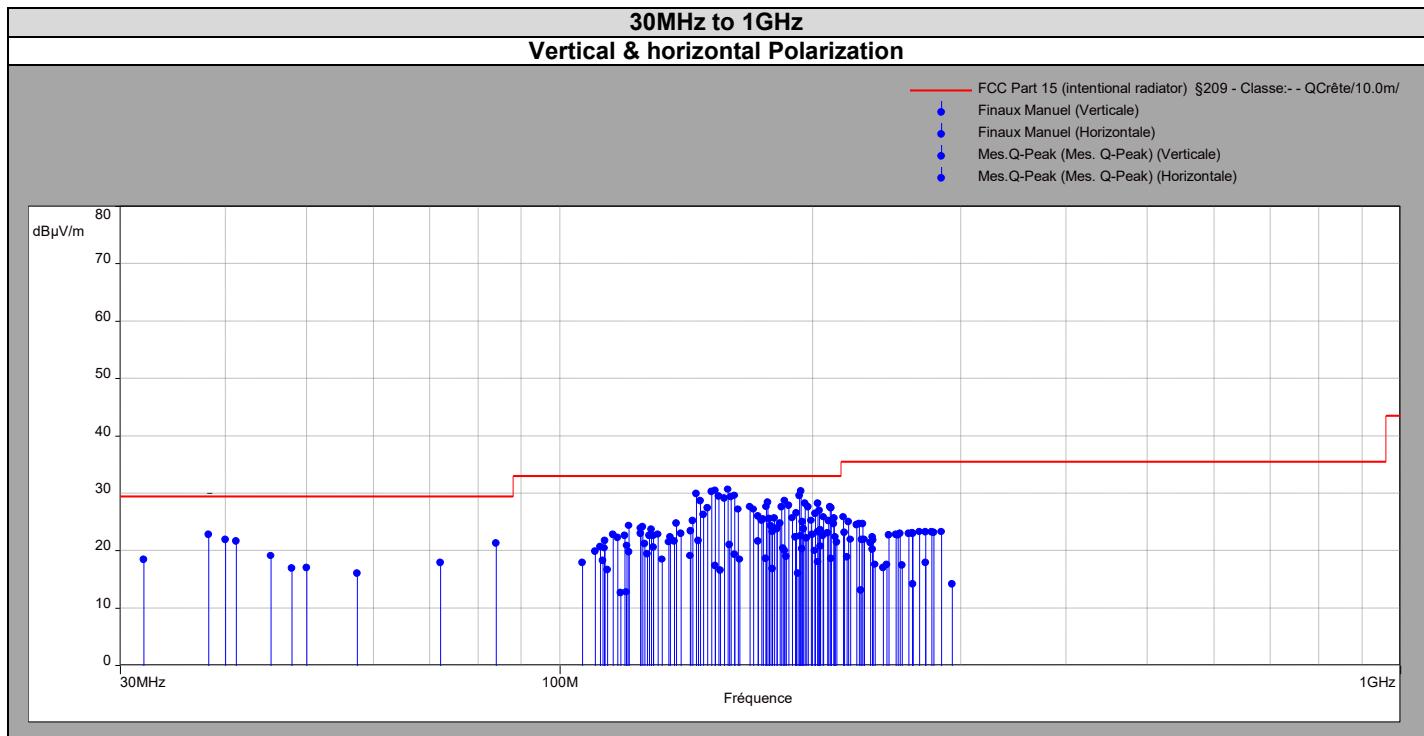
None

Divergence:



L C I E

4.6. RESULTS





L C I E

9kHz to 30MHz				
Polarization	Frequency (MHz)	Peak Level (dB μ V/m)	QPeak Level (dB μ V/m)	Limit (dB μ V/m)
Parallel	0.1341	-	80.47	105.05
Parallel	0.4014	-	33.44	95.51
Parallel	0.6705	-	29.73	71.08
Parallel	0.939	-	25.14	68.15
Perpendicular	0.1341	-	78.2	105.05
Perpendicular	0.4014	-	32.5	95.51
Perpendicular	0.6705	-	24.1	71.08

30MHz to 1GHz				
Polarization	Frequency (MHz)	Peak Level (dB μ V/m)	QPeak Level (dB μ V/m)	Limit (dB μ V/m)
Vertical	38.2	-	22.78	29.5
Vertical	146.9	-	28.63	33
Vertical	148.3	-	26.23	33
Vertical	149.9	-	27.4	33
Vertical	151.5	-	30.31	33
Vertical	153	-	30.55	33
Vertical	154.6	-	29.46	33
Vertical	156.9	-	29.15	33
Vertical	158.4	-	30.67	33
Vertical	159.9	-	29.33	33
Vertical	161.5	-	29.68	33
Vertical	183.6	-	27.63	33
Vertical	185.2	-	28.72	33
Vertical	191.3	-	26.54	33
Vertical	193.6	-	30.34	33

Above 1GHz						
Polarization	Frequency (MHz)	Duty cycle correction (dB)	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Peak Level (dB μ V/m)	Peak Limit (dB μ V/m)
all emissions were greater than 20 dB below the limit						

4.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **BIOLOG ID PRD 654-0002A**, SN: **01BI200500021**, in configuration and description presented in this test report, show levels compliant to the 47 CFR PART 15.209 limits.



5. UNCERTAINTIES CHART

47 CFR Part 15.209 & 15.207 Kind of test	Wide uncertainty laboratory (k=2) $\pm x(\text{dB}) / (\text{Hz}) / \text{ms}$	Uncertainty limit
Measurement of conducted disturbances in voltage on the AC power port (9 kHz – 150 kHz)	2,67	3.8
Measurement of conducted disturbances in voltage on the AC power port (150 kHz – 30 MHz)	2,67	3.4
Measurement of conducted disturbances in voltage on the telecommunication port. (AAN)	3,67	5.0
Measurement of conducted disturbances in current (current clamp)	2,73	2.9
Measurement of disturbance power	2,67	4.5
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC V01	4,48	/
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC C01	4,48	/
Measurement of radiated electric field from 30 to 1000MHz in horizontal position on the OATS (Euelles)	4,88	6.3
Measurement of radiated electric field from 1 to 18GHz on the Euelles site	5,16	/
Measurement of radiated electric field from 30 to 1000MHz in vertical position on the OATS (Euelles)	4,99	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC C01	5,08	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC C01	5,16	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC V01	5,08	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC V01	5,15	6.3
Measurement of radiated electric field from 1 to 6 GHz C01	5,1	5.2
Measurement of radiated electric field from 1 to 6 GHz V01	4,85	5.2
Measurement of radiated magnetic field from 10kHz to 30MHz on the OATS (Euelles)	4,48	/

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