



**LABORATORIUM VOOR OMGEVINGSMETINGEN
LABORATOIRE D'ESSAIS D'ENVIRONNEMENT
ENVIRONMENTAL TEST LABORATORY**

NOTIFIED BODY (NB2758) UNDER EU-DIRECTIVE 2014/30/EU	 041-TEST
ACCREDITED FOR EN ISO/IEC 17025 BY BELAC 041-TEST	
CONFORMITY ASSESSMENT BODY MRA US-EU SECTORAL ANNEX EMC (FCC PART 15 AND PART 18)	
RECOGNISED TESTING AUTHORITY FOR AUSTRALIA	

MC TESTREPORT

Product	Sensor Dot
Standard	FCC Part 15 Subpart B
Test Report	PCC-EMC-5476
LDN Number	4451
Date of issue	2022-03-15
Edition	3

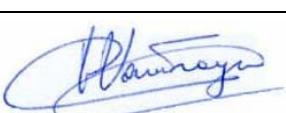
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This Test Report contains 29 pages

SECTION 1: IDENTIFICATION OF THE TEST LABORATORIA

LABORATORIA DE NAYER <u>Product Certification Centre (PCC)</u>	
J.De Nayerlaan 9 B-2860 St.-Katelijne-Waver Belgium Tel: +32 (0) 15 30 54 00 Fax: +32 (0) 15 32 1212	Direct phone numbers and e-mail address: (Test engineer) Jochen Geens +32(0)15 30 54 09 j.geens@labodenayer.be

TEST LABORATORY RESPONSIBILITIES			
Function	Name(s)	Date	Signature
Test Operator	Jochen Geens	2021-10-27	
Author Report	Jochen Geens Jan De Vos	2022-03-14	
Technical Expert	Dr.ir. Dirk Van Troyen	2022-03-14	



041-TEST – ISO17025

The test report may not be reproduced, unless as a complete packet, without written agreement of Laboratoria De Nayer v.z.w.

The results refer to the described sample or equipment under test only.

Neither the accredited status of Laboratoria De Nayer v.z.w., nor this test report implies that the sample or equipment under test is approved by BELAC or any other establishment.

In case the customer wants to refer to his appeal to our accredited laboratories, he will use the following or equivalent sentence: "Tested by Laboratoria De Nayer, E.M.C.department, accredited by BELAC for EMC-immunity and EMC-emission under registration number 041-TEST".

SECTION 2: CUSTOMER INFORMATION AND DATES

CUSTOMER INFORMATION	
Company name:	Byteflies N.V.
Address:	Borsbeekbrug 22, 6th floor 2600 Antwerpen
Contact person:	Niels Van Thienen
E-mail:	niels.vanthienen@byteflies.com

DATES	
Receipt of the EUT:	2021-09-03
Start of tests:	2021-09-06
End of tests:	2021-09-09

SECTION 3: EQUIPMENT UNDER TEST (E.U.T.)

The correctness of the description and identification of the equipment under test, its operating conditions, possible modifications and monitoring of its behaviour during and/ or after the test conditions generated by the De Nayer Environmental Test Laboratory are under the responsibility of the customer.

Identification of the E.U.T.

Intended use:	The Byteflies Kit is a multisensor device intended to collect non-invasive physiological and behavioral signals to be used in the clinic and/or home for Users that need continuous monitoring.
Manufacturer:	Byteflies NV
Marketing name:	Sensor Dot
Model / Type:	Sensor Dot (2103)
Software Version:	hw-dot-bletest@0942eda6aab52f04fff25949f9ec2c97439f401f
Maximum internal frequency:	32MHz (digital) 2.5GHz (intentional radiator)
Serial Number:	R3
FCC ID	

Illustrations: (Equipment under test)



Equipment under test (E.U.T.) - Example

SECTION 4: TEST SPECIFICATIONS AND TEST METHODS

Applied Tests or Technical Standards		
Emission:		
Test or Technical Standard	Title	
FCC CFR47 Part 15	Code of Federal Regulations – Part15: Radio Frequency Devices – Subpart B: Unintentional Radiators	
ANSI C63.4 (2014)	American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	

(*) if the logo  is mentioned, the measurement is under accreditation: 041-TEST – ISO17025

MRA: between E.C. and USA: CAB (EMC) [designation number BE0002] date of validation April 03, 2020

Equipment Classifications:

- Class A digital device: A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.
- Class B digital device: A digital device that is marketed for use in a residential environment, notwithstanding use in commercial, industrial or business environments. Examples of such devices include, but are not limited to, personal computer, calculators and similar electronic devices that are marketed for use by the general public.

Field Strength Calculation:

The field strength is calculated in the receiver for spurious radiated emission the “ESW26 - FCC RE low 10m” (30-1000MHz), “ESW26 - RE 1-12GHz” (1 -10GHz), “ESW26 - RE 8-18GHz” (10-18GHz) and “ESU40 RE 18G-40G 1m” (18-40GHz) are selected.

- “ESW26 - FCC RE low 10m” is the Transducer factor for the bilog antenna (combination of the AF of the R&S antenna, pre-amplifier and cables in the range 30MHz-1GHz).
- “ESW26 - RE 1-12GHz” is the Transducer factor for the horn antenna (combination of the AF of the horn antenna, pre-amplifier and cables in the range >1GHz).
- “ESW26 - RE 8-18GHz” is the Transducer factor for the horn antenna (combination of the AF of the horn antenna, pre-amplifier and cables in the range >8GHz).
- “FCC-RE-18_40” is the Transducer factor for the horn antenna (combination of the AF of the horn antenna, pre-amplifier and cables in the range >18GHz).

SECTION 5: OPERATION OF EUT DURING TESTING

Operating modes during emission testing

The device was configured, depending on the test being done:

1. Continuous TX with configured modulation

SECTION 6: SUMMARY OF TEST RESULTS

6.1 Test results of the emission tests.

Emission measurement according to: FCC part 15 subpart B		
Test	The EUT complies limits	Remarks
Conducted emissions (0.15 MHz – 30 MHz) mains	-	1
Radiated emissions (30-1000MHz)	Yes	
Radiated emissions (1-12.5GHz)	Yes	

Remark 1 : test not applicable battery operated device

Labeling requirements according to FCC§15.19:

(a)(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(b) Products subject to authorization under a Declaration of Conformity shall be labelled as follows:

(1) The label shall be located in a conspicuous location on the device and shall contain the unique identification described in Section 2.1074 of this chapter and the following logo:

(i) If the product is authorized based on testing of the product or system.



SECTION 7: DETAILED TEST RESULTS

7.1. EMISSION TESTS

The test has been performed according to the standard:
CFR 47 – Part15: Radio Frequency Devices – Subpart B: Unintentional Radiators

The orientation of the EUT was the X plane

7.1.1. Limits

Table: RE @ 3m (class B)

Frequency (MHz)	QP (dB μ V/m)
30-88	40
88-216	43.5
216-960	46.0
960-1000	54.0

Table: RE @ 3m (class B)

Frequency (GHz)	AV (dB μ V/m)
1-18	54.0

7.1.2. Radiated emission test (30M – 1GHz)

CONDITIONS	
The equipment was placed on a table at 80cm height, in a semi anechoic chamber with metal ground plane. The chamber complies with the ANSI C63.4/5 and CISPR 16. The radiated emission level was measured with a bilog antenna (30-1000MHz) at 3m distance. The maximum electromagnetic field has been measured by rotating the turntable in steps of 45 degrees and by sweeping the antenna in height between 1 and 4 meters, using 30-centimetre steps, for both horizontal and vertical polarization. Range: 30 MHz - 1 GHz The limit line is the quasi-peak limit line.	
Test date: 2021-09-08	Climate: t= 21°C, h=60%, l= 1017 hPa
Test equipment: Receiver: R&S ESW 26, MN: 20180039 Preamp: ZKL-2r7: MN: 201112419 Antenna: Chase CBL6111B, MN: 458580 Attenuator: Mini-Circuits 15542, 6dB, MN: 20180026 Antenna mast: Maturo AM4.0, MN: 20112341 Turntable: Maturo TT4.0-3t-EC, MN: 20112344 Controller: Maturo MCU, MN: 20112342 Cables: IR32, IR83, IR103 and IR120	

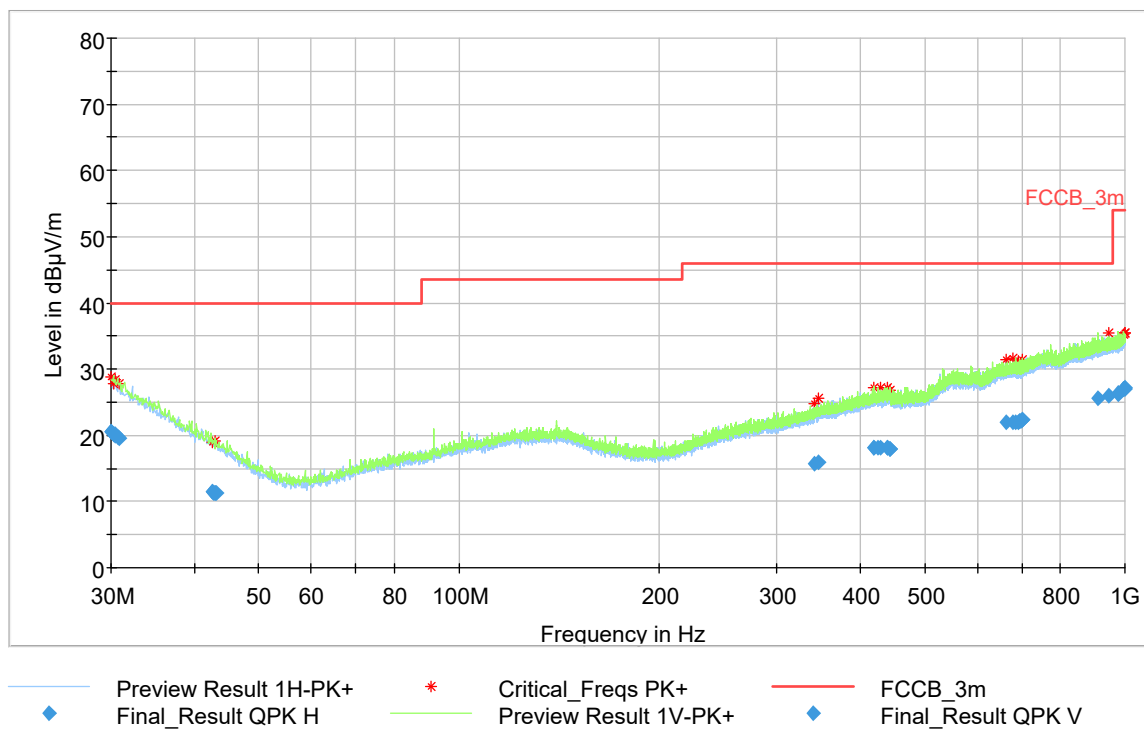
Hardware setup:	ESW26 RE 30M-1G 3m_FCC
Level unit:	dBµV/m
TDF:	Correction Table (vertical): CBL6111_ref Correction Table (horizontal): CBL6111_ref

Subrange	Step Size	Detectors	IF BW
30 MHz - 1 GHz	80 kHz	PK+	120 kHz
	40 kHz	QP	120 kHz

Radiated emission 30M – 1GHz:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Margin (dB)	Limit (dB μ V/m)	Height (cm)	Pol	Azimuth (deg)
30	20.61	19.4	40	150	H	225
426.48	18.16	27.8	46	160	V	0
661.6	21.89	24.1	46	150	H	90
677.36	21.98	24	46	100	H	0
684.88	22.02	24	46	370	V	90
691.2	22.06	23.9	46	100	H	315
695.92	22.16	23.8	46	190	V	315
696.8	22.21	23.8	46	370	V	315
701.28	22.29	23.7	46	100	H	0
702.88	22.39	23.6	46	340	V	135
910.72	25.64	20.4	46	220	V	135
946.88	25.97	20	46	100	H	0
977.92	26.37	27.6	54	340	V	315
995.52	27.01	27	54	150	H	315
996.4	27.06	26.9	54	310	V	45
998	27.09	26.9	54	150	H	90
999.84	27.22	26.8	54	200	H	225

Full Spectrum



Radiated Emission 30M – 1GHz

Test result	Pass: Class B
Remarks	

7.1.3. Radiated emission test (1 – 4GHz)

CONDITIONS	
The equipment was placed on a table at 80cm height, in a semi anechoic chamber with metal ground plane. The chamber complies with the ANSI C63.4/5 and CISPR 16. The radiated emission level was measured with a horn antenna at 3m distance. For this measurement, absorbers were placed between the antenna and the EUT. The maximum electromagnetic field has been measured by rotating the turntable in steps of 15 degrees and fixed antenna height at 1 meter, for both horizontal and vertical polarization. Range: 1 - 4 GHz The lower limit line is the average limit line.	
Test date: 2021-08-09	Climate: t= 21°C, h= 60%, l= 1017hPa
Test equipment: Receiver: R&S ESW 26, MN: 20180039 Preamp: LDN PAM3, MN: 20170072 Antenna: R&S HF906, MN: 2006054 Antenna mast: Maturo AM4.0, MN: 20112341 Turntable: Maturo TT2.0-2t, MN: 20112343 Controller: Maturo MCU, MN: 20112342 Cables: IR230 and IR433	

Hardware setup:	ESW26 RE 1-12G 3m_FCC
Level unit:	dBμV/m
TDF:	Correction Table (vertical): HF906-3m-PCC2 Correction Table (horizontal): HF906-3m-PCC2

Subrange	Step Size	Detectors	IF BW
1 – 12.5 GHz	400 kHz	AV	1 MHz
	400 kHz	CAV	1 MHz

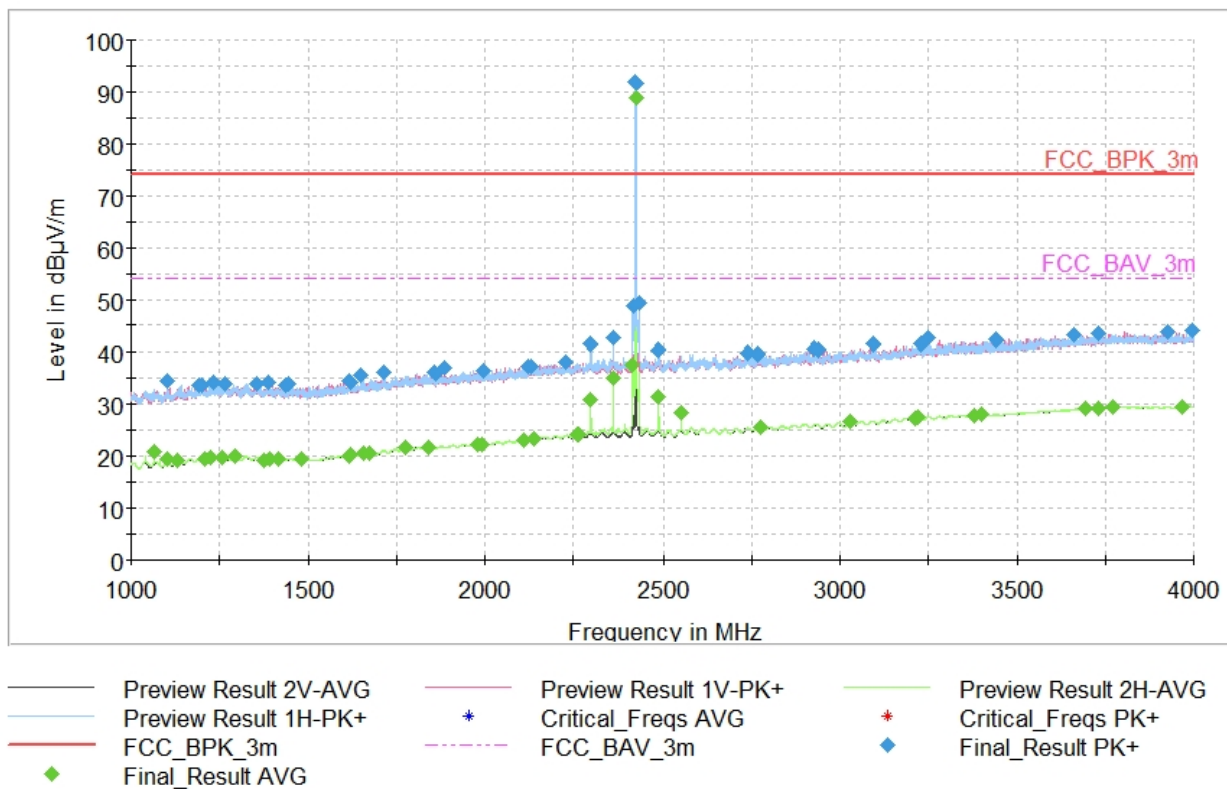
Radiated emission (1 – 4GHz)

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2414.80	48.77	74.00	25.2	1000.000	100.0	H	90.0
2422.40	91.95	*		1000.000	100.0	H	105.0
2423.60	91.60	*		1000.000	100.0	H	105.0

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2358.80	35.03	54.00	19.0	1000.000	100.0	H	90.0
2414.00	37.59	54.00	16.4	1000.000	100.0	H	105.0
2422.80	88.89	*		1000.000	100.0	H	105.0

*– intentional radiator.

Full Spectrum



Radiated Emission (1 – 4GHz)

Test result	Pass: Class B
Remarks	The peak at 2422.80MHz is caused by the BLE interface – intentional radiator

7.1.4. Radiated emission test (4 – 6GHz)

CONDITIONS	
The equipment was placed on a table at 80cm height, in a semi anechoic chamber with metal ground plane. The chamber complies with the ANSI C63.4/5 and CISPR 16. The radiated emission level was measured with a horn antenna at 3m distance. For this measurement, absorbers were placed between the antenna and the EUT. The maximum electromagnetic field has been measured by rotating the turntable in steps of 15 degrees and fixed antenna height at 1 meter, for both horizontal and vertical polarization. Range: 4 - 6 GHz The lower limit line is the average limit line.	
Test date: 2021-08-09	Climate: t= 21°C, h= 60%, l= 1017hPa
Test equipment: Receiver: R&S ESW 26, MN: 20180039 Preamp: LDN PAM3, MN: 20170072 Antenna: R&S HF906, MN: 2006054 Antenna mast: Maturo AM4.0, MN: 20112341 Turntable: Maturo TT2.0-2t, MN: 20112343 Controller: Maturo MCU, MN: 20112342 Cables: IR230 and IR433	

Hardware setup:	ESW26 RE 1-12G 3m_FCC
Level unit:	dBμV/m
TDF:	Correction Table (vertical): HF906-3m-PCC2 Correction Table (horizontal): HF906-3m-PCC2

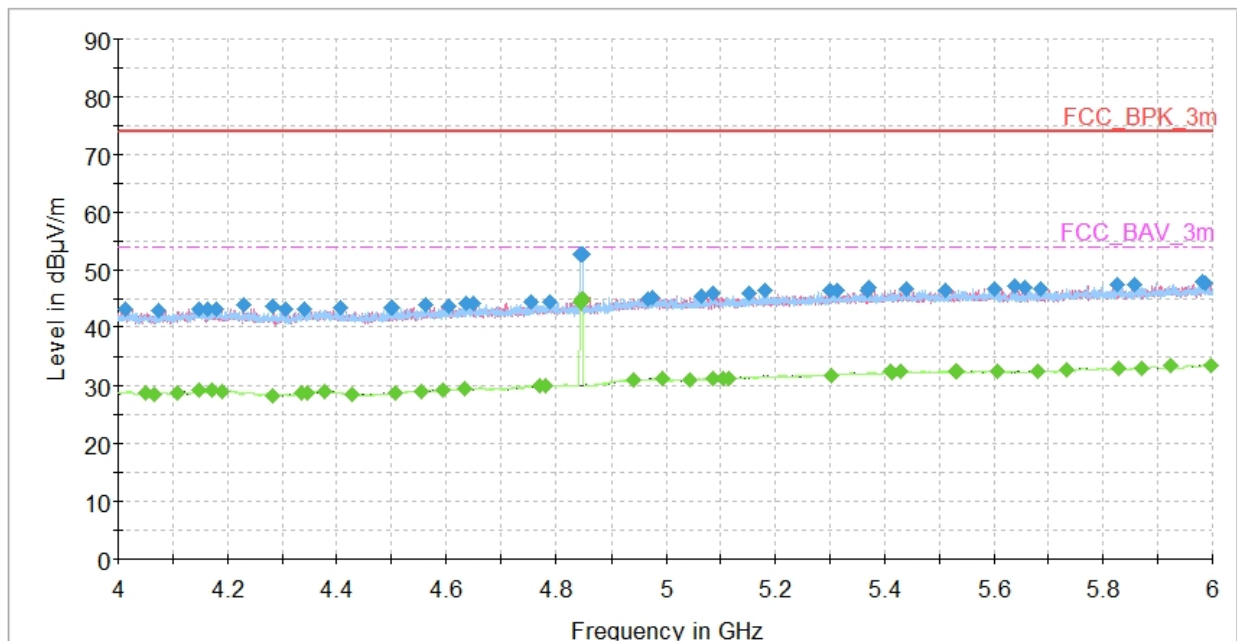
Subrange	Step Size	Detectors	IF BW
1 – 12.5 GHz	400 kHz	AV	1 MHz
	400 kHz	CAV	1 MHz

Radiated emission (4 – 6GHz)

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4844.80	52.74	74.00	21.3	1000.000	100.0	H	90.0
4846.80	52.55	74.00	21.5	1000.000	100.0	H	105.0

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4845.20	44.43	54.00	9.6	1000.000	100.0	H	90.0
4846.80	44.80	54.00	9.2	1000.000	100.0	H	90.0

Full Spectrum



Radiated Emission (4 – 6GHz)

Test result	Pass: Class B
Remarks	

7.1.5. Radiated emission test (6 – 12GHz)

CONDITIONS	
The equipment was placed on a table at 80cm height, in a semi anechoic chamber with metal ground plane. The chamber complies with the ANSI C63.4/5 and CISPR 16. The radiated emission level was measured with a horn antenna at 3m distance. For this measurement, absorbers were placed between the antenna and the EUT. The maximum electromagnetic field has been measured by rotating the turntable in steps of 15 degrees and fixed antenna height at 1 meter, for both horizontal and vertical polarization. Range: 6 - 12 GHz The lower limit line is the average limit line.	
Test date: 2021-08-10	Climate: t= 22°C, h= 61%, l= 1017hPa
Test equipment: Receiver: R&S ESW 26, MN: 20180039 Preamp: LDN PAM3, MN: 20170072 Antenna: R&S HF906, MN: 2006054 Antenna mast: Maturo AM4.0, MN: 20112341 Turntable: Maturo TT2.0-2t, MN: 20112343 Controller: Maturo MCU, MN: 20112342 Cables: IR230 and IR433	

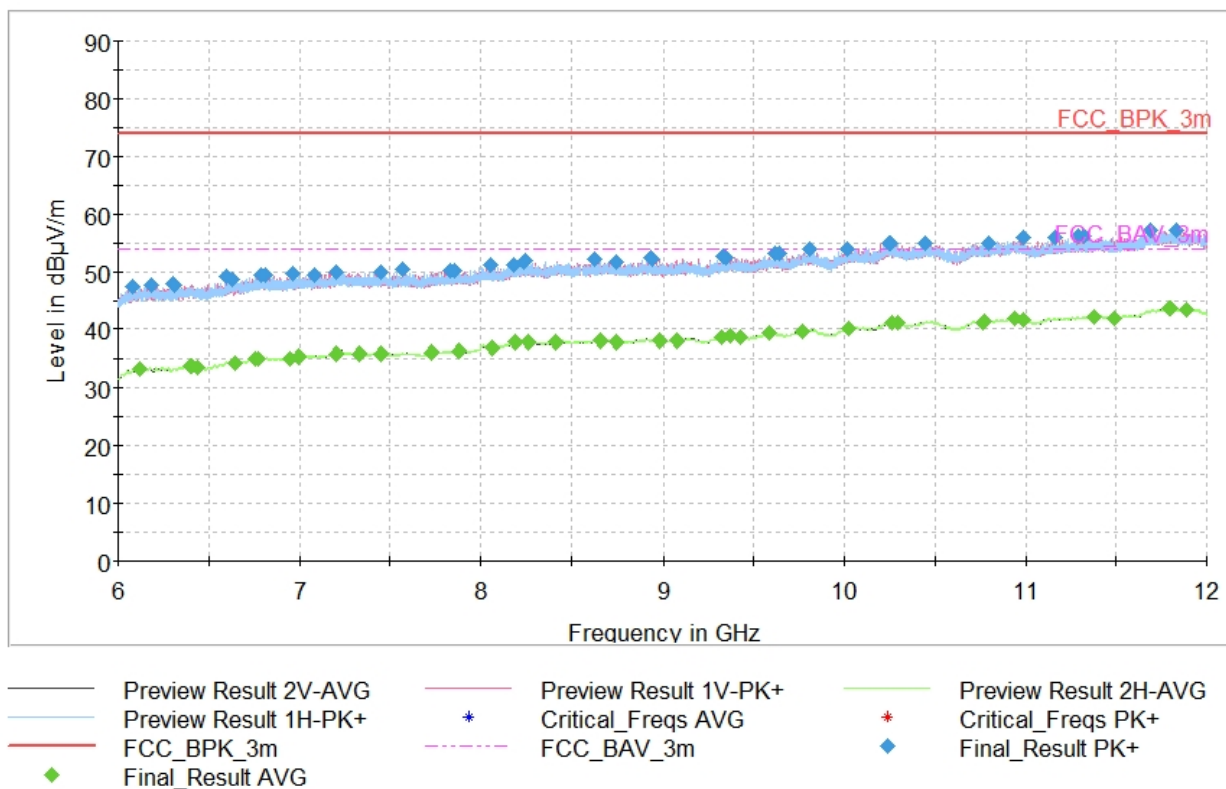
Hardware setup:	ESW26 RE 1-12G 3m_FCC
Level unit:	dBμV/m
TDF:	Correction Table (vertical): HF906-3m-PCC2 Correction Table (horizontal): HF906-3m-PCC2

Subrange	Step Size	Detectors	IF BW
1 – 12.5 GHz	400 kHz	AV	1 MHz
	400 kHz	CAV	1 MHz

Radiated emission (6 – 12GHz)

Remark : Noise floor

Full Spectrum



Radiated Emission (6 – 12GHz)

Test result	Pass: Class B
Remarks	

7.1.6. Radiated emission test (12 – 12.5GHz)

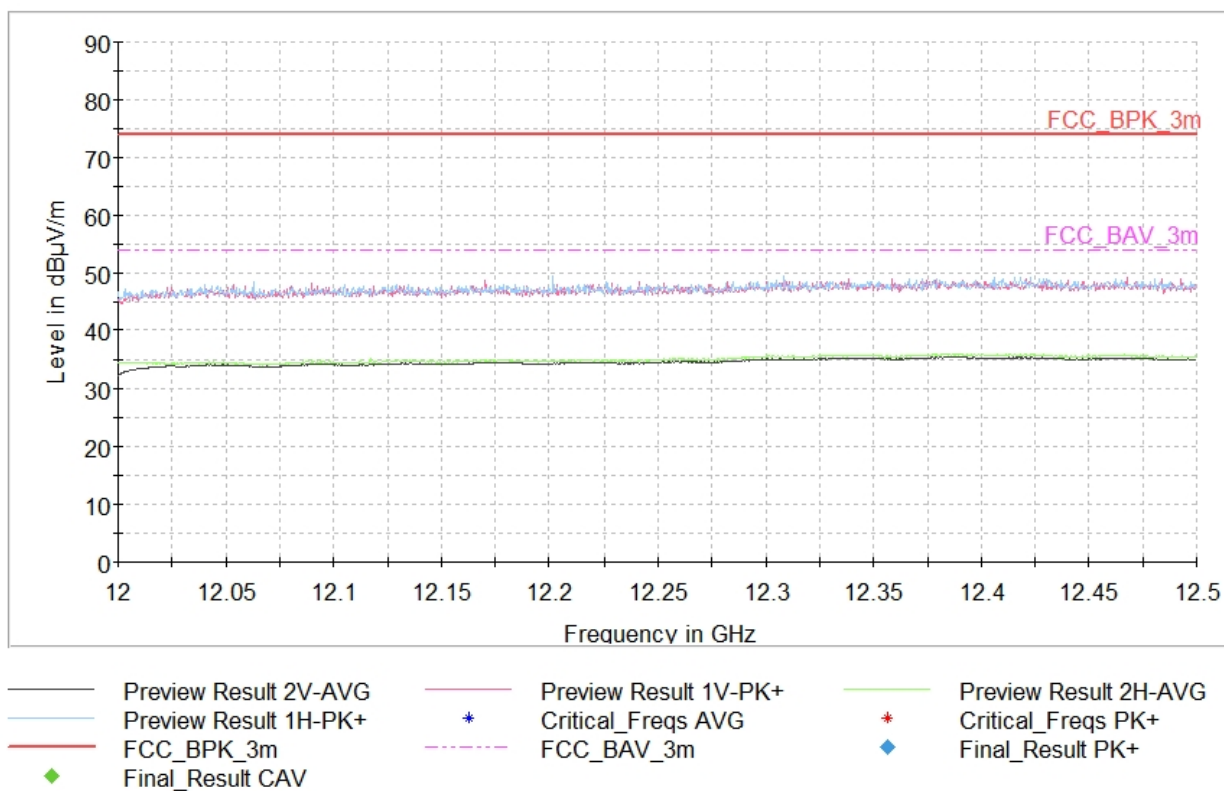
CONDITIONS	
The equipment was placed on a table at 80cm height, in a semi anechoic chamber with metal ground plane. The chamber complies with the ANSI C63.4/5 and CISPR 16. The radiated emission level was measured with a horn antenna at 3m distance. For this measurement, absorbers were placed between the antenna and the EUT. The maximum electromagnetic field has been measured by rotating the turntable in steps of 15 degrees and fixed antenna height at 1 meter, for both horizontal and vertical polarization. Range: 12 - 18 GHz The lower limit line is the average limit line.	
Test date: 2021-08-09	Climate: t= 22°C, h= 61%, l= 1017hPa
Test equipment: Receiver: R&S ESW26; MN: 20180039 Antenna: R&S HF906, MN: 2006054 Antenna mast: Maturo AM4.0, MN: 20112341 Turntable: Maturo TT2.0-2t, MN: 20112343 Controller: Maturo MCU, MN: 20112342 Preamp: LDN PAM4, MN: 475058 Cables: IR162, IR435	

Hardware Setup:	ESW26 RE 8-18G 3m
Receiver:	ESW26
Level Unit:	dB μ V/m
TDF:	Correction Table (vertical): HF906-3m-PCC2
	Correction Table (horizontal): HF906-3m-PCC2

Subrange	Step Size	Detectors	IF BW
8 GHz- 18 GHz	400kHz	PK+; CAV	1MHz

Radiated emission (12 – 12.5GHz)

Full Spectrum



Remark : Noise floor

Radiated Emission (12 – 12.5GHz)

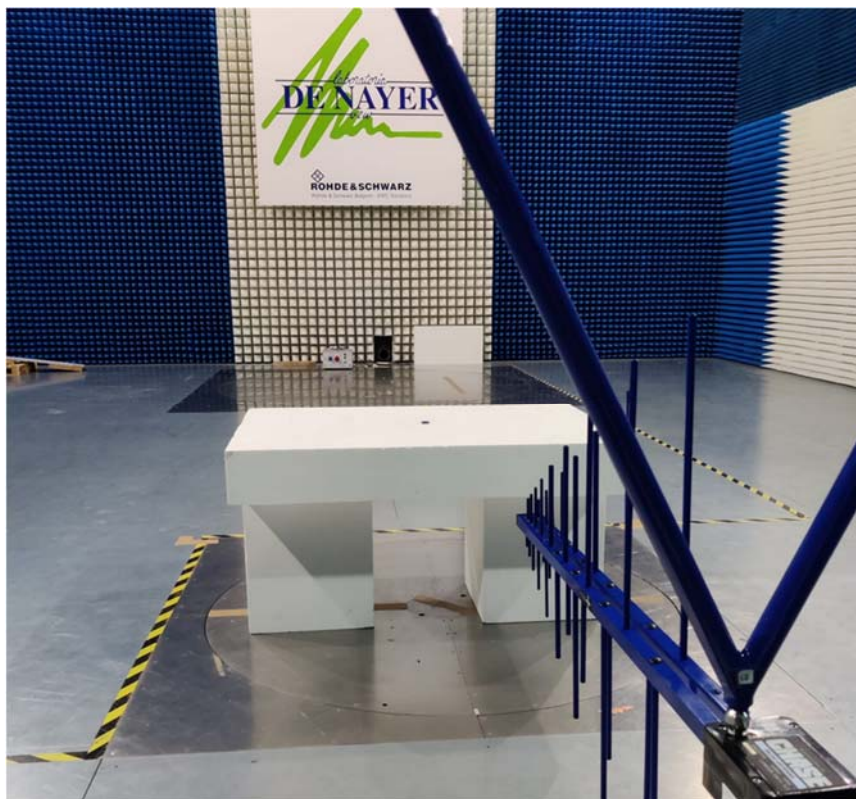
Test result	Pass: Class B
Remarks	

SECTION 8: MEASUREMENT UNCERTAINTIES

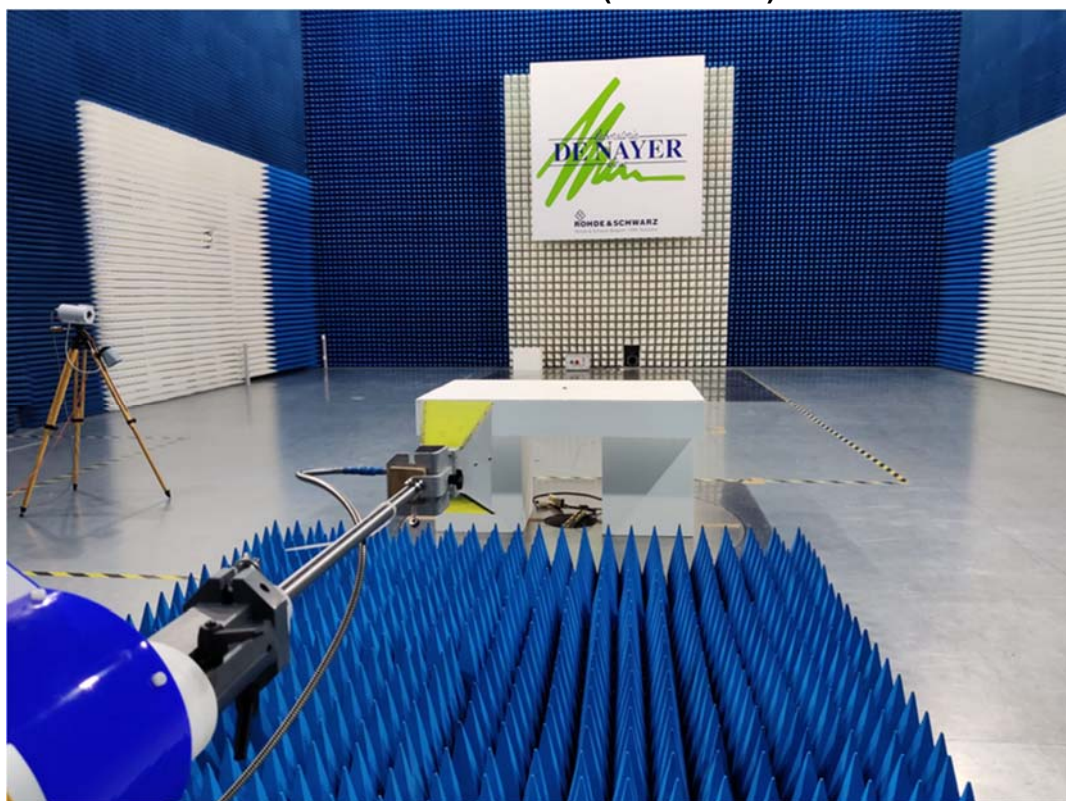
MEASUREMENT	FREQ. RANGE	SITE	APPLICABILITY	UNCERTAINTY
Radiated emission CISPR16 NIS81	30-200 MHz	SAR	3m	±5.8dB
	200-1000 MHz	SAR	3m	±5.8dB
	1-18 GHz	SAR	3m	±4.2dB
	18-40GHz	SAR	1m	±4.5dB
Conducted emission CISPR16 NIS81	150 kHz-30 MHz	-	LISN	±3.0dB

When a statement of conformity is made the laboratory does not take the measurement uncertainty into account

SECTION 9: PHOTOGRAPHS OF EQUIPMENT AND TEST SET-UP



Radiated Emission (30M-1GHz)



Radiated Emission (1-12.5GHz)

SECTION 10: ADDITIONAL INFORMATION GIVEN BY THE CUSTOMER

Applicant's role during testing
None

EUT information given by the customer: none

SECTION 11: MODIFICATIONS OF EUT

Modification
No modifications.

SECTION 12: HISTORY OF THE TEST REPORT

Edition	Date	Adjustment (reason for up-grade)
PCC-EMC-5476_ed0	2021-10-21	Draft
PCC-EMC-5476_ed1	2021-10-28	original
PCC-EMC-5476_ed2	2021-11-09	adding digital clock frequency
PCC-EMC-5476_ed3	2022-03-15	adding operating mode

SECTION 13: ACCREDITATION CERTIFICATE



Organisme belge d'Accréditation
Belgische Accreditatieinstelling
Belgische Akkreditierungsstelle
Belgian Accreditation Body

EA MLA Signatory

Accreditation Certificate No. 041-TEST

In compliance with the provisions of the Royal Decree of 31 January 2006 setting up BELAC, the Accreditation Board hereby declares to have granted accreditation conform the requirements of the standard EN ISO/IEC 17025:2017 to:

Laboratoria De Nayer vzw
Jan Pieter de Nayerlaan 9
2860 Sint-Katelijne-Waver

The body demonstrated the competence to perform the activities in the activity sites, as described in the scope of accreditation 041-TEST which is an integral part of the present certificate.

The current version of the scope of accreditation is available at www.belac.be.

This certificate remains valid as long as the body continues to meet the accreditation conditions.

The Chair of the Accreditation Board BELAC,



Maureen LOGGHE

Version : 8

Validity period : 2020-10-22 - 2024-01-07

Original version of this certificate is in Dutch.

.be

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BELAC 6-319 R0-2020

FCC:

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

To: Filip Nauwelaerts
Laboratoria De Nayer
f.nauwelaerts@labodenayer.be
From: George Tannahill
George.Tannahill@fcc.gov
Date: April 03, 2020

Test Firm Name: Laboratoria De Nayer
Designation Number: BE0002
Test Firm Registration Number: 963303

Subject: **FCC recognition of accreditation for Laboratoria De Nayer**

We have been notified by SPF Economie, PME, Classes moyennes et Energie that Laboratoria De Nayer has been accredited as a testing laboratory.

At this time Laboratoria De Nayer is hereby recognized to perform compliance testing on equipment subject to the Commission's Declaration Of Conformity (DOC) and Certification rules for the following scope(s):

Unintentional Radiators - FCC Part15, Subpart B
Industrial, Scientific, and Medical Equipment - FCC Part 18
Intentional Radiators - FCC Part 15 Subpart C

This recognition will expire upon expiration of the accreditation or notification of withdrawal of Commission's recognition.

Any questions about this recognition should be submitted as an inquiry to the FCC Knowledge Database at www.fcc.gov/kdb.