DEKRA

- The RvA is a signatory to the EA MLA.
- The RvA is a signatory to the ILAC MRA.
- The RvA is a signatory to the IAF MLA.
- FCC Registration Number: NL0002 / 375449

Assessment report No:

2292128.0502-RSM

ASSESSMENT REPORT
RF EXPSOURE - MPE

(*)	Identification of item to be assessed	Toplighting Force gen 2.0
(*)	Trademark	Philips
(*)	Model and /or type reference	TLF20 4160 3.6 RWLB 277-400V WC3 QB SP
(*)	Features, other identification of the product	Bluetooth LE, ZigBee FCC ID: 2AF2N-TLF207820V1 IC: 20659-TLF207820V1
(*)	Derived model(s)	TLF20 5000 3.6 RWLB 400V WC2 QB MP
(*)	Applicant´s name / address	Signify Netherlands N.V. HTC7 , 5656 AE Eindhoven Netherlands
	Assessment method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. FCC 47 CFR Part 1.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared. FCC 47 CFR Part 1.1310: Radiofrequency radiation exposure limits.
	Verdict Summary	IN COMPLIANCE
	Assessment performed by (name / position & signature)	Valtteri Lehtisalo Technical Professional EMC&Wireless Supervising by Jose Carlos Luque Technical Professional EMC&Wireless
	Approved by (name / position & signature)	Sedat Eser Operational Manager EMC
	Date of issue	2024-12-18
	Report template No	TRF_RSM_MPE_FCC2.1091_dev_R2.0 (*) "Data provided by the applicant"

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

1. This report is only referred to the item that has undergone the assessment.

2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.

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POSSIBLE ASSESSMENT CASE VERDICTS

Assessment case does not apply to test object	N/A
Assessment object does meet requirement	P (Pass) / PASS
Assessment object does not meet requirement	F (Fail) / FAIL

DEFINITION OF SYMBOLS USED IN THIS ASSESSMENT REPORT

☒ Indicates that the listed condition, standard or equipment is applicable for this report/Assessment/EUT.				
☐ Indicates that the listed condition, standard or equipment is not applicable for this report/Assessment/EUT.				
Decimal separator used in this report	☒	Comma (,)	☐	Point (.)

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

ASK	:	Amplitude Shift Keying
BER	:	Bit Error Rate
ERP/e.r.p.	:	effective radiated power
EMC	:	ElectroMagnetic Compatibility
EMF/emf	:	ElectroMagnetic Field
ERC	:	European Radiocommunications Committee
EUT / DUT	:	Equipment Under Test / Device Under Test
HF	:	High Frequency (range)
ISM	:	Industrial, Scientific and Medical
ITU-T	:	ITU-Telecommunication sector
LF	:	Low Frequency
NFC	:	Near Field Communication
OATS	:	Open Area Test Site
OBW	:	Occupied BandWidth
OFR	:	Operating Frequency Range
R&TTE	:	Radio and Telecommunications Terminal Equipment
RF	:	Radio Frequency
RFID	:	Radio Frequency Identification
RMS	:	Root Mean Square
RX	:	Receiver
SND	:	Signal, Noise and Distortion
SND/ND	:	Signal, Noise and Distortion over Noise and Distortion
SRD	:	Short Range Device
TR	:	Technical Report
TX	:	Transmitter
MS		Mobile Station

DATA PROVIDED BY THE APPLICANT

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item to be assessed", "Trademark", "Model and/or type reference", Features and "Derived model(s)").
2. Maximum output power and maximum antenna gain information.
3. Information provided by the client in the form AFRM_RF_Expsoure_Rev-1.0.docx.
4. Identity declaration (Letter of similarity). See below.

DEKRA Certification B.V. declines any responsibility with respect to the information provided by the applicant and that may affect the validity of results.

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DEKRA

Signify

Dekra
To: Jose Carlos Luque
Meander 1051
825 MJ Arnhem
The Netherlands

Subject: Letter of similarity   Date: 11/12/2024

With this writing we confirm that all wireless versions of the TLF20 portfolio (indicated with
WC2 or WC3 in the product name) use the same radio module, with the same settings and RF
paths.
As example the 2 luminaires (TLF20 4160 3.6 RWLB 277-400V WC3 QB and the TLF20 5000 3.6
RWLB 400V WC2 QB) which have been tested by Dekra, comply with the above statement.
We also confirm that both tested products make use of the same controlgear.

Kind Regards,

Tom Ceulemans

11/12/'24

Insert appropriate legal text here

According to the manufacturer, during its normal use, the separation distance between the device and the body of nearby users will be greater than 20 cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

The equipment specifications declared by the manufacturer for each supported technology and band are:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Maximum Conducted Output Power (dBm)	Antenna peak gain (dBi)	Cable loss (dBi)	Maximum E.R.P. (dBm)	Maximum E.R.P. (mW)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
BTLE	2.4 GHz	2400 - 2483,5	10,00	-6,00	0,25	1,60	1,45	3,75	2,37
ZigBee	2.4 GHz	2400 - 2483,5	10,00	-6,00	0,25	1,60	1,45	3,75	2,37

Table: Equipment specifications

DOCUMENT HISTORY

Report nr.	Date	Description
2292128.0502-RSM	2024-12-18	First release.

CONCLUSION, REMARKS AND COMMENTS

This is an assessment report. It encloses the assessment results given at chapter 2 and 3. Refer to this chapter for further details.

The equipment under test (EUT) does meet the requirements of the applicable standard(s).

1.   GENERAL INFORMATION

Description of the item ....:	Toplighting Force gen 2.0
Model / Type number ....:	TLF20 4160 3.6 RWLB 277-400V WC3 QB SP
	TLF20 5000 3.6 RWLB 400V WC2 QB MP
Serial number ....:	A164.135546477.0027 / A980.136658296.0016
Trademark ....:	Philips
Manufacturer.............................:	Signify Netherlands B.V.

Technology ....:	BLE Bluetooth 4.2 (5.1 compliant)
Operating frequency range(s) – Tx :	2.402 - 2.480 GHz
Operating frequency range(s) – Rx :	2.402 - 2.480 GHz
Type of Modulation ....:	Non-FHSS
Number of channel.......................:	11 (0-39)
Antenna type ....:	Integrated
Antenna gain ....:	-6dBi

Technology ....:	Zigbee 3.0
Operating frequency range(s) – Tx :	2.405 - 2.480 GHz
Operating frequency range(s) – Rx :	2.405 - 2.480 GHz
Type of Modulation ....:	Non-FHSS
Number of channel.......................:	6
Antenna type ....:	Integrated
Antenna gain ....:	-6dBi

Model: TLF20 4160 3.6 RWLB 277-400V WC3 QB SP

Rated power supply ....:	Voltage and Frequency		Power connection type				
			L1	L2	L3	N	PE
	☒	AC: 277V, 50Hz/60Hz	☒	☐	☐	☒	☒
	☒	AC 347V, 60Hz	☒	☒	☐	☐	☒
	☒	AC 400V, 50/ 60 Hz	☒	☒	☐	☐	☒
	☒	DC 5V, to radio device					
Rated Power ....:	1170W						
Clock frequencies ....:	<100 kHz: Switching convertors						
	☒ 16 and 32 MHz part Micro						
Other parameters.......................:	BLE Bluetooth 4.2 (5.1 compliant) + Zigbee 3.0.						
Software version ....:	1.3.2 FW Radio board						
Hardware version.......................:	Integrated RF module V1						
Dimensions in mm (W x H x D)...:	25 x 16 x 2.5						
Mounting position.......................:	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Via brackets in green house environment					

Model: TLF20 5000 3.6 RWLB 400V WC2 QB MP

Rated power supply ....:	Voltage and Frequency		Power connection type				
			L1	L2	L3	N	PE
	☒	AC: 400 V, 50/60Hz	☒	☒	☐	☐	☒
	☒	DC 5V, to radio device					
Rated Power ....:	1408W						

No	Documents as provided by the applicant - Description	File name	Issue date
1	General information form	Application form TLF20 4160 RWLB	2024-10-28
2	RF Exposure Assessment application form	Application form - RF_Exposure Assessment v1.0	2024-09-17
3	General information form	Application form TLF20 5000 RWLB	2024-11-19

2. **RF Exposure Assessment result and verdict**

RF Exposure <u>Exemption</u> evaluation:

The computed value(s) are below the exemption limit(s), so these modes meet the requirements stated in FCC 47 CFR Part 1.1307.

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Maximum Conducted Power (mW)	§1.1307(b)(3).i.(A) Exposure Limit (mW)	Verdict for exemption § 1.1307(b)(3).i
BTLE	2.4 GHz	2400 - 2483,5	20,00	10	1,00	MPE requiered
ZigBee	2.4 GHz	2400 - 2483,5	20,00	10	1,00	MPE requiered

Table: FCC Exemption Evaluation Results

The device fails to comply with applicable §1.1307(b)(3).i.(A) exemption limits, so Maximum Permissible Exposure (MPE) evaluation is necessary to demonstrate compliance.

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Maximum E.R.P. (mW)	§1.1307(b)(3).i.(C) Exposure Limit (mW)	Verdict for exemption § 1.1307(b)(3).i
BTLE	2.4 GHz	2400 - 2483,5	20,00	1,45	768,00	Pass
ZigBee	2.4 GHz	2400 - 2483,5	20,00	1,45	768,00	Pass

Table: FCC Exemption Evaluation Results

The computed value(s) are below the limit(s), so these modes meet the requirements stated in FCC 47 CFR Part 1.1310.

3. ANNEX 1 - FCC RF Exposure Information

FCC RF Exposure determination of exemption

According to FCC 47 CFR §1.1307 (b)(3) Determination of exemption:

(i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2), a single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20\,cm}(d/20\text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20\,cm} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\,cm} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

TABLE 1 TO §1.1307(b)(3)(i)(C)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 $R^2 f$.
1,500-100,000	19.2R^2.

(ii) For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for Pth, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

Pi = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

Pth,i = the exemption threshold power (Pth) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

ERPj = the ERP of fixed, mobile, or portable RF source j.

ERPth,j = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

Evaluated,k = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit,k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.

FCC RF Exposure evaluation

Limits for Maximum Permissible Exposure (MPE) for RF sources are defined in FCC 47 CFR "§1.1310 Radiation Exposure limits, paragraph (e)":

TABLE 1 TO §1.1310(E)(1)—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f^2)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f^2)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

Power density: $S[mW/cm^2] = \dfrac{P_{E.I.R.P.}[mW]}{4\Pi R[cm]^2}$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

$P_{E.I.R.P.}$ = P$_T$ + G$_T$ - L$_C$

Where:
P$_T$= transmitter time-averaged output power (including Duty Cycle and tune-up tolerance, if applicable)
G$_T$= gain of the transmitting antenna
L$_C$ = signal attenuation in the connecting cable between the transmitter and the antenna if applicable