



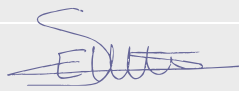
- The RvA is a signatory to the EA MLA.
- The RvA is a signatory to the ILAC MRA.
- The RvA is a signatory to the IAF MLA.
- FCC Registration Number: NL0002 / 375449
- ISED CABid: NL0003 / Company number: 27051

Test report No:
2292128.0501-RSM

Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Toplighting Force gen 2.0
(*) Trademark	Philips
(*) Model and /or type reference	TLF20 4160 3.6 RWLB 277-400V WC3 QB SP
(*) Features	Bluetooth LE, ZigBee
(*) Derived model(s)	TLF20 5000 3.6 RWLB 400V WC2 QB MP
Other identification of the product	FCC ID: 2AF2N-TLF207820V1 IC: 20659-TLF207820V1
(*) Applicant's name / address	Signify Netherlands N.V. HTC7 , 5656 AE Eindhoven Netherlands
Test method requested, standard	USA FCC Part 15.247 (10-1-23) Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-23) Edition: Radiated emission limits; general requirements. Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. CANADA RSS-247 Issue 3 (August 2023). CANADA RSS-Gen Issue 5 Amendment 1 (March 2019) and Amendment 2 (February 2021). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Verdict Summary	IN COMPLIANCE
Tested by (name / position & signature)	Valtteri Lehtisalo Technical Professional EMC&Wireless 
Approved by (name / position & signature)	Supervising by Jose Carlos Luque Technical Professional EMC&Wireless Sedat Eser Technical Professional EMC&Wireless 
Date of issue	2024-12-18
Report template No	TRF_RSM_FCC R1.0 (*) "Data provided by the applicant"

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COMPETENCES AND GUARANTEES

The 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.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document AM#2224. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%. Refer to the Annex 1 for further information.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%
Atmospheric pressure	86 kPa – 106 kPa

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

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

DEFINITION OF SYMBOLS USED IN THIS TEST REPORT

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

ABBREVIATIONS

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

EUT	: Equipment Under Test
QP	: Quasi-Peak
PK	: Peak
AV	: Average
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
RBW	: Resolution Bandwidth
VBW	: Video Bandwidth
Tx	: Transmitter
Rx	: Receiver
N/A	: Not Applicable
N/M	: Not Measured
RGP	: Reference Ground Plane
TX	: Transmission
RX	: Reception
BLE	: Bluetooth Low Energy

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 tested", "Trademark", "Model and/or type reference tested", Features and "Derived model(s)").
2. Derived model partial tested. These models have been declared by the applicant as being the same as the model under test.
3. 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.



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

DOCUMENT HISTORY

Report nr.	Date	Description
2292128.0501-RSM	2024-12-18	First release.

CONCLUSION, REMARKS AND COMMENTS

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

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

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 BV
Address	HTC7 , 5656 AE Eindhoven, Netherlands

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						

RF interface 1:

Technology	BLE Bluetooth 4.2 (5.1 compliant)
Frequency band / range(s)	2.402 - 2.480 GHz
Maximum chipset/conducted output power.....	10 dBm
Type of Modulation(s)	Non-FHSS
Number of channel.....	11 (0-39)
Channel spacing	2 MHz

Channel bandwidth	BLE 1Mbit PHY:1MHz/ BLE 2Mbit PHY:2MHz
Type of antenna	Integrated
Antenna gain	- 6dBi

RF interface 2:

Technology	Zigbee 3.0 (802.15.4)
Frequency band / range(s)	2.405 -2.480 GHz
Conducted output power	10 dBm
Type of Modulation(s)	Non-FHSS
Number of channel.....	6
Channel spacing	5 MHz
Channel bandwidth	2.4 MHz
Type of antenna.....	Integrated
Antenna gain	-6 dBi

Simultaneous transmission:

RF Interfaces transmitting simultaneously	N/A
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Distance between nearby persons and each device antenna (only required for RF Exposure/SAR if applies):

Distance in cm	3-5 meter
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Intended use of the Equipment Under Test (EUT)

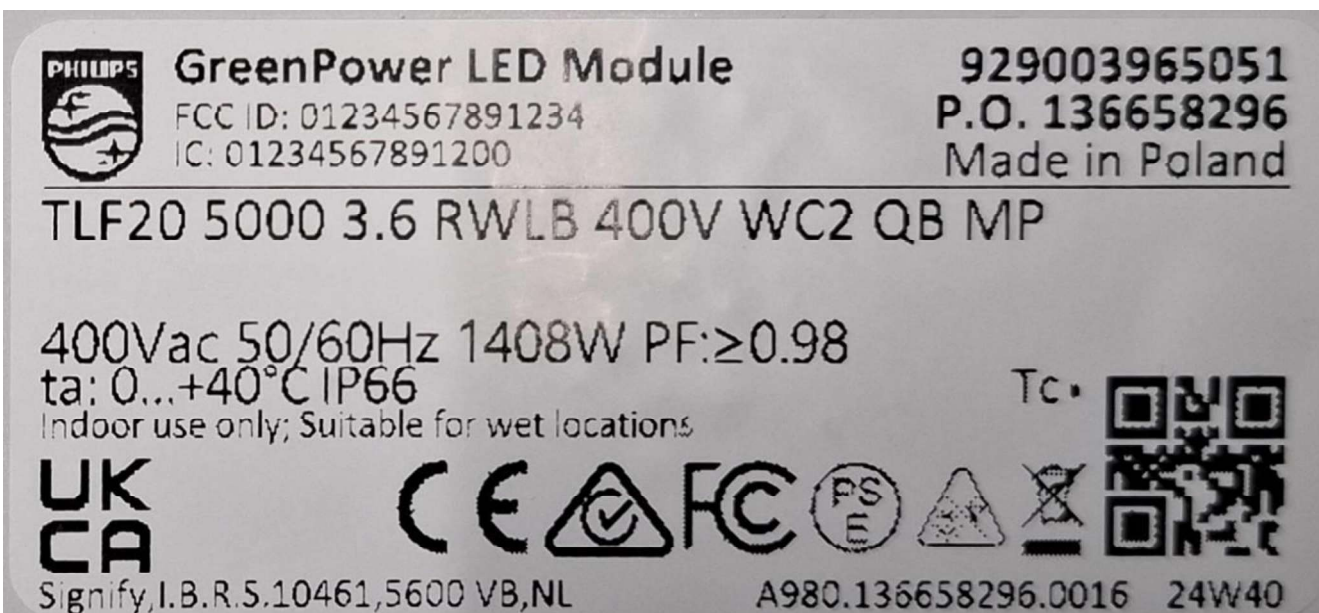
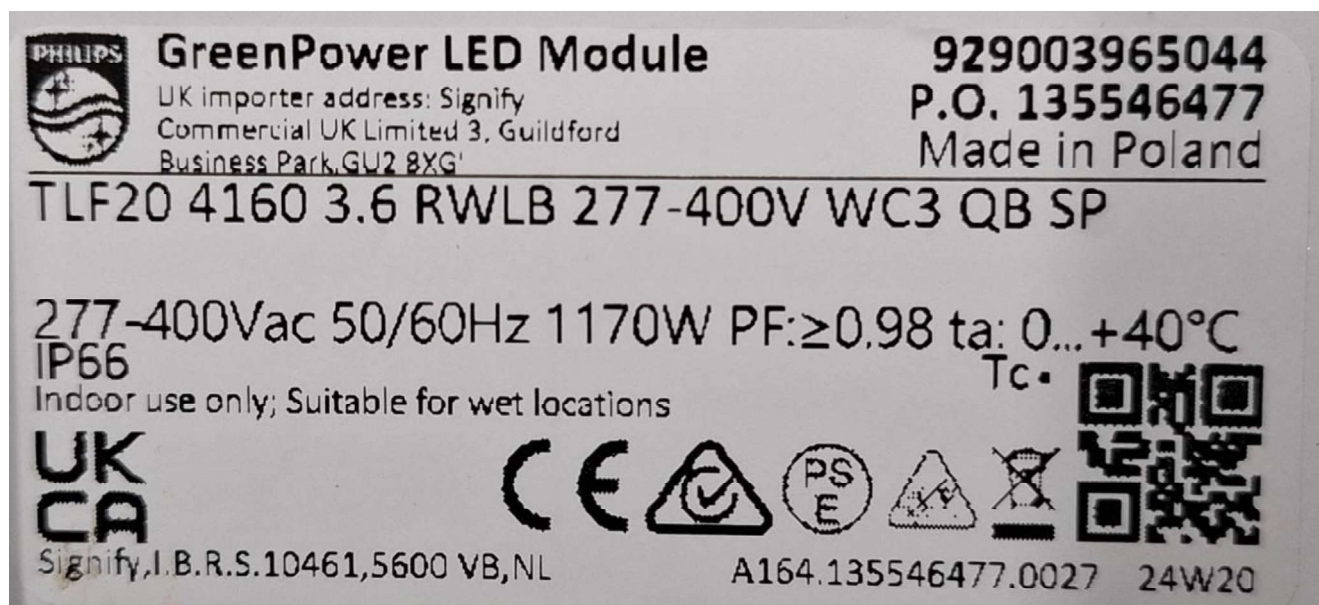
The new TLF2.0 range with integrated RF module V1.0 is to control light and light recipes in a green house environment. Once commissioned via BLE, the communication to a group of luminaires is done via Zigbee.

No	Module/parts of test item	Type	Manufacturer
1	Alpha driver (3 Channel)	Aster 1	Signify
2	LED Board	TLF2.0	Signify
3	Integrated RF Module V1	V1	Signify

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	General information form	Application form TLF20 5000 RWLB	2024-11-19

Modifications to the test item during testing	☒	N/A	☐	
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Copy of marking plate:



1.2 Test data

Test Location	DEKRA Certification B.V., The Netherlands
Date (start)	2024-10-03
Date (finish)	2024-11-21

2 DESCRIPTION OF TEST SETUP

2.1 Sample(s) used for tests

During the tests the following sample(s) has(have) been used.

Sample	Logistics number	Model number	Serial number	Remark(s) / Changes
01	105042 / 1-0	TLF20 4160 3.6 RWLB 277-400V WC3 QB SP	A164.135546477.0027	See 1
02	105042 / 1-4	Integrated RF Module V1	929003965044	See 2
03	107043 / 1-2	TLF20 5000 3.6 RWLB 400V WC2 QB MP	A980.136658296.0016	See 3
<u>Supplementary information:</u> 1. Radiated Sample. 2. Conducted Sample. 3. Radiated Sample.				

2.2 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

Operating mode	Description of the operating mode	Used for testing
OM#01	EUT ON. BLE 1Mbit GFSK TX continuous modulated carrier at 2402MHz, 2440MHz or 2480MHz.	☒
OM#02	EUT ON. ZigBee 250kBit OQPSK TX continuous modulated carrier at 2405MHz, 2440MHz or 2480MHz.	☒
<u>Supplemental information:</u> ---		

2.3 Port(s) of the EUT

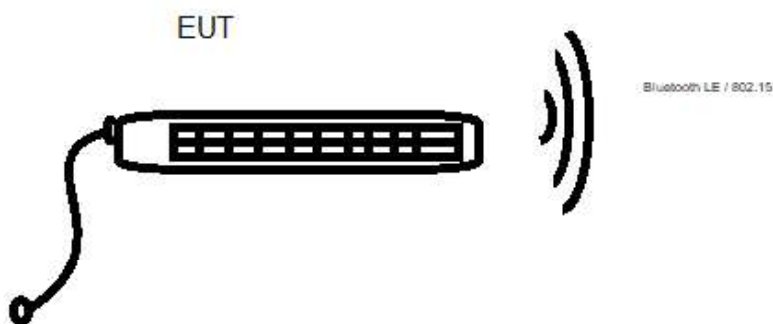
Port name and description	Connected to / Termination	Cable	
		Specified cable length [m]	Shielded [Y/N]
Power port	AC mains	60cm	N
<u>Supplemental information:</u> --			

2.4 Support / Auxiliary equipment / unit / software for the EUT

Auxiliary equipment / unit / software	Type / Version	Manufacturer	Supplied by
Laptop	5420	DELL	DEKRA B.V.
Evaluation kit for conducted tests	W7230F1	Silicon Labs	Signify Netherlands N.V.
<u>Supplemental information:</u> --			

2.5 Test Configuration / Block diagram used for tests

A laptop was connected to the EUT via Bluetooth to configure the BLE / ZigBee transmissions. The EUT was set to continuously transmit at maximum output power with the different modes and channels. After setting up the EUT, the Bluetooth connection to the laptop was disconnected.



2.6 Test Conditions

	Tn	Tmin	Tmax
Temperature (°C)	+15 to +35	N/A	N/A

2.7 Radiated Measurements

All radiated tests were performed in a semi-anechoic chamber. The used measurement antennas are:

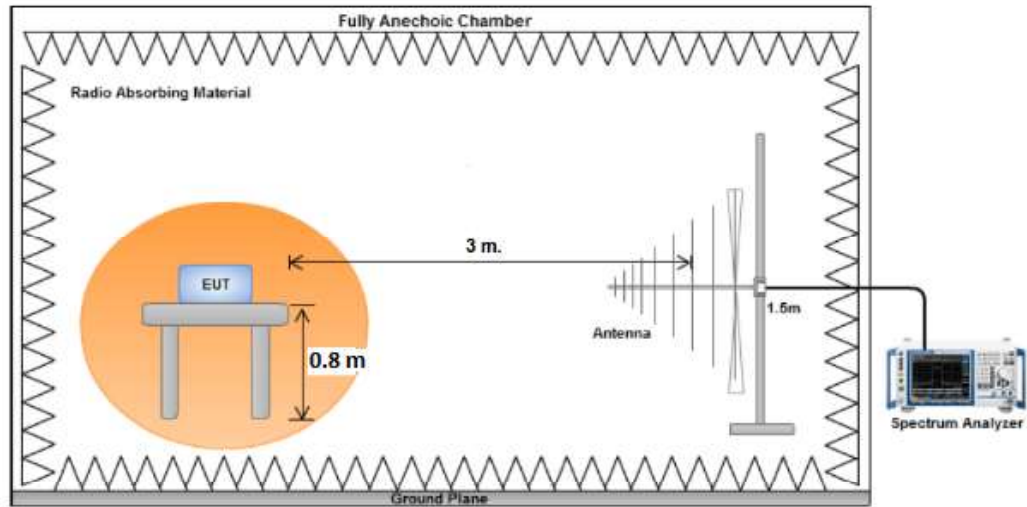
- Ultralog antenna situated at a distance of 3 m for the range between 30 MHz to 1000 MHz.
- Double ridge horn antenna situated at a distance of 3 m for the frequency range of 1 to 18 GHz.
- Double ridge horn antenna situated at a distance of 1 m for the frequency range of 18 to 26 GHz.

The EUT was set up on a non-conductive platform at a height of 0.8m for measurements below 1 GHz and 1.5m for over 1 GHz, and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission. The antenna is used in TILT mode for measurements above 1 GHz.

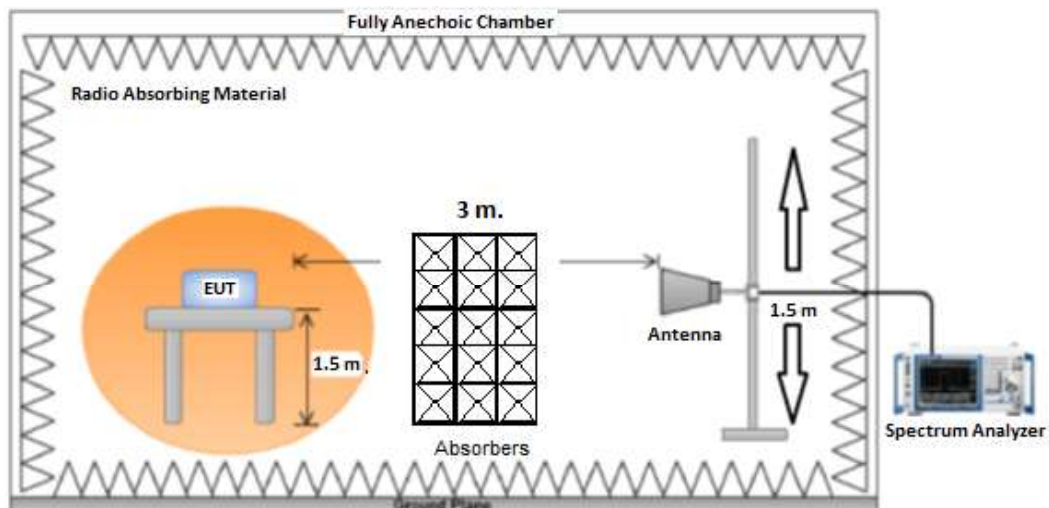
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

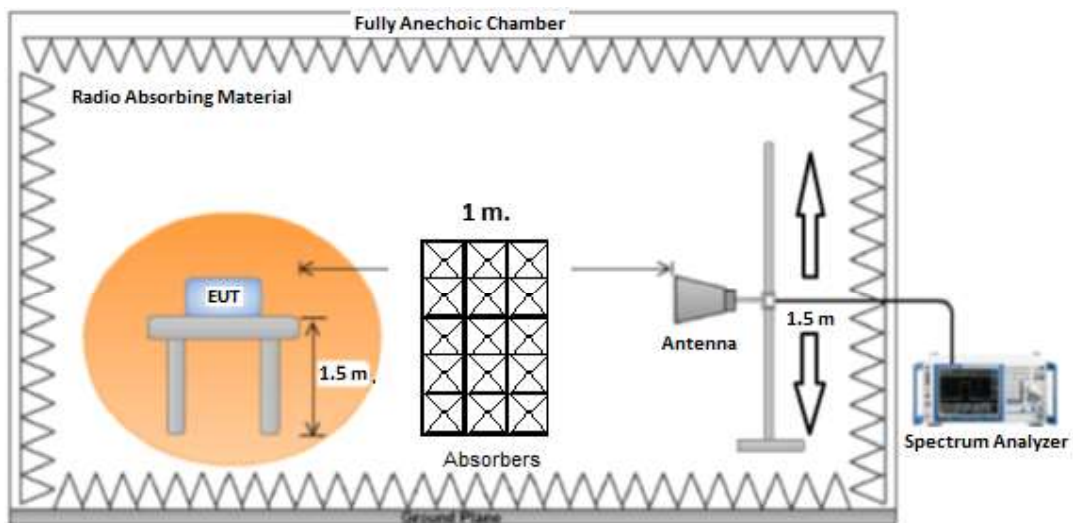
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 18 GHz (tilting of the antenna is not shown):



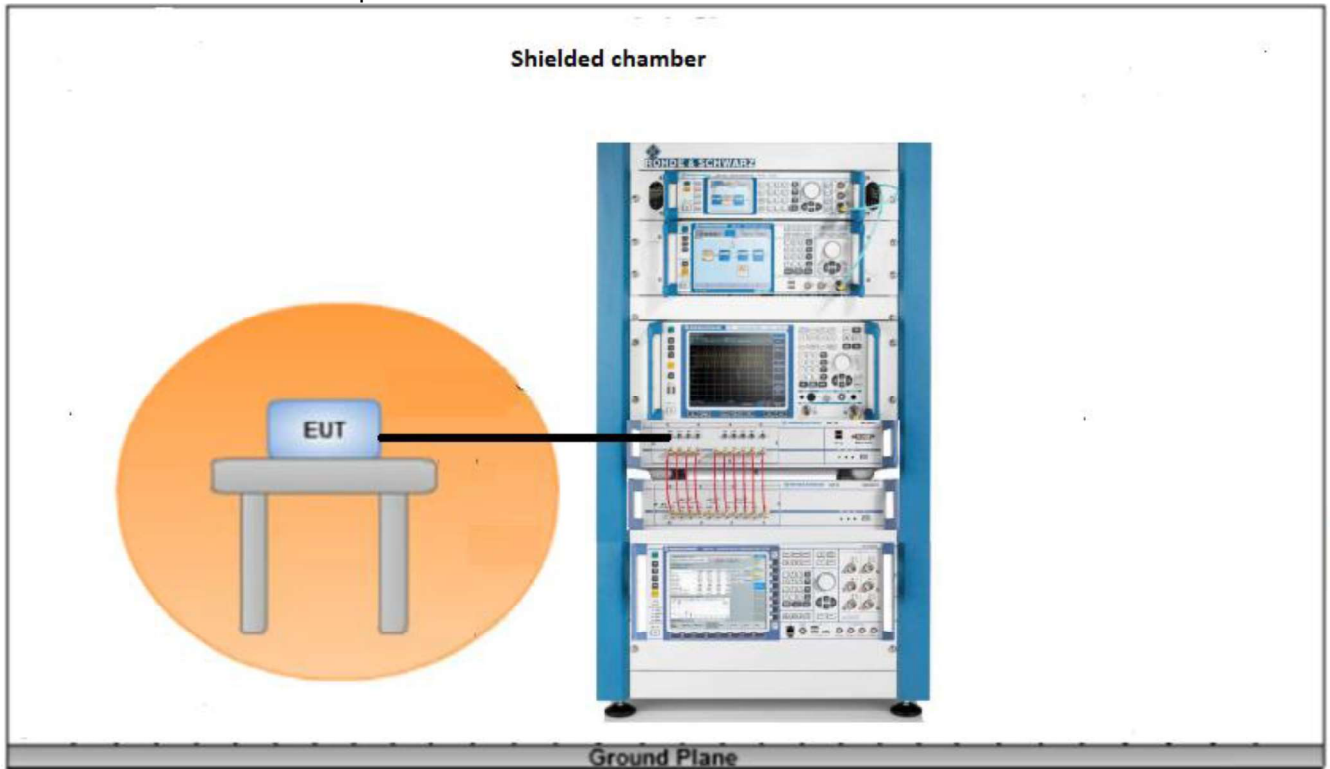
Radiated measurements setup from 18 GHz to 26 GHz (tilting of the antenna is not shown):



2.8 Conducted Measurements

The EUT was connected to the Evaluation kit which was powered via USB. The EUT was set up in a shielded room and it was connected to the spectrum analyzer using a low loss RF cable. The reading of the spectrum analyzer was corrected with the cable loss.

Conducted measurement setup:



3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC Rules & Regulations 47 CFR Chapter I - Part 15 Subpart C Clause 15.247	2023-01	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
RSS-247 Issue 3	2023-08	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

3.2 Overview of results – BLE 4.2 (GFSK 1Mbps)

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

Test case	Standard	Verdict	Remarks
Occupied Bandwidth	FCC 2.1049 / RSS-Gen Clause 6.7	P	-
6 dB Bandwidth	FCC 15.247 (a) (2) / RSS-247 Clause 5.2 (a)	P	-
Maximum Output Power and Antenna Gain	FCC 15.247 (b) / RSS-247 Clause 5.4 (d)	P	-
Band-edge Emissions Compliance	FCC 15.247 (d) / RSS-247 Clause 5.5	P	-
Power Spectral Density	FCC 15.247 (e) / RSS-247 Clause 5.2 (b)	P	-
Emission Limitations Radiated (Transmitter)	FCC 15.247 (d) / RSS-247 Clause 5.5	P	-
Supplementary information: --			

TLF20 5000 3.6 RWLB 400V WC2 QB MP:

Test case	Standard	Verdict	Remarks
Occupied Bandwidth	FCC 2.1049 / RSS-Gen Clause 6.7	N/M	See 1
6 dB Bandwidth	FCC 15.247 (a) (2) / RSS-247 Clause 5.2 (a)	N/M	See 1
Maximum Output Power and Antenna Gain	FCC 15.247 (b) / RSS-247 Clause 5.4 (d)	N/M	See 1
Band-edge Emissions Compliance	FCC 15.247 (d) / RSS-247 Clause 5.5	N/M	See 1
Power Spectral Density	FCC 15.247 (e) / RSS-247 Clause 5.2 (b)	N/M	See 1
Emission Limitations Radiated (Transmitter)	FCC 15.247 (d) / RSS-247 Clause 5.5	P (*)	See 2
<u>Supplementary information:</u> 1. These measurements can be leverage of the model TLF20 4160 3.6 RWLB 277-400V WC3 QB SP. 2. Only the worst case was measured.			

3.3 Overview of results – ZigBee**TLF20 5000 3.6 RWLB 400V WC3 QB SP:**

Test case	Standard	Verdict	Remarks
Occupied Bandwidth	FCC 2.1049 / RSS-Gen Clause 6.7	P	-
6 dB Bandwidth	FCC 15.247 (a) (2) / RSS-247 Clause 5.2 (a)	P	-
Maximum Output Power and Antenna Gain	FCC 15.247 (b) / RSS-247 Clause 5.4 (d)	P	-
Band-edge Emissions Compliance	FCC 15.247 (d) / RSS-247 Clause 5.5	P	-
Power Spectral Density	FCC 15.247 (e) / RSS-247 Clause 5.2 (b)	P	-
Emission Limitations Radiated (Transmitter)	FCC 15.247 (d) / RSS-247 Clause 5.5	P	-
<u>Supplementary information:</u> --			

TLF20 5000 3.6 RWLB 400V WC2 QB MP:

Test case	Standard	Verdict	Remarks
Occupied Bandwidth	FCC 2.1049 / RSS-Gen Clause 6.7	N/M	See 1
6 dB Bandwidth	FCC 15.247 (a) (2) / RSS-247 Clause 5.2 (a)	N/M	See 1
Maximum Output Power and Antenna Gain	FCC 15.247 (b) / RSS-247 Clause 5.4 (d)	N/M	See 1
Band-edge Emissions Compliance	FCC 15.247 (d) / RSS-247 Clause 5.5	N/M	See 1
Power Spectral Density	FCC 15.247 (e) / RSS-247 Clause 5.2 (b)	N/M	See 1
Emission Limitations Radiated (Transmitter)	FCC 15.247 (d) / RSS-247 Clause 5.5	P (*)	See 2
<u>Supplementary information:</u> - These measurements can be leverage of the model TLF20 4160 3.6 RWLB 277-400V WC3 QB SP. - Only the worst case was measured.			

3.4 Deviation(s) from the Standard(s) / Test Specification(s)

The following deviation(s) was / were made from the published requirements of the listed standards:
N/A.

4 TEST RESULTS – BLUETOOTH LOW ENERGY (BLE)

4.1 Occupied Bandwidth

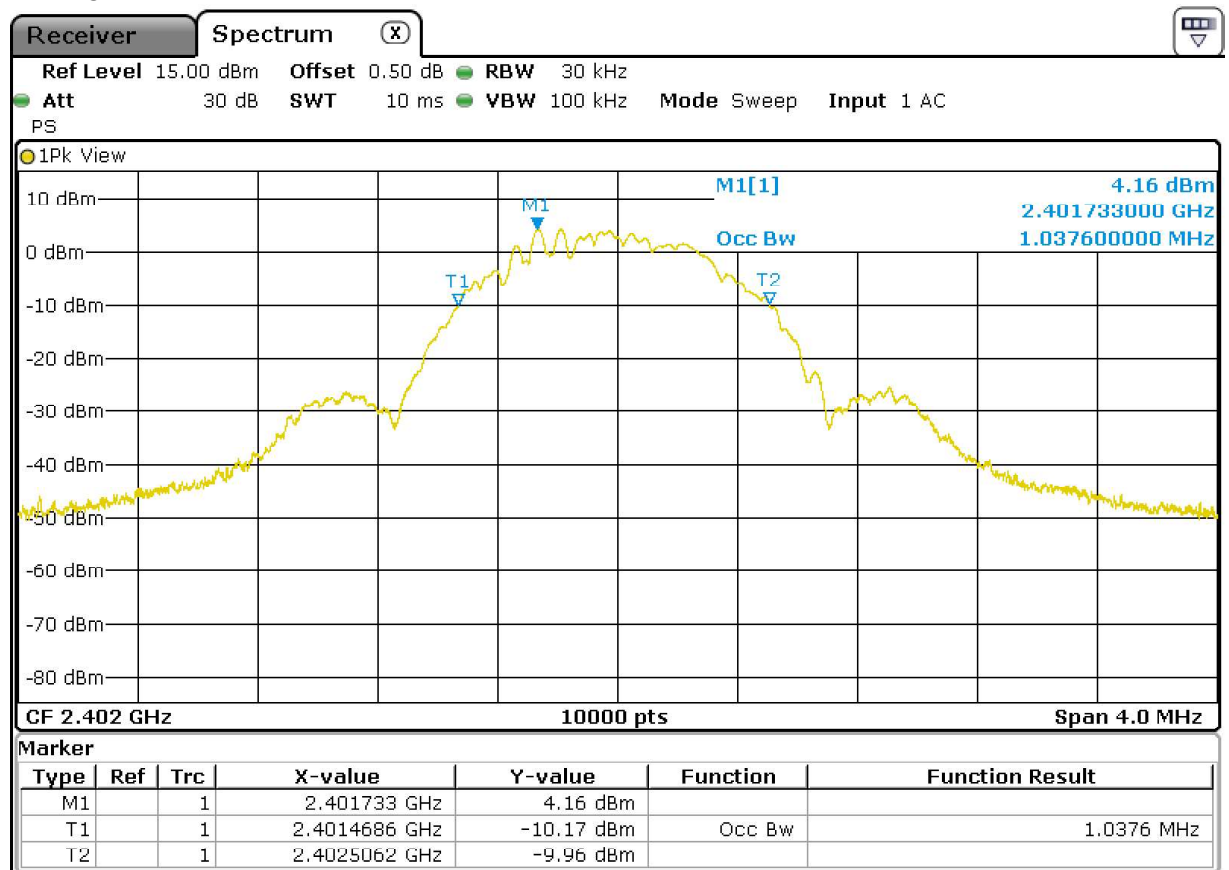
RESULTS

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

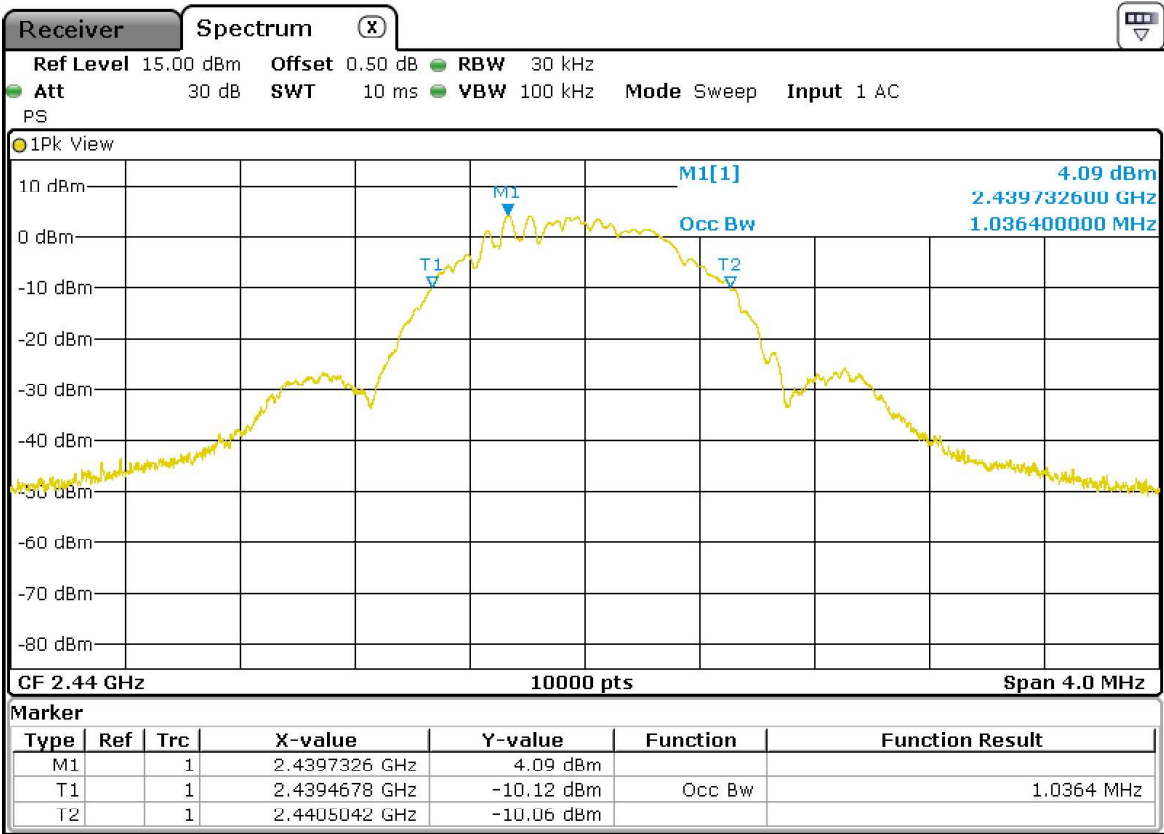
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% Bandwidth (MHz)	1.0376	1.0364	1.0368

99% Bandwidth:

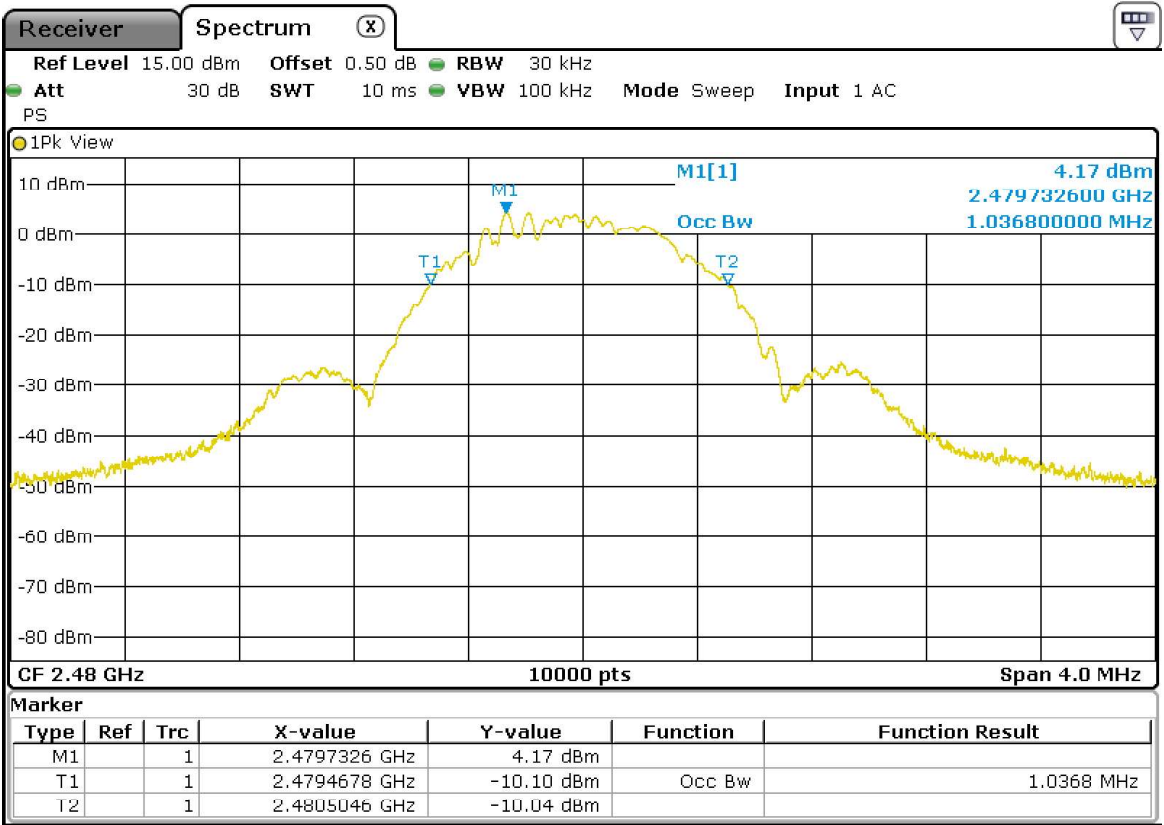
- Low Channel:



- Middle Channel:



- High Channel:



Verdict: PASS