



Test report No:
NIE: 65127REM.001

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04)

(*) Identification of item tested	Sensor device with Wirepas mesh network connectivity
(*) Trademark	Thingsee Beam
(*) Model and /or type reference	TSD2
Other identification of the product	HW Version: TSD2_02 SW Version: 2020.04.17.2_ts_tof2 FCC ID: Contains: 2AEU3TSBEAM IC: 20236-TSBEAM
(*) Features	Measurement of distance and acceleration. Wirepas protocol stack using BT LE radio.
Manufacturer	HALTIAN PRODUCTS OY Yrttipellontie 1 D, 90230 Oulu, Finland
Test method requested, standard	FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager
Date of issue	2020-08-07
Report template No	FDT08_22 (*) "Data provided by the client"

Index

Competences and guarantees	3
General conditions	3
Uncertainty	3
Data provided by the client.....	3
Usage of samples	4
Test sample description	4
Identification of the client.....	5
Testing period and place.....	5
Document history	5
List of equipment used during the test.....	6
Environmental conditions	7
Remarks and comments	8
Testing verdicts.....	8
Summary	8
Appendix A: Test results	9

Competences and guarantees

DEKRA Testing and Certification is a testing laboratory accredited by the National Accreditation Body (ENAC - Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a FCC recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report, FCC designation number ES0004.

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

DEKRA Testing and Certification 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 on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification at the time of performance of the test.

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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

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification internal document PODT000.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 1000 MHz is $I = \pm 4,9$ dB for quasi-peak measurements, $I = \pm 4,6$ dB for peak measurements ($k = 2$).

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 1000 MHz to 12.75 GHz is $I = \pm 2,6$ dB for peaks and average measurements ($k = 2$).

Data provided by the client

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").
2. The TSD2 is used for distance measurements and resulting data is sent wirelessly to a Wirepas protocol mesh network. The device has also an accelerometer. Typically TSD2 is used together with MTXH Thingsee Gateway in use cases where distance measurements are performed in several locations and this data is wirelessly collected and sent via 2G cellular connection to a data server / cloud.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples under test have been selected by: The client.

Sample **S/01** is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
65127/002	Sensor device with Wirepas mesh network connectivity	TSD2	EV701700028	2020-06-10

Test sample description

Ports..... :	Port name and description	Specified length [m]	Attached during test	Shielded		
			☐	☐		
			☐	☐		
Supplementary information to the ports..... :						
Rated power supply	Voltage and Frequency	Reference poles				
		L1	L2	L3	N	PE
	☐ AC:	☐	☐	☐	☐	☐
	☒ DC: 3.0V, 2 x AAA 1.5V alkaline primary batteries					
	☐ DC:					
Rated Power	Peak 24mW (3V x 8mA), average 120uW (3V x 40uA)					
Clock frequencies..... :	BT IC clocks 32.768kHz, 32MHz					
Other parameters	Not provided data					
Software version	2020.04.17.2_ts_tof2					
Hardware version	TSD2_02					
Dimensions in mm (L x W x D).... :	34mm x 17mm x 54mm					
Mounting position	☐ Table top equipment ☒ Wall/Ceiling mounted equipment ☐ Floor standing equipment ☐ Hand-held equipment ☐ Other:					
Modules/parts..... :	Module/parts of test item	Type		Manufacturer		
	nRF52832	BT IC		Nordic Semiconductor		
Accessories (not part of the test item)	Description	Type		Manufacturer		
	N/A					
Documents as provided by the applicant..... :	Description	File name		Issue date		
	N/A					

Identification of the client

HALTIAN PRODUCTS OY
Yrttipellontie 1 D, 90230 Oulu, Finland.

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-06-19
Date (finish)	2020-06-19

Document history

Report number	Date	Description
65127REM.001	2020-08-07	First release

List of equipment used during the test

Control Number	Description	Model	Manufacturer	Next Calibration
2942	EMI TEST RECEIVER 20Hz-40GHz	ESU40	ROHDE AND SCHWARZ	2021-09-17
4523	EMI TEST RECEIVER 20Hz-26.5GHz	ESU26	ROHDE AND SCHWARZ	2022-05-27
5641	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2021-07-31
6064	SEMIANECHOIC ABSORBER LINED CHAMBER	SAC-3	Frankonia	---
6126	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2021-04-17
6129	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2021-06-12
6132	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2021-04-20
6195	PRE-AMPLIFIER G>55dB 1-18GHz	AMF-7D-01001800-22-10P	NARDA	2021-05-19
6329	SHIELDED ROOM	---	FRANKONIA	---

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The test have been performed by the technical personnel: Antonio Ruiz.

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

Emission Test		
Requirement – Test case	Verdict	Remark
Radiated emission. Electromagnetic field measure (30 MHz – 1000 MHz)	P	---
Radiated emission. Electromagnetic field measure (1 GHz – 12,75 GHz)	P	---
Radiated emission. Electromagnetic field measure (12,75 GHz – 26 GHz)	N/A	(1)
Continuous conducted emission (150 KHz – 30 MHz)	N/A	(2)
<u>Supplymentary information and remarks:</u> (1) Range: $f > 12.75$ GHz. Test required only if the 5 th harmonics of the maximum internal work frequency EUT is higher than 12.75GHz. (2) Battery powered device.		

Appendix A: Test results

Appendix A Content

DESCRIPTION OF THE OPERATION MODES..... 11

RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE..... 12

DESCRIPTION OF THE OPERATION MODES

The operation modes described in this paragraph constitute a functionality of the sample under test for itself. The operation modes used by the samples to which the present report refers, are shown in the following table:

OPERATION MODE	DESCRIPTION
OM#01	EUT ON. Wirepas communication not established. Power supply: Internal batteries (3Vdc).

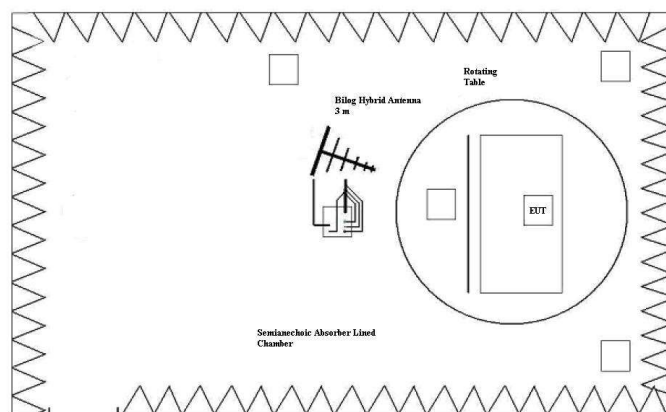
RADIATED EMISSION. ELECTROMAGNETIC FIELD MEASURE

LIMITS:	Product standard:	FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04)
	Test standard:	FCC CFR 47, Part 15, Subpart B (10-1-19 Edition) & ICES-003 Issue 6 (Updated 2019-04)

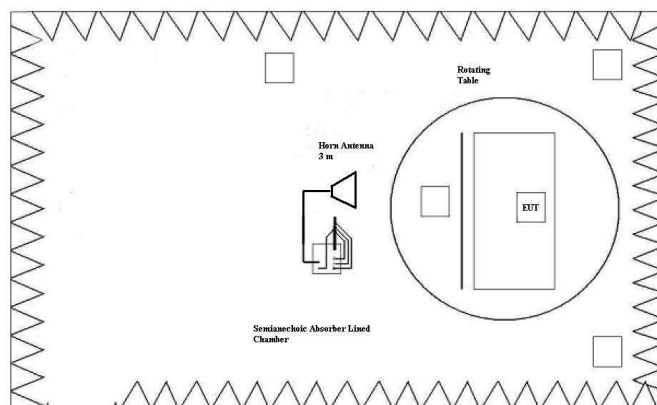
Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-19 Edition), Secs. 15.109 & ICES-003 Issue 6 (Updated 04-2019)

Frequency of emission (MHz)	Field strength (microvolt/meter)
30-88	100
88-216	150
21-960	200
Above 960	500



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

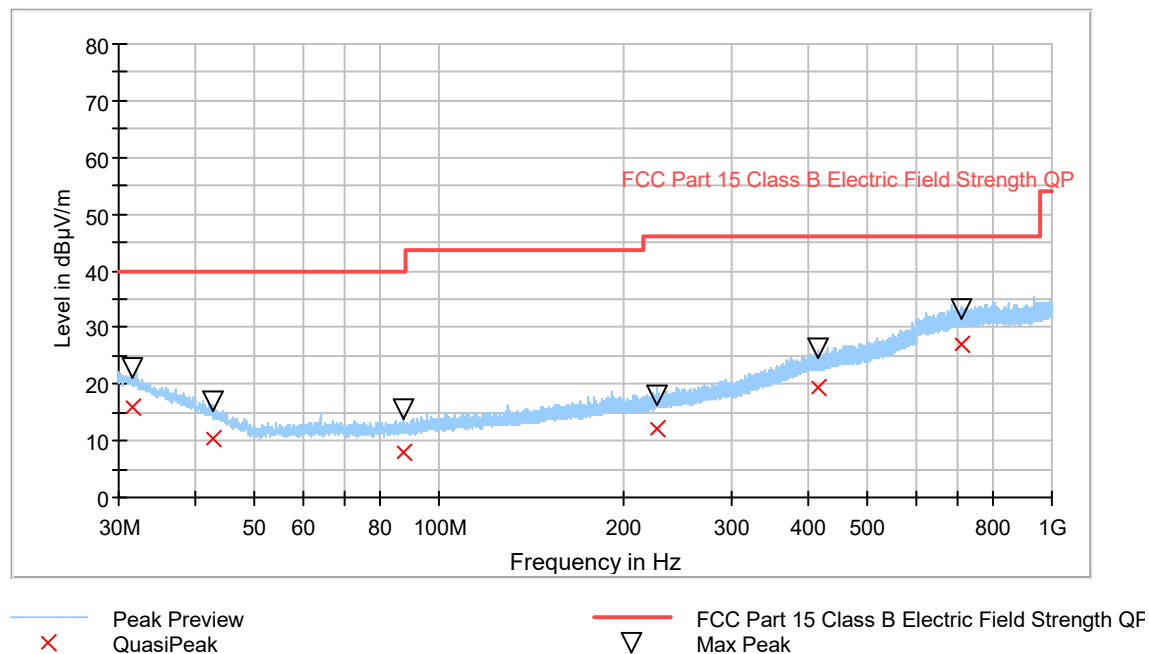
TESTED SAMPLE:	S/01
TESTED OPERATION MODES:	OM#01
TEST RESULTS:	CRmmnnRRPP: CR, Radiated Condition; mm: Sample number; nn: Operation mode; RR: Range; PP: Polarization.

CRmmnnRRPP	Description	Result
CR0101LR	Range: 30 MHz - 1000 MHz.	P
CR0101HR_PH	Range: 1 GHz – 12,75 GHz. Horizontal polarization.	P
CR0101HR_PV	Range: 1 GHz – 12,75 GHz. Vertical polarization.	P

Radiated Emission. CR0101LR

Project: 65127REM.001
Company: HALTIAN PRODUCTS OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Wirepas communication not established.
Power supply: Internal batteries (3Vdc).

Full Spectrum



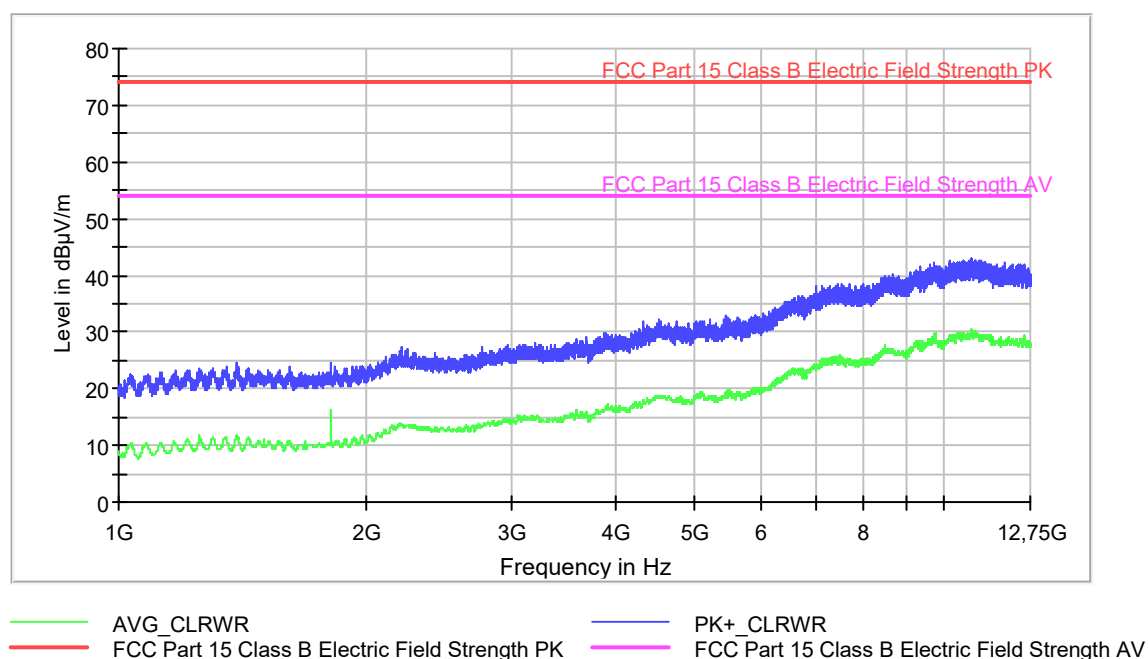
Maximizations

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Azimuth (deg)
31.677000	15.89	22.92	40.00	24.11	H	174.0
42.642000	10.44	17.00	---	---	V	-107.0
87.723000	7.83	15.65	---	---	H	-39.0
226.551000	12.25	17.98	---	---	H	-72.0
414.908000	19.28	26.41	---	---	H	-180.0
709.512000	26.93	33.09	46.00	19.07	H	-22.0

Radiated Emission. CR0101HR_PH

Project: 65127REM.001
Company: HALTIAN PRODUCTS OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Wirepas communication not established.
Power supply: Internal batteries (3Vdc). Horizontal Polarization

RE FCC Part 15 ClassB 1-12,75 GHz



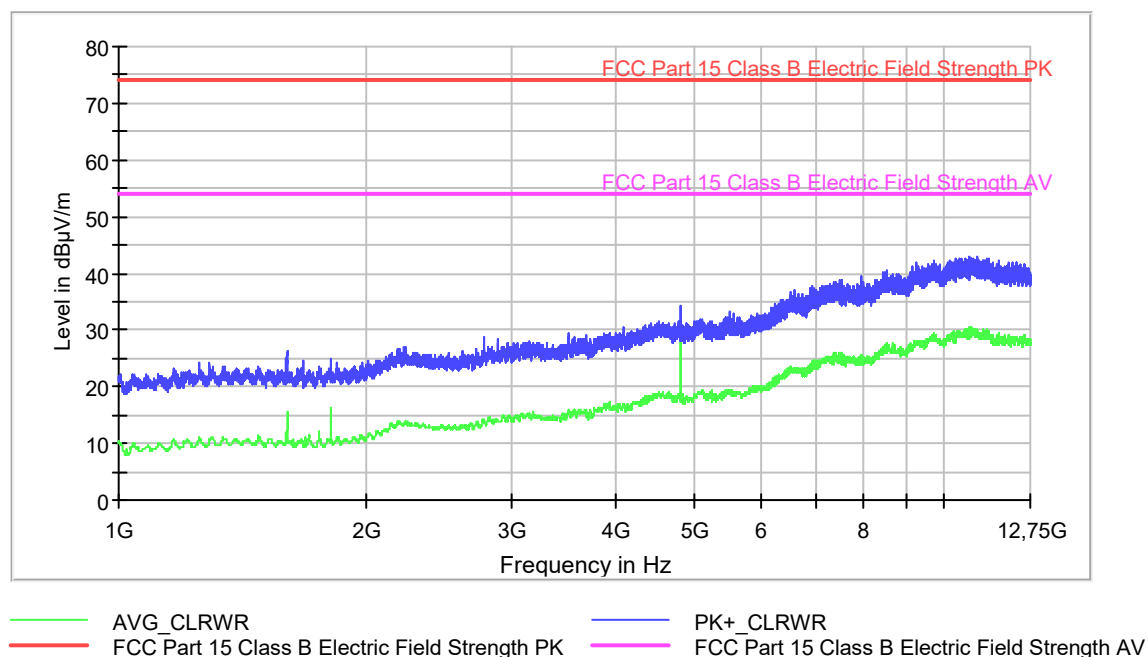
Subrange Maxima

Frequency (MHz)	PK+_CLRWR (dBµV/m)	AVG_CLRWR (dBµV/m)
2159.600000	26.0	13.1
3191.600000	27.9	14.8
4316.000000	31.8	17.4
5454.000000	32.7	19.2
6666.400000	36.4	22.8
7515.600000	38.6	25.6
9219.200000	40.6	27.7
10207.600000	42.7	29.3
10841.600000	42.9	30.4
11843.600000	42.3	28.2

Radiated Emission. CR0101HR_PV

Project: 65127REM.001
Company: HALTIAN PRODUCTS OY
Sample: S/01
Operation mode: OM#01
Description: EUT ON. Wirepas communication not established.
Power supply: Internal batteries (3Vdc). Vertical Polarization

RE FCC Part 15 ClassB 1-12,75 GHz



Subrange Maxima

Frequency (MHz)	PK+_CLRWR (dBµV/m)	AVG_CLRWR (dBµV/m)
1600.000000	26.5	15.7
2775.200000	28.6	14.1
4522.800000	31.5	19.0
4802.000000	34.1	28.5
6614.000000	36.9	22.9
7963.600000	39.4	25.5
9150.000000	41.2	27.3
10347.600000	42.8	29.2
10758.800000	43.0	30.4
11658.400000	42.2	29.2