

Prüfbericht-Nr.: Test report no.:	60440989-001	Auftrags-Nr.: Order no.:	23870482 030	Seite 1 von 7 Page 1 of 7
Kunden-Referenz-Nr.: Client reference no.:	2311184	Auftragsdatum: Order date:	2020.12.09	
Auftraggeber: Client:	Wittra Sweden AB			
Prüfgegenstand: Test item:	Gateway 1.0 US			
Bezeichnung / Typ-Nr.: Identification / Type no.:	Gateway 1.0 / FCC ID:2AYHX00347			
Auftrags-Inhalt: Order content:	RF Exposure Evaluation			
Prüfgrundlage: Test specification:	FCC 47 CFR 2.1091 IEEE Std. C95.1:2005			
Wareneingangsdatum: Date of sample receipt:	N/A			
Prüfmuster-Nr.: Test sample no.:	N/A			
Prüfzeitraum: Testing period:	N/A -			
Ort der Prüfung: Place of testing:	Lund, Sweden			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland Sweden			
Prüfergebnis*: Test result*:	Siehe Sonstiges / See Other			
überprüft von: reviewed by:	genehmigt von: authorized by:			
Datum: 2021.04.16 Date:	Datum: 2021.04.16 Date:			
Stellung / Position:	Senior Technical Expert	Stellung / Position:	Senior Technical Expert	
Sonstiges / Other:	See below for details			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
5 = mangelhaft N/T = nicht getestet 5 = poor N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts.</i>				

V05

Revision History60440989-00160440989-001

Revision	Date	Remarks	Author
001	2021.04.16	First Release	Niall Forrester
Note: Latest revision report will replace all previous reports			
This report based on RF Exposure FCC 47CR 2-1091 IEEE C95 Template version 1.1			

Statement of Compliance

Evaluation was performed based on FCC 47 CFR 2.1091 and IEEE C95.1:2005, together with the “General Population / Uncontrolled” requirements set out in FCC 47 CFR 1.1310 Table 1 (B)

The calculations below show that the Gateway 1.0 / FCC ID:2AYHX00347 device is compliant with these requirements at a distance of 20cm for all supported wireless transmitter technologies

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1. GENERAL INFORMATION

1.1 Test Site

Test Facility:	TÜV Rheinland Sweden AB
Address:	Mobilvägen 10
	223 62 Lund
	Sweden
Swedac Registration Number:	10325
FCC Test Firm Registration Number:	517458
ISED Test Site Registration Number:	24753

1.2 Client Information

Company Name:	Wittra Sweden AB
Address:	Rosenlundsgatan 40 0TR
	Stockholm 118 53
	Sweden
Contact Person:	Warwick Taws
Contact e-Mail / Telephone	wat@wittra.se

2. PRODUCT INFORMATION

2.1 General Description

Model name:	Gateway 1.0 US
Manufacturer:	TT Electronics PLC
Model number / Marketing name:	Gateway 1.0 US
FCC ID:	2AYHX00347
Description:	Gateway acting as a bridge between the wireless sensor network and the internet
Ancillary Equipment:	See section

The device incorporates the following pre-certified module:

- Raspberry Pi 4 Model B FCC ID: 2ABCB-RPI4B

The Raspberry Pi includes Bluetooth Low Energy. Other RF transmitters (IEEE 802.15.4 “Sub-GHz” and a second Bluetooth Low Energy transmitter) are implemented on an internal component of the Gateway, described below as “Border Router”.

2.2 Device Usage and Evaluation Distance

“The device is intended to be mounted in a physically secure location with restricted access (such as an IT server room) in an industrial environment. The device will typically be mounted on a plaster wall more than 2 metres above the ground (to facilitate good radio propagation from the antenna). In a worst-case scenario, the device could be mounted around head height in an equipment rack”

An evaluation distance of 20cm has been used

2.3 Wireless Technologies and Bands Supported by the EUT

Technology	Band	Frequency Range (Tx)	Evaluation Performed
IEEE 802.15.4g (Border Router)	902-928 MHz	902.0 MHz – 928.0 MHz	YES
Bluetooth LE (Border Router)	2.4 GHz	2400.0 MHz – 2483.5 MHz	YES
Bluetooth LE (Raspberry Pi)	2.4 GHz	2400.0 MHz – 2483.5 MHz	YES

2.4 Simultaneous Transmission Configurations

The device supports no simultaneous transmission capabilities

The Bluetooth Low Energy and IEEE 802.15.4 transmitters in the “Border Router” cannot transmit simultaneously.

The Bluetooth Low Energy transmitter in the Raspberry Pi is active only during firmware updates of the device and cannot transmit simultaneously with either of the transmitters in the Border Router

2.5 Conducted Power and Antenna Gain

Technology	Band	Max. Conducted Output Power (dBm)	Max. Time-Averaged Output Power (dBm)*	Antenna Gain (dBi)
IEEE 802.15.4g (Border Router)	902-928 MHz	9.30	9.30	2.20
Bluetooth LE (Border Router)	2.4 GHz	1.51	1.51	1.40
Bluetooth LE (Raspberry Pi)	2.4 GHz	2.40	2.40	3.50

3. TEST METHODS

3.1 Test Standards

Testing was performed according to the following standards / references

Standard	Version	Description
47 CFR 2.1091	-	Radiofrequency radiation exposure evaluation: mobile devices.

3.2 Additional references

Standard	Version	Description
IEEE Std. C95.1	2005	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

3.3 Limits

Extract from 47 CFR 1.1310 - Radiofrequency radiation exposure limits

Table 1B

Limits for Maximum Permissible Exposure (MPE)
(Limits for general Population / Uncontrolled Exposure)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
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 - 1500	-	-	f/1500	30
1500 - 10000	-	-	1.0	30

Notes:

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

4. EVALUATION DETAILS

4.1 Power Density (S) at 20cm Distance for Each Band and Technology

The Power Density at 20cm separation distance has been calculated for each of the transmitter technologies supported by the device according to a re-arrangement of the Friis formula, as below:

$$S = \frac{P * G}{4\pi * r^2}$$

Where:

- “S” is power density in mW/cm²
- “P” is maximum avg. conducted power (incl. tolerances) in mW according to data from the manufacturer
- “G” is the peak antenna gain (numerical) according to data from the manufacturer
- “r” is the separation distance (20 cm)

Technology	Band	Freq* (MHz)	Power (dBm)	P (mW)	Gain (dBi)	G (Num.)	r (cm)	S (mW/cm ²)	Limit ** (mW/cm ²)
IEEE 802.15.4g (Border Router)	902-928 MHz	902.0	9.30	8.51	2.20	1.66	20	0.0028	0.6013
Bluetooth LE (Border Router)	2.4 GHz	2400.0	1.51	1.42	1.40	1.38	20	0.0004	1.0000
Bluetooth LE (Raspberry Pi)	2.4 GHz	2400.0	2.40	1.74	3.50	2.24	20	0.0008	1.0000

*The lowest frequency in each band has been chosen, to give the most conservative limit

**The limits listed are from FCC 47 CFR 1.1310 Table 1 (B): “Limits for General Population/Uncontrolled”

From 300MHz to 1500MHz, the limit is f/1500 mW/cm² where “f” is the frequency in MHz

From 1500MHz to 100000MHz, the limit is 1.0 mW/cm²