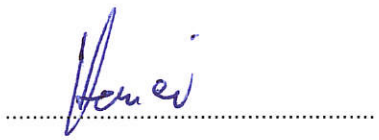
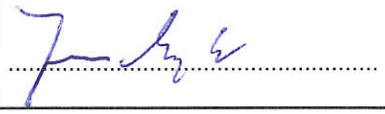
EMC TEST REPORT

FCC 47 CFR Part 15B, ISED ICES-003 Issue 6

Report Reference No	G0M-1709-6847-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970 IC Testing Laboratory site: 3470A-2
Applicant	stAPPtronics GmbH
Address	Frutzstrasse 4 6832 Sulz Austria
Test Specification	Full compliance test
Standard	47 CFR Part 15 Subpart B ISED ICES-003 Issue 6 ANSI C63.4:2014
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	stAPPone oGPS
Model(s)	stAPPone
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	2.1
Software Version(s)	Nordic DTM
FCC-ID	2AOGT-STAPPONE
IC	N/A
Test Result	**PASSED**

Possibe test case verdicts:		
required by standard but not tested	N/T	
not required by standard	N/R	
required by standard but not appl. to test object	N/A	
test object does meet the requirement	P(PASS)	
test object does not meet the requirement	F(FAIL)	
Testing:		
Date of receipt of test item	2017-10-09	
Report:		
Compiled by	Matthias Handrik	
Tested by (+ signature) (Responsible for Test)	Matthias Handrik	
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	
Date of Issue	2018-05-17	
Total number of pages	35	
General Remarks:		
The test results presented in this report relate only to the object tested. **The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.** This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
T_{NOM}	Nominal operating temperature
V_{NOM}	Nominal supply voltage

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2018-05-17	Initial Release	

REPORT INDEX

1 Equipment (Test Item) Under Test

Description	stAPPone oGPS	
Model	stAPPone	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)		
Hardware Version(s)	2.1	
Software Version(s)	Nordic DTM	
FCC-ID	2AOGT-STAPPONE	
IC	N/A	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	0205	
Radio Module	Type	Bluetooth Low Energy
	Model	Bluemod+S42
	Manufacturer	Telit Communication S.p.A.
	FCC-ID	RFRMS42
	IC	4957A-MS42
Supply Voltage	V_{NOM}	3.7 VDC
	V_{NOM}	120V AC (AC/DC adaptor)
AC/DC-Adaptor	None	
Manufacturer	stAPPtronics GmbH Frutzstrasse 4 6832 Sulz Austria	

1.1 Equipment Ports

Name	Type	Attributes		Comment
Power	AC	Count: Direction: Service only:	1 In No	
Description:				
AC	AC mains power input/output port			
DC	DC power input/output port			
IO	Input/Output port			
TP	Telecommunication port			
NE	Non-electrical port			

1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Laptop	Dell	Latitude E6420	S/N CXJ43R1
AE	Bluetooth Low Enrgy evaluation board	Nordic Semiconductor	PCA10028	
AE	AC/DC adaptor	-	TC E250	
Description:				
AE	Auxillary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
Comment:				

1.5 Operational Modes

Mode #	Description
1	EUT charging with wireless charger
2	EUT powered up. Bluetooth Low energy Connection to evaluation board.
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT is placed at the wireless charger and charging
2	EUT is placed in the measurement chamber. Bluetooth Low Energy evaluation board is connected to laptop; laptop is placed outside the measurement chamber. Active Bluetooth Low Energy connection from EUT to evaluation board.
Comment:	

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyzer in dBµV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyzer (dBµV) + A.F. (dB) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF	= Net Reading	:	Net reading	- FCC limit	= Margin
+21.5 dBµV	+ 26 dB = 47.5 dBµV/m	:	47.5 dBµV/m	- 57.0 dBµV/m	= -9.5 dB

2 Result Summary

FCC 47 CFR Part 15B, ISED ICES-003 Issue 6				
Reference	**Requirement**	**Reference Method**	**Result**	**Remarks**
Emission				
FCC 15.109 ICES-003, 8, 6.1	Radiated emissions	ANSI C63.4:2014	PASS	
FCC 15.107 ICES-003, 8, 6.2	AC power line conducted emissions	ANSI C63.4:2014	PASS	
Comment:				

Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

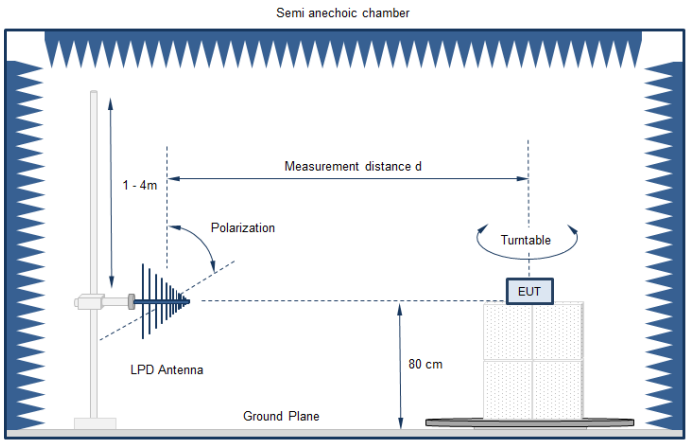
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

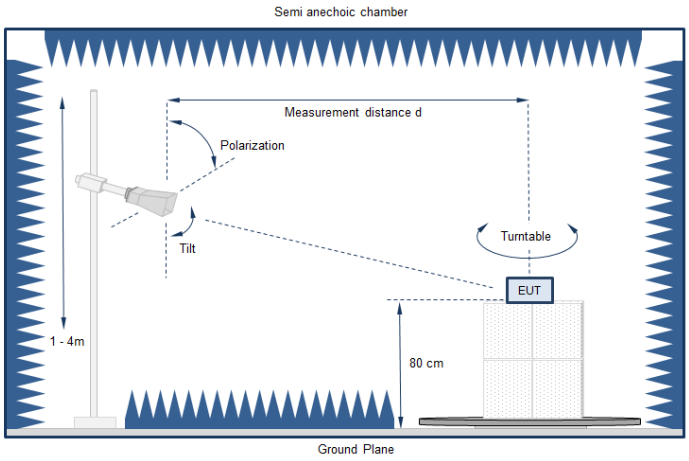
Test Information	
Reference	FCC 15.109, ICES-003, 8, 6.1
Reference method	ANSI C63.4:2014 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	0.205 (charger); 2400 (stAPPone)
Measurement range	30 MHz to 13 GHz
Temperature [°C]	21 C°
Humidity [%]	41 %
Operator	Matthias Handrik
Date	2018-05-07

2.1.2 Setup

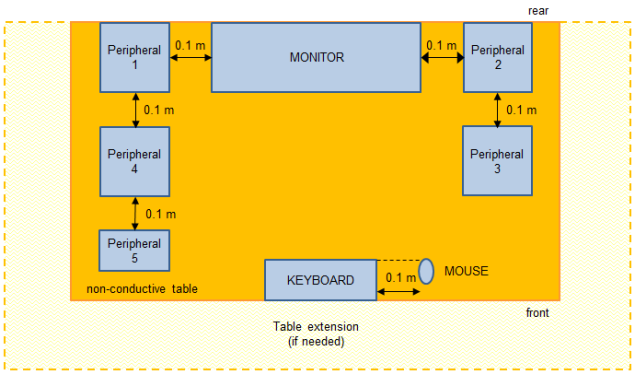
Measurement up to 1 GHz



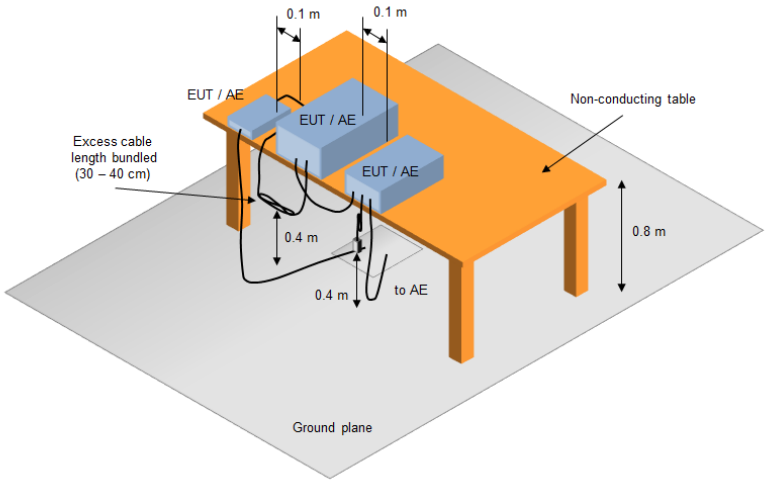
Measurement above 1 GHz



Equipment placement - Table top



Test Setup



2.1.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC1	EF00200	functional test	functional test
Keysight	EMI Test Receiver	N9038A-526/WXP	EF01070	2017-08	2018-08
R&S	Biconical Antenna	HK 116	EF00030	2016-04	2019-04
R&S	LPD Antenna	HL 223	EF00187	2016-05	2019-05
ETS-Lindgren	Horn Antenna	3117	EF01256	2017-07	2018-07

2.1.4 Procedure

Exploratory measurement
1. The EUT was placed on a non-conductive table at a height of 0.8m. 2. The EUT and support equipment, if needed, were set up to simulate typical usage. 3. Cables, of type and length specified by the manufacturer, were connected to at least one port of each type and were terminated by a device or simulating load of actual usage. 4. The antenna was placed at a distance of 3 or 10 m. 5. The received signal was monitored at the measurement receiver. 6. This procedure has to be performed in both antenna polarizations, horizontal and vertical. 7. The arrangement of the equipment with the maximum emission level is shown on the setup picture at item 1.3

Final measurement
1. The EUT was placed on a 0.8 m non-conductive table at a 3 m distance from the receive antenna. The antenna output was connected to the measurement receiver. 2. A biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was used for the frequency range from 200 – 1000 MHz. Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast. 3. The EUT and cable arrangement were based on the exploratory measurement results. 4. Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded. 5. The test data of the worst-case conditions were recorded and shown on the next pages.

2.1.5 Limits

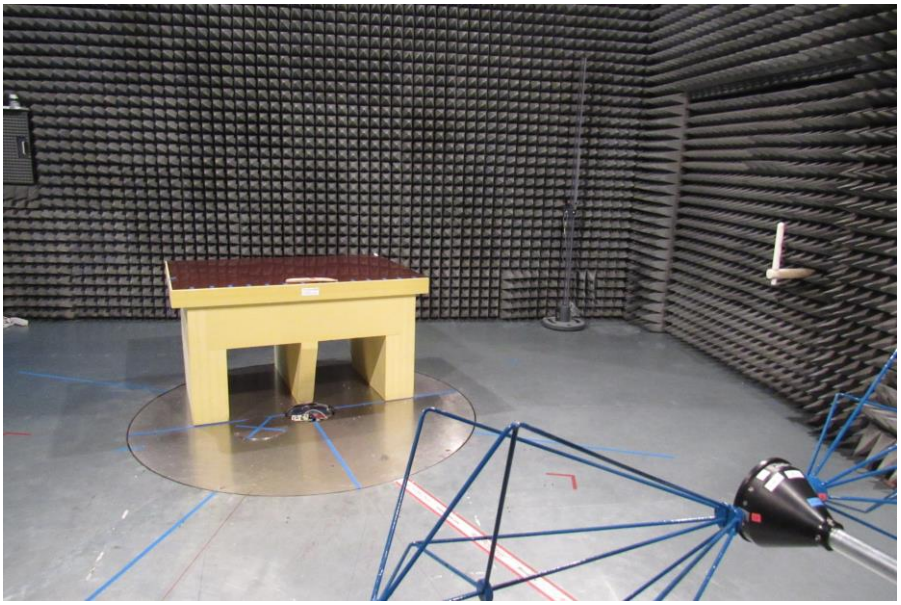
Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak Average	74 54

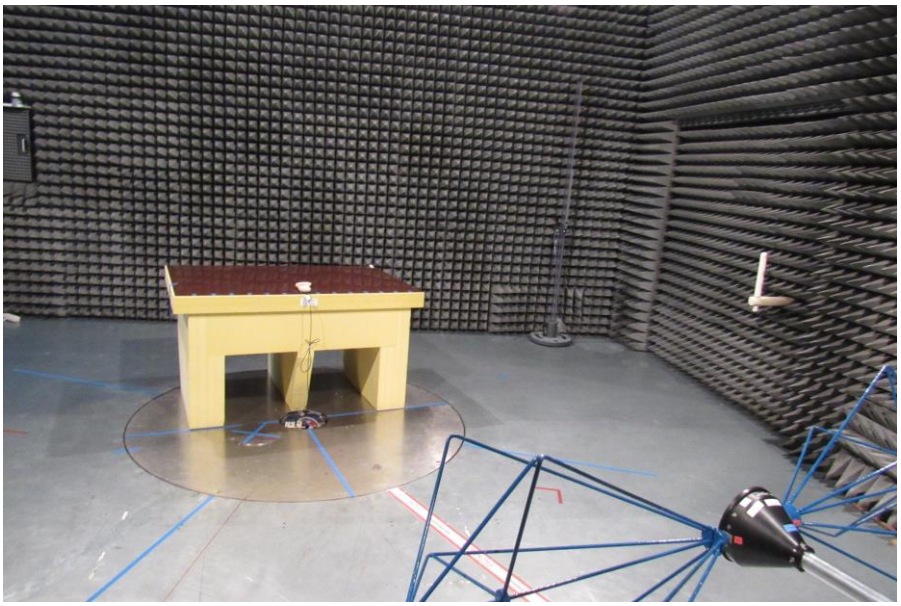
Class A @ 10 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	39
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46.5
960 - 1000	Quasi-peak	49.5
> 1000	Peak Average	69.5 49.5

2.1.6 Results

Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	
2	2	PASS	

2.1.7 Setup Photos

Test setup Operational mode 2


Test setup Operational mode 1


2.1.8 Records

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 5V DC via 120 VAC (AC/DC adaptor)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	Mode#1
Test Date:	2018-05-07
Note:	

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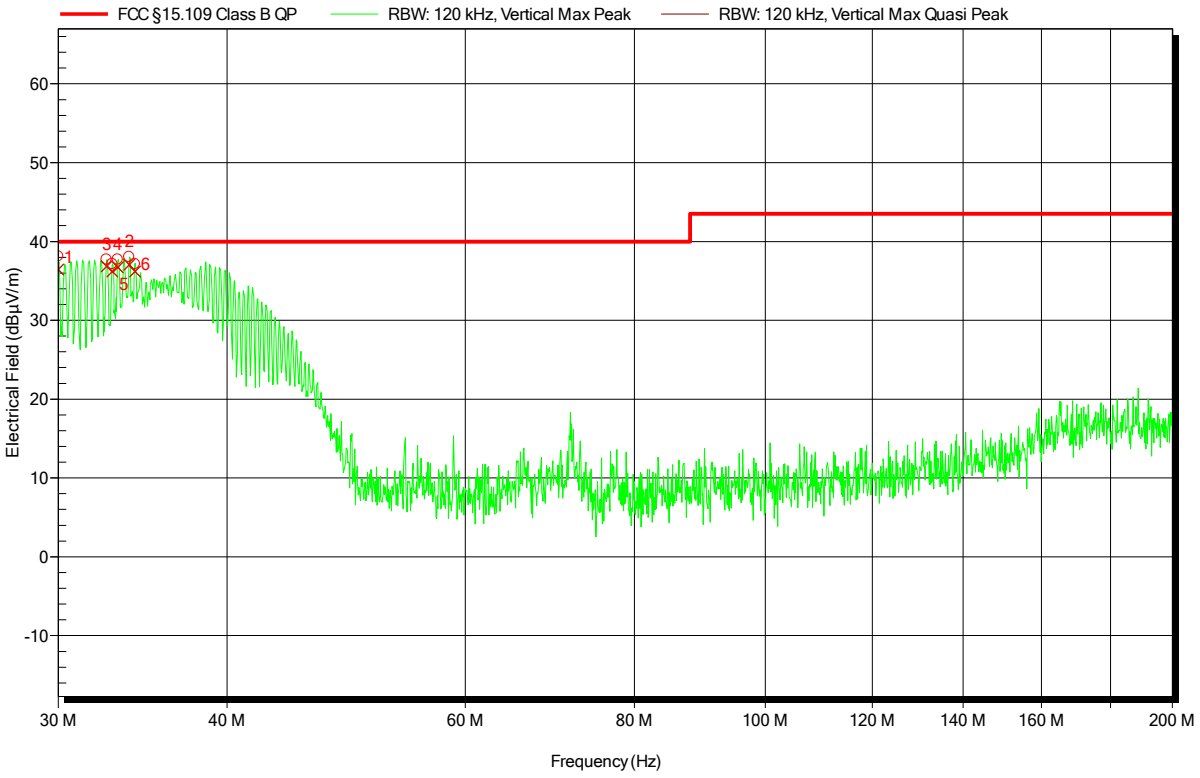

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	30 MHz	36.44 dBµV/m	40 dBµV/m	-3.56 dB	Pass	0 Degree	1 m
2	33.873 MHz	37.07 dBµV/m	40 dBµV/m	-2.93 dB	Pass	0 Degree	1 m
3	32.582 MHz	36.87 dBµV/m	40 dBµV/m	-3.13 dB	Pass	0 Degree	1 m
4	32.9 MHz	36.21 dBµV/m	40 dBµV/m	-3.79 dB	Pass	0 Degree	1 m
5	33.219 MHz	36.73 dBµV/m	40 dBµV/m	-3.27 dB	Pass	0 Degree	1 m
6	34.191 MHz	36.19 dBµV/m	40 dBµV/m	-3.81 dB	Pass	0 Degree	1 m

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 5V DC via 120 VAC (AC/DC adaptor)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	Mode#1
Test Date:	2018-05-07
Note:	

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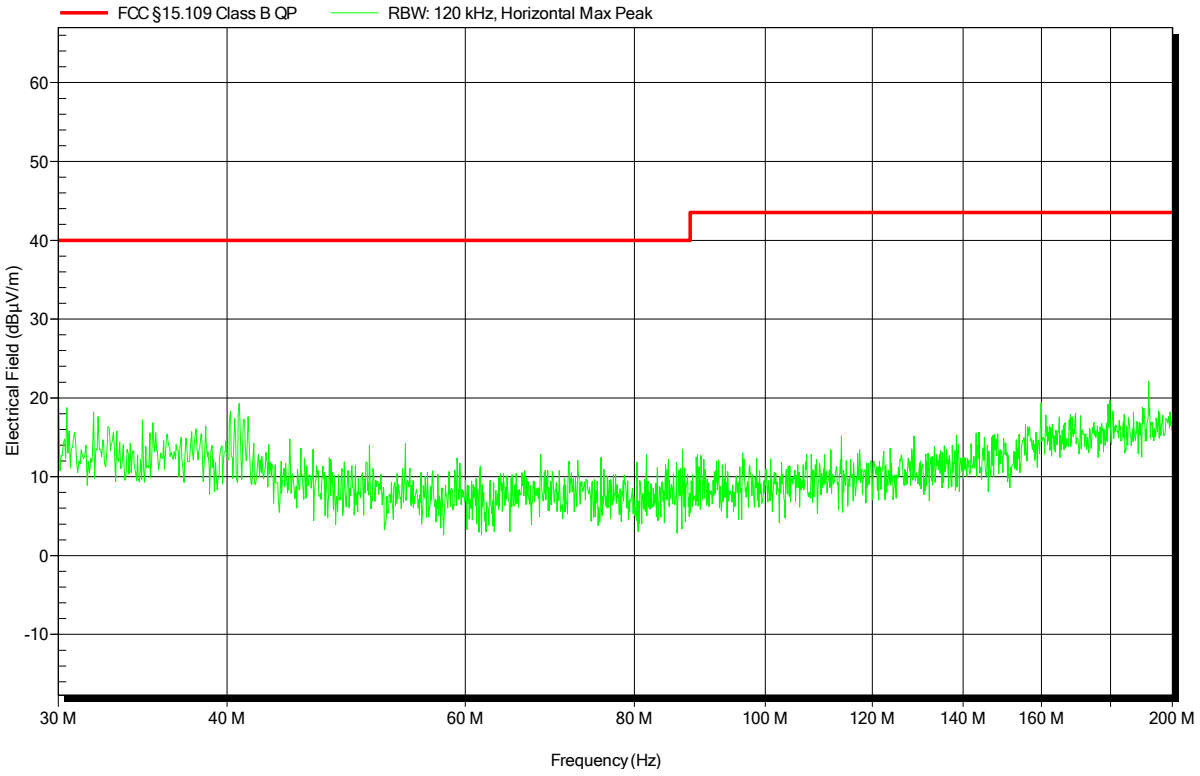

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 5V DC via 120 VAC (AC/DC adaptor)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	Mode#1
Test Date:	2018-05-07
Note:	

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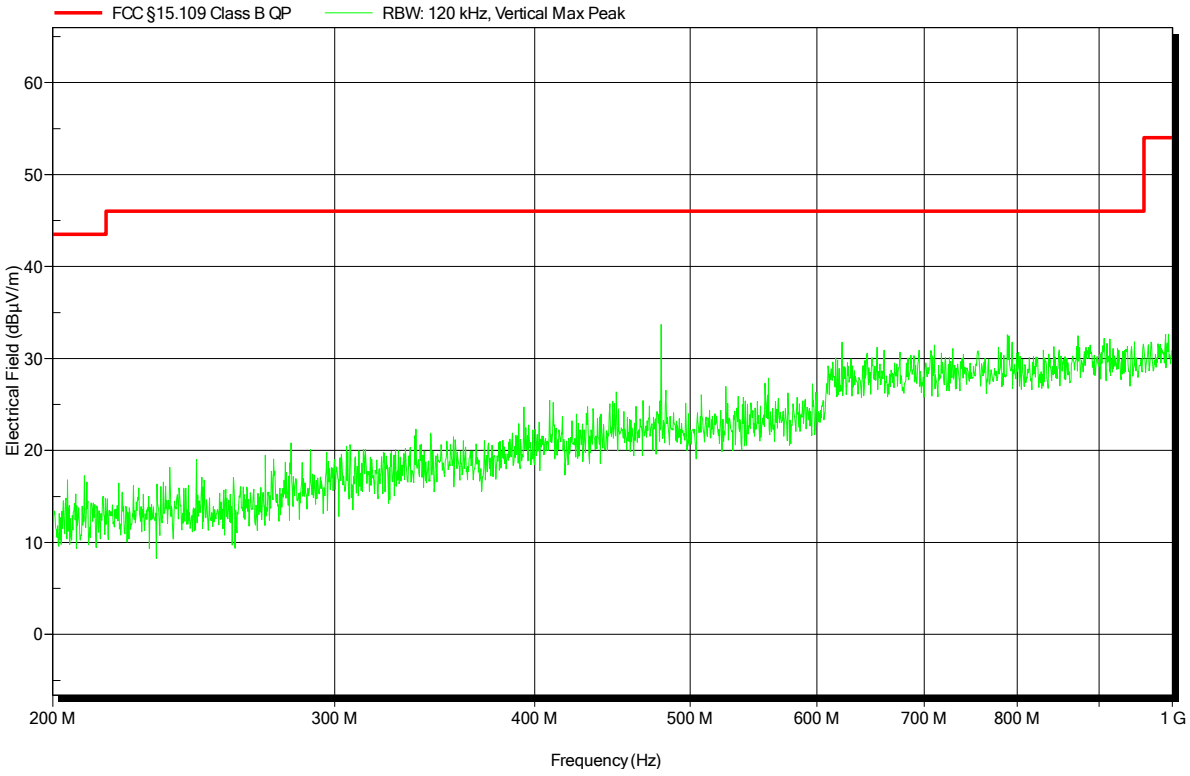

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 5V DC via 120 VAC (AC/DC adaptor)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	Mode#1
Test Date:	2018-05-07
Note:	

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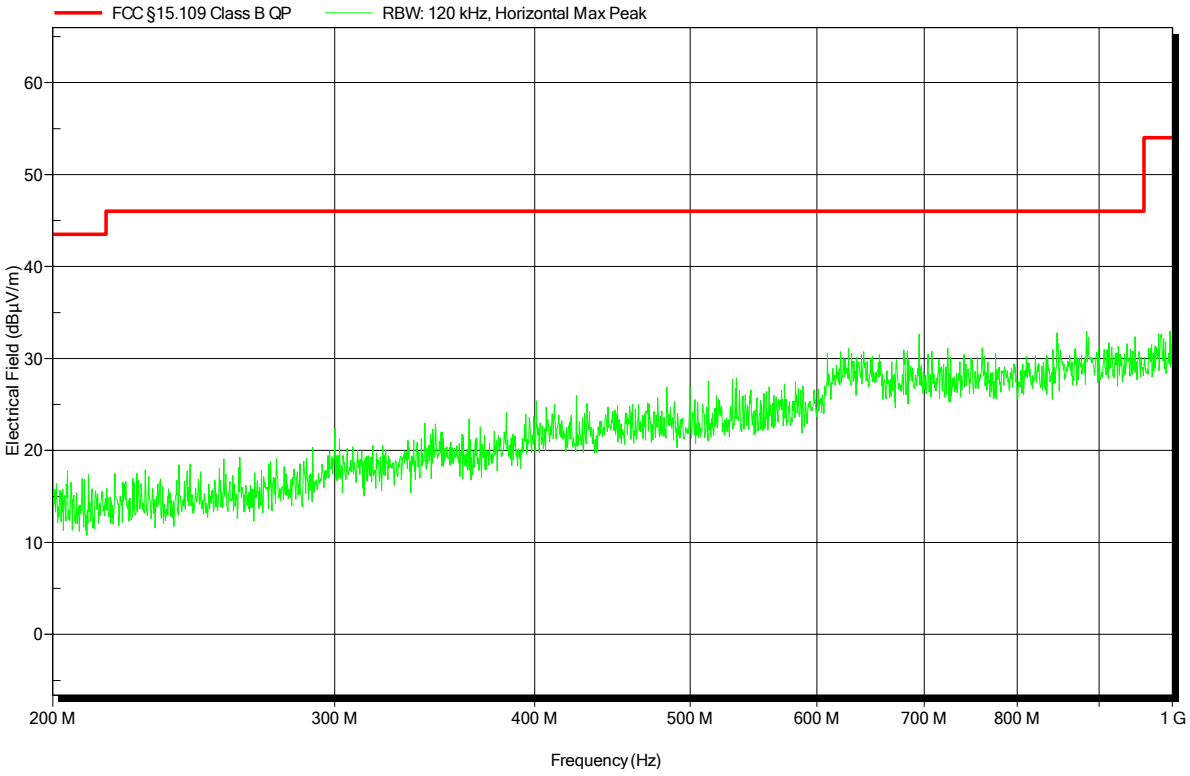

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 3.7 VDC (lithium battery)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	Mode#2
Test Date:	2018-05-07
Note:	

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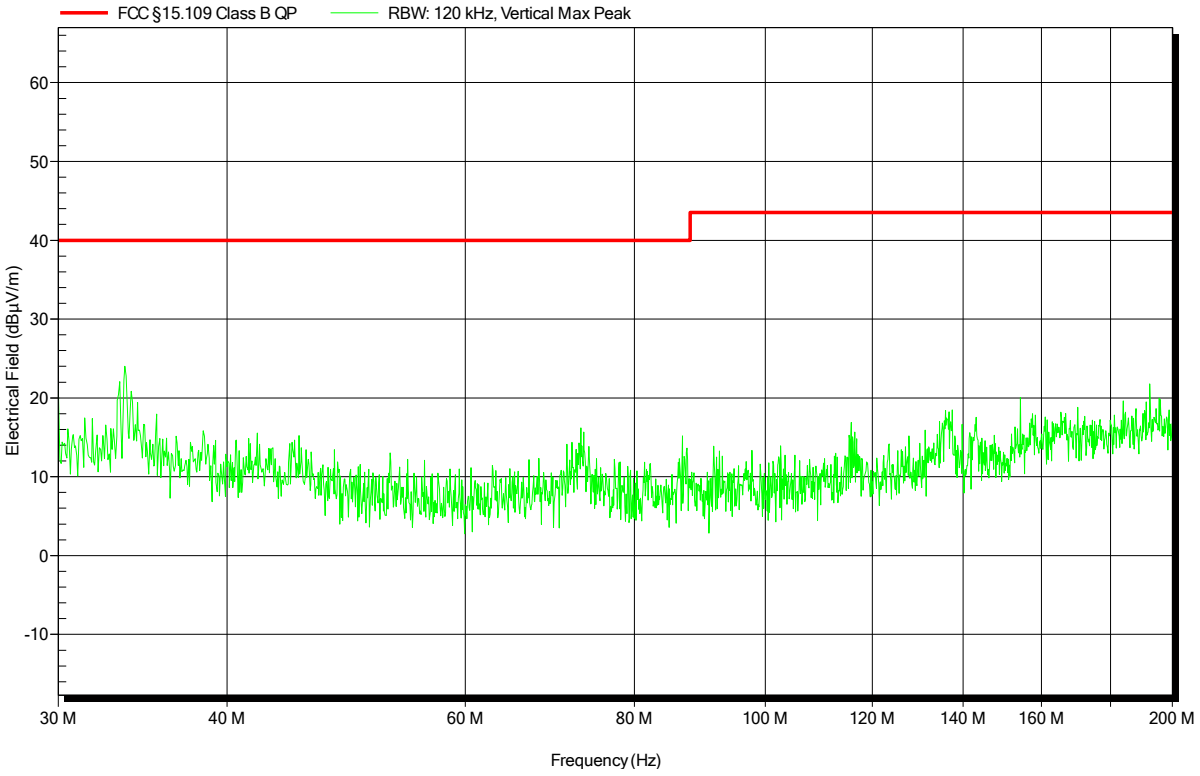

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 3.7 VDC (lithium battery)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	Mode#2
Test Date:	2018-05-07
Note:	

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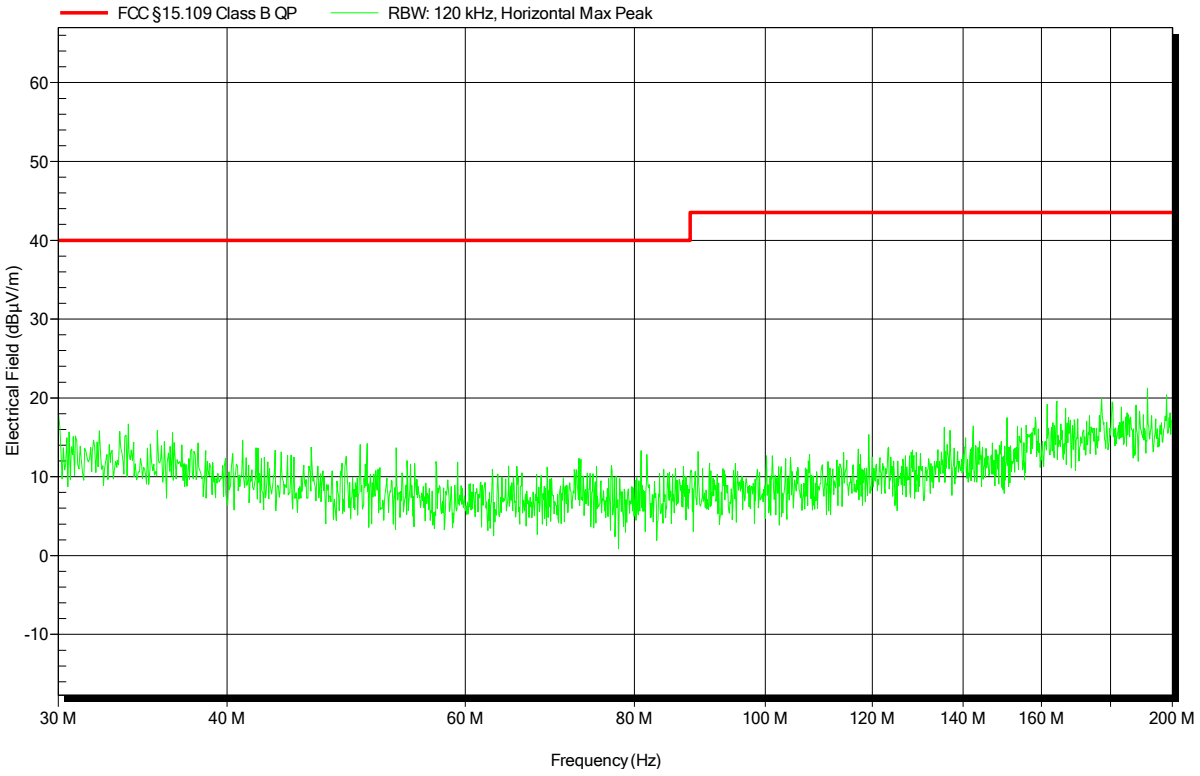

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 3.7 VDC (lithium battery)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	Mode#2
Test Date:	2018-05-07
Note:	

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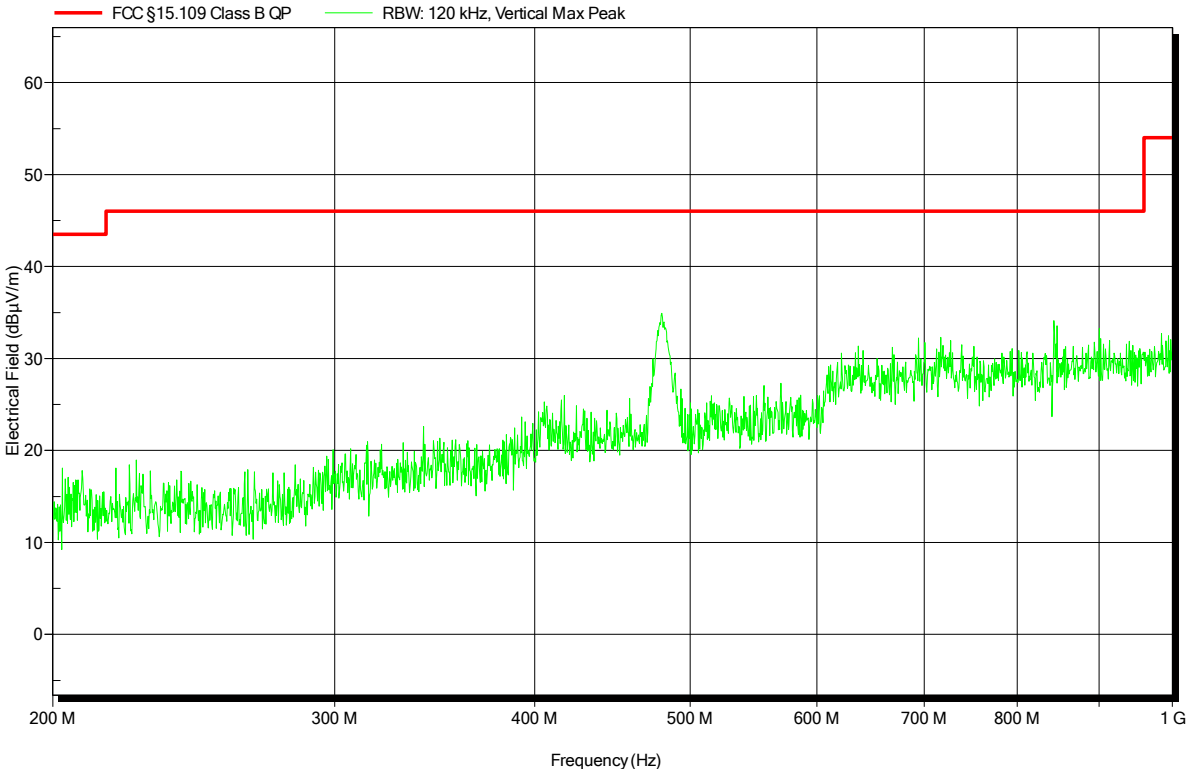

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
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Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 3.7 VDC (lithium battery)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	Mode#2
Test Date:	2018-05-07
Note:	

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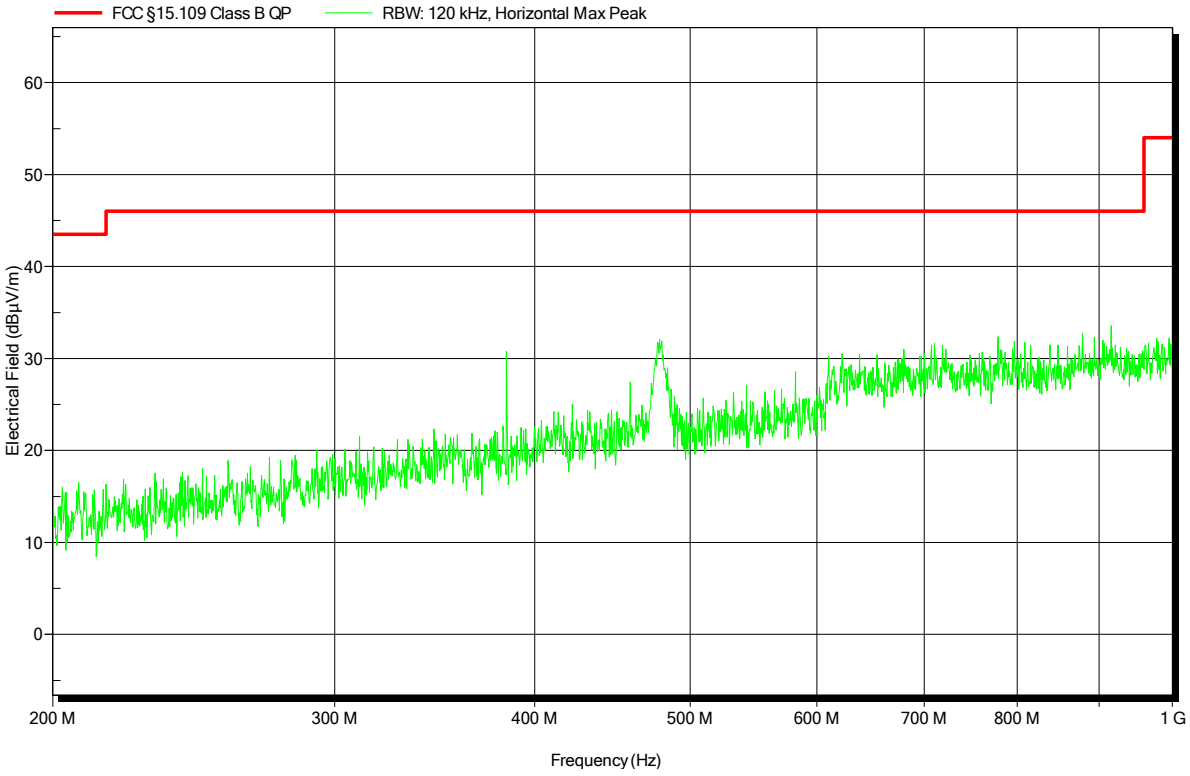

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 3.7 VDC (lithium battery)
Antenna:	ETS-Lindgren 3117, Vertical
Measurement distance:	3m
Mode:	Mode#2
Test Date:	2018-05-07
Note:	

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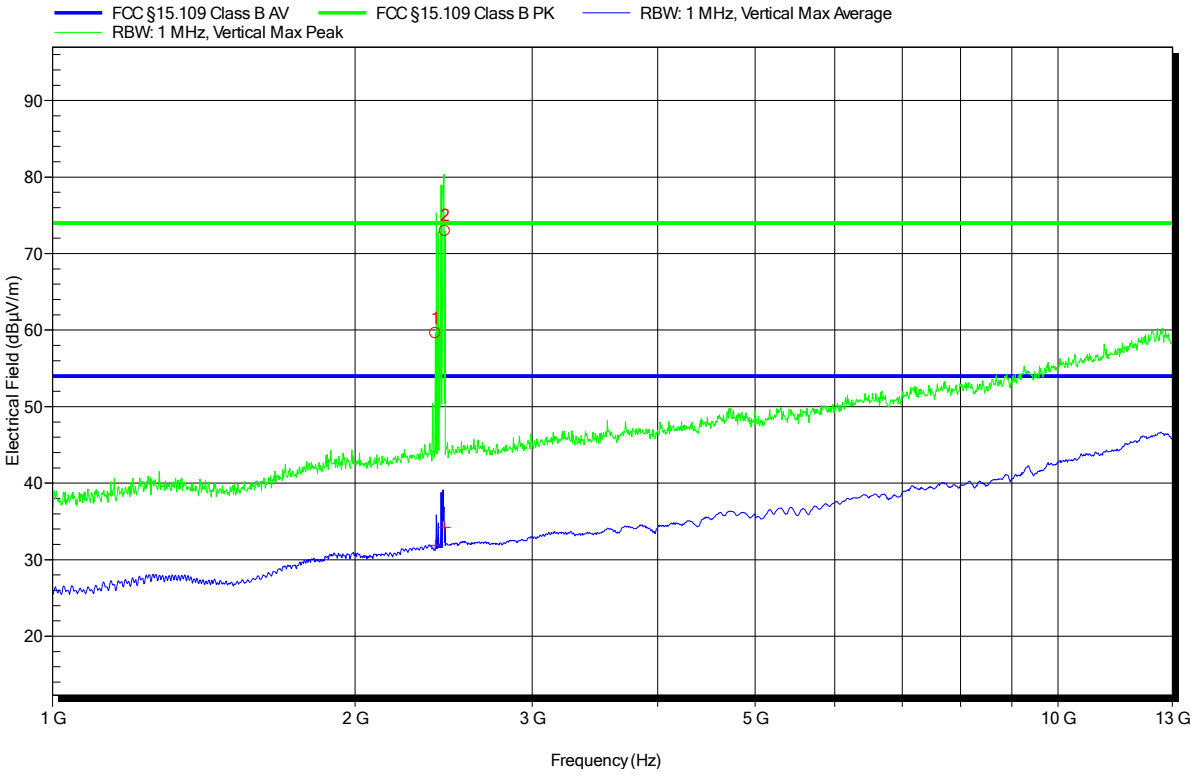

Peak Number	Frequency	Peak	Angle	Height
1	2.403 GHz	Bluetooth carrier		
2	2.457 GHz			

Radiated emissions under normal conditions according to FCC Part 15b

Project number: G0M-1709-6847

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EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 21°C, Unom: 3.7 VDC (lithium battery)
Antenna:	ETS-Lindgren 3117, Horizontal
Measurement distance:	3m
Mode:	Mode#2
Test Date:	2018-05-07
Note:	

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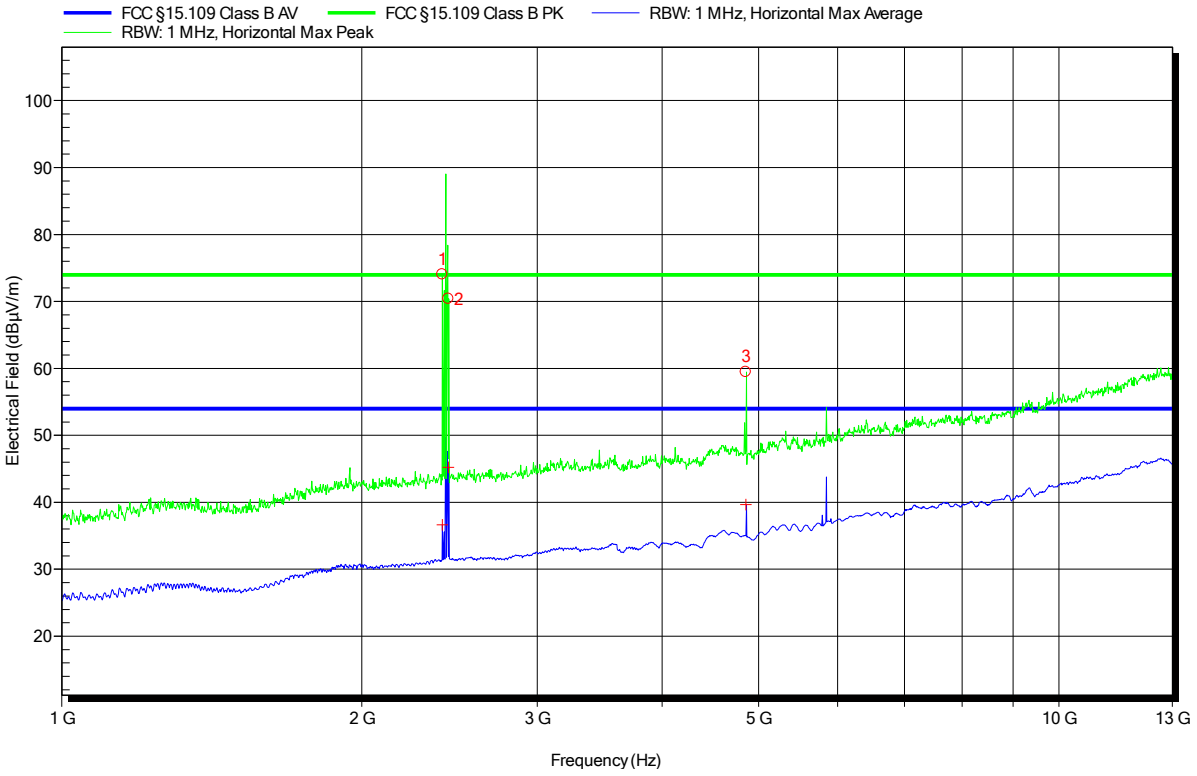


Peak Number	Frequency	Peak	Angle	Height
1	2.408 GHz	Bluetooth carrier		
2	2.443 GHz			
3	4.855 GHz	2nd harmonic		

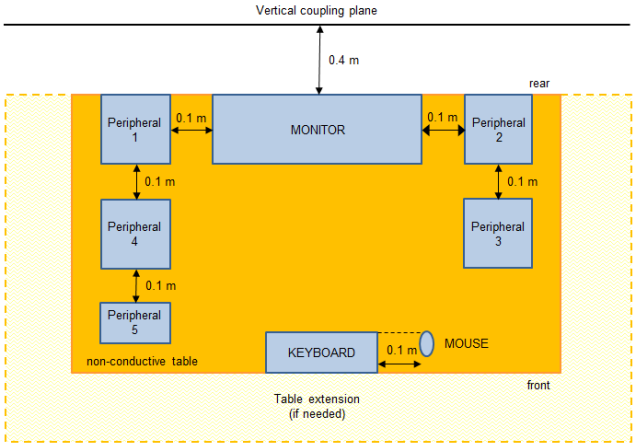
2.2 Test Conditions and Results - Conducted emissions acc. to ANSI C63.4

2.2.1 Information

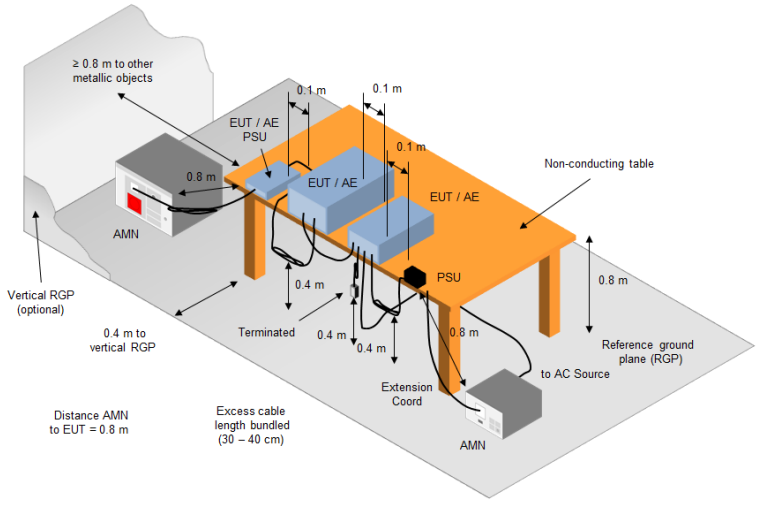
Test Information	
Reference	FCC 15.107, ICES-003, 8, 6.2
Reference method	ANSI C63.4:2014 Section 12
Measurement range	150 kHz to 30 MHz
Equipment class	Class B
Equipment type	Table top
Temperature [°C]	23 C°
Humidity [%]	42 %
Operator	Matthias Handrik
Date	2018-05-07

2.2.2 Setup

Equipment placement



Test Setup



2.2.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
R&S	AMN	ESH2-Z5	EF00182	2017-01	2019-01
R&S	Pulse Limiter	ESH3-Z2	EF01063	2017-07	2018-07
R&S	EMI Test Receiver	ESR 7	EF00943	2017-07	2018-07

2.2.4 Procedure

Exploratory measurement
1. The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
2. The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
3. The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
4. The LISN measurement port was connected to a measurement receiver
5. I/O cables were bundled not longer than 0.4 m
6. Measurement was performed in the frequency range 0.15 – 30MHz on each current-carrying conductor
7. To maximize the emissions the cable positions were manipulated
8. The worst configuration of EUT and cables is shown on a test setup picture at item 1.3

Final measurement
1. The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
2. The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
3. The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
4. The LISN measurement port was connected to a measurement receiver
5. The EUT and cable arrangement were based on the exploratory measurement results
6. The test data of the worst-case conditions were recorded and shown on the next pages

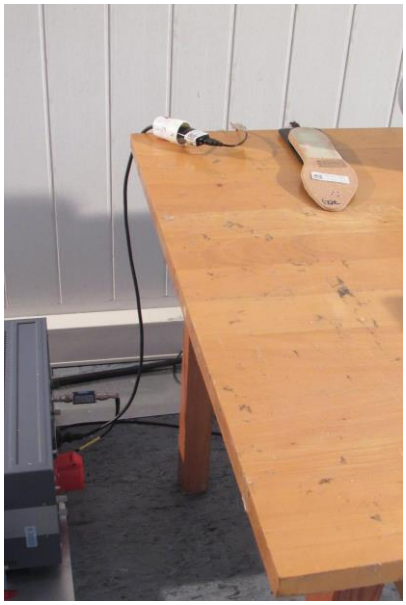
2.2.5 Limits

Class B		
Frequency [MHz]	Quasi-peak Limit [dBµV]	Average Limit [dBµV]
0.15 - 0.5	66 - 56 *	56 - 46 *
0.5 - 5	56	46
5 - 30	60	50
* Decreases with the logarithm of the frequency		

2.2.6 Results

AC power line conducted emissions					
Port	Coupling	Operational mode	EUT Configuration	Verdict	Remark
Power	AMN	1	1	PASS	

2.2.7 Setup Photos

Test Setup


2.2.8 Records

EMI voltage test in the ac-mains according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 23°C, Unom: 120V AC (AC/DC adaptor)
LISN:	ESH2-Z5 N
Mode:	Mode#1
Test Date:	2018-05-07
Note:	

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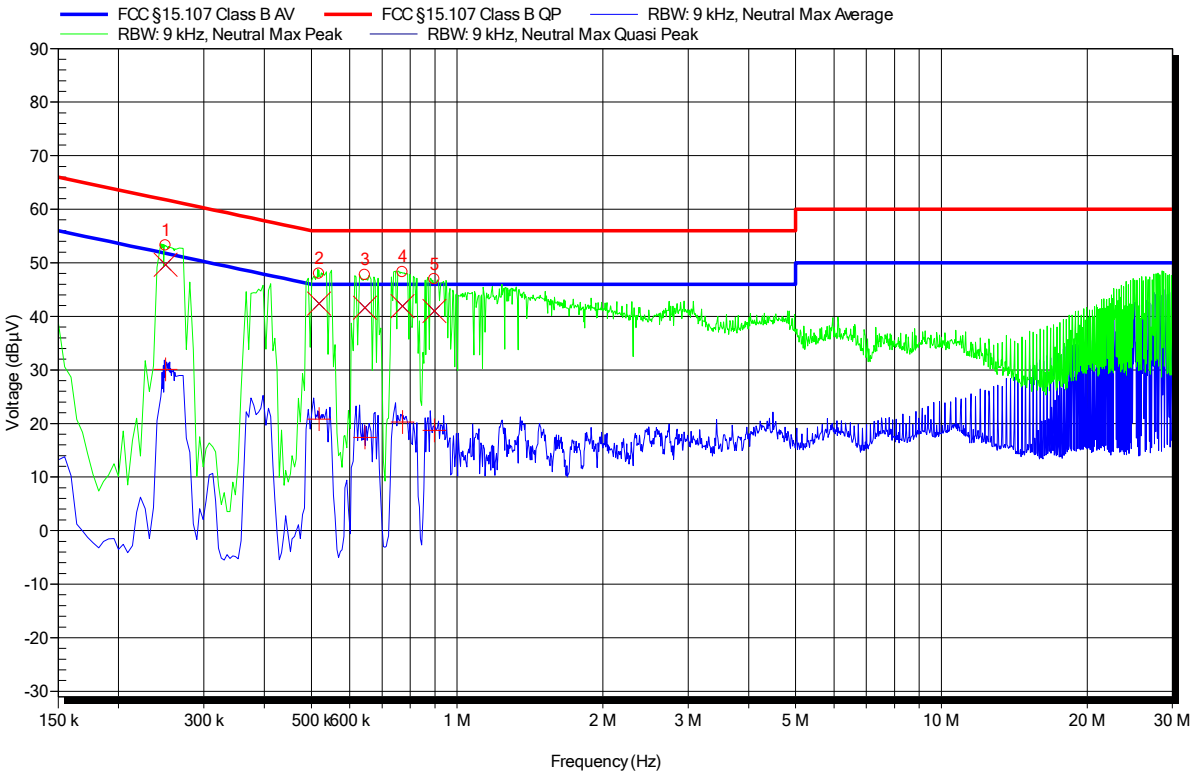

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	249.9 kHz	49.66 dBµV	61.76 dBµV	-12.1 dB	Pass
2	519 kHz	42.39 dBµV	56 dBµV	-13.61 dB	Pass
3	645 kHz	41.63 dBµV	56 dBµV	-14.37 dB	Pass
4	771 kHz	41.92 dBµV	56 dBµV	-14.08 dB	Pass
5	897 kHz	40.98 dBµV	56 dBµV	-15.02 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	249.9 kHz	30.08 dBµV	51.76 dBµV	-21.68 dB	Pass
2	519 kHz	20.84 dBµV	46 dBµV	-25.16 dB	Pass
3	645 kHz	17.41 dBµV	46 dBµV	-28.59 dB	Pass
4	771 kHz	20.28 dBµV	46 dBµV	-25.72 dB	Pass
5	897 kHz	18.69 dBµV	46 dBµV	-27.31 dB	Pass

EMI voltage test in the ac-mains according to FCC Part 15b

Project number: G0M-1709-6847

Applicant:	stAPPtronics GmbH
EUT Name:	stAPPone
Model:	stAPPone oGPS
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 23°C, Unom: 120V AC (AC/DC adaptor)
LISN:	ESH2-Z5 L
Mode:	Mode#1
Test Date:	2018-05-07
Note:	

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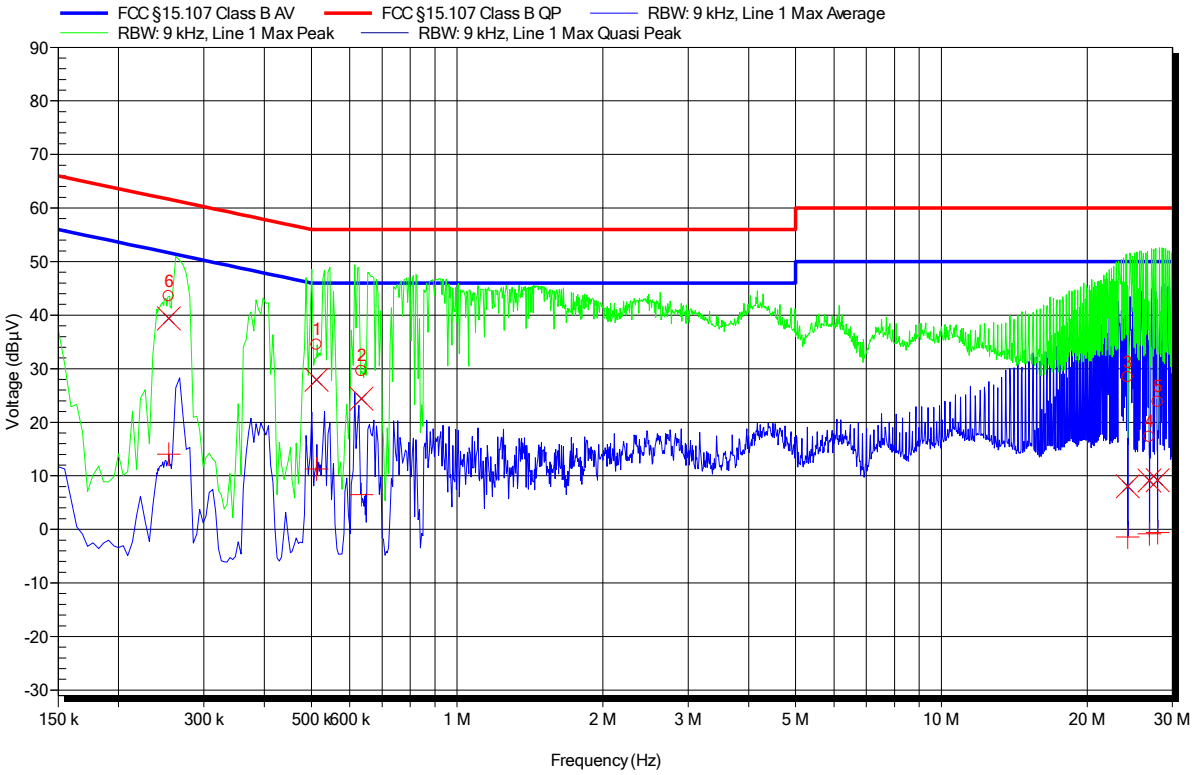

Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
1	512.7 kHz	27.96 dBµV	56 dBµV	-28.04 dB	Pass
2	634.65 kHz	24.41 dBµV	56 dBµV	-31.59 dB	Pass
3	24.26 MHz	8.05 dBµV	60 dBµV	-51.95 dB	Pass
4	26.889 MHz	9.1 dBµV	60 dBµV	-50.9 dB	Pass
5	27.958 MHz	9.21 dBµV	60 dBµV	-50.79 dB	Pass
6	253.95 kHz	39.38 dBµV	61.63 dBµV	-22.25 dB	Pass

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status
1	512.7 kHz	11.29 dBµV	46 dBµV	-34.71 dB	Pass
2	634.65 kHz	6.49 dBµV	46 dBµV	-39.51 dB	Pass
3	24.26 MHz	-1.41 dBµV	50 dBµV	-51.41 dB	Pass
4	26.889 MHz	-0.81 dBµV	50 dBµV	-50.81 dB	Pass
5	27.958 MHz	-0.57 dBµV	50 dBµV	-50.57 dB	Pass
6	253.95 kHz	14.04 dBµV	51.63 dBµV	-37.59 dB	Pass