eurofins | Product Service

EMC TEST REPORT

FCC 47 CFR Part 15B
Industry Canada ICES-003

Electromagnetic compatibility - Unintentional radiators

Report Reference No. ..... :	G0M-1505-4759-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 OATS Filing assigned code: 3470A
Applicant's name ..... :	tado GmbH
Address ..... :	Lindwurmstr. 76 80337 München GERMANY
Test specification:	
Standard..... :	47 CFR Part 15 Subpart B ICES-003, Issue 5:2012 ANSI C63.4:2014
Equipment under test (EUT):	
Product description	tado Smart AC Control
Model No.	WR01
Additional Models	None
Hardware version	WR0101
Firmware / Software version	21.0
Contains	FCC-ID: 2AE751 IC: 20406-1
Test result	**Passed**

Possible test case verdicts:	
- not applicable 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 ..... :	2015-06-02	
Date (s) of performance of tests ..... :	2015-08-17 – 2015-08-20	
Compiled by ..... :	Marcus Klein	
Tested by (+ signature)..... :	Yu Yu / Andreas Pflug	.....
Approved by (+ signature) ..... : Head of Lab	Marcus Klein	.....
Date of issue ..... :	2015-09-23	
Total number of pages ..... :	31	

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:

Version History

Version	Issue Date	Remarks	Revised by
V01	2015-09-23	Initial Release	

Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

REPORT INDEX

1 Equipment (Test item) Description

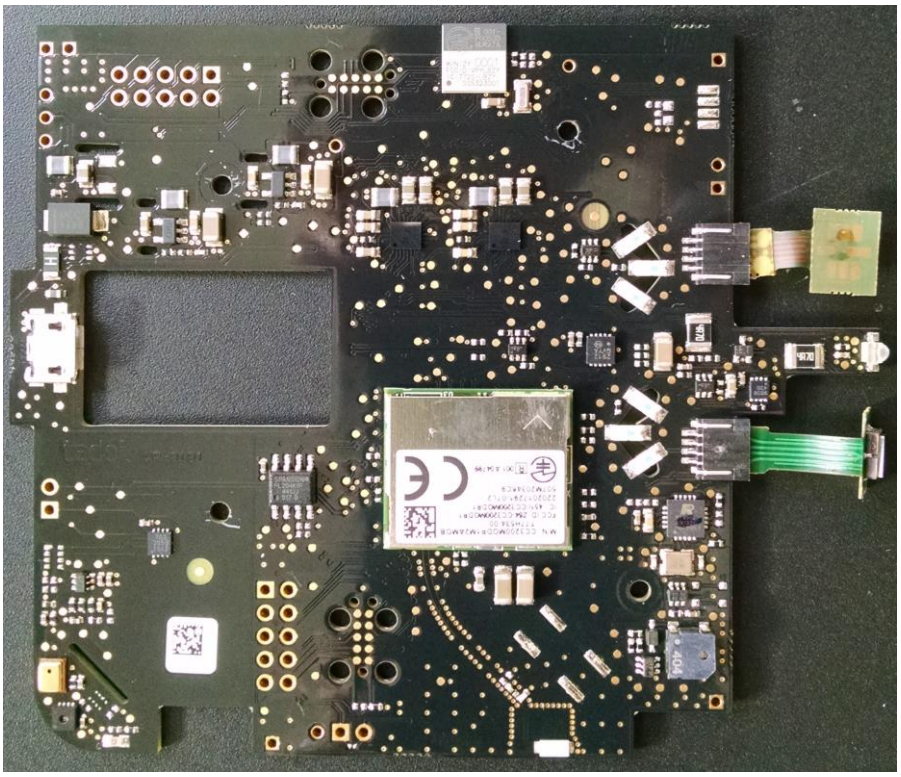
Description	tado Smart AC Control	
Model	WR01	
Additional Models	None	
Serial number	None	
Hardware version	WR0101	
Software / Firmware version	21.0	
Power supply	24 VDC	
AC/DC-Adaptor	Model : SK12G0500100Z Manufacturer : Lin Shiung Enterprise Input : 100-240VAC / 50-60Hz Output : 5 VDC / 1 A	
Radio module	Type	WLAN Module
	Model	CC3200MODR1
	Manufacturer	Texas Instruments
	HW Version	CC3200MODR1
	SW Version	-
	FCC-ID	Z64-CC3200MODR1
	IC	451I-CC3200MODR1
Radio module	Type	Bluetooth Module
	Model	Murata ZY Module
	Manufacturer	Murata
	HW Version	-
	SW Version	-
	FCC-ID	VPYLBZY
	IC	772C-LBZY
Manufacturer	Flextronics International Manufacturing Services Duty-Free Zone Limited Liability Company Munkas utca 28 8660 Tab Hungary	
Highest emission frequency	2480 MHz	
Device classification	Class B	
Equipment type	Tabletop	

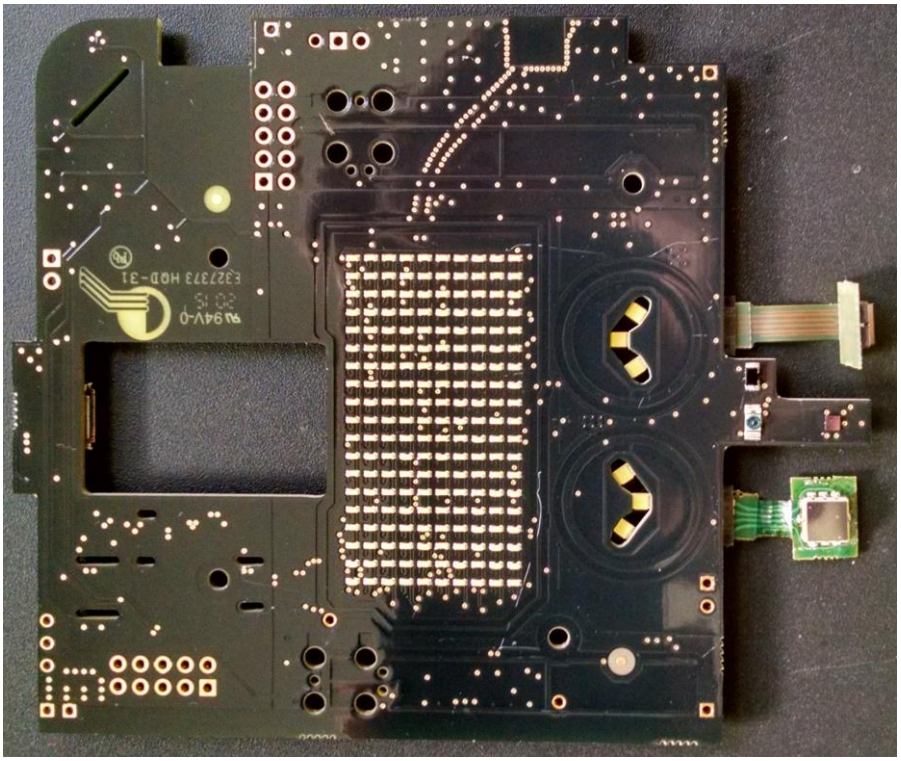
1.1 Photos – Equipment external

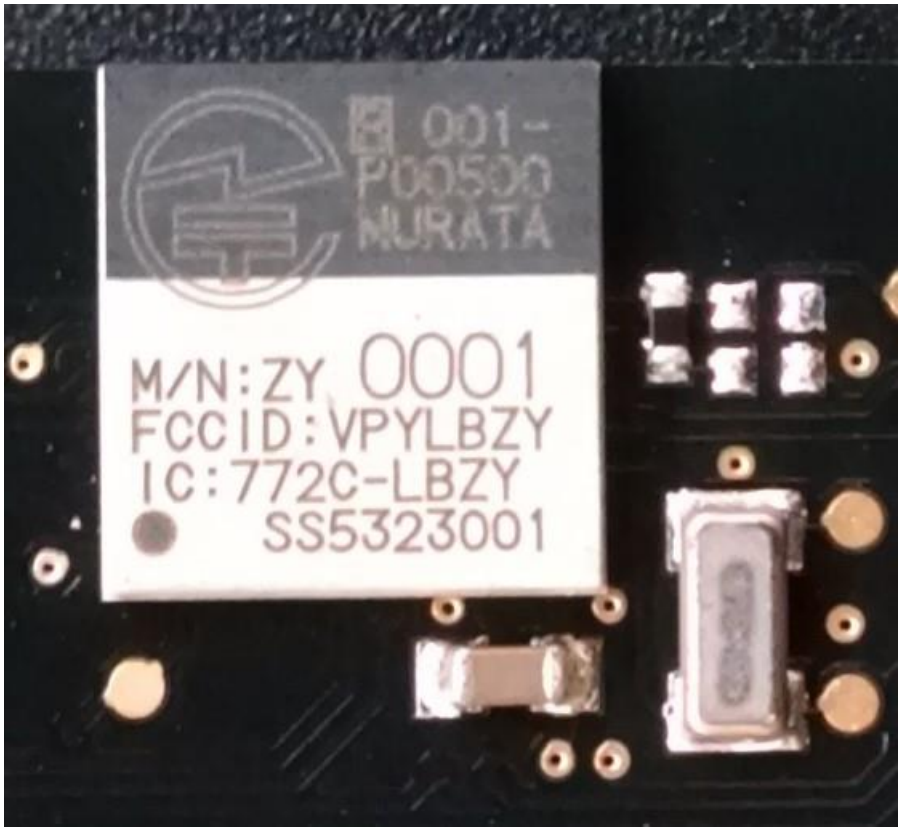
EUT Top


EUT Bottom


1.2 Photos – Equipment internal

PCB Top


PCB Bottom


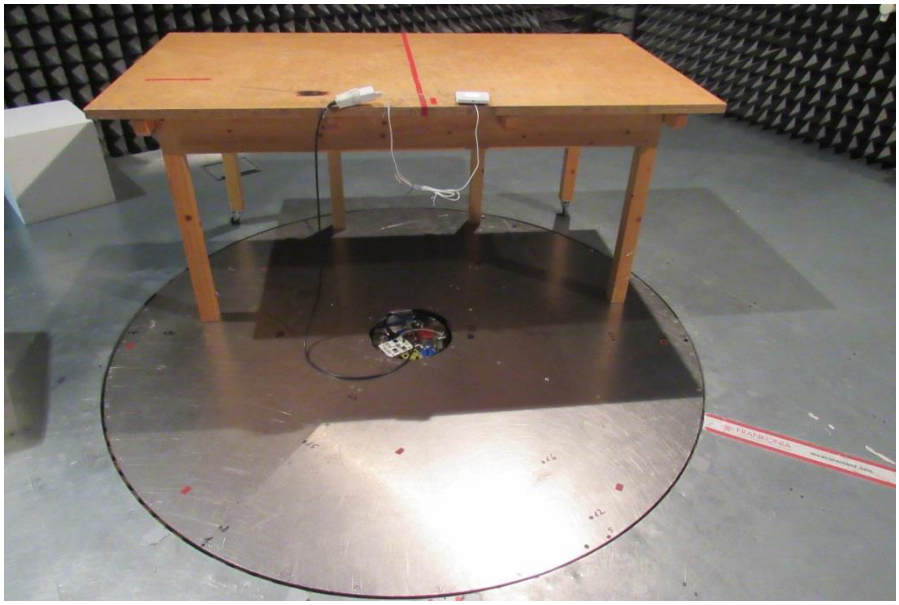
BT-Module


001-
P00500
MURATA
M/N:ZY 0001
FCC ID:VPYLBZY
IC:772C-LBZY
SS5323001

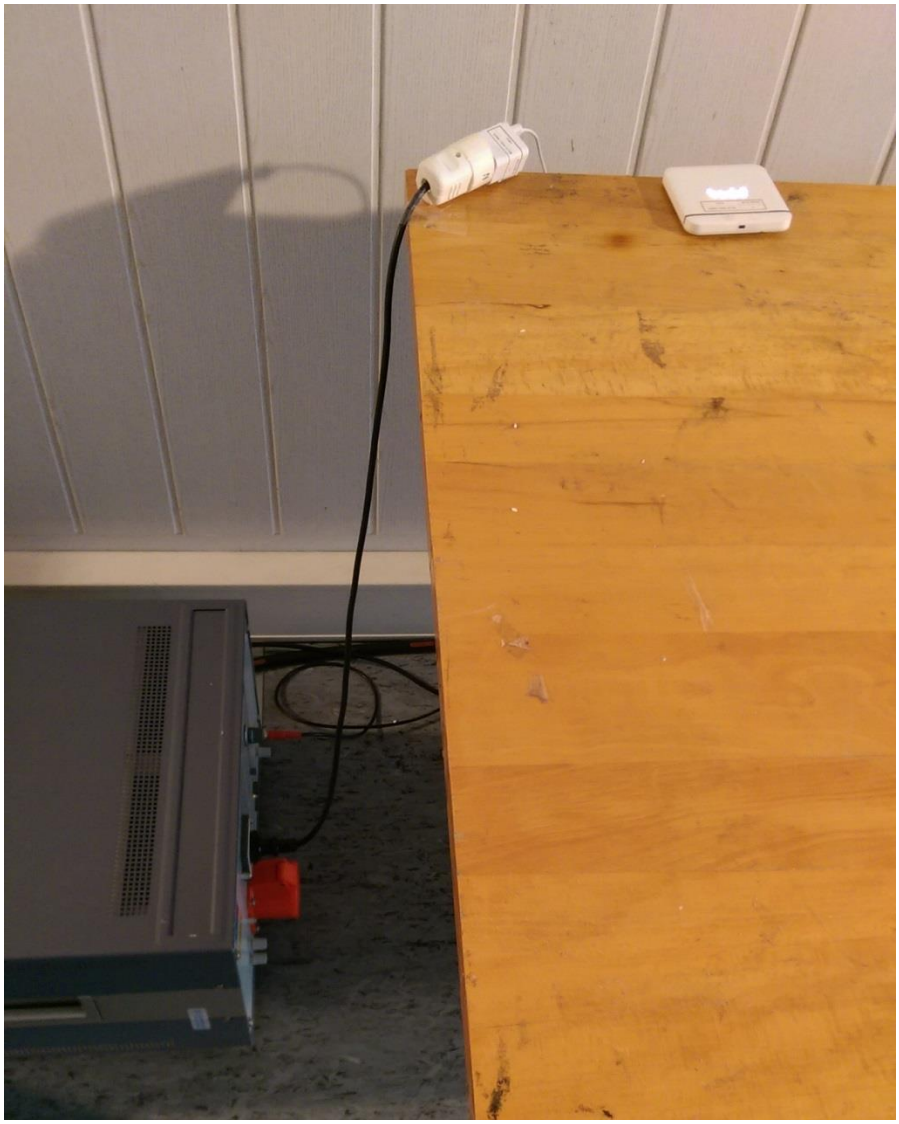
WLAN Module


M/N: CC3200MODR1M2AMOB
T77H534.00
FCC ID: Z64-CC3200MODR1
IC : 451I-CC3200MODR1
2202017291-07L2
507M20346C9
R 001-A04799

1.3 Photos – Test setup

Test Setup : Radiated Emissions


Test Setup : Conducted Emissions



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Notebook	Dell	Latitude	S/N: 4250214
AE	Bluetooth Dongle	BlueGiga	BLED112	
AE	WLAN Router	Netgear	WPN824	

***Note:** Use the following abbreviations:

AE : Auxiliary/Associated Equipment, or

SIM : Simulator (Not Subjected to Test)

CABL : Connecting cables

1.5 Input / Output Ports

Port #	Name	Type*	Max. Cable Length	Cable Shielded	Comments
1	AC Mains	AC	<3m	No	

***Note:** Use the following abbreviations:

AC : AC power port

DC : DC power port

N/E : Non electrical

I/O : Signal input or output port

TP : Telecommunication port

1.6 Operating Modes and Configurations

Mode #	Description
1	WLAN communication + Bluetooth communication + Infrared packet transmission + display always on

Configuration #	EUT Configuration
1	Fully configured with dedicated AC/DC Adapter

1.7 Test Equipment Used During Testing

Measurement Software			
Description	Manufacturer	Name	Version
EMC Test Software	Dare Instruments	Radimation	2014.1.15

Radiated emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Biconical Antenna	R&S	HK 116	EF00012	2013-02	2016-02
LPD-Antenne	R&S	HL 223	EF00187	2014-03	2017-03
Horn antenna	Schwarzbeck	BBHA 9120D	EF00018	2013-09	2016-09
EMI Test Receiver	R&S	ESU26	EF00887	2015-01	2016-01

Conducted emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	R&S	ESH2-Z5	EF00182	2014-11	2016-11
AMN	R&S	ESH3-Z5	EF00036	2014-12	2016-12
EMI Test Receiver	R&S	ESCS 30	EF00295	2014-10	2015-10

1.8 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, Industry Canada ICES-003				
Product Specific Standard	**Requirement – Test**	**Reference Method**	**Result**	**Remarks**
47 CFR 15.109 ICES-003 Item 6.2	Radiated emissions	ANSI C 63.4	PASS	
47 CFR 15.107 ICES-003 Item 6.1	AC power line conducted emissions	ANSI C63.4	PASS	
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Radiated emissions

Radiated emissions acc. FCC 47 CFR 15.109 / ICES-003						**Verdict: PASS**
Laboratory Parameters:	Required prior to the test		During the test			
Ambient Temperature	15 to 35 °C		26°C			
Relative Humidity	30 to 60 %		47%			
Test according referenced standards	Reference Method					
	ANSI C63.4					
Sample is tested with respect to the requirements of the equipment class	Equipment class					
	Class B					
Test frequency range determined from highest emission frequency	Highest emission frequency					
	2480 MHz					
Fully configured sample scanned over the following frequency range	Frequency range					
	30 MHz to 14 GHz					
Operating mode	1					
Configuration	1					
Limits and results Class B						
Frequency [MHz]	Quasi-Peak [dBµV/m]	Result	Average [dBµV/m]	Result	Peak [dBµV/m]	Result
30 – 88	40	PASS	-		-	-
88 – 216	43.5	PASS	-		-	-
216 – 960	46	PASS	-		-	-
960 – 1000	54	PASS	-		-	-
> 1000	-	-	54	PASS	74	PASS
Comments:						

Test Procedure:

The test site is in accordance with ANSI C63-4:2009 requirements and is listed by FCC.
The measurement procedure is as follows:

1) The EUT was placed on a 0.8 m non conductive table at a 3 m distance from the receive antenna (ANSI C63.4: 2009 item 6.2)
2) The antenna output was connected to the measurement receiver
3) 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
4) Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded.

Spurious emissions under normal conditions according to EN 301 489-1, EN 301 489-17

Project number: G0M-1505-4759

Applicant:	Tado° GmbH
EUT Name:	tado Smart AC Control
Model:	WR01
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2015-08-17
Note:	

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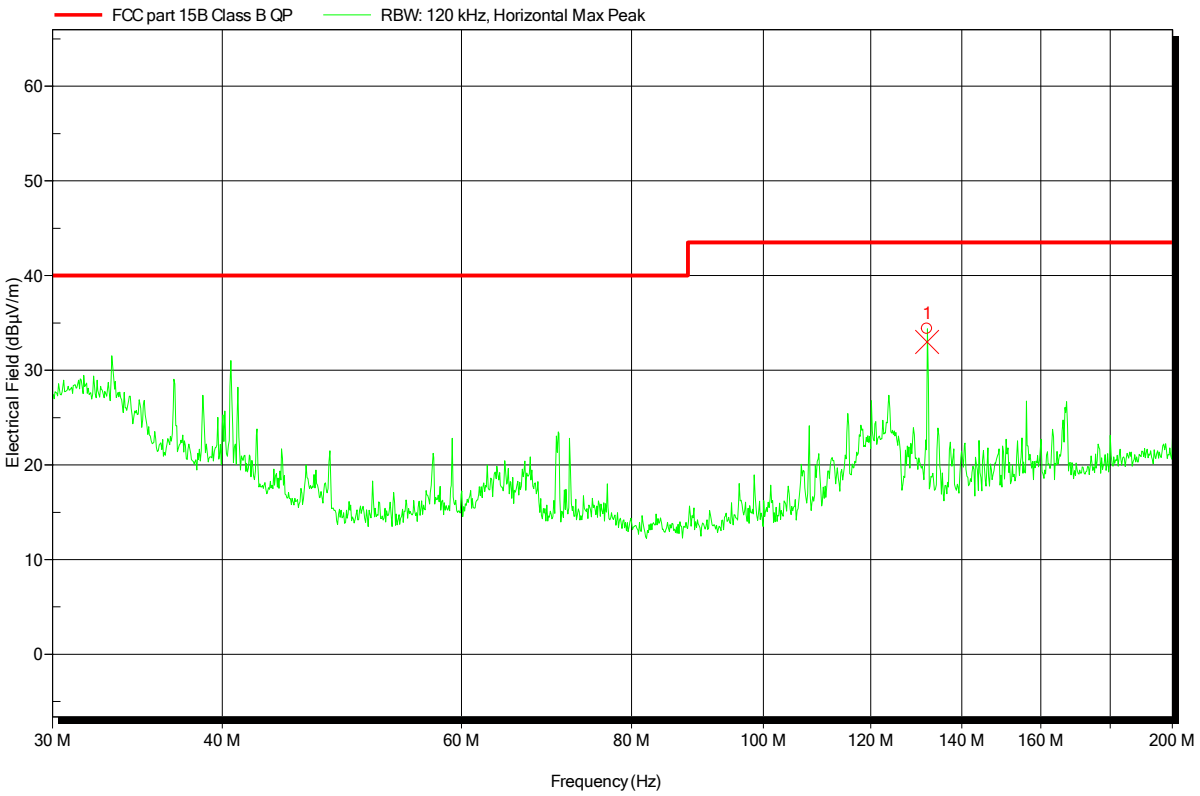

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
132 MHz	33 dBµV/m	43.5 dBµV/m	-10.5 dB	Pass

Spurious emissions under normal conditions according to EN 301 489-1, EN 301 489-17

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Model:	WR01
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2015-08-17
Note:	

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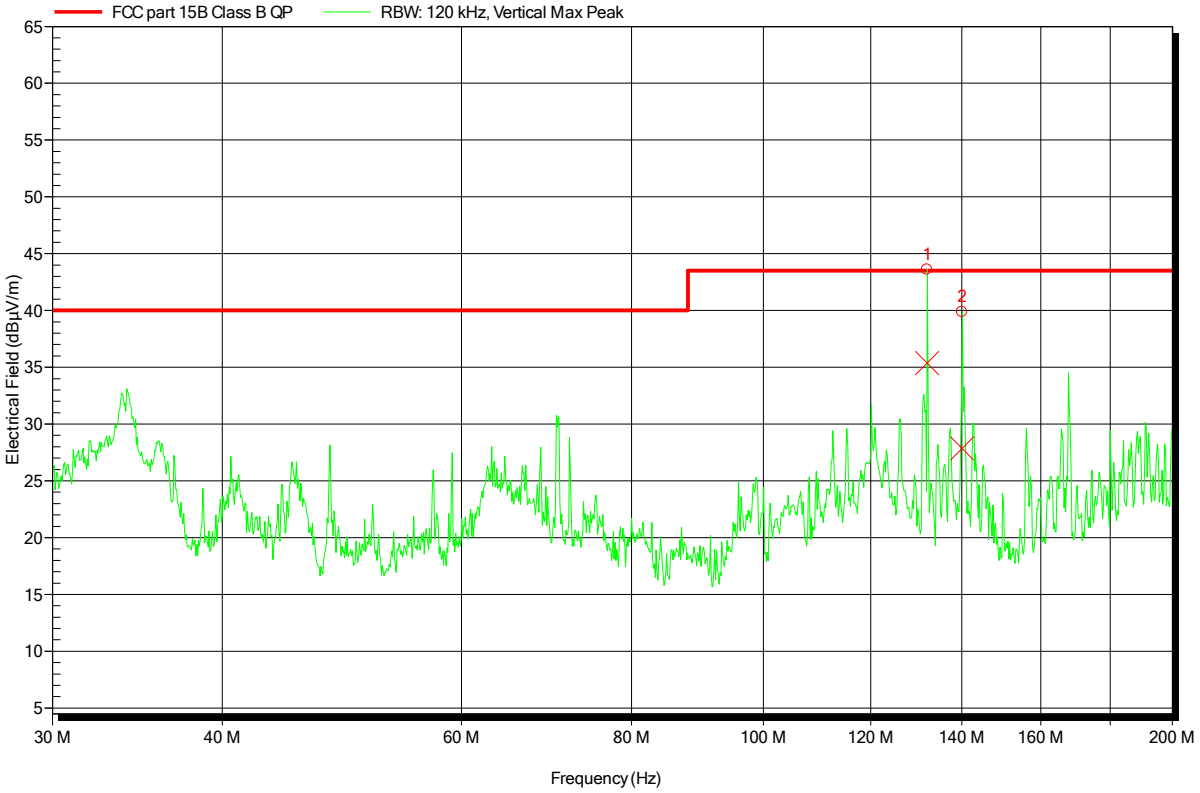

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
131.982 MHz	35.37 dBµV/m	43.5 dBµV/m	-8.13 dB	Pass
140.052 MHz	27.85 dBµV/m	43.5 dBµV/m	-15.65 dB	Pass

Spurious emissions under normal conditions according to EN 301 489-1, EN 301 489-17

Project number: G0M-1505-4759

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EUT Name:	tado Smart AC Control
Model:	WR01
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2015-08-17
Note:	

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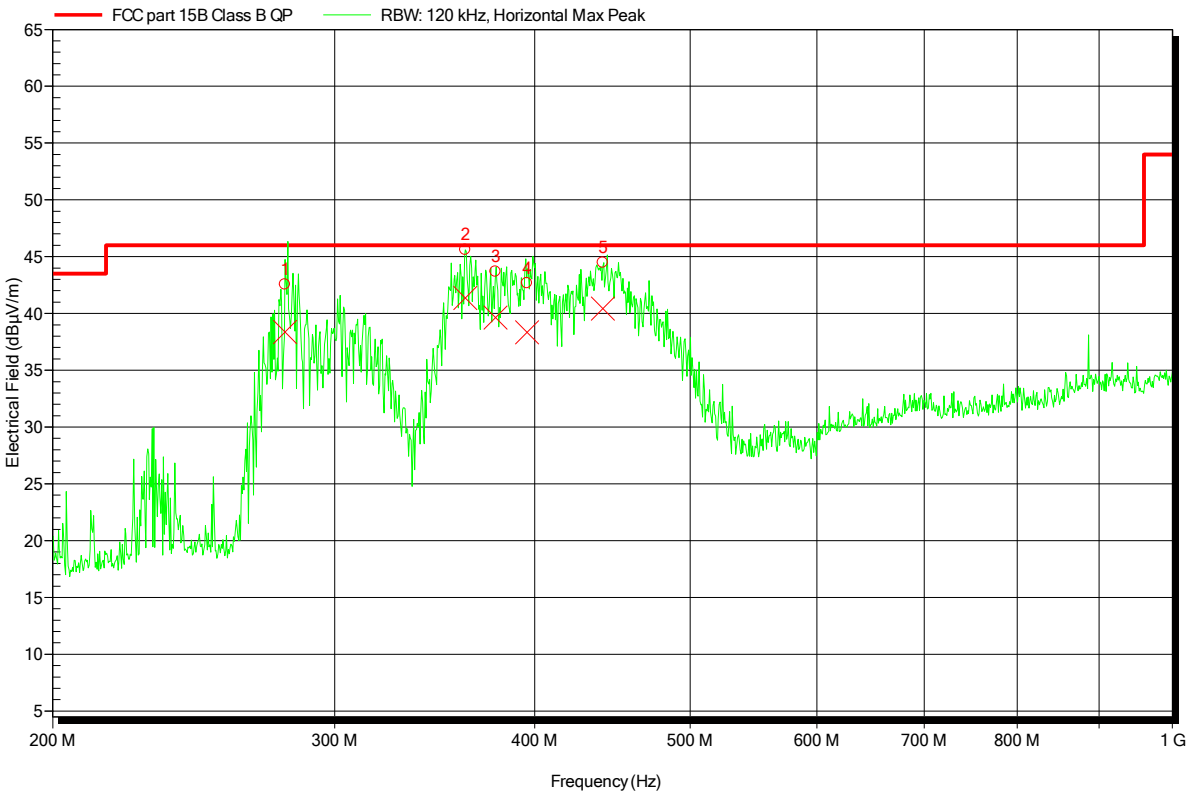

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
279.374 MHz	38.36 dBµV/m	46 dBµV/m	-7.64 dB	Pass
361.94 MHz	41.35 dBµV/m	46 dBµV/m	-4.65 dB	Pass
378.05 MHz	39.64 dBµV/m	46 dBµV/m	-6.36 dB	Pass
395.684 MHz	38.35 dBµV/m	46 dBµV/m	-7.65 dB	Pass
441.08 MHz	40.43 dBµV/m	46 dBµV/m	-5.57 dB	Pass

Spurious emissions under normal conditions according to EN 301 489-1, EN 301 489-17

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Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2015-08-17
Note:	

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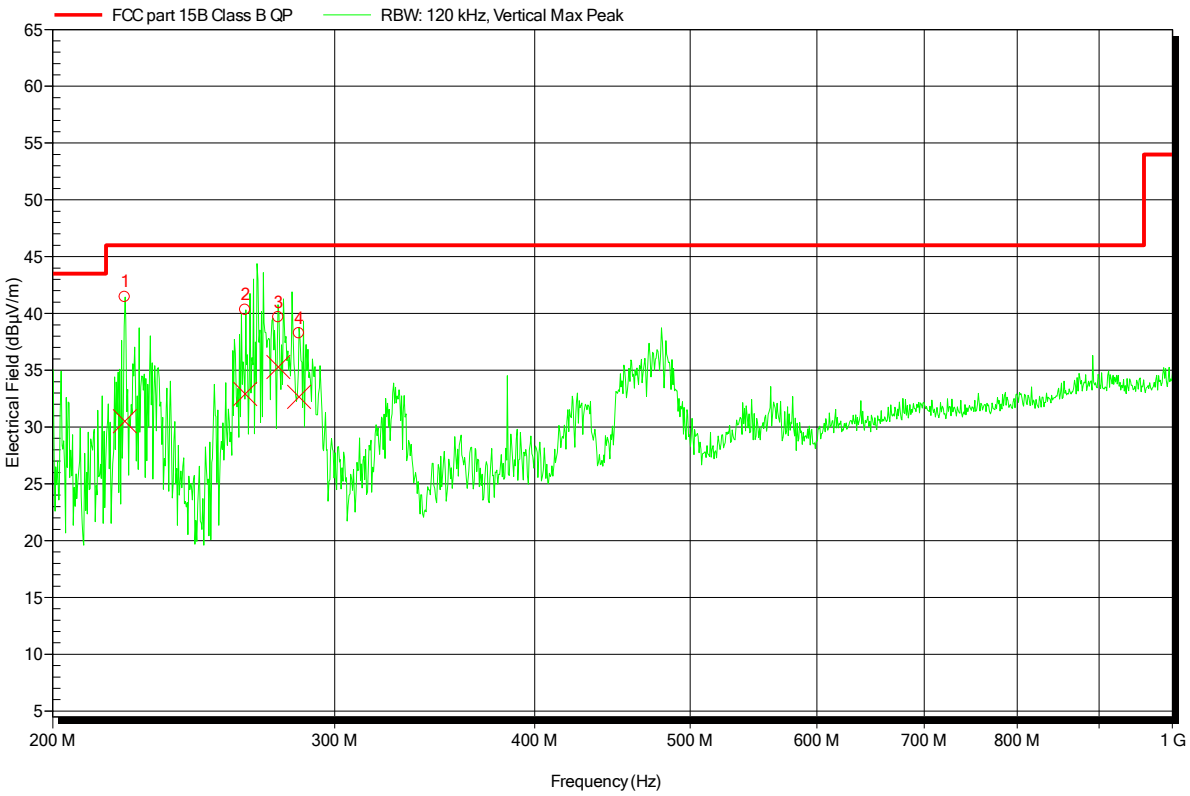

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
221.966 MHz	30.52 dBµV/m	46 dBµV/m	-15.48 dB	Pass
263.888 MHz	32.9 dBµV/m	46 dBµV/m	-13.1 dB	Pass
276.74 MHz	35.29 dBµV/m	46 dBµV/m	-10.71 dB	Pass
285.032 MHz	32.67 dBµV/m	46 dBµV/m	-13.33 dB	Pass

Spurious emissions under normal conditions according to EN 301 489-1, EN 301 489-17

Project number: G0M-1505-4759

Applicant:	Tado° GmbH
EUT Name:	tado Smart AC Control
Model:	WR01
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2015-08-19
Note:	

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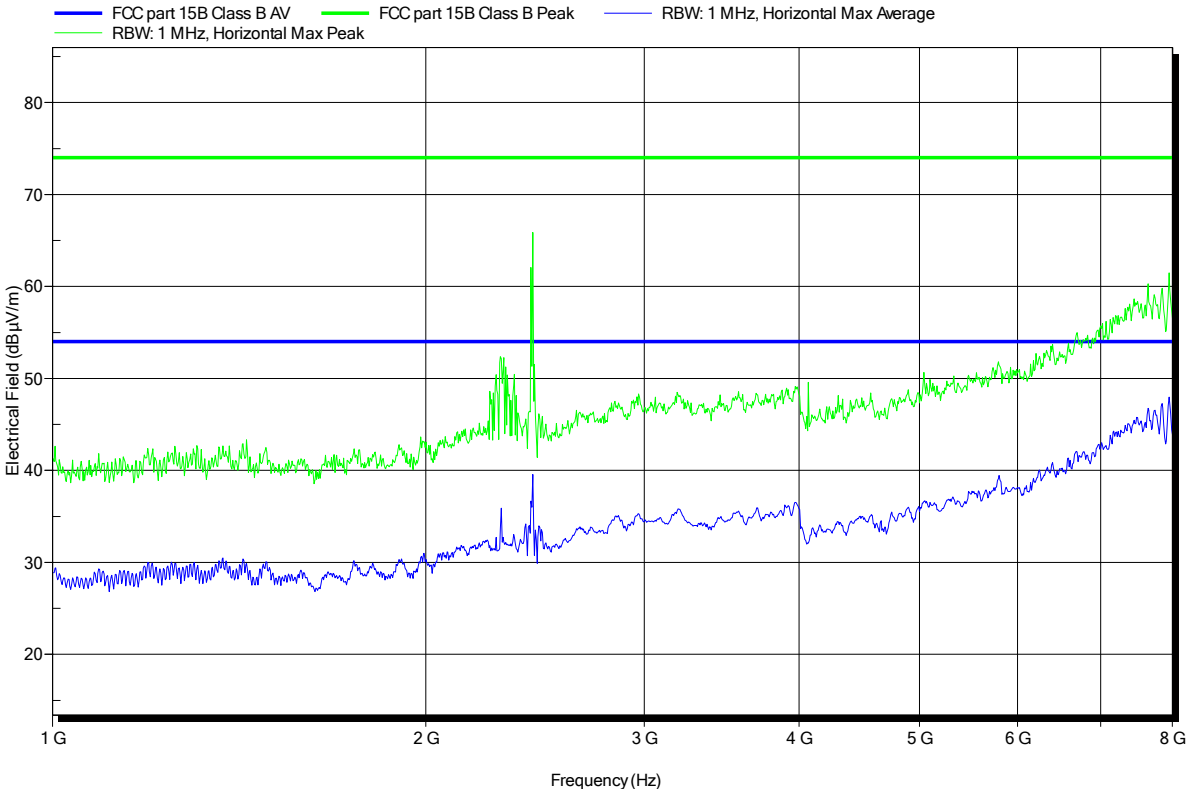

Spurious emissions under normal conditions according to EN 301 489-1, EN 301 489-17

Project number: G0M-1505-4759

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EUT Name:	tado Smart AC Control
Model:	WR01
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2015-08-19
Note:	

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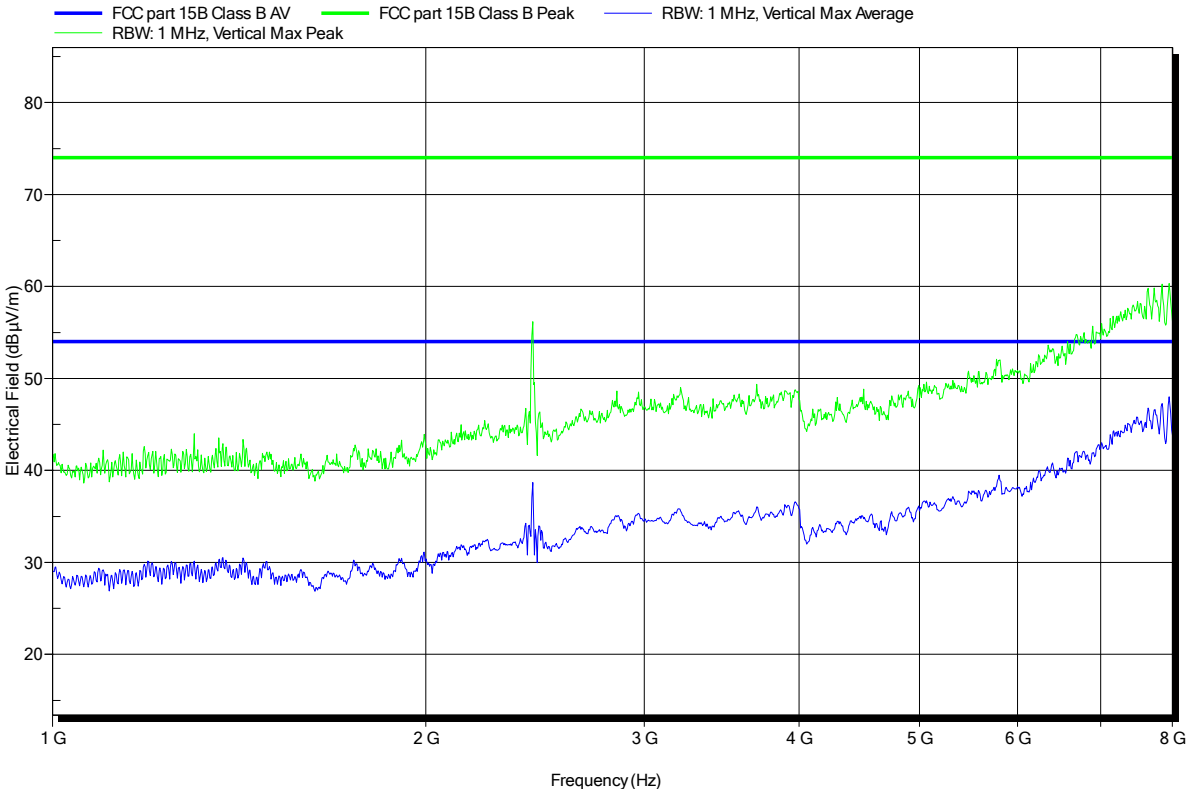

Spurious emissions under normal conditions according to EN 301 489-1, EN 301 489-17

Project number: G0M-1505-4759

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EUT Name:	tado Smart AC Control
Model:	WR01
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2015-08-19
Note:	

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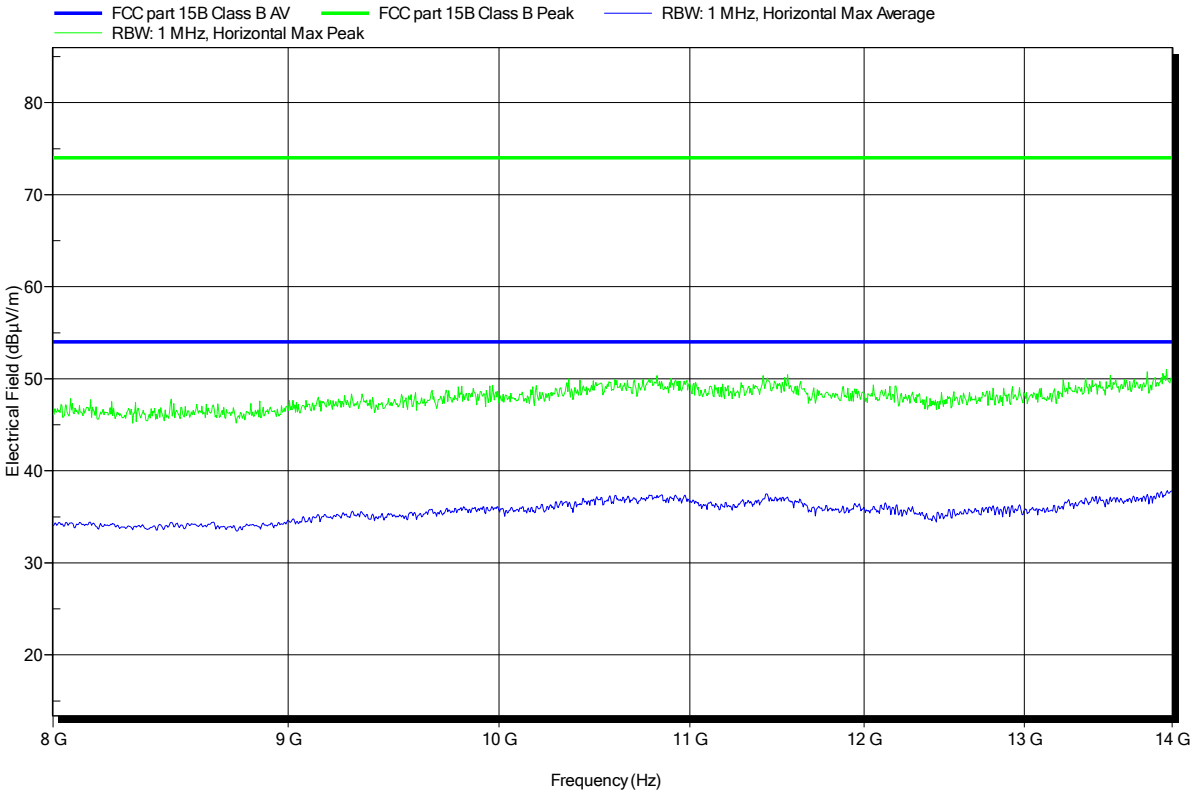

Spurious emissions under normal conditions according to EN 301 489-1, EN 301 489-17

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EUT Name:	tado Smart AC Control
Model:	WR01
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2015-08-19
Note:	

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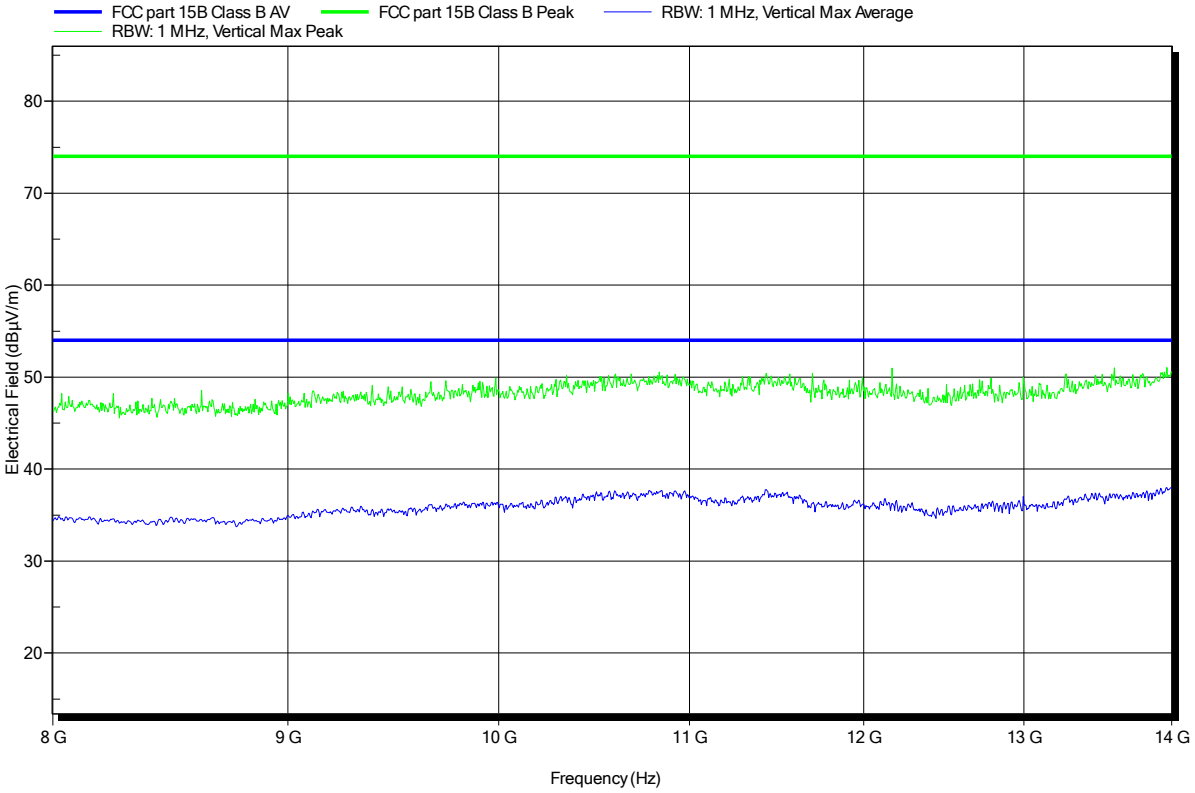

3.2 Test Conditions and Results – AC power line conducted emissions

Conducted emissions acc. FCC 47 CFR 15.107 / ICES-003		**Verdict: PASS**
Laboratory Parameters:	Required prior to the test	During the test
Ambient Temperature	15 to 35 °C	23°C
Relative Humidity	30 to 60 %	46%
Test according referenced standards	Reference Method	
	ANSI C63.4	
Fully configured sample scanned over the following frequency range	Frequency range	
	0.15 MHz to 30 MHz	
Sample is tested with respect to the requirements of the equipment class	Equipment class	
	Class B	
Points of Application	Application Interface	
AC Mains	LISN	
Operating mode	1	
Configuration	1	

Limits and results Class B

Frequency [MHz]	Quasi-Peak [dBµV]	Result	Average [dBµV]	Result
0.15 to 5	66 to 56*	PASS	56 to 46*	PASS
0.5 to 5	56	PASS	46	PASS
5 to 30	60	PASS	50	PASS

Comments:
* Limit decreases linearly with the logarithm of the frequency.

Test Procedure:

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: 2009 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

EMI voltage test in the ac-mains according to FCC PART 15B

Project number: G0M-1505-4759

Applicant:	Tado° GmbH
EUT Name:	tado Smart AC Control
Model:	WR01
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
LISN:	ESH2-Z5 L
Mode:	1
Test Date:	2015-08-18
Note:	

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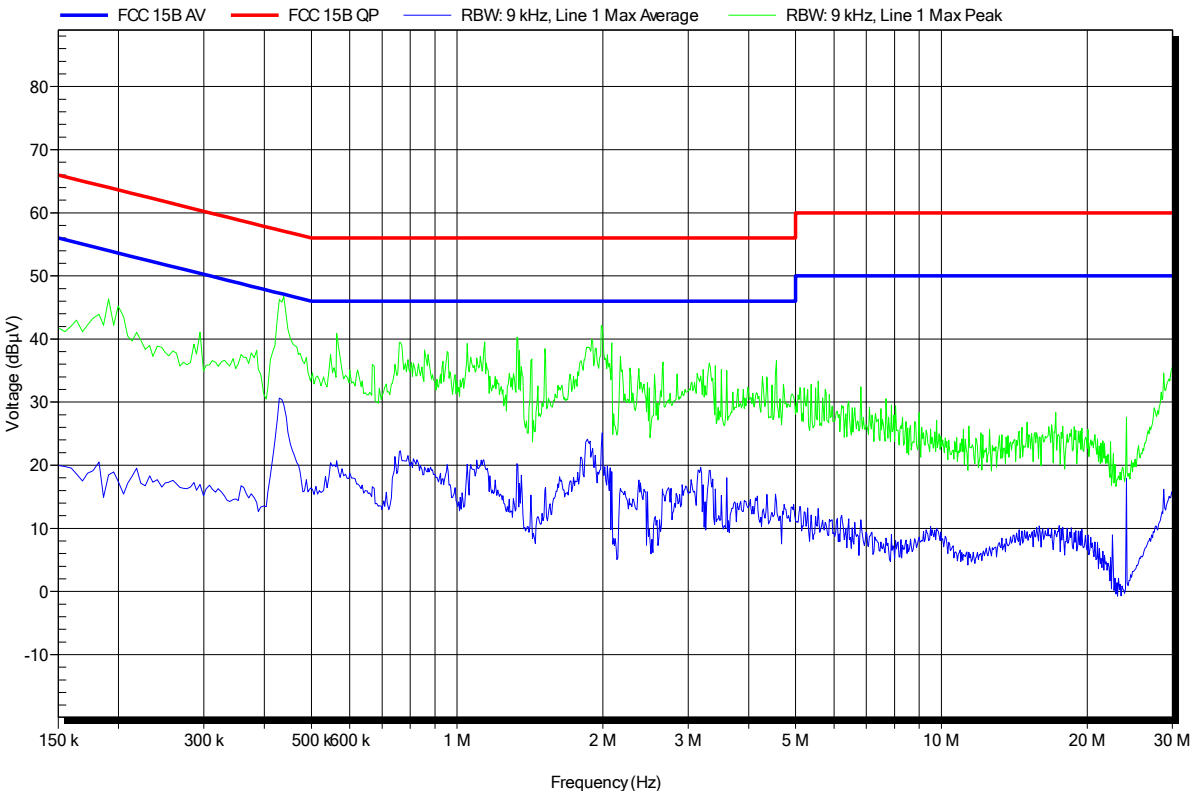

EMI voltage test in the ac-mains according to FCC PART 15B

Project number: G0M-1505-4759

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Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Yu
Test Conditions:	Tnom: 26°C, Unom: 5VDC via 120VAC AC/DC Adapter
LISN:	ESH2-Z5 N
Mode:	1
Test Date:	2015-08-17
Note:	

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