EMC TEST REPORT

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

Report Reference No	G0M-1909-8479-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	DAkkS - Registration number : D-PL-12092-01-03 (ISED) ISED Testing Laboratory site: 3470A-2 DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	pei tel Communications GmbH
Address	Rheinstraße 15 A 14513 Teltow GERMANY
Test Specification Standard(s)	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	PTCarPhone
Model(s)	PTCarPhone 6
Additional Model(s)	None
Brand Name(s)	PEI TEL
Hardware Version(s)	01
Software Version(s)	V.6.01.01
FCC-ID	2AU9JPTC6
IC	25691-PTC6
Test Result	**PASSED**

Possible 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	2019-11-18	
Report:		
Compiled by	Matthias Handrik	
Tested by (+ signature) (Responsible for Test)	Matthias Handrik	
Approved by (+ signature) (Head of Lab)	Christian Weber	
Date of Issue	2020-02-06	
Total number of pages	43	
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	2020-02-06	Initial Release	

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1 Equipment (Test Item) Under Test

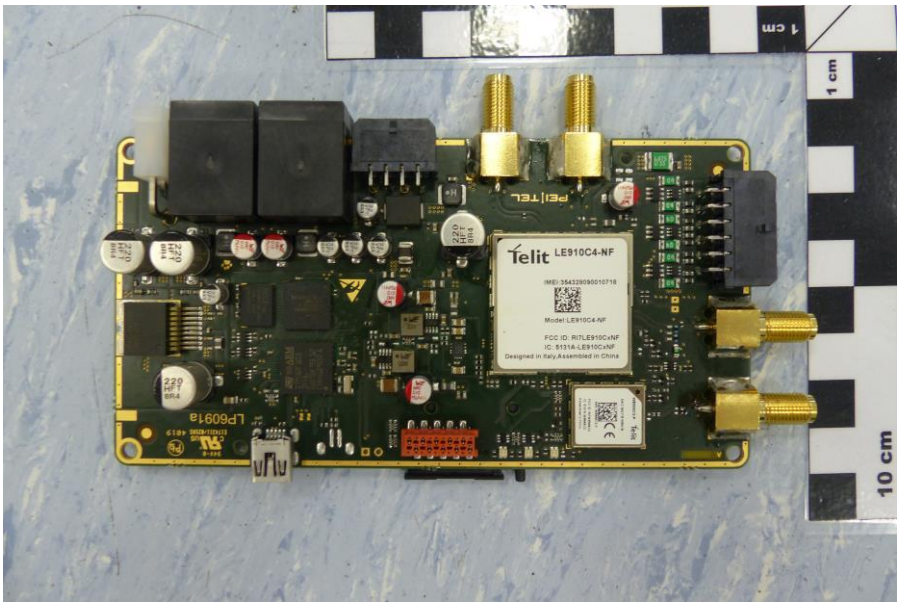
Description	PTCarPhone	
Model	PTCarPhone 6	
Additional Model(s)	None	
Brand Name(s)	PEI TEL	
Serial Number(s)	193596003	
Hardware Version(s)	01	
Software Version(s)	V.6.01.01	
FCC-ID	2AU9JPTC6	
IC	25691-PTC6	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	2500	
Radio Module	Type	Mobile communication module
	Model	LE910C4-EU
	Manufacturer	Telit
	FCC-ID	RI7LE910CXNF3
	IC	5131A-LE910CXNF
Radio Module	Type	WLAN module
	Model	WE866C3
	Manufacturer	Telit
	FCC-ID	RI7WE866C3
	IC	5131A-WE866C3
Supply Voltage	V_{NOM}	14 VDC
AC/DC-Adaptor	None	
Manufacturer	pei tel Communications GmbH Rheinstraße 15 A 14513 Teltow GERMANY	

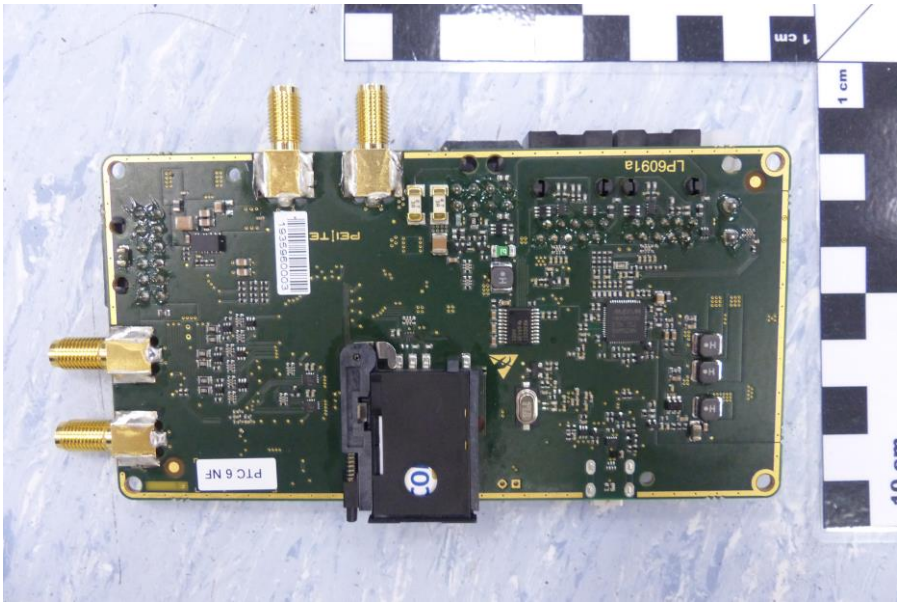
1.1 Equipment Ports

Name	Type	Attributes	Comment
LTE MIMO	IO	Count: 2 Direction: Out Service only: No	
Wifi	IO	Count: 1 Direction: IO Service only: No	
Loudspeaker Con	IO	Count: 1 Direction: Out Service only: No	
Harness	DC	Count: 1 Direction: In Service only: No	
Handset	IO	Count: 2 Direction: IO Service only: No	
Microphone	IO	Count: 1 Direction: In Service only: No	
GPS Antenna	IO	Count: 1 Direction: In Service only: No	
USB	IO	Count: 1 Direction: In Service only: YES	

Description:	
AC	AC mains power input/output port
DC	DC power input/output port
BAT	DC power input port connected to external battery
IO	Input/Output port
TP	Telecommunication port
NE	Non-electrical port

1.2 Equipment Photos - Internal

EUT PCB TOP


EUT PCB BOTTOM


1.3 Equipment Photos - External

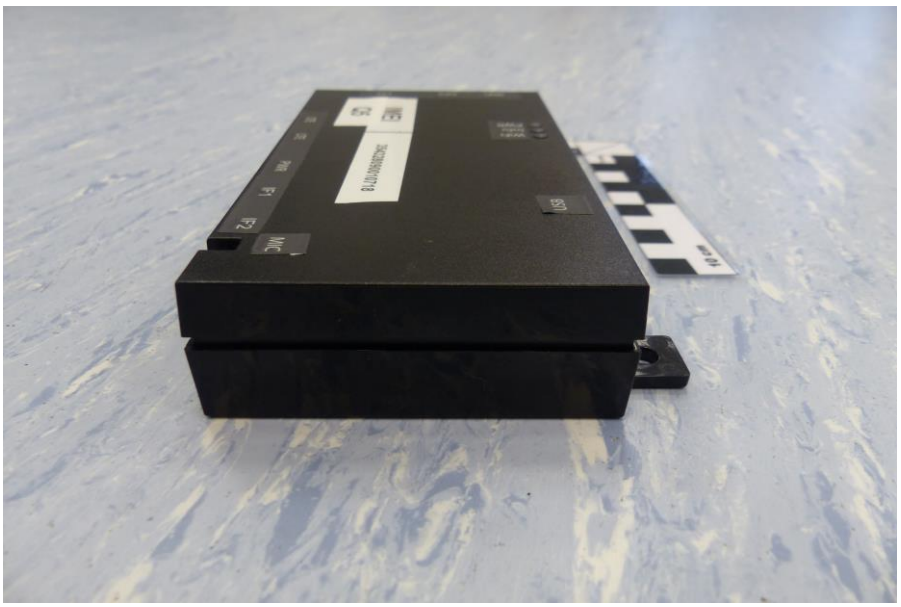
EUT TOP

EUT BOTTOM

EUT FRONT

EUT LEFT

EUT BACK

EUT RIGHT


1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
SIM	Radio Communication Tester	R&S	CMW290	
AE	Laptop	Lenovo	X250	
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment:				

1.5 Operational Modes

Mode #	Description
1	LTE + WLAN
2	UMTS + WLAN
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT powered via Laboratory power supply. EUT direct connected to CMW, measurement without mobile communication antennas. WLAN connection to laptop. Laptop is placed inside the measurement chamber (corner)
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 analyser in dBµV. Any external preamplifiers used are taken into account through internal analyser 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 analyser. 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 Analyser (dBµV) + A.F. (dB/m) = 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/m	= 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	Verdict	
FCC 15.107 ICES-003, 8, 6.2	AC power line conducted emissions	ANSI C63.4:2014	N/R	
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

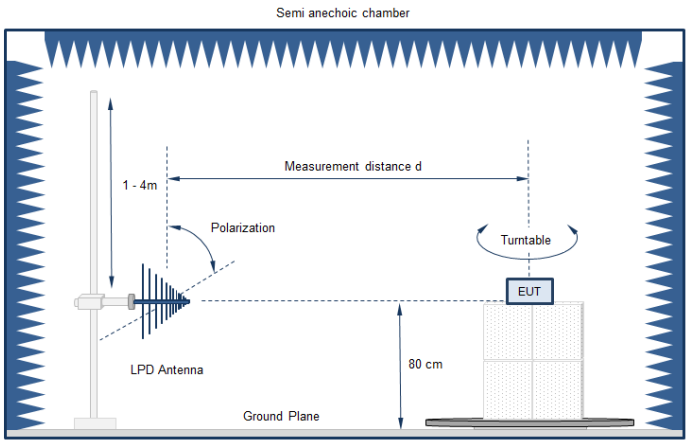
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

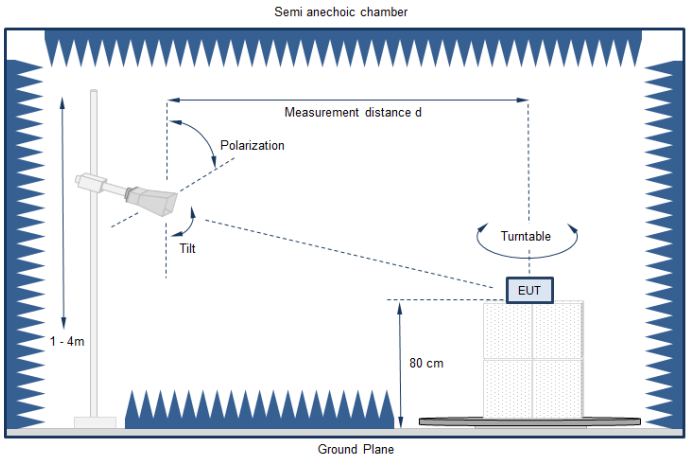
Test Information	
Reference	FCC 15.109, ICES-003, 8, 6.1
Reference method	ANSI C63.4:2014 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	2500
Measurement range	30 MHz to 30000 MHz
Temperature [°C]	22
Humidity [%]	25
Operator	Matthias Handrik
Date	2019-12-11

2.1.2 Setup

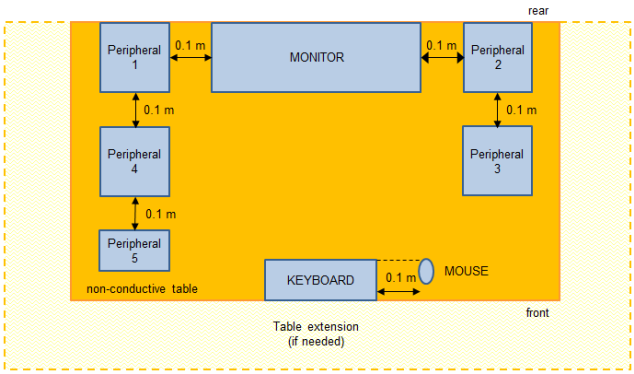
Measurement up to 1 GHz



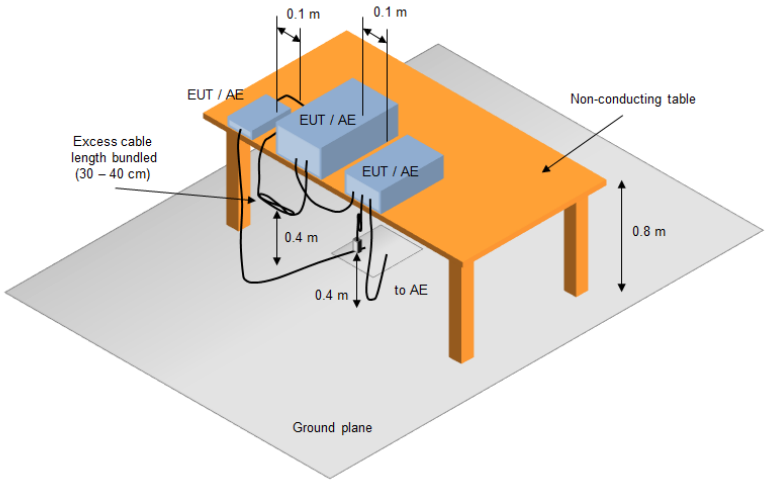
Measurement above 1 GHz



Equipment placement - Table top



Test Setup



2.1.3 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	Radimation	2016.1.10

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC1	EF00062	2018-07	2021-07
EMI Test Receiver	Keysight	N9038A-526/WXP	EF01070	2019-09	2020-09
Biconical Antenna	R&S	HK 116	EF00030	2019-04	2022-04
LPD Antenna	R&S	HL 223	EF00187	2019-05	2022-05
Horn antenna	Schwarzbeck	BBHA 9120D (1-18GHz)	EF00018	2016-09	2019-09
Spectrum analyzer	Rohde & Schwarz Vertriebs GmbH	FSW43	EF00896	2019-07	2020-07
40GHz High Gain Antenna	Amplifier Research	AT4560	EF00302	2019-05	2020-05

40GHz Standard Gain Horn with Amplifier	Flann Microwave Ltd	22240-25 Amp. CBL26402075	EF00301	2016-11	2019-11
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2019-05	2020-05
Climatic Sensor	Embedded Data Systems, LLC.	0200100000253 77E	EF01336	2019-05	2020-05

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

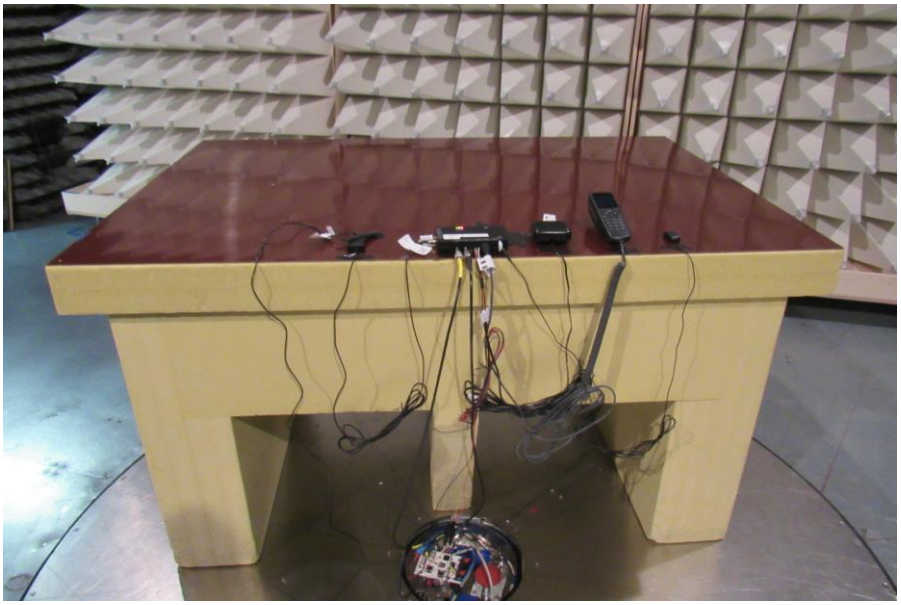
Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak Average	74 54

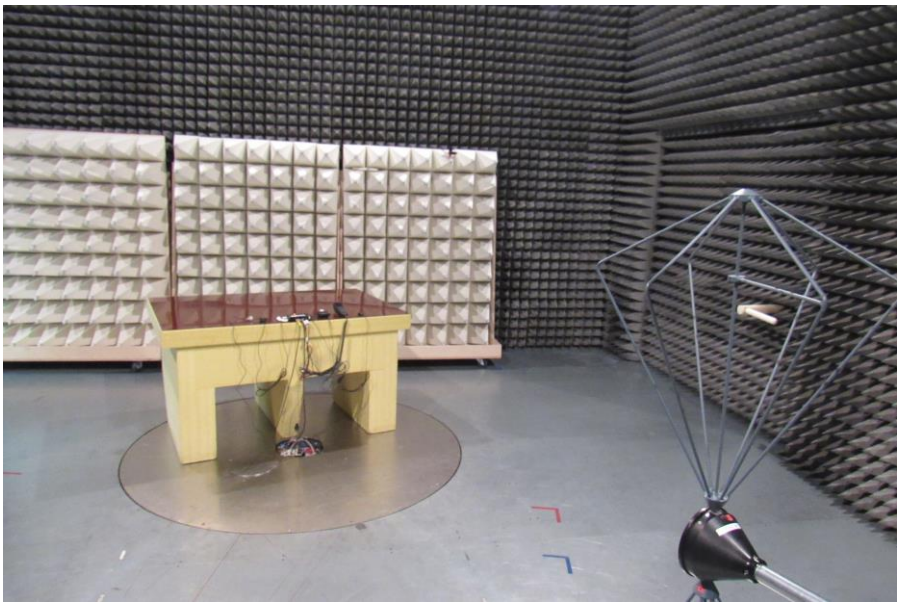
Class A @ 10 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	39
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46.5
960 - 1000	Quasi-peak	49.5
> 1000	Peak Average	69.5 49.5

2.1.6 Results

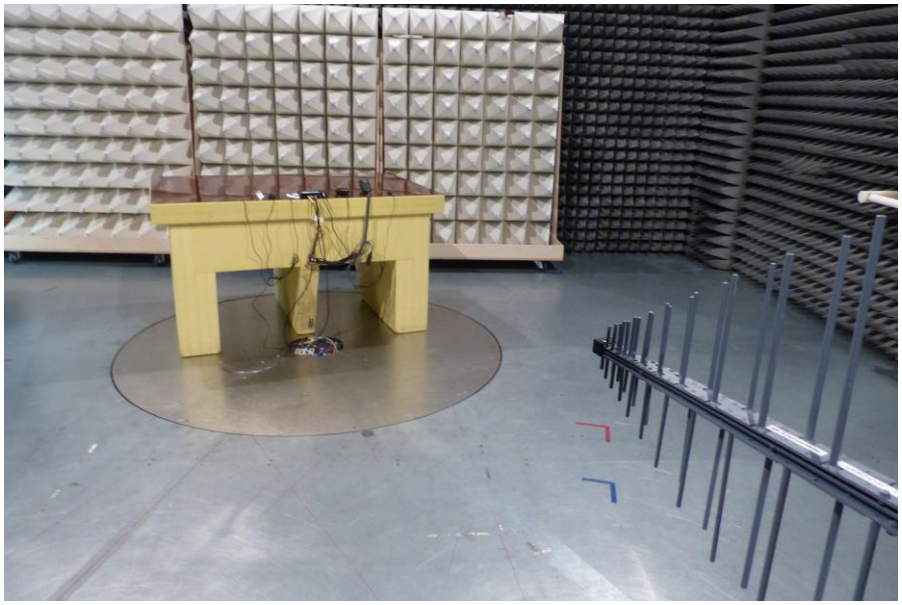
Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	Comment
2	1	PASS	Comment
Comment:	after evaluation of worst case for LTE / UMTS bands and WLAN, only worst case is documented in this test report		

2.1.7 Setup Photos

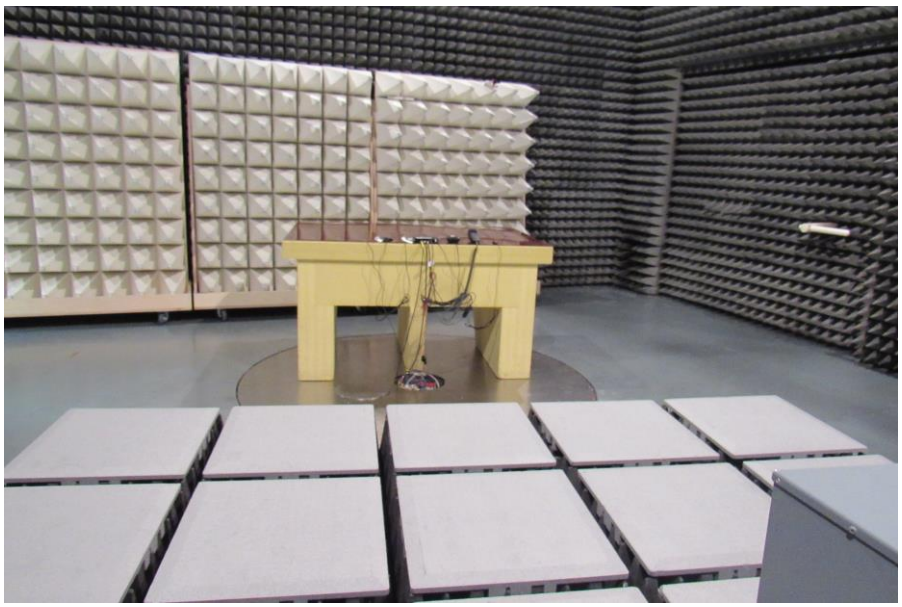
Test setup


Test setup 30-200MHz


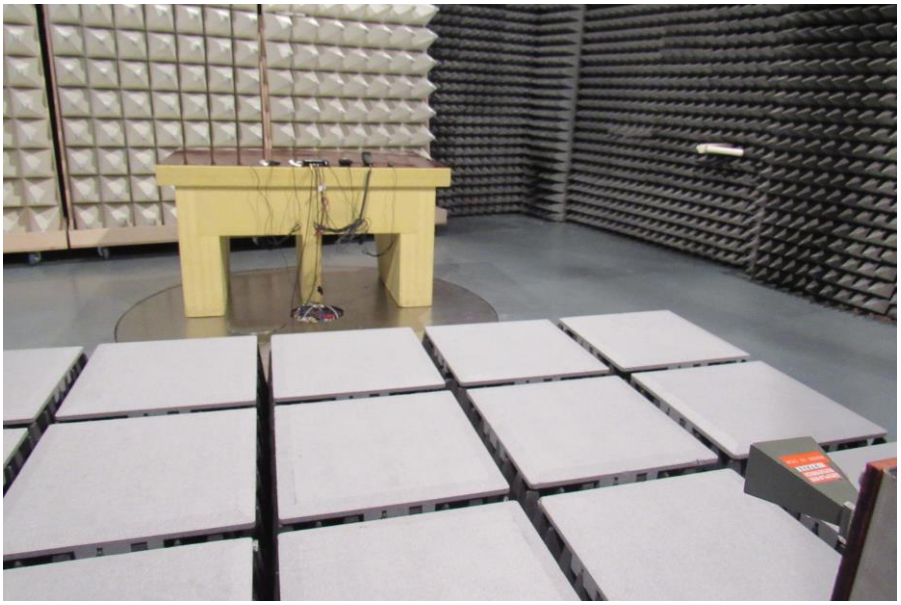
Test setup 200-1000MHz



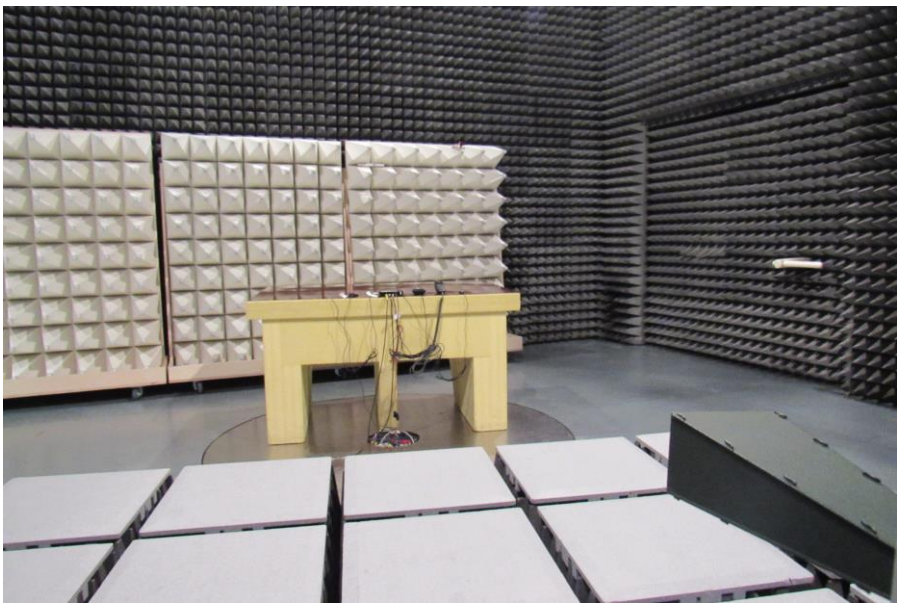
Test setup 1-17GHz



Test setup 17-26GHz



Test setup 26-30GHz



2.1.8 Records

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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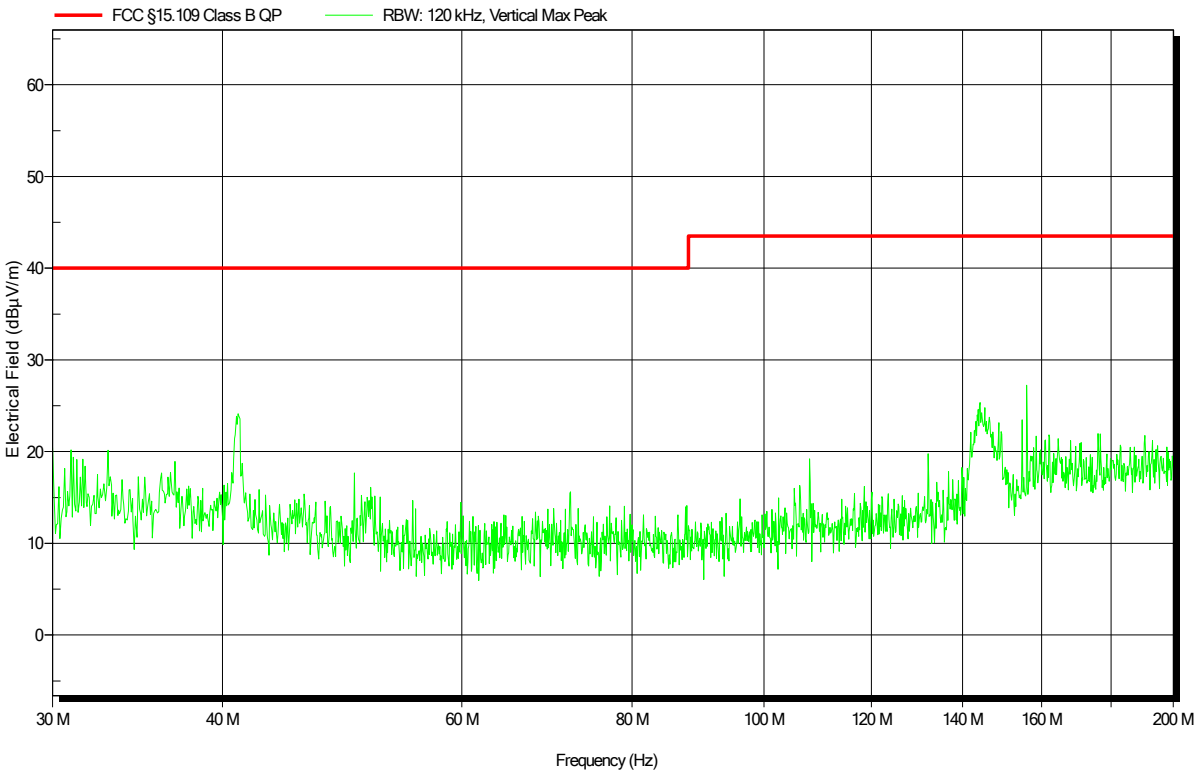

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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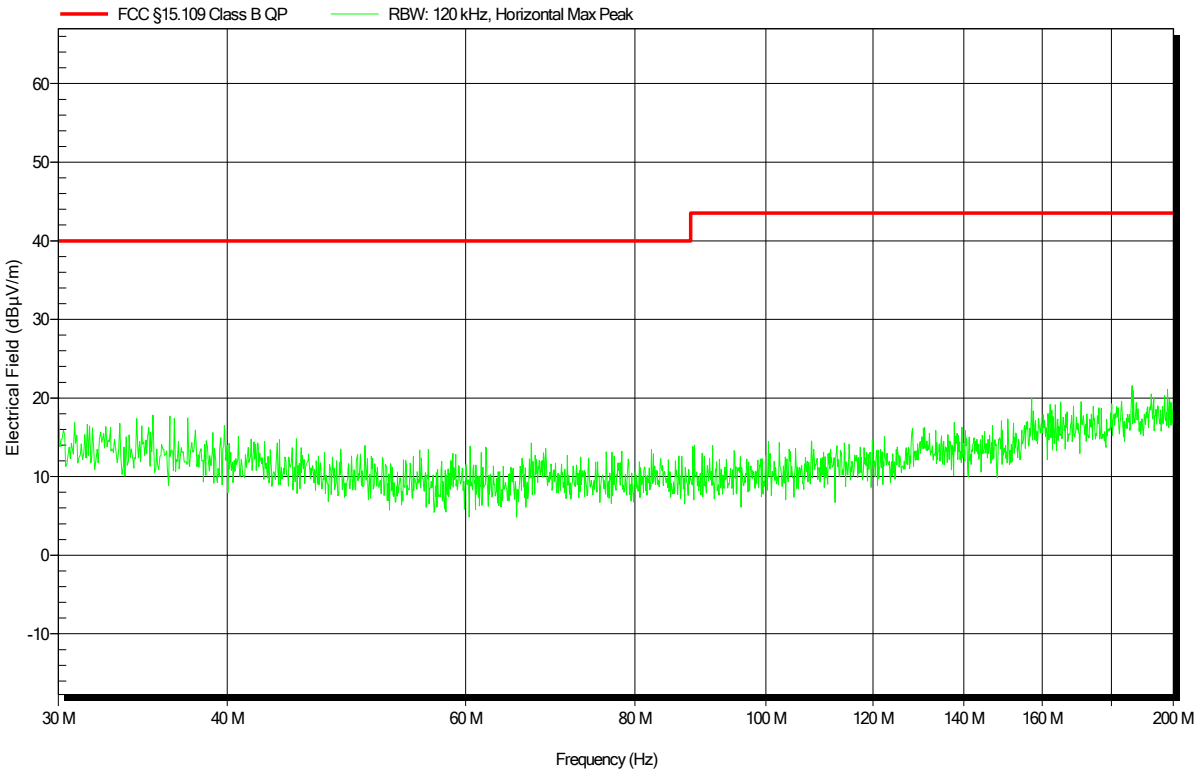

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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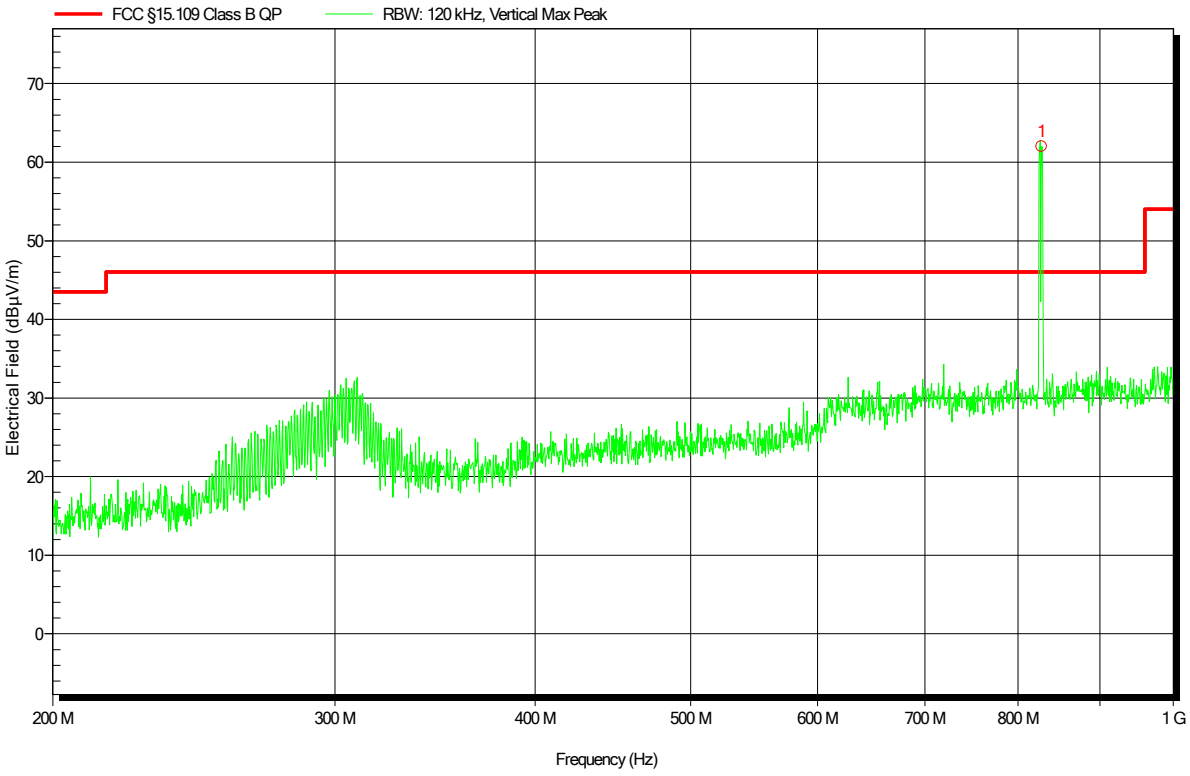

Peak Number	Frequency	
1	827.679 MHz	UMTS carrier

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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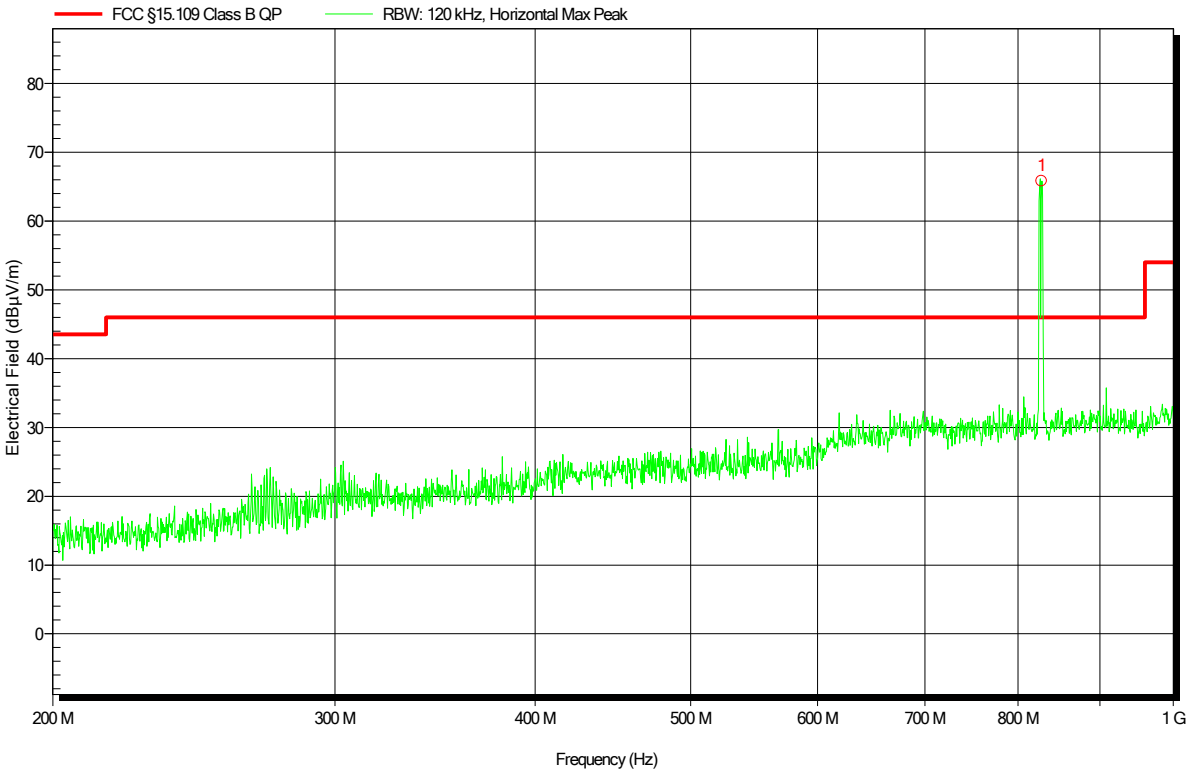

Peak Number	Frequency	
1	827.679 MHz	UMTS carrier

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-11
Note:	

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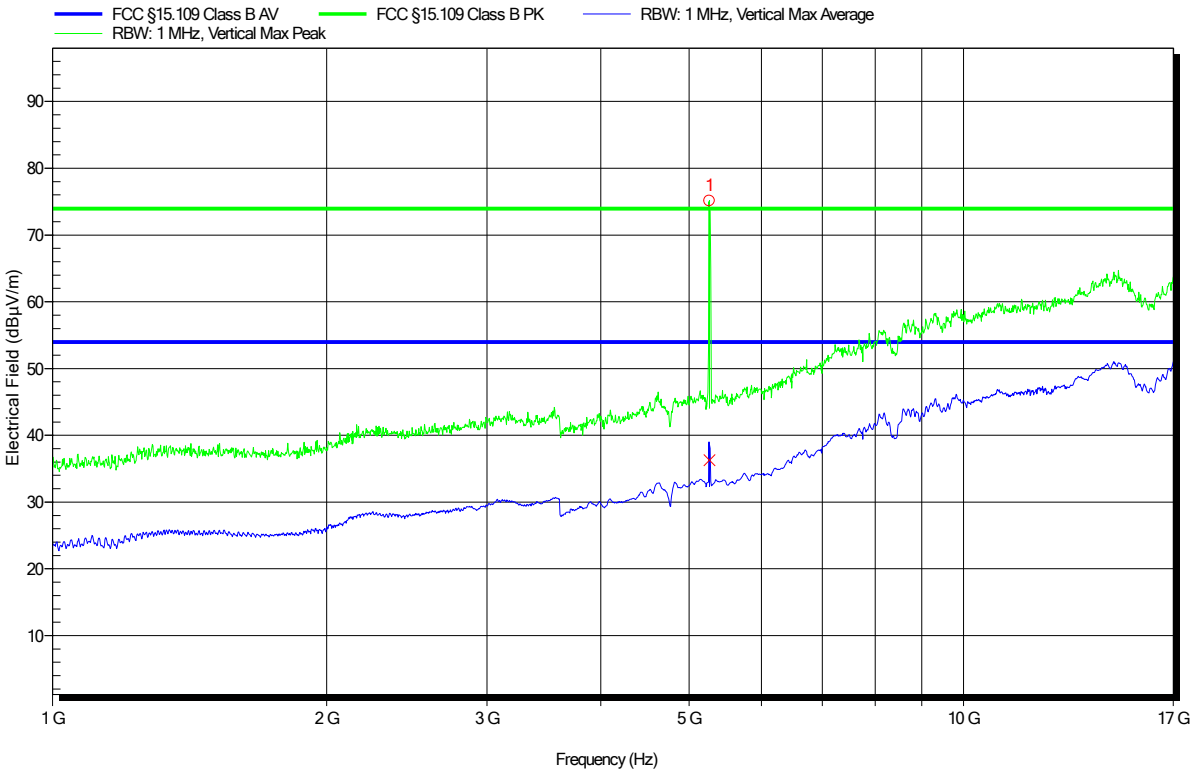

Peak Number	Frequency	
1	5.261 GHz	WLAN carrier

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-11
Note:	

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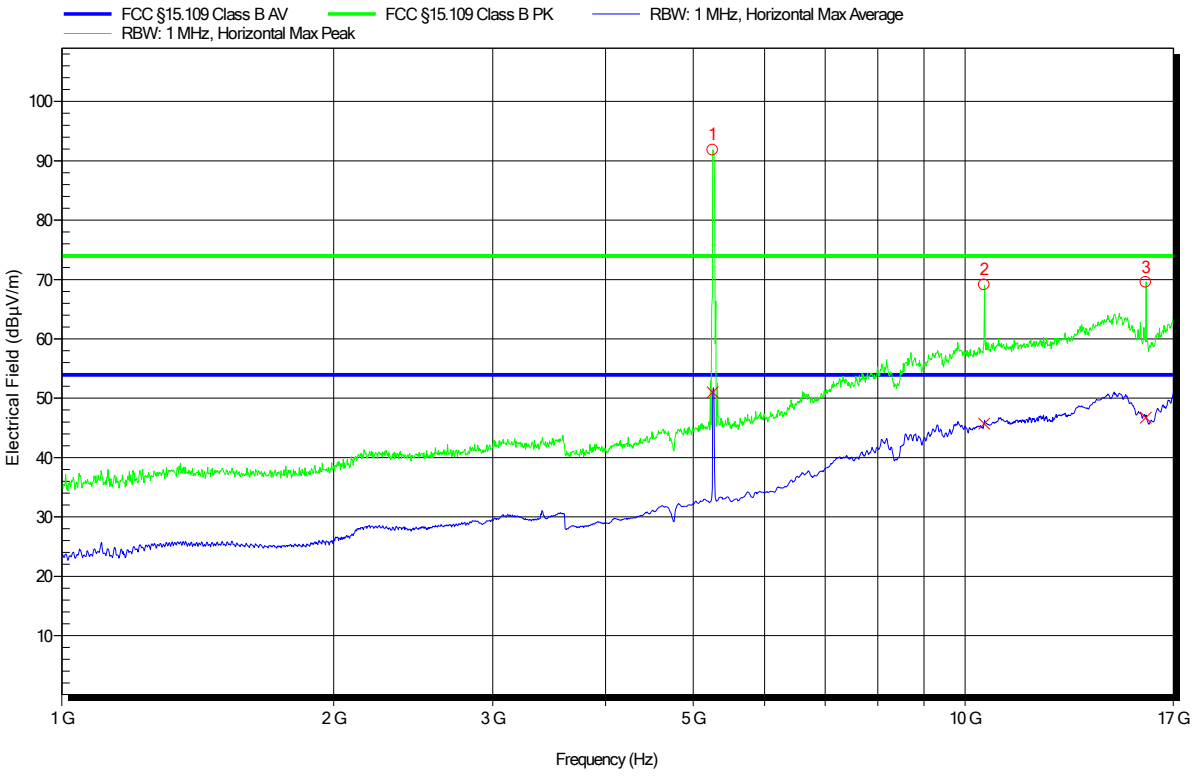

Peak Number	Frequency	Peak	Angle	Height
1	5.255 GHz	WLAN carrier		
2	10.498 GHz	2nd harmonics		
3	15.844 GHz	3rd harmonics		

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	AT4560, Vertical
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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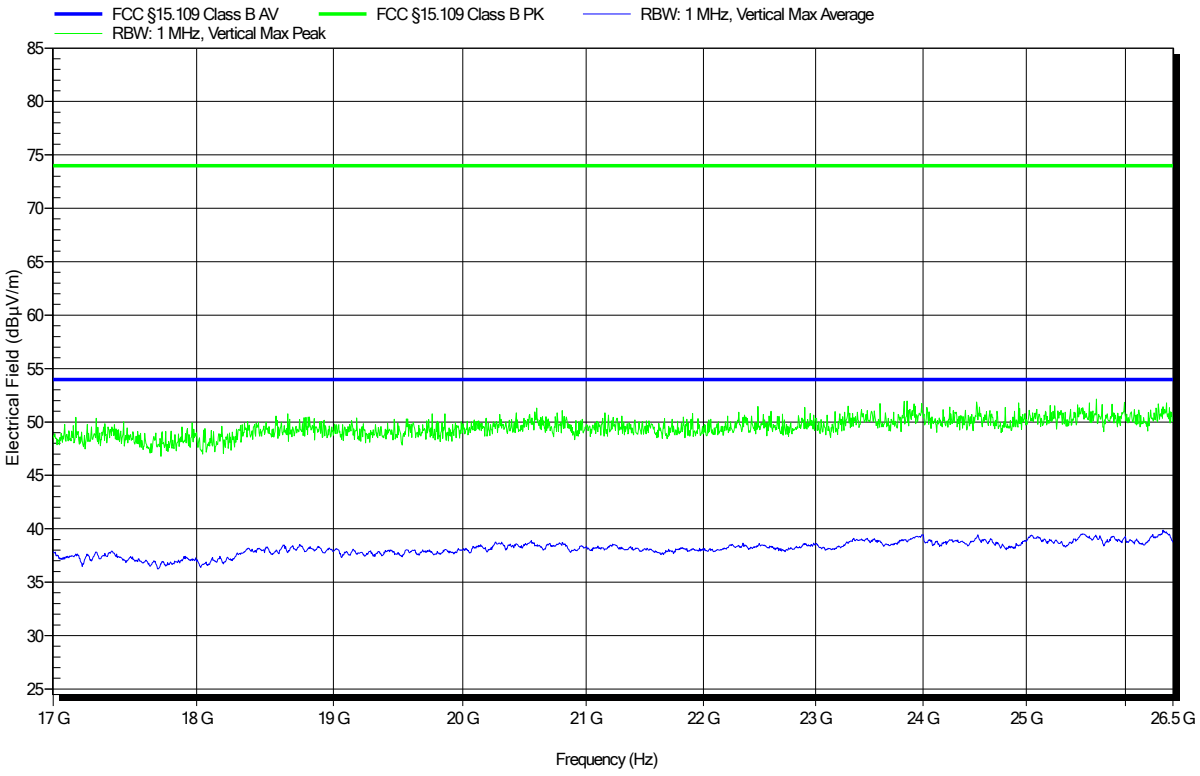

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	AT4560, Horizontal
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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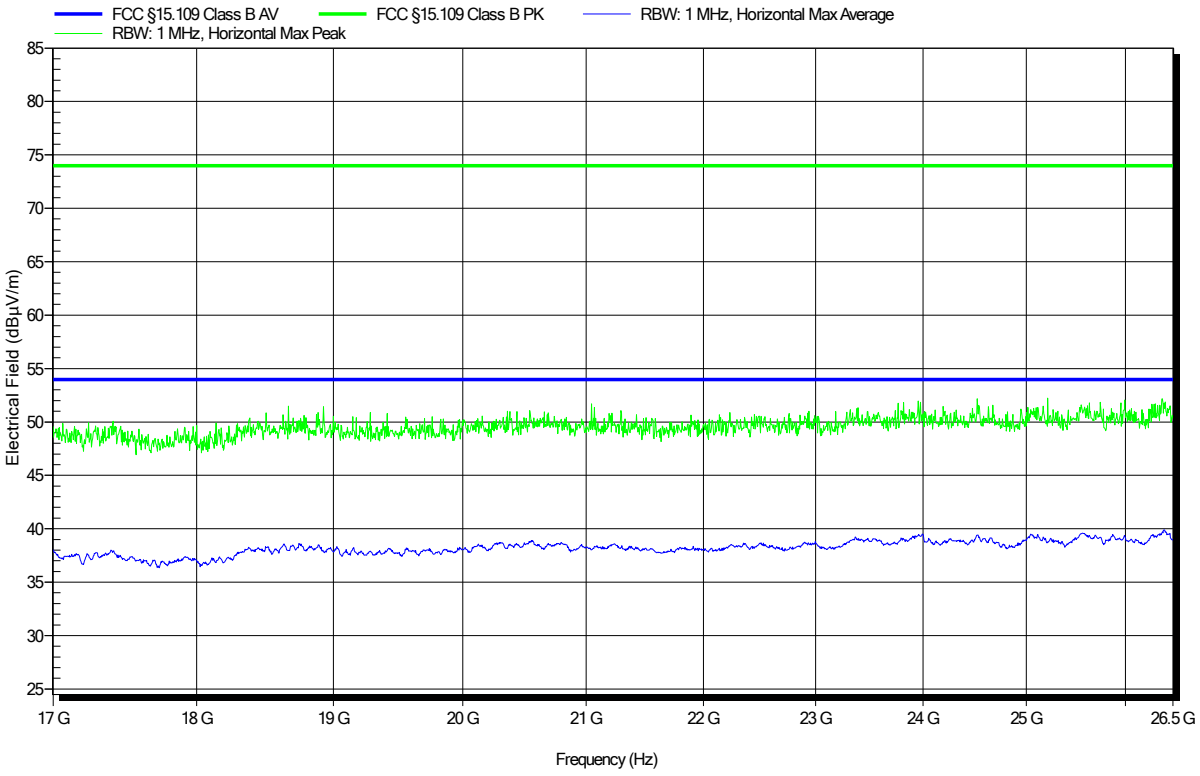

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	CBL264075, Vertical
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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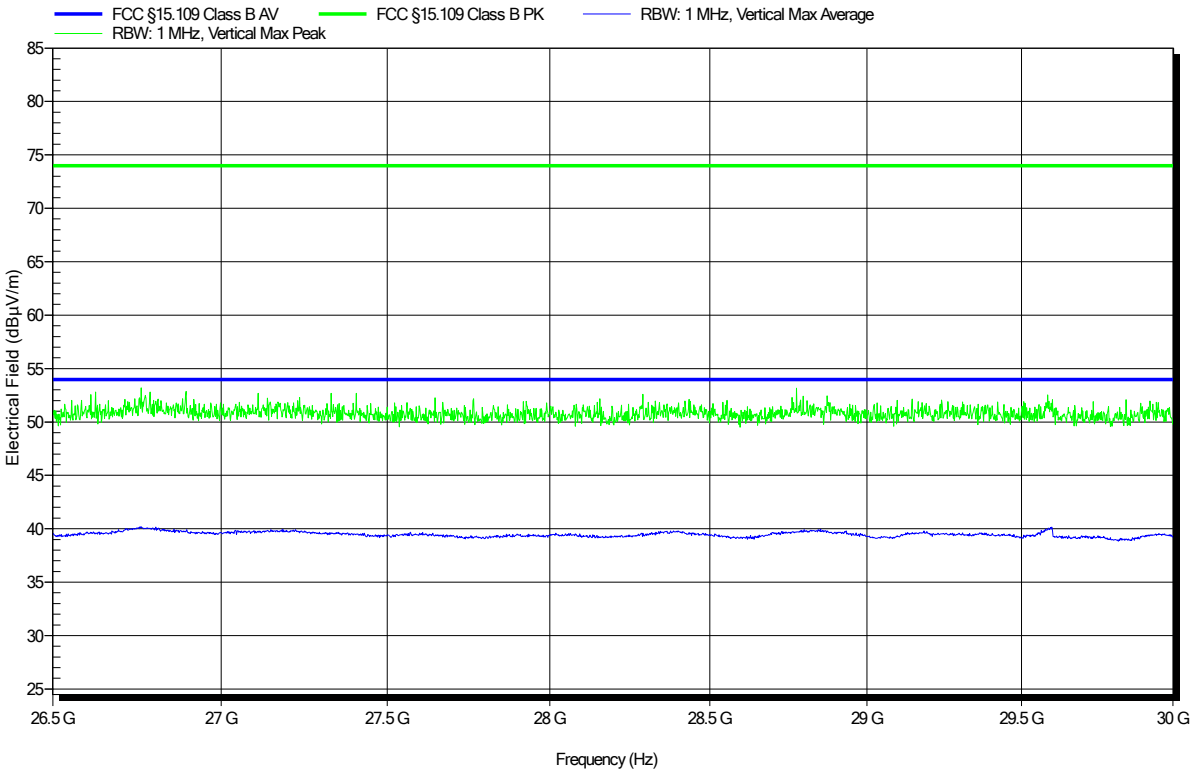

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	CBL264075, Horizontal
Measurement distance:	3m
Mode:	2: FDD V; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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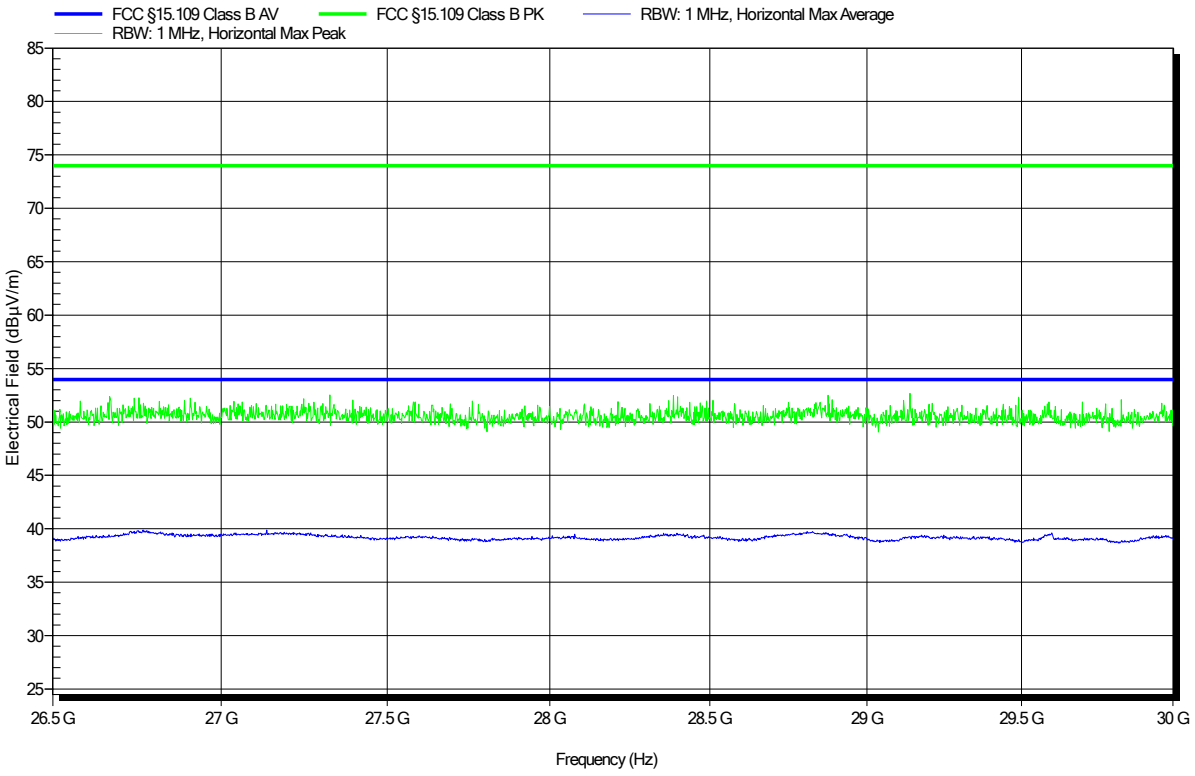

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	1: FDD 14; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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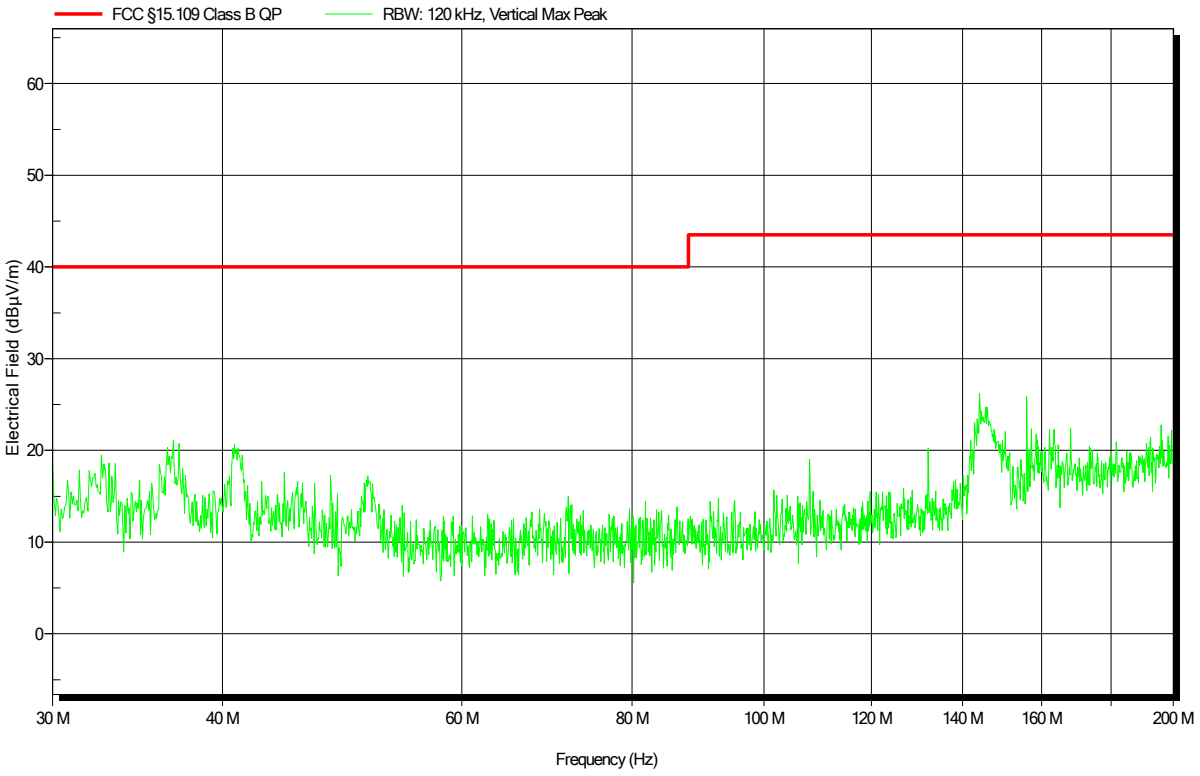

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	1: FDD 14; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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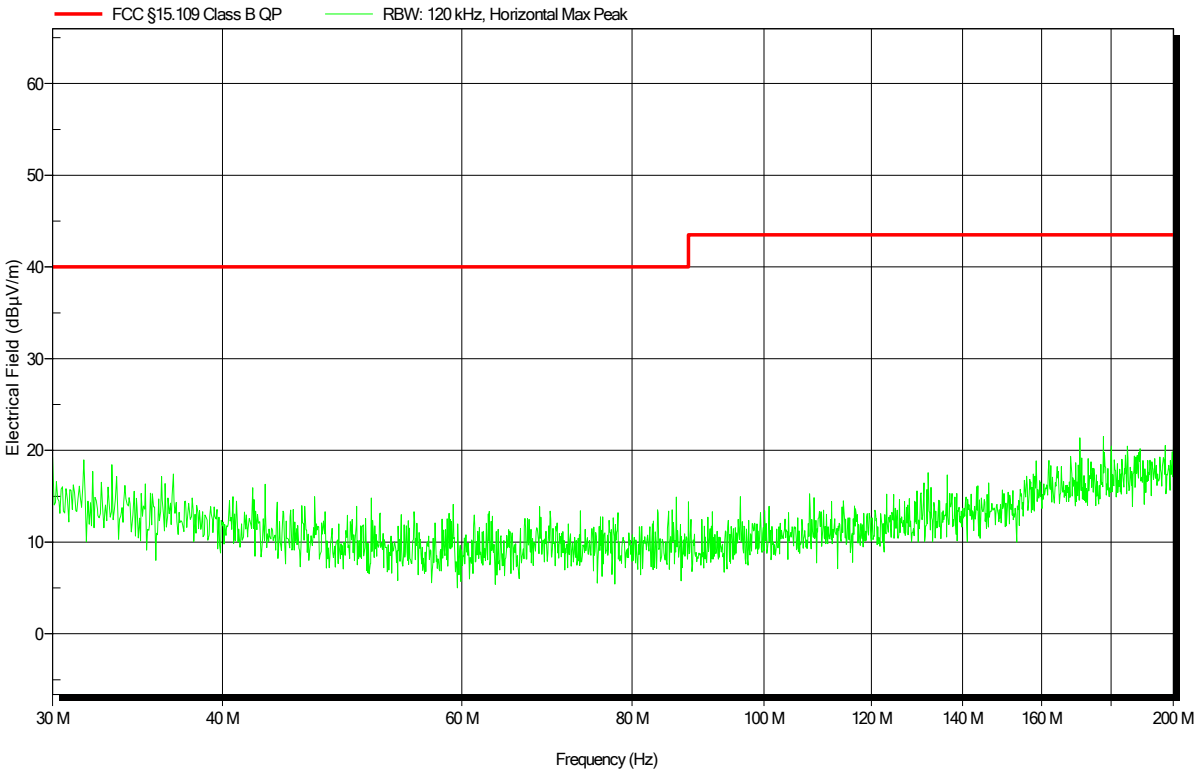

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	1: FDD 2; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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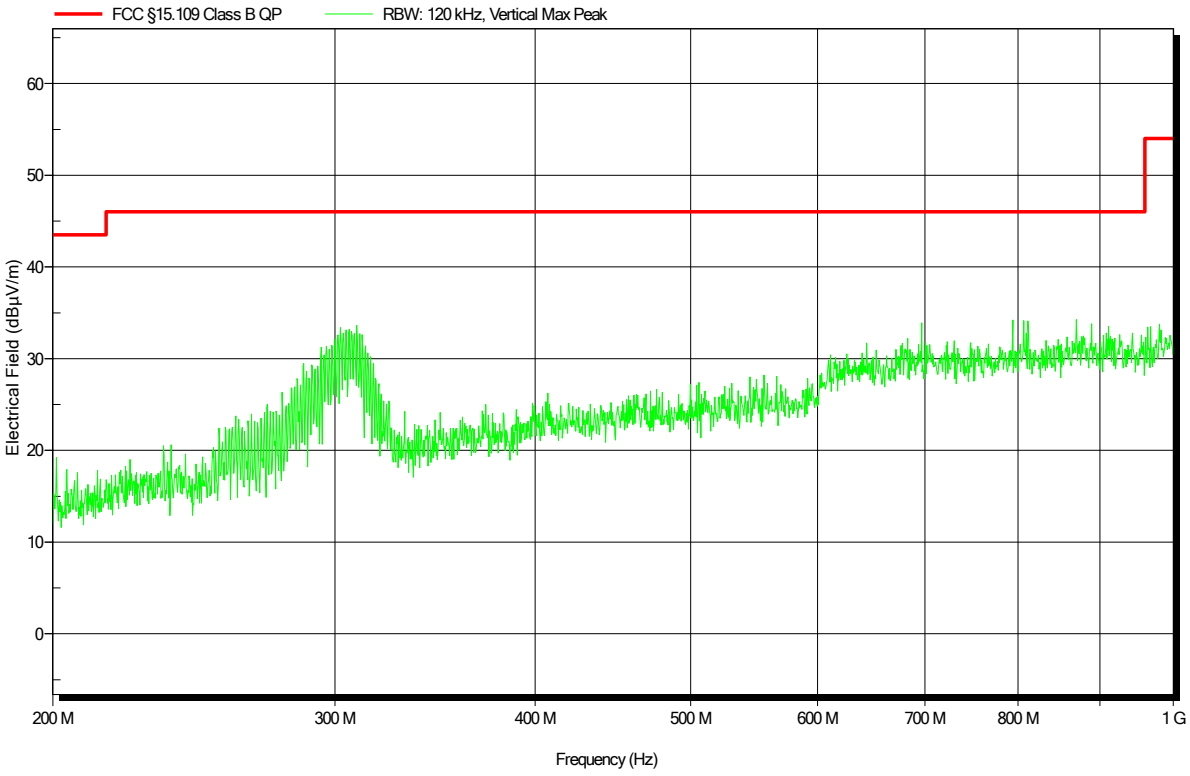

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	1: FDD 2; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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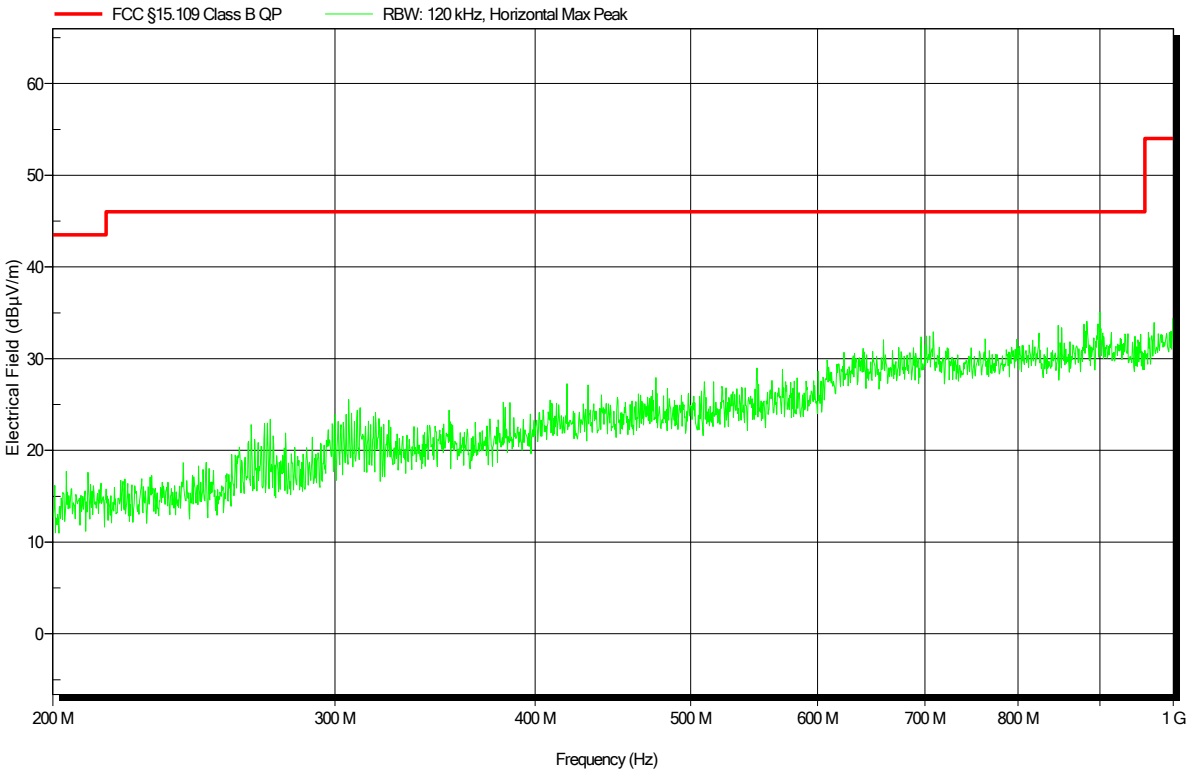
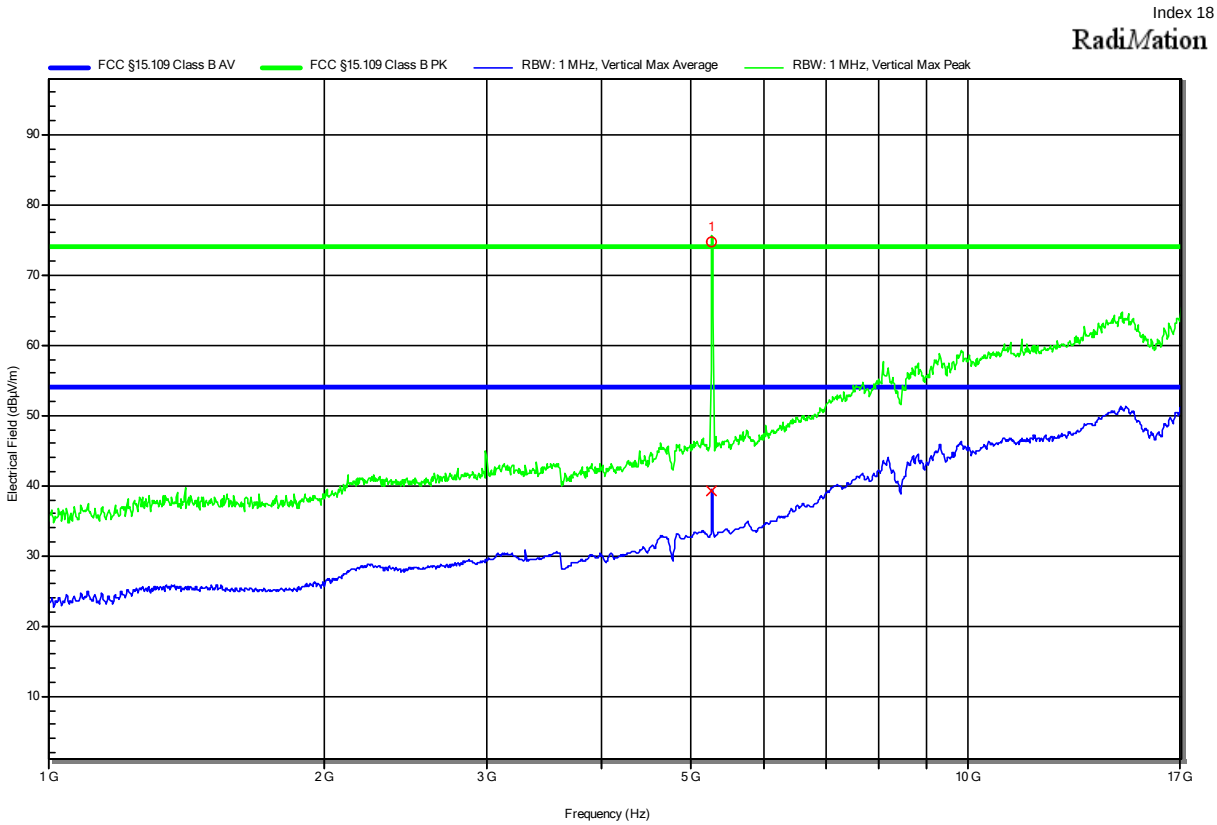


Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3m
Mode:	1: FDD 71; 5GHz WLAN
Test Date:	2019-12-13
Note:	

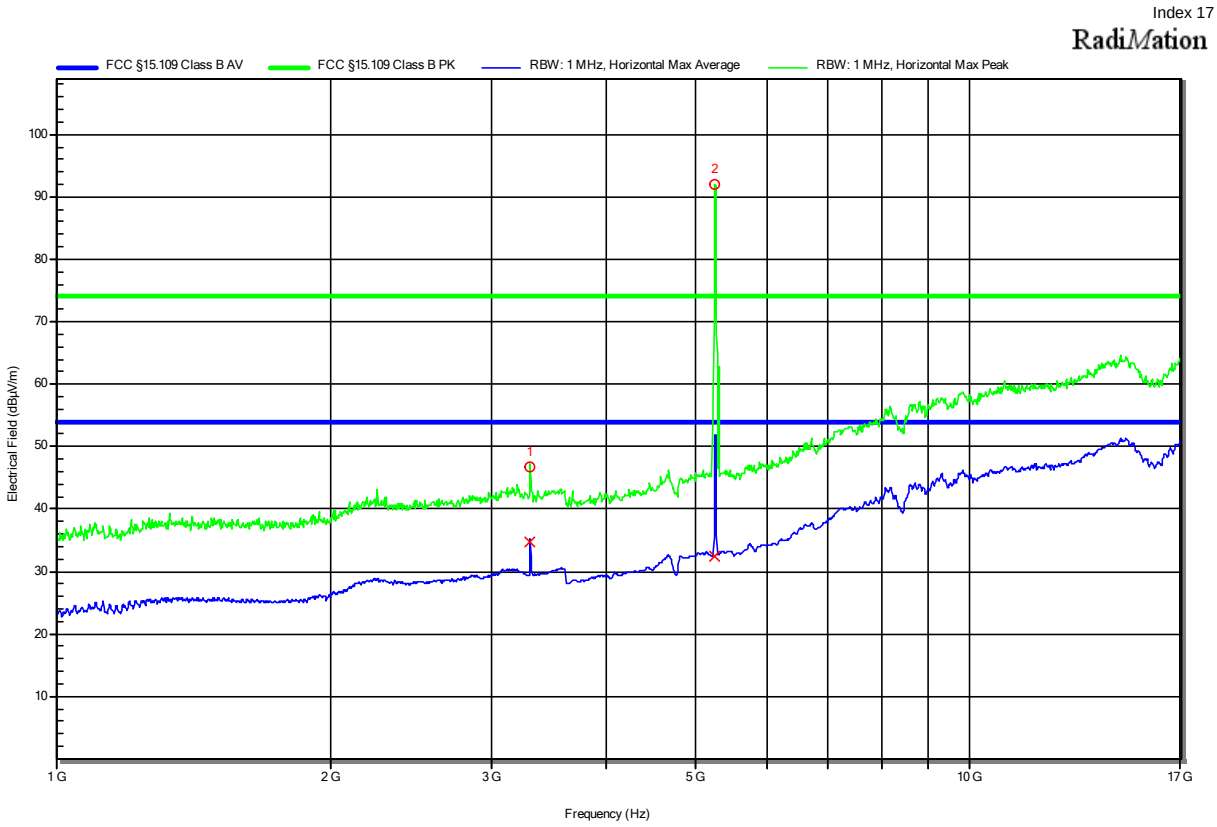


Peak Number	Frequency	
1	5.26 GHz	WLAN carrier

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3m
Mode:	1: FDD 71; 5GHz WLAN
Test Date:	2019-12-13
Note:	



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	3.302 GHz	46.69 dBµV/m	73.98 dBµV/m	-27.29	Pass	0 Degree	1 m
2	5.261 GHz	WLAN carrier					

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	3.302	34.8	53.98 dBµV/m	-19.18	Pass	0 Degree	1 m
2	5.261 GHz	WLAN carrier					

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	AT4560, Vertical
Measurement distance:	3m
Mode:	1: FDD 2; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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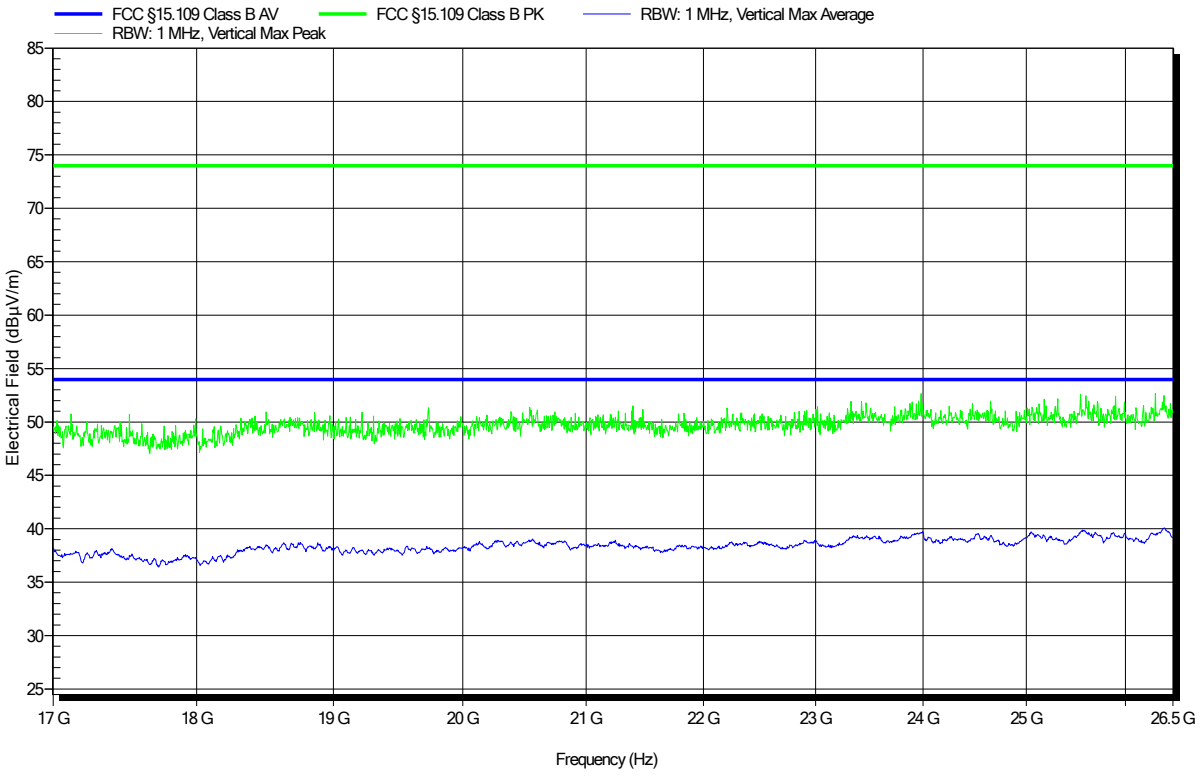

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	AT4560, Horizontal
Measurement distance:	3m
Mode:	1: FDD 2; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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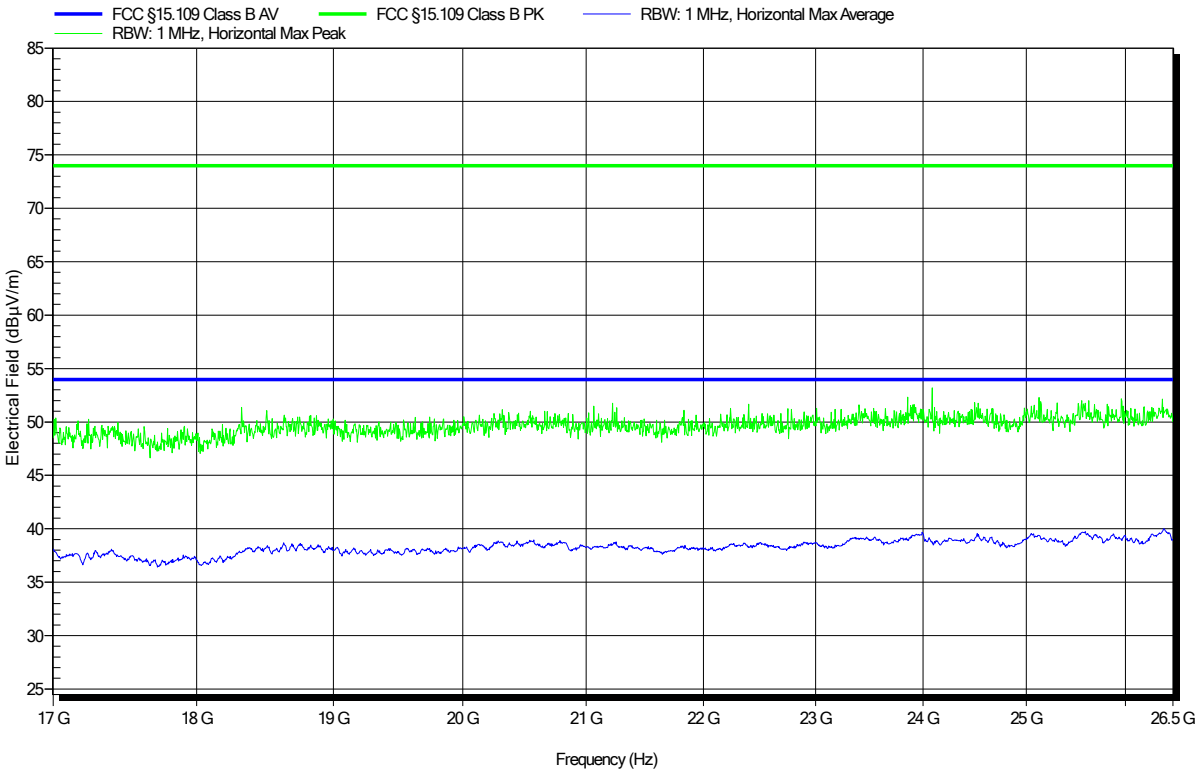

Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	CBL264075, Vertical
Measurement distance:	3m
Mode:	1: FDD 2; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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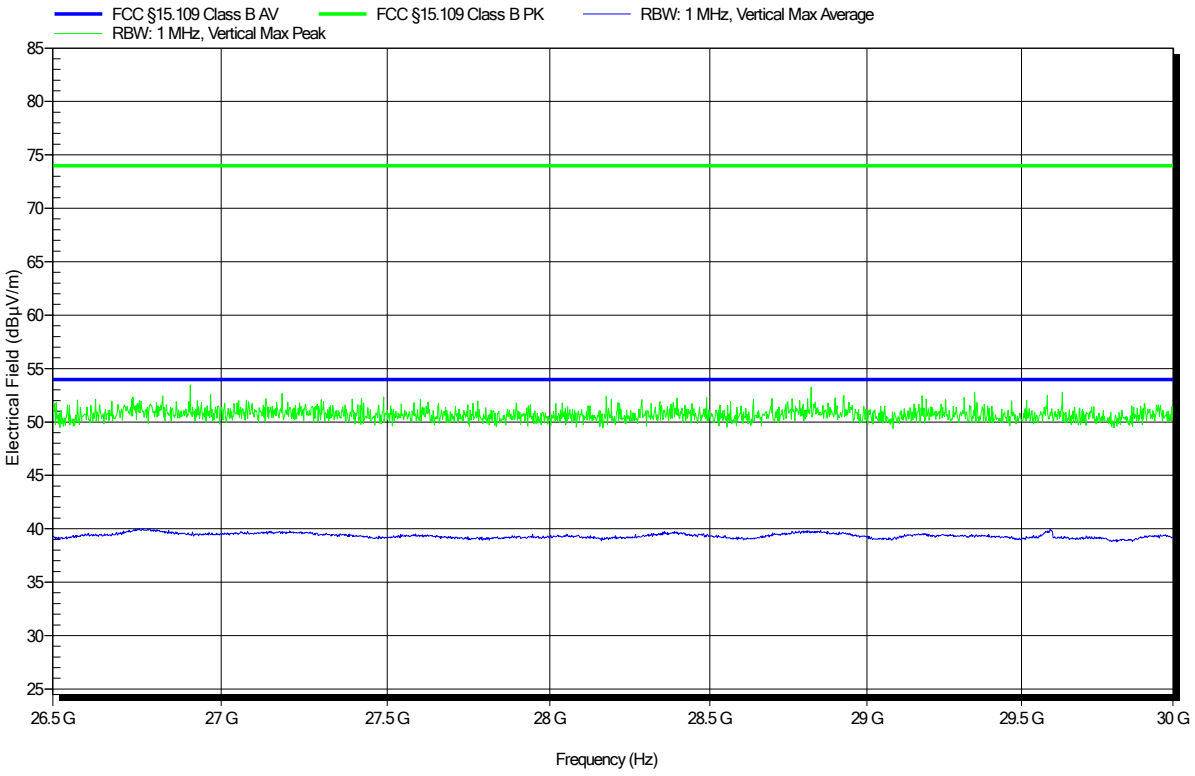
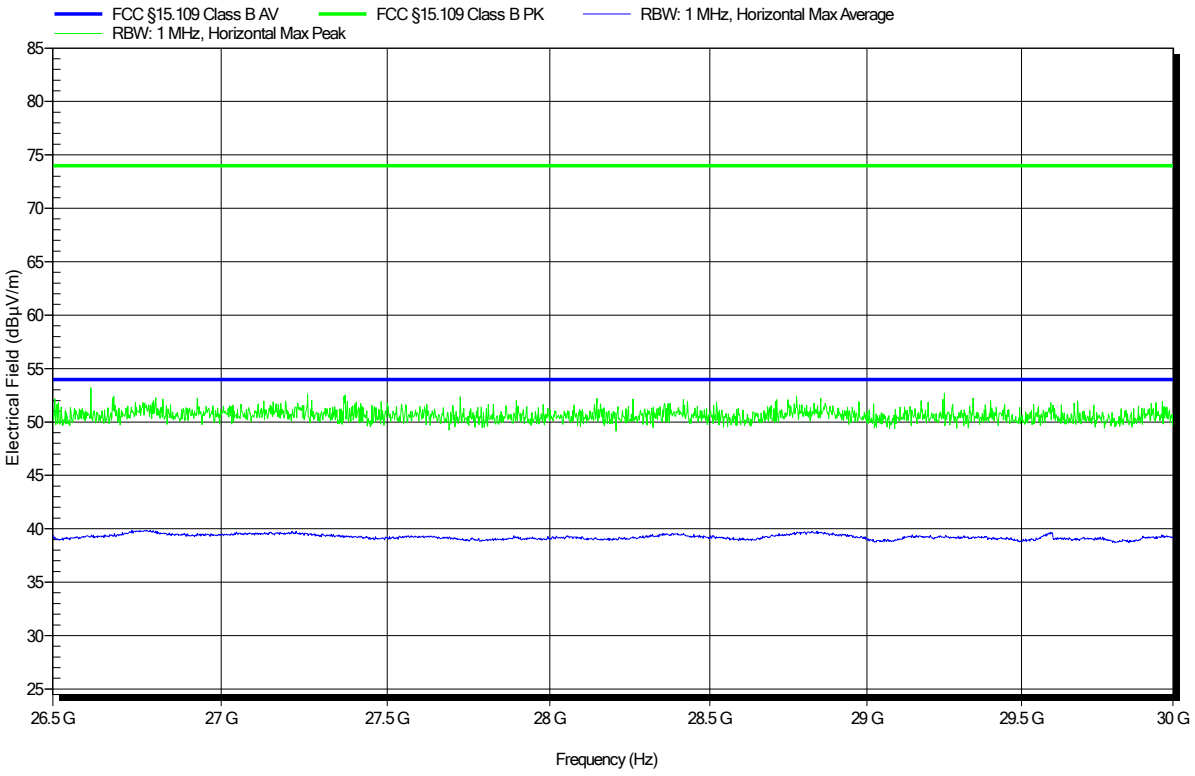


Radiated emissions according to FCC part 15B

Project number: G0M-1909-8479

Applicant:	pei tel Communications GmbH
EUT Name:	PTCarPhone
Model:	PTCarPhone 6
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 22°C, Unom: 14V DC
Antenna:	CBL264075, Horizontal
Measurement distance:	3m
Mode:	1: FDD 2; 5GHz WLAN
Test Date:	2019-12-13
Note:	

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