EMC TEST REPORT

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

Report Reference No	G0M-1905-8226-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	digades GmbH
Address	Äußere Weberstraße 20 02763 Zittau GERMANY
Test Specification	
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	VW RemoteStart
Model(s)	Remote Start Receiver - VWRSTR
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	HW 005
Software Version(s)	SW 0801
FCC-ID	QNFVWRSTR
IC	6869A-VWRSTR
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	2019-07-16	
Report:		
Compiled by	Stefan Dose	
Tested by (+ signature) (Responsible for Test)	Stephan Liebich Marco Belz	
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	
Date of Issue	2019-07-31	
Total number of pages	25	
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	2019-07-31	Initial Release	

REPORT INDEX

1 Equipment (Test Item) Under Test

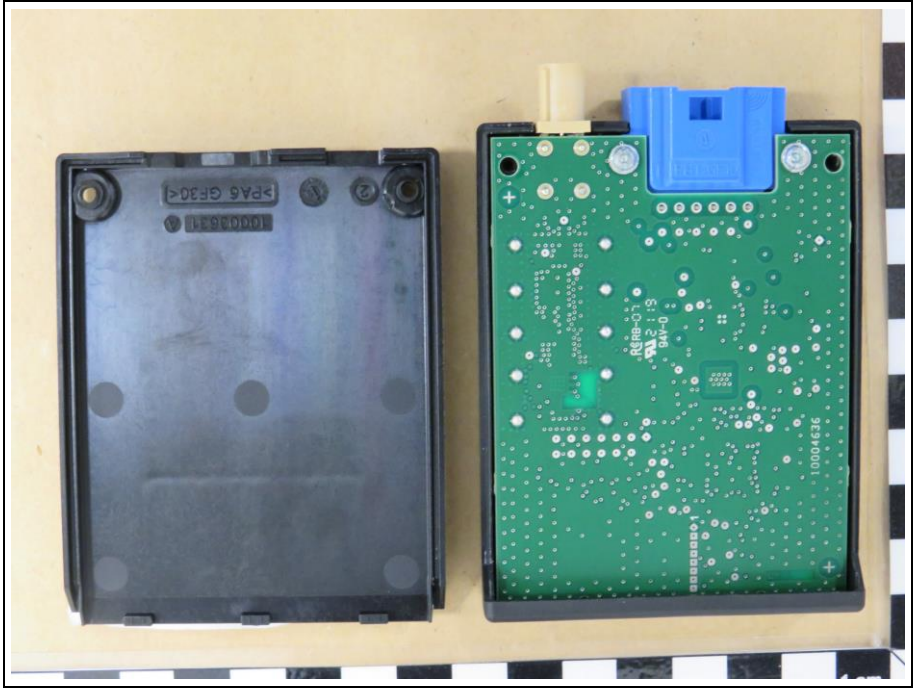
Description	VW RemoteStart	
Model	Remote Start Receiver - VWRSTR	
Additional Model(s)	None	
Brand Name(s)	None	
Serial Number(s)	000.065.761.A	
Hardware Version(s)	HW 005	
Software Version(s)	SW 0801	
FCC-ID	QNFVWRSTR	
IC	6869A-VWRSTR	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	919.5	
Supply Voltage	V_{NOM}	12 VDC vehicular battery
AC/DC-Adaptor	None	
Manufacturer	digades GmbH Äußere Weberstraße 20 02763 Zittau GERMANY	

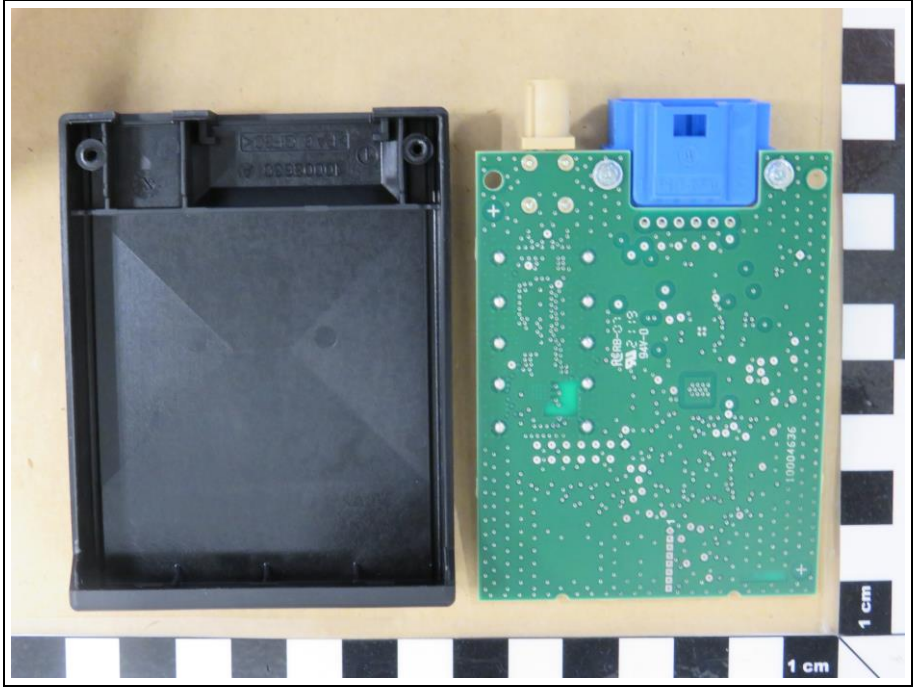
1.1 Equipment Ports

Name	Type	Attributes		Comment
Harness	DC;IO	Count: Direction: Service only:	1 In No	-
Antenna	IO	Count: Direction: Service only:	1 In No	-

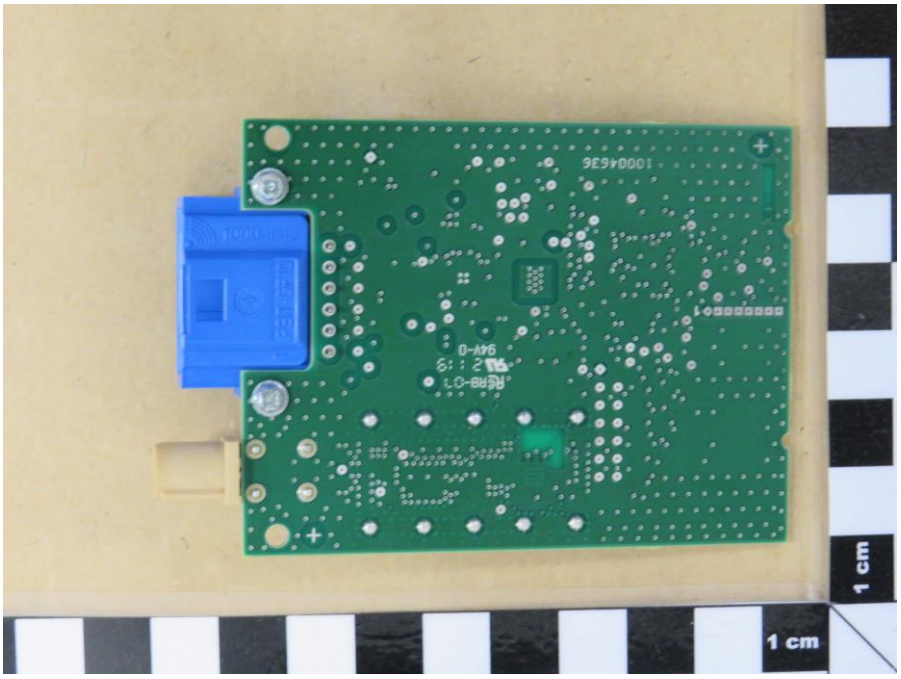
Description:	
AC	AC mains power input/output port
DC	DC power input/output port
IO	Input/Output port
TP	Telecommunication port
NE	Non-electrical port

1.2 Equipment Photos - Internal

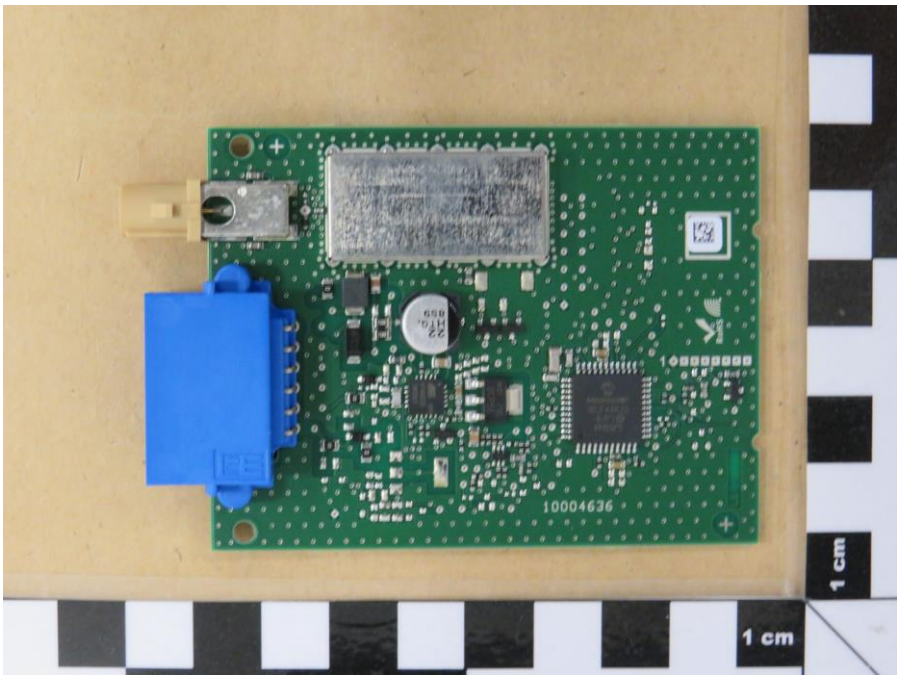
EUT WITH OPEN CASE


PCB WITH BOTTOM CASE


PCB BOTTOM SIDE



PCB-TOP-SIDE

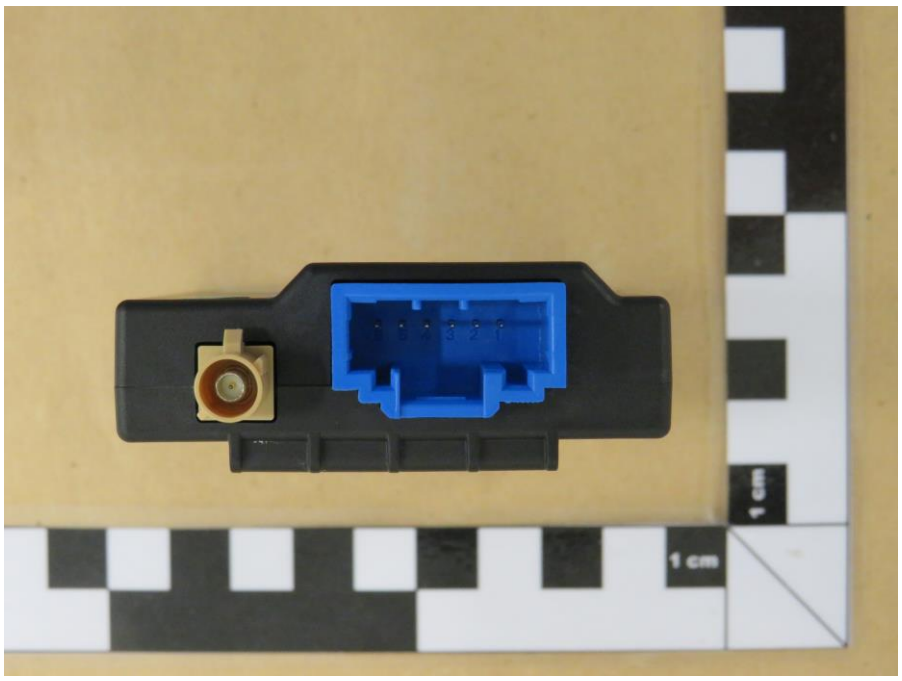


1.3 Equipment Photos - External

EUT TOP SIDE

EUT BOTTOM SIDE

EUT CONNECTOR SIDE



EUT LEFT SIDE

EUT RIGHT SIDE

EUT BACK SIDE

1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	remote control	digades	-	companion device
AE	Laptop	Lenovo	T420	-
AE	LIN LWL	Langer	LIN100	-
AE	LIN LWL	digades	LIN Master	-
AE	antenna	2J	2J520-250RG174-C96 Fakra D	-
MON	software	digades	BCM simulator	-
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment:				

1.5 Operational Modes

Mode #	Description
1	EUT powered up. Active RF on 919.5 MHz communication between EUT and companion device.
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT powered via 12 V DC battery. EUT is placed inside the measurement chamber. LIN LWL is connected from EUT to laptop. Laptop is placed outside the measurement chamber. Software visualized the LIN communication. Companion device 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	PASS	-
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

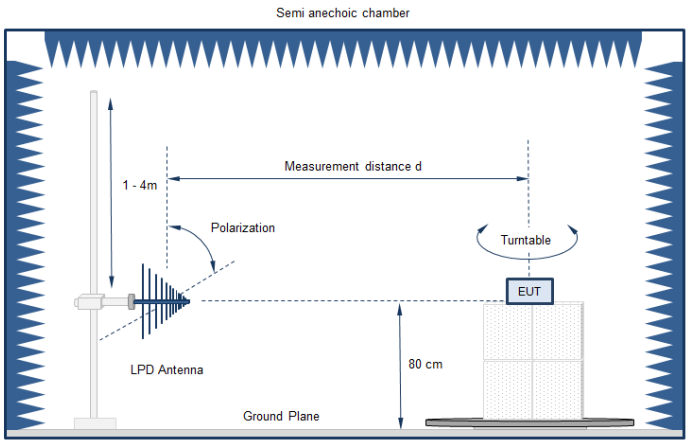
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

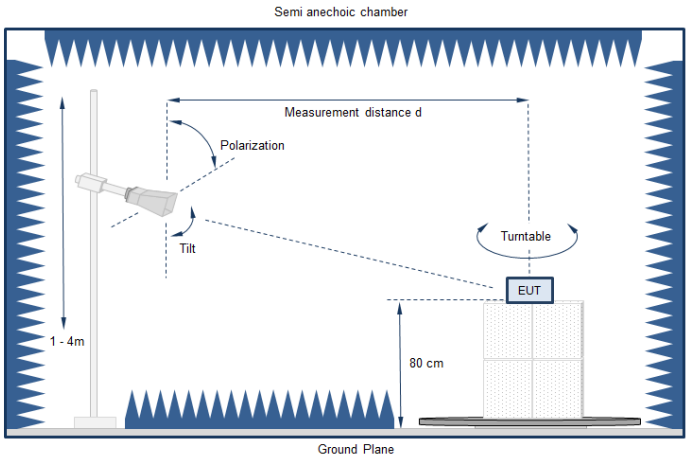
Test Information	
Reference	FCC 15.109, ICES-003, 8, 6.1
Reference method	ANSI C63.4:2014 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	919.5
Measurement range	30 MHz to 6 GHz
Temperature [°C]	20 – 25
Humidity [%]	50 – 55
Operator	Stephan Liebich supervised by Marco Belz
Date	2019-07-25

2.1.2 Setup

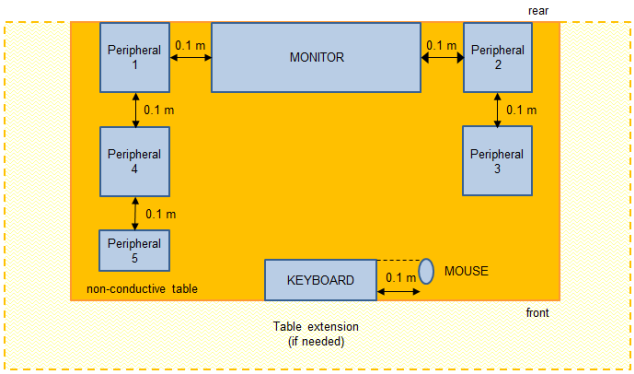
Measurement up to 1 GHz



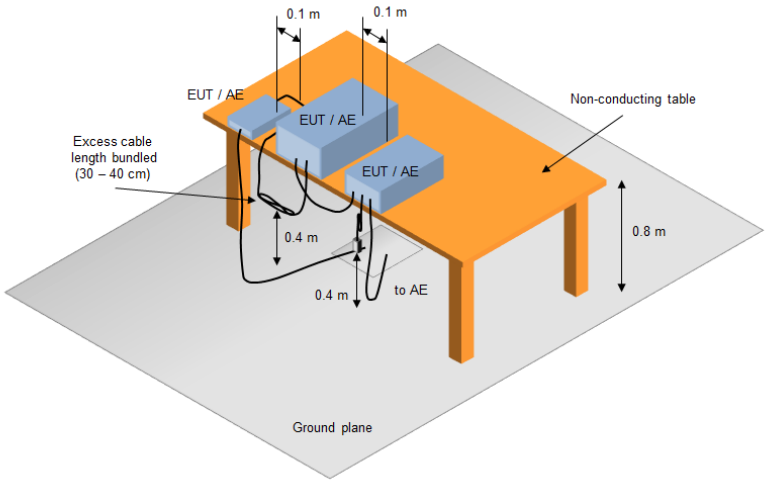
Measurement above 1 GHz



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	2018-08	2019-08
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	EF00018	2016-09	2019-09

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

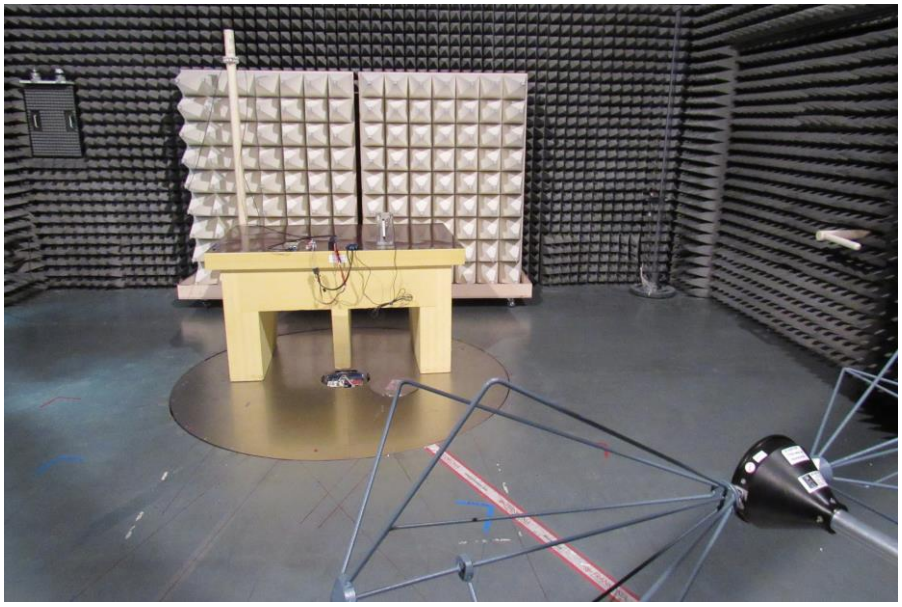
Class A @ 10 m		
Frequency [MHz]	Detector	Limit [dBµV/m]
30 - 88	Quasi-peak	39
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46.5
960 - 1000	Quasi-peak	49.5
> 1000	Peak Average	69.5 49.5

2.1.6 Results

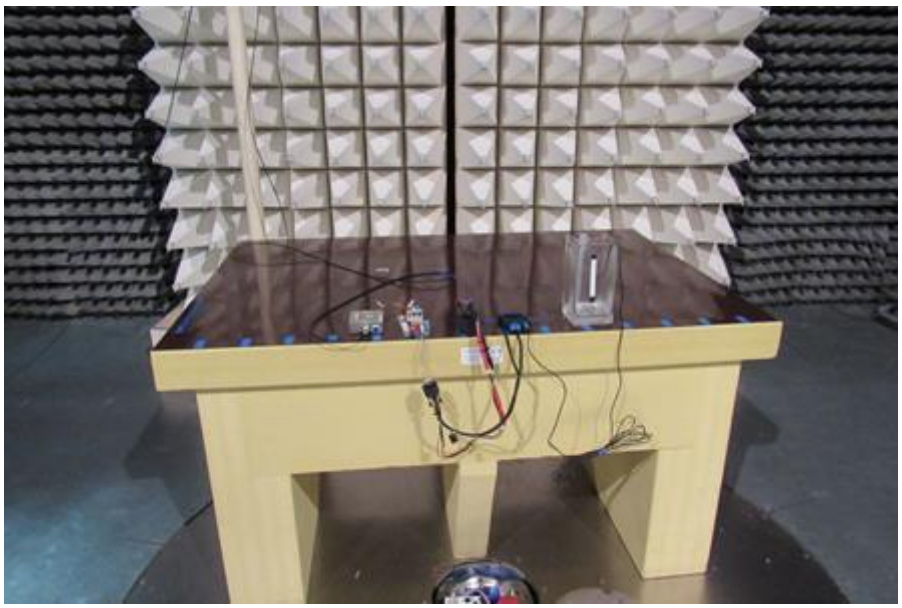
Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	-

2.1.7 Setup Photos

TEST SETUP: RADIATED EMISSION



TEST SETUP FOCUS: RADIATED EMISSION



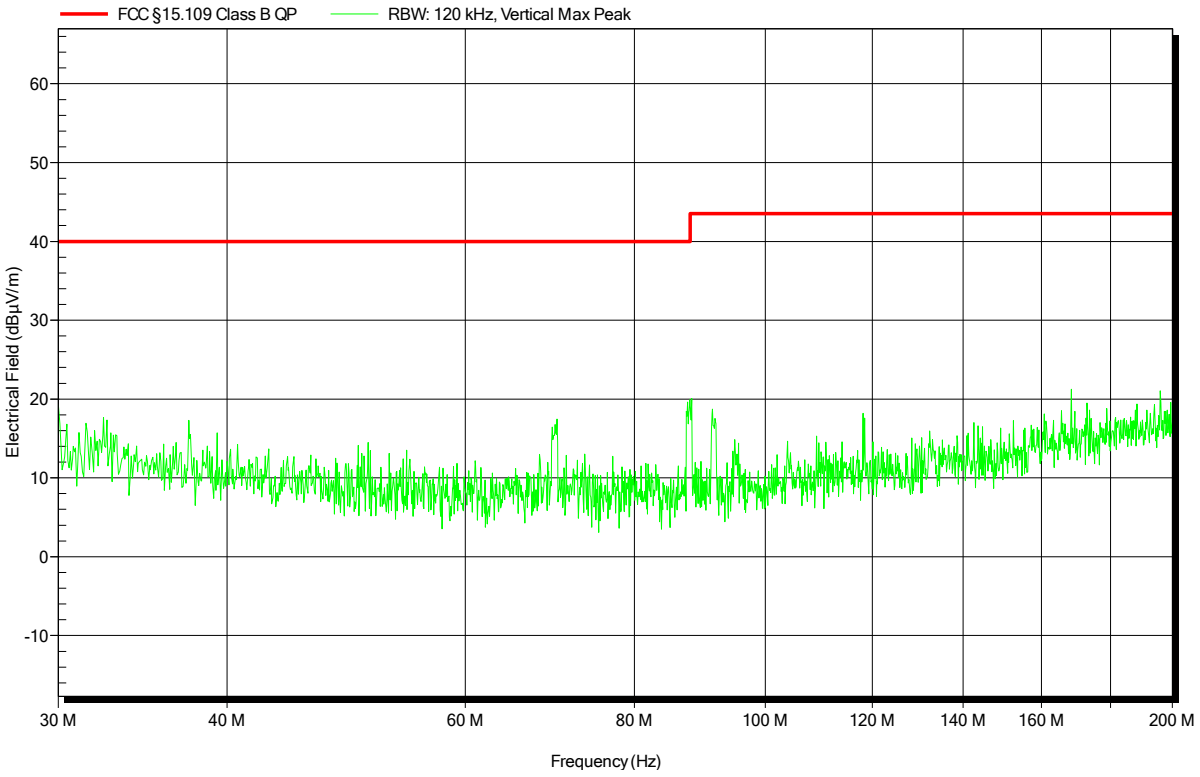
2.1.8 Records

Radiated emissions according to ICES-003, FCC Part 15b

Project number: G0M-1905-8226

Applicant:	digades GmbH
EUT Name:	VW RemoteStart
Model:	Remote Start Receiver - VWRSTR
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 12 V DC (vehicular battery)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2019-07-25
Note:	

Index 1

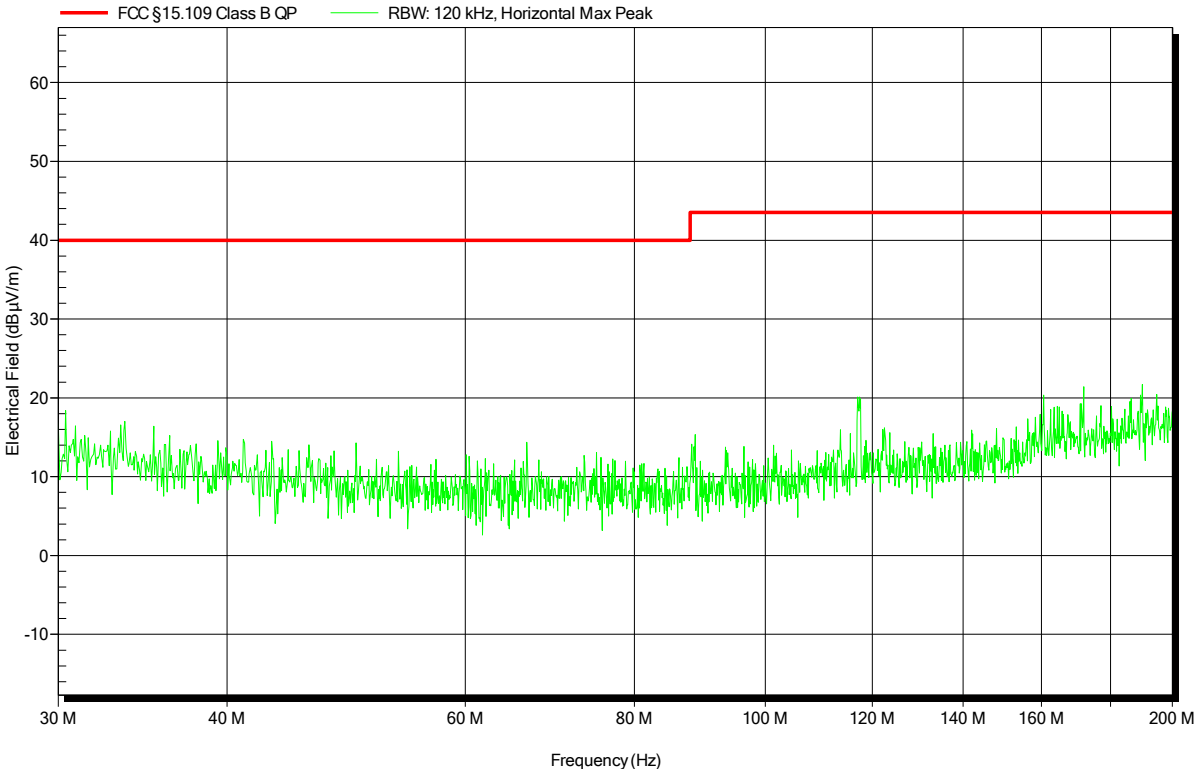


Radiated emissions according to ICES-003, FCC Part 15b

Project number: G0M-1905-8226

Applicant:	digades GmbH
EUT Name:	VW RemoteStart
Model:	Remote Start Receiver - VWRSTR
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 12 V DC (vehicular battery)
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2019-07-25
Note:	

Index 2

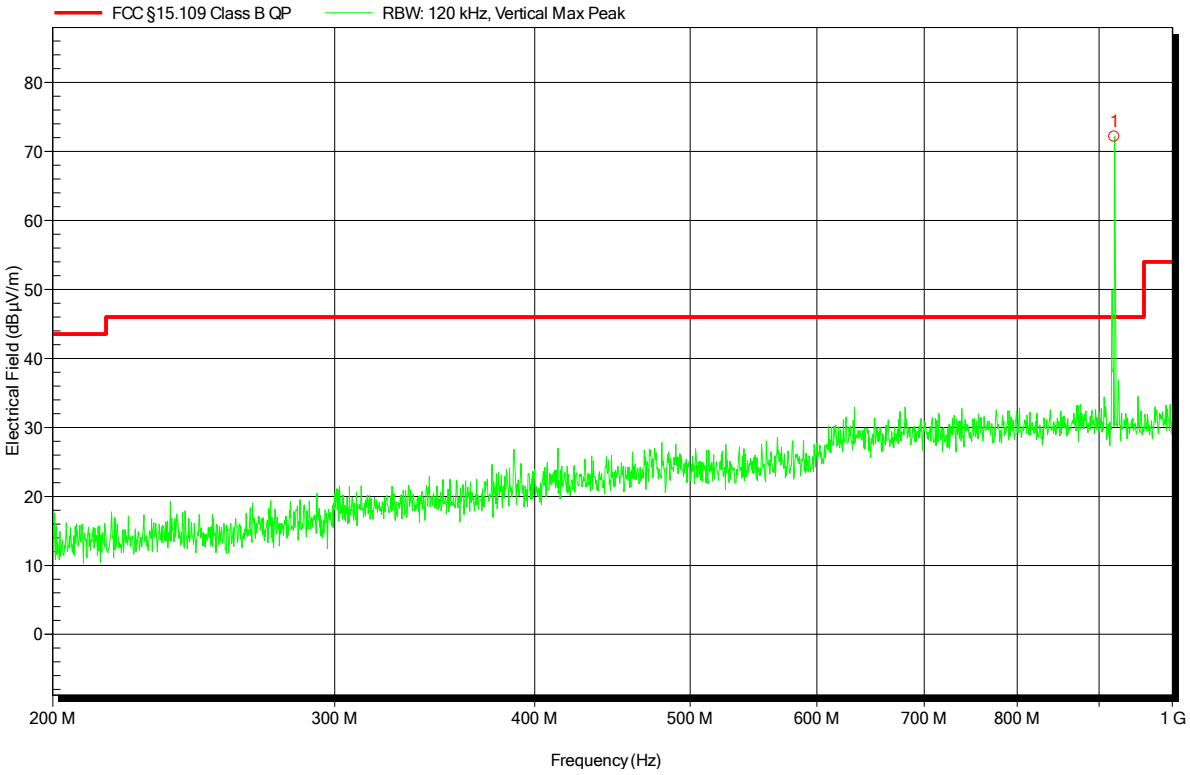


Radiated emissions according to ICES-003, FCC Part 15b

Project number: G0M-1905-8226

Applicant:	digades GmbH
EUT Name:	VW RemoteStart
Model:	Remote Start Receiver - VWRSTR
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 12 V DC (vehicular battery)
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2019-07-25
Note:	

Index 3



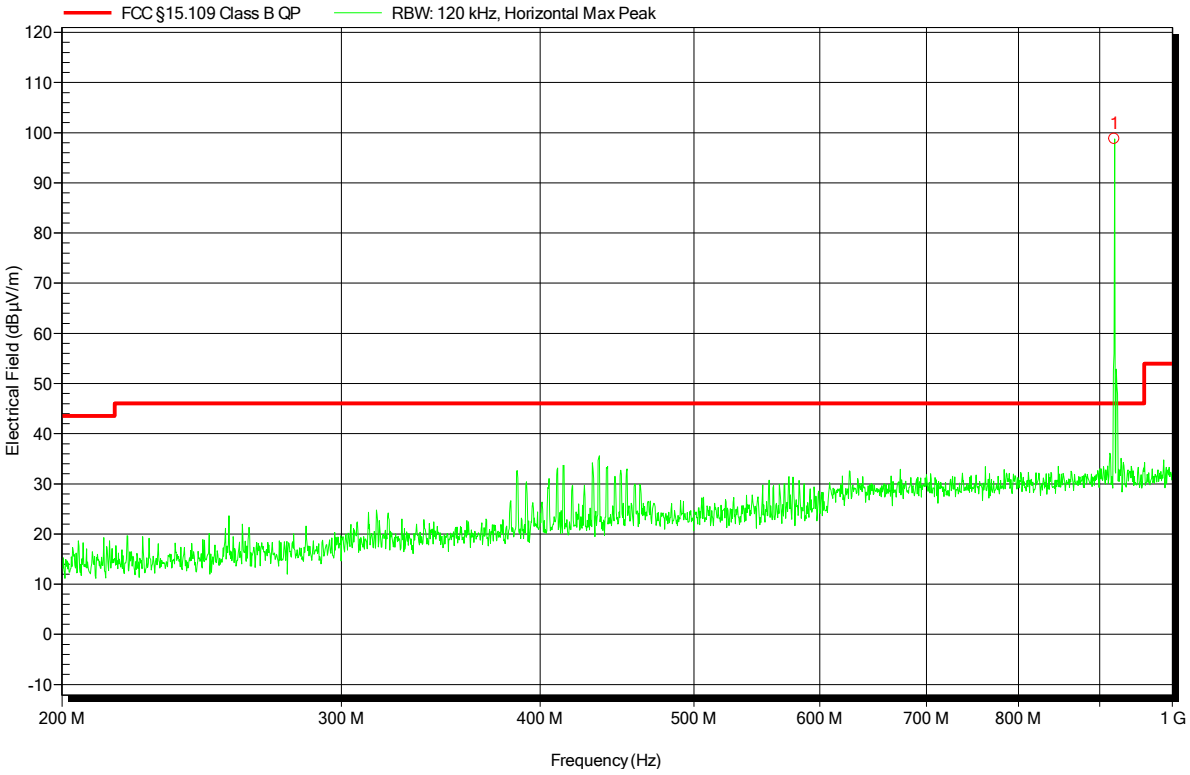
Peak Number	Frequency		Angle	Height
1	920.035 MHz	Short range device Carrier	0 Degree	1 m

Radiated emissions according to ICES-003, FCC Part 15b

Project number: G0M-1905-8226

Applicant:	digades GmbH
EUT Name:	VW RemoteStart
Model:	Remote Start Receiver - VWRSTR
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 12 V DC (vehicular battery)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2019-07-25
Note:	

Index 4



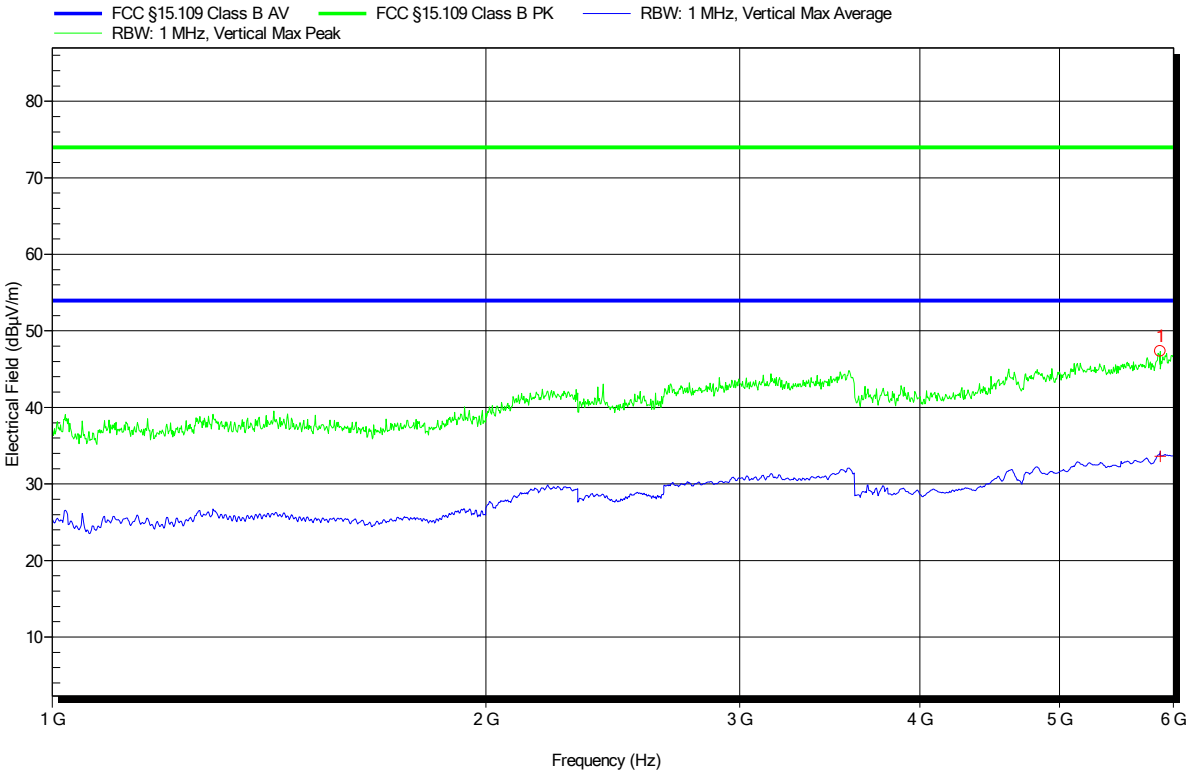
Peak Number	Frequency		Angle	Height
1	919.243 MHz	Short range device Carrier	0 Degree	1 m

Radiated emissions according to ICES-003, FCC Part 15b

Project number: G0M-1905-8226

Applicant:	digades GmbH
EUT Name:	VW RemoteStart
Model:	Remote Start Receiver - VWRSTR
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 12 V DC (vehicular battery)
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3m
Mode:	1
Test Date:	2019-07-25
Note:	

Index 6



Peak Number	Frequency	Peak	Angle	Height
1	5.874 GHz	47.34 dBµV/m	0 Degree	1 m

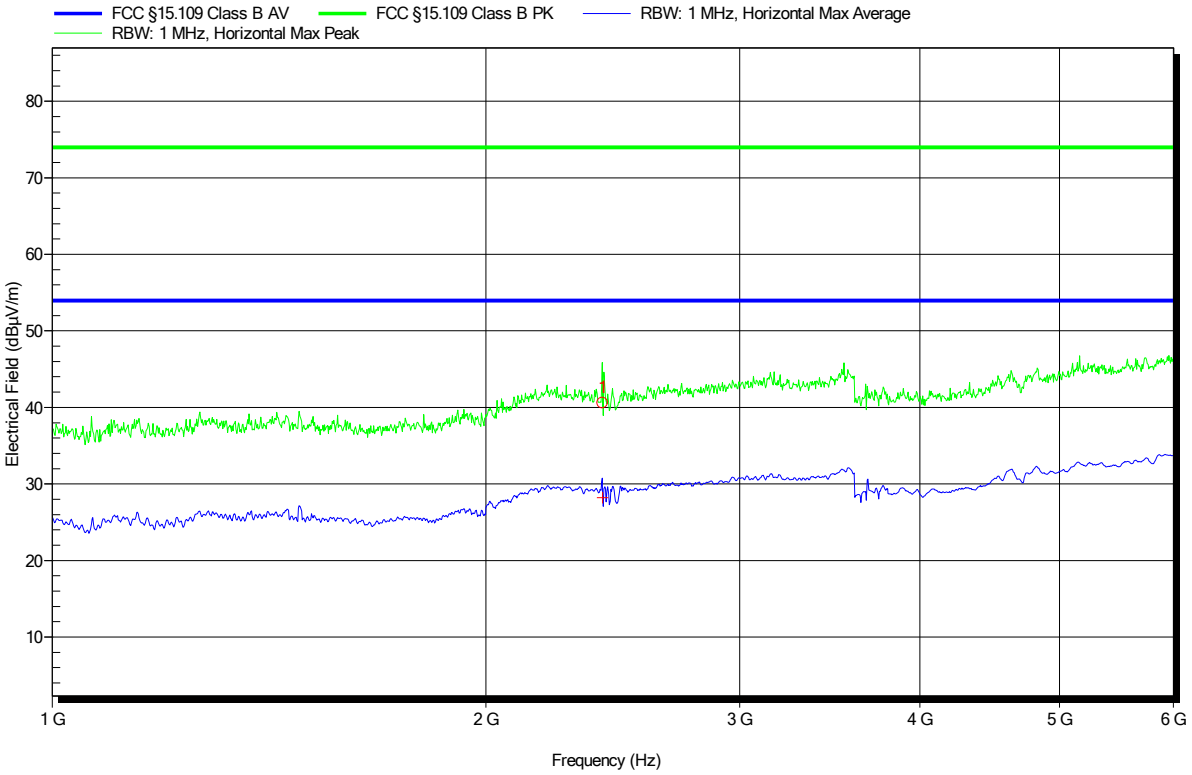
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	5.874 GHz	33.6 dBµV/m	53.98 dBµV/m	-20.38 dB	Pass	0 Degree	1 m

Radiated emissions according to ICES-003, FCC Part 15b

Project number: G0M-1905-8226

Applicant:	digades GmbH
EUT Name:	VW RemoteStart
Model:	Remote Start Receiver - VWRSTR
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Conditions:	Tnom: 21°C, Unom: 12 V DC (vehicular battery)
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3m
Mode:	1
Test Date:	2019-07-25
Note:	

Index 5



Peak Number	Frequency	Peak	Angle	Height
1	2.41 GHz	40.58 dBµV/m	0 Degree	1 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.41 GHz	28.2 dBµV/m	53.98 dBµV/m	-25.78 dB	Pass	0 Degree	1 m