

FCC TEST REPORT FCC 47 CFR Part 15C Industry Canada RSS-210 License exempt radio equipment	
Report Reference No.	G0M-1409-4198-TFC209LP-V02
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	Robert Bosch Car Multimedia GmbH
Address	Robert-Bosch-Straße 200 31139 Hildesheim GERMANY
Test specification:	
Standard	47 CFR Part 15C RSS-210, Issue 8, 2010-12 RSS-Gen, Issue 3, 2010-12 ANSI C63.4:2009
Equipment under test (EUT):	
Product description	Instrument cluster
Model No.	Audi FPK Gen1
Additional Model(s)	None
Brand Name(s)	BOSCH
Hardware version	H33
Firmware / Software version	0215
	FCC-ID: YBN-AU-FPK10 IC: 9595A-AUFPK10
Test result	Passed

Test Report No.: G0M-1409-4198-TFC209LP-V02

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

Possible test case verdicts:

- neither assessed nor tested : N/N
- required by standard but not appl. to test object..... : N/A
- required by standard but not tested..... : N/T
- not required by standard for the test object : N/R
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement..... : F (Fail)

Testing:

Test Lab Temperature : 20 – 23 °C

Test Lab Humidity : 32 – 38 %

Date of receipt of test item : 2014-09-29

Date (s) of performance of tests : 2014-09-29

Compiled by : Christian Weber

Tested by (+ signature) : Christian Weber
(Responsible for Test)

C. Weber


Approved by (+ signature) : Toralf Jahn

Date of issue : 2015-02-11

Total number of pages : 29

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
01	2015-01-05	Initial Release	
02	2015-02-11	Industry Canada references corrected	C. Weber

REPORT INDEX

1	EQUIPMENT (TEST ITEM) DESCRIPTION	5
1.1	Photos – Equipment External	6
1.2	Photos – Equipment internal	10
1.3	Photos – Test setup	14
1.4	Supporting Equipment Used During Testing	15
1.5	Test Modes	16
1.6	Test Equipment Used During Testing	17
1.7	Sample emission level calculation	18
2	RESULT SUMMARY	19
3	TEST CONDITIONS AND RESULTS	20
3.1	Test Conditions and Results – Occupied Bandwidth	20
3.2	Test Conditions and Results – Fundamental field strength emissions	22
3.4	Test Conditions and Results – Receiver radiated emissions	24
ANNEX A	Transmitter radiated spurious emissions	26
ANNEX B	Receiver radiated spurious emissions	28

1 Equipment (Test item) Description

Description	Instrument cluster	
Model	Audi FPK Gen1	
Additional Model(s)	None	
Brand Name(s)	BOSCH	
Serial number	None	
Hardware version	H33	
Software / Firmware version	0215	
FCC-ID	YBN-AU-FPK10	
IC	9595A-AUFPK10	
Equipment type	End product	
Radio type	Transceiver	
Radio technology	custom	
Operating frequency range	125 kHz	
Frequency range	F _{MID}	125 kHz
Modulations	ASK	
Number of channels	1	
Channel spacing	None	
Number of antennas	1	
Antenna	Type	integrated
	Model	unspecified
	Manufacturer	Biotronik SE & Co. KG
	Gain	unspecified
Manufacturer	Robert Bosch Car Multimedia GmbH Robert-Bosch-Straße 200 31139 Hildesheim GERMANY	
Power supply	V _{NOM}	12.0 VDC
	V _{MIN}	N/A
	V _{MIN}	N/A
AC/DC-Adaptor	Model	N/A
	Vendor	N/A
	Input	N/A
	Output	N/A

1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Companion Device	Bosch		
AE	Test Fixture	Bosch		
<p>*Note: Use the following abbreviations:</p> <p>AE : Auxiliary/Associated Equipment, or</p> <p>SIM : Simulator (Not Subjected to Test)</p> <p>CABL : Connecting cables</p>				

1.5 Test Modes

Mode #	Description	
Single	General conditions:	EUT powered by laboratory power supply
	Radio conditions:	Mode = standalone transmit Modulation = ASK Power level = Maximum
Receive	General conditions:	EUT powered by laboratory power supply
	Radio conditions:	Mode = standalone receive Modulation = ASK

1.6 Test Equipment Used During Testing

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

Occupied Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2014-02	2015-02

Field strength emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 1	EF00062	-	-
Spectrum Analyzer	R&S	FSIQ26	EF00242	2014-03	2015-03
Loop Antenna	R&S	HFH2-Z2	EF00184	2013-10	2014-10

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:

$$\text{Reading on Analyzer (dB}\mu\text{V)} + \text{A.F. (dB)} = \text{Net field strength (dB}\mu\text{V/m)}$$

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:

$$\text{Limit (dB}\mu\text{V/m)} = 20 \cdot \log (\mu\text{V/m})$$

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:

$$\begin{array}{rclcl} \text{Reading} & + & \text{AF} & = & \text{Net Reading} & : & \text{Net reading - FCC limit} & = & \text{Margin} \\ 21.5 \text{ dB}\mu\text{V} & + & 26 \text{ dB} & = & 47.5 \text{ dB}\mu\text{V/m} & : & 47.5 \text{ dB}\mu\text{V/m} - 57.0 \text{ dB}\mu\text{V/m} & = & -9.5 \text{ dB} \end{array}$$

2 Result Summary

FCC 47 CFR Part 15C, IC RSS-310				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
RSS-Gen 4.6.1	Occupied Bandwidth	RSS-Gen 4.6.1	N/R	Informational only
FCC 15.201(a), FCC 15.209 IC RSS-210 2.5	Field strength emissions	ANSI C63.4	PASS	
IC RSS-210 2.3 IC RSS-Gen 4.10 6.1	Receiver radiated spurious emissions	ANSI C63.4	PASS	
Remarks:				

3 Test Conditions and Results

3.1 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. to IC RSS-Gen			Verdict: PASS
Test according to measurement reference		Reference Method	
		RSS-Gen 4.6.1	
Test frequency range		Tested frequencies	
		F _{MID}	
EUT test mode		Single	
Limits			
None (Informational only)			
Test setup			
<div><div>Spectrum Analyzer</div><div>EUT</div></div>			
Test procedure			
<div>1. EUT set to test mode (Communication tester is used if needed)</div> <div>2. Span set to at least twice the emission spectrum</div> <div>3. Resolution bandwidth set to 1 % of span</div> <div>4. Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function</div>			
Test results			
Channel	Frequency [kHz]	Occupied Bandwidth [kHz]	
F _{MID}	125	38.08	
Comments: Measurement is applicable to all variants			

Occupied Bandwidth - F_{MID}

Occupied Bandwidth acc. to RSS-Gen

Project Number: G0M-1409-4198

Applicant: Robert Bosch Car Multimedia GmbH

EUT Name:

Model:

Test Site: Eurofins Product Service GmbH

Operator: Christian Weber

Test Conditions: Tnom / Vnom

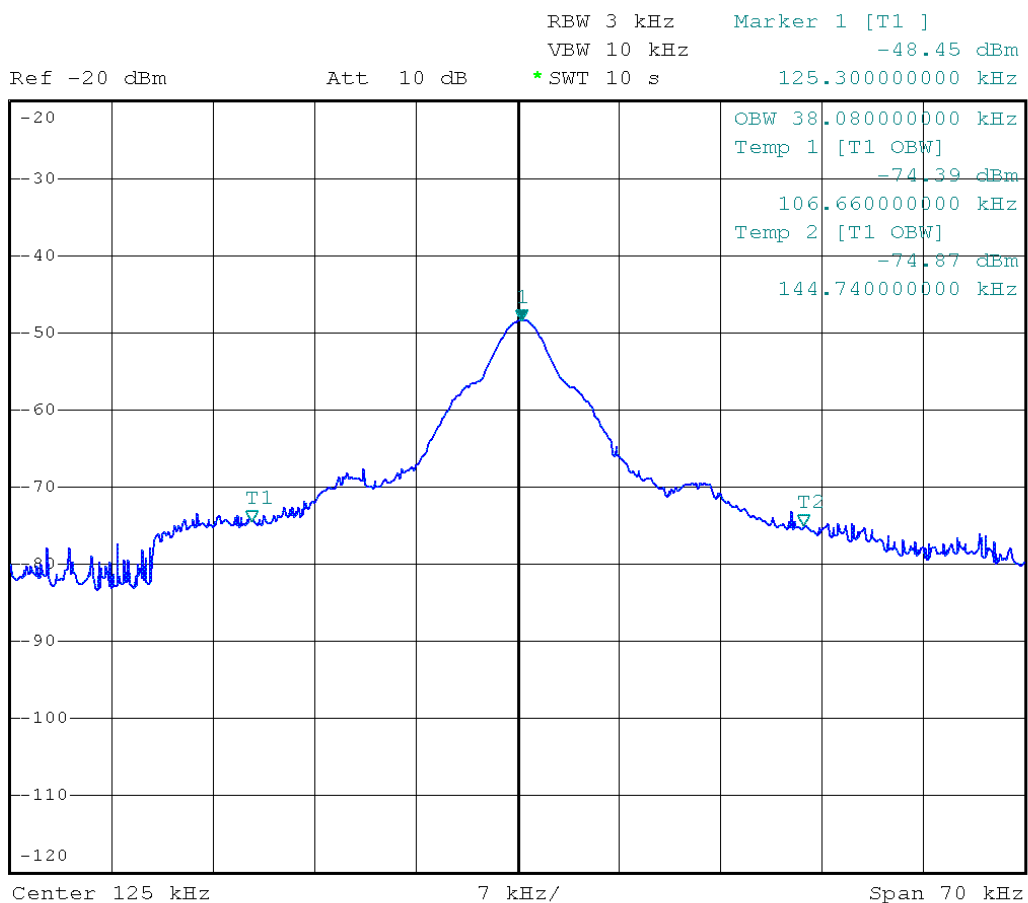
Mode: Tx, 125 kHz RFID

Test Date: 2014-09-29

Verdict: NONE (INFORMATION ONLY)

Note 1: A spectrum analyzer with an integrated 99% power bandwidth function is used

Note 2: OBW= 38.08 kHz



Comment: ANSI C63.17-1998

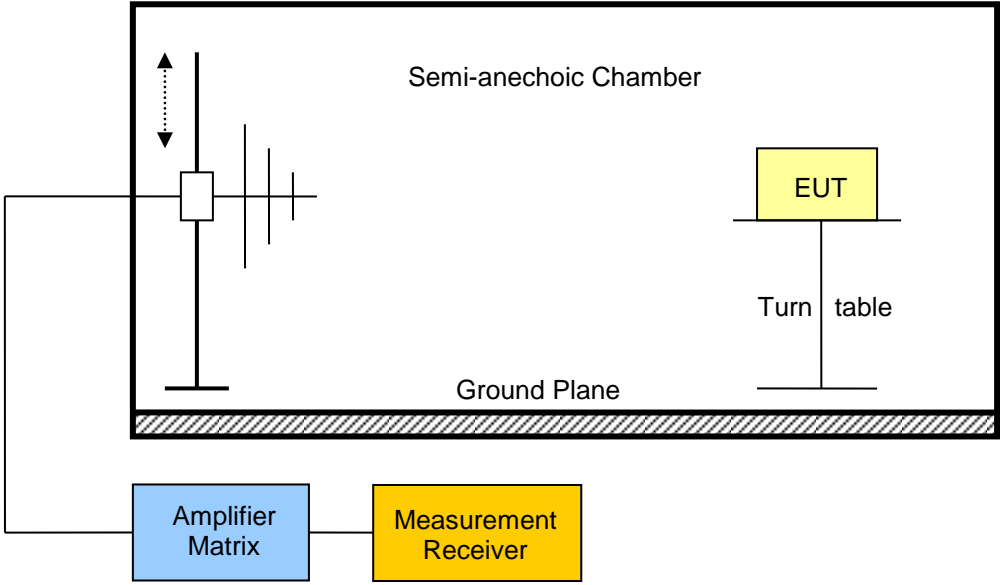
Date: 29.SEP.2014 16:24:39

Test Report No.: G0M-1409-4198-TFC209LP-V02

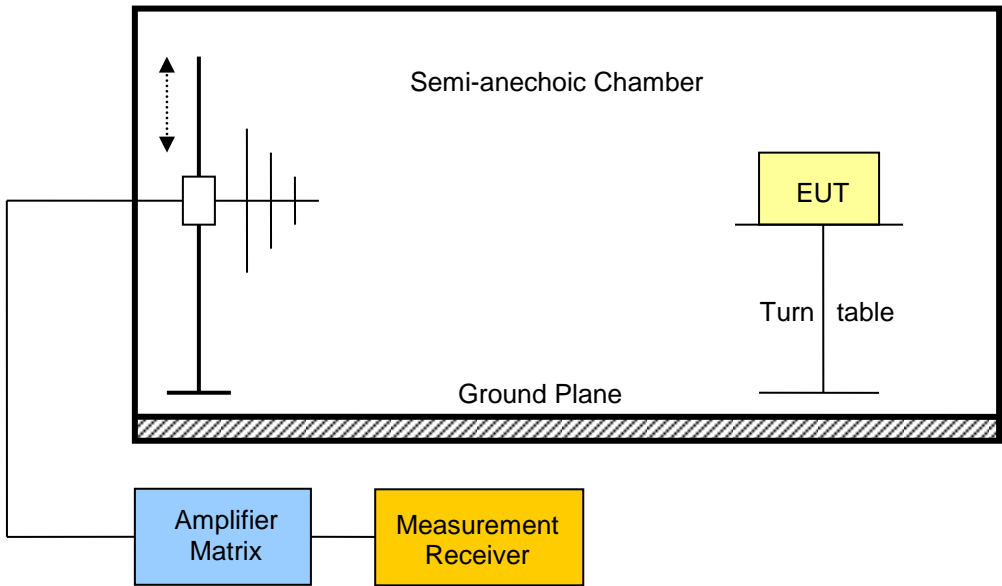
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

3.2 Test Conditions and Results – Fundamental field strength emissions

Field strength emissions acc. to FCC 47 CFR 15.201 / IC RSS-210				Verdict: PASS
Test according referenced standards		Reference Method		
		FCC 15.201(a) + 15.209 / IC RSS-210 2.5		
Test according to measurement reference		Reference Method		
		ANSI C63.4		
Test frequency range		Tested frequencies		
		9 kHz – 10 th Harmonic		
EUT test mode		Single		
Limits				
Frequency range [MHz]	Detector	Limit [µV/m]	Limit [dBµV/m]	Limit Distance [m]
0.009 – 0.490	Quasi-Peak	2400/F[kHz]	48.5 – 13.8	300
0.490 – 1.705	Quasi-Peak	2400/F[kHz]	13.8 – 1.4	30
1.705 – 30	Quasi-Peak	30	29.5	30
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.				

Test setup						
						
Test procedure						
<ol style="list-style-type: none"> 1. EUT set to test mode 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz 4. Markers are set to maximum emission levels 						
Test results						
Channel	Frequency [kHz]	Emission [kHz]	Level [db μ V/m]	Detector	Limit [db μ V/m]	Margin [dB]
F _{MID}	125	35.218	-38.30	avg	36.60	-74.92
F _{MID}	125	125.265	-12.90	avg	25.70	-38.54
F _{MID}	125	250.2	-54.40	avg	19.60	-74.01
F _{MID}	125	375.874	-47.70	avg	16.10	-63.83
F _{MID}	125	9246	04.20	pk	29.50	-25.34
Comments:						

3.4 Test Conditions and Results – Receiver radiated emissions

Receiver radiated emissions acc. to IC RSS-210				Verdict: PASS
Test according referenced standards	Reference Method			
	IC RSS-210 2.3			
Test according to measurement reference	Reference Method			
	ANSI C63.4			
Test frequency range	Tested frequencies			
	9 kHz – 3 th Harmonic			
EUT test mode	Receive			
Limits				
Frequency range [MHz]	Detector	Limit [μV/m]	Limit [dBμV/m]	Limit Distance [m]
0.009 – 0.490	Quasi-Peak	2400/F[kHz]	48.5 – 13.8	300
0.490 – 1.705	Quasi-Peak	2400/F[kHz]	13.8 – 1.4	30
1.705 – 30	Quasi-Peak	30	29.5	30
30 – 88	Quasi-Peak	100	40	3
88 – 216	Quasi-Peak	150	43.5	3
216 – 960	Quasi-Peak	200	46	3
960 – 1000	Quasi-Peak	500	54	3
> 1000	Average	500	54	3
Test setup				
				

Test procedure							
<ol style="list-style-type: none"> 1. EUT set to receive mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth below 1 GHz is set according to CISPR 16 with peak/quasi-peak detector and RBW of 1 MHz with peak/average detector is used above 1 GHz 4. Markers are set to peak emission levels 							
Test results							
Channel	Frequency [kHz]	Emission [MHz]	Emission Level [dB μ V/m]	Emission Level [μ V/m]	Det.	Limit [d μ V/m]	Margin [μ V/m]
F _{MID}	125	18.15	3.0	1.41	pk	29.5	-28.09
Comments:							

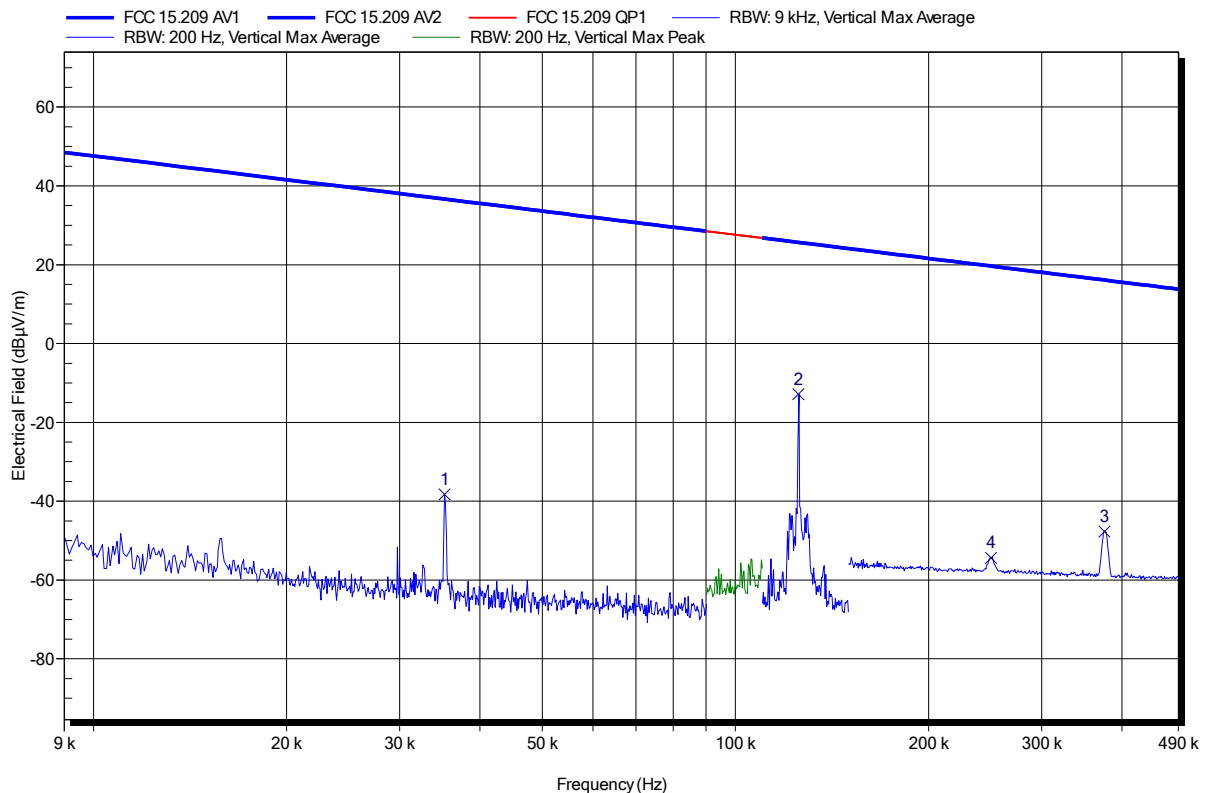
ANNEX A Transmitter radiated spurious emissions

Spurious emissions according to FCC 15.209

Project number: G0M-1409-4198

Applicant: Robert Bosch Car Multimedia GmbH
EUT Name: Instrument cluster
Model: Audi FPK Gen1
Test Site: Eurofins Product Service GmbH
Operator: Weber
Test Conditions: Tnom: 25°C, Vnom: 12 VDC (Car battery)
Antenna: Rohde & Schwarz HFH 2-Z2
Measurement distance: 3 m converted to 300 m
Mode: TX; 125 kHz RFID
Test Date: 2014-09-29
Note: EUT vertical

Index 3



Frequency	Average	Average Limit	Average Difference	Average Status
35.218 kHz	-38.3 dBµV/m	36.6 dBµV/m	-74.92 dB	Pass
125.265 kHz	-12.9 dBµV/m	25.7 dBµV/m	-38.54 dB	Pass
250.2 kHz	-54.4 dBµV/m	19.6 dBµV/m	-74.01 dB	Pass
375.874 kHz	-47.7 dBµV/m	16.1 dBµV/m	-63.83 dB	Pass

Test Report No.: G0M-1409-4198-TFC209LP-V02

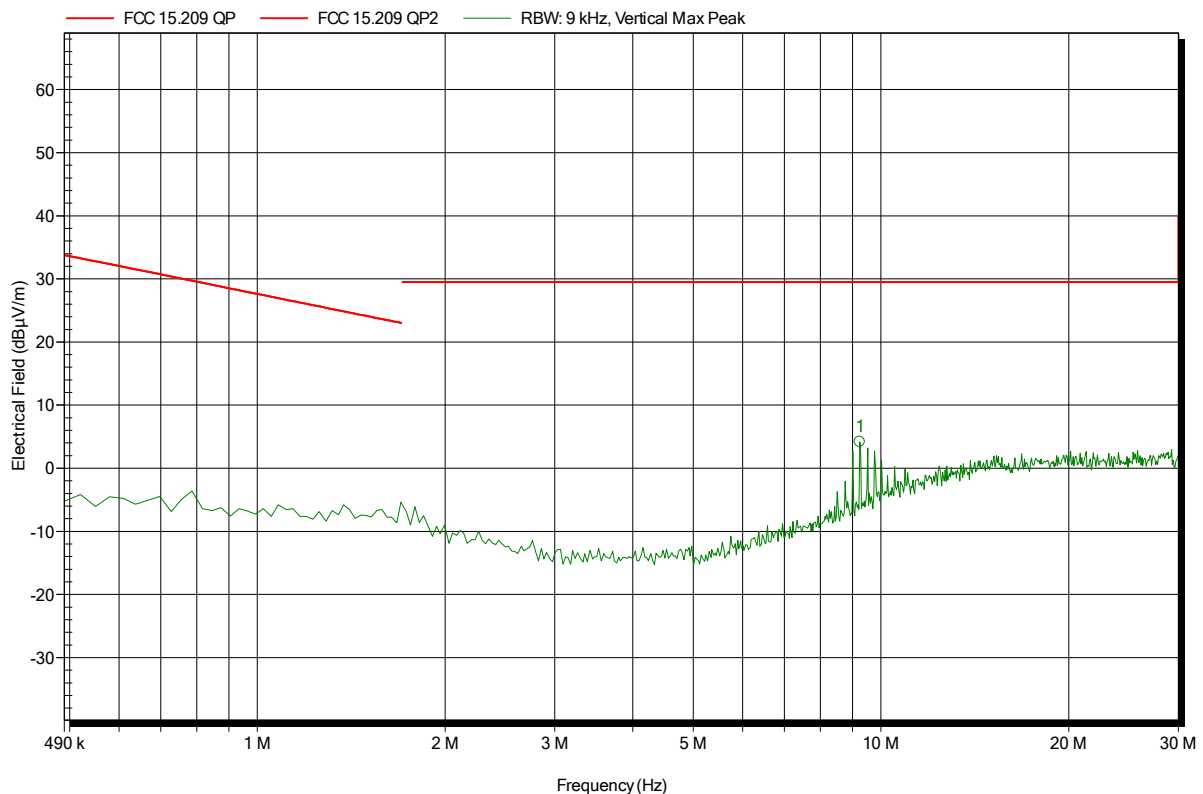
Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.209

Project number: G0M-1409-4198

Applicant: Robert Bosch Car Multimedia GmbH
 EUT Name: Instrument cluster
 Model: Audi FPK Gen1
 Test Site: Eurofins Product Service GmbH
 Operator: Weber
 Test Conditions: Tnom: 25°C, Vnom: 12 VDC (Car battery)
 Antenna: Rohde & Schwarz HFH 2-Z2
 Measurement distance: 3 m converted to 30 m
 Mode: TX; 125 kHz RFID
 Test Date: 2014-09-29
 Note: EUT vertical

Index 4



Frequency	Peak	Peak Limit	Peak Difference	Peak Status
9.246 MHz	4.2 dBµV/m	29.5 dBµV/m	-25.34 dB	Pass

Test Report No.: G0M-1409-4198-TFC209LP-V02

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

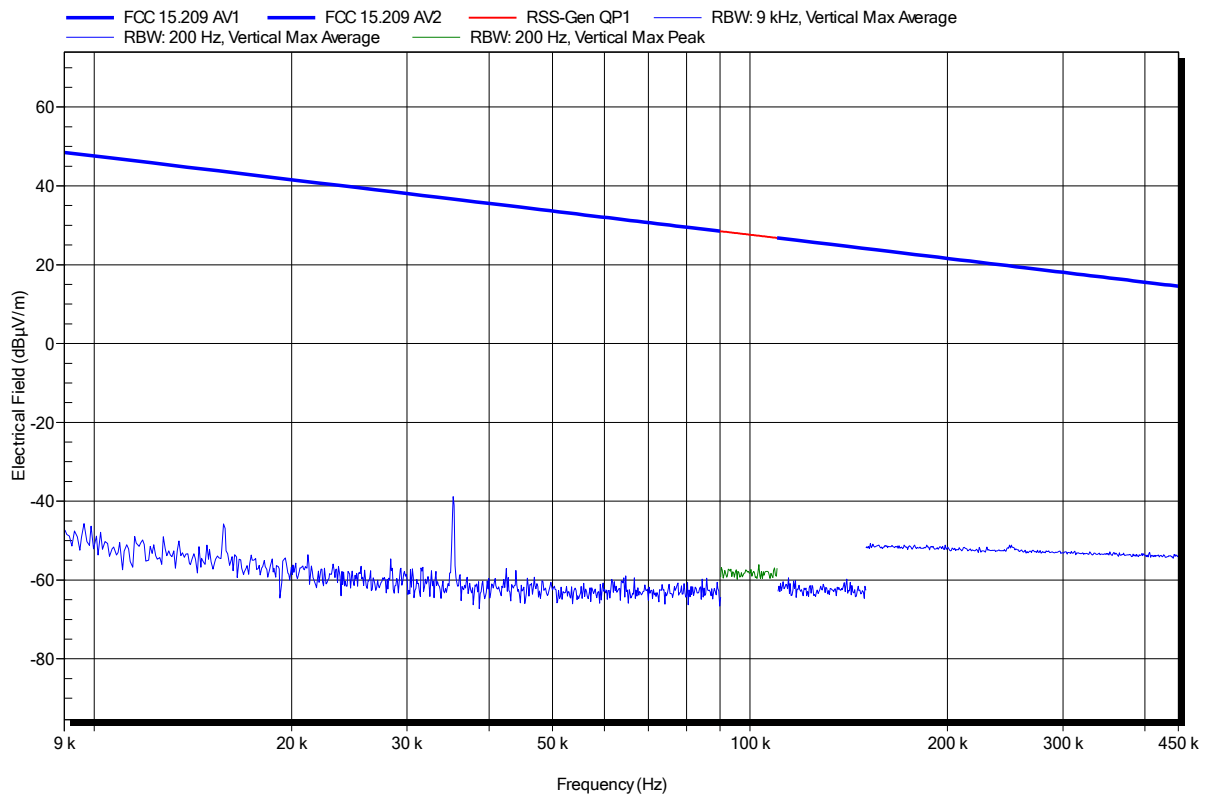
ANNEX B Receiver radiated spurious emissions

Spurious emissions according to RSS-GEN

Project number: G0M-1409-4198

Applicant: Robert Bosch Car Multimedia GmbH
 EUT Name: Instrument cluster
 Model: Audi FPK Gen1
 Test Site: Eurofins Product Service GmbH
 Operator: Weber
 Test Conditions: Tnom: 25°C, Vnom: 12 VDC (Car battery)
 Antenna: Rohde & Schwarz HFH 2-Z2
 Measurement distance: 3 m converted to 300 m
 Mode: TX; 125 kHz RFID Idle
 Test Date: 2014-09-29
 Note: EUT vertical

Index 5



Spurious emissions according to RSS-GEN

Project number: G0M-1409-4198

Applicant:	Robert Bosch Car Multimedia GmbH
EUT Name:	Instrument cluster
Model:	Audi FPK Gen1
Test Site:	Eurofins Product Service GmbH
Operator:	Weber
Test Conditions:	Tnom: 25°C, Vnom: 12 VDC (Car battery)
Antenna:	Rohde & Schwarz HFH 2-Z2
Measurement distance:	3 m converted to 30 m
Mode:	RX; 125 kHz RFID Idle
Test Date:	2014-09-29
Note:	EUT vertical

Index 6

