

FCC TEST REPORT FCC 47 CFR Part 15C Industry Canada RSS-210 Digital transmission systems operating within the 2400 – 2483.5 MHz band	
Report Reference No.	G0M-1312-3474-TFC247ZC-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	Atmel Automotive GmbH
Address	Koenigsbruecker Str. 61 01099 Dresden GERMANY
Test specification:	
Standard	47 CFR Part 15C KDB Publication No. 558074 RSS-210, Issue 8, 2010-12 RSS-Gen, Issue 3, 2010-12 ANSI C63.4:2009
Equipment under test (EUT):	
Product description	REB233SMAD Evaluation Kit
Model No.	ATREB233SMAD-EK
Hardware version	v1.8.0
Firmware / Software version	v0.6
	FCC-ID: VNR-E33SD-X5B-00 IC: N/A
Test result	Passed

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:

Date of receipt of test item: 2014-01-06

Date (s) of performance of tests: 2014-01-08 – 2014-01-14

Compiled by: Antje Bartusch

Tested by (+ signature).....: Wilfried Treffke 

(Responsible for Test)

Approved by (+ signature): Christian Weber 

Date of issue: 2014-02-17

Total number of pages: 47

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:

Test Report No.: G0M-1312-3474-TFC247ZC-V01

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

Version History

Version	Issue Date	Remarks	Revised by
01	2014-02-17	Initial Release	

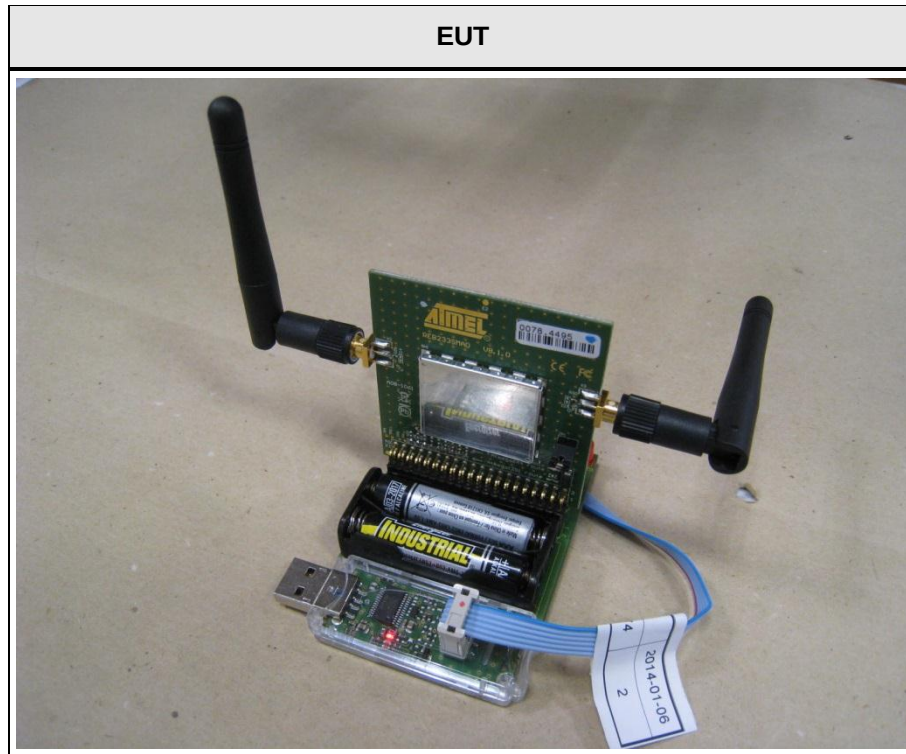
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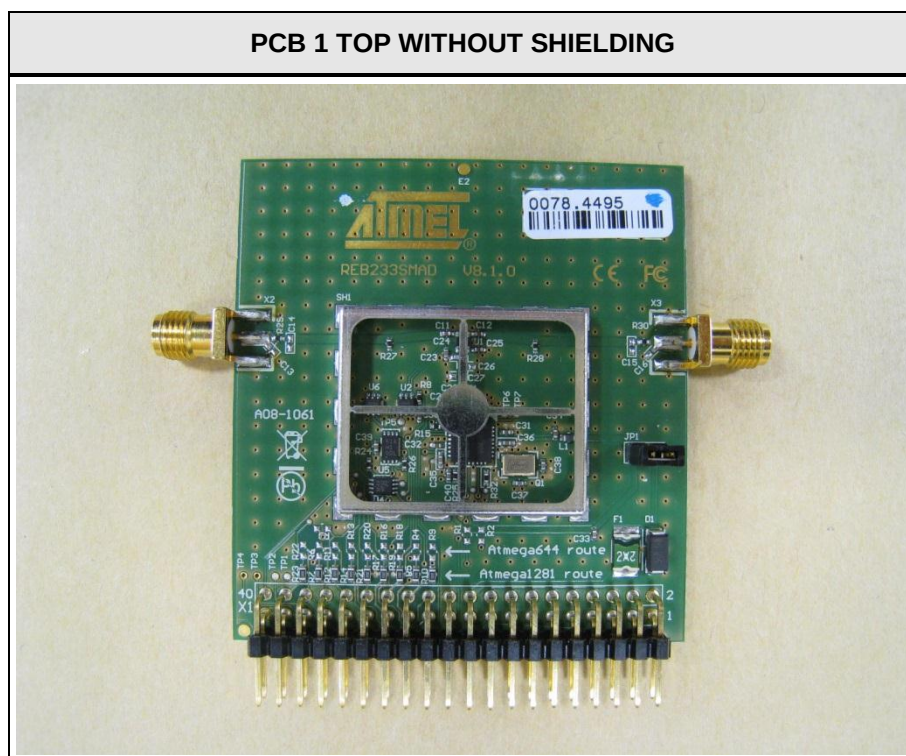
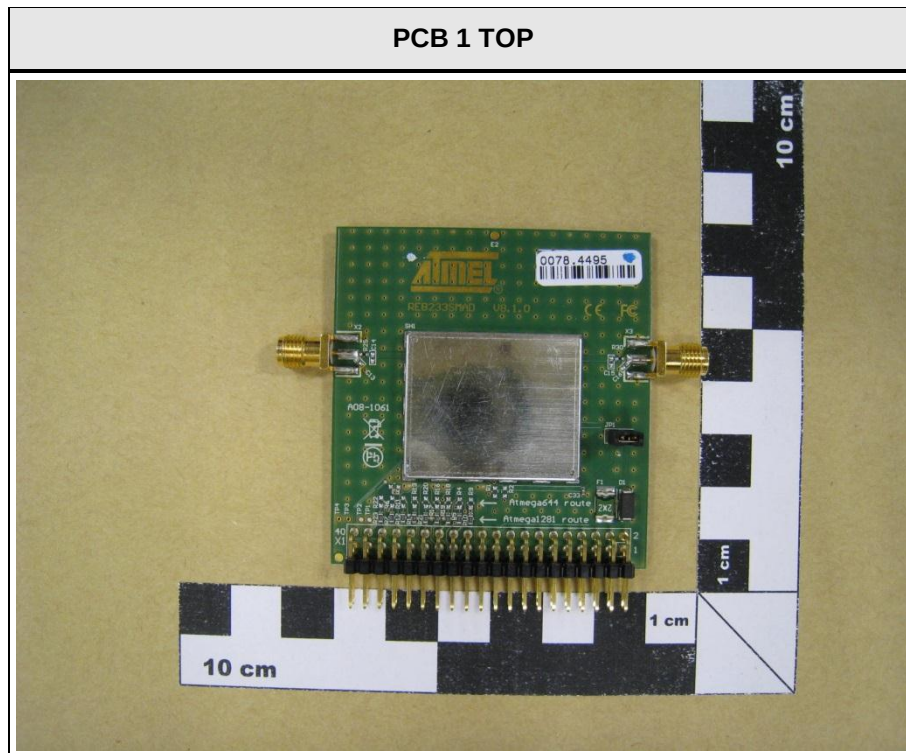
1 Equipment (Test item) Description

Description	REB233SMAD Evaluation Kit	
Model	ATREB233SMAD-EK	
Serial number	None	
Hardware version	v1.8.0	
Software / Firmware version	v0.6	
FCC-ID	VNR-E33SD-X5B-00	
IC	N/A	
Equipment type	Radio module	
Radio type	Transceiver	
Radio technology	IEEE 802.15.4a Chirp Spread Spectrum (CSS)	
Operating frequency range	Initiator 2402-2479 MHz Reflector 2404-2481 MHz	
Assigned frequency band	2400 - 2483.5 MHz	
Spreading	Chirp	
Modulations	DCCS	
Number of antennas	2	
Antenna	Type	2 x external dedicated
	Model	M35-S
	Manufacturer	Tekfun
	Gain	2dBi (declared by customer)
Manufacturer	dresden elektronik ingenieurtechnik gmbh Enno-Heidebroek-Straße 12 01237 Dresden GERMANY	
Power supply	V _{NOM}	3.0 VDC
	V _{MIN}	1.8 VDC
	V _{MAX}	3.6 VDC
AC/DC-Adaptor	Model	N/A
	Vendor	N/A
	Input	N/A
	Output	N/A

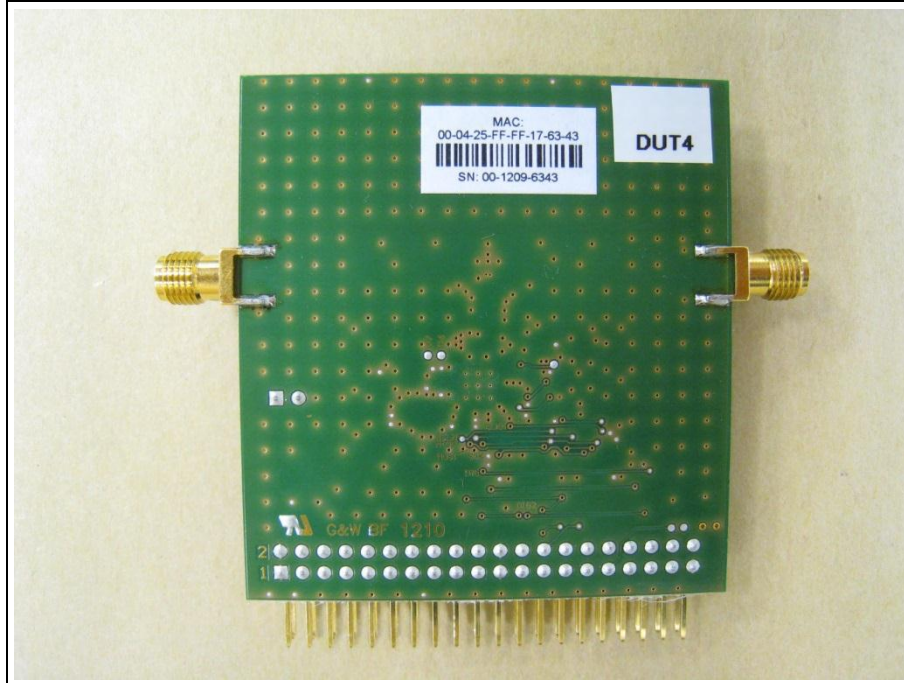
1.1 Photos – Equipment External



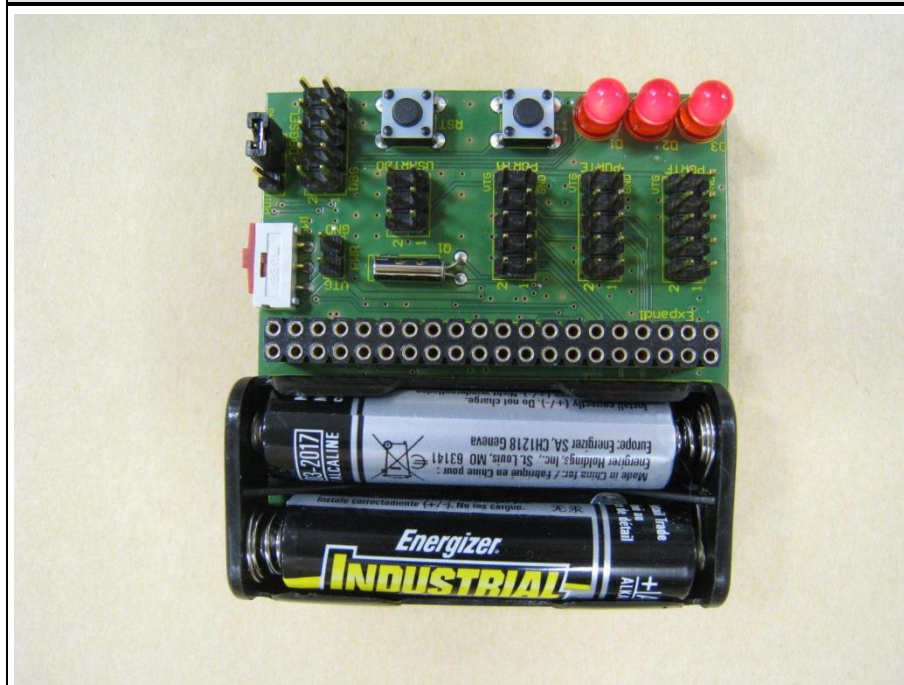
1.2 Photos – Equipment internal



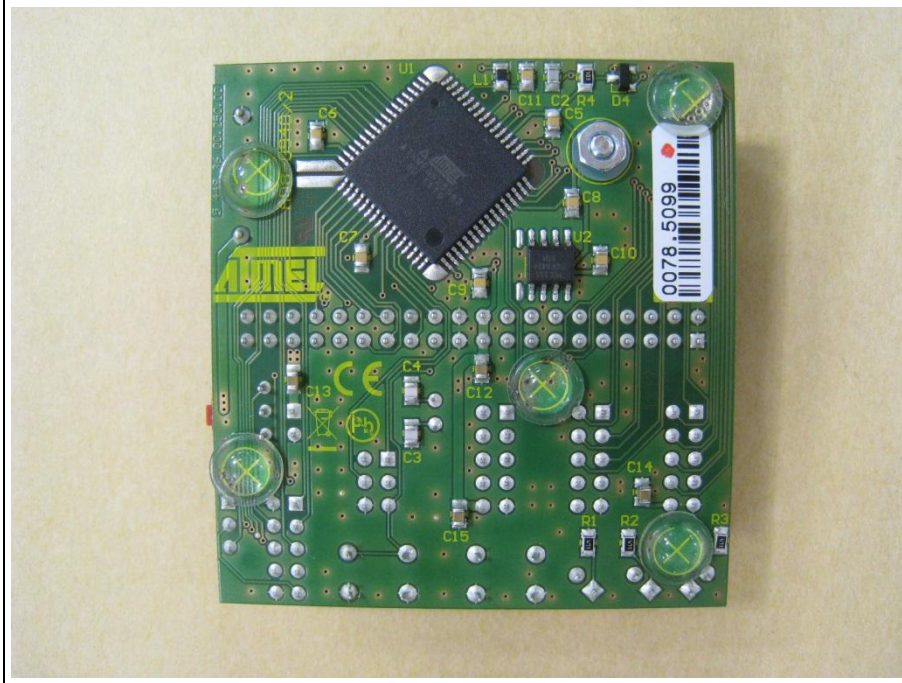
PCB1 BOTTOM



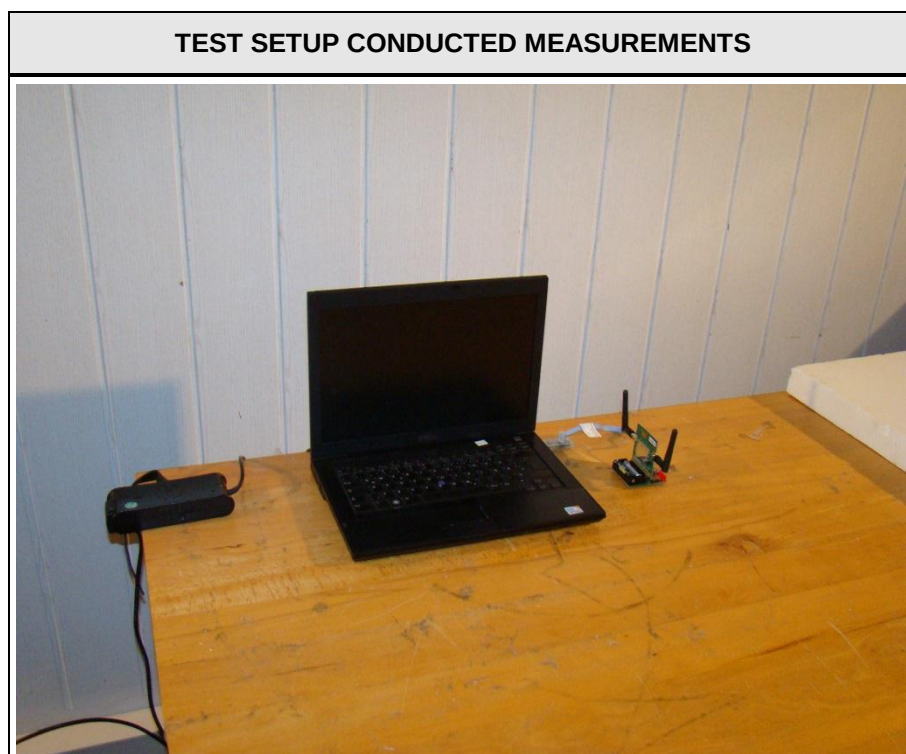
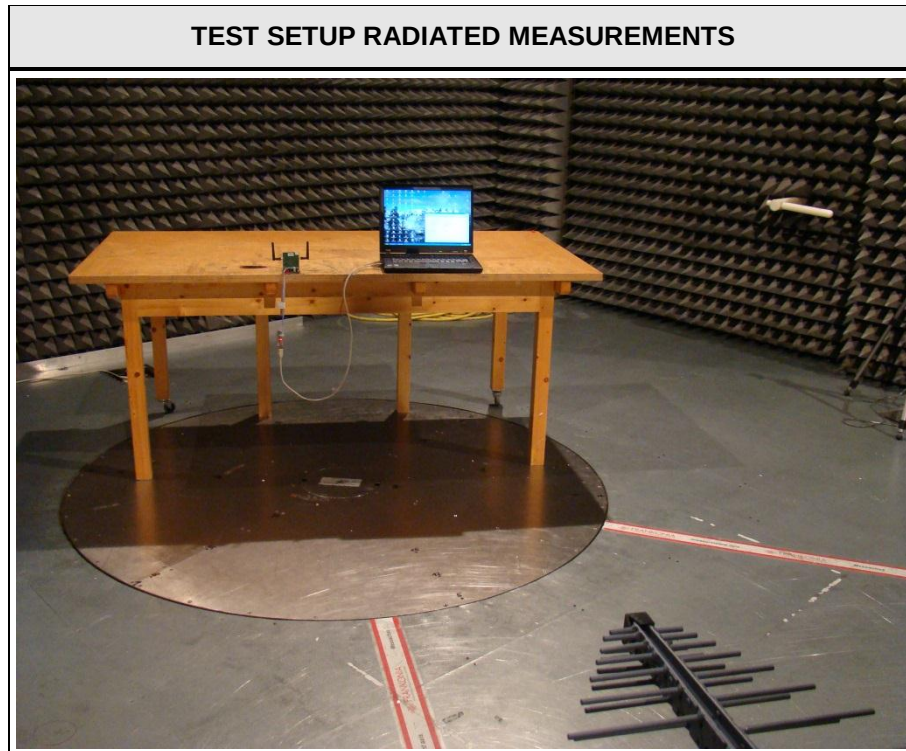
PCB 2 TOP



PCB 2 BOTTOM



1.3 Photos – Test setup



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	USB level shifter	dresden elektronik	BN-031648	
*Note: Use the following abbreviations: AE : Auxiliary/Associated Equipment, or SIM : Simulator (Not Subjected to Test) CABL : Connecting cables				

1.5 Test Modes

Mode #	Description	
Initiator	General conditions:	EUT powered by battery
	Radio conditions:	Mode = standalone transmit Spreading = Chirp Modulation = DCCS Duty cycle = 100 % Power level = Maximum
Reflector	General conditions:	EUT powered by battery
	Radio conditions:	Mode = standalone transmit Spreading = Chirp Modulation = DCCS Duty cycle = 100 % Power level = Maximum
AC-Powerline	General conditions:	EUT connected to notebook via usb, notebook powered by commercial AC/DC-Adapter
	Radio conditions:	Mode = standalone transmit Spreading = DSSS Power level = Maximum

1.6 Test Equipment Used During Testing

6dB Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2014-02	2015-02

Maximum peak conducted power					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2014-02	2015-02

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

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

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

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 5	EF00395	calibration	calibration
Spectrum Analyzer	R&S	FSIQ26	EF00242	2013-06	2014-06
Biconical Antenna	R&S	HK 116	EF00012	2013-02	2016-02
LPD antenna	R&S	HL 223	EF00187	2011-02	2014-02
LPD Antenna	R&S	HL 025	EF00327	2013-02	2016-02

AC powerline conducted emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	R&S	ESH2-Z5	EF00182	2012-10	2014-10
AMN	R&S	ESH3-Z5	EF00036	2012-11	2014-11
EMI Test Receiver	R&S	ESCS 30	EF00295	2013-10	2014-10

Test Report No.: G0M-1312-3474-TFC247ZC-V01

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

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:

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

2 Result Summary

FCC 47 CFR Part 15C, IC RSS-210				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
RSS-Gen 4.6.1	Occupied Bandwidth	RSS-Gen 4.6.1	N/R	
FCC § 15.247(a)(2) IC RSS-210 § A8.2	6dB Bandwidth	KDB Publication No. 558074	PASS	
FCC § 15.247(b)(3) IC RSS-210 § A8.4	Maximum peak conducted power	KDB Publication No. 558074	PASS	
FCC § 15.247(e) IC RSS-210 § A8.2	Power spectral density	KDB Publication No. 558074	PASS	
47 CFR 15.207 RSS-Gen 7.2.4	AC power line conducted emissions	KDB Publication No. 558074 / ANSI C63.4	PASS	
FCC § 15.247(d) IC RSS-210 § A8.5	Band edge compliance	KDB Publication No. 558074	PASS	
FCC § 15.247(d) IC RSS-210 § A8.5	Conducted spurious emissions	KDB Publication No. 558074	PASS	
FCC § 15.247(d) FCC § 15.209 IC RSS-210 A8.5 IC RSS-Gen 4.9 IC RSS-Gen 7.2.5	Transmitter radiated spurious emissions	KDB Publication No. 558074 / ANSI C 63.4	PASS	
IC RSS-Gen 4.10 IC RSS-Gen 6.1	Receiver radiated spurious emissions	ANSI C 63.4	N/A	
Remarks:				

3 Test Conditions and Results

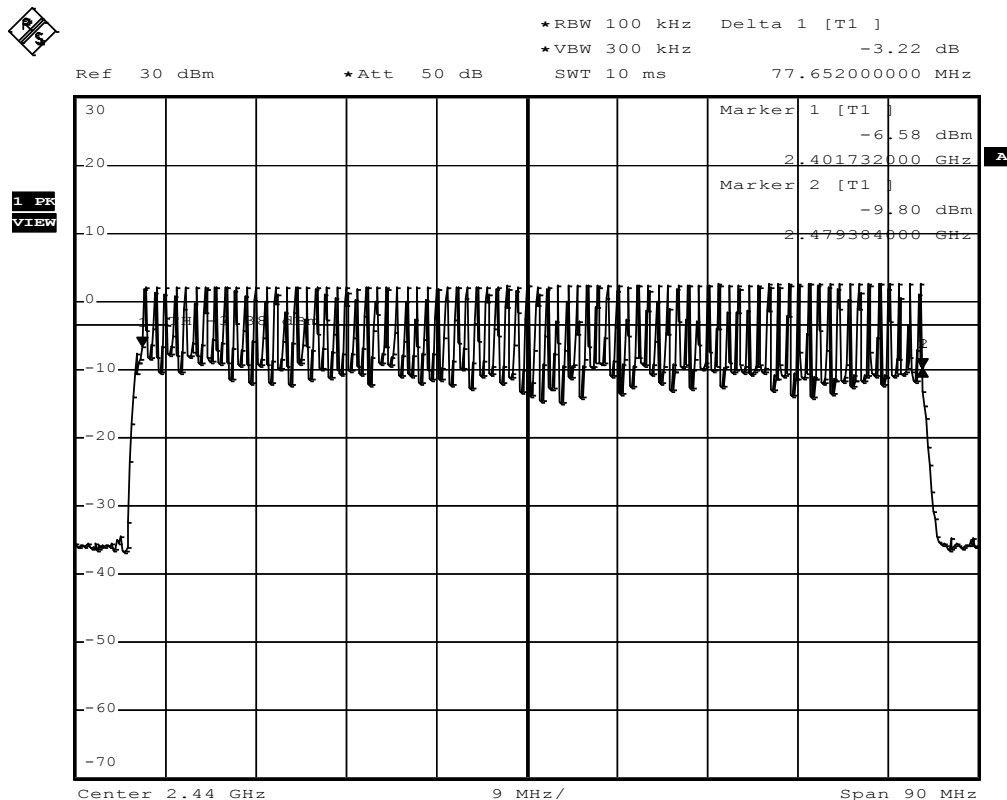
3.1 Test Conditions and Results – 6 dB Bandwidth

6dB Bandwidth acc. FCC 15.247 / IC RSS-210				Verdict: PASS	
EUT requirement rule parts and clause	Reference				
	FCC 15.247(a)(2) / IC RSS-210 A8.2				
Test according to measurement reference	Reference Method				
	FCC KDB Publication No. 558074				
Test frequency range	Tested frequencies				
	Initiator: 2402 - 2479 MHz Reflector: 2404 – 2481 MHz				
Limits					
≥ 500kHz					
Test setup					
Spectrum Analyzer EUT					
Test procedure					
1. EUT set to test mode 2. Span set to at least twice the emission spectrum 3. Detector set to peak and max hold and RBW is set to 100 kHz 4. Envelope peak value of emission spectrum is selected 5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak 6. Marker on envelope of spectrum is set to level of -6 dB to the right of the peak 7. 6 dB Bandwidth is determined by marker frequency separation					
Test results - Initiator					
Channel	Frequency [MHz]	Mode	6 dB Bandwidth [kHz]	Limit [kHz]	Result
F _{MID}	2402-2479	DCCS	77.652	500	PASS
Test results - Reflector					
Channel	Frequency [MHz]	Mode	6 dB Bandwidth [kHz]	Limit [kHz]	Result
F _{MID}	2404 – 2481	DCCS	78.000	500	PASS
Comments:					

6 dB Bandwidth – Chirp Initiator

FCC part 15.247 (a)2
Minimum 6 dB Bandwidth

EUT REB233SMAD Evaluation Kit
Model ATREB233SMAD-EK
Approval Holder Atmel Automotive GmbH / Ord.: G0M-1312-3474
Temperature / Voltage Tnom / Vnom
Test Site / Operator Eurofins Product Service GmbH / Mr. Treffke
Test Specification FCC part 15.247 (a)2
Comment 1 Minimum 6 dB Bandwidth
Comment 2 Initiator 2402-2479 MHz, DCCS
Comment 3 procedure 8.1 DTS BW (558074 D01 DTS)



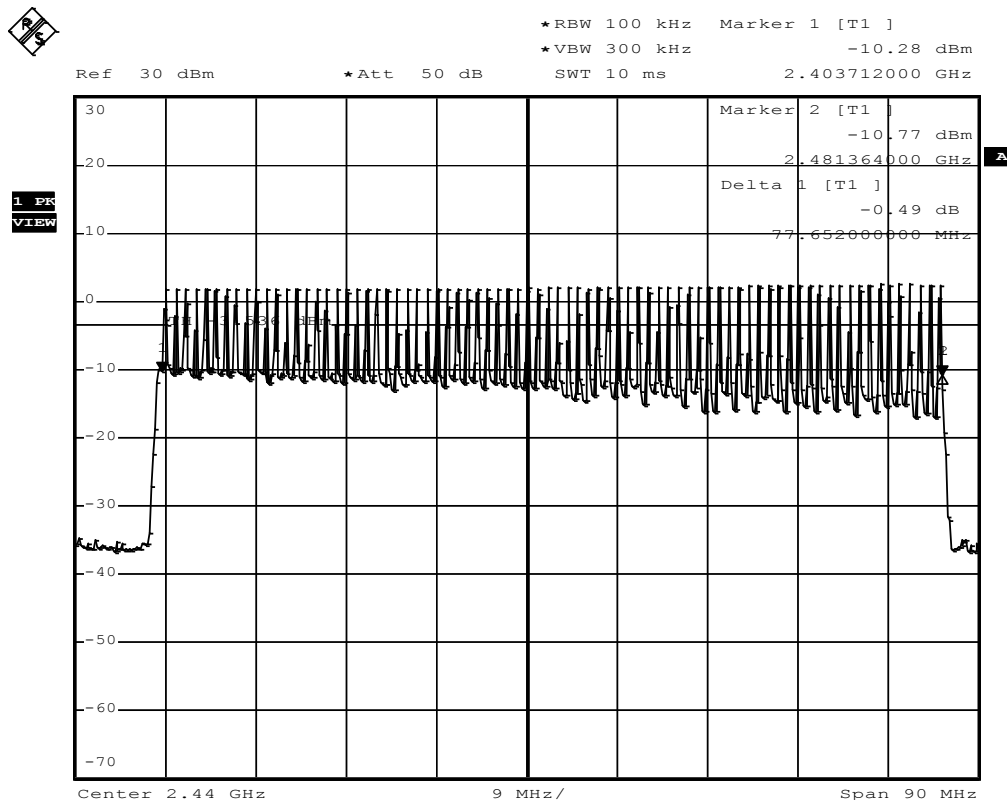
Comment: 6 dB bandwidth: 77652 KHz > 500 KHz; verdict: PASS
Date: 8.JAN.2014 13:35:53

6 dB Bandwidth – Chirp Reflector

FCC part 15.247 (a)2

Minimum 6 dB Bandwidth

EUT REB233SMAD Evaluation Kit
Model ATREB233SMAD-EK
Approval Holder Atmel Automotive GmbH / Ord.: G0M-1312-3474
Temperature / Voltage Tnom / Vnom
Test Site / Operator Eurofins Product Service GmbH / Mr. Treffke
Test Specification FCC part 15.247 (a)2
Comment 1 Minimum 6 dB Bandwidth
Comment 2 Reflector 2404-2481 MHz, DCCS
Comment 3 procedure 8.1 DTS BW (558074 D01 DTS)



Comment: 6 dB bandwidth: 77652 KHz > 500 KHz; verdict: PASS
Date: 8.JAN.2014 13:42:31

3.2 Test Conditions and Results – Maximum peak conducted power

Maximum peak conducted power acc. FCC 15.247 / IC RSS-210						Verdict: PASS	
EUT requirement rule parts and clause			Reference				
			FCC 15.247(b)(3) / IC RSS-210 A8.4				
Test according to measurement reference			Reference Method				
			FCC KDB Publication No. 558074				
Test frequency range			Tested frequencies				
			Initiator: 2402 - 2479 MHz Reflector: 2404 – 2481 MHz				
Measurement mode			Peak				
Maximum antenna gain			2 dBi ⇒ Limit correction = 0 dB				
Limits							
1 W (30 dBm)							
The conducted output power limit specified above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in the table, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.							
Test setup							
Spectrum Analyzer EUT							
Test procedure							
1. EUT set to test mode (Communication tester is used if needed) 2. Center frequency set to test channel center frequency 3. Span set to twice the 20 dB bandwidth and detector to peak and max hold 4. Resolution bandwidth is set to 3 MHz 5. Peak conducted power is determined from peak of spectrum envelope							
Test results - Initiator							
Channel	Frequency [MHz]	Voltage [VDC]	Mode	Peak power [dbm]	Peak power [W]	Limit [dBm]	Margin [dB]
F _{MID}	2402-2479	V _{NOM} = 3.0	DCCS	2.7	0.002	30	-27.30
Test results - Reflector							
Channel	Frequency [MHz]	Voltage [VDC]	Mode	Peak power [dbm]	Peak power [W]	Limit [dBm]	Margin [dB]
F _{MID}	2404-2481	V _{NOM} = 3.0	DCCS	2.7	0.002	30	-27.30
Comments:							

3.3 Test Conditions and Results – Power spectral density

Power spectral density acc. FCC 15.247 / IC RSS-210						Verdict: PASS
EUT requirement rule parts and clause			Reference			
			FCC 15.247(e) / IC RSS-210 A8.2			
Test according to measurement reference			Reference Method			
			FCC KDB Publication No. 558074			
Test frequency range			Tested frequencies			
			Initiator: 2402 - 2479 MHz Reflector: 2404 – 2481 MHz			
Measurement mode			Peak			
Limits						
8 dBm / 3 kHz						
Test setup						
Spectrum Analyzer EUT						
Test procedure						
1. EUT set to test mode (Communication tester is used if needed) 2. Center frequency set to test channel center frequency 3. Span is set large enough to capture maximum emissions in passband, RBW is set to 3kHz 4. Peak power density is determined from peak emission of envelope						
Test results - Initiator						
Channel	Frequency [MHz]	Test mode	Peak frequency [MHz]	Peak power density [dBm]	Limit [dBm/3kHz]	Margin [dB]
F _{MID}	2402 - 2479	DCCS	2467.000	2.62	8.0	-05.38
Test results - Reflector						
Channel	Frequency [MHz]	Test mode	Peak frequency [MHz]	Peak power density [dBm]	Limit [dBm/3kHz]	Margin [dB]
F _{MID}	2404 - 2481	DCCS	2478.160	2.42	8.0	-05.58
Comments:						

Power Spectral Density – Initiator

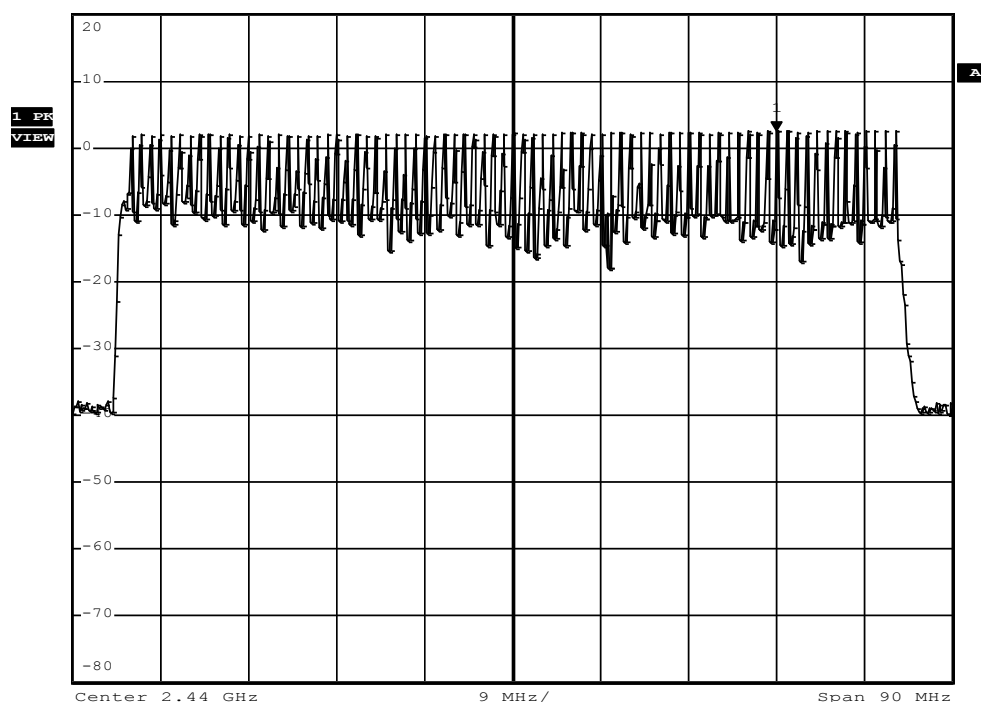
FCC part 15.247 (d)

Power spectral density (PSD)

EUT	REB233SMAD Evaluation Kit
Model	ATREB233SMAD-EK
Approval Holder	Atmel Automotive GmbH / Ord.: G0M-1312-3474
Temperature / Voltage	Tnom / Vnom
Test Site / Operator	Eurofins Product Service GmbH / Mr. Treffke
Test Specification	FCC part 15.247 (d)
Comment 1	Power spectral density conducted
Comment 2	Initiator 2402-2479 MHz, DCCS
Comment 3	Procedure 10.2 PKPSD (558074 D01 DTS Meas Guidance)



★RBW 100 kHz Marker 1 [T1]
 ★VBW 300 kHz 2.62 dBm
 Ref 20 dBm Att 50 dB SWT 10 ms 2.467000000 GHz



Comment: Maximum Power Spectral Density=2.62dBm
 Comment: f=2.467GHz RBW= 100kHz , Limit <8dBm/3kHz
 Date: 8.JAN.2014 09:40:08

Power Spectral Density – Reflector

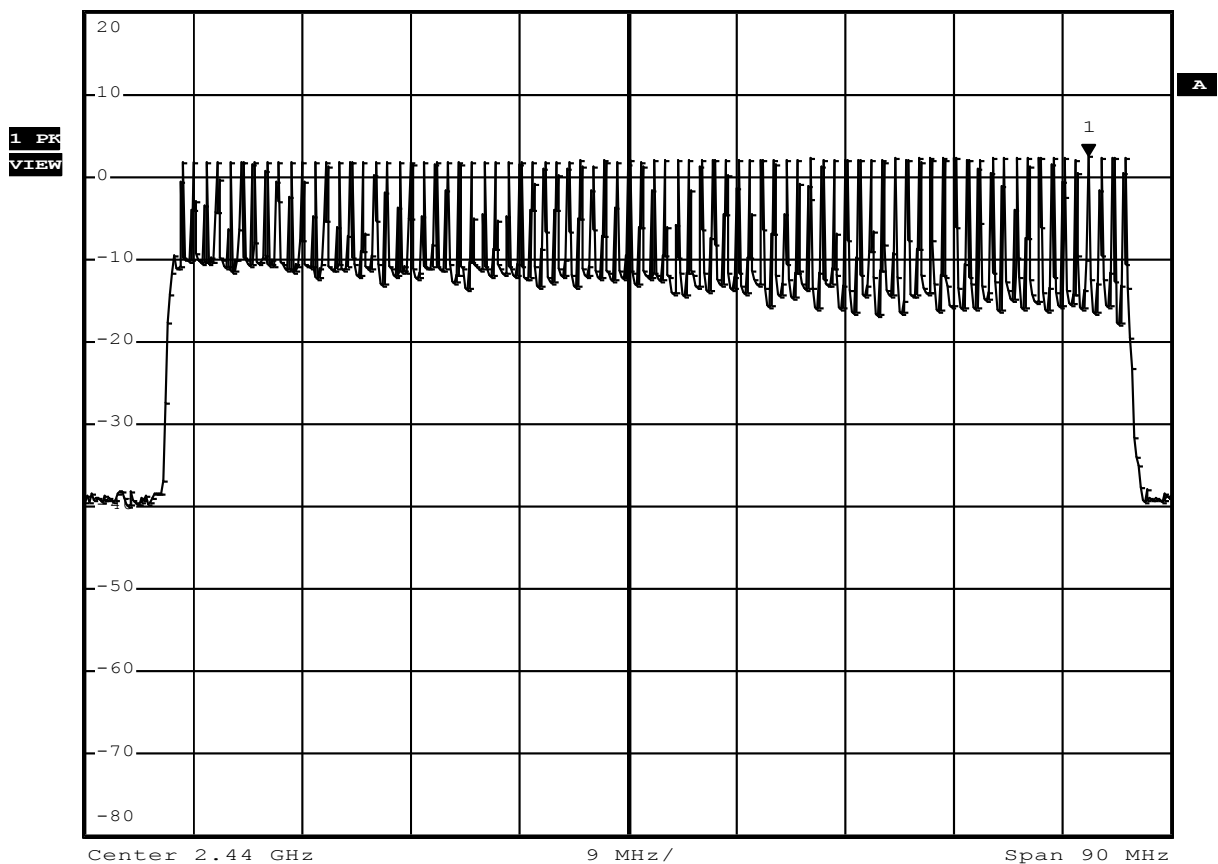
FCC part 15.247 (d)
Power spectral density (PSD)

EUT	REB233SMAD Evaluation Kit
Model	ATREB233SMAD-EK
Approval Holder	Atmel Automotive GmbH / Ord.: G0M-1312-3474
Temperature / Voltage	Tnom / Vnom
Test Site / Operator	Eurofins Product Service GmbH / Mr. Treffke
Test Specification	FCC part 15.247 (d)
Comment 1	Power spectral density conducted
Comment 2	Reflector 2404-2481 MHz, DCCS
Comment 3	Procedure 10.2 PKPSD (558074 D01 DTS Meas Guidance)



★RBW 100 kHz Marker 1 [T1]
★VBW 300 kHz 2.42 dBm

Ref 20 dBm Att 50 dB SWT 10 ms 2.478160000 GHz



Comment: Maximum Power Spectral Density=2.42dBm
Comment: f=2.47816GHz RBW= 100kHz , Limit <8dBm/3kHz
Date: 8.JAN.2014 10:15:06

Test Report No.: G0M-1312-3474-TFC247ZC-V01

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

3.4 Test Conditions and Results – AC power line conducted emissions

Power line conducted emissions acc. FCC 47 CFR 15.207 / IC RSS-Gen				Verdict: PASS	
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			
Points of Application		Application Interface			
AC Mains		LISN			
EUT test mode		AC-Powerline			
Limits and results					
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.					

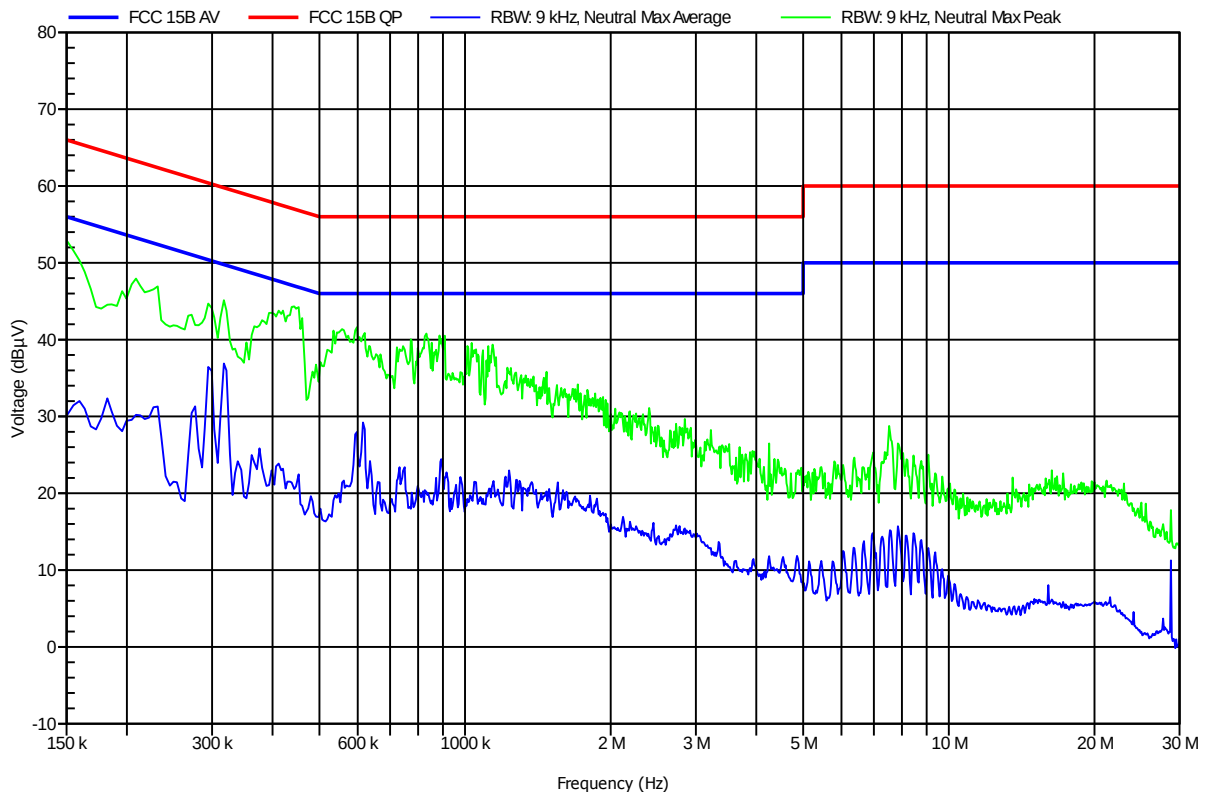
Conducted Emissions

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

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
 Test Conditions: Tnom: 23°C, Unom: 2x1.5VDC battery AA
 LISN: ESH2-Z5 N
 Mode: DCSS, max.power
 OQPSK
 Test Date: 2014-02-11
 Note:

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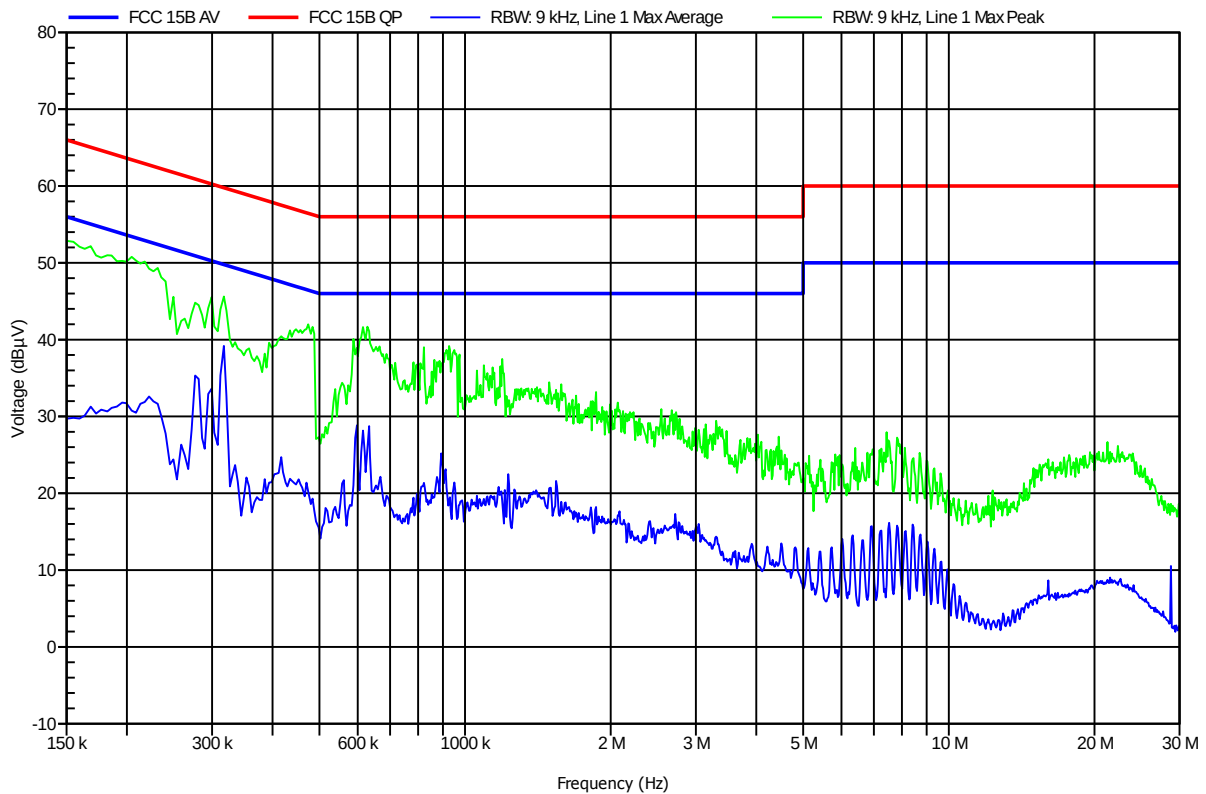


Conducted Emissions
EMI voltage test in the ac-mains according to FCC Part 15b

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Zunke
 Test Conditions: Tnom: 23°C, Unom: 2x1.5VDC battery AA
 LISN: ESH2-Z5 L
 Mode: DCSS, max.power
 OQPSK
 Test Date: 2014-02-11
 Note:

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3.5 Test Conditions and Results – Band edge compliance

Band-edge compliance acc. FCC 15.247 / IC RSS-210				Verdict: PASS	
EUT requirement rule parts and clause		Reference			
		FCC 15.247(d) / IC RSS-210 A8.5			
Test according to measurement reference		Reference Method			
		FCC KDB Publication No. 558074			
Test frequency range		Tested frequencies			
		Initiator: 2402 - 2479 MHz Reflector: 2404 – 2481 MHz			
Measurement mode		Peak			
Limits					
Limit			Condition		
≤ -20 dB / 100 kHz			Peak power measurement detector = Peak		
≤ -30 dB / 100 kHz			Peak power measurement detector = RMS		
Test setup					
Spectrum Analyzer EUT					
Test procedure					
1. EUT set to test mode (Communication tester is used if needed) 2. Span set around lower band edge and detector is set to peak and max hold 3. Resolution bandwidth is set to 100 kHz 4. Markers are set to peak emission levels within frequency band and outside frequency band 5. Band edge attenuation is determined from level difference					
Test results – Initiator F _{Low}					
Channel	Frequency [MHz]	Mode	Level [dBc]	Limit [dBc]	Margin [dB]
F _{Low}	2402	DCCS	-40.16	-20	-20.16
Test results – Initiator F _{High}					
Channel	Frequency [MHz]	Mode	Level [dBc]	Limit [dBc]	Margin [dB]
F _{High}	2481	DCCS	-41.81	-20	-21.81
Comments:					

3.6 Test Conditions and Results – Conducted spurious emissions

Conducted spurious emissions acc. FCC 15.247 / IC RSS-210						Verdict: PASS	
EUT requirement rule parts and clause			Reference				
			FCC 15.247(d) / IC RSS-210 A8.5				
Test according to measurement reference			Reference Method				
			FCC KDB Publication No. 558074				
Test frequency range			Tested frequencies				
			10 MHz – 10 th Harmonic				
Measurement mode			Peak				
Limits							
Limit				Condition			
≤ -20 dB / 100 kHz				Peak power measurement detector = Peak			
≤ -30 dB /100 kHz				Peak power measurement detector = RMS			
Test setup							
Spectrum Analyzer EUT							
Test procedure							
1. EUT set to test mode (Communication tester is used if needed) 2. Span it set according to measurement range 3. Resolution bandwidth is set to 100 kHz and detector to peak and max hold 4. Markers are set to peak emission levels within frequency band 5. Emission level is determined by second marker on emission peak 6. Attenuation is determined from level difference							
Test results - Initiator							
Channel	Frequency [MHz]	Mode	Emission [MHz]	Emission Level [dbm]	Peak power [dBm]	Limit [dBm]	Margin [dB]
F _{MID}	2402 – 2479	DCCS	24765	-37.02	2.6	-17.4	-19.62
Test results - Reflector							
Channel	Frequency [MHz]	Mode	Emission [MHz]	Emission Level [dbm]	Peak power [dBm]	Limit [dBm]	Margin [dB]
F _{MID}	2404 – 2481	DCCS	24803	-37.19	2.4	-17.6	-19.59
Comments:							

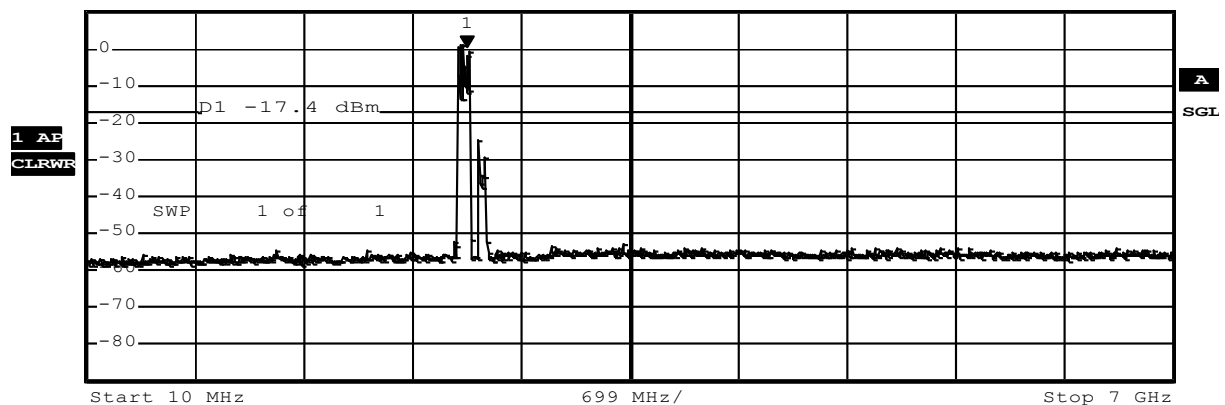
Conducted spurious emissions – Initiator

FCC part 15.247 (d)
Spurious Emissions

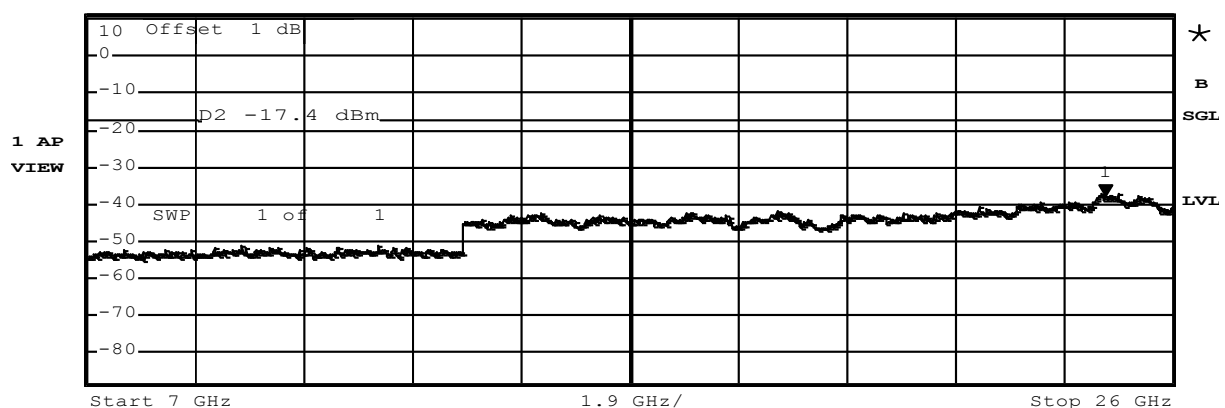
EUT	REB233SMAD Evaluation Kit
Model	ATREB233SMAD-EK
Approval Holder	Atmel Automotive GmbH / Ord.: G0M-1312-3474
Temperature / Voltage	Tnom / Vnom
Test Site / Operator	Eurofins Product Service GmbH / Mr. Treffke
Test Specification	FCC part 15.247 (d)
Comment 1	Spurious Emissions conducted
Comment 2	Initiator 2402-2479 MHz; DCCS
Comment 3	Emissions in non-restricted frequency bands 558074 D01 Meas Guidance



Ref 10 dBm * Att 30 dB * RBW 100 kHz Marker 1 [T1] 0.99 dBm
* VBW 300 kHz 2.435530000 GHz
* SWT 20 s



Ref 11 dBm * Att 30 dB * RBW 100 kHz Marker 1 [T1] -37.02 dBm
* VBW 300 kHz 24.765000000 GHz
* SWT 60 s



Date: 8.JAN.2014 10:09:29

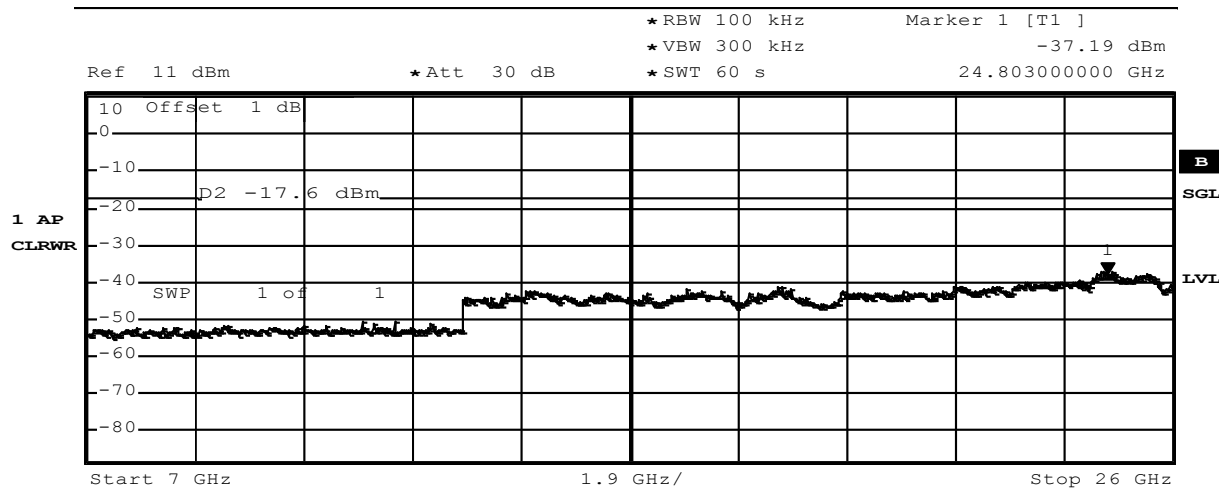
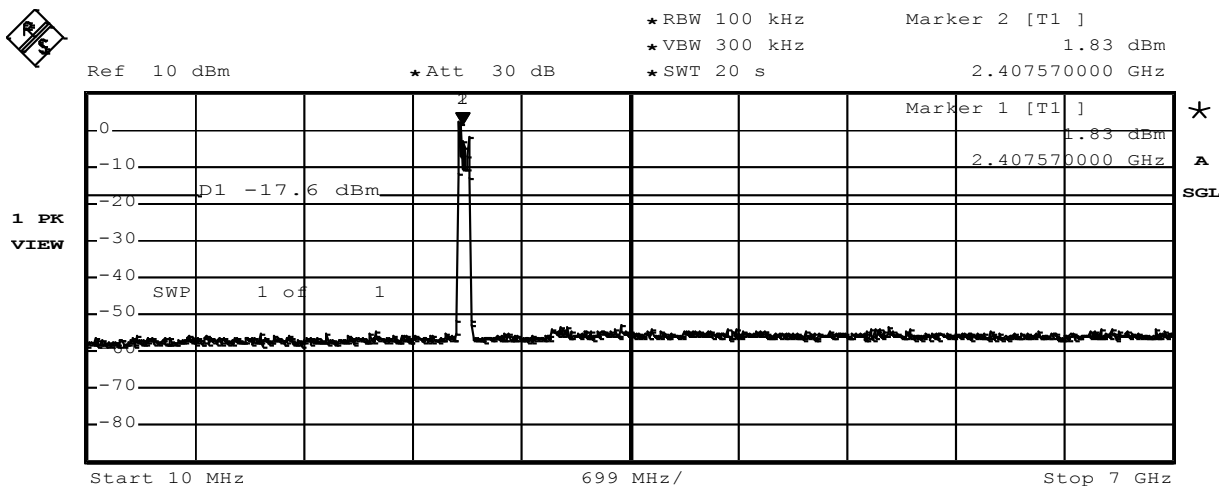
Test Report No.: G0M-1312-3474-TFC247ZC-V01

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

Conducted spurious emissions – Reflector

FCC part 15.247 (d)
Spurious Emissions

EUT	REB233SMAD Evaluation Kit
Model	ATREB233SMAD-EK
Approval Holder	Atmel Automotive GmbH / Ord.: G0M-1312-3474
Temperature / Voltage	Tnom / Vnom
Test Site / Operator	Eurofins Product Service GmbH / Mr. Treffke
Test Specification	FCC part 15.247 (d)
Comment 1	Spurious Emissions conducted
Comment 2	Reflector 2404-2481, DCCS
Comment 3	Emissions in non-restricted frequency bands 558074 D01 Meas Guidance

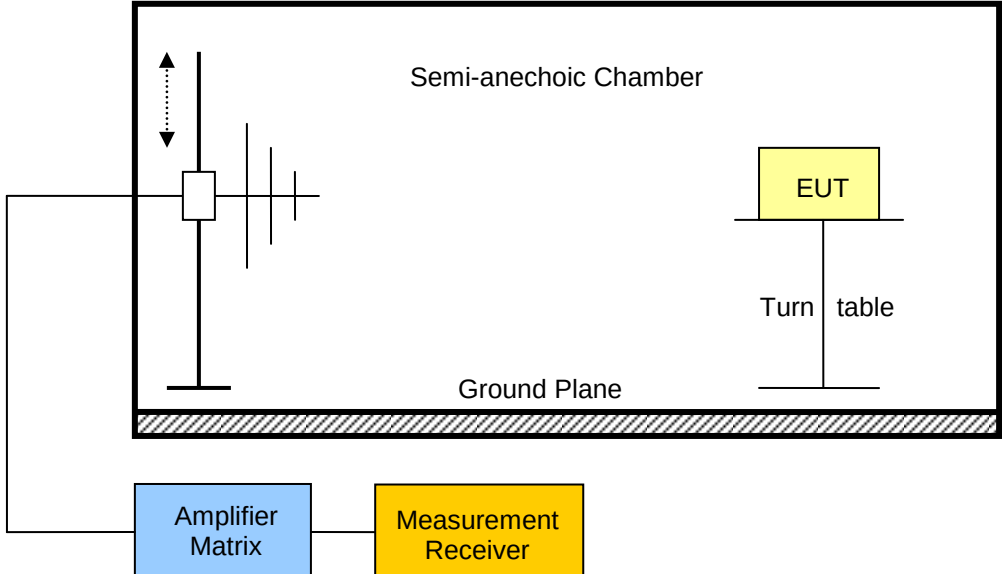


Date: 8.JAN.2014 09:56:43

Test Report No.: G0M-1312-3474-TFC247ZC-V01

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

3.7 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated emissions acc. FCC 47 CFR 15.247 / IC RSS-210				Verdict: PASS
Test according referenced standards	Reference Method			
	FCC 15.247(d) / IC RSS-210 A8.5			
Test according to measurement reference	Reference Method			
	FCC KDB Publication No. 558074 / ANSI C63.4			
Test frequency range	Tested frequencies			
	30 MHz – 10 th Harmonic			
Limits				
Frequency range [MHz]	Detector	Limit [μV/m]	Limit [dBμV/m]	Limit Distance [m]
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
Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). When average radiated emission measurements are specified, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.				
Test setup				
				

Test procedure									
1. EUT set to test 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 within restricted bands									
Test results									
Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dBμV/m]	Det.	Pol.	Limit [dBμV/m]	Limit dist. [m]*	Margin [dB]
F _{MID}	2402-2481	DCSS	2390	59.33	pk	ver	74.00	3	-14.67
F _{MID}	2402-2481	DCSS	2390	30.02	RMS	ver	54.00	3	-23.98
F _{MID}	2402-2481	DCSS	2400	81.23	pk	ver	95.00	3	-13.77
F _{MID}	2402-2481	DCSS	2483.5	66.20	pk	hor	74.00	3	-07.80
F _{MID}	2402-2481	DCSS	2483.5	38.91	RMS	hor	54.00	3	-15.09
F _{MID}	2402-2481	DCSS	2483.6	72.46	pk	ver	74.00	3	-01.54
F _{MID}	2402-2481	DCSS	2483.6	45.01	RMS	ver	54.00	3	-08.99
F _{MID}	2402-2481	DCSS	2500	49.23	pk	ver	74.00	3	-24.77
F _{MID}	2402-2481	DCSS	2500	25.69	avg	ver	54.00	3	-28.31
F _{MID}	2402-2481	DCSS	2533	82.39	pk	hor	95.00	3	-12.61
F _{MID}	2402-2481	DCSS	2569	82.71	pk	ver	95.00	3	-12.29
Comments: * Physical distance between EUT and measurement antenna.									

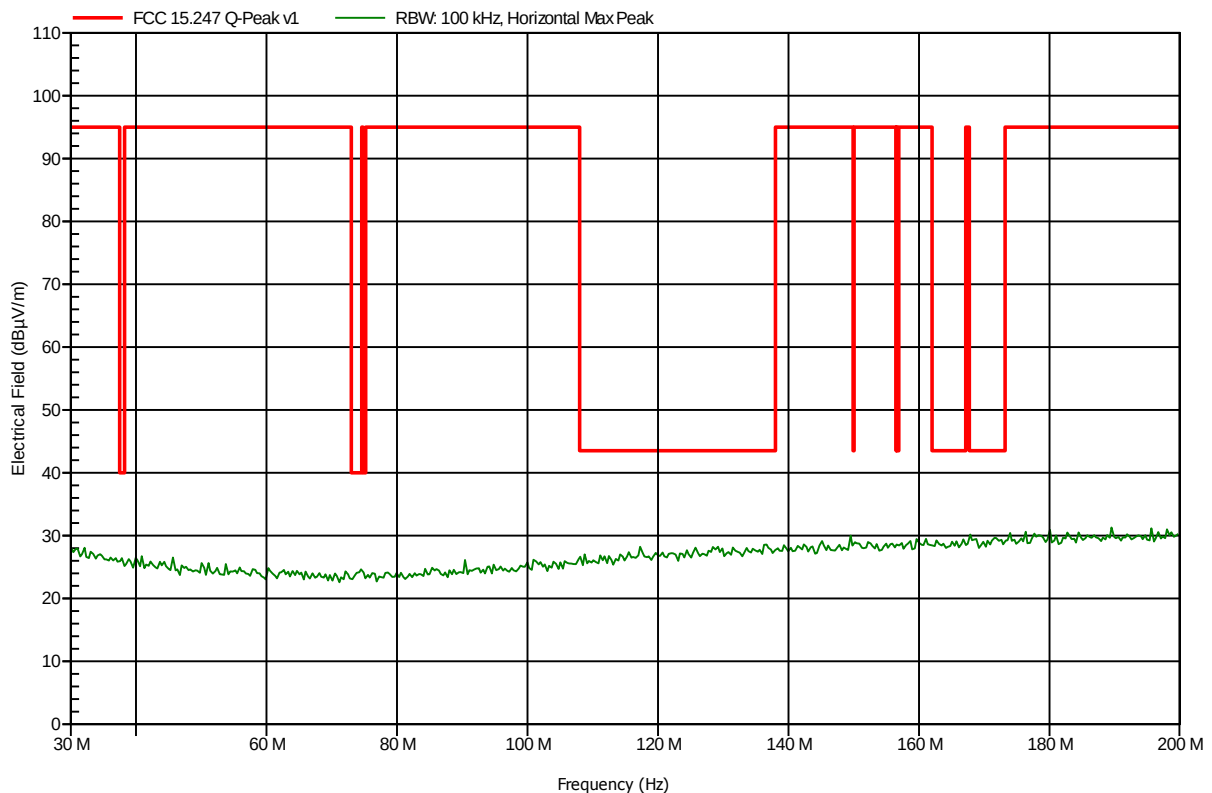
ANNEX A Transmitter radiated spurious emissions

Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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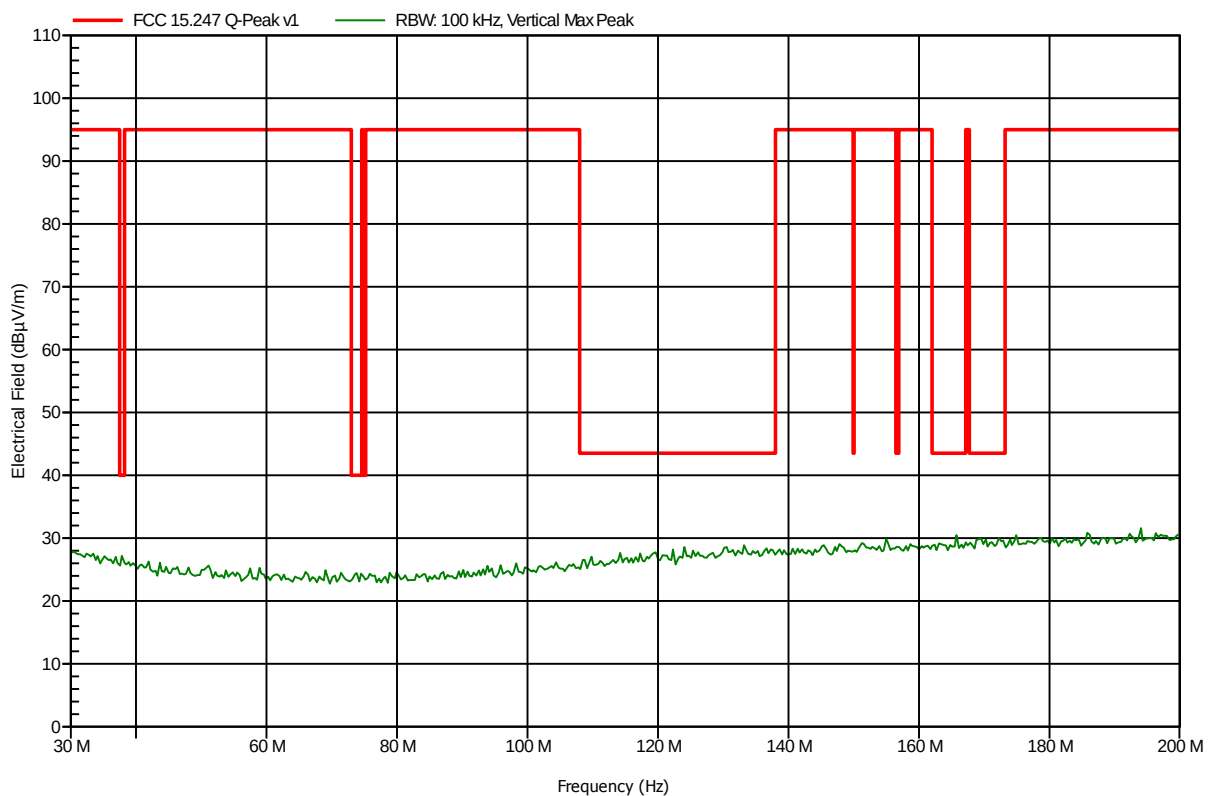


Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer:	Atmel Automotive GmbH
EUT Name:	REB233SMAD Evaluation Kit
Model:	ATREB233SMAD-EK
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; DCSS; ant.1; Pmax; Chirp
Test Date:	2014-01-14
Note:	

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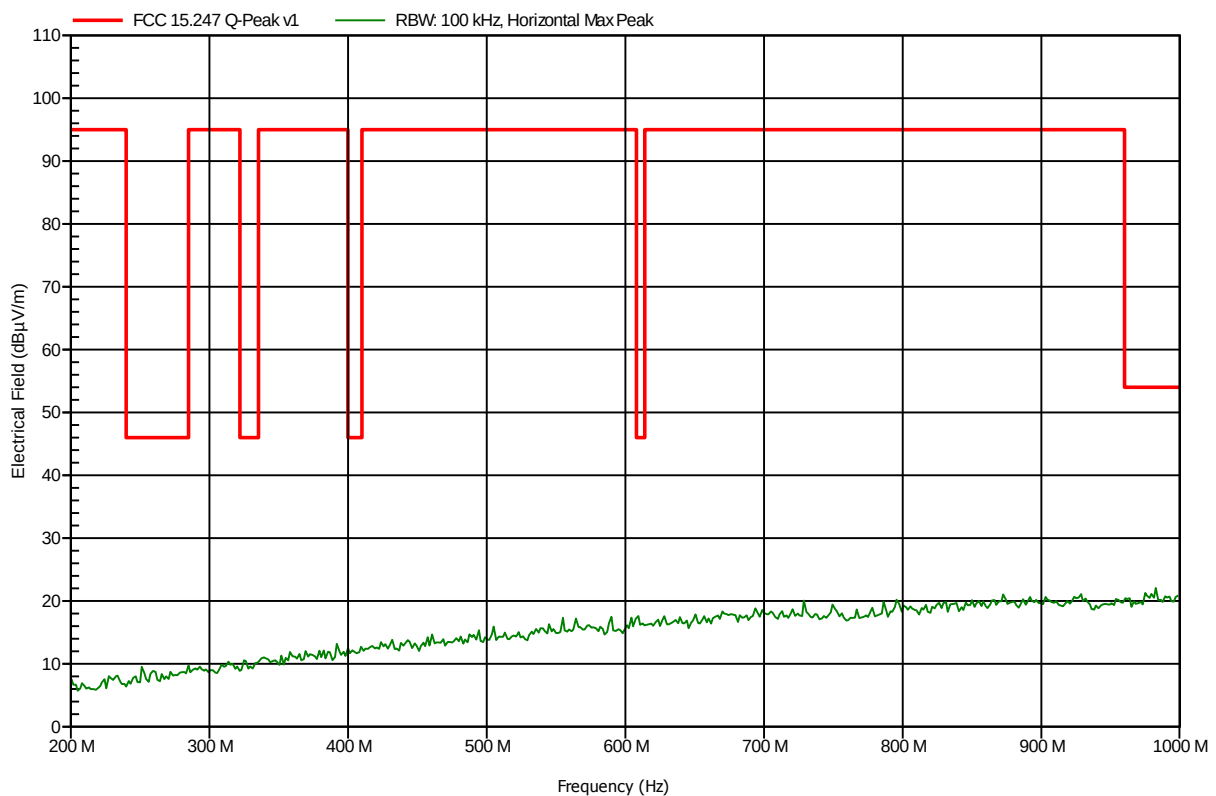


Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer:	Atmel Automotive GmbH
EUT Name:	REB233SMAD Evaluation Kit
Model:	ATREB233SMAD-EK
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; DCSS; ant.1; Pmax; Chirp
Test Date:	2014-01-14
Note:	

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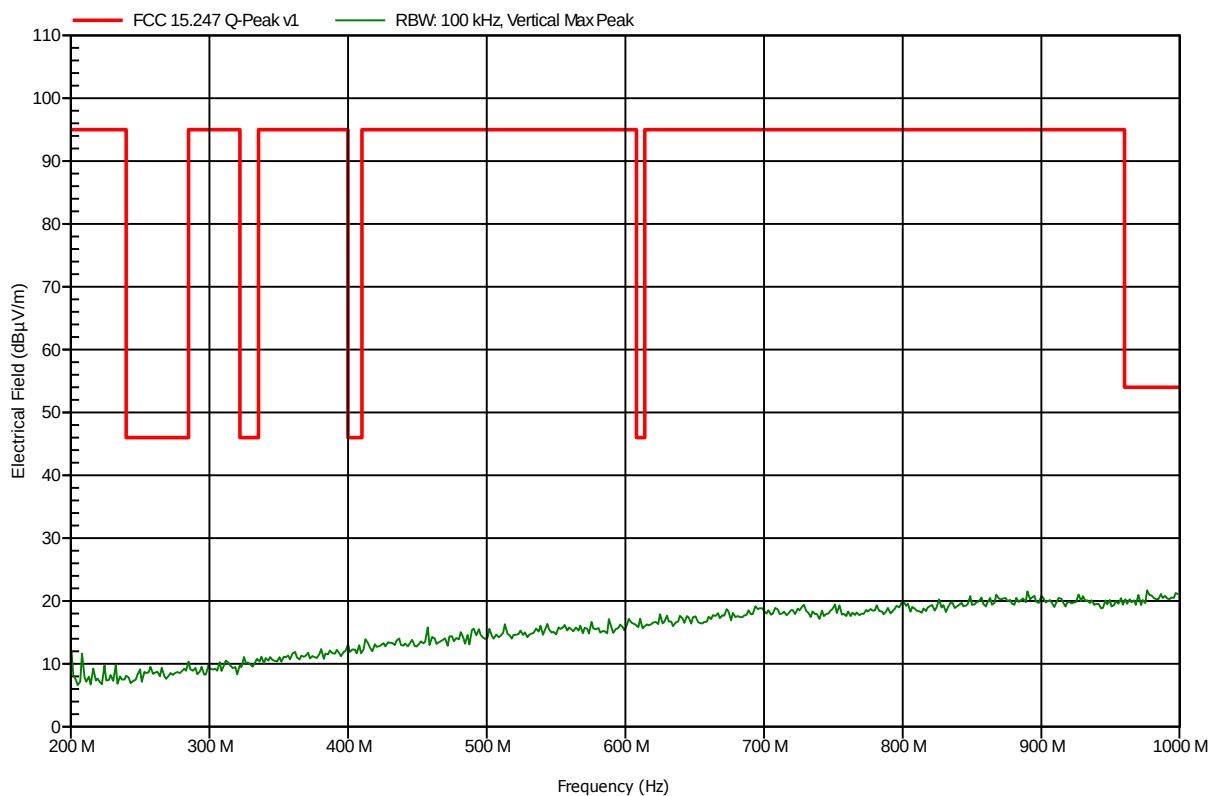


Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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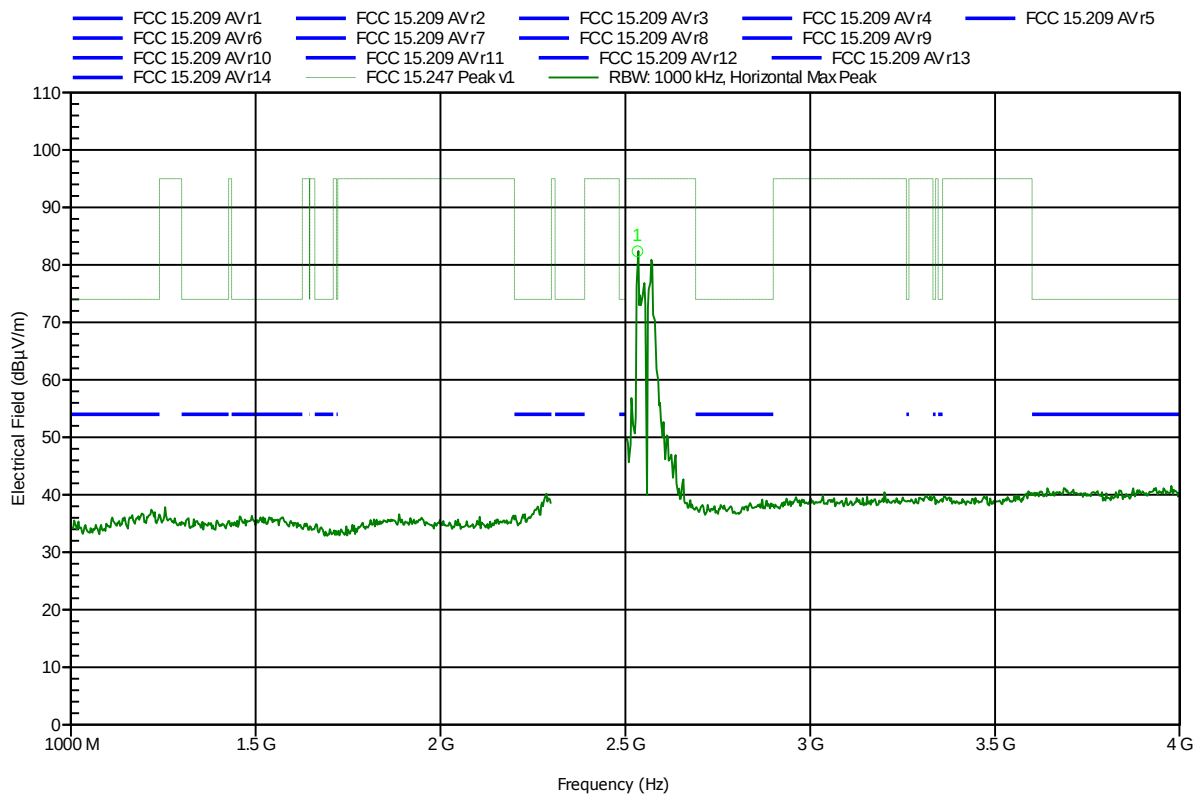


Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.533 GHz	82.39 dBµV/m	95 dBµV/m	-12.61 dB	Pass

Test Report No.: G0M-1312-3474-TFC247ZC-V01

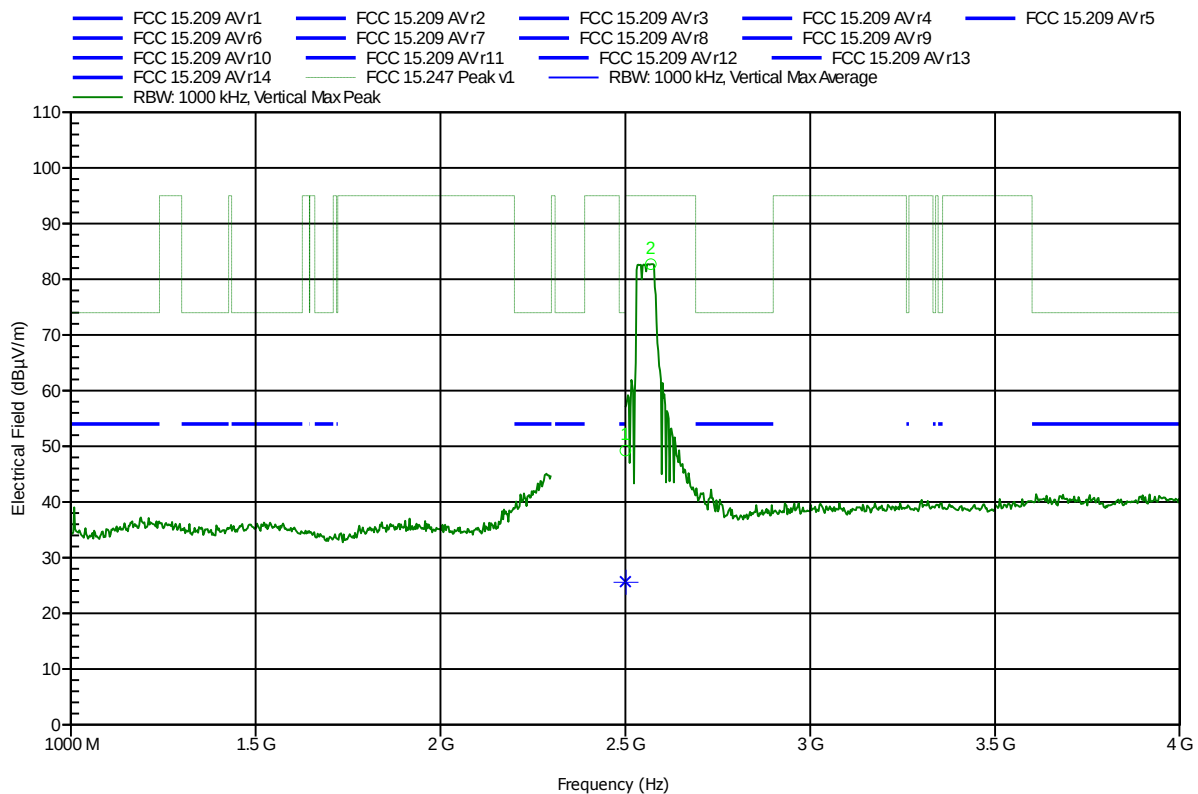
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247

Project number: GOM-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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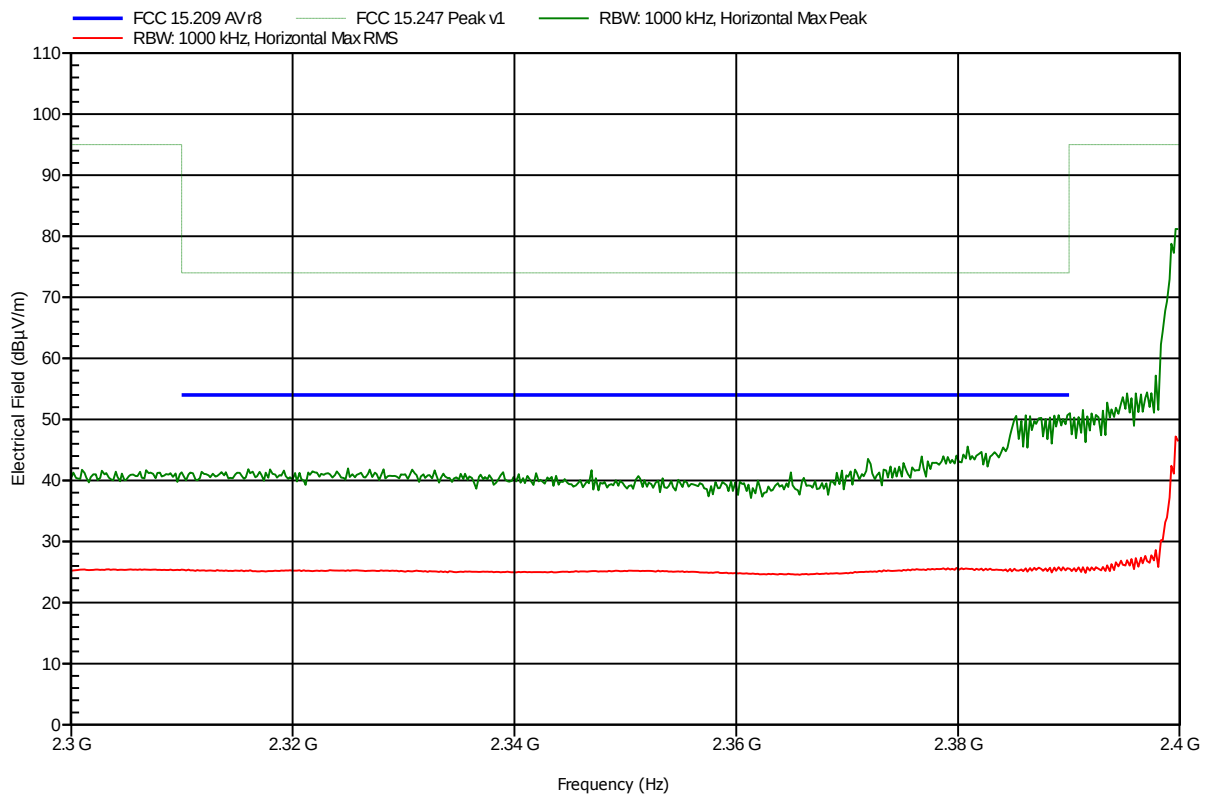
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.5 GHz	49.23 dBμV/m	74 dBμV/m	-24.77 dB	Pass
2.569 GHz	82.71 dBμV/m	95 dBμV/m	-12.29 dB	Pass
Frequency	Average	Average Limit	Average Difference	Average Status
2.5 GHz	25.69 dBμV/m	54 dBμV/m	-28.31 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note: lower bandedge; initiator mode

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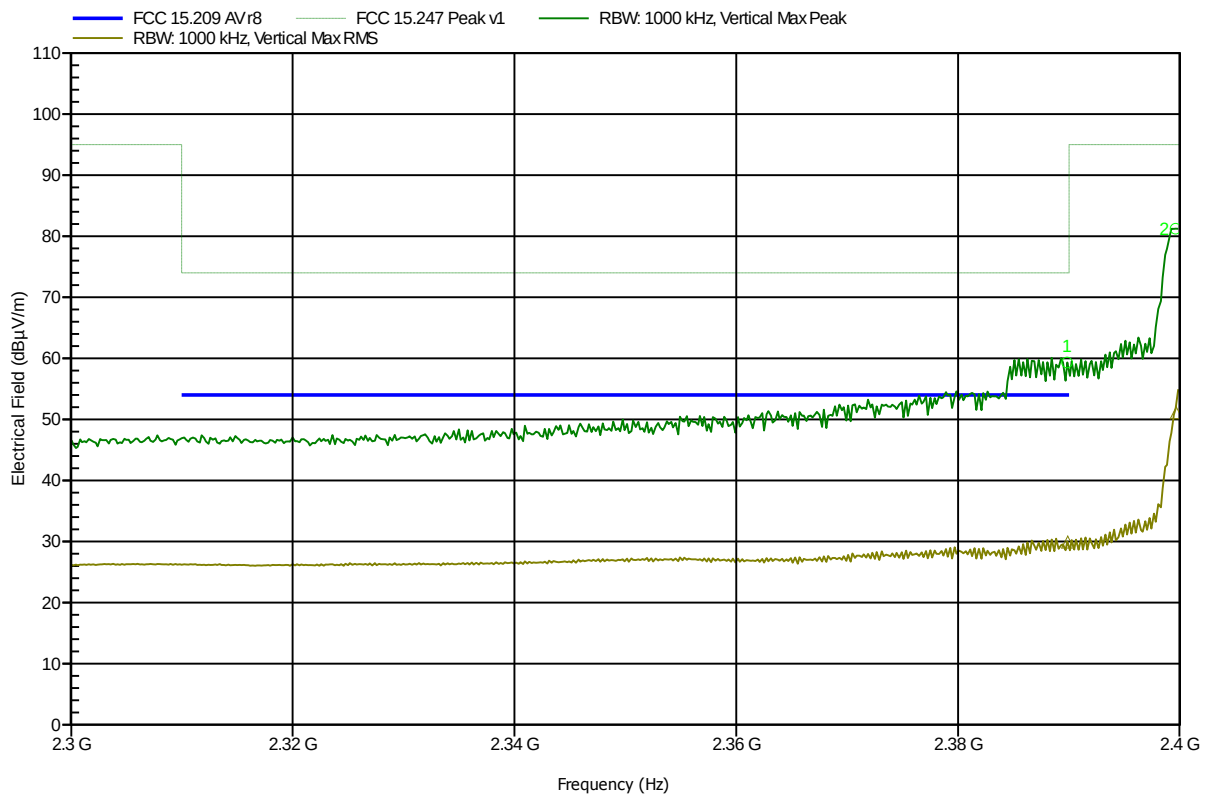


Spurious emissions according to FCC 15.247

Project number: GOM-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note: lower bandedge; initiator mode

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.39 GHz	59.33 dBμV/m	74 dBμV/m	-14.67 dB	Pass
2.4 GHz	81.23 dBμV/m	95 dBμV/m	-13.77 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.39 GHz	30.02 dBμV/m	54 dBμV/m	-23.98 dB	Pass

Test Report No.: GOM-1312-3474-TFC247ZC-V01

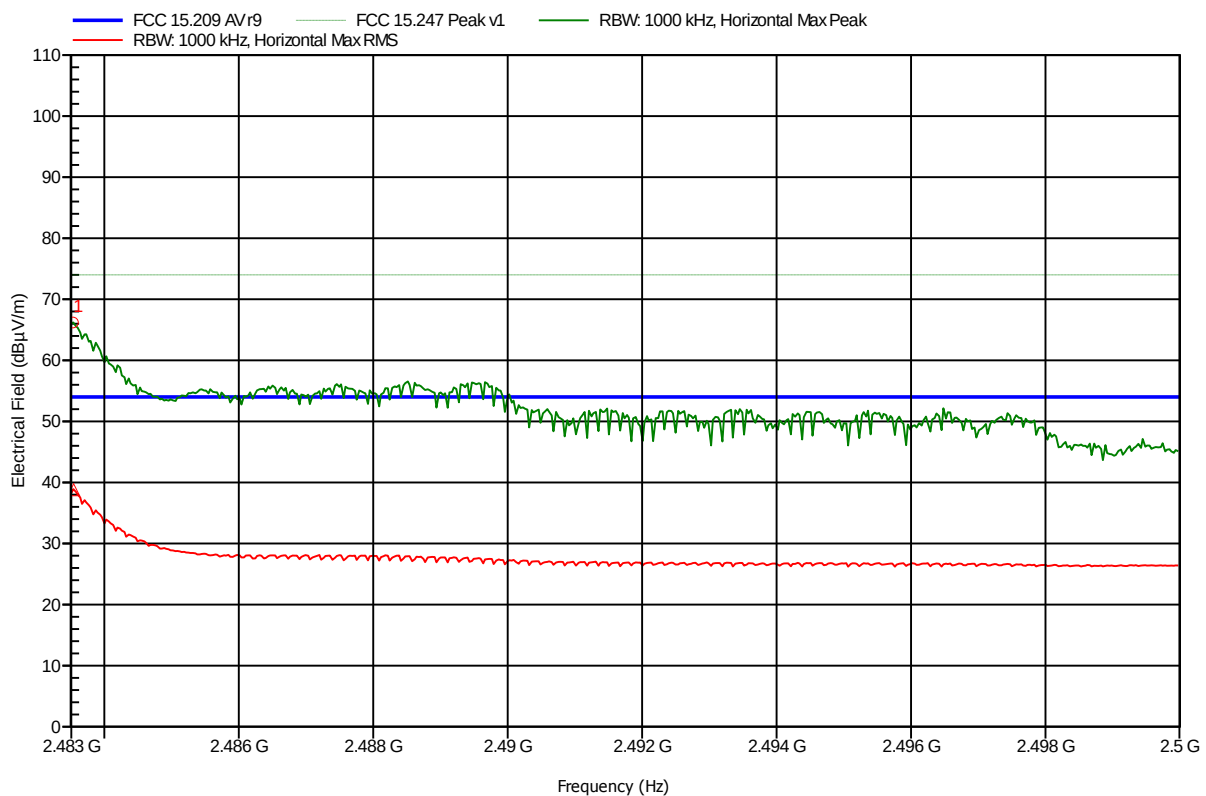
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note: upper bandedge; reflector mode

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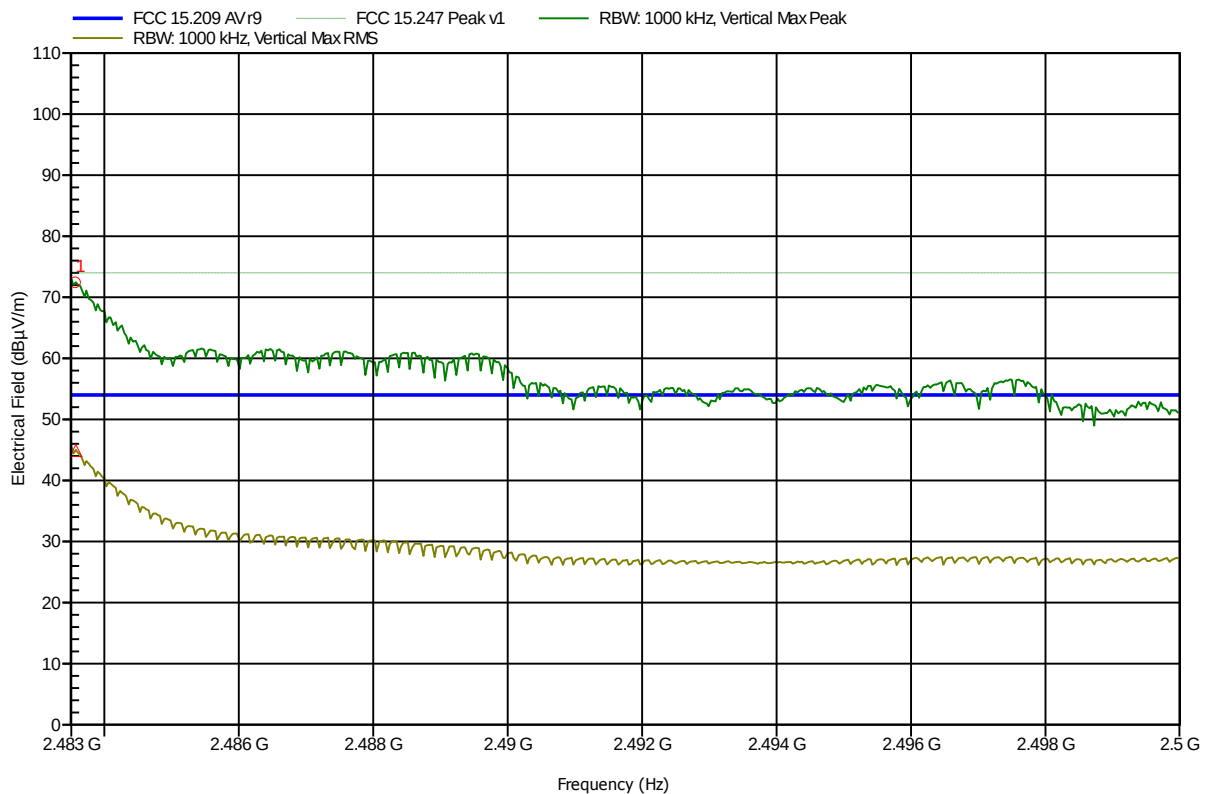
Frequency 2.4835 GHz	Peak 66.2 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -7.8 dB	Peak Status Pass
Frequency 2.4835 GHz	RMS 38.91 dBµV/m	RMS Limit 54 dBµV/m	RMS Difference -15.09 dB	RMS Status Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note: upper bandedge; reflector mode

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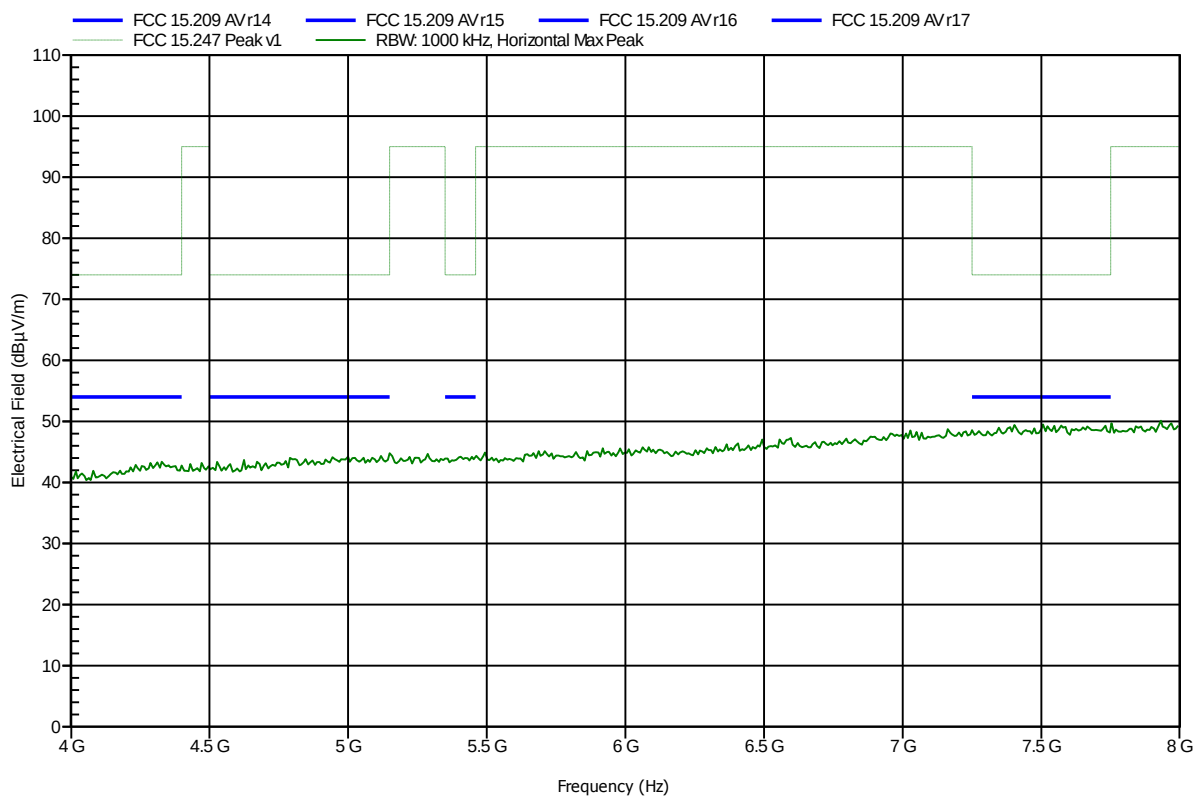
Frequency 2.4836 GHz	Peak 72.46 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -1.54 dB	Peak Status Pass
Frequency 2.4836 GHz	RMS 45.01 dBµV/m	RMS Limit 54 dBµV/m	RMS Difference -8.99 dB	RMS Status Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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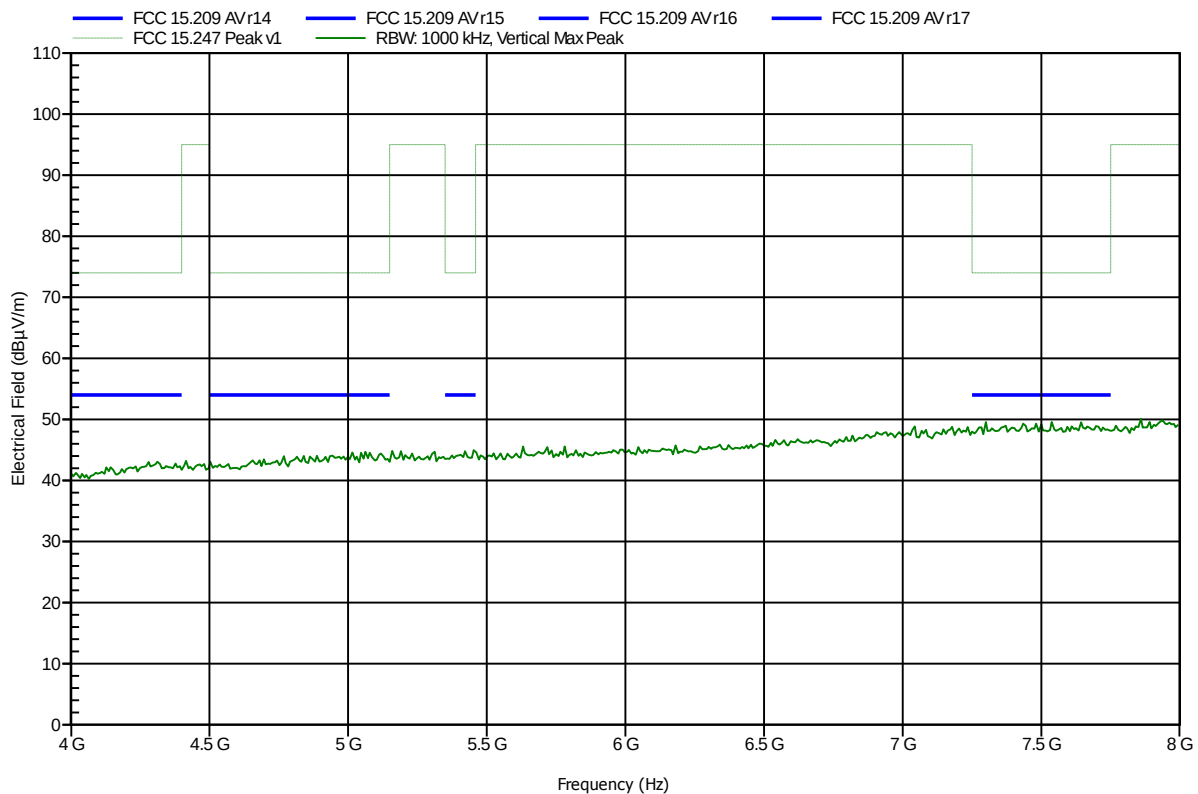


Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 3 m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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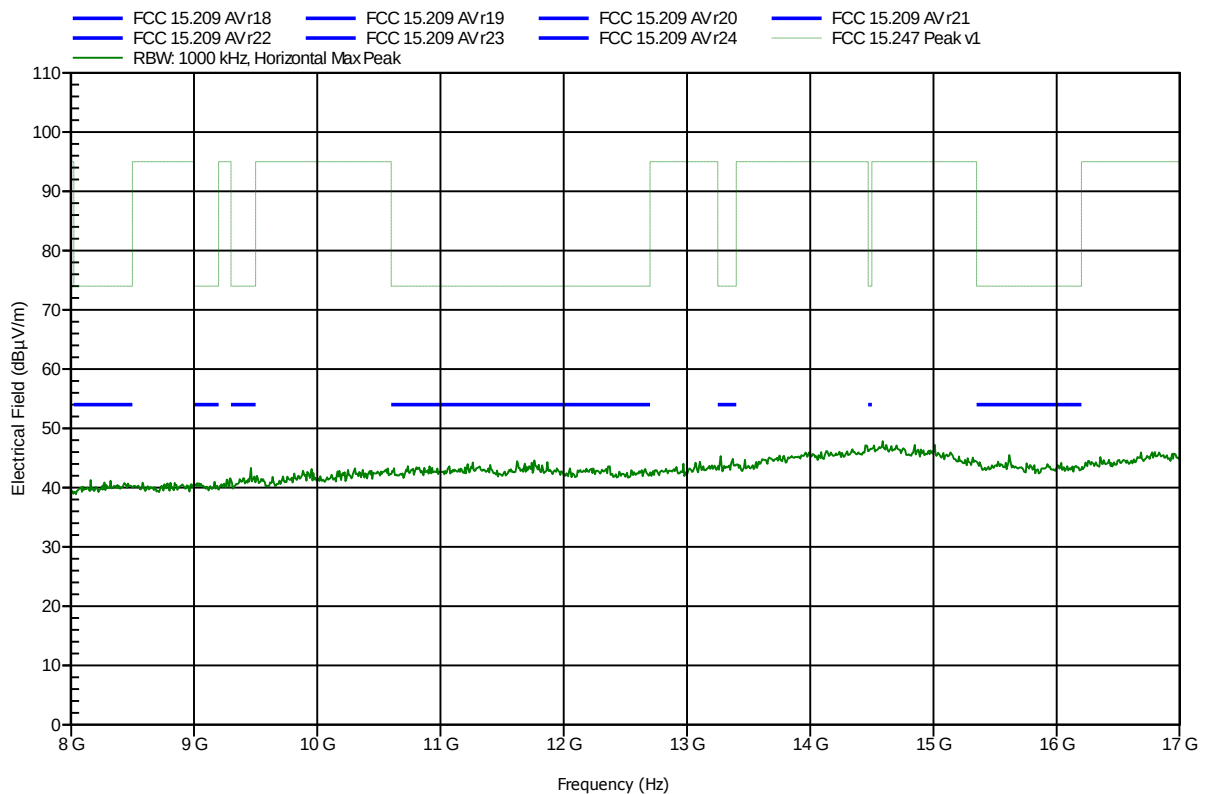


Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 100 cm converted to 3m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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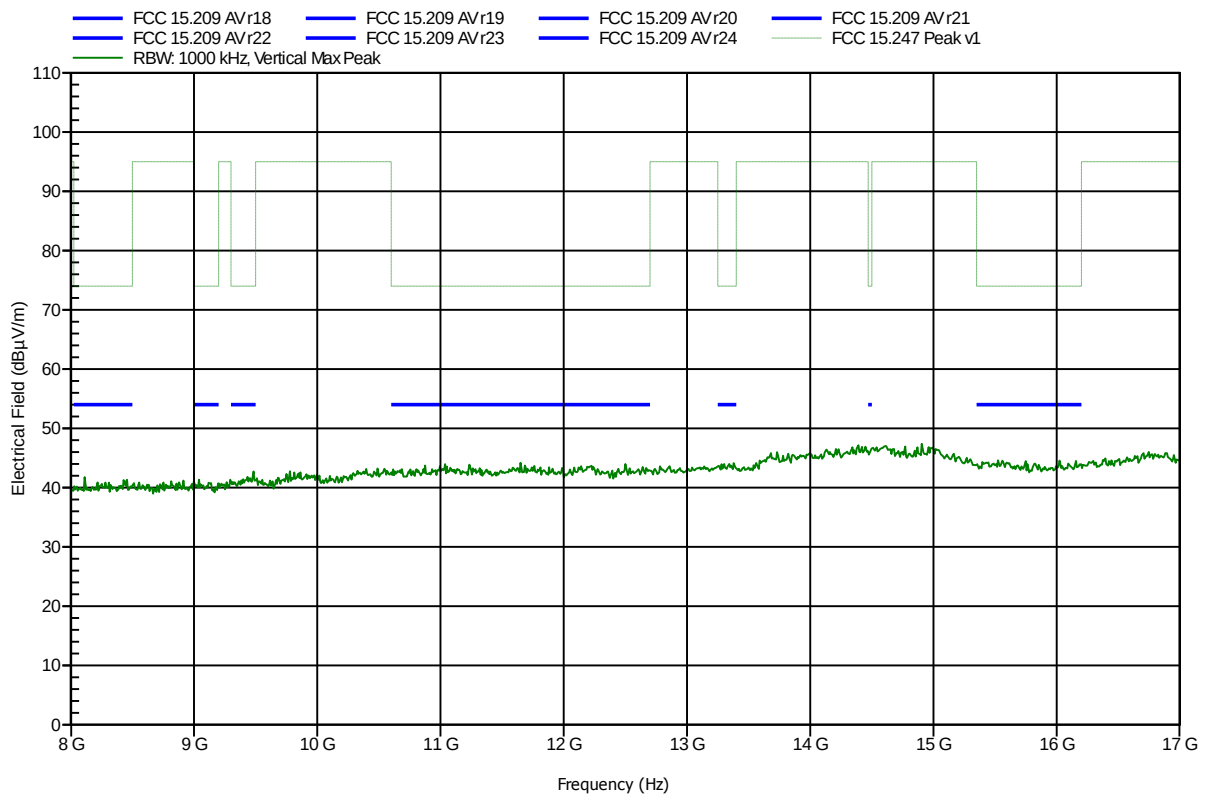


Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 100 cm converted to 3m
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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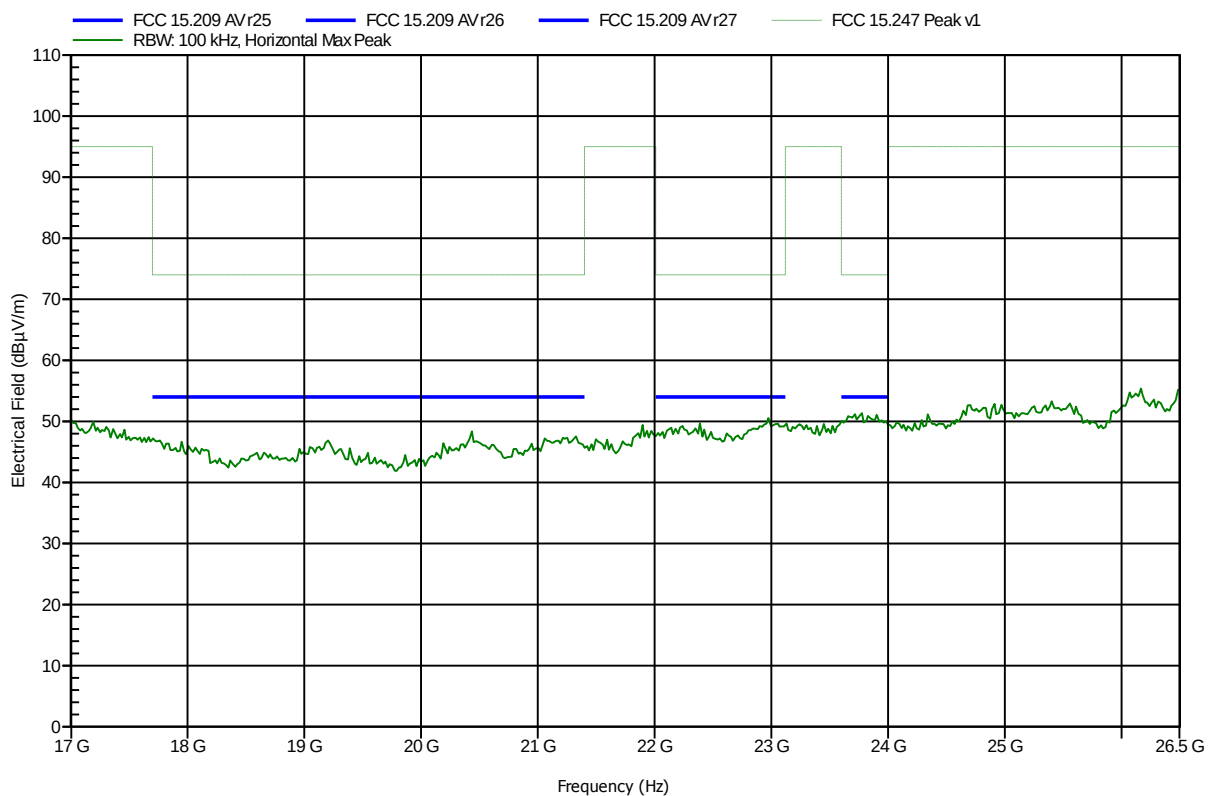


Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 100 cm
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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Test Report No.: G0M-1312-3474-TFC247ZC-V01

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

Spurious emissions according to FCC 15.247

Project number: G0M-1312-3474

Manufacturer: Atmel Automotive GmbH
 EUT Name: REB233SMAD Evaluation Kit
 Model: ATREB233SMAD-EK
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Treffke
 Test Conditions: Tnom: 25°C, Vnom: 3V DC (2x1.5 v battery)
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 100 cm
 Mode: TX; DCSS; ant.1; Pmax; Chirp
 Test Date: 2014-01-14
 Note:

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