

FCC TEST REPORT FCC 47 CFR Part 15C Industry Canada RSS-247 Digital transmission systems operating within the 2400 – 2483.5 MHz band	
Report Reference No.	G0M-1505-4775-TFC247ZBS-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 RSS-247, Issue 1, 2015-05 RSS-Gen, Issue 4, 2014-11 ANSI C63.10:2013 ANSI C63.4:2014
Test scope	complete Radio compliance test
Equipment under test (EUT):	
Product description	ATSAMR21 ZLL Module
Model No.	ATSAMR21B18-MZ210PA
Additional Model(s)	None
Brand Name(s)	ATMEL
Hardware version	Rev 2.3
Firmware / Software version	None
	FCC-ID: VNR-ATSAMZ210PA-0 IC: 20266-ATSMZ210PA0
Test result	Passed

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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: 2015-05-27

Date (s) of performance of tests: 2015-11-24 - 2015-11-27

Compiled by: Christian Weber

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

Approved by (+ signature): Toralf Jahn 
(Deputy Head of Lab)

Date of issue: 2015-11-27

Total number of pages: 98

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:

All conducted measurements were performed with test fixture, output power level of test fixture normalized to radiated output power measured in anechoic chamber. The data rate of the EUT is adjustable between 250 kbps and 2000 kbps. Pre-compliance measurements were performed to identify the worst case transmission mode and the 250 kbps transmission mode was selected.

Version History

Version	Issue Date	Remarks	Revised by
01	2015-11-27	Initial Release	

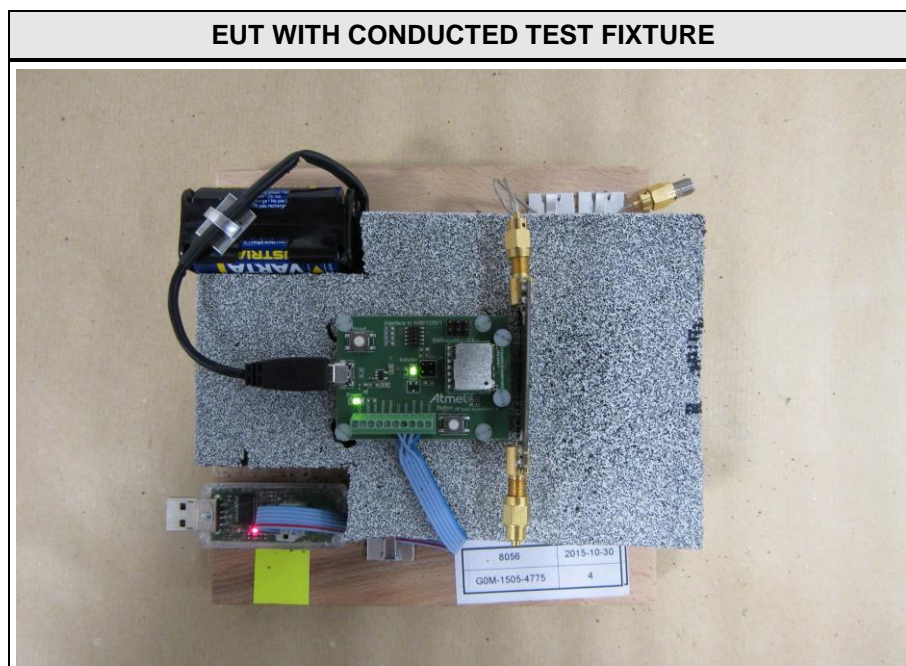
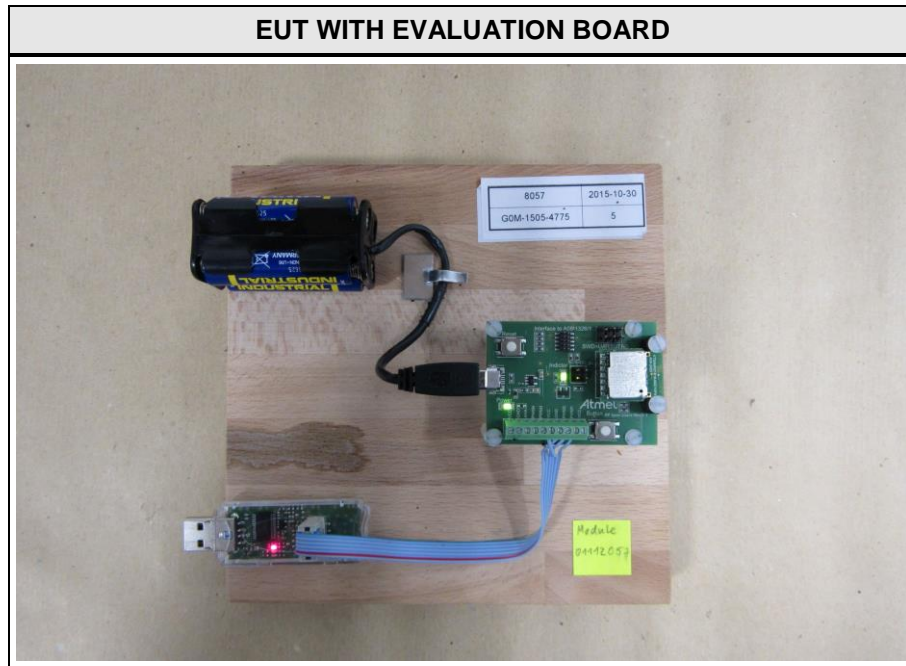
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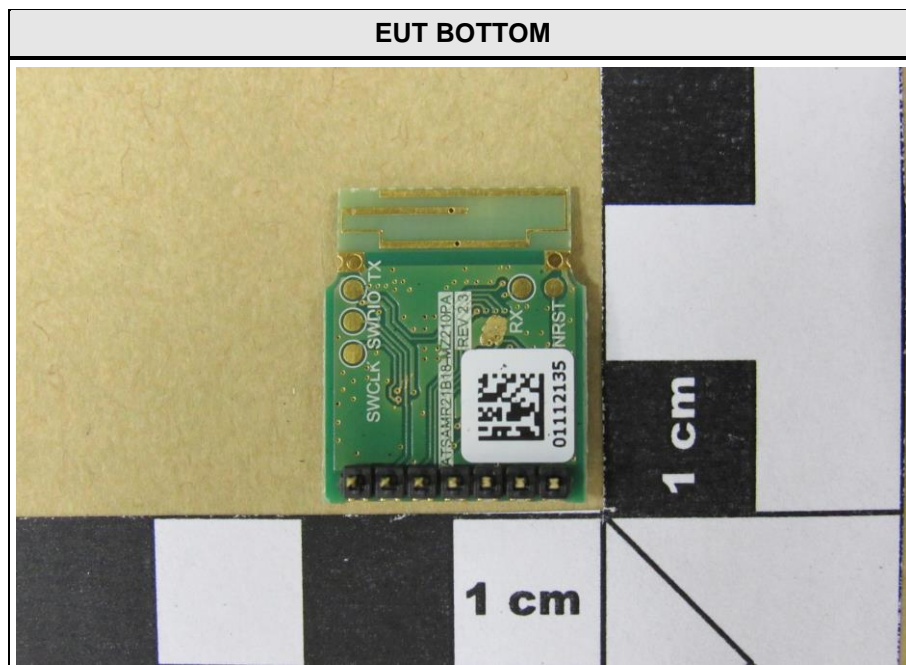
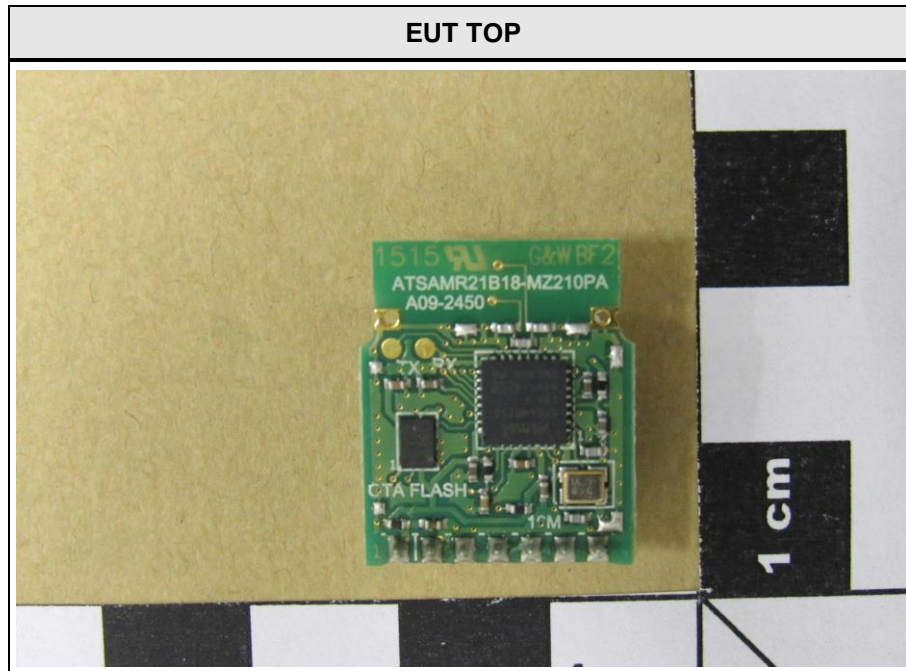
1 Equipment (Test item) Description

Description	ATSAMR21 ZLL Module	
Model	ATSAMR21B18-MZ210PA	
Additional Model(s)	None	
Brand Name(s)	ATMEL	
Serial number	None	
Hardware version	Rev 2.3	
Software / Firmware version	None	
FCC-ID	VNR-ATSAMZ210PA-0	
IC	20266-ATSMZ210PA0	
Equipment type	Radio module	
Radio type	Transceiver	
Radio technology	IEEE 802.15.4	
Operating frequency range	2405 - 2480 MHz	
Assigned frequency band	2400 - 2483.5 MHz	
Main test frequencies	F _{LOW}	2405 MHz
	F _{MID}	2450 MHz
	F _{HIGH-1}	2475 MHz
	F _{HIGH}	2480 MHz
Spreading	None (2000 kbps), DSSS (250 kbps)	
Modulations	O-QPSK	
Number of channels	15 (11-26)	
Channel spacing	5MHz	
Number of antennas	1	
Antenna	Type	integrated
	Model	PCB Antenna
	Manufacturer	Atmel
	Gain	0.0 dBi (customer declaration)
Manufacturer	Atmel Automotive GmbH Koenigsbruecker Str. 61 01099 Dresden GERMANY	
Power supply	V _{NOM}	5.0 VDC
AC/DC-Adaptor	Model	HNP10i MicroUSB
	Vendor	hn electronic
	Input	110V AC
	Output	5.0V DC / 2.0 A

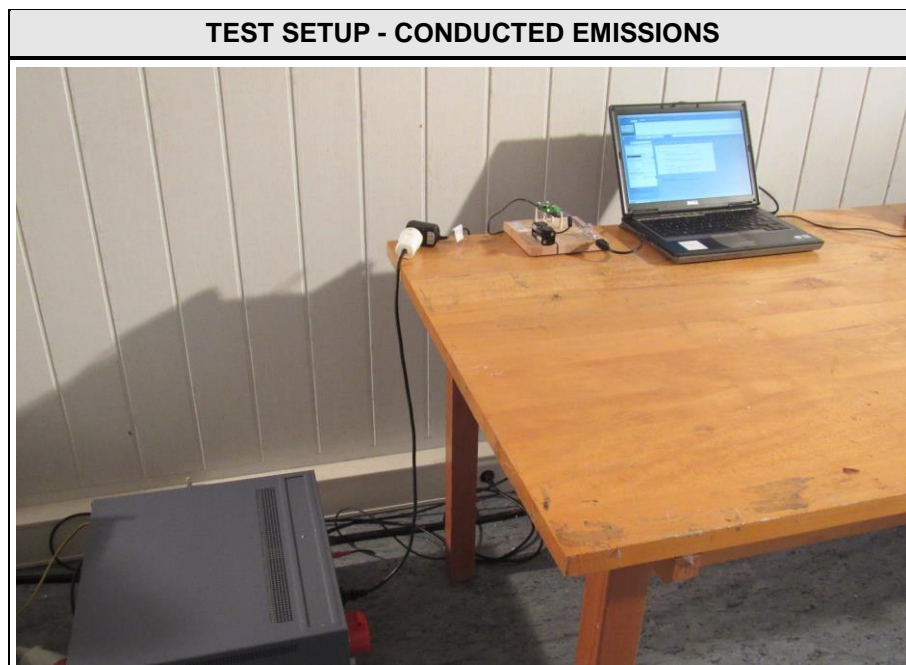
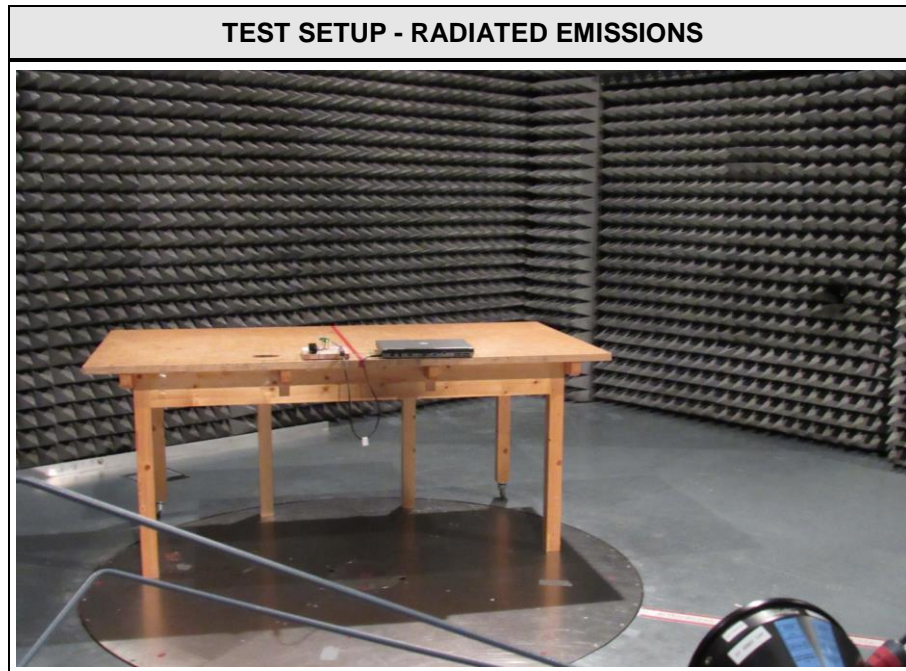
1.1 Photos – Equipment External



1.2 Photos – Equipment internal



1.3 Photos – Test setup



1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
SIM	Laptop	Dell	D620	Laptop with test software for radio test modes
<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	
250 kbps (+4)	General conditions:	EUT powered by dedicated AC/DC adaptor
	Radio conditions:	Mode = standalone transmit Spreading = DSSS Modulation = O-QPSK Data rate = 250 kbps Duty cycle = 100 % Power level = Maximum, Power Setting 4 (Channels 11-25)
250 kbps (-2)	General conditions:	EUT powered by dedicated AC/DC adaptor
	Radio conditions:	Mode = standalone transmit Spreading = DSSS Modulation = O-QPSK Data rate = 250 kbps Duty cycle = 100 % Power level = Maximum, Power Setting -2 (Channels 26)
2000 kbps (+4)	General conditions:	EUT powered by dedicated AC/DC adaptor
	Radio conditions:	Mode = standalone transmit Modulation = O-QPSK Data rate = 2000 kbps Duty cycle = 100 % Power level = Maximum, Power Setting 4 (Channels 11-26)
2000 kbps (-2)	General conditions:	EUT powered by dedicated AC/DC adaptor
	Radio conditions:	Mode = standalone transmit Modulation = O-QPSK Data rate = 2000 kbps Duty cycle = 100 % Power level = Maximum, Power Setting -2 (Channels 26)
Receive	General conditions:	EUT powered by fully charged batteries
	Radio conditions:	Mode = standalone receive Spreading = DSSS
AC-Powerline	General conditions:	EUT powered by dedicated AC/DC adaptor
	Radio conditions:	Mode = standalone transmit Spreading = DSSS Power level = Maximum

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	FSU 26	EF01003	2015-04	2016-04

6dB Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyzer	R&S	FSU 26	EF01003	2015-04	2016-04

Maximum peak conducted power					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyzer	R&S	FSU 26	EF01003	2015-04	2016-04

Power spectral density					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyzer	R&S	FSU 26	EF01003	2015-04	2016-04

Band edge compliance					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyzer	R&S	FSU 26	EF01003	2015-04	2016-04

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 1	EF00062	-	-
Spectrum Analyzer	R&S	FSIQ26	EF00151	2015-03	2016-03
Biconical Antenna	R&S	HK 116	EF00012	2013-02	2016-02
LPD Antenna	R&S	HL 223	EF00187	2014-03	2017-03
Horn antenna	Schwarzbeck	BBHA 9120D	EF00018	2013-09	2016-09

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

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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:

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

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:

Reading	+	AF	=	Net Reading	:	Net reading - FCC limit	=	Margin
21.5 dBμV	+	26 dB	=	47.5 dBμV/m	:	47.5 dBμV/m - 57.0 dBμV/m	=	-9.5 dB

2 Result Summary

FCC 47 CFR Part 15C, IC RSS-247				
Product Specific Standard Section	Requirement – Test	Reference Method	Result	Remarks
RSS-Gen 6.6	Occupied Bandwidth	ANSI C63.10	N/R	Informational only
FCC § 15.247(a)(2) IC RSS-247 § 5.2	6dB Bandwidth	ANSI C63.10	PASS	
FCC § 15.247(b)(3) IC RSS-247 § 5.4	Maximum peak conducted power	ANSI C63.10	PASS	
FCC § 15.247(e) IC RSS-247 § 5.2	Power spectral density	ANSI C63.10	PASS	
47 CFR 15.207 IC RSS-247 § 3.1	AC power line conducted emissions	ANSI C63.4	PASS	
FCC § 15.247(d) IC RSS-247 § 5.5	Band edge compliance	ANSI C63.10	PASS	
FCC § 15.247(d) IC RSS-247 § 5.5	Conducted spurious emissions	ANSI C63.10	N/A	Radiated test configuration for EUT. Radiated emissions are used instead.
FCC § 15.247(d) FCC § 15.209 IC RSS-247 § 5.5	Transmitter radiated spurious emissions	ANSI C63.10	PASS	
IC RSS-247 § 3.1	Receiver radiated spurious emissions	ANSI C63.10	PASS	
Remarks:				

3 Test Conditions and Results

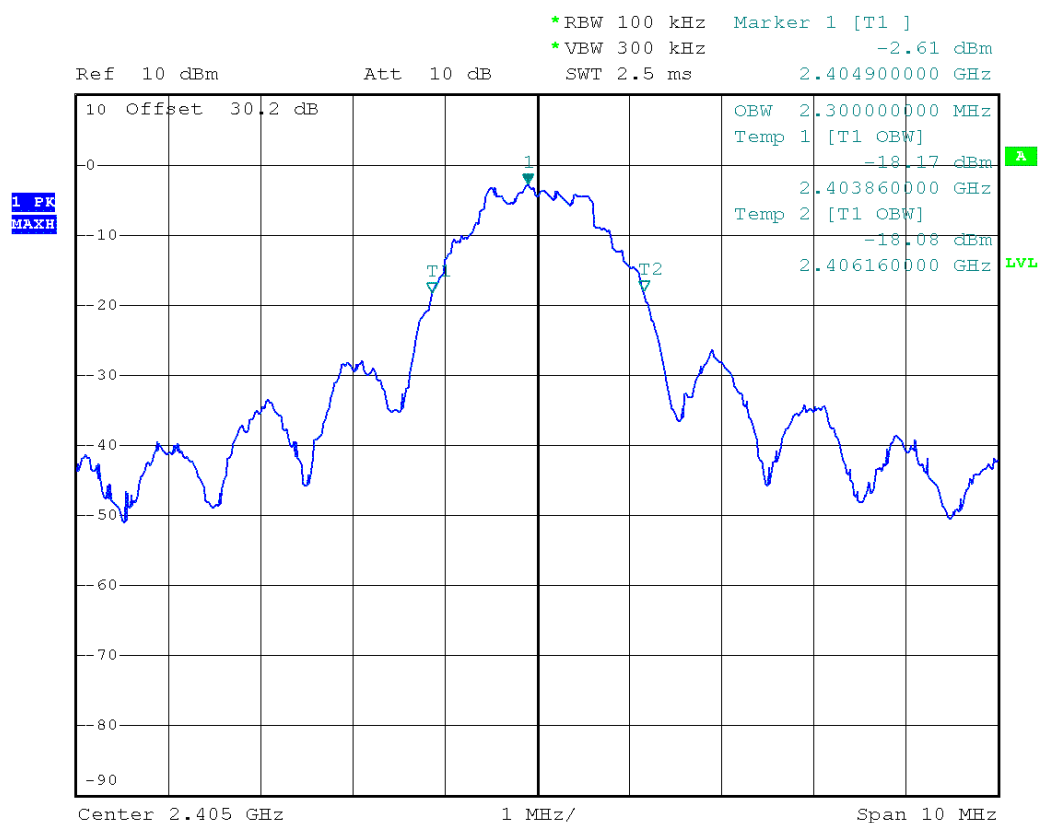
3.1 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. to IC RSS-Gen			Verdict: PASS
Test according to measurement reference	Reference Method		
	ANSI C63.10		
Test frequency range	Tested frequencies		
	F _{LOW} / F _{MID} / F _{HIGH}		
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 [MHz]	Mode	Occupied Bandwidth [MHz]
F _{LOW}	2402	250 kbps (+4)	2.300
F _{MID}	2440	250 kbps (+4)	2.320
F _{HIGH}	2475	250 kbps (+4)	2.380
F _{HIGH}	2480	250 kbps (-2)	2.440
F _{LOW}	2402	2000 kbps (+4)	2.340
F _{MID}	2440	2000 kbps (+4)	2.340
F _{HIGH}	2475	2000 kbps (+4)	2.360
F _{HIGH}	2480	2000 kbps (-2)	2.400
Comments:			

Occupied Bandwidth – 250 kbps – F_{Low}

Occupied Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 11, 2405 MHz
 Operating Conditions: T_{nom}/V_{nom}
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Occupied Bandwidth [MHz]: 2.300



Date: 1.JAN.2000 06:06:47

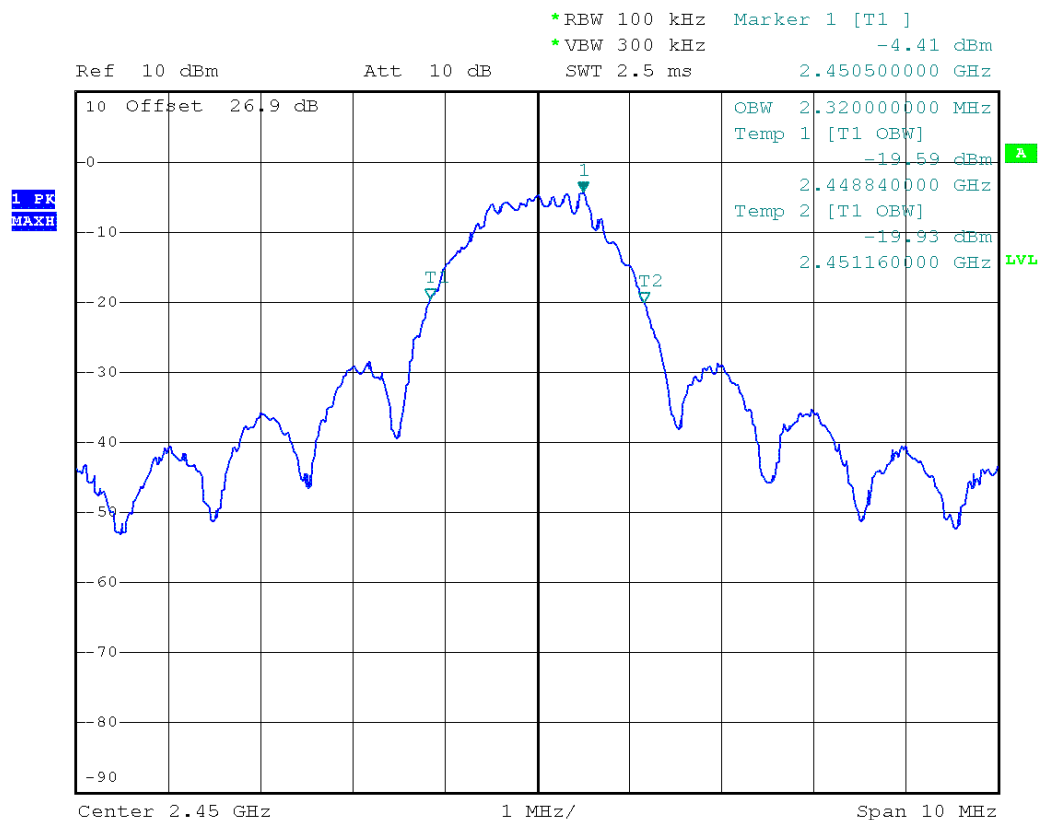
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – 250 kbps – F_{MID}

Occupied Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 20, 2450 MHz
 Operating Conditions: T_{nom}/V_{nom}
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Occupied Bandwidth [MHz]: 2.320



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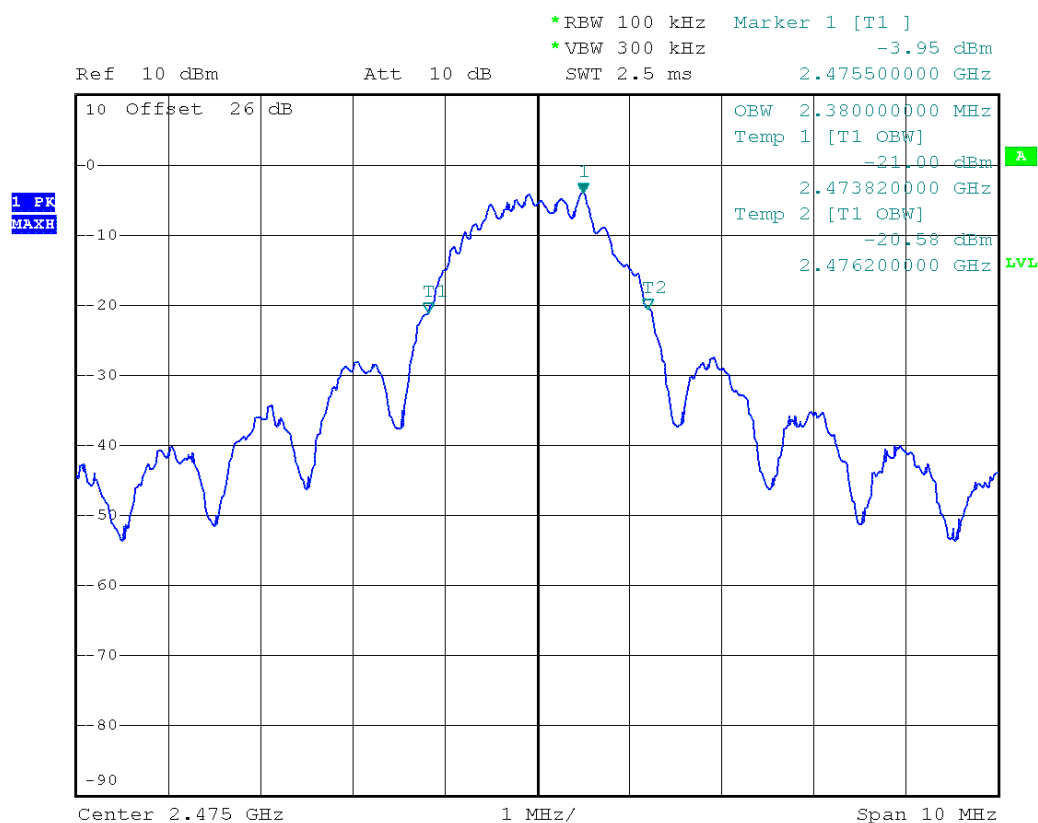
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – 250 kbps – F_{HIGH-1}

Occupied Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 25, 2475 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Occupied Bandwidth [MHz]: 2.380



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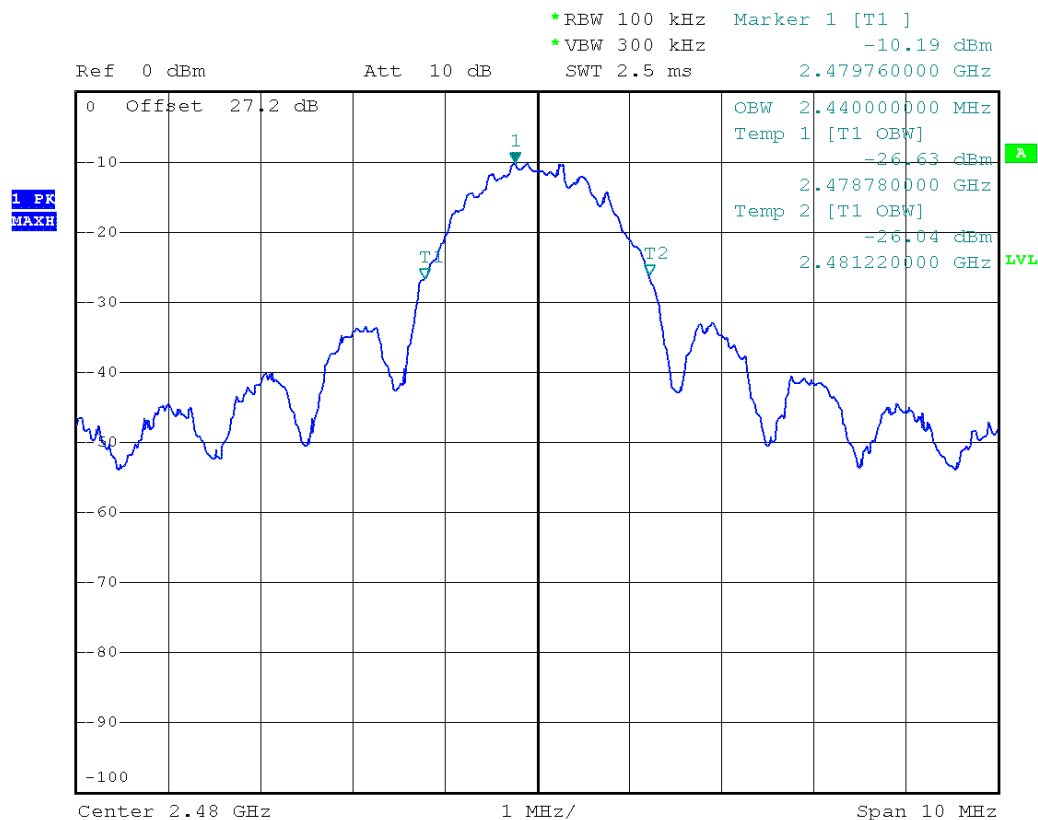
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Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – 250 kbps – F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 26, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = -2 dBm
 Occupied Bandwidth [MHz]: 2.440



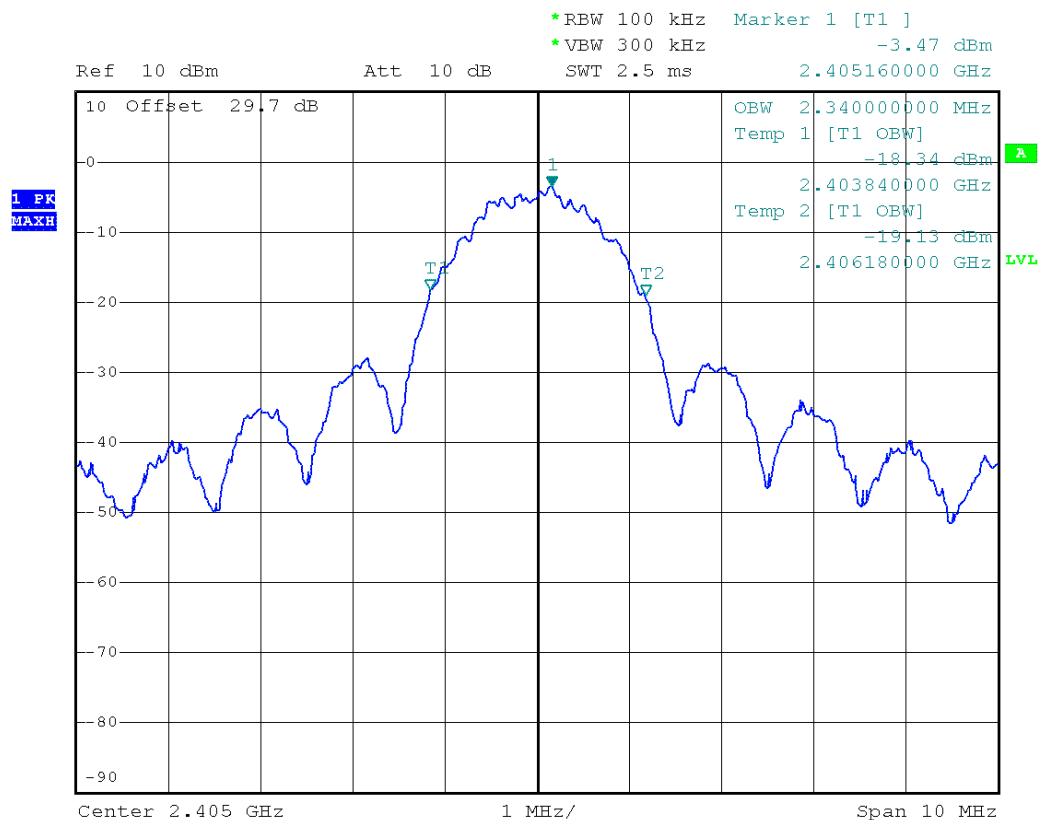
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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Occupied Bandwidth – 2000 kbps – F_{Low}

Occupied Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 11, 2405 MHz
 Operating Conditions: T_{nom}/V_{nom}
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Occupied Bandwidth [MHz]: 2.340



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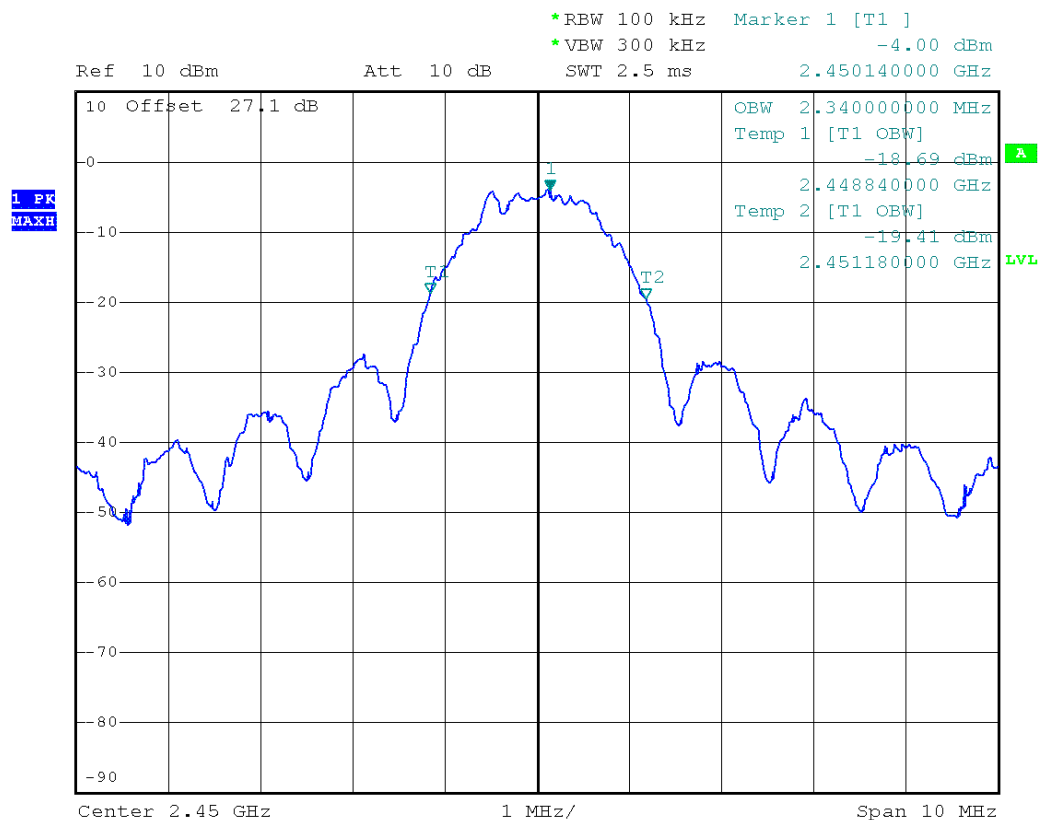
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Occupied Bandwidth – 2000 kbps – F_{MID}

Occupied Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 20, 2450 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Occupied Bandwidth [MHz]: 2.340



Date: 1.JAN.2000 06:14:51

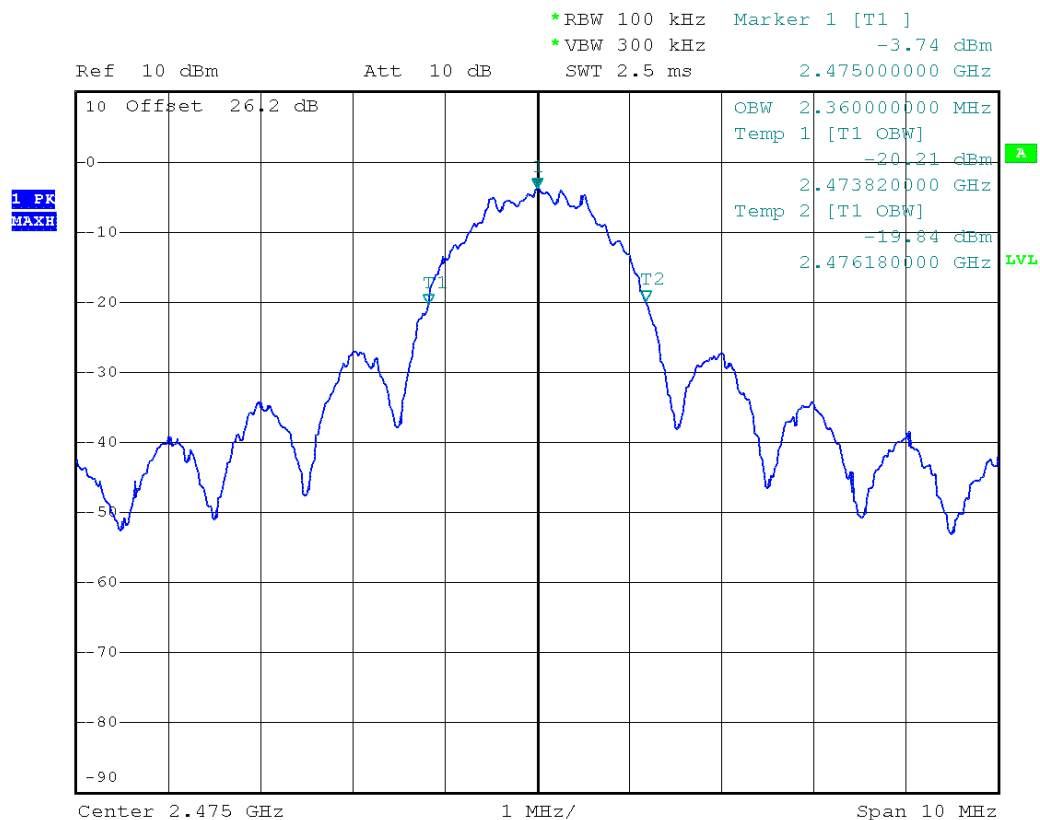
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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Occupied Bandwidth – 2000 kbps – F_{HIGH-1}

Occupied Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 25, 2475 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Occupied Bandwidth [MHz]: 2.360



Date: 1.JAN.2000 06:15:56

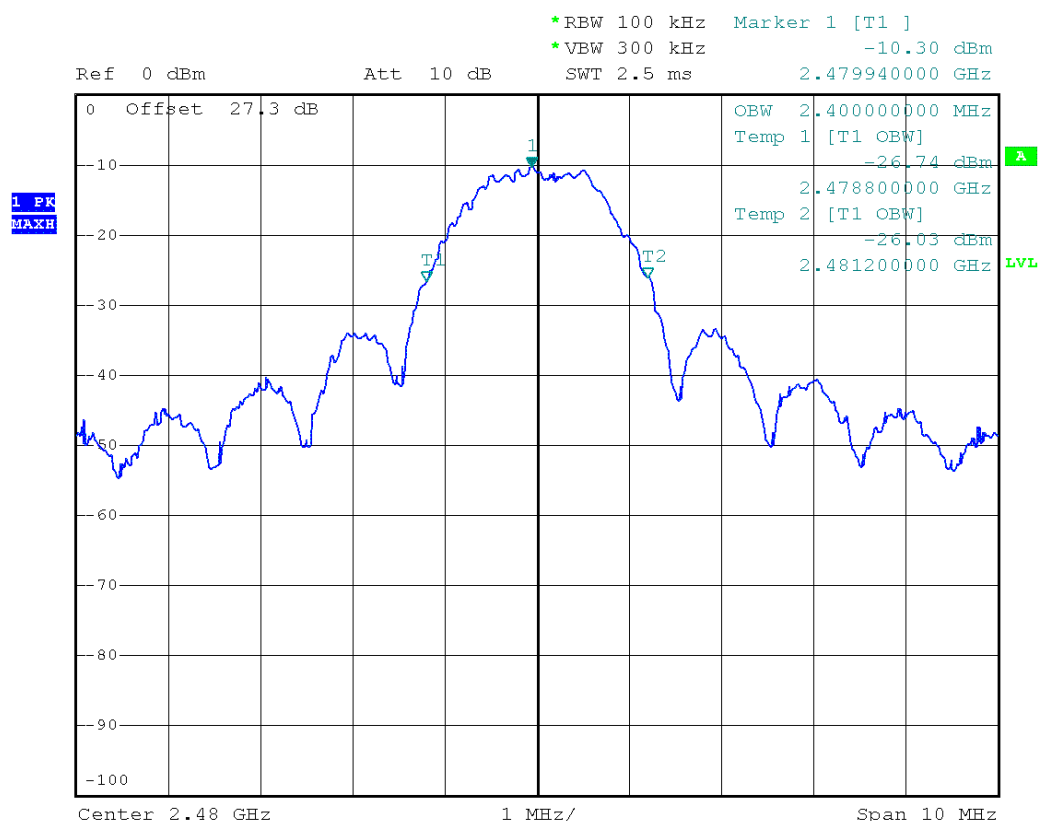
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

Occupied Bandwidth – 2000 kbps – F_{HIGH}

Occupied Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 6.9.3
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 26, 2480 MHz
 Operating Conditions: T_{nom}/V_{nom}
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = -2 dBm
 Occupied Bandwidth [MHz]: 2.400



Date: 1.JAN.2000 06:17:02

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

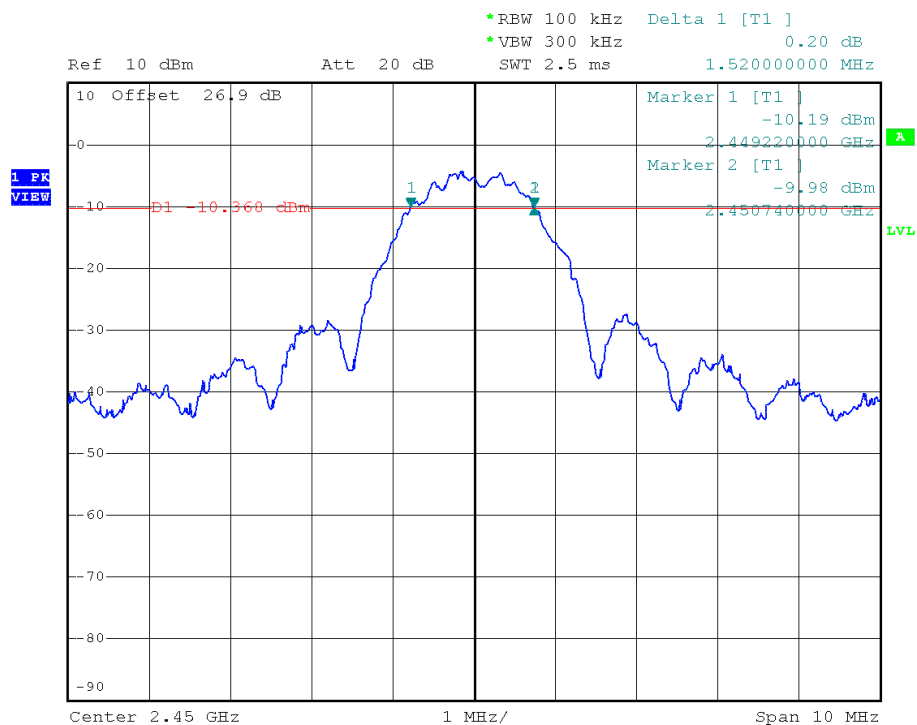
3.2 Test Conditions and Results – 6 dB Bandwidth

6dB Bandwidth acc. to FCC 15.247 / IC RSS-247				Verdict: PASS	
EUT requirement rule parts and clause	Reference				
	FCC 15.247(a)(2) / IC RSS-247 5.2				
Test according to measurement reference	Reference Method				
	ANSI C63.10				
Test frequency range	Tested frequencies				
	F _{LOW} / F _{MID} / F _{HIGH}				
Limits					
≥ 500kHz					
Test setup					
<div><div>Spectrum Analyzer</div><div>EUT</div></div>					
Test procedure					
<div>1. EUT set to test mode</div> <div>2. Span set to at least twice the emission spectrum</div> <div>3. Detector set to peak and max hold and RBW is set to 100 kHz</div> <div>4. Envelope peak value of emission spectrum is selected</div> <div>5. Marker on envelope of spectrum is set to level of -6 dB to the left of the peak</div> <div>6. Marker on envelope of spectrum is set to level of -6 dB to the right of the peak</div> <div>7. 6 dB Bandwidth is determined by marker frequency separation</div>					
Test results					
Channel	Frequency [MHz]	Mode	6 dB Bandwidth [kHz]	Limit [kHz]	Result
F _{LOW}	2405	250 kbps (+4)	1340	500	PASS
F _{MID}	2450	250 kbps (+4)	1520	500	PASS
F _{HIGH}	2475	250 kbps (+4)	1340	500	PASS
F _{HIGH}	2480	250 kbps (-2)	1440	500	PASS
F _{LOW}	2405	2000 kbps (+4)	1400	500	PASS
F _{MID}	2450	2000 kbps (+4)	1440	500	PASS
F _{HIGH}	2475	2000 kbps (-2)	1200	500	PASS
F _{HIGH}	2480	2000 kbps (-2)	1600	500	PASS
Comments: Test fixture used. Power level of test fixture normalized to maximum peak conducted output power determined by radiated measurements with EUT					

6 dB Bandwidth – 250 kbps – F_{Low}

DTS (6 dB) Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 20, 2450 MHz
 Operating Conditions: T_{nom}/V_{nom}
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Lower Frequency [MHz]: 2449.220
 Upper Frequency [MHz]: 2450.740
 6 dB Bandwidth [kHz]: 1520



Date: 1.JAN.2000 08:44:50

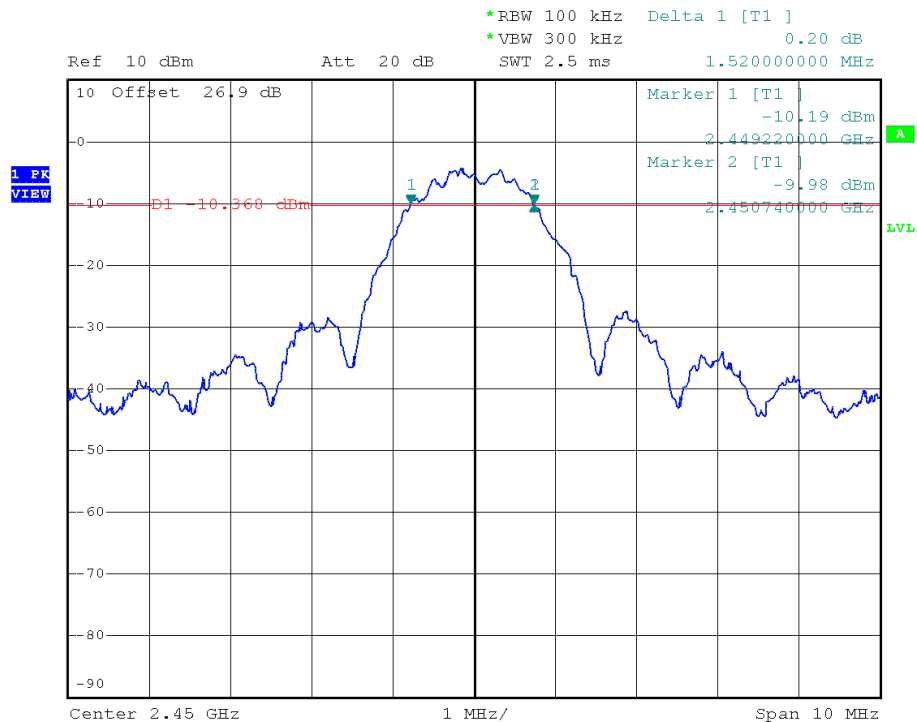
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

6 dB Bandwidth – 250 kbps – F_{MID}

DTS (6 dB) Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 20, 2450 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Lower Frequency [MHz]: 2449.220
 Upper Frequency [MHz]: 2450.740
 6 dB Bandwidth [kHz]: 1520



Date: 1.JAN.2000 08:44:50

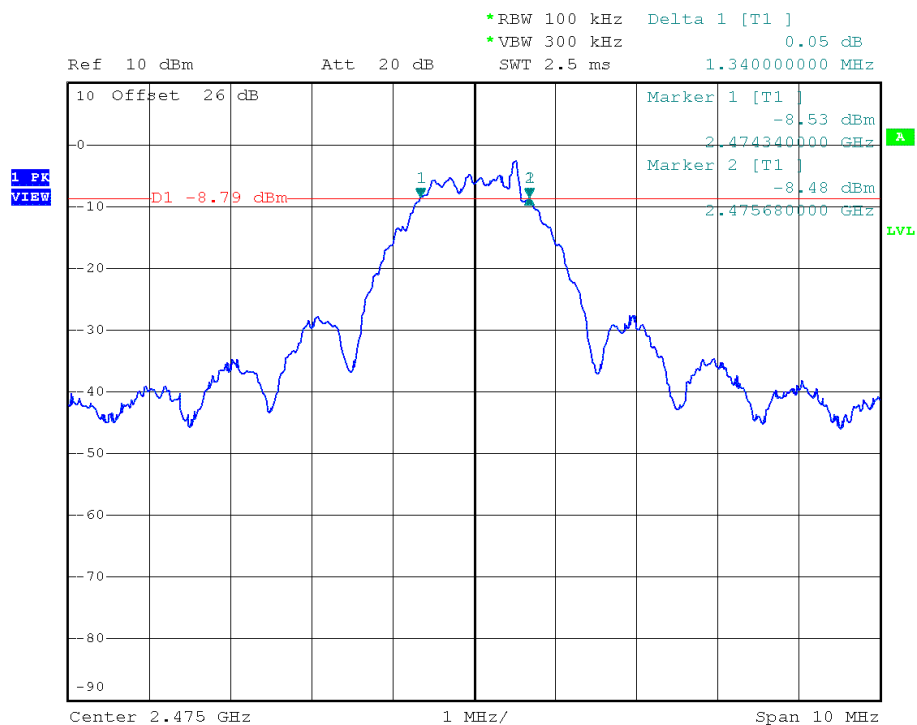
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

6 dB Bandwidth – 250 kbps – F_{HIGH-1}

DTS (6 dB) Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 25, 2475 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Lower Frequency [MHz]: 2474.340
 Upper Frequency [MHz]: 2475.680
 6 dB Bandwidth [kHz]: 1340



Date: 1.JAN.2000 08:45:51

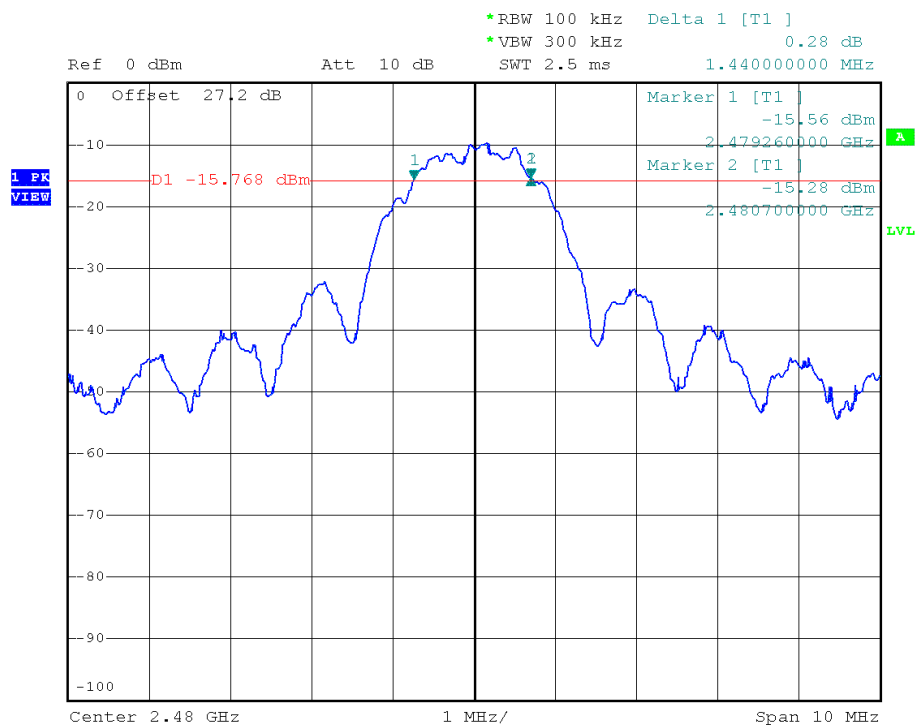
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

6 dB Bandwidth – 250 kbps – F_{HIGH}

DTS (6 dB) Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 26, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = -2 dBm
 Lower Frequency [MHz]: 2479.260
 Upper Frequency [MHz]: 2480.700
 6 dB Bandwidth [kHz]: 1440



Date: 1.JAN.2000 08:47:28

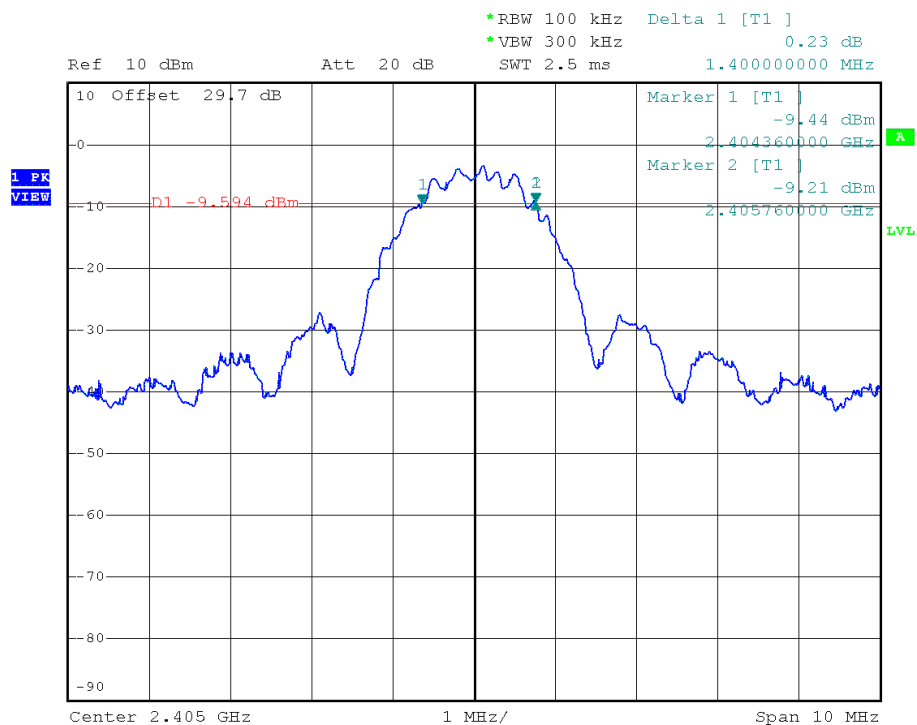
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

6 dB Bandwidth – 2000 kbps – F_{Low}

DTS (6 dB) Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 11, 2405 MHz
 Operating Conditions: T_{nom}/V_{nom}
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Lower Frequency [MHz]: 2404.360
 Upper Frequency [MHz]: 2405.760
 6 dB Bandwidth [kHz]: 1400



Date: 1.JAN.2000 08:48:37

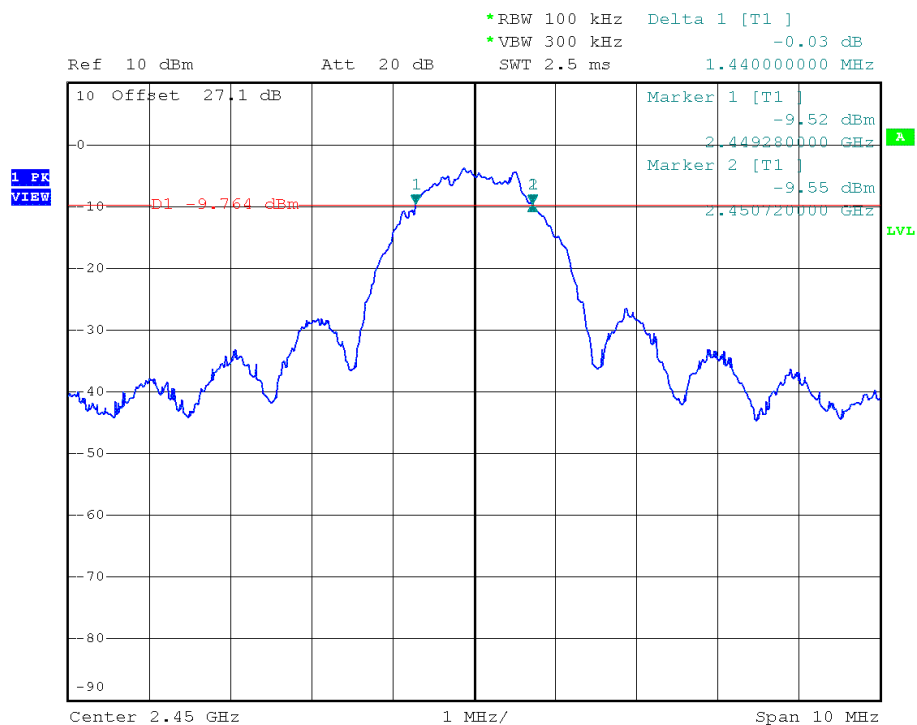
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

6 dB Bandwidth – 2000 kbps – F_{MID}

DTS (6 dB) Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 20, 2450 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Lower Frequency [MHz]: 2449.280
 Upper Frequency [MHz]: 2450.720
 6 dB Bandwidth [kHz]: 1440



Date: 1.JAN.2000 08:49:38

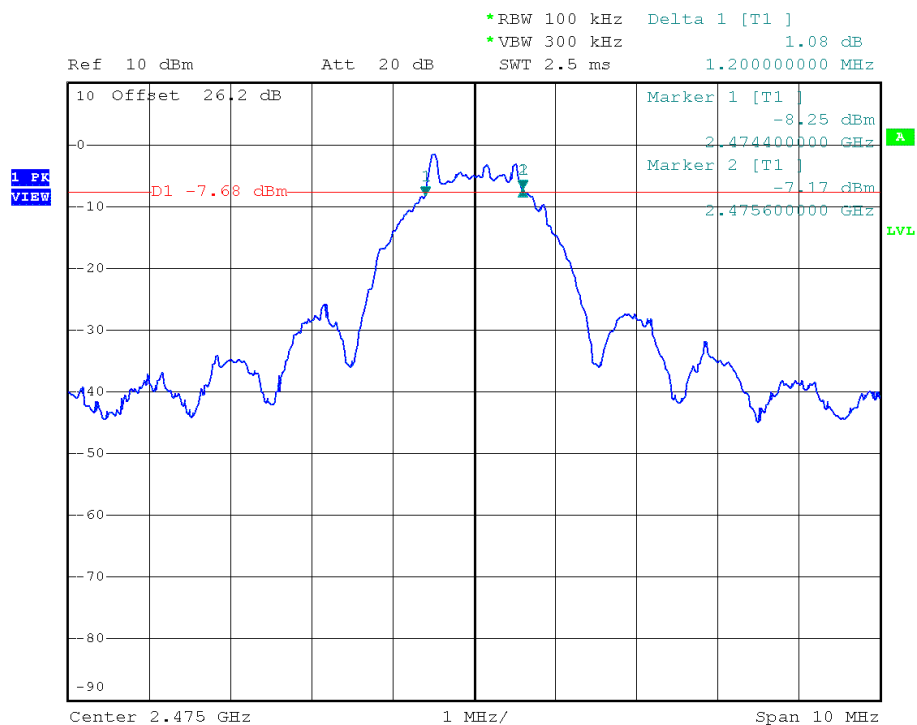
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

6 dB Bandwidth – 2000 kbps – F_{HIGH-1}

DTS (6 dB) Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 25, 2475 MHz
 Operating Conditions: T_{nom}/V_{nom}
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Lower Frequency [MHz]: 2474.400
 Upper Frequency [MHz]: 2475.600
 6 dB Bandwidth [kHz]: 1200



Date: 1.JAN.2000 08:50:37

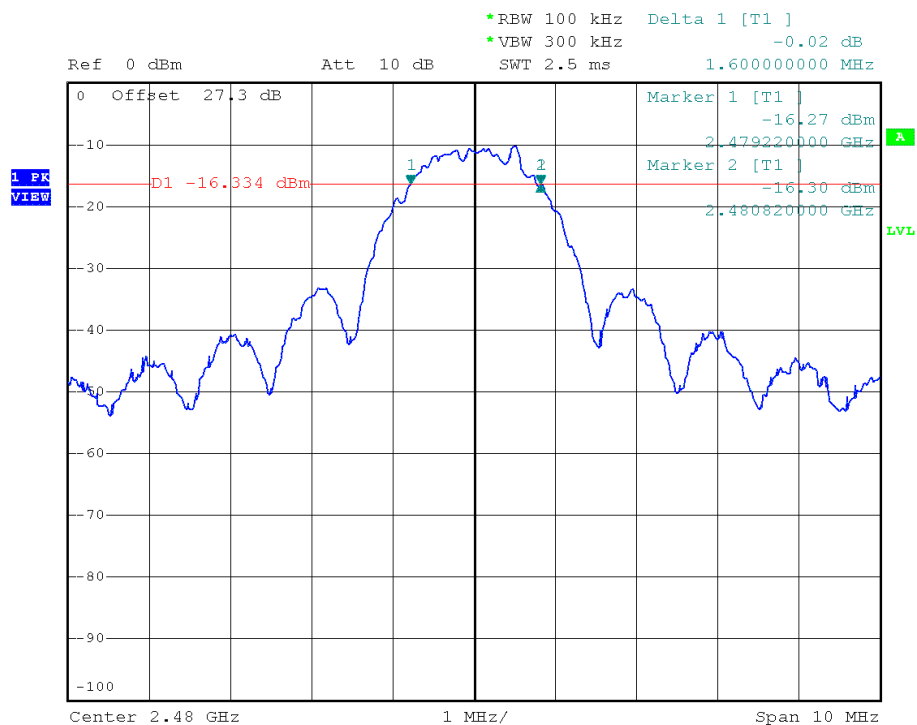
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

6 dB Bandwidth – 2000 kbps – F_{HIGH}

DTS (6 dB) Bandwidth

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.8.1 Option 1
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 26, 2480 MHz
 Operating Conditions: T_{nom}/V_{nom}
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = -2 dBm
 Lower Frequency [MHz]: 2479.220
 Upper Frequency [MHz]: 2480.820
 6 dB Bandwidth [kHz]: 1600



Date: 1.JAN.2000 08:51:52

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

3.3 Test Conditions and Results – Maximum peak conducted power

Maximum peak conducted power acc. to FCC 15.247 / IC RSS-247		Verdict: PASS
EUT requirement rule parts and clause	Reference	
	FCC 15.247(b)(3) / IC RSS-247 5.4	
Test according to measurement reference	Reference Method	
	ANSI C63.10	
Test frequency range	Tested frequencies	
	F _{LOW} / F _{MID} / F _{HIGH}	
Measurement mode	Peak	
Maximum antenna gain	0 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		
<div><div>Spectrum Analyzer</div><div>EUT</div></div>		
Test procedure		
<div><div>1. EUT set to test mode (Communication tester is used if needed)</div><div>2. Center frequency set to test channel center frequency</div><div>3. Span set to twice the 20 dB bandwidth and detector to peak and max hold</div><div>4. Resolution bandwidth is set to 3 MHz</div><div>5. Peak conducted power is determined from peak of spectrum envelope</div></div>		

Test results							
Channel	Frequency [MHz]	Voltage [VDC]	Mode	Peak power [dbm]	Peak power [W]	Limit [dBm]	Margin [dB]
F _{LOW}	2405	V _{NOM} = 5.0	250 kbps (+4)	0.1	0.001	30	-29.90
F _{MID}	2450	V _{NOM} = 5.0	250 kbps (+4)	-0.8	0.001	30	-30.80
F _{HIGH}	2475	V _{NOM} = 5.0	250 kbps (+4)	-0.8	0.001	30	-30.80
F _{HIGH}	2480	V _{NOM} = 5.0	250 kbps (-2)	-6.3	0.000	30	-36.30
F _{LOW}	2405	V _{NOM} = 5.0	2000 kbps (+4)	-0.8	0.001	30	-30.80
F _{MID}	2450	V _{NOM} = 5.0	2000 kbps (+4)	-0.8	0.001	30	-30.80
F _{HIGH}	2475	V _{NOM} = 5.0	2000 kbps (+4)	-0.8	0.001	30	-30.80
F _{HIGH}	2480	V _{NOM} = 5.0	2000 kbps (-2)	-6.3	0.000	30	-36.30
Comments:							

3.4 Test Conditions and Results – Power spectral density

Power spectral density acc. to FCC 15.247 / IC RSS-247					Verdict: PASS	
EUT requirement rule parts and clause		Reference				
		FCC 15.247(e) / IC RSS-247 5.2				
Test according to measurement reference		Reference Method				
		ANSI C63.10				
Test frequency range		Tested frequencies				
		F _{LOW} / F _{MID} / F _{HIGH}				
Measurement mode		Peak				
Limits						
8 dBm / 3 kHz						
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. Center frequency set to test channel center frequency</div> <div>3. Span is set large enough to capture maximum emissions in passband, RBW is set to 3kHz</div> <div>4. Peak power density is determined from peak emission of envelope</div>						
Test results						
Channel	Frequency [MHz]	Test mode	Peak frequency [MHz]	Peak power density [dBm]	Limit [dBm/3kHz]	Margin [dB]
F _{LOW}	2405	250 kbps (+4)	2404.920	-3.653	8.0	-11.65
F _{MID}	2450	250 kbps (+4)	2450.200	-4.269	8.0	-12.27
F _{HIGH}	2475	250 kbps (+4)	2475.504	-3.777	8.0	-11.78
F _{HIGH}	2480	250 kbps (-2)	2480.000	-9.879	8.0	-17.88
F _{LOW}	2405	2000 kbps (+4)	2404.904	-3.278	8.0	-11.28
F _{MID}	2450	2000 kbps (+4)	2450.248	-3.974	8.0	-11.97
F _{HIGH}	2475	2000 kbps (+4)	2474.800	-3.840	8.0	-11.84
F _{HIGH}	2480	2000 kbps (-2)	2480.488	-9.550	8.0	-17.55
Comments: Measured with RBW = 100 kHz, Test fixture used. Power level of test fixture normalized to maximum peak conducted output power determined by radiated measurements with EUT						

3.5 Test Conditions and Results – AC power line conducted emissions

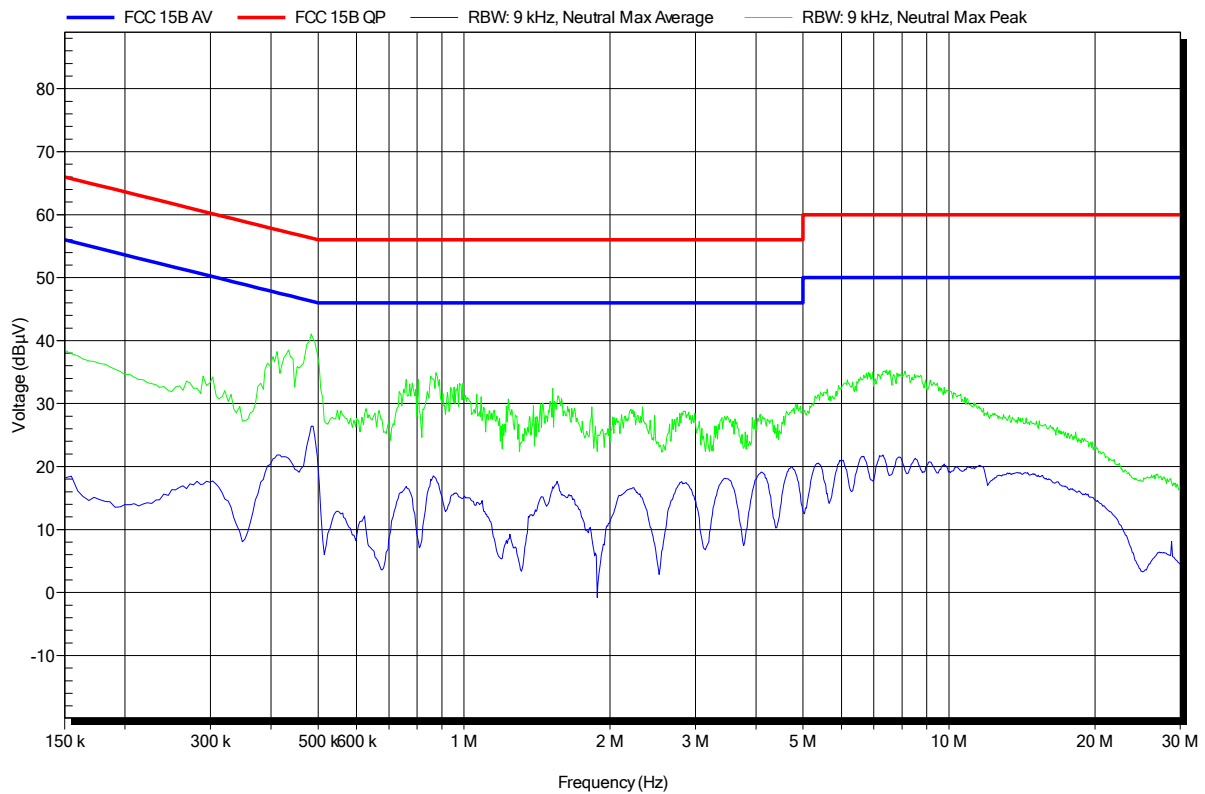
Power line conducted emissions acc. to FCC 47 CFR 15.207				Verdict: PASS	
Test according referenced standards		Reference Method			
		ANSI C63.4			
Fully configured sample scanned over the following frequency range		Frequency range			
		0.15 MHz to 30 MHz			
Points of Application		Application Interface			
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 1
EMI voltage test in the ac-mains according to FCC part 51B

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: 2.4GHz IEEE802.15.4 radio module
 Model: ATSAMR21
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pflug
 Test Conditions: Tnom: 23°C, Unom: 120VAC, AC/DC-adapter mod:HNP10I- Micro USB
 LISN: ESH2-Z5 N
 Mode: TX-RX(packet error rate test, continuously record)
 Test Date: 2015-08-03
 Note:

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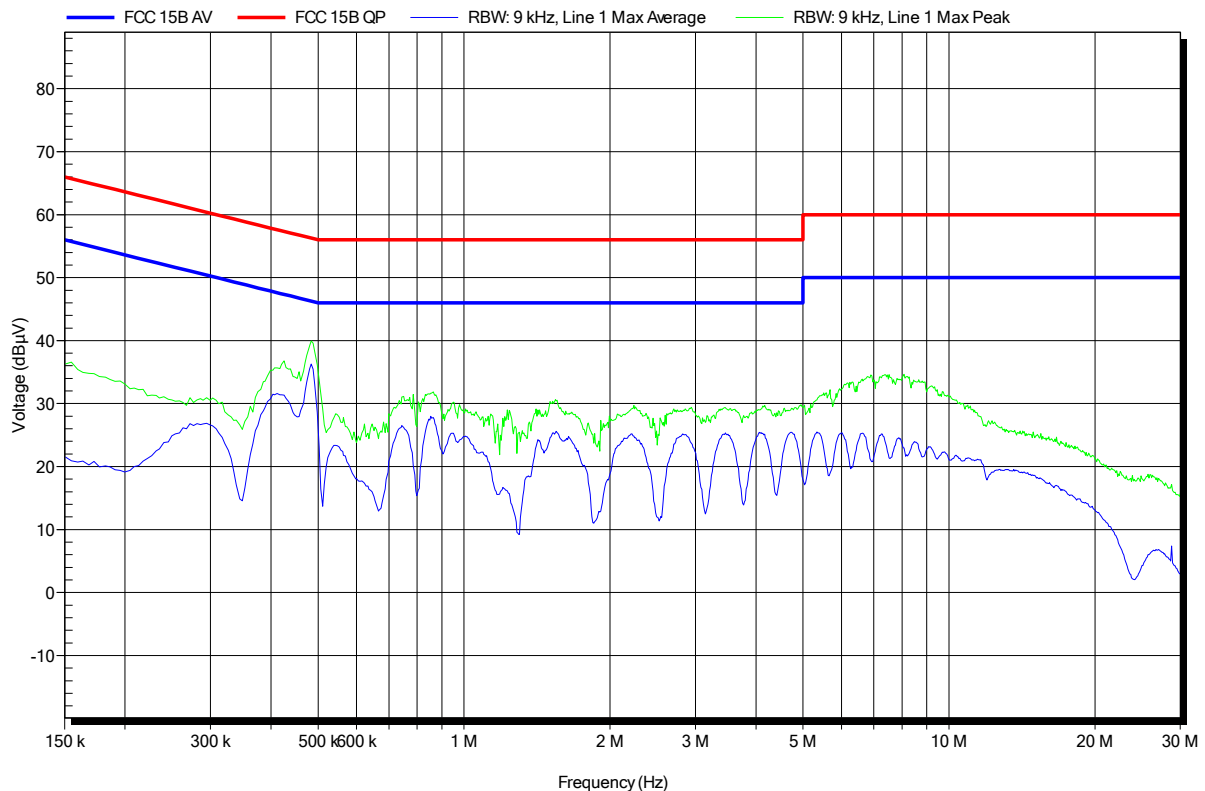


Conducted Emissions 2
EMI voltage test in the ac-mains according to FCC part 51B

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: 2.4GHz IEEE802.15.4 radio module
 Model: ATSAMR21
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pflug
 Test Conditions: Tnom: 23°C, Unom: 120VAC, AC/DC-adapter mod:HNP10I- Micro USB
 LISN: ESH2-Z5 L
 Mode: TX-RX(packet error rate test, continuously record)
 Test Date: 2015-08-03
 Note:

Index 25



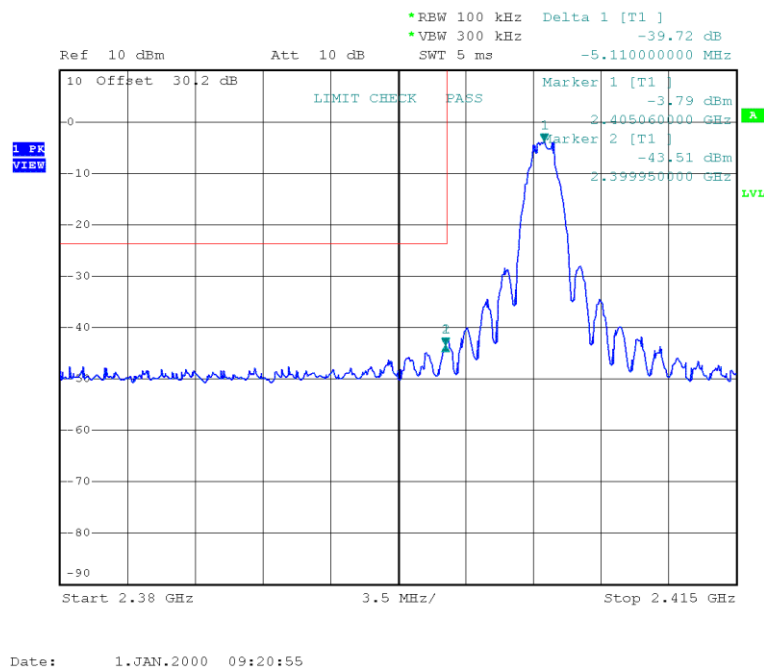
3.6 Test Conditions and Results – Band edge compliance

Band-edge compliance acc. to FCC 15.247 / IC RSS-247				Verdict: PASS	
EUT requirement rule parts and clause		Reference			
		FCC 15.247(d) / IC RSS-247 5.5			
Test according to measurement reference		Reference Method			
		ANSI C63.10			
Test frequency range		Tested frequencies			
		F _{LOW} / F _{HIGH}			
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					
<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 around lower band edge and detector is set to peak and max hold</div> <div>3. Resolution bandwidth is set to 100 kHz</div> <div>4. Markers are set to peak emission levels within frequency band and outside frequency band</div> <div>5. Band edge attenuation is determined from level difference</div>					
Test results					
Channel	Frequency [MHz]	Mode	Level [dBc]	Limit [dBc]	Margin [dB]
F _{LOW}	2405	250 kbps (+4)	-39.72	-20	-19.72
F _{HIGH}	2475	250 kbps (+4)	-37.28	-20	-17.28
F _{HIGH}	2480	250 kbps (-2)	-35.16	-20	-15.16
F _{LOW}	2405	2000 kbps (+4)	-34.77	-20	-14.77
F _{HIGH}	2475	2000 kbps (+4)	-38.25	-20	-18.25
F _{HIGH}	2480	2000 kbps (-2)	-35.66	-20	-15.66
Comments: Test fixture used. Power level of test fixture normalized to maximum peak conducted output power determined by radiated measurements with EUT					

Band-edge compliance – 250 kbps – F_{LOW}

Band-edge Compliance

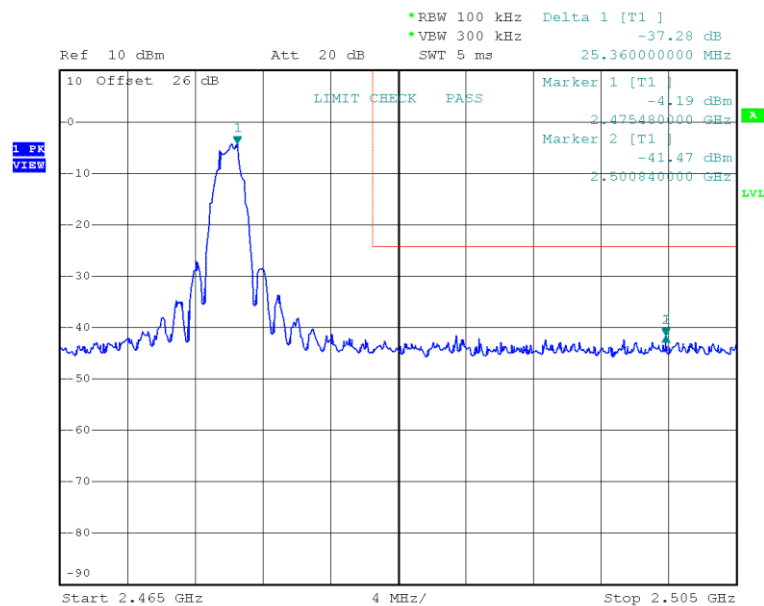
Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 11, 2405 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Band-edge: Lower
 In-band Frequency [MHz]: 2405.06
 Max. in-band Level [dBm/100 kHz]: -3.785
 Out-of-band Frequency [MHz]: 2399.95
 Max. out-of-band Level [dBm/100 kHz]: -43.506
 Attenuation [dB]: -39.72



Band-edge compliance – 250 kbps – F_{HIGH-1}

Band-edge Compliance

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 25, 2475 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Band-edge: Upper
 In-band Frequency [MHz]: 2475.48
 Max. in-band Level [dBm/100 kHz]: -4.191
 Out-of-band Frequency [MHz]: 2500.84
 Max. out-of-band Level [dBm/100 kHz]: -41.467
 Attenuation [dB]: -37.28



Date: 1.JAN.2000 09:24:59

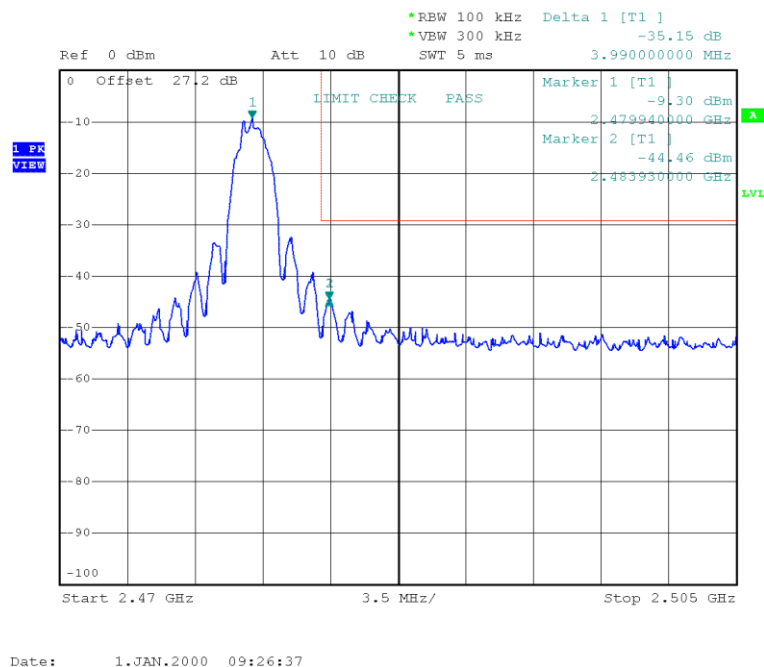
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

Band-edge compliance – 250 kbps – F_{HIGH}

Band-edge Compliance

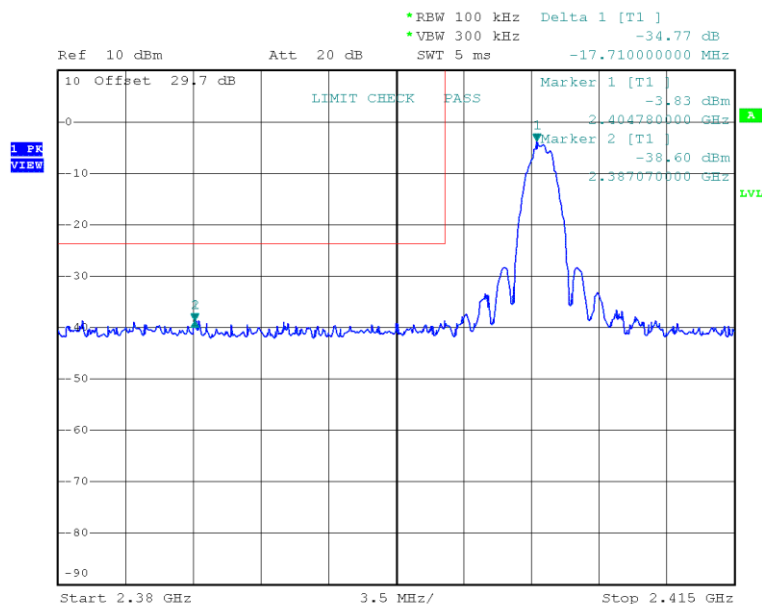
Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (DSSS/250 kbps), Channel: 26, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = -2 dBm
 Band-edge: Upper
 In-band Frequency [MHz]: 2479.94
 Max. in-band Level [dBm/100 kHz]: -9.304
 Out-of-band Frequency [MHz]: 2483.93
 Max. out-of-band Level [dBm/100 kHz]: -44.459
 Attenuation [dB]: -35.16



Band-edge compliance – 2000 kbps – F_{Low}

Band-edge Compliance

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 11, 2405 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Band-edge: Lower
 In-band Frequency [MHz]: 2404.78
 Max. in-band Level [dBm/100 kHz]: -3.828
 Out-of-band Frequency [MHz]: 2387.07
 Max. out-of-band Level [dBm/100 kHz]: -38.6
 Attenuation [dB]: -34.77

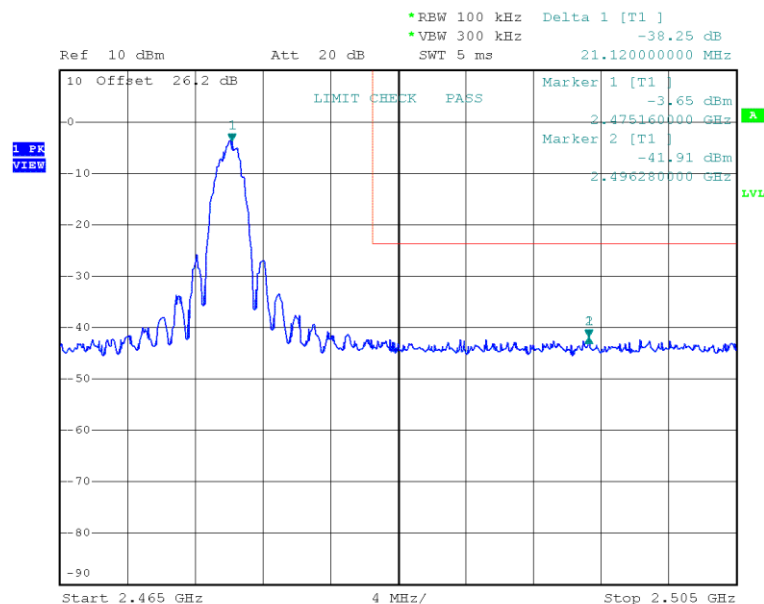


Date: 1.JAN.2000 09:28:01

Band-edge compliance – 2000 kbps – F_{HIGH-1}

Band-edge Compliance

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 25, 2475 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = 4 dBm
 Band-edge: Upper
 In-band Frequency [MHz]: 2475.16
 Max. in-band Level [dBm/100 kHz]: -3.654
 Out-of-band Frequency [MHz]: 2496.28
 Max. out-of-band Level [dBm/100 kHz]: -41.905
 Attenuation [dB]: -38.25



Date: 1.JAN.2000 09:29:26

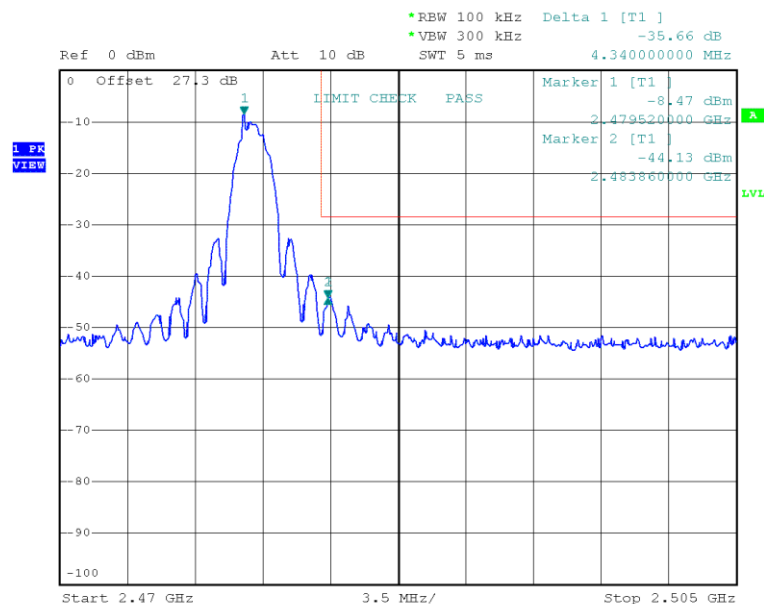
Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

Band-edge compliance – 2000 kbps – F_{HIGH}

Band-edge Compliance

Project Number: G0M-1505-4775
 Applicant: dresden elektronik ingenieurtechnik gmbh
 Model Description: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Sample ID: 4
 Reference Standards: FCC 15.247, RSS-247
 Reference Method: ANSI C63.10:2013, Section 11.11
 Operational Mode: IEEE 802.15.4 (2000 kbps), Channel: 26, 2480 MHz
 Operating Conditions: Tnom/Vnom
 Operator: C. Weber
 Test Site: Eurofins Product Service GmbH
 Test Date: 2015-11-26
 Note: Power Setting = -2 dBm
 Band-edge: Upper
 In-band Frequency [MHz]: 2479.52
 Max. in-band Level [dBm/100 kHz]: -8.469
 Out-of-band Frequency [MHz]: 2483.86
 Max. out-of-band Level [dBm/100 kHz]: -44.132
 Attenuation [dB]: -35.66

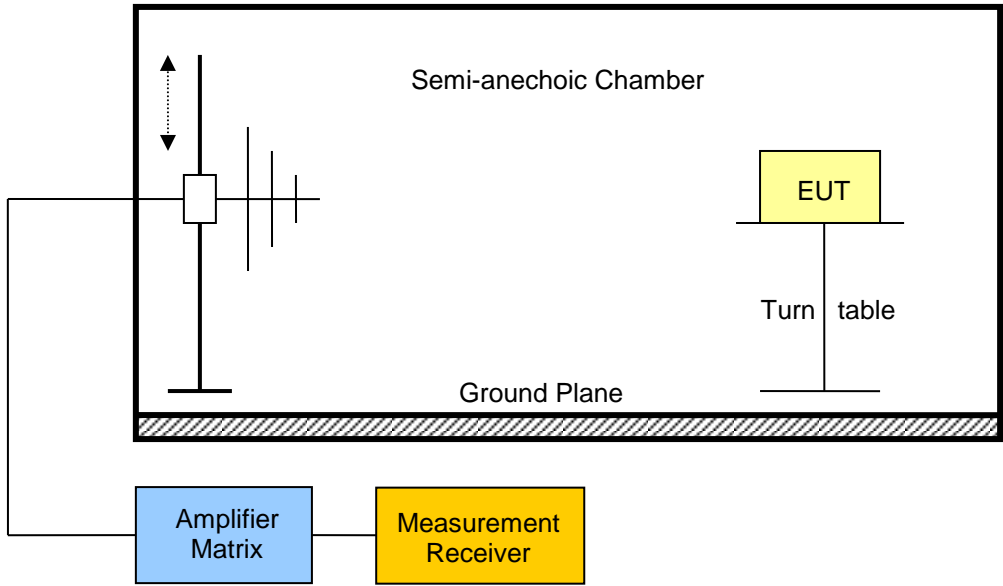


Date: 1.JAN.2000 09:30:37

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

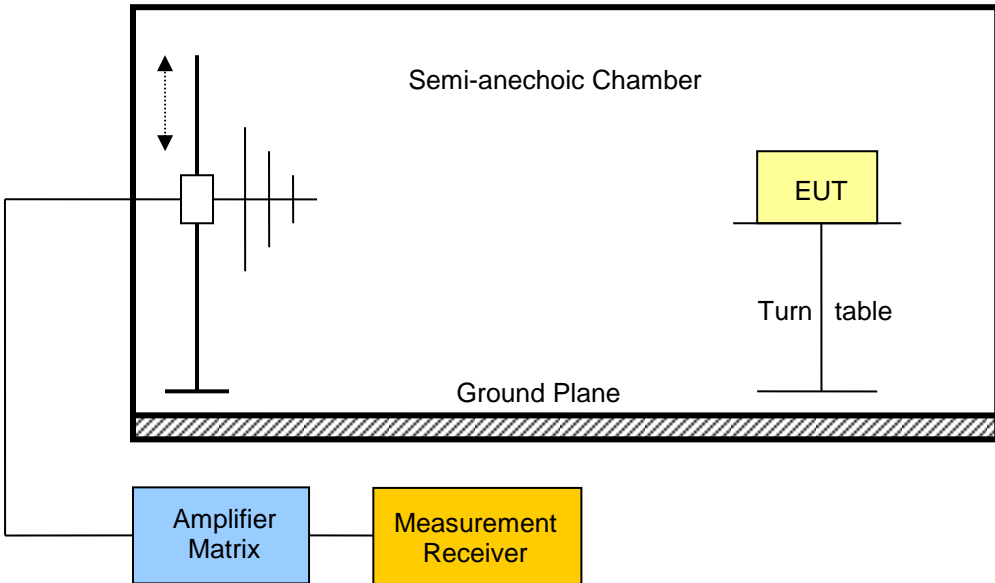
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

3.7 Test Conditions and Results – Transmitter radiated emissions

Transmitter radiated emissions acc. to FCC 15.247 / IC RSS-247				Verdict: PASS
Test according referenced standards	Reference Method			
	FCC 15.247(d) / IC RSS-247 5.5			
Test according to measurement reference	Reference Method			
	ANSI C63.10			
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
<p>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)).</p> <p>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.</p>				
Test setup				
				

Test procedure								
<ol style="list-style-type: none"> 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]	Margin [dB]
11	2405	250 kbps (+4)	2372	50.24	pk	ver	74.00	-23.76
11	2405	250 kbps (+4)	2372	36.86	RMS	ver	54.00	-17.14
11	2405	250 kbps (+4)	2375	50.47	pk	hor	74.00	-23.53
11	2405	250 kbps (+4)	2375	36.88	RMS	hor	54.00	-17.12
20	2450	250 kbps (+4)	7344	53.06	pk	hor	74.00	-20.94
26	2480	250 kbps (-2)	2483.5	60.36	pk	ver	74.00	-13.64
26	2480	250 kbps (-2)	2483.5	52.55	RMS	ver	54.00	-01.45
26	2480	250 kbps (-2)	2483.5	53.32	pk	hor	74.00	-20.68
26	2480	250 kbps (-2)	2483.5	43.90	RMS	hor	54.00	-10.10
Comments:								

3.8 Test Conditions and Results – Receiver radiated emissions

Receiver radiated emissions acc. to IC RSS-247				Verdict: PASS
Test according referenced standards	Reference Method			
	IC RSS-247 3.1			
Test according to measurement reference	Reference Method			
	ANSI C63.10			
Test frequency range	Tested frequencies			
	30 MHz – 5 th Harmonic			
EUT test mode	Receive			
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
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 [MHz]	Emission [MHz]	Emission Level [dBμV/m]	Pol.	Det.	Limit [dBμV/m]	Margin [dBμV/m]
20	2450	7408	52.06	hor	pk	53.98	-1.92 dB
20	2450	7720	52.05	ver	pk	53.98	-1.93 dB
20	2450	17736	49.86	ver	pk	53.98	-4.12 dB
Comments: * Emission level corresponds to ambient noise floor							

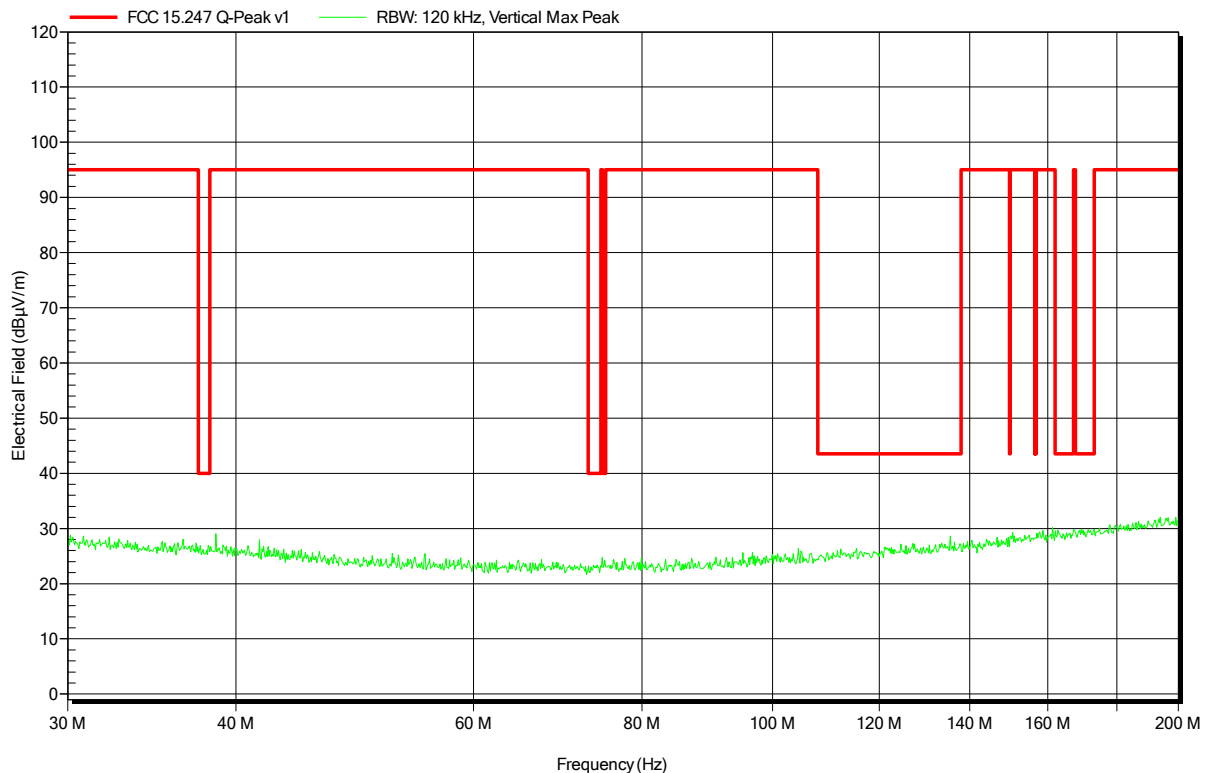
ANNEX A Transmitter radiated spurious emissions

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant:	dresden elektronik ingenieurtechnik gmbh
EUT Name:	ATSAMR21 ZLL Module
Model:	ATSAMR21B18-MZ210PA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 24°C, Vnom: 5.0 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
Test Date:	2015-11-24
Note:	

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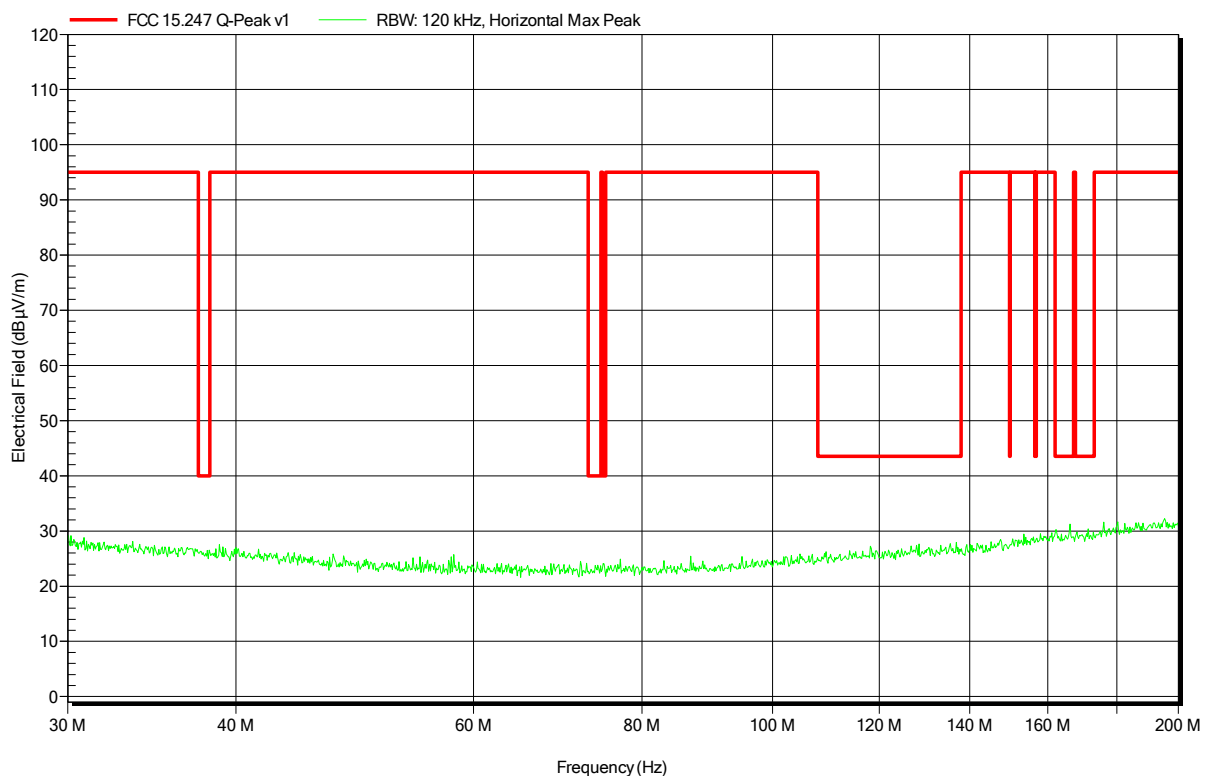


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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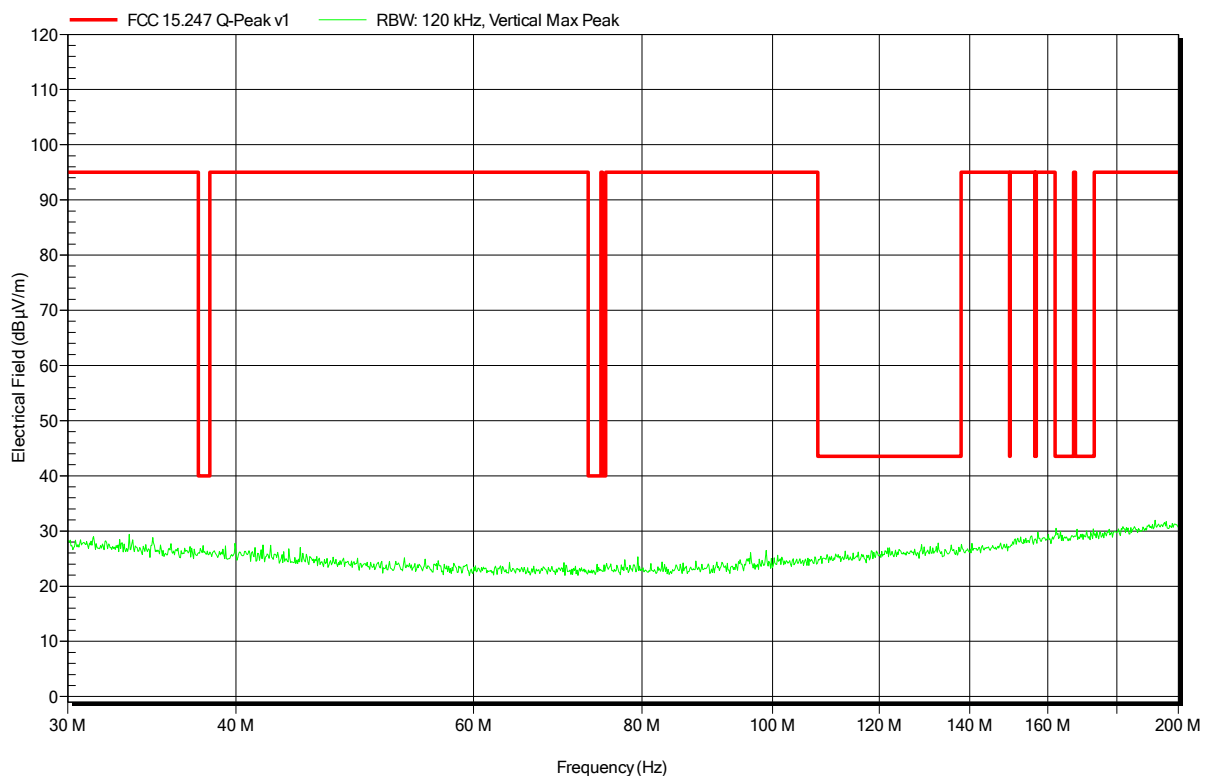


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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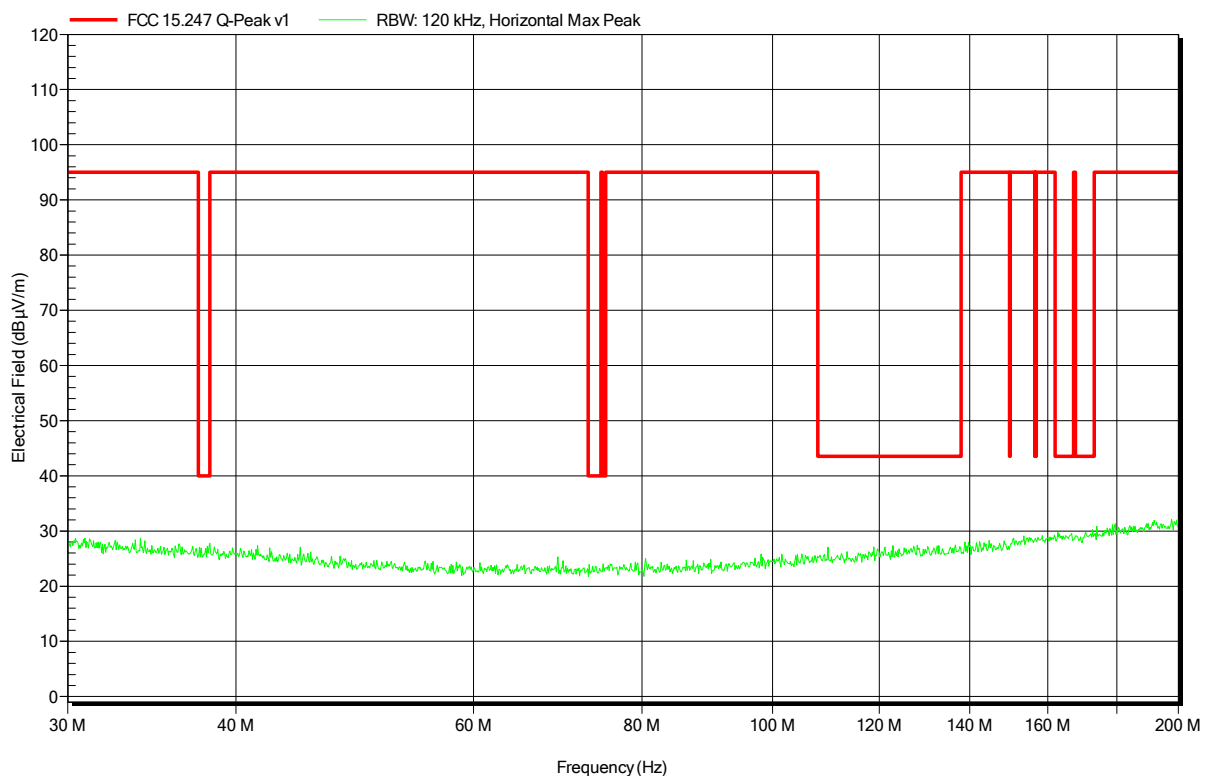


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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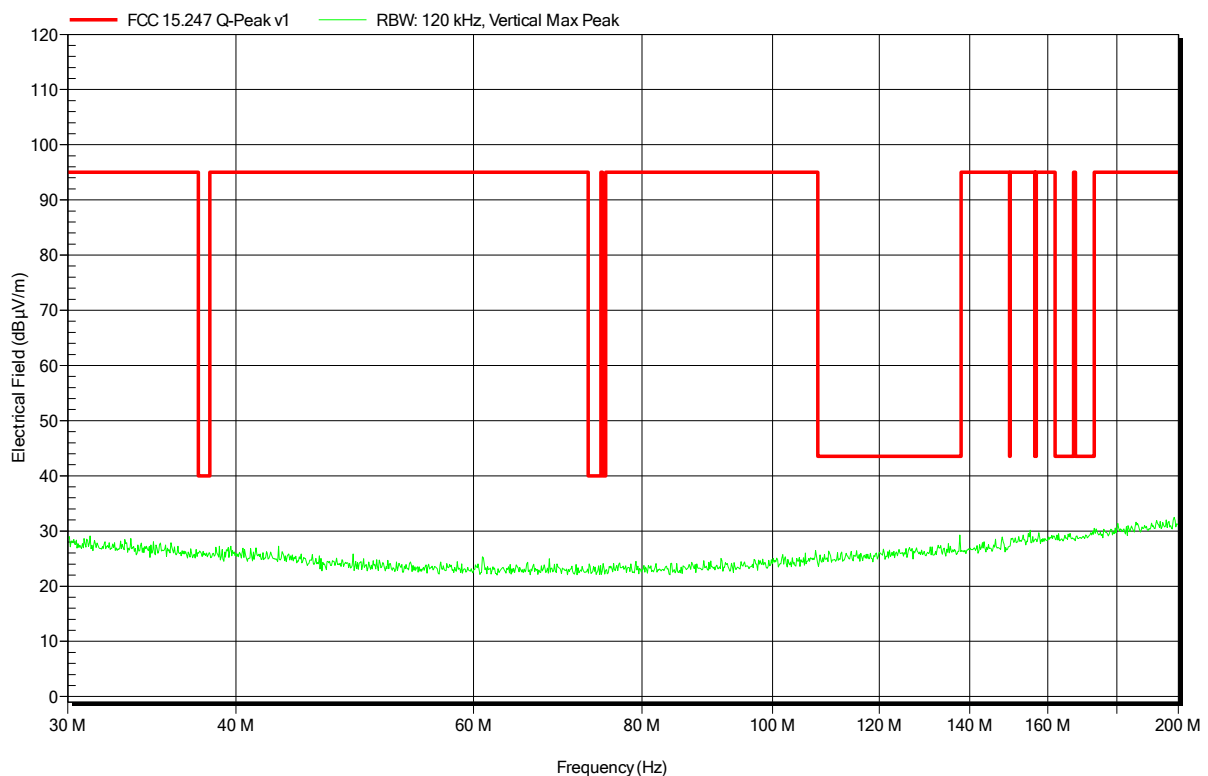


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HK 116, Vertical
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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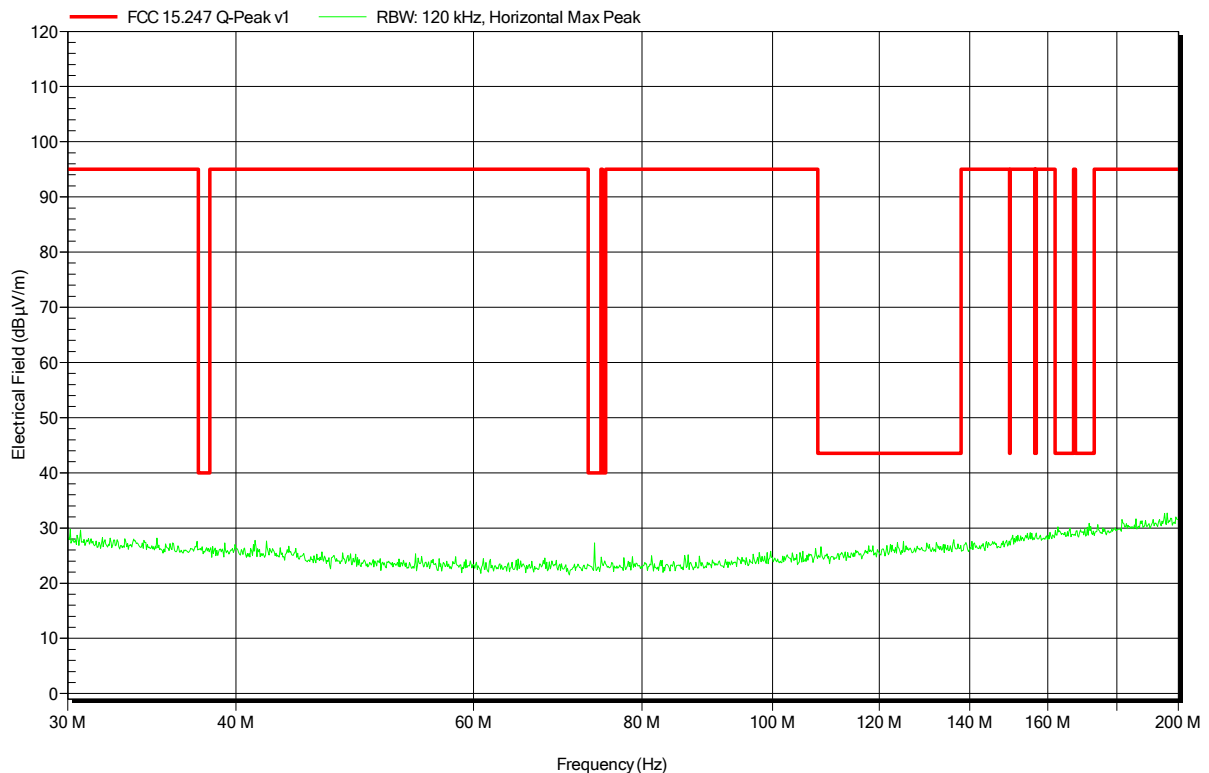


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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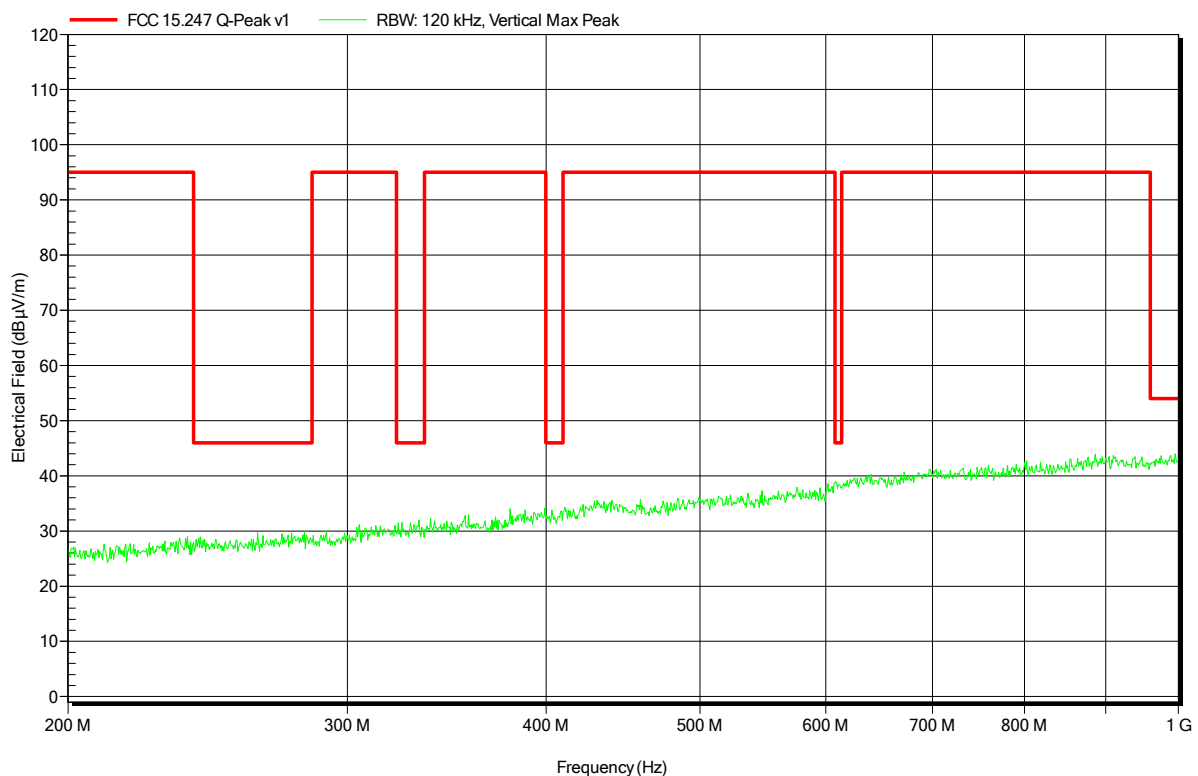


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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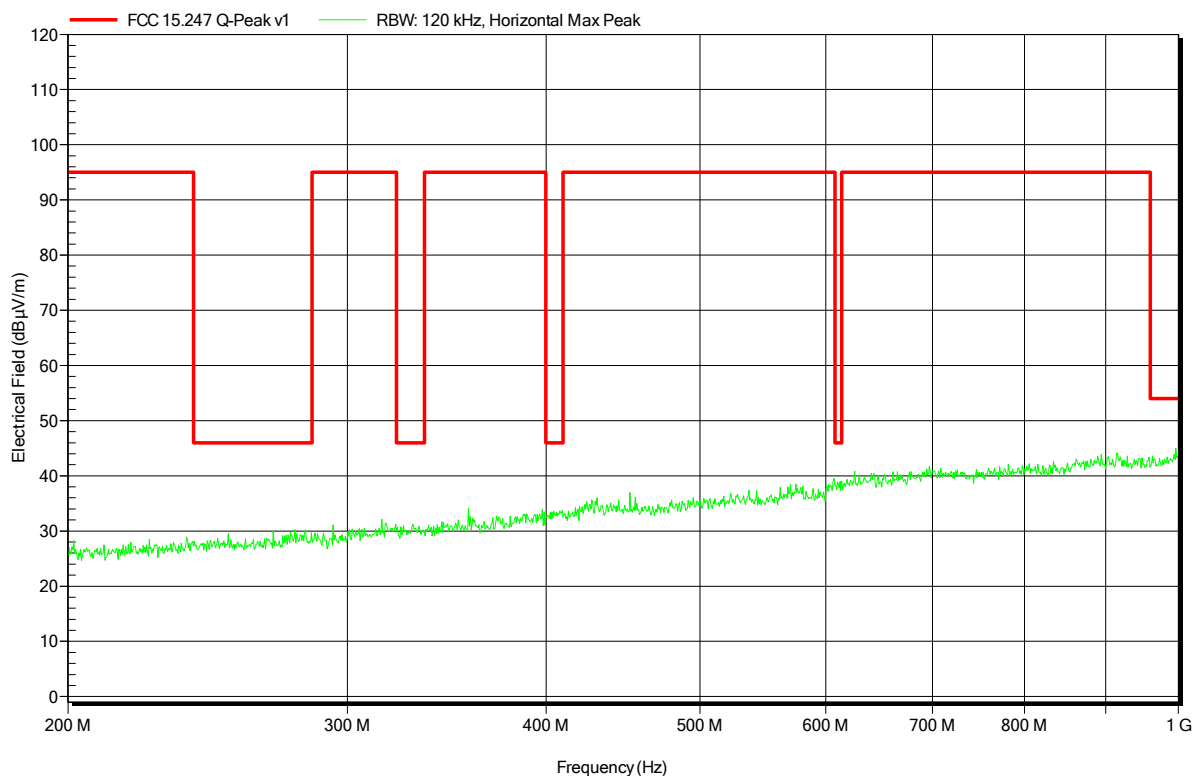


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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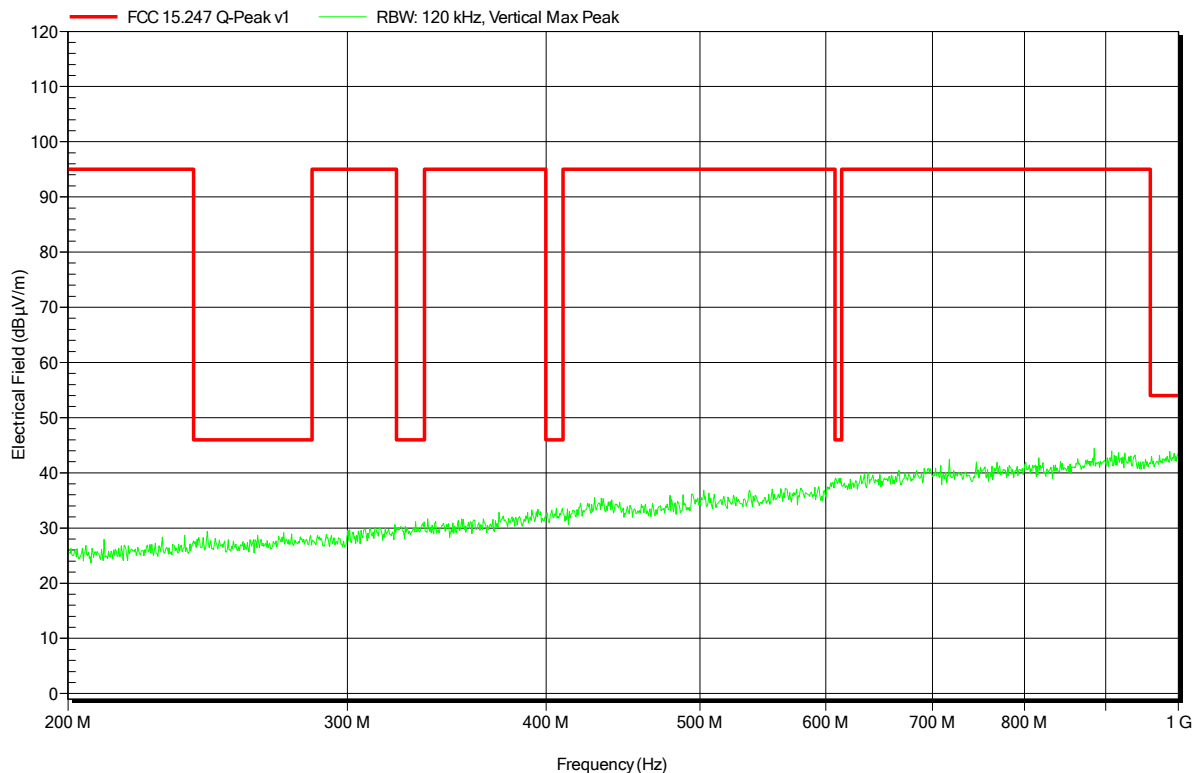


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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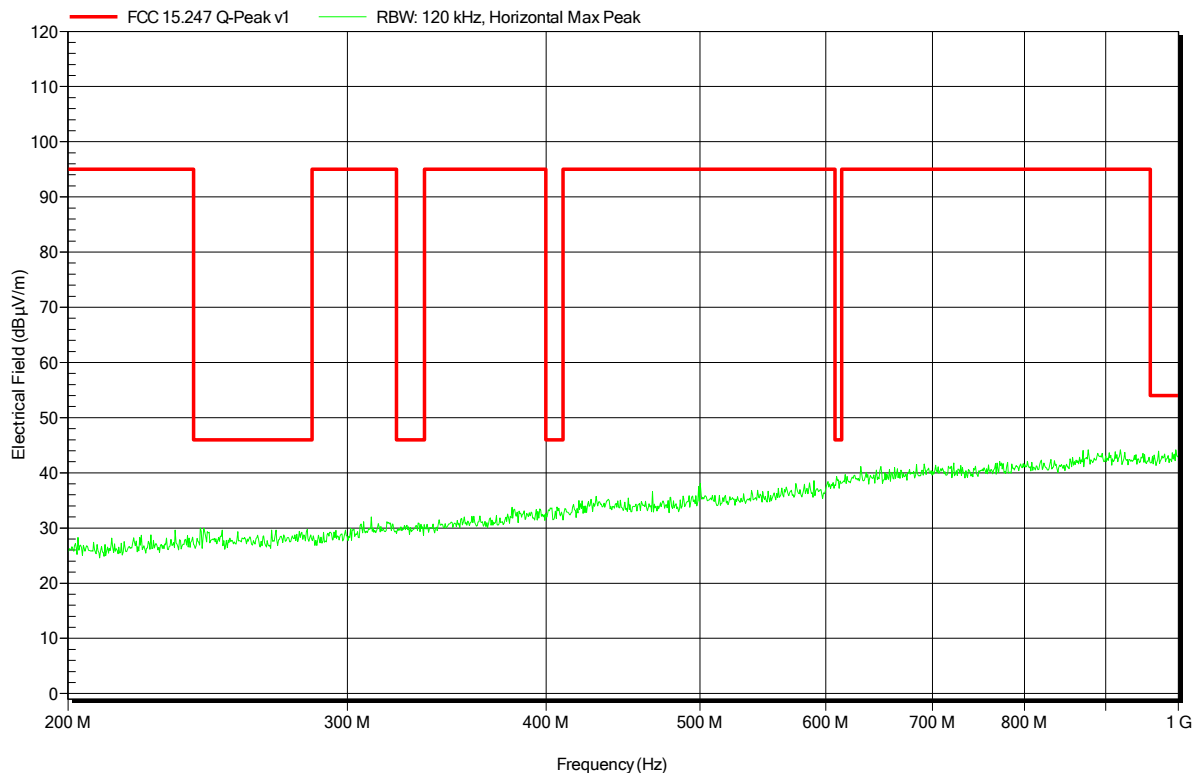


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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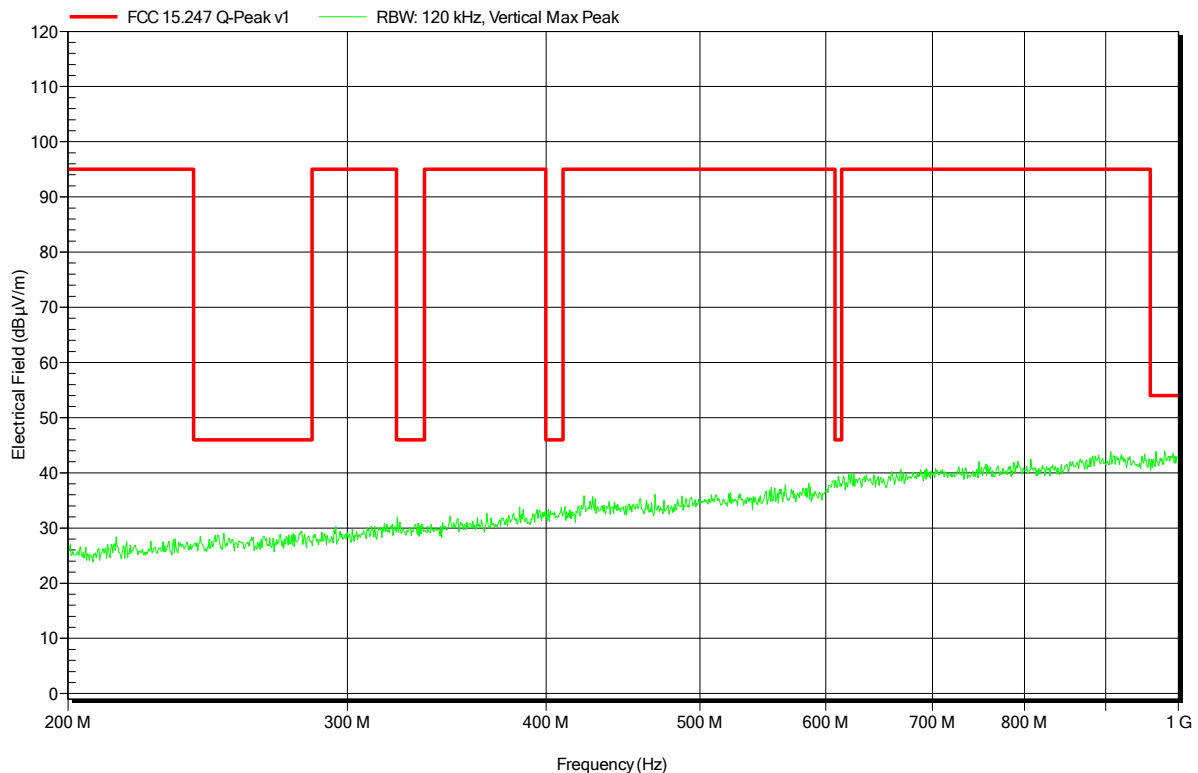


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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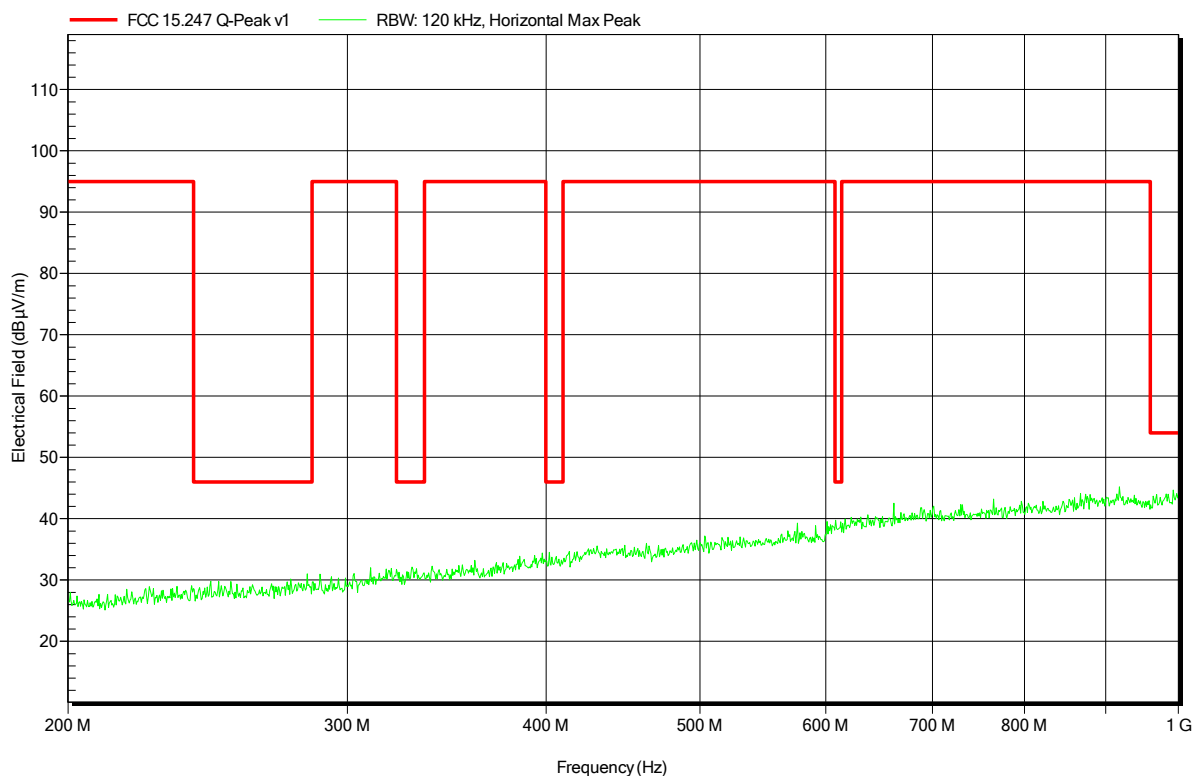


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Handrik
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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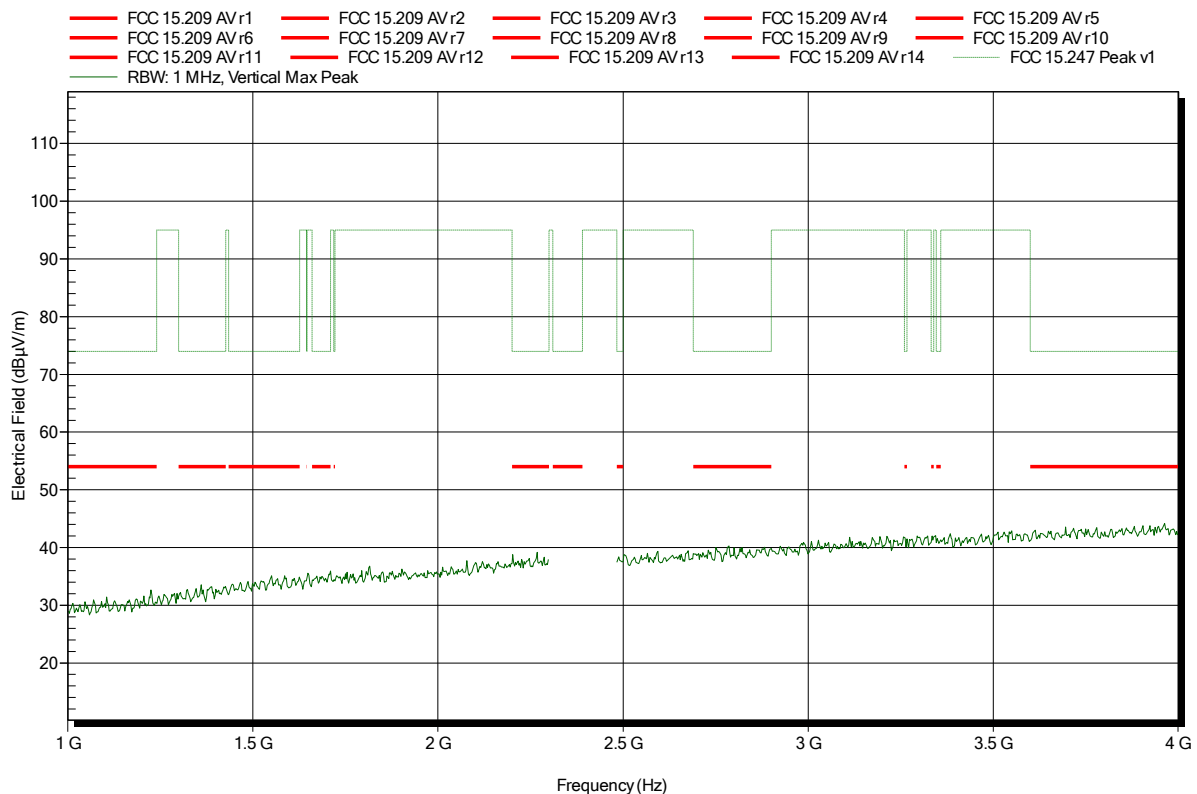


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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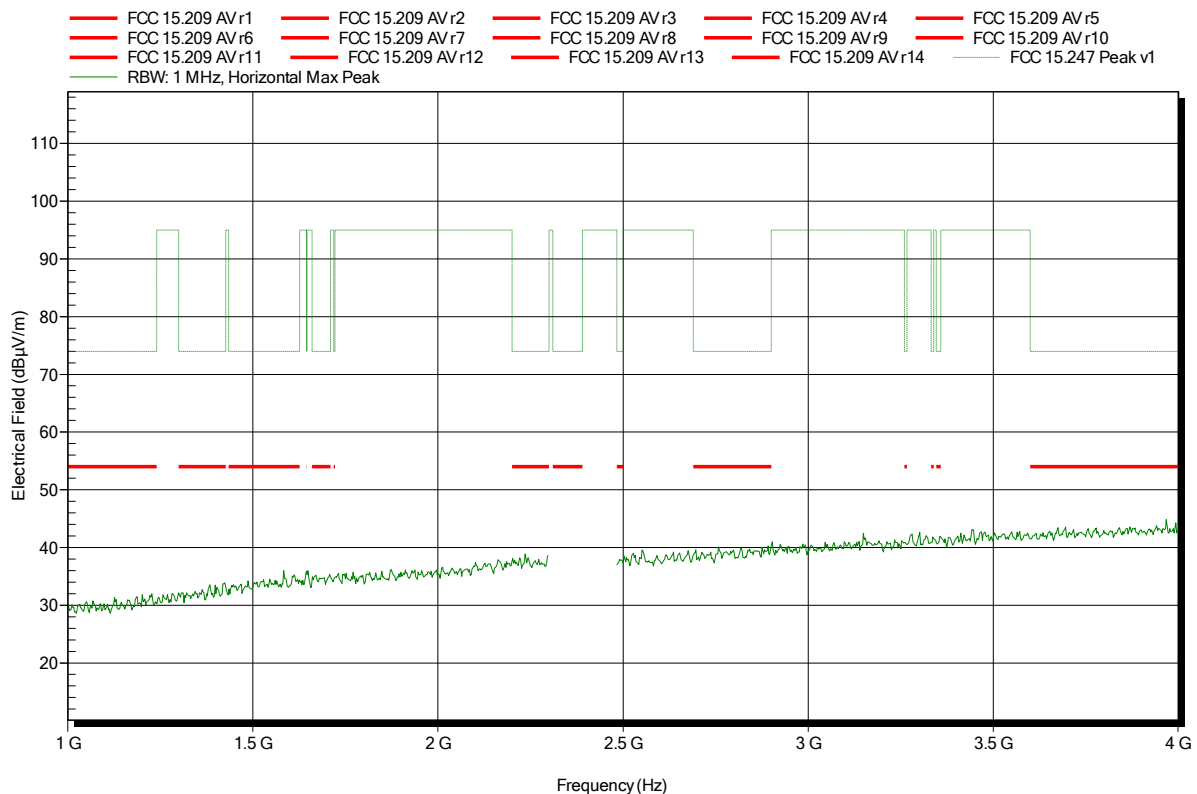


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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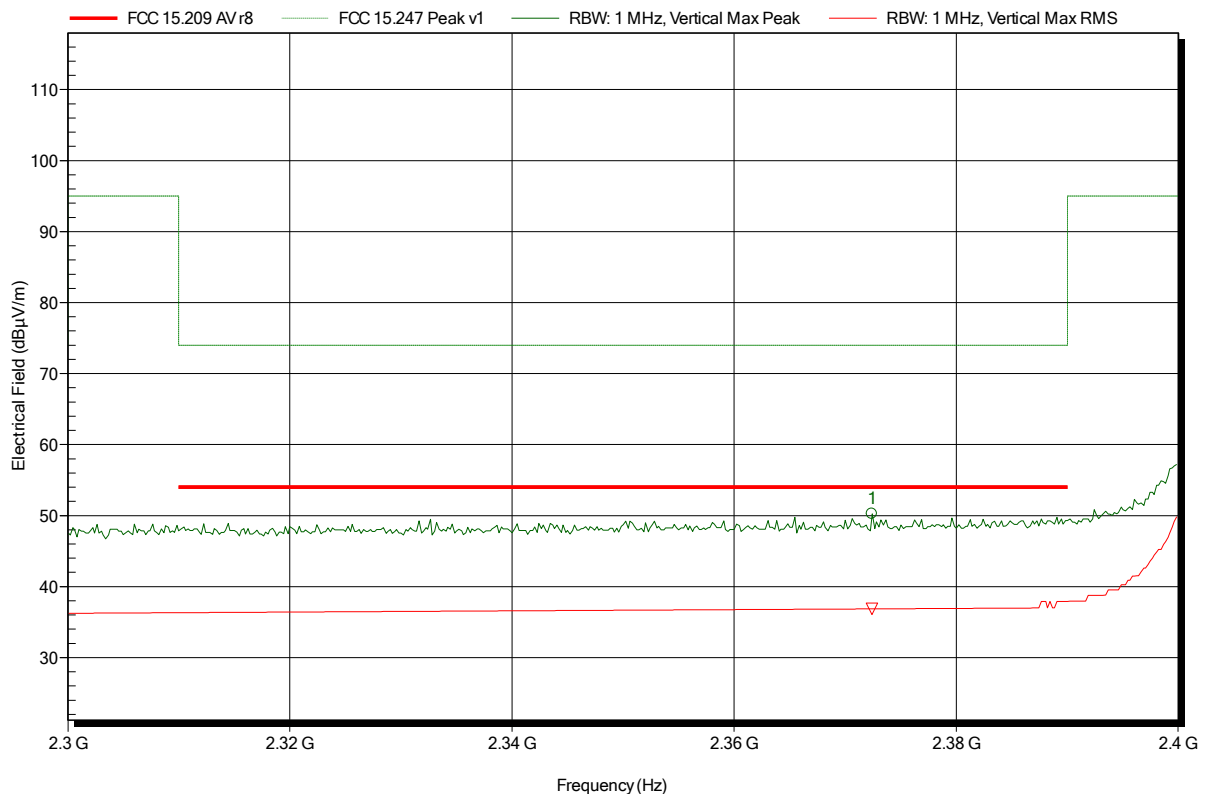


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-23
 Note: lower bandedge

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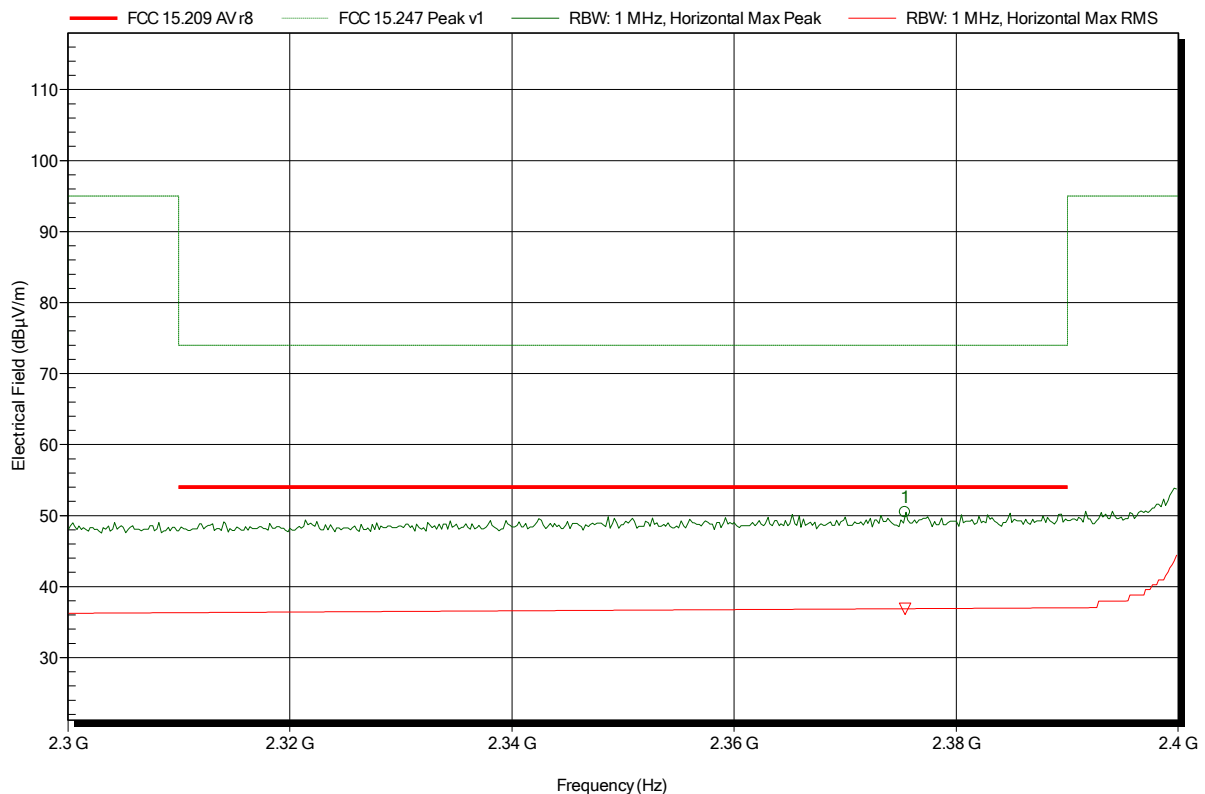
Frequency 2.372 GHz	Peak 50.24 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -23.76 dB	Peak Status Pass
Frequency 2.372 GHz	RMS 36.86 dBµV/m	RMS Limit 54 dBµV/m	RMS Difference -17.14 dB	RMS Status Pass

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-23
 Note: lower bandedge

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.375 GHz	50.47 dBµV/m	74 dBµV/m	-23.53 dB	Pass

Frequency	RMS	RMS Limit	RMS Difference	RMS Status
2.375 GHz	36.88 dBµV/m	54 dBµV/m	-17.12 dB	Pass

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

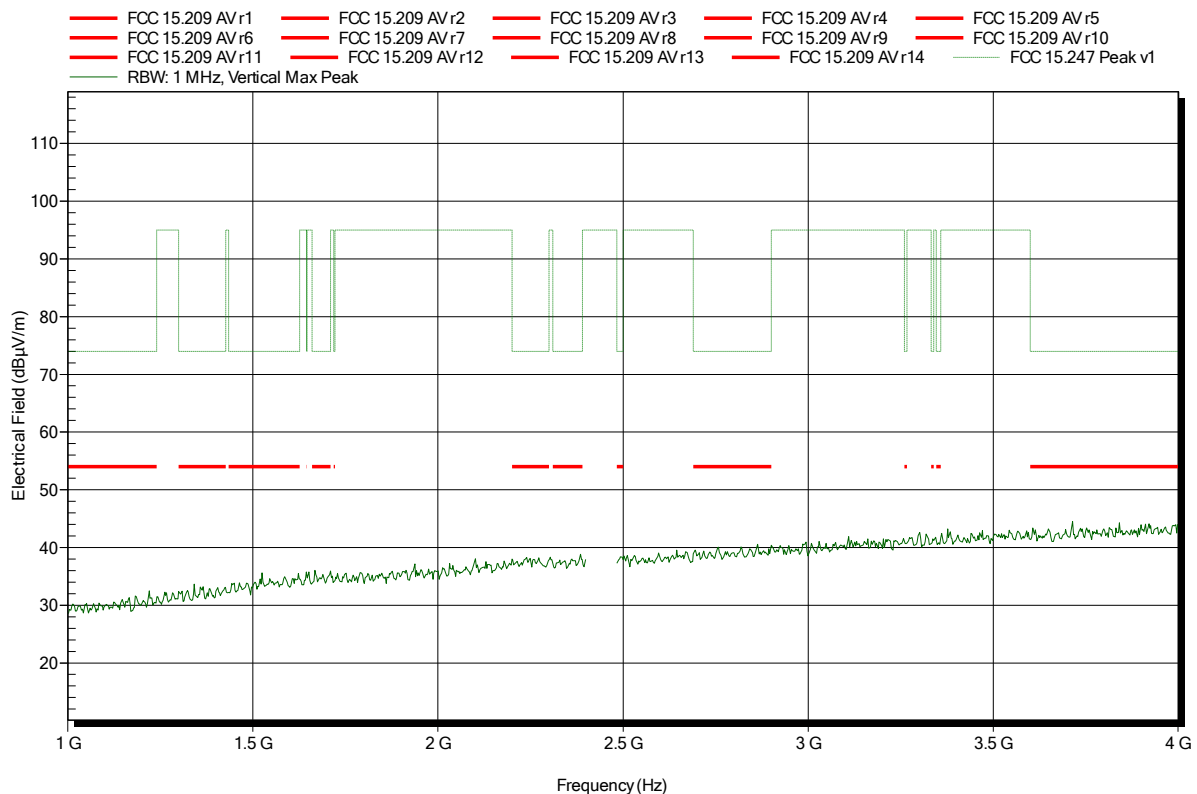
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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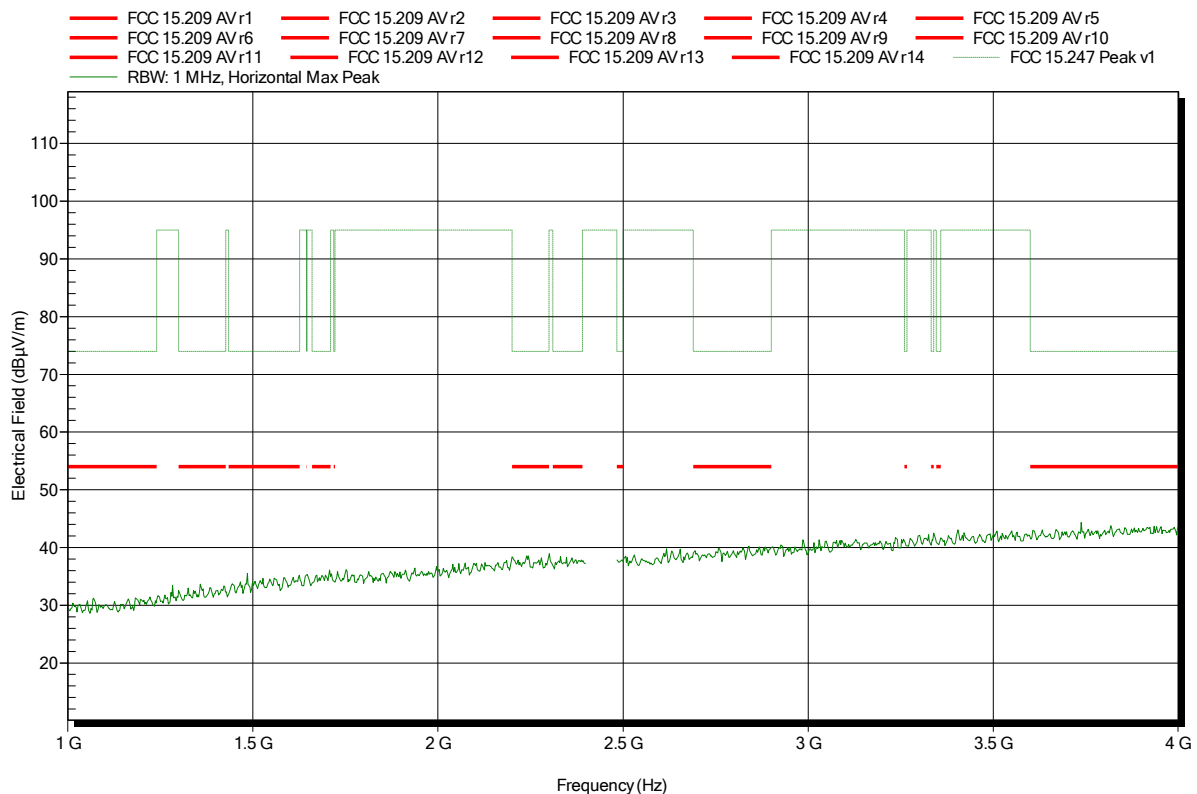


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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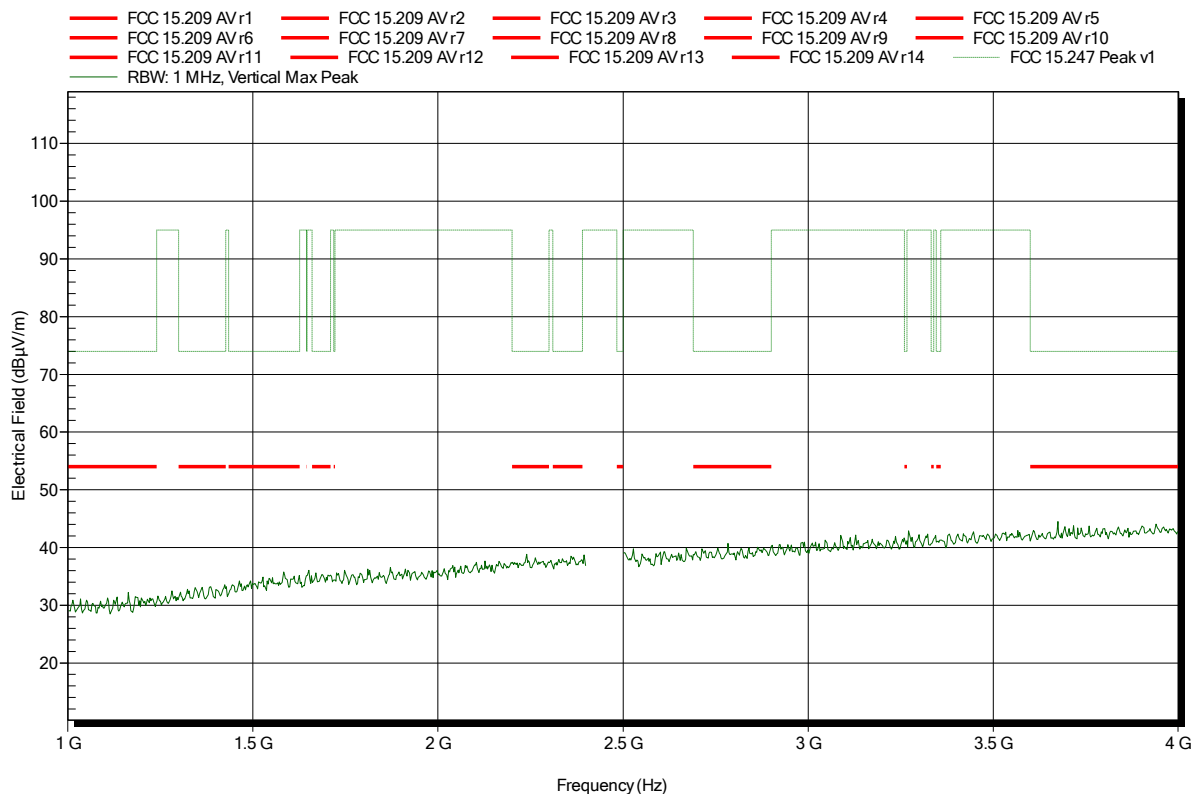


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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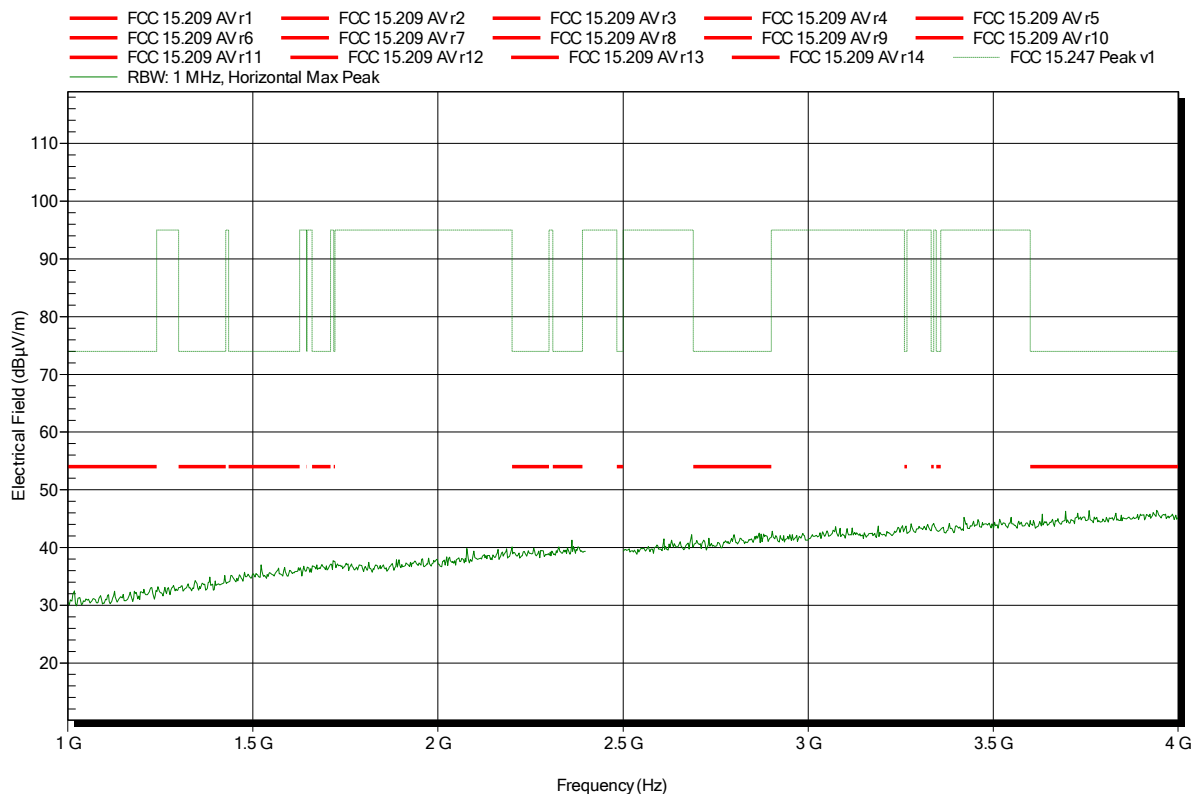


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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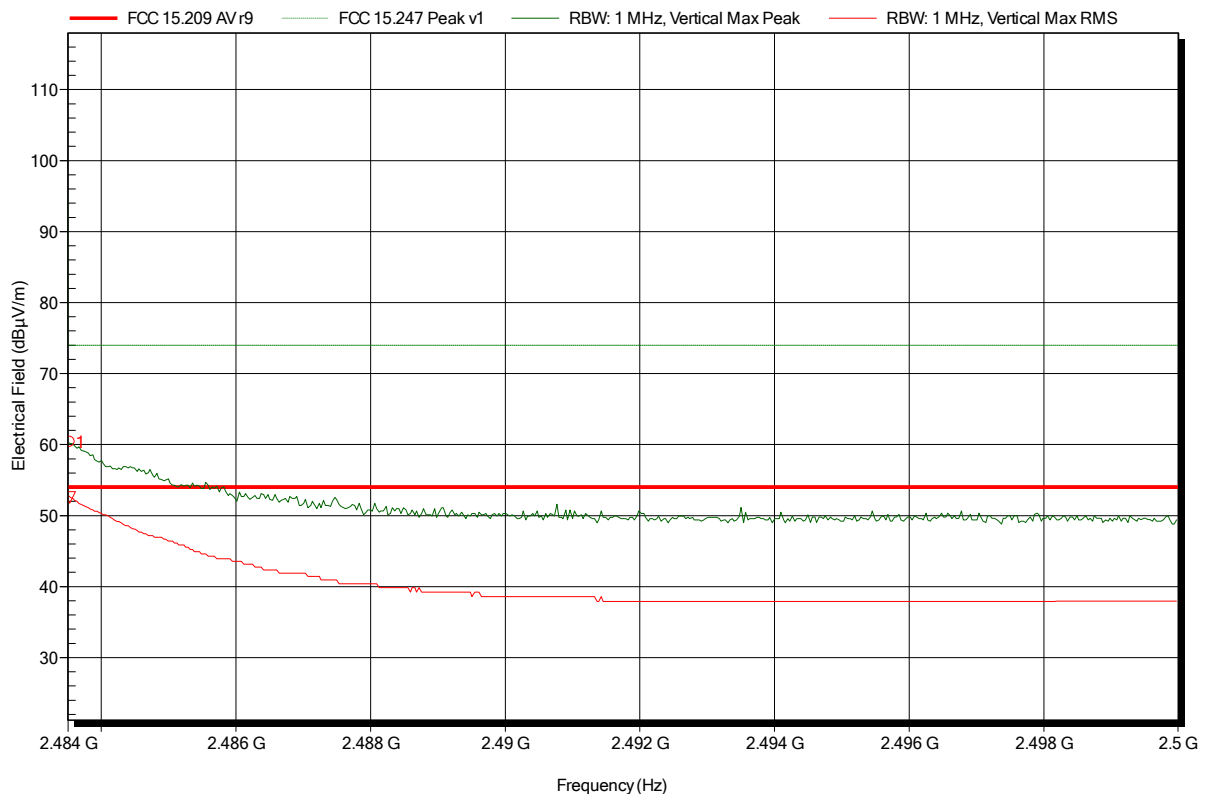


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-23
 Note: upper bandedge

Index 4



Frequency 2.4835 GHz	Peak 60.36 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -13.64 dB	Peak Status Pass
Frequency 2.4835 GHz	RMS 52.55 dBµV/m	RMS Limit 54 dBµV/m	RMS Difference -1.45 dB	RMS Status Pass

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

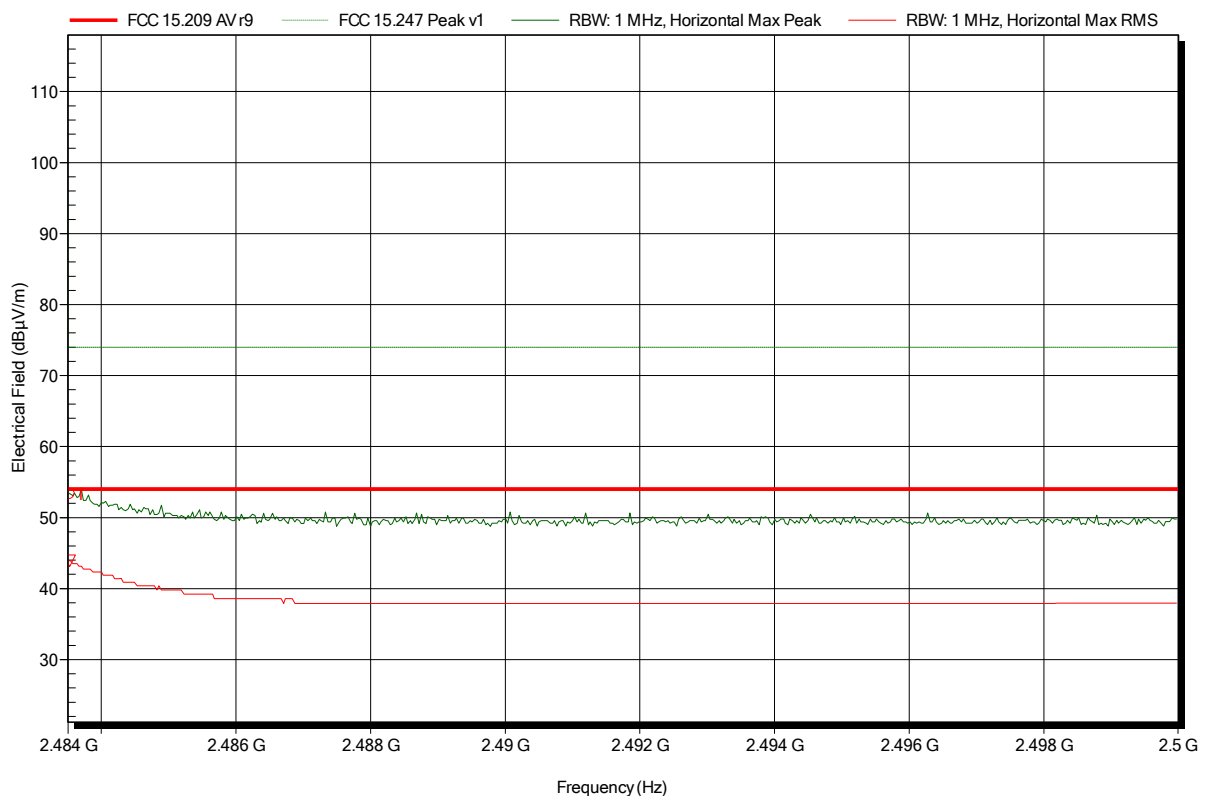
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Weber
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-23
 Note: upper bandedge

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Frequency 2.4835 GHz	Peak 53.32 dBµV/m	Peak Limit 74 dBµV/m	Peak Difference -20.68 dB	Peak Status Pass
Frequency 2.4835 GHz	RMS 43.9 dBµV/m	RMS Limit 54 dBµV/m	RMS Difference -10.1 dB	RMS Status Pass

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

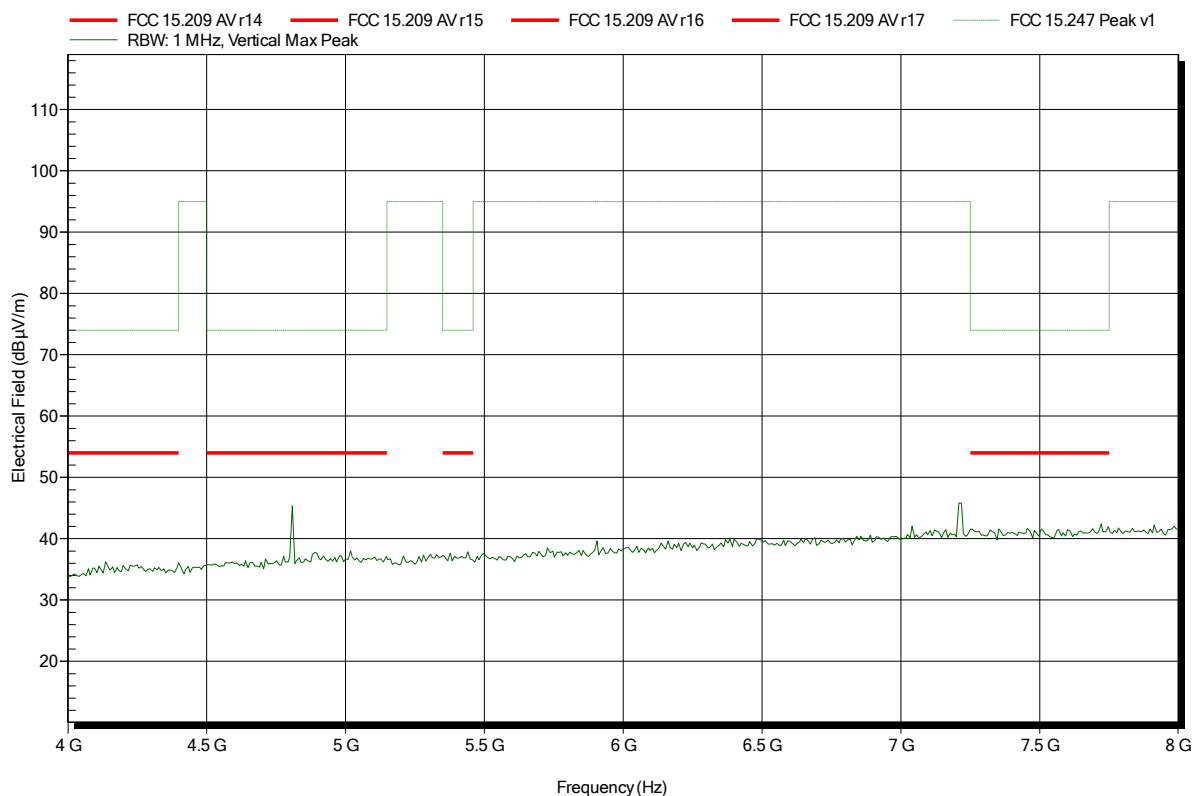
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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Test Report No.: G0M-1505-4775-TFC247ZBS-V01

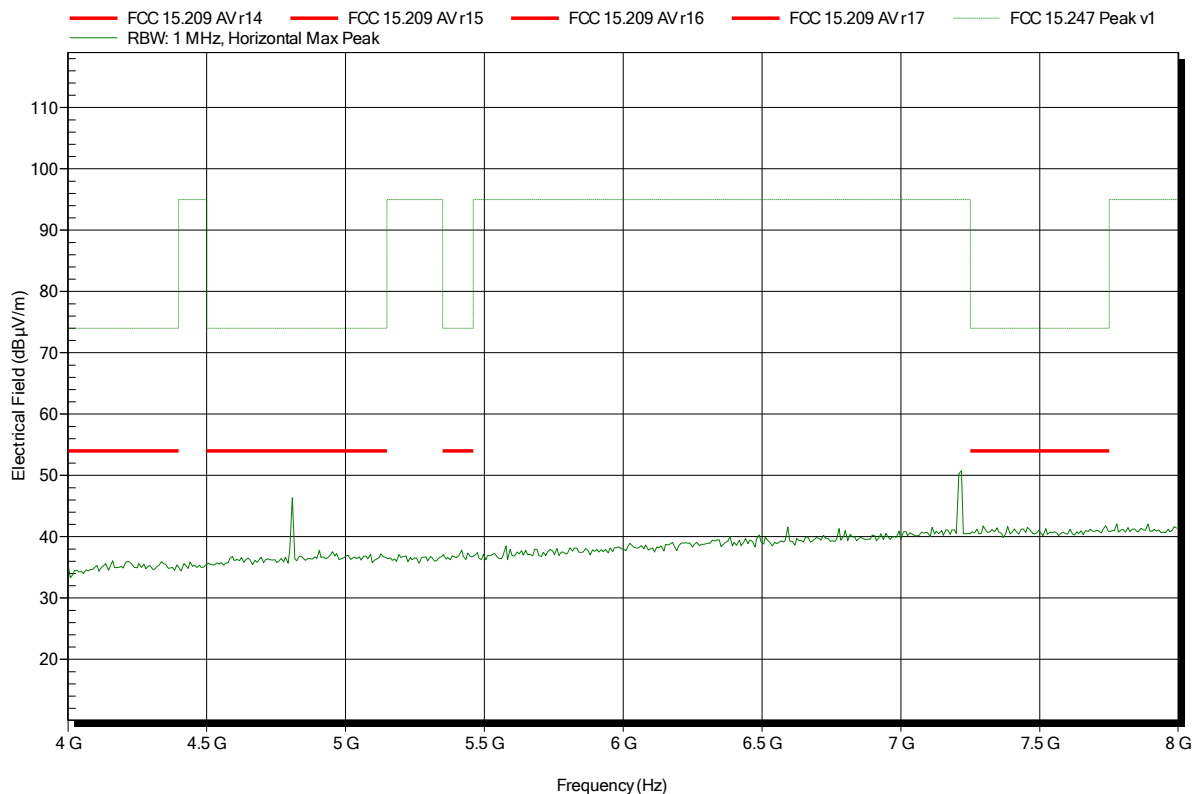
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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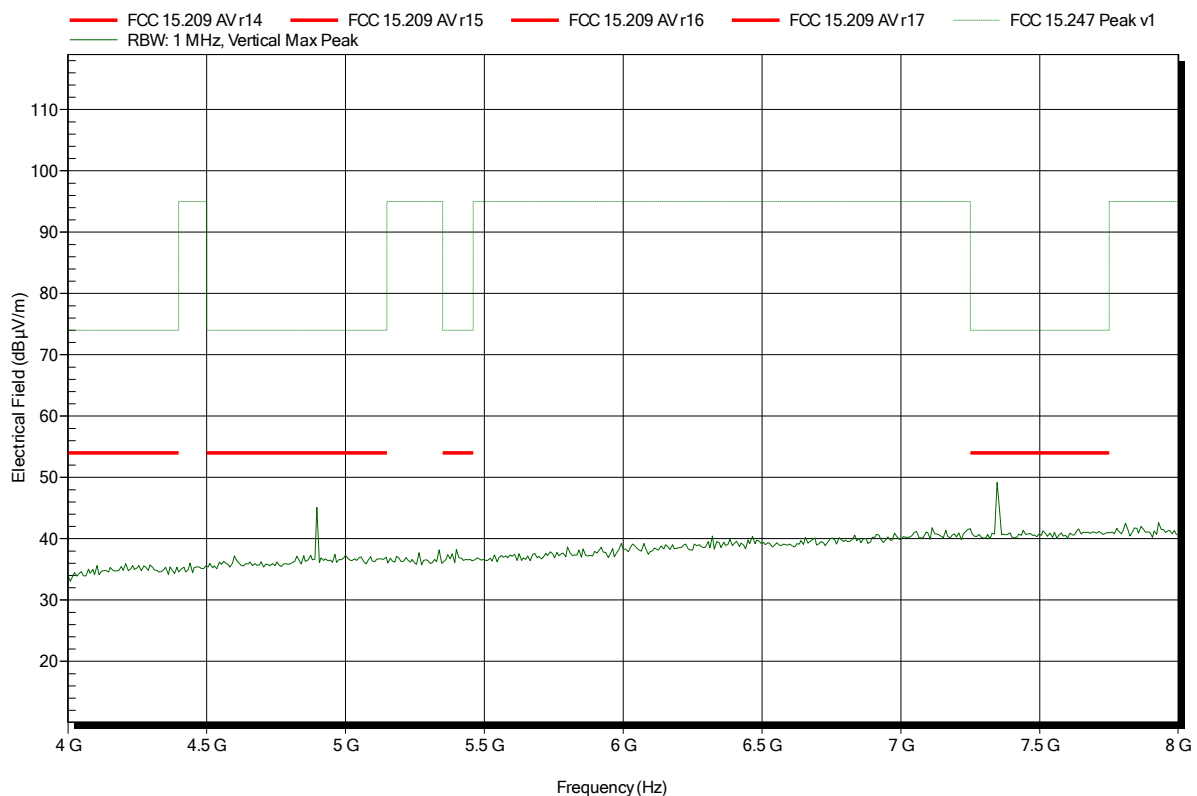


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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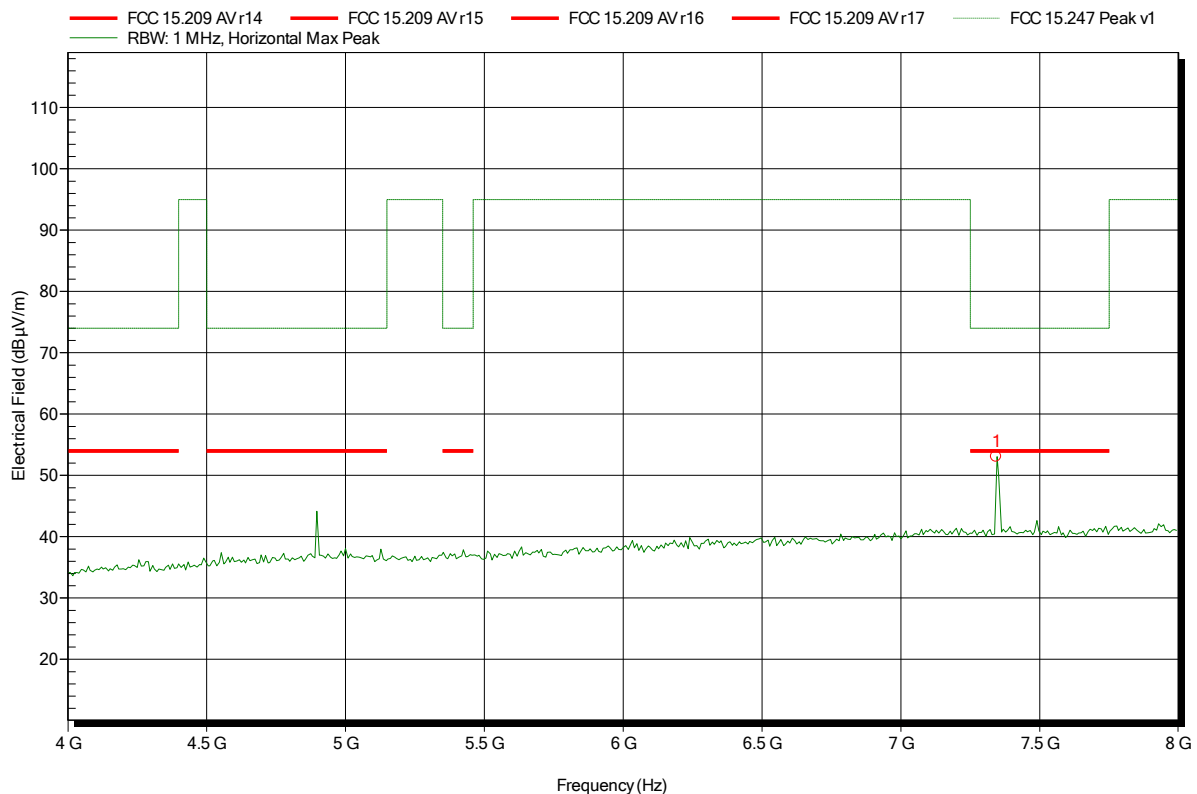


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.344 GHz	53.06 dBµV/m	74 dBµV/m	-20.94 dB	Pass

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

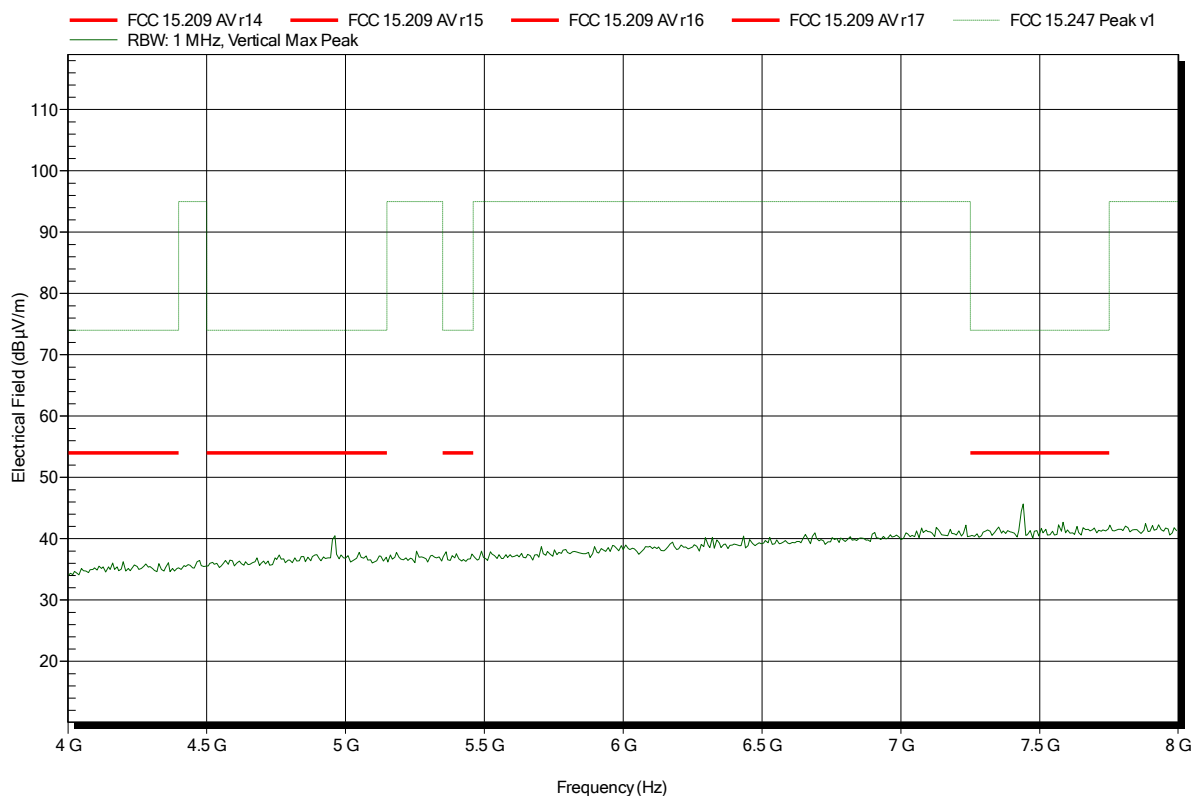
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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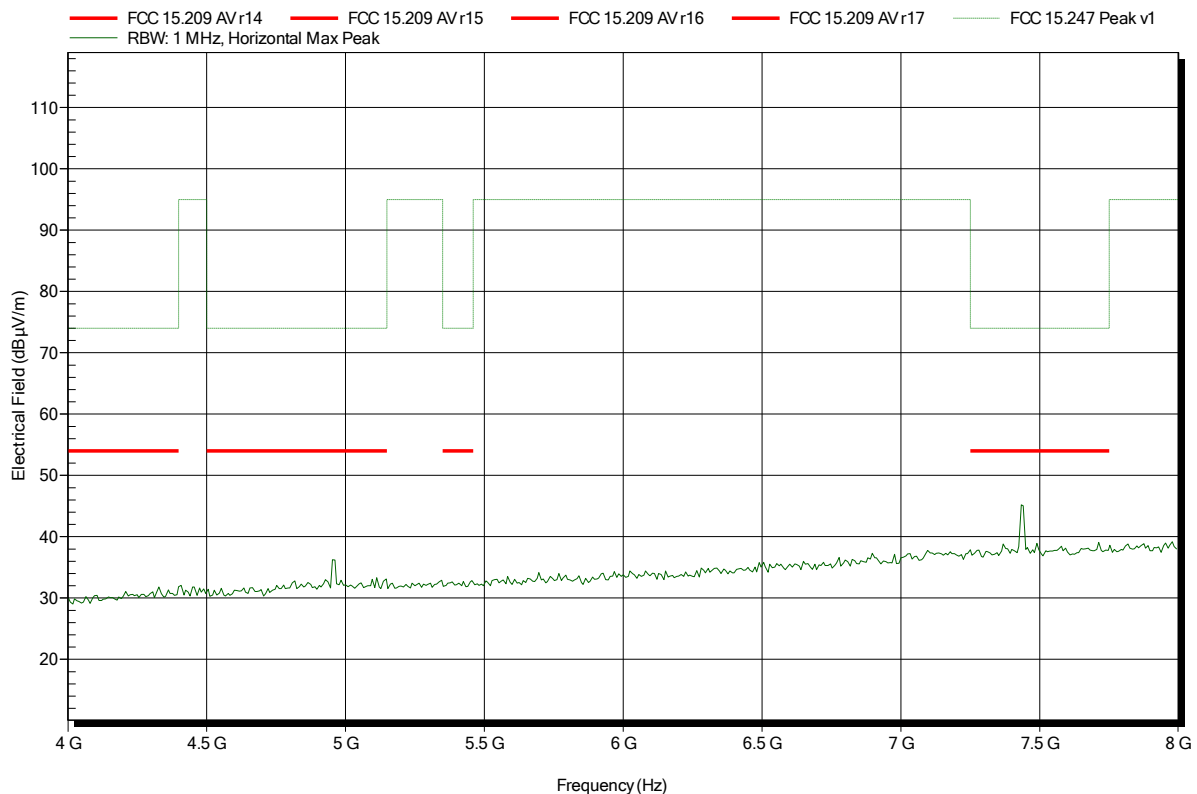


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-23
 Note:

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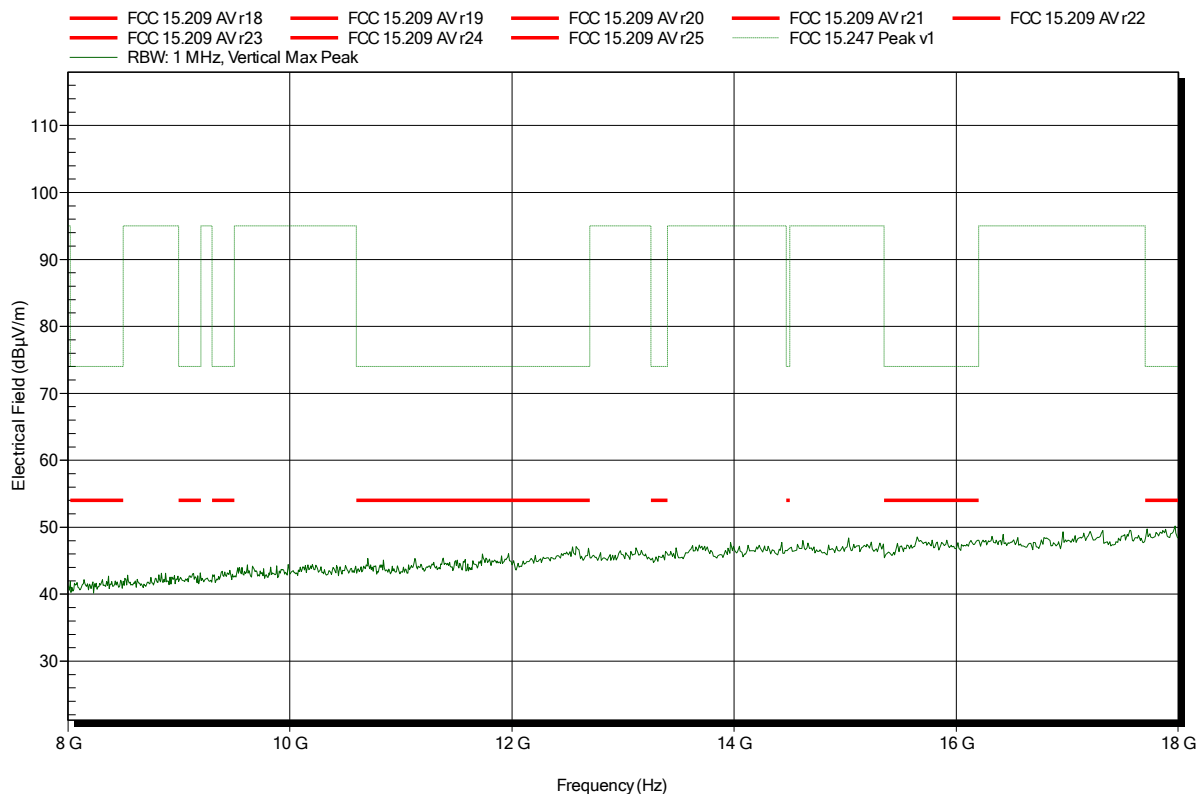


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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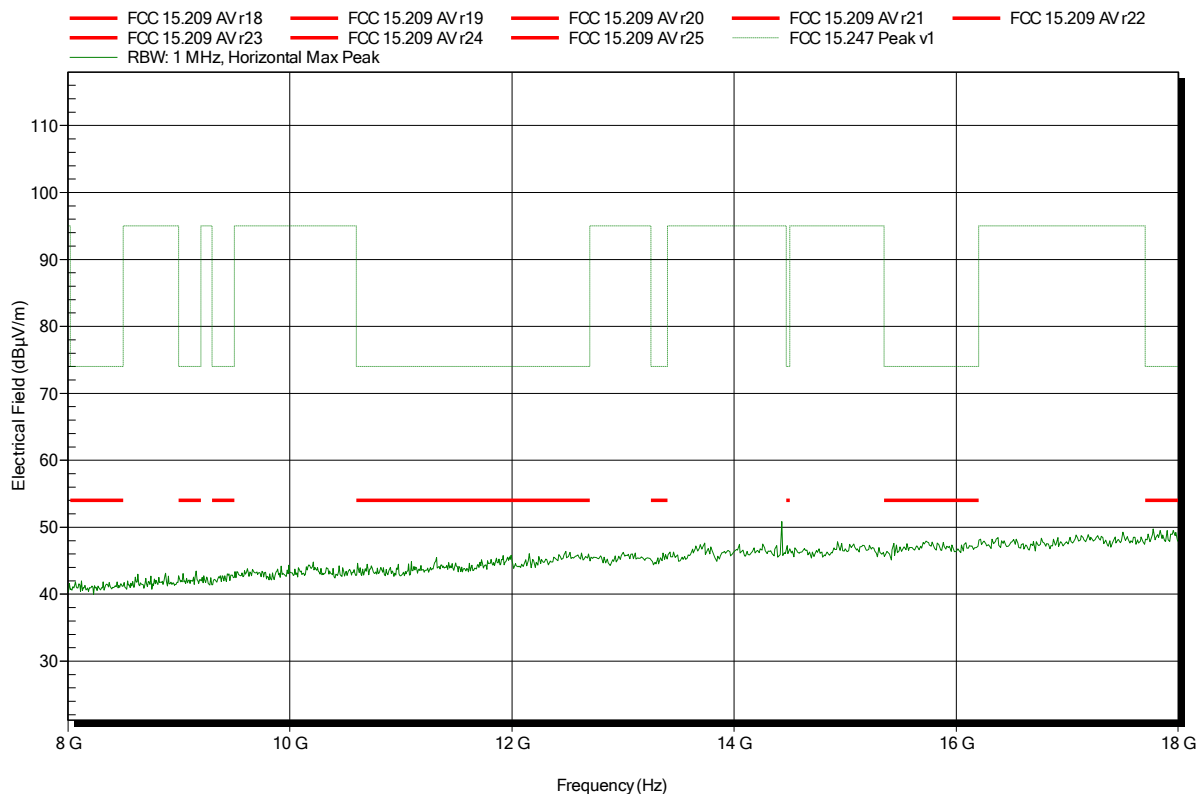


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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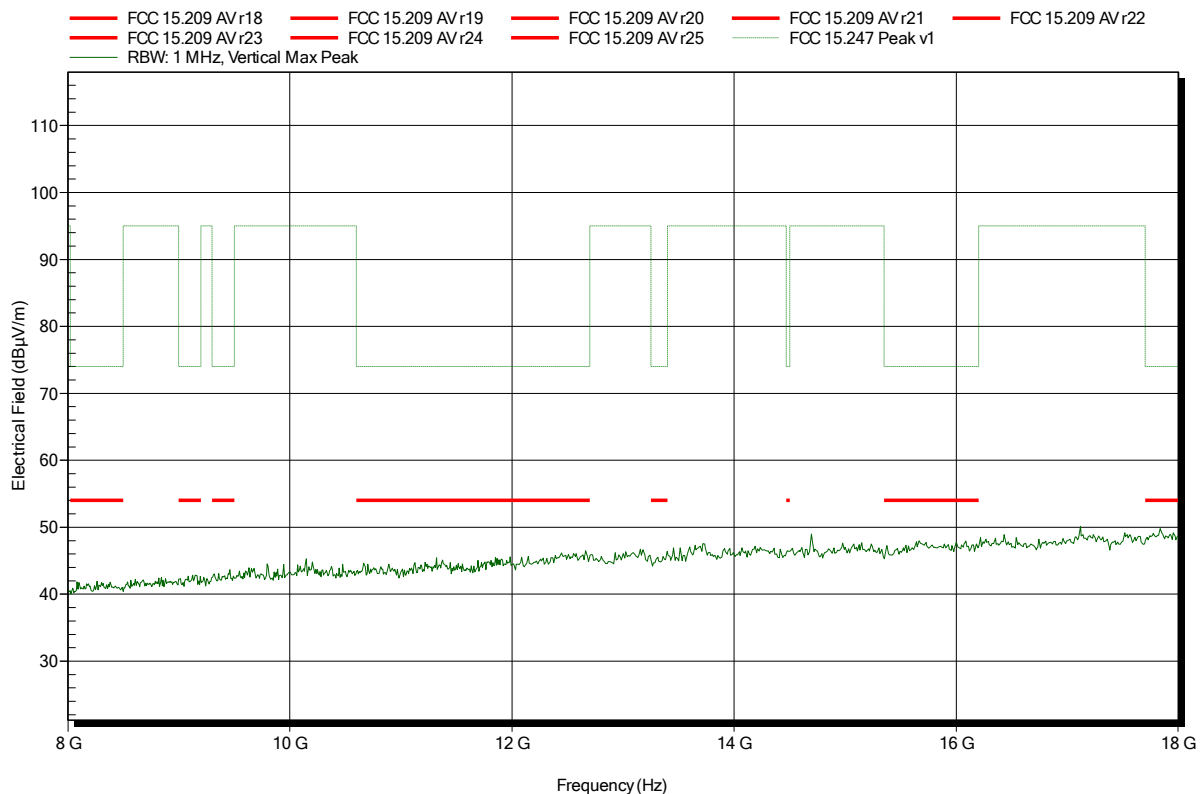


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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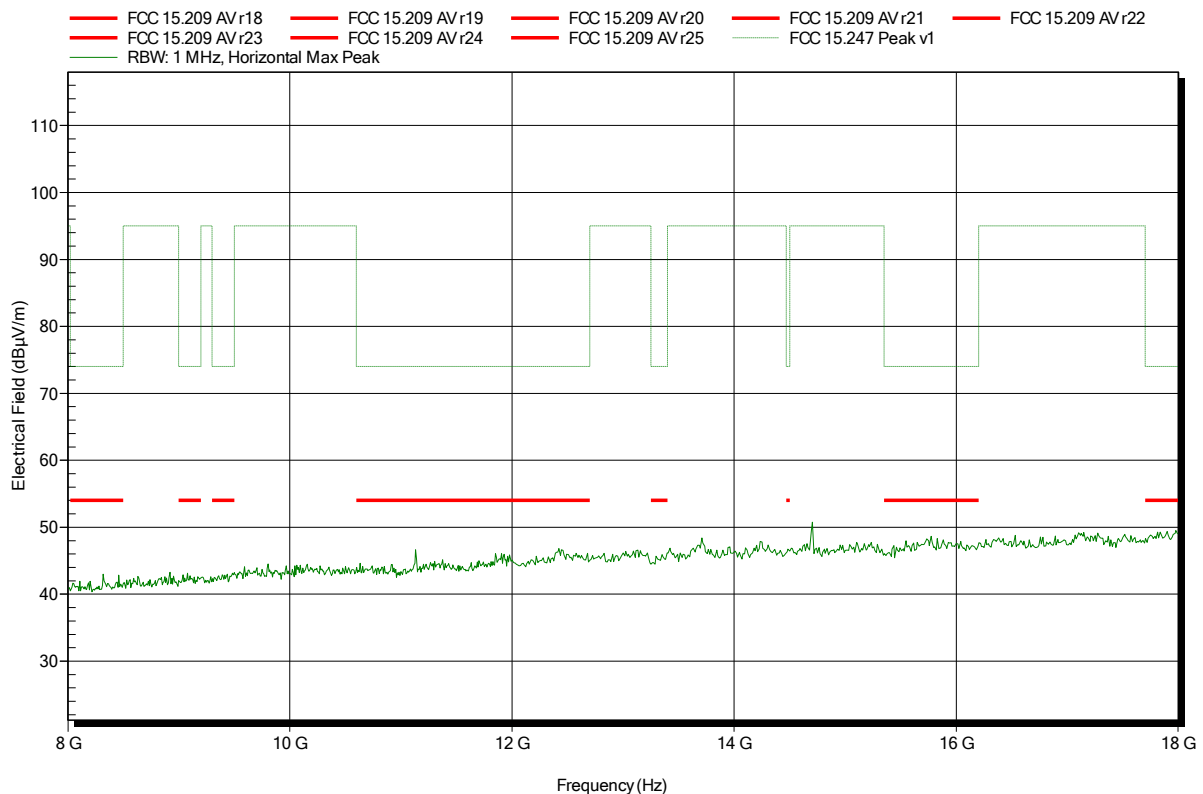


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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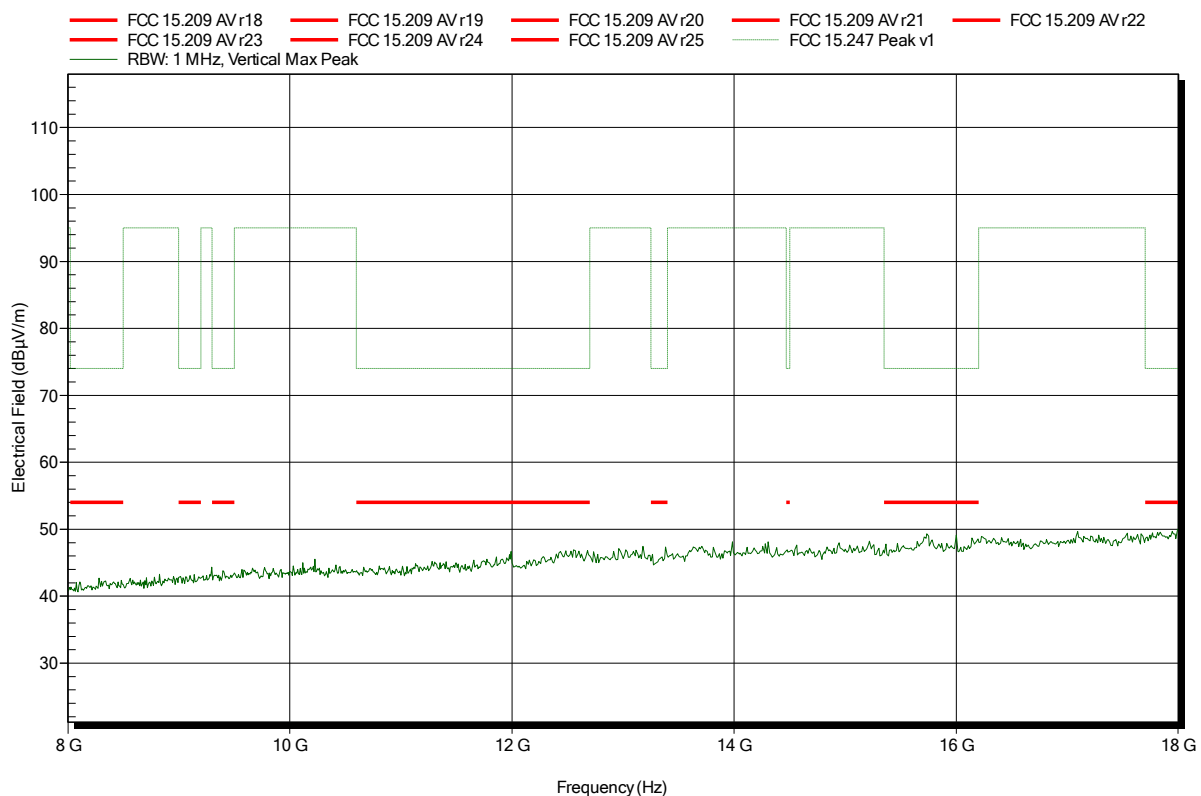


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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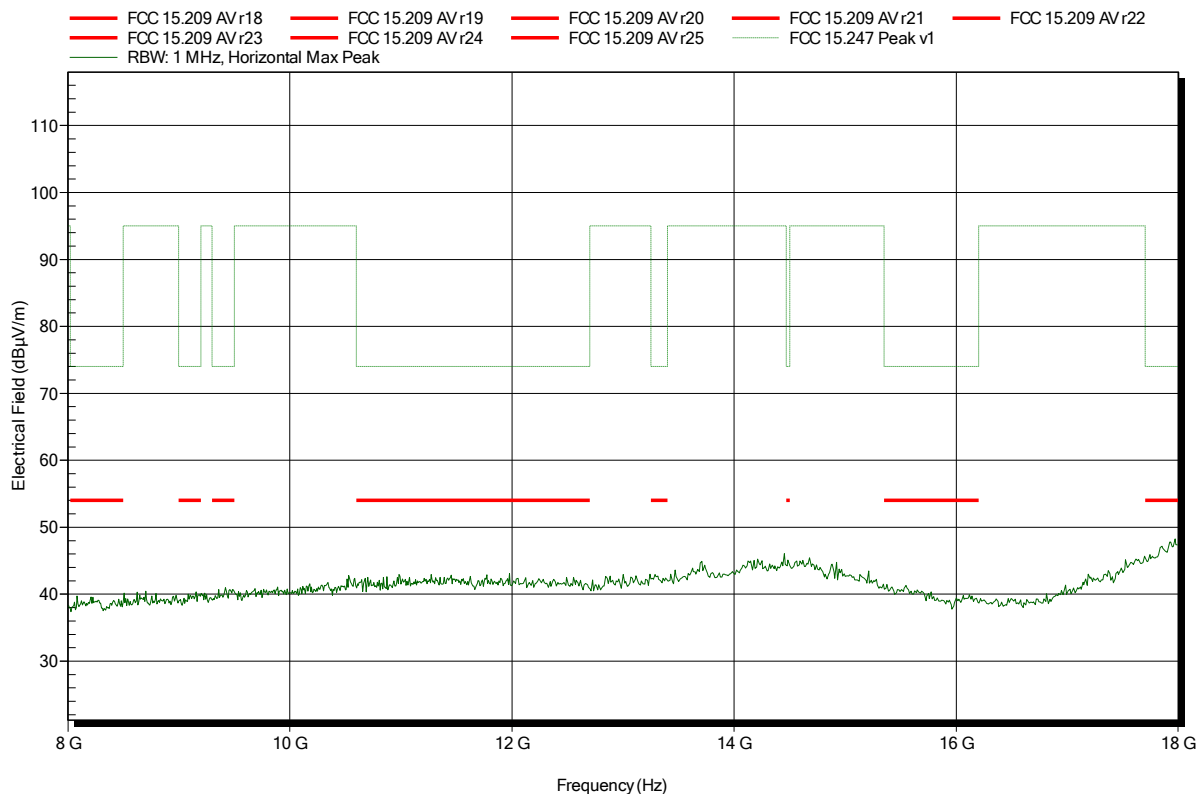


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-23
 Note:

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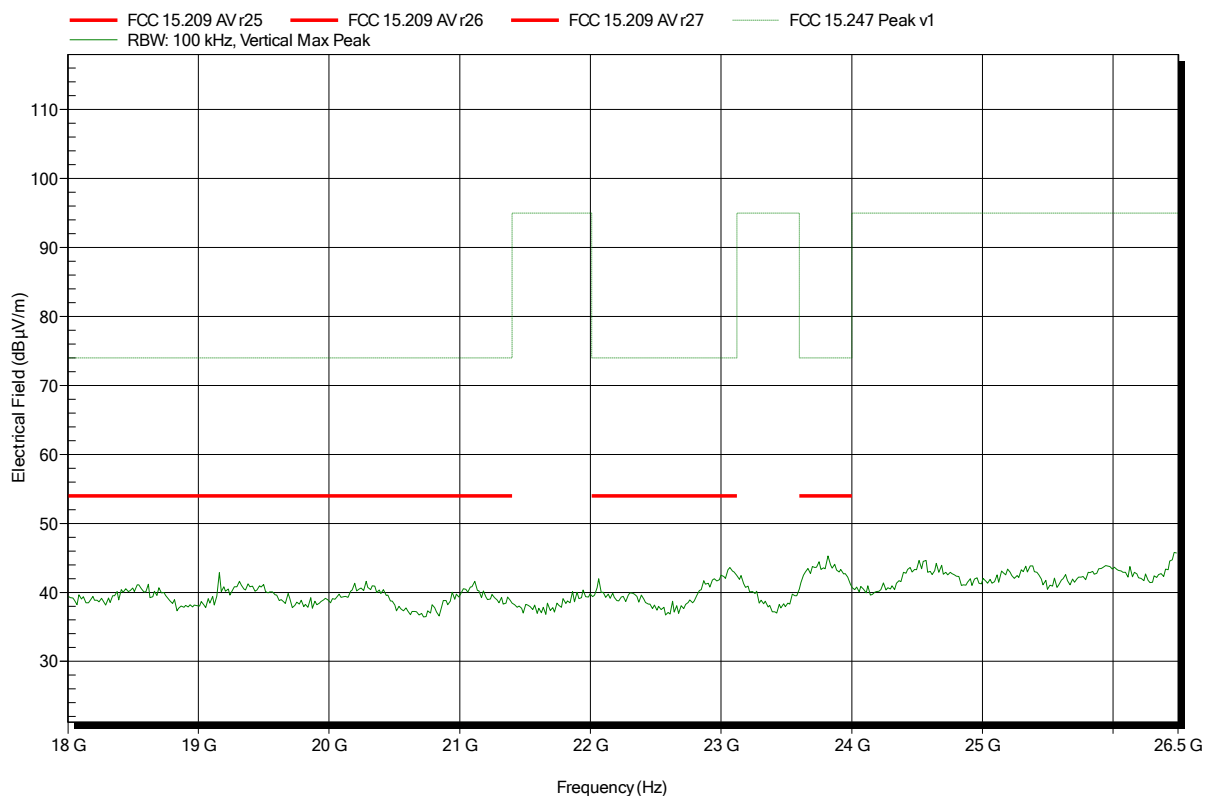


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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Test Report No.: G0M-1505-4775-TFC247ZBS-V01

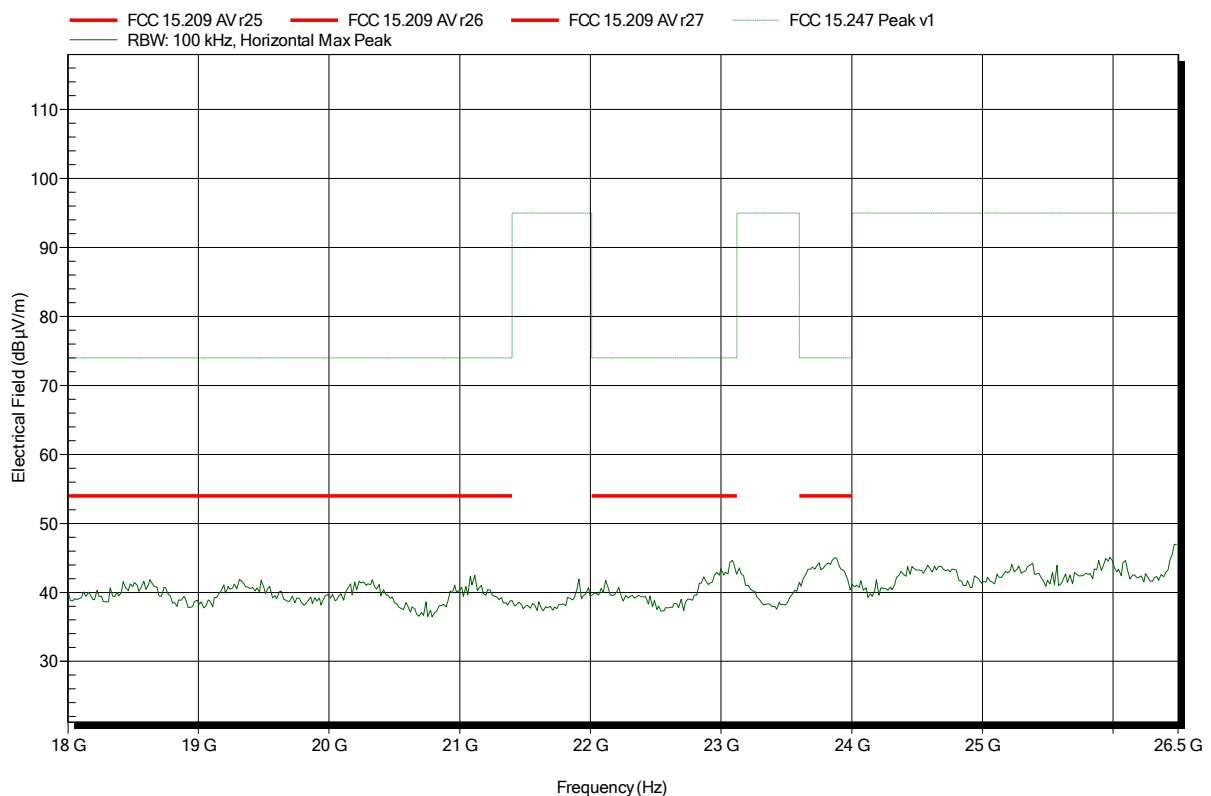
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 11, 2405 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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Test Report No.: G0M-1505-4775-TFC247ZBS-V01

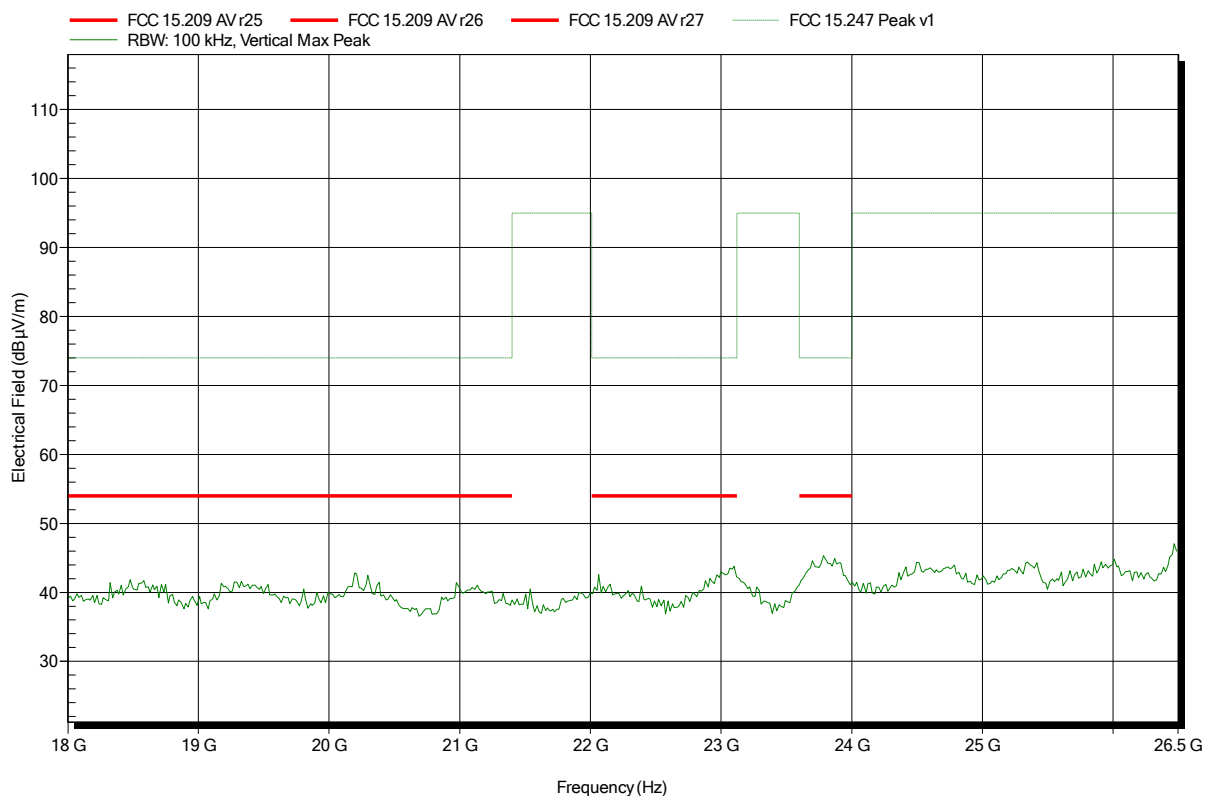
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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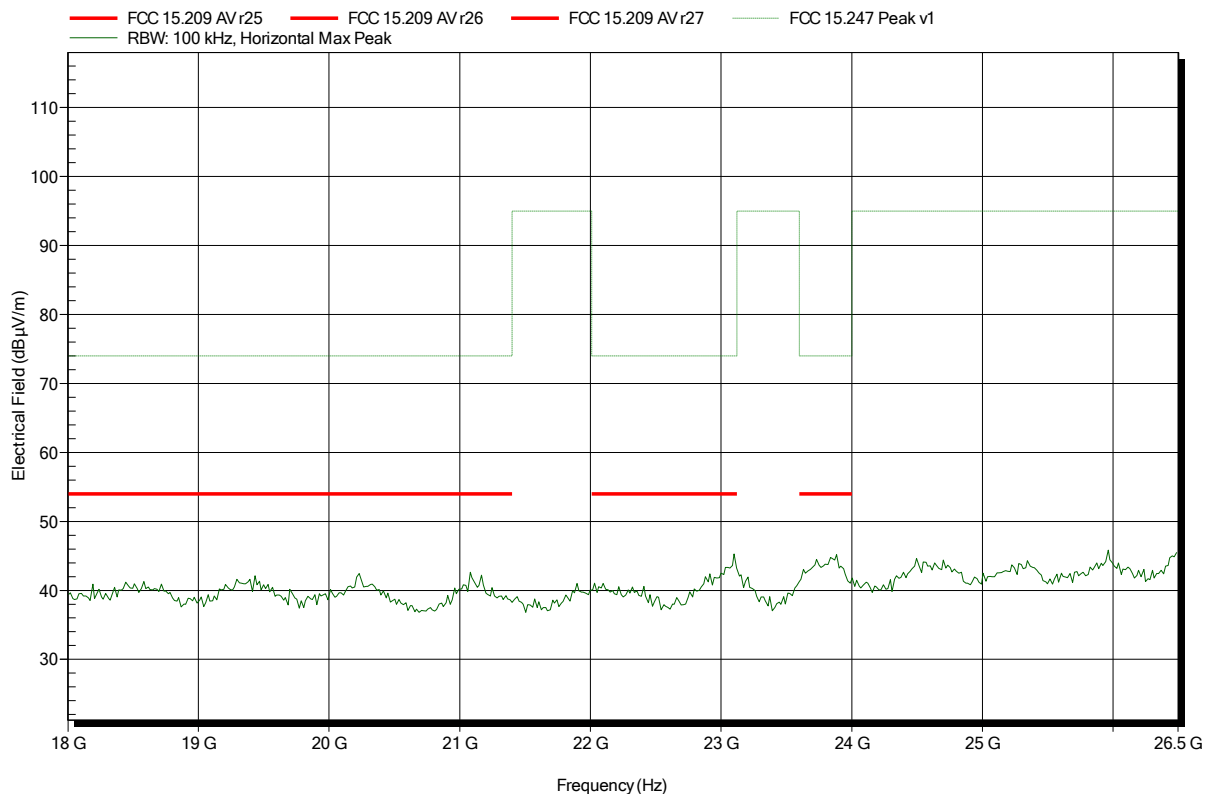


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 20, 2450 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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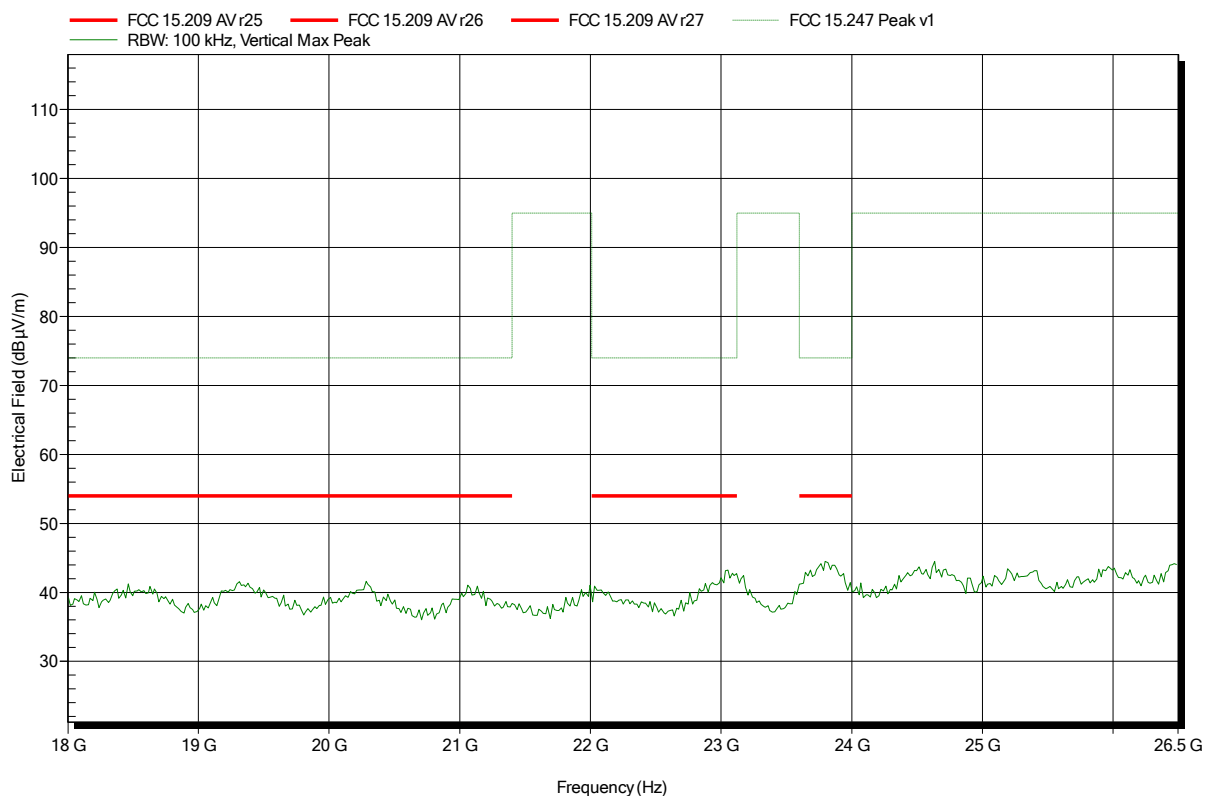


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-24
 Note:

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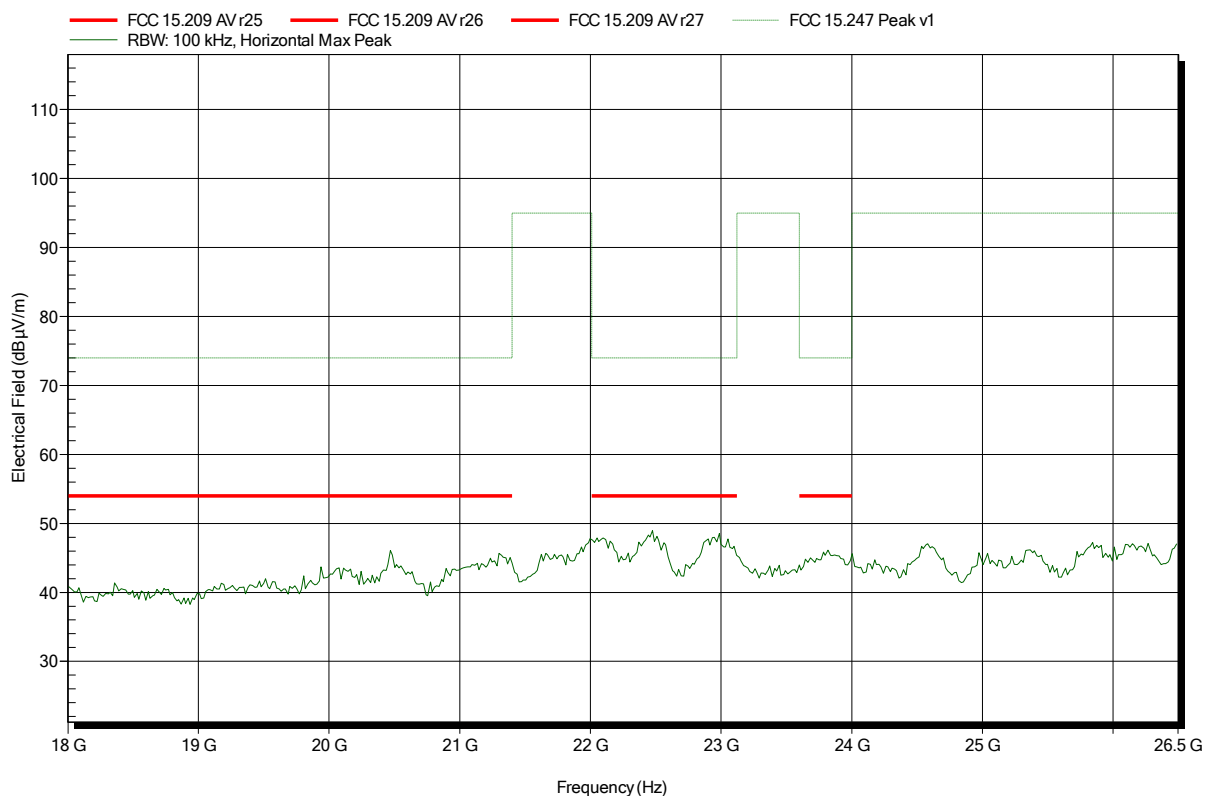


Spurious emissions according to FCC 15.247, RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: TX; IEEE 802.15.4, Ch. 26, 2480 MHz, 250 kbps
 Test Date: 2015-11-23
 Note:

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Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

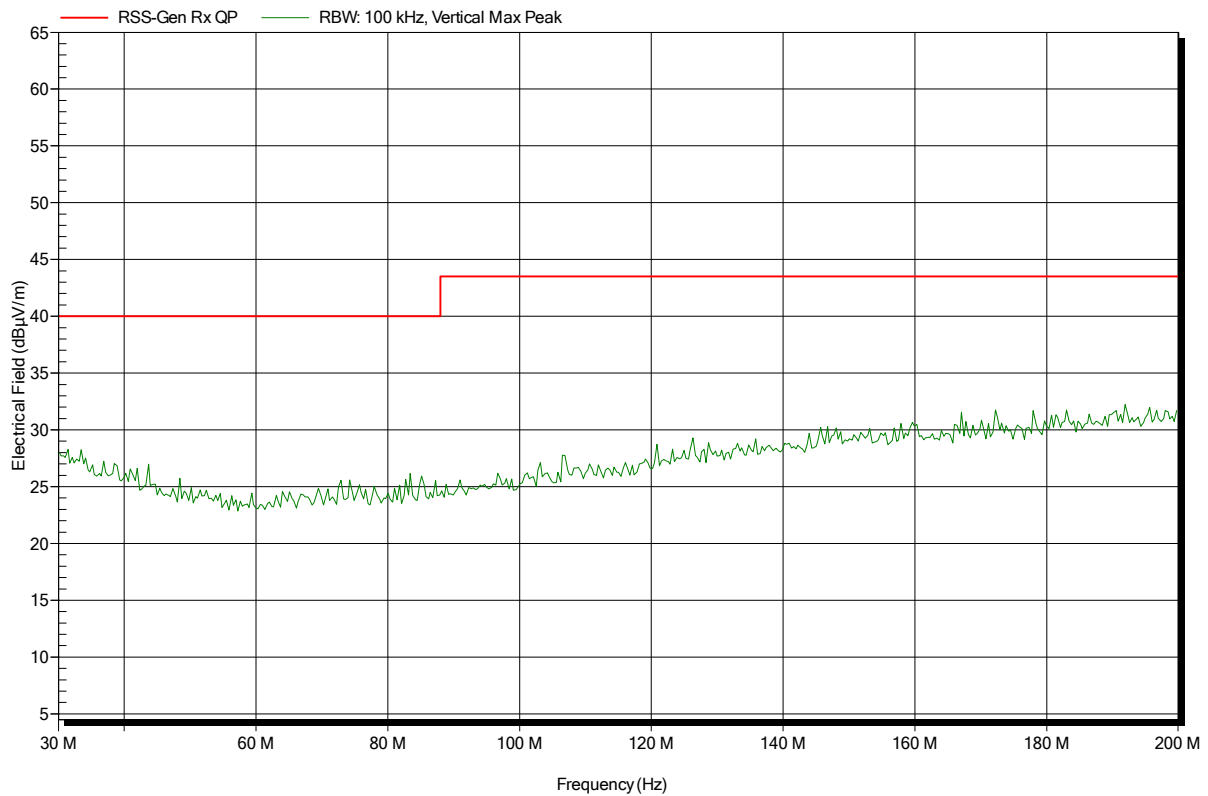
ANNEX B Receiver radiated spurious emissions

Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant:	dresden elektronik ingenieurtechnik gmbh
EUT Name:	ATSAMR21 ZLL Module
Model:	ATSAMR21B18-MZ210PA
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Pudell
Test Conditions:	Tnom: 24°C, Vnom: 5.0 VDC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
Test Date:	2015-11-24
Note:	

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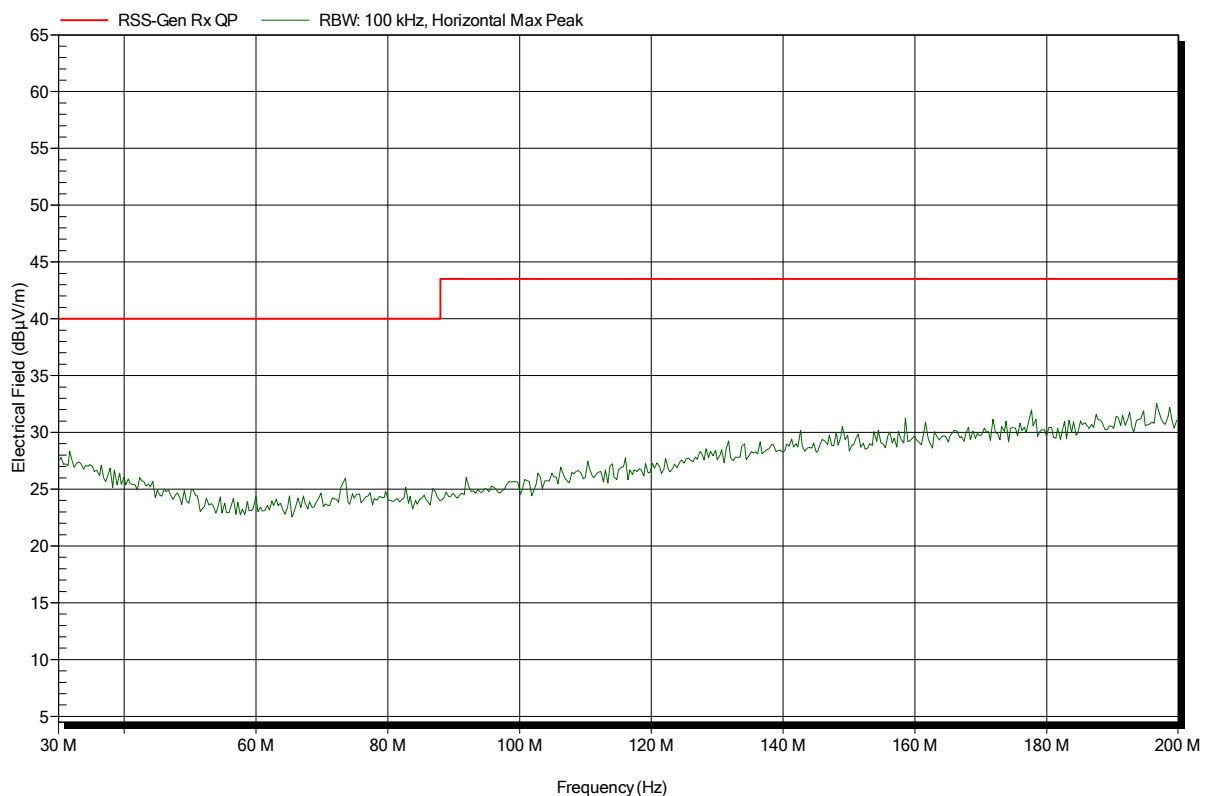


Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HK 116, Horizontal
 Measurement distance: 3 m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

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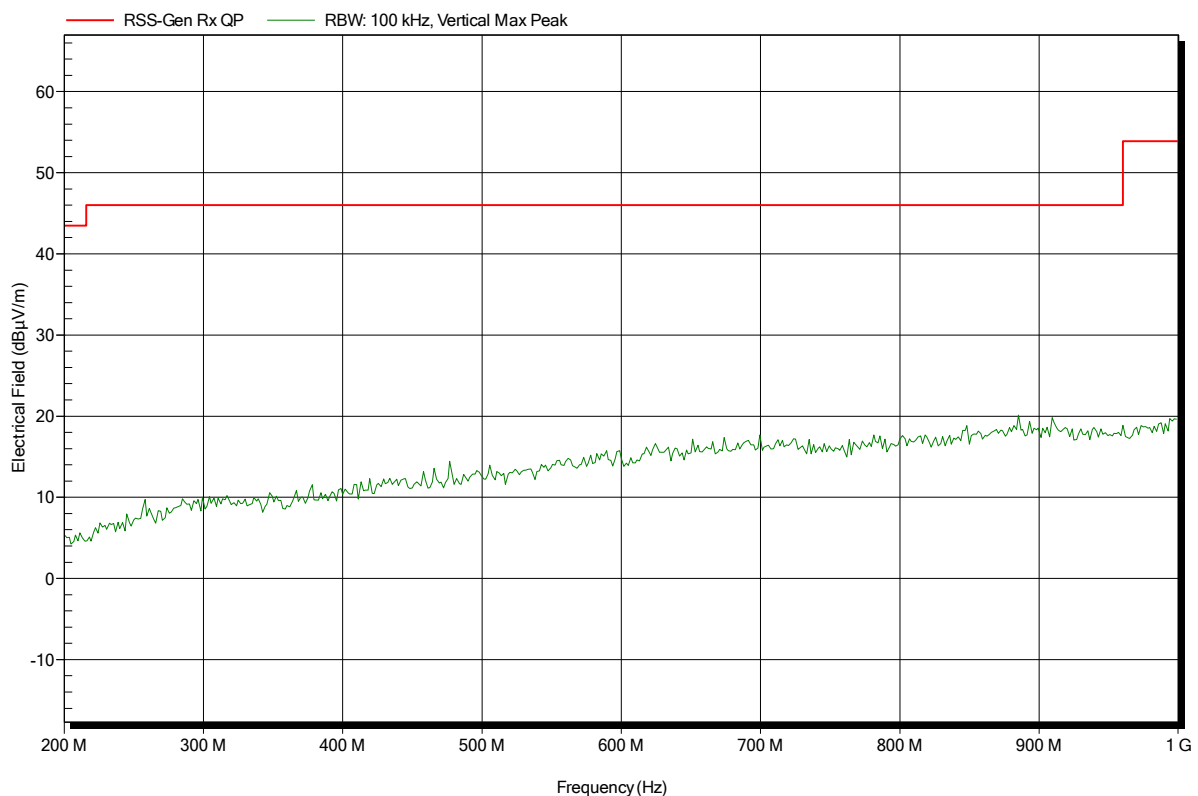


Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223, Vertical
 Measurement distance: 3 m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

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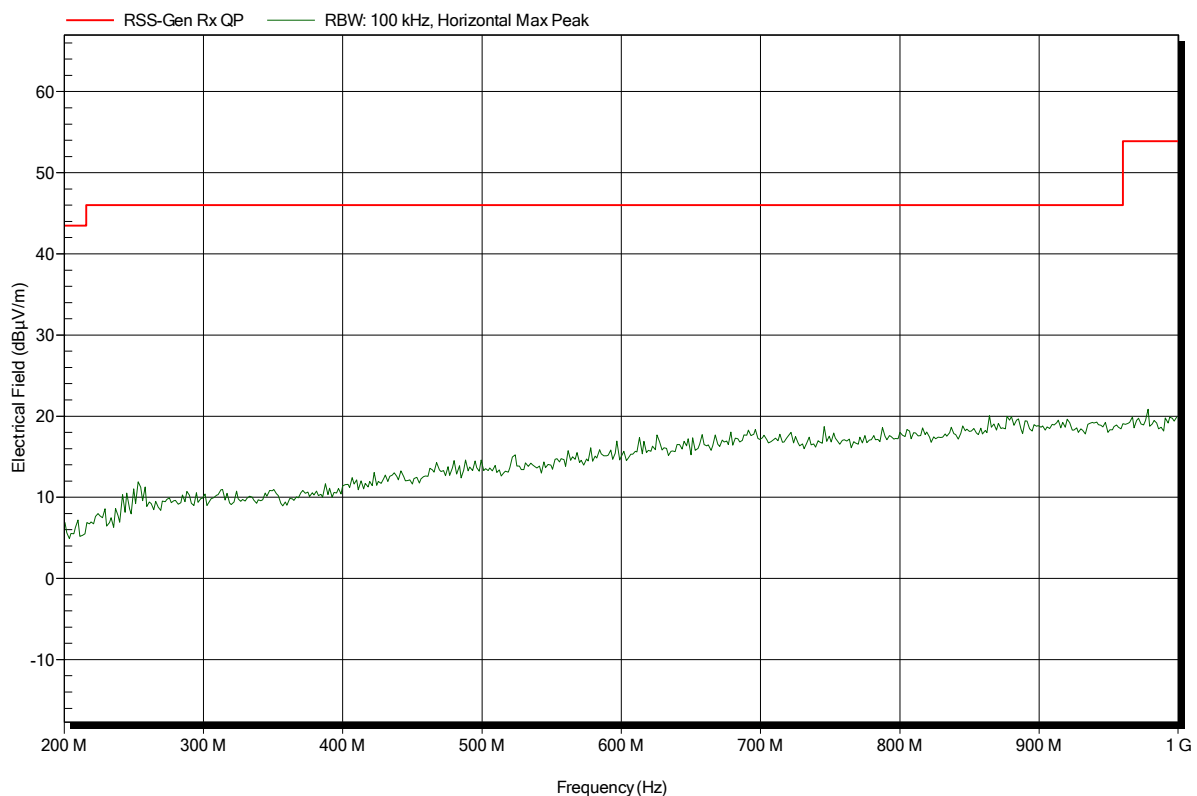


Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement distance: 3 m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

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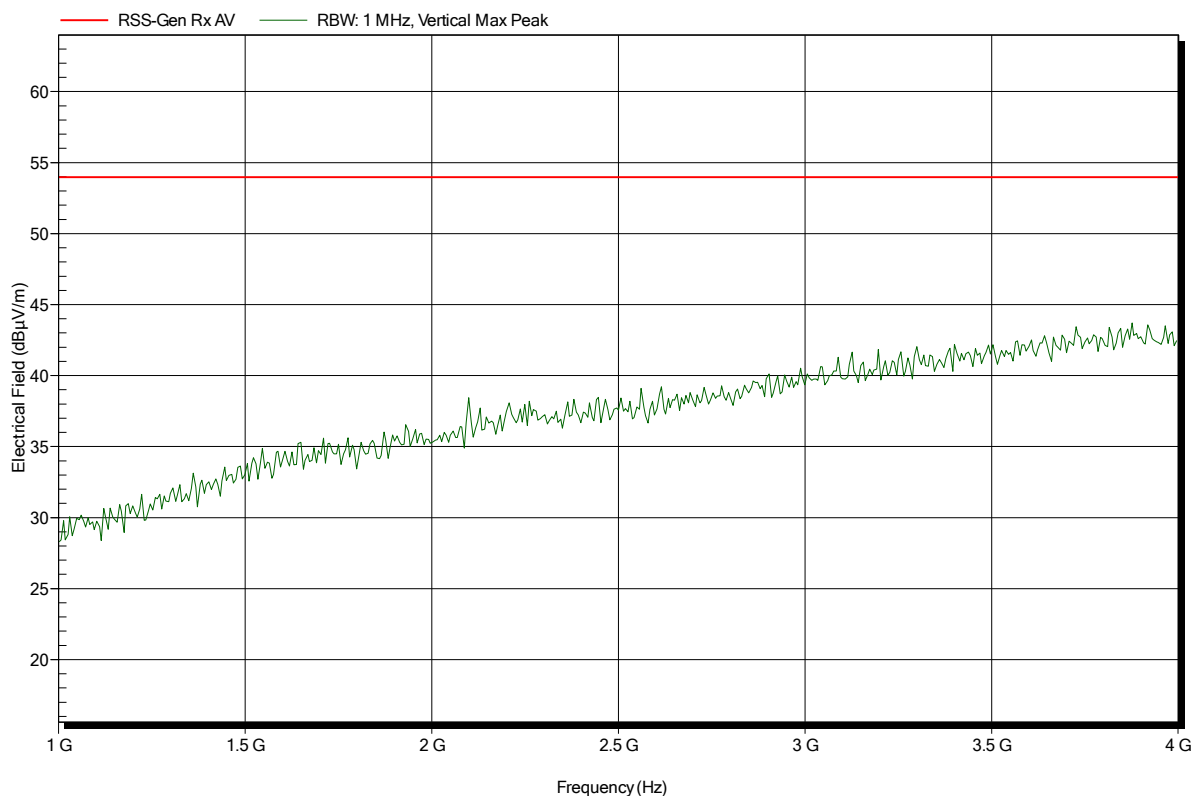


Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

Index 4

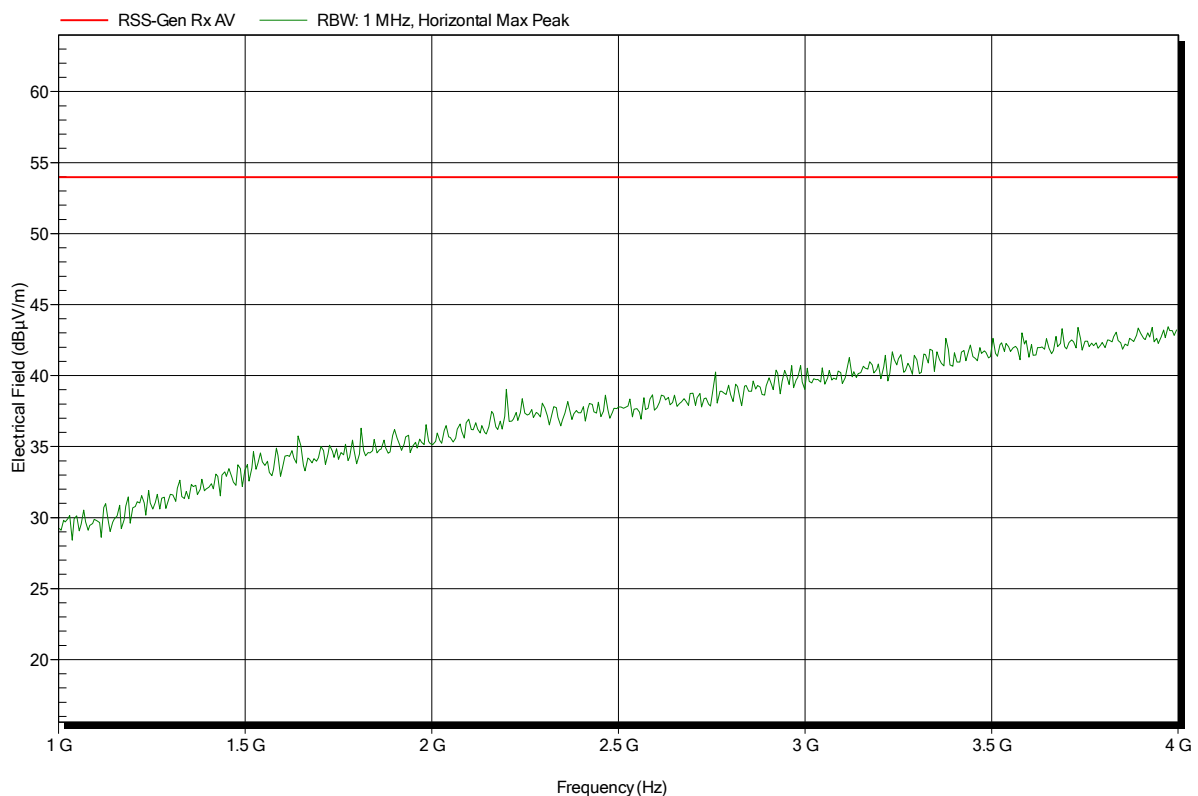


Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

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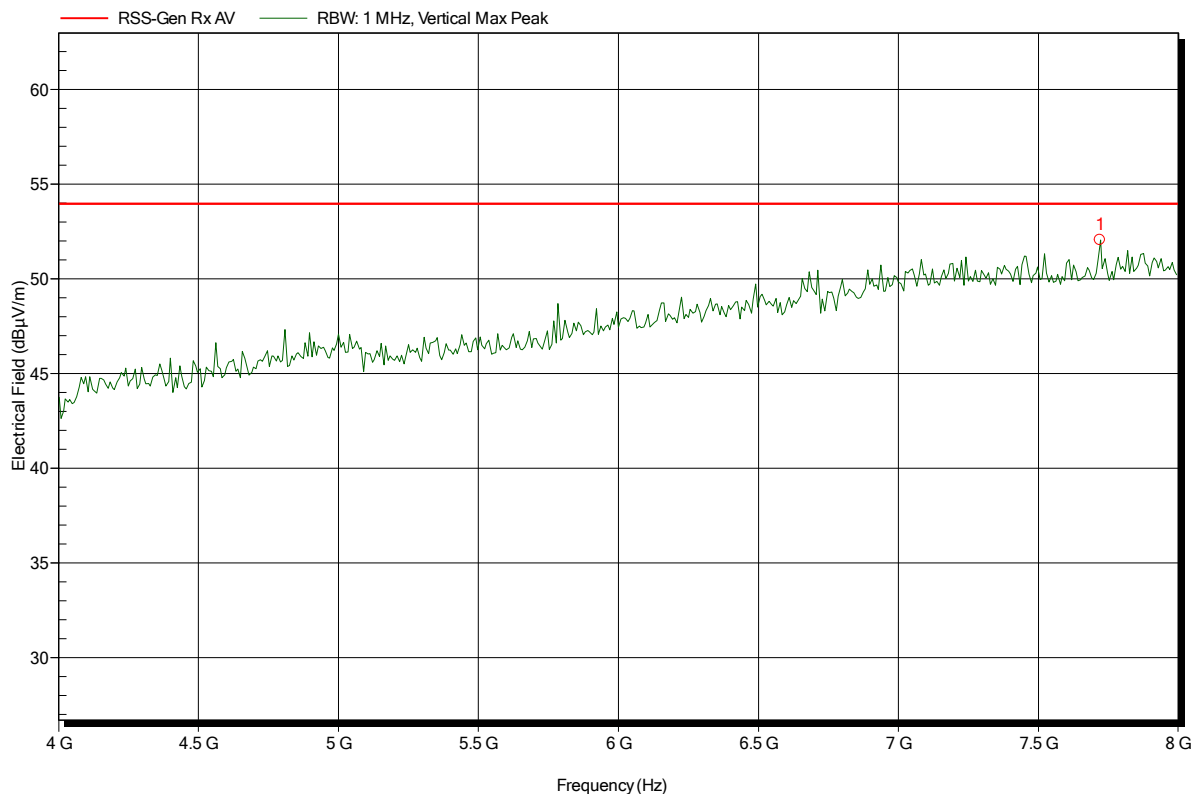


Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 3 m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

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Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.72 GHz	52.05 dBµV/m	53.98 dBµV/m	-1.93 dB	Pass

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

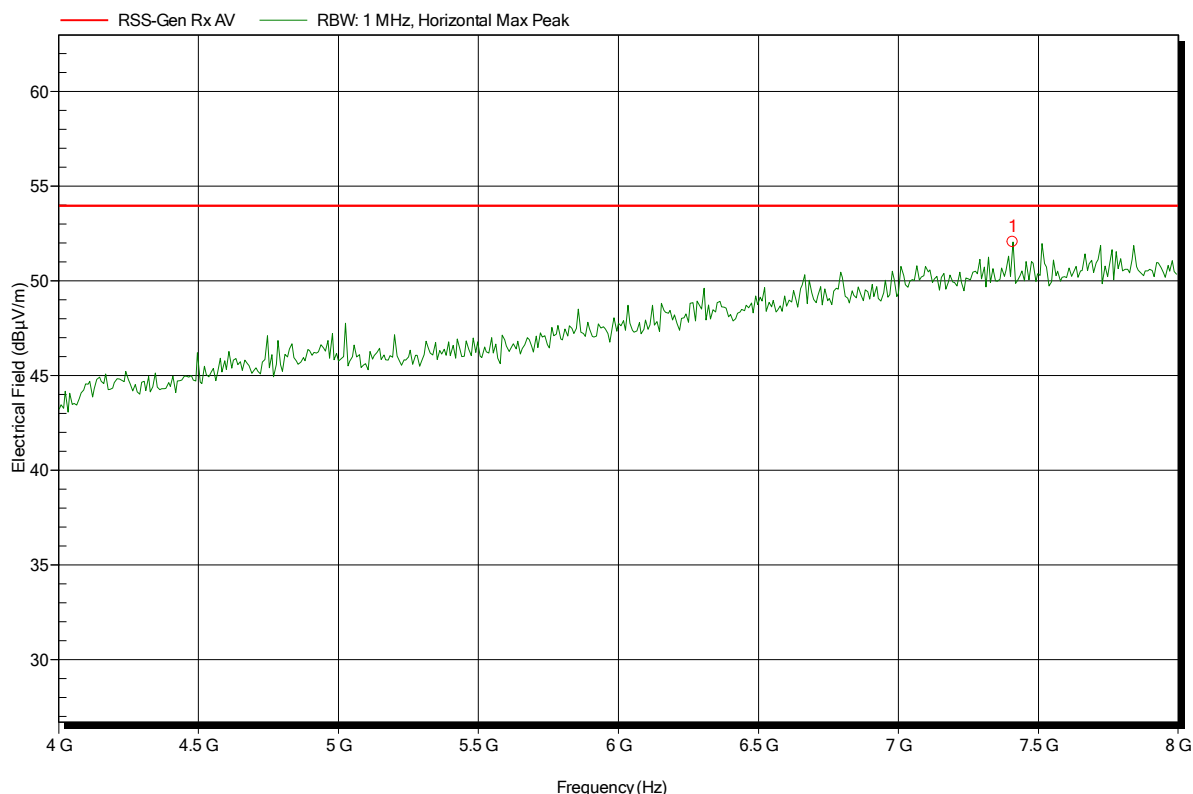
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 3 m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

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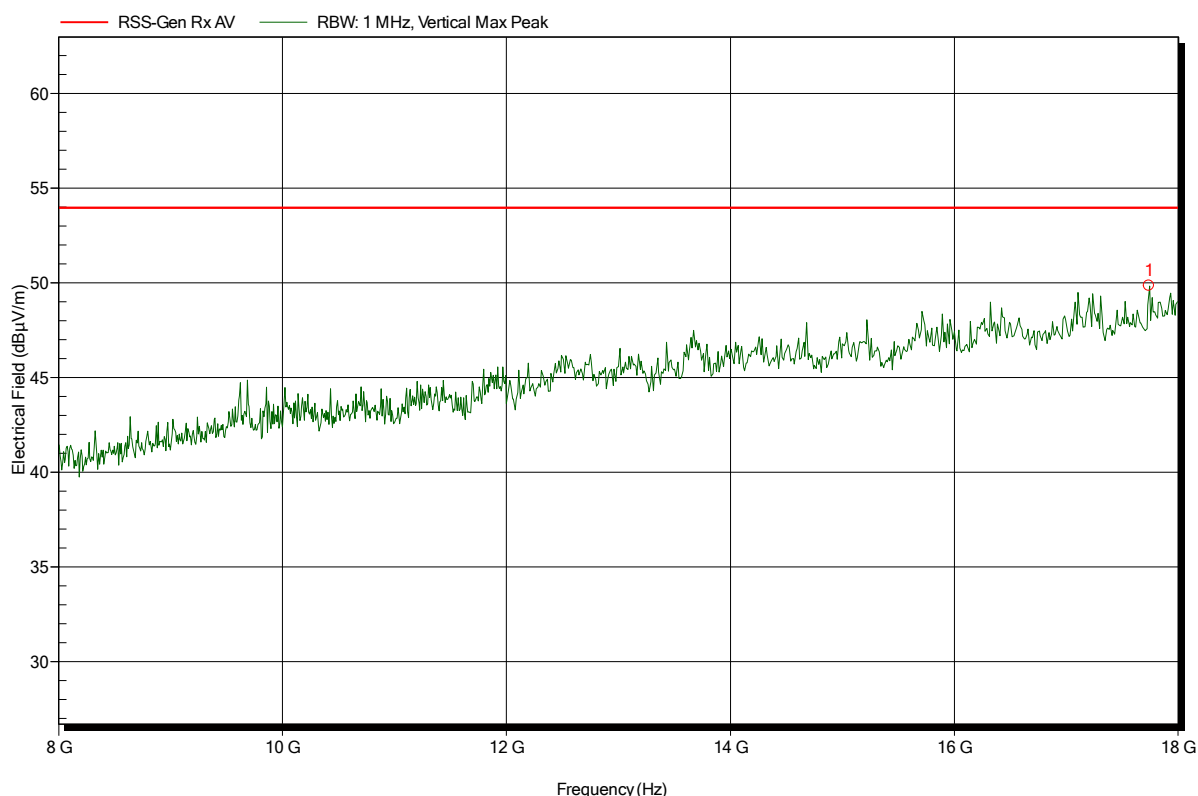
Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.408 GHz	52.06 dBµV/m	53.98 dBµV/m	-1.92 dB	Pass

Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Vertical
 Measurement distance: 1 m converted to 3m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

Index 1



Frequency	Peak	Peak Limit	Peak Difference	Status
17.736 GHz	49.86 dBµV/m	53.98 dBµV/m	-4.12 dB	Pass

Test Report No.: G0M-1505-4775-TFC247ZBS-V01

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

Spurious emissions according to RSS-247 Issue 1

Project number: G0M-1505-4775

Applicant: dresden elektronik ingenieurtechnik gmbh
 EUT Name: ATSAMR21 ZLL Module
 Model: ATSAMR21B18-MZ210PA
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Pudell
 Test Conditions: Tnom: 24°C, Vnom: 5.0 VDC
 Antenna: Rohde & Schwarz HL 025, Horizontal
 Measurement distance: 1 m converted to 3m
 Mode: RX; IEEE 802.15.4, Ch. 20, 2450 MHz, Receive- mode
 Test Date: 2015-11-24
 Note:

Index 2

