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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-1201-1705-TFC247W-V03
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 ..... :	Leica Geosystems AG
Address ..... :	Heinrich Wild Strasse 1 9435 Heerbrugg SWITZERLAND
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	VIPER Radio Modul 300m
Model No.	785828
Hardware version	v2
Firmware / Software version	U
	FCC-ID: RFD-CT300 IC: 3177A-CT300
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 ..... :	2012-03-19	
Date (s) of performance of tests ..... :	2012-09-04 - 2012-09-05	
Compiled by ..... :	Christian Weber	
Tested by (+ signature)..... : (Testing Manager)	Wilfried Treffke	.....
Approved by (+ signature) ..... : (Test Lab Manager)	Jens Zimmermann	.....
Date of issue ..... :	2012-10-19	
Total number of pages ..... :	78	

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:

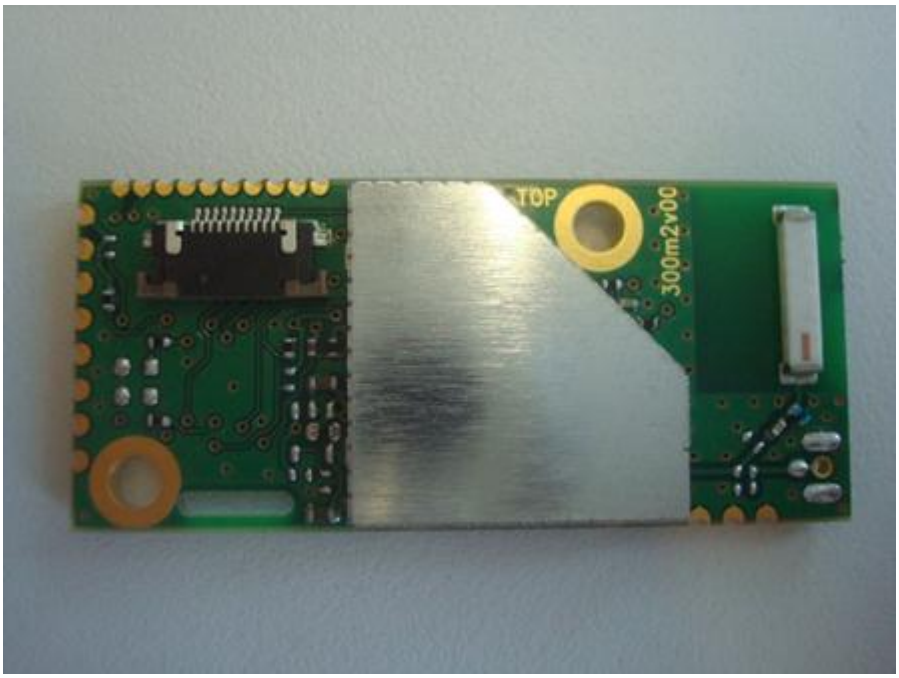
REPORT INDEX

1 Equipment (Test item) Description

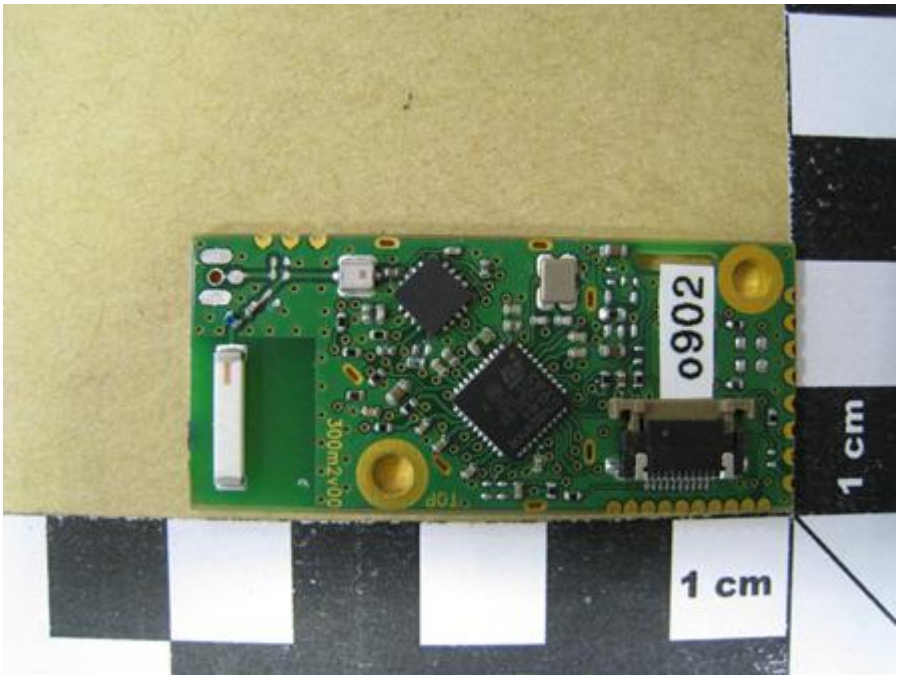
Description	VIPER Radio Modul 300m	
Model	785828	
Serial number	None	
Hardware version	v2	
Software / Firmware version	U	
FCC-ID	RFD-CT300	
IC	3177A-CT300	
Equipment type	Radio module	
Radio type	Transceiver	
Radio technology	IEEE 802.15.4 (Zigbee)	
Operating frequency range	2405 - 2475 MHz	
Assigned frequency band	2400 - 2483.5 MHz	
Main test frequencies	F_{LOW}	2405 MHz
	F_{MID}	2440 MHz
	F_{HIGH}	2475 MHz
Spreading	DSSS	
Modulations	O-QPSK	
Number of channels	15 (11 - 25)	
Channel spacing	5MHz	
Number of antennas	1	
Antenna	Type	integrated
	Model	2450AT45A100
	Manufacturer	Johanson Technologies, Inc.
	Gain	3.0 dBi
Manufacturer	Leica Geosystems AG Heinrich Wild Strasse 1 9435 Heerbrugg SWITZERLAND	
Power supply	V_{NOM}	3.15 VDC
	V_{MIN}	3.0 VDC
	V_{MAX}	3.3 VDC
AC/DC-Adaptor	Model	N/A
	Vendor	N/A
	Input	N/A
	Output	N/A

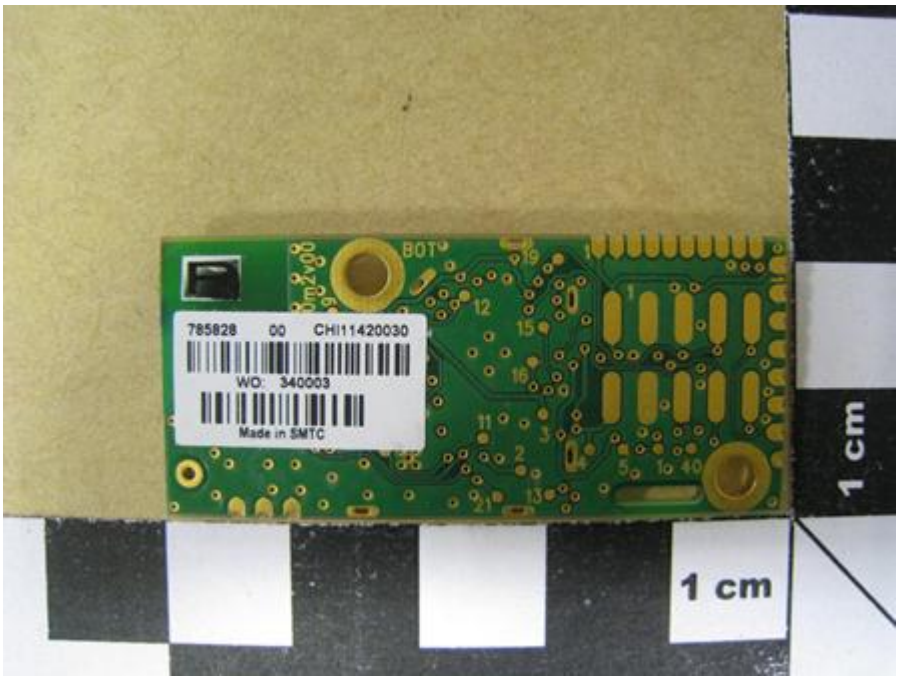
1.1 Photos – Equipment External

EUT WITH EVALUATION BOARD


EUT TOP WITH SHIELDING


1.2 Photos – Equipment internal

EUT TOP


EUT BOTTOM


1.3 Photos – Test setup

RADIATED EMISSIONS


CONDUCTED EMISSIONS


1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
None				

***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	
ZIGBEE	General conditions:	EUT powered by laboratory power supply.
	Radio conditions:	Mode = standalone transmit Spreading = DSSS Modulation = O-QPSK Data rate = 250 kbps Duty cycle = 100 % Power level = Maximum (11 dBm)
Receive	General conditions:	EUT powered by laboratory power supply.
	Radio conditions:	Mode = standalone receive Spreading = DSSS
AC-Powerline	General conditions:	EUT powered by commercial AC/DC-Adapter
	Radio conditions:	Mode = standalone transmit Spreading = DSSS Power level = Maximum (11dBm)

1.6 Test Equipment Used During Testing

Occupied Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2011-12	2012-12

6dB Bandwidth					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2011-12	2012-12

Maximum peak conducted power					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2011-12	2012-12

Power spectral density					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2011-12	2012-12

Band edge compliance					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2011-12	2012-12

Conducted spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	R&S	FSP 30	EF00312	2011-12	2012-12

Radiated spurious emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Semi-anechoic chamber	Frankonia	AC 5	EF00395	-	-
Spectrum Analyzer	R&S	FSIQ26	EF00151	2011-11	2012-11
Biconical Antenna	R&S	HK 116	EF00012	2010-01	2013-01
LPD Antenna	R&S	HL 223	EF00187	2011-02	2014-02
LPD Antenna	R&S	HL 025	EF00327	2010-02	2013-02

AC powerline conducted emissions					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	R&S	ESH2-Z5	EF00182	2010-09	2012-09
AMN	R&S	ESH3-Z5	EF00036	2010-11	2012-11
EMI Test Receiver	R&S	ESCS 30	EF00295	2012-08	2013-08

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:

Reading on Analyzer (dBµV) + A.F. (dB) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading	+	AF	=	Net Reading	:	Net reading - FCC limit	= Margin
21.5 dBµV	+	26 dB	=	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-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	Informational only
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	PASS	
Remarks:				

3 Test Conditions and Results

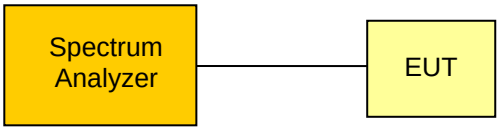
3.1 Test Conditions and Results – Occupied Bandwidth

Occupied Bandwidth acc. IC RSS-Gen	**Verdict: PASS**
Test according to measurement reference	Reference Method
	RSS-Gen 4.6.1
Test frequency range	Tested frequencies
	F_{LOW} / F_{MID} / F_{HIGH}

Limits

None (Informational only)

Test setup



Test procedure

1. EUT set to test mode (Communication tester is used if needed)
2. Span set to at least twice the emission spectrum
3. Resolution bandwidth set to 1 % of span
4. Occupied Bandwidth (99 %) measurement with spectrum analyzer built in measurement function

Test results

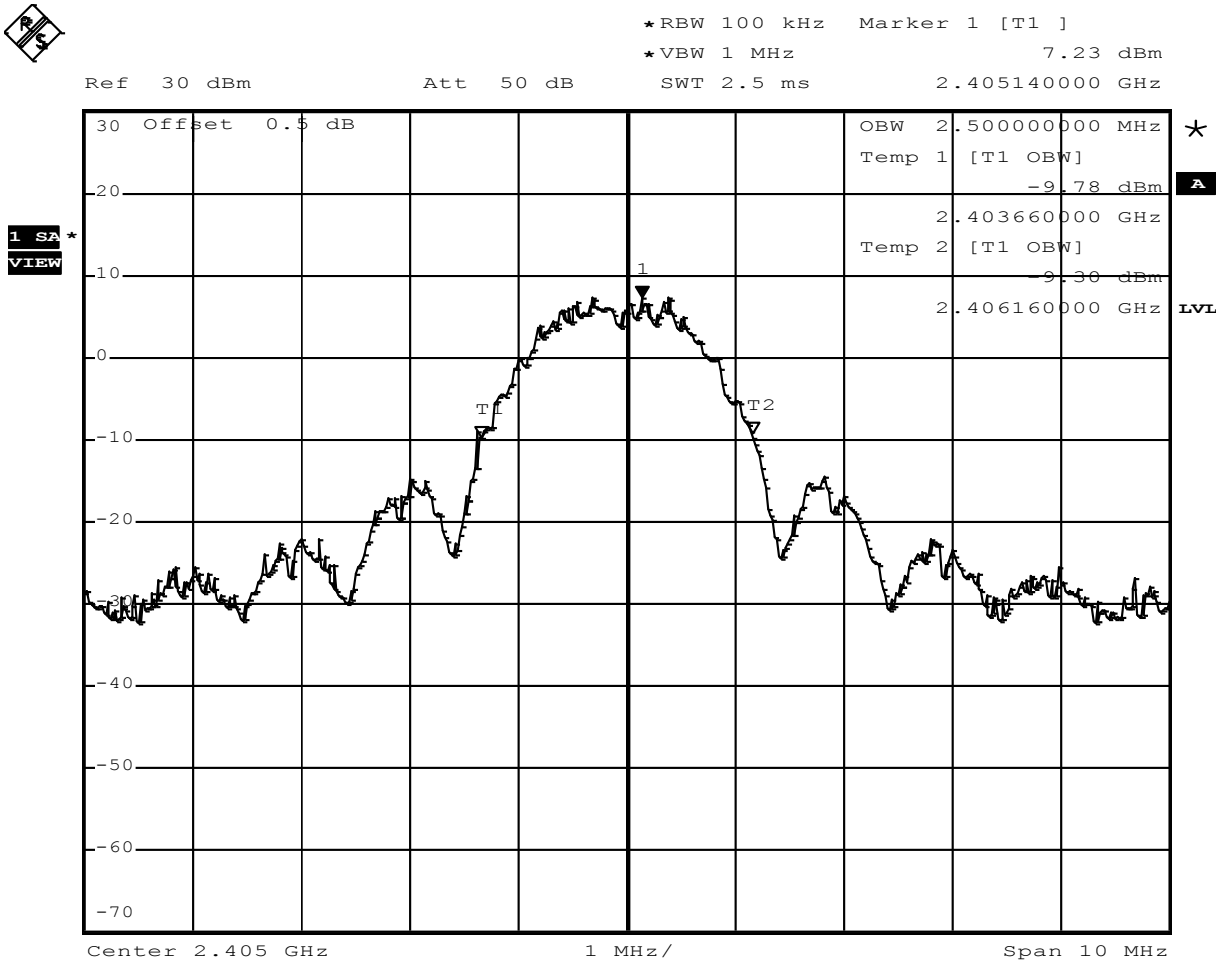
Channel	Frequency [MHz]	Mode	Occupied Bandwidth [MHz]
F_{LOW}	2405	ZIGBEE	2.500
F_{MID}	2440	ZIGBEE	2.520
F_{HIGH}	2475	ZIGBEE	2.520

Comments:

Occupied Bandwidth – ZIGBEE F_{LOW}

RSS Gen
Occupied Bandwidth

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, Vnom
Test Site / Operator	Eurofins Product Service GmbH, Mr. Treffke
Test Specification	4.4.1 Occupied Bandwidth
Comment 1	Channel.: 2405 MHz
Comment 2	A spectrum analyzer with an integrated 99% power bandwidth function is used
Comment 3	pass

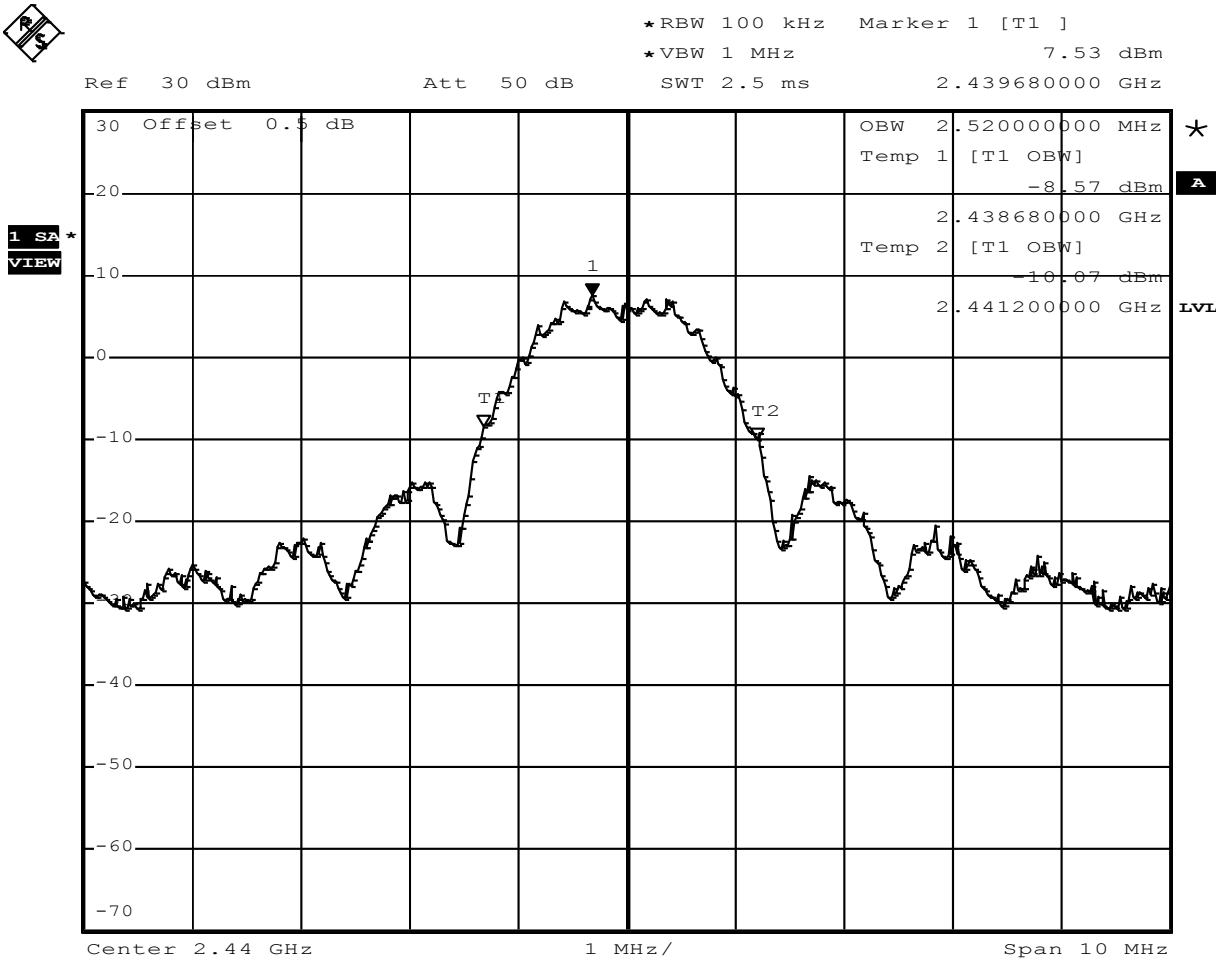


Comment: Occupied bandwidth: 2500 KHz
Date: 5.SEP.2012 10:33:19

Occupied Bandwidth – ZIGBEE F_{MID}

RSS Gen
Occupied Bandwidth

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, Vnom
Test Site / Operator	Eurofins Product Service GmbH, Mr. Treffke
Test Specification	4.4.1 Occupied Bandwidth
Comment 1	Channel.: 2440 MHz
Comment 2	A spectrum analyzer with an integrated 99% power bandwidth function is used
Comment 3	pass

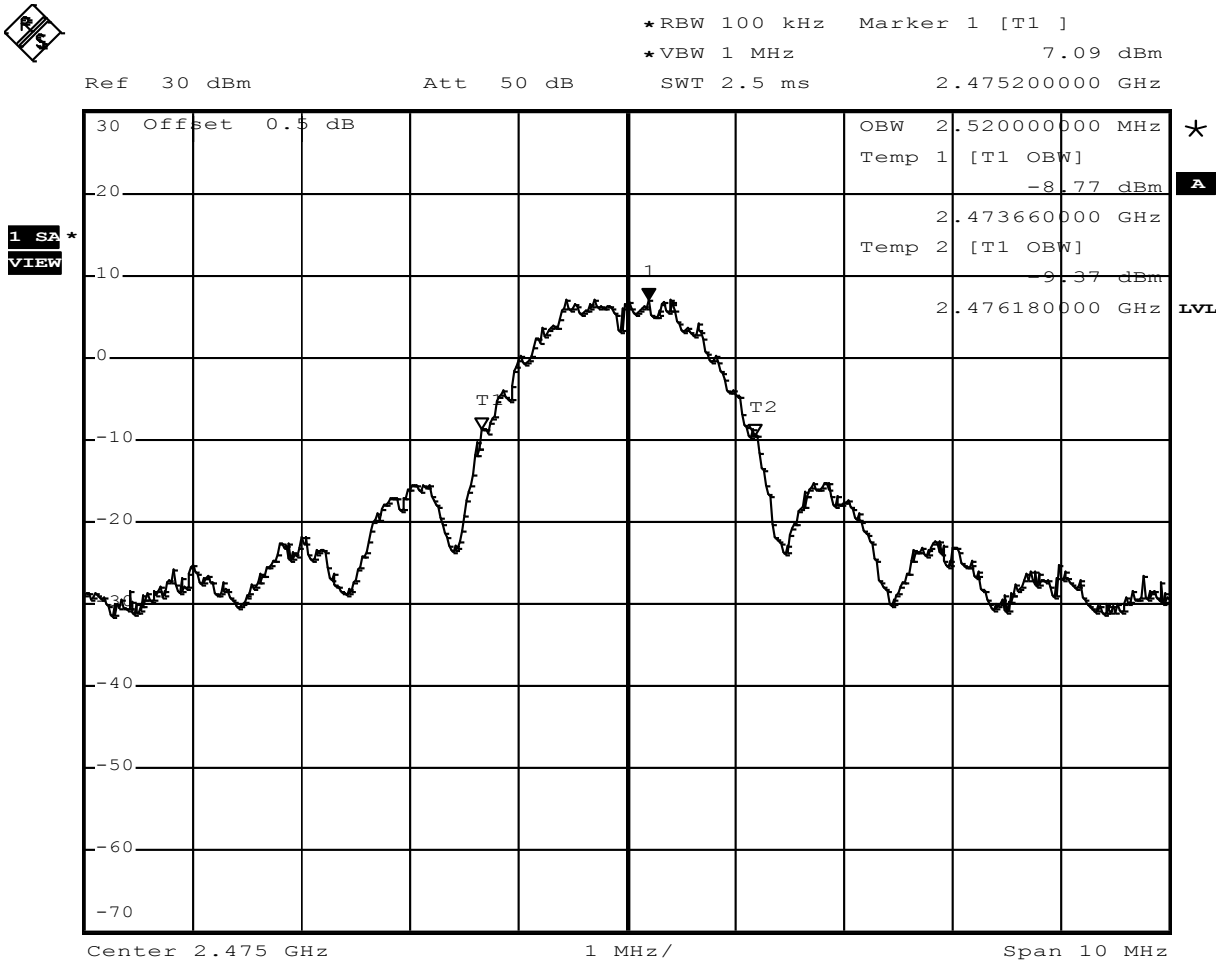


Comment: Occupied bandwidth: 2520 KHz
Date: 5.SEP.2012 10:35:39

Occupied Bandwidth – ZIGBEE F_{HIGH}

RSS Gen
Occupied Bandwidth

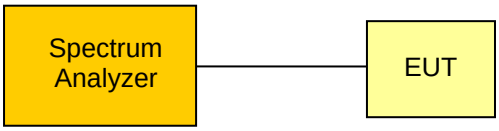
EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, Vnom
Test Site / Operator	Eurofins Product Service GmbH, Mr. Treffke
Test Specification	4.4.1 Occupied Bandwidth
Comment 1	Channel.: 2475 MHz
Comment 2	A spectrum analyzer with an integrated 99% power bandwidth function is used
Comment 3	pass



Comment: Occupied bandwidth: 2520 KHz
Date: 5.SEP.2012 10:37:05

3.2 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
	F_{LOW} / F_{MID} / F_{HIGH}
Limits	
≥ 500kHz	
Test setup	



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

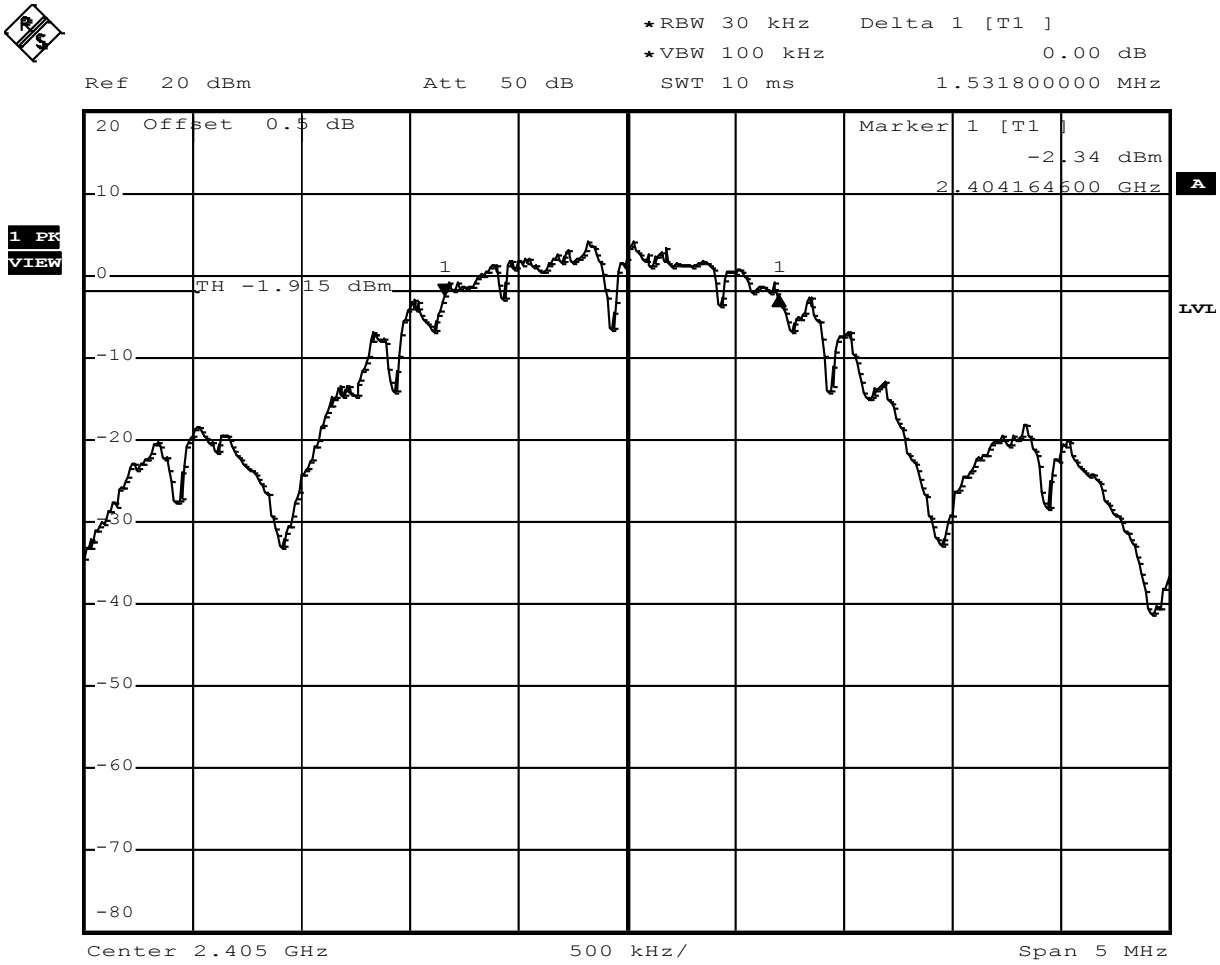
Channel	Frequency [MHz]	Mode	6 dB Bandwidth [kHz]	Limit [kHz]	Result
F_{LOW}	2405	ZIGBEE	1531.8	500	PASS
F_{MID}	2440	ZIGBEE	1530.6	500	PASS
F_{HIGH}	2475	ZIGBEE	1532.8	500	PASS

Comments:

6 dB Bandwidth – ZIGBEE F_{LOW}

FCC part 15.247 (a)2
Minimum 6 dB Bandwidth

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, 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	Channel : 2405 MHz, power level 11dBm
Comment 3	pass

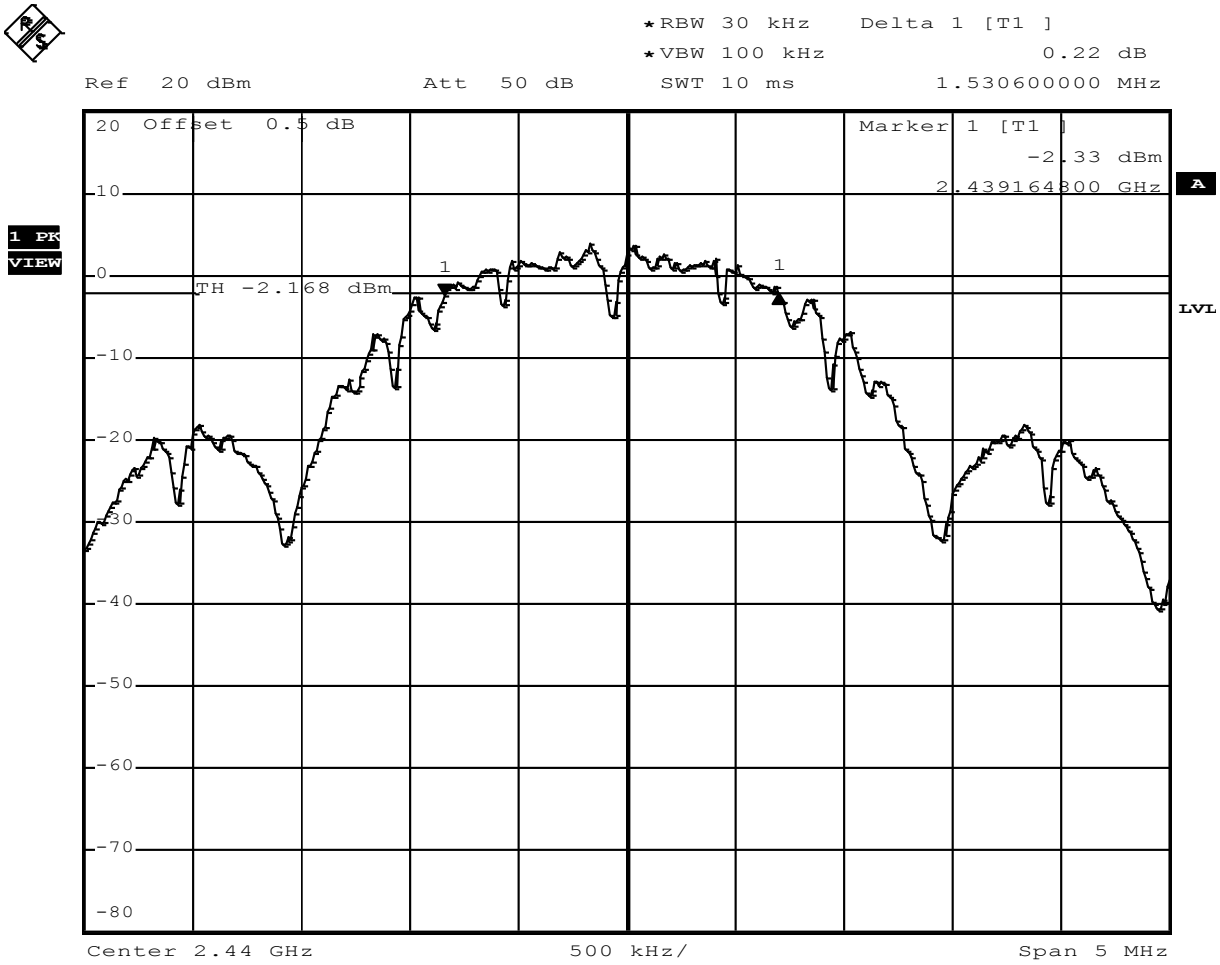


Comment: 6 dB bandwidth: 1531.8 KHz > 500 KHz; verdict: PASS
Date: 5.SEP.2012 10:07:18

6 dB Bandwidth – ZIGBEE F_{MID}

FCC part 15.247 (a)2
Minimum 6 dB Bandwidth

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, 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	Channel : 2440 MHz, power level 11dBm
Comment 3	pass

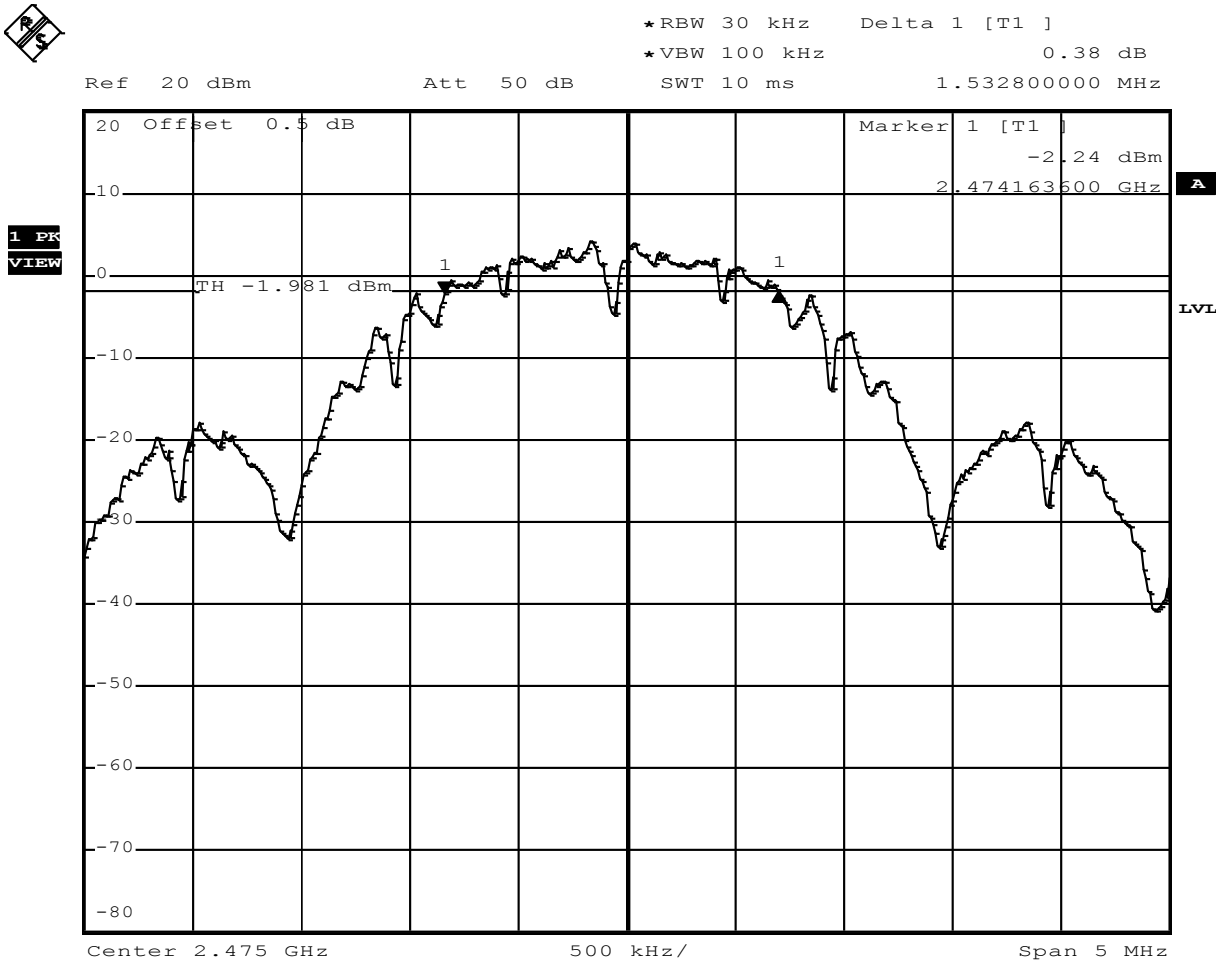


Comment: 6 dB bandwidth: 1530.6 KHz > 500 KHz; verdict: PASS
Date: 5.SEP.2012 10:09:47

6 dB Bandwidth – ZIGBEE F_{HIGH}

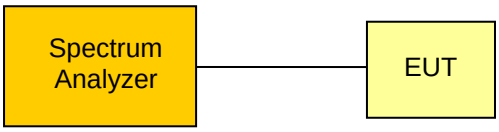
FCC part 15.247 (a)2
Minimum 6 dB Bandwidth

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, 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	Channel : 2475 MHz, power level 11dBm
Comment 3	pass



Comment: 6 dB bandwidth: 1532.8 KHz > 500 KHz; verdict: PASS
Date: 5.SEP.2012 10:12:05

3.3 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
	F_{LOW} / F_{MID} / F_{HIGH}
Measurement mode	Peak
Maximum antenna gain	3 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	
	
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							
Channel	Frequency [MHz]	Voltage [VDC]	Mode	Peak power [dbm]	Peak power [W]	Limit [dBm]	Margin [dB]
F_{LOW}	2405	V_{NOM} = 3.15	ZIGBEE	10.97	0.0125	30	-19.03
F_{LOW}	2405	V_{MIN} = 3.0	ZIGBEE	10.63	0.0116	30	-19.37
F_{LOW}	2405	V_{MAX} =3.3	ZIGBEE	11.21	0.0132	30	-18.79
F_{MID}	2440	V_{NOM} = 3.15	ZIGBEE	10.88	0.0123	30	-19.12
F_{MID}	2440	V_{MIN} = 3.0	ZIGBEE	10.57	0.0114	30	-19.43
F_{MID}	2440	V_{MAX} =3.3	ZIGBEE	11.09	0.0129	30	-18.91
F_{HIGH}	2475	V_{NOM} = 3.15	ZIGBEE	10.80	0.0120	30	-19.20
F_{HIGH}	2475	V_{MIN} = 3.0	ZIGBEE	10.53	0.0113	30	-19.47
F_{HIGH}	2475	V_{MAX} =3.3	ZIGBEE	10.98	0.0125	30	-19.02
Comments:							

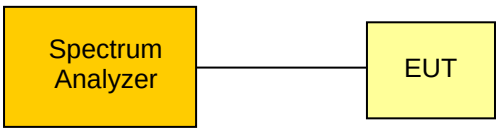
3.4 Test Conditions and Results – Power spectral density

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
	F_{LOW} / F_{MID} / F_{HIGH}
Measurement mode	Peak

Limits

8 dBm / 3 kHz

Test setup



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

Channel	Frequency [MHz]	Test mode	Peak frequency [MHz]	Peak power density [dBm]	Limit [dBm/3kHz]	Margin [dB]
F_{LOW}	2405	ZIGBEE	2405.162	-6.95	8.0	-14.95
F_{MID}	2440	ZIGBEE	2440.174	-7.22	8.0	-15.22
F_{HIGH}	2475	ZIGBEE	2475.067	-7.10	8.0	-15.10

Comments:

3.5 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 15B

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 25°C, Unom: 120 V AC (AC/DC adaptor) / USB
LISN:	ESH2-Z5 N
Mode:	active link
Test Date:	2012-09-21
Note:	

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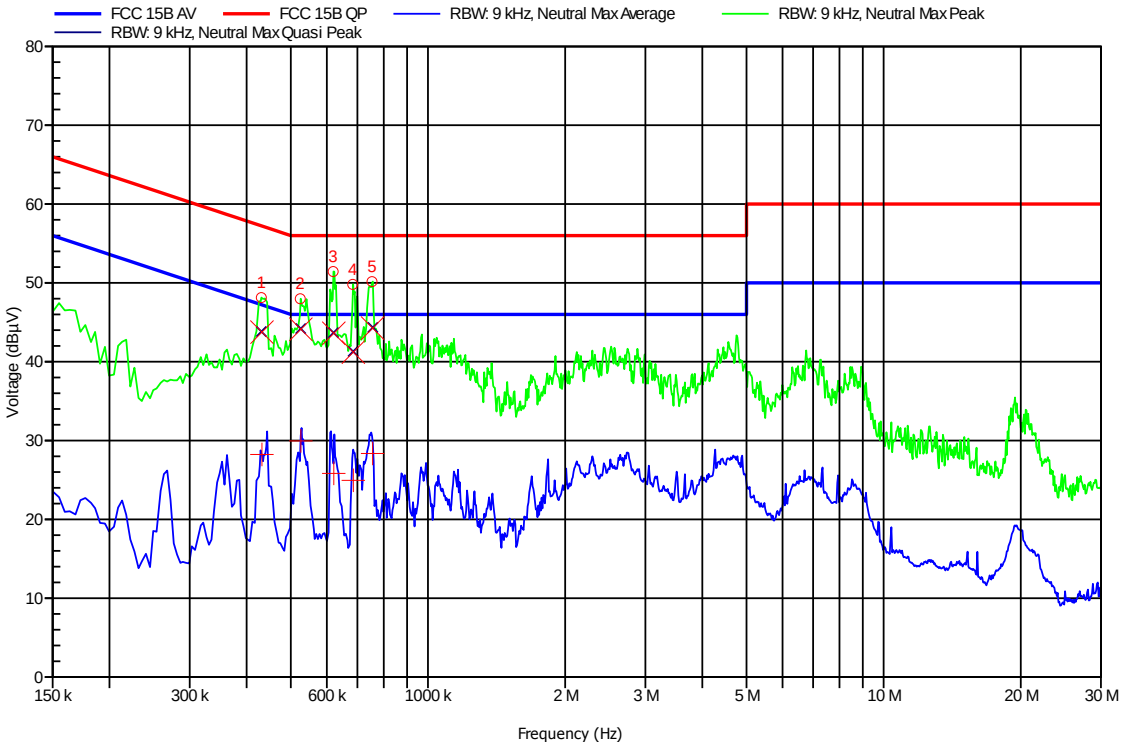

Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
430,8 kHz	43,83 dBµV	57,24 dBµV	-13,41 dB	Pass
524,4 kHz	44,19 dBµV	56 dBµV	-11,81 dB	Pass
619,35 kHz	43,68 dBµV	56 dBµV	-12,32 dB	Pass
683,7 kHz	41,29 dBµV	56 dBµV	-14,71 dB	Pass
753,9 kHz	44,34 dBµV	56 dBµV	-11,66 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
430,8 kHz	28,31 dBµV	47,24 dBµV	-18,93 dB	Pass
524,4 kHz	30,03 dBµV	46 dBµV	-15,97 dB	Pass
619,35 kHz	25,91 dBµV	46 dBµV	-20,09 dB	Pass
683,7 kHz	25,03 dBµV	46 dBµV	-20,97 dB	Pass
753,9 kHz	28,43 dBµV	46 dBµV	-17,57 dB	Pass

Conducted Emissions

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

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Handrik
Test Conditions:	Tnom: 25°C, Unom: 120 V AC (AC/DC adaptor) / USB
LISN:	ESH2-Z5 L
Mode:	active link
Test Date:	2012-09-21
Note:	

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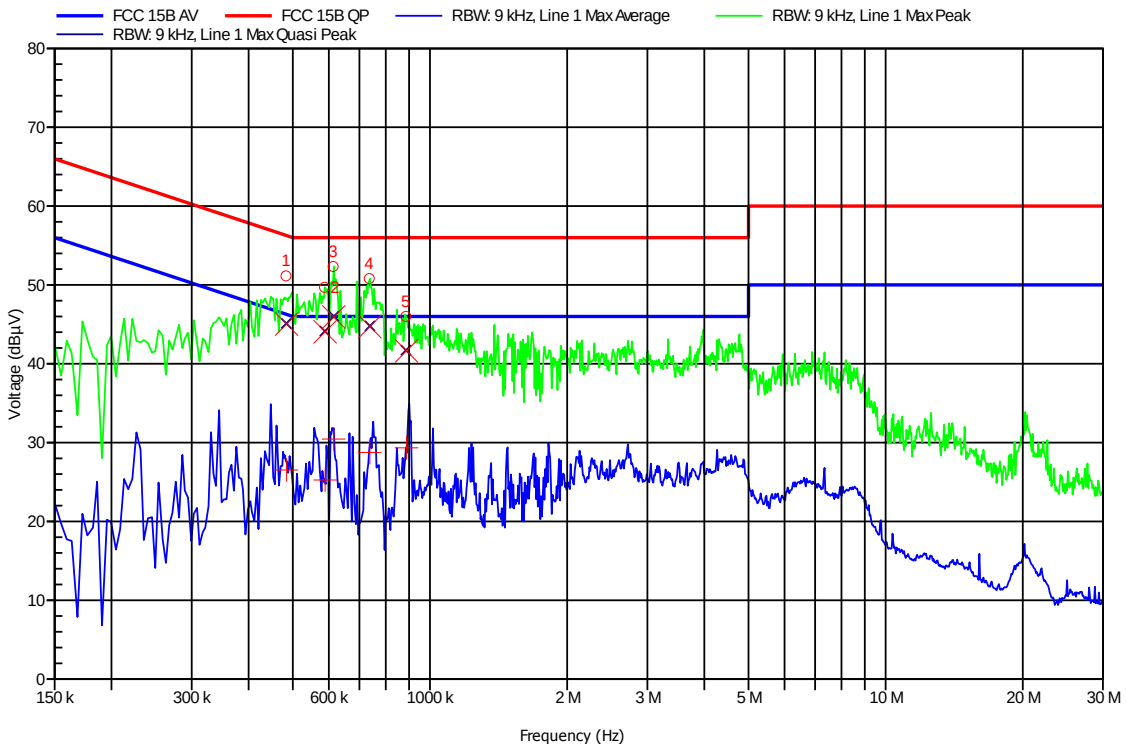


Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status
483 kHz	45,12 dBµV	56,29 dBµV	-11,17 dB	Pass
586,95 kHz	44,13 dBµV	56 dBµV	-11,87 dB	Pass
613,05 kHz	46,02 dBµV	56 dBµV	-9,98 dB	Pass
735,9 kHz	44,79 dBµV	56 dBµV	-11,21 dB	Pass
885,3 kHz	41,71 dBµV	56 dBµV	-14,29 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
483 kHz	26,6 dBµV	46,29 dBµV	-19,69 dB	Pass
586,95 kHz	25,33 dBµV	46 dBµV	-20,67 dB	Pass
613,05 kHz	30,52 dBµV	46 dBµV	-15,48 dB	Pass
735,9 kHz	28,83 dBµV	46 dBµV	-17,17 dB	Pass
885,3 kHz	29,41 dBµV	46 dBµV	-16,59 dB	Pass

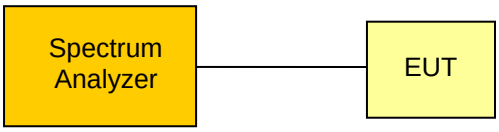
3.6 Test Conditions and Results – Band edge compliance

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
	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



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

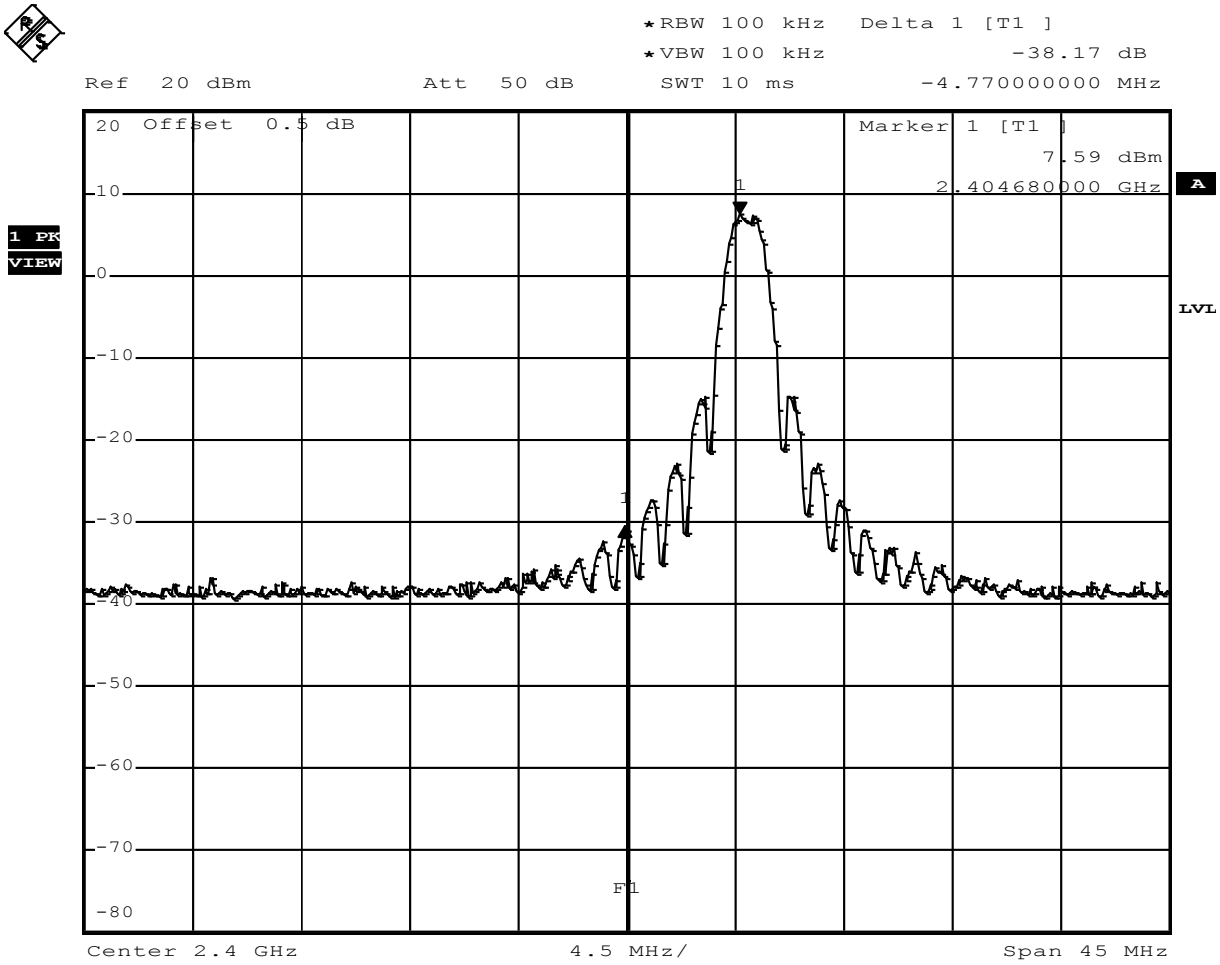
Channel	Frequency [MHz]	Mode	Level [dBc]	Limit [dBc]	Margin [dB]
F_{LOW}	2405	ZIGBEE	-38.17	-20	-18.17
F_{HIGH}	2475	ZIGBEE	-43.47	-20	-23.47

Comments:

Band-edge compliance – ZIGBEE F_{LOW}

FCC part 15.247
Band-edge compliance of RF conducted emissions

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, Vnom
Test Site / Operator	Eurofins Product Service GmbH, Mr. Treffke
Test Specification	FCC part 15 section 247(c)
Comment 1	Band-edge compliance
Comment 2	Channel.: 2405 MHz, power level 11
Comment 3	pass

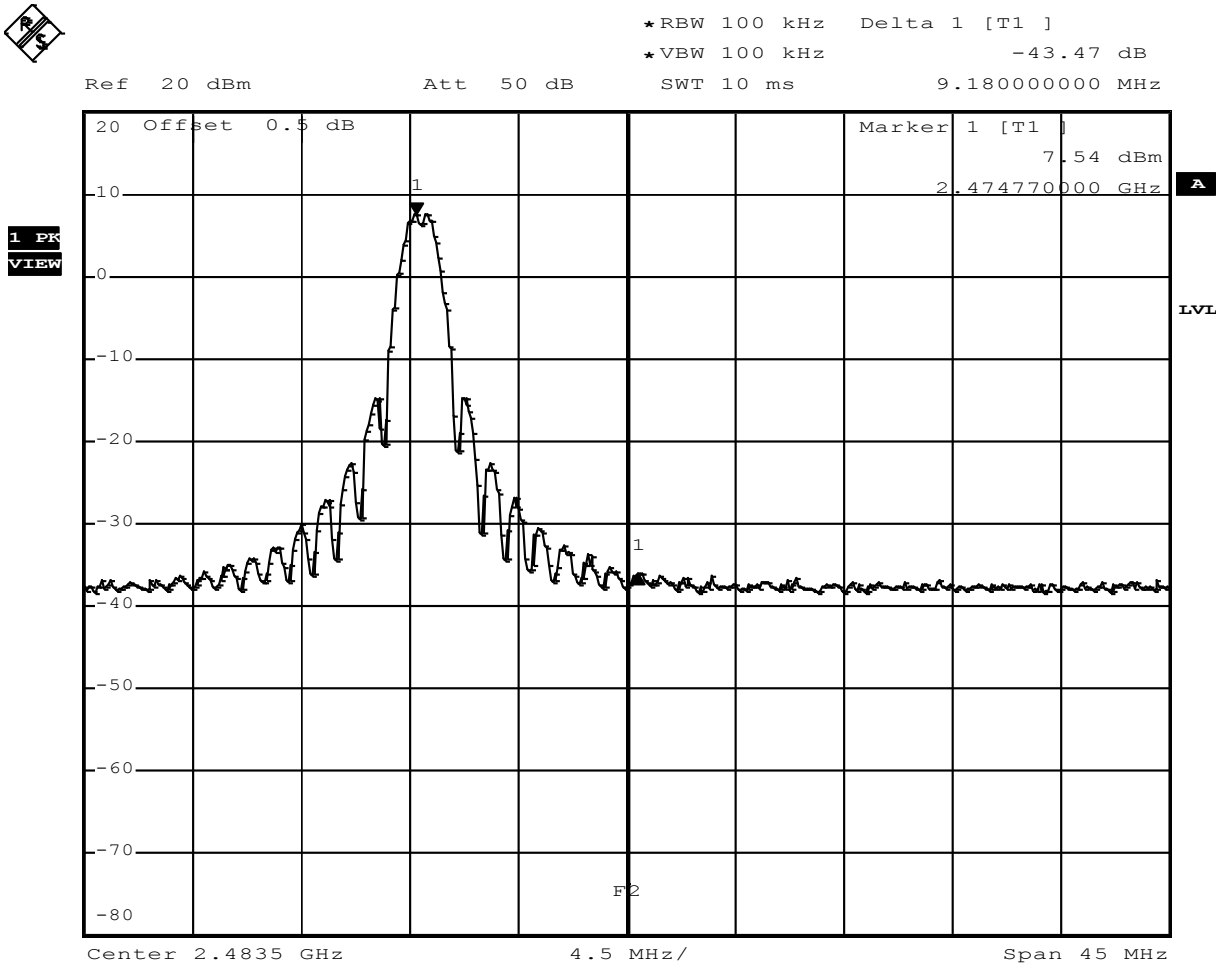


Comment: Limit: Marker Delta value >20 dB; Result: PASS
Date: 5.SEP.2012 13:21:25

Band-edge compliance – ZIGBEE F_{HIGH}

FCC part 15.247
Band-edge compliance of RF conducted emissions

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, Vnom
Test Site / Operator	Eurofins Product Service GmbH, Mr. Treffke
Test Specification	FCC part 15 section 247(c)
Comment 1	Band-edge compliance
Comment 2	Channel.: 2475 MHz, power level 11
Comment 3	pass



Date: 5.SEP.2012 13:07:49

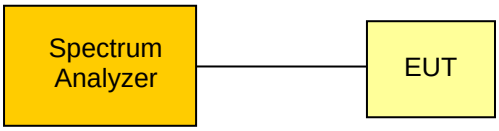
3.7 Test Conditions and Results – Conducted spurious emissions

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 – 10th 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



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

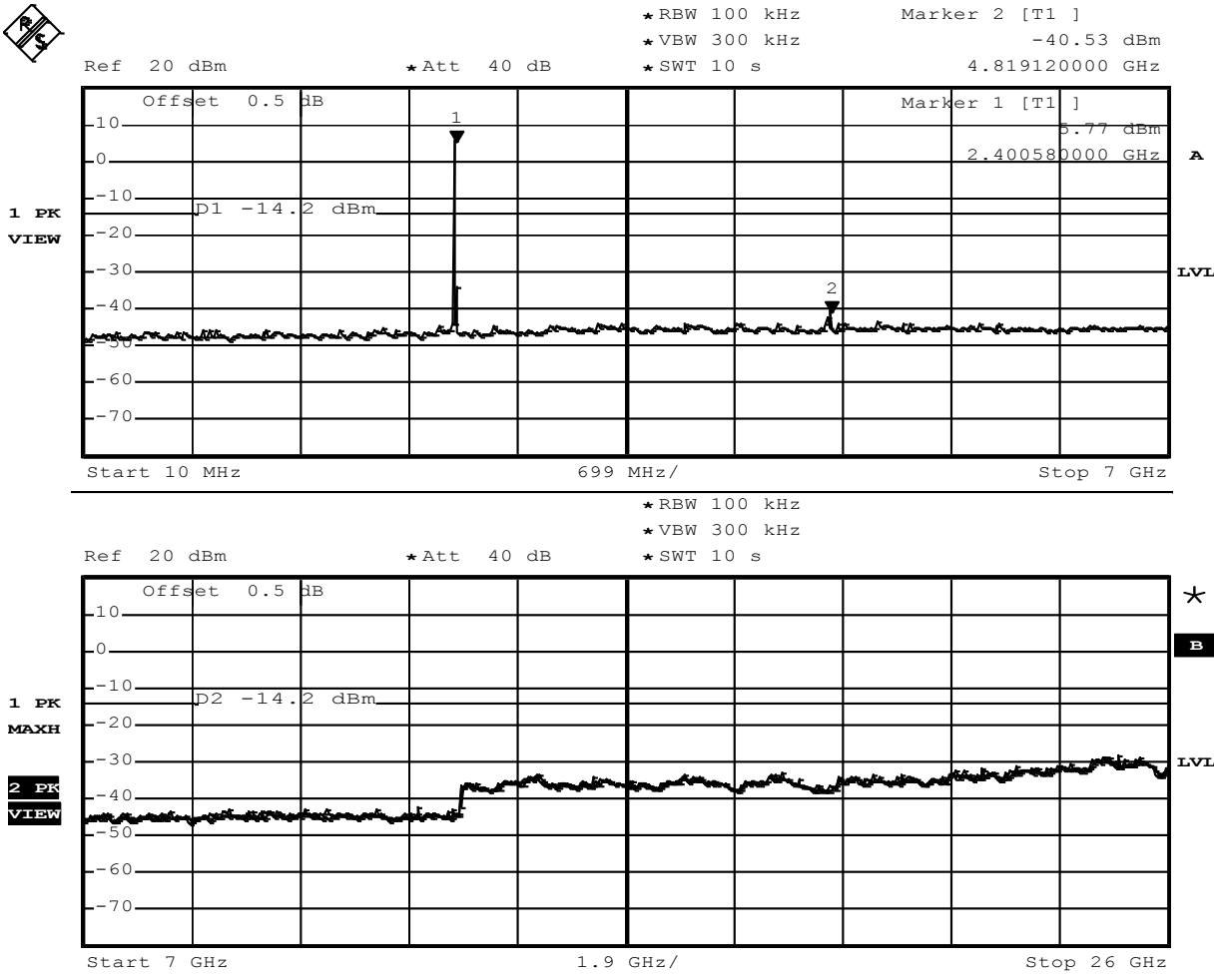
Channel	Frequency [MHz]	Mode	Emission [MHz]	Emission Level [dbm]	Peak power [dBm]	Limit [dBm]	Margin [dB]
F_{LOW}	2405	ZIGBEE	4819	-40.53	5.77	-14.23	-26.30
F_{MID}	2440	ZIGBEE	24708	-29.49	7.37	-12.63	-16.86
F_{HIGH}	2475	ZIGBEE	24860	-29.83	6.96	-13.04	-16.79

Comments:

Conducted spurious emissions – ZIGBEE F_{LOW}

FCC part 15.247 (d)
Spurious Emissions

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, Vnom
Test Site / Operator	Eurofins Product Service GmbH, Mr. Treffke
Test Specification	FCC part 15.247 (d)
Comment 1	Spurious Emissions conducted
Comment 2	Channel : 2440 MHz, power level 11dBm
Comment 3	pass

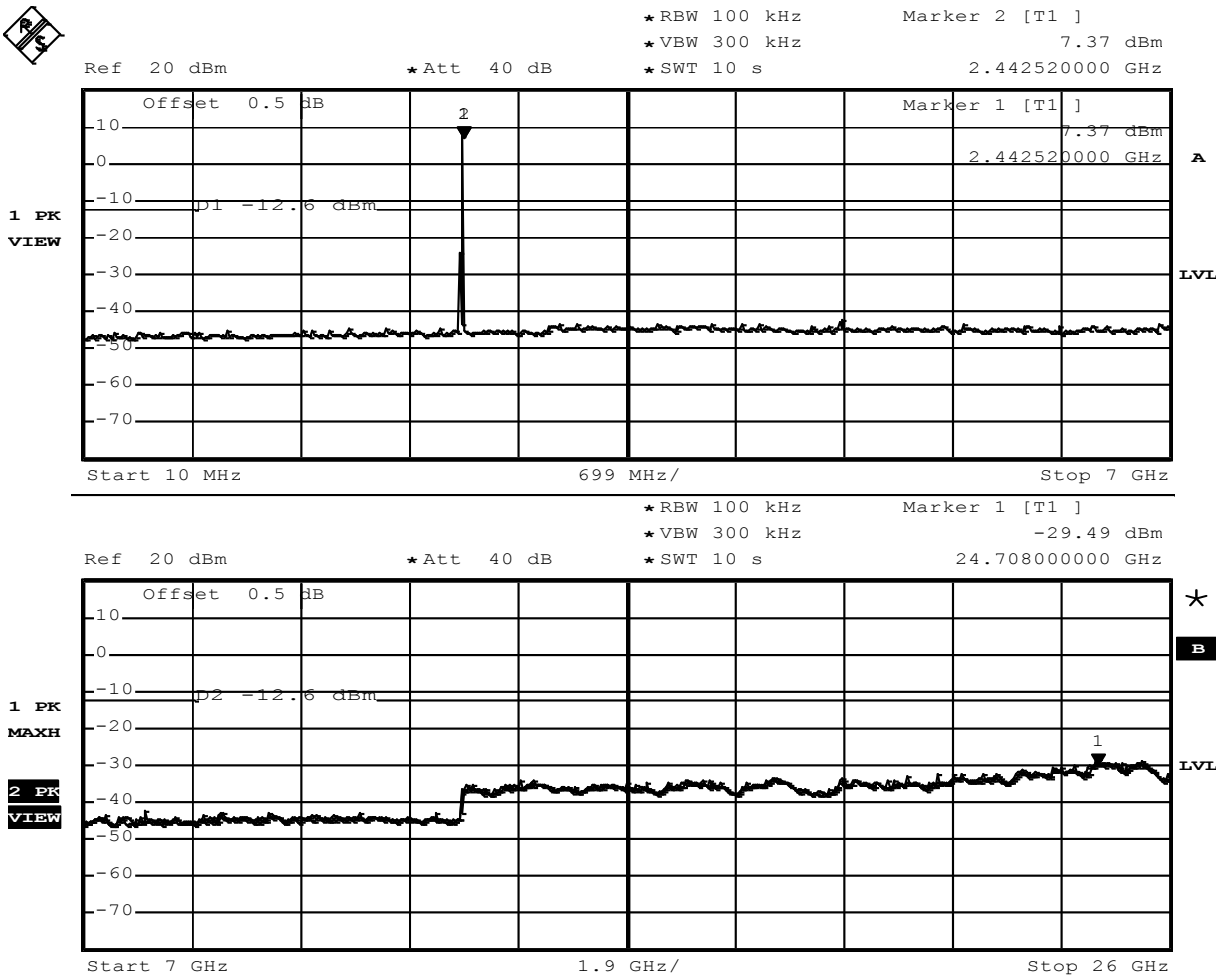


Date: 5.SEP.2012 10:26:40

Conducted spurious emissions – ZIGBEE F_{MID}

FCC part 15.247 (d)
Spurious Emissions

EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, Vnom
Test Site / Operator	Eurofins Product Service GmbH, Mr. Treffke
Test Specification	FCC part 15.247 (d)
Comment 1	Spurious Emissions conducted
Comment 2	Channel : 2440 MHz, power level 11dBm
Comment 3	pass

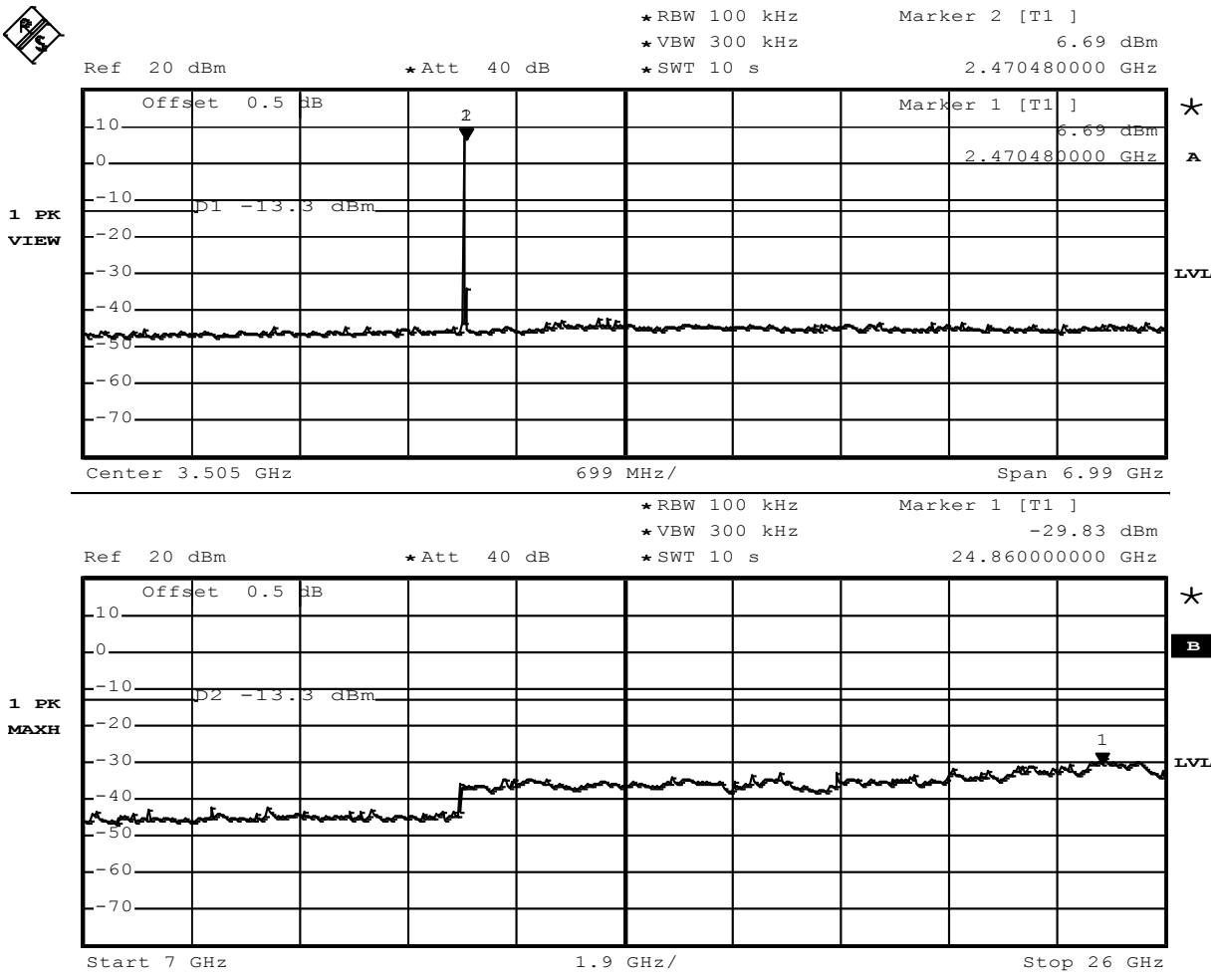


Date: 5.SEP.2012 10:24:14

Conducted spurious emissions – ZIGBEE F_{HIGH}

FCC part 15.247 (d)
Spurious Emissions

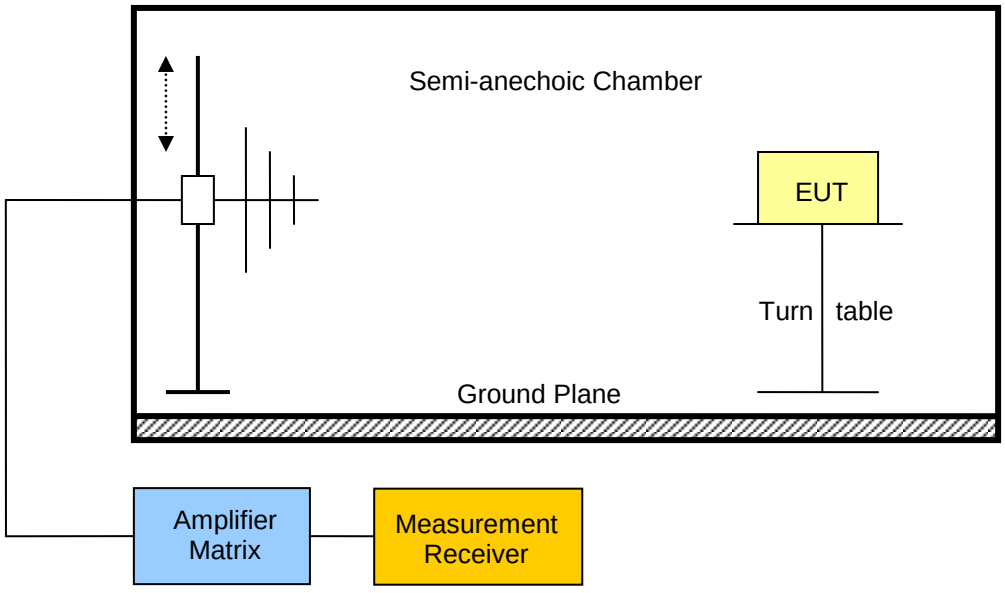
EUT	VIPER Radiomodule 300m
Model	785828
Approval Holder	Leica Geosystems AG / Ord.: G0M-1201-1705
Temperature / Voltage	25°C, Vnom
Test Site / Operator	Eurofins Product Service GmbH, Mr. Treffke
Test Specification	FCC part 15.247 (d)
Comment 1	Spurious Emissions conducted
Comment 2	Channel : 2475 MHz, power level 11dBm
Comment 3	pass



Date: 5.SEP.2012 10:17:37

3.8 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 – 10th 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

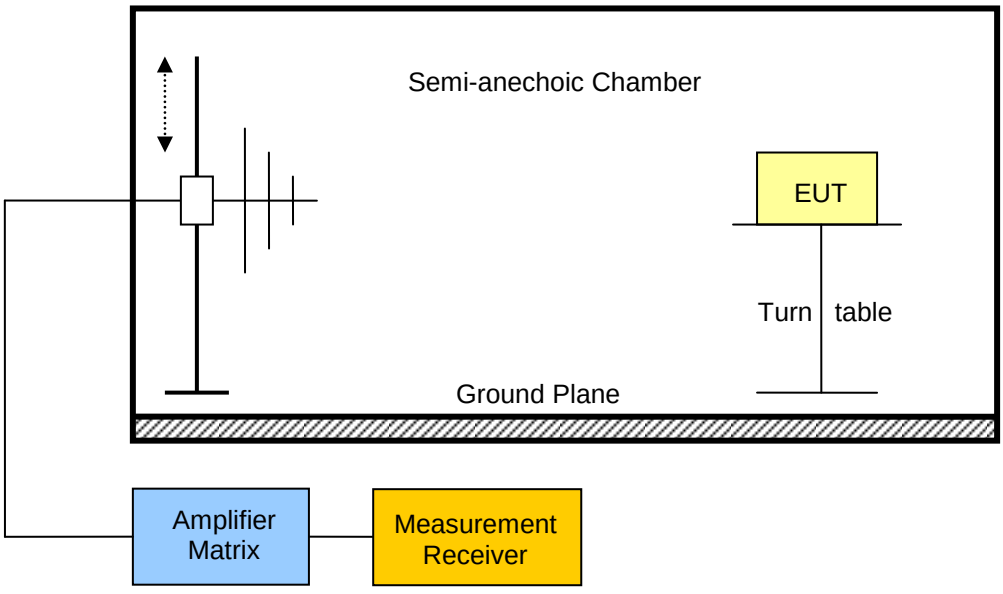
Test results – Internal Antenna

Channel	Frequency [MHz]	Mode	Emission [MHz]	Level [dbµV/m]	Det.	Pol.	Limit [dbµV/m]	Limit dist. [m]*	Margin [dB]
F_{LOW}	2405	ZIGBEE	2390	52.89	pk	hor	74	3	-21.11
F_{LOW}	2405	ZIGBEE	2390	43.76	avg	hor	54	3	-10.24
F_{LOW}	2405	ZIGBEE	2390	44.56	pk	ver	74	3	-29.44
F_{LOW}	2405	ZIGBEE	2390	34.70	avg	ver	54	3	-19.30
F_{LOW}	2405	ZIGBEE	2400	73.07	pk	hor	78.1	3	-05.03
F_{LOW}	2405	ZIGBEE	2400	64.47	avg	hor	78.1	3	-13.63
F_{LOW}	2405	ZIGBEE	2400	64.54	pk	ver	78.1	3	-13.56
F_{LOW}	2405	ZIGBEE	2400	55.54	avg	ver	78.1	3	-22.56
F_{LOW}	2405	ZIGBEE	4811	57.02	pk	hor	74	3	-16.98
F_{MID}	2405	ZIGBEE	4811	50.19	avg	hor	54	3	-03.81
F_{MID}	2440	ZIGBEE	4881	54.16	pk	hor	74	3	-19.84
F_{MID}	2440	ZIGBEE	4881	46.72	avg	hor	54	3	-07.28
F_{HIGH}	2475	ZIGBEE	2483	62.27	pk	hor	74	3	-11.73
F_{HIGH}	2475	ZIGBEE	2483	52.63	avg	hor	54	3	-01.37
F_{HIGH}	2475	ZIGBEE	2484	57.22	pk	ver	74	3	-16.78
F_{HIGH}	2475	ZIGBEE	2484	47.41	avg	ver	54	3	-06.59
F_{HIGH}	2475	ZIGBEE	4949	56.14	pk	hor	74	3	-17.86
F_{HIGH}	2475	ZIGBEE	4949	49.20	avg	hor	54	3	-04.80
F_{HIGH}	2475	ZIGBEE	7423	56.51	pk	ver	74	3	-17.49
F_{HIGH}	2475	ZIGBEE	7423	47.73	avg	ver	54	3	-06.27
F_{HIGH}	2475	ZIGBEE	7426	55.43	pk	hor	74	3	-18.57
F_{HIGH}	2475	ZIGBEE	7426	46.12	avg	hor	54	3	-07.88

Comments: * Physical distance between EUT and measurement antenna.

3.9 Test Conditions and Results – Receiver radiated emissions

Receiver radiated emissions acc. IC RSS-210				**Verdict: PASS**
Test according referenced standards	Reference Method			
	IC RSS-210 A8.5			
Test according to measurement reference	Reference Method			
	ANSI C63.4			
Test frequency range	Tested frequencies			
	30 MHz – 3th 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
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]	Emission Level [µV/m]	Det.	Limit [µV/m]	Margin [µV/m]
18	2440	288	23.17	14.40	pk	200	-185.6

Comments:
* Physical distance between EUT and measurement antenna.
** Emission level corresponds to ambient noise floor

ANNEX A Transmitter radiated spurious emissions

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	Tx, worst case

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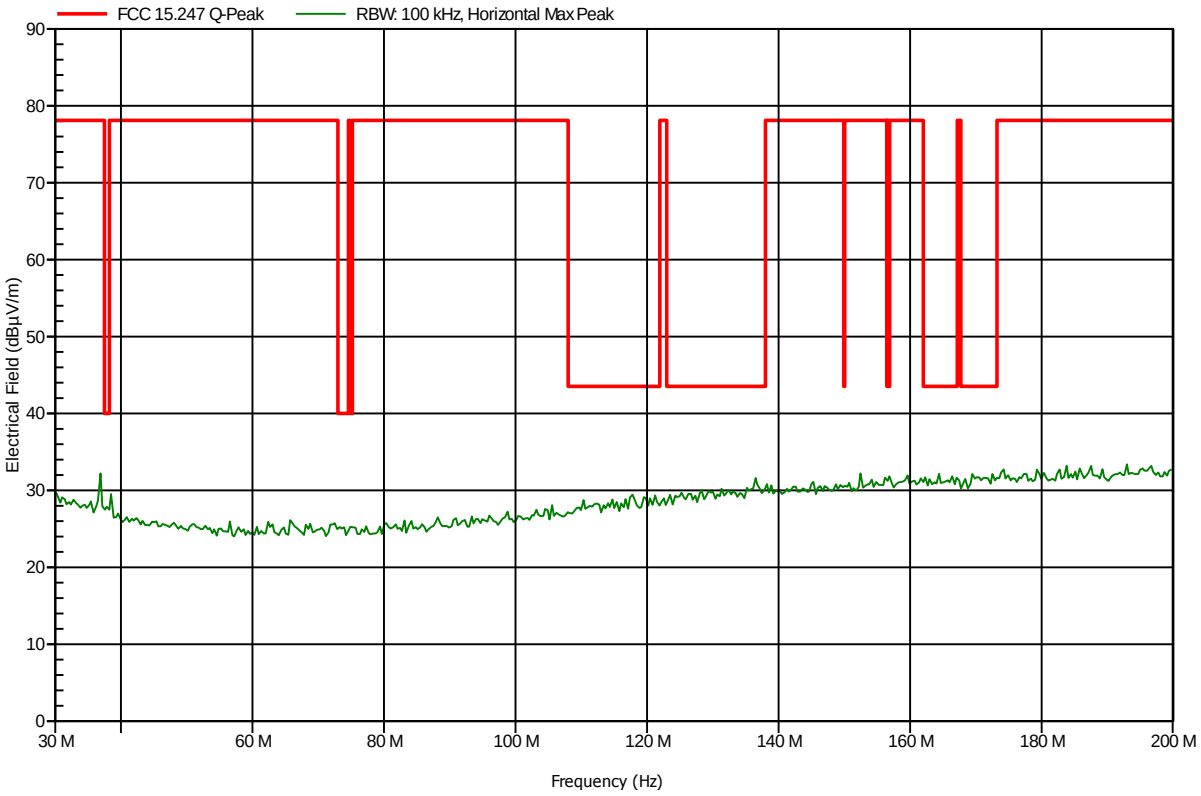

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	Tx, worst case

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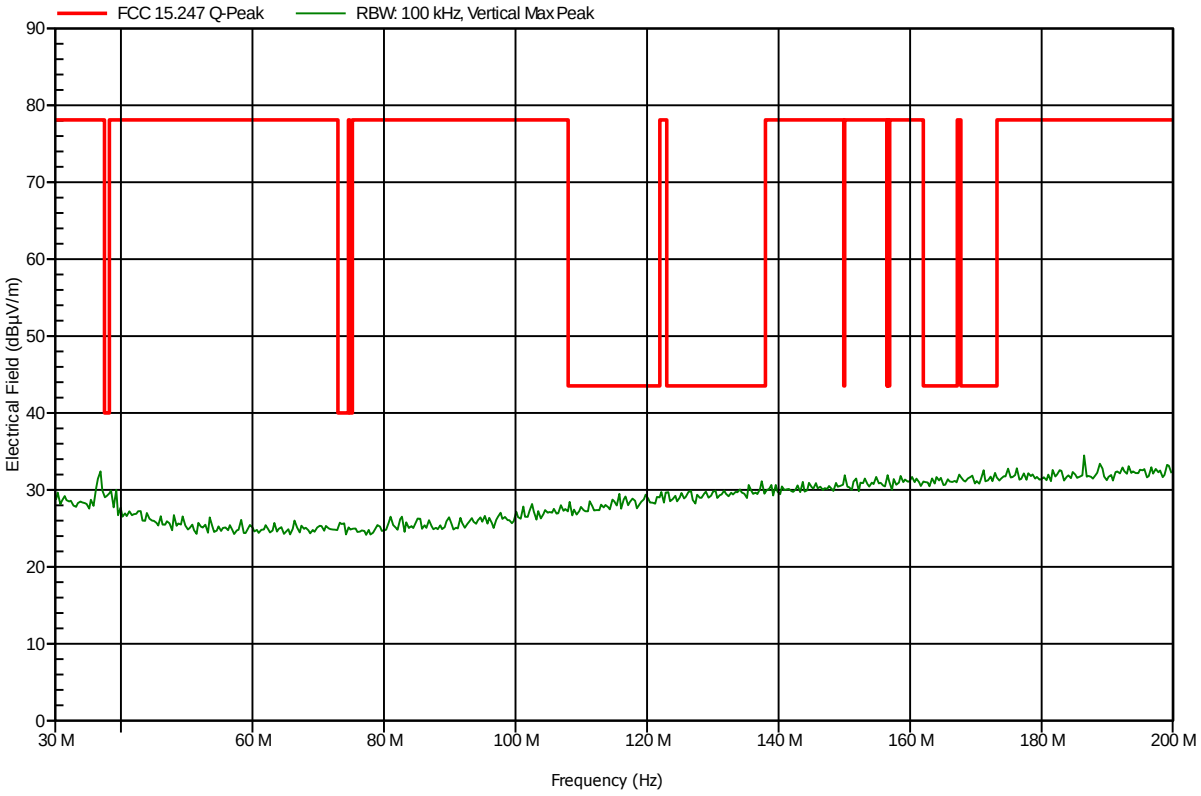

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	Tx, worst case

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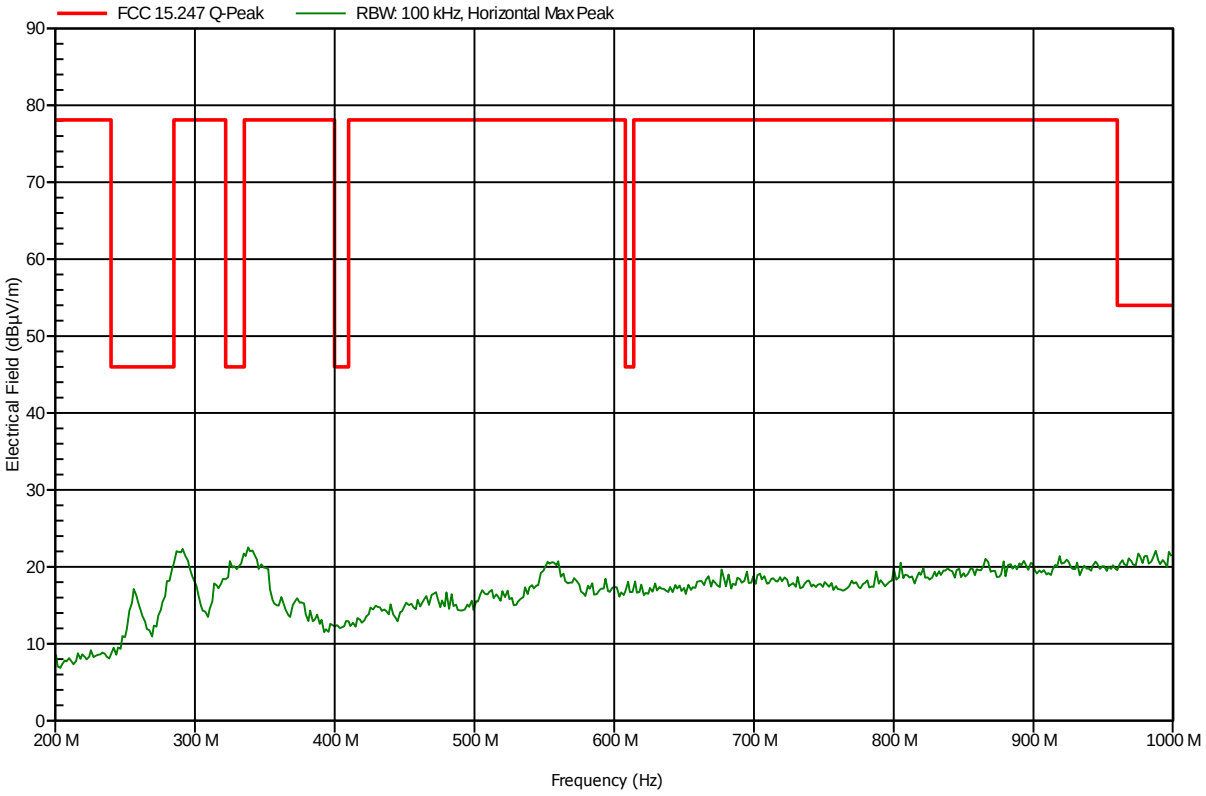

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	Tx, worst case

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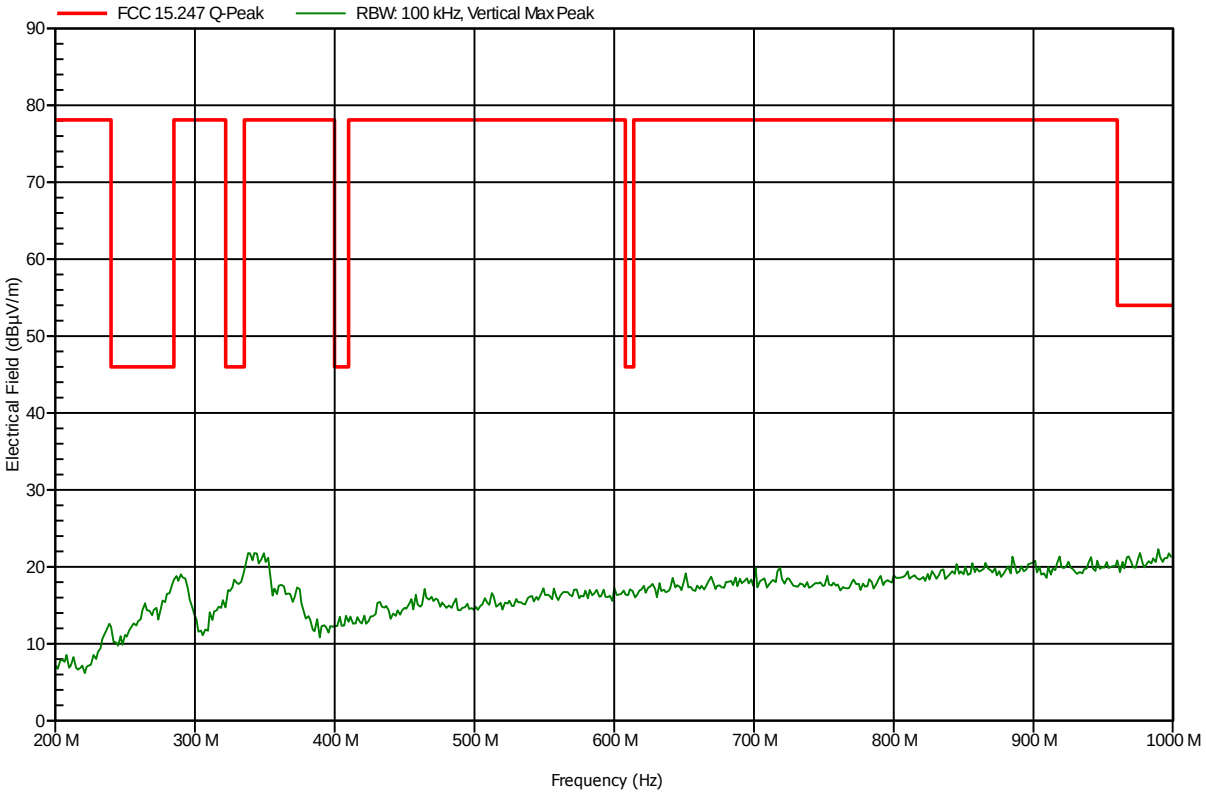

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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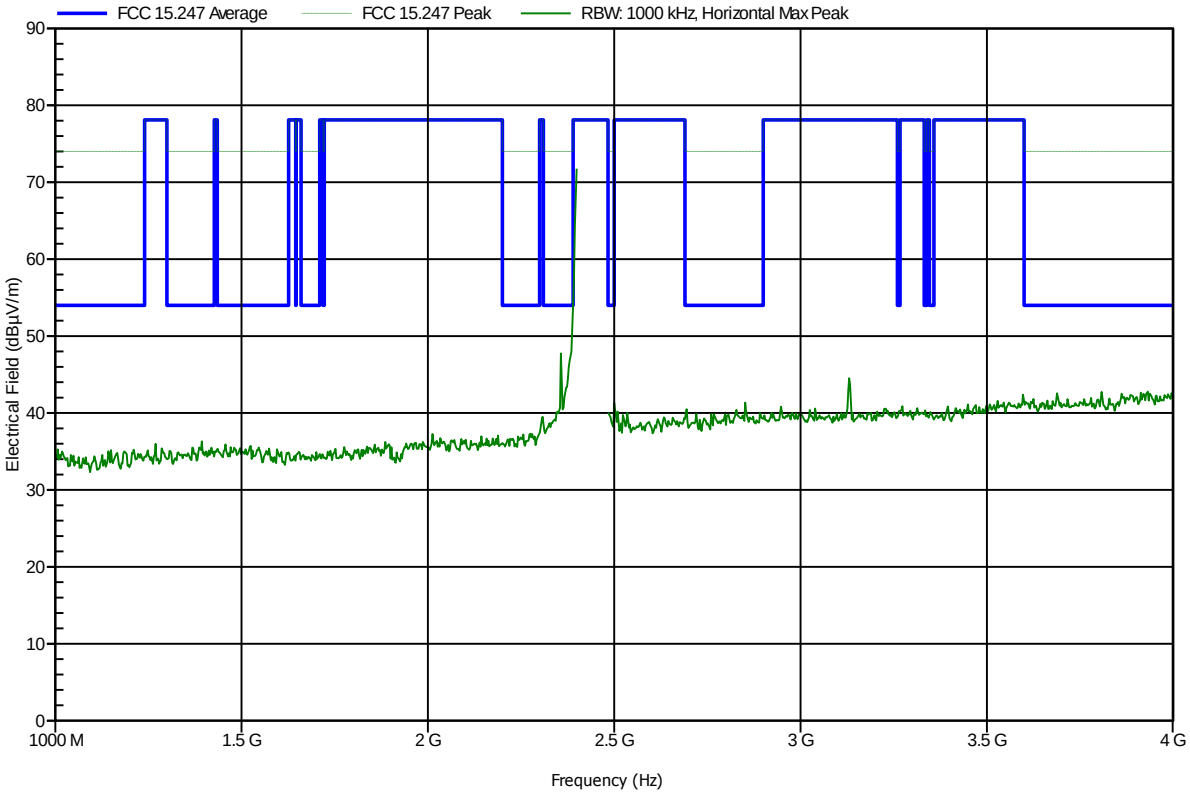

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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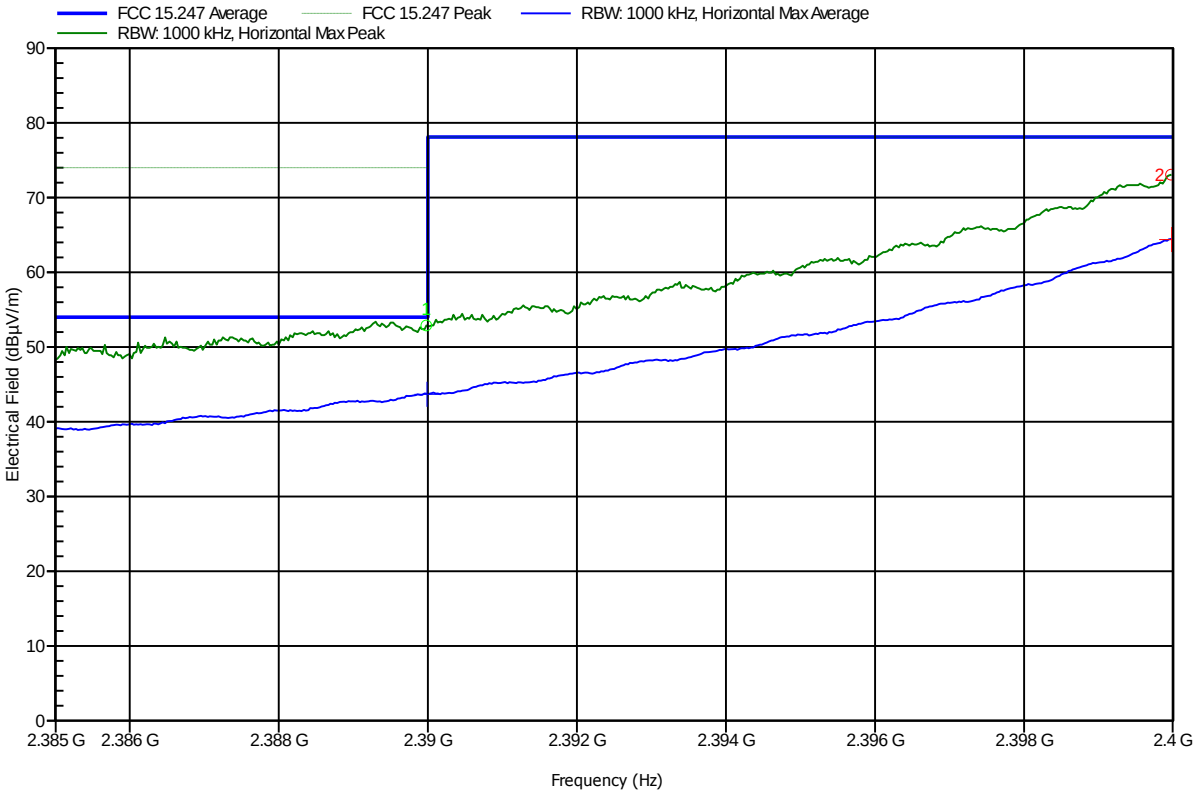

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.39 GHz	52.89 dBµV/m	74 dBµV/m	-21.11 dB	Pass
2.4 GHz	73.07 dBµV/m	78.1 dBµV/m	-5.03 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
2.39 GHz	43.76 dBµV/m	54 dBµV/m	-10.24 dB	Pass
2.4 GHz	64.47 dBµV/m	78.1 dBµV/m	-13.63 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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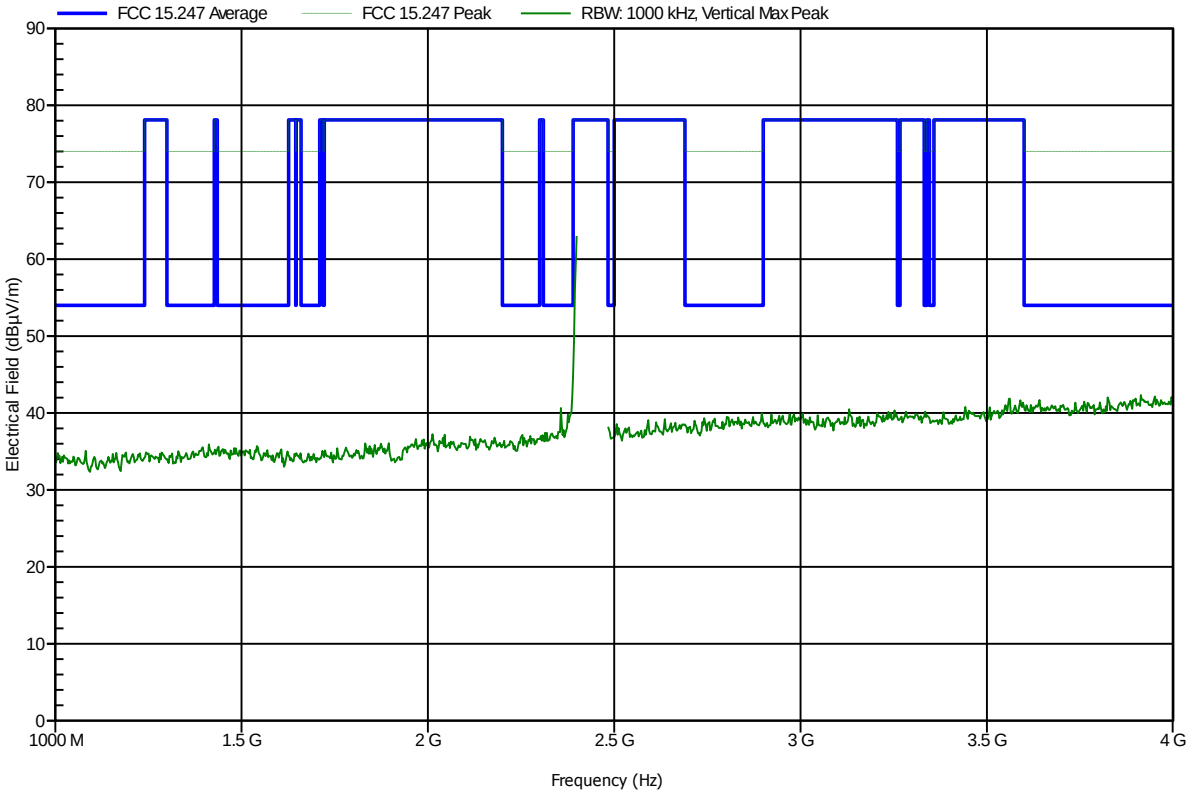

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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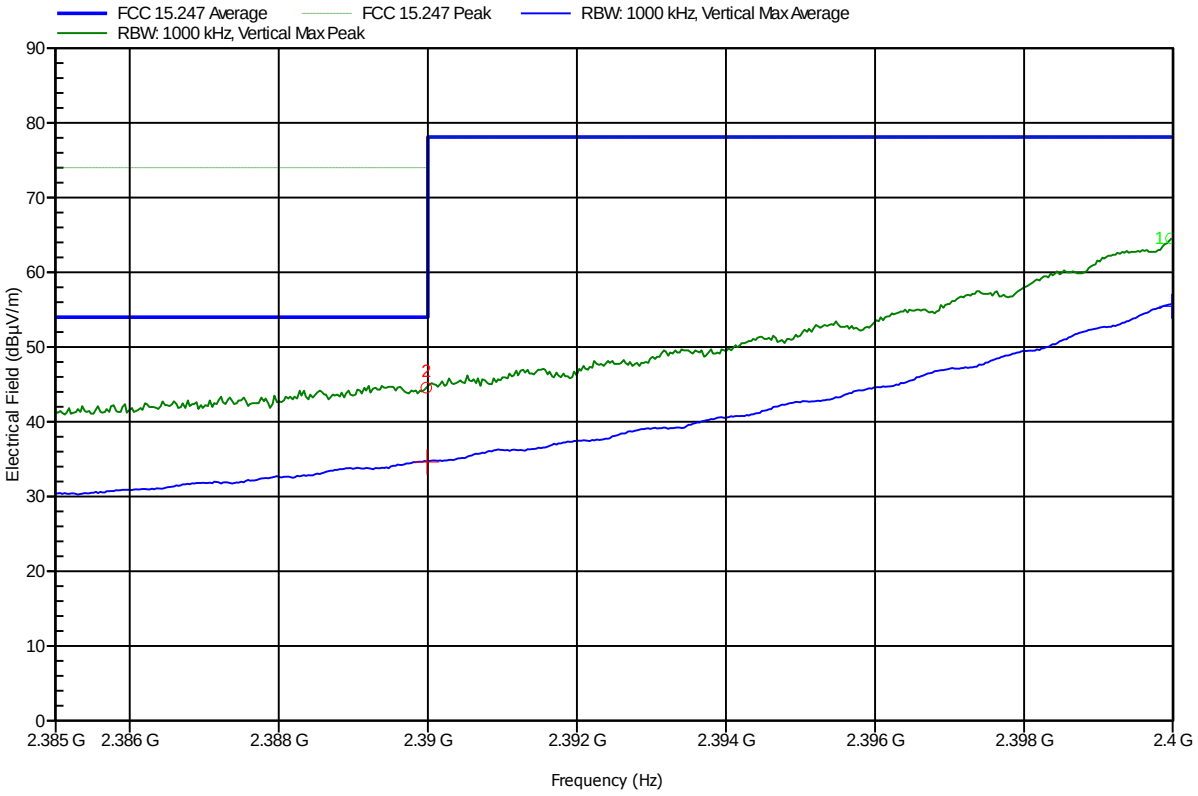

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.39 GHz	44.56 dBµV/m	74 dBµV/m	-29.44 dB	Pass
2.4 GHz	64.54 dBµV/m	78.1 dBµV/m	-13.56 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
2.39 GHz	34.7 dBµV/m	54 dBµV/m	-19.3 dB	Pass
2.4 GHz	55.54 dBµV/m	78.1 dBµV/m	-22.56 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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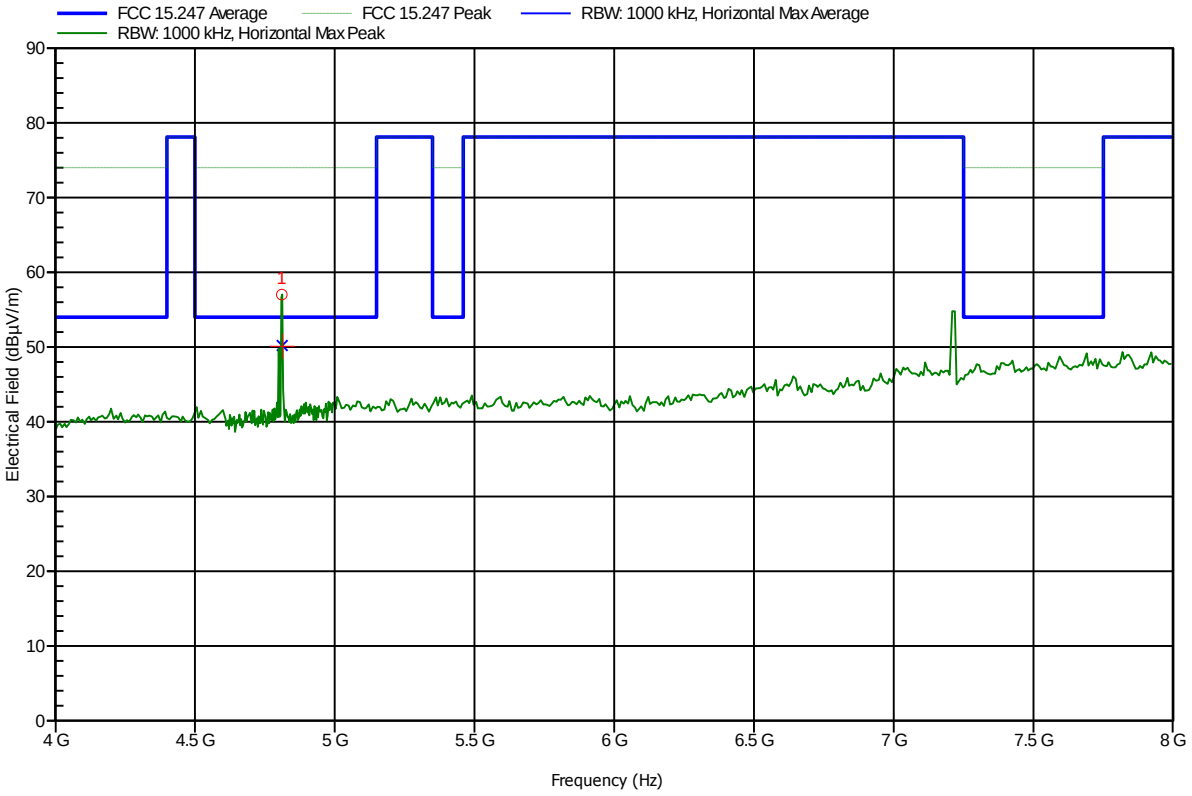

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.811 GHz	57.02 dBµV/m	74 dBµV/m	-16.98 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
4.811 GHz	50.19 dBµV/m	54 dBµV/m	-3.81 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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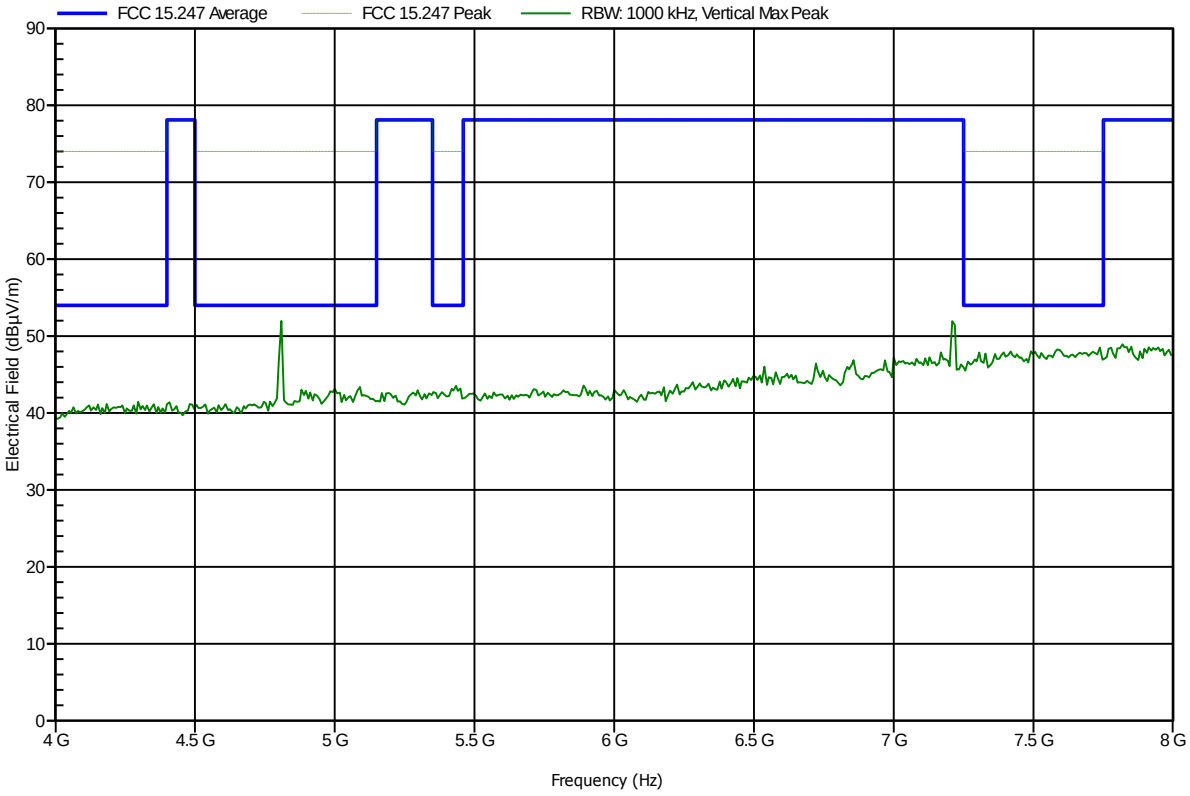

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	100 cm
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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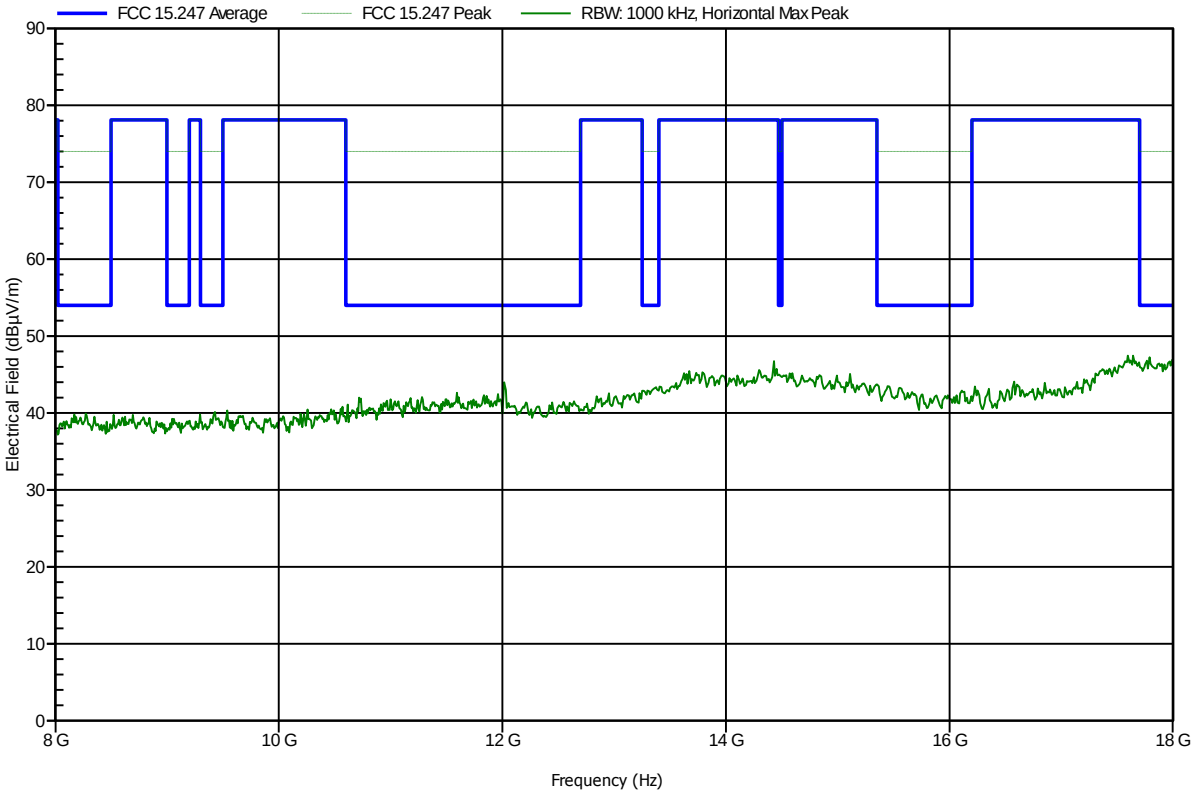

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	100 cm
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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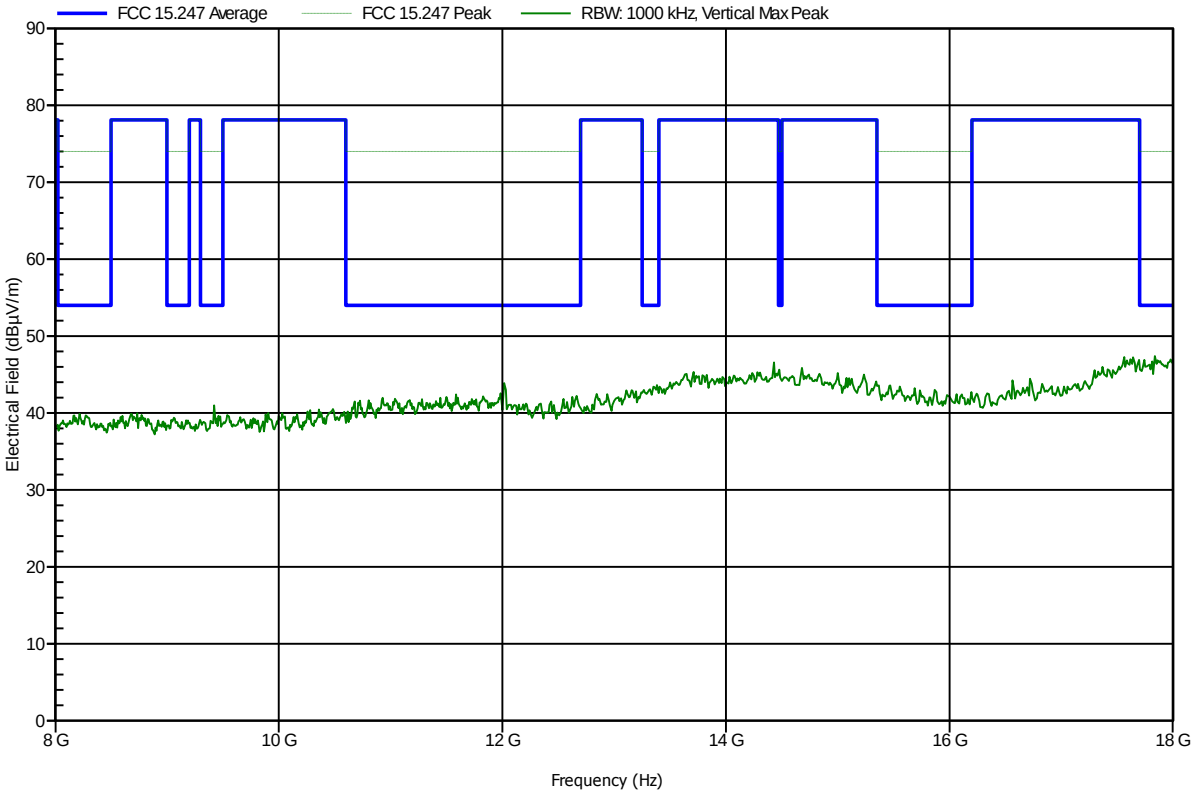

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 025, Horizontal
Measurement distance:	100 cm
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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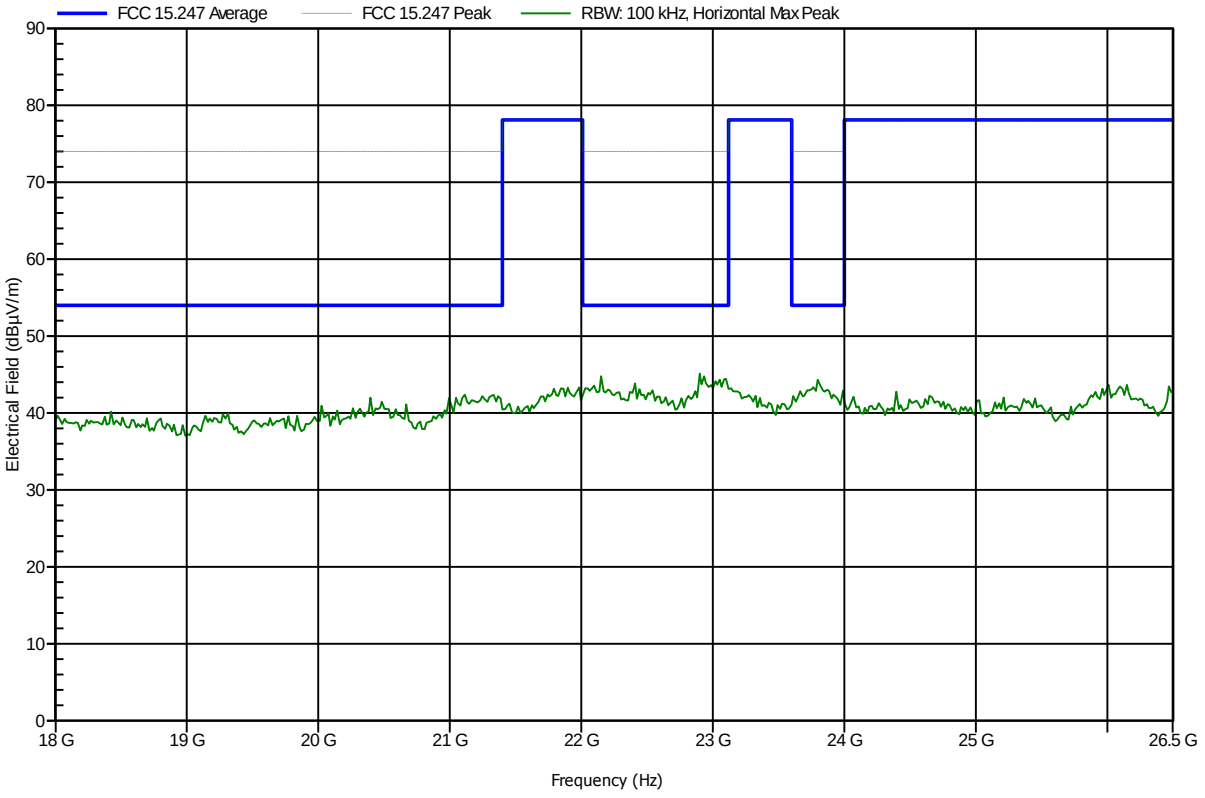

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 025, Vertical
Measurement distance:	100 cm
Mode:	TX; Ch.11; power level 11dBm
Test Date:	2012-09-04
Note:	

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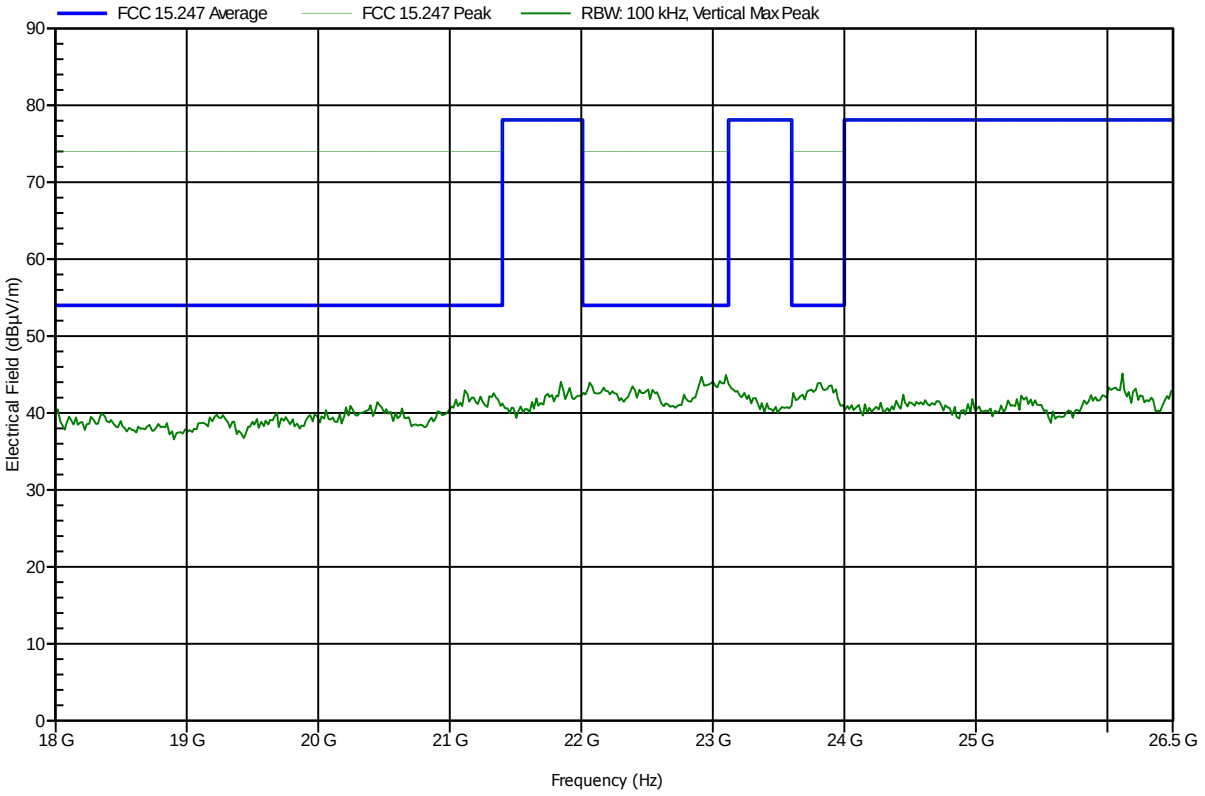

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.18; power level 11dBm
Test Date:	2012-09-04
Note:	

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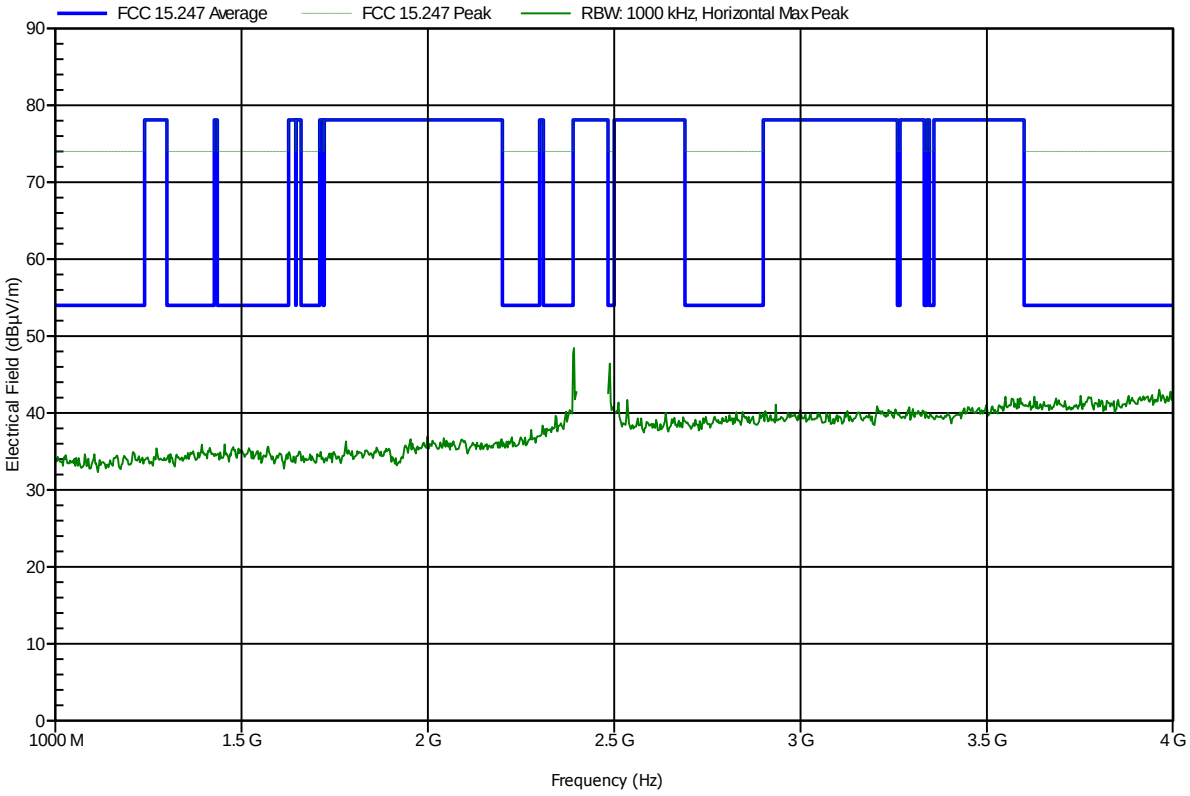

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.18; power level 11dBm
Test Date:	2012-09-04
Note:	

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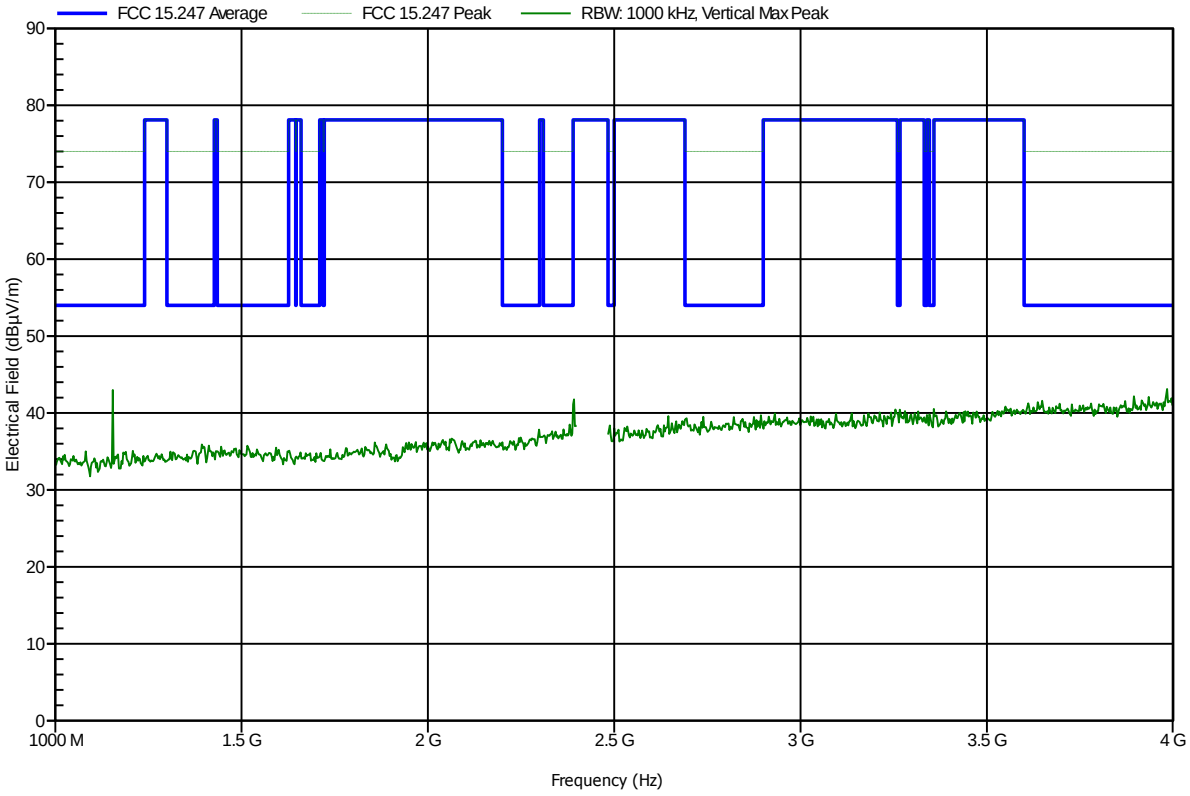

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.18; power level 11dBm
Test Date:	2012-09-04
Note:	

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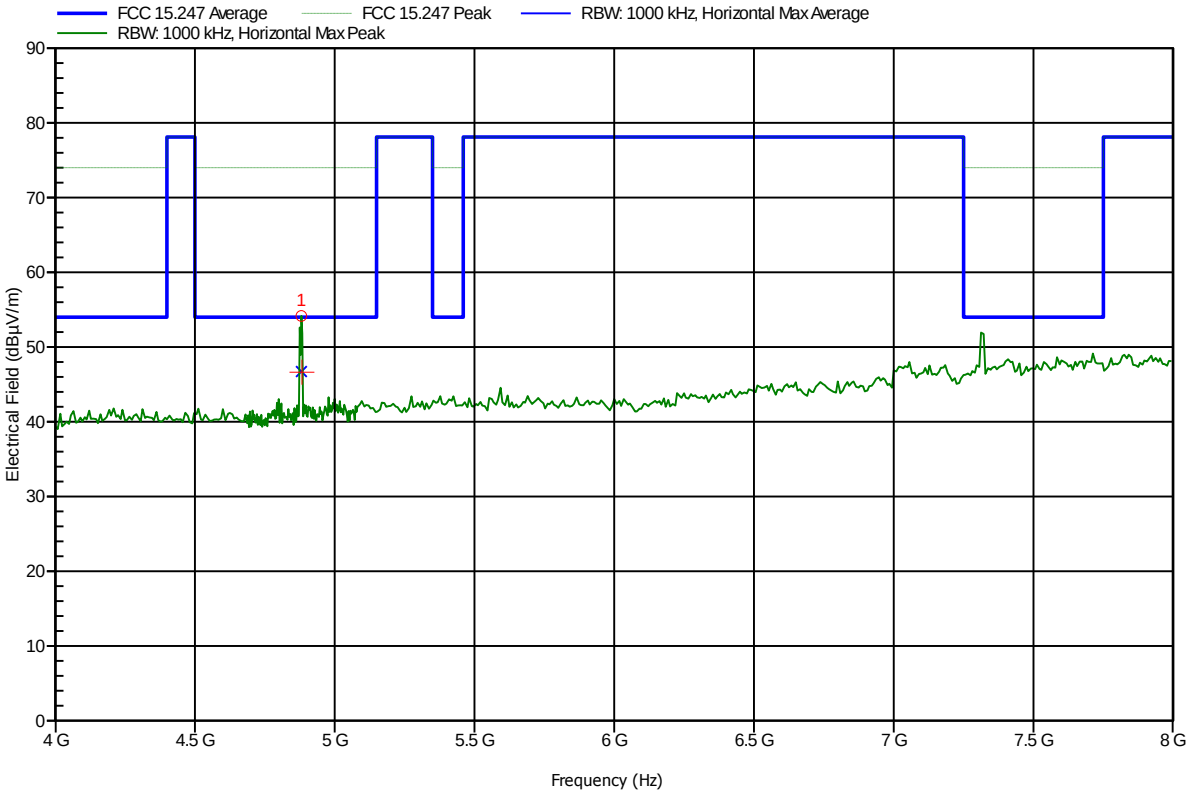

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.881 GHz	54.16 dBµV/m	74 dBµV/m	-19.84 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
4.881 GHz	46.72 dBµV/m	54 dBµV/m	-7.28 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.18; power level 11dBm
Test Date:	2012-09-04
Note:	

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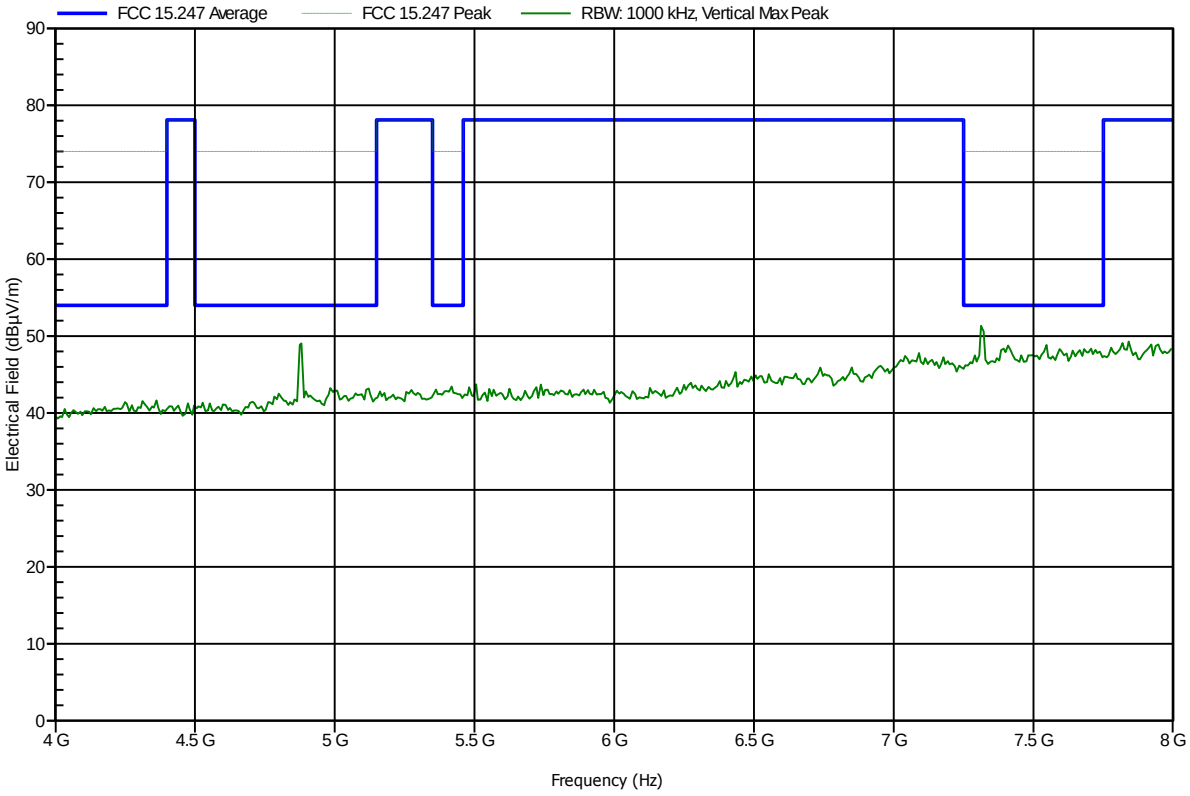

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	100 cm
Mode:	TX; Ch.18; power level 11dBm
Test Date:	2012-09-04
Note:	

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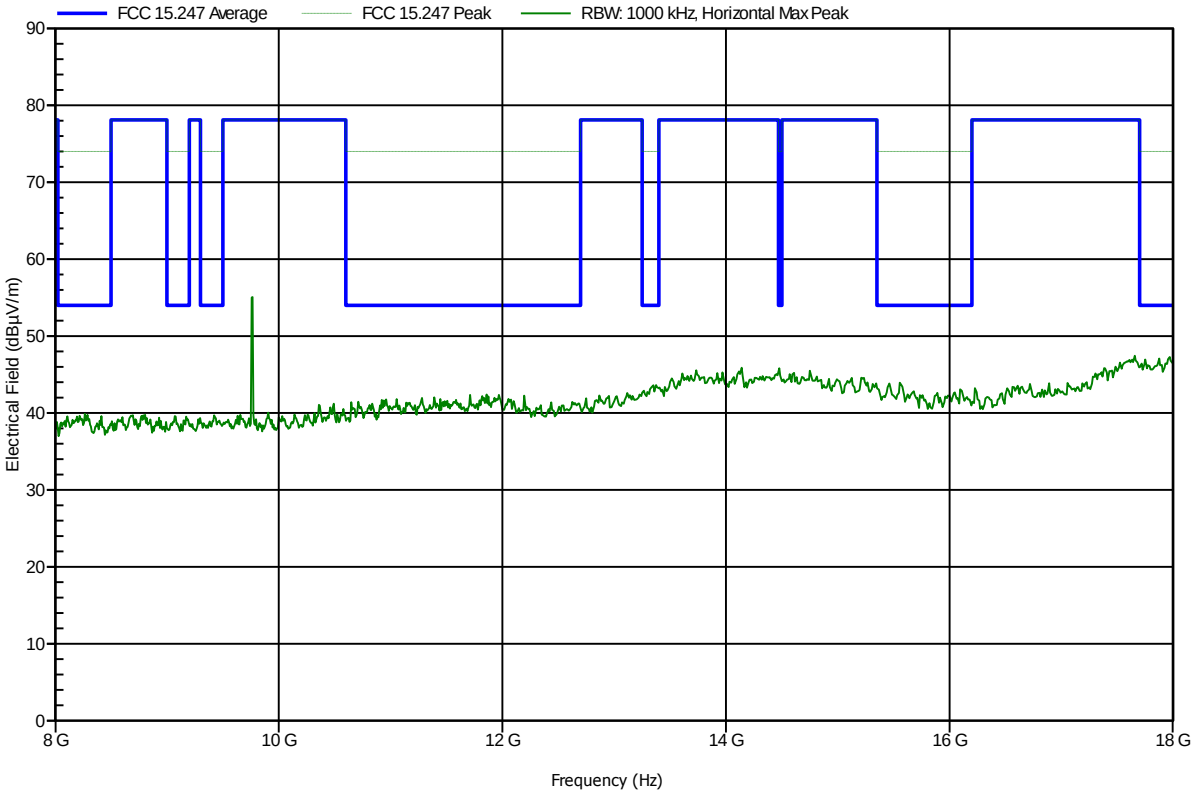

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	100 cm
Mode:	TX; Ch.18; power level 11dBm
Test Date:	2012-09-04
Note:	

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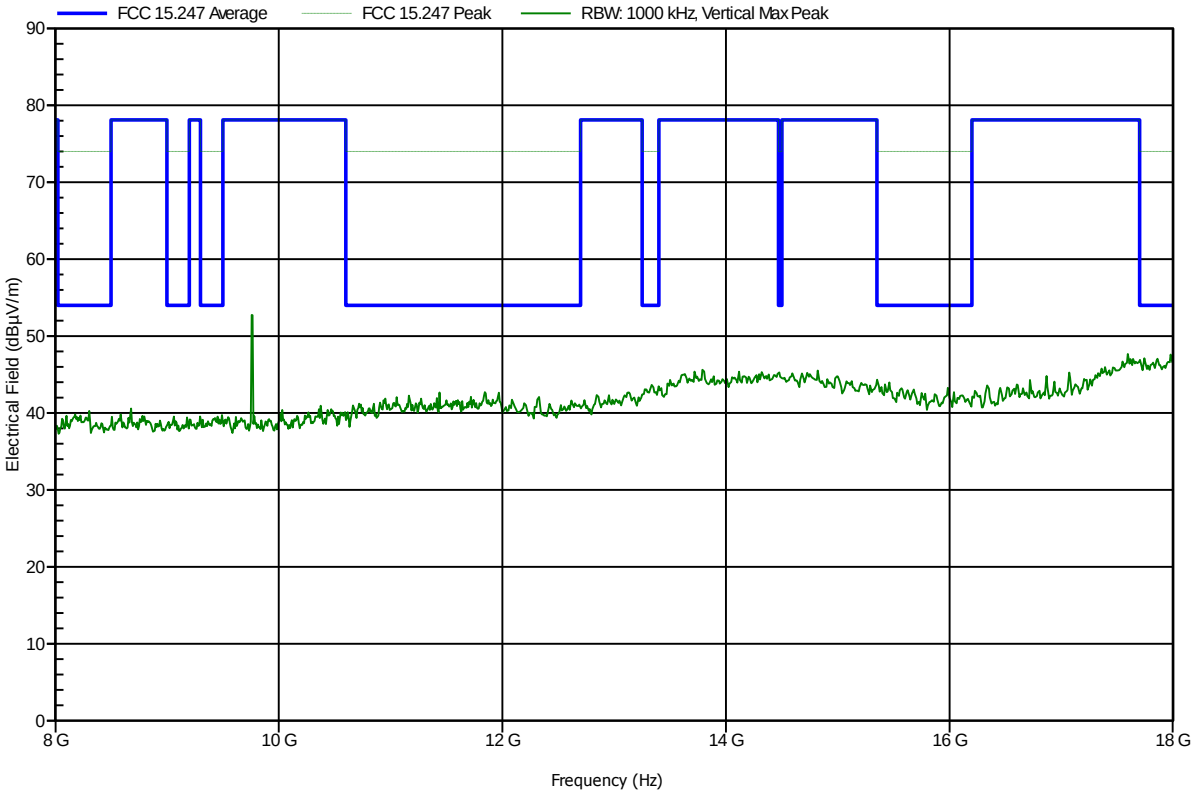

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 025, Horizontal
Measurement distance:	100 cm
Mode:	TX; Ch.18; power level 11dBm
Test Date:	2012-09-04
Note:	

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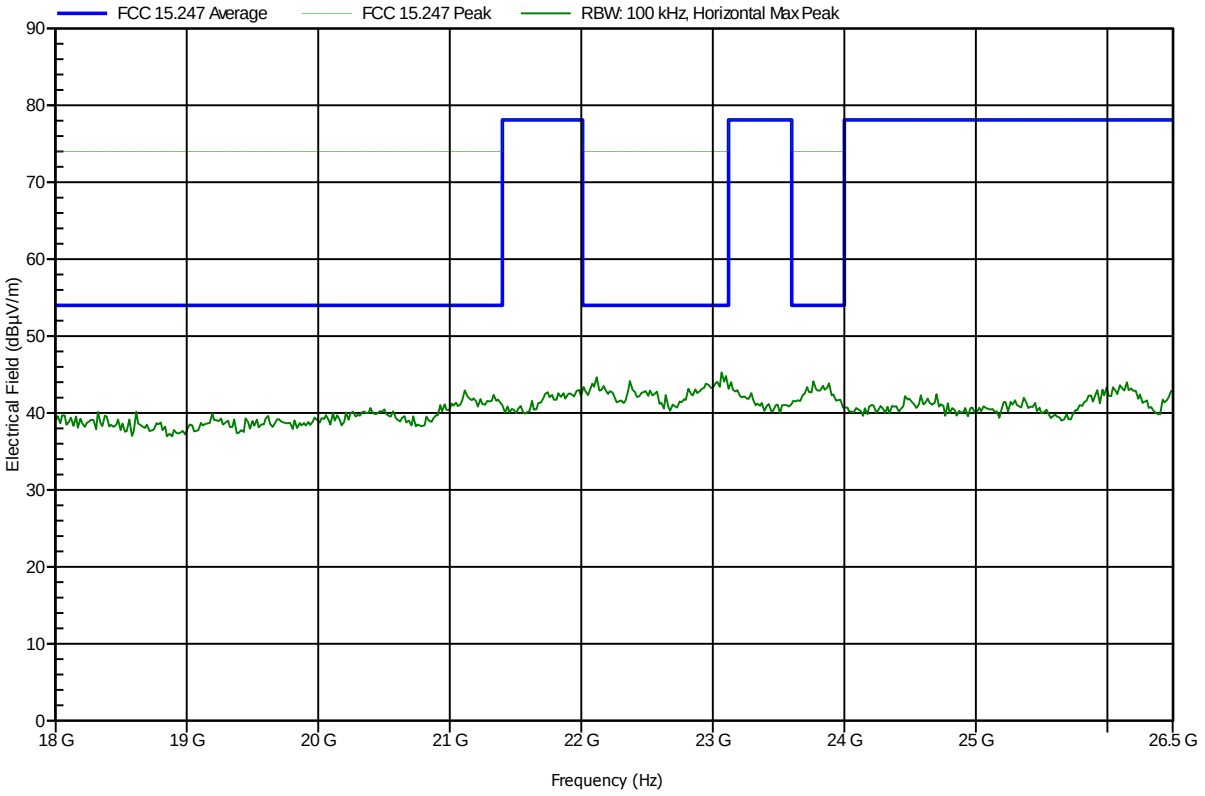

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 025, Vertical
Measurement distance:	100 cm
Mode:	TX; Ch.18; power level 11dBm
Test Date:	2012-09-04
Note:	

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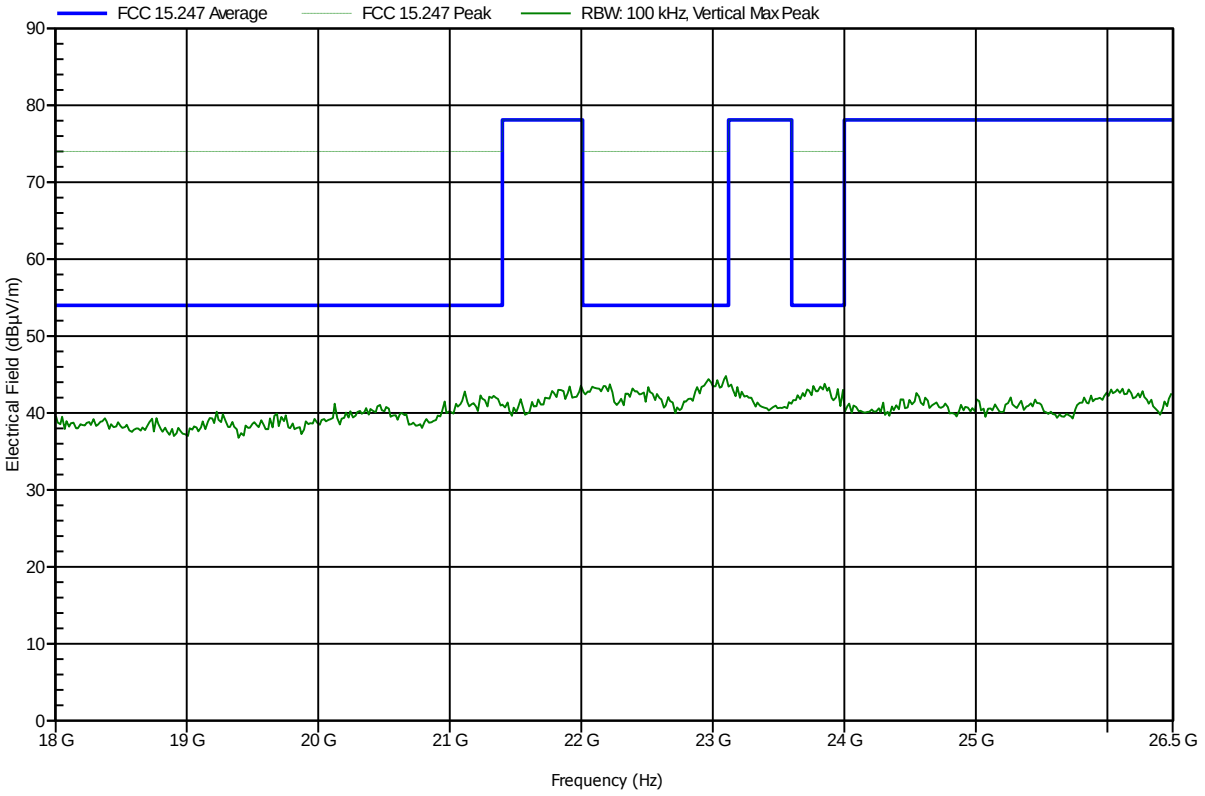

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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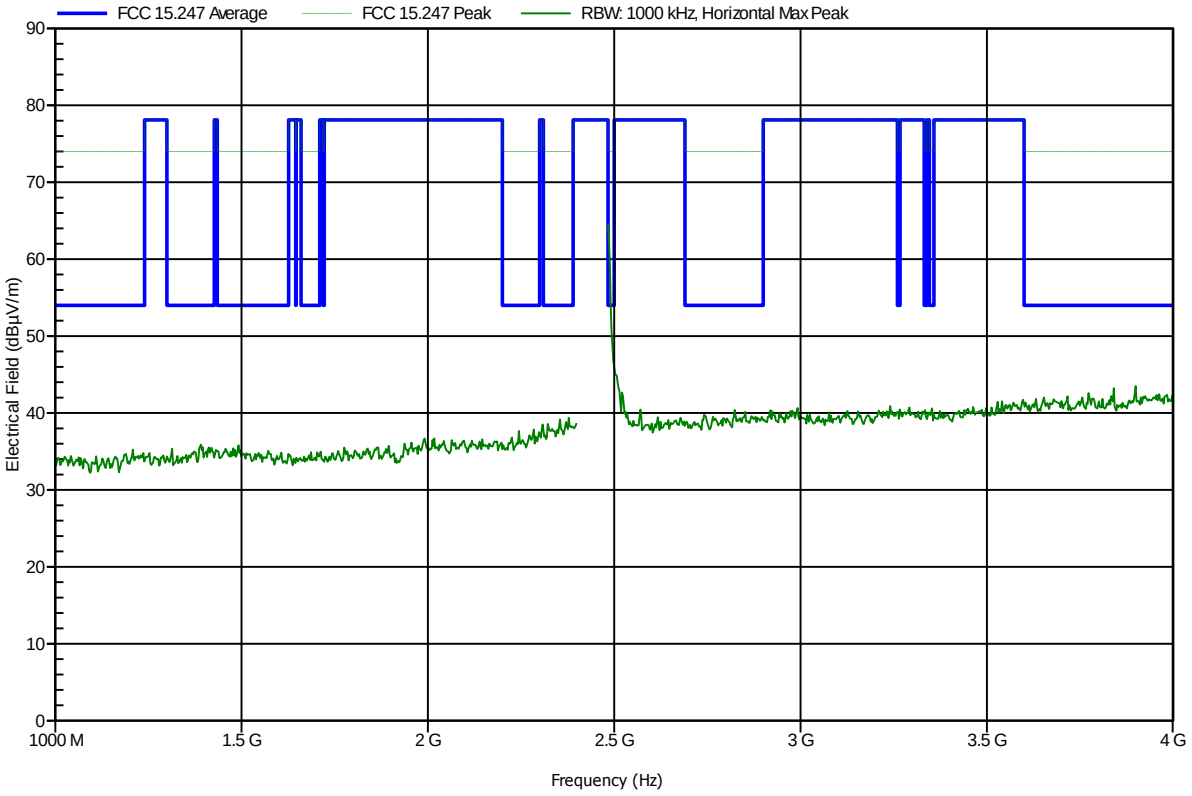

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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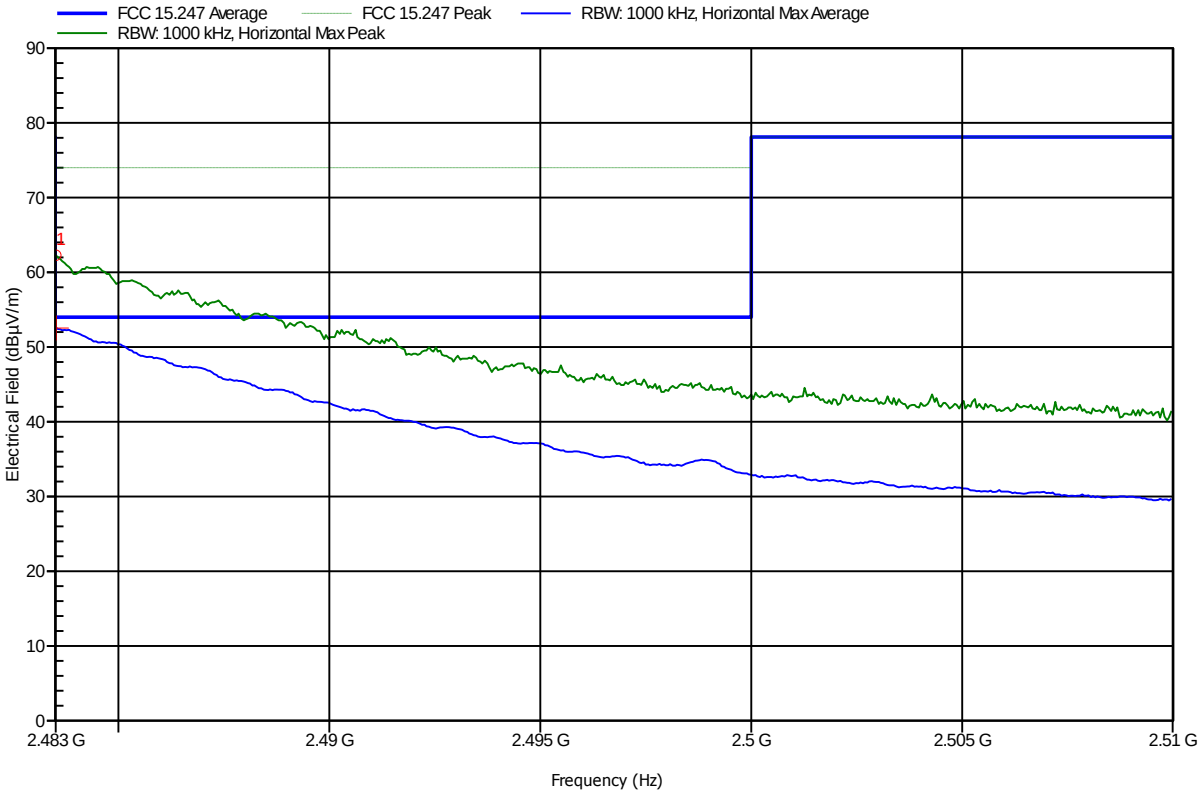

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.483 GHz	62.27 dBµV/m	74 dBµV/m	-11.73 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
2.483 GHz	52.63 dBµV/m	54 dBµV/m	-1.37 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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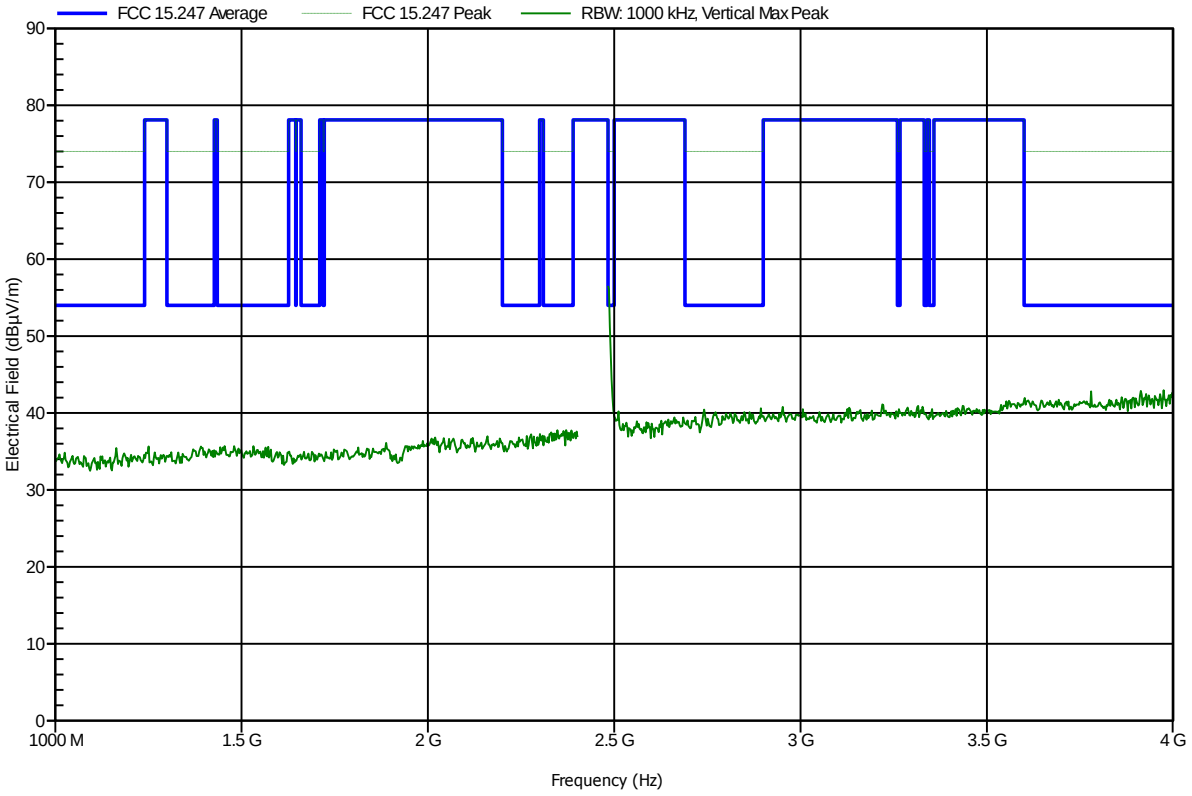

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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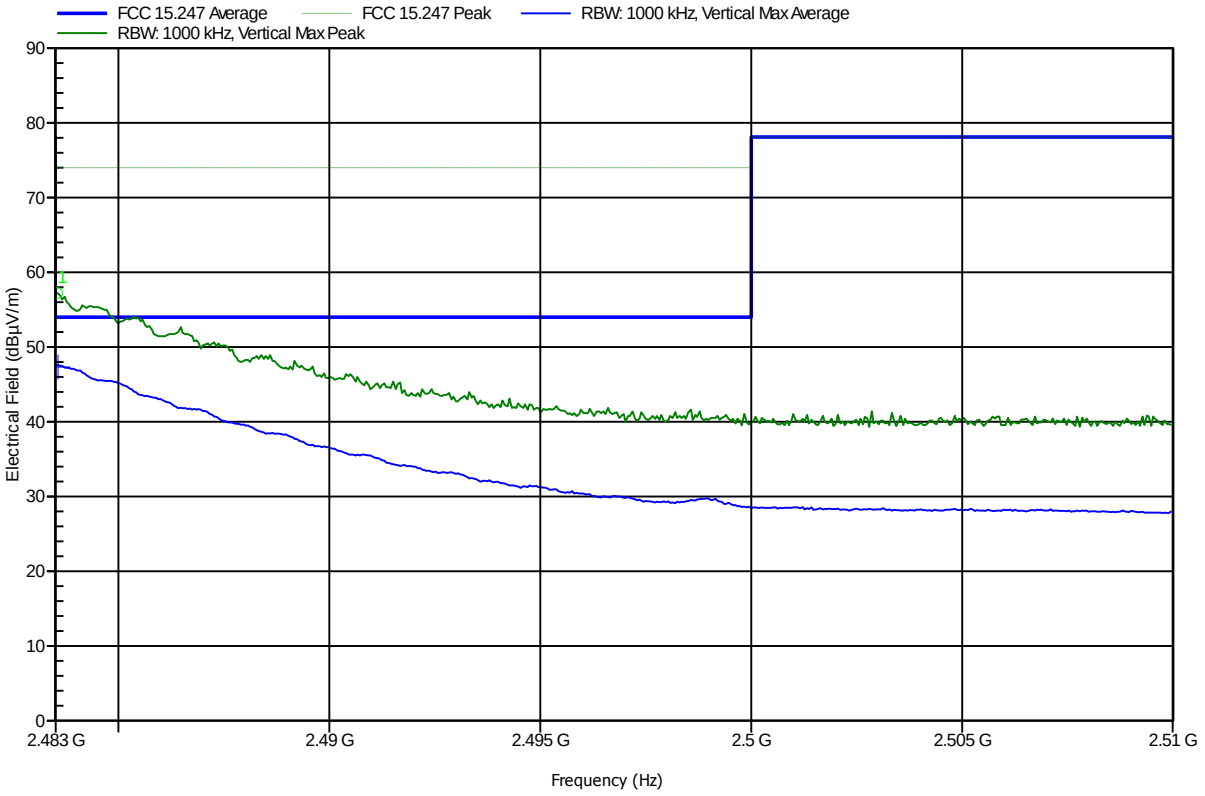

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
2.484 GHz	57.22 dBµV/m	74 dBµV/m	-16.78 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
2.484 GHz	47.41 dBµV/m	54 dBµV/m	-6.59 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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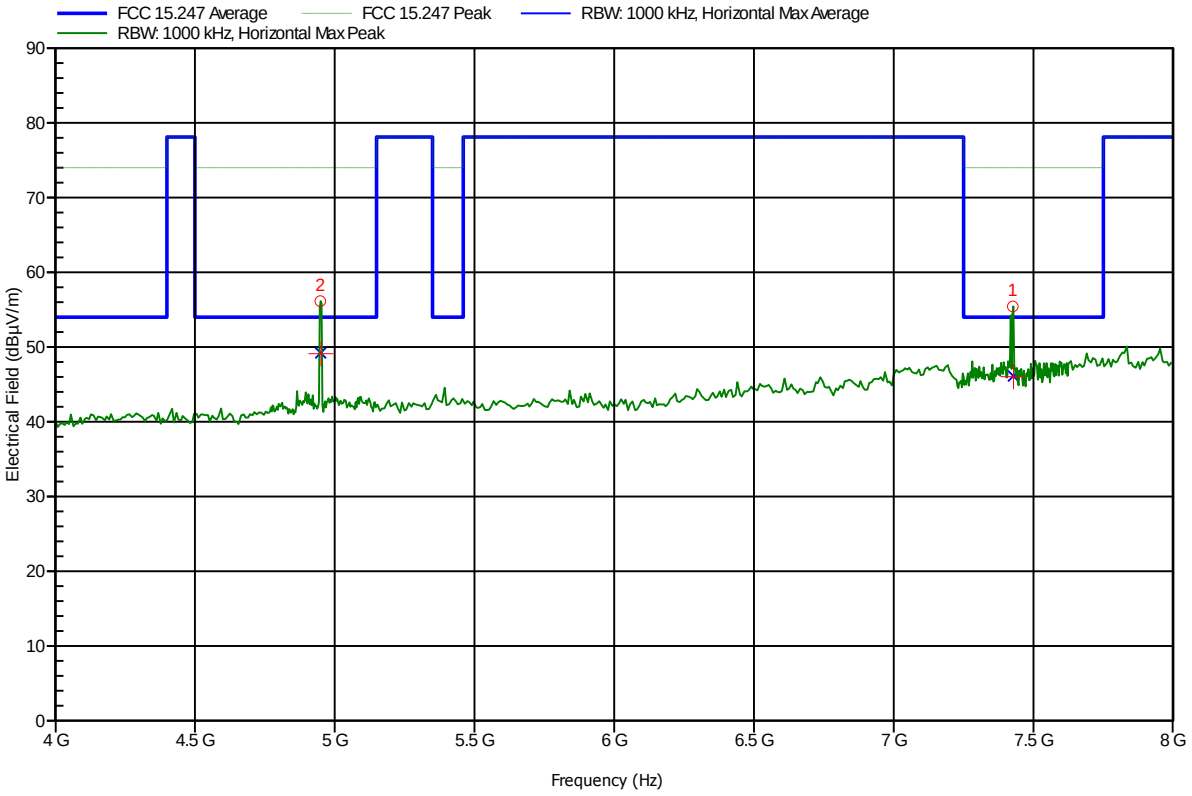

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
4.949 GHz	56.14 dBµV/m	74 dBµV/m	-17.86 dB	Pass
7.426 GHz	55.43 dBµV/m	74 dBµV/m	-18.57 dB	Pass

Frequency	Average	Average Limit	Average Difference	Average Status
4.949 GHz	49.2 dBµV/m	54 dBµV/m	-4.8 dB	Pass
7.426 GHz	46.12 dBµV/m	54 dBµV/m	-7.88 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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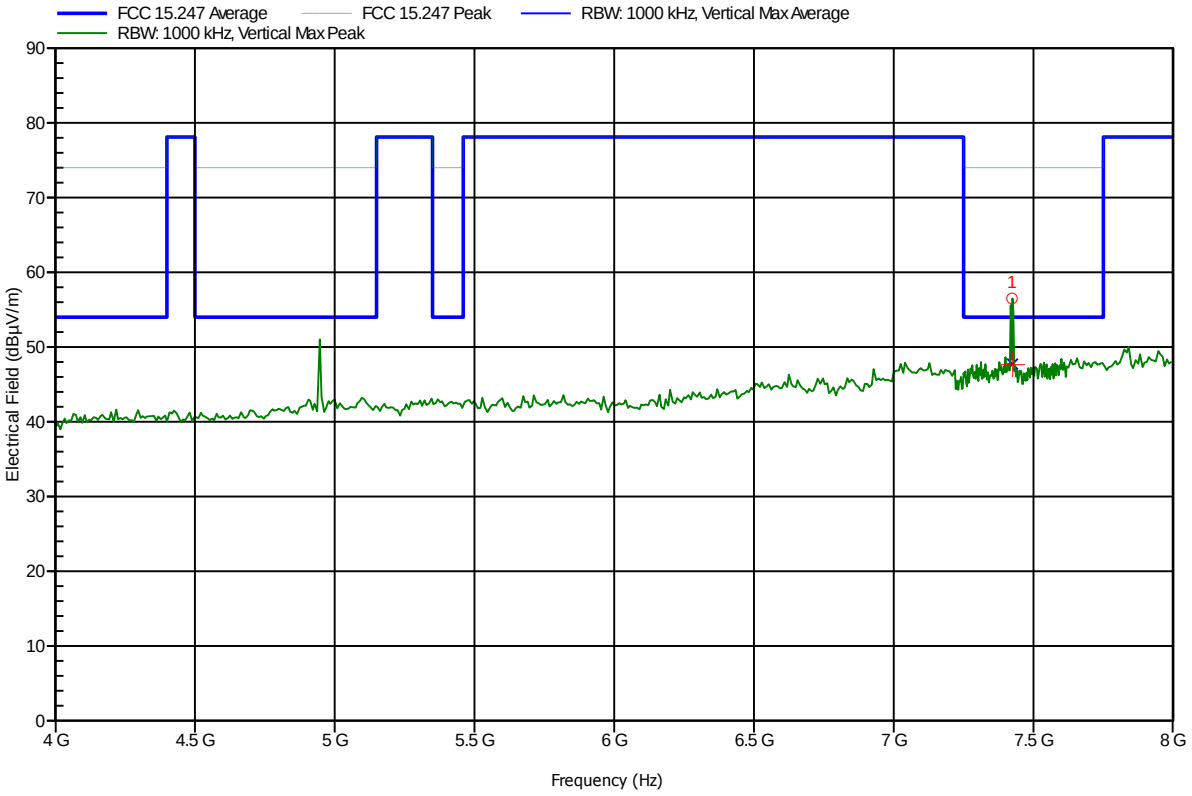

Frequency	Peak	Peak Limit	Peak Difference	Peak Status
7.423 GHz	56.51 dBµV/m	54 dBµV/m	2.51 dB	Fail

Frequency	Average	Average Limit	Average Difference	Average Status
7.423 GHz	47.73 dBµV/m	54 dBµV/m	-6.27 dB	Pass

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	100 cm
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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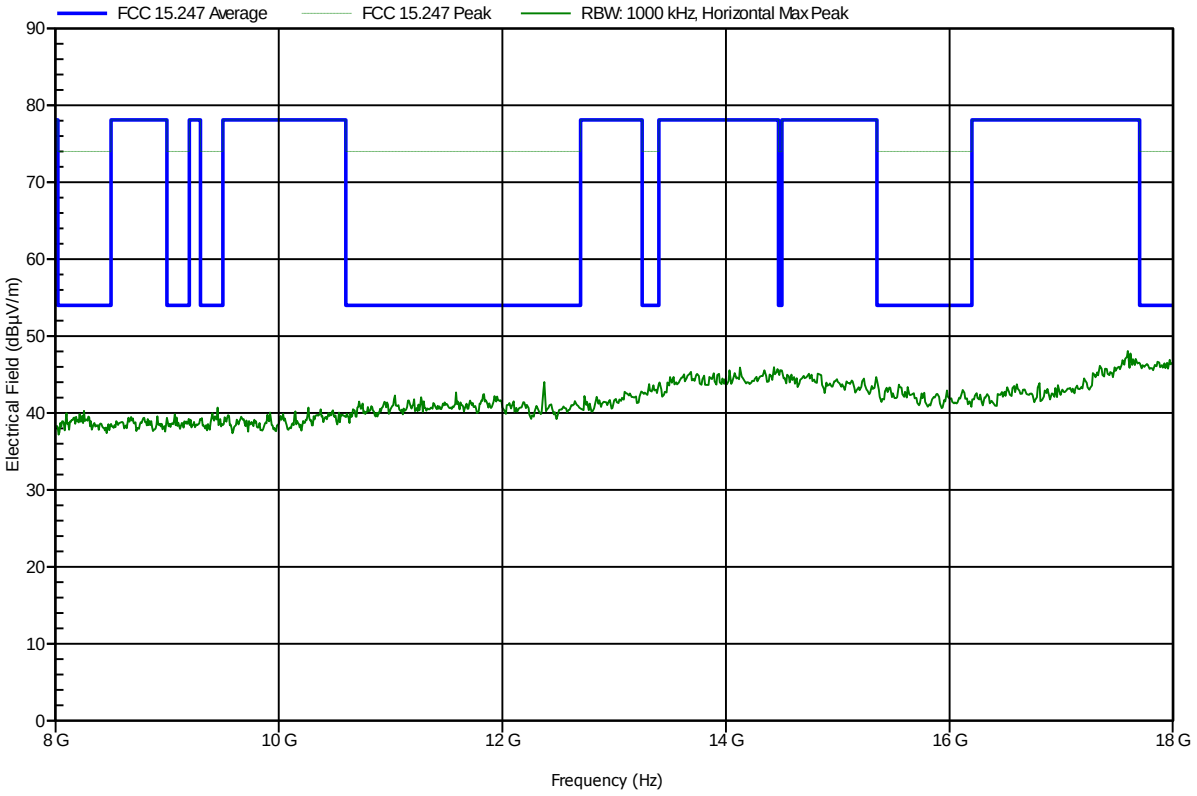

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	100 cm
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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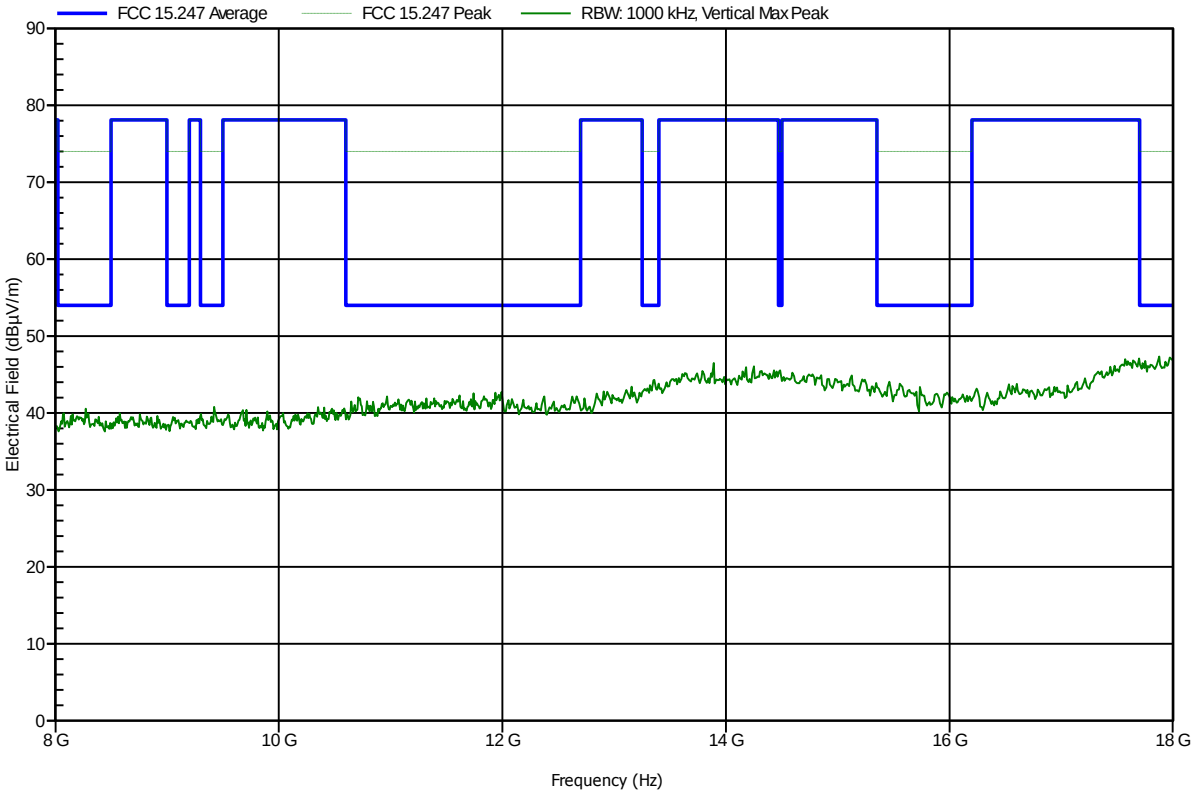

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 025, Horizontal
Measurement distance:	100 cm
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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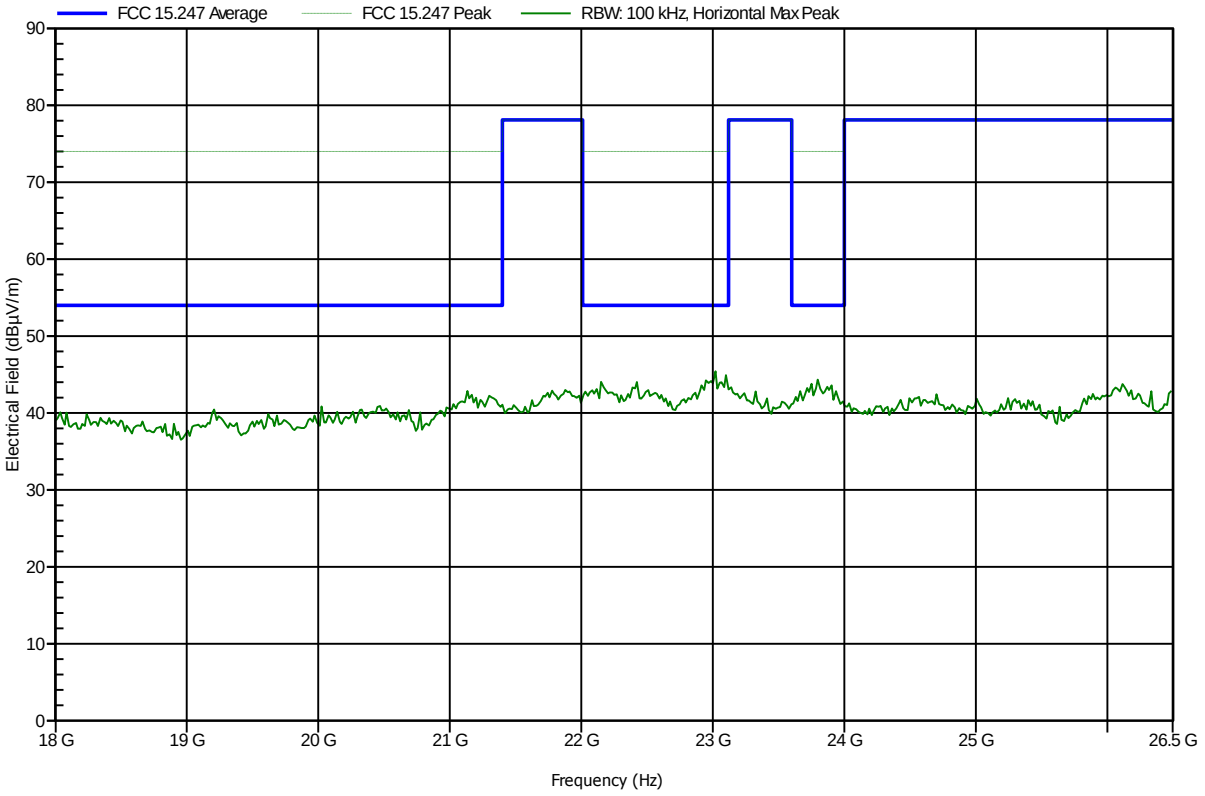

Spurious emissions according to FCC 15.247

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 025, Vertical
Measurement distance:	100 cm
Mode:	TX; Ch.25; power level 11dBm
Test Date:	2012-09-04
Note:	

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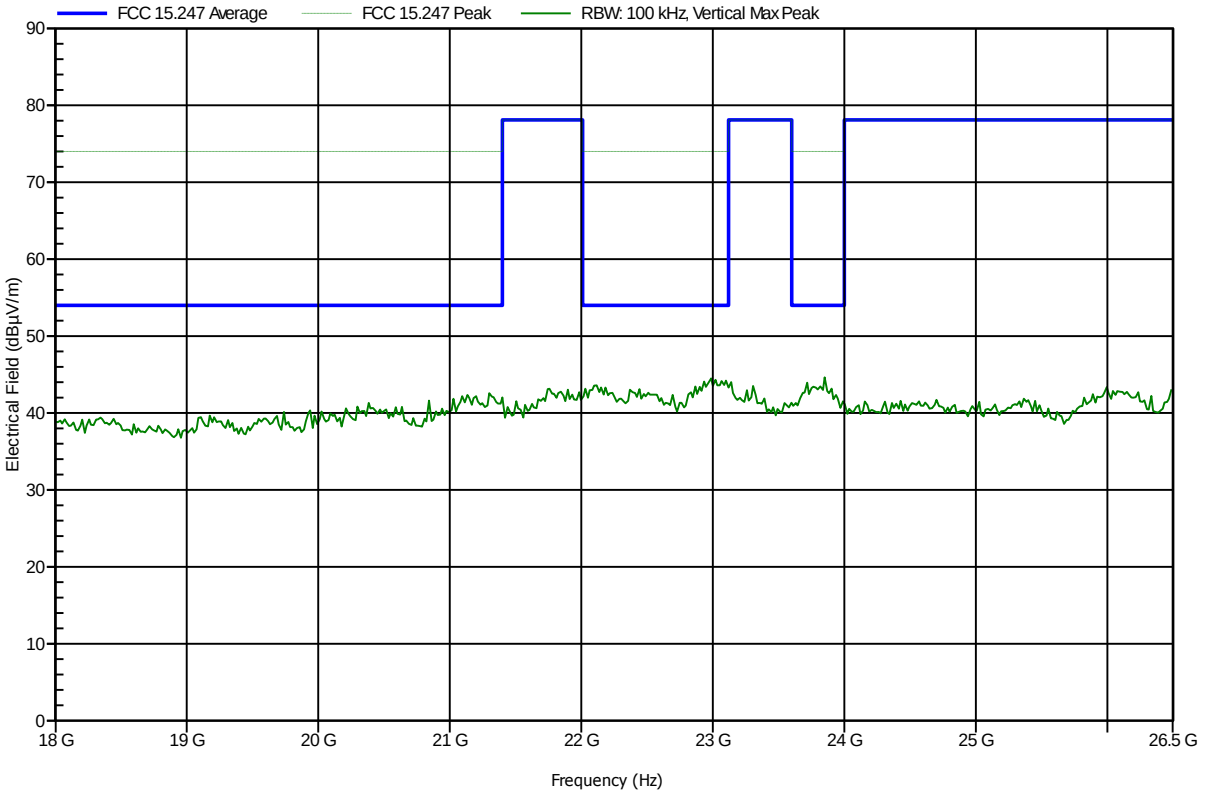

ANNEX B Receiver radiated spurious emissions

Spurious emissions according to RSS-GEN

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HK 116, Horizontal
Measurement distance:	3 m
Mode:	RX; Ch.18
Test Date:	2012-09-05
Note:	

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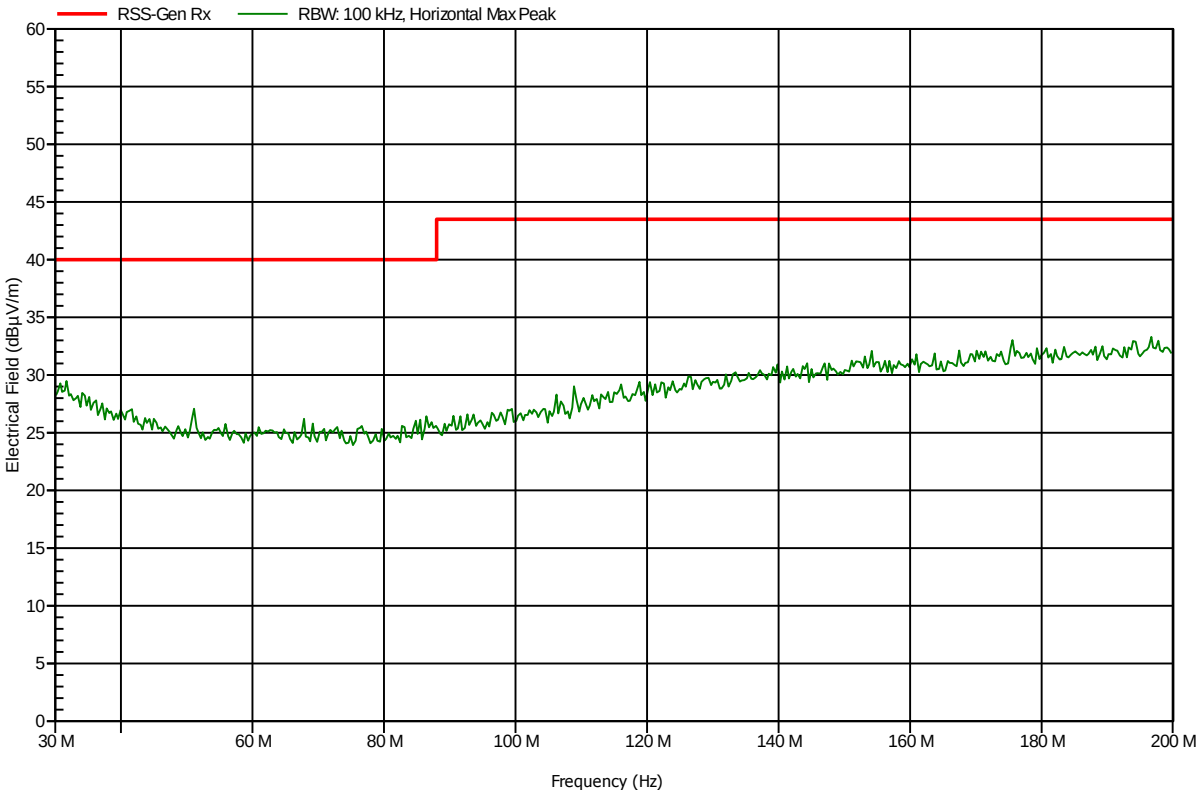

Spurious emissions according to RSS-GEN

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement distance:	3 m
Mode:	RX; Ch.18
Test Date:	2012-09-05
Note:	

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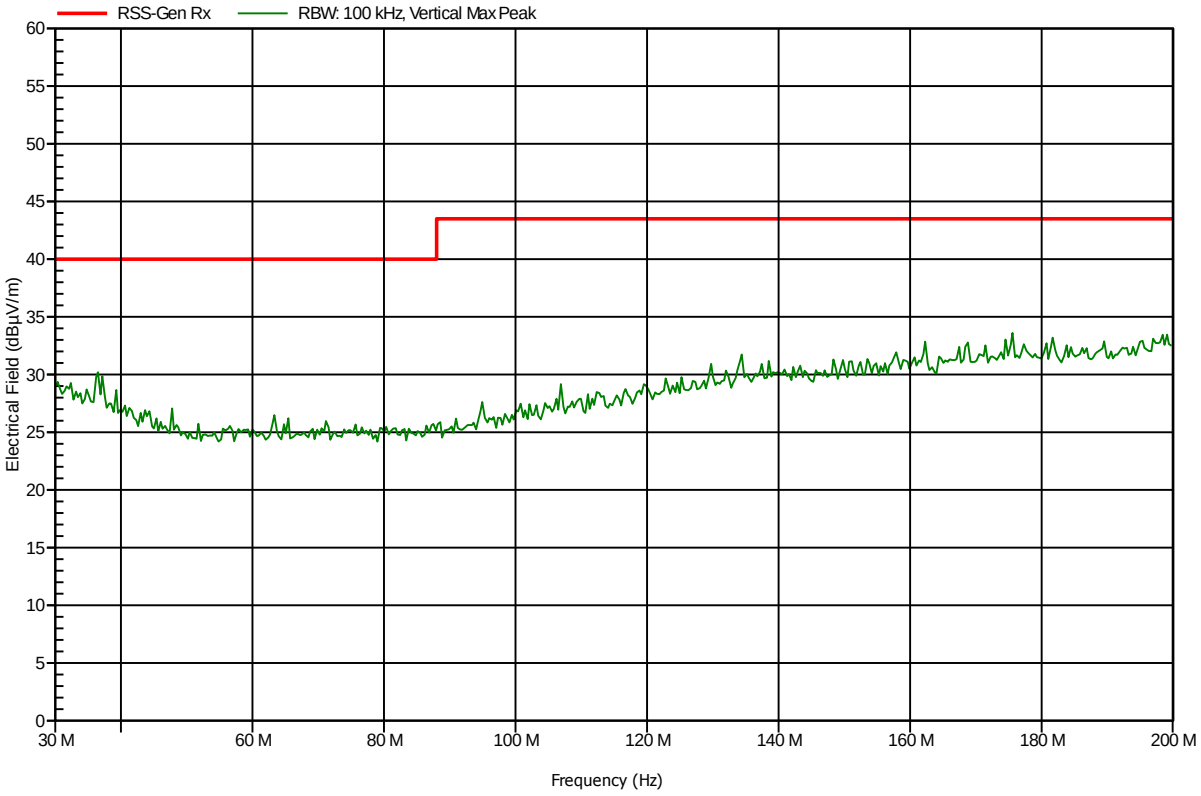

Spurious emissions according to RSS-GEN

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 223, Horizontal
Measurement distance:	3 m
Mode:	RX; Ch.18
Test Date:	2012-09-05
Note:	

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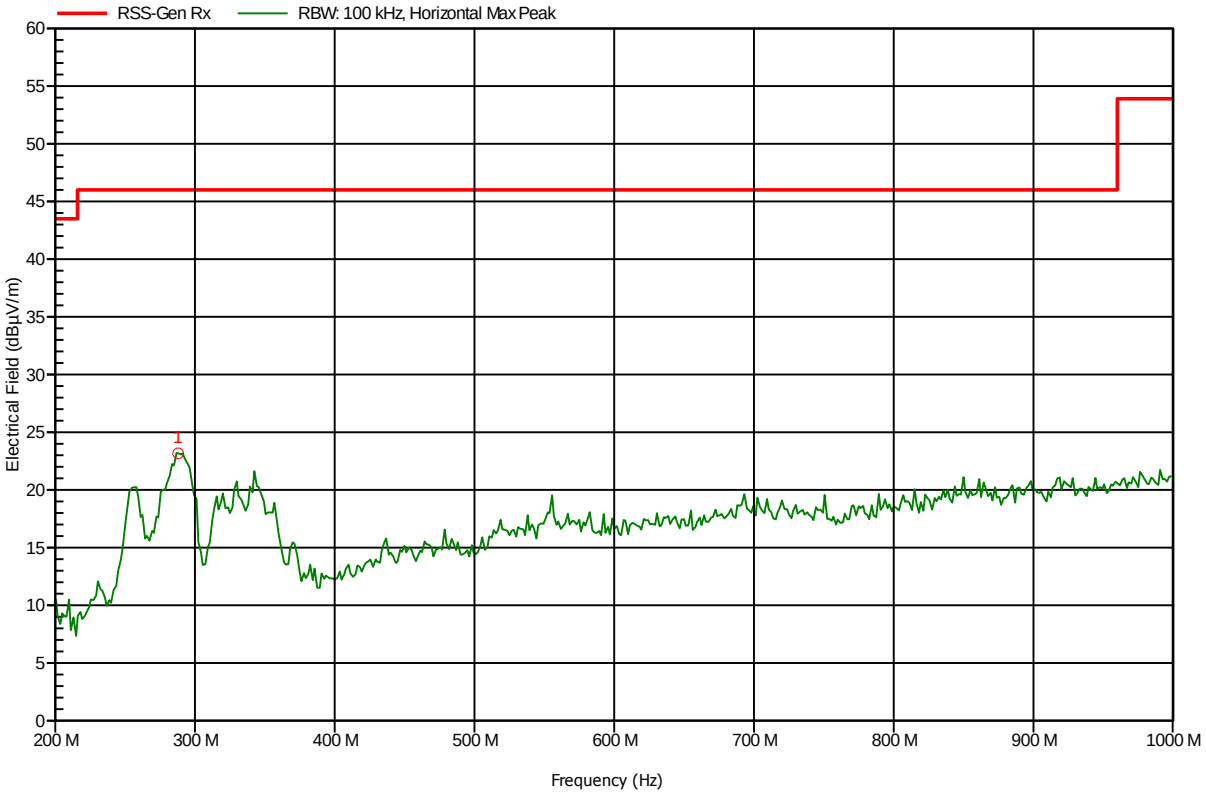

Frequency	Peak	Peak Limit	Peak Difference	Status
288 MHz	23.17 dBµV/m	46 dBµV/m	-22.83 dB	Pass

Spurious emissions according to RSS-GEN

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement distance:	3 m
Mode:	RX; Ch.18
Test Date:	2012-09-05
Note:	

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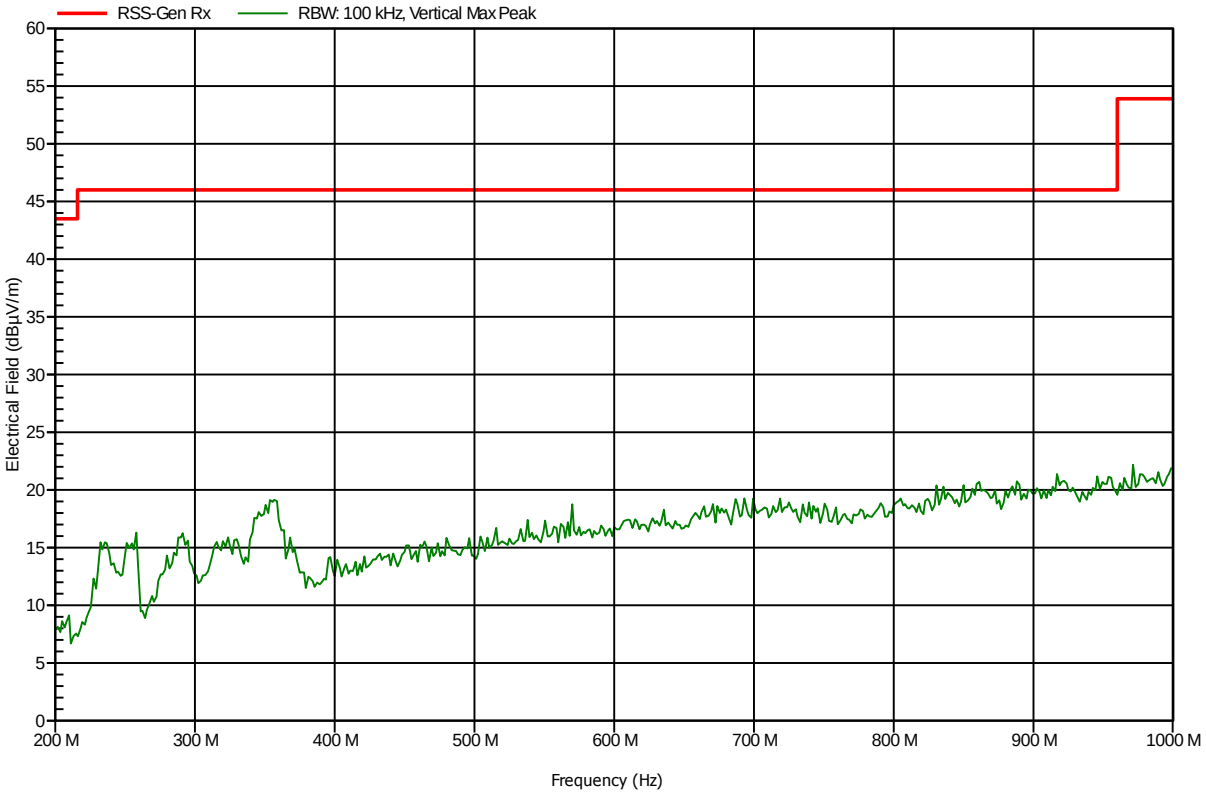

Spurious emissions according to RSS-GEN

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	RX; Ch.18
Test Date:	2012-09-05
Note:	

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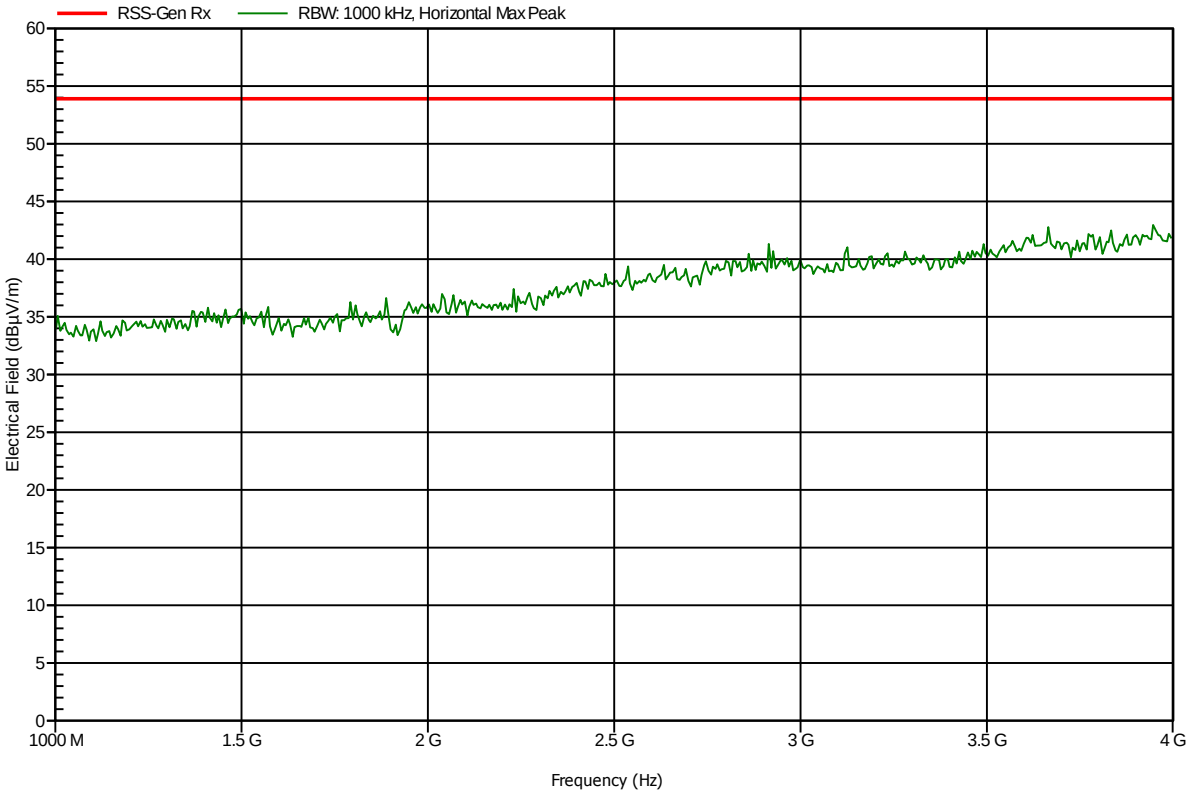

Spurious emissions according to RSS-GEN

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	RX; Ch.18
Test Date:	2012-09-05
Note:	

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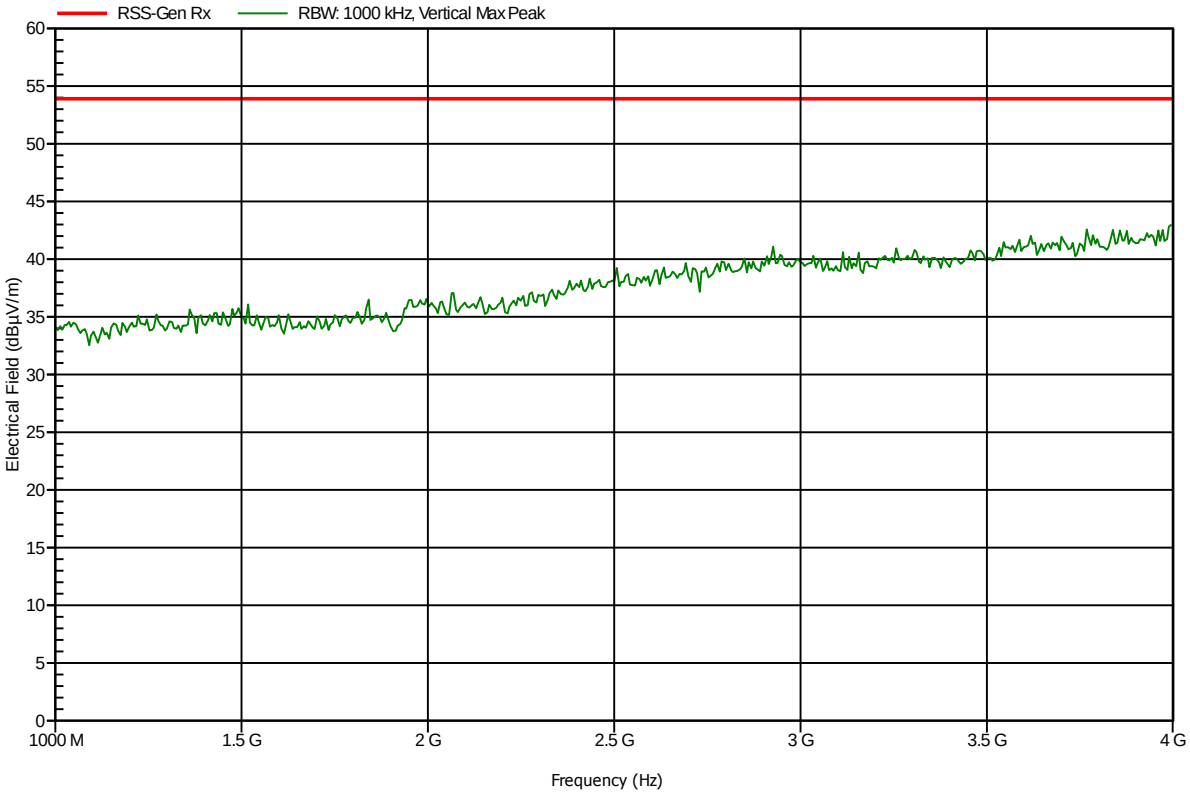

Spurious emissions according to RSS-GEN

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Horizontal
Measurement distance:	3 m
Mode:	RX; Ch.18
Test Date:	2012-09-05
Note:	

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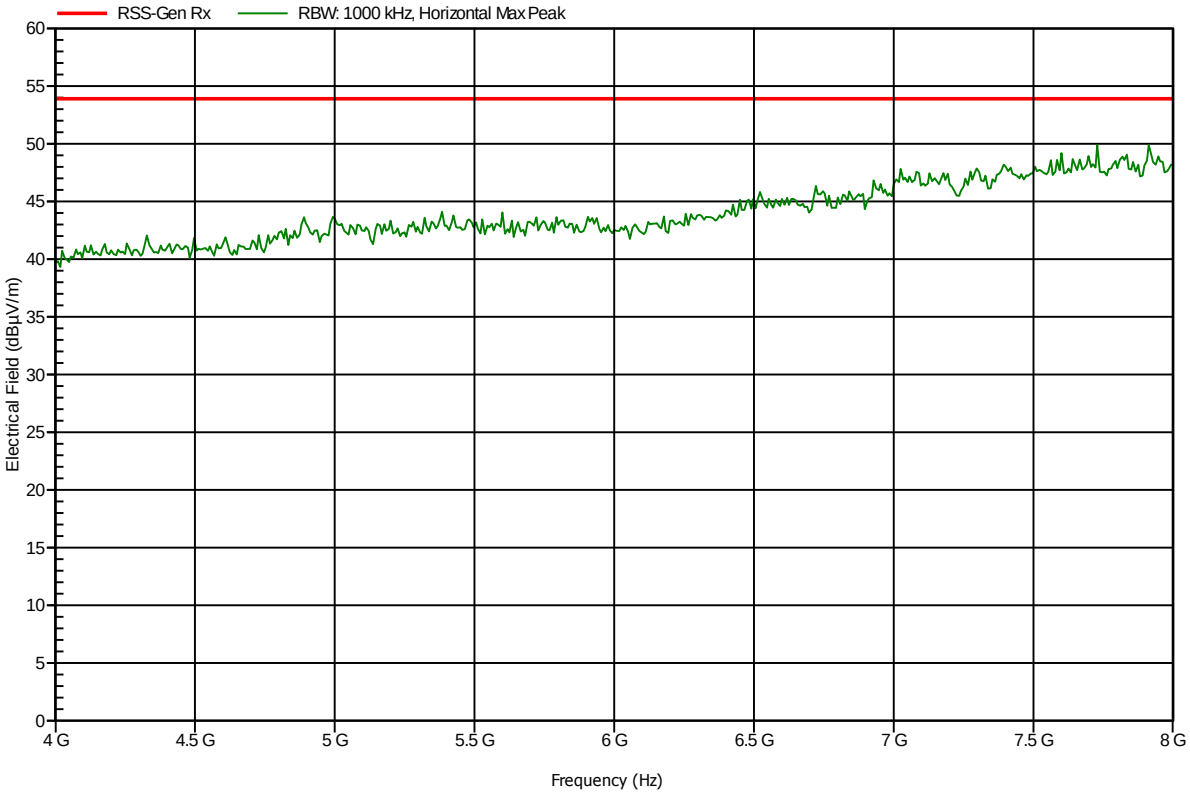

Spurious emissions according to RSS-GEN

Project number: G0M-1201-1705

Manufacturer:	Leica Geosystems AG
EUT Name:	IEEE 802.15.4 Radio Module
Model:	Viper 300m
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Treffke
Test Conditions:	Tnom: 25°C, Vnom: 3.15V DC
Antenna:	Schwarzbeck BBHA 9120D, Vertical
Measurement distance:	3 m
Mode:	RX; Ch.18
Test Date:	2012-09-05
Note:	

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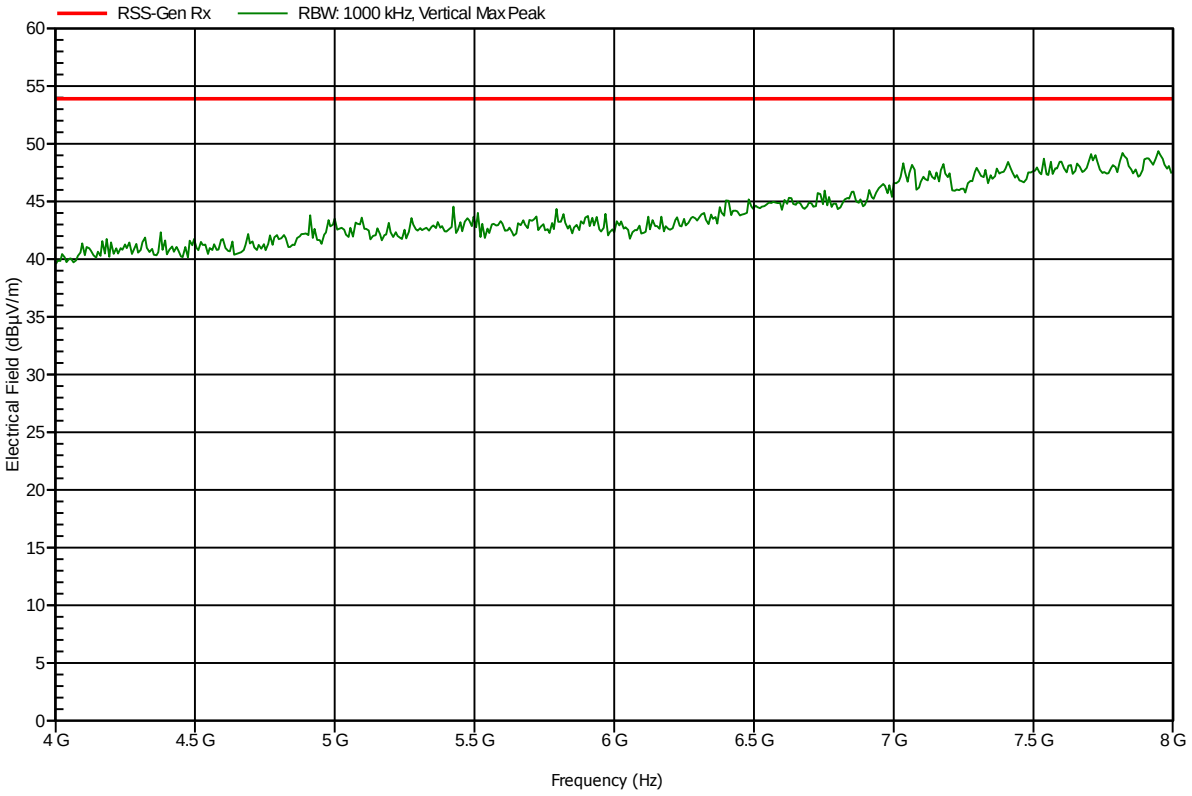

Version History

Version	Issue Date	Remarks		Revised by
01	2012-09-25	Initial Release		
02	2012-10-04	Replaced document: Replaced by: Reason: • Page 1 & 4: Software version changed	G0M-1201-1705-TFC247W-V01 G0M-1201-1705-TFC247W-V02	C. Weber
03	2012-10-19	Replaced document: Replaced by: Reason: • Page 4, 21: Antenna gain corrected • Page 8: Support equipment corrected	G0M-1201-1705-TFC247W-V02 G0M-1201-1705-TFC247W-V03	C. Weber