Global EMC Inc. Labs

EMC & RF Test Report

As per

RSS 210 Issue 8:2010

&

FCC Part 15 Subpart C:2014

Unlicensed Intentional Radiators

on the

Brickstream 3D+

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Testing produced for

brick stream

See Appendix A for full customer & EUT details.

Industry Canada
LAB REGISTRATION #6844A-3

FCC REGISTRATION #377448

R-4023, G-506
T-1246, C-4498

ACCREDITED
Testing Laboratory Certificate #2555.01

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This report is based on GEMC Template "FCC 15 247 Rev2."

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Report Scope

This report addresses the EMC verification testing and test results of Brickstream's 3D+ Camera, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:

RSS 210 Issue 8:2010
FCC Part 15 Subpart C 15.247:2014

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.

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Summary

The results contained in this report relate only to the item(s) tested.

EUT FCC Certification #, FCC ID:	2ADER-3210
EUT Industry Canada Certification #, IC:	12439A-3210
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Min Xie

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Client	**Brickstream Corp**
Product	**3D+ Camera**
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2014

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 (Table 1)	Restricted Bands for intentional operation	QuasiPeak Average	Pass
FCC 15.207	Power line conducted emissions	QuasiPeak Average	Pass
FCC 15.209 RSS-210 (Table 2)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)2 RSS-210 A8.2(a)	6 dB Bandwidth	> 500 kHz	Pass
FCC 15.247(b)2 RSS-210 A8.4(4)	Max output power	< 1 Watt	Pass
FCC 15.247(b)(4) RSS-210 A8.4(5)	Antenna Gain	< 6 dBi	Pass See Justifications
FCC 15.247(d) RSS-210 A8.5	Antenna conducted spurious	< 20 dBc	Pass
FCC 15.247(e) RSS-210 A8.2(b)	Spectral Density	< 8 dBm (3 kHz BW)	Pass
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	> 20 cm separation.	Pass See justification and calculations
Overall Result			**PASS**

All tests were performed by Min Xie.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a ‘PASS’ grade. If not ‘FAIL’ grade will be issued. Note that ‘PASS’ / ‘FAIL’ grade is independent of any measurement uncertainties.

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Justifications, Descriptions, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), the unit uses a Taoglas Patch Antenna (SWLP.2450.12.4.B.02) (2 dBi gain) which is less than 6 dBi gain.

For the Restricted Bands of operation, the EUT is designed to only operate between 2400 – 2483.5 MHz band.

For maximum permissible exposure, this device operates at less than 1 Watt at 2400 – 2483.5 MHz and is designed to operate greater than 20 cm from any personnel during normal operation. No testing is required, however worst case calculated exposure compliance follows later in this report.

The EUT is not a hybrid system and FCC 15.247 (f) does not apply to it. However the 15.247 (d) requirement of power density were met and are detailed later in this test report.

The EUT is for fixed installation use. For the scope of this test report the EUT was mounted in two orthogonal axes to maximize radiated emissions. Worst case results are presented.

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Applicable Standards, Specifications and Methods

ANSI C63.4:2009	- Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2009	- American national standard for testing unlicensed wireless devices
CFR 47 FCC 15	- Code of Federal Regulations – Radio Frequency Devices
FCC KDB 558074	- FCC KDB 558074 Digital Transmission Systems, measurements and procedures
ICES-003:2012	- Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
RSS-GEN	General Requirements and Information for the Certification of Radio Apparatus
RSS 210:2010	Issue 8: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power License-Exempt Radiocommunication Devices
CISPR 22:2008	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
ISO 17025:2005	- General Requirements for the competence of testing and calibration laboratories

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Sample calculation(s)

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)
Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)
Margin = 8.5 dB

Document Revision Status

Revision 1 - November 24, 2014
Initial release

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Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxiallary Equipment.

BW – Bandwidth. Unless otherwise stated, this is refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency

DTS Bandwidth – 6 dB bandwidth of the a DTS transmitter.

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Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations

The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, 377448), Industry Canada (IC, 6844A-3) and VCCI (R-4023, G-506, T-1246, and C-4498). This semi-anechoic chamber complies with the requirements of EN55016-2-3:2006, section 7.5 and the site attenuation requirements of EN55016-1-4. This chamber was additionally calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at Global EMC. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at Global EMC. Global EMC Inc is accredited to ISO 17025 by A2LA with Testing Certificate #2555.01. The laboratories current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

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Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (ºC)	Humidity (%)	Pressure (kPa)
2014/11/4 - 7	Radio Requirements	MX	18-21ºC	30 - 39%	96 -102kPa
2014/11/11	Power line Conducted Emission	MX	18-21ºC	30 - 39%	96 -102kPa

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Detailed Test Results Section

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6 dB Bandwidth of Digitally Modulated Systems – 15.247

Purpose

The purpose of this test is to ensure that the bandwidth occupied exceeds a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently wide. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.

Limits and Methods

The Limit is as specified in FCC Part 15 and RSS 210.

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz. This should be measured with a 100 kHz RBW and a 300 kHz VBW.

The method is given in Section 8.1 of FCC KDB 558074: June 9, 2014.

Results

The EUT meet the 6 dB bandwidth requirement. The 6 dB and 20 dB bandwidth for the Bluetooth Low Energy, 802.11 G, and N-Mode with 20 MHz and 40 MHz bandwidth are provided in the following table:

Table 1: 6 dB and 20 dB bandwidth

Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	20 dB Bandwidth (MHz)	6 dB Bandwidth Min. Limit (MHz)	Results
BLE	0	2402	0.7246	1.2395	0.5	Pass
BLE	19	2440	0.7186	1.2395	0.5	Pass
BLE	39	2480	0.7186	1.2395	0.5	Pass
802.11g	1	2412	16.287	17.186	0.5	Pass
802.11g	6	2437	16.287	17.086	0.5	Pass
802.11g	11	2462	15.888	17.086	0.5	Pass
802.11n 20 MHz	1	2412	17.485	18.323	0.5	Pass
802.11n 20 MHz	6	2437	17.246	18.204	0.5	Pass
802.11n 20 MHz	11	2462	16.647	18.323	0.5	Pass
802.11n	3	2422	35.930	37.209	0.5	Pass

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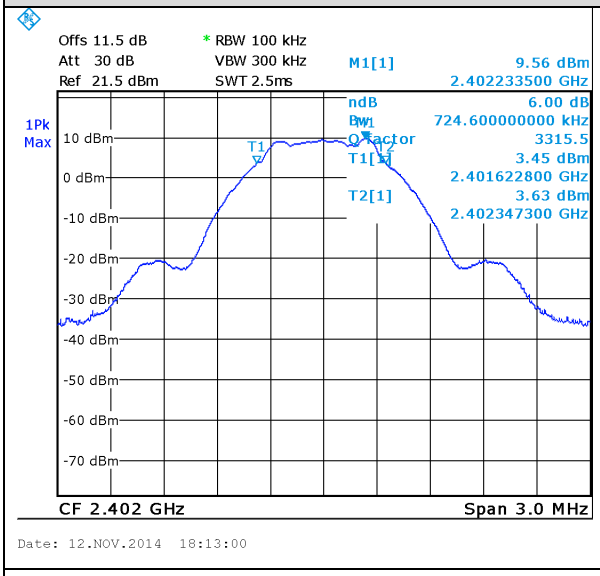
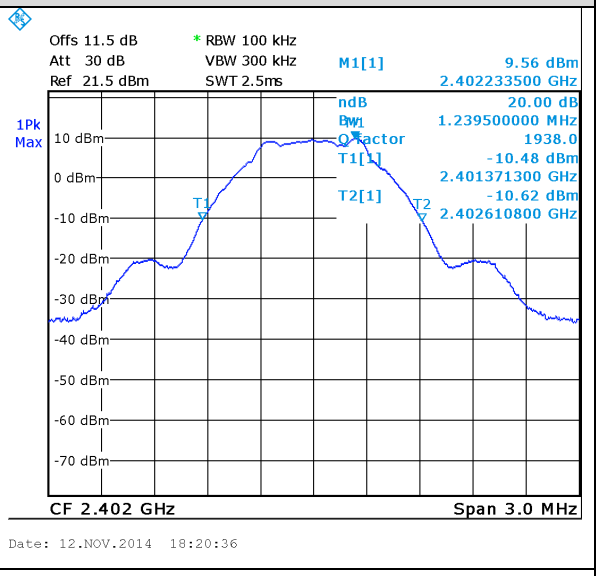
40 MHz						
802.11n 40 MHz	6	2437	35.290	37.209	0.5	Pass
802.11n 40 MHz	9	2452	34.520	39.290	0.5	Pass

Graph(s)

The graphs showed below shows the DTS Bandwidth during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.

BLE – Channel 0	
	
6 dB BW = 724.6 kHz	20 dB BW = 1.2395 MHz

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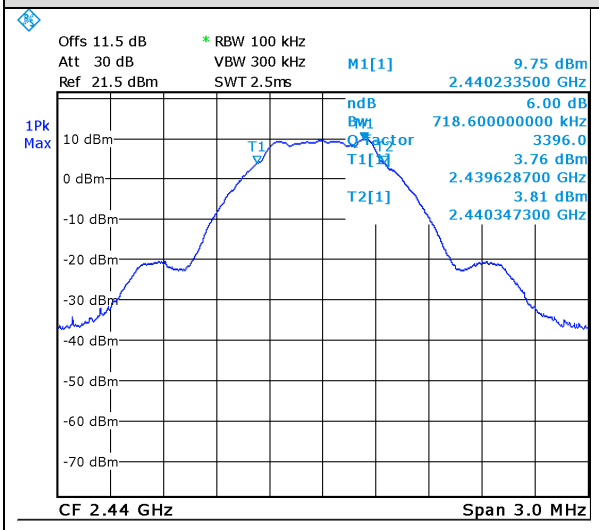
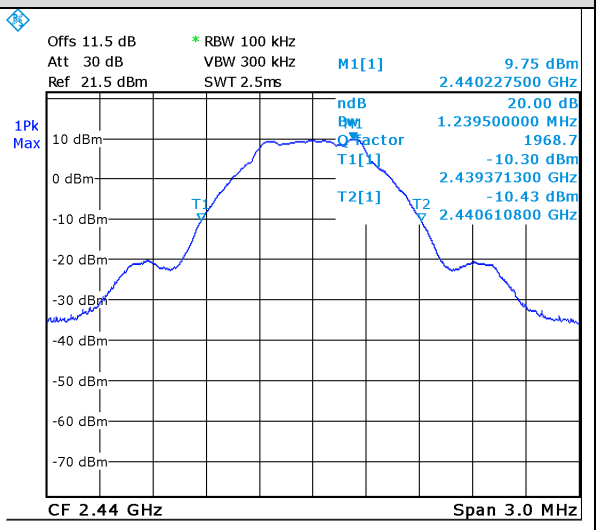
BLE – Channel 19

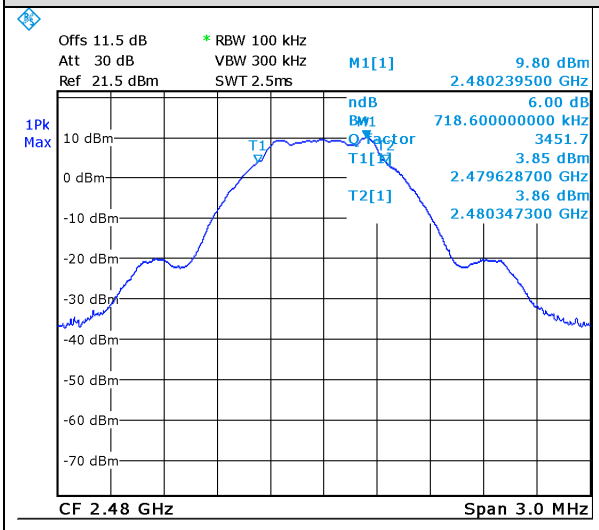


6 dB BW = 718.6 kHz

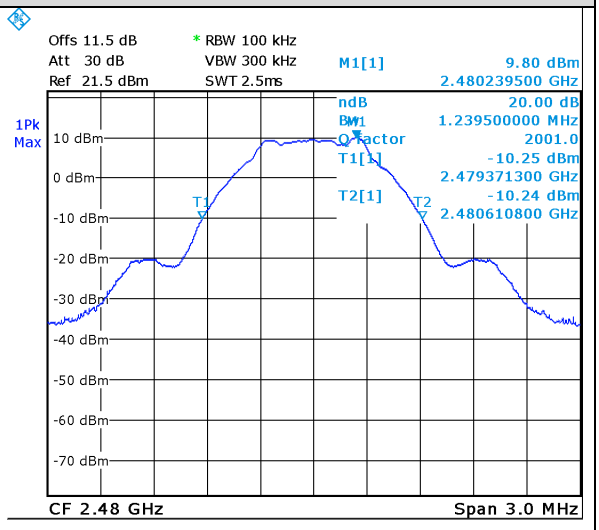


20 dB BW = 1.2395 MHz

BLE – Channel 39



6 dB BW = 718.6 kHz



20 dB BW = 1.2395 MHz

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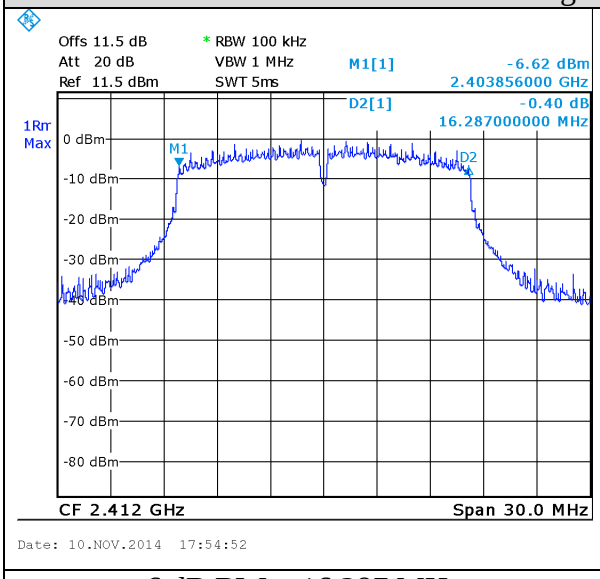
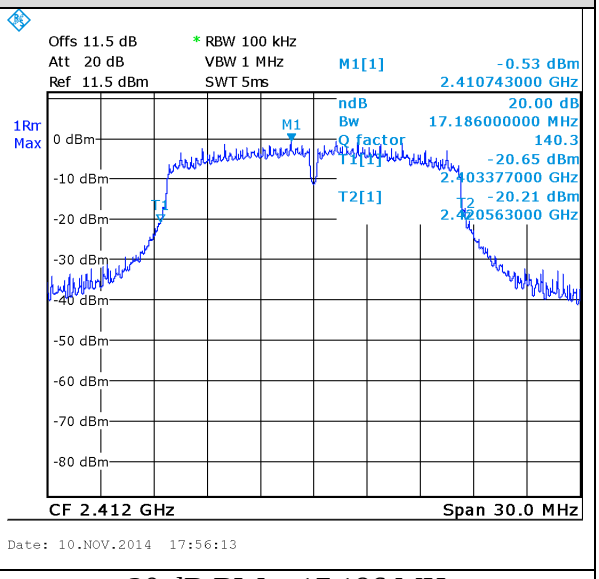
802.11g – Channel 1

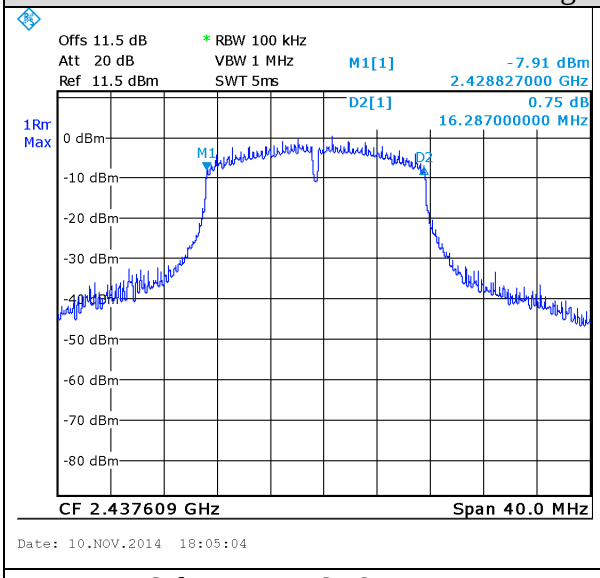


6 dB BW = 16.287 MHz

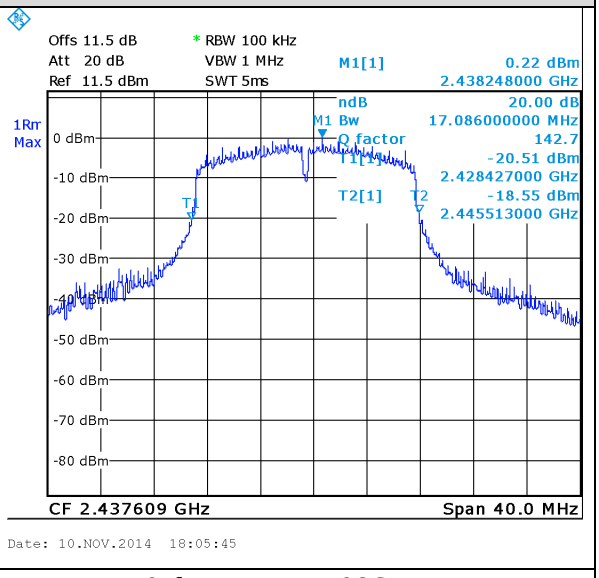


20 dB BW = 17.186 MHz

802.11g – Channel 6



6 dB BW = 16.287 MHz



20 dB BW = 17.086 MHz

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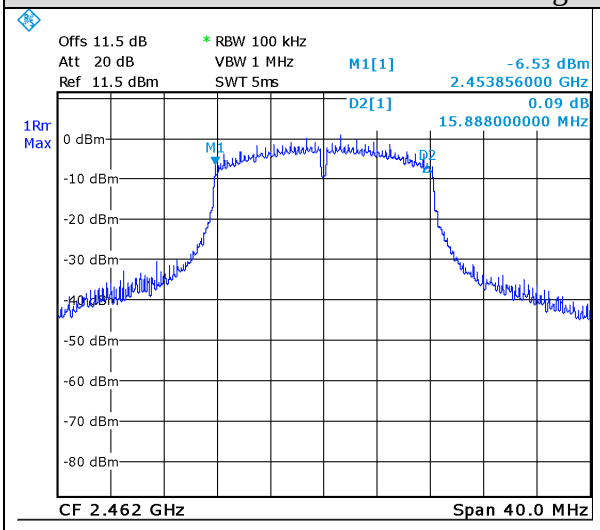
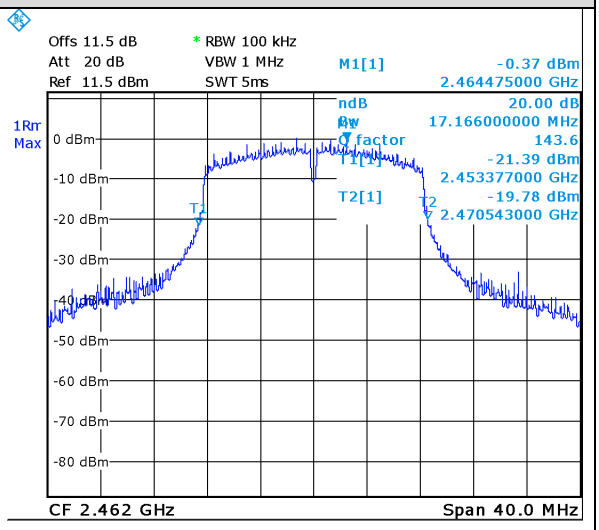
802.11g – Channel 11

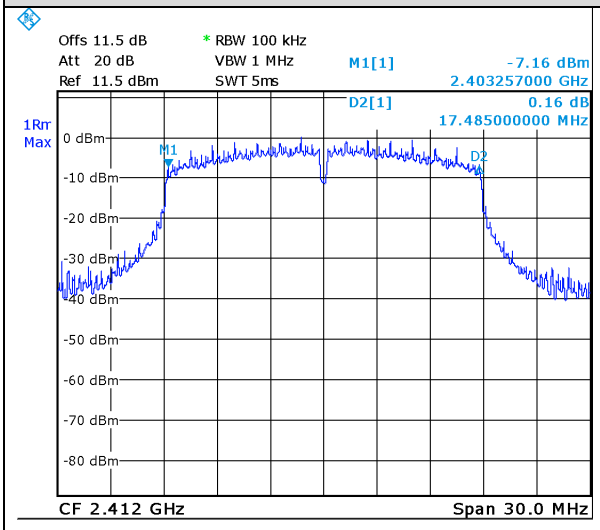


6 dB BW = 15.888 MHz

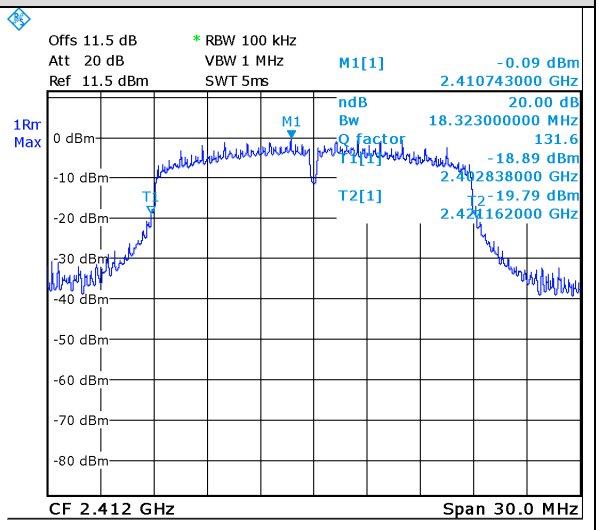


20 dB BW = 17.086 MHz

802.11n 20 MHz – Channel 1



6 dB BW = 17.485 MHz



20 dB BW = 18.323 MHz

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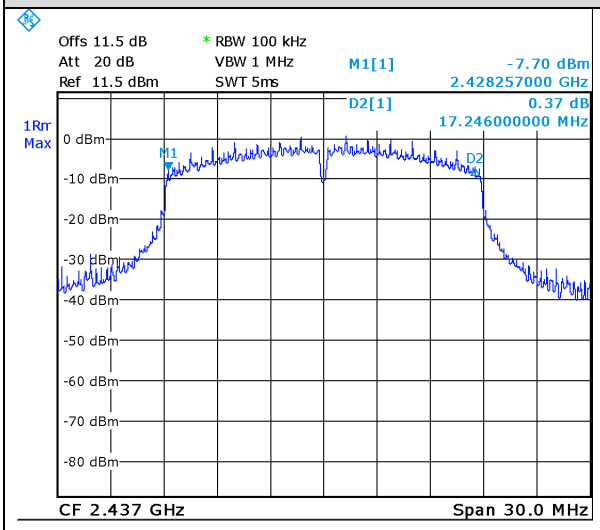
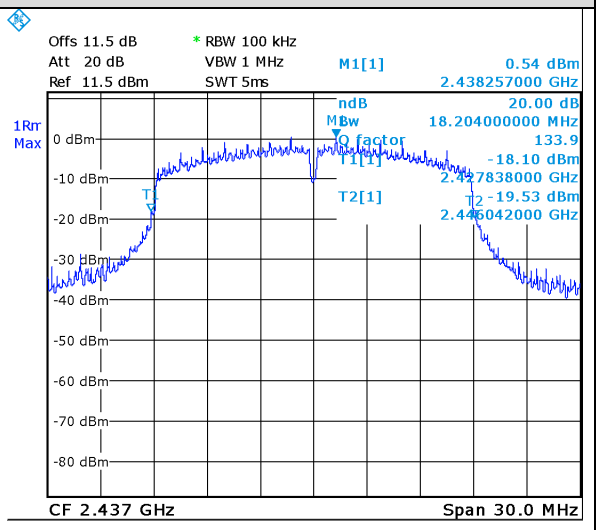
802.11n 20 MHz – Channel 6

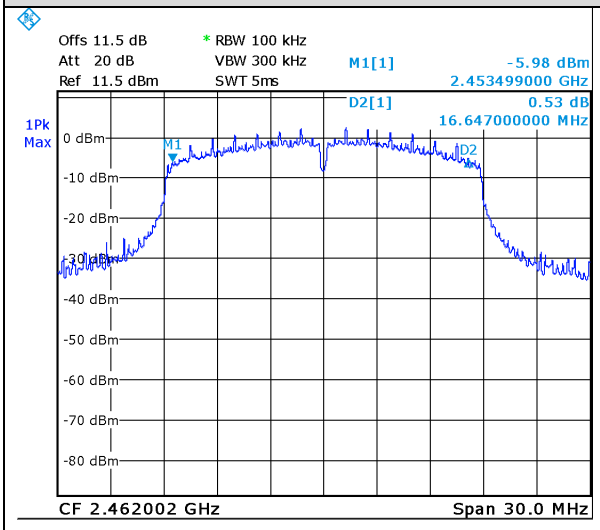


6 dB BW = 17.246 MHz

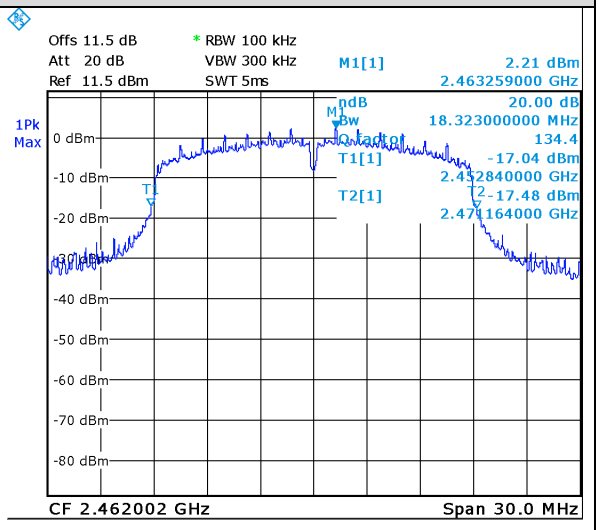


20 dB BW = 18.204 MHz

802.11n 20 MHz – Channel 11



6 dB BW = 16.647 MHz



20 dB BW = 18.323 MHz

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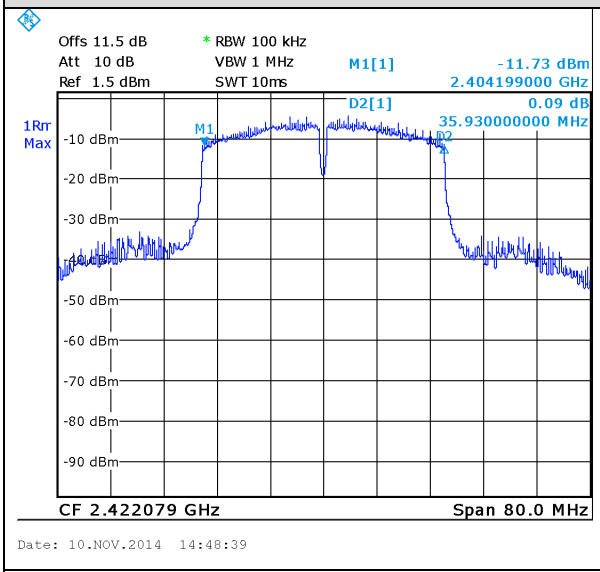
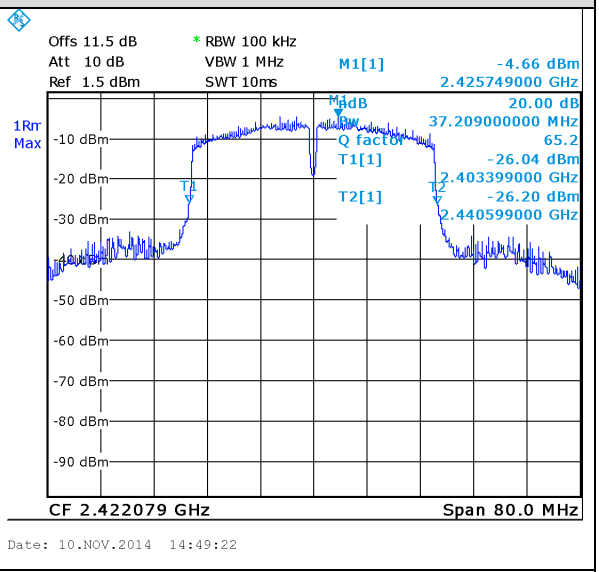
802.11n 40 MHz – Channel 3

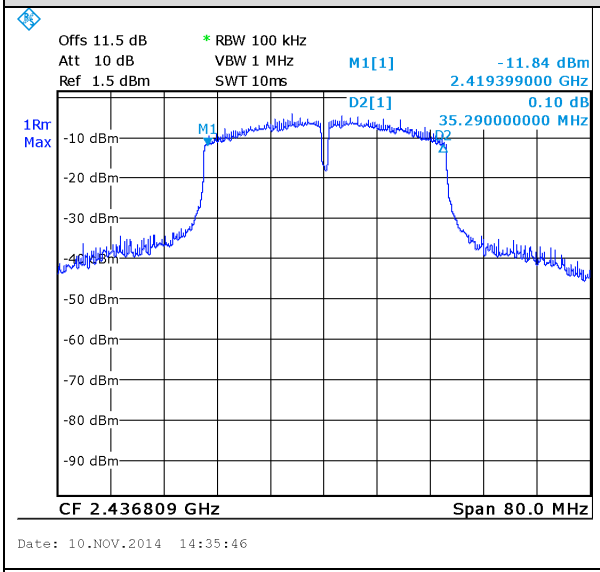


6 dB BW = 35.930 MHz

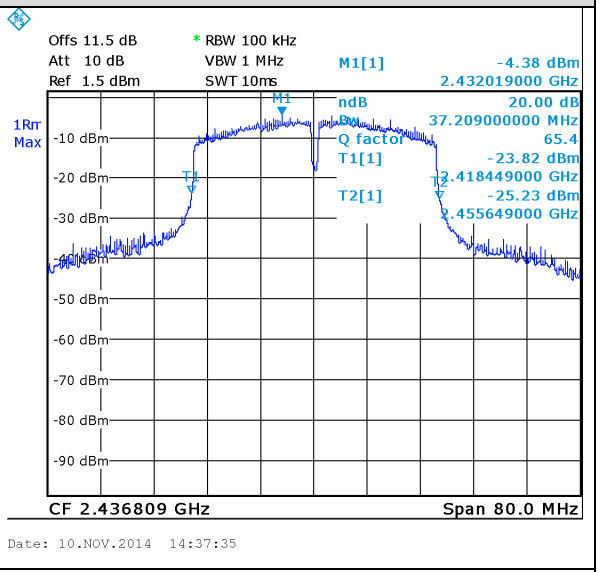


20 dB BW = 37.209 MHz

802.11n 40 MHz – Channel 6



6 dB BW = 35.290 MHz



20 dB BW = 37.209 MHz

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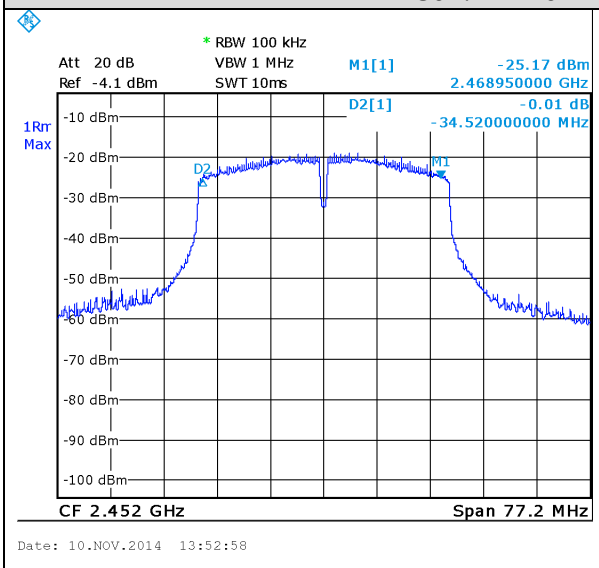
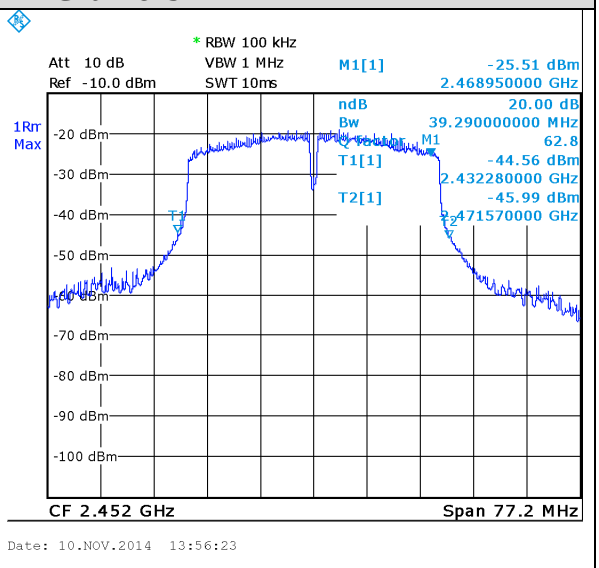
802.11n 40 MHz – Channel 9	
	
6 dB BW = 34.520 MHz	20 dB BW = 39.290MHz

Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.

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Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	ESL6	Rohde & Schwarz	Nov 15, 2013	Nov 15,2015	GEMC 160
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

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Maximum Peak Envelope Conducted Power – DM

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, that the maximum power does not exceed an amount which may create an an excessive power level.

Limits and Methods

The limits are defined in FCC Part 15.247(b) and RSS 210.
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the peak limit is 1 watt (30 dBm).

The method is given in Section 9.1.2 of FCC KDB 558074: June 9, 2014.

Results

The EUT passed. The power of the EUT was set to transmit at maximum power. The peak conducted power for Bluetooth Low Energy, 802.11 G, and N-Mode with 20 MHz and 40 MHz bandwidth are provided in the following table:

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Table 2: Peak conducted output power

Mode	Channel	Frequency (MHz)	Power Meter Reading (dBm)	Attenuator and Cable Loss Factor (dB)	Peak Conducted Power (dBm)	Limit (dBm)	Results
BLE	0	2402	-1.44	11.5	10.06	30	Pass
BLE	19	2440	-1.50	11.5	10.0	30	Pass
BLE	39	2480	-1.52	11.5	9.98	30	Pass
802.11g	1	2412	4.81	11.5	16.31	30	Pass
802.11g	6	2437	4.68	11.5	16.18	30	Pass
802.11g	11	2462	4.92	11.5	16.42	30	Pass
802.11n 20MHz	1	2412	4.95	11.5	16.45	30	Pass
802.11n 20MHz	6	2437	5.0	11.5	16.50	30	Pass
802.11n 20MHz	11	2462	5.16	11.5	16.66	30	Pass
802.11n 40MHz	3	2422	5.26	11.5	16.76	30	Pass
802.11n 40MHz	6	2437	5.33	11.5	16.83	30	Pass
802.11n 40MHz	9	2452	2.60	11.5	14.10	30	Pass

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Readings

The photos shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.

Tests were conducted using a power meter.

Figure 1: Power meter reading, BLE Channel 0- photo

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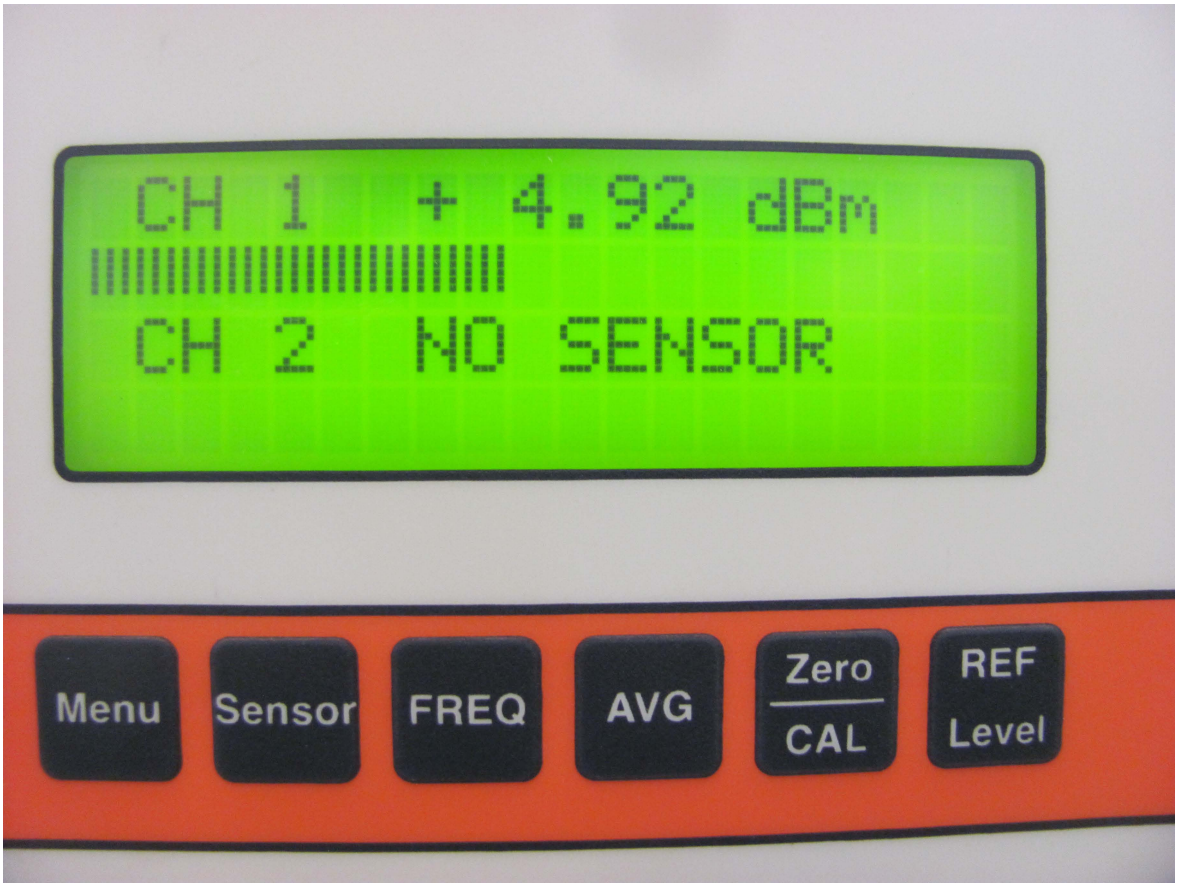

Figure 2: Power meter reading, 802.11g Channel 11– photo

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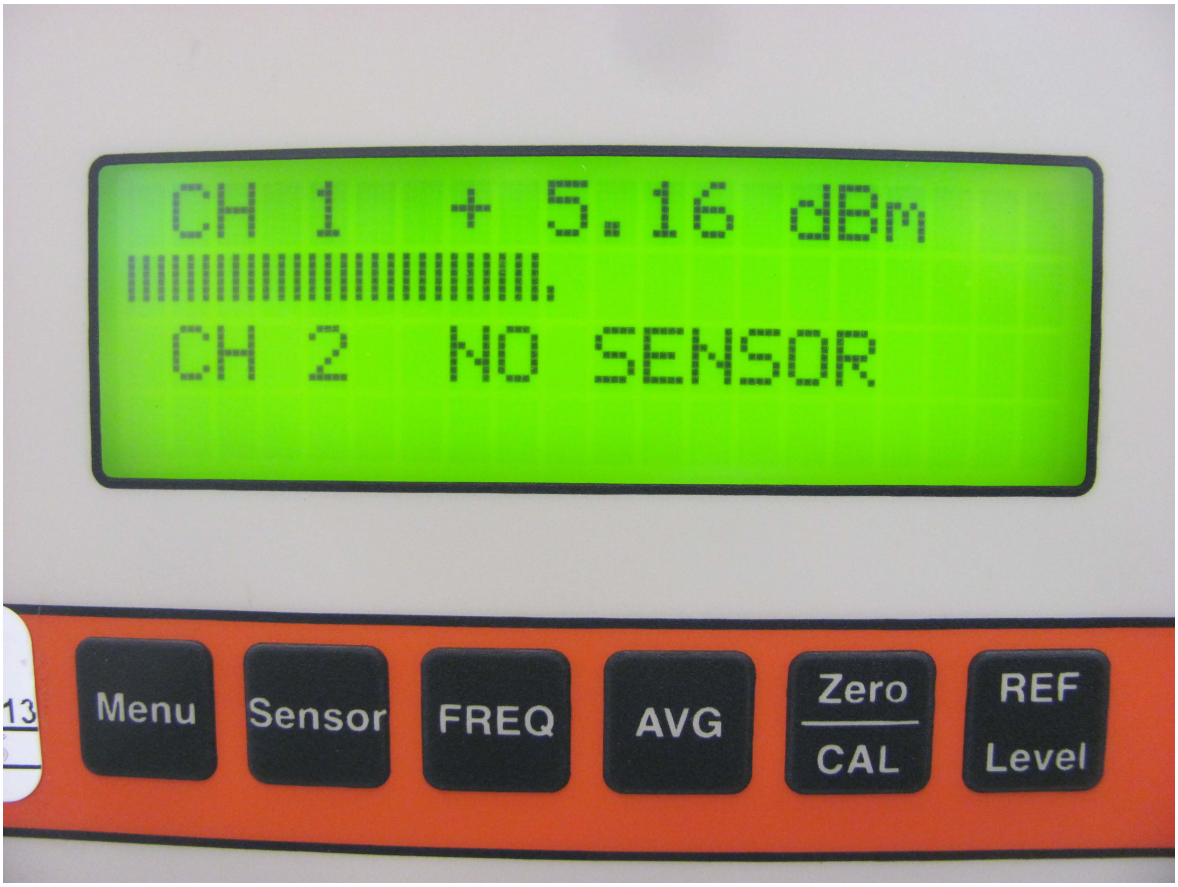

Figure 3: Power meter reading, 802.11n – 20 MHz BW– photo

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Figure 4:Power meter reading, 802.11n – 40 MHz BW - photo

Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Power Head	PH 2000	AR	Feb 7, 2013	Feb 7, 2015	GEMC 15
Power meter	PM 2002	AR	Feb 7, 2013	Feb 7, 2015	GEMC 16
Attenuator 10 dB	8493B	Agilent	NCR	NCR	133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

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Antenna Spurious Conducted Emissions (-20 dBc Requirement) – 15.247

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element at frequencies outside of the authorized spectrum does not exceed the limits specified. This ensures that the only the intended signal is delivered to the radiating element.

Limits and Methods

The limits are defined in 15.247(d). In any 100 kHz band, the peak spurious harmonics emissions must be at least 20 dB below the fundamental. Spurious Conducted emissions are to be evaluated up to the 10^{th} harmonic. This -20 dBc requirement also applies at the 'band edge' or 2.4 GHz and 2.4835 GHz.

The method is given in Section 11 of FCC KDB 558074: June 9, 2014.

Results

The EUT passed the limits. BLE, 802.11g, and n protocols are measured; low, middle and high channels were measured for each Protocol. The worst case was presented as a graph for the spectrum. The -20 dBc requirement is shown for the lower band edge at 2.4 GHz in the low channel. The -20 dBc requirement is also shown for the higher band edge at 2.4835 GHz in the high channel.

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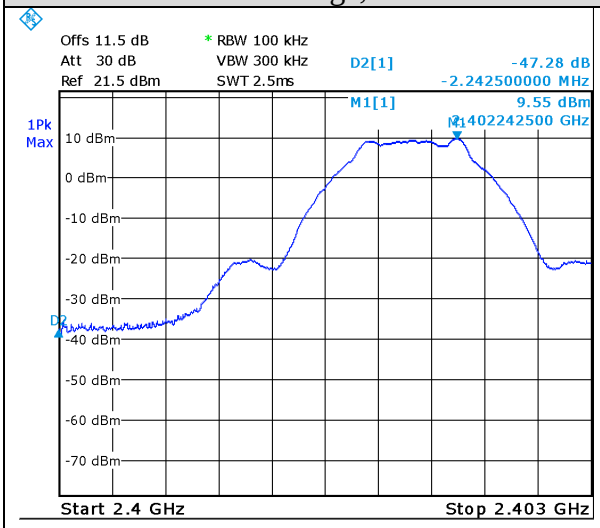
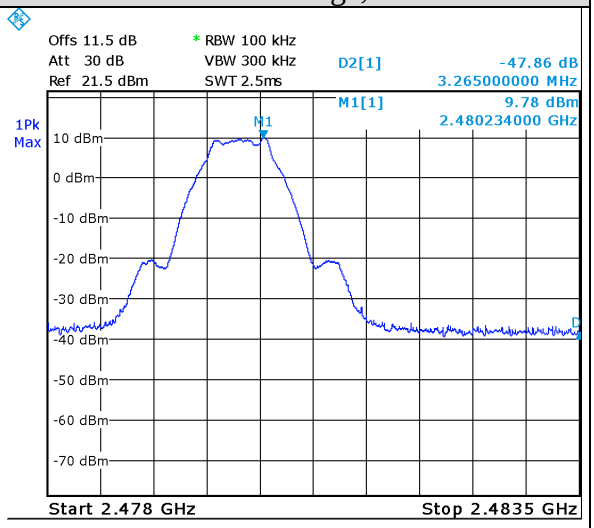
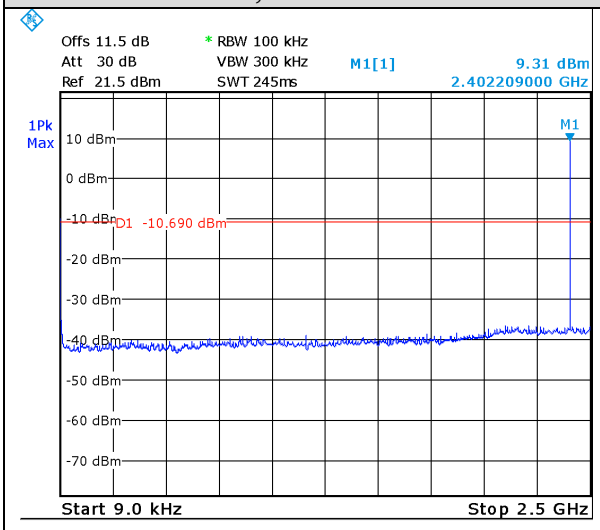
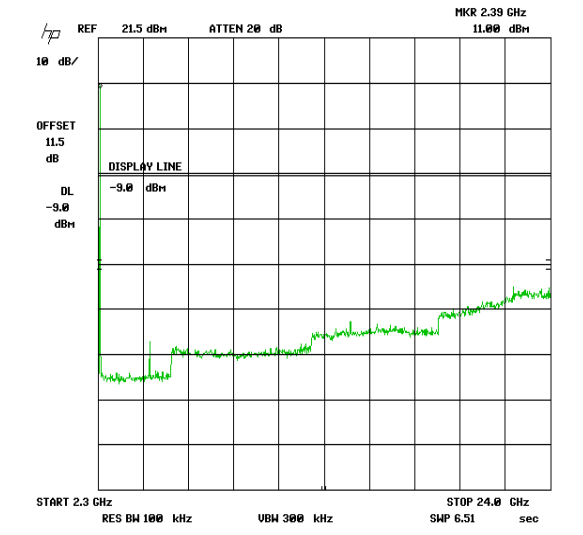
Graph(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.

<table>
<tr><th colspan="2">BLE</th></tr>
<tr><th>2.4 GHz Band edge, Channel 0</th><th>2.4835 GHz Band edge, Channel 39</th></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><th>Channel 0, 9 kHz – 2.5 GHz</th><th>Channel 0, 23 GHz – 24 GHz</th></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

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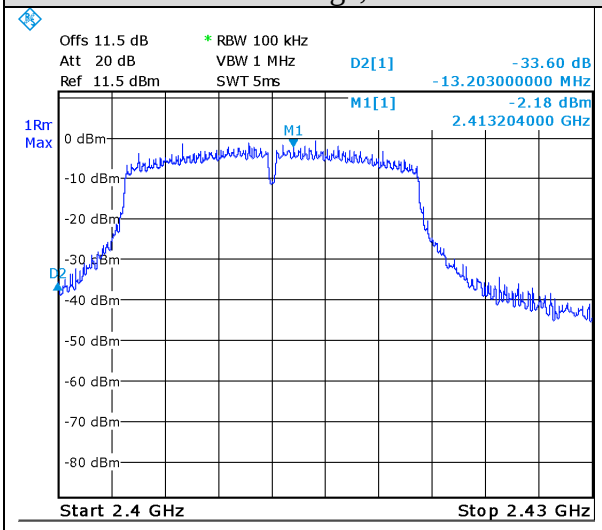
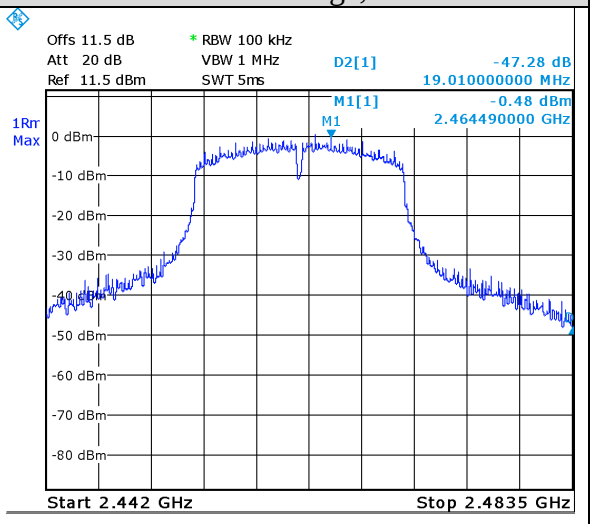
802.11g

2.4 GHz Band edge, Channel 1



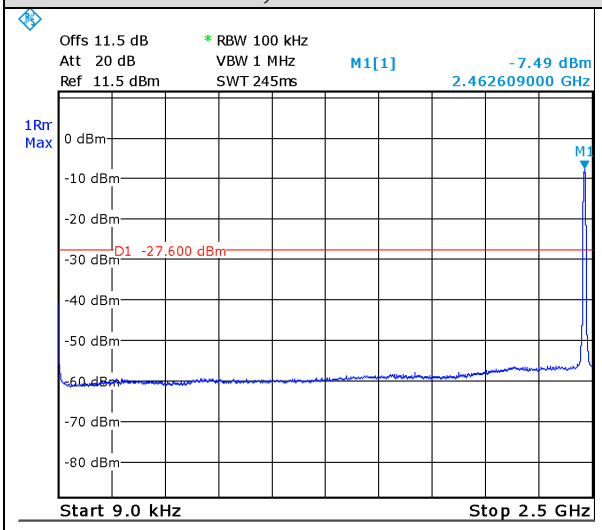
Date: 10.NOV.2014 17:52:00

2.4835 GHz Band edge, Channel 11



Date: 10.NOV.2014 18:14:06

Channel 11, 9 kHz – 2.5 GHz



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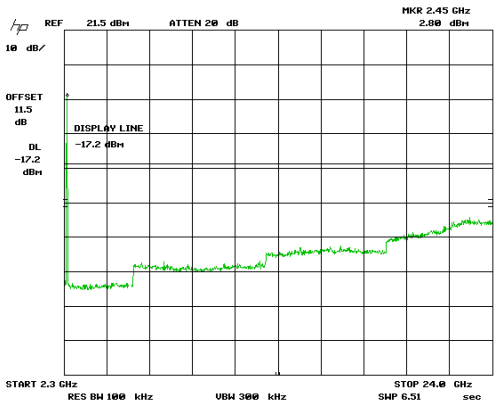
Channel 11, 23 GHz – 24 GHz



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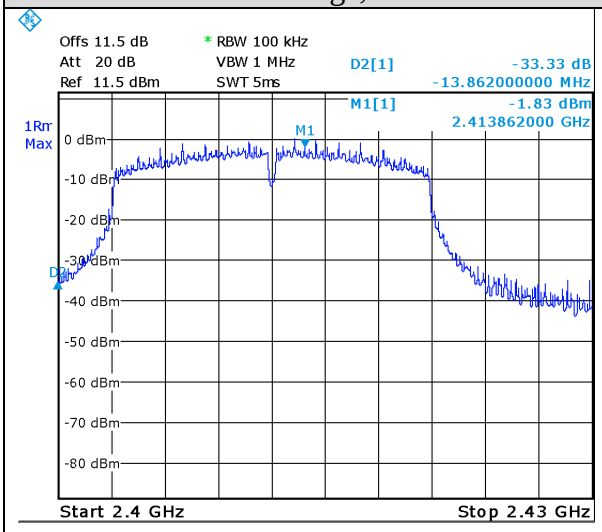
802.11n, 20 MHz

2.4 GHz Band edge, Channel 1



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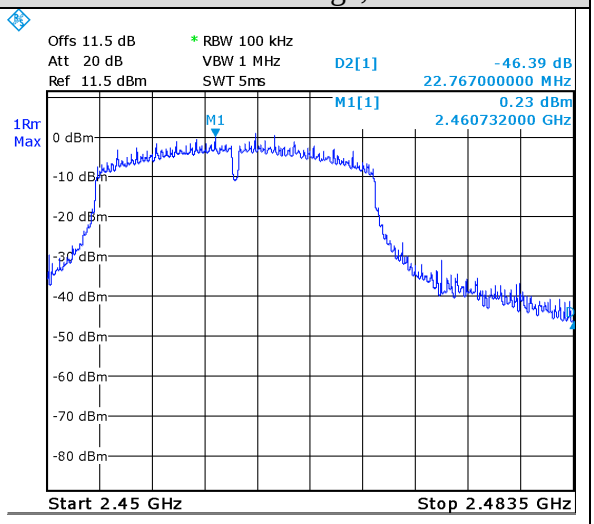
2.4835 GHz Band edge, Channel 11



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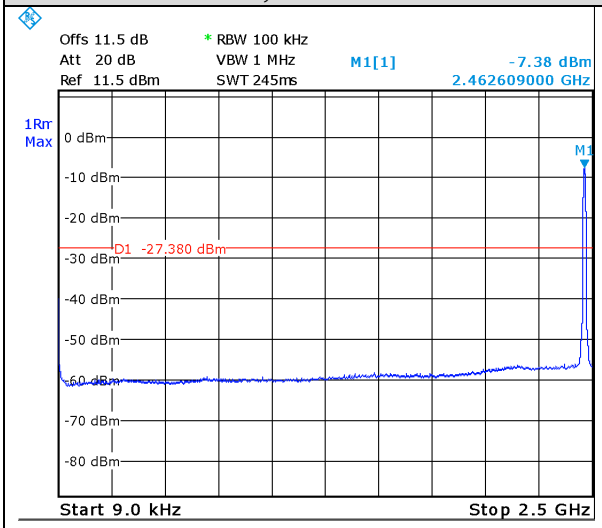
Channel 11, 9 kHz – 2.5 GHz



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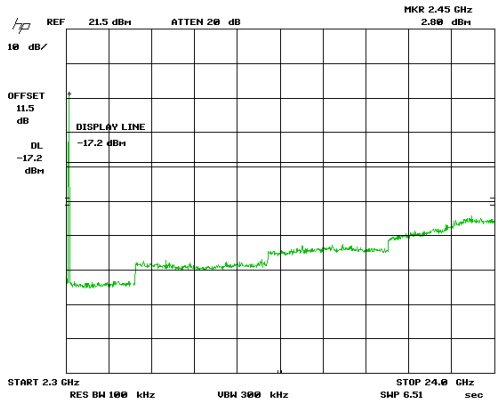
Channel 11, 23 GHz – 24 GHz



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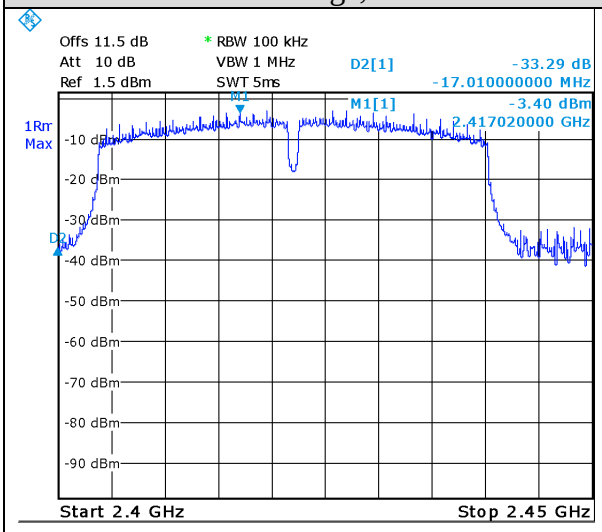
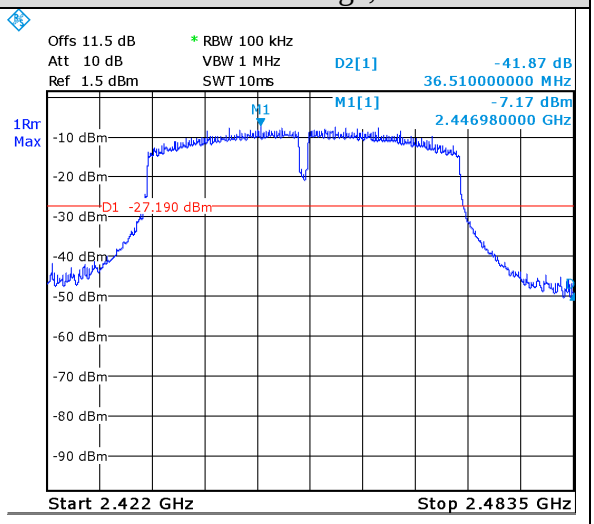
802.11n, 40 MHz

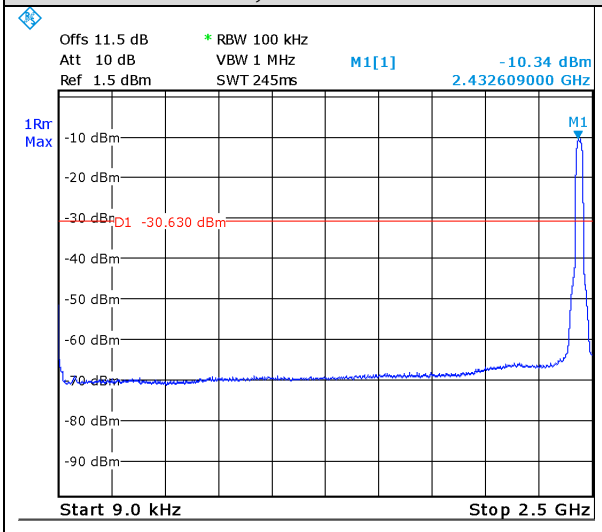
2.4 GHz Band edge, Channel 3



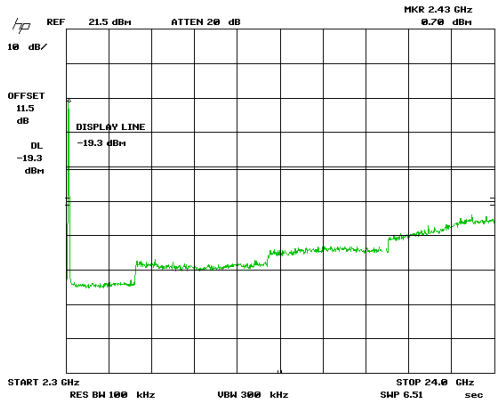
2.4835 GHz Band edge, Channel 9



Channel 6, 9 kHz – 2.5 GHz



Channel 6, 23 GHz – 24 GHz



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

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Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	May 21, 2014	May 21, 2016	GEMC 193
Quasi Peak Adapter	85650A	HP	May 21, 2014	May 21, 2016	GEMC 194
Spectrum Analyzer	ESL6	Rohde & Schwarz	Nov 15, 2013	Nov 15,2015	GEMC 160
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

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Radiated Emissions – 15.247

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit and Method

The method is given in Section 12.1 of FCC KDB 558074: June 9, 2014.
The limits are as defined in FCC Part 15, Section 15.209:

The limits, as defined in 15.247(d) for unintentional radiated emissions apply for those emissions that fall in the restricted bands, as defined in Section 15.205(a). These emissions must comply with the radiated emission limits specified in Section 15.209(a).

All unintentional emissions must also meet the 'Spurious Conducted Emissions' requirements of -20 dBc or greater. See also 'Spurious Conducted Emissions' for further details.

0.009 MHz – 0.490 MHz, 2400/F(kHz) uV/m at 300 m[1]
0.490 MHz – 1.705 MHz, 24000/F(kHz) uV/m at 30 m[1]
1.705 MHz – 30 MHz, 30 uV/m at 30 m[1]
30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m[1]) at 3 m
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m[1]) at 3 m
216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m[1]) at 3 m
Above 960 MHz, 500 uV/m (54.0 dBuV/m[1]) at 3 m
Above 1000 MHz, 500 uV/m (54 dBuV/m[2]) at 3m
Above 1000 MHz, 500 uV/m (74 dBuV/m[3]) at 3m

[1]Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1
[2]Limit is with 1 MHz measurement bandwidth and using an Average detector
[3]Limit is with 1 MHz measurement bandwidth and using a Peak detector

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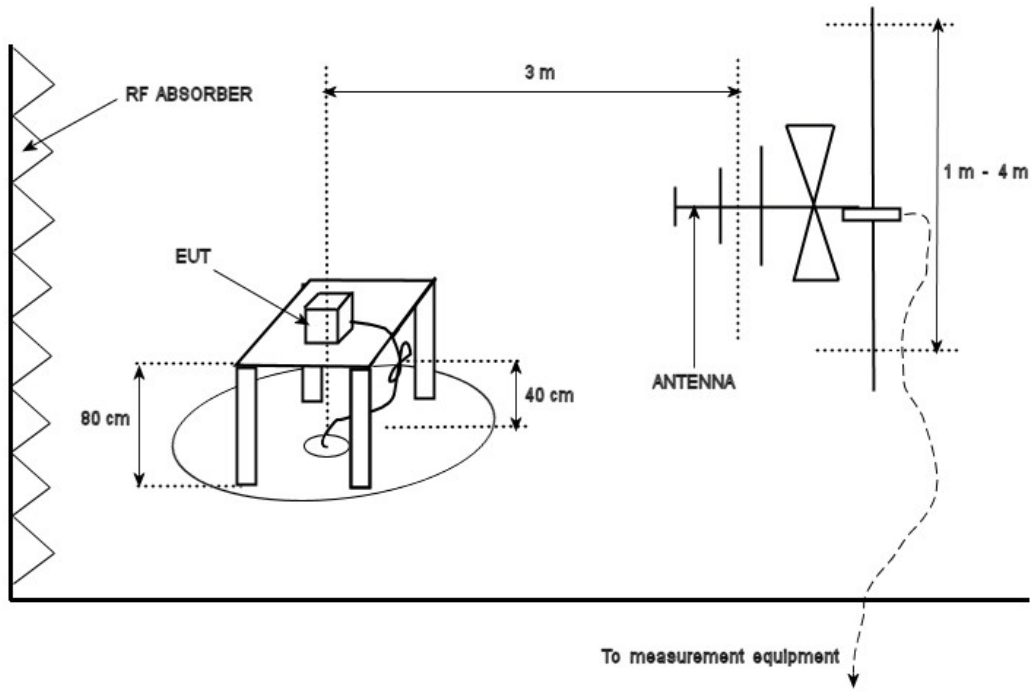
Typical Radiated Emissions Setup



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

The graphs shown below are maximized peak measurement graphs, measured with a resolution bandwidth greater than the final required detector and over a full 0-360° rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement.

For final measurements with the appropriate detector, please refer to the final measurement tables where applicable.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10^{th} harmonic (a minimum of a 24.835 GHz).

Devices scanned may be scanned at alternate test distances, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above

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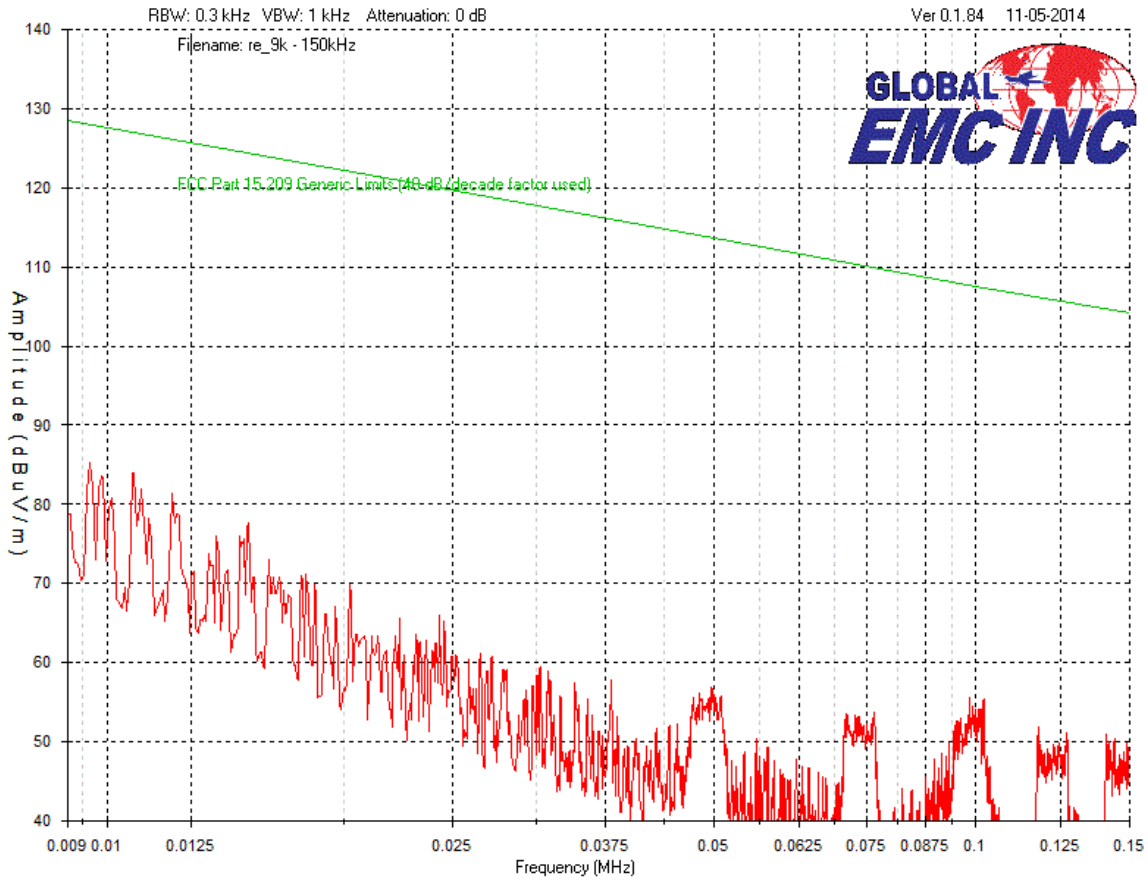
30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

Band edge measure graphs were shown for illustrations purpose. See final measurement section for all measurements.

9 kHz – 150 kHz



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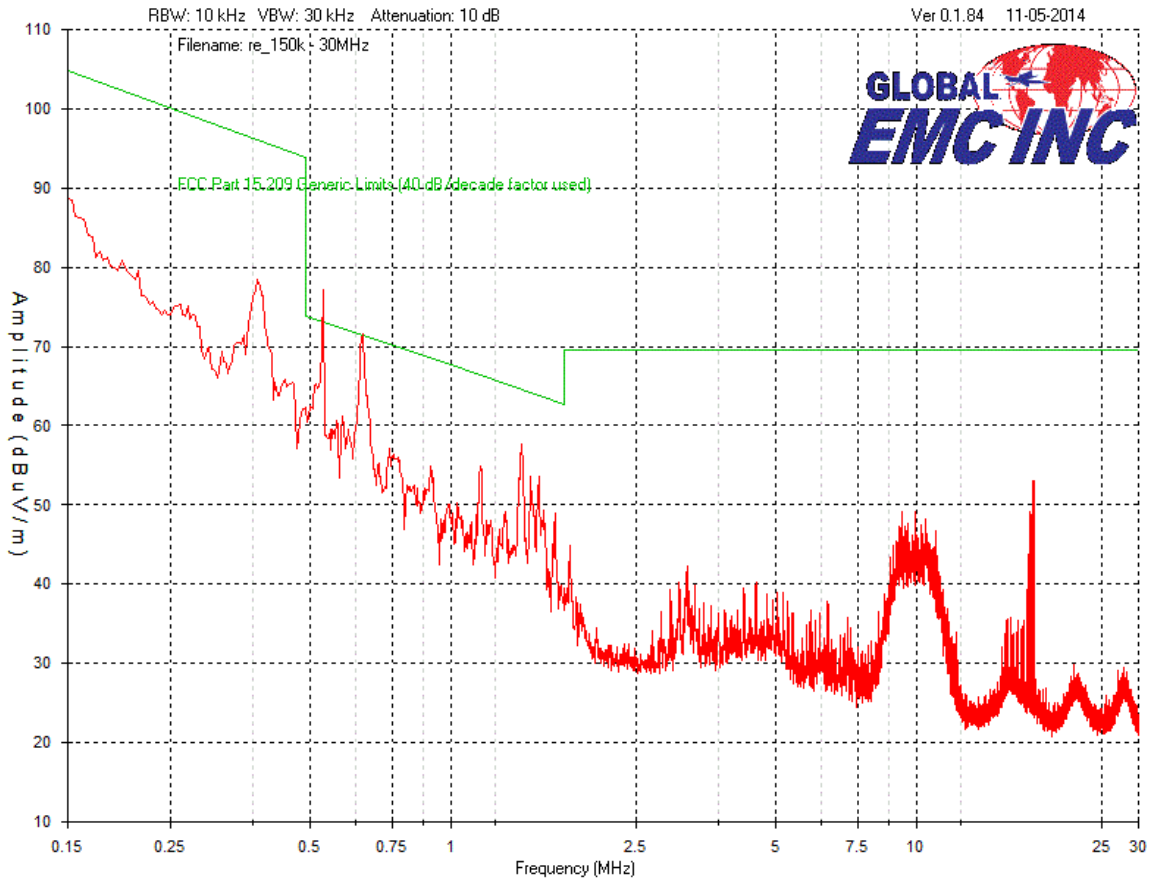
150 kHz – 30 MHz



Note: See Final Measurements and Results for measurements and explanations.

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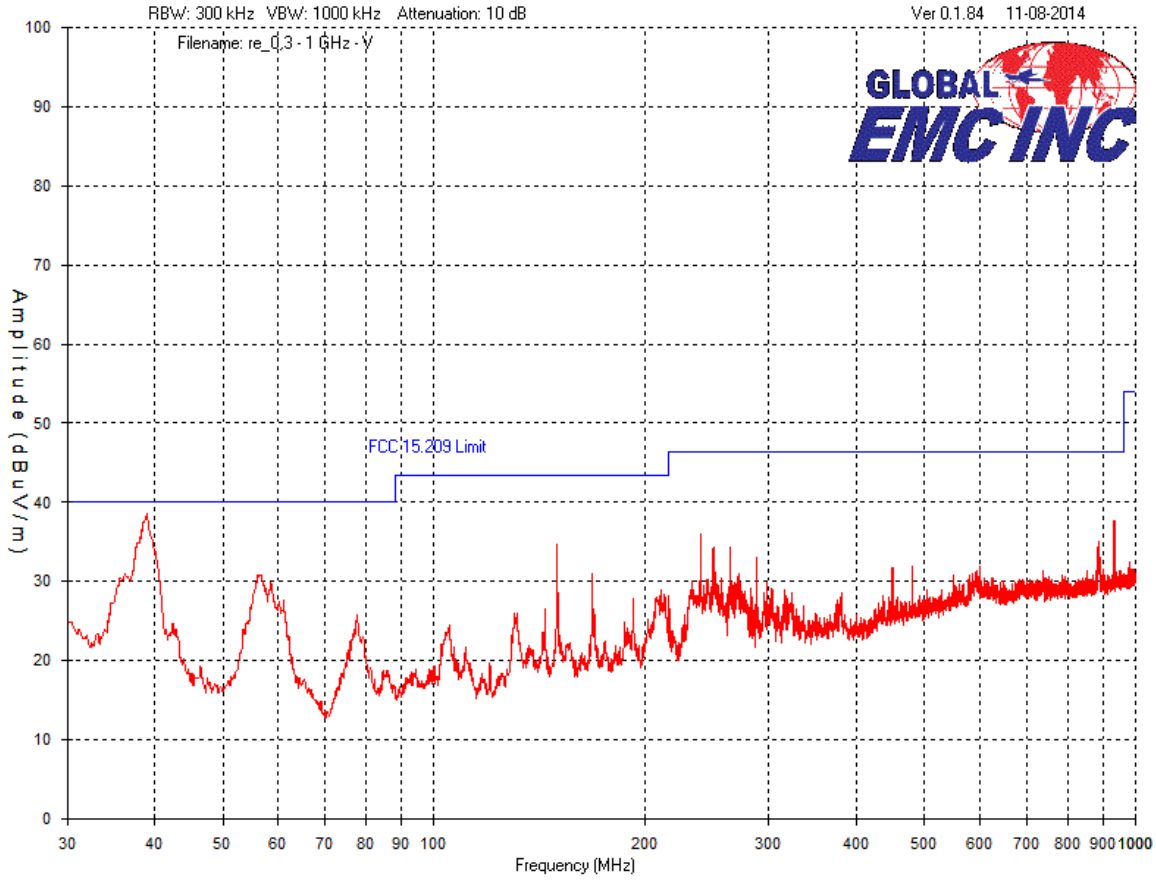
802.11n 40 MHz, Channel 6
Vertical – Peak Emission Graph
30 MHz – 1 GHz



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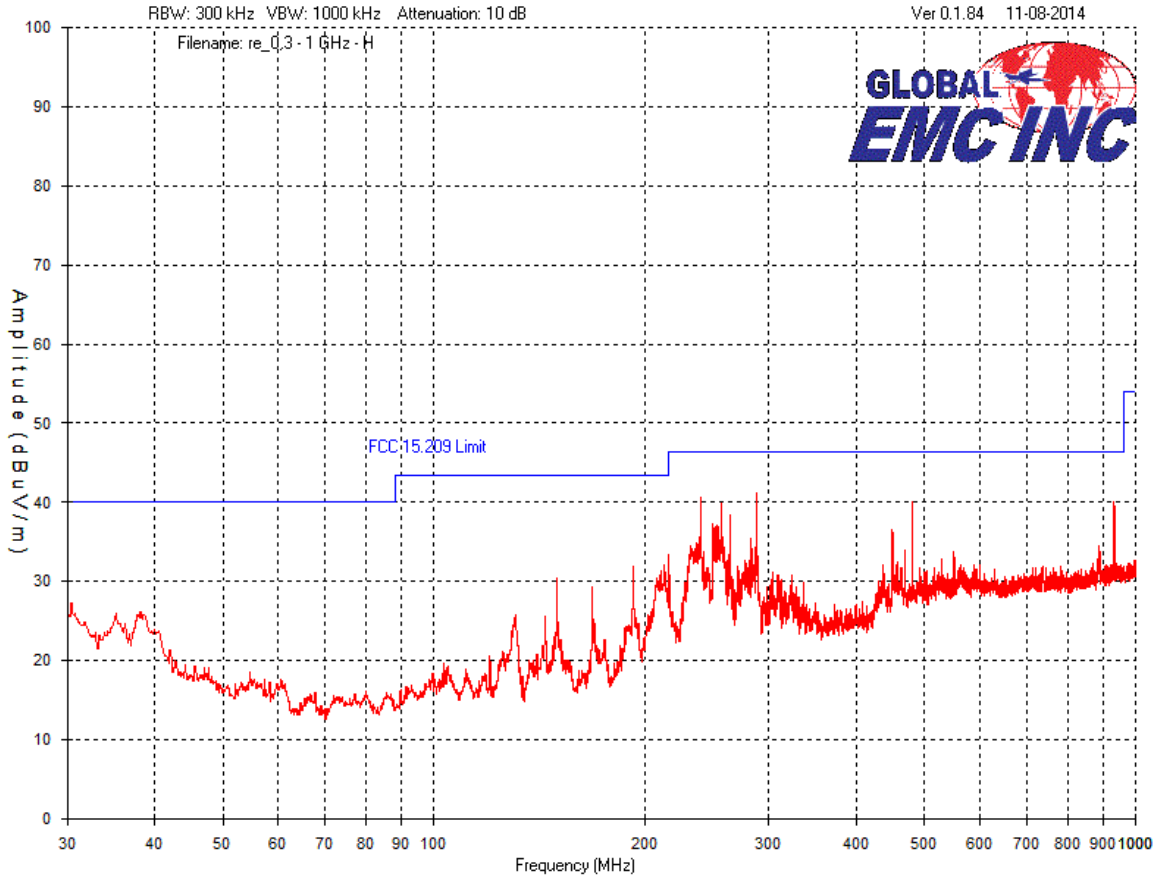
802.11n 40 MHz, Channel 6
Horizontal - Peak Emission Graph
30 MHz – 1 GHz



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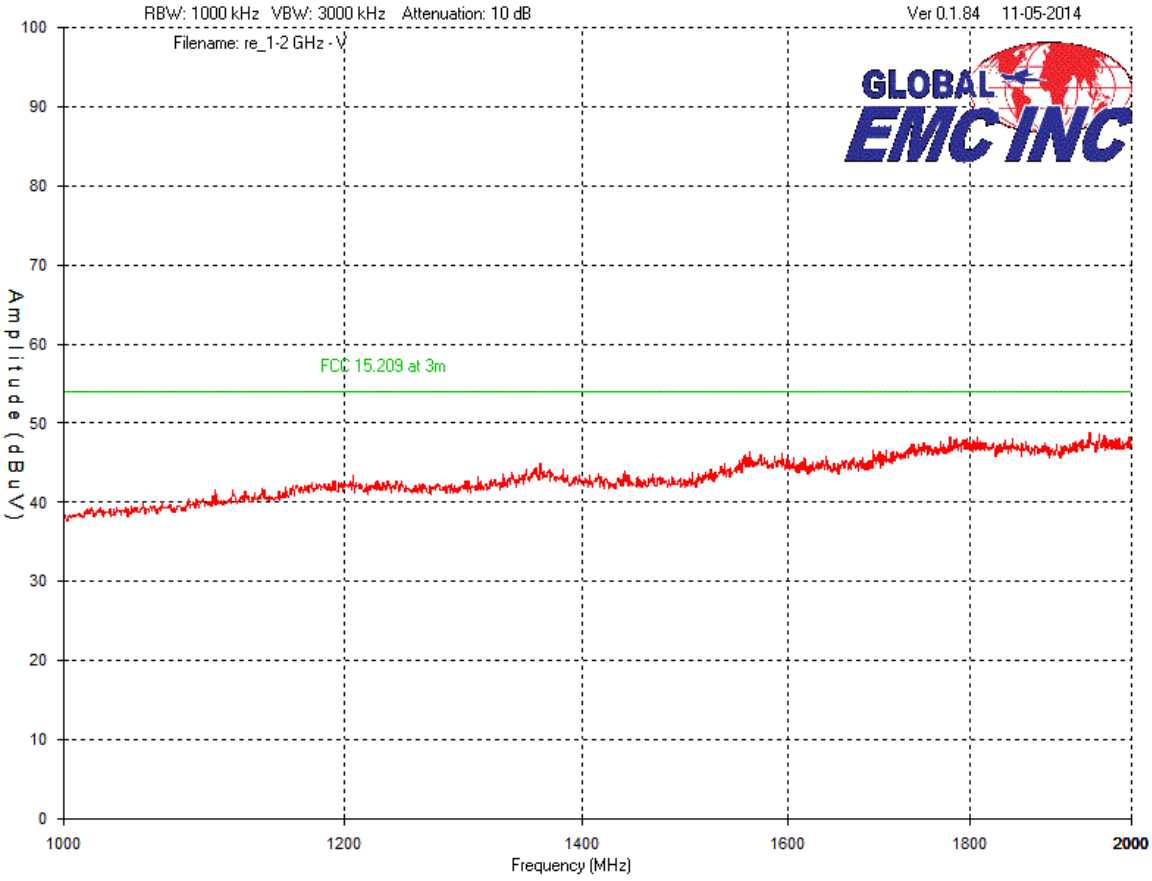
802.11n 40 MHz, Channel 6
Vertical – Peak Emission Graph
1 GHz – 2 GHz



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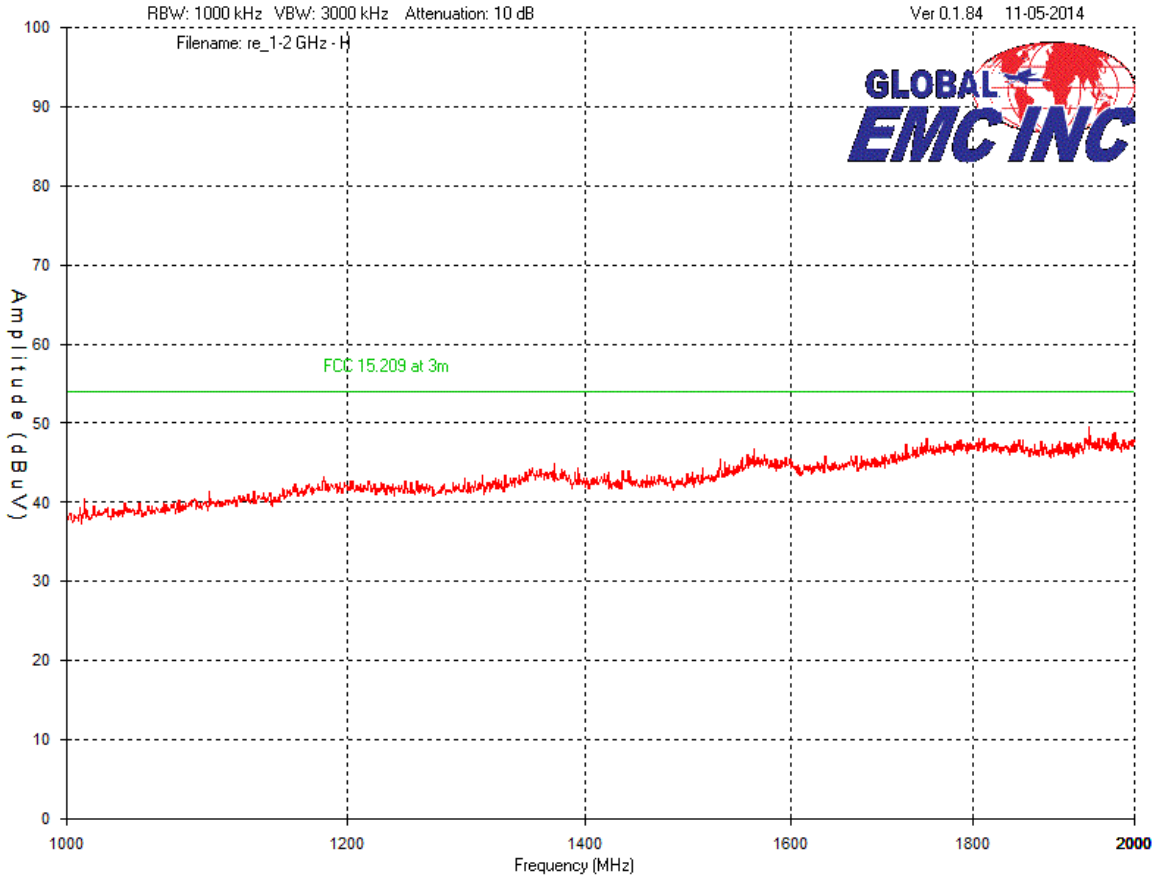
802.11n 40 MHz, Channel 6
Horizontal - Peak Emission Graph
1 GHz – 2 GHz



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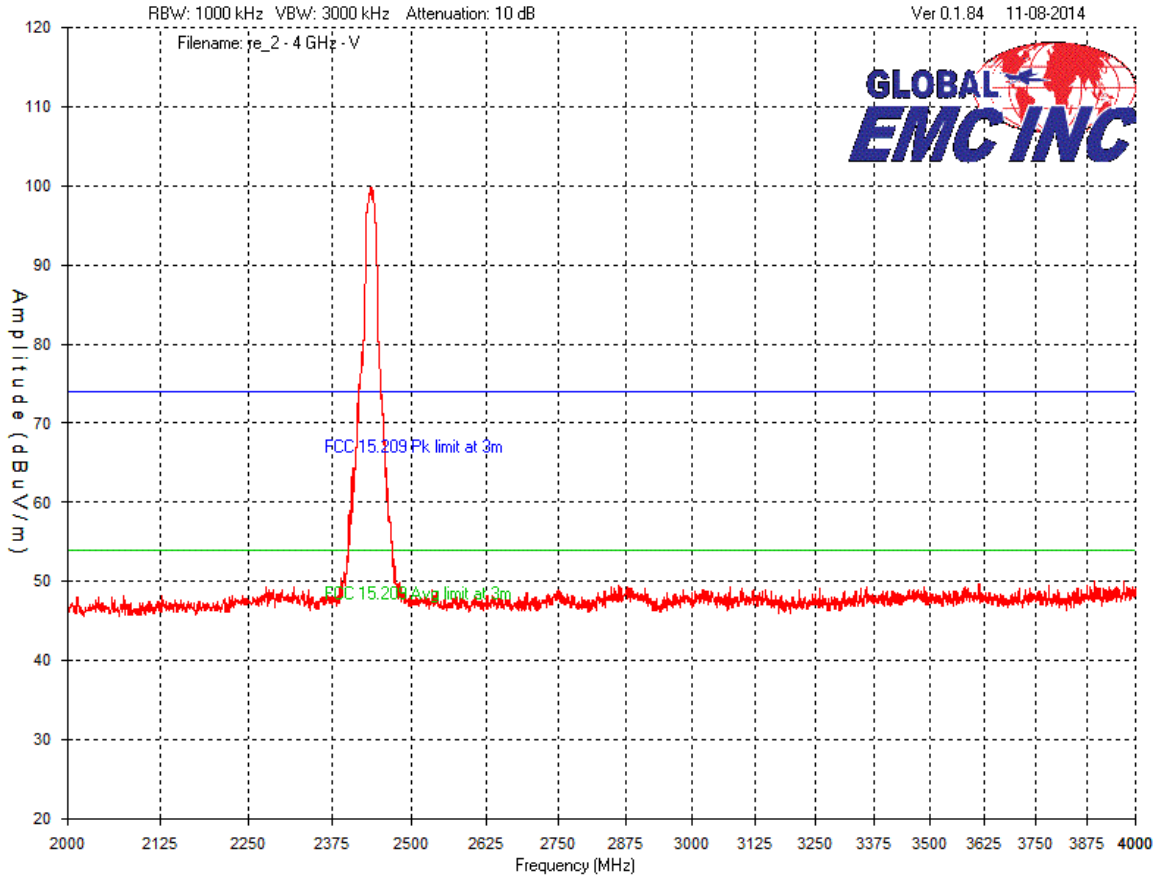
802.11n 40 MHz, Channel 6
Vertical – Peak Emission Graph
2 GHz – 4 GHz



Note: See Final Measurements and Results section for measurements.

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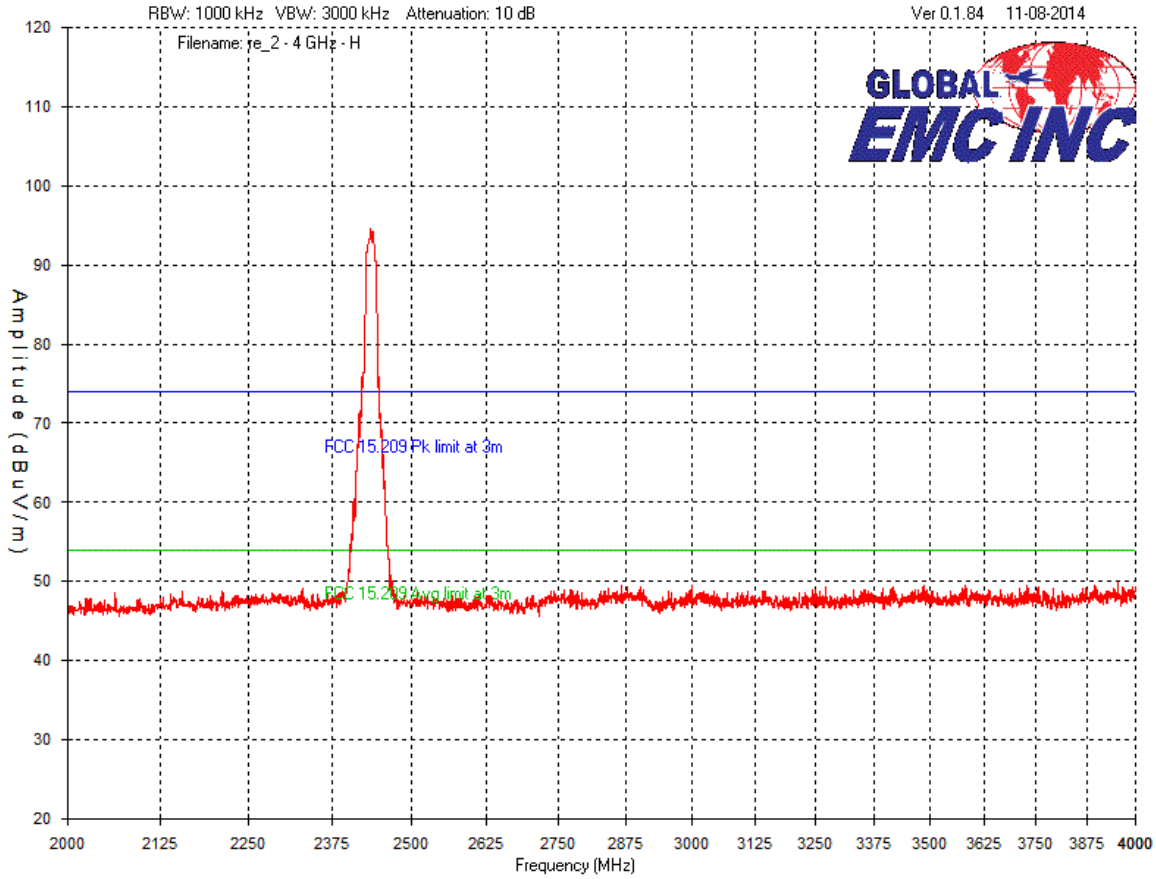
802.11n 40 MHz, Channel 6
Horizontal - Peak Emission Graph
2 GHz – 4 GHz



Note: See Final Measurements and Results section for measurements.

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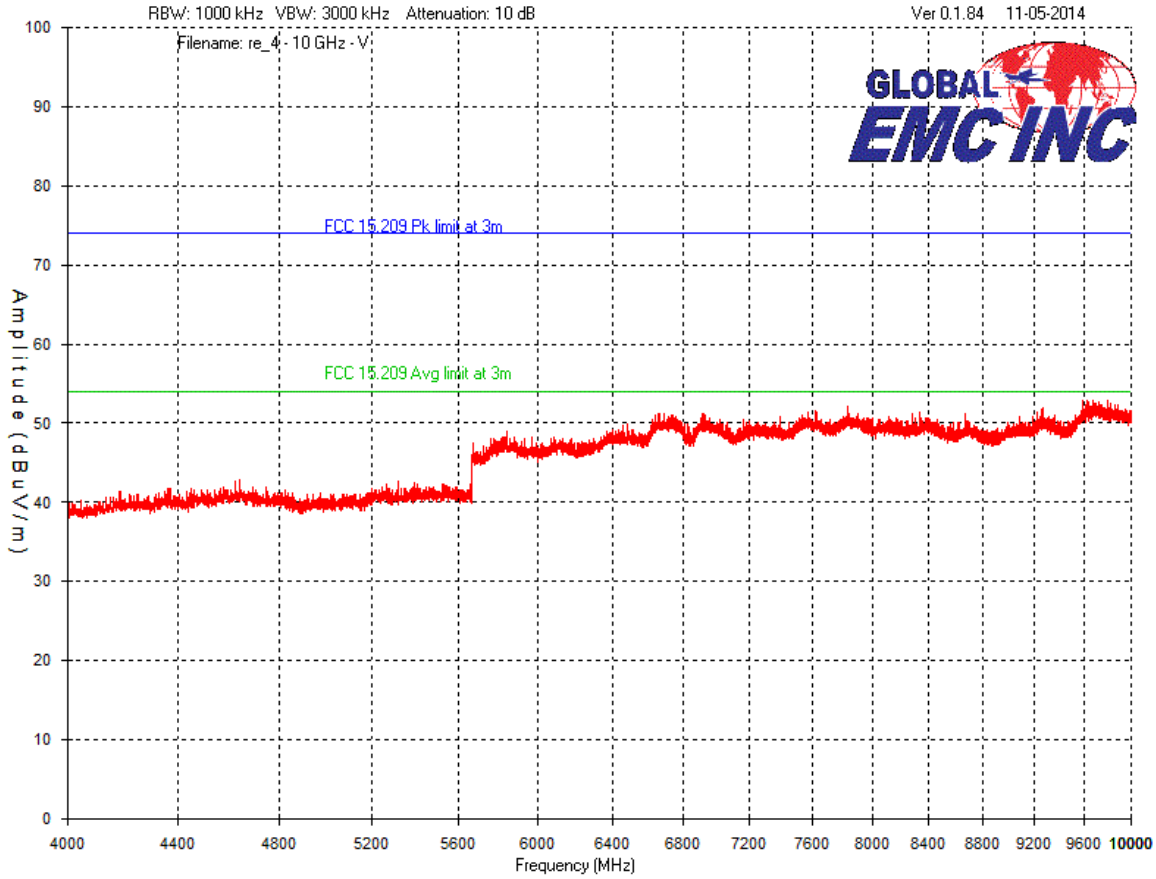
802.11n 40 MHz, Channel 6
Vertical – Peak Emission Graph
4 GHz – 10 GHz



Note: See Final Measurements and Results section for details.

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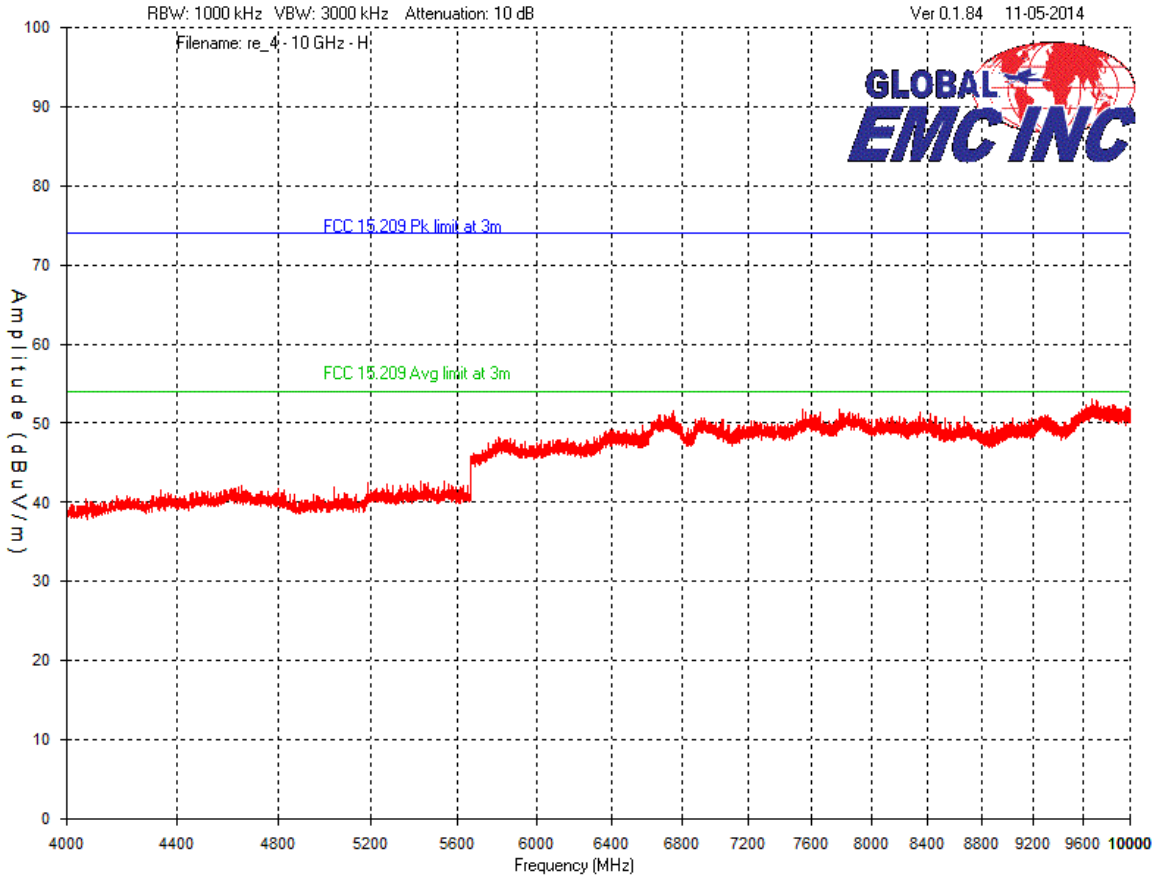
802.11n 40 MHz, Channel 6
Horizontal - Peak Emission Graph
4 GHz – 10 GHz



Note: See Final Measurements and Results section for details.

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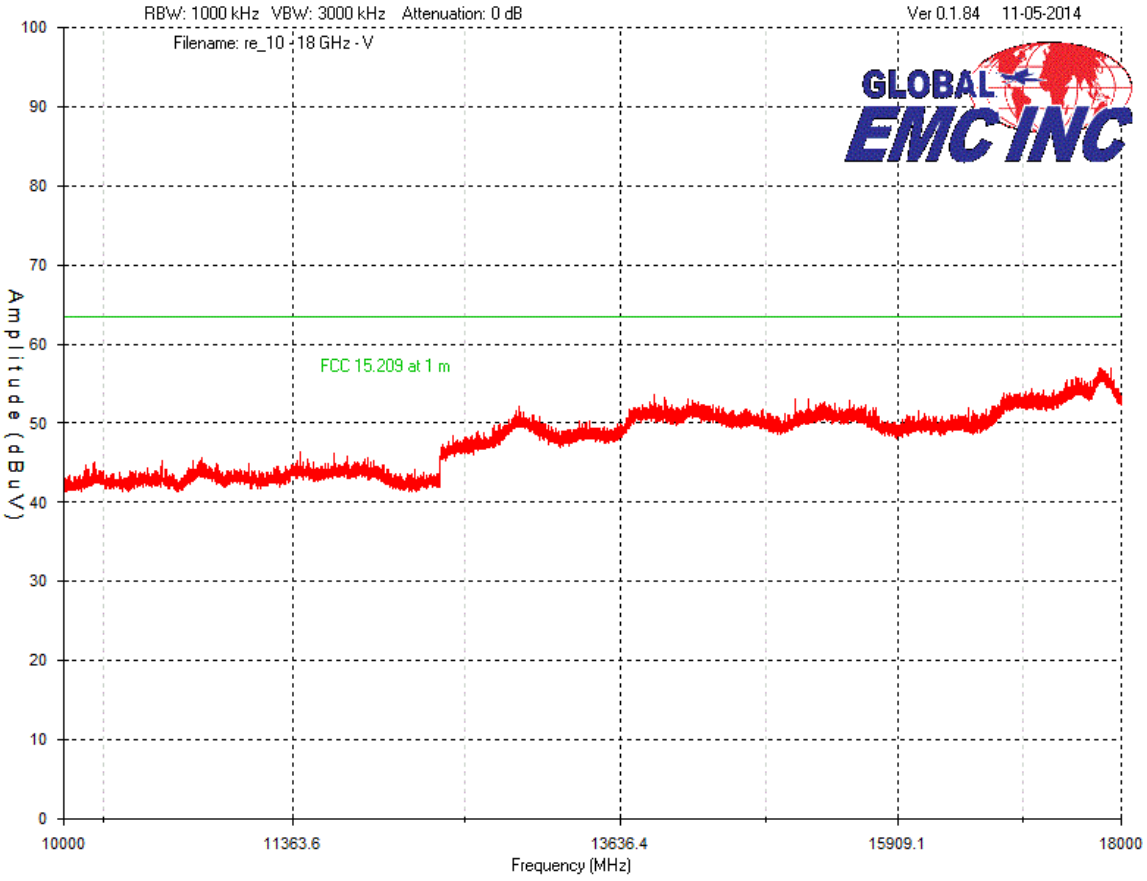
802.11n 40 MHz, Channel 6
Vertical – Peak Emission Graph
10 GHz – 18 GHz



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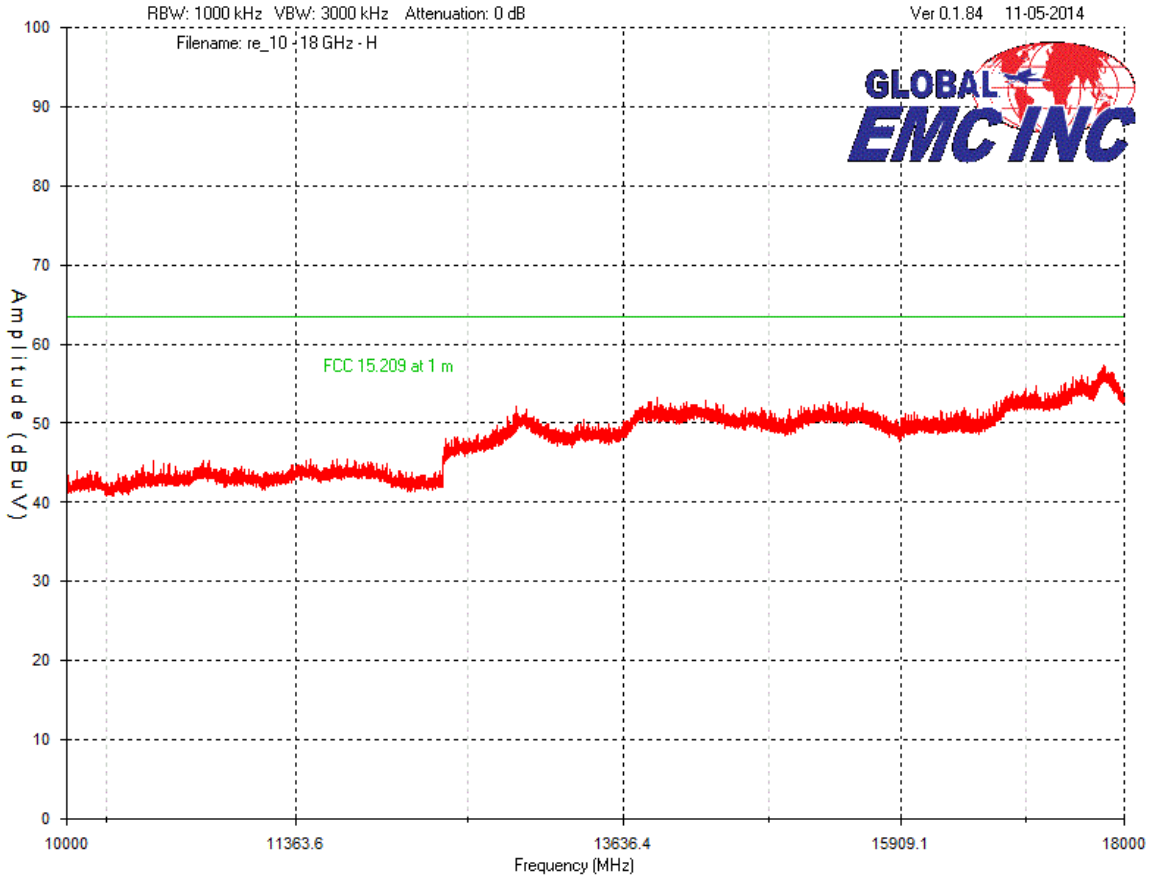
802.11n 40 MHz, Channel 6
Horizontal - Peak Emission Graph
10 GHz – 18 GHz



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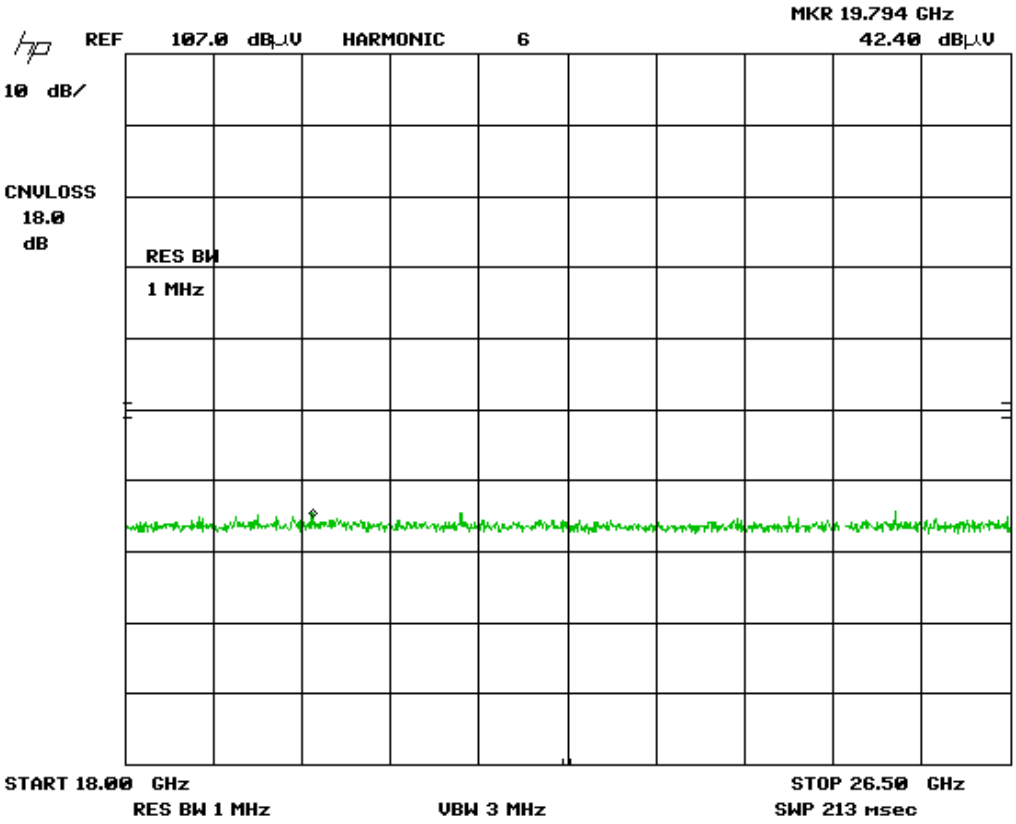
Low Channel – 18 GHz – 26 GHz
Horizontal - Peak Emission Graph



Plot was taken at 1 meter distances. All emission shown were noise floor of measurement instrument. No emissions were found in this frequency range.

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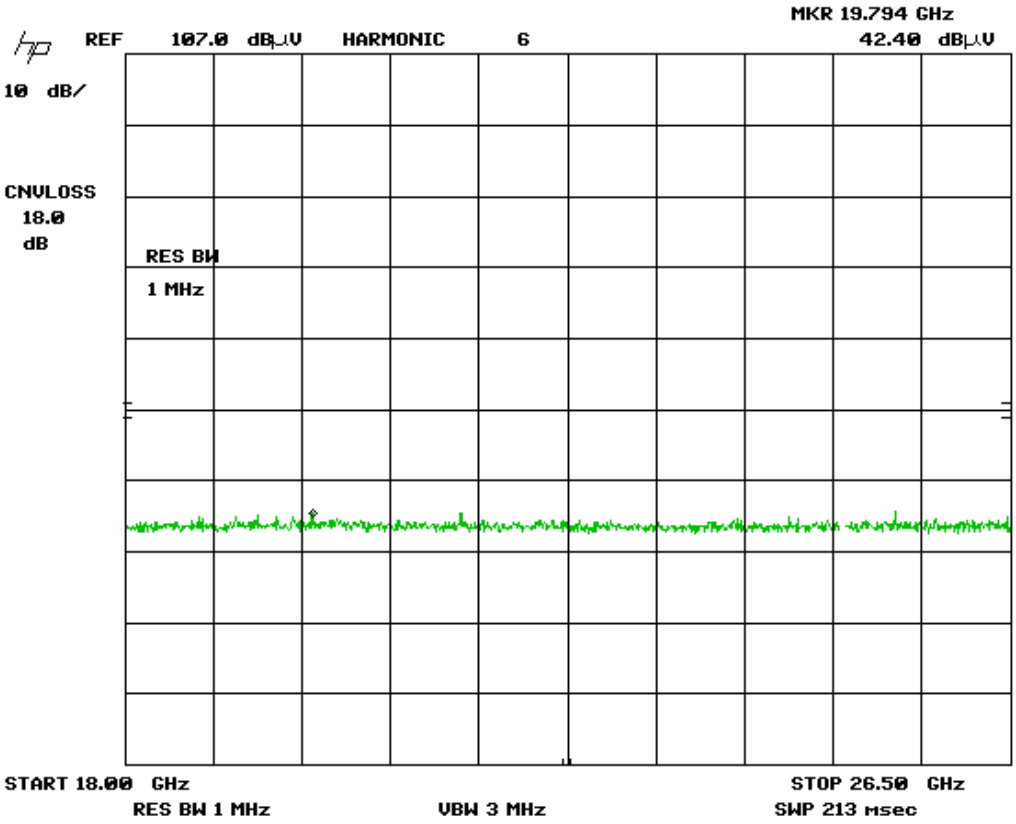
Low Channel – 18 GHz – 26 GHz
Vertical - Peak Emission Graph



Plot was taken at 1 meter distances. All emission shown were noise floor of measurement instrument. No emissions were found in this frequency range.

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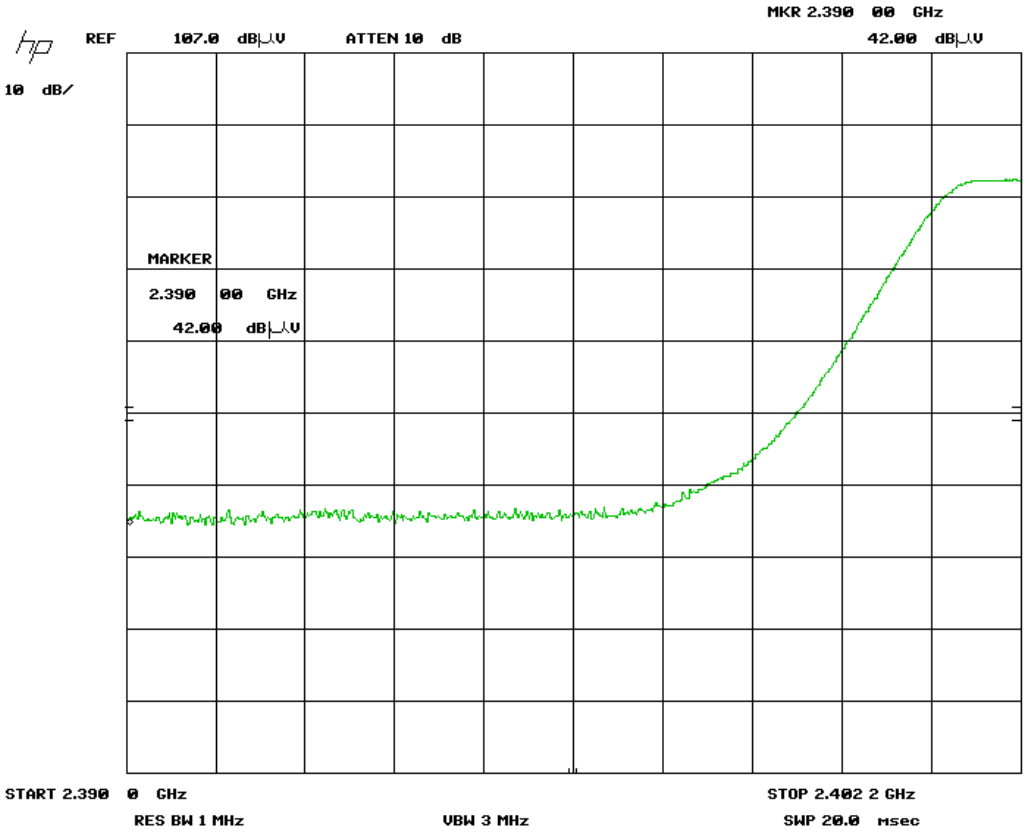
Band Edge – BLE Channel 0
Vertical - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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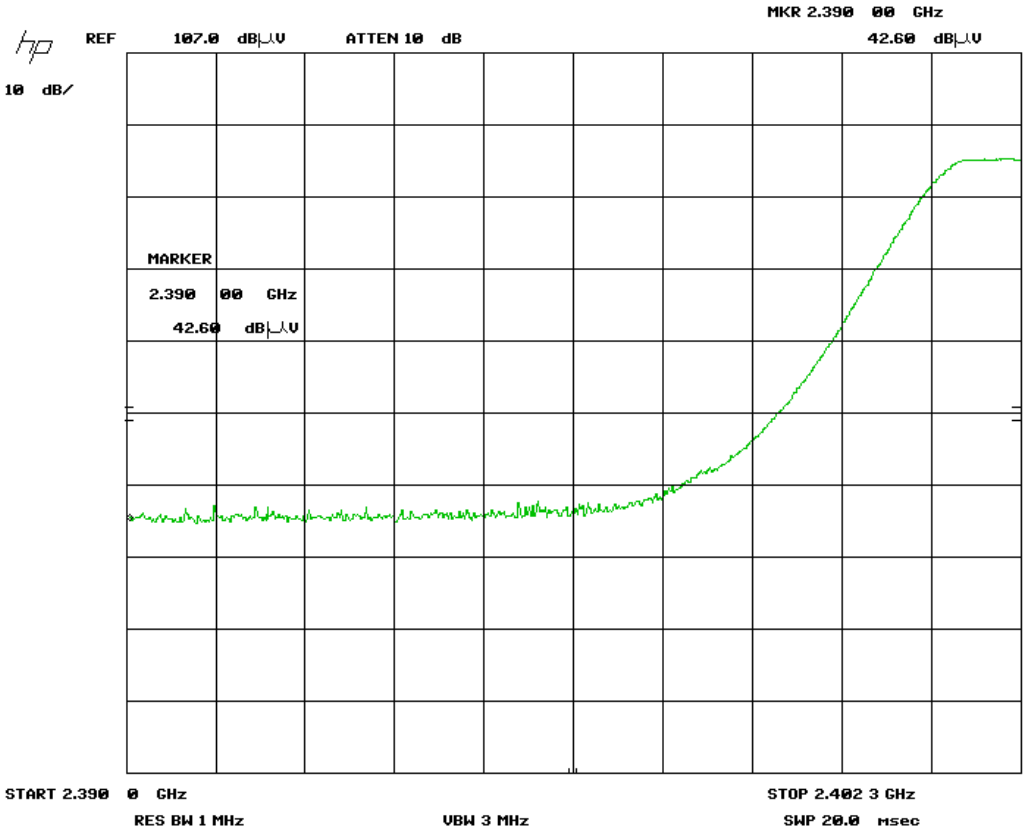
Band Edge – BLE Channel 0
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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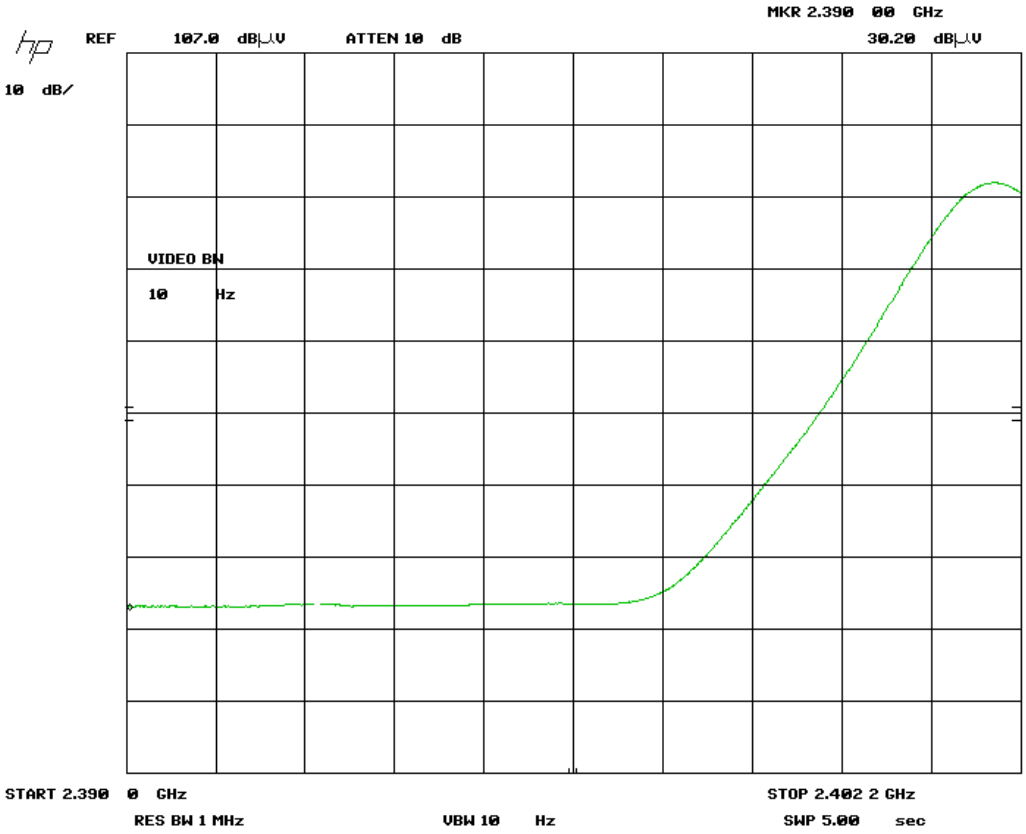
Band Edge – BLE Channel 0
Vertical – Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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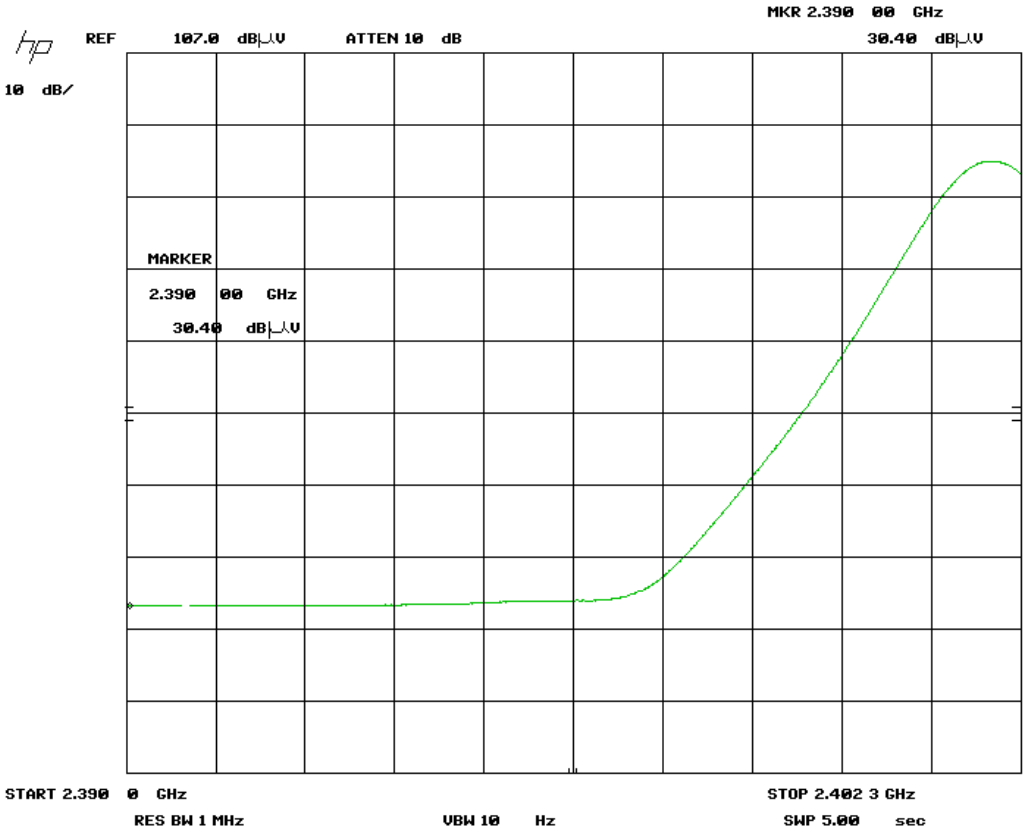
Band Edge – BLE Channel 0
Horizontal - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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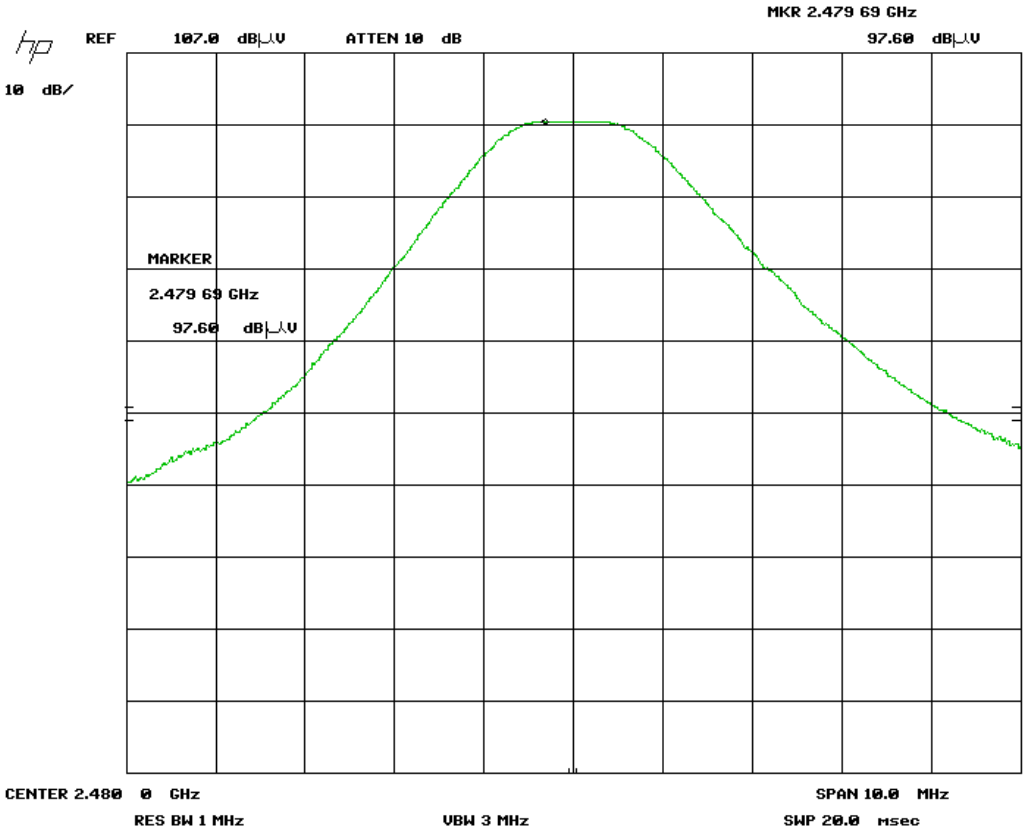
Fundamental Emission – BLE Channel 39
Vertical – Peak Emission



Note: Fundamental emission plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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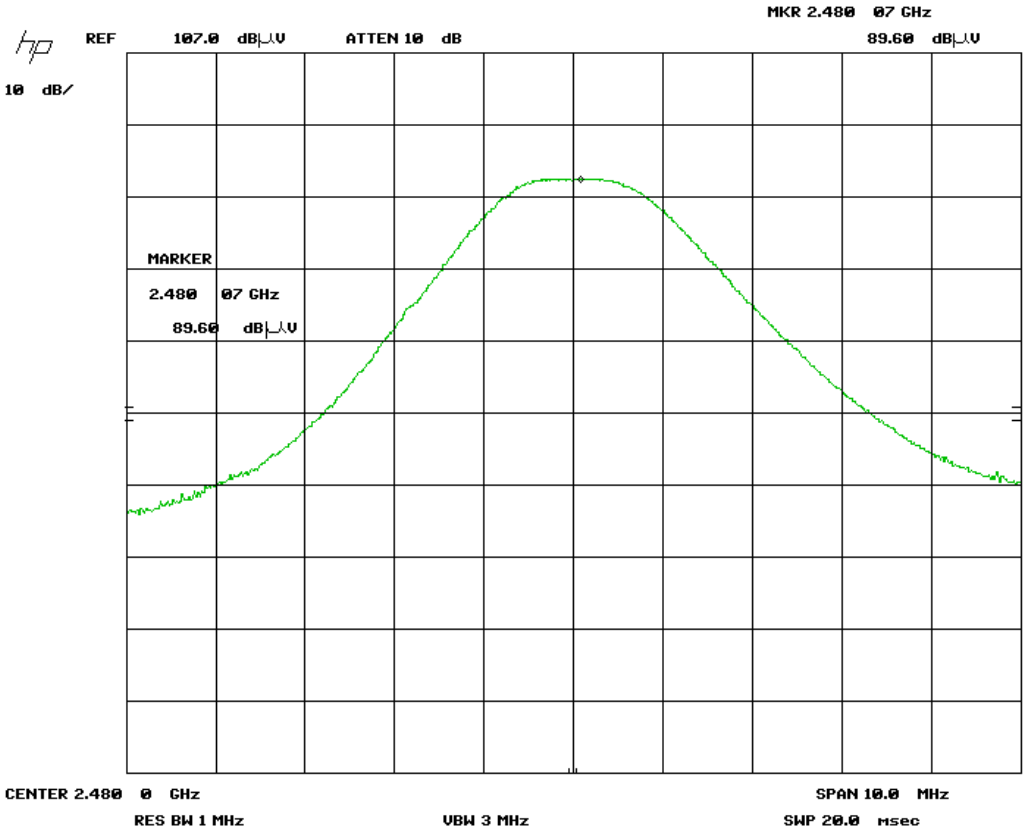
Fundamental Emission – BLE Channel 39
Horizontal – Peak Emission



Note: Fundamental emission plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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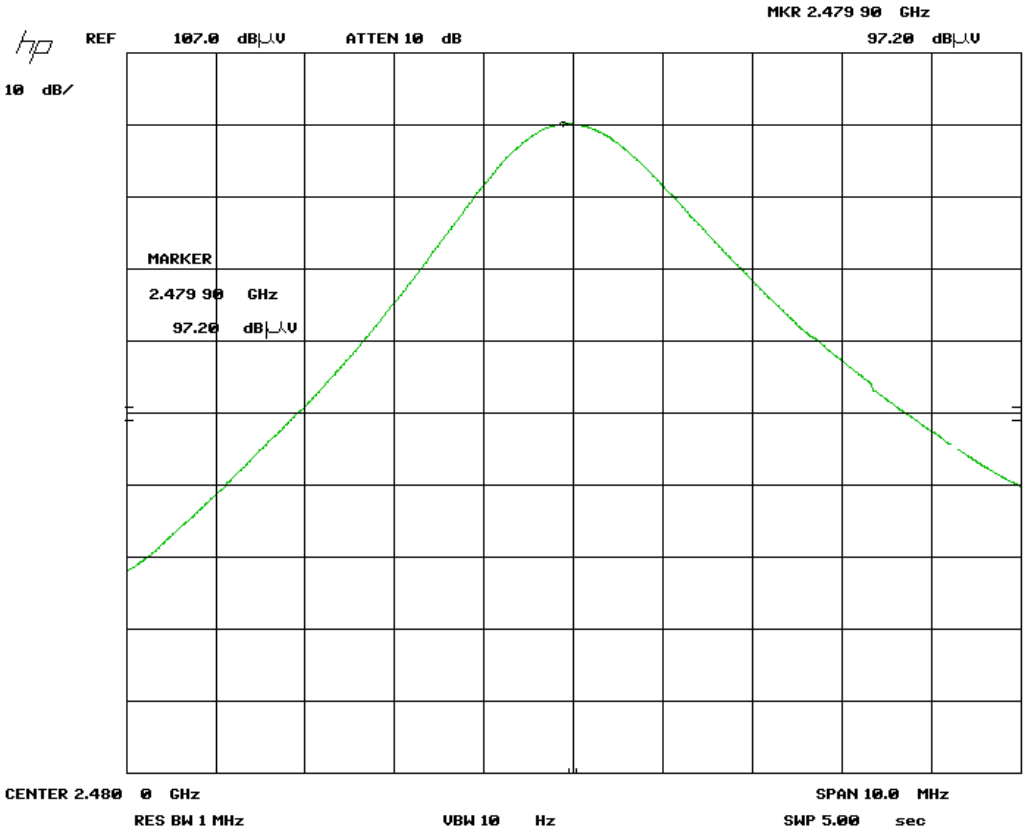
Fundamental Emission – BLE Channel 39
Vertical – Average Emission



Note: Fundamental emission plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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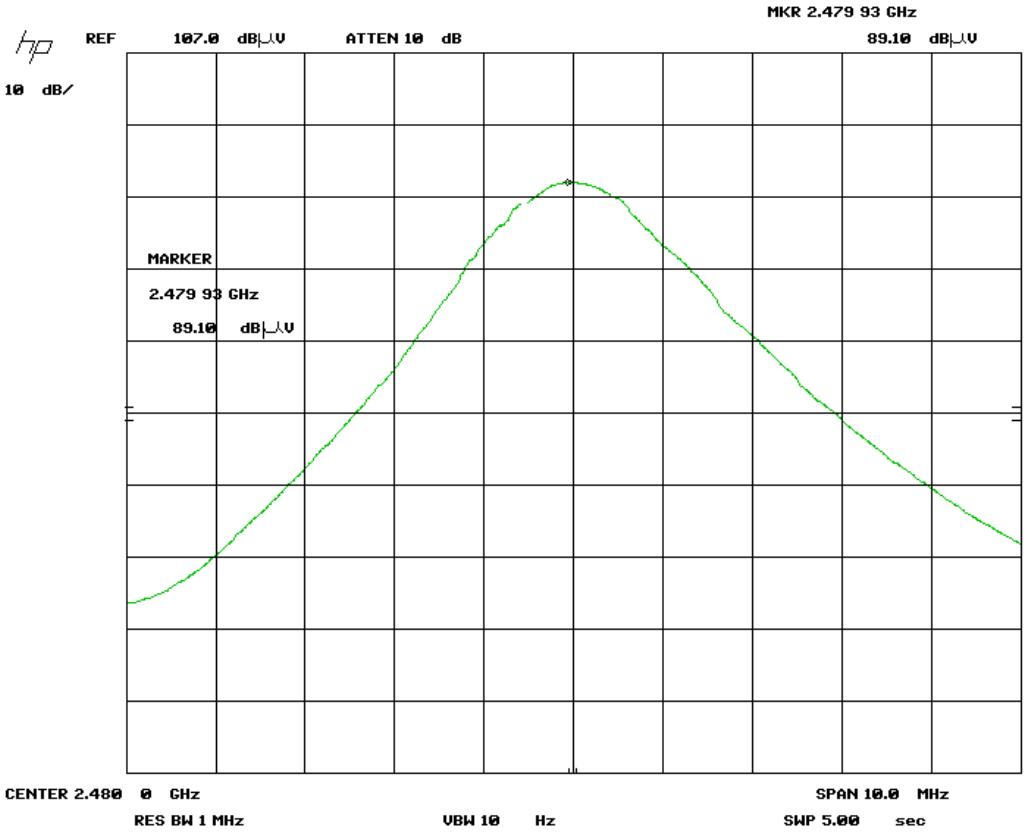
Fundamental Emission – BLE Channel 39
Horizontal – Average Emission



Note: Fundamental emission plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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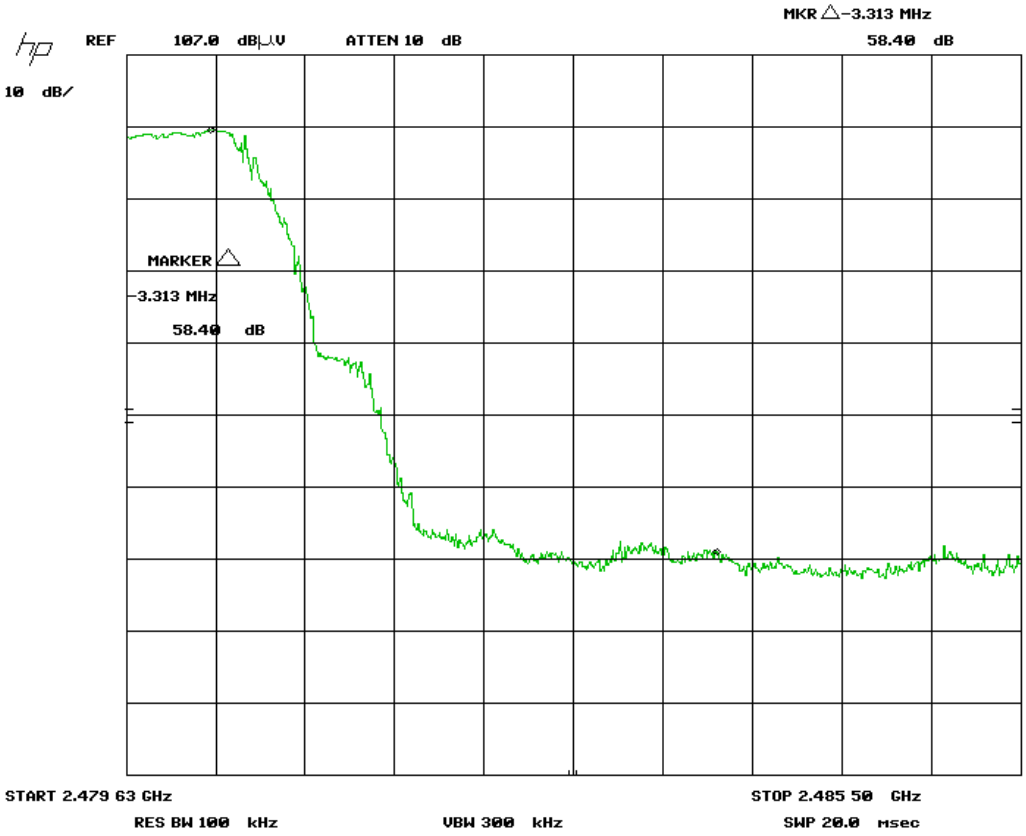
Marker Delta – BLE Channel 39
Vertical



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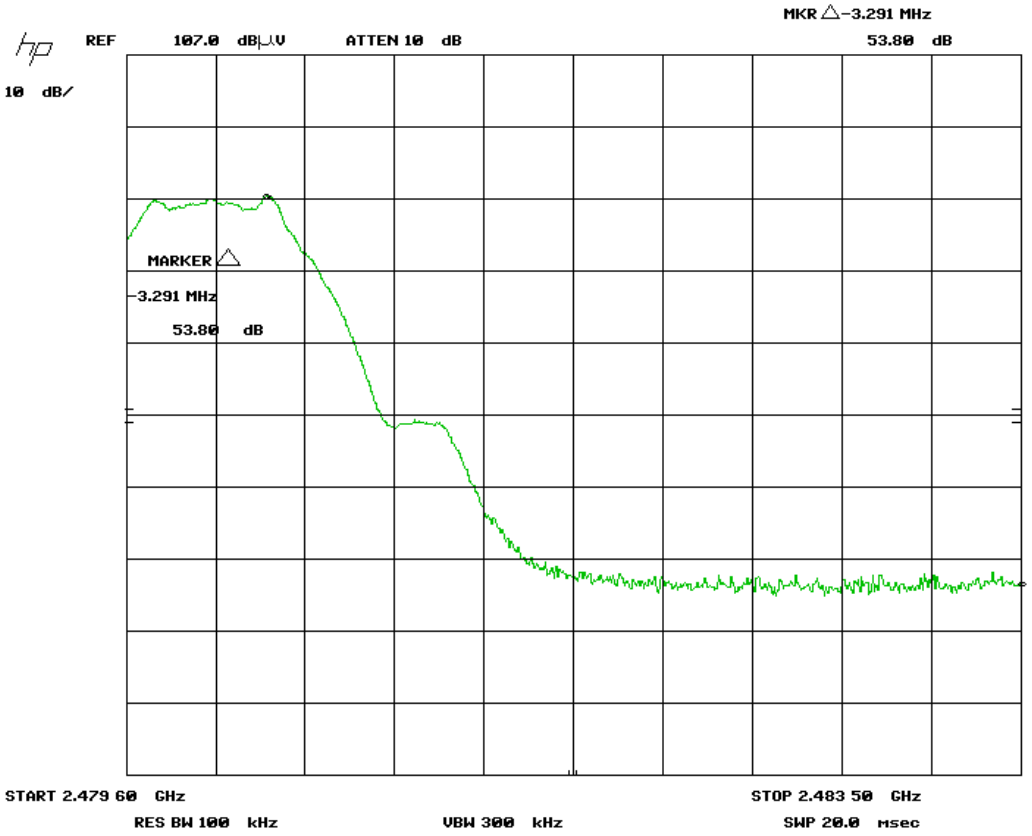
Marker Delta BLE Channel 39
Horizontal



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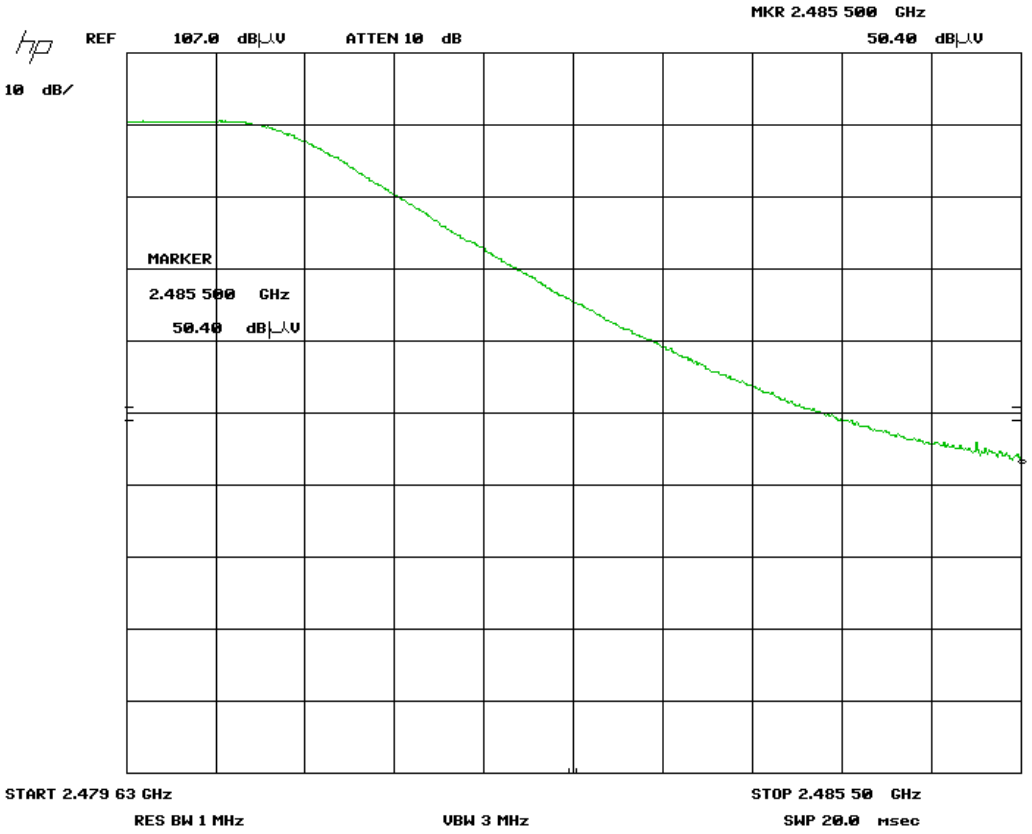
Band Edge (2485.5 MHz) – BLE Channel 39
Vertical - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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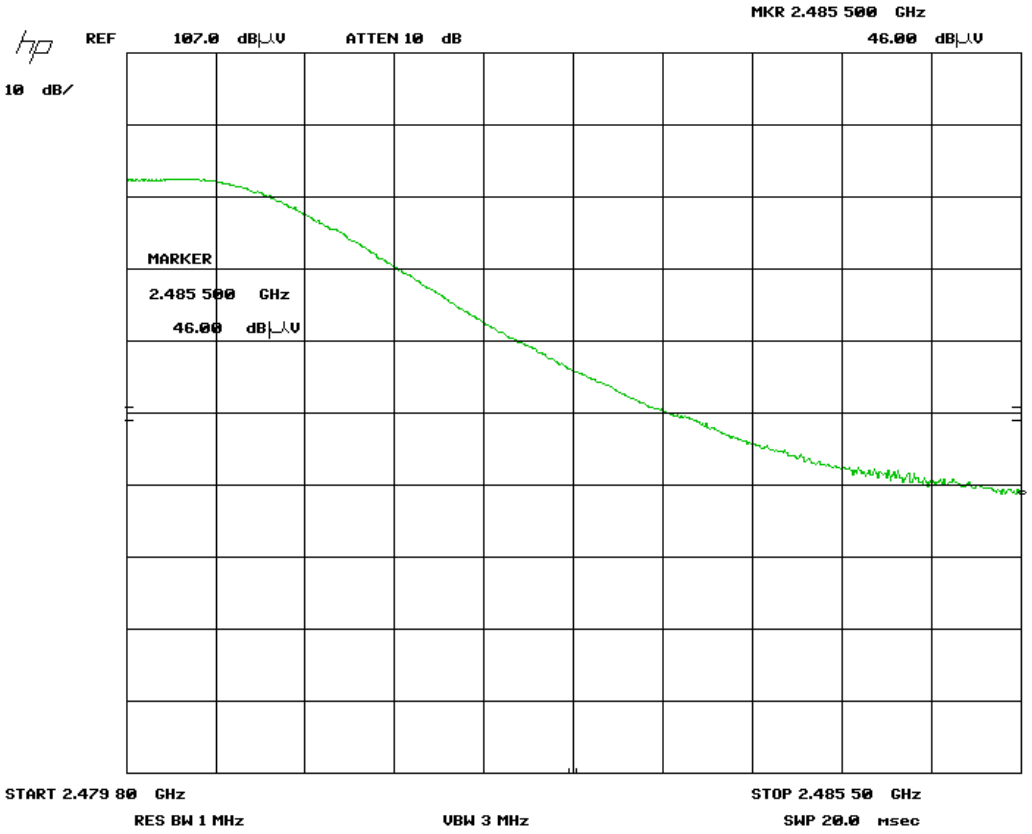
Band Edge (2485.5 MHz) – BLE Channel 39
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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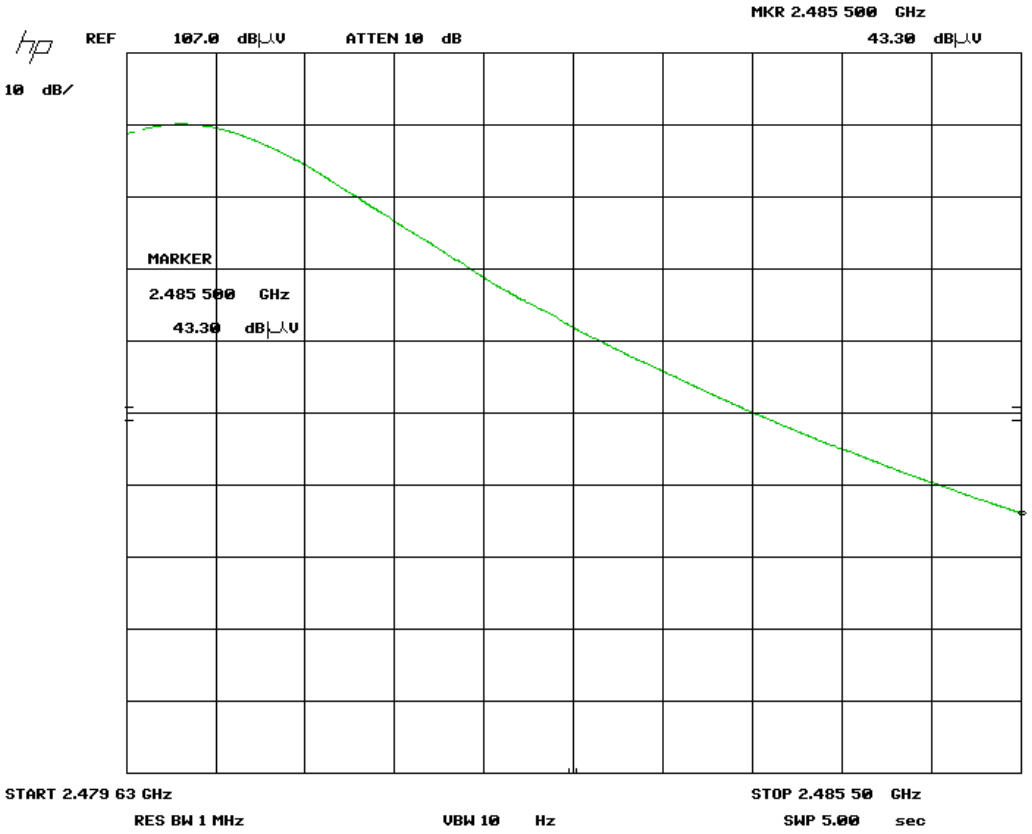
Band Edge (2485.5 MHz) – BLE Channel 39
Vertical - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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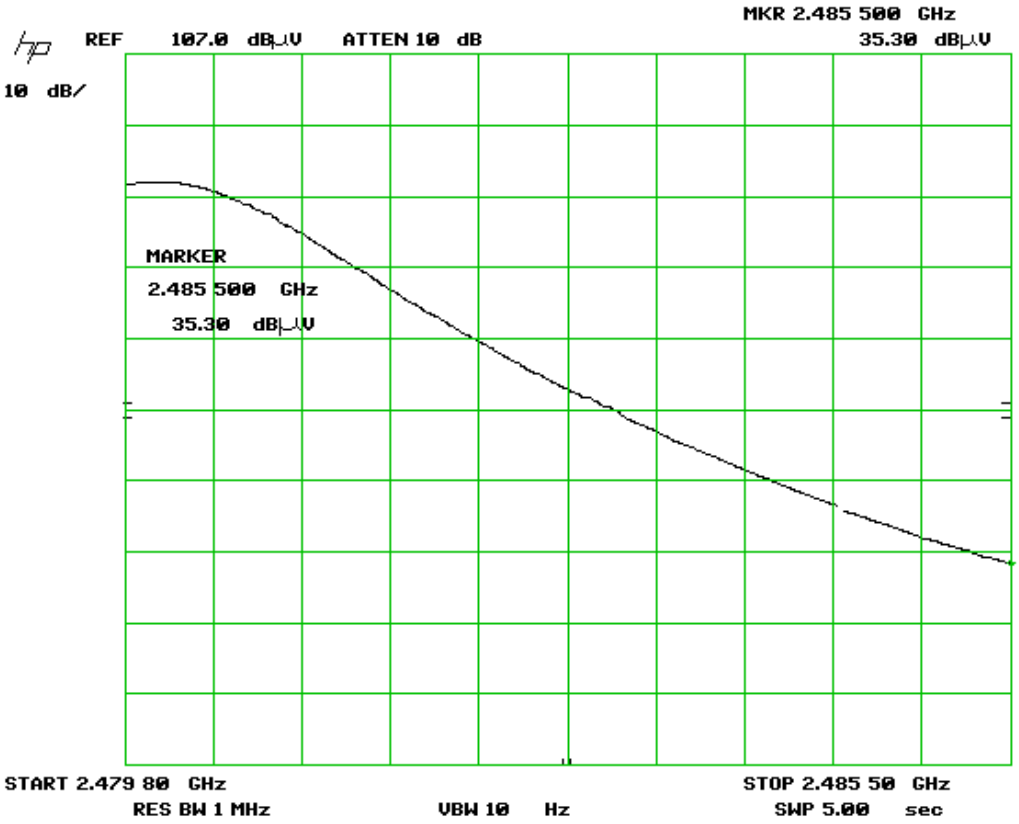
Band Edge (2485.5 MHz) – BLE Channel 39
Horizontal - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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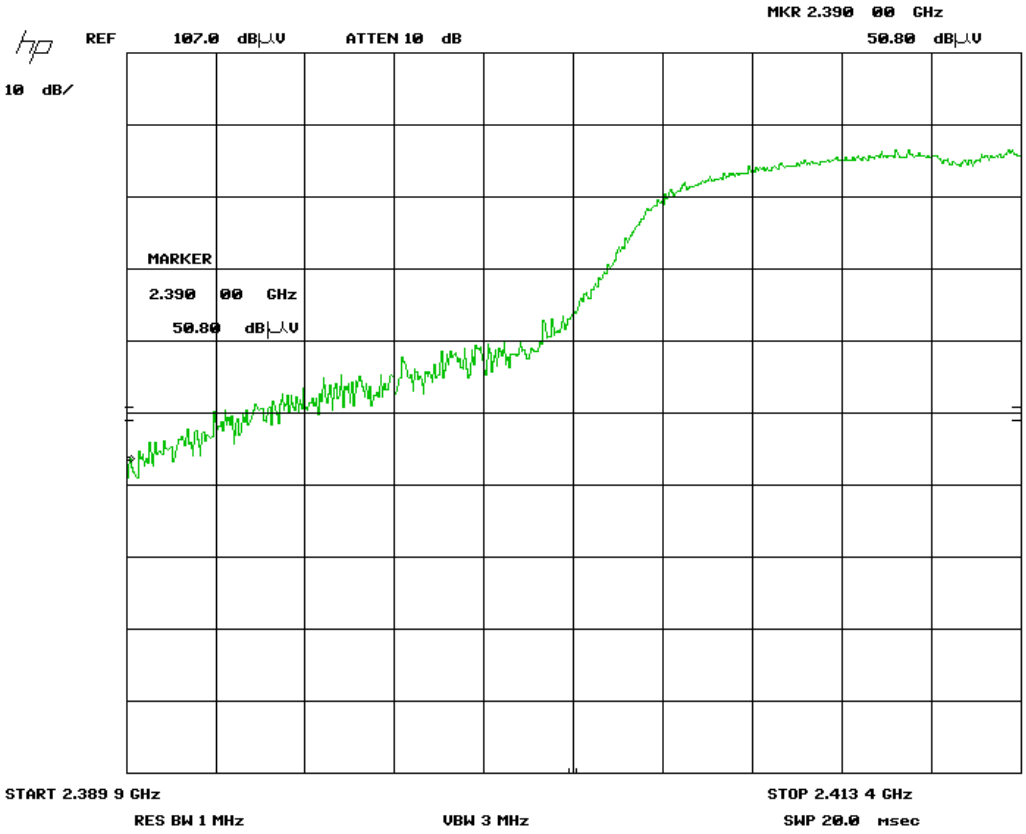
Band Edge – 802.11G Channel 1
Vertical - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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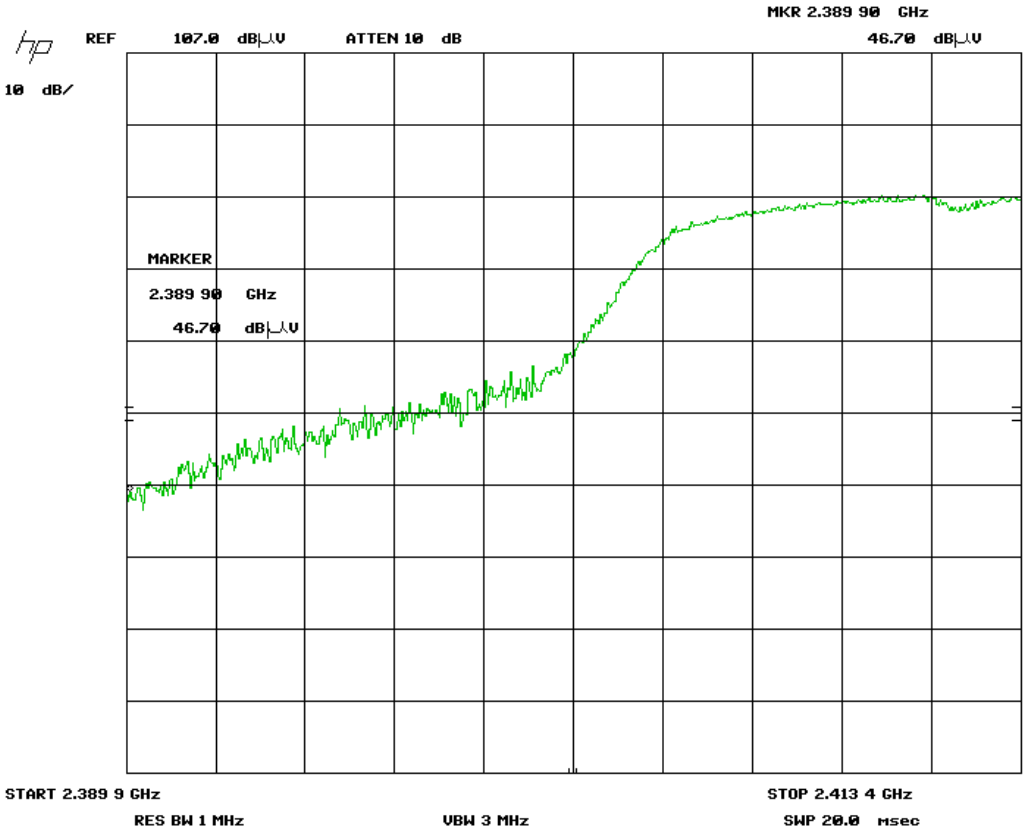
Band Edge – 802.11G Channel 1
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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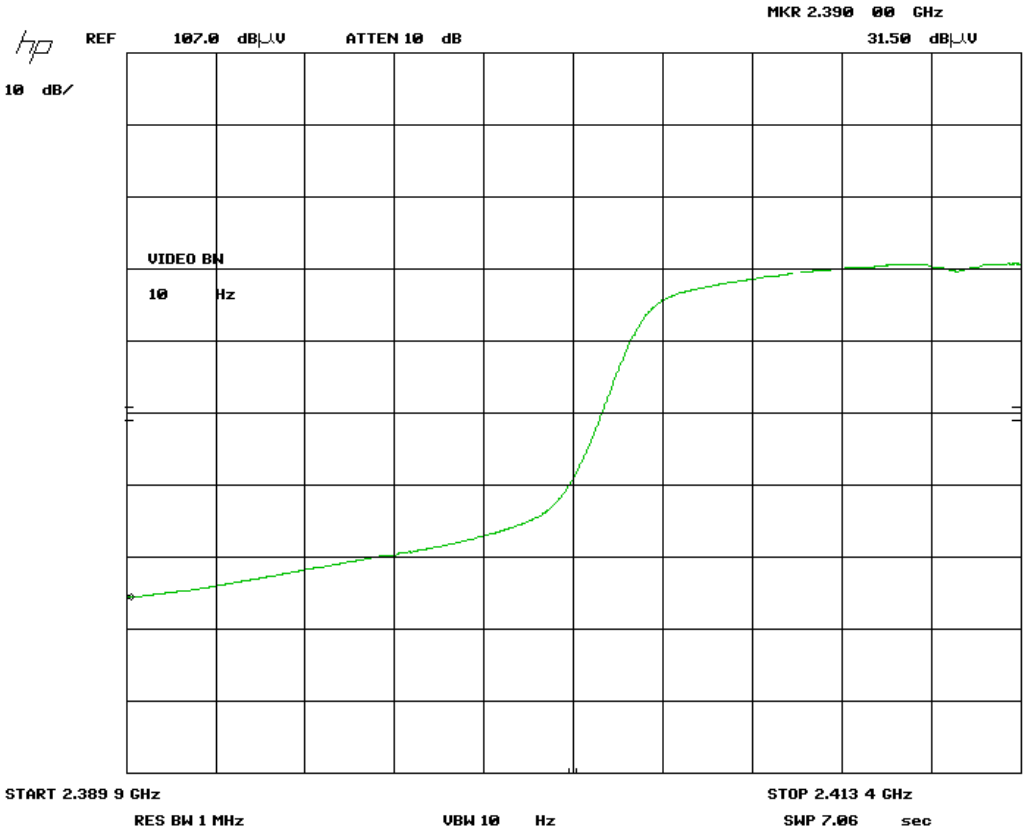
Band Edge – 802.11G Channel 1
Vertical – Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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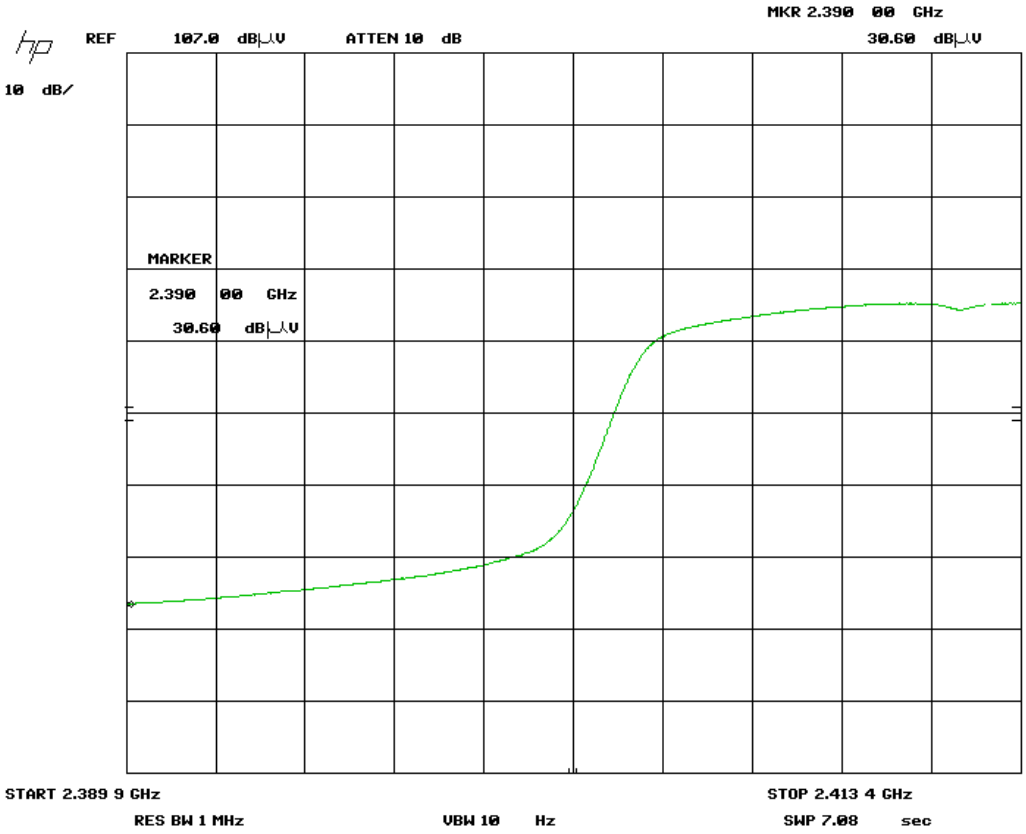
Band Edge – 802.11G Channel 1
Horizontal - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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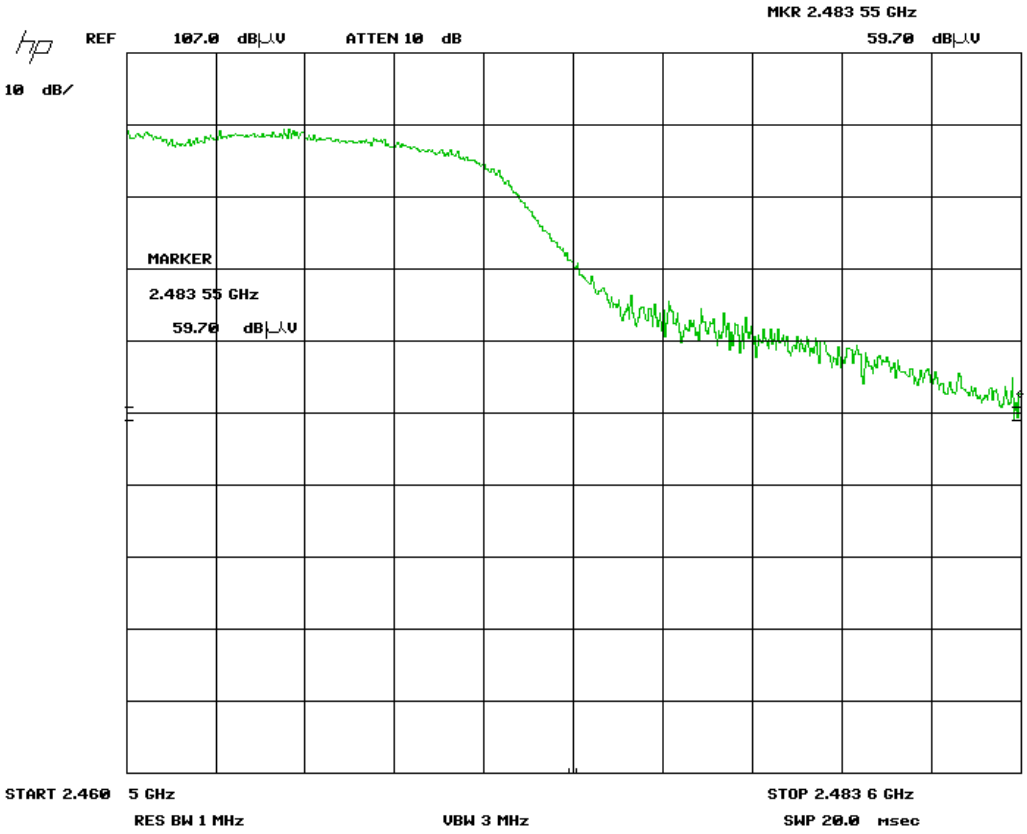
Band Edge – 802.11G Channel 11
Vertical - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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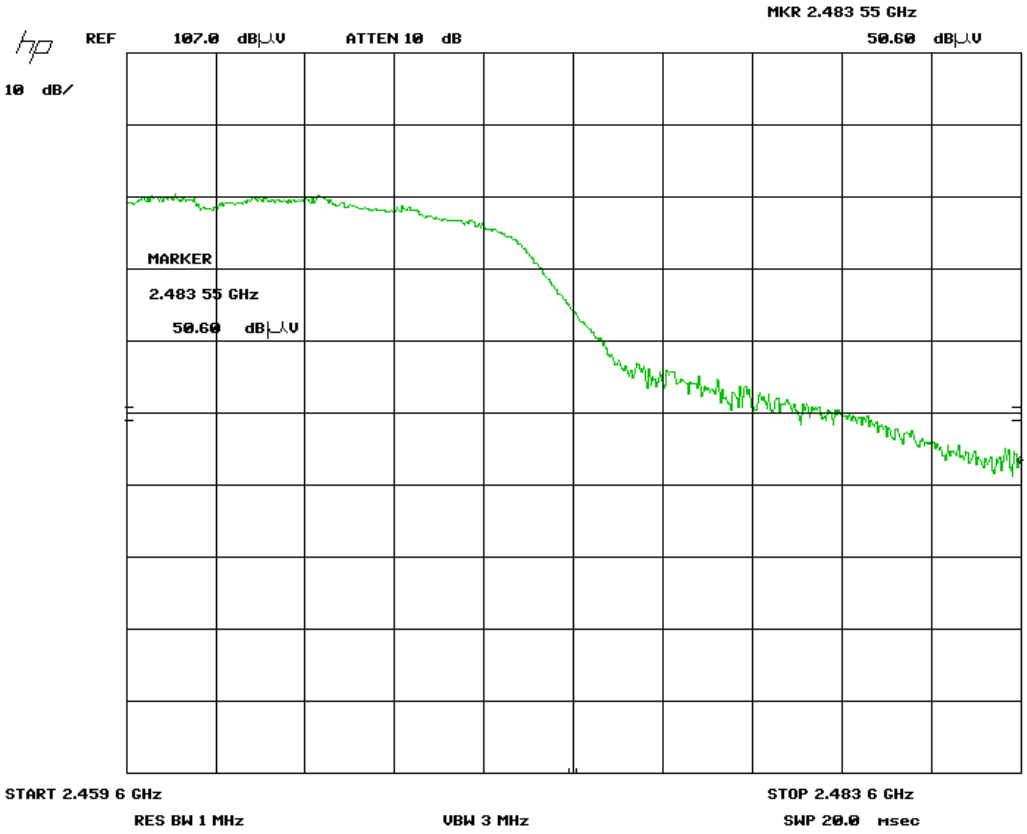
Band Edge – 802.11G Channel 11
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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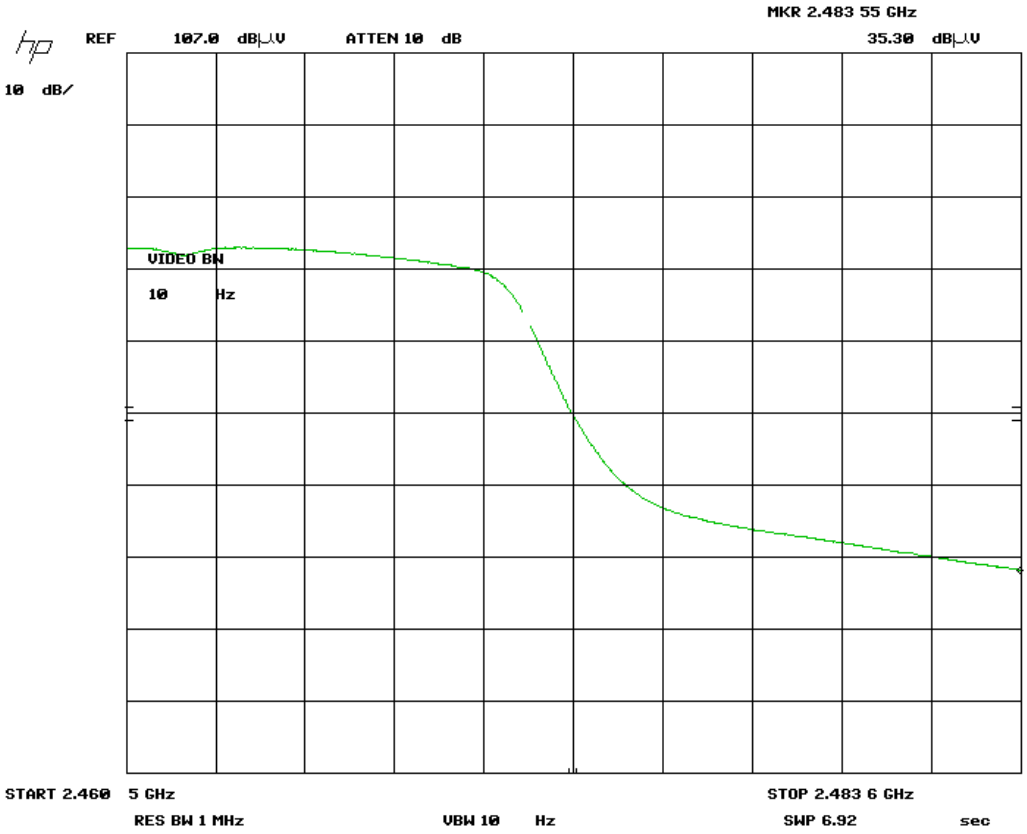
Band Edge – 802.11G Channel 11
Vertical - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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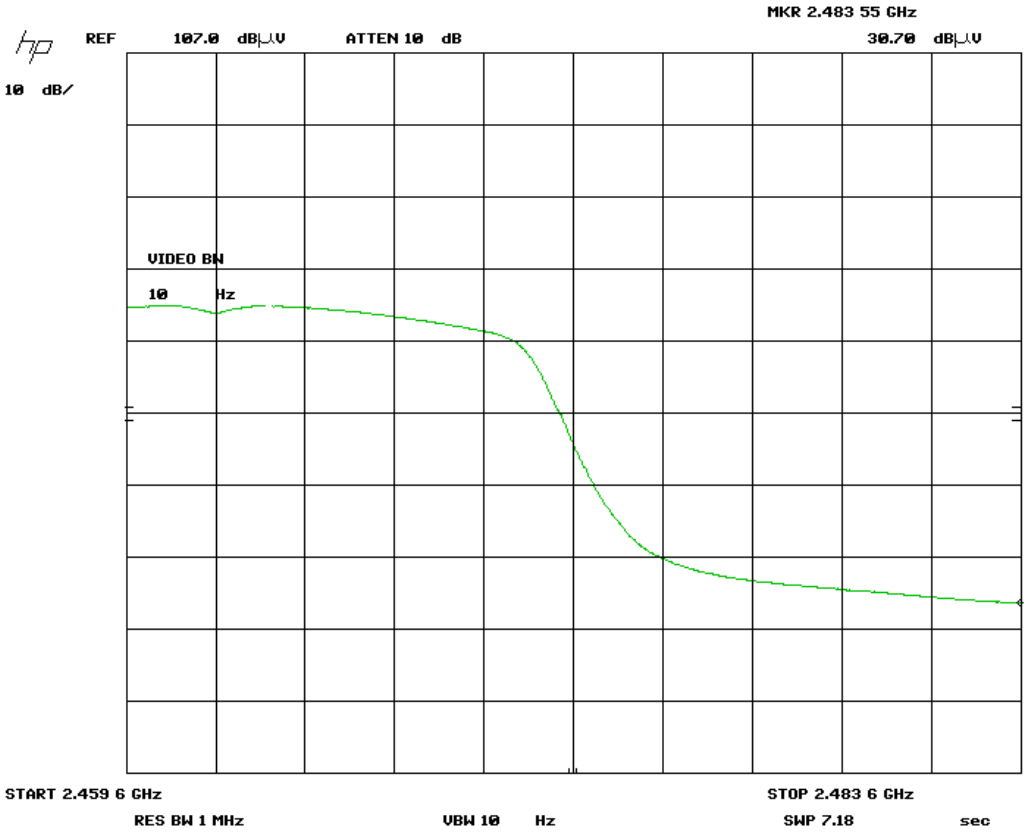
Band Edge – 802.11G Channel 11
Horizontal - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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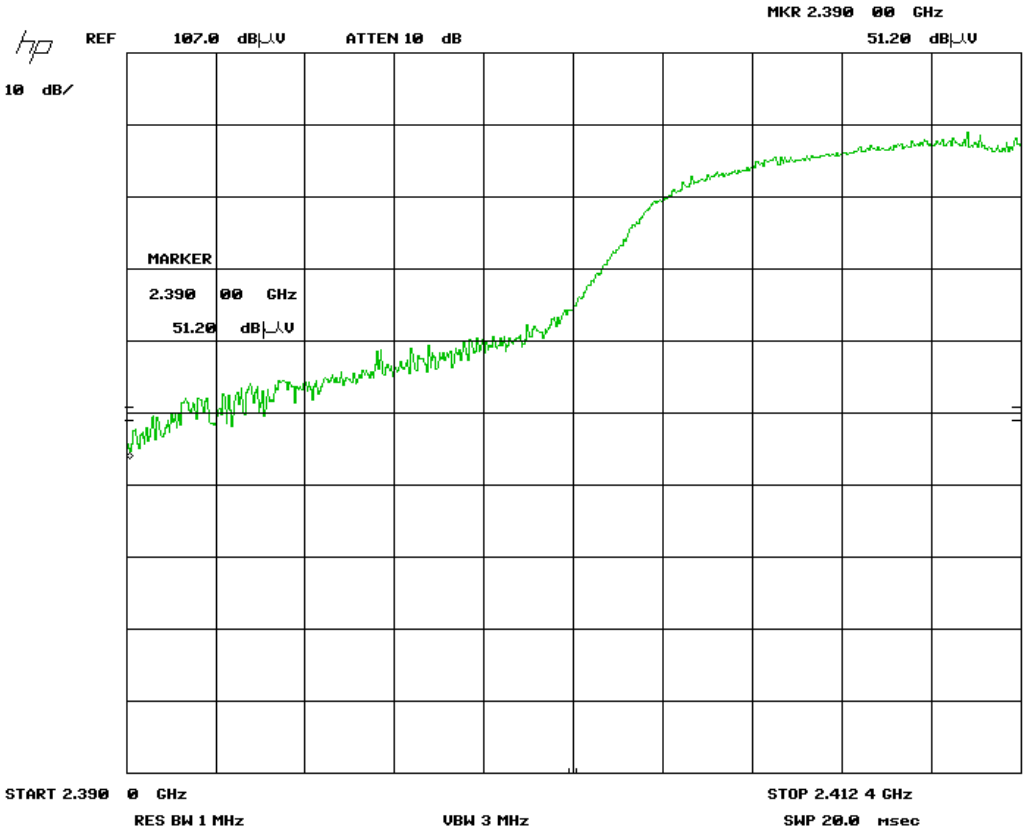
Band Edge – 802.11N, 20 MHZ Channel 1
Vertical - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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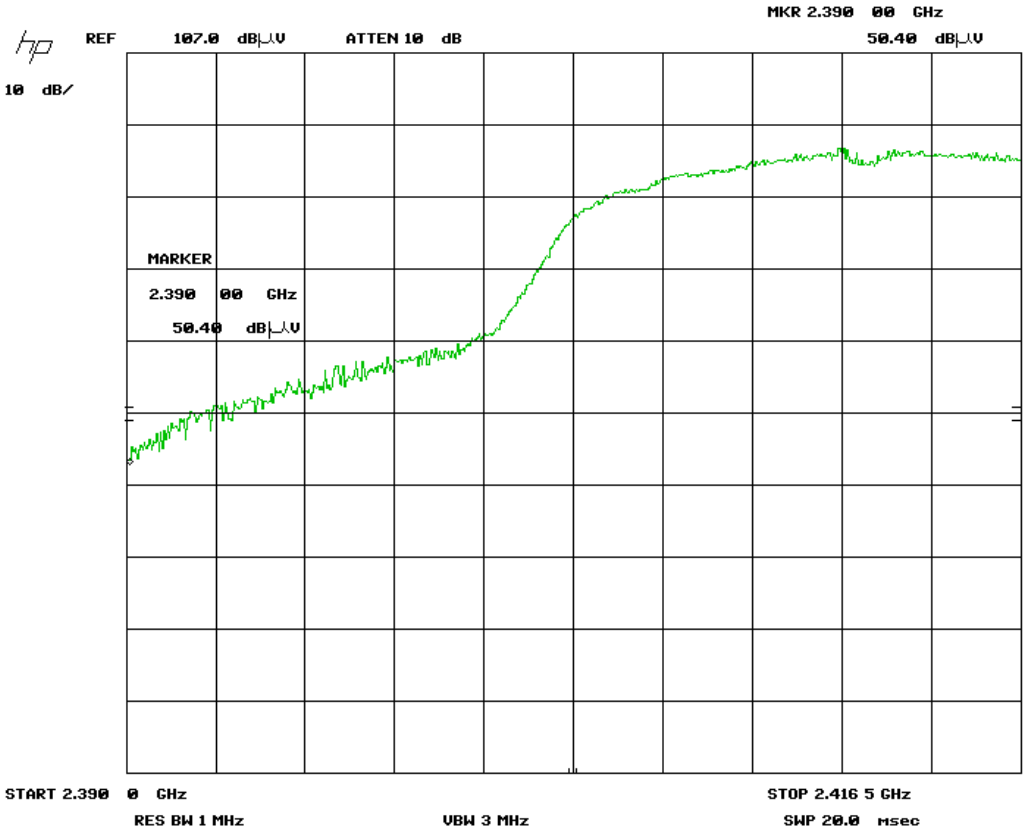
Band Edge – 802.11N, 20 MHZ Channel 1
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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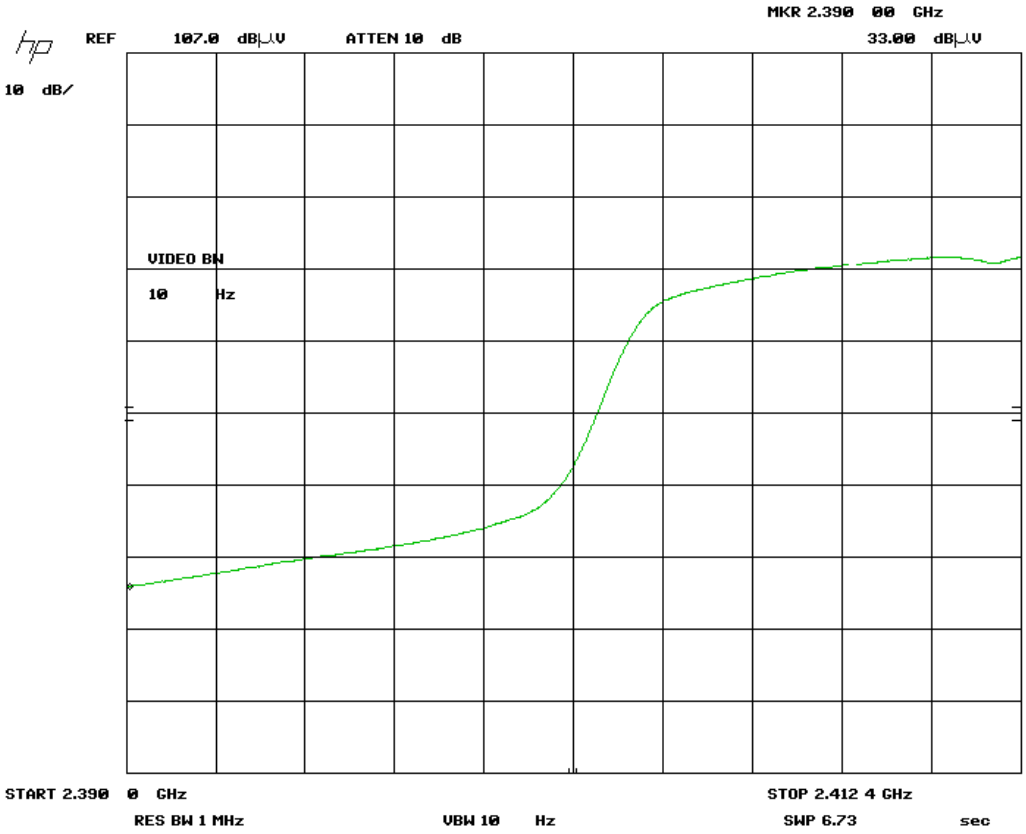
Band Edge – 802.11N, 20 MHZ Channel 1
Vertical – Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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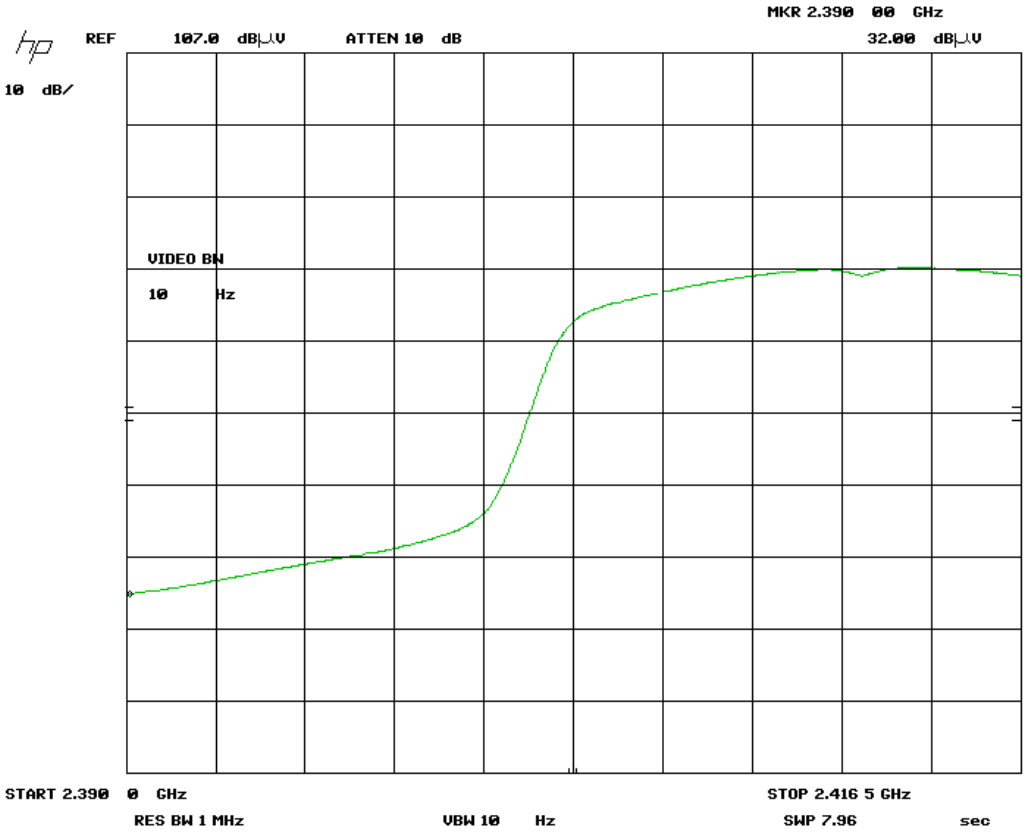
Band Edge – 802.11N, 20 MHZ Channel 1
Horizontal - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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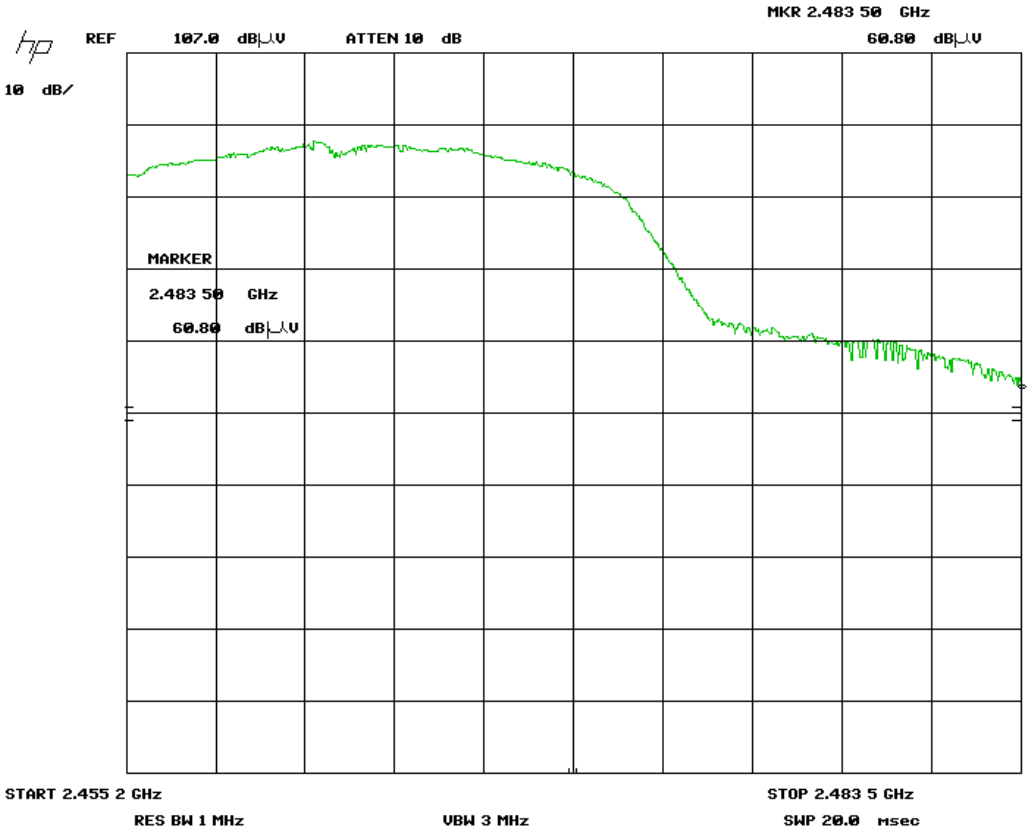
Band Edge – 802.11N, 20 MHZ Channel 11
Vertical - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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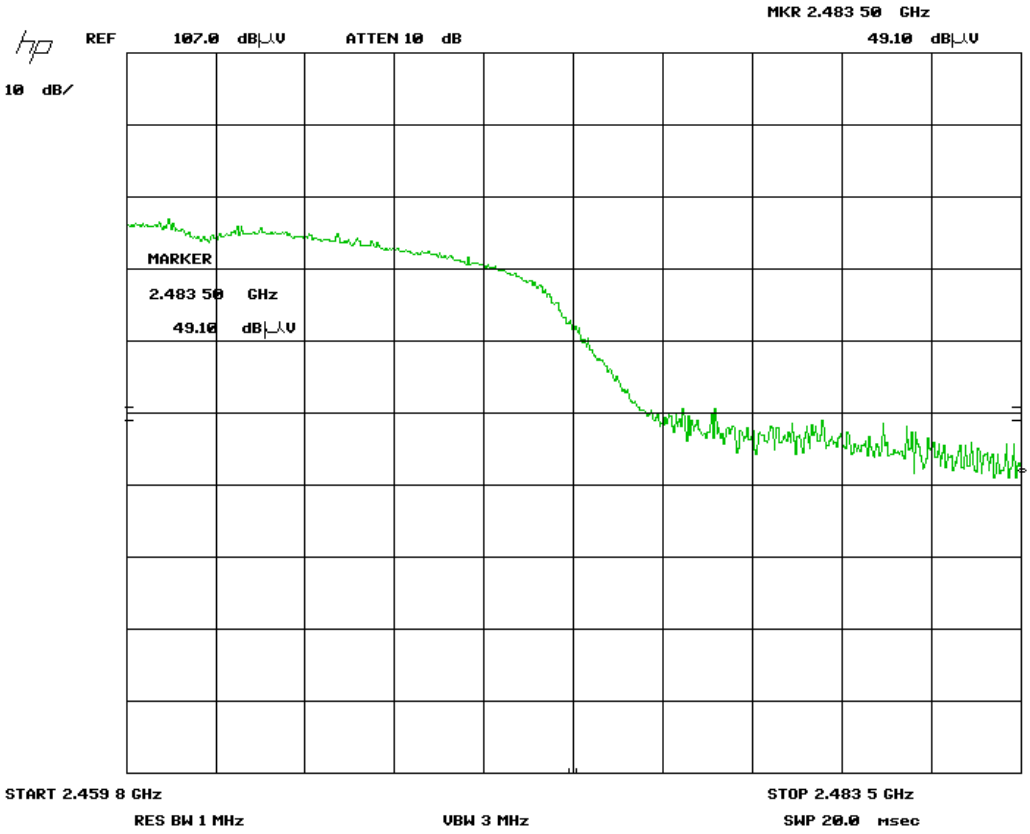
Band Edge – 802.11N, 20 MHZ Channel 11
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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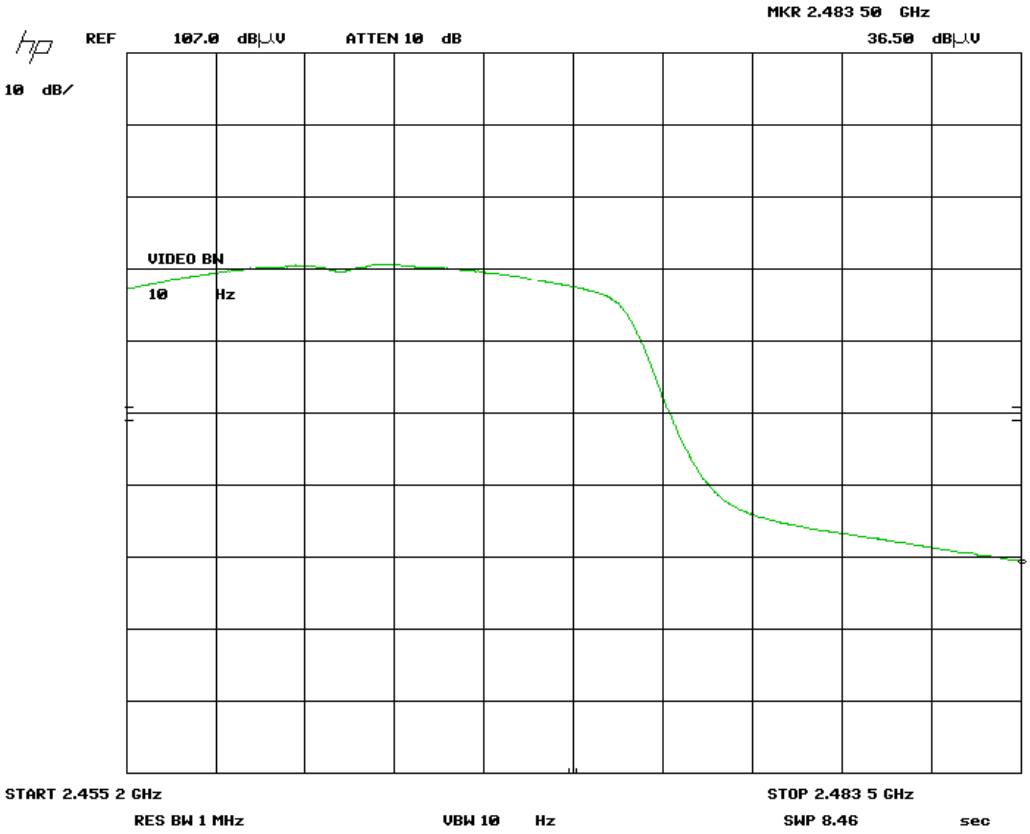
Band Edge – 802.11N, 20 MHZ Channel 11
Vertical - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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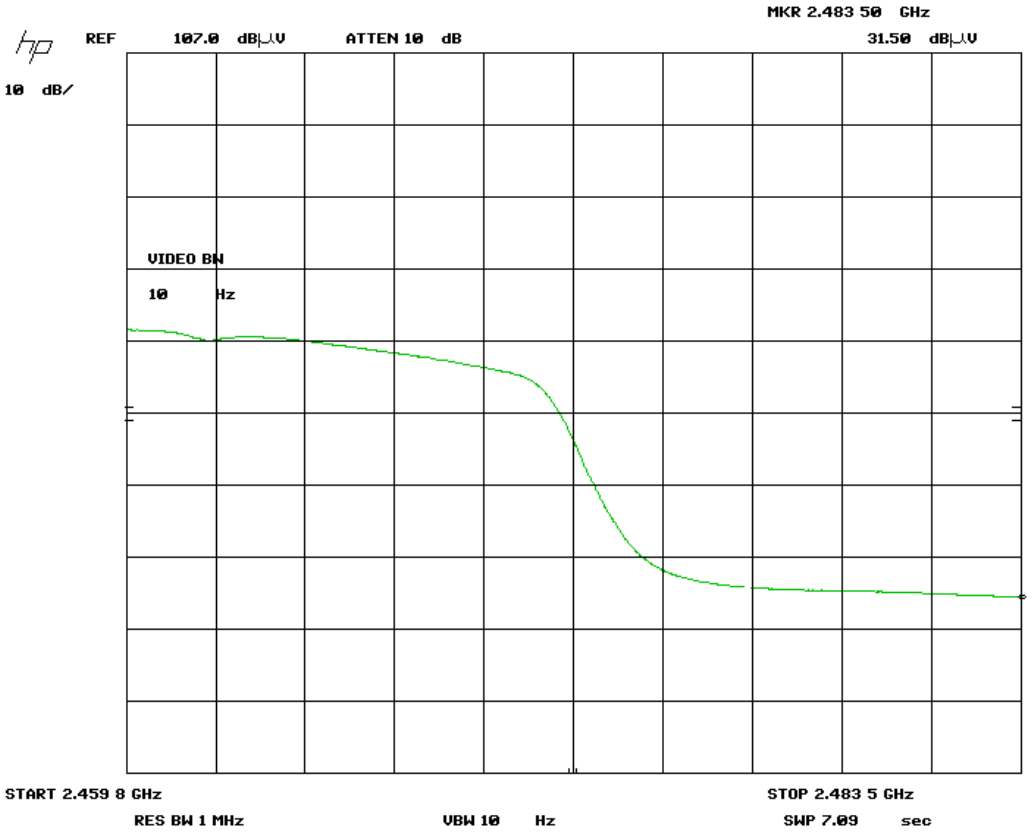
Band Edge – 802.11N, 20 MHZ Channel 11
Horizontal - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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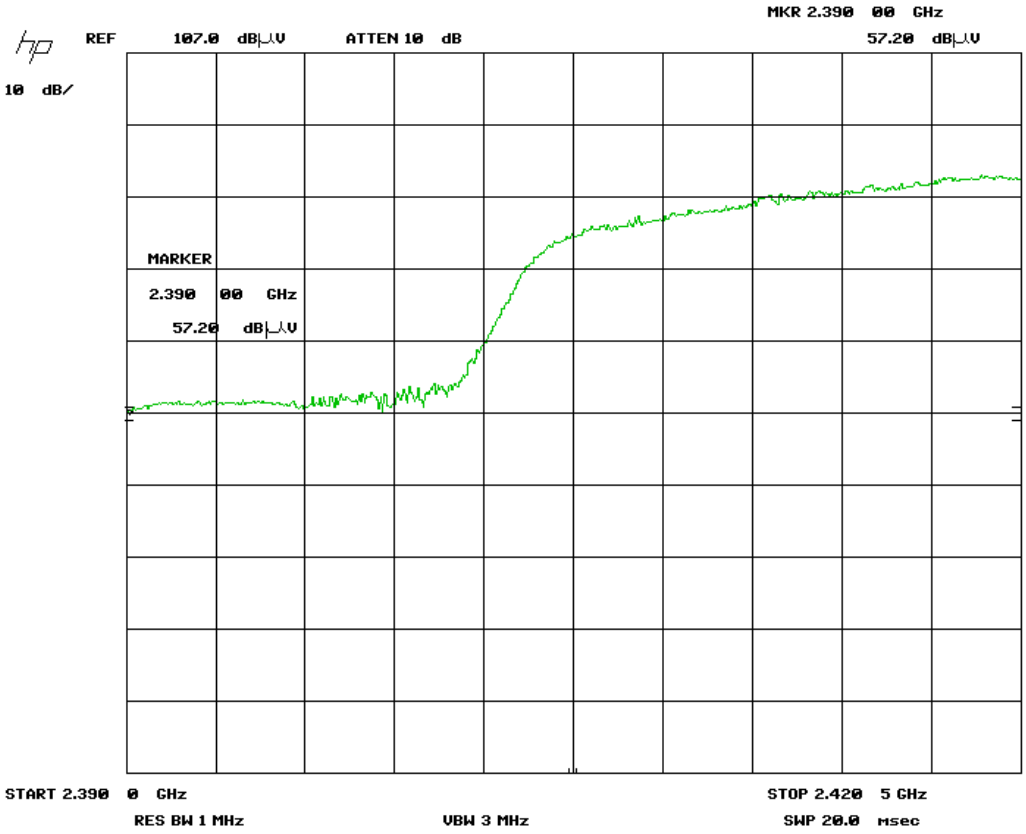
Band Edge – 802.11N, 40 MHZ Channel 3
Vertical - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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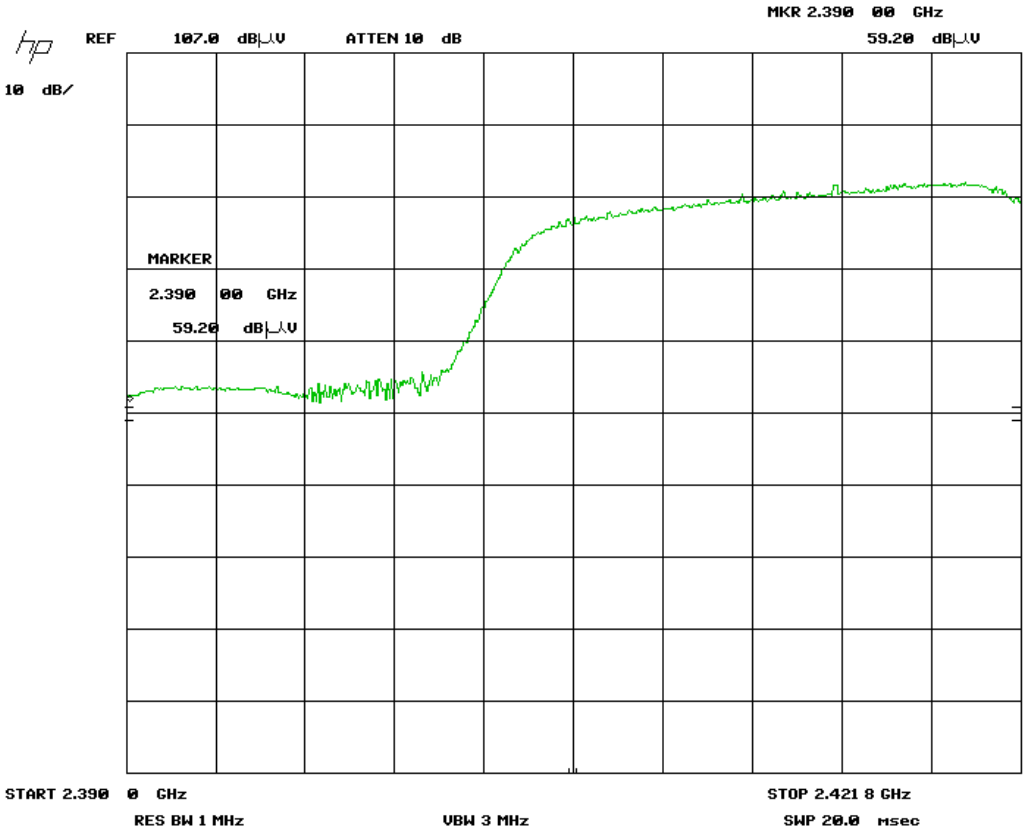
Band Edge – 802.11N, 40 MHZ Channel 3
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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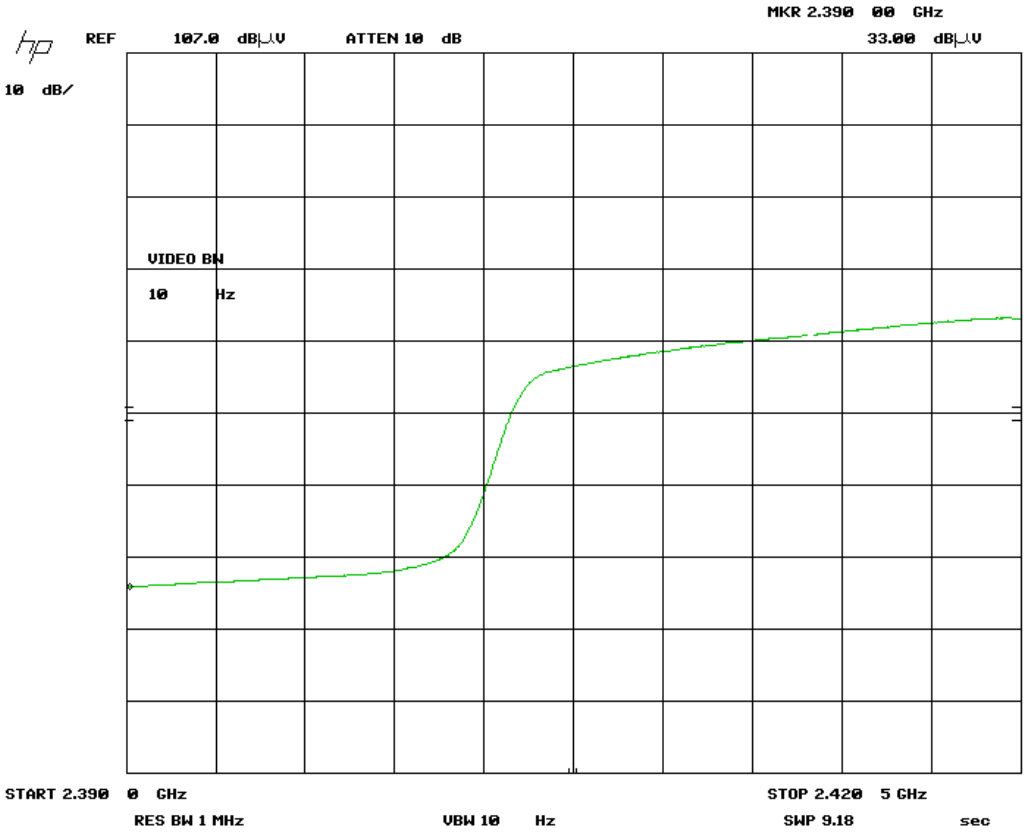
Band Edge – 802.11N, 40 MHZ Channel 3
Vertical – Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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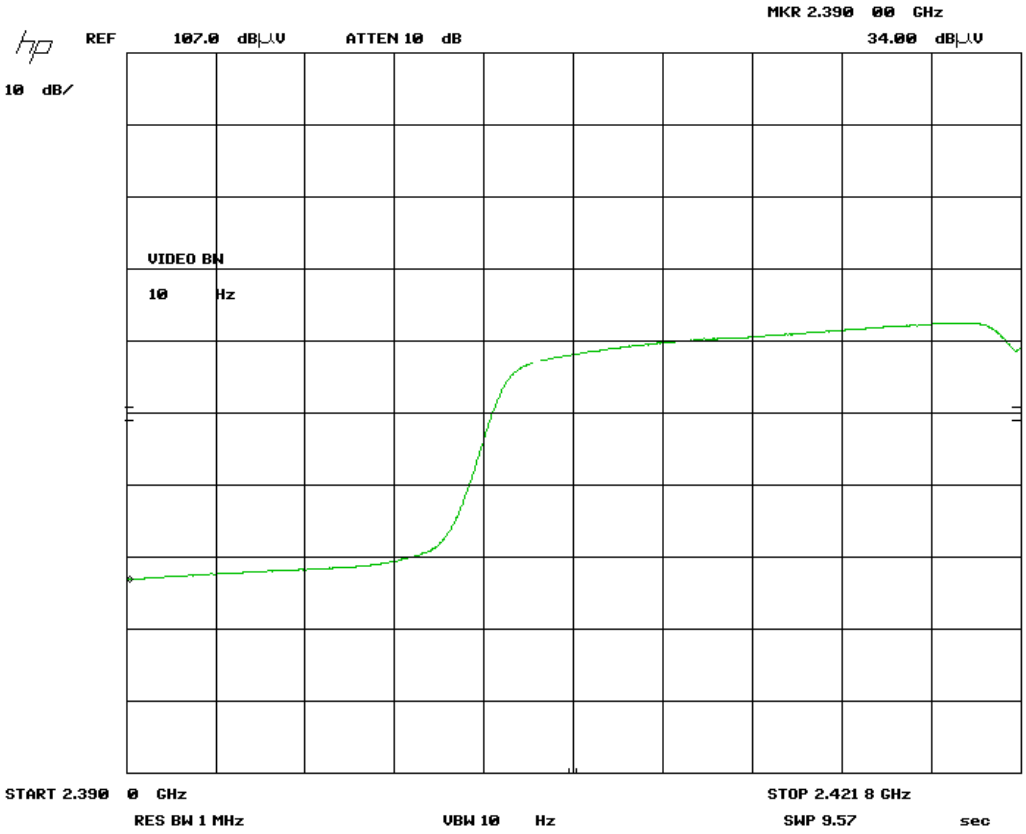
Band Edge – 802.11N, 40 MHZ Channel 3
Horizontal - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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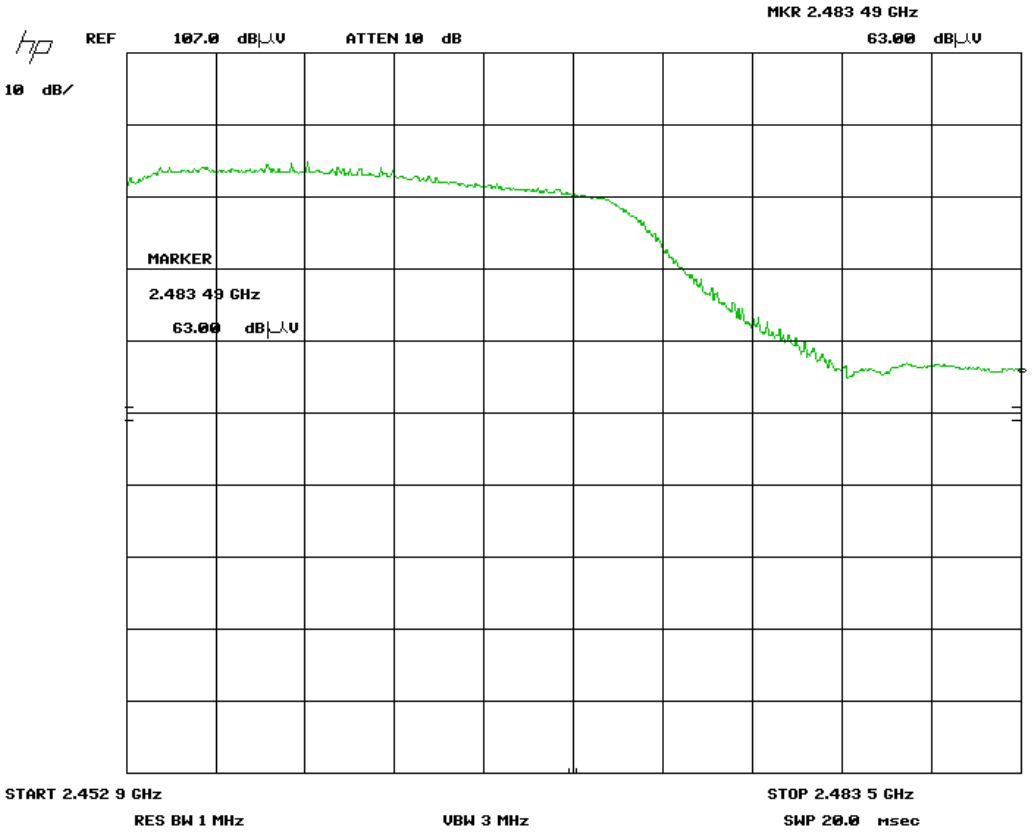
Band Edge – 802.11N, 40 MHZ Channel 9
Vertical - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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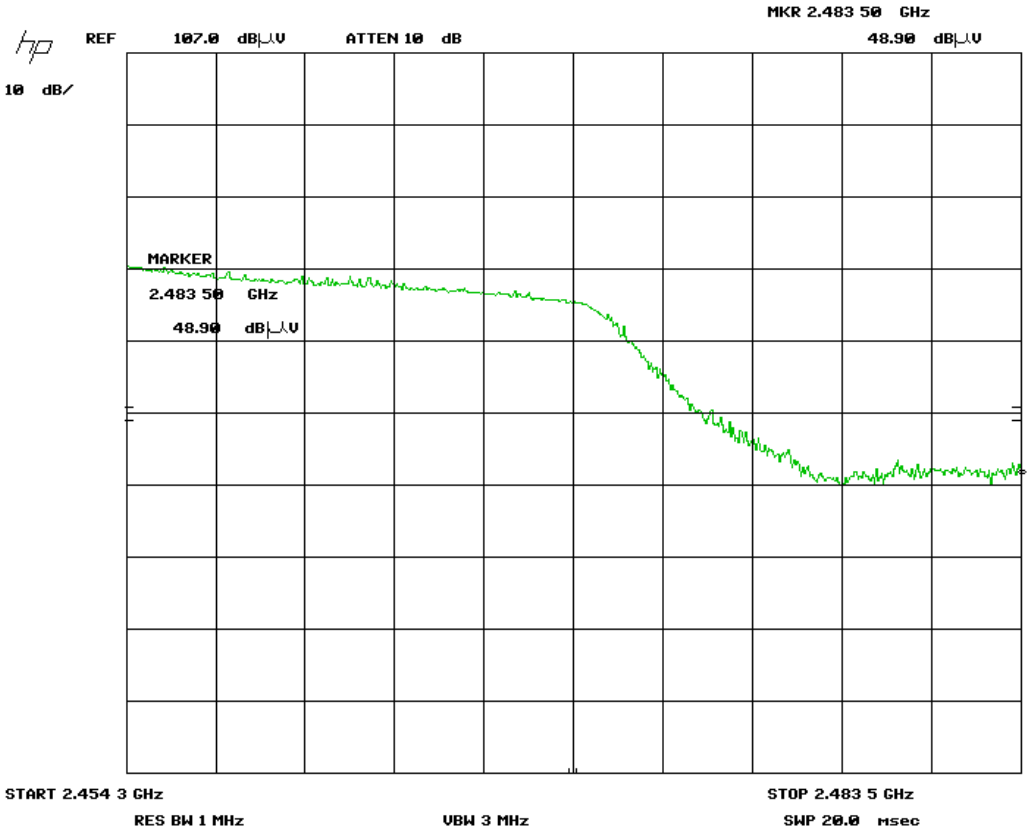
Band Edge – 802.11N, 40 MHZ Channel 9
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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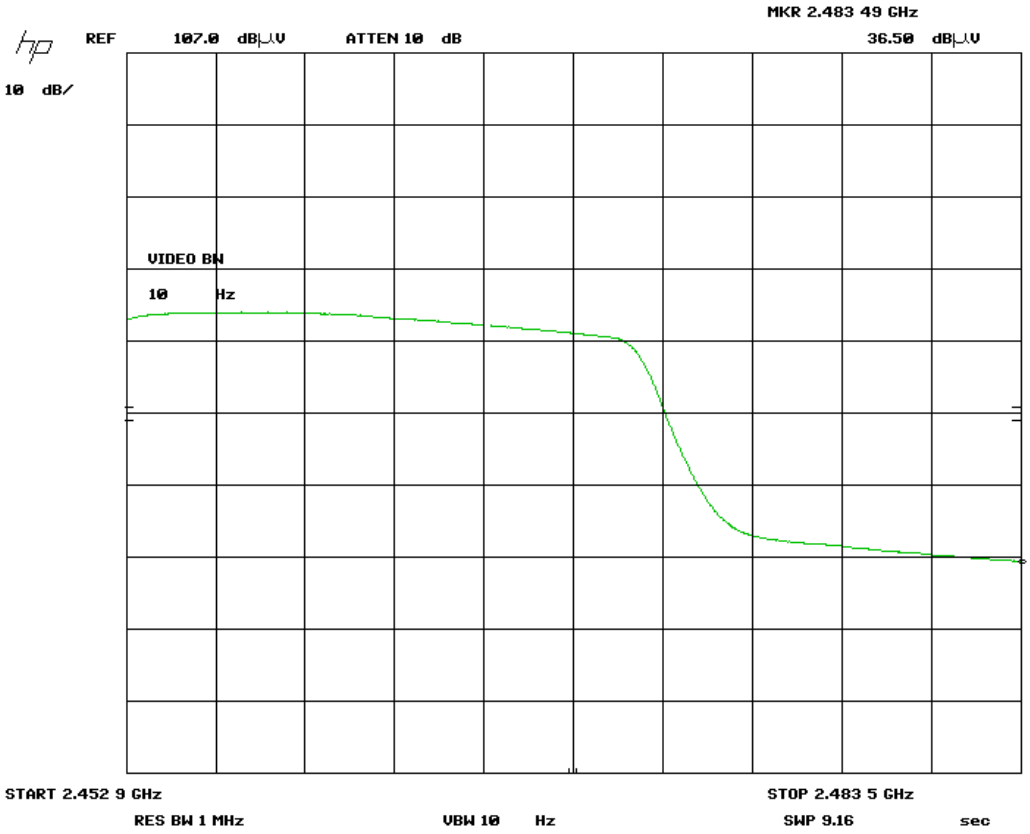
Band Edge – 802.11N, 40 MHZ Channel 9
Vertical - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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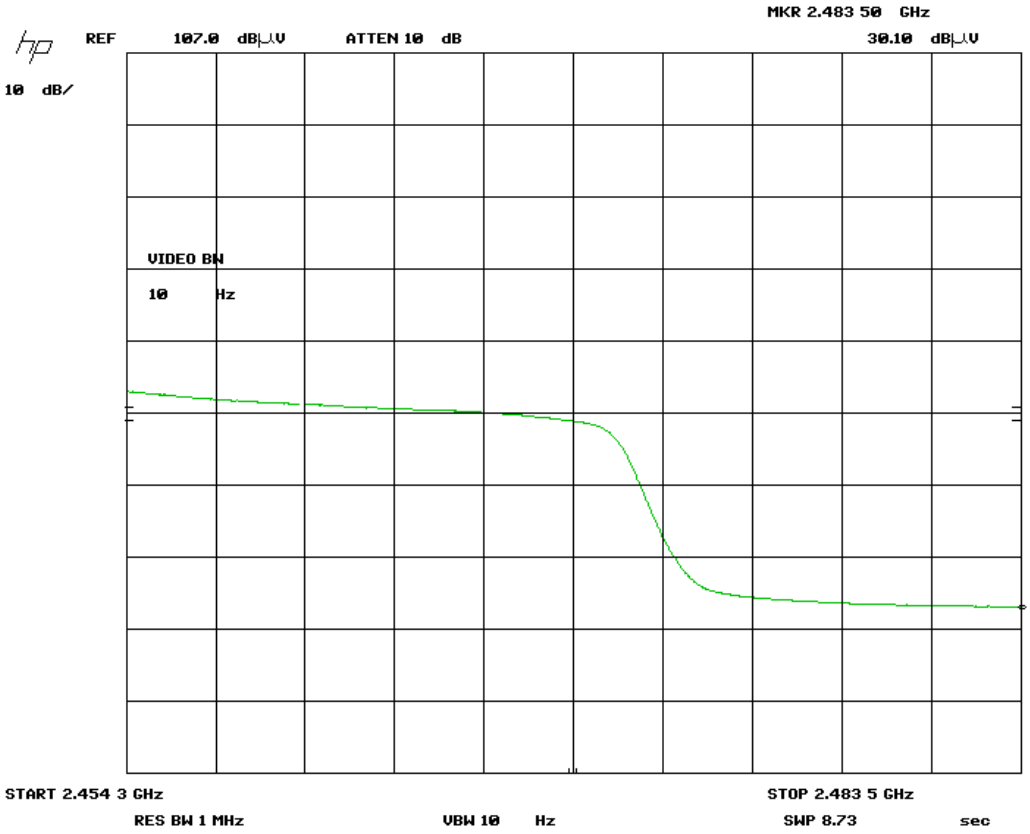
Band Edge – 802.11N, 40 MHZ Channel 9
Horizontal - Average Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section for corrected values.

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Final Measurements and Results

The EUT passed the limits. Low, middle and high bands were measured.

In accordance with 15.247(d), only frequencies exceeding the 15.209 limit that occur within the bands listed in 15.205, need to be verified with a final detector.

For frequency shown on the peak graphs and not listed in 15.205, measurements were taken for reference.

The measurements were maximized by rotating the turn table over a full 0-360 rotation and the antenna height was varied from 1 m to 4 m.

Loop Antenna							
Frequency (MHz)	Detector	Raw (dBuV)	Factors	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
0.6475	QP	43.1	20.4	63.5	71.4	7.9	Pass
0.5314	QP	40.5	22.1	62.6	73.1	10.5	Pass
0.653	QP	42.86	20.4	63.26	71.4	8.14	Pass

Vertical Emission Table							
Frequency (MHz)	Detector	Raw (dBuV)	Factors	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
38.924	QP	44.1	-18.3	25.8	40	14.2	Pass

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BLE

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
BLE Channel 0 - Flat (X-Axis)											
2402	Peak	Horz	83.2	30.8	4.1	10.0	35.8	92.3			PASS
2402	Avg	Horz	82.5	30.8	4.1	10.0	35.8	91.6			PASS
2402	Peak	Vert	88.2	30.8	4.1	10.0	35.8	97.3			PASS
2402	Avg	Vert	87.8	30.8	4.1	10.0	35.8	96.9			PASS
2390	Peak	Horz	41.9	30.8	4.1	10.0	35.8	51.0	74.0	23.0	PASS
2390	Avg	Horz	30.2	30.8	4.1	10.0	35.8	39.3	54.0	14.7	PASS
2390	Peak	Vert	42.0	30.8	4.1	10.0	35.8	51.1	74.0	22.9	PASS
2390	Avg	Vert	30.2	30.8	4.1	10.0	35.8	39.3	54.0	14.7	PASS
BLE Channel 0 - Horizontal (Z-Axis)											
2402	Peak	Horz	92.6	30.8	4.1	10.0	35.8	101.7			PASS
2402	Avg	Horz	92.0	30.8	4.1	10.0	35.8	101.1			PASS
2402	Peak	Vert	89.5	30.8	4.1	10.0	35.8	98.6			PASS
2402	Avg	Vert	89.1	30.8	4.1	10.0	35.8	98.2			PASS
2390	Peak	Horz	42.6	30.8	4.1	10.0	35.8	51.7	74.0	22.3	PASS
2390	Avg	Horz	30.4	30.8	4.1	10.0	35.8	39.5	54.0	14.5	PASS
2390	Peak	Vert	42.0	30.8	4.1	10.0	35.8	51.1	74.0	22.9	PASS
2390	Avg	Vert	30.2	30.8	4.1	10.0	35.8	39.3	54.0	14.7	PASS
4804	Peak	Horz	43.1	33.5	5.9	0.0	35.2	47.3	74.0	26.7	PASS
4804	Avg	Horz	29.1	33.5	5.9	0.0	35.2	33.3	54.0	20.7	PASS
4804	Peak	Vert	43.7	33.5	5.9	0.0	35.2	47.9	74.0	26.1	PASS
4804	Avg	Vert	29.1	33.5	5.9	0.0	35.2	33.3	54.0	20.7	PASS
7206	Peak	Horz	46.1	38.6	7.4	0.0	35.6	56.5	74.0	17.5	PASS
7206	Avg	Horz	32.4	38.6	7.4	0.0	35.6	42.8	54.0	11.2	PASS
7206	Peak	Vert	45.2	38.6	7.4	0.0	35.6	55.6	74.0	18.4	PASS
7206	Avg	Vert	32.4	38.6	7.4	0.0	35.6	42.8	54.0	11.2	PASS

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
BLE Channel 19 - Flat (X-Axis)											
2440	Peak	Horz	85.5	30.8	4.1	10.0	35.8	94.6			PASS
2440	Avg	Horz	84.9	30.8	4.1	10.0	35.8	94.0			PASS
2440	Peak	Vert	91.1	30.8	4.1	10.0	35.8	100.2			PASS
2440	Avg	Vert	90.3	30.8	4.1	10.0	35.8	99.4			PASS
BLE Channel 19 - Horizontal (Z-Axis)											
2440	Peak	Horz	92.5	30.8	4.1	10.0	35.8	101.6			PASS
2440	Avg	Horz	92.2	30.8	4.1	10.0	35.8	101.3			PASS
2440	Peak	Vert	96.9	30.8	4.1	10.0	35.8	106.0			PASS
2440	Avg	Vert	96.4	30.8	4.1	10.0	35.8	105.5			PASS
4880	Peak	Horz	43.1	33.5	5.9	0.0	35.2	47.3	74.0	26.7	PASS
4880	Avg	Horz	30.1	33.5	5.9	0.0	35.2	34.3	54.0	19.7	PASS
4880	Peak	Vert	42.1	33.5	5.9	0.0	35.2	46.3	74.0	27.7	PASS
4880	Avg	Vert	28.4	33.5	5.9	0.0	35.2	32.6	54.0	21.4	PASS
7320	Peak	Vert	46.2	38.6	7.4	0.0	35.6	56.6	74.0	17.4	PASS
7320	Avg	Vert	32.3	38.6	7.4	0.0	35.6	42.7	54.0	11.3	PASS
7320	Peak	Horz	45.7	38.6	7.4	0.0	35.6	56.1	74.0	17.9	PASS
7320	Avg	Horz	32.3	38.6	7.4	0.0	35.6	42.7	54.0	11.3	PASS

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Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
BLE Channel 39 - Flat (X-Axis)											
2480	Peak	Horz	85.3	30.8	4.1	10.0	35.8	94.4			PASS
2480	Avg	Horz	84.9	30.8	4.1	10.0	35.8	94.0			PASS
2480	Peak	Vert	85.9	30.8	4.1	10.0	35.8	95.0			PASS
2480	Avg	Vert	85.5	30.8	4.1	10.0	35.8	94.6			PASS
2483.5	Peak	Horz	34.8	30.8	4.1	10.0	35.8	43.9	74.0	30.1	PASS
2483.5	Avg	Horz	34.4	30.8	4.1	10.0	35.8	43.5	54.0	10.5	PASS
2483.5	Peak	Vert	34.2	30.8	4.1	10.0	35.8	43.3	74.0	30.7	PASS
2483.5	Avg	Vert	33.8	30.8	4.1	10.0	35.8	42.9	54.0	11.1	PASS
2485.5	Peak	Horz	44.3	30.8	4.1	0.0	35.8	43.4	74.0	30.6	PASS
2485.5	Avg	Horz	32.3	30.8	4.1	0.0	35.8	31.4	54.0	22.6	PASS
2485.5	Peak	Vert	43.4	30.8	4.1	0.0	35.8	42.5	74.0	31.5	PASS
2485.5	Avg	Vert	32.6	30.8	4.1	0.0	35.8	31.7	54.0	22.3	PASS
BLE Channel 39 - Horizontal (Z-Axis)											
2480	Peak	Horz	89.6	30.8	4.1	10.0	35.8	98.7			PASS
2480	Avg	Horz	89.1	30.8	4.1	10.0	35.8	98.2			PASS
2480	Peak	Vert	97.6	30.8	4.1	10.0	35.8	106.7			PASS
2480	Avg	Vert	97.2	30.8	4.1	10.0	35.8	106.3			PASS
2483.5	Peak	Horz	35.8	30.8	4.1	10.0	35.8	44.9	74.0	29.1	PASS
2483.5	Avg	Horz	35.3	30.8	4.1	10.0	35.8	44.4	54.0	9.6	PASS
2483.5	Peak	Vert	39.2	30.8	4.1	10.0	35.8	48.3	74.0	25.7	PASS
2483.5	Avg	Vert	38.8	30.8	4.1	10.0	35.8	47.9	54.0	6.1	PASS
2485.5	Peak	Horz	46.0	30.8	4.1	0.0	35.8	45.1	74.0	28.9	PASS
2485.5	Avg	Horz	35.3	30.8	4.1	0.0	35.8	34.4	54.0	19.6	PASS
2485.5	Peak	Vert	50.4	30.8	4.1	0.0	35.8	49.5	74.0	24.5	PASS
2485.5	Avg	Vert	43.3	30.8	4.1	0.0	35.8	42.4	54.0	11.6	PASS
4960	Peak	Horz	42.0	33.5	5.9	0.0	35.2	46.2	74.0	27.8	PASS
4960	Avg	Horz	30.8	33.5	5.9	0.0	35.2	35.0	54.0	19.0	PASS
4960	Peak	Vert	43.1	33.5	5.9	0.0	35.2	47.3	74.0	26.7	PASS
4960	Avg	Vert	31.5	33.5	5.9	0.0	35.2	35.7	54.0	18.3	PASS
7440	Peak	Vert	45.3	38.6	7.4	0.0	35.6	55.7	74.0	18.3	PASS
7440	Avg	Vert	31.9	38.6	7.4	0.0	35.6	42.3	54.0	11.7	PASS
7440	Peak	Horz	45.4	38.6	7.4	0.0	35.6	55.8	74.0	18.2	PASS
7440	Avg	Horz	31.9	38.6	7.4	0.0	35.6	42.3	54.0	11.7	PASS

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802.11g

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
802.11g Channel 1 - Flat (X-Axis)											
2412	Peak	Horz	87.5	30.8	4.1	10.0	35.8	96.6			PASS
2412	Avg	Horz	72.3	30.8	4.1	10.0	35.8	81.4			PASS
2412	Peak	Vert	94.0	30.8	4.1	10.0	35.8	103.1			PASS
2412	Avg	Vert	77.9	30.8	4.1	10.0	35.8	87.0			PASS
2390	Peak	Horz	46.7	30.8	4.1	10.0	35.8	55.8	74.0	18.2	PASS
2390	Avg	Horz	30.6	30.8	4.1	10.0	35.8	39.7	54.0	14.3	PASS
2390	Peak	Vert	50.8	30.8	4.1	10.0	35.8	59.9	74.0	14.1	PASS
2390	Avg	Vert	31.5	30.8	4.1	10.0	35.8	40.6	54.0	13.4	PASS
802.11g Channel 1 - Horizontal (Z-Axis)											
2412	Peak	Horz	94.9	30.8	4.1	10.0	35.8	104.0			PASS
2412	Avg	Horz	78.7	30.8	4.1	10.0	35.8	87.8			PASS
2412	Peak	Vert	95.9	30.8	4.1	10.0	35.8	105.0			PASS
2412	Avg	Vert	79.2	30.8	4.1	10.0	35.8	88.3			PASS
2390	Peak	Horz	52.3	30.8	4.1	10.0	35.8	61.4	74.0	12.6	PASS
2390	Avg	Horz	32.1	30.8	4.1	10.0	35.8	41.2	54.0	12.8	PASS
2390	Peak	Vert	51.2	30.8	4.1	10.0	35.8	60.3	74.0	13.7	PASS
2390	Avg	Vert	31.8	30.8	4.1	10.0	35.8	40.9	54.0	13.1	PASS
4824	Peak	Horz	42.2	33.5	5.9	0.0	35.2	46.4	74.0	27.6	PASS
4824	Avg	Horz	28.6	33.5	5.9	0.0	35.2	32.8	54.0	21.2	PASS
4824	Peak	Vert	42.1	33.5	5.9	0.0	35.2	46.3	74.0	27.7	PASS
4824	Avg	Vert	28.7	33.5	5.9	0.0	35.2	32.9	54.0	21.1	PASS
7236	Peak	Horz	46.9	38.6	7.4	0.0	35.6	57.3	74.0	16.7	PASS
7236	Avg	Horz	32.6	38.6	7.4	0.0	35.6	43.0	54.0	11.0	PASS
7236	Peak	Vert	46.5	38.6	7.4	0.0	35.6	56.9	74.0	17.1	PASS
7236	Avg	Vert	32.7	38.6	7.4	0.0	35.6	43.1	54.0	10.9	PASS
802.11g Channel 6 - Flat (X-Axis)											
2437	Peak	Horz	85.4	30.8	4.1	10.0	35.8	94.5			PASS
2437	Avg	Horz	70.1	30.8	4.1	10.0	35.8	79.2			PASS
2437	Peak	Vert	91.0	30.8	4.1	10.0	35.8	100.1			PASS
2437	Avg	Vert	75.7	30.8	4.1	10.0	35.8	84.8			PASS
82.11g Channel 6 - Horizontal (Z-Axis)											
2437	Peak	Horz	91.6	30.8	4.1	10.0	35.8	100.7			PASS
2437	Avg	Horz	75.5	30.8	4.1	10.0	35.8	84.6			PASS
2437	Peak	Vert	97.0	30.8	4.1	10.0	35.8	106.1			PASS
2437	Avg	Vert	80.8	30.8	4.1	10.0	35.8	89.9			PASS
4874	Peak	Horz	42.2	33.5	5.9	0.0	35.2	46.4	74.0	27.6	PASS
4874	Avg	Horz	27.9	33.5	5.9	0.0	35.2	32.1	54.0	21.9	PASS
4874	Peak	Vert	41.8	33.5	5.9	0.0	35.2	46.0	74.0	28.0	PASS
4874	Avg	Vert	27.7	33.5	5.9	0.0	35.2	31.9	54.0	22.1	PASS
7311	Peak	Vert	45.9	38.6	7.4	0.0	35.6	56.3	74.0	17.7	PASS
7311	Avg	Vert	32.4	38.6	7.4	0.0	35.6	42.8	54.0	11.2	PASS
7311	Peak	Horz	45.7	38.6	7.4	0.0	35.6	56.1	74.0	17.9	PASS
7311	Avg	Horz	32.2	38.6	7.4	0.0	35.6	42.6	54.0	11.4	PASS

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Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
802.11g Channel 11 - Flat (X-Axis)											
2462	Peak	Horz	82.7	30.8	4.1	10.0	35.8	91.8			PASS
2462	Avg	Horz	67.7	30.8	4.1	10.0	35.8	76.8			PASS
2462	Peak	Vert	89.7	30.8	4.1	10.0	35.8	98.8			PASS
2462	Avg	Vert	74.4	30.8	4.1	10.0	35.8	83.5			PASS
2483.5	Peak	Horz	44.4	30.8	4.1	10.0	35.8	53.5	74.0	20.5	PASS
2483.5	Avg	Horz	29.7	30.8	4.1	10.0	35.8	38.8	54.0	15.2	PASS
2483.5	Peak	Vert	52.2	30.8	4.1	10.0	35.8	61.3	74.0	12.7	PASS
2483.5	Avg	Vert	31.3	30.8	4.1	10.0	35.8	40.4	54.0	13.6	PASS
802.11g Channel 11 - Horizontal (Z-Axis)											
2462	Peak	Horz	87.1	30.8	4.1	10.0	35.8	96.2			PASS
2462	Avg	Horz	72.0	30.8	4.1	10.0	35.8	81.1			PASS
2462	Peak	Vert	96.5	30.8	4.1	10.0	35.8	105.6			PASS
2462	Avg	Vert	80.1	30.8	4.1	10.0	35.8	89.2			PASS
2483.5	Peak	Horz	50.6	30.8	4.1	10.0	35.8	59.7	74.0	14.3	PASS
2483.5	Avg	Horz	30.7	30.8	4.1	10.0	35.8	39.8	54.0	14.2	PASS
2483.5	Peak	Vert	59.7	30.8	4.1	10.0	35.8	68.8	74.0	5.2	PASS
2483.5	Avg	Vert	35.3	30.8	4.1	10.0	35.8	44.4	54.0	9.6	PASS
4924	Peak	Horz	41.9	33.5	5.9	0.0	35.2	46.1	74.0	27.9	PASS
4924	Avg	Horz	28.2	33.5	5.9	0.0	35.2	32.4	54.0	21.6	PASS
4924	Peak	Vert	42.0	33.5	5.9	0.0	35.2	46.2	74.0	27.8	PASS
4924	Avg	Vert	28.2	33.5	5.9	0.0	35.2	32.4	54.0	21.6	PASS
7386	Peak	Vert	46.8	38.6	7.4	0.0	35.6	57.2	74.0	16.8	PASS
7386	Avg	Vert	32.3	38.6	7.4	0.0	35.6	42.7	54.0	11.3	PASS
7386	Peak	Horz	45.8	38.6	7.4	0.0	35.6	56.2	74.0	17.8	PASS
7386	Avg	Horz	32.3	38.6	7.4	0.0	35.6	42.7	54.0	11.3	PASS

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802.11n – 20 MHz

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
802.11n - 20 MHz, Channel 1 - Flat (X-Axis)											
2412	Peak	Horz	86.8	30.8	4.1	10.0	35.8	95.9			PASS
2412	Avg	Horz	69.9	30.8	4.1	10.0	35.8	79.0			PASS
2412	Peak	Vert	92.2	30.8	4.1	10.0	35.8	101.3			PASS
2412	Avg	Vert	76.3	30.8	4.1	10.0	35.8	85.4			PASS
2390	Peak	Horz	48.2	30.8	4.1	10.0	35.8	57.3	74.0	16.7	PASS
2390	Avg	Horz	31.2	30.8	4.1	10.0	35.8	40.3	54.0	13.7	PASS
2390	Peak	Vert	51.4	30.8	4.1	10.0	35.8	60.5	74.0	13.5	PASS
2390	Avg	Vert	32.4	30.8	4.1	10.0	35.8	41.5	54.0	12.5	PASS
802.11n - 20 MHz, Channel 1 - Horizontal (Z-Axis)											
2412	Peak	Horz	93.6	30.8	4.1	10.0	35.8	102.7			PASS
2412	Avg	Horz	77.1	30.8	4.1	10.0	35.8	86.2			PASS
2412	Peak	Vert	95.5	30.8	4.1	10.0	35.8	104.6			PASS
2412	Avg	Vert	79.2	30.8	4.1	10.0	35.8	88.3			PASS
2390	Peak	Horz	50.4	30.8	4.1	10.0	35.8	59.5	74.0	14.5	PASS
2390	Avg	Horz	32.0	30.8	4.1	10.0	35.8	41.1	54.0	12.9	PASS
2390	Peak	Vert	51.2	30.8	4.1	10.0	35.8	60.3	74.0	13.7	PASS
2390	Avg	Vert	33.0	30.8	4.1	10.0	35.8	42.1	54.0	11.9	PASS
4824	Peak	Horz	42.0	33.5	5.9	0.0	35.2	46.2	74.0	27.8	PASS
4824	Avg	Horz	28.9	33.5	5.9	0.0	35.2	33.1	54.0	20.9	PASS
4824	Peak	Vert	42.6	33.5	5.9	0.0	35.2	46.8	74.0	27.2	PASS
4824	Avg	Vert	29.2	33.5	5.9	0.0	35.2	33.4	54.0	20.6	PASS
7236	Peak	Horz	46.4	38.6	7.4	0.0	35.6	56.8	74.0	17.2	PASS
7236	Avg	Horz	32.7	38.6	7.4	0.0	35.6	43.1	54.0	10.9	PASS
7236	Peak	Vert	46.9	38.6	7.4	0.0	35.6	57.3	74.0	16.7	PASS
7236	Avg	Vert	33.1	38.6	7.4	0.0	35.6	43.5	54.0	10.5	PASS
802.11n - 20 MHz, Channel 6- Flat (X-Axis)											
2437	Peak	Horz	85.4	30.8	4.1	10.0	35.8	94.5			PASS
2437	Avg	Horz	70.2	30.8	4.1	10.0	35.8	79.3			PASS
2437	Peak	Vert	91.6	30.8	4.1	10.0	35.8	100.7			PASS
2437	Avg	Vert	74.9	30.8	4.1	10.0	35.8	84.0			PASS
802.11n - 20 MHz, Channel 6 - Horizontal (Z-Axis)											
2437	Peak	Horz	92.7	30.8	4.1	10.0	35.8	101.8			PASS
2437	Avg	Horz	75.8	30.8	4.1	10.0	35.8	84.9			PASS
2437	Peak	Vert	95.9	30.8	4.1	10.0	35.8	105.0			PASS
2437	Avg	Vert	79.0	30.8	4.1	10.0	35.8	88.1			PASS
4874	Peak	Horz	41.2	33.5	5.9	0.0	35.2	45.4	74.0	28.6	PASS
4874	Avg	Horz	28.7	33.5	5.9	0.0	35.2	32.9	54.0	21.1	PASS
4874	Peak	Vert	42.1	33.5	5.9	0.0	35.2	46.3	74.0	27.7	PASS
4874	Avg	Vert	29.1	33.5	5.9	0.0	35.2	33.3	54.0	20.7	PASS
7311	Peak	Vert	46.4	38.6	7.4	0.0	35.6	56.8	74.0	17.2	PASS
7311	Avg	Vert	32.6	38.6	7.4	0.0	35.6	43.0	54.0	11.0	PASS
7311	Peak	Horz	46.3	38.6	7.4	0.0	35.6	56.7	74.0	17.3	PASS
7311	Avg	Horz	33.2	38.6	7.4	0.0	35.6	43.6	54.0	10.4	PASS

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Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
802.11n - 20 MHz, Channel 11 - Flat (X-Axis)											
2462	Peak	Horz	83.9	30.8	4.1	10.0	35.8	93.0			PASS
2462	Avg	Horz	68.9	30.8	4.1	10.0	35.8	78.0			PASS
2462	Peak	Vert	91.2	30.8	4.1	10.0	35.8	100.3			PASS
2462	Avg	Vert	74.9	30.8	4.1	10.0	35.8	84.0			PASS
2483.5	Peak	Horz	47.4	30.8	4.1	10.0	35.8	56.5	74.0	17.5	PASS
2483.5	Avg	Horz	30.5	30.8	4.1	10.0	35.8	39.6	54.0	14.4	PASS
2483.5	Peak	Vert	53.3	30.8	4.1	10.0	35.8	62.4	74.0	11.6	PASS
2483.5	Avg	Vert	32.0	30.8	4.1	10.0	35.8	41.1	54.0	12.9	PASS
802.11n - 20 MHz, Channel 11 - Horizontal (Z-Axis)											
2462	Peak	Horz	83.8	30.8	4.1	10.0	35.8	92.9			PASS
2462	Avg	Horz	68.8	30.8	4.1	10.0	35.8	77.9			PASS
2462	Peak	Vert	94.1	30.8	4.1	10.0	35.8	103.2			PASS
2462	Avg	Vert	77.6	30.8	4.1	10.0	35.8	86.7			PASS
2483.5	Peak	Horz	49.1	30.8	4.1	10.0	35.8	58.2	74.0	15.8	PASS
2483.5	Avg	Horz	31.5	30.8	4.1	10.0	35.8	40.6	54.0	13.4	PASS
2483.5	Peak	Vert	60.8	30.8	4.1	10.0	35.8	69.9	74.0	4.1	PASS
2483.5	Avg	Vert	36.5	30.8	4.1	10.0	35.8	45.6	54.0	8.4	PASS
4924	Peak	Horz	43.5	33.5	5.9	0.0	35.2	47.7	74.0	26.3	PASS
4924	Avg	Horz	29.8	33.5	5.9	0.0	35.2	34.0	54.0	20.0	PASS
4924	Peak	Vert	41.2	33.5	5.9	0.0	35.2	45.4	74.0	28.6	PASS
4924	Avg	Vert	28.9	33.5	5.9	0.0	35.2	33.1	54.0	20.9	PASS
7386	Peak	Vert	45.9	38.6	7.4	0.0	35.6	56.3	74.0	17.7	PASS
7386	Avg	Vert	32.1	38.6	7.4	0.0	35.6	42.5	54.0	11.5	PASS
7386	Peak	Horz	44.7	38.6	7.4	0.0	35.6	55.1	74.0	18.9	PASS
7386	Avg	Horz	31.7	38.6	7.4	0.0	35.6	42.1	54.0	11.9	PASS

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802.11n – 40 MHz

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
802.11n - 40 MHz, Channel 3 - Flat (X-Axis)											
2422	Peak	Horz	82.2	30.8	4.1	10.0	35.8	91.3			PASS
2422	Avg	Horz	63.9	30.8	4.1	10.0	35.8	73.0			PASS
2422	Peak	Vert	85.8	30.8	4.1	10.0	35.8	94.9			PASS
2422	Avg	Vert	66.9	30.8	4.1	10.0	35.8	76.0			PASS
2390	Peak	Horz	52.0	30.8	4.1	10.0	35.8	61.1	74.0	12.9	PASS
2390	Avg	Horz	31.0	30.8	4.1	10.0	35.8	40.1	54.0	13.9	PASS
2390	Peak	Vert	55.4	30.8	4.1	10.0	35.8	64.5	74.0	9.5	PASS
2390	Avg	Vert	32.2	30.8	4.1	10.0	35.8	41.3	54.0	12.7	PASS
802.11n - 40 MHz, Channel 3 - Horizontal (Z-Axis)											
2422	Peak	Horz	89.3	30.8	4.1	10.0	35.8	98.4			PASS
2422	Avg	Horz	69.7	30.8	4.1	10.0	35.8	78.8			PASS
2422	Peak	Vert	91.7	30.8	4.1	10.0	35.8	100.8			PASS
2422	Avg	Vert	71.0	30.8	4.1	10.0	35.8	80.1			PASS
2390	Peak	Horz	59.2	30.8	4.1	10.0	35.8	68.3	74.0	5.7	PASS
2390	Avg	Horz	34.0	30.8	4.1	10.0	35.8	43.1	54.0	10.9	PASS
2390	Peak	Vert	57.2	30.8	4.1	10.0	35.8	66.3	74.0	7.7	PASS
2390	Avg	Vert	33.0	30.8	4.1	10.0	35.8	42.1	54.0	11.9	PASS
4844	Peak	Horz	43.2	33.5	5.9	0.0	35.2	47.4	74.0	26.6	PASS
4844	Avg	Horz	30.2	33.5	5.9	0.0	35.2	34.4	54.0	19.6	PASS
4844	Peak	Vert	42.2	33.5	5.9	0.0	35.2	46.4	74.0	27.6	PASS
4844	Avg	Vert	28.6	33.5	5.9	0.0	35.2	32.8	54.0	21.2	PASS
7266	Peak	Horz	46.3	38.6	7.4	0.0	35.6	56.7	74.0	17.3	PASS
7266	Avg	Horz	32.5	38.6	7.4	0.0	35.6	42.9	54.0	11.1	PASS
7266	Peak	Vert	45.9	38.6	7.4	0.0	35.6	56.3	74.0	17.7	PASS
7266	Avg	Vert	32.4	38.6	7.4	0.0	35.6	42.8	54.0	11.2	PASS
802.11n - 40 MHz, Channel 6 - Flat (X-Axis)											
2437	Peak	Horz	82.2	30.8	4.1	10.0	35.8	91.3			PASS
2437	Avg	Horz	62.7	30.8	4.1	10.0	35.8	71.8			PASS
2437	Peak	Vert	84.9	30.8	4.1	10.0	35.8	94.0			PASS
2437	Avg	Vert	65.8	30.8	4.1	10.0	35.8	74.9			PASS
802.11n - 40 MHz, Channel 6 - Horizontal (Z-Axis)											
2437	Peak	Horz	87.7	30.8	4.1	10.0	35.8	96.8			PASS
2437	Avg	Horz	68.2	30.8	4.1	10.0	35.8	77.3			PASS
2437	Peak	Vert	92.8	30.8	4.1	10.0	35.8	101.9			PASS
2437	Avg	Vert	72.6	30.8	4.1	10.0	35.8	81.7			PASS
4874	Peak	Horz	43.4	33.5	5.9	0.0	35.2	47.6	74.0	26.4	PASS
4874	Avg	Horz	30.4	33.5	5.9	0.0	35.2	34.6	54.0	19.4	PASS
4874	Peak	Vert	42.5	33.5	5.9	0.0	35.2	46.7	74.0	27.3	PASS
4874	Avg	Vert	29.6	33.5	5.9	0.0	35.2	33.8	54.0	20.2	PASS
7311	Peak	Vert	46.1	38.6	7.4	0.0	35.6	56.5	74.0	17.5	PASS
7311	Avg	Vert	32.1	38.6	7.4	0.0	35.6	42.5	54.0	11.5	PASS
7311	Peak	Horz	45.7	38.6	7.4	0.0	35.6	56.1	74.0	17.9	PASS
7311	Avg	Horz	31.9	38.6	7.4	0.0	35.6	42.3	54.0	11.7	PASS

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Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselecor	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
802.11n - 40 MHz, Channel 9 - Flat (X-Axis)											
2452	Peak	Horz	76.7	30.8	4.1	10.0	35.8	85.8			PASS
2452	Avg	Horz	58.8	30.8	4.1	10.0	35.8	67.9			PASS
2452	Peak	Vert	84.2	30.8	4.1	10.0	35.8	93.3			PASS
2452	Avg	Vert	64.3	30.8	4.1	10.0	35.8	73.4			PASS
2483.5	Peak	Horz	41.9	30.8	4.1	10.0	35.8	51.0	74.0	23.0	PASS
2483.5	Avg	Horz	29.7	30.8	4.1	10.0	35.8	38.8	54.0	15.2	PASS
2483.5	Peak	Vert	51.5	30.8	4.1	10.0	35.8	60.6	74.0	13.4	PASS
2483.5	Avg	Vert	30.8	30.8	4.1	10.0	35.8	39.9	54.0	14.1	PASS
802.11n - 40 MHz, Channel 9 - Horizontal (Z-Axis)											
2452	Peak	Horz	81.8	30.8	4.1	10.0	35.8	90.9			PASS
2452	Avg	Horz	63.9	30.8	4.1	10.0	35.8	73.0			PASS
2452	Peak	Vert	90.8	30.8	4.1	10.0	35.8	99.9			PASS
2452	Avg	Vert	71.0	30.8	4.1	10.0	35.8	80.1			PASS
2483.5	Peak	Horz	48.7	30.8	4.1	10.0	35.8	57.8	74.0	16.2	PASS
2483.5	Avg	Horz	30.1	30.8	4.1	10.0	35.8	39.2	54.0	14.8	PASS
2483.5	Peak	Vert	63.0	30.8	4.1	10.0	35.8	72.1	74.0	1.9	PASS
2483.5	Avg	Vert	36.5	30.8	4.1	10.0	35.8	45.6	54.0	8.4	PASS
4904	Peak	Horz	42.7	33.5	5.9	0.0	35.2	46.9	74.0	27.1	PASS
4904	Avg	Horz	30.1	33.5	5.9	0.0	35.2	34.3	54.0	19.7	PASS
4904	Peak	Vert	41.9	33.5	5.9	0.0	35.2	46.1	74.0	27.9	PASS
4904	Avg	Vert	30.1	33.5	5.9	0.0	35.2	34.3	54.0	19.7	PASS
7356	Peak	Vert	45.9	38.6	7.4	0.0	35.6	56.3	74.0	17.7	PASS
7356	Avg	Vert	32.8	38.6	7.4	0.0	35.6	43.2	54.0	10.8	PASS
7356	Peak	Horz	46.1	38.6	7.4	0.0	35.6	56.5	74.0	17.5	PASS
7356	Avg	Horz	31.7	38.6	7.4	0.0	35.6	42.1	54.0	11.9	PASS

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Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Oct 2, 2013	Oct 2, 2015	GEMC 190
Quasi Peak Adapter	85650A	HP	Oct 1, 2013	Oct 1, 2015	GEMC 191
Loop Antenna	EM 6871	Electro-Metrics	Feb 5, 2013	Feb 5, 2015	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 5, 2013	Feb 5, 2015	GEMC 71
BiLog Antenna	3142-C	ETS	Feb 4, 2013	Feb 4, 2015	GEMC 137
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC 133
4GHZ-12GHz High Pass filter	11SH10-4000/T12000-0/0	K & L Microwave	NCR	NCR	GEMC 119
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	Sept 9, 2014	Sept 9, 2016	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	Sept 10, 2014	Sept 10, 2016	GEMC 6365
Horn Antenna 18 GHz - 26.5 GHz	SAS-572	A.H. Systems	Sept 9, 2014	Sept 9, 2016	GEMC 6371
18.0-26.5 GHz Harmonic Mixer	11970K	HP	Jan 28, 2014	Jan 28, 2016	GEMC 158
1-26G pre-amp	HP 8449B	HP	Sept 9, 2014	Sept 9, 2016	GEMC 6351
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev1.doc"

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Power Spectral Density – 15.247 DM

Purpose

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

Limits and Methods

The limits are defined in 15.247(e).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

The method is given in Section 10.2 of FCC KDB 558074: June 9, 2014.

Results

The EUT passed. The peak power spectral density of the EUT was measured with the EUT set to transmit at maximum power. The PKPSD was conducted for Bluetooth Low Energy, 802.11 G, and N-Mode with 20 MHz and 40 MHz bandwidth are provided in the following table: The PKPSD was measured with a 3 kHz resolution bandwidth.

Table 3: Peak power spectral density

Mode	Channel	Frequency (MHz)	PKPSD (dBm/3 kHz)	PSD Limit (dBm)	Results
BLE	0	2402	-6.33	8	Pass
BLE	19	2440	-6.29	8	Pass
BLE	39	2480	-6.08	8	Pass
802.11g	1	2412	-21.03	8	Pass
802.11g	6	2437	-20.51	8	Pass
802.11g	11	2462	-20.56	8	Pass
802.11n 20 MHz	1	2412	-20.36	8	Pass
802.11n 20 MHz	6	2437	-20.57	8	Pass
802.11n 20 MHz	11	2462	-11.49	8	Pass
802.11n 40 MHz	3	2422	-25.02	8	Pass

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802.11n 40 MHz	6	2437	-24.82	8	Pass
802.11n 40 MHz	9	2452	-26.83	8	Pass

Graph(s)

The graphs shown below show the power spectral density of the device during the conducted measurement operation of the EUT. Low, middle, and high channel was investigated in each mode, with the worst case being presented.

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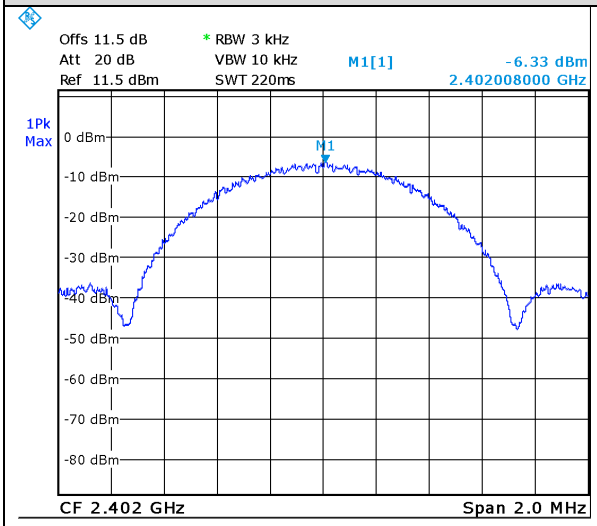
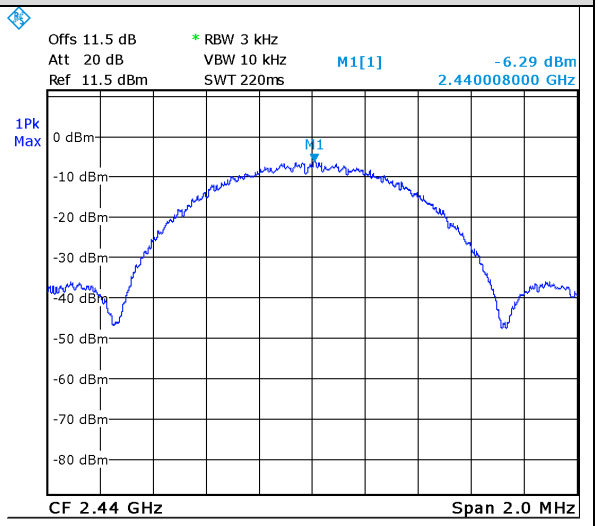
BLE

Channel 0



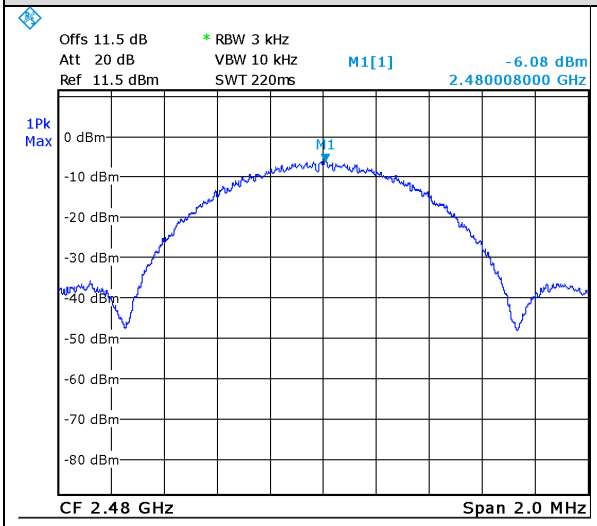
Date: 12.NOV.2014 18:10:08

Channel 19



Date: 12.NOV.2014 18:02:07

Channel 39



Date: 12.NOV.2014 17:58:59

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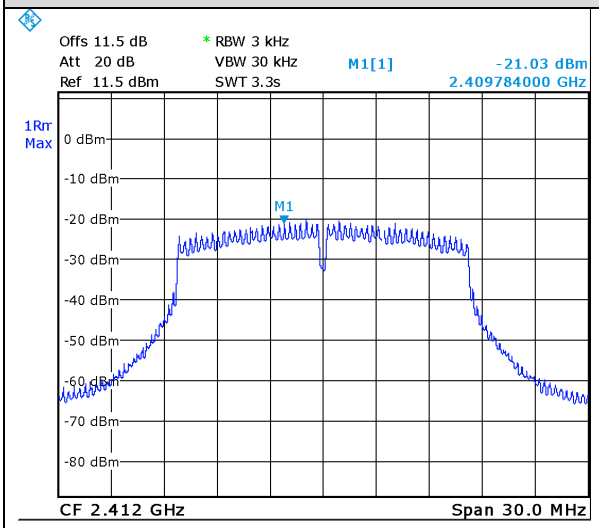
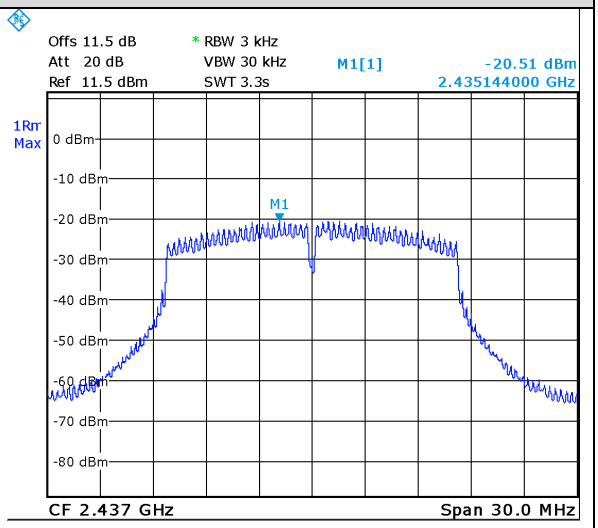
802.11g

Channel 1



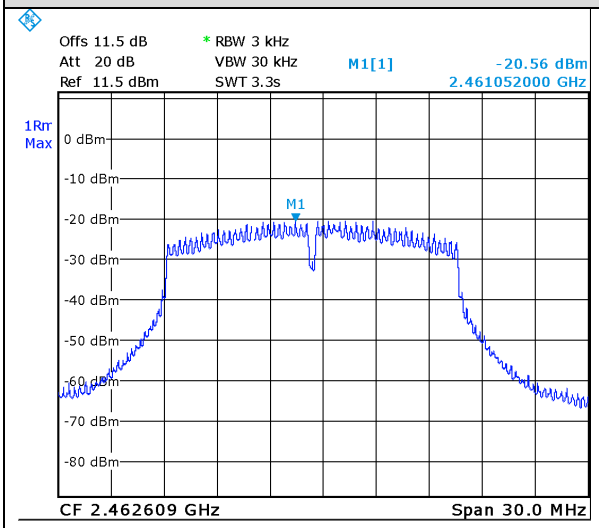
Date: 10.NOV.2014 17:58:44

Channel 6



Date: 10.NOV.2014 18:00:55

Channel 11



Date: 10.NOV.2014 18:16:25

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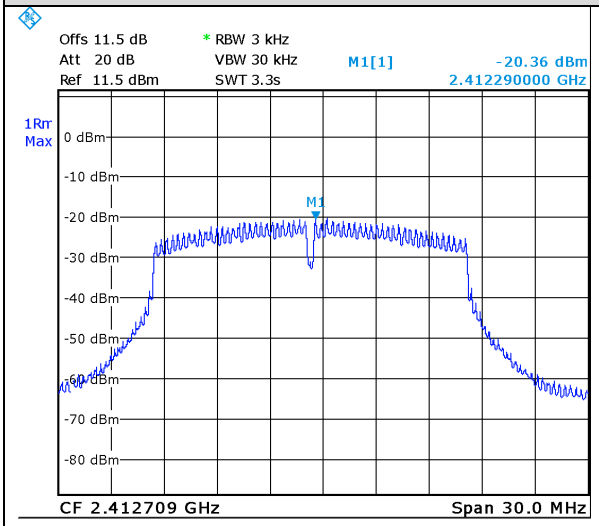
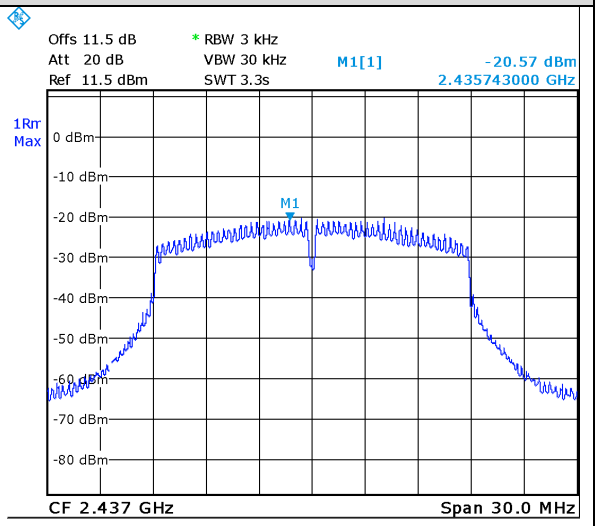
802.11n – 20 MHz

Channel 1



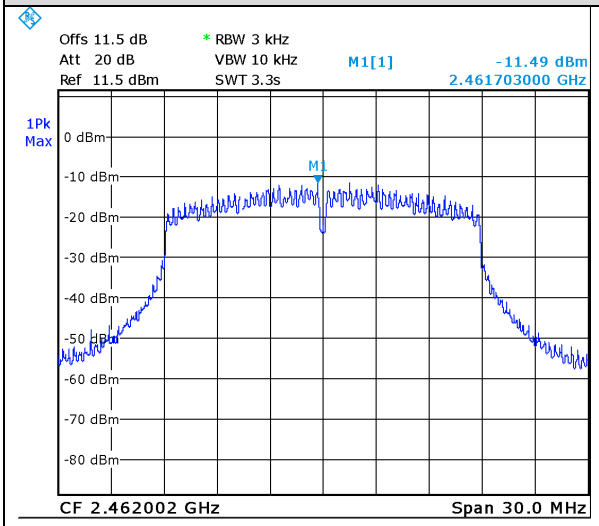
Date: 10.NOV.2014 18:37:54

Channel 6



Date: 10.NOV.2014 18:40:01

Channel 11



Date: 10.NOV.2014 19:00:45

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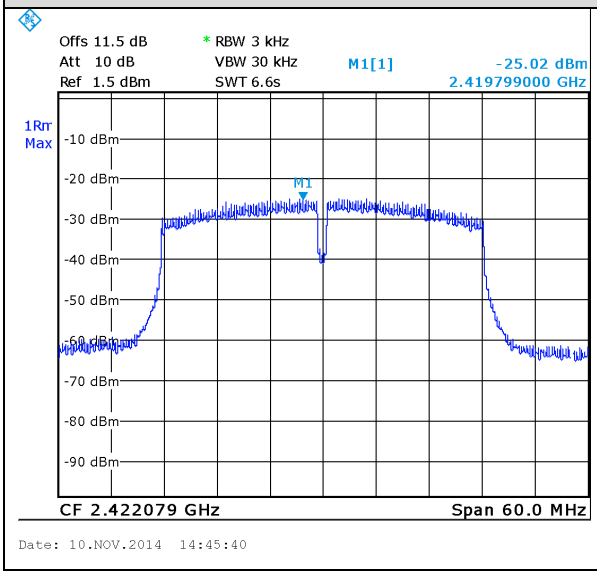
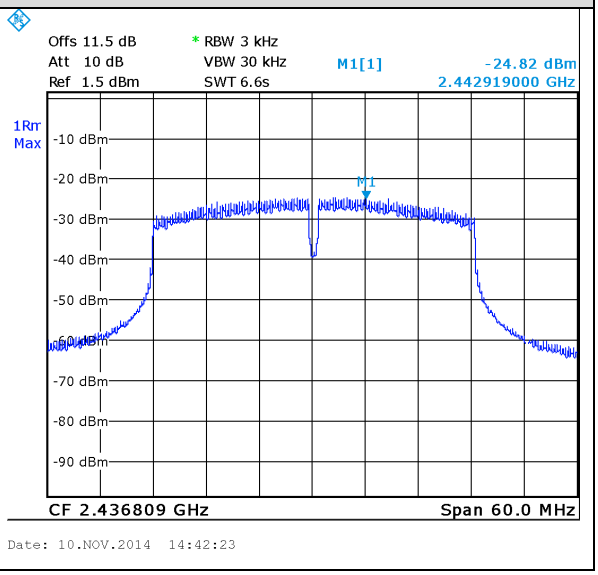
802.11n – 40 MHz	
Channel 3	Channel 6
	

Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	ESL6	Rohde & Schwarz	Nov 15, 2013	Nov 15,2015	GEMC 160
Attenuator 10 dB	8493B	Agilent	NCR	NCR	GEMC133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

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Maximum Permissible Exposure – 15.247

Purpose

The purpose of this test is to ensure that the RF energy intentionally transmitted, in terms of power density emitted from the EUT at a stated operating distance does not exceed the limits listed below as defined in the applicable test standard, as calculated based upon readings obtained during testing. This helps protect human exposure to excessive RF fields.

Limit(s) and Method

The limits, as defined in FCC 15.247(i) and FCC 1.1310 Table 1 (B) limits for general public exposure was applied. The limit for the frequency range of 1.5 GHz to 100 GHz was applied to the 15.247 device. This is a limit of 1.0 mW/cm^2. The distance used for calculations was 20 cm, as this is the minimum distance an operator will be from the EUT during normal operation, as stated by the manufacturer.

Results

The EUT passed the requirements. The worst case calculated power density was 0.0152 mW/cm^2, this is significantly under the 1.0 mW/cm^2 requirement.

Calculations

Method 1 (conducted power)

$P_d = (P_t*G) / (4*pi*R^2)$
Where Pt = Peak power conducted output
Where G = 2 dBi, or numerically 1.58
Where R = 20 cm

Mode	Channel	Frequency (MHz)	Peak Conducted Power (dBm)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Results
BLE	0	2402	10.06	20	0.0032	1.0	Pass
802.11g	11	2462	16.42	20	0.0138	1.0	Pass
802.11n 20MHz	11	2462	16.66	20	0.0146	1.0	Pass
802.11n 40MHz	6	2437	16.83	20	0.0152	1.0	Pass

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Power Line Conducted Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard, as measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio operators, maritime radio, CB radio, and so on, from unwanted interference.

Limits & Method

The limits are as defined in 47 CFR FCC Part 15 Section 15.207
Method is as defined in ANSI C64.10:2009

Average Limits		QuasiPeak Limits	
150 kHz – 500 kHz	56 to 46 dBuV	150 kHz – 500 kHz	66 to 56 dBuV
500 kHz – 5 MHz	46 dBuV	500 kHz – 5 MHz	56 dBuV
5 MHz – 30 MHz	50 dBuV	500 kHz – 30 MHz	60 dBuV

The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Both limits are applicable, and each is specified as being measured with a 9 kHz measurement bandwidth.

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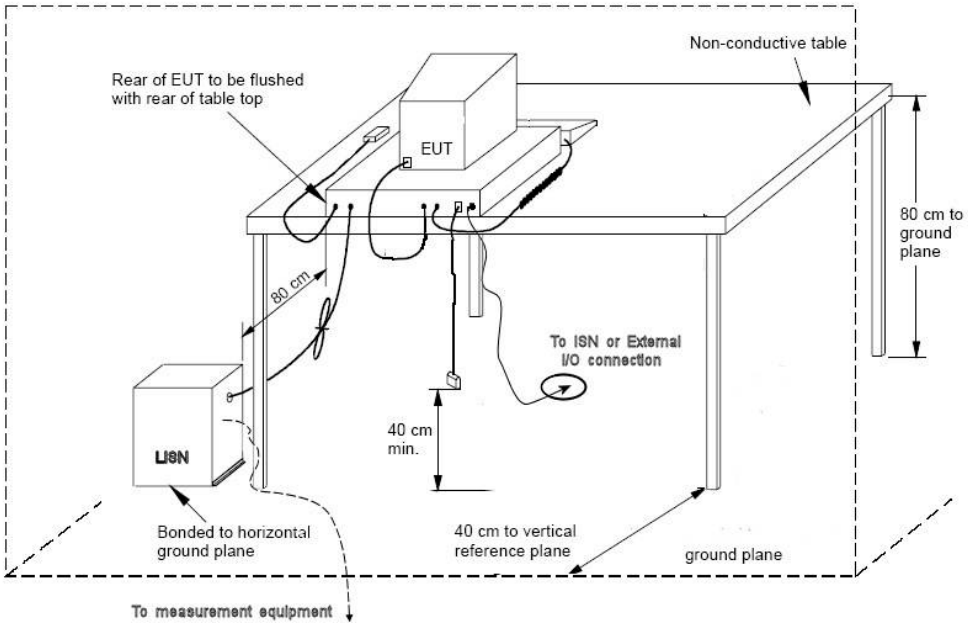
Typical Setup Diagram



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-3.6 dB with a 'k=2' coverage factor and a 95% confidence level.

Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector where applicable, please refer to the table. The graph shown below is a peak measurement graph, measured with a resolution bandwidth greater then or equal to the final required detector. These graphs are performed as a worst case measurement to enable the detection of frequencies of concern and for considerable time savings.

The EUT was a Power Over Ethernet equipment. It does not directly plug into the public low voltage mains supply. Power line conducted emission was performed on the AC/DC power supply of a PoE injector.

Power line conducted emissions were performed with the transmitter transmitting at 100% duty cycle.

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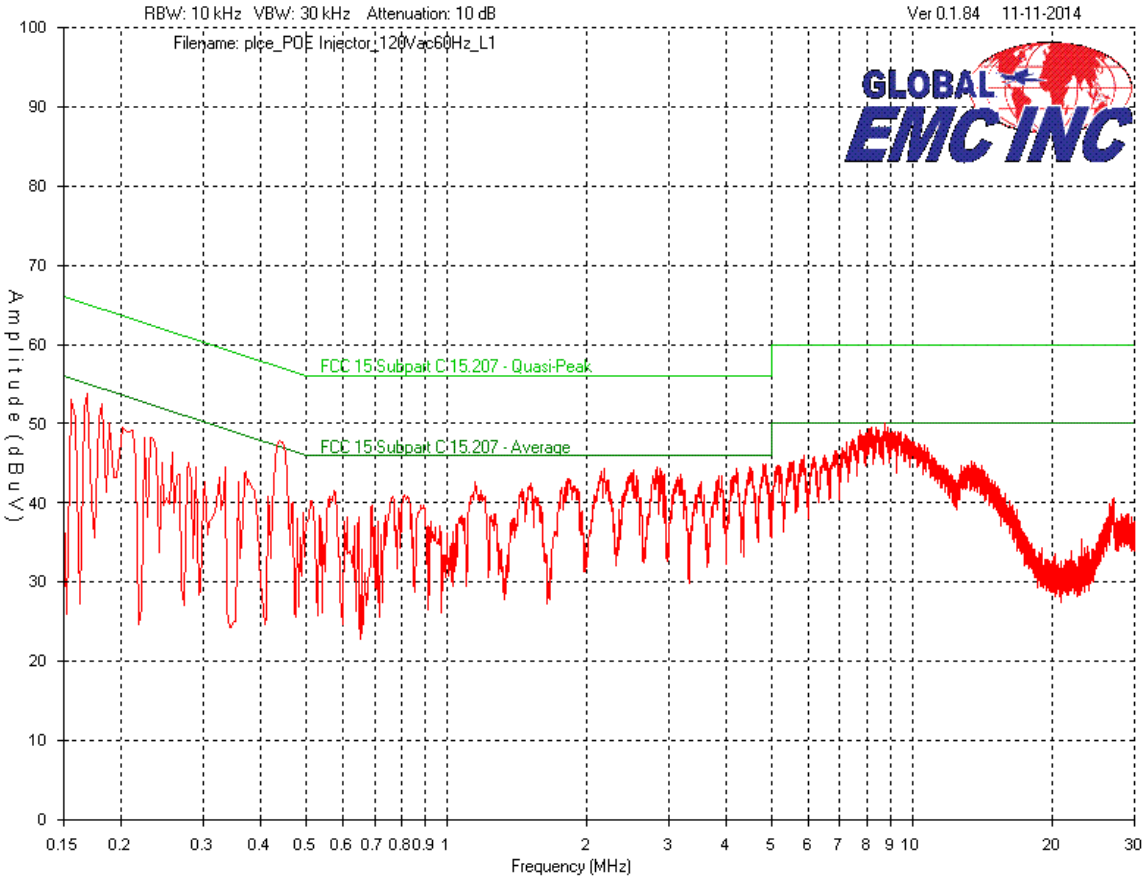
L1(Line) – 120Vac 60Hz



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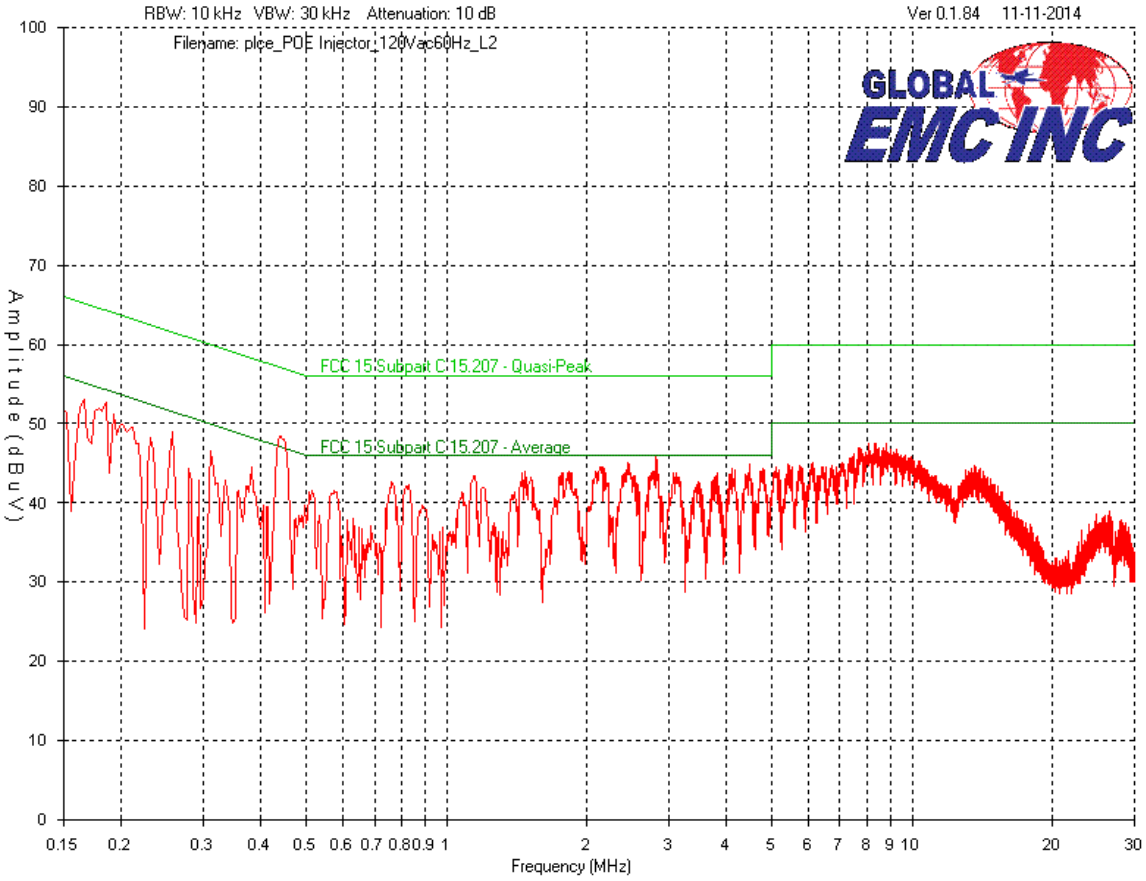
L2 (Neutral) – 120Vac 60Hz



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Final Measurements

Supply	120 Vac 60 Hz						
Line Emission Table							
Frequency (MHz)	Detector	Raw (dBuV)	Factors	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
0.4388	AVG	31.8	10.2	42	47.1	5.1	Pass
8.7611	AVG	23.7	10.3	34	50	16	Pass
4.8352	AVG	17.2	10.2	27.4	46	18.6	Pass
0.1695	AVG	24.7	10.2	34.9	55	20.1	Pass
4.4815	AVG	16.8	10.2	27	46	19	Pass
2.8333	AVG	15.2	10.2	25.4	46	20.6	Pass
2.1811	AVG	18.1	10.2	28.3	46	17.7	Pass
Emission Table							
0.442	AVG	32.7	10.2	42.9	47	4.1	Pass
2.8235	AVG	17.9	10.2	28.1	46	17.9	Pass
2.4472	AVG	19.6	10.2	29.8	46	16.2	Pass
4.488	AVG	15.3	10.2	25.5	46	20.5	Pass
2.1551	AVG	18.2	10.2	28.4	46	17.6	Pass
4.7995	AVG	16.4	10.2	26.6	46	19.4	Pass
4.1116	AVG	15.8	10.2	26	46	20	Pass

Notes:

1. See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up for the highest line conducted emission

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Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Nov 15, 2013	Nov 15, 2015	GEMC 160
LISN	FCC-LISN-50/250-16-2-01	FCC	Feb 06, 2013	Feb 06, 2015	GEMC 65
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

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Appendix A – EUT Summary

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For further details for filing purposes, refer to filing package.

General EUT Description

Client	
Organization	Brickstream Corp 2 Sun Court NW, Suite 400 Norcross, GA 30092
Contact	Ralph Crabtree
EUT Details	
EUT Name (for report title)	3D+
FCC ID	2ADER-3210
Industry Canada #	12439A-3210
Equipment category	Comercial
EUT is powered using	PoE
Input voltage range(s) (V)	44 – 57 VDC
Frequency range(s) (Hz)	DC
Transmits RF energy? (describe)	Yes
Basic EUT functionality description	2-Lens Smart Camera (called Brickstream 3D+) that provides the capability to track people within the view of the camera and then perform track analytics: counting, queue length, time in area.

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT & Test Setup Photographs'.

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EUT Configuration

Please see Appendix B for a picture of the unit running in normal conditions.

- Wireless were configured to transmit at continuously at 100% duty cycle

Operational Setup

These devices are required to be attached to the EUT for its normal operation.

- A PoE injector is connected to the EUT to provide power and Ethernet communication.
- A Wi-Fi network switch and a computer is connected to the PoE injector to control the EUT.

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Appendix B – EUT and Test Setup Photographs

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Figure 5: Radiated emission setup – photo 1

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Figure 6: Radiated emission setup – photo 2

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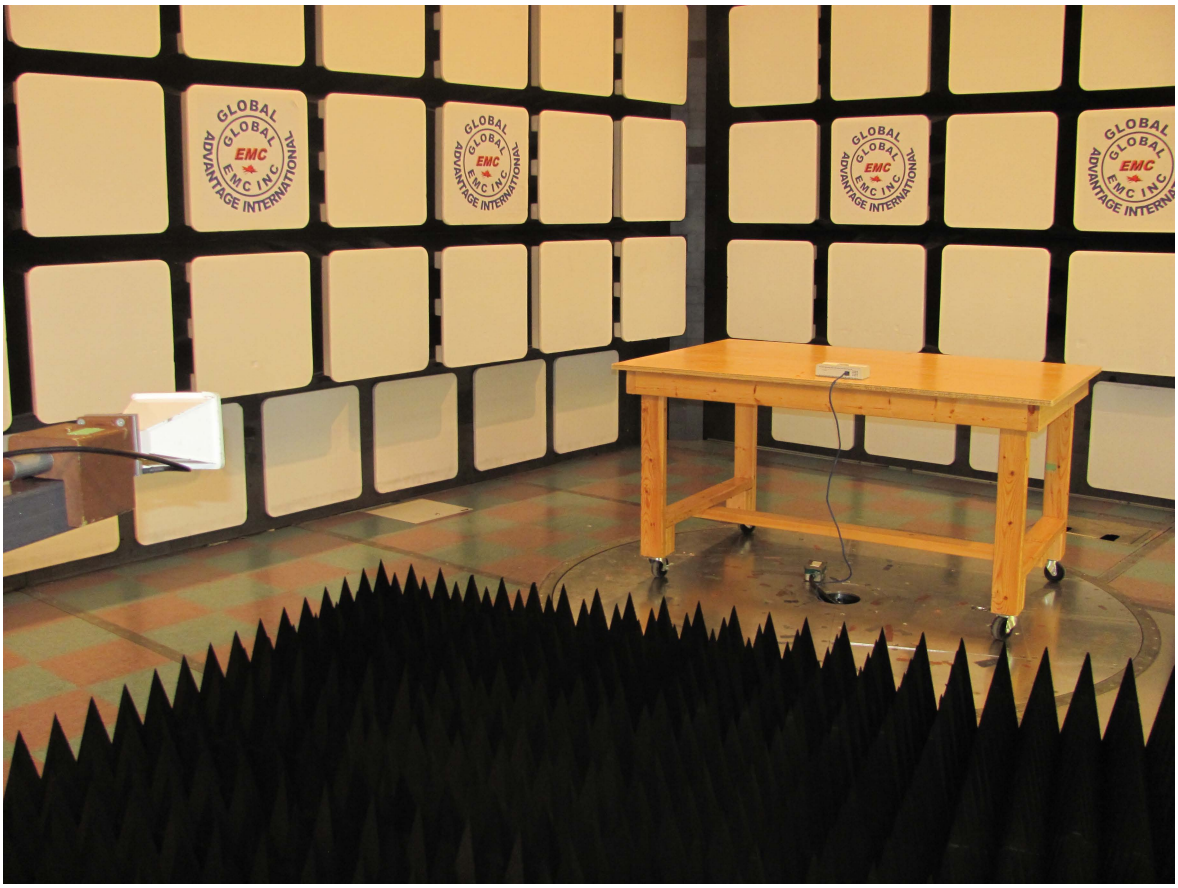

Figure 7: Radiated emission setup – photo 3

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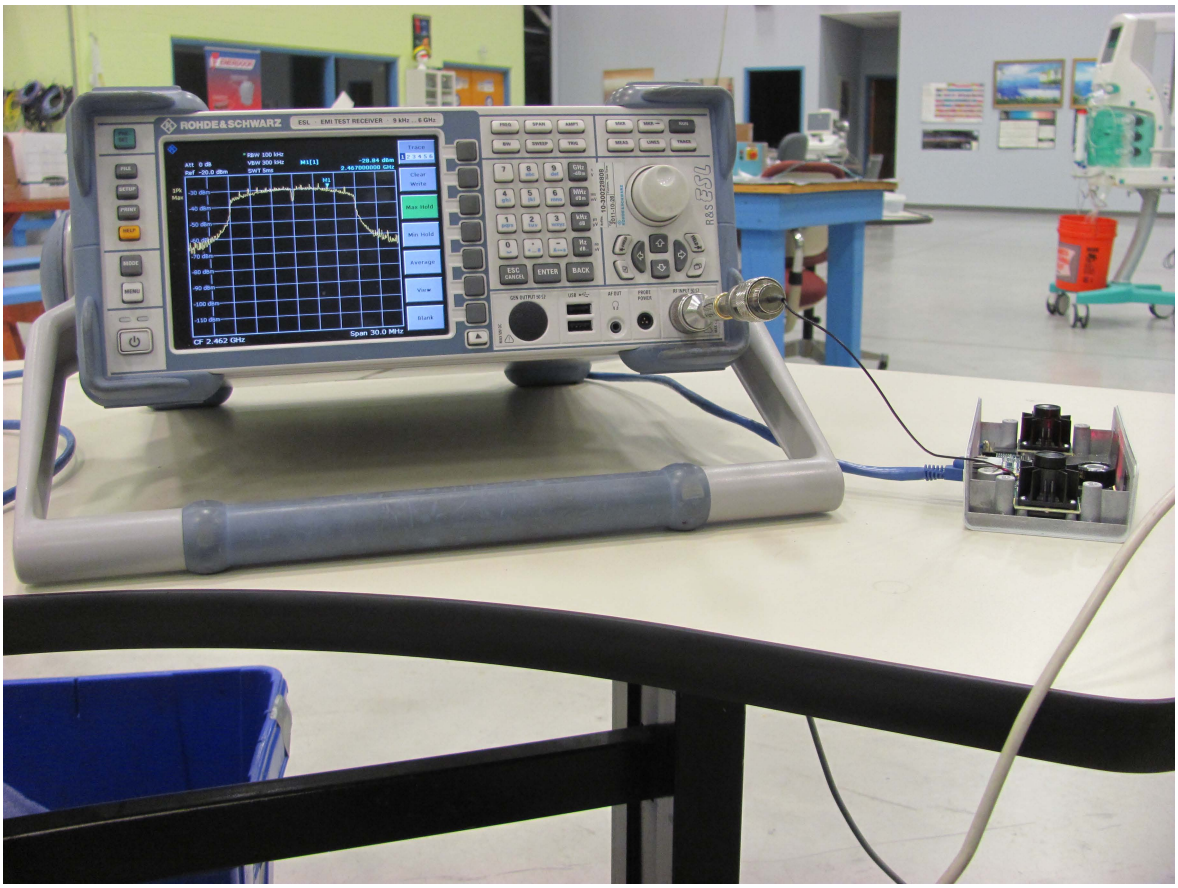

Figure 8: Antenna port conducted emission setup – photo

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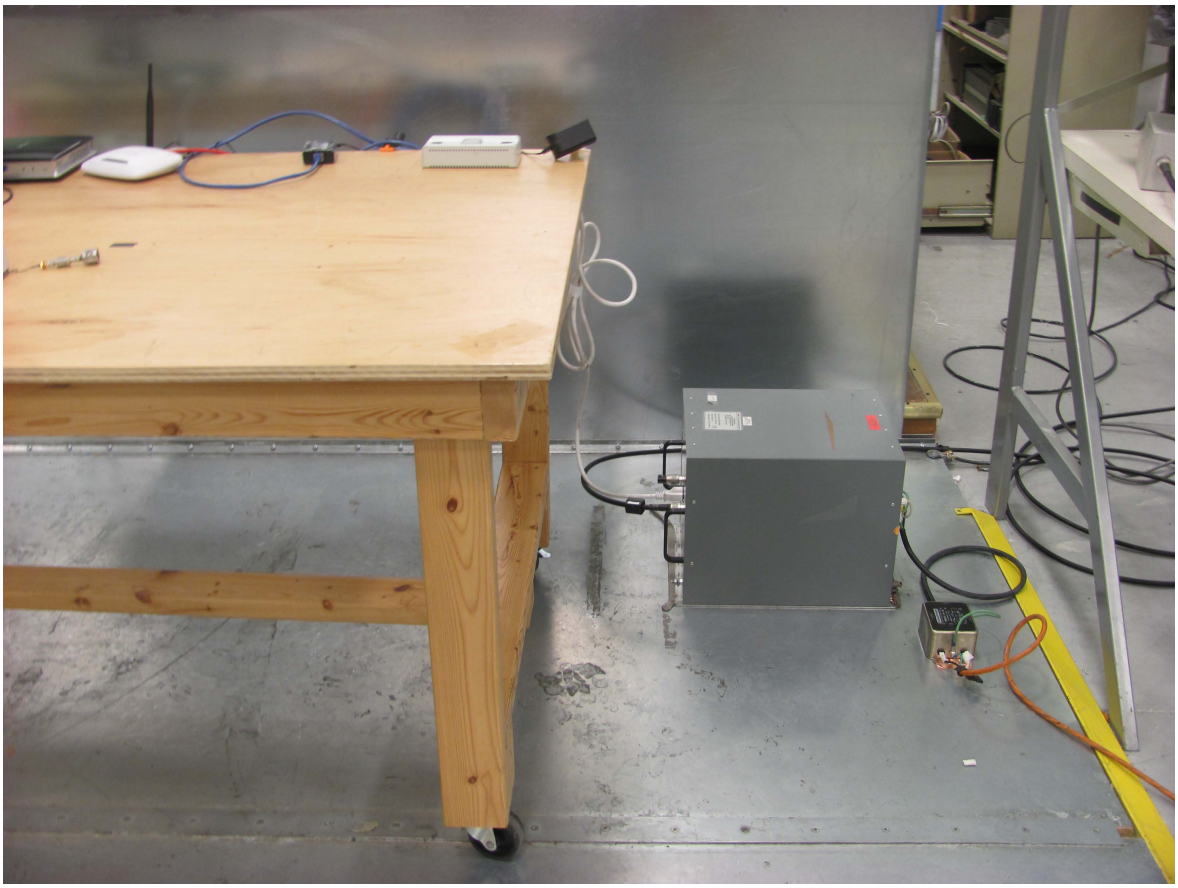

Figure 9: Power line conducted emission setup – photo 1

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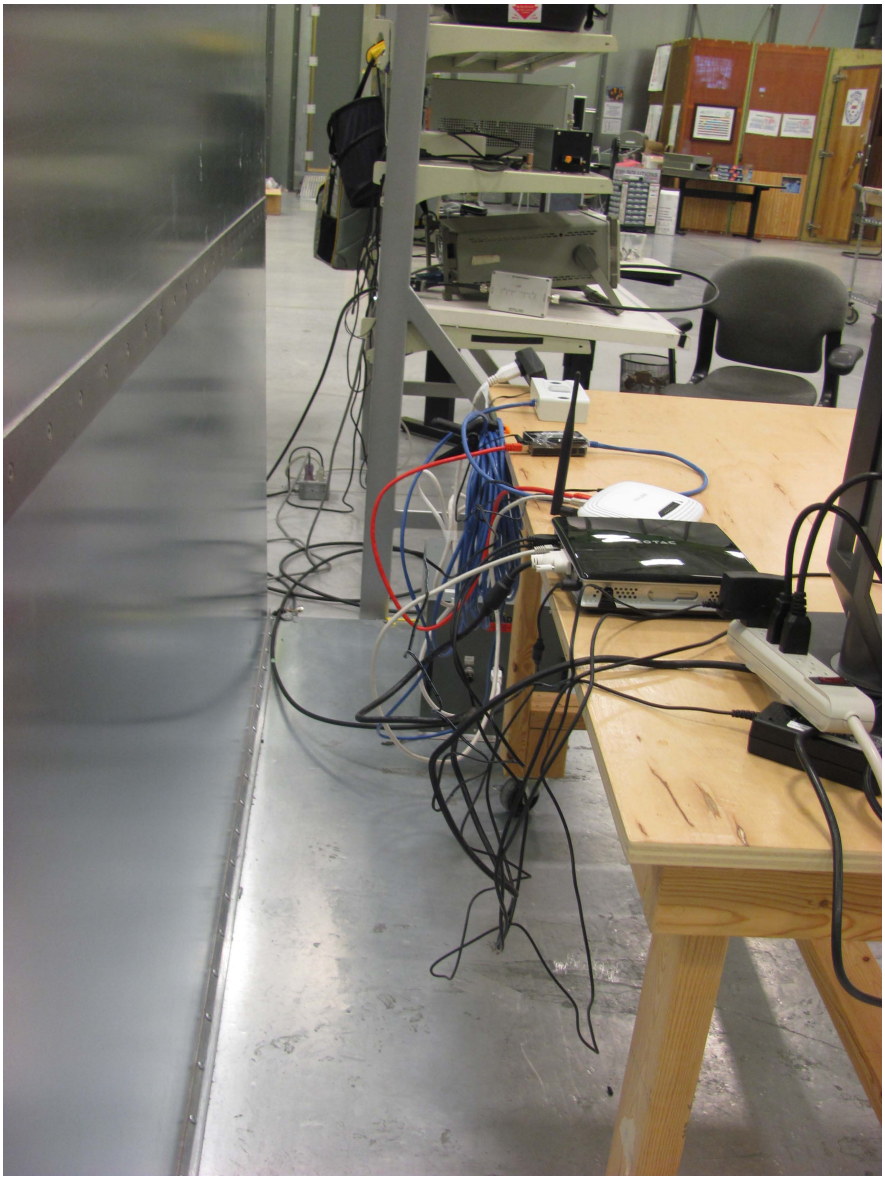

Figure 10: Power line conducted emission setup – photo 2

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