

# TUV SUD Canada/Global EMC Inc.

## EMC & RF Test Report

As per

**RSS 247: 2015**

**&**

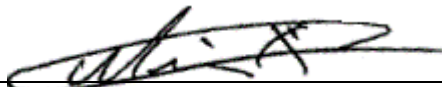
**FCC Part 15 Subpart C: 2015**

**Unlicensed Intentional Radiators**

Canada

on the

**GWY10**



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Project Engineer  
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Testing produced for




See Appendix A for full customer & EUT details.



Testing Laboratory  
Certificate  
#2955.02




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

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

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Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Report Scope

This report addresses the EMC verification testing and test results of MMB Research's **Communication Gateway, Model: GWY10**, herein referred to as EUT (Equipment Under Test) performed at TUV SUD Canada/Global EMC Labs.

The EUT was tested for compliance against the following standards:


RSS 247:2015  
FCC Part 15 Subpart C 15.247:2015

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 TUV SUD Canada/Global EMC Inc.


Opinions/interpretations expressed in this report, if any, are outside the scope of TUV SUD Canada/Global EMC Inc. accreditation. Any opinions expressed do not necessarily reflect the opinions of TUV SUD Canada/Global EMC Inc., unless otherwise stated.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Summary

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

EUT FCC Certification #, FCC ID:	XFF-GWY10
EUT Industry Canada Certification #, IC:	8365A-GWY10
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Min Xie


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS-GEN (Table 6)	Restricted Bands for intentional operation	QuasiPeak Average	Pass
FCC 15.207 RSS-GEN (Table 3)	Power line conducted emissions	QuasiPeak Average	Pass
FCC 15.209 RSS-GEN (Table 4)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)2 RSS-247 5.2 (1)	6 dB Bandwidth	> 500 kHz	Pass
FCC 15.247(b)2 RSS-247 5.4 (4)	Max output power	< 1 Watt	Pass
FCC 15.247(b)4 RSS-247 5.4 (4)	Antenna Gain	< 6 dBi	Pass See Justifications
FCC 15.247(d) RSS-247 5.5	Antenna conducted spurious	< 20 dBc	Pass
FCC 15.247(e) RSS-247 5.2 (2)	Spectral Density	< 8 dBm (3 kHz BW)	Pass
FCC 15.247(i) RSS-102	Maximum Permissible Exposure	> 20 cm separation.	Pass See justification and calculations
<b>Overall Result</b>			<b>PASS</b>

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. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '\*'.

Client	<b>MMB Research Inc</b>	
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Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

### ***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, the Zigbee uses a permanently connected monopole antenna (5 dBi peak gain) and the WIFI uses a PCB antenna (2.8 dBi Airgain N2420) 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.


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.

For the scope of this test report the EUT was mounted in two orthogonal axes to maximize emissions. Worst case results are presented.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## ***Applicable Standards, Specifications and Methods***

ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American national standard for testing unlicensed wireless devices
CFR 47 FCC: 2015	Code of Federal Regulations – Radio Frequency Devices
CISPR 22:2008	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
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
ISO 17025:2005	General Requirements for the competence of testing and calibration laboratories
RSS-GEN Issue 4	General Requirements and Information for the Certification of Radio Apparatus
RSS-247 Issue 1	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS 102 Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

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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 0 - May 19, 2016  
Initial release

Revision 1 June 4, 2016  
Appendix B was removed from report to reduce file size. Information contained in Appendix B is also in External Photo and Test Support exhibits.  
The revision replaces Revision 0 in its entirety.



Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Definitions and Acronyms

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

**AE** – Auxillary 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


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Testing Facility

Testing for EMC on the EUT was carried out at TUV SUD Canada/Global EMC Inc. near 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, CA6844), 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 TUV SUD Canada/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 TUV SUD Canada/Global EMC. TUV SUD Canada/Global EMC Inc is accredited to ISO 17025 by A2LA with Testing Certificate #2955.01. 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 –

<b>Date</b>	<b>Test</b>	<b>Init.</b>	<b>Temperature (°C)</b>	<b>Humidity (%)</b>	<b>Pressure (kPa)</b>
2016/2/17 - 22	Radiated emission	MX	20-24°C	39 - 50%	96 -102kPa
2016/2/23 - 24	Antenna conducted	MX	20-24°C	39 - 50%	96 -102kPa
2016/5/17	N-Mode Radiated emission	MX	20-24°C	39 - 50%	96 -102kPa
2016/5/18	N-Mode Antenna Conducted Emission	MX	20-24°C	39 - 50%	96 -102kPa

Client	<b>MMB Research Inc</b>	 Canada
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Detailed Test Results Section

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## 6dB Bandwidth of Digitally Modulated Systems

### 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 247.

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 and ANSI C63.10.

### Results

The EUT passed. The measured 6 dB BW and the minimum 99% BW are shown in tables below:

Bandwidth: Zigbee			
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Lo Channel (0xB)	2405	1618	2452
Mid Channel (0x13)	2445	1618	2436
Hi Channel (0x19)	2475	1602	2452
Hi Channel (0x1A)	2480	1618	2480

Bandwidth: WIFI B-Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Lo Channel	2412	10128	13365
Mid Channel	2437	10064	13400
Hi Channel	2462	10134	13422


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

Bandwidth: WIFI G-Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Lo Channel	2412	16634	16634
Mid Channel	2437	16682	16683
Hi Channel	2462	16586	16634

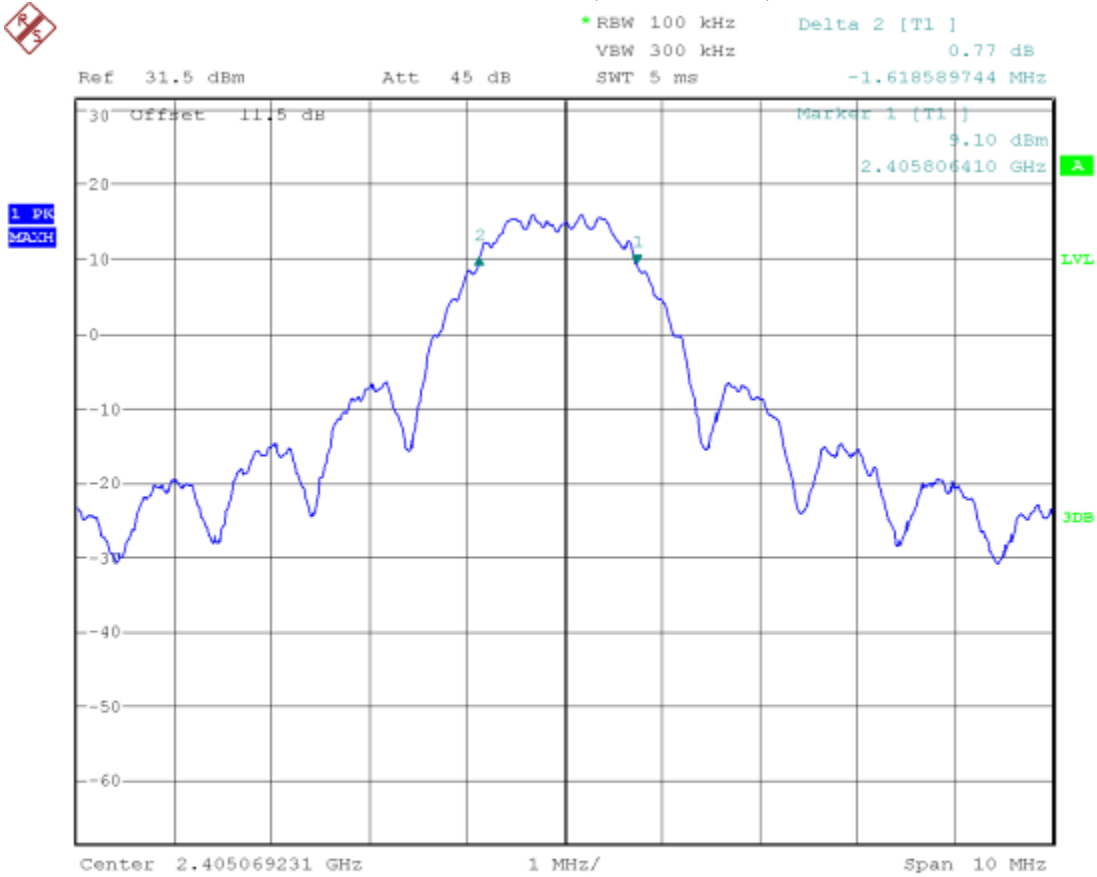
Bandwidth: WIFI N-Mode			
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Lo Channel	2412	17688	17725
Mid Channel	2437	17779	17850
Hi Channel	2462	17811	17840

### Graph(s)


The graphs showed below shows the OBW 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.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

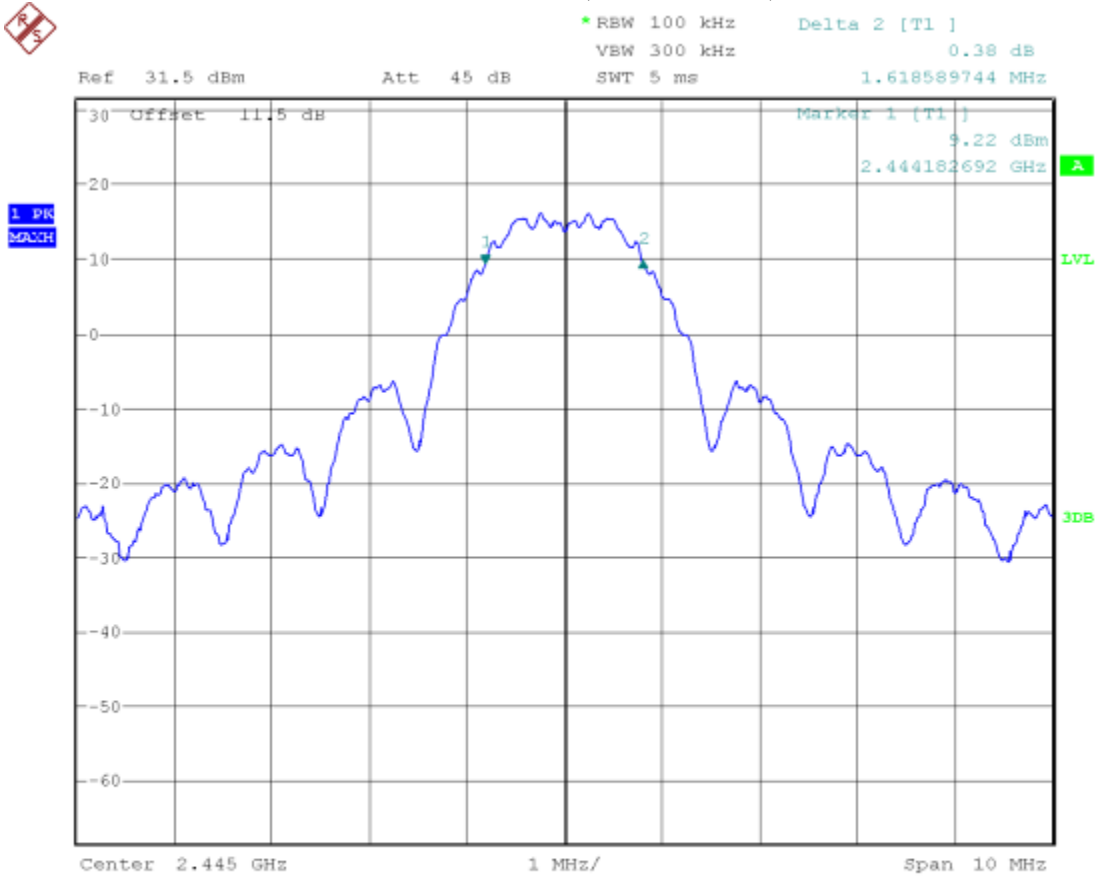
6 dB Bandwidth: **Zigbee**  
Low Channel (Channel 0xB)



Date: 24.FEB.2016 13:20:37


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: **Zigbee**  
Mid Channel (Channel 0x13)

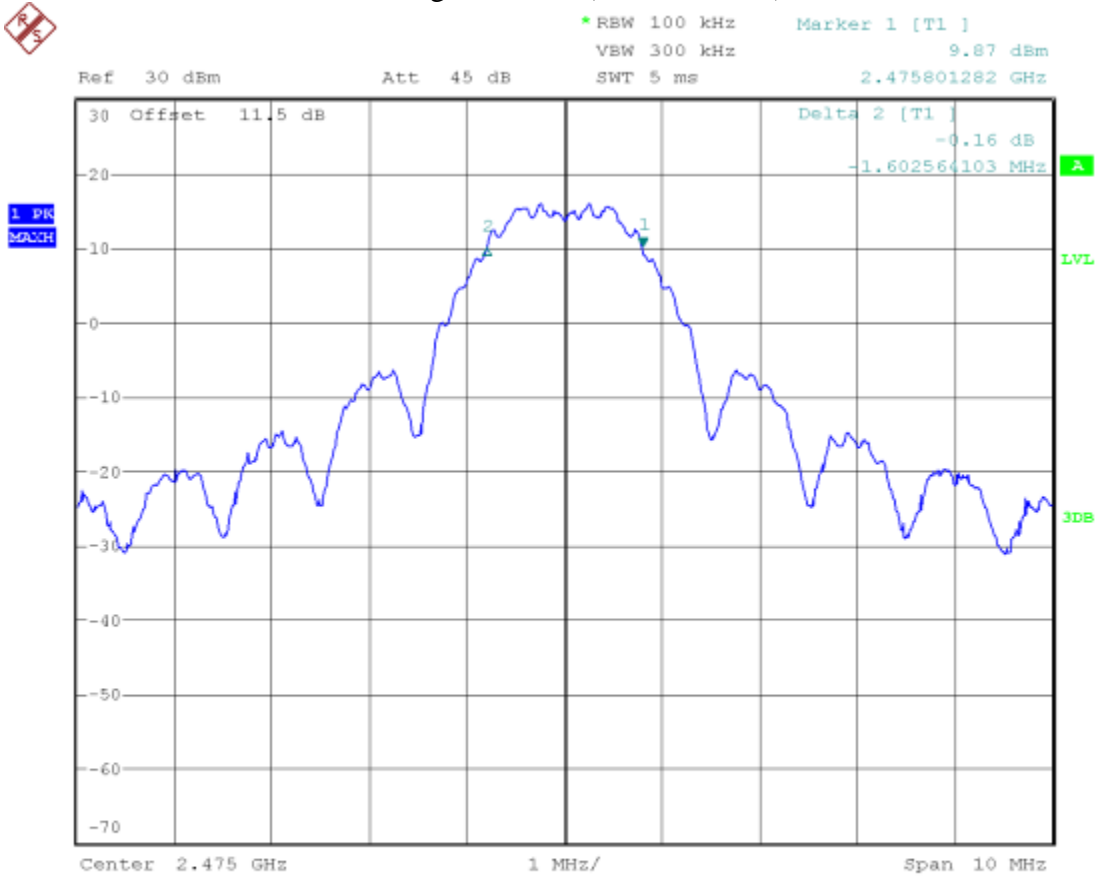


Date: 24.FEB.2016 13:32:08




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: **Zigbee**  
High Channel (Channel 0x19)

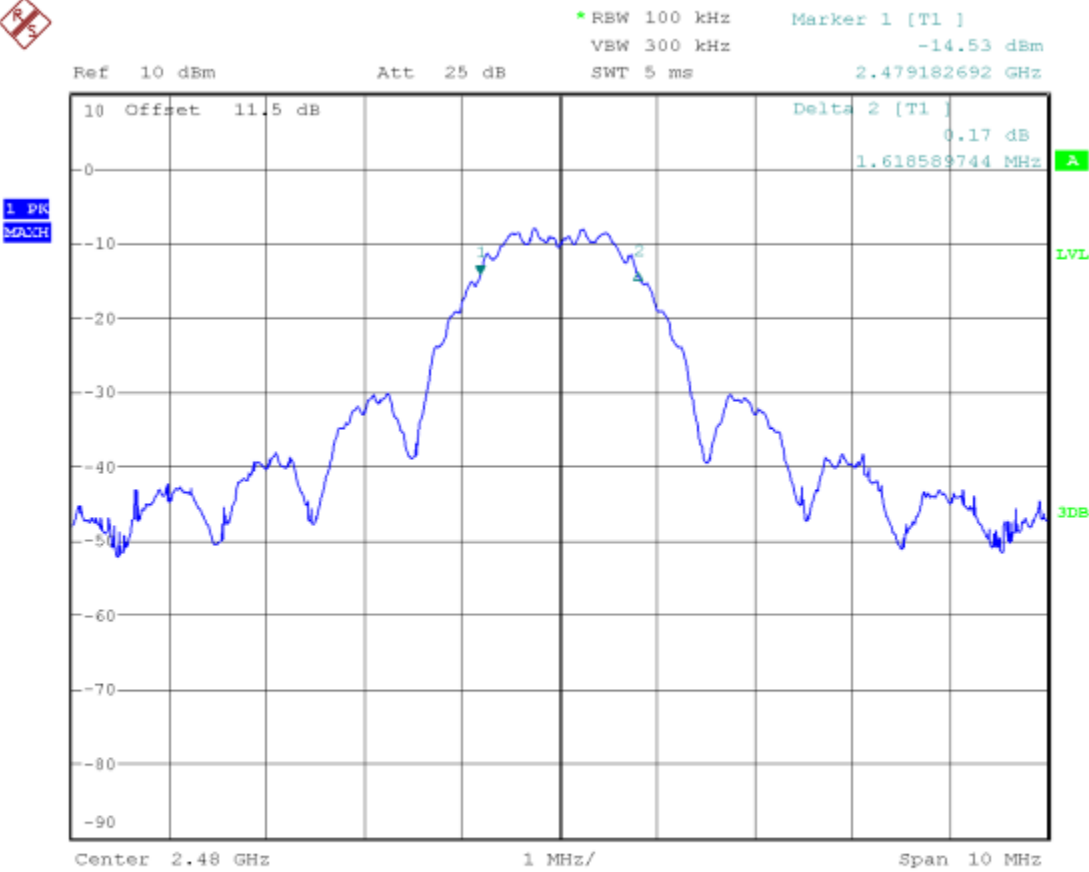


Date: 24.FEB.2016 13:54:14


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: **Zigbee**

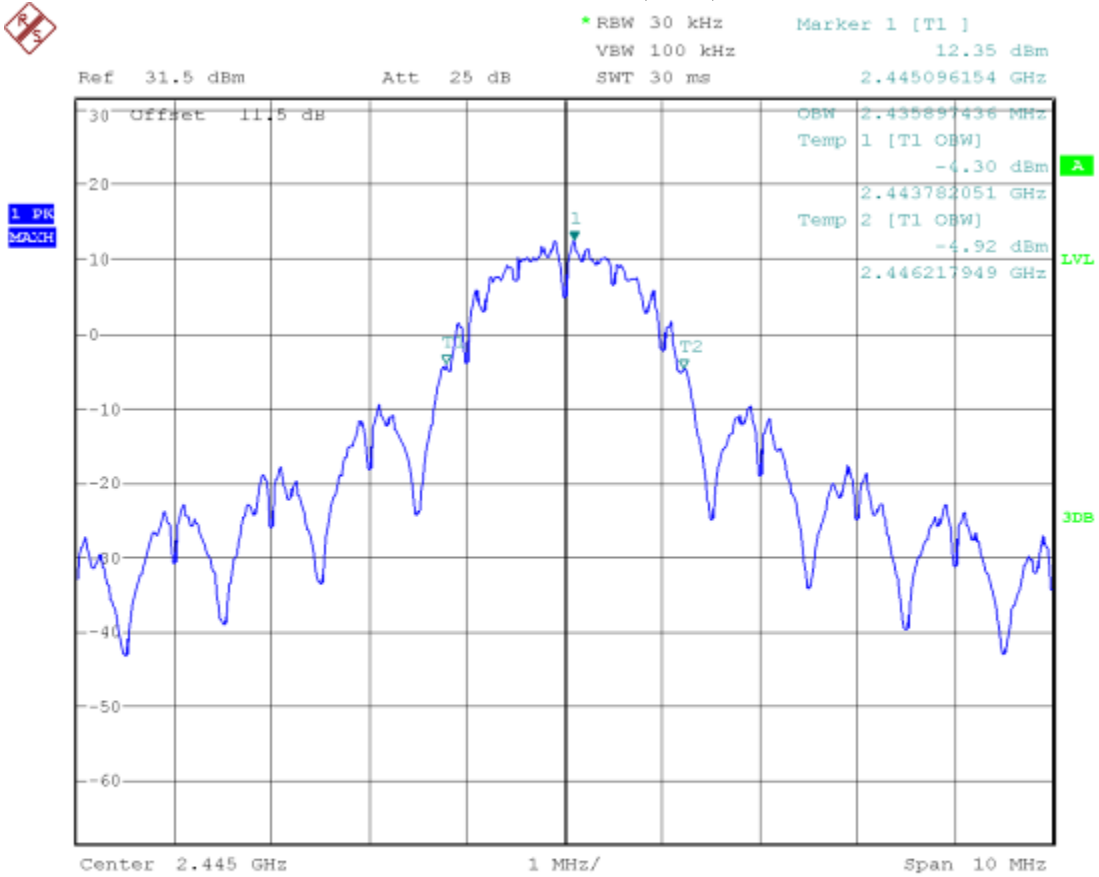
High Channel (Channel 0x1A)




Date: 24.FEB.2016 13:47:41

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

99% Bandwidth: **Zigbee**  
Mid Channel (0x13)

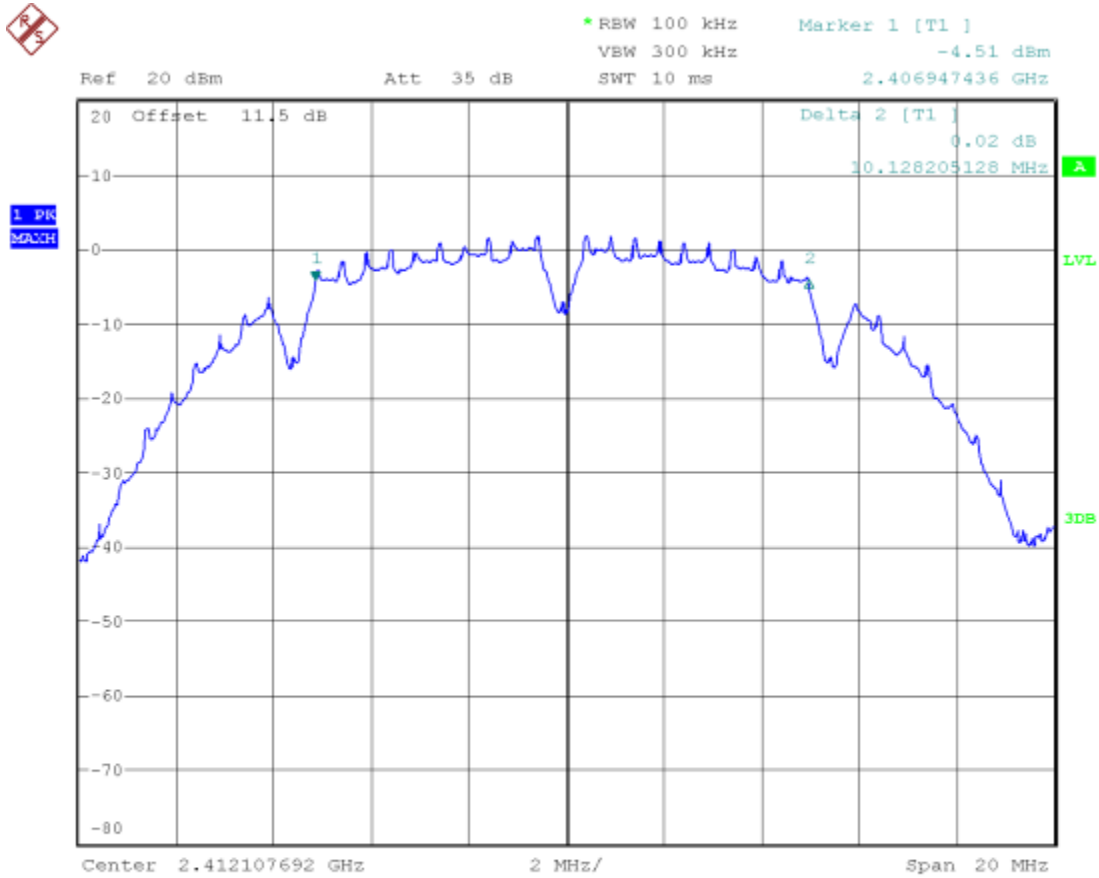


Date: 24.FEB.2016 13:36:02


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: WIFI B-Mode

Low Channel

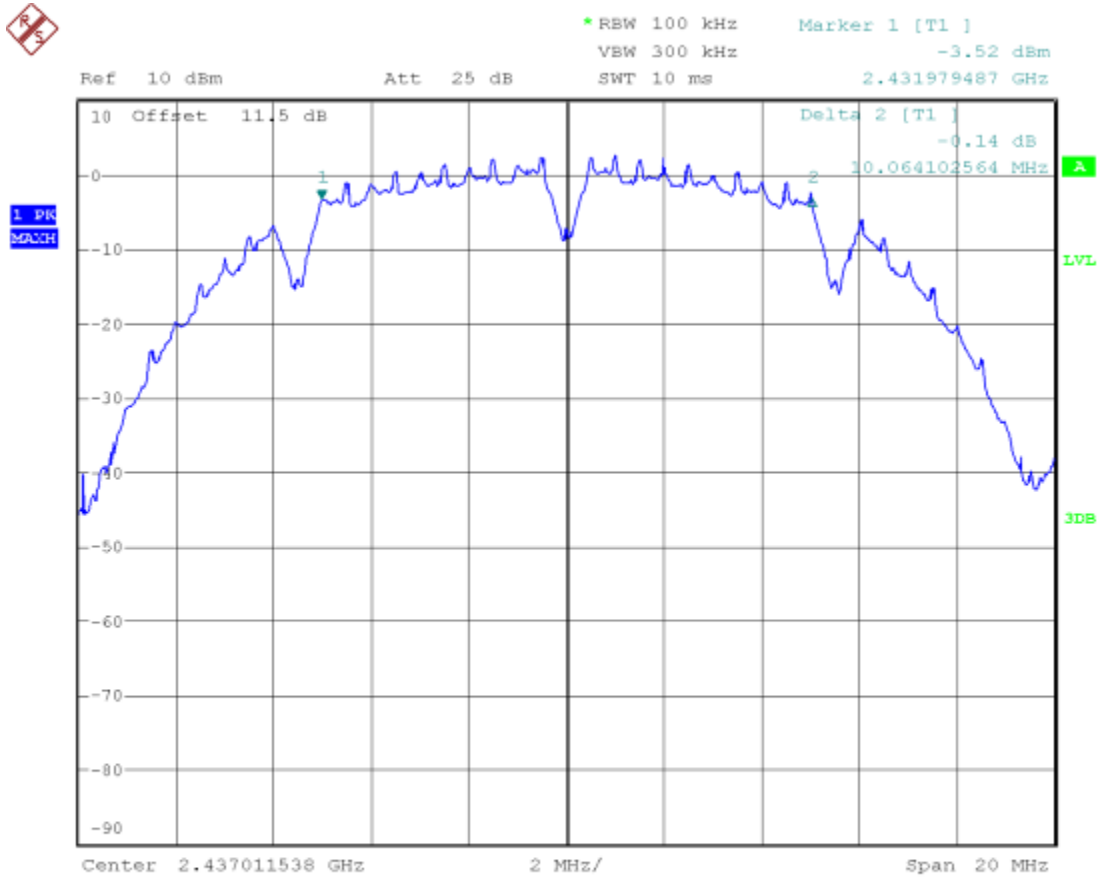


Date: 23.FEB.2016 10:50:27


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: WIFI B-Mode

Mid Channel

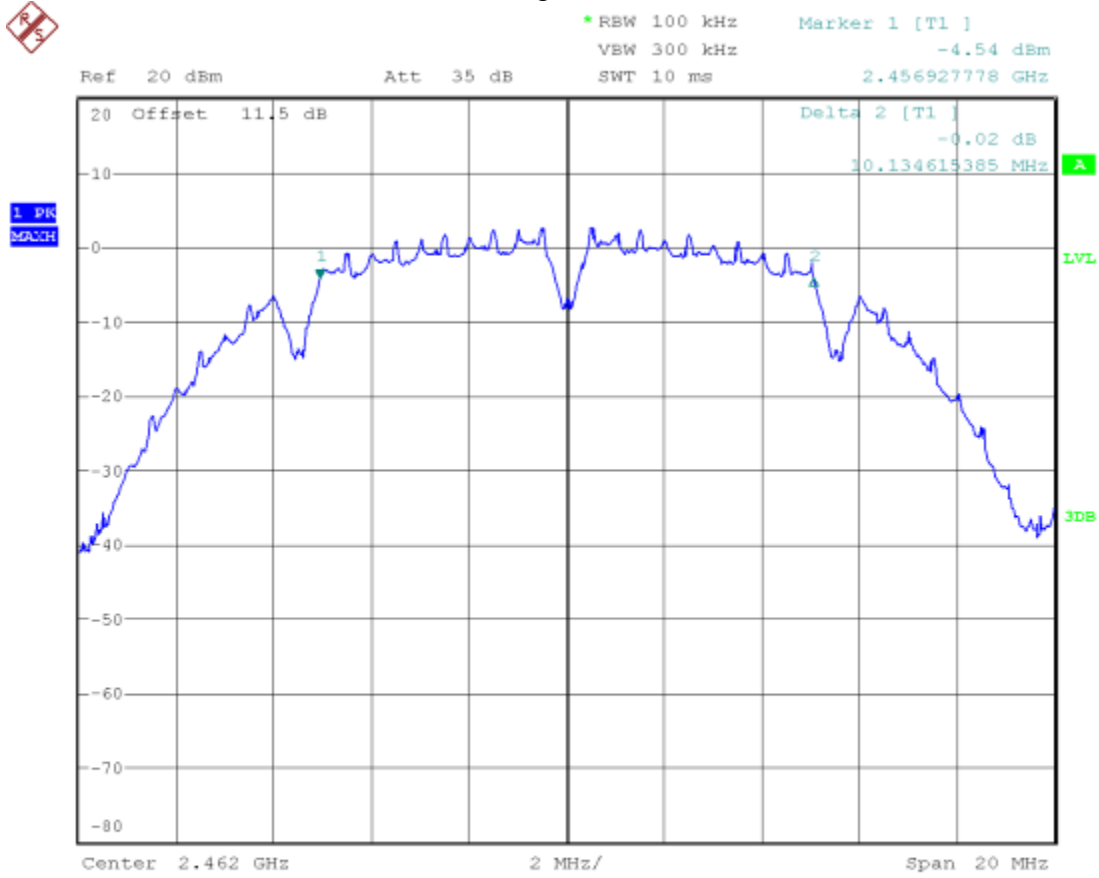


Date: 23.FEB.2016 19:08:34


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: WIFI B-Mode

High Channel

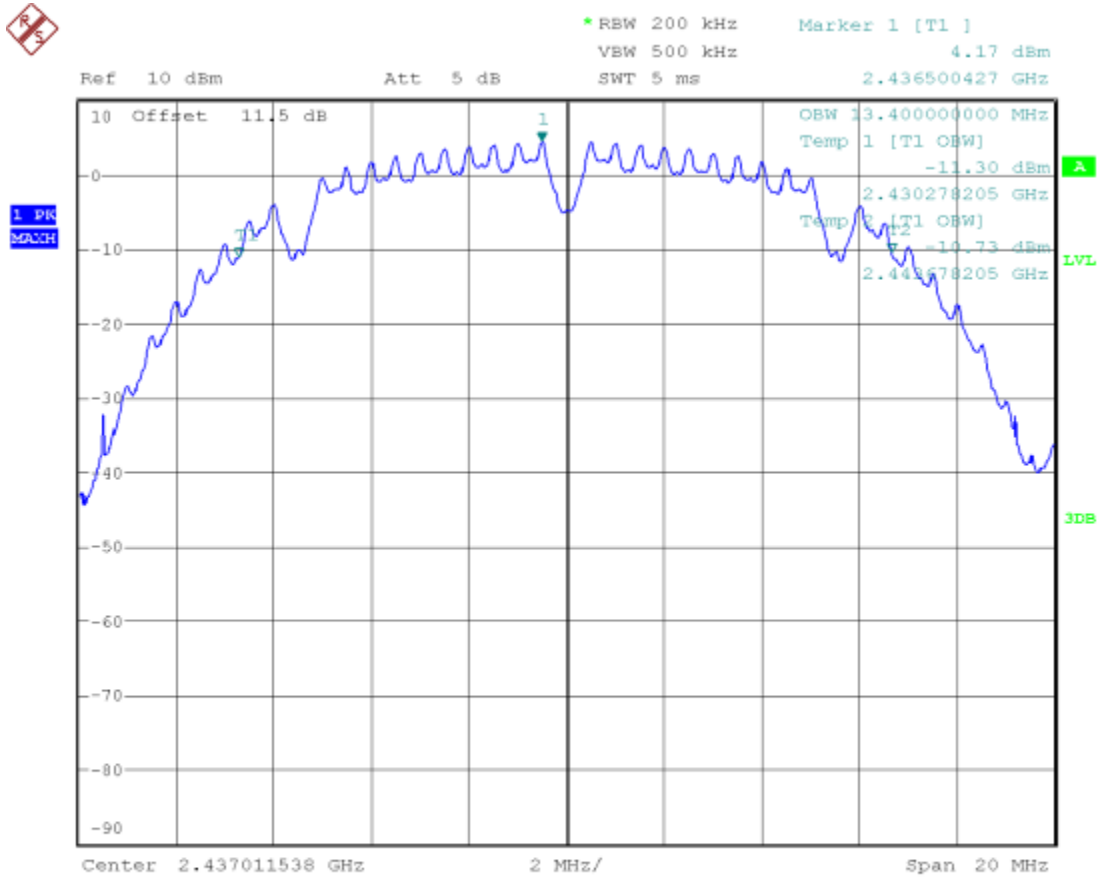


Date: 23.FEB.2016 19:18:42


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

99% Bandwidth: WIFI B-Mode

Mid Channel

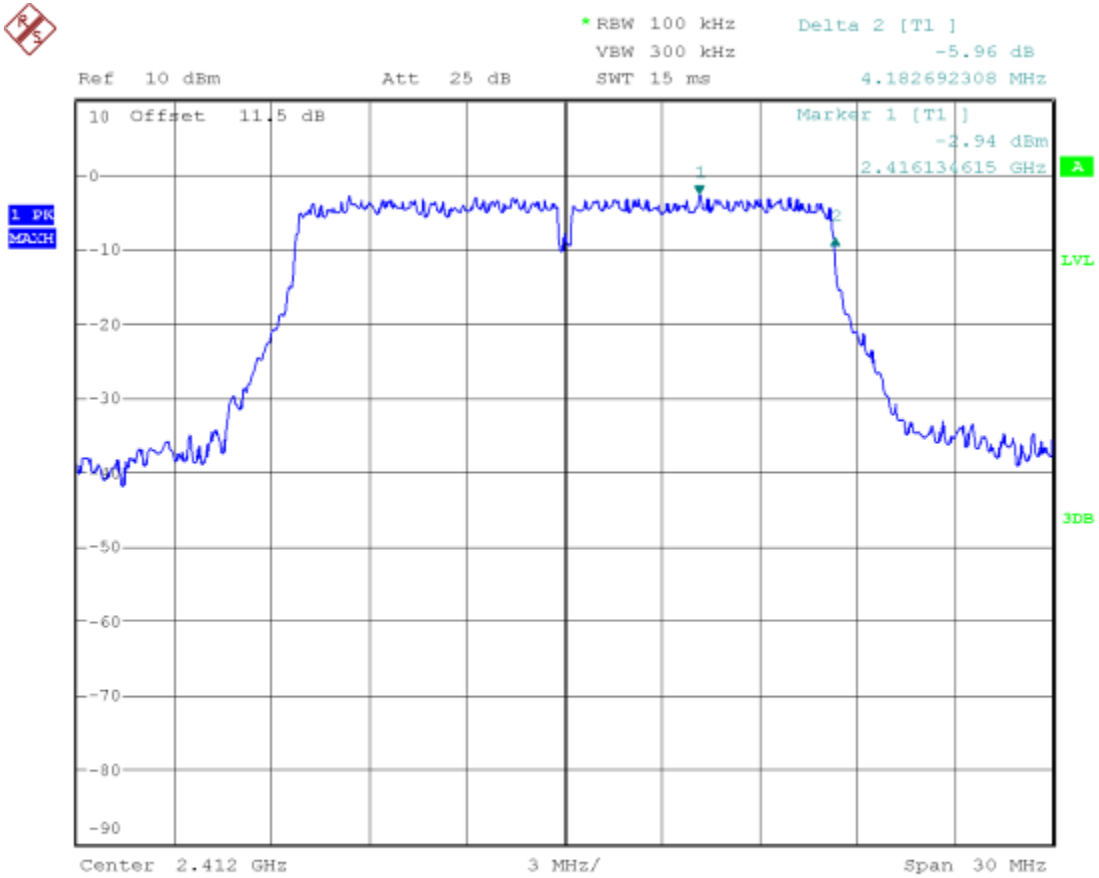


Date: 23.FEB.2016 19:12:34

Client	<b>MMB Research Inc</b>	 Canada
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


6 dB Bandwidth: WIFI G-Mode

Low Channel



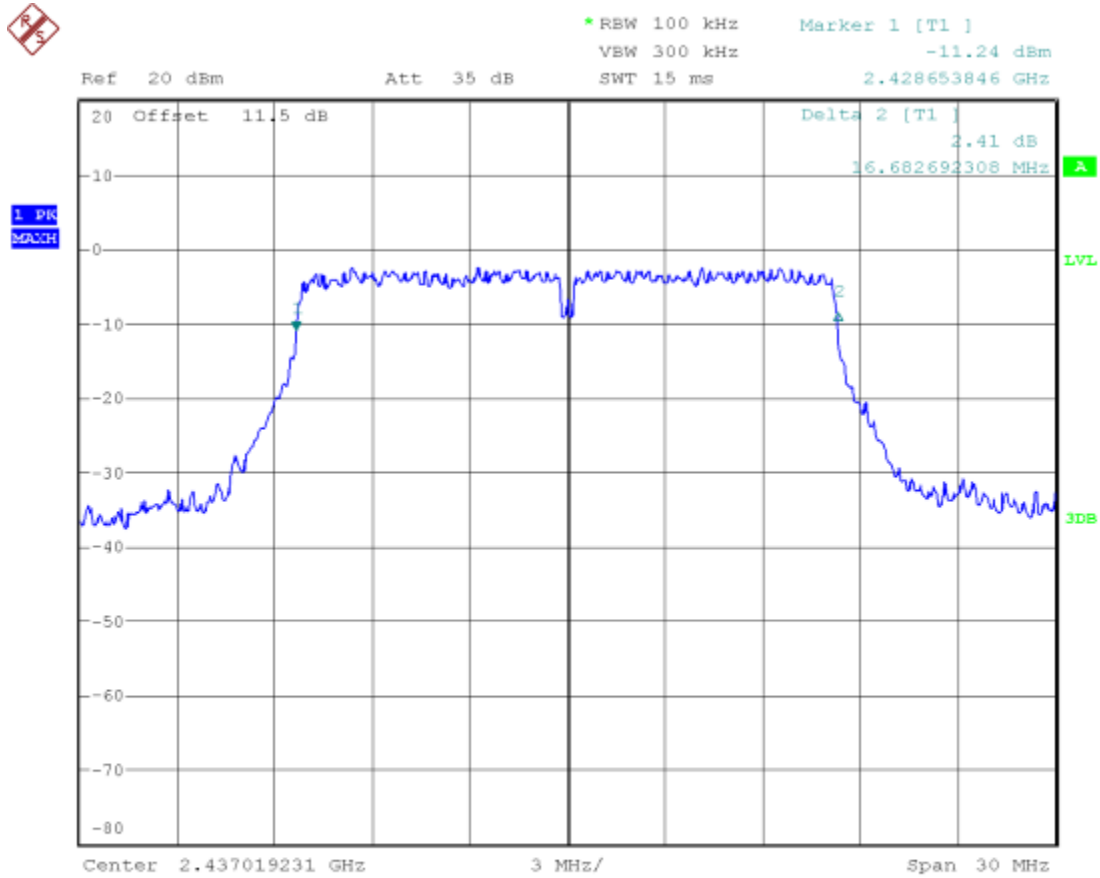
Date: 24.FEB.2016 12:05:25




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: WIFI G-Mode

Mid Channel

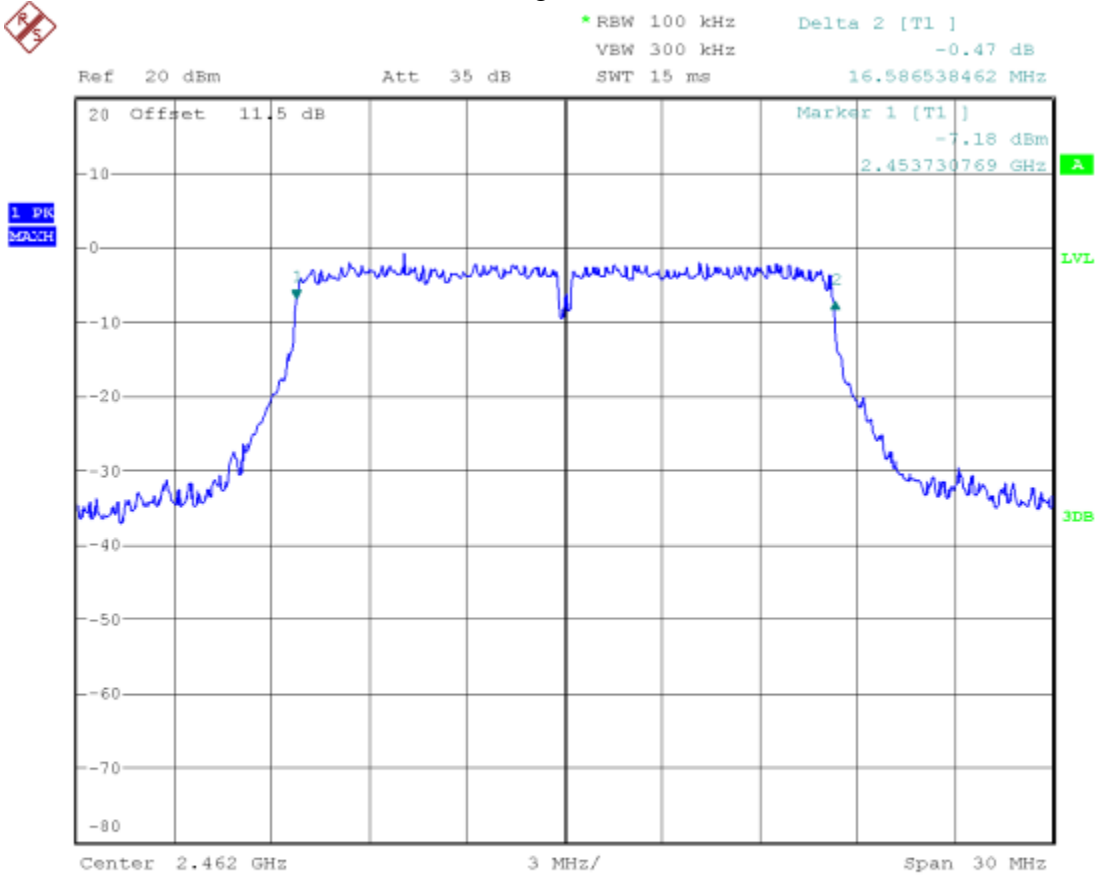


Date: 24.FEB.2016 12:18:12


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: WIFI G-Mode

High Channel

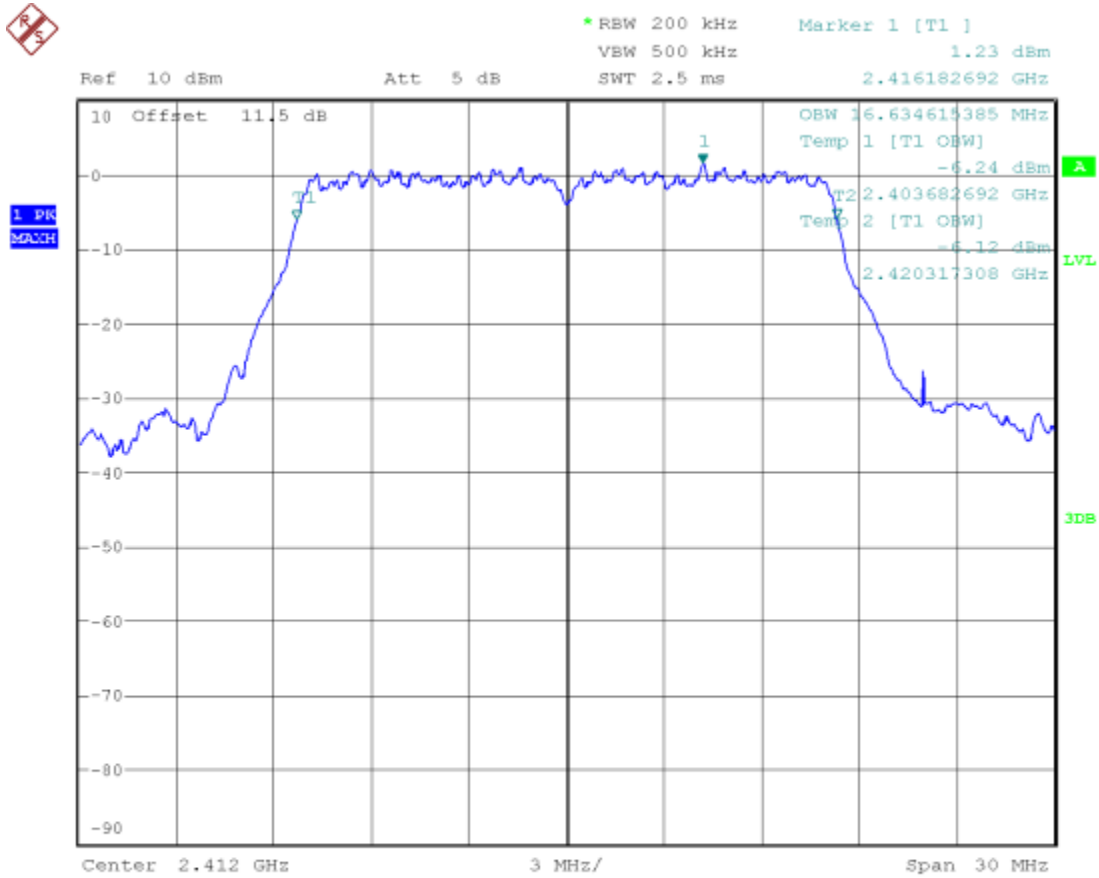


Date: 24.FEB.2016 12:23:21


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

99% Bandwidth: WIFI G-Mode

Low Channel

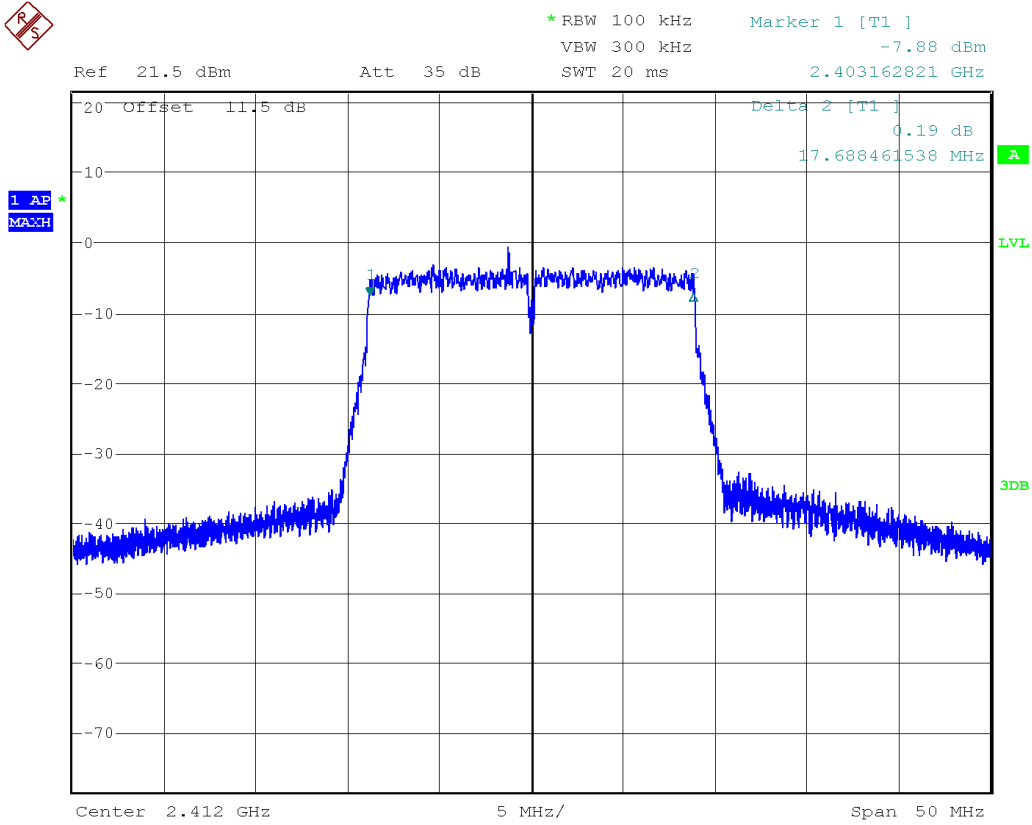


Date: 24.FEB.2016 12:11:01


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

6 dB Bandwidth: WIFI G-Mode

Low Channel

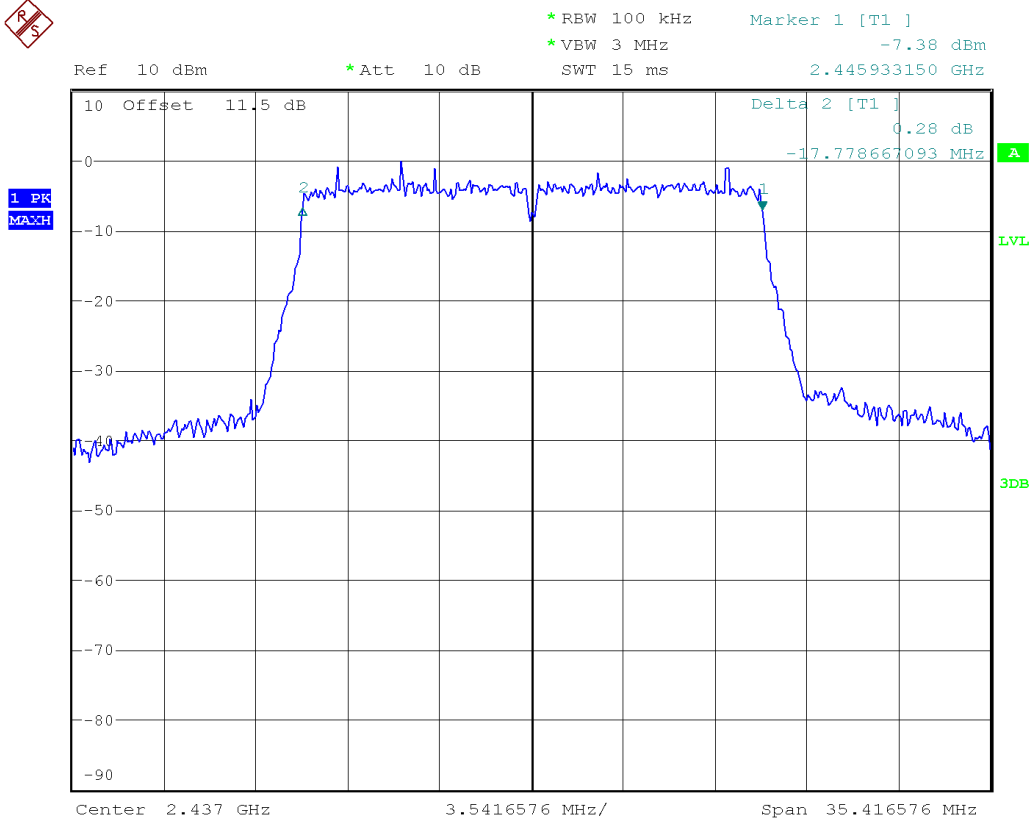


Date: 18.MAY.2016 12:42:35


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	<b>RSS 247:2015 / FCC Part 15 Subpart C 15:2015</b>	

6 dB Bandwidth: WIFI G-Mode

Mid Channel

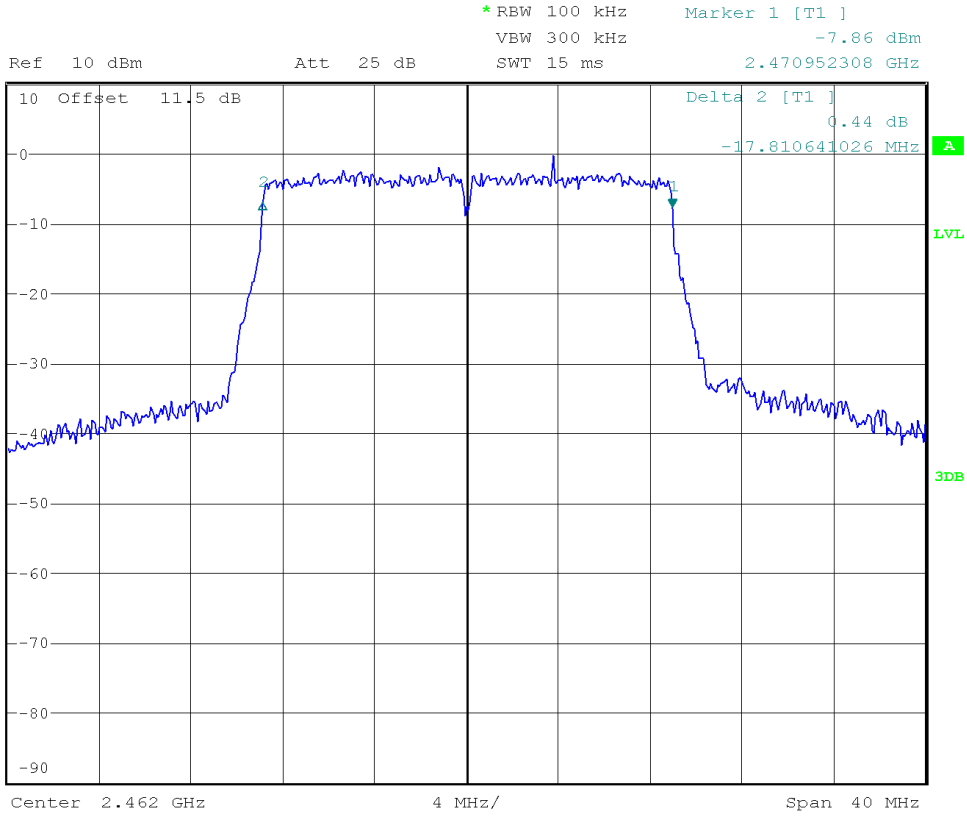


Date: 18.MAY.2016 13:31:25

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


6 dB Bandwidth: WIFI G-Mode

High Channel



Date: 18.MAY.2016 13:47:30




Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration / Verification date	Next calibration/ Verification due date	Asset #
Spectrum Analyzer	FSU	Rohde & Schwarz	Jan 19, 2015	Jan 19, 2017	GEMC 198
Attenuator 10 dB	8493B	Agilent	Feb 11, 2016	Feb 11, 2017	GEMC133

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"



Client	<b>MMB Research Inc</b>	
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Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## **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 excessive power level.

### **Limits and Methods**

The limits are defined in FCC Part 15.247(b) and RSS 247.

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.


The method is given in Section 9.1.2 of FCC KDB 558074 and ANSI C63.10

### **Results**

The EUT passed. The peak power of the EUT was measured with the EUT set to transmit at maximum power. Three Channels were measured for each transmitter/mode. The following tables show the peak power: The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer.

Peak Power: Zigbee			
Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)
Lo Channel (0xB)	2405	19.38	86.70
Mid Channel (0x13)	2445	19.43	87.70
Hi Channel (0x19)	2475	19.38	86.70
Hi Channel (0x1A)	2480	-4.43	0.36

Peak Power: WIFI B-Mode			
Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)
Lo Channel	2412	15.70	37.15
Mid Channel	2437	16.15	41.21
Hi Channel	2462	16.59	45.60


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

Peak Power: WIFI G-Mode			
Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)
Lo Channel	2412	21.46	139.96
Mid Channel	2437	21.94	156.31
Hi Channel	2462	22.05	160.32

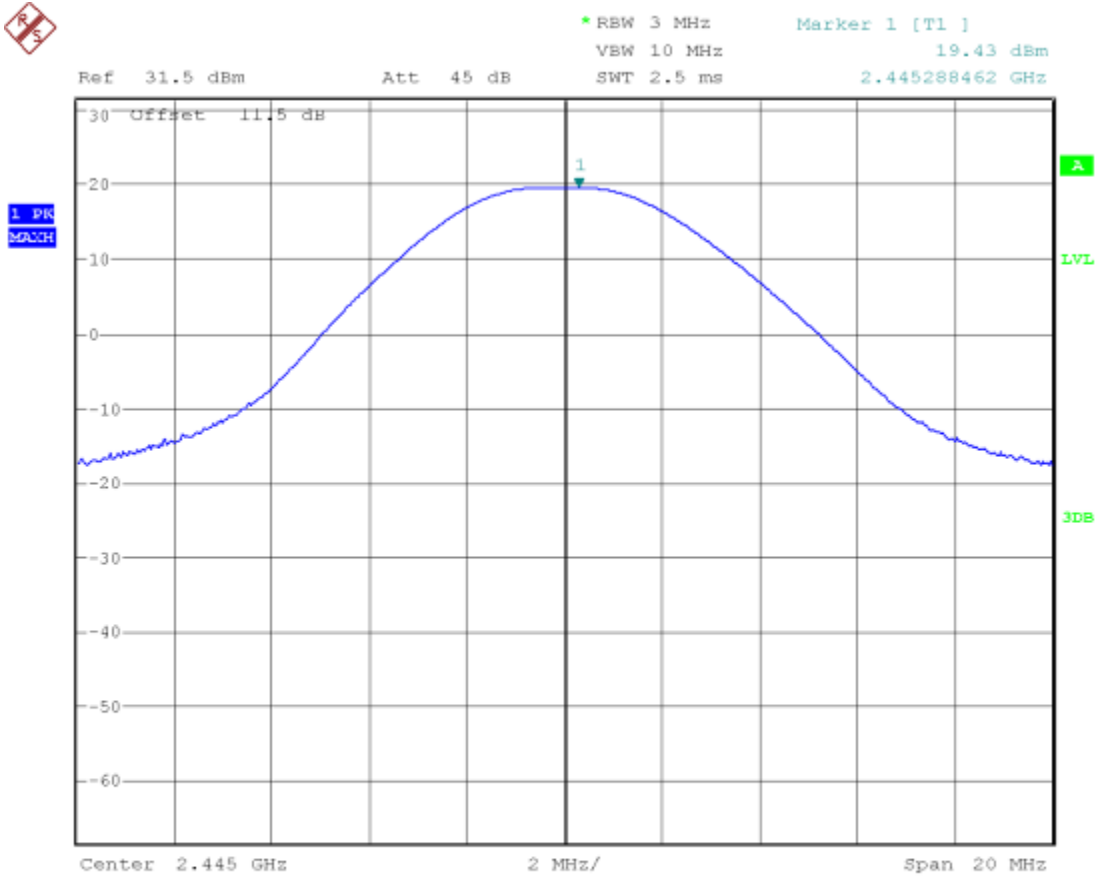
Peak Power: WIFI N-Mode			
Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)
Lo Channel	2412	20.52	112.72
Mid Channel	2437	21.00	125.89
Hi Channel	2462	21.62	145.21

## Readings


The plots shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. The measurement RBW is  $\geq$  than the DTS bandwidth.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

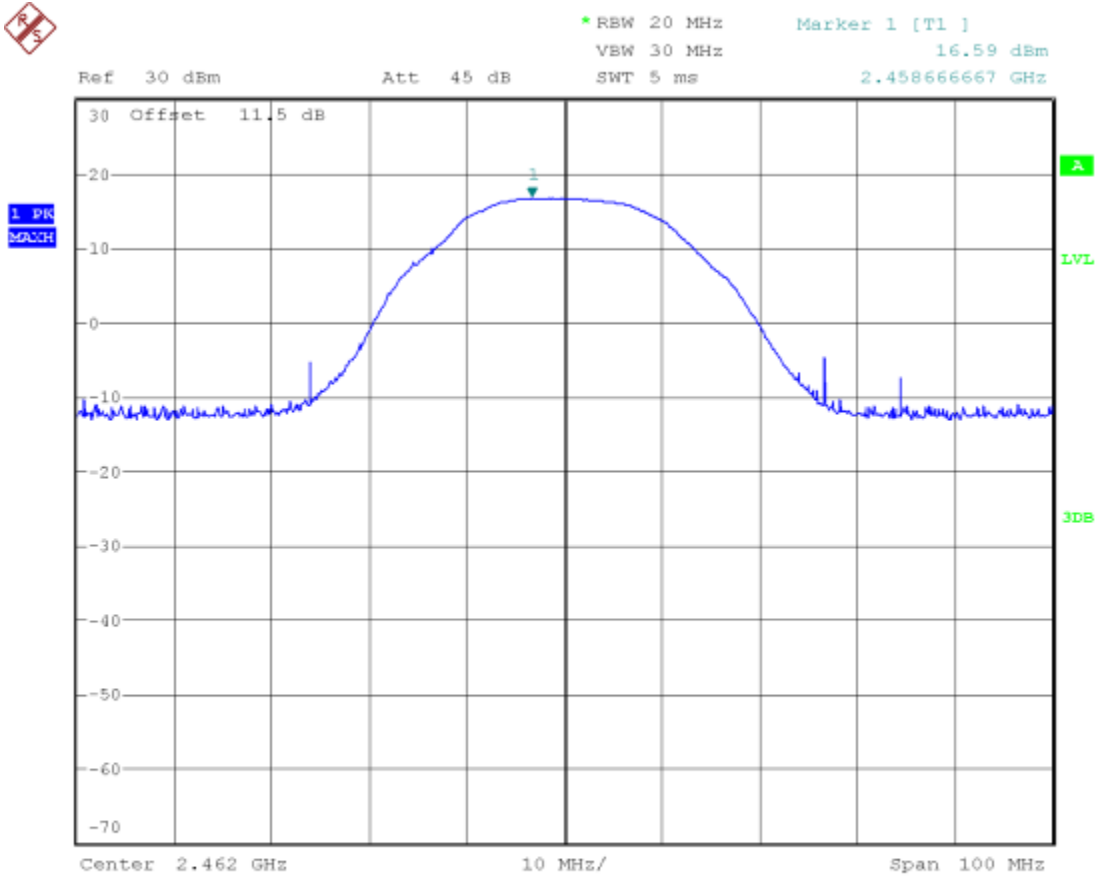
Peak Power: Zigbee  
Channel 0x13




Date: 24.FEB.2016 13:29:18

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

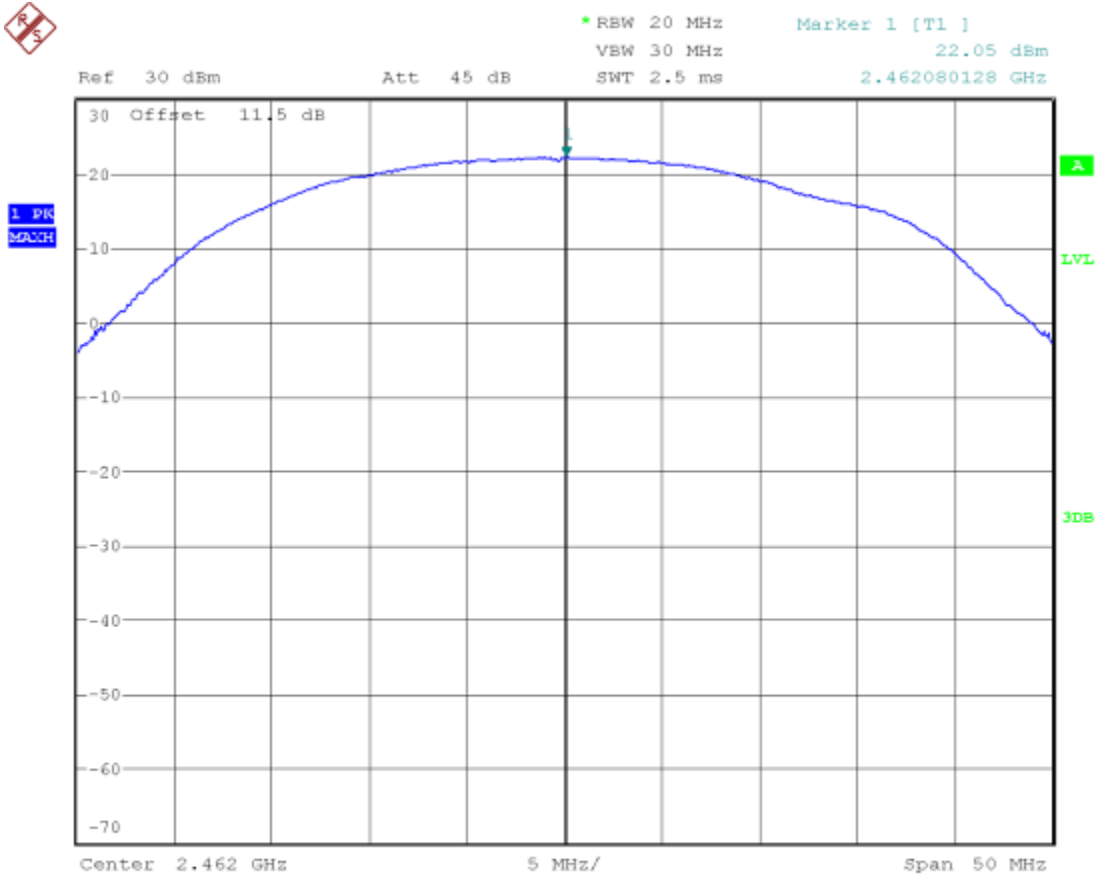
Peak Power: WIFI B-Mode  
Channel 11




Date: 23.FEB.2016 19:15:14

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

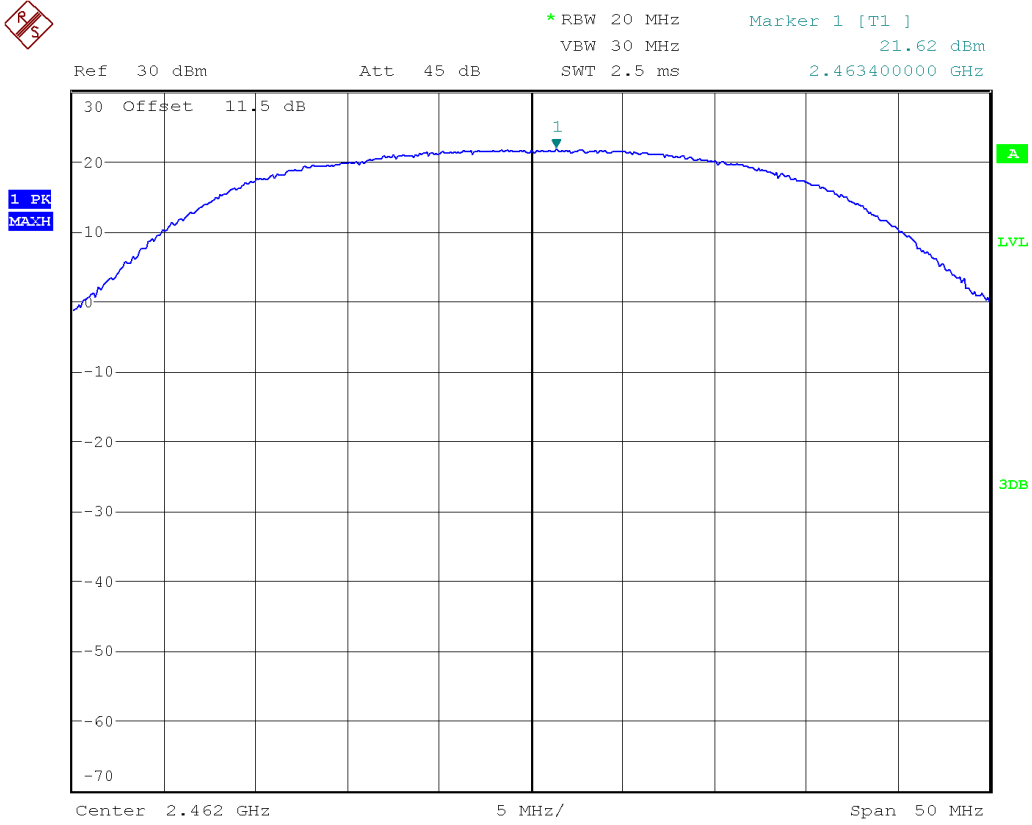
Peak Power: WIFI G-Mode  
Channel 11



Date: 24.FEB.2016 12:29:54


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

Peak Power: WIFI N-Mode  
Channel 11



Date: 18.MAY.2016 14:22:24


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

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration / Verification date	Next calibration/ Verification due date	Asset #
Spectrum Analyzer	FSU	Rohde & Schwarz	Jan 19, 2015	Jan 19, 2017	GEMC 198
Attenuator 10 dB	8493B	Agilent	Feb-11, 2016	Feb-11, 2017	GEMC133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	Feb-10, 2015	Feb-10, 2016	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## ***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<sup>th</sup> 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 and ANSI C63.10


### **Results**

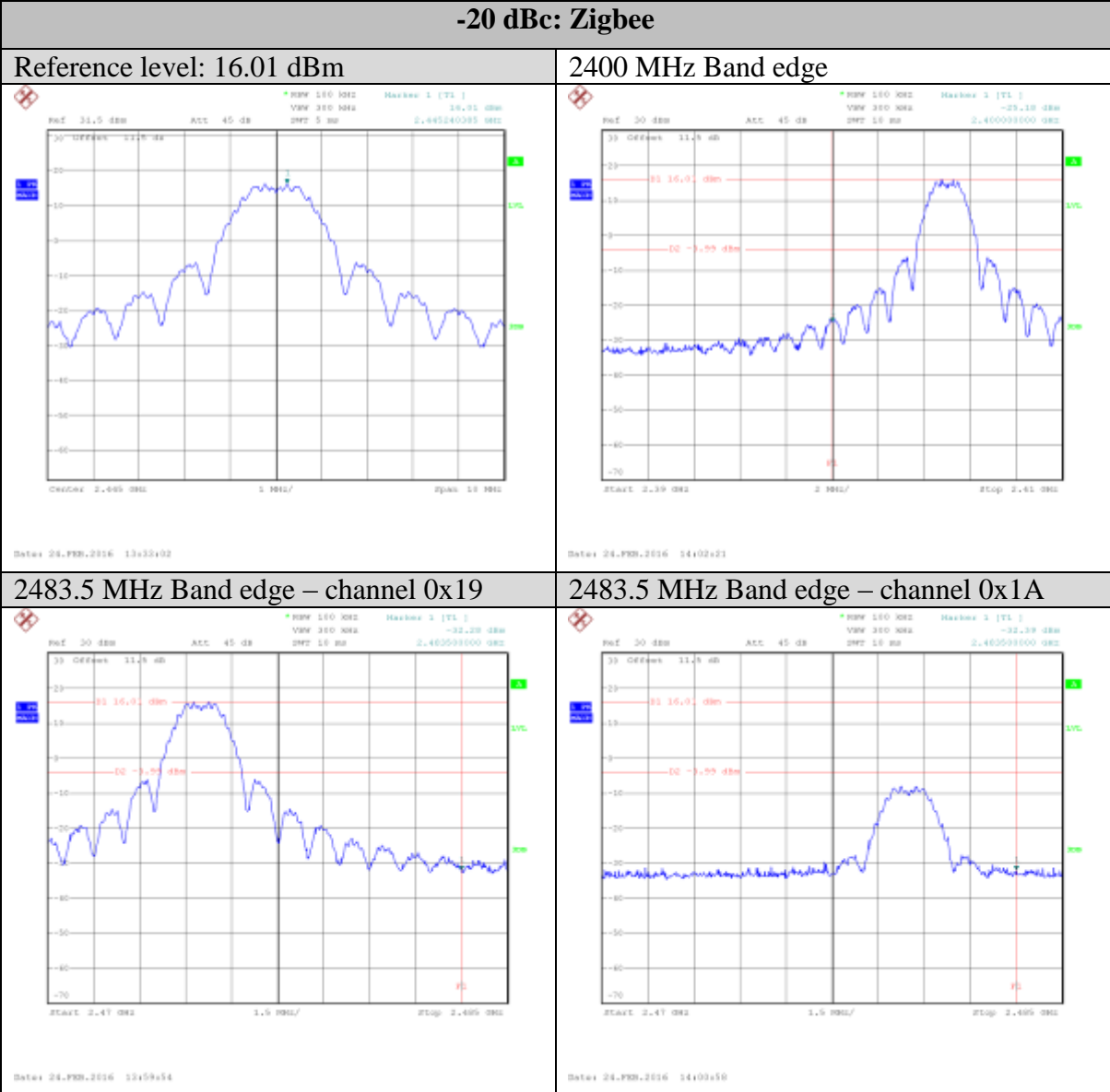
The EUT passed the limits. Low, middle and high channels were measured. The worst case was presented as a graph for the spectrum. The -20 dBc requirement is shown for the lower band edge at 2.4 GHz in the low band. The -20 dBc requirement is also shown for the higher band edge at 2.4835 GHz in the high band. The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer.


### **Graph(s)**

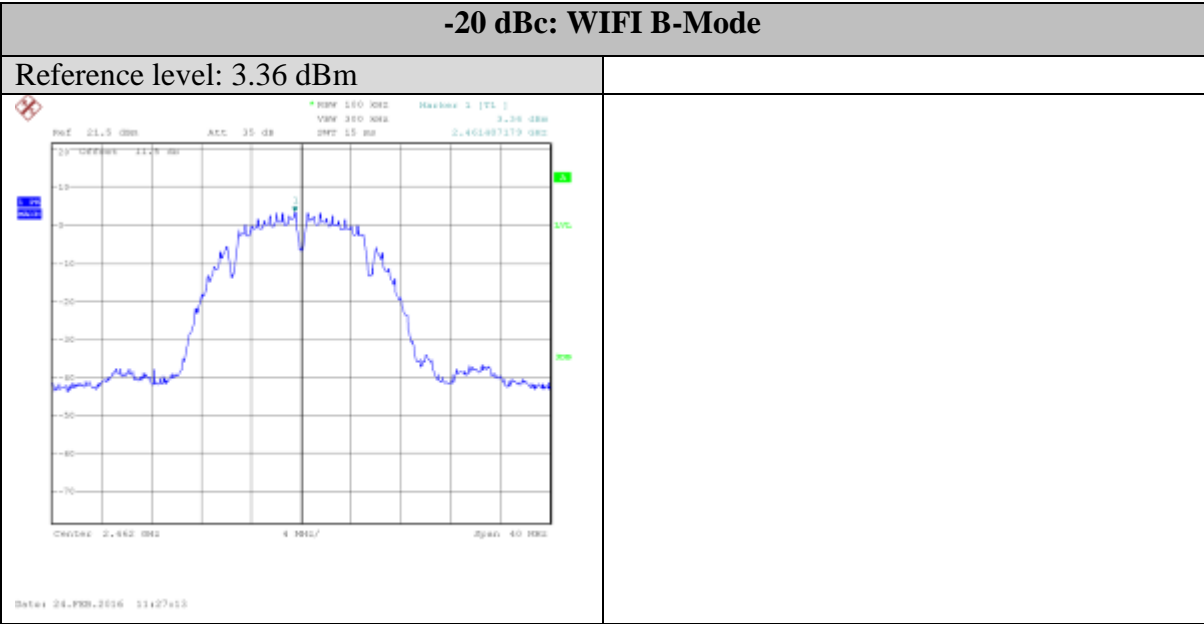
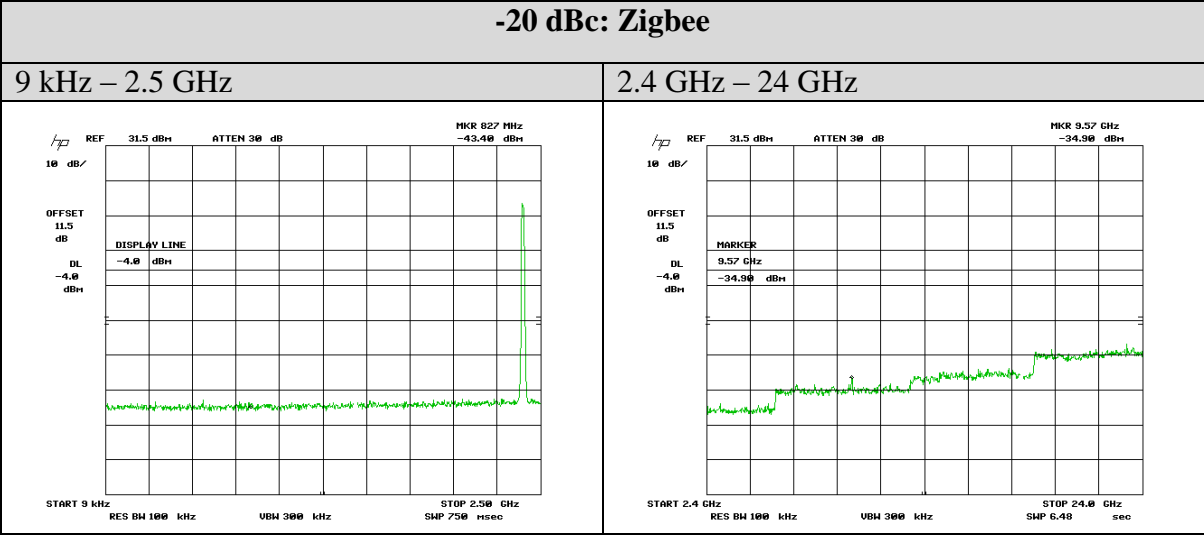
The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

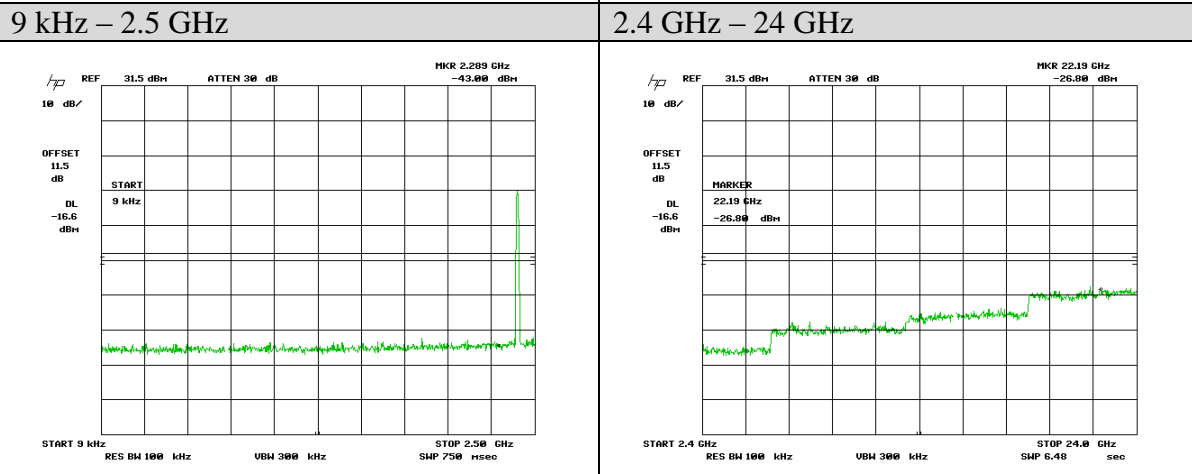
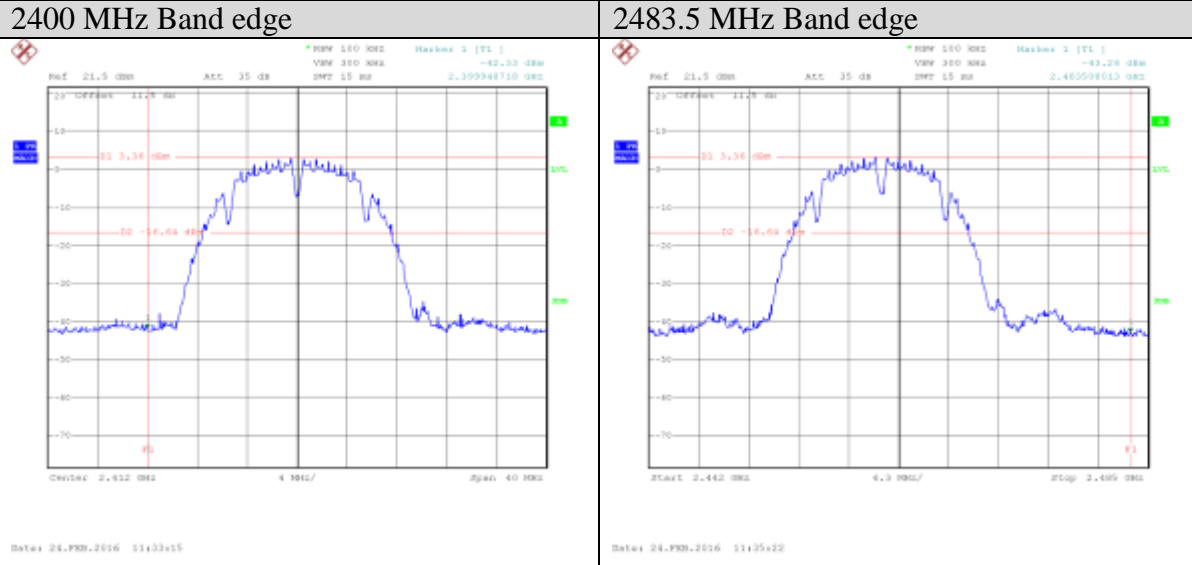



Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	



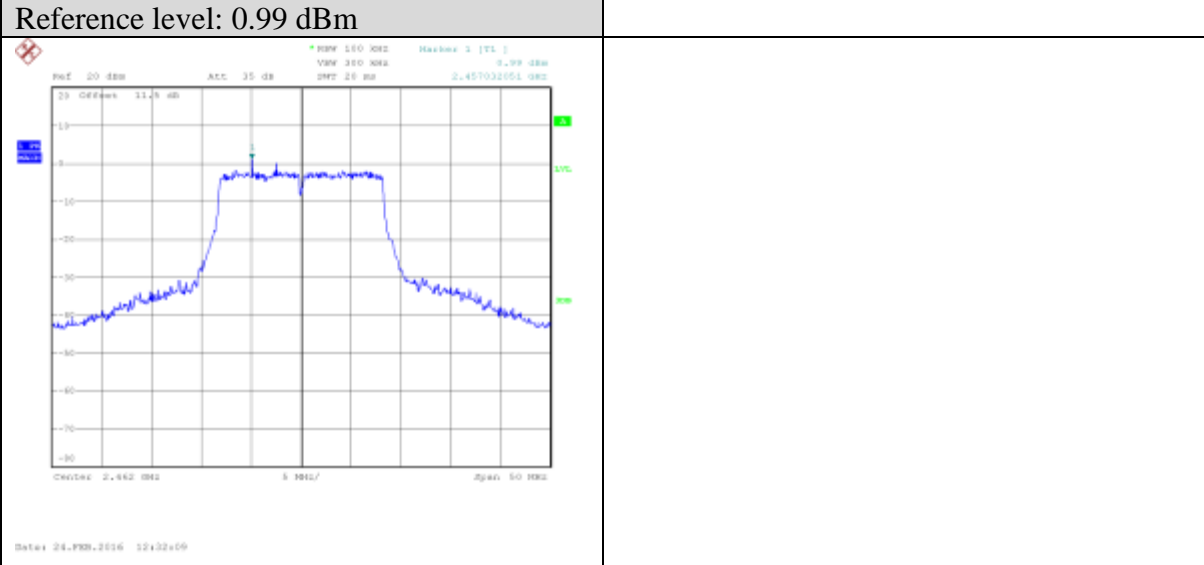
Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

**-20 dBc: WIFI B-Mode**

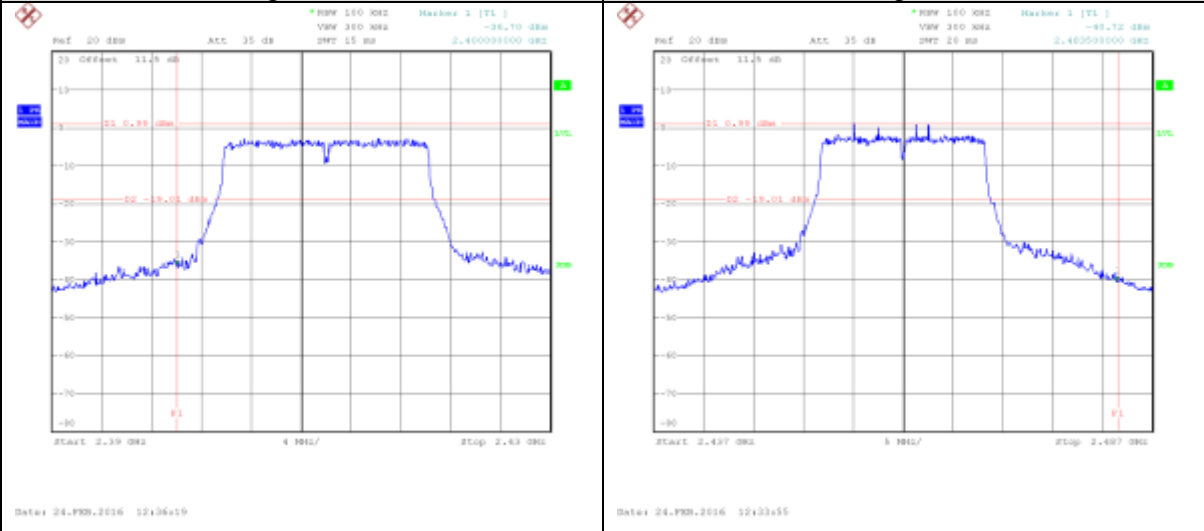



Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

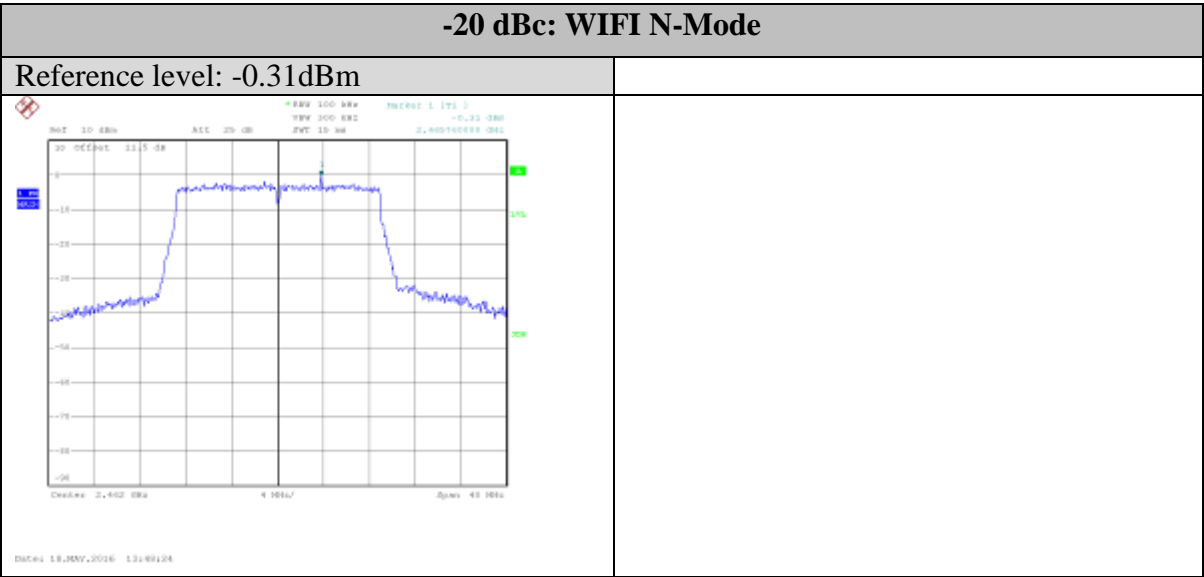
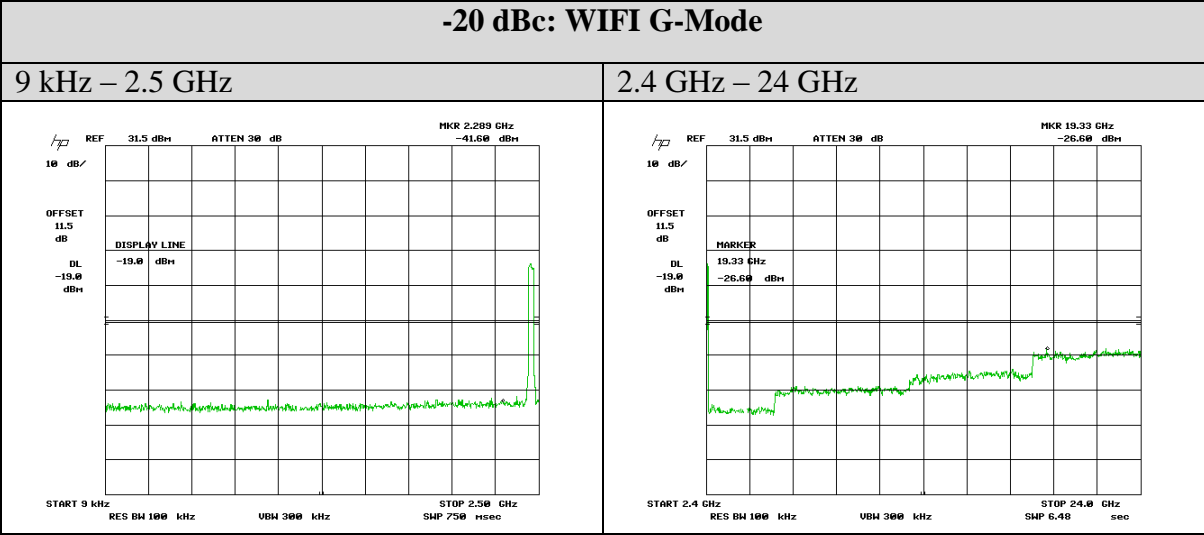
**-20 dBc: WIFI G-Mode**




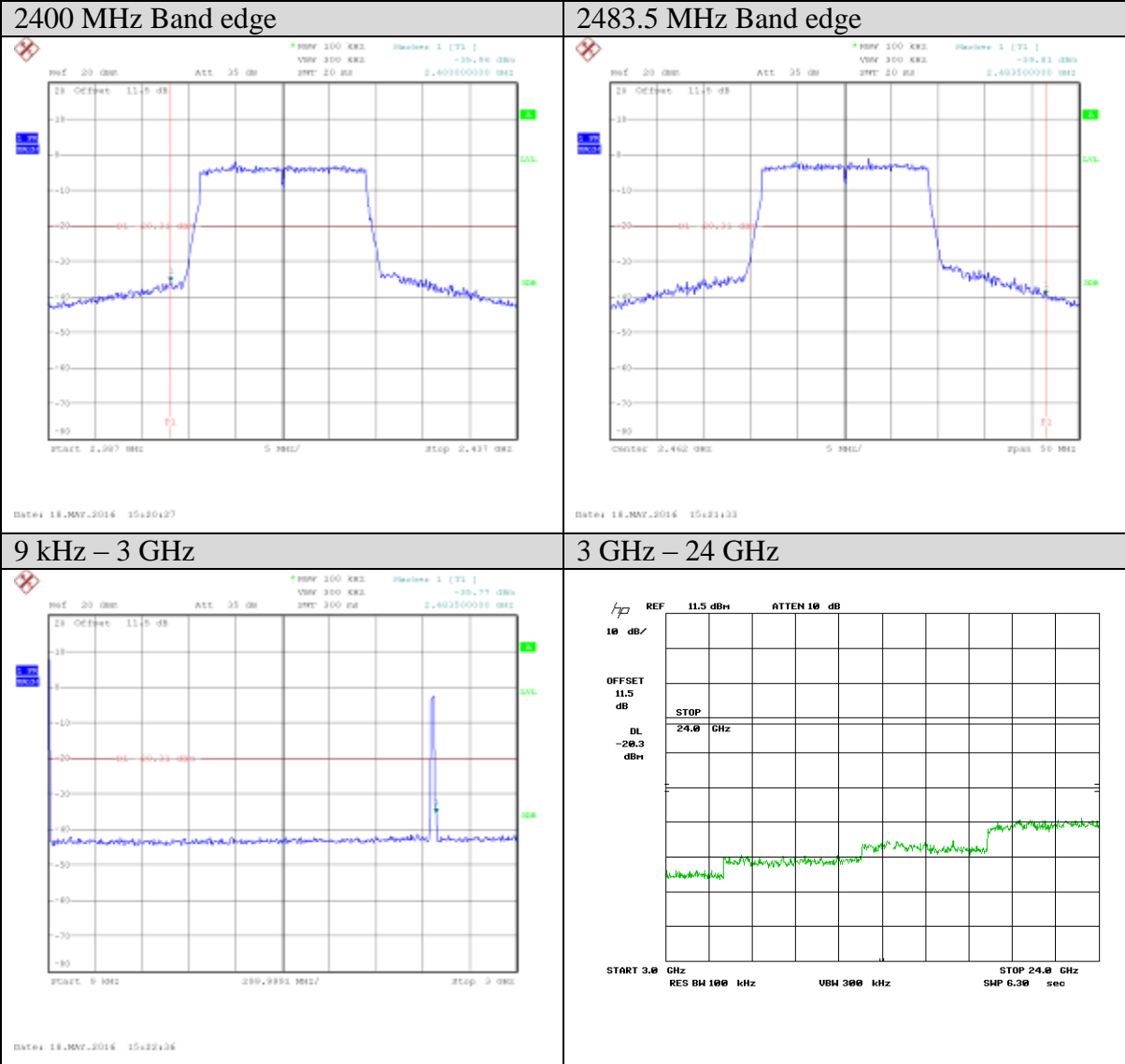
2400 MHz Band edge      2483.5 MHz Band edge




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	



Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	<b>RSS 247:2015 / FCC Part 15 Subpart C 15:2015</b>	




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

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration / Verification date	Next calibration/ Verification due date	Asset #
Spectrum Analyzer	8566B	HP	Nov 27, 2015	Nov 27, 2017	GEMC 190
Quasi Peak Adapter	85650A	HP	Nov 27, 2015	Nov 27, 2017	GEMC 191
Spectrum Analyzer	FSU	Rohde & Schwarz	Jan 19, 2015	Jan 19, 2017	GEMC 198
Attenuator 10 dB	8493B	Agilent	Feb-11, 2016	Feb-11, 2017	GEMC133
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	Feb-10, 2016	Feb-10, 2017	GEMC 29

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## ***Spurious Radiated Emissions***

### **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 and ANSI C 63.10

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<sup>1</sup>

0.490 MHz – 1.705 MHz, 24000/F (kHz) uV/m at 30 m<sup>1</sup>

1.705 MHz – 30 MHz, 30 uV/m at 30 m<sup>1</sup>

30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m<sup>1</sup>) at 3 m

88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m<sup>1</sup>) at 3 m

216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m<sup>1</sup>) at 3 m

Above 960 MHz, 500 uV/m (54.0 dBuV/m<sup>1</sup>) at 3 m

Above 1000 MHz, 500 uV/m (54 dBuV/m<sup>2</sup>) at 3m


Above 1000 MHz, 500 uV/m (74 dBuV/m<sup>3</sup>) at 3m

<sup>1</sup>Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1

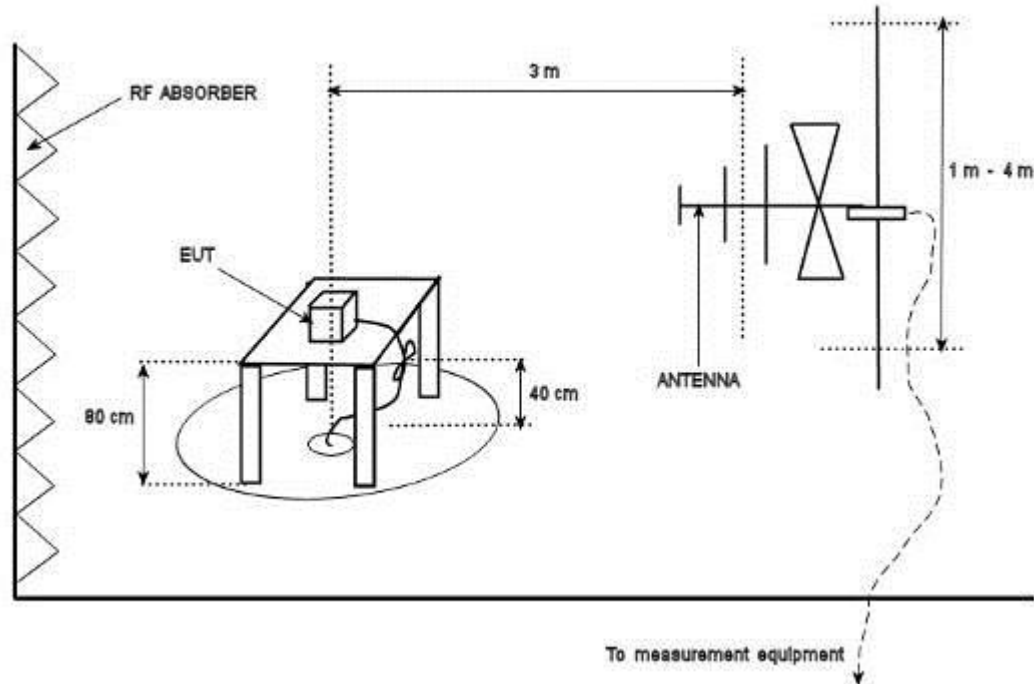
<sup>2</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector

<sup>3</sup>Limit is with 1 MHz measurement bandwidth and using a Peak detector



Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

### 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

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, 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, and provides considerable time savings.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10<sup>th</sup> 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

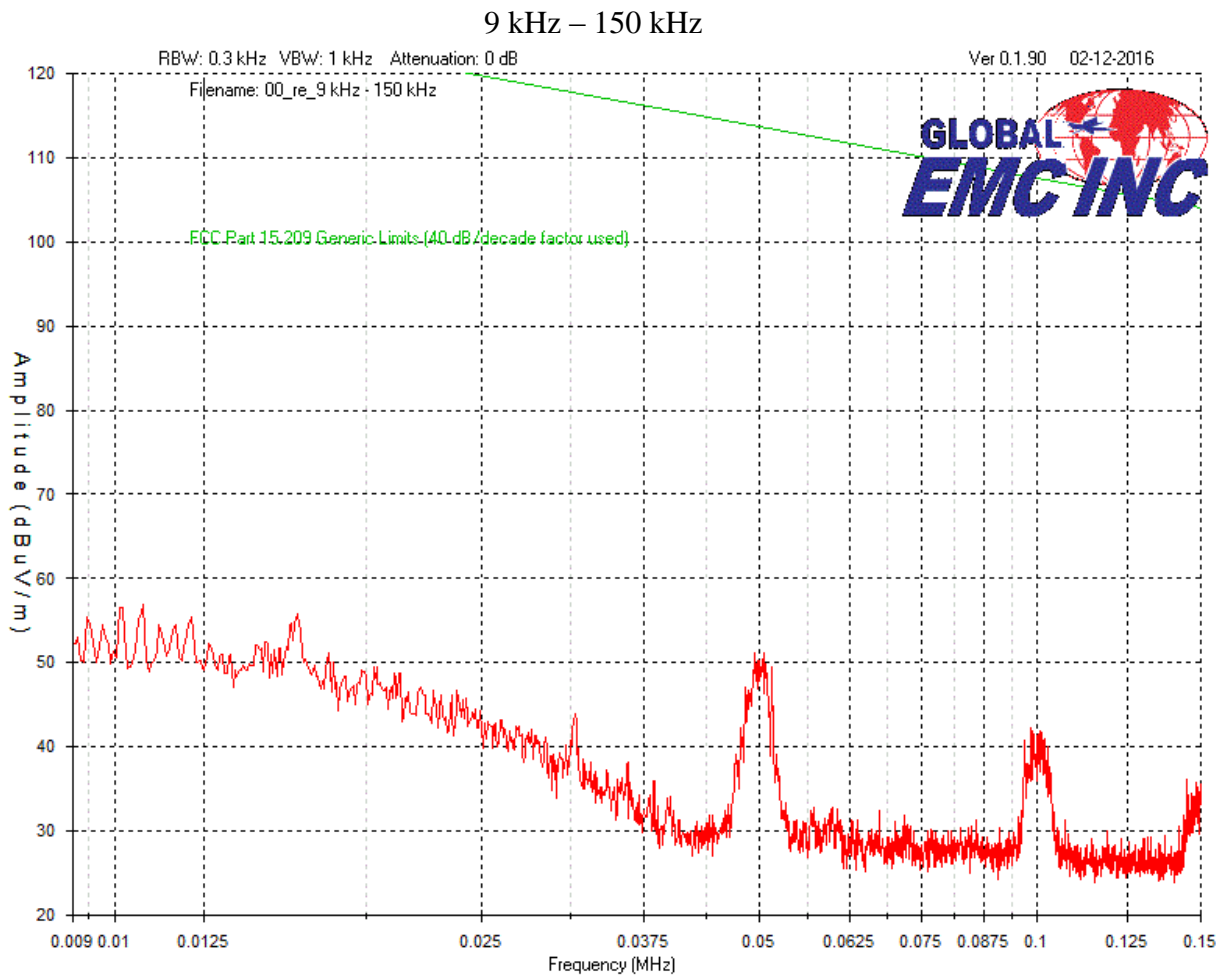
Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


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.

Low, middle and high channels were measured, each in three orthogonal axes were checked; however the worst case graphs are presented.

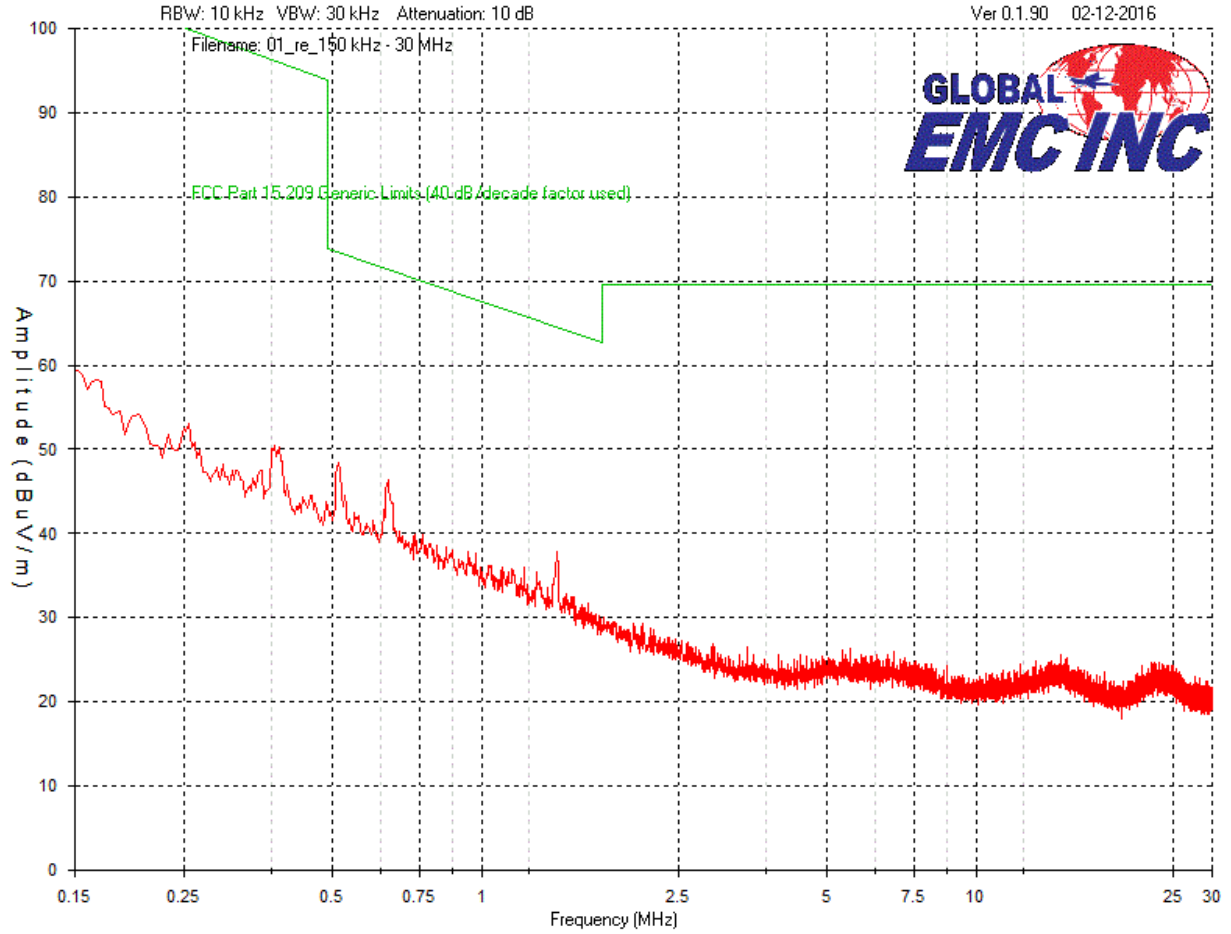
Band edge measure graphs were shown for illustrations purpose. See final measurement section for all measurements.


### Zigbee Peak Graphs



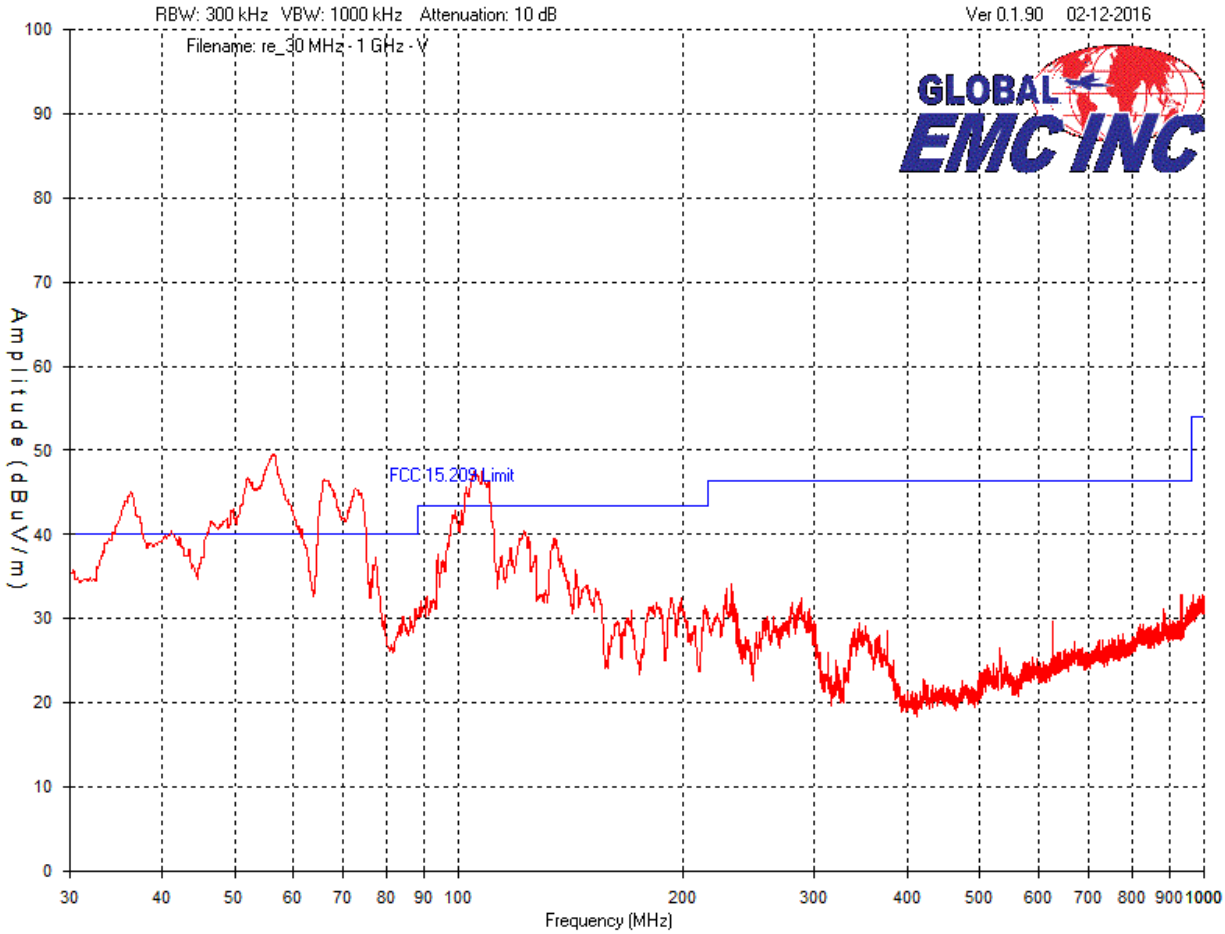
Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


150 kHz – 30 MHz



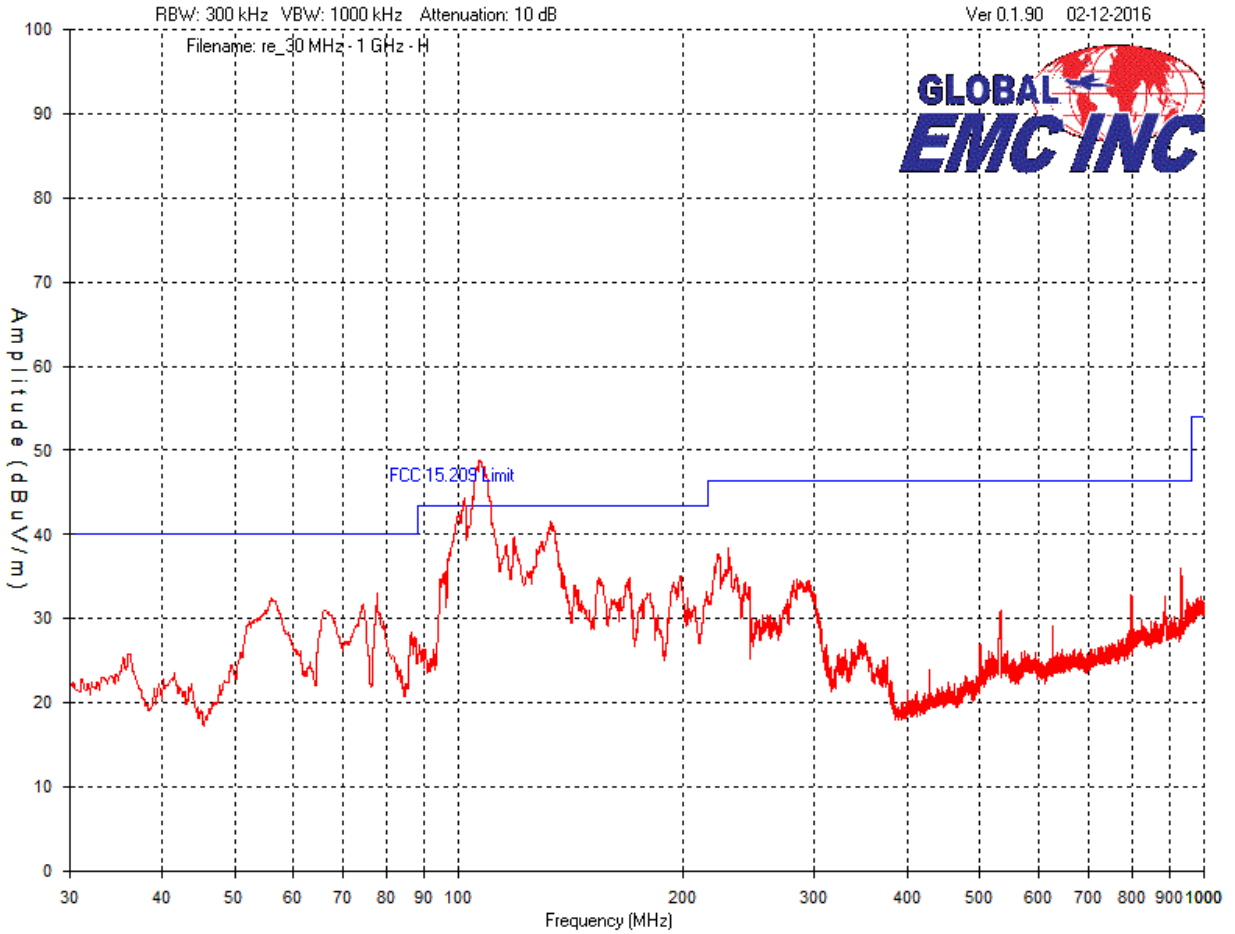
Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


Mid Channel - 30 MHz – 1 GHz  
Vertical – Peak Emission Graph



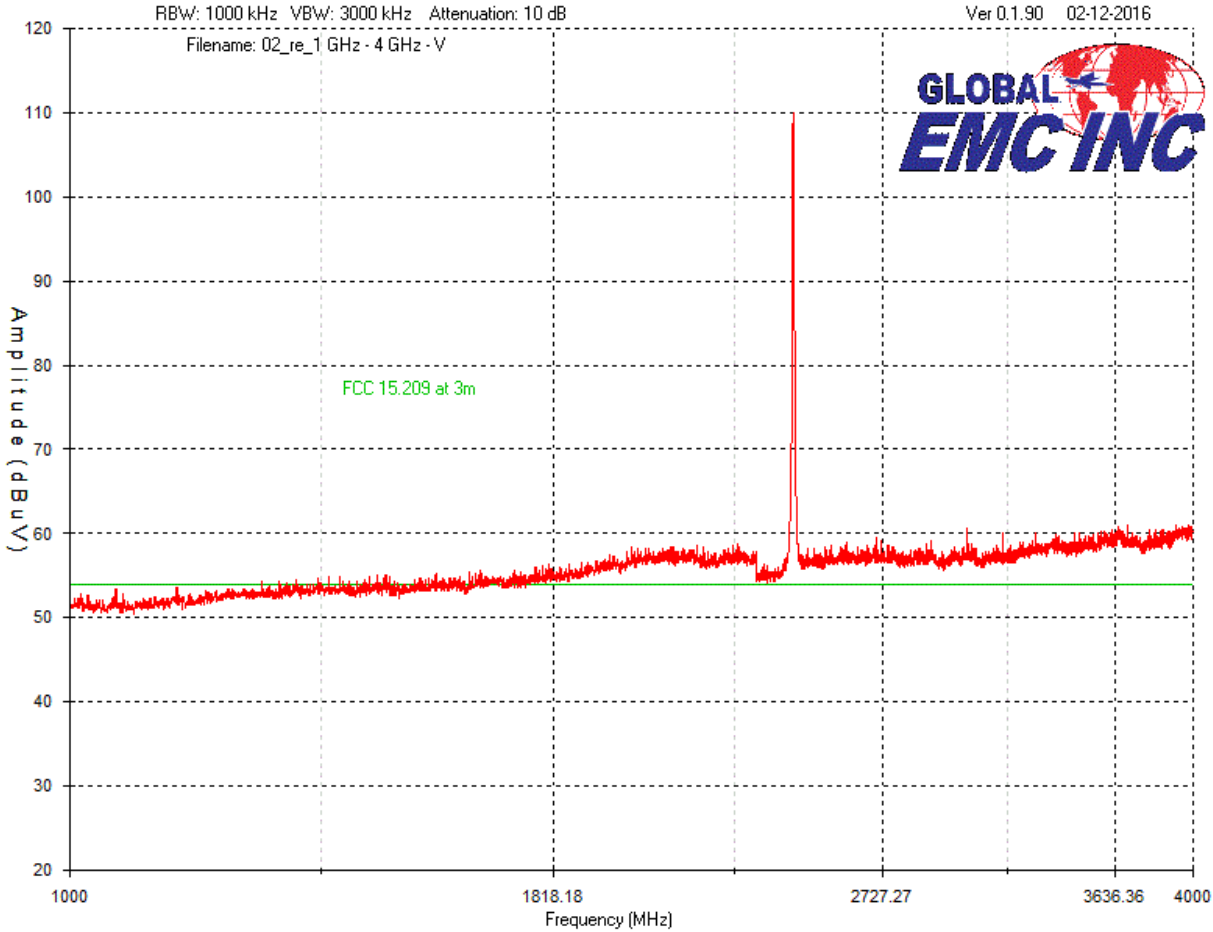
Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

Mid Channel – 30 MHz – 1 GHz  
Horizontal - Peak Emission Graph




Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

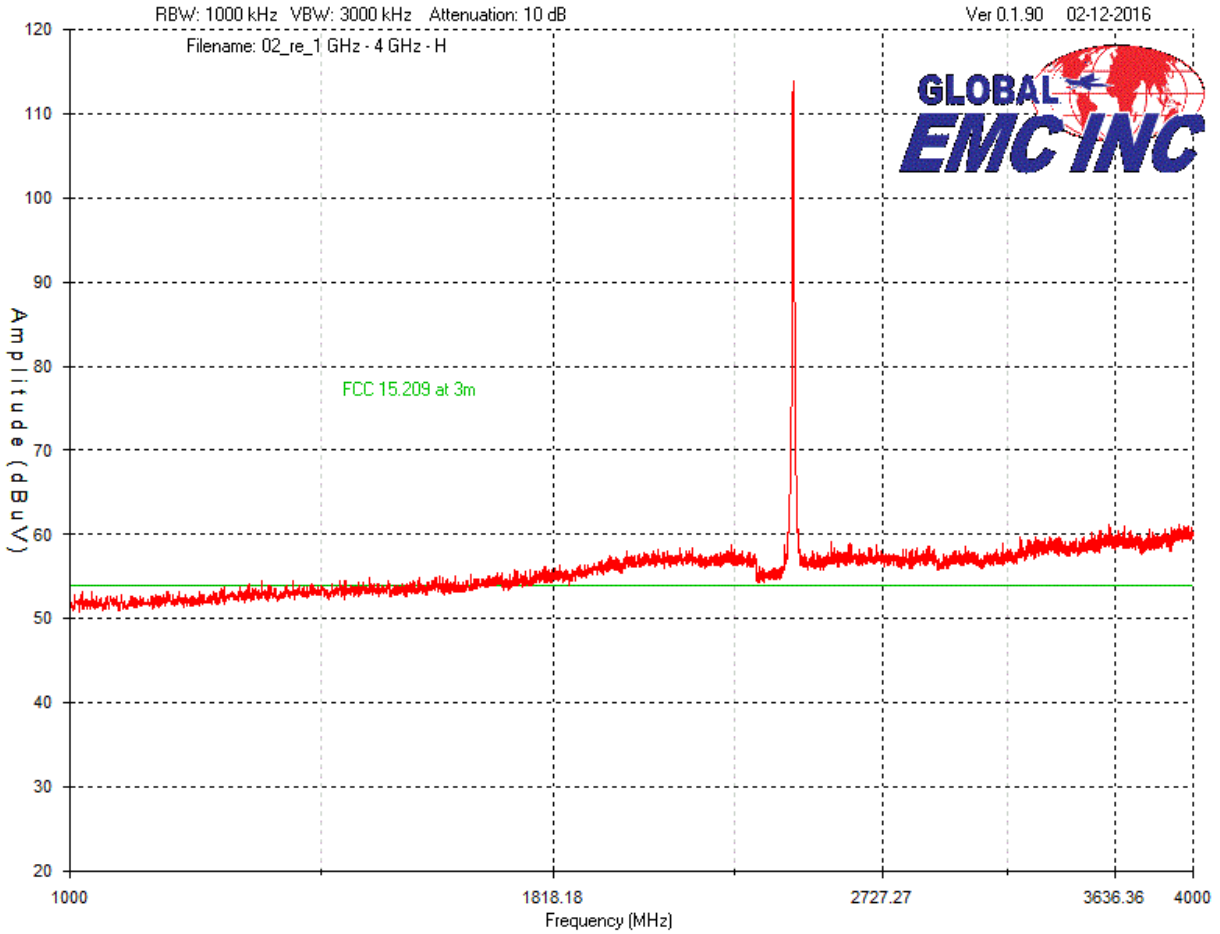
Mid Channel – 1 GHz – 4 GHz  
Vertical - Peak Emission Graph




Note: due to the attenuation used in from of the pre-amp, the noise floor of the measurement instrument was higher than average limit. See Graph 1: Zigbee vertical average emission, 1 GHz – 4 GHz. for average plot.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

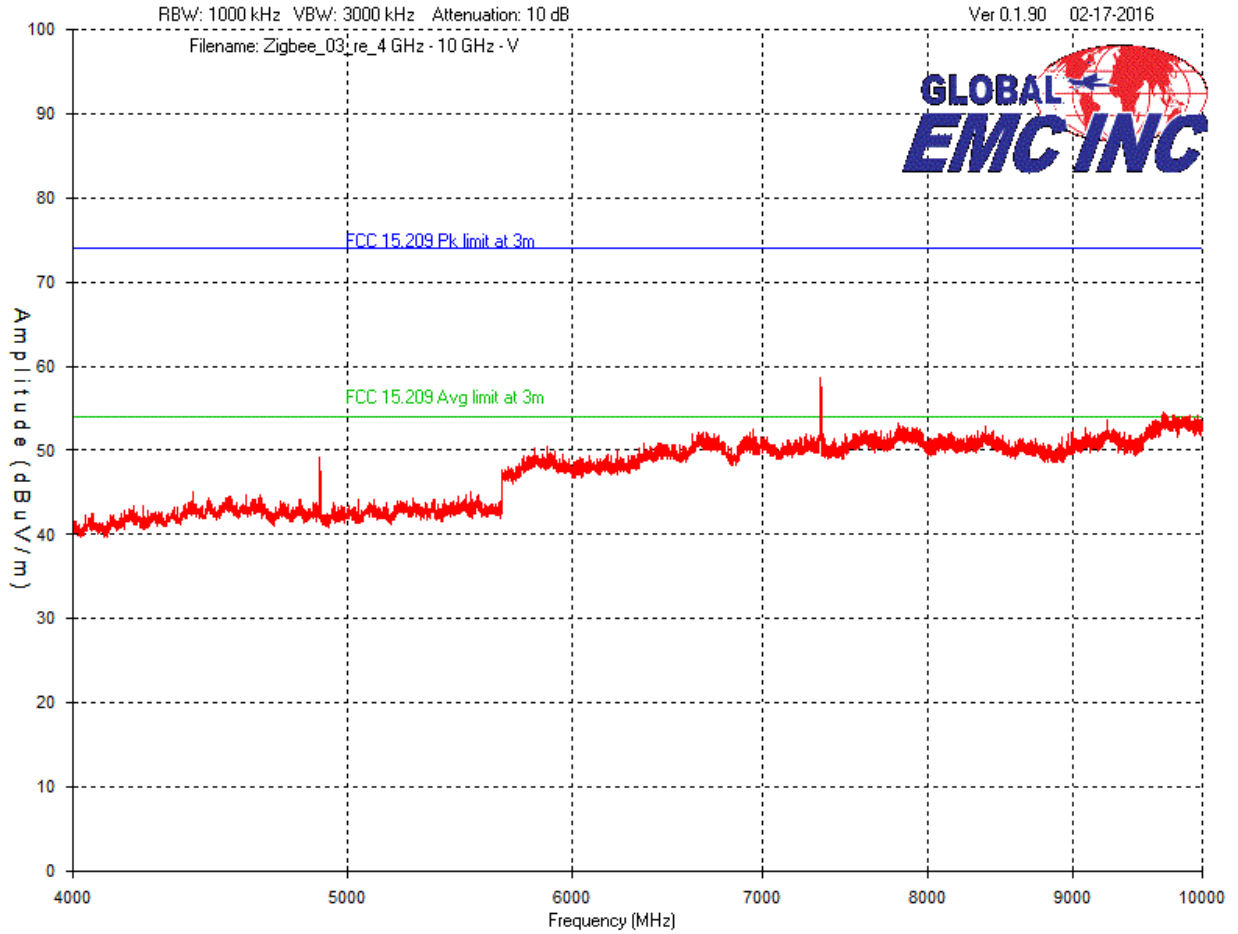
Mid Channel – 1 GHz – 4 GHz  
Horizontal - Peak Emission Graph



Note: due to the attenuation used in from of the pre-amp, the noise floor of the measurement instrument was higher than average limit. See Graph 2: Zigbee horizontal average emission, 1 GHz – 4 GHz.for average plot.


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

Mid Channel – 4 GHz – 10 GHz  
Vertical - Peak Emission Graph

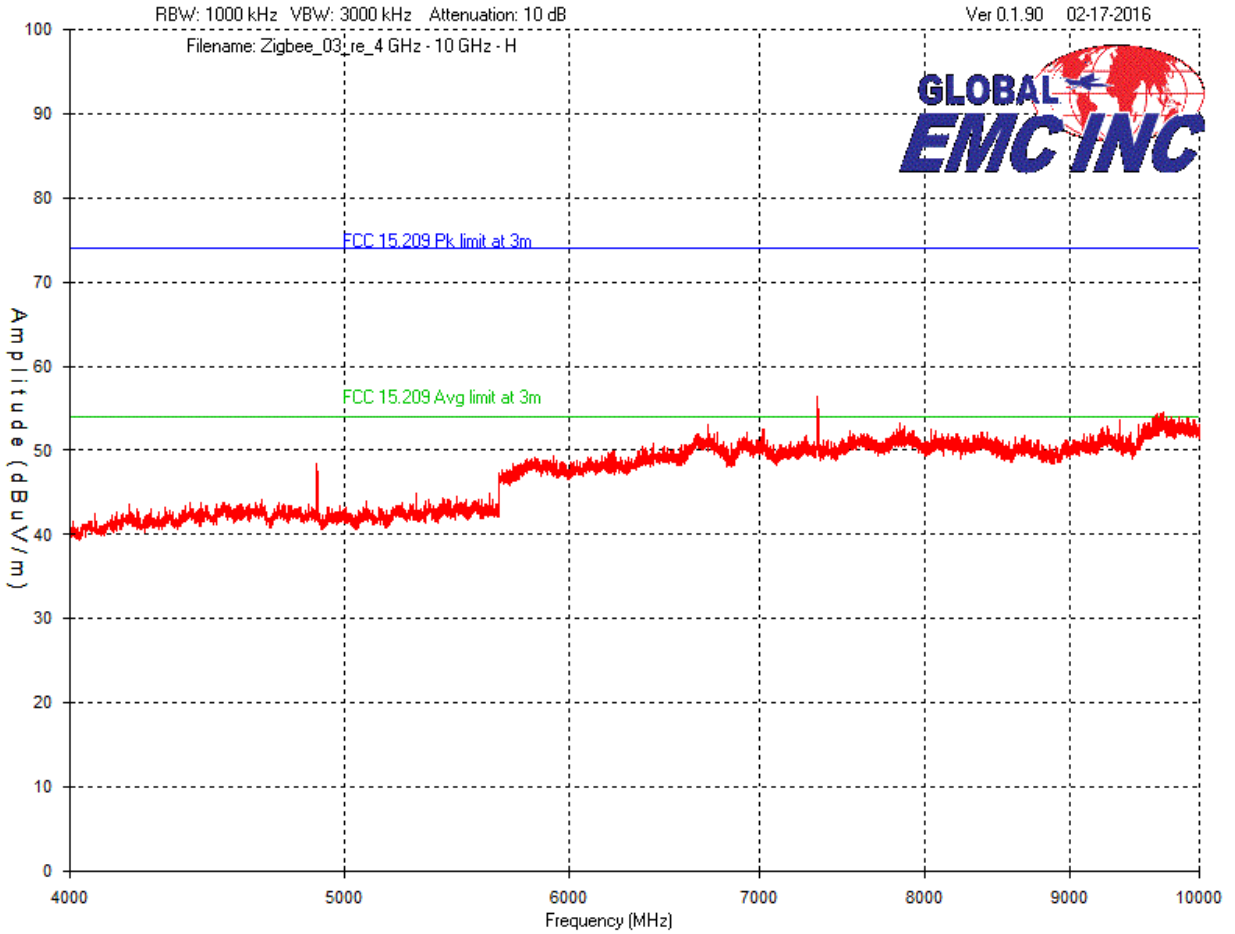


Note: See Final Measurements and Results section starting on page 144 for measurements.




Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

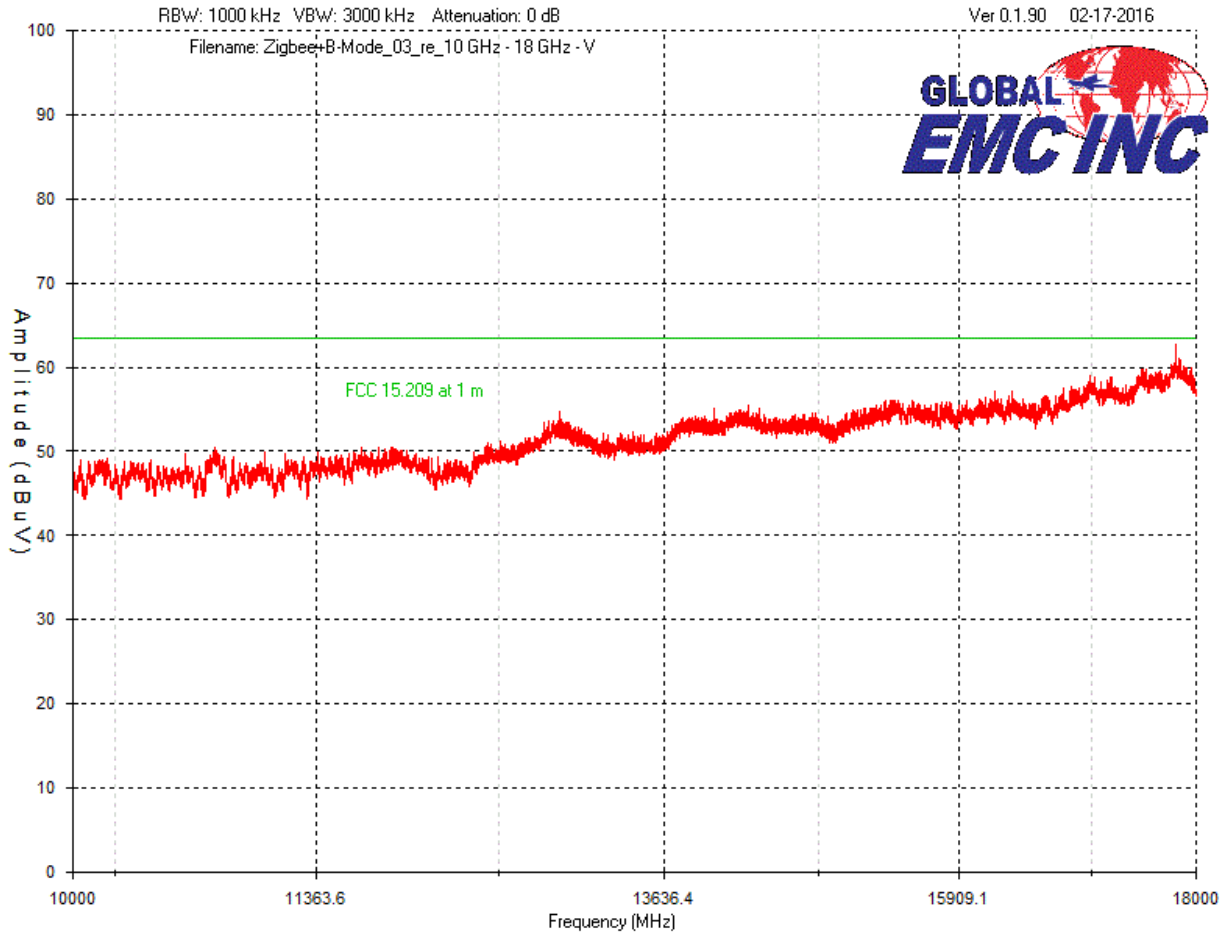
**Mid Channel – 4 GHz – 10 GHz  
Horizontal - Peak Emission Graph**




Note: See Final Measurements and Results section starting on page 144 for measurements.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

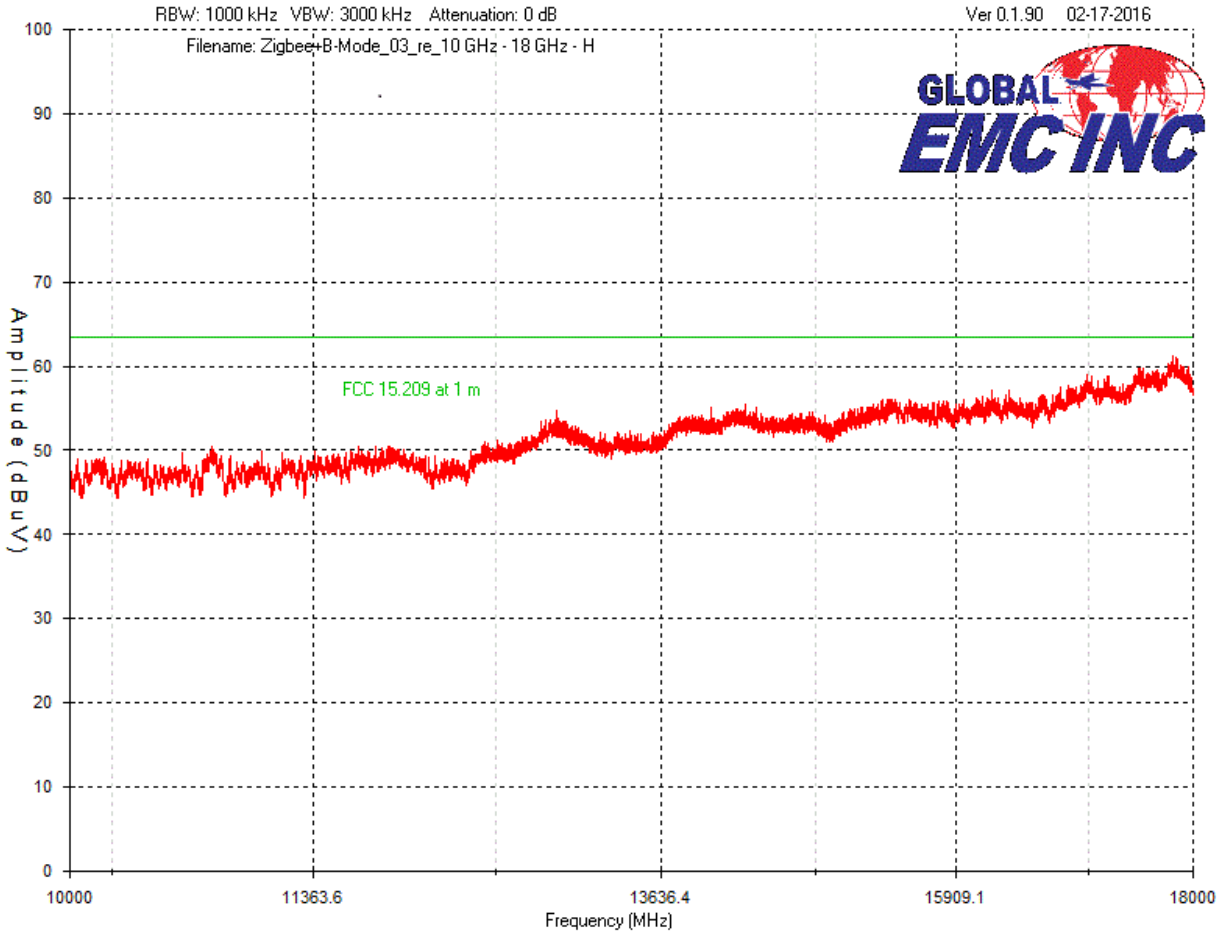
Mid Channel – 10 GHz – 18 GHz  
Vertical - Peak Emission Graph




Note: See Final Measurements and Results section starting on page 144 for measurements.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

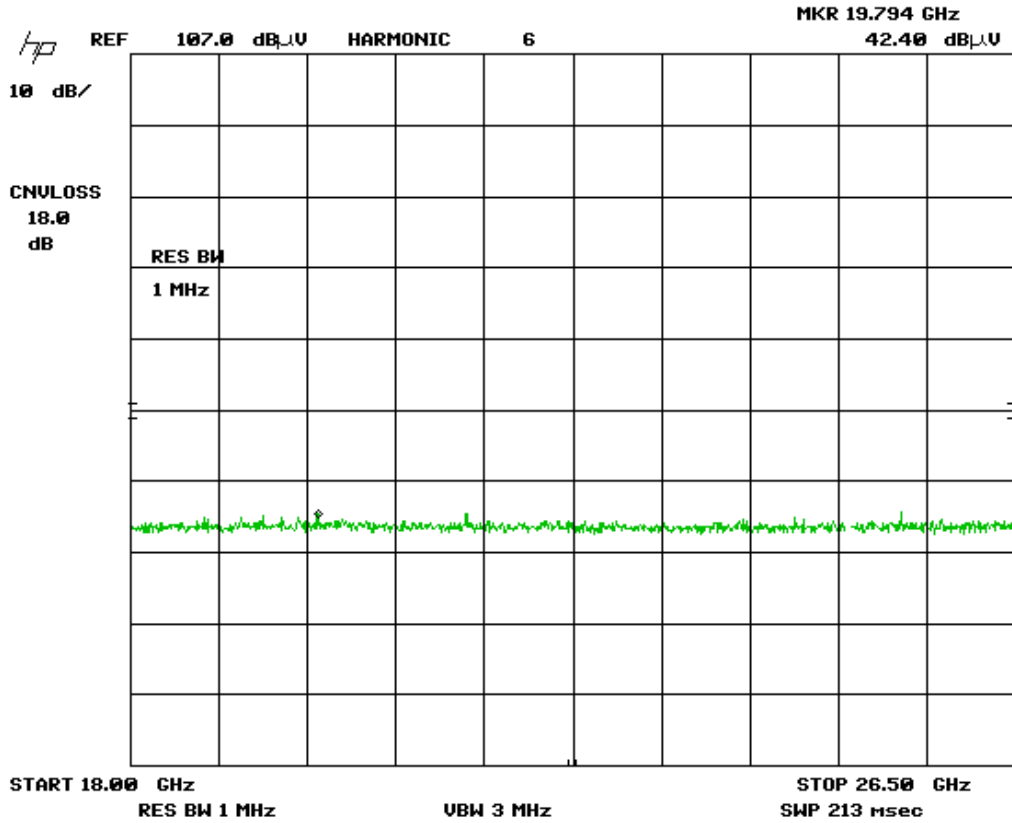
Mid Channel – 10 GHz – 18 GHz  
Horizontal - Peak Emission Graph




Note: See Final Measurements and Results section starting on page 144 for measurements.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

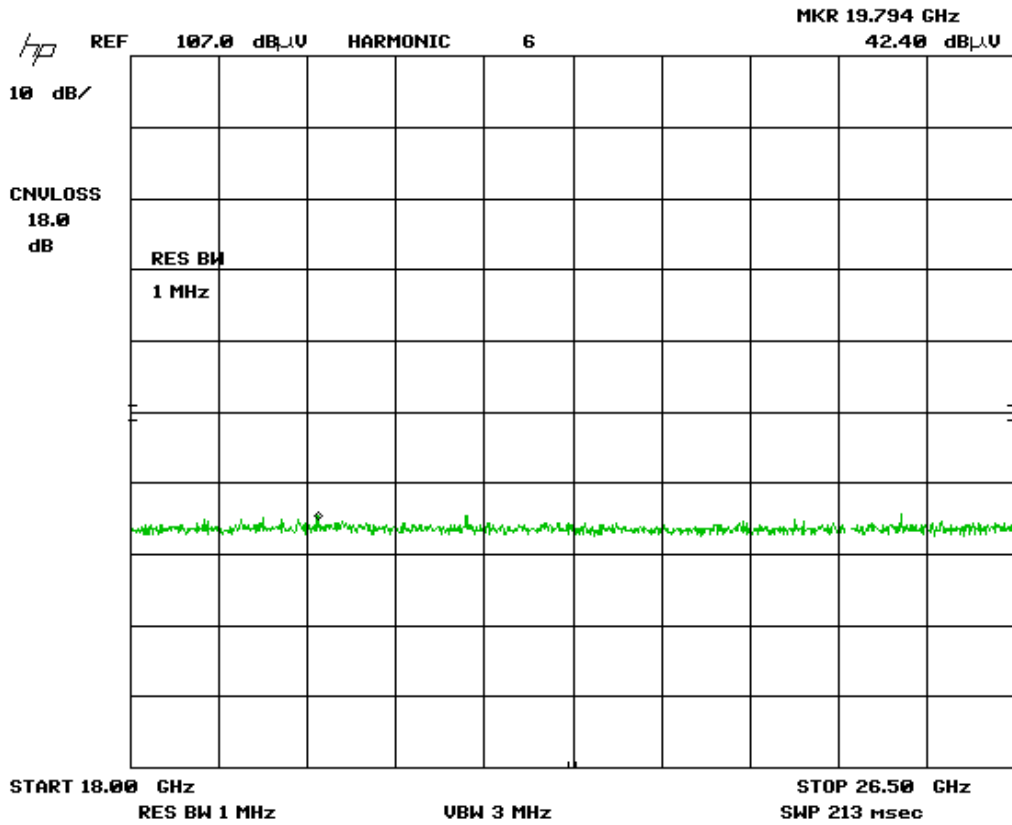
Mid Channel – 18 GHz – 26 GHz  
Horizontal - Peak Emission Graph




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

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

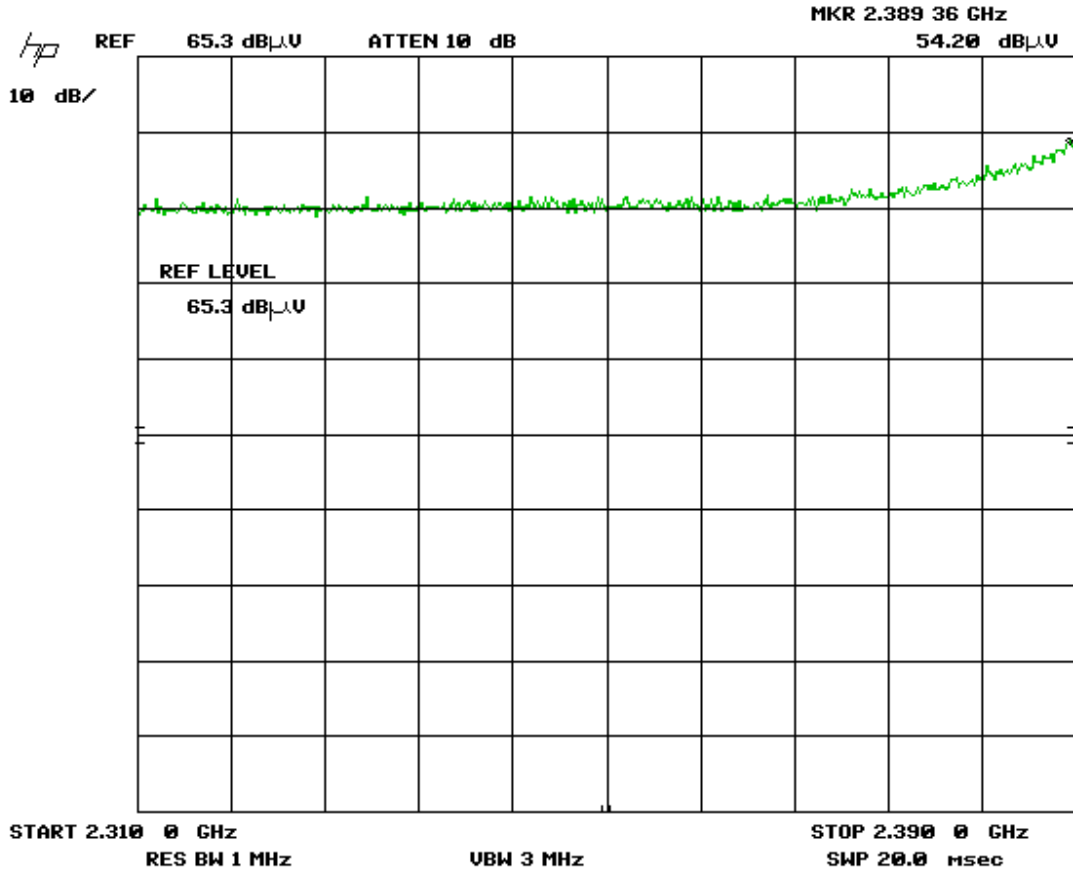
Mid Channel – 18 GHz – 26 GHz  
Vertical - Peak Emission Graph




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

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

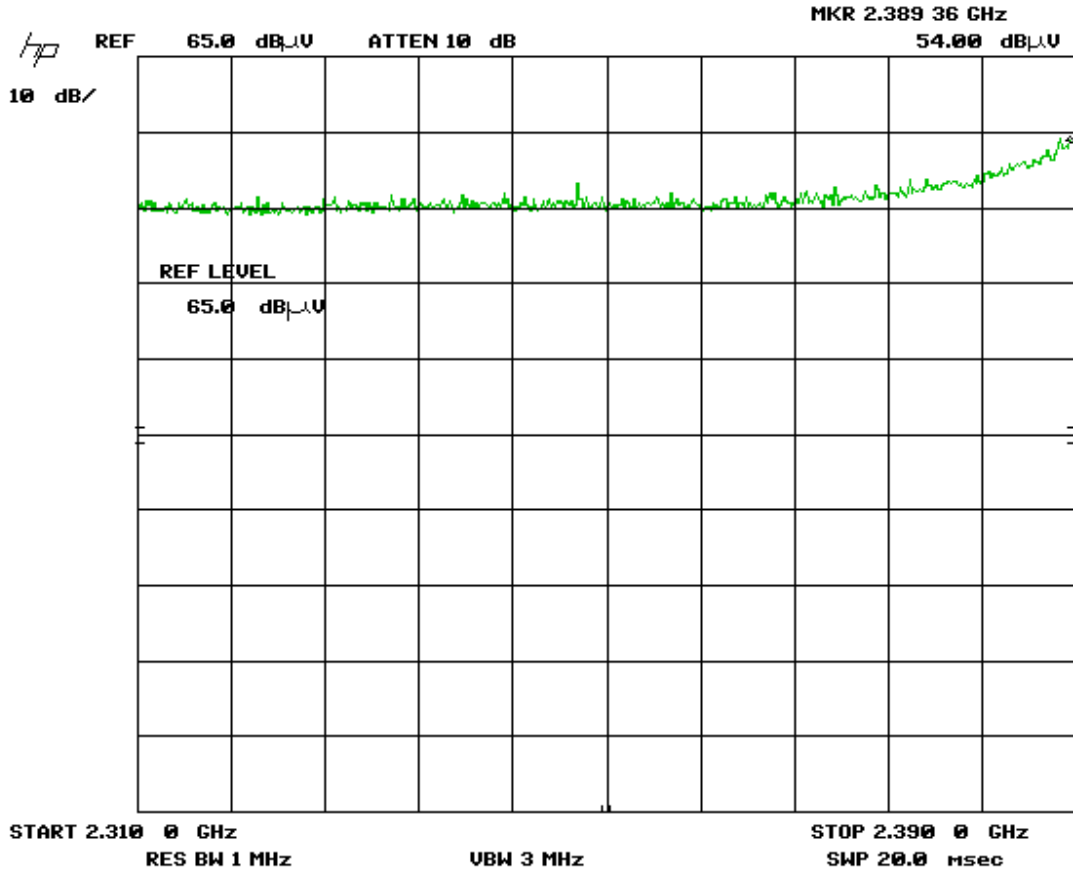
Restricted-Band, Band Edge – Low Channel  
Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

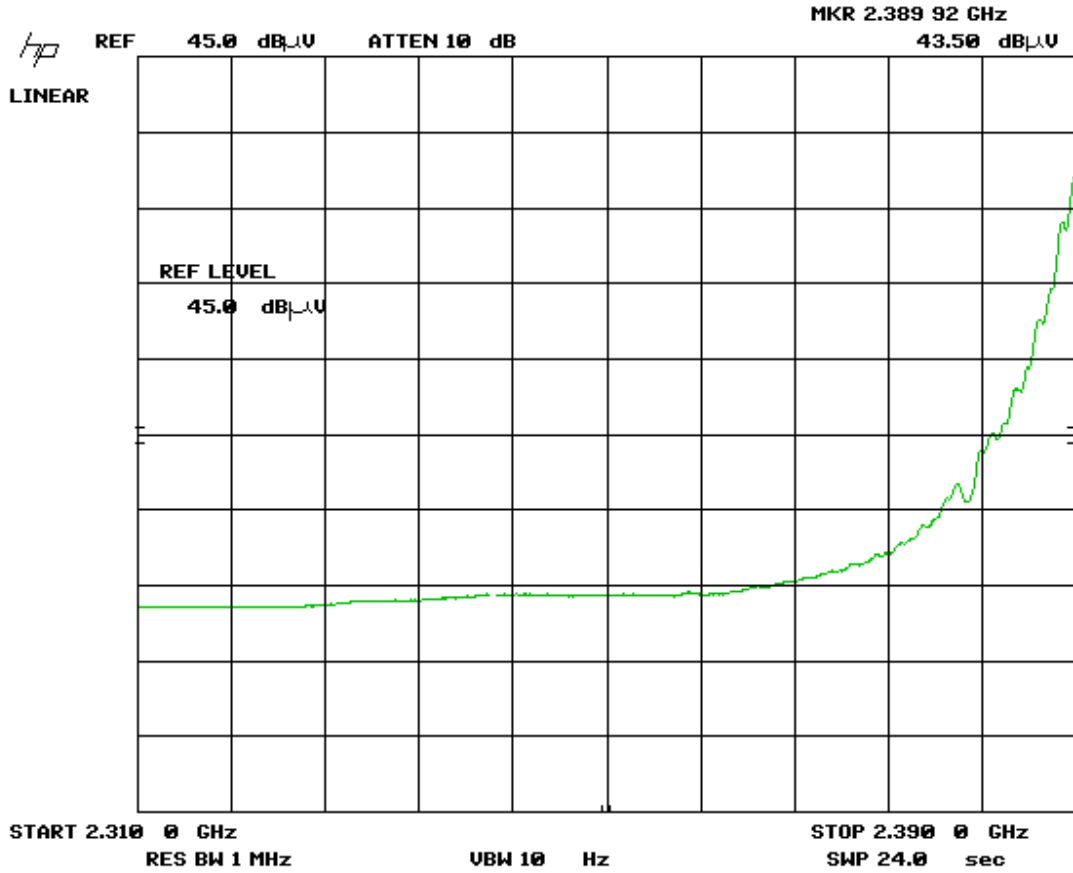
Restricted-Band, Band Edge – Low Channel  
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

Restricted-Band, Band Edge – Low Channel  
Vertical – Average Emission

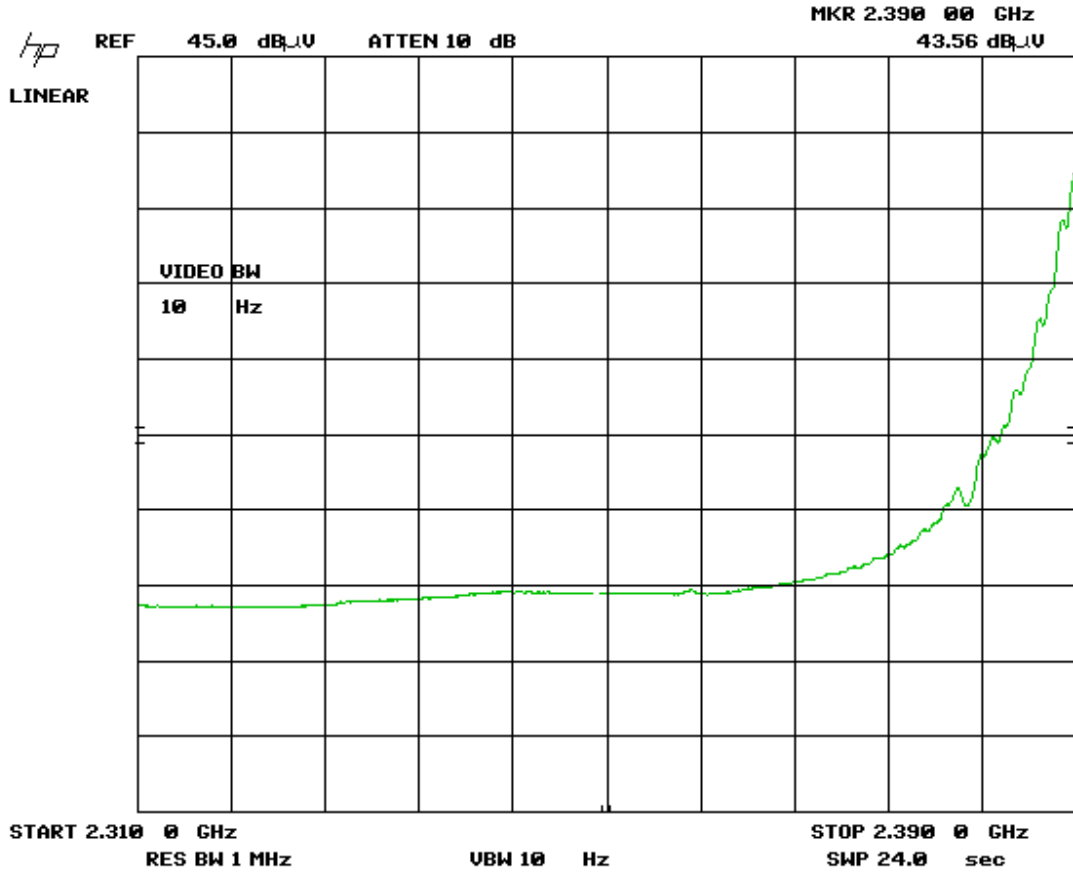


Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

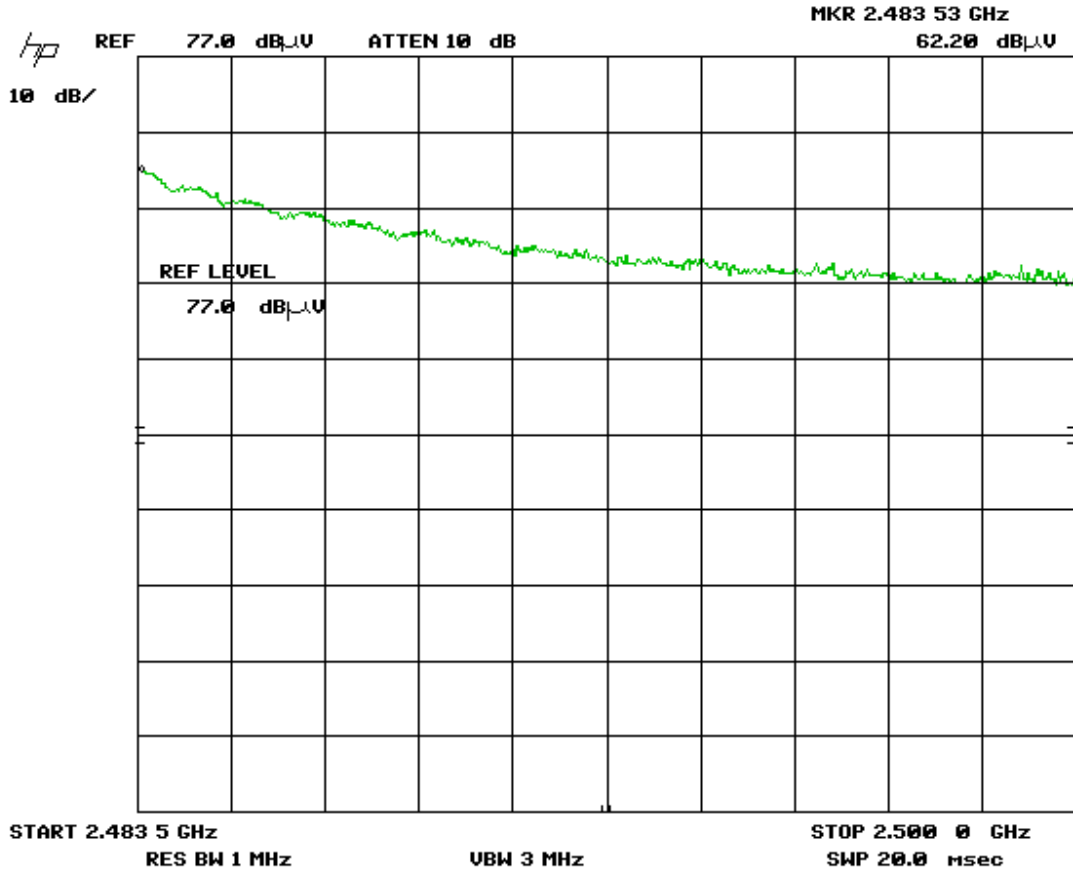
Restricted-Band, Band Edge – Low Channel  
Horizontal - Average Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

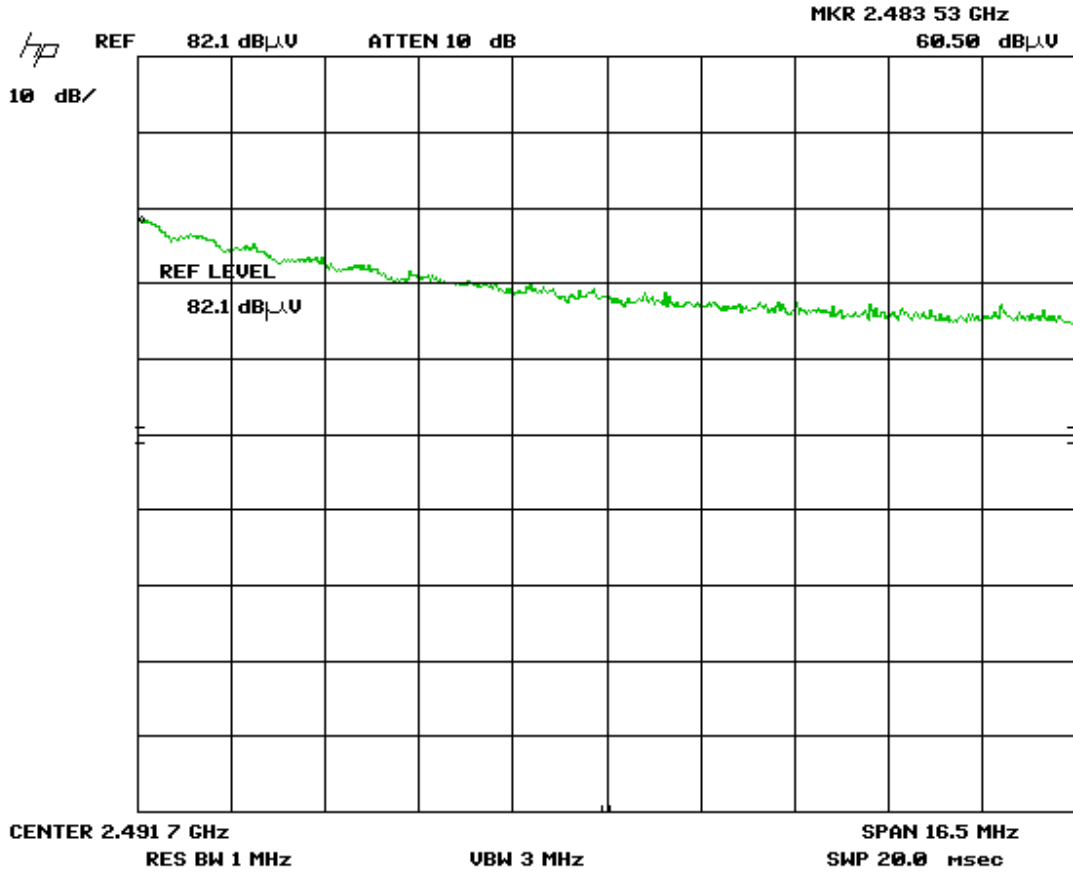
Restricted-Band, Band Edge – Channel 0x19  
Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

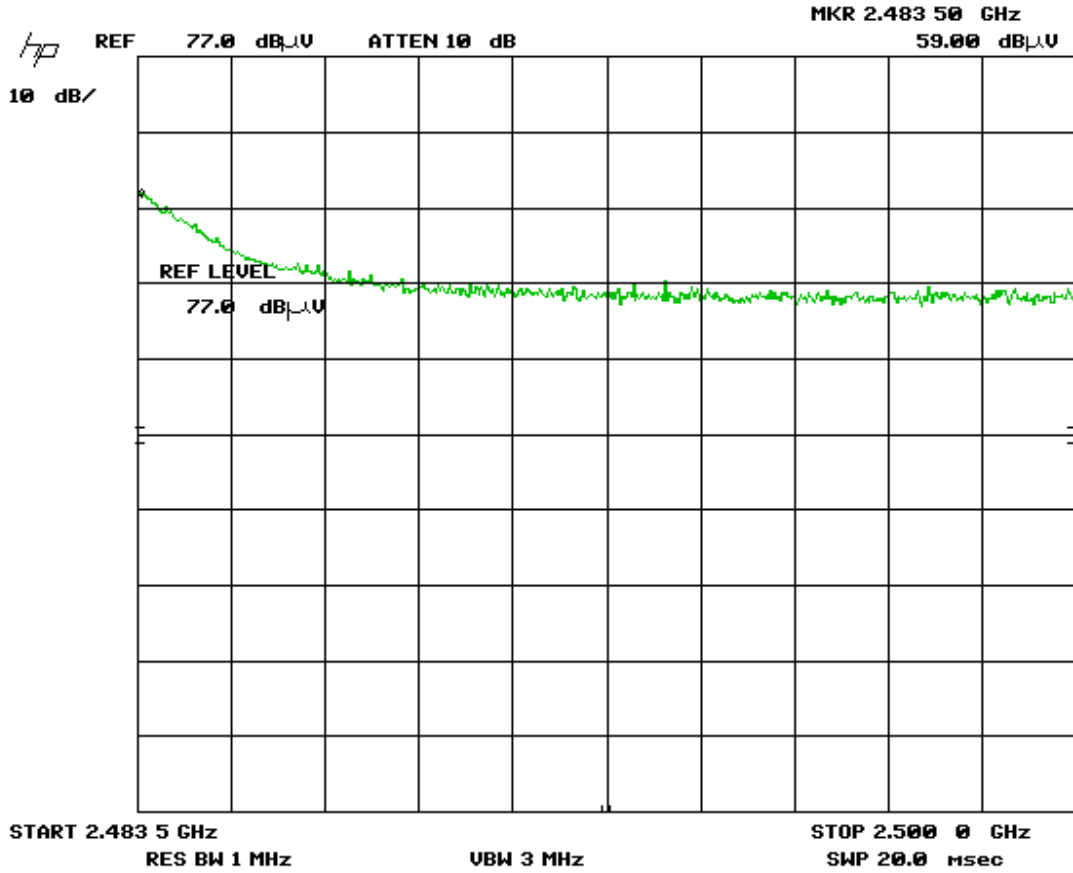
Restricted-Band, Band Edge – Channel 0x19  
Horizontal - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

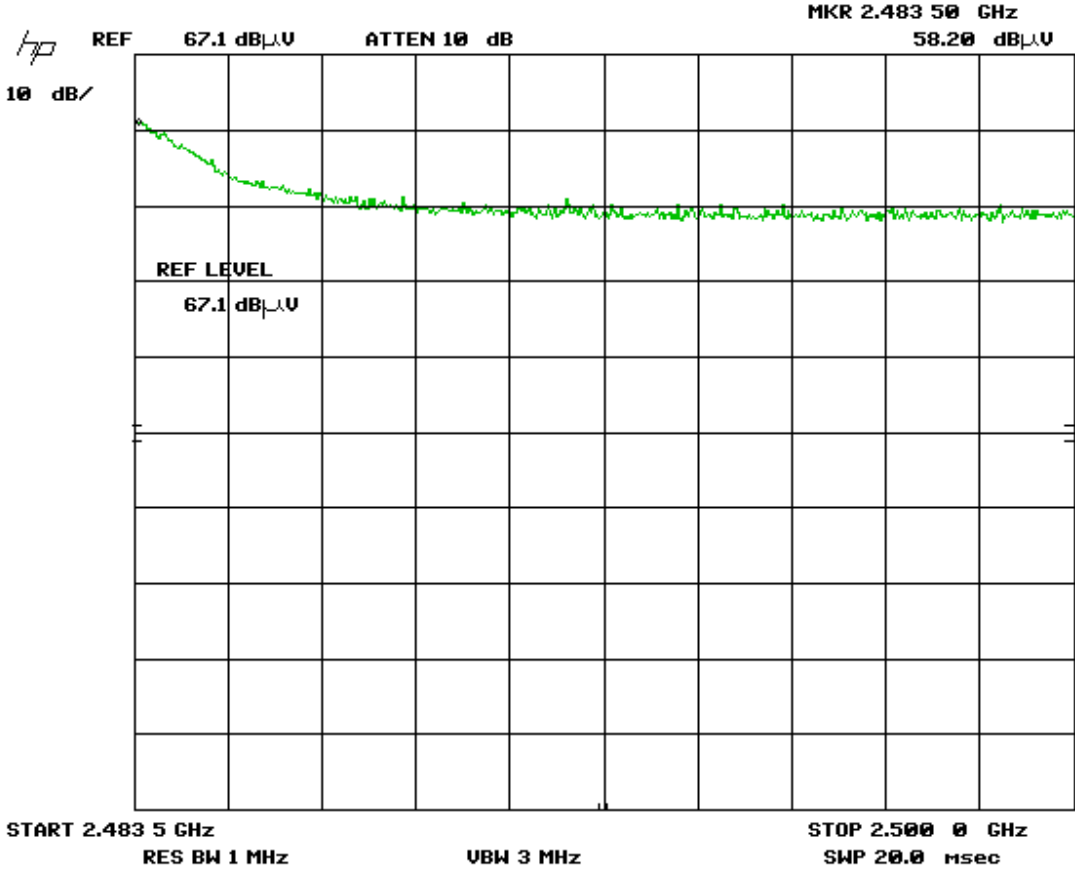
Restricted-Band, Band Edge – Channel 0x1A  
Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

Restricted-Band, Band Edge – Channel 0x1A  
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 starting on page 144 for corrected values.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

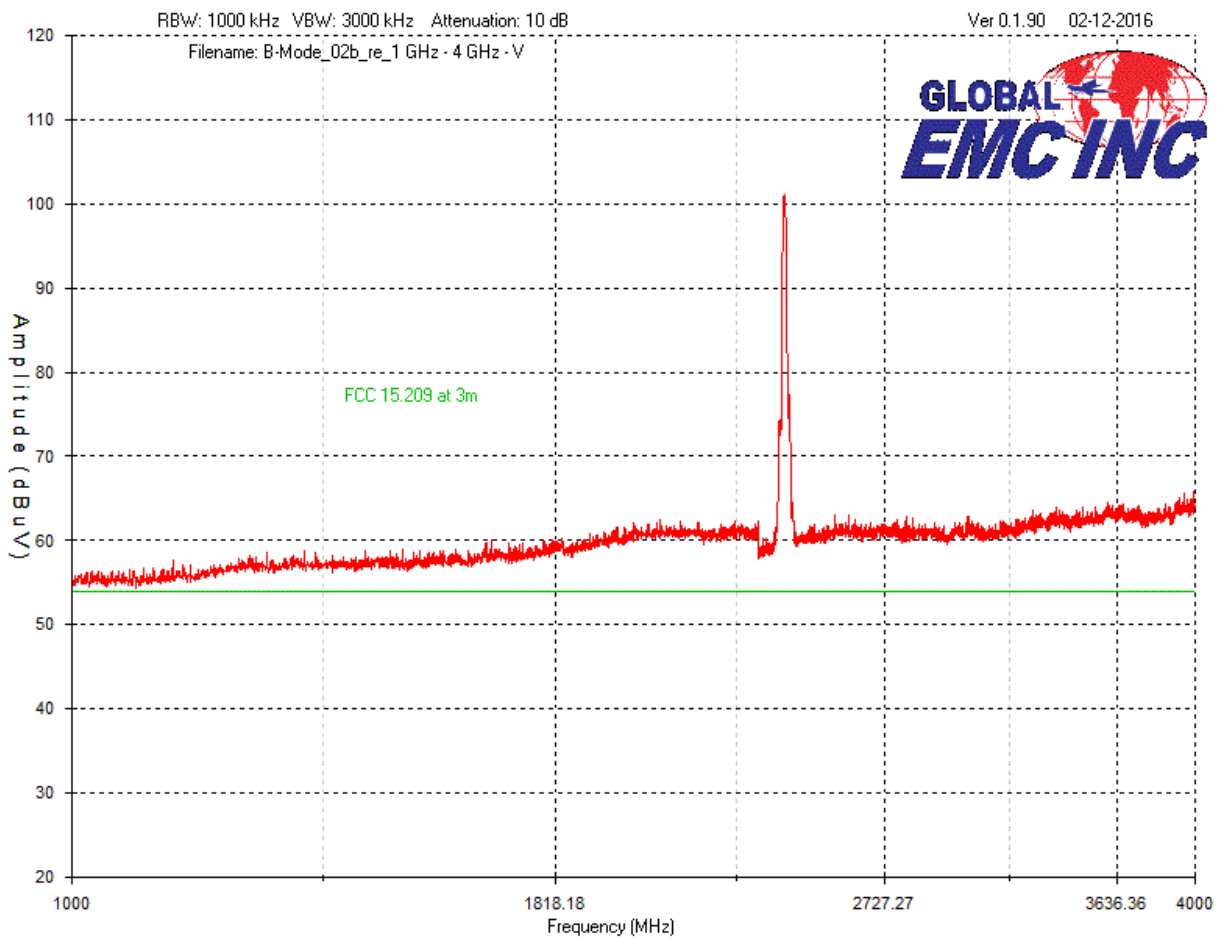
## WIFI

Both B, G, and N modes were tested for spurious emission. The worst case peak graphs are presented below.


Band edge emissions for both protocols were presented.

Emissions between 9 kHz – 1 GHz were identical to peak emission graphs shown in Zigbee Peak Graphs.

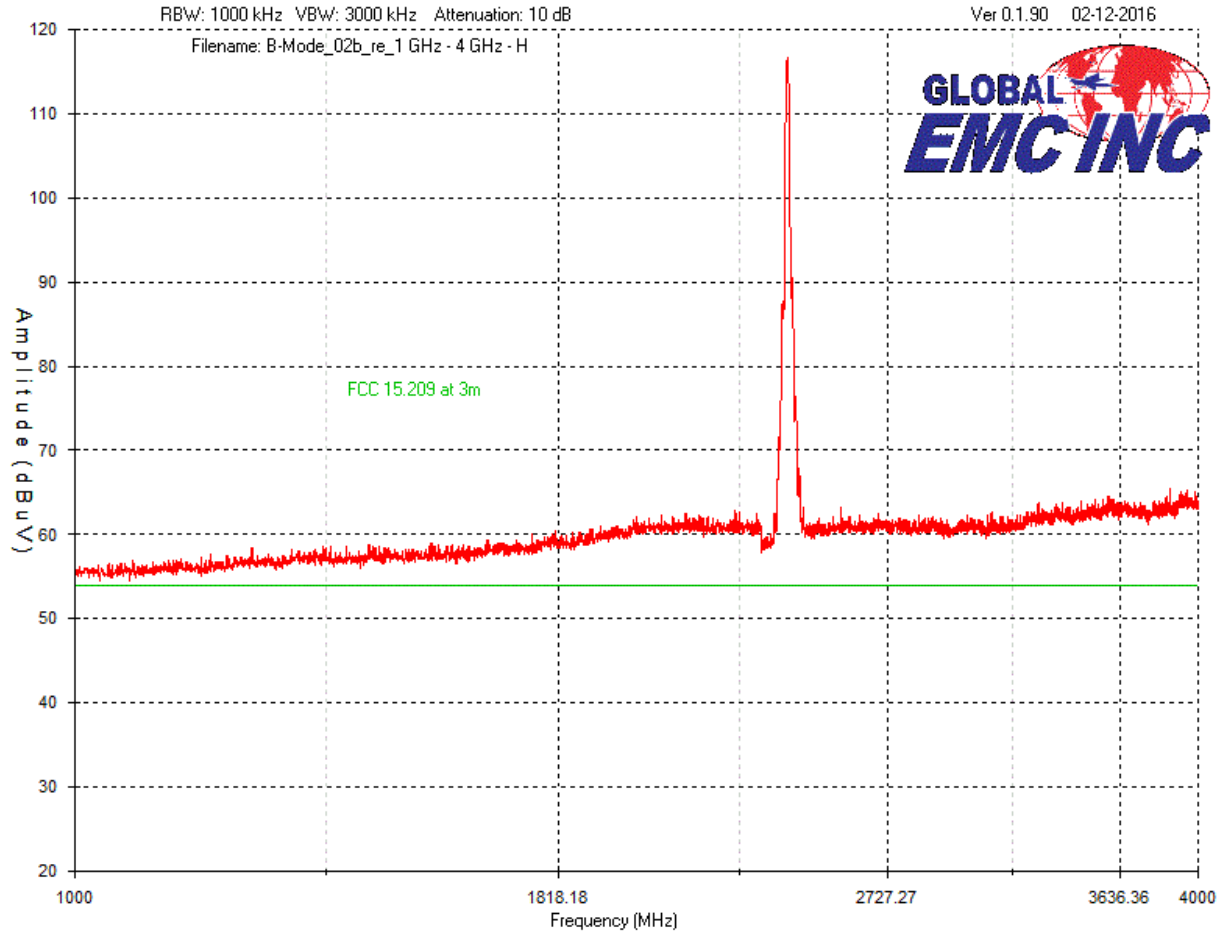
Mid Channel – 1 GHz – 4 GHz  
Vertical - Peak Emission Graph




Note: due to the attenuation used in from of the pre-amp, the noise floor of the measurement instrument was higher than average limit. See Graph 1: Zigbee vertical average emission, 1 GHz – 4 GHz. for average plot.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

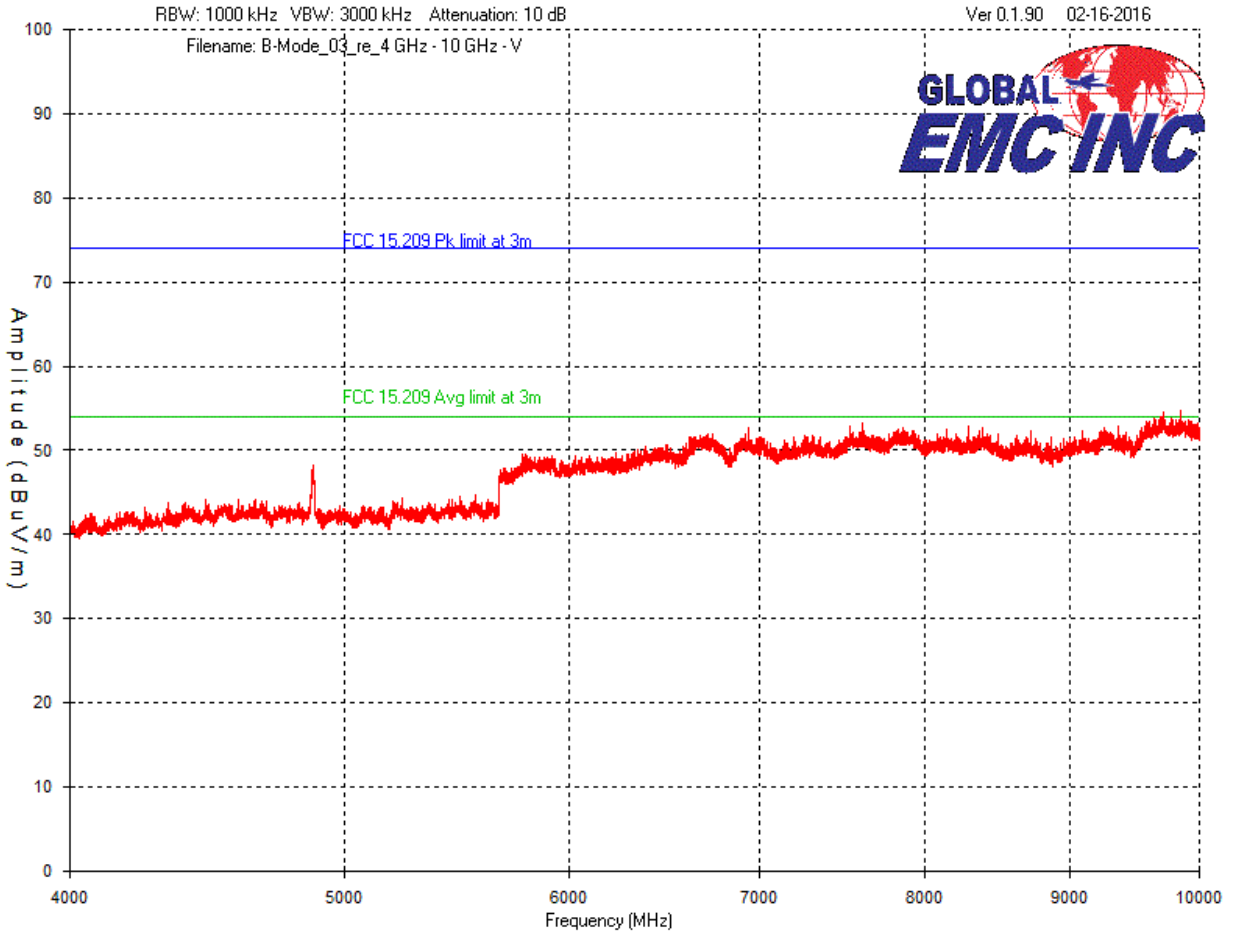
Mid Channel – 1 GHz – 4 GHz  
Horizontal - Peak Emission Graph



Note: due to the attenuation used in from of the pre-amp, the noise floor of the measurement instrument was higher than average limit. See Graph 4: WIFI B-Mode horizontal average emission, 1 GHz – 4 GHz. for average plot.


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

**Mid Channel – 4 GHz – 10 GHz  
Vertical - Peak Emission Graph**

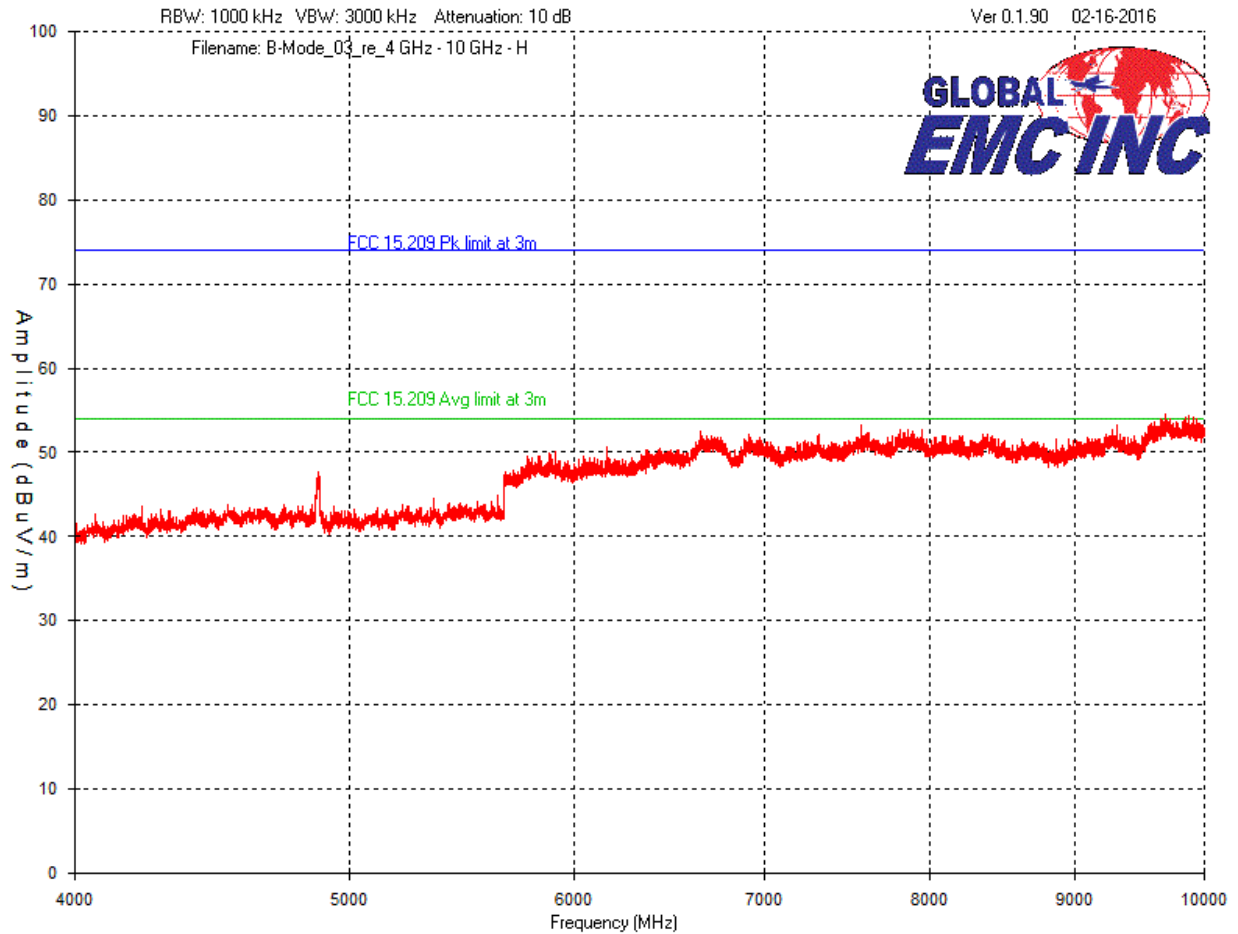


Note: See Final Measurements and Results section starting on page 144 for measurements.




Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

**Mid Channel – 4 GHz – 10 GHz  
Horizontal - Peak Emission Graph**

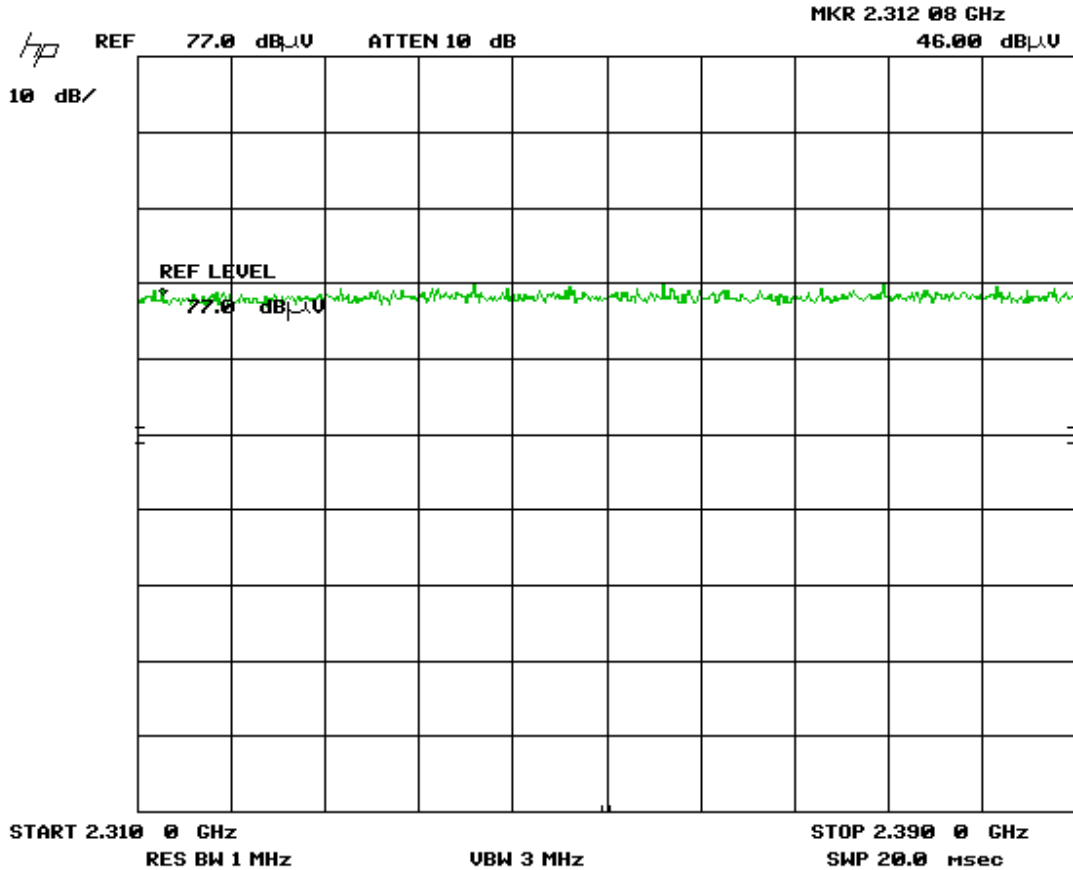


Note: See Final Measurements and Results section starting on page 144 for measurements.


There are no emissions from 10 GHz – 26 GHz. Representative Plots are provided in Zigbee Peak Graphs section.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

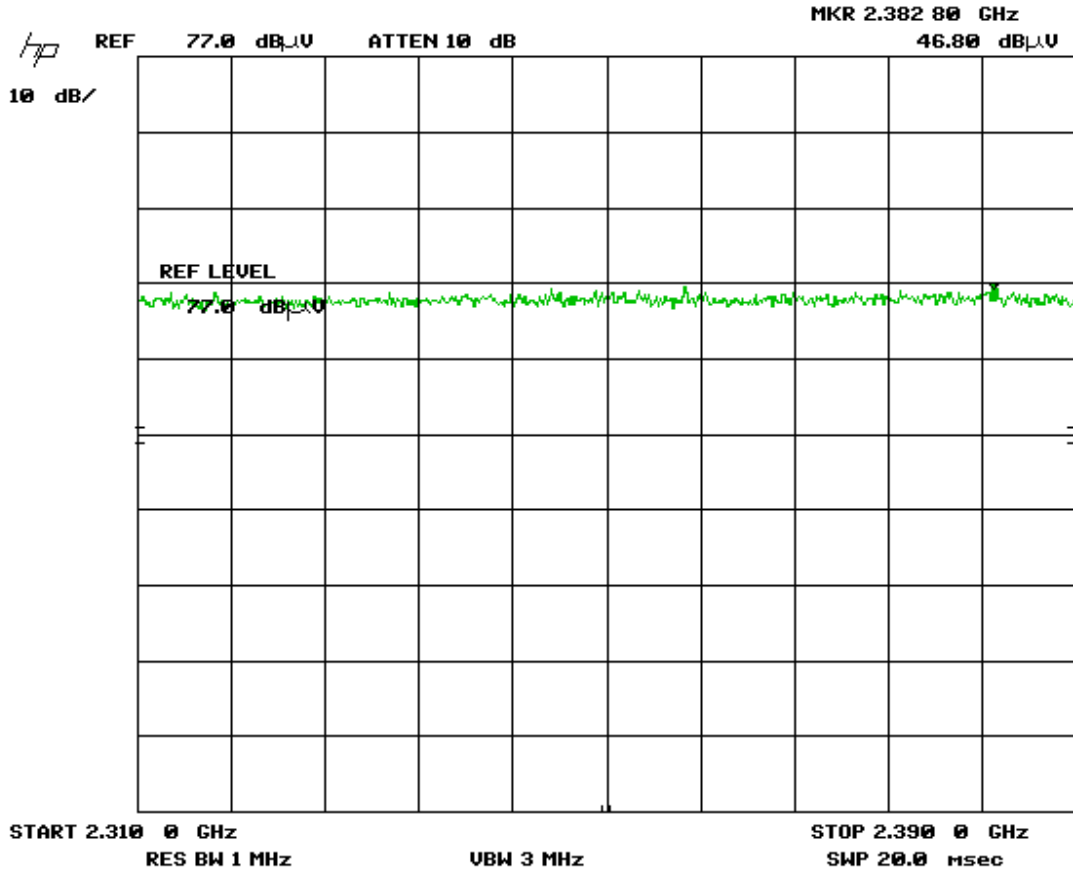
B-Mode  
Restricted-Band, Band Edge – Low Channel  
Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

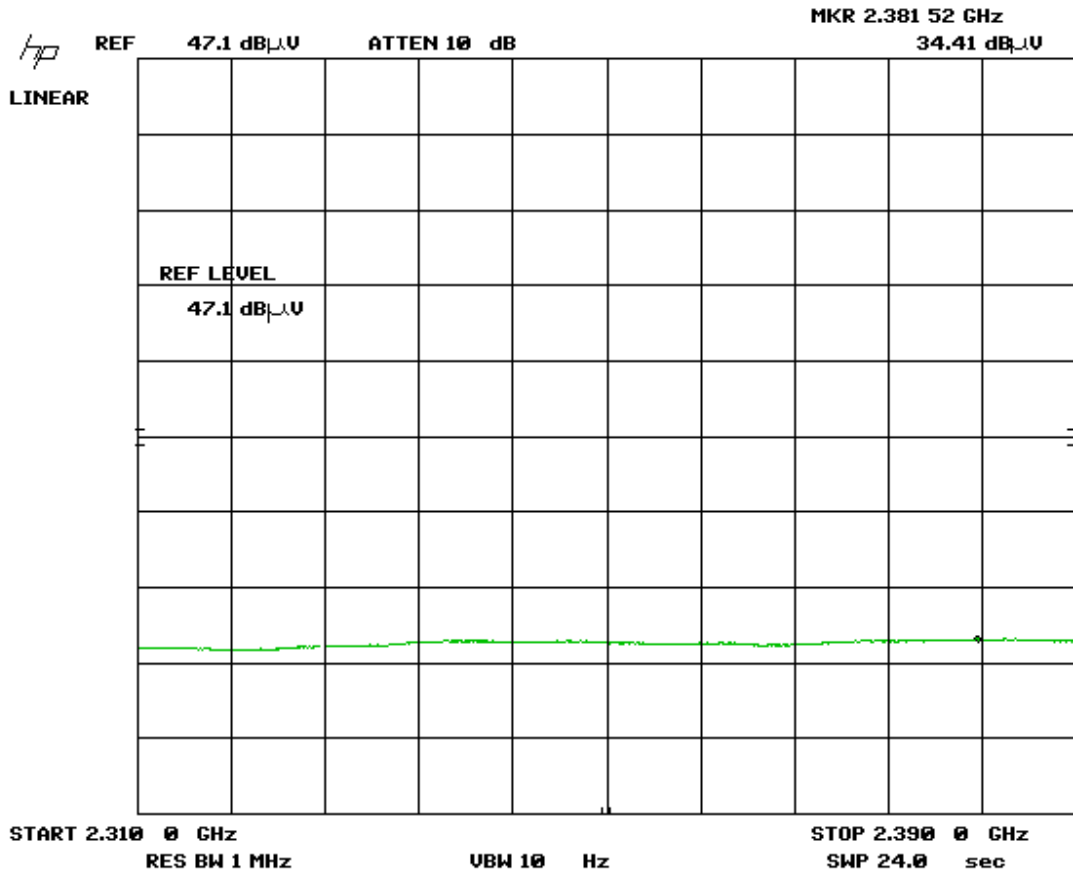
B-Mode  
Restricted-Band, Band Edge – Low Channel  
Horizontal - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

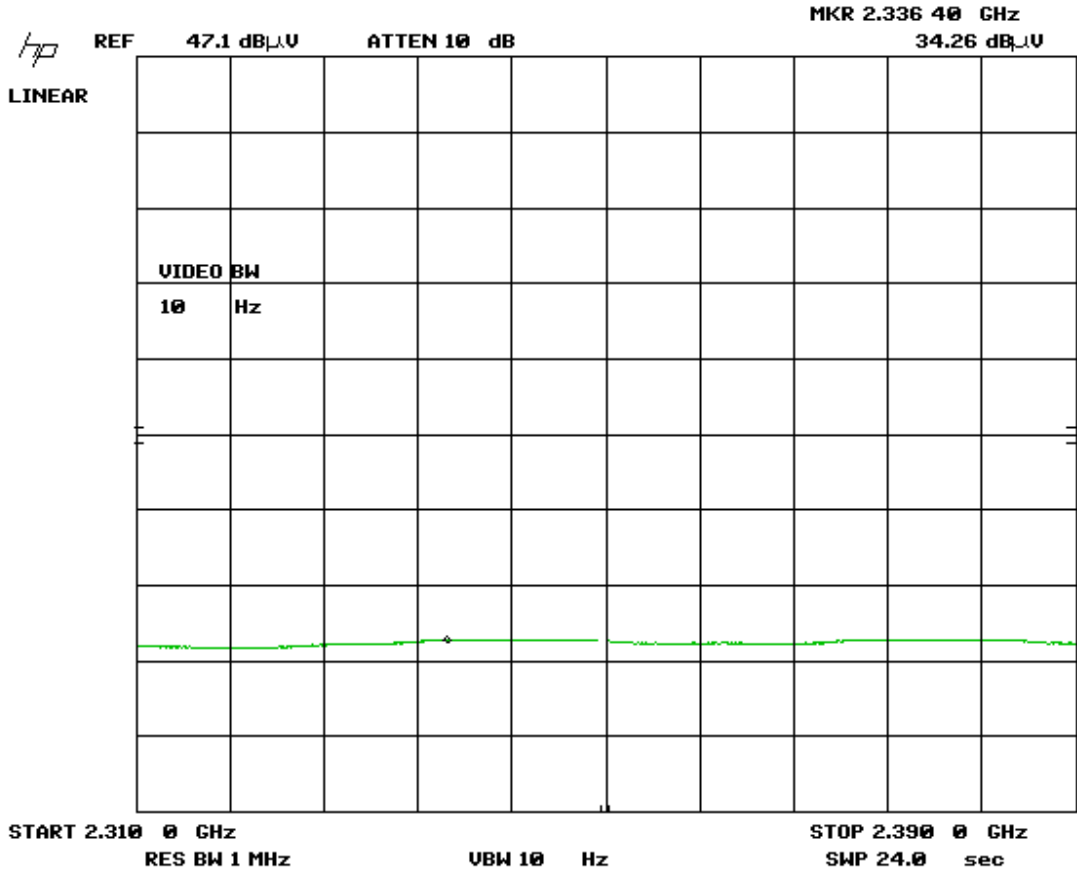
B-Mode  
 Restricted-Band, Band Edge – Low Channel  
 Vertical – Average Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

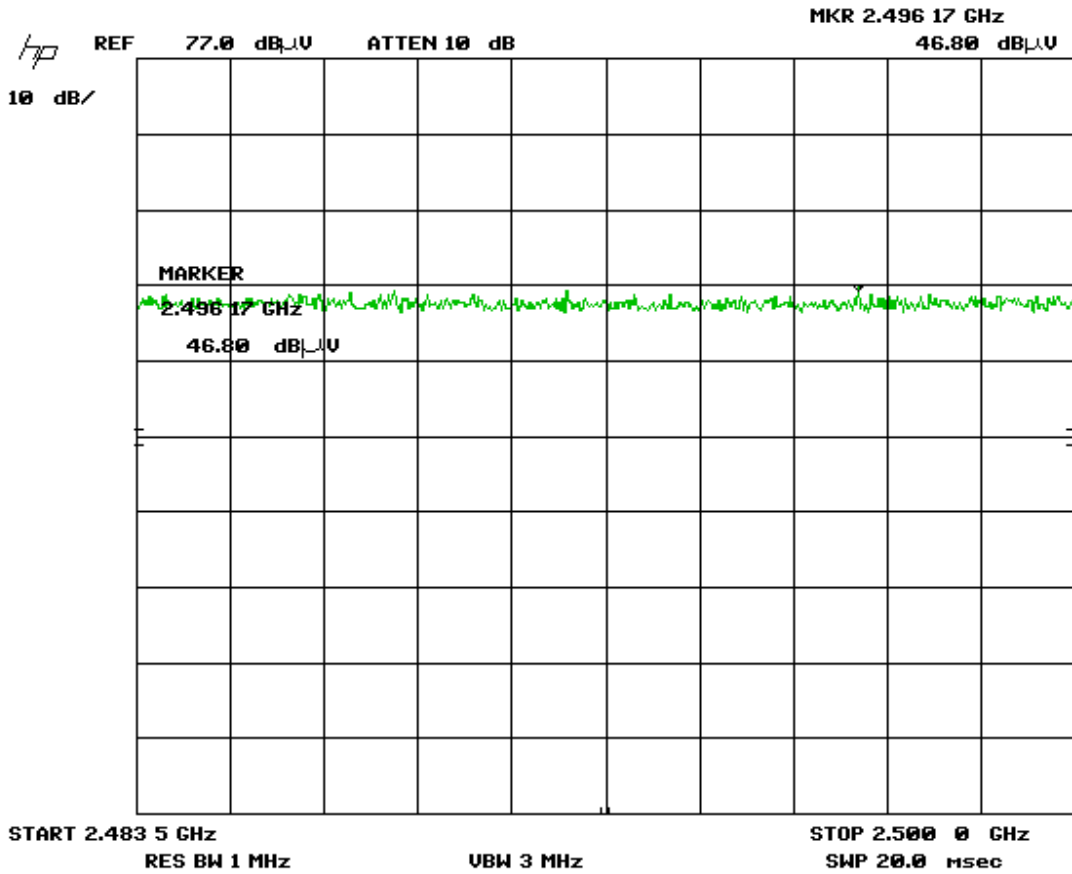
**B-Mode**  
**Restricted-Band, Band Edge – Low Channel**  
**Horizontal - Average Emission**




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

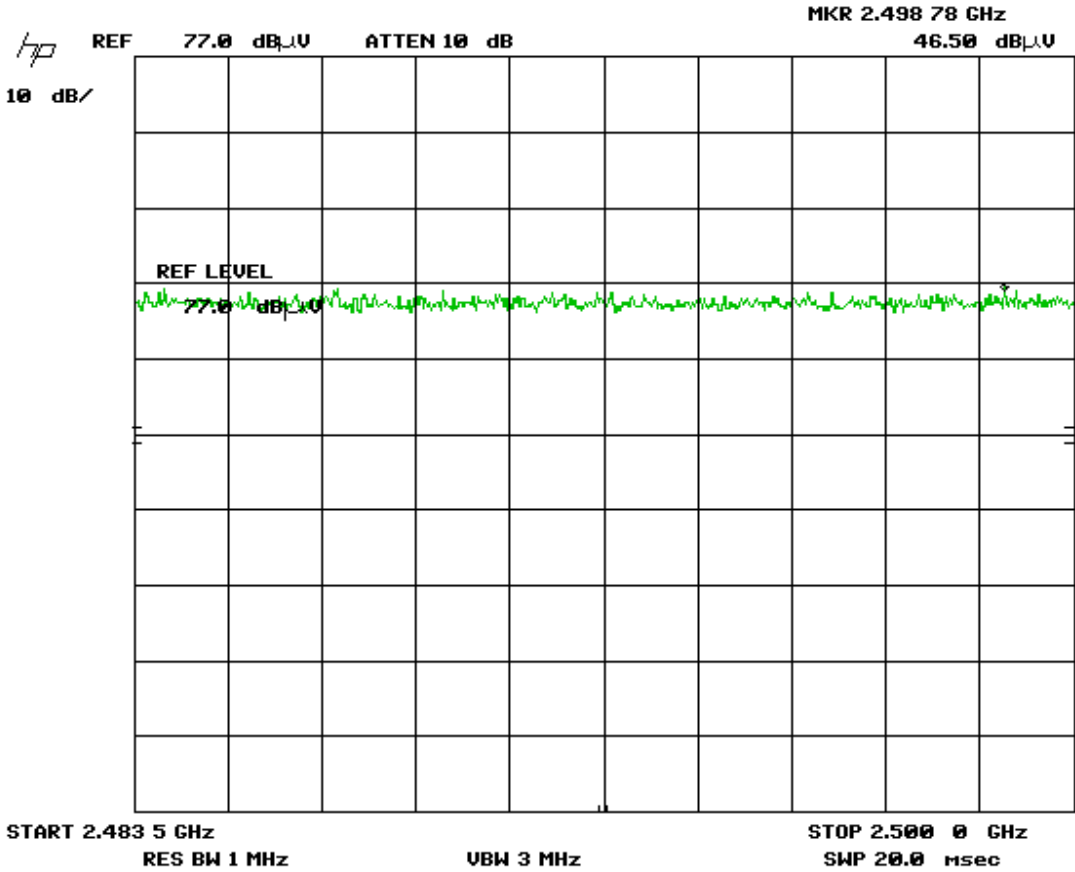
B-Mode  
 Restricted-Band, Band Edge – High Channel  
 Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

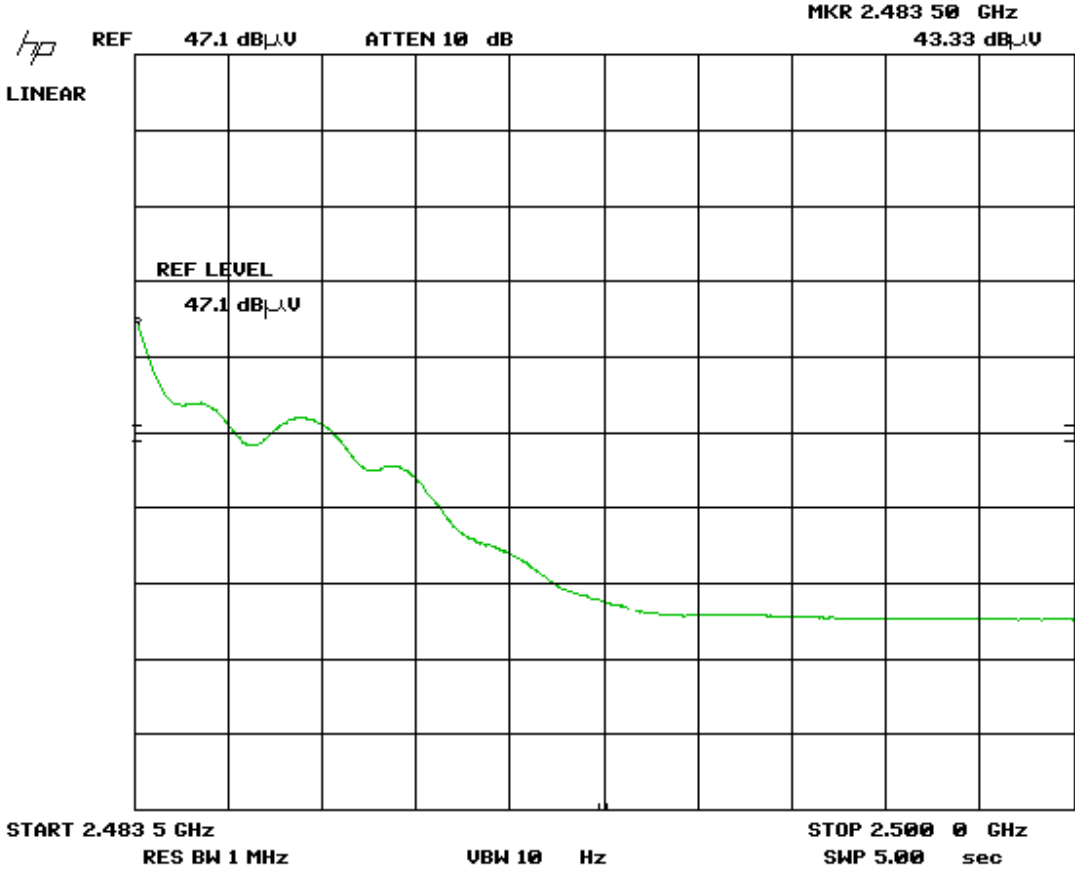
B-Mode  
 Restricted-Band, Band Edge – High Channel  
 Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

**B-Mode**  
**Restricted-Band, Band Edge – High Channel**  
**Vertical - Average Emission**

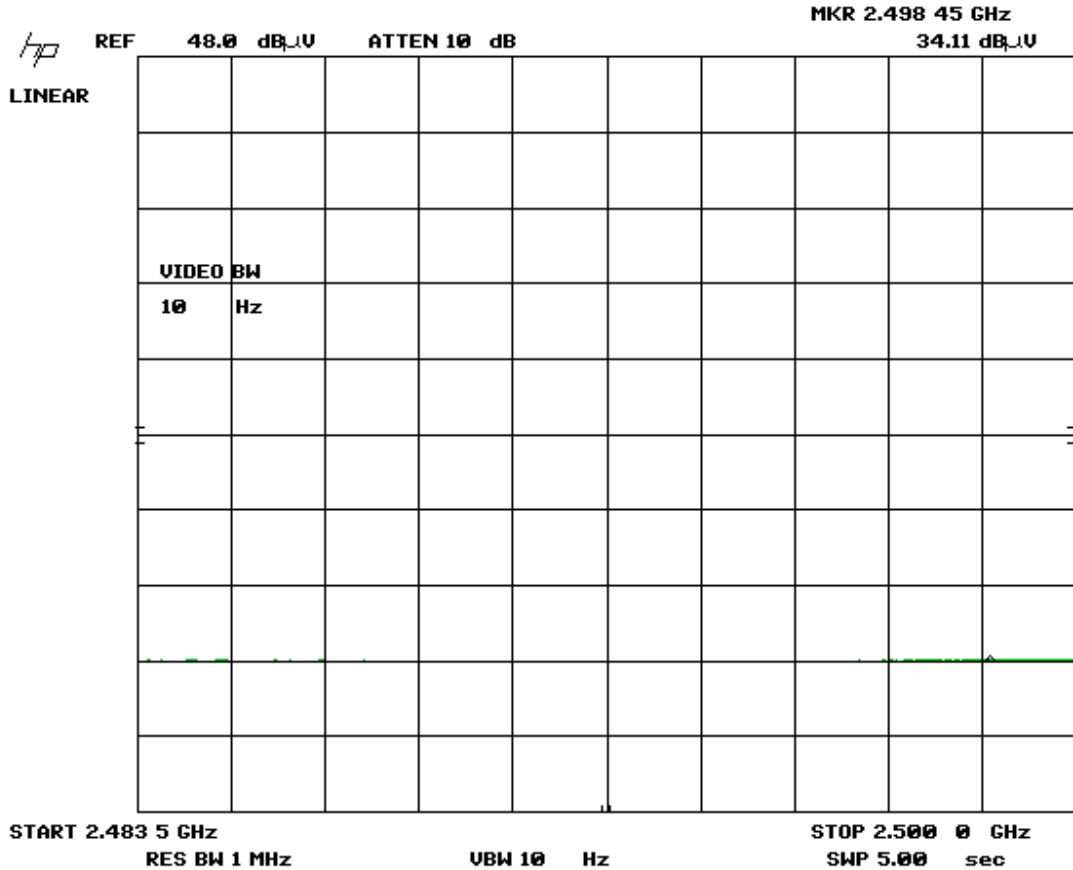


Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

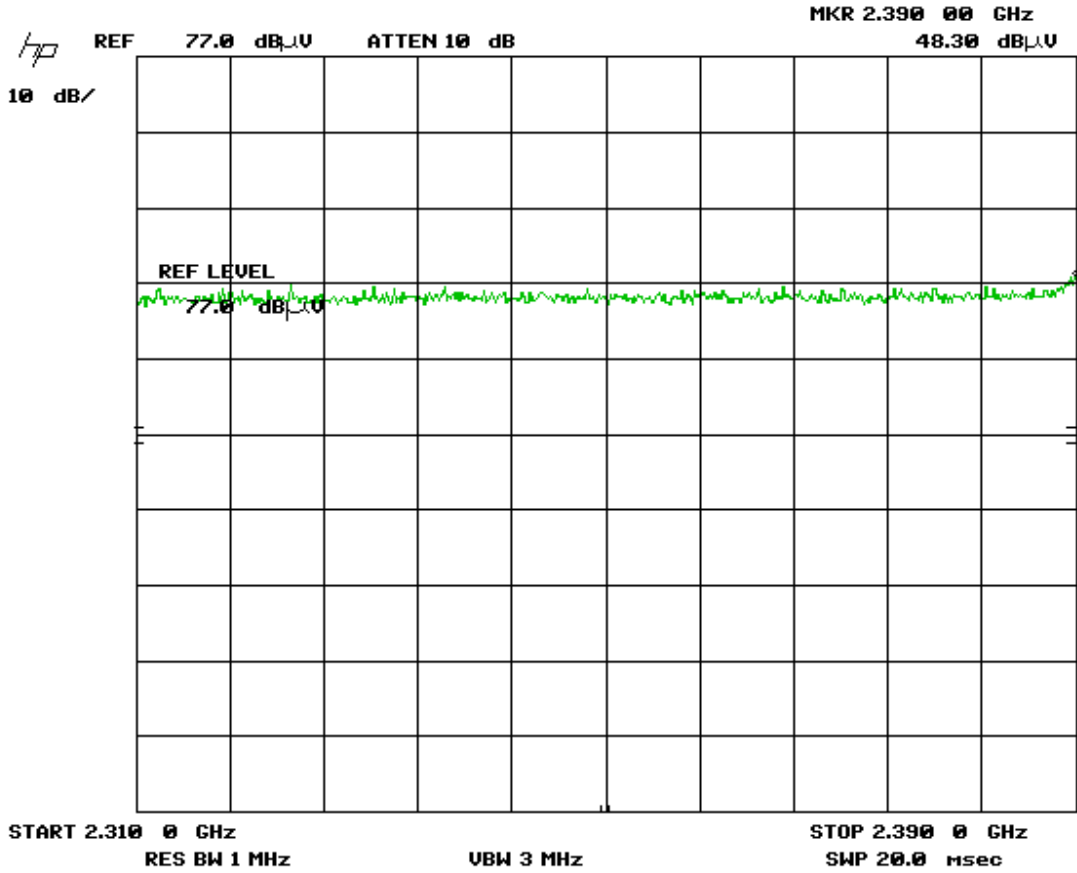
B-Mode  
 Restricted-Band, Band Edge – High Channel  
 Horizontal - Average Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

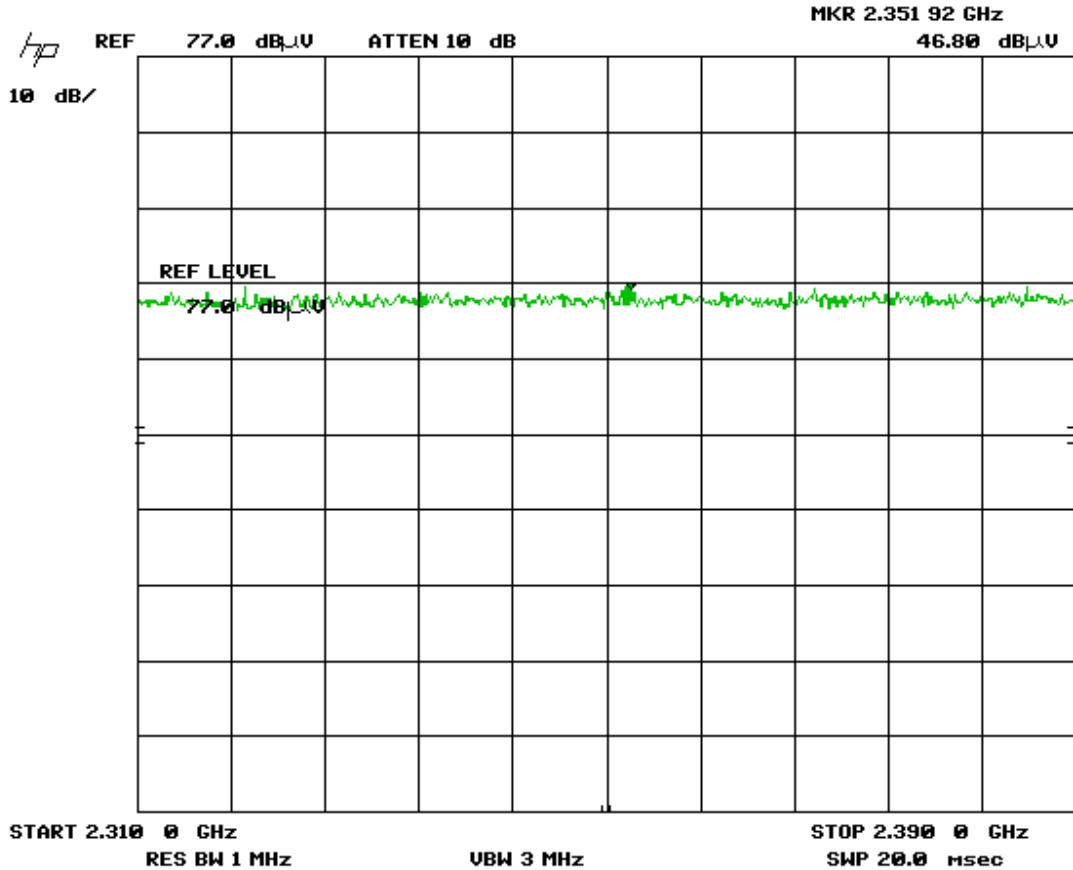
G-Mode  
 Restricted-Band, Band Edge – Low Channel  
 Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

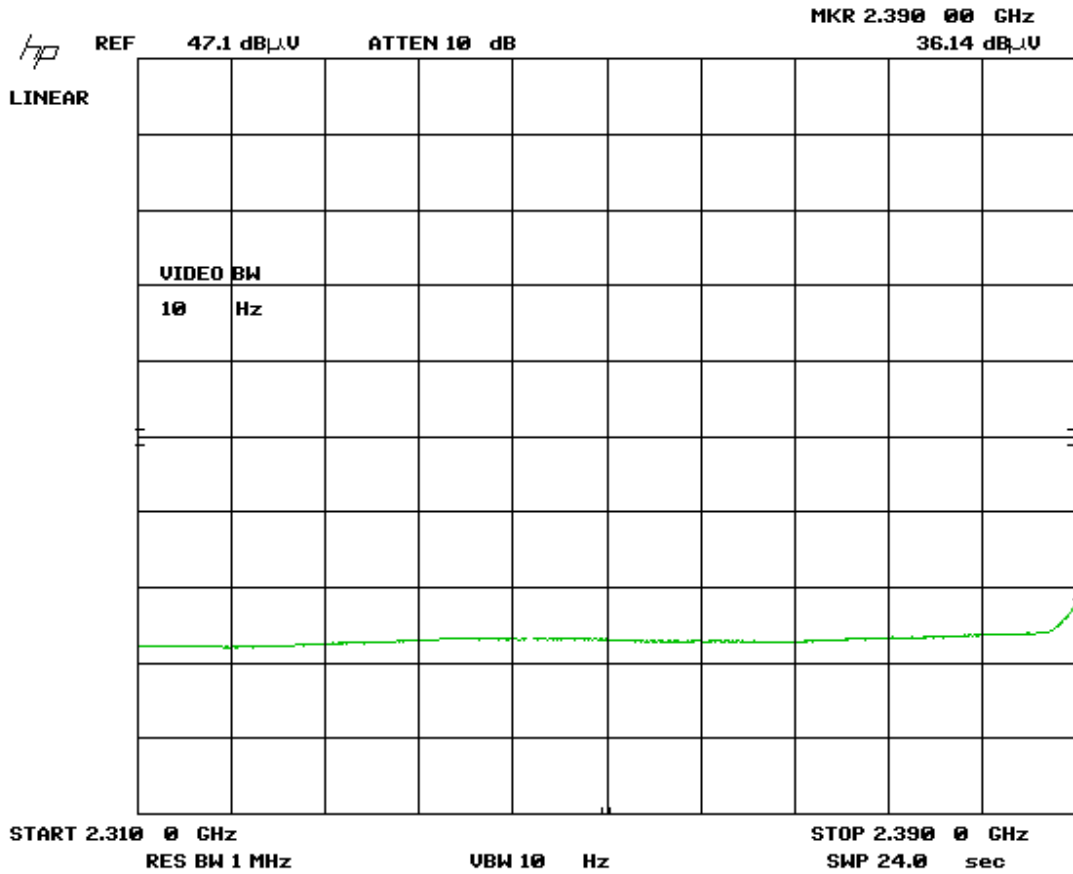
G-Mode  
Restricted-Band, Band Edge – Low Channel  
Horizontal - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

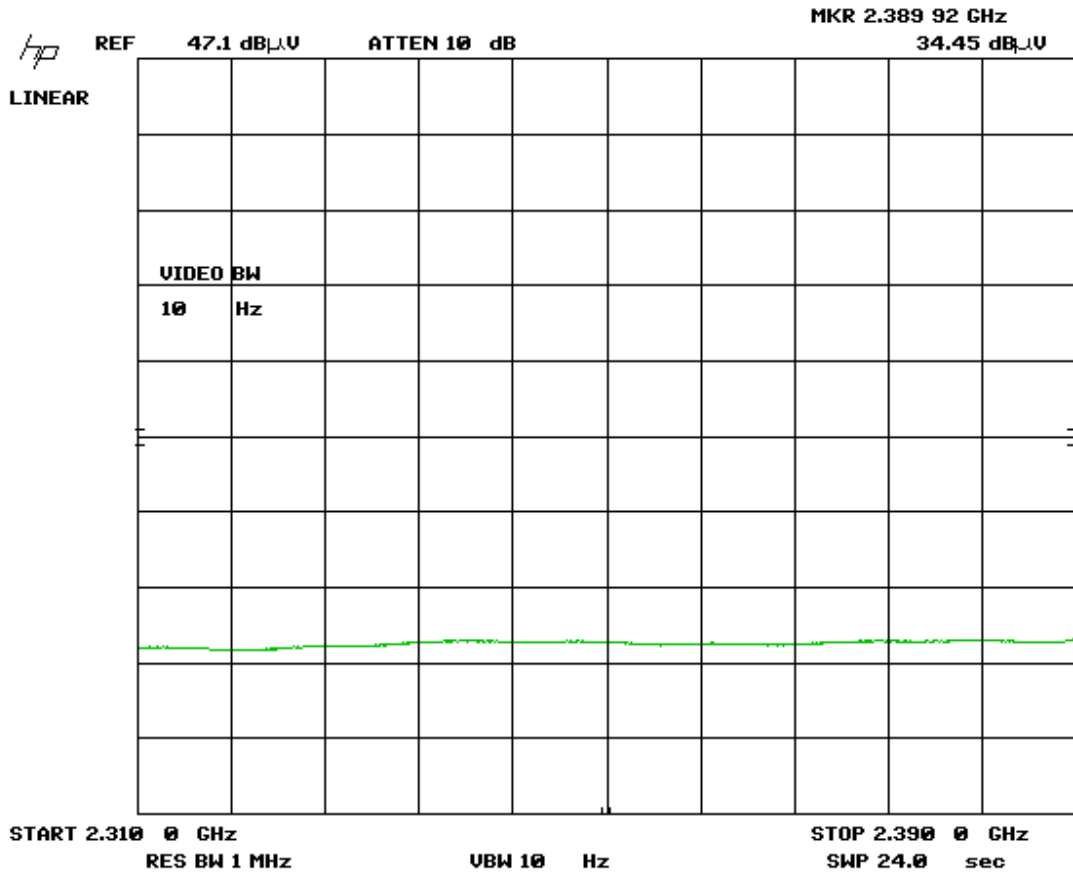
G-Mode  
Restricted-Band, Band Edge – Low Channel  
Vertical – Average Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

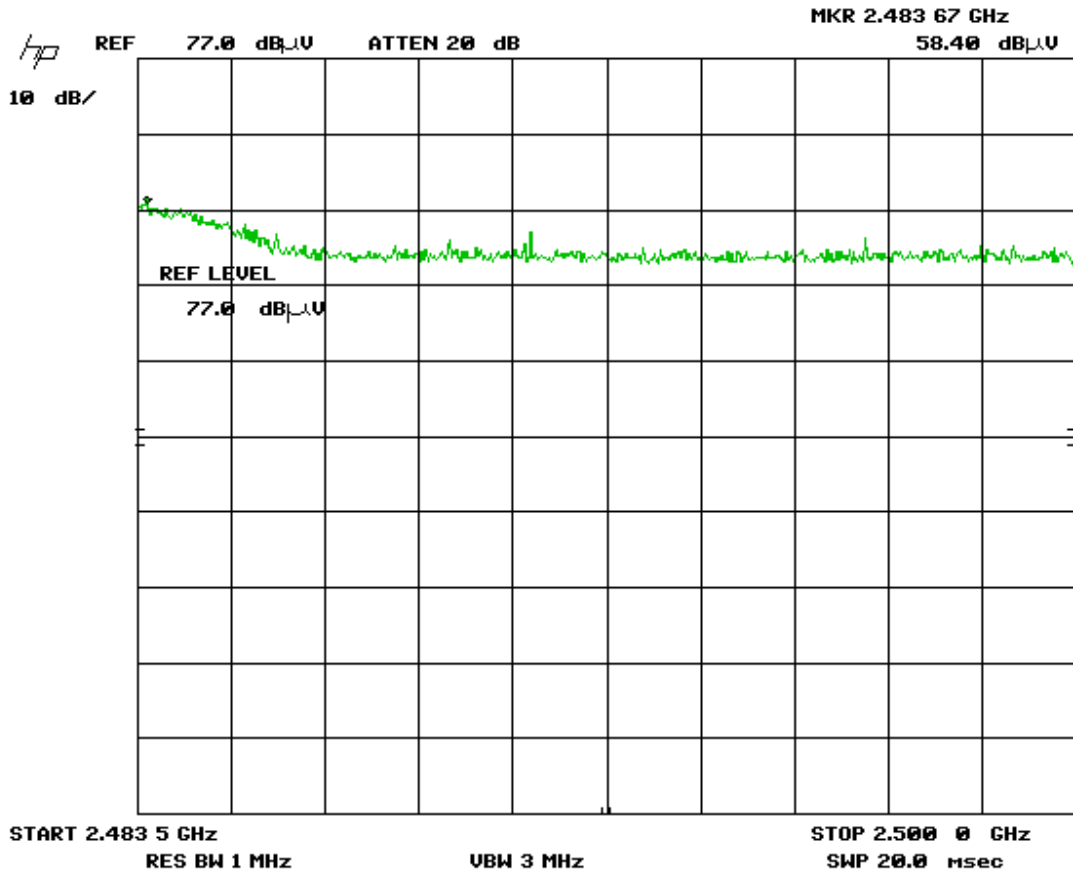
G-Mode  
Restricted-Band, Band Edge – Low Channel  
Horizontal - Average Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

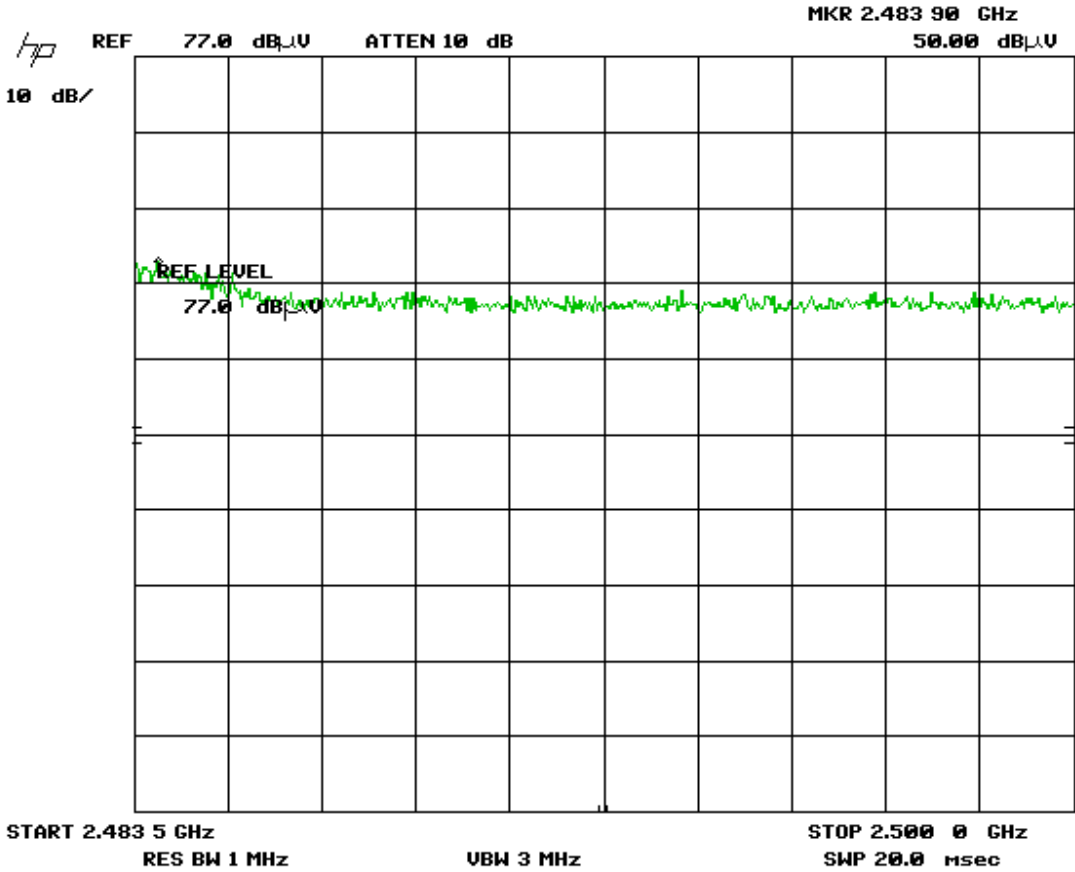
G-Mode  
Restricted-Band, Band Edge – High Channel  
Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

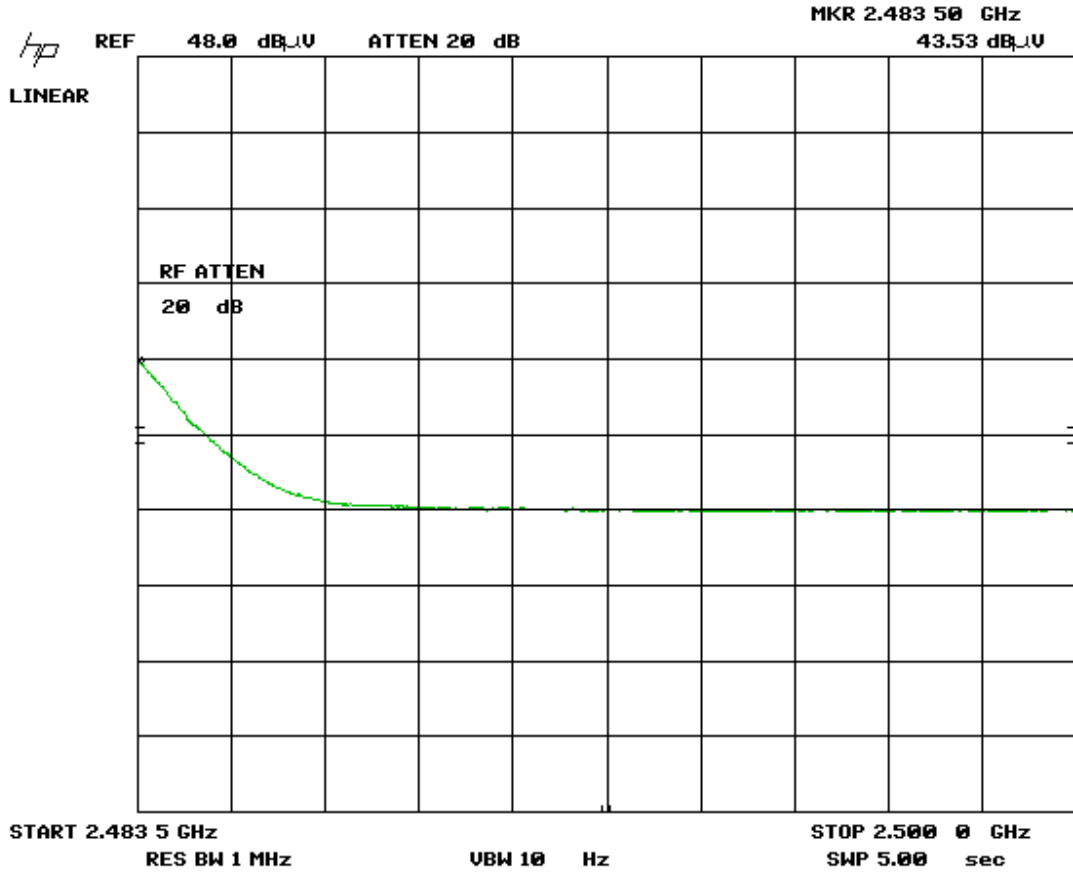
**G-Mode**  
**Restricted-Band, Band Edge – High Channel**  
**Horizontal - Peak Emission**



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

G-Mode  
Restricted-Band, Band Edge – High Channel  
Vertical - Average Emission

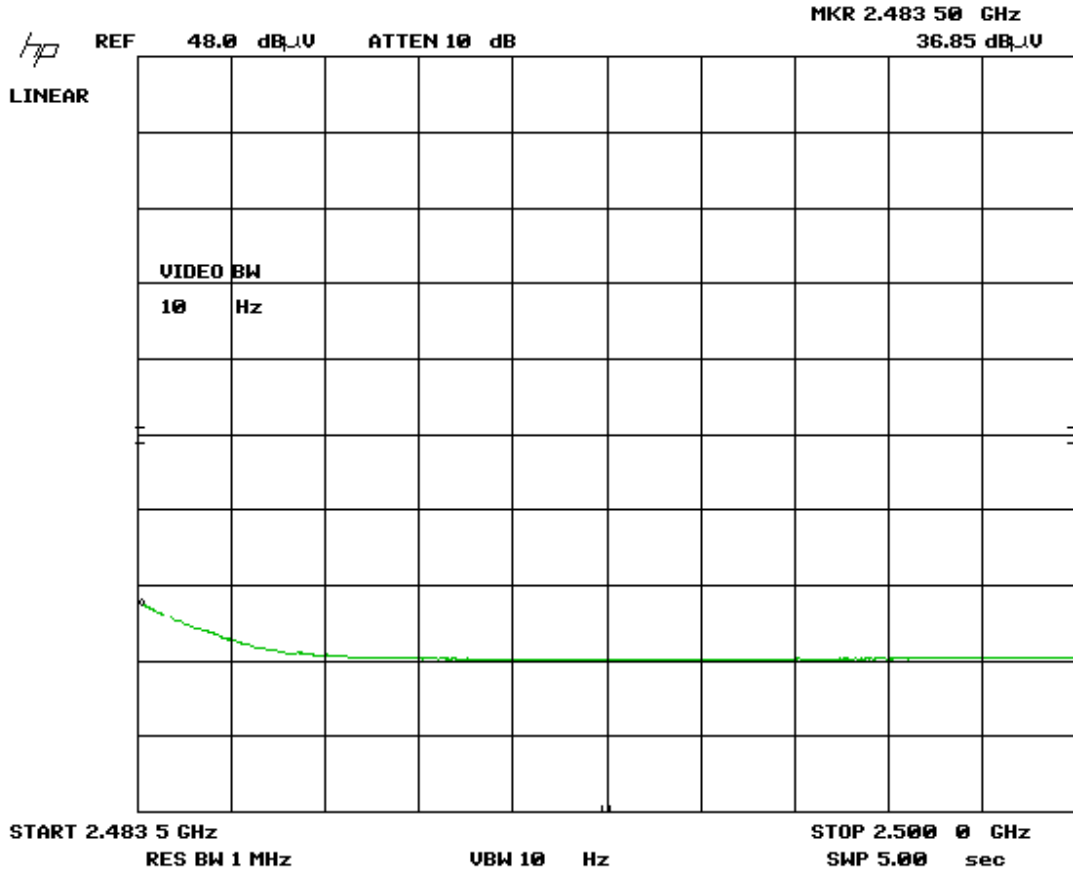


Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

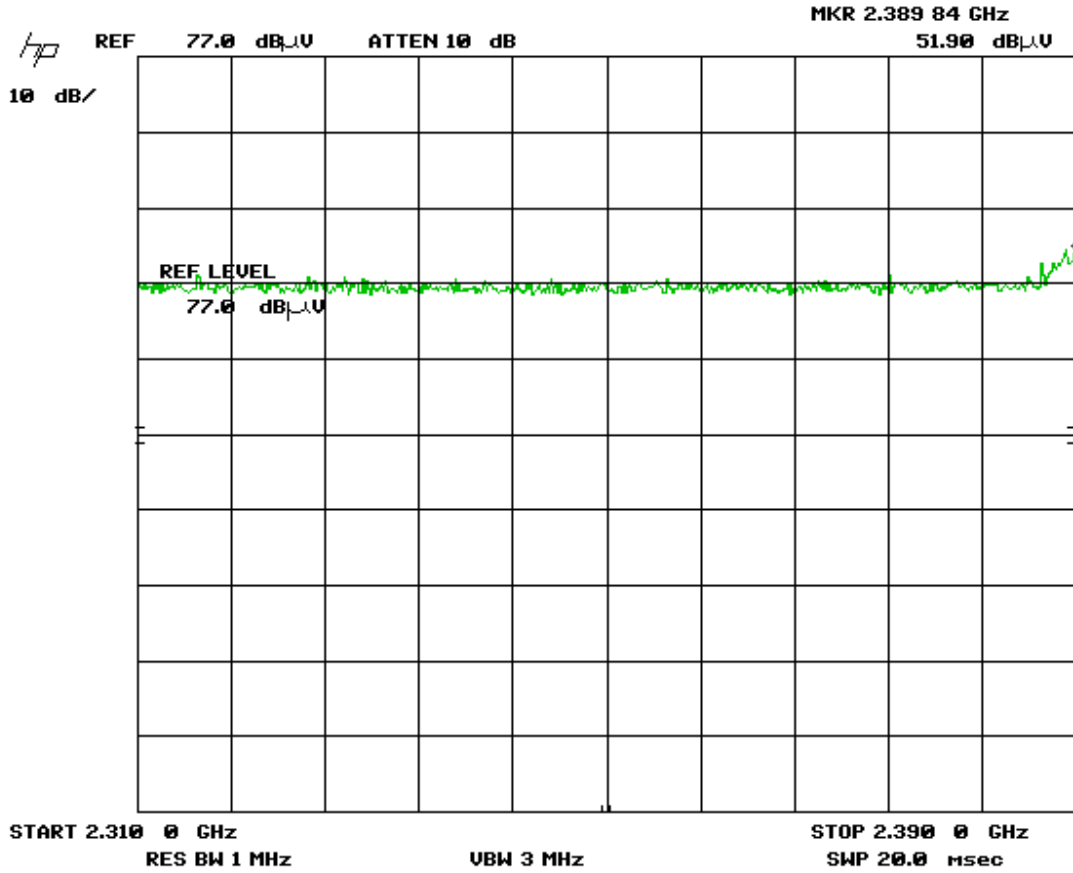
G-Mode  
 Restricted-Band, Band Edge – High Channel  
 Horizontal - Average Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

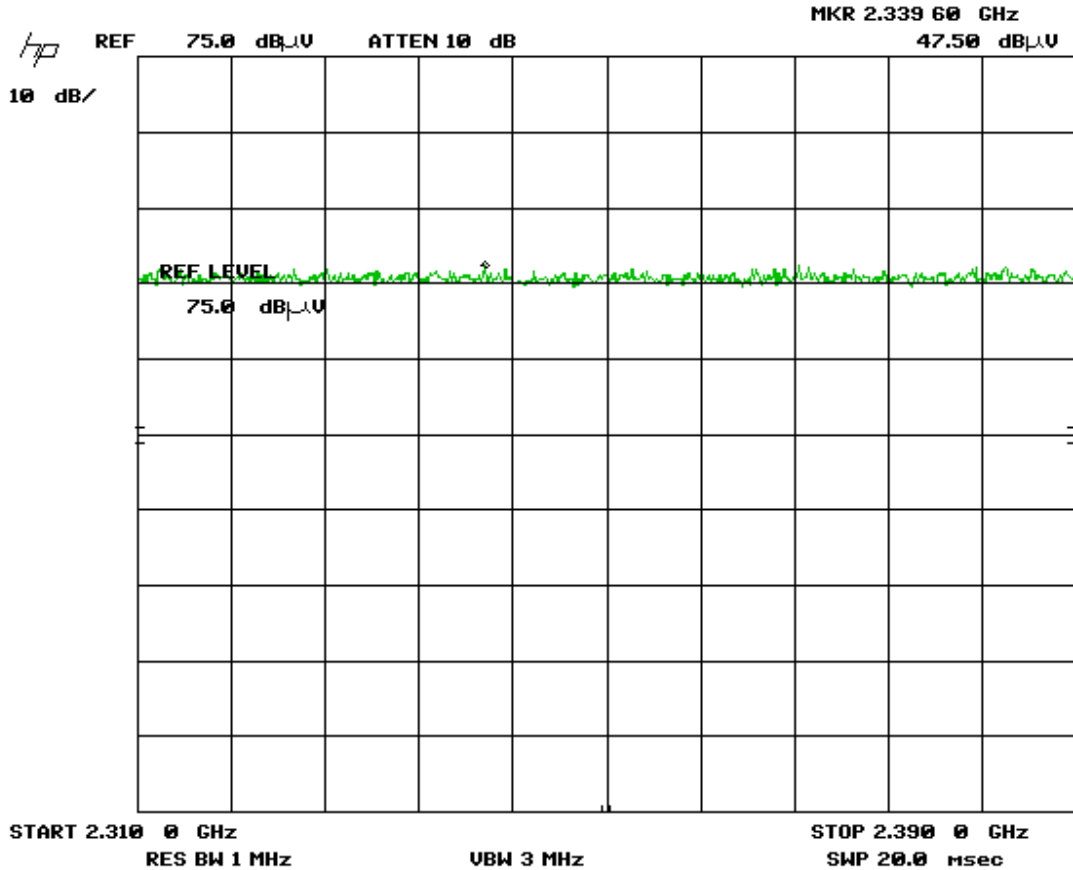
N-Mode  
Restricted-Band, Band Edge – Low Channel  
Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

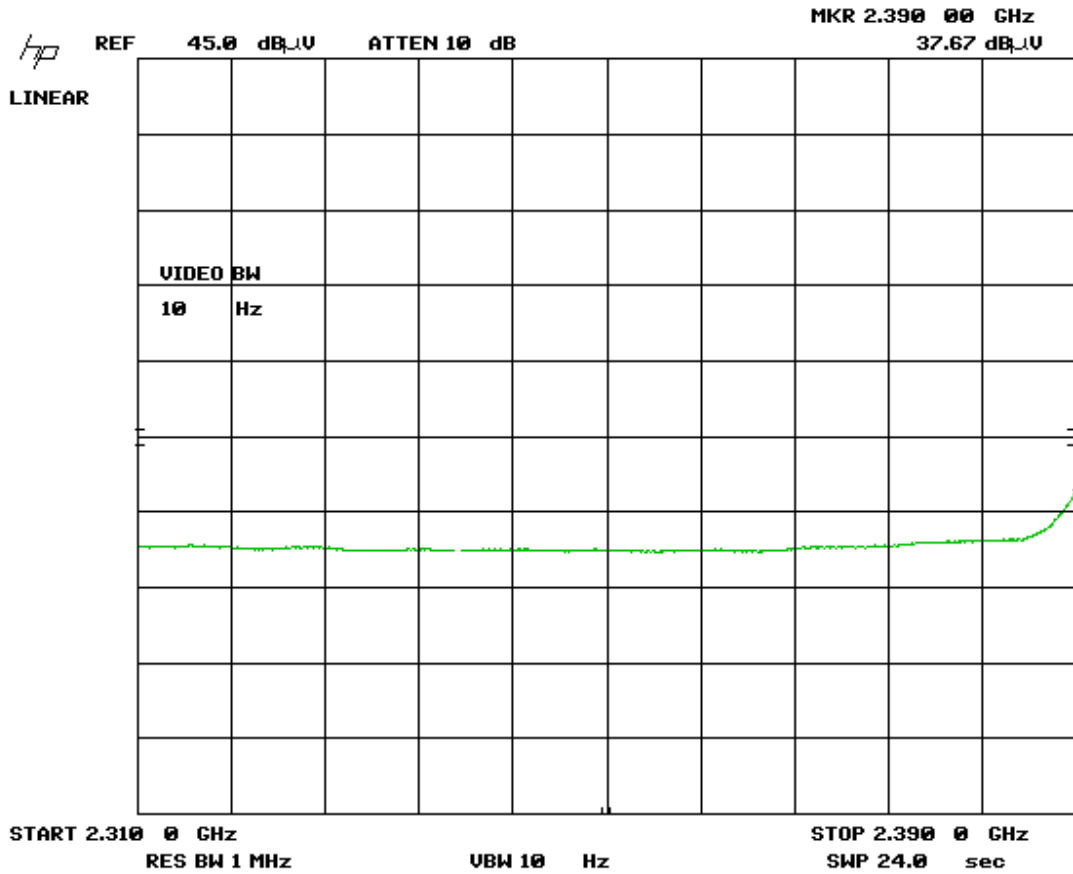
N-Mode  
 Restricted-Band, Band Edge – Low Channel  
 Horizontal - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

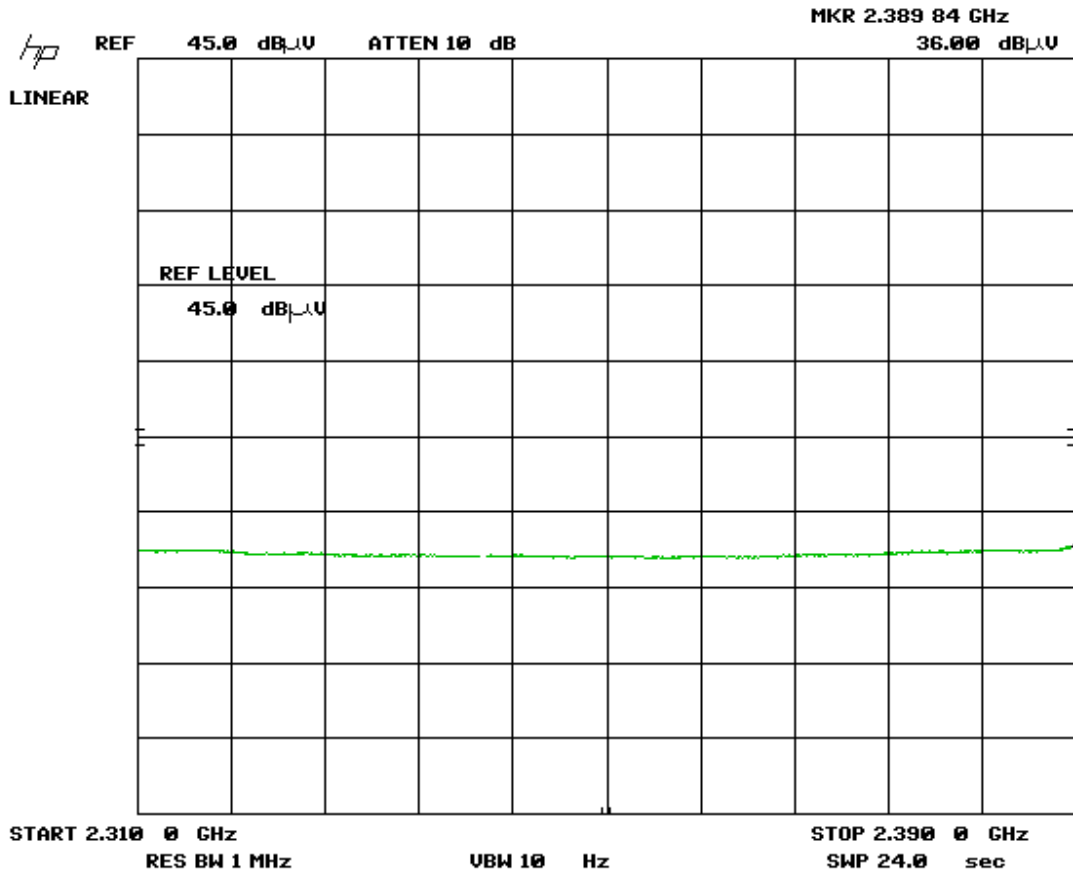
N-Mode  
 Restricted-Band, Band Edge – Low Channel  
 Vertical – Average Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

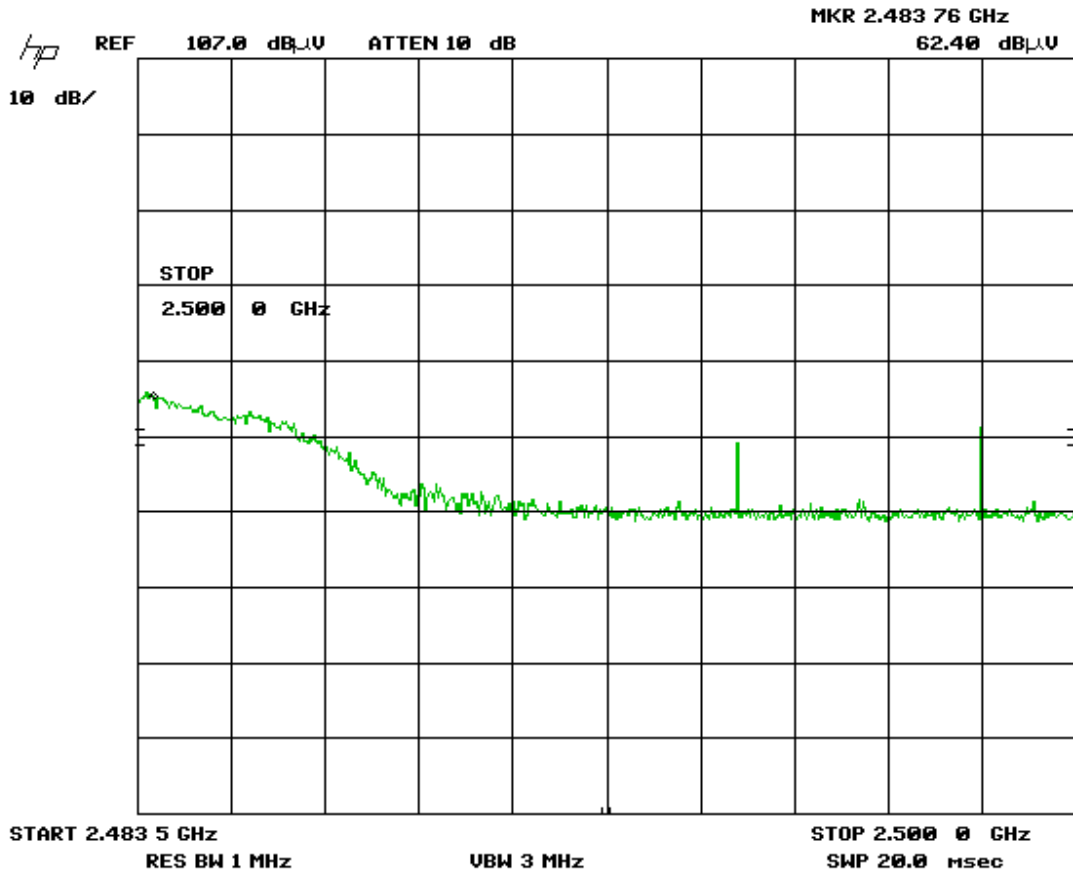
N-Mode  
Restricted-Band, Band Edge – Low Channel  
Horizontal - Average Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

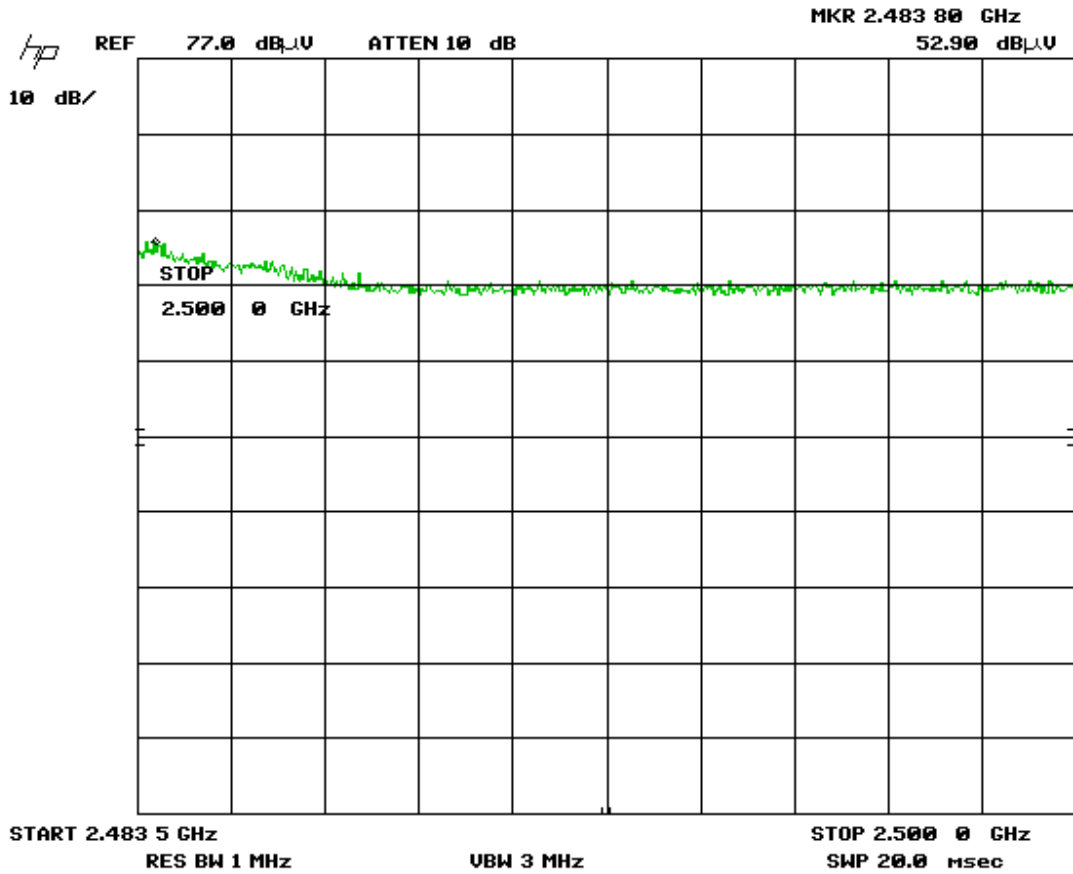
N-Mode  
 Restricted-Band, Band Edge – High Channel  
 Vertical - Peak Emission




Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

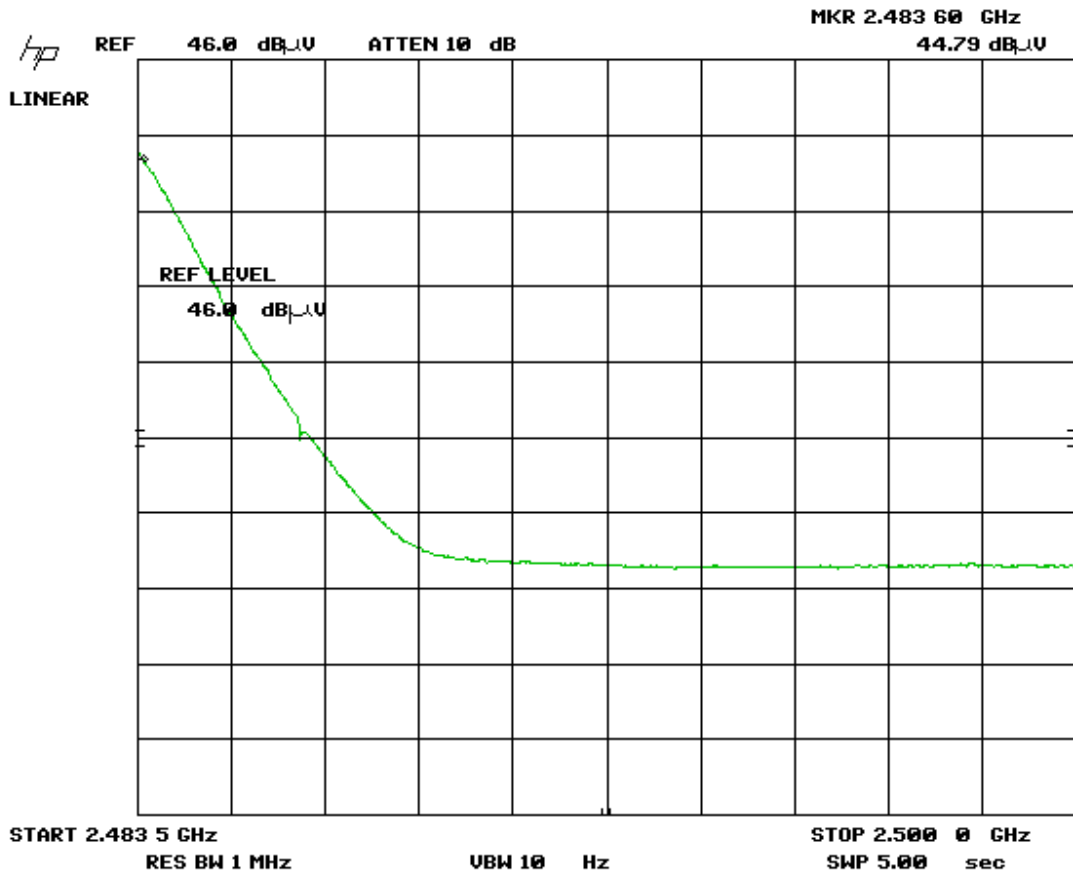
N-Mode  
Restricted-Band, Band Edge – High Channel  
Horizontal - Peak Emission



Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

N-Mode  
Restricted-Band, Band Edge – High Channel  
Vertical - Average Emission

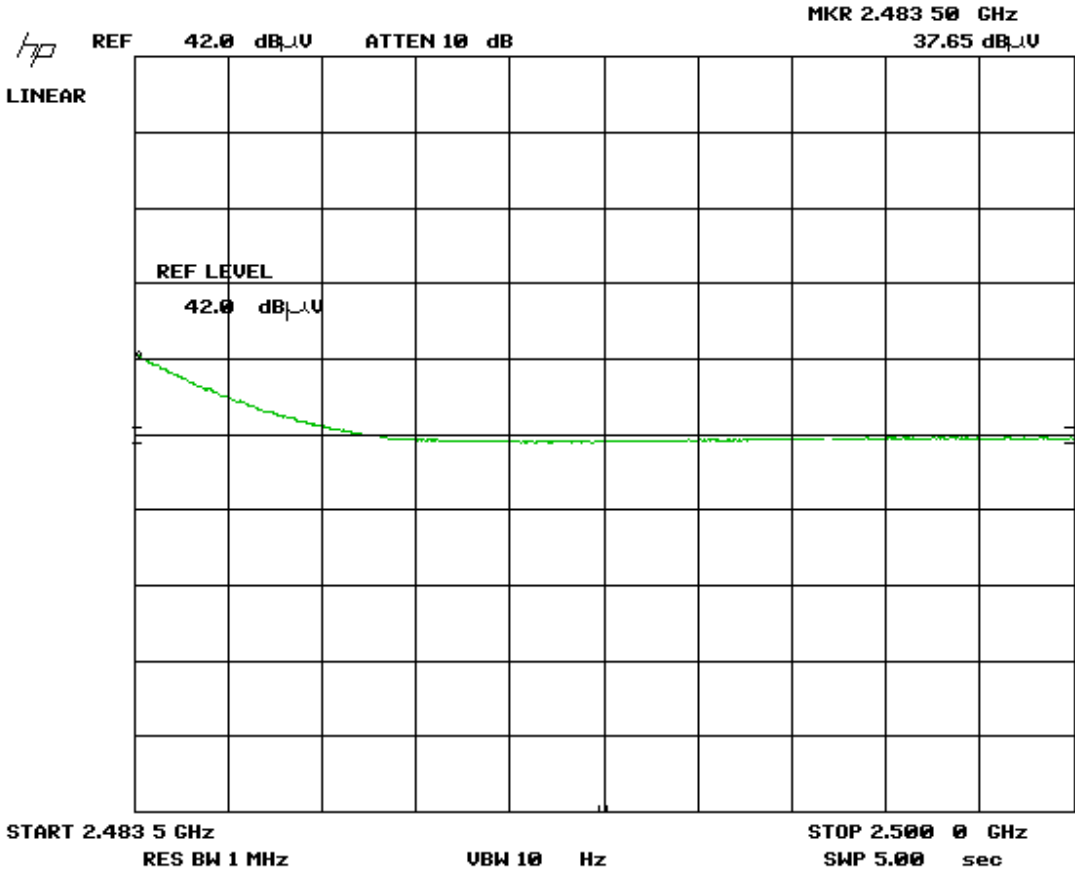


Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

N-Mode  
 Restricted-Band, Band Edge – High Channel  
 Horizontal - Average Emission



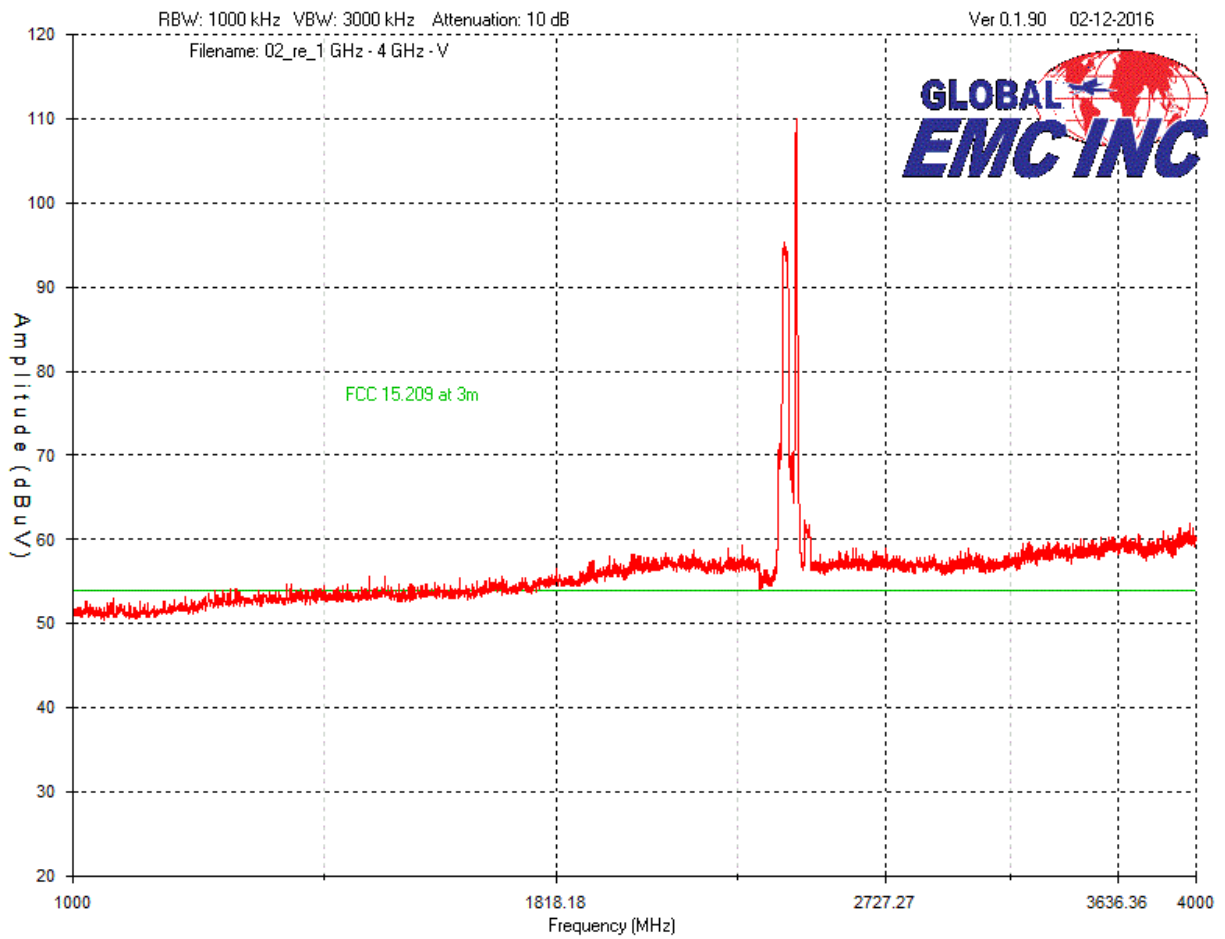
Note: Bandedge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Zigbee and WIFI Co-Location

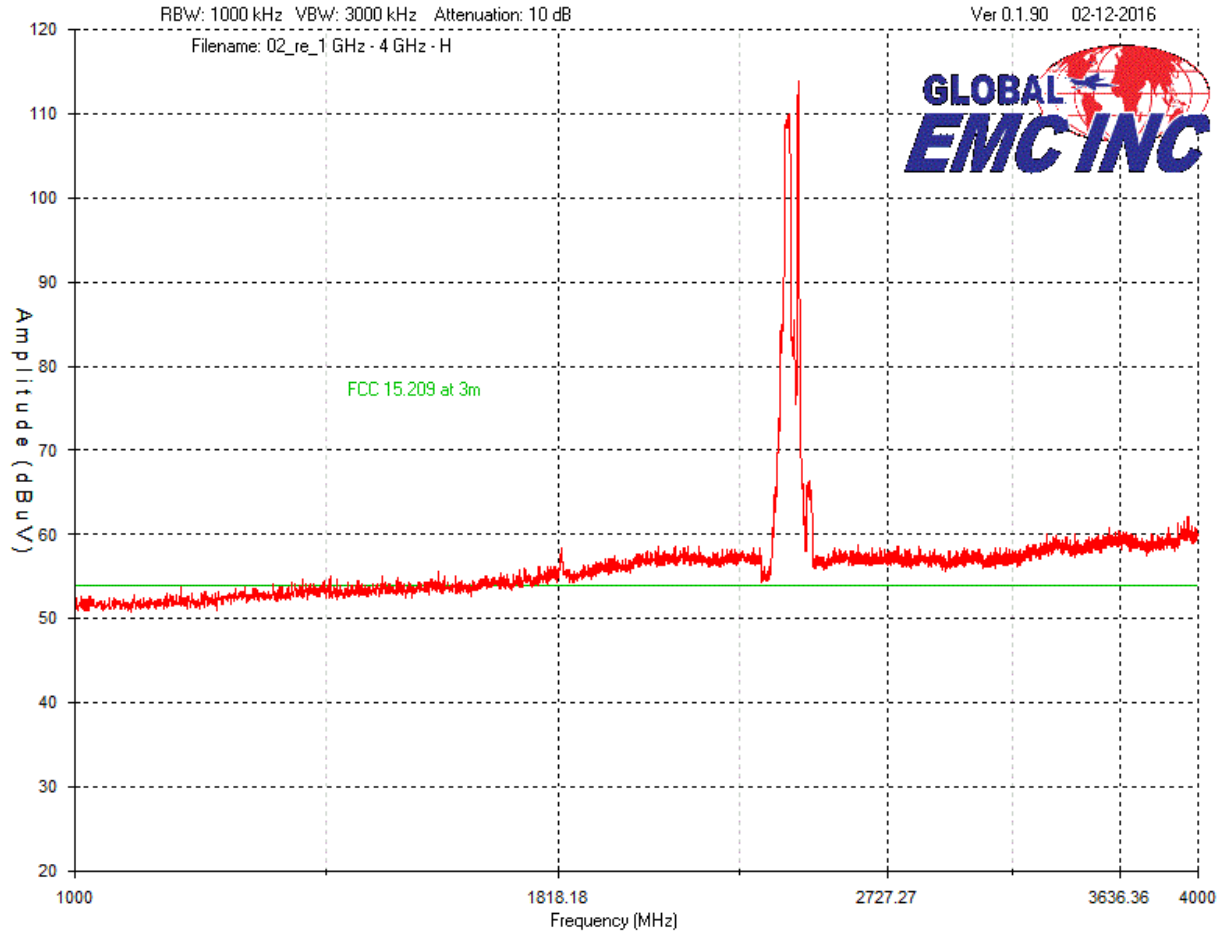
Emissions between 9 kHz – 1 GHz were identical to peak emission graphs shown in Zigbee Peak Graphs.


Mid Channel – 1 GHz – 4 GHz  
Vertical - Peak Emission Graph



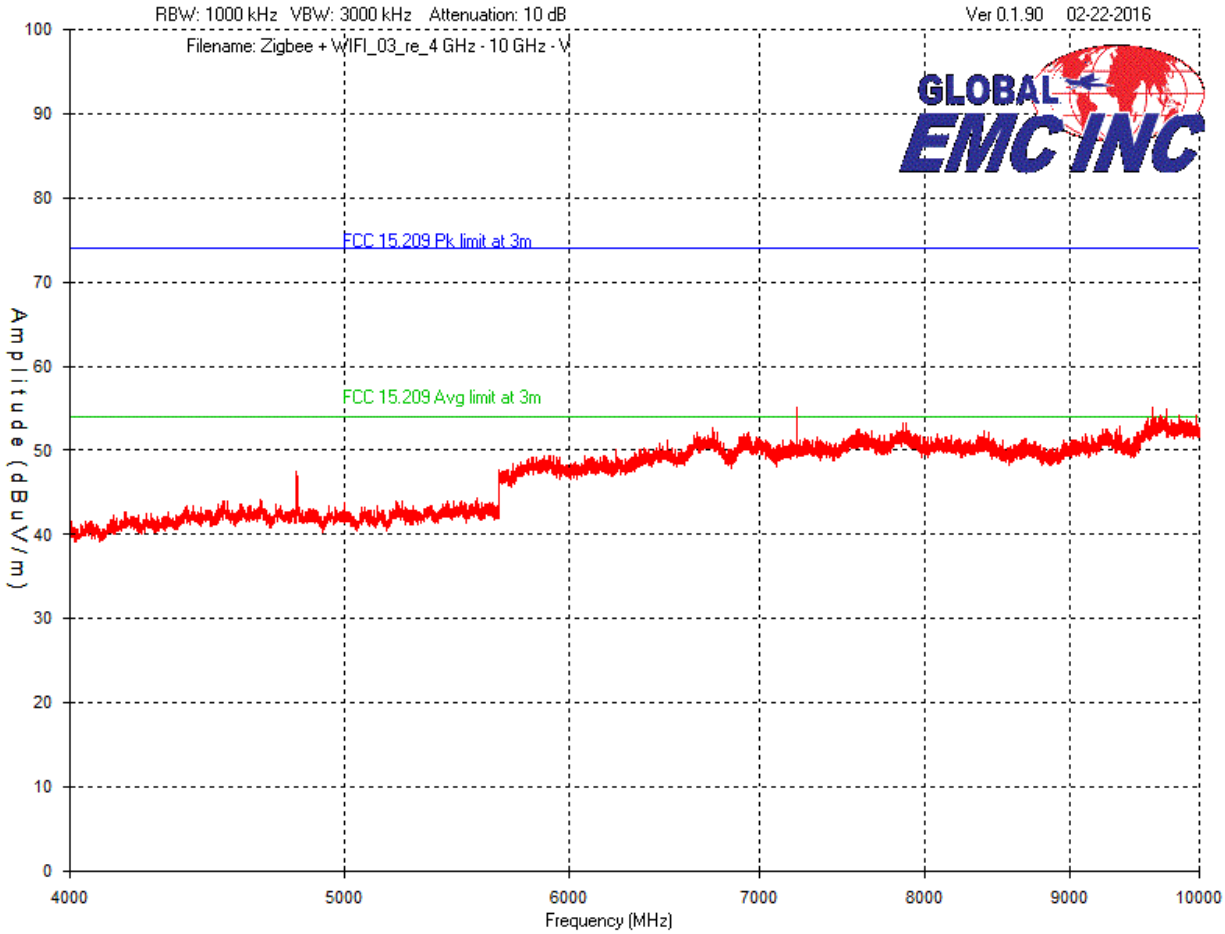
Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

Mid Channel – 1 GHz – 4 GHz  
Horizontal - Peak Emission Graph




Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

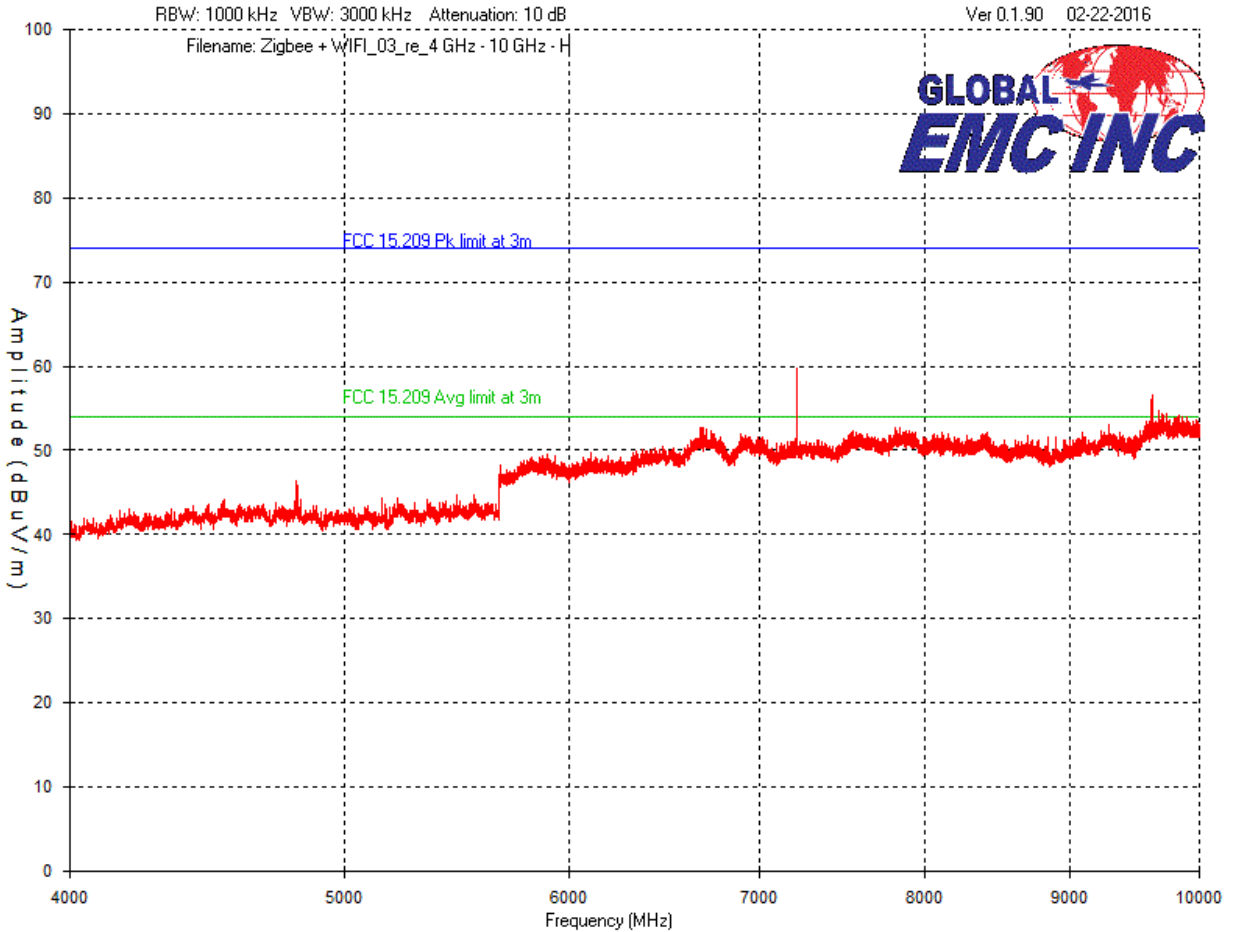
**Mid Channel – 4 GHz – 10 GHz  
Vertical - Peak Emission Graph**



Note: See Final Measurements and Results section starting on page 144 for measurements.


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

**Mid Channel – 4 GHz – 10 GHz  
Horizontal - Peak Emission Graph**



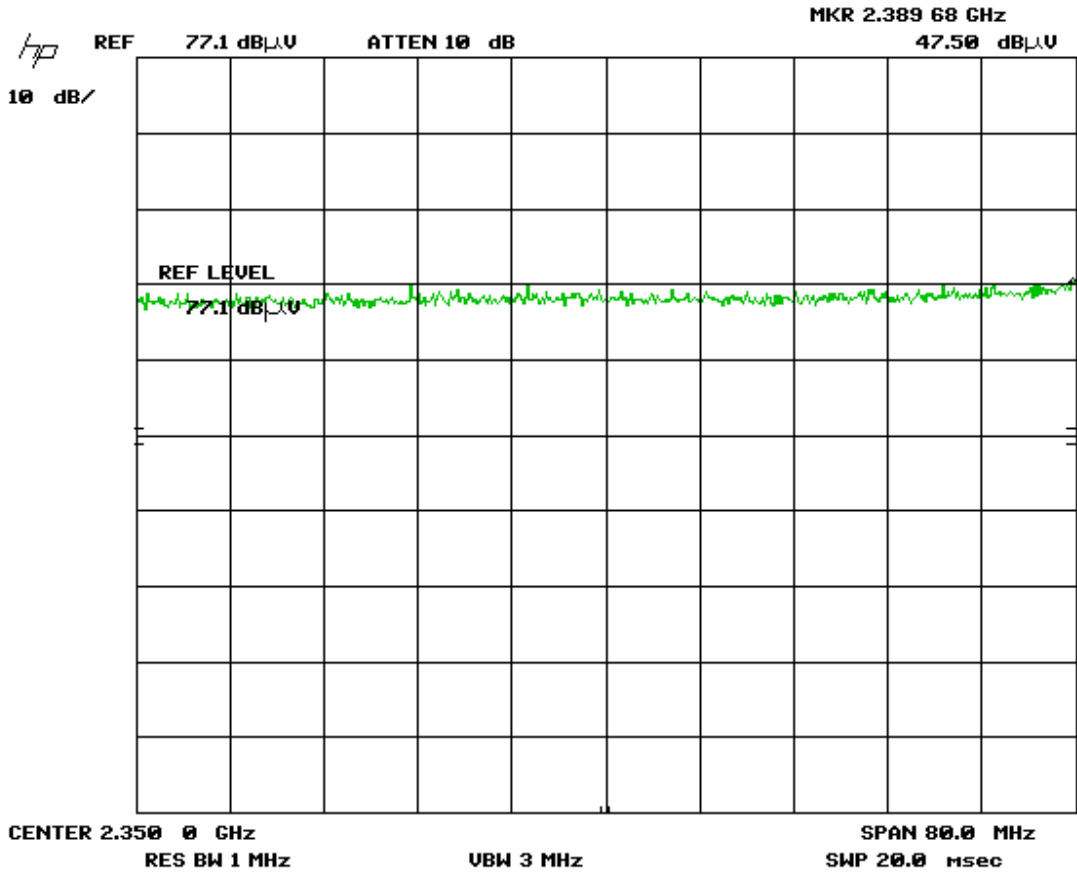
Note: See Final Measurements and Results section starting on page 144 for measurements.

There are no emissions from 10 GHz – 26 GHz. Representative plots are provided in Zigbee Peak Graphs section.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

### Co-location WIFI B-Mode and Zigbee: Low Channels

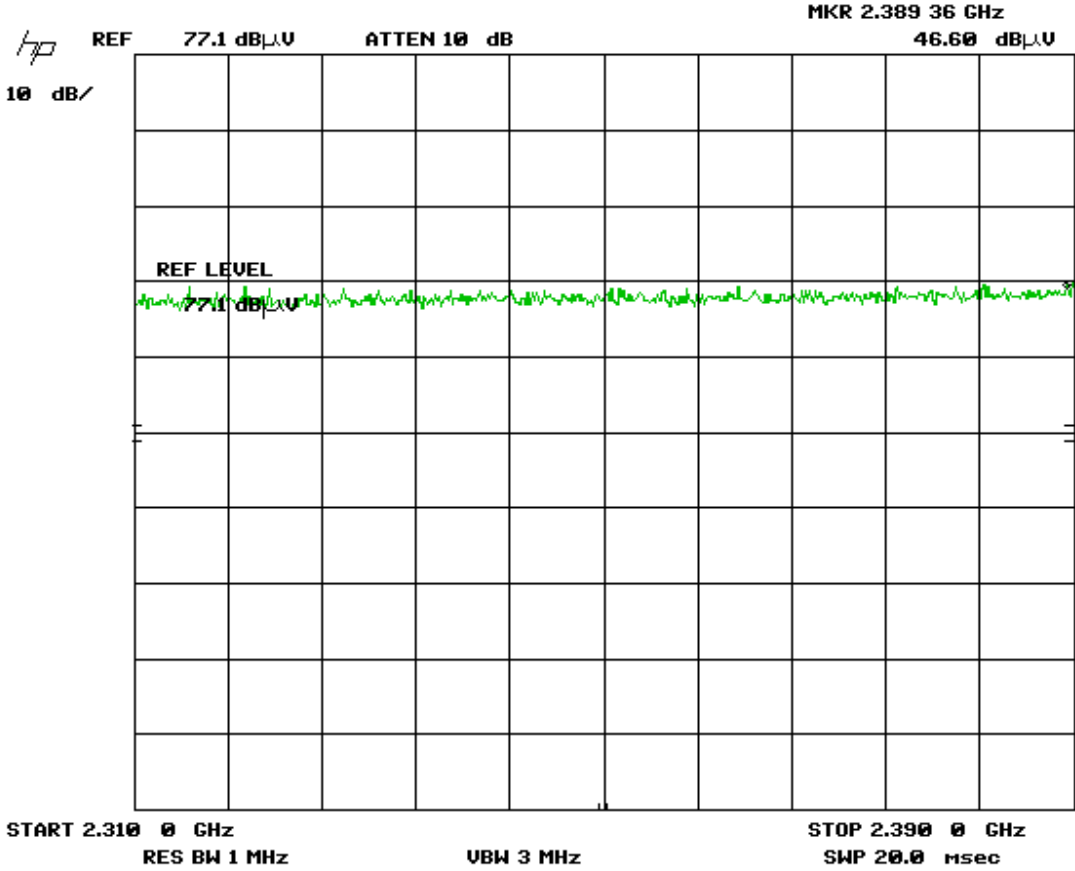
WIFI B-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

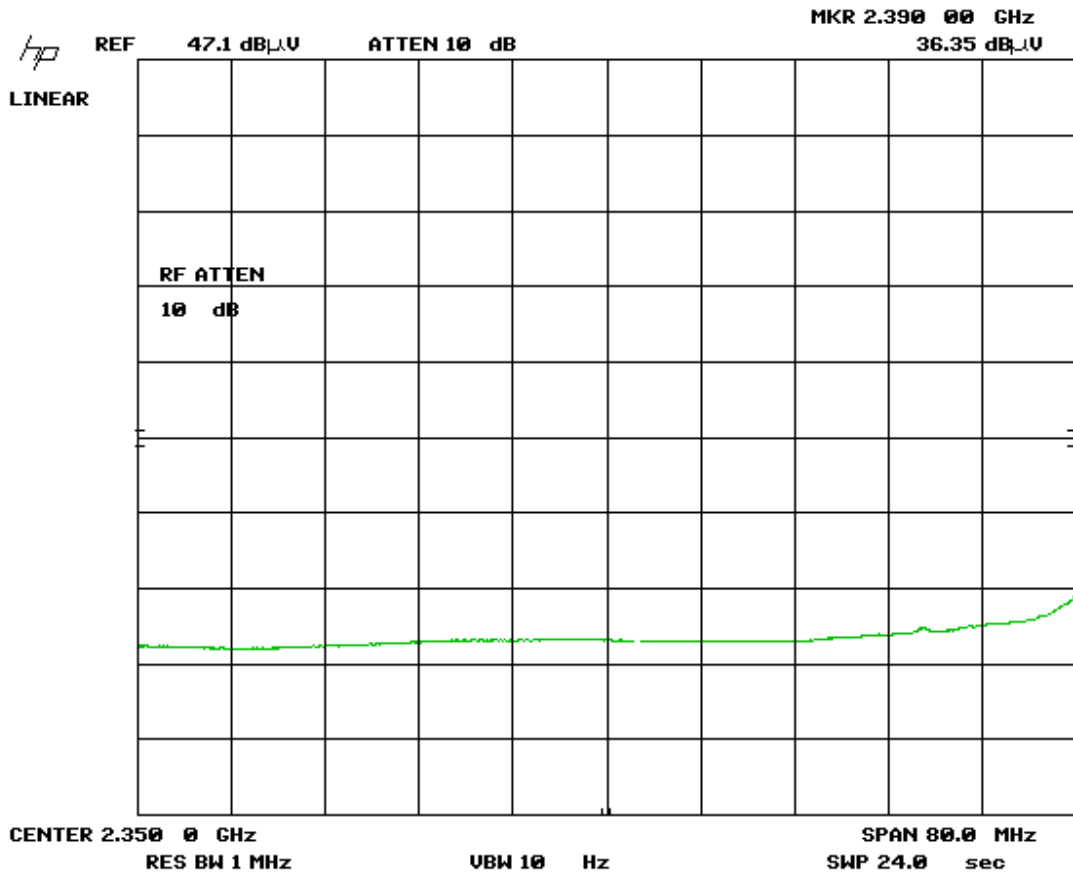
WIFI B-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Horizontal - Peak Emission



Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

WIFI B-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Vertical –Average Emission

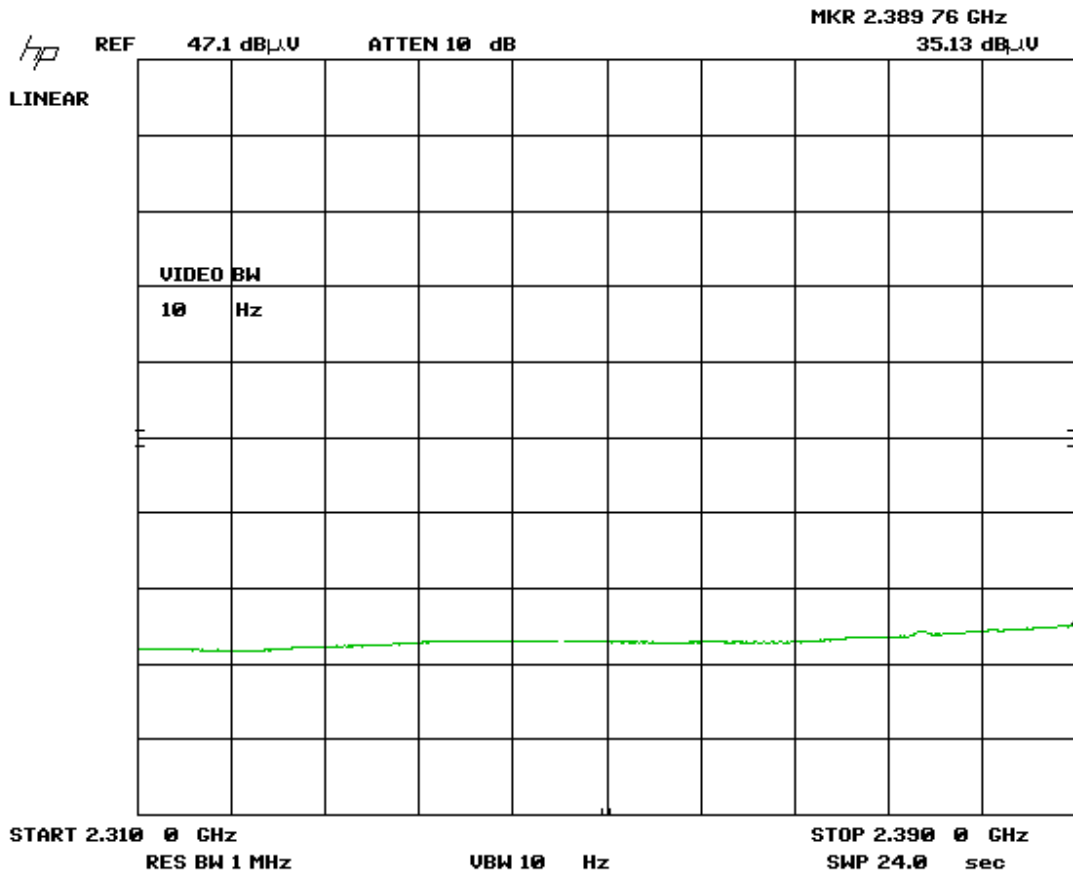


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

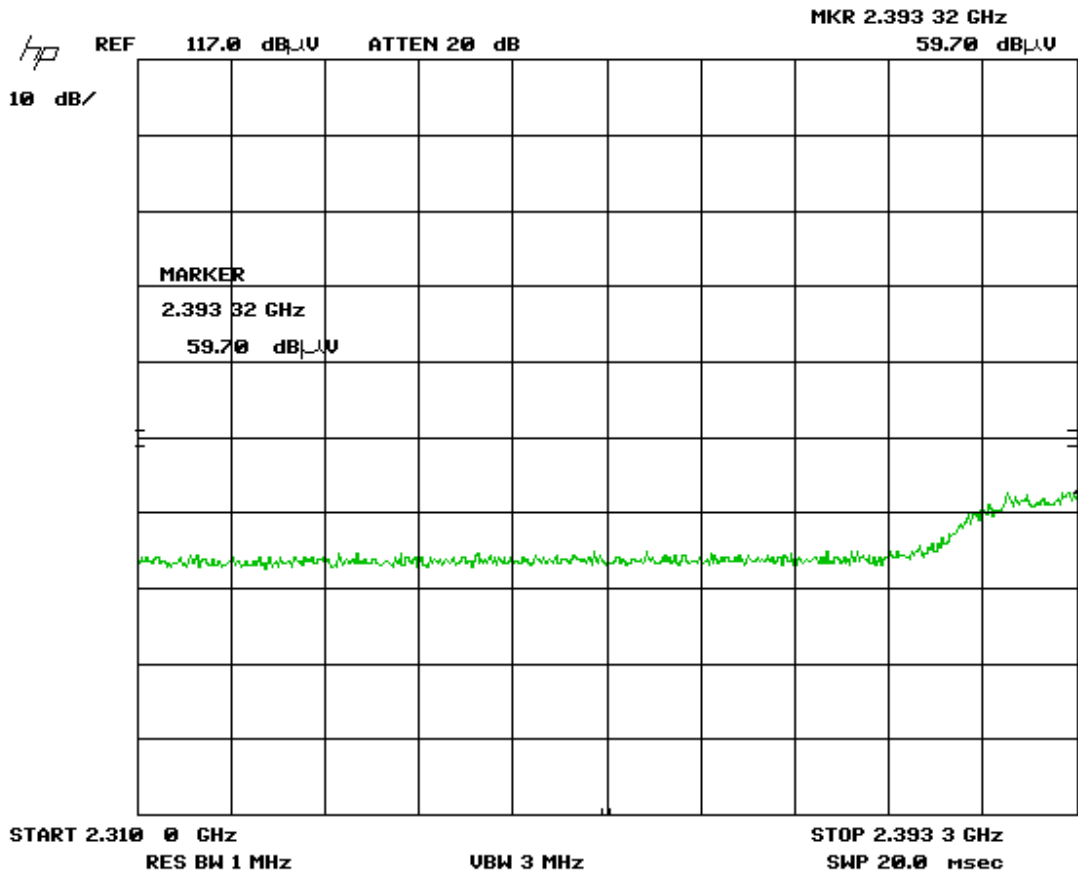
WIFI B-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Horizontal – Average Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

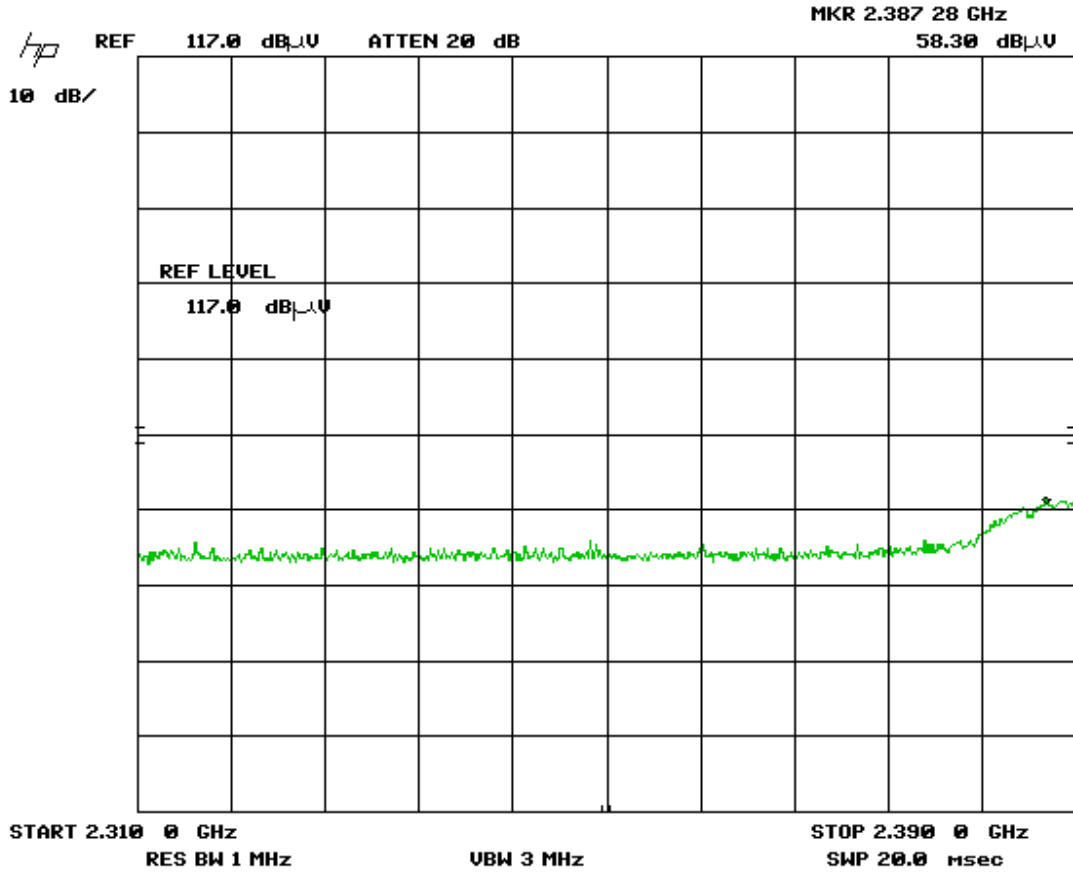
WIFI B-Mode and Zigbee  
Restricted-Band, Band Edge – WIFI Ch 3, Zigbee Ch 0xB  
Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

WIFI B-Mode and Zigbee  
Restricted-Band, Band Edge – WIFI Ch 3, Zigbee Ch 0xB  
Horizontal - Peak Emission

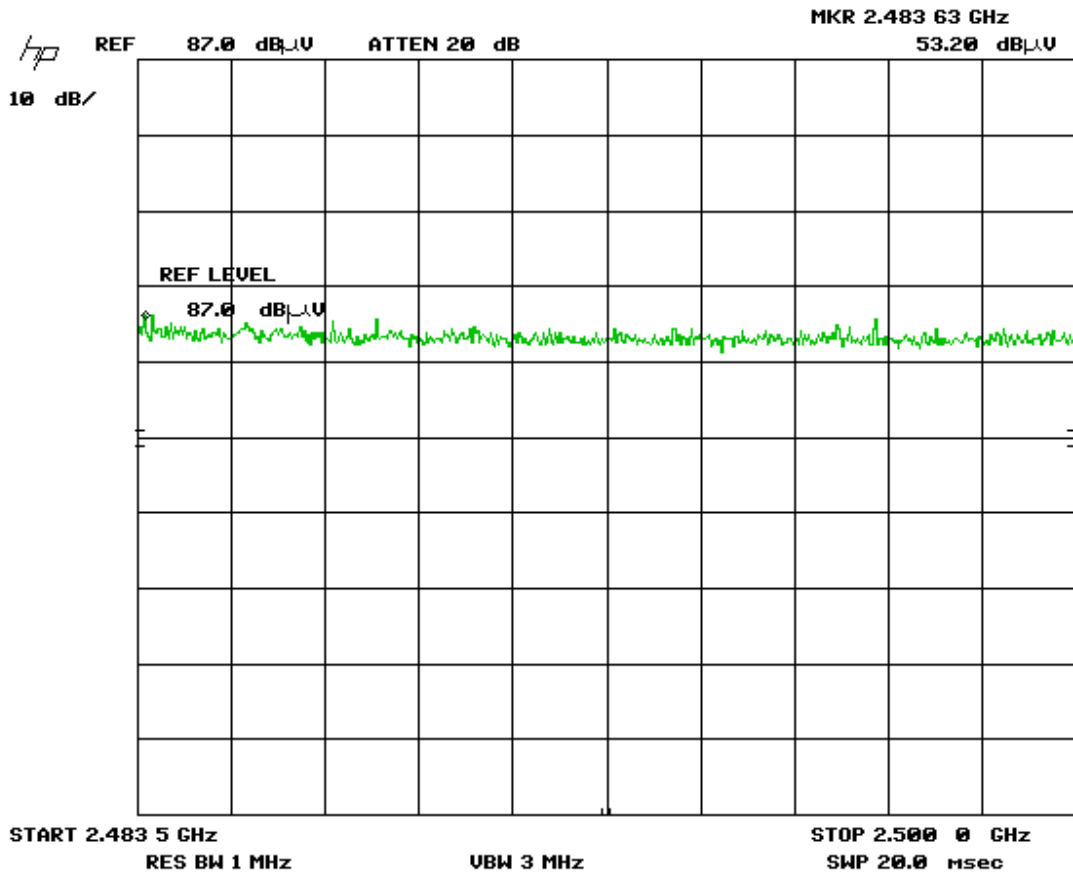


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Co-location WIFI B-Mode and Zigbee: High Channels

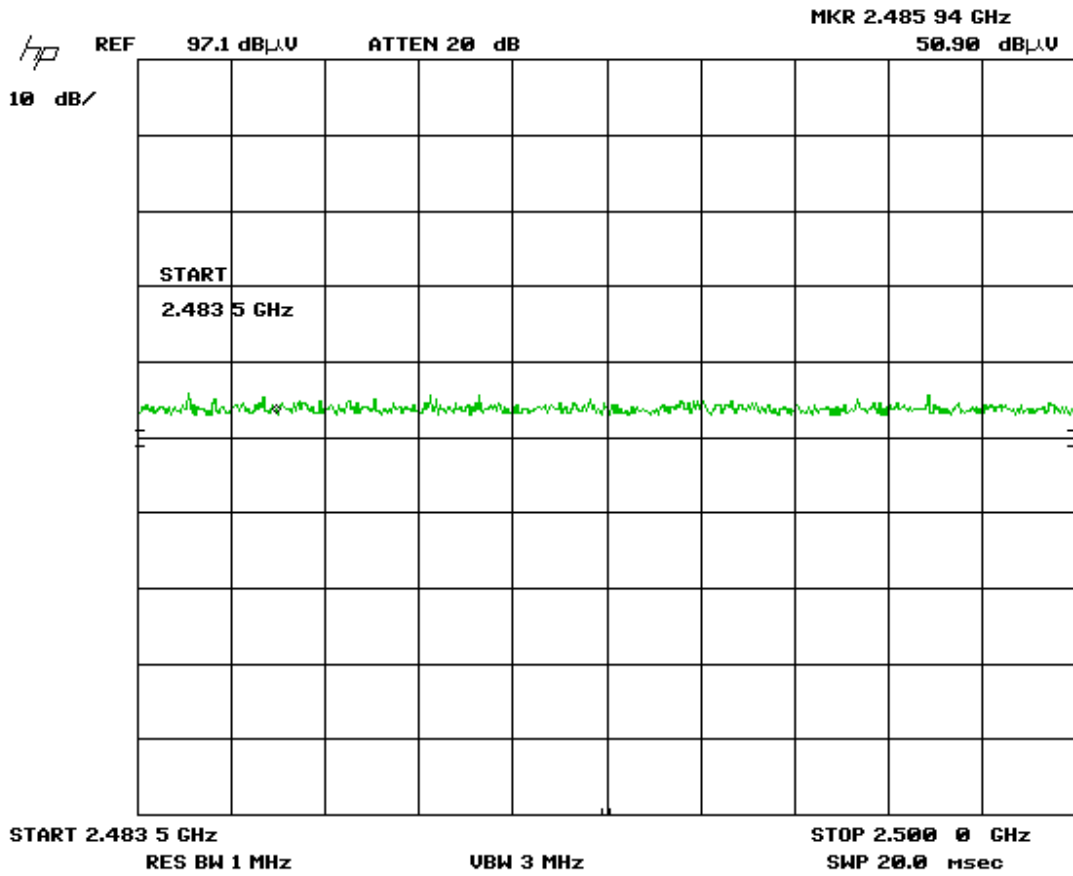
WIFI B-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

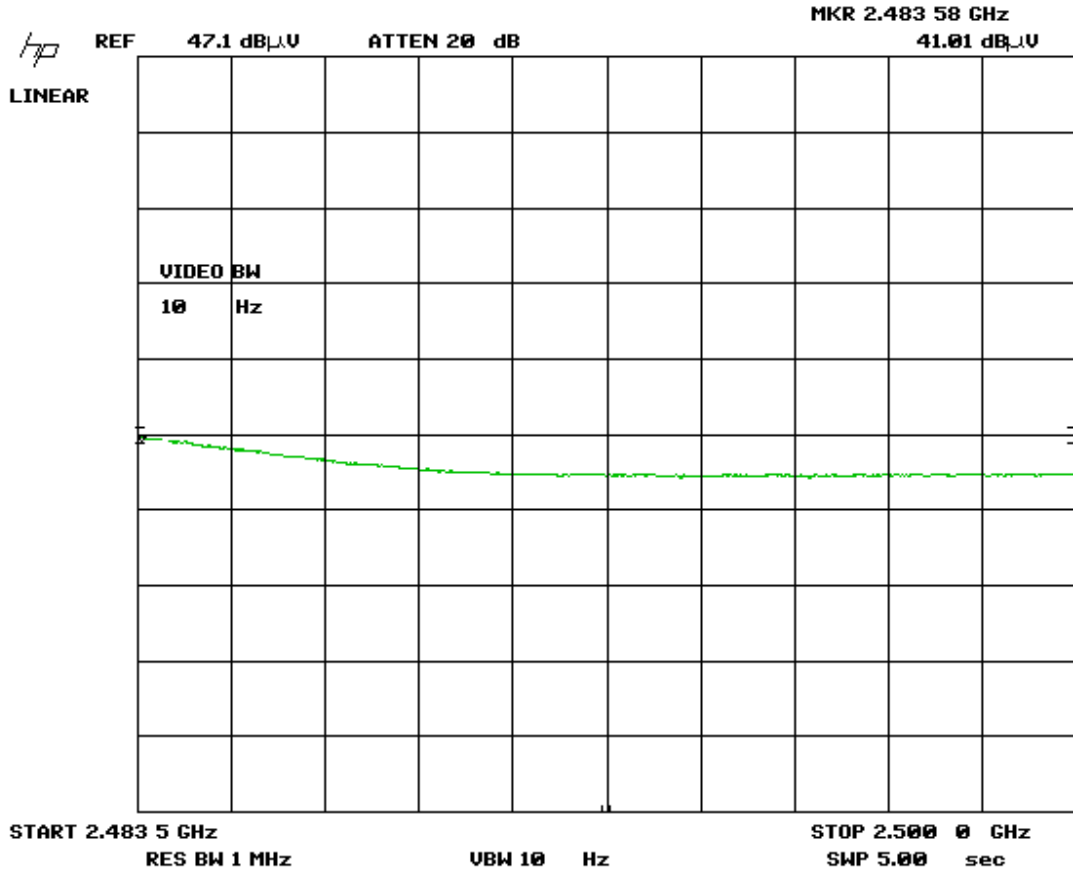
**WIFI B-Mode and Zigbee**  
**Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13**  
**Horizontal - Peak Emission**




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

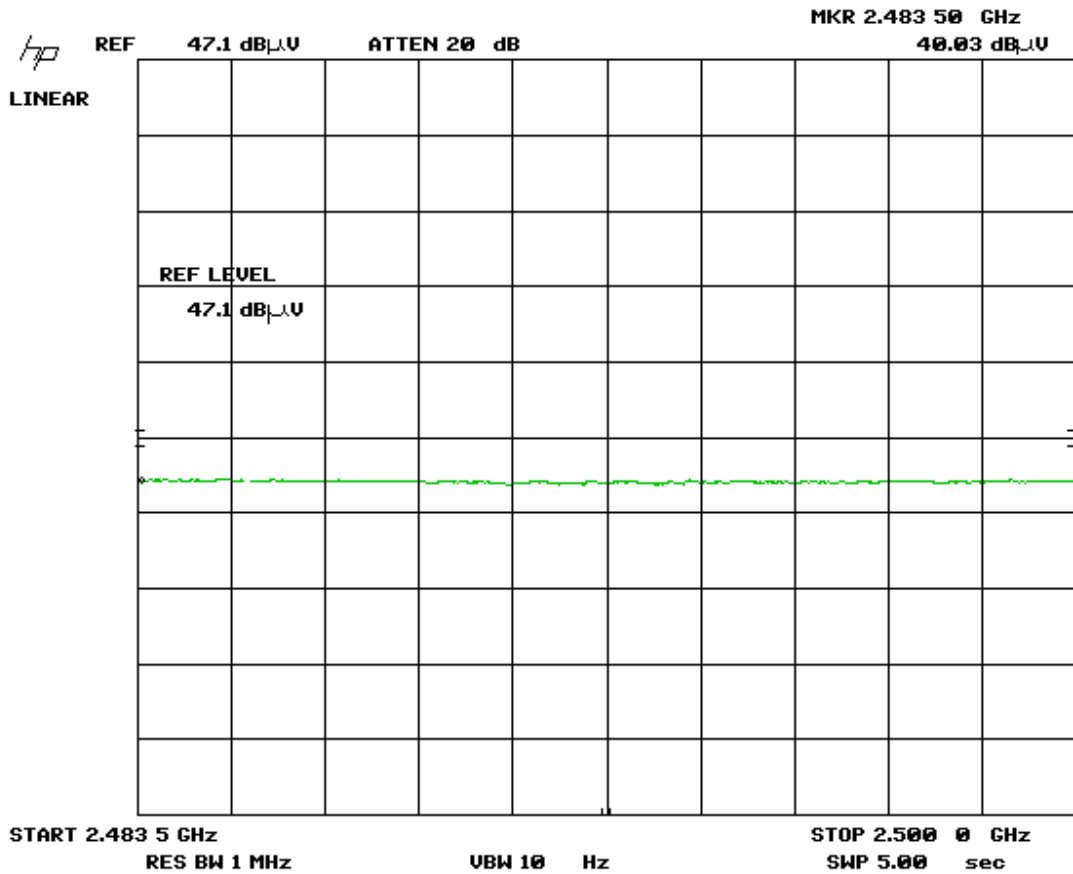
**WIFI B-Mode and Zigbee**  
**Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13**  
**Vertical –Average Emission**




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

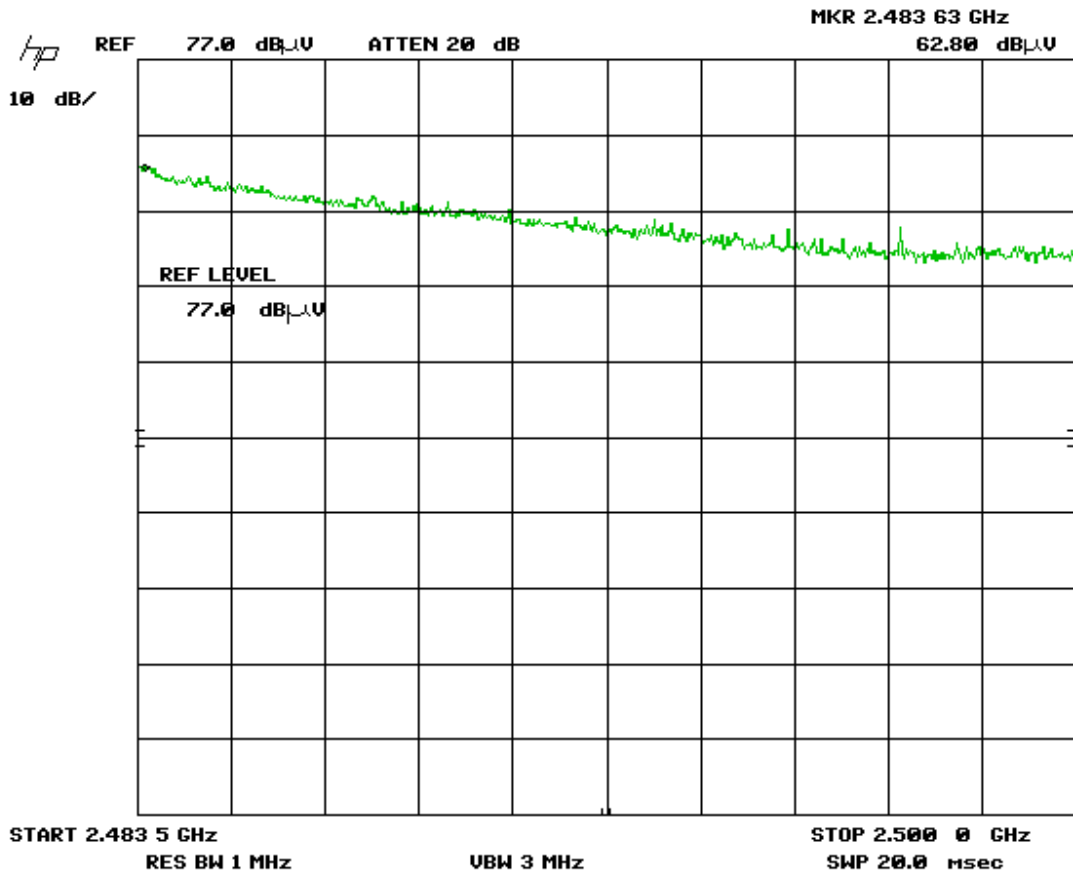
WIFI B-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Horizontal – Average Emission



Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

WIFI B-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x19  
 Vertical - Peak Emission

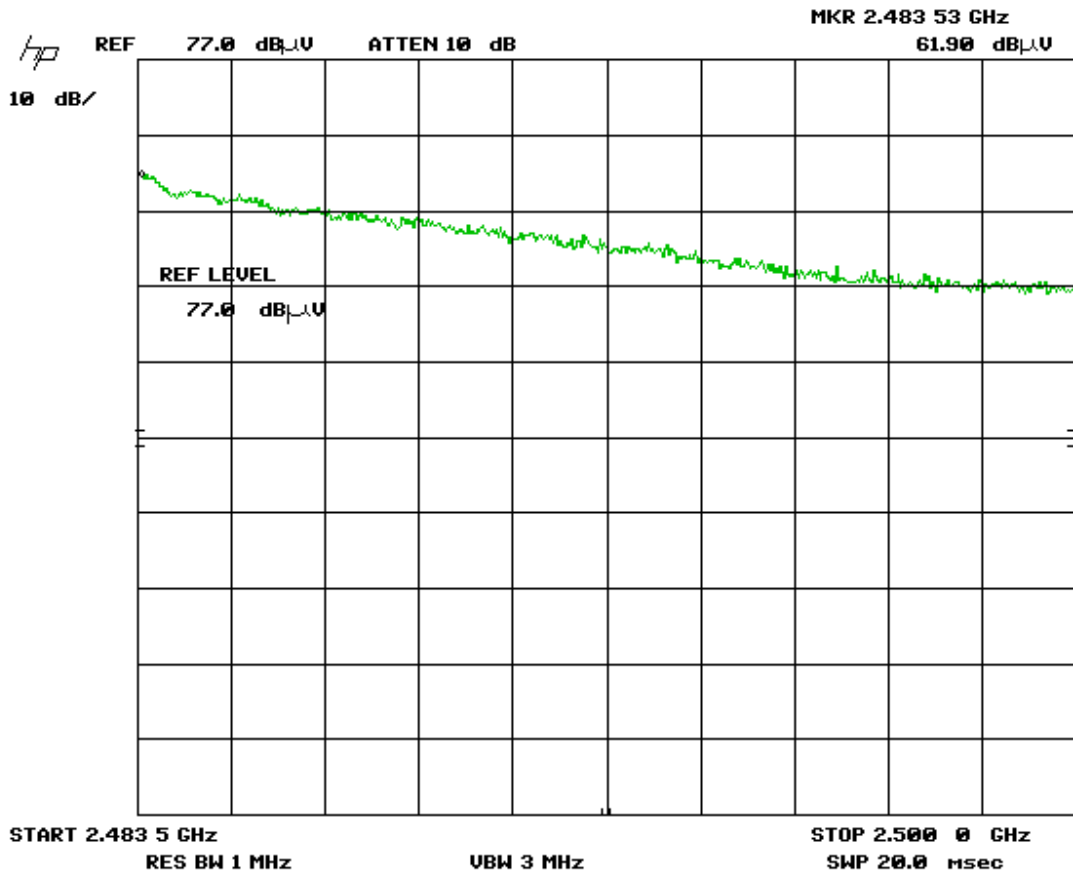


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

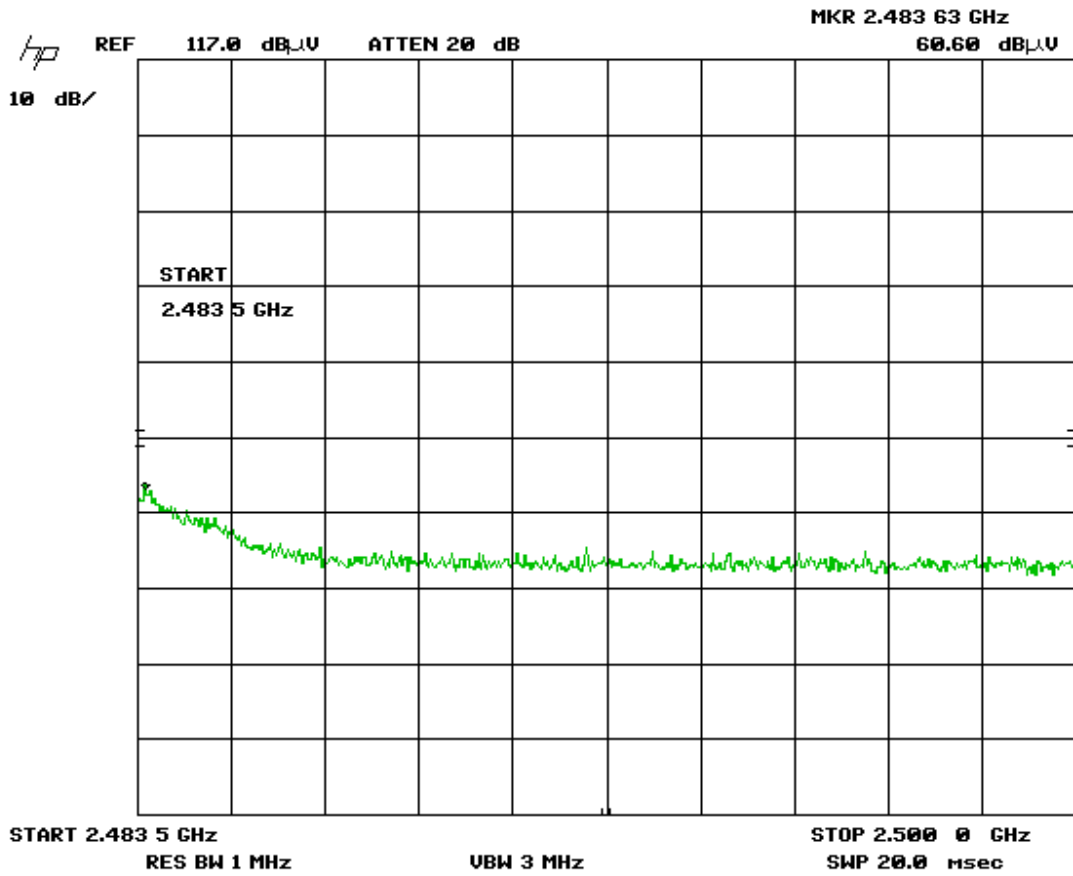
WIFI B-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x19  
 Horizontal - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

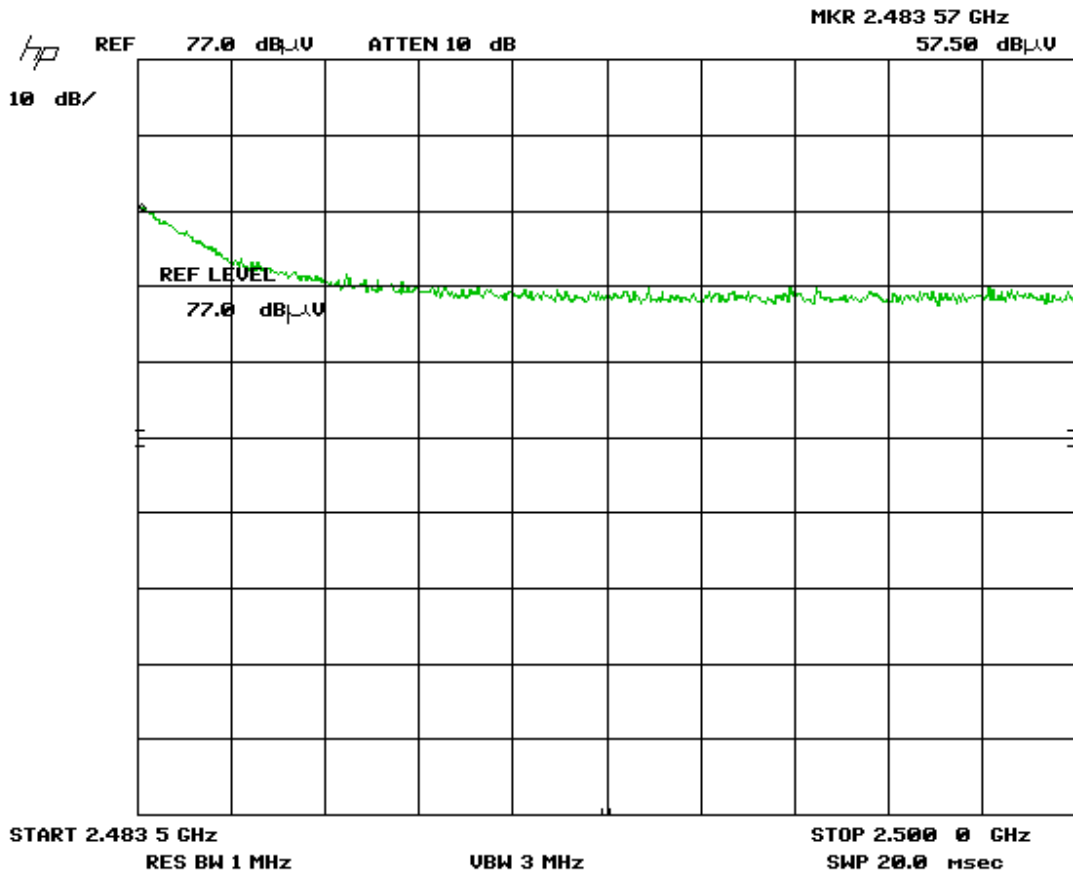
**WIFI B-Mode and Zigbee**  
**Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x1A**  
**Vertical - Peak Emission**




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

**WIFI B-Mode and Zigbee**  
**Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x1A**  
**Horizontal - Peak Emission**

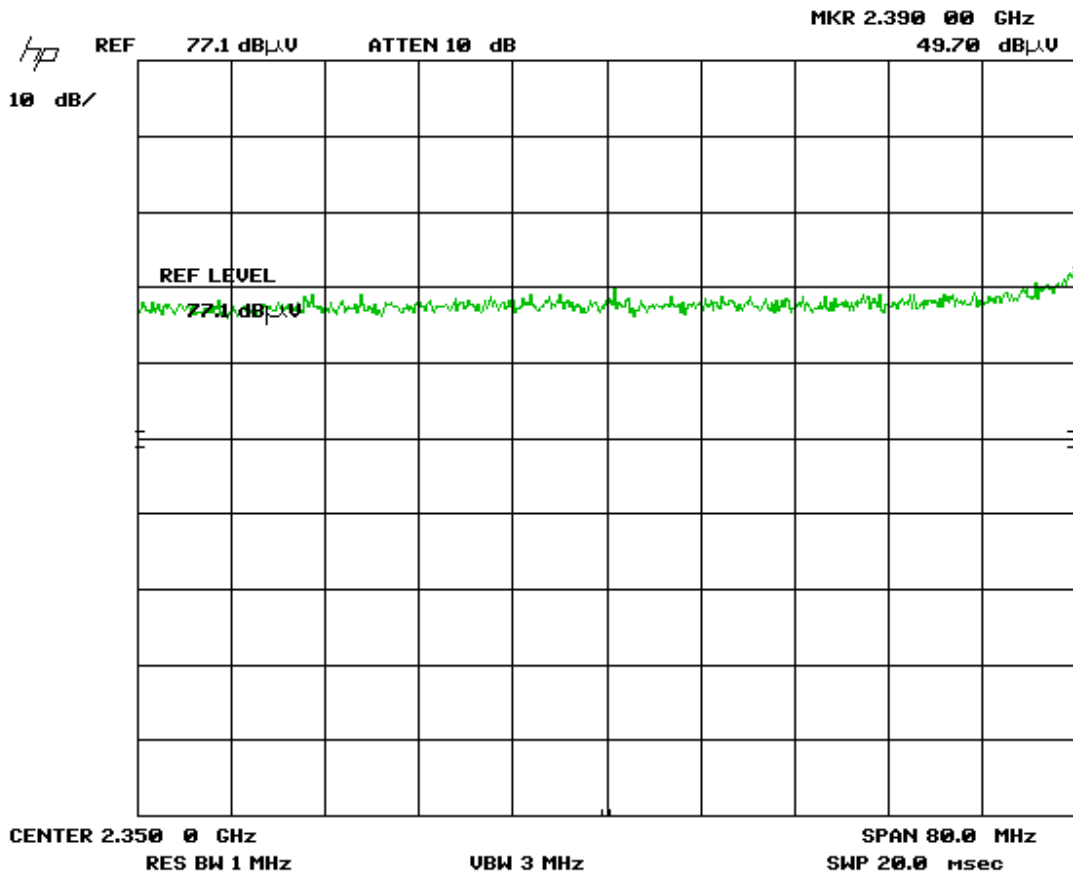


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Co-location WIFI G-Mode and Zigbee: Low Channels

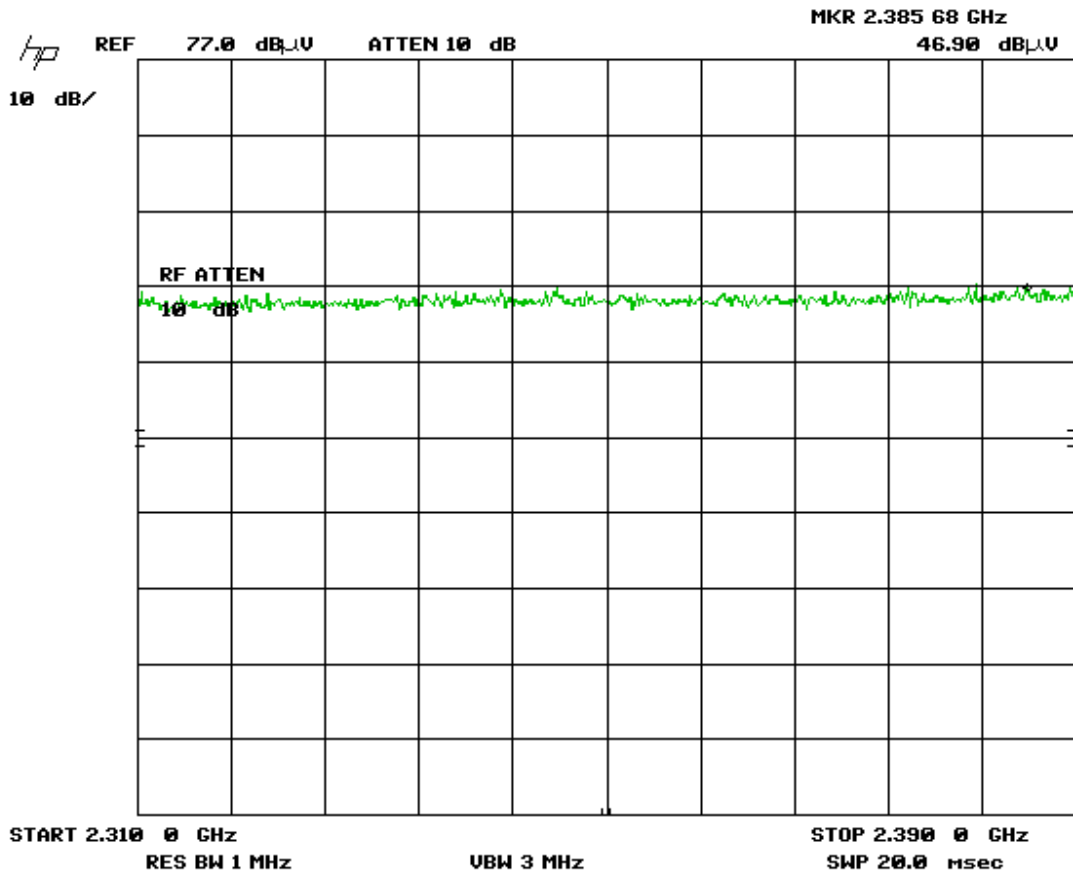
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

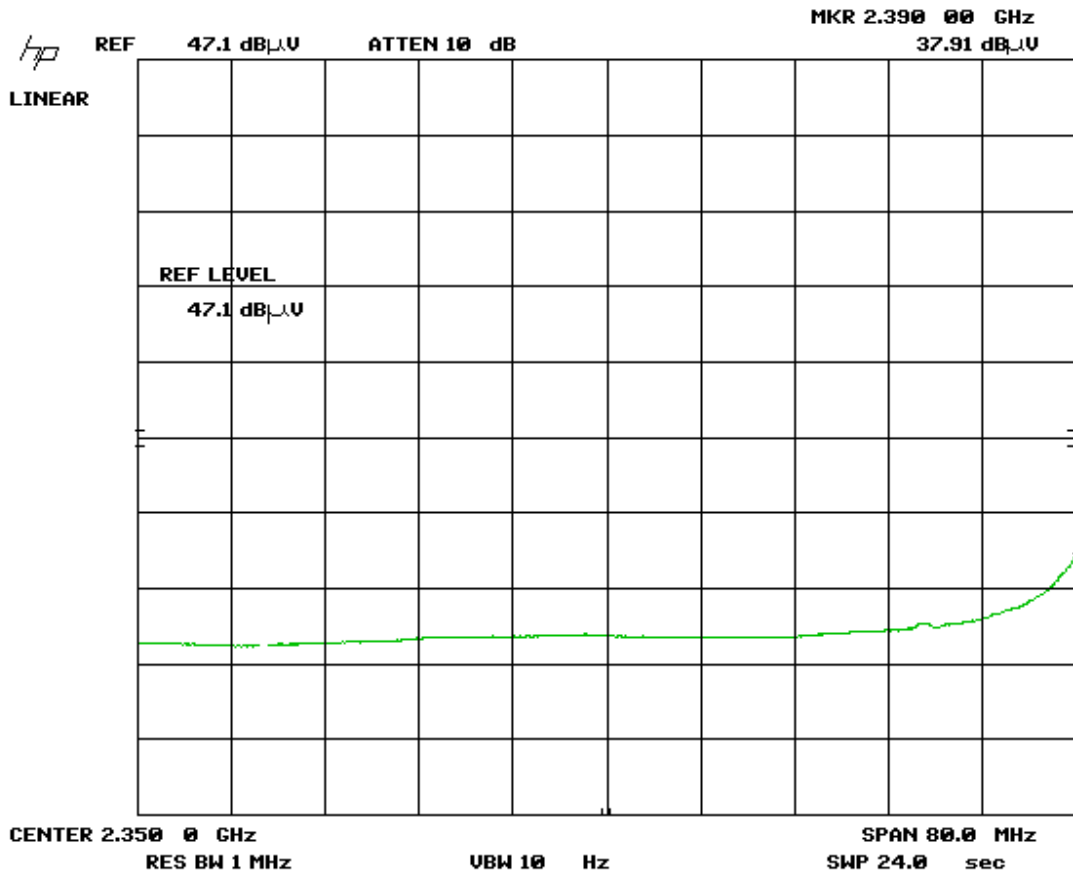
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Horizontal - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

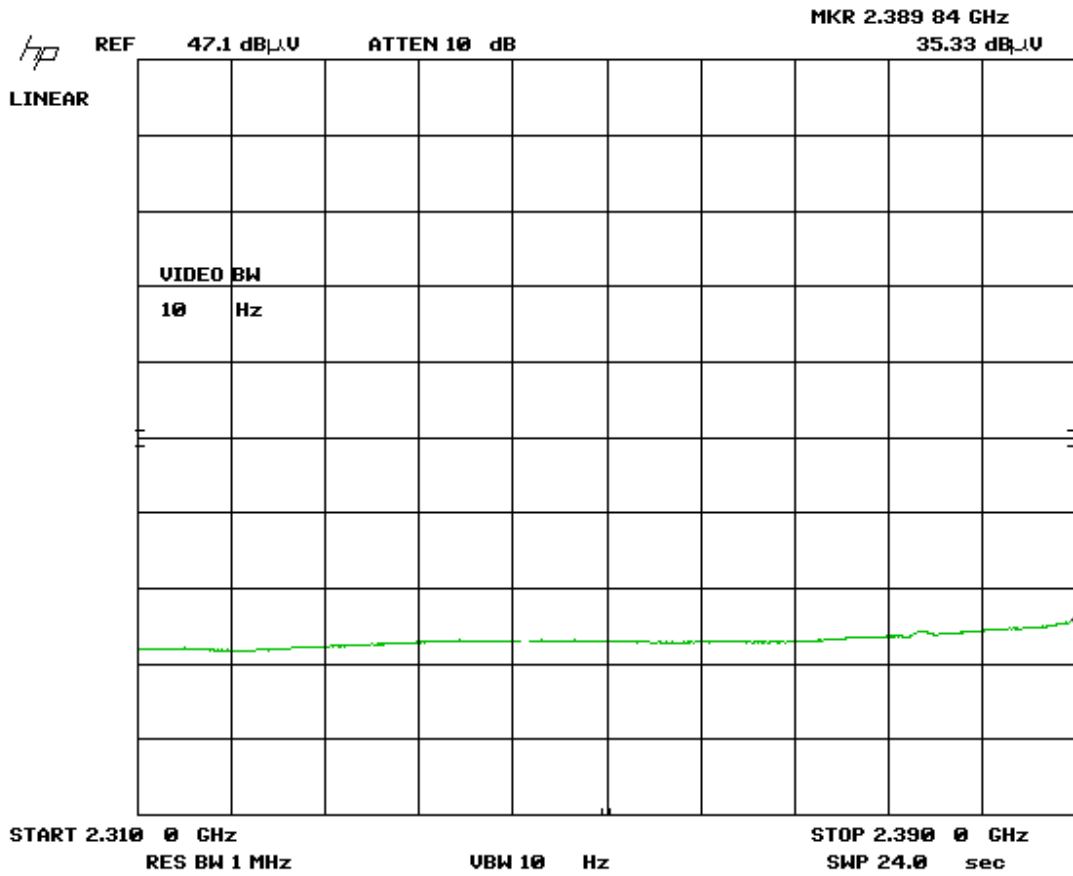
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Vertical –Average Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

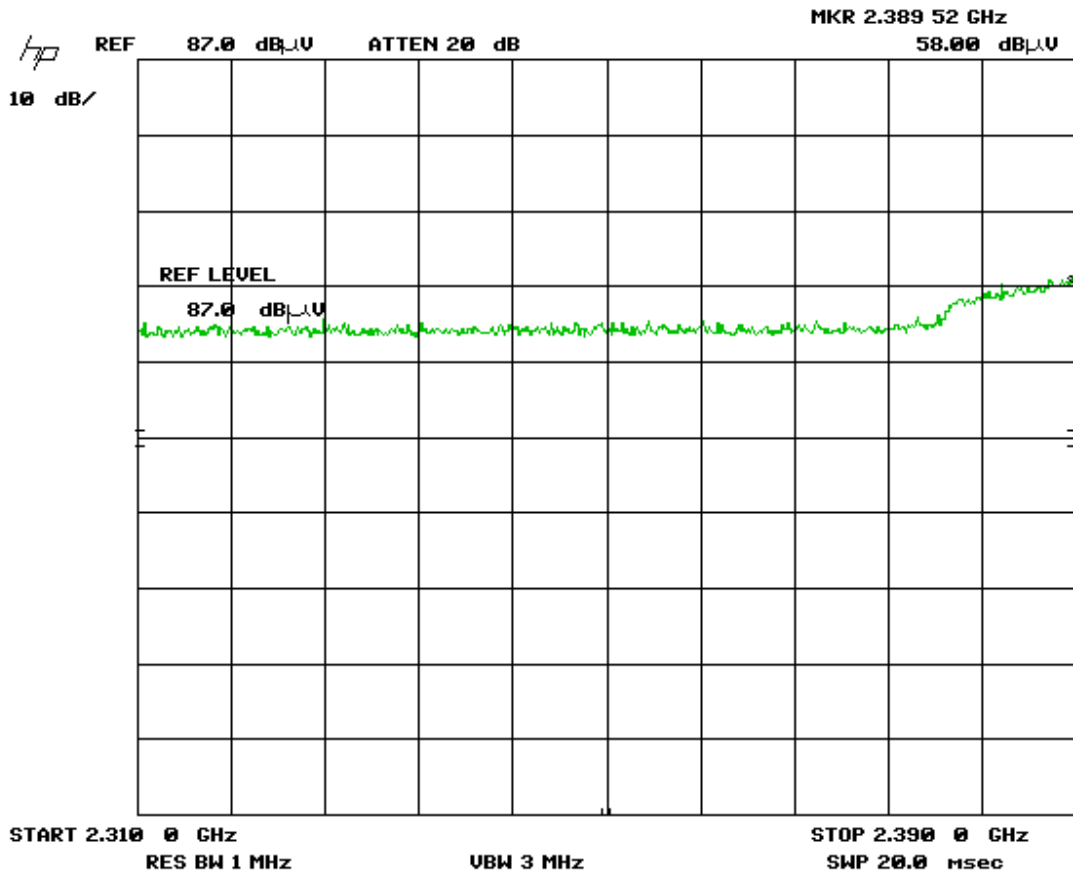
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Horizontal – Average Emission



Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

WIFI G-Mode and Zigbee  
Restricted-Band, Band Edge – WIFI Ch 3, Zigbee Ch 0xB  
Vertical - Peak Emission

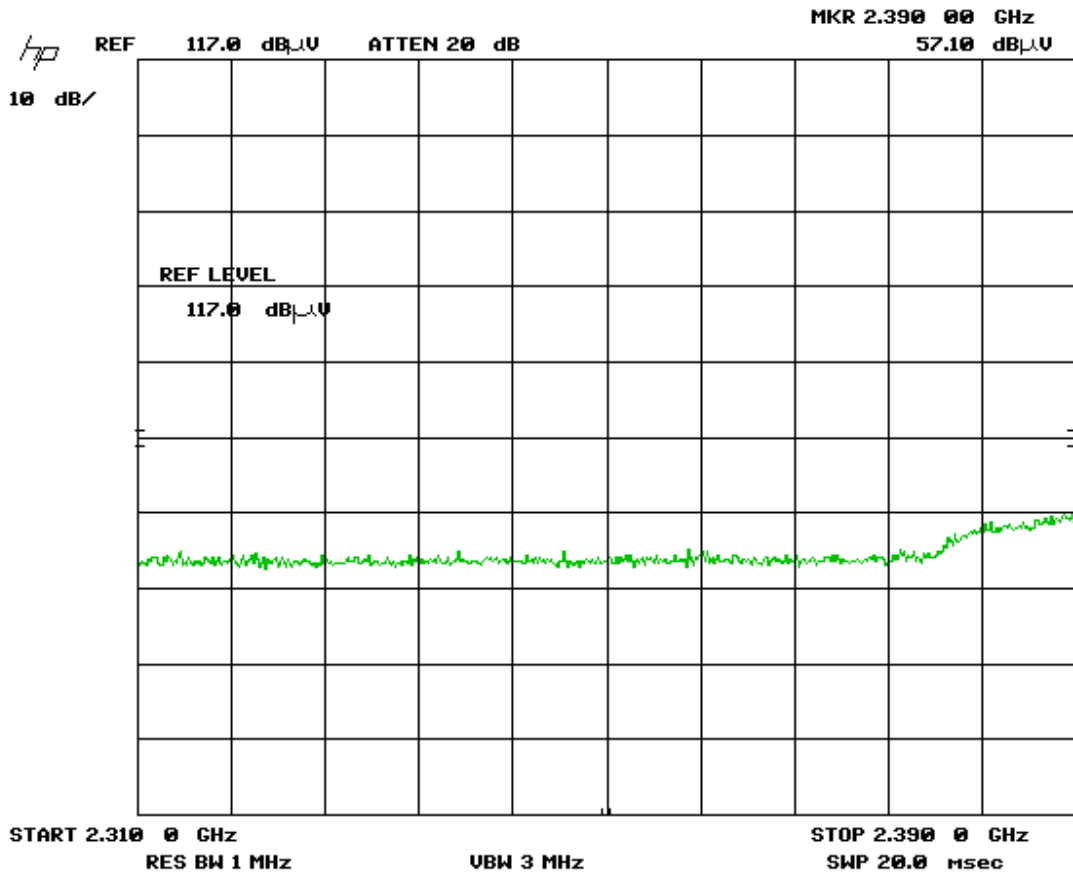


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 3, Zigbee Ch 0xB  
 Horizontal - Peak Emission

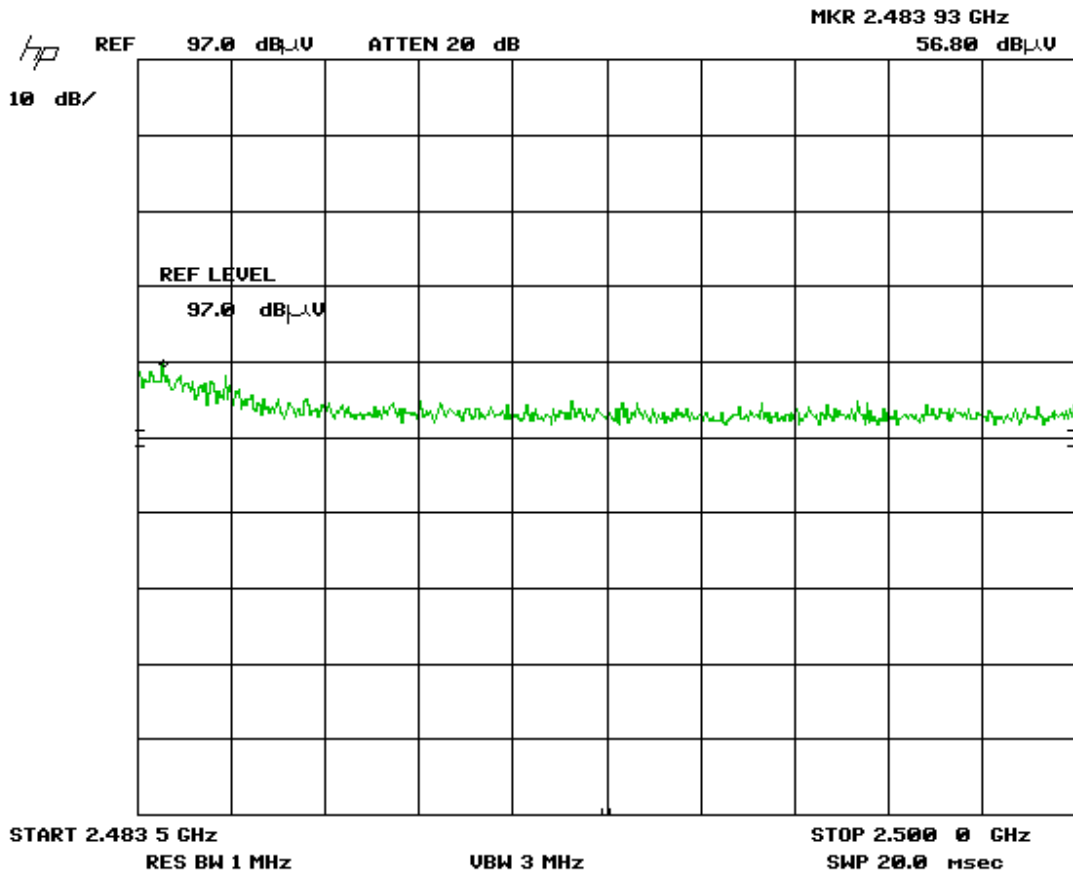


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Co-location WIFI G-Mode and Zigbee: High Channels

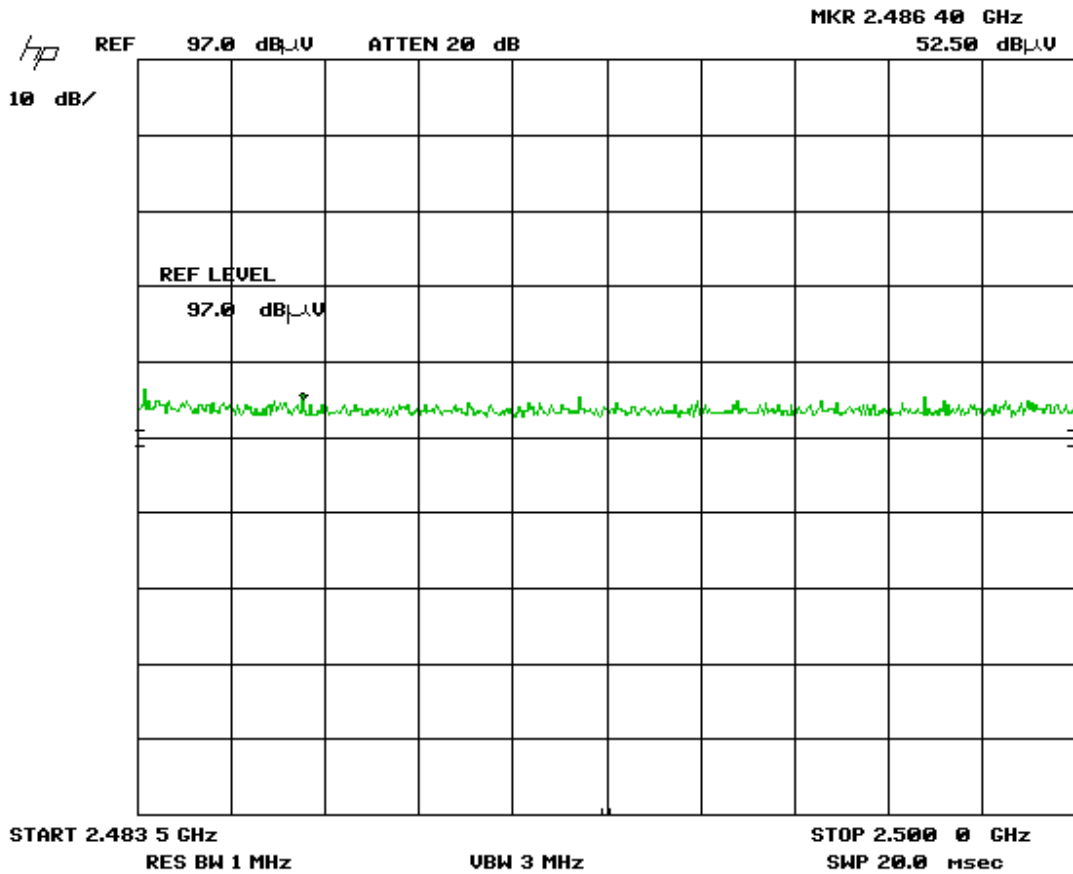
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

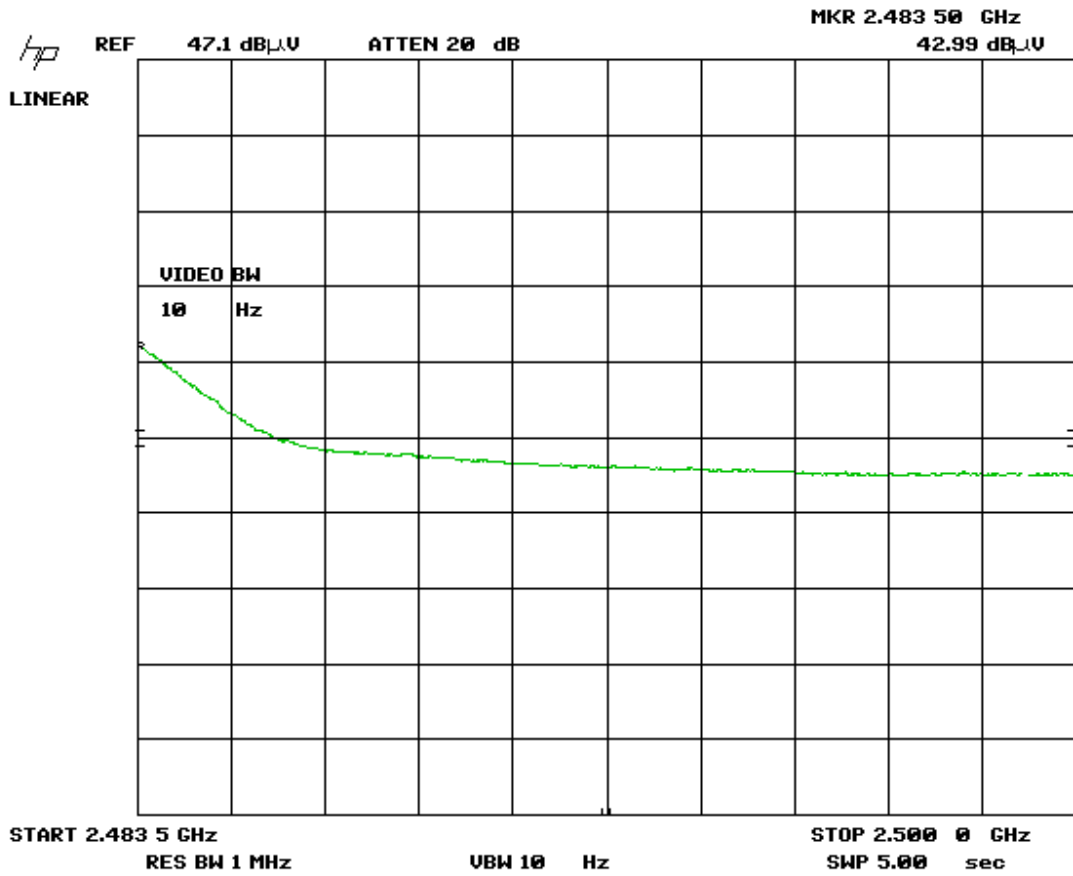
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Horizontal - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

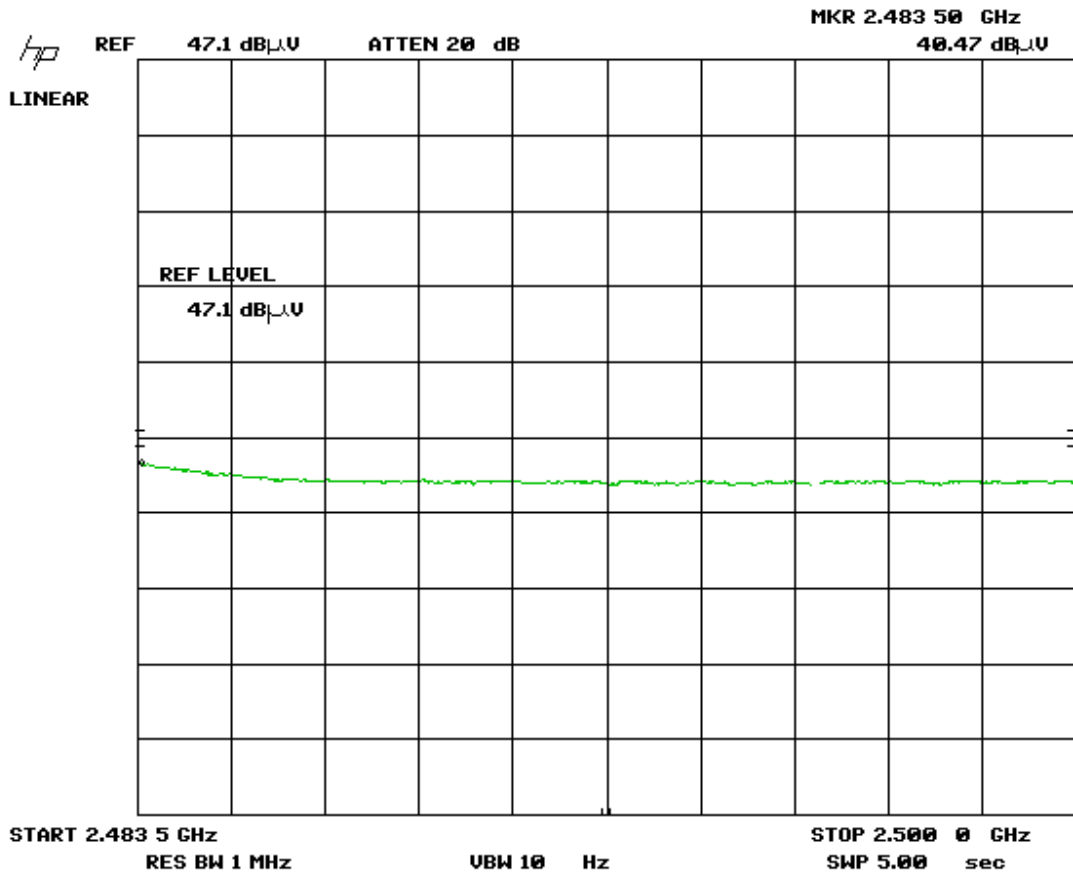
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Vertical –Average Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

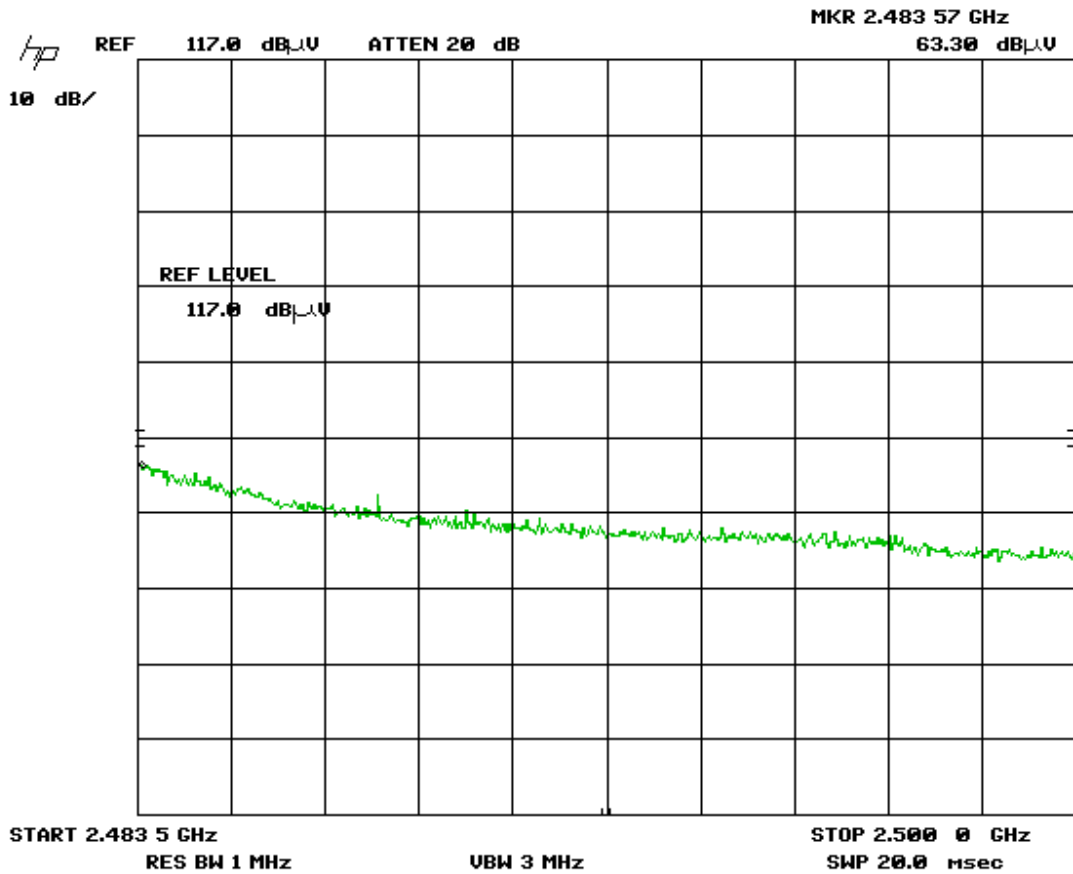
**WIFI G-Mode and Zigbee**  
**Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13**  
**Horizontal – Average Emission**




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

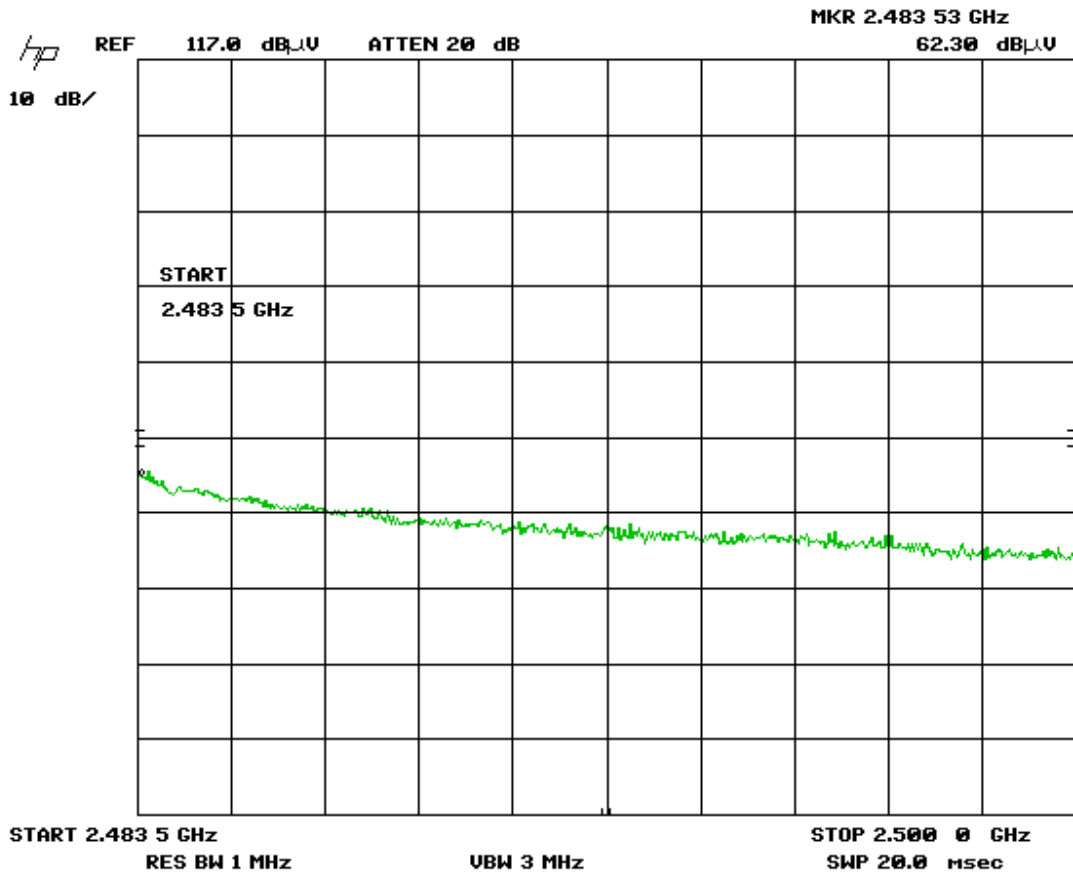
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x19  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

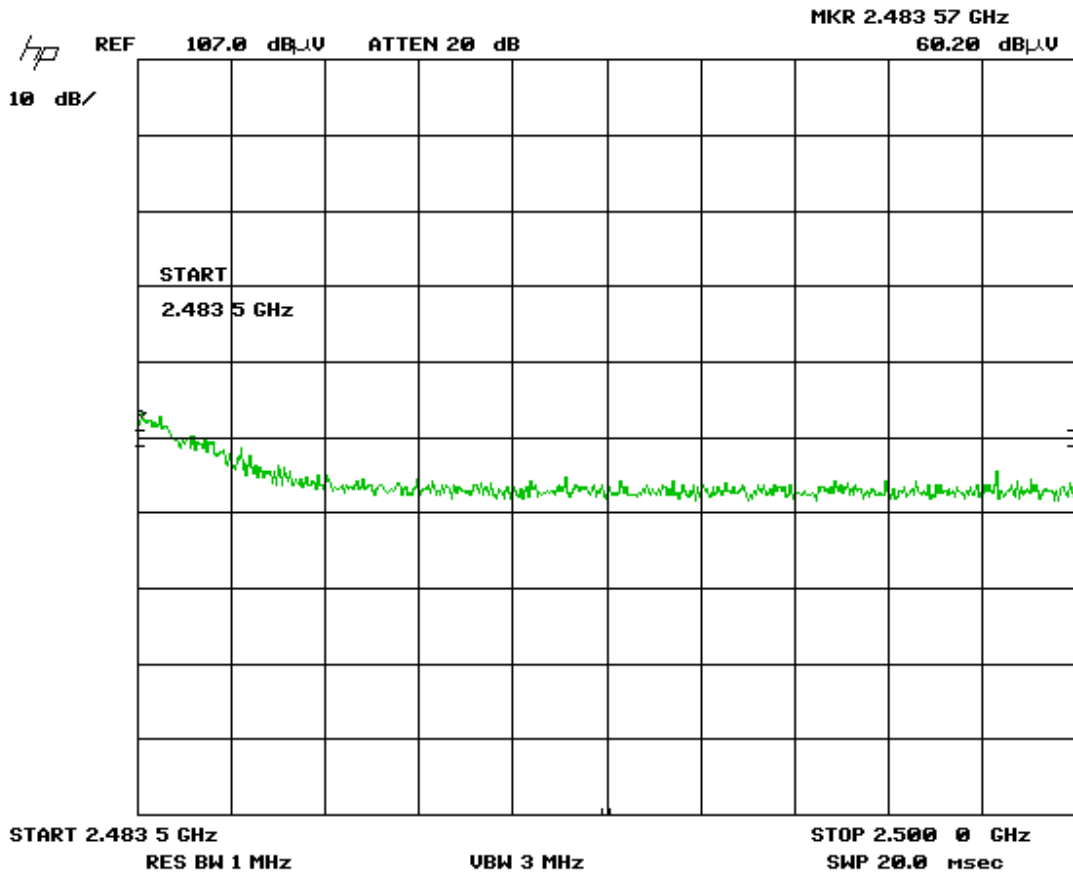
WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x19  
 Horizontal - Peak Emission



Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

**WIFI G-Mode and Zigbee**  
**Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x1A**  
**Vertical - Peak Emission**

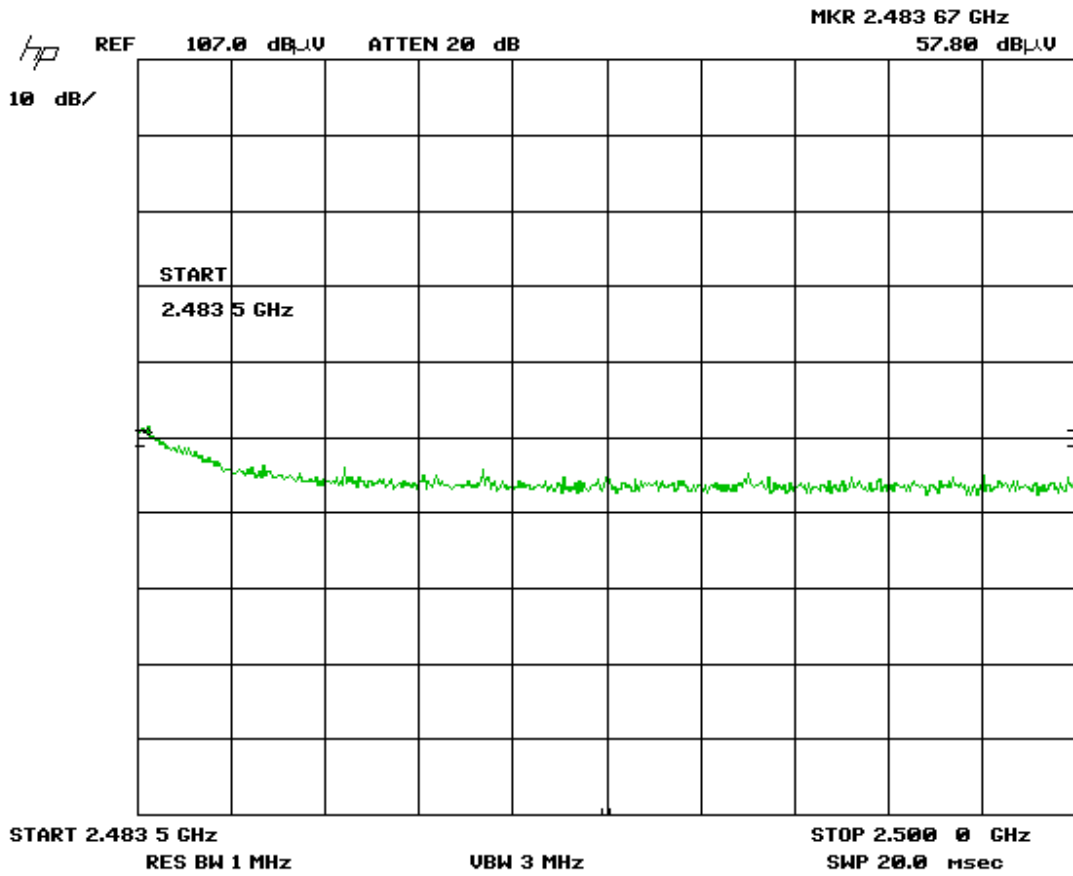


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

WIFI G-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x1A  
 Horizontal - Peak Emission

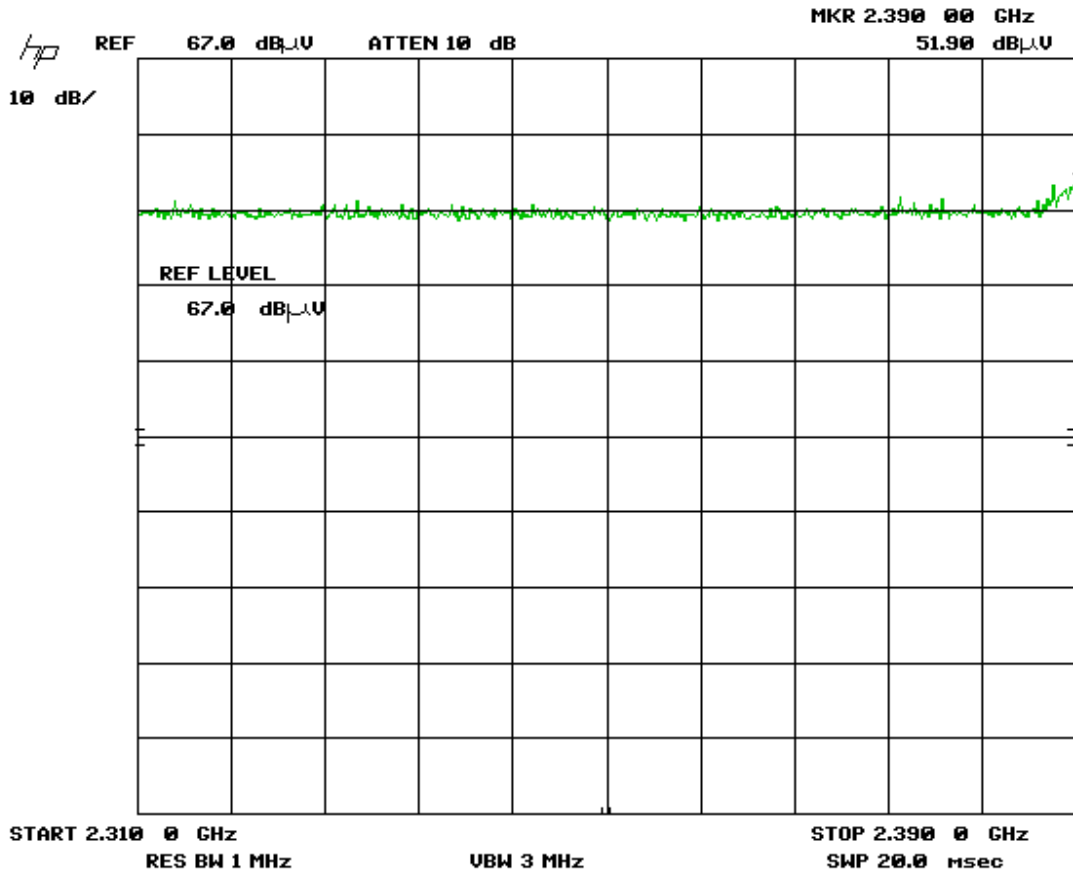


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.


Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Co-location WIFI N-Mode and Zigbee: Low Channels

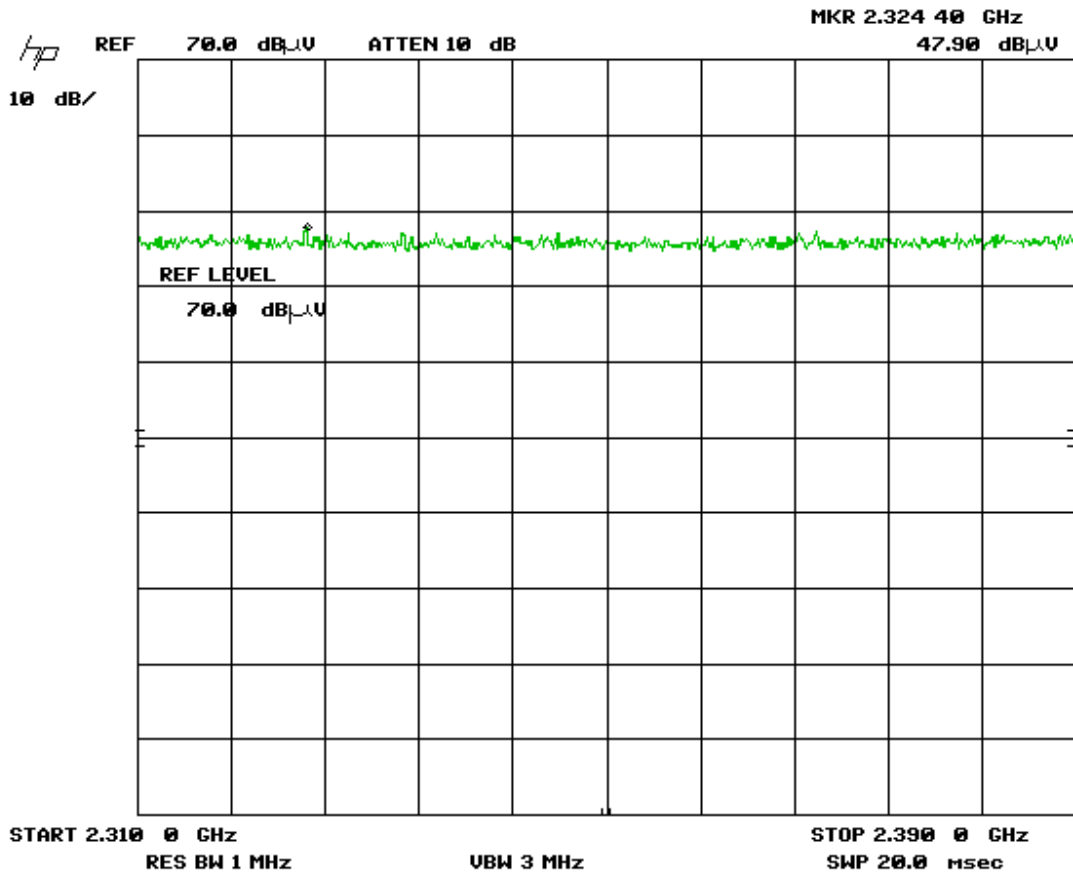
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

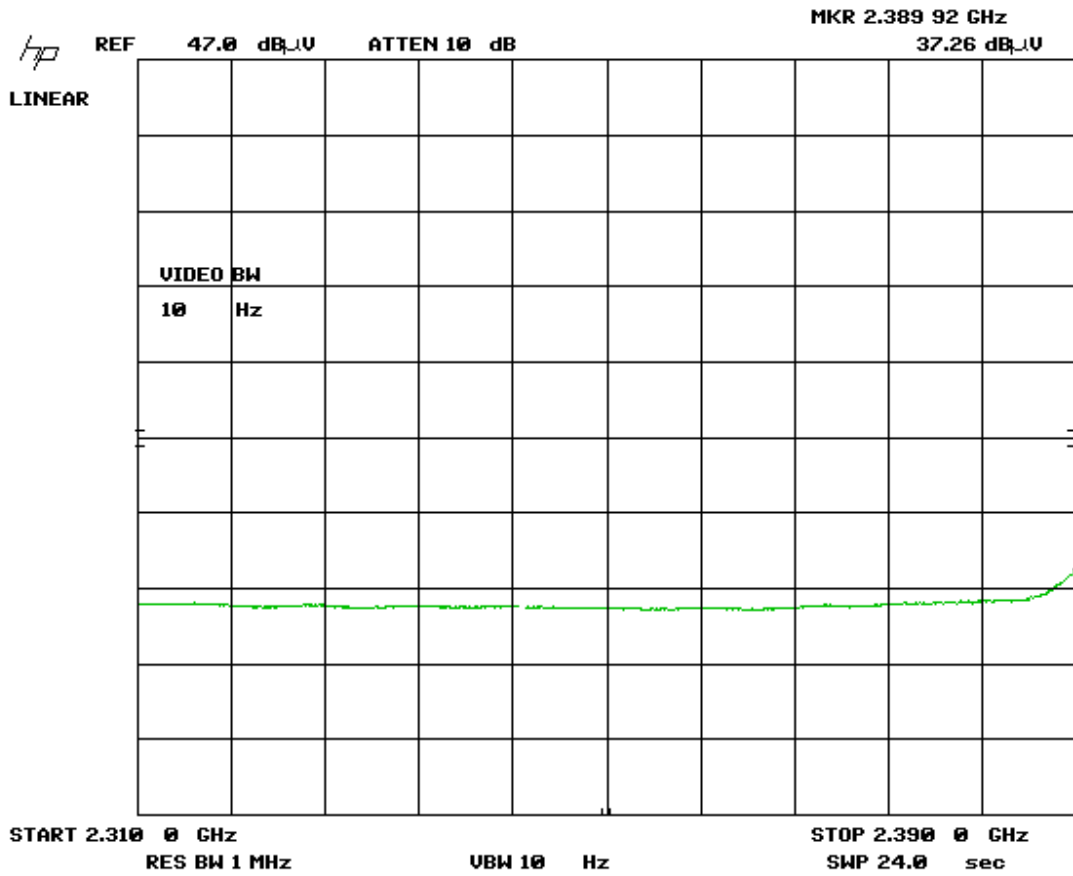
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Horizontal - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

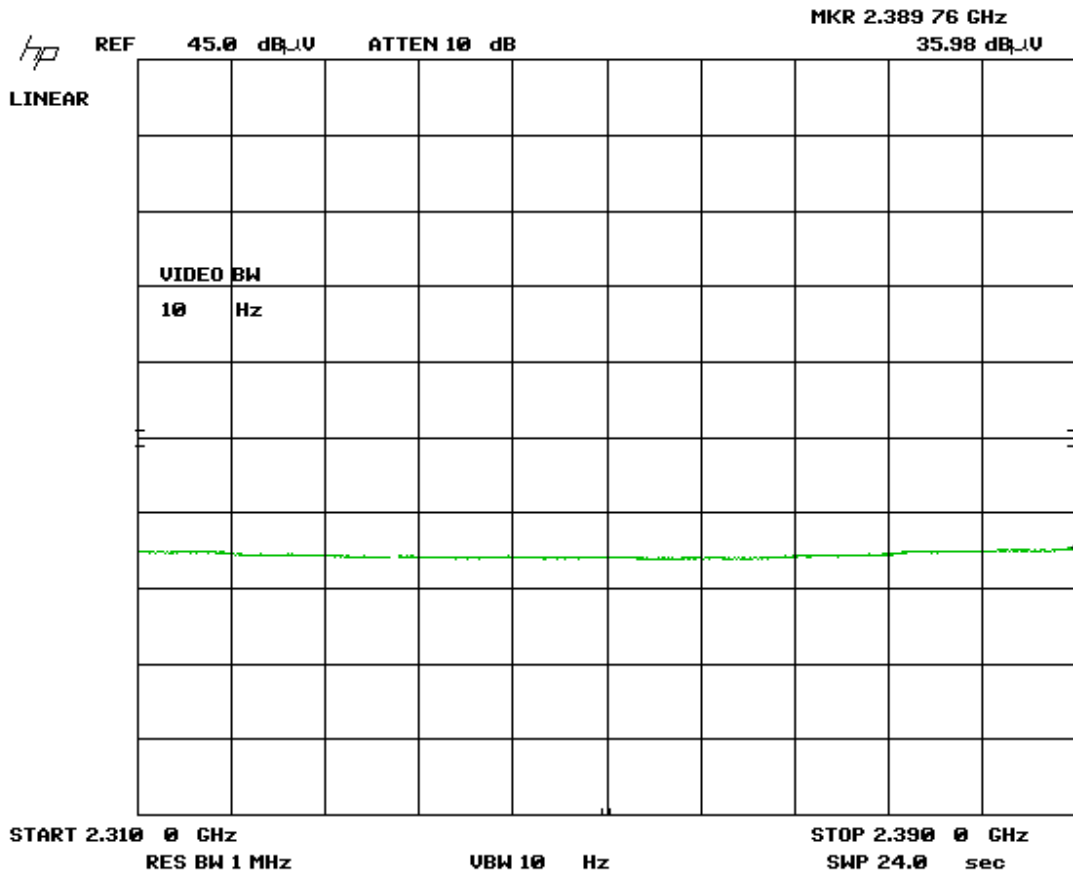
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Vertical –Average Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

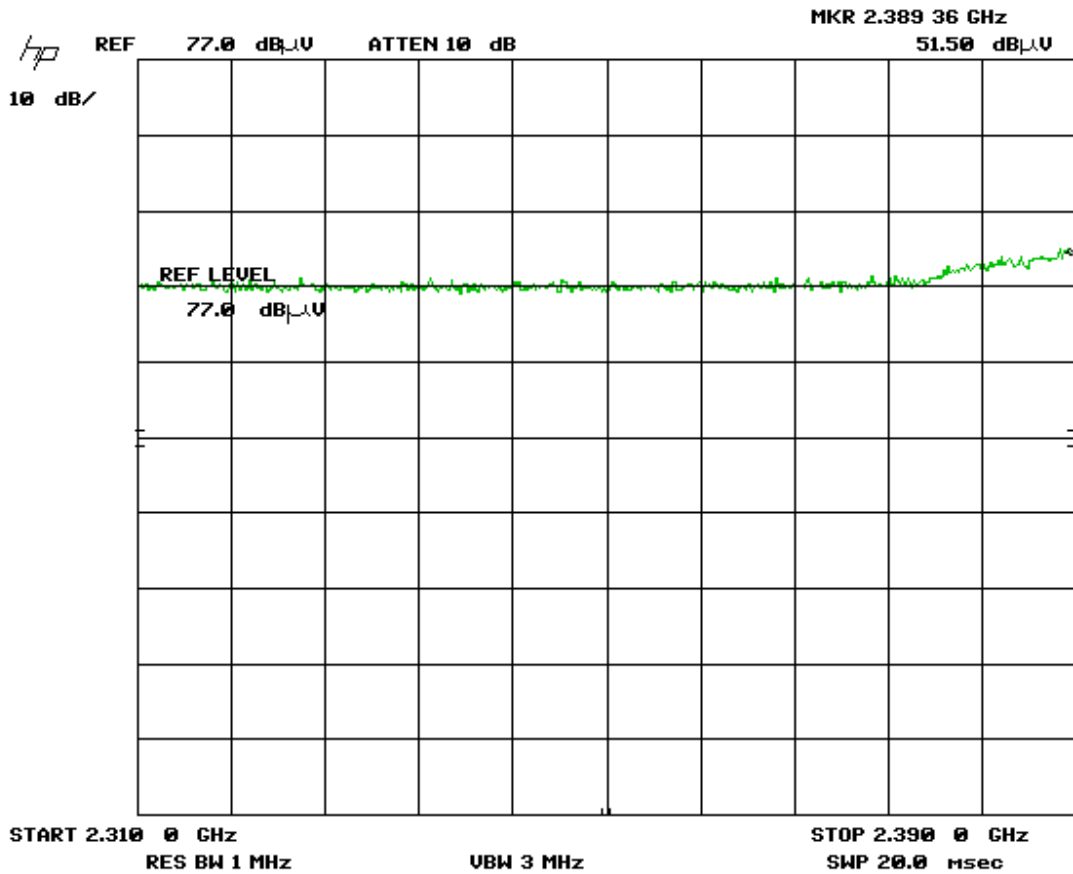
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 1, Zigbee Ch 0xF  
 Horizontal – Average Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

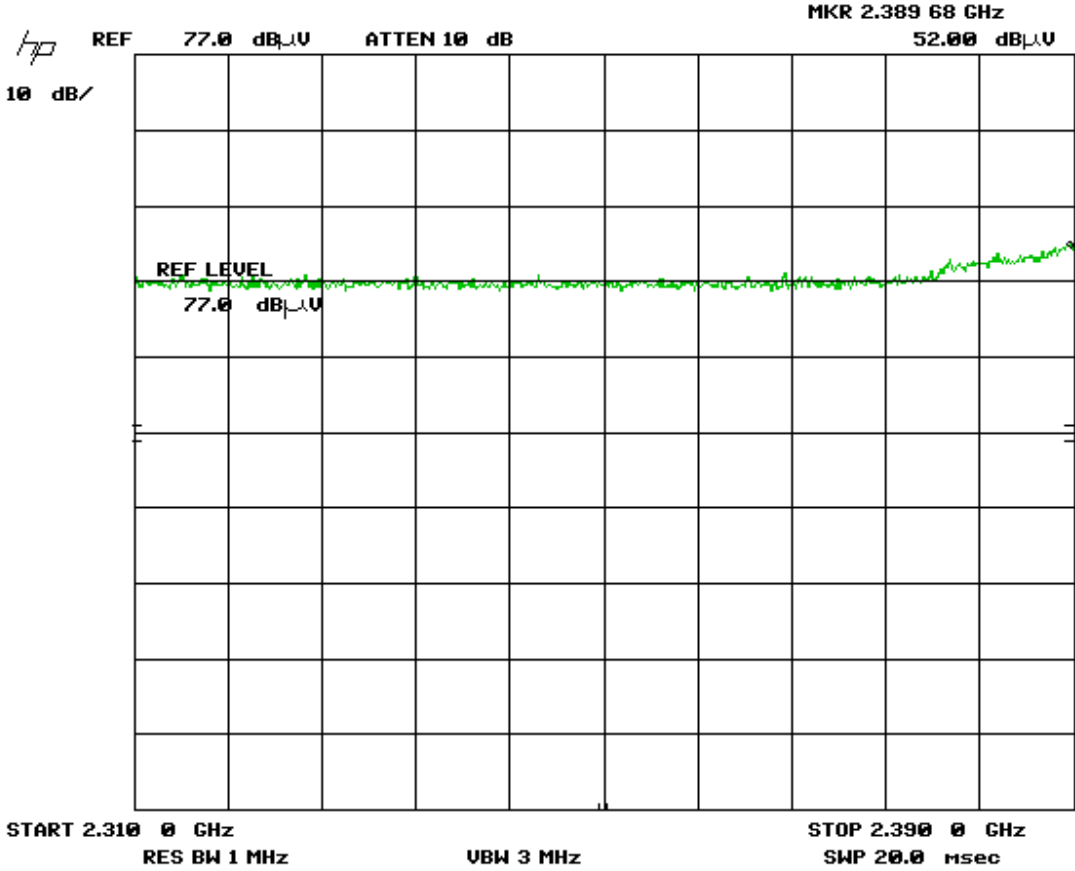
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 3, Zigbee Ch 0xB  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 3, Zigbee Ch 0xB  
 Horizontal - Peak Emission

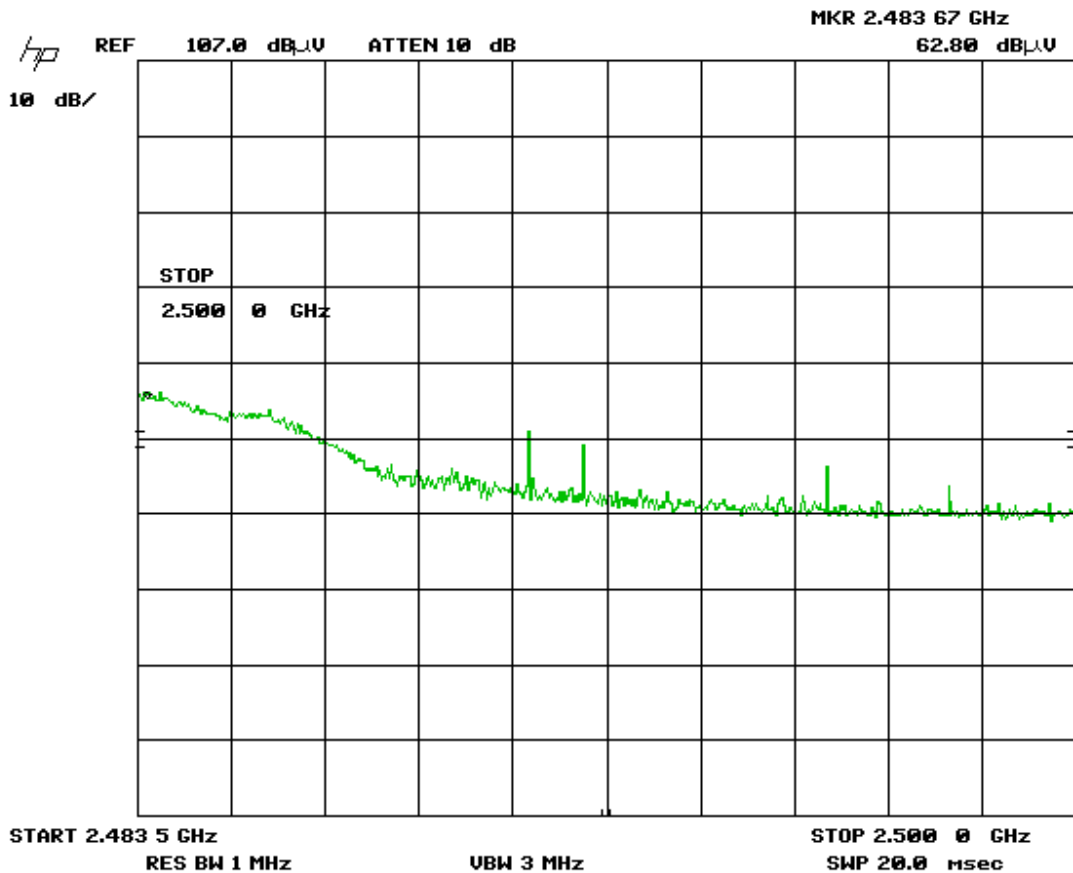


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


## Co-location WIFI N-Mode and Zigbee: High Channels

WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Vertical - Peak Emission

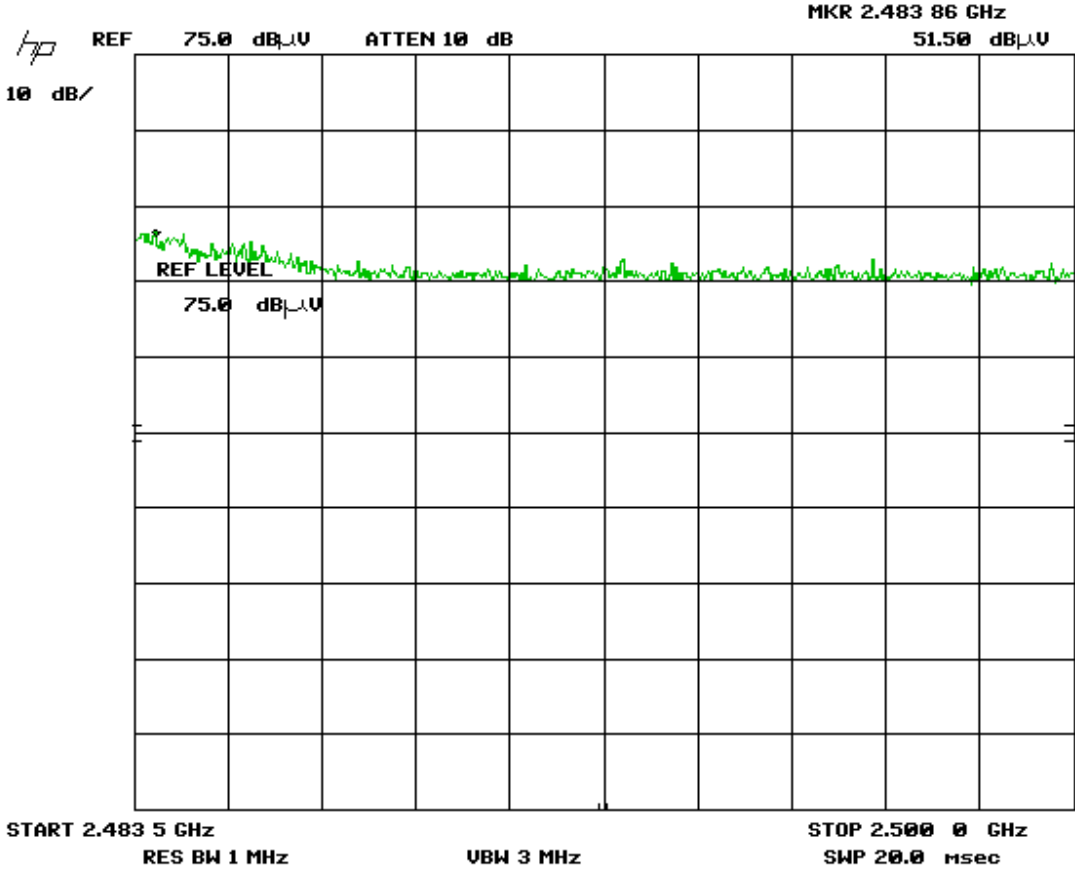


Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

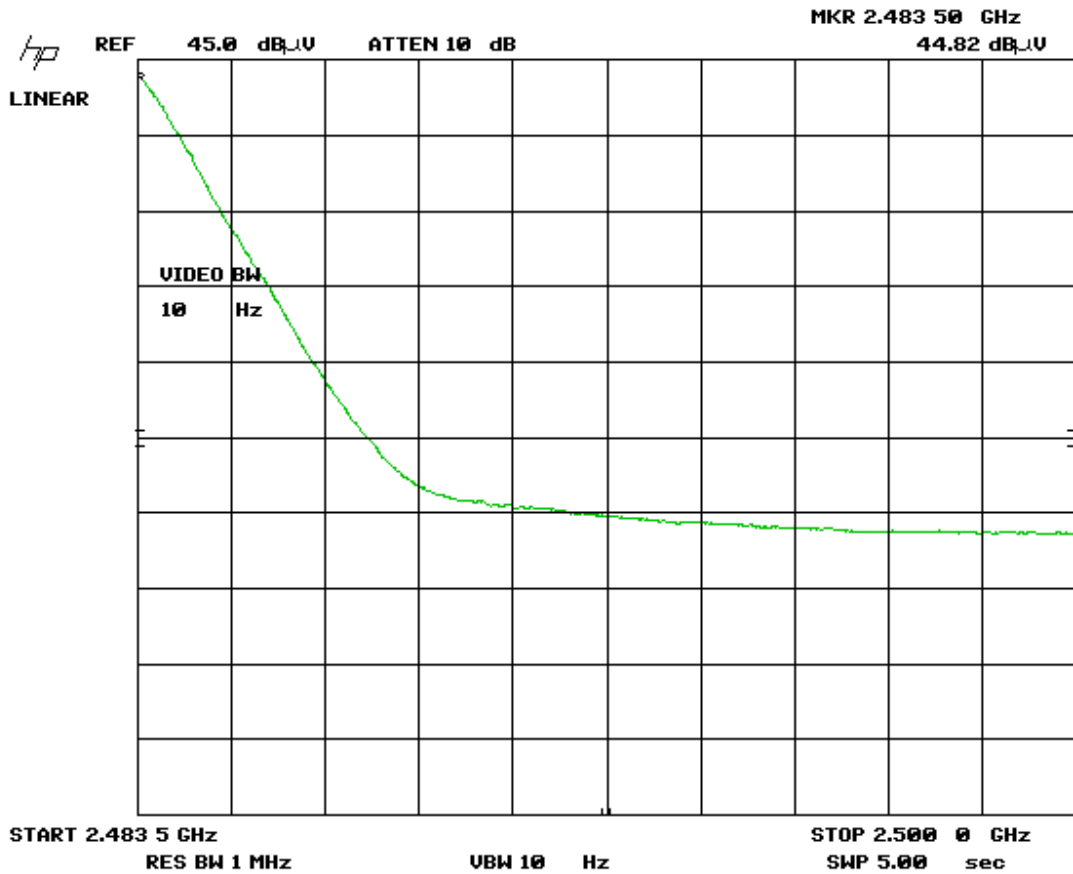
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Horizontal - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

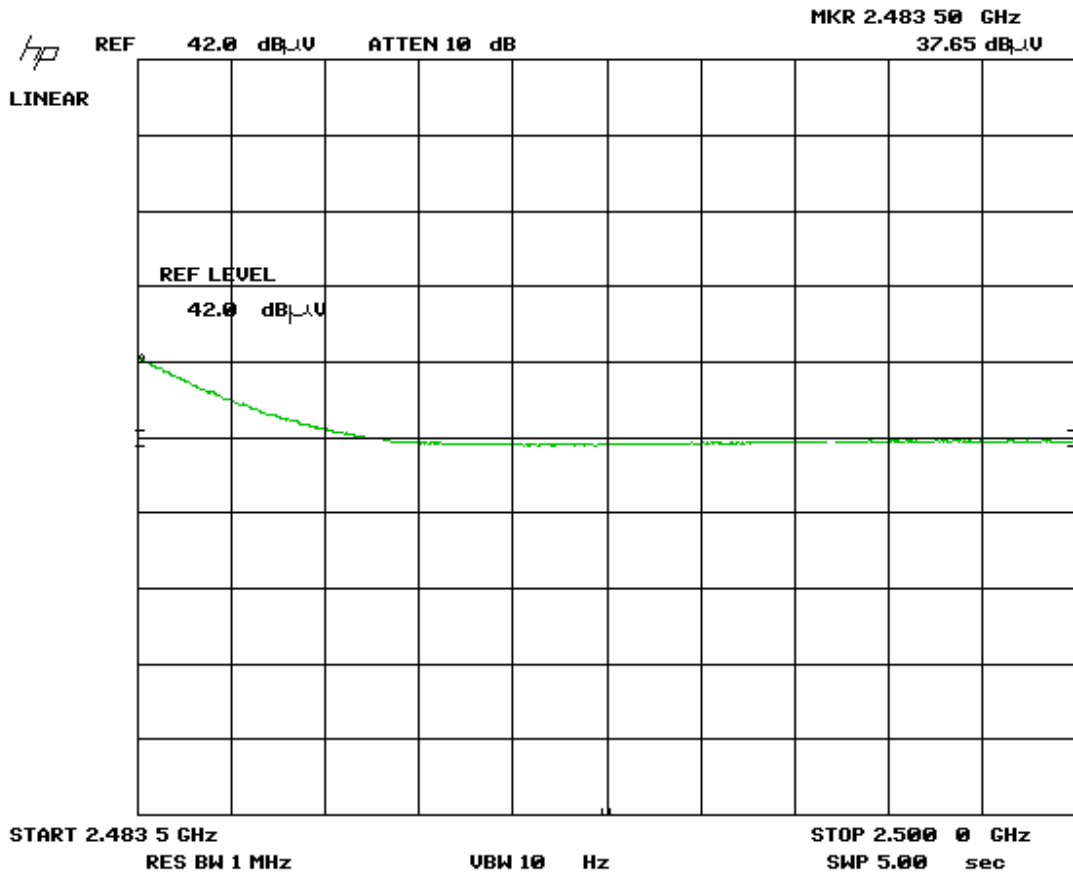
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Vertical –Average Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

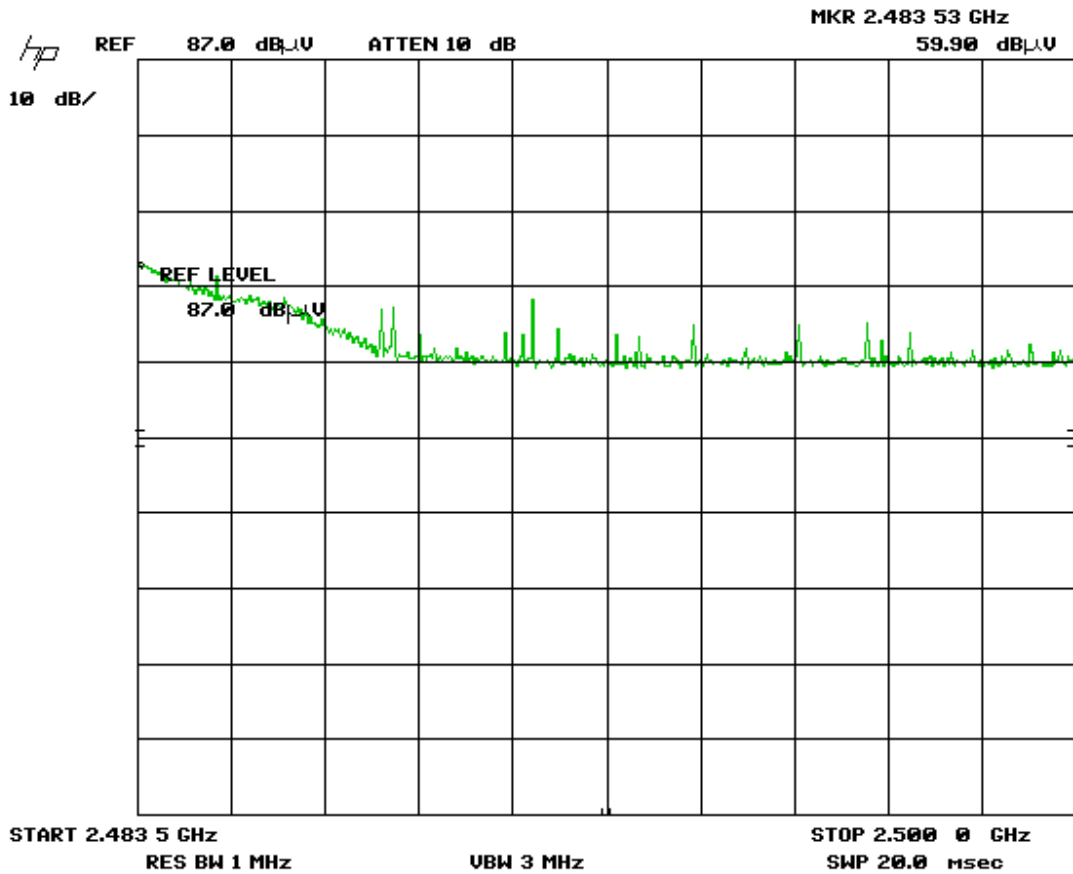
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x13  
 Horizontal – Average Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

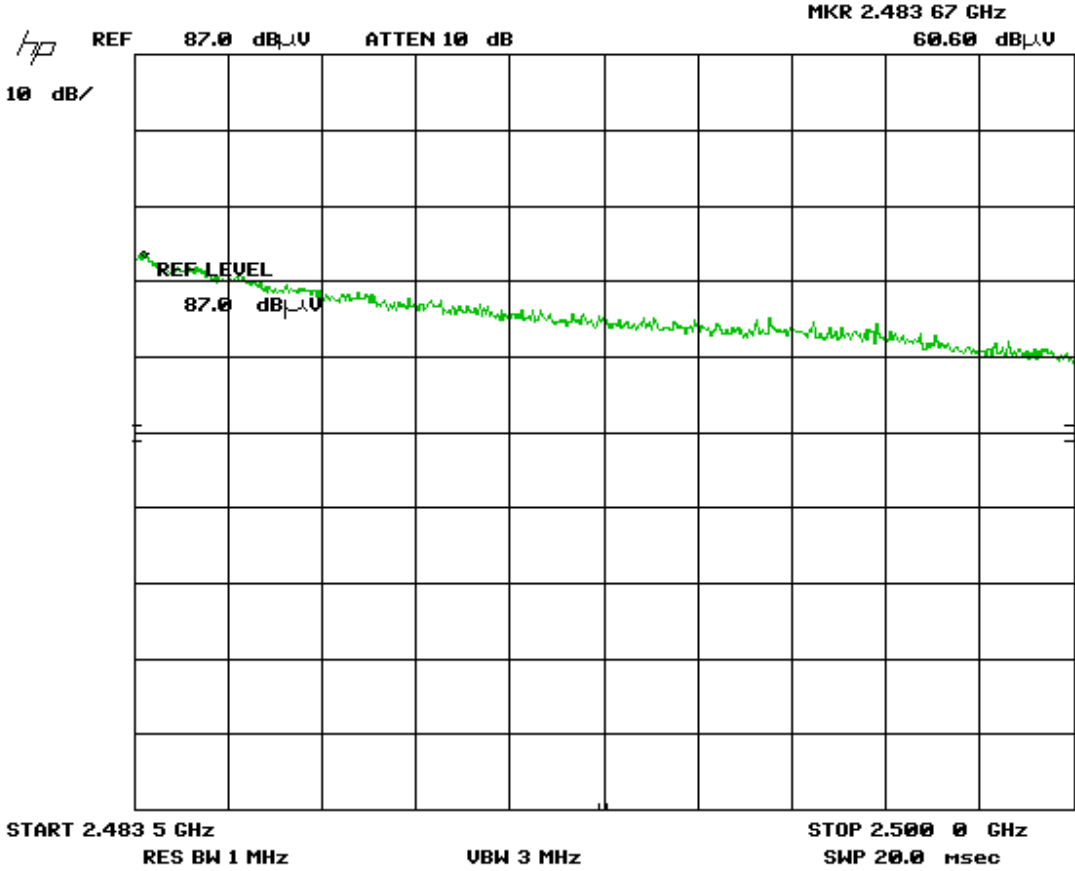
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x19  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

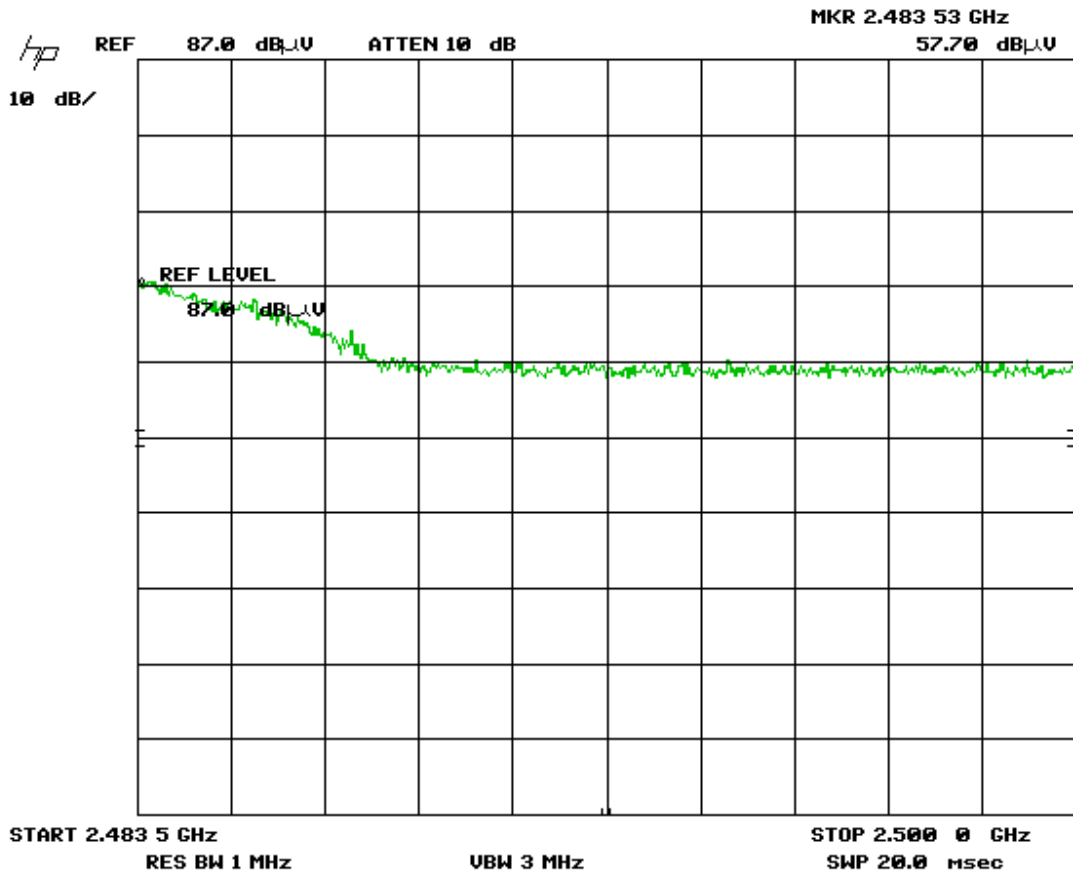
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x19  
 Horizontal - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

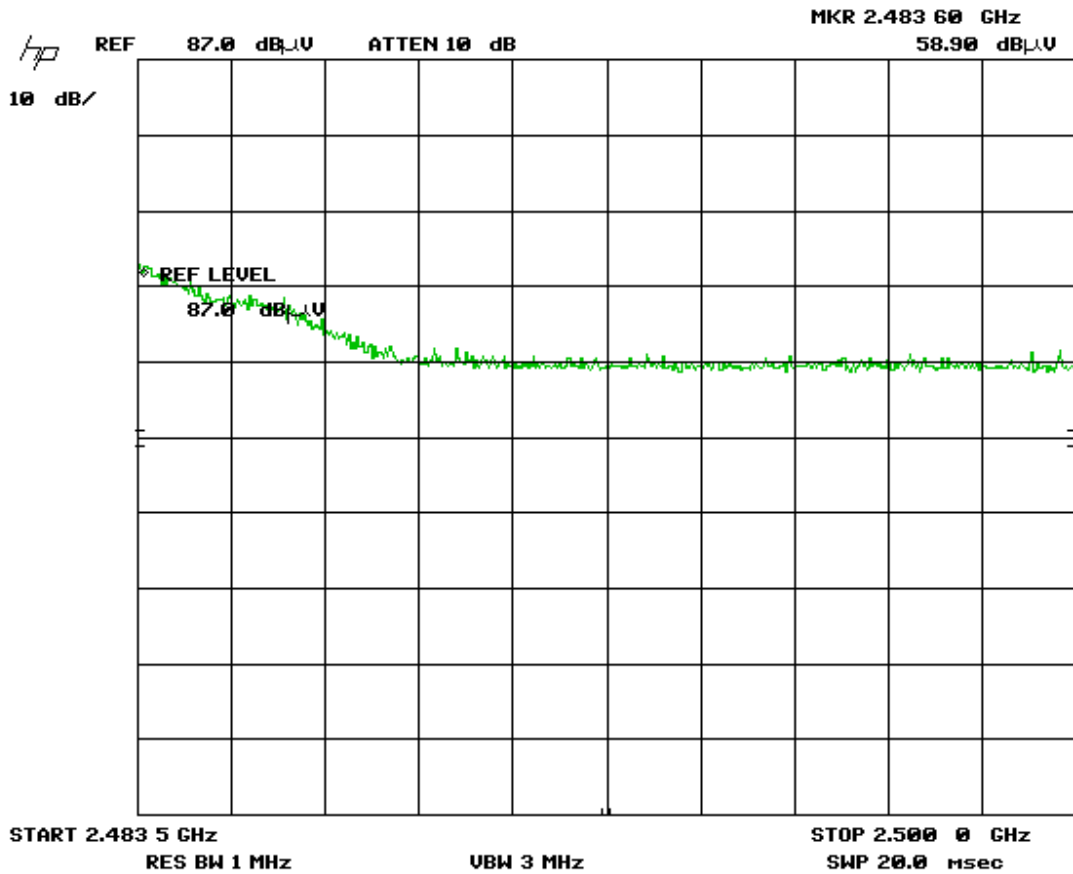
WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x1A  
 Vertical - Peak Emission




Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

WIFI N-Mode and Zigbee  
 Restricted-Band, Band Edge – WIFI Ch 11, Zigbee Ch 0x1A  
 Horizontal - Peak Emission



Note: Band edge plots were taken with 3 m measurements distance. The marker shows the raw value; see Final Measurements and Results section starting on page 144 for corrected values.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## 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. Emission outside the restricted bands were measured for information purpose.

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.

Product	Tripoli						
Supply	120 Vac 60 Hz						
Emission Table							
Frequency (MHz)	Detector	Raw (dBuV)	Correction Factors (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
56.384	QP	62.7	-26.1	36.6	40	3.4	Pass
65.987	QP	58.1	-26.6	31.5	40	8.5	Pass
36.208	QP	48.8	-16.8	32.0	40	8.0	Pass
107.891	QP	55.3	-21.2	34.1	43.5	9.4	Pass
122.441	QP	52.7	-20.6	32.1	43.5	11.4	Pass
133.984	QP	48.8	-20.9	27.9	43.5	15.6	Pass
9879.33	AVG	34.2	12.7	46.9	54.0	7.1	Pass
Emission Table							
106.727	QP	56.3	-21.3	35.0	43.5	8.5	Pass
132.626	QP	51.1	-20.9	30.2	43.5	13.3	Pass
9712.33	AVG	34.1	12.8	46.9	54.0	7.1	Pass




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Zigbee band edge and harmonic measurement


Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(μV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(μV/m)	Emission limit dB(μV/m)	Margin dB	Result
Low Channel (11) - Y axis (Vertical) Setpower 0x1 (Actual Power = 1 dBm)											
2405	Peak	Horz	108.8	30.7	4.2	10.0	35.8	117.9			PASS
2405	Avg	Horz	106.7	30.7	4.2	10.0	35.8	115.8			PASS
2405	Peak	Vert	108.1	30.7	4.2	10.0	35.8	117.2			PASS
2405	Avg	Vert	105.9	30.7	4.2	10.0	35.8	115.0			PASS
2390	Peak	Horz	54.0	30.7	4.2	10.0	35.8	63.1	74.0	10.9	PASS
2390	Avg	Horz	35.3	30.7	4.2	10.0	35.8	44.4	54.0	9.6	PASS
2390	Peak	Vert	54.2	30.7	4.2	10.0	35.8	63.3	74.0	10.7	PASS
2390	Avg	Vert	35.5	30.7	4.2	10.0	35.8	44.6	54.0	9.4	PASS
4810	Peak	Horz	50.0	33.5	5.8	0.0	35.3	54.0	74.0	20.0	PASS
4810	Avg	Horz	31.3	33.5	5.8	0.0	35.3	35.3	54.0	18.7	PASS
4810	Peak	Vert	49.4	33.5	5.8	0.0	35.3	53.4	74.0	20.6	PASS
4810	Avg	Vert	30.7	33.5	5.8	0.0	35.3	34.7	54.0	19.3	PASS
7215	Peak	Horz	57.2	38.2	7.1	0.0	35.5	67.0	74.0	7.0	PASS
7215	Avg	Horz	38.5	38.2	7.1	0.0	35.5	48.3	54.0	5.7	PASS
7215	Peak	Vert	52.8	38.2	7.1	0.0	35.5	62.6	74.0	11.4	PASS
7215	Avg	Vert	34.1	38.2	7.1	0.0	35.5	43.9	54.0	10.1	PASS
9620	Peak	Horz	53.6	39.4	8.7	0.0	36.1	65.6	74.0	8.4	PASS
9620	Avg	Horz	34.9	39.4	8.7	0.0	36.1	46.9	54.0	7.1	PASS
9620	Peak	Vert	51.3	39.4	8.7	0.0	36.1	63.3	74.0	10.7	PASS
9620	Avg	Vert	32.6	39.4	8.7	0.0	36.1	44.6	54.0	9.4	PASS
Mid Channel (0x13) - Y axis (Vertical) Setpower 0x1 (Actual Power = 1 dBm)											
2445	Peak	Horz	107.1	30.7	4.2	10.0	35.8	116.2			PASS
2445	Avg	Horz	105.2	30.7	4.2	10.0	35.8	114.3			PASS
2445	Peak	Vert	107.7	30.7	4.2	10.0	35.8	116.8			PASS
2445	Avg	Vert	105.7	30.7	4.2	10.0	35.8	114.8			PASS
Mid Channel (0x13) - Z axis (Flat) Setpower 0x1 (Actual Power = 1 dBm)											
2445	Peak	Horz	107.6	30.7	4.2	10.0	35.8	116.7			PASS
2445	Avg	Horz	105.6	30.7	4.2	10.0	35.8	114.7			PASS
2445	Peak	Vert	106.4	30.7	4.2	10.0	35.8	115.5			PASS
2445	Avg	Vert	104.4	30.7	4.2	10.0	35.8	113.5			PASS

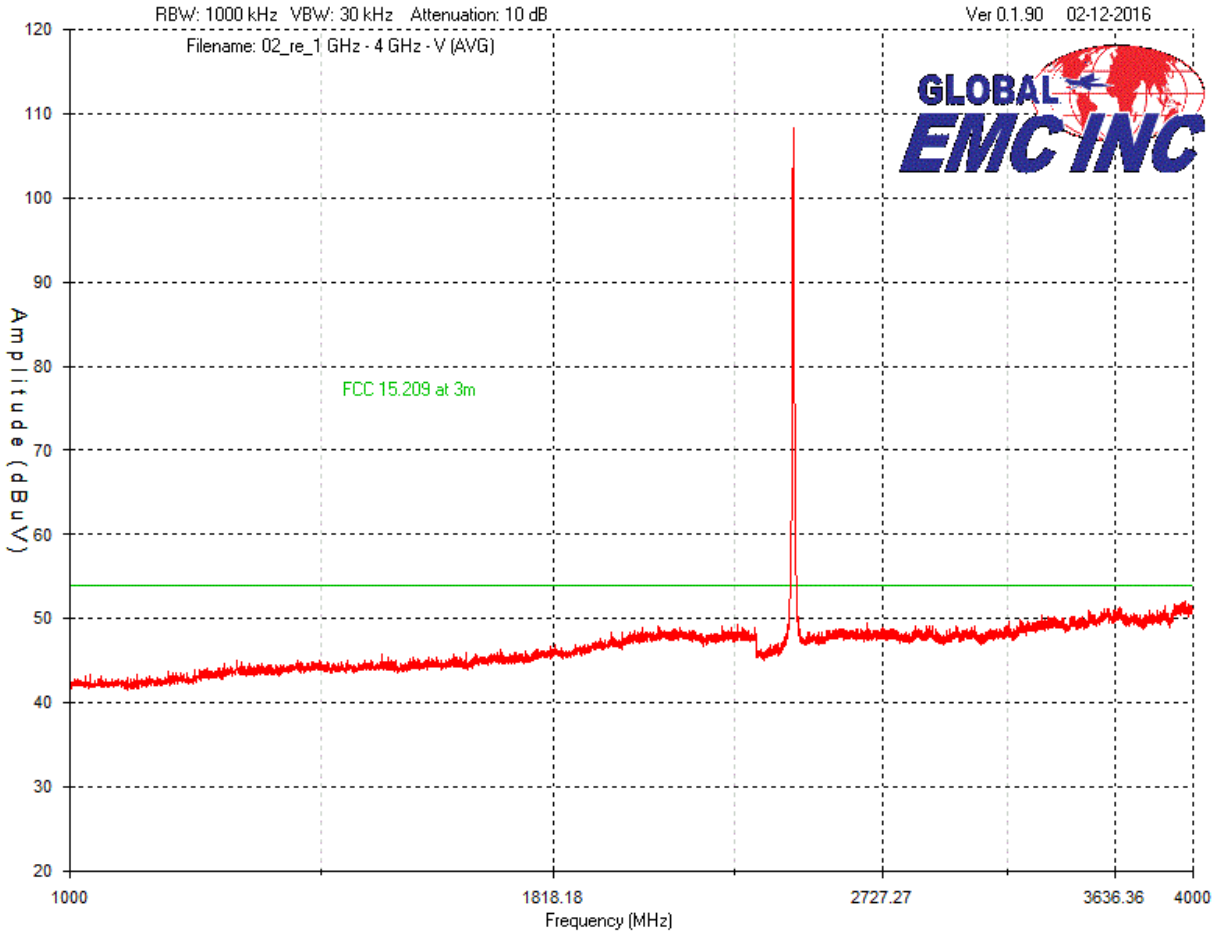
**Note 1: A duty cycle correction factor of -18.7 dB was used to derive average emissions from peak emissions.**

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
High Channel (0x19) - Z axis (Flat) - set power 1 (Actual Power = 1 dBm)											
2475	Peak	Horz	106.2	30.7	4.2	10.0	35.8	115.3			PASS
2475	Avg	Horz	104.3	30.7	4.2	10.0	35.8	113.4			PASS
2475	Peak	Vert	108.4	30.7	4.2	10.0	35.8	117.5			PASS
2475	Avg	Vert	106.1	30.7	4.2	10.0	35.8	115.2			PASS
2483.5	Peak	Horz	60.5	30.7	4.2	10.0	35.8	69.6	74.0	4.4	PASS
2483.5	Avg	Horz	41.8	30.7	4.2	10.0	35.8	50.9	54.0	3.1	PASS
2483.5	Peak	Vert	62.2	30.7	4.2	10.0	35.8	71.3	74.0	2.7	PASS
2483.5	Avg	Vert	43.5	30.7	4.2	10.0	35.8	52.6	54.0	1.4	PASS
High Channel (0x1A) -Z Axis (Flat) Set Power -0x1A (Actual Power = -26 dBm)											
2480	Peak	Horz	84.1	30.7	4.2	10.0	35.8	93.2			PASS
2480	Avg	Horz	82.0	30.7	4.2	10.0	35.8	91.1			PASS
2480	Peak	Vert	85.3	30.7	4.2	10.0	35.8	94.4			PASS
2480	Avg	Vert	83.1	30.7	4.2	10.0	35.8	92.2			PASS
2483.5	Peak	Horz	58.2	30.7	4.2	10.0	35.8	67.3	74.0	6.7	PASS
2483.5	Avg	Horz	39.5	30.7	4.2	10.0	35.8	48.6	54.0	5.4	PASS
2483.5	Peak	Vert	58.8	30.7	4.2	10.0	35.8	67.9	74.0	6.1	PASS
2483.5	Avg	Vert	40.1	30.7	4.2	10.0	35.8	49.2	54.0	4.8	PASS

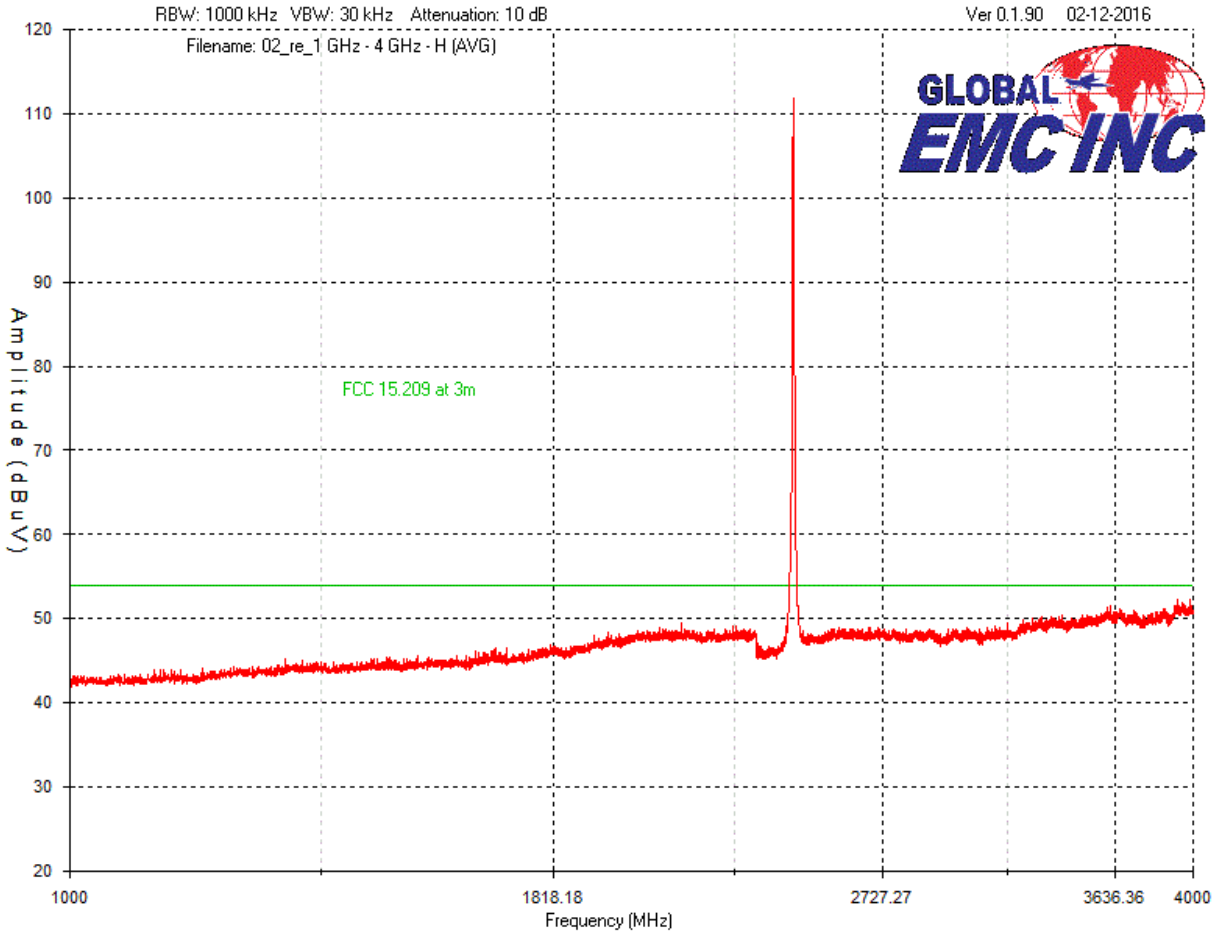
**Note 2: A duty cycle correction factor of -18.7 dB was used to derive average emissions from peak emissions.**

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	




**Graph 1: Zigbee vertical average emission, 1 GHz – 4 GHz.**

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	




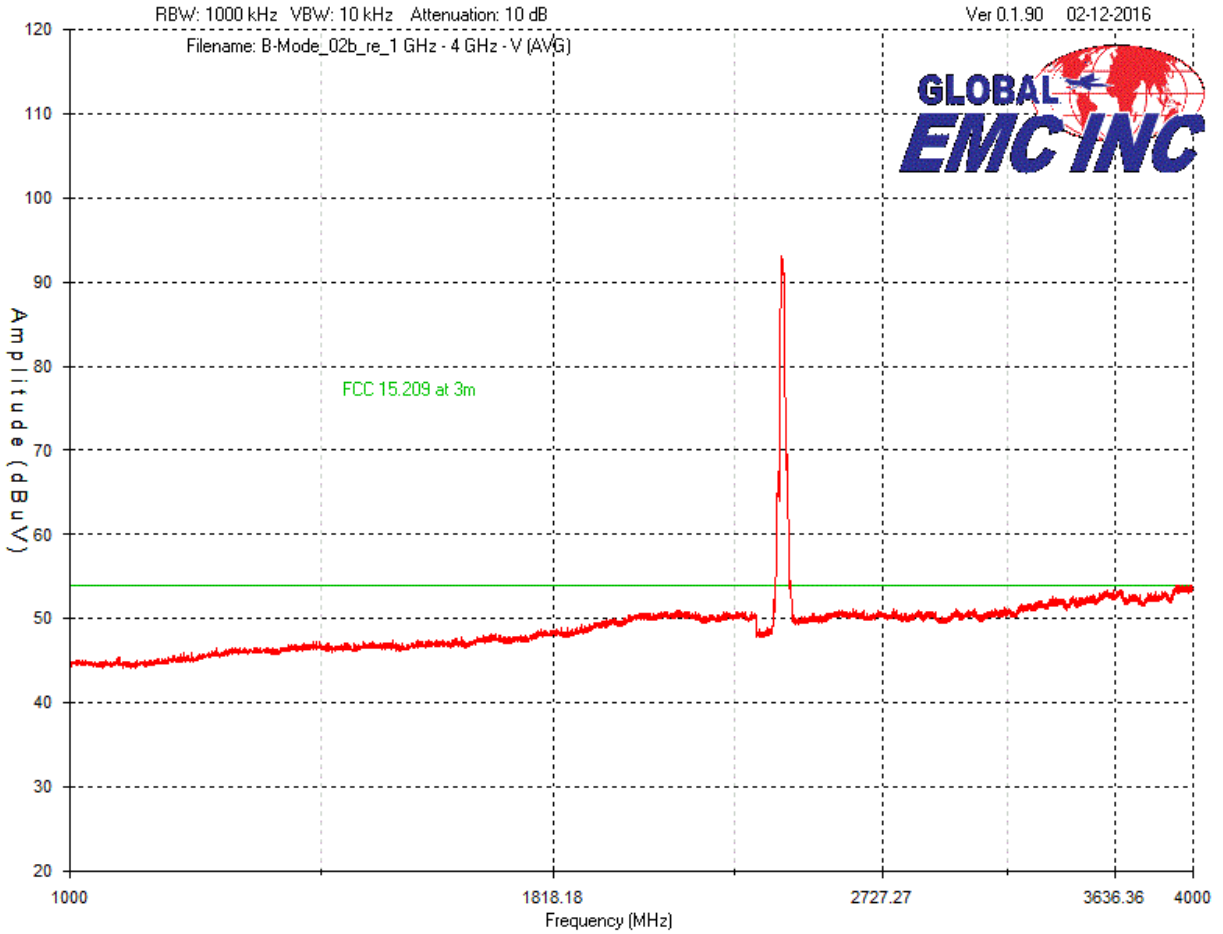
**Graph 2: Zigbee horizontal average emission, 1 GHz – 4 GHz.**

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


## WIFI B-Mode harmonics and band edge

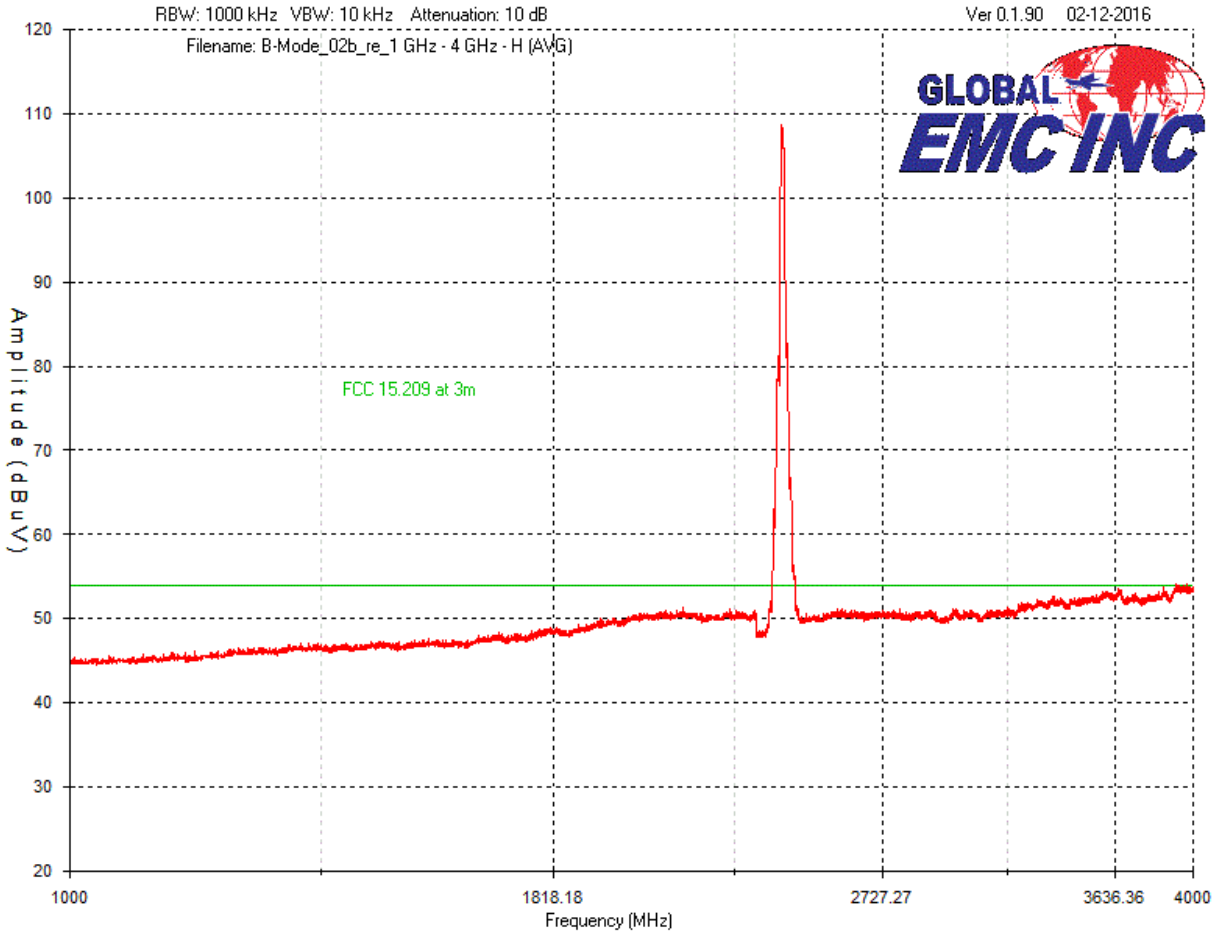
Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
Low Channel (1) - Y Axis (Vertical) Set Power 13 (Command "22 11 13 0", "17 1 5")											
2405	Peak	Horz	90.9	30.7	4.2	10.0	35.8	100.0			PASS
2405	Avg	Horz	82.2	30.7	4.2	10.0	35.8	91.3			PASS
2405	Peak	Vert	96.7	30.7	4.2	10.0	35.8	105.8			PASS
2405	Avg	Vert	88.0	30.7	4.2	10.0	35.8	97.1			PASS
2390	Peak	Horz	46.8	30.7	4.2	10.0	35.8	55.9	74.0	18.1	PASS
2390	Avg	Horz	34.3	30.7	4.2	10.0	35.8	43.4	54.0	10.6	PASS
2390	Peak	Vert	46.0	30.7	4.2	10.0	35.8	55.1	74.0	18.9	PASS
2390	Avg	Vert	34.4	30.7	4.2	10.0	35.8	43.5	54.0	10.5	PASS
Mid Channel (0x13) - Y axis (Vertical)											
2437	Peak	Horz	89.6	30.7	4.2	10.0	35.8	98.7			PASS
2437	Avg	Horz	80.9	30.7	4.2	10.0	35.8	90.0			PASS
2437	Peak	Vert	99.1	30.7	4.2	10.0	35.8	108.2			PASS
2437	Avg	Vert	90.4	30.7	4.2	10.0	35.8	99.5			PASS
Mid Channel (0x13) - Z axis (Flat)											
2445	Peak	Horz	98.2	30.7	4.2	10.0	35.8	107.3			PASS
2445	Avg	Horz	89.7	30.7	4.2	10.0	35.8	98.8			PASS
2445	Peak	Vert	84.2	30.7	4.2	10.0	35.8	93.3			PASS
2445	Avg	Vert	75.3	30.7	4.2	10.0	35.8	84.4			PASS
High Channel (11) -Y Axis (Vertical) Set Power 13 (Command "22 11 13 0", "17 1 5")											
2462	Peak	Horz	92.8	30.7	4.2	10.0	35.8	101.9			PASS
2462	Avg	Horz	83.9	30.7	4.2	10.0	35.8	93.0			PASS
2462	Peak	Vert	99.4	30.7	4.2	10.0	35.8	108.5			PASS
2462	Avg	Vert	90.5	30.7	4.2	10.0	35.8	99.6			PASS
2483.5	Peak	Horz	46.5	30.7	4.2	10.0	35.8	55.6	74.0	18.4	PASS
2483.5	Avg	Horz	34.1	30.7	4.2	10.0	35.8	43.2	54.0	10.8	PASS
2483.5	Peak	Vert	46.8	30.7	4.2	10.0	35.8	55.9	74.0	18.1	PASS
2483.5	Avg	Vert	34.5	30.7	4.2	10.0	35.8	43.6	54.0	10.4	PASS
4924	Peak	Horz	44.0	33.5	7.7	0.0	35.3	49.9	74.0	24.1	PASS
4924	Avg	Horz	31.8	33.5	7.7	0.0	35.3	37.7	54.0	16.3	PASS
4924	Peak	Vert	45.1	33.5	7.7	0.0	35.3	51.0	74.0	23.0	PASS
4924	Avg	Vert	31.9	33.5	7.7	0.0	35.3	37.8	54.0	16.2	PASS
7386	Peak	Vert	46.7	38.2	5.8	0.0	35.5	55.2	74.0	18.8	PASS
7386	Avg	Vert	34.9	38.2	5.8	0.0	35.5	43.4	54.0	10.6	PASS
7386	Peak	Horz	46.5	38.2	5.8	0.0	35.5	55.0	74.0	19.0	PASS
7386	Avg	Horz	34.8	38.2	5.8	0.0	35.5	43.3	54.0	10.7	PASS

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	




**Graph 3: WIFI B-Mode vertical average emission, 1 GHz – 4 GHz.**

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	




**Graph 4: WIFI B-Mode horizontal average emission, 1 GHz – 4 GHz.**

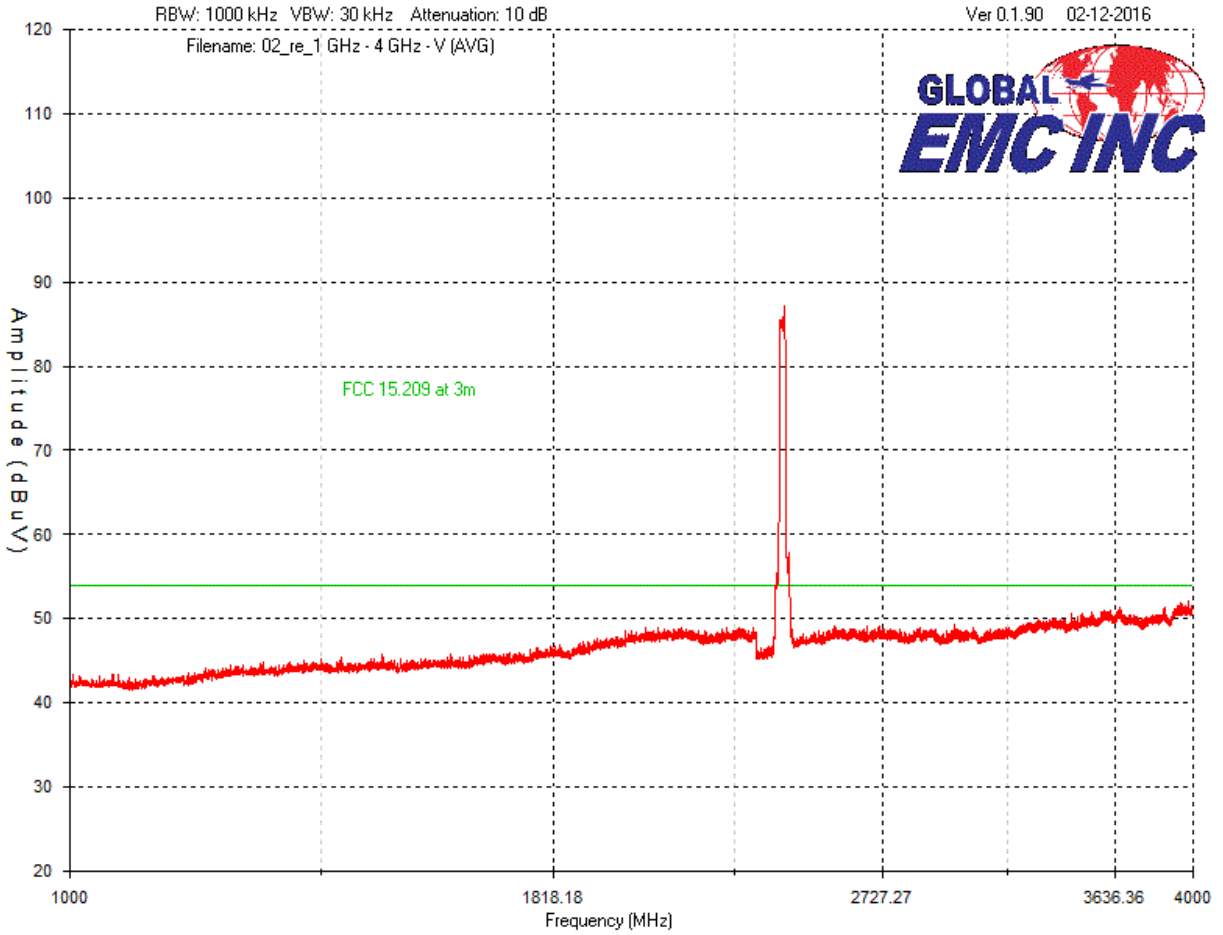
Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## WIFI G-Mode harmonics and band edge


Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
Low Channel (1) - Y Axis (Vertical) Set Power 13 (Command "22 11 13 1", "17 1 13")											
2412	Peak	Horz	88.5	30.7	4.2	10.0	35.8	97.6			PASS
2412	Avg	Horz	77.2	30.7	4.2	10.0	35.8	86.3			PASS
2412	Peak	Vert	94.6	30.7	4.2	10.0	35.8	103.7			PASS
2412	Avg	Vert	83.5	30.7	4.2	10.0	35.8	92.6			PASS
2390	Peak	Horz	46.8	30.7	4.2	10.0	35.8	55.9	74.0	18.1	PASS
2390	Avg	Horz	34.5	30.7	4.2	10.0	35.8	43.6	54.0	10.4	PASS
2390	Peak	Vert	48.3	30.7	4.2	10.0	35.8	57.4	74.0	16.6	PASS
2390	Avg	Vert	36.1	30.7	4.2	10.0	35.8	45.2	54.0	8.8	PASS
Mid Channel (6) - Y axis (Vertical)											
2437	Peak	Horz	86.4	30.7	4.2	10.0	35.8	95.5			PASS
2437	Avg	Horz	75.7	30.7	4.2	10.0	35.8	84.8			PASS
2437	Peak	Vert	96.8	30.7	4.2	10.0	35.8	105.9			PASS
2437	Avg	Vert	85.4	30.7	4.2	10.0	35.8	94.5			PASS
Mid Channel (6) - Z axis (Flat)											
2437	Peak	Horz	95.8	30.7	4.2	10.0	35.8	104.9			PASS
2437	Avg	Horz	84.7	30.7	4.2	10.0	35.8	93.8			PASS
2437	Peak	Vert	81.8	30.7	4.2	10.0	35.8	90.9			PASS
2437	Avg	Vert	70.5	30.7	4.2	10.0	35.8	79.6			PASS
High Channel (11) -Y Axis (Vertical) Set Power 13 (Command "22 11 13 1", "17 1 13")											
2462	Peak	Horz	90.5	30.7	4.2	10.0	35.8	99.6			PASS
2462	Avg	Horz	79.0	30.7	4.2	10.0	35.8	88.1			PASS
2462	Peak	Vert	97.3	30.7	4.2	10.0	35.8	106.4			PASS
2462	Avg	Vert	85.8	30.7	4.2	10.0	35.8	94.9			PASS
2483.5	Peak	Horz	50.0	30.7	4.2	10.0	35.8	59.1	74.0	14.9	PASS
2483.5	Avg	Horz	36.9	30.7	4.2	10.0	35.8	46.0	54.0	8.0	PASS
2483.5	Peak	Vert	58.4	30.7	4.2	10.0	35.8	67.5	74.0	6.5	PASS
4924	Peak	Horz	44.1	33.5	7.7	0.0	35.3	50.0	74.0	24.0	PASS
4924	Avg	Horz	31.7	33.5	7.7	0.0	35.3	37.6	54.0	16.4	PASS
4924	Peak	Vert	44.9	33.5	7.7	0.0	35.3	50.8	74.0	23.2	PASS
4924	Avg	Vert	32.0	33.5	7.7	0.0	35.3	37.9	54.0	16.1	PASS
7386	Peak	Vert	47.6	38.2	5.8	0.0	35.5	56.1	74.0	17.9	PASS
7386	Avg	Vert	35.0	38.2	5.8	0.0	35.5	43.5	54.0	10.5	PASS
7386	Peak	Horz	46.4	38.2	5.8	0.0	35.5	54.9	74.0	19.1	PASS
7386	Avg	Horz	34.6	38.2	5.8	0.0	35.5	43.1	54.0	10.9	PASS

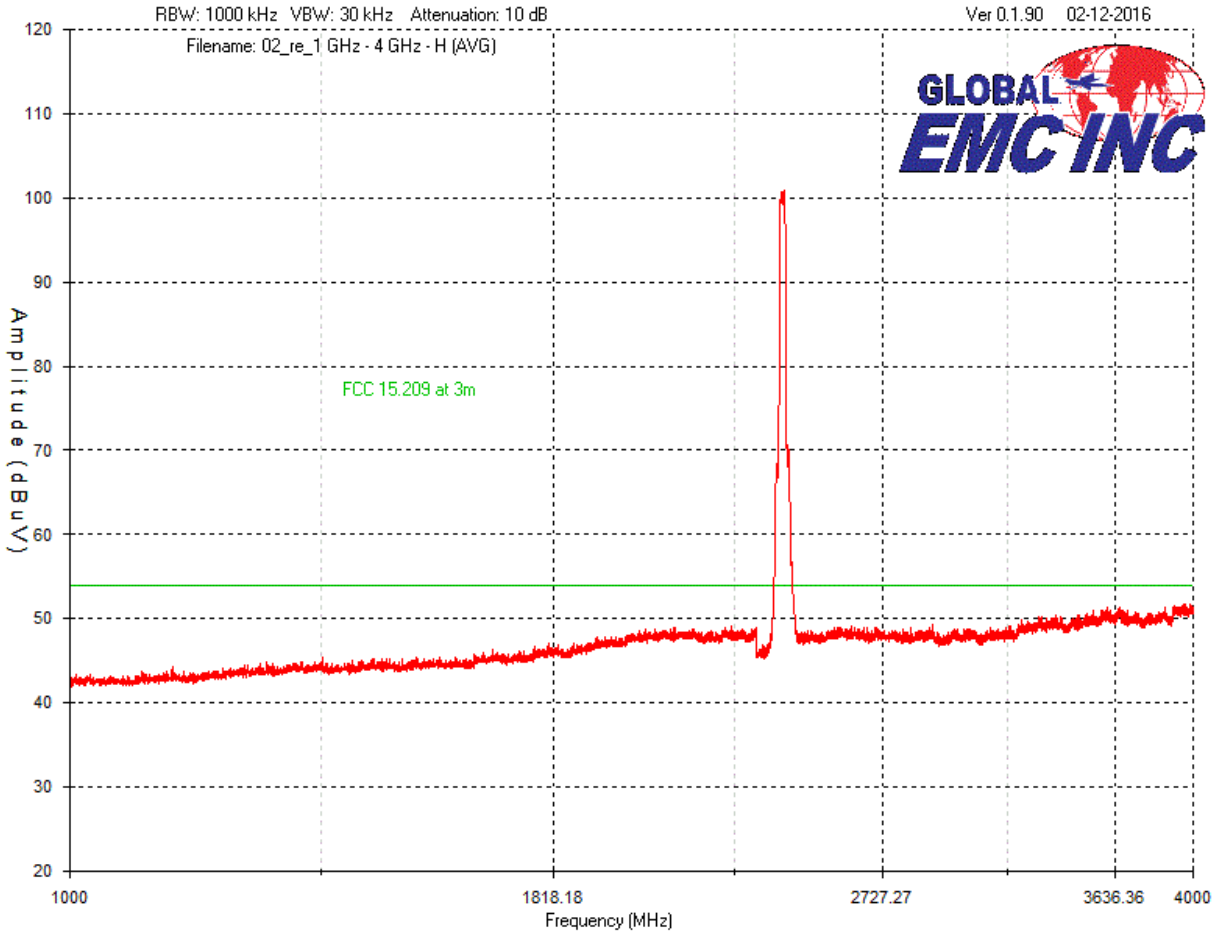


Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	




**Graph 5: WIFI G-Mode vertical average emission, 1 GHz – 4 GHz.**

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	




**Graph 6: WIFI G-Mode horizontal average emission, 1 GHz – 4 GHz.**

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

### WIFI N-Mode harmonics and band edge

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
Low Channel (1) - Y Axis (Vertical) Set Power 13 (Command "22 11 13 1", "17 1 13")											
2412	Peak	Horz	84.1	30.7	4.2	10.0	35.8	93.2			PASS
2412	Avg	Horz	73.2	30.7	4.2	10.0	35.8	82.3			PASS
2412	Peak	Vert	95.3	30.7	4.2	10.0	35.8	104.4			PASS
2412	Avg	Vert	84.7	30.7	4.2	10.0	35.8	93.8			PASS
2390	Peak	Horz	47.5	30.7	4.2	10.0	35.8	56.6	74.0	17.4	PASS
2390	Avg	Horz	36.0	30.7	4.2	10.0	35.8	45.1	54.0	8.9	PASS
2390	Peak	Vert	51.9	30.7	4.2	10.0	35.8	61.0	74.0	13.0	PASS
2390	Avg	Vert	37.7	30.7	4.2	10.0	35.8	46.8	54.0	7.2	PASS
Mid Channel (6) - Y axis (Vertical)											
2437	Peak	Horz	85.0	30.7	4.2	10.0	35.8	94.1			PASS
2437	Avg	Horz	74.8	30.7	4.2	10.0	35.8	83.9			PASS
2437	Peak	Vert	95.3	30.7	4.2	10.0	35.8	104.4			PASS
2437	Avg	Vert	84.8	30.7	4.2	10.0	35.8	93.9			PASS
Mid Channel (6) - Z axis (Flat)											
2437	Peak	Horz	92.5	30.7	4.2	10.0	35.8	101.6			PASS
2437	Avg	Horz	82.3	30.7	4.2	10.0	35.8	91.4			PASS
2437	Peak	Vert	87.1	30.7	4.2	10.0	35.8	96.2			PASS
2437	Avg	Vert	76.1	30.7	4.2	10.0	35.8	85.2			PASS
High Channel (11) -Y Axis (Vertical) Set Power 13 (Command "22 11 13 1", "17 1 13")											
2462	Peak	Horz	85.2	30.7	4.2	10.0	35.8	94.3			PASS
2462	Avg	Horz	74.9	30.7	4.2	10.0	35.8	84.0			PASS
2462	Peak	Vert	96.3	30.7	4.2	10.0	35.8	105.4			PASS
2462	Avg	Vert	85.3	30.7	4.2	10.0	35.8	94.4			PASS
2483.5	Peak	Horz	52.9	30.7	4.2	10.0	35.8	62.0	74.0	12.0	PASS
2483.5	Avg	Horz	37.6	30.7	4.2	10.0	35.8	46.7	54.0	7.3	PASS
2483.5	Peak	Vert	62.9	30.7	4.2	10.0	35.8	72.0	74.0	2.0	PASS
2483.5	Avg	Vert	44.8	30.7	4.2	10.0	35.8	53.9	54.0	0.1	PASS
4924	Peak	Horz	43.8	33.5	5.8	0.0	35.3	47.8	74.0	26.2	PASS
4924	Avg	Horz	32.8	33.5	5.8	0.0	35.3	36.8	54.0	17.2	PASS
4924	Peak	Vert	45.2	33.5	5.8	0.0	35.3	49.2	74.0	24.8	PASS
4924	Avg	Vert	32.8	33.5	5.8	0.0	35.3	36.8	54.0	17.2	PASS
7386	Peak	Vert	49.1	38.2	7.1	0.0	35.5	58.9	74.0	15.1	PASS
7386	Avg	Vert	36.7	38.2	7.1	0.0	35.5	46.5	54.0	7.5	PASS
7386	Peak	Horz	49.2	38.2	7.1	0.0	35.5	59.0	74.0	15.0	PASS
7386	Avg	Horz	36.8	38.2	7.1	0.0	35.5	46.6	54.0	7.4	PASS

Note 3: 1 GHz – 4 GHz Average plot for N-Mode are similar to G-Mode.

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


## WIFI B-Mode and Zigbee co-location harmonics and band edge

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
Zigbee: Low Channel (11) - Z axis (Vertical) Setpower 0x1 (Actual Power = 1 dBm), WIFI: Channel 3 Setpower = 13,											
2390	Peak	Horz	58.3	30.7	4.2	10.0	35.8	67.4	74.0	6.6	PASS
2390	Avg	Horz	39.6	30.7	4.2	10.0	35.8	48.7	54.0	5.3	PASS
2390	Peak	Vert	59.7	30.7	4.2	10.0	35.8	68.8	74.0	5.2	PASS
2390	Avg	Vert	41.0	30.7	4.2	10.0	35.8	50.1	54.0	3.9	PASS
4810	Peak	Horz	51.6	33.5	5.8	0.0	35.3	55.6	74.0	18.4	PASS
4810	Avg	Horz	32.9	33.5	5.8	0.0	35.3	36.9	54.0	17.1	PASS
4810	Peak	Vert	52.3	33.5	5.8	0.0	35.3	56.3	74.0	17.7	PASS
4810	Avg	Vert	33.6	33.5	5.8	0.0	35.3	37.6	54.0	16.4	PASS
7215	Peak	Horz	55.3	38.2	7.1	0.0	35.5	65.1	74.0	8.9	PASS
7215	Avg	Horz	36.6	38.2	7.1	0.0	35.5	46.4	54.0	7.6	PASS
7215	Peak	Vert	51.4	38.2	7.1	0.0	35.5	61.2	74.0	12.8	PASS
7215	Avg	Vert	32.7	38.2	7.1	0.0	35.5	42.5	54.0	11.5	PASS
9620	Peak	Horz	52.0	39.4	8.7	0.0	36.1	64.0	74.0	10.0	PASS
9620	Avg	Horz	33.3	39.4	8.7	0.0	36.1	45.3	54.0	8.7	PASS
9620	Peak	Vert	49.8	39.4	8.7	0.0	36.1	61.8	74.0	12.2	PASS
9620	Avg	Vert	31.1	39.4	8.7	0.0	36.1	43.1	54.0	10.9	PASS
High Channel (0x19) - Z axis (Flat) - set power 1 (Actual Power = 1 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	61.9	30.7	4.2	10.0	35.8	71.0	74.0	3.0	PASS
2483.5	Avg	Horz	43.2	30.7	4.2	10.0	35.8	52.3	54.0	1.7	PASS
2483.5	Peak	Vert	62.8	30.7	4.2	10.0	35.8	71.9	74.0	2.1	PASS
2483.5	Avg	Vert	44.1	30.7	4.2	10.0	35.8	53.2	54.0	0.8	PASS
High Channel (0x1A) -Z Axis (Flat) Set Power -0x1A (Actual Power = -26 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	57.3	30.7	4.2	10.0	35.8	66.4	74.0	7.6	PASS
2483.5	Avg	Horz	38.6	30.7	4.2	10.0	35.8	47.7	54.0	6.3	PASS
2483.5	Peak	Vert	57.4	30.7	4.2	10.0	35.8	66.5	74.0	7.5	PASS
2483.5	Avg	Vert	38.7	30.7	4.2	10.0	35.8	47.8	54.0	6.2	PASS

**Note 4: Co-location band edges data were measured with the Zigbee as the outer most transmitter. A duty cycle correction factor of -18.7 dB was used to derive average emissions from peak emissions.**

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
High Channel (0x12) -Z Axis (Vertical) Set Power 1 (Actual Power = 1 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	51.9	30.7	4.2	10.0	35.8	61.0	74.0	13.0	PASS
2483.5	Avg	Horz	40.0	30.7	4.2	10.0	35.8	49.1	54.0	4.9	PASS
2483.5	Peak	Vert	23.2	30.7	4.2	10.0	35.8	32.3	74.0	41.7	PASS
2483.5	Avg	Vert	41.0	30.7	4.2	10.0	35.8	50.1	54.0	3.9	PASS
Channel (0xF) - Z axis (Vertical) Setpower 0x1 (Actual Power = 1 dBm) WIFI Setpower = 13, Ch 1											
2390	Peak	Horz	46.6	30.7	4.2	10.0	35.8	55.7	74.0	18.3	PASS
2390	Avg	Horz	35.1	30.7	4.2	10.0	35.8	44.2	54.0	9.8	PASS
2390	Peak	Vert	47.5	30.7	4.2	10.0	35.8	56.6	74.0	17.4	PASS
2390	Avg	Vert	36.5	30.7	4.2	10.0	35.8	45.6	54.0	8.4	PASS

**Note 5: Co-location band edges data were measured with the WIFI as the outer most transmitter.**

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


## WIFI G-Mode and Zigbee co-location harmonics and band edge

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
Low Channel (11) - Z axis (Vertical) Setpower 0x1 (Actual Power = 1 dBm) WIFI Setpower = 13, Ch 3											
2390	Peak	Horz	57.1	30.7	4.2	10.0	35.8	66.2	74.0	7.8	PASS
2390	Avg	Horz	38.4	30.7	4.2	10.0	35.8	47.5	54.0	6.5	PASS
2390	Peak	Vert	58.0	30.7	4.2	10.0	35.8	67.1	74.0	6.9	PASS
2390	Avg	Vert	39.3	30.7	4.2	10.0	35.8	48.4	54.0	5.6	PASS
4810	Peak	Horz	53.5	33.5	5.8	0.0	35.3	57.5	74.0	16.5	PASS
4810	Avg	Horz	34.8	33.5	5.8	0.0	35.3	38.8	54.0	15.2	PASS
4810	Peak	Vert	52.4	33.5	5.8	0.0	35.3	56.4	74.0	17.6	PASS
4810	Avg	Vert	33.7	33.5	5.8	0.0	35.3	37.7	54.0	16.3	PASS
7215	Peak	Horz	54.7	38.2	7.1	0.0	35.5	64.5	74.0	9.5	PASS
7215	Avg	Horz	36.0	38.2	7.1	0.0	35.5	45.8	54.0	8.2	PASS
7215	Peak	Vert	52.3	38.2	7.1	0.0	35.5	62.1	74.0	11.9	PASS
7215	Avg	Vert	33.6	38.2	7.1	0.0	35.5	43.4	54.0	10.6	PASS
9620	Peak	Horz	53.2	39.4	8.7	0.0	36.1	65.2	74.0	8.8	PASS
9620	Avg	Horz	34.5	39.4	8.7	0.0	36.1	46.5	54.0	7.5	PASS
9620	Peak	Vert	50.7	39.4	8.7	0.0	36.1	62.7	74.0	11.3	PASS
9620	Avg	Vert	32.0	39.4	8.7	0.0	36.1	44.0	54.0	10.0	PASS
High Channel (0x19) - Z axis (Vertical) - set power 1 (Actual Power = 1 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	61.7	30.7	4.2	10.0	35.8	70.8	74.0	3.2	PASS
2483.5	Avg	Horz	43.0	30.7	4.2	10.0	35.8	52.1	54.0	1.9	PASS
2483.5	Peak	Vert	63.3	30.7	4.2	10.0	35.8	72.4	74.0	1.6	PASS
2483.5	Avg	Vert	44.6	30.7	4.2	10.0	35.8	53.7	54.0	0.3	PASS
High Channel (0x1A) -Z Axis (Vertical) Set Power -0x1A (Actual Power = -26 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	57.8	30.7	4.2	10.0	35.8	66.9	74.0	7.1	PASS
2483.5	Avg	Horz	39.1	30.7	4.2	10.0	35.8	48.2	54.0	5.8	PASS
2483.5	Peak	Vert	60.2	30.7	4.2	10.0	35.8	69.3	74.0	4.7	PASS
2483.5	Avg	Vert	41.5	30.7	4.2	10.0	35.8	50.6	54.0	3.4	PASS

**Note 6: Co-location band edges data were measured with the Zigbee as the outer most transmitter. A duty cycle correction factor of -18.7 dB was used to derive average emissions from peak emissions.**

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
High Channel (0x12) -Z Axis (Vertical) Set Power 1 (Actual Power = 1 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	52.5	30.7	4.2	10.0	35.8	61.6	74.0	12.4	PASS
2483.5	Avg	Horz	40.7	30.7	4.2	10.0	35.8	49.8	54.0	4.2	PASS
2483.5	Peak	Vert	56.8	30.7	4.2	10.0	35.8	65.9	74.0	8.1	PASS
2483.5	Avg	Vert	43.0	30.7	4.2	10.0	35.8	52.1	54.0	1.9	PASS
Low Channel (0xF) - Z axis (Vertical) Setpower 0x1 (Actual Power = 1 dBm) WIFI Setpower = 13, Ch 3											
2390	Peak	Horz	46.9	30.7	4.2	10.0	35.8	56.0	74.0	18.0	PASS
2390	Avg	Horz	35.3	30.7	4.2	10.0	35.8	44.4	54.0	9.6	PASS
2390	Peak	Vert	49.7	30.7	4.2	10.0	35.8	58.8	74.0	15.2	PASS
2390	Avg	Vert	37.9	30.7	4.2	10.0	35.8	47.0	54.0	7.0	PASS

**Note 7: Co-location band edges data were measured with the WIFI as the outer most transmitter.**

Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


### WIFI N-Mode and Zigbee co-location harmonics and band edge

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
Low Channel (11) - Z axis (Vertical) Setpower 0x1 (Actual Power = 1 dBm) WIFI Setpower = 13, Ch 3											
2390	Peak	Horz	52.0	30.7	4.2	10.0	35.8	61.1	74.0	12.9	PASS
2390	Avg	Horz	33.3	30.7	4.2	10.0	35.8	42.4	54.0	11.6	PASS
2390	Peak	Vert	51.5	30.7	4.2	10.0	35.8	60.6	74.0	13.4	PASS
2390	Avg	Vert	32.8	30.7	4.2	10.0	35.8	41.9	54.0	12.1	PASS
4810	Peak	Horz	47.4	33.5	5.8	0.0	35.3	51.4	74.0	22.6	PASS
4810	Avg	Horz	28.7	33.5	5.8	0.0	35.3	32.7	54.0	21.3	PASS
4810	Peak	Vert	46.1	33.5	5.8	0.0	35.3	50.1	74.0	23.9	PASS
4810	Avg	Vert	27.4	33.5	5.8	0.0	35.3	31.4	54.0	22.6	PASS
7215	Peak	Horz	51.6	38.2	7.1	0.0	35.5	61.4	74.0	12.6	PASS
7215	Avg	Horz	32.9	38.2	7.1	0.0	35.5	42.7	54.0	11.3	PASS
7215	Peak	Vert	51.5	38.2	7.1	0.0	35.5	61.3	74.0	12.7	PASS
7215	Avg	Vert	32.8	38.2	7.1	0.0	35.5	42.6	54.0	11.4	PASS
9620	Peak	Horz	49.7	39.4	8.7	0.0	36.1	61.7	74.0	12.3	PASS
9620	Avg	Horz	31.0	39.4	8.7	0.0	36.1	43.0	54.0	11.0	PASS
9620	Peak	Vert	50.0	39.4	8.7	0.0	36.1	62.0	74.0	12.0	PASS
9620	Avg	Vert	31.3	39.4	8.7	0.0	36.1	43.3	54.0	10.7	PASS
High Channel (0x19) - Z axis (Vertical) - set power 1 (Actual Power = 1 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	60.6	30.7	4.2	10.0	35.8	69.7	74.0	4.3	PASS
2483.5	Avg	Horz	41.9	30.7	4.2	10.0	35.8	51.0	54.0	3.0	PASS
2483.5	Peak	Vert	59.9	30.7	4.2	10.0	35.8	69.0	74.0	5.0	PASS
2483.5	Avg	Vert	41.2	30.7	4.2	10.0	35.8	50.3	54.0	3.7	PASS
High Channel (0x1A) -Z Axis (Vertical) Set Power -0x1A (Actual Power = -26 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	57.7	30.7	4.2	10.0	35.8	66.8	74.0	7.2	PASS
2483.5	Avg	Horz	39.0	30.7	4.2	10.0	35.8	48.1	54.0	5.9	PASS
2483.5	Peak	Vert	58.9	30.7	4.2	10.0	35.8	68.0	74.0	6.0	PASS
2483.5	Avg	Vert	40.2	30.7	4.2	10.0	35.8	49.3	54.0	4.7	PASS

**Note 8:** Co-location band edges data were measured with the Zigbee as the outer most transmitter. A duty cycle correction factor of -18.7 dB was used to derive average emissions from peak emissions.

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB	Result
High Channel (0x13) -Z Axis (Vertical) Set Power 1 (Actual Power = 1 dBm) WIFI CH11, POWER=13											
2483.5	Peak	Horz	51.5	30.7	4.2	10.0	35.8	60.6	74.0	13.4	PASS
2483.5	Avg	Horz	37.7	30.7	4.2	10.0	35.8	46.8	54.0	7.2	PASS
2483.5	Peak	Vert	62.5	30.7	4.2	10.0	35.8	71.6	74.0	2.4	PASS
2483.5	Avg	Vert	44.8	30.7	4.2	10.0	35.8	53.9	54.0	0.1	PASS
Low Channel (0xF) - Z axis (Vertical) Setpower 0x1 (Actual Power = 1 dBm) WIFI Setpower = 13, Ch 1											
2390	Peak	Horz	47.9	30.7	4.2	10.0	35.8	57.0	74.0	17.0	PASS
2390	Avg	Horz	36.0	30.7	4.2	10.0	35.8	45.1	54.0	8.9	PASS
2390	Peak	Vert	51.9	30.7	4.2	10.0	35.8	61.0	74.0	13.0	PASS
2390	Avg	Vert	37.3	30.7	4.2	10.0	35.8	46.4	54.0	7.6	PASS


**Note 9:** Co-location band edges data were measured with the WIFI as the outer most transmitter.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration / Verification date	Next calibration/ Verification due date	Asset #
Spectrum Analyzer	8566B	HP	Nov 27, 2015	Nov 27, 2017	GEMC 190
Quasi Peak Adapter	85650A	HP	Nov 27, 2015	Nov 27, 2017	GEMC 191
Loop Antenna	EM 6871	Electro-Metrics	Feb 3, 2015	Feb 5, 2017	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 3, 2015	Feb 5, 2017	GEMC 71
Bilog Antenna	CBL6111	Chase	Dec 17, 2015	Dec 17, 2017	GEMC 201
Attenuator 10 dB	8493B	Agilent	Feb 11, 2016	Feb 11, 2017	GEMC 133
4GHZ-12GHz High Pass filter	11SH10-4000/T12000-0/0	K & L Microwave	Apr 9, 2015	Apr 9, 2016	GEMC 119
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	Sept 9, 2014	Sept 9, 2016	GEMC 6403
Q-Par Horn Antenna (2 to 18 GHz)	WBH218HN	Q-par	Feb 12, 2016	Feb 12, 2018	GEMC 6375
Double Ridge Guide Horn Antenna 1-18 GHz	AH-118	Com-Power Corporation	July 1, 2015	July 1, 2017	GEMC 214
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	Feb 8, 2016	Feb 8, 2018	GEMC 158
1-26G pre-amp	HP 8449B	HP	Sept 9, 2014	Sept 9, 2016	GEMC 6351
2.0-8.0 GHz Amplifier	11975A	HP	Feb 8, 2016	Feb 8, 2018	GEMC157
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	Feb 1, 2016	Feb 1, 2017	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	Feb 1, 2016	Feb 1, 2017	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	Feb 1, 2016	Feb 1, 2017	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions\_Rev1.doc"

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## ***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.

### **Results**


The EUT passed. Low, medium, and high band was tested. The worst case PSD for each transmitter/more are:

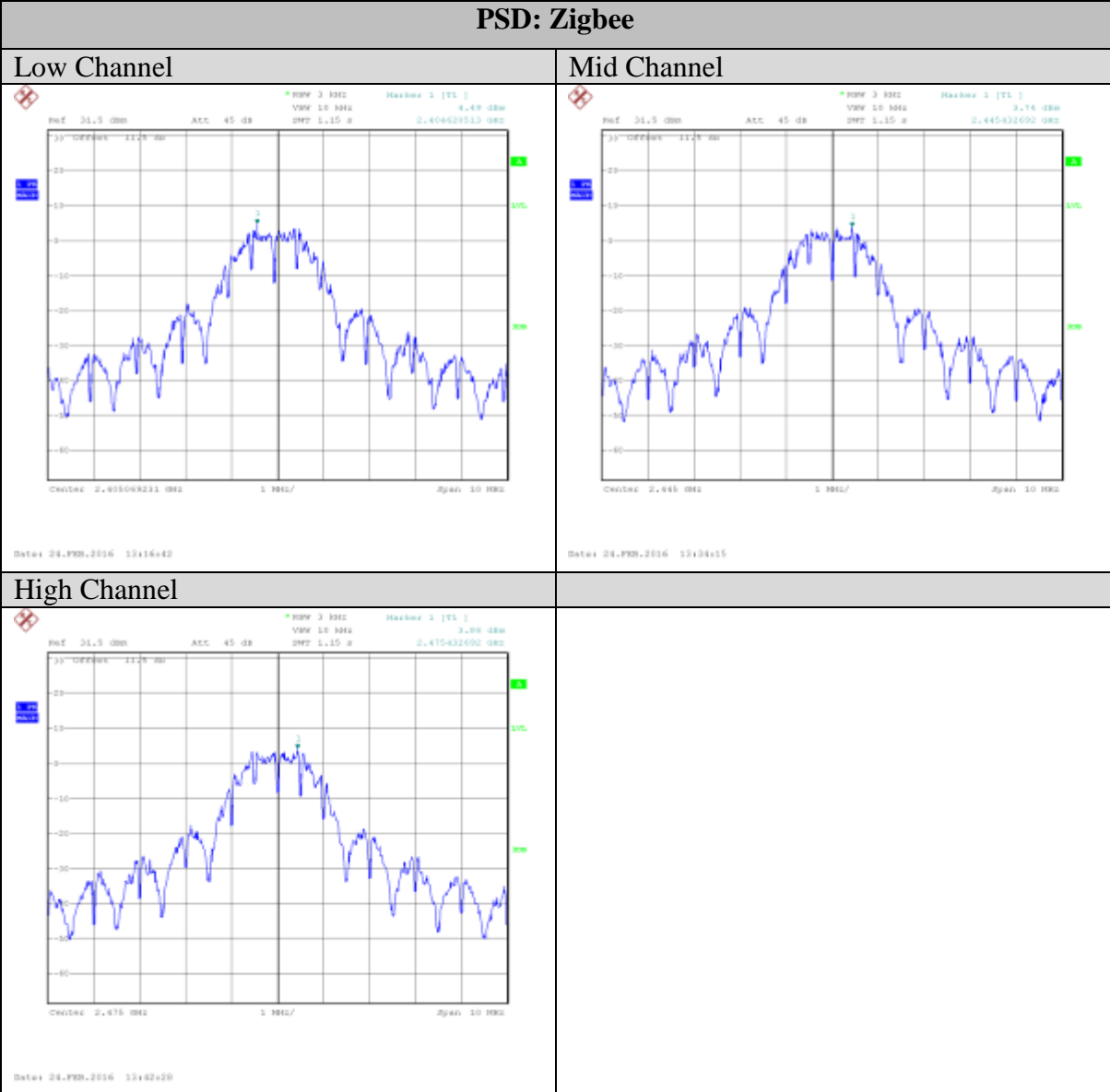
- Zigbee: 4.49 dBm/3kHz
- WIFI B-Mode: -15.88 dBm/3kHz
- WIFI G-Mode: -12.10 dBm/3kHz


### **Graph(s)**

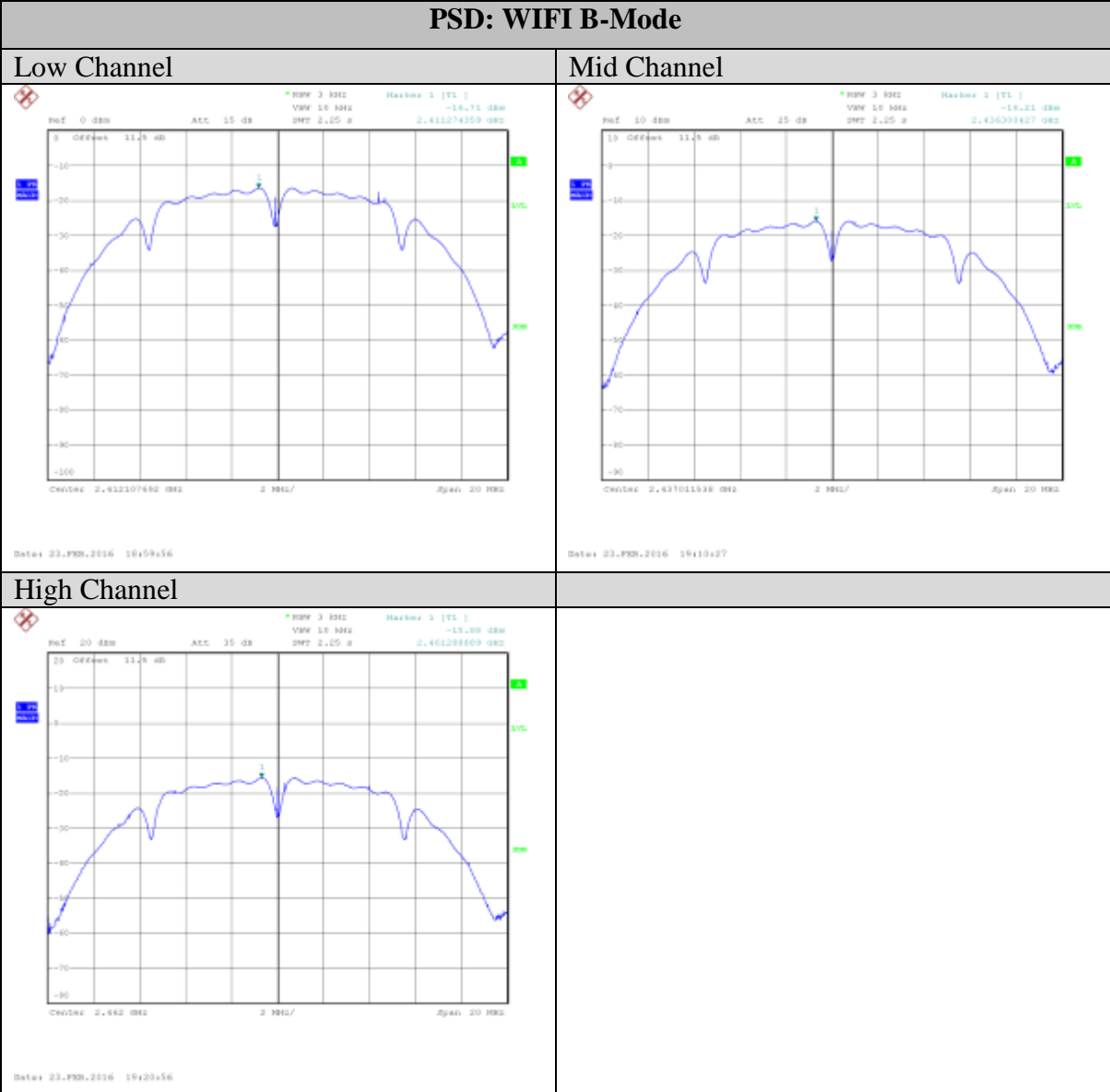
The graphs shown below show the power spectral density of the device during the conducted measurement operation of the EUT. Low, middle, and high channel was investigated in each mode, with the worst case being presented. The external attenuator and cable loss are accounted for as reference offset in the spectrum analyzer.




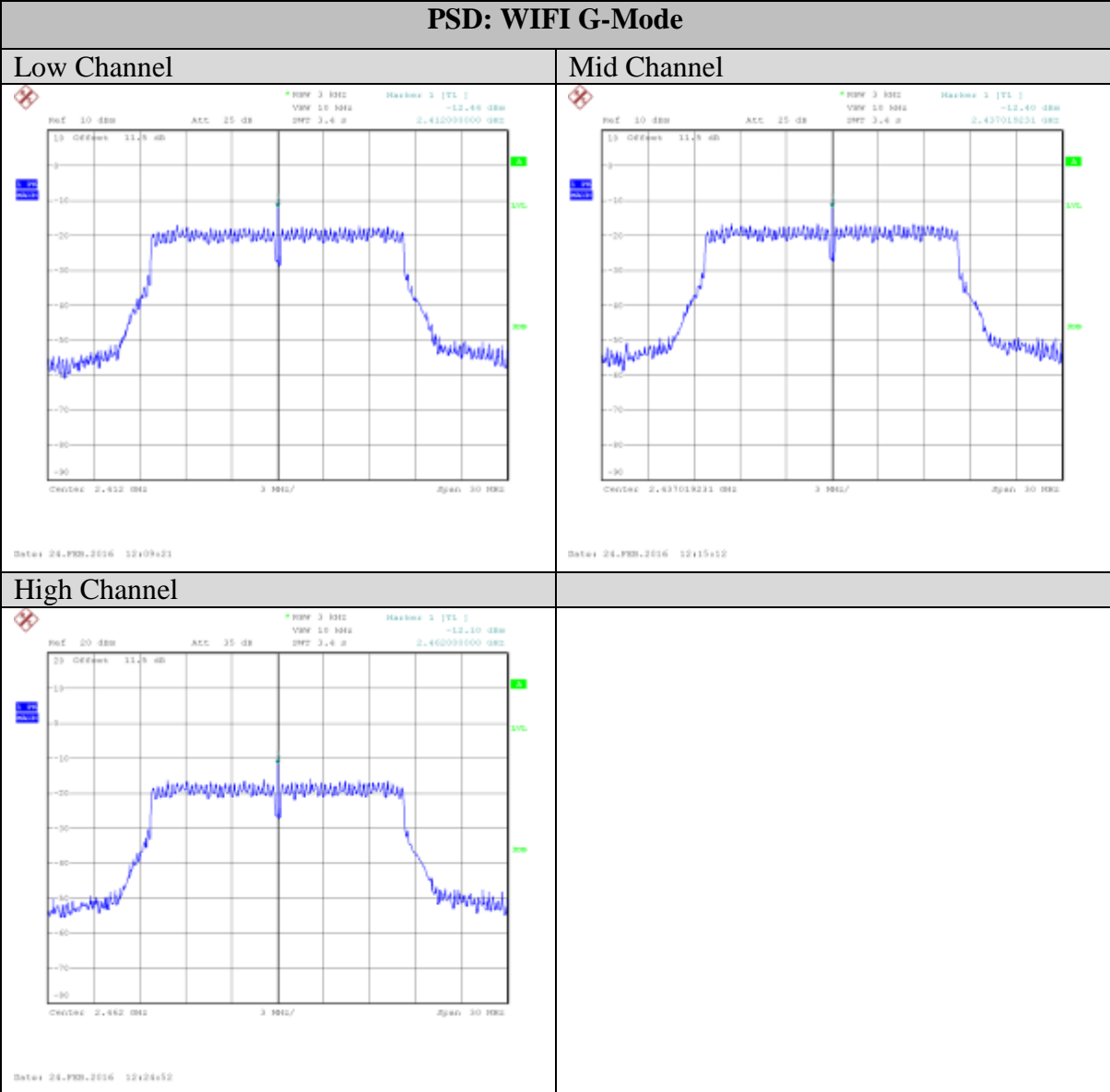
Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	<b>RSS 247:2015 / FCC Part 15 Subpart C 15:2015</b>	




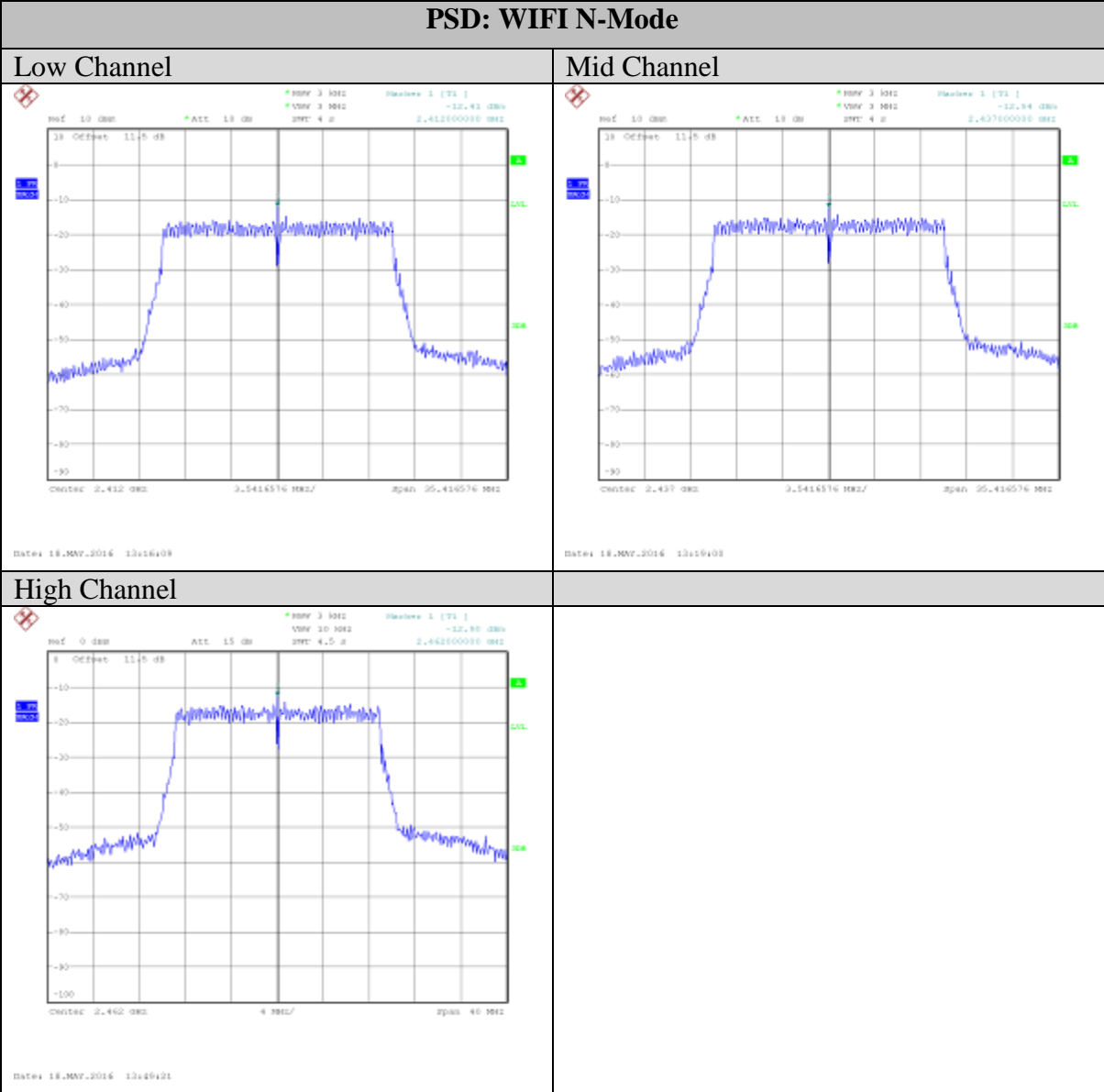
Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	




Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	



Client	MMB Research Inc	
Product	GWY10	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	




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

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

### Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration / Verification date	Next calibration/ Verification due date	Asset #
Spectrum Analyzer	FSU	Rohde & Schwarz	Jan 19, 2015	Jan 19, 2017	GEMC 198
Attenuator 10 dB	8493B	Agilent	Feb-11, 2016	Feb-11, 2017	GEMC133

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## ***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 C64.10:2013

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

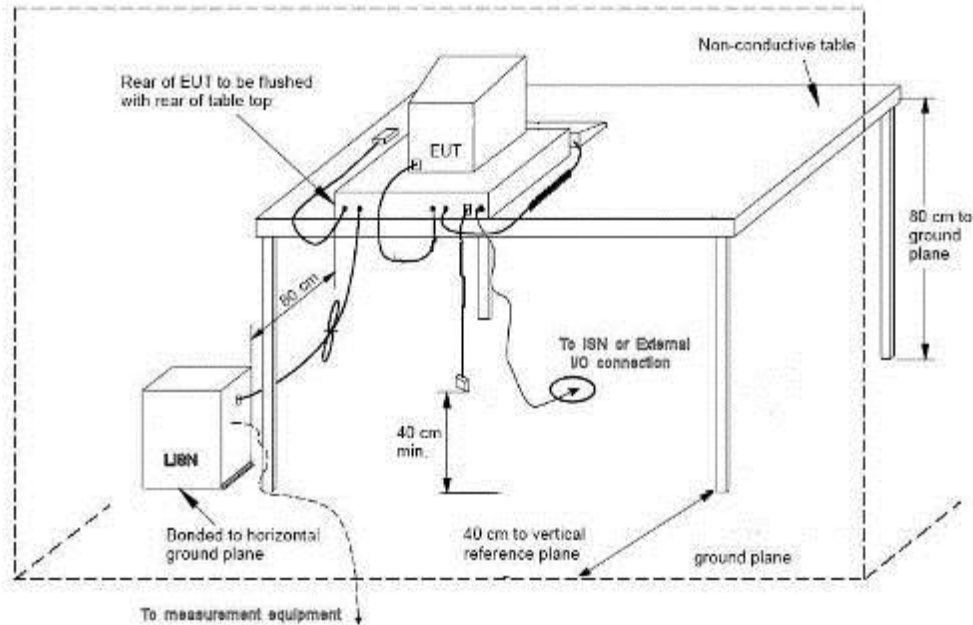
The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

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.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

### 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.

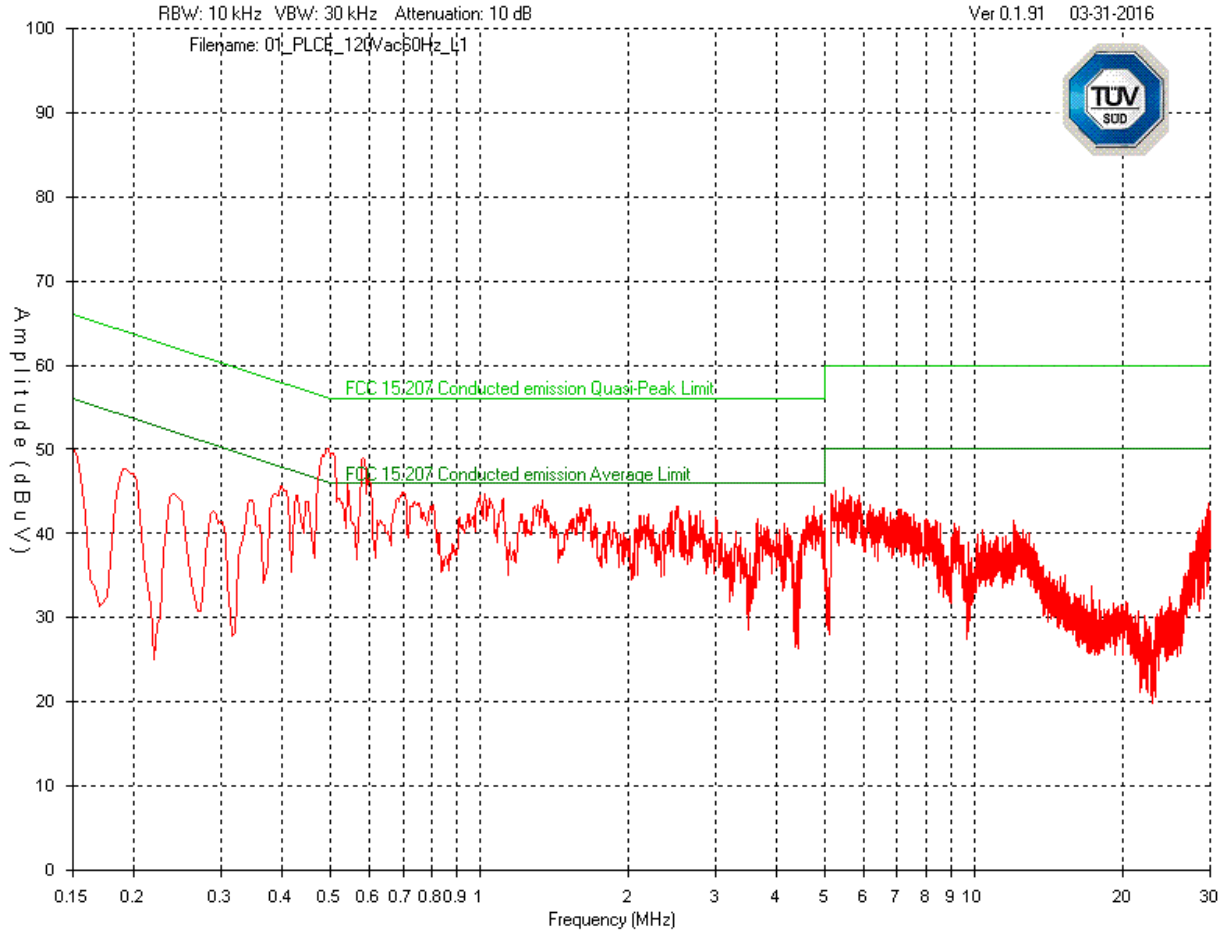
### Preliminary Graphs

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 than 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.


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

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	<b>RSS 247:2015 / FCC Part 15 Subpart C 15:2015</b>	

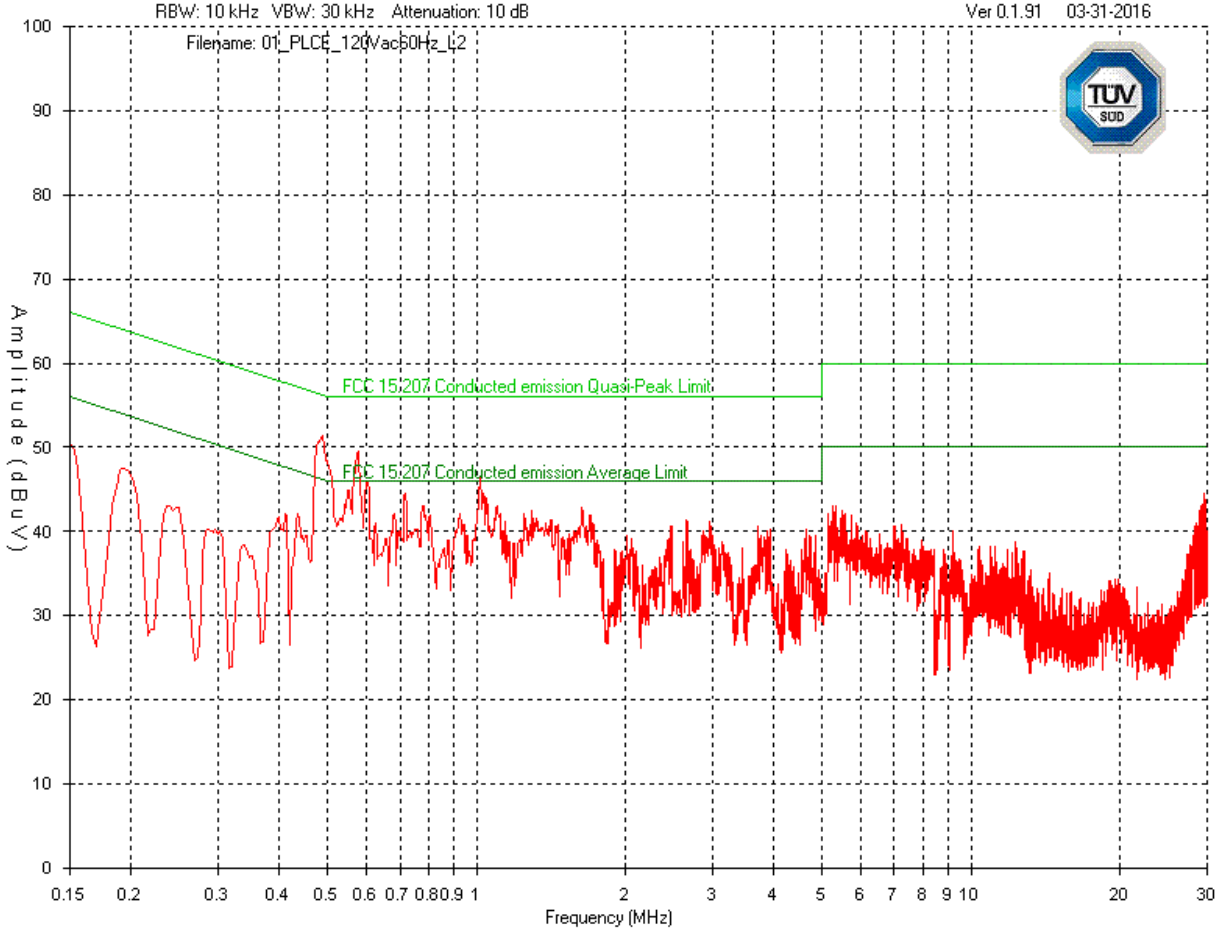
L1 (Line) – 120Vac 60Hz






Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

L2 (Neutral) – 120Vac 60Hz




Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Final Measurements

Product Category	Class B						
Product	Tripoli						
Supply	120 VAC 60 Hz						
Line Emission Table							
Frequency (MHz)	Detector	Raw (dBuV)	Factors	Level (dBuV)	Limit (dB)	Margin (dB)	Pass/Fail
0.4923	AVG	21.5	10.0	31.5	46.1	14.6	Pass
0.582	AVG	14.1	10.0	24.1	46.0	21.9	Pass
0.6984	AVG	14.4	10.0	24.4	46.0	21.6	Pass
1.0274	AVG	14.0	10.1	24.1	46.0	21.9	Pass
1.3398	AVG	13.4	10.1	23.5	46.0	22.5	Pass
0.3993	AVG	17.5	10.0	27.5	47.9	20.4	Pass
Neutral Emission Table							
0.489	AVG	17.8	10.0	27.8	46.2	18.4	Pass
0.5754	AVG	12.2	10.0	22.2	46	23.8	Pass
1.0174	AVG	11.8	10.1	21.9	46	24.1	Pass
0.7183	AVG	11.9	10.0	21.9	46	24.1	Pass

### Notes:


1. No peak emissions exceeded power line conducted emission Quasi-Peak limits; therefore, the unit was deemed to meet Quasi-Peak requirements base on peak emissions.
2. See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up for the highest line conducted emission

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

### Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration / Verification date	Next calibration / Verification due date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Nov 25, 2015	Nov 25, 2017	GEMC 160
LISN	FCC-LISN-50/250-16-2-01	FCC	Jan-15, 2015	Jan-15, 2017	GEMC 65
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	Feb-11, 2015	Feb-11, 2017	GEMC 28

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## ***RF Exposure***

### **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 FCC 1.1310 Table 1 (B) limits for general public exposure was applied. The limits for the frequency ranges 300 MHz to 1.5 GHz and 1.5 GHz to 100 GHz was applied. The limits are  $f/1500 \text{ mW/cm}^2$  and  $1.0 \text{ mW/cm}^2$  respectively.

As per FCC KDB 447498, Clause 4.3.1 b), the 1-g SAR exclusion threshold for 200 mm test distance is 1597 mW (see below for calculations).

For RSS 102 the RF exposure exemption limit for a 2400 MHz transmitter is  $1.31 \times 10^{-2} f^{0.6834} \text{ W}$  which is 2.65 W.

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 meets the requirements.

The EUT passed the requirements. The worst case calculated power density was  $0.061 \text{ mW/cm}^2$ , this is significantly under the  $1.0 \text{ mW/cm}^2$  requirement.

For FCC SAR exemption, the maximum power the WIFI transmits is 160 mW which is less than 1597mW; therefore, the EUT meets individual SAR testing exclusion requirements.

For FCC SAR exemption, the maximum power the Zigbee transmits is 88 mW which is less than 1597mW; therefore, the EUT meets individual SAR testing exclusion requirements.

As per FCC KDB 447498, Clause 4.3.2 b), a standalone SAR value of 0.4 W/kg is used as the estimated 1-g SAR. The sum of the SAR value for both transmitters is 0.8 W/kg which is less than the 1.6 W/kg limit.

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

For RSS 102, the E.I.R.P of the Zigbee is 19.43 dBm + 5 dBi = 24.43 dBm (0.277 W) which is significantly less than the 2.65 W RF Exposure exemption limit.

For RSS 102, the E.I.R.P of the WIFI is 22.05 dBm + 2.8 dBi = 24.85 dBm (0.205 W) which is significantly less than the 2.65 W RF Exposure exemption limit.

## Calculations – Power Density

### Zigbee

Method 1 (conducted power)

$$P_d = (P_t * G) / (4 * \pi * R^2)$$

Where  $P_t = 19.43$  dBm or 87.70 mW as per Peak power conducted output

Where  $G = 5$  dBi, or numerically 3.16

Where  $R = 20$  cm

$$P_d = (87.79 \text{ mW} * 3.16) / (4 * \pi * 20\text{cm}^2)$$

$$P_d = 277.33 \text{ mW} / 5026 \text{ cm}^2$$

$$P_d = 0.055 \text{ mW/cm}^2$$

### WIFI

Method 1 (conducted power)

$$P_d = (P_t * G) / (4 * \pi * R^2)$$

Where  $P_t = 22.05$  dBm or 160.32 mW as per Peak power conducted output

Where  $G = 2.8$  dBi, or numerically 1.90

Where  $R = 20$  cm

$$P_d = (160.32 \text{ mW} * 1.90) / (4 * \pi * 20\text{cm}^2)$$


$$P_d = 205.49 \text{ mW} / 5026 \text{ cm}^2$$

$$P_d = 0.061 \text{ mW/cm}^2$$

### Antenna Co-location

The MPE requirement for collocated antennas are that the sum of ratios should be less than 1.

The sum of ratios ( $P_d / \text{Limit}$ ) for each transmitter is  
 $(P_d(\text{WIFI})/\text{Limit}(\text{WIFI})) + (P_d(\text{Zigbee})/\text{Limit}(\text{Zigbee}))$

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

$$(0.061/1.0) + (0.055/1.0) = 0.116 < 1$$

The EUT meets the antenna collocation MPE requirements.

### Calculations – SAR Exclusion Limit

According to FCC KDB 447498, Clause 4.3.1 a) the exclusion power for up to 50 mm is

$$\text{Power @ 50 mm} = (3 * \text{distance}) / \sqrt{f(\text{GHz})}$$

$$\text{Power @ 50 mm} = (3 * 50) / \sqrt{2.4}$$


$$\text{Power @ 50 mm} = 97 \text{ mW}$$

According to FCC KDB 447498, Clause 4.3.1 b), the test exclusion power for above 50 mm is


$$\text{Power @ 50 mm} + (\text{dist} - 50 \text{ mm}) \times 10$$

The exclusion power for 200 mm is therefore

$$97 \text{ mW} + ((200 \text{ mm} - 50 \text{ mm}) * 10) = 1597 \text{ mW}$$

Client	<b>MMB Research Inc</b>	 Canada
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## Appendix A – EUT Summary

Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	


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

## General EUT Description

<b>Client</b>	
<b>Organization</b>	MMB Research Inc.
<b>Contact</b>	Mark Borins
<b>Phone</b>	416.636.3145
<b>Email</b>	mark.borins@mmbresearch.com
<b>EUT Details</b>	
<b>EUT Model number</b>	Communication Gateway
EUT Model / SN (if known)	GWY10
<b>Equipment Category</b>	Wireless
<b>Basic EUT Functionality</b>	<p>The GWY10 contains a ZigBee radio transceiver with integrated microcontroller operating in the 2.4GHz ISM band. The radio operates according to the IEEE 802.15.4 standard.</p> <p>The GWY10 also contains 802.11 b/g transceiver that operates in the 2.4 GHz ISM band.</p> <p>ZigBee Gateway to communicate data between smart meter and inverter</p>
<b>Input Voltage and Frequency</b>	120-240 Vac 50/60 Hz
<b>Connectors available on EUT</b>	Ethernet (RJ45) and USB
<b>Peripherals Required for Test</b>	Laptop
<b>Release type</b>	Final
<b>Intentional Radiator Frequency</b>	2405 – 2480.0 MHz for Zigbee 2412 – 2462 MHz for 802.11 b/g transceiver.

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’.



Client	<b>MMB Research Inc</b>	
Product	<b>GWY10</b>	
Standard(s)	RSS 247:2015 / FCC Part 15 Subpart C 15:2015	

## EUT Configuration

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

- Wireless were configured to transmit at 100% duty cycle;
- For Zigbee, the power output for channel 0xB to 0x19 were set using settxpower 0x1 and for channel 0x1A were set using settxpower -0x1A;
- For WIFI, the power output were set using client provided instruction 22 [channel] [power] [mode] with power = 13.

## Operational Setup

No additional device were required to be attached to the EUT for its normal operation.