



Canada

# EMC & RF Test Report

As per

## RSS-247 Issue 1:2015 & FCC Part 15 Subpart 15.247:2016

Unlicensed Intentional Radiators

on the

**amera**

Issued by:

**TÜV SÜD Canada Inc.**  
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Testing produced for

**cognitive**<sup>TM</sup>  
systems corp.


Amir Emami,  
Project Engineer

See Appendix A for full client &  
EUT details.




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



Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

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Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Report Scope

This report addresses the EMC verification testing and test results of the **amera** Model: **66260000**, and is herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:


RSS-247 Issue 1:2015

FCC Part 15 Subpart C 15.247:2016

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

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc, unless otherwise stated.


Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Summary

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

EUT	amera
FCC Certification #, FCC ID:	2AJF766260000
Industry Canada Certification #, IC:	21812-66260000
EUT passed all tests performed	Yes
Tests conducted by	Amir Emami


For testing dates, see "Testing Environmental Conditions and Dates".

Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## 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	RF Exposure	> 20 cm separation.	Pass See justification and Calculations
<b>Overall Result</b>			<b>Pass</b>

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 '\*'.

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### ***Notes, Justifications, or Deviations***

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

The unit contains two identical, custom designed, dipole antennas. Only one antenna is selected by the software at a time and therefore, these antennas will never receive or transmit simultaneously. For the antenna conducted emission tests, a verification was done at both antenna ports and both produced the same results. Therefore, testing was done at one of these antenna ports (S1001) only.

For the antenna requirement specified in FCC 15.203 (RSS-247 section 5.4(4)), the antenna has a peak gain of 5.1dBi as specified by the manufacturer, which is less than the 6 dBi gain limit.


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

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

The EUT has a fixed (source based) duty cycle of 2% (2ms on time/100ms). For the average radiated emission measurements of the band edges in the restricted bands, a duty cycle correction factor of 2% [ $20\log(2\%) = -33.98$ ] was applied to the peak measurement to obtain the average measurement.

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

The EUT also contains a modularly certified Texas Instruments transmitter (FCC ID: Z64-WL18DBMOD, IC: 4511-WL18DBMOD). The software guarantees simultaneous operation of the two radios will not occur and therefore, antenna co-location testing is not applicable.

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

### ***Sample Calculation(s)***

#### **Radiated Emission Test**

Margin = Limit – (Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain)

Margin = 50.5dB $\mu$ V/m – (50dB $\mu$ V + 10dB + 2.5dB – 20dB)


Margin = 8.0 dB (pass)

#### **Power Line Conducted Emission Test**

Margin = Limit – (Received Signal + Attenuation Factor + Cable Loss + LISN Factor)

Margin = 73.0dB $\mu$ V – (50dB $\mu$ V + 10dB + 2.5dB + 0.5dB)


Margin = 10.0 dB (pass)

Client	<b>Cognitive Systems Corp.</b>	
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Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## 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 15 Subpart C:2016	Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators
CISPR 22:2008	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
FCC KDB 558074: 2016	FCC KDB 558074 Digital Transmission Systems, measurements and procedures
ICES-003 Issue 6 2016	Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
RSS-GEN Issue 4 2014	General Requirements and Information for the Certification of Radio Apparatus
RSS-247 Issue 1:2015	Issue 1: Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ISO 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories



Client	<b>Cognitive Systems Corp.</b>	 Canada
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Document Revision Status

Revision 1 - September 1, 2016  
Initial Release

Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Definitions and Acronyms

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

**AE** – Auxiliary Equipment. A digital accessory that feeds data into or receives data from another device (host) that in turn, controls its operation.

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

**EMC** – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

**EMI** – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.


**EUT** – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

**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


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## Testing Facility

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

## Calibrations and Accreditations


The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Industry Canada (IC, 6844A-3) and Voluntary Control Council for Interference (VCCI, R-4023, G-506, C-4498, and T-1246). This chamber was 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 TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada Inc is accredited to ISO 17025 by A2LA with Testing Certificate #2555.01. The laboratory's 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 environmental conditions were recorded in the facility during time of testing

<b>Date</b>	<b>Test</b>	<b>Initials</b>	<b>Temperature (°C)</b>	<b>Humidity (%)</b>	<b>Pressure (kPa)</b>
July 12, 2016	Radiated Emissions	AE	20 – 24	40 – 51	98.0 – 102.0
July 13, 2016	Antenna Conducted Emissions	AE	20 – 24	40 – 51	98.0 – 102.0
July 5, 2016	Power Line Conducted Emissions	AE	20 – 24	40 – 51	98.0 – 102.0

Client	<b>Cognitive Systems Corp.</b>	 Canada
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Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Detailed Test Results Section

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## ***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 Method**

The limit is as specified in FCC Part 15.247(a)(2) 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**

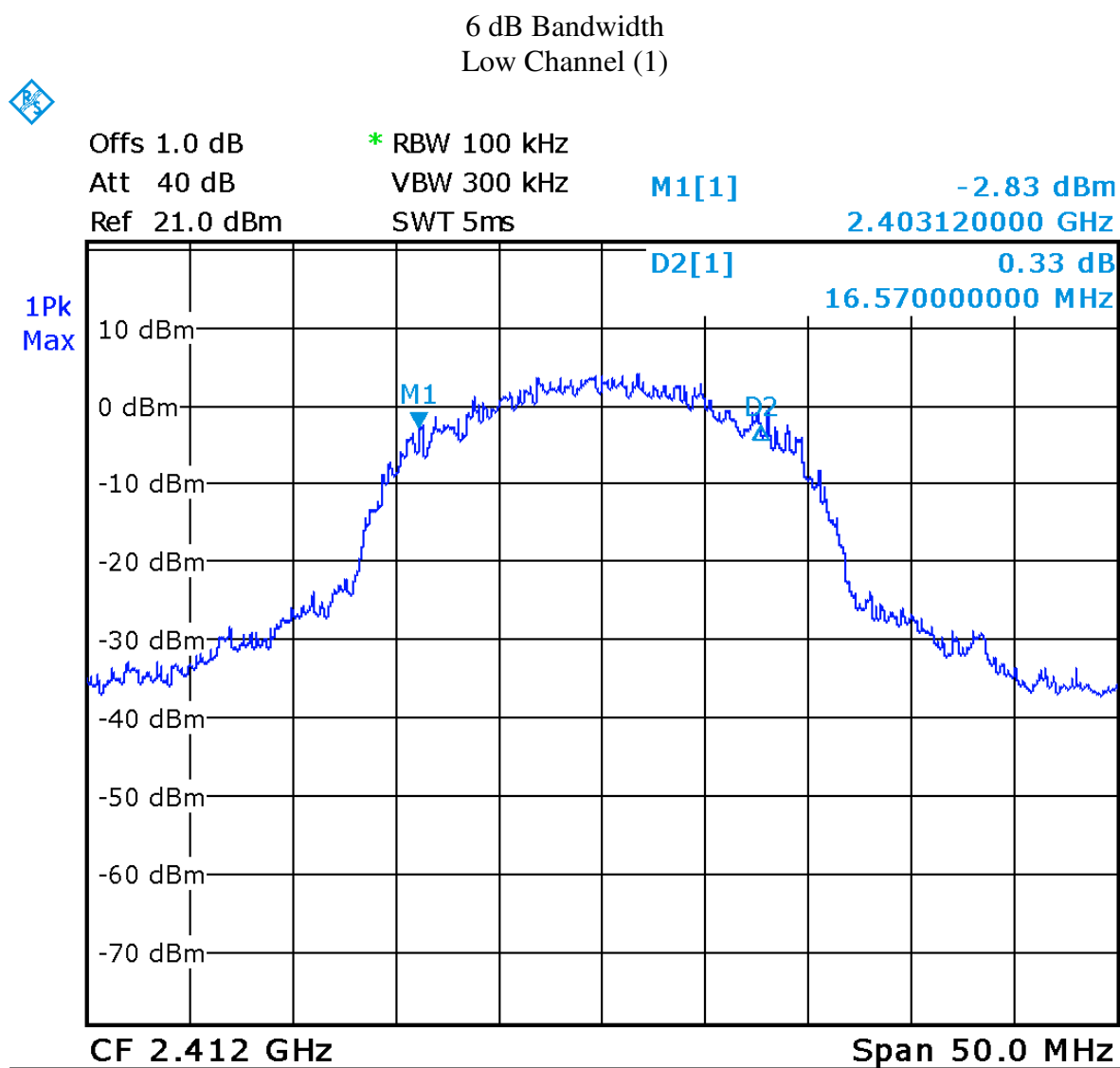
The EUT passed. The minimum 6 dB BW measured was 16.37MHz and the maximum 99% BW at full power setting was 20.36MHz.

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2412	16.57	20.36
Ch 2	2417	16.37	20.36
Mid	2437	16.37	20.26
High	2462	16.37	20.26


Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Graphs

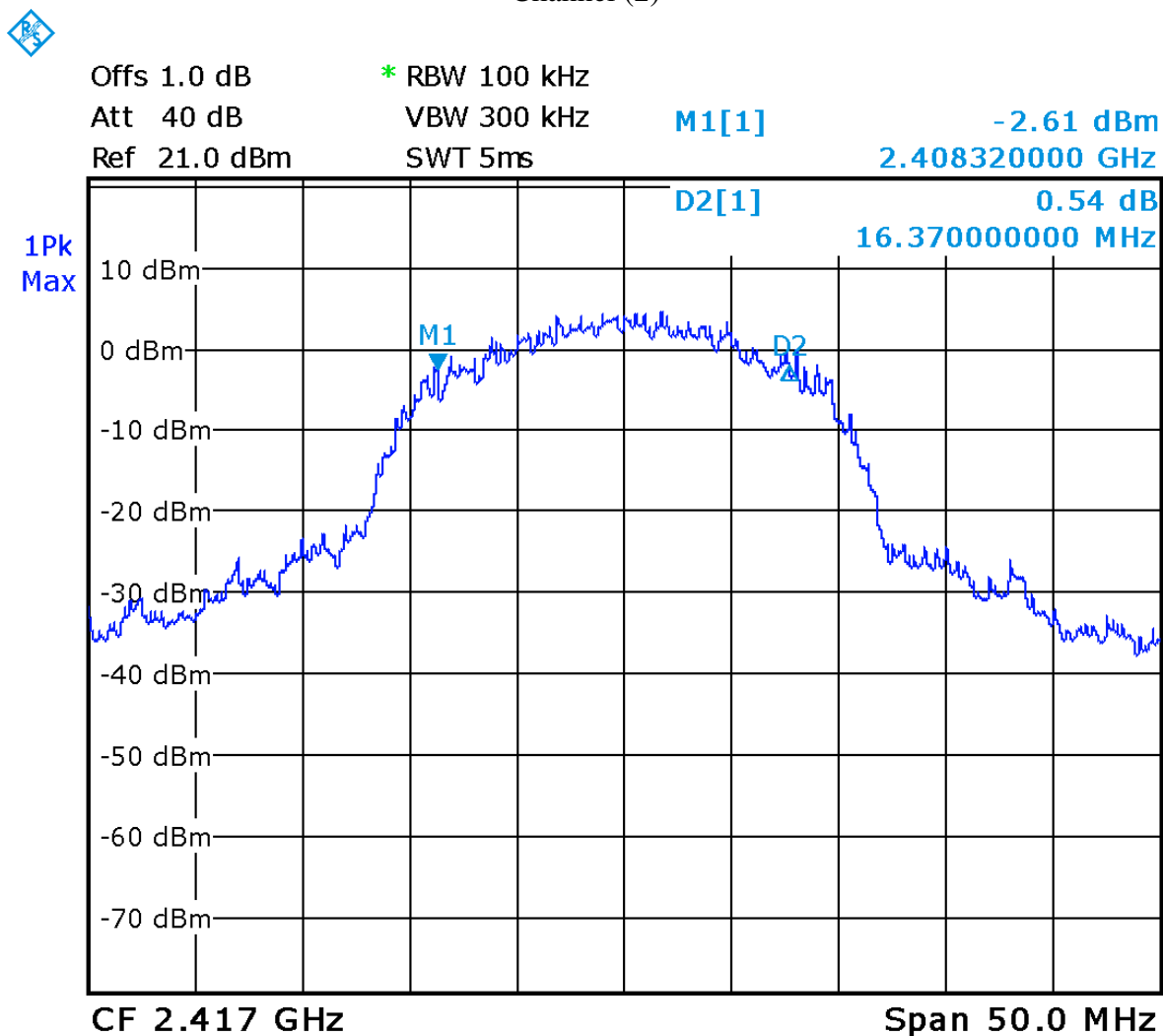
The graphs showed below show the OBW during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. Max hold is performed for a duration of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



Date: 13.JUL.2016 14:08:25


Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

6 dB Bandwidth  
Channel (2)

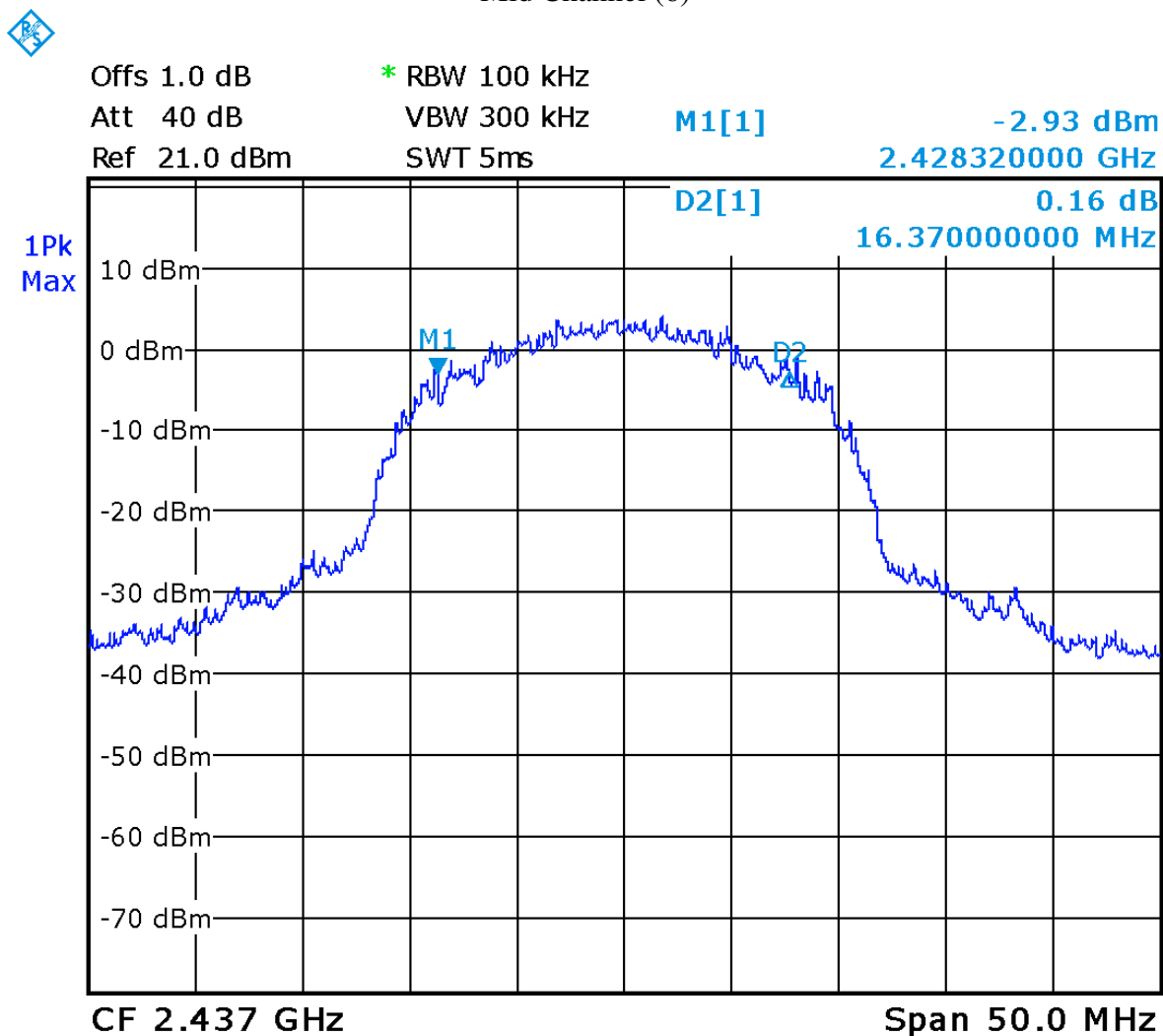


Date: 13.JUL.2016 14:14:24




Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

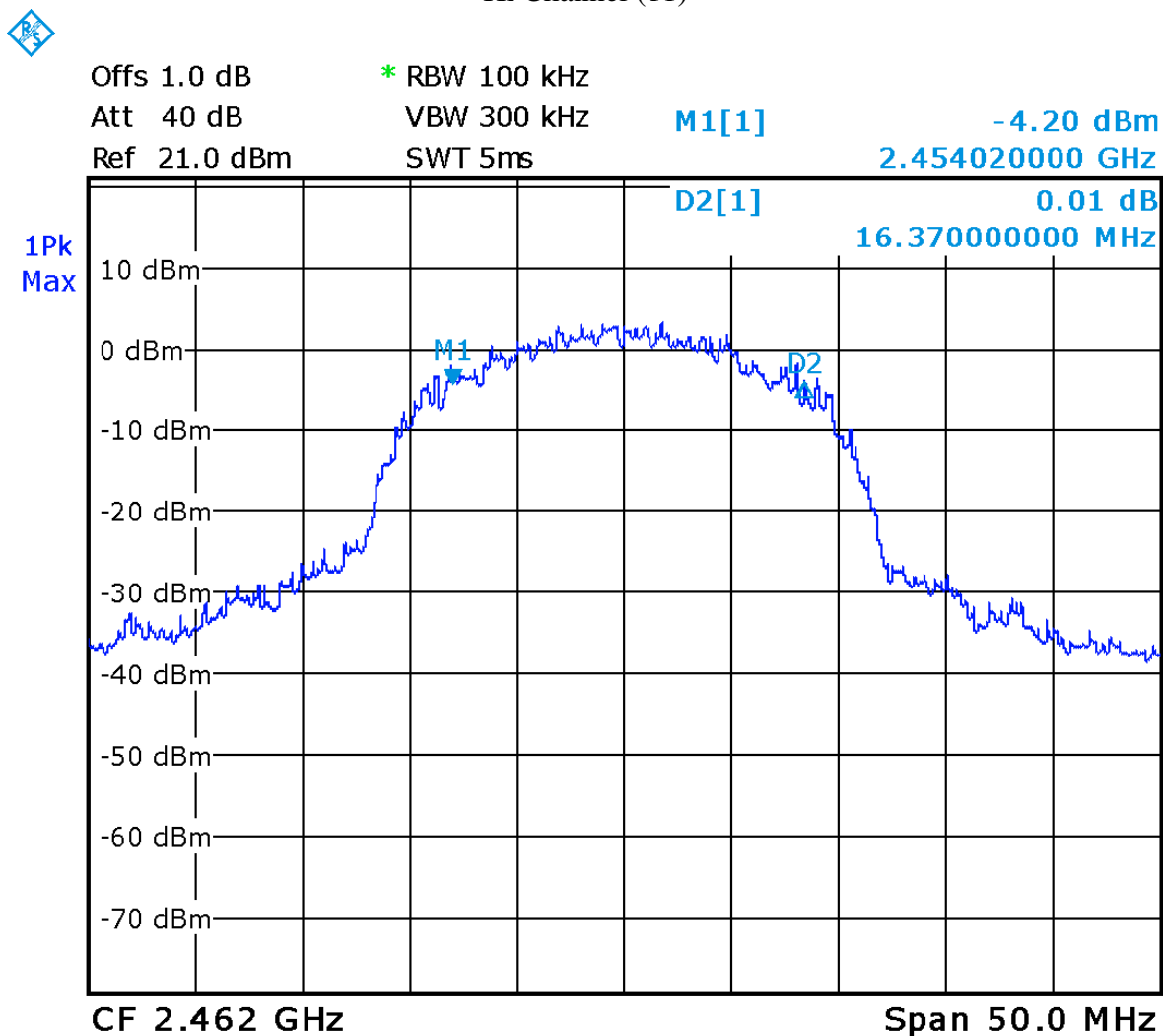
6 dB Bandwidth  
Mid Channel (6)




Date: 13.JUL.2016 14:20:54

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

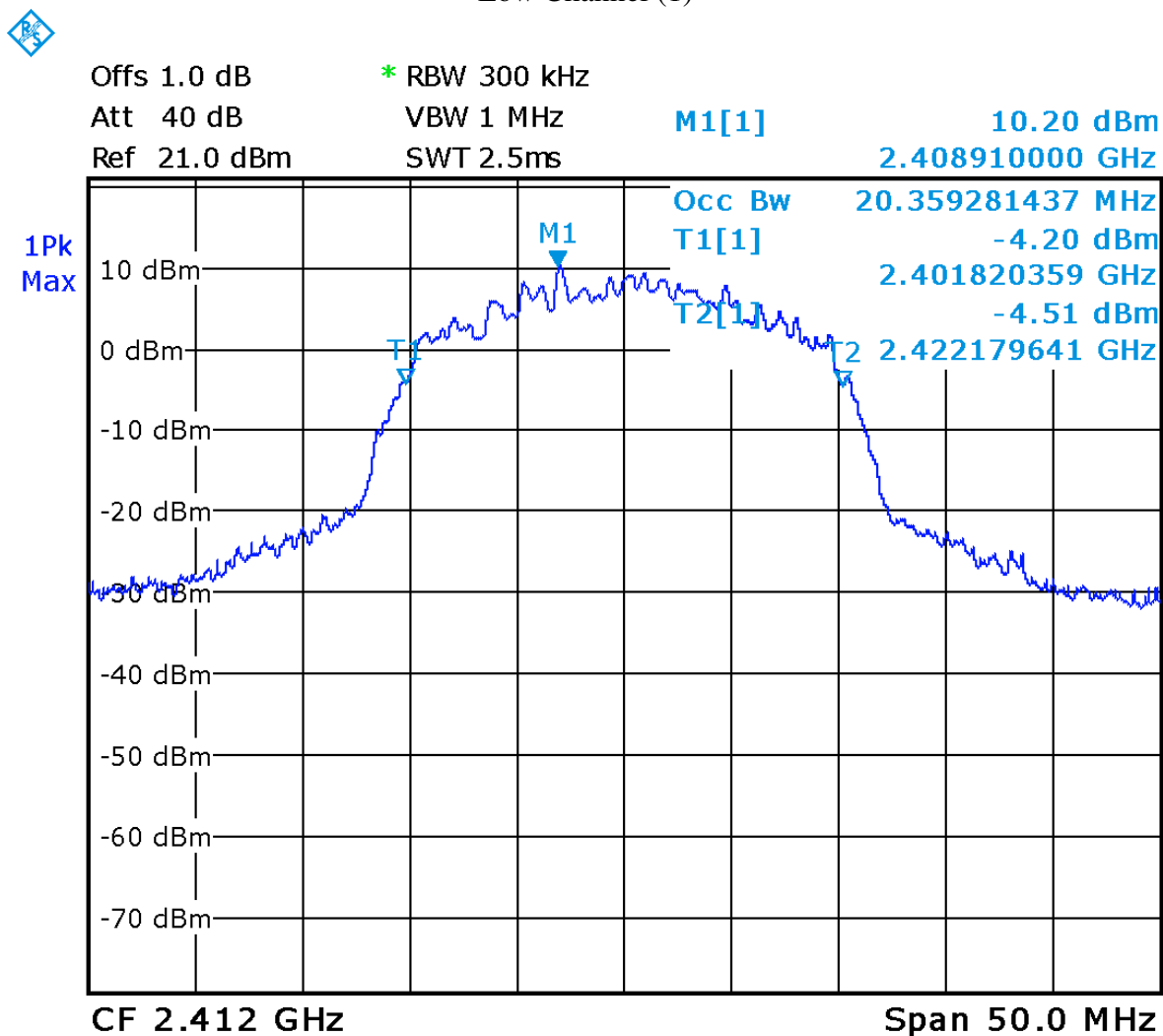
6 dB Bandwidth  
Hi Channel (11)



Date: 13.JUL.2016 14:23:04


Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

99% Bandwidth  
Low Channel (1)




Date: 13.JUL.2016 14:10:39

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

Client	<b>Cognitive Systems Corp.</b>	 Canada
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Nov. 25, 2015	Nov. 25, 2017	GEMC 160

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## 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, the maximum power does not exceed an amount which may create an excessive power level.

### Limits and Method

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 (30 dBm).

The method is given in ANSI C63.10 Clause 11.9.1.2 Integrated band power method.

### Results

The EUT passed. The EUT was set to transmit at 97% Tx Digital Scaling power on channel 1 and maximum power (100%) on channel 2 to 11. Four channels were measured. The following table shows the peak power:

Channel	Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)
Low	2412	23.28	212.81
Ch 2	2417	23.45	221.31
Mid	2437	23.33	215.28
High	2462	22.57	180.72

Note: Cable losses are accounted for as reference offset in the spectrum analyzer

### Graphs


The plots shown below show the peak power output of the device. This is measured by a max hold on the spectrum analyzer using a RBW of 1MHz. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute.

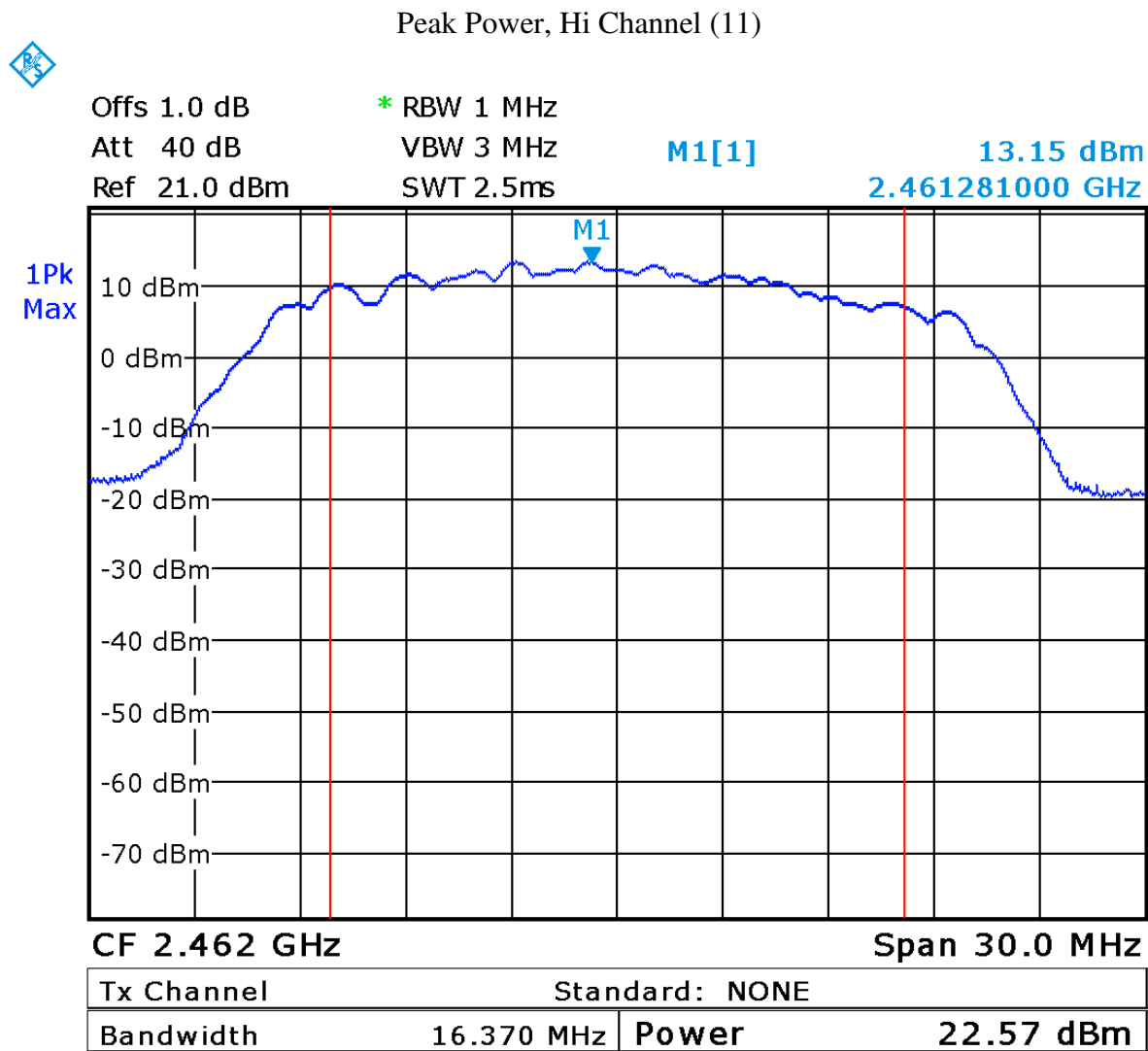









Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	




Date: 13.JUL.2016 14:40:48

See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

Client	<b>Cognitive Systems Corp.</b>	 Canada
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Nov. 25, 2015	Nov. 25, 2017	GEMC 160

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## ***Antenna Spurious Conducted Emissions (-20 dBc Requirement)***

### **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 Method**

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

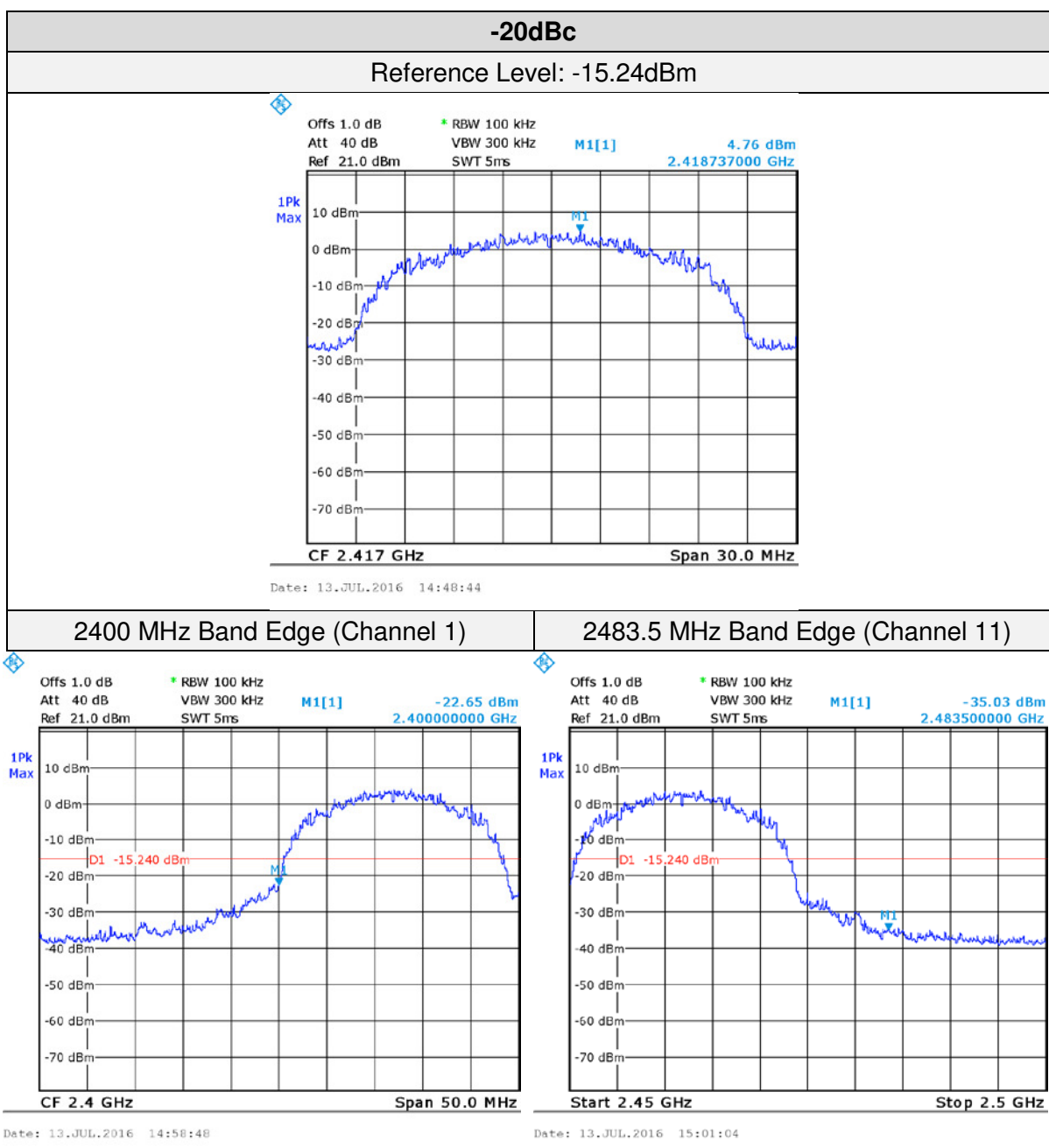
### **Results**


The EUT passed. Low, middle and high bands were measured. The worst case is 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 and also for the higher band edge at 2.4835 GHz in the high band.

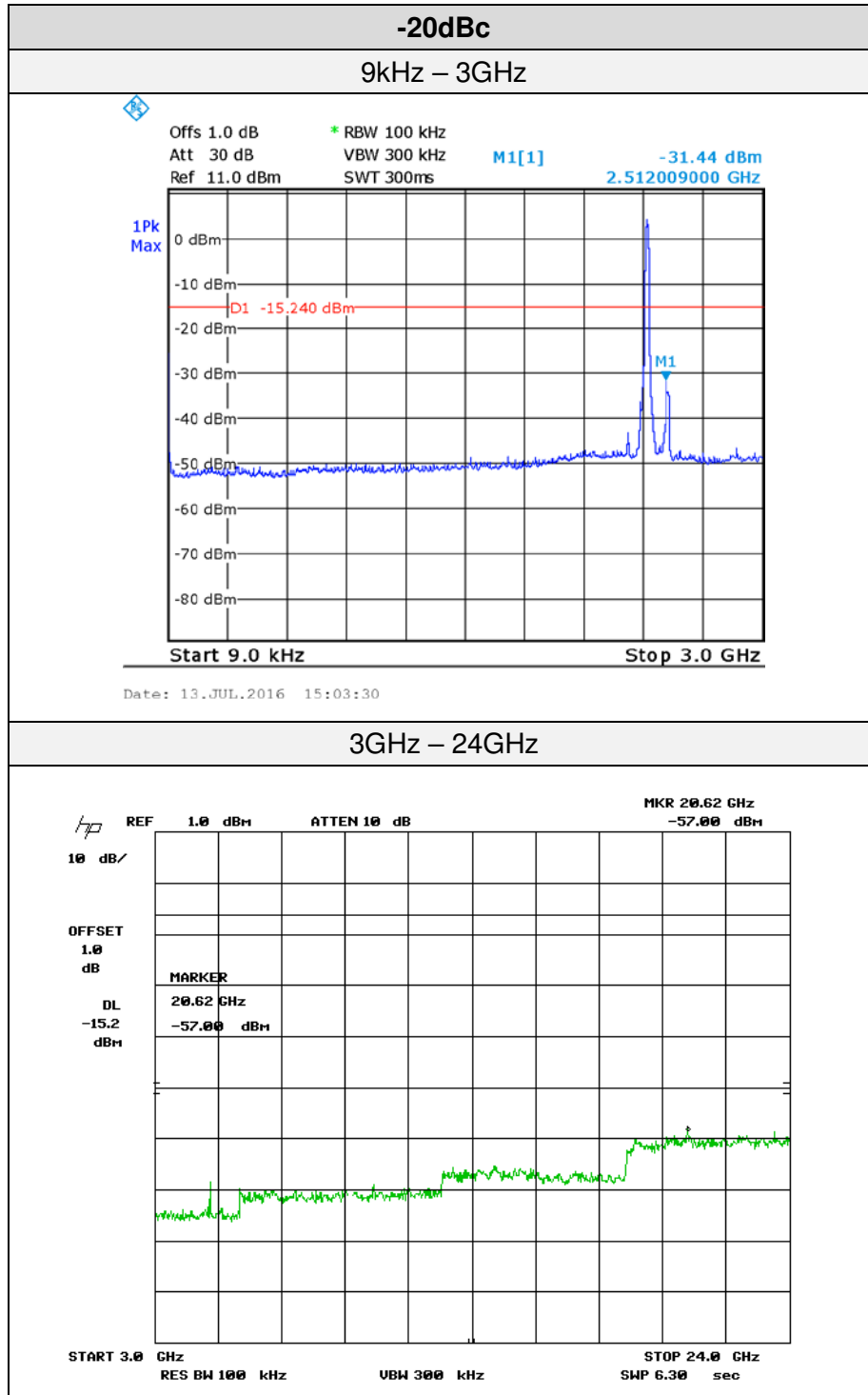
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	


## Graphs

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



Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	




Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Nov. 25, 2015	Nov. 25, 2017	GEMC 160
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

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## ***Transmitter 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.

### **Limits and Method**

The method is as defined in Section 12.2 of FCC KDB 558074 and ANSI C63.10.

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 ‘Antenna Spurious Conducted Emissions (-20dBc)’ for further details.


Frequency	Limit
0.009 MHz – 0.490 MHz	2400/F(kHz) uV/m at 300m <sup>1</sup>
0.490 MHz – 1.705 MHz	24000/F(kHz) uV/m at 30m <sup>1</sup>
1.705 MHz – 30 MHz	30 uV/m at 30m <sup>1</sup>
30 MHz – 88 MHz	100 uV/m (40.0 dBuV/m <sup>1</sup> ) at 3m
88 MHz – 216 MHz	150 uV/m (43.5 dBuV/m <sup>1</sup> ) at 3m
216 MHz – 960 MHz	200 uV/m (46.0 dBuV/m <sup>1</sup> ) at 3m
Above 960 MHz	500 uV/m (54.0 dBuV/m <sup>1</sup> ) at 3m
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

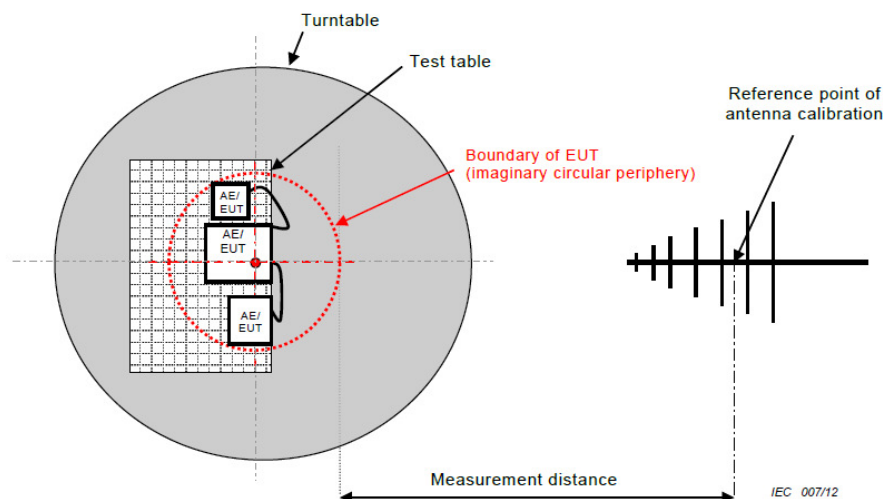
<sup>2</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector

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

Based on ANSI C63.4 Section 4.2, if the Peak detector measurements do not exceed the Quasi-Peak limits, where defined, then the EUT is deemed to have passed the requirements.

Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

### Typical Radiated Emissions Setup



### Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 4.25\text{dB}$  for 30MHz – 1GHz and  $\pm 4.93\text{dB}$  for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.

### Preliminary Graphs


The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

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 24.835 GHz).

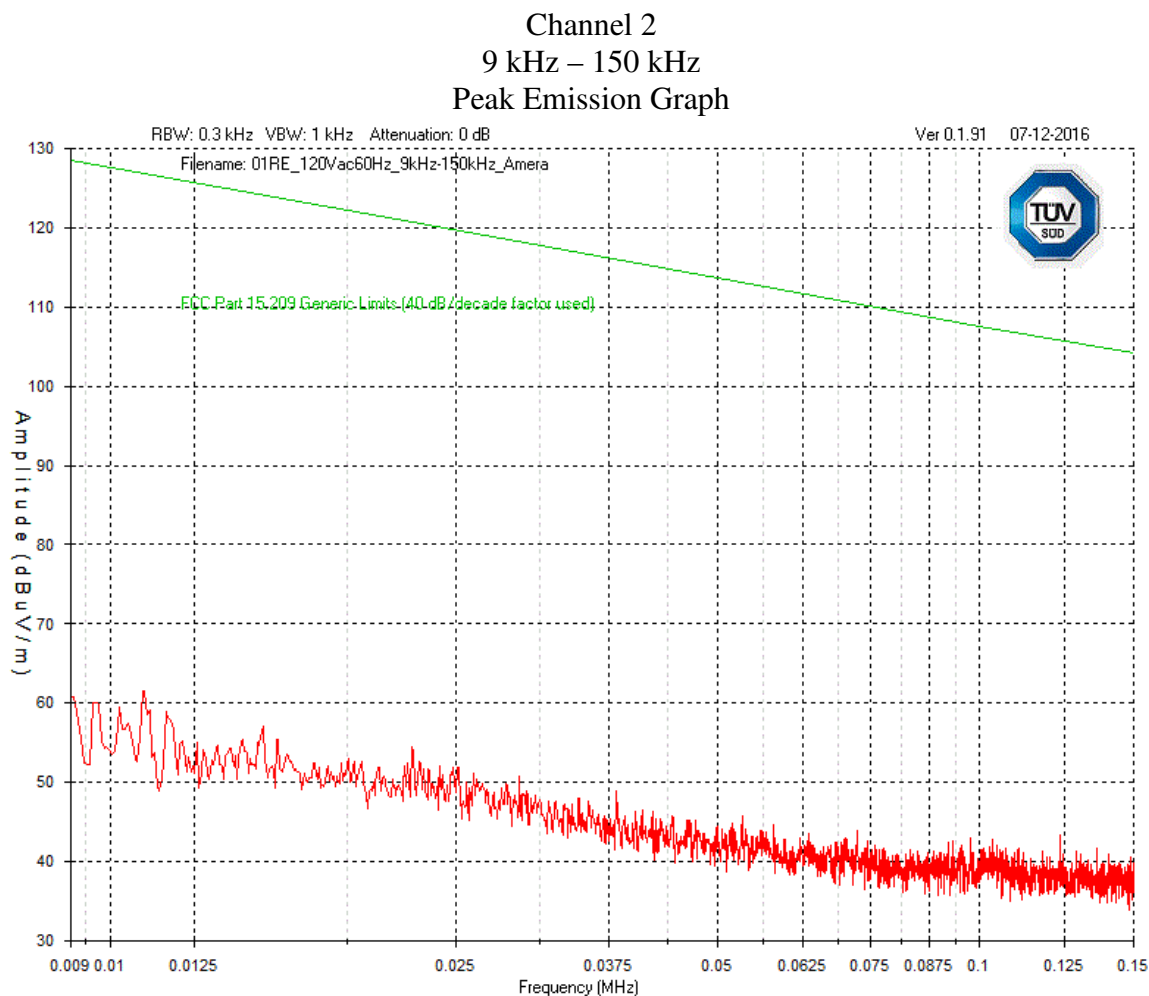
Devices scanned may be scanned at alternate test distances and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.


Low, middle and high channels were checked. However, the worst case graphs are presented.



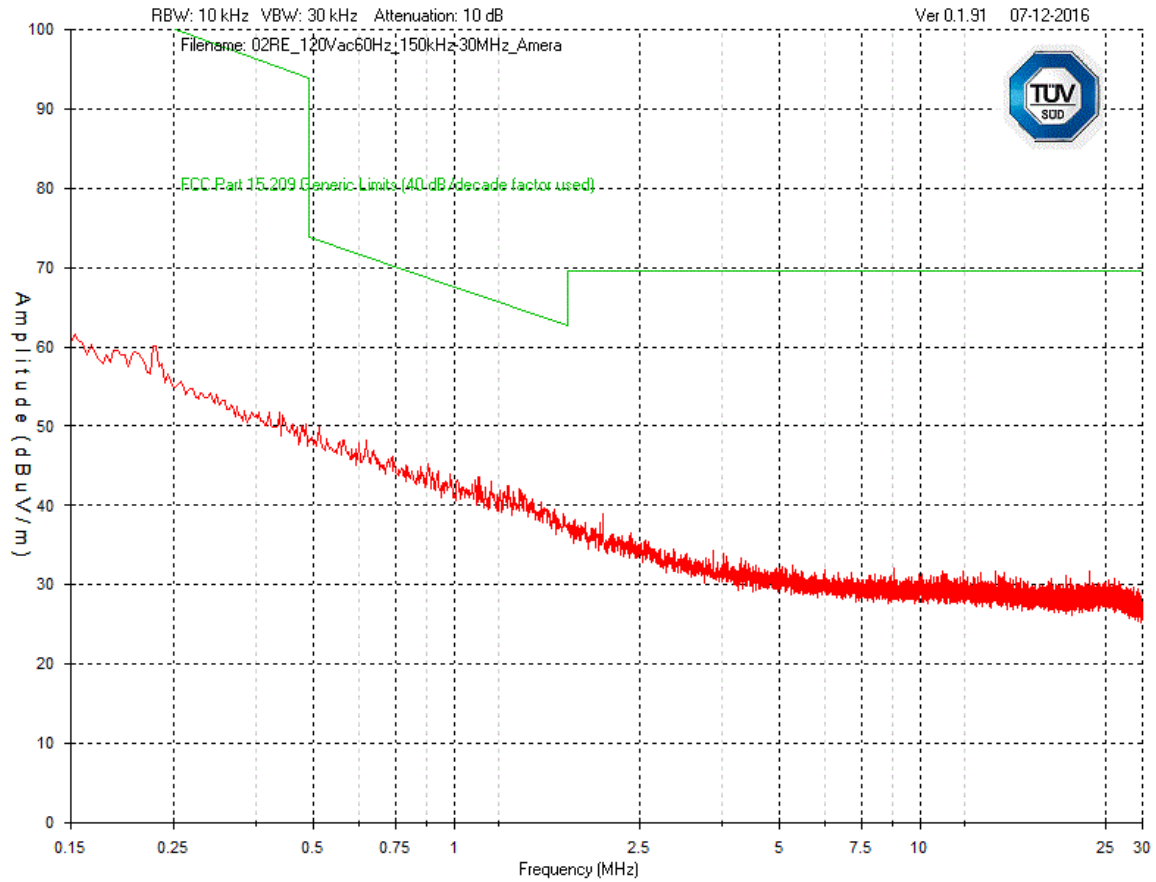
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	


Band-edge measurement graphs are shown for illustration purposes. See final measurement section for all measurements.



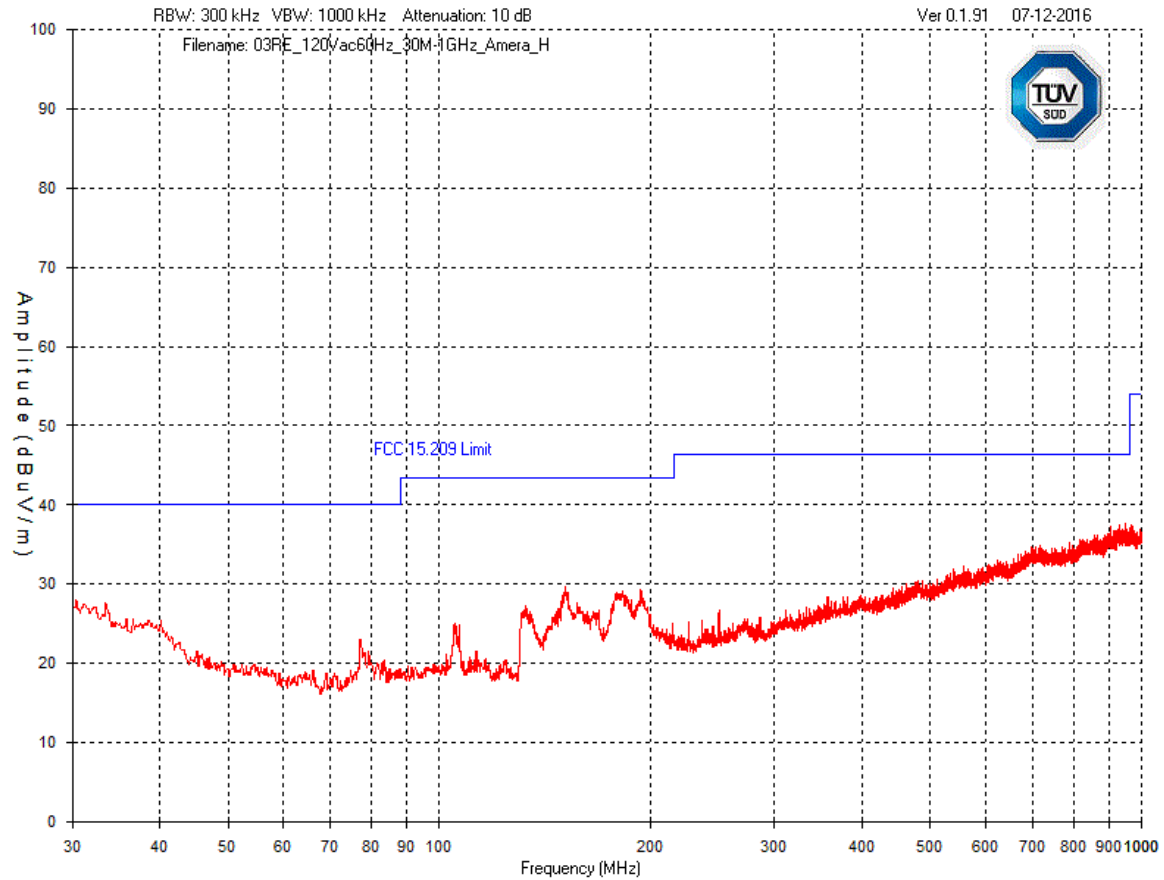
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	


Channel 2  
150 kHz – 30 MHz  
Peak Emission Graph



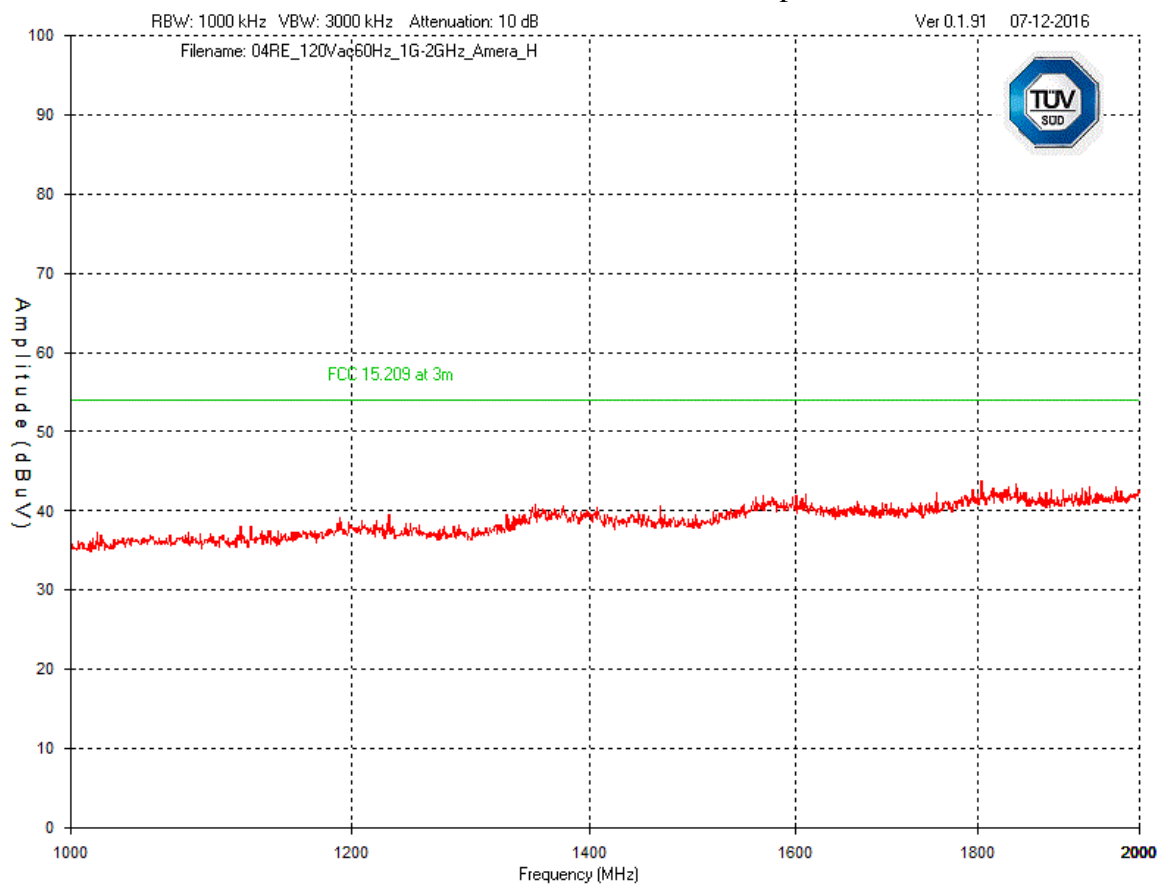
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	


Channel 2 – 30 MHz – 1 GHz  
Horizontal - Peak Emission Graph



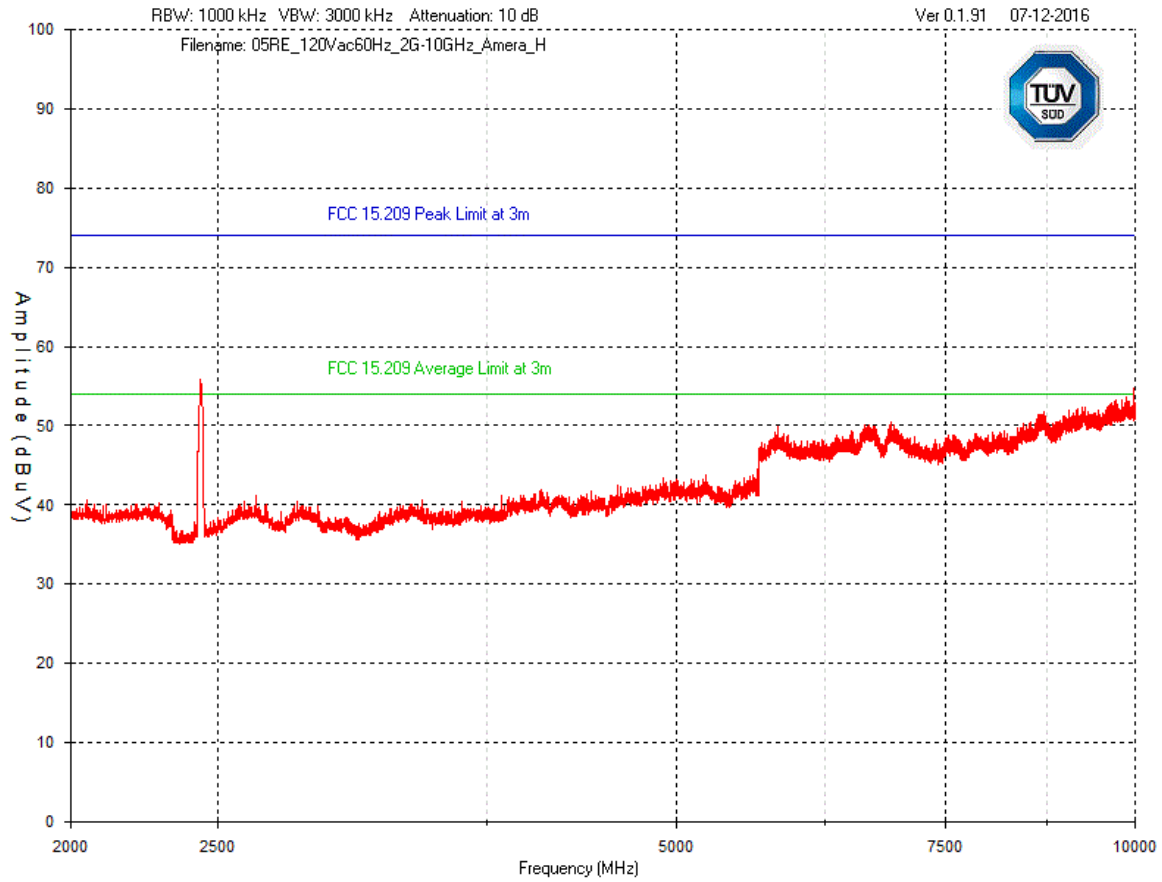
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	


### Channel 2 – 1 GHz – 2 GHz Horizontal - Peak Emission Graph



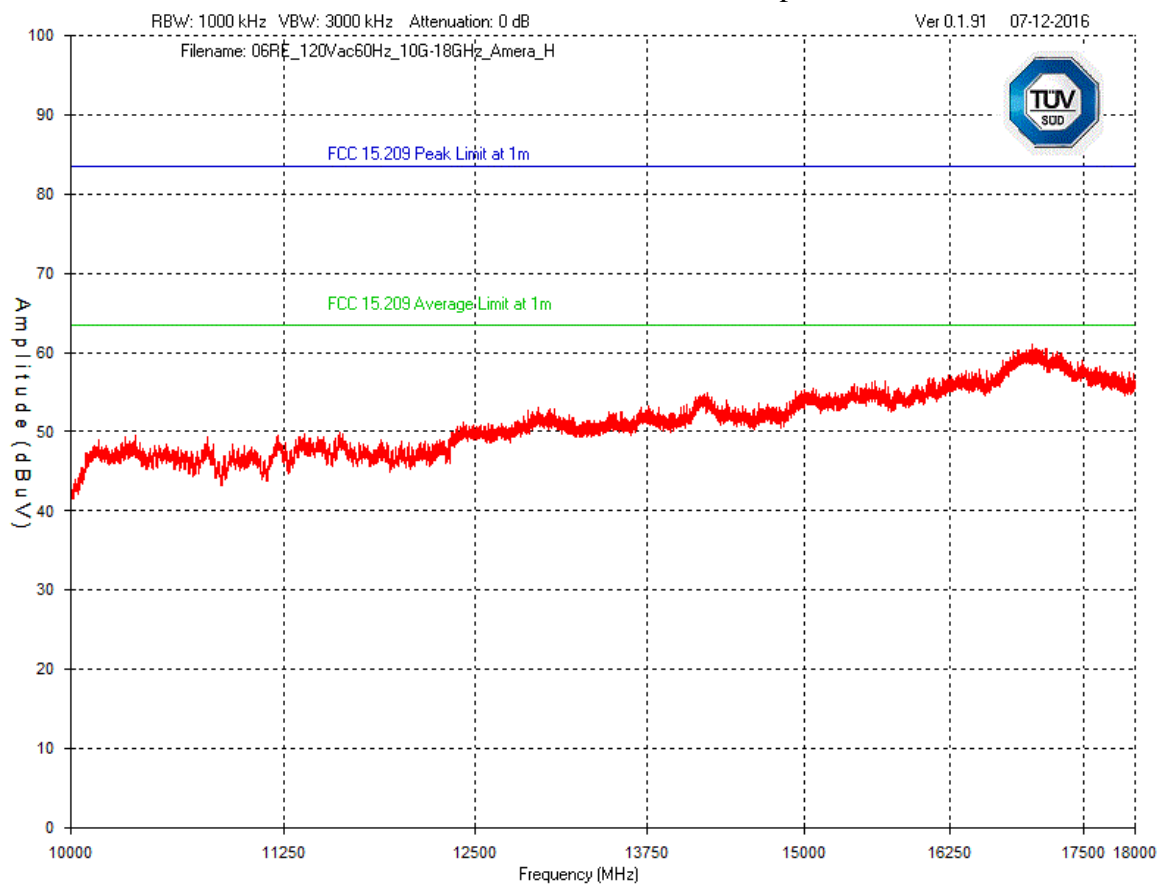
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

Channel 2 – 2 GHz – 10 GHz  
Horizontal - Peak Emission Graph




Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

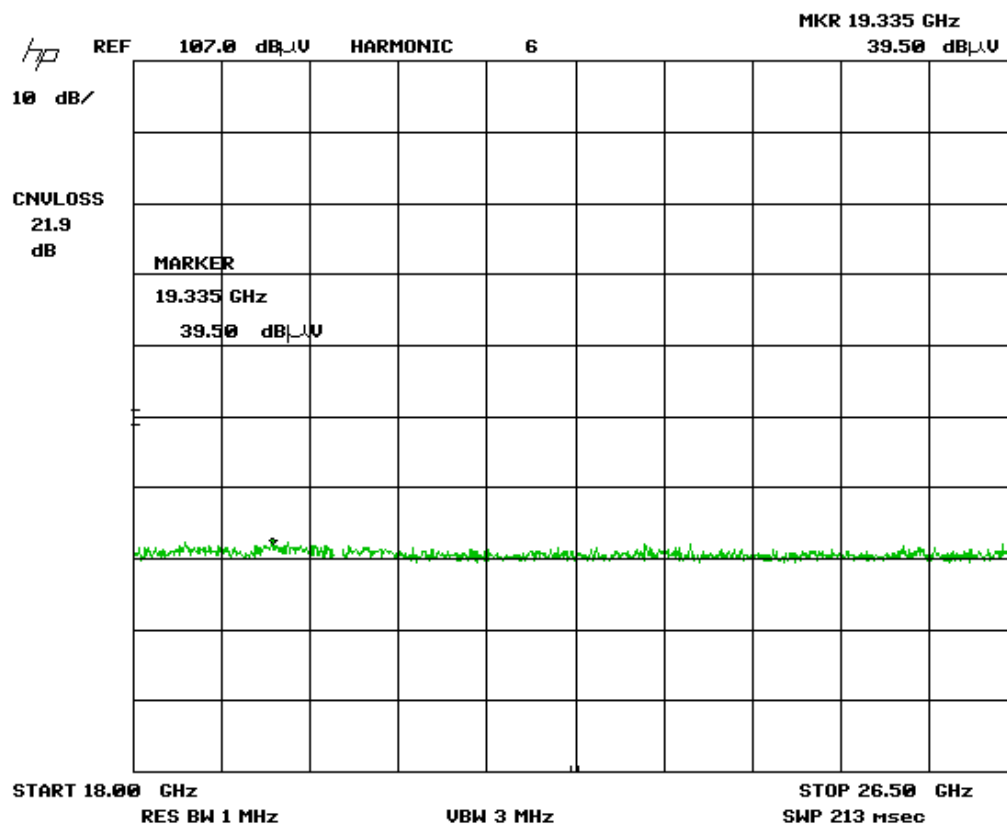
Channel 2 – 10 GHz – 18 GHz  
Horizontal - Peak Emission Graph




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

Client	Cognitive Systems Corp.	 Canada
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

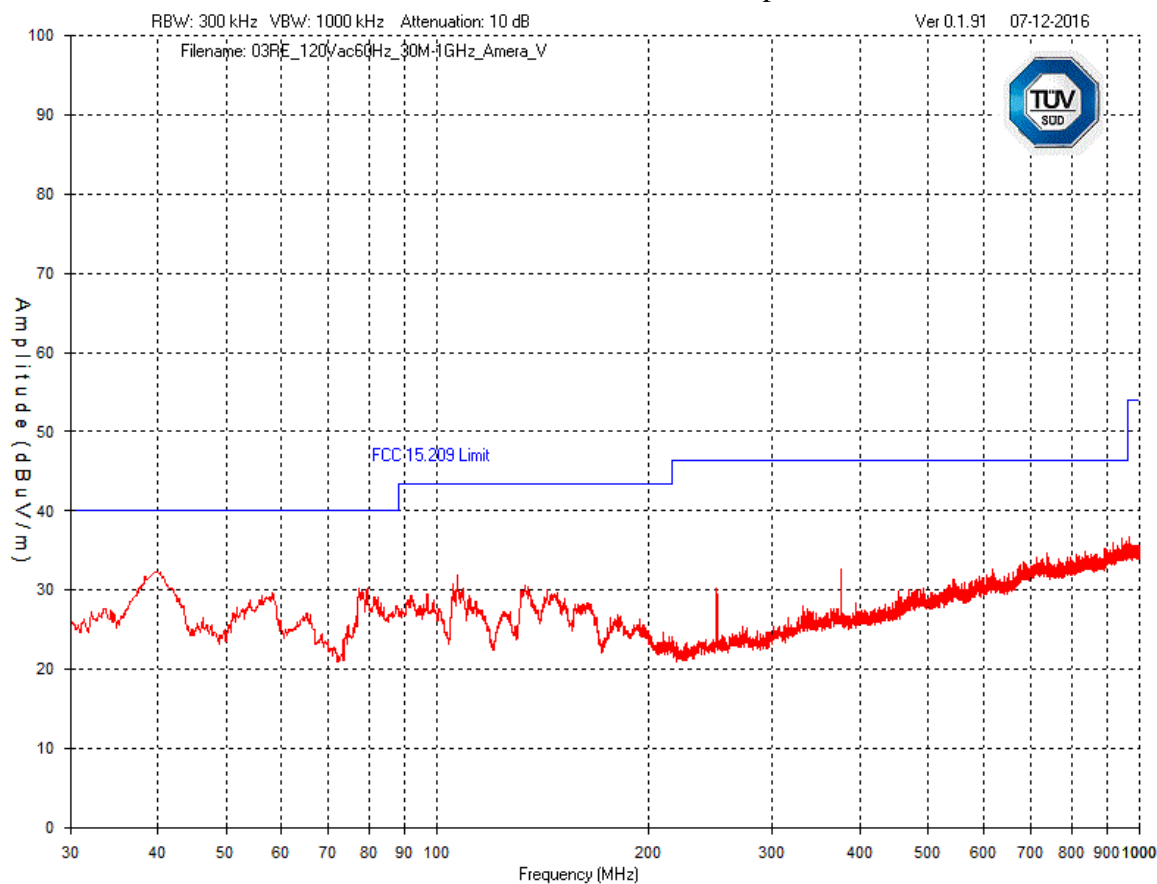
Channel 2 – 18 GHz – 26.5 GHz  
Horizontal - Peak Emission Graph




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

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

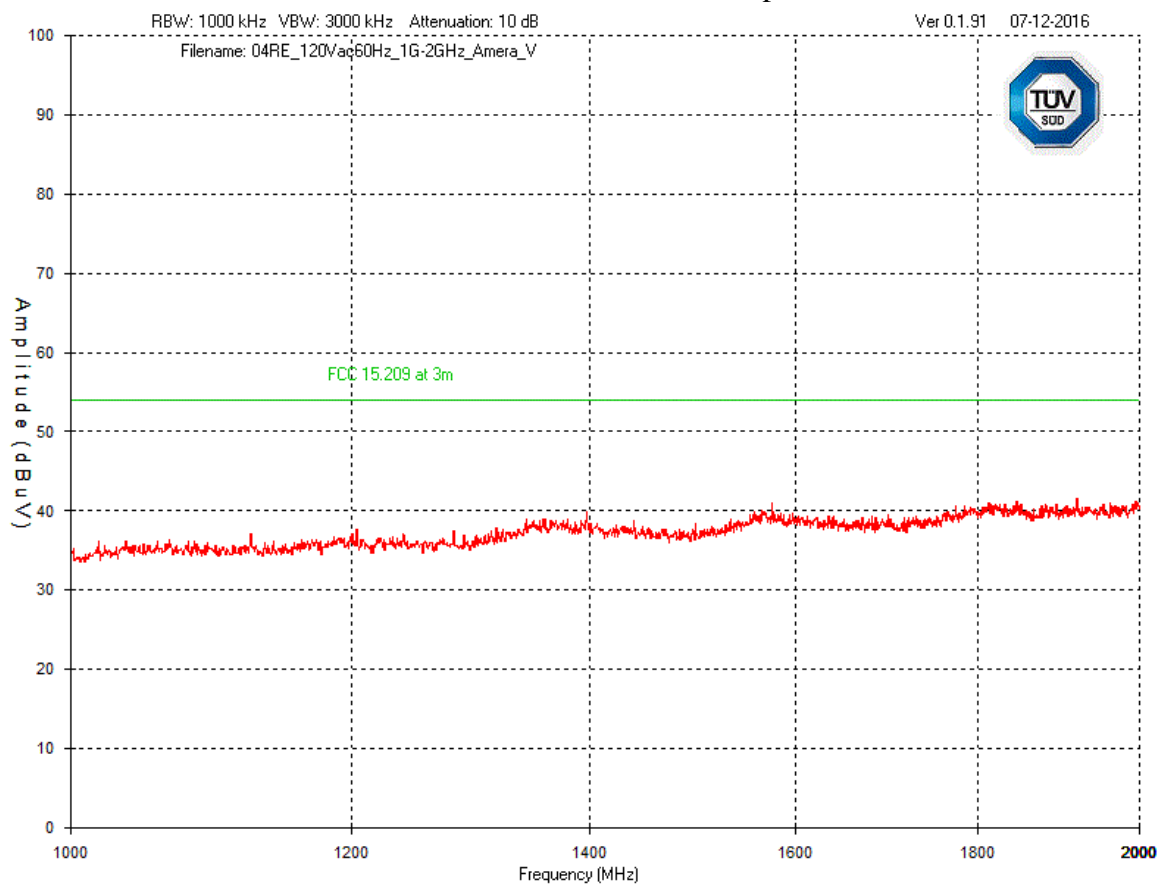
Channel 2 – 30 MHz – 1 GHz  
Vertical - Peak Emission Graph






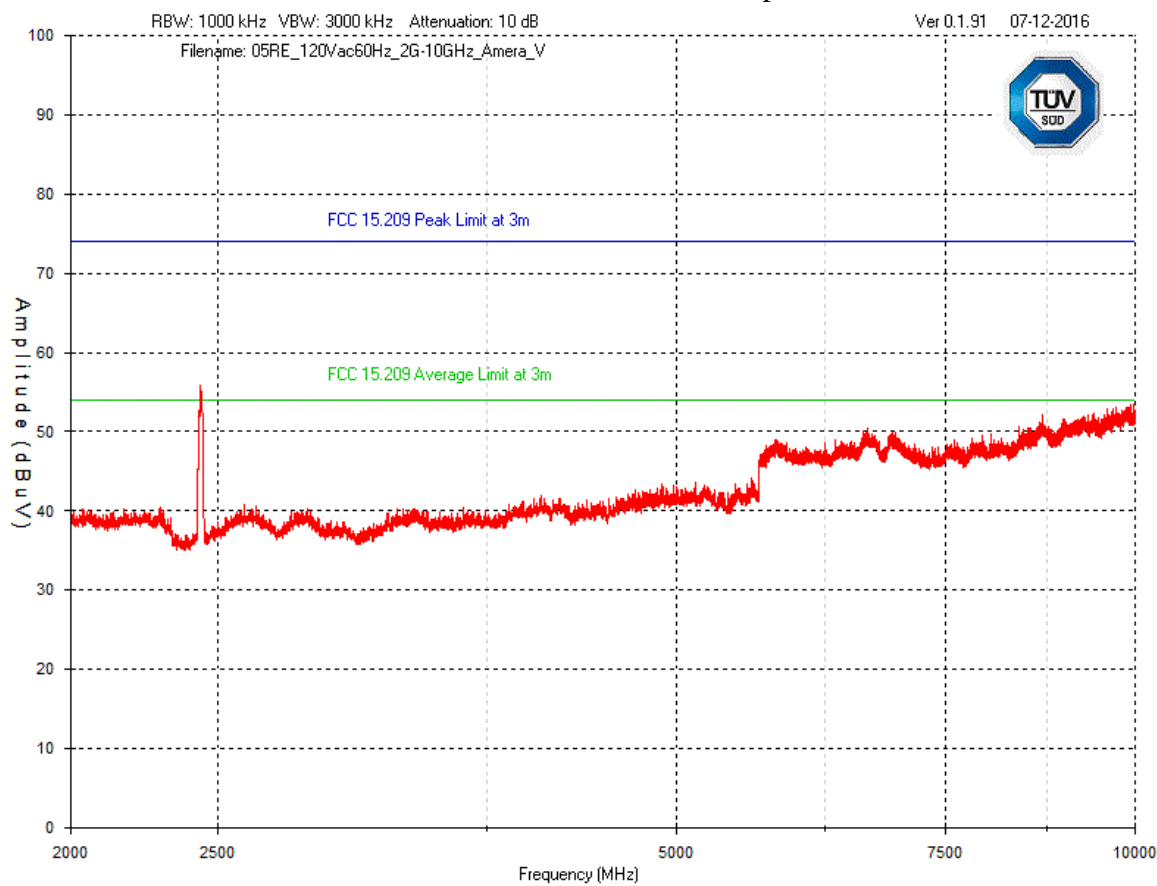
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	


Channel 2 – 1 GHz – 2 GHz  
Vertical - Peak Emission Graph



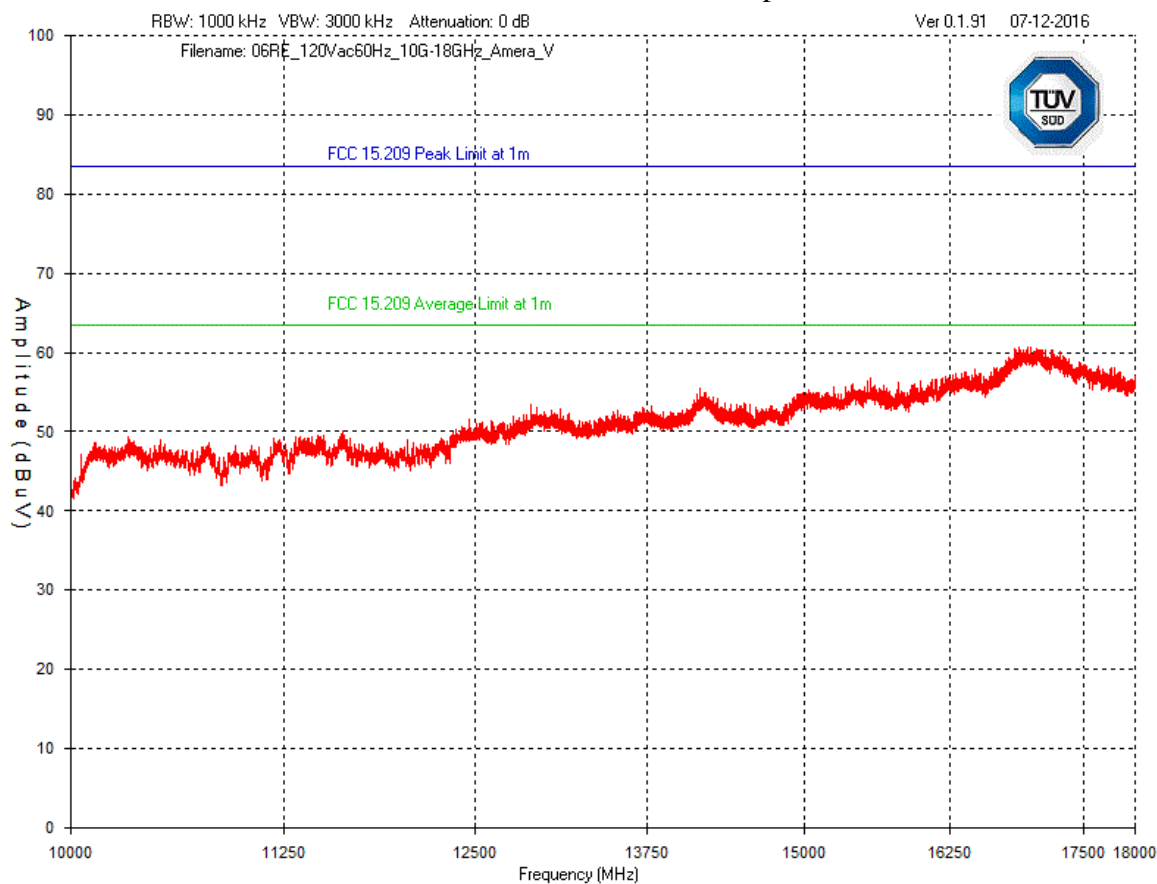
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

Channel 2 – 2 GHz – 10 GHz  
Vertical - Peak Emission Graph




Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

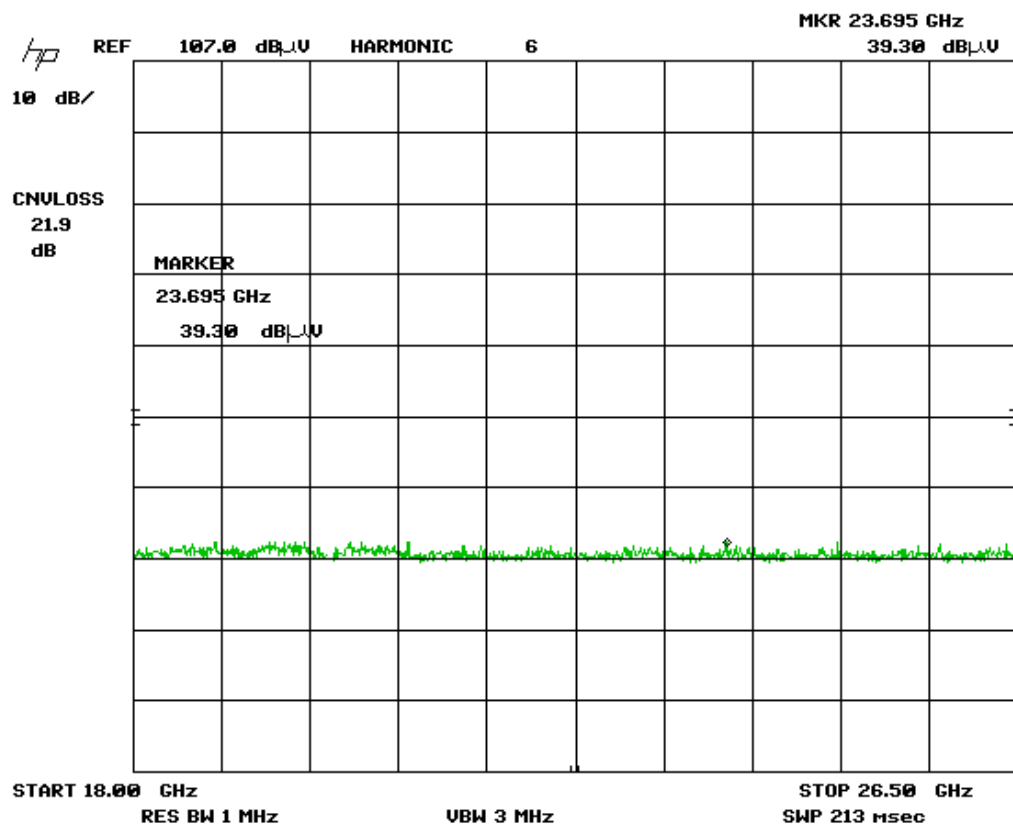
Channel 2 – 10 GHz – 18 GHz  
Vertical - Peak Emission Graph




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

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

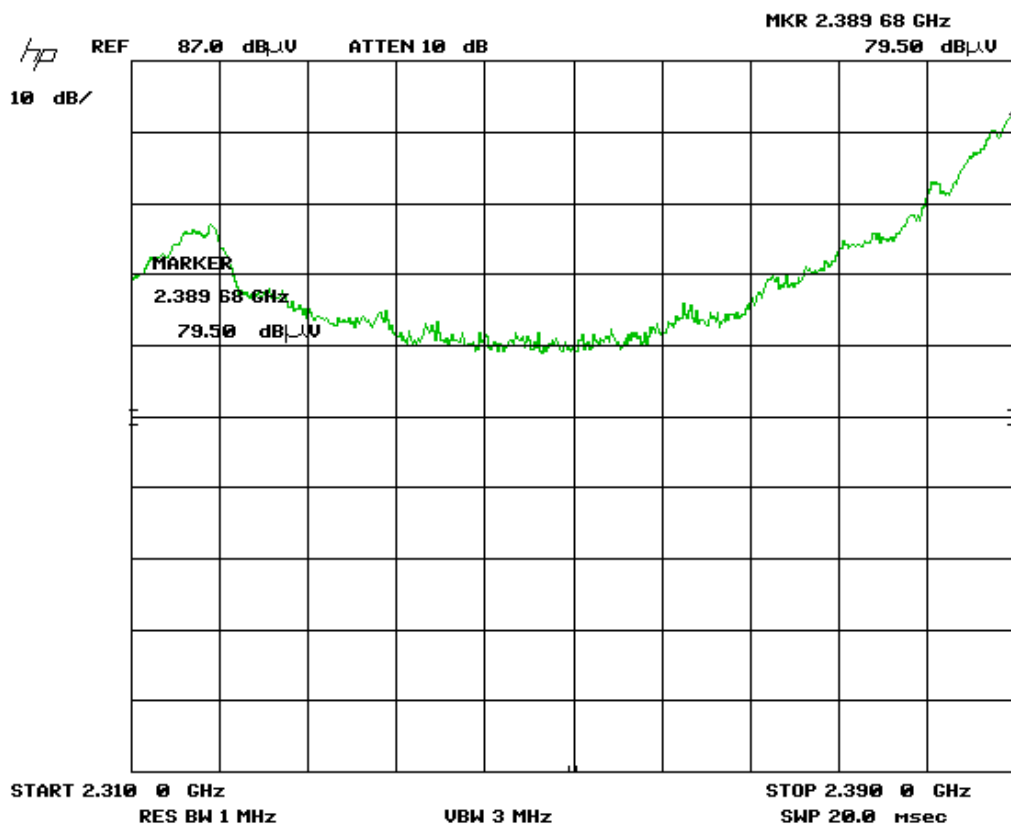
Channel 2 – 18 GHz – 25 GHz  
Vertical - Peak Emission Graph




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

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

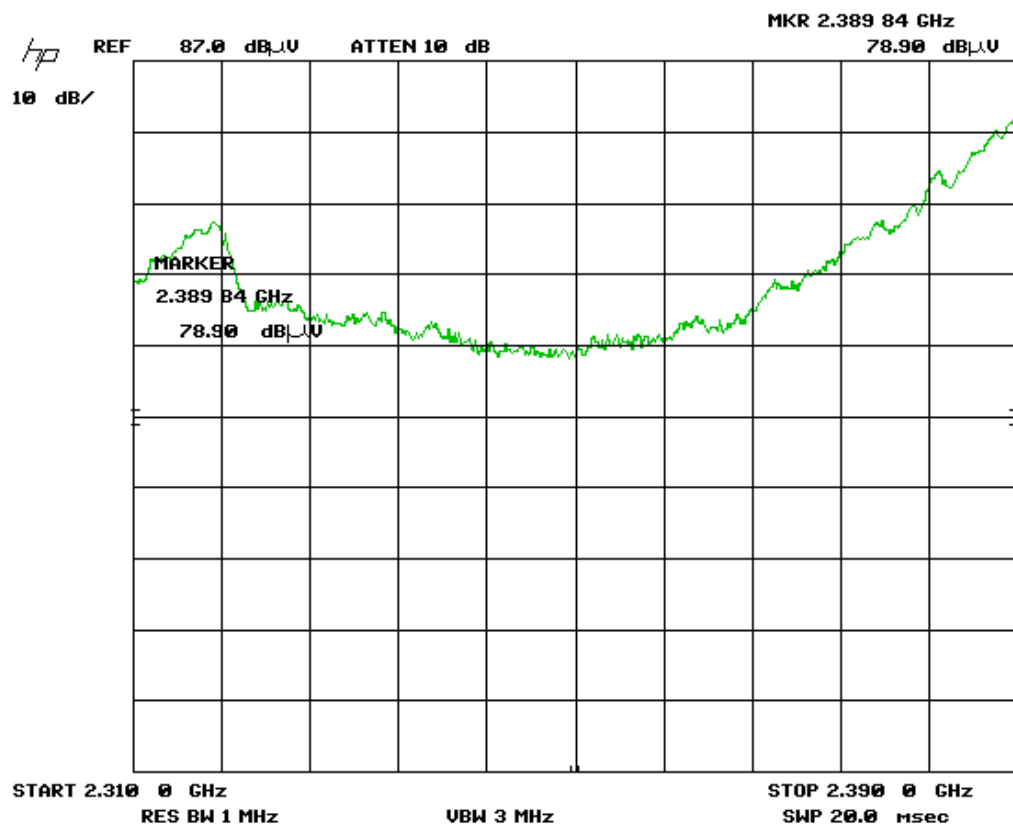
Band Edge – Low Channel (1)  
Horizontal - Peak Emission




Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

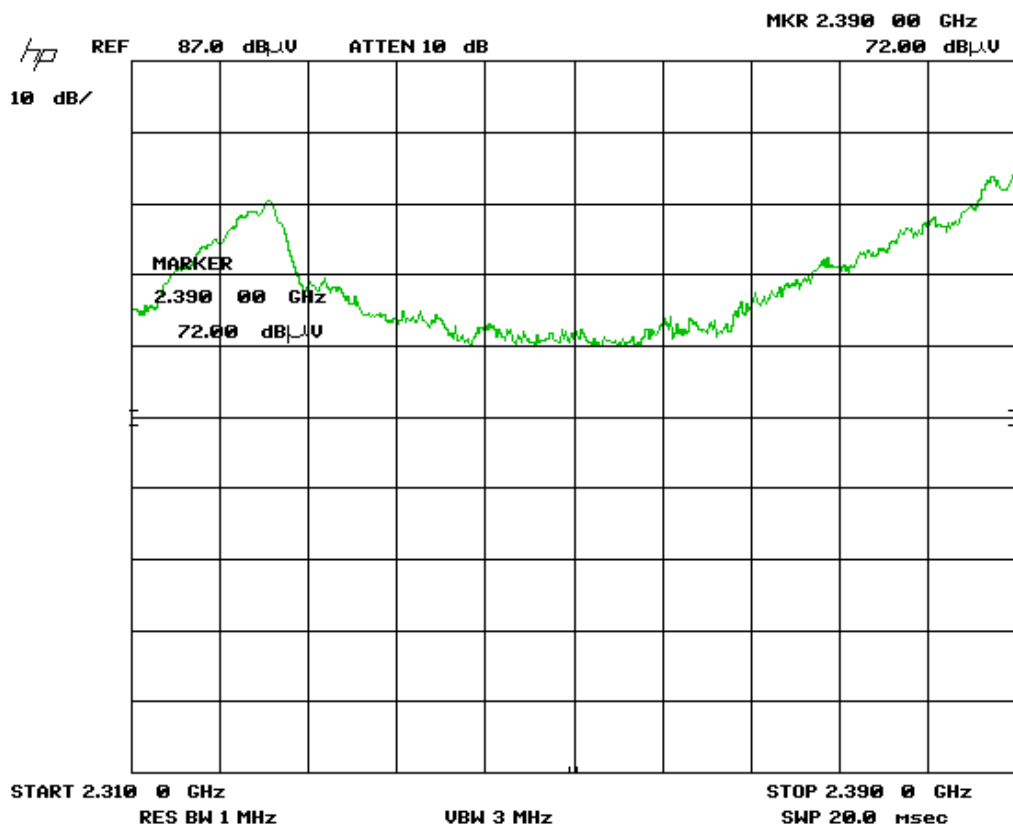
Band Edge – Low Channel (1)  
Vertical - Peak Emission




Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

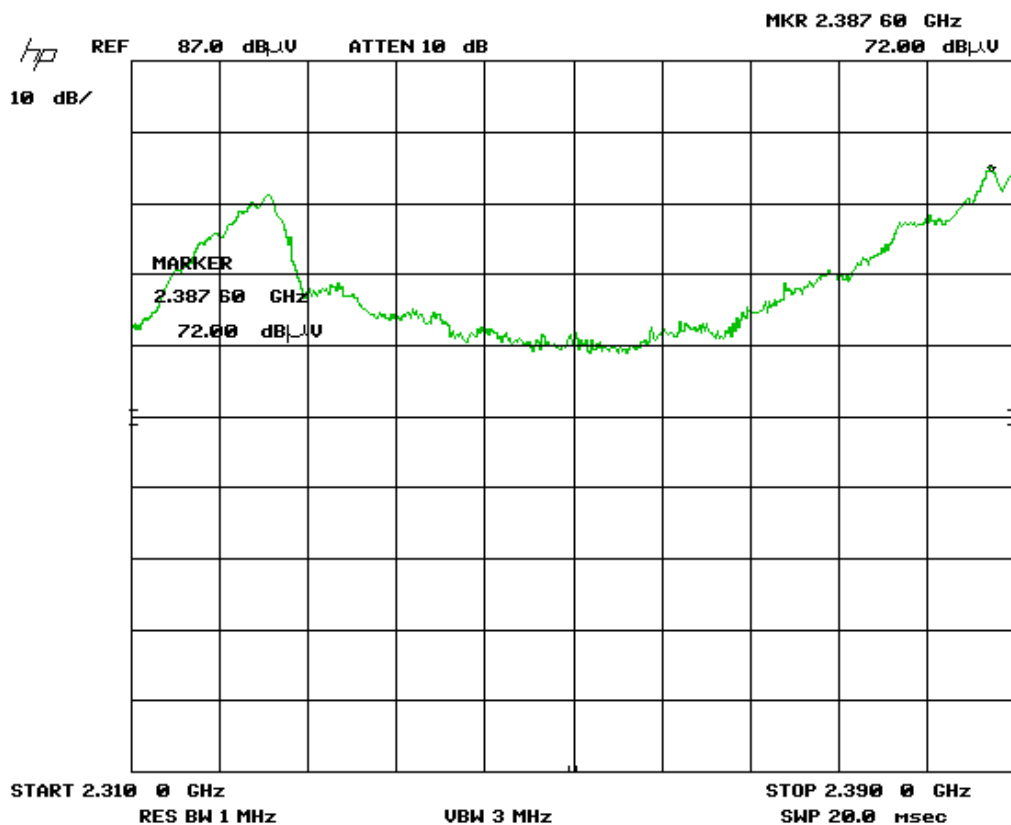
Band Edge – Channel (2)  
Horizontal - Peak Emission



Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.


Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

Band Edge – Channel (2)  
Vertical - Peak Emission

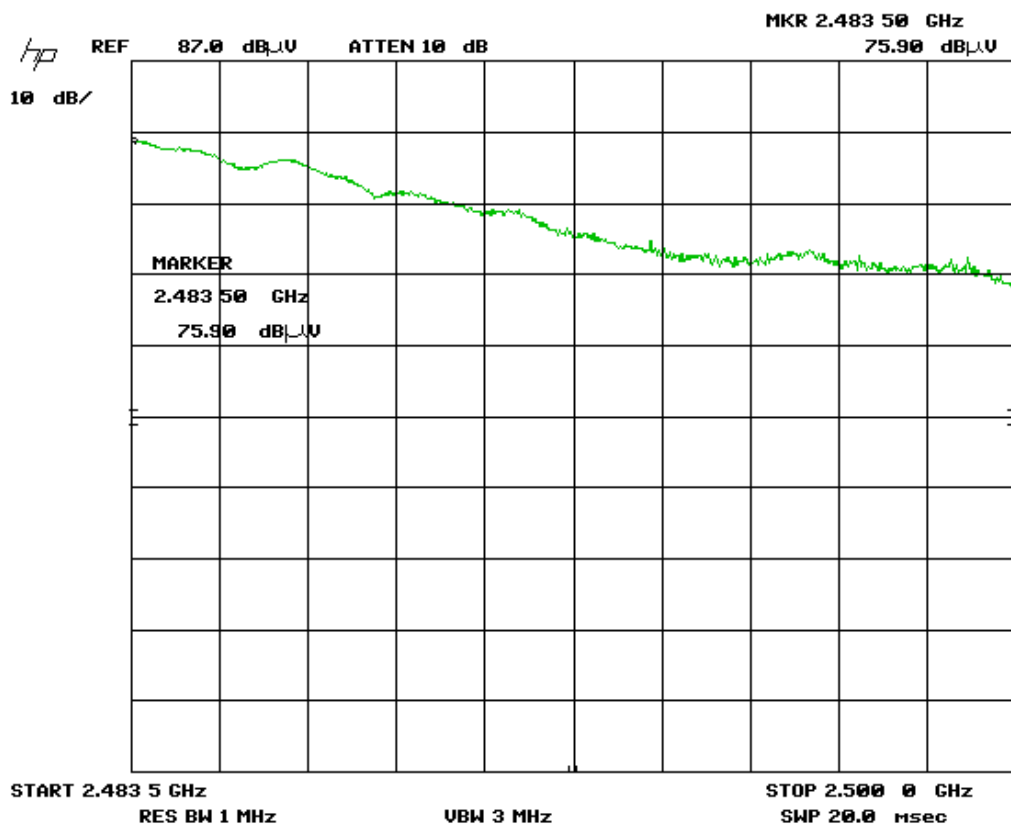


Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.




Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

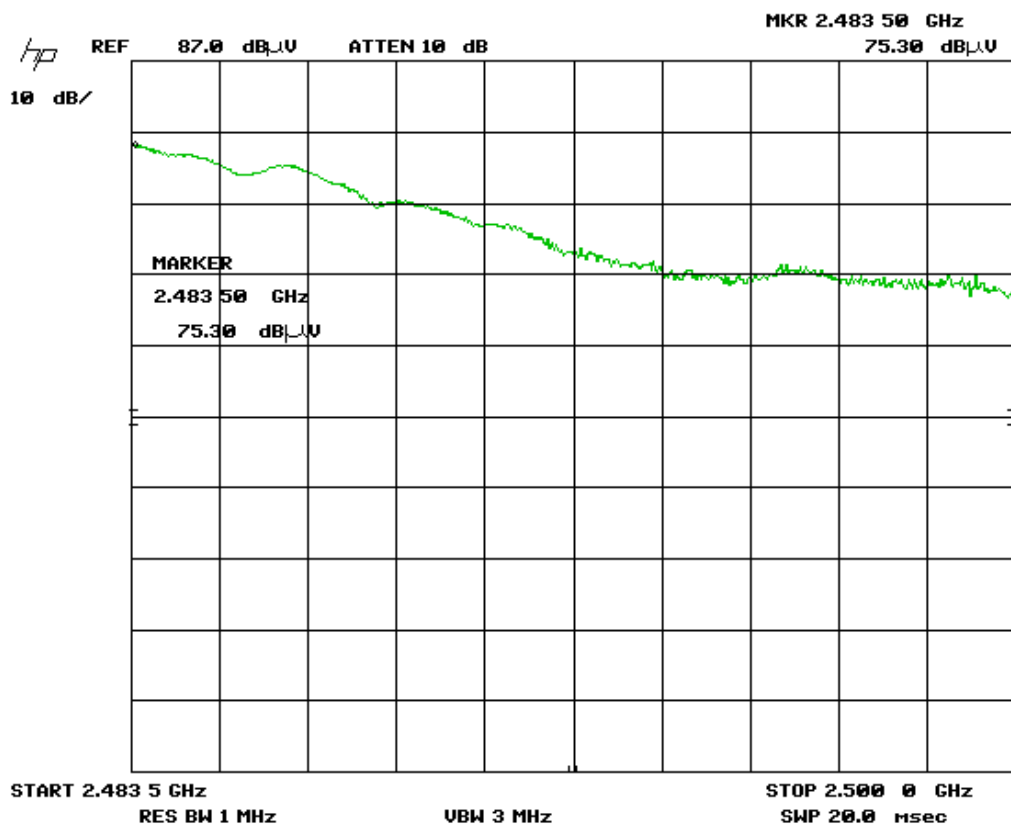
Band Edge – Hi Channel (11)  
Horizontal - Peak Emission




Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	Cognitive Systems Corp.	 Canada
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

Band Edge – Hi Channel (11)  
Vertical - Peak Emission



Note: Restricted band Band Edge plot was taken at a 3m measurement distance. The marker shows the raw value. See the Final Measurements and Results section below for correct values.

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Final Measurements and Results


The EUT passed. Low, middle, and high bands were measured as well as channel 2. Power on the low channel (channel 1) was reduced to 97% Tx digital scaling in order to meet the band edge limits. All other channels were set to 100%. For the average radiated emission measurements of the band edges in the restricted bands, the duty cycle correction factor method was used. A duty cycle correction factor of 2% ( $20\log(2\%) = -33.98$ ) was applied to the peak measurement to obtain the average measurement.

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. Emissions outside the restricted bands were measured for informational purposes.

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 Category			Class B							
Supply			120Vac 60Hz							
Frequency (MHz)	Detector Peak/AVG	Received Signal (dBμV)	Antenna Factor (dB/m)	Atten Factor (dB)	Cable Factor (dB)	Pre-Amp (dB)	Level (dBμV/m)	AVG Limit (dBμV/m)	AVG Margin (dB)	Pass/Fail
Horizontal Antenna Polarization										
9967.00	AVG	36.9	31.5	0	10.6	-36.0	43.0	54.0	11.0	Pass
Vertical Antenna Polarization										
9939.67	AVG	37.2	31.5	0	10.5	-36.1	43.1	54.0	10.9	Pass
8698.80	AVG	38.3	30.4	0	9.1	-35.7	42.1	54.0	12.0	Pass

### Spurious Emission Measurements

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

Test Frequency (MHz)	Detection Mode	Antenna Polarity (Horz/Vert)	Received Signal (dBµV)	Antenna Factor (dB/m)	Cable Factor (dB)	Attenuator (dB)	Pre-Amp Gain (dB)	Level (dBµV/m)	Emission Limit (dBµV/m)	Margin (dB)	Result
Low Channel (1) - PWR = 97%											
2412	Peak	Horz	115.6	26.4	3.6	0.0	-35.8	109.8			PASS
2412	Avg	Horz	104.1	26.4	3.6	0.0	-35.8	98.3			PASS
2412	Peak	Vert	114.6	26.4	3.6	0.0	-35.8	108.8			PASS
2412	Avg	Vert	103.6	26.4	3.6	0.0	-35.8	97.8			PASS
2390	Peak	Horz	79.5	26.4	3.6	0.0	-35.8	73.7	74.0	0.3	PASS
2390	Avg	Horz	45.5	26.4	3.6	0.0	-35.8	39.7	54.0	14.3	PASS
2390	Peak	Vert	78.9	26.4	3.6	0.0	-35.8	73.1	74.0	0.9	PASS
2390	Avg	Vert	44.9	26.4	3.6	0.0	-35.8	39.1	54.0	14.9	PASS
Channel (2) - PWR = 100%											
2417	Peak	Horz	116.1	26.4	3.6	0.0	-35.8	110.3			PASS
2417	Avg	Horz	104.5	26.4	3.6	0.0	-35.8	98.7			PASS
2417	Peak	Vert	115.1	26.4	3.6	0.0	-35.8	109.3			PASS
2417	Avg	Vert	104.0	26.4	3.6	0.0	-35.8	98.2			PASS
2390	Peak	Horz	72.0	26.4	3.6	0.0	-35.8	66.2	74.0	7.8	PASS
2390	Avg	Horz	38.0	26.4	3.6	0.0	-35.8	32.2	54.0	21.8	PASS
2390	Peak	Vert	72.0	26.4	3.6	0.0	-35.8	66.2	74.0	7.8	PASS
2390	Avg	Vert	38.0	26.4	3.6	0.0	-35.8	32.2	54.0	21.8	PASS
4834	Peak	Horz	43.7	27.8	5.8	0.0	-35.3	42.0	74.0	32.0	PASS
4834	Avg	Horz	31.9	27.8	5.8	0.0	-35.3	30.2	54.0	23.8	PASS
4834	Peak	Vert	43.9	27.8	5.8	0.0	-35.3	42.2	74.0	31.8	PASS
4834	Avg	Vert	31.9	27.8	5.8	0.0	-35.3	30.2	54.0	23.8	PASS
7251	Peak	Horz	47.7	29.0	7.5	0.0	-35.5	48.7	74.0	25.3	PASS
7251	Avg	Horz	35.0	29.0	7.5	0.0	-35.5	36.0	54.0	18.0	PASS
7251	Peak	Vert	47.2	29.0	7.5	0.0	-35.5	48.2	74.0	25.8	PASS
7251	Avg	Vert	35.0	29.0	7.5	0.0	-35.5	36.0	54.0	18.0	PASS
Mid Channel (6) - PWR = 100%											
2437	Peak	Horz	114.8	26.3	3.6	0.0	-35.8	108.9			PASS
2437	Avg	Horz	103.3	26.3	3.6	0.0	-35.8	97.4			PASS
2437	Peak	Vert	113.5	26.3	3.6	0.0	-35.8	107.6			PASS
2437	Avg	Vert	102.5	26.3	3.6	0.0	-35.8	96.6			PASS
High Channel (11) - PWR = 100%											
2462	Peak	Horz	114.4	26.3	3.6	0.0	-35.8	108.5			PASS
2462	Avg	Horz	103.1	26.3	3.6	0.0	-35.8	97.2			PASS
2462	Peak	Vert	114.4	26.3	3.6	0.0	-35.8	108.5			PASS
2462	Avg	Vert	103.1	26.3	3.6	0.0	-35.8	97.2			PASS
2483.5	Peak	Horz	75.9	26.3	3.6	0.0	-35.8	70.0	74.0	4.0	PASS
2483.5	Avg	Horz	41.9	26.3	3.6	0.0	-35.8	36.0	54.0	18.0	PASS
2483.5	Peak	Vert	75.3	26.3	3.6	0.0	-35.8	69.4	74.0	4.6	PASS
2483.5	Avg	Vert	41.3	26.3	3.6	0.0	-35.8	35.4	54.0	18.6	PASS


### Peak Power and Band Edge Measurements

Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration / Verification Date	Next Calibration / Verification 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
Horn Antenna 2 – 18 GHz	WBH218HN	Q-par	Feb 12, 2016	Feb 12, 2018	GEMC 6375
Pre-Amp 1 – 26.5 GHz	HP 8449B	HP	Sept 09, 2014	Sept 09, 2016	GEMC 6351
Horn Antenna 18 - 26.5 GHz	SAS-572	A.H. Systems	Sept 09, 2014	Sept 09, 2016	GEMC 6371
Harmonic Mixer 18 - 26.5 GHz	11970K	HP	Feb 8, 2016	Feb 8, 2018	GEMC 158
Pre-Amp 9 kHz – 1 GHz	LNA 6901	Teseq	Jan 30, 2015	Jan 30, 2017	GEMC 168
Attenuator 3 dB	612-03-1	Meca Electronics, Inc	Feb 11, 2016	Feb 11, 2017	GEMC 222
Loop Antenna	EM 6871	Electro-Metrics	Feb 3, 2015	Feb 3, 2017	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 3, 2015	Feb 3, 2017	GEMC 71
BiLog Antenna	3142-C	ETS	Sept 8, 2014	Sept 8, 2016	GEMC 8
2.4GHz-2.5GHz Notch Filter	BRM50702	Micro-Tronics	July 11, 2016	July 11, 2017	GEMC 230
RF Cable 7m	LMR-400-7M-50Ω-MN-MN	LexTec	Feb 1, 2016	Feb 1, 2017	GEMC 28
RF Cable 10m	LMR-400-10M-50Ω-MN-MN	LexTec	Feb 1, 2016	Feb 1, 2017	GEMC 27
RF Cable 0.5m	LMR-400-0.5M-50Ω-MN-MN	LexTec	Feb 1, 2016	Feb 1, 2017	GEMC 31
Emissions Software	0.1.91	Global EMC	NCR	NCR	GEMC 58

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Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## ***Power Spectral Density***

### **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 Method**

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, channel 2, middle, and high bands were tested. The worst case value is -8.42 dBm as measured with a 3 kHz resolution bandwidth (peak power).

### **Graphs**

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. Cable losses are accounted for as reference offset in the spectrum analyzer.

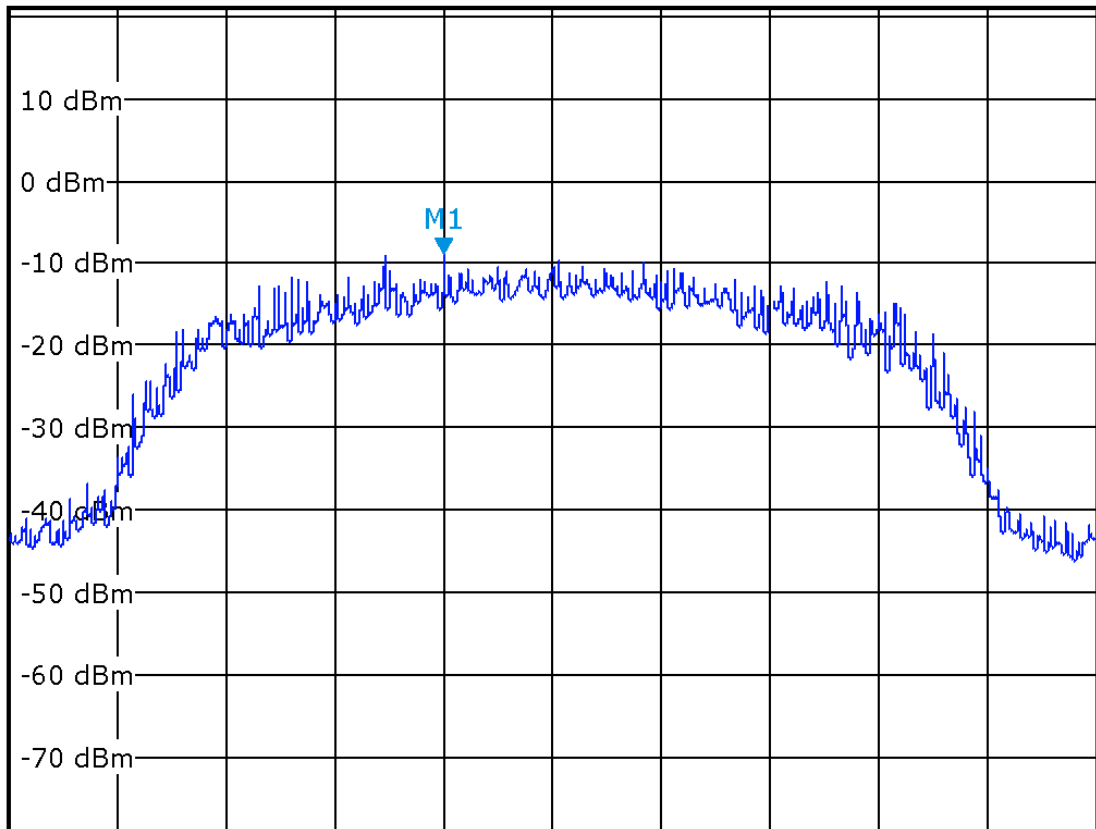
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

# PSD - Low Channel (1)



Offs 1.0 dB      \* RBW 3 kHz  
Att 40 dB      VBW 10 kHz      **M1[1]**      **-8.70 dBm**  
Ref 21.0 dBm      SWT 3.3s      **2.409006000 GHz**


1Pk  
Max



CF 2.412 GHz

Span 30.0 MHz

Date: 13.JUL.2016 14:51:50

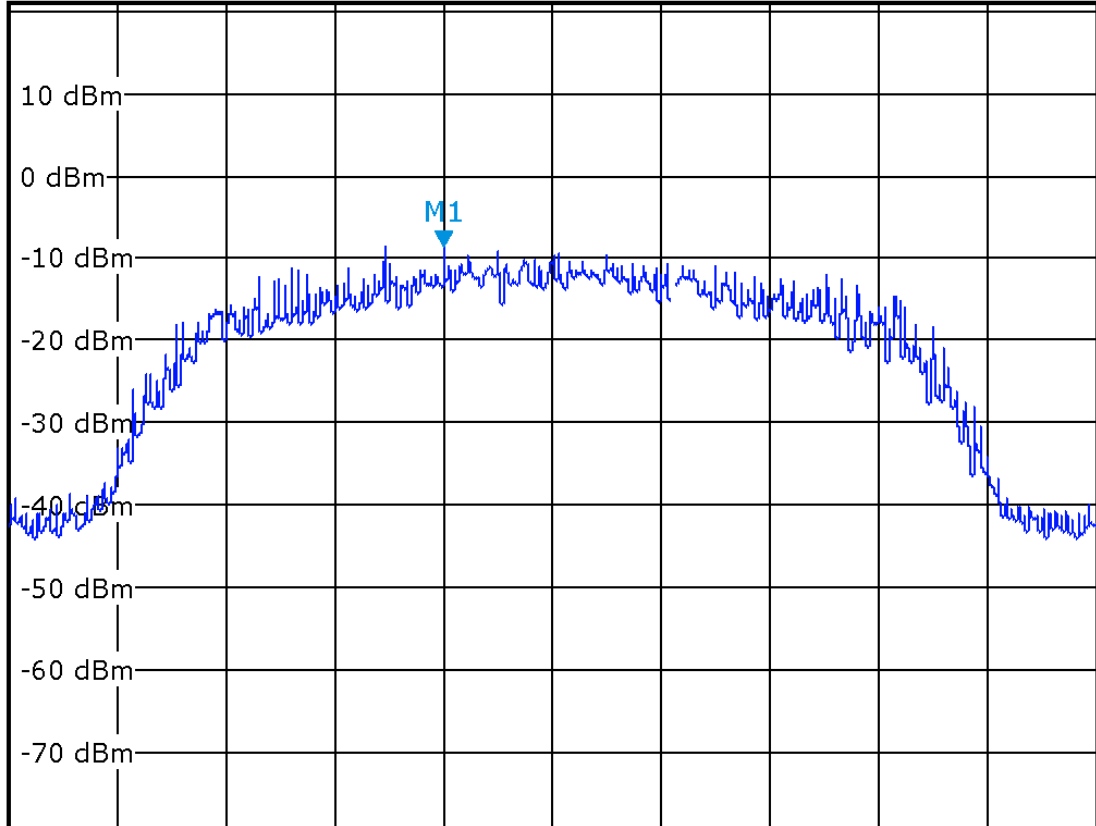
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

# PSD - Channel (2)



Offs 1.0 dB      \* RBW 3 kHz  
Att 40 dB      VBW 10 kHz      **M1[1]**      **-8.42 dBm**  
Ref 21.0 dBm      SWT 3.3s      **2.414006000 GHz**

1Pk  
Max




CF 2.417 GHz

Span 30.0 MHz

Date: 13.JUL.2016 14:50:20



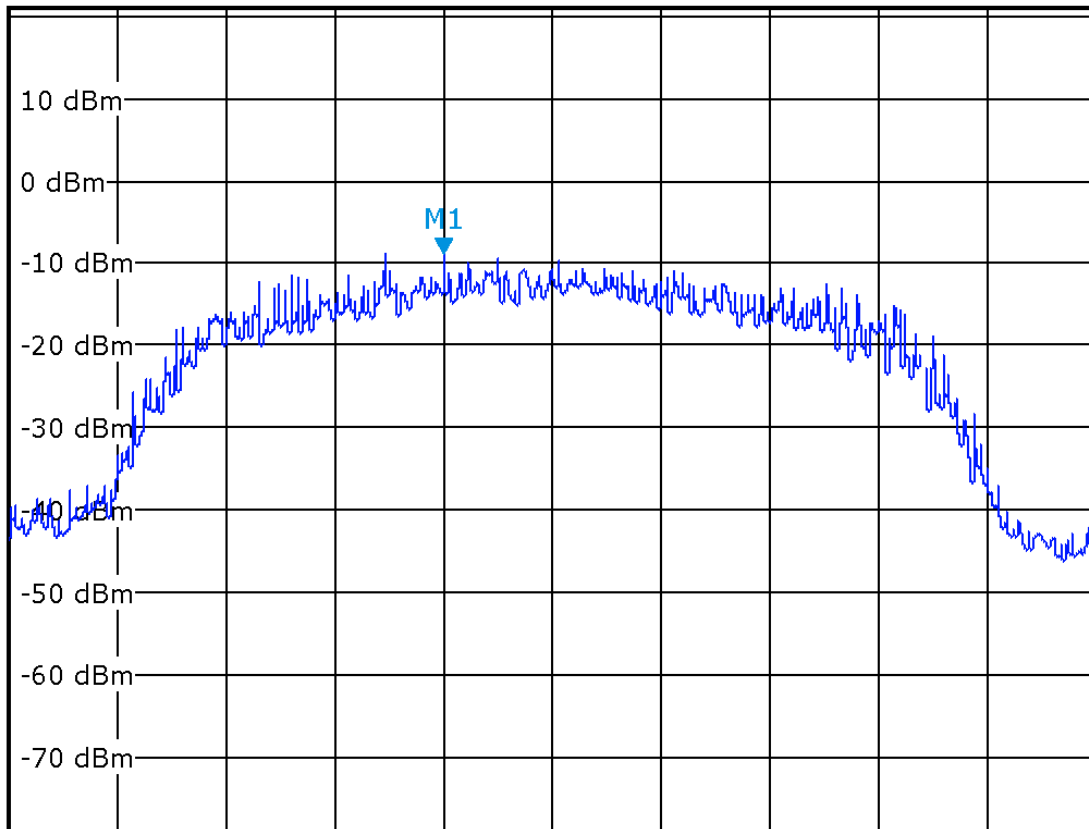
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

# PSD - Mid Channel (6)



Offs 1.0 dB      \* RBW 3 kHz  
Att 40 dB      VBW 10 kHz      **M1[1]**      **-8.70 dBm**  
Ref 21.0 dBm      SWT 3.3s      **2.434006000 GHz**


1Pk  
Max



CF 2.437 GHz

Span 30.0 MHz

Date: 13.JUL.2016 14:46:39

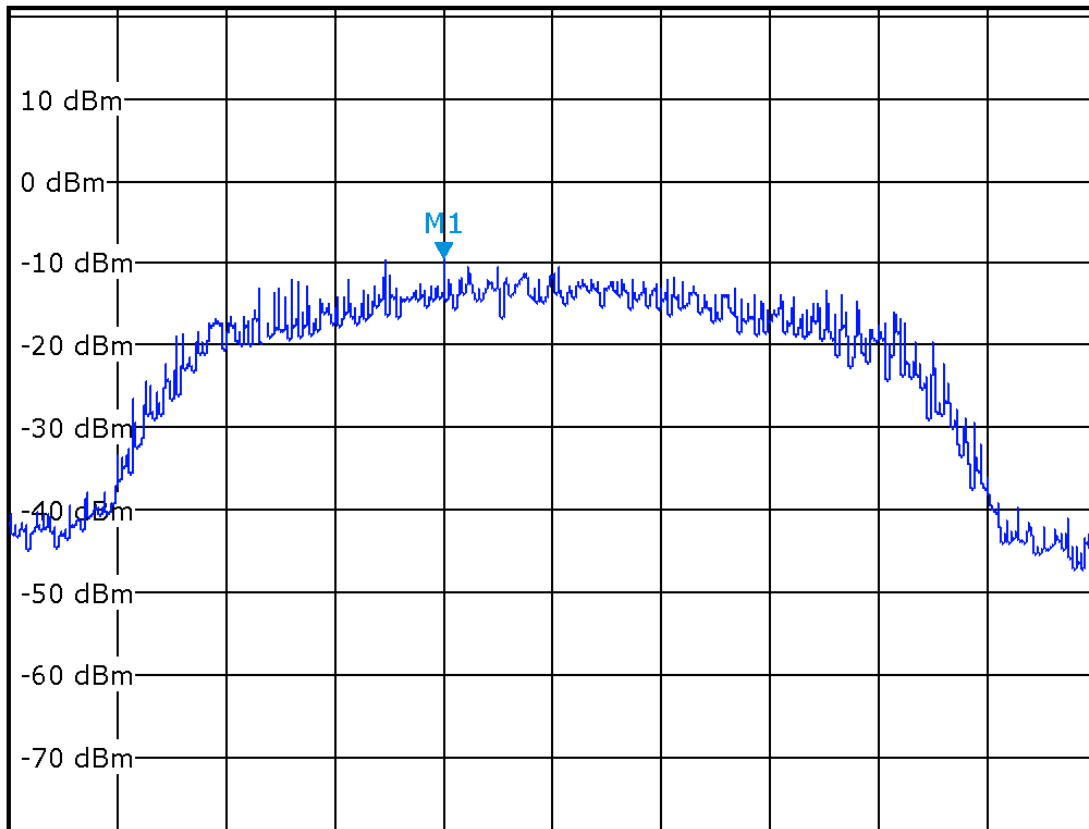
Client	Cognitive Systems Corp.	 TÜV SÜD Canada
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

# PSD - Hi Channel (11)



Offs 1.0 dB      \* RBW 3 kHz  
 Att 40 dB      VBW 10 kHz      **M1[1]**      **-9.42 dBm**  
 Ref 21.0 dBm      SWT 3.3s      **2.459006000 GHz**

1Pk  
Max




CF 2.462 GHz

Span 30.0 MHz


Date: 13.JUL.2016 14:45:15

See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

Client	<b>Cognitive Systems Corp.</b>	 Canada
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Nov. 25, 2015	Nov. 25, 2017	GEMC 160

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## 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 and Method

The limits are as defined in 47 CFR FCC Part 15 Section 15.207


Method is as defined in ANSI C63.4:2014

Average Limits		Quasi-Peak Limits	
150 kHz – 500 kHz	56 to 46* dB $\mu$ V	150 kHz – 500 kHz	66 to 56* dB $\mu$ V
500 kHz – 5 MHz	46 dB $\mu$ V	500 kHz – 5 MHz	56 dB $\mu$ V
5 MHz – 30 MHz	50 dB $\mu$ V	5 MHz – 30 MHz	60 dB $\mu$ V

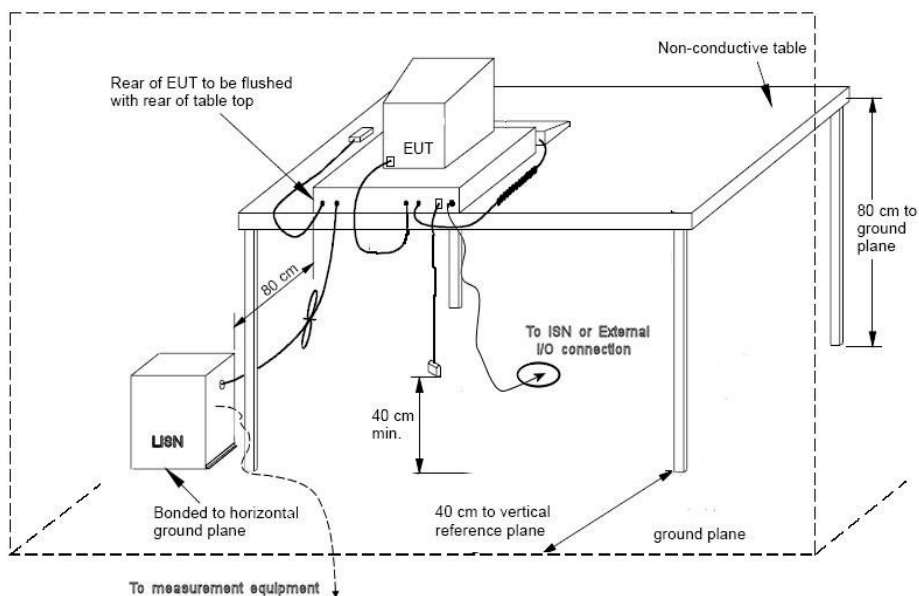
\* Decreases linearly with the logarithm of the frequency

Both Quasi-Peak and Average limits are applicable and each is specified as being measured with a resolution bandwidth of 9 kHz. For Quasi-Peak, a video bandwidth at least three times greater than the resolution bandwidth is used.

Based on ANSI C63.4 Section 4.2, if the Peak or Quasi-Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

### Typical Setup Diagram




### Measurement Uncertainty

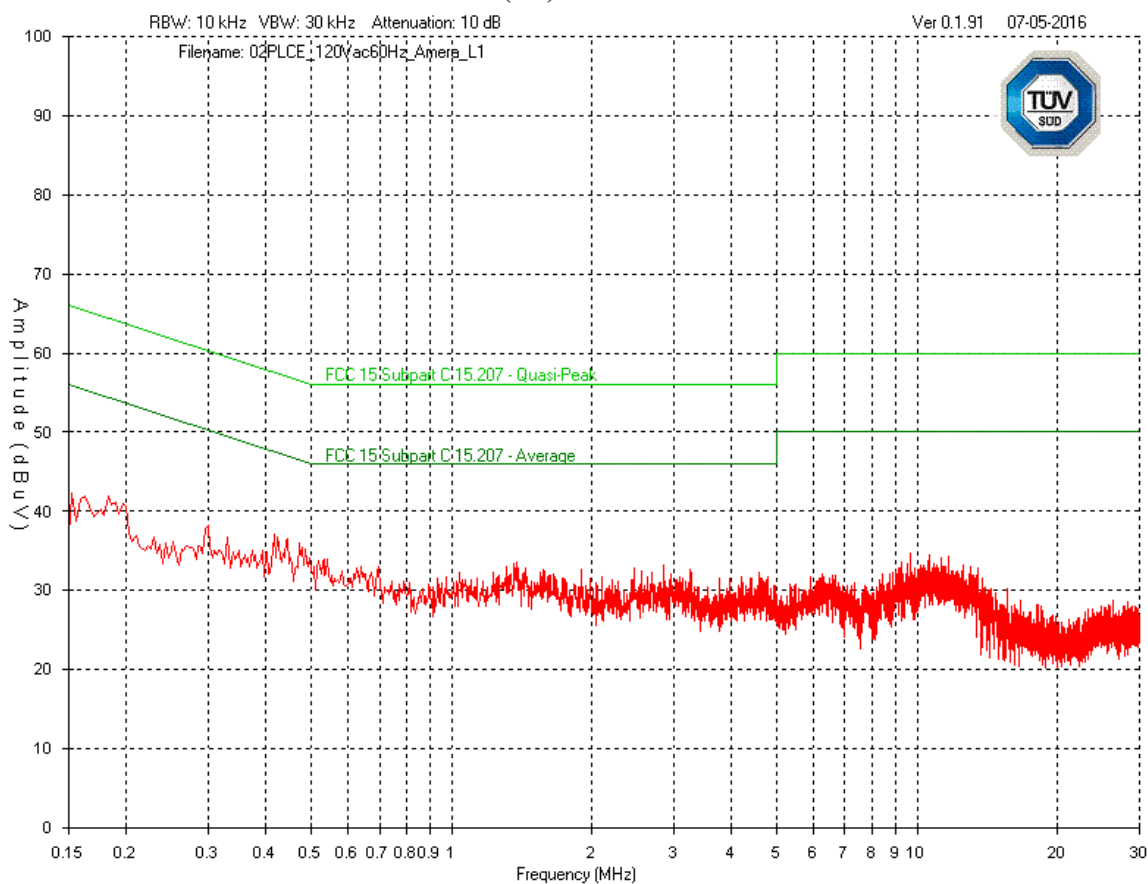
The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 2.91\text{dB}$  with a 'k=2' coverage factor and a 95% confidence level.


### Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

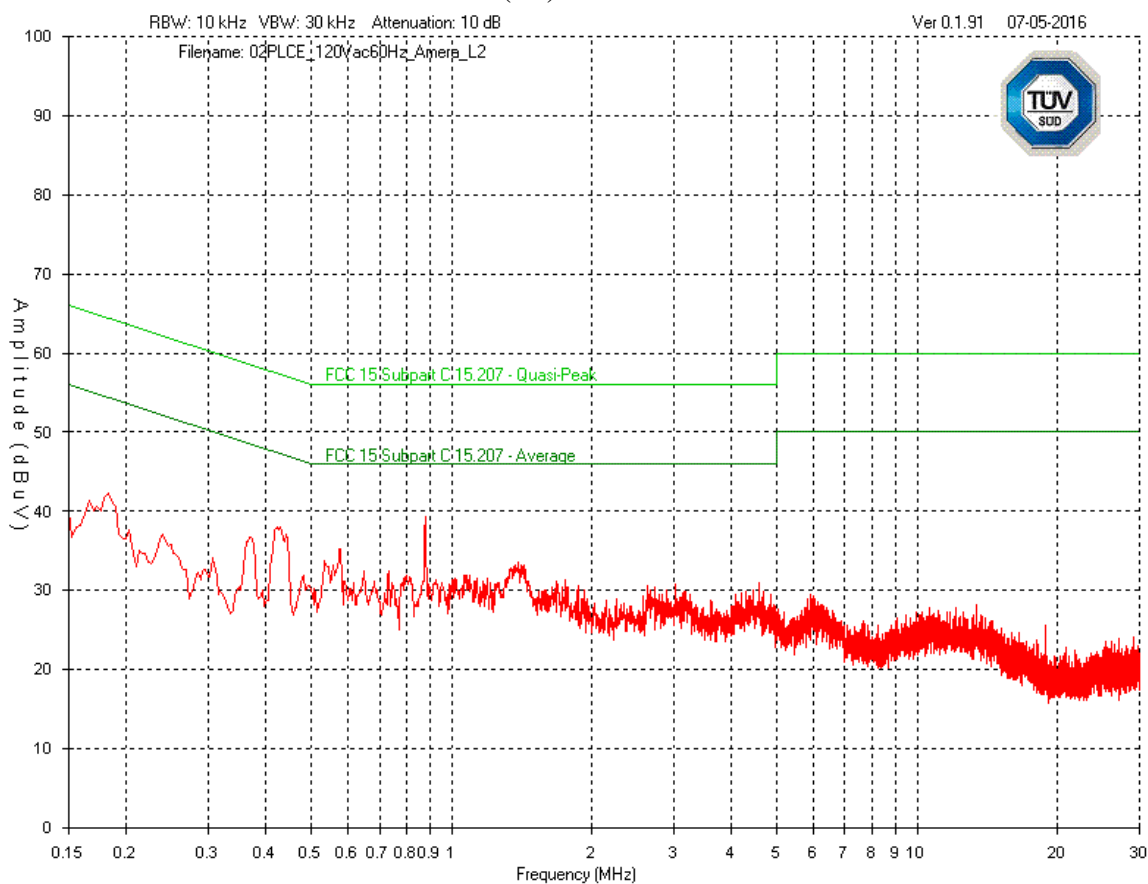
Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	


### Line 1 (L1) – 120Vac 60Hz



Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

### Line 2 (L2) – 120Vac 60Hz



Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Final Measurements

Product Category			Class B								
Supply			120Vac 60Hz								
Frequency (MHz)	Detector Peak/AVG/QP	Received Signal (dBμV)	Atten Factor (dB)	Cable Factor (dB)	LISN Factor (dB)	Level (dBμV)	QP Limit (dBμV)	AVG Limit (dBμV)	QP Margin (dB)	AVG Margin (dB)	Pass/Fail
Line 1											
1.381	PEAK	23.5	10	0.1	0.0	33.6	56	46.0	22.4	12.4	Pass
2.860	PEAK	23.1	10	0.1	0.0	33.2	56	46.0	22.8	12.8	Pass
2.462	PEAK	22.8	10	0.1	0.0	32.9	56	46.0	23.1	13.1	Pass
3.264	PEAK	22.6	10	0.1	0.0	32.7	56	46.0	23.3	13.3	Pass
0.153	PEAK	32.2	10	0.0	0.0	42.2	66	55.8	23.6	13.6	Pass
4.565	PEAK	22.3	10	0.1	0.0	32.4	56	46.0	23.6	13.6	Pass
Line 2											
0.880	PEAK	29.3	10	0.1	0.0	39.4	56	46.0	16.6	6.6	Pass
0.429	PEAK	28.0	10	0.1	0.0	38.1	57	47.3	19.2	9.2	Pass
0.575	PEAK	25.2	10	0.1	0.0	35.3	56	46.0	20.7	10.7	Pass
0.369	PEAK	26.7	10	0.1	0.0	36.8	59	48.5	21.7	11.7	Pass
0.183	PEAK	32.2	10	0.0	0.0	42.2	64	54.3	22.1	12.1	Pass
1.390	PEAK	23.6	10	0.1	0.0	33.7	56	46.0	22.3	12.3	Pass

Average and Quasi-Peak Emissions Table

Note:


Peak = Peak measurement

AVG = Average measurement

QP = Quasi-Peak measurement

See 'Appendix B – EUT, Peripherals and Test Setup Photos' for photos showing the test set-up for the highest line conducted emission




Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration 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-50Ω-MN-MN	LexTec	Feb 1, 2016	Feb 1, 2017	GEMC 28
RF Cable 1m	LMR-400-1M-50Ω-MN-MN	LexTec	Feb 1, 2016	Feb 1, 2017	GEMC 29
Attenuator 10 dB	612-10-1	Meca Electronics, Inc	Feb 11, 2016	Feb 11, 2017	GEMC 223
Emissions Software	0.1.91	Global EMC	NCR	NCR	GEMC 58

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Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## RF Exposure

The device is a mobile device intended to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure and the body of the user or nearby persons.

## FCC General SAR test exclusion guidance:

As per FCC KDB 447498 Section 4.3.1 b), the SAR Test Exclusion Threshold for 100 MHz to 6 GHz at test separation distances > 50 mm is determined by:

- 1) {[Power allowed at *numeric threshold* for 50 mm)] + [(test separation distance – 50 mm) (f<sub>(MHz)</sub>/150)]} mW, for 100 MHz to 1500 MHz
- 2) {[Power allowed at *numeric threshold* for 50 mm)] + [(test separation distance – 50 mm)\*10]} mW, for > 1500 MHz and ≤ 6 GHz


Where:

Power allowed at *numeric threshold* for 50 mm (for 1-g SAR) is given by:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] [\sqrt{f_{(\text{GHz})}}] \leq 3.0$$

$$(\text{max power of channel, including tune-up tolerance, mW}) \leq [3.0 / \sqrt{f_{(\text{GHz})}}] * [\text{min. test separation distance, mm}]$$

f<sub>(GHz)</sub> is the RF channel transmit frequency in GHz

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## SAR Calculations: 2412 – 2462 MHz DTS transmitter

Power allowed at *numeric threshold* for 50 mm:

(max power of channel, including tune-up tolerance, mW)  $\leq [3.0 / \sqrt{(2.462 \text{ GHz})}] * [50 \text{ mm}]$

(max power of channel, including tune-up tolerance, mW)  $\leq 95.6 \text{ mW}$

Therefore, SAR Exclusion for 200 mm test distance is:

{[Power allowed at *numeric threshold* for 50 mm)] + [(test separation distance – 50 mm)\*10]}  
mW, for > 1500 MHz and  $\leq 6 \text{ GHz}$

= [95.6 mW] + [(200 mm – 50 mm) \* 10]  
= 1596 mW

The EUT meets the SAR Exclusion Threshold. Peak conducted power of DTS transmitter was measured to be 221.31 mW which is below the 1596mW threshold.

## Radiofrequency Radiation Exposure Evaluation: Mobile Devices

Mobile devices shall be evaluated for RF radiation exposure according to the provisions of FCC §2.1091 and the MPE guidelines identified in FCC §1.1310.

As per FCC §1.1310 Table 1(B), the limit for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields for General Population/Uncontrolled Exposure in the frequency range of 300 MHz to 1.5 GHz is  $f/1500 \text{ mW/cm}^2$  and in the frequency range of 1.5GHz to 100GHz is  $1.0 \text{ mW/cm}^2$ . Where f = frequency in MHz.

The power density formula is given by:

$$P_d = (P_{out} * G) / (4 * \pi * R^2)$$

Where,


$P_d$  = Power density in  $\text{mW/cm}^2$

$P_{out}$  = Conducted output power to antenna in mW

G = Numeric Antenna Gain

$\pi$  = 3.1416

R = Separation distance in cm

Client	Cognitive Systems Corp.	
Product	amera	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

### MPE Calculation: 2412 – 2462 MHz DTS transmitter

The DTS transmitter has a maximum conducted output power of 23.45dBm or 221.31mW and an antenna gain of 5.1dBi or 3.2 numerically.

For a distance of 20cm, the power density is:

$$P_d = (221.31\text{mW} * 3.2) / (4 * 3.1416 * (20\text{cm})^2)$$

$$P_d = 0.142 \text{ mW/cm}^2$$

The device passes the requirement. The calculated power density of 0.142 mW/cm<sup>2</sup> is below the 1.0 mW/cm<sup>2</sup> limit.

### Industry Canada (IC) RF Exposure Exemption Limits for Routine Evaluation

As per RSS 102 Section 2.5.2, RF exposure evaluation is not required if the device operating at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than:


$$1.31 \times 10^{-2} f^{0.6834} \text{ W (adjusted for tune-up tolerance), where } f \text{ is in MHz}$$

For a 2412 MHz transmitter, this e.i.r.p limit is 2.68 W.


### MPE Calculation: 2412 – 2462 MHz DTS transmitter

The DTS transmitter has a maximum conducted output power of 23.45dBm and an antenna gain of 5.1dBi.

The e.i.r.p of the EUT is 23.45 dBm + 5.1 dBi = 28.45 dBm (0.70 W) which is significantly less than the 2.68 W exemption limit.

Client	<b>Cognitive Systems Corp.</b>	 Canada
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Appendix A – EUT Summary


Client	<b>Cognitive Systems Corp.</b>	
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

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

## General EUT Description

Client	
Organization / Address	Cognitive Systems Corp. 560 Westmount Road North Waterloo, ON N2L 0A9
Phone	+ 1-519-514-0347
EUT Details	
EUT Name	amera
EUT Model	66260000
Equipment Category	ITE
Basic EUT Functionality	The amera is a cognitive radio sensor product that can receive and analyze radio signals between 690MHz and 4GH
Input Voltage and Frequency	AC/DC adaptor: - 120V / 60Hz (Cincon TRG1505-A-11E13 VI)
Rated Input Current	2A max
Connectors available on EUT	RJ45, USB-A, USB microB, Barrel Jack
Peripherals Required for Test	Laptop with test software
Release type	Final
Intentional Radiator Frequency	2400 – 2483.5 MHz
EUT Configuration	Wireless configured to transmit at maximum possible duty cycle.

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated.

Client	<b>Cognitive Systems Corp.</b>	 Canada
Product	<b>amera</b>	
Standard(s)	RSS 247 Issue 1:2015 FCC Part 15 Subpart 15.247:2016	

## Appendix B – EUT and Test Setup Photos

See the PDF files which are separate from this test report.