
Project 17647-15

Trident Research LLC
Quantum Q6 Edge Head Array with Bluetooth Low Energy

IDHBT500

Wireless Certification Report

Prepared for:

Stealth Products LLC
104 John Kelly Dr
Burnet, Texas 78611

By

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7 April 2017

Reviewed by

A handwritten signature in black ink, appearing to read 'Larry Finn'.

Larry Finn
Chief Technical Officer

Written by

A handwritten signature in black ink, appearing to read 'Eric Lifsey'.

Eric Lifsey
EMC Engineer

Revision History

Revision Number	Description	Date
DRAFT	Draft for review.	7 Apr 2017
01	Finalized.	18 Apr 2017

Corrections:

All citations in this report of iDrive, Quantum 6, refer to the IDHBT500.

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Compliance Certificate

Applicant	Device & Test Identification
Stealth Products LLC 104 John Kelly Dr Burnet, Texas 78611 Certificate Date: 7 April 2017	FCC ID: 2AJXVIDHBT500 Industry Canada ID: Not applicable. Model(s): IDHBT500 Laboratory Project ID: 17647-15

The device named above was tested utilizing the following documents and found to be in compliance with the required criteria:

Requirement	Reference	Detail
FCC 47 CFR Part 15 C	15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
FCC 47 CFR Part 15 C	15.209	Radiated emission limits; general requirements.
FCC 47 CFR Part 15 C	15.107, 15.207	Conducted emission limits.
FCC 47 CFR Part 15 C	15.205	Restricted Bands of Operation
KDB 558074 D01	DR01	DTS Measurement Guidance v03r02
KDB 412172	D01	Guidelines for Determining the ERP and EIRP of an RF Transmitting System
OET Bulletin 65*	Edition 97-01, and Supplement C, Ed. 01-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
RSS-247	Issue 1	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen	Issue 4	General Requirements and Information for the Certification of Radio Apparatus
RSS-102	Issue 4	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

*MPE is reported separately from this document. **Corresponding RSS references are listed in the body of the report.

I, Eric Lifsey, for Professional Testing (EMI), Inc., being familiar with the above requirements and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Eric Lifsey
EMC Engineer

This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

Representative of Applicant

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States and Canada.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

1.2 EUT Description

Table 1.2.1: Equipment Under Test		
Manufacturer / Model	Serial #	Description
Stealth Products LLC iDrive 4.0	none	2400-2483.5 MHz FHSS transceiver; using Bluetooth Low Energy radio protocols.

*This was the normal firmware sample. Additional non-serial numbered samples were programmed to operate on fixed frequencies as needed for various tests.

Table 1.2.2: Support Equipment		
Manufacturer / Model	Serial #	Description
none		none

The EUT is a HMI controlled by sensors that respond to intentional head movement by the wheelchair occupant. It includes a Bluetooth Low Energy radio designed as a wireless link to wheelchair electronic controls by smart phones.

The EUT measures approximately 12.5 cm x 4.5 cm x 3.5 cm. It is powered by the 12 V power system of the host wheelchair.

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

The EUT was tested as a DTS device as its bandwidth satisfies the DTS minimum bandwidth requirements. In the final application it will be also hopping per the Bluetooth protocol.

1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

1.6 Radiated Measurements

Radiated levels are determined as follows:

$$\text{Raw Measured Level} + \text{Antenna Factor} + \text{Cable Losses} - \text{Amplifier Gain} = \text{Corrected Level}$$

Conducted RF levels, if applicable, are determined as follows:

$$\text{Raw Measured Level} + \text{Attenuator Factor} + \text{Cable Losses} = \text{Corrected Level}$$

Conducted mains levels are determined as follows:

$$\text{Raw Measured Level} + \text{LISN Factor} + \text{Cable/Filter/Limiter Losses} = \text{Corrected Level}$$

Additionally, measurement distance extrapolation factors are applied and documented where used.

1.7 Applicable Documents and Clauses

Table 1.7.1: Applicable Documents

Document	Title
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators
RSS-247 Issue 1	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Table 1.7.2: Applicable Clauses

Parameter	FCC Part 15 Rule Paragraphs	IC RSS References
Transmitter Characteristics	15.247	RSS-247 5.2 (DTS) & 5.4, RSS-Gen
Bandwidth	15.247(a)(1), 2.1049, KDB 558074 D01	RSS-Gen 4.6
Spurious Emission	15.247, 15.209, 15.205	RSS-247 5.5, RSS-GEN 4.9, 4.10
Band Edge	15.247, 15.205	RSS-247 5.5, RSS-Gen 4.9
Antenna Requirement	15.203	RSS-Gen 8.3
Conducted Emissions, Mains	15.207	RSS-Gen 8.8

2.0 Fundamental Power

2.1 Test Procedure

Peak power is measured using radiated means with modulation. The transmitter hopping sequence is disabled to operate on a single channel for the measurement.

2.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(a)(3) // RSS-247 5.2	Fundamental Power Conducted Limits 1 W Limit Restated as Field: 125.23 dB μ V/m @ 3 m	12 Sep 2016

2.3 Test Results, Peak Power

The EUT was measured for radiated power in three orthogonal orientations and two polarities each; the maximum orientation/polarity is reported below.

Table 2.3.1 Power, Peak, Radiated; Orientation: Upright; Polarity Horizontal			
Frequency MHz	Measured Peak Power dB μ V/m @ 3 m	Maximum Measured Peak Power Restated as EIRP in dBm	Maximum Measured Peak Power Restated as EIRP in mW
2402	94.0	-1.2	0.75
2440	84.1	-11.1	0.08
2480	80.2	-15.0	0.03

Measured in 3 MHz RBW, 3 MHz VBW.

The EUT was satisfied the requirements.

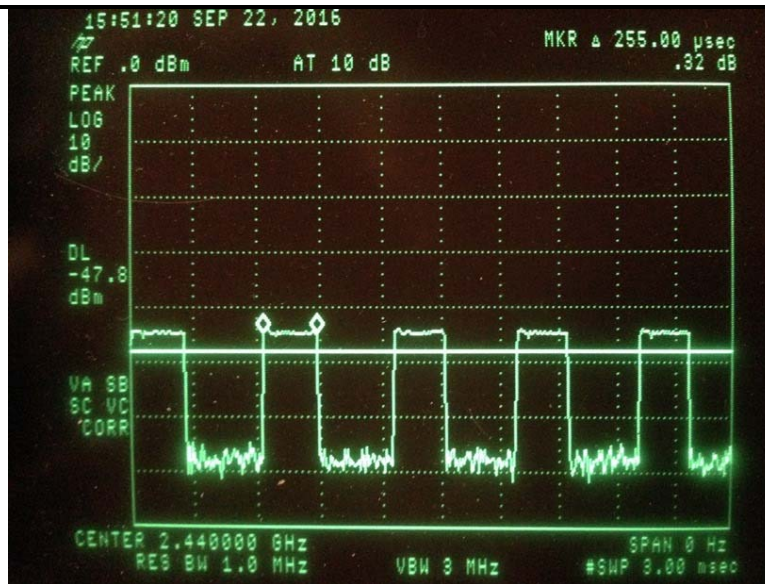
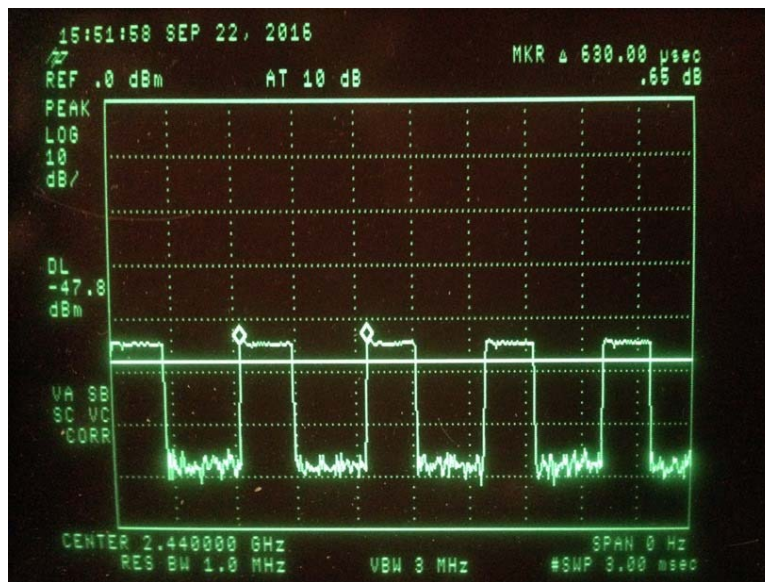
2.4 Test Results, Duty Cycle

Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

Table 2.5.1 Duty Cycle Results and Average Duty Cycle Factor Result				
Measured On Time (msec)	Measured Time Interval (msec)	Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)
0.255	0.630	$= 20 * \log_{10} (0.255 \text{ msec} / 0.630 \text{ msec})$	-7.85	-7.85

The allowed duty cycle factor is applied to peak measured harmonic signals to find average levels.

Plotted results appear below.

**Transmit On Time****Transmit Period**

3.0 Power Spectral Density

3.1 Test Procedure

A spectrum analyzer is either connected directly to the EUT or used by radiated means to measure the fundamental emission. It is adjusted to measure the power spectral density in the specified resolution bandwidth.

3.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(e) // RSS-247, 5.2	Power Spectral Density, Conducted Limit: 8 dBm / 3 kHz Restated as field strength limit: 103.23 dB μ V/m at 3 m	NA

3.3 Test Results

The fundamental peak power measured below the limit for this test and at a greater resolution bandwidth; the EUT satisfies the criteria without additional measurement.

4.0 Occupied Bandwidth

4.1 Test Procedure

Bandwidth is measured by radiated means. A recording of the results is included.

4.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
14.247(a)(2), 2.1049, KDB 558074 D01 // RSS-Gen 4.6	Bandwidth, 6 dB, 20 dB	8 Aug 2016

4.3 Test Results

The bandwidth measurement is used to verify DTS characteristics and/or for general reporting for agency application.

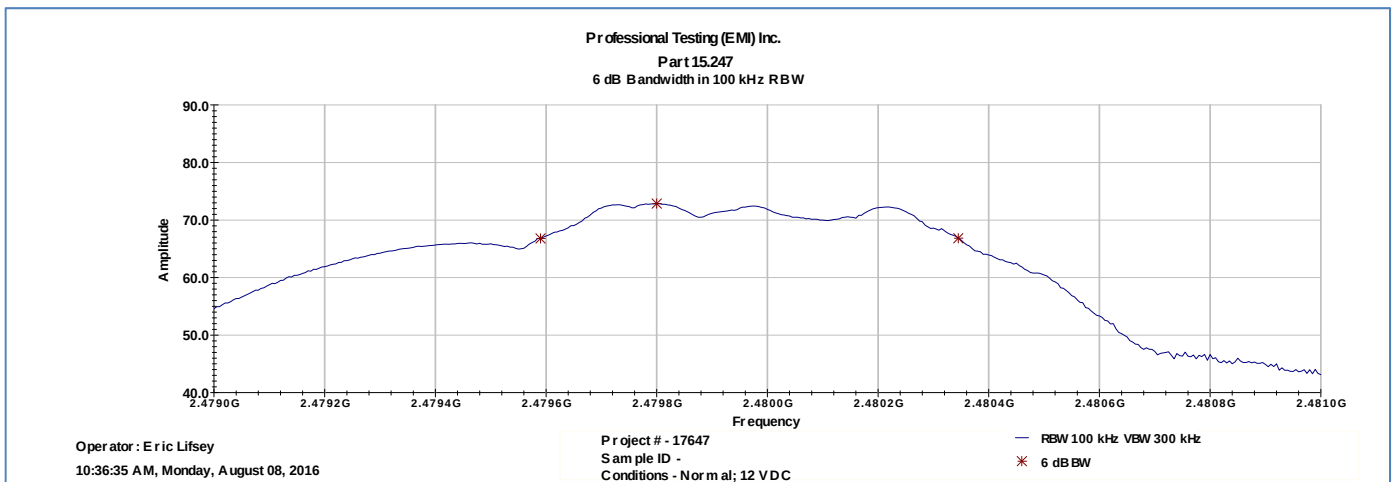
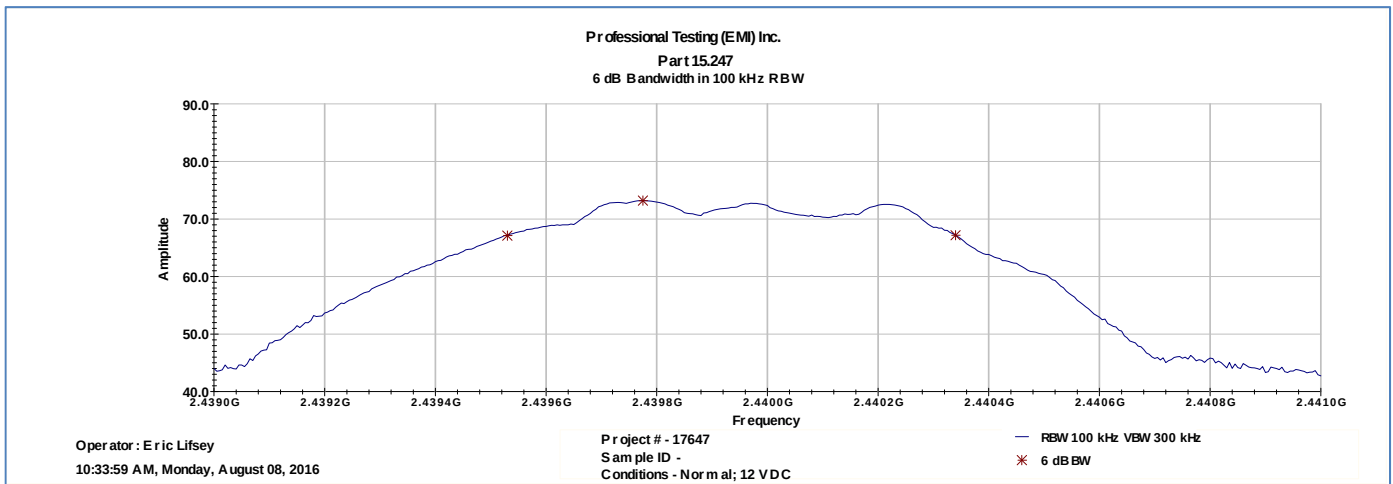
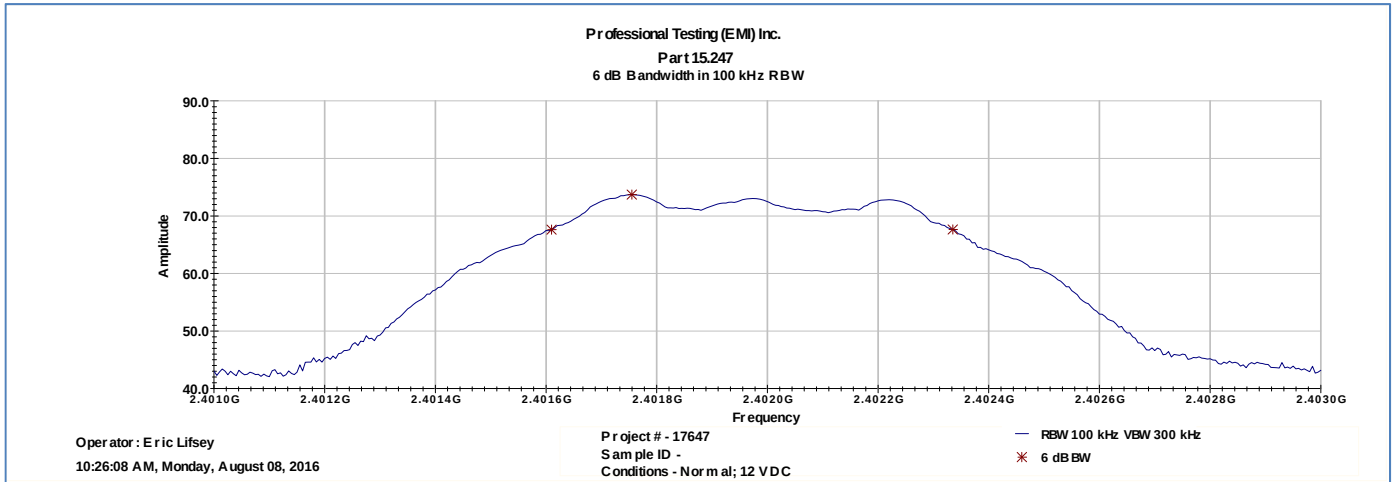
The EUT was found to be in compliance with applicable requirements.

Table 5.3.1 Bandwidth 6 dB, Minimum 500 kHz in 100 kHz RBW			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Minimum BW (kHz)
725	810	755	725

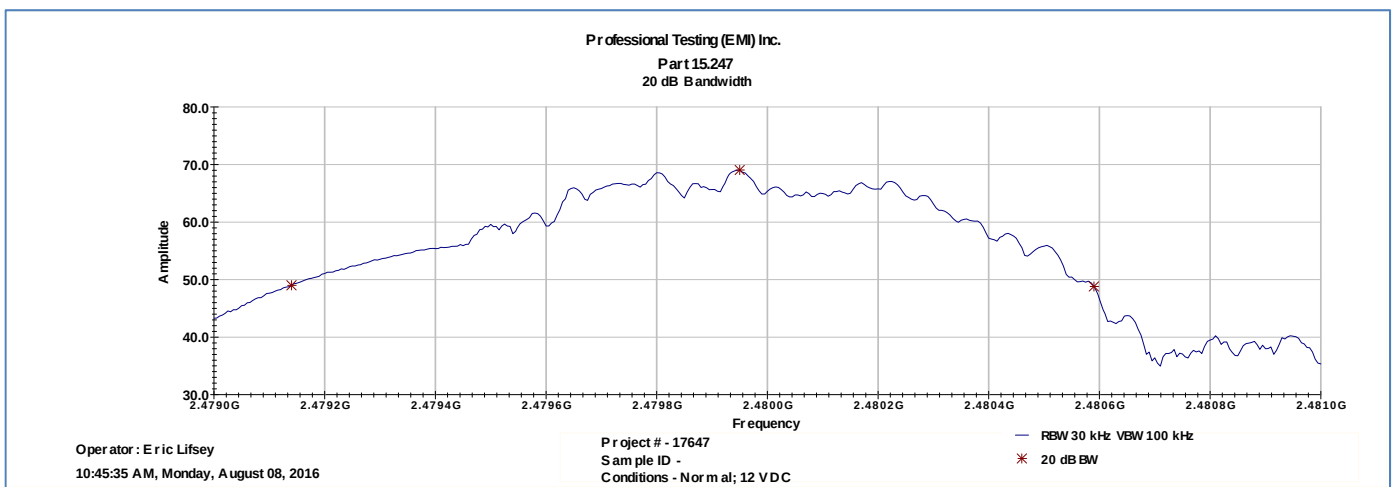
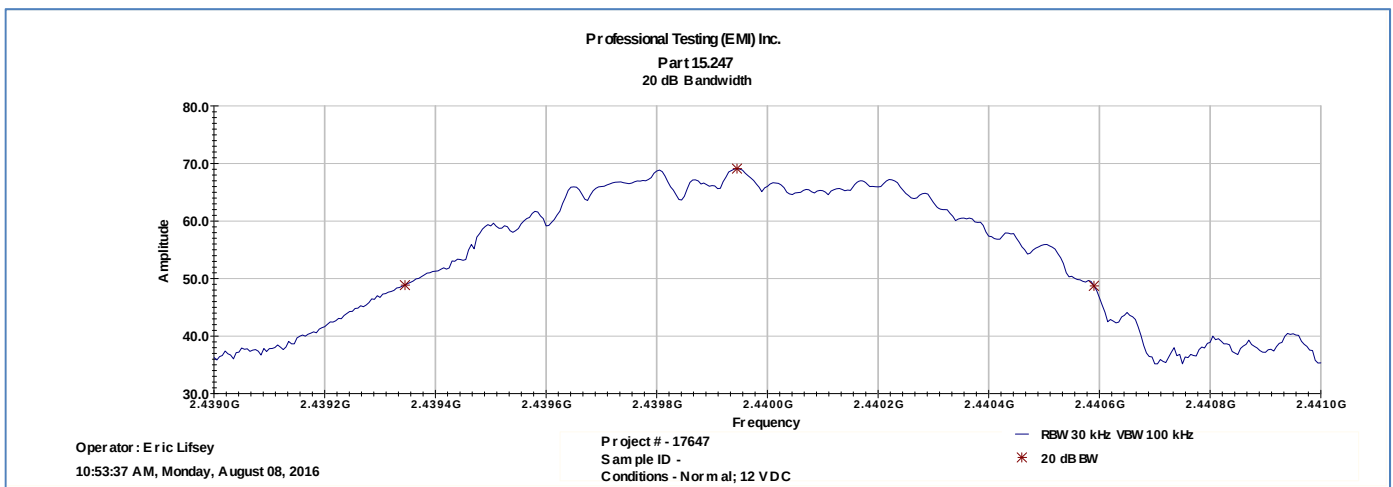
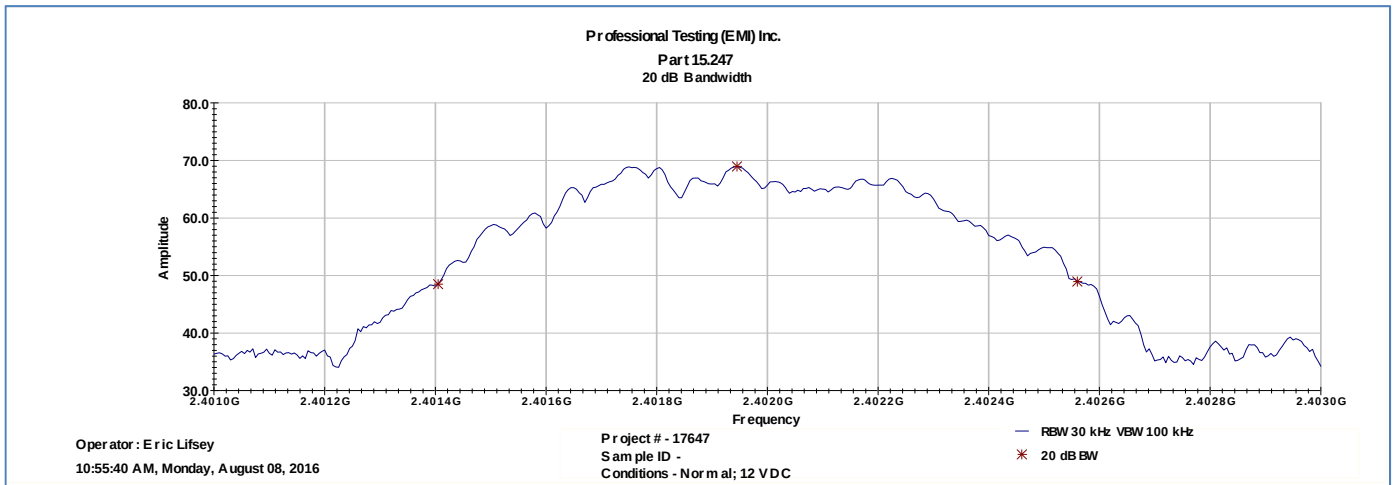
Table 5.3.2 Bandwidth 20 dB, Measure and Report			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
1155	1245	1450	1450

Plotted measurements appear on the following pages.

4.3.1 Bandwidth Plots, 6 dB



4.3.2 Bandwidth Plots, 20 dB



5.0 Band Edge

5.1 Test Procedure

EUT is placed into normal transmit operation on the nearest band edge channel. The spectrum analyzer is approximately centered on the band edge frequency with span sufficient to include the peak of the adjacent fundamental signal. Measurement includes at least two standard bandwidths from the respective band edge. If required, the band-edge marker-delta method of C63.4 is utilized.

5.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.205 // RSS-247 5.5, RSS-Gen 4.9	Unwanted Emissions Adjacent to Authorized Band, Radiated	22 Sep 2016

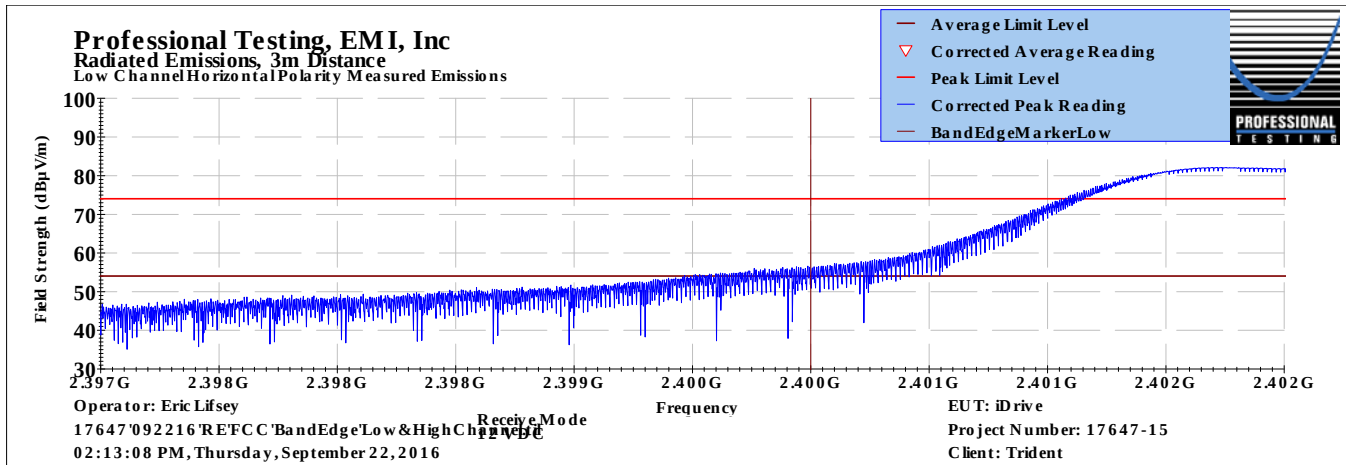
5.3 Test Results

Measurements included more than 2 standard bandwidths (standard bandwidth 1 MHz) from the band edges to provide a clear view of the fundamental and the declining emission levels. Peak detection with max-hold was employed.

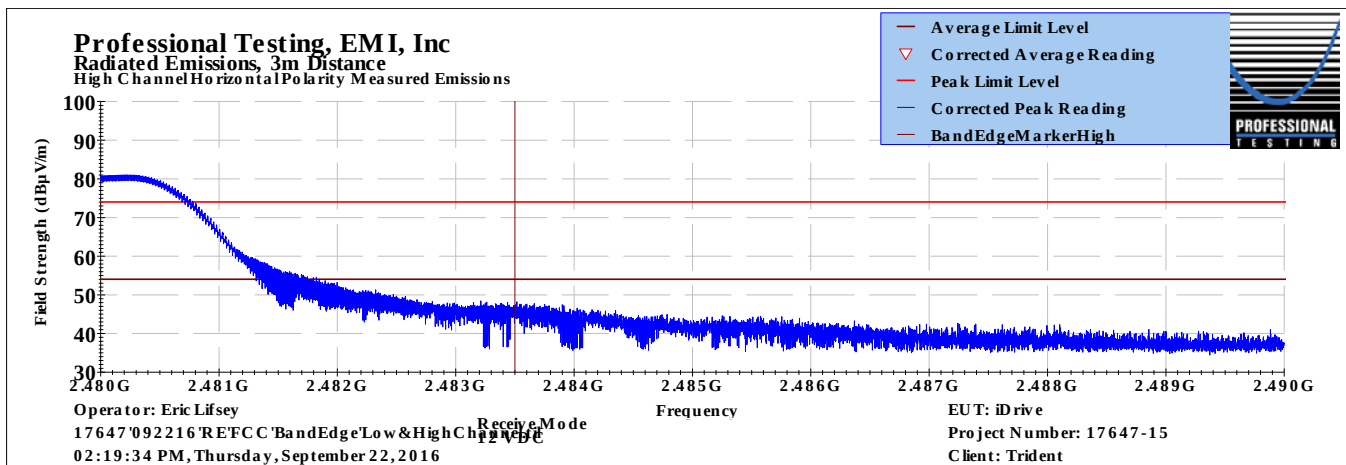
Applicable Duty Cycle Factor for Averaging Peak Emissions: -7.85 dB

The EUT satisfied the criteria. Plotted results of peak detection appear on the following pages.

5.3.1 Low Channel Band Edge



5.3.2 High Channel Band Edge

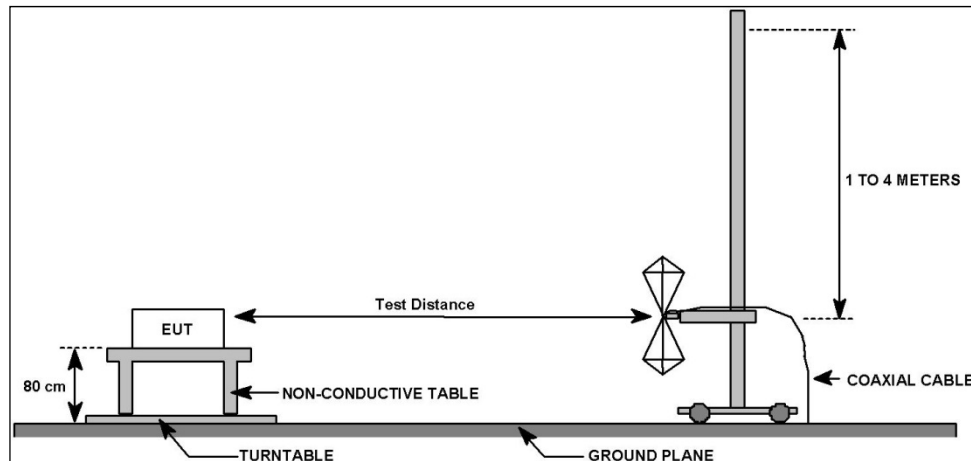


6.0 Radiated Spurious Emissions, Receive Mode

6.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate and 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



6.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Receive Mode	22 Sep 2016

6.3 Test Results

The EUT was tuned to the middle channel and placed in receive mode.

The EUT satisfied the criteria. Recorded data is presented below.

Table 6.3.1: Radiated Spurious Emissions, Receive Mode, Below 1 GHz, Vertical Polarity

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.10–2013		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	9/22/2016	EUT Serial #:	none
Customer:	Trident	EUT Part #:	none
Project Number:	17647-15	Test Technician:	Eric Lifsey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	iDrive Head Array	Witness' Name:	none
Radiated Emissions Test Results Data Sheet		Page:	1 of 1
EUT Line Voltage:	12 VDC	EUT Power Frequency:	0 N/A
Antenna Orientation:	Vertical	Frequency Range:	30MHz to 1GHz
EUT Mode of Operation:		Receive (BT advertising)	
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30 MHz - 1 GHz Vertical Polarity Measured Emissions The graph shows Field Strength (dBµV/m) on the y-axis (0 to 60) versus Frequency (MHz) on the x-axis (30M to 1G). A red line represents the Quasi-peak Limit Level, which is 30 dBµV/m from 30 MHz to 100 MHz, then steps up to 35 dBµV/m from 100 MHz to 1 GHz. A blue line represents the measured emissions, which fluctuates between approximately 5 and 30 dBµV/m. A legend in the top right corner identifies the red line as the Quasi-peak Limit Level, the blue line as the Corrected Quasi-peak Reading, the green line as the Corrected Peak Value, the yellow line as the Verified Low-PRF QP Reading, and the purple line as the LPRF Verification Limit. The Professional Testing logo is also present. Operator: Eric Lifsey 17647'092216'REFCC'Spurious'RXmode'.til 11:26:34 AM, Thursday, September 22, 2016 Receive Mode 12 VDC EUT: iDrive Project Number: 17647-15 Client: Trident			
≤ 1GHz Vertical Antenna Polarity Measured Emissions			

Table 6.3.2: Radiated Spurious Emissions, Receive Mode, Below 1 GHz, Horizontal Polarity

Professional Testing, EMI, Inc.			
Test Method:		ANSI C63.10–2013	
In accordance with:		FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits	
Section:		15.109	
Test Date(s):	9/22/2016	EUT Serial #:	none
Customer:	Trident	EUT Part #:	none
Project Number:	17647-15	Test Technician:	Eric Lifsey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	iDrive Head Array	Witness' Name:	none
Radiated Emissions Test Results Data Sheet		Page: 1 of 1	
EUT Line Voltage:	12 VDC	EUT Power Frequency:	0 N/A
Antenna Orientation:	Horizontal	Frequency Range:	30MHz to 1GHz
EUT Mode of Operation:		Receive (BT advertising)	
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30 MHz - 1 GHz Horizontal Polarity Measured Emissions The graph shows Field Strength (dBµV/m) on the y-axis (0 to 60) versus Frequency (MHz) on the x-axis (30M to 1G). A red line represents the Quasi-peak Limit Level, which is a step function: 30 dBµV/m from 30M to 100M, 35 dBµV/m from 100M to 300M, and 40 dBµV/m from 300M to 1G. A blue line represents the measured emissions, which fluctuates between approximately 5 and 30 dBµV/m. A legend in the top right corner identifies the red line as 'Quasi-peak Limit Level', the blue line as 'Corrected Quasi-peak Reading', a green line as 'Corrected Peak Value', a green triangle as 'Verified Low-PRF QP Reading', and a blue 'x' as 'LPRF Verification Limit'. The Professional Testing, EMI, Inc. logo is also present. Operator: Eric Lifsey 17647'092216'REFCC'Spurious'RXmode'.til 11:26:33 AM, Thursday, September 22, 2016 Receive Mode 12 VDC EUT: iDrive Project Number: 17647-15 Client: Trident			
≤ 1GHz Horizontal Antenna Polarity Measured Emissions			

Table 6.3.3: Radiated Spurious Emissions, Receive Mode, Above 1 GHz, Vertical Polarity

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.10–2013		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	9/22/2016	EUT Serial #:	none
Customer:	Trident	EUT Part #:	none
Project Number:	17647-15	Test Technician:	Eric Lifsey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	iDrive Head Array	Witness' Name:	none
Radiated Emissions Test Results Data Sheet		Page:	1 of 1
EUT Line Voltage:	12 VDC	EUT Power Frequency:	0 N/A
Antenna Orientation:	Vertical	Frequency Range:	Above 1GHz
EUT Mode of Operation:	Receive (BT advertising)		
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Vertical Polarity Measured Emissions The graph displays field strength measurements from 1 GHz to 13 GHz. The y-axis ranges from 20 to 90 dBµV/m. Two red horizontal lines represent the Average Limit Level at approximately 75 dBµV/m and the Peak Limit Level at approximately 55 dBµV/m. A blue line shows the corrected average reading, which remains below the average limit. A blue line with markers shows the corrected peak reading, which remains below the peak limit. The Professional Testing logo is in the top right corner of the graph area. Operator: Eric Lifsey 17647'092216'REFCC'Spurious'RXmode'.til 12:11:06 PM, Thursday, September 22, 2016 Receive Mode 12 VDC EUT: iDrive Project Number: 17647-15 Client: Trident			
> 1GHz Vertical Antenna Polarity Measured Emissions			

Table 6.3.4: Radiated Spurious Emissions, Receive Mode, Above 1 GHz, Horizontal Polarity

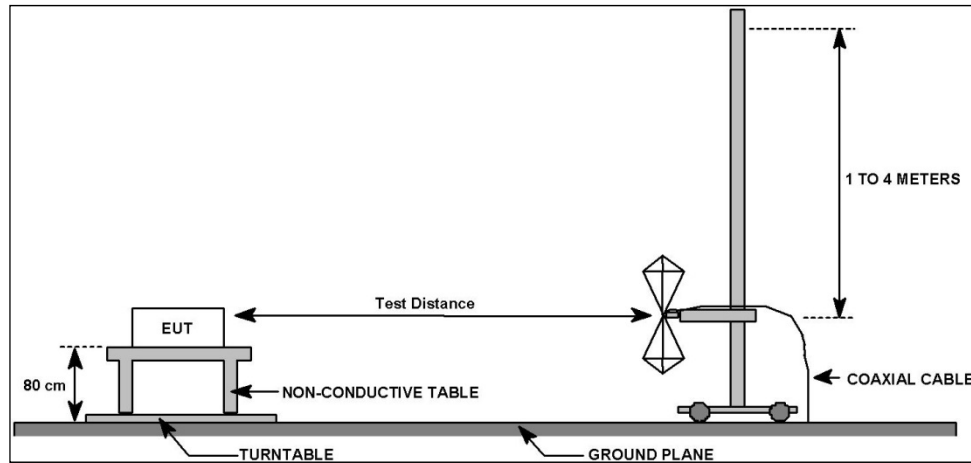
Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.10-2013		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	9/22/2016	EUT Serial #:	none
Customer:	Trident	EUT Part #:	none
Project Number:	17647-15	Test Technician:	Eric Lifsey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	iDrive Head Array	Witness' Name:	none
Radiated Emissions Test Results Data Sheet		Page:	1 of 1
EUT Line Voltage:	12 VDC	EUT Power Frequency:	0 N/A
Antenna Orientation:	Horizontal	Frequency Range:	Above 1GHz
EUT Mode of Operation:	Receive (BT advertising)		
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions The graph displays field strength measurements from 1 GHz to 13 GHz. The y-axis ranges from 20 to 90 dBµV/m. Two red horizontal lines represent the Average Limit Level at approximately 75 dBµV/m and the Peak Limit Level at approximately 55 dBµV/m. A blue line with markers shows the corrected average reading, which remains consistently below the average limit level. A blue line with markers shows the corrected peak reading, which remains consistently below the peak limit level. The background of the graph area is light blue. — Average Limit Level ▽ Corrected Average Reading — Peak Limit Level — Corrected Peak Reading PROFESSIONAL TESTING Operator: Eric Lifsey 17647092216'REFCC'SpuriousRXmode.tif 12:16:09 PM, Thursday, September 22, 2016 Frequency Receive Mode 12 VDC EUT: iDrive Project Number: 17647-15 Client: Trident			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

7.0 Radiated Spurious Emissions, Transmit Mode

7.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate using 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



7.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Transmit Mode	3 Aug 2016 – 22 Aug 2016

7.3 Test Results

Three EUTs were employed to cover the three test channels of bottom, middle, and top channel.

Modulation was enabled for this test and the transmitter was placed into continuous transmit mode.

The duty cycle averaging factor applies -7.85 dB to the peaks recorded for the harmonics.

All measurements used peak detection.

Table 7.3.1: TX Mode, Below 1 GHz, Vertical Polarity

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits							
Section:		15.109							
Test Date(s):		8/3/2016, 8/19/16, 8/22/16			EUT Serial #:		None		
Customer:		Trident Research LLC			EUT Part #:		None		
Project Number:		17647-10			Test Technician:		E Lifsey, D Kohutek, and S Flint		
Purchase Order #:		P010882			Supervisor:		Lisa Arndt		
Equip. Under Test:		iDrive Head Array			Witness' Name:		Sean Brickley		
Radiated Emissions Test Results Data Sheet							Page: 1 of 1		
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A N/A			
Antenna Orientation:		Vertical			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmit Hopping, Right Pod Activated				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
31.7921	10	191	1.59	Quasi-peak	24.1	12.625	29.5	-16.9	Pass
33.1104	10	44	1.92	Quasi-peak	23.6	12.127	29.5	-17.4	Pass
34.8589	10	42	1.24	Quasi-peak	23	11.479	29.5	-18.0	Pass
45.5663	10	64	4.11	Quasi-peak	23.5	6.334	29.5	-23.2	Pass
396.746	10	217	3.11	Quasi-peak	22.2	15.108	35.6	-20.5	Pass
754.816	10	148	3.01	Quasi-peak	21.7	22.604	35.6	-13.0	Pass
916.027	10	117	1.29	Quasi-peak	21.3	26.291	35.6	-9.3	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 10m Distance
30MHz - 1GHz Vertical Polarity Measured Emissions

Operator: Dave Kohutek
17647_REB_FCC_01.tif
10:25:50 AM, Wednesday, August 03, 2016

EUT Mode: Transmit Hopping
EUT Power: 12VDC

EUT: iDrive Head Array
Project Number: 17647-10
Client: Trident Research LLC

≤ 1GHz Vertical Antenna Polarity Measured Emissions

≤ 1GHz Vertical Antenna Polarity Measured Emissions

Table 7.3.2: TX Mode, Below 1 GHz, Horizontal Polarity

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits							
Section:		15.109							
Test Date(s):		8/3/2016, 8/19/16, 8/22/16		EUT Serial #:		None			
Customer:		Trident Research LLC		EUT Part #:		None			
Project Number:		17647-10		Test Technician:		E Lifsey, D Kohutek, and S Flint			
Purchase Order #:		P010882		Supervisor:		Lisa Arndt			
Equip. Under Test:		iDrive Head Array		Witness' Name:		Sean Brickley			
Radiated Emissions Test Results Data Sheet								Page: 1 of 1	
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A		N/A	
Antenna Orientation:		Horizontal		Frequency Range:		30MHz to 1GHz			
EUT Mode of Operation:				Transmit Hopping, Right Pod Activated					
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
32.5663	10	50	2.51	Quasi-peak	23.8	12.356	29.5	-17.1	Pass
33.9953	10	106	2.97	Quasi-peak	23.3	11.741	29.5	-17.8	Pass
36.3451	10	70	3.58	Quasi-peak	23	9.692	29.5	-19.8	Pass
293.714	10	158	2.34	Quasi-peak	22.1	11.741	35.6	-23.9	Pass
571.37	10	187	1.29	Quasi-peak	22.1	18.419	35.6	-17.2	Pass
891.703	10	126	3.72	Quasi-peak	21.3	26.226	35.6	-9.4	Pass

Professional Testing, EMI, Inc

Radiated Emissions, 10m Distance

30MHz - 1GHz Horizontal Polarity Measured Emissions

Operator: Dave Kohutek

17647_REB_FCC_01.tif

10:25:50 AM, Wednesday, August 03, 2016

EUT Mode: Transmit Hopping

EUT Power: 12VDC

EUT: iDrive Head Array

Project Number: 17647-10

Client: Trident Research LLC

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

Table 7.3.3: TX Mode, Above 1 GHz, Vertical Polarity, Bottom Channel

Professional Testing, EMI, Inc.									
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices								
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits								
Section:	15.209								
Test Date(s):	8/3/2016, 8/19/16, 8/22/16				EUT Serial #:	None			
Customer:	Trident Research LLC				EUT Part #:	None			
Project Number:	17647-10				Test Technician:	E Lifsey, D Kohutak, and S Flint			
Purchase Order #:	P010882				Supervisor:	Lisa Arndt			
Equip. Under Test:	iDrive Head Array				Witness' Name:	Sean Brickley			
Radiated Emissions Test Results Data Sheet								Page: 1 of 1	
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A		N/A	
Antenna Orientation:		Vertical		Frequency Range:		Above 1GHz			
EUT Mode of Operation:					Transmit CH0				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
11530.6	3	234	2.11	Average	27.3	38.708	54.0	-15.2	Pass
12522.6	3	32	2	Average	27.8	38.689	54.0	-15.3	Pass
12640.3	3	333	2.66	Average	27.8	38.633	54.0	-15.3	Pass
14828.2	3	138	1.95	Average	28.5	40.137	54.0	-13.8	Pass
16668.2	3	40	1.23	Average	27.3	42.764	54.0	-11.2	Pass
16902.5	3	352	1.9	Average	27.3	42.798	54.0	-11.2	Pass
17823.9	3	11	3.3	Average	27.1	43.026	54.0	-10.9	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz Vertical Polarity Measured Emissions

Operator: Spencer Flint
17647_REB_Run02_GHz.tif
07:55:18 PM, Monday, August 08, 2016

EUT Mode: Transmit Continuous
EUT Power: 12VDC
Channel0 (2402MHz)

— Average Limit Level
▽ Corrected Average Reading
— Peak Limit Level
— Corrected Peak Reading

PROFESSIONAL TESTING

EUT: iDrive Head Array

Project Number: 17647-10

Client: Trident Research LLC

> 1GHz Vertical Antenna Polarity Measured Emissions

Table 7.3.4: TX Mode, Above 1 GHz, Horizontal Polarity, Bottom Channel

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		8/3/2016, 8/19/16, 8/22/16		EUT Serial #:		None			
Customer:		Trident Research LLC		EUT Part #:		None			
Project Number:		17647-10		Test Technician:		E Lifsey, D Kohutek, and S Flint			
Purchase Order #:		P010882		Supervisor:		Lisa Arndt			
Equip. Under Test:		iDrive Head Array		Witness' Name:		Sean Brickley			
Radiated Emissions Test Results Data Sheet								Page: 1 of 1	
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A		N/A	
Antenna Orientation:		Horizontal		Frequency Range:		Above 1GHz			
EUT Mode of Operation:				Transmit CH0					
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
11514.5	3	186	1.78	Average	27.3	38.844	54.0	-15.1	Pass
11630.5	3	40	2.19	Average	27.3	38.29	54.0	-15.7	Pass
14921.9	3	333	3.64	Average	28.5	40.542	54.0	-13.4	Pass
15098.7	3	234	3.04	Average	27.8	40.438	54.0	-13.5	Pass
16285.6	3	242	1.29	Average	27.4	42.496	54.0	-11.5	Pass
16871.2	3	51	3.72	Average	27.6	43.045	54.0	-10.9	Pass
17731	3	351	2.15	Average	26.9	42.421	54.0	-11.5	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz Horizontal Polarity Measured Emissions

Average Limit Level

Corrected Average Reading

Peak Limit Level

Corrected Peak Reading

Operator: Spencer Flint
17647_REB_Run02_GHz.tif
07:55:18 PM, Monday, August 08, 2016

EUT Mode: Transmit Continuous
EUT Power: 12VDC
Channel 0 (2402MHz)

EUT: iDrive Head Array
Project Number: 17647-10
Client: Trident Research LLC

> 1GHz Horizontal Antenna Polarity Measured Emissions

> 1GHz Horizontal Antenna Polarity Measured Emissions

Table 7.3.5: TX Mode, 18-25 GHz, Vertical Polarity, Bottom Channel

Professional Testing, EMI, Inc.					
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices			
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits			
Section:		15.209			
Test Date(s):		9/12/2016		EUT Serial #: None	
Customer:		Trident Research LLC		EUT Part #: None	
Project Number:		17647-10		Test Technician: Eric Lifsey	
Purchase Order #:		P010882		Supervisor: Lisa Arndt	
Equip. Under Test:		iDrive Head Array		Witness' Name: None	
Radiated Emissions Test Results Data Sheet					
				Page: 1 of 1	
EUT Line Voltage:		12 VDC		EUT Power Frequency: N/A N/A	
Antenna Orientation:		Vertical		Frequency Range: Above 1GHz	
EUT Mode of Operation:				Transmit CH0	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions Field Strength (dBµV/m) 80 70 60 50 40 30 18.0G 18.7G 19.4G 20.1G 20.8G 21.5G 22.2G 22.9G 23.6G 24.3G 25.0G Operator: Spencer Flint 17647_REB_Run02_GHz+18-25_ChannelBottom 01:06:47 PM, Monday, September 12, 2016 EUT Mode: Transmit Continuous EUT Power: 12VDC Channel0 (2402MHz) EUT: iDrive Head Array Project Number: 17647-10 Client: Trident Research LLC Average Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading  Field Strength (dBµV/m) 80 70 60 50 40 30 18.0G 18.7G 19.4G 20.1G 20.8G 21.5G 22.2G 22.9G 23.6G 24.3G 25.0G Operator: Spencer Flint 17647_REB_Run02_GHz+18-25_ChannelBottom 01:06:47 PM, Monday, September 12, 2016 EUT Mode: Transmit Continuous EUT Power: 12VDC Channel0 (2402MHz) EUT: iDrive Head Array Project Number: 17647-10 Client: Trident Research LLC Average Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading  > 1GHz Vertical Antenna Polarity Measured Emissions					

Table 7.3.6: TX Mode, 18-25 GHz, Horizontal Polarity, Bottom Channel

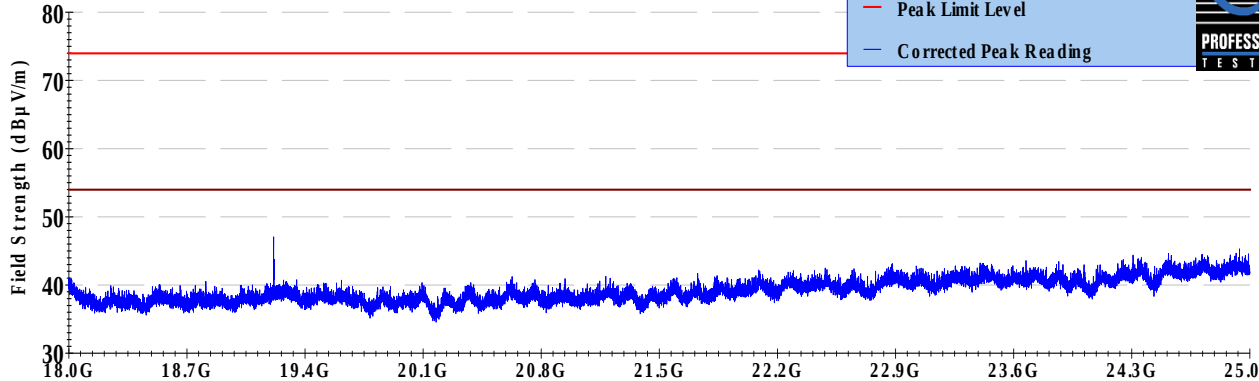
Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	9/12/2016	EUT Serial #:	None
Customer:	Trident Research LLC	EUT Part #:	None
Project Number:	17647-10	Test Technician:	Eric Lifsey
Purchase Order #:	P010882	Supervisor:	Lisa Arndt
Equip. Under Test:	iDrive Head Array	Witness' Name:	None
Radiated Emissions Test Results Data Sheet		Page: 1 of 1	
EUT Line Voltage:	12 VDC	EUT Power Frequency:	N/A N/A
Antenna Orientation:	Horizontal	Frequency Range:	Above 1GHz
EUT Mode of Operation:		Transmit CH0	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions Average Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading   Operator: Spencer Flint 17647_REB_Run02_GHz+18-25_ChanBottom 01:06:47 PM, Monday, September 12, 2016 Frequency EUT Mode: Transmitt Continuous EUT Power: 12VDC Channel0 (2402MHz) EUT: iDrive Head Array Project Number: 17647-10 Client: Trident Research LLC			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

Table 7.3.7: TX Mode, Above 1 GHz, Vertical Polarity, Middle Channel

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		8/3/2016, 8/19/16, 8/22/16			EUT Serial #:		None		
Customer:		Trident Research LLC			EUT Part #:		None		
Project Number:		17647-10			Test Technician:		E Lifsey, D Kohutck, and S Flint		
Purchase Order #:		P010882			Supervisor:		Lisa Arndt		
Equip. Under Test:		iDrive Head Array			Witness' Name:		Sean Brickley		
Radiated Emissions Test Results Data Sheet								Page: 1 of 1	
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A N/A			
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmit CH19				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
5335.77	3	250	3.77	Average	32.6	30.454	54.0	-23.5	Pass
11447.1	3	225	1.75	Average	27.1	38.526	54.0	-15.4	Pass
12479.2	3	268	1.04	Average	27.8	38.711	54.0	-15.2	Pass
13950.1	3	85	1.29	Average	28.2	38.987	54.0	-15.0	Pass
15418	3	288	3.77	Average	27.2	40.784	54.0	-13.2	Pass
16725.6	3	303	1.36	Average	27.3	42.811	54.0	-11.1	Pass
16956.7	3	338	1.43	Average	27.3	42.692	54.0	-11.3	Pass
17110.3	3	348	1.36	Average	27.1	42.315	54.0	-11.6	Pass

Professional Testing, EMI, Inc

Radiated Emissions, 3m Distance

1-18GHz Vertical Polarity Measured Emissions

Operator: Spencer Flint

17647_REB_Run03_GHz.ttl

05:32:36 PM, Friday, August 19, 2016

EUT Mode: Transmit Continuous

EUT Power: 12VDC

Channel 19 (2440MHz)

EUT: iDrive Head Array

Project Number: 17647-10

Client: Trident Research LLC

> 1GHz Vertical Antenna Polarity Measured Emissions

> 1GHz Vertical Antenna Polarity Measured Emissions**Note - The 5335.77 MHz signal was found to be an ambient and not from the EUT.**

Table 7.3.8: TX Mode, Above 1 GHz, Horizontal Polarity, Middle Channel

Professional Testing, EMI, Inc.											
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices										
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits										
Section:	15.209										
Test Date(s):	8/3/2016, 8/19/16, 8/22/16				EUT Serial #:	None					
Customer:	Trident Research LLC				EUT Part #:	None					
Project Number:	17647-10				Test Technician:	E Lifsey, D Kohutek, and S Flint					
Purchase Order #:	P010882				Supervisor:	Lisa Arndt					
Equip. Under Test:	iDrive Head Array				Witness' Name:	Sean Brickley					
Radiated Emissions Test Results Data Sheet								Page:	1	of	1
EUT Line Voltage:		12		VDC		EUT Power Frequency:		N/A		N/A	
Antenna Orientation:		Horizontal				Frequency Range:		Above 1GHz			
EUT Mode of Operation:						Transmit CH19					
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results		
11547.4	3	272	2.62	Average	27.4	38.715	54.0	-15.2	Pass		
12508.4	3	18	3.27	Average	27.8	38.71	54.0	-15.2	Pass		
13172.3	3	282	3.6	Average	26.6	38.066	54.0	-15.9	Pass		
13829.1	3	90	3.15	Average	28.6	39.066	54.0	-14.9	Pass		
15190.6	3	311	1.16	Average	27.6	40.312	54.0	-13.6	Pass		
16296.2	3	351	3.04	Average	27.4	42.535	54.0	-11.4	Pass		
16867.8	3	24	1.21	Average	27.5	43.017	54.0	-10.9	Pass		
17970.1	3	126	3.46	Average	26.5	42.919	54.0	-11.0	Pass		

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz Horizontal Polarity Measured Emissions

Operator: Spencer Flint
17647_REB_Run03_GHz.tif
05:32:36 PM, Friday, August 19, 2016

— Average Limit Level
▽ Corrected Average Reading
— Peak Limit Level
— Corrected Peak Reading

PROFESSIONAL TESTING

EUT Mode: Transmit Continuous
EUT Power: 12VDC
Channel 19 (2440MHz)

EUT: iDrive Head Array
Project Number: 17647-10
Client: Trident Research LLC

> 1GHz Horizontal Antenna Polarity Measured Emissions

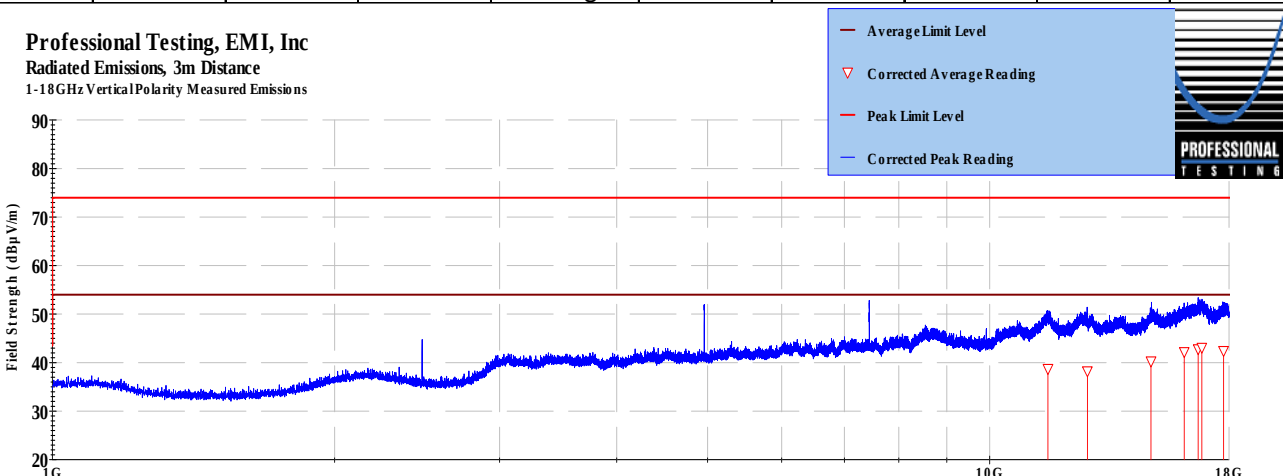
Table 7.3.9: TX Mode, 18-25 GHz, Vertical Polarity, Middle Channel

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	9/12/2016	EUT Serial #:	None
Customer:	Trident Research LLC	EUT Part #:	None
Project Number:	17647-10	Test Technician:	Eric Lifsey
Purchase Order #:	P010882	Supervisor:	Lisa Arndt
Equip. Under Test:	iDrive Head Array	Witness' Name:	None
Radiated Emissions Test Results Data Sheet		Page:	1 of 1
EUT Line Voltage:	12 VDC	EUT Power Frequency:	N/A N/A
Antenna Orientation:	Vertical	Frequency Range:	Above 1GHz
EUT Mode of Operation:		Transmit CH19	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions Operator: Spencer Flint 17647_REB_Run03_GHz+18-25_ChMiddle 12:48:45 PM, Monday, September 12, 2016 EUT Mode: Transmit Continuous EUT Power: 12VDC Channel 19 (2440MHz) EUT: iDrive Head Array Project Number: 17647-10 Client: Trident Research LLC			
> 1GHz Vertical Antenna Polarity Measured Emissions			

Table 7.3.10: TX Mode, 18-25 GHz, Horizontal Polarity, Middle Channel

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	9/12/2016	EUT Serial #:	None
Customer:	Trident Research LLC	EUT Part #:	None
Project Number:	17647-10	Test Technician:	Eric Lifsey
Purchase Order #:	P010882	Supervisor:	Lisa Arndt
Equip. Under Test:	iDrive Head Array	Witness' Name:	None
Radiated Emissions Test Results Data Sheet		Page:	1 of 1
EUT Line Voltage:	12 VDC	EUT Power Frequency:	N/A N/A
Antenna Orientation:	Horizontal	Frequency Range:	Above 1GHz
EUT Mode of Operation:	Transmit CH19		
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions — Average Limit Level ▽ Corrected Average Reading — Peak Limit Level — Corrected Peak Reading Operator: Spencer Flint 17647_REB_Run03_GHz+18-25_ChanMiddle 12:48:44 PM, Monday, September 12, 2016 EUT Mode: Transmit Continuous EUT Power: 12VDC Channel 19 (2440MHz) EUT: iDrive Head Array Project Number: 17647-10 Client: Trident Research LLC			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

Table 7.3.11: TX Mode, Above 1 GHz, Vertical Polarity, Top Channel

Professional Testing, EMI, Inc.										
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices								
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits								
Section:		15.209								
Test Date(s):		8/3/2016, 8/19/16, 8/22/16			EUT Serial #:		None			
Customer:		Trident Research LLC			EUT Part #:		None			
Project Number:		17647-10			Test Technician:		E Lifsey, D Kohutek, and S Flint			
Purchase Order #:		P010882			Supervisor:		Lisa Arndt			
Equip. Under Test:		iDrive Head Array			Witness' Name:		Sean Brickley			
Radiated Emissions Test Results Data Sheet							Page: 1 of 1			
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A		N/A		
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz			
EUT Mode of Operation:					Transmit CH39					
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results	
11539.9	3	294	2.37	Average	27.3	38.728	54.0	-15.2	Pass	
12711.3	3	154	1.95	Average	27.5	38.23	54.0	-15.7	Pass	
14865	3	240	1.29	Average	28.5	40.281	54.0	-13.7	Pass	
16129.5	3	140	1.25	Average	27.2	42.214	54.0	-11.7	Pass	
16689.8	3	346	3.73	Average	27.3	42.779	54.0	-11.2	Pass	
16842.2	3	335	1.13	Average	27.6	43.091	54.0	-10.9	Pass	
17762.6	3	21	3.8	Average	26.8	42.423	54.0	-11.5	Pass	
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Vertical Polarity Measured Emissions  Operator: Spencer Flint 17647_REB_Run05_GHz.tif 08:53:05 PM, Monday, August 22, 2016 EUT Mode: Transmit Continuous EUT Power: 12VDC Channel 39 (2480MHz) EUT: iDrive Head Array Project Number: 17647-10 Client: Trident Research LLC										
> 1GHz Vertical Antenna Polarity Measured Emissions										

> 1GHz Vertical Antenna Polarity Measured Emissions

Table 7.3.12: TX Mode, Above 1 GHz, Horizontal Polarity, Top Channel

Professional Testing, EMI, Inc.										
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices								
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits								
Section:		15.209								
Test Date(s):		8/3/2016, 8/19/16, 8/22/16			EUT Serial #:		None			
Customer:		Trident Research LLC			EUT Part #:		None			
Project Number:		17647-10			Test Technician:		E Lifsey, D Kohutek, and S Flint			
Purchase Order #:		P010882			Supervisor:		Lisa Arndt			
Equip. Under Test:		iDrive Head Array			Witness' Name:		Sean Brickley			
Radiated Emissions Test Results Data Sheet							Page: 1 of 1			
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A		N/A		
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz			
EUT Mode of Operation:					Transmit CH39					
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results	
11528.1	3	277	3.76	Average	27.3	38.804	54.0	-15.2	Pass	
12399.1	3	117	1.99	Average	27.2	38.095	54.0	-15.9	Pass	
12681	3	229	1.94	Average	27.6	38.36	54.0	-15.6	Pass	
16709	3	21	2.48	Average	27.3	42.809	54.0	-11.1	Pass	
16809.7	3	218	2.79	Average	27.6	43.087	54.0	-10.9	Pass	
17840.8	3	160	1.62	Average	27.2	43.109	54.0	-10.8	Pass	
17902.9	3	47	2.31	Average	26.9	43.12	54.0	-10.8	Pass	

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz Horizontal Polarity Measured Emissions

Average Limit Level

Corrected Average Reading

Peak Limit Level

Corrected Peak Reading

Operator: Spencer Flint
17647_REB_Run05_GHz.tif
08:53:05 PM, Monday, August 22, 2016

EUT Mode: Transmit Continuous
EUT Power: 12VDC
Channel 39 (2480MHz)

EUT: iDrive Head Array
Project Number: 17647-10
Client: Trident Research LLC

> 1GHz Horizontal Antenna Polarity Measured Emissions

> 1GHz Horizontal Antenna Polarity Measured Emissions

Table 7.3.13: TX Mode, 18-25 GHz, Vertical Polarity, Top Channel

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	9/12/2016	EUT Serial #:	None
Customer:	Trident Research LLC	EUT Part #:	None
Project Number:	17647-10	Test Technician:	Eric Lifsey
Purchase Order #:	P010882	Supervisor:	Lisa Arndt
Equip. Under Test:	iDrive Head Array	Witness' Name:	None
Radiated Emissions Test Results Data Sheet		Page:	1 of 1
EUT Line Voltage:	12 VDC	EUT Power Frequency:	N/A N/A
Antenna Orientation:	Vertical	Frequency Range:	Above 1GHz
EUT Mode of Operation:		Transmit CH39	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions Operator: Spencer Flint 17647_REB_Run05_GHz+18-25_ChanTop.tif 12:28:58 PM, Monday, September 12, 2016 EUT Mode: Transmit Continuous EUT Power: 12VDC Channel 39 (2480MHz) EUT: iDrive Head Array Project Number: 17647-10 Client: Trident Research LLC			
> 1GHz Vertical Antenna Polarity Measured Emissions			

Table 7.3.14: TX Mode, 18-25 GHz, Horizontal Polarity, Bottom Channel

Professional Testing, EMI, Inc.					
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices			
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits			
Section:		15.209			
Test Date(s):		9/12/2016		EUT Serial #: None	
Customer:		Trident Research LLC		EUT Part #: None	
Project Number:		17647-10		Test Technician: Eric Lifsey	
Purchase Order #:		P010882		Supervisor: Lisa Arndt	
Equip. Under Test:		iDrive Head Array		Witness' Name: None	
Radiated Emissions Test Results Data Sheet					
				Page: 1 of 1	
EUT Line Voltage:		12 VDC		EUT Power Frequency: N/A N/A	
Antenna Orientation:		Horizontal		Frequency Range: Above 1GHz	
EUT Mode of Operation:				Transmit CH39	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions Operator: Spencer Flint 17647_REB_Run05_GHz+18-25_ChanTop.tif 12:28:58 PM, Monday, September 12, 2016 Frequency EUT Mode: Transmit Continuous EUT Power: 12VDC Channel39 (2480MHz) EUT: iDrive Head Array Project Number: 17647-10 Client: Trident Research LLC					
> 1GHz Horizontal Antenna Polarity Measured Emissions					

8.0 Antenna Construction Requirements

The design was investigated for meeting the antenna construction requirements of the applicable rules.

8.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users in ways that would void their authorization to use the device.

8.2 Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.203 // RSS-Gen 8.3	Antenna Construction	8 Aug 2016

8.3 Results

Table 8.3.1 Antenna Construction Details		
Antenna Manufacturer and Model/PN		Specifications
Linx Technologies	ANT-2.45-CHP-T	Antennas 2.45GHz Chip Ant.
Max Gain 0.5 dBi		

- Antenna is chip style component.
- There is no external antenna connector.
- The antenna is not accessible.

The antenna design above satisfies the requirements of the rules.

9.0 Equipment

9.1 Radiated Emissions 30 MHz to 25 GHz

Radiated Emissions Test Equipment List					
Tile! Software Version:		4.2.A, May 23, 2010, 08:38:52 AM			
Test Profile:		2016 RE_ClassB - Boresite+Mast_LowPRF_072616.til			
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	2/5/2017
1890	HP	8447F	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	2/1/2018
1937	Agilent	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz, Opt. AYZ	MY44808298	12/15/2016
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	135454	1/25/2017
C027D	none	RG214	Cable Coax, N-N, 25m	none	10/1/2016
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
0942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
1509B	Braden	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	3/14/2017
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, .1-18GHz	0	1/11/2018
C030	none	none	Cable Coax, N-N, 30m	none	10/1/2016
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	110313	2/25/2017
1542	A.H. Systems	SAS-572	Antenna, Horn 18-26.5GHz, 20dB gain	225	N/A
1973	Agilent	83017A	Amplifier, Microwave 0.5-26.5 GHz	MY39500497	2/2/2018
2262	Keysight	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz	MY42510155	7/18/2017

9.2 Bandwidth and Duty Cycle

Asset #	Manufacturer	Model #	Description	Calibration Due
2216	HP	8593E	Spectrum Analyzer	19 Jul 2017

10.0 Measurement Bandwidths

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan				
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range
0.009	0.15	0.3	2	Multiple Sweeps
0.15	30	9	6	Multiple Sweeps
30	1000	120	2	Multiple 800 mS Sweeps
1000	6000	1000	2	Multiple Sweeps
6000	18000	1000	2	Multiple Sweeps
18000	26500	1000	2	Multiple Sweeps
*Notes: 1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range. 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz. 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz. 4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz. 5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.				

Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

End of Report

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