

Emissions Test Report

EUT Name: Luxury Audio Integrated Amplifier Model No.: No5805 & No5802

CFR 47 Part 15.247:2018 and RSS-247:2017

Prepared for:

Harman International Industries, Inc 50 Waterview Drive, Suite 240 Shelton, CT 06484 U.S.A.

Prepared by:

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	08/30/2018	Original Document	
1	12/11/2018	Corrected equipment calibration date	KC
2	03/19/2019	Corrected standard references and added hopping mode band-edge conducted emissions	КС

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Applicant:	Harman International Industries, Inc 50 Waterview Drive, Suite 240 Shelton, CT 06484
Requester / Applicant:	John Garay
Name of Equipment:	Luxury Audio Integrated Amplifier
Model No.	No5805 & No5802
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.247:2018 and RSS-247:2017
Test Dates:	August 22, 2018 to August 29, 2018

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 558074 D01 15.247 Measurement Guidance v05

Test Methods:

Emissions: ANSI C63.10-2013, KDB 558074 D01 15.247 Measurement Guidance v05

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Ken Chijan

percomp

Kerwinn Corpuz	March 25, 2019	Jeremy Luong	March 25, 2019
Test Engineer	Date	Laboratory Signature	Date
Hac-MEA			STRY IADA
Testing Co	ert #3331.02 US11	293	2M-1

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1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.247:2018 and RSS-247:2017 based on the results of testing performed on August 22, 2018 to August 29, 2018 on the Luxury Audio Integrated Amplifier Model No5805 & No5802 manufactured by Harman International Industries, Inc This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing were performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

The report documents the 2.4 GHz radio characteristics for the No5805 & No5802.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.10:2013	Test Parameters	Measured Value	Result
	2402 MHz to 2480 M	IHz Band	•	•
Spurious Emission in Transmitted Mode	CFR47 15.209, CFR47 15.247 (d), RSS-GEN Sect.8.9	Class B	8.4 dP (Margin)	Complied
Restricted Bands of Operation	CFR47 15.205, RSS GEN Sect.8.10	Class B	-6.4 db (Margin)	Complied
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.8.8	Class B	-9.86 dB (Margin)	Complied
Occupied Bandwidth	CFR47 15.247 (a1), RSS GEN Sect.6.7	N/A	20dB BW = 1.252 MHz 99% BW = 1.179 MHz	Complied
Channel Separation	CFR47 15.247 (a1), RSS 247 Sect. 5.1 (b)	>25 kHz	1023 kHz	Complied
Number of Hopping Channels	CFR47 15.247 (a1)(iii), RSS 247 Sect. 5.1(d)	>15	79 Channels	Complied
Average time occupancy of Channel	CFR47 15.247 (a1), RSS 247 Sect. 5.1(d)	< 0.4 sec	324.06ms	Complied
Maximum Transmitted Power	CFR47 15.247 (a1), RSS 247 Sect. 5.1 (b)	<125 mWatts	5.408 mW	Complied
Out of Band Emission	CFR47 15.247 (d), RSS 247 Sect. 5.5	< -20 dBr	- 18.37 dBr (-35.90 dBm at 2400 MHz)	Complied

Note: 1. Meet restricted band emission requirements.

2. This report is only documented for 2402 – 2480MHz.

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

US Federal Communications Commission 2.1.1



TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 is recognized by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (US1131). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18,

and 90. The accreditation is updated every 3 years.

2.1.2 NIST / A2LA



TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:2005 (Testing Cert #3331.02). The scope of laboratory accreditation includes

emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada



TUV Rheinland of North America at the 1279 Quarry Ln, Pleasanton, CA 94566 address is accredited for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described

in reports submitted to and accepted (File Number 2932M-1). This reference number is the indication to the Certification Officers that the site meets the requirements. The accreditation is updated every 3 years.

2.1.4 Japan – VCCI



The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment,

and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 has been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0268

2.1.5 Acceptance by Mutual Recognition Arrangement



The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, Pleasanton, California 94566, USA.

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code 3331.02). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7 m x 4.8 m x 3.175 mm thick aluminum floor connected to PE ground.

For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470-k Ω resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470-k Ω resistors.

For EFT, Surge, PQF, the HCP and VCP are removed.

RF Field Immunity testing is performed in a 7.3m x 4.3m x 4.1m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.8m x 3.7m x 3.175mm thick aluminum ground plane.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength $(dB\mu V/m) = RAW - AMP + CBL + ACF$

Where: RAW = Measured level before correction $(dB\mu V)$

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

 $Measurement + Antenna \ Factor-Amplifier \ Gain+Cable \ loss=Radiated \ Emissions \ (dBuV/m)$

25 dBuV/m + 17.5 dB - 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty Emissions

Per CISPR 16-4-2	Ulab	Ucispr
Radiated Disturbance @ 10	meters	· · · · · · · · · · · · · · · · · · ·
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3	meters	
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @	Mains Terminals	·
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

Voltech PM6000A

The estimated combined atom doed up containty for homeonic symmetry of flicker measurements is 15.00/	Per CISPR 16-4-2
The estimated combined standard uncertainty for harmonic current and nicker measurements is \pm 3.0%.	Methods

2.3.3 Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is \pm 8.2%.	Per IEC 61000-4-2
The estimated combined standard uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated combined standard uncertainty for conducted immunity measurements with CDN is \pm 3.66 dB	Per IEC 61000-4-6
The estimated combined standard uncertainty for power frequency magnetic field immunity is $\pm 2.9\%$.	Per IEC 61000-4-8

Thermo KeyTek EMC Pro

The estimated combined standard uncertainty for EFT fast transient immunity measurements is $\pm 2.6\%$.
The estimated combined standard uncertainty for surge immunity measurements is $\pm 2.6\%$.
The estimated combined standard uncertainty for voltage variation and interruption measurements is $\pm 1.74\%$.

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005.

3 Product Information

3.1 Product Description

The Model No5805 & No5802 is Mark Levinson Luxury Audio Integrated Amplifier. It has wireless capability, Bluetooth, operating in the band 2.4 GHz.

Model differences are:

No5805 - connect to analog and digital audio sources.

No5802 - interfaces with digital sources only.

The Model No5805 was used for final evaluation.

No5805 rear panel overview:



No5802 rear panel overview:



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3.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of a EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.3 Operating Mode

A description of the operation mode is given in the Test Plan Section. In the case of a EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.4 Unique Antenna Connector

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of CFR47 Parts 15.211, 15.213, 15.217, 15.219, or 15.221.

3.4.1 **Results**

The No5805 & No5802 uses the permanently attached chip antenna inside the device. Refer to EUT Photo for details. There is no external antenna connection available.

4 EUT Duty Cycle

All measurements are to be performed with the EUT transmitting at least 98% duty cycle. If the continuous transmission (or at least 98% duty cycle) cannot be achieved, the following additions to the measurement are required.

4.1 Test Method

The conducted method was used to measure the duty cycle factor according to ANSI C63.10: 2013 Sect. 11.6.

Duty cycle correction factor = $10 \log (1 / D)$; where D is the duty cycle.

4.2 Result

Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
Standard	100	0	100	0

Note: All measurements used 100% duty cycle.

Agilent Spec	trum Analyzer - Swept SA					
(XI	RF 50 Ω DC	SE	INSE:INT	ALIGN AUTO	_	12:45:08 PM Aug 30, 2018
Sweep	Time 100.0 ms	PNO: Wide	Trig: Free Run	Avg Type: L Avg Hold: 49	og-Pwr /100	TRACE 1 2 3 4 5 6 TYPE MWWWWWW
		IFGain:Low	Atten: 30 dB			DET P N N N N
10 dB/div	Ref Offset 0.5 dB Ref 20.50 dBm					
203						
10.5						
0.500						
-9.50						
-19.5						
-29.5						
-39.5						
-49.5						
-59.5						
-69.5						
Center 2	2 44100000 GHz					Span 0 Hz
Res BW	100 kHz	#VBW	V 300 kHz		Sweep	100.0 ms (1001 pts)
MSG				STATUS		

Figure 1: Maximum Transmitted Power, 2402 MHz

Testing was performed in accordance with CFR 47 Part 15.247:2018 and RSS-247:2017. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in Section 8 of the standard were used.

5.1 Output Power Requirements

The maximum output power requirement is the maximum equivalent isotropic radiated power delivering at the transmitting antenna under specified conditions of measurements in the presence of modulation.

The maximum output power and harmonics shall not exceed CFR47 Part 15.247 (a)(1) and RSS 247 Sect. 5.1(b)

Frequency hopping systems in the 2400-2483.5 MHz band: 125 mW.

5.1.1 Test Method

The conducted method was used to measure the channel power output according to ANSI C63.10:2013 Section 7.8.5. The measurement was performed with modulation per CFR47 Part 15.247 (a)(1) and RSS-247 Sect. 5.1. This test was conducted on 3 channels on No5805 & No5802. The worst mode result indicated below.





5.1.2 **Results**

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Test Conditions: Conducted Measurement, Hopping OFF		Date : August 23, 2018			
Antenna Type: Cl	nip		Power Se	etting: fixed at 50	
Max. Antenna Ga	ı in: 1.7 dBi		Signal St	ate: Modulated	
Duty Cycle: 100 %	6		Data Rat	e: BDR and EDR	
Ambient Temp.: 2	23° C		Relative	Humidity: 37 %RH	
		802.15.	1 Mode		
Packet	Operating Channel	Lir [dB	nit Sm]	Peak Power [dBm]	Margin [dB]
	2402 MHz	30.	.00	5.28	-15.72
DH1	2441 MHz	30.	.00	6.57	-14.43
	2480 MHz	30.	.00	7.33	-13.67
	2402 MHz	30.	.00	5.25	-15.75
DH3	2441 MHz	30.00		6.52	-14.48
	2480 MHz	30.00		7.29	-13.71
	2402 MHz	30.	.00	5.24	-15.76
DH5	2441 MHz	30.00		6.5	-14.5
	2480 MHz	30.00		7.27	-13.73
	2402 MHz	30.	.00	3.56	-17.44
2-DH1	2441 MHz	30.	.00	5.22	-15.78
	2480 MHz	30.	.00	6.06	-14.94
	2402 MHz	30.	.00	3.57	-17.43
2-DH3	2441 MHz	30.	.00	5.27	-15.73
	2480 MHz	30.	.00	6.03	-14.97
	2402 MHz	30.	.00	3.58	-17.42
2-DH5	2441 MHz	30.	.00	5.28	-15.72
	2480 MHz	30.	.00	6.02	-14.98
3-DH1	2402 MHz	30.	.00	3.59	-17.41

Table 2: RF Output Power at the	Antenna Port – Test Results
---------------------------------	-----------------------------

	2441 MHz	30.00	5.35	-15.65
	2480 MHz	30.00	6.09	-14.91
	2402 MHz	30.00	3.66	-17.34
3-DH3	2441 MHz	30.00	5.4	-15.6
	2480 MHz	30.00	6.14	-14.86
	2402 MHz	30.00	3.63	-17.37
3-DH5	2441 MHz	30.00	5.38	-15.62
	2480 MHz	30.00	6.15	-14.85
Note: The EUT is capable to transmit at both BDR and EDR. The worst case at low, middle, and high				
frequencies are sho	own below.			



Figure 2: Maximum Transmitted Power, 2402 MHz (DH1)



Figure 3: Maximum Transmitted Power, 2441 MHz (DH1)



Figure 4: Maximum Transmitted Power, 2480 MHz (DH1)

5.2 Occupied Bandwidth

The occupied bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency.

The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

20 dB bandwidth was performed by coupling the output of the EUT to the input of a spectrum

analyzer.

5.2.1 Test Method

The conducted method was used to measure the occupied bandwidth. The measurement was performed with modulation per CFR47 15.247 (a)(1) and RSS GEN Sect. 6.7. This test was conducted on 3 channels on No5805 & No5802. The worst sample result indicated below.

Test Setup:



5.2.2 **Results**

These measurements were used for information only

Test Conditions: Conducted Measurement, Hopping OFF		Date: August 28, 2018		
Antenna Type: Chip		Power Setting: fixed at 5	50	
Max. Antenna Gain: 1.7	dBi	Signal State: Modulated		
Duty Cycle: 100 %		Data Rate: BDR and ED	R	
Ambient Temp.: 23° C		Relative Humidity: 35 %	6RH	
	Bandwic	ith (MHz)		
Packet	Freq. (MHz)	20dB Bandwidth MHz	99% Bandwidth MHz	
	2402	0.926	0.851	
DH1	2441	0.926	0.843	
	2480	0.927	0.842	
	2402	0.930	0.860	
DH3	2441	0.919	0.843	
	2480	0.926	0.841	
	2402	0.936	0.870	
DH5	2441	0.935	0.863	
	2480	0.935	0.865	
	2402	1.209	1.158	
2-DH1	2441	1.213	1.158	
	2480	1.210	1.161	
	2402	1.232	1.167	
2-DH3	2441	1.247	1.175	
	2480	1.250	1.174	
2-DH5	2402	1.235	1.171	
2-0115	2441	1.235	1.174	

Table 3:	Occupied	Bandwidth -	Test Results
I UDIC J.	Occupica	Dunuwium	TOSt RObults

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	2480	1.248	1.173	
	2402	1.201	1.144	
3-DH1	2441	1.199	1.146	
-	2480	1.198	1.148	
	2402	1.250	1.175	
3-DH3	2441	1.252	1.179	
	2480	1.250	1.179	
	2402	1.249	1.170	
3-DH5	2441	1.250	1.174	
	2480	1.252	1.176	
Note: Worst case for Occupied Bandwidth are shown below.				



Figure 5: Occupied Bandwidth at 2402 MHz (3-DH3)



Figure 6: Occupied Bandwidth at 2441 MHz (3-DH3)



Figure 7: Occupied Bandwidth at 2480 MHz (3-DH3)

5.3 Hopping Frequency Requirements

The Frequency Hopping Requirements are applicable to the equipment using Frequency Hopping Spread Spectrum (FHSS) modulation.

Per CFR47 15.247 (a)(1)(iii), RSS 247 Sect.5.1(b) and 5.1(d), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or twothirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

5.3.1 Test Method

The conducted method were used to measure the carrier frequency separation according to ANSI C63.10:2013 Section 7.8.2, frequency hopping system in Sect. 7.8.3, and time of occupancy in Sect. 7.8.4. The measurement was performed with the EUT set to hop to channel frequencies. Results indicated below.





5.3.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Test Conditions: Conducted Measurement		Date: August 29, 2018			
Antenna Type: Chip			Power Setting: fixe	ed at 50	
Max. Antenna Ga	ain: 1.7 dBi		Signal State: Modu	ılated	
Duty Cycle: 100 9	%		Data Rate: BDR a	nd EDR	
Ambient Temp.:	22° C		Relative Humidity	: 38 %RH	
		Average Occu	ipancy Time		
Packet	Pulse Width (ms)	# of Pulses (3.16s)	Ave. Time (ms)	Limit (s)	Result
DH1	0.403	32	128.96	< 0.4	Pass
DH3	1.661	16	265.76	< 0.4	Pass
DH5	2.915	11	320.65	< 0.4	Pass
2-DH1	0.438	32	140.19	< 0.4	Pass
2-DH3	1.691	16	270.56	< 0.4	Pass
2-DH5	2.938	11	323.18	< 0.4	Pass
3-DH1	0.437	32	139.97	< 0.4	Pass
3-DH3	1.683	16	269.28	< 0.4	Pass
3-DH5	2.946	11	324.06	< 0.4	Pass

Table 4: Frequency Hopping Requirements

Note: The dwell time in each channel must be less than 0.4 seconds. The total time for 79 hopping channels is 31.6 seconds. To determine the average dwell time, the frequency 2441MHz was sample in 3.16 second, an $1/10^{\text{th}}$ of the total 79 hopping channels dwell time.

Minimum Channel Separation				
Package	Hopping Separation (kHz) Two-Third of 20dB Bandwidth Limit (kHz) Result			
DH1	990.5	> 0.618	Pass	
DH3	1005	> 0.620	Pass	

DH5	998	> 0.624	Pass
2-DH1	1000.5	> 0.809	Pass
2-DH3	1003	> 0.834	Pass
2-DH5	1000.5	> 0.833	Pass
3-DH1	1000.5	> 0.801	Pass
3-DH3	1000.5	> 0.835	Pass
3-DH5	1023	> 0.835	Pass

Note 1: The EUT was hopping randomly all 79 operating channels. The channel separation was measured at the middle channel, 2441 MHz. Two-Third of the highest 20dB bandwidth was used.

Note 2: For 20 dB Occupied Bandwidth plot, refer to Section 5.2 of this test report.

Minimum Number of Channels					
Range (2402MHz -2480MHz)	Min. Channel Limit	Result			
79	15	Pass			
Nata, Dath DDD and EDD used the same number of henring showneds					

Note: Both BDR and EDR used the same number of hopping channels.

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Figure 8: Pulse Width for 3-DH5



Figure 9: Number of Pulses in 3.16 sec for 3-DH5





Figure 10: Hopping Separation for DH1



Figure 11: Hopping Separation for 2-DH1



Figure 12: Hopping Separation for 3-DH1



Figure 13: Number of Operating Channels (79)

5.4 Out of Band Emission requirements

Any frequency outside the band of 2400 MHz to 2483.5 MHz, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under the regulation, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. ; CFR 47 Part 15.247(d) and RSS 247 Sect. 5.5.

5.4.1 **Test Method**

The conducted method was used to measure the channel power output according to ANSI C63.10:2013 Section 7.8.6 and Section 7.8.8. The measurement was performed with modulation per CFR47 Part 15.247 (a)(1) and RSS-247 Sect. 5.1. This test was conducted on 3 channels on No5805 & No5802. The worst mode result indicated below.

5.4.2 **Results**

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Test Conditions:ConductedMeasurement,Hopping OFFOfferDate: August 28, 2018								
Antenna Type: Chip	Pow	Power Setting: fixed at 50						
Max. Antenna Gain: 1	.7 dBi	Sign	Signal State: Modulated					
Duty Cycle: 100 %	Data	Data Rate: See below						
Ambient Temp.: 23° C			Relative Humidity: 35 %RH					
-20 dBr Band Edge Results								
Package/ Power	Operating Freq.	Lim (dBr	it n)	Measured Value (dBm)	Result			
DH1	2402 MHz	-15.9	97	-38.71	Pass			
	2441 MHz	-14.2	24	-62.62	Pass			
	2480 MHz	-13.7	0	-56.47	Pass			
2-DH5	2402 MHz	-18.5	55	-36.03	Pass			
	2441 MHz	-16.5	6	-61.90	Pass			
	2480 MHz	-16.4	7	-57.61	Pass			
3-DH3	2402 MHz	-18.6	50	-35.63	Pass			
	2441 MHz	-16.4	18	-61.63	Pass			

 Table 5: Band Edge Requirements – Test Results

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		2480 MHz		-15.94		-55.36	Pass	
Note: The stated limits for 20 dBr are relative to each individual output per ANSI C63.10 Method. The worst case of each data rate is recorded.								
Out of Band Emission								
Package/ Power	Ope	rating Freq.	L (d	imit Bm)	it Measured Value n) (dBm)		Result	
DH1	2	402 MHz	-1	5.97	-47.32 (dBm (2.558GHz)	Pass	
	2	441 MHz	-1	4.24	-47.16	dBm (2.597GHz)	Pass	
	2	480 MHz	-1	3.70	-47.26 d	lBm (2.6359GHz)	Pass	
2-DH5	2	402 MHz	-1	8.55	-49.06	dBm (2.558GHz)	Pass	
	2	441 MHz	-1	6.56	-49.75	dBm (2.597GHz)	Pass	
	2	480 MHz	-1	6.47	-53.18 d	lBm (2.6359GHz)	Pass	
3-DH3	2	402 MHz	-1	8.60	-52.88 (dBm (2.558GHz)	Pass	
	2	441 MHz	-1	6.48	-51.65	dBm (2.597GHz)	Pass	
	2	480 MHz	-1	5.94	-49.40 d	lBm (2.6359GHz)	Pass	
Note: The state	d limits	are relative to	each inc	dividual c	output per A	NSI C63.10 Method	 .	

Test Conditions: Conducted Measurement, Hopping ON			Date: March 25, 2019				
Antenna Type: Chip		P	Power Setting: fixed at 50				
Max. Antenna Gain:	1.7 dBi	S	Signal State: Modulated				
Duty Cycle: 100 %		Γ	Data Rate: See below				
Ambient Temp.: 23° C			Relative Humidity: 34 %RH				
-20 dBr Band Edge Results							
Package/ Power	Operating Freq.	I ((.imit 1Bm)	Measured Value (dBm)	Result		
DH1	2402 MHz	-	13.58	-38.74	Pass		
	2480 MHz	-	13.47	-60.39	Pass		
2-DH5	2402 MHz	- [16.01	-45.99	Pass		
	2480 MHz	-	16.50	-62.07	Pass		
3-DH3	2402 MHz	-	16.27	-40.81	Pass		
	2480 MHz	-	15.77	-61.96	Pass		
Note: The worst case o	f each data rate is recor	ded.					

 Table 6: Band Edge Requirements – Test Results
Agiler	nt Spe	ctrur	n Ana	ılyzer - Swept SA	5							
XI R	L	-	RF	50Ω DC			SENSE:INT		ALIGN AUTO		10:36:	44 AM Aug 28, 2018
Jer	iter	Fre	eq ∠	.4020000L	JU GHZ F IF	NO: Fast +++ Gain:Low	Trig: Free Atten: 30	Run dB	Avg Hold	: 100/100		
10 d	B/div	,	Ref Ref	Offset 0.5 dB 20.50 dBm	I						011 Wkr4 2.40 16-	l 415 GHz .748 dBm
Log								1				
10.5							(2				3
J.5UU								1.				
9.50								} *─				-15.97 dBm
-19.5												
-29.5							\wedge	2				
39.5							, i	-				
-49.5								++				
59.5			وارجان		. New Lines .	and the state of the second	-	1		and the second second second	and the property of the lot of the	and the state of the state of the
-69.5	⊢											
Cen	ter '	2.4	120) GHz							Sna	n 150.0 MHz
≠Re	s Bl	W 1	00	kHz		#VB	W 300 kHz			Swee	ep 14.67 ms	(10000 pts
MKR	MODE	TRC	SCL	>	<	Y	FUN	CTION	FUNCTION WIDTH		FUNCTION VALUE	^
1	N		f	2.4	401 992 GHz	4.030	dBm dBm					
3	N		f	2.	483 500 GHz		dBm					
4 5	N		T	2.4	401 415 GHZ	-16.748	dBm					
6												
8												
9 10												
11												
50												2
-									-000000			

Figure 14: Band Edge Requirements at 2402 MHz – DH1



Figure 15: Out of Band Emission Requirements at 2402 MHz – DH1

Agilent Spectrum Analyzer - Swept SA													
<mark>ιχι</mark> ℝ Cer	L nter	Fre	RF	50 Ω DC	00 GHz		SENSE:INT		ALIGN AUT #Av	∵o giType:	RMS	10:49:	51 AM Aug 28, 2018 TRACE 1 2 3 4 5 6
			- - -		F IF	PNO: Fast Gain:Low	Trig: Free Atten: 30	e Run dB	Avg	Hold: 1	00/100		
10 d	IB/div	/	Ref Ref	Offset 0.5 dB 20.50 dBm	1						MI	(r4 2.44) -16	0 415 GHz 6.438 dBm
Log		-			_			<u>_1</u>					
n 500	í							Y					
-9.50								4					44.04 49-
-19.5													-14.24 dBm
-29.5	-												
-39.5	- -						ļ.	r w					
-49.5	- -				^ 2								
-59.5	Winni	ad and	nyi di y			and advarablement	and products	- h.	a distant per per dan di sebelar	and to be have	at a spin a chilanna Sail	meters and second	and a finite of a first of state (see
-69.5													
Cer #Re	nter es B	2.44 W 1	100 00	0 GHz kHz		#VB	W 300 kH;	z			Sweep	Spa 14.67 ms	n 150.0 MHz s (10000 pts)
MKR 1	MODE	TRC	SCL	2	× 440.927.CHz	Y 5 765	fu	NCTION	FUNCTION WIE	тн	FI	JNCTION VALUE	^
2	N		f	2.	400 000 GHz	-62.623	dBm						
4	N		f	2.	483 300 GH2 440 415 GHz	-16.438	dBm						
6													
8													
9 10													
11 <													>
MSG									I osт/	TUS			

Figure 16: Band Edge Requirements at 2441 MHz – DH1



Figure 17: Out of Band Emission Requirements at 2441 MHz – DH1

Agile	nt Spe	ectru	m Ana	alyzer - Swept SA									
IXI R	L	End	RF	50 Ω DC			SENSE:INT		AL		RMS	11:04	17 AM Aug 28, 2018
Cer	iter	Fre	eq 2	2.48000000	IU GHZ F IF	PNO: Fast 🔸	Trig: Fre Atten: 3	e Run)dB		Avg Hold:	100/100		
10 d	IB/div	v	Ref Ref	Offset 0.5 dB 7 20.50 dB m	1						N	18r4 2.48 13-	0 555 GHz 3.734 dBm
Log								<u>1</u>					
10.5								- (Y					
0.500								4					
-9.50								_ ⊘ `					-13.70 dBm
-19.5	;												
-29.5	- -												
-39.5	i –												
-49.5	; <mark> 2</mark>							<mark>\</mark> }3					
-59.5	i 📛			And the second		deal was delayed	Manual and	- V.		al transmitted	o a Berline Britik Berzeige	and the second se	
-69.5	;												
Cer #Re	nter es B	2.4 W 1	00 I	0 GHZ kHz		#VB	W 300 KH	z			Swee	Spa p 14.67 m	n 150.0 MHz s (10000 pts)
MKR	MODE	TRC	SCL	>	<	Y	F	INCTION	FUNCT	ION WIDTH		FUNCTION VALUE	<u>^</u>
1	N		f f	2.	479 827 GHz 400 000 GHz	6.297	dBm dBm						
3	N		f	2.4	483 500 GHz	-56.469	dBm						
4 5	N		г	2.0	480 555 GHZ	-13./34	авт						
6													
8													
9 10													
11													~
MSG										STATUS			
wood										No status			

Figure 18: Band Edge Requirements at 2480 MHz – DH1





Report Number: 31863803.001 EUT: Luxury Audio Integrated Amplifier, Model: No5805 & No5802 Report Date: August 30, 2018

gilent Sp	ectrur	n Anal	lyzer - Swept SA								
enter	r Fre	RF 9 q 2	50 Ω DC .40200000) GHz	NO: Fast	Trig: Free	Run	ALIGN AUTO #Avg Ty Avg Ho	ype: RMS Id: 100/100	02:40	19 PM Aug 28, 2018 TRACE 1 2 3 4 5 TYPE M WWWW DET P N N N N
0 dB/di	iv	Ref (Ref	Dffset 0.5 dB 20.50 dB m	IF	Gain.Luw	Haten. oo				Mkr4 2.40 -2′	1 265 GH 1.392 dBm
10.5						(1				
500							Å				
9.5											-18.55 dB
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9.5											Ad . I. Miresteria . I
1.5				a de la construction de la construction de la construcción de la construcción de la construcción de la constru La construcción de la construcción d	ang tang tang tang tang tang tang tang t				nun finnen Brunklander sårber er		
enter Res B	· 2.40 3W 1	0200 00 k	GHz Hz		#VB	W 300 kHz			Swe	Spa ep 14.67 m	n 150.0 MH s (10000 pt
R MOD	E TRC 1	SCL f	2.40 2.40 2.40	02 008 GHz	1.447 -36.026	dBm dBm	ICTION	FUNCTION WIDTH		FUNCTION VALUE	
N N		f f	2.4 2.4	83 500 GHz 01 265 GHz	-21.392	dBm dBm					
,))											
ц											>
6									5		

Figure 20: Band Edge Requirements at 2402 MHz – 2-DH5





Agilent Spectrum Analyzer - Swept SA													
Cen	ıter	Fre	RF Pq 2	50 Ω DC) GHz	NO East ↔	SENSE:INT	Run	ALIGN	AUTO Avg Type: Avg Hold: 1	RMS 00/100	02:43:2	2 PM Aug 28, 2018 RACE 1 2 3 4 5 6 TYPE M 444
					IF	Gain:Low	Atten: 30	dB					DET P NNNNN
10 d	B/div	,	Ref Ref	Offset 0.5 dB 20.50 dBm							MI	(r4 2.440 -18	265 GHz 801 dBm
Log								1					
10.5							(
0.500								N,					
-9.50								X4					-16.56 dBm
-19.5													
-29.5 20.5							U						
-39.5 49.5								1					
-49.0					\Diamond^2		Ň			ali ana ang a	\wedge		
-69.5	and set	ik prive (M	WArgent		No. Series and a second state	and the second secon	international stands				an the state of th	an and the state of the state o	an san an a
00.0													
Cen #Re	ter s B	2.44 W 1	110 00	0 GHz kHz		#VB	W 300 kHz				Sweep	Spar 14.67 ms	150.0 MHz (10000 pts)
MKR	MODE	TRC	SCL	×		Y	FUN	ICTION	FUNCTION	WIDTH	F	UNCTION VALUE	^
1	N		f	2.4	40 992 GHZ 00 000 GHZ	-61.897	dBm dBm						
3	N		f	2.4	33 500 GHz 40 265 GHz	-62.289 -18.801	dBm dBm						
5													
7													
9													
10 11													~
<													
MSG									<u></u>	STATUS			

Figure 22: Band Edge Requirements at 2441 MHz – 2-DH5



Figure 23: Out of Band Emission Requirements at 2441 MHz – 2-DH5

Agiler	nt Spe	ctru	m Ana	lyzer - Swept SA							
(X) R	L	Ere	RF			SENSE:INT			: RMS	02:45:0 T	9 PM Aug 28, 2018 RACE 1 2 3 4 5 6
		<u> </u>	<u>54</u> 2	48000000 GH2	PNO: Fast +++	Trig: Free Atten: 30	Run dB	Avg Hold:	100/100		DET P N N N N
10 4	Diala		Ref Dof	Offset 0.5 dB					М	kr4 2.480 -17	705 GHz 379 dBm
Log		v	Rei	20.30 0.511							
10.5	;						1				
0.500	⊢						<u></u>				
-9.50	\vdash						▲4 —				-16.47 dBm
-19.5							Y				10.41 0.01
-29.5	-										
-39.5	-					<u>/</u>	<u> </u>				
-49.5	2						×\3				
-59.5	- 		مر الم	a de para de marge des des antes de partes de la companya de la companya de la companya de la companya de la co	and the state of the state			and the second second	tel sur les fest ter enternite	and the second second second	and to train and barrows
-69.5									and the second se	and do i a ser o de la della de la	and the second se
_											
Cen #Re	nter es B	2.43 W 1	8000 8000	0 GHZ kHz	#VB	W 300 kHz			Sweep	Spar 14.67 ms	150.0 MHz (10000 pts)
MKR	MODE	TRC	SCL	×	Y	FUN	CTION	FUNCTION WIDTH		UNCTION VALUE	^
1	N		f	2.480 143 GHz	3.532	dBm					
3	N		f	2.483 500 GHz	-57.611	dBm					
4	N		Ť	2.480 /05 GHz	-17.379	dBm					
6											
8											
9 10											
11											~
MSG								IL STATUS			2
MGG								NO STATUS			

Figure 24: Band Edge Requirements at 2480 MHz – 2-DH5



Figure 25: Out of Band Emission Requirements at 2480 MHz – 2-DH5

Rt RF S0.9 DC SERVEE.INT ALIGANTO OC221:42/PM Aug232.018 Center Freq 2.402000000 CHz PN0: Fast → Trig: Free Run IFGain:Low Avg Type: RNS AvgiHold: 100/100 Mkr4 2.401 280 GHz D0 21:42/PM Aug232.018 10 dB/div Ref Offset 0.5 dB Mkr4 2.401 280 GHz -20.711 dBm -20.711 dBm 10 dB/div Ref 0.000 dBm -20.711 dBm -20.711 dBm -20.711 dBm 10 dB/div Ref 0.000 dBm -20.711 dBm -20.711 dBm -20.711 dBm 10 dB/div Ref 0.000 dBm -20.711 dBm -20.711 dBm -20.711 dBm 10 dB/div Ref 2.401 280 GHz -20.711 dBm -20.711 dBm -20.711 dBm 10 dB/div Ref 2.401 280 GHz -20.711 dBm -20.711 dBm -20.711 dBm 10 dB/div Ref 2.40200 GHz -20.711 dBm -20.711 dBm -20.711 dBm 10 dB/div Ref 2.401 992 GHz 1.397 dBm -20.711 dBm -20.711 dBm 10 dB/div 11 f 2.401 280 GHz -20.711 dBm -20.711 dBm -20.711 dBm 10 dB/div 1	Agilent Spectrum Analyzer - Swept SA												
Center Freq 2.40200000 CHz PNO: Fast IFGain:Low Trig: Free Run Atten: 30 dB Mkr4 2.401 280 GHz -20.711 dBm 10 dB/div Ref Offset 0.5 dB Mkr4 2.401 280 GHz -20.711 dBm -20.711 dBm 10 dB/div Ref Offset 0.5 dB -20.711 dBm 10 dB/div 1 -1 -1 10 dB/div 1 -1 -1 -1 10 dB/div 1 -1 -1 -1 -1 10 dB/div Ref Offset 0.5 dB -20.711 dBm -20.711 dBm -20.711 dBm 10 dB/div -1 -1 -1 -1 -1 -1 10 dB/div -1 <th>LXIR</th> <th>۱L.</th> <th>_</th> <th>RF</th> <th>50 Ω DC</th> <th></th> <th></th> <th>SENSE:INT</th> <th></th> <th>ALIGNAUTO</th> <th>DMC</th> <th>02:21:42</th> <th>2 PM Aug 28, 2018</th>	LXI R	۱L.	_	RF	50 Ω DC			SENSE:INT		ALIGNAUTO	DMC	02:21:42	2 PM Aug 28, 2018
Ref Offset 0.5 dB Mkr4 2.401 280 GHz 0 dB/div Ref 20.50 dBm -20.711 dBm 0 d 1 1 1 0 dB/div 1 1 1 0 dB/div 1 1 1 1 0 dB/div 1 1 1 1 1 0 dB/div 1 1 1 1 1 1 0 dB/div 1 <th>Cer</th> <th>nter</th> <th>Fre</th> <th>eq 2</th> <th>2.4020000</th> <th>JU GHZ F IF</th> <th>NO: Fast ↔ Gain:Low</th> <th>Trig: Free Atten: 30 d</th> <th>Run 18</th> <th>Avg Hold:</th> <th>100/100</th> <th></th> <th></th>	Cer	nter	Fre	eq 2	2.4020000	JU GHZ F IF	NO: Fast ↔ Gain:Low	Trig: Free Atten: 30 d	Run 18	Avg Hold:	100/100		
Log 105 105 105 105 105 105 105 105	10 d	B/div	v	Ref Ref	Offset 0.5 dB 20.50 dBm	I					М	kr4 2.401 -20.	280 GHz 711 dBm
103 1	Log								4				
9.50 9.50 9.50 9.50 9.50 19.5 9.50 9.50 9.50 9.50 29.5 9.50 9.50 9.50 9.50 29.5 9.50 9.50 9.50 9.50 29.5 9.50 9.50 9.50 9.50 20.5 9.50 9.50 9.50 9.50 20.7 1.50 0.50 0.50 2 N 1 1 2.35,634 2 N 1 1 2.401 2 N 1 1 2.20,711 3 N 1 1 2.20,711 3 1 1 1 1 3 1 1 1 4 9.5 9.00 9.00 5 9.00 9.00 9.00 1 1 1 1.397 3 N 1 1 4 1 1.397 5 1.397 1.397 6 1 1.397 7 2.000 1.357 8 9 1.000 9 1.000 1.000 9 1.000 1.000	10.5								\mathcal{D}^{I}				
9-50	U.5UL	1							h				
1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1935 1937 1937 1937 <t< td=""><td>-9.6L</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>4</td><td></td><td></td><td></td><td>-18.60 dBm</td></t<>	-9.6L								4				-18.60 dBm
-295 -397 -397	-19.5								2				
335 33 49.5 33 59.5 59.5 59.5 59.5 59.5 59.5 59.5 59.5 59.5 59.5 59.5 59.5 Span 150.0 MHz	-29.5							$ \rightarrow $					
495 5	-39.5							- M	1				3
59.5 Image: section of the	-49.5	5 							N.				\rightarrow
69.5 Span 150.0 MHz Center 2.40200 GHz #VBW 300 kHz Sweep 14.67 ms (10000 pts) Miss Model TFC SCL X Y FUNCTION WIDTH 2 N 1 f 2.400 000 GHz 35.634 dBm 2 N 1 f 2.400 000 GHz 35.634 dBm 3 N 1 f 2.401 992 GHz	-59.5	i I i i i i i i i i i i i i i i i i i i		L anguage	a way and the discontinue	م الحال المراجع المتحد المراجع	والمتوجع والمتراجع والمتروجة	La constant de la constant	- Andrewson	-		and the state of the second states of the second states of the second states of the second states of the second	
Kits Kits FUNCTION FUN	-69.5	5 											
MKE MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE 1 N 1 f 2.401 992 GHz 1.397 dBm FUNCTION WIDTH FUNCTION VALUE	Cer #Re	nter es B	2.4(W 1	020 00	0 GHz kHz		#VB	W 300 kHz	1		Sweep	Span 14.67 ms	150.0 MHz (10000 pts)
1 N 1 f 2.401992 GHz 1.397 dBm 2 N 1 f 2.400 000 GHz	MKR	MODE	TRC	SCL	>	<	Y	FUN	CTION F	FUNCTION WIDTH	1	UNCTION VALUE	^
3 N 1 f 2.483 500 GHz	1	N		f	2.	401 992 GHz 400 000 GHz	-35.634	dBm dBm					
1 1 2.401280 GH2 -20.711 dBm 6 6 6 6 7 8 6 9 10 11 10 11 11	3	N		f	2.	483 500 GHz		dBm					
6 7 8 9 10 11 11	5	IN		1	۷.	401 280 GHZ	-20.711	ubm					
8 9 10 11 11	6 7												
10 11 ≤ SIG	8												
11 VIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	10												
ISG US STATUS	11												~
	MSG												

Figure 26: Band Edge Requirements at 2402 MHz – 3-DH3



Figure 27: Out of Band Emission Requirements at 2402 MHz – 3-DH3

Agilent Spectrum Analyzer - Swept SA													
Cent	er l	Fre	RF P q 2	50 Ω DC 2.44100000	00 GHz	PNO: Fast ↔	SENSE:INT Trig: Fre Atten: 30	e Run) dB	ALIGN AUT #Av Avg	o g Type: Hold: 1	RMS 00/100	02:23:	51 PM Aug 28, 2018 TRACE 1 2 3 4 5 6 TYPE M WWW DET P N N N N
10 dB	/div		Ref Ref	Offset 0.5 dB 20.50 dBm		Sumes					MI	(r4 2.44) -18	0 280 GHz 8.104 dBm
10.5 -								1					
0.500 - .9 50								Ĺ					
-19.5 -													-16.48 dBm
-29.5 -								1					
-39.5 -					A.2						3		
-59.5	lato (m)	un a	ili en en	and the state of t		and at the section of	Pula production	1		-	ter the state of the	www.www.www.	uld ten, din genjerje de div
-09.0 -	or 1		140										n 450 0 Milla
Span 150.0 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 14.67 ms (10000 pts)													
MKR M 1 2 3	ODE N N N	TRC 1 1	SCL f f	2. 2. 2. 2.	440 992 GHz 400 000 GHz 483 500 GHz	3.520 -61.626 -59.658	dBm dBm dBm	INCTION	FUNCTION WID	ТН	F	UNCTION VALUE	<u>^</u>
4 5 6	N		f	2.	440 280 GHz	-18.104	dBm						
7 8													
9 10 11													~
< MSG									I st	ATUS			>

Figure 28: Band Edge Requirements at 2441 MHz – 3-DH3





Agile	nt Spe	ectru	m Ana	alyzer - Swept SA									
IXI R	L		RF	50 Ω DC			SENSE:INT		ALIGN AU		DMC	02:25:5	6 PM Aug 28, 2018
Cer	nter	Fre	eq 2	2.4800000	IO GHZ F IF	PNO: Fast +++ Gain:Low	Trig: Free Atten: 30	e Run dB	#A Av	vg Type: g Hold:1	I00/100		
10 d	B/div	v	Ref Ref	Offset 0.5 dB 20.50 dBm							N	lkr4 2.480 -16	690 GHz 418 dBm
Log								<u>لم</u>					
10.5								Ŷ					
0.500								1.					
-9.50								♦ –					-15.94 dBm
-19.5								11					
-29.5													
-39.5	\vdash						/						
-49.5	2							-					
-59.5	- 	Lettel	أرطيبيها	ماليس الجمعية المعسا	باحاط والمتأو بالمادات والم	A MAN PARAMANA PARA	Martin Martin	- 1	UN-MARKEN AND A	and the second	and the second second for	And the second second	Alle of Longing and Parallel
-69.5	-												
_												-	450.0.00
Cer #Re	nter es B	2.4 W 1	001	U GHZ kHz		#VB	W 300 kH:	z			Swee	spar 0 14.67 ms	150.0 IVIHZ (10000 pts)
MKR	MODE	TRC	SCL	×	(Y	FU	NCTION	FUNCTION W	(IDTH		FUNCTION VALUE	^
1	N		f f	2.4	180 158 GHz	4.062	dBm dBm						
3	N		f	2.4	183 500 GHz	-55.360	dBm						
4 5	N		г	2.4	180 690 GHZ	-16.418	авт						
6													
8													
9 10													
11													~
MSG									rL -	TATUS			>
NGG									4 <u>0</u> 3	TATUS			

Figure 30: Band Edge Requirements at 2480 MHz – 3-DH3





Agiler	nt Spe	ectrui	n Ana	lyzer - Swept SA								
XI R	L	_	RF	50Ω DC			SENSE:INT	AL	IGN AUTO	DMC	09:41:3:	2 AM Mar 25, 2019
Cer	nter	Fre	eq 2	2.4020000	JU GHZ F IF	PNO: Fast 🔸	Trig: Free Atten: 30 d	Run dB	#Avg Hold: 1	100/100	Ţ	TYPE M WWWWW DET P N N N N N
10 d	B/div	,	Ref Ref	Offset 0.5 dB 20.50 dBm	1					M	kr4 2.477	015 GHz dBm
Log												14
10.5									LEASBARAALAINE		MARKARALAAAA	ANANANANANANANAN
0.500 -9.50												
-19.5												
-29.5								2				
-39.5							<u> </u>					
-49.5							¥					
-59.5	MAN	ANN	MAAA	AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	<u>AAAAbabababaa</u>	MALLIN	he d he d he d he					3
-69.5			,,									→
Cer #Re	nter Is B	2.4) W 1	020) 00	0 GHz kHz		#VB	W 300 kHz			Sweep	Span 14.67 ms	150.0 MHz (10000 pts)
MKB	MODE	TRC	SCL		X	Y	FUN	CTION FUNC	TION WIDTH	F	UNCTION VALUE	~
1	N		f	2.	467 159 GHz	6.422	dBm dBm					
3	N		f	2.	483 500 GHz		dBm					
4 5	N		т	2.	477 015 GHZ		aBm					
6												
8												
10												
11												~
MSG									E STATUS			
									v			

Figure 32: Band Edge Requirements at 2402 MHz – DH1 Hopping Mode



Figure 33: Band Edge Requirements at 2480 MHz – DH1 Hopping Mode

Agiler	Agilent Spectrum Analyzer - Swept SA											
LXI R	L	E	RF	50 Ω DC			SENSE:INT	AL	IGN AUTO	DMC	10:39:0	4 AM Mar 25, 2019
Cer	iter	Fre	ad 7	2.4020000	JU GHZ F IF	PNO: Fast 🔸	Trig: Free Atten: 30	Run dB	Avg Hold: 1	100/100	,	
10 d	B/div	,	Ref Ref	Offset 0.5 dB 20.50 dBm	•					M	kr4 2.477	015 GHz dBm
Log												A1 4
10.5										11.		
-9.50								and the second	NAMA AND			-16.01 dBm
-19.5												
-29.5	\vdash											
-39.5	⊢							2				
-49.5							<u> </u>					3
-59.5	lin,		, in the	and the state of the	anilara anitalati	a fail an	an sumitive state					→ →
-69.5												
Cen #Re	ter s B	2.4(W 1	020 00	0 GHz kHz		#VB	W 300 kHz	1	1	Sweep	Span 14.67 ms	150.0 MHz (10000 pts)
MKR	MODE	TRC	SCL		<	Y	FUN	CTION FUNC	TION WIDTH	F	UNCTION VALUE	^
1	N		f	2.	469 004 GHz 400 000 GHz	3.987	dBm dBm					
3	N		f	2.	483 500 GHz		dBm dBm					
5	IN			2.9	477 015 612		ubiii					
6 7												
8												
10												
<												
MSG									I STATUS			

Figure 34: Band Edge Requirements at 2402 MHz – 2-DH5 Hopping Mode



Figure 35: Band Edge Requirements at 2480 MHz – 2-DH5 Hopping Mode



Figure 36: Band Edge Requirements at 2402 MHz – 3-DH3 Hopping Mode



Figure 37: Band Edge Requirements at 2480 MHz – 3-DH3 Hopping Mode

5.5 Transmitter Spurious Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmitting mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS GEN Sect. 8.9 and 8.10.

5.5.1 **Test Methodology**

5.5.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a height of 1 - 4m. Measurement equipment was located outside of the chamber < 1GHz frequency range.

5.5.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m nonconductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

The final scans performed on the highest power measured, for three operating channels: 2402 MHz, 2441 MHz, and 2480 MHz at DH1.

5.5.1.3 Deviations

None.

Test Setup:



5.5.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209: 2018 and RSS Gen Sect. 8.9, 8.10: 2018.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

All harmonics and spurious emission which are outside of the restricted band shall be 20 dB below the inband emission.

5.5.3 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength $(dB\mu V/m) = FIM - AMP + CBL + ACF$

Where:

FIM = Field Intensity Meter (dB μ V) AMP = Amplifier Gain (dB) CBL = Cable Loss (dB) ACF = Antenna Correction Factor (dB/m) μ V/m = $10^{\frac{dB\mu V/m}{20}}$

5.5.4 Test Results

The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and Test Plan.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 7: Transmit Spurious Emission at Restricted Band Edge Requirements											
Test Cond Hopping O	itions: Radi FF	ated Mea	asurement	t at 3 mete	ers,	Date: August 24, 2018					
Antenna T	ype: Chip				Power Setting: fixed at 50						
Max. Ante	nna Gain: -	+1.7 dBi			Signal	State: Mod	ulated				
Duty Cycle	e: 100 %				Data 1	Rate: see bel	ow				
Ambient T	'emp.: 23° (C			Relati	ve Humidit	y: 37 %RF	I			
Band Edge Results											
Freq.	Level	Pol.	15.209	9/15.247	tector	Azimuth	Height	Comments			
MHz	dBuV/m	V/H	Limit	Margin	Pk/Avg		degrees	meters			
2390.0	55.76	V	74.00	-18.24	Pk		208	106	BT-2402MHz, DH1		
2390.0	56.88	V	74.00	-17.12	Pk		208	106	BT-2402MHz, DH1, 2MHz Span		
2390.0	43.38	V	54.00	-10.62	Avg		208	106	BT-2402MHz, DH1		
2390.0	43.38	V	54.00	-10.62	-10.62 A [•]		208	106	BT-2402MHz, DH1, 2MHz Span		
2390.0	55.19	Н	74.00	-18.81		Pk	149	207	BT-2402MHz, DH1		
2390.0	55.35	Н	74.00	-18.65		Pk	149	207	BT-2402MHz, DH1, 2MHz Span		
2390.0	43.38	Н	54.00	-10.62	A	Avg	149	207	BT-2402MHz, DH1		
2390.0	43.38	Н	54.00	-10.62	A	Avg	149	207	BT-2402MHz, DH1, 2MHz Span		
2483.5	57.98	V	74.00	-16.02		Pk	188	103	BT-2480MHz, DH1		
2483.6	59.06	V	74.00	-14.94	Pk		188	103	BT-2480MHz, DH1, 2MHz Span		
2483.5	43.38	V	54.00	-10.62	A	Avg	188	103	BT-2480MHz, DH1		
2483.5	43.38	V	54.00	-10.62	A	Avg	188	103	BT-2480MHz, DH1, 2MHz Span		
2483.5 58.96 H 74.00 -15.04						Pk	144	193	BT-2480MHz, DH1		

Table 7. T • • • . ъ . 1 D d Edaa D .

2483.5

2483.5

2483.5

59.76

45.31

43.38

Η

Η

Η

74.00

54.00

54.00

-14.24

-8.69

-10.62

Pk

Avg

Avg

144

144

144

193

193

193

BT-2480MHz, DH1,

2MHz Span

BT-2480MHz, DH1

BT-2480MHz, DH1,

2MHz Span

Band Edge Results (Hopping Mode)										
Freq.	Level	Pol.	15.209	0/15.247	Detector	Azimuth	Height	Comments		
MHz	dBuV/m	V/H	Limit	Margin	Pk/Avg	degrees	meters			
2389.9	56.15	V	74.00	-17.85	Pk	208	106	BT-Hopping, DH1		
2389.3	57.51	V	74.00	-16.49	Pk	208	106	BT-Hopping, DH1, 2MHz Span		
2389.9	40.88	V	54.00	-13.12	Avg	208	106	BT-Hopping, DH1		
2390.0	43.38	V	54.00	-10.62	Avg	208	106	BT-Hopping, DH1, 2MHz Span		
2390.0	55.44	Н	74.00	-18.56	Pk	149	207	BT-Hopping, DH1		
2389.9	56.29	Н	74.00	-17.71	Pk	149	207	BT-Hopping, DH1, 2MHz Span		
2390.0	43.38	Н	54.00	-10.62	Avg	149	207	BT-Hopping, DH1		
2390.0	43.38	Н	54.00	-10.62	Avg	149	207	BT-Hopping, DH1, 2MHz Span		
2483.5	57.27	V	74.00	-16.73	Pk	188	103	BT-Hopping, DH1		
2483.5	56.93	V	74.00	-17.07	Pk	188	103	BT-Hopping, DH1, 2MHz Span		
2483.5	43.38	V	54.00	-10.62	Avg	188	103	BT-Hopping, DH1		
2483.5	43.38	V	54.00	-10.62	Avg	188	103	BT-Hopping, DH1, 2MHz Span		
2483.5	57.92	Н	74.00	-16.08	Pk	144	193	BT-Hopping, DH1		
2483.6	58.73	Н	74.00	-15.27	Pk	144	193	BT-Hopping, DH1, 2MHz Span		
2483.5	43.38	Н	54.00	-10.62	Avg	144	193	BT-Hopping, DH1		
2483.5	43.38	Н	54.00	-10.62	Avg	144	193	BT-Hopping, DH1, 2MHz Span		
Note: Band	l Edge meas	surement	were mad	le on the h	ighest power	level (DH1)				



Figure 38: Radiated Emission at 2390 MHz Edge for Channel 2402 MHz at DH1 – Vertical (Pk)



Figure 39: Radiated Emission at 2390 MHz, 2 MHz Span, for Channel 2402 MHz at DH1 – Vertical (Pk)



Figure 40: Radiated Emission at the 2390 MHz Edge for Channel 2402 MHz at DH1 – Vertical (Avg)



Figure 41: Radiated Emission at 2390 MHz, 2 MHz Span, for Channel 2402 MHz at DH1 – Vertical (Avg)



Figure 42: Radiated Emission at the 2390 MHz Edge for Channel 2402 MHz at DH1 – Horizontal (Pk)



Figure 43: Radiated Emission at 2390 MHz, 2 MHz Span, for Channel 2402 MHz at DH1 – Horizontal (Pk)



Figure 44: Radiated Emission at the 2390 MHz Edge for Channel 2402 MHz at DH1 – Horizontal (Avg)



Figure 45: Radiated Emission at 2390 MHz, 2 MHz Span, for Channel 2402 MHz at DH1 – Horizontal (Avg)



Figure 46: Radiated Emission at the 2483.5 MHz Edge for Channel 2480 MHz at DH1 – Vertical (Pk)



Figure 47: Radiated Emission at 2483.5 MHz, 2 MHz Span, for Channel 2480 MHz at DH1 – Vertical (Pk)



Figure 48: Radiated Emission at the 2483.5 MHz Edge for Channel 2480 MHz at DH1 – Vertical (Avg)



Figure 49: Radiated Emission at 2483.5 MHz, 2 MHz Span, for Channel 2480 MHz at DH1 – Vertical (Avg)



Figure 50: Radiated Emission at the 2483.5 MHz Edge for Channel 2480 MHz at DH1 – Horizontal (Pk)



Figure 51: Radiated Emission at 2483.5 MHz, 2 MHz Span, for Channel 2480 MHz at DH1 – Horizontal (Pk)



Figure 52: Radiated Emission at the 2483.5 MHz Edge for Channel 2480 MHz at DH1 – Horizontal (Avg)



Figure 53: Radiated Emission at 2483.5 MHz, 2 MHz Span, for Channel 2480 MHz at DH1 – Horizontal (Avg)



Figure 54: Radiated Emission at the 2390 MHz Edge for Hopping Channel at DH1 – Vertical (Pk)



Figure 55: Radiated Emission at the 2390 MHz, 2 MHz Span, for Hopping Channel at DH1 – Vertical (Pk)



Figure 56: Radiated Emission at the 2390 MHz Edge for Hopping Channel at DH1 – Vertical (Avg)



Figure 57: Radiated Emission at the 2390 MHz, 2 MHz Span, for Hopping Channel at DH1 – Vertical (Avg)



Figure 58: Radiated Emission at the 2390 MHz Edge for Hopping Channel at DH1 – Horizontal (Pk)



Figure 59: Radiated Emission at the 2390 MHz, 2 MHz Span, for Hopping Channel at DH1 – Horizontal (Pk)



Figure 60: Radiated Emission at the 2390 MHz Edge for Hopping Channel at DH1 – Horizontal (Avg)



Figure 61: Radiated Emission at the 2390 MHz, 2 MHz Span, for Hopping Channel at DH1 – Horizontal (Avg)



Figure 62: Radiated Emission at the 2483.5 MHz Edge for Hopping Channel at DH1 – Vertical (Pk)



Figure 63: Radiated Emission at the 2483.5 MHz, 2 MHz Span, for Hopping Channel at DH1 – Vertical (Pk)



Figure 64: Radiated Emission at the 2483.5 MHz Edge for Hopping Channel at DH1 – Vertical (Avg)



Figure 65: Radiated Emission at the 2483.5 MHz, 2 MHz Span, for Hopping Channel at DH1 – Vertical (Avg)



Figure 66: Radiated Emission at the 2483.5 MHz Edge for Hopping Channel at DH1 – Horizontal (Pk)



Figure 67: Radiated Emission at the 2483.5 MHz, 2 MHz Span, for Hopping Channel at DH1 – Horizontal (Pk)



Figure 68: Radiated Emission at the 2483.5 MHz Edge for Hopping Channel at DH1 – Horizontal (Avg)



Figure 69: Radiated Emission at the 2483.5 MHz, 2 MHz Span, for Hopping Channel at DH1 – Horizontal (Avg)

SOP 1 Radiated Emissions Tracking # 31863803.001 Page 1 of 7											
EUT Na	me	Luxu	ry Audio	Integrate	d Amplifier		Date	,	Augu	st 23, 2018	
EUT Mo	del	No58	805 & No	5802			Tem	p/Humi	in <u>22° C</u>	/ 39%rh	
EUT Sei	rial						Tem	p/Hum	out <u>N/A</u>		
Standar	nng. d		47 Part 1	5 Subpar	t C RSS-2	47 RSS-G	EN RBW	/ VBW	q <u>3.3 v</u> 120 k	DC Hz/ 300 kH	7
Dist/Ant	t Used	d <u>3m /</u>	JB3	o Ouspui	10,1100 2		Perf	ormed by	Kerwi	nn Corpuz	<u> </u>
30 MHz – 1 GHz Transmit at 2441 MHz											
Frequer	ncy	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MHz	2	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
41.01	1	33.99	2.58	-14.98	21.59	QP	V	126	346	40.00	-18.41
51.65	5	43.82	2.64	-20.00	26.47	QP	V	103	246	40.00	-13.54
54.35	5	38.10	2.66	-20.21	20.56	QP	V	313	40	40.00	-19.45
59.95	5	49.53	2.68	-20.61	31.60	QP	V	129	360	40.00	-8.40
72.00	0	39.37	2.76	-20.04	22.08	QP	V	110	234	40.00	-17.92
77.45	5	36.57	2.77	-20.28	19.06	QP	V	167	314	40.00	-20.94
85.27	7	38.65	2.81	-20.38	21.07	QP	V	186	144	40.00	-18.93
105.9	92	23.00	2.90	-16.50	9.40	QP	V	351	242	43.50	-34.10
70.0 60.0				TOV Kneinia	ind of North America					[1] Horizont [2] Vertical Qpk Lmt	sī
50.0									Cep	+ Formal	
40.0											
30.0						Munichter	the state of the s	ladapullisi (Neber ^{iki}	adinida ana ana ana ana an		
20.0		Maral Al	MANANA		II wit .					Meas Dist 3m Spec Dist 3m	
	M.MWW.								Fre	iquenoy: MHz	
30.0		130.0 230.0	0 330.	9 430.0	530.0	630.0	730.0	830.0	930.0 1000.0		
Harr	rman, Bluetoot mame: o:\prog	th module, DH1, 2441MHz gram files (x88)\emisoft -	z vasona\results\20180	823_Harman_BT_RE2	temi						
Spec Mar	rgin =	Level - Limit + ANT Fact	t, Level = or	Raw+ Cb	I+ CF ± Unc	ertainty					
Combined	Standa	ard Uncertain	ty Uc(y) = :	± 4.52 dB	Expanded U	ncertainty U	= kuc(y)	<u>k = 2 for 95</u>	% confidence		
Note: 1. Radiated Spurious Emissions measurement were made on the highest power level (DH1). The worst case was observed at mid channel of DH1.											

2. No significant emission was observed below 30 MHz.

SOP 1 Rad	diated Em	nissions		Tracki	Tracking # 31863803.001 Page 2 of 7								
EUT Name	Luxu	iry Audio	Integrate	d Amplifier		Date	•	Aug	August 27, 2018				
EUT Model	No58	305 & No	5802			Tem	p / Hum i	in 22°	22° C / 36%rh				
EUT Serial	0923	3				Tem	p / Hum	out N/A	N/A				
EUT Config.	DH1					Line	AC / Fre	q 3.3	3.3 VDC				
Standard	CFR	47 Part 1	5 Subpar	t C, RSS-2	47, RSS-GI	EN RBV	/ VBW	1 M	1 MHz/ 3 MHz				
Dist/Ant Use	ed 3m /	DRH-118	3&1m//	AHA-840		Perf	Performed by Kerwinn Corpuz						
1 – 18 GHz Transmit at 2402 MH													
Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin			
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB			
4804.26 41.34		2.14	-0.38	43.10	Average	Н	154	144	54.00	-10.90			
7206.39 29.16		2.64	3.12	34.92	Average	Н	238	4	54.00	-19.08			
14580.57	23.39	3.85	11.52	38.76	Average	Н	182	34	54.00	-15.24			
17905.71	24.83	4.20	15.24	44.27	Average	V	166	128	54.00	-9.73			



SOP [·]	SOP 1 Radiated EmissionsTracking # 31863803.001 Page 3 of 7												
EUT N	ame	Luxu	ry Audio	Integrated	d Amplifier		Date August 27, 2017						
EUT M	odel	No58	305 & No	5802			Tem	Temp / Hum in <u>22° C / 36%rh</u>					
EUT S	erial	0923		out <u>N/A</u>									
EUT C	onfig.	DH1 Line AC / Freq 3.3											
Standa	ard	CFR	47 Part 1	5 Subpar	t C, RSS-24	47, RSS-GI	EN RBW	/ / VBW	1 MH	z/ 3 MHz			
Dist/A	nt Use	e d 3m /	DRH-11	3 & 1m / A	AHA-840		Perfe	ormed by	/ Kerwi	nn Corpuz			
18 – 25 GHz Transmit at 2402 MHz													
Frequ	ency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin		
MF	łz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB		
2584	6.56	42.36	8.15	-12.87	37.64	Peak	Н	150	285	54.00	-16.36		
dBuV/m 80.0	IBUV/m TUV Rheinland of North America										a		
70.0										[2] Vertical Av Lmt			
60.0													
50.0									Av				
40.0													
30.0	William		hendigetheringteren	i dina ng mang ng kita ng kita Ng kita ng kita									
20.0													
10.0										Spec Dist 3m			
									Fr	equency: MHz			
0.0	00.0								25499.9	99			
1000.0 zkież sze Harman, Bluetooth module, DH1, 2402MHz Filename: otiprogram files (x88)iemisoft - vazonalvesults/20180827_Harman_BT_RE7.emi													
Spec M CF= An	argin = np Gair	Level - Limi + ANT Fact	t, Level =	= Raw+ Cb	I+ CF ± Unc	ertainty							
Combine	ed Stand	lard Uncertain	ty $U_c(y) =$	± 4.52 dB	Expanded U	ncertainty U =	= kuc(y)	<i>k</i> = 2 for 95	5% confidence)			
Note: 1	1. Rad	iated Spurio	ous Emis	sions mea	asurement	were made	on the hig	hest pow	er level (DH	H1).			
2. Detected Noise Floor. No significant emission was observed from 18GHz to 25GHz.													
SOP 1 Rad	Track	Tracking # 31863803.001 Page 4 of 7											
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EUT Name	Luxu	iry Audio	Integrate	d Amplifier		Dat	Date August 27, 2018						
EUT Model	EUT Model No5805 & No5802						Temp / Hum in 22° C / 36%rh						
EUT Serial	0923	3				Ten	וף / Hum	out	N/A				
EUT Config.	DH1					Line	e AC / Fre	q	3.3 V	DC			
Standard	CFR	47 Part 1	5 Subpar	t C, RSS-24	47, RSS-GI	EN RB	N / VBW		1 MH	z/ 3 MHz			
Dist/Ant Used 3m / DRH-118 & 1m / AHA-840 Performed by Kerwinn Corpuz													
1 – 18 GHz Transmit at 2441 MHz													
Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azi	muth	Limit	Margin		
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	d	eg	dBuV/m	dB		
4882.04	40.12	2.25	-0.21	42.16	Average	Н	108	1	34	54.00	-11.85		
7322.45	29.65	2.63	3.30	35.58	Average	Н	115		22	54.00	-18.42		
14590.61	23.25	3.87	11.54	38.66	Average	Н	245	2	54	54.00	-15.34		
17885.04	24.80	4.21	15.17	44.18	Average	Н	170	2	86	54.00	-9.82		



SOP	OP 1 Radiated EmissionsTracking # 31863803.001 Page 5 of 7										
EUT N	ame	Luxu	ry Audio	Integrated	d Amplifier		Date		Augu	st 27, 2018	
EUT M	lodel	I No5805 & No5802 Temp / Hum in 22°						i n <u>22° C</u>	: / 36%rh		
EUT S	erial	I 0923 Temp / Hum out N/A						out <u>N/A</u>			
EUT C	onfig.	DH1					Line	AC / Fre	q <u>3.3 V</u>	DC	
Standa	ard	CFR	47 Part 1	5 Subpar	t C, RSS-24	47, RSS-GI	EN RBW	/VBW	1 MH	z/ 3 MHz	
Dist/A	nt Use	d 3m /	DRH-11	8 & 1m / A	AHA-840		Perfo	ormed by	/ Kerwi	nn Corpuz	
				18	3 – 25 GHz	Transmit at	2441 MH	Z			
Frequ	ency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MF	lz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
2584	1.25	42.06	8.15	-12.87	37.34	Pk	V	150	240	54.00	-16.66
dBuV/m 80.0				TUV Rheinla	ind of North America				~	[1] Horizonta [2] Vertical	
70.0										Av Lmt	
60.0											
50.0									Au		
40.0											
30.0	Huntlehender	há hipita sin di ting sa fini di pagi	interspiritisty at			in the second second second					
20.0										Meas Dist 1m	
10.0										Spec Dist 3m	
0.0									Fn	equency: MHz	
1800.0 2649.599 Harman, Bluetooth module, DH1, 2441MHz Filename: c:\program files (x88)\emisoft - vasona\results\20180827_Harman_BT_RE8.emi											
Spec M CF= An	Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty CF= Amp Gain + ANT Factor										
Note:	ed Stand 1. Radi	ard Uncertain	ty <i>u_c(y) =</i> ous Emis	± 4.52 dB sions mea	Expanded U	ncertainty <i>U</i> = were made	= <i>κu</i> c(y) on the hig	$\kappa = 2$ for 95 hest pow	er level (DH	e H1).	
	2. Dete	2. Detected Noise Floor. No significant emission was observed from 18GHz to 25GHz.									

SOP 1 Rac	Tracki	Tracking # 31863803.001 Page 6 of 7									
EUT Name	Luxu	ry Audio	Integrate	d Amplifier		Date	Date August 27, 2018				
EUT Model	No58	305 & No	5802			Tem	p / Hum i	in	22° C	/ 36%rh	
EUT Serial	0923	}				Tem	p / Hum	out	N/A		
EUT Config.	DH1					Line	AC / Fre	q T	3.3 VI	DC	
Standard	CFR	47 Part 1	5 Subpar	t C, RSS-24	47, RSS-GI	EN RBV	V / VBW	-	1 MH:	z/ 3 MHz	
Dist/Ant Used 3m / DRH-118 & 1m / AHA-840						Perf	ormed by	/	Kerwi	nn Corpuz	
1 – 18 GHz Transmit at 2480 MHz											
Frequency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azin	nuth	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	de	eg	dBuV/m	dB
7440.58	29.16	2.70	2.97	34.83	Average	Н	132	1	4	54.00	-19.17
4959.87	35.67	2.16	-0.23	37.60	Average	V	240	16	58	54.00	-16.40
14292.63	23.40	3.70	10.88	37.97	Average	V	111	19	94	54.00	-16.03
17923.70	24.76	4.21	15.14	44.12	Average	V	200	26	58	54.00	-9.88



SOP	SOP 1 Radiated Emissions Tracking # 31863803.001 Page 7 of 7										
EUT N	ame	Luxu	ry Audio	Integrated	d Amplifier		Date		Augu	st 27, 2018	
EUT M	odel	I No5805 & No5802 Temp / Hum in 22				i n <u>22° C</u>	: / 36%rh				
EUT S	erial	I <u>0923</u> Temp / Hum out <u>N//</u>						out <u>N/A</u>			
EUT C	onfig.	DH1					Line	AC / Fre	q <u>3.3 V</u>	DC	
Standa	ard	CFR	47 Part 1	5 Subpar	t C, RSS-24	47, RSS-GI	EN RBW	/VBW	1 MH:	z/ 3 MHz	
Dist/A	nt Use	e d 3m /	DRH-11	8 & 1m / A	AHA-840		Perfo	ormed by	/ Kerwi	nn Corpuz	
				18	3 – 25 GHz	Transmit at	2480 MH	Z			
Frequ	ency	Raw	Cable Loss	AF	Level	Detector	Polarity	Height	Azimuth	Limit	Margin
MF	lz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB
2438	5.62	41.82	8.10	-12.60	37.32	Peak	Н	150	22	54.00	-16.68
dBuV/m 80.0				TUV Rheinla	ind of North America					[1] Horizonta [2] Vertical	
70.0										Av Lmt	
60.0											
50.0											
20.0		i de la sua di da seco de las de l	المتعدل وروال وروال	a da sine fadimental da de da	the desire we will be an	antitellant dass i filmation state	ilina a linda interitatione				
50.5		an and a subsequently of	an haalin ka ka sa ka sa	ersten ogsån og b	a series and the series of the	and a strength of the second	· • • •				
20.0											
									'	Meas Dist 1m	
10.0									En	Spec Dist 3m	
0.0										~	
Havman, Bluetooth module, DH1, 2480MHz Harman, Bluetooth module, DH1, 2480MHz Filename: c:\program files (x88)\emisoft - vasona\vesults\20180827_Harman_BT_RE5.emi											
Spec M CF= An	Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty CF= Amp Gain + ANT Factor										
Combine	ed Stand	lard Uncertain	ty $U_c(y) =$	± 4.52 dB	Expanded U	ncertainty U =	= kuc(y)	k = 2 for 95	% confidence)	
Note:	1. Radi 2. Dete	ated Spurio	ous Emis Floor. N	sions mea o significa	asurement ant emission	were made h was obse	on the hig	hest pow 18GHz to	er level (DH 25GHz.	H1).	

5.6 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2014. These test methods are listed under the laboratory's A2LA Scope of Accreditation.

This test measures the levels emanating from the EUT's AC input port, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

The AC conducted emissions of equipment under test shall not exceed the values in CFR47 Part 15.207: 2018 and RSS- GEN Sect. 8.8: 2018.

5.6.1 **Test Methodology**

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50μ H / 50Ω LISNs.

Testing is either performed in Lab 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the semi-anechoic chamber is a 2m x 2m solid aluminum frame and panel, and it is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN.

5.6.1.1 Deviations

There were no deviations from this test methodology.

5.6.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

 Table 8: AC Conducted Emissions – Test Results

Test Conditions: Conducted Emissions		Test Date: August 29, 2018			
Antenna Type: Chip		Power Setting: fixed at 50			
Max. Antenna Gain: 1.7 dBi		Signal State: Modulated			
Ambient Temp.: 23 °C		Relative Humidity: 39%			
Configuration		Frequency Range	Test Result		
Line 1 (Hot)	0.15 to 30 MHz		Pass		
Line 2 (Neutral)		0.15 to 30 MHz	Pass		

SOP 2 Condu	ucted Emis	ssions	Track	ing # 318638	303.001 Pag	je 1 Of 4		
EUT Name	Luxury	Audio Integ	rated Amplifi	ier	Date	e	August 29,	2018
EUT Model	No5805	5 & No5802		Ten	np / Hum in	23° C / 39%	6 rh	
EUT Serial	0923			Ten	Temp / Hum out <u>N/A</u>			
EUT Config.	DH1				Line	e AC / Freq	110Vac/60	Hz
Standard	CFR47	Part 15.207	7 and RSS G	ien	RB	N / VBW	9 kHz / 30 kHz	
Lab/LISN	Lab #5	/Com-Pow	er, Line 1		Per	formed by	Kerwinn Corpuz	
Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin
MHz	dBuV	dB	dB	dBuV		Line	dBuV	dB
0.157	34.96	9.82	0.05	44.83	QP	Live	65.60	-20.76
0.157	17.51	9.82	0.05	27.38	Avg	Live	55.60	-28.22
0.202	30.41	9.83	0.04	40.28	QP	Live	63.51	-23.23
0.202	27.45	9.83	0.04	37.32	Avg	Live	53.51	-16.19
0.494	25.71	9.84	0.03	35.58	QP	Live	56.10	-20.52
0.494	26.37	9.84	0.03	36.24	Avg	Live	46.10	-9.86
0.584	22.24	9.85	0.03	32.12	QP	Live	56.00	-23.88
0.584	19.22	9.85	0.03	29.10	Avg	Live	46.00	-16.90
0.711	19.83	9.86	0.03	29.72	QP	Live	56.00	-26.28
0.711	16.17	9.86	0.03	26.06	Avg	Live	46.00	-19.94
0.875	12.60	9.87	0.03	22.50	QP	Live	56.00	-33.50
0.875	13.71	9.87	0.03	23.61	Avg	Live	46.00	-22.39
0.157	34.96	9.82	0.05	44.83	QP	Live	65.60	-20.76
0.157	17.51	9.82	0.05	27.38	Avg	Live	55.60	-28.22
0.202	30.41	9.83	0.04	40.28	QP	Live	63.51	-23.23
0.202	27.45	9.83	0.04	37.32	Avg	Live	53.51	-16.19
Spec Margin = Q	P./Ave Limi	t, ± Uncerta	inty					

Combined Standard Uncertainty $U_c(y) = \pm 1.2 \text{ dB}$ Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment and transmitted at DH1 Hopping Channel. USB power port were connected to supporting equipment, Laptop.



SOP 2 Condu	SOP 2 Conducted Emissions Tracking # 31863803.001 Page 3 Of 4								
EUT Name	Luxury	Audio Integ	rated Amplifi	er	Dat	e	August 29,	2018	
EUT Model	No5805	5 & No5802	Ter	np / Hum in	23° C / 39%	∕₀ rh			
EUT Serial	0923			Ter	Temp / Hum out N/A				
EUT Config.	DH1				Lin	Line AC / Freq 110Vac/60Hz			
Standard	CFR47	Part 15.207	7 and RSS G	ien	RB	W / VBW	9 kHz / 30	kHz	
Lab/LISN	Lab #5	/Com-Pow	er, Line 2	1	Per	formed by	Kerwinn Co	orpuz	
Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	
MHz	dBuV	dB	dB	dBuV		Line	dBuV	dB	
0.165	31.58	9.82	0.05	41.45	QP	Neutral	65.21	-23.77	
0.165	10.17	9.82	0.05	20.04	Avg	Neutral	55.21	-35.17	
0.210	26.06	9.83	0.04	35.93	QP	Neutral	63.21	-27.28	
0.210	9.11	9.83	0.04	18.98	Avg	Neutral	53.21	-34.23	
0.247	20.87	9.83	0.04	30.74	QP	Neutral	61.85	-31.11	
0.247	6.06	9.83	0.04	15.93	Avg	Neutral	51.85	-35.92	
0.270	19.48	9.83	0.04	29.34	QP	Neutral	61.13	-31.79	
0.270	4.01	9.83	0.04	13.88	Avg	Neutral	51.13	-37.25	
0.292	17.33	9.83	0.03	27.19	QP	Neutral	60.47	-33.27	
0.292	3.10	9.83	0.03	12.96	Avg	Neutral	50.47	-37.50	
1.847	9.39	9.88	0.03	19.30	QP	Neutral	56.00	-36.70	
1.847	3.37	9.88	0.03	13.28	Avg	Neutral	46.00	-32.72	
0.165	31.58	9.82	0.05	41.45	QP	Neutral	65.21	-23.77	
0.165	10.17	9.82	0.05	20.04	Avg	Neutral	55.21	-35.17	
0.210	26.06	9.83	0.04	35.93	QP	Neutral	63.21	-27.28	
0.210	9.11	9.83	0.04	18.98	Avg	Neutral	53.21	-34.23	
Spec Margin = QF	P./Ave Limi	t, ± Uncertai	inty						

Combined Standard Uncertainty $U_c(y) = \pm 1.2 \text{ dB}$ Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment and transmitted at DH1 Hopping Channel. USB power port were connected to supporting equipment, Laptop.



6 Test Equipment Use List

6.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Bilog Antenna	Sunol Sciences	JB3	A020502	03/27/2018	03/27/2019
Horn Antenna	EMCO	3115	9211-3969	05/16/2017	05/16/2019
Horn Antenna	Com-Power	AHA-840	105005	05/26/2017	05/26/2019
Loop Antenna	EMCO	6502	9110-2683	07/20/2017	07/20/2019
LISN	Com-Power	LI-215	12100	01/24/2018	01/24/2019
Spectrum Analyzer	Agilent	N9038A	MY552260210	01/22/2018	01/22/2019
Spectrum Analyzer	Rohde Schwarz	ESIB40	832427/002	01/22/2018	01/22/2019
Spectrum Analyzer	Rohde Schwarz	FSV40	1321.3008K40	09/19/2017	09/19/2018
Amplifier	Sonoma Instruments	310	165516	01/23/2018	01/23/2019
Amplifier	Miteq	TTA1800-30-HG	1842452	01/23/2018	01/23/2019
Power Meter	Agilent	E4418B	MY45103902	01/24/2018	01/24/2019
Power Sensor	Hewlett Packard	8482A	1925A04647	01/24/2018	01/24/2019
Thermo Chamber	Espec	BTZ-133	0613436	05/31/2018	05/31/2019
Multimeter	Fluke	177	92780312	01/22/2018	01/22/2019
DC Power Supply	Agilent	E3634A	MY400004331	01/25/2018	01/25/2019
Notch Filter	Micro-Tronics	BRM50702	037	VBU	VBU
Signal Generator	Anritsu	MG3694A	42803	03/20/2018	03/20/2019
Signal Generator	Rohde & Schwarz	SMF100A	1167.0000K02	09/19/2017	09/19/2018
Signal Generator	Rohde & Schwarz	SMBV100A	1407.6004K02	09/19/2017	09/19/2018
Power Sensors	Rohde & Schwarz	OSP120	1520.9010.02	09/19/2017	09/19/2018
Thermo Chamber	Tenney	T30RS	10.785-19	03/01/2018	03/01/2019

VBU = verify before use.

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

7 EMC Test Plan

7.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

7.2 Customer

Table 9: Customer	r Information
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Company Name Harman International Industries, Inc				
Address	50 Waterview Drive, Suite 240			
City, State, Zip	Shelton, CT 06484			
Country	U.S.A.			

 Table 10: Technical Contact Information

Name	John Garay
E-mail	John.garay@harman.com
Phone	(203) 924-5349

7.3 Equipment Under Test (EUT)

 Table 11: EUT Specifications

EUT Specifications					
Bluetooth Package Dimensions	24.5 mm; 0.96" (L) x 13.5 mm; 0.53" (W) x 2.2 mm; 0.086" (H)				
DC Input	3.3 VDC				
Environment	Indoor				
Operating Temperature Range:	+10 to +40 degrees C				
Multiple Feeds:	☐ Yes and how many ⊠ No				
Product Marketing Name (PMN)	No5805 or No5802				
Hardware Version Identification Number (HVIN)	No5805 or No5802				
Firmware Version Identification Number (FVIN)	1.1				
Bluetooth Radio					
Operating Mode	BDR and EDR				
Transmitter Frequency Band	2402 MHz to 2480 MHz				
Operating Bandwidth	1 MHz				
Max. Power Output	7.33 dBm				
Power Setting	255 / 50 (fixed)				
Antenna Type	Chip antenna				
Antenna Gain	1.7 dBi				
Modulation Type	GFSK, $\pi/4$ -DQPSK and 8DPSK				
Data Rate	1 Mbps, 2Mbps, and 3Mbps				
 Note: 1. This report only documents the radio characteristics for 2402 - 2480 MHz bands. 2. Refer to Section 3.1 Product Description, in this report, for model differences of No5805 and No5802. 					

Table 12: Interface Specifications

Interface Type	Cabled with what type of cable?	Is the cable shielded?	Maximum potential length of the cable?	Metallic (M), Coax (C), Fiber (F), or Not Applicable?
USB (used for data communication)	USB	🖂 No	Metric: 3 m	M
USB (used to power Bluetooth)	USB	No No	Metric: 3 m	M
Note: These USB cables were use for test purposes only.				

Table 13: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	LENOVO	E440	PF-063HA6-	Setup EUT operating channel
			14/12	& Conducted Emission Test
DC Power Supply	Agilent	E3634A	MY40004331	Radiated Emission Test
Note: See Section 6 of this test report for DC power supply calibration information.				

 Table 14: Description of Sample used for Testing

Device	Serial	RF Connection	CFR47 Part 15.247
Bluetooth Module	Prototype	Integrated Antenna	Radiated Emissions
			Conducted Emissions
		Direct via SMA Connection	Transmit Power, Occupied
			Bandwidth, Out of Band Emission,
			Hopping Requirement

 Table 15: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
Bluetooth Module	Chip	Transmit	N/A	EUT upright	N/A
Note: The Bluetooth Module is located in front panel of an audio system and placed upright. All emission scans performed on the Y-Axis.					

7.4 Test Specifications

Testing requirements

Table 16: Test Specifications

Emissions and Immunity		
Standard	Requirement	
CFR 47 Part 15.247: 2018	All	
RSS-247 Issue 2, 2017	All	

END OF REPORT