

Test Report issued under the responsibility of:

ITC ENGINEERING SERVICES, INC.

CISPR32 : 2015 Class B / FCC Part 15 Class B (EMI)	
Report Reference No.....:	20170621-ITE-FCC
Date of Issue	7/14/2017
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Testing Laboratory	ITC Engineering Services, Inc.
Address	9959 Calaveras Road, Box 543, Sunol CA 94586
Applicant's Name	Osterhout Design Group
Address	153 Townsend Street, Suite 570, San Francisco, CA 94107
Contact.....	Mr. Karim ElKatcha
Phone	415-215-6833
Test Specification Standard	See Report for Details
Test Procedure	Emissions : CISPR32 : 2015 Class B / FCC Part 15 Class B (EMI)
Judgment.....	Complies as Tested
Manufacturer Logo	
Manufacturer	Osterhout Design Group
Model/Type Reference	R7 long with flex cable
Input Voltage Rating	100-240V, 50/60Hz



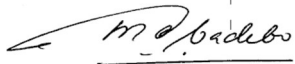
ISO/IEC 17025:2005 Accredited Laboratory

Certificate #: L2470

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1.1 TESTING LOCATION

☒ Testing Laboratory:	:	ITC Engineering Services, Inc.
Testing Location/Address	:	9959 Calaveras Road, PO Box 543, Sunol, CA 94586, USA
Prepared By (Name + Signature)	:	Benjamin Jing 
Tested By (Name + Signature)	:	Benjamin Jing
Approved By (Name + Signature)	:	Michael Gbadebo, PE 
☐ Manufacturer Facility	:	
Testing Location/Address	:	
Tested By (Name + Signature)	:	
Approved By (+ Signature)	:	
☐ 3rd Party Test Facility	:	
Testing Location/Address	:	
Tested By (Name + Signature)	:	
Approved By (+ Signature)	:	

1.2 REVISION HISTORY

#	Revision Date	Old Report Number	New Report Number	Revision
N/A	N/A	N/A	20170621-01-ITE-FCC	N/A

1.3 SUMMARY OF TESTS

ITC Engineering Services, Inc. as an independent testing laboratory, declares that the equipment specified above was tested to the requirements of:

EMISSIONS REGULATIONS: CISPR32 : 2015 Class B / FCC Part 15 Class B (EMI)

1.4 DECLARATION/DISCLAIMER

It is the manufacturer's responsibility to assure that additional production units of these models are manufactured with identical electrical and mechanical characteristics. This report is the confidential property of the applicant. As a mutual protection to our applicants, the public, and ourselves, extracts from the test report shall not be reproduced except in full without ITC Engineering Service's written approval. The applicant/manufacturer shall not use this report to claim product endorsement by any US Government agency.

1.5 CONDITION OF EUT

Equipment Under Test (EUT) was tested as it was received.

1.6 GENERAL DESCRIPTION OF EUT

EUT is a smart glasses, it offers immersive 3D HD viewing of stored or streaming video content, with stereo audio, in a static setting, or in a head orientation tracking augmented vision mode.

1.7 EUT PORTS AND CONNECTORS

Ports and connectors:

One port for I/O and DC power.

1.8 LIST OF PERIPHERALS USED DURING TEST

Description	Manufacturer	Model Name	Serial Number
Laptop PC	Apple	A1502	C02R6KEKFVH3
AC Adapter	Apple	N/A*	N/A*

1.9 GENERAL TEST REMARKS

The EUT was operated under the following conditions during the testing:

☐	Standby	☐	Test Program (H - Pattern)
☐	Test Program (Color Bar)	☐	Test Program (Applicant Specific)
☐	TV/VCR Signal Input	☐	Signal Generator Input
☐	Continuous Audio Tone (1kHz)	☐	Cycled Audio Tone (1kHz)
☐	Printer/Parallel Function	☐	Modem/Serial Function
☐	Serpentine Program with I/O	☐	Serpentine Program without I/O
☐	Practice Operation	☒	Normal Operating Mode
☐	Essential Operation (Functional Safety)	☐	Continuous Unmonitored Operation
☒	Continuous Monitored Operation	☐	Non-Continuous Operation

Does the EUT Meet the Requirements in Accordance with Technical Regulations?

☒ Meets Regulation Requirements	☐ Does Not Meet Regulation Requirements
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Does the EUT Fulfill the Customer's Requirements?

☒ Fulfills the customer's requirements	☐ Does Not fulfill the customer's requirements
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2 EMISSIONS TESTS PER CISPR 32 :2015 CLASS B /FCC PART 15.209

2.1 RADIATED EMISSIONS PER CISPR 32/ FCC CLASS B

The EUT was placed on a wooden turntable 80 cm above a ground reference plane in the Semi-Anechoic Chamber. The EUT was then powered on and placed in an operational mode. Radiated emissions were monitored from 30MHz to 6GHz using antennas placed ten meters from the EUT. The antennas were oriented in both horizontal and vertical polarizations and were elevated from one to four meters while the unit was rotated and monitored. The results were recorded.

2.1.1 ADMINISTRATIVE AND ENVIRONMENTAL DETAILS

Site Used:	Semi-Anechoic Chamber
Test Date:	7/14/2017
Test Engineer:	Benjamin Jing
Temperature:	27°C
Humidity:	43 %

2.1.2 TEST EQUIPMENT

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date
Biconical Antenna	EMCO	3104	3459	1/09/2018
L. P. Antenna	EMCO	3146	1596/1001	5/23/2018
Horn Antenna	EMCO	3115	11966E	2/03/2018
EMC Analyzer	Agilent	E7405A	US40240257	7/16/18
DRGH Antenna	AH Systems	SAS-571	587	10/14/2017
Pre-amplifier	Agilent	83051A	9010	CNR*
Power Supply	Hewlett Packard	87422A	3234A00895	CNR*

*CNR – Calibration Not Required

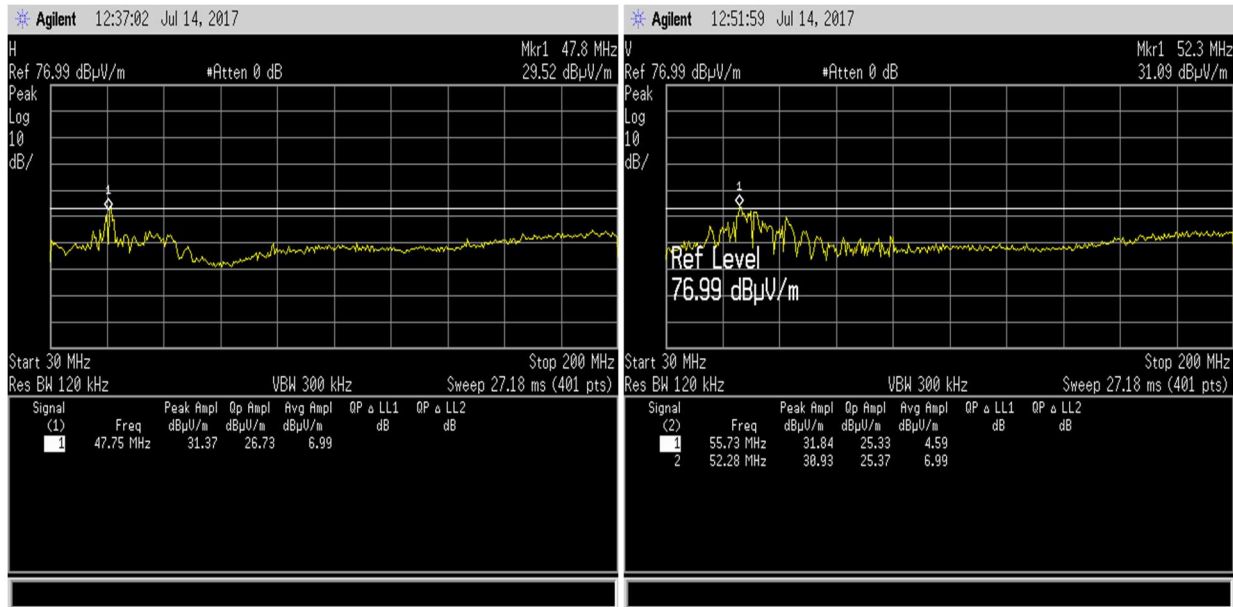
2.1.3 TEST RESULTS

The EUT meets the requirements of the test for Radiated Emissions.

2.1.4 MEASUREMENT UNCERTAINTY

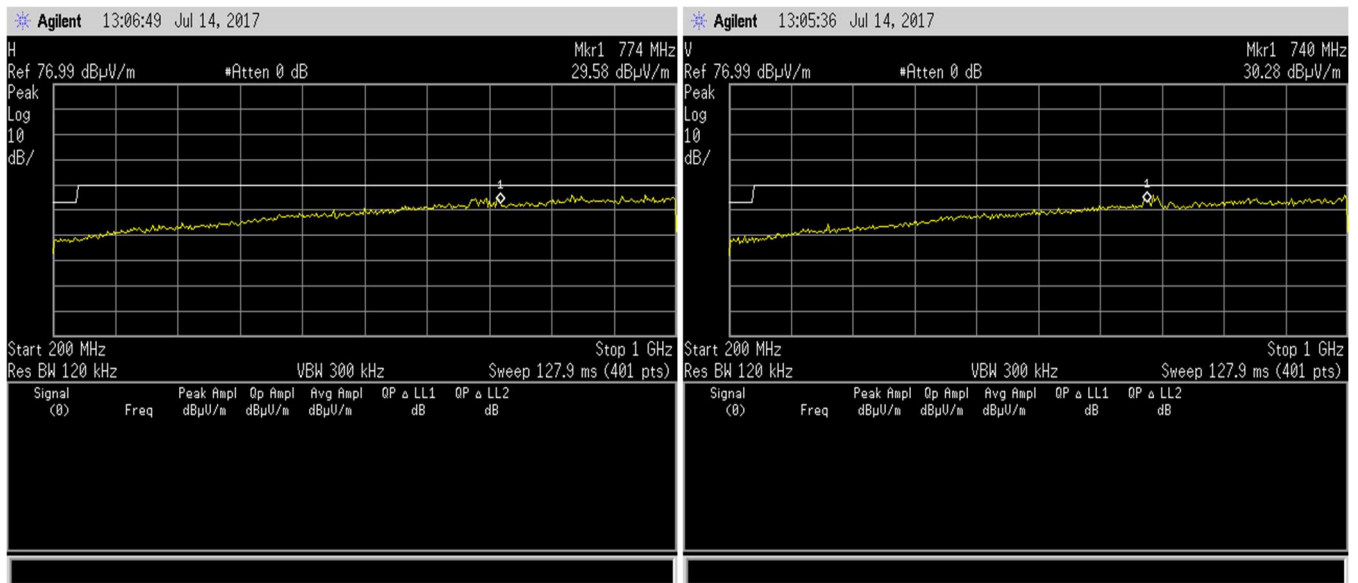
UNCERTAINTY OF RADIATED EMISSIONS MEASUREMENT – 30MHz THROUGH 1 GHz					
	Uncertainty Contribution	Value	Data Source	Prob. Dist.	Divisor
1	Antenna (Bi-conical / Log Periodic)	± .82	Cal. Lab	Normal	$k = 2$
2	Cable loss /Attenuator	± 0.5	Historical record	Normal	$k = 1$
3	Receiver/SA Specification	± 2.3	Mfg. Spec.	Rectangular	1.73
4	Mismatch	± 0.5	Historical record	"U"	1.41
5	Site Corrections: Site Imperfections:	± 4.0	Site Atten. Data	Triangular	2.45
6	Separation Distance: at 3m	± 0.2	Site Atten. Data	Rectangular	1.73
7	Combined Standard Uncertainty $u_c(y)$	±2.62		Normal	
8	Expanded Uncertainty U	±4.47		Normal	$k = 2$
Combined Standard Uncertainty Calculation $(y) = [(.82/2)^2 + (0.5/1)^2 + (2.3/1.73)^2 + (0.5/1.41)^2 + (4.0/2.45)^2 + (0.2/1.73)^2]^{1/2} = (0.168 + 0.25 + 1.77 + 0.126 + 2.65 + 0.013)^{1/2} = 2.622$ $(u_c(y)) = U_{lab} = \pm 5.24$					

2.1.5 TEST DATA



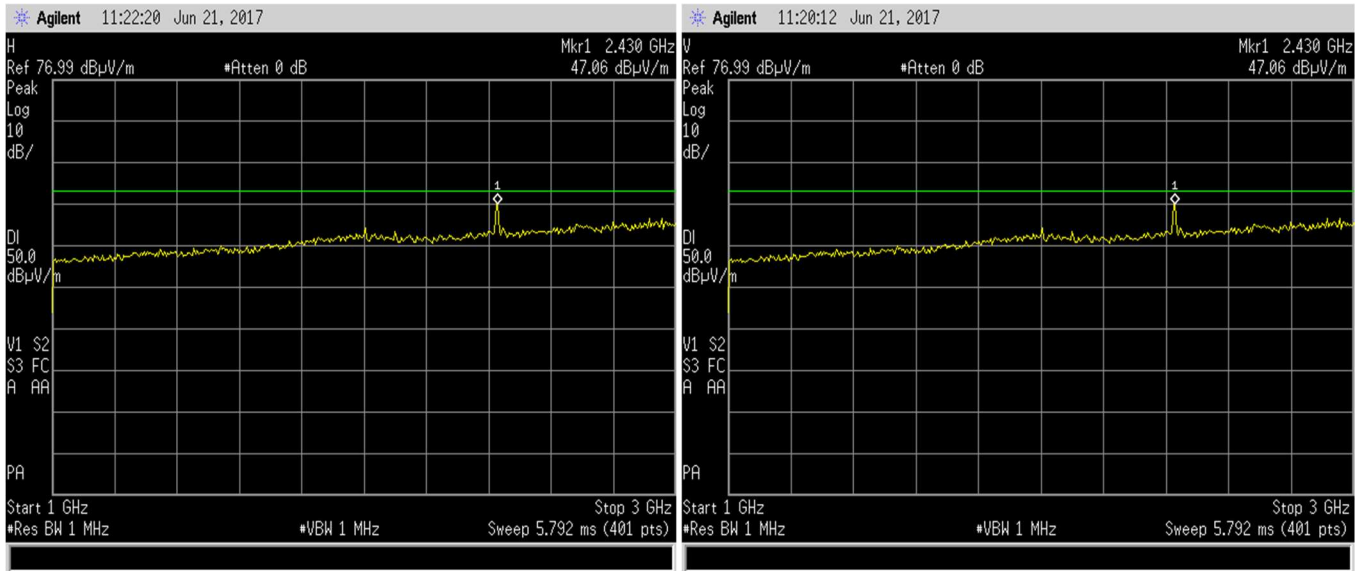
30 – 200MHZ HORIZONTAL

30 – 200MHZ VERTICAL



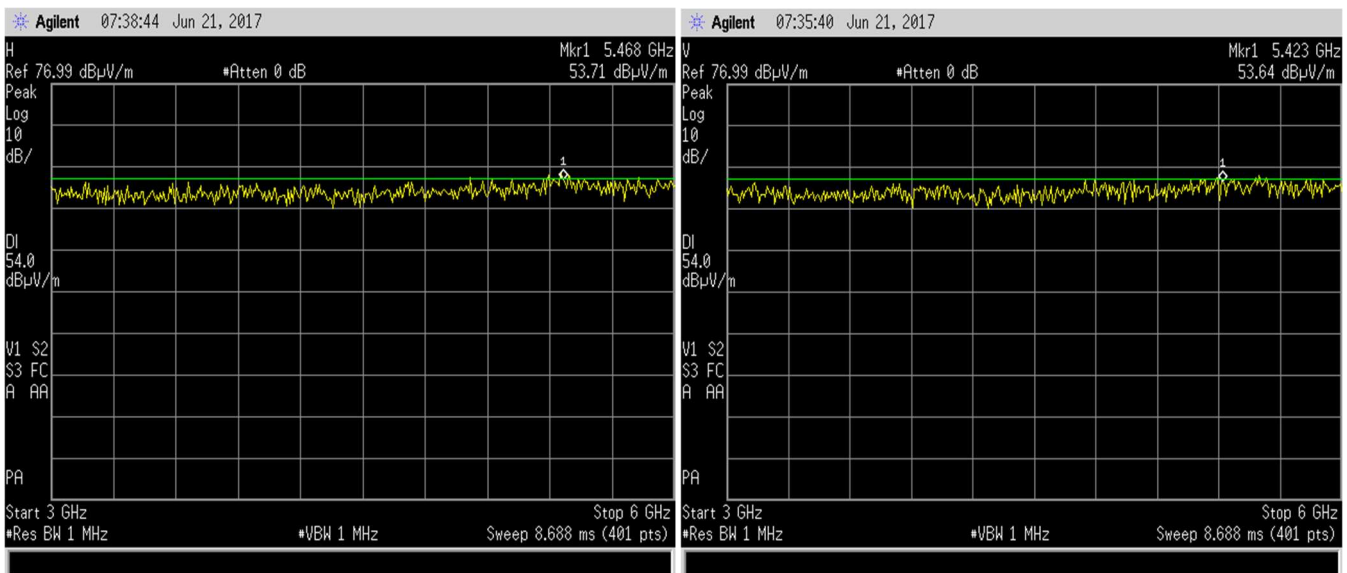
200MHZ – 1G HORIZONTAL

200MHZ – 1GHZ VERTICAL



1 - 3 GHZ HORIZONTAL

1 - 3 GHZ VERTICAL

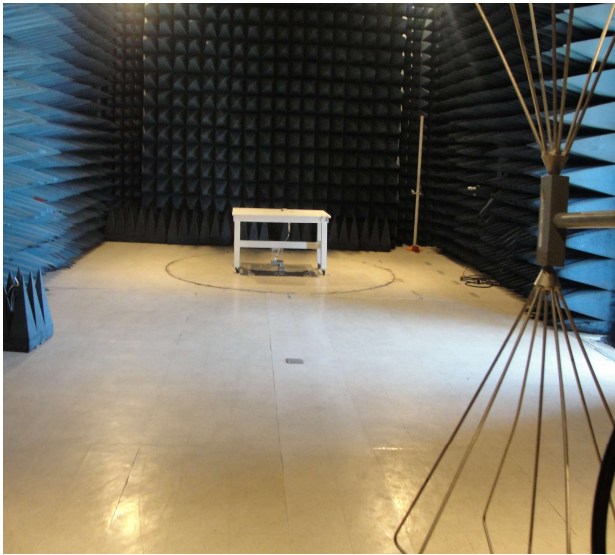
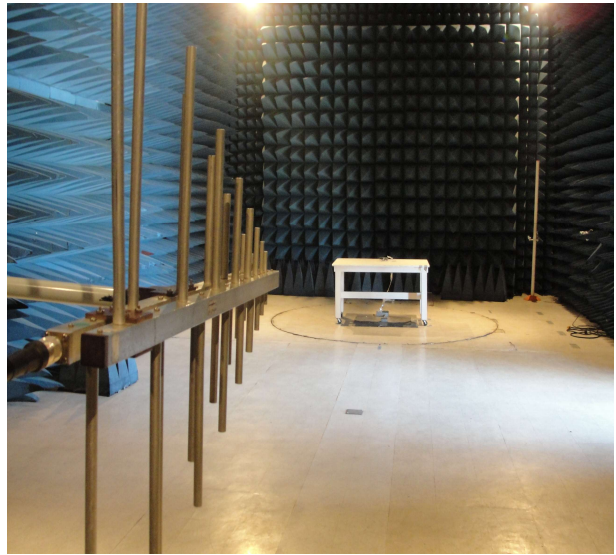
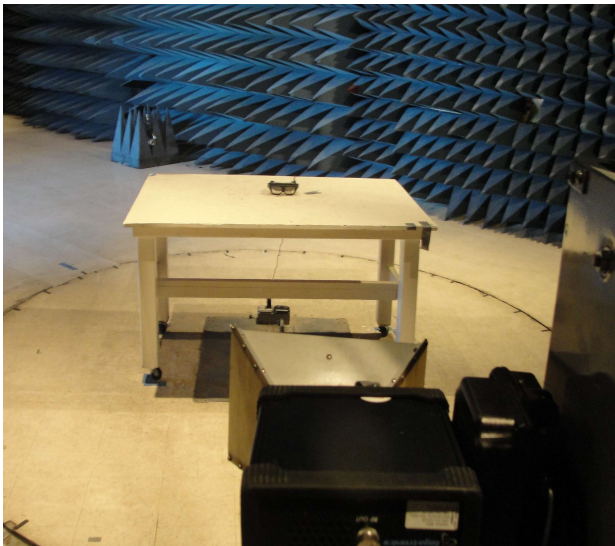
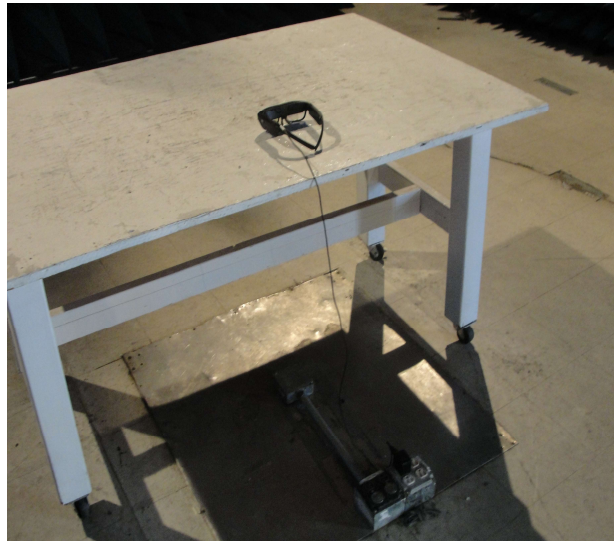


3 - 6 GHZ HORIZONTAL

3 - 6 GHZ VERTICAL

Note :

- 1) For above 1 GHz, the limit lines of these plots are CISPR32 Class B average limits, and peak detector is set. If peak data is below average limit, no average measurement is required.
- 2) The levels of the radiated spurious emissions above 6 GHz are too low to be tested. .

2.1.6 TEST SETUP PHOTO**Set-up for 30 – 200 MHz Radiated Emission****Set-up for 0.02 – 1 GHz Radiated Emission****Set-up for > 1 GHz Radiated Emission****Set-up View on Turn-table**

2.2 CONDUCTED EMISSIONS PER CISPR 32 :2015 /FCC PART 15 CLASS B

The EUT was placed on the table in Test Lab 2A and 80 cm away from the grounded vertical reference plane. The power supplied to the EUT was provided through a LISN (Line Impedance Stabilization Network) and any excess power cord was looped into figure "8" between the LISN and the EUT. The EUT was powered on and placed in an operational mode. The line conducted tests were performed on both the hot and neutral lines and the emissions recorded.

2.2.1 ADMINISTRATIVE AND ENVIRONMENTAL DETAILS

Site Used:	EMC Lab 2A
Test Date:	6/21/2017
Test Engineer:	Benjamin Jing
Temperature:	28°C
Humidity:	43 %
Test Voltage 1:	120 V~, 60 Hz

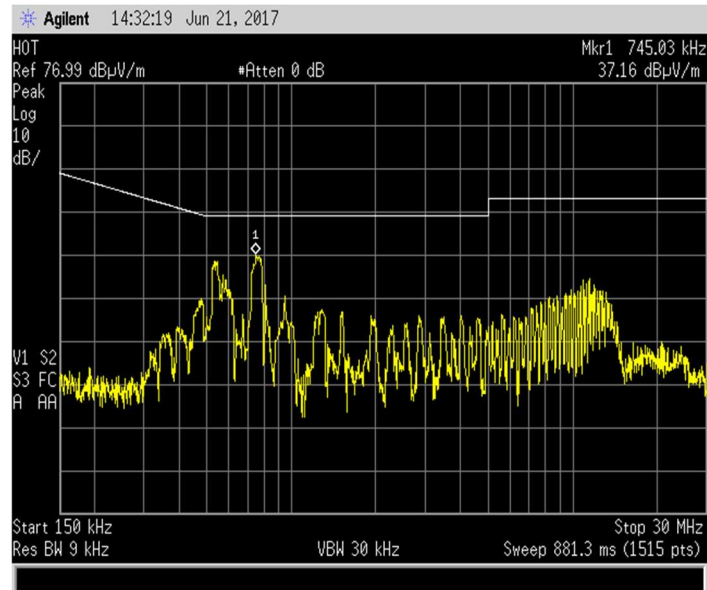
2.2.2 TEST EQUIPMENT

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date
EMC Analyzer	Agilent	E7405A	US40240257	1/09/2018
Power Source	California Instruments	1251R	LO5211	VBU*
LISN (25 Amp)	EMCO	3825/2	8901-1447	7/21/2017

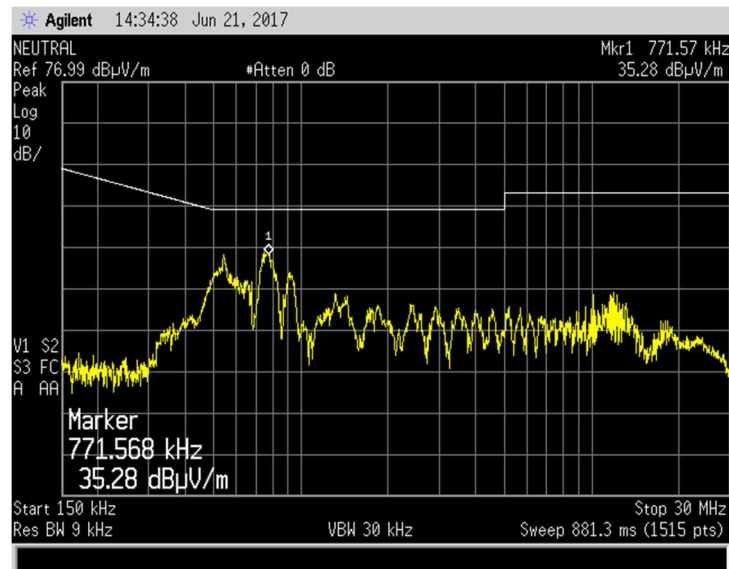
2.2.3 TEST RESULTS

The EU meets the requirements of the test for Conducted Emissions per CISPR32/FCC Part15 CLASS B.

2.2.4 TEST DATA



HOT LINE CONDUCTED EMISSIONS



NEUTRAL LINE CONDUCTED EMISSIONS

2.2.5 MEASUREMENT UNCERTAINTY

UNCERTAINTY OF CONDUCTED EMISSIONS MEASUREMENT – 150KHz THROUGH 30MHz					
	Uncertainty Contribution	Value	Data Source	Prob. Dist.	Divisor
1	Cable and Attenuator Calibration	± 0.5	Historical Data	Normal	$k = 1$
2	Receiver/SA specification	± 2.0	Mfg. Spec.	Rectangular	1.73
3	Receiver Corrections:		Mfg. Spec.		
	Sine Wave Voltage	±0.55		Normal	$k = 2$
	Pulse Amplitude Response	± 1.5		Rectangular	1.73
	Pulse Repetition Rate Response	± 0.75		Rectangular	1.73
4	LISN coupling specification	± 2.0	Cal. Lab.	Normal	$k = 2$
5	Mismatch	± 0.26	Estimation	"U"	1.41
6	Combined Standard Uncertainty $u_c(y)$	± 1.91		Normal	
7	Expanded Uncertainty U	± 3.82		Normal	$k = 2$
Combined Standard Uncertainty Calculation: $u_c(y) = [(0.5/1)^2 + (2.0/1.73)^2 + (0.55/2)^2 + (1.5/1.73)^2 + (0.75/1.73)^2 + (2.0/2)^2 + (0.26/1.41)^2]^{1/2}$ $= (0.25 + 1.34 + .076 + .75 + 1 + .034)^{1/2} = 1.91$ $2(u_c(y)) = U_{lab} = \pm 3.82$					

2.2.6 CONDUCTED TEST SETUP



AC Line Conducted Emission Test Set-up

3 APPENDIX

Manufacturer:	Osterhout Design Group		
General Description:	The Equipment Under Test (EUT), the R-7 Smart Glasses, offers immersive 3D HD viewing of stored or streaming video content, with stereo audio, in a static setting, or in a head orientation tracking augmented vision mode.		
Model:	R7 with long flex cable		
Serial Number of EUT:	-		
AC Adaptor Rated Voltage:	100-/240 V~,50/60Hz		
EUT Voltage:	5 Vdc		
Cable Type:	Power Cable	Cable Length: 3ft	Shielded ☐ Unshielded ☒

3.1 MODIFICATION LETTER

No modifications were done to the EUT during testing.

To Whom It May Concern:

The EUT, Smart Glasses described in this report was tested to the requirements of the standard below.

Standards EUT was tested to:

CISPR32 : 2015 Class B / FCC Part 15 Class B

Emissions Test Methods:

CISPR 32 : 2015 Class B

For further information, please contact the manufacturer at:

Osterhout Design Group
153 Townsend Street, Suite 570, San Francisco, CA 94107

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