Test Report Issued Under the Responsibility of:

ITC ENGINEERING SERVICES, INC.

FCC CFR Title 47 Part 15 Subpart C 15.205, 15.209, 15.247	
Report Reference No. ..... :	20151015-01 Reticle_Speed_Mouse_FCC
Date of Issue ..... :	12/16/2015
Total Number of Pages ..... :	27
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 USA 94107
Contact ..... :	Mr. Brian Donnelly
Phone ..... :	415-644-4000
Fax ..... :	415-644-4039
Test Specification Standard ..... :	FCC CFR Title 47 Part 15 Subpart C 15.205, 15.209, 15.247
Test Procedure ..... :	KDB 558074 D01 DTS Meas Guidance v03r04 &ANSI C63.4:2009, ANSI C63.10:2009 (Test Procedures)
Judgment ..... :	Complies as Tested
Test Item Description ..... :	Bluetooth Smart (No EDR) Finger Controller for R-7 Glasses
Manufacturer Logo ..... :	ODG
Manufacturer ..... :	Osterhout Design Group
Model/Type Reference ..... :	Reticle Speed Mouse
RF Operating Frequency Band ..... :	2.402- 2.48 GHz

ACCREDITED
TESTING CERT #3382.01

ISO/IEC 17025:2005 Accredited Laboratory

Table of Contents

LIST OF FIGURES

1 DOCUMENTATION

1.1 Testing Location

☒ ITC Testing Laboratory:	:	ITC Engineering Services, Inc.
Testing Location/Address	:	9959 Calaveras Road, PO Box 543, Sunol, CA 94586, USA
Prepared By (Name + Signature)	:	Shane Duncan
Tested By (Name + Signature)	:	Shane Duncan
Approved By (Name + Signature)	:	Michael Gbadebo, P.E.
☐ 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 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.

1.3 Revision History

#	Revision Date	Revision
1	01/15/2016	Tested radiated emissions at middle low and high frequency page 10 Tested Radiated spurious emissions and restricted emissions from 2.31-2.39 GHz and 2.4835-2.5 GHz page 21

1.4 Condition Of EUT

Equipment Under Test (EUT) was tested as it was received. The radiated mode tests utilize the EUT internal antenna. For the conducted mode tests, the internal antenna was bypassed and an RF cable was connected from the PCB to the spectrum analyzer. The EUT Bluetooth radio was software controllable using a laptop.

1.5 General description of EUT

Product	Reticle Speed Mouse
Model No.	RSM-D05
Power Supply	Removable rechargeable Lithium Polymer battery
I/O Ports	Battery terminal, custom
Operating Frequency Range	2.402- 2.48 GHz
Bluetooth Smart	
FCC ID	2ADCMRSM1
Modulation Type	GFSK, (250 kbps), (1 Mbps), (2 Mbps)
Modulation Technology	FHSS
Transfer Rate	250kbps, 1Mbps, 2Mbps
Number of Channels	40
Maximum Output Power	0 dBm typ.
Antenna	
Antenna Type	Ultra miniature chip antenna
Antenna Gain, Peak	1 dBi peak, -1.5 dBi average
Radiation Pattern	Omni

1.6 Operational description of EUT

The Reticle Speed Mouse is a HID intended to work exclusively with the ODG R-7 Smart Glasses platform to control all functions without physical interaction with the head-mounted eyewear.

1.7 List of Applicant Peripheral/Supporting Equipment Used During Test

Description	Manufacturer	Type	Serial Number
Laptop	Apple	MacBook Pro	Not Accessible
AC Adapter	Apple	Standard	Not Provided

1.8 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

The requirements according to the technical regulations are:

☒	Met	☐	Not Met

The Equipment Under Test does:

☒	Fulfill the general approval requirements	☐	Not fulfill the general approval requirements

1.9 Summary of Tests

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

Section of FCC Title 47 CFR	Test Description	Result
15.209	Radiated Emissions, general	Passed
15.207	Conducted Emissions	Passed
15.247 (a)(2)	6 dB Bandwidth	Passed
15.247 (b)(3)	Peak Conducted Output Power	Passed
15.247 (e)	Power Spectral Density	Passed
15.247 (d)	Band-Edge Measurement	Passed
2.1049 (h)	Occupied Bandwidth	Passed
15.247 (a)(1)	Time of Occupancy	Passed
15.209/.205	Conducted Spurious & Restricted Band Emissions	Passed
15.247 (b)(4)	Gain of Transmission Antenna	Passed

1.10 Measurement Uncertainty

The measurement of uncertainty levels were estimated based on calculation in accordance with TR 100-028-1. Using the value k = 2 for expanded uncertainty, this provides a 95% level of confidence.

	Measurement Method	Calculated Uncertainty (dB)
1	RF Power, Conducted	± 1.5
2	Radiated emission of transmitter (30MHz - 1 GHz) @ 3m	± 3.2
3	Radiated emission of transmitter (1 - 25 GHz) @ 3m	± 2.5

1.11 Test Set up Photos

Figure 1: Conducted RF Test Setup

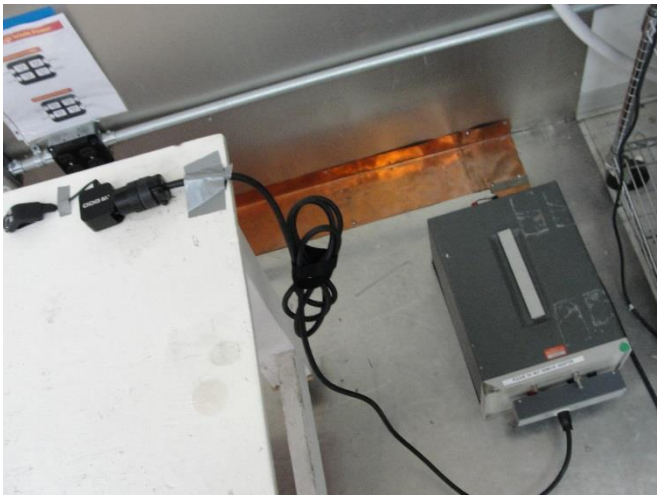


Figure 2: Conducted Emission Test Setup (Side View)

Figure 3: Conducted Emission Test Setup (Front View)

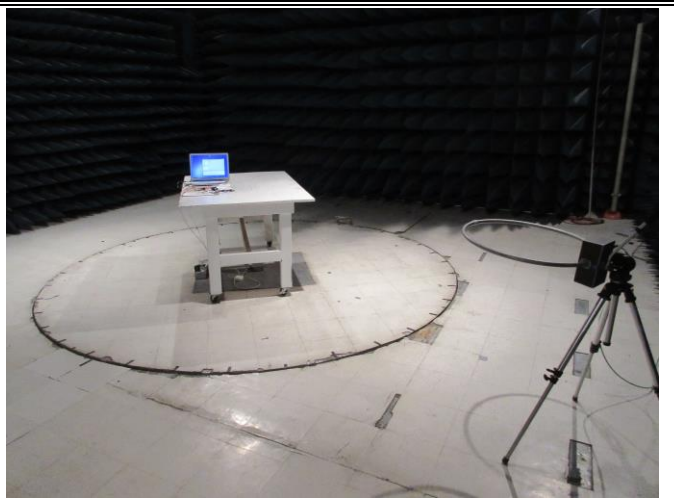


Figure 4: RE Test Setup - Active Loop Antenna

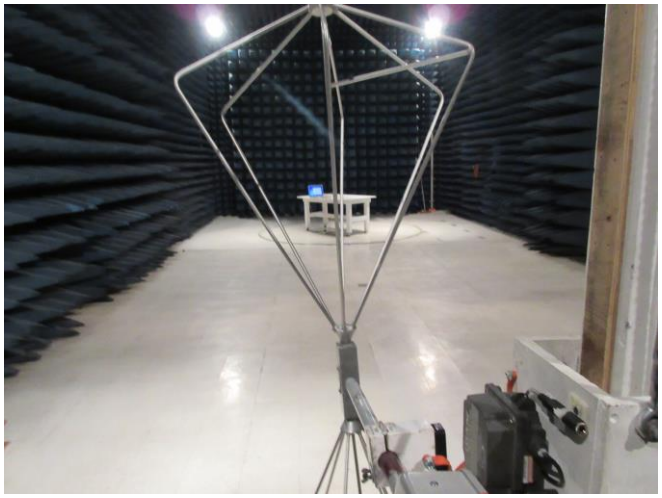


Figure 5: RE Test Setup – Biconical

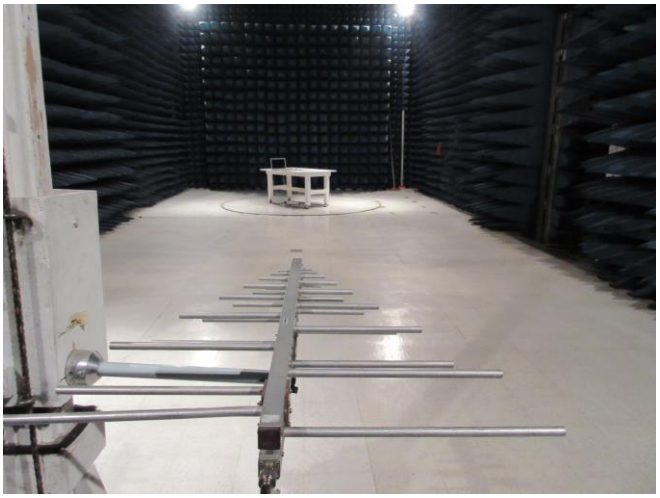


Figure 6:RE Test Setup- Log Periodic

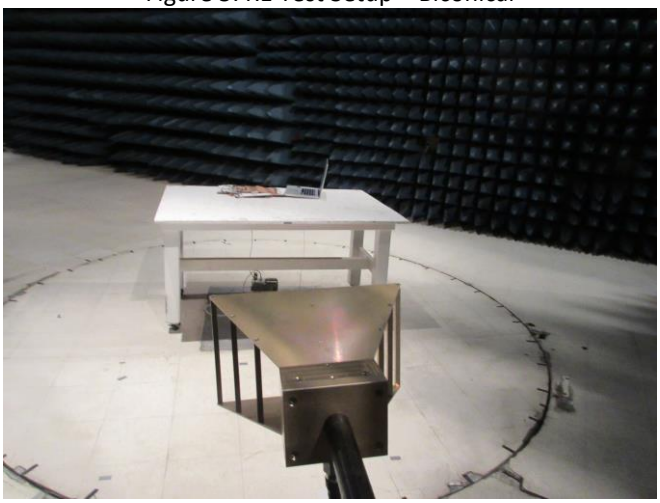


Figure 7: RE Test Setup – DRG Horn(1-18 GH)

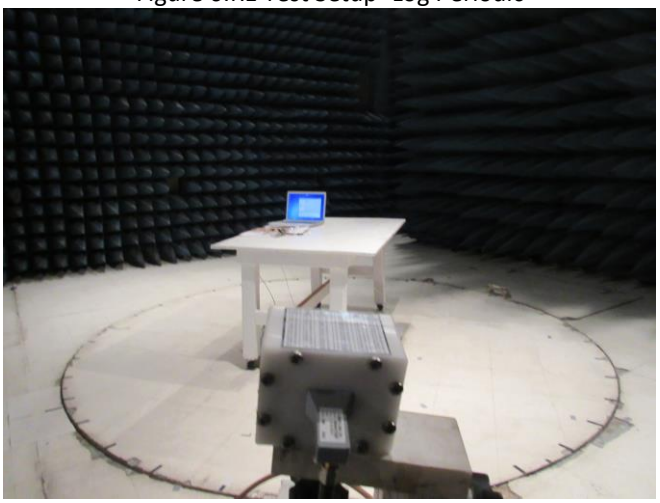


Figure 8:RE Test Setup- Horn(18-25 GHz)

2 RADIATED EMISSIONS PER FCC PART 15.209

2.1 Administrative and Environmental Details

Site Used:	Semi-Anechoic Chamber
Test Date:	11/13/15, 1/17/16
Test Engineer:	Shane Duncan
Temperature	21°C
Humidity:	48%

2.2 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
EMC Analyzer	Agilent	E7405A	US40240257	7/16/16	2 yr
Active Loop Antenna	EMCO	6502	1071/1001	10/14/16	2 yr
Bi-Conical Antenna	EMCO	3104	3459	10/14/16	2 yr
Log Periodic Antenna	EMCO	3146	9510-4202	6/16/16	2 yr

2.3 Test Set up Photo(s)

Refer to Figures 4-6.

2.4 Limits/Requirements

Frequency (MHz)	Field strength Average (µV/m)	Field strength Average (dBµV/m)	Field strength Peak (dBµV/m)	Measurement distance (m)	Average Limit @ 3m (dBµV/m)	Peak Limit @ 3m (dBµV/m)
0.009-0.49	267 – 4.9 **	48.5 - 13.8	68.5 – 33.8	300*	88.5 – 53.8	108.5 – 73.8
0.49-1.705	49 – 14.1 ***	33.8 - 23	53.8 - 43	30*	53.8 - 43	73.8 - 63
1.705-30	30	29.5	49.5	30*	49.5	69.5
30-88	100	40	60	3	-	-
88-216	150	43.5	63.5	3	-	-
216-960	200	46	66	3	-	-
Above 960	500	54	74	3	-	-

*Measurement performed at 3m per 47 CFR 15.31 (f)(2) distance scaling factor.
** 2400/F(kHz)
*** 24000/F(kHz)

2.5 Test Description and Procedure

The EUT was placed on a non-conducting table whose surface is 80 cm above the ground plane. The table may be rotated in order to maximize the signal received by the measurement system. RF emissions from 9 kHz to 1 GHz are received by a series of antennas. The active loop is 3 m away and the biconical, and log-periodic are located 10 m away from the EUT. The elevation of the antennas above the ground plane is adjusted (1-4 m) for maximum signal, except for the active loop which is fixed at 1m. Both horizontally and vertically polarized signals are detected and recorded. Data presented below represents worst case signal levels.

2.6 Test Data Tables

9 KHz-30MHz Radiated Emissions

Transmit Freq (MHz)	Freq (MHz)		Peak Emission (dBuV/m)		Average (dBuV/m)		Quasi-Peak (dBuV/m)		Result	Limit (dBuV/m)
	H	V	H	V	H	V	H	V		
2402	10.1	10.1	30.22	34.41	6.99	6.99	30.22	34.41	Passed	43
2446	28.47	28.61	43.87	37.07	39.75	31.06	37.88	32.32	Passed	43
2480	28.62	28.63	42.07	37.37	39.84	31.54	37.46	32.10	Passed	43

30-200 MHz Radiated Emissions

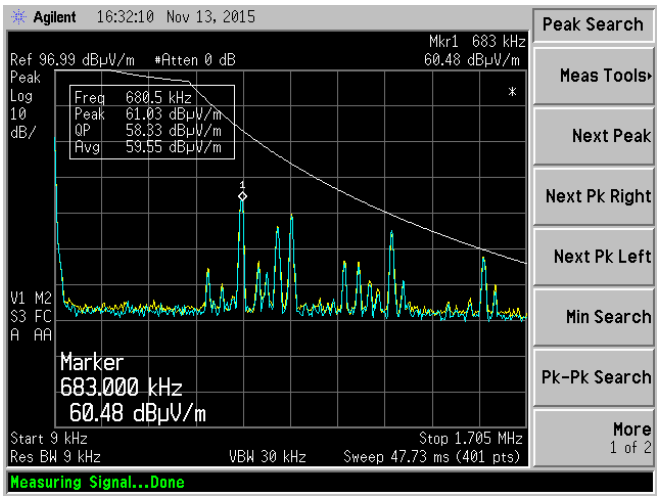
Transmit Freq (MHz)	Freq (MHz)		Peak Emission (dBuV/m)		Average (dBuV/m)		Quasi-Peak (dBuV/m)		Result	Limit (dBuV/m)
	H	V	H	V	H	V	H	V		
2402	98.01	79.31	22.81	27.67	17.25	6.99	22.74	18.77	Passed	30
2446	196.3	191.2	15.84	15.58	6.99	6.99	9.67	9.3	Passed	30
2480	186.9	42.62	16.04	9.253	6.99	6.99	9.36	21.15	Passed	30

200-1000 MHz Radiated Emissions

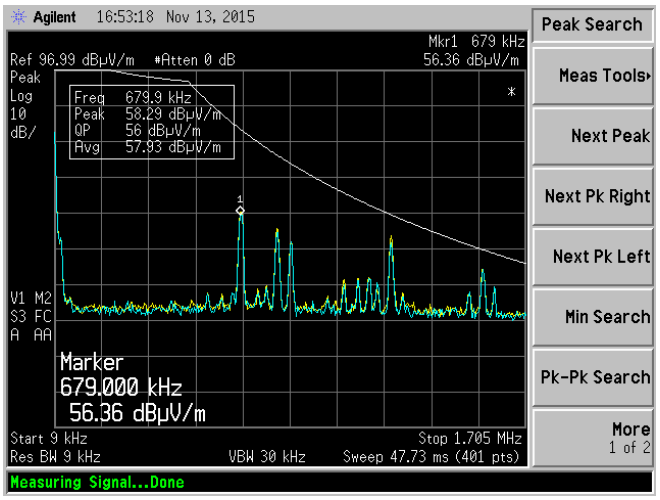
Transmit Freq (MHz)	Freq (MHz)		Peak Emission (dBuV/m)		Average (dBuV/m)		Quasi-Peak (dBuV/m)		Result	Limit (dBuV/m)
	H	V	H	V	H	V	H	V		
2402	864	506.3	32.81	31.55	6.99	22.1	27.16	6.99	Passed	37
2446	891.3	891.3	30.22	29.82	19.07	15.68	27.12	26.48	Passed	37
2480	692.3	891	31.76	29.06	15.88	17.33	27.65	26.04	Passed	37

NOTE: H MEANS HORIZONTAL AND V MEANS VERTICAL ANTENNA POLARIZATIONS

2.7 Test Data Plots

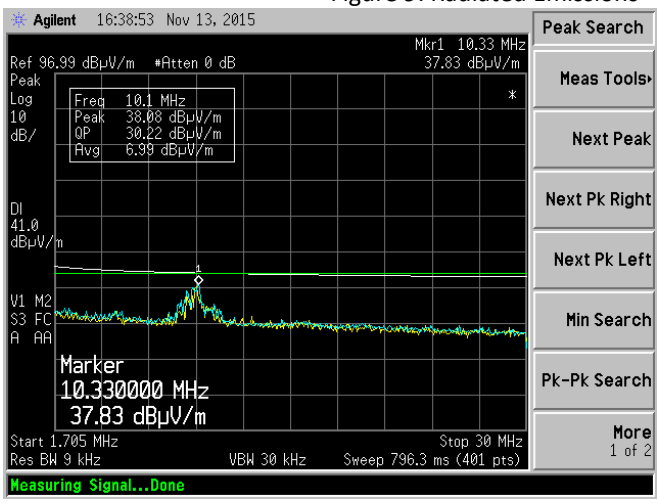


a) Horizontal polarization Ch.0 Shown(22 &39 similar)

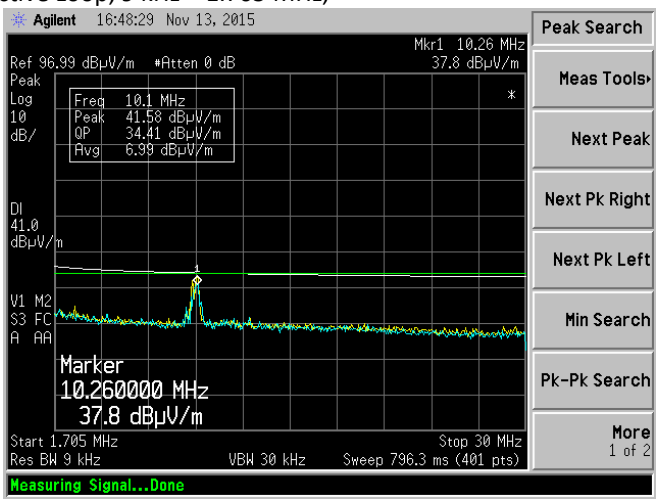


b) Vertical polarization Ch.0 Shown(22 &39 similar)

Figure 9: Radiated Emissions – Active Loop, 9 kHz – 1.705 MHz,

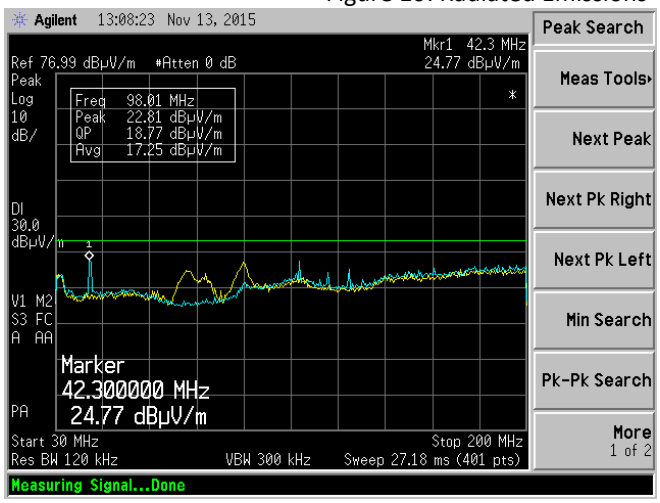


a) Horizontal polarization Ch.0 Shown(22 &39 similar)

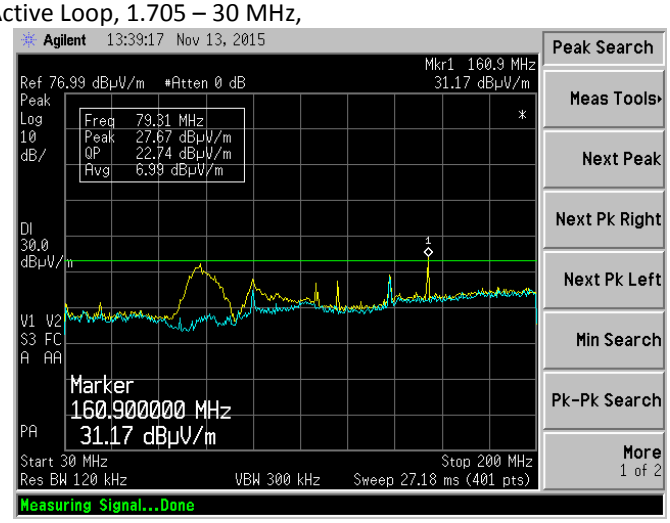


b) Vertical polarization Ch.0 Shown(22 &39 similar)

Figure 10: Radiated Emissions – Active Loop, 1.705 – 30 MHz,

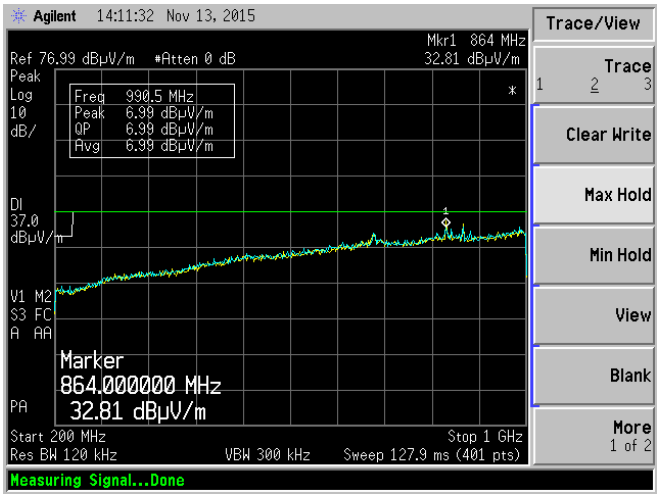


a) Horizontal Polarization CH.0 SHOWN (22 &39 SIMILAR)

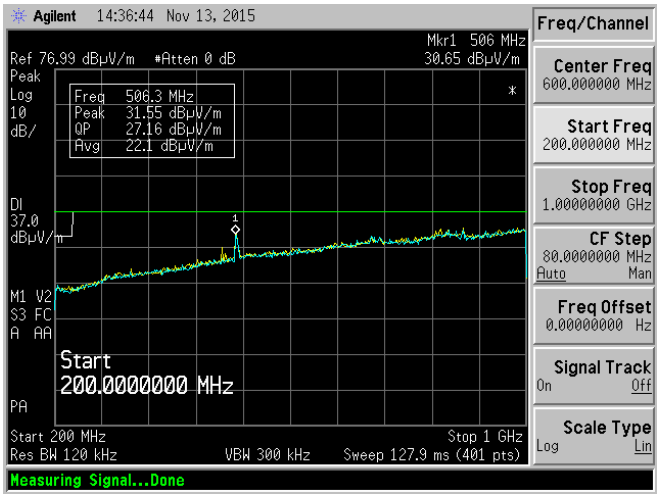


b) Vertical Polarization CH.0 SHOWN (22 &39 SIMILAR)

Figure 11: Radiated Emissions – Biconical Antenna,



a) Horizontal Polarization CH.0 SHOWN (22 &39 SIMILAR)



b) Vertical Polarization CH.0 SHOWN (22 &39 SIMILAR)

Figure 12: Radiated Emissions – Log Periodic Antenna,

3 CONDUCTED POWER LINE EMISSIONS PER FCC PART 15.207– BLUETOOTH SMART

3.1 Administrative and Environmental Details

Site Used:	EMC Lab 2A
Test Date:	11/10/15
Test Engineer:	Shane Duncan
Temperature	23°C
Humidity:	33%

3.2 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
EMC Analyzer	Agilent	E7405A	US40240257	7/16/16	2 yr
LISN	EMCO	3825/2	8901-1229	10/15/16	2 yr

3.3 Test Set up Photo(s)

Refer to Figure 1.

3.4 Limits/Requirements

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

3.1 Test Description and Procedure

The EUT was placed in a shielded room 80 cm above the horizontal ground reference plane and 40 cm away from the vertical ground reference plane. AC mains input to the DC charging adapter was supplied through a LISN (Line Impedence Stabilization Network) and the excess power cord was looped into Figure “8” above the LISN. The 5Vdc output of the charging adapter was supplied to the EUT. The line conducted tests were performed on the AC mains hot and neutral lines.

3.2 Test Data Plots

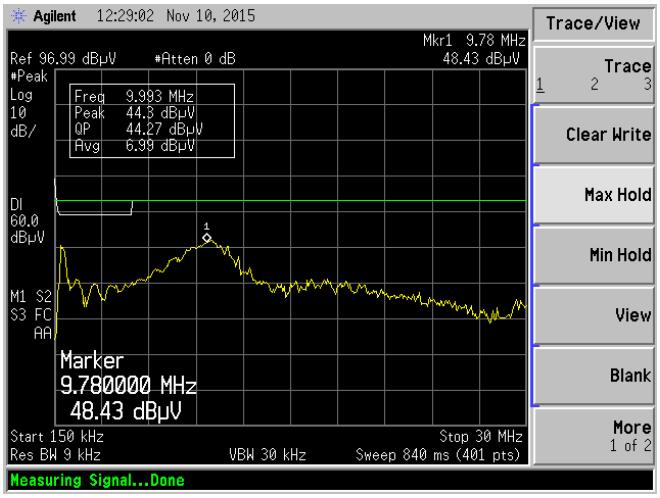


Figure 13: Conducted Emissions Test Data 60 Hz Hot 0.15-30 MHz

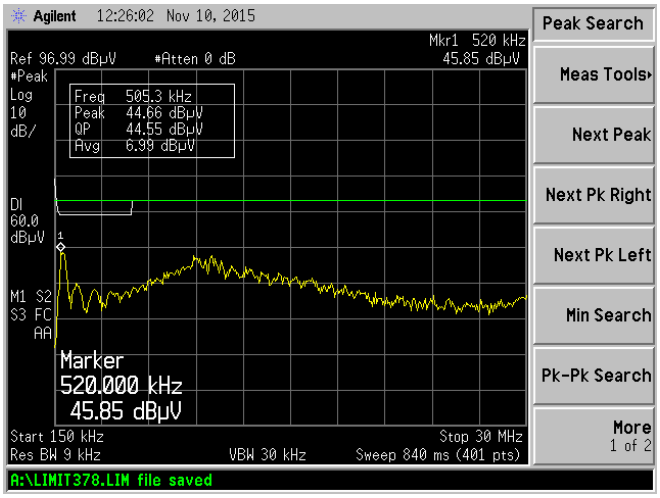


Figure 14: Conducted Emissions Test Data 60 Hz Neutral 0.15-30 MHz

4 MINIMUM 6 DB BANDWIDTH PER FCC PART 15.247 (A)(2) – BLUETOOTH SMART

4.1 Administrative and Environmental Details

Site Used:	EMC Lab 2A
Test Date:	11/04/15, 11/19/15
Test Engineer:	Shane Duncan
Temperature	21°C
Humidity:	48%

4.2 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
CSA Spectrum Analyzer	Agilent	N1996A	MY45371881	01/05/18	2 yr

4.3 Test Set up Photo(s)

Refer to Section Figure1.

4.4 Limits/Requirements

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

4.5 Test Description and Procedure

The EUT is connected to the spectrum analyzer by opening the connection to the internal chip antenna and attaching a suitable patch cable. The minimum 6dB bandwidth is determined by measuring the width of the carrier signal between the lowest frequency and the highest frequency of the carrier signal where the level is 6dB below the maximum signal power. The EUT is set to transmit single channel, modulated and maximum controlled power output. The test is performed at or near the low, mid and high channel of the operating band.

4.6 Test Data Results

channel	frequency	gfsk	Results
0	2402	0.650	Pass
22	2446	0.637	Pass
39	2480	0.662	Pass

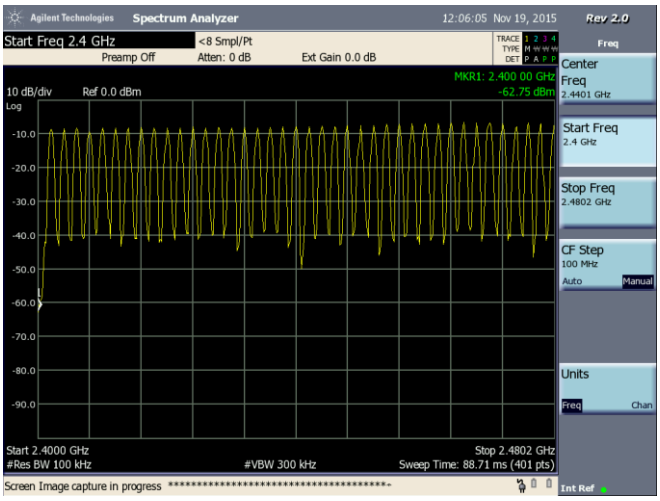


Figure 15: Bluetooth Smart Channels (40)

4.7 6 dB Bandwidth measurement plots

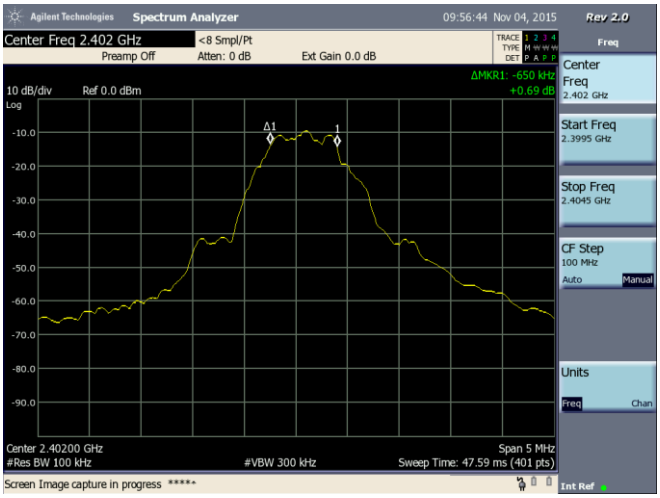


Figure 16: 6dB GFSK bandwidth (Ch0 shown, Ch22 & 39 similar)

4.8 Carrier Frequency separation Plot

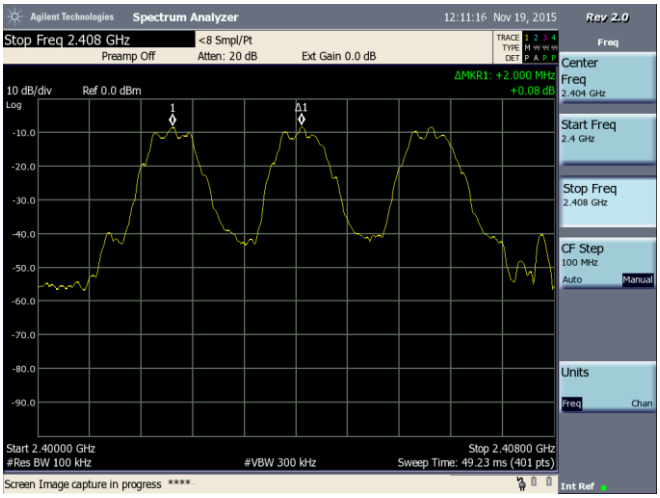


Figure 17: GFSK Carrier Frequency Separation 2 MHz (Ch0, 1 & 2)

5 PEAK CONDUCTED OUTPUT POWER PER FCC PART 15.247 (B)(3) – BLUETOOTH SMART

5.1 Administrative and Environmental Details

Site Used:	EMC Lab 2A
Test Date:	11/04/15
Test Engineer:	Shane Duncan
Temperature	23°C
Humidity:	41%

5.2 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
CSA Spectrum Analyzer	Agilent	N1996A	MY45371881	01/05/18	2 yr

5.3 Test Set up Photo(s)

Refer to Figure 1.

5.4 Limits/Requirements

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

5.5 Test Description and Procedure

The EUT is connected to the spectrum analyzer by opening the connection to the internal chip antenna and attaching a suitable patch cable. The maximum peak conducted output power was measured at the center peak of the selected channel. Measurements are performed at each of the low, mid and high frequencies in the band.

5.6 Test data Tables

Channel	Freq.(MHz)	MPP (dBm)	CPP (dBm)	Margin = 30 - CPP (dB)	Result
0	2402	-9.4	-7.4	37.4	Passed
22	2446	-8.74	-6.74	36.74	Passed
39	2480	-8.68	-6.68	36.68	Passed

MPP = Measured Peak PowerCPP = Corrected Peak Power = MPP + Cable Loss (2 dB)

5.7 Peak Power Plots

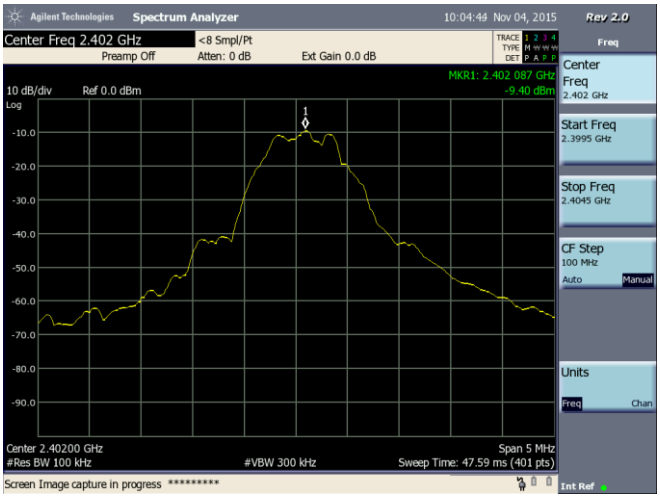


Figure 18: GFSK Peak Power (Ch0 shown, Ch22 & 39 similar)

6 POWER SPECTRAL DENSITY PER FCC PART 15.247 (D) – BLUETOOTH SMART

6.1 Administrative and Environmental Details

Site Used:	EMC Lab 2A
Test Date:	11/04/15
Test Engineer:	Shane Duncan
Temperature	23°C
Humidity:	41%

6.1 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
CSA Spectrum Analyzer	Agilent	N1996A	MY45371881	01/05/18	2 yr

6.1 Test Set up Photo(s)

Refer to section Figure1.

6.2 Limits/Requirements

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 30 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

6.3 Test Description and Procedure

The EUT is connected to the spectrum analyzer by opening the connection to the internal chip antenna and attaching a suitable patch cable. The spectrum analyzer power spectral density measurement function is performed at each of the low, mid and high frequencies in the band.

Channel	Freq.(MHz)	MPSD (dBm/30 kHz)	CPSD (dBm/30 kHz)	Margin = 8 - CPSD (dB)	Result
		gfsk	gfsk	gfsk	
0	2402	-13.84	-11.84	19.84	Passed
22	2446	-13.5	-11.5	19.5	Passed
39	2480	-12.62	-10.62	18.62	Passed

PSD = Measured Power Spectral Density CPSD = Corrected Power Spectral Density = MPSD + Cable Loss 2 dB

6.4 Power spectral density Plots

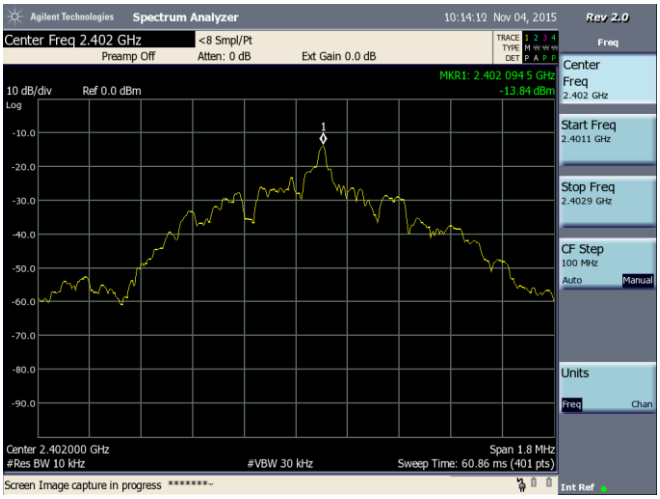


Figure 19: GFSK Power Spectral Density (Ch0 shown, Ch22 & 39 similar)

7 LOWER/UPPER BAND EDGE PER FCC PART 15 SECTION 15.247 (D) – BLUETOOTH SMART

7.1 Administrative and Environmental Details

Site Used:	EMC Lab 2A
Test Date:	1/15/15
Test Engineer:	Shane Duncan
Temperature	23°C
Humidity:	41%

7.2 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
CSA Spectrum Analyzer	Agilent	N1996A	MY45371881	01/05/18	2 yr

7.3 Test Set up Photo(s)

Refer to section Figure 1.

7.4 Limits/Requirements

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

7.5 Test Description and Procedure

Using the conducted test method, the band edge measurement was made at the peak level of the emission at the band edge (outside of the operating band) relative to the center peak of the operating frequency channel by using marker delta function. The span was set to be wide enough to capture the highest peak level of the operating channel to the band edge.

7.6 Test Plots

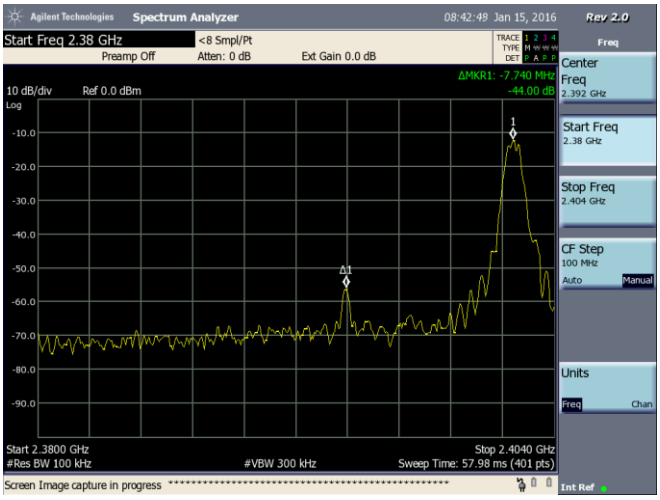


Figure 20: GFSK Ch0 Lower Band Edge

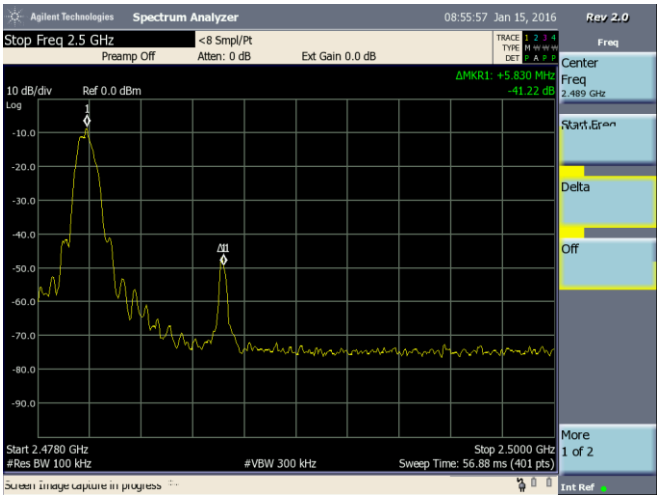


Figure 21: GFSK Ch39 Upper Band Edge

8 OCCUPIED BANDWIDTH PER FCC PART 2 SECTION 2.1049 (H) – BLUETOOTH SMART

8.1 Administrative and Environmental Details

Site Used:	EMC Lab 2A
Test Date:	11/04/15
Test Engineer:	Shane Duncan
Temperature	23°C
Humidity:	41%

8.2 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
CSA Spectrum Analyzer	Agilent	N1996A	MY45371881	01/05/18	2 yr

8.3 Test Set up Photo(s)

Refer to section Figure1.

8.4 Limits/Requirements

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. Transmitters employing digital modulation techniques—when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated.

8.5 Test Description and Procedure

Using the conducted test method, the occupied bandwidth measurement was made utilizing the CSA Analyzer's OBW function. The span was set to be wide enough to capture the entire operating channel.

8.6 Test Plots

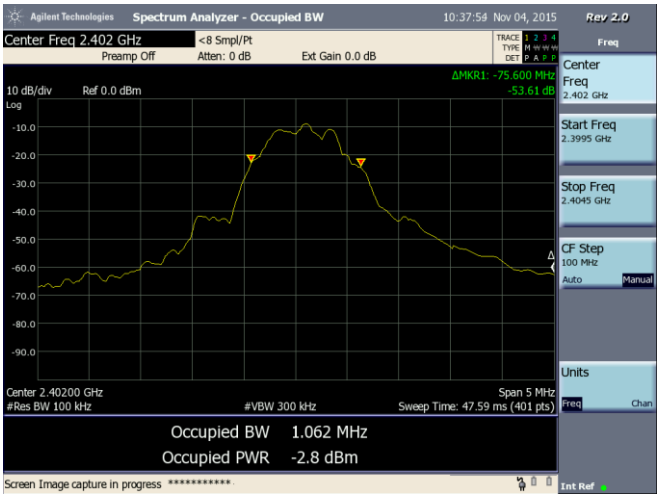


Figure 22: GFSK Occupied Bandwidth (Ch0 Shown, Ch22 & 39 Similar)

9 TIME OF OCCUPANCY PER FCC PART 15.247 (A)(1)

9.1 Administrative and Environmental Details

Site Used:	EMC Lab 2A
Test Date:	12/17/15
Test Engineer:	Shane Duncan
Temperature	21°C avg.
Humidity:	42% avg.

9.2 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
CSA Spectrum Analyzer	Agilent	N1996A	MY45371881	1/05/18	2 yr

9.3 Limits/Requirements

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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

9.4 Test Set up Photo(s)

Refer to section Figure1.

9.5 Test Description

The EUT is connected to the spectrum analyzer by opening the connection to the internal chip antenna and attaching a suitable patch cable. The time of occupancy requires two measurements to be performed while the EUT is frequency hopping:
Transmit time – The center frequency is set to the frequency to be measured. The span is set to zero span and the sweep time and trigger delay adjusted to isolate the pulse for marker-delta measurement and recording.
Transmit interval – The sweep time is then adjusted in order to see subsequent transmit pulses.]
Time of occupancy then is:

# of pulses in the sample interval x transmit time x (100/3).

9.6 Time of Occupancy Measurement Plots

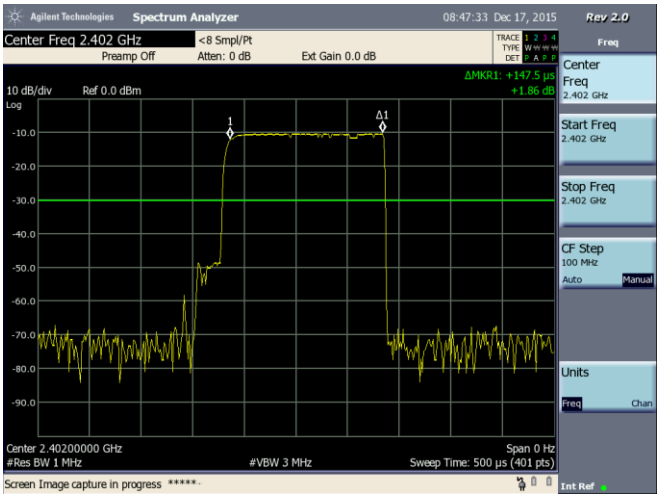


Figure 23: Transmit time (Ch0 shown, Ch22 & 39 similar)

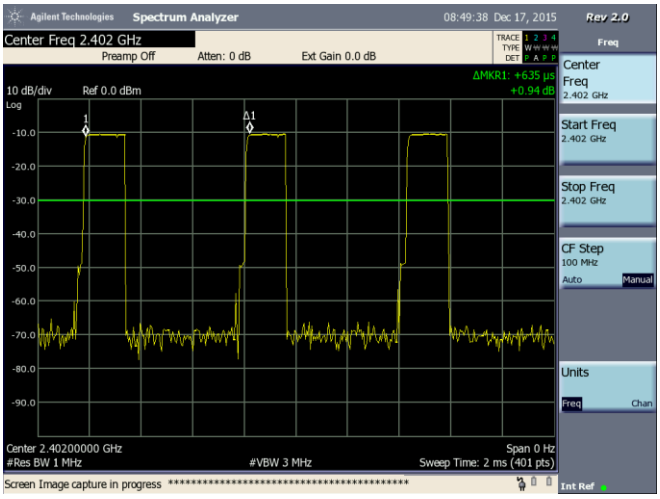


Figure 24: Transmit interval (Ch0 shown, Ch22 & 39 similar)

3 x .1475ms x (100/3) = 14.75ms = 0.01475s < 0.4s

10 RADIATED SPURIOUS & RESTRICTED BANDS EMISSIONS PER FCC PART 15 SECTIONS 15.209 & 15.205

10.1 Administrative and Environmental Details

Site Used:	Semi Anechoic Chamber
Test Date:	01/17-18/16
Test Engineer:	Shane Duncan
Temperature	20°C
Humidity:	47%

10.2 Test Equipment

Equipment Description	Manufacturer	Model Name	Serial Number	Calibration Due Date	Calibration Interval
EMC Analyzer	Agilent	E7405A	US40240257	7/16/16	2 yr
Pre-Amplifier	Agilent	83051A	0000009025	VBU*	N/A**
Amplifier	Giga-tronics	GT-1040A	1112003	VBU*	N/A**
DRG Horn Antenna	AH Systems	SAS-571	587	10/14/16	1yr
Horn Antenna	Schwarzbeck	15633	BBHA9170267	10/16/16	1yr
EMC Analyzer	Agilent	E7405A	US40240257	7/16/16	2 yr

10.3 Test Set up Photo(s)

Refer to section 1.11 (Figures).

10.4 Limits/Requirements

FCC Part 15 section 15.209 Radiated emission limits

Frequency (MHz)	Field strength Average (microvolts/meter)	Field strength Average (dBuV/meter)	Field strength Peak (dBuV/meter)	Measurement distance (meters)
Above 960	500	54	74	3

FCC Part 15 section 15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	**4.5-5.15**
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	**7.25-7.75**
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	**2483.5-2500**	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8

12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	
13.36-13.41			

10.5 Test Description and Procedure

For radiated emissions, the packaged EUT was placed 80 cm above the ground plane on a non-conducting table. The transmit and receive configuration of the EUT was controlled by the same means as the conducted tests. Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c). Spurious Emissions were measured using a peak detector.

10.6 Radiated Spurious Emissions Data Tables

1-3 GHz Radiated Emissions

Freq (MHz)	Channel	Freq (GHz)		Measured Peak Emission (dBuV/m)		Limit (dBuV/m)
		H	V	H	V	
2402	0	2.43	2.34	51.66	52.61	54
2446	22	2.425	2.395	51.56	48.67	54
2480	39	2.46	1.335	49.77	41.67	54

3-13 GHz Radiated Emissions

Freq (MHz)	Channel	Freq (GHz)		Measured Peak Emission (dBuV/m)		Limit (dBuV/m)
		H	V	H	V	
2402	0	12.83	12.95	42.99	42.61	54
2446	22	13.0	12.23	38.78	39.21	54
2480	39	12.65	12.70	38.96	38.82	54

13-18 GHz Radiated Emissions

Freq (MHz)	Channel	Freq (GHz)		Measured Peak Emission (dBuV/m)		Limit (dBuV/m)
		H	V	H	V	
2402	0	15.15	15.01	46.74	47.33	54
2446	22	14.79	17.66	46.44	46.57	54
2480	39	17.65	17.78	46.31	47.39	54

18-25 GHz Radiated Emissions

Freq (MHz)	Channel	Freq (GHz)		Measured Peak Emission (dBuV/m)		Limit (dBuV/m)
		H	V	H	V	
2402	0	21.8	24.84	40.78	40.14	54
2446	22	22.57	18.00	41.10	40.95	54
2480	39	21.96	24.39	40.62	41.41	54

NOTE: H MEANS HORIZONTAL AND V MEANS VERTICAL ANTENNA POLARIZATIONS

10.7 Restricted Band Radiated Emissions

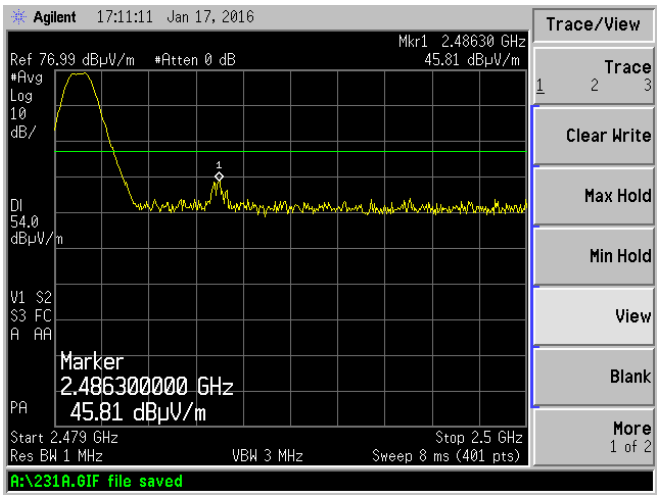


Figure 25: Restricted Band 2.4835-2.5 GHz Average Detector

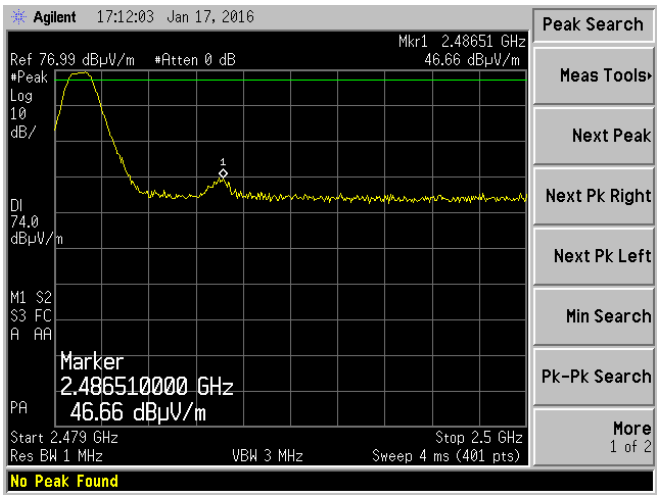


Figure 26: Restricted Band 2.4835-2.5 GHz Peak Detector

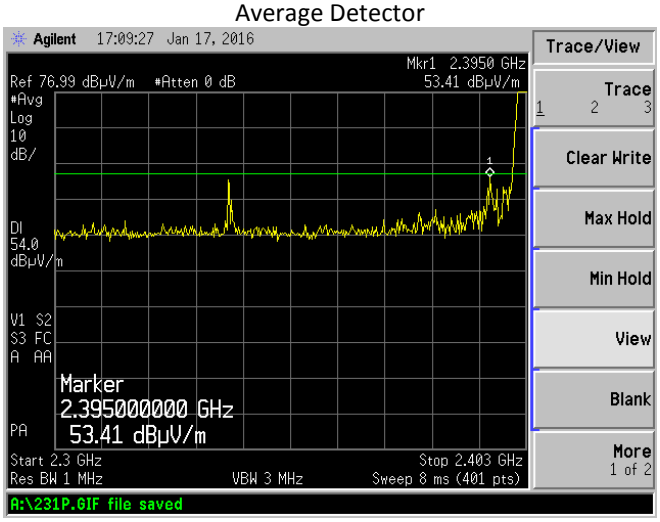


Figure 27: Restricted Band 2.31-2.39 GHz Average Detector

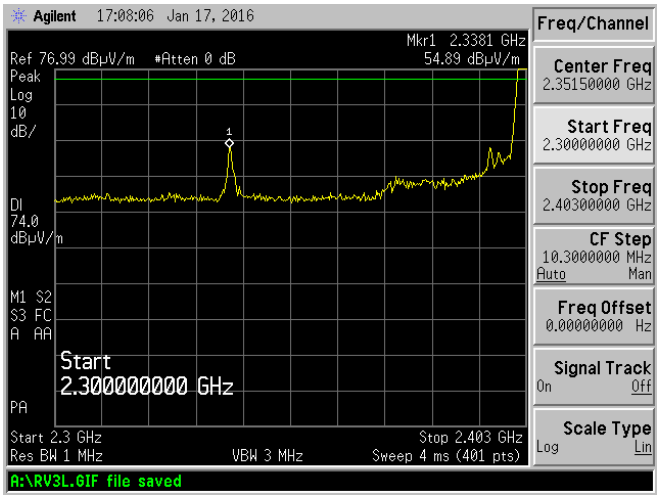


Figure 28: Restricted Band 2.31-2.39 GHz Peak Detector

10.8 Radiated Spurious Emissions Plots

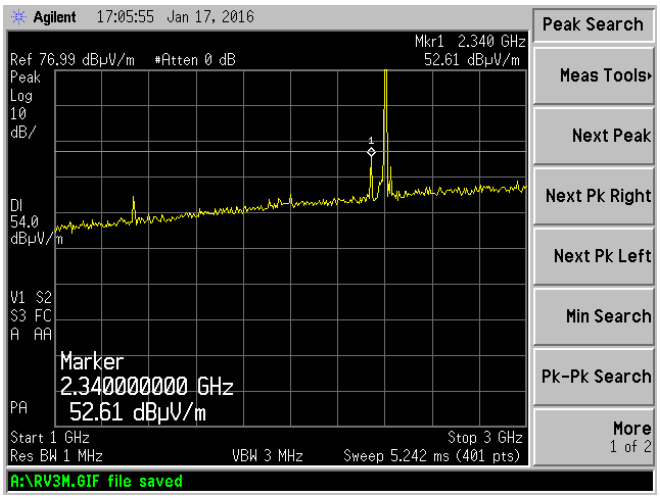


Figure 29: Radiated Spurious Emissions Vertical (1-3 GHz) Channel 0 Shown, 22 and 39 Similar

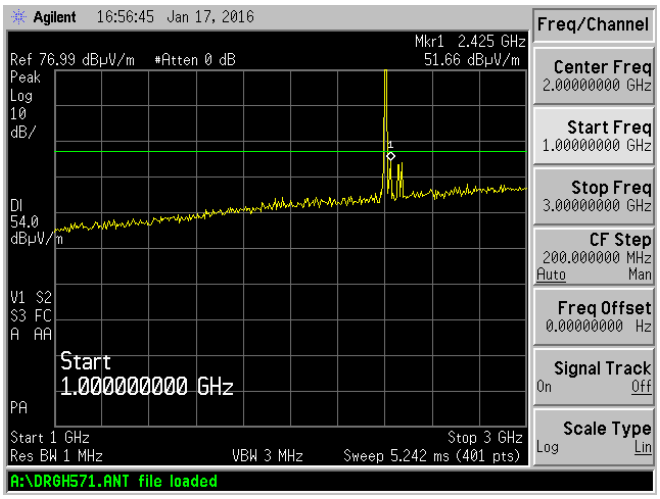


Figure 30: Radiated Spurious Emissions Horizontal (1-3 GHz) Channel 0 Shown, 22 and 39 Similar

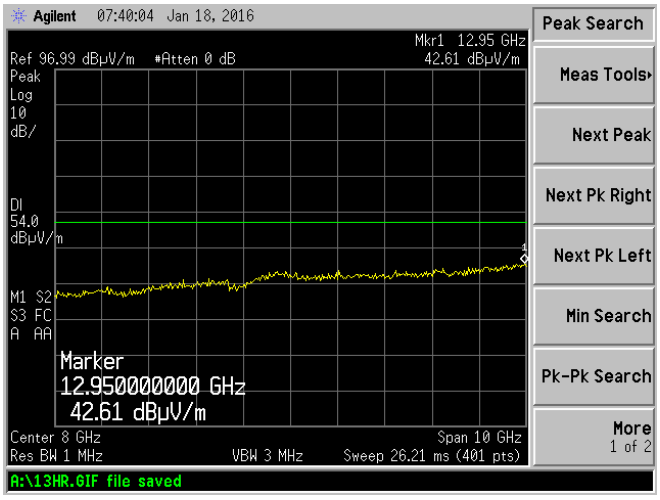


Figure 31: Radiated Spurious Emissions Vertical (3-13 GHz) Channel 0 Shown, 22 and 39 Similar

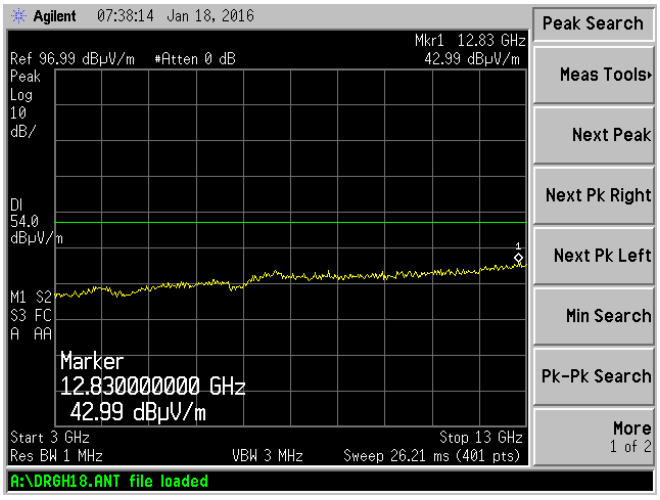


Figure 32: Radiated Spurious Emissions Horizontal (3-13 GHz) Channel 0 Shown, 22 and 39 Similar

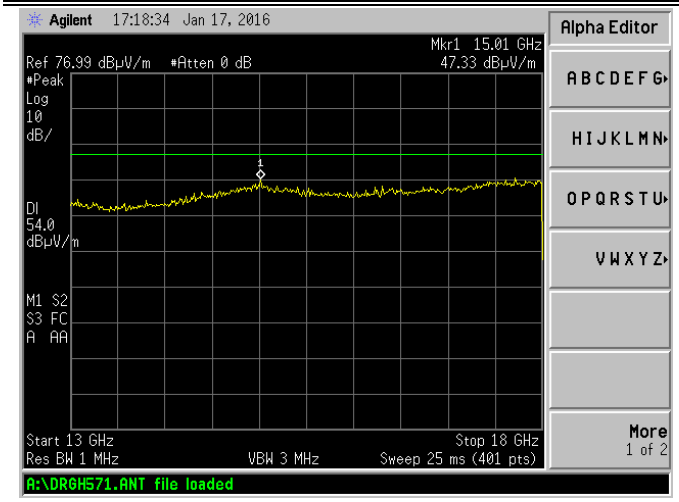


Figure 33: Radiated Spurious Emissions Vertical (13-18 GHz) Channel 0 Shown, 22 and 39 Similar

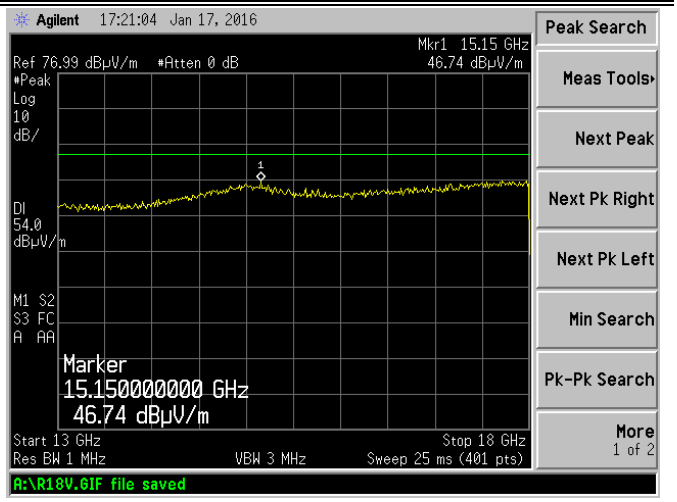


Figure 34: Radiated Spurious Emissions Horizontal (13-18 GHz) Channel 0 Shown, 22 and 39 Similar

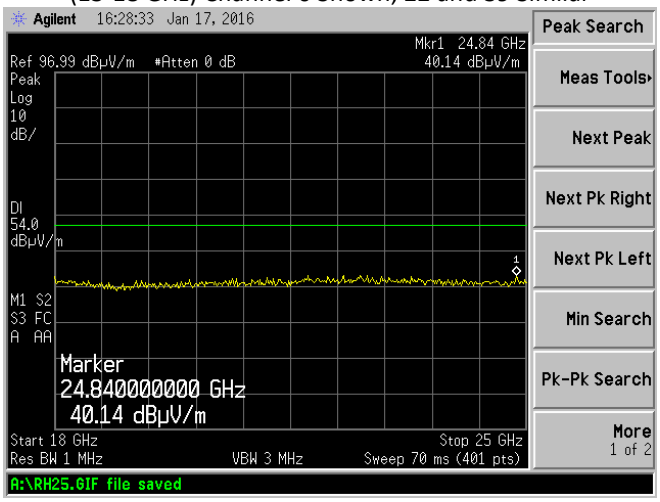


Figure 35: Radiated Spurious Emissions Vertical (18-25 GHz) Channel 0 Shown, 22 and 39 Similar

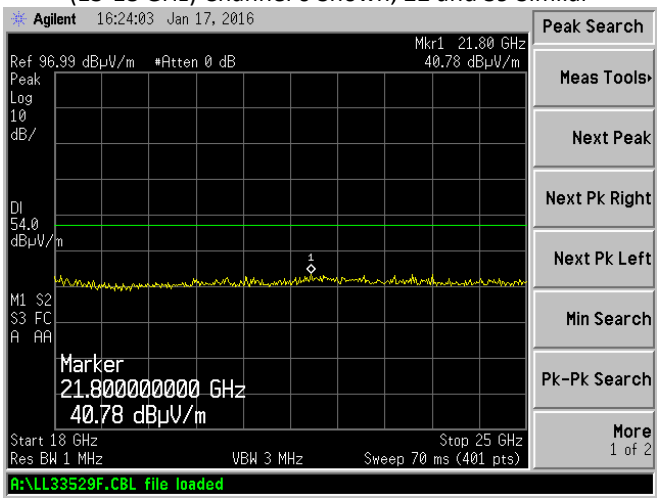


Figure 36: Radiated Spurious Emissions Horizontal (18-25 GHz) Channel 0 Shown, 22 and 39 Similar

11 GAIN OF TRANSMISSION ANTENNA PER FCC PART 15.247 (B)(4)

11.1 Limits/Requirements

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.
The EUT antenna used has a stated peak gain of -3 dBi, and an average gain of -6 dBi.

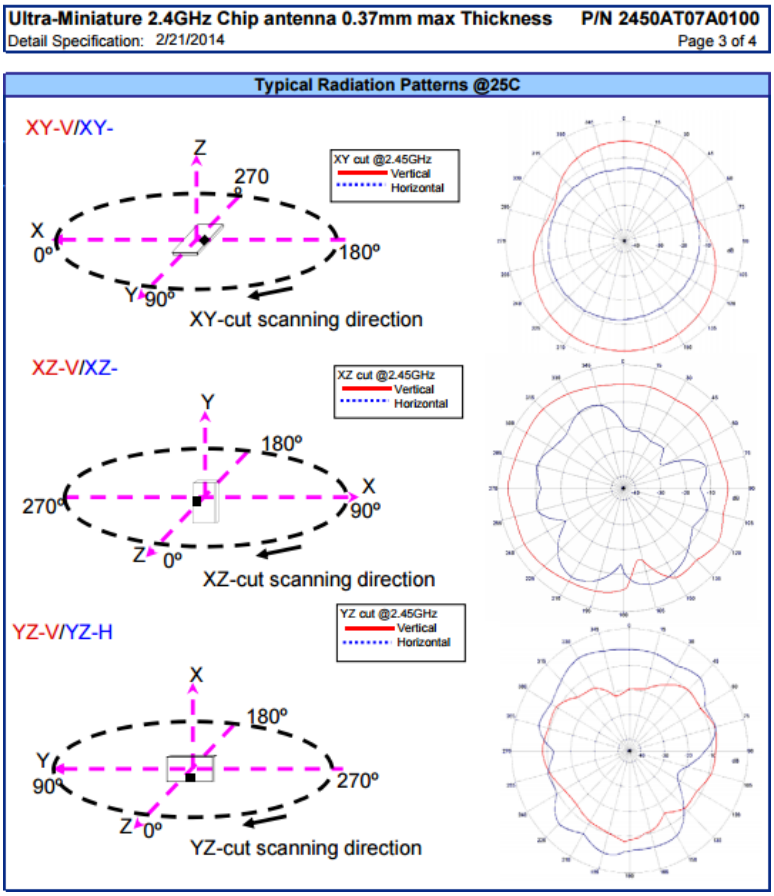


Figure 37: Antenna Radiation Pattern

12 APPENDIX:

12.1 EUT Technical Specifiactions

Manufacturer:	Osterhout Design Group		
General Description:	The Reticle Speed Mouse is a HID intended to work exclusively with the ODG R-7 Smart Glasses platform to control all functions without physical interaction with the head-mounted eyewear.		
EUT Name:	Reticle Speed Mouse	**Model:**	RSM
Dimensions:	6cm x 2.5cm x 2.4cm	**Serial Number:**	RSM-D05
Operating Frequency:	2.402 GHz- 2.48 GHz	**Power Cord Type:**	☐ Shielded ☒ Un-Shielded

12.2 EUT Photos

Attached in the submittal documents.