



## Test Report

Prepared for: Emotiv Inc.

Model: Emotiv EPOC Model 1.1

Description: EEG Neuroheadset for consumer use - Trademarked as EPOC+

Serial Number: N/A

FCC ID: FCC ID: 2ADIH-EPOC02

To

FCC Part 15.249

Date of Issue: April 6, 2015

On the behalf of the applicant:

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Attention of:

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**Alex Macon**  
Project Test Engineer

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### Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	November 1, 2014	Alex Macon	Original Document
2.0	April 3, 2015	Alex Macon	Added SAR exemption calculation on pg. 10



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The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

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Testing Certificate Number: **2152.01**



**FCC Site Reg. #349717**

**IC Site Reg. #2044A-2**

**Non-accredited tests contained in this report:**

**N/A**



**The applicant has been cautioned as to the following**

15.21: Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a): Special Accessories

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator the responsible part may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.



### **Standard Test Conditions Engineering Practices**

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.10-2009 and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Measurement results, unless otherwise noted, are worst-case measurements.

<b>Environmental Conditions</b>		
<b>Temperature (°C)</b>	<b>Humidity (%)</b>	<b>Pressure (mbar)</b>
25.1 – 25.7	40.2 – 47.6	965.2 – 968.3

### **EUT Description**

**Model:** Emotiv EPOC Model 1.1

**Description:** EEG Neuroheadset for consumer use - Trademarked as EPOC+

**S/N:** N/A

**Software:** Nordic Semiconductor Master Control Panel

#### **Additional Information:**

The device is a Wireless Neurological Headset transceiver, which communicates to a USB transceiver connected to a personal computer

The link between the headset transceiver and USB transceiver transmits data continuously and is required for proper operation of the product.

### **EUT Operation during Tests**

The Client has provided several dongles to place the EUT in High Mid and Low channels and also a dongle for normal operation



**Accessories:**

Qty	Description	Manufacturer	Model	S/N
3	USB Dongles	Emotiv	1.0	N/A

**Cables:** None

**Modifications:** None

**15.203: Antenna Requirement:**

- The antenna is permanently attached to the EUT
- The antenna uses a unique coupling
- The EUT must be professionally installed
- The antenna requirement does not apply



### Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.249(a)	Fundamental Field Strength	Pass	
15.249(d)	Out of Band Spurious Emissions	Pass	
RSS-210	6dB Occupied Bandwidth	Pass	





### Fundamental Field Strength

**Name of Test:**

Fundamental Field Strength

**Engineer:** Alex Macon

**Test Equipment Utilized:**

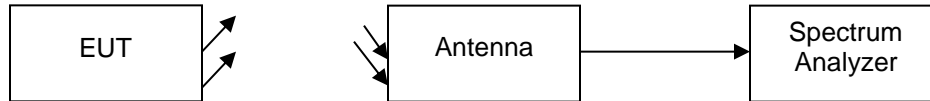
i00103, i00271, i00379, i00428

**Test Date:** 10/14/14

### Test Procedure

The EUT was tested in a semi-anechoic chamber at a distance of 3 meters from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Fundamental Field Strength.

### Test Setup



### Spectrum Analyzer Settings

Detector Settings	RBW	VBW	Span
Peak	1 MHz	1 MHz	As Necessary
Average	1 MHz	3 MHz	As Necessary

### Sample Calculations:

Correction Factors include Antenna and cable insertion loss.

Measured Level includes correction factors that were entered into the spectrum analyzer before recording test data.



### Fundamental Field Strength

Tuned Frequency (MHz)	Peak Measured Level (dBuV/m)	Peak Limit (dBuV/m)	Result
2402	92.08	114.0	Pass
2461	89.22	114.0	Pass
2480	87.94	114.0	Pass

All peak emissions are below the average limit of 94 dBuV/m

#### SAR exclusion calculation:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR,<sup>25</sup> where

$$[(0.0323)/(5)] * [\sqrt{2402}]$$

$$0.00646 * 49.0102 = 0.316$$

**This device is exempt from SAR**



### Radiated Spurious Emissions

**Name of Test:**

Radiated Spurious Emissions

**Engineer:** Alex Macon

**Test Equipment Utilized:**

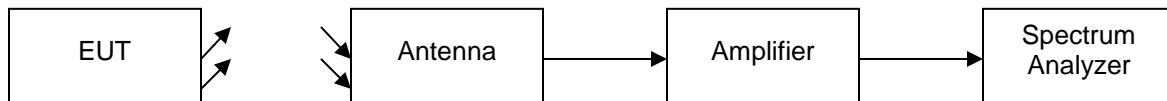
i00177, i00271, i00379, i00428

**Test Date:** 10/14/14

### Test Procedure

The EUT was tested in a semi-anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the limits for Radiated Spurious Emissions. The antenna, band reject filter, amplifier and cable correction factors were input into the spectrum analyzer before recording data. The spectrum for each tuned frequency was examined to the 10<sup>th</sup> harmonic.

### Test Setup



### Analyzer Settings

Detector Settings	RBW	VBW	Span
Peak	1 MHz	3 MHz	As Necessary
Average	1 MHz	3 MHz	As Necessary

Sample Calculations:

Correction Factors include Antenna and cable insertion loss correction factors.

Measured Level includes correction factors that were input to the spectrum analyzer before recording test data



### Radiated Spurious Emissions

Tuned Frequency (MHz)	Emission Frequency (MHz)	Peak Measured Level (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)
2402	4803.8	43.52	54.0	-10.48
2402	7207.1	52.31	54.0	-1.69
2402	9610.05	46.33	54.0	-7.67

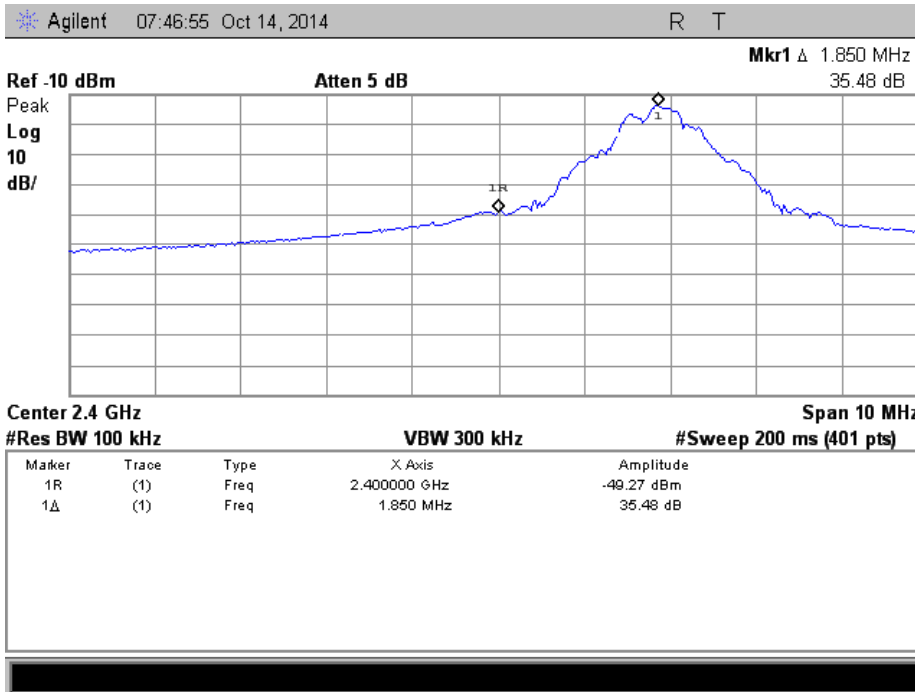
Tuned Frequency (MHz)	Emission Frequency (MHz)	Peak Measured Level (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)
2461	4923.2	42.7	54.0	-11.3
2461	7386.8	49.04	54.0	-4.96
2461	9848.6	45.75	54.0	-8.25

Tuned Frequency (MHz)	Emission Frequency (MHz)	Peak Measured Level (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)
2480	4960.02	43.68	54.0	-10.32
2480	7439.85	48.08	54.0	-5.92
2480	9919.8	45.1	54.0	-8.9

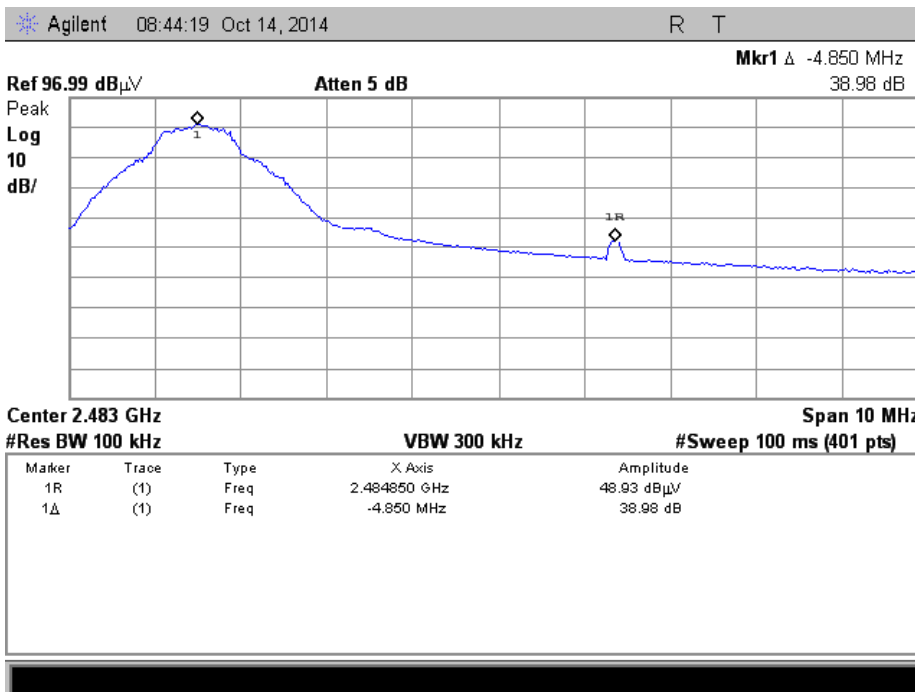
All peak readings are below the Average limit.



### Lower Band Edge Plot



### Upper Band Edge Plot





**99% Occupied Bandwidth**

**Name of Test:**

99% Occupied Bandwidth

**Engineer:** Alex Macon

**Test Equipment Utilized:**

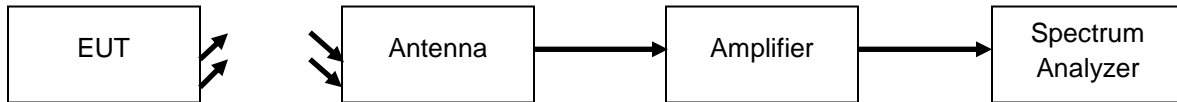
i00103, i00271, i00379, i00428

**Test Date:** 10/14/14

**Test Procedure**

The EUT was tested in a semi anechoic chamber at a distance of 3 meter from the receiving antenna. The Span was set wide enough to capture the entire transmit spectrum and the resolution bandwidth was set to at least 1% of the span. The analyzer was set to max hold while the 99% and 6dB bandwidths were measured.

**Test Setup**



**Occupied Bandwidth Summary**

**99% OCBW**

Frequency MHz	Recorded Measurement (MHz)	Result
2402	2.124	Pass
2461	2.044	Pass
2480	2.094	Pass

**6dB OCBW**

Frequency MHz	Recorded Measurement (kHz)	Result
2402	723	Pass
2461	752	Pass
2480	731	Pass



**Test Equipment Utilized**

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Power Supply	Kenwood	PR18-3A	i00008	Verified on: 10/14/14	
EMI Receiver	HP	8546A	i00033	2/24/14	2/24/15
Horn Antenna	EMCO	3115	i00103	12/11/12	12/11/14
Transient Limiter	Com-Power	LIT-153	i00123	Verified on: 11/12/14	
High Pass Filter	Trilithic	4HX3400-3-XX	i00177	Verified on: 10/14/14	
Bi-Log Antenna	Schaffner	CBL611C	i00267	2/24/14	2/24/15
Horn Antenna, Amplified	ARA	DRG-118/A	i00271	5/8/14	5/8/16
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	3/24/14	3/24/15
Voltmeter	Fluke	87III	i00319	2/22/14	2/22/15
Spectrum Analyzer	Tektronix	RSA3308A	i00345	3/18/14	3/18/15
AC Power Source	Behlman	BL 6000	i00362	Verified on: 11/12/14	
EMI Analyzer	Agilent	E7405A	i00379	1/14/14	1/14/15
Signal Generator	Rohde & Schwarz	SMU200A	i00405	12/11/13	12/11/14
Thermo Hygrometer	Omega	RH81	i00408	4/15/13	4/15/15
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	11/26/13	11/26/15
LISN	COM-Power	LI-125A	i00446	7/25/14	7/25/15
LISN	COM-Power	LI-125A	i00447	7/25/14	7/25/15

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT