Penumbra Inc.
RF Exposure Exhibit

SCOPE OF WORK
EMC TESTING – Real Immersive System, Model: Xavier 1/Xavier 2, Part Number: 18826 (WTM, Wireless Transmitter Module)

REPORT NUMBER
104407842MPK-027A

ISSUE DATE
January 08, 2021

REVISED DATE
March 19, 2021

PAGES
8

DOCUMENT CONTROL NUMBER
Non-Specific Radio Report Shell Rev. December 2017 MPK

© 2017 INTERTEK

RF Exposure Exhibit
(portable devices)

Report Number: 104407842MPK-027A
Project Number: G104407842

Original Issue Date: January 08, 2021
Revision Issued Date: March 19, 2021

Product Designation: Real Immersive System
Model Tested: Xavier 1/Xavier 2
Part Number: 18826 (WTM, Wireless Transmitter Module)

FCC ID: 2AQU7-REAL02T
IC: 24199-REAL02T

to

47CFR 2.1093
RSS-102 Issue 5

for

Penumbra Inc.

Tested by:
Intertek
1365 Adams Court
Menlo Park, CA 94025 USA

Client:
Penumbra Inc.
One Penumbra Place
Alameda, CA 94502 USA

Report prepared by:

Anderson Soungpanya/ Project Engineer

Report reviewed by:

Krishna Vemuri / EMC Manager

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Report No. 104407842MPK-027A	
Equipment Under Test:	Real Immersive System
Trade Name:	Penumbra Inc.
Model(s) Tested:	Xavier 1/Xavier 2
Applicant:	Penumbra Inc.
Contact:	Puneet Goyal
Address:	Penumbra Inc. One Penumbra Place Alameda, CA 94502
Country:	USA
Tel. Number:	510-440-5598
Email:	pgoyal@penumbrainc.com
Applicable Regulation:	47CFR 2.1093 RSS-102 Issue 5

TABLE OF CONTENTS

1.0 RF Exposure Summary

Test	Reference FCC	Reference Industry Canada	Result
Radio frequency Radiation Exposure Evaluation	47 CFR§2.1093	RSS-102 Issue 5	Complies

2.0 RF Exposure Limits

2.1 FCC Limits

According to FCC KDB 447498 D01 v06 Appendix A, at frequency 2479 MHz and separation distance of ≤ 5 mm SAR Exemption limit is ≤ 9.53 mW.

2.2 Industry Canada Limits

According to RSS-102 sec. 2.5.1, at frequency 2479 MHz and separation distance of ≤ 5 mm SAR Exemption limit is ≤ 3.94 mW.

3.0 Test Results (Portable Configuration)

3.1 Classification

For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

3.2 EIRP calculations

The Real Immersive System, Model: Xavier 1/Xavier 2 consist of one 2.4GHz radio.

3.3 Maximum RF Power

Real Immersive System, Model: Xavier 1/Xavier 2 :

Frequency Range (MHz)	Peak RF Output	Antenna Gain[1]	Note
2402 – 2479	4.04 dBm or 2.54mW	1.3dBi	Conducted power measurements were taken from 104407842MPK-027

[1]As declared by the manufacturer.

3.4 RF Exposure Calculation

3.4.1 RF Exposure calculation for 2.4GHz radio, Real Immersive System, Model: Xavier 1/Xavier 2 :

Duty Cycle calculation based on Operational Description provided by the manufacturer:
There are 244 Frames transmitted per second: 1/244 = 4096 usec => Each TDMA frame (F) length is 4096 usec
Each packet sent is composed of 71 bits + payload length.
(71 bits: 8bit preamble + 40bit address + 7bit length + 16bit CRC)
Payload length (UIIMU mode 2) = 19 bytes
Total payload length: 19*8 + 71 = 223 bits
Total payload length sent at 2Mbps: 223 / 2000000 = 111.5 usec
Duty cycle: 111.5 / 4096 = **2.72%**

3.4.2 RF Exposure calculation FCC

Calculations for this report are based on highest power measured.

Power input to antenna	Source-based Duty Cycle	Numerical Gain	Corrected input power into antenna	EIRP	Frequency
2.54 mW	2.72% (0.0272)	1.35	0.07 mW	0.09mW	2402-2479

Corrected Input Power = Power input*Duty Cycle

EIRP = Corrected Input Power*Antenna Gain*Duty Cycle

RF Exposure calculation for FCC KDB 447498 D01 v06

According to FCC KDB 447498 D01 v06 Appendix A, at frequency 2479 MHz and separation distance of ≤ 5 mm SAR Exemption limit is ≤ 9.53 mW

Max Peak Conducted Power measured = 0.07 mW

Results: SAR evaluation is not required since the higher of the maximum conducted or equivalent isotopically radiated power (EIRP) source-based, time averaged output power is below the exemption limit.

3.4.3 RF Exposure calculation ISED

Calculations for this report are based on highest power measured.

Power input to antenna	Source-based Duty Cycle	Numerical Gain	Corrected input power into antenna	EIRP	Frequency
2.54 mW	2.72% (0.0272)	1.35	0.07 mW	0.09mW	2402-2479

Corrected Input Power = Power input*Duty Cycle

EIRP = Corrected Input Power*Antenna Gain*Duty Cycle

According to RSS-102 sec. 2.5.1, at frequency 2479 MHz and separation distance of ≤ 5 mm SAR Exemption limit is ≤ 3.94 mW.

Max EIRP measured = 0.09 mW

Results: SAR evaluation is not required since the higher of the maximum conducted or equivalent isotopically radiated power (EIRP source-based, time averaged output power is below the exemption limit.

Note: Antenna gains below 0 are considered as 0dBi.

4.0 Document History

Revision/ Job Number	Writer Initials	Reviewers Initials	Date	Change
1.0/ G104407842	AS	KV	January 08, 2021	Original document
1.1/ G104407842	AS	KV	March 19, 2021	Updated DC calculation to coincide with operational description and updated limits.