RF Exposure Evaluation Report

APPLICANT	:	Samsara Networks
EQUIPMENT	:	VG33
BRAND NAME	:	SAMSARA
MODEL NAME	:	010-0033
MARKETING NAME	:	VG33
FCC ID	:	2AIHD0033
STANDARD	:	47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA652039	Rev. 01	Initial issue of report	Aug. 16, 2016

1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Samsara Networks
Address	501 York St, San Francisco, CA 94110

Manufacturer	
Company Name	Samsara Networks
Address	501 York St, San Francisco, CA 94110

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	VG33
Brand Name	SAMSARA
Model Name	010-0033
Marketing Name	VG33
FCC ID	2AIHD0033
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	· 802.11a/b/g/n HT20/HT40 · Bluetooth EDR/LE
HW Version	1.0
SW Version	1.0
Product Marketing Name(PMN)	VG33
Firmware Version Indentification Number(FVIN)	1.0
Host Marketing Name(HMN)	VG33
EUT Stage	Production Unit

WWAN Module Information	
Product Name	EHS6
Model No.	EHS6
FCC ID	OIPEHS6
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz
Mode	· GSM/GPRS/EGPRS · RMC/AMR 12.2Kbps · HSDPA · HSUPA · HSPA+ (16QAM uplink)
Remark: The WWAN module is also integrated into this host to do Sim-Tx analysis.	

3. Maximum RF average output power among production units

Mode	Average power(dBm)
GSM 850_GPRS 1 Tx slot	33
GSM 850_GPRS 2 Tx slots	31
GSM 850_GPRS 3 Tx slots	29
GSM 850_GPRS 4 Tx slots	28
GSM 850_EDGE 1 Tx slot	28
GSM 850_EDGE 2 Tx slots	25
GSM 850_EDGE 3 Tx slots	23
GSM 850_EDGE 4 Tx slots	22
GSM 1900_GPRS 1 Tx slot	30
GSM 1900_GPRS 2 Tx slots	28
GSM 1900_GPRS 3 Tx slots	26
GSM 1900_GPRS 4 Tx slots	25
GSM 1900_EDGE 1 Tx slot	26
GSM 1900_EDGE 2 Tx slots	23
GSM 1900_EDGE 3 Tx slots	22
GSM 1900_EDGE 4 Tx slots	20

Mode	Average power(dBm)
WCDMA Band V	24
WCDMA Band II	24

Mode / Band	Average Power (dBm)			
	EDR			LE
	1Mbps	2Mbps	3Mbps	
2.4 GHz Bluetooth	-3	-7	-7	1

Band / Mode	IEEE 802.11 Average Power (dBm)		
	11b	11g	HT20
2.4GHz Band	16	18	18

Band / Mode	IEEE 802.11 Average Power (dBm)		
	11a	11n-HT20	11n-HT40
5.2GHz Band	14	14	14
5.8GHz Band	14	14	14

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = Power Density
P = Output Power at Antenna Terminals
G = Gain of Transmit Antenna (linear gain)
R = Distance from Transmitting Antenna

5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm^2)	Limit (mW/cm^2)	Power Density / Limit
GPRS 850 (1 Tx slot)	824.2	2.15	33.00	35.150	3.273	412.098	0.082	0.549	0.149
GPRS 850 (2 Tx slots)	824.2	2.15	31.00	33.150	2.065	518.800	0.103	0.549	0.188
GPRS 850 (3 Tx slots)	824.2	2.15	29.00	31.150	1.303	488.652	0.097	0.549	0.177
GPRS 850 (4 Tx slots)	824.2	2.15	28.00	30.150	1.035	518.800	0.103	0.549	0.188
EGPRS 850 (1 Tx slot)	824.2	2.15	28.00	30.150	1.035	130.317	0.026	0.549	0.047
EGPRS 850 (2 Tx slots)	824.2	2.15	25.00	27.150	0.519	130.317	0.026	0.549	0.047
EGPRS 850 (3 Tx slots)	824.2	2.15	23.00	25.150	0.327	122.744	0.024	0.549	0.044
EGPRS 850 (4 Tx slots)	824.2	2.15	22.00	24.150	0.260	130.317	0.026	0.549	0.047
GPRS 1900 (1 Tx slot)	1850.2	2.15	30.00	32.150	1.641	206.538	0.041	1.000	0.041
GPRS 1900 (2 Tx slots)	1850.2	2.15	28.00	30.150	1.035	260.016	0.052	1.000	0.052
GPRS 1900 (3 Tx slots)	1850.2	2.15	26.00	28.150	0.653	244.906	0.049	1.000	0.049
GPRS 1900 (4 Tx slots)	1850.2	2.15	25.00	27.150	0.519	260.016	0.052	1.000	0.052
EGPRS 1900 (1 Tx slot)	1850.2	2.15	26.00	28.150	0.653	82.224	0.016	1.000	0.016
EGPRS 1900 (2 Tx slots)	1850.2	2.15	23.00	25.150	0.327	82.224	0.016	1.000	0.016
EGPRS 1900 (3 Tx slots)	1850.2	2.15	22.00	24.150	0.260	97.499	0.019	1.000	0.019
EGPRS 1900 (4 Tx slots)	1850.2	2.15	20.00	22.150	0.164	82.224	0.016	1.000	0.016
WCDMA Band 5	826.4	2.15	24.00	26.150	0.412	412.098	0.082	0.551	0.149
WCDMA Band 2	1852.4	2.15	24.00	26.150	0.412	412.098	0.082	1.000	0.082
Bluetooth	2402.0	2.80	1.00	3.800	0.002	2.399	0.001	1.000	0.001
2.4GHz WLAN	2412.0	2.80	18.00	20.800	0.120	120.226	0.024	1.000	0.024
5GHz WLAN	5180.0	4.00	14.00	18.000	0.063	63.096	0.013	1.000	0.013

Note: For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.

5.2. Collocated Power Density Calculation

WWAN Power Density / Limit	WLAN Power Density / Limit	Bluetooth Power Density / Limit	∑(Power Density / Limit) of WWAN+WLAN+Bluetooth
0.188	0.024	0.001	0.213

Note:

1. For colocation analysis, GPRS850 (4TX slot) is chosen for summation due to the highest (power density/limit) among all WWAN wireless modes.
2. ∑(Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN + Bluetooth.
3. Considering the WWAN module collocation with the WLAN and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.