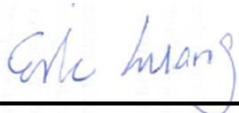


RF Exposure Evaluation Report

APPLICANT : Universal Global Scientific Industrial Co., Ltd.
EQUIPMENT : LTE module
BRAND NAME : SEQUANS Communications
MODEL NAME : VZ22Q, VZ22M
FCC ID : COFVZ22Q
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



SPORTON INTERNATIONAL INC.

No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan R.O.C.



Table of Contents

1. ADMINISTRATION DATA	3
1.1. Testing Laboratory	3
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	3
3. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS	4
4. RF EXPOSURE LIMIT INTRODUCTION	5
5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	6
5.1. Standalone Power Density Calculation	6
5.2. Collocated Power Density Calculation.....	6

Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA4D1209	Rev. 01	Initial issue of report	Jan. 27, 2015

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	Universal Global Scientific Industrial Co., Ltd.
Address	141, Lane 351, Taiping Road, Tsautuen, Nantou 54261, Taiwan

Manufacturer	
Company Name	Universal Scientific Industrial (Shanghai)
Address	No. 1558, Zhang Dong Road, Zhangjiang Hi-Tech Park, Shanghai, P.R. China 201203

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	LTE module
Brand Name	SEQUANS Communications
Model Name	VZ22Q, VZ22M
FCC ID	COFVZ22Q
Wireless Technology and Frequency Range	LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 4: 1710.7 MHz ~ 1754.3 MHz
Mode	• LTE: QPSK, 16QAM
Antenna Type	Dipole Antenna
HW Version	V01
SW Version	17940
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

**3. Maximum RF average output power among production units**

LTE Band 4				
average power(dBm)				
Modulation	BW (MHz)	RB size	MPR	Power
QPSK	20	≤ 18	0	24.00
QPSK	20	> 18	1	23.00
16QAM	20	≤ 18	1	23.00
16QAM	20	> 18	2	22.00
QPSK	15	≤ 16	0	24.00
QPSK	15	> 16	1	23.00
16QAM	15	≤ 16	1	23.00
16QAM	15	> 16	2	22.00
QPSK	10	≤ 12	0	24.00
QPSK	10	> 12	1	23.00
16QAM	10	≤ 12	1	23.00
16QAM	10	> 12	2	22.00
QPSK	5	≤ 8	0	24.00
QPSK	5	> 8	1	23.00
16QAM	5	≤ 8	1	23.00
16QAM	5	> 8	2	22.00

LTE Band 13				
average power(dBm)				
Modulation	BW (MHz)	RB size	MPR	Power
QPSK	10	≤ 12	0	24.00
QPSK	10	> 12	1	23.00
16QAM	10	≤ 12	1	23.00
16QAM	10	> 12	2	22.00
QPSK	5	≤ 8	0	24.00
QPSK	5	> 8	1	23.00
16QAM	5	≤ 8	1	23.00
16QAM	5	> 8	2	22.00



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/f ²)	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/f ²)	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 ERP (dBm)	Maximum ERP (W)	Maximum EIRP (dBm)	Maximum EIRP (W)	Maximum Output Power Limit (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)
LTE Band 13	777	10.0	24.0	31.860	1.535	34.000	2.512	3.000	2511.886	0.500	0.518
LTE Band 4	1710	6.0	24.0	27.860	0.611	30.000	1.000	1.000	1000.000	0.199	1.000

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

5.2. Collocated Power Density Calculation

Note:

1. This MPE analysis is applicable to any collocated transmitters with transmit power for WLAN/WiMax is less than or equal to 29dBm and for Bluetooth is less than or equal to 15dBm.
2. A maximum antenna gain of 5 dBi for WLAN/WiMAX/BT has been assumed for all collocated antennas.

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum ERP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
LTE Band 13	777	6.5	24.0	30.5	1.12	1122.02	0.223	0.518	0.431
LTE Band 4	1710	6.0	24.0	30.0	1.00	1000.00	0.199	1.000	0.199
WLAN2.4GHz Band	2412	5.0	29.0	34.0	2.51	2511.89	0.500	1.000	0.500
WLAN5GHz Band	5180	5.0	29.0	34.0	2.51	2511.89	0.500	1.000	0.500
WiMax2.6GHz	2500	5.0	29.0	34.0	2.51	2511.89	0.500	1.000	0.500
WiMax3.5GHz	3400	5.0	29.0	34.0	2.51	2511.89	0.500	1.000	0.500
WiMax3.7GHz	3600	5.0	29.0	34.0	2.51	2511.89	0.500	1.000	0.500
Bluetooth	2402	5.0	15.0	20.0	0.10	100.00	0.020	1.000	0.020

**<Collocated analysis>****Note:**

1. For colocation analysis, LTE Band 13 is chosen for summation due to the highest (power density/limit) among all WWAN wireless modes.
2. Σ (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

Max WLAN Power Density / Limit	Max Bluetooth Power Density / Limit	Max WWAN Power Density / Limit	Σ (Power Density / Limit) of WWAN + WLAN + Bluetooth
0.500	0.020	0.431	0.951

Conclusion:

Based on 47 CFR§2.1091, the analysis concludes that this product is compliant with the RF exposure requirements in mobile exposure condition, provided the peak gain of the connected WWAN antenna, the conducted power and the antenna gain of the collocated transmitter, do not exceed the limits for each frequency band listed below.

Device	Technology	Band	Frequency (MHz)	Maximum Conducted Power (dBm)	Standalone Maximum Antenna Gain (dBi)	Collocated Maximum Antenna Gain (dBi)
LTE Module	LTE	Band 13	777 - 787	24.0	10.0	6.5
		Band 4	1710 - 1755	24.0	6.0	6.0