

1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant: Shenzhen Qiyue Optronics Company Limited
Address of applicant: Flat3,Tower 3, Excellence Meilin Center Plaza, Zhongkang Road 128, Shangmeilin, Futian District, Shenzhen , China

Manufacturer: SHENZHEN QIYUE OPTRONICS COMPANY LIMITED BRANCH
Address of manufacturer: A/B/C/D Building, Xitian Industrial Park, Dashuikeng Community,Guanlan Street, Longhua New District, Shenzhen City, China

General Description of EUT:

Product Name: 50" Class Smart 4K UHD LED TV
Trade Name: Emerson
Model No.: ETS-5000K
Adding Model(s): D50A315d-U-A-W, XXXXXXXX50XXXXXX(Where "X"can be any alphanumeric of A-Z or 0-9 or blank or -, indicates different client)
Rated Voltage: AC120V/60Hz
Battery Capacity: /
Power Adapter: /
FCC ID: XOM-ETS-5000K
Equipment Type: Fixed device

Technical Characteristics of EUT:

Bluetooth(BLE mode)

Bluetooth Version: V5.0 (BLE mode)
Frequency Range: 2402-2480MHz
RF Output Power: 1Mbps: 3.85dBm (Conducted)
2Mbps: 3.95dBm (Conducted)
Data Rate: 1Mbps, 2Mbps
Modulation: GFSK
Quantity of Channels: 40
Channel Separation: 2MHz
Type of Antenna: Integral Antenna
Antenna Gain: 2dBi

Bluetooth (BR/EDR mode)

Bluetooth Version: V5.0 (BR/EDR mode)
Frequency Range: 2402-2480MHz
RF Output Power: 6.39dBm (Conducted)
Data Rate: 1Mbps, 2Mbps, 3Mbps
Modulation: GFSK, $\pi/4$ DQPSK, 8DPSK
Quantity of Channels: 79

Channel Separation:	1MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	2dBi
Wi-Fi (2.4G)	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20) 2422-2452MHz for 802.11n(HT40)
RF Output Power:	Antenna 0: 17.18dBm (Conducted) Antenna 1: 17.24dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Quantity of Channels:	11 for 802.11b/g/n(HT20); 7 for 802.11n(HT40)
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	2dBi
Wi-Fi (5G)	
Support Standards:	802.11a, 802.11n-HT20, 802.11n-HT40, 802.11ac-VHT20, 802.11ac-VHT40,802.11ac-VHT80
Frequency Range:	5180-5240MHz, 5745-5825MHz 5180-5240MHz:
Max. RF Output Power:	Antenna 0: 16.79dBm (Conducted) Antenna 1: 16.80dBm (Conducted) 5745-5825MHz:
	Antenna 0: 16.86dBm (Conducted) Antenna 1: 16.53dBm (Conducted)
Type of Modulation:	QPSK, 16QAM, 64QAM,256QAM
Type of Antenna:	Integral Antenna
Antenna Gain:	5180-5240MHz:1.93dBi 5745-5825MHz:1.73dBi

1.2 RF Exposure Exemption

According to §1.1307(b)(3) and KDB 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A):The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Option C: FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2/f^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2 f$
1,500-100,000	$19.2 R^2$

For Multiple RF sources: FCC Rule Part 1.1307(b)(3)(ii):

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

1.3 Calculated Result

Radio Access Technology	Prediction Frequency	Output Power	Antenna Gain	Duty Cycle	Tune-Up Time-Averaged Power	ERP
	(MHz)	(dBm)	(dBi)	(%)	(dBm)	(dBm)
Bluetooth	2402	6.39	2.0	100	7.00	6.85
Wi-Fi (2.4GHz) Ant 0	2412	17.18	2.0	100	18.00	17.85
Wi-Fi (2.4GHz) Ant 1	2412	17.24	2.0	100	18.00	17.85
Wi-Fi (5GHz) Ant 0	5745	16.86	1.73	100	17.00	16.58
Wi-Fi (5GHz) Ant 1	5180	16.80	1.93	100	17.00	16.78

Frequency (MHz)	Option	Min. Distance	Max. Power		Exposure Limit	Ratio	Result
		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
2402	C	20.00	6.85	4.84	768.00	0.01	Pass
2412	C	20.00	17.85	60.95	768.00	0.08	Pass
2412	C	20.00	17.85	60.95	768.00	0.08	Pass
5745	C	20.00	16.58	45.50	768.00	0.06	Pass
5180	C	20.00	16.78	47.64	768.00	0.06	Pass

Note: 1. Time-Averaged Power=Output Power * Duty Cycle; ERP= Time-Averaged Power+ Antenna gain-2.15dB

2. Option A, B and C refers as clause 1.2.

3. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power. For option C, ERP converts to Max. Power;

4. For option B, P_{th} (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).

5. Ratio= Tune-Up ERP (mW)/ Exposure Limit (mW)

Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Ratio 3	Simultaneous Ratio	Limit	Result
						Pass/Fail
Bluetooth + Wi-Fi Ant 0 + Wi-Fi Ant 1	0.01	0.08	0.06	0.15	1	Pass

Result: Pass