

# 1. RF Exposure Requirements

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## 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:  
 Antenna 0: 16.79dBm (Conducted)  
 Antenna 1: 16.80dBm (Conducted)  
 Max. RF Output Power: 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  $\lambda$  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 <sup>2</sup>
1.34-30	3,450 R <sup>2</sup> /f <sup>2</sup>
30-300	3.83 R <sup>2</sup>
300-1,500	0.0128 R <sup>2</sup> f
1,500-100,000	19.2R <sup>2</sup>

**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