

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: 55" LED UHD TV
Trade Name: Continental
Model No.: CE-TV55UQW1F2US
Adding Model(s): D55N215-U-A-I, XXXXXXXX55XXXXXXXXX(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: XOMCETV55UQW1F2US
Equipment Type: Fixed device

Technical Characteristics of EUT:

Bluetooth(BLE mode)

Bluetooth Version: V5.0 (BLE mode)
Frequency Range: 2402-2480MHz
RF Output Power: 2.15dBm (Conducted)
Data Rate: 1Mbps
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: 7.85dBm (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: 16.75dBm (Conducted)
 Antenna 1: 16.21dBm (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-VHT80
 Frequency Range: 5150-5250MHz, 5725-5850MHz
 RF Output Power: 5150-5250MHz:
 Antenna 0: 14.81dBm (Conducted), Antenna 1: 14.93dBm (Conducted)
 5725-5850MHz:
 Antenna 0: 14.17dBm (Conducted), Antenna 1: 14.61dBm (Conducted)
 Type of Modulation: QPSK, 16QAM, 64QAM,256QAM
 Type of Antenna: Integral Antenna
 Antenna Gain: 5150-5250MHz Antenna 0 & 1: 1.93dBi
 5725-5850MHz Antenna 0 & 1: 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	19.2R 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	7.85	2.0	100	8.00	7.85
Wi-Fi (2.4GHz) Ant 0	2412	16.75	2.0	100	17.00	16.85
Wi-Fi (2.4GHz) Ant 1	2412	16.21	2.0	100	17.00	16.85
Wi-Fi (5GHz) Ant 0	5150	14.81	1.93	100	15.00	14.78
Wi-Fi (5GHz) Ant 1	5150	14.95	1.93	100	15.00	14.78

Frequency (MHz)	Option	Min. Distance	Max. Power		Exposure Limit	Ratio	Result
		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
2402	C	20.00	7.85	6.10	768.00	0.01	Pass
2412	C	20.00	16.85	48.42	768.00	0.06	Pass
2412	C	20.00	16.85	48.42	768.00	0.06	Pass
5150	C	20.00	14.78	30.06	768.00	0.04	Pass
5150	C	20.00	14.78	30.06	768.00	0.04	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	0.06	0.06	0.13	1	Pass

Result: Pass