UHD World Association
世界超高清视频产业联盟

Technical requirements of the public display system (indoor LCD) of UHD video and audio broadcasting system for "Bai Cheng Qian Ping"

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Contents

Technical requirements of the public display system（indoor LCD） of UHD video and audio broadcasting system for “Bai Cheng Qian Ping”

1 Scope

This document specifies the technical requirements for the UHD LCD 2D/3D indoor public display system (hereinafter referred to as "UHD LCD 2D/3D") of the UHD video and audio transmission system for "Bai Cheng Qian Ping".

This document is applicable to the R&D, production, testing and application of the UHD LCD 2D/3D indoor public display system of the UHD video and audio transmission system for "Bai Cheng Qian Ping".

2 Normative References

The contents in the following documents, through normative references in the text, constitute indispensable provisions of this document. Among them, the dated reference documents are only applicable to the version corresponding to that date; For undated references, the latest version (including all amendments) is applicable to this document.

GB 4943.1-2022 Audio Video, Information Technology and Communication Technology Equipment Part 1: Safety Requirements

GB/T 9254.1-2021 Information Technology Equipment, Multimedia Equipment and Receivers Electromagnetic compatibility Part 1: Emission requirements

GB 17625.1-2012 Electromagnetic Compatibility Limits Harmonic Current Emission Limits (Input current of each phase of equipment ≤ 16A)

GB/T 17626.2-2018 Electromagnetic compatibility Testing and measurement techniques Electrostatic discharge immunity test

GB/T 17626.5-2019 Electromagnetic compatibility testing and measurement techniques Surge (impact) immunity test

GB 24850-2020 Limited Values and Levels of Energy Efficiency for Flat Panel TVs and STBs

SJ/T 11343-2015 General Specification for LCD Display of Digital TV

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 LCD screen

The applied voltage changes the orientation of liquid crystal molecules to modulate the intensity of light passing through the liquid crystal to produce a display screen with grayscale or color images.

3.2 LCD splicing screen

The display screen is composed of multiple LCD screens that can display pictures and video signals independently.

3.3 UHD LCD screen

4K UHD LCD and 8K UHD LCD are collectively referred to as UHD LCD.

3.4 **4K UHD LCD screen**

The physical resolution of Ultra HD LCD reaches 3840 × 2160.

3.5 **8K UHD LCD screen**

The physical resolution of Ultra HD LCD reaches 7680 × 4320.

3.6 **UHD LCD system**

Display system including ultra-high definition LCD and video processing.

3.7 **3D crosstalk**

Represent comfort, measure the degree of cross interference between left and right eyes, and reflect it through brightness.

3.8 **3D compatible viewing zone**

According to the 3D test map, the left and right eyes just see the positive and negative 40cm area of the corresponding image of the left and right eyes.

3.9 **Number of 3D views**

The number of images corresponding to a single viewing angle.

3.10 **3D depth of screen**

Represents the spatial stereo effect, which is the information along the vertical axis corresponding to the display plane.

3.11 **Physical gap**

The gap between the edges of adjacent display units in the LCD splicing screen.

Note: The physical seam is shown in Figure 1.

3.12 **Optical dark string**

When the LCD unit displays the full white field image signal, the distance from the edge of the displayed image to the outermost edge of the screen.

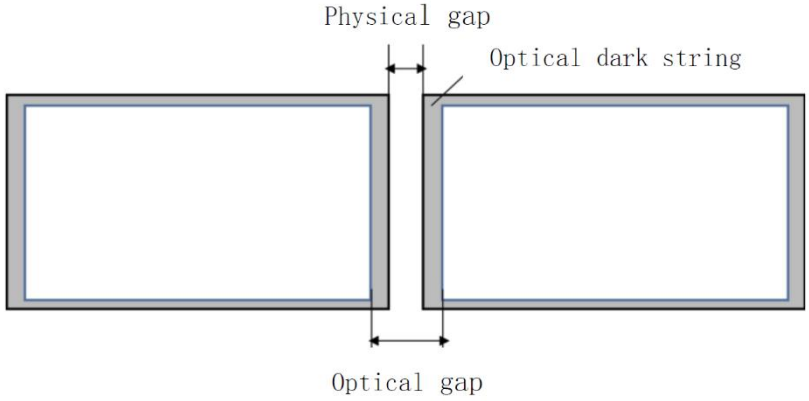
Note: The optical dark edge is shown in Figure 1.

3.13 **Optical gap**

The size of two optical dark edges of adjacent LCD units plus physical seam.

Note: The optical seam is shown in Figure 1.

Figure 1 **Schematic diagram of physical seam, optical dark edge and optical seam**



3.14 **Audio Vivid**

Technical specifications for audio coding and decoding specified by T/UWA 009.1, and the name of supporting derivative technology.

3.15 **Bai Cheng Qian Ping**

'Bai Cheng Qian Ping' means 'a hundred cities and a thousand large screens', which is a public promotion project, refers to the 8K UHD HDR image and 3D audio played on over a thousand large screens at commercial streets in more than hundred major cities.

4 **Abbreviations**

The following abbreviations are applicable to this document.

DP Display Port
DVI Digital Visual Interface
HDMI High Definition Multimedia Interface
HDR High Dynamic Range
LCD Liquid Crystal Display
3D 3-dimension

5 **General requirements**

5.1 **Normal service conditions**

The conditions for normal indoor use are as follows:

——Temperature: 5 ℃~35 ℃;
——Relative humidity: 20%~80%;
——Atmospheric pressure: 86kPa~106kPa;
——Power supply: AC 220 (1 ± 10%) V, (50 ± 1) Hz; Or AC 380 (1 ± 10%) V, (50 ± 1) Hz.

5.2 **Appearance structure**

The appearance structure shall meet the following conditions:

——The display screen shall be clean in appearance, free of concave and convex marks, scratches, cracks, burrs, mold spots and other defects, and the surface coating shall be free of blistering, cracking, falling off, etc;The metal parts shall be free of rust and other mechanical damage, and the perfusion shall not spill.

——The display screen should not have noticeable specular reflection and diffuse reflection.

——The text identification on the system surface shall be clear and complete; The surface shall be provided with product identification, which shall be marked with general symbols or Chinese. The identification shall not be easily erased and shall not be curled.

——Buttons, switches and knobs shall be operated flexibly and reliably, and parts shall be fastened without looseness. The whole machine shall have sufficient mechanical stability.

——The installation of the splicing screen needs to adapt to the application requirements of the venue, and the overall structure needs to be compact and generous.

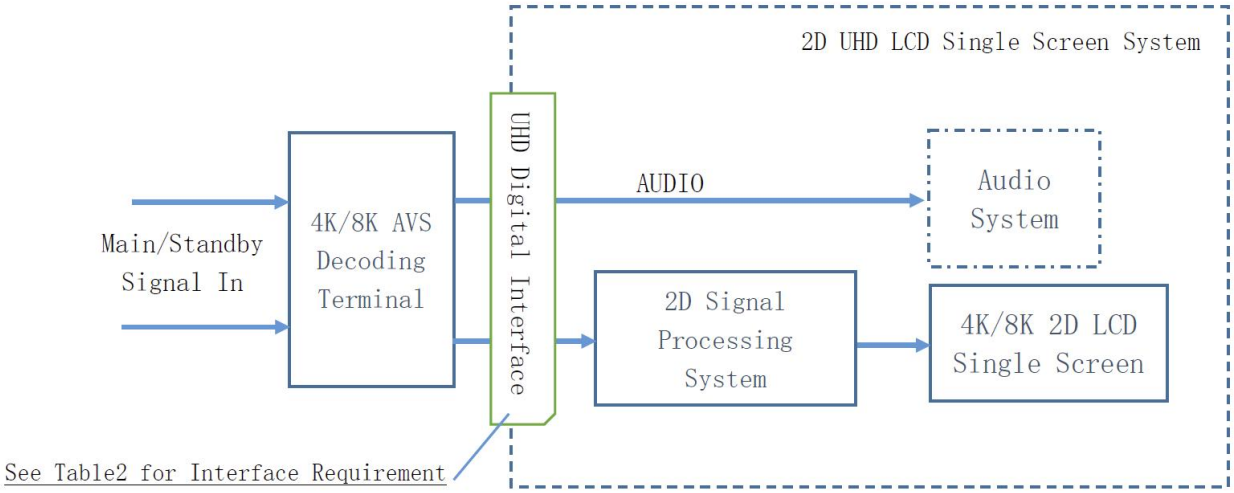
5.3 **System architecture**

5.3.1 **4K/8K 2D Ultra HD LCD Screen System**

4K/8K 2D ultra-high definition LCD screen system is divided into single screen system and splicing screen system.

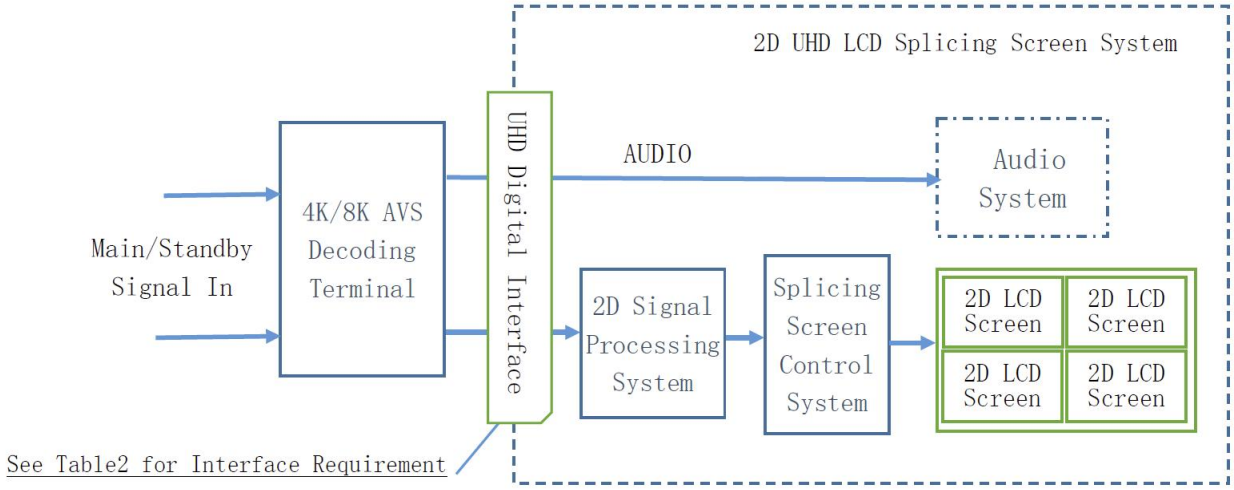
2D monomer screen system architecture refers to Figure 2.

Figure 2 **Architecture of 4K/8K 2D Ultra HD LCD Single Screen Display System**



2D splicing screen system architecture refers to Figure 3.

Figure 3 **Architecture of 4K/8K 2D Ultra HD LCD Panel Display System**

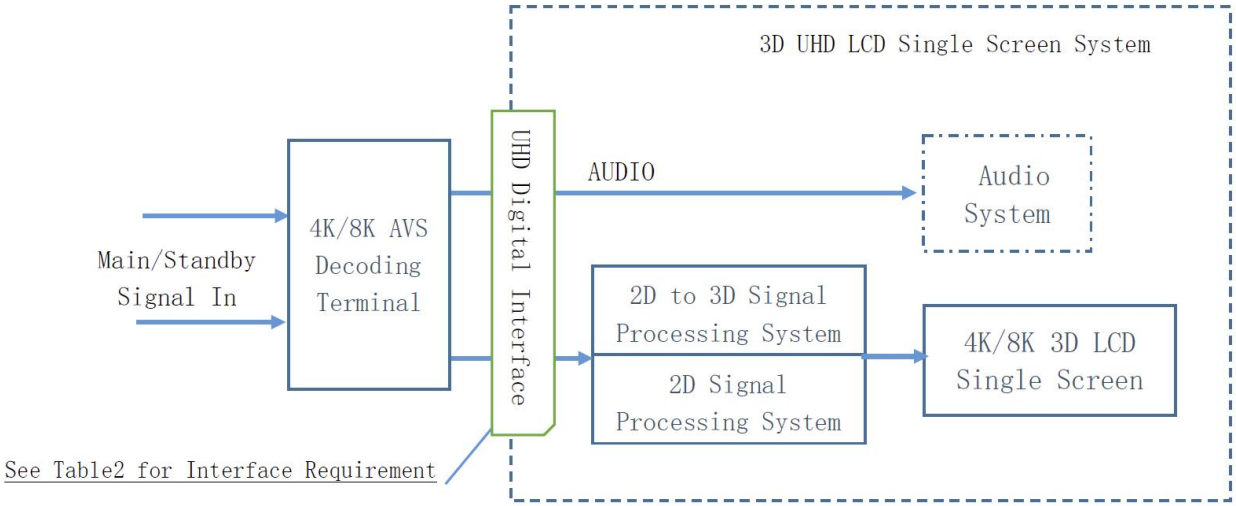


5.3.2 **4K/8K 3D Ultra HD LCD Screen System**

4K/8K 3D ultra-high definition LCD screen system can be divided into single screen system and splicing screen system.

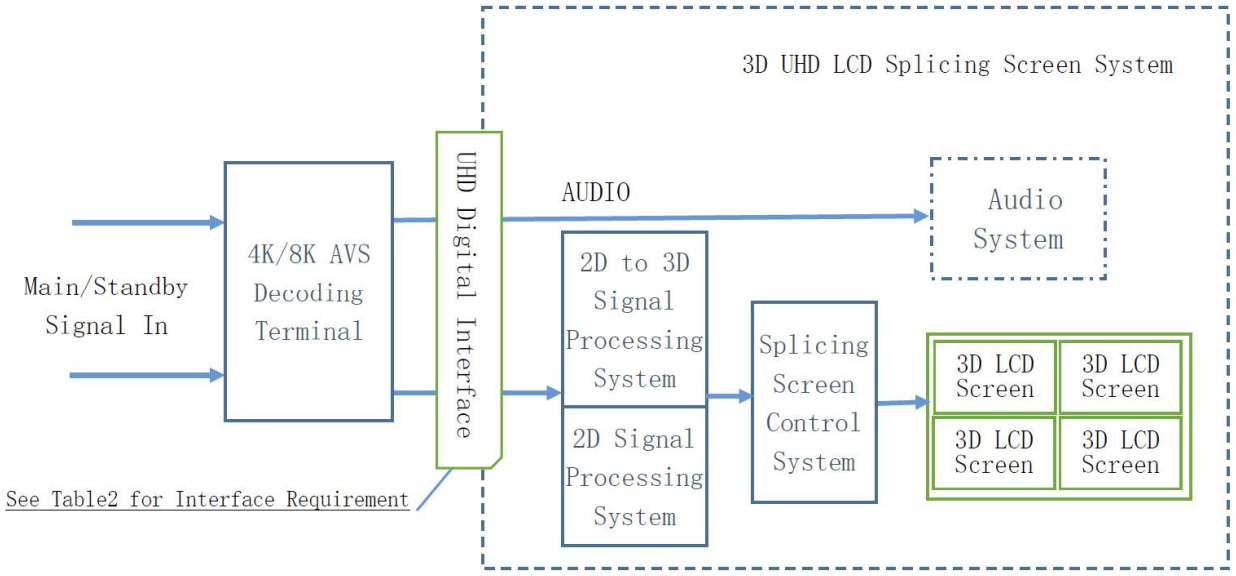
3D monomer screen system architecture refers to Figure 4.

Figure 4 **Architecture of 4K/8K 3D Ultra HD LCD Single Screen Display System**



3D splicing screen system architecture refers to Figure 5

Figure 5 **Architecture of 4K/8K 3D Ultra HD LCD Single Screen Display System**



In 3D UHD LCD display system, 2D/3D display control signal of 4K/8K AVS decoding terminal shall be responded in real time. That is:

——After receiving the 2D display request signal, play the video in 2D mode on the LCD screen;

——After receiving the 3D display request signal, turn the 2D video to 3D video on the LCD screen and play it again.

5.4 **Playback requirements**

Subjective requirements for 2D video playing: the image and picture shall be complete and smooth without fragmentation, jitter and deformation.

Subjective requirements for 3D video playing: the image and the picture are complete, smooth, without jitter, the picture is not blurred, no ghosting, and the three-dimensional appearance is comfortable.

When the system supports 2D real-time to 3D function, 4K video input delay shall be ≤ 60ms, and 8K video input delay shall be ≤ 300ms.

The splicing screen display system plays the whole screen without any picture out of sync.

5.5 **Functional requirements**

The system functions shall meet the configuration requirements in Table 1.

Table 1 **Functional configuration requirements**

No.	Function	Requirements
1	Video input	Mandatory
2	Brightness adjustment	Mandatory
3	Color adjustment	Mandatory
4	Adjustable color temperature	Mandatory
5	Signal window opening	Mandatory
6	Support HDR (in accordance with GY/T 315-2018 standard)	Mandatory
7	Full screen display	Mandatory
8	Window Overlay	Mandatory
9	Brightness correction	Mandatory for splicing screen
10	chromatic correction	Mandatory for splicing screen
11	Redundant backup function	Optional
12	Visual System management	Optional
13	Visual system operation and maintenance	Optional
14	3D display	Mandatory for 3D
15	3D depth of field adjustment	Mandatory for 3D
16	3D parallax adjustment	Mandatory for 3D
17	3D Area Display Settings	Optional
18	2D to 3D	Optional

5.6 **system interface**

The system interface shall meet the configuration requirements in Table 2.

Table 2 **System interface configuration**

No.	Interface		Requirements
1	Digital video input interface	4K	One channel HDMI2.0 Mandatory
		8K	Either 4-way HDMI 2.0 or 1-way HDMI 2.1 is required
2	Single LCD input interface		DVI or HDMI or DP is required
3	Control port		Mandatory
4	Video output interface		Mandatory
5	Audio input connector		Optional
6	Audio output interface		Optional

5.7 **Display performance requirements**

The display performance of 2D ultra-high definition LCD display system, single screen shall meet the requirements of Table 3, and splicing screen shall meet the requirements of Table 4. The display performance

of 3D ultra-high definition LCD display system, single screen shall meet the requirements of Table 5, and splicing screen shall meet the requirements of Table 6.

Table 3 **Display performance requirements for 2D UHD LCD single screen display system**

No.	Display performance		Unit	Technical requirement
1	Physical resolution	4K	pixel	≥3840×2160
		8K		≥7680×4320
2	Maximum brightness	White screen	cd/m2	≥350
3	Brightness angle	level	°	≥70
		vertical		≥60
4	contrast ratio		times	≥1000:1
5	Uneven brightness in the screen		%	≤30
6	Color unevenness in the screen ()Δu'v'		— -	≤0.03
5	response time		ms	≤9
7	Frame changing frequency		Hz	≥50
8	Support signal input		bit	8/10
9	Color temperature		K	3200-9300 adjustable
10	Pixel defect	Full screen	individual	The total number of independent bad points does not exceed 2
		Area (100 × 100 pixels)		There should be no two consecutive bad points

Table 4 **Display performance requirements of 2D UHD LCD splicing screen display system**

No.	Display performance		Unit	Technical requirement
1	Full screen resolution after splicing		pixel	≥3840×2160
2	Single mosaic screen resolution		pixel	≥1920×1080
3	Maximum brightness	White screen	cd/m2	≥400
4	Brightness angle	level	°	≥70
		vertical		≥60
5	contrast ratio		times	≥1000:1
6	response time		ms	≤9
7	Physical seam		mm	≤1
8	Optical seam		mm	≤5
9	Flatness		mm	≤2
10	Uneven brightness in the screen		%	≤30
11	Color unevenness in the screen ()Δu'v'		—	≤0.03
12	Uneven brightness between screens		%	≤25
13	Color unevenness between screens ()Δu'v'		—	≤0.02
14	Image mosaic error	horizontal direction	pixel	⩽1
15		Vertical direction	pixel	⩽1
16	Frame changing frequency		Hz	⩾50
17	Support signal input		bit	8/10
18	Color temperature		K	3200-9300 adjustable

No.	Display performance		Unit	Technical requirement
19	Pixel defect	Each splicing screen	individual	The total number of independent bad points does not exceed 2
		Area (100 × 100 pixels)		There should be no two consecutive bad points

Table 5 **Display performance requirements of 3D UHD LCD single screen display system**

No.	Display performance		Unit	Technical requirement
1	Physical resolution	4K	pixel	≥3840×2160
		8K		≥7680×4320
2	Maximum brightness	White screen	cd/m2	≥250
3	contrast ratio		times	≥1000:1
4	response time		ms	≤9 ≤ 9
5	Frame changing frequency		Hz	≥50 ≥ 50
6	Support signal input		bit	8/10
7	Color temperature		K	3200-9300 adjustable
8	Pixel defect	Full screen	individual	The total number of independent bad points does not exceed 2
		Area (100 × 100 pixels)		There should be no two consecutive bad points
9	3D viewing area		m	2~12m
10	3D depth		cm	≥30
11	3D crosstalk		%	≤10
12	3D image format		—	Left and right/up and down/X Palace/3Dmax/2D+Z
13	Number of 3D views		individual	≥4

Table 6 **Display performance requirements of 3D UHD LCD splicing screen display system**

No.	Display performance		Unit	Technical requirement
1	Full screen resolution after splicing		pixel	≥3840×2160
2	Single mosaic screen resolution		pixel	≥1920×1080
3	Maximum brightness	White screen	cd/m2	≥250
4	contrast ratio		times	≥1000:1
5	response time		ms	≤9
6	Physical seam		mm	≤3
7	Optical seam		mm	≤10
8	Flatness		mm	≤2
9	Uneven brightness between screens		%	≤25
10	Color unevenness between screens ()Δu'v'		—	≤0.02
11	Image mosaic error	horizontal direction	pixel	≤2
12		Vertical direction	pixel	≤2

No.	Display performance		Unit	Technical requirement
13	Frame changing frequency		Hz	⩾50
14	Support signal input		bit	8/10
15	Color temperature		K	3200-9300 adjustable
16	Pixel defect	Full screen	individual	The total number of independent bad points does not exceed 2
		Area (100 × 100 pixels)		There should be no two consecutive bad points
17	3D sharpness		pixel	Related to a single screen, point-to-point
18	3D viewing area		m	2~12m
19	3D depth		cm	⩾30
20	3D crosstalk		%	⩽10
21	3D image format		—	Left and right/up and down/X Palace/3Dmax/2D+Z
22	Number of 3D views		individual	⩾4

5.8 **Security**

The system security shall meet the requirements of GB 4943.1-2022.

5.9 **Electromagnetic compatibility**

5.9.1 **Radio disturbance**

The radio disturbance limit of the system shall meet the requirements of GB/T 9254.1-2021.

5.9.2 **harmonic current**

The system harmonic current shall meet the requirements of GB 17625.1-2012.

5.9.3 **Immunity**

The system immunity limit shall meet the requirements of GB/T 17626.2-2018 and GB/T 17626.5-2019.

5.10 **Environmental test requirements**

The system environmental test requirements shall meet the requirements of SJ/T 11343-2015.

5.11 **Reliability**

Refer to SJ/T 11343-2015 for display reliability.

5.12 **Energy efficiency requirements**

The energy efficiency of 2D UHD LCD single screen shall at least meet the requirements of Level 3 of the energy efficiency level index value of flat panel TV in GB 24850-2020.

5.13 **Environmental protection**

The toxic and harmful substances on the display screen should comply with relevant national regulations.

5.14 **Audio system**

Audio system is optional. See Appendix A for relevant suggestions on audio system.

Appendix A (Normative) Sound system

A. 1 Audio system

The display screen audio system should support analog and digital input interfaces, PCM and encoded audio data. The functions and physical interfaces of the audio system refers to Table 1.

Table A.1 **Audio system functions and physical interfaces**

No.	Items	Describe
1	Input interface	Support no less than two channels of audio XLR interface input and SPDIF interface input
2	decoding	Support MPEG-1 layer 2 and surround sound decoding, support surround sound down mixing stereo, and support jingcai sound decoding
3	Audio output	At least support stereo audio output
4	Loudspeaker and power amplifier	Speakers and matching power amplifiers should be selected according to the distance and area of viewing area and outdoor site conditions. Its frequency response, distortion, sound field unevenness, language intelligibility and other indicators shall meet the requirements of relevant national standards. When in the best viewing position, the sound pressure level shall not be less than 80dB (C-weighted)

References

[1] GB/T 2423.1-2008 Environmental Testing for Electric and Electronic Products Part 2: Low Temperature
[2] GB/T 2423.2-2008 Environmental Testing for Electric and Electronic Products Part 2: High Temperature
[3] SJ/T 11591.4.2.1-2016 Stereoscopic Display Devices Part 4-2-1: Measurement Methods for Free Stereoscopic Display Devices Optical and Photoelectric
[4] SJ/T 11646-2016 Test Method for Image Quality of Open eye Stereo Television
[5] SJ/T 11710-2018 Acceptance Specification for LCD Splicing System