UHD World Association
世界超高清视频产业联盟

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

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Contents

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1 Scope

This document specifies the technical requirements for the outdoor UHD LED display system (hereinafter referred to as the system) 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 outdoor UHD LED 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 Information Technology Equipment Safety Part 1: General Requirements
GB 17625.1 Electromagnetic Compatibility Limits Harmonic Current Emission Limits (Input current of each phase of equipment ≤ 16A)
GB 50017 Steel Structure Design Standard
GB 50464 Technical Code for Video Display System Engineering
GB/T 9254.1 Information Technology Equipment, Multimedia Equipment and Receivers Electromagnetic Compatibility Part 1: Emission Requirements
GB/T 9254.2 Information Technology Equipment, Multimedia Equipment and Receivers Electromagnetic Compatibility Part 2: Immunity Requirements
GB/T 41808—2022 Image parameter values for high dynamic range television for use in production and programme exchange (ITU-R BT.2100-2:2018)
SJ/T 11141 General Specification for Light Emitting Diode (LED) Display

3 Terms and Definitions

SJ/T 11141 and the following terms and definitions are applicable to this document.

3.1 UHD LED display

4K and 8K UHD LED display are collectively referred to as UHD LED display.

3.2 4K UHD LED display

The LED display screen with ultra-high definition, wide color gamut and high dynamic range and the physical resolution of which could reach 3840 × 2160 (inclusive) and above.

3.3 8K UHD LED display

The LED display screen with ultra-high definition, wide color gamut and high dynamic range and the physical resolution of which could reach 7680 × 4320 (inclusive) and above.

3.4 UHD LED display system

Display system including ultra-high definition LED display and video processing.

3.5 Video processing system

A system that can input, process and output multiple video signals. Video processing functions mainly include video format conversion, video splicing, video synchronization, video scaling, windowing, window roaming, window overlay, character overlay, and other functions include deinterlacing, video noise reduction, video enhancement, etc.

3.6 **Window**

The display area of the input signal is specified in the screen group.

3.7 **Background**

The default picture screen of the windowless display section on the LED display.

3.8 **Redundant backup function**

When a signal source of input interface, output interface or any host in the dual host is interrupted, the control system automatically switches to the corresponding backup input interface, backup output interface or another host in the dual host for display, so as to ensure that the LED display screen always displays the corresponding picture or image.

3.9 **Signal processing bits**

The display system can process and display the coding bits of component colors of the content.

3.10 **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.

LED Light Emitting Diode
3D 3-dimension
HDMI High Definition Multimedia Interface
HDR High Dynamic Range
EOTF Electro-optical Transfer Function
PFC Power Factor Correction

5 General requirements

5.1 Normal service conditions

The normal use conditions of outdoor system are as follows:

——Temperature: - 30 ℃~50 ℃;
——Relative humidity: 20%~80% (no condensation);
——Air pressure: 86kPa~106kPa;
——Power supply: AC 220 (1 ± 10%), (50 ± 1) Hz; 380 (1 ± 10%) V, (50 ± 1) Hz.

5.2 Appearance structure

The outer surface of LED display unit shall be free of obvious scratches.

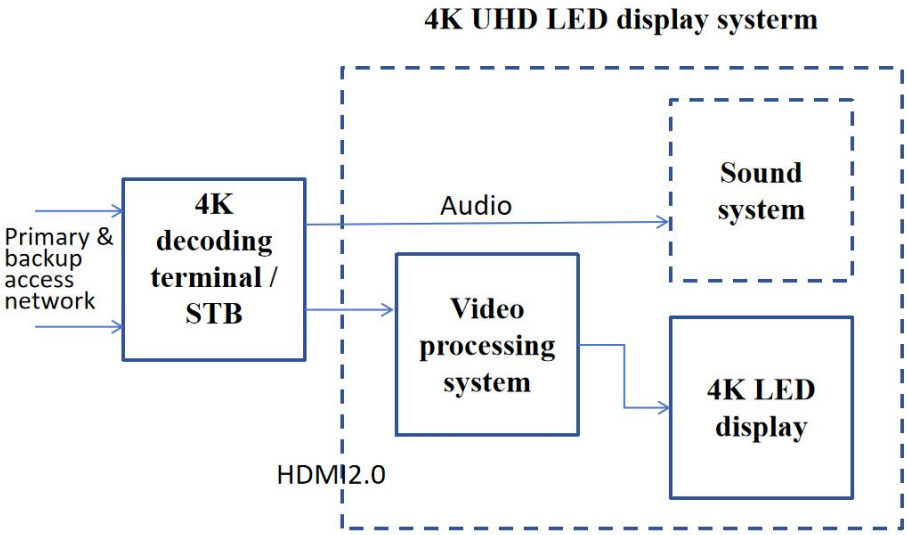
The appearance of LED screen shall be clean, and the surface shall be free of concave convex marks, scratches, cracks, burrs, mold spots and other defects. The surface coating shall be free of blistering, cracking, falling off, etc; The metal parts shall be free of rust and other mechanical damage, and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

5.3 System block diagram

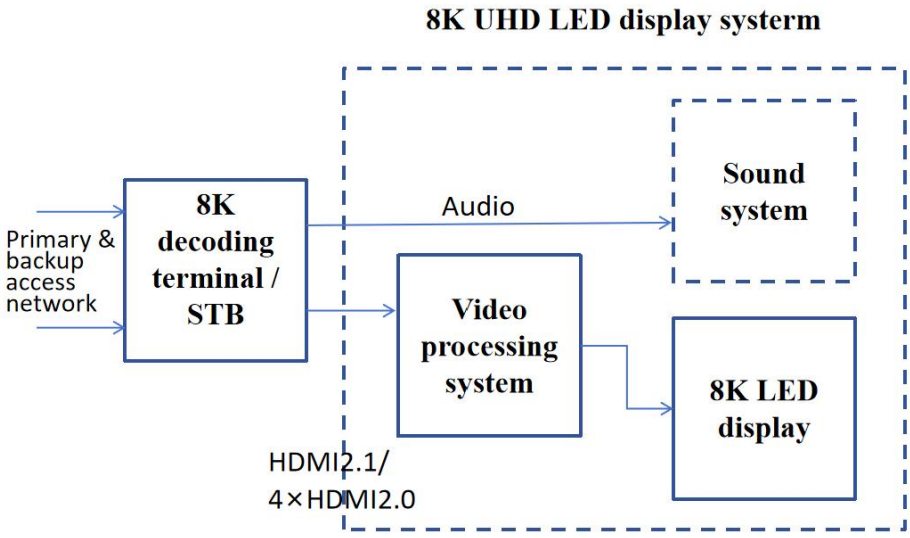
4K system block diagram refers to Figure 1.

Figure 1 **4K Ultra HD LED Display System Block Diagram**



8K system block diagram refers to Figure 2.

Figure 2 **8K Ultra HD LED Display System Block Diagram**



5.4 Broadcast requirements

The image and picture shall be complete and smooth without fragmentation, jitter and deformation.

5.5 Functional requirement

The system function shall meet the requirements in Table 1.

Table 1 **Functional 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 (conform with GB/T 41808-2022 standard)	Mandatory
7	Full screen display	Mandatory
8	Full screen roaming	Mandatory
9	Window zoom	Mandatory
10	Window overlay	Mandatory
11	Brightness correction	Mandatory
12	Chromatic correction	Mandatory
13	Smoke and temperature alarm	Mandatory
14	Built in underlay	Optional
15	Redundant backup function	Optional
16	Visual system of management	Optional
17	Visual system of operation and maintenance	Optional
18	3D display	Optional
19	Signal pre-monitoring and echo	Optional
20	Scene setting and patrol	Optional

5.6 System interface

The system interface shall meet the requirements in Table 2.

Table 2 **Display system interface**

No.	Interface		Requirements
1	Digital video input interface	4K	1 channel HDMI 2.0 Mandatory
		8K	Either 4-channel HDMI 2.0 or 1-channel HDMI 2.1 is required
2	Control port		Mandatory
3	Video output interface		Optional
4	Audio input connector		Optional
5	Audio output interface		Optional

5.7 Physical performance requirements

The physical performance of the system shall meet the requirements of Table 3.

Table 3 **Physical performance requirement**

No.	Physical performance	Unit	Technical requirements
1	Relative deviation of pixel center distance	%	≤5
2	Horizontal displacement	%	≤5
3	Vertical dislocation	%	≤5

5.8 Display performance requirement

The system display performance shall meet the requirements in Table 4.

Table 4 **Display performance requirements**

No.	Display performance		Unit	Technical requirements
1	Physical resolution		pixel	≥3840×2160(4K) ≥7680×4320(8K)
2	Maximum brightness	white light	cd/m2	≥5000
		Black light		≥3500
3	Visual angle	horizontal	°	≥140
		vertical		≥120
4	Chromaticity angle	horizontal	°	≥150
		vertical		
5	Contrast ratio		times	≥5000:1
6	Brightness uniformity		%	≥95
7	Chromaticity nonuniformity		—	Δu'v'≤0.01
8	Color gamut coverage (BT.2020)		%	≥78（CIE 1931）
9	Frame frequency		Hz	≥50
10	Refresh rate		Hz	≥3840
11	Signal processing bits		bit	≥14
12	Support signal input		bit	10
13	Chromatic coordinate deviation	u’	—	±0.015
		v’		±0.015
14	Pixel out of control rate	Full screen	—	≤1×10-4（There should not be 3 consecutive bad points）
		Area(100×100 pixels)		≤3×10-4（There should not be 3 consecutive bad points）
15	Non uniformity of black screen		%	≤10
16	EOTF curve fit		—	0.7-1.3
17	Color temperature		K	3200-9300 adjustable

5.9 **Protection grade**

The protection level of the display screen shell is greater than IP65 on the front and greater than IP43 on the back.

5.10 **Security**

The system security shall meet the requirements of GB 4943.1.

5.11 **Electromagnetic compatibility**

5.11.1 **Radio disturbance**

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

5.11.2 **Harmonic current**

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

5.11.3 **Immunity**

The system immunity shall meet the requirements of GB/T 9254.2.

5.12 **Environmental adaptability**

The system environment adaptability shall meet the requirements of SJ/T 11141.

5.13 **Reliability**

The mean time between failures (MTBF) of display screen shall not be less than 5000h.

Support 7 × 24h continuous trouble free operation.

5.14 **Environmental protection**

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

5.15 **Energy saving characteristics**

At ambient temperature, the power factor of the display power supply converter is not less than 93%, and the conversion efficiency is not less than 85%, with PFC function.

The display screen shall meet the requirements of relevant energy-saving standards.

The energy efficiency of white LED light shall be greater than or equal to 3.0cd/W, and that of black LED light shall be greater than or equal to 2.4cd/W.

5.16 **Building strength requirements**

The building strength of the display system shall meet the requirements of GB 50017 and GB 50464.

5.17 **Audio system**

Recommendations on sound systems are provided in Appendix A.

Appendix A
(informative) Audio system

A.1 Audio system

The display screen audio system may support analog and digital input interfaces, PCM and encoded audio data. The functions and physical interfaces of the audio system are shown in Table A.1.

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

NO.	Items	Description
1	Input	Support at least two channels of audio XLR interface input and SPDIF interface input
2	Decoding	Supports MPEG-1 layer 2 and AC-3 decoding, preferably Audio Vivid decoding, support surround sound downmix stereo, preferably support 3D audio downmix sruuound sound and stereo
3	Output	At least support stereo audio output, preferably surround audio and 3D audio output
4	Loudspeaker and power amplifier	Speakers and matching power amplifiers should be selected based on the distance and area of the viewing area, as well as the outdoor venue conditions. The frequency response, distortion, sound field unevenness, language intelligibility and other indicators should meet the requirements of relevant national standards. When in the best viewing position, the sound pressure level should not be less than 80dB (C weighted).