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## Research on the black and white balance technology of TV camera technology

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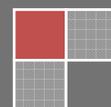
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### ABSTRACT

The black and white balance technique is one of predominant television camera techniques. During the process of photography, the black and white balance should be adjusted according to the color temperature of light source and filters. The black and white balance technique is of profound significance to TV camera, and it enables the TV system to make a real and vivid representation of the specific color. For the television system, its central role is to relieve the color in internal situation to reproduce color of the situation. In the TV camera technology, the representation of color is based on the performances of cameras as well as the balance of black and white photography technique. In the process of the black and white balance adjustments, you need to select the appropriate color temperature and light source, which is the key to the black and white balance technique. The main reason to choose appropriate lighting is that human vision has a corresponding adaptation for specific color. For example, bright colors will produce the stimulating effect on Visual system. This study is to analyze the black and white balance techniques in the TV camera technology through black and white balance theory to analyze their specific types, how to set up a television camera system with black and white balance techniques in practice, and specific factors that should be considered in the actual settings. The essay analyzes the black and white balance technique in the TV camera technology. According to its properties, the essay focuses on the significance of the black and white balance adjustment in TV camera technology, the factors that should be concerned in the adjustment, and the impact of different adjustments on the television camera technique.

### KEYWORDS

TV camera technology; Black balance technology; White balance technology; Black and white balance adjustment principle



## INTRODUCTION

As the black balance and white balance techniques are the two core principles in the TV camera technology, this essay focuses on the black and white balance in the TV camera technology, the TV camera black and white balance adjustment and adjustment types. Along with the development and progress of the information age, TV camera technology constantly is improving, in which black and white balance adjustment is extremely necessary<sup>[1]</sup>. In TV photography, when an internal system selects the appropriate filters, the white balance and black balance adjust. The important application of the TV camera white balance techniques is for color cameras, to accurately make the camera image to accurately reflect the landscape conditions, while the black balance is used to reproduce the color in the vision. In camera technology, there is an important external factor on black and white balance settings, which needs to be considered, that is, the influence of color temperature. The core function of TV system as well as TV is to reproduce colors. Whether the TV can accurately show images or not is directly linked with the performance of TV camera system, and the black and white adjustment techniques.

The TV screen can really show the connection between the television camera systems directly linked to the performance, and systems technology has something to do with the black and white balance adjustment.

## DISCUSSION ABOUT TV CAMERA TECHNIQUES

### TV camera techniques

TV camera technology is the TV camera's staff's mastery of light and color TV systems, specific situational stability orientation, composition, processing and application of integrated technology. With the development of modern science and technology, the demands for TV systems increase too, both on high-performance system configuration and on the sharpness of the picture and color matching<sup>[2]</sup>. Typically, the picture quality every channel is associated with the actual photography skills. TV photography has two main parts: TV camera technology and film arts. The TV camera technology is to use black and white balance to present the actual picture, laying the firm foundation for high quality television programs.

### Light source and color reduction technology in the TV camera technique

Light source is premise and foundation of the TV system picture and inappropriate light setting will directly impact the presentation of the pictures. The settings of light have a direct influence on the composition and the specific scene. In addition, Color matching in the TV camera technique and restoration is an extremely important process; the restoration of color is based on the camera's white balance adjustment technology<sup>[3]</sup>.

### Other technology in TV photography

For staff at the TV camera, stability of the picture settings is an important technical point. Any footage shot in the TV camera photographing process should follow the principle of stability from the beginning to the end with stability as a precondition. Whether the TV can accurately show images or not is directly linked with the performance of TV camera system, and the black and white adjustment techniques. Stability of the picture shoot can ensure the efficiency of the pictures. Through comprehensive analysis of situational stability of the TV camera, scene of the TV camera staff stability of the scene needs TV camera staff to act under the principle of clearance, stability, accuracy and average<sup>[4]</sup>.

## BLACK BALANCE AND WHITE BALANCE IN THE TV CAMERA TECHNOLOGY

### White balance technology

The white balance technique is mainly used in the color camera, to present these specific shooting situation scenes. The specific color in each image is made up of red, green and blue primary color, which will be combined in different degrees into different colors. As for specific images or load-bearing, the color in the pictures should be adjusted based on three basic colors to ensure the accurate presentation of the scene.

During the adjustment, the white balance technique of the TV camera technology is used to restore and match the colors.

Generally, in the specific TV system camera, the white balance technique is an important technology. But in the specific photography, when staffs use the camera to film the dark-colored or black objects, the three basic colors: red, green, and blue, maintain the equal state. At this time, the graph displayed by the television system screen does not have any color, a completely black image, which is known as the black balance in the professional area<sup>[5]</sup>. As for the TV camera technology, camera needs to adjust the white balance and black balance depending on the specific needs of the pictures, to ensure that the color does not have any biases and the reproduction of color can be effectively conducted.

### The types of white balance technology

The white balance technology in the television camera technique has two types, namely, auto white balance techniques and manual white balance techniques<sup>[6]</sup>. In the black and white balance adjustment process, the selection of filters and filter settings of the TV camera are critical. The specific settings are shown in TABLE 1, that is, the settings of TV camera's filter under typical situations.

**TABLE 1 : Settings of TV camera's filter under typical situations**

Color filter knob sets	Appropriate shooting conditions
3200K	Sunrise, Sunset, Indoor
5600K+1/4ND	Sunny of outdoor
5600K	Cloudy and rainy of outdoor
6000K+1/16ND	Snow scene, alpine, coast or the other bright scene

### Automatic white balance technology

The key function of the automatic white balance technique is that it can automatically adjust the settings of white balance in the set range when the user applies cameras for shooting specific situations. What it adjusts is the color temperature of the video system, with on-load color temperature kept between 2500k and 7000k<sup>[7]</sup>. If the camera's color temperature exceeds this range, final footage will have color distortion, which cannot be automatically corrected. Therefore, we need to manually adjust and correct the image with the white balance technology.

The automatic white balance technology of TV camera techniques consists of two forms: auto-tracking white balance technology and automatic white balance technology in television systems. The auto-tracking white balance is changed according to specific color changes in the actual shooting process. Generally, the range of the auto-tracking white balance techniques remains between 2800k and 6000k<sup>[8]</sup>. This range is also the best range of scene in the shooting, within which the colors will be more natural, real and vivid. The white scene is relatively less in the scene shootings. For example, most of the scene is shown by high temperature objects, such as blue sky and white clouds. Therefore, the continuous white balance technology cannot achieve the effective control and display of the colors, which requires manually adjustments in order to guarantee high quality of pictures.

### Manual white balance techniques

The main function of the manual white balance techniques is to ensure the balance setting of the images are more accurate in the adjustment of the white balance in the TV cameras or to give more authentic presentation of the color in some specific scene while shooting. Such as, the shooting of the sunset requires the manual way to adjust the images to present a more vivid scene. The White balance the camera system requires to use the controller to regulate the white balance technique in order to improve and adjust the pictures.

### Adjustment of black balance and white balance techniques

In order to reproduce colors more accurate in the actual shootings, the filters in the system should be selected in an appropriate way, which refers to the adjustment of the black and white balance techniques in the cameras. The specific process goes as followed:

(1) First of all, the white objects need a standard white balance adjustment in relative degree. Under normal circumstances, white objects can be seen as the camera's White Board, for example, the color white is usually used as the grayscale test card in the camera system for standard proofing. When a camera system loses its system white test cards, the staff can use white paper for contrast.

(2) Second, a selected white background should be set up in the specific shooting scene, especially in the objects that needs to be shoot for a contrast in color. Then, there is some reference for the adjustment of the white balance techniques in the shooting. No reflected light points could appear on the object in the white background in the actual shooting, to avoid color distortion in the image.

(3) The camera lens in the camera should focus on the white reference, and the focal length of lens should be appropriately adjusted, making the whole white background object can cover the entire screen.

(4) The switch button of the automatic white balance should be open, when the circuits in the system can adjust it by the automatic white balance techniques. In the next two or three seconds, the white balance indicator in the camera system will displays the "OK", which means the automatic adjustment of the white balance technique in the system has been completed and the image after improvement has been saved into the corresponding position.

(5) At last, in manual way, the switch of automatic white balance technology in the television camera system should be off, when the white balance technology is stopped and the auto black balance circuit in the system is activated. The half an hour aperture in the camera system will close and adjust the black balance of the image automatically. At this time, the black balance LED displays the word "OK", which means the automatic adjustment of black balance technology in the system is completed, and the image after improvement has been saved into the corresponding position.

Usually, in the black and white balance adjustment of the snake-like TV system, the black balance adjustment of the whole system exerts some effects on the white balance of the images. Therefore, after the black balance adjustment, the white balance of the image should be regulated in an appropriate way. Its main sequence goes as followed: White balance adjustment-Black balance adjustment- White balance adjustment.

### The influence of the color temperature in TV camera system on the black and white balance

The color temperature of the light source in TV camera system influences the adjustment of the black and white balance techniques. According to relevant researches, cameras, human eyes and films have uncertainty characteristics on color temperature of light source deviation<sup>[9]</sup>. In general, values of different color temperature deviation in the black and white balance techniques are shown in TABLE 2.

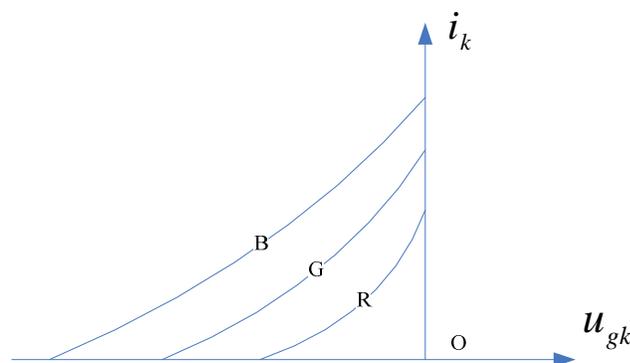
**TABLE 2 : Values of different allowable color temperature deviation in the black and white balance techniques**

Micro cases	Color temperature (k)	Allowable color temperature deviation(k)
333+17=350	2857	-143
333	3000	
333-17=316	3166	+166
250+17=267	3745	-255
250	4000	
250-17=233	4292	+292
200+17=217	4608	-392
200	5000	
200-17=183	5464	+464
167+17=184	5435	-565
167	6000	
167-17=150	6667	+667
143+17=160	6250	-750
143	7000	+937
143-17=126	7937	
125+17=142	7042	-958
125	8000	
125-17=108	9259	+1259

### PRINCIPLES OF THE ADJUSTMENT OF THE BLACK AND WHITE BALANCE IN TV CAMERA TECHNIQUES

According to these analyses above, we can see the black and white balance technique in TV camera techniques is mainly used in color TV picture tubes to have the color in the footage presented authentically. In the color blending process, if the colors are expected to be shown authentically in the TV, it is essential to make sure the black and white image received have no other colors, which can control the authenticity of color by controlling the three basic colors, or the color distortion may occur. In the actual camera process, appropriate strategies should be adopted to adjust the black and white balance techniques based on the specific pictures received, to make the color of pictures more vivid. Above all, that is the process of the adjustment of the black and white balance techniques, which is also called as balance adjustment in camera system in professional field.

The modulation of the color in color TV picture tubes of the TV camera system is shown in the Figure 1. The "ik" in the graph stands for cathode beam current; the "U<sub>gk</sub>" stands for voltage; the "B", "G" and "R" represent the modulation curve graph of the three basic colors (blue, green and red respectively).



**Figure 1 : The modulation of the color in color TV picture tubes**

## CONCLUSION

With the development of the information age, TV camera technology has been continuously improving and the adjustment of black and white balance is essential. During the actual camera in the TV system, an appropriate filter in the internal TV system should be select, whose black and white balance should be adjusted. The black and white balance technique is mainly used in the color cameras to present scenes and colors more authentically, and display the real image of specific objects to the audiences, which is also the key function of the black and white balance technique in TV camera. In a word, the essence of the black and white balance technique is the authentic reproduction of colors in the system. In the settings of the black and white balance, the effect caused by light sources in the camera and color temperatures should be concerned. The appropriate filter is essential to ensure the color in the scene can be authentically presented by the black and white balance techniques.

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