

Some requirement on future flat panels

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Abstract

Two different kinds of subjects are discussed. One is "Enhanced color space for displays" and the other one is "An application for large format displays". Originally defined color space by NTSC has never been used widely for TVs and information displays as there have been no available display devices. LCD panels with new light sources for backlighting will provide much wider color space. LCD monitors which use these new panels will meet almost 100% with the color space defined by NTSC or Adobe. Now, It is the time to deploy wider color space defined by such as the NTSC or Adobe as the standard of LCD display panels.

As the large format display devices with reasonable price have not been available till plasma panels became available, application of these panels as an information display in public space is a quite new experience for us. Various kinds of practical applications are observed and coming out. It will generate many and new types of businesses.

1.Enhanced color space for displays

1-1. Introduction

It has been well known that current available color space for plasma display panels is around 82% and for LCD panels and CRT are around 72% of

originally defined color space of NTSC or Adobe. There have been various kinds of problems to be solved to realize this 100% compatible color space with that of defined by NTSC or Adobe. We developed and have sold CRT monitors which has the color space 100% compatible with Adobe since last year but this has a draw back which is slow response time of green phosphor. So, this monitor is good to display still images but not good to display fast moving images.

Recently we finished development of a 21.3" LCD monitor with LED backlight which has the color space 100% compatible with that of Adobe. We will start to manufacture this monitor within this year in small quantity.

We also developed a 18.1" LCD monitors which is not yet in the market but it has the 90% compatible color space of Adobe defined color space using CCFL as backlight. However, CCFL which provides 90% compatible color space has problem of shorter life time (around 25,000 hours) and it is not yet solved at our side. I believe that it will not need so long time to be solved.

While, a report was presented at SID-04 by ADI that 96% NTSC compatible LCD with CCFL was developed.[1]

Color space of our LED backlit monitor, its color spectrum and band width of color filters are shown in Figure 1 and 2 respectively.

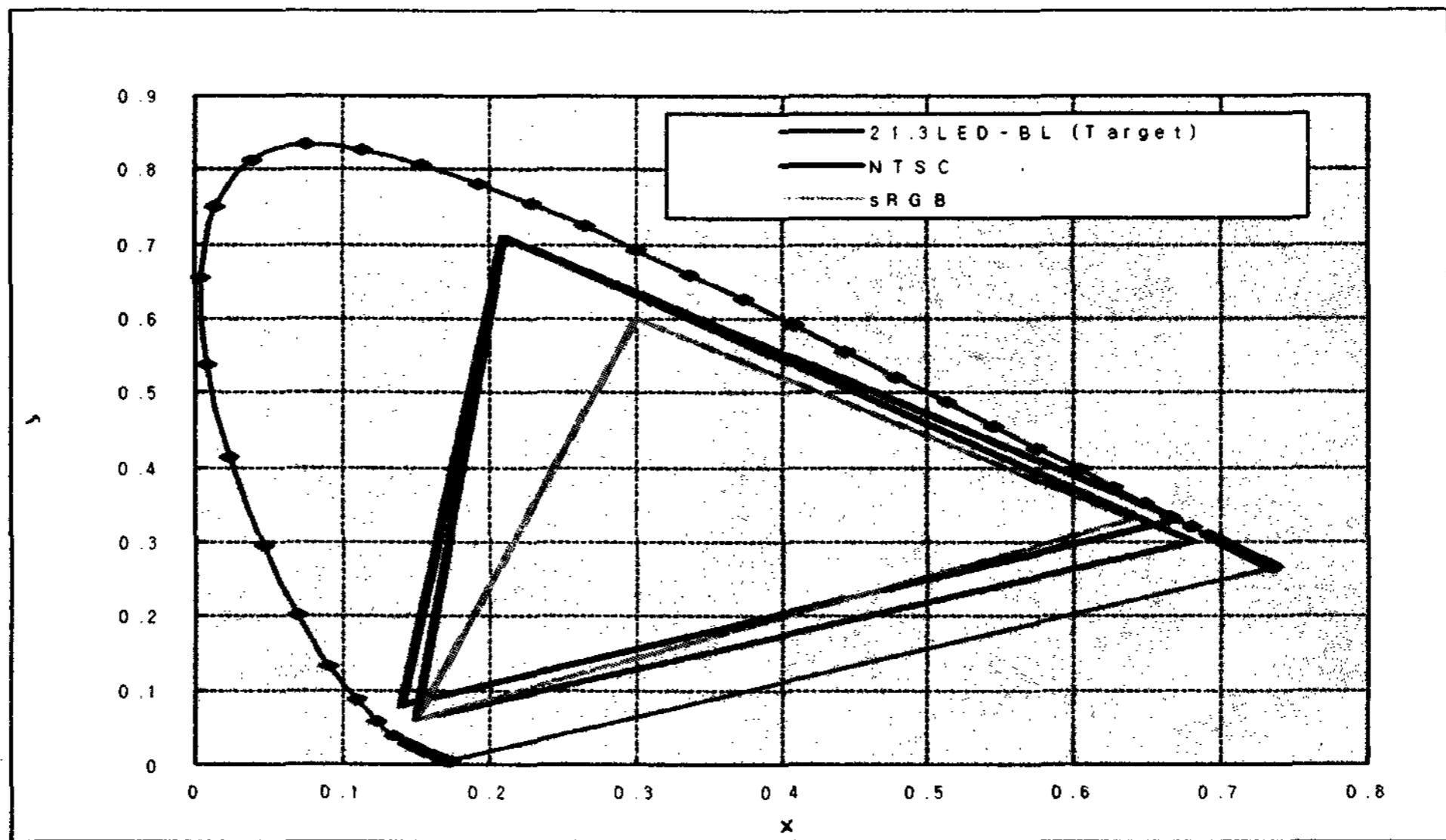


Figure 1
CIE1931 xy color coordinate

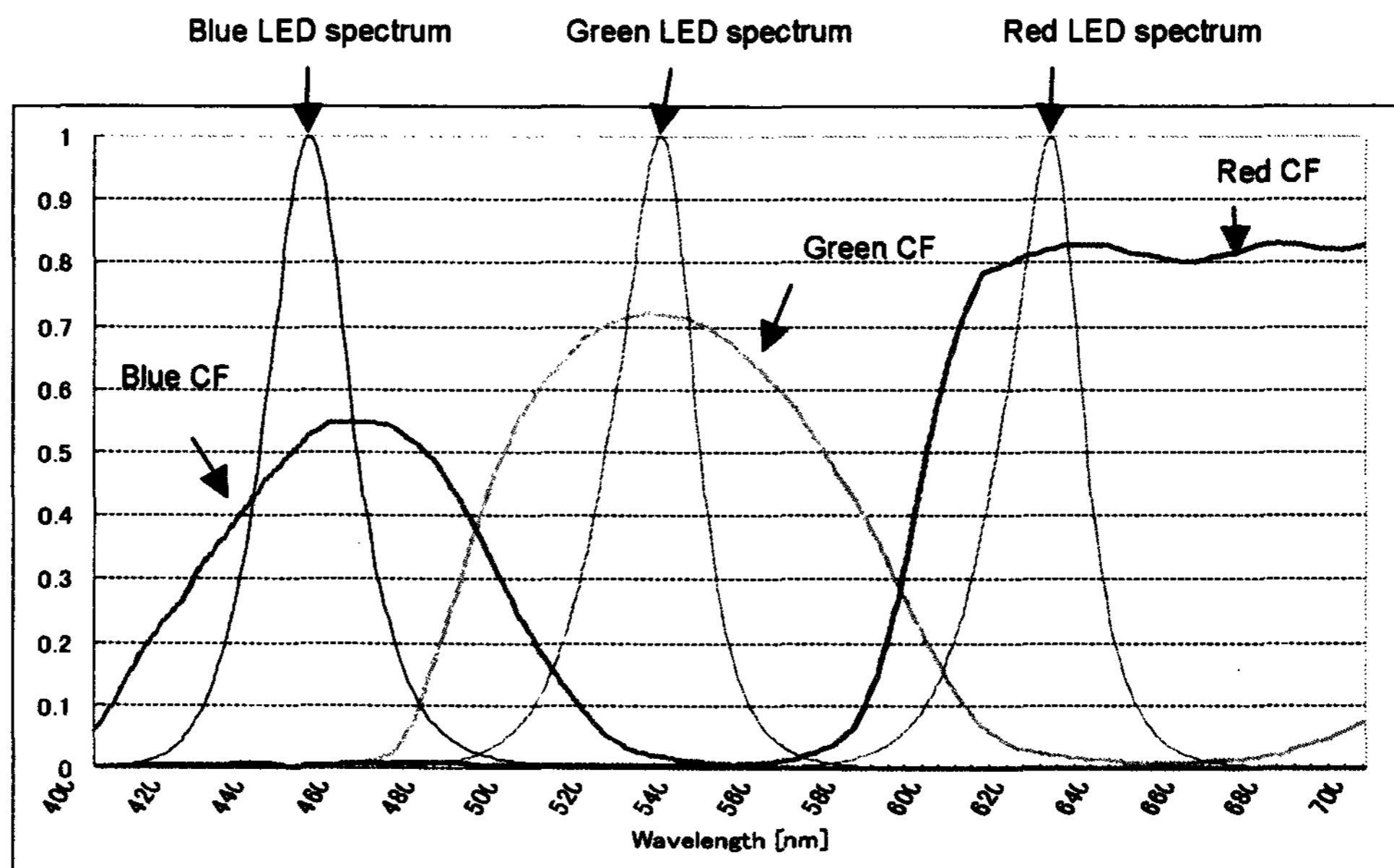


Figure 2
RGB LED spectrum vs Color Filter characteristics

1-2. Color space of Image taking and generating devices

Before digital cameras became available, it was difficult to realize 100% NTSC or Adobe compatible color space for cameras. Now it is totally changed.

Digital cameras and digital movie cameras have potentially much wider color space and there will be no problem for taking pictures which have 100% compatible color space with that of NTSC or Adobe. Many high end models of digital cameras in the market have color space compatible with that of defined by Adobe.

Image scanners which use LED for scanning light source and some high end models also has no problem to realize 100% compatible color space and those are already in the market.

PCs has no problem theoretically to generate all colors within CIE chart which shows all colors to be recognized by human eyes.

1-3. Difference of color space in practical colors

As it is impossible to show the difference of color space in practical colors using general type of projectors, our developmental sample with 100% compatible and one of our products which has 72% compatible color space are demonstrated for reference.

As it is known from Figure 1, CIE color chart, there are some space which is not displayed with true colors by current 72% compatible color space, from green to cyan and blue area. It is said that these area is the least sensible area for human eyes as difference of colors but it will be easily recognized as different colors by comparing those colors to each other. So, in actual world, we recognize those colors as different colors for instance various kinds of greens of leaves of woods and grasses at outdoor. Those are important colors for human life giving a kind of relaxant effect.

1-4. A new world for imaging

Wide introduction of NEW LC Displays with wider color space will encourage information providers to supply images utilizing much wider color space. TV may start to broadcast in wider color space.

More vivid, enhanced color images will be enjoyed

at homes.

Images taken by digital cameras and digital movie cameras will be matched with the NEW LC Displays and people can enjoy the new color world which is more closer to real world.

Images generated by computer devices will have much wider color space and fantastic color images will be generated on the NEW LC Displays.

Image scanners will surely provide the NEW LC Displays enhanced color images from printed color images with high color quality. Much more closer images with original printed images will be displayed on the display screen.

1-5. Requirement for LCD modules to make 100% compatible information displays more popular.

1-5-1. Low module cost

CCFL which provide 100% compatible with NTSC color space will be cheaper than LED as light source for sometime from now. So, development of new CCFL is critical to make module cost lower.

1-5-2. LCD panels with higher light transmission

When LED is used as light source, less number of LEDs makes module cost cheaper. Higher light transmission rate means less number of LEDs for light source. Higher light transmission for panels is critical to make panel cost lower.

It is one way to deploy a field sequential lighting system with LEDs. Eliminating color filter by deploying field sequential lighting will improve greatly light transmission of panels. Current switching speed of TN panels is coming close to 8 mS level and it will be soon realized 2~3 mS switching time which is necessary to have reproduced moving images of satisfactory level with field sequential lighting system. At the same time, it will contribute greatly on cost reduction of modules.

2. An application for Large format screens

2-1. Introduction

Since Plasma panels have been introduced, Information Displays which are used at public space, we call this type of Information Display as Public Display, have opened many kinds of applications for large format displays. As LCD panels are brighter than Plasma panels and longer in product life, LCD has provided new opportunities for the application especially in brighter public space.

Advantages of these flat panels such as thin thickness of panels, rather lighter weight than similar size CRT, easy to install and reasonable price, lead to new application for large format screens as a display device in public space such as airports, train and bus stations, restaurants, sports bars, fast food chain stores, super markets and department stores, show rooms, hospitals, hotels, banks and so on.

The large format displays have been still making new potential opportunities visible day by day.

2-2. Business environment for Public Displays

Broadband communication capability is now available with cables and wireless communication systems. It became possible to send from one place to many places even moving pictures through broadband communication systems. Posters have been used to tell messages to the public as major communication device in the past. Now, Public Displays will take significant part of the posters role and generate new applications at various kinds of public space to deliver message to the public.

The biggest difference at Public Displays from the poster is many kinds of still pictures with text, text pages, moving pictures, and mix of all these contents can be displayed on one single screen. If necessary, sound will be added.

All these contents will be sent via broadband or supplied in form of DVD or other type of memory devices. It depends on its urgency and /or cost. It is very sure that time from generation of contents to reproduce contents on the displays is very much shorter than in case of the printed poster and cheaper the cost for generation of contents.

2-3. Business opportunities for Large format displays

As 30",40",50" size of flat displays were not available till plasma panels became available in reasonable price, product awareness to Public Displays is still not high to the public. Combination of broadband communication and the Large format display are going to change our perception on advertisement and delivering system of messages to the public. There are so many small public spaces around our living environment. Those are as described in section 2-1 as examples but those are a part of applications already known well. There must be much more small public spaces besides of those examples where Public Displays deliver specific messages effectively to the small public.

Combination of broadband communication systems and large format screens will provide new perception on small scale advertisement. Also, it will become popular to rent Public Displays as advertisement spaces.

Many kinds of small size billboards will be replaced by the Large format displays. Public Displays will deliver the public more attractive messages by showing moving images and various kinds of changing still images.

2-4. Requirement for the large format panels

2-4-1. Lower panel cost

The lower panel cost will generate much more new types of applications at smaller public spaces such as a sign board at privately owned small shops, convenience stores, small restaurant and bars and various kinds of kiosks. Sometimes those displays of the small shops may be rent for advertisement space of big manufacturers' products.

2-4-2. Brighter screens with higher contrast ratio and wider viewing angle and wider color space

Although current brightness and viewing angle are acceptable for specific application, brighter and higher contrast ratio with wider viewing angle and wider color space will encourage to install the Public Display in another new applications.

2-4-3. Higher light transmission and slim bezel

More than two monitors will be used together in various cases. Sometimes more than two monitors are used as one display space. In those cases, thick bezel of monitors, it means very often thick bezel of LCD panels, is an obstacle for viewers. Thin bezel panels will be much appreciated. Also, when more than two monitors compose a display space, heat radiated from monitor's display area, namely LCD panels, annoys viewers. It is essential to reduce heat generated at LCD panels to be used at many different public spaces.

3. Coming to the close

I proposed two cases which are not so new but not well recognized widely. I believe both of these will provide big business opportunities and contribute to make our daily life better. In that sense, it will be important for this industry to improve display panels to meet with requirement from a monitor manufacturer which will open another new world.

4. Reference

[1] M. Nishimura et al, SID 04 digest,p122-125.