Optimized LGP for Blue LED

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Abstract

In study, we've disigned LGP that have optimized pattern for blue LED. We used to have active area 3.5" of LGP and blue led(6EA) of LUXPIA in Korea. Also, we made Pattern Generation.

I. Introduction

The flat-displays opposite to the CRT monopolize the display market have developed rapidly to put up the thin thickness, light weight, graceful exterior and so on. Flat-displays have gotten the several problems as the quality, the color scene, a response rate, power consumption compare with those. Though it have these problems, we expect that it will lead growth of displays market. The flat-display includes LCD, PDP, RPTV as well as SED, OLED that will come out soon. The LCD occupied the highest rate in the display market.

Also the industrialization and the research about LCD is progressing actively the inside and outside of the country at present.

LCD have need the BLU (Back Light Unit), in order to display a information,
because LC is non-self device.
So, we have to consider circumspectly not only brightness but also view angle. We use LED, CCFL, EEFL, EL as the backlight source of BLU. And then, the LED and CCFL is the most popular light sources among them. The LED is the general tendency of the world, because the CCFL includes a mercury, and it is a big health hazard.

These days a mercury control is an international problem. that is reason, LED will take the lead in the backlight source market,

In this paper, we designed LGP (Light Guide Panel) of edge type that use LED as source.

2. Experimental

First of all, we measured the shape of the each pattern and the spread of random patterns on the whole of 3.5" BLU by using STM-6 microscope, OLYMPUS Co. in OTEC (Optical Technology Education Center) in Korea

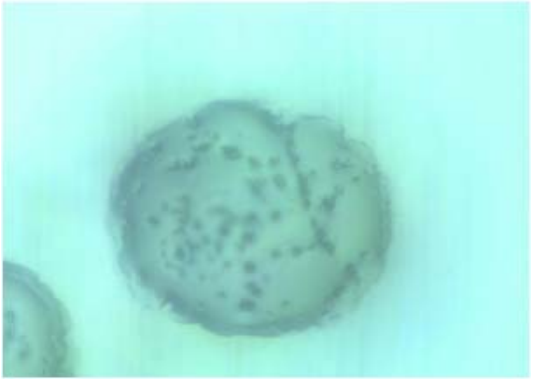

Fig 1 Circle Pattern (X1000)

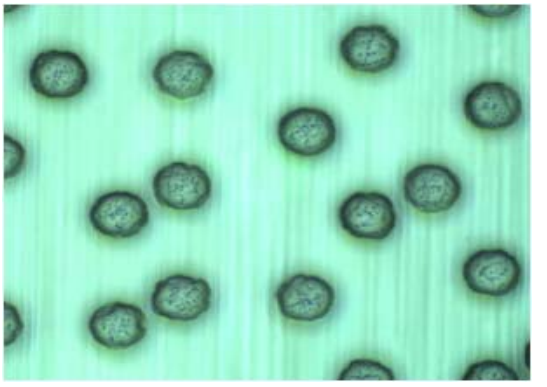

Fig 2 Circle Pattern (X200)

A manufacturing process measure of pattern is the shape of a hemisphere that a radius and height are 75㎛.

The Fig.1 show length and width of pattern are 66㎛ and 72㎛ respectively. We have to consider this average error while we desigen the pattern of LGP.

Also, we have to consider that each pattern have different numerical value. Next, we measured the brightness of each parts (prism sheets, diffuser sheet, protect prism, LGP) in BLU. A measurement apparatus is a spectral radiometer, CS-1000 to be able to rotate to 4 axes(x, y, theta, phi). We was able to know not only change of brightness but also view angle.

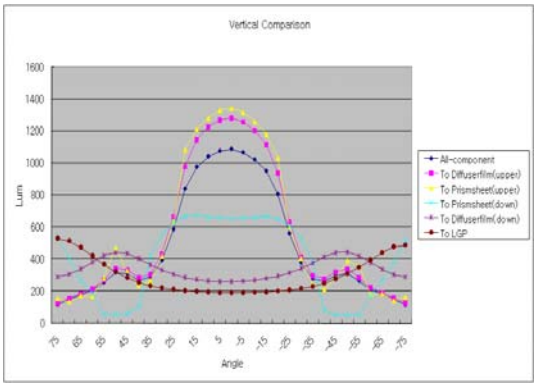

Fig 3 View angle of vertical direction

From above Fig.3 we can know how do each parts have an effect on BLU. In only LGP, we can know the whole brightness is very low. Also a brightness of the front direction is more low than a side direction. However, when diffuser sheet and prism sheet exist, an average brightness improve over three times. In particular, the brightness of front direction improves over five times than before.

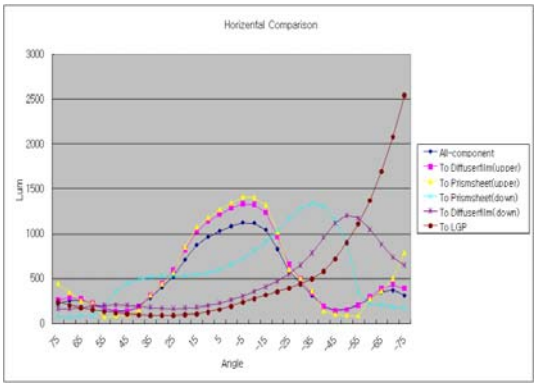

Fig 4 View angle of horizontal direction

This is Fig.4 that measure at horizontal direction. In only LGP, we can know to have the highest brightness at the opposite direction of a source. However, when diffuser sheet and prism sheet exist, an average the brightness of front direction improves higher than a side direction.

According to the experiment, we can know what properties of prism sheets and diffuser sheet in BLU. If we make LGP to have uniform and high brightness except prism sheet and diffuser sheet, we will decease the thickness of BLU. And then, we can help in cost-cutting. Of course, the improver LGP to use prism sheet or diffuser will make the BLU to have more higher quality than before.

we have looked for the optimize pattern distribution of LGP, in order to make more better than LGP.

3. Result

We designed the LGP to use ASAP(Advanced Systems Analysis Program), that is, optical simulation software.

In generally, the distribution of pattern is proportionate the distance from a light source. We divided the active area into four areas. We used the third order spline interpolation for area ratio distribution function.

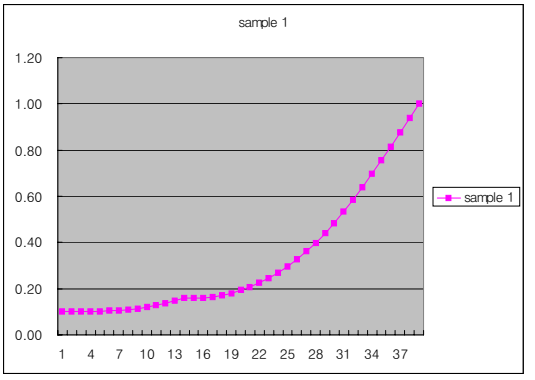

Fig 5 Third order spline of sample 1.

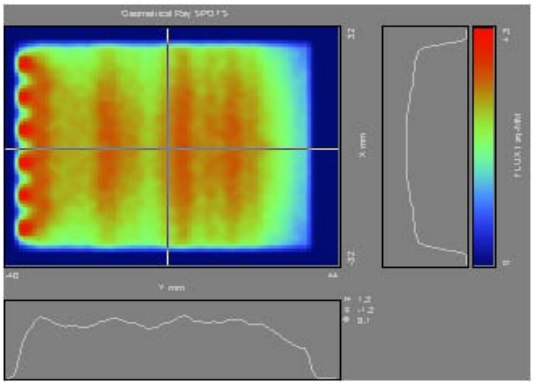

Fig 6 Simulation result of sample 1.

In the sample 1, we can know that the center of brightness focus on the part of a source. Also, End part of active area looks dark. So, we changed the interpolation quotient.

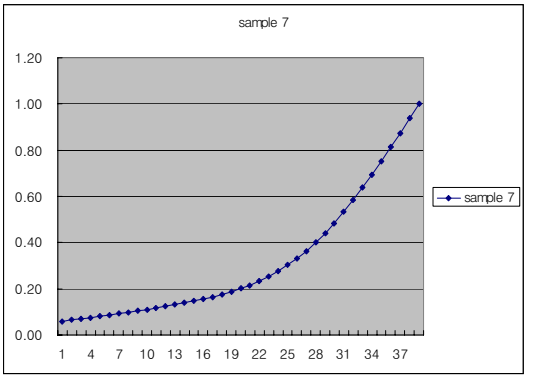

Fig 7 Third order spline of sample 7.

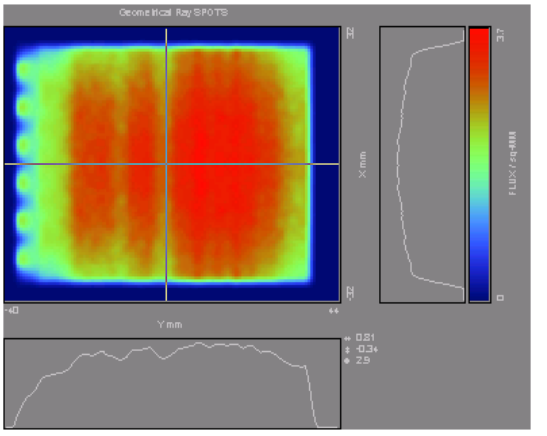

Fig 8 Simulation result of sample 7.

We have compensated each area from sample 1 to sample 7. we designed lastly the sample 7. We can get the highly and widely distributed brightness at sample 7 as compared with sample 1. When we stick to the lightproof at parts of source and out side, the uniform of brightness is more better than before.

4. Reference

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